

MANAGING SPOTTED OWL HABITAT

Operational Guidelines Component of the Spotted Owl Management Plan

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Introduction

Within the context of a higher level plan under the Forest Practices Code, the Spotted Owl Management Plan was developed with the goal of "achieving a reasonable level of probability that owl populations will stabilize and possibly improve over the long term without significant short- and long-term impacts on timber supply and forestry employment."

The plan relies on a total land area of about 363 000 hectares of protected areas and Special Resource Management Zones (SRMZs) distributed throughout the Chilliwack and Squamish Forest Districts (Figure 1). Of this total, approximately 204 000 hectares of Crown forest land (including GVWD watersheds) are designated as SRMZs under the higher level plan. The long-term stabilization, and possible improvement, of the spotted owl population is dependent upon maintaining sufficient levels of suitable owl habitat within these areas. Forest practices within SRMZs will be oriented towards creating, enhancing or maintaining a sufficient quantity and quality of suitable owl habitat.

The plan is supported by two components. The strategic plan component describes the objectives and policies for spotted owl management in the province under the *Forest Practices Code of British Columbia Act* and provides the link between the higher level plan and forest management within spotted owl areas. The strategic plan component identifies how and where spotted owls will be managed, provides an assessment of population stabilization and timber supply impacts, and provides an implementation strategy. The second component, the operational guidelines component, provides an interpretation of the strategic plan component objectives and provides specific guidelines to achieve these objectives at the landscape and stand level within SRMZs. The primary goal within SRMZs is to integrate spotted owl management and forest management objectives with consideration for social and economic opportunities.

This document provides direction to resource managers for establishing long-term resource management plans for each SRMZ, silviculture guidelines for accelerating the development of suitable owl habitat, and timber harvesting guidelines for maintenance or enhancement of suitable owl habitat within the SRMZs.

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Adaptive Management

Many recommendations within this document are based on spotted owl habitat research conducted in Washington State or are based on the best professional judgement. Over time, it is anticipated that these recommendations will change as new information becomes available. The goal of this adaptive process is to improve the protection of spotted owls while improving the methods and efficiencies of forest management within spotted owl areas. As part of this plan, a Spotted Owl Research and Inventory Advisory Committee will provide direction for research and inventories to verify the objectives and guidelines presented within this document. This committee will then provide advice on changes to operational procedures to the Spotted Owl Management Inter-agency Team (SOMIT) for consideration.

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SPECIAL RESOURCE MANAGEMENT ZONES

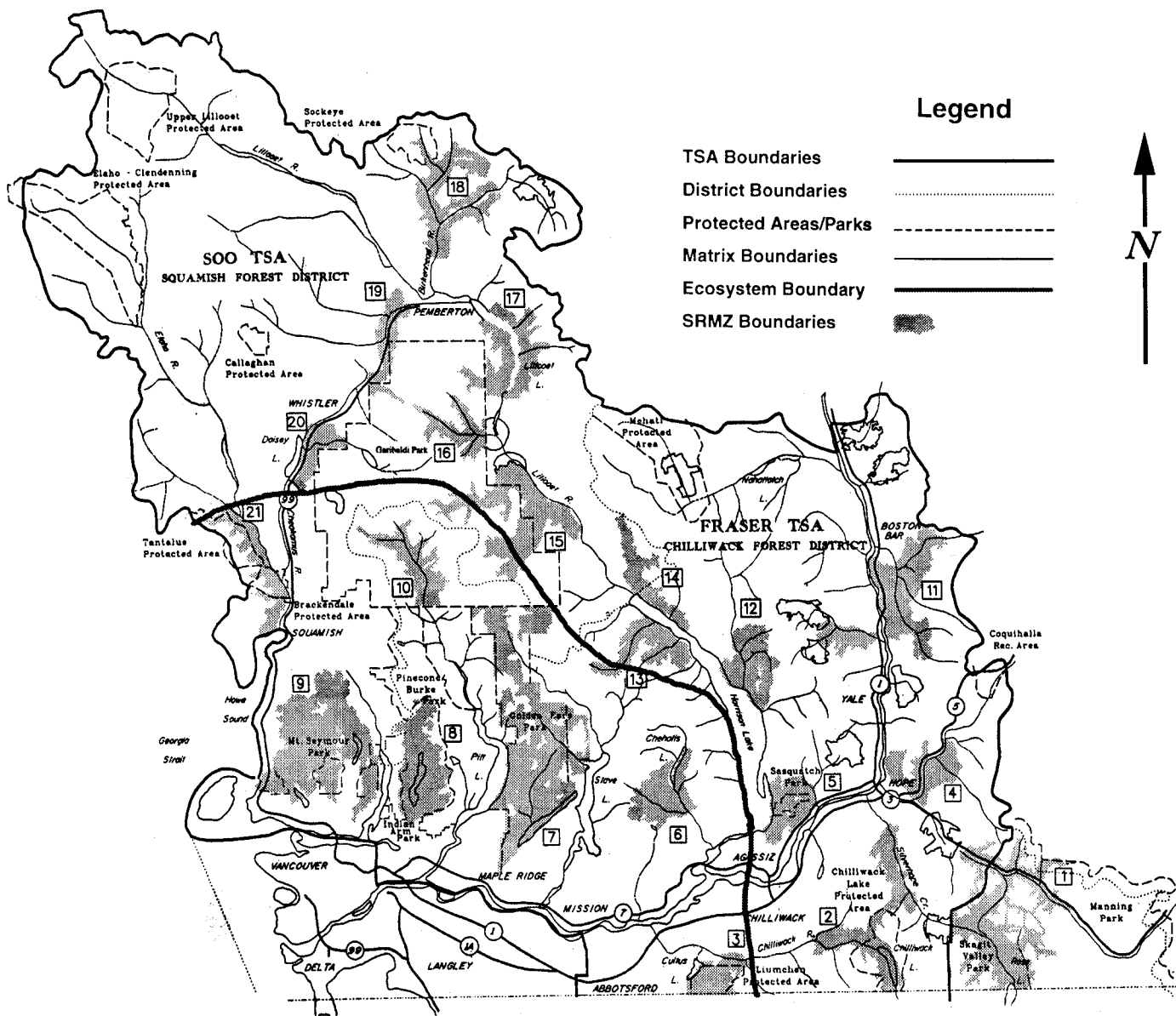


Figure 1. Areas of spotted owl management within the Chilliwack and Squamish forest districts.

Resource Management Plans

Higher level plans established under the *Forest Practices Code of British Columbia Act* enable management objectives to be established for unique resource requirements in specific areas. The management of spotted owl habitat will be accomplished within the context of higher level plan objectives for SRMZs and by establishing resource management plans (RMP) which provide the overall goals and objectives that direct development at the operational level. Resource management plans must consider the objectives of other higher level plans such as land and resource management plans and landscape unit plans (Figure 2).

A RMP is required to outline how the management objectives of the Spotted Owl Management Plan will be integrated within each SRMZ over a long-term planning horizon of one or more forest rotations. This integration will be achieved by maintaining a minimum 67% of the gross forested land as suitable owl habitat in each activity centre within SRMZs to ensure that owl populations stabilize and possibly improve over the long term. As well, it will provide opportunities for silvicultural and harvesting systems to create, enhance and maintain owl habitat. Each RMP will identify landscape and stand level management strategies to manage suitable owl habitat and to provide forestry, economic and employment opportunities.

A RMP must be completed and approved by the district manager and designated environment official prior to long-term operations occurring within SRMZs (excluding Cheakamus and Wedge/Green SRMZs). A transition period of two years will be given for resource managers to develop each RMP. During this period, a transition strategy, which follows the intent of the Spotted Owl Management Plan, will be implemented to direct all forest development in SRMZs.

Table 1 summarizes the planning steps for the development of RMPs.



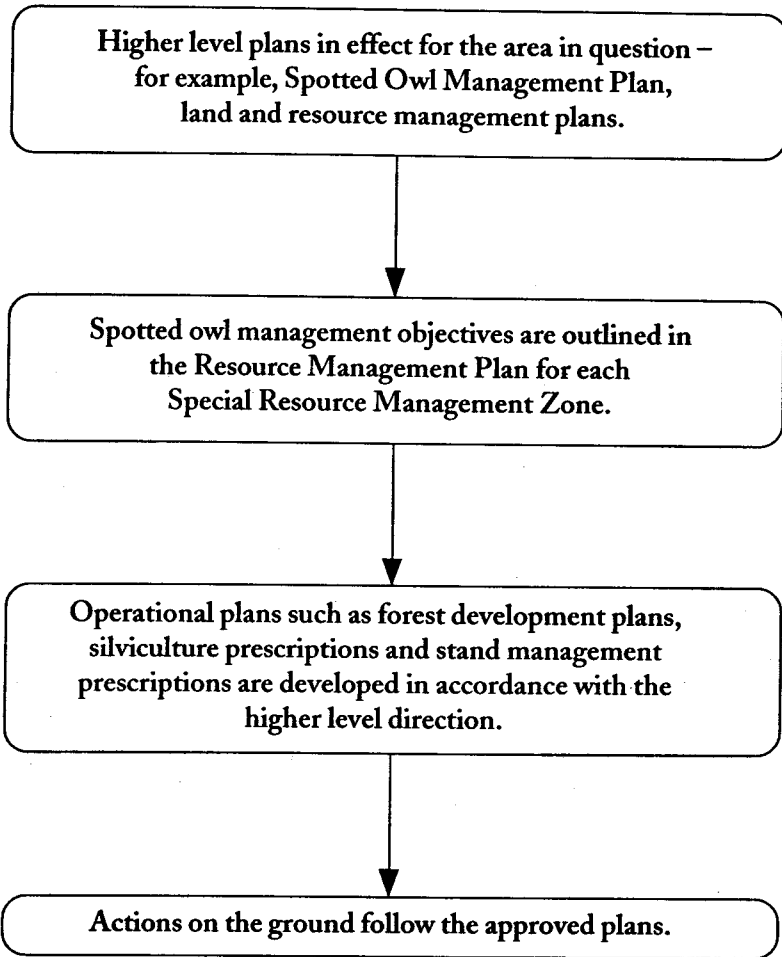


Figure 2. *The hierarchy of planning as it relates to spotted owl management in BC.*

