

Appendix XX
High Conservation Value Forest –
North Vancouver Island



Western Forest Products Limited

High Conservation Value Forests

North Vancouver Island Region

July 2000

Appendix Documents have not been included.
Refer to www.westernforest.com for complete Report

Version 1.1

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4.0 Introduction

The Forest Stewardship Council (FSC) certification assessment of Western Forest Products' operations within the North Vancouver Island Region (NVIR) will include consideration of *Principle 9 —Maintenance of High Conservation Value Forests*.

Principle 9 was revised in January 1999 by the membership of the FSC. Which adopted language developed by the Principle 9 Working Group at Chetumal, Mexico in September 1998. The revisions addressed concerns expressed by forest managers, certifiers, conservation groups and other forest stakeholders regarding the ecological, economic and social complexity associated with natural forest management.

Principle 9 requires that forest areas being considered for certification be assessed to determine the presence of High Conservation Value (HCV) Forest (HCVF) attributes. If these attributes are present, the forest manager must demonstrate they are being maintained or enhanced. The principle requires that: "Decisions regarding high conservation value forests shall always be considered in the context of a precautionary approach²³."

Principle 9 also requires that: "*The consultative portion of the certification process must place emphasis on the identified conservation attributes, and options for the maintenance thereof.*"²⁴ The May 1999 first draft FSC standard for British Columbia further elaborates on this requirement: "(9.2.a) Where HCV Forests are identified, the management planning process and the certification process are required to ensure adequate participation and/or review by: all parties directly affected by any changes to the identified high conservation values, appropriate technical authorities with specialties in the identified high conservation values, and/or local advocate groups with interests in the identified high conservation values."

Principle 9 further requires that management plans "*include...specific measures that ensure the maintenance and/or enhancement of the applicable conservation attributes,*"²⁵ and that "*Annual monitoring shall be conducted to assess the effectiveness of the measures employed to maintain or enhance the applicable conservation attributes.*"²⁶

WFP's approach to meeting the requirements of Principle 9 begins with the recognition that the principle focuses on the presence of attributes which may meet the FSC definition of high conservation value. Although not formally recognized as such, WFP has been managing for these attributes for many years. The company began the process of assessment by asking three specialists familiar with North Vancouver Island Region to identify and recommend appropriate management approaches to maintain and enhance HCV Forest attributes present in Tree Farm Licence 6, Forest Licence A19240 and Managed Forest 61.

Consultation with specialists, affected communities, conservation groups and government agencies with regard to protection of HCV Forests and other attributes has been ongoing for many years.

The following report outlines the work WFP has undertaken in preparation for formal management of HCV Forests and reflects comments and input received during the consultation phase February to May 2000.

²³ Principle 15 of the Rio Declaration states: "In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.

²⁴ P&C 9.2 Revised January 1999

²⁵ P&C 9.3 Revised January 1999

²⁶ P&C 9.4 Revised January 1999

5.0 HCV Forests Consultation

WFP and its predecessor companies have been operating within the forests of NVIR since the turn of the century. Over time, WFP, with the aid of many resource specialists, has developed a sound knowledge of the resource values and attributes in the region. This information is continually refined and updated to satisfy corporate requirements and meet the expectations of government agencies, other resource users, special interests, and the public. It forms the basis for all of WFP's planning.

Our present approach to managing HCV Forest issues is based on input gathered from the following:

1. Technical experts from government, industry, academia and the consulting sector. Specialists in ecosystems and wildlife have developed and are refining strategies to identify and maintain HCV Forest attributes.
2. Public consultation as part of the Management Plan (MP) and Forest Development Plan (FDP) preparation processes. These processes provide avenues for involving a broad range of stakeholders, including First Nations, local communities, and environmental groups. Resource professionals in the fisheries, parks and environment ministries are an integral part of the agency consultation process which is part of the MP and FDP.
3. Strategic direction provided by the Vancouver Island Summary Land Use Plan (VISLUP), Vancouver Island Land Use Plan (VILUP), in addition to other plans developed as part of this process. The plan evolved from extended public and special interest group consultations and negotiations over several years and provides management emphasis and identification of protected areas, as well as special consideration for wildlife habitat and ecosystem representation.
4. Community groups ranging from Fish and Wildlife Associations and Salmonid Enhancement Groups to Community Resource Boards. Many of our employees are volunteers with these groups and shape WFP's corporate culture with local ideas and perspectives.
5. Summary documents, such as this one, distributed to a range of interested parties to promote feedback on the criteria being used to identify HCV Forest attributes and the management strategies being developed to maintain and monitor those attributes.

While the term "High Conservation Value Forest" is new, the concept behind it is not. Various forms of public consultation over the past two decades have effectively identified special areas that were the "HCV Forest" areas of their day. Development of the HCV Forest concept is another step in the continuous evolution of forest resource identification and management.

5.1 Historical Consultation

For more than 30 years WFP has undertaken extensive public consultation on the Management Plans for Tree Farm Licence 6 and the former Block 4 portion of Tree Farm Licence 25 in NVIR. To meet government consultation requirements and to ensure public involvement in identifying important attributes, this process required the company to undertake media advertising and contact a broad list of stakeholders for the TFL – the current stakeholder list exceeds 150 individuals and organizations and is growing.

Since the early 1980's this consultation has also involved open houses in various North Island communities in which the company presented its proposed plans, objectives and other

aspects of its operations in an interactive format. More than 12 day-long open houses involving in excess of 200 people have occurred since.

These public sessions included senior staff who review, with interested public, various aspects of management, attributes and plans for the upcoming five years as well as reporting on the previous five years. The public sessions are valuable in directing the company on its management of both timber and other resource issues in the TFL.

The company views its Management Plans as a primary guiding document where important attributes such as special management zones, ecosystems, fish and wildlife habitats and areas of interest for recreation and tourism were discussed and input received from the public. Records of this input and the Management Plans are part of the confirmation that input received is used in the process.

In the late 1980's, the company also began public consultation processes for the preparation and approval of its annual Forest Development Plans. This process involved open houses and public advertising of the plans. WFP views these sessions as another important element in consultation with the public on HCV Forest attributes. In the ten-year period ending in 1999, a total of 28 open houses were held in North Island communities where 481 participants provided 101 written comments.

WFP's history of public consultation is extensive. Resource agency personnel were closely consulted on Management Plans and Development Plans as early as the 1970's. These professional reviews were critical in focusing company attention on resource values other than timber with an emphasis on ecological, cultural, riparian and habitat values. The resource agency staff provided detailed comment and direction on company plans. In most instances the Ministry of Forests District Manager requires the company to accommodate the recommendations of agency personnel.

5.2 Present and Future Consultation

An important component of the assessment of HCV Forest attributes is ensuring stakeholders are consulted. They are asked to review and comment on WFP's approach to evaluate and maintain HCV Forests. WFP has built upon the experience gained in years of early consultation efforts to present this assessment to a diverse range of First Nations, independent scientists, academics, conservation groups, community groups, the public and various levels of governments.

Starting in the fall of 1999, WFP began a series of local consultative meetings to discuss the principles of the Forest Stewardship Council. During these meetings with local community groups, town councils, logging contractors and WFP employees the concepts of Principle 9 and of HCV Forests were introduced.

In November 1999, with the help of a team of external specialists in ecology, fisheries and wildlife, WFP prepared a formal statement outlining the assessment process that defined and described the attributes of HCV Forests within NVIR according to the FSC definition. This statement was circulated and a request for feedback was made to interested parties, including those groups previously consulted. Additional meetings were held with First Nations, government regulatory agencies and the public. Circulation of the statement was further extended to other parties using WFP's web site. Comments resulting from the HCV Forests statement document have been used to further refine the assessment process.

As part of WFP's ongoing planning processes it is expected that the locations and characteristics of HCV Forests in NVIR will continue to be reviewed and refined by input from government agencies, external specialists, stakeholders, special interest groups, First Nations and the public.

6.0 HCV Forests Attribute Assessment

6.1 HCV Forests Defined

High Conservation Value Forests are defined as those that possess one or more of the following attributes:

- *Forest areas containing globally, regionally or nationally significant:*
 - *Concentrations of biodiversity values (e.g. endemism, endangered species, refugia); and/or*
 - *Large landscape level forests, contained within, or containing the management unit, where viable populations of most if not all naturally occurring species exist in natural patterns of distribution and abundance*
- *Forest areas that are in or contain, rare, threatened or endangered ecosystems*
- *Forest areas that provide basic services of nature in critical situations (e.g. watershed protection, erosion control)*
- *Forest areas fundamental to meeting basic needs of local communities (e.g. subsistence, health) and/or critical to local communities' traditional cultural identity (areas of cultural, ecological, economic or religious significance identified in cooperation with such local communities).*

A framework for conducting a conservation assessment has been completed by WFP. Aspects of this assessment have now been completed and WFP is currently working on finalizing the locations of HCV Forests within the North Vancouver Island Region. The following information is being utilized as indicators for identifying HCV Forest characteristics and location:

6.2 Forest Areas containing globally, regionally or nationally significant...

- Concentration of biodiversity values (e.g. endemism, endangered species, refugia); and/or
- Large landscape level forests, contained within, or containing, the management unit, where viable populations of most if not all naturally occurring species exist in natural patterns of distribution and abundance.

6.2.1 Concentration of biodiversity values

As part of our strategy for managing forest-dependent wildlife, known sensitive species and their associated habitat requirements have been identified. Of the sensitive species identified, two are red-listed mammals, two are red-listed birds, three are blue-listed mammals and eight are blue-listed birds. In addition to red- and blue-listed species, two other mammals have been identified as regionally important. Species identified in our review are included in Appendix II. Note that there are many factors that have resulted in these species being identified as sensitive, few of which are related to forest development.

Maintaining the distribution and abundance of known sensitive species is a major component of WFP's wildlife management approach. Strategies will continue to be refined and aid in identifying habitat types that are critical for sensitive species.

There have been no recorded observations of red-listed plants in NVIR. Two blue-listed plants have been collected but from non-forested or sparsely treed wetlands and are unlikely to occur within harvesting blocks.

NVIR also supports numerous fish populations. Although only one fish species, the giant black stickleback, is considered rare or endangered, the importance of retaining small anadromous spawning stocks is recognized. Appendix III includes an assessment of fish and fish habitat values found in NVIR.

