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FINAL HABITAT CONSERVATION PLAN

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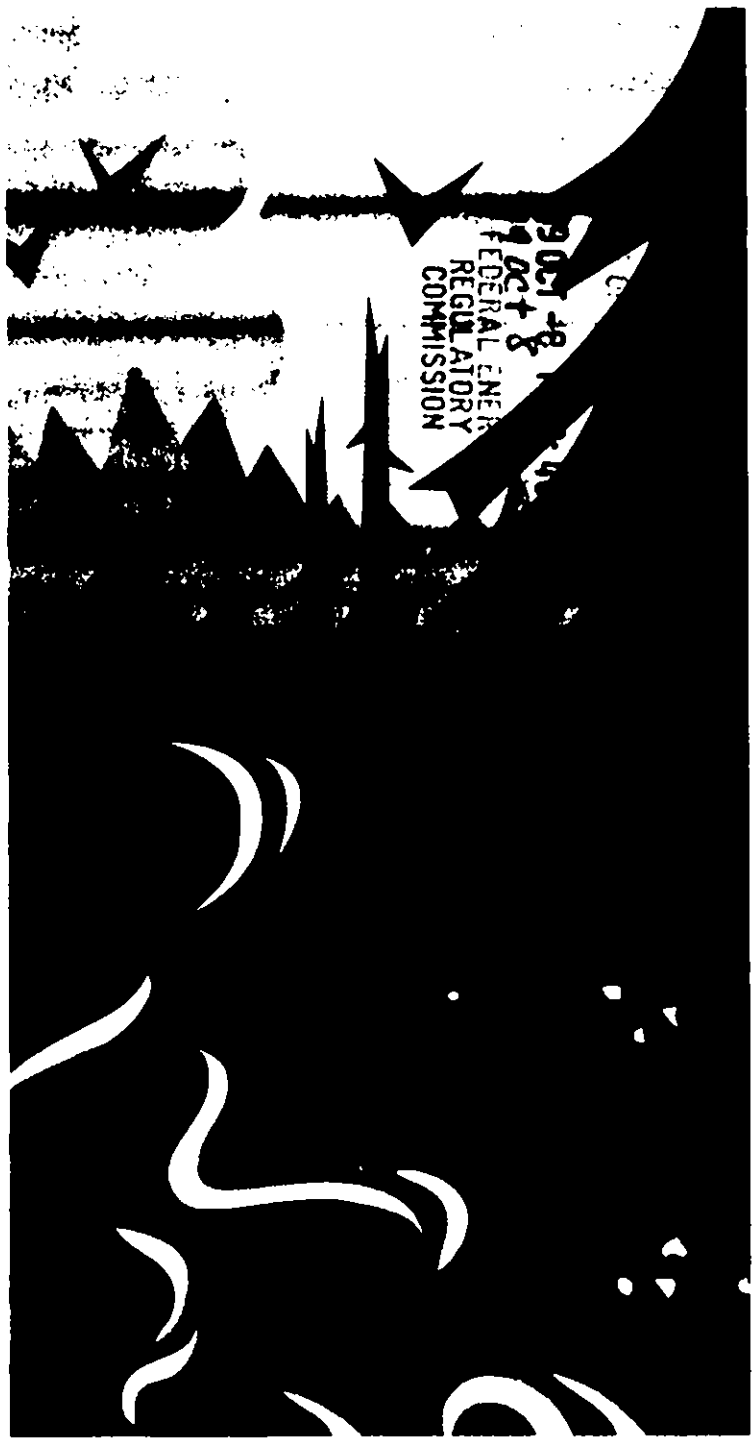


WASHINGTON STATE DEPARTMENT OF
Natural Resources
Jennifer M. Belcher - Commissioner of Public Lands

Authority

This Plan was approved and adopted by the Board of Natural Resources (Resolution 96-911, November 5, 1996).

Board of Natural Resources

The following individuals were seated on the Board at the time of adoption.

Jennifer Belcher, *Chair, Commissioner of Public Lands*
Judith Billings, *Superintendent of Public Instruction*
David Thorud, *Dean, College of Forest Resources, University of Washington*
Dorothy Duncan, *County Commissioner representing the Forest Board counties*
Bob Nichols, *Executive Policy Division, OFM - designee for Governor Mike Lowry*
James Zuiches, *Dean, College of Agriculture and Home Economics, Washington State University*

No absolute threshold exists for acceptable road densities within drainage basins because the maximum carrying capacity for roads in a watershed depends on the topography, geology, climate, and competing ecological and land-use objectives, as well as road use, type, location, and construction method. Cederholm and Reid (1987) reported that 2.5 miles per square mile or less constitutes the optimum number of road miles for the Clearwater River basin. Roads on flatter ground than the Hoh-Clearwater terrain, however, are less likely to deliver sediment to streams; therefore, comparatively more roads might be possible without degrading water quality. Hence, optimum road densities must be determined on a watershed basis.

The riparian conservation strategy seeks to use landscape-planning tools to analyze the projected needs for roads over the long term (i.e., greater than 100 years) and use this information to minimize the total road density within each watershed. The Clallam River Landscape Plan (DNR Olympic Region 1995) represents one of several prototypes for how DNR envisions carrying out this objective in the 11 landscape planning units in the Experimental Forest. This method or other similar ones would be used to address road densities elsewhere in the Experimental Forest. The specific methods or models used, however, will vary as new technologies become available.

As an example, the Clallam River Landscape Plan covers approximately 16,000 acres in the northern portion of the Experimental Forest. The plan features conservation strategies similar to those proposed for the entire Experimental Forest and seeks to schedule management activities over multiple decades consistent with the dual objectives of sustaining long-term commodity production and ecological values. The present and future transportation network was evaluated through the use of a computer model (i.e., Scheduling and Network Analysis Program, Sessions and Sessions 1994) that analyzes proposed harvest units and road networks for a given landscape unit on the basis of constraints imposed by the conservation objectives and inventoried watershed conditions. The analysis was projected 100 years into the future so that the model would create all possible management units and road networks within the planning area. The resulting road network represented the maximum road density that hypothetically would be necessary at any time in the future. The analysts then systematically evaluated each road in the transportation layer to identify roads that could be eliminated because they duplicated access by other means or, in the case of existing roads, would not be used in the future. This analysis resulted in a comprehensive, long-term (i.e., 100-year) road plan for all essential new construction, abandonment, and relocation.

Protection of Forested Wetlands

The objective of forested-wetlands protection in the Experimental Forest is to maintain and aid natural restoration of wetland hydrologic processes and functions. The wetland strategy for the OESF seeks to achieve this objective by:

(1) retaining plant canopies and root systems that maintain adequate water transpiration and uptake processes;

(2) minimizing disturbance to natural surface and subsurface flow regimes;

(3) ensuring stand regeneration.

In addition, wetlands in areas susceptible to blowdown would be treated comparably to stream buffers, with maintenance of wind-firm stands as a primary conservation objective. Harvest-design experiments to achieve sturdy buffers should be considered in these instances.

Wetlands, as defined by the state Forest Practices Board Manual (WFPB 1993a), will be protected in the OESF. Forested wetlands larger than 0.25 acre and bogs larger than 0.1 acre will be protected with buffers and special management considerations. This is consistent with Policy No. 21 of DNR's Forest Resource Plan, which calls for "no net loss of naturally occurring wetland acreage and function" (DNR 1992 p. 36). Series of smaller wetlands will be protected if they function collectively as a larger wetland. In addition to meeting the requirements stated in WAC 222-30-020(7) (WFPB Manual 1993a), nonforested wetlands will receive buffer protection consistent with DNR's wetlands policy quoted above.

Table IV.9 describes the level of buffer protection proposed for forested and nonforested wetlands in the Experimental Forest. Average buffer widths are measured from the outer edge of the forested wetland, as defined by the U.S. Fish and Wildlife Service. (See Bigley and Hull 1993.) The recommended buffer width for wetlands greater than 5 acres is equal to the average site potential tree height for riparian forests in the OESF. For wetlands between 0.25 and 5 acres, the recommended buffer width averages two-thirds of the site potential tree height. Site-potential tree heights are determined from Wiley (1978) for dominant conifer species; see discussion related to coarse woody debris in Summary: Benefits of the Riparian Conservation Strategy later in this section.

Table IV.9: Proposed protection of forested and nonforested wetlands in the Olympic Experimental State Forest

Average buffer widths are measured from the outer edge of the forested wetland. Average buffer widths for forested wetlands: 150 feet for wetlands greater than 5 acres;100 feet for wetlands 0.25 to 5 acres.

Harvest within forested wetlands and their buffers	▮ Retain at least 120 square feet basal area ▮ Take appropriate steps to maintain wind-firm buffers, as per recommendations for exterior riparian buffers
Harvest within forested buffers of nonforested wetlands	▮ No harvest within 50 feet of wetland edge ▮ Harvest within buffers beyond 50 feet designed to maintain stand wind-firmness, as per recommendations for exterior riparian buffers ▮ Leave trees should be representative of the dominant and co-dominant species in the intact forest edge of the wetland

DNR estimated that retaining 120 square feet basal area in forested wetlands would maintain a minimum level of hydrologic function in wetland trees. This estimate is derived from models of leaf area recovery following harvest. Basal area is assumed to be an adequate surrogate for leaf area index in predicting the impacts of partial harvest on tree evapotranspiration and canopy interception. Predictions of leaf area index response (Kimmins 1993; McCarthy and Skaggs 1992) indicate that improvements in leaf area index with time should compensate for some modifications of wetland hydrology associated with tree removal. (See Section D of this chapter titled Riparian Strategy for the Five West-side Planning Units for additional discussion of the leaf area.)

Integration of Research and Monitoring

The riparian conservation strategy is integrated with the research and monitoring strategy for the OESF described in Chapter V. All experiments performed in riparian areas, particularly those to evaluate windthrow behavior in riparian forests, will be carried out according to research protocols established for the Experimental Forest. Watershed conditions will be monitored over time through:

(1) the monitoring method described in Standard Methodology for Conducting Watershed Analysis (WFPB 1995);

(2) the monitoring program established for the Hoh River, Kalaloch Creek, and Nolan Creek drainages (Hoh Tribe and DNR, Memorandum of Understanding, 1993); and

(3) the monitoring strategy for the Experimental Forest, implemented through the landscape planning program or the proposed 12-step watershed-assessment procedure. (See Implementing the Riparian Conservation Strategy later in this section.)

RATIONALE FOR THE RIPARIAN CONSERVATION STRATEGY

The effects of forest management activities on the physical and biological condition of riparian ecosystems, particularly with regard to the loss of habitat complexity, have been documented locally on the Olympic Peninsula (e.g., Cederholm and Lestelle 1974; Cederholm and Salo 1979; Schlichte et al. 1991; Benda 1993; Shaw 1993; Quinn and Peterson 1994; DNR and U.S. Forest Service 1994; DNR, Olympic Region 1995; McHenry et al. 1995; DNR and U.S. Forest Service, Sol Duc Watershed Analysis, in progress), as well as throughout the Pacific Northwest (e.g., Harr et al. 1975; Bisson and Sedell 1984; Grant 1986; Swanson et al. 1987; Bisson et al. 1992). Management-related modifications of riparian habitat occur, regardless of who owns or manages the land, as a consequence of the terrain characteristics, soil properties, rainfall regimes, and other natural phenomena that increase susceptibility to mass wasting and changes in channel morphology. The principal causes for loss of habitat complexity in the OESF are:

(1) channel erosion and sedimentation associated with landslides and related channel disturbances (e.g., debris flows and dam-burst floods);

(2) reduction in stream shade and delivery of organic debris to the channels due to alteration of the structure and composition of streamside forests; and

(3) channel-bank erosion and loss of long-term sources of coarse woody debris due to past management practices and extensive windthrow disturbances.

The dimensions of the interior-core buffers have been set on the basis of locally documented requirements for protecting channel margins and hillslopes susceptible to mass wasting. DNR chose this physical rationale because relatively more quantitative information exists regarding landforms and geomorphic processes than for ecological processes affecting riparian areas within the Experimental Forest. (See supporting evidence and discussion concerning current riparian practices in the Experimental Forest in the Draft EIS that accompanies this HCP.) Buffers wider than currently mandated by state-regulated Riparian Management Zones (WFPB 1993a) are frequently needed to incorporate unstable ground in the OESF. For example, most Types 4 and 5 streams in proposed harvest areas with slopes exceeding approximately 70 percent are protected by no-harvest buffers because of the recurrence and severity of landslides and debris flows that originate in the headwalls of these drainages (Benda 1993; Hoh Tribe and DNR 1993; O'Connor and Cundy 1993; Shaw 1993; DNR, Olympic Region, 1995; McHenry et al. 1995). Type 5 channels are a special concern in the Experimental Forest because they are the primary conduit for delivering material from upslope areas to fish-bearing stream reaches. Furthermore, current practices in DNR's Olympic Region commonly provide greater protection than state-regulated Riparian Management Zones in low-gradient alluvial stream systems (i.e., Types 1-3) because state-regulated Riparian Management Zones frequently do not adequately protect incised channel margins, unstable terrace and hillslope margins, and floodplain wetlands.

The dimensions of the exterior buffer represent DNR's best understanding of what might be required to protect the integrity of the interior-core buffers. A number of site factors promote susceptibility to windthrow on the western Olympic Peninsula, but there are no proven management techniques for successfully minimizing potential windthrow. The conservation strategy, which really is a working hypothesis, will lead toward better understanding of windthrow in managed forests through experimentation and systematic application and refinement of knowledge gained.

Although the riparian conservation buffers have been established on the basis of physical arguments, DNR expects that these buffers will contribute to the maintenance and recovery of ecological habitat complexity in aquatic and riparian systems. This hypothesis derives from the current understanding of the dynamics and processes of these systems. For that reason, research and monitoring can improve scientific knowledge and management practices in the Experimental Forest.

Table IV.10 compares the average buffer widths proposed for mass-wasting and windthrow protection in the OESF with those recommended in the literature for key physical and ecological parameters that are essential for creating and maintaining riparian and aquatic habitat in the OESF. This is not an exhaustive list of the ecological variables in riparian areas, but rather those key parameters about which enough is currently known to guide the development of best management practices in riparian areas. The importance of these parameters for salmonids is discussed generally in Section D of Chapter III titled Salmonids and the Riparian Ecosystem. The benefits of the riparian conservation strategy with regard to these parameters are summarized in the next paragraphs.

Table IV.10: Comparison of average riparian buffer widths expected as a result of applying the Olympic Experimental State Forest riparian conservation strategy and buffer widths proposed in the literature for several key watershed parameters

Buffer widths are given as average horizontal distances (or range of averages) outward from the active channel margin.

Key watershed parameter	Buffer width by stream type - proposed for the OESF				
	1	2	3	4	5
Mass wasting	150 ft all Type 1 streams will be protected	150 ft all Type 2 streams will be protected	100 ft all Type 3 streams will be protected	100 ft all Type 4 streams will be protected	0-500+ ft; depends on size of contribution area[1] and amount of unstable ground[2]
Mass wasting and windthrow combined	150 ft inner, 150 ft outer[3]	150 ft inner, 150 ft outer[3]	100 ft inner, 150 ft outer[3]	100 ft inner, 50 ft outer[3]	variable inner, 50 ft outer[3]

Key watershed parameter	Buffer width by stream type - proposed in the literature[4]				
	1	2	3	4	5
Coarse-woody-debris recruitment[5]	108-168 ft	108-168 ft	105-153 ft	105-153 ft	105-153 ft
Stream shade availability[6]	108-168 ft	108-168 ft	105-153 ft	105-153 ft	105-153 ft
Riparian forest microclimate[6]	300 ft	300 ft	250 ft for >5-ft-wide channels	125 ft	
Channel bank stability	Commensurate with mass-wasting buffer protection on stream channels.				
Lateral channel migration	Commensurate with combined mass-wasting and windthrow protection on stream channels.				
Water quality[6]	108-168 ft	108-168 ft	105-153 ft	105-153 ft	105-153 ft
Water quantity	Unknown. Objectives of proposed buffers are to help moderate peak-flow discharges related to removal of vegetation (e.g., harvest) by ensuring hydrologic maturity of forests, as per Washington Forest Practices Board (1994).				
Windthrow	Unknown. Objectives of proposed buffers are to enhance stand wind-firmness by decreasing tree height/diameter ratios, fetch distances in adjacent harvest units, and edge effect.				
Surface and road erosion	Variable, depending on site conditions. Objectives are to minimize erosion through implementation and comprehensive road-maintenance plans for each landscape unit (see text).				

[1]"Contribution area" refers to upslope channel heads, bedrock hollows, unchannelized valleys, and topographic depressions; see discussion of OESF Type 5 drainages in the Draft EIS associated with this HCP.

[2]Refer to discussion of Type 5 drainages in the Draft EIS associated with this HCP.

[3]Exterior (wind) buffer, where harvest and management activities are allowed. On Type 5 streams, exterior buffers will only be *applied as necessary where there are interior-core buffers. See text.*

[4]See discussion in this section of the text for citations of current literature.

[5]Buffer widths are based on available literature citing one site potential tree height for each stream type as the ecologically appropriate measure; see discussion in text.

[6]Buffers widths are recommended by FEMAT (1993) and Cederholm (1994).

Recruitment of Coarse Woody Debris

The probability that a tree will fall into a stream is greatest where the slope distance from the tree base to the active channel margin is less than one site potential tree height (i.e., as defined in Section D of this chapter titled Riparian Conservation Strategy for the Five West-side Planning Units; FEMAT 1993). The interior-core buffer widths for each stream type on the OESF are greater than or approximately equal to the site potential tree height for a 50-year growing cycle and 70 to 90 percent of the site potential tree height for a 120-year growing cycle. Representative site potential tree heights for each stream type were calculated by identifying streams of known type on soil survey maps registered by orthophotos, determining average site indices for growth potential from survey data for soils commonly found on stream banks and floodplains, and employing tree-height tables published in Wiley (1978). Estimated site potential tree heights for the Experimental Forest are: for Types 1 and 2 streams, 108 feet for a 50-year growing period, 155 feet for a 100-year period, and 168 feet for a 120-year period; and for Types 3 through 5 streams, 105 feet for a 50-year growing period, 153 feet for a 100-year period, and 165 feet for a 120-year period. Field measurements (McDade et al. 1990) indicate that buffer widths equal to approximately 60 percent of the average tree height will provide 90 percent of the natural level of instream large woody debris. Extrapolating from these results, a buffer width equal to approximately the 100-year site potential tree height, which is more than 60 percent of the 200-year site potential tree height (i.e., 60 percent of an old-growth tree height), should provide more than 90 percent of the natural level of instream large woody debris.

Stream Shade Availability

Shade regulates stream water temperatures throughout the year. Shade is supplied primarily by the forest canopy above and adjacent to the channel. Shade, however, varies with the type, height, and density of streamside vegetation, as well as local topography and diurnal changes in position of the sun relative to channel orientation (Naiman et al. 1992). The probability that a tree will provide shade is greatest where the slope distance from the tree base to the active channel margin is equal to or less than one site potential tree height. Limited studies in the western Pacific Northwest suggest that riparian buffers about 100 feet wide supply shade equivalent to undisturbed late successional or old-growth forests (Steinblums 1977; Beschta et al. 1987). Steinblums et al. (1984) reported that buffers between 75 feet and 125 feet wide maintain 60 to 80 percent of the undisturbed canopy density and, hence, the potential for stream shading. These widths are commensurate with, or less than, those recommended for recruitment of coarse woody debris. The proposed interior-core buffers, hence, are expected to be wide enough to provide 80 to 100 percent of stream shade, provided that streamside canopies are dominated by mature conifers. In the OESF, hardwood-dominated riparian forests offer insufficient shade following seasonal loss of foliage to moderate winter water temperatures (e.g., Hatten and Conrad 1995). Goals of the OESF riparian conservation strategy, therefore, are to maintain sufficient buffers in mature stands to moderate water temperatures year round and to manage for conifer succession in hardwood-dominated stands and young plantations. Because 70 percent of the riparian areas on DNR-managed lands in the OESF are hardwood-dominated or young stands, however, recovery of full stream-shade potential will take several decades.

Nutrient Input to Streams

Riparian vegetation regulates the food-energy base of aquatic ecosystems by supplying plant and animal detritus to the stream and forest floor. Dissolved nutrients and litter derived from flowers and fruits, leaves,

needles, wood, and insects provide essential food for aquatic invertebrates and fish (Gregory et al. 1991; Bilby and Bisson 1992). The Forest Ecosystem Management Assessment Team (1993) suggests that input of plant litter and other organic particulates from streamside forests decreases beyond a distance of about one-half tree height from the active channel margin. Other information relating probability of nutrient input to slope distance from the channel margin is scarce. Hence, the working hypothesis for the OESF is that sufficient forest-generated nutrients will be supplied from the area of interior-core buffers to maintain nutrient delivery to streams. The Experimental Forest will provide a forum for testing these hypotheses.

Alders, in particular, are important components of the aquatic and riparian ecosystem because they fix nitrogen and are significant sources of nitrogen as a dissolved nutrient. Although a goal of the Experimental Forest is to aid regeneration of conifers in hardwood-dominated stands, it is also the intent to maintain a conifer-hardwood mix characteristic of natural disturbance regimes, including alders as dominant and co-dominant species where ecologically appropriate within the riparian system.

Riparian Microclimate

Riparian forests moderate climatic conditions in the transitional areas between terrestrial and aquatic environments. Riparian ecosystems support more aquatic, terrestrial, and amphibious species than upland habitats, in part because streams and streamside forests create a more humid microclimate, have higher transpiration rates, are cooler in summer and warmer in winter, and maintain moister soils and greater air movement (Brown 1985). The ability of a riparian forest to ameliorate microclimate is diminished significantly where vegetation is removed from both sides of the stream. Few data are available from the western Olympic Peninsula or elsewhere in the Pacific Northwest pertaining to the effects of forest management on riparian microclimates. The primary working hypothesis of the OESF riparian conservation strategy, therefore, is that riparian microclimate will be improved by minimizing edge effects associated with proximity of harvest units to channels and their orientation with respect to prevailing wind directions. The exterior riparian buffer reduces wind disturbances of streamside forests and shields the riparian core from edge effects associated with intensive management on adjacent ground. Part of the experimental approach in establishing exterior buffers will be to situate adjacent harvest units and employ harvest designs (e.g., partial cuts, small clearcut units, uneven-aged stands) that reduce the potential for progressive loss of riparian-buffer function by edge-effect processes (e.g., blowdown).

Characteristic riparian microclimates may also be maintained by placing buffers on both sides of a stream that are sufficiently wide to insulate water and soils from direct radiation, reduce wind velocities in riparian forests and retain soil and air humidities.

Water Quality

The riparian conservation strategy seeks to maintain and aid natural restoration of water quality in order to meet state water-quality standards for all existing characteristic uses (e.g., aquatic habitat and domestic and municipal water supplies). The principal causes of declining water quality in the Experimental Forest are water temperatures that exceed state and federal standards and turbidity associated with stream sedimentation on commercial forest lands. According to current scientific understanding, the best method to deal with temperature and turbidity problems is to place buffers on streams that are wide enough to:

(1) maintain natural background sediment-delivery rates and minimize management-related input of sediments to streams;

(2) provide enough shade to regulate water temperatures; and

(3) assure long-term sources of coarse woody debris that will trap sediment and moderate flow.

The riparian conservation strategy seeks to reduce stream turbidity by:

(1) protecting all mass-wasting and surface-erosion sites that have a potential for delivering sediment to streams;

(2) maintaining roads and limiting road densities (i.e., potential new sources of surface erosion) through comprehensive road-maintenance plans; and

(3) restoring long-term sources of coarse woody debris. This strategy also provides for maintaining and restoring stream shade. (See previous discussion of stream shade availability in this section.)

Water Quantity

Increased surface runoff to streams can result from vegetation removal (Likens et al. 1970; Eschner and Larmoyeux 1963; Blackburn et al. 1982; WFPB 1994) and increased numbers of road drainages delivering water to streams. Precipitation conditions on the western Olympic Peninsula that lead to increases in the frequency and volume of peak flows are rain-on-snow events, rainfall of high intensity and long duration typical of winter months, and heavy rain on frozen ground, which can occur during January and February. The potential for these conditions to affect seasonal and annual water quantity is influenced by the type, age, and density of forest vegetation. Approximately 19 percent of DNR-managed lands in the OESF, mostly in the Hoh and Clearwater drainages, lie in the rain-on-snow zone as defined by state forest practices regulations (WFPB 1994). The state addresses the cumulative effects of rain-on-snow events by regulating the percent area in Type 3 basins with greater than 70 percent forest-crown closure and less than 75 percent hardwood or shrub canopies.

DNR recommends using the methods for analyzing rain-on-snow and peak-flow events given in the Standard Methodology for Conducting Watershed Analysis (WFPB 1994). In addition, DNR expects that limiting the amount of new road construction and improving drainages on existing roads will reduce the potential for augmenting peak flows. Furthermore, the unzoned-forest approach to conserving habitat for listed species likely will lead to forest conditions, within about 35 years, that will assure hydrologic maturity in at least 70 percent of each Type 3 basin. Because current knowledge is incomplete, a priority research direction for the OESF is to investigate the relationships between forest management and hydrology in order to improve scientific understanding leading to effective management of water quantity.

IMPLEMENTING THE RIPARIAN CONSERVATION STRATEGY

The OESF riparian conservation strategy will be in effect throughout the life of this HCP. Landscape plans are the vehicle for implementing commodity production and conservation strategies in the Experimental Forest. Riparian buffers will serve as the foundation for landscape plans, around which forest management, conservation, and research activities will be designed. A primary objective of the Experimental Forest will be to support natural restorative processes of streams and streamside forests

by whatever means necessary, so that riparian environments can recover suf-ficiently to sustain both commercial forest enterprises and healthy ecosystems.

Prior to landscape planning in each of the 11 landscape planning units in the Experimental Forest, watershed conditions will be evaluated and monitored through a 12-step watershed assessment procedure (described later). Results from assessments of physical and biological conditions obtained from the regulatory watershed-analysis process (WFPB 1994) will be used where possible, in lieu of those assessments required in the 12-step process. Therefore, following the implementation of the OESF, preliminary assessments and management activities will occur before landscape planning in most landscape planning units.

Landscape Planning

Methods and procedures for landscape planning will likely be similar to those developed for the Clallam River Landscape Plan, which was designed for 16,000 acres of state land in the northern part of the Experimental Forest (DNR Olympic Region 1995). In this prototype landscape plan, management, economic, conservation, and recreation objectives were evaluated simultaneously. Maps of riparian buffers, designed to protect unstable ground and key ecological features, served as the primary planning layer around which other management and conservation strategies evolved. The riparian layer was built into a harvest planning model so that designs for harvest units, logging settings, and roads took into account the conservation objectives for and requirements of riparian protection. In addition, economic analyses and harvest level projections factored in the long-term costs and benefits of protecting riparian areas.

Watershed-assessment techniques used during landscape planning might include those found in the "Forest Agreement Related to the Hoh River, Kalaloch Creek and Nolan Drainages" (Hoh Tribe and DNR, Memorandum of Understanding 1993) and Standard Methodology for Conducting Watershed Analysis (WFPB 1994) and designed for the 12-step watershed assessment (described below). The agency may wish to sponsor a regulatory watershed analysis in lieu of some or all parts of the 12-step process. However, given the watershed concerns in the OESF, DNR likely will go beyond the state Forest Practices Board (WFPB 1994) methods in order to account for issues not addressed in the Forest Practices Board manual. Therefore, additional analyses for any given landscape planning unit might include water quality, wildlife habitat, nontimber commodity production, urban influences, estuarine/near-shore marine conditions, or other relevant issues.

Twelve-step Watershed Assessment Procedure

The objectives of the OESF riparian conservation strategy are to maintain and aid restoration of riparian functions at the watershed scale, rather than at the site-specific level. Implementing these objectives, therefore, requires an evaluation procedure by which the aquatic and streamside conditions at a given site can be assessed in relation to the known influences of physical, biological, and land-use factors throughout the watershed. Effective management and conservation strategies are dictated not only by site conditions but also by cumulative effects of management activities both upstream and downstream of the site. Consequently, the watershed assessment should assure that connectivity between riparian segments is accounted for in the design of long-term management, conservation, and research strategies.

No specific restrictions on management activities are given in the riparian conservation strategy, other than on road-building (described later). Adhering to the objectives of the riparian conservation strategy and implementing the watershed assessment procedure likely will identify specific activities that can be performed with minimum impact to the ecosystem. For example, the number of trees that can be removed from a riparian buffer in a particular watershed will be determined by assessing the potential for that buffer to continue providing coarse woody debris, stream shade, wind-firm stands, nutrients, sediment storage, streamflow moderation, and aquatic and terrestrial habitat for sensitive species.

Figure IV.13 outlines the assessment procedure for meeting riparian management and conservation objectives in the Experimental Forest. The intent is that managers, foresters, and scientists work together through the 12 steps to assure that proposed timber management or research activities do not conflict with the objectives of the riparian conservation strategy. This process will begin with the implementation of the OESF and will occur before landscape planning. The assessment methods may also be used during landscape planning. The steps are:

(1) Initiate the decision making procedure. The need for this procedure is triggered when DNR timber management (i.e., cutting trees, building roads) or manipulative research is proposed within a given Type 3 or larger watershed in the Experimental Forest. Manipulative research includes the removal, alteration, or addition of aquatic or riparian features, including live or dead vegetation, water, aquatic and riparian biota, sediments, bedrock, and artificial structures.

(2) Recognize the conservation objective of managing riparian and aquatic systems in the OESF: to maintain and aid natural restoration of riparian and aquatic functions and processes. Commodity production and riparian research are allowed as long as they are consistent with the conservation objective.

(3) Conduct preliminary assessment of physical and biological watershed conditions using results from the regulatory watershed-analysis process, where available. Table IV.11 lists the components of this assessment, some or all of which might be included in the analysis. Methods and guidelines would be established in agency procedures developed for the OESF. Where advantageous, methods described in the Standard Methods for Conducting Watershed Analysis (WFPB 1994) would be employed. Where possible, methods would yield quantitative data for analysis and future monitoring needs. The assessment would include an evaluation of the probable impact of proposed management or research activities on watershed conditions. This assessment would serve as a baseline for evaluating subsequent activity proposals and cumulative effects in the watershed by providing written record of conditions, decisions, activities, and results of management, research, and conservation efforts; and a scientifically sound rationale for the chosen management, research, and conservation strategies.

(4) Evaluate the degree to which watershed conditions meet the needs for maintaining viable riparian and aquatic processes and functions. Refer to objectives of the riparian conservation strategy, buffer-width recommendations, and Table IV.10.

Figure IV.13: Twelve-step watershed assessment procedure for meeting riparian conservation and management objectives in the Olympic Experimental State Forest

See discussion of each step in the text.

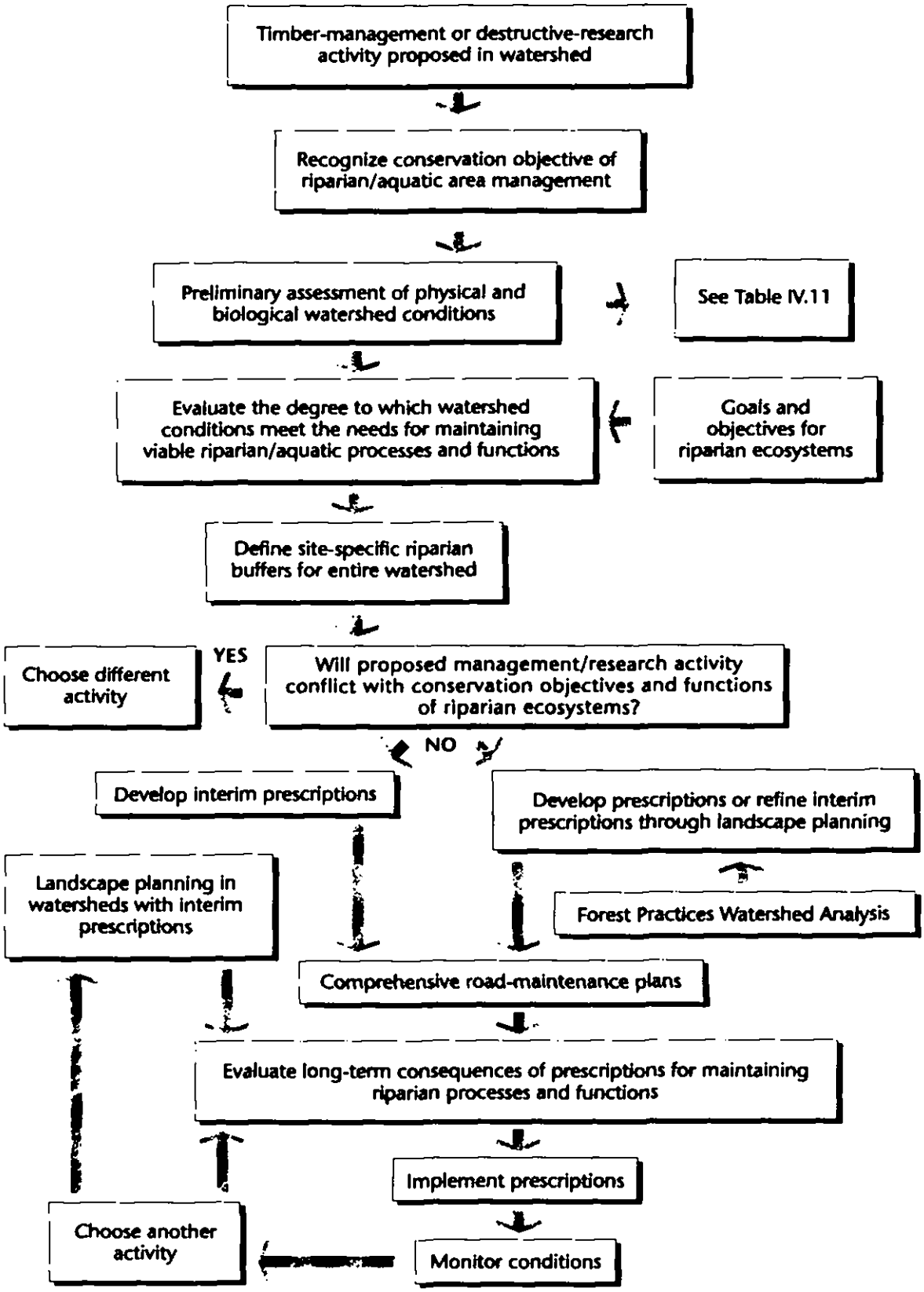


Table IV.11: Components of a preliminary assessment of physical and biological watershed conditions for the 12-step watershed assessment procedure for the Olympic Experimental State Forest

Some or all components might be evaluated, depending on watershed characteristics and the availability of analytical techniques. Methods will be outlined in agency procedures for implementation of the OESF. See step (3) in the text.

Mass wasting — existing and potential sites

Surface erosion — existing and potential sites

Road network densities

Road conditions — use, location, sidecast, and other problems

Road drainage structures — presence and condition

Hillslope hydrology processes (e.g., changes in channel-forming flows, rain-on-snow potential)

Water quality and quantity (e.g., temperatures, turbidity, supply)

Physical stream-channel conditions and processes

Floodplain and channel interactions

- physical interactions (e.g., bank erosion, lateral channel migration, hydrology)
- biological interactions (e.g., nutrient productivity)

Riparian microclimate (e.g., shade, ambient temperatures)

Coarse-woody-debris recruitment potential

Riparian plant community structure and composition

Riparian forest health

Habitat distribution, quality, and quantity for fish

Habitat distribution, quality, and quantity for fish prey (e.g., macro-invertebrates)

Habitat distribution, quality, and quantity for key riparian-dependent species[1]

Wildlife use of riparian areas (e.g., migration routes, foraging, predation potential)

Wind disturbance patterns (e.g., windthrow potential)

Past and proposed land-use practices (e.g., influence on biological/physical riparian processes)

[1]Key species currently are defined as those that are listed, or are candidates for listing, under the Endangered Species Act or by the Washington Department of Fish and Wildlife, or are listed as threatened, rare, or in need of monitoring by the Department of Natural Resources Natural Heritage Program. Habitat for other unlisted riparian-obligate species will be considered indirectly through consideration of habitat for listed and candidate species.

(5) Using information gathered in the preceding steps, delineate riparian buffers for each stream segment in the watershed so that: (a) conservation objectives for aquatic and riparian protection are met; (b) buffers protect local physical and biological features; and (c) the probable influence of adjacent land-use practices on riparian forests are considered.

(6) Determine whether the proposed management or research activity would conflict with the objectives of the riparian conservation strategy. Choose another management strategy if the proposed activity cannot be accomplished without compromising the long-term sustainability of riparian functions and processes. If no proposed management activity has a high probability of meeting the riparian objectives, then management or manipulative-research activities will be postponed until watershed conditions improve.

(7) Develop interim prescriptions (or long-term prescriptions if this procedure is used as the watershed assessment for landscape planning). Short-term and long-term management and manipulative-research plans would be documented, including proposed schedules for site re-entry and the nature of activities proposed for each entry. Prescriptions might be refined during landscape planning to accommodate new information and technological advances. The riparian conservation strategy will remain in place through the development and implementation of management prescriptions and landscape plans.

(8) Develop a comprehensive road-maintenance plan. In most instances, this plan will be developed for a landscape planning unit prior to landscape planning because the 11 landscape planning units will be evaluated sequentially over the course of several years.

(9) Evaluate the long-term consequences of management prescriptions for each site in maintaining watershed-wide riparian processes and functions, particularly where multiple entries are planned.

(10) Implement interim prescriptions pending landscape plans. On-the-ground implementation will be reviewed by qualified technical experts to assure that conservation objectives are being met.

(11) Monitor riparian conditions on a regular basis (e.g., every two to five years) to evaluate whether conservation objectives continue to be met. Failure to meet these objectives would require restorative or corrective measures and modification of management activities.

(12) Choose another management or research activity in the assessed watershed. Additional proposals will be evaluated using information from the preliminary watershed assessment, landscape planning, monitoring in the watershed, and field investigations of site-specific conditions. Implementing these activities will depend on satisfactory completion of steps (6) and (9) above.

Management activities most likely to occur in the interior-core buffers in the OESF are:

- selective harvest of hardwoods to encourage long-term sources of coniferous woody debris and channel-bank stabilization; harvest would occur on stable ground, where silviculturally feasible and ecologically sound;

- *thinning of young stands to promote wind-firm trees;*
- restoration efforts, including habitat-enhancement projects;
- research projects, provided that they maintain or improve habitat for aquatic and riparian-dependent species;
- tree pruning to diversify forest structure; and
- single-tree removals, if the number and size of trees removed do not reduce the long-term functions and processes of riparian ecosystems.

Management activities in the interior-core buffers, or forested wetland and their buffers, would exclude herbicide release and new road construction in riparian areas unless, in the case of riparian buffers, stream crossings are essential. Roads in wetlands or their buffers will require on-site and in-kind wetland replacement, in accordance with the Forest Resource Plan (DNR 1992). Crossings will be designed to take the most direct route possible across streams, in order to minimize obstructions to fish passage, peak flows, bank destabilization, and sediment delivery.

Management activities most likely to occur in exterior buffers in the OESF are:

- *partial cuts of 33 percent or less by volume, per rotation, aggregated* or dispersed, depending on the operational objectives for maintaining wind-firm stands;
- experiments designed to promote wind-firmness of the interior-core buffer; and
- forest-structure modifications, including thinning, pruning, and tree-topping to improve stand wind-firmness.

SUMMARY: BENEFITS OF THE RIPARIAN CONSERVATION STRATEGY

The riparian conservation strategy will benefit the future health of riparian forests in the OESF in several ways:

- Riparian areas will be managed primarily *to protect and restore* physical and biological processes while allowing some extraction of forest commodities. The conservation's intent is to sustain habitat that is capable of supporting viable populations of salmonids and other aquatic and riparian-dependent species.
- Buffers described in the riparian conservation strategy will be applied to all stream types[2] and on all DNR-managed lands in order to minimize stream sedimentation, stabilize channel banks, reduce windthrow potential, enhance long-term recruitment of coarse woody debris, and protect other key physical and biological functions that maintain habitat complexity for aquatic and riparian-dependent species.
- This strategy ensures that the structural and compositional *complexity of riparian habitat will be improved. A goal of this* strategy will be to manage hardwood stands such that they regain a conifer-to-hardwood ratio more characteristic of naturally disturbed riparian forests. Approximately 70 percent of riparian areas on

[2]Buffers will be applied to all stream types but not necessarily to all Type 5 streams. See discussions in subsections titled Interior-core Buffers and Exterior Buffers.

DNR-managed lands in the Experimental Forest are dominated by hardwoods or conifer plantations less than 15 years old. The remaining 30 percent are mature second-growth, late successional, or old-growth stands that are highly fragmented; many are susceptible to wind disturbances because they cross exposed hillslopes or valley terraces. Young conifer plantations in riparian areas will be manipulated to promote robust and structurally diverse riparian forests. Management activities will restore long-term sources of coarse woody debris, improve year-round shade potential to streams, diversify riparian habitat, strengthen bank and floodplain stability, and increase wind-firmness of streamside forests.

- This strategy likely will benefit physical and biological conditions of near-shore marine habitat by reducing sediment loads carried from upland sites by river systems and deposited in estuarine and near-shore environments. Estuarine conditions influence salmonid smolting and can govern species survival (e.g., Bisson et al. 1992). Near-shore habitats, including eel-grass and kelp beds, provide shelter and forage for anadromous species and their prey.

- Protecting forested wetlands can improve water quality and aquatic habitat by: (1) minimizing the probability of soil compaction; (2) protecting unstable ground within and adjacent to wetlands; (3) moderating peak and low flows in watersheds; (4) conserving wetland biodiversity; (5) minimizing windthrow; (6) decreasing sediment delivery to wetlands; and (7) providing viable off-channel habitat for salmonids during channel peak-flow events.

Future Riparian Conditions in the OESF

The riparian conservation strategy constitutes a plan for the future in the OESF. Aquatic ecosystems will derive their greatest benefits from restoration of functional forest cover on previously logged, unstable hillslopes and in streamside forests, rather than from concentrating protection measures in existing, mature conifer stands. The intent is to restore riparian areas such that they can be incorporated in the general management strategies for unzoned future forests (see previous discussion in the OESF subsection titled Integrated Approach to Production and Conservation) that will be capable of sustaining both timber production and riparian ecosystem functions. The need for defined buffers will diminish as riparian forests regain the ability to sustain ecological and physical functions without management assistance. Available studies (e.g., Schlichte et al. 1991; Benda 1993; Shaw 1993), however, suggest that this recovery will take several decades to centuries for many river systems in the Experimental Forest.

Statistical analyses of implementing the proposed riparian buffers indicate that approximately 22 percent of the OESF land base will fall inside the interior-core buffer (Table IV.12). DNR currently treats an average of about 18 percent of the land base as no-cut riparian buffers. Therefore, implementing the interior-core buffer strategy on all DNR-managed lands in the OESF will incorporate an additional 4 percent of the land base. For a Type 3 watershed in steep, unstable terrain, this might amount to as much as a 60 percent increase in land placed within the interior-core buffer. However, in contrast with the current no-cut riparian buffers, management activities will be allowed in the OESF riparian buffers as long as these activities are consistent with the conservation objectives. In addition, DNR currently is required to protect all such areas under the Class IV-Special regulations of the state Forest Practices Act (WFPB 1993b). Applying the average recommended exterior riparian buffers increases the acreage in

Table IV.12: Number of acres and percent of land base projected in the Olympic Experimental State Forest riparian interior-core buffer, exterior buffer, and combined (total) buffer, by forest age class

Land base in the OESF totals approximately 264,000 acres. Figures for the total buffer were calculated assuming 33 percent average timber volume removal from the exterior riparian buffer. (See text.)

Forest age class (years)	Interior buffer		Exterior buffer		Total buffer	
	acres	percent	acres	percent	acres	percent
200+	520	0.20	397	0.16	917	0.36
101-199	9,254	3.62	5,164	2.02	14,418	5.64
71-100	3,181	1.24	2,143	0.84	5,324	2.08
51-70	2,369	0.93	1,382	0.54	3,751	1.47
41-50	1,410	0.55	873	0.34	2,283	0.89
31-40	3,265	1.28	1,891	0.74	5,156	2.02
21-30	9,249	3.61	4,985	1.95	14,234	5.56
11-20	16,815	6.57	8,735	3.42	25,550	9.99
0-10	10,653	4.16	5,855	2.29	16,508	6.45
Total	**56,716**	**22.16**	**31,425**	**12.30**	**88,141**	**34.46**

riparian management zones by an estimated 12 percent, although certain harvest activities can occur in these areas (e.g., maximum timber volume removal of 33 percent).

Table IV.12 shows the number of acres and percent of land base in each buffer category, by forest age class, out of 264,000 total acres of DNR-managed land in the OESF. Approximately 35 percent of the total acres, therefore, will contribute to maintaining and restoring riparian functions and processes. These acres also will provide more than 50 percent of the proposed habitat for northern spotted owls and a significant percentage of habitat for marbled murrelets.

Multispecies Conservation Strategy for Unlisted Species in the Olympic Experimental State Forest

INTRODUCTION

It is central to the mission of the Olympic Experimental State Forest to learn how to manage commercial forests that integrate commodity production and species conservation. Management that maintains or restores habitat for populations of native flora and fauna on the Olympic Peninsula is fundamental to the OESF. Plant and animal species for which there is some concern about population viability and features on the landscape that serve important functions as habitat for those species will receive special attention.

The multispecies conservation strategy for DNR-managed lands in the Experimental Forest is different from that for the five west-side planning units because the OESF strategy is based in large part on the unique conservation strategies in the OESF for riparian ecosystems and northern spotted owls and because of the experimental approach to integrated management for forest commodity and ecosystem values that is the mission of the Experimental Forest. (The multispecies conservation strategy for the five west-side planning units is discussed in Section F of this chapter. Neither multispecies strategy will be applied in the east-side planning units under this HCP.)

The strategy proposes conservation objectives for maintaining or restoring a level of habitat capability for unlisted species on DNR-managed lands in the OESF. To achieve these conservation objectives, DNR will develop and test a variety of methods that integrate commercial forest management and maintenance or restoration of habitat for unlisted species and will apply those methods that are most effective and efficient. This habitat management will be planned and implemented at the landscape level. Objectives of this landscape-level management are directed at developing landscapes that produce a mix of robust commercial products and ecosystem outputs across the entire Experimental Forest.

Conservation of habitat for unlisted species will primarily be derived from the integrated, ecosystem-oriented management rather than direct the management. This approach can be stated and implemented as a working hypothesis for evaluation and systematic application and refinement: DNR can meet its objectives for conservation of habitat for unlisted species in the OESF by managing stands and landscapes to meet its conservation objectives for riparian ecosystems, spotted owls, and marbled murrelets and by implementing additional site- or species-specific conservation measures in response to certain circumstances.

The multispecies conservation strategy discusses provision of habitat for animal species of concern and other unlisted species and special landscape features identified as uncommon habitats or habitat elements. For the purposes of the HCP, species of concern are federally listed, state-listed, federal candidate, and state candidate animal species. Federally listed species are addressed in the sections of this chapter on the marbled murrelet (see Section B), other listed species (see Section C), and in the OESF strategy for the northern spotted owl (see earlier in this Section E). The other species of concern are addressed in this subsection, except anadromous salmonids and bull trout, whose habitat is conserved through the OESF riparian conservation strategy (see earlier in this Section E). Other unlisted species include other animal species that may become listed or candidates for listing in the future. Uncommon habitats and habitat elements are talus fields, caves, cliffs, and large, structurally unique trees. (See the subsection titled protection of Uncommon Habitats in Section F of this chapter.)

Within the OESF, 33 animal species are considered species of concern because information indicates they face some risk of at least local extinction: six are federally listed, 10 are federal species of concern, five are state candidates with no federal status, four are sensitive species,and bull trout and seven species of anadromous salmonids have been or are under review for listing by the federal goverment. (The federally listed species are shown in Table III.8,the salmonids in Table III.11, and the other species in Table III.14.) Other species will probably be added to this list in the coming decades, but it is difficult to predict which species are, or will be, at the brink of "at risk."

Federal guidelines (e.g., spotted owl circles) and state rules (WAC 232-12-292, WAC 222-16-080) place species-specific constraints on forest practices for the benefit of federally listed and state-listed species. But, given the large and probably expanding array of listed and candidate species, species-specific forest practices have become an inefficient and impractical means of attaining wildlife conservation objectives and providing income to the trusts. Within the confines of a managed forest, the most effective means for the conservation of wildlife is to provide functional habitat. The Experimental Forest will contribute to the survival of species of concern and other unlisted species through forest management that provides a variety of well-distributed, interconnected habitats.

The multispecies strategy discusses the objectives for conservation of habitat for unlisted species of concern and other unlisted species. Then the benefits to habitat for unlisted species through the other OESF and the marbled murrelet conservation strategies are described. The multispecies strategy closes with a description of conservation of habitat for specific unlisted species of concern and a summary of types of habitat provided on DNR-managed lands in the Experimental Forest.

CONSERVATION OBJECTIVES

The objectives of the strategy for conservation of habitat for unlisted species are:

(1) to develop and implement land-management plans that do not appreciably reduce the likelihood of survival and recovery of unlisted species on the Olympic Peninsula;

(2) to learn to integrate the values of older forest ecosystems and their functions with commercial forest activities; and

(3) to fill critical information gaps related to the composition, structure, and function of aquatic, riparian, and upland ecosystems and the links between these, forest management activities, and conservation of habitat for unlisted species.

DNR anticipates that meeting these objectives will entail a significant effort in forest management, research, and monitoring over an extended period of time. (See the sections titled Monitoring and Research in Chapter V.) Management practices in the near term will be directed by current knowledge and hypotheses, but in time, as knowledge, techniques, and hypotheses change, management practices will adapt to those new circumstances. This is consistent with the mission of the Experimental Forest.

A description of proposed management practices related to conservation of habitat for unlisted species and unique habitat elements follows. Some deviations from these practices will occur in the near term as formal, experimental studies designed to address information needs related to integrating conservation and production. It is also likely that some of the practices may change in the long term as new information, techniques, and other circumstances warrant. Thus, these descriptions are intended to be straightforward ways to characterize a standard level of commitment to conservation while reserving the option to achieve conservation objectives by other means.

For certain species, additional conservation measures are proposed for known nesting, denning, and/or roosting sites. Under this HCP, DNR shall not be required to survey for nests, dens, roosts, or individual occurrences

of unlisted species. Currently, baseline data on many of these species are recorded in the Washington Department of Fish and Wildlife Non-game Database.

The habitats most critical for the conservation of unlisted species on DNR-managed lands in the OESF contain elements of late successional coniferous forest, riparian areas and wetlands, or both. The aggregate landscape-level effects of the Experimental Forest riparian and spotted owl conservation strategies and the HCP marbled murrelet conservation strategy, as described below, are expected to provide habitat for most unlisted species. However, some unlisted species require special landscape features or habitat elements that may not be adequately conserved by the species-specific strategies. Thus, special conservation measures for talus fields, caves, cliffs, large snags, and large, structurally unique trees may be important to these species. The protection of uncommon habitats and habitat elements is described in Section F of in this chapter titled Multispecies Conservation Strategy for Unlisted Species in the Five West-side Planning Units. The specific discussion in that section to be applied in the OESF is called Protection of Uncommon Habitats.

CONSERVATION STRATEGY

The Experimental Forest multispecies conservation strategy is proposed as an outcome of landscape-level management in the OESF. Central to the planning and implementation of landscape management are the proposed conservation measures for riparian ecosystems, spotted owls, and marbled murrelets. The aggregate effect of these conservation strategies is the creation of landscapes centered on healthy riparian ecosystems that contain interconnected patches of late successional, mid-aged, and young forests. Late successional forests consist of both mature (80-200 years old) and old-growth (greater than 200 years old) forest age classes (Thomas et al. 1993; FEMAT 1993; Spies and Franklin 1991).

Riparian Conservation Strategy

(See the earlier part of this section on the Experimental Forest titled Riparian Conservation Strategy.)

The principal components of the riparian conservation strategy are forested buffers to protect stream channels and unstable hillslopes. Management activities within these buffers will be governed by the following conservation objectives:

(1) to maintain and aid restoration of the composition, structure, and function of aquatic, riparian, and associated wetland systems;

(2) to maintain and aid restoration of the physical integrity of stream channels and floodplains;

(3) to maintain and aid restoration of water to the quantity, quality, and timing with which these systems evolved;

(4) to maintain and aid restoration of the sediment regime in which these systems evolved; and

(5) to develop, use, and distribute information on aquatic, riparian, and associated wetland ecosystem processes.

The riparian strategy will result in complex, productive aquatic habitats in streams and wetlands and late successional conifer forest as the predominant cover type along streams and on unstable hillslopes. As a result, this strategy will benefit nearly all aquatic, wetland, riparian obligate, and upland species on DNR-managed lands in the OESF.

The riparian strategy will be implemented by establishing interior-core buffers that minimize disturbance of unstable channel banks and adjacent hillslopes and by establishing exterior buffers that protect the interior-core buffers from wind damage. Additionally, DNR will continue its commitment to "no overall net loss of naturally occurring wetland acreage and function" (DNR 1992 p. 36). Interior-core buffers are estimated to cover 56,000 acres (22 percent) of DNR-managed land in the OESF. Exterior buffers may cover up to (31,000 acres) 12 percent of DNR-managed land in the Experimental Forest.