Table 1. *Summary of resource management plan requirements and responsibilities*

	Resource management plan requirement	Responsibility
Step I: Spotted Owl Inventory	<ul style="list-style-type: none"> Owl inventories to identify critical owl habitats In the RMP, include a detailed owl inventory plan to monitor resident owls 	MELP
Step II: Long-term Activity Centre Establishment	<ul style="list-style-type: none"> Each long-term activity centre should average about 3200 ha to reflect the median annual home range size of a breeding spotted owl pair 	MELP, MoF, and licensees
Step III: Forest Stand Inventory	<ul style="list-style-type: none"> Habitat inventories are required to assess the amount of Type A and B suitable habitat Determine what forest practices may occur and/or are needed to promote the development of suitable owl habitat 	Licensee and MELP
Step IV: Identify the Initial 67% Owl Habitat Area	<p>Ideally, each long-term activity centre should maintain:</p> <ul style="list-style-type: none"> a minimum target of 50% of the gross forested land within activity centres as Type A owl habitat large patches greater than 500 ha of suitable owl habitat to minimize the effects of forest fragmentation corridors of suitable habitat greater than 1 km wide to provide interior forest conditions for owl movement between large patches a minimum 500 m radius reserve zone around known nest sites and critical roost sites <p>The 67% owl habitat area should consider:</p> <ul style="list-style-type: none"> inoperable forests visual quality objectives (VQO) low productive sites environmentally sensitive areas 1 Forest Practices Code requirements other Red-/Blue-listed species habitat requirements other regionally important wildlife habitat requirements 	MELP, MoF and licensees
Step V: Identify Harvesting and Silviculture Priorities	<ol style="list-style-type: none"> Prioritize salvage of catastrophic damage Clearcut or clearcut with reserves is permitted if the remaining stands will provide 67% suitable habitat Partial harvest of 80- to 100-year-old stands to accelerate the development of suitable owl habitat characteristics Commercial thin immature stands (30 to 80 years old) to promote owl habitat characteristics Partial harvest suitable owl habitat (100 years and older) to enhance owl habitat characteristics 	Licensees
Step VI: Detailed Resource Management Plan	<ul style="list-style-type: none"> Joint approval by the Ministry of Forests district manager and a Ministry of Environment, Lands and Parks designated environment official 	MELP, MoF and licensees
Step VII: Adaptability of Resource Management Plans	<ul style="list-style-type: none"> Make changes as needed to the RMP in response to new information, natural disturbances and other unforeseen factors that may influence the success or failure of the plan 	MELP, MoF and licensees
Step VIII: Monitoring and Review	<ul style="list-style-type: none"> Annually with FDP submission Every five years, re-submission for approval 	MELP, MoF and licensees

Step I: Spotted Owl Inventory Requirements

Spotted owl inventories should be completed for each SRMZ to identify critical nesting and roosting habitats to prevent the displacement or loss of owls from the current population in the SRMZ. This information will identify critical habitats within the 67% habitat target, which is important for planning silviculture and harvesting activities. Currently, spotted owl inventories are conducted by the Ministry of Environment, Lands and Parks and follows the Ministry of Environment, Lands and Parks' Spotted Owl Inventory Protocol. Inventory information will be made available to assist in the development of RMPs.

Critical habitats will change over time due to habitat modifications or spotted owls dying or vacating their territories and new owls occupying vacant territories. Therefore, as part of the RMP, a detailed owl inventory plan should be developed to monitor resident owls and to confirm the location of critical nesting habitat prior to forest development. The inventory plan will also help monitor the owl population to ensure that the population stabilizes and the management plan is achieving its goals.

Step II: Long-term Activity Centre Establishment

All long-term activity centres must be identified and established within each SRMZ prior to forest development. These activity centres may not be currently occupied by owls, but will be managed for owls over the long term. Each long-term activity centre should average about 3200 hectares to reflect the size of the median annual home range of a breeding spotted owl pair. To the greatest extent possible, each activity centre should be circular in shape to minimize the amount of edge. Ideally, these long-term activity centres should be based around currently known nesting or roosting sites. However, due to the size and structure of the SRMZ, long-term activity centres established in the RMP will likely be more evenly distributed, edge to edge, throughout the SRMZs. This may result in a currently known activity centre overlapping two or more of these long-term activity centres. If this occurs, the RMP must address and manage the currently known activity centre, and gradually phase it out over time as the overlapping long-term activity centres achieve sufficient suitable owl habitat.

Step III: Forest Stand Inventory Requirements

Habitat inventories within SRMZs are required in order to determine the amount of Type A and B suitable habitat (see Table 2 for a definition). This will determine what forest practices may occur and/or are needed to promote the development of suitable owl habitat. Until information is collected on spotted owl habitat attributes, it is recommended that current information gathered from timber cruises, silviculture prescriptions, forest cover maps or other available data be

Table 2. Suitable owl habitat

Spotted owls require habitat with specific forest stand attributes to provide for foraging, roosting, dispersal and nesting. The quality of habitats used by owls is variable and can be graded from superior to poor, and likely varies from ecosystem to ecosystem, and site to site. This document defines the quality of suitable owl habitat as either Type A (superior quality) or Type B (moderate quality) based on quantitative stand characteristics. Variation in habitat structure exists between coastal and interior forest types. The use of "suitable owl habitat" or "suitable habitat" in this document will include both Type A and B habitats.

Habitat type	Serai stage	
	Mature and old Type B – Moderate quality (Foraging, dispersal, and roosting)	Old Type A – Superior quality (Nesting, roosting, foraging and dispersal)
Wetter maritime ecosystems (CWHdm, CWHvm1, MHmm1) (NDT 1, 2; Rare to infrequent stand initiating events)		
Suitable habitat characteristics	<ul style="list-style-type: none"> • few canopy layers, multi-species canopy dominated by large (51 cm dbh) overstorey trees (typically 247–457 stems/ha, although densities as low as 86 stems/ha are possible where large diameter trees are present). • moderate to high (60–80%) canopy closure • some large trees (51 cm) with various deformities (e.g., large cavities, broken tops, dwarf mistletoe infections). • large (51 cm dbh) snags present. • accumulations of fallen trees and other woody debris on the ground. 	<ul style="list-style-type: none"> • a multi-layered, multi-species canopy dominated by large (76 cm dbh) overstorey trees (typically 37 to 185 stems/ha). • moderate to high (60–80%) canopy closure. • a high incidence of large trees with various deformities (e.g., large cavities, broken tops, dwarf mistletoe infections). • numerous large (76 cm dbh) snags (typically 5 stems/ha). • large accumulations of fallen trees and other woody debris on the ground.
Dryer subaritime ecosystems (CWHds1, CWHms1, CWHms2, MHmm2, ESSFmw and IDFww) (NDT 2,4; Infrequent stand initiating events to frequent stand maintaining fires)		
Suitable habitat characteristics	<ul style="list-style-type: none"> • a multi-layered, multi-species canopy dominated by overstorey trees approximately 30 cm dbh. • stands must contain 20% Df and/or Hw in the overstorey. • approximately 50% canopy closure. • dominant live trees with various deformities (e.g., large cavities, broken tops, dwarf mistletoe infections). • snags and down logs, at least some of which are of similar dbh to dominant live trees. 	<ul style="list-style-type: none"> • a multi-layered, multi-species canopy dominated by large (51 cm dbh) overstorey trees (typically 173–247 stems/ha, although tree densities as low as 86 stems/ha are possible where large diameter trees are present). • moderate to high (>70%) canopy closure. • some large trees with various deformities (e.g., large cavities, broken tops, dwarf mistletoe infections). • large (51 cm dbh) snags present (typically 7 stems/ha). • accumulations of large (51 cm dbh) fallen trees and woody debris on the ground.

Note: The stand characteristics listed above for suitable and superior owl habitats are based on inventory information from Washington state. Until specific spotted owl research and forest attribute inventory information is collated and quantified, the definition of suitable owl habitat, for the purposes of developing and approving operational plans, will be forested lands that are older than 100 years. Habitat surveys are required to determine the stand attributes described above before being considered as suitable owl habitat.

used to evaluate stands for habitat type. In general, Type B habitats will be characterized by forests aged between 100 and 140 years (age class 6 and 7) and heights greater than height class 2. Type A habitat will generally be forests older than 140 years (age class 8 and 9) with heights greater than height class 2.

Step IV: Identification of the Initial 67% Owl Habitat Area

The objective in SRMZs is to maintain a minimum 67% of the gross forested land base as suitable owl habitat within each long-term activity centre. To achieve this, it is recommended that forests be identified that will be managed initially to achieve this target and that will develop into or be maintained as Type A or B habitat. Ideally, the 67% owl habitat areas should consist of:

- a minimum target of 50% of the gross forested land within activity centres as Type A owl habitat
- large patches greater than 500 hectares of suitable owl habitat to minimize the effects of forest fragmentation
- corridors of suitable habitat greater than one kilometre wide to provide interior forest conditions for owl movement and forage between large patches
- a minimum 500-m radius reserve zone around known nest sites and critical roost sites.

To reduce overall timber supply impacts, the 67% owl habitat area should overlap, as much as possible, heavily constrained features of the land base, including:

- inoperable forests
- visual quality objectives (VQO) for retention and partial retention
- low productive sites (i.e., site class less than 15)
- environmentally sensitive areas 1 (e.g., terrain stability, hydrology)
- Forest Practices Code requirements (e.g., biodiversity and riparian guidebooks)
- other Red-/Blue-listed species habitat requirements (i.e., those identified under the Code)
- other regionally important wildlife habitat requirements (e.g., deer winter range).

