



# United States Department of the Interior

## FISH AND WILDLIFE SERVICE

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IN REPLY REFER TO:

### Memorandum

**To:** Regional Director, Region 1  
Portland, Oregon

**From:** Assistant Regional Director, North Pacific Coast Ecoregion  
Portland, Oregon

**Subject:** Findings and Recommendations on Issuance of an Incidental Take Permit for Threatened and Endangered Species on Lands managed by the Washington Department of Natural Resources (DNR) Based on a Habitat Conservation Plan and Implementation Agreement for Listed and Unlisted Species Submitted in Support of DNR's Application (PRT 812521)

The DNR has applied to the U.S. Fish and Wildlife Service (USFWS or Service) for an incidental take permit (permit) for gray wolves (*Canis lupus*) (wolves), grizzly bears (*Ursus arctos - U.a. horribilis*) (bears), northern spotted owls (*Strix occidentalis caurina*) (owls), bald eagles (*Haliaeetus leucocephalus*) (eagles), American peregrine falcons (*Falco peregrinus*) (falcons), marbled murrelets (*Brachyramphus marmoratus marmoratus*) (murrelets), Columbian white-tailed deer (*Odocoileus virginianus leucurus*), Aleutian Canada geese (*Branta canadensis leucopareia*), and Oregon silverspot butterflies (*Speyeria zerene hippolyta*) under section 10(a) of the Endangered Species Act of 1973, as amended (ESA or Act). DNR's application is based on a Habitat Conservation Plan (HCP) (DNR 1996a) and Implementation Agreement (IA) (DNR et al. 1996) which would cover unlisted species as well as the listed species mentioned above.

This document presents the findings and recommendations of the Service on DNR's application, based on the HCP and IA, that would cover listed species on approximately 1.6 million acres and unlisted species on approximately 1.3 million acres of land managed by DNR in the State of Washington. Based on the findings stated herein, the Service staff recommend approval of the HCP and IA, and issuance of the permit to DNR, subject to the conditions described below.

#### I. DESCRIPTION OF PROPOSAL

A complete description of the HCP and IA, including a summary of HCP measures designed to minimize and mitigate the impacts of incidental take, and activities to be covered under the

permit is given in the Biological Opinion (BO) (USFWS 1997a) for the Service's action on the DNR application, which is hereby incorporated by reference.

## II. PUBLIC COMMENT

The Service published a Notice of Availability of the Draft Environmental Impact Statement (DEIS) (USDI et al. 1996a) and Receipt of an Application for the Proposed Issuance of an Incidental Take Permit for Threatened and Endangered Species on Lands Managed by the Washington Department of Natural Resources Within the Range of the Northern Spotted Owl., in the Federal Register on April 5, 1996 (61 FR 15297). Publication of the notice initiated a comment period which closed on May 20, 1996. Five public meetings were held across the State during the comment period. The Service received 173 comments, representing 181 individuals and organizations, in the form of letters and public testimony. Comments received were thoroughly reviewed by the Services and were summarized and responded to in writing in an Appendix to the Final Environmental Impact Statement (FEIS) (USDI et al. 1996b). Many of the comments resulted in changes to the proposed HCP, IA, and/or DEIS. The FEIS contains sections displaying changes to the proposed HCP, IA, and DEIS as well as the Appendix of written responses to comments by topic. The FEIS contains a complete list of commentors.

Subsequent to preparation of the FEIS, the Service published a notice of availability in the Federal Register on November 1, 1996 (61 FR 56563) at which time a 30-day waiting period was initiated. The Service received comments from 11 writers. These comments were reviewed and responses were prepared for inclusion in the Record of Decision (ROD) (USFWS 1997b).

## III. INCIDENTAL TAKE PERMIT CRITERIA - ANALYSIS AND FINDINGS

The following discussion documents the Service's findings with respect to the issuance criteria for incidental take permits established in section 10(a) of the ESA and implementing regulations.

### A. The taking will be incidental.

Takings of species under the DNR HCP and IA would result from, but would not be the purpose of, otherwise lawful activities conducted or carried out by the DNR or persons authorized by the DNR. The HCP and IA do not authorize any intended, directed, or purposeful take of any wildlife covered by the HCP.

### B. DNR will, to the maximum extent practicable, minimize and mitigate the impacts of taking northern spotted owls, marbled murrelets, gray wolves, grizzly bears, bald eagles, peregrine falcons, Columbian white-tailed deer, Oregon silverspot butterflies, and Aleutian Canada geese, and other species occurring in the habitat types found on the lands covered by the HCP.

The impacts of incidental take under the DNR HCP and IA would vary depending on the species and habitat type affected by the timber harvest or other management activity resulting in the take. Analyses of the impacts of take and the minimization and mitigation measures under the DNR HCP, for listed and unlisted species, are attached hereto and incorporated herein as Appendix A and Appendix B. Generally, the impacts of incidental take under the DNR HCP, and the effectiveness of the plan's minimization and mitigation measures to compensate for this take, depend on the habitat type upon which the species is dependent. As described in the BO, the DNR HCP is a "habitat-based" conservation plan which protects "habitat types" that occur on DNR lands covered by the HCP.

### Northern Spotted Owls

Throughout the DNR HCP lands, approximately 321,800 to 342,800 acres of existing suitable habitat may be released for harvest in the short term (first 10 years) under the HCP. That amount of habitat could be considered as a measure of the short-term impact. The proposed action is expected to result in the take of a large number of owls (about 179 owl pairs, young, and/or territorial singles) in the short term (first 10 years). Most of this short-term take is located outside the HCP Nesting, Roosting, and Foraging (NRF)-management areas that would be provided by the HCP. Additional owls (over 72 owl pairs, young, and/or territorial singles) may be taken throughout the permit period (10 to 70 years). Mitigation is in the form of NRF and dispersal habitats which are placed in strategic locations in order to maximize the benefits from those habitats. Owl sites are expected to be maintained near or above current levels in the HCP NRF-management areas and in the Olympic Experimental State Forest (OESF). The HCP NRF-management areas have been designated in proximity to Federal Reserves, established under the Northwest Forest Plan (NWFP) (USDA and USDI 1994a, 1994b), and in areas of concern, where they would provide the greatest and most effective mitigation. The mitigation package is designed to work in concert with, and complement, the NWFP.

As explained in Appendix A, although the estimated number of owls that may be taken under the HCP is large, many of these owls have a very small percentage of their home range, and/or the suitable habitat within that home range, on DNR-managed lands. As a consequence, removal of DNR habitat would have a proportionally small impact to many sites. Almost 40 percent (668,000 acres) of the DNR-managed lands in the HCP area will be managed to provide owl habitat of some type; however, not all of these lands will actually be owl habitat at any given point in time. About 12 percent or 200,851 acres (6 percent or 100,426 acres at any given time) will be managed to provide dispersal habitat, about 8 percent or 142,879 acres (6.3 percent or 106,189 acres at any given point in time) will be managed to provide foraging and dispersal habitat, and about 19 percent or 325,065 acres (5.6 percent or 93,068 acres at any given point in time) is expected to provide nesting habitat (Tables 5 and 6 of Appendix A.).

The most important features of this mitigation are its location and its certainty. The NRF-management areas are located in proximity to Federal Reserves and in areas of concern, where they would provide the greatest and most effective mitigation. For example, 115 of 145 owl cite centers in the west-side planning units are within two miles of Federal Reserves, and 66 of those 145 cite centers are inside DNR NRF-management areas. In addition, the combination of stand structure commitments and leave-tree strategy under the HCP will improve habitats for owls across all of the DNR-managed landscapes in the HCP area. The HCP provides guaranteed amounts of habitat. Without the HCP, there would be no guarantee that even the projected amounts of habitat in the FEIS would be provided. Without the HCP, a number of sites would have harvest of current DNR owl habitat restricted, but other acres could be released. Over time, as owls vacate sites or relocate, additional amounts of habitat could be harvested, resulting in less habitat, more fragmentation, and lower prospects of persistence for remaining owls. For those reasons, the HCP has distinct advantages over the current situation and the conditions that would likely prevail without the HCP.

Critical habitat for owls is unlikely to be adversely affected by the proposed action. No DNR-managed lands have been designated as spotted owl critical habitat. Edge impacts would not likely extend beyond 600 feet within Critical Habitat Units (CHUs). Less than 0.5 percent of the critical habitat units could be potentially impacted. In addition, HCP NRF-management areas have been designated in proximity to Federal Reserves (where most critical habitat units have been established) and these NRF-management areas would be managed in a manner to support the objectives of maintaining owls in those areas.

#### Marbled Murrelets

For the murrelet, the level of take under the DNR HCP would result from timber harvest and other activities on up to 74,286 acres of unsurveyed suitable marbled murrelet habitat. The DNR HCP defines suitable marbled habitat as any parcel at least 5 acres in size, within 55 miles of the marine environment, and containing at least one potential nesting platform per acre. Incidental take from the HCP would be in the form of harm and harassment. Only a small portion of this habitat is expected to be of high quality. For instance, estimates indicate that only about 18,245 acres would be likely to contain more than 2 nesting platforms per acre. The habitat prioritization and survey strategy and the commitment to protect all known occupied sites identified by the surveys minimizes the amount of take. Impacts to the murrelet would occur primarily from the potential loss of up to 5 percent of the occupied sites on DNR land. However, due to the habitat prioritization procedures specified in the HCP, this habitat is expected to be low-quality, and less important to murrelets than high-quality habitat. The mitigation in the form of identification of occupied murrelet sites, and the protection of those sites is substantial. The HCP also provides for important marbled murrelet habitat research.

The research and inventory work conducted in the first few years of the HCP would further identify occupied stands. This is a very important first step in preparation for a comprehensive adaptive management plan. A more comprehensive plan would identify the parameters which are most effective in predicting which stands have value for murrelets and are therefore likely to be used by the birds. This will be important in deciding which suitable stands to retain as potential replacement stands or to fill gaps in species distribution. A number of other relationships between murrelets and their habitat use may assist in the development of the adaptive-management strategies.

Of the existing 148,572 acres estimated to provide the minimum characteristics of murrelet habitat, it is estimated that the HCP could result in the harvest of 66 to 75 percent or 99,048 to 111,429 acres. This estimated harvest includes 74,286 acres of unsurveyed suitable low-quality habitat which may be released at the conclusion of the habitat relationship study and an additional 24,762 to 37,413 acres of surveyed, suitable, and unoccupied habitat. Of the habitat remaining at the conclusion of the habitat relationship study and surveys, at least 50 percent would be retained even if no stands were determined to be occupied. However, assuming an occupancy rate of one-third, 24,762 acres would be retained as occupied habitat. Of the 49,524 acres of suitable but unoccupied habitat which would have already been surveyed, 50 percent or 24,762 acres could be released for harvest. On average, the acreage retained for murrelet mitigation would be of higher quality than that habitat released for harvest. For instance, a portion of the 25-33 percent of the existing habitat which will be retained for murrelets is expected to provide habitat for at least 95 percent of the occupied sites on DNR-managed lands.

The HCP would protect and enhance occupied habitat associated with greater than 95 percent of the occupied sites on DNR-managed lands. It will maintain 50 percent of the high-quality suitable habitat for murrelet use, whether or not it is occupied, and will retain all of the high-quality habitat within 0.5 mile of an occupied site to ensure that opportunities for murrelet use are maintained in those areas as well. The HCP murrelet strategy would substantially improve understanding of murrelet ecology and habitat relationships, conserve important murrelet habitat, and maximize future management options.

Approximately 426,000 acres of DNR-managed lands have been designated as CHUs within the planning area. This was a substantial portion of the CHUs in some planning units. Overall, DNR manages about 26 percent of the land designated as critical habitat in Washington. Of those 426,000 acres, about 73,396 acres are currently estimated to provide suitable habitat. While significant amounts of habitat and nonhabitat containing the critical habitat primary constituent elements may be harvested, due to habitat conditions, these acres are not expected to contribute any appreciable amount to the recruitment of birds into the breeding population. However, the habitat with the most value to the species (occupied habitat and high-quality habitat within 0.5 mile of

occupied habitat) would be retained, and there would be no significant diminishment in the value the lands designated as critical habitat are currently providing. As a result, any harvest in murrelet critical habitat is not expected to decrease the value of DNR-managed lands to the survival and recovery of the murrelet.

### Bald Eagles

For eagles, the protection afforded nest sites under the proposed HCP would substantially and effectively minimize the level of take. A small amount of take may result from activities in and around other habitats, such as roosting habitat, but the protections afforded known nesting sites and the incidental benefits associated with the habitat-based approach which will protect riparian, wetland, and other habitats would provide a substantial amount of mitigation for eagles.

A cooperative management plan as required under the Washington State Bald Eagle Protection Rules (WAC-232-12-292) whenever DNR's forest-management activities are proposed near a verified bald eagle nesting territory would be required without an HCP, as would some protection of winter communal roost sites. These protections associated with the Bald Eagle Protection Act and State regulations would not be supplanted by this HCP. The proposed HCP would provide additional protection of foraging areas associated with nest sites, pilot trees, and winter feeding concentration areas throughout the HCP planning area. In addition, implementation of the proposed HCP would yield substantial benefits as a result of riparian and wetland management west of the Cascade Crest. Large trees would be more likely in riparian and wetland management areas under the proposed HCP and may serve as potential nesting trees. Furthermore, the Service expects contribution to eagle conservation under measures providing for large trees in harvest units on the west side of the Cascades. These measures would not be provided in the absence of the proposed HCP. Under the HCP, benefits to fish populations (potential eagle prey) on the west side of the Cascade Crest are also expected to be substantially greater than would be the case under current minimum State regulations.

### Peregrine Falcons

Like eagles, the protection afforded falcon nest sites under the proposed HCP would substantially and effectively minimize the level of take. A small amount of take may result from activities in and around other habitats, such as roosting habitat, but the protections afforded known nesting sites and the incidental benefits associated with the habitat-based approach which will protect riparian, wetland, cliff, and other habitats provide a substantial amount of mitigation for falcons.

The DNR HCP would provide the following conservation strategy for falcons: (1) survey cliffs likely to have use as peregrine falcon aeries; (2) protect known and potential nest sites; (3) implement wetland and riparian strategies that benefit prey species; and (4)

implement cliff and talus strategies that provide incidental protection to potential nest sites. Each of these provides clear benefits over that expected in the absence of the proposed HCP, whereby only known sites would be protected.

### Gray Wolves

The number of wolves in the planning area is low. Throughout the planning area, the HCP would protect known wolf den sites and site-specific plans would be developed for the area within 8 miles of a sighting. Under the HCP, DNR would attempt to provide more secure conditions for both wolves and their prey species by closing roads to increase big game security, and restricting forest-management activities, including road construction and use, to occur at times of the year when wolves are least likely to be present. In addition, cover would be provided through the stand-structures provided as part of the multi-species strategy and the riparian conservation strategy on the west side of the cascade Crest. This would also be expected to benefit wolf prey. Large amounts of Federal lands in the North Cascades are being managed to provide opportunities for increasing wolf populations.

Wolves are fairly adaptable. Wolves have high reproductive rates and flexible habitat needs (Wise et al. 1991). Although wolves can be impacted by roads and increased accessibility, they appear to be relatively unaffected by other forest-management activities, such as timber harvest and silvicultural prescriptions. Wolves would be conserved as well under the DNR HCP, if not better, than they would be without the proposed HCP.

### Grizzly Bears

The number of grizzly bears in the North Cascades is low. The North Cascades may have a population of 10 to 20 grizzly bears (Almack et al. 1993). The Service is in the process of completing a Grizzly Bear Recovery Plan Chapter for the North Cascades. In conjunction with this recovery effort, large amounts of Federal lands in the North Cascades are being managed to provide opportunities for increasing grizzly bear populations. Actions taken on some private lands are also being designed to provide opportunities for recovering viable grizzly bear populations in the North Cascades. Without augmentation, bear recovery is likely to be slow due to the low densities in adjacent portions of Canada. However, Servheen et al. (1991) concluded that the Washington portion of the North Cascades ecosystem contains sufficient quality habitat and space to maintain and recover a viable grizzly bear population.

Throughout the planning area, the HCP would protect known grizzly bear den sites, and site-specific plans would be implemented around documented sightings to provide temporary conflict management. The site-specific plans would be developed upon a Class I sighting and would cover a 10-mile radius for five years. These plans would be

developed in conjunction with the Service to ensure that the necessary factors are fully addressed. The DNR HCP may provide some incidental hiding cover for grizzly bears as a result of harvest unit size and configuration throughout the planning area and the leave tree strategy on the West-side planning units. The HCP also calls for the development of a Comprehensive Road Management Plan. The Comprehensive Road Management Plan is expected to address road location, construction, maintenance, buffers, use patterns, seasonal restrictions, closures, abandonment, and densities. These road management factors are some of the most important to consider in an effort to maintain suitable grizzly bear habitat. The Services will work in conjunction with DNR in developing the road plan and expect it to be completed in five years.

However, the mitigation the DNR HCP would provide does not appear to be adequate for the impacts that could occur to grizzly bears throughout a 70-year permit. In addition to the mitigation measures proposed in the HCP, the DNR HCP should also commit to reducing road densities, controlling access, providing visual screening, and retain and develop specific hiding cover designed for bears. This would be especially true should use by grizzlies be documented in the vicinity of DNR-managed lands. No enhancement or maintenance of seclusion or spring seasonal habitats would be provided by the HCP. The HCP does not provide for firearm restrictions, seasonal-use restrictions, or sanitation guidelines to reduce human-bear conflicts. These measures would be necessary to minimize and mitigate take that may occur once residency and use by bears is established.

Considered as a whole, the DNR HCP does not provide adequate minimization and mitigation measures to warrant issuance of a 70-year permit for grizzly bears. However, given the present low numbers of bears in the planning area, the minimization and mitigation measures are adequate to issue a short-term permit for grizzly bears. A 5-year permit is appropriate given the current provisions of the DNR HCP. The HCP provisions for temporary conflict management with humans and incidental hiding cover are adequate to minimize the low level of take that may result during a 5-year permit.

DNR may apply to the Service to have the 5-year permit amended to extend the grizzly bear permit coverage for an additional 65 years. In support of that application, DNR would need to amend the HCP to reduce road densities, use proper selection of road location, build roads to specific specifications, follow sanitation guidelines, control access, enhance or maintain seclusion of key seasonal habitats, restrict seasonal use of roads and forest-management activities, provide visual screening along roads, and provide hiding cover specifically for grizzly bears. The extent to which these factors would apply to specific parcels of DNR lands would depend on the value of the parcel as grizzly bear habitat for recovery of the species as discussed in the Grizzly Bear Recovery Plan (USFWS 1993:23), and identified in the North Cascades section of the Recovery Plan under development. These factors are interrelated in many ways, such that additional attention directed toward one or more factors can result in additional flexibility with

respect to other factors. For instance, if roads are effectively closed to vehicle traffic, visual screening along those roads would not be necessary. If continued reliance is placed upon site-specific plans, a contingency plan should be cooperatively developed to take effect upon a grizzly bear sighting and remain in effect until the site-specific plan is developed and implemented.

#### Aleutian Canada Geese

DNR requested that Aleutian Canada geese be included on the incidental take permit, even though the likelihood of taking this species is low. These geese winter on lakes, ponds, wetlands, grasslands, and agricultural fields in southwestern Washington, as well as in portions of Oregon and California. Aleutian Canada Geese have used habitats in southwestern Washington as migrants and winter residents. As the populations continue to increase, it is expected they will expand their wintering areas.

The DNR HCP would be unlikely to impact these geese and does not provide any specific protective measures for them. However, HCP provisions in the West-side and OESF planning units to protect water quality and wetlands would have benefits for Aleutian Canada geese. Aleutian Canada Geese would be better provided for under the HCP than they would be without the proposed HCP.

#### Columbian White-tailed Deer

DNR has requested that Columbian white-tailed deer be included on the incidental take permit even though the likelihood of taking one of these species is low. The deer's current range is limited to bottom lands and several islands in an 18-mile reach of the Columbia River near Cathlamet, Washington, and in an area near Roseburg, Oregon. DNR-managed lands within the deer's range are in the process of being transferred to the FWS as part of the Julia Butler Hansen Columbian White-Tailed Deer National Wildlife Refuge. This transfer would take place with or without the HCP. Parcels on Puget Island are leased to private landowners for agriculture, grazing, and home sites but are not covered by this HCP.

Columbian white-tailed deer are primarily grazers and utilize farm fields and pastures within a short distance of forest cover. Forest management activities within the planning area are not expected to affect Columbian white-tailed deer unless they expand from their current range during the permit duration.

Columbian white-tailed deer are not likely to be taken as a result of the HCP. DNR managed lands are within the current range of the deer are either in the process of being transferred to the Service or are not covered by the HCP. However, the riparian strategy would mitigate for effects to the Columbian white-tailed deer if their range should expand in the future.

### Oregon Silverspot Butterfly

DNR has requested that Oregon silverspot butterfly be included on the incidental take permit even though the likelihood of taking this species is low. The Oregon silverspot butterfly is found only in habitats that support its larval host plant, western blue violet (*Viola adunca*). Such habitats include coastal salt-spray meadows and open fields on the Long Beach Peninsula near Loomis Lake. DNR managed a small parcel of land near the northern end of the Long Beach Peninsula that could contain such habitat, but this parcel is no longer managed by DNR.

In spite of the lack of current habitats on DNR-managed lands, DNR has committed to avoid harvesting, road construction, aerial application of pesticides, or site preparation, within 0.25 mile of an occurrence of an individual Oregon silverspot butterfly. Herbicide spraying is another activity which could impact violets which are specifically susceptible to such chemicals. It is not expected that herbicides would be used in these habitats, and if they were used in adjacent areas, would be included in the commitment to avoid site preparation within 0.25 miles of an individual Oregon silverspot butterfly.

DNR currently has no known lands that are occupied by Oregon Silverspot Butterflies. However, should they occur in the future, the HCP provides adequate minimization and minimization.

### Unlisted Species

Appendix B presents an assessment of unlisted species and their habitats to help determine whether it is appropriate for the Service to approve the implementation agreement with the Washington Department of Natural Resources regarding unlisted species in accordance with their Habitat Conservation Plan (HCP). Appendix B forms the technical basis for the findings with respect to unlisted species, and is summarized below.

To ensure that all species which may use the habitats present on DNR-managed lands west of the Cascade Crest are adequately addressed, the DNR HCP contains a series of conservation measures. Appendix B considers the impacts that may result from the covered activities and the minimization and mitigation provided by the DNR HCP's conservation measures. In order to determine whether the impacts have been minimized and mitigated to the maximum extent practicable, the Service compared the impacts to species with the minimization and mitigation and also made comparisons to what would occur in the absence of the HCP. The Service also focused on the results expected under the HCP to ensure that, in conjunction with adjacent habitats outside the HCP lands, the subject species will have their life-requisites fully addressed.

In Appendix B, the Service describes the habitats and their characteristics in western Washington, some of the processes operating in those forests and habitats, and the types of forest conditions expected to result from management as a result of DNR's HCP. It is impracticable for the Service to analyze each of the species separately. Rather, the Service developed a number of habitat categories to assess which might be covered in the HCP. For each habitat category, the Service provides a description of that habitat category or attribute, describes or quantifies the baseline condition or status, describes the expected future condition in the absence of an HCP, and compares it to the expected result of the proposed HCP. There is also a discussion section relating the benefits received from the HCP to the various structures and functions associated with those habitats and relating those benefits to sample species which use those habitats. In Appendix B, structure refers to arrangement of elements such as snags, large wildlife trees, logs, coarse woody debris, understory vegetation, some standing live and dead trees and species communities within the landscape. Forest legacies are those structural elements that carry over from the pre-harvest stand, are maintained during regeneration harvest, and become part of the post-harvest stand.

#### Conifer-dominated Stands:

Mature forest with structure and the "old-forest" component are the most limiting at present and are expected to be of most concern in the future. It is expected that younger stands will continue to be abundant due to short rotations on other properties. Continuation of management on DNR-managed lands and continuation of stochastic events will continue to provide younger stands. The structures and diversity of younger stands are either less limiting to early seral species or are expected to improve anyway (i.e., residual structure left as a legacy from previous rotations). Therefore, the Service continues to focus its attention on the most limiting components. These habitat components are those forests and forest structures associated with unmanaged forests and forests greater than 70 years in age.

The DNR HCP would maintain conifer-dominated forests in amount and quality that would continue to contribute valuable habitat for all species associated with west-side forests and the types of habitat found on DNR-managed lands. The oldest forests would remain as a function of riparian habitat buffers, uncommon habitat buffers, unstable slopes, high-elevation areas, poor growing-site potential, occupied murrelet stands, owl nesting patches, and Natural Resource Conservation Areas and Natural Area Preserves. High-elevation areas, poor site areas, and unstable slopes may not all have the capability to grow and retain older conifer forests. The managed forest, however, would also make a contribution through a combination of structural legacies and sufficient rotation age for those legacies to function in the context of a structurally diverse forest in a manner that emulates the natural condition as much as is possible on an economically productive managed tree farm. The amounts of structurally complex forest, and to

a lesser degree, closed canopy forest, will work in concert with those stands providing older forest structures to provide landscapes which contain upland interior forest with the components and landscape juxtaposition necessary for many species. The amounts and quality of these habitats will exceed that expected without an HCP. Species dependent on all stages of conifer forest will be adequately addressed because all geographic areas will maintain some mix of older and younger stands and the quality of these stands will be better than without the HCP. But, more importantly, a sufficient quality, quantity, and juxtaposition of habitats will exist to meet the biological needs of the species associated with these conifer forests, and, therefore, these species will be adequately addressed by the HCP.

#### Deciduous Forest Stands:

In general, the quality and quantity of deciduous forests, such as maple, is expected to be similar to natural levels under the HCP. Reductions in burning for site preparation, in conjunction with the resultant decreased need for herbicide spray, will allow stands of young forest to develop with a better balance of deciduous and conifer trees. Early stages of forest stands in which significant deciduous components exist will be of higher quality under the HCP due to the structural legacies retained from the previous stand. A preference will be given for leave trees of species with propensity for cavities, such as maple. Areas which are naturally inclined to support deciduous forest will be maintained as deciduous forest and not converted to conifer species. Deciduous stands may currently be higher in amount than would occur naturally. These stands are often short-lived in comparison to conifer stands and dependent on natural disturbance regimes in most areas for their continuation. Under the HCP, these natural processes are expected to continue and would continue to dominate as a determining factor in location and amount of deciduous forest. The species which are adapted to the natural types and amounts of these deciduous habitats will continue to be adequately addressed.

#### Forest Stand Attributes:

Forest stand attributes such as snags, large wildlife trees, cavities, and downed logs are forest-habitat structures that provide many functions important to wildlife species. These forest stand attributes are expected to be of higher quality with the HCP than without it. At the time of final harvest, site preparation, which includes less burning and then subsequently less spraying, will maintain a better mix of species in future stands. Retention of residual features such as downed wood and standing trees will be important to later stands. The HCP would provide 3 large, quality snags; 2 very large or unique trees; and 3 other green recruitment trees for each acre harvested on the average. This would equate to an average of 8 stems per acre which would provide for a range of species similar to pre-harvest stands. Slight preference will be shown for certain species as snags, and younger green

recruitment trees are more likely to be shade-tolerant species. The distribution of these residual trees will be variable; when possible, they will be distributed in several patches throughout the harvest unit. Snags and coarse woody debris will likely be in higher amounts in special management areas such as NRF-management areas, dispersal-management areas, riparian and wetland-buffers, and in association with other special habitats. Generally speaking, the quantity of snags is more limiting than coarse woody debris. If sufficient snags and green trees are retained, they will eventually become coarse woody debris. The snags and leave trees retained under the HCP will be left permanently. Mid-rotation thinnings will therefore maintain snags and coarse woody debris and are also likely to accelerate understory development. Taken as a whole, the combination of shrubby understory with features such as snags, large trees, and coarse woody debris will act synergistically and provide benefits for many forest-dwelling species dependent on such attributes.

#### Landscape Attributes:

DNR Harvest units will be about 60-70 acres on the plan area. This size is a compromise between making numerous small clearcuts, which results in maximum fragmentation, and requires many roads for accessing each unit, and making few clearcuts that are very large, which produces a lot of interior forest when the subsequent stand matures, but also creates a large void on the landscape that is not fully utilized by the edge-dependent species. Rotation length is probably the single greatest determinant influencing the amount of edge versus interior forest on a landscape. Secondary considerations include size of harvest units and distribution within the planning area. DNR's average rotation is an improvement over the normal operations conducted on other commercial forest lands in the region. Harvest units might often be located near recently harvested areas to the extent allowed by State regulations regarding green-up. This would facilitate periods of activity in subbasins, followed by periods of inactivity during which time roads could be closed or abandoned. Another benefit of this management is that these harvested areas would be of similar age and, after a number of years, would start to represent larger blocks of old forest. This will also help maintain a low edge: interior ratio for blocks of mature forest, and may help to reduce the risk of wind-throw. Initial estimates of stand structures indicate that sufficient amounts of habitat will be in structurally complex forest to provide large blocks and connectivity. The riparian areas will serve as additional connective corridors. Landscape levels of closed canopy forest should ensure that connectivity of habitat patches exists at high levels.

#### Riparian Habitat:

Past forest-management practices such as insufficient buffers and instream structures, deforested and unstable slopes, and too many and poorly designed roads have resulted in riparian systems which have been degraded in several ways.

The HCP would rectify this by providing better riparian buffers, limiting activities within the riparian areas and on unstable slopes, and protecting natural processes, water quality and quantity, and features important to all riparian wildlife. The HCP incorporates adaptive management to take advantage of additional information as it becomes available and would incorporate the results of Watershed Analysis. Active restoration would be conducted on some riparian ecosystems. Under the HCP, DNR will develop a comprehensive road management plan and will develop a plan to manage Type 5 streams on stable slopes. In these ways the HCP will rectify the adverse impacts of past management and will minimize and mitigate for the impacts that will result from DNR forest-management activities.

**Wetland Habitat:**

Wetland buffers under the HCP are larger and more robust than would be expected without the HCP. If it were not for the HCP, forested wetlands would not receive protection. Natural hydrology would be maintained by provisions of the HCP. Species dwelling within wetlands will benefit from the protection of water quality and natural processes associated with the riparian and wetland areas. Species which seek forested habitats in association with wetlands will benefit from both the forested wetland protection as well as the features retained in wetland buffers such as snags and coarse woody debris.

**Aquatic Habitats:**

The combination of provisions for riparian areas, wetlands, and springs provide for conservation of aquatic species. Ecosystem protection would be derived largely from management directed at maintaining and restoring riparian ecosystem function as well as older forest conditions across much of the managed uplands which are expected to benefit all aquatic species. This management should provide the clean, cool water and the habitat components needed by these species because the HCP protects natural processes. It is expected that the protection of those natural processes, which operate in a dynamic fashion upon the aquatic environment will sustain water quality, within-water structures, and sedimentation rates at natural levels to adequately address the species adapted to life in these habitats.

**Other Special Habitats:**

Special habitats in the DNR HCP include caves, cliffs, talus, oak woodlands, prairies, grasslands, and meadows, subalpine meadows and shrub fields, alpine tundra, krumholtz, and glaciers. Each of these special habitats was examined separately as part of Appendix B. The HCP provides measures to reduce the impacts of timber harvest upon these habitat categories and the species they support. Where these habitats and features are found on DNR-managed lands,

they would persist and continue to function as wildlife habitat under the HCP. Without the HCP, there would likely be little or no conservation measures for these habitats.

#### Nontimber-related Activities:

The assessment of nontimber-related activities does not include the effects which might result from removal of timber associated with those nontimber activities. The activity of timber harvest was already considered separately. However, ground disturbance from activities such as sand and gravel extraction and construction of roads, trails, and campgrounds are considered. Disturbance and displacement of species is perhaps the most common form of impact that could occur from these nontimber activities. The 1996 level of impact will not be exceeded without an HCP amendment because these species are treated as though they were listed under the HCP.

The FEIS stated that the only activity occurring in 1996 under mining contracts was exploration. Because of this provision, all new rock mining activities would be subject to Service review and would require an amendment if additional take were expected to result.

At the present time, the Services do not have sufficient information concerning the 1996 levels of impacts resulting from sand and gravel mining on DNR-managed lands to be able to find that mining activities within riparian areas and the 100-year flood plain are sufficiently minimized and mitigated to allow a 70 to 100 year incidental take permit, when or if anadromous salmonids or other aquatic and riparian species are listed under the ESA. DNR currently has up to 40 such contracts, with 15 to 20 contracts in forested areas for the sale of sand or gravel, affecting up to 1,000 total acres. Sales under these contracts are subject to the State Environmental Policy Act (SEPA) and to DNR's SEPA policy for the elimination of conditions that are hazardous to fish. The measures needed to accomplish this are not described. DNR has advised the Services that sand and gravel mining are subject to water quality permits administered by the Washington Department of Ecology.

Due to the lack of specific information on the location and intensity of mining activities in riparian areas and the 100-year flood plain, the Services conclude that effects or impacts to any anadromous fish or other aquatic and riparian dependents species resulting from such mining activities on DNR-managed lands will only be covered by the unlisted species provisions of the IA for a period ending on January 30, 1998. Thereafter, impacts or effects from sand and gravel mining or other mining contracts will not be covered by the unlisted species provisions of the IA unless DNR has provided additional information concerning the location of such activities, and the extent of their impacts to anadromous fish and other

aquatic and riparian wildlife. This information is necessary for the Services to conclude that for a 70 to 100 year permit, mining effects on anadromous salmonid and other aquatic and riparian dependent species would be adequately minimized and mitigated for by the HCP.

**Conclusion:**

Most of the habitat types improve both fish and wildlife habitat quality and quantity, and others only improve in quantity. The younger stand stages are not expected to increase in acreage numbers but will continue to be available at adequate amounts, especially considering the availability of these habitat types on other ownerships. The younger stand stages should increase in quality due to the retention of structures from previous rotations and protections of natural processes. Restrictions on herbicide use will benefit herbaceous and deciduous components of younger stands and older mixed conifer/deciduous stands.

Older conifer forest will increase in both quality and quantity over time. While projected amounts of habitat without the HCP also include increases in the old forest amount, these amounts are not guaranteed. Attrition and movement of owl sites would decrease old forest habitat amounts in the absence of the HCP. With the HCP, an increase in older forests and a higher quality of forest is expected in other stands that will provide older forest attributes across the landscape. The HCP provides certainty that these older forest habitat types will increase in both quality and quantity.

Special habitat types such as riparian and wetland areas, caves, and talus slopes have also been addressed by provisions of the HCP and are expected to provide better fish and wildlife habitat as a result of the HCP. For many of these types, there is little or no protection without the HCP. A number of species-specific measures are also included to provide further conservation for species of concern such as the harlequin duck (*Histrionicus histrionicus*), Pacific fisher (*Martes pennanti pacifica*), and Vaux's swift (*Chaetura vauxi*).

Based upon the foregoing analysis, and the analyses in Appendix A and B of this document, the Service finds that the DNR HCP will minimize and mitigate the impacts of take of the listed species addressed herein to the maximum extent practicable and will also minimize and mitigate, to the maximum extent practicable, the impacts of taking the unlisted species dependent upon habitats on DNR HCP lands west of the Cascade Crest.

**C. DNR will ensure adequate funding for the HCP is provided.**

The proposed HCP and IA commit DNR to adequately fund implementation of the HCP. Failure by DNR to provide adequate funds to carry out the HCP would be grounds for suspension of the incidental take permit. The IA specifically states that failure by DNR to ensure adequate funding to implement the proposed HCP shall be grounds for suspension or partial suspension of the incidental take permit.

DNR-managed lands and related assets are worth nearly \$7 billion. Fiscal year 1996 revenue from trust and aquatic lands was over \$309 million. About 85 percent of DNR's revenue from State lands is derived from timber harvest (DNR 1996b). The DNR is expected to require an additional 1 to 2 million in its operating budget to implement the monitoring, research, and implementation measures contained in the HCP (DNR 1996c). This amount is no greater than what DNR would save as a result of elimination of operations surveys for northern spotted owls and what it would otherwise expend on operational surveys for murrelets (DNR 1996c).

D. The IA for DNR's HCP provides detailed procedures to deal with unforeseen and extraordinary circumstances.

The IA for the DNR HCP establishes procedures for determining whether unforeseen circumstances have arisen and, if so, a consultation process between the DNR and the Services to arrive at mutually agreed upon changes or modifications to the HCP and IA to address the unforeseen circumstances. If the parties are unable to identify measures dealing with unforeseen circumstances to which the DNR consents, the IA provides a procedure whereby the Services may demonstrate the existence of extraordinary circumstances warranting additional mitigation. The IA defines "extraordinary circumstances" as a substantial and material adverse change in the status of a species that was not foreseen on the effective date of the IA which can be remedied by additional or different mitigation measures on the HCP lands. Extraordinary circumstances may be dealt with through additional mitigation provided by the DNR with its express written consent, voluntarily made available by conservation organizations or other private sources, or, to the extent in accordance with law and available appropriations, by the Services.

The IA for the DNR HCP also mandates certain adaptive management practices to be implemented by the DNR to respond to new information or scientific developments without a determination of unforeseen or extraordinary circumstances.

E. Takings under the DNR HCP would not appreciably reduce the likelihood of the survival and recovery of the affected species in the wild.

The legislative history of the ESA demonstrates the intent of Congress that for listed threatened or endangered species this finding is to be based on a determination of "not likely to jeopardize" under section 7(a)(2) of the ESA. As a result, the Service's action on DNR's application has also been reviewed section 7 of the Act. In the BO, the Service concluded that issuance of an incidental take permit to DNR based on the HCP would not be likely to jeopardize the continued existence of the northern spotted owl, grizzly bear, gray wolf, marbled murrelet, bald eagle, American peregrine falcon, Columbian white-tailed deer, Oregon silverspot butterfly, or Aleutian Canada goose.

In the BO, the Service also determined that the proposed action would not be likely to result in destruction or adverse modification of critical habitat designated for the northern spotted owl or the marbled murrelet. No other designated critical habitat would be affected by issuance of an incidental take permit based on the DNR HCP.

Based on the analyses in this document and in NMFS (1997), the Services conclude that the DNR HCP adequately addresses the conservation of most unlisted species that may occur in the various habitat types found on the DNR HCP lands west of the Cascade Crest. As a result of the HCP, most fish and wildlife habitat types/features that occur on DNR managed lands in the planning area, would either not change significantly, or would be enhanced when compared to the no-action alternative (Appendix B). Habitat types such as mature riparian forest would be managed to increase in both quantity and quality over the term of the HCP. By conserving all habitat types which occur on DNR managed lands in the planning area, the Services believe that the HCP would provide adequate protection to all species likely to use those habitat types. The habitat management measures combined with the species-specific conservation measures will minimize and mitigate impacts to these species associated with DNR timber harvest and non-timber management activities specified under the HCP. Therefore, the DNR HCP would not be expected, directly or indirectly, to appreciably reduce the likelihood of survival and recovery in the wild of the unlisted species dependent on the habitat types covered by the HCP. However, if such unlisted species are listed in the future and DNR requests those species be added to the incidental take permit, an amendment would be necessary and consultation under section 7 of the ESA would be reinitiated.

As explained previously in this document, the Services do not have sufficient information concerning the 1996 levels of impacts resulting from sand and gravel mining to determine the effects of a 70 to 100 year permit. However, the Services have determined that mining activities within riparian areas and the 100-year flood plain would not directly or indirectly, be likely to appreciably reduce the likelihood of survival and recovery in the wild of the unlisted species dependent on the habitat types covered by the HCP beyond January 30, 1998.

**F. Other measures, as required by the Service, will be met.**

The DNR HCP and IA incorporate all elements determined by the Service to be necessary for issuance of an incidental take permit under section 10(a) of the ESA. As elaborated in the proposed HCP, DNR would implement effectiveness monitoring and report results to the Service as part of its obligations under the HCP and IA. The Service would monitor compliance in accordance with its regulatory responsibilities under the ESA.

DNR would prepare an annual report that describes the results of all monitoring activities carried out during the preceding calendar year. Monitoring reports would be completed and submitted to the Service by March 30 of each year. In addition, standard year-end reports,

such as summaries of timber sales and other management activities, will be compiled through DNR's GIS or other methods. DNR will provide any readily available existing information requested by the Service to verify the information contained in such reports.

G. The Service has received the necessary assurances that the plan will be implemented.

Signing of the IA by DNR and the Services assures that the proposed HCP will be implemented. Any incidental take permit would be conditioned on compliance with the HCP and IA.

#### IV. ALTERNATIVES

A more detailed description and analysis of the following Alternatives are contained in the DEIS and FEIS, and will be discussed and analyzed in the ROD.

Alternative A/1 (No-Action Alternative): No incidental take permit would be issued and no HCP would be implemented, for listed or unlisted species. DNR would observe Washington State forest-practices regulations and avoid take of federally listed species. DNR would likely follow its own policies where those exceed State regulations; however, those policies are subject to change at any time. This alternative was analyzed in detail in the FEIS but not selected as the preferred alternative as it did not meet the described purposes and needs of the Applicant.