Management within the exterior (wind) buffer will be largely experimental, and the forest conditions allowed to develop within the exterior buffer will be based on their efficacy in minimizing windthrow. DNR currently hypothesizes that structurally diverse, mature conifer forests that sustain varying degrees of harvest will be the long-term outcome of management in many of the exterior buffers.

Suitable habitat for aquatic and riparian obligate species should be provided in the interior-core riparian buffers, especially as their functions are maintained by exterior buffers. Wetland species will be protected because DNR maintains no overall net loss of naturally occurring wetland acreage and function. For upland species, the long-term benefit of riparian ecosystem conservation is a network of late successional forests in streamside areas and on unstable hillslopes that serve as habitat for nesting, foraging, or resting.

Marbled Murrelet Conservation Strategy

(See Section B of this chapter for the marbled murrelet conservation strategy.)

Landscape conditions outside riparian areas and not on unstable hillslopes will be enhanced by management for marbled murrelets. The long-term murrelet conservation strategy is not yet developed, but it will quite likely entail the preservation of some marbled murrelet nesting habitat, and this will increase the amount of late successional forest available to other species.

Spotted Owl Conservation Strategy

(See the earlier part of this section on the OESF titled Conservation Strategy for the Northern Spotted Owl.)

The unzoned spotted owl conservation strategy sets a minimum standard of at least 40 percent of each landscape in young-forest marginal (as defined by Hanson et al. 1993) or better quality habitat and at least half of this, or 20 percent of each landscape planning unit, in old forest (Hanson et al. 1993). Because of the riparian conservation strategy alone, four of the 11 landscape planning units (Reade Hill, Willy-Huel, Upper Clearwater, and Copper Mine — see Map IV.9) are expected to exceed the minimum standard for spotted owl conservation. In the other seven landscape planning units (Kalaloch, Sadie Creek, Clallam, Upper Sol Duc, Goodman Creek, Dickodochtedor, and Queets), the riparian strategy makes a significant contribution toward meeting the spotted owl minimum standard.

DNR-managed lands outside of riparian areas in these landscape planning units will be managed on harvest rotations that provide enough habitat to meet the landscape minimums.

Forest Management in the OESF

The working hypothesis of the OESF is that it is possible to manage forest stands and landscapes for integrated outputs of commodity and ecosystem products. In conjunction with the conservation strategies described for spotted owls, marbled murrelets, riparian ecosystems, and uncommon habitats, a variety of forest stand management prescriptions will be implemented. (See Section H of this chapter titled Forest Land Management Activities.) Some stands may be managed under an even-aged regime of short rotations (50 to 60 years). Other stands may be managed by a series of light, partial cuts that retain the composition, structure, and function of late successional forests throughout all or most of the management cycle. Individual activities will be planned and implemented within the framework of specific landscape-wide plans for each landscape planning unit. These landscape plans will focus and direct the integration of commodity, ecosystem, and information outputs, in part, by mapping and scheduling timber harvests and other silvicultural activities so that their influence on ecosystem processes can be assessed in advance.

After stand-regenerating disturbances such as fire or clearcutting, stand development proceeds through a series of identifiable successional stages. Various systems have been used to describe forest succession. The system of Brown (1985) is based on the structural condition of the stand and identifies six stages: grass/forb, shrub, open sapling/pole, closed sapling/pole/sawtimber, large sawtimber, and old growth. Large sawtimber is approximately equivalent to mature forest. Mature and old-growth forests are considered to be late successional (Thomas et al. 1993). Conifer forest stands are often in the closed sapling/pole/sawtimber stage between about 30 and 80 years of age (Brown 1985), and stands exhibiting such conditions are generally considered to be young forest (Spies and Franklin 1991). Forests subjected to even-aged management and relatively short rotations should provide suitable habitat for species that utilize grass/forb, shrub, open sapling/pole, and closed sapling/pole/sawtimber stages of forest succession. Forests managed under less conventional regimes, e.g., various forms of uneven-aged management, should provide late successional habitat over some portion of the management cycle.

SPECIES BY SPECIES CONSERVATION FOR UNLISTED SPECIES OF CONCERN

Fish

(Habitat for bull trout and anadromous salmonids will be provided through the OESF riparian conservation strategy detailed earlier in this section.)

OLYMPIC MUDMINNOW

The riparian conservation strategy should protect the spawning and rearing habitats of the Olympic mudminnow through:

(1) commiting to "no overall net loss of naturally occurring wetland acreage and function" (DNR 1992 p. 36);

(2) protecting lakes and ponds classified as Types 1, 2, or 3 waters; and

(3) protecting Types 1, 2, 3, and 4 rivers and streams. Additional protection of aquatic habitat will occur through the prohibition of timber harvest on unstable hillslopes and road network management.

Amphibians

VAN DYKE'S SALAMANDER

Van Dyke's salamanders occur primarily in rock rubble near small streams and headwall seepages in the OESF. The interior-core buffers of the riparian conservation strategy are designed to protect these naturally unstable areas. Exterior buffers will protect the functions of interior-core buffers where necessary. Protection of riparian areas and unstable hillslopes as described in the Experimental Forest riparian conservation strategy should provide adequate protection for Van Dyke's salamander habitat within the OESF.

TAILED FROG

Tailed frogs require cool, clean, well-aerated water and a stable microclimate. They primarily inhabitat smaller streams with relatively steep gradients in the OESF. Interior-core buffers of the Experimental Forest riparian conservation strategy were designed to protect these areas from damage to their channel banks or from mass-wasting events at higher elevations in watersheds. Exterior buffers will protect the functions of interior-core buffers where necessary. The OESF riparian conservation strategy should provide adequate protection for tailed frog habitat within the OESF.

CASCADES FROG

Cascades frogs are known both from elevations above DNR-managed lands and from lower elevations in and around the OESF. These frogs occur in and near wetlands and other slow-flowing waters away from the main channels of streams. The OESF riparian conservation strategy is designed to maintain or restore the composition, structure, and function of aquatic, riparian, and associated wetland ecosystems; it incorporates current DNR wetlands policy that states there will be no overall net loss of naturally occurring wetland acreage and function (DNR 1992 p. 36). The OESF riparian conservation strategy and the current DNR policy on wetlands should provide adequate protection for Cascades frog habitat within the OESF.

Birds

HARLEQUIN DUCK

OESF riparian conservation will contribute to the viability of harlequin ducks on the Olympic Peninsula in two ways. First, the maintenance or restoration of mature and old-growth forests within riparian zones, especially along Types 1, 2, and 3 waters, should shelter nest sites from disturbance. Second, the principal foods of the harlequin duck are benthic macro-invertebrates, whose diversity and abundance the riparian conservation strategy is expected to enhance.

NORTHERN GOSHAWK

Under the unzoned spotted owl conservation strategy, at least 40 percent of DNR's forested lands within each landscape planning unit will be young-forest marginal (Hanson et al. 1993) or better quality habitat, and at least 20 percent of DNR's forest lands will be old forest (Hanson et al. 1993) or better. The riparian interior-core and unstable slope protection established under the riparian strategy constitutes, on average, 22 percent of each landscape planning unit, and this will eventually become late successional coniferous forest. These conditions exceed the landscape prescriptions recommended by Reynolds et al. (1992) for northern goshawks. Thus, the combined outcomes of the riparian and spotted owl conservation strategies should provide adequate protection for goshawk habitat within the OESF.

GOLDEN EAGLE

Golden eagles nest in large trees or on cliffs. These uncommon habitats and habitat elements will be protected as described earlier in the discussion on uncommon habitats in the section of this chapter titled Multispecies Conservation in the Five West-side Plannning Units. The combination of the riparian conservation strategy and forest management in the OESF should provide breeding, foraging, and resting habitat for the golden eagle. Many forests on unstable hillslopes will not be harvested and some of these areas will contain large trees. Management within the interior-core riparian buffer is expected to result in the development of late successional forest containing large live trees. Even-aged forest management throughout the OESF will continue to provide openings for foraging habitat.

Golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668, Revised 1978). Under this act, it is unlawful to molest or disturb golden eagles and their nests. RCW 77.16.120 of the Wildlife Code of Washington prohibits destroying the nests of protected wildlife. Consistent with these regulations, trees or snags that contain known active golden eagle nests shall not be harvested. Thus, current laws, regulations, and proposed conservation strategies should provide adequate protection for golden eagles within the OESF.

VAUX'S SWIFT

The combination of the riparian, spotted owl, and marbled murrelet conservation strategies should provide forest conditions suitable for Vaux's swift breeding, foraging, and resting habitat. In concert, these three strategies promote the development of landscapes containing significant amounts of older forests and large trees that will provide nesting, roosting, and foraging habitat. Other foraging habitat will result from general management of upland forests.

Conservation measures for large, structurally unique trees (described in the discussion of uncommon habitats in Section F of this chapter titled Multispecies Conservation Strategy in the Five West-side Planning Units) will retain habitat for nesting and roosting. Consistent with RCW 77.16.120, trees or snags that are known to contain active Vaux's swifts nests shall not be harvested. Green tree and snag retention are subject to the safety standards of the Department of Labor and Industries (WAC 296-54).

Additional Mitigation

Trees or snags known to be used by Vaux's swifts for nesting or roosting shall not be harvested, except as formal, experimental studies designed to address information needs related to integrating conservation and production or as other, exceptional circumstances warrant. Green tree and snag retention are subject to the safety standards of the Department of Labor and Industries (WAC 296-54).

PILEATED WOODPECKER

The combination of the riparian, spotted owl, and marbled murrelet conservation strategies should provide forest conditions suitable for pileated woodpecker breeding, foraging, and resting habitat. In concert, these three strategies promote the development of landscapes containing significant amounts of older forests and large trees that will provide nesting, roosting, and foraging habitat. Other foraging habitat will result from general management of upland forests.

Conservation measures for large snags and large, structurally unique trees (described in the discussion of uncommon habitats in Section F of this chap-

ter titled Multispecies Conservation Strategy in the Five West-side Planning Units) will retain structural elements required by pileated woodpeckers for nesting and roosting. Additional conservation measures for snags (also described in Section F of this chapter) will increase the density of snags, and consequently, opportunities for foraging.

Consistent with RCW 77.16.120, trees or snags that are known to contain active pileated woodpecker nests will not be harvested. In addition, trees or snags that are known to have been used by pileated woodpeckers for nesting will not be harvested. Green tree and snag retention are subject to the safety standards of the Department of Labor and Industries (WAC 296-54).

OLIVE-SIDED FLYCATCHER

There are no established management recommendations for the olive-sided flycatcher. The creation of forest edges through clearcutting probably benefits the species, but extensive clearcutting with short harvest rotations would eliminate the mature forests and tall snags which this species requires. The combination of the riparian, spotted owl, and marbled murrelet conservation strategies should provide forest conditions suitable for olive-sided flycatcher breeding, foraging, and resting habitat. In concert, these three strategies promote the development of landscapes containing significant amounts of older forests and large trees that will provide nesting, roosting, and foraging habitat. Other habitat will result from general management of upland forests. The landscape conditions projected for the OESF are expected to adequately provide for the habitat needs of the olive-sided flycatcher.

LITTLE WILLOW FLYCATCHER

In the OESF, even-aged forest management should provide the type of nesting habitat that the species requires. The landscape conditions projected to occur in the OESF should provide adequately for the nesting, foraging, and other habitat needs of little willow flycatchers.

Mammals

MYOTIS BATS

The combination of the riparian, spotted owl, and marbled murrelet conservation strategies should provide forest conditions suitable for myotis bat breeding, foraging, and resting habitat. In concert, these three strategies promote the development of landscapes containing significant amounts of older forests and large trees for nesting, roosting, and foraging habitat, and productive riparian and wetland ecosystems for foraging habitat. Other habitat will result from general management of upland forests.

Talus fields, cliffs, and caves have been designated priority habitats by the Washington Department of Fish and Wildlife (1995a). Talus fields, cliffs, and caves will be protected (as described in the discussion of uncommon habitats in Section F of this chapter titled Multispecies Conservation Strategy in the Five West-side Planning Units), and DNR will also protect very large old trees as described in that same section.

Additional Mitigation

Live trees or snags that are known to be used by myotis bat species as communal roosts or maternity colonies shall not be harvested, except as formal, experimental studies designed to address information needs related to integrating conservation and production or as other, exceptional circumstances warrant. Green tree and snag retention are subject to the safety standards of the Department of Labor and Industries (WAC 296-54).

TOWNSEND'S BIG-EARED BAT

There are no confirmed breeding sites for this bat on the western Olympic Peninsula. The species requires caves for nursery colonies and hibernacula. No caves are known to exist in the OESF. Therefore, forest management in the OESF is expected to have little or no impact on Townsend's big-eared bats. In the event that a cave is discovered, it will be protected as described in the discussion on uncommon habitats (found in Section F of this chapter titled Multispecies Conservation Strategy in the Five West-side Planning Units).

FISHER

The aggregate landscape level effects of the riparian, spotted owl, and marbled murrelet conservation strategies, will provide more than 68,000 acres of contiguous fisher habitat across the Willy-Huel, Kalaloch, Copper Mine, Upper Clearwater, and Queets landscape planning units. (See Map IV.9.) This habitat area will also provide a connection between the main body of the Olympic National Park and the National Park's coastal strip. The Olympic National Park contains over 284,300 acres of fisher habitat. The Olympic National Forest currently contains 241,100 acres of fisher habitat and under the President's Forest Plan, it should have approximately 334,200 acres by the year 2074 (Holthausen et al. 1994). The contiguous fisher habitat in the OESF is seen as adjunct to this high-quality habitat on federal land.

DNR-managed roads are routinely closed for cost-effective forest management and protection of public resources, including wildlife (DNR 1992 p. 41). Road closures benefit the fisher population by limiting human disturbance and reducing the likelihood of accidental trapping. Road closures will continue on DNR-managed lands and will be consistent with cost-effective forest management and policies set forth by the Board of Natural Resources.

Additional Mitigation

DNR shall place restrictions in its contracts for sales of timber and other valuable materials, as well as in its grants of rights of way and easements, to prohibit activities within 0.5 mile of a known active fisher den site between February 1 and July 31 where such activities would appreciably reduce the likelihood of denning success.

SUMMARY OF HABITAT TYPES PROVIDED ON DNR-MANAGED FOREST LANDS IN THE OLYMPIC EXPERIMENTAL STATE FOREST

See Table IV.7 for an estimate of different habitat types provided in the OESF based on one set of harvest regimes. Refer to footnotes 2-5 of that table for brief explanations of the habitat types.

F. Multispecies Conservation Strategy for Unlisted Species in the Five West-side Planning Units

Introduction

The multispecies conservation strategy for the five west-side planning units is directed at providing habitat for animal species of concern and other unlisted animal species and at special landscape features identified as uncommon habitats or habitat elements. For the purposes of this HCP, species of concern are federally listed, state-listed, federal candidate, and state candidate animal species. (See Table III.7 for the federally listed species and Table III.13 for the other species of concern excluding anadromous salmonids and bull trout. Those are named in Table III.10.) Other unlisted species include other animal species that may use the types of habitat found within the five west-side planning units and that may become listed or candidates for listing in the future. For the purposes of this HCP, uncommon habitats on DNR-managed lands are talus fields, caves, cliffs, oak woodlands, large snags, balds, mineral springs, and large, structurally unique trees.

Under this HCP, multispecies conservation strategies shall be implemented on DNR-managed lands in the five west-side planning units and the Olympic Experimental State Forest (OESF). The multispecies conservation strategy for the OESF is discussed in Section E of this chapter. Briefly, the OESF strategy differs somewhat from that for the five west-side planning units because:

(1) the emphasis in the OESF on research and systematic application and refinement of knowledge gained to achieve effective and efficient integration of commodity production and conservation will likely lead to changes in conservation strategies over time; and

(2) the conservation strategies for salmonids and the northern spotted owl, which are the foundation of the multispecies conservation strategies, are different for the OESF. (See Section E of this chapter for a complete discussion of the OESF conservation strategies.)

Neither multispecies conservation strategy will be applied in the east-side planning units. But all DNR management activities there will still comply with state Forest Practices Rules and applicable state wildlife regulations and will be consistent with the policies set forth by the Board of Natural Resources.

DNR will continue to participate in watershed analysis according to state Forest Practices Rules (WFPB 1994). If watershed analysis indicates that public resources require a greater level of protection than that specified by the HCP, the prescriptions developed through watershed analysis to provide this additional protection shall be implemented. However, because (as of the writing of this HCP) watershed analysis does not address wildlife, the HCP multispecies conservation strategy shall continue to apply to DNR-managed lands in Watershed Administrative Units (WAU) for which watershed analysis has been conducted, unless stated otherwise elsewhere in this HCP.

For uncommon habitats and certain species of concern, the multispecies conservation strategy specifies special management prescriptions and/or additional mitigation. The management prescriptions and mitigation are

intended to be straightforward ways to provide a standard level of protection. In some instances, these will not be the most efficient means available to provide effective wildlife conservation. Therefore, in places where DNR believes that effective conservation can be provided in a more efficient way, DNR through cooperation with the U.S. Fish and Wildlife Service, may develop a site-specific management plan that provides adequate protection for the species or habitat occurring at that site. When a management plan approved by the U.S. Fish and Wildlife Service is in place, the special management prescriptions and/or additional mitigation specified in this HCP shall be waived.

If, however, DNR discovers some active nesting, denning, or roosting sites in the course of forest management activities, or through voluntary surveys, or such sites are documented by the Washington Department of Fish and Wildlife on DNR-managed lands, DNR shall provide the special protection described in the subsection titled Species by Species Conservation. At the time a new species is proposed for listing, and a written request to add that species to the permit is made by DNR, DNR will evaluate and consider additional protection measures such as seasonal restrictions and protection of nesting/denning sites.

Within the five west-side planning units, 62 animal species are considered species of concern because information indicates they face some risk of extinction: nine are federally listed, two, including the bull trout, are federal candidates, 23 are federal species of concern, two are listed by the state but have no special federal status, 12 are state candidates with no special federal status, seven are sensitive species, and seven species of anadromous salmonids have been or are under review by the federal government for listing. (The federally listed species are shown in Table III.8, the salmonids in Table III.11, and the other species in Table III.14.) Other species will probably be added to this list in the coming decades, but it is difficult to predict which species are at the brink of "at risk."

Federal guidelines (e.g., spotted owl circles) and state rules (WAC 232-12-292, WAC 222-16-080) place species-specific constraints on forest practices for the benefit of federally listed and state-listed species. But, given the large and probably expanding array of listed and candidate species, species-specific forest practices have become an inefficient and impractical means of attaining wildlife conservation objectives and providing income to the trusts. Within the confines of a managed forest, the most effective means for the conservation of wildlife is to provide functional habitat. Under this HCP, DNR will contribute to the survival of species of concern and other unlisted species through forest management that provides a variety of well-distributed, interconnected habitats.

The multispecies strategy discusses the objectives for conservation of habitat for unlisted species of concern and other unlisted species. Then the benefits to habitat of unlisted species through the other HCP conservation strategies are described, followed by a discussion of protection of uncommon habitats. The strategy closes with a description of conservation for habitat of specific unlisted species of concern and a summary of habitat types provided on DNR-managed lands in the five west-side planning units.

Conservation Objectives

DNR had identified three conservation objectives for its multispecies strategy on DNR-managed lands in the five west-side planning units to provide habitat that:

(1) helps maintain the geographic distribution of unlisted species that have small annual or breeding-season home range areas;

(2) contributes to demographic support of populations of unlisted species with large home ranges on federal forest reserves (National Parks, National Forest Wilderness Areas, National Forest Late successional Reserves, etc.); and

(3) facilitates the dispersal of these wide-ranging species among federal forest reserves.

Maintenance of geographic distribution means supporting the continued presence of the species, or its habitat, over as much of its historic range as possible. Therefore, objective (1) requires that habitat supporting the life needs of unlisted species with small ranges be provided throughout the range of the species on DNR-managed lands in the five west-side planning units. Demographic support refers to the continued viability of populations through the reproductive contribution of individuals. Therefore, objective (2) requires that habitat capable of supporting the successful reproduction of wide-ranging unlisted species be provided on DNR-managed lands in the five west-side planning units near federal reserves. Dispersal entails the movement of individuals from one subpopulation to another. Therefore, objective (3) requires that foraging and resting habitat of wide-ranging unlisted species be provided on DNR-managed lands in the five west-side planning units between blocks of federal reserves.

The habitats most critical for the conservation of unlisted species on DNR-managed lands in the five west-side planning units contain elements of late successional coniferous forest, riparian areas and wetlands, or both. The aggregate landscape-level effects of the HCP riparian, spotted owl, and marbled murrelet conservation strategies, as described below, are expected to provide habitat for most unlisted species. However, some unlisted species require special landscape features or habitat elements that may not be adequately conserved by the species-specific strategies. Thus, the special protection of talus fields, caves, cliffs, oak woodlands, and very large old trees are considered necessary to provide conservation for these species. Furthermore, some unlisted species are known or thought to be highly sensitive to human disturbance, and therefore, in the context of a managed forest, special management to reduce human disturbance is warranted.

Conservation Strategy

The HCP multispecies conservation strategy is built upon conservation measures directed at providing habitat for three taxa: salmonids (the riparian strategy), the northern spotted owl, and the marbled murrelet. (See Sections C, A, and B, respectively, of this chapter for more detail on each strategy.) The aggregate effect of this species-specific conservation is the creation of landscapes containing interconnected patches of late successional forest. Late successional forests consist of both mature (80-200 years old) and old-growth (greater than 200 years old) forest age classes (Thomas et al. 1993; FEMAT 1993; Spies and Franklin 1991). In addition, the other managed forests will provide early and mid-seral stage forest habitat.

RIPARIAN CONSERVATION STRATEGY

This strategy benefits nearly all aquatic, wetland, riparian obligate, and upland species that may occupy DNR-managed lands. The riparian management zones established along all Types 1, 2, 3, and 4 waters should provide suitable habitat for aquatic and riparian obligate species. Wetland species will be protected through DNR's continued commitment to "no overall net loss of naturally occurring wetland acreage and function" (DNR 1992 p. 36). For upland species, the long-term benefit of salmonid conservation is a network of riparian corridors connecting upland patches of late successional forest on unstable hillslopes.

The riparian buffer of the riparian management zone is estimated to occupy 69,000 acres along Types 1, 2, 3, and 4 waters (6 percent of DNR-managed forest lands in the five west-side planning units). The riparian management zone will be managed to maintain or restore salmonid habitat. Given this objective, most of the no-harvest and minimal-harvest areas (58,000 acres) in the riparian management zone will likely develop into forest that has old-growth characteristics. The low-harvest area (11,000 acres) is managed according to the same objective, but its distance from water may permit more management activities, and therefore, in most places, the low-harvest area will likely eventually contain forests with a range of late successional characteristics. Unstable hillslopes are estimated to occupy an additional 5 to 10 percent of DNR-managed forest land outside the riparian management zone. Unstable areas will be managed to minimize the risk of mass wasting, and it is likely that little harvest will occur there. Unstable hillslopes should add another 60,000 to 120,000 acres of late successional forest, with some portion being old growth.

Overall, salmonid and riparian conservation is expected to result in the maintenance or restoration of 129,000 to 189,000 acres of forest with mature and old-growth characteristics (11 to 16 percent of the five west-side planning units). However, natural disturbances will cause the amount to vary over time. Approximately 9 percent of these areas are currently in a late successional stage, and 84 percent are expected to be in a late successional stage by the year 2195. The ubiquity of streams, particularly Type 4 waters and Type 5 waters on unstable hillslopes, will ensure connectivity among patches of late successional forest.

Management within the wind buffers of the riparian management zone will be largely experimental, and therefore, the forest conditions within the wind buffer cannot be accurately predicted. Wind buffers may occupy up to 1 percent (10,000 acres) of DNR-managed forest land in the five west-side planning units.

MARBLED MURRELET CONSERVATION STRATEGY

Landscape conditions outside riparian areas and not on unstable hillslopes will be enhanced by management for marbled murrelets. Preliminary estimates of marbled murrelet habitat suggest that between 47,000 and 108,000 acres of habitat exists outside riparian management zones and not on unstable hillslopes — another 4 to 9 percent of the west-side planning units. The long-term murrelet conservation strategy is not yet developed, but it will quite likely entail the preservation of some marbled murrelet nesting habitat, and this will increase the amount of late successional forest available to other species.

NORTHERN SPOTTED OWL CONSERVATION STRATEGY

In the five west-side planning units, the spotted owl strategy designates 163,000 acres to be managed as nesting, roosting, and foraging (NRF)

habitat for the spotted owl. There will be two 300-acre nest patches per 5,000 acres of managed forest in NRF management areas, for a total of approximately 20,000 acres. These nest patches will consist of high quality spotted owl nesting habitat with old-growth forest characteristics. The nest patches will occur within a larger, contiguous 500-acre area, of which the remaining 200 acres shall be sub-mature forest (as defined in Hanson et al. 1993) or higher quality habitat. At least 50 percent of the designated NRF management area in each WAU (including the nest patches) will be sub-mature forest or higher quality habitat.

The riparian conservation strategy will result in 11 to 16 percent of the NRF management area in a late successional condition. High-quality spotted owl nesting habitat in nest patches will occupy 12 percent of NRF management areas, but portions of the nests patches will be in riparian areas or on unstable hillslopes. The nest patches are estimated to occupy 10 percent of the NRF management area outside those areas protected by the riparian conservation strategy. The marbled murrelet strategy will contribute additional late successional forest, but an accurate estimate of amount cannot be made at this time. Nest patches and the riparian conservation strategy will result in late successional forest over 21 to 26 percent of designated NRF management areas. Therefore, on average, another 24 to 29 percent of the area designated for NRF management in each WAU will need to be submature forest or better to meet the 50 percent requirement for each WAU with designated NRF habitat.

A working hypothesis of the spotted owl conservation strategy is that the development of spotted owl habitat may be accelerated through special forest management. The calculation of harvest rotations are based on the assumption that managed forests can attain sub-mature characteristics at approximately age 70 years. Designated NRF management areas may be managed under an even-aged regulated forest system, and under such management, the 50 percent sub-mature forest prescription would require a harvest rotation of at least 100 years. Consequently, an additional 14 to 21 percent of the area designated for NRF management in each WAU will be mature forest (i.e., more than 80 years old). On average, 40 to 42 percent of the designated NRF management area in each WAU will be late successional forest, with some portion possessing old-growth characteristics.

In the five west-side planning units, the spotted owl strategy designates 117,000 acres to be managed as spotted owl dispersal habitat, which supports the movement of juvenile spotted owls among sub-populations on federal reserves. Dispersal habitat must provide foraging and roosting opportunities in amounts adequate to promote the survival of spotted owls. At least 50 percent of the designated dispersal management areas in each WAU will meet the minimum specifications for dispersal habitat.

Using the average site productivity of DNR-managed forests on the west side, dispersal habitat characteristics are estimated to be attained at approximately 40 years of age. Dispersal habitat areas will be managed under an even-aged regulated forest system, and therefore, the 50 percent prescription will require a harvest rotation greater than 40 years. The riparian conservation strategy will result in 11 to 16 percent of the land base in a late successional forest. The marbled murrelet strategy will contribute additional late successional forest, but an accurate estimate of amount cannot be made at this time. To meet the 50 percent prescription, another 34 to 39 percent of the land base must be dispersal or higher quality owl habitat, and therefore, a harvest rotation between 65 and 70 years is necessary.

OTHER MANAGED FORESTS

In conjunction with the conservation strategies described for spotted owls, marbled murrelets, riparian ecosystems (salmonids), and uncommon habitats, DNR will continue with a wide range of forest land management activities. (See Section II of this chapter, titled Forest Land Management Activities, for more discussion.) Typically, even-aged management is based on either an economic rotation or a maximum volume rotation. Currently, the most widely used harvest age is based on the economic rotation, which is approximately 50 to 60 years in west-side forests. Maximum volume rotations are approximately 80 to 100 years, the age at which stands reach maturity.

After a natural disturbance, such as fire, a stand regenerates and develops through a succession of seral stages. Managed forests often follow a similar, yet altered, pattern of sucession after a clearcut timber harvest. Various systems have been used to describe forest succession. The system used by Brown (1985) is based on the structural condition of the stand and identifies six stages: grass/forb, shrub, open sapling/pole, closed sapling/pole/sawtimber, large sawtimber, and old growth. Large saw timber is approximately equivalent to mature forest. Mature and old-growth forests are considered to be late successional (Thomas et al. 1993). Conifer forest stands develop closed sapling/pole/sawtimber structural conditions at approximately 30 to 80 years of age (Brown 1985), and stands exhibiting such conditions are generally considered to be young forest (Spies and Franklin 1991). Forests managed on an economic or maximum volume rotation should provide suitable habitat for species that utilize grass/forb, shrub, open sapling/pole, and closed sapling/pole/sawtimber stages of forest succession.

Benefits of the Species-Specific Strategies to Unlisted Species

A population's extinction risk, or conversely, its viability, is primarily a function of population size. Larger populations are more resilient to adverse environmental changes, whether such changes are natural or human-caused. Reductions in a species' habitat quality or quantity are necessarily followed by a decrease in population size, and a substantial decrease in population size increases the risk of extinction. Improving habitat quality or quantity should, in theory, lead to a larger population and decreased risk of extinction.

Geographic distribution is also a factor in risk of extinction. Maintaining a species over a large geographic area decreases the risk of extinction caused by environmental change. Over a sufficiently large area, it is unlikely that catastrophic disturbances (e.g., forest fires), harsh weather, or disease will directly affect all sub-populations. Ecological distribution may also play a role in long-term population viability. Exposing sub-populations to a range of ecological conditions maintains the genetic variation in a population. Genetic variation at the population level is essential for adaptation to changing environmental conditions.

DNR-managed forests on the west side are distributed from the Canadian border to the Columbia River Gorge and from the Cascade crest to the Pacific Coast. The five west-side planning units include portions of five physiographic provinces (Northern Cascades, Southern Washington Cascades, Puget Trough, Olympic Peninsula, and the Coast Ranges — see Map III.1), three major vegetational zones (Sitka spruce, western hemlock, and silver fir — see discussion in the section of Chapter I titled Land Covered by the HCP), and a range of climatic conditions (Franklin

and Dyrness 1973; see also section of Chapter I titled Land Covered). This mix of soils, vegetation, and climate exposes sub-populations to a range of ecological conditions. The large geographic area covered by the five west-side planning units and the range of ecological conditions within them will contribute to the long-term viability of unlisted species populations.

The conservation strategies for salmonids and marbled murrelets should serve to reduce the risk of extinction for many unlisted species, in particular those that have small home ranges and depend on riparian/wetland ecosystems or late successional forests. The riparian (salmonid) strategy will maintain or restore the quantity, quality, and geographic distribution of riparian/wetland habitats. The murrelet strategy is expected to result in the retention of a significant amount of late successional forest. Even-aged forest management will provide habitat for species that utilize young forests. Some unlisted species depend on special landscape features or habitat elements that have yet to be addressed. The conservation measures for talus fields, caves, cliffs, oak woodlands, large snags, balds, mineral springs, and large, structurally unique trees described later in this section are intended to provide habitat for these species.

The spotted owl conservation strategy positions large landscapes of mature and old-growth forest within 2 miles of federal reserves (National Parks, National Forest Wilderness Areas, National Forest Late successional Reserves, etc.). For wide-ranging species (northern goshawk, Pacific fisher, California wolverine, grizzly bear, gray wolf), the conservation benefits of this HCP are seen as adjunct to those provided by federal reserves. Wildlife populations on federal lands will benefit from the proximity of additional riparian and late successional forests on DNR-managed lands. The HCP conservation strategies will broaden the geographic distribution of late successional forest and improve connectivity between noncontiguous blocks of federal land. For those unlisted species sensitive to human disturbance, special management as described below will enhance the reproductive success of individuals.

Protection of Uncommon Habitats

The conservation strategies for salmonids, spotted owls, and marbled murrelets protect habitat for many unlisted species, particularly those associated with late successional forests or riparian ecosystems. For species that rely on uncommon habitats or habitat elements, additional measures are necessary to meet the conservation objectives of the HCP. These measures specifically address talus, caves, cliffs, oak woodlands, large snags, and large, structurally unique trees. The protection of talus, caves, cliffs, and oak woodlands is important because once altered or destroyed, these habitats are difficult to restore or recreate. Large snags and large, structurally unique trees are essential habitat elements that are generally scarce in managed forest

TALUS

Talus has been designated a priority habitat by the Washington Department of Fish and Wildlife (WDFW 1995). It is a homogenous area of rock rubble ranging in size from 1 inch to 6.5 feet (WDFW 1995a; Herrington and Larsen 1985). Naturally occurring talus fields often develop at the base of cliffs or steep hillslopes as gravitational forces act upon disintegrating rock. As more rock accumulates, talus fields expand into adjacent areas of vegetation. Organic soils and pioneering vegetation may also begin to appear in some portions of talus fields in the primary stage of forest succession.

The Larch Mountain salamander requires talus in upland areas (Leonard et al. 1993). Dunn's and Van Dyke's salamanders are also known to inhabit the moist spaces between and under the rocks in talus fields (WDW 1991). Several bat species of concern use rock crevices in large talus for solitary roosts (Christy and West 1993; Holroyd et al. 1994). The microclimatic conditions and shelter provided in the spaces between and under rocks are the elements that make talus an important habitat. Because talus with a high soil content lacks such spaces, it is less important as habitat.

The rock rubble that forms talus fields accumulates where the slope is less than the angle of repose. Although talus provides habitat for some species, the talus fields are also used as road beds and the rocks are used to build roads. (Forty-seven percent is the average angle of repose for unconsolidated materials). The stability of these areas, as evidenced by these accumulations, often make them highly suitable for road beds. Routing roads around all talus fields to preserve them as habitat would mean building on less stable parts of a hillslope, creating the potential for mass wasting and sedimentation. This would be contrary to the riparian conservation strategy, which seeks to reduce the adverse impacts of roads on salmonid habitat.

Much talus is composed of hard rock, which may be suitable material for road construction. Mining talus fields for road construction can result in both short-term and long-term minimization of adverse impacts to salmonid habitat. Heavy trucks hauling construction materials can cause a short-term increase in road erosion and stream sediment concentrations, which can be lessened by using rocks from nearby talus fields (Cederholm et al. 1981). In addition, the use of construction materials inferior to hard rock talus can lead to increased risk of road failure and long-term increases in stream sedimentation caused by surface erosion. Therefore, the protection of all talus fields would conflict with the riparian conservation strategy, which requires that the adverse affects of upland management activities on salmonid habitat be minimized. Besides which, the hauling of materials to a road construction site can be prohibitively expensive compared to the mining of talus.

The conservation objectives for the talus habitat are to maintain its physical integrity and minimize microclimatic change. To meet these objectives, avoid conflict with the conservation of salmonid habitat, and promote cost effective forest management, naturally occurring talus fields shall be protected as follows:

(1) Nonforested Talus - defined as exposed talus with 30 percent or less canopy closure.

- No timber harvest will occur in talus fields greater than or equal to 1 acre.
- No timber harvest will occur in talus fields greater than 1/4 acre in spotted owl NRF and dispersal habitat management areas in the Columbia Planning Unit, except for the western half of the Siouxon Block and 2 isolated sections near Highway 12 where no timber harvest will occur in talus fields greater than 1 acre.
- A 100-foot-wide timber buffer will be applied around talus fields identified above. The buffer will be measured from the edge of the nonforested talus field, i.e. where canopy closure first exceeds 30 percent.

- Timber harvest in the buffer must retain at least 60 percent canopy closure. Any yarding within the buffer will protect the integrity of the talus field.

(2) Forested Talus - defined as exposed talus with greater than 30 percent canopy closure.

- Timber harvest may not remove more than one-third of standing timber volume each harvest rotation from forested talus not located in talus buffers.

(3) Nonforested and Forested Talus

- Road construction through talus fields and buffers will be avoided, provided that the routing of roads will be accomplished in a practicable and economically feasible manner, that is consistent with other objectives of a comprehensive landscape-based road network planning process.

- The mining of rock from talus fields and buffers for road construction will be avoided, provided construction materials can be acquired in a practicable manner, consistent with other objectives of a comprehensive road network planning process.

If a functional relationship between relative density and canopy closure can be demonstrated, then relative density can be substituted for canopy closure in the above definitions of talus.

CAVES

The Washington Department of Fish and Wildlife (1995) defines cave as "a naturally occurring cavity, recess, void, or system of interconnected passages which occurs under the earth in soils, rock, ice, or other geological formations, and is large enough to contain a human." This landscape feature has been designated a priority habitat by the Washington Department of Fish and Wildlife (1995a). Caves possess unique microclimates: constant high humidity levels, low evaporation rates, stable temperatures, and an absence of light. The archetypal cave possesses three zones: entrance zone, twilight zone, and dark zone. The entrance zone receives direct light and commonly has a vegetative component. The twilight and dark zones lie beyond the entrance zone in cave passages, i.e., the corridors and chambers that constitute a cave. The twilight zone receives no direct light, but light is detectable. Shade tolerant plants may inhabit this zone. The dark zone is devoid of light and photosynthetic plant life. In terms of species richness, the cave ecosystem is relatively simple, and therefore it is more vulnerable to environmental disturbances.

Species associated with caves in western Washington include the Larch Mountain salamander (WDW 1991), Townsend's big-eared bat (WDW 1991), long-legged myotis, long-eared myotis, fringed myotis, and Yuma myotis (Christy and West 1993). Only six caves are known on DNR-managed land (WDFW Priority Habitats Database 1995). Most caves in western Washington are lava tubes, which are long passages typically close to the surface.

The Washington Department of Fish and Wildlife definition of a cave is extraordinarily broad, and it is unlikely that all geomorphological features that fit this definition are important to wildlife. Under this HCP, when a cave is found, DNR shall determine, in cooperation with the the U.S. Fish

and Wildlife Service, whether it is important to wildlife habitat, and only those caves identified as important habitat shall be protected. The conservation objectives for such caves are to:

(1) maintain the microclimate at the cave entrance;

(2) maintain the physical integrity of cave passages; and

(3) minimize human disturbance to bat hibernacula and maternity colonies.

Caves and cave passages that have been identified as important wildlife habitat shall be protected as follows:

- A 250-foot-wide buffer shall be established around cave entrances. No disturbance of soils or vegetation shall occur within these buffers.
- Where surface activities may disturb a cave passage, a 100-foot-wide buffer shall be established on both sides of the cave passage. No disturbance of soils or vegetation shall occur within these buffers.
- Roads shall not be constructed within 0.25 mile of a cave entrance, provided that the routing of roads around caves can be accomplished in a practicable manner, consistent with other objectives of a comprehensive landscape-based road network planning process.
- Where surface activities may disturb a cave passage, roads shall not be constructed within 300 feet of the cave passage, provided that the routing of roads around caves can be accomplished in a practicable manner, consistent with other objectives of a comprehensive landscape-based road network planning process.
- Newly discovered caves shall be explored and mapped before forest management activities in their vicinity may commence. Explorations will be timed to avoid active maternity colonies or hibernacula.
- The location of caves will be kept confidential by DNR, to the extent permitted by law.

CLIFFS

Cliffs are steep, vertical, or overhanging rock faces; those greater than 25 feet tall and below 5,000 feet in elevation are considered a priority habitat by Washington Department of Fish and Wildlife (1995a). Ledges provide important nesting sites for peregrine falcons. Fissures and overhanging rock provide roosting and hibernation sites for several unlisted bat species of concern (Sarell et al. 1993).

Cliffs are often composed of hard rock that is suitable for road construction. The occasional proximity of cliffs to road construction reduces the hauling distance of road construction materials. The use of construction materials inferior to hard rock can lead to increased risk of road failure and long-term increases in stream sedimentation caused by surface erosion. Furthermore, the acquisition and hauling of materials to a road construction site can be prohibitively expensive compared to the mining of cliffs.

The conservation objectives for cliff habitat are to minimize disturbance to geomorphic features and to protect species that inhabit cliffs. However, few

management practices have been specifically developed for cliffs in managed forests. Therefore, management prescriptions to meet these objectives shall be developed on a site-specific basis with consideration given to the following:

(1) During planning for harvest activities around cliffs greater than 25 feet tall and below 5,000 feet in elevation, DNR shall evaluate the cliff to determine if use by wildlife is likely (e.g., are fissures/overhangs present suitable for bats, are ledges/perch trees present suitable for nesting raptors, etc.) and, if so, provide adequate protection measures including, but not limited to:

   a. protection of integrity of cliffs judged suitable and likely for wildlife use (e.g., during felling/yarding, logs should not be allowed to disturb cliff face);

   b. retention of 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

   c. avoidance of damage to significant cavities, fissures, and ledges.

(2) All cliffs in excess of 150 feet in height will be evaluated for peregrine falcon use as described elsewhere in this HCP (see Minimization and Mitigation for Other Federally Listed Species in All Planning Units)

(3) All cliffs with known peregrine falcon aeries will be protected according to Forest Practice regulations and the commitments contained in this HCP for peregrines (see Minimization and Mitigation for Other Federally Listed Species in All HCP Planning Units).

The mining of rock from cliffs for road construction shall be avoided, provided construction materials can be acquired in a practicable manner, and is consistent with other objectives of a comprehensive landscape-based road-network planning process.

OAK WOODLANDS

Oak woodlands have been designated a priority habitat by the Washington Department of Fish and Wildlife (1995a). Oregon white oak (*Quercus garryana*) is the only native oak in Washington. The center of its range is the Willamette Valley of Oregon; the northern limit of its range is along the lower east slopes of the central Washington Cascades. Scattered Oregon white oak woodlands occur in the Puget Trough, the Columbia Gorge, and along the east slope of the southern Washington Cascades (Franklin and Dyrness 1973). Oregon white oak is also an important component of some ponderosa pine stands along the east slope of the southern and central Washington Cascades (Franklin and Dyrness 1973). In the area covered by the HCP, DNR manages about 4,000 acres of oak woodland (e.g., where oak is the primary tree species) and an additional 7,000 acres of mostly ponderosa pine stands in which oak is a significant associate (e.g., where oak is a secondary or tertiary tree species), but only about 500 acres of oak woodland are in the five west-side planning units (DNR GIS 1995).

Fire is believed to have had a crucial role in the maintenance of oak woodlands by limiting and reducing the number of encroaching conifers. Fire may also stimulate sprouting in Oregon white oaks and enhance the growth of seedlings by removing competing herbaceous vegetation. Without natural wildfires or managed periodic burns, the vegetative composition of the

woodland changes. Douglas fir becomes established, and within three to four decades, the rapidly growing conifer overtops the oak, at which point the plant community may be irreversibly altered.

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, which is listed by the state as threatened. Species that find significant habitat in these areas are primarily those that are at the center of their ranges farther south.

The conservation objectives for this habitat are to:

(1) maintain the current quality and distribution of oak habitat to the extent possible considering air quality, fire management, and other constraints; and

(2) restore the quality and distribution of oak habitat where consistent with the above constraints.

Oak woodlands shall be managed as follows:

(1) Partial harvest may occur in oak woodlands. Such harvest will:

- retain all very large dominant oaks (greater than 20 inches dbh);
- maintain 25 to 50 percent canopy cover;
- remove encroaching conifers, except western white pine; and
- retain standing dead and dying oak trees.

(2) Prescribed underburns shall be conducted where appropriate.

(3) Road construction through oak woodlands shall be avoided, provided that the routing of roads around oak woodlands can be accomplished in a practicable manner, consistent with other objectives of a comprehensive landscape-based road network planning process.

LARGE, STRUCTURALLY UNIQUE TREES

Very large trees with certain structural characteristics are important habitat elements in conifer forests of western Washington. Individual trees most valuable for wildlife possess large strong limbs, open crowns, large hollow trunks, and broken tops or limbs. Many live trees that exhibit such characteristics are described by foresters as "deformed" or "defective". These trees provide important, perhaps essential, nesting and/or roosting habitat for two listed species, the marbled murrelet and bald eagle, and several bird species of concern including Vaux's swift, and the pileated woodpecker, as well as forest bats. In western Washington, three species of trees attain enormous size, are very long-lived, and are generally quite wind-firm persisting through numerous disturbances — Sitka spruce (*Picea sitchensis*), Douglas fir (*Pseudotsuga menziesii*), and western redcedar (*Thuja plicata*). According to Waring and Franklin (1979), on "better sites" in the Pacific Northwest, Douglas fir, Sitka spruce, and western redcedar can attain typically large diameters, from 60 to 87 inches, 70 to 90 inches, and 60 to 118 inches, respectively. In a managed forest, the largest examples of such trees are sometimes referred to as old-growth remnants.

The conservation objectives for this habitat element are to:

(1) retain very large trees with certain structural characteristics important to wildlife, and

(2) retain large trees that may develop these structural characteristics.

Research on animal species using large, structurally unique trees provides guidance for retention criteria. In western Washington, the mean diameter of Douglas fir used for nesting by bald eagles was 50 inches dbh (n = 70) and ranged from 24 to 90 inches dbh (Anthony et al. 1982). Bald eagles used Sitka spruce that ranged from 41 to 109 inches dbh and averaged 75 inches dbh (n = 17) (Anthony et al. 1982). Raley et al. (1994) found more than two-thirds of the roost trees used by radio-tagged pileated woodpeckers were large hollow western redcedars (mean diameter = 81 inches dbh). Vaux's swifts have been found roosting and nesting in hollow western redcedars similar to those used by pileated woodpeckers. Hamer and Nelson (1995) found that in Washington, marbled murrelets nest in trees that average 60 inches dbh (n = 6) and range in size from 35 to 87 inches dbh.

DNR shall conserve the habitat elements provided by large, structurally unique trees as follows:

- When selecting trees for retention, a preference shall be shown for large trees with structural characteristics important to wildlife, or those considered to be old-growth remnants.

- At least 1 tree per acre selected for retention shall belong to the largest diameter class of living trees in the management unit before harvest (by 2-inch increments). At least 1 other tree per acre shall belong to the dominant crown class.

- The trees selected for retention will be left in the harvest unit where practicable, and may be clumped to improve wildlife habitat, protect trees from severe weather, or facilitate operational efficiency, but where practicable, the density of clumps may not be less than 1 clump per 5 acres.

- Trees selected for retention will pose no hazard to workers during harvest operations per the safety standards of the Washington Department of Labor and Industries (WAC 296-54).

SNAGS

DNR shall conserve the habitat elements provided by large snags as follows:

- At least three snags shall be retained for each acre harvested, on average. DNR will try to leave all snags where safe and practical.

- If available, snags retained will be at least 15 inches dbh and 30 feet tall. DNR will try to leave all snags where safe and practical.

- Priority for retention will be given to large hollow snags, hard snags with bark, and snags that are at least 20 inches dbh and 40 feet tall.

- At least five live trees shall be retained permanently for each acre harvested, on average. Two of these trees will be as described in the section on large, structurally unique trees. The other three trees per acre will belong to the dominant, codominant, or intermediate crown classes, and, when available, will have at least one-third of their height in live crown.

- Priority for retention will be given to tree species which have a propensity to develop cavities (e.g., maple), but the stand tree species diversity after harvest should be generally representative of the tree species diversity prior to harvest.

- If fewer than three snags per acre are available prior to harvest, or if fewer than three snags can be left because of safety concerns, additional live trees will be retained so that the total number of stems per acre retained after harvest is, on average, at least 8 per acre. If additional live trees belong to the co-dominant or intermediate crown classes, and when available, will have at least one-third of their height in live crown. If intermediate crown-class trees are retained, shade-tolerant species with at least one-third of their height in live crown will be selected.

- Snags and trees selected for retention within the harvest units may be clumped to improve wildlife habitat, protect trees from severe weather, or facilitate operational efficiency, but where practicable, the density of clumps may not be less than one clump per five acres.

- Snags and trees selected for retention will pose no hazard to workers during harvest operations per safety standards of the Washington Department of Labor and Industries (WAC 296-54).

BALDS

Road construction through balds shall be avoided, provided that the routing of roads around balds can be accomplished in a practicable manner and is consistent with other objectives of a comprehensive landscape-based road network planning process.

MINERAL SPRINGS

Mineral springs provide important resources for certain animal species, e.g., the band-tailed pigeon (*Columbia fasciata*). To prevent or reduce adverse impacts to this landscape feature and the wildlife species associated with it, DNR will cooperate with the U.S. Fish and Wildlife Service in planning management activities within 200 feet of known mineral springs. Such activities will be designed to: (1) retain adequate trees for perching; and (2) maintain berry, fruit, and mast producing shrubs and trees, particularly in openings near mineral springs. Trees harvested near mineral springs will be felled away from the spring. DNR will avoid crossing mineral springs with yarding equipment and will prohibit the crossing of mineral springs by ground-based logging equipment. Residual large green trees and snags within 25 feet of mineral springs will be left, and either clumped or scattered depending upon operational feasibility. In addition, DNR will continue to minimize the use of herbicides as directed by Forest Resource Plan Policy No. 33.

Species by Species Conservation for Unlisted Species of Concern

Habitat for these species will be protected through the conservation strategies for the northern spotted owl and the marbled murrelet, and particularly through the riparian conservation strategy. Please refer to the full descriptions of these strategies as discussed in Sections A, B, and C, respectively, of this chapter for more details.

MOLLUSKS

Newcomb's Littorine Snail

DNR manages several parcels of land near the southern shores of Grays Harbor. The riparian conservation strategy of the HCP is expected to provide protection of the estuarine and wetland habitats considered

important to the Newcomb's littorine snail. This protection will be achieved primarily through:

(1) the application of the riparian management zone to estuaries, all of which are shorelines of the state (RCW 90.58.030) and therefore Type 1 waters; and

(2) riparian buffers along Types 1, 2, 3, and 4 waters. Riparian buffers will mediate the delivery of sediment, detrital nutrients, and large woody debris from inland areas to estuaries.

Furthermore, although no specific HCP strategies have been designed for the protection of estuarine areas, some additional protection is expected through DNR's compliance with the Shoreline Management Act (RCW 90.58) and the guidelines for forest management practices promulgated under this Act (WAC 173-16-060).

California Floater and Great Columbia River Spire Snail

DNR expects the riparian conservation strategy of the HCP to protect the rivers and large streams (Types 1, 2 and 3 waters) considered important to the California floater and the great Columbia River spire snail.

ARTHROPODS

Beller's Ground Beetle, Long-horned Leaf Beetle, and Hatch's Click Beetle

DNR expects the riparian conservation strategy of the HCP to protect the sphagnum bog habitat in which these three species of beetles occur through a commitment to "no overall net loss of naturally occurring wetland acreage and function" (DNR 1992 p 36). Sphagnum bogs associated with low-elevation lakes will be provided further protection when the lake is a Type 1, 2, or 3 water.

Fender's Soliperlan Stonefly and Lynn's Clubtail

DNR expects the riparian conservation strategy of the HCP to protect the aquatic habitats considered important to the Fender's soliperlan stonefly and Lynn's clubtail. The riparian conservation strategy should facilitate the redevelopment of riparian plant communities and the natural variability of the aquatic environment. The natural mix of conifer and deciduous species within the riparian buffer should occur through ecosystem restoration. Also, natural disturbances, such as floods and channel migration will continue to create the silty waters that Lynn's clubtail uses for breeding.

FISH

Olympic Mudminnow

The riparian conservation strategy is expected to protect the spawning and rearing habitats of the Olympic mudminnow through:

(1) committing to "no overall net loss of naturally occurring wetland acreage and function" (DNR 1992 p. 36);

(2) protecting lakes and ponds classifies as Types 1, 2, and 3 waters;

(3) protecting Types 1, 2, 3, and 4 rivers and streams; and

(4) treating Type 4 and 5 waters documented to contain fish that are proposed candidates for federal listing as Type 3 waters, if appropriate.

Additional protection of aquatic habitat will occur through the prohibition of timber harvest on unstable hillslopes and road network management that minimizes adverse impacts to salmonid habitat.

Pacific Lamprey and River Lamprey

The riparian conservation strategy as described above for the Olympic mudminnow should protect the spawning and rearing habitats of the Pacific and river lampreys.

Green Sturgeon

Green sturgeon spawning and juvenile rearing habitats are not known to occur in Washington, and thus are out of the bounds of the area covered by the HCP. However, some adult habitat occurs in Grays Harbor, Willapa Bay, and along the Columbia River and its estuaries. This habitat would receive some protection through the riparian conservation strategy as described above for Newcomb's littorine snail.

AMPHIBIANS

Larch Mountain Salamander

This species is strongly associated with talus. Talus fields that are 1 acre or larger in size will be protected as previously described in the subsection titled Protection of Uncommon Habitats. Also, DNR expects the riparian conservation strategy to protect talus fields within or immediately below unstable areas because no harvest will occur on hillslopes with a high risk of mass wasting. In addition, the riparian management zone along Types 1, 2, 3, and 4 waters may encompass some talus fields.

Dunn's and Van Dyke's Salamanders and the Tailed Frog

The riparian conservation strategy is expected to protect the breeding, foraging, and resting habitats of Dunn's and Van Dyke's salamanders and the tailed frog. Riparian buffers along Types 1, 2, and 3 waters will be approximately equal to the site potential height of trees in a mature conifer stand, or 100 feet, whichever is greater. A riparian buffer 100 feet wide will be applied to both sides of Type 4 waters. Management of the no-harvest and minimal-harvest areas of the riparian buffer is anticipated to maintain or restore forests with mature or old-growth characteristics.