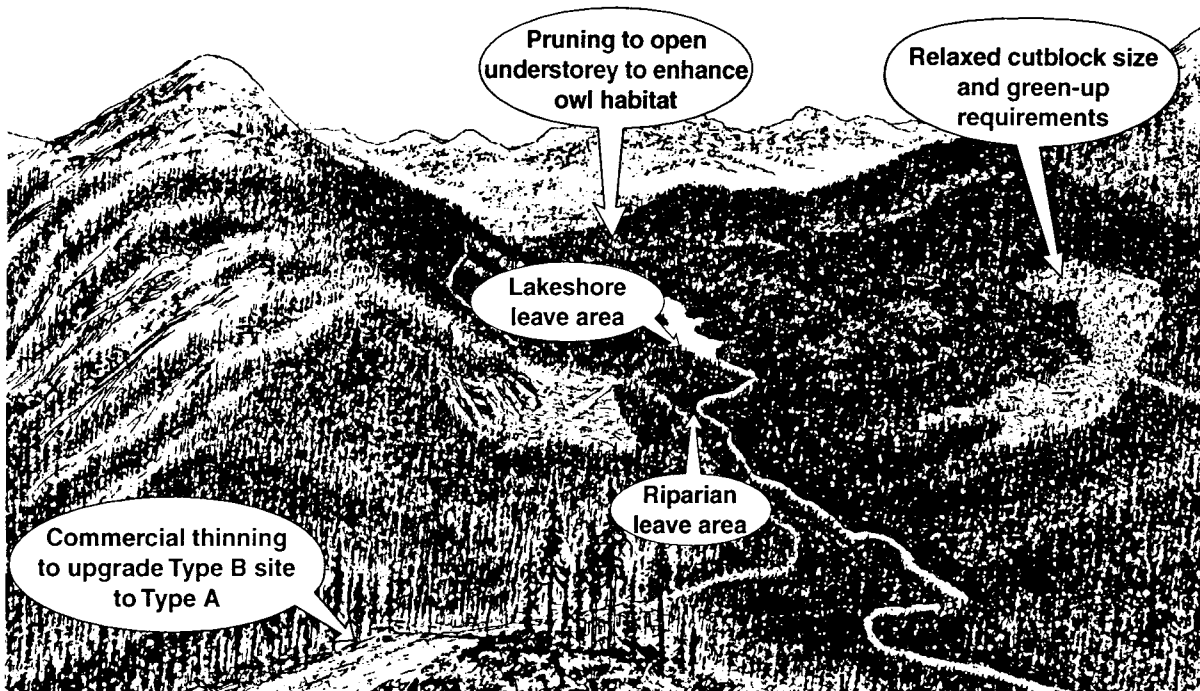
Step V: Identification of Harvesting and Silviculture Priorities

1. Salvage of catastrophic damage in stands may be carried out where removal of the damaged forest would reduce the risk of further damage to the remaining stand and maintain or improve the habitat suitable for owls. Salvage may benefit both the owl and the health of the forests by promoting the restoration of suitable owl habitat and by preventing further potential disturbance to the forests (e.g., spread of pests). Opportunities for salvage should be monitored on an annual basis and the RMP modified to accommodate any catastrophic damage.
2. If the activity centre contains over 67% suitable owl habitat, look for opportunities to harvest the excess mature forest. Forest managers are encouraged to locate forest development in younger stands to create or enhance suitable owl habitat versus the older stands that are functioning already as suitable owl habitat. The harvest should be designed to promote silviculture opportunities that accelerate the restoration of suitable owl habitat so that additional mature and/or old forests may be harvested.

Cutblock Size

To minimize forest fragmentation and maintain large patches of suitable owl habitat, the current pattern of cut and leave strips may be altered. Larger blocks of partial harvest or clearcuts with reserves are more desirable than a patchwork system of smaller, widely dispersed cutblocks that creates forest fragmentation. To accommodate larger cutblocks, the higher level plan:

- will provide flexibility to the 40-hectare cutblock requirement (Operational Planning Regulation part 3.21) to allow for larger cutblock sizes to reduce forest fragmentation in adjacent stands.
- will provide flexibility to the green-up requirement of adjacent blocks (Operational Planning Regulation part 3.23) to allow for larger cutblock sizes to reduce forest fragmentation in adjacent stands.



3. If the activity centre does not contain 67% suitable owl habitat, look for enhancement opportunities in non-suitable habitat to increase the amount of suitable owl habitat. Generally this would include commercial thinning (30–80 years), and partial harvest (80–100 years) to produce future habitat. This will accelerate the achievement of the 67% target and thereby allow for the harvest or further enhancement of other mature forests.
4. Look for enhancement opportunities within existing suitable owl habitat. When considering the level of volume extraction, several factors, over and above the required habitat characteristics, should be considered, including the degree of enhancement and the importance of the stand for current owl needs. For example, a forest manager may propose a prescription that removes greater than 30% stand volume to enhance suitable owl habitat to superior conditions. As a result, it may take 30 years or more for the canopy and stand in the treatment area to recover back to suitable habitat conditions following the stand treatment. However, if there is less than 67% suitable owl habitat within the activity centre, the existing owls require the treated stand to remain suitable over the short term. In this case, alternative options may be required that could include harvesting a smaller volume (i.e., less than 30%) from the stand to maintain the canopy and stand attributes as suitable habitat, or the enhancement may be delayed until additional suitable habitat has been established in another stand.

Step VI: Completion of the Detailed Resource Management Plan

Joint approval by the Ministry of Forests district manager and a designated environment official is required for each RMP prior to approval of other operational plans in the SRMZs. The objectives of the RMP must be addressed in the operational plans.

Step VII: Adaptability of Resource Management Plans

Catastrophic events such as fire, windthrow, insects and disease could affect the objectives of the RMPs and reduce the probability of stabilizing the owl population. As well, research and inventories will provide new information on habitat requirements and/or improve methods of forest management within spotted owl areas. Therefore, resource management plans must be adaptive and may require change in response to new information, natural disturbances or other unforeseen factors that alter the ability of the plan to meet its objectives. Any significant changes to the RMP require the approval of the Ministry of Forests district manager and the Ministry of Environment, Lands and Parks designated environment official.

Step VIII: Monitoring and Review of the Resource Management Plan

The objectives stated in each RMP will be considered during the development of operational plans. The RMPs will be reviewed with forest managers annually during the forest development plan submission. Every five years the RMP must be re-submitted to the district manager and designated environment official for approval.

Stand Level Planning within the Resource Management Plan

Spotted owls require specific forest stand attributes to provide for foraging, roosting, nesting and movement. These attributes have been found primarily in old-growth forests. Occasionally, they occur in younger forests that exhibit old-growth forest like conditions created from earlier disturbances (e.g., fire, wind, selective logging) which left behind large trees, snags and downed logs. The maintenance and creation of these old-growth structural attributes in younger forests may lead to greater utilization by spotted owls.

A goal of the Spotted Owl Management Plan is to achieve suitable owl habitat at an earlier age than through natural succession (Figure 3). This will require both intensive silviculture and partial harvesting of young and mature forests, as well as the retention of structural forest attributes at the time of final harvest. It is expected that intensively managed forests will, on average, attain suitable owl habitat conditions at 100 years of age (likely range between 80 and 120 years).

Silviculture prescriptions will outline how the stands will be harvested and regenerated until they are free growing (about 10 to 20 years after harvest depending on site conditions and environmental factors). Silviculture prescriptions should be designed to promote the rapid restoration of suitable owl habitat and the retention of old forest stand structures that occur within the stand. They should also prescribe forest practices that minimize the risk of large scale natural disturbances (i.e., windthrow, disease, insect and fire).

Harvest objectives must be clearly defined. Multiple-entry and variable-density treatments may be required to produce the desired stand attributes or to retain stand attributes for creating future suitable owl habitat at final stand entry. Stand level planning objectives for achieving or maintaining suitable owl habitat conditions over a planning horizon of one or more forest rotations must be incorporated into all operational plans (i.e., forest development plans, silviculture prescriptions, logging plans). This long-term planning will be achieved largely through silviculture prescriptions and the RMP.

Stand management prescriptions for immature stands provide the basis for the longer-term planning commitment to achieve the objectives of the RMP. No single entry into the stand should be proposed without consideration of subsequent entries. Prescriptions should be developed on a site-by-site basis and should be designed to optimize the natural features within the stand. Forest managers are encouraged to work closely with regional fish and wildlife staff to develop the long-term strategies for specific blocks.

Unmanaged Stand



Current Forest Management



Northern Spotted Owl Habitat Management



Time →

Figure 3. Comparative forest development of spotted owl habitat with other systems.

Ecological Considerations

The Chilliwack and Squamish Forest Districts have been divided naturally into two broad ecosystems for the purposes of owl habitat development. The *Biodiversity Guidebook* was used to key into the natural disturbance types (NDT) and the associated biogeoclimatic subzones. The two ecosystems addressed within this document are the wetter maritime and dryer subarctic ecosystems (Figure 1, page 2).

The wetter maritime ecosystem is distinguished by NDT 1 and 2, which are characterized as rare to infrequent stand initiating events such as fire, windthrow, insect and disease or other catastrophic occurrences. The landscape is distinguished by many small areas of regenerated forests surrounded by older mature forests. Biogeoclimatic subzones exhibiting these characteristics in the two forest districts are CWHdm, CWHvm1 and MHmm1. It is recognized that interior

Transitional Ecosystem

Between the wetter maritime and dryer subarctic ecosystems occurs a transitional ecosystem, which exhibits forest characteristics of both ecosystems. There is, however, limited information on spotted owl habitat in these transitional areas. Resource managers should consider the stand characteristics and ecosystem type when prescribing stand treatments in these transitional areas. Table 2 should be used as a guide for ranges of the attributes for the transition zone.

Douglas-fir and ponderosa pine biogeoclimatic zones rarely have stand initiating events but are not included in NDT 1 because the stand maintaining surface fires are the dominant ecological influence.

The dryer subarctic ecosystem is distinguished by NDT 2 and 4, which are characterized by infrequent to frequent stand initiating events, usually through fire. The landscape in NDT 2 would consist of extensive areas of even-aged stands with snags and vets

that have survived previous fires. NDT 4 is characterized by a mosaic of uneven-aged forest interspersed with grass and shrub openings.

Biogeoclimatic subzones exhibiting these characteristics in the two TSAs are CWHds1, CWHms1, MHmm2, ESSFmw and IDFww.

The habitat requirements for spotted owls have been divided into the wetter maritime and dryer subarctic ecosystems (Table 2, page 7). Forest managers and agencies should recognize the distinct habitat requirements of these ecosystems when prescribing stand treatments.

Specific Spotted Owl Habitat Requirements

Spotted owls require forests with structural characteristics that provide protection from predators and the environment, structures for nesting and roosting, relatively high prey availability and are open enough to allow easy movement within and beneath the canopy. At least seven important stand level habitat objectives have been identified to promote the use of stands by spotted owls.