Alternative B/2 (Proposed-HCP Alternative): DNR would receive an incidental take permit under section 10(a) of the ESA, based on the HCP and IA which address certain unlisted species as well as listed species such as the spotted owl and marbled murrelet. This alternative is described in detail in the proposed HCP and is summarized above. This Alternative is DNR's preferred alternative, and meets the needs of the Services. As stated in the FEIS, this alternative creates a comprehensive package of conservation measures while meeting the needs the Applicant stated in applying for an incidental take permit.

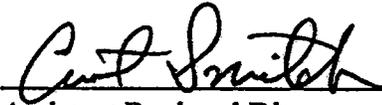
Alternative C/3: This Alternative meets the needs of the Service and provides additional benefits for fish and wildlife beyond those contained in Alternative B/2. DNR indicated that Alternative C/3 would not allow them to fulfill their fiduciary responsibility to produce sufficient revenues for the trust beneficiaries. Alternative C/3 would produce 3.4 to 16.3 percent less volume, and proportionally less revenue for the trust beneficiaries, especially in certain geographic areas. This would hinder and perhaps prevent DNR from fulfilling its fiduciary obligations to the trust beneficiaries, the DNR did not propose C/3 in its application package. Therefore, alternative C/3 was not adopted by FWS..

**V. GENERAL CRITERIA AND DISQUALIFYING FACTORS**

The Service has no evidence that DNR's permit application should be denied on the basis of criteria or conditions set forth in 50 CFR 13.21(b)(c). DNR has met the criteria for the issuance of an incidental take permit and does not have any disqualifying factor that would prevent such a permit from being issued under current regulations.

**VI. RECOMMENDATION ON PERMIT ISSUANCE**

Based on the foregoing analyses and findings, I recommend issuance of a permit to authorize incidental taking of northern spotted owls, marbled murrelets, gray wolves, grizzly bears, bald eagles, peregrine falcons, Aleutian Canada geese, Columbian white-tailed deer, and Oregon silverspot butterflies, and approval of the HCP and IA submitted in support of DNR's permit application, subject to the conditions described in Appendix C hereof.

Approve:   
Assistant Regional Director  
North Pacific Coast Ecoregion

11/30/97  
Date

Concur:   
Regional Director

11/30/97  
Date

## VII. REFERENCES

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**APPENDIX A. Analysis of Impacts of the Washington Department of Natural Resources  
Habitat Conservation Plan on Listed Species Within the Planning Area**

**APPENDIX B. Analysis of Impacts of the Washington Department of Natural Resources  
Habitat Conservation Plan on Unlisted Species Within the Planning Area**

**APPENDIX C. Recommended Permit Conditions**

**APPENDIX D. List of Scientific Names**

**APPENDIX A. Analysis of Impacts of the Washington Department of Natural Resources  
Habitat Conservation Plan on Listed Species Within the Planning Area**

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The Washington Department of Natural Resources (DNR) has applied to the U.S. Fish and Wildlife Service (USFWS or Service) for an incidental take permit (permit) for gray wolves (*Canis lupus*) (wolves), grizzly bears (*Ursus arctos* - *U.a. horribilis*) (bears), northern spotted owls (*Strix occidentalis caurina*) (owls), bald eagles (*Haliaeetus leucocephalus*) (eagles), American peregrine falcons (*Falco peregrinus*) (falcons), marbled murrelets (*Brachyramphus marmoratus marmoratus*) (murrelets), Columbian white-tailed deer (*Odocoileus virginianus leucurus*), Aleutian Canada geese (*Branta canadensis leucopareia*), and Oregon silverspot butterflies (*Speyeria zerene hippolyta*) under section 10(a)(1)(B) of the Endangered Species Act of 1973, as amended (ESA or Act). DNR has also requested that the USFWS and National Marine Fisheries Service (NMFS; collectively, Services) enter into an Implementation Agreement (IA) (DNR et al. 1996) to conserve currently unlisted fish and wildlife species which are dependent on habitats analyzed in the Habitat Conservation Plan (HCP) (DNR 1996a). DNR proposes to manage its lands in the planning area pursuant to the proposed HCP and IA that were developed as part of their permit application.

The analysis below was prepared by the Service as a detailed summary of the effects of the HCP and IA on listed wildlife species. The analysis was performed using information from the Biological Opinion (BO) (USFWS 1996), Draft Environmental Impact Statement (USDI et al. 1996a), and Final Environmental Impact Statement (USDI et al. 1996b), prepared for the Service's action on the DNR application, the HCP and IA, and other scientific and commercial information. These documents are incorporated herein by reference.

### Northern Spotted Owl

Analyses of effects of the proposed action on owls have been presented in the DEIS, FEIS, and BO.

### **Amount of Take Expected**

The FWS anticipates incidental take of spotted owl pairs, young, and/or territorial singles associated with harvest of suitable habitat as outlined below. Incidental take on these acres may be in the form of harm due to the removal of suitable habitat on DNR-managed lands, as well as harassment when harvest of this habitat occurs during the nesting season. The FWS anticipates incidental take of spotted owls associated with nontimber resource activities will be in the form of disturbance and is also summarized below.

### **West-side Planning Units**

In the near term (within the first 10 years), the FWS anticipates the incidental take in the form of harm or harassment of up to 70 known and 15 projected unknown spotted owl pairs, young, and/or territorial singles. In the long term (10 to 70 years), the FWS anticipates the incidental take in the form of harm or harassment of up to 36 potential future spotted owl pairs, young, and/or territorial singles.

## **East-side Planning Units**

In the near term, the FWS anticipates the incidental take in the form of harm or harassment of up to 47 known and 16 projected unknown spotted owl pairs, young, and/or territorial singles. In the long term, the FWS anticipates the incidental take in the form of harm or harassment of up to 36 potential future spotted owl pairs, young, and/or territorial singles.

## **Olympic Experimental State Forest**

In the near-term, the FWS anticipates the incidental take in the form of harm or harassment of up to 31 spotted owl pairs, young, and/or territorial singles. In the long-term, the FWS anticipates the incidental take in the form of harm or harassment of spotted owls associated with harvest of 3,300 to 16,300 acres per decade.

## **Disturbance-related Take**

In addition, the FWS anticipates the incidental take of spotted owls adjacent to disturbance type activities which may occur on DNR-managed lands in all three areas. Disturbance may be caused by timber harvest activities as well as nontimber resource activities. The FWS anticipates that take may occur on an average of 26,675 acres of timber harvest activities per year for the first decade. The FWS anticipates that disturbance from nontimber resource activities could affect up to 1,060 acres per year. Incidental take due to these activities will be in the form of harassment, when activities occur during the nesting season and significantly disrupt normal behavior patterns.

## **Impacts of Take**

### **Five West-side Planning Units**

In the west-side planning units, approximately 75-80 percent of the existing suitable habitat may be released for harvest in the short term under the HCP. This amount of habitat (269,000 - 287,000 acres) could be considered a measure of the short-term impact. Most of that loss would occur outside those areas considered by the Service as most important for maintenance of owls (outside NRF-management areas). Inside the NRF-management areas, about 81,500 acres of habitat would be retained. There are currently about 84,954 acres of submature or better habitat within the west-side NRF-management areas. Because excess habitat above the 50-percent target would be identified on a Watershed Analysis Unit (WAU)-specific basis and because 5 percent of the habitat may be degraded below the submature level, the amount of habitat maintained through the short term may be approximately 73,400 acres.

The worst-case scenario for habitat amounts and habitat quality within NRF-management areas are that the amount of habitat could be only 45 percent because of the provision for degradation

of 5 percent of existing habitat and that only the 300 acres in nest patches would be nesting-quality habitat. There are three reasons that the worst-case scenario is unlikely to occur.

First, stand-structure objectives from the all-species strategy indicate that under the HCP NRF-management areas would be 59 to 71 percent complex forest (older than about 70 years) by year 2096 (Tables 1 and 2). Complex forest is comparable in quality to submature forest and would provide foraging and dispersal habitat for spotted owl. At levels approaching 50-60 percent, it is expected that fragmentation will be minimized, connectivity will be maintained, and patch size will be optimized.

Second, the management objective for the NRF habitat in any given WAU will depend on an assessment of Federal and DNR-managed lands within the WAU. Where the combined Federal and DNR-managed NRF habitat averages less than 50 percent of the landscape, DNR will maintain all the NRF habitat present on DNR-managed lands within the WAU -- in some cases this exceeds 50 percent -- until the combined Federal/DNR objective of 50 percent is met. Where this goal is already met, and DNR lands are already greater than 50 percent NRF, they may harvest habitat down to the 50 percent level so long as it does not bring the combined average of Federal and DNR-managed lands below the 50 percent threshold. As an example, in a particular WAU, with equal amounts of Federal and State lands, the Federal lands contain 45 percent habitat and DNR-managed lands contain 67 percent habitat, DNR may harvest 12 percent. However, once DNR reaches the 55 percent level any further harvest would drop the combined (Federal/DNR) average below 50 percent, and would therefore not be allowed under the HCP. Thus, as a general statement, WAUs below 50 percent of DNR-managed lands will improve to the 50 percent level and not every WAU above the 50-percent threshold will be harvested down to that level to ensure that habitat remains where it is most needed.

Third, existing owl habitat is of varying quality now and will likely improve in quality if it is left untreated. Even if all 81,500 acres (50 percent of the NRF-management areas) were Old Forest, at the manipulation rate of 5 percent every 2 years, it would only take 20 years to degrade all the Old Forest to submature habitat; however this is unlikely. In many situations, Old-Forest stands would yield limited economic returns through selective thinnings that would still maintain submature characteristics. In those situations, it is more likely that DNR would maintain those habitats until 50-percent targets can be exceeded and Old Forest could be harvested as surplus, which would allow clear cutting and greater economic returns. This is primarily true in the west side planning units. Another factor contributing to habitat quality is the quality of submature habitat. Minimum standards for submature would be exceeded in many such stands. If those standards can be reached in stands that are 70 years in age, and the maturation of riparian areas is considered, then it would take rotations of 110 to 120 years to provide 50 percent of the landscape in that condition. The habitat-based approach to adequately address all species includes stand-structure objectives for DNR managed lands on the west side (Tables 1 and 2) which indicate that as much as 32 to 46 percent of west-side NRF-management areas (and 12 to 22 percent of the west-side planning units as a whole) may be in Old Forest (forest stands older than 150 years) by 2096. Another factor which contributes to Old Forest is the riparian strategy.

Many of these stands are in younger forest today, but, due to the riparian strategy, would become Old Forest by the end of the permit. The FEIS (A3-25) contains a graph depicting expected changes in riparian stand structure. These riparian stands would eventually provide Old Forest at the stand level, although they may not function as nesting habitat on the landscape unless surrounded by other parcels of older forest. In addition to these considerations, other factors such as unstable slopes and occupied murrelet stands may contribute to the availability of nesting-quality habitat.

The NRF-management areas are expected to continue contributing demographic support throughout the permit period, with no significant drop in the number of owls using these areas. However, pronounced impacts to owls would occur within the areas that are not designated for maintenance of owl habitat (900,468 acres), and, to a lesser degree, in the areas designated for dispersal habitat (115,851 acres). Only minor, incidental, amounts of nesting habitat are expected in these areas and most sites dependent on DNR habitat in these areas would be placed at risk of take. Tables 1, 2, 3, and 4 contain both 1996 conditions and those that would occur in the year 2096 under the HCP to display the increases in complex and fully functional forest habitat type (the most important habitat types for spotted owls) for the lands that would not be managed for owls or would be managed as dispersal habitat. Dispersal areas would have a greater probability of providing nesting habitat than no-role areas because of the higher amounts of habitat and their general locations near or adjacent to source populations. Both the dispersal and no-role areas would, however, provide temporary refuge for dispersing owls and single resident owls on occasion. Assuming that reproductive populations would not be maintained in these areas, the species distribution would be reduced. No-role areas comprise 76.3 percent (900,468 acres) of the west-side planning units and dispersal areas comprise another 9.8 percent (115,851 acres). In combination, about 85 percent of DNR's west-side planning units outside the OESF may be unable to function in the future as source populations of spotted owls. However, those areas are contributing little today because of the current degraded habitat conditions which would only improve under the HCP. The effects of not specifically managing for demographic support in these areas may be a general reduction in the species distribution and a lesser amount of connectivity between source areas.

Table 1. DNR HCP Stand Stage Projections at year 2096 in Percent of On-base Land Area.

Stand Stage (in years)	West-side			
	NRF	DF	No-Role	Total
Open (0-10 )	2	6	7	5-6
Regen (10-20)	5	8	12	10-11
Pole (20-40)	13	16	23	20-21
Closed (40-70)	22	30	33	31
Complex (70+)	59	39	25	31
Fully Functional <sup>1</sup> (150-200+)	32	12	9	12

<sup>1</sup> Fully Functional is a subset of Complex

Table 2. DNR HCP Stand Stage Projections at Year 2096 in Percent of On-base and Off-base Land Area.<sup>1</sup>

Stand Stage (in years)	West-side			
	NRF	DF	No-Role	Total
Open (0-10)	1-2	5-6	6-7	5-6
Regen (10-20)	4-5	7-8	10-12	9-11
Pole (20-40)	9-13	13-16	20-23	17-21
Closed (40-70)	16-22	25-30	28-33	26-31
Complex (70+)	59-71	39-49	25-35	31-42
Fully Functional <sup>2</sup> (150-200+)	32-46	12-20	9-17	12-22

<sup>1</sup> The above estimates include off-base acres (high-elevation, poor site, unstable slopes, murrelet stands, NRCAs, NAPs) where no harvest will occur. Riparian and wetland buffers were included in the on-base acres. Many off-base or riparian acres lack the potential to attain "Old-forest Conditions". For instance, many riparian areas will always be alder and not conifer due to the flooding regime and some unstable slopes will continue to be unstable and may never support anything except young alder. The figures above are displayed as a range to indicate that level of uncertainty. These should represent the Services best estimate of the HCPs result.

<sup>2</sup> Fully Functional is a subset of Complex

Table 3. DNR HCP Stand Stage Projections at year 1996 in Percent of On-base Land Area.

Stand Stage (in years)	West-side			
	NRF	DF	No-Role	Total
Open (0-10)	3	3	5	5
Regen (10-20)	10	10	13	12
Pole (20-40)	14	22	15	16
Closed (40-70)	30	47	41	40
Complex (70+)	44	18	26	27
Fully Functional <sup>1</sup> (150-200+)	15	3	2	4

<sup>1</sup> Fully Functional is a subset of Complex

Table 4. DNR HCP Stand Stage Projections at Year 1996 in Percent of On-base and Off-base Land Area.

Stand Stage (in years)	West-side			
	NRF	DF	No-Role	Total
Open (0-10)	3	3	5	5
Regen (10-20)	9	9	12	11
Pole (20-40)	12	22	15	15
Closed (40-70)	28	47	40	39
Complex (70+)	49	19	28	30
Fully Functional <sup>1</sup> (150-200+)	23	4	3	6

<sup>1</sup> Fully Functional is a subset of Complex

### OESF Planning Unit

On the OESF, most of the current Old Forest (about 50,600 - 50,900 acres) would be retained, however, because Old Forest is assessed by individual landscape planning units, some planning units currently exceed the 20-percent target and, as a result, about 10-16 percent (5,000 - 8,000 acres) of the existing OESF Old Forest would be available for harvest in the short term. This released habitat would be "metered out" (distributed through time so that an even amount would

be harvested in each decade) over a 40-60 year period thus reducing short-term impacts. The number of expected owl pairs in the Olympic Peninsula population vary depending on the assumed juvenile survivorship. Several estimates of the owl "carrying capacity" were provided in Table 4.4.14 of the FEIS.

### **East-side Planning Units**

On the east side, approximately 47,800 acres (70 percent or more of the existing 67,400 acres of suitable habitat) may be released for harvest. Most of this released habitat would occur outside NRF-management areas in areas deemed less valuable for owls. Because excess habitat above the 50-percent target would be identified on a WAU-specific basis, the amount of habitat maintained through the short term may be somewhat less than 19,550 acres.

As on the west side, the most pronounced impacts on the east side of the Cascade Crest are expected in those areas with no designated role for owls (104,700 acres) and, to a lesser degree, in the areas designated for dispersal habitat (85,000 acres). These impacts are the loss of distribution on the edge of the spotted owls' eastern range. Only minor incidental amounts of nesting habitat are expected in areas not designated as NRF-management areas and most sites dependent on DNR-managed lands in these areas would be placed at risk of take.

### **Disturbance**

HCP-wide, a minimum 70-acre seasonal restriction around nest sites will be employed for timber activities. Meaningful (i.e., 0.7-mile radius) seasonal restrictions are to be placed in effect only within the NRF-management areas and the OESF to further minimize the take of owl sites. Lack of DNR surveys, however, would negate the value of those seasonal restrictions after the first 5-10 years unless owl sites are tracked through other mechanisms. Research and monitoring in the OESF, and the associated documentation and tracking of owl sites, may retain the value of these site-specific owl provisions in that area. Owls are most likely to nest in nest patches, off-base acres, or on adjacent Federal lands. However, if nesting occurred throughout NRFMA, 50 percent could be disturbed per year and 2.5 percent of sites each year may be subject to harvest within the nesting stand.

DNR has committed to initiate the HCP amendment process if the 1996 level of incidental take increases as a result of expanding the level of nontimber resource activities on DNR-managed lands covered by the HCP. The Biological Opinion describes and quantifies the level of incidental take of spotted owls due to disturbance by nontimber activities in 1996. The HCP and Hansen (1996) describe the 1996 level of activities.

### **Description of Mitigation**

Tables 5 and 6 that explain the habitat designations that form the basis of the spotted owl mitigation. While the amount of NRF and dispersal lands is relatively small (relative to the total

area covered by the proposed HCP), and the definition of NRF habitat includes lower-quality submature habitat which only provides foraging and roosting functions on the west side and does not contribute to nesting opportunities, the distribution of the mitigation lands is efficient and effective. The quality of NRF habitat is expected to be high as a result of several factors. In order to achieve the stand structure and owl habitat commitments, DNR would need to either establish preserves or manage on longer rotations (approximately 110 to 120 years). The "off-base" acres will contribute greater amounts of old forest as time goes by. The stand structure commitments will guarantee certain minimum amounts of habitat types. The owl strategy would only allow DNR to harvest down to the 50 percent level where Federal lands in the WAU are at 50 percent. Where Federal lands have less habitat, DNR will maintain greater amounts of habitat to compensate while the federal lands are recovering. In combination with dispersal management areas, 40 percent of DNR-managed lands will be managed in some way to specifically benefit the spotted owl.

Table 5. Acres Managed Specifically for Owl Habitat (Not all the acres would be habitat at any given point in time). Percentages are of DNR-managed lands by area.

AREA NAME	TOTAL ACRES	NRF AREA	FORAGING ONLY AREA	DISPERSAL AREA	NO-ROLE AREA
West	1,179,598	20,400 (1.7%)	142,879 (12%) <sup>1</sup>	115,851 (9.8%)	900,468 (76.3%)
East	228,800	39,100 (17.1%)		85,000 (37.2%)	104,700 (45.8%)
OESF	265,565	265,565 (100%)			
<b>TOTAL</b>	<b>1,673,963</b>	<b>325,065 (19.4%)<sup>1</sup></b>	<b>142,879 (8.5%)</b>	<b>200,851 (12.0%)</b>	<b>1,005,168 (60.0%)</b>

<sup>1</sup> Because nesting habitat can also serve as foraging habitat, the following combined figures are provided: West 163,279 (13.8%); Total 467,944 (28.0%).

Table 6. Minimum Acres of Owl Habitat Possible under Owl Strategy Alone. Percentages are of DNR-managed lands by area.

AREA	NRF HABITAT	FORAGING HABITAT	DISPERSAL HABITAT
West	20,400 (1.7%) <sup>1</sup>	53,076 (4.5%) <sup>1</sup>	57,926 (4.9%)
East	19,550 (8.5%)		42,500 (18.6%)
OESF	53,113 (20%)	53,113 (20%)	
TOTAL	93,068 (5.6%)	106,189 (6.3%)	100,426 (6.0%)

<sup>1</sup>Together these two total 73,476 acres which is 45% of the 163,279 acres of NRF that could be present on the landscape at any one time. Half of the 163,279 NRF acres is 81,500 acres.

Without the HCP, there would be no guarantee that even the projected amounts of habitat in the FEIS would be provided. The HCP provides guaranteed amounts of habitat. Without the HCP, a number of sites would have harvest of current DNR owl habitat restricted, but other acres could be released. Over time, as owls vacate sites or relocate, additional amounts of habitat could be harvested, resulting in less habitat, more fragmentation, and lower prospects of persistence for remaining owls. For those reasons, the HCP has distinct advantages over the current situation and the conditions that would likely prevail without the HCP.

In addition, the NRF-management areas are located in-proximity to Federal Reserves and in areas of concern, where they would provide the greatest and most effective mitigation. The mitigation package is designed to work in concert with, and compliment, the Northwest Forest Plan (USDA and USDI 1994a, 1994b). In accordance with the areas of concern described as important in the State's spotted owl rule, the mitigation lands are a substantial contribution. The proposed owl mitigation is further analyzed by each of the 10 individual areas of concern in the following sections.

**OESF:** The entire OESF would be managed to provide owl habitat in an unzoned manner across the landscape. The OESF would be divided into 11 landscape planning units to ensure an even distribution of habitats. The objective for each landscape planning unit is 20 percent Young Forest Marginal habitat and 20 percent Old Forest habitat, for a total of 40 percent owl habitat. In the landscape planning units under 20 percent there would be no harvest of Old Forest until 20 percent is achieved; where the landscape planning unit exceeds 20 percent now, the excess habitat would be "metered out evenly" (even distribution of harvest per decade) over about 40-60 years (the predicted "recovery" phase for the OESF). Most of the Old Forest is currently over 160 years. Whenever excess exists in the future, Old Forest could, theoretically, be replaced by the newly grown Old Forest which may be of lesser quality. Such conversion would be limited by the murrelet strategy, multi-species approach, unstable slopes, and riparian areas.

The remaining portion of the 40-percent, owl-habitat target (i.e., 20 percent) could be in Young Forest Marginal habitat, which is predicted to develop at ages between 50 and 70 years. All currently existing Young Forest Marginal habitat could be "metered-out" (even distribution of harvest per decade) for harvest through the 40-60 year recovery period because it is expected that new Young Forest Marginal habitat would be coming on board to balance this out. If Young Forest Marginal/Old Forest habitats combined together function as "suitable" habitat at the landscape level, 40 percent of all DNR-managed lands in OESF would be "suitable habitat" and should maintain demographic support of owls throughout the permit period. This should also help maintain the demographic linkage to the coastal strip.

**Finney Block:** Much of the DNR-managed lands within this area of concern are within 2 miles of a Federal Reserve. As such, most of these lands have been designated to provide NRF habitat. A large contiguous block of DNR-managed lands to the north of the Finney Block runs east and west. The western half would be designated for dispersal habitat. Additional mitigation would be provided in nearby areas. Immediately west of Mt. Baker, to the north of the area of concern, lands within 2 miles of the Federal Reserve are also designated as NRF-management areas. Northwest of Steven's Pass and to the south of the Finney area, NRF-management areas have been designated adjacent to Federal Reserves. Those parcels not designated as NRF-management areas in this location are primarily Natural Resource Conservation Areas (NRCAs) or Natural Area Preserves (NAPs). There is also a small amount of NRF-management area in the Steven's Pass vicinity and again well to the south adjacent to Federal Reserves immediately to the north of I-90. All other lands in this general vicinity would be managed without objectives for owls.

**Wenatchee:** This area of concern contains about 10-12 isolated sections of DNR-managed lands. About half the lands are NRF-management areas and about half have not been designated for owl management. The NRF-management area sections are located adjacent to and interspersed with the Federal lands. None of the lands found to the north between Lake Chelan and Mazama were designated for owl management.

**Blewett Pass:** All the DNR-managed lands in this area of concern are designated as NRF-management areas; however, only three small parcels totaling about 1,000 acres are found in this area of concern. All other lands nearby to this area were not designated for owl management.

**I-90 East:** DNR-managed lands are relatively few and scattered. There is an approximately equal distribution of NRF-management, dispersal-management, and lands not designated for owls within the area of concern. A few additional sections are found on the eastern (southeastern) edge of this area of concern. About 4 of those 89 sections would be NRF-management areas and the remaining lands were not designated for owl management. Nearby this area of concern, about 8 sections of DNR-managed land would be designated as NRF-management area to the southwest and south of Blewett Pass. A mixture of NRF-management and dispersal-management areas would be provided east of White Pass. Most

other lands in nearby areas were not designated for owl management. To the south, the vast majority of the checkerboard lands to the north of the Yakama Indian Nation are designated for dispersal-management area.

**I-90 West:** The only DNR section within this area of concern is designated as a NRF-management area. Nearby, a large block of DNR-managed lands has been designated as dispersal-management areas to the west of the area of concern.

**Mineral Block:** Most lands within the area of concern are designated as dispersal-management areas, the few remaining lands are either NRF-management areas or areas not designated for owl management. The 600 to 1,200 acres immediately east of the northern extreme of the Mineral Block (Federal land) are designated as NRF-management areas. Two sections in the extreme southeast portion of this area of concern are NRF-management area, and the remaining DNR-managed lands are dispersal-management areas.

**Souixon:** DNR manages a large contiguous block of land in this area of concern. The vast majority of DNR-managed lands in this area of concern are NRF-management areas, even where such lands are further than 2 miles from Federal Reserve.

**Columbia River Gorge:** DNR-managed lands in this area of concern are split between NRF-management and dispersal-management areas. NRF-management area occurs as a contiguous block with a scattered pattern of associated parcels closer to Stevenson, while dispersal-management area is further to the west in another contiguous block with associated parcels. This should correlate with the other adjacent opportunities for connectivity in Washington and Oregon. Other lands outside the above described areas were not designated for owl management.

**White Salmon:** Several northern parcels adjacent to the Yakama Indian Nation are NRF-management areas. There are NRF-management designations north and west of Trout Lake and also a parcel of NRF-management area located in the larger block of dispersal-management area on the western edge of the area of concern. All other DNR-managed lands within the area of concern would at least serve a dispersal role. Nearby lands generally were not designated for owl management. However, a small amount of land outside the area of concern to the east of the northern portion may serve a dispersal role.

**Other Areas:** As a result of the proposed 4(d) rule (USDI 1995), the establishment of the State spotted owl rule, and the subsequent reanalysis for the Olympic Peninsula (Reanalysis Team Report; Holthausen et al. 1995), State and Federal wildlife agencies discussed designation of areas with regard to the type of contribution needed from nonfederal landowners. Several areas did not receive any such designation. These include all lands within the Straits Planning Unit and within the South Coast Planning Unit. In the Columbia Planning Unit west of I-5 or at lower-elevation areas to the east of I-5, DNR-managed lands were not designated for owl management.

One of the areas that has received particular attention despite the low density of owls is Southwest Washington. This area is generally considered that area south of Highway 8 and west of Interstate 5. Southwest Washington has been intensively harvested beginning early in Washington's history. Many portions of this area have already been harvested three or more times. Old-growth forest is conspicuously scarce, and the landscape is dominated by younger plantations (e.g., less than 45 years old). Yet, in spite of the low densities of what the Service would normally consider to be suitable owl habitat, 16 known owl sites (including two breeding pairs) have persisted. This may be related to the inherent productivity of this area. Southwest Washington contains only negligible amounts of Federal lands. State and Federal agencies have been refining the geographic areas in which they believe contributions of habitat are needed from private lands to help support spotted owl populations. These processes have not placed this type of focus on Southwest Washington to date because the owl sites in this area are remote from demographic clusters, have been experiencing low site-viability, and opportunities to improve the situation are limited.

Currently there are about 21 owl sites in the Western Washington Lowlands Province; 16 of these are in Southwest Washington and the remaining sites are adjacent to the Western Washington Cascades Province immediately to the east of this area. All 21 of these sites are dependant on nonfederal lands. The southern most sites in the Olympic Peninsula Province are similarly dependent on nonfederal lands. Of the 16 sites in Southwest Washington, DNR-managed lands contain the site centers and/or significant amounts of habitat for at least half of the sites, including both of the two breeding pairs that occur in Southwest Washington.

The Service must assess the proposed HCP in several ways; two of the considerations are discussed below. One consideration will be to determine if the lack of demographic support in Southwest Washington, as proposed in the DNR HCP, would significantly reduce the likelihood of survival and recovery of that species in the wild throughout the range of the species. In conducting the analysis, the Service's section 7 consultation process contained the assumption that other nonfederal lands would continue to be subject to section 9 prohibitions on take. In the Biological Opinion, the Service concluded that the proposed HCP would not significantly reduce the likelihood of survival and recovery of that species in the wild throughout the range of the species.

A second consideration is whether the proposed HCP would minimize and mitigate the effects of the take to the maximum extent practicable. This must be viewed in the overall context of the amount of owls to be taken and the impacts that would result. A relatively small number of sites (16) exist in Southwest Washington. The proposed HCP would likely result in the take of over half of those sites, including both breeding pairs. This would have a major impact on the owl population in that area, and would likely result in the loss of ability for Southwest Washington to support nesting owls. This would further isolate the Olympic Peninsula population from populations in the Cascades and Oregon Coast Range. However, the Reanalysis Team Report (Holthausen et al. 1995) stated that attempts to maintain a "habitat connection across southwestern Washington....would have little effect on the status of the owl population on the

Peninsula if that population was stable or nearly stable." A number of limitations of this report were listed in the Biological Opinion. The Reanalysis Team Report cautioned that their conclusions are dependent on the current understanding of demographic trends.

A larger number of owl sites would be taken throughout the remainder of the State than in Southwest Washington, but these would represent a smaller percentage of the sites in those other areas than the percentage of Southwest Washington. The Service does perform an assessment of impacts on the local level, but does not compare impacts to mitigation on local areas. The impacts of take to occur Statewide are assessed in this document relative to the mitigation proposed Statewide in the proposed HCP, which includes nesting habitat, foraging and roosting habitat, dispersal habitats in key locations across the State, and other aspects of the proposed HCP which might benefit owls. The amount of mitigation in Southwest Washington, however, is minor and merely incidental with respect to owls. As a result, the species distribution may not be maintained in this large area. The Service notes that recommendations of the Scientific Advisory Group (Hanson et. al. 1993) and the objective of the DNR HCP with regard to maintaining species distribution would not be met by the proposed HCP. However, stand-structure objectives indicate that under the HCP in the year 2096, DNR would provide 25 to 35 percent Complex Forest (approximates submature habitat) and 9 to 17 percent Fully Functional Forest (approximates Old Forest) in the areas which are not managed for owls, such as southwestern Washington (Tables 1 and 2). Compared to the percentages currently available, (Tables 3 and 4), the stand-structure objectives may ameliorate impacts to owls in this area.

#### **Comparison of Impacts and Mitigation**

In exchange for the take of over 179 owl pairs, young, and/or territorial singles in the short term (within the first 10 years), and over 72 owl pairs, young, and/or territorial singles in the long term (10 to 70 years), DNR is offering to manage a total of 669,000 acres toward demographic support and/or dispersal for owls (Table 5). This is expected to result in about 199,000 acres providing demographic support and about 100,000 acres providing dispersal habitat at any given time (Table 6). The value of that mitigation would depend on surrounding conditions (e.g., Federal Reserves). Many Late-Successional Reserves are not currently providing a full compliment of late-successional habitat, but are expected to develop greater amounts of such habitat over time. As the Late-Successional Reserves improve in habitat conditions and support larger numbers of owls, the mitigation provided by DNR would become more effective.

About 1.7 percent of the west-side planning units would be within the 300-acre nesting patches (20,400 acres total) (Tables 5 and 6). Those areas are designed to provide nesting habitat. The remainder of the habitat within west-side NRF-management areas can be submature habitat (foraging/roosting). To achieve 45 percent of the NRF-management area (50-percent target minus 5 percent which may be degraded below the submature threshold), DNR would be required to provide another 53,000 acres of submature habitat.

Those 53,000 acres represent another 4.5 percent of the west-side planning units (Table 6).

Therefore, at least 6.2 percent of the west-side planning units may be providing mitigation in the form of demographic support for the owl sites and habitats harvested elsewhere in that portion of the State. These acres would be carefully and strategically located based on a predetermined set of conditions listed in the proposed HCP on page IV.6-7. Nest habitat patches shall consist of the highest quality nesting habitat available in each 5,000-acre block and shall be identified using one of the following methods, listed in order of preference: (1) location of known status 1 site centers with highest quality habitat being designated first; (2) high quality nesting characteristics where available from inventory data; (3) Type A habitat prior to Type B habitat; (4) age class data using the oldest forest first with field verification and delineation as identified above; and, (5) where no 300-acre patches that meet these definitions exist, the next highest quality habitat would be selected. If the application of silvicultural techniques would speed the development of necessary characteristics where it is currently lacking, these activities would be permitted. These nest patches would be designated during the first year of HCP implementation.

In addition to the commitment that 50 percent would be submature or better, additional amounts of habitat above the minimum submature standard would be provided on the west-side planning units. Riparian areas, unstable slopes, and occupied murrelet habitat may contribute toward this habitat and over time are expected to develop into late-successional habitat. Stand-structure projections indicate that 31 to 42 percent of the west side units would be in complex forest (forests over 70 years) and 59 to 71 percent of the NRF-management areas would be complex forest by year 2096 (Tables 1 and 2). In dispersal-management areas 39 to 49 percent, and 25 to 35 percent in areas not designated for owl management, are expected to be in complex forests (70 years old or better) (Tables 1 and 2). Much of this forest would be owl habitat at the stand level but may occur in parcels too small, narrow, or remote to contribute meaningfully to demographic support. These areas would, however, provide opportunities for foraging and roosting within the broader landscape which may assist single or dispersing owls meet some of their life-history requirements.

Similar to the west side, east-side dispersal forest is not designed to provide NRF habitat. However, due to the lengthened rotations (110-120 years) necessary to provide 50 percent of an area in dispersal-quality habitat, some additional amount of habitat would become NRF habitat and remain in that condition for a period of time prior to harvest. These stands should assist dispersing owls by providing foraging and roosting opportunities.

The OESF forest would be composed of 40 percent suitable habitat. Some of the intervening habitat would also likely be dispersal quality. In fact, stand-structure objectives (Table 7) for on-base lands indicate that 60-70 percent of the OESF would be complex forest (older than 70 years) by 2096, a 2- to 3-fold increase from current conditions.

Table 7 . DNR HCP Stand Stage Projections by percent of total acres in the OESF. <sup>1</sup>

Stand Stage (in years)	OESF at year 1996	OESF with HCP at year 2096	OESF without HCP at year 2096
Open (0-10)	20	5-15	< 5
Regen (10-20)	25	5-15	5
Pole (20-40)	25	5-15	20
Closed (40-70)	5-10	5-15	30-35
Complex (70+)	20-30	60-70	40-50
Fully Functional <sup>2</sup> (150-200+)	< 2	10-15	10-15

<sup>1</sup> Off-base land area estimates not available for OESF

<sup>2</sup> Fully Functional is a subset of Complex

Cumulative effects were described in the BO and FEIS. Significant harvesting of private lands is expected to continue. Much of the forest base is expected to be converted to other uses, especially in the lower-elevation forests along major development corridors. The loss of a significant amount of habitat in these areas which are generally remote from Federal lands would have a small impact on the overall owl population due to the small number of owl sites currently located in these areas, their remoteness from sizeable clusters, and their overall low value toward the maintenance of the species.

The HCP commitment to not increase the level of incidental take resulting from nontimber activities is significant. As stated in the BO, the 1996 owl level of take from nontimber activities in the form of disturbance is 1,060 acres per year. That amount of take will be mitigated by DNR's commitment to manage the landscape to conserve all habitat types which occur on DNR managed lands in the planning area.

### Summary

The proposed action is expected to result in the take of a large number of owls (about 179 owl pairs, young, and/or territorial singles) in the short term (first 10 years). Most of this short-term take is located outside the NRF-management areas. Additional owls may be taken throughout the permit period. Mitigation is in the form of NRF and dispersal habitats which are placed in strategic locations in order to maximize the benefits from those habitats. Owl sites are expected to be maintained near or above current levels in the NRF-management areas and in the OESF. NRF-management areas have been designated in proximity to Federal Reserves and in areas of concern, where they would provide the greatest and most effective mitigation. The mitigation package is designed to work in concert with, and complement, the Northwest Forest Plan.

Although there is a large amount of estimated take, many of these sites have a very small percentage of their home range, and/or the suitable habitat within that home range, which overlap on DNR-managed lands. As a consequence, removal of DNR habitat would have a proportionally small impact to many sites. The HCP provides guaranteed amounts of habitat. Without the HCP, a number of sites would have current DNR habitat restricted, but other acres could be released. Over time, as sites become vacant, additional amounts of habitat could be harvested resulting in less habitat, more fragmentation, and lower prospects of persistence for remaining owls. For those reasons, the HCP has distinct advantages over the current situation.

The level of take resulting from non-timber activities is minimal and will be minimized by DNR's commitment to not exceed the 1996 levels and will be mitigated by the HCP landscape management commitments.

In the Biological Opinion, the Service found that critical habitat for owls is unlikely to be adversely affected by the proposed action. No DNR-managed lands have been designated as spotted owl critical habitat. Edge impacts would not likely extend beyond 600 feet within critical habitat units. Less than 0.5 percent of the critical habitat units could be potentially impacted (Stoll, 1996). In addition, NRF-management areas have been designated in proximity to Federal Reserves (where most critical habitat units have been established) and these NRF-management areas would be managed in a manner to support the objectives of maintaining owls in those areas.

### Marbled Murrelet

Analyses of effects of the proposed action on murrelets have been presented in the DEIS, FEIS, and BO.

#### **Amount of Take Expected**

The FWS anticipates incidental take of all marbled murrelets associated with the harvest of up to 74,286 acres of unsurveyed, suitable marbled murrelet habitat on DNR-managed lands, as discussed in the BO. Incidental take on these acres will be in the form of harm due to the removal of suitable, occupied habitat, as well as harassment, when harvest of this habitat occurs during the nesting season.

The FWS also anticipates the incidental take of marbled murrelets located on properties adjacent to disturbance type activities which may occur on DNR-managed lands. Disturbance may be caused by timber harvest activities as well as nontimber resource activities. The FWS anticipates that take from disturbance may occur on an average of 23,500 acres of timber harvest activities per year. The FWS anticipates that disturbance from nontimber resource activities could affect up to 338 acres per year. Incidental take due to these activities will be in the form of harassment, when such harvest or nontimber resource activities occur during the nesting season and significantly disrupt normal behavior patterns.

## Impacts of Take

Initially, habitat removal is expected to focus on lower-quality habitats. During the initial release of low-quality habitat, as many as 5 percent of the occupied sites on DNR-managed lands could be harvested. The amount of habitat expected to be released at this stage could be about 30-50 percent of the total amount of suitable habitat on DNR-managed lands. The remaining high-quality habitat would be surveyed.

Subsequently, upon completion of those surveys, additional habitat could be released for harvest. The amount of habitat to be released could theoretically be another 50 percent of the remaining habitat. This habitat would be high-quality, but unoccupied, habitat. It is possible, therefore, that as a result of both these stages of release that 75 percent of the suitable habitat could be released outside of the OESF and Southwest Washington. In the OESF, the provision to maintain 20 percent Old Forest for owls would prevent the release of much of the higher-quality murrelet habitat. In Southwest Washington, all of the high-quality murrelet habitat must be maintained until the completion of the adaptive-management element of the murrelet strategy is implemented, unless at least 12 months have passed since the initiation of negotiations of the draft adaptive-management element without completion of those negotiations. The provision to maintain high-quality suitable habitat within 0.5 mile of occupied sites may further restrict release of habitat depending on the distribution of occupied sites. Any release of occupied sites or further release of suitable habitat would be contingent upon completion of the adaptive-management plan. If such adaptive management were to increase the level of take anticipated, a permit amendment would be required.

The DNR HCP may result in a large number of habitat acres that could be affected by DNR-management activities (23,500 acres from timber harvest activities and 338 acres from non-timber activities). Disturbance of murrelets will result in some loss of reproductive potential. However, the actual effect of disturbance on murrelets is of less significance to the species than effects resulting from habitat loss because: 1) disturbance due to such activities is unlikely to cause adult mortality and is less likely to cause juvenile mortality; 2) the loss of a year's reproduction from disturbance is not equivalent to potential total (lifetime) loss of reproduction for a pair resulting from timber harvest; and, 3) future reproduction at a site is not precluded.

## Description of Mitigation

The commitment to survey and identify most occupied sites is significant. This allows for the protection of those sites through deferral of harvest. Almost 95 percent of DNR's occupied sites would be protected and enhanced for the length of the permit. Some incidental benefits would also be expected to accrue for murrelets as a result of the unstable slope and riparian protection strategies in the proposed HCP. However, many unstable slopes will never support mature conifer forests.

DNR has committed to initiate the HCP amendment process if the 1996 level of incidental take

increases as a result of expanding the level of nontimber resource activities on DNR-managed lands covered by the HCP. The BO discusses the incidental take of marbled murrelets on 338 acres due to disturbance by nontimber activities. The HCP and Hansen (1996) describe the 1996 level of activities.

