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