Forest community

In wetter ecosystems, spotted owls most often use conifer-dominated forest types, but also may use mixed conifer-hardwood stands. Pure stands of hardwoods may be used by spotted owls for foraging and roosting in the summer, but they provide little protection from weather in winter. In general, landscapes with greater than a 30% composition of conifers are used by spotted owls. In dryer ecosystems, spotted owls use pure fir, mixtures of pine and fir, and mixed conifer forests. Generally, greater than a 20% composition of firs (Douglas-fir or grand fir) is required to support owls. *Therefore, one objective is to maintain no less than these minimum composition levels of firs within both ecosystems.*

One of the most important species is Douglas-fir. The ectomycorrhizal fungi associated with Douglas-fir provides an important food source for northern flying squirrels, the primary prey species of the spotted owl. Increasing the composition and number of conifers, particularly Douglas-fir, within both ecosystems will increase the suitability and use of the forest stand. It is also important to maintain a diversity of conifer and hardwood species within a stand. This will provide structural complexity and support a wide diversity of plants and animals, particularly prey, that are associated with specific tree species.



Canopy closure

Canopy closure includes the overhead coverage of dominant, co-dominant and intermediate trees, and generally excludes suppressed understory trees and shrubs. Canopy closure contributes to maintaining thermal cover and regulation, and provides protection from predators. Stands used by spotted owls, and particularly around nest sites, generally exhibit canopy closures greater than 70% in both ecosystems. Canopy closures of less than 60%, and 50% in the wetter and dryer ecosystems respectively, are rarely used by spotted owls for foraging and roosting. *Therefore, one important objective is to maintain canopy closures greater than 60% and 50% in the wetter and dryer ecosystems respectively, to provide suitable owl habitat conditions, and closures greater than 70% to provide nesting habitat.*

Tree density and height

Spotted owls require a canopy that is open enough to allow the owl to fly within and beneath it. Young stands are often too dense for owls to fly through, and often may have many limbs near the forest floor which can impede the capture of prey. *The objectives for tree density and height, when evaluated simultaneously, should describe forests open enough, both within and below live trees, to provide suitable conditions for owl use.* In the wetter ecosystem, suitable habitat (Type B) is achieved when the overstorey attains between 247–457 stems per hectare greater than 50 cm dbh and taller than 25 m. Superior habitat (Type A) is achieved when the overstorey attains between 37–185 stems per hectare greater than 75 cm dbh and taller than 25 m. In the dryer ecosystem, suitable habitat (Type B) is achieved when the overstorey attains between 247–457 stems per hectare greater than 30 cm dbh and taller than 27 m. Superior habitat (Type A) is achieved when the overstorey attains between 173–247 stems per hectare greater than 51 cm dbh and taller than 27 m.

Vertical diversity

Stand level habitats used by spotted owls typically include a multi-layered canopy with a high degree of structural diversity. This allows the owl to fly within and beneath the canopy, and provides roosting and foraging perches at a variety of heights throughout the canopy and forest floor. *The stand level objective is to achieve or maintain two, or preferably more, canopy layers.* This can be achieved by opening stands to induce the growth of suppressed stems, thereby establishing an additional canopy layer. As well, opening the stand may provide a shrub and/or hardwood layer in the understorey. This will also establish an additional layer, but may not meet spotted owl needs if the only two layers are overstorey and shrub cover.

Snags and cavity trees

Spotted owls use a wide variety of natural or pre-formed structures for nests. These are comprised of large cavities, abandoned goshawk nests, or large platforms created by snags, broken tops of trees or trees affected by mistletoe. Since spotted owls do not create their own nests and given their large body size, natural formed nest structures must be large in order to support nesting females and their young. In addition to owls, flying squirrels use cavities in snags and live trees as den sites. In young stands, cavities in live trees are likely absent and less abundant than in older stands. *The stand level objective is to achieve or maintain a minimum number of snags and cavity trees to provide nest sites for owls and dens for flying squirrels.*

Dead and coarse woody debris

A number of mammalian prey of the spotted owl, such as flying squirrels, voles, shrews, and mice, inhabit the forest floor. Fallen trees and large limbs are especially important for these animals, and provide moist microclimates, protective cover for movement, sites for nests and burrows, and food in the form of fungi, plants and invertebrates. *The stand level objective is to contribute to the existing coarse woody debris at each entry into the stand.*

Shrubs

Understorey vegetation provides cover and food in the form of fungi, foliage, seeds, fruit and insects for a number of mammalian prey of the spotted owl, such as flying squirrels, voles, shrews and mice. Fungi associated with shrubs are an important food source for the flying squirrel. *The stand level objective will be to achieve or maintain a patchy distribution of shrubs over at least 40% of a stand with patches averaging at least 24% ground cover of shrubs.*



Silviculture Guidelines

The goal of silviculture is to achieve stand level forest attributes that provide for the needs of spotted owls and other old forest associated species while providing economic and employment opportunities. The objective is to accelerate the development of old-growth like conditions by regularly manipulating (up to four entries) the forest stand to ensure that adequate levels of cavities, snags, species composition, vertical diversity, tree density and height, coarse wood debris, and light are maintained.

The following guidelines will help forest managers develop specific stand level plans for enhancing young forests to create spotted owl habitat. Prior to any forest development, a detailed silviculture prescription is required describing the management activities to be performed to maintain the inherent productivity of the site, accommodate all resource values including biological diversity, and produce a free growing forest stand capable of meeting stated management objectives.

Site preparation

Three types of site preparation may be used to prepare the site for planting or to enhance regeneration of natural stands.

Broadcast burning should be avoided if it will eliminate or reduce the coarse woody debris requirements for habitat development. Burning of roadside and landing accumulations will be restricted between April 1 and August 30 within a 1-km radius of known nest sites, and should only be conducted as part of the overall SRMZ fuel management plan. If possible, large debris should be evenly scattered back into the cutblock to add to the coarse woody debris requirements provided it does not meet utilization standards. Burning may also be required to reduce or eliminate insect or disease from spreading to adjacent stands. If burning is required, any prescribed snags or green trees retained from harvesting on the block should be maintained.

Mechanical site preparation can be used to improve planting opportunities and will enhance the accumulation of woody debris piles or windrows for prey species habitat. Mechanical site preparation may however create exposed mineral soil that could promote the invasion of pioneer species of vegetation.

Chemical site preparation using herbicides to reduce the competition from undesirable vegetation could be used prior to planting to ensure the establishment of the plantation. Prior to the application of herbicides, the treatment should be assessed for any potential impact on habitats and prey in adjacent stands. If the use of aerial application is considered, design the block considering which snags and green trees will be retained, as they could pose a safety hazard to the aircraft.

Planting or natural regeneration

To create the elements of future stand diversity and provide stand structure, planning for regeneration of stands should include a strategy to create mixed species stands. Planting objectives should include a mix of desirable species as indicated in the *Establishment to Free Growing Guidebook – Vancouver Forest Region*. Species selection should also consider tree species important to the development of prey habitat (e.g., Douglas-fir).

In areas where natural regeneration is the objective, consideration should be given to interplanting of an alternate species such as Douglas-fir, western redcedar or hemlock to provide a more desirable mix for future owl habitat. Although these species may be the alternate species for the biogeoclimatic subzone and may not perform as well as the desired species, they are important as a seed source for prey species and owl habitat development. Variable density planting (cluster planting) may be practised to promote habitat diversity.

Brushing and weeding – vegetation control

The control of competing vegetation in the first 15 years of a plantation or naturally regenerated stands may be required to meet the legal obligation of free growing stands. Competing vegetation consists of

herbs, grasses, shrubs and various deciduous species. Although important to the future stand diversity, prey source and owl habitat needs, early seral stages of stand development may require control of vegetation for the survival of conifer regeneration. Ecosystems will benefit from retaining nitrogen-fixing species in the stand. Therefore, site prescriptions should ensure that only target species are controlled, and those trees identified for retention are clearly marked.

Manual vegetation control usually provides a control of vegetation for a limited time. On good sites the control may only last for one growing season and, therefore, would require repeated treatments over several years. This results in very high costs and should be considered only in sensitive areas where herbicides are restricted, such as riparian areas and deer winter ranges.

Chemical vegetation control is the most cost effective control of competing vegetation. Herbicide application alters the early successional vegetation of the young stand, and re-invasion of many species will occur a few years following application. Herbicides can be applied using broadcast, spot or aerial treatment methods. Strict control of application must be maintained at all times to ensure that only the desired vegetation is treated, that habitat and prey populations in adjacent stands are not affected, and to meet all the requirements of the permit.

Precommercial thinning – juvenile spacing

Precommercial thinning is the first entry into the forest stand. It is recommended that precommercial thinning be used to enhance the stand for future owl habitat and to prepare the stand for future commercial thinning opportunities. As such, it is important that the objectives of the stand be clearly defined in the RMP. Reference should be made to Tables 3 (page 26) and Table 4 (page 29) to ensure that the prescription will reflect the preferred stand attributes of the wetter maritime or dryer sub-maritime ecosystems.

Prescription for precommercial thinning:

- space to vary densities within the stand
- leave a species mix with preference to Douglas-fir, western hemlock, western redcedar, and some deciduous species on suitable sites
- where possible, create a layered stand by leaving understorey western redcedar and western hemlock to establish another canopy layer on suitable sites
- leave all large snags (unless determined unsafe) and other retained stand attributes to provide for the development of suitable habitat.



Pruning

Pruning involves the removal of live branches from the bole of trees. This results in improved wood quality by increasing the amount of clear wood available from a tree. Pruning may also enhance owl habitat by opening the understorey canopy to provide easier movement by owls through the stand and by increasing light levels to benefit the herb and shrub layers that support owl prey. However, the owl also requires roosting perches from the canopy to the forest floor. Therefore, maintaining some lower branches is required to provide potential roosting structures.

Pruning is usually restricted to those species that do not exhibit epicormic branching characteristics, such as western redcedar, and should occur as early as possible following juvenile spacing of the stand. Generally pruning occurs where Douglas-fir exists at 300–600 stems per hectare.

Multiple treatments could remove up to three lifts (a lift is about 2.8 m) over a period of time. To enhance owl habitat it is recommended that one-third of trees maintain their branches to within three metres above the ground.

Commercial thinning

Commercial thinning is the first entry into an immature stand that provides timber with an economic return. Commercial thinning also plays an essential role in producing stand conditions that will accelerate the development of suitable owl habitat. The goal of commercial thinning is to achieve Type B or A suitable owl habitat. Commercial thinning to create spotted owl habitat may remove more volume than is generally practised and it may leave behind greater structural diversity (e.g., deformed trees, snags, deciduous trees). The greater volume removal will provide more light to the forest floor to stimulate vegetative growth.