Some seeps will be protected through Type 5 stream protection. Type 5 waters that flow through an area with a high risk for mass wasting will be protected under the riparian conservation strategy, and other Type 5 waters will be protected where necessary for key nontimber resources, such as water quality, fish, wildlife habitat, and sensitive plant species (DNR 1992 p. 35).

Dunn's and Van Dyke's salamanders are occasionally found in upland talus (WDW 1991). Talus fields that are 1 acre or larger will be protected as described previously in the subsection titled Uncommon Habitats.

Northern Red-legged Frog, Cascades Frog, and Spotted Frog

The riparian conservation strategy is expected to protect the breeding, foraging, and resting habitats of the northern red-legged, Cascades, and spotted frogs through:

(1) committing to "no overall net loss of naturally occurring wetland acreage and function" (DNR 1992 p. 36);

(2) protecting lakes and ponds classified as Types 1, 2, or 3 waters; and

(3) protecting Types 1, 2, 3, and 4 rivers and streams.

The riparian conservation strategy should facilitate the redevelopment of riparian plant communities and the natural variability of the aquatic environment. The natural mix of conifer and deciduous species within the riparian buffer should occur through ecosystem restoration.

REPTILES

Northwestern Pond Turtle

The riparian conservation strategy is expected to protect the breeding, foraging, and resting habitats of the northwestern pond turtle through:

(1) committing to "no overall net loss of naturally occurring wetland acreage and function" (DNR 1992 p. 36);

(2) protecting lakes and ponds classified as Types 1, 2, or 3 waters; and

(3) protecting Types 1, 2, 3, and 4 rivers and streams.

In addition, under WAC 222-16-080 of the state Forest Practices Rules, harvesting, road construction, aerial application of pesticides, or site preparation within 0.25 mile of a known individual occurrence, documented by the Washington Department of Fish and Wildlife, of a northwestern pond turtle are Class IV-Special forest practices and require an environmental checklist in compliance with the State Environmental Policy Act. The environmental checklist may indicate a need for further protection of the species' critical wildlife habitat.

California Mountain Kingsnake

The California mountain kingsnake occupies oak and pine forests. Oak woodlands have been designated a priority habitat by the Washington Department of Fish and Wildlife (1995a). Oak woodlands will be protected as described previously in the subsection titled Protection of Uncommon Habitats.

The riparian conservation strategy is expected to provide protection of the habitat of the California mountain kingsnake. No harvest will occur on hillslopes with a high risk of mass wasting, and some oak forest exists within unstable areas. The riparian management zone along Types 1, 2, 3, and 4 waters may also encompass some oak forest.

BIRDS

Harlequin Duck

The riparian conservation strategy is expected to protect the breeding, foraging, and resting habitats of the harlequin duck. Buffers along Types 1, 2, and 3 waters will be approximately equal to the site potential height of trees in a mature conifer stand, or 100 feet, whichever is greater. A riparian buffer 100 feet wide will be applied to both sides of Type 4 waters. Management of the no-harvest and minimal-harvest areas of the riparian buffer is anticipated to maintain or restore forests with mature or old-growth characteristics.

Forest management in the riparian buffer must maintain or restore the quality of salmonid habitat, and the resulting conditions should also be conducive to natural densities of aquatic macro-invertebrates upon which the Harlequin duck feeds. The adverse impacts of human disturbance will be minimized by the riparian buffer, which is estimated to have an average width of 150 to 160 feet. Human disturbance will be further reduced by the wind buffer that will be placed where needed along the windward side of many reaches of Types 1, 2, and 3 waters.

ADDITIONAL MITIGATION

DNR shall place restrictions in its contracts for sales of timber and other valuable materials, as well as in its grants of rights of way and easements, to prohibit activities within 165 feet of a known active harlequin duck nest site between May 1 and September 1 where such activities would appreciably reduce the likelihood of nesting success.

Northern Goshawk

The combination of the riparian, spotted owl, and marbled murrelet conservation strategies is expected to provide forest conditions suitable for northern goshawk breeding, foraging, and resting habitat. In concert, these three strategies ensure the development of large landscapes of mature and old-growth forest. In spotted owl NRF management areas, there will be two 300-acre nest patches per 5,000 acres of managed forest. These nest patches will consist of high quality spotted owl nesting habitat that has old-growth characteristics. The nest patches will occur within a larger, contiguous 500-acre area, of which the remaining 200 acres shall be sub-mature forest or higher quality habitat. At least 50 percent of the designated NRF management areas in each WAU (including the nest patches) will be sub-mature forest (as defined in Hanson et al. 1993) or higher quality habitat. On average, 40 to 42 percent of the designated NRF management area in each WAU will be mature or old-growth forest. The landscape conditions in the NRF management areas will meet or exceed the habitat recommendations made by Reynolds et al. (1992) for northern goshawks.

In the five west-side planning units, the spotted owl strategy designates 117,000 acres to be managed as spotted owl dispersal habitat, which supports the movement of juvenile spotted owls among sub-populations on federal reserves. It is likely the availability of this habitat will enhance the survival of dispersing juvenile goshawks as well. At least 50 percent of the designated dispersal management areas in each WAU will meet the minimum specifications for spotted owl dispersal habitat.

Outside the spotted owl NRF management areas, the riparian and murrelet conservation strategies will protect goshawk breeding, foraging, and resting habitat. Management within the riparian buffer, particularly in the no-harvest and minimal-harvest areas, should eventually result in forests with mature and old-growth characteristics. Mature and old-growth forests will also exist on hillslopes with a high risk of mass wasting. The long-term murrelet conservation strategy is not yet developed, but it will quite likely entail the preservation of some late successional forest. Consistent with RCW 77.16.120, outside NRF management areas, trees or snags that are known to contain active goshawk nests will not be harvested.

To meet the objective of providing habitat for demographic support of goshawk populations on federal forest reserves, additional mitigation is necessary to ensure the reproductive success of goshawk breeding pairs in

DNR-managed forests. In particular, special management is necessary to minimize human disturbance around active nest sites.

ADDITIONAL MITIGATION

DNR shall place restrictions in its contracts for sales of timber and other valuable materials, as well as in its grants of rights of way and easements, to prohibit activities within 0.55 mile of a known active northern goshawk nest site located in a NRF management area between April 1 and August 31 where such activities would appreciably reduce the likelihood of nesting success. A circle of radius 0.55 mile will circumscribe the entire post-fledgling family area (600 acres).

Sandhill Crane and Black Tern

The riparian conservation strategy is expected to protect the wetland habitats of the sandhill crane and black tern through: (1) committing to "no overall net loss of naturally occurring wetland acreage and function" (DNR 1992 p. 36), and (2) protecting lakes and ponds classified as Types 1, 2, or 3 waters.

In addition, under WAC 222-16-080 of the state Forest Practices Rules, harvesting, road construction, aerial application of pesticides, or site preparation within 0.25 mile of a known active nesting area, documented by the Washington Department of Fish and Wildlife, of a sandhill crane are Class IV-Special forest practices and require an environmental checklist in compliance with the State Environmental Policy Act. The environmental checklist may indicate a need for further protection of the species' critical wildlife habitat.

Olive-sided Flycatcher

The combination of the riparian, spotted owl, and marbled murrelet conservation strategies should provide forest conditions suitable for olive-sided flycatcher breeding, foraging, and resting habitat. In concert, these three strategies ensure the development of large contiguous landscapes of mature and old-growth forest. At least 50 percent of the designated NRF management areas in each WAU (including the spotted owl nest patches) will be sub-mature forest (as defined in Hanson et al. 1993) or higher quality habitat. On average, 40 to 42 percent of the designated NRF management area in each WAU will be mature or old-growth forest.

Outside spotted owl NRF management areas, the riparian and murrelet conservation strategies will protect breeding, foraging, and resting habitat. Management within the riparian buffer, particularly in the no-harvest and minimal-harvest areas, should eventually result in forests with mature and old-growth characteristics. Mature and old-growth forests will also exist on hillslopes with a high risk of mass wasting. The long-term murrelet conservation strategy is not yet developed, but it will quite likely entail the preservation of some late successional forest.

Little Willow Flycatcher

The riparian conservation strategy and forest management in the five westside planning units are expected to provide breeding, foraging, and resting habitat for the little willow flycatcher. Buffers along Types 1, 2, and 3 waters will be approximately equal to the site potential height of trees in a mature conifer stand, or 100 feet, whichever is greater. A riparian buffer 100 feet wide will be applied to both sides of Type 4 waters. The natural mix of conifer and deciduous species should occur through ecosystem restoration. Also, natural disturbances such as floods, and channel migration will

continue to create the alder and willow riparian habitat preferred by this species.

Even-aged forest management throughout the five west-side planning units will continue to provide shrubby habitats in regenerating clearcuts and sapling stands.

Common Loon

The riparian conservation strategy is expected to protect the loon's lake habitat. The adverse impacts of human disturbance will be minimized by the riparian buffer, which is estimated to have an average width of 150 to 160 feet and will be applied along the shoreline of Types 1, 2, and 3 lakes and ponds. Human disturbance will be further reduced by the wind buffer that will be placed where needed along the riparian buffer on the windward side of Types 1, 2, and 3 waters. In order to meet the conservation objectives, further mitigation is required to reduce the adverse affects of human disturbance.

ADDITIONAL MITIGATION

DNR shall place restrictions in its contracts for sales of timber and other valuable materials, as well as in its grants of rights of way and easements, to prohibit activities within 500 feet of a known active common loon nest site between April 1 and September 1 where such activities would appreciably reduce the likelihood of nesting success.

Golden Eagle

Golden eagles nest in large trees or on cliffs. These uncommon habitats and habitat elements will be protected as described earlier in this section. The combination of the riparian conservation strategy and forest management in the five west-side planning units should provide breeding, foraging, and resting habitat for the golden eagle. Many forests on unstable hillslopes will not be harvested and some of these areas will contain large trees. Buffers along Types 1, 2, and 3 waters will be approximately equal to the site potential height of trees in a mature conifer stand, or 100 feet, whichever is greater. A riparian buffer 100 feet wide will be applied to both sides of Type 4 waters. Management within the riparian buffer is expected to result in the development of late successional forest containing large live trees. Even-aged forest management throughout the five west-side planning units will continue to provide openings for foraging habitat.

Golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668, Revised 1978). Under this Act, it is unlawful to molest or disturb golden eagles and their nests. RCW 77.16.120 of the Wildlife Code of Washington prohibits destroying the nests of protected wildlife. Consistent with these regulations, trees or snags that contain known active golden eagle nests shall not be harvested.

Vaux's Swift

The combination of the riparian, spotted owl, and marbled murrelet conservation strategies is expected to provide forest conditions suitable for Vaux's swift breeding, foraging, and resting habitat. In concert, these three strategies ensure the development of large contiguous landscapes of mature and old-growth forests containing large live tree and snags. In spotted owl NRF management areas, there will be two 300-acre nest patches per 5,000 acres of managed forest. These nest patches will consist of high quality spotted owl nesting habitat, which will have old-growth forest characteristics. The nest patches will occur within a larger, contiguous 500-acre area, of which

the remaining 200 acres shall be sub-mature forest or higher quality habitat. At least 50 percent of the designated NRF management areas in each WAU (including the nest patches) will be sub-mature forest or higher quality habitat.

Even-aged forest management will provide a full range of seral stages for foraging. No harvest will occur on unstable hillslopes with a high risk of mass wasting, and some of these areas will contain large live trees and large snags. Management activities within the riparian buffer are expected to result in the development of late successional forest containing large live trees.

Outside the NRF management areas, the riparian and murrelet conservation strategies will protect breeding and resting habitat. Management within the riparian buffer, particularly in the no-harvest and minimal-harvest areas, should eventually result in forests with mature and old-growth characteristics. Mature and old-growth forests will also exist on hillslopes with a high risk of mass wasting. The long-term murrelet conservation strategy is not yet developed, but it will quite likely entail the preservation of some late successional forest.

Large, structurally unique trees and large hollow snags will be protected as described previously in the subsection titled Protection of Uncommon Habitat. In addition, consistent with RCW 77.16.120, trees or snags that are known to contain active Vaux's swift nests shall not be harvested. Green tree and snag retention are subject to the safety standards of the Department of Labor and Industries (WAC 296-54).

ADDITIONAL MITIGATION

Live trees or snags that are known to be used by Vaux's swifts as night roosts shall not be harvested. Green tree and snag retention are subject to the safety standards of the Department of Labor and Industries (WAC 296-54).

Lewis' Woodpecker

Oak woodlands are used for breeding, foraging, and resting habitat by Lewis' woodpecker. Oak woodlands have been designated a priority habitat by the Washington Department of Fish and Wildlife (1995a) and will be protected as described previously in the subsection titled Protection of Uncommon Habitats. The riparian conservation strategy is expected to guarantee some protection of this habitat within unstable areas because no harvest will occur on hillslopes with a high risk of mass wasting areas. The riparian management zone along Types 1, 2, 3, and 4 waters may also encompass some oak forests.

The riparian conservation strategy should protect some deciduous riparian habitat. Buffers along Types 1, 2, and 3 waters will be approximately equal to the site potential height of trees in a mature conifer stand. A riparian buffer 100 feet wide will be applied to both sides of Type 4 waters. DNR expects this management to result in the development of late successional forest containing large snags. The natural mix of conifer and deciduous species should occur through ecosystem restoration, and natural disturbances, such as floods, and channel migration will continue to create the cottonwood riparian habitat preferred by this species.

Pileated Woodpecker

The combination of the riparian, spotted owl, and marbled murrelet conservation strategies is expected to provide forest conditions suitable for pileated woodpecker breeding, foraging, and resting habitat. In concert, these three strategies ensure the development of large contiguous landscapes of mature and old-growth forest containing large live tree and snags. At least 50 percent of the NRF management area in each WAU will be sub-mature forest (as defined in Hanson et al. 1993) or higher quality. There will be two 300-acre nest patches per 5,000 acres of managed forest in NRF management areas. These nest patches will consist of high quality spotted owl nesting habitat, which has old-growth forest characteristics. The nest patches will occur within a larger, contiguous 500-acre area, of which the remaining 200 acres shall be sub-mature forest or higher quality habitat. On average, 40 to 42 percent of the designated NRF management area in each WAU will be mature or old-growth forest.

Outside of spotted owl NRF management areas, the riparian and murrelet conservation strategies will protect breeding and resting habitat. Management within the riparian buffer, particularly in the no-harvest and minimal-harvest areas, should eventually result in forests with mature and old-growth characteristics. Mature and old-growth forests will also exist on hillslopes with a high risk of mass wasting. The long-term murrelet conservation strategy is not yet developed, but it will quite likely entail the preservation of some late successional forest.

Snags will be retained according to state Forest Practices Rules. Under WAC 222-30-020(11), three wildlife reserve trees (typically snags) are left for each acre harvested in western Washington. The wildlife reserve trees must be 10 or more feet in height and 12 or more inches dbh. These minimum sizes do not guarantee that wildlife trees suitable for pileated woodpeckers will be retained. The retention of large, structurally unique trees, as described previously in the subsection titled Protection of Uncommon Habitats, will provide a source for large snags.

Conservation measures for large snags and large, structurally unique trees will retain structural elements required by pileated woodpeckers for nesting and roosting. Additional conservation measures for snags will increase the density of snags, and consequently, opportunities for foraging.

Consistent with RCW 77.16.120, trees or snags that are known to contain active pileated woodpecker nests will not be harvested. In addition, trees or snags that are known to have been used by pileated woodpeckers for nesting will not be harvested. Green tree and snag retention are subject to the safety standards of the Department of Labor and Industries (WAC 296-54).

Purple Martin

The riparian conservation strategy is expected to protect the open riparian/wetland habitat of purple martins through:

(1) committing to "no overall net loss of naturally occurring wetland acreage and function" (DNR 1992 p. 36); and

(2) the protection of lakes and ponds classified as Types 1, 2, or 3 waters.

Conservation measures for large snags and large, structurally unique trees will retain structural elements required by purple martins for nesting.

In addition, consistent with RCW 77.16.120, trees or snags that are known to contain active purple martin nests will not be harvested. Green tree and snag retention are subject to the safety standards of the Department of Labor and Industries (WAC 296-54).

Western Bluebird

Even-aged forest management throughout the five west-side planning units will continue to provide openings suitable for breeding, foraging, and resting habitat. Conservation measures for large snags and large, structurally unique trees will retain structural elements required by western bluebirds for nesting.

In addition, consistent with RCW 77.16.120, trees or snags that are known to contain active western bluebird nests will not be harvested. Green tree and snag retention are subject to the safety standards of the Department of Labor and Industries (WAC 296-54).

MAMMALS

Myotis Bats

The combination of the riparian, spotted owl, and marbled murrelet conservation strategies should provide forest conditions suitable for myotis bat breeding, foraging, and resting habitat. In concert, these three strategies ensure the development of large contiguous landscapes of mature and old-growth forest. On average, 40 to 42 percent of the designated NRF management area in each WAU will be mature or old-growth forest.

Outside of spotted owl NRF management areas, the riparian and murrelet conservation strategies will protect breeding and resting habitat. Management within the riparian buffer, particularly in the no-harvest and minimal-harvest areas, should eventually result in forests with mature and old-growth characteristics. Mature and old-growth forests will also exist on hillslopes with a high risk of mass wasting. The long-term murrelet conservation strategy is not yet developed, but it will quite likely entail the preservation of some late successional forest.

Talus fields, cliffs, and caves will be protected as described previously in the subsection titled Protection of Uncommon Habitats, and DNR will also protect large, structurally unique trees and large snags as described in the same subsection.

ADDITIONAL MITIGATION

Live trees or snags that are known to be used by myotis bat species as communal roosts or maternity colonies shall not be harvested. Green tree and snag retention are subject to the safety standards of the Department of Labor and Industries (WAC 296-54).

Townsend's Big-eared Bat

Caves will be protected as described previously in the subsection titled Protection of Uncommon Habitats.

California Wolverine

There is very little montane forest on DNR-managed lands. But 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. The combination of the riparian, spotted owl, and marbled murrelet conservation strategies is expected to provide forest conditions suitable for wolverine breeding, foraging, and resting habitat. In concert, these three strategies should ensure the development of large landscapes of mature and old-growth forest. Forest management will create a range of habitat types from grass-forb to late-successional forest.

To meet the objective of providing habitat for demographic support of populations on federal forest reserves additional mitigation is necessary to ensure the reproductive success of breeding adults in DNR-managed forests. In particular, special management is necessary to minimize human disturbance around active den sites and eliminate trapping mortality.

DNR-managed roads are routinely closed for cost-effective forest management and protection of public resources, including wildlife (DNR 1992 p. 41). Road closures benefit the wolverine population by limiting human disturbance and reducing the likelihood of accidental trapping. Road closures will continue on DNR-managed lands and will be consistent with cost-effective forest management and policies set forth by the Board of Natural Resources.

ADDITIONAL MITIGATION

DNR shall place restrictions in its contracts for sales of timber and other valuable materials, as well as in its grants of rights of way and easements, to prohibit activities within 0.5 mile of a known active wolverine den site located in a spotted owl NRF management area between January 1 and July 31 where such activities would appreciably reduce the likelihood of denning success.

Pacific Fisher

The combination of the riparian, spotted owl, and marbled murrelet conservation strategies is expected to provide forest conditions suitable for fisher breeding, foraging, and resting habitat. In concert, these three strategies ensure the development of large landscapes of mature and old-growth forest. At least 50 percent of the designated NRF management areas in each WAU (inclusive of the nest patches) will be sub-mature forest (as defined in Hanson et al. 1993) or higher quality habitat. The high-quality owl nesting habitat in nest patches will have old-growth forest characteristics. On average, 40 to 42 percent of the designated NRF management area in each WAU will be mature or old-growth forest.

In the five west-side planning units, the spotted owl strategy designates 117,000 acres to be managed as spotted owl dispersal habitat. At least 50 percent of the designated dispersal management area in each WAU will meet the minimum specifications for spotted dispersal habitat. The purpose of dispersal habitat is to support the movement of juvenile spotted owls between sub-populations on federal reserves, and it is likely the availability of this habitat may also enhance the survival of dispersing juvenile fishers.

The geographical distribution of areas managed for spotted owl breeding habitat will maintain some of the elevational range of fisher habitat. DNR-managed forests are generally located at a lower elevation than federal

lands. To meet the objective of providing habitat for demographic support of populations on federal forest reserves, additional mitigation is necessary to ensure the reproductive success of breeding adults in DNR-managed forests. In particular, special management is necessary to minimize human disturbance around active den sites and eliminate trapping mortality.

DNR-managed roads are routinely closed for cost-effective forest management and protection of public resources including wildlife (DNR 1992 p. 41). Road closures benefit the fisher population by limiting human disturbance and reducing the likelihood of accidental trapping. Road closures will continue on DNR-managed lands and will be consistent with cost-effective forest management and policies set forth by the Board of Natural Resources.

Conservation measures for large snags and large, structurally unique trees will retain structural elements required by fishers for denning and resting.

ADDITIONAL MITIGATION

DNR shall place restrictions in its contracts for sales of timber and other valuable materials, as well as in its grants of rights of way and easements, to prohibit activities within 0.5 mile of a known active fisher den site located in a spotted owl NRF management area between February 1 and July 31 where such activities would appreciably reduce the likelihood of denning success.

Western Gray Squirrel

Oak woodlands are the breeding, foraging, and resting habitat of the western gray squirrel. Oak woodlands have been designated a priority habitat by the Washington Department of Fish and Wildlife (1995a), and will be protected as described previously in the subsection titled Protection of Uncommon Habitats.

The riparian conservation strategy is expected to provide some protection of the breeding, foraging, and resting habitat of the western gray squirrel. No harvest will occur on hillslopes with a high risk of mass wasting, and some oak forest will exist within unstable areas. The riparian management zone along Types 1, 2, 3, and 4 waters may also encompass some oak forest.

In addition, under WAC 222-16-080 of the state Forest Practices Rules, the Forest Practices Board may adopt rules pertaining to management activities which impact western gray squirrels. These rules would provide further protection of the species' critical wildlife habitat.

Lynx

Although the lynx may potentially occur in the area covered by the HCP, it is not known to occur in the five west-side planning units. Therefore, it is not discussed in this section.

California Bighorn Sheep

Although the California bighorn sheep may potentially occur in the area covered by the HCP, it is not known to occur in the five west-side planning units. Therefore, it is not discussed in this section.

Summary of Habitat Types Provided on DNR-managed Lands in the Five West-Side Planning Units

The type and distribution of habitat available during the term of this HCP will be the result of commitments under the HCP, natural events, forest management policies of the Board of Natural Resources and DNR, technological developments that influence management practices, and land transactions.

HABITATS TO BE MAINTAINED OR RESTORED UNDER THE HCP

Spotted Owl Nesting, Roosting, and Foraging (NRF) Areas

Two types of habitat are required within designated NRF areas:

(1) high quality nesting habitat; and

(2) areas that, at a minimum, meet the sub-mature habitat definition.

In every 5,000 acres, there shall be two 300-acre nest patches of high quality spotted owl nesting habitat that has old-growth characteristics. These nest patches will occur within a larger, contiguous 500-acre area, of which the remaining 200 acres shall be sub-mature forest or higher quality habitat. At least 50 percent of the designated NRF management areas in each WAU (Watershed Administrative Unit) shall be sub-mature, including the nest patches.

See Section A of Chapter IV on spotted owl mitigation for a full description of these habitats, their distribution, and the amount required. The definitions of these habitats are summarized below:

- High quality nesting habitat (average condition over a 300-acre nesting habitat patch)
  - at least 31 trees per acre greater than or equal to 21 inches dbh with at least 15 trees per acre greater than or equal to 31 inches dbh;
  - at least three trees from the above group of 31 trees have broken tops;
  - at least 12 snags per acre larger than 21 inches dbh;
  - a minimum of 70 percent canopy closure; and
  - a minimum of 5 percent ground cover of large woody debris.
- Sub-mature habitat (applied as average stand conditions)
  - forest community dominated by conifers or in mixed conifer/hardwood forest, the community is composed of at least 30 percent conifers (measured as stems per acre dominant, co-dominant, and intermediate trees);
  - at least 70 percent canopy closure;
  - tree density of between 115 and 280 trees per acre greater than 4 inches dbh;

- dominant and co-dominant trees at least 85 feet tall;
- at least three snags or cavity trees per acre that are at least 20 inches dbh; and
- a minimum of 5 percent ground cover of large down woody debris.

Spotted Owl Dispersal Areas

Within designated spotted owl dispersal areas, 50 percent of the area shall be maintained in stands that meet the dispersal habitat definition. See Section A of Chapter IV on spotted owl mitigation for a full description of this habitat. The definition of dispersal habitat is summarized below:

- canopy cover of at least 70 percent;
- quadratic mean diameter of at least 11 inches dbh for the 100 largest trees in a stand;
- top height of at least 85 feet; and
- at least four trees per acre from the largest size class retained for future snag and cavity trees.

Marbled Murrelet Habitat Blocks

The interim conservation strategy for the marbled murrelet calls for deferring harvest on suitable habitat blocks while studies are conducted to provide information for developing a long-term conservation strategy. The amount of habitat required for murrelets in the long-term strategy is expected to be less than is identified using the current definition. See Section B of Chapter IV for a complete discussion of the mitigation for marbled murrelets. Suitable marbled murrelet habitat that will be used for identifying blocks to be deferred is defined as a contiguous forested area meeting all of the following three criteria:

- at least five acres in size;
- containing an average of at least two potential nesting platforms per acre; and
- within 50 miles of marine waters.

Riparian Management Zones

Management activities allowed within riparian management zones will influence the type of habitat provided. The requirements for no harvest within the first 25 feet of the active channel margin and minimal harvest in the next 75 feet will tend to leave, or develop over time, timber stands with a range of mature to old-growth characteristics. Through restoration efforts consistent with the riparian conservation objective of maintaining or restoring salmonid freshwater habitat on DNR-managed lands, most riparian management zones will be coniferous with minor hardwood components. Hardwoods will be maintained on sites that are not environmentally suited to conifers. See Section D of Chapter IV for a detailed discussion of riparian management zones.

Wetlands

DNR will allow no overall net loss of naturally occurring wetland acreage or function. This applies to nonforested and forested wetlands. See Section D of Chapter IV on the riparian conservation strategy for a detailed discussion of wetland management activities and habitat. For forested wetlands and buffers of nonforested wetlands, timber harvests shall be designed to maintain the perpetuate stands that:

- are as wind-firm as possible;
- have large root systems to maintain the uptake and transpiration of ground water; and
- have a minimum basal area of 120 square feet per acre.

Uncommon Habitats

See Section F of Chapter IV on the multispecies conservation strategy for a discussion of uncommon habitats on DNR-managed lands. The following uncommon habitats will be identified and protected:

- cliffs;
- caves and cave passages that have been identified as important wildlife habitat;
- oak woodlands
  (Oak woodlands are very limited in the five west-side planning units. Where they occur, they will be managed to maintain the current quality and distribution of the habitat to the extent possible considering air quality, fire management, and other constraints and to restore the quality and distribution of this habitat where consistent with these constraints.); and
- talus fields that are one acre or larger.

HABITATS PROVIDED ON DNR-MANAGED LANDS

After a natural disturbance, such as fire, a stand regenerates and develops through a succession of seral stages. Managed forests follow a similar pattern of succession following clearcut timber harvest. A variety of wildlife habitats on DNR-managed lands will occur in the different seral stages (Brown 1985) described below:

- Grass/forb
  Grass/forb-dominated areas develop quickly on cleared lands and are common for a few years after harvest or site preparation activities. In cases where a significant shrub layer existed under the timber that was harvested, a grass/forb condition frequently will not develop. Generally, a grass/forb condition exists at the time sites are planted or develops shortly after planting.
- Shrub
  Shrubs develop on a site following harvests, including thinnings, or start developing at the same time as grasses and forbs. However, shrubs generally take a few years to develop to the point of dominating a site. The length of time shrubs dominate an area depends primarily on the development of trees. Tree seedlings are generally present on these sites but are not tall enough to impact the shrubs.

- Open sapling/pole
  In the open sapling/pole condition, shrubs are frequently the dominant vegetation, but trees are tall enough to prevent being suppressed by shrubs.

- Closed sapling/pole/sawtimber
  This condition is marked by very dense tree canopies which limit all ground vegetation. Thinning commonly opens the canopy sufficiently to allow shrubs to redevelop.

- Large sawtimber
  Large sawtimber is frequently defined as stands with an average diameter greater than 21 inches. In managed stands, trees often have a relatively uniform size and may approach the tree sizes found in old-growth stands. However, these stands generally lack characteristics such as snags, down woody debris, and the two or more canopy layers that are found in old-growth stands.

- Old growth
  Old-growth stands are characterized by the presence of snags, down woody debris, and two or more canopy layers that develop as a result of the mortality of overstory trees. Stand diameters may be similar to or larger than large sawtimber stands.

Table IV.13 lists the types of habitat expected to be provided under the HCP on DNR-managed lands in the five west-side planning units. Examples of representative species that might use that habitat type, management activities that may be conducted, potential negative impacts that may result from the management activities, and benefits expected to accrue from the HCP are given for each habitat type. Additional details regarding the management activities are included in Section H (Forest Land Management Activities) of this chapter.

Table IV.13: Habitats and representative wildlife species covered by this HCP for the west-side planning units

(Source: Brown 1985, Thomas et al. (1993), Parsons et al. (1991), and Pyle (1989)).

Type of habitat	Representative species that can use these habitat types
Spotted owl high quality nesting habitat	dusky shrew, long-eared myotis, northern flying squirrel, Pacific fisher, wood duck, northern goshawk, barred owl, pileated woodpecker, olive-sided flycatcher, northern spotted owl, hoary bat, bushy-tailed woodrat, red tree vole, harlequin duck, marbled murrelet, Vaux's swift, red-breasted nuthatch, Dunn's salamander, Larch Mountain salamander, Van Dyke's salamander, tailed frog, pine white butterfly, Johnson's hairstreak butterfly, *Acalypta saudersi* (a lace bug), *Cychrus tuberculatus* (a carabid beetle), *Lobosoma horridum* (a weevil), *Omus dejeani* (a tiger beetle)
Spotted owl sub-mature habitat	dusky shrew, long-legged myotis, northern flying squirrel, Pacific fisher, wood duck, hairy woodpecker, northern goshawk, barred owl, olive-sided flycatcher, northern spotted owl, hoary bat, bushy-tailed woodrat, red tree vole, red-breasted nuthatch, Dunn's salamander, northwestern salamander, Van Dyke's salamander, tailed frog, northern alligator lizard, pine white butterfly, coral hairstreak butterfly, California hairstreak butterfly, *Cychrus tuberculatus* (a carabid beetle), *Lobosoma horridum* (a weevil), *Omus dejeani* (a tiger beetle)
Spotted owl dispersal habitat	Douglas' squirrel, sharp-shinned hawk, Swainson's thrush, evening grosbeak, dusky shrew, northern spotted owl, long-legged myotis, mountain beaver, creeping vole, bobcat, elk, Vaux's swift, orange-crowned vireo, northern alligator lizard, rubber boa, long-toed salamander,

Table IV.13: Habitats and representative wildlife species covered by this HCP for the west-side planning units *(continued)*

Type of habitat	Representative species that can use these habitat types
Spotted owl dispersal habitat *(continued)*	*Cychrus tuberculatus* (a carabid beetle), *Lobosoma horridum* (a weevil), *Omus dejeani* (a tiger beetle)
Marbled murrelet habitat	dusky shrew, long-legged myotis, northern flying squirrel, Pacific fisher, wood duck, northern goshawk, barred owl, hairy woodpecker, Oliver-sided flycatcher, marbled murrelet, hoary bat, bushy-tailed woodrat, red tree vole, harlequin duck, Vaux's swift, red-breasted nuthatch, Dunn's salamander, Larch Mountain salamander, Van Dyke's salamander, tailed frog, pine white butterfly, Johnson's hair-streak butterfly, *Acalypta saudersi* (a lace bug), *Cychrus tuberculatus* (a carabid beetle), *Lobosoma horridum* (a weevil), *Omus dejeani* (a tiger beetle)
Conifer-dominated riparian ecosystems	long-legged myotis, Pacific fisher, mink, wood duck, sharp-shinned hawk, ruffed grouse, olive-sided flycatcher, purple martin, Dunn's salamander, Van Dyke's salamander, salamander, tailed frog, dusky shrew, Trowbridge's shrew, southern red-backed vole, river otter, Barrow's goldeneye, band-tailed pigeon, long-eared owl, red-breasted sapsucker, hermit thrush, evening grosbeak, Cascade frog, bull trout, coho salmon, steelhead salmon, mayflies, stoneflies, caddisflies, midges, arborvitae hair-streak butterfly
Hardwood-dominated riparian ecosystems	long-legged myotis, mink, wood duck, purple martin, northwestern pond turtle, common garter snake, Dunn's salamander, northern red-legged frog, ruffed grouse, dusky shrew, shrew mole, yellowpine chimunk, river otter,

Table IV.13: Habitats and representative wildlife species covered by this HCP for the west-side planning units *(continued)*

Type of habitat	Representative species that can use these habitat types
Hardwood-dominated riparian ecosystem *(continued)*	Barrow's goldeneye, Cooper's hawk, band-tailed pigeon, downy woodpecker, black-headed grosbeak, Olympic salamander, Olympic mudminnow, mayflies, stoneflies, caddisflies, dreamy duskywing butterfly, western tiger swallowtail
Nonforested wetland	northern harrier, common snipe, northwestern pond turtle, northern red-legged frog, spotted frog, Beller's ground beetle, long-horned leaf beetle, Hatch's click beetle, mallard, mink, dusky shrew, Pacific shrew, coast mole, Yuma myotis, long-tailed vole, American bittern, little willow flycatcher, common loon, sandhill crane, black tern, coho salmon, Olympic mudminnow, dragonflies, damselflies, sonora skipper butterfly
Forested wetland	long-legged myotis, Pacific fisher, ruffed grouse, sharp-shinned hawk, barred owl, olive-sided flycatcher, purple martin, Van Dyke's salamander, northern red-legged frog, mink, spotted frog, dusky shrew, water shrew, bushy-tailed woodrat, common merganser, band-tailed pigeon, northern saw-whet owl, red-breasted sapsucker, western toad, dragonflies, flies, cad-disflies, pale tiger swallowtail butterfly
Cliffs	fringed myotis, long-legged myotis, Yuma myotis, mountain goat, peregrine falcon, turkey vulture, black swift, cliff swallow, western fence lizard, bushy-tailed woodrat, golden eagle, wasps, shorttailed black swallowtail butterfly

Table IV.13: Habitats and representative wildlife species covered by this HCP for the west-side planning units *(continued)*

Type of habitat	Representative species that can use these habitat types
Caves	Townsend's big-eared bat, fringed myotis, long-legged myotis, Yuma myotis, coyote, California wolverine, mountain lion, bobcat, black swift, Larch Mountain salamander, crickets
Oak woodland	western gray squirrel, Lewis' woodpecker, California mountain kingsnake, Propertius' duskywing butterfly, Oregon green hairstreak butterfly
Talus	Cascade golden-mantled ground squirrel, mountain goat, Pacific fisher, California wolverine, bobcat, white-tailed ptarmigan, common nighthawk, rosy finch, western fence lizard, Larch Mountain salamander, Dunn's salamander, Van Dyke's salamander, wolf spiders, jumping spiders, small-footed myotis
Grass/forb forest stage	coast mole, vagrant shrew, Townsend's vole, coyote, long-tailed weasel, black-tailed deer, common nighthawk, white-crowned sparrow, northwestern garter snake, western fence lizard, northwestern salamander, western bluebird, wolf spiders, grasshoppers, mariposa copper butterfly, silvery blue butterfly, Blackmore's blue butterfly, western meadow fritillary butterfly, *Oncocnemis dunbari* (a moth), *Formica neorufibarbis* (an ant)
Shrub forest stage	coast mole, Townsend's vole, mountain beaver, coyote, long-tailed weasel, black-tailed deer, common nighthawk, blue grouse, rufous hummingbird, hermit thrush, white-crowned sparrow, rufous-sided towhee, northwestern garter snake, western fence lizard,

Table IV.13: Habitats and representative wildlife species covered by this HCP for the west-side planning units *(continued)*

Type of habitat	Representative species that can use these habitat types
Shrub forest stage *(continued)*	northwestern salamander, western bluebird, Pacuvius' duskywing butterfly, satyr anglewing butterfly
Open sapling/pole forest stage	coast mole, Douglas' squirrel, mountain beaver, black-tailed deer, long-tailed weasel, coyote, blue grouse, rufous hummingbird, American robin, hermit thrush, rufous-sided towhee, western fence lizard, western bluebird, Phoebus parnassian butterfly, golden hairstreak butterfly, western tailed blue butterfly, bobcat, snowshoe hare
Closed sapling/pole/sawtimber forest stage	Douglas' squirrel, sharp-shinned hawk, Swainson's thrush, evening grosbeak, dusky shrew, long-legged myotis, mountain beaver, creeping vole, bobcat, elk, Vaux's swift, orange-crowned vireo, northern alligator lizard, rubber boa, long-toed salamander, *Cychrustuberculatus* (a carabid beetle), *Lobosoma horridum* (a weevil), *Omus dejeani* (a tiger beetle)
Large sawtimber forest stage	dusky shrew, long-legged myotis, northern flying squirrel, Pacific fisher, wood duck, hairy woodpecker, northern goshawk, barred owl, olive-sided flycatcher, hoary bat, bushy-tailed woodrat, red tree vole, red-breasted nuthatch, Dunn's salamander, northwestern salamander, Van Dyke's salamander, tailed frog, northern alligator lizard, coral hairstreak butterfly, pine white butterfly, California hairstreak butterfly, *Cychrus tuberculatus* (a carabid beetle), *Lobosoma horridum* (a weevil), *Omus dejeani* (a tiger beetle)

Table IV.13: Habitats and representative wildlife species covered by this HCP for the west-side planning units *(continued)*

Type of habitat	Representative species that can use these habitat types
Old-growth forest stage	Johnson's hairstreak butterfly, pine white butterfly, *Acalypta saudersi* (a lace bug), *Cychrus tuberculatus* (a carabid beetle), *Lobosoma horridum* (a weevil), *Omus dejeani* (a tiger beetle); and see list for spotted owl high quality nesting habitat

Provision of a Range of Forest Types Across the HCP Landscape

DNR management activities that will occur under the HCP will ensure a range of forest types in adequate amounts to provide for multi-species conservation across the landscape covered by the HCP. DNR has modeled the age-class distribution that will likely result from expected management under the HCP and existing policies. Results from this modeling have been used to develop a table (see Table IV.14) of expected percentages of each of several forest habitat/structural types, using age-class as a surrogate, that would likely exist 100 years following implementation of such management.

Table IV.14: DNR HCP stand structure objectives at year 100 (in percent of land area)

Stand Stage[1]	West-side Planning Units Excluding the OESF	OESF Planning Unit
Open (0-10 Years)[2]	5-10	5-15
Regeneration (10-20 years)[2]	5-15	5-15
Pole (20-40 years)[2]	15-25	5-15
Closed (40-70 years)[2]	25-35	5-15
Complex (at least 70 years)[2]	25-35	60-70
Fully Functional	(At least 150 years)	(At least 200 years)
(Subset of Complex)	10-15	10-15

[1]Stand stages are defined as:
Open- earliest seral stage, overstory has been removed; dominated by herbs and shrubs with some young conifer and deciduous trees present

Regeneration-shrubs and saplings, branches beginning to intertwine; dense canopies from ground-level upwards.

Pole - early stages of stem exclusion, stems closely spaced and numerous; little understory; limited self-pruning; and insufficient canopy lift to allow larger birds to penetrate

Closed - have undergone some stem exclusion and competition mortality; have achieved some canopy lift from self-pruning; have well-developed, deep canopies, and lacking complex structural characteristics of older types.

Complex - stocked with large trees with a variety of diameters and heights 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 opening in the canopy.

Fully Functional - a subset of complex forests but more mature and structurally complex.

[2]Age-classes shown are a surrogate for stand structure. If and when it can be shown that appropriate structure can be obtained at a different age, different age classes may be used.

The information in the above table was derived from modeling that contained assumptions based on the Forest Resource Plan policies. These assumptions are described in Appendix 5 of the Final EIS (available from DNR). The FRP states that the goal for average rotation age for west-side conifer dominated forests will be 60 years. At present, DNR expects to continue this policy and information regarding the average rotation age will be provided to the U.S. Fish and Wildlife Service and the National Marine Fisheries Service at scheduled inter-agency HCP reviews. However, as long as DNR can show that reaching the stand structure objectives is likely, other rotation ages may be used. Additionally, DNR maintains the flexibility to harvest specific stands at an earlier age to address specific silvicultural situations (i.e., a 30- to 35-year old stand that was not thinned at an appropriate age may be more quickly converted into a healthy, productive stand by clear-cutting the stand and "starting over").

Subsequent to the modeling exercise, DNR, the U.S. Fish & Wildlife Service and the National Marine Fisheries Service negotiated a 70-year term for this HCP, with provisions for up to three, 10-year extensions. (See the Implementation Agreement in Appendix B of this document.) Such exten-

sions could occur at DNR's option if commitments of the HCP are met at year 70, or at the U.S. Fish and Wildlife Service's option if commitments have not been met at year 70. Currently no projections are available for the forest structure expected at year 70. However, during the first year following approval of the HCP, additional modeling will be conducted by DNR. The modeling will be by decade and the results will be provided to the U.S. Fish and Wildlife Service at, or by, the first annual review. These decadal projections will be used by DNR as part of its monitoring process.

The projections for year 70 will be a part of the U.S. Fish and Wildlife Service's evaluation of whether DNR has met the commitments of the HCP at year 70. In that evaluation, the U.S. Fish and Wildlife Service will also review DNR's progress in meeting the conservation objectives included in Chapter IV of this HCP. DNR's HCP provides for the conservation of both listed and unlisted species. Detailed, specific conservation measures are described elsewhere in this chapter for the northern spotted owl and a long-term strategy will be developed for the marbled murrelet. Additional important, but more limited, measures will be described for certain other listed species. Conservation measures affecting the unlisted species include those undertaken for listed species with additional measures described for certain important habitat types. The most important conservation measures affecting unlisted species are those associated with the riparian conservation strategy.

Of the HCP's three primary conservation components (spotted owl conservation strategy, marbled murrelet conservation strategy, and riparian conservation strategy), the marbled murrelet strategy is the only one that is interim in nature. A long-term strategy will not be developed for a number of years. An adequate and appropriate means of evaluating commitments for the marbled murrelet at year 70 cannot be described, at this time, except in terms of compliance with the strategy described in Chapter IV.

The riparian conservation strategy will be implemented in the five west-side planning units and the OESF. DNR's compliance and effectiveness monitoring plan for the riparian areas should provide sufficient information for the U.S. Fish and Wildlife Service to determine whether commitments in this area have been met at year 70.

The spotted owl conservation strategy sets specific goals for developing and maintaining NRF and dispersal habitat in specific amounts and locations (by WAU). Approximately 200,000 acres are designated for a NRF habitat role and 125,000 of those acres (62.5 percent) are in WAUs that are already at or above the goals set in this HCP. The conditions in the WAUs that are not currently at or above the goal, will be reviewed by the U.S. Fish and Wildlife Service at year 70, when evaluating whether DNR has met its obligations under the HCP.

As described above, the 70 year term should be sufficient for all species based upon the anticipated habitats resulting from the HCP management strategies. Riparian areas and uncommon/special habitats (e.g., talus, caves, wetlands) are expected to provide improved wildlife habitat over the life of the plan. Older stand structures (i.e., structurally complex forests and fully functional forests) increase or remain constant when comparing the current conditions with those anticipated at the end of the permit period. Healthy riparian systems, mature forest with structure, and uncommon/special habitats comprise the major concerns regarding adequacy of habitats. Younger forests (between 40 and 70 years) will continue to be provided as a result of timber management. In addition, the long-term plan

for murrelets will be developed in consideration of the 70-year permit term to ensure its adequacy. Finally, as mentioned above in this section, the U.S. Fish and Wildlife Service and the National Marine Fisheries Service will review DNR's progress in meeting the conservation objectives and may require an extension of the HCP if it can be demonstrated that DNR failed to achieve the commitments of the HCP.

G. Conservation Assessments for Federally Listed Plant Species, Candidate Plant Species, and Plant Species of Concern

In general, the federally listed and proposed endangered and threatened plant taxa described below have very limited ranges and narrow habitat requirements and are restricted to very small areas. Because of these factors, it is anticipated that they can be effectively managed while meeting other land-management objectives. DNR maintains a database on these species, including both site-specific and species-specific information, that will be useful in locating and protecting known sites and potential habitat. However, no comprehensive inventories of these species exist for DNR-managed lands.

Federally Listed Plant Species

Brief statements about each species are provided below; additional information can be obtained from either the U.S. Fish and Wildlife Service's Endangered Species Office in Olympia or DNR's Natural Heritage Program.

ARENARIA PALUDICOLA

Swamp sandwort was historically known to occur in "swamps near Tacoma" but has not been seen or collected in Washington since the late 1800s. Reports from several other western Washington locations have been determined to be misidentifications. However, additional inventory in Washington is needed, primarily in wetlands within the Puget Lowlands. The only known extant site in the world is found in a brackish wetland in California. However, this species could occur in wetlands near the Pacific Coast, Willapa Bay, or Puget Sound. The HCP for the five west-side planning units and the OESF would likely provide better protection of this species' habitat because of their better overall wetland and riparian protections.

HOWELLIA AQUATILIS

Water howellia is an aquatic annual generally found in vernal ponds or portions of ponds in which there is a significant seasonal draw down of the water level. All known ponds have a deciduous tree component around their perimeters; most have conifers as well. The species is currently known to occur in Washington, Idaho, and Montana. In Washington, it has been found in Clark, Pierce and Spokane Counties. Historically it was also known to occur in Thurston and Mason Counties, as well as in Oregon and California. There has been no inventory of water howellia on DNR-managed lands, but if water howellia does occur in the planning area, then the HCP would reduce adverse effects because it offers better overall wetlands protection.

LOMATIUM BRADSHAWII

Bradshaw's lomatium was thought to be endemic to the Willamette Valley in Oregon until 1994, when it was discovered in Clark County, Washington. The one site in Washington is a seasonally flooded wetland dominated by grasses, sedges and rushes. As far as is now known within the HCP planning area, this species is restricted to wetlands in flood-plain habitats at low elevations in the Columbia Planning Unit. Although not known to occur on DNR-managed lands, some DNR-managed lands may provide potential habitat. The HCP provides better protection of this species' habitat because

of its better overall wetland and riparian protections. The OESF would have no effect, as the species is not known or expected to occur in the planning unit.

SIDALCEA NELSONIANA

Nelson's checkermallow was also thought to be restricted to Oregon until relatively recently. There are known sites in Cowlitz and Lewis counties, Washington. These sites are in low elevation, moist meadows within the South Coast and Columbia HCP planning units. These sites may qualify as wetlands. There is a limited amount of DNR-managed land that contains suitable habitat. There is expected to be no change regarding the effects of management on this species due to its restriction to open, moist meadow habitats.

Plant Species Proposed for Federal Listing

CASTILLEJA LEVISECTA

Golden paintbrush occurs from Thurston County northward to Vancouver Island. Historically it was also known to occur in the Willamette Valley in Oregon and in Clark County, Washington. The species is restricted to grasslands and areas dominated by a mixture of grasses and shrubs. Although this species occurs in grasslands, it could be affected by timber harvest through road building, yarding, or decking logs on adjacent grasslands. Where conifers invade *C. levisecta* habitat, the removal of trees is beneficial to the species. There are only 10 known sites with *C. levisecta* in the world, eight of which are in Washington and one of these is a DNR-managed natural area preserve. All sites are quite small in area and are subject to a variety of threats, the most serious of which is the invasion by a mixture of Douglas-fir, Scot's broom, blackberries, and roses. It is not known to occur, nor is it expected to occur within the OESF. There is little to no DNR-managed land adjacent to sites that harbor this species. The HCP is not expected to have any effect on this species.

Federal Candidate Plant Species

There is one vascular plant species that is a candidate for listing (as of February 1996) under the federal ESA which is known to occur, or is reasonably suspected of occurring, within the HCP planning area. Additional information about this species can be obtained from DNR's Natural Heritage Program.

SIDALCEA OREGANA VAR. CALVA

This taxon is restricted to the Chelan Planning Unit. It may occur on DNR-managed forest land. It can occur along small riparian areas and some of the sites would qualify as wetlands. The HCP can be expected to provide better protection due to the overall better riparian zone and wetlands protections. The OESF would have no effect since the taxon is not known or expected to occur on the OESF.

Plant Species of Concern

There are a number of vascular plant taxa that are species of concern to the U.S. Fish and Wildlife Service (as of February 1996) which are known to occur, or are reasonably suspected of occurring, within the HCP Planning Area. Additional information about these species can be obtained from DNR's Natural Heritage Program.

ABRONIA UMBELLATA SSP. ACUTALATA

This taxon is thought to be extirpated from the state of Washington. The historic locations were coastal sand dunes. Timber management under the HCP and OESF would have no effect.

ARTEMISIA CAMPESTRIS SSP. BOREALIS VAR. WORMSKIOLDII

This taxon is restricted to areas immediately adjacent to the Columbia River in Grant and Klickitat counties. The areas do not support conifers and are far enough removed from DNR forest management that management activities are not likely to have any impact.

ASTER CURTUS

This taxon is restricted to grassland habitats in the lowlands of the Puget trough. It may occur in grasslands adjacent to DNR-managed forest land. It is not known nor expected to occur on the OESF. Because the plant is generally restricted to nonforested habitats, the HCP and the OESF are expected to have little effect on this species.

ASTRAGALUS AUSTRALIS VAR. OLYMPICUS

This taxon is restricted to relatively high elevations in the northeastern portion of the Olympic Peninsula. It is only known to occur in the Olympic National Park and Olympic National Forest.

ASTRAGALUS PULSIFERAE VAR. SUKSDORFII

In Washington, this taxon is restricted to the Klickitat Planning Unit and occurs in somewhat open ponderosa pine stands with a relatively sparse understory. The one known site of *A. pulsiferae* on DNR-managed land is within a designated dispersal habitat management area. Higher harvest levels may provide better habitat protection for this taxon than lower harvest levels. However, increased harvest levels may not be a recommended method for enhancing the habitat for this taxon; prescribed burns, or allowing natural fires to burn, would likely be a preferable method. The OESF would not be affected, as the taxon is not known or expected to occur there.

ASTRAGALUS SINUATUS

This taxon does not occur within the HCP Planning Area. It is restricted to a very small range east of the planning area in Chelan County.

BOTRYCHIUM ASCENDENS

This taxon appears to have a fairly broad ecological amplitude and wide geographic range. However, there is insufficient information available regarding its response to timber harvest activities to evaluate the HCP and its effects.

CALOCHORTUS LONGEBARBATUS VAR. LONGEBARBATUS

In Washington, this taxon is restricted to the Klickitat Planning Unit. It could occur on DNR-managed lands. It occurs primarily in open grasslands, but occasionally extends into open forest stands. Within the Yakama Indian Reservation, it can be found within harvested units and along roadway openings. Although this taxon could benefit from timber harvest in areas adjacent to meadow openings, it is anticipated that there will be no change regarding the effects of management on this species. The OESF will have no effect since the taxon is not known or expected to occur on the OESF.

CASTILLEJA CRYPTANTHA

This taxon does not occur and is not expected to occur, on DNR-managed lands within the HCP Planning Area. It is restricted to subalpine and alpine meadows around the northern perimeter of Mt. Rainier.

CIMICIFUGA ELATA

This taxon occurs in DNR Dispersal management areas and potentially within NRF management areas. The taxon occurs within the North Coast, Straits, South Puget, South Coast, and Columbia planning units. The HCP is expected to be beneficial due to the lower timber harvest levels in NRF and Dispersal management areas. The OESF would have no effect, since the taxon is not known or expected to occur on the OESF.

CORYDALIS AQUAE-GELIDAE

This taxon occurs primarily along Types 3 through 5 waters, including small seeps, and is restricted to the Columbia Planning Unit. It could occur on DNR-managed lands. The HCP is expected to provide better protection due to the overall better riparian zone protections.

CYPRIPEDIUM FASCICULATUM

This taxon occurs within a variety of coniferous stands within the Klickitat, Yakima, and Chelan planning units. It could occur on DNR-managed lands. There is insufficient information available regarding this species' response to timber harvest activities to evaluate the HCP and its effects.

DELPHINIUM LEUCOPHAEUM

This taxon is essentially a grassland species and is restricted to the South Coast Planning Unit. It could occur on DNR-managed lands. The HCP is expected to have no effect on this species. The OESF would have no effect since the taxon is not known or expected to occur on the OESF.

DELPHINIUM VIRIDESCENS

This taxon is restricted to the Chelan and Yakima planning units. It may occur on DNR-managed lands. It can occur along small riparian areas and some of the sites would qualify as wetlands. The HCP can be expected to provide better protection due to the overall better riparian zone and wetlands protections. The OESF is expected to have no effect since the taxon is not known or expected to occur on the OESF.

DODECATHEON AUSTROFRIGIDUM

In Washington, this taxon is currently known only to occur in the Mt. Colonel Bob Wilderness Area of the Olympic National Forest. However, in Oregon it is known to occur in lower elevation riparian areas. The HCP and the OESF would presumably provide better protection due to overall better riparian zone protections.