Three Special Management Zones (SMZ) have been identified in the defined forest area as part of the Vancouver Island Land Use Plan. This land use plan was produced through a multi-stakeholder, consensus-based process over a period of three years. The intent of the SMZ designation is to identify land and coastal areas with regionally significant values or combinations of values requiring comprehensive management objectives and strategies to ensure compatible development. Two zones, SMZ 2 – West Coast Nahwitti Lowlands and SMZ 7 – Johnstone Strait, have been designated with the primary objectives of managing for significant scenic and recreational values and for the maintenance of coastal wildlife habitat. The third, SMZ 4 – Koprino, has been established to focus on retention of a significant proportion of old forest, and on maintenance/enhancement of wildlife habitat associated with old forests. The SMZs, which are described in detail in Appendix IV, cover approximately 23,000 hectares of NVIR. The zoning recommendations and associated objectives in the VILUP are being implemented by WFP. Critical portions of the SMZs within NVIR have been identified as candidates for HCV Forest.

6.2.2 Landscape Level Forests in natural conditions

Forest lands within the North Island have been significantly modified by Europeans for almost a century. The region also experienced a “catastrophic” (versus endemic) natural disturbance at the turn of the century when close to 10% or 15,000 ha of the assessment area’s productive forests were leveled, in widely distributed patches, by hurricane-force winds. Although these sites now support maturing coniferous forest, this event, in addition to occasional fire disturbance, produced a mottled landscape with fewer extensive, intact tracts of undisturbed old forest. However this deficit of large tracts of intact old forest did not preclude fully functioning ecosystems and viable populations of naturally occurring species. The past century of forest harvesting has continued to diversify the landscape by adding a range of seral stages where previously younger forests were rare or occurred sporadically. This change may have reduced populations of species closely associated with late seral forests and favoured previously less abundant species that require shrubs and early seral habitats (e.g. neotropical migrant birds). Current conservation efforts focus on maintaining late seral habitat and species.

6.3 Forest areas that contain rare, threatened or endangered ecosystems...

As part of the recent land use planning initiatives on Vancouver Island (≈3,353,000 ha.), a protected area strategy was completed that increased the designation of protected areas to 439,000 ha or one-seventh of Vancouver Island. The process sought to ensure all ecosystems would be well represented within this protected area system. Local gaps in the ecosystem representation have been identified in NVIR and are being addressed through landscape level strategies. Currently, there are six Provincial Parks designated in and around NVIR: Cape Scott, Marble River, Misty Lake, Quatsino, Raft Cove and Brooks Peninsula. Details about the parks located in and around NVIR can be found in Appendix VII. As well,

WFP has established or donated private properties for three additional reserves for ecosystem maintenance: Spruce Bay Old Growth Reserve, Varney Bay Gene Pool Reserve and Cluxewe Salt Marsh.

At the local level, WFP is involved in the Landscape Unit planning process that is ongoing throughout BC. The intent is to ensure representation of both terrestrial ecosystems and old forests in each landscape unit. Through this process each landscape unit within NVIR was ranked for biodiversity, timber and other resource values relative to surrounding landscapes. Based on this ranking, a biodiversity management emphasis (High, Intermediate or Low) was established for each unit to provide appropriate levels of biodiversity management. Planning is currently underway to meet the desired biodiversity emphasis options. Many of the areas identified during this process will be considered HCV Forest.

WFP, as part of their inventory process, has conducted detailed terrestrial ecosystem classification for most of NVIR. This classification system, in combination with information provided by the B.C. Conservation Data Centre has identified some rare plant communities potentially present in NVIR. A review of these communities and their associated habitat conditions (see Appendix V) indicates that many of these communities are represented in existing protected areas, but those not well represented would be further captured in riparian forest. An assessment of the major riparian complexes found in NVIR has been used to determine candidate areas for appropriate HCV Forest designation.

Atypical substrates found in NVIR are also being considered for HCV Forest designation. Atypical substrates are defined as locales of special soils that support uncommon to rare species adapted to these special conditions. Within NVIR exposed limestone bedrock is an atypical substrate. This carbonate rock, as it weathers, releases bases (especially calcium) and produces less acidic soils than other bedrock types. In spite of thin soils, nutrient cycling is rapid and productivity high. Because limestone weathers by solution, these sites develop karst features (caves, sinkholes etc.) and a distinctive surface morphology (epikarst). These sites contain distinctive plant communities with uncommon herbs, ferns and bryophytes and have considerable recreational value for spelunkers.

6.4 Forest areas that provide basic services of nature in critical situations...

HCV Forests include those forests that provide ecological services in critical situations. Within NVIR, drinking water supplied to communities is considered as such, and consequently both Calbrick Creek and Quatse River watersheds are included as HCVF. Several other small creeks are under water licence and are also being used for domestic purposes. Local communities including WFP employees and their families rely on these water sources. As HCV Forests these watersheds will be managed for water quality and flow.

WFP also recognizes that there are forests in NVIR that are critical for maintaining slope stability and preventing soil erosion. Evaluation of terrain and soil conditions is being used to identify critical areas warranting HCV Forest designation. At the landscape level, maps of slope stability are derived from terrain and ecosystem maps using a standard provincial, five-class stability rating system. At the operational planning level, terrain stability field assessments are undertaken in conjunction with silviculture and logging plans (WFP was undertaking such assessments for more than a decade before they were required by government regulation). Both of these approaches are used to identify sensitive terrain where retention of forest cover is required (i.e. as protection forest). This includes virtually all stability class V and part of the stability class IV rated terrain types. In addition, critical sites identified during the preparation of silviculture plans are incorporated into reserves within or

on the boundary of cutblock units. For example, this includes fragile folisol soils that overlie coarse, blocky colluvial deposits where regeneration could not be assured following logging

6.5 Forest areas fundamental to the needs of communities and cultural identity...

For many years WFP has had a working relationship with local First Nations whose territories cover the defined forest area (Appendix VIII). Consultation with these groups occurs during the preparation of Traditional Use Studies, Archeological Impact Assessments, operational plan reviews and through discussions that support community programs and employment opportunities. Areas identified as having traditional significance or cultural concerns are accommodated in WFP's planning and forestry activities. Areas of cultural significance, with the agreement of First Nations, will be designated as HCV Forest.

In addition to local First Nations communities, there are a number of communities within the area that rely heavily on the forest industry for employment. WFP has been actively working with these communities to ensure the company's goals coincide with those of the communities. As recreation and tourism within NVIR continues to develop, WFP has worked toward ensuring facilities exist for public recreation. This work has resulted in the creation and maintenance of twenty-three recreation sites. These recreation sites are being considered for HCV Forest designation.

7.0 HCV Forests Management Strategies

WFP's ecological classification system is the foundation for forest management planning and activities in NVIR. This work provides a solid basis for interpretation of forest ecology and provides guidance for developing conservation strategies.

Currently, new Management Plans for Tree Farm Licence 6 and Managed Forest 61 are being prepared. Management Plans, and subsequent Landscape Unit Plans, will use WFP's ecosystem classification work to relate not only timber productivity, but also to identify key wildlife habitats and ecosystems. The recent development of computer modeling technology now allows spatial analysis of multiple resource interactions. Using this approach, the conservation of biodiversity, wildlife and fish habitat, water quality, and soil stability and ecosystem productivity become building blocks of timber harvesting and silviculture decision-making.

Development of strategies to address the maintenance and/or enhancement of conservation attributes by identifying and protecting areas of important old forest characteristics, significant riparian influence and unique ecosystems is continuing. Proposed management strategies will continue to be evaluated and adapted in response to new information and experience. On-going resource inventories will ensure our knowledge of forest and habitat conditions remains up-to-date. Appendix II, IX and X outline management strategies that are being used to maintain HCV Forest attributes.

In the spirit of the precautionary principle, activity planning around HCV Forest attributes will always be conservative, and ensure that protection of the value(s) is a high priority.

8.0 HCV Forests Adaptive Management

The concept of HCVF is relatively new and remains untested. During the early period of implementation attribute definitions, management actions, and monitoring programs will of necessity be flexible. As mistakes are made and new information becomes known through consultation, research, and operational experience, management strategy will be adjusted.

Whereas some HCVF attributes are permanently fixed in space (e.g. riparian areas) other attributes have a temporal nature. For example certain habitat elements may be associated with seral stages; hence HCVF designations would move as forest succession progresses. New HCVF attributes will be identified and some HCVF designations may be removed. For example a community water source may be replaced with an alternative source and hence in future may not be designated as HCVF for watershed protection. Should a natural disturbance set back an old forest reserve to an early seral state, it would be logical to move the HCVF designation to a more appropriate replacement area. It is important to recognize that attributes define HCV and not necessarily map polygons. Maps of HCVF are therefore transitory and adaptive.

Once HCVF attributes are identified, initial strategies for managing and conserving these attributes will be decided upon and form the basis of management and operational plans.

As implementation proceeds, adaptive management will be needed to ensure that a rigorous and systematic approach to adjusting HCVF management strategies is followed.

Some adaptive management strategies will be passive: for example where there is insufficient HCVF area for a well-replicated test or where extra precaution is warranted.

In most cases however a range of options needs to be looked at and evaluated in a formal or active manner such that comparisons of the outcomes of alternate options are meaningful. This will involve careful planning, experimental design, indicator monitoring, and data analysis to steer future management, in an iterative fashion, toward desired future forest conditions. Desired future forest conditions are also changing with changing social values and new scientific knowledge, further necessitating adaptive management strategies.

9.0 HCV Forests Monitoring

Due to WFP's history in the area, information regarding forest cover can be traced back decades using aerial photos, original land survey notes, original forest inventory maps and timber cruise drawings and information. In the late 1980's WFP began maintaining this inventory information in a Geographical Information System (GIS), which now allows for comparisons of past and present forest cover conditions. As additional resource inventories, such as ecosystem classification, have been collected, refined or updated, they too have been captured within the GIS. This amalgamation of inventory information into a common system enables detailed analysis and monitoring of past, present and future resource conditions.

Annual reports document past forestry activities for much of the defined forest area including items pertinent to this criterion:

- public involvement
- management and utilization of timber resources
- protection and conservation measures
- forest health management
- silviculture
- research

Other methods that may be useful for monitoring conservation attributes include the use of government statistics for the area:

- escapement records of salmon (DFO/WFP program)
- salmon harvest records (DFO program)
- hunting and trapping records (Ministry of Environment, Lands and Parks, Wildlife Branch)
- flora and fauna occurrence records (Royal British Columbia Museum)

WFP continues to consult with external experts to help shape monitoring and adaptive management systems to ensure high conservation characteristics are maintained or enhanced in the long term. Identification of appropriate indicators and methodologies for monitoring has begun as part of WFP's conservation strategy. As part of planning commitments, WFP will continue to advocate and participate in research projects and refine resource inventories. Appendix IX and Appendix XII outline some adaptive management and monitoring methods that will be used to ensure HCV Forest attributes are being managed to ensure their maintenance over time.