To maintain sufficient levels of light reaching the forest floor, several entries may be required. Therefore, harvest objectives must be clearly defined in the silvicultural prescription as it may involve a multiple-entry and variable-density treatment to produce the desired stand attributes. No single entry should be proposed without consideration for any subsequent entry. Prescriptions should be developed on a site-by-site basis, and should be designed to optimize the natural features within the block. Forest managers are encouraged to work closely with regional fish and wildlife staff to develop the long-term strategy for the specific block.

Prescriptions for commercial thinning:

- create a two- or three-canopy layered stand
- create a variable-density, multi-species stand structure

- create small openings (0.1 to 0.5 hectares in size over no more than 5% of the block) and replant with a shade tolerant species; these openings should be centred around pockets of stands affected by disease (i.e., root rot, mistletoe)
- retain some structurally deformed trees; this may include hemlock infected with mistletoe
- retain all snags and vets, unless determined unsafe by a wildlife danger tree assessor. A wildlife tree patch should be considered for high quality wildlife trees.
- retain existing coarse woody debris, and leave an additional 25 m³ per hectare composed of tops and non-merchantable logs for coarse woody debris requirements, provided it does not meet utilization standards
- maintain or increase the Douglas-fir component in the stand.

The following is an example of how a stand could be thinned up to three times before final harvest or retained for Type A or B habitat in the wetter maritime ecosystem.

First commercial thinning at age 30 on good and medium sites:

- variable density thinning of all crown classes to an average of 220 stems per hectare, varying stand densities from 170 stems per hectare to 275 stems per hectare
- retain non-merchantable trees, deciduous trees and shrubs
- retain or create two snags per hectare >50 cm.

Second commercial thinning at age 60:

- variable density thinning of all crown classes to an average of 170 stems per hectare, varying stand densities from 110 stems per hectare to 220 stems per hectare
- maintain the natural levels of coarse woody debris on the site. Retain coarse woody debris from harvesting, especially logs >50 cm in diameter that do not meet utilization standards
- create potential cavities in three live trees per hectare >50 cm dbh by removing the upper crown to develop a candelabra effect
- retain or create two snags per hectare >50 cm
- retain non-merchantable trees, deciduous trees and shrubs.



Third commercial thinning at age 90:

- variable density thinning of co-dominant and intermediate to an average of 100 stems per hectare, varying stand densities from 80 stems per hectare to 170 stems per hectare to produce a multi-layered stand
- retain or create four cavity trees per hectare
- retain or create five snags per hectare >50 cm dbh
- retain non-merchantable trees, deciduous trees and shrubs
- maintain the natural levels of coarse woody debris on the site. Retain coarse woody debris from harvesting, especially logs >50 cm in diameter that do not meet utilization standards
- underplanting may be required to ensure species diversity and multi-layered stands.

Fertilization

Fertilizer is generally applied to stands that exhibit nutrient deficiencies or to stands following treatment. It can be re-applied every nine years thereafter. Fertilizer treatments can increase volume returns as much as 5% and provide for enhancement of wildlife habitat by increasing the understorey vigour, seed abundance and quality, decomposition and biomass production. Chemical fertilizers have been commonly used for additional forest nutrients, however the forest manager should consider the benefits of managing nitrogen-fixing species within the stand. These species could provide additional stand diversity.

Conifer release

This term usually refers to forest stands aged 20 to 40 years old where there is competition between conifers and deciduous species. Conifer release can be carried out by either mechanical or chemical methods. Strict control of any chemical application must be maintained at all times to ensure that only the desired vegetation is treated, and that habitat and prey populations within the stand and in adjacent stands are not impacted. If chemical application is required, it is recommended that spot treatments be used.

Prescriptions for conifer release:

- Retain all single deciduous trees or small patches <0.5 hectare to provide stand diversity.
- Groups of deciduous trees >0.5 hectare can be removed or retained. If removal is the desired treatment, it should be followed with planting of shade tolerant conifer species.
- Create snags from deciduous or coniferous trees by girdling or chemical injection.

Stand conversion

Some sites are occupied by competing tree species, such as mixed deciduous-conifer stands, that are a result of not sufficiently restocking the site after a harvest or a natural disturbance. This can lead to poor conifer forest production. To convert the site to produce a more desirable crop of conifer, the site may be harvested to remove specific tree species. In most cases, stand conversion has been used to convert very high growing sites from pure deciduous stands or mixed conifer-deciduous stands to conifers.

Prescriptions for stand conversion:

- Pure deciduous stands can be clearcut, with the intent to convert to Douglas-fir, western redcedar, western hemlock and grand fir, and should follow the guidelines outlined in this document for clearcutting in the various ecosystems.
- Sites with mixed deciduous and conifer trees should attempt to retain all standing live conifer trees, aside from safety and operational concerns, as these trees will accelerate the development of suitable habitat on the site.
- Retain all snags and vets, unless determined unsafe by a wildlife danger tree assessor. A wildlife tree patch should be considered for high quality wildlife trees.
- Retain existing coarse woody debris, and leave an additional 25 m³ per hectare of tops and non-merchantable logs for coarse woody debris requirements.

Timber Harvesting Guidelines

Timber harvesting entries into a mature forest stand (stand maturity begins between 80 and 110 years) provide a source of timber volume with an economic return. Harvesting plays an essential role in producing stand conditions that will accelerate the development of suitable owl habitat, and maintaining or improving stand conditions for the owl. The goal of harvesting within the 67% owl habitat area is to achieve or maintain Type B or A suitable owl habitat, with the emphasis on improving stand conditions. Harvesting also plays an essential role in retaining stand attributes that have been shown to accelerate regenerating stands into a condition that will provide suitable owl habitat. The RMP should identify the specific management goals for the stand.

The following guidelines will help forest managers develop specific stand level plans for harvesting. There are four basic types of silvicultural systems used in harvesting. Clearcutting, seed tree retention, and shelterwood systems produce even-aged stands while the selection system will produce an uneven-aged stand (Figure 4). In most cases, a combination of these systems will be used over the life of the stand. For

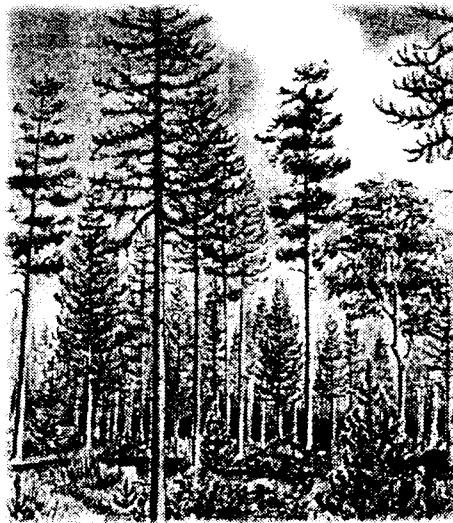
example, the partial harvest system could be used to enhance a stand from Type B to Type A habitat. Once the objective of 67% owl habitat is reached, the stand could be clearcut, leaving some old forest elements for the next stand.



Clearcut



Seed tree



Selection



Shelterwood

Figure 4. *Examples of the four basic silvicultural systems used in harvesting.*

Partial harvests in wetter maritime ecosystems

Partial harvests, which include shelterwood and selection systems, provide an opportunity to maintain or improve habitat suitability while providing a source of timber and economic return. Partial harvest systems allow for the creation or retention of trees of multiple ages, multiple species and structural diversity, canopy closure and multi-layered canopy, all characteristics that are required by the spotted owl. Partial harvests can achieve these through either single-tree selection or group selection and may require regular re-entries (15–50 years) into the stand. Table 3 describes what attributes should be enhanced in the development of suitable owl habitat from Type B to A.

Where partial harvest systems in wetter maritime ecosystems could be applied:

- Partial harvest systems will generally be used to harvest forests that fall within the 67% suitable owl habitat within SRMZs and activity centres with the goal of maintaining or improving, but not degrading, the quality of the habitat.
- Partial harvest systems will be used where site conditions warrant special harvesting or regeneration considerations such as high elevation sites, retention or partial retention visual quality objectives, sensitive sites or community watersheds.
- Partial harvests may be used for stand conversion where the retention of standing live trees is operationally feasible.
- Partial harvests may be used to salvage timber that has been damaged by insects, disease, fire, windthrow or other natural disturbance, where the retention of standing live trees is operationally feasible.
- Partial harvest may be used to harvest a larger area without concern for cutblock size, green-up requirements or adjacency rules of the Code.

Prescription for partial harvest in wetter maritime ecosystems:

- Stands should be designed to be windfirm after harvest.
- Prescriptions should be designed to meet regeneration objectives.
- Maintain a minimum of 60% crown closure, if the management prescription is to retain habitat suitability soon after harvest.
- Create or maintain a multi-layered canopy.
- Maintain a range of large and small diameter trees.
- Create or maintain five snags >50 cm dbh per hectare if possible or prescribe the creation of suitable snags.
- Maintain at least one-third of the number of stems per hectare from each of the dominant, co-dominant and intermediate layers.

Table 3. Management guidelines for wetter maritime ecosystems^{a, b}

The guidelines in the following table provide the criteria for classification of habitat as suitable or superior. The shaded columns indicate the preferred stand parameters to be retained in stand harvest operations. The intent is to cycle forest stands through the habitat classes indicated. Note that large trees, broken tops, and deformed limb requirements may be addressed in the same trees. Distribution of the noted characteristics need not be uniform, but may be in patches or corridors. For example, the 10% uncut patches and riparian reserve may provide adequate numbers of snags and large trees. Currently, an inventory attribute collection methodology is under development.