ERIGERON HOWELLII

In Washington, this taxon is restricted to the Columbia Planning Unit. It generally occurs in open areas. Canopy removal is not expected to have a negative impact, but ground-disturbing activity might. There is insufficient information to analyze how the HCP would affect this species. The OESF would have no effect since the taxon is not known or expected to occur on the OESF.

ERIGERON OREGANUS

In Washington, this taxon is restricted to the Columbia Planning Unit. It occurs within owl dispersal habitat; however, it is found primarily on exposed rock. Canopy removal will not generally have a negative impact. There is probably no change regarding the effects of management on this species. The OESF would have no effect since the taxon is not known or expected to occur on the OESF.

FILIPENDULA OCCIDENTALIS

In Washington, this taxon is restricted to river and creek banks in southwest Washington, in the Columbia and South Coast HCP planning units. Some DNR-managed land is relatively close to known sites for this taxon. It is expected that the HCP could provide more protection because of its better riparian protections. The deferrals and protections for the marbled murrelet provided by the HCP could also benefit this species. The OESF would have no effect since the taxon is not known or expected to occur on the OESF.

HACKELIA VENUSTA

This taxon is restricted to the Chelan Planning Unit. All known sites are on U.S. Forest Service lands. Some DNR-managed land occurs within the range of this species. Canopy removal would not have a negative impact and in fact might be beneficial. However, ground-disturbing activities could have a negative impact. At present, there is insufficient data to analyze the HCP and its potential effects on this species.

LATHYRUS TORREYI

This taxon was thought to be extirpated from the state of Washington. The historic locations were scattered in Clark and Pierce counties. The only extant site is at McChord Air Force Base, where it inhabits a mature conifer stand with an open understory. Timber management on DNR-managed lands under the HCP and OESF is unlikely to have an adverse effect.

LOMATIUM SUKSDORFII

In Washington, this taxon is restricted to the Klickitat Planning Unit. It may occur on DNR-managed lands. It can occur within riparian areas, but it is not restricted to such areas. It occurs on slopes that may support scattered individual conifers, on the edges of conifer stands, or in stand openings. There is likely no change regarding the effects of management on this species. The OESF would have no effect since the taxon is not known or expected to occur on the OESF.

LOMATIUM TUBEROSUM

This taxon is restricted to talus slopes, mostly in nonforested areas, although there can be trees adjacent to the talus. Conservation measures for talus slopes will benefit this species. Within the HCP Planning Area, this taxon is known only to occur within the Yakima Planning Unit.

LUPINUS SULPHUREUS VAR. KINCAIDII

This taxon is essentially a grassland species and, in Washington, is restricted to the South Coast Planning Unit. It is unlikely to occur on DNR-managed lands. The HCP is expected to have no effect on this species. The OESF is expected to have no effect since the taxon is not known or expected to occur on the OESF.

MECONELLA OREGANA

This taxon occurs in grasslands, sometimes adjacent to forested areas, although generally in somewhat savannah-like conditions. It is expected that there would no change regarding the effects of management on this species. The OESF would have no effect since the taxon is not known or expected to occur on the OESF.

MIMULUS JUNGERMANNIOIDES

This taxon was historically known to occur in the Klickitat Planning Unit, but is currently thought to be extirpated from the state of Washington. It is restricted to seepage areas in exposed basalt. It is unlikely to occur on DNR-managed lands. The HCP is not expected to have any impact on this taxon. The OESF would have no effect since the taxon is not known or expected to occur on the OESF.

PENSTEMON BARRETTIAE

This taxon occurs primarily on exposed basalt in Washington and is known to occur only in the Klickitat Planning Unit. It may occur on DNR-managed lands. It may occur within riparian areas, although it is not restricted to riparian areas. There is expected to be no change regarding the effects of management on this species. The OESF would have no effect since the taxon is not known or expected to occur on the OESF.

PETROPHYTUM CINERASCENS

This taxon is within the very eastern edge of the Chelan Planning Unit. In fact, it is restricted to rock outcrops adjacent to the Columbia River.

RANUNCULUS RECONDITUS

This taxon is known to occur in Klickitat County, but not within the HCP planning area.

RORIPPA COLUMBIAE

This taxon is restricted to the immediate shores of the Columbia River and islands in the Columbia River along the Hanford Reach and in Skamania County. No DNR-managed lands are known to harbor this species and timber management under the HCP is not expected to have an impact.

SILENE SEELYI

This taxon is restricted to cracks in exposed rock in a small portion of the Chelan, and maybe the Yakima, planning units. Although it is not known to occur on DNR-managed lands, some DNR-managed lands are in close proximity to known locations for this species. The species is probably not affected to any great degree by canopy removal. It is expected that there would be no change regarding the effects of management on this species.

SISYRINCHIUM SARMENTOSUM

In Washington, this taxon is restricted to the Klickitat Planning Unit. It may occur on DNR-managed lands. It occurs in moist meadows and small forest openings, and it may be occur in riparian and/or wetland areas. The HCP can be expected to provide better protection due to the better riparian and wetland protections. The OESF would have no effect since the taxon is not known or expected to occur on the OESF.

SULLIVANTIA OREGANA

In Washington, this taxon is known to occur only in the Columbia Planning Unit and occurs within waterfall spray zones and seepage areas. A site with *S. oregana* is located in a DNR-managed natural area preserve, and other sites may occur in DNR-managed parcels adjacent to the preserve. The HCP is expected to provide better protection because of its better riparian and wetland protections The OESF would have no effect since the taxon is not known or expected to occur on the OESF.

TAUSCHIA HOOVERI

This taxon is restricted to lithosolic, nonforested habitats. It is known to occur on DNR-managed land. It occurs mostly east of the HCP Planning Area, although some sites are within the Yakima and perhaps the Klickitat planning units.

TRIFOLIUM THOMPSONII

This taxon is known to occur only in the Chelan Planning Unit. It is a grassland species, but it also occurs on the edge of forest stands. Fire is important in maintaining its habitat. This species is known to occur on DNR-managed lands. There is expected to be no change regarding the effects of management on this species. The OESF would have no effect since the taxon is not known or expected to occur on the OESF.

H. Forest Land Management Activities

Introduction

This section describes common forest practices that will occur during the first decade on DNR-managed lands in the area covered by the HCP. Ranges of the level of the various activities are estimated. Some forest management activities described herein reflect the silvicultural regimes used in the harvest simulator model that projected estimates of harvest levels for DNR-managed lands under the HCP[1]. Other forest management activities described are not part of those silvicultural regimes used for harvest calculations but are important elements of forest management under the HCP.

The level of activity estimated in this section should not be confused with the minimization and mitigation required in the HCP. Rather, these forest management activities will be used to achieve the habitat goals that constitute the minimization and mitigation under the HCP as well as to increase the productivity and value of forest products from DNR-managed lands in the area covered by the HCP.

The ranges of activity level (summarized in Table IV.15 at the end of this section) are based upon (1) historical levels, (2) estimates of activity required to achieve conservation objectives in the harvest simulator model, (3) evaluation of current criteria for selecting potential forest stands for various silvicultural treatments, and (4) estimates from DNR Regions of the level of activity that could occur operationally over the next decade. Harvest calculations are based upon typical silvicultural regimes, estimated to achieve the habitat objectives described in the conservation strategies as well as to increase the commercial productivity of DNR-managed lands in the area covered by the HCP.

However, it is neither practical nor prudent to commit to specific levels of silvicultural practices as part of this HCP. Optimizing silvicultural investments is a process that is ongoing and subject to site-specific evaluation of alternatives for limited management fund investments.

Forest land management activities on DNR-managed lands will be guided by the various applicable state and federal regulations, DNR policies such as the Forest Resource Plan of 1992, and the provisions of this plan and the incidental take permit. These guiding regulations and policies shape DNR's forest land management priorities and budget. The priorities, pace, and level of activity will depend upon, among other things, the level of budget available.

The discussion in this section describes first, activities common to all planning units and then, those specific to each of the three major planning areas covered by the HCP: the east-side planning units, the five west-side planning units, and the Olympic Experimental State Forest (OESF) Planning Unit, as defined in the section in Chapter I titled Organization of the Planning Area. (See also Map I.4.)

Activities Common to All Planning Units

Many forest land management activities are common to all of the planning areas. Management of special use areas such as Natural Resource Conservation Areas, Natural Area Preserves, DNR-managed recreation sites and other public use areas will continue under current policies and regulations.

[1] DNR projected harvest levels based on the HCP conservation strategies, using a set of forest regimes to model stand growth. These projections were presented to the Board of Natural Resources on October 10, 1996

LANDSCAPE PLANNING

DNR expects landscape planning to be part of the process for implementing conservation strategies on DNR-managed lands in the permit area. DNR's Forest Resource Plan of 1992 (Policy No. 16, p. 30) established landscape planning as a management approach. While the landscape planning process described in the Forest Resource Plan will be an ongoing process, only a few plans will be completed at the time the HCP is implemented. However, landscape assessments utilizing the concepts of landscape planning can be useful and successful at many levels. For example, a plan based on a landscape assessment can be as simple as a computerized geographic information system report that displays resource information that indicates forest stands available for various silvicultural activities, or as complex as a detailed documentation of the physical, natural, and cultural resources along with a specific schedule of activities through time to reach highly focused, multiple objectives.

During the first decade of the permit, DNR will base management of forest lands in the permit area on some level of landscape assessment in designated dispersal and nesting, roosting, and foraging areas. The priority and complexity of landscape assessment will depend upon the needs of DNR and availability of budget. The most efficient and precise application of the conservation strategies will be accomplished through landscape planning.

RESOURCE INFORMATION

In order to apply the conservation strategies efficiently, accurate updated information will be required. Forest resource information in the permit area will be continually updated, verified, and documented during the first decade of the permit.

Activities carried out on DNR-managed lands that change the forest condition, such as road building, harvesting, precommercial thinning and reforestation, will be tracked and documented in DNR's geographic information system.

DNR intends to finish its new Forest Resource Inventory during the first decade of the permit. The Forest Resource Inventory will provide, for the first time, computerized information on various forest structures important for wildlife conservation, such as snags, vegetative ground cover, and certain noncommercial plant species.

Field verification of habitat will occur as a part of landscape planning during the first decade of this permit. Current conditions will be verified for designated nesting, roosting, and foraging habitat and dispersal habitat for spotted owls. Changing habitat conditions over time will be tracked.

LAND REPOSITIONING

Land transactions are carried out to increase the asset value of the trusts or to move lands into more appropriate use, such as parks, Natural Area Preserves, or Natural Resource Conservation Areas, with compensation to the trusts. Over the last decade, an active era for land transactions, DNR disposed of about 259,000 acres and acquired about 234,000 acres. DNR will continue to pursue land repositioning in order to meet these objectives at a level that will meet the needs of the trusts. The rate of land transactions will be influenced by opportunity and funding. (See the Implementation Agreement.) Land transactions are not expected to increase the level of take for any species covered by the incidental take permit. DNR commits to maintaining the conservation objectives described in Chapter IV of the HCP in the course of its land disposition program, as outlined in the

Implementation Agreement. In the event that a land disposition increases the level of take, or if land disposed of by DNR does not remain subject to the HCP and the cumulative impact of the disposition would have a significant adverse effect on a particular species, DNR will follow the process for making a major amendment to the HCP and the Incidental Take Permit as outlined in the Implementation Agreement. The land transaction program is not intended to alter DNR's obligations for mitigation as set forth in this HCP.

NONTIMBER RESOURCES

All planning units will continue to be managed for nontimber resources, guided by applicable regulations, DNR policies such as the Forest Resource Plan of 1992, and the conditions of the HCP and the permit. DNR markets nontimber resources that include but are not limited to road use permits, sand and gravel sales, sales of special forest products such as boughs and brush, prospecting leases and mining contracts, oil and gas leases, grazing permits and leases, electronic site leases, and other special permits, licenses, sales, and leases. At the 1996 level of these activities, no take, or insignificant (i.e., *de minimis*) take is occurring. Beginning no later than January 1, 1999, new/renewed permits, contracts, or leases for such activities will include the commitments of the HCP, such that they will not increase the level of take beyond a *de minimis* level. The level of impact resulting from these activities will be reviewed by DNR and the U.S. Fish and Wildlife Service and National Marine Fisheries Service during the annual meetings as described in subsection 16.2b of the Implementation Agreement. DNR will monitor the level of such activities and provide this information to the U.S. Fish and Wildlife Service and National Marine Fisheries Service prior to their annual meetings.

Many nontimber resource activities are subject to review under SEPA (WAC 197-11). Except for those actions that are categorically exempt (WAC 197-11-800), other government agencies and interested parties are notified of proposed actions as required by SEPA. As a matter of course, DNR notifies the Washington Department of Fish and Wildlife, Washington Department of Ecology, and the appropriate county and tribal governments. Government agencies and interested parties are notified by issuing either a determination of nonsignificance, a mitigated determination of nonsignificance, a public scoping notice, or a draft EIS. Agencies and interested parties can comment on and appeal the findings of the SEPA determination.

Current DNR nontimber resource uses are described, including the current level of each activity, below:

Rights-of-way - Policy No. 26 of the Forest Resource Plan addresses granting public rights-of-way. It says:

> "The department will grant rights of way to private individuals or entities when there is an opportunity for enhancing trust assets and when detriments are offset."

Easements for rights-of-way are granted for roads, powerlines, and pipelines. During the 9-year period between 1983 and 1991, approximately 2,100 rights-of-way were issued. These involved approximately 105 miles of new road construction and removed approximately 2,500 acres from timber production. Typically, these roads are part of the same road network used for forest management and would be subject to the same conservation measures for design, construction, use, maintenance, and abandonment described in the HCP. Large powerline and pipeline rights-of-way are subject to review under SEPA.

DNR has adopted the following SEPA policy for granting rights-of-way (WAC 332-41-665):

> "Recognizing that construction and/or reconstruction under upland right of way grants can create adverse impacts to the elements of the environment, it is the policy of the department to condition grants where necessary:
>
> (i) to protect all surface resources including but not limited to soil and water, through authorized right of way operation on public lands, and to cause rehabilitation or reestablishment on a continuing basis the vegetative cover, soil stability, and water condition appropriate to intended subsequent use of the area;
>
> (ii) to meet air quality standards; and
>
> (iii) to protect recreational and special use areas under lease by requiring mitigating action."

Special Forest Products - Policy No. 8 of the Forest Resource Plan addresses special forest products. It says:

> "The department will encourage and promote the sale of special forest products where appropriate and will market them in a manner consistent with the overall policies of this plan."

WESTERN GREENS — (salal, beargrass, huckleberry, rushes, ferns, mosses)
Currently there are approximately 65 leases covering 30,000 acres (average 460 acres/lease) and 240 one-year individual, nonexclusive permits for designated blocks of DNR-managed land. Over the term of the HCP, it is expected that individual permits will slightly increase and the amount of leased acreage will decrease. The long-term decrease in leased acreage is projected from the current trend in decreasing the U.S. share of the international market in floral greens. Collection of branches from salal, evergreen huckleberry, and ferns is a self-limiting process because only part of the foliage of any plant meets commercial quality standards. Thus, harvesting practices result in retention of most of the plant, and consequently a photosynthetic base for the regeneration of new foliage (Amaranthus and Pilz 1996). No significant environmental damage has been observed as a result of DNR leases, though no formal assessment has been conducted. The long-term ecological effects of floral green collection are unknown. Monitoring of such activities would allow for adjustment of lease conditions should adverse environmental impacts be documented. Collection of moss has potential negative environmental impacts (FEMAT 1993). Collection of moss from DNR-managed lands is not currently a large program. Should this situation change, however, some monitoring of effects of moss collection and/or regulation of moss collection may be needed. Leases for brush picking are categorically exempt from SEPA review (WAC 197-11-800). Actions or activities that are categorically exempt are those that would not normally have significant adverse environmental impacts. An action or activity that is categorically exempt may be subject to review under SEPA if it occurs in an environmentally sensitive area. For example, a categorically exempt action occurring in a wetland or in an area with a state listed species may be subject to review under SEPA.

CHRISTMAS GREENS — (cut noble fir, silver fir, white pine, red cedar, and Douglas fir boughs)

There are 14 current 1- to 3-year sales involving 9,000 acres total and three, 10-year leases involving 3,000 acres total. Additionally, small volumes under $1,000 in value and involving less than 1,000 acres are permitted to approximately 15 individuals or small companies per year. A determination of nonsignificance was issued under SEPA for the collection of Christmas greens.

MUSHROOMS

No commercial harvesting is allowed. Recreational harvesting is allowed with restrictions on quantity. Recreational harvest is limited to 3 gallons per person per day of a single species and no more than 9 gallons per person per day total. Compliance is not currently monitored and some commercial-scale harvest may be occurring on DNR-managed lands. Most mushroom harvesting on DNR-managed lands occurs in the South Puget Sound Planning Unit, with some occurring on the Olympic Peninsula and in the western portion of the Klickitat Planning Unit. Individual commercial permits are currently under consideration. Over the term of the HCP, it is expected that harvest from the wild will increase. It is likely that access to lands for mushroom collection will diminish due to road closures. Mushroom collection does not appear to occur very distant from roads. Most edible mushrooms are the fruiting bodies of ectomycorrhizal fungi, which play important roles in forest ecosystem processes, including providing forage for northern flying squirrels, which are an important prey item of spotted owls. The long-term ecological effects of mushroom collection are unknown (FEMAT 1993). No environmental impact assessment of mushroom collection has been conducted specifically on DNR-managed lands. It is thought that the highest potential for negative damage to the resource could come from disruptive collection methods such as raking (Amaranthus and Pliz 1996). This type of collection method has not been widely observed on DNR-managed lands. Monitoring of mushroom collection levels and utilization of any relevant research on the ecological effects of mushroom harvesting would assist in HCP implementation.

CHRISTMAS TREES

There are currently 5 leases to grow Christmas trees on DNR-managed lands covering less than 600 acres. All current leases expire within the next 8 years. It is not expected that this program will expand in the future, and may be eliminated altogether due to lack of market demand. Leases for Christmas tree harvesting are categorically exempt from SEPA review (WAC 197-11-800).

MEDICINALS

DNR is not involved in any medicinal research or management at this time. There are 1 to 2 small-value annual permits (for example, cascara bark).

FIREWOOD

The Revised Code of Washington (RCW 76.20) requires that DNR offer free firewood, up to 6 cords per person per year, and authorizes direct sales and bid/auction sales. In most Regions, demand for free personal use firewood is greater than supply. The Regions make available what they can and there is no estimate available for the amount of material removed or the acreage involved. Wood collected as personal use firewood is generally down logs located near roads or landings. Over the course of the HCP, it is expected that firewood removal will decrease due to more restrictions on woodstove use in urban areas and concerns for wildlife and biomass loss. At present, licenses or approvals for firewood removal are categorically exempt from SEPA review (WAC 197-11-800).

Valuable Material Sales- Sand and gravel sales are handled under sale contracts. Current contracts cover approximately 30 to 40 acres each and total less than 1,000 acres. Most commercial contracts do not apply to forested areas. However, 15 to 20 commercial contracts are in forested areas, including some smaller pits that are primarily for DNR use but from which occasional loads are sold to other forest land managers. If the sand or gravel material is sold, then the activity is subject to review under SEPA, and the purchaser is responsible for obtaining all necessary permits. DNR has adopted a SEPA policy for surface mining (WAC 332-41-665), described below, that applies to sand and gravel mines which are subject to SEPA.

Water quality in the vicinity of sand and gravel mines is protected through the National Pollutant Discharge Elimination System Permit Program (NPDES) (WAC 173-220). The Washington Department of Ecology administers this program and issues NPDES permits only to facilities that can meet the surface and groundwater standards described in WAC 173-201A and WAC 173-200, respectively.

The purchaser must file a plan of operations that is reviewed by the DNR administrative Region. Under the HCP, the plan of operations would be reviewed to ensure compliance with the commitments of the HCP. Exploration holes drilled on DNR-managed land in search of sand and gravel deposits are plugged and the site restored. For example, if the site was used for timber production before exploration, then, where feasible, the site is restored for continued timber production. The reclamation of surface mines, excluding those used for on-site forest road construction or maintenance, is regulated by the Surface Mining Act (RCW 78.44), which is enforced by DNR.

Prospecting Leases/Mining Contracts - A mineral prospecting lease permits the lessee to prospect for metallic and industrial (nonmetallic) minerals. The lease must be converted to a mining contract before mine development or operations commence. There are 13 existing leases in the HCP Planning Area. Most prospecting leases are 500 to 600 acres. Activities conducted under mineral prospecting leases are exempt from SEPA requirements, unless it is determined that a specific activity needs to undergo a SEPA review. The lessee is responsible for obtaining all necessary permits, although there are limited permits required for exploration. Before any surface disturbing work is conducted on a leased area, the lessee must file a plan of operations that is reviewed by the DNR administrative Region. Under the HCP, the plan of operations would be reviewed to ensure compliance with the commitments of the HCP. Exploration holes drilled on DNR-managed land in search of mineral deposits are plugged and the site restored. Roads may be constructed during mineral exploration. Typically, these roads are part of the same road network used for forest management and would be subject to the same conservation measures for design, construction, use, maintenance, and abandonment described in the HCP.

There are 17 mining contracts in the HCP Planning Area, but there are no active open-pit metallic or open-pit industrial mineral mines or underground mines on DNR-managed land. The only activity occuring under these contracts is exploration. Conversion of a mineral prospecting lease to a mining contract requires a phased review under SEPA. This review is phased since the location and scope of future activities is not known. An EIS may be required if large-scale mining is contemplated. DNR has adopted the following SEPA policy for surface mining (WAC 332-41-665):

"To provide that the usefulness, productivity, and scenic values of all lands and waters involved in surface mining within the state will receive the greatest practical degree of protection and restoration, the following aspects of surface mining may be conditioned:

(i) Proposed practices to protect adjacent surface resources;

(ii) Specifications for surface gradient restoration to a surface suitable for the proposed subsequent use of the land after reclamation is completed, and proposed method of accomplishment;

(iii) Matter and type of revegetation or other surface treatment of disturbed areas;

(iv) Method of prevention or elimination of conditions that will create a public nuisance, endanger public safety, damage property, or be hazardous to vegetative, animal, fish, or human life in or adjacent to the area;

(v) Method of control of contaminants and disposal of surface mining refuse;

(vi) Method of diverting surface waters around the disturbed areas;

(vii) Method of restoration of stream channels and stream banks to a condition minimizing erosion and siltation and other pollution."

Any mining activities would comply with the commitments of the HCP.

Water quality in the vicinity of underground and open pit mines is protected through the NPDES Permit Program (WAC 173-220). The Washington Department of Ecology administers this program and issues NPDES permits only to facilities that can meet the surface and groundwater standards described in WAC 173-201A and WAC 173-200, respectively.

Metals mining and milling is regulated by the Metals Mining and Milling Operations Act (RCW 78.56), which is mainly enforced by the Washington Department of Ecology. An EIS is required for any proposed metal mining and milling operation. Any tailings facility must be designed to prevent the release of pollution and a waste rock management plan that emphasizes pollution prevention must be approved by the Washington Department of Ecology (RCW 78.56.100). In Washington, there is a moratorium on the use of heap leach extraction processes and a prohibition on in situ extraction processes (RCW 78.56.160).

Another type of mining that could occur on DNR-managed forest land over the term of the HCP is placer mining. There are no commercial placer mines on DNR-managed forest lands, nor are there any commercial placer prospecting leases or mining contracts. But, recreational placer mining is growing in popularity. Recreational prospecting permits are issued by DNR (RCW 79.01.651). DNR establishes the rules for the location, equipment, methods, and other appropriate permit conditions of recreational prospecting on DNR-managed lands. Commercial placer prospectors and miners must obtain a hydraulic project approval permit from the Washington Department of Fish and Wildlife (WAC 220-110), a NPDES permit from the Washington Department of Ecology, a permit from the U.S. Army Corps of Engineers, and the action is subject to review under SEPA.

Oil and Gas Leases - There are approximately 77 existing leases and most are in the Puget Sound lowlands. Some are small leases but most leases cover full legal sections. The total acreage affected by all oil and gas leases is approximately 20,000 to 25,000 acres. Much oil and gas exploration is accomplished through a process known as "thumping." Thumping is the measurement of seismological tremors caused by the dropping of extremely large weights or the detonation of explosives. Exploration may also be acomplished through drilling. The on-site operations of exploratory wells can generally be contained in 5 acres or less. Historically, surface disturbance on these sites has been minimal. Only two wells have been drilled on DNR-managed land. One of these wells is currently being used for active exploration, and the other well has been abandoned and plugged. No oil or gas is currently produced on DNR-managed land. In fact, no oil or gas is currently produced in the state of Washington. All oil and gas leases go through a phased review under SEPA before the parcel is auctioned.

Potential adverse impacts of exploration for and extraction of oil and gas on air and water are regulated by the Washington Department of Ecology. Water quality in the vicinity of underground and open pit mines is protected through the NPDES Permit Program (WAC 173-220). The Washington Department of Ecology administers this program and issues individual permits only to facilities that can meet the surface and groundwater standards described in WAC 173-201A and WAC 173-200, respectively.

Oil and gas wells are regulated through the Oil and Gas Conservation Act (RCW 78.52) which is enforced by DNR. Sufficient safeguards to minimize hazards of pollution of all surface and ground waters is required. If acceptable safeguards cannot be provided, then a drilling permit is is not issued (RCW 78.52.125). Exploration holes drilled in search of oil or gas deposits must be plugged in a manner as to prevent the pollution of fresh water supplies (RCW 78.52.150). DNR would also require that the site be restored. For example, if the site was used for timber production before exploration, then, where feasible, the site would be restored for continued timber production.

Because the location and scope of eventual activities are not known, the initial SEPA review does not include details (i.e., the management of riparian zones), but subsequent phased reviews would occur if and when additional activities are planned, and the depth of the review would depend on the activities planned. Before any surface disturbing work is conducted on a leased area, the lessee must file a plan of operations that is reviewed by the DNR administrative Region. Under the HCP, the activities would be reviewed to ensure compliance with the commitments of the HCP. Roads may be constructed during oil and gas exploration or extraction. Typically, these roads are part of the same road network used for forest management and would be subject to the same conservation measures for design, construction, use, maintenance, and abandonment described in the HCP. Oil or gas produced at a well site may be transported by truck or by pipeline. Pipeline construction is also subject to SEPA review.

Grazing Permits - There are approximately 15 permit and 6 leased ranges located in Yakima and Klickitat counties (approximately 100,000 acres) and the Methow Valley (approximately 5,000 acres). Grazing occurs only on DNR-managed lands east of the Cascade crest where DNR is not applying for unlisted species agreements.

Electronic Site Leases - There are 427 leases with 100 sites, totaling 106 acres, currently extant. Hence, electronic sites average only about 1 acre in

size. Approximately 80 percent of the sites are on non-forested mountain tops and the remaining 20 percent are on second-growth highway corridors. Roads are constructed to access electronic sites, but these roads are part of the same road network used for forest management and would be subject to the same conservation measures for design, construction, use, maintenance, and abandonment described in this HCP. Occasional disturbance to wildlife may occur during periodic visits for maintenance and improvements. On DNR-managed lands the impacts of electronic site leases relative to the impacts of timber management are *de minimus*.

Recreational Sites - Policy No. 29 of the Forest Resource Plan addresses recreation on state forest lands. It says:

> "The department will allow recreation on state forest land when compatible with the objectives of the Forest Resource Plan. As part of its efforts, the department will continue to comply with the Statewide Comprehensive Outdoor Recreation Plan."

There are approximately 150 total sites, most affecting less than 20 acres, and 2 to 3 large (300 to 600 acres), leased sites. Acreage by DNR administrative Region: Olympic = 141 acres, Central = 696 acres, South Puget Sound = 315 acres, Southwest = 159 acres, Northwest = 515 acres, Northeast =783, and Southeast = 630 acres. Total area of recreational sites is 3,239 acres. Many, if not most, recreational sites have been built in riparian areas. Under the HCP, future development of recreation sites would adhere to the riparian conservation strategy. (See HCP Chapter IV.D.) Recreational activities conducted in DNR-managed forests include hiking, biking, horseback riding, skiing, off-road vehicle use (e.g., motorcycles, snowmobiles, 4-wheel drive trucks), and camping. Some trails, including those used by off-road vehicles, are located within riparian areas. DNR is concerned about damage to aquatic resources caused by recreational activity in high use areas, and has undertaken a program in the Tahuya State Forest to develop and monitor measures that will mitigate these impacts. In general, on DNR-managed lands the impacts of recreational activity relative to the impacts of timber management are *de minimus*.

TRANSPORTATION SYSTEM MANAGEMENT

DNR prioritizes transportation system management by activities such as storm damage repair, current use for commercial hauling of forest products, and public use. Use is regulated through blockage, where practical, and through restricted use agreements with the Washington Department of Fish and Wildlife, tribes, and others. Regular maintenance and replacement activities are scheduled to accommodate access and use needs.

New road construction may occur in conjunction with timber sale activity and other land management needs. Construction decisions will be consistent with mitigation and conservation strategies in the HCP. Reasonable expectations for new, permanent road construction during the first decade are for between 50 and 100 miles in the east-side planning units, 700 and 800 miles in the five west-side planning units, and 80 and 100 miles in the OESF.

PUBLIC USE

Public use of DNR-managed forest lands in the permit area will continue to be guided by applicable regulations and DNR policies. Within this framework, public use may occur at designated sites or in a more dispersed fashion throughout the ownership. Under certain conditions, public use may be restricted or denied, as provided for in applicable regulations and policy. Public use may be addressed in landscape plans or as separate actions required to meet the needs of DNR.

Activities in the East-side Planning Units

This subsection describes typical silvicultural activities that may occur on DNR-managed forest lands covered by the HCP within the range of the northern spotted owl east of the Cascade crest. All of the silvicultural activities described in this section will be guided by state Forest Practice Rules, DNR policies such as the Forest Resource Plan (DNR 1992), and the conditions of the permit.

FOREST HEALTH

Activities that address forest health issues have the potential to become an increasingly important aspect of forest management in the east-side planning units. Examples of these activities are under-burning, applying pesticides, controlling root rot, and salvaging.

Under-burning may be prescribed as a way to reduce fuel loading, encourage regeneration, and control stocking of appropriate tree species. At the writing of this HCP, technical development of under-burning is still under way, and its feasibility and effectiveness are still uncertain. About 500 acres per year of DNR-managed lands in the east-side planning units are currently being under-burned. DNR Regions estimate approximately 2,000 acres per year could benefit from under-burning. However, the developmental nature of this program along with funding limitations will probably limit the program to between 3,000 and 10,000 acres in the east-side planning units during the first decade of the permit. Other silvicultural activities, such as vegetation management, precommercial thinning, and commercial thinning, may be used to achieve the same forest health objectives as under-burning.

Application of biological or chemical agents to control forest insect pests may be required during the first decade of this permit. Insects that may cause major damage to forest stands are monitored annually. Low background levels of loss are accepted as part of a normal condition. When losses build to unacceptable levels, and analysis predicts the persistence of an insect population, a control project may be planned. All projects are required to go through an environmental assessment as a Class IV-Special application under state Forest Practices Rules. These activities may be done as part of a multi-landowner cooperative effort or unilaterally by DNR. The level of these activities is extremely difficult to predict because of variations in natural cycles. However, current insect populations indicate it is reasonable to expect between 2,000 and 15,000 acres of treatment in the east-side planning units during the first decade. Appropriate treatment might include site-specific application of insecticides. At some of these sites the application of insecticides could result in the incidental take of federally listed invertebrate species. Such activities shall be covered under the Incidental Take Permit except for aerial application of pesticides, which shall be covered upon the U.S. Fish and Wildlife Service's approval of a site-specific plan presented by DNR. If the U.S. Fish and Wildlife Service disapproves such a plan, or if approval of such a plan is not forthcoming within 30 days of the U.S. Fish and Wildlife Service's receipt of the plan, a multi-agency science team may be convened to resolve questions regarding the biological basis of the U.S. Fish and Wildlife Service's decision.

Root-rot control is often required in certain stands in the east-side planning units. Direct control commonly consists of pulling or pushing over infected stumps, followed by planting with a conifer species not susceptible to root rot. This activity is expensive and is done only if other alternatives are unavailable. Based on historical levels for this activity, it is reasonable to

expect between 1,000 and 5,000 acres will be treated in the east-side planning units during the first decade of the permit. The application of fertilizer has also been demonstrated to reduce the impacts of root rot. It is estimated that between 4,000 and 10,000 acres will be fertilized during the first decade.

To help restore forest health, salvage of trees killed by fire, insects, or disease is a common silvicultural activity in the east-side planning units. The amount of salvage is, to a large extent, unpredictable. Fires or insect outbreaks can create large acreages to be salvaged in any given year. Based on past history, if there are no catastrophic events, it is reasonable to expect between 5,000 and 10,000 acres of salvage logging to occur during the first decade of the permit.

TIMBER HARVESTING

Timber harvesting on DNR-managed lands in the east-side planning units is carried out in the context of a silvicultural prescription designed to ensure forest productivity and perpetuate or restore forest health. Clearcutting, shelterwood cuts, and selective harvest are all employed in these planning units. Clearcut harvesting removes the trees from a harvest site. According to state Forest Practices Rules and DNR policies, some "leave trees" are left in clumps, along streams, or scattered throughout the harvest unit. Clearcut harvesting prepares the site for reforestation. Planting with bare root stock of a species appropriate for the site, natural regeneration by seeding from adjacent stands, or a combination of both methods are common after clearcut harvesting. Shelterwood harvesting is increasingly used as a way to prepare for regeneration of forest stands. This method leaves and protects a number of trees per acre (usually 10 to 30) to provide a seed source and shade protection for young trees. Once reforestation is complete, the shelterwood trees can be removed in a commercial harvest or they can be retained to provide structural diversity as the stand ages. These trees may be left standing through the entire rotation, providing large-diameter trees in the next harvest. By far the most common of the timber harvesting prescriptions is selective harvesting, which can have important impacts on forest health and may be done with the objective of improving the overall health of the forest by removing certain trees or tree species.

During the first decade of the permit, there will be between 3,000 and 6,000 acres of clearcut harvesting, between 1,000 and 5,000 acres of shelterwood harvesting, and between 25,000 and 35,000 acres of selective harvesting. These harvest levels are consistent with HCP estimated harvest levels and historic harvest patterns. The range of acres for shelterwood is slightly greater than recent experience based on anticipated management through the next decade.

REGENERATION

Re-establishing or regenerating forest stands after fire, disease, insect infestation, or harvest is a part of the silvicultural practices in the east-side planning units. This practice is conducted under a prescription to ensure forest health and productivity in a cost-effective manner. Planting of bare root stock and natural seeding from adjacent stands, from seed trees left in the harvest unit, or from trees remaining after a selective harvest are all successful methods of regeneration in the east-side planning units. By far the most common method is natural seeding from trees remaining after a selective harvest.

It is reasonable to expect between 6,000 and 20,000 acres of planting during the first decade of the permit. Planting levels have historically been at the lower end of this projection. The upper end of the range is based on the opportunity to increase productivity on understocked forest land by more fully utilizing these sites. The increase also reflects supplemental planting in areas that will naturally regenerate in order to ensure a better distribution of seedlings, restock areas in a shorter time, and increase species diversity. Natural seeding is expected to regenerate the balance of harvested acres.

COMMERCIAL THINNING

Thinning young stands so that remaining trees can develop faster and with less competition is employed when favorable markets allow cost-effective operations. Commercial thinning can also benefit forest health and the development of certain types of wildlife habitat. Because harvest operations often combine selective tree harvest with commercial thinning, depending upon the particular stand condition in the harvest area, it is difficult to estimate how many acres of commercial thinning may occur during the first decade of the permit. However, it is reasonable to expect between 4,000 and 10,000 acres of commercial thinning in the east-side planning units in the first 10 years. This increase from historic levels can be attributed to DNR's current emphasis on identifying and commercially thinning stands that would benefit from reduced densities and to the current demand for smaller wood than was historically marketable.

PRECOMMERCIAL THINNING

Precommercial thinning is a silvicultural practice prescribed to space overstocked, even-aged stands of young trees so the remaining trees will have less competition for light and water and thereby have the potential for better growth. If the market will not support the sale of the trees cut from these stands, the operation is termed precommercial. Most forest stands in the east-side planning units are of uneven age and, therefore, do not require precommercial thinning. It is reasonable to expect a range of 3,000 to 10,000 acres of precommercial thinning to be prescribed during the first decade of the permit in the east-side planning units. The lower end of this range represents historic levels. Thinning has tended to be sporadic, varying from no activity to a maximum of about 1,200 acres in a single year. However, DNR Region staff have indicated, on the basis of stand growth and economic evaluation, that thinning about 1,500 acres per year would benefit the trusts. The upper end of the range reflects an expanded program to meet a portion of this potential opportunity.

OTHER SILVICULTURAL ACTIVITIES

Some silvicultural activities not usually associated with east-side forest management are expected to increase significantly in the next decade. These may include site preparation in advance of reforestation, vegetation management designed to reduce competition to young trees from brush, and fertilization calculated to enrich nutrient-poor soils. Although these and other silvicultural activities are unpredictable in scale and timing, DNR expects during the first decade of the permit period to do 2,500 to 14,000 acres of site preparation and 5,000 to 15,000 acres of vegetation management.

Other silvicultural activities may be prescribed in the east-side planning units during the first decade of the permit that are not commonly applied now or that have not been developed. These might include pruning of young trees or certain stand or tree manipulations designed to enhance wildlife

habitat. It is not reasonable to speculate on the quantity or description of these potential activities. Research or demonstration projects on silvicultural techniques may also be done during this time period.

SPOTTED OWL DISPERSAL AND NESTING, ROOSTING, AND FORAGING HABITAT

An important forest management objective in the east-side planning units is the creation or maintenance of habitat for spotted owls (discussed in Section A of this chapter titled Minimization and Mitigation for the Northern Spotted Owl). On landscapes where these conservation objectives are applied, silvicultural practices will be designed to meet the habitat objective as well as the other forest management objectives detailed above. For example, tree selection in partial harvest can move total landscape conditions toward a specified habitat objective by ensuring that remaining stands have specific tree species, spacing, and diameter distribution. All silvicultural practices described for the east-side planning units may be employed to achieve habitat objectives under the permit. At the end of the first decade, it reasonable to expect approximately 25,000 acres of dispersal habitat and approximately 34,000 acres of nesting, roosting, and foraging (NRF) habitat in the east-side planning units.

Activities in the Five West-side Planning Units

This subsection describes typical silvicultural activities that may occur on DNR-managed forest lands covered by the HCP within the range of the northern spotted owl west of the Cascade crest, except in the Olympic Experimental State Forest (described in the next subsection). All of the silvicultural activities described in this section will be guided by state Forest Practices Rules, DNR policies such as the Forest Resource Plan (DNR 1992), and the conditions of the permit.

FOREST HEALTH

Forest health activities are usually limited to protection from wildfire and treatment of root rot. Rarely is control of forest defoliators (leaf-eating insects) required. Healthy forests are usually maintained by controlling tree species on specific sites.

Wildfire is the largest single threat to forest health in the five west-side planning units. Wildfire can have many different ignition sources, although human-caused fires are increasingly common. It is reasonable to expect no significant change in the level of loss from fire during the first decade of the permit.

Stump pushing has been used to control root rot in a few areas. However, the most common situation is to treat root-rot patches in forest stands by clearcut harvesting the affected area and reforesting with an alternate species not susceptible to root rot. This is normally done as part of a timber sale that is not solely targeted at disease control. It is reasonable to expect between 2,500 and 5,000 acres of species conversion for root-rot control during the first decade of the permit. This estimate is based on historical levels and is not expected to change significantly.

Leaf-eating insects, such as hemlock looper, have historically been controlled by aerial spraying of insecticide. Because there have been no major insect infestations on DNR-managed lands in the five west-side planning units for several decades, it is unlikely this treatment will be required or actually carried out during the first decade of the permit. Should unforeseen attacks by forest defoliators occur, they might require appropriate

treatment to be determined at that time. Such appropriate treatment might include site-specific application of insecticides. At some of these sites the application of insecticides could result in the incidental take of federally listed invertebrate species. Such activities shall be covered under the Incidental Take Permit except for aerial application of pesticides, which shall be covered upon the U.S. Fish and Wildlife Service's approval of a site-specific plan presented by DNR. If the U.S. Fish and Wildlife Service disapproves such a plan, or if approval of such a plan is not forthcoming within 30 days of the U.S. Fish and Wildlife Service's receipt of the plan, a multi-agency science team may be convened to resolve questions regarding the biological basis of the U.S. Fish and Wildlife Service's decision.

TIMBER HARVESTING

Timber harvesting is perhaps the most common silvicultural practice carried out in forest stands on DNR-managed lands in the five west-side planning units. Timber harvests are designed to produce commercial products and to prepare the forest site for regeneration. Various harvest methods are used to facilitate various regeneration prescriptions. (See the previous discussion titled Timber Harvesting, in the subsection on the east-side planning units, for a description of clearcut and shelterwood harvesting.)

It is reasonable to expect between 140,000 and 165,000 acres of clearcut harvesting to occur on DNR-managed lands in the five west-side planning units during the first decade of the permit based on DNR's harvest level projections. Acreages were decreased slightly to reflect anticipated increases in other harvest techniques.

It is reasonable to expect between 1,000 and 5,000 acres of shelterwood harvest in the five west-side planning units during the first decade of the permit. The lower end of this estimate reflects historical levels for shelterwood harvests. DNR expects to increase the use of this harvest method as more emphasis is placed on maintaining structural diversity in forest stands.

Seed tree harvest is used less frequently in the five west-side planning units as a method of naturally regenerating a forest stand. Trees to be left to provide seed for regeneration are selected for their superior form and quality and are left scattered throughout the harvest unit. It is reasonable to expect between 500 and 1,000 acres of seed tree harvest to occur in the five west-side planning units during the first decade of the permit. This represents the historical level for this activity, which is not expected to change during the next decade.

Green trees, snags, and down logs are commonly left in harvest units. These structures add diversity to regenerated forest stands, enriching younger stands for wildlife benefits. These structures also help maintain long-term forest productivity. State Forest Practices Rules, DNR's Forest Resource Plan (1992), and the terms of the HCP provide the basis for retaining such structures.

Selective harvest and single tree harvesting can occur where special management objectives make these harvest methods appropriate. Partial cuts can be prescribed in order to develop and maintain a multi-aged, multi-storied stand. Single tree selection may be used to create diversity in an even-aged stand or to remove valuable products from a stand without changing its basic characteristics. During the first decade of this HCP, it is reasonable to expect between 20,000 and 30,000 acres of partial cuts in the five west-side planning units. This range reflects historical levels for

selective harvests with some allowance for an increase in the use of this harvest method in managing NRF areas.

COMMERCIAL THINNING

Commercial thinning removes some trees from forest stands that are spaced too close together, provided a net financial return can be achieved. Creating more space between trees allows them to grow faster, increasing diameter and thus volume per tree. This practice often generates income before final harvest and increases value of the final harvest by improving the quality of the logs produced.

Conifer stands in the five west-side planning units are commonly overstocked, offering candidates for commercial thinning. Many planted stands are invaded by natural seedlings, which produces a species mix and an overstocked condition. Commercial thinning provides an opportunity to select desired species or produce a desired species mix and to initiate a multi-layered stand condition. Commercial thinning also provides an opportunity to manage the stand toward a prescribed condition, such as spotted owl dispersal habitat. It is reasonable to expect between 30,000 and 45,000 acres of commercial thinning to occur in the five west-side planning units during the first decade of the permit.

Commercial thinning had essentially been abandoned by DNR as a silvicultural tool in the mid-1970s. Region interest in the program caused a resurgence several years ago. Since that time, there has been a significant increase in the level of thinning. This activity is included in the regimes modeled for the HCP harvest projections. The larger acreage of the estimate reflects the level from the harvest model; the lower end is a projection of the current level through the next decade.

PRECOMMERCIAL THINNING

Precommercial thinning is prescribed to space young, overstocked stands in order to allow the remaining trees to grow into commercially valuable products sooner than would otherwise occur. Because this operation does not produce products that are valuable enough to cover the cost of the thinning operation, it is not a commercial operation, but rather an investment designed to increase the value of the stand. Additionally, precommercial thinning can accelerate the development of young stands toward certain habitat conditions desirable for wildlife by opening up crowded, dense stands and allowing other types of vegetation to grow, and by accelerating the growth of the remaining trees. Forest stands that are precommercially thinned are likely to become dispersal habitat sooner than those stands not precommercially thinned.

Because precommercial thinning is an investment, it will be accomplished as budget is available, and candidate stands will be prioritized according to the rate of return expected and the landscape needs to develop habitat as described in the HCP conservation strategies. It is reasonable to expect between 100,000 and 200,000 acres of precommercial thinning to be accomplished during the first decade of the permit on DNR-managed lands in the five west-side planning units. The wide range in this estimate reflects the uncertainty in funding. The lower end of the estimate is based on historic levels, whereas the upper end is about two-thirds of the acreage DNR Regions have identified as needing thinning to maintain growth and increase value. The regimes modeled for the HCP harvest projections indicate a probable precommercial thinning level about mid-way in this range. However, the harvest projections did not account for the backlog that exists from previous fluctuations in funding.

SITE PREPARATION

Site preparation is prescribed if an area scheduled for reforestation requires some treatment to ensure success or increase the efficiency of the reforestation effort. Typical preparations include burning forest debris remaining after harvest, applying herbicides in order to reduce vegetation that might compete with seedlings, or mechanically scarifying the ground to expose mineral soil that will aid the establishment of seedlings.

Site preparation on DNR-managed lands will be guided by state Forest Practices Rules and DNR policies such as the Forest Resource Plan (DNR 1992). Burning forest debris, a traditional site preparation practice, has become less common as concerns for air quality have increased and as the need to provide leave trees and snags has been understood. Further, a greater reliance on natural regeneration and various kinds of partial harvest render burning less appropriate as a site preparation tool. Use of herbicides for site preparation is rare for much the same reasons as the decline in burning. During the first decade of the HCP in the five west-side planning units, it is reasonable to expect between 500 and 1,000 acres of debris burning, between 5,000 and 10,000 acres of herbicide treatment as site preparation, and between 1,000 and 3,000 acres of scarification. Site-preparation acreage ranges are a combination of levels from recent history (last five years) and estimates by DNR Regions.

REGENERATION

Regenerating the forest stand after harvest or after natural disturbances is an important part of silviculture on DNR-managed lands in the five west-side planning units. The harvest method (clearcut, shelterwood, or seed tree) generally determines the regeneration method. The most common method in the five west-side planning units is planting with bare root stock of conifer species appropriate for the particular site. Natural seeding often occurs in these plantations as well, creating a young multispecies stand. Regeneration from natural seeding is prescribed where it is reasonable to expect a plentiful seed source from the desired species and other favorable factors. Some naturally seeded areas are supplemented with planted stock to meet reforestation objectives of number of trees per acre within a certain time. It is reasonable to expect between 120,000 and 160,000 acres of reforestation by planting and between 5,000 and 30,000 acres of strictly natural seeding to be accomplished in the five west-side planning units during the first decade of the HCP. Regeneration levels are directly proportional to harvest levels and depend on harvest method. The estimated level of activity is based on restocking all areas that are harvested for regeneration. There will likely be an increase in the use of natural seeding because of shifts in harvest methods and better recognition of natural seed sources.

VEGETATION MANAGEMENT

Vegetation management is prescribed to control competing vegetation in order to increase the survival, growth, and health of conifers. However, the objective of vegetation control is not to rid the plantation of all vegetation except conifer crop trees. The presence of alder or other hardwoods in a conifer plantation is desirable as long as they do not replace the conifers or significantly reduce the growth rate and yield of the intended crop trees.

Various methods can be used to control competing vegetation. Site-specific conditions and management objectives are considered when choosing a control method. Forest Resource Plan Policy No. 33 tacitly directs DNR to minimize the use of herbicides. The policy directs DNR to weigh the

effectiveness of herbicide use against likely adverse effects on public water supplies, public health, fish health, and fish and wildlife habitat. The strategy for minimizing herbicide use presented in Policy No. 33 (DNR 1992) is a conservation measure which is part of DNR's HCP.

Hand slashing or cutting of unwanted vegetation , ground or aerial application of herbicide, and combinations of these methods may be used. The most common type of vegetation control is hand slashing of alder in young forest stands to encourage conifer saplings. DNR expects between 60,000 and 100,000 acres of hand slashing to occur during the first decade in the five west-side planning units. Ground application of herbicides is used to control big leaf maple and other vegetation. It is reasonable to expect between 40,000 and 50,000 acres of ground application of herbicide during the first decade of this HCP. Aerial application of herbicides can be used to control alder and herbaceous plants. It is reasonable to expect between 20,000 and 30,000 acres of aerial applications of herbicides during the first decade of the HCP.

Region input indicates an increased need for vegetation management beyond historic levels. The range for hand slashing reflects historic levels in the lower estimate, whereas the higher value includes an increase based on input from DNR Regions. Aerial application estimates are based on the historic range with no anticipated increases. Ground herbicide use reflects a historic trend of moderately increasing use and is consistent with estimates from DNR Regions.

FERTILIZATION

Application of nitrogen and other mineral nutrients to forest stands can increase growth and be a cost-effective investment for stands growing in certain nutrient-poor soils. This activity is usually done when management funds are available and other investment opportunities in forest productivity are less cost-effective. Large tracts of forest are typically treated once or twice during the harvest rotation. Benefits can be optimized if the applications are done after commercial thinning and about 10 years before final harvest. It is reasonable to expect fertilizer to be applied aerially on 30,000 to 115,000 acres of DNR-managed lands in the five west-side planning units during the first decade of the HCP. The large range in estimated acres of aerial fertilization is due to budget uncertainty. Biosolids are scheduled to be applied in limited areas during the first decade of the HCP. Research on biosolid applications may lead to increased use of this technique in the future.

STAND CONVERSION

Many stands now managed by DNR developed naturally after the original harvest decades ago. Without prescribed silvicultural activities, these stands developed in a variety of ways; for example, some stands developed into brush and hardwood species. When markets support such practices, these stands are harvested and replanted with conifer species. This conversion of stands from low commercial value species to more valuable conifer species is sometimes called stand conversion or stand rehabilitation. Stand conversion is done only on those lands that have supported conifer stands in the past. Lands that are best suited to hardwoods will not be converted. This practice increases the future value of these stands. It is reasonable to expect between 5,000 and 10,000 acres of stand conversion to occur during the first decade in the five west-side planning units.

SPOTTED OWL DISPERSAL AND NESTING, ROOSTING, AND FORAGING HABITAT

An important forest management objective in the five west-side planning units is the creation or maintenance of habitat for northern spotted owls. (See Section A of this chapter for the spotted owl conservation strategy.) On landscapes where these conservation objectives are prescribed, silvicultural practices will be designed to meet the habitat objective as well as the other forest management objectives detailed above. Any or all of the silvicultural practices described for the five west-side planning units may be employed to achieve habitat objectives under the permit. For example, precommercial thinning can accelerate the development of dispersal habitat, whereas commercial thinning can accelerate the development of NRF habitat. Green tree and snag retention can be used to improve the quality of both types of spotted owl habitat to meet conservation objectives. Partial cuts and single tree selection may be applied to existing NRF habitat without degrading the quality of habitat beyond the threshold identified in the HCP. At the end of the first decade of the HCP, it is reasonable to expect approximately 58,000 acres of dispersal habitat and approximately 66,000 acres of NRF habitat in the designated DNR-managed parcels in the five west-side planning units.

MARBLED MURRELET HABITAT

The details of the long-term conservation strategy for marbled murrelets are not known at this time. (See conservation strategy for the marbled murrelet in Section B of this chapter.) However, once the strategy is identified, silvicultural practices described in this section may be applied to meet the conservation objectives for marbled murrelets. Protection of nesting sites may require special silvicultural practices, which will be determined when the long-range conservation strategy is developed.

RIPARIAN MANAGEMENT ZONES

Forest management is allowed in riparian management zones under certain conditions to maintain or restore salmonid freshwater habitat. (See Section D of this chapter titled Riparian Conservation Strategy.) Silvicultural practices that might be appropriate for riparian management zones may include precommercial thinning, commercial thinning, partial cuts, single tree selection harvesting, and stand conversion.

Precommercial thinning and commercial thinning can be used to accelerate the development of riparian forest stands in order to provide essential elements of salmon habitat as well as contribute to upland species habitat needs. Shade and large woody debris can be provided from larger diameter trees that are grown using these practices. Spotted owl habitat and marbled murrelet habitat can be developed faster with the application of these practices in riparian management zones. The complex forest structures resulting from these practices can provide habitat for multiple species. See Table IV.16 at the end of this section for an estimate of the acres of riparian habitat to be developed during the first decade.

Stand conversion can be employed to restore riparian management zones to more natural conditions. Restoration is an activity allowed in the riparian conservation strategy. The most common restoration prescription might be the conversion of streamside hardwood or brush stands, typically created after original logging over the past decades, to conifer stands that can provide a source of large woody debris to the streams. Because a complete inventory of stream miles that could benefit from stand conversion is not available at this time, estimates of acreage to be converted cannot be made.

A program to identify opportunities and accomplish stand conversion along streams may be developed during the first decade of the permit.

Partial cuts and single tree harvest may be appropriate in riparian management zones to increase wind-firmness of the riparian buffers or for other reasons.