Appendix XXI
High Conservation Value Forest Attribute
Management Strategy

High Conservation Value Forests Attribute Management Strategies

1.0 Purpose

In 1998 Western Forest Products Limited (WFP) applied for Forest Stewardship Council (FSC) certification of 233,000 hectares within its North Vancouver Island Region (NVIR). The FSC certification scheme is based on 10 international Principles and Criteria. By applying for FSC Certification WFP has committed to conducting its operations in compliance with all the Principles and Criteria of FSC.

Principle 9, **Maintenance of High Conservation Value Forests** states that “*Management activities in high conservation value forests shall maintain or enhance the attributes which define such forests. Decisions regarding high conservation value forests shall always be considered in the context of a precautionary approach*”.

Of the Criteria associated with Principle 9, Criteria 9.3 is related to the specific management of High Conservation Value Forest (HCVF) attributes. In January 2000, WFP developed a report entitled “High Conservation Value Forests North Vancouver Island Region”. Using the FSC’s definition and based on the company’s experience operating in NVIR, the report was developed to determine the presence of HCVF attributes, particularly those inadequately covered by existing programs and policies, within WFP’s forest tenures. It also suggested potential management strategies. This report was revised in August 2000 incorporating the feedback that was received during a consultation process with stakeholders and First Nations, and forms the basis for moving ahead with formal management of HCVF.

Management of HCVF focuses on the precautionary maintenance or enhancement of attributes such as significant concentrations of biodiversity, ecosystems at risk, watersheds, unstable terrain, or fundamental economic or cultural needs of local communities or First Nations.

This document elaborates on the management strategies that will be used to maintain or enhance HCVF attributes that have been identified within WFP’s North Vancouver Island Region through several decades of public and stakeholder participation and consultation processes.

2.0 High Conservation Value Forests Defined

High Conservation Value Forests are defined as those that possess one or more of the following attributes:

- Forest areas containing globally, regionally or nationally significant:
 - Concentrations of biodiversity values (e.g. endemism, endangered species, refugia); and/or
 - Large landscape level forests, contained within, or containing the management unit, where viable populations of most if not all naturally occurring species exist in natural patterns of distribution and abundance
- Forest areas that are in or contain, rare, threatened or endangered ecosystems
- Forest areas that provide basic services of nature in critical situations (e.g. watershed protection, erosion control)
- Forest areas fundamental to meeting basic needs of local communities (e.g. subsistence, health) and/or critical to local communities’ traditional cultural identity (areas of cultural, ecological, economic or religious significance identified in cooperation with such local communities).

2.1 Concentration of biodiversity values

2.1.1 Wildlife

As part of our strategy for managing forest-dependent wildlife, known sensitive species and their associated habitat requirements have been identified (Table 1). There are many factors that have resulted in these species being identified as sensitive, few of which are forest development related including the lack of adequate inventory information.

Table 1 – Red, blue listed and regionally important Mammals and Birds

Red-listed Species ¹	Habitat
Pacific water shrew	Riparian areas and wetlands
Keen's long-eared myotis	Caves and nearby old growth
Northern goshawk <i>laingi</i>	Low to mid elevation mature to old growth stands (nesting)
Marbled Murrelet	Old growth with large branches greater than 15cm in diameter
Blue-listed Species ²	Habitat
Ermine	Riparian areas with dense understory
Vancouver Island Wolverine	High elevation stand types
Roosevelt Elk	Low elevation old growth (winter) and young second growth
Great blue heron	Deciduous stand types, wetlands and estuaries
Peregrine falcon <i>pealei</i>	Rocky ledges with overhanging vegetation (nesting)
White-tailed ptarmigan	Generalist, uses a range of seral stages
Western screech owl	Low elevation riparian areas (nesting)
Northern pygmy owl	Low elevation, late seral stage stand types (nesting)
Huttin's vireo	Low elevation, late seral stage stand types (nesting)
Sandhill crane	Wetlands, estuaries
Regionally Important Species	Habitat
Black bear	Generalist, uses a range of seral stages
Black-tail deer	Generalist, uses a range of seral stages

1 – Red Listed Species are species that are considered endangered or threatened in BC and generally has less than 20 occurrences in the province. It may have more if BC represents much of the remaining world population, if the population trend is precipitously down, or if the threats to remaining populations is serious.

2 – Blue Listed Species are species that are considered vulnerable in BC and generally has between 21 and 100 occurrences in the province.

Maintaining the distribution and abundance of known sensitive species is a major component of WFP's wildlife management approach. Strategies will continue to be refined and aid in identifying habitat types that are critical for sensitive species.

2.1.2 Plants

There have been no recorded observations of red-listed plants in NVIR. Two blue-listed plants have been collected, but from non-forested or sparsely treed wetlands and are unlikely to occur within harvesting blocks.

2.1.3 Fish

NVIR supports numerous fish populations within the watersheds and streams found there. Although only one fish species, the giant black stickleback, is considered rare or endangered, the importance of retaining small anadromous spawning stocks is recognized. The Misty Lake Ecological Reserve was established to protect the giant black stickleback.

2.1.4 Special Management Zones

Three Special Management Zones (SMZ) have been identified in the defined forest area as part of the Vancouver Island Land Use Plan (VILUP). VILUP was developed from a thorough multi party consultation process in the mid 1990's. The SMZs, which are described in detail in WFP's High Conservation Value Forests North Vancouver Island Region document, cover approximately 23,000 hectares of NVIR. The intent of the SMZ designation is to identify land and coastal areas with regionally significant values or combinations of values requiring comprehensive management objectives and strategies to ensure compatible development.

2.1.4.1 West Coast Nahwitti Lowlands SMZ

The West Coast Nahwitti Lowlands Special Management Zone is located on the outer west-coast of northern Vancouver Island immediately south of Cape Scott. The primary values of this SMZ are: maintenance of scenic values, as visible from coastal areas and access routes; protection of cultural/heritage (archaeological) values; protection of sensitive coastal fish and wildlife habitats, and maintenance of recreation values and opportunities.

2.1.4.2 Koprino SMZ

The Koprino Special Management Zone is located along the west coast of northern Vancouver Island. More specifically it is situated at the southern tip of the West Coast Nahwitti Lowlands SMZ and runs to Koprino Harbour and across to Jules Bay on Holberg Inlet. The primary values associated with this SMZ are the protection of old growth biodiversity and connectivity functions, and the protection of upland wildlife habitat.

2.1.4.3 Johnstone Strait SMZ

The Johnstone Strait Special Management Zone is located on the east coast of Vancouver Island immediately south of Bauza Cove and north of the Tsitika Protected Area. The primary values associated with this SMZ are: the maintenance of scenic values, as visible from coastal areas; the maintenance of old growth biodiversity values; the maintenance of coastal wildlife habitats; and the maintenance of shoreline recreation opportunities.

2.2 Large Landscape Level Forests

The forests of NVIR have undergone significant alteration over the past century as a result of both human and catastrophic events. Therefore there are no large unaltered landscape level forests located within NVIR tenures. However, there are several protected areas adjacent to NVIR tenures that do contain large intact landscape level forests. Over 70,000 hectares are contained within Cape Scott Provincial Park and Brooks Peninsula Provincial Park. These two areas provide for the full range of biological attributes.

2.3 Forest areas that are in or contain, rare, threatened or endangered ecosystems

WFP, as part of their inventory process, has conducted detailed terrestrial ecosystem classification for most of NVIR. This classification system, in combination with information provided by the BC Conservation Data Centre has identified some rare plant communities potentially present in NVIR (Table 2). A review of these communities and their associated habitat conditions indicates that most of these communities are well represented in existing protected areas. Those not well represented (CWHvm1 07 & CWHvm1 09) may be present in North Island riparian forests.

Atypical substrates found in NVIR are also being considered for HCVF designation. Atypical substrates are defined as locales of special soils that support uncommon to rare species adapted to these special conditions. Within NVIR exposed limestone bedrock is an atypical substrate. Because limestone weathers by solution, these sites develop karst features (caves, sinkholes etc.) and a distinctive surface morphology (epikarst). These sites may contain distinctive plant communities characterized by uncommon herbs, ferns and bryophytes and have underground features, where present, are of considerable recreational value for spelunkers.

Table 2 – Red and Blue Listed Ecosystems Potentially in NVIR

PLANT COMMUNITY	BEC UNIT	PROV. RANK ¹	PROV. LIST	DISTRIBUTION
VERY WET HYPERMARITIME CWH				
Picea sitchensis / Maianthemum dilatatum	CWHvh1/08	S2	RED	Limited to higher terraces on larger rivers.
Alnus rubra / Maianthemum dilatatum	CWHvh1/10	S3	BLUE	Early seral community limited to active floodplains of larger rivers; somewhat similar to WFP's S4 ecosystem.
Picea sitchensis / Gaultheria shallon	CWHvh1/14	S3	BLUE	Very limited extent. Dry, rocky, coastal headlands within 100-200 metres of the coast.
Picea sitchensis / Kindbergia oregana	CWHvh1/15	S2S3	BLUE	Very limited extent on old, raised beaches in close proximity to present-day sand/shingle beaches.
Picea sitchensis / Malus fusca	CWHvh1/19	S2S3	BLUE	Very limited extent bordering small minerotrophic (fen) wetlands (S11ecosystems) on fluvial terraces.

PLANT COMMUNITY	BEC UNIT	PROV. RANK ¹	PROV . LIST	DISTRIBUTION
VERY WET MARITIME CWH				
Tsuga heterophylla - Pinus contorta / Cladina rangiferina	CWHvm1/0 2	S2S3	BLUE	Very limited extent on very thin-soiled rock outcrops, usually in close proximity to the east coast and inner coast of Quatsino Sound, and on small offshore islands. Not operable. This includes WFP's S2P ecosystem.
Tsuga heterophylla - Thuja plicata / Gaultheria shallon	CWHvm1/0 3	S2S3	BLUE	Widespread but generally not extensive ecosystem of rocky outcrop sites with virtually continuous Folisol soils. Partly operable because of low volume and only when closely associated with adjacent better sites/stands.
Thuja plicata – Tsuga heterophylla / Polystichum munitum	CWHvm1/0 4	S3?	BLUE	Limited to relatively well-drained colluvial, limestone and raised beach sites (inner, not outer coast), in places with some Douglas fir. This includes WFP's mapped S3B, S12F and only a minor component (est.5%) of mapped S13
Abies amabilis – Thuja plicata / Rubus spectabilis	CWHvm1/0 7	S3	BLUE	On moist, rich sites of high fluvial terraces, fluvial fans, gullies and seepage sites; best expressed on high terraces of larger rivers (but on older surfaces and older soils than CWHvm1/08).
Picea sitchensis / Rubus spectabilis	CWHvm1/0 9	S2	RED	A later seral alluvial site on higher terraces of major rivers; included with WFP's S3 ecosystem on Fp and Ft terrain types.
Tsuga heterophylla - Thuja plicata / Gaultheria shallon	CWHvm2/0 3	S2S3	BLUE	Widespread but generally not extensive ecosystem of rocky outcrop sites with Folisol soils.