Owl habitat characteristic	Characteristics of suitable owl habitat (Type B)	Guidelines for partial cutting to enhance to superior habitat	Characteristics of superior owl habitat (Type A)	Guidelines for retention of old forest elements when clearcutting	Purpose
Crown closure	60–80% 5 m of open canopy above ground	Maintain minimum 60% crown closure	60–80% 5 m of open canopy above ground	Maintain 10–15% of stand in uncut patches	Thermal cover, predator protection
Canopy layers	≥2	Maintain or develop at least 3 canopy layers	≥3	Maintain or develop at least 3 canopy layers	Foraging, perches
Limb height	Limbs to within 3 m of ground	Allow branch retention to within 3 m of ground on at least 1/3 of stand	Limbs to within 3 m of ground	Allow branch retention to within 3 m of ground on at least 1/3 of stand	Perches, foraging
Tree species	≥2 tree species	Maintain 2–3 conifer species with 6–10 deciduous trees/ha interspersed	≥2 tree species	Maintain 2–3 conifer species with 6–10 deciduous trees/ha interspersed	Forage for prey, nesting, perches
Large trees	>50 cm dbh overstorey of 247–457 stems/ha (down to 86 if trees are large)	Retain at least 40 of the largest trees/ha	>75 cm dbh overstorey of 37–185 stems/ha	Retain at least 15 of the largest trees/ha	Abundant, prey, nesting, roosting
Dead or broken tops or large deformed limbs	n/a	Retain 2 trees/ha >50 cm dbh with broken tops	≥5 trees/ha with dead or broken tops	Retain 2 trees/ha >50 cm dbh with broken tops	Nesting and foraging, perches
Snags	≥5 snags/ha >51 cm dbh	Retain ≥5 snags and/or dying trees >50 cm dbh/ha	≥5 snags/ha >76 cm dbh	Retain ≥5 snags and/or dying trees >76 cm dbh/ha	Foraging, perches
Coarse woody debris	≥100 m ³ /ha of large woody debris >10 cm dbh at various stages of decomposition	Maintain existing coarse woody debris, and add 25 m ³ /ha of unmerchantable logs >50 cm diameter	≥268 m ³ /ha of large woody debris >10 cm dbh at various stages of decomposition	Maintain existing coarse woody debris, and add 25 m ³ /ha of unmerchantable logs >50 cm diameter	Nesting, abundant, prey
Understorey vegetation	≥40% patches with at least 24% ground cover in patches		≥40% patches with at least 24% ground cover in patches		Forage for prey

^a The stand characteristics listed above for suitable and superior owl habitats are based on inventory information from western Washington state. When information from spotted owl research and inventories is compiled in BC, this table may be revised.

^b CWHdm, CWHvm1, MHmm1. NDT 1, 2; rare to infrequent stand initiating events.

- Maintain existing coarse woody debris, and add 25 m³ per hectare of additional unmerchantable coarse woody debris scattered over the cutblock by falling trees, dangerous snags or by leaving all tops in the stand.
- Design and lay out roads considering additional future entries into the stand.

Clearcut or clearcut with reserves in wetter maritime ecosystems

Clearcuts or clearcuts with reserves can provide stand attributes for the development of future suitable owl habitat. The retention of old forest attributes will provide some of the diverse structure necessary to accelerate the re-establishment of suitable owl habitat. Table 3 provides guidelines for stand attribute retention.

Where the application of clearcuts and clearcut with reserves in wetter maritime ecosystems could be applied:

- Clearcuts with reserves will generally be used to harvest forests that exceed the 67% suitable owl habitat target within SRMZs and activity centres.
- Clearcuts with reserves may be used for stand conversion where partial harvest is not operationally feasible.
- Clearcuts with reserves may be used to salvage timber that has been damaged by insects, disease, fire, windthrow or other natural disturbance, where partial harvest is not operationally feasible.
- Clearcuts with reserves may be used as part of the overall fuel management plan in the SRMZ.

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Fuel Management Objectives

• The primary fuel management objective is to reduce the risk of large scale wildfire. Requirements for leaving higher levels of coarse woody debris, snags and green trees for owl habitat will increase the fuel loading and fire risk in the SRMZs. To reduce the risk of large areas of habitat being affected, fuel management corridors should be identified in the RMP as per the *Fuel Management Guidebook*.

Prescription for clearcut or clearcut with reserves in wetter maritime ecosystems:

- Regeneration objectives must be identified in the silviculture prescription.
- Reserve areas should consist of:
 - 10–15% of the total forest area of the harvesting prescription
 - multi-aged, multi-species and multi-layered stands
 - concentration of large snags (over 76 cm) or old Douglas-fir or grand fir vets
 - windfirm or enhanced windfirm green trees
 - large broken tops or deformed trees (e.g., large cavities, dwarf mistletoe infection)

- Clearcut areas should consist of:
 - existing coarse woody debris with 25 m³ per hectare of additional unmerchantable coarse woody debris scattered over the cutblock. This should include logs >50 cm in diameter. Retention of the natural levels of coarse woody debris should be maintained on the site. Introduction of woody debris caused from harvesting will be encouraged to remain on the site, especially logs >50 cm in diameter that do not meet utilization standards.
 - a minimum 15 of the largest healthy, windfirm trees per hectare that do not interfere with the regeneration of the stand
 - deciduous trees for stand diversity, whenever possible
- Avoid burning large debris in roadside or landing accumulations if possible; rather, scatter the debris back into the cutblock for added coarse woody debris.

Partial harvests in dryer subarctic ecosystems

Partial harvests, which include shelterwood and selection systems, provide an opportunity to maintain or improve habitat suitability while providing a source of timber and economic return. Partial harvest systems allow for the creation or retention of trees of multiple ages, multiple species and structural diversity, canopy closure and multi-layered canopy, all characteristics that are required by the spotted owl. Partial harvests can achieve these through either single-tree selection or group selection and may require regular re-entries (15–50 years apart) into the stand. Table 4 describes what attributes should be enhanced in converting suitable owl habitat from Type B to A.

Where partial harvest in dryer subarctic ecosystems could be applied:

- Partial harvest systems will generally be used to harvest forests that fall within the 67% suitable owl habitat within SRMZs and activity centres with the goal of maintaining or improving, but not degrading, the quality of the habitat.
- Partial harvest systems will be used where site conditions warrant special harvesting or regeneration considerations such as high elevation sites, retention or partial retention visual quality objectives, sensitive sites or community watersheds.
- Partial harvests may be used for stand conversion where the retention of standing live trees is operationally feasible.
- Partial harvests may be used to salvage timber that has been damaged by insects, disease, fire, windthrow or other natural disturbance, where the retention of standing live trees is operationally feasible.

Table 4. *Management guidelines for dryer subarbitime ecosystems^{a, b}*

The guidelines in the following table provide the minimum criteria for classification of habitat as suitable or superior. The shaded columns indicate the minimum stand parameters required to be retained in harvest operations. The intent is to cycle forest stands through the habitat classes indicated. Note that large trees, broken tops, and deformed limb requirements may be addressed in the same trees. Distribution of the noted characteristics need not be uniform, but may be in patches or corridors. For example, the 10% uncut patches and riparian reserve may provide adequate numbers of snags and large trees. Currently, an inventory attribute collection methodology is under development.

Owl habitat characteristic	Characteristics of suitable owl habitat (Type B)	Guidelines for partial cutting to enhance to superior habitat	Characteristics of superior owl habitat (Type A)	Guidelines for retention of old forest elements when clearcutting	Purpose
Crown closure	≥50% 5 m of open canopy above ground	Maintain minimum 50% crown closure	60–85% 5 m of open canopy above ground	Maintain 10–15% of stand in uncut patches	Thermal cover, predator protection
Canopy layers	≥2	Maintain or develop at least 3 canopy layers	≥3	Maintain or develop at least 3 canopy layers	Foraging, perches
Limb height	Limbs to within 3 m of ground	Allow branch retention to within 3 m of ground on at least 1/3 of stand	Limbs to within 3 m of ground	Allow branch retention to within 3 m of ground on at least 1/3 of stand	Perches, foraging
Tree species	≥2 tree species	Maintain 2–3 conifer species with 6–10 deciduous trees/ha interspersed	≥2 tree species	Maintain 2–3 conifer species with 6–10 deciduous trees/ha interspersed	Forage for prey, nesting, perches
Large trees	≥30 cm dbh overstorey	Retain at least 200 of the largest trees/ha	≥51 cm dbh overstorey of 173–247 stems/ha	Retain at least 40 of the largest trees/ha	Abundant, prey, nesting, roosting
Dead or broken tops or large deformed limbs	n/a	Retain 2 trees/ha >30 cm dbh with broken tops	≥5 trees/ha with dead or broken tops	Retain 2 trees/ha >50 cm dbh with broken tops	Nesting, foraging, perches
Snags	≥5 snags/ha >30 cm dbh	Retain ≥5 snags and/or dying trees >30 cm dbh/ha	≥7 snags/ha >51 cm dbh	Retain ≥7 snags and/or dying trees >51 cm dbh/ha	Foraging, perches
Coarse woody debris	≥100 m ³ /ha of large woody debris >10 cm dbh at various stages of decomposition	Maintain existing coarse woody debris, and add 20 m ³ /ha of unmerchantable logs >30 cm diameter	≥268 m ³ /ha of large woody debris >10 cm dbh at various stages of decomposition	Maintain existing coarse woody debris, and add 20 m ³ /ha of unmerchantable logs >30 cm diameter	Nesting, abundant, prey
Understorey vegetation	≥40% patches with at least 24% ground cover in patches		≥40% patches with at least 24% ground cover in patches		Forage for prey

^a The stand characteristics listed above for suitable and superior owl habitats are based on inventory information from western Washington state. When information from spotted owl research and inventories is compiled in BC, this table may be revised.

^b CWHds1, CWHms1, CWHms2, MHmm2, ESSFmw and IDFww. NDT 2, 4; infrequent stand initiating events to frequent stand maintaining fires.

- Partial harvest may be used to harvest a larger area without concern for cutblock size, green-up requirements or adjacency rules of the Code.

Prescription for partial harvest in dryer subaritime ecosystems:

- Stands should be designed to be windfirm after harvest.
- Prescriptions should be designed to meet regeneration objectives.
- Maintain a minimum of 50% crown closure, if the management prescription is to retain habitat suitability soon after harvest.
- Create or maintain a multi-layered canopy.
- Maintain a range of large and small diameter trees.
- Create or maintain snags >30 cm dbh per hectare or prescribe the creation of suitable snags.

Forest Health Objectives

Long-term health of the forest is important for owl habitat, timber production and other forest values. Low levels of pest activity can be tolerated and may contribute to the maintenance or enhancement of owl habitat characteristics. High levels of pests can reduce habitat suitability for owls, reduce timber values and increase risk of wildfire. Landscape level and stand level forest health guidelines found in the Forest Practices Code *Forest Health Guidebook* should be implemented.