Activities in the Olympic Experimental State Forest Planning Unit

This subsection will describe typical silvicultural activities that may occur on DNR-managed forest lands covered by the HCP in the OESF Planning Unit. All silvicultural practices described for the five west-side planning units can be prescribed for the OESF; therefore, they will not be described again in this subsection. Basic silvicultural practices may be modified or emphasized in the OESF, but only the significant differences in silvicultural practices from those described in the subsection on the five west-side planning units will be described here. The forest management activities described in this section will be guided by state Forest Practices Rules, DNR policies such as the Forest Resource Plan (DNR 1992), and the conditions of the permit.

COMMODITY PRODUCTION AND ECOSYSTEM MAINTENANCE

Forest management on DNR-managed lands in the OESF will focus on both commodity production and ecosystem maintenance. Managing the forest ecosystem implies a process by which stand-level decisions regarding silvicultural practices and activities are influenced by larger scale landscape-level ecological goals and objectives to achieve an appropriate balance between using the forest for commodity production and sustaining natural ecological functions. In the OESF, DNR will seek to understand the complexity of forest ecosystems within a commercial forest. This emphasis is what is unique about this planning unit. Where appropriate, knowledge gained will be carried over to DNR-managed lands in other planning units.

SILVICULTURAL PRACTICES

Understanding ecological principles and natural tendencies in the context of tree growth and forest communities should provide better guidance to forest managers as they prescribe silvicultural applications. This is not to imply that management should passively allow nature to take its course. Rather, the OESF will be a place to learn how to manage actively in harmony with natural forest growth and reap the benefits of its inherent ecological and commercial outputs.

Forest growth can be described as having four basic stages or structures. These are stand initiation (an open condition and new regeneration), stem-exclusion (tree competition and mortality), understory reinitiation (undergrowth development and some tree regeneration) and old growth. The primary hypothesis of the OESF is that it is possible to provide and protect ecological values in a managed forest by maintaining an arrangement of forest structures and stand densities.

Silviculture in the OESF should be viewed as a means of manipulating and producing a variety of possible stand structures at the landscape level. The various silvicultural practices described in the previous subsection on the five west-side planning units constitute an array of forest management choices to develop stands and landscapes that will have desirable conditions for both timber production and wildlife habitat. For example, spotted owls

have shown a strong habitat preference for forest that has multi-layered canopies containing trees ranging from young saplings to those with large diameters. Old-growth forests contain large-diameter trees, which have considerable economic value. Where old-growth attributes are desired in the future for both ecological and economic values, management strategies (silvicultural practices) must be initiated to recreate these attributes, because protecting existing old growth is not sufficient to ensure the presence of old growth in the future. It is intended that OESF silvicultural practices will endeavor to enhance stand structure diversity by including plans for maintaining or developing large-diameter trees.

Silvicultural prescriptions that emphasize both commodity production and ecological function begin with stand-level silvicultural operations. These actions will focus increasingly on what is retained as well as what is removed from stands and will prescribe arrangement of structure within and across multiple stands to meet desired patterns that benefit both stand-level and ultimately landscape-level ecological objectives. For example, some of the components of old-growth ecosystems have been described as large, standing trees, both live and dead, large-diameter down wood, and large woody debris in streams. Silvicultural prescriptions promoting these components will satisfy forest-stand diversity objectives and landscape-level diversity of habitat.

Other silvicultural activities (e.g., selective harvest) can develop multiple age-class stand conditions that, over time, can enhance stand-level diversity and provide both small- and large-tree age classes that support favorable economic returns and ecosystem values. Variations of in-stand silvicultural prescriptions for mid-aged stands in the OESF will provide opportunities for immediate commodity production and set a course for future in-stand habitat benefits. The application of various silvicultural prescriptions to test the general hypothesis of the OESF will provide much of the experimentation direction for the forest.

QUANTIFYING SILVICULTURAL PRACTICES

Due to the experimental nature of the OESF, it is difficult to quantify potential management activities. However, based on current inventory, the conservation strategies, and potential harvest opportunities, one can reasonably expect approximate ranges described in Table IV.15 at the end of this section. Potential experimental harvest within some riparian, murrelet, and spotted owl habitat is not included in these estimates but is expected to occur during the first 10 years. These ranges reflect an attempt to capture what could occur as a result of experimenting with many variables, including rotation length, silvicultural treatment options, and experimentation in habitat maintenance and creation in managed stands. The quantity and distribution of harvest among commercial thinning, selective and shelterwood harvesting, and clearcutting may shift as activities are designed to meet site-specific conditions and specific production and conservation objectives. Furthermore, activities estimated for the first decade of the HCP are not necessarily representative of what will occur in subsequent decades.

Learning how to sustain natural ecological functions within the context of a managed forest will lead forest managers to employ silvicultural prescriptions that are most harmonious with natural forest development. Harvesting will focus on retaining structural elements of the original stand, while site preparation and reforestation will be prescribed to minimize disruptions of the natural forest renewal process. For this reason, natural regeneration will be more important in the OESF Planning Unit than in the five west-side planning units. Tree spacing, through both precommercial and commercial

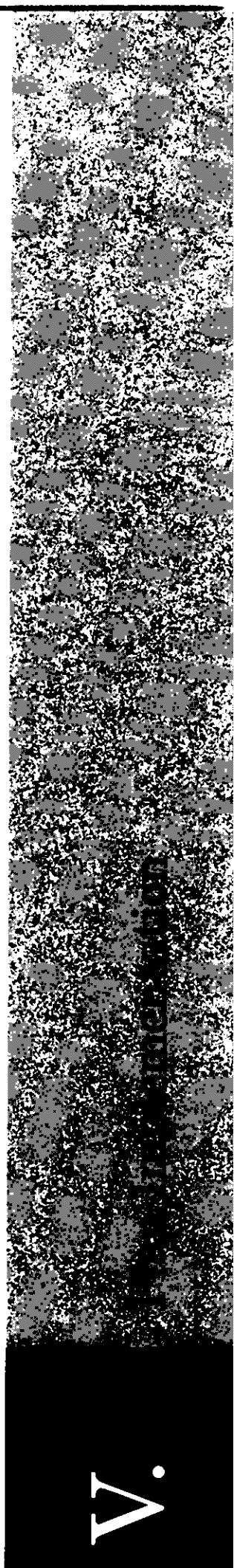
thinning, will be carried out to increase the rate of development of forest stands towards desired target conditions. Selective harvesting may be prescribed more frequently here to develop multi-layered stand structures more quickly. Clearcutting will occur but with more emphasis on structure retention in order to provide structural diversity to future stands. All of the silvicultural prescriptions will be designed to meet landscape goals consistent with the overall objectives of the OESF and the conditions of the permit.

Table IV.15: Estimated amount of forest land management activities on DNR-managed lands in the area covered by the HCP during the first decade of the HCP

Activity	East-side planning units (acres)	West-side planning units (acres)	OESF Planning Unit (acres)
Harvest: clearcut	3,000-6,000	140,000-165,000	3,000-15,000
seed tree	0	500-1,000	0-300
shelterwood	1,000-5,000	1,000-5,000	300-1,000
selective	25,000-35,000	20,000-30,000	8,000-11,300
salvage	5,000-10,000	0	1,500-2,500
commercial thinning	4,000-10,000	30,000-45,000	25,000-35,000
Site preparation: broadcast burn	0-1,000	500-1,000	0-1,000
herbicide	500-5,000	5,000-10,000	0
scarification	2,000-8,000	1,000-3,000	0-1,000
Regeneration: planting	6,000-20,000	120,000-160,000	3,000-15,000
natural seeding	30,000-50,000	5,000-30,000	800-1,200
Vegetation management: hand slashing	0	60,000-100,000	5,000-10,000
ground herbicide	0	40,000-50,000	0-1,000
aerial herbicide	5,000-15,000	20,000-30,000	0-500
Forest health: under-burning	3,000-10,000	0	0-500
root-rot control	1,000-5,000	2,500-5,000	0-500
insect damage control	2,000-15,000	0	0-500
Precommercial thinning	3,000-10,000	100,000-200,000	10,000-25,000
Fertilization	4,000-10,000	30,000-115,000	0-1,000

Table IV.16: Estimated amount of habitat on DNR-managed lands in the area covered by the HCP at the end of the first decade of the HCP

Type of habitat	East-side planning units	West-side planning units	OESF Planning Unit
Dispersal	34,000	58,000	N/A
Nesting, roosting, foraging	25,000	66,000	56,000
Riparian	N/A	23,000	10,000



V. Plan Implementation

Implementation of the HCP is governed by an agreement among DNR, U.S. Fish and Wildlife Service, and the National Marine Fisheries Service. (See the Implementation Agreement.) The Implementation Agreement defines the roles and responsibilities of these parties regarding implementation of the HCP. The HCP and the Implementation Agreement are supplementary to each other. Together, they fulfill the requirements as outlined in the Endangered Species Act for issuance of an incidental take permit. (See the section in Chapter II on the Endangered Species Act for a discussion of these requirements.) The processes for addressing unforeseen or extraordinary circumstances, amending the HCP, review, and funding are among the issues discussed in the Implementation Agreement.

Funding

DNR shall submit to the Washington State Legislature, on at least a biennial basis, an agency operating and capital budget for asset management that will be adequate to fulfill DNR's obligations under the HCP, Incidental Take Permit, and Implementation Agreement. Failure by DNR to ensure that adequate funding is provided to implement the HCP shall be grounds for suspension or partial suspension of the Incidental Take Permit.

Transition Activities

Timber sales prepared by DNR normally require approximately 24 months of preparation between the planning of the sale and its eventual auction. The HCP conservation strategies require certain actions to occur (i.e., the designation of the 300-acre spotted owl nest patches) and certain materials be prepared (e.g., implementation procedures for riparian areas) in the first year after approval of the HCP and issuance of the Incidental Take Permit. Additionally, once implementation procedures are completed, training will be required for DNR staff. For these reasons, following approval of the HCP and issuance of the Incidental Take Permit, a transition period will be required. Timber sales in the DNR "pipeline" at the time of approval of the HCP will continue to be brought forward by DNR through the end of calendar year 1998, provided such sales are consistent with spotted owl survey agreements in effect between DNR and the U.S. Fish and Wildlife Service. Such sales will not include known occupied marbled murrelet sites or unsurveyed, suitable marbled murrelet habitat. Because of current DNR actions such as spotted owl survey efforts and the deferral of sale of marbled murrelet habitat, it is believed that take of any listed species will be limited to non-existent. Mitigation for any such take has been included in the conservation strategies contained within the HCP.

Monitoring

OBJECTIVES

DNR shall monitor this HCP on DNR-managed lands according to the following objectives for all planning units:

(1) to determine whether the HCP conservation strategies are implemented as written; and

(2) to determine whether implementation of the conservation strategies results in anticipated habitat conditions.

These two monitoring objectives can be referred to as implementation and effectiveness monitoring, respectively (U.S. Forest Service et al. 1994).

There is a third monitoring objective, referred to as validation monitoring (U.S. Forest Service et al. 1994), for DNR-managed lands in the Olympic Experimental State Forest (OESF) Planning Unit:

(3) to evaluate cause-and-effect relationships between habitat conditions resulting from implementation of the conservation strategies and the animal populations these strategies are intended to benefit.

Implementation monitoring will document the types, amounts, and locations of forest management activities carried out on DNR-managed lands in each HCP planning unit, both inside and outside areas addressed by the conservation strategies. Activities in areas addressed by the HCP will be described in sufficient detail to document compliance with the requirements of the conservation strategies. Activities outside of these areas will be described in summary detail. Implementation monitoring will also periodically describe changes in landscape-level habitat conditions in areas managed to provide spotted owl and murrelet habitat. Such monitoring will be primarily accomplished through DNR's planning and tracking, and geographic information systems. Statistically valid sampling of management activities will be conducted to evaluate the reliability of information stored in these databases.

Effectiveness monitoring will document changes in habitat conditions, including general forest structure, specialized habitat features (e.g., in-stream large woody debris, marbled murrelet nesting platforms), and spotted owl prey populations, that result from timber harvest and other forest management activities carried out pursuant to the HCP. Only habitat areas addressed by the conservation strategies, i.e., riparian, spotted owl nesting, roosting, and foraging (NRF), spotted owl dispersal, and marbled murrelet habitat areas, will be monitored for effectiveness. Within these habitat areas, representative samplings will be monitored, which means not all managed acres or management activities will be monitored. Effectiveness monitoring will rely upon field-based before-and-after comparisons. Changes in habitat conditions will be evaluated both in the short term (one to three years after harvest) and over the life of the HCP.

Validation monitoring, which will occur only within the OESF Planning Unit, will document spotted owl and marbled murrelet use of areas managed to provide nesting habitat, and salmonid use of streams crossing DNR-managed lands. For spotted owls and marbled murrelets, validation monitoring will rely upon surveys to detect changes in site occupancy, numbers and locations of breeding pairs, and reproduction, as appropriate for each species. For salmonids, validation monitoring will employ surveys to detect changes in the productivity of spawning adults and salmon-habitat relationships. As an additional objective for the OESF, validation monitoring reflects the emphasis on experimentation that defines the OESF. (See Section E in Chapter IV titled Olympic Experimental State Forest Planning Unit.) In this sense, the OESF will be an open-air laboratory in which the assumptions that underlie the conservation strategies will be tested.

MONITORING PROGRAM

Table V.1 outlines the monitoring program that results from applying the first two monitoring objectives to the major conservation strategies. (See the sections in Chapter IV on conservation strategies for the northern spotted owl, marbled murrelet, and riparian areas, and the unique spotted owl and riparian conservation strategies for the OESF.) Implementation and effectiveness monitoring will be carried out for all of these major strategies. The spotted owl conservation strategy, current spotted owl and marbled murrelet habitat, and current riparian ecosystem conditions are not uniform across planning units. Effectiveness monitoring will necessarily be tailored to the conservation strategy and habitat or ecosystem conditions in each planning unit.

Validation monitoring will be carried out for spotted owl nesting habitat, marbled murrelet nesting habitat, and salmonid habitat in the OESF. Validation monitoring will not be undertaken for the other conservation strategies or in other planning units. Validation monitoring will not be undertaken for spotted owl dispersal habitat. The OESF spotted owl conservation strategy does not draw the management distinction between NRF habitat and dispersal habitat that prevails in other HCP planning units. In the other planning units, an evaluation of the cause-and-effect relationship between conditions on DNR-managed lands and the ability of juvenile spotted owls to disperse successfully across the landscape would be difficult to design, expensive to implement, and impractical to undertake, given the distribution of DNR-managed lands. Resources for monitoring the HCP's success in providing dispersal habitat will be better directed at evaluating forest structure and prey responses (i.e., effectiveness monitoring) in areas that are specifically managed for spotted owl dispersal habitat.

Validation monitoring for salmonid habitat will be focused to detect changes in the productivity of spawning adults and salmon-habitat relationships, parameters that are not affected by marine conditions and downstream fisheries. This will involve estimating numbers of spawning adults and numbers of recruits (i.e., out migrating smolts or rearing juveniles), and surveying different stream habitat types and conditions to determine fish numbers, species composition, and densities. Validation monitoring for salmonid habitat will be conducted in an appropriate watershed unit comprised primarily of DNR-managed lands, to minimize the potential influences of management activities not under DNR's control. Validation monitoring will not be conducted for any other, non-salmonid fish species, or for wildlife species (other than spotted owls and marbled murrelets) influenced by the riparian/salmonid conservation strategy.

Effectiveness and validation monitoring need not be undertaken while the interim murrelet conservation strategy is in effect. Although lower quality habitat types that support up to 5 percent of the total murrelet use of DNR-managed lands within each of the five west-side and the OESF planning units may be harvested under the interim strategy, DNR will not alter or manage the higher quality murrelet nesting habitat, which supports 95 percent of potentially occupied sites, during this period. Neither will there be any attempt to alter or manage any habitat known to be occupied by murrelets, regardless of habitat quality. DNR expects to initiate effectiveness monitoring in all planning units where murrelet nesting habitat is a management goal once the long-term murrelet conservation strategy has been designed and implemented. DNR also expects to initiate validation monitoring in the OESF once the long-term murrelet conservation strategy is in place.

DNR recognizes the substantial financial commitment that the HCP monitoring program entails. DNR will provide adequate funding for monitoring to the extent that DNR is given the flexibility to make such budget decisions. DNR shall request funds from the legislature to cover the costs of the monitoring program. The exact funding level may vary from year to year, depending on actions of the legislature.

MONITORING PROCEDURES

Detailed procedures will be prepared to implement the monitoring approaches for each element of the HCP monitoring program outlined in Table V.1. These procedures will identify specific assumptions or hypotheses to be tested, data to be collected, sampling intensity and frequency, field and analysis methods, budgets, and timelines; the procedures will provide the level of detail anticipated in the U.S. Fish and Wildlife Service's Endangered Species Habitat Conservation Planning Handbook (USFWS and NMFS 1996). Monitoring procedures will be prepared by a team of scientists from DNR, the U.S. Fish and Wildlife Service, and the National Marine Fisheries Service. Implementation, effectiveness, and validation monitoring procedures will be completed and reviewed before forest management activities consistent with a conservation strategy are first undertaken. Tables V.2 and V.3 outline some of the environmental variables that will be measured as part of effectiveness monitoring for the spotted owl and riparian conservation strategies, respectively.

MONITORING REPORTS

DNR will prepare an annual report that describes the results of all monitoring activities carried out during the preceding calendar year. Monitoring reports will be completed and submitted to the U.S. Fish and Wildlife Service by March 30 of each year.

Table V.1: Outline of the HCP monitoring program

	HCP habitat goals			
Monitoring objective	**Spotted owl nesting, roosting, foraging habitat**	**Spotted owl dispersal habitat**	**Marbled murrelet nesting habitat[1]**	**Riparian/salmonid habitat**
Implementation	All planning units	All planning units	Five west-side planning units and the OESF	Five west-side planning units and the OESF
Effectiveness	All planning units	All planning units	Five west-side planning units and the OESF	Five west-side planning units and the OESF
Validation	OESF Planning Unit only		OESF Planning Unit only	OESF Planning Unit only (salmonid habitat only)

[1]Only implementation monitoring will be done during the interim conservation strategy for the marbled murrelet. See text.

Table V.2: Environmental variables to be measured in effectiveness monitoring for the spotted owl conservation strategy

Environmental Variables	
Spotted owl nesting, roosting, and foraging habitat	**Spotted owl dispersal habitat**
density of nesting structures	
snag density	
snag diameter	
distribution	
	tree density
	tree species composition
	tree diameter distribution canopy closure
	canopy height
	woody debris ground cover
	prey density

Table V.3: Environmental variables to be measured in effectiveness monitoring for the riparian conservation strategy

Salmonid Habitat Element	Environmental Variables
large woody debris	linear density
	size category
	tree species
	shape of form
	decay category
	poolforming function
channel characteristics	bankfull width
	bankfull depth
	stream gradient
	total water surface area
	pool maximum depth
	pool residual depth
	pool location
	pool frequency
sediments	percent of fine sediment in spawning gravel

MANAGEMENT ACTIVITIES IN PROGRESS OR UNDER WAY WHEN THE HCP IS ADOPTED

Management activities in progress or under way when the HCP is adopted that are exempt from compliance with the conservation strategies (see the Implementation Agreement) will be reported as part of implementation monitoring. Otherwise, such activities will not be monitored.

Research

OBJECTIVES

The conservation strategies in this HCP require that research be carried out to answer certain specific questions. These questions can be grouped under three broad research objectives:

- To obtain information needed to move from short- to long-term conservation strategies.
- To obtain information needed to assess and improve the effectiveness of the conservation strategies.
- To obtain information needed to increase management options and commodity production opportunities for lands managed pursuant to the HCP.

RESEARCH PRIORITIES AND TOPICS

These objectives give rise to three research priorities:

(1) Research that is a necessary part of a conservation strategy. DNR recognizes the interim nature of a short-term approach and has delayed management actions until new information is obtained.

(2a) Research needed to assess or improve conservation strategies that are in place. Information gaps that restrict DNR's ability to provide conservation benefits are evident, but DNR has not delayed management actions.

(2b) Research needed to increase management options and commodity production opportunities for lands managed pursuant to the HCP, including testing of new technologies and experimental application of silvicultural techniques.

(3) Research needed to improve general understanding of the animals, habitats, and ecosystems addressed by the HCP.

Research topics identified in the HCP can be prioritized accordingly.

Priority 1

Riparian

- Determine how to design and manage riparian buffers that maintain wind-firm streamside forests.
- Evaluate the local and downstream effects of forest management activities along Type 5 waters not associated with unstable slopes. Determine whether conditions necessitate buffers along Type 5 streams, and if so, determine how to design and manage such buffers.

Spotted Owl

- Determine the amounts of down woody debris necessary for nesting, roosting/foraging, and dispersal habitats.
- Develop better stand-level definitions for nesting habitat.
- Determine the amount and distribution of nesting habitat needed to support nesting spotted owls within managed forest landscapes.
- Develop better stand- and landscape-level definitions for dispersal habitat.
- Determine how to manage and harvest timber within nesting and roosting/foraging habitats.

Marbled Murrelet

- Evaluate the habitat relationships of murrelets occupying DNR-managed lands. Determine which areas and habitat conditions support nesting murrelets.
- Determine whether certain breeding sites are more important to the population than others and, if so, identify the conditions that influence these differences.
- Develop the ability to delineate the boundaries of breeding sites.
- Determine how to protect and manage breeding sites.
- Determine whether nesting murrelets can colonize unoccupied suitable habitat.

Priority 2

Riparian

- Determine how to harvest timber and meet conservation objectives within riparian areas.
- Determine how to harvest timber and meet conservation objectives on hillslopes with high mass-wasting potential without triggering land slides and causing adverse effects to fish habitat.
- Determine the best approach to growing healthy riparian buffers while managing the buffer for economic return.

Spotted Owl

- Determine the types, amounts, and configurations of habitat required to support spotted owls in managed forest landscapes.
- Develop the ability to accelerate development of functional spotted owl nesting and roosting/foraging habitats in conjunction with commercial silvicultural activities and timber harvest.
- Determine how to reduce the risk of catastrophic habitat loss due to fire, insects, or disease, while maintaining existing nesting and roosting/foraging habitats.

Marbled Murrelet

- Determine whether it is possible to harvest timber at or near breeding sites and meet conservation objectives.

Multispecies

- Determine how to design, create, and manage landscape-level habitat patterns to benefit a variety of native animals that use the various forest ages and structures in a geographic area.

- Determine how to best move these patterns across the landscape through time in order to allow maximum flexibility for timber harvest.

Priority 3

Riparian

- Develop basic information on the relationships between forest management activities and riparian ecosystems in managed forests.

- Develop basic information on the relationships between forest management activities and hydrology in managed forests, particularly the relationships among forest management activities, basin soils, and stream-channel/stream-bed changes during rain-on-snow floods.

Spotted Owl

- Determine whether snags are a necessary part of northern flying squirrel habitat in eastern Washington.

Marbled Murrelet

- Develop basic information on murrelet ecology.

Other research topics may arise as the HCP is implemented and new knowledge is obtained.

RESEARCH PROGRAM

DNR will actively manage the HCP research program to ensure that information is obtained in a timely and cost-effective manner and that research is accomplished with high standards of quality and credibility. DNR does not intend to create a large research infrastructure to conduct the necessary investigations. Most HCP research will be done for DNR by qualified research institutions through cooperative agreements and contracts. Certain applied research that requires close coordination with DNR operations may be carried out by DNR scientists. Some enhancement of current DNR infrastructure will be required to direct the research program, manage the information obtained, and ensure that new information is successfully incorporated into operational programs.

To the maximum extent possible, HCP research will be carried out on DNR-managed lands in the OESF Planning Unit, where management emphasizes research and experimentation. (See the section in Chapter I titled Why the OESF is Unique and Section E of Chapter IV on the OESF conservation strategies.) The special research relationship between DNR and the Olympic Natural Resources Center will enhance DNR's ability to meet HCP information needs. Research that cannot be carried out on the western Olympic Peninsula, or cannot be extrapolated from this planning unit, will take place on other appropriate DNR-managed lands.

There is considerable overlap between the HCP research priorities described previously and those envisioned for the OESF. (See the section in Chapter I titled Why the OESF is Unique.) However, it is important to note that the OESF has broader research objectives and different overall research priorities than those that are part of this HCP. In other words,

both priorities for the HCP and other, non-HCP priorities will shape the overall OESF research program. Research on watershed processes and aquatic habitats, the habitat needs of late seral species, ecosystem productivity and health, timber harvesting systems, landscape management, and other topics will be featured in the OESF, in addition to the HCP research topics described previously.

DNR recognizes the substantial financial commitment that the HCP research program entails. DNR will provide research funding commensurate with the importance of the HCP and the scope of the research questions to the extent DNR is given flexibility to make that decision. The exact funding level may vary from year to year, depending on actions of the Legislature, but DNR shall request at least $1 million per year for HCP research until the Priority 1 research topics listed above have been adequately addressed. In some cases, however, it may not be necessary for DNR to fund research on a particular topic. Other organizations may sponsor work that will generate the knowledge needed. An important part of the HCP research program will be to stay in touch with other Pacific Northwest research programs and assimilate information that can be used to meet HCP information needs.

RESEARCH PROCEDURES AND REPORTS

A research procedure will be prepared for each investigation that is part of the HCP research program. Research procedures will describe background and rationale, specific objectives, research approach, hypotheses to be tested, data to be collected, field and analysis methods, budgets, and timelines. A study's principal investigator(s) will prepare procedures for research in consultation with DNR. Investigators will also prepare annual reports that describe the results of work carried out during the preceding year, summarize data collected, and present preliminary data analyses. A comprehensive final report that includes detailed results, conclusions, and management recommendations will be prepared at the conclusion of each research project. DNR will emphasize rapid dissemination of research results to DNR managers, planners, and technical specialists, and rapid assimilation of new information into conservation and management approaches. DNR will also require investigators to seek publication of research results in refereed professional journals.

Reporting

The Implementation Agreement describes how reviews and inspections will occur.

DNR will provide the U.S. Fish and Wildlife Service and the National Marine Fisheries Service with standard year-end reports compiled through DNR's geographic information system or other methods, such as summaries of timber sales and other management activities. As discussed in the earlier section in this chapter titled Monitoring, DNR will also prepare an annual report that describes the results of all monitoring activities carried out during the preceding calendar year. Monitoring reports will be completed and submitted to the U.S. Fish and Wildlife Service by March 30 of each year.

1 No Action/No Change (Current Practices)

2 No Harvest/No Take

VI.

VI. Alternatives to the HCP that Would Avoid Take

A discussion of the range of alternatives can be found in the Draft Environmental Impact Statement. However, to meet the requirements for an HCP, a brief discussion is included here of alternatives that would avoid take and why they are not as suitable for DNR-managed lands as operating under an HCP with incidental take permits. (A copy of the Draft Environmental Impact Statement can be obtained from DNR.)

No Action/No Change (Current Practices)

This alternative is considered in detail in the Draft Environmental Impact Statement. Like this HCP, the No Action/No Change alternative adheres to trust duties, state Forest Practices Rules, policies of the Board of Natural Resources, and laws of general applicability such as the Endangered Species Act.

Briefly, under the No Action/No Change alternative, DNR would not seek incidental take permits or an agreement on unlisted species from the U.S. Fish and Wildlife Service or the National Marine Fisheries Service. DNR would not implement a habitat conservation plan. To comply with the Endangered Species Act, DNR's trust land management would be regulated by the federal government and guided by the policies of the Board of Natural Resources as stated in the 1992 Forest Resource Plan.

DNR would continue management policies and practices designed to reduce the risk of violating the Endangered Species Act. Specific policies and practices with regard to compliance with federal law are not necessarily associated with state Forest Practices Rules. Risk-management practices or policies include:

(1) conducting two-year surveys on proposed timber sales in suitable spotted owl habitat;

(2) deferring from sale some suitable spotted owl habitat within the boundary of the Olympic Experimental State Forest;

(3) deferring timber sales involving potential marbled murrelet habitat within 40 miles of marine waters and conducting a case by case review of sales between 40 and 52.25 miles;

(4) conducting marbled murrelet habitat relationship studies to assist the Board of Natural Resources in determining an acceptable level of risk; and

(5) screening certain other sales for potential taking of a federally listed species.

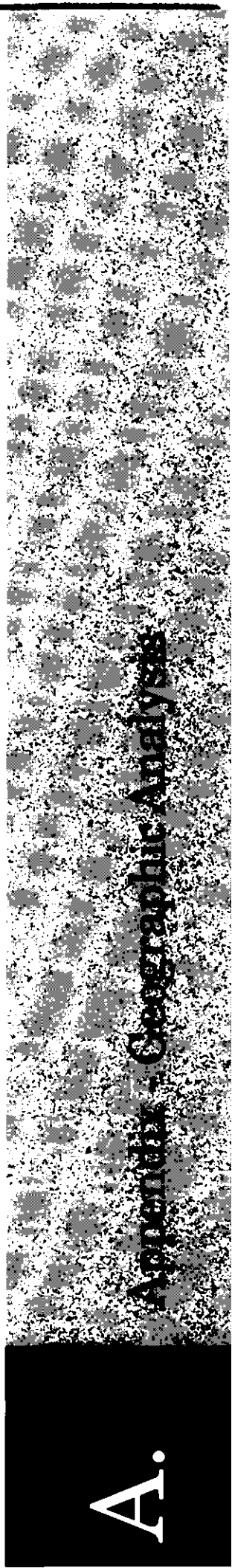
Under the No Action/No Change alternative, the focus of DNR's conservation efforts related to compliance with the Endangered Species Act is on current habitat conditions. Existing suitable habitat for murrelets would be essentially off limits for harvest; and in areas now occupied by spotted owls, sales would be offered only where there is more than 40 percent habitat within a circle. Where survey information shows a spotted owl activity center (or circle) has been abandoned, additional acres would be available for sale upon the completion of a series of decertification surveys. Conversely, where surveys show new spotted owl activity and habitat below the 40 percent threshold, these areas would be off limits. The No Action alternative assumes DNR will continue to survey in an attempt to clear for harvest as much mature timber as possible, but also that the Board would continue its current risk-management approach regarding sales in suitable habitat. The costs of complying with the Endangered Species Act would include the costs of continuing the current survey program.

Uncertainty regarding compliance with the Endangered Species Act is the dominant feature of this alternative and would continue through time. Requirements could stiffen, more species could be listed, or requirements could relax with changes in federal policy. DNR would respond to changing the Endangered Species Act requirements and take precautions when guidance is lacking to ensure compliance with the Endangered Species Act.

The No Action/No Change alternative does not allow DNR to provide the same level of certainty, stability, and flexibility as the HCP would in carrying out DNR's duties as trust manager. (See the section of Chapter II titled Trust Duties.) Because of the continuing changes in regulations to avoid take of a listed species and the possible listings of additional species with more resulting regulations, there is a degree of uncertainty that inhibits DNR's management. Such uncertainty causes lack of stability in DNR's timber sales program, which is the primary source of revenue for the trusts. Uncertainty also limits flexibility in operations. In contrast, it is expected that the HCP will allow DNR to better meet its duty to the trust of striving to produce the most substantial support possible over the long term consistent with all trust duties conveyed on DNR by the state of Washington.

No Harvest/No Take

Briefly, under the No Harvest alternative, DNR would achieve compliance with the Endangered Species Act by not conducting harvest activities, building roads, or conducting other land management activities within or near existing and potential habitat for listed and candidate species. Forested trust lands would be unmanaged in an effort to grow new habitat for listed and candidate species. This alternative is not feasible because it would not allow DNR to meet its legal obligations to the trusts. (See the section of Chapter II titled Trust Duties.) To eliminate the state's responsibilities as trustee, the State Enabling Act and the State Constitution would have to be amended.



Appendix A. Geographic Analysis

Much of the underlying analysis for the conservation strategies in the HCP was supported by DNR's geographic information system.

A geographic information system (GIS) is a system of integrated processes for the entry, analysis, and query of any data that can be referenced to a specific location. Comprised of computer hardware and software, geographic data, support staff, and applications, the purpose of a GIS is to provide meaningful geographic information in either map or report form.

A GIS query can take either of two general forms. In one form, the user begins with a specific known location (e.g., a timber stand, ownership parcel, or stream segment) and queries the GIS for all characteristics of that location (e.g., age of timber, owner of parcel, or name of stream). For the other form of query, the user enters a list of desired characteristics, without knowledge of where they exist, and queries the GIS for the locations having those characteristics (e.g., stands with timber more than 60 years old, owned by the county, or within 1 mile of the Rushing River).

DNR has been developing its GIS since 1982 and now has a well established, state-of-the-art system. Its client-server architecture consists of a central corporate database, more than 40 workstations, ARC/INFO software, and nearly 400 trained DNR staff. The GIS has become integrated into almost every facet of DNR's daily operations.

For the HCP, DNR's GIS has been used in two general phases: (1) initially providing information to evaluate the current situation, and (2) modeling potential conservation strategies and analyzing results. For the first phase, a large amount of statewide geographic data was required to help lay the foundation of the HCP and define conservation objectives. To avoid producing endless numbers of maps with all possible combinations of geographic data, DNR staff developed a computer menu that allowed any combination of data to be selected and mapped on the computer screen. During Science Team meetings, the maps were displayed through an overhead projector so that the scientists could query the GIS and see the results. Aided by map analyses, the Science Team and DNR determined the wildlife species on which to focus efforts, the resulting geographic extent of the HCP, and the appropriate geographic subunits to use for more detailed analysis.

The second phase — modeling and analysis — used the GIS to its full potential. The breadth and variety of GIS use in this context can best be shown by the following examples. For modeling the conservation strategies for the northern spotted owl and marbled murrelet, the GIS was used to map and evaluate:

- elevation breaks and observed sightings defining the Washington range of both species;
- spatial relationships between DNR-managed forest lands and federal reserves;

- distribution of potential habitat across lands managed by various state and federal agencies; and
- timber age distributions on DNR-managed forest lands.

For developing riparian ecosystem conservation strategies, the GIS was used to map and evaluate:

- stream densities (miles of stream per square mile) by stream type;
- miles of stream, summarized by stream type;
- stream gradients, summarized by stream type;
- hillslopes and slope shapes (for predicting areas of slope instability);
- elevation, rainfall, vegetation, and latitude (to predict rain-on-snow zones, which in turn may predict runoff problems);
- areas where soils may be susceptible to erosion when disturbed;
- various stream buffering scenarios, along with their contribution to habitat and effect on timber harvest activities;
- road densities (miles of road per square mile);
- road/stream intersections (bridges, culverts, fords) as potential trigger points for storm runoff; and
- stream stocking status for anadromous fish.

Approximately 85 percent of the geographic data utilized were already resident in DNR's GIS. The remainder was acquired primarily from the U.S. Forest Service and the Washington Department of Fish and Wildlife.

Any GIS data is, by definition, only a *model* of reality — a snapshot of conditions that are highly complex and dynamic. Although computer automation can give a very high level of precision, it does not in itself assure accuracy. Accuracy is achieved and maintained only at significant cost and is relative to the specific need. Therefore, while all the data used in GIS analysis are of a reasonably high quality, great diligence was exercised throughout the process to assure that the data were not used beyond their inherent limitations.

The GIS has been an important tool for communicating among the scientists, DNR staff, other government agencies, the beneficiaries, and the general public. It was a fundamental aid in establishing confidence in the conservation strategies. The GIS will continue to play a large part in implementing and monitoring the HCP.

B.

Appendix B. Implementation Agreement

IMPLEMENTATION AGREEMENT FOR THE WASHINGTON STATE DEPARTMENT OF NATURAL RESOURCES HABITAT CONSERVATION PLAN

THIS AGREEMENT is made and entered into as of the 30th day of January, 1997, by and between the Secretary of the Interior acting through the United States Department of the Interior, as represented by the UNITED STATES FISH AND WILDLIFE SERVICE ("USFWS"), an agency of the federal government, the Secretary of Commerce acting through the NATIONAL OCEANIC & ATMOSPHERIC ADMINISTRATION as represented by the NATIONAL MARINE FISHERIES SERVICE ("NMFS"), an agency of the federal government, and the WASHINGTON STATE DEPARTMENT OF NATURAL RESOURCES, ("DNR"), an agency of the State of Washington, which includes the WASHINGTON STATE BOARD OF NATURAL RESOURCES ("BOARD").

BACKGROUND

1.0 DNR manages approximately 2.1 million acres of forest lands within the State of Washington.

2.0 Approximately 1.6 million acres of DNR-managed forest lands are within the range of the Northern Spotted Owl (*Strix occidentalis caurina*), (*"the Owl"*).

3.0 The Marbled Murrelet (*Brachyramphus marmoratus*), Bald Eagle (*Haliaeetus leucocephalus*), Grizzly Bear (*Ursus arctos*), Gray Wolf (*Canis lupus*), Peregrine Falcon (Falco peregrinus), Columbian White-tailed Deer (*Odocoileus virginianus leucurus*), Aleutian Canada Goose (*Branta canadenis leucopareia*), and Oregon Silverspot Butterfly (*Speyeria zerene hippolyta*) (*hereafter known collectively as "other federally listed species"*) occur or may occur on the PERMIT LANDS.

4.0 The aforementioned species are listed as threatened or endangered under the Federal Endangered Species Act, 16 U.S.C. § 1531, *et seq.*, ("ESA"), and any taking, as that term is used in the ESA, of these species is prohibited, except as permitted by the ESA.

5.0 Incidental takings in accordance with an Incidental Take Permit ("ITP") issued by the SERVICES in conjunction with approval of a Habitat Conservation Plan ("HCP") are authorized by the ESA.

6.0 DNR, with technical assistance from the SERVICES and others, has prepared an HCP for the Owl and other species that may use the types of habitat that occur on the PERMIT LANDS.

7.0 DNR has applied to have the ITP include the Owl and other federally listed species that may currently use the types of habitats that occur on PERMIT LANDS; and to have the ITP, as amended from time to time, include every species that becomes listed after the effective date of this Implementation Agreement ("Agreement") and that may now or hereafter use the types of habitats that occur within the five Westside Planning Units of the PERMIT LANDS and the Olympic Experimental State Forest (OESF).

8.0 The SERVICES require an Implementation Agreement to be signed by all PARTIES associated with issuance of an ITP for a long-term HCP.

9.0 The purposes of this Agreement are to obtain an approved HCP and ITP covering DNR-management activities on the PERMIT LANDS; to implement the HCP; to commit the PARTIES to fulfill and faithfully perform their respective obligations, responsibilities, and tasks to the extent consistent with their respective authorities; to identify remedies and recourse should any of the PARTIES fail to perform such obligations, responsibilities, and tasks; and to provide for regulatory relief, stability, and species conservation.

10.0 The SERVICES have given full consideration to the HCP and this Agreement and found them to meet the requirements for issuance of an ITP under the ESA.

11.0 DNR has given full consideration to the HCP, its alternatives, the ITP, and this Agreement and found the HCP, the ITP, and this Agreement to be in the best interest of each of the trusts.

NOW, THEREFORE, in consideration of the mutual covenants and conditions contained below, the PARTIES agree as follows:

AGREEMENT

12.0 Definitions. The terms of the HCP, and this Agreement shall be interpreted as supplementary to each other, but in the event of any direct contradiction between the terms of the HCP and this Agreement, the terms of this Agreement shall control. Terms capitalized in this document shall have the meanings set forth in this section.

12.1 The terms "PARTY" and "PARTIES" shall mean one or all of the following: the Secretary of the Interior acting through the United States Department of the Interior, as represented by the USFWS, the Secretary of Commerce acting through the National Oceanic and Atmospheric Administration, as represented by NMFS, and DNR, including the BOARD.

12.2 The terms "SERVICE" and "SERVICES" shall mean the USFWS and/or the NMFS acting on behalf of their respective Secretaries.

12.3 The terms "ITP" and "PERMIT" shall mean an incidental take permit issued to DNR pursuant to Section 10(a) of the ESA to authorize any incidental take of listed species which may result from otherwise lawful DNR-management activities on PERMIT LANDS, which are conducted in accordance with the HCP and this Agreement.

12.4 The term "PERMIT LANDS" shall mean the lands covered by the ITP and HCP, as referred to in section 15.1 of this Agreement.

12.5 The term "HCP" shall mean the Habitat Conservation Plan prepared by DNR, and as amended.

12.6 The term "SPECIES ADDRESSED IN THE HCP" includes all species currently listed as threatened or endangered that may use the types of habitat found on the PERMIT LANDS, and all species hereafter listed as threatened or endangered that may use the types of habitat found within the five Westside Planning Units and the OESF. These species include species listed under the ESA or afforded similar status or protection by federal law or regulation applicable to or affecting the PERMIT LANDS during the term of the HCP.

12.7 The term "DAYS" shall mean calendar days.

12.8 The term "COMPLIANCE" shall mean substantial compliance with the commitments of the HCP, ITP, and this Agreement.

12.9 The terms "DEMONSTRATES" and "DEMONSTRATING" shall mean to establish the existence of a condition or development by use of the best scientific and/or commercial data available.

12.10 The term "PEER REVIEWED" shall mean that consistent with section B(1) of the Interagency Cooperative Policy for Peer Review in Endangered Species Activities (59 Fed. Reg. 34,270), the SERVICES will provide for peer review of the scientific data on which the agencies base any finding requiring peer review in this Agreement to ensure that any such findings are based on the best scientific and commercial data available. The SERVICES will request peer review so that the reviews will be completed within seventy-five (75) DAYS of DNR's request. In the event peer review of such data is not available in time to enable the SERVICES to meet their obligations established by statute, regulation, or this Agreement, the required finding or decision based on such data will be effective, but will be reconsidered by the SERVICES as soon as that information becomes available.

13.0 Incorporation by Reference. The HCP is intended to be, and by this reference is, incorporated herein.

14.0 Responsibilities of the PARTIES. The PARTIES agree to be bound by and to the commitments of the HCP, the ITP, and this Agreement, subject to amendment, renewal, or termination as provided herein.

15.0 PERMIT LANDS.

15.1 PERMIT LANDS Description. Contained in Map I.1 of the HCP, and incorporated herein by reference, are Geographic Information Systems (GIS) data describing the PERMIT LANDS subject to the HCP, the ITP, and this Agreement. Said lands are referred to in the HCP, the ITP, and this Agreement variously as the "DNR-managed lands in the area covered by the HCP," "PERMIT LANDS," the "DNR forest lands," the "DNR-managed lands," the "lands within the planning units," and other similar terms. All such terms, unless otherwise indicated, used in the HCP, the ITP, or this Agreement refer to those lands identified in Map I.1 of the HCP as "DNR-managed HCP lands."

15.2 Natural Area Preserves and Natural Resource Conservation Areas. DNR manages approximately 45,000 acres of Natural Area Preserves ("NAPs") and Natural Resource Conservation Areas ("NRCAs") that lie within the range of the Owl. Approximately 14,765 acres of these lands have been designated as important for achieving the commitments of the HCP. It is expected that the designated lands will continue to provide this habitat in the future and this habitat will count as mitigation so long as such habitat remains present. DNR will notify the SERVICES if the designated lands, or a portion thereof, will no longer be managed consistent with the commitments of the HCP. While not subject to the commitments of the HCP or this Agreement, so long as they are managed consistent with the commitments of the HCP, the SERVICES will give DNR credit for the habitat provided by the designated lands in terms of meeting the commitments assigned to DNR in the HCP, the ITP, and this Agreement. Whether the designated lands continue to provide this habitat, and the mitigation if they do not, will be considered by the SERVICES at the time the SERVICES are notified by DNR that the designated lands will no longer be managed consistent with the commitments of the HCP. Take incidental to DNR-management activities on the designated lands is authorized by the ITP so long as such take is in COMPLIANCE with the HCP, the ITP, and this Agreement.

16.0 Forest Product Sales and Other Management Activities Other Than Land Sales, Purchases, and Exchanges.

16.1 Management Activities Subject to this Agreement. DNR has an active management program for its PERMIT LANDS, including but not limited to forest practices, forest product sales, other valuable material sales, licenses, permits, leases, rights-of-way, and public uses. So long as the SERVICES have not suspended or revoked the ITP under section 26.0 of this Agreement or DNR has not terminated the ITP under section 27.0, the ITP will authorize any incidental take otherwise prohibited by the ESA which may result from otherwise lawful DNR-management activities that are conducted in accordance with the HCP and this Agreement.

16.2 Management Activities in Progress or Under Way.

a. Timber Sales. DNR will incorporate the relevant commitments of the HCP into all timber sales sold on or after January 1, 1999. DNR may, but is not required to, incorporate the commitments of the HCP into timber sales sold prior to January 1, 1999.

b. Nontimber Resource Activities. Excepting designations and leases under subsection 25.3.a(2) of this Agreement, DNR will incorporate the relevant commitments of the HCP into all nontimber resource transactional documents pertaining to PERMIT LANDS including, but not limited to, leases, licenses, permits, contracts, and sales, executed on or after January 1, 1999. DNR may, but is not required to, incorporate the commitments of the HCP into nontimber resource transactional documents pertaining to PERMIT LANDS including, but not limited to, leases, licenses, permits, contracts, and sales, executed prior to January 1, 1999. As leases, licenses, contracts, and permits of PERMIT LANDS are renewed, DNR shall alter such leases, licenses, contracts, and permits, to the extent permitted by law, to ensure compatibility with the commitments of the HCP. The level of nontimber resource activity and associated take, if any, of SPECIES ADDRESSED IN THE HCP will be reviewed annually in conjunction with the annual meeting under subsection 17.2 of this Agreement. The annual review meetings will be used by the PARTIES to ensure that any expansion in the level of DNR's nontimber resource activities, as described in

Chapter IV of the HCP, that occur on PERMIT LANDS do not result in increased incidental take of SPECIES ADDRESSED IN THE HCP. If increased incidental take will result, DNR will initiate the amendment process under subsection 25.3(b)-(c) of this Agreement. At the annual meeting, DNR will provide the SERVICES with the results of the nontimber resource monitoring efforts as described in the HCP.

16.3 Severability. Management activities on DNR lands are often accomplished through an agent, lessee, licensee, contractor, permittee, right-of-way grantee, or purchaser. Take incidental to otherwise lawful activities of these entities is authorized by the ITP so long as such take is authorized by DNR and is in COMPLIANCE with the HCP, the ITP, and this Agreement. A violation of the ITP by an agent, lessee, licensee, contractor, permittee, right-of-way grantee, or purchaser, which was not authorized by DNR, shall not result in the suspension, revocation, or termination of the ITP, nor shall it affect other benefits, rights, or privileges under the ITP, except as to that agent, lessee, licensee, contractor, permittee, right-of-way grantee, or purchaser.

17.0 Land Transfers, Purchases, Sales, and Exchanges. DNR has an active program of land acquisition and disposition, including but not limited to land transfers, sales, purchases, and exchanges. This program includes intergrant transactions. The HCP provides for continuation of this program.

17.1 Conservation Objectives of the HCP. The HCP and this Agreement recognize that it is necessary for DNR to continue to pursue an active land disposition program. In carrying out such an active land disposition program, DNR commits to maintaining the conservation objectives described in Chapter IV of the HCP in the course of its land disposition program. DNR may dispose of PERMIT LANDS, including PERMIT LANDS within any Watershed Administrative Unit ("WAU"), or any quarter-township in eastern Washington, even though such a disposition is not in accord with the habitat goals for a particular WAU, or quarter-township, so long as the conservation objectives described in Chapter IV of the HCP are maintained. Annual and other meetings held under section 17.2 will address whether disposition of PERMIT LANDS would have a significant adverse effect on the conservation objectives described in Chapter IV of the HCP.

17.2 Notification and Annual Review of Land Transactions. The PARTIES will hold annual meetings in December of each year, unless otherwise mutually agreed upon by the PARTIES, to review proposed and completed land transactions involving PERMIT LANDS. At such meetings, DNR will notify the SERVICES in writing of any known proposed land transfers, purchases, sales, or exchanges expected to occur within the upcoming year involving PERMIT LANDS. A follow up meeting will be held within sixty (60) DAYS after the annual meeting, if needed. Additional meetings may be convened on a more frequent basis or incorporated into the scheduled comprehensive reviews contemplated under section 21.0 with the mutual consent of the PARTIES. DNR will mail to the SERVICES preliminary transactional documents at the time such documents are mailed to the BOARD for all land transactions involving PERMIT LANDS that were not discussed during the annual meetings. DNR will also mail the closing documents to the SERVICES within thirty (30) DAYS of closing for all transactions involving PERMIT LANDS. Neither SERVICE, however, shall have the power to veto any land transaction. DNR will amend annually, or more frequently if it desires, the HCP pursuant to section 25.3 of this Agreement to reflect lands added to or removed from the PERMIT LANDS. In no event will DNR conduct management activities that will result in take on lands that will be added to the ITP prior to amendment of the HCP.

17.3 Land Acquisition by Transfer, Purchase, or Exchange. The PARTIES shall, upon request by DNR, add lands acquired by transfer, purchase, or exchange within the range of the Owl to the HCP, ITP, and this Agreement. DNR will incorporate the relevant commitments of the HCP into the management of these new PERMIT LANDS. No additional mitigation will be required unless the management of these new PERMIT LANDS increases take beyond the level authorized in the ITP. If the management of these new PERMIT LANDS increases take beyond the level authorized in the ITP, then any additional mitigation will be determined through amendment of the HCP based on mutual agreement among the PARTIES. DNR, at its sole discretion, may at any time add acquired lands to the WAU or quarter-township base referred to in Chapter IV of the HCP, but is not required to do so. So long as land DNR seeks to add to the HCP in accordance with this paragraph does not increase the level of take, it shall be the subject of a minor amendment to the HCP pursuant to section 25.3 and shall thereafter be PERMIT LANDS.

17.4 Land Disposition by Transfer, Sale, or Exchange. DNR, at its sole discretion, may voluntarily dispose of PERMIT LANDS by transfer, sale, or exchange. DNR, at its sole discretion, may require that the recipient of the disposed land commit to managing the disposed land in accordance with the HCP and this Agreement. DNR is not required by the HCP, the ITP, or this Agreement to require continuation of the commitments of the HCP or this Agreement on the disposed land. If DNR sells or exchanges DNR-managed lands, NAPs, or NRCAs, and the acquiring entity commits in writing to the SERVICES that the lands disposed by DNR will be managed in a manner which maintains the commitments of the HCP, DNR will continue to be given credit for such lands for the purpose of determining whether DNR is in COMPLIANCE with the HCP, the ITP, and this Agreement. If land disposed of by DNR does not remain subject to the provisions of the HCP, and the cumulative impact of the land disposition would have a significant adverse effect on the affected species, the PARTIES, based on the best scientific and commercial data available at the time, shall amend the HCP, this Agreement, and the ITP to provide replacement mitigation for the affected species pursuant to the standards and processes outlined in the extraordinary circumstances provisions of section 24 herein.

17.5 Federal Condemnation. In the event of condemnation of DNR-managed lands, NAPs, or NRCAs by the federal government, the PARTIES shall not be required to replace mitigation lost due to condemnation. The PARTIES' obligations relating to the condemned lands under the HCP and this Agreement shall be terminated.

17.6 Rights and Authorities Preserved. Except as otherwise specifically provided in this Agreement, nothing herein contained shall be deemed to restrict the rights, privileges, and powers of the State of Washington or DNR to manage the use of, or exercise all of the rights incident to, land ownership associated with the PERMIT LANDS. Nothing herein contained shall be interpreted to restrict the authority of the SERVICES to administer the ITP with respect to the PERMIT LANDS in accordance with this Agreement and the ESA.

18.0 Funding. DNR shall submit to the Washington State Legislature, on at least a biennial basis, an agency operating and capital budget for asset management that will be adequate to fulfill DNR's obligations under the HCP, ITP, and this Agreement. Failure by DNR to ensure adequate funding is provided to implement the HCP shall be grounds for suspension or partial suspension of the ITP.

The SERVICES shall include in their annual budget requests sufficient funds to fulfill their respective obligations under the HCP, ITP, and this Agreement.

19.0 Duration.

19.1 Term of PERMIT. The HCP, ITP, and this Agreement shall remain in full force and effect for a period of seventy (70) years from the effective date, or until revocation under section 26.0 or termination under section 27.0 of this Agreement, whichever occurs sooner. Amendments to the HCP, the ITP, or this Agreement shall be in full force and remain in effect for the then remaining term of this Agreement or until revocation under section 26.0 or termination under section 27.0 of this Agreement, whichever occurs sooner.

19.2 PERMIT Renewal. Unless revoked under section 26.0 or terminated under section 27.0 of this Agreement, DNR may renew the PERMIT, HCP, and this Agreement on the existing terms or other mutually agreeable terms three (3) times for a period of up to ten (10) years per renewal, provided:

(a) DNR is in COMPLIANCE with the HCP and this Agreement;

(b) the PARTIES have met approximately three (3) years prior to the scheduled PERMIT or renewal period expiration date to discuss the renewal of the PERMIT, HCP, and this Agreement, and DNR provides the SERVICES with at least eighteen (18) months notice of its intent to renew the PERMIT;

(c) DNR finds that renewal of the PERMIT, HCP, and this Agreement would be in the best interest of each of the trusts; and

(d) the sum of the original PERMIT term and any continuation or renewal periods does not exceed one hundred (100) years.