S2 - Imperiled

Imperiled provincially because such communities with old-growth or primary forest are extremely rare or because of some factor(s) making them especially vulnerable to disturbance.

S3 – Rare or Uncommon

Provincially rare or uncommon in an old-growth / primary forest condition and susceptible to disturbance.

2.4 Forest areas fundamental to meeting basic needs of local communities

Local communities depend on the forests to meet several basic needs. The long-term viability of communities is dependent in part on the supply of good quality water and conducting forest operations in a sensitive manner that respects site sensitivity and stability.

2.4.1 Water Supplies

HCVF include those forests that provide ecological services in critical situations. Within NVIR, drinking water supplied to communities is considered as such, and consequently both Calbick Creek and Quatse Lake watersheds are included as HCVF. Several other creeks are under water licence and are also being used for domestic purposes. Local communities including WFP employees and their families

rely on these water sources. As HCVF these watersheds will be managed for water quality and flow.

2.4.2 Slope Stability

WFP also recognizes that there are forests in NVIR that are critical for maintaining slope stability and preventing soil erosion. Evaluation of terrain and soil conditions is being used to identify critical areas warranting HCVF designation. Landscape and stand level assessments are completed to identify sensitive terrain where retention of forest cover is required (i.e. as protection forest).

2.5 Forest critical to local communities' traditional cultural identity

Over several decades of consultation, local communities have identified the forests of NVIR as having important cultural, religious, ecological, economic, and recreational values.

2.5.1 Cultural and Religious

For many years WFP has had a working relationship with local First Nations whose territories cover the defined forest area. Consultation with these groups occurs during the preparation of Traditional Use Studies, Archeological Impact Assessments, operational plan reviews and through discussions that support community programs and employment opportunities. Areas and individual features identified as having traditional significance or cultural concerns are accommodated in WFP's planning and forestry activities. Areas of cultural significance, with the agreement of First Nations, will be designated as HCVF.

2.5.2 Ecological

The forests of NVIR are of significant ecological importance to local communities. The ecological health of the forests is directly related to the health and sustainability of the communities.

2.5.3 Economic

There are a number of communities within the area that rely heavily on the forests of NVIR for employment and their economic stability. Non-timber forest products are locally important and important sites may be designated HCVF. WFP actively works with these communities to ensure the company's goals coincide with those of the communities.

2.5.4 Recreation

As recreation and tourism within NVIR continues to develop, WFP has worked towards ensuring facilities exist for public recreation. This work has resulted in the creation and maintenance of twenty-three recreation sites. These recreation sites are designated HCVF.

3.0 Attributes

Management of High Conservation Value Forests is based on providing for and managing for specific attributes. During initial implementation attribute definitions will be subject to ongoing review and revision. As new information becomes known through consultation, research, and operational experience, attributes and their management strategy will be adjusted accordingly.

Whereas some HCVF attributes are permanently fixed spatially (e.g. riparian areas) other attributes are of a temporal nature. For example certain habitat elements may be associated with seral stages (e.g. traditional mushroom and berry picking areas, ungulate forage areas, etc); hence HCVF designations would move as forest succession progresses. New HCVF attributes will be identified and some HCVF designations may be removed. For example a community water source may be replaced with an alternative source and hence in future may not be designated as HCVF for watershed protection. Should a natural disturbance set back an old forest reserve to an early seral state, it would be logical to move the HCVF designation to a more appropriate replacement area. It is important to recognize that attributes define HCVF and not necessarily map polygons. Maps of HCVF are therefore transitory and adaptive.

4.0 Management Strategies

Once HCVF attributes are identified, initial strategies for managing and conserving these attributes are required and will form the basis of management and operational plans. Management strategies will vary in approach depending on the type of attribute they are designed to provide. For some attributes the strategy will be developed to manage individual features (CMTs, bear dens, nest trees, etc.) while for others a strategy is required for an area (hydroriparian ecosystems, community watersheds, etc.). It is important to recognize that while management strategies and initial targets may be set for specific attributes, they will change over time as more consultation, research, and operational experience takes place.

4.1 Wildlife

Consultant Laurie Kremsater developed “A Strategy for Managing Wildlife” in North Vancouver Island Region in 1999. The wildlife strategy focuses on maintaining terrestrial forest dependent organisms across the tenure. Three tactics have been developed to accomplish this.

- Maintaining the amount, distribution and heterogeneity of habitat and landscape elements important for biodiversity over time.
- Ensuring representation of ecologically distinct habitat types across NVIR, to maintain lesser known species and ecological functions.
- Maintaining the distribution and abundance of known sensitive species in NVIR.

The first two tactics will combine to form a coarse filter, which should provide for the majority of species whose needs are relatively unknown. While maintaining a range of suitable habitats across the landscape will provide for the majority of the species, the final tactic will form a fine filter to provide for those species whose needs are relatively known and are not provided for under the coarse filter. The fine filter would provide for species on the provincial red and blue lists or species identified in the Identified Wildlife Management Strategy as regionally important that warrant special consideration. Particular attention will be given to old growth dependent species.

4.1.1 Habitat of Sensitive Terrestrial Vertebrates

Providing habitat for sensitive terrestrial vertebrates is based on using coarse and fine filters at the landscape and stand levels.

4.1.2 Coarse Filter – Landscape Level

4.1.2.1 Old Forest

As Kremsater points out in “A Strategy for Managing Wildlife” old forest structure is an important source of biodiversity and many of its attributes can only be developed with age. Therefore, it is important to retain some areas of old forest over time. WFP will maintain areas of old forest across the landscape in a variety of patch sizes.

Strategy: Through the completion of Landscape Unit (LU) Planning Old Growth Management Areas will be designated as long-term reserves and HCVF.

Target: At least 13% of the forested landbase in each LU will be designated as long-term reserves as Old Growth Management Areas (OGMA). These OGMAs will either be, or will be managed to become (by implementing a recruitment strategy for older second growth stands), old forests.

4.1.2.2 Forest Interior

Within “A Strategy for Managing Wildlife” Kremsater has outlined several points regarding edge and forest interior condition. As stated in the strategy although much of the information suggests that edge effects are not dramatic WFP will monitor on a precautionary approach to ensure those species not researched yet are provided for.

Strategy: During the designation of OGMAs several large areas within each LU will be designated.

Target: Within each LU there will be at least 10 OGMAs greater than 50 ha in size and over 200m wide. Of those OGMAs at least 4 will be over 100 ha and 600 m wide.

4.1.2.3 Patch Size

Some species benefit by the proximity of different habitat types for cover, forage, and breeding. Whereas, others may be negatively affected by microclimatic changes, predation effects, or loss of connectivity. For many species edge is likely unimportant. WFP will maintain areas of different seral stages across the landscape in a variety of patch sizes.

Strategy: During the designation of OGMAs several large areas will be designated. During forest development planning block size must be varied to increase the variability of patch sizes.

Target: Within each LU there will be at least 10 OGMAs greater than 50 ha in size and over 200m wide and 10 OGMAs below 25 ha in size.

4.1.3 Coarse Filter – Stand Level

4.1.3.1 Old Forest

While providing old forest at the landscape level will provide for the majority of species, some species with a smaller range will require some stand level structure. Stand level structure will also contribute to the biodiversity of the area.

Strategy: In addition to landscape level reserves stand level reserves must be incorporated into the planning of forest operations.

Target: The following targets will be used to ensure stand level old forest reserves relative to the completion of LU plans.

Table 3: Stand Level Reserve Targets

Landscape Unit	BEC Subzone	After LU Plans (% of Area)
San Josef	CWH vh	6
	CWH vm	10
	MH mm	1
Holberg	CWH vh	10
	CWH vm	12
	MH mm	6
Marble	CWH vm	10
	MH mm	1
Mahatta	CWH vh	10
	CWH vm	12
	MH mm	0
Neroutsos	CWH vm	10
	MH mm	1
Keogh	CWH vm	12
	MH mm	4
Nahwitti	CWH vh	10
	CWH vm	4
Bonanza	CWH vm	11
	MH mm	7

4.1.3.2 Coarse Woody Debris

Coarse woody debris (CWD) is an important stand level attribute as it is important for several species.

Strategy: CWD will be maintained throughout harvested stands by managing to current utilization standards. Where protection and reforestation commitments can be met, piles less than 50 m² in size will be left for CWD. Where hazardous snags are required to be felled from reserves, they will be left on site as CWD.

Target: >10 m³/hectare average across harvested block

4.1.3.3 Snags

Snags are an important attribute for the maintenance of several species and as a source of future CWD. However, snags can also be a serious safety hazard for forest workers. Therefore, it is important to maintain safe snags throughout the forested landscape.

Strategy: During block layout, areas of significant snag concentrations will be included within stand level reserves. To reduce the area of reserve edge and thus reduce the number of snags felled for safety reasons, layout will favour relatively larger reserves over multiple small dispersed patches where many more snags may have to be removed. Snags adjacent to harvest areas will be assessed to determine their safety. Safe snags will be maintained. Stand level reserves will be designed of a sufficient size to maintain snags at the stand level.

Target:

Size	Landscape (Snags/ha)	Percent of landscape	Stand/Block (Snags/ha)
dbh >30cm	5	15%	15
		25%	10
		70%	4
		30%	2
dbh <30cm	15	12%	30
		25%	15
		85%	8
		15%	3

4.1.3.4 Riparian Forest

A Strategy for Managing Wildlife identifies riparian forest as a key attribute for the maintenance of several species.

Strategy: Riparian zones will be managed in compliance with the Forest Practices Code and Private Forest Landowners Regulations. Where applicable, restoration programs will be investigated to determine the likelihood of success and appropriate methods to achieve target levels of unaltered or restored hydroriparian forests.

Target: 500 ha of unaltered or restored hydroriparian forests.