- Maintain at least one-third of the number of stems per hectare from each of the dominant, co-dominant and intermediate layers.
- Maintain existing coarse woody debris, and add 25 m³ per hectare of additional unmerchantable coarse woody debris scattered over the cutblock by falling trees, dangerous snags or by leaving all tops in the stand.
- Lay out roads considering additional future entries into the stand.

Clearcut or clearcut with reserves in dryer subaritime ecosystems

Clearcuts or clearcuts with reserves can provide the attributes for stand development for future suitable owl habitat. The retention of old forest elements provides the diverse structure necessary for the development of suitable owl habitat. Table 4 (page 29) provides the guidelines for what to leave on a block to help accelerate the process of habitat development and describes the attributes of Type B and A owl habitat.

Where clearcut or clearcut with reserves in dryer subaritime ecosystems could be applied:

- Clearcuts with reserves will generally be used to harvest forests that exceed the 67% suitable owl habitat target within SRMZs and activity centres.
- Clearcuts with reserves may be used for stand conversion where partial harvest is not operationally feasible.

- Clearcuts with reserves may be used to salvage timber that has been damaged by insects, disease, fire, windthrow or other natural disturbance, where partial harvest is not operationally feasible.
- Clearcuts with reserves may be used as part of the overall fuel management plan in the SRMZ.

Prescription for clearcut or clearcut with reserves in dryer subarctic ecosystems:

- Regeneration objectives must be identified in the silviculture prescription.
- Reserve areas should consist of:
 - 10–15% of the total area of the harvesting prescription
 - multi-aged, multi-species and multi-layered stands
 - concentration of large snags (>51 cm dbh) or old Douglas-fir and/or grand fir vets
 - windfirm or enhanced windfirm green trees
 - large broken tops or deformed trees (e.g., large cavities, dwarf mistletoe infection)
- Clearcuts should consist of:
 - existing coarse woody debris with 20 m³ per hectare of additional unmerchantable coarse woody debris scattered over the cutblock. This should include logs >30 cm in diameter. Maintain the natural levels of coarse woody debris on the site. Introduction of woody debris created from harvesting will be encouraged, especially logs >30 cm in diameter that do not meet utilization standards.
 - a minimum of 40 of the largest healthy, windfirm trees per hectare that minimizes interference with the regeneration of the stand
 - deciduous trees for stand diversity
- Avoid burning large debris in roadside or landing accumulations if possible; rather, scatter the debris that does not meet utilization standards back into the cutblock for added coarse woody debris.

Salvage Logging Guidelines

Natural disturbances caused by insect, disease, wildfire, windthrow or other catastrophic events can lead to poor timber quality and forest degradation within adjacent forest stands. The primary salvage objectives are to reduce the risk of further forest degradation and to accelerate the recovery to suitable owl habitat conditions. On a site-specific basis, the forest manager and agencies should consider the extent of the disturbance, its effect on the remaining stands, its impact on spotted

owl management, and the potential economic and employment opportunities. Salvage may be approved where damage exceeds approximately 30% of the stand volume, or where retaining the damaged timber may result in further damage to the remaining stand and is jointly approved by the district manager and designated environment official. Road construction to remove salvage timber should be minimized and consideration should be made for alternate harvesting methods such as helicopter logging.

Road Construction Guidelines

Forest roads are required for harvesting, forest management, fire and recreation access. Strategic access design and management should be incorporated into the RMP for each SRMZ. Road construction can reduce habitat quality and harass owls during nesting periods. Keeping roads out of or away from critical owl habitat and nest sites is encouraged. Roads required through suitable owl habitat should be designed to keep right-of-way width to between 15 to 20 m. Operation of road construction machinery should not occur within 200 m and blasting within 400 m of nest sites during the period March 1 to July 31.

An Example of Forest Development Opportunities within a Resource Management Plan

In the following example three maps are shown of SRMZ #12 located in the Clear/Hornet Creek area. Figure 5a depicts the current constraints on forest management. Figure 5b shows the 67% suitable owl habitat and the age class distribution that will be targeted for the long-term habitat requirements. Figure 5c shows the areas of opportunities for short- and long-term forest management and harvesting opportunities.

Developing the Resource Management Plan – Constraint Map

This map is used to help prevent excessive impacts to current timber supplies. Planners use a variety of constraint codes when determining areas to be included in the 67% spotted owl habitat. These include: inoperable; low site less than 15; ESA1 (not used for timber supply calculations); VQO retention; partial retention; and deer winter range (highly constrained).

Process

Forest cover constraints were used to develop the map in Figure 5a as follows:

- inoperable
- environmentally sensitive areas 1
- visual quality objectives for retention and partial retention
- low site below site class 15
- environmentally sensitive areas identified as deer winter range.

Analysis

Table 5a shows the results of the amount of area within the total SRMZ and by individual activity centre that is heavily constrained for forest development and the moderate to low constrained areas (unconstrained). It should be noted that the areas shown as unconstrained will still be subject to a number of Code restrictions (i.e., riparian area restriction).

The results of this mapping process will provide the basis for locating the areas to be identified as the 67% suitable owl habitat.

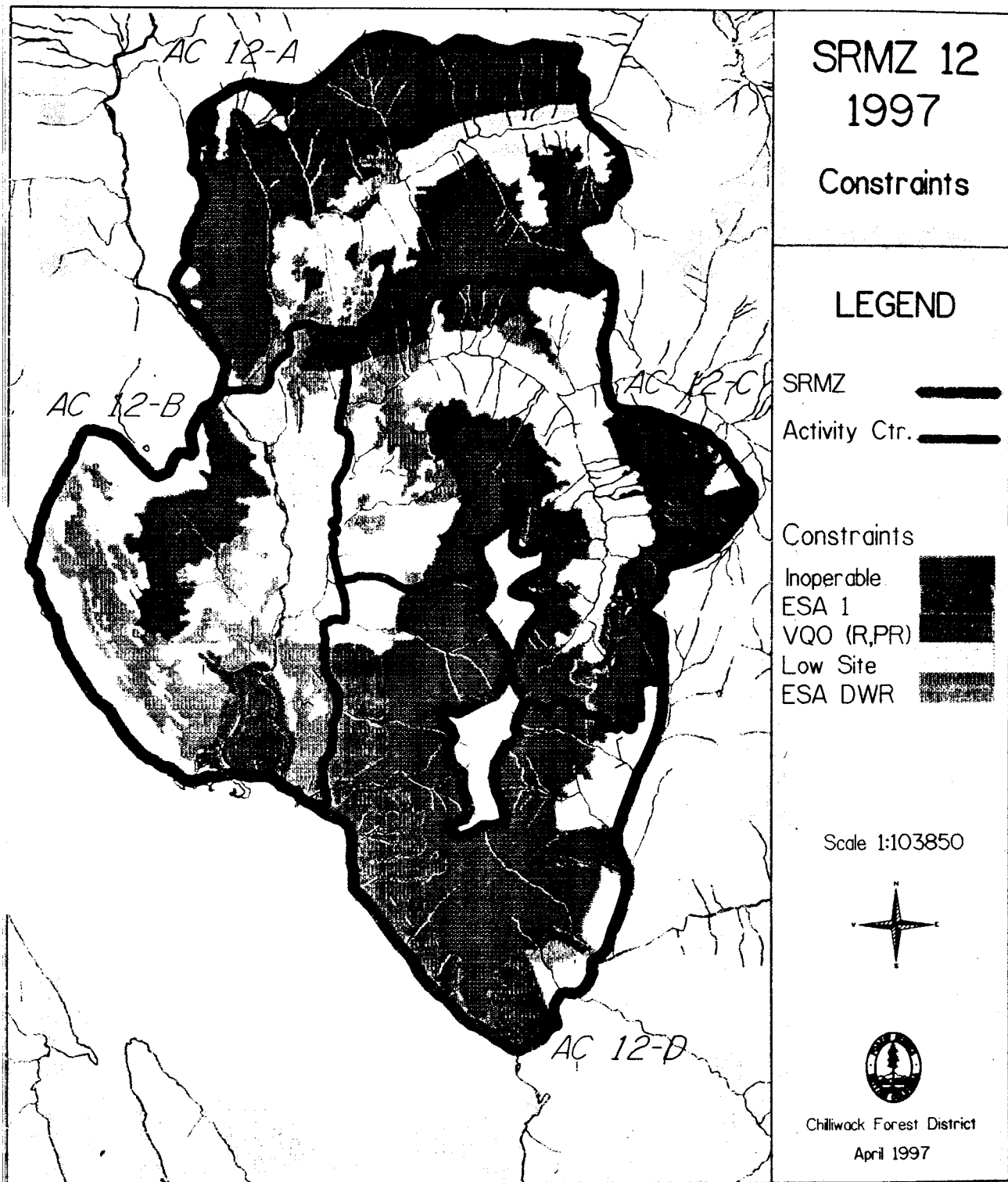


Figure 5a. Constraints on forest management in SRMZ #12 – the Clear/Hornet Creek area.

Table 5a. Constrained area

Activity centre	Area total (ha)	Constrained forest (ha)	Unconstrained forest (ha)
12-A	3 200	2 457	526
12-B	3 078	1 722	1 198
12-C	3 457	2 039	1 205
12-D	2 977	2 286	470
Total SRMZ	12 712	8 504	3 399

Developing the Resource Management Plan – Activity Centre Boundaries and Suitable Owl Habitat Map

Figure 5b shows the area of present and future 67% suitable owl habitat within each of the activity centres for SRMZ #12 Clear/Hornet Creek.

The internal boundaries of the activity centres are drawn and the short- and long-term spotted owl habitat required is identified in conjunction with the licensee and agencies.

Process

- Forest cover age classes projected to 1996 and the constraints map in Figure 5a were used as the basis for the development of the map in Figure 5b.
- The criteria used to determine the boundaries of the 67% suitable owl habitat and the internal activity centres are as follows:
 - The internal activity centre boundaries were established with the intent of having approximately 3200 hectares in each of the activity centres. The internal boundaries should be established by regional Fish and Wildlife staff and in close consultation with the licensees and the Ministry of Forests.
 - Stands over 100 years (age class 6–9) were used as suitable owl habitat.
 - Use the heavily constrained areas as much as possible.
 - The total 67% current and future suitable habitat areas were identified. Not all of this area is of suitable owl habitat at present.
 - Maintain larger patches of suitable owl habitat greater than 500 hectares.
 - Maintain corridors of suitable habitat greater than 1 km wide to provide interior forest conditions for spotted owl movement between large patches of habitat.
 - Consideration for current and future forest development planning locations.