### **Comparison of Impacts and Mitigation**

Of the existing 148,572 acres estimated to provide the minimum characteristics of murrelet habitat, it is estimated that the HCP could result in the harvest of 66 to 75 percent or 99,048 to 111,429 acres. This estimated harvest includes 74,286 acres of unsurveyed suitable low-quality habitat which may be released at the conclusion of the habitat relationship study and an additional 24,762 to 37,413 acres of surveyed, suitable, and unoccupied habitat. Of the habitat remaining at the conclusion of the habitat relationship study and surveys, at least 50 percent would be retained even if no stands were determined to be occupied. However, assuming an occupancy rate of one-third, 24,762 acres would be retained as occupied habitat. Of the 49,524 acres of suitable but unoccupied habitat which would have already been surveyed, 50 percent or 24,762 acres could be released for harvest. On average, the acreage retained for murrelet mitigation would be of higher quality than that habitat released for harvest. For instance, a portion of the 25-33 percent of the existing habitat which will be retained for murrelets is expected to provide habitat for at least 95 percent of the occupied sites on DNR-managed lands

The enhancement and protection of almost 95 percent of DNR's occupied sites for the length of the permit period is a significant action. In comparison, the 5 percent of DNR occupied sites within the "low-quality" habitat which may be harvested would be expected to be of low value for murrelet reproduction and survival, and contribute little to recruitment and maintenance of population levels. Higher-quality suitable, but unoccupied habitat would subsequently be harvested. A worst-case scenario is that 50 percent of those high-quality habitats could be harvested, including in Southwest Washington. This would be unlikely to occur during the short period of time allotted between the completion of surveys and the anticipated development of an adaptive-management element. However, it may be an accurate assumption if the adaptive-management element is not completed or is significantly delayed. Although the adaptive-management element of the strategy is not considered in the assessment at this time, that process is expected to result in comprehensive, detailed, landscape-level planning that would meet the objectives of the Service, contribute to the conservation efforts of the NWFP, and make a significant contribution to maintaining and protecting marbled murrelet populations in western Washington over the permit period.

Additionally, about 426,000 acres of DNR-managed lands have been designated as Critical Habitat Units (CHUs) within the planning area. This was a substantial portion of the CHUs in some planning units. Overall, DNR manages about 26 percent of the land designated as critical habitat in Washington. Of those 426,000 acres, about 73,396 acres are currently estimated to provide suitable habitat. While significant amounts of habitat and nonhabitat containing the primary constituent elements may be harvested, these acres are not expected to contribute any

appreciable amount to the recruitment of birds into the breeding population. However, the habitat with the most value to the species (occupied habitat and high-quality habitat within 0.5 mile of occupied habitat) would be retained and provide for no significant diminishment in the value those designated lands are currently providing. As such, the removal of these habitats is not expected to decrease the value of DNR-managed lands to the survival and recovery of the species.

### **Summary**

In this proposed permit authorization, the proposed HCP would significantly contribute to murrelet conservation based on the commitments to survey all high quality habitat, protect all known occupied sites, and not harvest 50 percent of the high-quality unoccupied habitat.

Potential take could occur as a result of harvest in unsurveyed, lower-quality habitats in stands where murrelets were overlooked during surveys (e.g., stands with fewer birds and little vocalization may be less likely to be detected); in stands which are not occupied or used for nesting at the time of surveys, but are occupied later during harvest operations; or in stands which develop nesting characteristics during the permit period and are later subjected to harvest. Potential take may also occur due to disturbance of murrelets during the nesting season as a result of timber and non-timber related activities. The level of take resulting from non-timber activities is minimal and will be minimized by DNR's commitment to not exceed the 1996 levels of take and will be mitigated by the HCP landscape management commitments. It was estimated that about 70-80 percent or more of existing murrelet habitat might be released under plan and 50 percent of the higher-quality (surveyed, but unoccupied) habitat could be harvested. The most important murrelet habitat would be protected under the HCP and the removal of the other habitats are not expected to diminish the value of the DNR CHUs within the planning area.

### **Grizzly Bear**

Analyses of effects of the proposed action on bears have been presented in the DEIS, FEIS, and BO.

Impacts to grizzly bears depend on whether bears are using the impacted areas. The number of bears currently residing in the North Cascades is low. The season of operation, type of habitat, permanency of habitat alteration, removal of cover, and placement of roads are all consideration which would determine the level of impacts to bears. Grizzly bears are particularly susceptible to displacement and mortality from roads. They are often the object of poaching and vandalism, and are often the victims of human-bear conflicts. Recent evidence, including evidence derived through a 6-year evaluation of the North Cascades, indicates that the North Cascades may harbor a small number (10 to 20) of resident grizzly bears (Almack et. al. 1993). A Recovery Plan Chapter for the North Cascades is being developed by the Service and Bear Management Situation Areas will soon be delineated. In conjunction with this recovery effort, large amounts of Federal lands in the North Cascades are being managed to provide opportunities for increasing

grizzly bear populations. Actions taken on some private lands are also being designed to provide opportunities for recovering viable grizzly bear populations in the North Cascades. Servheen et al. (1991) concluded that the Washington portion of the North Cascades ecosystem contains sufficient quality habitat and space to maintain and recover a viable grizzly bear population. However, without augmentation, the recovery is likely to be slow due to the low densities in adjacent portions of Canada. .

### **Amount of Take Expected**

The FWS anticipates incidental take of grizzly bears associated with approximately 159,000 acres of timber harvest that are within 10 miles of Class 1 or Class 2 grizzly bear sightings within the term of the HCP. Incidental take of grizzly bears associated with these acres will be in the form of harm due to the removal of suitable habitat on DNR-managed lands, as well as harassment when harvest of this habitat occurs during the denning season.

Disturbance may also be caused by nontimber resource activities. The FWS anticipates that disturbance from nontimber resource activities in the form of harassment could occur on approximately 1,010 acres per year from ORV use only. The FWS anticipates no incidental take of den sites from nontimber resource activities.

### **Impacts of Take**

Home range and habitat studies of grizzly bears suggest that optimal bear habitat includes a mixture of forested areas, used for hiding and thermal cover, as well as open meadows, avalanche chutes, and open-habitats where bears forage for plants and small mammals (LeFranc et al. 1987). It is likely that the DNR-managed lands, being lower in elevation and on periphery of Federal lands are more likely to provide spring (post-emergence) habitat which are essential to bears when first coming out of their dens in the spring. Recent research suggests that open roads with unrestrained public use can contribute to grizzly bear mortality, and females with cubs typically exhibit less preference for areas with high road density (Mace and Manley 1993; Interagency Grizzly Bear Committee 1993). Concerns regarding open-road density (roads open to the public) and available preferred habitat are related in that excessive open-road densities may displace grizzly bears from otherwise preferred habitat or expose bears to greater mortality risk should they become attracted to habitats with road networks used extensively by humans.

Foraging habitat is expected to remain constant at low-elevations. It is expected that about 5 percent of DNR-managed lands west of the Cascade Crest (excluding the OESF) would be in the open forest stage at all times. Forage, such as browse and berry-producing plants (e.g., huckleberry and serviceberry) generally increase following harvest or thinnings. This is particularly true where herbicide spraying is restricted, as is proposed in this HCP. Nonforested habitats will also provide foraging opportunities. At higher elevations, grizzly bears are attracted to open areas for forage plants, as well as concentrations of ladybug beetles and army cutworm moths. Most of the areas at higher elevations on DNR-managed lands are either NRCA/NAP,

off-base acres due to elevation, or would be entered less frequently due to slow growth. The site-specific plans proposed in the HCP are expected to minimize impacts to grizzly bears, as should the Comprehensive Road Management Plan, once it is developed.

### **Description of Mitigation**

DNR would continue to comply with the State regulations for den site protection even after the HCP would be implemented. Where den sites may go undetected, it is unlikely that operations would be conducted on steep slopes at those elevations during the winter.

Site-specific plans would be developed upon a Class I sighting and would cover a 10-mile radius for 5 years. These plans would be developed in conjunction with the Service to ensure that DNR-management activities with the potential to affect bears are fully addressed. The DNR HCP may provide some incidental hiding cover for grizzly bears as a result of harvest unit size and configuration throughout the planning area, and the leave tree strategy on the West-side planning units. Once the Comprehensive Road Management Plan is developed, it should address road location, construction, maintenance, buffers, use patterns, seasonal restrictions, closures, abandonment, and densities. These activities are some of the most important to consider in an effort to maintain suitable grizzly bear habitat. The Services will work in conjunction with DNR in developing this plan.

DNR has committed to initiate the HCP amendment process if the 1996 level of incidental take increases as a result of expanding the level of nontimber resource activities on DNR-managed lands covered by the HCP. The Biological Opinion describes and quantifies the level of incidental take of grizzly bears due to disturbance by nontimber activities. The HCP and Hansen (1996) describe the 1996 level of activities.

### **Comparison of Impacts and Mitigation**

Under the proposed HCP, open road density would not be controlled by DNR. There is no target density for open roads or total roads. Target road densities recommended have generally been less than or equal to 1 mile of road per section of land. No assessment of the amount of land within security areas was conducted, and no commitment to maintain any security areas is contained in the proposed HCP.

Road location or the placement of roads is another important factor for which no commitment has been made in the proposed HCP. Placing roads through essential bear habitats is likely to displace bears and/or place bears using those habitats in greater vulnerability. Road standards are also used to reduce the impacts of roads upon bears. Such standards are used to facilitate the eventual closure and obliteration of new roads and minimize their impacts upon bears.

Visual screening is important to reduce direct mortality of bears along open roads but is not provided for in the HCP. It is often recommended that a buffer be retained between important

grizzly use areas and new roads to provide adequate cover. Wider buffer strips may be necessary in open habitats or on steep slopes. Visual screening should also be used between prime habitats and even-aged harvest units. It is recommended that land managers provide cover as close as possible on both road edges. Cover should be retained so as to encompass open feeding sites.

Firearms are often involved when direct mortality occurs. Closing of roads is an important act to reduce direct mortality. Where roads must be used for administrative purposes, protection should be provided by closing the road to the public and restricting firearms in vehicles used for administrative purposes, especially outside of legal hunting seasons. The proposed HCP does not consider any such actions. Sanitation guidelines are also important for reducing human-bear conflicts. No such provision are contained in the proposed HCP.

Timing of activities is another commonly employed tool to avoid impacting bears while still allowing management activities to proceed. It is recommended that land managers schedule construction and activity times to avoid seasonal-use periods. Such provisions are not contained in the DNR HCP.

Once residency and use by bears is established, it would be necessary to take certain measures. These may include further lowering of road densities in those localities, additional seasonal restrictions, additional emphasis on habitat provision, and public awareness.

The mitigation proposed in the HCP does not appear to be adequate for the impacts that could occur to grizzly throughout a 70-year permit. In addition to the mitigation measures proposed in the HCP, the DNR HCP should also commit to reducing road densities, controlling access, providing visual screening, and specific hiding cover designed for bears. This would be especially true should use by grizzlies be documented in the vicinity of DNR-managed lands. No enhancement or maintenance of seclusion or spring seasonal habitats would be provided in the proposed HCP. The HCP does not provide for firearm restrictions, seasonal-use restrictions, or sanitation guidelines to reduce human-bear conflicts. These measures would be necessary to minimize and mitigate take that may occur once residency and use by bears is established.

However, DNR's HCP does include some provisions for temporary conflict management and hiding cover. The proposed HCP states that within 10 miles of a Class I grizzly bear observation, DNR would implement practicable site-specific plans to limit human disturbance on DNR-managed lands inside the Recovery Zone. Those measures to limit disturbance would remain in effect until 5 years from the date of the sighting. Upon a sighting of a grizzly bear, several steps would be necessary: verification of the sighting as a Class I sighting, development of a proposed site-specific plan, negotiation of that plan, and eventual implementation of that plan. These steps might delay effective action, especially considering the seasonal nature of habitat use by grizzlies. To avoid unnecessary impacts during the process of establishing a site-specific plan, a contingency plan should be cooperatively developed which would be placed in effect upon a grizzly bear sighting and would remain in effect until replaced by the site-specific plan.

The DNR HCP may also provide incidental hiding cover in key locations. Harvest unit size and configuration would not be specifically considered under the proposed HCP, however, harvest units which do not exceed 600 feet from hiding cover would generally be the rule. Most harvest units of under 26 acres would meet this criteria even if perfectly round. Most harvest units are not perfectly round. A 1,200 foot by 2,400 foot harvest unit would contain over 66 acres. Most DNR sales are 40-60 acres. In addition, the west-side planning units leave tree strategy provides that 1 clump of leave trees be left for each 5 acres harvested. Clumps would likely be 200-400 feet apart. This may reduce sight distances and provide access to hiding cover. Hiding cover and secure areas are particularly important in areas surrounding streams, wetlands, ridges, avalanche chutes, shrub fields, parks, and slab-rock areas. It is expected that such cover may be provided incidentally through the habitat-based approach and timber-harvest logistics. The west-side riparian protection buffers (above applicable State regulations) are wide and may also provide hiding cover for grizzly bears. The provisions regarding special habitats such as caves, talus, and wetlands on the west-side planning units should further protect key areas and provide hiding cover.

In addition, a number of areas at higher elevations have been designated as NRCAs or NAPs. These areas are usually in high elevations and contain unique habitats or features such as alpine meadows that are likely to be sought by grizzly bears. These areas would not be harvested, and non-timber activities are not likely to occur in them, and road densities may be reduced.

Geographic prioritization is often a first step in developing a management plan. During development of the proposed HCP, it was decided early on that management practices for bears would be implemented within the Recovery Zone to a greater extent than outside the Recovery Zone. However, without data from a North Cascades Recovery Plan it was not possible to further categorize lands within the Recovery Zone. It is expected that such information will become available during the first 5 years of the HCP. The Comprehensive Road Management Plan is also expected to be completed within 5 years.

### **Summary**

The DNR HCP does not provide adequate minimization and mitigation measures to warrant issuance of a 70-year permit for grizzly bears. However, given the present low numbers of bears in the planning area, the minimization and mitigation measures are adequate to issue a short-term permit for grizzly bears. A five-year permit is appropriate given the current provisions of the DNR HCP. The HCP provisions for temporary conflict management with humans and incidental hiding cover are adequate to minimize the low level of take that may result during a five year permit.

DNR may apply to the Service to have the 5-year permit amended to extend the grizzly bear permit coverage for an additional 65 years. In support of that application, DNR would need to amend the HCP to reduce road densities, use proper selection of road location, build roads to

specific specifications, follow sanitation guidelines, control access, enhance or maintain seclusion of key seasonal habitats, restrict seasonal use of roads and forest-management activities, provide visual screening along roads, and provide hiding cover specifically for grizzly bears. The extent to which these factors would apply to specific parcels of DNR lands would depend on the value of the parcel as grizzly bear habitat for recovery of the species as discussed in the Recovery Plan (USFWS 1993:23), and identified in the North Cascades section of the Recovery Plan under development. These factors are interrelated in many ways, such that additional attention directed toward one or more factors can result in additional flexibility with respect to other factors. For instance, if roads are effectively closed to vehicle traffic, visual screening along those roads would not be necessary. If continued reliance is placed upon site-specific plans, a contingency plan should be cooperatively developed to take effect upon a grizzly bear sighting and remain in effect until the site-specific plan is developed and implemented. The Service will utilize the direction in the Recovery Plan, which is being developed for the North Cascades, and the management and geographic guidance contained therein, when considering such application.

The level of take resulting from non-timber activities is minimal and will be minimized by DNR's commitment to not exceed the 1996 levels of take and will be mitigated by the HCP landscape management commitments.

### Gray Wolf

Analyses of effects of the proposed action on wolves have been presented in the DEIS, FEIS, and BO.

Historically, the major causes of the decline in wolf populations in the lower 48 States were trapping, poisoning, and shooting as well as reduction in prey abundance (Mech 1970). The effects of timber harvest on wolves depend on whether wolves are utilizing the area for denning, rendezvous sites, foraging in seasonal concentration areas, or just dispersing. The effects to wolves are also associated with the potential effects upon their prey. Although harvest can impact den and rendezvous sites, road construction and management have the highest potential to impact wolves. There have been 149 reliable observations of wolves in the planning area (within the outer boundaries of the proposed HCP area) since 1983.

### **Amount of Take Expected**

The FWS anticipates incidental take of gray wolves with the harvest of timber on approximately 430,900 acres within 8 miles of Class 1 or Class 2 gray wolf sightings on DNR-managed lands over the life of the project, as discussed under Effects of the Action. Incidental take on these acres may be in the form of harm due to the removal of suitable habitat, as well as harassment, when harvest of this habitat occurs during the denning season and significantly disrupts normal behavior patterns.

Disturbance may also be caused by nontimber resource activities. The FWS anticipates that disturbance from nontimber resource activities could occur on approximately 4,520 acres per year from ORV use only. Incidental take due to these activities will be in the form of harassment, when such harvest or nontimber resource activities occur during the denning season. The FWS anticipates no incidental take of den sites occurred from nontimber resource activities.

### **Impacts of Take**

Little proactive consideration is given specifically to wolves in the proposed HCP. Generally, increased road densities will have impacts upon wolves. Most DNR-managed lands in these areas are already at excessive road densities. Increased road densities, particularly in otherwise secluded areas, could increase the risk of direct mortality and lessen the value of those DNR-managed lands as well as adjacent lands. However, under the HCP, road construction and public access would be limited in ungulate seasonal concentration areas. This should provide wolves with some seclusion during key seasons. Removal of timber could reduce hiding and travel cover, but would be less severe on the west side where the riparian and other habitat-based strategies will be employed. Harvest, road construction, and other activities near undiscovered den sites could inhibit the survival of young wolves, as well as render suitable den and rendezvous sites unsuitable. Activities within close proximity to the den could thwart reproductive efforts for that year or result in destruction of the den. The loss of reproduction from no more than 1 percent of potential dens per year should not preclude the existence of each pack, or diminish the number of packs using DNR-managed lands. Wolves are fairly adaptable. Wolves have high reproductive rates and flexible habitat needs (Wise et al. 1991), and, although they can be impacted by roads and increased accessibility, they appear to be relatively unaffected by other forest-management activities, such as timber harvest and silvicultural prescriptions. So long as sufficient prey is provided and direct mortality is kept to a minimum, they have a reasonable chance of persisting within a given area. Large amounts of Federal lands in the North Cascades are being managed to provide opportunities for increasing wolf populations.

### **Description of Mitigation**

Den and rendezvous site protection to reduce the chance that known sites are disturbed or destroyed during that breeding season would be implemented. Seasonal consideration of road use in ungulate concentration areas would be employed to lessen impacts during key seasons such as the winter. Site-specific plans to limit human disturbance and direct mortality would be implemented within a radius of 8 miles from a Class I sighting and would remain in place for 5 years. The Service would participate in the development of such plans and must approve the final plan. Incidental benefits would be received by the provision of riparian and wetland strategies on the west side which should provide travel, thermal, and hiding cover for wolves as well as for ungulates. Cave and talus protection provided by the proposed HCP on the west side may provide incidental protection to undiscovered den sites. The balance of stand structures to benefit all species on the west side may incidentally provide ungulates with adequate foraging and cover opportunities to maintain healthy prey populations for wolves.

DNR has committed to initiate the HCP amendment process if the 1996 level of incidental take increases as a result of expanding the level of nontimber resource activities on DNR-managed lands covered by the HCP. The Biological Opinion describes the incidental take of wolves due to disturbance by nontimber activities. The HCP and Hansen (1996) describe the 1996 level of activities.

### **Comparison of Impacts and Mitigation**

Unknown den sites may be impacted, however, known den sites would receive seasonal protection to minimize the impacts occurring during that breeding season. Consideration of seasonal restrictions and road closures in important ungulate areas focuses attention where it is most necessary for wolves. Site-specific plans in the vicinity of sightings may be used to further reduce impacts to wolves and would again be most likely employed where wolves are either most numerous, or most visible, both of which are an indication that these would be areas and times where and when wolves would be most vulnerable.

Site-specific plans would be somewhat limited in utility because of their limited duration (five years) and need for a documented siting before being developed. However, site-specific plans may have potential to temporarily improve road management and other factors in the immediate vicinity of sightings. If a pack were to establish frequent and repetitive use of an area, especially in a somewhat predictable in pattern, these management plans may prove to be adequate for wolves. Continuous sightings of wolves would mean the continuation of the site management plan beyond the initial five years.

### **Summary**

The HCP would protect known den sites. Consideration would be given toward seasonal road closures and seasonal management of forest-management activities on ungulate fawning/calving areas and wintering grounds, which will also benefit wolf prey. Site-specific plans would be implemented around documented sightings. Cover would be provided through the stand-structures provided as part of the multi-species strategy on the west side of the cascade Crest. This would also be expected to benefit wolf prey. Cover would also be provided in west-side riparian areas. Wolves have high reproductive rates, flexible habitat needs, and are fairly adaptable (Wise et al. 1991), although they can be impacted by roads and increased accessibility, they appear to be relatively unaffected by other forest-management activities, such as timber harvest and silvicultural prescriptions. Wolves would be better protected under the proposed HCP than they would without the proposed HCP and incidental take permit.

The level of take resulting from non-timber activities will be minimized by DNR's commitment to not exceed the 1996 levels of take and will be mitigated by the HCP landscape management commitments.

## Bald Eagles

Analyses of effects of the proposed action on eagles have been presented in the DEIS, FEIS, and BO.

Eagles winter and nest within the planning area. There are 44 known eagle territories located on DNR-managed lands within the HCP area. Bald eagles are particularly intolerant of human disturbance during the breeding season. Human activities can cause abandonment of nests and have resulted in reproductive failures. In some cases, eagles may have relocated their nests to avoid excessive disturbance. Eagle tolerance of human activity varies between individuals. In

general, adult eagles are more sensitive to disturbance during courtship, egg-laying, and incubation, and their sensitivity decreases as young develop.

### **Amount of Take Expected**

The FWS anticipates incidental take of bald eagles associated with the harvest of timber on approximately 200,000 acres that are within 3 miles of anadromous fish bearing streams over the life of the project. Incidental take on these acres may be in the form of harm due to the removal of suitable habitat on DNR-managed lands. Incidental take in the form of harassment may occur when harvest of this habitat occurs during the nesting or wintering season, and it significantly disrupts normal behavior patterns. The FWS anticipates that disturbance associated with 34,000 acres of timber harvest may occur annually on DNR-managed lands.

The FWS also anticipates the incidental take of bald eagles from nontimber resource activities could affect up to 326 acres per year. Incidental take due to these activities will be in the form of harassment, when such harvest or nontimber resource activities occur during the nesting or wintering season, and it significantly disrupts normal behavior patterns.

### **Impacts of Take**

The proposed HCP would likely result in harvest at a level or distribution that differs from what would occur in the absence of the proposed HCP. Some of the older forest removed through harvest would be potential bald eagle nesting and/or roosting habitat. Comprehensive surveys to locate bald eagle winter concentrations and communal night roosting areas have not been conducted on most nonfederal lands since 1990, and there is no requirement to survey areas prior to harvest. On the east side, harvest of areas released from take prohibitions regarding spotted owls may have impacts upon salmonids. State regulations could form the baseline of riparian protection under the proposed HCP on the east side. This would not only impact salmonids as a prey item for eagles, but could reduce opportunities for nesting, roosting, and perching. Such riparian protection, or lack thereof, could have significant effects upon wintering eagles.

## **Description of Mitigation**

Under the proposed HCP, a site management plan would be prepared for eagle nest sites and winter roost sites, as it would under State regulations. However, under the HCP and throughout the planning area, nest site plans would include consideration of associated foraging areas, perch trees, as well as the nest site and the immediate vicinity. The disturbance of eagles at winter concentration areas would also be avoided throughout the planning area. Incidental benefits would be derived on the west side of the Cascades from the implementation of the riparian strategy and other provisions to protect aquatic habitats and benefit salmonids. Some incidental benefits may also be derived from the large tree retention strategy on the west side as well as the strategy to protect cliffs for wildlife values that would be implemented on the west side. The east-side lands would not receive this level of mitigation.

DNR has committed to initiate the HCP amendment process if the 1996 level of incidental take increases as a result of expanding the level of nontimber resource activities on DNR-managed lands covered by the HCP. The Biological Opinion describes and quantifies the level of incidental take of eagles due to disturbance by nontimber activities. The HCP and Hansen (1996) describe the 1996 level of activities.

## **Comparison of Impacts and Mitigation**

The most likely impacts to eagles are through the removal of roost sites on the east and west sides of the Cascade Crest and from activities occurring on the east side where the proposed HCP would not protect riparian areas and large trees that may be used for future nesting. Overall, the riparian and large-tree benefits, along with the stand-structure projections for on-base lands and site-specific provisions should result in a better landscape for eagles on the west side of the Cascade Crest than might occur without the proposed HCP. Large trees would be more likely in riparian and wetland management areas under the proposed HCP and may serve as potential nesting trees. Furthermore, the Service expects contribution to eagle conservation under measures providing for large trees in harvest units on the west side of the Cascades.

## **Summary**

A cooperative management plan as required under the Washington State Bald Eagle Protection Rules (WAC-232-12-292) whenever DNR's forest-management activities are proposed near a verified bald eagle nesting territory would also be required without an HCP, as would some protection of winter communal roost sites. These protections associated with the Bald Eagle Protection Act and State regulations would not be supplanted by this HCP. On both the east and west-side, the proposed HCP would provide additional protection of foraging areas associated with nest sites, pilot trees, and winter feeding concentration areas. In addition, implementation of the proposed HCP would yield substantial benefits as a result of riparian and wetland management west of the Cascade Crest. Large trees would be more likely in riparian and wetland management areas under the proposed HCP and may serve as potential nesting trees.

Furthermore, the Service expects contribution to eagle conservation under measures providing for large trees in harvest units on the west side of the Cascades. These measures would not be provided in the absence of the proposed HCP and, therefore, demonstrate a benefit of the proposed HCP over current regulations. Fish populations (potential eagle prey) on the west side of the Cascade Crest are also expected to benefit substantially over the implementation of minimum State regulations.

The level of take resulting from non-timber activities is minimal and will be minimized by DNR's commitment to not exceed the 1996 levels of take and will be mitigated by the HCP landscape management commitments.

### **Peregrine Falcons**

Analyses of effects of the proposed action on peregrine falcons have been presented in the DEIS, FEIS, and BO.

American peregrine falcons nest almost exclusively on cliffs, usually near water (within 1 mile). Physiographic characteristics of cliffs used for nesting are currently being studied, but the data have not yet been completely analyzed. Preliminary results indicate that the most preferable sites are sheer cliffs 150 feet or more in height, although some nests have been found on smaller cliffs. The cliff usually has a small cave or overhung ledge large enough to contain three or four full-grown nestlings. Several holes or ledges that can be used in alternate years are apparently not an absolute requirement but probably increase the suitability of the cliff. Peregrines have nested from near sea level to over 11,000 feet, anywhere suitable cliffs are found except in the desert.

Associated with the nest territory is a foraging area. This generally includes wooded areas, marshes, open grasslands, coastal strands and bodies of water. Wooded areas near water attract a diverse avifauna, and bodies of water provide open areas where prey cannot easily escape attack. Marshes, savannahs, and shorelines are also common foraging areas.

### **Amount of Take Expected**

The FWS anticipates the incidental take of up to one pair of peregrine falcons due to disturbance from timber harvest activities on DNR-managed lands. Incidental take at these sites may be in the form of harassment when such disturbance occurs during the nesting season, and results in a significant disruption of normal behavior patterns. The FWS anticipates no incidental take of peregrine falcons due to disturbance from nontimber resource activities.

## Impacts of Take

The impacts to peregrines are expected to be minor. Prey habitats are expected to be protected on the west side of the Cascade Crest. On the east side of the Cascade Crest, many prey areas are likely prairie wetlands and other nonforested areas. Protection of potential nest sites and surveys of likely sites would all serve to significantly reduce impacts to peregrines.

## Description of Mitigation

To protect the nesting/breeding habitat of the peregrine falcon, DNR would implement the following actions: (1) conduct field reviews, by staff knowledgeable of peregrine biology and requirements, of all cliffs in excess of 150 feet; (2) conduct protocol surveys for peregrine falcon aeries at cliffs judged to have likely potential for use (i.e., a rock cliff vertical face greater than 150 feet); (3) review and, where necessary, manage public access to DNR-managed lands within 0.5 mile of a known peregrine aerie; (4) protect ledges on cliffs judged suitable for aeries; (5) retain trees along the base and top of cliffs judged suitable for aeries, especially perch trees along the top of cliffs; (6) keep the location of peregrine aeries on DNR-managed lands confidential to the extent permitted by law; and (7) avoid harvesting, road construction, aerial application of pesticides, or site preparation within 0.5 mile of a known active nest site between March 1 and July 30 or within 0.25 mile of the nest at other times of the year.

Site-specific prescriptions would be implemented that will protect falcons. DNR would: (1) preceding harvest activities around cliffs greater than 25 feet tall and below 5,000 feet in elevation, determine if use by wildlife is likely; (2) where wildlife use of fissures, overhangs, ledges, and raptor perch trees are present, protect the integrity of cliffs during felling, yarding, and other actions; (3) retain trees on cliff benches and along the base and top of cliffs judged suitable for nesting raptors, especially perch trees along the top of cliffs; and (4) avoid the damage to significant cavities, fissures, and ledges. Protection afforded riparian areas, wetlands, and other special habitats would maintain suitable foraging habitat for peregrines on the west side of the Cascade Crest.

Incidental benefits and minimization of impacts are also expected to result from implementation of the talus strategy. Talus rock often accumulates along the base of cliffs. The proposed HCP includes provisions which limit the harvest of forested talus and provides managed buffers surrounding talus fields. Reduced harvests and road building in those talus areas which tend to be found at base of cliffs would reduce the impacts to falcons nesting on those cliffs.

DNR has committed to initiate the HCP amendment process if the 1996 level of incidental take increases as a result of expanding the level of nontimber resource activities on DNR-managed lands covered by the HCP. The BO describes the zero level of incidental take of falcons due to disturbance by nontimber activities. The HCP and Hansen (1996) describe the 1996 level of activities.

## Comparison of Impacts and Mitigation

The impacts are expected to be low based on the nature of the protection afforded potential and active nest sites. Foraging sites would be protected on the west side of the Cascade Crest by the wetland conservation strategy and are less likely to be disrupted as a result of timber-related activities on the east side of the Cascade Crest because many of the foraging sites would be nonforested uplands or wetlands. The mitigation to protect active aerie sites as well as protect potential sites, is significant. The riparian and wetland strategies on the west side of the Cascade Crest would contribute habitat to the maintenance of prey species. The level of take would be minimized to very low levels by protecting sites with the most potential to be used by falcons as aeries.

## Summary

The proposed HCP offers a simple protection strategy for falcons: (1) survey likely cliffs; (2) protect known and potential nest sites; (3) implement wetland and riparian strategies that benefit prey species; and (4) implement cliff and talus strategies that provide incidental protection to potential nest sites. Each of these provides clear benefits over that expected in the absence of the proposed HCP, whereby only known sites would be protected.

The level of take resulting from non-timber activities is zero.

## Aleutian Canada Geese

DNR requested that Aleutian Canada geese be included on the incidental take permit, even though the likelihood of taking this species is low and the proposed HCP would be unlikely to impact these geese. Aleutian Canada Geese winter on lakes, ponds, wetlands, grasslands, and agricultural fields in southwestern Washington, as well as in portions of Oregon and California. Aleutian Canada Geese have used habitats in southwestern Washington as migrants and winter residents. As the populations continue to increase, it is expected they will expand their wintering areas.

## Amount of Take

Incidental take in the form of harassment (disturbance) may be caused by timber harvest and nontimber resource activities. Due to the rare occurrence of Aleutian Canada geese on DNR-managed lands and their lack of association with habitats where these activities occur, the FWS does not anticipate these activities will incidentally take any Aleutian Canada geese.

## **Impacts of Take**

The impacts to Aleutian Canada geese are minimal due to the rare occurrence of the geese on DNR-managed lands and their lack of association with forested habitats.

## **Description of Mitigation**

The HCP does not provide any specific protective measures for geese. However, HCP provisions in the West-side planning units for salmonids that protect water quality and protective measures for wetlands would have benefits for Aleutian Canada geese. The explicit riparian conservation strategy of larger and less manipulated buffers on ponds and lakes (Type 1 through 4 Waters), including inner riparian management zones (minimum 100 feet) and outer wind buffers where there is a moderate potential for windthrow, will effectively maintain or increase the amount and quality of resting and foraging areas available to the species. The HCP's increased buffers and restrictions of harvest activities within riparian management zones, would

maintain the quality of aquatic systems, including lakes and ponds that Aleutian Canada geese might use for foraging and resting sites along its migratory route.

Within the OESF, enhanced riparian ecosystem quality derived from 150-foot average inner-core buffers on Type 1 through 3 Waters and 50-foot inner buffers on Type 4 and 5 Waters will minimize the impact of forest management activities on Aleutian Canada goose habitat. Furthermore, protection of forage and resting opportunities as a direct result of prohibited harvest within 50 feet of nonforested wetlands will likely occur.

DNR has committed to initiate the HCP amendment process if the 1996 level of incidental take increases as a result of expanding the level of nontimber resource activities on DNR-managed lands covered by the HCP. The Biological Opinion describes and quantifies the level of incidental take of Aleutian Canada goose due to disturbance by nontimber activities. The HCP and Hansen (1996) describe the 1996 level of activities.

## **Comparison of Impacts and Mitigation**

The likelihood of take is low. Benefits would be provided by the HCP riparian strategy and wetland protection provisions. Maintaining water quality and protecting lakes and ponds classified as Type 1, 2, 3, or 4 Waters would enhance resting areas, and protecting associated riparian vegetation would maintain foraging opportunities. Wetland buffers would maintain forage opportunities due to the restriction on the types of timber harvest activities that would be allowed within them.

DNR's nontimber resource activities occur almost exclusively in forested habitat and along roads with the exception of grazing leases, which occur east of the Cascade crest, and approximately 80 acres of leased electronic sites situated on non-forested mountain tops. Due to the rare

occurrence of Aleutian Canada geese on DNR-managed lands and their lack of association with forested habitats, DNR's nontimber resource activities in 1996 had no impact on the Aleutian Canada goose.

### **Summary**

The DNR HCP will provide benefits to Aleutian Canada Geese through implementation of the riparian strategy and wetland protection provisions. Aleutian Canada Geese would be better provided for under the HCP than they would be without the proposed HCP.

### **Columbian White-tailed Deer**

DNR has requested that Columbian white-tailed deer be included on the incidental take permit even the likelihood of taking one of these species is low. The deer's current range is limited to bottom lands and several islands in an 18-mile reach of the Columbia River near Cathlamet, Washington, and in an area near Roseburg, Oregon. DNR-managed lands within the deer's range are in the process of being transferred to the FWS as part of the Julia Butler Hansen Columbian White-Tailed Deer National Wildlife Refuge. Parcels on Puget Island are leased to private landowners for agriculture, grazing, and home sites but are not covered by this HCP.

Columbian white-tailed deer are primarily grazers and utilize farm fields and pastures within a short distance of forest cover. Forest management activities within the planning area are not expected to affect Columbian white-tailed deer unless they expand from their current range during the permit duration.

### **Amount of Take**

Incidental take in the form of harassment (disturbance) may be caused by timber harvest and nontimber resource activities. DNR-managed lands inhabited by the Columbian white-tailed deer are not part of the HCP area. The FWS does not anticipate any incidental take through implementation of the HCP.

### **Impacts of Take**

The proposed HCP does not address agricultural activities and the leasing of agricultural lands. DNR is already cooperating with the Service in the management of areas important to these deer. It is expected that activities under the proposed HCP would be unlikely to affect Columbian white-tailed deer.

### **Description of Mitigation**

No specific mitigation measures for Columbian white-tailed deer are provided in the DNR HCP. However, the HCP riparian conservation strategy may prove beneficial for the riparian and tidal

forests that are potential habitat for these deer should the deer expand their range.

DNR has committed to initiate the HCP amendment process if the 1996 level of incidental take increases as a result of expanding the level of nontimber resource activities on DNR-managed lands covered by the HCP. The Biological Opinion describes and quantifies the level of incidental take of Columbian white-tailed deer due to disturbance by nontimber activities. The HCP and Hansen (1996) describe the 1996 level of activities.

### **Comparison of Impacts and Mitigation**

The impacts to Columbian white-tailed deer will be minimal because they are not currently known to inhabit lands covered by the HCP. The riparian strategy in the proposed HCP is most likely beneficial to this species should they expand their range. Since the impacts are minimal, the incidental mitigation is adequate.

### **Summary**

Columbian white-tailed deer are not likely to be taken as a result of the HCP. DNR managed lands are within the current range of the deer are either in the process of being transferred to the Service or are not covered by the HCP. However, the riparian strategy would mitigate for effects to the Columbian white-tailed deer if their range should expand in the future.

### **Oregon Silverspot Butterfly**

DNR has requested that Oregon silverspot butterfly be included on the incidental take permit even though the likelihood of taking this species is low. The Oregon silverspot butterfly is found only in habitats that support its larval host plant, western blue violet (*Viola adunca*). Such habitats include coastal salt-spray meadows and open fields on the Long Beach Peninsula near Loomis Lake. DNR managed a small parcel of land near the northern end of the Long Beach Peninsula that could contain such habitat, but this parcel is no longer managed by DNR.

### **Amount of Take Expected**

Incidental take in the form of harassment (disturbance) may be caused by timber harvest and nontimber resource activities. The Oregon silverspot butterfly is not known to exist on any DNR-managed lands and DNR-managed lands contain no potential habitat. The FWS does not anticipate these activities will incidentally take any Oregon silverspot butterflies.

### **Impacts of Take**

The impacts to Oregon silverspot butterflies are minimal due to the rare occurrence of these butterflies on DNR-managed lands and their lack of association with forested habitats.

## **Description of Mitigation**

In spite of the lack of current habitats on DNR-managed lands, DNR has committed to avoid harvesting, road construction, aerial application of pesticides, or site preparation, within 0.25 mile of an occurrence of an individual Oregon silverspot butterfly. Herbicide spraying is another activity which could impact violets which are specifically susceptible to such chemicals. It is not expected that herbicides would be used in these habitats, and if they were used in adjacent areas would be included in the commitment regarding site preparation.

DNR has committed to initiate the HCP amendment process if the 1996 level of incidental take increases as a result of expanding the level of nontimber resource activities on DNR-managed lands covered by the HCP. The Biological Opinion describes and quantifies the level of incidental take of Oregon silverspot butterflies due to disturbance by nontimber activities. The HCP and Hansen (1996) describe the 1996 level of activities.

## **Comparison of Impacts and Mitigation**

The impacts to Oregon silverspot butterflies are expected to be minimal since the species rarely occurs on DNR-managed lands and DNR has provided protective prescriptions to ensure they would be protected if found on their lands.

## **Summary**

DNR currently has no known lands that are occupied by Oregon silverspot butterflies. However, should they occur in the future, the HCP provides adequate minimization and minimization.

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**APPENDIX B. Analysis of Impacts of the Washington Department of Natural Resources  
Habitat Conservation Plan on Unlisted Species Within the Planning Area**

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## INTRODUCTION

The Washington Department of Natural Resources (DNR) has requested that the U.S. Fish and Wildlife Service (USFWS or Service) and National Marine Fisheries Service (NMFS; collectively, Services) enter into an Implementation Agreement (IA) (DNR 1996a) to conserve currently unlisted fish and wildlife species which are dependent on habitats analyzed in the Habitat Conservation Plan (HCP) (DNR 1996b). DNR proposes to manage its lands in the planning area pursuant to the HCP and IA that were developed as part of their agreement request.

The analysis below was prepared by the Service as a detailed summary of the effects of the HCP and IA on unlisted fish and wildlife species. The analysis was performed using information from the Draft Environmental Impact Statement (USDI et al. 1996a), and Final Environmental Impact Statement (USDI et al. 1996b), prepared for the Service's action on the DNR request, the HCP and IA, and other scientific and commercial information. These documents are incorporated herein by reference. Scientific names of species identified in the text are presented in Appendix D.

The DNR HCP and IA would cover all species that may occur in the HCP habitat types within the planning area west of the Cascade Crest. Congress intended that unlisted species could be covered by HCPs as if they were listed. To ensure such species are adequately addressed, the Applicant's HCP proposes to address the range of habitats that exist on the planning area west of the Cascade Crest, including riparian protection, unique/uncommon habitat management, and provision of a range of forest stand structures in addition to the HCP conservation measures proposed for the listed species that would also benefit unlisted species dependent on similar habitats. In combination, these conservation measures provide significant benefits to fish and wildlife species that may occur in the area, particularly when compared to that expected in the absence of the DNR HCP. Without the HCP, DNR has little, if any, obligation to provide conservation measures for many of the unlisted species or their habitats. This includes fish and other riparian obligates.

For the Service to provide an applicant with assurances regarding unlisted species, the Service must find that the DNR HCP and IA would adequately address the conservation of those species for which coverage is sought, as though they were listed. However, it is impracticable to analyze each of these species separately regarding their individual habitat and life-history requirements relative to the considered actions under the alternatives. Rather, the DNR HCP and this document propose a habitat-based approach to conservation and assessment of impacts. The HCP would maintain a range of forest successional conditions across the plan area at all times. The primary assumption with regard to impacts to these unlisted species is that if adequate amounts of habitat of sufficient quality are provided and other factors do not preclude the use of that habitat, then these unlisted species will persist and flourish. The question is whether the combination of the described protective minimization and mitigation measures, natural diversity within the habitats on DNR-managed lands, and the diversity of treatments to be implemented

under each of the alternatives would provide a sufficient amount of habitat for these species, in conjunction with habitats provided on adjacent ownerships.