4.1.4 Fine Filters

The majority of the species identified within Table 1 will be provided for using the coarse level filters. However, in addition to the coarse filters some fine filters may be required for specific species.

4.1.4.1 Pacific Water Shrew

This species is dependent on a narrow riparian zone along fast flowing streams and the margins along wetlands.

Strategy: The coarse level filter should provide for this species.

Target: A target is not applicable.

4.1.4.2 Keen's Long Eared Myotis

Very little is known about the habitat needs of this species. The fine filters that will be used to provide some of the attributes likely required by this species are based on providing suitable roosting sites.

Strategy: Caves identified during harvest planning will be closely examined to determine whether they are used by this species. Caves found to contain this species will have a reserve zone established around them and be designated HCVF. Snags and hollow trees are also thought to be used by this bat to roost.

Target: A target is not applicable for the fine filter, as the management is dependent on the presence of the species. The coarse level filters for snags and old forest conditions are addressed under their respective sections.

4.1.4.3 Northern Goshawk

The majority of the management for this species is covered within the coarse filter. Species specific management will focus on activities adjacent to known nests.

Strategy: Cooperation will continue with the Ministry of Environment Lands and Parks (MOELP) on the completion of goshawk inventory programs. In consultation with MOELP, design management zones and operational constraints adjacent to nests.

Target: Additional consultation with MOELP is required to set targets.

4.1.4.4 Marbled Murrelets

Habitat quality will be determined using a habitat model refined in 1998/99. Specific management for marbled murrelets is focussed on providing nesting habitat. This will be done by providing some large landscape level reserves in areas with moderate to high marbled murrelet habitat.

Strategy: Incorporate marbled murrelet habitat model results into the designation of OGMAs. Within each LU design several large reserves in areas of moderate to high murrelet habitat. Where these areas do not exist in an old forest prepare a recruitment plan to address this.

Target: In each LU with Marbled Murrelets identified as a key value, establish at least 2 OGMAs over 200 ha in size, with moderate to high habitat suitability.

4.1.4.5 Ermine

The requirements for this species are related to providing CWD in riparian areas of managed stands.

Strategy: Manage CWD and riparian areas in accordance to Section 4.1.3.2 & 4.1.3.4 respectively.

Target: As per Section 4.1.3.2 & 4.1.3.4

4.1.4.6 Vancouver Island Wolverine

The Vancouver Island wolverine has not been sited for several decades within the forests of NVIR. However, if any breeding occurrences are located within NVIR then the following strategy will be implemented.

Strategy: Reserves will be evaluated and developed as required through the consultation with MOELP.

Target: All recognized wolverine dens will be protected.

4.1.4.7 Roosevelt Elk

Roosevelt elk are present within NVIR in Stranby, Victoria Lake, and Waukwaas areas. A model has been developed to evaluate potential habitat suitability. The results of this modeling exercise will be used in the LU planning process. Some key winter ranges have been identified in consultation with MOELP.

Strategy: Encourage the Ministry of Forests and MOELP to finalize elk winter ranges for the Forest Licence. During LU planning use the results of the habitat modeling to identify key reserves in the known elk use areas. Cooperate with MOELP on limiting the opportunities for poaching.

Target: Identify key elk habitat areas in Marble, Nahwitti, and Keogh LUs with elk habitat as a key attribute during LU planning. Maintain VL300 gate to limit

poaching.

4.1.4.8 Great Blue Heron

Great blue herons are commonly seen within NVIR. However, no known nests have been located in NVIR. Management surrounding this species will focus on providing nesting sites.

Strategy: In consultation with MOELP, design site specific management around nesting colonies as they are discovered.

Target: Dependent on location of nesting colonies.

4.1.4.9 Peregrine Falcon

Peregrine falcons have been seen in NVIR, although no known nesting sites have been located. However, management will be based on protection of nest sites as they are identified.

Strategy: During forest management activities, if nests are discovered buffers will be designed around the sites and operational constraints will be developed as required in consultation with MOELP. Stand level reserves will also incorporate rocky ledges into Wildlife Tree Patches where possible.

Target: 100 % of discovered nests will be protected.

4.1.4.10 White-tailed Ptarmigan

Management for the White-tailed Ptarmigan will be based on breeding habitat. No known breeding areas are located in NVIR.

Strategy: As breeding areas are discovered management zones will be designed adjacent to the areas.

Target: Not applicable, dependant on location of breeding habitat.

4.1.4.11 Western Screech Owl

Cavity nest sites and riparian areas appear to be important attributes for the Western Screech Owl. Coarse level filters should provide these attributes.

Strategy: As per sections 4.1.3.3 and 4.1.3.4 for snags and riparian forest. Also within areas of riparian ecosystem restoration establish screech owl nesting boxes to increase the immediate availability of suitable nesting sites.

Target: As per applicable sections.

4.1.4.12 Northern Pygmy Owl

Little is known about the specific needs of this species. Although, the bird does appear to use old woodpecker holes for nesting.

Strategy: Coarse level filters should be sufficient for this species. Sufficient habitat should be provided through managing for snags as per Section 4.1.3.3.

Target: As per section 4.1.3.3

4.1.4.13 Huttins Vireo

It is unclear why this species is listed, as it appears to use a variety of habitats.

Strategy: Coarse level filters are sufficient. Kremsater indicates no specific management is required.

Target: Not applicable

4.1.4.14 Sandhill Crane

This species is associated with wetlands and estuaries for breeding areas.

Strategy: A 10 metre reserve will be established on all classified wetlands. Significant non-classified wetlands will receive a management zone where some trees will be retained. Estuaries will receive site specific management prescriptions appropriate to their size and biological significance. Prescriptions will be developed in consultation with MOELP. Access will be limited during breeding season when requested by MOELP.

Target: Not applicable as they are dependent on presence of wetlands and estuaries.

4.1.4.15 Black Bears

Black bears are a regionally important species within NVIR. They are common throughout the area. Management is based on the retention of denning sites for the bears. Sites normally used by the bears include large hollow trees, windfalls and stumps.

Strategy: Bear dens discovered during the planning phases of forest management will be incorporated into group or single tree reserves. Where cutting of the tree is unavoidable the tree will be high stumped and roofed where possible and required. Future den sites will be provided for in the development of landscape and stand level reserves. Results of habitat modeling will be used during LU planning. Training for the identification of bear dens will be conducted.

Target: Maintain stand and landscape level reserves as per Sections 4.1.2.1. and 4.1.3.1.

4.1.4.16 Black Tailed Deer

Black tailed deer are a regionally important species within NVIR. They are common throughout the area. Management is based on providing suitable winter habitat for the species.

Strategy: Deer Winter Ranges (DWR) have been identified within NVIR. Some of the DWRs have been classified as Ungulate Winter Ranges (UWR) under the Forest Practices Code. Where this has not taken place the DWR will be evaluated during the LU planning process to determine whether there are other more suitable sites for deer.

Target: Approximately the same area of DWR will be retained as long term reserves within the LU planning process.

4.1.4.17 Bald Eagle and Osprey

Although the Bald Eagle and Osprey have not been designated as either red or blue listed or a regionally significant species they are an important part of the wildlife within NVIR. Management will focus on the presence of nests and management surrounding the nests. WFP has maintained an inventory of raptor nests since late the 1980's. This inventory undergoes a regular review and updating.

Strategy: Nests of both species will be protected in either stand or landscape level reserves. Adequate flyaway zones and perch trees will be provided for in these reserves. Operational timing constraints will be developed depending on the use of the nest tree during proposed operations. Fecundity and use surveys will be carried out on a regular basis. Training for the identification of

nests will take place.

Target: Protect 100% of known and discovered nest sites.

4.2 Fish Habitat

The management for fish habitat revolves around the maintenance of: stream integrity and channel condition; providing future sources of large woody debris; moderating stream flow; maintaining clean water; the degree of fish presence. Riparian Reserve zones and hydro riparian ecosystems will be considered HCVF.

4.2.1 Stream Integrity and Channel Condition

Stream integrity and channel condition are important attributes for fish habitat they will be managed through the incorporation of specific riparian management strategies.

Strategy: The implementation of riparian management strategies is imperative to the maintenance of stream integrity and channel condition. Forest Practices Code will be followed on all Tree Farm Licence and Forest Licence land. Managed Forest land will be managed to Private Forest Landowners Regulations at a minimum.

Target: Targets will be assessed on an individual basis, as they are stream specific.

4.2.2 Large Woody Debris Inputs

To maintain long-term productivity and structure within fish streams there must be a continual supply of Large Woody Debris (LWD). LWD supplies a stream with wood that creates debris jams and deflects water to create habitat for fish. The requirement of LWD for a stream is dependent on the energy of the stream. The higher the stream energy (flow speed and volume), the greater the requirement for LWD. Low energy streams require less or smaller LWD, as the erosion power of these streams is not sufficient to significantly alter fish habitat. However, in higher energy streams only larger woody debris is stable and creates shelter, resting areas and suitable spawning sites for fish. Long-term supply of LWD may be of concern for larger streams that have been harvested to both edges. With diminished sources of LWD the fish habitat within a stream will likely decline until second growth is sizeable unless a shorter term recruitment strategy is in place.

Strategy: Maintain a supply of LWD within the riparian areas of streams. Amount of LWD will be dependent on the size and energy of the stream. On fish bearing streams over 3.0 metres in width that have been harvested to the bank on both sides, evaluate future LWD sources and where required develop a recruitment strategy to provide future LWD.

Target: Complete stream evaluations and develop strategies by 2005.

4.2.3 Moderate Flow

Forest harvesting can have impacts on the hydrological balance of watersheds. One of the potential impacts is an increase in peak stream flows. Thus increasing the potential for runoff related erosion.

Strategy: In order to monitor and evaluate the potential hydrological impacts of harvesting within a watershed, Coastal Watershed Assessments will be carried out and updated on a regular basis.

Target: The equivalent clearcut area (the area that has been clearcut with a reduction factor to account for the hydrologic recovery due to forest regeneration) shall not exceed 30% without the advice of a qualified professional.

4.2.4 Clean Water

Fish are dependent on a constant supply of clean well-oxygenated water. Without proper care during forest harvesting this attribute can be compromised by an increase in siltation. The deactivation of high risk road systems is also of primary importance in the reduction of siltation.