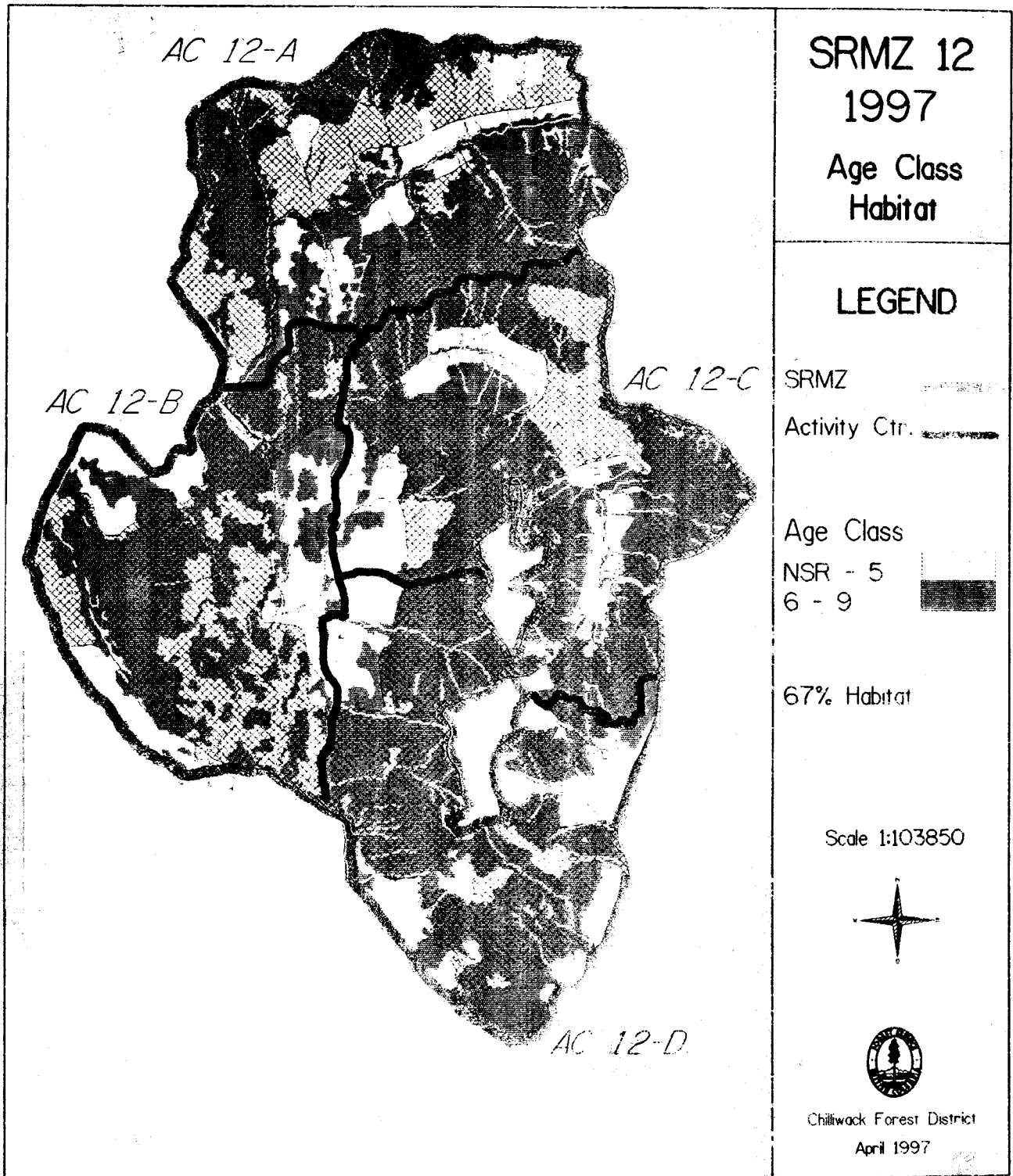


Figure 5b. Age class distribution and current 67% suitable owl habitat in SRMZ #12 - the Clear/Hornet Creek area

Analysis

Table 5b shows the amount of area that is required to meet the requirement of 67% within each of the activity centres. The overall total for the SRMZ indicates only 66% suitable owl habitat (age classes 6-9) over the 100 years, while the activity centres vary from 56% to 75%.

The forest management implications are that, in activity centres 12-A and 12-B, it will be some time before areas will be approved for clearcut harvesting. In these areas, forest managers will be encouraged to practice owl habitat enhancement techniques.

Table 5b. *Spotted owl habitat*

Activity centre	Total area (hectares)	Suitable owl habitat area (hectares)	Suitable habitat (%)
12-A	3 200	1 930	65
12-B	3 078	1 621	56
12-C	3 457	2 030	68
12-D	2 977	2 257	75
Total SRMZ	12 712	7 838	66

Developing Resource Management Plans – Opportunities Map

This map shows the opportunities that exist for commercial thinning, partial harvesting and clearcutting. The map only shows what is available at the present time. When complete, the RMP will provide one or more rotations of planning projections.

Process

- An analysis was completed to develop Figure 5c map with the following assumptions:
 - all stands 30-80 years would be commercial thinned
 - all stands 80-120 years would be partial harvested
 - clearcuts would be approved in activity centres where the suitable owl habitat was greater than the 67%.
- Once the areas are identified, a joint planning team consisting of licensees and regional Fish and Wildlife and Forest Service district staff should review the projections in the context of forest development and owl habitat enhancement opportunities.
- Five-year projections with up to one rotation should be made.

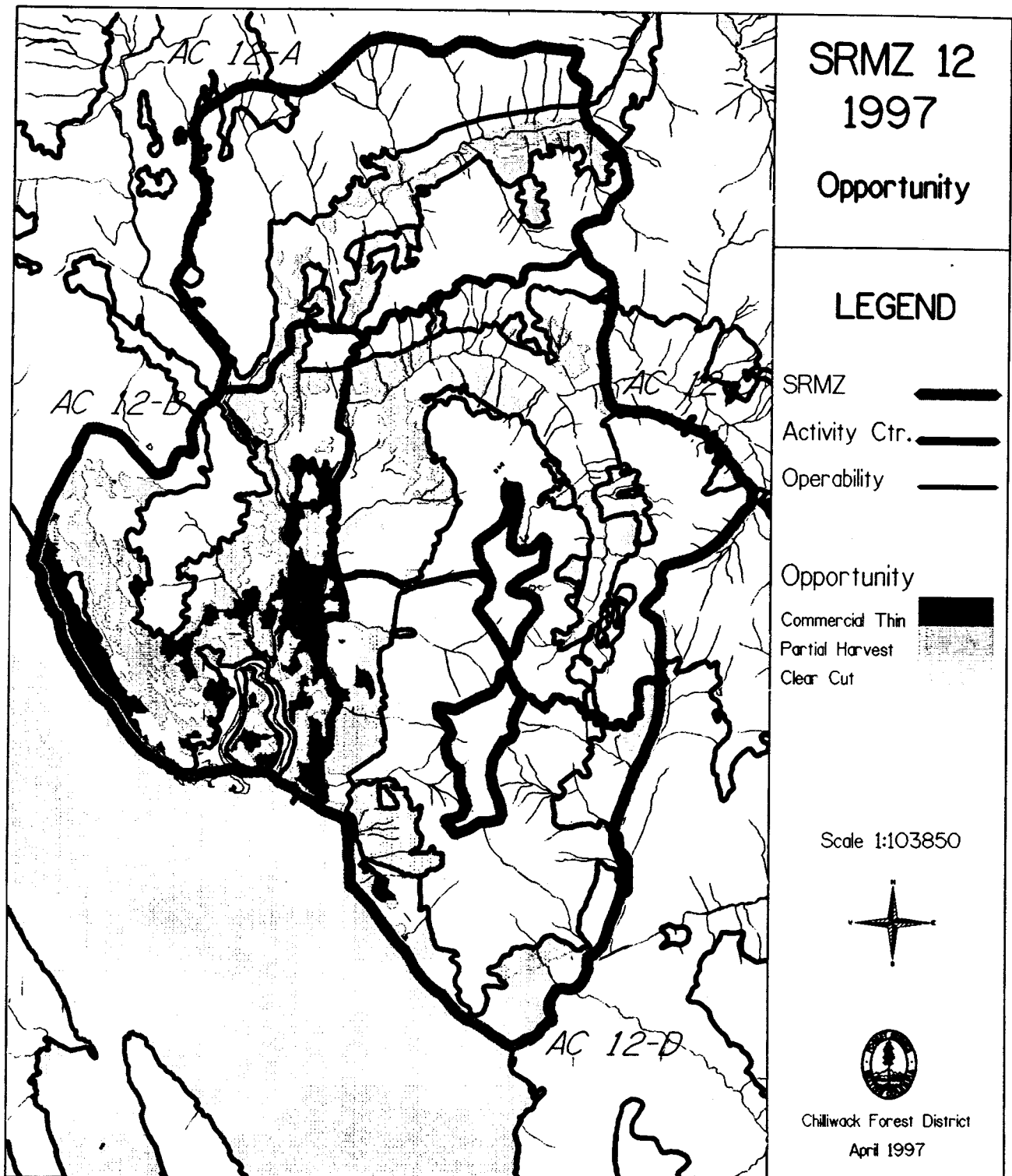


Figure 5c. Areas with opportunities for short- and long-term forest management and harvesting opportunities in SRMZ #12 – the Clear/Hornet Creek area.

Analysis of opportunities within the SRMZ

In this example of the RMP, development opportunities exist for commercial thinning, partial harvesting and clearcuts when the SRMZ is subdivided into activity centres. In activity centres 12-C and 12-D there is more than the required 67% spotted owl habitat requirements. Opportunities for clearcuts are available but may be subject to other constraints such as deer winter range, visual quality or other Code constraints. Many of these constraints could be compatible with the objectives of spotted owl habitat management. Table 5c shows the area available in each of the activity centres.

Table 5c. *Development opportunity*

Activity centre	Commercial thinning areas (hectares)	Partial harvest area (hectares)	Clearcut area (hectares)
12-A	0	120	0
12-B	206	270	0
12-C	0	104	268
12-D	17	109	255
Total SRMZ	223	603	523