19.3 PERMIT Continuation. Unless revoked under section 26.0 or terminated under section 27.0 of this Agreement, the SERVICES may require DNR to continue implementing the HCP, PERMIT, and this Agreement for up to three (3) periods of up to ten (10) years apiece, provided that:

(a) at the end of the original PERMIT term or the continuation periods under this subsection, the SERVICES DEMONSTRATE that DNR has failed to achieve its commitments under the HCP as described in Chapter IV of the HCP;

(b) the PARTIES have met approximately three (3) years prior to the scheduled expiration date to discuss the potential for continuation or renewal of the HCP, PERMIT, and this Agreement, and the SERVICES provide DNR with at least eighteen (18) months notice of their intent to require continuation of the HCP, PERMIT, and this Agreement; and

(c) the sum of the original PERMIT term and any continuation or renewal periods does not exceed one hundred (100) years.

20.0 Reporting and Inspections. DNR will provide the SERVICES with two (2) copies of each report described in Chapter V of the HCP, at the addresses designated by the SERVICES, and any readily available existing information requested by either SERVICE to verify the information contained in such reports. Either SERVICE may inspect PERMIT LANDS in accordance with its then applicable regulations. Except as provided in its regulations, the inspecting SERVICE will notify DNR thirty (30) DAYS prior to the date they intend to make such inspections and allow DNR representatives to accompany SERVICE personnel when making inspections. To assist DNR in meeting its obligations under this Agreement, the SERVICE will brief DNR in writing on the factual information learned during any inspection within thirty (30) DAYS of such inspection, except as provided in its regulations.

21.0 Comprehensive Reviews. The PARTIES to this Agreement will conduct periodic reviews of the HCP, the ITP, and this Agreement, consulting with one another in good faith to identify any amendments that might more effectively and economically mitigate any incidental take. The PARTIES shall conduct comprehensive reviews within one month of the first, fifth, and tenth, anniversaries of the effective date and every tenth anniversary thereafter for the full term that this Agreement is in effect. Upon mutual agreement of all the PARTIES, additional reviews may be scheduled at any time.

22.0 Adequacy and Certainty.

22.1 Assurances. The HCP provides habitat conservation for all SPECIES ADDRESSED IN THE HCP, while providing regulatory relief, certainty, flexibility, and stability for DNR. Specifically, the conservation strategies afforded all habitat types, and the species specific measures of the HCP and this Agreement, adequately provide for all SPECIES ADDRESSED IN THE HCP and contain measurable criteria for the biological success of the HCP. Unless the SERVICES have suspended or revoked the ITP under section 26.0 of this Agreement or have not added a newly listed species to the PERMIT under subsection 25.1(b) of this Agreement, DNR is assured by this Agreement that any incidental taking of a SPECIES ADDRESSED IN THE HCP in the course of its otherwise lawful management activities will be authorized under the ESA. The SERVICES are assured by this Agreement that the incidental taking authorized by the ITP is consistent with the conservation of the species under the ESA.

22.2 Findings by the SERVICES. Based upon the best scientific and commercial data available and after careful consideration of all comments received, the SERVICES have found that with respect to all SPECIES ADDRESSED IN THE HCP:

(a) that any take on PERMIT LANDS under the HCP will be incidental;

(b) the impacts of any incidental take under the HCP will, to the maximum extent practicable, be minimized and mitigated;

(c) that DNR will ensure that adequate funding for the HCP will be provided in accordance with this Agreement and the HCP;

(d) that any taking of a SPECIES ADDRESSED IN THE HCP will not appreciably reduce the likelihood of the survival and recovery of such species in the wild; and

(e) that other measures and assurances required by the SERVICES as being necessary or appropriate for the purposes of the HCP are met.

23.0 Unforeseen Circumstances.

23.1 Unforeseen Circumstances Consultation. In the event of unforeseen circumstances arising in connection with the HCP, the ITP, or this Agreement, the appropriate SERVICE may request consultation with DNR regarding those circumstances and may suggest modifications to the commitments of the HCP, the ITP, or this Agreement. DNR shall consult with the SERVICE to explore whether there is a mutually acceptable means for adjusting the commitments of the HCP, the ITP, and this Agreement that maintains the interests of all PARTIES. If the cost of a mutually acceptable adjustment would be significant to DNR, then the PARTIES must strive to find further or different voluntary adjustments that would avoid or minimize the cost to DNR. The SERVICES shall not seek from DNR without its consent a commitment of additional land or financial undertaking beyond the level of mitigation which is provided under the commitments of the HCP, the ITP, and this Agreement.

23.2 Findings of Unforeseen Circumstances. The SERVICES shall have the burden of DEMONSTRATING that unforeseen circumstances have arisen. If DNR, after consultation and in its sole discretion, does not agree voluntarily to implement the requested changes, then the SERVICE must look to section 24.0 regarding extraordinary circumstances if it wishes to continue to pursue changes, and must satisfy the provisions of section 24.0 regarding such desired changes. The SERVICES agree that so long as DNR is in COMPLIANCE with its commitments under the HCP, ITP, and this Agreement, they will not impose on DNR any nonconsensual additional land-use restrictions, financial obligations, or any other form of additional mitigation for any SPECIES ADDRESSED IN THE HCP except under extraordinary circumstances as addressed in section 24.0.

24.0 Extraordinary Circumstances.

24.1 Extraordinary Circumstances Defined. Additional mitigation requirements shall not be imposed upon DNR without its consent provided DNR is in COMPLIANCE with the HCP, the ITP, and this Agreement, and the HCP is properly functioning, except under extraordinary circumstances. Extraordinary circumstances shall mean that continued DNR-management activities in accordance with the HCP, the ITP, and this Agreement would result in a substantial and material adverse change in the status of a species that was not foreseen on the effective date of this Agreement which can be remedied by additional or different mitigation measures on the PERMIT LANDS. The SERVICES shall have the burden of DEMONSTRATING that extraordinary circumstances exist.

24.2 Findings of Extraordinary Circumstances. Findings of extraordinary circumstances must be clearly documented in writing and based upon reliable, PEER REVIEWED technical information regarding the status and habitat requirements of the affected species. Furthermore, in deciding whether any extraordinary circumstances exist with respect to a particular SPECIES ADDRESSED IN THE HCP, which might warrant additional mitigation, the SERVICES shall consider, but not be limited to the following factors:

(a) the size of the current range of the affected species;

(b) the percentage of range adversely affected by the HCP;

(c) the percentage of range conserved by the HCP;

(d) the ecological significance of that portion of the range affected by the HCP;

(e) the level of knowledge about the affected species and the degree of specificity of the species conservation program under the HCP;

(f) whether the HCP was originally designed to provide an overall net benefit to the affected species and contained measurable criteria for assessing the biological success of the HCP; and

(g) whether failure to adopt additional conservation measures would appreciably reduce the likelihood of survival and recovery of the particular species in the wild.

Upon a finding of extraordinary circumstances, the SERVICES will have ninety (90) days to determine any additional mitigation necessary, during which time DNR will use its best efforts to avoid a substantial and material adverse change in the status of the affected species. If the SERVICES are unable to achieve appropriate additional mitigation, the SERVICES shall work with DNR to find the least disruptive method of continuing DNR-management activities.

24.3 Effect of Additional Mitigation Measures on the HCP. Any additional mitigation measures approved under this section shall change the original terms of the HCP only to the minimum extent necessary and shall be limited to modifications on the PERMIT LANDS, and any additional mitigation requirements under this Agreement shall not involve additional financial commitments by DNR or land use restrictions on DNR without its express written consent. The SERVICES may seek additional funding for mitigation from other sources.

24.4 SERVICES Free to Take Independent Action. Nothing in this Agreement shall be construed to limit or constrain either SERVICE from carrying out lawful additional mitigation actions at their own cost with respect to the protection of any listed species, or endeavoring to provide mitigation by means of other resources or financial assistance to DNR to the fullest extent possible in accordance with law and available appropriations.

24.5 Adaptive Management. Adaptive management provides for ongoing modifications of management practices to respond to new information and scientific developments. The monitoring and research provisions of the HCP are in part designed to identify modifications to existing management practices. The following adaptive management practices shall be implemented by DNR as reasonably necessary to respond to the following changes of circumstances and are not subject to subsections 23.1, 23.2, 24.1, 24.2, and 24.3:

(a) the best available scientific and commercial data indicate that an increase in the percentage of ground cover of dead and down wood is required for the support of the Owl in the definition of sub-mature habitat in Chapter IV section A of the HCP, provided DNR's responsibility shall be limited to 15 percent ground cover averaged over a stand;

(b) the best available scientific and commercial data indicate that the model used to delineate mass wasting on a site-specific basis under Chapter IV section D of the HCP can be reasonably improved to increase its accuracy;

(c) the best available scientific and commercial data indicate that the landscape-based road network management process described in Chapter IV section D of the HCP can be reasonably and practically improved, considering both the costs and benefits of implementing the improvement;

(d) the necessity for continued provision of nest patches has changed as a result of conducting research to determine the biological feasibility of using silvicultural techniques to create spotted owl nesting habitat;

(e) with specific reference to the marbled murrelet, the habitat definitions will be refined for each planning unit as a result of DNR's habitat relationships study;

(f) with specific reference to the marbled murrelet, the interim conservation strategy will be replaced with a long-term management plan upon completion of the inventory survey phase;

(g) management activities allowed within the riparian management zones will be refined within the first decade of the HCP;

(h) wind buffer management is refined as this priority research item is addressed;

(i) a long-term conservation strategy for forest management along Type 5 Waters is developed and incorporated into the HCP at the end of the first ten years of the HCP; and

(j) prescriptions resulting from a completed watershed analysis call for additional measures than those specified in the HCP.

All other adaptive management strategies are subject to subsections 23.1, 23.2, 24.1, 24.2, 24.3, and 24.4.

25.0 Amendments and Modifications.

25.1 PERMIT Amendments and Modifications. The ITP may be amended or modified as follows:

a. General Amendments to the ITP. The ITP can be amended or modified in accordance with SERVICE regulations as provided in this Agreement. If the federal regulations that govern PERMIT amendment have been modified from those codified at 50 C.F.R §§ 13.23, 220.11, 222.25, and 222.26, as of the effective date of this Agreement, the modified regulations will apply only to the extent the modifications are required by subsequent enactment of the Congress or

court order, or upon a determination by DNR that application of the modifications is in the best interests of the relevant trusts.

b. New Listings. The ITP for the Owl and other federally listed species that may currently use the types of habitats that occur on the PERMIT LANDS will be issued contemporaneously with the signing of this Agreement. In the future, the SERVICES shall add to the ITP, within sixty (60) DAYS of receipt by the appropriate SERVICE of a written request by DNR, each species that may use the types of habitats that occur within the five West Side Planning Units and the OESF that is listed as a threatened or endangered species during the term of this Agreement at the level of take requested by DNR and supported by the HCP without requiring additional mitigation, unless, within the specified sixty-day period, the SERVICE DEMONSTRATES that extraordinary circumstances under section 24.0 exist. If such extraordinary circumstances are found to exist, the SERVICE shall provide the appropriate additional mitigation or other amendments in a timely manner and amend the ITP to include the affected species if appropriated funds are available. If appropriated funds are not available, the SERVICES shall use all lawful means, including soliciting nongovernmental sources of funds and other alternative methods of mitigation or amendment, to endeavor to achieve the appropriate additional mitigation and amend the ITP to cover the particular species.

25.2 Amendments to the Agreement. This Agreement may be amended only with the written consent of each of the PARTIES.

25.3 HCP Amendments. The HCP may be amended as follows:

a. Minor HCP Amendments.

(1) The following types of minor amendments may be made to the HCP without notification, provided that the conservation objectives of the HCP are being maintained, there is no increase in the level of incidental take, and appropriate mitigation is provided. Amendments allowable under this subsection include the following:

(a) land acquisition and disposition as described in section 17.0, which provides for periodic notice and review of DNR land transactions involving PERMIT LANDS;

(b) corrections of typographic and grammatical errors and similar editing errors, which do not change the intended meaning of the HCP; and

(c) corrections to any maps, GIS data, or exhibits to reflect previously approved changes in the HCP or other new information.

(2) So long as appropriate mitigation is provided, the alteration of an HCP commitment or commitments, the formal designation of urban lands pursuant to state law, and the leasing of PERMIT LANDS for commercial, residential, or industrial purposes, or the implementation of one or more of the adaptive management strategies described in Chapter IV of the HCP or subsection 24.5 of this Agreement, that does not increase the level of take authorized by the ITP is a minor amendment effective sixty (60) DAYS after the SERVICES receive written notice

from DNR, unless the appropriate SERVICE responds in writing with specific concerns during the sixty-day notification period.

b. Major HCP Amendments. For other amendments of the HCP, including those amendments that would increase the level of take, proposed by DNR, DNR shall provide a written description of the proposed amendment, the effects of the proposal on the HCP, and any alternative ways in which the objectives of the proposal might be achieved. The proposed amendments shall become effective upon written approval by the appropriate SERVICE. The SERVICE shall approve or disapprove the proposed amendment within 180 DAYS after receipt of the DNR proposal.

c. HCP Amendments and the ITP. HCP amendments that will result in an increased level of incidental take will require amendment to the ITP under subsection 25.1.a of this Agreement. HCP amendments that do not increase the level of incidental take will not require amendment to the ITP under subsection 25.1.a of this Agreement so long as appropriate mitigation is provided.

26.0 ITP Suspension or Revocation. The SERVICES maintain the right to suspend or revoke the ITP in accordance with federal law and this Agreement. The SERVICES agree, however, that so long as DNR is in COMPLIANCE with the HCP, the ITP, and this Agreement, they will not suspend or revoke the ITP, or otherwise sanction DNR except to the extent that the sanction, suspension, or revocation of the ITP is required by applicable federal law or the terms of this Agreement. Any revocation of the ITP, in whole or in part, automatically terminates the relevant commitments of the HCP and this Agreement, and subjects activities no longer covered by the ITP to all applicable provisions of the ESA and SERVICE regulations relating to the taking of a listed species. If federal regulations should be modified from those codified at 50 C.F.R. §§ 13.26-13.29, and/or § 222.27, as of the effective date of this Agreement, the modified regulations will apply only to the extent the modifications are required by subsequent enactment of the Congress or court order, or upon a determination by DNR that application of the modifications is in the best interests of the relevant trusts.

27.0 Termination and Mitigation after Termination.

27.1 Generally. DNR reserves the right to terminate for any reason the HCP and this Agreement with thirty (30) DAYS written notice to the SERVICES. For listed species, the written termination notice shall contain a statement describing the species taken, the level of take, and the species mitigation provided prior to termination. DNR management activities not resulting in incidental take may continue after termination. Unlisted species are treated in subsection 27.5. The PARTIES agree that DNR may terminate the HCP and this Agreement in whole, or in part.

27.2 Effect of Termination. Subject to the provisions of this section and subsection 29.1 of this Agreement, any termination of the HCP and this Agreement, in whole or in part by DNR under section 27, automatically terminates the relevant commitments of the HCP, the ITP and this Agreement, except as otherwise provided in this section 27, and subjects activities no longer covered by the ITP to all applicable provisions of the ESA and SERVICE regulations relating to the taking of a listed species.

27.3 Mitigation After Termination for listed species. Subject to the provisions of subsection 29.1, if the HCP and this Agreement are terminated by DNR, in whole or in part, the appropriate SERVICE may require DNR to mitigate any incidental take of a listed species affected by the termination that occurred during the term of the HCP and this Agreement to the effective date of the termination. Such mitigation may require DNR to continue relevant mitigation measures of the HCP as to some or all of the PERMIT LANDS for some or all of the period which would have been covered by the HCP and this Agreement. The SERVICES shall not extend mitigation requirements to non-PERMIT LANDS, nor shall mitigation requirements be extended beyond the term of this Agreement. Mitigation requirements, if any, shall not exceed the difference between mitigation already provided under the HCP and that required by the HCP for listed species at the time of termination. Unlisted species are treated in subsection 27.5.

27.4 Delisting of a Species. In the event that a species is delisted under the ESA, the commitments of the HCP and this Agreement regarding such species shall be terminated. Mitigation measures designed primarily to benefit the delisted species need not be continued after delisting due to another species unless the appropriate SERVICE DEMONSTRATES that failure to continue those measures would not maintain the conservation objectives of the HCP for the other species, or DNR determines that continuation of such measures is in the best interest of the relevant trusts. The SERVICES shall have the burden of DEMONSTRATING that failure to continue the measures in question would not maintain the conservation objectives of the HCP for another species.

27.5 Unlisted Species. The PARTIES agree that DNR may terminate, in whole or in part, the commitments of the HCP and this Agreement regarding unlisted species upon seventy-five (75) DAYS written notice to the SERVICES. Termination of the commitments of the HCP with regard to an unlisted species relieves the SERVICES from their obligations under subsection 25.1.b to add the species to the ITP if it becomes listed.

Within said seventy-five (75) DAYS the SERVICES shall notify DNR in writing if they will require any mitigation as a result of such termination and, if so, the mitigation to be required. In order to require any mitigation after termination, the SERVICES shall DEMONSTRATE that termination would result in a substantial and material adverse change in the biological status of the affected species. Said DEMONSTRATION shall be based upon reliable, PEER REVIEWED technical information as to the species affected by the proposed termination.

To DEMONSTRATE whether the termination might warrant mitigation after termination and what mitigation might be required, the SERVICES shall consider, but not be limited to, the following factors:

(a) the size of the current range of the affected species;

(b) the percentage of range adversely affected by the termination of the HCP;

(c) the percentage of range conserved by the HCP;

(d) the ecological significance of that portion of the range affected and conserved by the HCP;

(e) the level of knowledge about the affected species and the mitigation provided to the species under the HCP; and

(f) whether the HCP was originally designed to provide an overall net benefit to the affected species.

During the said seventy-five (75) DAYS, DNR will use its best efforts to avoid a substantial and material adverse change in the status of the affected unlisted species. If the PARTIES are unable to agree on the necessity for or the amount of such mitigation, the SERVICES and DNR shall work to resolve any such dispute by using the interagency science team and non-binding mediation provisions under subsection 29.4 prior to final determination. The SERVICES shall not extend mitigation requirements to non-PERMIT LANDS, nor shall mitigation requirements be extended beyond the term of this Agreement. Requirements for such mitigation, if any, shall not exceed the difference between mitigation already provided under the HCP and that required by the HCP for unlisted species at the time of termination.

After the PARTIES mutually agree on a final determination of the potential mitigation to be provided after termination, if any, as to an unlisted species, DNR shall send final notice of such termination, or withdraw the notice of termination. Final notice of termination for an unlisted species shall be effective thirty (30) DAYS after written notice to the SERVICES.

28.0 Authority, Remedies and Enforcement. Each of the PARTIES to this Agreement shall have all remedies available in equity or at law to enforce the commitments of the HCP, the ITP, and this Agreement including specific performance. No PARTY shall be liable for damages to any other PARTY or person for any breach of this Agreement, any performance or failure to perform a mandatory or discretionary obligation imposed by this Agreement, or any other cause of action arising from this Agreement. The HCP, this Agreement, and the ITP shall be interpreted and administered in accordance with the ESA. Nothing contained in this Agreement is intended to unlawfully limit the authority or responsibility of the United States government or DNR to invoke penalties or otherwise fulfill their respective responsibilities as public agencies in accordance with law.

29.0 Informal Dispute Resolution Procedures.

29.1 Termination of the PERMIT. A SERVICE receiving a termination notice under section 27.0 of this Agreement shall notify DNR within sixty (60) DAYS after receipt of the notice if it disagrees with the statement of take or mitigation contained therein. Failure by a SERVICE to disagree with the statement of take or mitigation within sixty (60) DAYS shall constitute agreement with and approval of the statement. If the PARTIES cannot agree on the statement of take, or on necessary mitigation, if any, within sixty (60) DAYS after receiving the notice of disagreement, the PARTIES shall endeavor in good faith to resolve their disagreement through nonbinding mediation.

29.2 In the Event of a Possible Violation. If either SERVICE has reason to believe that DNR may have violated the commitments of the HCP, the ITP, or this Agreement, written notice must be provided to DNR regarding the specific provisions which may have been violated and the mitigation that the responsible federal agency proposes to correct the alleged violation. DNR will have sixty (60) DAYS from the date of receipt of notice, or such longer period of time as may be

mutually agreed upon, to respond. If the PARTIES cannot agree on the violation or necessary mitigation within thirty (30) DAYS after receiving DNR's response, the PARTIES shall endeavor in good faith to resolve their disagreement through nonbinding mediation.

29.3 Minor HCP Amendments Under Subsection 25.3.a(2). In the event that DNR receives timely notice from the appropriate SERVICE regarding a proposed minor HCP amendment under subsection 25.3.a(2), the proposed minor amendment shall not be effective and the PARTIES shall have thirty (30) DAYS from DNR's receipt of the notice within which to reach mutual agreement through discussion. DNR may convene an interagency science team to provide technical assistance on the disputed issue. If the issue is not resolved within the thirty (30) DAY time period, the PARTIES shall endeavor in good faith to resolve their disagreement through nonbinding mediation, unless an extension is mutually agreed upon by all PARTIES.

29.4 Scheduled Reviews. In the event that a dispute arises at one of the scheduled reviews under section 17.0 of this Agreement, the PARTIES shall have thirty (30) DAYS from receipt of the notice of disagreement to reach mutual agreement through discussion. DNR may convene an interagency science team to provide technical assistance on the disputed issue. If the issue is not resolved within the thirty (30) DAY time period, the PARTIES shall endeavor in good faith to resolve their disagreement through nonbinding mediation, unless an extension is mutually agreed upon by all PARTIES. For land transactions not discussed at the scheduled reviews referenced above, the PARTIES shall endeavor to reach mutual agreement through discussion; the convening of an interagency science team by DNR or other dispute resolution procedures described above will not occur until a scheduled review, absent mutual consent of the PARTIES.

29.5 Other Disputes. In the event of other significant disputes involving the HCP, the ITP, or this Agreement, any PARTY shall provide the other PARTIES with a written notice of disagreement. Within thirty (30) DAYS of receiving the notice of disagreement, the PARTIES shall endeavor in good faith to resolve the dispute through nonbinding mediation.

29.6 Termination of Mediation. Nothing in this Agreement shall prevent any PARTY from terminating nonbinding mediation at any time and seeking any remedy or enforcement procedure available by law or regulation.

30.0 General Provisions.

30.1 No Partnership. Except as otherwise expressly set forth herein, neither the commitments of the HCP, the ITP, nor this Agreement shall make or be deemed to make any PARTY to this Agreement the agent for or the partner of any other PARTY.

30.2 Not a Covenant Running With the Land. Neither the HCP, ITP, or this Agreement shall be construed to establish a covenant that runs with the land.

30.3 Severability. If any of the commitments of the HCP, the ITP, or this Agreement are found to be invalid or unenforceable, or this Agreement is terminated in part, all other commitments shall remain in effect to the extent they can be reasonably applied in the absence of such invalid, unenforceable, or terminated commitment or commitments.

30.4 Congressional Officials Not to Benefit. No member of or delegate to Congress shall be entitled to any share or part of this Agreement, or to any benefit that may arise from it.

30.5 Availability of Funds. Implementation and ongoing adherence to the HCP and this Agreement by all PARTIES shall be subject to the availability of appropriated funds. Failure by DNR to ensure adequate funding to implement the HCP shall be grounds for suspension or partial suspension of the ITP.

30.6 No Third Party Contract Beneficiaries. The commitments of the HCP, the ITP, and this Agreement are not intended to create, and do not create, any third-party beneficiary interest herein in the public or in any member thereof, nor shall it authorize anyone not a PARTY to this Agreement to maintain a suit based in whole or in part on any provision of this Agreement, the HCP, or ITP. The rights of the public under the ESA are set forth in 16 U.S.C. §1540(g) and nothing in this Agreement expands or otherwise alters the rights of citizens thereunder.

30.7 Counterparts. This Agreement may be executed in counterparts with each copy constituting an original. A complete original of this Agreement shall be maintained in the official records of each of the PARTIES hereto.

30.8 Entire Agreement. This Agreement supersedes any and all other agreements, either oral or in writing, among the PARTIES hereto with respect to the subject matter hereof, and contains all of the covenants and agreements among them with respect to said matters except for The 1979 Cooperative Agreement for Endangered Plants and The Agreement for Establishment and Operation of the Washington Cooperative Fish and Wildlife Research Unit. Further, each PARTY to this Agreement acknowledges that no representation, inducement, promise, or agreement has been made by another PARTY or anyone acting on behalf of another PARTY that is not embodied herein.

30.9 Contents Not Binding in Other Litigation. The contents of the HCP, ITP, and this Agreement shall not be construed as statements against interest or admissions and are not binding in litigation except in matters related to enforcement by the PARTIES of the HCP, ITP, and this Agreement. In addition, DNR reserves the right to assert that its activities do not require an ITP.

31.0 Notices. The names, addresses, and telephone and facsimile numbers of the designated representatives may be changed at any time by written notice to the other PARTIES. Notices under this Agreement will be deemed received when delivered personally, on electronic confirmation that a facsimile message has been received at the "FAX" number most recently provided by the recipient representative, or five (5) DAYS after deposit in the United States mail, certified and postage prepaid, return receipt requested and addressed as above.

32.0 Designated Representatives. Each PARTY to this Agreement will designate a representative through whom notices under this Agreement shall originate and to whom notices under this Agreement shall be directed. The initial designated representatives are:

for DNR:
Department of Natural Resources Administrator
Washington State Department of Natural Resources
1111 Washington Street S.E.
P.O. Box 47000
Olympia, Washington 98504-7000
Telephone: (360) 902-1000
FAX: (360) 902-1796

for USFWS:
Assistant Regional Director
United States Fish and Wildlife Service
911 N.E. 11th Avenue
Portland, Oregon 97232-4181
Telephone: (503) 231-6159
FAX: (503) 872-2771

for NMFS:
Regional Administrator
National Marine Fisheries Service
7600 Sand Point Way N.E.
Seattle, Washington 98115-0070
Telephone: (206) 526-6150
FAX: (206) 526-6426

IN WITNESS WHEREOF, THE PARTIES HERETO have executed this Implementation Agreement to be in effect as of the date last signed below.

WASHINGTON DEPARTMENT OF NATURAL RESOURCES
including THE BOARD OF NATURAL RESOURCES

Date 1/30/97

JENNIFER M. BELCHER
Commissioner of Public Lands

Approved as to form this 30th day of January, 1997.

Paul A. Silver, Senior Assistant Attorney General

UNITED STATES DEPARTMENT OF THE INTERIOR
through the U.S. FISH AND WILDLIFE SERVICE

Date 1/30/97

MICHAEL J. SPEAR
Regional Director

UNITED STATES DEPARTMENT OF COMMERCE
through the NATIONAL MARINE FISHERIES SERVICE

Date 1/30/97

WILLIAM W. STELLE, Jr.
Regional Administrator

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Staff Reports

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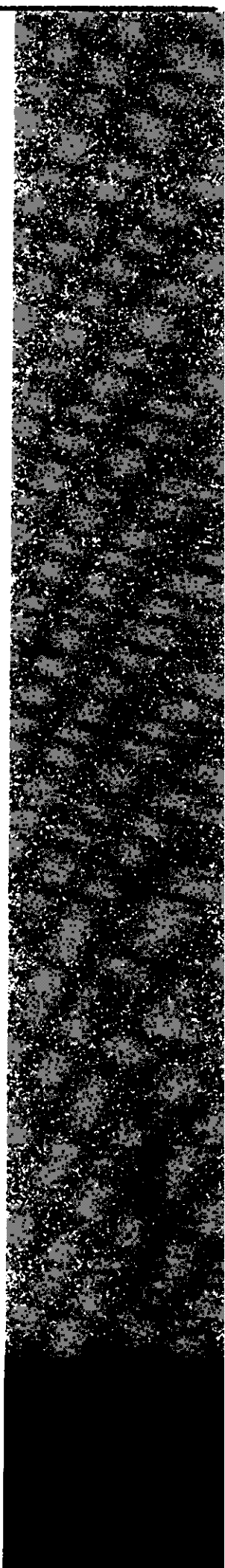

Glossary

Active channel - Defined by DNR as the stream area occupied by typical flood events (i.e., comparable to the two-year recurring flood). The active channel generally coincides with the ordinary high-water mark.

Age class - An interval, commonly 10 years, into which the age range of forest stands is divided for classification.

Anadromous fish - Those species of fish that mature in the ocean and migrate to freshwater rivers and streams to spawn; an example is salmon.

Aquatic zone - The location of aquatic ecosystems within the riparian ecosystem, as defined in the HCP.

Blowdown - Trees felled by high wind.

Board of Natural Resources - A Washington State board that establishes policies for the Department of Natural Resources to ensure that the acquisition, management, and disposition of lands and resources within DNR's jurisdiction are based on sound principles. The board is composed of six members: The Commissioner of Public Lands, the Governor, the Superintendent of Public Instruction, the dean of the College of Agriculture at Washington State University, the dean of the College of Forest Resources at the University of Washington, and an elected representative from a county that contains Forest Board land.

Bog - A hydrologically isolated, low nutrient wetland that receives its water from precipitation only. Bogs typically have no inflow and rarely have outflows. Bogs have peat soils 16 or more inches in depth (except where over bedrock), 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.

Buffer - A forested strip left during timber harvest to conserve sensitive ecosystems or wildlife habitat. Management activities may be allowed as long as they are consistent with the conservation objectives for the buffer.

Candidate species - A federal and state designation for species that are being considered for listing. Federal candidate species, category 1, are species for which there is substantial information to support listing the species as threatened or endangered; listing proposals are either being prepared or are delayed. Federal candidate species, category 2, are species for which information indicates that listing may be appropriate, but conclusive data are not available; additional information is being collected. State candidate species are those that the Washington Department of Fish and Wildlife will review for possible listing as endangered, threatened, or sensitive. Federal candidate species are examined

individually to determine their status in Washington and whether inclusion as a listed species is appropriate or warranted.

Canopy - The continuous cover of branches and foliage formed collectively by the crowns of adjacent trees and other woody growth. See also "Understory canopy" and "Overstory canopy."

Canopy closure - The degree to which the canopy (forest layers above one's head) blocks sunlight or obscures the sky. See also "Relative density."

Clearcut - A harvest method in which all or almost all of the trees are removed in one cutting; an even-aged silvicultural system. Clearcutting establishes a stand without protection from an overstory canopy.

Climax - The culminating, highly stable stage in plant succession for a given environment; an ecosystem will stay at the climax stage until disturbance affects the ecosystem and the stages of ecological succession begin again.

Cluster - An area that contains habitat capable of supporting three or more breeding pairs of spotted owls with overlapping or nearly overlapping home ranges.

Coarse woody debris - See "Large woody debris."

Code of Federal Regulations (CFR) - A codification of the general and permanent rules published in the Federal Register by the Executive departments and agencies of the federal government.

Commercial thinning - The removal of generally merchantable trees from an even-aged stand, so that the remaining trees can develop faster and with less competition.

Critical habitat, federal - Areas designated under the federal Endangered Species Act that have the physical and biological features necessary for the conservation of a listed species and that require special management.

Critical habitat, state - Habitats of threatened or endangered species as designated by the Washington Forest Practices Board.

Debris avalanches - The very rapid and usually sudden sliding and flowage of loose, unsorted mixtures of soil and weathered bedrock.

Debris flow - A moving mass of rock fragments, soil, and mud, more than half the particles being larger than sand size; can travel many miles down steep confined mountain channels; a form of debris torrent.

Debris torrent - Debris flow or dam-break flood. Rapid movement of a large quantity of materials, including wood and sediment, down a stream channel. Usually occurs in smaller streams during storms or floods, and scours the stream bed.

Demographic support - The reproductive contributions of individuals which enhance population viability.

Diameter at breast height (dbh) - The diameter of a tree, measured 4.5 feet above the ground on the uphill side of the tree.

Direct influence zone - The area in uplands, bordering the riparian zone, that has a direct influence on aquatic ecosystems. Direct influences include shading, sedimentation, input of organic nutrients, and recruitment of large woody debris.

Dispersal - The movement of juvenile, subadult, and adult animals from one sub-population to another. For juvenile spotted owls, dispersal is the process of leaving the natal territory to establish a new territory.

Dispersal habitat, spotted owls (east-side planning units) - In DNR's HCP, dispersal habitat has the following characteristics: (1) canopy closure of at least 50 percent; (2) overstory tree density of at least 40 trees per acre that are at least 11 inches dbh; (3) top height of at least 60 feet; (4) retention of four green trees per acre from the largest size class present for recruitment of snags and cavity trees; and, (5) at least 50 percent of DNR-managed lands designated for dispersal function on a quarter township basis will be maintained in these stand conditions.

Dispersal habitat, spotted owls (west-side planning units) - Habitat used by juvenile owls or by owls of any age to disperse or move from one area of nesting-roosting-foraging habitat to another. In DNR's HCP, dispersal habitat will be maintained on 50 percent of lands selected for a dispersal habitat role. The 50 percent will be measured on a WAU basis. In the HCP, dispersal habitat has the following minimum characteristics: (1) canopy cover of at least 70 percent; (2) the largest trees in a stand should have a quadratic mean dbh of 11 inches; (3) a top canopy height of at least 85 feet (top height is the average height of the 40 largest diameter trees per acre); and, (4) green tree retention of at least four trees from the largest size class per acre. Type A, Type B, and sub-mature habitat can be counted as dispersal habitat.

Down woody debris - See "Large woody debris."

Draft Environmental Impact Statement (DEIS) - A public document prepared pursuant to the State or National Environmental Policy Acts (SEPA or NEPA).

Earthflow - A mass-movement landform and process characterized by downslope translation of soil and weathered rock over a discrete basal shear surface (landslide) within well defined lateral boundaries.

Edge - Where plant communities meet or where successional stages or vegetative conditions with plant communities come together.

Edge effects - The drastically modified environmental conditions along the margins, or "edges," of forest patches surrounded by partially or entirely harvested lands.

Effectiveness monitoring - Monitoring done to determine whether the HCP conservation strategies result in the anticipated habitat conditions.

Enabling Act - The Congressional Enabling Act of 1889, which authorized statehood for Washington. The act provided the state with Federal Grant lands to be held in trust for the support of the state's public institutions and placed limits on the sale, lease and management of these lands.

Endangered species - A federal and state designation. A species determined to be in danger of extinction throughout all or a significant portion of its range.

Endangered Species Act - The federal Endangered Species Act of 1973, as amended, sets up processes by which plant or animal species can be designated as threatened or endangered. Two federal agencies, the U.S. Fish and Wildlife Service and the National Marine Fisheries Service, administer the act. Once species are listed, the act also provides that these agencies develop recovery plans for these species, including conserving the ecosystems on which listed species depend.

Environmental impact statement (EIS) - A document prepared under the National and/or State Environmental Policy Acts to assess the effects that a particular action will have on the environment.

Evapotranspiration - The conversion of water, whether open or as soil moisture (both by evaporation) or within plants (by transpiration), into water vapor that is released to the atmosphere.

Even-aged - A system of forest management in which stands are produced or maintained with relatively minor differences in age; generally, less than a 10-year difference in age.

Evolutionarily Significant Units - A population that is substantially reproductively isolated from other population units of the same species, and represents an important component in the evolutionary legacy of the species.

Exterior riparian buffer - A buffer whose purpose is to protect the integrity of the interior-core buffer; part of the OESF riparian strategy. See also "Buffer."

Extirpation - The elimination of a species from a particular area.

Federally listed - Species formally listed as a threatened or endangered species under the federal Endangered Species Act; designations are made by the U.S. Fish and Wildlife Service or National Marine Fisheries Service.

Federal Reanalysis Team - A group of six federal scientists assembled to review existing data and develop a population model to estimate the importance of contributions of varying amounts of habitat from nonfederal lands to the long-term existence of a spotted owl population on the Olympic Peninsula.

Federal reserves - Federal lands that have been, or are proposed to be, withdrawn from acreage used for timber yields. These include Congressional Reserves such as national parks, wild and scenic rivers, national recreation areas, national monuments, and wilderness; Late-Successional Reserves, Riparian Reserves, Administratively Withdrawn Areas, Research Natural Areas, Special Recreation Management Areas, etc.

50-11-40 guideline- The Interagency Scientific Committee's recommendation that forested federal lands between designated Habitat Conservation Areas be managed such that 50 percent of every quarter township have forest stands in which trees have an average dbh of 11 inches and at least a 40 percent canopy closure.

Forest ecosystem - The interrelationships between the various trees and other organisms (both plants and animals) that form a community; and the interrelationships between these organisms and the physical environment in which they exist.

Forest Ecosystem Management Assessment Team (FEMAT) - A team organized by the federal government in 1993 to develop a management plan for federal lands within the range of the northern spotted owl.

Forest Practices Act - A Washington State statute establishing minimum standards for forest practices and providing for necessary administrative procedures and rules applicable to activities conducted on or pertaining to forests on both state-managed and private lands.

Forest Practices Board - A Washington State board created to write forest practices rules which are administered and enforced by the Washington Department of Natural Resources.

Forest Resource Plan - DNR's Forest Land Management Division's 1992 final policy plan, containing the current policies of the Board of Natural Resources.

Forest stand - See "Stand."

Fragmentation - The spatial arrangement of successional stages across the landscape as the result of disturbance; often used to refer specifically to the process of reducing the size and connectivity of late successional or old-growth forests. Fragmentation of existing habitat increases the accessibility of nest sites to predators and isolates portions of the population.

Geographic information system (GIS) - A computer system that stores and manipulates spatial data, and can produce a variety of maps and analyses. DNR's GIS is able to (1) assign information and attributes to polygons and lines, which represent relationships on the ground; and, (2) update and retrieve inventory, mapping, and statistical information. DNR uses its GIS as one of several tools for setting landscape-level planning objectives.

Geomorphic processes - Landscape-modifying processes such as erosion, mass wasting, and stream flow.

Green tree retention - A stand management practice in which live trees are left within harvest units to provide habitat components.

Habitat complexity - As defined in the HCP OESF riparian conservation strategy, habitat complexity includes (1) variations in stream flow velocity and depth by structural obstructions to channel flow; (2) physical and biological interactions between a channel and its floodplain; (3) aquatic and riparian structures that provide cover from predators; (4) a variety of stream substrates that include gravel for fish spawning and macroinvertebrate habitat; (5) sufficient storage area within channels and floodplains for sediment and organic matter; and, (6) diversity of riparian vegetation that provides adequate sources of woody debris and nutrients to channels, and that moderates water and air temperatures within the riparian corridor.

Habitat conservation plan (HCP) - An implementable program for the long-term protection and benefit of a species in a defined area; required

as part of a Section 10 incidental take permit application under the federal Endangered Species Act.

Habitat preference - The choice of habitat(s) that the animal would make if all habitat types were available to it.

Habitat selection - The choice of a habitat(s) directly available to the animal.

Harm - A form of take under the federal ESA; defined in federal regulations as an act which actually kills or injures wildlife. Such acts may include significant habitat modification or degradation where it actually kills wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering (50 CFR 17.3).

High quality nesting habitat, spotted owls (five west-side planning units) - An interim definition developed in DNR's HCP, to be applied as an average condition over a 300-acre nesting habitat patch. High quality nesting habitat consists of (1) at least 31 trees per acre greater than or equal to 21 inches dbh per acre; (2) at least three trees from the above group of 31 trees have broken tops; (3) at least 12 snags per acre greater than 21 inches dbh; (4) a minimum of 70 percent canopy closure; and, (5) a minimum of 5 percent ground cover of large down woody debris.

Home range - The area used by a species and to which it exhibits fidelity. There is much geographic variation in spotted owl home range size. The median home range (determined by USFWS radio telemetry data) is a circle 1.8 miles in radius east of the I-5 corridor, or a circle 2.7 miles in radius west of the I-5 corridor. Hanson et al. (1993) determined that the median range radius for owls in the western Washington Cascades is 2.0 miles. Researchers have observed median home ranges of 14,232 acres on the Olympic Peninsula and 6,609 acres in the eastern Cascades. (See Chapter III of the HCP for more discussion.)

Hydrologic analysis unit (HAU) - Subdivisions of the Watershed administrative unit (WAU) used in the Washington Forest Practices Board's watershed analysis manual 'Hydrology Module.'

Hydrologic maturity - The degree to which hydrologic processes (e.g., interception, evapotranspiration, snow accumulation, snowmelt, infiltration, runoff) and outputs (e.g., water yield and peak disharge) in a particular forest stand approach those expected in a late seral stand under the same climatic and site conditions. In DNR's HCP, a "hydrologically mature forest," with respect to rain-on-snow runoff, is a well-stocked conifer stand at age 25 years or older.

Identifiable channel - A river or stream channel with well-defined and measurable channel banks where vegetative ground cover has been disturbed and sediment is exposed.

Implementation Agreement (IA) - A part of the application for an incidental take permit, which specifies the terms and conditions, resources, schedule of activities, and expectations for the parties to the agreement.

Implementation monitoring - Monitoring done to determine whether the HCP conservation strategies are implemented as written.

Incidental take - The taking of a federally listed wildlife (animal) species, if the taking is incidental to, and not the purpose of, carrying out otherwise lawful activities. See also "Take."

Incidental take permit - Permit issued by the U.S. Fish and Wildlife Service to either a private entity or a state, that allows incidental take of a threatened or endangered species; permit also requires permitee to carry out specified actions that minimize and mitigate the incidental take, and may contribute to the recovery of the species.

Interior-core riparian buffer - Streamside buffer in the HCP OESF riparian strategy; minimizes disturbance of unstable channel banks and adjacent hillslopes, and protects and aids natural restoration of riparian processes and functions. See "Buffer."

Landscape - Large regional units of lands that are viewed as a mosaic of communities, or a unit of land with separate plant communities or ecosystems forming ecological units with distinguishable structure, function, geomorphology, and disturbance regimes. In DNR's HCP, a landscape is defined as a large area comprised of various interacting patterns of stand structure and function going through alterations over time.

Landscape assessment - In DNR's HCP, any method to field verify the amount of habitat in WAUs on DNR-managed lands.

Landscape-level planning - The process of planning across a larger area than stand by stand.

Landscape planning - The process of planning for a specified landscape by setting specific objectives for a given area, such as protection of wildlife and timber production.

Landscape planning unit - Landscape-level planning units used by DNR's Olympic Region to identify 11 watershed-based units within the Olympic Experimental State Forest.

Landslide - Any mass movement process characterized by downslope transport of soil and rock, under gravitational stress, by sliding over a discrete failure surface; or the resultant land form. In forested watersheds, landsliding typically occurs when local changes in the soil pore water pressure increase to a degree that the friction between soil particles is inadequate to bind them together.

Large saw - Large sawtimber. DNR's GIS forest classification for large saw is: dominant dbh 20-30 inches; more than 10 dominant trees/acre of this size; co-dominant trees are 14 inches dbh or greater; two or three canopy layers more closed than old growth; small snags present with sparse or no large snags; few large down logs.

Large woody debris - Large pieces of wood in stream channels or on the ground - includes logs, pieces of logs, and large chunks of wood; provides streambed stability and/or habitat complexity. Also called coarse woody debris or down woody debris. Large organic debris is large woody debris, but may contain additional non-woody debris, such as animal carcasses.

Late successional forest - A mature and/or old-growth forest stand. Also called late seral stage forest. Typical characteristics are moderate to

high canopy closure, a multi-layered, multispecies canopy dominated by large overstory trees, numerous large snags, and abundant large woody debris (such as fallen trees) on the ground. Typically, stands 80-120 years old are entering this stage.

Layered - A transitional forest structure, when second-growth is being manipulated to create old growth features; there is greater structural diversity than understory and somewhat less than with classic old growth.

Leeward - In this document, the side of a stream opposite that from which the wind blows.

Listed wildlife species - Species formally listed as endangered, threatened, or sensitive by a federal (USFWS or NMFS) or state (WDFW) agency.

Low-harvest area - As defined for the HCP's west-side planning units, the outermost portion of the riparian buffer, more than 100 feet from the active channel margin.

Low order streams - Small streams with very few tributaries; often are headwaters. Type 4 and 5 waters are low order streams.

Maintenance and Enhancement Phase - In the HCP OESF strategy, the remainder of the permit period following the restoration of threshold amounts of total spotted owl habitat (40 percent) in all Landscape planning units. This phase follows the Restoration Phase.

Maintenance of species distribution - Supporting the continued presence of a species in as much of its historic range as possible.

Marbled murrelet - A Pacific seabird that nests in mature or old-growth forests within 50 miles of the marine environments; listed as a threatened species by the U.S. Fish and Wildlife Service and Washington State.

Marbled murrelet habitat - For marbled murrelets, potential habitat is coniferous forests within 50 miles of the coast; old growth regardless of stand size; mature forests (80-200 year old stands) with or without an old growth component; young stands with remnant old growth or mature trees greater than 32 inches in diameter; young (70-80 years) coniferous forests that have deformities that result in structures suitable for nesting. Marbled murrelet habitat requires structural features such as large residual trees, large limbs, and nesting platforms.

Mass wasting - Dislodgment and downslope transport of soil and rock under the direct application of gravitational stress, i.e., without major action of water, wind, or ice.

Matrix - As proposed by FEMAT, the matrix is the area of federal lands where most timber harvest will occur, in the areas outside of the Late-Successional Reserves and Riparian Reserves.

Mature stand - The period of life in a forest stand from culmination of mean annual increment to an old-growth stage or to 200 years. This is a time of gradually increasing stand diversity. Hiding cover, thermal cover, and some forage may be present.

Metapopulation - Several sub-populations linked together by immigration and emigration. Metapopulation dynamics are influenced by the relationships between source and sink habitats and source and sink sub-populations.

Minimal-harvest area - As defined for the HCP's west-side planning units, the part of the riparian buffer outside of the no-harvest area; the next 75 feet from the active channel, and inside the low-harvest area (25-100 feet from the stream).

Mitigation - Methods of reducing adverse impacts of a project, by (1) limiting the degree or magnitude of the action and its implementation; (2) rectifying the impact by repairing, rehabilitating, or restoring the affected environment, (3) reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action, or, (4) compensating for the impact by replacing or providing substitute resources or environments.

Monitor species - A state designation. Wildlife species native to the state of Washington that: (1) were at one time classified as endangered, threatened, or sensitive; (2) require habitat that has limited availability during some portion of its life cycle; (3) are indicators of environmental quality; (4) require further field investigations to determine population status; (5) have unresolved taxonomy which may bear upon their status classification; (6) may be competing with and impacting other species of concern; or, (7) have significant popular appear.

National Environmental Policy Act (NEPA) - NEPA requires all federal agencies to consider and analyze all significant environmental impacts of any action proposed by those agencies; to inform and involve the public in the agency's decision-making process; and to consider the environmental impacts in the agency's decision-making process.

National Marine Fisheries Service (NMFS) - The federal agency that is the listing authority for marine mammals and anadromous fish under the Endangered Species Act.

Natural Area Preserve (NAP) - In Washington State, a natural area which has been so dedicated under the provisions of state law, or formally committed to protection by a cooperative agreement between a government landholder and the Department of Natural Resources.

Natural Heritage Program - A DNR program that identifies, selects and nominates outstanding natural areas in Washington; also, oversees state listing of plants.

Natural Resources Conservation Area (NRCA) - Washington State lands designated by the legislature to protect special scenic and/or ecological values.

Nest patches - Patches of old forest with a high degree of structural complexity (i.e., forest types known to support nesting spotted owls) that will be retained in an unmanaged state during the research phase of the HCP; part of the west-side NRF management strategy.

Nesting platform, marbled murrelet - Any large limb or other structure at least 50 feet above ground and at least 7 inches in diameter. In DNR's HCP, platforms are counted in conifer trees only, and only if located within the live crown.

Nesting, roosting, and foraging habitat (NRF) - Habitat with the forest structure, sufficient area, and adequate food source to meet the needs of a nesting pair of spotted owls. The forest structure consists of stands at least 70 years old that include a three-layer canopy of very large diameter trees (200+ years old) from the previous stand, large diameter trees (70+ years old), and small understory trees, along with snags and large down woody debris.

No-harvest area - As defined for the HCP's west-side planning units, the 25 feet of the riparian buffer closest to the stream.

Northern spotted owl - A medium-size dark brown owl that has round to elliptical white spots on the head, white mottling on the body and abdomen, and white bars on the tail; native to the Pacific coastal region. Federally listed as a threatened species, and listed as endangered by Washington State.

NRF management areas - Lands identified in DNR's HCP that will be managed to provide demographic support and contribute to maintaining species distribution for the spotted owl. Also called NRF areas.

Old-growth forest - A successional stage after maturity that may or may not include climax old-growth species; the final seral stage. Typically, contains trees older than 200 years. Stands containing Douglas fir older than 160 years, which are past full maturity and starting to deteriorate, may be classified as old growth. DNR's GIS forest classification for old growth is: a dominant dbh of 30 inches or greater; usually more than eight dominant trees/acre; three or more canopy layers with less than complete canopy closure; several snags/acre with a 20 inch dbh or greater; and several down logs per acre with a 24 inch dbh or greater.

Olympic Experimental State Forest (OESF, the Experimental Forest) - A DNR planning unit on the Olympic Peninsula, which has unique potential for research and experiments involving forestry, wildlife, and related disciplines; an integral part of DNR's HCP.

Orographic - Pertaining to mountains, especially in regard to their location, distribution, and accompanying phenomenon; also, said of the precipitation that results when moisture-laden air encounters a high barrier and is forced to rise over it, such as the precipitation on the windward slopes of a mountain range facing a steady wind from a warm ocean.

Overstory canopy - The uppermost forest canopy layer. See also "Canopy" and "Understory canopy."

Owl circle - A radius that approximates the median spotted owl home range size. See also "Home range."

Packing - An increased density of birds nesting in the habitat that is available.

Partial cutting - Removal of selected trees from a forest stand, leaving an uneven-aged stand of well-distributed residual, healthy trees. Also called uneven-aged management.

Patch - See "Nest patches."

Physiographic province - A region of which all parts are similar in

geologic structure and climate and which consequently had a unified geomorphic history; a region whose pattern of relief features or landforms differs significantly from that of adjacent regions.

Planning unit - DNR-managed land units, grouped into three blocks for the purpose of implementing the HCP: the Olympic Experimental State Forest, five west-side planning units, and three east-side planning units. The nine planning units in the HCP area are: Olympic Experimental State Forest, South Coast, North Coast, Columbia, Straits, South Puget, Chelan, Yakima, and Klickitat.

Pole - Any considerable length of round timber before saw log size, ready for use without further conversion. DNR's GIS classification for pole is: dominant dbh 10-14 inches; one canopy layer; and, little or no down dead woody debris.

Population dynamics - How populations and the environment interact to cause changes in a population over time.

Population viability analysis - Using population dynamics to analyze how large a population needs to be and how its habitat needs to be distributed across landscapes to persist over time. See also "Viable population."

Precommercial thinning - Cutting trees at an immature age to allow for better growth of the remaining trees; may include removal of excess and/or diseased trees in the 10-35 year class.

Proposed threatened or endangered species - Species proposed by the USFWS or NMFS for listing as threatened or endangered under the Endangered Species Act; not a final designation.

Rain-on-snow zone - Area, generally defined as an elevation zone, where it is common for snowpacks to be partially or completely melted during rainstorms several times during the winter.

Recovery plan - A plan developed by a government agency, that if implemented is expected to result in the recovery of a threatened or endangered species to the extent that the species can be delisted from threatened or endangered status.

Relative density (RD) - The basal area of a stand divided by the square root of the quadratic mean dbh of the stand. In the HCP, when canopy closure is used in a habitat definition, RD will be used as a measurement if and when DNR has established a correlation between RD and canopy closure in spotted owl habitats for its lands.

Reserves - See "Federal reserves."

Restoration Phase - In the HCP OESF strategy, the 40-60 year period during which existing young stands are developing the characteristics of young forest marginal and sub-mature habitat.

Revised Code of Washington (RCW) - A revised, consolidated, and codified form and arrangement of all the laws of the state of a general and permanent nature.

Riparian buffer - As defined for the HCP's west-side planning units, the

inner buffer of the riparian management zone that serves to protect salmonid habitat. See "Riparian management zone."

Riparian ecosystem - In DNR's HCP, the area of direct interaction between terrestrial and aquatic environments.

Riparian management zone - Defined in DNR's Forest Resource Plan (1992) Policy No. 20, and refined in DNR's HCP, an area consisting of an inner riparian buffer and an outer wind buffer. The riparian buffer serves to protect salmonid habitat; the wind buffer protects the riparian buffer. This policy expands the level of protection required under the current Forest Practices Act and authorizes DNR to establish riparian protection zones along Type 1 through 4 waters and, when necessary, along Type 5 waters. DNR may remove timber from riparian management zones if adequate protection can be provided to fish and other nontimber resources. These riparian management zones apply to the west-side planning units.

Riparian zone - A narrow band of moist soils and distinctive vegetation along the banks of lakes, rivers, and streams; in the HCP, the portion of the riparian ecosystem between the aquatic zone and the direct influence zone (uplands).

River mile - *A statute mile as measured along the center line of a river.* River miles are measured from the mouth of the river, or are discrete measures of distance (i.e., a distance of 2-4 river miles).

Salmonids - Fish species belonging to the family Salmonidae, including trout, salmon, char, and whitefish species.

Sapling - A young tree no longer a seedling but not yet a pole. DNR's GIS classification for sapling is: approximately 2-5 inches dbh.

Seed tree harvest - A harvest method in which all mature timber from an area is harvested in one entry except for a small number of trees left as a seed source for the harvested area.

Selective harvest - A general term for partial cutting or salvage cutting in which individual trees are removed.