Strategy: Harvest activities will utilize low impact systems to minimize any harvesting induced siltation. During road construction siltation reduction methods (hay bails, filter fabric, timely seeding of exposed sites, etc.) will be used during the construction of stream crossings likely to impact fish habitat. Natural drainage patterns will be maintained. The identified high risk watersheds within NVIR have been evaluated for their potential risk to increase siltation and damage to fish habitat. On a priority basis the deactivation of all high risk road systems will be completed in an orderly fashion to ensure the greatest risks are dealt with first. Forest management activities will use specific procedures to minimize the likelihood of petroleum products or chemicals from entering into water.

Target: A specific target is not applicable as the goal is for all water to remain clean. Sediment control will be used on all streams likely to impact fish habitat. Complete the deactivation of all identified high risk road systems in NVIR by 2004.

4.2.5 Fish Presence

The presence of fish within a stream is an important attribute for the development of management strategies. The presence of fish is determined by using intensive stream surveys.

Strategy: Maintain or increase current populations of native fish species within all streams in NVIR. Continue salmonid enhancement activities at Marble River, Cordy Creek and Colonial Creek Hatcheries until populations are fully recovered as determined by Department of Fisheries and Oceans. *Target:* Population targets will be developed in conjunction with Department of Fisheries and Oceans and Ministry of Environment, Lands and Parks. Target release levels for the salmon enhancement facilities is 750,000 fry annually.

4.2.6 Fish Habitat Restoration

WFP is active in the restoration of fish habitat within NVIR. Restoration activities are completed based on overview and site specific prescriptions. These restoration activities have created a substantial amount of spawning, rearing, and over wintering sites for important salmon and steelhead species.

Strategy: Continue participating in fish habitat restoration programs. Secure funding to complete the required fish habitat restoration works for NVIR watersheds. Complete fish habitat restoration identified and prioritized through the overview fish habitat assessments.

Target: Complete overview fish habitat assessments for identified priority watersheds by 2002. Complete identified fish habitat restoration activities within priority watersheds by 2004.

4.3 Special Management Zones

Three Special Management Zones (SMZ) are located within NVIR. These zones are West Coast Nahwitti, Koprino, and Johnstone Strait. Each of these SMZs has a specific set of primary values associated to the areas.

4.3.1 West Coast Nahwitti Lowlands

The primary values of this SMZ are the maintenance of scenic values; protection of cultural/heritage (archaeological) values; protection of sensitive coastal fish and wildlife habitats, and maintenance of recreation values and opportunities.

4.3.1.1 Visuals

The maintenance of visual quality within the SMZ is very important. A proportion of the SMZ can be seen from the water.

Strategy: Scenic attributes will be provided for through a comprehensive analysis of proposed harvest blocks. Visual Impact Assessments will be carried out for blocks that are visible within the “Scenic Area”. Proposed blocks that are visible from designated travel corridors will be designed to ensure that they meet the Visual Quality Objectives for the area.

Target: Targets will be set on an individual basis, based on the block location within the Landscape Unit.

4.3.1.2 Cultural/Heritage

Due to the coastal location of the SMZ the presence of cultural/heritage sites are common. In the majority of the cases the features and sites are related to First Nations traditional use within the area.

Strategy: Archaeological assessments will be carried out in areas that have a moderate to high likelihood of containing cultural features. Upon discovery of these attributes, management strategies will be developed in consultation with the particular First Nations involved. Not all features will be mapped to protect the confidentiality of the features.

Target: Not applicable as features are dependent on presence.

4.3.1.3 Coastal Fish and Wildlife Habitat

Coastal fish and wildlife habitat is an important attribute of the West Coast Nahwitti Lowlands SMZ. In 1995 WFP proposed to establish a coastal recreation, biodiversity, and wildlife reserve along coast from Grant Bay to Cape Scott Park. This corridor would vary in width from 50 to 400 meters. However, no formal response has been received from government on this issue.

Strategy: A comprehensive set of reserves and retention areas will be designed during the Landscape Unit planning process. Specific species management will be carried out as per Section 4.1. WFP will voluntarily pursue the Coastal corridor proposal as HCVF beyond legislative requirements.

Target: As per Section 4.1.

4.3.1.4 Coastal Recreation

The west coast of the island provides some excellent recreation opportunities for visitors of all skill levels. WFP has identified two areas within the SMZ as having very high recreation potential and thus would be designated as HCVF.

They are located adjacent to Grant Bay and Topknot Beach. WFP has also developed several other recreation sites within the SMZ including Palmerston Recreation Area, Hecht Beach Trail, and Raft Cove Access Trail. There are two provincial parks located within and adjacent to the SMZ. WFP roads are the primary access to all of these recreation sites and parks. As discussed above a coastal reserve was proposed in 1995 with no formal response.

Strategy: Continue maintenance programs on existing WFP recreation sites. Continue road maintenance programs accessing recreation areas and parks. As road developments reach new features, develop other sites in consultation with Ministry of Forests and local communities. WFP will further pursue the coastal reserve proposal.

Target: Maintain the existing WFP recreation sites and evaluate upgrading and expansion of Grant Bay and Topknot Beach.

4.3.2 Koprino

The primary values associated with this SMZ are the protection of old growth biodiversity, and the protection of upland wildlife habitat.

4.3.2.1 Old Forest

The overall management directive for the Koprino SMZ is to focus on the retention of a high proportion of old forest.

Strategy: During LU planning large OGMA's will be located within the SMZ.

Target: Locate approximately 750 ha of OGMA's within the SMZ.

4.3.2.2 Upland Wildlife Habitat

The Koprino SMZ had 2 Deer Winter Ranges located in it that were not designated as Ungulate Winter Ranges. However one of the focuses of this SMZ remains as upland wildlife habitat.

Strategy: Wildlife habitat will be provided for at the landscape level during the LU planning process. Specific management is outlined in Sections 4.1.2, 4.1.3, and 4.1.4. Several large OGMA's will be located within the Koprino SMZ. Placement of these OGMA's will utilize the results of modeling carried out to identify the quality of deer and marbled murrelet habitat.

Target: A minimum of 3 OGMA's over 100 hectares in size will be located within the moderate or high deer or elk habitat identified using the model. One of those areas will be at least 300 hectares in size.

4.3.3 Johnstone Strait

The primary values associated with this SMZ are the maintenance of scenic values; old growth biodiversity values; coastal wildlife habitats; and shoreline recreation opportunities.

4.3.3.1 Visuals

The Johnstone Strait SMZ is located within a very high tourist use area and within direct view of the community of Alert Bay. Therefore, visuals have been determined to be a key attribute for this SMZ.

Strategy: Visual values will be provided for through a comprehensive analysis of proposed harvest blocks. Visual Impact Assessments will be carried out for blocks within the "Scenic Area". Proposed blocks will be designed to ensure that they meet the Visual Quality Objectives for the area.

Target: Targets will be set on an individual basis based on the specific sensitivity and the location within the Landscape Unit.

4.3.3.2 Old Forest

The Bonanza Landscape Unit has received a significant level of harvest pressure over the past number of decades. As a result of this the retention of old forest within this SMZ has become an important attribute.

Strategy: During the LU planning process the SMZ will be evaluated for the location of OGMAs. Establishment of OGMAs will be targeted within the SMZ. Where the designation of a sufficient amount of OGMAs is not possible within the SMZ a recruitment strategy (in consultation with MOELP and MOF) will be developed to attain desired levels.

Target: Locate at least 13% of the LU in OGMAs.

4.3.3.3 Wildlife Habitat

The Johnstone Strait SMZ is an important source of coastal wildlife habitat. The marine/foreshore interface is thought to provide important habitat for several wildlife species. However little is known about the exact requirements of these areas. Therefore the management strategy will take a cautious approach within this area until further information is available on the habitat requirements in these type of areas.

Strategy: The management strategy for wildlife habitat within this area is to place a marine management zone along the ocean for the length of the SMZ. The zone width will vary depending on the wildlife habitat encountered and the adjacent topography. The zone will be developed to retain structures important for wildlife as outlined in Section 4.1. Harvest activity may take place within this area to help enhance the diversity of the zone.

Target: A target width of 50 m will be used.

4.3.3.4 Recreation

The Johnstone Strait SMZ is located along the shores adjacent to several high use recreation areas (whale watching, kayaking, fishing, camping, etc.). Therefore, an important attribute within this SMZ is coastal recreation. The MOF has identified recreation potential areas on Blinkhorn Peninsula and at Kaikash Creek. Both of these areas are surrounded by WFP tenures but not located within the tenures.

Strategy: WFP will work with the MOF on the potential of providing access to Blinkhorn and Kaikash Recreation Areas as proposed forest development approaches these areas. As forest development approaches the shoreline future recreation developments will be assessed with MOF.

Target: Not applicable.

4.4 Community Water Supply

Communities are dependent on several streams and watersheds within NVIR for a constant supply of fresh clean water. Management for these key attributes will focus on minimizing siltation, controlling deleterious substances, and regulating water flow water.

4.4.1 Clean Water

Clean water will be maintained by minimizing siltation and controlling petroleum and other chemical products.

Strategy: Siltation will be controlled through the maintenance of natural drainage patterns and avoiding cross-stream yarding. Reserves and retention areas will be utilized on larger streams. Overview soil sensitivity assessments will be carried out to help anticipate areas of potential impacts on water quality. During road construction siltation reduction methods (hay bails, filter fabric, timely seeding of exposed sites, etc.) will be used during the construction of stream crossings. Natural drainage patterns will be maintained. Standard Operating Procedures will be implemented to minimize the introduction of petroleum products and other chemicals within stream systems.

Target: No measurable decline in water quality due to forest management activities. Sediment control will be used on all stream crossings above the water intake.

4.4.2 Water Flow Levels

A steady supply of water is an important attribute for one of the potential impacts is an increase in peak stream flows. Thus increasing the potential for runoff related erosion.

Strategy: In order to monitor and evaluate the potential hydrological impacts of harvesting within a watershed, Coastal Watershed Assessments will be carried out and updated on a regular basis.

Target: The equivalent clear-cut area shall not exceed 30% without the advice of a qualified professional.

4.5 Slope Stability

Proper management in unstable slopes is important for safety and environmental reasons. Management strategies related to slope stability are designed to prevent road related or logging induced slides from occurring, thus preventing possible injuries and siltation. The strategy for managing unstable slopes is based on several factors including completing stability assessments, and the implementation of Standard Operating Procedures.

4.5.1 Slope Stability Assessments

Slope stability assessments are completed at two levels, an overview level and a site-specific assessment. The overview assessment is conducted on a large scale to provide the forest manager with an indication of where stability concerns may be anticipated. This has been completed for NVIR tenures. The site-specific assessments are completed on an individual road or block basis to provide a detailed analysis of the stability of the area.