Although the Service analyzed all habitat categories in this document, there are several upon which it places particular emphasis. "Mature forest with structure" (e.g., large trees, multiple canopies, snags, coarse woody debris, horizontal and vertical diversity) is one ecosystem component that the Service has identified as most in need on western Washington landscapes, currently and in the future. The current landscape condition has been altered from its historic state via the harvest and fragmentation of old-growth forests which supported habitat for a number of obligate species. For a number of reasons described below, the Service is less concerned about other stand structures which occur within the rotation age of a typical managed forest. A corollary issue is the effect of this decline of older forests on the health of aquatic and riparian systems. Again, the Service has identified mature forest with structure as a key component of a "properly functioning" riparian/aquatic system. These conclusions were drawn by assessing the forest conditions that are prevalent on the landscape today, those conditions expected if the industrial forest-management practices of recent years were to continue, the impacts that have been evident as a result of such management, and by contrasting those conditions and impacts with the conditions expected under management that emulates the natural forested condition under which the species in question evolved. The Service goals are related to conserving habitat for many species by protecting natural functions necessary for ecosystem health and biodiversity; developing and maintaining habitat which may be of limited availability in surrounding landscapes (especially mature forest with structure) and other existing unique habitats; and providing healthy riparian areas which will protect water quality and aquatic species.

Under the HCP, additional mitigation for species of concern would be provided as follows: (1) harlequin duck: no activity allowed that would appreciably reduce likelihood of nesting success within 165 feet of a known active nest between May 1 and September 1; (2) northern goshawk: no activity allowed that would appreciably reduce likelihood of nesting success within 0.55 mile of a known active nest between April 1 and August 31; (3) common loon: no activity allowed that would appreciably reduce likelihood of nesting success within 500 feet of a known active nest between April 1 and September 1; (4) Vaux's swift: trees and snags known to be used as night roosts will not be harvested; (5) myotis bats: trees and snags known to be used as communal roosts or maternal colonies will not be harvested; and, (6) California wolverine and Pacific fisher: no activity allowed that would appreciably reduce likelihood of denning success within 0.5 mile of a known active den between January 1 and July 31 (for wolverine) or February 1 and July 31 (for fisher).

On the OESF, additional mitigation for species of concern would be provided as follows: (1) Vaux's swift: trees and snags known to be used as nests or night roosts will not be harvested; (2) Myotis bats: trees and snags known to be used as communal roosts or maternal colonies will not be harvested; and, (3) Fisher: within 0.5 mile of a known active den between February 1 and July 3, no activity that would appreciably reduce likelihood of denning success. Exceptions to

the additional mitigation restrictions, on the OESF, related to nesting and roosting are limited to formal, experimental studies designed to address information needs related to integrating conservation and production or as other exceptional circumstances warrant.

## **BACKGROUND**

The forested conditions of western Washington are generally dominated by subclimax Douglas-fir and climax western hemlock and western red cedar. Hardwoods can be common on recently disturbed sites and special habitats. Common hardwoods include red alder and big-leaf maple. Common understory plants include vine maple, ocean spray, snowberry, huckleberries, swordfern, and salal. As elevations increase, there are a number of different zones that occur. Near the coast, there is a "fog-drip" zone dominated by Sitka spruce and western hemlock. Further inland, western hemlock still dominates but spruce becomes scarce. Grand fir and Douglas-fir comprise the most common species in the next zone. As elevations increase, subalpine forests consisting of Pacific silver fir and subalpine fir become more common. Noble fir and mountain hemlock occur near timberline and alpine regions.

Prior to timber harvest, openings in the forest were generally a result of stochastic events such as disease, insects, wind, and fire, as well as floods, mass-wasting, beaver activity, etc. Species which utilize openings and early-seral stages evolved with these forests and developed dispersal capabilities to adeptly pioneer new and transient habitat patches resulting from disturbances. These species capitalize on opportunities to reproduce when and where these ephemeral habitats are available. These species are often characterized as "R-selected" species. These ephemeral patches soon begin to move through successional pathways and add to the biodiversity of the forest through a series of age and structure classes.

In western Washington, insects and disease influence landscapes and participate in creating the biodiversity sought by many species. Laminated root-rot is one of the most common diseases of forests west of the Cascades, and accounts for the majority of root-disease mortality in the region. The disease is spread by rootlets of infected tree contacting rootlets of uninfected trees. The pathogen persists in soil within dead decomposing wood for as long as 50 years after removal of infected stumps. Most conifers, other than red cedar, experience mortality readily. The most often used treatment is to clearcut the entire infected area and plant laminated root-rot-resistant tree species for a rotation. This adds species diversity on a landscape level. Another treatment is to remove susceptible trees from the smaller infected area and to plant or encourage resistant trees, this adds diversity at the stand level. Alder is resistant and is thought to inhibit the pathogen through its nitrogen-fixing abilities as well as some other functions. Laminated root-rot has resulted in much of the horizontal, within-stand diversity we see today in western Washington.

Dwarf mistletoes can affect all conifers, with each species infected by a different dwarf mistletoe strain. This disease is very prevalent in hemlock stands. Long-term effects are a general loss of vigor in infected trees, including loss of growth, top-kill, and distortion (brooming) dependent

on degree of infection. Older trees may survive infection, although there may be large growths or brooms on lateral branches. Younger trees in an understory beneath such infected older trees will likely not survive to maturity. Mistletoe brooms and platforms on horizontal branches form much-needed structures for many wildlife species, such as the marbled murrelet. Johnson's hairstreak butterfly are also dependent on this plant. These structures, in conjunction with trees of sufficient size, canopy density, and/or other characteristics within a stand are often responsible for creation of needed habitat for species of concern such as the spotted owl and the marbled murrelet.

Heart-rots are also known to affect Pacific Northwest conifers. These are fungal diseases spread by wind-borne pollen. Heart-rots are very important to cavity-nesters which require strong structural shells and inner decayed wood to produce suitable cavities. White-pine blister rust is a disease likely to infect white pine stands on the west side of the Cascades. It can eventually cause mortality of individual trees through gradual drain of vigor. Blister rust is responsible for much of the historic decline in western white pine. Western white pine is a reliable source of valuable seed for wildlife forage and the HCP has special provisions for this tree species when found in association with oak woodlands.

Douglas-fir beetle as the name implies, is specific to Douglas-fir. Stand-wide loss of vigor and even mortality are possible depending on seriousness of outbreak. Losses on the Gifford Pinchot National Forest have been extensive in the last several years. Spruce bud worm and Pine bark beetle are not very prevalent on the west side of the Cascade Crest.

As a general rule, forest pathogens afflict individual trees or stands that have been stressed by some other cause such as logging, ice, or wind damage; suppression and crowding; moisture; or senescence. Some of these damages are beyond the control of the forest manager, such as moisture, wind, and ice damage. However, maintaining a diversity of tree species within a stand, and careful thinning to keep individual stems growing vigorously, will generally reduce susceptibility to infection or infestation.

From a wildlife perspective, diseases and insects often introduce much needed diversity into otherwise monotypic single-aged stands. However, insects and disease, when they occur at landscape-level epidemic proportions, may not benefit wildlife and represent a negative economic impact to the landowner. Little is known about the factors that determine when, where, and to what extent such an outbreak may occur. For the most part, stand-level management practices typically employed by land-managers are not likely to precipitate an outbreak of a forest pathogen. Landscape-scale management practices, coupled with climatic conditions, are generally the causes behind widespread insect and disease outbreaks. Large epidemics have the potential to engulf stands on a stochastic basis, and for the most part, site-specific management practices, unless they are extreme, could be ineffective in forestalling loss of timber in these instances.

Windthrow potential is a function of many interrelated factors: Species of tree, form and history of tree, depth of rooting, soil characteristics, soil-moisture saturation, severity and frequency of wind storms, stand level characteristics, and position on the landscape. Windthrow can have positive and negative effects for wildlife, but only has negative effects economically.

Windthrow will be avoided by all alternatives, however, it will not likely be eliminated under any of the alternatives. Given the attention received by this potential loss, windthrow will not likely be a significant factor under any of the alternatives.

Fire can be a major landscape altering event. There are several characteristics of a fire regime that determine its influence on the landscape. Frequency is how often a fire occurs in a stand. Intensity is how hot a fire burns; while severity relates to the impact on the trees. Severity incorporates intensity with the fire adaptations of the species or ecosystem of interest. Extent is how wide spread a fire becomes on the landscape. How these factors are integrated into a fire regime depends on the region of interest (Agee 1994). Drier regions tend to have more frequent fires and wetter regions have fires less-often. However, severity is often inversely related to frequency so that fires in wetter regions, when they do occur, are often of high severity and may be stand-replacing fires.

On the western Olympic Peninsula and along the coast in Southwest Washington (Willapa Hill:), the conditions are generally wet and this area is under the influence of a maritime climate. This region has a minimal fire history due to the tremendous amount of precipitation received annually, very-high levels of moisture and low ambient temperatures present throughout the summer, dense lush undergrowth, and low incidence of lightning strikes. However, although infrequent, fires have been intense and severe when they have rarely occurred. In the western Cascades, Southwest Washington away from the coast, and central and southern Puget Trough the conditions are mesic in nature with a moist climate. Fires are generally low or low to moderate in frequency but moderate to high in intensity. Drier sites within this region may have more frequent but low intensity fires.

Although fire is a part of the ecosystem, the character of the vegetation and the western Washington landscape is not dominated by the effects of fire. Due to the large amounts of precipitation received annually, levels of moisture and ambient temperatures present throughout the summer, and low incidence of lightning strikes; only a low or low to moderate frequency of fire is anticipated. In the northern Puget Trough and northeast Olympic Peninsula, conditions can be semi-dry, with a moderate to dry coastal climate. This region generally experiences moderate fire frequencies and variable fire severity and intensity, most often moderate.

### *Habitat Categories for Analysis*

Habitat categories addressed by this section include a variety of forest stands, physiographic features, and even individual trees. Some species require or depend upon more than one habitat category. Some species may be much more restrictive in their use of habitats and may depend upon only specific types of habitats within the broad categories discussed in this section. For

instance, some species are not only reliant on wetlands, but on those wetlands classified as bogs. As much as possible, forested habitats were divided according to forest structure and composition in a way that should be meaningful to forest-dwelling wildlife. Age classes of forested habitats were used as a surrogate for structure and composition in making estimates for this assessment. Conifer-dominated forests were classified as open forest, regeneration forest, dense-pole forest, open multi-aged forest; closed-canopy forest, and structurally complex forest (including fully functional forest). Deciduous-tree-dominated forests were classified as young, middle-aged, and old. Landscape-level attributes, interior forest and edge areas, were also addressed. Stand-level attributes were also examined and included wildlife trees, coarse woody debris, shrub understory, as well as several others. Uncommon and special habitats addressed include: riparian corridors; wetlands; healthy aquatic systems; caves; cliffs; talus; oak woodlands; prairies, grasslands, and meadows; subalpine meadows and shrubfields; and alpine tundra, krumholtz, and glacier habitats.

Under intensive silviculture, stands can be managed in a manner that includes regular thinnings to remove dead or dying trees and maintain the most vigorously growing trees in an evenly spaced manner. Such stands are frequently of little value to wildlife, even when they are older. Certainly, some species make use of these stands, but the species most impacted by the current dearth of old, unmanaged stands will be unlikely to meet all their life-requisites in such stands. The HCP will not result in such stands, but stand characteristics will be determined by factors other than age. Therefore, although it is common to refer to the need for older stands, and many categorizations (such as those included herein to some degree) include the use of age as a criteria, this is merely a surrogate for structure. Age (time since stand initiation) is used herein instead of structure because there is a lack of detailed wildlife-oriented, stand-inventory data, and because of our current inability to consistently and reliably use stand characteristics to predict habitat value for wildlife species.

### *Source of Data*

The current and projected amounts of the above forest structural stages that are referenced in the text of the assessments of each habitat category are for the on-base and off-base lands in combination. "On-base" lands are those lands that will be subject to harvest and managed to some degree to produce timber. Riparian and wetland buffers were included in the on-base lands because some level of timber harvest is likely in those areas. "Off-base" lands are those which will not be harvested and include high-elevation areas, poor growing sites, unstable slopes, marbled murrelet occupied sites, Natural Resource Conservation Areas (NRCAs), and Natural Area Preserves (NAPs). Although no harvest will occur for timber-production purposes in these off-base areas, some harvest may occur in areas designated as NRCAs or NAPs for prairie restoration or similar purposes.

Estimates of habitat amounts for 1996 on the OESF and remaining portions of the west-side planning units are presented in Table 1 along with projections for 2096.

Projections for amounts of habitat expected for 2096 in the absence of a incidental take permit are also displayed in Table 1.

For the west-side forests (excluding the OESF), habitat amounts are displayed by the land designations with respect to the spotted owl conservation strategy. The amounts expected for 1996 and the amounts expected for 2096 under the HCP are presented in Tables 2 and 3 respectively for on-base lands and Tables 4 and 5 for the on-base and off-base lands in combination. It is not possible to add projections for NRF-management areas, dispersal-management areas, and areas which were not designated for spotted owl habitat management to calculate projections for the west side planning units unless percentages are weighted by acreage in each area.

Table 1 . Stand Stage Projections with and without the HCP in percent of land area. <sup>1</sup>

Stand Stage (in years)	OESF at year 1996 (% on and off base)	OESF with HCP at year 2096 (%on and off base)	OESF without HCP at year 2096 (% on and off base)	West-side at year 1996 (% on-base only)	West-side with HCP (% on-base only)	West-side without HCP (on-base only)	West-side at year 1996 (% on and off base)	West-side at year 2096 with HCP (on and Off-base)	West-side without HCP (On-base and Off-base)
Open (0-10)	20	5-15	<5	5	6	5-6	5	5-6	4-6
Regen (10-20)	25	5-15	5	12	11	10-11	11	9-11	8-11
Pole (20-40)	25	5-15	20	16	21	20-21	15	17-21	17-21
Closed (40-70)	5-10	5-15	30-35	40	31	29	39	26-31	24-29
Complex (70+)	20-30	60-70	40-50	27	31	30	30	31-42	30-37
Fully Functional <sup>1</sup> (150-200+)	<2	10-15	10-15	4	12	16	6	12-22	16-29

<sup>1</sup> Fully Functional is a subset of Complex

<sup>2</sup> The above estimates include off-base acres (high-elevation, poor site, unstable slopes, murrelet stands, NRCAs, NAPs) where no harvest will occur. Riparian and wetland buffers were included in the on-base acres.

Table 2. DNR HCP Stand Stage Projections at year 1996 in Percent of On-base Land Area.

Stand Stage (in years)	West-side			
	NRF	DF	No-Role	Total
Open (0-10)	3	3	5	5
Regen (10-20)	10	10	13	12
Pole (20-40)	14	22	15	16
Closed (40-70)	30	47	41	40
Complex (70+)	44	18	26	27
Fully Functional <sup>1</sup> (150-200+)	15	3	2	4

<sup>1</sup>Fully Functional is a subset of Complex

Table 3. DNR HCP Stand Stage Projections at Year 1996 in Percent of On-base and Off-base Land Area. <sup>1</sup>

Stand Stage (in years)	West-side			
	NRF	DF	No-Role	Total
Open (0-10)	3	3	5	5
Regen (10-20)	9	9	12	11
Pole (20-40)	12	22	15	15
Closed (40-70)	28	47	40	39
Complex (70+)	49	19	28	30
Fully Functional <sup>2</sup> (150-200+)	23	4	3	6

<sup>1</sup>The above estimates include off-base acres (high-elevation, poor site, unstable slopes, murrelet stands, NRCAs, NAPs) where no harvest will occur. Riparian and wetland buffers were included in the on-base acres.

<sup>2</sup>Fully Functional is a subset of Complex

Table 4. DNR HCP Stand Stage Projections at year 2096 in Percent of On-base Land Area.

Stand Stage (in years)	West-side			
	NRF	DF	No-Role	Total
Open (0-10)	2	6	7	5-6
Regen (10-20)	5	8	12	10-11
Pole (20-40)	13	16	23	20-21
Closed (40-70)	22	30	33	31
Complex (70+)	59	39	25	31
Fully Functional <sup>1</sup> (150-200+)	32	12	9	12

<sup>1</sup> Fully Functional is a subset of Complex

Table 5. DNR HCP Stand Stage Projections at Year 2096 in Percent of On-base and Off-base Land Area.<sup>1</sup>

Stand Stage (in years)	West-side			
	NRF	DF	No-Role	Total
Open (0-10)	1-2	5-6	6-7	5-6
Regen (10-20)	4-5	7-8	10-12	9-11
Pole (20-40)	9-13	13-16	20-23	17-21
Closed (40-70)	16-22	25-30	28-33	26-31
Complex (70+)	59-71	39-49	25-35	31-42
Fully Functional <sup>2</sup> (150-200+)	32-46	12-20	9-17	12-22

<sup>1</sup> The above estimates include off-base acres (high-elevation, poor site, unstable slopes, murrelet stands, NRCAs, NAPs) where no harvest will occur. Riparian and wetland buffers were included in the on-base acres.

<sup>2</sup> Fully Functional is a subset of Complex

Off-base acres currently includes a variety of ages similar to the on-base acres. This age distribution would probably change over the next 70 to 100 years as no timber management is expected in the off-base areas. In the absence of natural limitations, an extremely high percentage of these lands will be over 70 years of age, and a high percentage will be over 150 years, by the end of the permit period. The amount of acreage and the treatment of off-base

lands was assumed to be equal under all possible scenarios. However, many off-base and riparian acres lack the potential to attain true "Old-forest Conditions". For instance, many riparian areas will always be alder, not conifer, due to flooding regime, and some unstable slopes will continue to be unstable and may never support anything except young alder. Therefore, the figures are displayed above as a range to indicate uncertainty.

The Service expects certain changes to occur in stand stage amounts within the first 50-70 years. The Service expects: (1) a decrease in the 10- to 20-year stand stage early in the permit period; (2) a steady decrease in the 40- to 70-year stand stage; and (3) a steady increase in the 70+-year stand stage. Within the 70+-year stand stage, the Service expects: (1) in the 70- to 100-year category, approximately stable amounts for the first 50 years as various stands move through this phase and a decrease in this category late in the permit period; (2) in the 100- to 150-year category, an increase early in the permit period and, as stands mature, they will be replaced by additional stands moving into this category; and (3) in the 150+-year category, slight increases during the first 50 years, after which larger increases will occur (i.e., as much as 5-fold increases in some cases).

One key difference in the figures displayed above, with respect to the DNR HCP and the expected results in the absence of the HCP, is that there is increased certainty about stand stage amounts with the HCP. In the absence of the HCP, stand stages, especially the older forests, will be dependant on factors such as spotted owl and murrelet locations. The estimates above assumed all currently restricted lands would remain restricted, and a certain percentage of potential marbled murrelet stands would be occupied. However, if occupancy rates were lower, or if there is attrition or movement of sites, a greater amount of habitat would become available for harvest in the absence of the HCP. In addition, in locations where harvest is possible (i.e., in spotted owl circles which contain more than 40 percent suitable habitat), DNR would most likely harvest the most valuable stands (i.e., usually the oldest) first if DNR did not have the assurances provided by the HCP. Therefore, the projections of stand stages in the absence of the HCP should be viewed as an optimistic projection.

Under the DNR HCP, the commitment is to develop, in the first year, projections by decade for stand stages is based upon a refinement of the 100-year commitments. These decadal projections will include both on-base and off-base lands and will further display the need to manage stand stage amounts over time to achieve the 100-year goals.

The Service, in consideration of the magnitude and longevity of this DNR HCP, analyzed stand stage amount distribution patterns through time and space. The Service concluded it would not be possible for DNR to significantly degrade the stand structure early in the permit period and still achieve the long-term HCP conservation commitments. In addition, the requirements for DNR to provide "non-declining flow" of revenue would similarly prevent such short-term actions since a significant short-term degradation would result in lower long-term revenues. If DNR does not attain the objectives of the HCP, the Services have the ability to require permit continuation until 2096. DNR also has the ability to extend the permit period until 2096. The

majority of analysis beginning with the DNR-HCP Science Team's assessments of likelihood to "maintain viable, well-distributed populations for 100 years," has focused on a 100-year period. Therefore, because of the current level of stand structures, the projected level at year 2096, and the steady and constant improvement needed to achieve those objectives (consistent with DNR's constraint to provide non-declining revenue flow), the Service believes it is appropriate to analyze the future condition at year 2096.

With regard to spatial patterns of distribution, the Service considered several factors. Sustained (non-declining) flow for DNR is determined, to some extent, by subareas. DNR considers County Trust lands separately to ensure each County Trust is managed on a non-declining-flow basis. Then DNR considers non-county lands in each of 5 west-side regions to ensure Trust lands in each region are managed on a non-declining-flow basis. This is an important consideration in whether an equal distribution of stand structures is expected across the landscapes within the HCP area. County Trust lands form a significant portion of the DNR-managed land base. In addition, the division of the remaining lands into regional analysis units ensures that sufficient amounts of "mature forest with structure" will be found in all geographic areas of the project area. Another consideration which will be equally as important on the large scale, and perhaps even more important on each landscape, will be the logistics associated with special habitat considerations. For instance, riparian areas (including fishbearing streams) are found in every geographic province and every Watershed Administrative Unit in the State. Older forest would mainly be found in buffers surrounding uncommon habitats, such as riparian areas, and thus would be distributed across the landscape. Not every uncommon habitat will be so well distributed.

The Service has analyzed stand stage amounts separately for the Olympic Experimental State Forest (OESF) because the OESF will be managed uniquely. The Service also analyzed each of the three categories of lands developed in the spotted owl strategy in the west-side planning units because those designations will substantially influence habitat amounts expected over time. The Service did not deem it necessary to analyze smaller geographic units for the reasons stated above (non-declining flow and ubiquitous riparian areas).

### *Analysis*

This analysis focuses on, but is not limited to, the impacts upon habitat quality and quantity that may result from the proposed action, and compares those impacts expected under the HCP to impacts which might result in the absence of the incidental take permit. For each habitat category below, the Service provides a description of that habitat category or attribute, describes or quantifies the baseline condition or status, describes the expected future condition in the absence of an HCP, and compares it to the expected result of the DNR HCP. There is also a discussion section relating the benefits received from the HCP to various structures and functions associated with those habitats and relating those benefits to indicator species (species of concern). Example species are sometimes used to display concepts and to accentuate the diversity of species that may use the habitats and that are being discussed through the use of this

habitat-based approach. The species were chosen because they show a particular affinity to the habitat category or attribute and illustrate the benefits derived from the HCP as well as illustrate the variety of species covered. The most important considerations are whether the amount and types of habitats, as well as their juxtaposition, will adequately provide for the biological needs of the species adapted to those habitats.

## **FOREST STAND MITIGATION CATEGORIES**

### ***Conifer-dominated Stand Species***

#### **Open Forest Stage**

**Description:** This habitat category is defined as the earliest of the seral stages, from 0-10 years of age. The overstory has been removed and forbs, grasses, and other herbs, as well as low shrubs, dominate the vegetation. Young conifer and deciduous trees are also present. These harvested stands will be planted to Douglas-fir or, where appropriate, to another commercial species and most-likely maintained in a conifer-dominated state through silviculture and replanting. There will be deciduous species present in these younger stands, especially those stands younger than 10 years of age. Species that use this habitat category include pollen-gathering insects such as butterflies (Lepidoptera), and social insects such as some bees, ants, and wasps (Hymenoptera), band-tailed pigeons, Townsend's vole, and the red-tailed hawk.

**Current Status:** Currently, DNR-managed lands within the west-side planning units are 5 percent open forest. West-side NRF-management areas are 3 percent open forest, Dispersal-management areas are 3 percent open forest, and lands not designated for spotted owl management are 5 percent open forest. Within the OESF, preliminary estimates indicate about 20 percent of stands are currently in the open forest stage.

**Current Trend Without HCP:** Based on DNR estimates, 4-6 percent of DNR-managed lands on the westside would be in this habitat category at year 2096. Based on average rotations of 60 years (40-80 years), it could be expected that those stands which fall outside riparian areas, uncommon habitats, unstable slopes, and murrelet sites, as well as habitat provided for spotted owls would provide 17 percent (12-25 percent) open forests. The OESF would provide less open forest (less than 5 percent) in 2096.

Harvesting prescriptions applied at final harvest under current regulations will maintain and recruit some small amount of structural elements into the subsequent rotations. As the young planted stands develop, they should have slightly more structural elements than has been typically seen in managed forests over the last decade.

**HCP Result:** The DNR HCP is expected to result in similar amounts of this habitat category (5-6 percent). At year 2096 it is expected that open forests would encompass 1-2 percent of NRF-management areas, 5-6 percent of Dispersal-management areas, and 6-7 percent of the

remaining areas, for a total of 5-6 percent. The OESF would contain 5-15 percent.

**Discussion:** Under the DNR HCP, NRF-management areas may contain less early seral forest than some other areas. Harvesting in NRF-management areas may be restricted by the strategy employed and existing shortage of late seral forest (i.e., NRF goals are not met), and where there are unusually large amounts of land in the mid-aged forest which are not ready for harvest. In the areas adjacent to Federal Reserves (which will be managed for old-forest characteristics), the amount of open forest stage available in the future may be greatly influenced by events such as fire, flood, disease, and windthrow which will continue to create early seral openings (open forests). These processes (i.e., channel migration, channelized debris flows) may be particularly important in riparian areas where harvest will no longer be used to create openings. However, not every species will be able to utilize beneficial habitats in clear-cut harvest units. Some species, such as the little willow flycatcher which may rely on areas of shrubs and deciduous trees in and adjacent to riparian areas, may benefit from smaller openings within stands. Other species such as deer and elk would likely utilize harvest units, especially if they are not excessively large or rectilinear.

Under the DNR HCP, it is likely that a steady, albeit possibly lower, supply of this stage would be provided over time. Due to considerations of residual trees and other harvest practices, the quality of this habitat may be improved. In many areas, some species such as Columbian black-tailed deer may experience slight short-term and localized reductions from current population levels, regardless of which alternative is implemented, due to age-class distribution of forests across all the ownerships. In some areas, early seral stages are overabundant and are not sustainable. Local distribution of open units in the future may depend on harvest scheduling and the availability of harvest-aged timber.

Availability of open early seral stages will usually be the converse of late seral availability. Some local areas may experience short-term reductions in the amount of this ephemeral stage. There will be adequate amounts of early seral openings for all wildlife species native to this region, due to a combination of timber harvest and stochastic events. However, the usefulness of this habitat may vary somewhat. The character of these stands often changes rapidly during a 10-year period.

When these units are in proximity to other stands providing other life requisites (e.g., hiding cover), are not excessively large, or contain sufficient residual structure, they are used by many species. As an example, western bluebirds forage in open areas, especially where cavities exist for nesting. In addition to older mature stages, olive-sided flycatchers will utilize this forest stage in areas of abundant snags. Canopy openings and edges provide ideal foraging environments. Elk also forage in open areas especially in proximity to nearby security and thermal cover.

The principal threat to the golden eagle in Washington is the destruction of open rangeland habitat, with which it is most-commonly associated. In western Washington, nest sites are

primarily in large trees within mature or old-growth forests near the edge of clearcuts. Clearcut logging creates forest conditions highly favorable to golden eagles, i.e., it hunts for mammals (rabbits, squirrels, mountain beaver) in large open areas. Timber harvest creates a distribution of different seral stages within drainage basins. Even-aged forest management throughout the west-side planning units would continue to provide openings for foraging habitat. In addition, the cliff-protection strategy and the very large old trees specified for retention under the HCP would be available as potential nest sites for golden eagles in proximity to open forests. The potential habitat provided for golden eagles under the HCP would be better than that provided under without the HCP.

The band-tailed pigeon is found in the coniferous forest zone and is associated with mixed conifer-hardwood habitats. Low-elevation forests with various seral stages and openings that are well interspersed are used during the nesting season. They feed upon plant foods including buds, flowers, and fruits of hardwood trees, shrubs, and herbaceous plants, but also feed on cultivated fruits and grains. This species is dependent upon the availability of mineral sources (e.g., mineral springs, cattle salt blocks) for producing crop milk for juveniles. Impacts to mineral springs would be reduced under the HCP by designing management activities within 200 feet of mineral springs, to retain food sources, restrict herbicide spraying, avoid disturbance, and address other conservation needs. Herbicide use would be restricted under the HCP in all areas and would improve the quality of open forest throughout the HCP area.

Management in the recent past has created abundant amounts of open forest, but has also decreased the quality of this habitat through active management to control vegetation (e.g., herbicide spray) competing with targeted regeneration species. Many species, such as band-tailed pigeons, depend upon the seeds and berries produced by broad-leaved plants in this forest stage. Amounts of forage and berries produced begin to decrease as newly planted trees grow taller and begin to shade and suppress the herbaceous and shrub layers. Treatments to enhance the growth of trees and reduce competition with other vegetation often diminish the usefulness of these earlier stages to wildlife. However, under the HCP, herbicide use would be regulated by the HCP commitment to maintain the 1992 Forest Resource Policy with respect to the use of herbicide spray which should improve the quality of these habitats for all species.

**Conclusion:** Conversion to nonforestry land-use would be one of the few likely threats to the availability of this stage. Conversion to agriculture can provide some species with similar habitat or forage needs. This habitat is expected to remain abundant on other lands within the planning area. In summary, the Service believes that although open forest habitat may decrease in quantity on DNR-managed lands over the HCP period, the quality of that habitat will increase due to mitigation measures associated with structural retention and reduction in herbicide spray. Further, without the HCP, the quantity of this habitat would most probably decrease anyway and quality would not improve substantially. Therefore, overall, the species dependent on this habitat will likely be better off with the HCP than without it, and should continue to have their biological needs met.

## Regeneration Forest Stage

**Description:** These forests are defined as those forests which are 10 to 20 years old and are composed of shrubs and saplings. They are old enough that their branches are beginning to intertwine and out-compete many of the shrubs. Canopies are very dense from the ground upward. Sparrows, thrushes, and porcupines are expected to use this habitat category. This habitat category provides effective hiding cover for many species such as the snowshoe hare.

**Current Status:** Currently, DNR-managed lands in the west side planning units are 11 percent regeneration forest. Proposed NRF-management areas are 9 percent regeneration forest, Dispersal-management areas are 9 percent regeneration forest, and the remainder of the units are 12 percent regeneration forest. Within the OESF, about a quarter of the stands are currently at this stage. This habitat category, in conjunction with dense pole habitat category, is 'over abundant' now, which is having ramifications for wildlife by fragmenting remaining stands and reducing the amount of available habitat in the other stand stages.

**Current Trend Without HCP:** Based on DNR estimates, 8-11 percent of DNR-managed lands on the west side would be in regeneration forest at year 2096. Based on average rotations of 60 years (40-80 years), it could be expected that those stands which fall outside riparian areas, uncommon habitats, unstable slopes, and murrelet sites, as well as habitat provided for spotted owls would provide 17 percent (12-25 percent) regeneration stands. It is estimated that at year 2096, about 5 percent of the OESF would be in this habitat category.

**HCP Result:** At year 2096 under the DNR HCP, it is expected that regeneration forests would encompass 4-5 percent of NRF management areas, 7-8 percent of Dispersal management areas, and 10-12 percent of the remaining areas. About 9-11 percent of the west-side stands would be in this habitat category at year 2096. It is estimated that at year 2096, about 5-15 percent of the OESF would be in this habitat category.

**Discussion:** Managed timberlands will continue to provide regular supplies of regeneration stage timber. Under the DNR HCP, NRF-management areas may contain less early seral forest than other areas. This is because timber harvest in NRF-management areas may be restricted by a number of factors discussed earlier. In areas adjacent to Federal Reserves, the amount of regeneration stage available in the future may be influenced by natural stochastic events which will continue to create early seral openings that will eventually become regeneration forests. These processes may be particularly important in riparian areas where some species, such as Nashville, orange-crowned, and Wilson's warblers depend on thickets or shrubs. The quality of this habitat will improve as the structural legacies left as a result of timber harvests

conducted under the HCP become structures in regeneration forests 10 years from now. It is expected that species such as the snowshoe hare will find sufficient amounts of foraging habitat throughout the planning period.

The yellow-billed cuckoo favors moderately dense thickets and second-growth forest. This species primarily inhabits deciduous stands adjacent to riparian and wetland areas. Dense stands with abundant shrub and sapling growth are selected for nesting. The yellow-breasted chat and a number of warblers also use this forest stage for nesting habitat. It is expected that species using this habitat, such as the snowshoe hare, will find sufficient amounts of foraging and hiding habitat throughout the planning period.

**Conclusion:** The quality of this habitat will improve as the structural legacies left as a result of timber harvests conducted under the HCP become structures in regeneration forests 10 years from now. The regeneration forest is expected to occur in adequate amounts due to silviculture and stochastic events, and the quality is expected to improve as a result of HCP structural retention and management prescriptions. Further, without the HCP, such improvement in quality would be less likely. Therefore, the species dependent on this habitat category will be better off with the HCP than without it.

### **Dense Pole Forest Stage**

**Description:** The dense-pole stage of forest development occurs during the early stages of stem exclusion, usually between 20 and 40 years old. Stems are closely spaced and numerous and little understory exists. The lower limit of the canopy begins to raise as self-pruning of branches occurs. Generally, there is insufficient canopy lift to allow larger birds, such as spotted owls, to penetrate. Other birds such as warblers and, in some of the older pole forest, waxwings and grosbeaks, would make use of this habitat category. As the stands reach a stage where stem exclusion occurs, the deciduous component will often decline naturally. The deciduous component also declines through silvicultural treatments. Small cavity-dwellers utilize this habitat category as considerable suppression mortality occurs at this stage creating small diameter snags and foraging habitat.

**Current Status:** Currently, DNR-managed lands on the west side are 15 percent dense-pole forest. Proposed NRF-management areas are 12 percent dense pole, Dispersal-management areas are 22 percent dense pole, and the lands not designated for spotted owl management are 15 percent dense pole. Within the OESF, preliminary estimates indicate that about 25 percent of the land base is currently in this habitat category.

**Current Trend Without HCP:** Based on DNR estimates, 17-21 percent of DNR-managed lands on the west side (exclusive of the OESF) would be in this habitat category at year 2096. This estimate includes riparian areas, unstable slopes, and murrelet sites, as well as habitat provided for spotted owls. Based on average rotations of 60 years (40-80 years), it could be expected that those stands which fall outside such areas would provide 33 percent (25-50 percent) dense pole forests. Within the OESF, about 20 percent would be in this habitat category.

**HCP Result:** Overall, 17-21 percent of west-side stands are expected to be in this stage at year 2096. At year 2096, it is expected that dense pole forests would encompass 9-13 percent of NRF management areas, 13-16 percent of Dispersal management areas, and 20-23 percent of the remaining areas. Within the OESF, about 5-15 percent would be in this habitat category. Over the next 20 years, the pole stands should be more useful to wildlife in general than the current stands in this age class. As the younger age classes progress into this habitat category, they will have been treated silviculturally with prescriptions designed to maintain, and hasten development of, structural attributes important to wildlife. However, it will take 20 years before stands harvested under the DNR HCP provisions begin to move into this condition.

**Discussion:** Most managed timberlands will continue to provide regular supplies of pole timber. It is highly unlikely that timber managers will manage on rotations much shorter than 30-40 years. In areas adjacent to Federal Reserves, the amount of pole timber available in the future may be greatly influenced by natural and stochastic events. Stochastic events such as fire, flood, disease, and windthrow will continue to create early seral openings that will eventually become pole forests. It will take 20 years before stands harvested under the DNR HCP provisions begin to move into this condition. Yet, State forest-practice regulations and DNR policies implemented over the last 10 years should also help improve the future condition of these stands beginning in about 10 more years, albeit to a lesser degree than the DNR HCP prescriptions.

The golden-crowned kinglet, yellow-rumped warbler, and the Douglas squirrel are expected to use this stage. However, these species will also make primary use of older forests as well. In general, this forest stage is not very valuable to a large number of species and together with the regeneration forest stage is overly abundant on the landscape. If left untreated, the stands growing into this category as a result of "clean silviculture" of the past 20-40 years, may be overly stocked and may lack the diversity of species and residual features of coarse woody debris and legacy trees.

**Conclusion:** The HCP provides commitments that ensure adequate amounts and quality of this habitat category. A greater amount of this habitat may be provided in the absence of the HCP, but would likely lack the improvements in quality, such as structural characteristics, the HCP will provide. The HCP more closely emulates a natural forest with regard to the composition and abundance of this habitat category, and in that way more fully provides for the species needs..

### **Open Multi-Aged Stand Stage**

**Description:** This habitat category is not a common forest stage on the west side. Douglas-fir is considered the most desirable species in areas where it can be grown and is relatively shade-intolerant. Even-aged harvests with the intent of planting Douglas-fir following harvest will retain too few overstory trees to produce this habitat category on the west side outside of the hemlock zone and Sitka spruce zones. Partial harvests done for wildlife and resource objectives will usually leave too many trees to be considered in this habitat category. Partial harvests like

thinnings will mainly be aimed at improving health and vigor of the dominant age class. There may be exceptions, especially the experimental management within the OESF. Some stands which may have a canopy which has been elevated above the ground by pruning in conjunction with thinning, self-pruning, or fire, and would contain younger trees at various ages of development might be included in this category as well. On the west side, opening of stands will bring a quick response from understory plants, natural regeneration may occur by some shade-tolerant species; but, unless properly managed, would not likely progress far before they were suppressed. However, where such stands might occur on the west side, such as on dry sites with glacial-till soils, they are discussed by age of dominant trees for the purposes of this assessment.

**Current Status:** Such stands are currently uncommon west of the Cascade Crest.

**Current Trend Without HCP:** They would be expected to remain uncommon in the absence of a permit.

**HCP Result:** Actions taken under the DNR HCP might increase this habitat type slightly. Some experimental silviculture may be used in areas to hasten the development of late-seral habitats. During the early years following such a treatment, stands would provide this type of habitat. Also, on a smaller scale, provisions to provide retention of overstory trees during regeneration harvests may lead to small pockets of such habitat.

**Discussion:** These stands would be most likely located where tree-species composition (i.e., shade-tolerant species) is compatible with this management. To create such stands, overstory trees would need to be removed and the canopy sufficiently opened so that significant natural release and regeneration, or artificial underplanting, could occur. Management would need to be directed at both the older trees and the younger trees as future crop trees. True multi-aged stands would be more likely to be unmanaged or lightly managed and would closely resemble the Fully Functional Older Forest discussed later. The stands provided in a managed forest would most likely contain two age classes, possibly three.

Species that utilize such habitats include coopers hawk, great horned owl, western screech owl. They would most likely be found where clumps of denser conifer trees were found in association with the open structures. Rufous-sided towhees would benefit by the generally more dense understory that would result. Cavity nesters such as Lewis's woodpecker, red-headed woodpecker, and flickers would benefit as well from the increase in prey.

**Conclusion:** This is an uncommon stand type on the west side at present. Most species which utilize this habitat also fare well under edge conditions or use deciduous stands as well. Post-thinning stands are expected to occur under the HCP and will provide forests of this type.

**Closed-Canopy Forest Stage**

**Description:** Closed-canopy forest (closed forest) is defined as those coniferous forests between 40 and 70 years of age. They are old enough so that they have undergone some stem exclusion and competition mortality and the trees in these stands have begun to increase in diameter; have achieved some lift to the lower portion of the canopy as self-pruning occurs; and have well-developed, deep canopies. However, these stands are young enough that they have not developed the complex structures characteristic of the next older habitat category.

Characteristics of stands at this stage are highly variable, depending on stocking density and other factors. At the densities being planted today, Closed Canopy forest would still contain much "stem exclusion" in 40-70 years. Most species relying on closed forests (e.g., tanagers) are likely able to substitute older, more-complex stands when those are available. Where sufficient understory exists, (mainly as a result of stand opening whether through natural processes or more-commonly through silviculture) species such as deer and elk may derive benefits from these closed-canopy stands. Phenology is often delayed so that a greater quality of forage is available late in the growing season within closed stands. Thermal and hiding cover are provided by canopy closure and depth, bole size and density, and undergrowth; but, older forests (being more complex) may provide even greater benefits.

**Current Status:** Currently, DNR-managed lands in the west side planning units are 39 percent closed forest. NRF-management areas are 28 percent closed forest, Dispersal-management areas are 47 percent closed forest, and the remainder of the units are 40 percent closed forest. Within the OESF, preliminary estimates indicate that about 5-10 percent of stands are currently in the closed-canopy forest stage.

**Current Trend Without HCP:** Due to the existing age distribution of forested stands on DNR-managed lands, it is expected that there will be a ready supply of mid-seral forests for many decades, regardless of whether or not the DNR HCP is implemented. Silvicultural options in mid-seral forests can increase or decrease the amount of time stands will remain in this stage before obtaining late-successional characteristics. The silvicultural options exercised in the absence of an HCP might not place emphasis on structural retention.