Sensitive species - *A state designation. State sensitive species are species* native to the state of Washington that are vulnerable or declining and are likely to become endangered or threatened in a significant portion of their ranges within the state without cooperative management or the removal of threats.

Shelterwood cut - A harvest method in which a portion of a mature forest stand is removed in two or more cuttings; a portion of the stand is retained as a source of seed and/or protection during the period of regeneration.

Silviculture - The theory and practice of controlling the establishment, composition, growth, and quality of forest stands in order to achieve management objectives.

Sink area - The area in which local mortality rate exceeds local reproductive rate. Because mortality rates exceed reproduction, these populations would go extinct without immigration from source areas.

Site center - The actual nest tree or the primary roost of territorial owls.

Site index - A measure of forest productivity expressed as the height of the dominant trees in a stand at an index age.

Site index curves - Nonlinear regressions of tree height versus breast height age for different site productivities; used as a means to predict future growth.

Site potential tree height - The height a dominant tree may attain, given site conditions where it occurs.

Slump - A landslide characterized by a shearing and rotary movement of a generally independent mass of rock or earth along a curved slip surface (concave upward) and about an axis parallel to the slope from which it descends, and by backward tilting of the mass with respect to that slope so that the slump surface often exhibits a reversed slope facing uphill.

Small saw - Small sawtimber. DNR's GIS forest classification for small saw is: dominant dbh 14-20 inches; one or two canopy layers; small snags or none present; and, small down dead wood or none present.

Snag - Dead tree that is still standing.

Source area - The area in which local reproductive success is greater than local mortality (lambda is greater than one at the scale of an owl cluster). Populations in source areas produce an excess of individuals that must emigrate from their natal area to establish new territories.

Special Emphasis Areas - Proposed federally designated areas in Washington, as outlined in the draft 4(d) rule under the ESA.

Spotted owl - See "Northern spotted owl."

Spotted owl site status - See "Status 1 through 5, spotted owl site centers."

Stand - A group of trees that possess sufficient uniformity in composition, structure, age, spatial arrangement, or condition to distinguish them from adjacent groups.

Stand conversion - The conversion of stands from low-commercial value species to more valuable conifer species; also called stand rehabilitation.

Stand initiation - The first stage of forest growth; an open condition and new regeneration. The other three stages are stem exclusion, understory reinitiation, and old growth.

State Environmental Policy Act (SEPA) - This law is the basic state charter for protection of the environment. SEPA requires all state agencies to consider and analyze all significant environmental impacts of any action proposed by those agencies; to inform and involve the public in the agency's decision-making process; and to consider the environmental impacts in the agency's decision-making process.

Status 1 through 5, spotted owl site centers - Status assigned to spotted owl site centers by the Washington Department of Fish and Wildlife (WAC 222-16-080). The five categories are: Status 1- Pair or

reproductive; Status 2- Two birds, pair status unknown; Status 3- Resident territorial single; Status 4- Status unknown; and, Status 5- Historic status (formerly occupied).

Stem exclusion - The second stage of forest growth, with tree competition and mortality. The other three stages are stand initiation, understory reinitiation, and old growth.

Stream classifications - See "Water typing system."

Subalpine - The area above the upper limit of contiguous closed forest and beneath the upper limit of growth; typically, a mosaic of tree patches and meadows.

Sub-mature forest - DNR defines this as a younger forest category that includes mid-seral forest (non-late successional or old growth) that has the structural characteristics necessary to provide roosting and foraging functions.

Sub-mature habitat (east-side planning units) - In DNR's HCP, sub-mature habitat has the following characteristics: (1) forest community composed of at least 40 percent Douglas-fir or grand fir component; (2) canopy closure of at least 70 percent; (3) tree density of between 110-260 trees per acre; (4) tree height or vertical density with either (a) dominant and co-dominant trees at least 90 feet tall, and/or (b) two or more canopy layers, numerous intermediate trees, numerous low perches; (5) snags/cavity trees or mistletoe infection with either (a) three or more snags or cavity trees per acre that are equal to or greater than 20 inches dbh, and/or (b) a moderate to high infection of mistletoe; and (6) 5 percent ground cover of dead and down wood averaged over a stand.

Sub-mature habitat (west-side planning units) - In DNR's HCP, sub-mature habitat has the following characteristics: (1) forest community dominated by conifers, or in mixed conifer/hardwood forest, the community is composed of at least 30 percent conifers (measured as stems per acre dominant, co-dominant, and intermediate trees); (2) at least 70 percent canopy closure; (3) tree density of between 115-280 trees per acre (all greater than 4 inches dbh); (4) height of dominant and co-dominant trees at least 85 feet tall; (5) at least three snags or cavity trees per acre that are at least 20 inches dbh; and, (6) a minimum of 5 percent ground cover of large down woody debris.

Sub-population - A well-defined set of interacting individuals that comprise a proportion of a larger, interbreeding population.

Suitable habitat block, marbled murrelets - In DNR's HCP, a suitable habitat block is a contiguous forested area that is at least 5 acres in size, contains an average of at least two potential nesting platforms per acre, and is within 50 miles of marine waters.

Take - A prohibited action under federal law, except where authorized. To harass, harm, pursue, hunt, wound, kill, trap, capture, or collect a federally listed threatened or endangered species, or to attempt to do so (ESA, Section 3[19]). Take may include disturbance of the listed species, nest, or habitat, when disturbance is extensive enough to disrupt normal behavioral patterns for the species, although the affected individuals may not actually die. See also "Harm" and "Incidental take."

Talus - A homogeneous area of rock rubble, 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.

Target conditions - Achieving ecological recovery and population restoration of a listed species; target conditions are often defined in federally-mandated recovery plans for a given species.

Taxon - A category in the biological system of arranging plants and animals in related groups, such as class, family, or phylum.

Threatened species - A federal and state designation as defined in the Endangered Species Act for species likely to become an endangered species throughout all or a significant portion of their range within the foreseeable future.

Threatened and endangered species - Formal classifications of species. Federal designations are made by the U.S. Fish and Wildlife Service or the National Marine Fisheries Service. State of Washington designations are made by the Washington Fish and Wildlife Commission (RCW 77.08.010). See also "Candidate species," "Endangered species," "Proposed threatened or endangered species," "Sensitive species," and "Threatened species."

Trust - In law, a fiduciary relationship in which one person (the trustee) holds the title to property or manages it for the benefit of another (the beneficiary).

Trust lands - Those lands held in trust and managed by the Washington Department of Natural Resources for the benefit of the trust beneficiaries.

Turbidity - The relative clarity of water, which may be affected by material in suspension in the water.

Types 1 through 5 streams or waters - See "Water typing system."

Underburning - Prescribed burning of the forest floor or understory for botanical or wildlife habitat objectives, hazard reduction, or silvicultural objectives.

Understory canopy - Forest undergrowth; the lowest canopy layer of trees and woody species. See also "Canopy" and "Overstory canopy."

Understory reinitiation - The third stage of forest growth, with undergrowth development and some tree regeneration. The other three stages are stand initiation, stem exclusion, and old growth.

Uneven-aged - Forests composed of trees that differ markedly in age. This results from partial cutting practices.

U.S. Fish and Wildlife Service (USFWS) - The federal agency that is the listing authority for species other than marine mammals and anadromous fish under the Endangered Species Act.

Unzoned forest - In DNR's HCP, a forest without areas deferred from timber management.

Validation monitoring - *Monitoring done to evaluate the cause-and-effect* relationships between habitat conditions resulting from the HCP conservation strategies and the animal populations these strategies are intended to benefit.

Vegetative zones - Broad areas that have similar types of vegetation. Zones within the HCP area include the Sitka spruce zone, the western hemlock zone, the Pacific silver fir zone, the subalpine fir/mountain hemlock zone, the alpine zone, the grand fir zone, the Douglas-fir zone, and the ponderosa pine zone (based on Franklin and Dyrness 1973).

Viability analysis - See "Population viability analysis."

Viable population - A population that is of sufficient size and distribution to be able to persist for a long period of time in the face of demographic variations, random events that influence the genetic structure of the population, and fluctuations in environmental conditions, including catastrophic events.

Washington Administrative Code (WAC) - All current, permanent rules of each state agency, adopted pursuant to chapter 34.05 RCW.

Washington Board of Natural Resources - See "Board of Natural Resources."

Washington Forest Practices Act - See "Forest Practices Act."

Washington Forest Practices Board - See "Forest Practices Board."

Washington Fish and Wildlife Commission - The state commission with statutory authority to list threatened, endangered, and sensitive species.

Water resource inventory area (WRIA) - Watershed-based planning unit, defined by the Washington State Department of Ecology. WRIAs are determined by drainages to common water bodies.

Water typing system - A simplified explanation of Washington's classifications of water types appears here. For the complete classification system, see WAC 222-16-030.

Type 1: All waters, within their ordinary high-water mark, as inventoried as "shorelines of the state."

Type 2: Segments of natural waters which are not Type 1 and have a high fish, wildlife, or human use. These are segments of natural waters and periodically inundated areas of their associated wetlands.

Type 3: Segments of natural waters which are not Type 1 or 2 and have a moderate to slight fish, wildlife, and human use. These are segments of natural waters and periodically inundated areas of their associated wetlands

Type 4: Segments of natural waters which are not Type 1, 2, or 3, and for the purpose of protecting water quality downstream are classified as Type 4 water upstream until the channel width becomes less than 2 feet in width between the ordinary high-water marks. These may be perennial or intermittent.

Type 5: Natural waters which are not Type 1, 2, 3, or 4; including streams with or without well-defined channels, areas of perennial or intermittent seepage, ponds, natural sinks and drainage ways having short periods of spring or storm runoff.

Watershed - The drainage basin contributing water, organic matter, dissolved nutrients, and sediments to a stream or lake.

Watershed administrative unit (WAU) - In Washington, the basic hydrologic unit used for watershed analysis. See WAC 222-22-020 for more information.

Watershed analysis - A systematic procedure for characterizing watershed and ecological processes to meet specific management objectives; provides a basis for resource management planning. In Washington, the assessment of a watershed administrative unit completed under state law.

Wetland - Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions, such as swamps, bogs, fens, and similar areas.

Wetland typing system - A simplified explanation of Washington's classifications of wetland types appears here. For the complete classification system, see WAC 222-16-035.

Nonforested Wetland - Any wetland or portion thereof that has, or if the trees were mature would have, a crown closure of less than 30 percent. There are two types of nonforested wetlands: Type A and Type B. A Type A Wetland is (1) greater than 0.5 acre in size; (2) associated with at least 0.5 acre of ponded or standing open water; or, (3) are bogs and fens greater than 0.25 acre. A Type B Wetland classification is all other nonforested wetlands greater than 0.25 acre.

Forested Wetland - Any wetland or portion thereof that has, or if the trees were mature would have, a crown closure of 30 percent or more.

Wildlife Code of Washington - Title 77 RCW (Revised Code of Washington).

Wind buffer - As defined for the HCP's west-side planning units, the outer buffer of the riparian management zone that maintains the ecological integrity of the riparian buffer by reducing windthrow.

Windthrow - Trees blown down by wind; also called blowdown.

Yarding - Transporting logs from the point of felling to a collecting point or landing.

Young forest - A forest that is 50-80 years old.

Young forest marginal habitat - As defined by the Washington Forest Practices Board Spotted Owl Advisory Group, younger forest that provides some of the characteristics spotted owls need for roosting, foraging, and dispersal. This habitat type corresponds to the low to mid-range of the former Type C designation.

The following references were used in developing the glossary:

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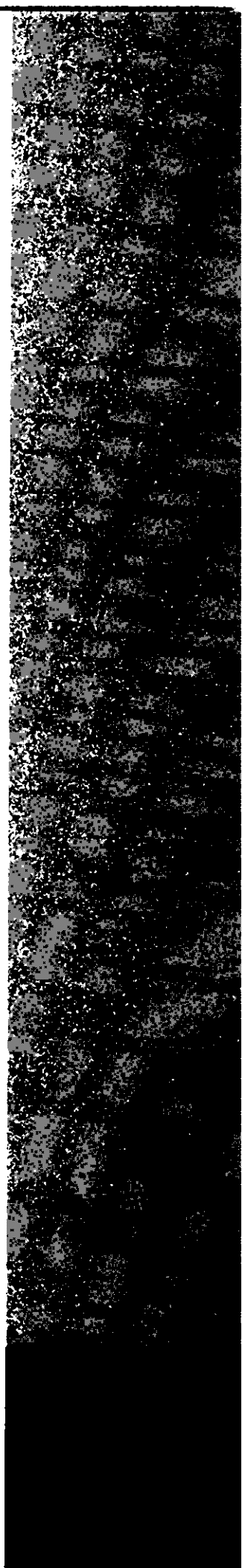
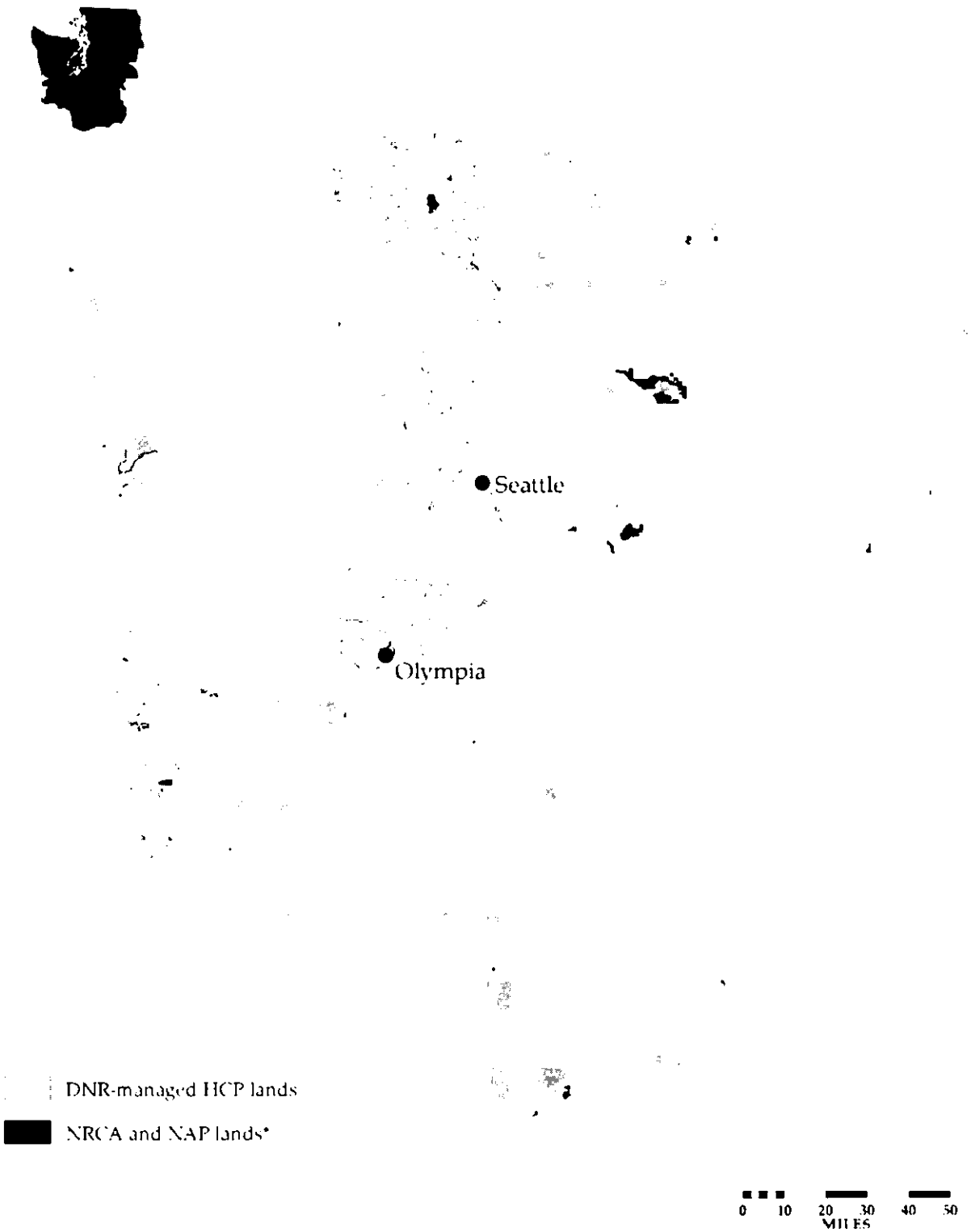
Washington Forest Practices Board. 1994. Washington Forest Practices: Board manual, Standard methodology for conducting watershed analysis under chapter 222-22 WAC, version 2.1. Washington Department of Natural Resources, Forest Practices Division, Olympia. 1 v.



Map I.1: DNR-managed lands covered by the Habitat Conservation Plan



RMS 8/97 (Source: DNR Geographic Information System, January 1997)
This map is for planning purposes only.
*Natural Resources Conservation Areas and Natural Area Preserves.
See section in Chapter I titled Land Covered by the HCP.

Map I.2: Location of uneven-aged and even-aged stands on DNR-managed lands covered by the HCP

RMS 8/97 (Source: DNR Geographic Information System, January 1997)
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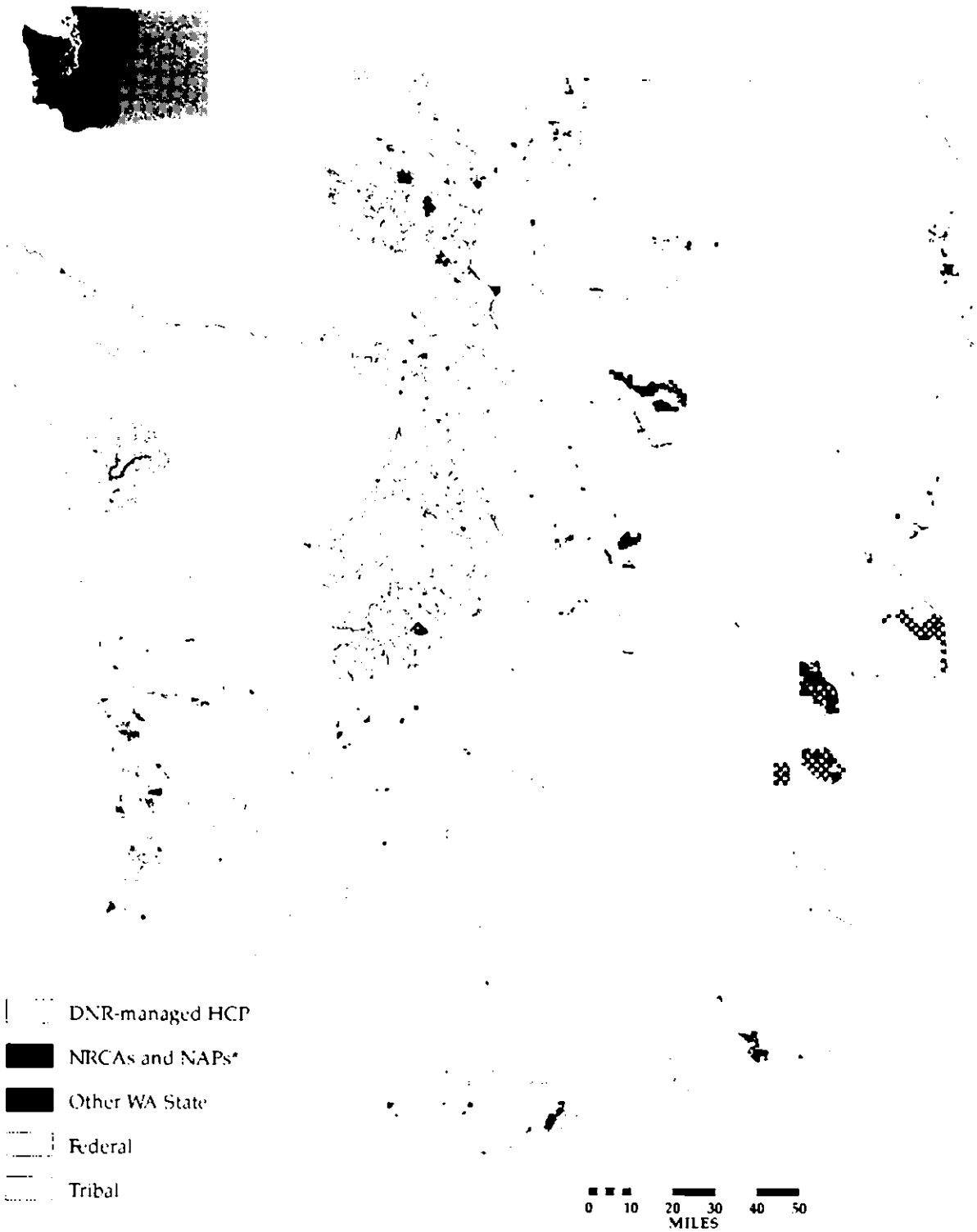
Map I.3: DNR-managed lands and adjacent ownerships in the area covered by the HCP



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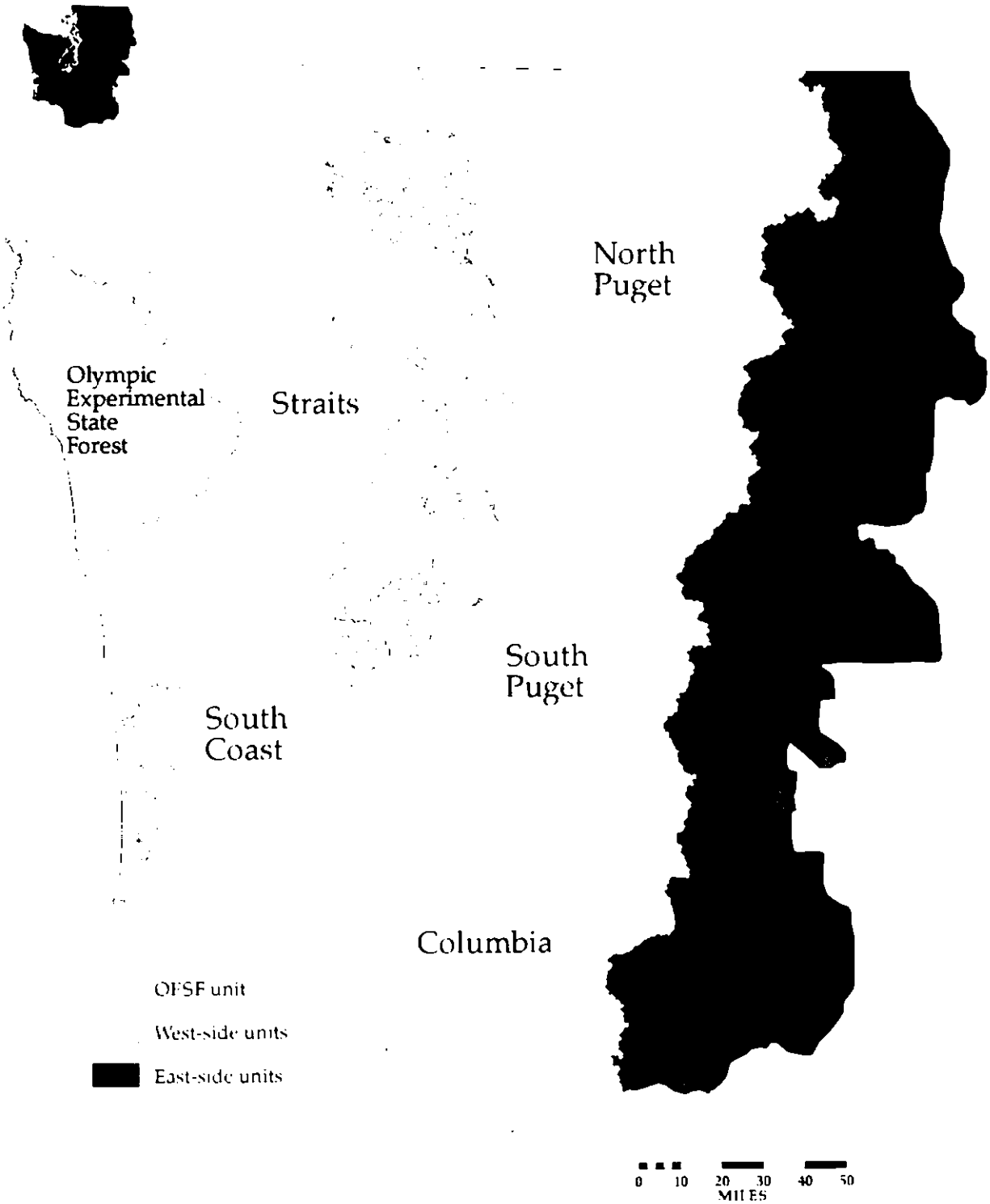
*Natural Resources Conservation Areas and Natural Area Preserves.
See section in Chapter I titled Land Covered by the HCP

Map I.4: HCP planning units



RMS 8.97 (Source: DNR Geographic Information System, January 1997)
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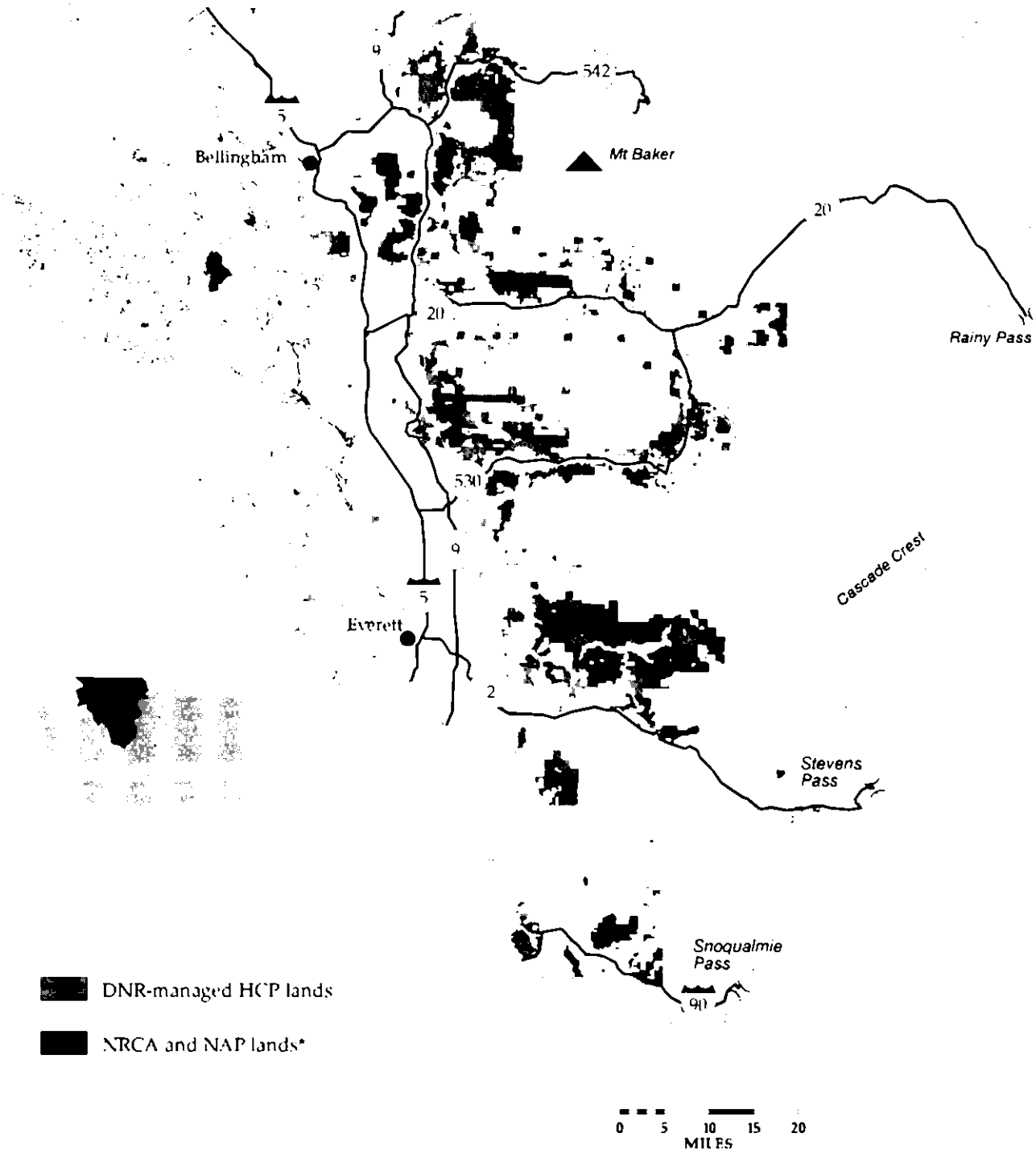
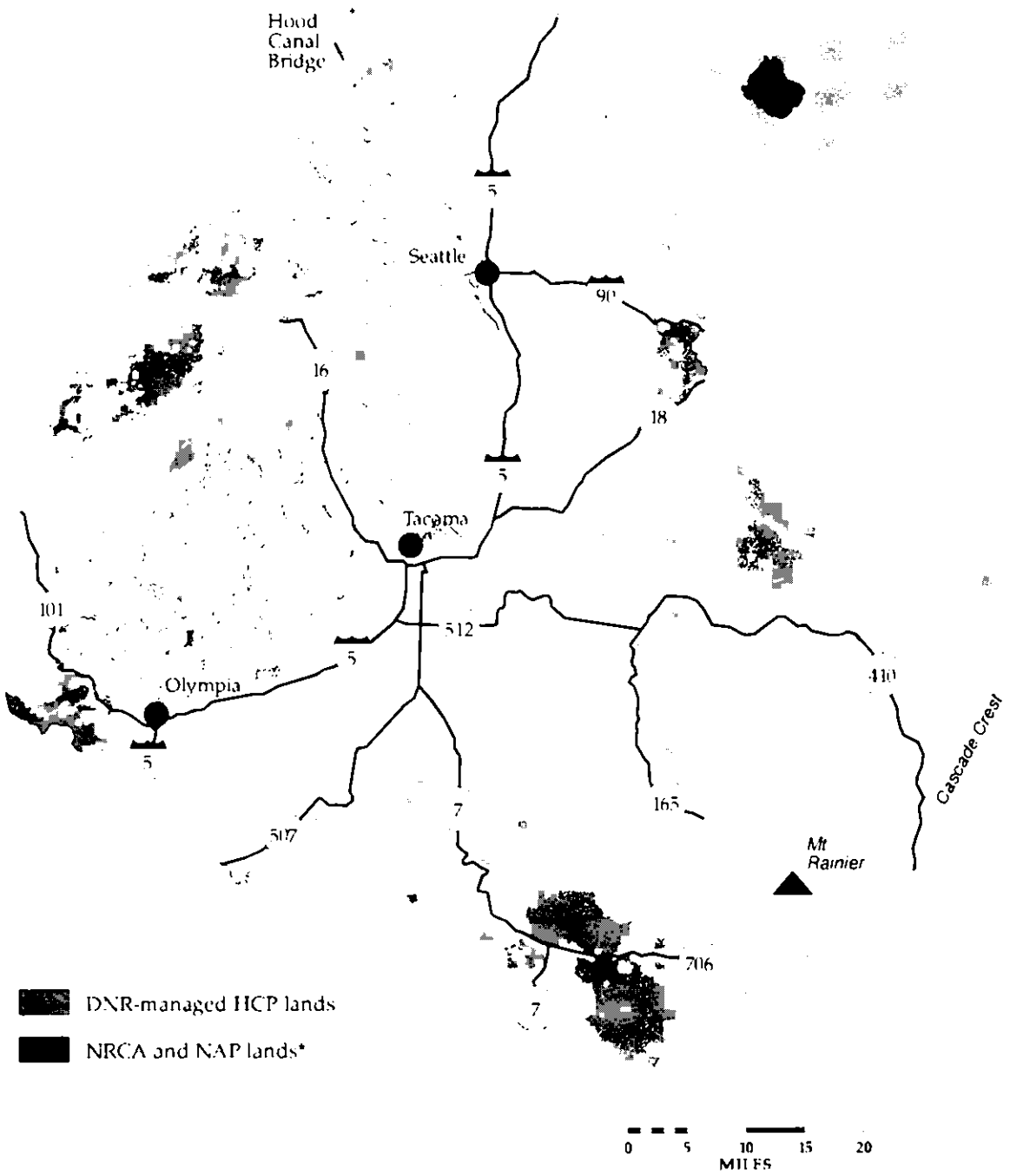
Map I.5: North Puget Planning Unit



RMS 8 97 (Source: DNR Geographic Information System, January 1997)
This map is for planning purposes only.
*Natural Resources Conservation Areas and Natural Area Preserves
See section in Chapter I titled Land Covered by the HCP.

Map I.6: South Puget Planning Unit



RMS S 97 (Source: DNR Geographic Information System, January 1997)
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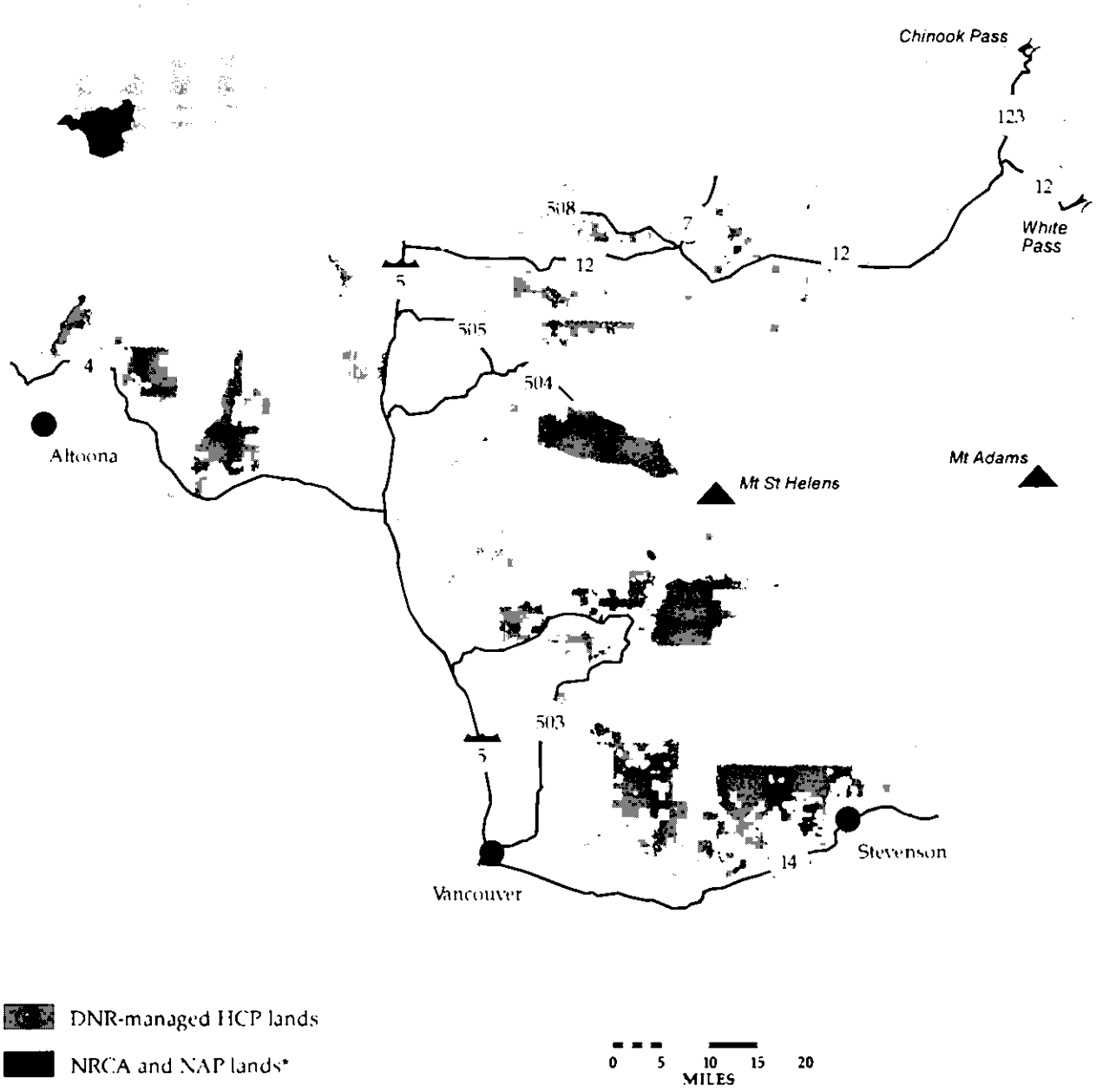
*Natural Resources Conservation Areas and Natural Area Preserves:
See section in Chapter I titled Land Covered by the HCP

Map I.7: Columbia Planning Unit



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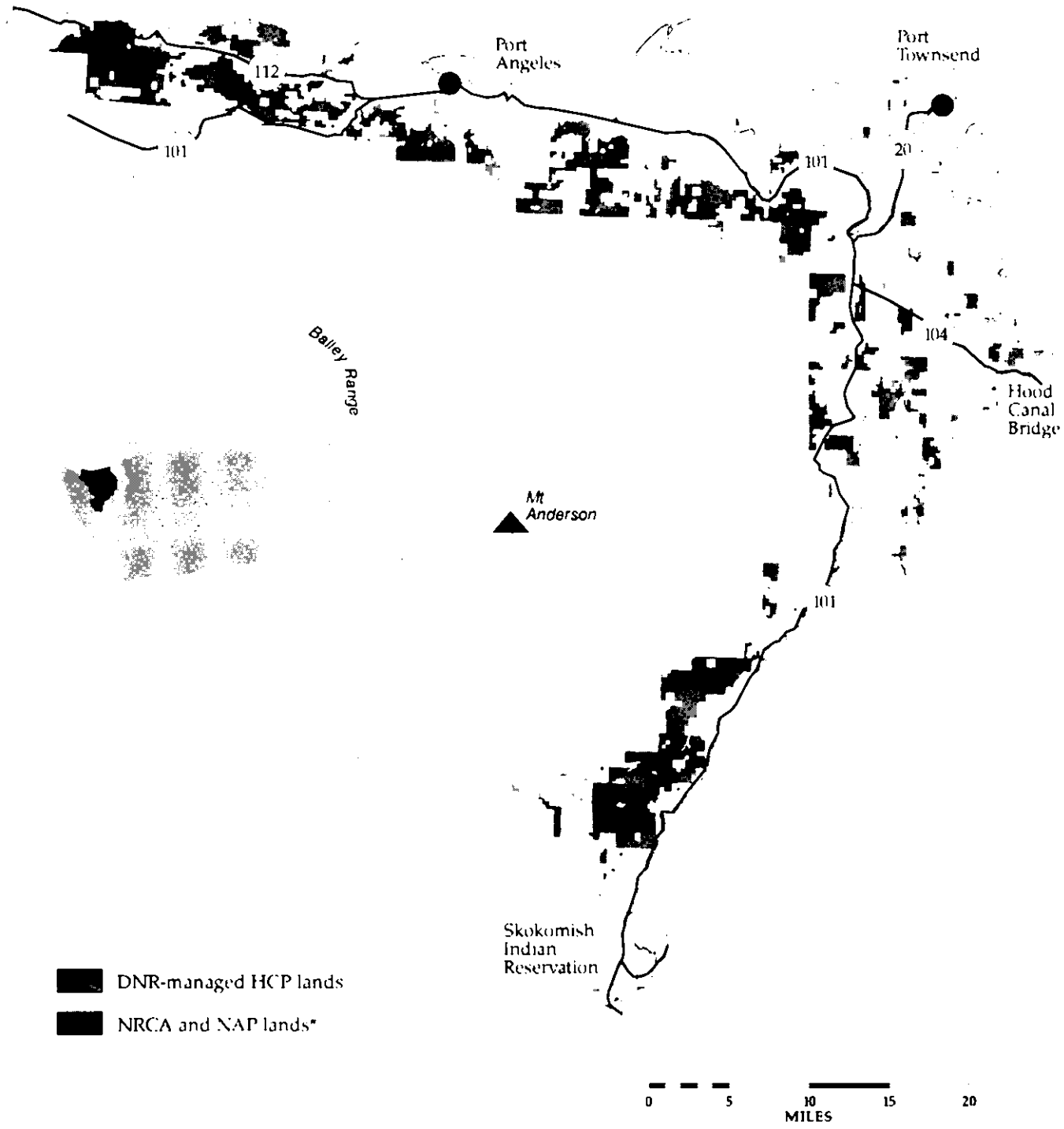
*Natural Resources Conservation Areas and Natural Area Preserves.
See section in Chapter I titled Land Covered by the HCP.

Map I.8: Straits Planning Unit



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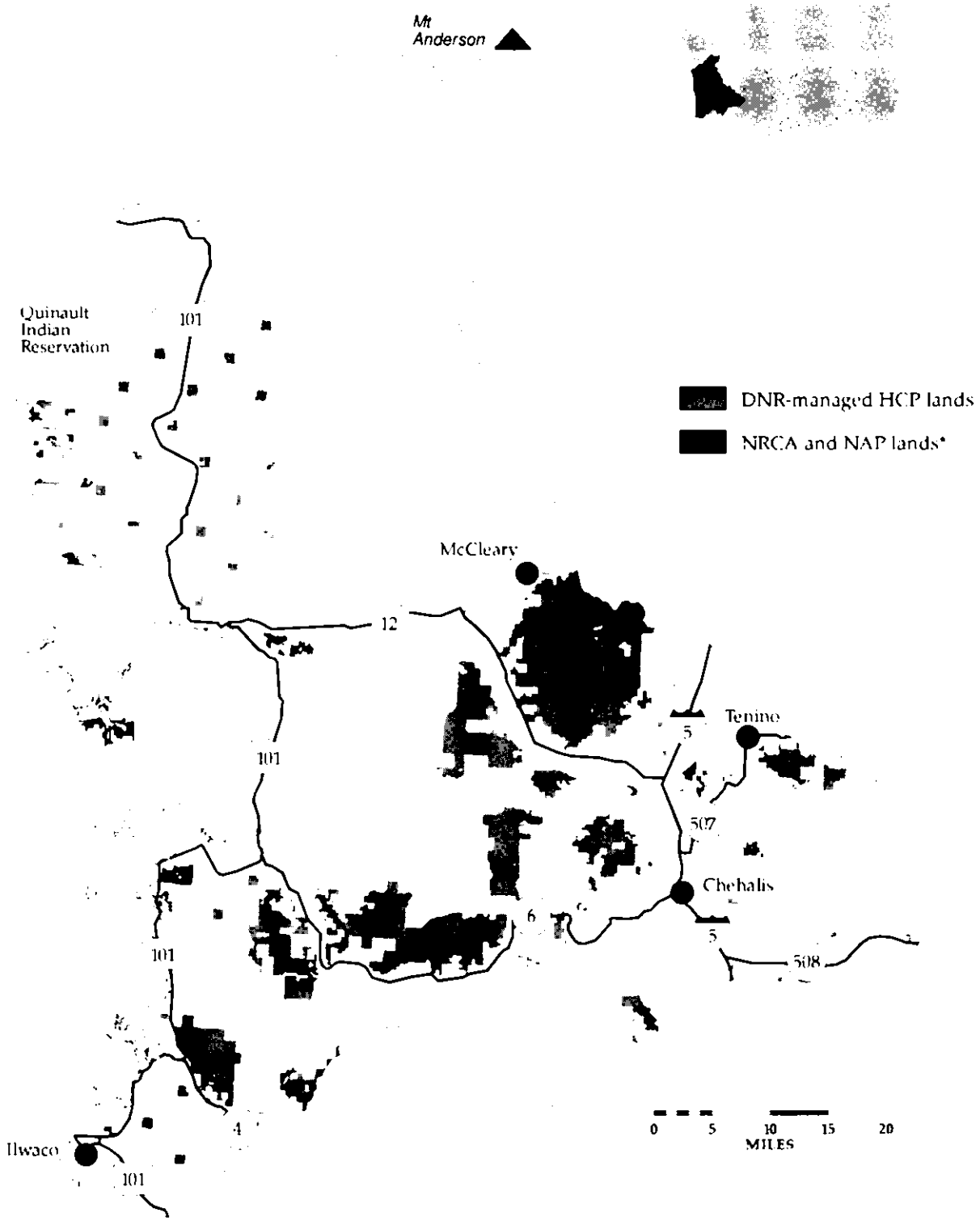
*Natural Resources Conservation Areas and Natural Area Preserves.
See section in Chapter I titled Land Covered by the HCP.

Map I.9: South Coast Planning Unit



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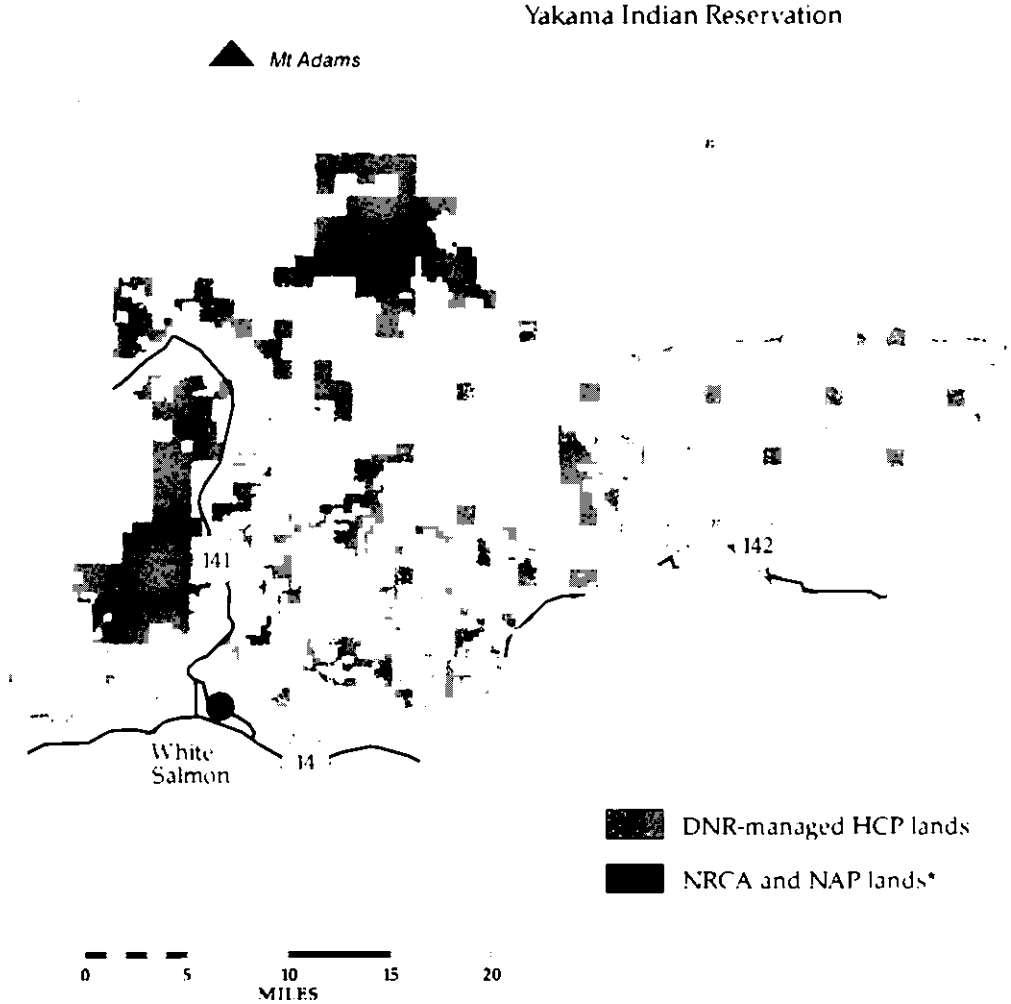
*Natural Resources Conservation Areas and Natural Area Preserves.
See section in Chapter I titled Land Covered by the HCP.

Map I.10: Klickitat Planning Unit



RMS 8 97 (Source: DNR Geographic Information System, January 1997)
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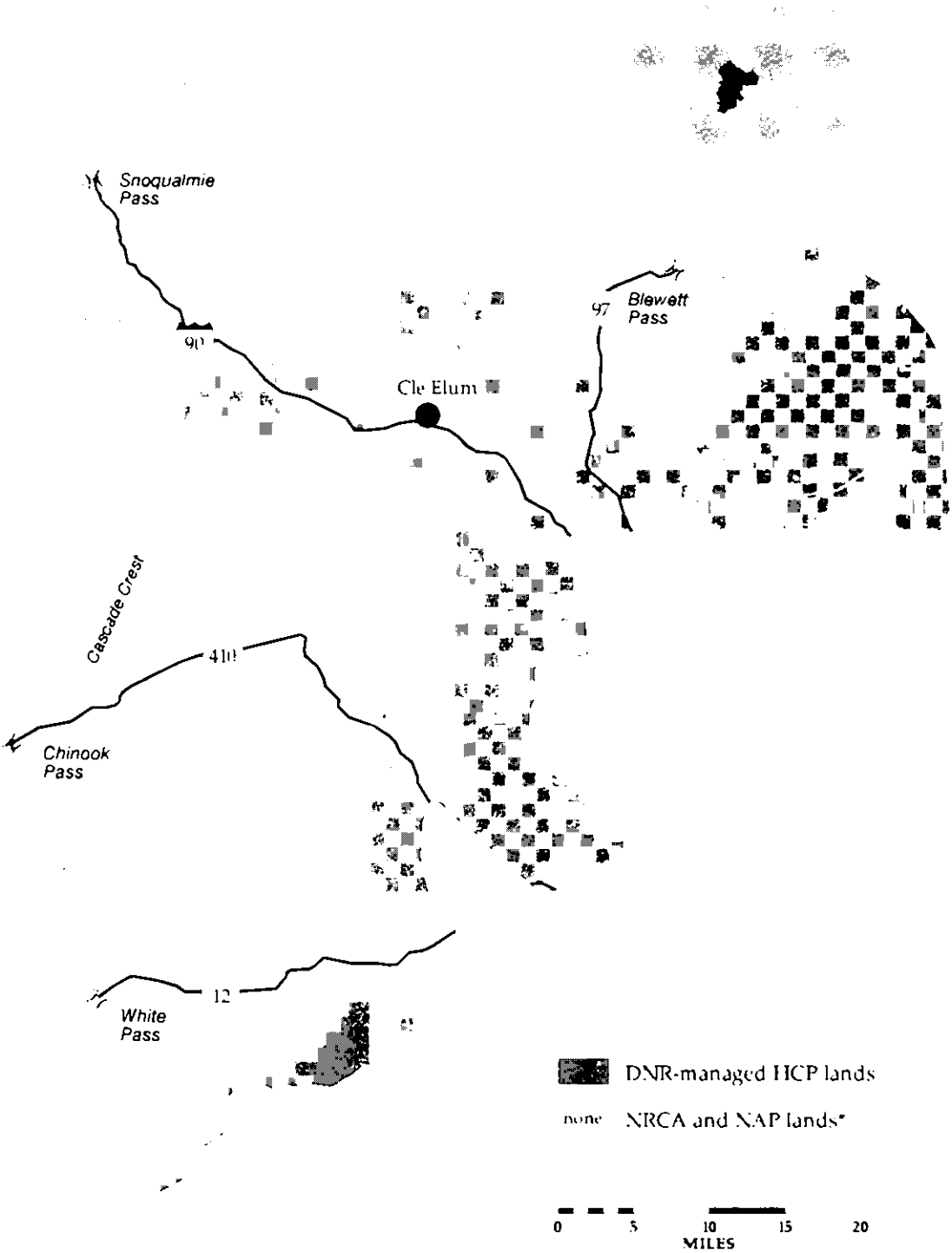
*Natural Resources Conservation Areas and Natural Area Preserves
See section in Chapter I titled Land Covered by the HCP

Map I.11: Yakima Planning Unit



RMS 8 97 (Source: DNR Geographic Information System, January 1997)
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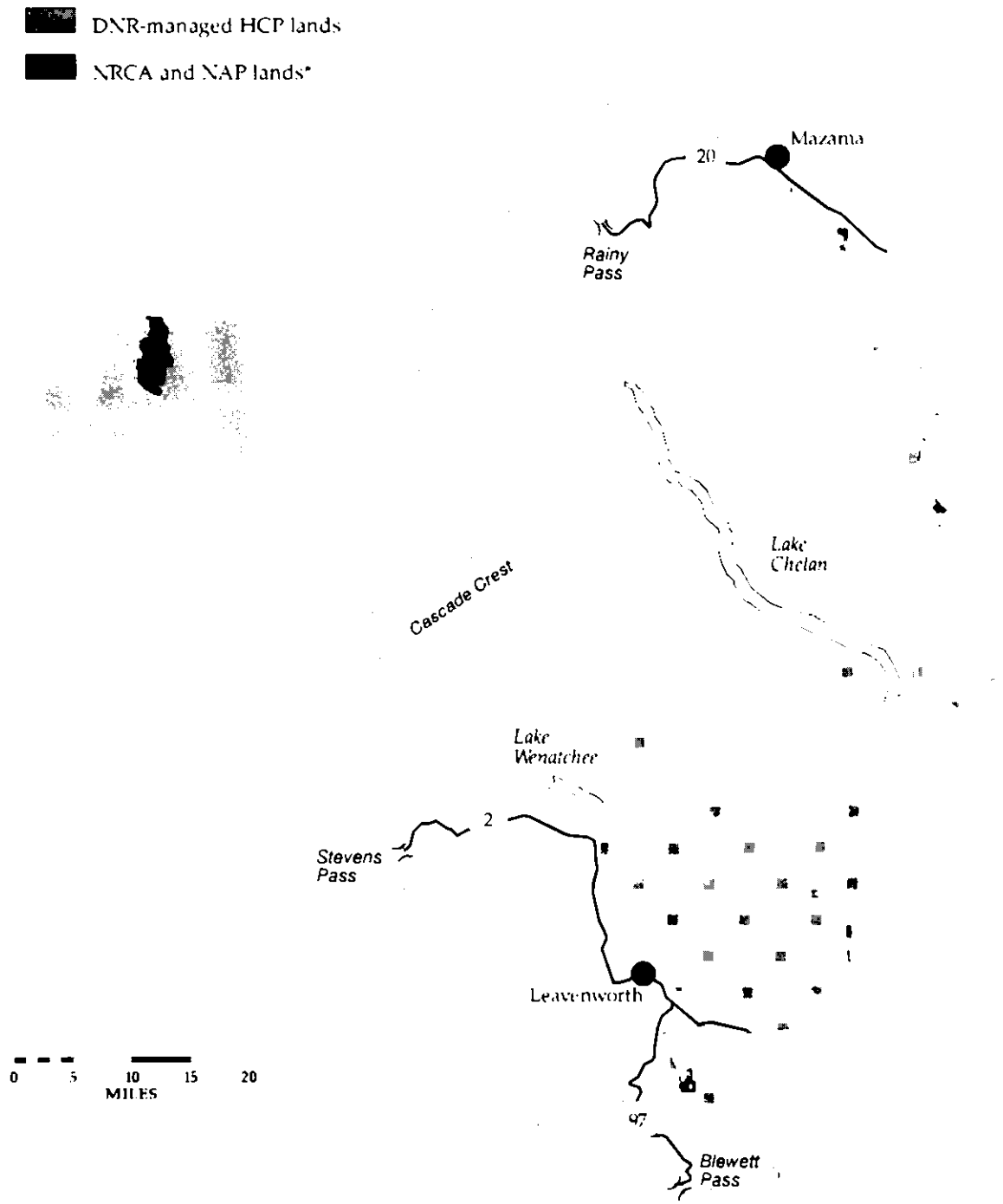
*Natural Resources Conservation Areas and Natural Area Preserves.
See section in Chapter I titled Land Covered by the HCP.