Strategy: Based on the overview assessment and indications of slope instability discovered during field assessments detailed stability (geotechnical) assessments will be conducted. Recommendations of the assessments will be followed to reduce the likelihood of slides. HCVF will be identified depending on the nature of the recommendations (i.e. areas that are required to be deleted from harvest).

Target: The target is to cause no landslides from forest management activities.

4.5.2 Standard Operating Procedures

Employees working in the forest industry depend on proper planning, equipment, and procedures to minimize their risk of being injured while at work. WFP has developed Standard Operating Procedures (SOP) to address slope stability issues. Following the SOP should help reduce the likelihood of injuries and environmental damage related to landslides.

Strategy: Utilize the Slope Stability - SOP for working in areas with slope stability concerns. Follow rainfall shut down guidelines contained within this SOP.

Target: The target for injuries or landslides related to forest management activities - is zero (0).

4.6 Cultural Significance

WFP's NVIR tenures cover the traditional territories of six First Nations. Each of the First Nations has differing requirements to address their concerns around the management of cultural sites and specific attributes. The strategies presented are general as each specific occurrence will have its own strategy developed in conjunction with the specific First Nation involved.

4.6.1 Village Sites and Burial Grounds

Village sites and burial grounds are very sensitive areas and of great importance to all First Nations.

Strategy: Although the majority of these sites are contained within Indian Reserves outside of NVIR tenures, if they are encountered the following approach will be taken (including European cemeteries). Village sites and burial grounds will be reserved from harvest with an appropriate sized management zone established to ensure that the areas are not impacted by management activities. Specific sizes of reserves and management zones will be developed on a site-specific basis determined through consultation with the communities involved. The identification of such areas will be kept confidential. Enquiries will be directed to the First Nations.

Target: Not applicable.

4.6.2 Middens

A midden is a prehistoric habitation site generally characterized by the presence of a large amount of shell and bone fragments. The majority of middens are found along riparian or marine interfaces fairly close to shore.

Strategy: As middens are identified specific management strategies will be developed in consultation with the applicable First Nation. In general terms strategies would involve where possible relocating harvest boundaries and relocating roads to ensure that the areas are not disturbed by management activities. Where these options are not possible a specific plan will be developed in consultation with the First Nation and Archaeology Branch.

Target: Not applicable.

4.6.3 Culturally Modified Trees

WFP, through the use of consulting archaeologists and First Nation members has been conducting surveys to locate culturally modified trees (CMTs) for several years. CMTs are mostly found within western red cedar types located close to the ocean, major rivers, or known areas of past habitation. The presence of CMTs is a good indication of a First Nation's traditional use of the area.

Strategy: As CMTs are identified specific management strategies will be developed in

consultation with the applicable First Nation. In general terms strategies involve where possible relocating harvest boundaries and relocating roads to ensure that the attributes are not disturbed or establishing a management zone to ensure their presence into the future. Where these options are not possible a specific plan will be developed with the First Nation in consultation with Archaeology Branch. Removal or alteration of CMTs may be possible depending on the relative rarity of the attribute, its sensitivity and the possible use for wildlife and other values.

Target: Not applicable.

4.7 Recreation and Tourism

Communities depend on the forests surrounding their homes as areas of personal recreation and for the promotion of tourism. The tenures of NVIR are managed to provide for these opportunities through specific management for: provincial and regional parks; the identification of key features; existing company facilities; freshwater sport fishing areas; and visual quality.

4.7.1 Provincial and Regional Parks

There are several provincial and regional parks within the vicinity of NVIR. WFP roads are a main source of access for several of these parks. WFP's management strategies for these attributes focus on access and adjacent forest management.

Strategy: WFP will maintain its current road network that provides access to several provincial and regional parks adjacent to NVIR. Road access and a reasonable level of maintenance will be carried out by the company. Consultation will take place with the MOELP and the Regional District on all planned forest development adjacent to provincial and regional parks respectively. Forest management activities will be developed to ensure that they do not impact on the activities of the parks.

Target: Maintain existing park access and continue consultation.

4.7.2 Key Features

Key recreation features are identified through the public consultation and inventory processes. Once identified, management strategies must be developed to address each feature where development may have impacts on the feature.

Strategy: Complete and keep up-to-date recreation inventories for NVIR tenures. Where features are identified that will be impacted, develop specific strategies to address and minimize impacts.

Target: Continue public consultation on key recreation features. Develop strategies as forest development approaches identified features.

4.7.3 Existing Company Funded Facilities

WFP maintains a comprehensive recreation program within NVIR. WFP currently maintains 7 overnight campgrounds with approximately 100 sites, 5 day use picnic areas and 6 forest trails. WFP has established a public project account from which it funds the maintenance of all of these sites. The long-term maintenance of these sites in a safe and clean state is of primary importance to WFP.

4.7.3.1 Campgrounds

Seven overnight campgrounds are located throughout the tenures of NVIR. The maintenance for these sites is provided by WFP

Strategy: Continue with the maintenance programs for all existing campgrounds. Continue to promote the use of these sites by the public. Maintain the policy of not collecting user fees for the use of these sites.

Assess the availability of funding for the development of new campgrounds as new unique features are encountered such as those found at Topknot Beach.
Target: Maintain at least 60 overnight campsites within NVIR.

4.7.3.2 Day-Use Area

WFP has developed 5 day use areas within NVIR, which are very popular with local residents.

Strategy: Continue funding the regular maintenance of the current day-use areas. Assess funding availability for the expansion of the day-use areas as use requires and new features are discovered.

Target: Maintain at least 20 picnic sites within NVIR.

4.7.3.3 Trails

The development of forest trails have served several purposes including providing the general public with education on forest processes, and access to several unique features. Six trails have been developed thus far in NVIR to serve these purposes.

Strategy: Continue maintenance on all existing forest trails based on use levels. Evaluate required upgrades to the existing trail systems based on their use and potential environmental impacts. Continue trail development to the west coast at key access points.

Target: Maintain 6 trail systems.

4.7.4 Sport Fishing

Several of the major lakes and stream systems contain significant populations of sports fish and are used by the public to fish.

Strategy: Riparian management strategies will be developed for each riparian feature with special attention given to their accessibility by sports fishers. Several of the more commonly used systems have had a trail network developed by the fishers. Access will be maintained to these trails. Streamside fishing trails will be retained after harvesting.

Target: Maintain existing trail system.

4.7.5 Visuals

The development of tourism opportunities within the North Island has many times been linked to the scenic beauty of the area. Local tourist operators have at times, expressed their concern over the visual quality of areas adjacent to their developments. Landscape inventories have been completed for NVIR which classifies the Visual Quality Objectives, Visual Sensitivity, Visual Absorption Capability and the Existing Visual Condition. Scenic areas have also been designated within NVIR tenures.

Strategy: Current inventories will be reviewed for each proposed harvest area. Visual Impact Assessments will be carried out for those areas that are located within a Scenic Area. All harvest areas will be designed to ensure that the Visual Quality Objectives of the area are met. Landscape inventories will be updated on a regular basis to ensure new developments are adequately addressed.

Target: Design harvest areas to meet the Visual Quality Objectives for the landscape unit.

4.8 Ecosystems

The Conservation Data Center (CDC) has identified several ecosystems that are rare or endangered that are likely found within NVIR. The majority of these ecosystems are well represented in an unharvested state within protected areas and areas constrained from harvest activities. However, the few ecosystems which are not well represented in these areas are associated with riparian areas that are mostly constrained from harvest. As mentioned in Section 2.3 exposed limestone areas are an atypical substrate within NVIR.

4.8.1 Riparian Ecosystems

The CDC has identified CWHvh1-08 and CWHvm1-09 as Red listed ecosystems and CHWvm1-07 as a Blue listed ecosystem. All of these ecosystems are associated with riparian areas. Under the Lewis Ecosystem Classification System used in NVIR, these ecosystems would be primarily part of larger S3 ecosystem and to a lesser extent the S4 and S5 ecosystems.

Strategy: The retention of forest in Riparian Reserve Zones, Old Growth Management Areas, and Wildlife Tree Patches will ensure the future presence of unharvested riparian associated ecosystems. A training program will be developed and implemented to ensure that field staff can identify these ecosystems. In areas where the riparian areas have been harvested along major streams and rivers a restoration program will be evaluated for possible implementation based on their relative importance, likelihood of success, and availability of funding. For deciduous dominated ecosystem (S4), alder will be the preferred species. For conifer dominated ecosystems (S3 & S5), management will concentrate on producing climax conifer dominated stands.

Target: At least 13% of riparian ecosystems retained in either an unharvested state or scheduled for restoration.

4.8.2 Exposed Limestone

NVIR has a significant component of limestone that runs through the center of the tenures. As discussed in Section 2.3 exposed limestone bedrock is an atypical substrate. These sites contain distinctive plant communities with uncommon herbs, ferns and bryophytes and have considerable recreational value for spelunkers.

Strategy: Limestone ecosystems will be maintained in a mosaic of diverse forest age classes. As limestone features are discovered during forest management activities, site specific management strategies will be developed that are best suited to the feature in consultation with MOF Recreation Officer. Strategies may include the establishment of retention areas around significant karst features with measures to improve wind firmness (topping, pruning...). An evaluation of limestone dependent species will be carried out to determine their sensitivity to harvesting and occurrence in different seral stages. As karst features are discovered the karst inventory will be updated to reflect the new information. Road construction activities will be designed to avoid/minimize impact on cave and karst features. Sediment will be controlled and drainage will be directed away from karst features. A training program will be developed and implemented to ensure that field staff can identify these features.

Target: 450 hectares of unaltered or restored karst-limestone areas.

4.9 Rare and Endangered Plants

There have been two species of rare and endangered plants identified within NVIR. Both of these species are associated with bog or wetland ecosystem associations. Although these sites are not normally associated with harvest activities a precautionary approach will be taken by the development of a management strategy.

Strategy: Information circulars are in preparation (A. Inselberg) for field foresters who develop silviculture prescriptions; circulars will make foresters aware of the rare species and present habitat information and photos to facilitate their identification. If encountered, logging/silviculture plan would be modified accordingly with input from an ecologist.

Target: Not applicable.

4.10 Economic Stability

The forests of NVIR are a vital part of the economic stability of local North Vancouver Island communities. However, no areas have been identified as HCVF for the purpose of economic stability, as little interest has been generated in doing this during consultation. This is very likely to change in the near future, as communities become more aware of and involved in the designation and management of HCVF.

5.0 Summary

This document summarizes the current approach that will be used in managing for HCVF attributes. However, the development and refinement of these management strategies and targets is a continual process that will be refined over time through increased consultation, education, and experience.