Based on DNR estimates, 24-29 percent of DNR-managed lands on the west side would be in this habitat category at year 2096. Based on average rotations of 60 years (40-80 years), it could be expected that upland managed stands would provide 33 percent (0-38 percent) closed forests. It is expected that 30-35 percent of the OESF would be in closed forest at the year 2096. It is reasonable to assume that between spotted owl circles, riparian buffers, wetland buffers, unstable slopes, and general silviculture, stands with habitat that is closed forest or older would likely be provided in fair amounts across all landscapes. Without an HCP, there is no guarantee for any rotation age or habitats. A change from a rotation which averages 60 years to one which averages 40 years may significantly alter this assessment.

**HCP Result:** In the long term, there is greater certainty that closed canopy stands will be provided under the DNR HCP because closed canopy stands are an intermediate stage necessary to obtaining late-seral characteristics. Under the HCP, DNR would be managing in a manner to

provide late seral habitats in some landscapes that would include harvests of some late seral habitat while developing other late seral habitat. This would ensure a continuing but dynamic amount of mid-seral forests that would be guaranteed under this alternative. Substantial areas will also be managed as spotted owl dispersal habitat which will provide mid-seral forests in those areas.

Based on DNR estimates, 26-31 percent of DNR-managed lands on the west side (excluding the OESF) would be in this habitat category at year 2096. This estimate includes riparian areas, unstable slopes, and murrelet sites, as well as habitat provided for spotted owls. The distribution of closed forests would be influenced little by the location of NRF management areas and Dispersal management areas. At year 2096, it is expected that 16-22 percent of the NRF management areas, 25-30 percent of the Dispersal management areas, and 28-33 percent of the remaining areas would be in closed forest.

On the OESF, the DNR HCP includes an objective that would maintain at least 40 percent of each landscape planning area as young forest marginal habitat (habitat that is suitable for spotted owl dispersal with some characteristics that provide roosting or foraging opportunities) or better. Under this alternative, the harvest of stands younger than 100 years of age is distributed through time to strike a balance with regrowth. It is estimated that at year 2096, 5-15 percent of the OESF would be in closed forest.

**Discussion:** Without the DNR HCP, DNR-managed lands might produce 24-29 percent closed-canopy forest at year 2096, but results under this scenario (without an HCP) are highly variable. It is estimated that the HCP would contribute about 26-31 percent closed forest. The HCP would place emphasis on structural retention which will improve the quality of these stands. The amount of closed forest provided on the OESF under the HCP (5-15 percent) is less than what is expected in its absence (30-35 percent).

When examining the amount of land in closed-canopy forest and older, more advanced habitat categories which may exist at year 2096 in comparison to the current amount (69 percent), DNR-managed lands would contribute 59-61 percent without an HCP and would contribute 62-68 percent under the HCP. Distribution under the DNR HCP would likely be 81-87 percent in the NRF-management areas, 69-74 percent in the Dispersal management areas, and 58-63 percent in the remaining areas. There is also very little difference on the OESF when considering that more advanced forests can substitute for closed forest for many species. All alternatives provide about 70-75 percent closed and older forests.

Silvicultural techniques which are designed to produce late-seral characteristics would also be applied in NRF-management areas and riparian areas. Similarly, mid-rotation thinning or thinnings would be expected to improve understory, provide multiple-layered canopies, as well as active structure retention will all increase habitat value of this age class in several decades. These thinnings can be particularly beneficial when conducted at variable densities to further increase diversity within and between stands. Thinnings may also have the added advantage of

providing enough revenue to allow longer rotations, which in conjunction with the benefits of thinning, would provide late-seral characteristics at an earlier age as well as provide a high-quality timber product.

Species which rely on closed-canopy forest or older categories for security and thermal cover, such as black-tailed deer and elk, may benefit from the HCP. Fragmentation of remaining forest patches by roads and intervening harvests may have synergistic effects which could increase vulnerability of these game species. It is expected that these effects would be greatest in the areas where DNR-managed lands are interspersed with numerous smaller and privately owned tracts, and less so where DNR-managed lands are in contiguous blocks or adjacent to Federal lands. Closed forest may not provide the structures and benefits needed by many species which depend on structurally complex, interior forest, but closed forest may provide a sufficient buffer to these older stands so that microclimate variability is reduced and those older stands function more thoroughly as interior forest.

The provision of habitat amounts and resulting patch sizes of closed forests and older categories in certain landscapes (e.g., Southwest Washington) may benefit species utilizing contiguous forests such as the northern goshawk, and the reduction in fragmentation and isolation under the HCP may benefit a number of low-mobility species. Red-breasted nuthatch seek contiguous patches of forest at this age and older, especially where sufficient mortality has occurred within the stand through senescence or residual structure remain from the previous stand. A number of neotropical migrants are also edge-sensitive and are expected to benefit as a result of the HCP.

**Conclusion:** Without the DNR HCP, DNR-managed lands might produce about the same amount of this habitat as with the HCP, but results without the HCP would be highly variable in terms of habitat quality and quantity. The HCP would place emphasis on structural retention which will improve the quality of these stands. The HCP also provides a commitment to obtain the objective amounts of these stands which would not be guaranteed in the absence of the HCP. When analyzing in combination the forests in this category and those that are more developed, the HCP provides distinct benefits over what would occur without the HCP.

### **Structurally Complex Forest Stage**

**Description:** Structurally complex forests are those which are stocked with large trees. A variety of tree diameters and heights are evident. Mortality within the stand (or residual trees, snags, and logs) provides cavities in standing snags, downed logs, deformities in standing live trees, large horizontal branches, and a complex canopy with conifer establishment occurring under openings in the canopy. For the purposes of this discussion, conifer stands greater than 70 years of age were considered to be structurally complex forest, although it is recognized that the quality and level of structural complexity will be greater in stand which are older. Species using this habitat category range from the Johnson's hairstreak butterfly to the northern goshawk.

**Current Status:** Currently, NRF management areas as proposed in the HCP are 49 percent

complex forest, proposed Dispersal management areas are 19 percent complex forest, and the remainder of the units are 28 percent complex forest. As a whole, these areas are 30 percent complex forest. According to preliminary estimates, about 20-30 percent of the OESF is composed of stands over 70 years of age.

**Current Trend Without HCP:** Complex forest will likely be provided as a result of spotted owl conservation, marbled murrelet protection, and other actions such as unstable-slope protection. The spotted owl conservation strategy will only occur within spotted owl circles under current regulations in the absence of an HCP; however, there is no guarantee for the amount of complex forests. The level of protection may decrease as spotted owls perish or relocate, surveys document such change, and stands are harvested. However, habitat modeling efforts assumed no such decline in sites or relaxations in regulatory environment. The quality of habitat may be reduced where the 40-percent threshold is met and younger habitat develops allowing harvest of older forest habitat.

Based on DNR estimates, 30-37 percent of DNR-managed lands on the west side (exclusive of the OESF) would be in this habitat category at year 2096. This estimate includes riparian areas, unstable slopes, and murrelet sites, as well as habitat provided for spotted owls. Based on average rotations of 60 years (40-80 years), it could be expected that those stands which fall outside such areas would provide 0 percent (0-12 percent) complex forests. Most spotted owl sites occur in proximity to Federal lands; thus, it is expected that without the DNR HCP the distribution of complex forests may be determined largely by the distribution of spotted owl sites.

Without the DNR HCP, the OESF would also contribute complex forest as a result of spotted owl and murrelet conservation, riparian buffers, and, to a lesser degree, unstable-slope protection. Distribution of the resulting forests would be determined by the distribution of spotted owl and murrelet sites, stream types, and unstable slopes. The level of riparian protection that would occur without the DNR HCP in the OESF is somewhat more certain due to the Hoh Agreement and given the degree of concern about mass wasting, sedimentation, and salmon that exists in this region. It is therefore more likely that larger and more robust buffers would be utilized in the OESF than in the remainder of west-side planning units. Preliminary stand-structure projections indicate that 40-50 percent of the OESF could be in stands over 70 years of age at year 2096.

**HCP Result:** Based on DNR estimates, 31-42 percent of DNR-managed lands in west-side planning units (excluding the OESF) would be in this habitat category at year 2096. Older forests produced and maintained in riparian areas, murrelet sites, and other such areas would benefit from the protection provided by surrounding stands if those stands are of sufficient development to buffer the effects of sun, wind, and predators. The distribution of complex forests will be determined largely by the location of proposed NRF-management areas and Dispersal management areas. At year 2096, it is expected that 59-71 percent of the NRF management areas, 39-49 percent of the Dispersal management areas, and 25-35 percent of the

remaining areas would be in complex forest.

In the OESF, the objective is that at least 40 percent of each of the 11 landscape planning units would be in forest stages similar to complex forest at year 2096. This would include sites protected for murrelets, riparian areas, and unstable slopes. Given the topographic nature of the OESF and the concern regarding unstable slopes, it is uncertain how much additional protection would be needed to meet the 40-percent target. Much of this habitat category may occur on steep and unstable slopes. However, because of the 11 landscape planning units and the need to meet this target for each such unit, it is expected that the complex forest will be well distributed. The number of murrelet sites is also expected to be higher than other HCP planning units but would not be any more certain regarding the characteristics of such sites. The level of management within riparian buffers is somewhat vague and it is therefore uncertain how much complex forest would be provided in these areas. However, complex forest is also expected to be retained or developed within 50 feet of nonforested wetlands. Preliminary DNR estimates indicate that 60-70 percent of the OESF would be in stands over 70 years old at the year 2096.

With the DNR HCP, unstable slopes may be deferred from harvest until more is learned about how these slopes can be managed without increasing the risk of mass wasting and erosion. It is possible that in the short term, and even in the long term to some degree, that unstable slopes will contribute somewhat to complex forests.

Constant ingrowth of this age class will occur under the DNR HCP, in riparian buffers and other habitats, as well as to a lesser degree in the managed stands. A number of stands will provide maximum economic return if managed on rotations longer than 60 years. It is expected that DNR may average a 60 year rotation, but individual stands may remain between regeneration harvests for as many as 80 years. Those stands over time would provide complex forest for only a brief time during the rotation and would be of less quality than those stands in areas or habitats under special consideration, such as riparian areas, spotted owl nest patches, or murrelet stands.

**Discussion:** The need for contributions of late-seral forest by nonfederal lands will be highest in those areas where little Federal land exists such as Southwest Washington, the Puget trough, and low-elevation portions of the Olympic Peninsula, such as the Straits Planning Unit. Nonfederal lands at low elevations are needed to conserve late-successional-dependent species (FEMAT 1993; Thomas et. al. 1993). There are few spotted owl territories remaining in Southwest Washington (the South Coast Planning Unit and the extreme western portion of the Columbia Planning Unit) and the prospect for the existing territories persisting is not good without the contributions from nonfederal landowners.

The need for nonfederal contributions of habitat by species requiring complex forest in Southwest Washington will be particularly acute given the lack of contribution by Federal lands. Species whose range may otherwise be disrupted due to the lack of federal lands may include, for example, the Keen's myotis, Pacific fisher, and late-seral herbaceous plants, fungi, and arboreal lichens. Some species may rely on these landscapes in greater proportion than others,

and may be more affected by actions in this landscape. For instance, species which depend on late seral/complex forests in the low-elevation, Sitka spruce zone may be most affected. Dunn's salamander is not found elsewhere in Washington and relies on these forests. Currently, relatively small amounts of complex forest persist in southwest Washington placing a higher ecological value on those remaining stands. Without the buffering effect of more conservatively managed Federal lands, actions to harvest these habitats will have impacts which will be higher in proportion to the impacts resulting from harvest of similar habitats in other areas. Cumulative effects such as development and conversion to agriculture may further limit the potential for this forest category to develop in the future.

In the absence of the HCP, DNR would provide some complex forests associated with spotted owl circles in some of these areas of concern. If spotted owl sites do not persist in the absence of the HCP, DNR would no longer be required to provide that habitat. Without the DNR HCP, complex forest in Southwest Washington would depend on site persistence, site movements over time, and other factors. These areas have been experiencing low site viability. Without the DNR HCP, there would be few spotted owl territories remaining in southwest Washington (the South Coast Planning Unit and the extreme western portion of the Columbia Planning Unit) and the prospect for these territories persisting is not good without the contributions from nonfederal landowners. Current regulations, may cause or perpetuate gaps (large areas with no late-seral forest) in certain landscapes due to existing ownership patterns.

While areas such as southwest Washington and the Straits Planning Unit may not benefit from lands that will be managed for spotted owl nesting and foraging specifically, they will still receive incidental benefits from the multi-species strategy. It is expected that 25-35 percent of the lands not designated for spotted owl management, such as southwest Washington and the Straits Planning Unit, will provide structurally complex forest. The DNR HCP may favor some landscapes at the expense of other landscapes, more so than would occur in the absence of the HCP, but would provide greater certainty which would not be available in the absence of the DNR HCP.

Under the proposed HCP, while very little provision is made specifically for spotted owls in southwest Washington, contributions of DNR habitat will result from riparian and uncommon habitat provisions, murrelet strategy, and, perhaps, from some unstable slopes. In addition, some of the Natural Resource Conservation Areas (NRCAs) and Natural Area Preserves (NAPs) may also contain complex forests. The largest difference between the HCP and the alternative of current regulations is the lack of certainty provided without an HCP with regard to the amounts and distribution of complex forest.

Northern goshawks are strongly associated with late-successional coniferous forests and are most abundant in old growth. Breeding northern goshawks use large tracts of mature and old-growth forest in which they can maneuver and forage below the canopy, and where large trees are available for nesting. They require trees large enough to provide a foundation for nest construction. Northern goshawk foraging areas comprise the largest portion of their home

ranges and typically include a greater diversity of forest age classes and structural characteristics (e.g., snags, woody debris) than nest areas, and tend to support abundant avian prey populations. Large trees are used by northern goshawks as hunting perches, and canopy openings provide opportunities for prey capture.

The combination of the riparian and spotted owl conservation strategies should provide forest conditions suitable for northern goshawk breeding, foraging, and resting habitat. In concert, these strategies should ensure the development of contiguous landscapes of submature to old-growth forest. Additional northern goshawk habitat may also be provided as a result of delaying harvest on most stands considered to be murrelet habitat, until an adaptive-management element of the murrelet strategy is developed. As stands adjacent to the riparian buffers develop under the proposed harvest regime and stand-structure projections, they may provide adequate contiguous blocks of closed canopy forest suitable for northern goshawks. Since riparian buffers would be wider than without the HCP, the potential to develop northern goshawk habitat would be greater under this alternative.

Northern goshawks may be highly sensitive to human disturbance. Timber harvesting within 0.25 mile (the nearest 125 acres) of northern goshawk nest sites in Idaho resulted in a 75 to 80 percent reduction in occupancy of their nesting territories (Patla 1990). DNR would not allow activities that may appreciably reduce the likelihood of successful nesting within 0.55 mile of a known active northern goshawk nest which is located in the areas managed for spotted owl breeding between April 1 and August 31. A circle of radius 0.55 mile circumscribes the entire post-fledgling family area (600 acres). This protection would serve to minimize human disturbance around active nest sites.

In addition, the strategy to retain 3 snags and 5 green trees per acre of harvest (4 of the largest trees per acre in dispersal-management areas) would benefit northern goshawks by providing habitat for prey species and potential future nest trees in upland areas. This conservation measure is enhanced by the added provisions to include one tree from the largest diameter size class, and to retain large, structurally unique trees valuable to wildlife, where possible. This conservation measure would complement the spotted owl and riparian strategies to provide more habitat than that provided without the HCP.

Even some generalist species, such as black-tailed deer and elk, which rely on mature forest for security and thermal cover may benefit. The comprehensive road-management plan should reduce fragmentation of remaining mature forest patches by better managing roads. The HCP would also regulate intervening harvests which may have synergistic effects in combination with roads. Such management would decrease vulnerability of these game species.

In NRF-management areas, adequate quantity and quality and juxtaposition of complex forests will be provided. These areas tend to be adjacent to or near Federal Reserves and will support the ability of the Federal lands to provide needed habitat. In the absence of the proposed HCP, owl territories are particularly dense and might be expected to provide late-seral forests in these

same general areas, but with far less certainty that the HCP provides. This means the HCP has a higher level of certainty of providing habitat for the other species in these key areas adjacent to Federal Reserves.

The DNR HCP would provide more complex forest in riparian areas in most geographic areas than would occur without the HCP. The wind buffer prescription may provide some complex forest, but even if they do not, they will protect the complex forest within the riparian area. Those factors which are necessary to avoid impacts to salmonid and riparian wildlife habitat would be maintained. The protection afforded unstable slopes would be the same as presented without an HCP, and should benefit species which may use such habitats particularly where these areas are located adjacent to riparian areas.

**Conclusion:** While there is no guarantee these complex forests will exist without the DNR HCP, there is a commitment that this habitat class will be provided under the DNR HCP. In either case, some complex forest may be provided as a result of owl conservation, marbled murrelet protection, and other actions. Stand-structure analysis indicated that as much as 25-35 percent of the area not designated for owl management might still provide complex forest by 2096 including the 9-17 percent in older forest. HCP lands outside the OESF will be approximately 31-42 percent complex forest and 12-22 percent older forest. Much of the off-base acres are a result of factors such as unstable slopes or low site-productivity and these sites might not support old forest. The amount of these habitats expected might realistically be somewhere between these two values. While the amount of complex forest may not change significantly, the quality of that habitat would increase when considering that there is an expected increase in older forest from 6 percent to 12-22 percent. Together, the owl strategy, the snag and leave tree strategy, and the guaranteed riparian and wetland management zones, in concert with the stand-structure objectives would provide adequate complex forest habitat throughout the HCP area to provide for the needs of the species.

#### **Fully Functional Older Forest Stage (Older Forest) - A Subset of Structurally Complex Forest**

**Description:** For the purposes of this analysis, this subset of the mature, structurally complex forest was examined separately. The richness and species diversity of these habitats may provide for the needs of species beyond what is provided by stands which are merely structurally complex. It was assumed that forests older than 150 years in age would begin to satisfy these needs. In the OESF, the amount of habitat that is either older than 100 years or older than 200 years will be discussed.

**Current Status:** Currently, NRF management areas as proposed under the DNR HCP are 23 percent older forest, Dispersal management areas are 4 percent older forest, and the remainder of the planning units are 3 percent older forest. As a whole, the west side planning units outside the OESF are 6 percent older forest. Within the OESF, preliminary estimates indicate that about 15-20 percent of the forest stands are older than 100 years and less than 2 percent are over 200

years old.

**Current Trend Without HCP:** There are no guarantees that older forests will be retained or developed. Although current guidelines may remain in place, where circles are near 40 percent habitat, substitution of younger owl habitat may occur. Spotted owls may also perish or relocate, allowing harvest of additional habitat. Murrelet sites will contribute to older forest because little management will occur within these sites. Little older forest is likely to occur in riparian areas. Some older forest may be found in conjunction with unstable slopes until more is learned about harvesting these slopes without placing them at greater risk for erosion and mass wasting.

Based on DNR estimates, 16-29 percent of DNR-managed lands on the west side (exclusive of the OESF) would be in this habitat category at year 2096. This estimate includes riparian areas, unstable slopes, and murrelet sites, as well as habitat provided for spotted owls. Based on average rotations of 60 years (40-80 years), it could be expected that none of those stands which fall outside such areas would provide older forests. As mentioned earlier, most spotted owl sites occur in proximity to Federal lands. Because a major portion of the older forest provided in the absence of an HCP will occur as a result of the protection afforded regulatory spotted owl circles, it is expected that without an HCP the distribution of older forests may be determined largely by the distribution of spotted owl sites.

At year 2096, it is expected that all of the complex forest (40-50 percent of the OESF) would be in stands over 100 years old and about 10-15 percent of the OESF would be in stands over 200 years of age. About 20 percent of the stands over 100 years and almost all stands over 200 years would likely be previously unharvested stands (unharvested since date of stand initiation).

Older Forest may be provided by areas protected for murrelets. However, those areas will yield patches of uncertain size, shape, amount, and distribution but would likely be of high quality. It is expected that murrelet sites will occur more frequently near marine waters and at low elevations. Landscapes with significant patches of older forest may contain proportionally more murrelet sites as well.

**HCP Result:** Under this alternative, some older forest is expected to occur in the 300-acre nest patches provided in the spotted owl strategy during the research and transition phases of managing these sites. Most murrelet sites would be expected to eventually become older forest as would the 25-foot no-harvest riparian buffer and possibly even the 25- to 100-foot minimal-harvest zone.

Based on DNR estimates, 12-22 percent of DNR-managed lands on the west side (excluding the OESF) would be in this habitat category at year 2096. This estimate includes riparian areas, unstable slopes, and murrelet sites, as well as nesting habitat provided for spotted owls. The distribution of older forests will be determined largely by the location of the 20,400 acres of spotted owl nesting patches. At year 2096, it is expected that 32-46 percent of the NRF

management areas, 12-20 percent of the Dispersal management areas, and 9-17 percent of the remaining areas would be in older forest.

On the OESF, this alternative contains an objective of 20 percent of forest equivalent in structure to those greater than 100 years in age, and it is likely that large portions of that 20 percent would be in this habitat category during the first 40-60 years. As mentioned above, most murrelet sites would eventually provide older forest as would the 50-foot zone around nonforested wetlands. The OESF riparian strategy may also provide some older forest. According to preliminary estimates, it is expected that 50-60 percent would be forest older than 100 years old at year 2096 and that 10-15 percent would be old forest (over 200 years old). About 5 percent of the forest stands over 100 years old and about 90 percent of the stands over 200 years old would have been previously unharvested.

**Discussion:** The amounts of forest older than 100 years of age for the OESF would be 43 percent without the HCP and 64 percent for the DNR HCP. For stands older than 200 years of age these amounts are expected to be 14 percent without an HCP and 12 percent for the DNR HCP. Older forest without the DNR HCP would be distributed according to current spotted owl circles but would not have any commitments associated with it. As spotted owl sites perish or relocate, that habitat would be available for harvest. Older forest in the DNR HCP would be distributed across all 11 landscape planning units.

As described earlier for complex forests, some landscapes may be not fare as well as other landscapes. These areas are also the same areas about which the Service is concerned with regard to older forest (i.e., southwest Washington). In the absence of Federal lands or contributions by Federal lands, the conditions for a number of species dependent on these forests will be determined by nonfederal lands.

Stand-structure analysis indicated that as much as 9-17 percent of the areas not designated for spotted owl management might provide old forest at 2096. Much of the off-base acres are a result of factors such as unstable slopes or low site productivity and these sites might not support old forest. The amount of old forest expected might be somewhere between these two values. Without the HCP, there is little certainty that the projections would be achieved.

Johnson's hairstreak, is a butterfly whose larvae depend on species of dwarf mistletoe, in western hemlock in low-elevation, late-successional forests. Adults feed on nectar sources from Pacific dogwood and Oregon grape. The DNR HCP will provide some late-successional forests in low-elevation areas. For instance, marbled murrelet habitat will provide habitat for Johnson's hairstreak as will the older forest committed to in the stand-structure. Natural levels of dwarf mistletoe infestation are expected to continue.

The Pacific fisher prefers mature and old-growth-coniferous forests, and uses riparian areas disproportionately more than their occurrence. Fishers are associated with low- to mid-elevation

forests, and it is thought that fishers avoid high elevations because they are poorly adapted to deep snowpacks. Fishers require habitat with large hollow snags or trees which are used as maternity dens. The structural complexity of older forests results in dense prey populations, and provides denning and resting sites for fishers. The purpose of dispersal habitat is to support the movement of juvenile spotted owls between subpopulations on Federal Reserves, and it is likely that the availability of this habitat may enhance the survival of dispersing juvenile fishers. Most of the spotted owl habitat provided on DNR-managed lands would be at elevations less than 3,300 feet (1,000 meters), because that is where their ownership lies, and, thus, this habitat would likely benefit fishers. Large, old trees would be specified for retention as part of the snag and leave tree strategy. These provisions would protect current potential fisher den sites as well as provide potential future den sites. DNR would conduct no activity within 0.5 mile of a known active fisher den between February 1 and July 31. This provision only applies in areas managed for spotted owl breeding habitat and to those activities that would appreciably reduce the likelihood of denning success. Some management may occur in the outer portion of the stream buffers and in the wetland buffers around forested wetlands, however, these strategies would retain suitable snags and downed logs for fishers and contribute to protection of potential foraging areas.

The great gray owl uses mature conifer stands in the winter, especially adjacent to high elevation meadows and wetlands. The combination of the spotted owl strategy, wetland and riparian buffers, and the NRCAs and NAPs should provide habitat for the great gray owl.

**Conclusion:** Both the quality and quantity of this forest type will improve in the long term under the HCP. The amounts of these habitats provided in the absence of the HCP is uncertain and would be primarily dependent on presence of spotted owls and murrelets and the maintenance of current regulations. More importantly, the HCP would provide certainty that those habitats would be available in sufficient amounts to adequately address the needs of the species.

### **Discussion and Summary Regarding Conifer-dominated Stands**

Mature forest with structure and the "old-forest" component are the most limiting at present and are those stands expected to be of most concern in the future. It is expected that younger stands will continue to be abundant due to short rotations on other properties. Continuation of management on DNR-managed lands and continuation of stochastic events will continue to provide younger stands. The structures and diversity of younger stands are either less limiting to early seral species or are expected to improve anyway (i.e., residual structure left as a legacy from previous rotations). Therefore, the Service continues to focus its attention on the most limiting components. These habitat components are those forests and forest structures associated with unmanaged forests and forests greater than 70 years in age.

The Service believes that the DNR HCP will maintain conifer-dominated forests in amount and quality that will continue to contribute valuable habitat for all species associated with west-side

forests and the types of habitat found on DNR-managed lands. The oldest forests will remain as a function of riparian habitat buffers, uncommon habitat buffers, unstable slopes, high-elevation areas, poor growing-site potential, occupied murrelet stands, spotted owl nesting patches, and NRCAs and NAPs. High-elevation areas, poor site areas, and unstable slopes may not all have the capability to grow and retain older conifer forests. The managed forest, however, will also make a contribution through a combination of structural legacies and sufficient rotation age for those legacies to function in the context of a structurally diverse forest in a manner that emulates the natural condition as much as is possible on an economically productive managed tree farm. The amounts of structurally complex forest, and to a lesser degree, closed canopy forest, will work in concert with those stands providing older forest structures to provide landscapes which contain upland interior forest with the components and landscape juxtaposition necessary for so many species. The amounts and quality of these habitats will exceed that expected without an HCP. The Service believes species dependent on all stages of conifer forest will be adequately addressed because all geographic areas will maintain some mix of older and younger stands and the quality of these stands will be better than without the HCP.

### *Deciduous Forest Stand Species*

#### **Young Deciduous Forests**

**Description:** This stage would include deciduous stands in the 10-20 year old category. Stands younger than 10 years old are included in the open forest stage discussed earlier even where such stands are dominated by deciduous trees. Young Deciduous Forest stands are often dense, with individual trees of small diameter, and a fairly well developed herbaceous layer as these stands do not provide the year-round shading found in coniferous stands.

**Current Status:** These stands are not particularly common on the landscape. Previous forestry practices that did not include replanting, but depended on natural regeneration often resulted in such stands. However, these practices were replaced by an era in which burning followed by herbicide application was used excessively. Many of today's alder-dominated upland stands were generated in an era of natural regeneration without planting. Later, burning was a common method of site preparation which encouraged alder regeneration to a degree which led to extensive herbicide spraying and eventually resulted in lesser amounts of alder in regenerating stands. The current trend away from burning will initially result in fewer alder and deciduous sprouts, thus eliminating the need to spray. This will likely result in a better balanced stand of conifers and deciduous trees over the long term.

**Current Trend Without HCP:** Most site-preparation practices today no longer utilize burning, followed later by spraying. Therefore, many stands will continue to have a deciduous component. However, deciduous forest would likely only occur occasionally in areas such as landslide chutes, channel migration zones, and wet hillsides prone to soil creep. These are the areas that will continue to be alder dominated. Management in the recent past has created the potential for this habitat type by removing conifer overstory, but has decreased the quality and

amount of this habitat through active management to control vegetation (e.g., herbicide spray) competing with targeted regeneration species (conifers). Many species, such as band-tailed pigeons, depend upon the seeds and berries produced by broad-leaved plants in this forest stage.

**HCP Result:** There are small scattered patches in areas prone to soil movement. Historically, the region was conifer dominated, and deciduous forest likely only occurred occasionally in areas such as landslide chutes, channel migration zones, and wet hillsides prone to soil creep. These are the areas that will continue to be alder dominated, despite silvicultural efforts to the contrary. Therefore, the Service anticipates that this habitat type, early successional forests dominated by deciduous species, will be fairly constant across the plan area through the permit period.

**Discussion:** Hardwoods can be common on recently disturbed sites and special habitats. Common hardwoods include red alder and big-leaf maple. The preferred habitat of the little willow flycatcher is stands of alder or willow, thickets of salmonberry or blackberry, and low dense shrubby vegetation. In drier climates the species is mainly a riparian species. In wetter climates, such as the western Olympic Peninsula, it has also been observed using shrubby habitats in regenerating clearcuts and in sapling stands between 10 and 20 years old. The HCP would try to maintain the natural mix of conifer and deciduous species. The ecological integrity of the riparian buffer, and the little willow flycatcher habitat contained therein, would be protected by wind buffers. Wetland buffers would also contribute to the protection of little willow flycatcher habitat in forested and nonforested wetlands. Even-aged forest management throughout the west-side planning units would continue to provide shrubby habitats in regenerating clearcuts and sapling stands. Some species, such as the little willow flycatcher, which may also rely on areas of shrubs and deciduous trees in and adjacent to riparian areas, may benefit from smaller openings provided within those areas, and less so from larger harvest units. The HCP will provide leave trees within units that will be distributed or occur in several clumps which should further benefit such species.

**Conclusion:** The HCP offers several distinct advantages over proceeding in the absence of the HCP. Structural legacies will be retained in even-aged management units. Riparian and wetland protections will protect natural functions including those that produce within stand openings. Herbicide control will provide benefits where deciduous shrubs and trees sprout following overstory removal. The emphasis in the leave tree strategy for large snags will ensure structures capable of supporting cavities are present within this habitat type. The emphasis on legacy trees with a propensity toward cavities (i.e., maple) will further benefit this habitat type.

### **Middle-aged Deciduous Forests**

**Description:** This stage would include deciduous stands in the 20-40 year old category. In western Washington, such stands are usually dominated by a combination of Alder and big-leaf maple.

**Current Status:** These stands are also not very common outside of riparian areas or areas of soil movement.

**Current Trend Without HCP:** Where this habitat type occurs in upland management units, it will most likely be harvested and planted to conifer and will not be replaced in kind. It is expected that silvicultural treatments will prevent these sites from reverting to alder, hence, this type of stand will not likely occur in the upland units. However, deciduous forest would likely only occur occasionally in areas such as landslide chutes, channel migration zones, and wet hillsides prone to soil creep. These are the areas that will continue to be alder dominated.

**HCP Result:** Alder-dominated stands are mainly naturally regenerated after logging or some other disturbance. Where this habitat type occurs in upland management units, it would most likely be harvested over the course of the DNR HCP and planted to conifer. It is expected that silvicultural treatments will reduce the amount of alder present in the resulting stands, hence, stands dominated by alder would not likely occur in the upland units. Most site-preparation practices under the HCP would not utilize burning, followed later by spraying. Therefore, many stands will continue to have a deciduous component. However, much of this type is currently in the riparian zones, and some fraction of it will persist on the landscape, and move up through the age classes. Further, the young alder patches mentioned above will move into this age class over time.

**Discussion:** Red-breasted and yellow-bellied sapsuckers require trees with defect (i.e., heart-rot) for nesting. But these species do not need exceedingly large cavities. Sharp-shinned hawks may nest in small conifer patches surrounded by deciduous forest and generally forage in dense forest. The stands in the areas with a natural propensity for deciduous trees shall be maintained in those areas. Upland stands will contain a natural mix of species. These species should find these habitats in natural proportions on the landscape.

**Conclusion:** This habitat category will probably decline but will always persist at some low level on the landscape, as it did under a natural situation and in many of the same locations. The HCP will retain deciduous trees in riparian areas where it is not, rather than converting such areas to conifer. The species dependent on such habitat will continue to be adequately addressed.

### **Old Deciduous Forests**

**Description:** These forests are deciduous dominated forest older than 40 years in age. Most such forests begin declining in vigor at about 60-80 years. Further, these declining stems are providing cavities for primary and secondary cavity nesters.

**Current Status:** Most of this habitat naturally regenerated as the result of removing the old growth, and individual stems are beginning to decline in vigor. These stands are having dominants and co-dominants topple, creating gaps in the over story which enables new seedlings

to germinate, or releases existing shade tolerant conifers. Unlike the previous two habitat categories (young and middle-aged deciduous forests) these stands are somewhat more common in upland management units as a result of management conducted over 50-60 years ago.

**Current Trend Without HCP:** Many of these areas would likely be harvested over the next 20 years or more. The remaining areas would be reserved due to being in steep unstable slopes or riparian areas. Even those stands in upland units which are not harvested would begin to revert back to conifer dominated stands, especially shade-tolerant conifers, during the next 20 or more years.

**HCP Result:** Many of these areas would be harvested as discussed above under mid-aged deciduous stands. There is very little difference in this regard between the proposed action and what would occur in the absence of a permit. The HCP would discourage the use of burning and spraying in site-preparation and, although conifer conversion will occur in many areas that would normally be conifer-dominated, restoration activities will not convert natural deciduous forests to conifer.

**Discussion:** The current proportion of the landscape in older alders is likely higher than what was found in the region historically. The conditions resulting from past practices undoubtedly favored alder, and enabled formerly conifer sites to become alder dominated. Most site-preparation practices under the HCP would not utilize burning, followed later by spraying. Therefore, many stands will continue to have a deciduous component. Some amount of older stands will continue over time due to the dynamics of many parcels of ground and the growth of these stands over time. Whether such sites support older deciduous stands will

likely be determined by the frequency of disturbance and set back to younger stands. Also, these stands if not disturbed will likely convert to conifer dominance over the long term, due to stand dynamics and relative longevity.

Northern flying squirrels are known to use cavity nests in live red alder and will benefit from patches of red alder found throughout the plan area. A number of species nest in cavities from shed branches and other types of defect in live large maples and other deciduous trees as well as the dead deciduous trees found in such stands.

**Conclusion:** The current proportion of the landscape in older alders is likely higher than what was found in the region historically. The HCP will mainly provide this habitat through riparian, wetland, and unstable slope strategies and should resemble the amount and quality occurring naturally.

### **Summary of Deciduous Forest Stands**

In general, the quality and quantity of deciduous forests is expected to be similar to natural

levels under the HCP. Reductions in burning as site preparation, in conjunction with the resultant decrease need for herbicide spray will allow stands of young forest to develop with a better balance of deciduous and conifer trees. Early stages of forest stands in which significant deciduous components exist will be of higher quality under the HCP due to the structural legacies retained from the previous stand. A preference will be given for leave trees of species with propensity for cavities such as maple. Areas which are naturally inclined to support deciduous forest, will be maintained as deciduous forest and not converted to conifer species. Deciduous stands may currently be higher in amount than would occur naturally. These stands are often short-lived in comparison to conifer stands and dependent on natural disturbance regimes in most areas for their continuation. Under the HCP, those natural processes are expected to continue and would continue to dominate as a determining factor in location and amount of deciduous forest.

## **FOREST STAND MITIGATION ATTRIBUTES**

In the following discussion, the proposed action is examined to determine the availability of the structures and functions present in older forest habitat, as well as the structures utilized by forest-dwelling wildlife in general, and whether the quality and availability of these attributes are sufficient to adequately mitigate the impacts of taking unlisted species.

### *Wildlife Trees*

**Description:** Snags, large wildlife trees, cavities, and downed logs are forest-habitat structures that provide many functions important to wildlife species. Vaux's swifts depend upon large, hollow snags for nesting and roosting sites. These structures are usually common in unmanaged stands as well as stands managed for wildlife objectives. These structures may be limited in managed stands where there are no specific wildlife objectives or past natural events and past management activity precluded them. Many species select defective live trees or cavity trees for nesting, in lieu of using standing dead trees. Snag and cavity dependents include taxa that are dependant upon cavities or loose bark for nesting or roosting, decomposing wood as food (detritivores) or foraging, etc. Specific taxa include woodpeckers, some passerines, most bats (all but cave-associated bats), some waterfowl, detritivores, beetles (Coleoptera), and others.

**Current Status:** Many stands are depauperate at present. This is especially true for stands harvested between 10 and 80 years ago. During this time, clear-cutting was often followed by intense site-preparation. Railroad logging also was conducted early in this period and often resulted in post-harvest fires. Prior to this period, high-grading was a common harvest technique and logs which were either too large, had sustained serious damage in felling, or were found to be defective were considered cull and not valuable enough for horses and men to expend the energy of removing them from the forest. In many portions of the State, some of the best habitat remaining are second growth forests that were high-graded over 80 years ago.

State and Federal regulations on worker safety dictate management practices regarding snags and

defective trees. Where high-lead logging systems are used, leave trees are often clumped in one or more portion of the harvest unit. Where tractor logging is possible, workers may safely work from the cab and snags are more likely to be left.

**Current Trend Without HCP:** DNR would meet the minimums established by State regulations (WAC 222-30-20(11)). The State regulations require wildlife reserve trees to be left where they do not conflict with power lines, worker safety regulations, and where they will not create a significant fire hazard. In Western Washington, for each acre harvested, the regulations require 3 wildlife reserve trees (10 or more feet in height and 12 inches in d.b.h.) and 2 green recruitment trees (10 or more inches in d.b.h. and 30 feet in height and with at least a third of their height in live crown) be left. Where wildlife reserve trees are not available, no additional green recruitment trees are required

**HCP Result:** The snag resource, comprised of standing dead, cavity trees, and defective live trees, will increase frequency and size over the life of the plan. The DNR HCP will improve the existing structural complexity of harvested stands by retaining, on the average, three snags and two very large trees for each acre harvested and retaining an additional three dominants, co-dominants, or intermediates. Minimum snag sizes are 15 inches in diameter and 30 feet in height. However, the HCP states that a preference will be shown for snags that are 20 inches in diameter and 40 feet in height. When selecting intermediates, a preference will be shown for shade-tolerant trees with two-thirds green canopy because these trees will have a greater chance of "being released" (recovering from a period of suppression and competition and recovering sufficient vigor to continue normal growth). The above described residual trees would be left permanently including during subsequent thinning and regeneration harvests.

In dispersal-management areas, DNR would retain 4 trees from the largest size class for each acre harvested. In NRF-management areas, only stands with at least three snags or cavity trees per acre that are at least 20 inches d.b.h. will count as submature habitat toward the objective habitat amounts. In high-quality nesting habitat for spotted owls, the DNR HCP will require at least 12 snags per acre larger than 21 inches d.b.h. and will require that at least three trees over 21 inches d.b.h. have broken tops. Greater experimentation regarding wildlife leave trees would be expected within the OESF.

**Discussion:** With the DNR HCP, DNR would employ a leave tree strategy which would focus on leaving at least two large trees per acre in harvested areas. This strategy would also leave 3 snags per acre harvested, as well as 3 additional green recruitment trees per acre harvested for a total of 8 stems per acre.

Important considerations with regard to wildlife are the amount, quality, distribution, and juxtaposition of leave trees and snags. Snag dynamics must also be considered and involve the assessment of green recruitment trees left for future snags.

The quality of snags left under the DNR HCP would be good. Snags would be a minimum of 15

inches d.b.h. and 30 feet in height. Preference will be shown for those 20 inches and greater in d.b.h. and 40 feet and greater in height. Large, hollow snags, snags with intact bark, and particularly valuable snags would be retained. Future snags provided as a result of the legacy trees should be of high quality. Leaving 1 tree from the largest diameter class for each acre harvested should ensure large quality snags in the future stand.

Senescence occurs in developing stands and would provide smaller snags with or without an HCP. However, the provisions of the DNR HCP to leave 5 green trees per acre, especially since 1 will be of the largest size category and another would be a structurally unique tree or one with particular value for wildlife, the DNR HCP is expected to better provide live defective trees with high value for wildlife. Many species nest on platforms commonly found as a result of mistletoe deformities or very large branches. These are the type of structures the DNR HCP would provide in excess of current regulations.

Many snag-dependant species require minimum heights in excess of 40 feet. A few species require snags that are quite tall. Brown creepers need snags in excess of 80 feet, red-breasted sapsuckers in excess of 70, and chestnut-backed chickadee and violet-green swallows use snags over 60 feet tall. The preference for snags over 40 feet tall and the retention of 1-2 trees per acre from the largest 2-inch diameter class will ensure that snags of these heights are present.

Many snag-dependent species need snags in excess of 20-25 inches in diameter and include the spotted owl, vaux's swift, pileated woodpecker, and the Pacific fisher. Of the species examined in a review of the literature, few species utilized snags less than 10 inches in diameter (Sloan 1996).

For some species, the surrounding habitats are somewhat irrelevant as long as suitable high-quality snags are available. Vaux's swifts nest in late-successional coniferous forests. There are indications that they depends on old-growth forests for survival. The species requires large hollow snags or cavities in the broken tops of live trees for nesting and night roosting. Nest snags west of the Cascades are at least 40 feet tall and 25 inches d.b.h. Hundreds of Vaux's swifts may use a single large hollow tree for night roosting. There is usually one nest per tree. They exploit all seral stages while foraging, but show a strong preference for spaces over water.