Map I.12: Chelan Planning Unit



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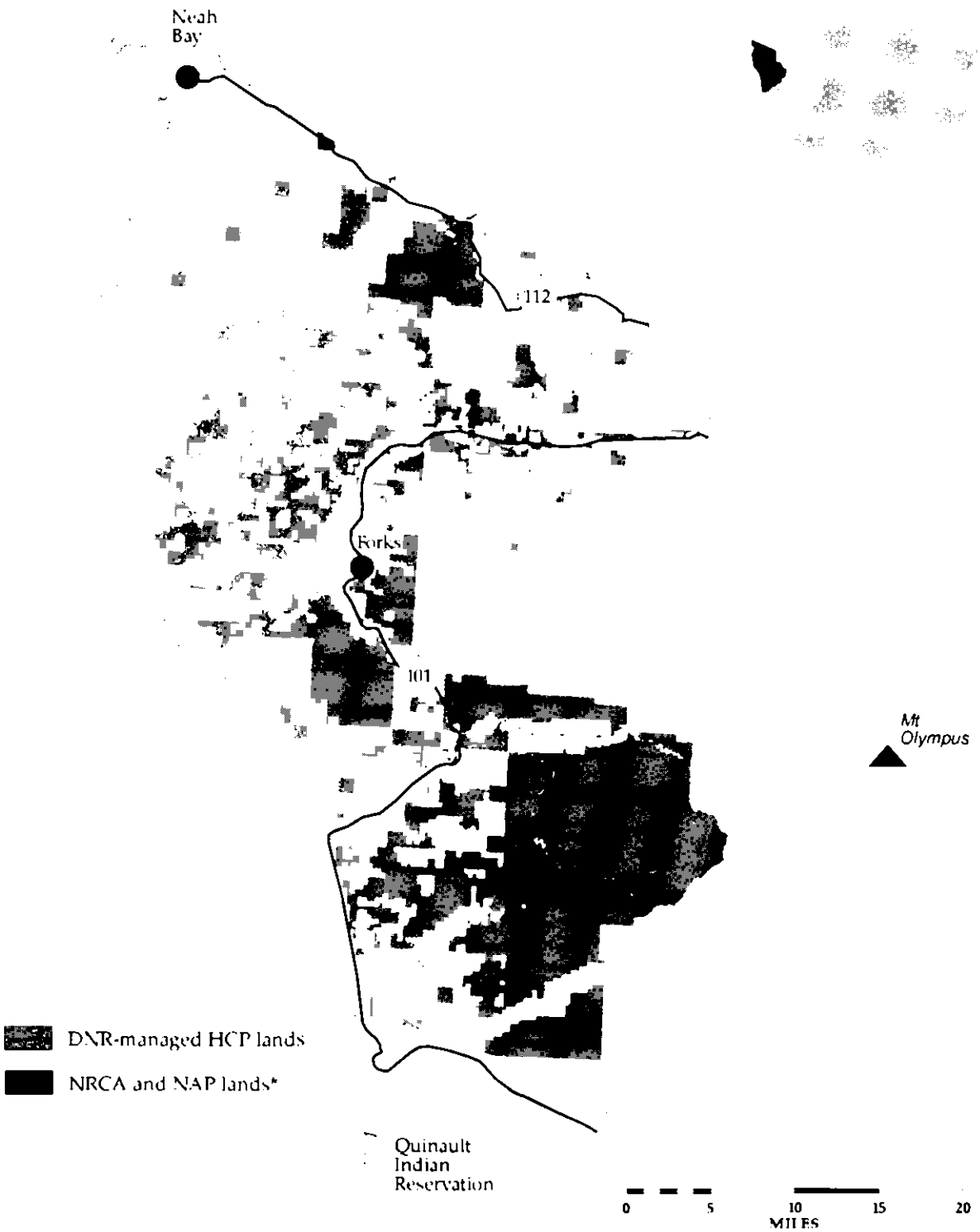
*Natural Resources Conservation Areas and Natural Area Preserves.
See section in Chapter I titled Land Covered by the HCP.

Map I.13: The Olympic Experimental State Forest Planning Unit



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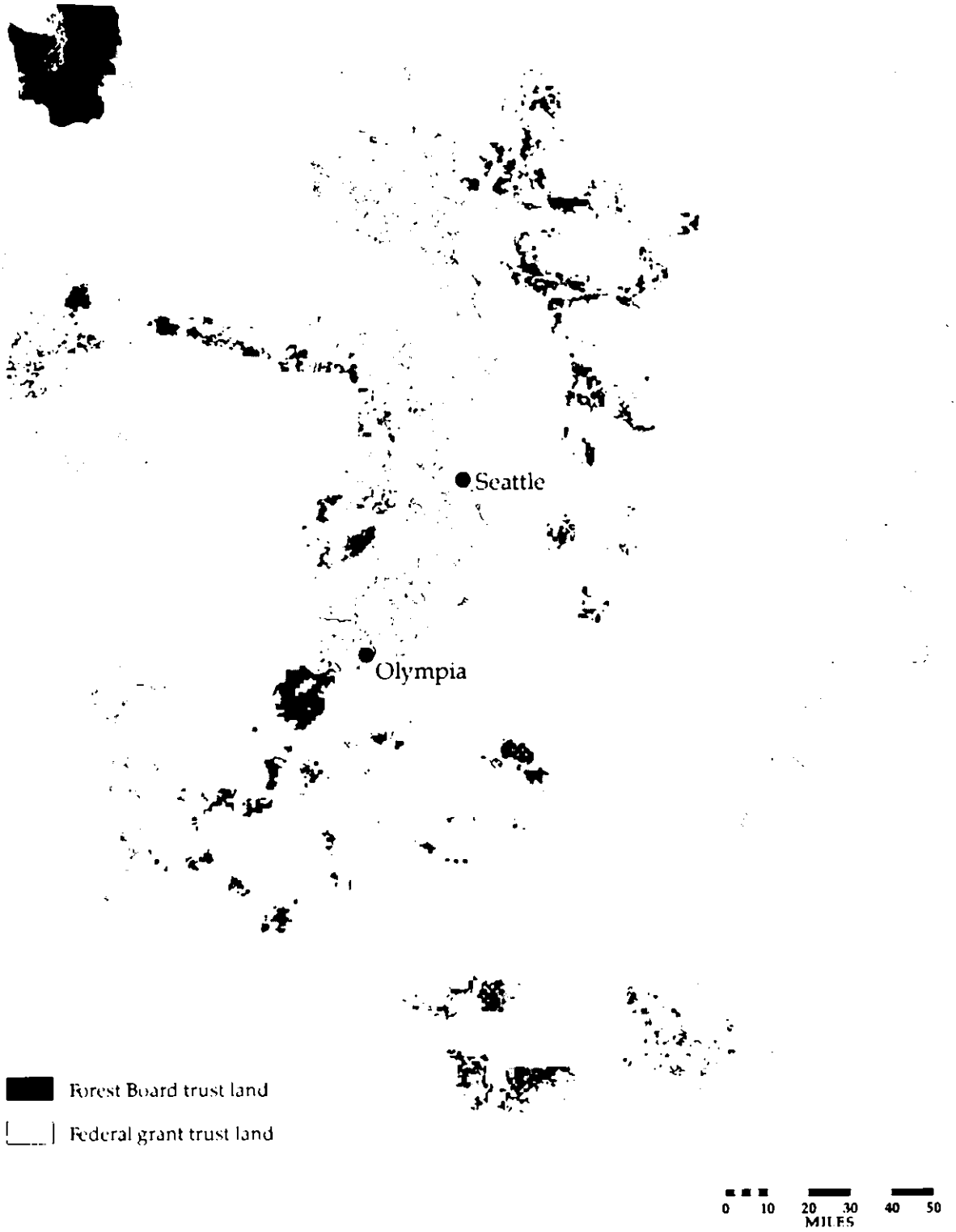
*Natural Resources Conservation Areas and Natural Area Preserves:
See section in Chapter I titled Land Covered by the HCP.

Map II.1: DNR-managed trust lands in the area covered by the HCP



RMS 8 97 (Source: DNR Geographic Information System, January 1997)
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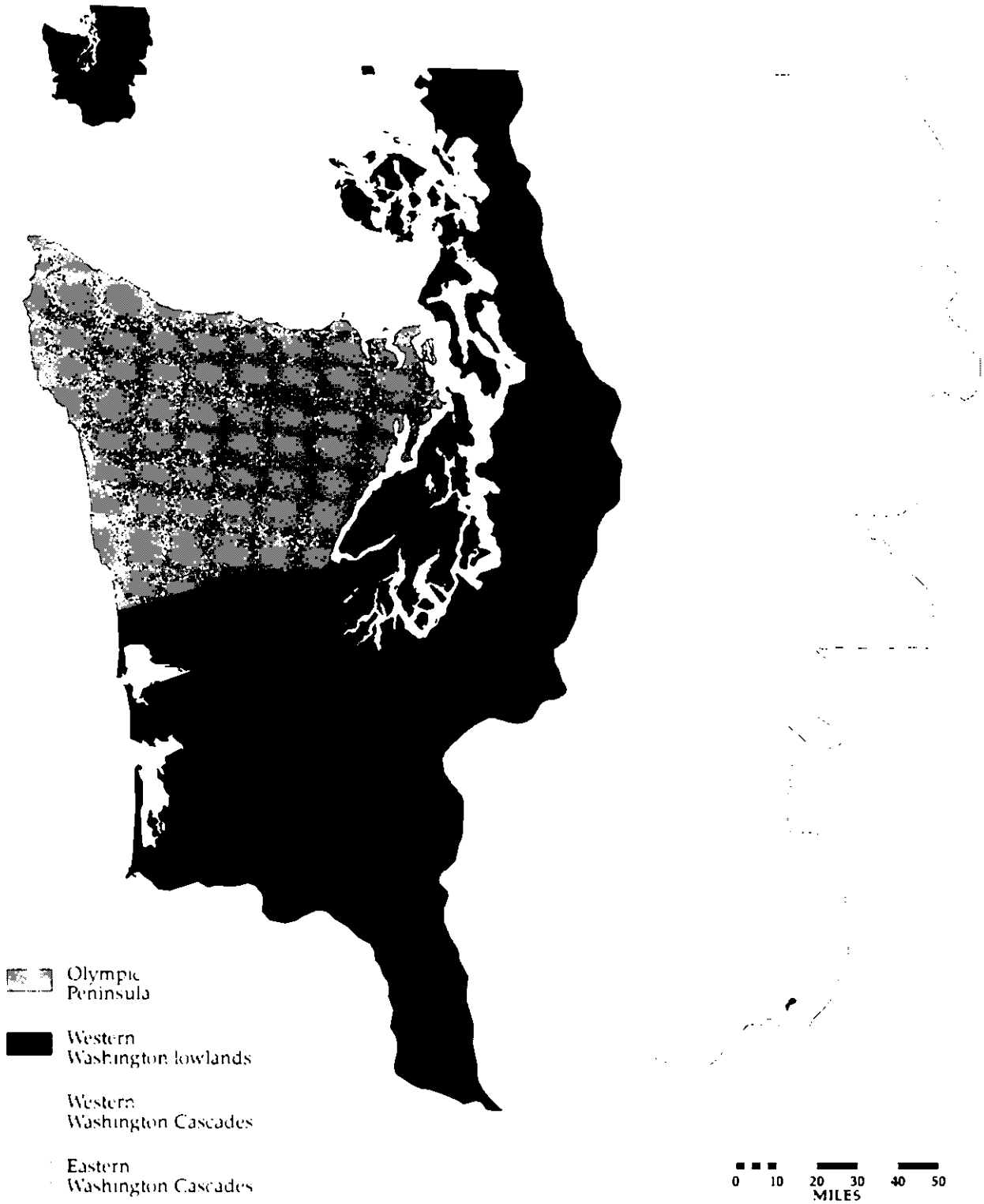
Map III.1: Physiographic provinces of the northern spotted owl



RMS 8-97 (Source: USDI 1992a p. 32)
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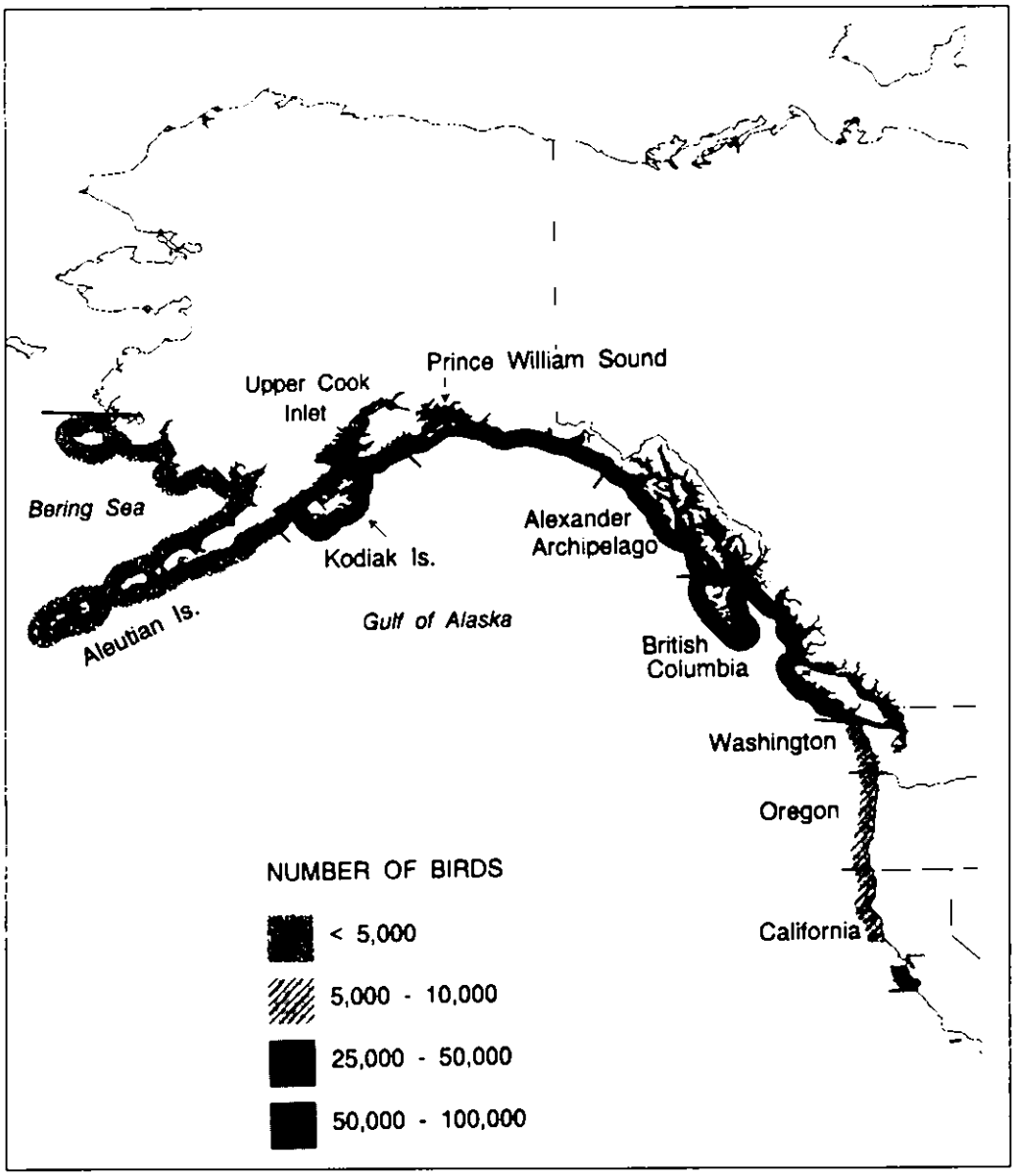
Map III.2: Range of the marbled murrelet and population sizes along the Pacific coast



RMS 8/97 (Source: Reproduced from Ralph et al. 1995 p. 52)
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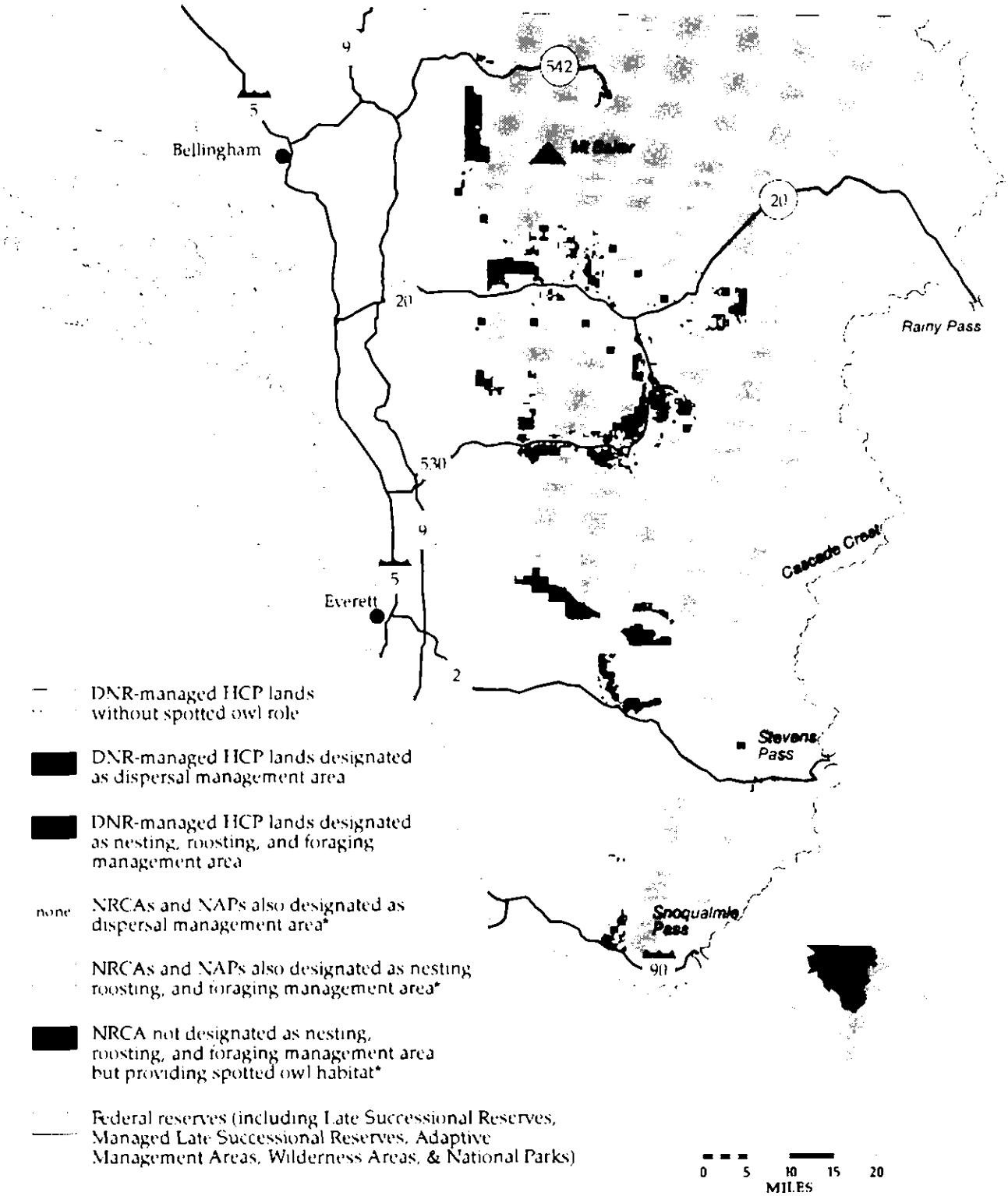
Map IV.1: Role of DNR-managed lands in providing mitigation for the northern spotted owl in the North Puget Planning Unit



RMS 8.97 (Source: DNR Geographic Information System, January 1997)
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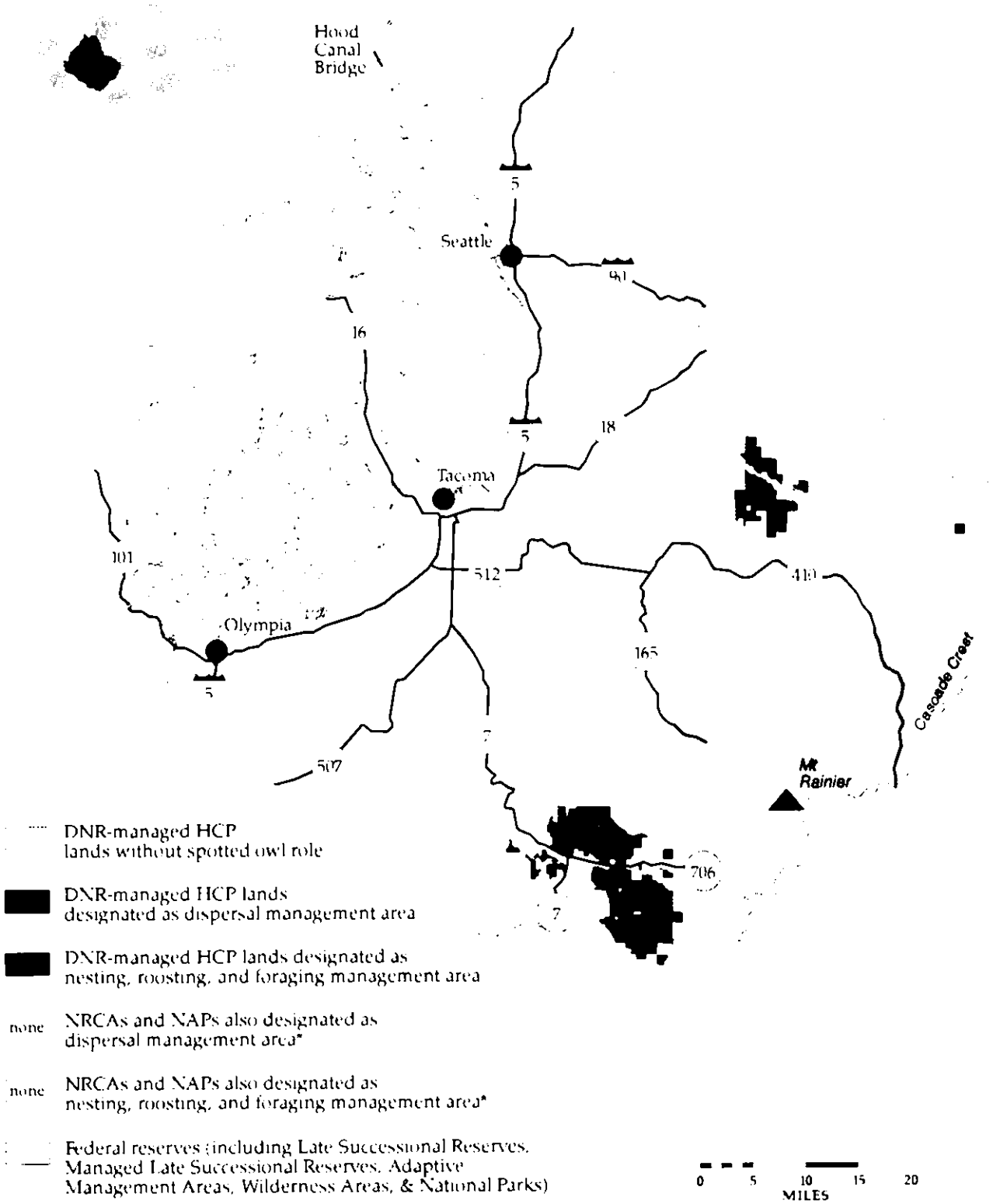
*Natural Resources Conservation Areas and Natural Area Preserves.
See section in Chapter I titled Land Covered by the HCP

Map IV.2: Role of DNR-managed lands in providing mitigation for the northern spotted owl in the South Puget Planning Unit



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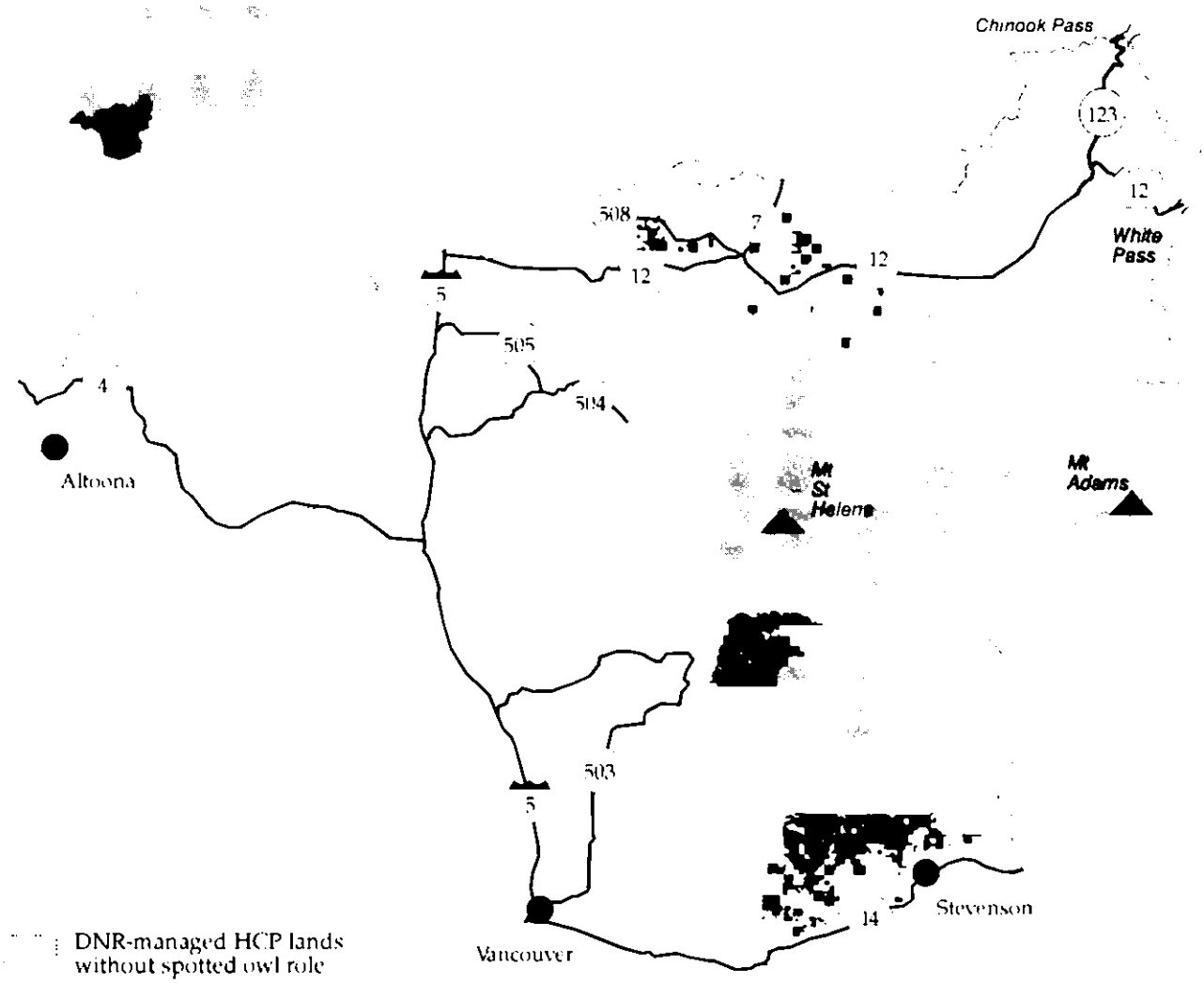
*Natural Resources Conservation Areas and Natural Area Preserves:
See section in Chapter I titled Land Covered by the HCP.

Map IV.3: Role of DNR-managed lands in providing mitigation for the northern spotted owl in the Columbia Planning Unit



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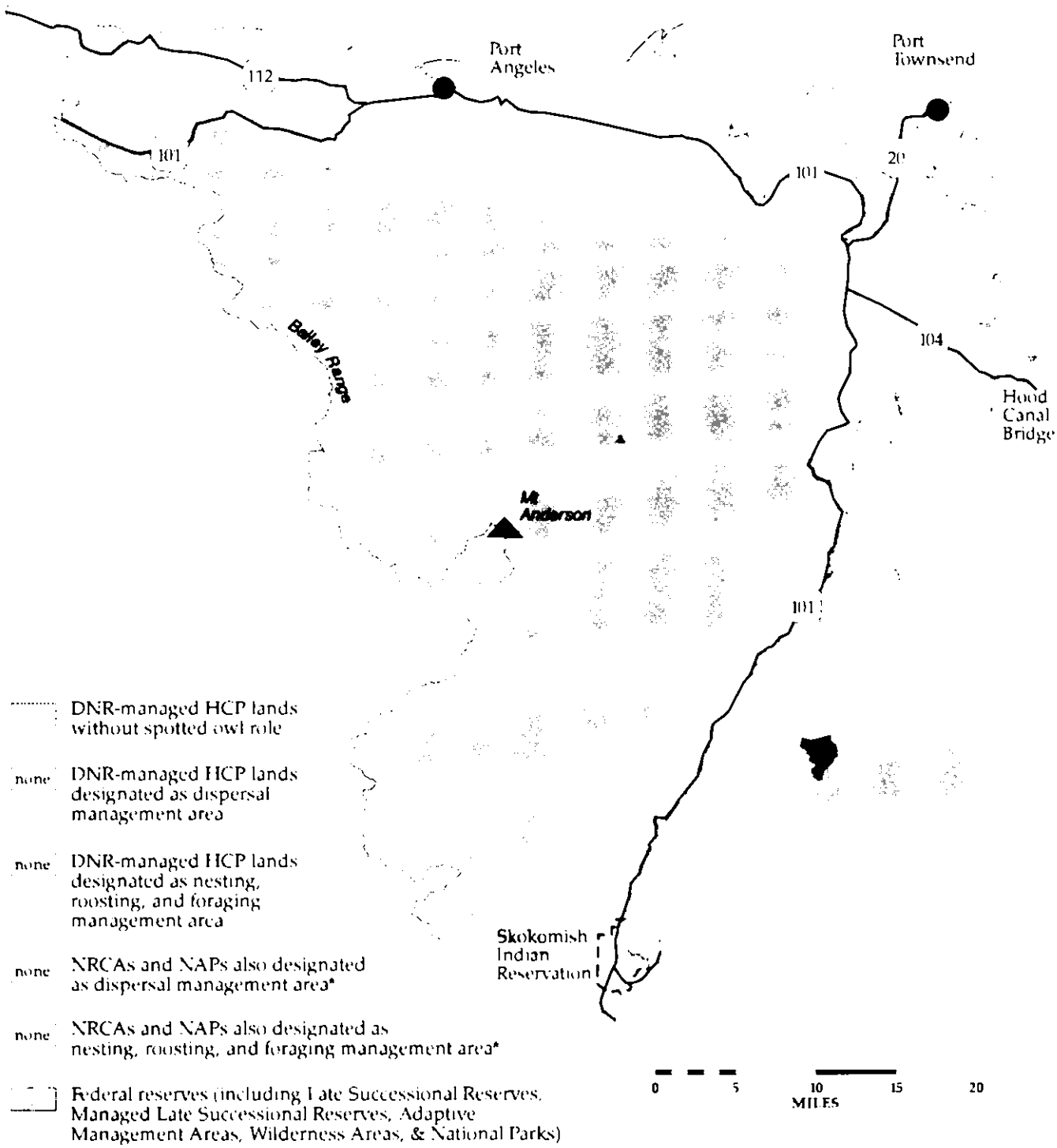
*Natural Resources Conservation Areas and Natural Area Preserves:
See section in Chapter I titled Land Covered by the HCP

Map IV.4: Role of DNR-managed lands in providing mitigation for the northern spotted owl in the Straits Planning Unit



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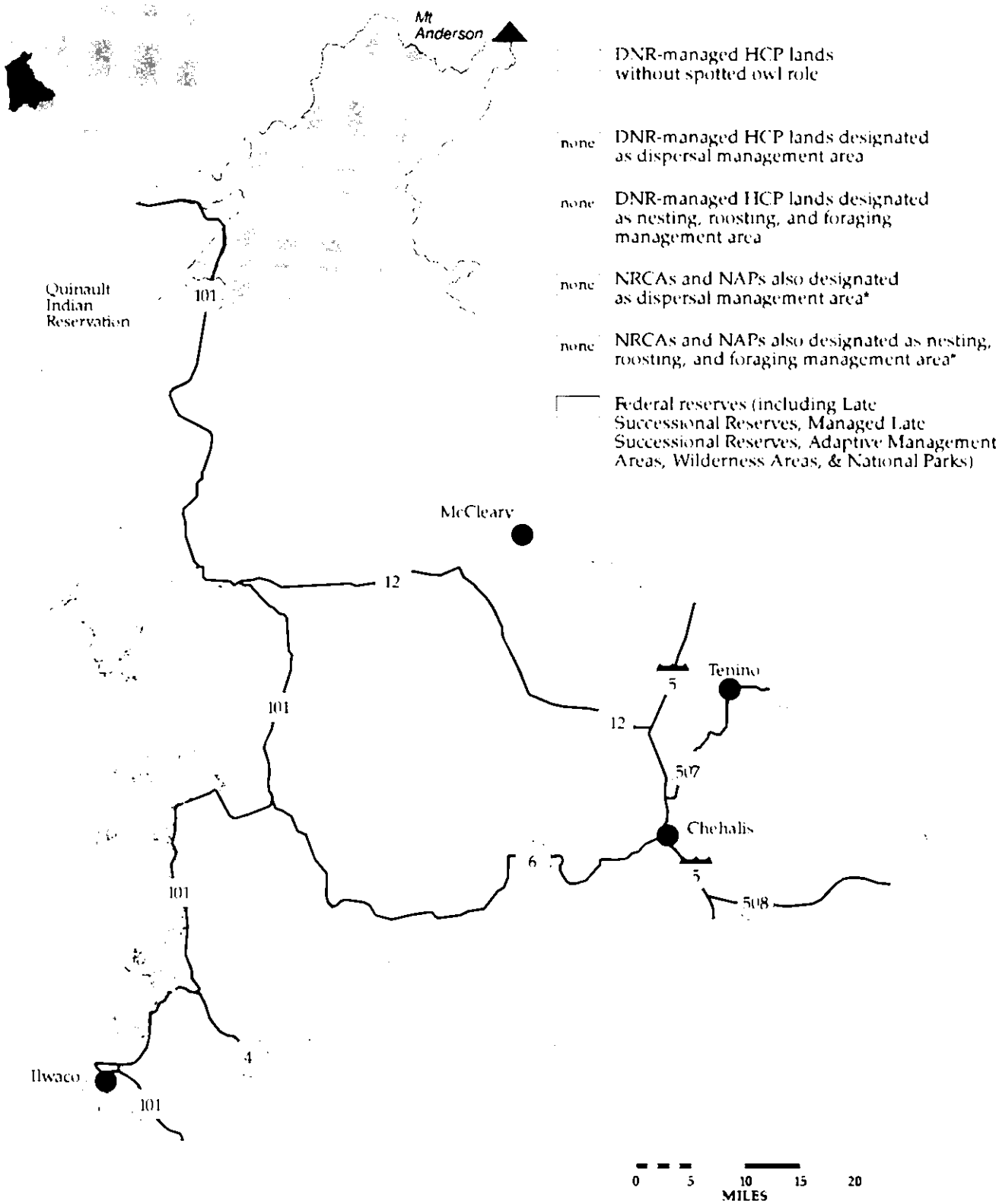
See section in Chapter I titled Land Covered by the HCP.

Map IV.5: Role of DNR-managed lands in providing mitigation for the northern spotted owl in the South Coast Planning Unit



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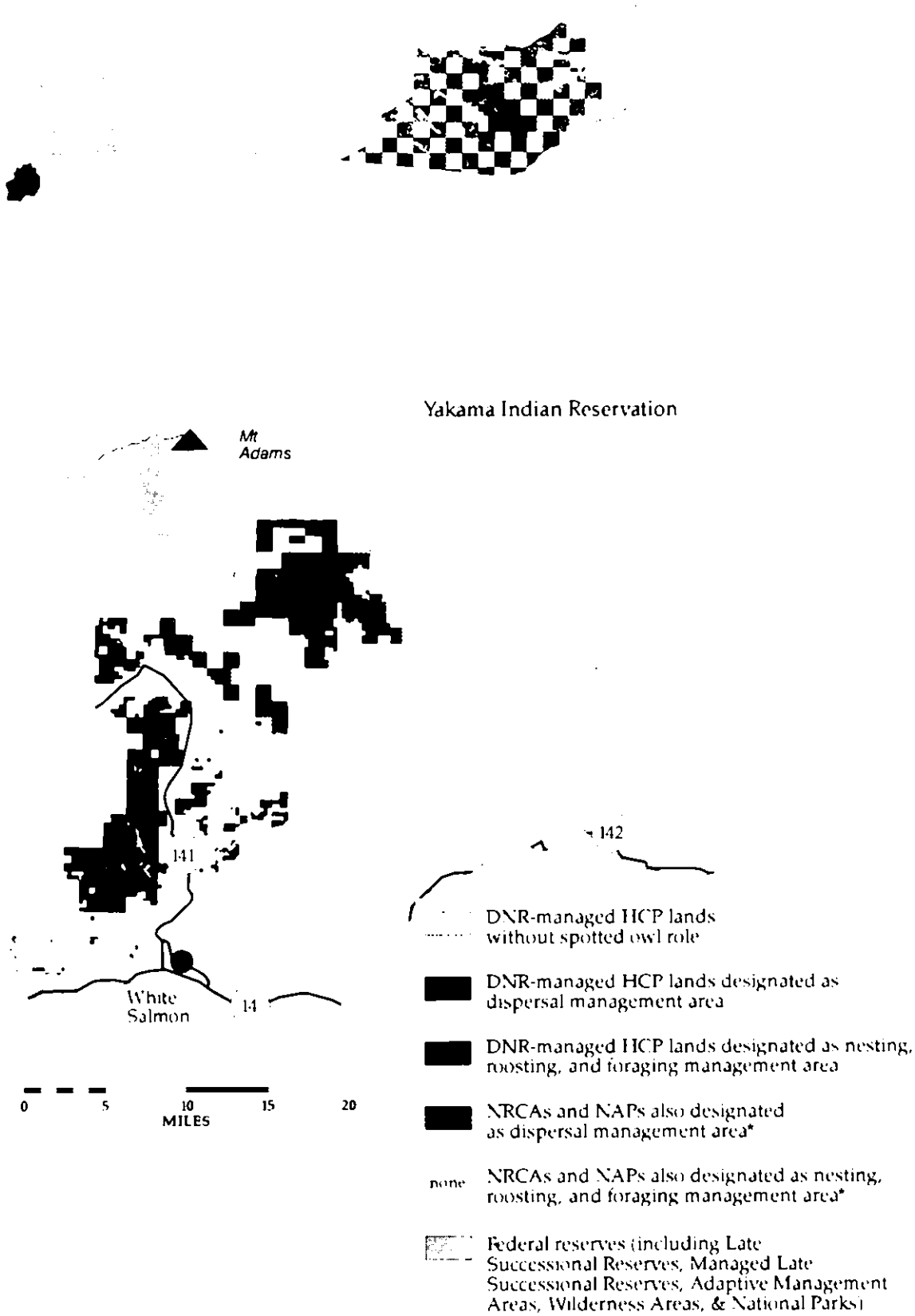
*Natural Resources Conservation Areas and Natural Area Preserves.
See section in Chapter I titled Land Covered by the HCP.

Map IV.6: Role of DNR-managed lands in providing mitigation for the northern spotted owl in the Klickitat Planning Unit



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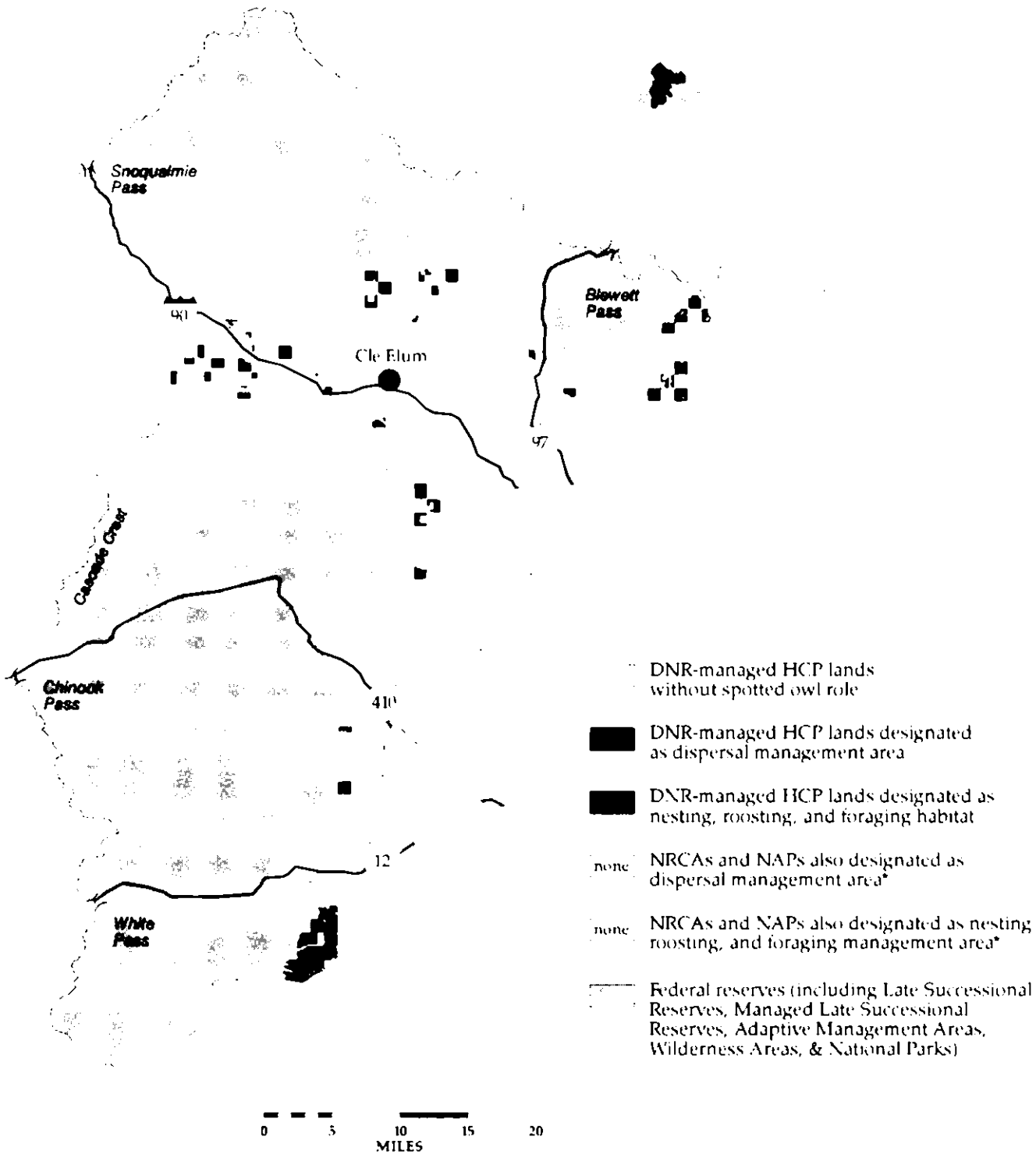
*Natural Resources Conservation Areas and Natural Area Preserves.
See section in Chapter I titled Land Covered by the HCP.

Map IV.7: Role of DNR-managed lands in providing mitigation for the northern spotted owl in the Yakima Planning Unit



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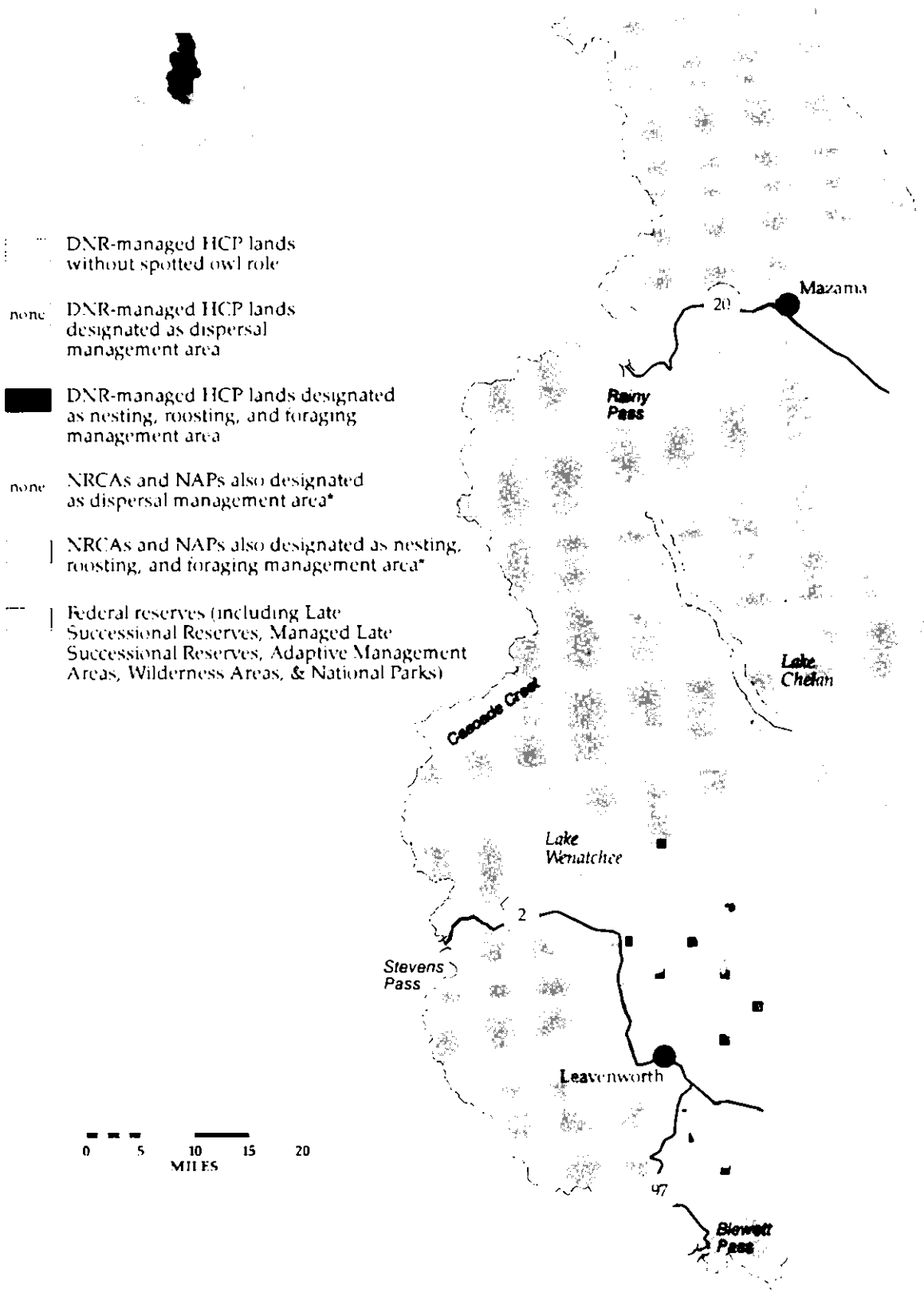
Map IV.8: Role of DNR-managed lands in providing mitigation for the northern spotted owl in the Chelan Planning Unit



RMS 8 97 (Source: DNR Geographic Information System, January 1997)
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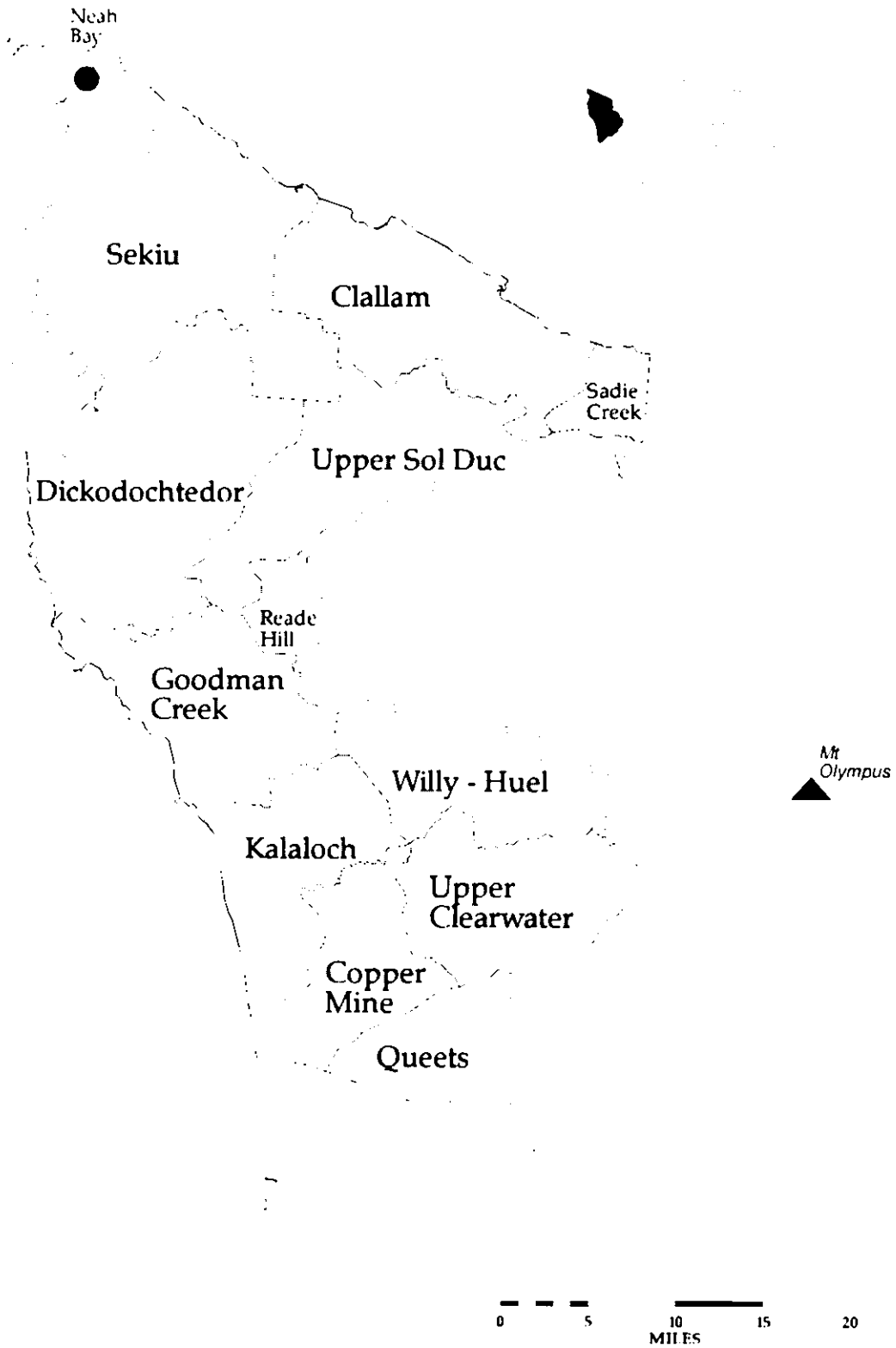
See section in Chapter I titled Land Covered by the HCP

Map IV.9: Landscape planning units in the Olympic Experimental State Forest



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