The combination of spotted owl, murrelet, unstable slope, riparian, and stand structure strategies, in combination with the leave tree strategy should provide Vaux's swift nesting habitat. The leave tree strategy places emphasis on large hollow snags over 40 feet tall that would be ideal Vaux's swift nesting structure. Large leave trees will become the large snags of future forests. Snags that are known to be used by Vaux's swifts as night roosts or are known to contain active Vaux's swifts nests will also be retained. The large, old trees would be selected for their unique structural characteristics or because they are considered to be old-growth remnants. These green trees would have the potential to become suitable snags for Vaux's swift in the future.

Each OESF landscape planning unit would have a 40-percent threshold amount of nesting,

roosting and foraging habitat for spotted owls, of which half would be older forest habitat. This strategy, the riparian strategy, and wetland buffers, would likely provide an adequate amount of suitable snags for Vaux's swift. In addition, specific provisions for protection of very large, old trees, snag and green tree retention, and protection of known Vaux's swift night roosts and active nests as described earlier would be implemented on the OESF as well.

Tree species with a propensity to develop cavities (e.g., maples) would be shown preference for retention, but the post-harvest stand should generally be representative of pre-harvest tree-species diversity.

The DNR HCP would leave a greater number of green recruitment trees per acre than would occur without the HCP. If snags are present, 3 snags would be left both with and without the HCP. An additional 5 green recruitment trees would be left under the HCP (2 of which would be large and unique). State regulations would require that 2 green recruitment trees be left. If snags are not present, State regulations would still only require that 2 green recruitment trees be left. Under the HCP, a total of 8 green recruitment trees will be left if no snags are present.

Often, snags and green leave trees are clumped as a result of harvest-unit logistics. Many harvest operations are made logistically more simple by clumping all leave trees in one or two clumps at the edge of the harvest unit. Clumping leave trees in this manner benefits some species, while distributing leave trees benefits others. Those species which depend upon undisturbed sites would benefit from clumping, which may include many ground-dwelling animals such as amphibians. Clumping may provide a refugia from which some species can later disperse into the surrounding unit as it matures. Northern sawwhet owls and flycatchers may utilize clumps of leave trees and snags adjacent to open areas. Some species would benefit more from a distributed pattern of leave trees rather than leaving single clumps. Many species, such as the northern flying squirrel, are territorial during at least part of the year. Flying squirrels are important prey species for several forest carnivores including spotted owls. Flying squirrels have home ranges on the order of 1-10 acres and are believed to defend a territory during the breeding season (Madden 1974). Single clumps would reduce the number of flying squirrel territories that a stand would be able to support. However, a strategy which would provide clumps of leave trees and snags every 5 acres, such as proposed in the HCP, would likely serve the needs of flying squirrels and other such species quite well. Vaux's swift, fisher, and marten require hollow snags which are often in short supply. Some species of trees, which rot more rapidly in the core leaving a structurally sound shell surrounding a softer or hollow core, provide superior cavity-nesting opportunities for many species. The HCP will provide emphasis on the retention of these structures.

As the stands mature, the legacy trees provide habitat for different guilds of species at different times. Trees left with or without the HCP should provide a sufficient number of legacy trees once the stands become mature, but large, higher-quality wildlife trees would be of greater number than would occur without the DNR HCP. Sufficient structure would not be guaranteed

in the younger stands without the HCP, because the State regulations do not require replacement green trees when snags are not available and allow smaller snags to be retained in lieu of larger snags.

With the HCP, large trees left in harvested units would be selected for characteristics important to wildlife and will provide habitat for many species which utilize openings. For example, bluebirds, violet-green swallows, kestrels, flickers, and Lewis' woodpeckers utilize snags and trees with cavities when they occur within and adjacent to open areas. Rufous hummingbirds utilize trees for nesting in very early stages of forest succession and rely on dense stems and foliage for nesting sites. Other species, such as sapsuckers, nuthatches, and flying squirrels would use snags once surrounded by forests of sufficient development. The retention of structural components coupled with the regenerating stand will begin to form the multiple canopy layering that is required by many late-successional wildlife species. It is expected that secondary cavity-nesting species would benefit by providing for the needs of primary excavators. The types of structures described above will be recruited as stands develop. The HCP would provide a much greater quality of leave trees and snags in younger and older forests than would occur without the DNR HCP.

Some species not only require specific types of trees for suitable cavities (e.g., rot faster on inside than the outside so it maintains a suitable shell) but also require specific habitats surrounding those structures. The pileated woodpecker requires old forest surrounding its nest sites which support populations of carpenter ants, purple martins require snags near water for foraging on flying insects, the western bluebird uses snags in or near upland openings such as old burns or clearcuts.

The pileated woodpecker inhabits mature and old-growth forests with large snags and fallen trees. The best habitat appears to be conifer stands with two or more canopy layers, with the uppermost being 80-100 feet high. Pileated woodpeckers excavate nest cavities in snags or live trees with dead wood. Roost tree characteristics are similar to those of nest trees. Within their home range, pileated woodpeckers show a preference for foraging in forests 40 years or older and in riparian areas, where they search for insects on large snags, logs, and stumps.

Habitats resulting from a combination of HCP strategies would contain suitable large trees and snags preferred by pileated woodpeckers. In addition, under the HCP, very large, old trees would be retained. Preference would be shown for hard snags with bark at least 20 inches d.b.h. and at least 40 feet high. Large secondary cavity nesters such as raccoons, martens, and spotted owls make use of the large cavities excavated by pileated woodpeckers. Historic sites will be protected. For that reason, as well as for pileated woodpeckers themselves, historic pileated woodpecker nesting trees would also be retained.

Purple martins require cavities for nesting. Declines in purple martin populations have been attributed to a reduction in the number of snags across its breeding range. Historically, the species probably utilized cavities excavated by woodpeckers. Its preferred breeding habitat is

open areas near water. The species is an aerial forager of insects, and uses all seral stages of riparian/wetland forest as foraging habitat.

Spotted owl management is expected to result in the development of late-successional forest containing a variety of snags. Ecosystem restoration within the riparian buffer would try to maintain the natural mix of conifer and deciduous species. In addition, this alternative contains a special provision for protecting very large, old trees as part of the snag and green tree retention strategy. The additional snags and green trees would function as a source of current and future habitat for purple martins.

The western bluebird requires cavities for nesting, and often nest in cavities excavated by woodpeckers. Nests are found in open woodlands, burned areas with snags, and other open areas with scattered trees. Western bluebirds are found in the majority of clearcuts where snags are present, and bluebird density is correlated with snag density. The species forages on small invertebrates and berries. Prey are often captured by hawking from low perch. The riparian strategy would protect some snags suitable for western bluebirds. The DNR HCP would result in forests with mature and old-growth characteristics, and snags of different size and decay class and would ensure that current and future snags are available in upland areas for use by western bluebirds.

Some species, such as the three-toed and black-backed woodpeckers, use snag-concentration areas such as occur following fires where the trees are killed and/or damaged but left standing. These species should benefit from the salvage provision in the DNR HCP which states that in conducting salvage activities DNR shall, to the maximum extent practicable minimize the harvest of live trees to those necessary to access and complete the salvage activity and maximize and clump the retention of large, safe, standing trees to provide future snags.

**Conclusion:** The minimum leave trees required in the absence of the DNR HCP might not provide sufficient habitat for these species because there is no particular focus on the value of large trees for wildlife. Without the DNR HCP, there would be no guarantee that snags would be provided above the requirements in State regulations. With the HCP, large snags will be available in early-seral and late-seral stands. Dispersal areas will have robust levels of snags as will nesting patches for spotted owls. All areas will have uniquely large trees left within harvest units and distributed in a manner so that they will be usable to species with large and small home ranges. The wildlife tree provisions of the HCP exceed the current regulations in every manner. Primary excavating species, including the woodpecker guild (pileated, downy, hairy woodpecker(s), northern flicker, and red-breasted sapsucker) and red-breasted nuthatch will benefit from the management of standing dead and cavity trees by the DNR HCP. Therefore, secondary cavity-nesting species, such as the northern flying squirrel which also use standing dead trees and cavity trees, will be well provided by the outcome of the HCP.

## *Coarse Woody Debris*

**Description:** Coarse woody debris is generally considered to be fallen, dead, boles of trees. Coarse woody debris dependents are those species that depend on accumulations of large dead and downed woody material, as a micro-site with appropriate temperature and humidity qualities, or as food sources. Coarse woody debris is also important in reestablishment of young conifers in many areas through the process whereby rotting logs support young trees and provide a source of moisture. These logs are known as "nurse logs". Beetles (Coleoptera) also are known to rely on this material. Specific taxa include detritivores, (especially invertebrates), amphibians, forest floor mammals (e.g., microtines), and mollusks. Specifically, these species include ensatina, western red-backed salamander, northern alligator lizard, rubber boa, sharp-tailed snake, western skink, Townsends' solitaire, common poorwill, ruffed grouse, long-tailed vole, Pacific jumping mouse, as well as weasels and other carnivores.

**Current Status:** The stands that were harvested about 80 or more years ago usually had considerable amounts of coarse woody debris retained in the stands. The forest operations of that era only yarded the material that was destined for the mills, and cull material was left on site. Some of these stands, however, have been subjected to harvest since then. Most of this large material in forest floors is still valuable, but has become less so since much of it is currently in advance stages of decay.

**Current Trend Without HCP:** Intensively managed stands are depauperate and current regulations are likely to improve conditions minimally. As young stands grow and enter the stem-exclusion phase of stand development, standing dead trees and coarse woody debris will be recruited into these stands. State regulations require two downed logs per acre with a small end diameter of at least 12 inches and a length greater than or equal to 20 feet (or equivalent volume) shall be left.

**HCP Result:** The DNR HCP will require at least 5 percent ground cover of coarse woody debris as a requirement of submature habitat or high-quality nesting habitat for spotted owls. These percentages may be adjusted upward (but not to exceed 15 percent) as a result of adaptive management. The DNR HCP will not supplant the State regulations regarding retention of coarse woody debris in harvest units. The HCP will, however, through the improved leave tree strategy, ensure a larger supply of high-quality coarse woody debris in future stands. Riparian and uncommon habitats will also make a contribution of coarse woody debris into the stands; much of this material will be large (greater than 24 inches d.i.b.). The objectives for large woody debris in riparian areas will provide for additional large diameter material in the form of standing dead trees and coarse woody debris components.

**Discussion:** Under the DNR HCP, the abundance of standing dead and cavity trees will increase on the plan area leading to an increase in the abundance of coarse woody debris on the plan area. The tailed frog is dependent on the riparian zone but also finds habitat in coarse woody debris. It is likely that the tailed frog would benefit and persist on the plan area from the actions of the

DNR HCP. Arboreal mammals (northern flying squirrels and Townsend's chipmunk) and forest-floor mammals (deer mouse and southern red-backed vole) also are closely tied to the abundance of coarse woody debris habitat. Some members of the woodpecker guild, specifically pileated and hairy woodpeckers and northern flicker use coarse woody debris and will thrive under the provisions of the DNR HCP in comparison with the absence of an HCP. Commercial thinning, retention of standing dead and cavity trees, riparian and uncommon-habitat protection will contribute to the prevalence of coarse woody debris on the plan area and benefit the wildlife species dependent upon this habitat.

The California mountain kingsnake occurs in oak and pine forests and on chaparral up to 9,000 feet in elevation. Their breeding, foraging, and resting habitat occurs primarily in early to mid-seral stage forests. They may be found under and inside rotting logs and sometimes under rocks. The HCP is likely to protect Oregon white oak woodlands and some ponderosa pine stands where white oak is a significant component.

Some species, such as wolverines, bobcat, weasels, and long-tailed vole depend on, or at least prefer, concentrations of coarse woody debris such as occur on a temporary basis following fire, windstorms, and infestations. Those species' needs would be addressed through the salvage provision described earlier under Wildlife Trees, in conjunction with older forests.

**Conclusion:** Under the HCP, coarse woody debris will be provided in riparian areas, nest patches, submature spotted owl habitat, as a result of the leave tree strategy and the eventual downfall of those structures, buffers on wetlands and uncommon habitats, and wherever older forest occurs. These would all contribute coarse woody debris at a level and distribution in excess of what would occur without the HCP. State regulations would retain a small amount at time of harvest. Without the HCP, some coarse woody debris would occur in areas restricted due to spotted owls and marbled murrelets. The HCP is expected to provide for those species dependant on coarse woody debris.

### *Shrub Understory*

**Description:** The development of woody shrubs is key to providing forage habitat for northern flying squirrels and other prey species of spotted owls. Understory shrubs also provide perches for spotted owls to hunt from. The major understory species found in the plan area also provide fruits and masts which are used as food sources for many wildlife species. Understory dependents are those species that exploit resources in the area between the forest floor and the upper canopy. This canopy layer is typically composed of deciduous shrubs and small shade-tolerant conifers. Specific taxa include passerines, especially warblers and thrushes; invertebrates; and arboreal mammals, such as the northern flying squirrel and Townsend's chipmunk.

**Current Status:** The luxuriant growth of understory shrubs should not be a concern in this region of Washington State. To the contrary, too much growth of understory shrubs can slow tree growth by competing for space and light.

**Current Trend Without HCP:** Thinning, and other silvicultural treatments that will be implemented on the plan area will hasten the development of understory vegetation and secondary canopy layers.

**HCP Result:** The HCP will increase the heterogeneity of the stands and increase the amount of suitable Young Forest Marginal habitat on the plan area over the permit period.

**Discussion:** Hardwoods can be common on recently disturbed sites and special habitats. Common hardwoods include red alder and big-leaf maple. Common understory plants include vine maple, ocean spray, snowberry, huckleberries, swordfern, and salal.

The DNR HCP would maintain a range of forest successional conditions across the plan area at all times. Commercial thinning on a large proportion of the plan area will improve the understory vegetation in openings created in these thinned stands, thus improving the condition of forage and roost sites for spotted owls and the spotted owl prey species that forage in the protective cover of understory plants. Clear cutting is planned for many stands upon completion of the rotation and the growth of understory vegetation will be substantial. The variety and form of the shrub vegetation on the plan area will provide an abundant source of buried seed for seedling production of vegetation. Additionally, abundant understory vegetation can be expected to sprout from rhizomes (salal) or spores (ferns) of many species that are currently found on the plan area, and from sprouting of plants (maples) that are cut or injured during harvest operations.

**Conclusion:** The Service believes that species dependent on shrub understory for all or part of their life requisites will benefit from implementation of the DNR HCP. Mid-rotation thinnings, control of herbicide use, and the removal of the disincentive for longer rotations with aggressive thinnings to provide quality wood, should lead to a more developed understory in stands of all ages.

#### ***Other Forest Stand Attributes***

These attributes include functions such as seed-crop production. The variety and form of the shrub vegetation on the plan area will provide an abundant source of buried seed for seedling production of vegetation, especially if silvicultural treatments include mid-rotation thinnings as well as the off-base acres which will serve as refugia for more sensitive plants. Refugia would also be provided by riparian areas which will be found throughout the landscape. Large and older conifer trees produce far more seeds than younger trees. Fine woody debris is expected to be provided under the DNR HCP as well as without the HCP. It is a function of any forested area and is not expected to be a limiting factor. This material is expected to accumulate in

greater depth in older stands and therefore the benefits of this accumulation should be related to the abundance of those structurally complex and fully functional forests discussed earlier. Soil nutrients and structure should be maintained by the HCP and would benefit species such as moles and mountain beaver. The HCP soil structure protection will result from amounts of old forest, protection of less stable slopes, maintenance of integrity of "wet soils" and wetland areas. Bark maturity (heavily furrowed, thick bark) provide crevices for nesting, and for lichen, fungi, and a host of invertebrates. As the bark peels it provides points of entry for disease vectors which accelerate decadence and decay. The HCP will provide far more older forests, and through legacy trees retention, will benefit bats that are found under bark, as well as amphibians like salamanders that will use these micro-habitats once those trees fall and become logs with well-developed bark.

Multi-layered canopy will be enhanced through mid-rotation thinnings, longer rotations, off-base acres, riparian areas, and management for spotted owl habitat in designated areas. This management will be important to Pacific red-backed vole and is an important factor in snow reduction and thermal cover at higher elevations which would benefit species like elk and great gray owls. Canopy arthropods are found in greater abundance in multi-canopy, older forest stands. Old forest associated communities (epiphytes, bryophytes, lichen, fungi, and vascular plants) are also expected to benefit in proportion to the older forest as well as from some of the special habitat buffers, and to a lesser degree from provision of structurally complex forest. Hypogenous mycorrhizal fungi are generally more abundant in old forest and naturally regenerated forests than in managed stands. This is likely due in part to the greater amounts of coarse woody debris and more stable microclimates. These stand-level attributes would benefit from the provision of interior forest, older forest, as well as the residual clumps of legacy trees that would provide refugia in the developing stands.

### *Summary of Forest Stand Attributes*

Forest stand attributes are expected to be of higher quality with the HCP than without it. At the time of final harvest, site preparation, which includes less burning and then subsequently less spraying, will maintain a better mix of species in future stands. Retention of residual features such as downed wood and standing trees will be important to later stands. The HCP would provide 3 large, quality snags; 2 very large or unique trees; and 3 other green recruitment trees for each acre harvested on the average. This would equate to an average of 8 stems per acre on the average which would provide for a range of species similar to pre-harvest stands. Slight preference will be shown for certain species as snags, and younger green recruitment trees are more likely to be shade-tolerant species. The distribution of these residual trees will be variable; when possible they will be distributed in several patches throughout the harvest unit. Snags and coarse woody debris will likely be in higher amounts in special management areas such as NRF-management areas, dispersal-management areas, riparian and wetland buffers, and in association with other special habitats. Generally speaking, the quantity of snags is more limiting than coarse woody debris. If sufficient snags and green trees are retained, they will eventually become coarse woody debris. The snags and leave trees retained under the HCP will be left

permanently. Mid-rotation thinnings will therefore maintain snags and coarse woody debris and are also likely to accelerate understory development. Taken as a whole, the combination of shrubby understory with features such as snags, large trees, and coarse woody debris will act synergistically and provide benefits for many forest dwelling species dependent on such attributes.

## **LANDSCAPE MITIGATION ATTRIBUTES**

A conflict exists in making harvest-management decisions regarding harvest unit size and juxtaposition. Numerous small units will result in maximum fragmentation and edge, and will also require many roads to access these units. Fewer but large units will retain more interior forest but creates a large void that is not fully utilized by edge-dependent species. Rotation length is a primary determining factor influencing the amount of edge versus interior forest. Secondary considerations are the size and distribution on the landscape. The following analysis explores the balance between these two competing factors.

### *Interior Forest*

**Description:** For the purposes of this discussion, interior forests are those structurally complex forest (greater than 70 years) which are of a sufficient distance (100-300 feet) from the edge of younger stands or nonforested areas to maintain conditions which are characteristic of nonfragmented forests. Murrelets and a number of other forest-nesting birds are subject to high predation rates when exposed to forest patches with high edge-to-area ratios. A number of species dependent on moist, stable conditions are negatively affected by changes in microclimate which occur in the vicinity of edges.

Interior forest species are those taxa that need large tracts of forest with intact canopy. These species are typically susceptible to predation or microclimate effects if they are forced to be located near an edge. Specific taxa include invertebrates (e.g., canopy arthropods) and passerines (e.g., warblers).

**Current Status:** It is possible that in the short term, and the long term to some degree, unstable slopes will make some contribution to interior forests. However, many such slopes are incapable of growing or supporting older forests. The stage of forest development on these unstable slopes varies across the landscape. One common factor is that they are often located adjacent to or nearby streams or seeps. Although we do not know the size or shape of these patches, adjacency to the riparian corridor system should complement the forests found within those corridors.

**Current Trend Without HCP:** With regard to the contribution made by spotted owl sites, the amount would depend to a large degree on the existing situations present in current spotted owl circles. The contribution received from murrelet sites would depend on whether murrelet sites were of sufficient size and shape to provide interior forest conditions. Riparian buffers may contribute complex forest, but may be too narrow to provide interior forest unless they are

adjacent to mature stands. However, many species will benefit by widely distributed, complex-forest components within buffers. Other species require interior forest with complex structure and would derive benefit only when buffers are adjacent to other complex forest. Unstable slopes may be deferred from harvest until more is learned about how these slopes can be managed without increasing the risk of mass wasting and erosion.

On the OESF, the amount of interior habitat provided through the riparian and murrelet strategies may be minimal. Where these areas occur in proximity to one another or in proximity to unstable slopes, areas may coalesce into patches of habitat sufficient to provide some interior forest. Spotted owl circles by themselves are also unlikely to provide large amounts of interior forest, but in conjunction with the above strategies may make a contribution.

**HCP Result:** Interior forest is likely to occur within the NRF-management areas as the 50-percent goal is achieved. The 500-acre patches are likely to contain a considerable amount of interior forest. The contribution received from murrelet sites would depend on whether murrelet sites were of sufficient size and shape to provide interior forest conditions. The situation with regard to riparian and unstable-slope areas is similar to what would be expected in the absence of an HCP.

On the OESF, interior forest is likely to occur to some extent within the OESF as the 40-percent goal is achieved. The contribution received from murrelet sites would depend on whether murrelet sites were of sufficient size and shape to provide interior forest conditions. The situation with regard to riparian and unstable-slope areas is similar to what would be expected in the absence of an HCP.

The stand structure commitments (Table 3) which include off-base lands display the amounts of old forest, structural complex forest, and closed canopy forest found in NRF-management areas, dispersal-management areas, and areas with no designation for spotted owl management.

The Service expects the amount of NRF habitat in the NRF-management areas to be of sufficient quantity to reduce fragmentation and provide connectivity because we anticipate that greater than 50 percent of those areas will support NRF-quality habitat for the following reasons:

- (1) The habitat-based approach used to address all species utilizes a commitment to obtain certain stand-structure objectives. According to those commitments, the Service expects Complex Forest (approximates NRF habitat) to remain above 50 percent throughout the permit period, culminating in 59-71 percent by year 2096.. The OESF is expected to be 60-70 percent structurally complex forest at year 2096.
- (2) The management objective for the NRF habitat in any given Watershed will depend on an assessment of Federal and DNR-managed lands within the WATERSHED WAR. Where Federal and DNR-managed NRF habitat combined average less than 50 percent of

the landscape, DNR will maintain all the habitat present on DNR-managed lands within the WATERSHED WAU -- in some cases this exceeds 50 percent -- until the combined Federal/DNR objective of 50 percent is met. Where this goal is already met, and DNR lands are already greater than 50 percent NRF, they may harvest habitat down to the 50 percent level so long as it does not bring the average of Federal and DNR-managed lands combined below the 50 percent threshold. As an example, in a particular WATERSHED WAU, the Federal lands contain 45 percent habitat and DNR-managed lands are of similar acreage containing 67 percent habitat, DNR may harvest 12 percent. However, once they reach the 55 percent level any further harvest would drop the combined (Federal/DNR) average below 50 percent, and would not be allowed. Therefore, as a general statement, WAUs below 50 percent of DNR-managed lands will improve to the 50 percent level; while not every WATERSHED WAU above the 50-percent threshold would be harvested down to that level.

In addition, the 300-acre nest patches and the 200 acres of adjacent submature habitat (together a contiguous 500-acre patch) would be designated within a 0.7-mile radius which would ensure a contiguous patch with sufficient area:perimeter ratio to ensure interior forest conditions.

**Discussion:** Harvest units will be about 60-70 acres on the plan area. This size is a compromise between making numerous small clearcuts, which results in maximum fragmentation, and requires many roads for accessing each unit, and making few clearcuts that are very large, which produces a lot of interior forest when the subsequent stand matures, but also creates a large void on the landscape that is not fully utilized by the edge-dependent species. Deferring harvest for many of the high quality mature stands will prolong the period when mature, closed canopy units are adjacent to one another, and therefore provide interior conditions. Rotation length is probably the single greatest determinant influencing the amount of edge versus interior forest on a landscape. DNR's average rotation is an improvement over the normal operations conducted on other commercial forest lands in the region. Although some of these forests produced by management practices may not contain the necessary structures to be considered old forest, buffering of old forest by landscape amounts of closed canopy forest and complex forest may be considerable. It is expected that 62-68 percent of the west-side units will provide closed canopy or older forest in year 2096. The Old Forest will provide the valuable habitat itself, structurally complex forest will contribute many of the same attributes and would buffer the older forest, and Closed Canopy forest would provide additional buffering at the landscape level.

A number of studies have attempted to address this issue of landscape continuity. In general they find that at first habitat loss is the major effect to species dependant on older forests, but as habitat is removed beyond a certain point, fragmentation effects were added to those of habitat loss. Most studies seem to indicate that percolation occurs when habitat comprises 40-50 percent of the landscape but its ability to "span" the landscape peaks at levels which approach 60 percent. In addition, landscapes are not located randomly. Placement of riparian corridors and unstable slopes are often interrelated. The effects of habitats intermediate between nonhabitat

and the most preferred habitats (i.e., closed canopy forests) are often significant. Tree height and density is often sufficient to buffer older forests from the negative effects on temperature, relative humidity, sunlight, and wind speed. The amount of closed canopy forests on the landscape are often considerable.

**Conclusion:** The DNR HCP would provide larger amounts of interior forest than is estimated to occur in the absence of the HCP. The distribution of such interior forest is likely skewed toward the NRF-management areas. Other areas may be dependent upon riparian areas, unstable slopes, and murrelet sites for interior forest. This would not leave insufficient amounts of interior forest, for some species across large landscapes, because of the stand-structure objectives by spotted owl-management area. Patch size and adjacency is likely to increase as the amount of complex forest increases beyond 40 or 50 percent.

### *Edge*

**Description:** Edge species include taxa that make their living in an ecotone between two or more habitat types, due to the preponderance of resources available at these edges. These species are most of the hunted wildlife species, flycatchers, numerous invertebrates, and many mammalian and avian predators.

**Current Status:** This habitat category is very common on today's landscape. This is a habitat category that was far less common in pre-settlement times. The Service believes that the species relying on this habitat type are generally quite common in managed forest landscapes, including the plan area.

**Current Trend Without HCP:** The trend without the HCP would depend on the area. In areas which are constrained by spotted owl or murrelet concerns, edge would continue to decrease as little harvest would occur in suitable habitat. Harvest would continue in those stands that were not yet habitat. In areas outside such constraints, harvest would occur at a level to ensure those areas did not become suitable for spotted owls or murrelets and that harvest was sufficient to compensate for lack of harvest in other areas. In general, the amount of edge habitat would remain at high levels.

**HCP Result:** With an average 60- to 80-year rotation, enough of the plan area will be in younger structural stages (those containing grass, forbs, shrubs, seedlings, and saplings) to provide adequate forage for these species. Under the DNR HCP, 5-10 percent of the plan area will be clearcut harvested every 10 years. For many of the mammalian and avian predators in this group, edges and recently clearcut areas are important hunting areas, though they typically depend on closed canopy forests for breeding and sheltering sites. These species should also fare well under the landscape designed in the DNR HCP.

**Discussion:** The preferred habitat of the olive-sided flycatcher is late-successional coniferous forest, in particular, open coniferous forest with tall standing dead trees. The species is often found along forest edges, where it perches on tall, exposed snags.

The riparian and spotted owl conservation strategies should ensure the development of large contiguous landscapes of submature to old-growth forest. Management within the riparian buffer should eventually result in stands with mature and old-growth characteristics. More habitat is provided by the wider guaranteed riparian buffers, and the spotted owl conservation strategy that provides older forests for spotted owl nesting. Provision for conserving large, old trees important to wildlife, as part of the snag and green tree retention strategy, which eventually may become snags preferred by the olive-sided flycatcher.

Management of the riparian ecosystem on the OESF would be expected to provide some breeding, foraging, and resting habitat of the olive-sided flycatcher, and other species associated with late-successional and old-growth forests. This strategy would likely ensure some olive-sided-flycatcher habitat would be distributed throughout the OESF.

The lynx occurs in very remote areas, using extensive tracts of dense forests that are interspersed with rock outcrops, bogs, and thickets for breeding, foraging, and resting habitat. They use a mosaic of forest types from early-successional to mature conifer and deciduous forests, as long as snowshoe hare are present, upon which they are almost totally dependent. Lynx forage in early-successional forest for prey, and den in mature forests. A primary component of suitable habitat for this species is a low level of human activity.

The likelihood that lynx would occur on DNR-managed lands in the HCP area is small. However, protection of the lynx's prey base in early-seral-stage forests or potential den sites in mature forests would be incidental to the balance of stand structures expected on the landscape.

**Conclusion:** The HCP is expected to place greater emphasis on mid-rotation thinnings and higher-quality wood. The balance of stand structures, the continuation of revenue-generating timber harvest, and naturally occurring stochastic events should equal or exceed the amount of edge habitat that would have occurred naturally. This will however be somewhat less than would occur in the absence of the HCP.

### ***Summary of Landscape Attributes***

DNR Harvest units will be about 60-70 acres on the plan area. This size is a compromise between making numerous small clearcuts, which results in maximum fragmentation, and requires many roads for accessing each unit, and making few clearcuts that are very large, which produces a lot of interior forest when the subsequent stand matures, but also creates a large void on the landscape that is not fully utilized by the edge-dependent species. Rotation length is probably the single greatest determinant influencing the amount of edge versus interior forest on a landscape. Secondary considerations include size of harvest units and distribution within the

planning area. DNR's average rotation is an improvement over the normal operations conducted on other commercial forest lands in the region. Harvest units might often be located near recently harvested areas to the extent allowed by State regulations regarding green-up. This would facilitate periods of activity in subbasins, followed by periods of inactivity during which time roads could be closed or abandoned. Another benefit of this management is that these harvested areas would be of similar age and, after a number of years, would start to represent larger blocks of old forest. This will also help maintain a low edge:interior ratio for blocks of mature forest, and may help to reduce the risk of wind-throw. Initial estimates of stand structures indicate that sufficient amounts of habitat will be in structurally complex forest to provide large blocks and connectivity. The riparian areas will serve as additional connective corridors. Landscape levels of closed canopy forest should ensure that connectivity of habitat patches exists at high levels.

## **RIPARIAN HABITAT MITIGATION**

### *Riparian Corridors*

**Description:** Riparian areas, as described in EIS Sections 4.2.3, 4.3.2, and 4.4.2, include forested areas adjacent to streams and wetlands which influence those aquatic and wetland habitats, and are in turn influenced by those habitats as well. Many species dependent on moist environments or dependent on aquatic environments for a portion of their life history requirements are often dependent on riparian habitats. Riparian dependents are those species that are dependents upon the transition between the aquatic environment and the terrestrial uplands for some portion of their life cycle. This includes some of the amphibians, invertebrates, birds and mammals that occur on the plan area. Riparian areas are important sources of cavities for certain species, such as cavity-nesting ducks (e.g., wood ducks, Barrow's golden-eye, hooded mergansers, and buffleheads).

**Current Status:** Quality of riparian forest can be influenced by a variety of disturbance events, including timber harvest and road construction. Much of the original composition of riparian zones on DNR-managed lands has been altered by past logging. Channels were simplified by channelized landslides and splash-damming that removed in-stream structure and pools. Fish passage was inadvertently blocked in some streams by roads and railroad fills, which reduced the return of nutrients to upper reaches of these streams. Riparian trees were largely removed by logging in these riparian zones which resulted in less shade, large woody debris, and decreased bank stability. Many of the streams experience elevated temperatures and excessive amounts of sediment. Due to recent changes to the Washington Forest Practices Act, clear-cutting along fishbearing streams has not occurred recently, and therefore, younger age classes are becoming less-common in riparian forests. However, species composition of forests along streams is often skewed toward deciduous dominance, especially along the more level stream reaches, and toward younger stands than desired. About 10 percent of these areas are over 101 years in stand age, 30 percent are 50-100 years, 20 percent are 26-50 years, 10 percent are 13-25 years, and 10 percent are 0-12 years. About 20 percent are in deciduous stands.

**Current Trend Without HCP:** Regulations established for riparian protection through promulgation of State regulations, or *de facto* State regulations which result from completion of Watershed Analysis would be expected to continue. It is also expected that DNR would adhere to those regulations. Under State regulations, the protection on streams varies by stream type and size, as well as substrate. Type 1 and 2 waters over 75 feet wide receive 100-foot buffers, Type 1 and 2 waters under 75 feet in width receive a 75 foot buffer, Type 3 waters over 5 feet wide receive a 50 foot buffer, and Type 3 waters less than 5 feet wide receive a 25 foot buffer. Type 4 and 5 streams seldom receive any buffers. The number of trees within the buffer varies. Type 3 streams generally are only required to have 25 trees per 1,000 feet of stream (about 44 trees per acre). Larger streams may require as many as 100 trees per 1,000 feet. Tree size requirements generally specify that trees must be representative of the pre-harvest stand on Type 1 and 2 streams. Type 3 streams over 5 feet wide receive 12-inch trees and smaller Type 3 streams only require 6-inch trees. Buffers are measured from the ordinary high-water mark and do not include the channel migration zone or off-channel habitats. Stand structures within riparian areas would be unlikely to improve under current regulations.

**HCP Result:** This strategy should lead to an age-class distribution dominated by conifer stands 100-200 years in age (70 percent) and stands over 200 years in age (10 percent) at year 2096. These stands will likely increase throughout the permit period. The DNR HCP provides specific protection for many habitat components of riparian ecosystems. Buffer widths are established with consideration to stream type and size and site potential tree height. Additional buffers may be prescribed for retention in wind-prone areas, but it is not possible to predict how often or under which situations these will occur. The DNR HCP provides wind buffers of a prescribed width on the windward side only of fishbearing streams where necessary because there is potential for windthrow. The occurrence of wind buffers would be more likely to occur in exposed stands along coastal areas. Possible treatments expected for riparian buffers are discussed in the HCP and are herein included by reference.

Riparian management zones will be established on Type 1 through Type 4 Waters consisting of riparian buffers and, where applicable, wind buffers. Forest-management activities in riparian management zones (100-year floodplain as the inner margin) will be allowed as follows: (1) 25-foot (horizontal distance) no-harvest area (restoration activities are allowed); (2) next 75 feet will be a 'minimal-harvest' area for ecosystem restoration and/or selective single tree removal; (3) remaining portion of riparian buffer will be a 'low-harvest' area for selective removal of single trees or groups of trees, and thinning and salvage operations. Riparian buffers of one site potential tree or 100 feet, whichever is greater, measured on the horizontal, will be applied to both sides of Types 1, 2 and 3 Waters; expected to average 150-160 feet. Riparian buffers of 100 feet will be applied to both sides of Type 4 Waters. All Type 4 and Type 5 Waters classified prior to January 1, 1992, will be verified in the field or assumed to be Type 3 Waters and will be buffered accordingly. Type 5 Waters will be protected by buffering for steep and unstable slopes, where applicable; estimated to be approximately 50 percent of Type 5 Waters. Type 1 and Type 2 Waters will receive a 100-foot wind buffer along the windward side of streams, and Type 3 Waters wider than 5 feet will receive a 50-foot buffer along the windward

side of streams, where there is at least a moderate potential for windthrow. Harvest activity within the wind buffer will be on a site-specific basis that may include single tree or group selection, and thinning and salvage operations. Roads and yarding will be permitted when required through riparian buffers. DNR's road-management strategy will minimize further road-related degradation of riparian and aquatic habitats. Type 4 or 5 streams documented to contain fish that are proposed or candidates for Federal listing will be treated as Type 3 waters.

To accommodate the greater flexibility afforded by managing riparian areas on a site-specific basis and to accommodate the uncertainties surrounding the results of these activities conducted over time, an adaptive-management process would be used to specify management activities within riparian-management areas. Mechanisms used to achieve conservation objectives will vary as new information becomes available. It is expected that a relatively constant amount of these stands (20 percent) will remain in deciduous forests. The management decisions for the no-harvest area (0-25 feet), the minimal harvest area (25-100 feet), and the low harvest area (100 feet to the buffer's edge) may not be clearly defined now, but will be developed to achieve the desired biological and economic conditions described earlier in this document. The DNR HCP would permit actions so long as there were no negative impacts to salmonids or riparian wildlife, or current conditions are maintained. This would mean that water quality, sedimentation, temperature, and large woody debris would all be considered and management activity would be decided by DNR on a site-specific basis. If watershed analysis is completed and indicates public resources require a greater level of protection than specified in the HCP, the prescriptions developed through watershed analysis would be implemented.

The climatic, geological, and physiographic characteristics of the OESF present special problems for forest management around riparian areas which warrant different treatments than most other parts of the State. Specifically, the objectives of the OESF riparian strategy are to maintain and aid the restoration of: (1) the composition, structure, and function of the aquatic, riparian, and wetland systems which support aquatic organisms; (2) the physical integrity of channels and floodplains; (3) water quality and quantity; (4) natural flow and disturbance regimes such as natural sedimentation regimes; and (5) develop, use, and disseminate information about how to achieve these objective in commercial managed forests. The goal is to provide resource protection and natural restoration with a long-term effort to develop solutions through active resource management and experimentation. On the OESF, all Type 1 through Type 4 Waters will be protected with interior-core buffers on each side of the stream; Type 5 Waters will receive site-specific protection necessary to protect identifiable channels and unstable ground. Type 1 and Type 2 Water interior-core buffers will average 150 feet on each side of the stream; Type 3 and Type 4 Water interior-core buffers will average 100 feet on each side of the stream. Type 1 through Type 4 Waters, and Type 5 Waters when an interior core is established, will receive exterior-core wind buffers to protect the integrity of the interior-core buffers from damaging winds. Wind buffers will be applied to all riparian segments for which stand wind-firmness cannot be documented. Wind buffers will be applied to both sides of the streams, but the widths may vary so that the most wind-prone areas would receive the most protection. Type 1 through Type 3 Water exterior-core buffers will average 150 feet where applied; Type 4 and

Type 5 Water exterior-core buffers will average 50 feet where applied. Thirty-three percent, or less, by volume of the riparian trees in the designated exterior buffer may be removed for commercial purposes during each harvest rotation on 75 to 85 percent of the riparian areas. Site-specific experimentation may occur on the remaining 15 to 25 percent.

The conservation objectives of the HCP adaptive management on the OESF would also include such items as bank stability, water temperature, shade, and natural sedimentation rates, retention of large trees and snags necessary to support viable populations of riparian wildlife and recruit future snags, coarse woody debris (downed logs on land) and large woody debris (in-stream logs, and maintaining the natural capacity of these areas to provide diversity including overstory composition, understory composition, detritus inputs, and natural pool frequencies. When single tree removal is conducted, factors such as lean of the tree, distance from stream bank, size, soundness, and abundance of other mature conifer would be considered during a site-specific analysis.

**Discussion:** Though riparian conditions and instream habitat are generally degraded currently throughout the DNR HCP area, the measures taken in this HCP will help to restore riparian and instream habitat across the Plan Area. The DNR HCP might result in greater and more rapid reestablishment of conifers in riparian areas where conifers originally existed, compared with no HCP. Although short-term impacts from actions such as alder removal and conversion to conifers may impact immediate large woody debris levels and shading, as well as other parameters of the riparian buffer, these restoration actions are projected to have positive benefits for many species in the long term.

The use of the 100-year floodplain as the initiation point for buffers will help ensure riparian habitat remains along valley-bottom streams and rivers and will especially benefit species utilizing off-channel habitats. The buffers on fishbearing streams will provide for the growth and development of a properly functioning riparian zone that will provide over the life of the DNR HCP the full compliment of riparian functions. The no-cut zone (that may be based on rooting and canopy diameters but will be at least 25 feet) will provide bank stability and root strength. The minimal harvest zone would add to the benefits of the no-cut zone for factors such as providing litter/detritus inputs for healthy nutrient supply for aquatic invertebrates and other species, and providing sufficient shade to maintain water temperatures. The buffer as a whole, including the low-harvest area, is expected to intercept sediment and provide a continual source of large woody debris for instream structural elements important to fish and important to maintaining natural pool-riffle ratios and stream-bank stability.

The size of the proposed buffer should address large woody debris needs within the stream as well as the needs of terrestrial and amphibious species which utilize the terrestrial components of these riparian areas. The amount of large woody debris expected to be recruited into the stream is a function of tree heights and buffer widths. Buffer widths equal to approximately 60 percent of the average site-potential tree height will provide 90 percent of the natural level of large woody debris to the stream. The height of a tree at 100 years (100-year site index) is roughly

equivalent to 60 percent of the site-potential tree height. Buffers of this size should therefore deliver more than 90 percent of the natural level of large woody debris.

In addition to providing large woody debris, shade, and other characteristics desired for aquatic species, the goals of the DNR HCP riparian areas include providing snags, downed logs, cavities, and other characteristics important to riparian terrestrial wildlife such as shrubby understories and diversity. The DNR HCP would provide buffers that should be adequate for use by many wildlife species as travel corridors.

Wind buffers will be established on many streams under the HCP. Wind buffers are designed to increase the stability and longevity of the riparian buffers. Because the majority of blowdown occurs within the first 50-100 feet and diminishes rapidly beyond that distance, wind buffers as proposed in the HCP are expected to be effective in maintaining the integrity of riparian buffers. In addition, these buffers will also contribute valuable habitat for terrestrial species and enhance the value of the riparian buffers.

Other prescriptions will minimize sediment inputs due to landslides, assess the condition of fish habitats and riparian stands, and monitor the effects of forest practices on aquatic habitats. The road maintenance prescriptions will reduce sediment delivered to aquatic resources. Also, in accordance with the road maintenance plan, DNR will prioritize and remove blockages to fish passage. Yarding may disrupt buffer vegetation and impact stream banks resulting in short-term impacts. These actions would also increase

diversity for and benefit some terrestrial species dependent on early-seral riparian areas. The alternative to yarding, additional road construction, would have long-term impacts to water temperatures, sediment, and hydrological regimes.

Qualified staff will identify unstable slopes on a site-specific basis by a combination of geomorphic models and field reconnaissance. Where slope stability models are less accurate, DNR will also rely on other information. The prescriptions contained in the HCP preclude much of the need for Watershed Analysis. On the OESF, a 12-step process will also be used to identify important considerations. Throughout the HCP, where watershed analysis is conducted, DNR will adopt the result of the watershed analysis if those prescriptions are more restrictive than those of the HCP.

The DNR HCP does not specify the density and size of trees to remain within the buffers. Frequent entries for timber harvest could, in some situations, decrease the production of large trees, snags, and eventually large woody debris. However, under the DNR HCP, riparian sites would only be entered when adjacent units are harvested. Uniquely large trees should be retained in the interims. Large trees, snags, and downed logs would likely exist in greater amounts than on adjacent upland sites. The extent of harvest in riparian areas is expected to be light. In the absence of refinements through adaptive management, no more than 10 percent of the conifers and 20 percent of deciduous trees would be removed from the buffer and wind

buffer through partial harvest during a rotation. This could include up to 25 percent of the volume in the low harvest zone and 50 percent of the volume in the wind buffer. Within the no-cut zone only commonly accepted restoration activities may occur.

Under the DNR HCP, riparian prescriptions would be tailored to the site-specific conditions through the use of the adaptive-management provisions. These considerations will consider the topography, soil moisture, channel characteristics, frequency of channel disturbance events, and other pertinent considerations. The Service is confident this site-specific approach will provide protection for the sensitive resources found along waterways.

The DNR HCP riparian strategy is expected to maintain natural levels of water quality, water temperature, and hydrological flow-regimes. The effectiveness monitoring will test assumptions made in some of the prescriptions, as well as monitor additional variables. If monitoring data indicates the prescriptions are not producing the desired future conditions, implementation of the prescriptions must be changed to better accomplish the desired end. Because these elements form the basis of adaptive management in this HCP, the incorporation of new information and the ability to change management strategy is assured. This flexibility is key to assuring this HCP will improve conditions for anadromous salmonids, and therefore other aquatic species in the DNR HCP area.

### *Riparian Attributes*

#### **Sediment**

Under current State forest-practices regulations, there would be minimal protection of riparian areas and no requirement to upgrade roads. Some mass-wasting areas may not receive sufficient protection to effectively minimize delivery of sediments to streams. Under the DNR HCP, the extent of conservation measures to be developed and implemented under the comprehensive road-management plan provides relief from the most likely damaging effects of forest operations.

#### **Microclimate**

As a result of harvesting done without the DNR HCP, summer temperatures would likely exceed tolerable limits for species such as salmonids, and relative humidity likely would become too low following total removal of over story for some species such as salamanders. Some species might eventually recolonize the unit, from adjacent suitable habitat, when the over story closes, stream shading is again in place, and moisture and temperature regimes restored to acceptable parameters. However, under the DNR HCP, perennial streams will receive 100 foot buffers with at least 25-foot no-harvest cores. These refugia would maintain viable populations following timber harvest of the surrounding units; and, therefore, would serve as source populations for species to recolonize other areas in the unit as the stand matures and returns to optimum conditions for the species. Since harvest prescriptions under the DNR HCP would

result in habitat conditions that enable a variety of amphibious species to persist in all perennial non-fish streams, and provide protection on a number of seasonally ephemeral streams, the Service concludes that these species are better addressed than they would be under State regulations. In addition, the use of wind buffers, where necessary, will not only increase the stability and longevity of the riparian buffers, but will increase their value by providing a buffer to ameliorate the edge effects and ensure riparian areas function more like interior forests.

It is expected that many species requiring moist conditions or older forests may eventually use riparian areas for specific life-history requirements or as travel/dispersal corridors. The benefit of these corridors will be proportional to their adjacency to other needed habitats. For example, riparian corridors will provide raptor dispersal or nesting habitat if adjacent stands are in advanced seral stages. As another example, links for amphibians to nearby wetlands or other off-channel habitat may prove important to the use of those habitats. It is expected that the DNR HCP will provide wider and better buffers than would occur without the HCP, and that the HCP buffers would result in better connectivity to other habitats.

Stream-breeding amphibians utilize similar habitats for breeding, foraging, and resting. In Washington, Dunn's salamander is found only in the Willapa Hills. They are considered to be a highly aquatic species and usually associated with seepages or streams located in heavily shaded areas. The species is located in the splash zone of creeks typically under rocks and occasionally under woody debris. It has also been found in talus where there is high humidity. Van Dyke's salamander is endemic to Washington and associated with seepages or streams located in mature and old-growth-coniferous forests. They are considered to be the most aquatic species of woodland salamanders. The species is typically located in the splash zone of creeks under rocks, logs, and woody debris. It has also been found in wet talus, forest litter, and lava tubes. Tailed frogs occur in or near fast-flowing, permanent streams within forested areas. The species prefers cold temperature waters and has a narrow range of temperature tolerance. Adults forage along stream edges or from the surface of exposed rocks or downed logs, and during wet nights in the adjacent older forest. They are adapted for life in cold fast-flowing mountain streams. At low elevation sites, frog density is correlated with forest age, and most closely associated with old-growth forests. The principal habitat consideration for these species is the maintenance of buffers along smaller headwater streams and for wet talus. The HCP would treat small seeps and wetlands as though they were Type 5 waters.

Based on the protection measures for steep and unstable slopes, and preliminary assessments (Shaw pers. comm.) it is anticipated that greater than 50 percent of Type 5 streams will be protected by restrictions on management activities near these streams. Riparian buffers would include a no-harvest zone of at least 25 feet likely protecting stream splash zones occupied by Dunn's and Van Dyke's salamander. Management activities within the riparian buffers would be stratified according to the constraints imposed by the no-harvest, minimal-harvest, and low-harvest areas. Under the management anticipated to occur in the no-harvest and minimal-harvest areas, forests with mature or old-growth characteristics are expected to develop. The riparian buffer should be sufficient for maintaining the key habitat components of stream.

bank integrity, stream shading, sediment load, detrital nutrient load, and large woody debris, and thus the habitat of many stream-breeding amphibians such as Van Dyke's salamander and the tailed frog. Additional protection of aquatic habitat would occur through road network management that minimizes adverse impacts to salmonid habitat.

Common loons breed on large wooded lakes with dense populations of fish. Nests are built on the ground within 5 feet of the water's edge. Nest sites may be reused in successive years. Loons require sufficient surface area to take-off. Buffers along the shoreline of nonforested wetlands greater than or equal to 0.25 acre in size would be at least 100 feet wide while buffers around "shoreline of the State" (Type 1 water) and lakes larger than 1 acre (Type 2 water) and their associated wetlands would be a site-potential tree height or 100 feet and would be sufficient to protect potential loon nesting habitat. The adverse impacts of human disturbance could possibly be minimized by the blocking effect of the wetland buffers. In addition, to reduce the adverse effects of human disturbance, DNR would not allow activities that would appreciably reduce the likelihood of nesting success within 500 feet of a known active nest between April 1 and September 1.

Harlequin ducks breed almost exclusively along fast-flowing mountain streams. Nests are typically located close to clear streams with rocky substrates and rapids and may be on the ground in dense vegetation, piles of woody debris, undercut stream banks, between rocks, or in hollow trees. Bank vegetation near nest sites is highly variable, but the species is thought to show a preference for mature or old-growth forest. They forage in fast-moving streams where they feed primarily on benthic macro invertebrates and roe. Mid-stream loafing sites such as gravel bars or large woody debris provide resting habitat. Human disturbance greatly affects this species. The riparian management zones provided in the HCP would likely function as a source of in-stream large woody debris for loafing, as well as protect potential nest sites for harlequin ducks. The ecological integrity of the riparian buffer, and the duck habitat contained therein, would be protected by wind buffers along some streams. Aquatic habitats, and the prey of harlequin ducks would also be protected by these measures. The adverse impacts of human disturbance would be minimized by the riparian buffer which is estimated to have an average width of 150 to 160 feet. DNR would not allow any activities that may cause an appreciable reduction in the likelihood of nesting success within 165 feet of a known active harlequin duck nest between May 1 and September 1. The nest protection provision described in the DNR HCP would not be implemented in the OESF because, the riparian protection would be adequate to protect harlequin duck nests.

Cavity-nesting ducks need suitable cavity trees/snags near, generally within 550 feet of foraging and brooding habitat. Conservation efforts that provide substantial riparian and wetland buffers with sufficient cavity tree and snag components should benefit cavity-nesting ducks; these measures will also protect water quality in foraging and brooding habitats.

Regrowth of forests in portions of buffers where forests, snags, and cavity trees are lacking may also provide some support to cavity-nesting ducks, when trees reach a sufficient size and

condition for primary excavators to create cavities. The 25-foot no-harvest and 75-foot minimal-harvest zones would ensure that some cavity trees near stream banks would be retained. Openings created by some harvest entries may provide plant foods for species like the wood duck. Wind buffers, where designated, may provide additional area to buffers which could further reduce disturbance and provide additional cavities for cavity-nesting ducks. The provision to retain 3 snags and 5 green trees per acre, as well as the provision to retain large, unique wildlife trees, would also provide potential cavity trees for use by cavity-nesting ducks when located near riparian buffers.

**Conclusion:** The riparian zone of influence probably has more importance to more species of fish and wildlife than any other habitat type in the Pacific Northwest. The DNR HCP would provide substantially more riparian habitat protection than would be received in the absence of the DNR HCP. The HCP protection is expected to provide for all the riparian functions important to riparian-dependent species. The DNR HCP establishes a process to ensure the necessary functions and characteristics of riparian areas are achieved through adaptive management. The habitat needs of terrestrial riparian species will also be met.

### *Summary of Riparian Habitat Mitigation*

Past forest-management practices have resulted in a legacy of riparian systems which have been degraded in several ways. Insufficient buffers and instream structures, deforested and unstable slopes, and too many and poorly designed roads. The HCP attempts to rectify this by including riparian buffers, limitations to activities within the riparian areas and on unstable slopes and other provisions to protect natural processes, water quality and quantity, and features important to all riparian wildlife. The HCP incorporates adaptive management to take advantage of additional information as it becomes available and would incorporate the results of Watershed Analysis. Active restoration would be conducted on some riparian ecosystems. Under the HCP, DNR will develop a comprehensive road management plan and will develop a plan to manage Type 5 streams on stable slopes. In these ways the HCP will rectify the adverse impacts of past management and will minimize and mitigate for the impacts that will result from forest-management activities.

## **WETLAND HABITAT MITIGATION**

### *Wetlands*

**Description:** Wetlands are those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support a prevalence of vegetation typically adapted for life in saturated soil conditions, such as swamps, bogs, fens, and similar areas. Wetlands are often varied and are important for a number of species. Young fish mature in wetlands. Many species of amphibians, such as the Cascades frog, are associated with wetlands.

Some species utilize wetlands during portions of their life cycle or to fulfill certain requirements. For instance, great blue herons feed in nonforested wetlands and nest in trees along riparian or wetland edges.

Wetlands are diverse. Bogs are hydrologically isolated, low-nutrient wetlands that receive water only from precipitation, usually with no inflow or outflow. They generally have peat soils that are 16 or more inches in depth and specially adapted vegetation such as sphagnum moss, Labrador tea, bog laurel, sundews, and some sedges. Bogs may have an overstory of spruce, hemlock, cedar, or other tree species, and may be associated with open water. Sphagnum bogs support a unique set of species such as Beller's ground beetle and Hatch's click beetle.

Larger wetlands have greater seasonal persistence of open water, seasonal and spatial variation, and year-to-year variation. Smaller shallow wetlands may be ephemeral and used by species (e.g., chorus frog) which breed and mature quickly. Larger wetlands, however, would also be used by species such as Northwest salamander. Larger, deeper, more-complex wetlands would be more likely to contain pockets of open water and may support species such as loons and shorebirds. In years where water volumes are high, the surface area of the wetland may increase beyond proportion resulting in a significant change in the "wetland edge". Mudflats exposed when water levels recede are used by shorebirds.

**Current Status:** Wetlands have been recognized as important for some time. Larger wetlands have historically been most likely to receive some level of protection. Smaller wetlands have often been degraded from harvest or roadbuilding in the past. Both those actions have the ability to alter hydrology.

**Current Trend Without HCP:** Forest Practices regulations and Watershed Analysis may provide good protection of environmental features such as water quality, but may not be adequate for all wildlife species. State regulations would only buffer wetlands which are greater than 0.5 acre. Forested wetlands (those with the potential to support 30 percent canopy coverage) are not protected by state regulations. Nonforested wetlands without associated open water greater than 0.5 acres are required to have a 25-foot minimum, 50-foot average buffer if these wetlands are over 5 acres in size. The 25-foot buffer width minimum would be the only requirement on these wetlands between 0.5 and 5 acres in size. For wetlands with associated open water, 50-foot minimums and 100-foot averages apply on those greater than 5 acres and 25-foot minimum and 50-foot averages apply to those between 0.5 and 5 acres as well as to bogs between 0.25 and 0.5 acres in size. Within this zone, 5 trees greater than 20 inches dbh, 25 trees greater than 12 inches dbh, and another 45 trees greater than 6 inches dbh shall be left on a per acre basis. This would equate to about 35-40 square feet of basal area for comparison purposes. Several other provisions restrict the level of activity with these areas and their buffers.

**HCP Result:** Under the HCP, DNR will adhere to State regulatory minimums and to higher policy standards under DNR's Forest Resource Plan. If these policies and regulations were to be discontinued in the future, the DNR HCP would continue to provide the indicated level of

protection for wetlands. The DNR HCP would buffer wetlands as small as 0.25 acre. Wetlands between 0.25 and 1 acre in size would receive a 100-foot buffer, while larger wetlands would receive a buffer of up to a site potential tree height. Buffers and forested wetlands activities would maintain 120 square feet of basal area with emphasis on wind-firmness. Ground-based equipment would generally be precluded, natural surface and subsurface drainage conditions would be maintained or restored, and no roading would occur without on-site mitigation. Seeps and wetlands less than 0.25 acres will be treated as type 5 waters under the DNR HCP.

On the OESF, buffers are expected to be based on tree height and should average over 100 feet on wetlands from 0.25 to 1 acre, and 150 feet on wetlands greater than 1 acre. Buffers and forested wetlands would still maintain 120 square feet of basal area, but the trees would be representative dominants and co-dominants. Bogs less than 0.1 acre will be buffered on the OESF under the DNR HCP. In addition, there would be no harvest allowed within 50 feet of nonforested wetlands. This conservation strategy would be integrated with a research and monitoring program.

**Discussion:** Amphibians are more likely to be near the wetland edge and should benefit from the buffer sizes provided by the HCP. A zone adjacent to the edge which is free from ground-based equipment will also avoid direct loss of amphibians as well as compaction of soil and interstitial spaces in the substrate. Such a zone will help maintain the stability of the wetland edge. Some of the primary objectives of the additional buffer width beyond those of State regulations is directed at wildlife species such as cavity-nesting birds which may be dependant on the wetland but may venture greater distances from the edge, and species with greater microclimatic requirements.

Another important consideration is the avoidance of soil compaction and avoidance of direct impacts to flora and fauna. The DNR HCP would buffer wetlands greater than 0.25 acre. DNR may do this in the absence of the HCP if current policy is maintained. However, the DNR HCP would ensure that the Forest Resource Plan policies of 1992 were continued as a minimum. On the OESF, DNR would also provide buffers on smaller bogs and additional protection for all bogs. The leave tree strategy in wetland buffers should be more robust under the DNR HCP because buffers will be guaranteed to be at least 100 feet wide on the average, as opposed to 25-50 feet under current State regulations. In addition, State regulations only require that a small number of larger trees be retained. However, the DNR HCP would retain at least 120 square feet of basal area while in the absence of an HCP, DNR might only retain 75 trees per acre most of which could be as small as 6 inches in diameter in western Washington, and total less than 40 square feet of basal area.

It is expected that snag and cavity-dependent species which live adjacent to forested and nonforested wetlands would fare better under the DNR HCP than in the absence of the HCP. Greater amounts of large woody debris (important loafing sites for turtles and ducks) would be provided in the DNR HCP. Greater protection for the microclimate would also be protected by

the DNR HCP. Smaller forested and nonforested wetlands, which may contribute significantly to the total acreage of protected wetlands, would be protected more thoroughly under the DNR HCP than under State regulations.

The treatment of nonforested wetlands in open areas (e.g., within prairie areas) does not differ among any of the alternatives. These habitats are particularly sensitive in areas of remnant prairies. Many sensitive plant species in the State are associated with ponds or wetlands located in remnant prairies such as those found in the Puget lowlands. Spotted frogs have become extremely rare in western Washington and once depended upon low-elevation wetlands with nonwoody vegetation. Impacts to these species would not vary by alternatives. Road construction and development likely pose the greatest threats for these species, rather than timber harvesting.

Beller's Ground Beetle, Long-horned Leaf Beetle, and Hatch's Click Beetle are known to inhabit eutrophic sphagnum bogs in or near low elevation lakes. Sphagnum bog habitat in which these three species of beetles occur will be protected far better with the HCP than it would otherwise be without the DNR HCP. Even though these species are not known to occur on the OESF, bogs greater than or equal to 0.1 acre will receive protection on the OESF.

Northwestern pond turtles inhabit marshes, sloughs, moderately deep ponds, and slow-moving portions of creeks and rivers. Their habitat needs include emergent basking sites, such as partially submerged logs, vegetation mats, rocks, and mud banks. Pond turtles hibernate in the bottom mud of streams or ponds, or on land up to 1,375 feet from water. The breeding habitat is most often located near the margin of a pond or stream and utilize meadows as well as young seral stages of most forest types including hardwoods, mixed hardwoods, and coniferous forests. Protection of essential northwestern pond turtle habitat where turtles have not been observed would be guaranteed through the protection of wetlands and riparian areas. HCP wetland buffers would be a source for providing greater amounts of woody debris, which would contribute loafing sites for turtles in and around the wetlands.

Sandhill cranes are extremely wary and, therefore, use only large tracts of open habitat with good visibility. Potential habitat for this species includes grain fields, wet meadows, large marshes, and shallow ponds. Nesting habitat consists of extensive shallow-water marshes with dense emergent plant cover. Wet meadows and grasslands are used for foraging and resting habitat. The HCP would offer wetland protection which would also provide a buffer from disturbance in addition to the protection afforded the sandhill crane by the State critical-wildlife-habitat designation.

Forested wetlands and seeps may be used by a number of amphibians. Van Dyke's salamander may be found in seeps within old-growth forests. Some of this habitat would be protected as a result of riparian buffers, wetland protection, seep protection (seeps will be treated as wetlands), and the stand-structure commitments.

High elevation wetlands support the Cascades frog which is a montane species and generally occurs above 2,625 feet in elevation in montane meadows. This species is generally found in relatively small bodies of water rather than in large lakes. Frequently used habitats include relatively small, unvegetated potholes and marsh-like areas that are overflows of larger lakes. Breeding habitat for Cascades frogs include shallow, gently sloping margins of the shore or overflow areas, generally over soft substrates and protected from severe wave action. Tadpoles prefer relatively warm, shallow water close to the shoreline with abundant vegetation. Foraging and resting habitat occurs in the above described riparian/wetland habitats of high-elevation coniferous and subalpine forests.

Low-elevation wetlands support the spotted frog which is highly aquatic, using marshy ponds, streams, and lakes. The spotted frog's historic range included low-elevation wetlands of the Puget Trough. Courtship and breeding habitat includes warm, shallow margins of ponds or rivers, or in temporary ponds. Breeding, foraging, and resting habitats for this frog species includes palustrine wetlands such as small ponds, bogs, and forested swamps, and to some extent Type 2 and 3 Waters. The HCP protection would contribute to the maintenance of the integrity of slow-moving streams, backwater eddies, and adjacent forest stands in which these species occur. Preclusion of ground based equipment, on-site mitigation for road building, maintenance of buffers, no-harvest zone on streams and OESF wetlands.

**Conclusion:** Wetland attributes expected to be maintained by the HCP include protection from compaction and rutting, maintenance of natural-flow regimes, retention of snags in vicinity of the wetland, large-woody-debris input maintained, and microclimate. Species using the variety of wetlands found on DNR-managed lands should be better addressed with the HCP than without the HCP.

### *Summary of Wetland Habitat Mitigation*

Wetland buffers under the HCP are larger and more robust than would be expected without the HCP. If it were not for the HCP, forested wetlands would not receive protection. Natural hydrology would be maintained by provisions of the HCP. Species dwelling within wetlands will benefit from the protection of water quality and natural processes associated with the riparian and wetland areas. Species which seek forested habitats in association with wetlands will benefit from both the forested wetland protection as well as the features retained in wetland buffers such as snags and coarse woody debris.

## **AQUATIC HABITAT MITIGATION**

### *Healthy Aquatic Systems*

**Description:** These habitats include all standing water and running water at the surface-to-air interface and beneath the surface of the water. Species dependent on the aquatic habitat category include life-long residents such as sculpins and other resident fish, and part-time residents such

as amphibians. Some of these species, such as tailed frogs and bull trout, have more stringent requirements than others. Aquatic dependents include taxa that are obligates of aquatic (water) habitats at some point in their life cycle, such as fish; and part-time residents such as stream- and pond-breeding amphibians; and aquatic invertebrates like the Orders Odonata (dragonflies), Ephemeroptera (mayflies), and others.

**Current Status:** Beaver impoundments are common in the lower gradient (less than 6 percent) streams. Lakes, ponds, and nonriparian-associated wetlands are known to occur on the plan area. Riparian conditions and instream habitat are generally degraded as are many wetland conditions.

**Current Trend Without HCP:** State regulations would be employed for riparian areas, wetland protection, unstable slopes, and road specifications. Watershed analysis is a State regulatory process which focuses on one basin at a time and attempts to address cumulative impacts and areas of special concern, and finally develop specific recommendations to deal with those concerns. With time, Watershed Analysis would likely be completed which may then place additional management requirements upon DNR with

regard to buffer size and management, unstable slopes, sedimentation, and road density, construction and maintenance standards, and placement to protect public resources including fish.

**HCP Result:** Organisms dependent on aquatic systems would likely fare better under the DNR HCP. Combinations of more robust wetland protection, riparian corridors, and the treatments of stable and unstable uplands should all contribute to improved water quality which would include temperature, sediment, and seasonal flow regimes which more closely emulate those found naturally. Shading and microclimate protection should help keep water temperatures at normal levels. To accommodate the greater flexibility afforded by managing riparian areas on a site-specific basis and to accommodate the uncertainties surrounding the results of these activities conducted over time, an adaptive-management process would be used to specify management activities within riparian-management areas. Mechanisms used to achieve conservation objectives will vary as new information becomes available. This strategy should lead, over time to an age-class distribution dominated by stands 100-200 years in age (70 percent) and stands over 200 years in age (10 percent). These stands will likely increase throughout the permit period. It is expected that a relatively constant amount of these stands (20 percent) will remain in deciduous forests.

Type 4 and 5 waters make up approximately 90 percent of the stream network length and provide a link between the upland slopes and fish-bearing streams. These streams are important sources of water, sediment, nutrients, and wood. The HCP buffers Type 4 waters with a 100-foot buffer and about half of Type 5 waters would be buffered as a result of unstable slopes. The remaining Type 5 streams on stable slopes and ground will be the subject of research and future adaptive management.

The HCP contains provisions for maintaining hydrologic maturity in the rain-on-snow zone to reduce damage during peak flows resulting from significant rain-on-snow events. Wetland management should also minimize the potential adverse impacts of forest management in peak flows in the winter and low flows in the summer. Mineral springs and the species dependant on those unique habitats would also benefit from specific conservation measures.

**Discussion:** One assumption made in this analysis is that bull trout and salmonids, being temperature and water-quality sensitive and having requirements for undisturbed substrates and free passage, represent species which can serve as indicators for other aquatic species. Effects of the DNR HCP on anadromous fish are discussed in the Unlisted Species Assessment prepared by NMFS on this action. Salmonids, especially bull trout, may be the species which are most likely to be influenced by water-quality and passage issues in the forested environments. It is assumed that provisions to address these salmonids will provide the needed habitat quality and quantity for other fish and aquatic species. It is expected that the riparian prescriptions in most areas should adequately address stream flows, shade, water temperature, water quality, turbidity, large woody debris, bank stability, detritus input, sedimentation, pool-riffle ratios, and channel morphology. Under all alternatives, the protection for aquatic habitats is expected to be enhanced by protection of unstable slopes. Protection of aquatic habitats would be greater under the DNR HCP than would occur without the HCP.

The DNR HCP is expected to protect the following riparian functions: sufficient shade, bank stability, litter/detritus inputs, large woody debris, and other factors deemed important for fish and other aquatic vertebrate and invertebrate species. For instance, irregular stream flows may be the most limiting factor to some aquatic species, such as mollusks. The DNR HCP would not cover (and this analysis does not include) actions which may be taken regarding water diversion or direct manipulation of stream flows. However, provisions for hydrological maturity and other aspects of the riparian strategy are expected to help maintain flows at natural levels. Wetlands can help to moderate stream flows through attenuation of flood-peaks during storm events, and by discharging ground water during low-flow periods. The DNR HCP is more protective of factors that influence wetland hydrology and may therefore benefit stream flows more than would occur without an HCP.

The discussion under the Riparian habitat Category included large woody debris. That section explained why large woody debris inputs to streams will be adequate. Large woody debris is very important to stream structure and function. Large woody debris is contributed to the aquatic systems from the riparian forest by such processes as stream bank erosion, wind damage, and slope failures. Large woody debris protects banks from erosion, provides a substrate for diatoms and other small organisms, and slows water velocity providing eddies and deep pools. Where it accumulates (e.g., complex log jams), large woody debris provides complex hiding cover and refuge to escape high-velocity flows for smaller species and young fish. Large woody debris provides an interface between air and water. It increases the overall diversity of stream morphology (e.g., through the formation of pools and riffles). In smaller streams, large woody debris can form small dams that store significant amount of sediment that would otherwise be

transported downstream. The importance of large woody debris to aquatic organisms includes providing refuge during high flow conditions and when being sought by predators. Large woody debris stabilizes substrates used for spawning beds and egg incubation. The presence of large woody debris of sufficient size contributes to channel stability, and also forms rearing pools and riffles which contribute to diversity and food productivity.

Species inhabiting western Washington lakes, rivers, and streams have become adapted to cool, clean water, with abundant gravels and a diversity of habitats composed of riffles and pools and have evolved in a largely forested setting. Many of their adaptations are associated with cool water temperatures, high oxygen concentrations, gravels that are relatively free of sand and silt, and large woody debris habitat. These species have become adapted to utilizing large woody debris, gravel crevices, deep pools, or off-channel habitats (e.g., pond-headed or spring-fed tributaries, oxbows) to escape high flows in the winter and spring. They generally prefer gravels that are free of unnaturally high levels of silt or sand as spawning habitats.

Newcomb's littorine snail is an estuarine species that is known to occur near the high-tide mark in *Salicornia* spp. salt marshes. All DNR-managed lands within the HCP area adjacent to estuarine habitat such as the salt marshes of Grays Harbor and Willapa Bay are Natural Area Preserves (NAP). As such, the habitat required by Newcomb's littorine snail is expected to be protected. Aquatic species such as the Newcomb's littorine snail would benefit from the riparian conservation measures. The HCP would ensure more-natural levels of sediments, organic nutrients, and large woody debris flowing into the estuaries from inland areas. The Newcomb's littorine snail is not expected to occur in the OESF.

California floater is a freshwater clam that inhabits medium- to large-sized rivers and creeks. The riparian management strategy guarantees a high-quality aquatic habitat. There are several provisions of the HCP to reduce peak flows to background levels. These include provisions for hydrological maturity in the rain-on-snow zone, provision of large woody debris in streams, and the wetland protection strategy.

Fender's soliperlan stonefly and Lynn's clubtail utilize aquatic habitats. Lynn's Clubtail, a dragonfly, primarily uses large rivers, but has also been recorded in mountain lakes. Lynn's clubtail uses silty water for breeding. The measures in the DNR HCP to protect the natural process which operate in upland and riparian areas to maintain siltation and other functions at natural background levels would benefit both species, even though they have somewhat different life-history requirements.

Bull Trout are most often associated with cool, clear, mountain streams and lakes during spawning and incubation. Streams utilized by this species are typically high-elevation headwaters fed by snowmelt or springs. Highest abundance of this species is attained in streams dominated by gravel and cobble; waters less than 59-64 degrees F. It requires clean, mostly sediment-free bottom area or an abundance of large woody debris for cover. Sheltered pools with large organic debris and clean cobble substrate provide rearing habitat for adults. Five

characteristics of rearing habitat are of primary importance to bull trout: channel stability, substrate composition, cover, temperature, and migratory corridors. The HCP contains provisions to protect bank stability through the 25-foot no harvest zone and the allowable activities within the riparian zone. Buffers are expected to filter silt and fine sediments. Roads will be constructed and maintained in a manner to protect salmonid habitat. Buffers will provide large woody debris which will provide cover as well as instream complexity needed to segregate substrates. Riparian buffers are expected to provide shade and cool temperatures. This is especially true since Type 4 streams will be buffers as will about half the Type 5 streams. Culvert blockages will be identified and prioritized for removal.

Within the geographic range of the Olympic mudminnow, spawning and rearing habitats are highly restricted to ponds and marshy streams in coastal lowlands with deep slow-flowing water choked with aquatic vegetation and with a soft mud bottom high in organic matter. They are found most often in turbid water. Although they prefer cooler waters, Olympic mudminnows also occur in water temperatures ranging from 32 to 70 degrees Fahrenheit. Because spawning and rearing for the Olympic mudminnow is restricted to ponds and marshy streams which are often associated with wetlands, the establishment of, and restriction of timber-management activities within, wetland management zones directly protects essential habitats for this species.

Pacific lamprey spawn in cold water, depositing their eggs in clean sand, gravel and cobble substrates. They spawn predominantly in low-gradient stream segments, usually just above riffles at the tail end of pools at water depths of 1-3 feet. Juvenile rearing habitat is found downstream from the redd where they hatched, typically in slow, cool, soft-bottomed stretches in back waters, pools, and quiet eddies. At transformation, Pacific lampreys move out of the burrow and travel downstream in late summer during flood conditions, eventually reaching the sea or a lake which provides adult rearing habitat. The river lamprey occurs in coastal streams. Most river lamprey spawning habitat probably occurs in smaller headwater streams and rivers with rearing habitat occurring in silt deposits in both riffle and pool habitats.

In addition to the smaller headwater streams, Pacific and river lampreys also inhabit low-gradient streams and large rivers. The DNR HCP would contribute to stream stability, and water temperature and quality, providing some protection of the spawning and rearing habitat of these fish species. The measures in the DNR HCP to protect salmon habitat would likely protect the stream features and functions that most of these non-salmonid fish species require.

The cutthroat trout is a highly ubiquitous species and usually seeks out small, remote headwater tributaries for spawning and early rearing, where it can minimize competition with other salmon species. Small-sized gravels with some sand are most often used for spawning. Habitats of preference are the riffles for the very young and deep pools with large woody debris for older year classes. They often move into pond-fed and other runoff tributaries for refuge from high flows, and for preferred feeding conditions. Many of the very steep headwater tributaries are occupied by non-anadromous forms of cutthroat. Management of the riparian ecosystem is expected to provide adequate protection of spawning and rearing habitats. The DNR HCP uses

the active channel margin to delineate the stream compared to current regulations which uses the ordinary high water mark, and this will result in better protection of off-channel overwintering habitats for cutthroat. Other than for a few exceptions, two-thirds of DNR-managed lands in the significant rain-on-snow zone will be maintained in a hydrologically mature state. The DNR HCP would provide better protection from sediment runoff from roads than State regulations, because of the minimization of active road density based on the comprehensive road network management plan. Because of all these protective measures Alternative B will more than adequately protect the salmon habitat components (i.e., gravels, clean cool well-oxygenated water, large woody debris, etc.).

**Conclusion:** Ecosystem protection would be derived largely from management directed at maintaining and restoring riparian ecosystem function as well as older forest conditions across much of the managed uplands which are expected to benefit all aquatic species. This management should provide the clean, cool water and the habitat components needed by these species because the HCP protects natural processes.

### *Summary of Aquatic Habitat Mitigation*

The combination of provisions for riparian areas, wetlands, and springs provide for conservation of aquatic species. Ecosystem protection would be derived largely from management directed at maintaining and restoring riparian ecosystem function as well as older forest conditions across much of the managed uplands which are expected to benefit all aquatic species. This management should provide the clean, cool water and the habitat components needed by these species because the HCP protects natural processes. It is expected that the protection of those natural processes, which operate in a dynamic fashion upon the aquatic environment will sustain water quality, within-water structures, and sedimentation rates at natural levels to adequately address the species adapted to life in these habitats.

## **MITIGATION FOR OTHER HABITATS**

### *Caves*

**Description:** Caves are considered naturally occurring cavities or recesses large enough to contain a human (PHS 1994). This would likely require at least a 2-foot diameter opening and 4-foot depth. Caves have attributes of high humidity and stable temperature. This is the result of opening:passage relationships that are either cylindrical or restricted. This may also be the result of significant cave depths such that air does not flow freely to and from outside environment causing desiccation and rapid temperature changes. According to common definitions, a cave should have a zone characterized by darkness and silence and are often divided into entrance, twilight, and darkness zones. Caves may contain active seepage. Caves with known maternal colonies or hibernacula for significant number of bats would meet minimum size and shape requirements described above.

Caves are important habitats for many species, including as yet undiscovered species. Some species are adapted specifically for life in caves and some of these only occur in one or a few caves (e.g., the campodeid dipluran *Haplocampa* spp., the stygobiont copapod *Stygonitocrella* spp.; WDW 1994). Cave dwellers often depend on the relatively stable conditions found in caves. Some cave inhabitants are extremely intolerant of disturbance (such as Townsend's big-eared bat).

**Current Status:** The locations of all caves are not known. The locations of some caves on DNR-managed lands may be unknown. Caves are a nonrenewable resource, limited in quantity (some types of caves more limited than others), highly unique communities. Washington contains most diverse lava-tube ecosystems in North America and possibly the World (IUCN; referenced from PHS).

**Current Trend Without HCP:** No specific provisions would be provided for this habitat category in the absence of an HCP.

**HCP Result:** Caves and passages would be identified as to whether they were providing important wildlife habitat. DNR would maintain microclimate and physical integrity by establishing a 250-foot wide buffer around cave entrances; no disturbance of soils or vegetation would occur. Cave passages would be protected by 100-foot wide buffers; no disturbance of soils or vegetation would occur. Roads would not be constructed within 0.25 mile of a cave entrance, provided that routing of roads around caves can be accomplished in a practicable manner. Roads would not be constructed within 300 feet of a cave passage, provided that routing of roads around caves can be accomplished in a practicable manner. Human disturbance to bat hibernacula and maternity colonies will be minimized by maintaining the confidentiality of cave locations.

**Discussion:** Buffers at cave entrances are particularly important to maintaining constant environmental conditions in terms of temperature and relative humidity. Bats often locate their hibernation roosts according to temperature gradients. Drastic fluctuations in winter cave temperatures would be devastating for hibernating bats. Moisture fluctuations would impact amphibians, invertebrates, and fungi. State regulations would offer no specific protection to caves whereas the DNR HCP would provide 250-foot buffers at entrances and 100-foot buffers on each side of cave passages. In addition, there would be an effort to locate roads away from entrances and passages under the DNR HCP, which would help maintain the integrity of the cave.

Townsend's big-eared bats are very dependent on caves for hibernation. The presence of suitable undisturbed roost, maternity, and hibernaculum sites is the most important habitat component dictating the presence of this species. Big-eared bats use caves, buildings, mines, and the undersides of bridges with appropriate temperature and humidity for breeding (maternity colonies) and resting/roosting (hibernaculum). This species can occur in nearly any forest type as long as suitable breeding and resting/roosting habitat, such as nursery and hibernaculum sites,

are present. Townsend's big-eared bats prefer to forage in mid-seral stage coniferous forests. The HCP, through its balance of stand structures, is expected to provide forest conditions suitable for big-eared bats to forage. Protection of breeding and roosting habitat of the big-eared bat would be provided by the conservation measures directed toward caves. In addition, there is a provision directed toward preventing human disturbance to bat caves by keeping cave locations confidential.

**Conclusion:** The DNR HCP provides a much greater level of protection to cave habitats and their resident and temporary residents than would occur in the absence of the HCP. These HCP implements the suggestions of the Priority Habitat Species publication (WDFW 1996) which addresses cave and passage integrity, microclimate within the cave, and protections from disturbance.

### *Cliffs*

**Description:** A cliff is defined as a steep, vertical, or overhanging rock face. Those greater than 25 feet high and below 5,000 feet in elevation are considered a priority habitat by WDFW. Ledges provide important nesting sites for peregrine falcons. Fissures and overhanging rock provide roosting and hibernating sites for several bat species. Examples of species utilizing cliffs for habitat are mountain goats, mountain lions, rock wren, cliff swallow, black swift, turkey vulture, western fence lizard, bushy-tailed woodrat, common nighthawk, raven, barn owl, violet-green swallow, and a variety of bats.

**Current Status:** No estimate of the number and locations of cliffs was available for this assessment.

**Current Trend Without HCP:** No specific provisions would be provided for this habitat category in the absence of the DNR HCP. Under current State regulations, unless species are present that would require additional actions (i.e., peregrine falcons), it is assumed that little protection would be provided unless it came at no economic cost. Cliffs are often composed of hard rock that is suitable for road construction and are often destroyed and mined for that reason.

The DNR HCP states that mining of rock from cliffs for road construction would be avoided when practicable, that an evaluation will be conducted to identify important wildlife features which may exist, and that site-specific prescriptions would be developed where appropriate. The DNR HCP provides for assessing wildlife values and establishing a site-specific plan when necessary to protect those values. Practicality will be determined by the DNR and the Services in consideration of technological limitations and economic constraints.

**Discussion:** The DNR HCP may contribute to maintaining most cliff areas intact and addresses the maintenance of vegetation within and adjacent to cliff areas for the use of nesting birds or for

the maintenance of shelter from the elements. Timber-management actions could result in some level of impact to cliff-dependent species, but the evaluations and management plans should provide protection for those cliffs with the highest values for wildlife.

**Conclusion:** The HCP provides a protection mechanism for those features of cliffs important for wildlife, whereas the State regulations provide no protection.

### *Talus*

**Description:** Talus fields are homogeneous areas of rock rubble, usually coarse and angular, ranging in average size from 1 inch to 6.5 feet, derived from and lying at the base of a cliff or very steep, rocky slope. Talus is used by larch mountain salamanders, pikas, and common nighthawk. Talus fields for the purpose of the DNR HCP are defined as those talus areas with less than 30 percent canopy cover. Other forested areas are referred to as forested talus.

**Current Status:** Talus field inventories were not available for this analysis, but talus is not an uncommon feature in portions of the Cascades and Olympic mountains.

**Current Trend Without HCP:** State regulations currently offer no specific protection for talus fields.

**HCP Result:** The DNR HCP would provide a 100-foot buffer around talus fields over 1 acre in size (0.25 acre in some key areas). Talus fields would not incur any harvest; however, within the buffer, harvest might occur so long as it maintained 60 percent canopy coverage. In forested talus areas outside those buffers, harvest can occur so long as no more than one-third of the volume is removed during each rotation. Within talus fields and associated buffers, road building will be avoided, provided that the routing of roads around such areas can be accomplished in a practical manner that is consistent with other objectives of a comprehensive landscape-based road network plan. These buffers should help maintain the integrity and microclimate of the talus fields, as well as provide a supply of coarse woody debris.

**Discussion:** Talus fields would not incur any harvest, however, within the forested talus, a harvest of up to a third of the volume might occur once during each rotation. Because that harvest will occur infrequently, such as once each 60-80 years, shading and microclimate protection would remain as would snags and downed logs of substantial size. If the talus field itself were capable of supporting large trees, it might provide shade and a supply of downed logs. Yarding would generally not disrupt talus under the DNR HCP, yet there is no guarantee that no disruption might occur.

Dunn's and Van Dyke's salamanders are occasionally found in talus. The Larch Mountain salamander has restricted habitat requirements, including stabilized talus ranging in size between 0.4 and 2.3 inches with some soil deposits in the interstices. They are more common in areas with dense overstories of conifers or deciduous trees that help maintain higher moisture levels.

The species appears to be confined to talus, old-growth coniferous forests, or collapsed lava tubes throughout its range. The DNR HCP will help maintain critical temperature and moisture regimes, as well as the integrity of talus fields and protect large woody debris. Harvest would be permitted in the buffer but only where 60 percent canopy cover could be retained, which is anticipated to adequately maintain the microclimate regimes within the buffered talus. In the forested talus outside of the buffer, no more than 33 percent of the volume would be harvested during any single rotation. The species life-requisites also appear to be met in old-growth forest stand conditions where woody debris may provide the protective refugia that are offered by talus in other areas and at the entrances to caves. Both these habitats have already been addressed and should also benefit the Larch Mountain salamander.

**Conclusion:** It appears that talus-dependent species would be better off under the DNR HCP than without the DNR HCP because the talus field itself would not be subject to timber harvest and yarding would often avoid talus fields. The DNR HCP would provide a forested buffer around talus fields as well as protection of forested talus. Disruption will be much less frequent under the DNR HCP. These habitats would be maintained for the long-term survival and benefit of species.

### *Oak Woodlands*

**Description:** Oak woodlands occur mainly on the east side of the Cascades. On the west side, they occur in the Puget trough area, the Columbia Gorge area, and scattered areas on the west side. Oak woodlands are a rare plant community in Washington and provide important habitat for several high-priority species, including Lewis' woodpecker and the western gray squirrel. Although limited and declining, oaks and their associated communities comprise distinct woodland ecosystems. The various plant communities and stand-age mixtures within oak forests provide valuable habitat that contributes to wildlife diversity. Oak woodlands, in conjunction with other forest types, provide a mixture of feeding, resting, and breeding habitats for many wildlife species including over 200 vertebrate species and a profusion of invertebrate species.

On the west side, oaks often occupy a narrow zone between prairies and conifer forests. Fire had a crucial role in maintenance of oak woodlands by limiting encroaching conifers. Fire also stimulates sprouting of oaks and enhances the growth of seedlings by removing competing herbaceous vegetation. In the absence of fire conifers eventually overtop oaks. The decay characteristics of oak are ideal for cavity nesters. Leaves and acorns provide a food source for an array of species. Invertebrates that depend on oaks include moths, wasps, spiders, and butterflies. Dead oaks harbor insects and provide cavities, while the fungi and insects they support provide food for species such as the Nashville warbler. Open-canopy stands have more developed understories.

**Current Status:** DNR manages about 4,000 acres of oak woodlands and an additional 7,000 acres of mostly ponderosa pine stands in which oak is a significant associate, but only about 500 acres of oak woodland are in the west-side planning units.

**Current Trend Without HCP:** Oak woodlands are not currently harvested; however, there is no specific prescription for management of these woodlands and no guarantee they would not be harvested sometime in the future.

**HCP Result:** The DNR HCP addresses oak woodlands in several meaningful ways. All dominant (open-form) oaks would be retained (greater than 20 inches d.b.h.), as would standing dead and dying oaks, oaks with cavities, and downed logs. Under-burns may be used when appropriate and encroaching conifers (except western white pine) would be selectively removed. Removal of conifers would be especially beneficial on the west side of the Cascade Mountains. Approximately 25 to 50 percent of the canopy coverage would be retained.

**Discussion:** It is likely that these actions would result in retention and restoration of existing oak woodlands which support species such as the western gray squirrel, Lewis' and acorn woodpeckers, white-breasted nuthatches, and many cavity nesters, whereas State regulations would not.

The management anticipated under the HCP will benefit oak-woodland communities in the following ways. These oak/conifer woodlands are transitional communities that require management for continued maintenance. In areas where white oak has developed into a woodland stand, it is important to protect regeneration of this species. Dense stands of the tree benefit from being opened to allow the trees to spread and become mature, stately oaks. Open-grown trees without competition tend to produce better acorn crops, a good food source for many wildlife species, as well as future potential oak trees.

Lewis' woodpecker is associated with open ponderosa pine forests and cottonwood riparian areas. It also uses selectively logged or burned coniferous forest and oak woodlands. The species excavates nest cavities, but will also occupy natural cavities or cavities excavated by other woodpeckers. The species uses a hawking technique to capture insects, and, therefore, prefers riparian deciduous forest and early seral coniferous forest as foraging habitat.

Ecosystem restoration within the riparian buffer would try to maintain the natural mix of conifer and deciduous species. The riparian conservation strategy is expected to guarantee some protection of Lewis' woodpecker oak woodlands habitat. Special provisions for protecting very large, old trees and snags in oak woodlands would protect current and future potential Lewis' woodpecker habitat.

Western gray squirrel (*Sciurus griseus*) relies on oak woodland as its primary habitat. Oak/conifer (Douglas-fir) have the highest habitat value for western gray squirrel, providing a variety of food, cover, and nest sites. The western gray squirrel preferentially selects stands with open or patchy understories, rather than stands with dense understory vegetation. The management actions taken under the HCP to bring conifers and oaks back in balance, retain large oaks and decadent oaks, and conduct understory burning should benefit the squirrel.

**Conclusion:** The DNR HCP will provide all the habitat structure and function necessary to support oak-woodland-dependent species in excess of what would occur in the absence of the HCP. Large oaks will be retained to provide those large dead and structurally complex trees. Conifers and smaller oaks would be removed to manage for an open canopy. Underburning may be used to enhance sprouting and remove competing vegetation.

### ***Prairies, Grasslands, and Meadows***

**Description:** Prairies and other grasslands as described herein are those lands where the climax vegetation under natural regimes of fire, drought, and other naturally occurring events would be maintained as vegetation mainly composed of grasses and forbs.

**Current Status:** The project boundary does not include grasslands in central and eastern Washington. Activities covered under this project do not include grazing or grassland management.

**Current Trend Without HCP:** Remnant prairies are a concern in the Puget Lowlands; however, it is expected that DNR's primary actions in these areas would be restoration or preservation.

**HCP Result:** The HCP would not alter the management of these areas. DNR does manage a number of prairie areas, such as Mima Mounds, within the range of the HCP. They are restricted by the DNR HCP, but would continue to be managed separately as NRCAs or NAPs. NRCAs and NAPs would not be covered by the proposed incidental take permit. However, their retention and management for perpetuation of natural processes would likely count as mitigation so long as the conservation and management of these areas continue. In addition, DNR would avoid road construction through "balds" when conducting such construction in forested environments. These areas are often areas of serpentine soils which support unique plant communities and may therefore support animal species which depend on their unique plants. Invertebrates are often linked to single species of plants. Wolves may use these areas as rendezvous sites.

**Discussion:** Several species of gopher, butterflies, and sensitive plants would benefit from DNR management of these areas. These include the Oregon silver-spot butterfly which relies on violets. West-side prairies have been devastated by development and fire suppression. Fire suppression has resulted in conifer encroachment and loss of prairies. This has probably impacted a number of species more severely in the State of Washington than forest management.

**Conclusion:** DNR management would be affected little in these areas by the HCP. DNR's current management in west-side prairies is ecological restoration. This is not expected to change under the HCP.

### *Subalpine Meadows and Shrub Fields*

**Description:** These habitat classes include many of the nonforested areas at high elevations which support vegetation. Blueberry fields and avalanche chutes, as well as wet meadows, are all examples of these habitats. In many such areas, conifers are slow to establish except in proximity to other conifers where snow drifts prevent opportunistic grasses and low-growing vegetation from forming a mat. Mountain goats forage in these areas. Elk utilize these areas during the summer and early fall. Ravens and wolverines forage in these areas.

**Current Status:** Very few DNR-managed lands are at elevations that would include these habitat classes. Most of these areas are likely adjacent to, or under, Federal ownership.

**Current Trend Without HCP:** DNR manages several areas with subalpine meadows, such as portions of Mount Si, as NRCAs or NAPs.

**HCP Result:** NRCAs and NAPs are not part of the DNR HCP, but would continue to be managed separately as NRCAs or NAPs. NRCAs and NAPs would not be covered by the proposed incidental take permit, but their retention and management for perpetuation of natural processes would likely count as mitigation so long as the conservation and management of these areas continue. These protective area designations will ensure the continuation of natural habitats and processes in these high-elevation areas.

**Discussion:** Subalpine meadows and shrub fields are, by definition, not timbered, but may be surrounded by high-elevation timber types which do not regenerate or grow very quickly or reliably. These habitat classes support several species which can be impacted by disturbance. Grizzlies utilize these habitats for foraging but require nearby escape cover to help minimize human-bear interactions. Mountain goats forage in these areas when escape cover (cliffs) are nearby. Mountain goats also need older forests nearby for use during critical periods. The largest threats to these habitat classes include human disturbance. High-elevation areas are particularly sensitive to such disturbance, but the designations of NRCAs and NAPs would minimize disturbance and habitat modification.

**Conclusion:** These habitat types are expected to be minimally impacted by DNR-management. NRCA and NAP designations will protect the habitats, the functions associated with those habitats, and the species which depend on them.

### *Alpine Tundra, Krumholtz, and Glaciers*

**Description:** This habitat category is characterized by low, shrubby, slow-growing woody plants and a ground cover of boreal lichens, sedges, and grasses. The Krumholtz is a transition zone from subalpine forests and meadows to the alpine tundra and is characterized by dwarfed,

wind-sheared trees as a result of prolonged winters, extreme temperatures, accumulations of snow, and exposure to winds. These include high-elevation areas with significant amounts of year-round snow fields, bare soil, or exposed rock.

**Current Status:** This is an extremely rare habitat class for DNR-managed lands. Most of these habitats are either adjacent to, or under, Federal ownership.

**Current Trend Without HCP:** These areas are not generally managed for timber and are most likely NRCAs or NAPs.

**HCP Result:** No timber harvest actions are planned for these areas. Designations as NRCAs or NAPs would be expected to continue with the DNR HCP.

**Discussion:** Access to these areas is probably the sole factor under DNR's control. Under the HCP it is expected that there will be fewer open roads adjacent to Federal Reserves, especially within and immediately adjacent to the Grizzly Bear Recovery Zone in the Cascades. Most of these areas are likely accessible by foot only.

Mountain goats are found in alpine and subalpine areas and prefer steep slopes or cliffs, since they offer an untapped food source and protection from predators. Thermal cover and habitat connectivity, as well as freedom from disturbance are some of the attributes that should benefit goats in alpine meadows and in cliff areas. The protection of cliffs will further provide for the needs of mountain goats.

### *Summary of Other Habitat Mitigation*

Each of these special habitats has been examined separately as part of this assessment. The HCP provides measures to reduce the impacts of timber harvest upon these habitat categories and the species they support. Where these habitats and features are found on DNR-managed lands, the Service expects those habitats to persist and continue to function as wildlife habitat. Without the HCP, there would likely be little or no conservation measures for these habitats.

## **COMBINATIONS OF HABITATS**

Some species use a combination of habitats. Mountain goats use cliffs in high-elevation areas. Purple martins use snags near water bodies. Northern red-legged frogs inhabit moist and riparian forests near permanent water. Bats use snags in old forest and caves for roosts and maternity colonies. Yet, they often forage over wetlands and riparian areas. Bats often feed behind log jams where flying insects gather and concentrate in the eddies of air currents. Aquatic insects often spend larval stages in aquatic habitats, use the log jams and emergent vegetation to "emerge", and spend an ephemeral life span in the terrestrial environment.

As an example of how the HCP would provide for these type of species, the Service examined Myotis bats. In concert, the HCP strategies should ensure the development of large contiguous landscapes of submature to old-growth forest containing large trees and snags. In addition, talus fields, cliffs, and caves would be protected. Live trees or snags that are known to be used by myotis bat species as communal roosts or maternity colonies would not be harvested. Very large long-lived trees, trees with well-developed surface structures (bark), and snags that may function as roost sites would be retained, providing potential suitable snags for maternal roosts now and in the future. Provisions directed toward preventing human disturbance to bat caves by keeping cave locations confidential would also benefit these species. Feeding areas such as open clearcuts and edges would continue to be available.

Because all of the habitat types have been addressed by the DNR HCP, all unlisted species have been addressed whether they depend on one or many habitats to fulfill their life-history requirements.

#### **OTHER FACTORS AFFECTING HABITAT AVAILABILITY**

In this document, the Service has already addressed the primary concern and assumption of the habitat-based approach -- that the availability of habitats will determine the abundance of species. The second consideration is whether those habitats will remain useable. Continued development along Puget Sound and throughout the Puget trough will impact species whose ranges include or are concentrated within these areas regardless of the habitat types used by those species. Those species dependent on extremely young stands of mixed conifer/hardwood would probably be impacted the least, and those dependant on mature forest have already been heavily impacted.

Availability of habitat to the species normally utilizing the covered habitat categories can be influenced by several factors, including patch size and connectivity to other habitats. Many species are poor dispersers. Low-mobility species may not be able to pioneer all patches of habitat as they develop. Riparian corridors will form the basis for such connections. Also, the landscape levels of closed canopy and structurally complex forest are expected to contribute to landscape-level continuity.

Roads may also form barriers to some low-mobility species. Roads can create physical barriers for species, particularly when associated with large accumulations of slash on steep slopes. Larger species usually are able to find ways around such barriers within a short distance. Roads and their associated disturbances can reduce the availability of surrounding habitats. Habitat effectiveness is reduced for species subject to road-related impacts such as direct mortality or disturbance. These effects, however, are very interrelated with the effects of local and landscape levels of cover. Some species are affected to a greater degree by road densities. Excessive road densities may also preclude use of those areas by some species. Direct mortality of many species also increases in proximity to open roads. Other species may be impacted in other ways. Dust accumulation near roads may inhibit necessary functions for some smaller animals. Road

management (in terms of the amount of open road or sighting of roads in specific locations) is not likely to differ significantly by alternative but will greatly affect species which use open areas and are subject to human-induced disturbance or mortality. The comprehensive road management plan is expected to address the aspects of road location, construction, standards, densities, and maintenance to satisfy the requirements of most species.

As an example, the California wolverine is a wide-ranging species that utilizes a wide variety of habitat types, and is generally found in remote montane forest areas. Wolverine habitat is probably best defined in terms of adequate year-round food supplies in large, sparsely inhabited wilderness, rather than in terms of plant associations. Wolverines may use managed lands as long as the land is adjacent to a refugia such as a wilderness area. A primary component of suitable habitat for this species is a low level of human activity.

There is very little montane forest on DNR-managed lands. However, some parcels of DNR-managed forest are positioned adjacent to Federal wilderness areas and Federal Late-Successional Reserves that may serve as refugia for wolverines. Therefore, it is possible that wolverines could now or in the future be present in DNR-managed forests. It is likely that wolverines would only utilize DNR-managed lands at the higher elevations and where the largest tracts of land occur that remain undisturbed by human activity. These are most likely adjacent to large undisturbed wilderness areas and areas designated as NRCAs or NAPs. Under the HCP, DNR would conduct no activity that would appreciably reduce the likelihood of denning success within 0.5 mile of a known active wolverine den between January 1 and July 31 in areas managed for spotted owl breeding habitat. Road closures on DNR-managed lands would occur, consistent with cost-effective forest management and the policy set forth in the Forest Resource Plan. Under this policy, DNR would cooperate with the Services to restrict road access to protect sensitive wildlife habitat.

The use of herbicides, pesticides, and fertilizers may have impacts upon the usability of habitats for many species and may contribute to direct mortality as well. This will be particularly true for many invertebrates or for species dependant on sensitive broad-leaved plants. Additional impacts and exclusion from habitats may occur from activities which are unrelated to this plan. The DNR HCP commits to the 1992 herbicide use policy and only site-specific plans for pesticide use that are approved by the Service would be covered by the incidental take permit. In these ways the HCP has addressed useability of habitat categories.

#### **ANALYSIS OF EFFECTS RESULTING FROM NONTIMBER-RELATED ACTIVITIES**

In addition to the timber-related activities covered by the DNR HCP, DNR has requested coverage for a number of nontimber-related activities. Nontimber activities include actions commonly conducted by DNR or their contractors within the forest and other habitats and include gathering and collection of vegetation; extraction and sales of rock, sand, and gravel; oil and gas exploration and extraction, mining and prospecting, construction and maintenance of non-motorized and motorized recreational facilities; construction, maintenance, and granting of

rights-of-way; firewood cutting; grazing; and ORV use of established trails and facilities. These activities are described in greater detail in the FEIS and Hansen (1996) and form a basis for the following assessment.

The unlisted species will be treated by the HCP as though they were listed. If nontimber activities result in impacts to any species beyond the 1996 level of impact, an amendment would be required and the appropriate amount, distribution, duration, and type of minimization and mitigation would be provided. The Services would review the level of these activities annually, including any new sales, leases, contracts etc. to ensure that the level of impact remains at or below the 1996 level of impact. Therefore, impacts from nontimber-related activities which might otherwise result, would be unlikely to occur without an amendment.

Firewood cutting is not anticipated to occur in wetland areas and other special habitat types or their buffers. Firewood cutting will occur primarily at landings which occur along open roads. Roads otherwise closed to the public may remain open for a slightly longer period of time to accommodate this activity. This may result in minor increases in traffic, but is not expected to significantly increase disturbance of species or increase rutting or erosion of roads. While concentrations of coarse woody debris are important to many species such as small mammals and salamanders, the concentrations of this material above normal levels often found at landings, in conjunction with the typical locations of landings away from wet areas and removed from forest cover, would not be expected to benefit species. In fact, some removal of this material may hasten the return of vegetation and actually benefit a variety of species including shrub and forest dwelling birds. Firewood harvest would result in some localized disturbance during a time of year when most species have concluded their birthing and rearing stages. Larger species which rear for longer periods of time are generally mobile enough to avoid this disturbance. No green trees or standing snags are expected to be harvested, and coarse woody debris is not expected to be removed from forested stands or from harvest units that may be deficient in this material.

Harvest of Christmas trees or Christmas greens is not likely to occur in wetland areas or other special habitat types and is not expected to disrupt riparian or wetland function. This activity will generally occur in young stands where foliage exposed to the sun is readily accessible. Very often, it will be conducted at higher elevations as noble fir and other species are often considered highly desirable for Christmas greens. Christmas tree leases are few and most likely occur at lower elevations. These activities may result in some additional traffic on existing roads but this is not expected to increase disturbance levels or impact road processes. The amount of disturbance occurring from these activities directly is minimal because the collections are done by hand and travel through the stands is by walking. Gathering of other plant materials (e.g., sword fern and huckleberries) are most likely to occur in particular types of forest. Sword fern is usually harvested in stands that have been thinned which has resulted in increased understory growth. Huckleberries are often picked where bushes receive full sunlight and adequate moisture. Medicinal collections in 1996 were limited to Cascara bark and did not involve harvest of Pacific yew. It is unlikely that gathering of plant materials will occur on habitat types

such as talus slopes or cliffs, but some activity may occur in wetland and riparian buffers. These activities tend to occur close to roads and be self limiting. The Service does not expect any significant impacts to occur as a result of these activities continuing at their current levels.

Rights-of-way activities would not include pipelines, powerlines, or highways unless a permit amendment would be completed. Most access roads would comply with the HCP requirements for road management and placement, exceptions are expected to be infrequent and still subject to State regulations. The Service estimated length of rights-of-way at the 1996 level to result in about 87 acres of activity, based upon standard 60-foot rights-of-way. Because the timber removal from those acres was previously considered under timber-related impacts, only the grading and road construction and operation effects are considered in this section. These activities may have impacts upon forest-floor species. Species which live in shallow burrows or in the duff layer may suffer the most from earth-moving activities. Road construction may also impact other burrowing animals as a result of habitat loss as well as direct impacts. The level of impact resulting from 87 acres of rights-of-way per year on 1.6 million acres of HCP lands are expected to be negligible.

In addition to the extraction conducted by DNR in association with road construction and maintenance in support of the timber program, DNR may lease or conduct third-person sales of these materials. Gravel, sand, and rock extraction can have severe impacts to water quality, hydrological regimes, and other important habitat parameters when not conducted properly. Gravel and sand extraction often occur in valley-bottom areas. Some limited level of sand and gravel extraction may currently be occurring within riparian, wetland, and floodplain areas. Those activities occurring within the aquatic lands (between the ordinary high-water marks) are not covered by this HCP because aquatic lands are not included in the HCP area. Only the "forest lands" are included as HCP lands.

Rock extraction did not occur in 1996. According to the IA, only the 1996 level of take (or impact) to these species would be covered upon listing of any unlisted species. The FEIS stated that the only activity occurring in 1996 under non-sand and gravel mining contracts was exploration. Because of this provision, all new mining activities would be subject to review by the Services and would require an amendment if additional take were expected to result.

As with other non-timber activities, future contracts, leases, and sales would be reviewed in an annual meeting with the DNR and the Services. The plan of operations for sand and gravel extraction would be reviewed to ensure compliance with the commitments of the HCP. The HCP commitment regarding activities in the Riparian Management Zone (including the 100-year floodplain) states that forest-management activities that maintain or restore the quality of salmonid habitat shall be allowed. The primary objectives with respect to wetlands are "no overall net loss of naturally occurring wetland acreage and function" and "maintain hydrologic function". Future extraction facilities could not be established in wetland areas and be consistent with these objectives. Future activities planned for the riparian zone and riparian buffers could not include sand and gravel extraction because of the inconsistency with the

primary objective to maintain and restore salmonid habitat. Limiting this activity within the riparian and wetland areas would provide benefits to many aquatic and riparian dependent species such as bull trout, salmon, tailed frogs, and spotted frogs. Even though future actions would not be permitted in these areas, the Services remain concerned about existing activities.

At the present time, the Services do not have sufficient information concerning the 1996 levels of impacts resulting from sand and gravel mining on DNR-managed lands to be able to find that mining activities within riparian areas and the 100-year flood plain are sufficiently minimized and mitigated to allow a 70 to 100 year incidental take permit, when or if anadromous salmonids or other aquatic and riparian species are listed under the ESA. DNR currently has up to 40 such contracts, with 15 to 20 contracts in forested areas for the sale of sand or gravel, affecting up to 1,000 total acres. Sales under these contracts are subject to the State Environmental Policy Act (SEPA) and to DNR's SEPA policy for the elimination of conditions that are hazardous to fish. The measures needed to accomplish this are not described. DNR has advised the Services that sand and gravel mining are subject to water quality permits administered by the Washington Department of Ecology.

Due to the lack of specific information on the location and intensity of mining activities in riparian areas and the 100-year flood plain, the Services conclude that effects or impacts to any anadromous fish or other aquatic and riparian dependents species resulting from such mining activities on DNR-managed lands will only be covered by the unlisted species provisions of the IA for a period ending on January 30, 1998. Thereafter, impacts or effects from sand and gravel mining or other mining contracts will not be covered by the unlisted species provisions of the IA unless DNR has provided additional information concerning the location of such activities, and the extent of their impacts to anadromous fish and other aquatic and riparian wildlife. This information is necessary for the Services to conclude that mining would be adequately minimized and mitigated for in the HCP, and would not appreciably reduce the likelihood of the survival and recovery of anadromous salmonid and other aquatic and riparian dependent species in the wild.

Communication sites are typically located on elevated sites and are not likely to occur in or near riparian and wetland habitats. Roads constructed to access such sites would be unlikely to expand the current forest-road network. Such roads would also be constructed according to the comprehensive road-management plan, when it is completed, in most cases. Towers and facilities located on such elevated sites create possible points of collision for low-flying birds, which may occur on an infrequent basis. Many of these facilities are located adjacent to highway corridors and in second growth forest. Impacts of site maintenance are expected to be minimal as disturbances are expected to be infrequent and any use or disposal of chemicals such as cleaning fluids and paint would be in accordance with applicable guidelines and regulations.

Nonmotorized recreation impacts may occur in and around the recreational facilities. When these occur near wetlands and riparian areas they may result in deposition of refuse and other waste to those habitats. Disturbance to basking reptiles or nesting birds is expected to be minor.

The impacts are expected to be minor as a result of such facilities. In upland habitats surrounding these facilities, similar impacts may occur to the species utilizing those habitats. Little if any trampling or direct effects are expected to result from these nonmotorized activities.

Campgrounds and constructed trails could have some minor water-quality, hydrological-flow, and other impacts to wetland and riparian species. The HCP will ensure that such take remains at 1996 levels of impact and that such recreational facilities are located outside riparian and wetland areas. Where these facilities currently exist within wetland and riparian areas, it is expected that, over time, they will eventually be relocated or replaced by other facilities in less-sensitive areas.

Access to shallow waters and wetland areas are often precluded by logistics and density of vegetation, yet some disruption of those areas may occur. Similarly cliffs and talus slopes could be impacted at the local level by recreation facilities. Species which utilize these habitats such as pikas may be disturbed.

Grazing can be a major influencing factor for wetland and riparian species, as well as species dependant on forb and grass areas. However, DNR only conducts this activity on the east side of the Crest. No unlisted species agreement is provided east of the Crest. Section 9 of the Act would prohibit take of other species on the east side should they become listed. Alleviation from the restriction of take for species such as spotted owls, eagles, and falcons, may allow some activities in areas previously restricted, but, this is not expected to increase the level of grazing.

Oil, gas, and mining operations are expected to be minimal. The 1996 levels of such activities are small as were the resulting impacts. Safeguards are already in place under State and Federal regulations and were designed to protect hydrology and water quality. These operations could have particularly severe impacts if allowed to occur in shallow wetlands. A combination of existing laws and the provision of the HCP to limit these activities to 1996 levels of impact will preclude future placement of such facilities within wetland or riparian habitats. Provisions in the HCP regarding other special habitats would limit the locations of oil and gas facilities.

ORV use of the trails which are constructed and maintained on the HCP lands are covered by this permit. Some impacts, similar to the impacts under right-of-way, may have occurred on a small amount of trail constructed in 1996. The impacts that result from trail maintenance are minor. Culverts are cleared and downed limbs and logs are removed to the side of the trail. Brush is occasional cleared by hand. These activities are expected to be minor. The commitment to limit the level of impact to that which occurred in 1996 will preclude further construction of trail unless a similar amount of trail is decommissioned so that the overall amount of trail does not increase, thereby maintaining disturbance effects at the 1996 level. Disturbance effects from ORV use of the established trails would pertain to a number of species.

Any dens or nests in the habitats expected to contain such trails or to be located in close proximity to those trails could be impacted. Trampling of slow-moving mammals, reptiles, and amphibians is also possible. Use of established trails and facilities, when properly managed, should maintain impacts at acceptable levels.

## References

- Madden, J.R. 1974. Female territoriality in a Suffolk County, Long Island population of *Glaucomys volans*. *Journal of Mammalogy*. Volume 55, pages 647-652.
- Shaw, Susan. 1995 and 1996. Personal Communications. Washington Department of Natural Resources. Forks, Washington.
- Sloan, K. 1996. Notes to File: Snag Size requirements of snag-dependant species. USDI Fish and Wildlife Service. Olympia, Washington.
- U.S. Department of Interior, U.S. Department of Commerce, and Washington Department of Natural Resources. 1996a. Draft Environmental Impact Statement on the proposed issuance of an incidental take permit for threatened and endangered species on lands managed by the Washington Department of Natural Resources within the range of the northern spotted owl. March 1996. Olympia, Washington.
- U.S. Department of Interior, U.S. Department of Commerce, and Washington Department of Natural Resources. 1996b. Final Environmental Impact Statement on the proposed issuance of an incidental take permit for threatened and endangered species on lands managed by the Washington Department of Natural Resources within the range of the northern spotted owl. November 1996. Olympia, Washington.
- Washington Department of Natural Resources. 1996a. Habitat Conservation Plan. Olympia, Washington. November 1996.
- Washington Department of Natural Resources, U.S. Fish and Wildlife Service, and National Marine Fisheries Service. 1996. Implementation Agreement. Olympia, Washington.

## APPENDIX C. List of Recommendations to the Service

Service staff recommend the following conditions for any incidental take permit issued to DNR under section 10(a) of the Act based on DNR's HCP and IA:

- A. General conditions set out in Subpart D of 50 CFR 13, and specific conditions contained in Federal regulations cited in Block #2 above (50 CFR 17.22(b)(3), 17.32(b)(3)), are hereby made a part of this permit. All activities authorized herein must be carried out in accordance with and for the purposes described in the application submitted. Continued validity or renewal of this permit is subject to complete and timely compliance with all applicable conditions, including the filing of all required information and reports.
- B. The validity of this permit is also conditioned upon strict observance of all applicable foreign, State, local, or other Federal law.
- C. Valid for use by Permittee named above and its authorized officers, employees, contractors, and agents.
- D. This permit is subject to the provisions of Title 50 *Code of Federal Regulations* Parts 10, 13, and 17.
- E. The authorization granted by this permit is subject to full and complete compliance with, and implementation of, the Habitat Conservation Plan (HCP), and Implementation Agreement (IA), executed by the Permittee, the U.S. Fish and Wildlife Service and the National Marine Fisheries Service. This permit, and the HCP and IA, are binding upon the Permittee, and any authorized officer, employee, contractor, or agent conducting permitted activities.
- F. The term of the this permit shall be from January 30, 1997 to January 30, 2067, except the permit term for grizzly bears (*Ursus arctos horribilis*) shall be from January 30, 1997 to January 30, 2002. The permittee may apply for a permit amendment to extend the permit term for grizzly bears until January 30, 2067.
- G. Permittee, and its authorized officers, employees, contractors, and agents are authorized to incidentally take gray wolves (*Canis lupus*), grizzly bears, northern spotted owls (*Strix occidentalis caurina*), bald eagles (*Haliaeetus leucocephalus*), American peregrine falcons (*Falco peregrinus*), marbled murrelets (*Brachyramphus marmoratus marmoratus*), Columbian white-tailed deer (*Odocoileus virginianus leucurus*), Aleutian Canada geese (*Branta canadensis leucopareia*), and Oregon silverspot butterflies (*Speyeria zerene hippolyta*) in the course of otherwise lawful activities in accordance with the terms and conditions of the HCP, IA, the permit, and the Incidental Take Statement of the Biological Opinion (attached).

- H. Permittee shall notify the Service of new locations of permit species that are discovered within the area covered by the HCP, including, but not limited to, locations of occupied murrelet habitat; owl site centers; wolves; nests, communal roosts, or feeding concentrations of bald eagles; peregrine falcon nests; Columbian white-tailed-deer; Aleutian Canada geese; and Oregon silverspot butterflies.
- I. Upon locating any dead, injured, or sick individuals of any listed species covered by this permit, Permittee shall, within 3 working days, notify the U.S. Fish and Wildlife Service's Western Washington Office, Olympia, Washington (360-753-9440). Instructions for proper handling and disposition of such specimens will be issued at that time. Care must be taken in handling sick or injured specimens to ensure effective treatment and care, and in the handling of dead specimens to preserve biological material in the best possible state.
- J. Permittee shall refer to permit number PRT-812521 in all correspondence and reports concerning permit activities. Any questions you may have about this permit should be directed to the Supervisor, U.S. Fish and Wildlife Service, Western Washington Office, Olympia, Washington (360-753-9440).
- K. All applicable provisions of this permit must be presented and clearly explained to all authorized officers, employees, contractors, or agents of Permittee conducting authorized activities.
- L. Permittee shall notify the Service if any nontimber activity (as described in the IA) is expected to increase beyond its 1996 level and include with such notification a description of any take likely to result from any such increase. The DNR will review new forest product sales, other valuable material sales, licenses, permits, leases, rights-of-way, and public uses with the Services during the annual meetings.

**APPENDIX D. List of Species Vernacular Names and Scientific Binomials  
Used in the Service's Section 10(a) Findings and  
Recommendations**

**Mammals**

Gray Wolf	<i>Canis lupus</i>
Lynx	<i>Lynx canadensis</i>
Bobcat	<i>Lynx rufus</i>
Mountain Lion	<i>Felis concolor</i>
California Wolverine	<i>Gulo gulo luteus</i>
Pacific Fisher	<i>Martes pennanti pacifica</i>
Marten	<i>Martes americana</i>
Grizzly Bear	<i>Ursus arctos</i> (U.a. horribilis)
Columbian White-tailed Deer	<i>Odocoileus virginianus leucurus</i>
Elk	<i>Cervus elaphus</i>
Black-tailed Deer	<i>Odocoileus hemionus</i>
Mountain Goat	<i>Oreamnos americanus</i>
Mountain Beaver	<i>Aplodontia rufa</i>
Northern Flying Squirrel	<i>Glaucomys sabrinus</i>
Townsend's Chipmunk	<i>Tamias townsendii</i>
Douglas' Squirrel	<i>Tamiasciurus douglasii</i>
Western Gray Squirrel	<i>Sciurus griseus</i>
Beaver	<i>Castor canadensis</i>
Bushy-tailed Woodrat	<i>Neotoma cinerea</i>
Deer Mouse	<i>Peromyscus maniculatus</i>
Boreal (Southern) Red-backed Vole	<i>Clethrionomys gapperi</i>
Long-tailed Vole	<i>Microtus longicaudus</i>
Townsend's Vole	<i>Microtus townsendii</i>
Pacific Jumping Mouse	<i>Zapus trinotatus</i>
Common Porcupine	<i>Erethizon dorsatum</i>
American Pika	<i>Ochotona princeps</i>
Snowshoe Hare	<i>Lepus americanus</i>
Townsend's Big-eared Bat	<i>Plecotus townsendii</i>
Keen's Myotis	<i>Myotis keenii</i>

Birds

Northern Spotted Owl

Bald Eagle

Peregrine Falcon

Northern Goshawk

Golden Eagle

Turkey Vulture

Sharp-shinned Hawk

Cooper's Hawk

Red-tailed Hawk

American Kestrel

Ruffed Grouse

Band-tailed Pigeon

Yellow-billed Cuckoo

Barn Owl

Great Gray Owl

Northern Saw-whet Owl

Western Screech Owl

Great Horned Owl

Common Nighthawk

Common Poorwill

Black Swift

Rufous Hummingbird

Red-breasted Sapsucker

Yellow-bellied Sapsucker

Downy Woodpecker

Hairy Woodpecker

Three-toed Woodpecker

Black-backed Woodpecker

Northern Flicker

Lewis' Woodpecker

Pileated Woodpecker

Red-headed Woodpecker

Acorn Woodpecker

Olive-sided Flycatcher

Little Willow Flycatcher

Violet-green Swallow

Cliff Swallow

Common Raven

Chestnut-backed Chickadee

Red-breasted Nuthatch

White-breasted Nuthatch

*Strix occidentalis caurina*

*Haliaeetus leucocephalus*

*Falco peregrinus*

*Accipiter gentilis*

*Aquila chrysaetos*

*Cathartes aura*

*Accipiter striatus*

*Accipiter cooperii*

*Buteo jamaicensis*

*Falco sparverius*

*Bonasa umbellus*

*Columbia fasciata*

*Coccyzus americanus*

*Tyto alba*

*Strix nebulosa*

*Aegolius acadicus*

*Otus kennicottii*

*Bubo virginianus*

*Chordeiles minor*

*Phalaenoptilus nuttalli*

*Cypseloides niger*

*Selasphorus rufus*

*Sphyrapicus ruber*

*Sphyrapicus varius*

*Picoides pubescens*

*Picoides villosus*

*Picoides tridactylus*

*Picoides arcticus*

*Colaptes aratus*

*Asyndesmus lewis*

*Dryocopus pileatus*

*Melanerpes erythrocephalus*

*Melanerpes formicivorus*

*Contopus borealis*

*Empidonax traillii brewstri*

*Tachycineta thalassina*

*Hirundo pyrrhonota*

*Corvus corax*

*Parus rufescens*

*Sitta canadensis*

*Sitta carolinensis*

Brown Creeper  
Rock Wren  
Golden-crowned Kinglet  
Vaux's Swift  
Purple Martin  
Western Bluebird  
Townsend's Solitaire  
Orange-crowned Warbler  
Nashville Warbler  
Yellow-rumped Warbler  
Wilson's Warbler  
Yellow-breasted Chat  
Rufous-sided Towhee  
Aleutian Canada goose  
Common Loon  
Harlequin Duck  
Barrow's Goldeneye  
Bufflehead  
Common Goldeneye  
Hooded Merganser  
Wood Duck  
Marbled murrelet  
Sandhill Crane  
Black Tern

#### Reptiles

Northwestern Pond Turtle  
Northern Alligator Lizard  
Western Fence Lizard  
Western Skink  
California Mountain Kingsnake  
Sharptail Snake  
Rubber Boa

#### Amphibians

Larch Mountain Salamander  
Dunn's Salamander  
Van Dyke's Salamander  
Tailed Frog  
Northern Red-legged Frog  
Cascades Frog  
Oregon Spotted Frog

*Certhia americana*  
*Salpinctes obsoletus*  
*Regulus satrapa*  
*Chaetura vauxi*  
*Progne subis*  
*Sialia mexicana*  
*Myadestes townsendi*  
*Vermivora celata*  
*Vermivora ruficapilla*  
*Dendroica coronata*  
*Wilsonia pusilla*  
*Icteria virens*  
*Pipilo erythrophthalmus*  
*Branta canadensis leucopareia*  
*Gavia immer*  
*Histrionicus histrionicus*  
*Bucephala islandica*  
*Bucephala albeola*  
*Bucephala clangula*  
*Lophodytes cucullatus*  
*Aix sponsa*  
*Brachyramphus marmoratus marmoratus*  
*Grus canadensis*  
*Chlidonias niger*

*Clemmys marmorata marmorata*  
*Elgaria coerulea*  
*Sceloporus occidentalis*  
*Eumeces skiltonianus*  
*Lampropeltis zonata*  
*Contia tenuis*  
*Charina bottae*

*Plethodon larselli*  
*Plethodon dunni*  
*Plethodon vandykei*  
*Ascaphus truei*  
*Rana aurora aurora*  
*Rana cascadae*  
*Rana pretiosa*

Columbia Spotted Frog  
Northwestern Salamander  
Ensatina  
Western Red-backed Salamander  
Pacific Tree Frog

*Rana luteiventris*  
*Ambystoma gracile*  
*Ensatina eschsholtzii*  
*Plethodon vehiculum*  
*Pseudacris regilla*

#### **Fish**

Cutthroat  
Bull Trout  
Olympic Mudminnow  
Pacific Lamprey  
River Lamprey  
Green Sturgeon

*Oncorhynchus clarki*  
*Salvelinus confluentis*  
*Novumbra hubbsi*  
*Lamptera tridentata*  
*Lamptera ayresi*  
*Acipenser medirostris*

#### **Invertebrates**

Oregon silverspot butterfly  
Newcomb's Littorine Snail  
California Floater  
Beller's Ground Beetle  
Long-horned Leaf Beetle  
Hatch's Click Beetle  
Fender's Soliperlan Stonefly  
Lynn's Clubtail  
Johnson's (mistletoe) Hairstreak  
Western Pine Bark Beetle  
Douglas-fir Beetle  
Western Spruce Bud Worm  
Campodied Dipluran  
Stygobiont Copapod

*Speyeria zerene hippolyta*  
*Algamorda newcombiana*  
*Anodonta californiensis*  
*Agonum belleri*  
*Donacia idola*  
*Eamus hatchii*  
*Soliperla fenderi*  
*Gomphus lynnae*  
*Mitoura johnsoni*  
*Dendroctonus brevicomis*  
*Dendroctonus pseudotsugae*  
*Choristoneura occidentalis*  
*Haplocampa spp.*  
*Stygonitocrella spp.*

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#### **Plants**

Western Hemlock  
Mountain Hemlock  
Douglas-fir  
Pacific Silver Fir  
Grand Fir  
Subalpine Fir  
Noble Fir  
Sitka Spruce  
Ponderosa Pine  
Western White Pine

*Tsuga heterophylla*  
*Tsuga mertensiana*  
*Pseudotsuga menziesii*  
*Abies amabilis*  
*Abies grandis*  
*Abies lasiocarpa*  
*Abies procera*  
*Picea sitchensis*  
*Pinus ponderosa*  
*Pinus monticola*

Pacific Yew  
Western Red Cedar  
Red Alder  
Big-leaf Maple  
Black Cottonwood  
Oregon White Oak  
Pacific Dogwood  
Salal  
Blueberry  
Huckleberry  
Oregon Grape  
Western Bog Laurel  
Labrador Tea  
Common Snowberry  
Current  
Gooseberry  
Oceanspray  
Salmonberry  
Blackberry  
Willow  
Cascara  
Vine Maple  
Oregon Checkermallow  
Golden Paintbrush  
Water Howellia  
Western Blue Violet  
Marsh Sandwort  
Nelson's Checkermallow  
Bradshaw's Lomatium  
Glasswort, Saltwort  
Sundew  
Peat Moss  
Dwarf Mistletoe  
Laminated Root Rot  
White Pine Blister Rust

*Taxus brevifolia*  
*Thuja plicata*  
*Alnus rubra*  
*Acer macrophyllum*  
*Populus trichocarpa*  
*Quercus garryana*  
*Cornus nuttallii*  
*Gaultheria shallon*  
*Vaccinium spp.*  
*Vaccinium spp.*  
*Berberis spp.*  
*Kalmia microphylla*  
*Ledum groenlandicum*  
*Symphoricarpos albus*  
*Ribes spp.*  
*Ribes spp.*  
*Holodiscus discolor*  
*Rubus spectabilis*  
*Rubus spp.*  
*Salix spp.*  
*Rhamnus purshiana*  
*Acer circinatum*  
*Sidalcea oregana var. calva*  
*Castilleja levisecta*  
*Howellia aquatilis*  
*Viola adunca*  
*Arenaria paludicola*  
*Sidalcea nelsoniana*  
*Lomatium bradshawii*  
*Salicornia spp.*  
*Drosera rotundifolia*  
*Sphagnum spp.*  
*Arceuthobium spp.*  
*Phellinus weirii*  
*Cronartium ribicola*