Appendix XXII
Strategy Outline for Managing Wildlife

Strategy Outline for Managing Wildlife

By Laurie Kremsater, R.P.F., R.P. Bio, MSc.

Western Forest Products is developing a forest management plan for North Vancouver Island Region (NVIR) that can be certified as ecologically sound and socially responsible. Ecologically sound forestry requires that attention be given to long-term site productivity, water quality and flow, protection of rare ecosystems, and several other ecological indicators. The provision of habitat for wildlife and the persistence and productivity of key wildlife species are key indicators of the appropriateness of management activities.

The wildlife strategy for NVIR focuses on means of maintaining terrestrial forest dependant organisms across the tenure. Three main tactics will accomplish the goal:

1. Maintaining the amount, distribution and heterogeneity of habitat and landscape elements important for biodiversity over time.
2. Ensuring representation of ecologically distinct habitat types across NVIR, to maintain lesser known species and ecological functions.
3. Maintaining the distribution and abundance of known sensitive species in NVIR.

The first tactic, maintaining habitat attributes and landscape patterns over time is the emphasis of most strategies to maintain habitat for wildlife and is the emphasis of the Biodiversity Guidelines of the Forest Practices Code. There are simply too many species to address the needs of each individually. For those species that are unknown, or for species whose requirements may not tie closely to the habitat attributes and patterns addressed under tactic 1, the strategy also addresses representation of ecosystems (tactic 2). Several species, however, need individual attention. Some of these species are legislated by the Identified Wildlife Strategy, others are identified in the red and blue lists, and still others have been identified by local forest managers and biologists. The third tactic will ensure that actions are undertaken to address needs of species that are especially vulnerable to forestry practices and whose habitat requirements are relatively well known.

Tactics 1 and 2 combine into a coarse filter approach that maintains ecosystems, structures and habitat patterns to sustain ecosystem functions such as dispersal and migration for organisms whose needs are not well known or unknown. Tactic 3 is a fine filter: managing for sensitive species whose habitat needs are relatively well known and who may not be addressed adequately by the coarse filter.

We outline the essence of a coarse filter approach but focus much of this discussion on the fine filter supplement. This is not because the fine filter is more important than the coarse filter. The opposite is true. Rather, the rationale and approaches to the coarse filter management have been described in detail elsewhere (Biodiversity Guidelines, CSP 1995, Bunnell et al. 1998a) and are general to coastal B.C. The fine filter is more specific to NVIR.

Tactic 1. Maintaining the amount, distribution and heterogeneity of habitat and landscape elements important for biodiversity: a coarse filter.

Stand-level coarse filter: Particular habitat elements or landscape features are known or thought to contribute substantially to forest biodiversity. At the stand level, important habitat elements include live trees, snags, downed wood, deciduous trees, canopy cover and vertical and horizontal heterogeneity, shrub cover, herb-layer cover, and forest floor depth and composition (Thomas 1979, Hunter 1990). These elements are of direct importance to many vertebrates (Bunnell et al. 1998), and are often key factors for non-vertebrates that are

declining in managed forests (e.g., Berg et al. 1994, Frisvoll and Prestø 1997, Kaila et al. 1997). These attributes have been discussed at length by Bunnell et al 1998a,b, Franklin 1988, Hunter 1990, CSP 1995). Since most authors agree on the importance of leaving structure and the types of structure that need to be retained, interested readers are directed to those previous papers; the discussions will not be repeated here. The attributes of particular importance are those associated with older stands: large live trees, dead and dying trees, down wood, and intact forest floor. They are critical to provide habitat for a wide variety of wildlife in managed forests.

Forest-level coarse filter: Across forest landscapes several features are thought to be important to sustaining biodiversity. The most important of these are riparian habitats, areas of old forest, connectivity, edges and forest interior conditions (Rochelle et al. 1999). These features are more controversial than stand-level recommendations. Some are controversial because their effects on wildlife are uncertain (e.g. corridors). Others are accepted as important to wildlife (e.g., riparian areas), but application to forest management is unclear (e.g., what are appropriate protection measures?). Because of these issues, the forest-level coarse filter issues are outlined in more detail than the stand-level issues. In depth discussions can be found in Bunnell et al. 1998a,b; Hunter 1990, and Rochelle et al. 1999.

Riparian habitats: Riparian systems (waterbodies and their adjacent terrestrial environment) are dominant features of coastal watersheds and are important habitats for terrestrial and aquatic organisms. As well, many ecosystem functions such as dispersal, nutrient cycling, and trophic processes that influence fish habitat, centre on the riparian system. Although most vertebrates do not require riparian areas (Bunnell et al. 1998), many (about 70%) use these areas heavily for a variety of reasons. Riparian areas are usually productive, vegetatively diverse and structurally diverse, and as such they provide a wide variety of resources to wildlife. Deciduous trees and broadleaf shrubs are often abundant in riparian areas and account for some of the abundance of vertebrates found in riparian zones. These deciduous species also hold key roles in trophic pathways by providing inputs of litter and insects into streams to support aquatic invertebrates and vertebrates downstream. Some amphibians may spend as many as 5 years as larvae in small streams which are susceptible to changes in riparian vegetation. Riparian zones are often thought of as providing travel corridors, some species are restricted to movements in riparian zones (e.g., mink, river otter, beaver). There is growing evidence that many other species also move along streambanks. Although the requirement of riparian areas as corridors is not completely clear, it is likely that they play an important role. There is no evidence that riparian protection need be continuous to maintain water temperature or quality or to allow riparian zones to function as movement corridors. It is more important that riparian reserves follow topographic breaks and natural features than to force a buffer of a given width along the entire length of a stream.

Riparian areas can be dramatically affected by forestry activities, particularly roadbuilding. The FPC provides protection to salmon-bearing streams and their adjacent habitat. WFP is aware of the influences of small streams on the water quality of larger streams into which they feed. Road crossings at smaller streams should be monitored to note significant increases in sedimentation that may influence the waters downstream. A degree of protection can be accomplished through the placement of wildlife tree patches around headwater streams, avoidance of cross-stream yarding and retention of lesser vegetation.

Riparian areas are gradients between aquatic and terrestrial systems; the extent of the zone is therefore difficult to delineate. Narrow reserves appear to meet the objectives of maintaining stream integrity and water quality and may accommodate vascular plants

associated with the riparian zone, but not all birds or mammals are found in narrow buffers. This generality is supported by several authors (see Bunnell et al. 1998). That said, there are no universally appropriate buffer widths, but FPC standards for S1, S2 and S3 streams seem not a bad compromise.

As well as ensuring protection of small streams, riparian buffers should be afforded to wetlands and lakes even if they are less than 2 ha. Some wetland buffers can be accomplished using stand-level retention. Again there is no evidence that wetland buffers need be entire although it is the author's opinion that these buffers should include the majority of the perimeter.

Management questions as to how to design riparian reserves so that as much as possible can remain standing are being investigated. To *some extent*, blow down can provide important inputs of down wood to the site and provide inputs of large down wood to the stream, but the preferred approach is to find ways to keep the majority of the buffer standing.

Roads usually have greater impacts on riparian systems than harvesting because of increased sediment production and the potential for road-related slides. The increased sediment production is associated with overland flow from road surfaces, particularly when roads are under construction or in active use; with overland flow off cutslopes and fillslopes prior to their revegetation, and with concentrated flows along ditchlines that result from collected overland flows and intercepted subsurface flows. Consequently, roads in the riparian area should be avoided whenever possible. Midslope roads, when necessary, should be carefully engineered to allow natural flow of subsurface water.

One red-listed mammal, the Pacific Water Shrew, found within NVIR uses riparian areas. As well marbled murrelet (red listed), although not designated as a riparian associate, may well find nest platforms on old trees in these highly productive areas.

Old forest: Many attributes of old forests contribute to biodiversity. Some are structural elements such as large live trees, snags and down wood that can be retained during harvesting and so be present in managed stands. For example, broadleaved trees are sometimes found in old growth forests and can be maintained in managed stands, as can openings and some degree of structural heterogeneity (by thinnings and clumping of retention). Not all features of old growth can be retained or created in managed stands, and many of these features require old age to develop. Large trees are clearly dependent on age. Rough bark that supports overwintering insects that feed bark gleaners (e.g., brown creeper, woodpeckers, nuthatches, chickadees) also requires age to develop. The degree of rot in a tree, especially heart rot, is largely dependent on age. Hollow logs are created only from hollow trees (heartrot does not persist once a tree is down), and these hollow trees are critical habitat as dens for black bears. Large snags and large down wood only come from large trees. Depth of litter, growth of lichens, and epiphytes such as mosses and liverworts also require old age to accumulate.

Most research indicates that it is the amount of old forest habitat rather than its arrangement that is most important to several species (Bunnell 1999). Both red-listed birds are dependent on structures of old forest. For these red-listed vertebrates most of these structures can be retained in managed stands or in mixes of managed and old growth stands. For some non-vertebrates such as invertebrates, bryophytes, and lichens the degree of dependence on intact areas of old forest may be higher than for vertebrates. For these species for which there is little information it is prudent to reserve some areas of intact old growth as a conservative approach.

Several species listed in Table 2 are of concern because of their association with old trees, large down wood or cavities. These species include, but are not restricted to, merlin (especially the 'black' subspecies), bald eagle, osprey, golden eagle, wood duck, Barrow's goldeneye, common merganser, pileated woodpecker and Vaux's swift.

Forest edge and interior: Forests edges can be relatively long term features formed where two plant communities meet, or they can be relatively short term features formed where successional stages within plant communities come together. Conceptually, edges have environments significantly different from the interior of adjacent patches – different microclimate, vegetation, microclimate, and wildlife species, they are not simple linear features but rather regions of gradual change.

Forest practices, especially in even-aged management, create edges. There is tremendous variability in responses around edges, both for abiotic variables and biotic responses (Kremsater and Bunnell 1999). Findings from studies in a non-forested matrix (most of the current literature) do not transfer appropriately to conditions within an area of forest stands of different ages. Below is a summary of the major points regarding edge and interior from Kremsater and Bunnell (1999) and tentative recommendations derived from those.

- 1) Microclimatic edge effects are well documented, though highly variable in western, coastal forests. Microclimate changes near edges extend 1 to 3 tree heights into forests, depending on aspect and variable measured. Microclimatic effects appear to increase structural diversity of the vegetation near edges and increase vertebrate species richness, primarily in response to shrubby vegetation. Influences on invertebrates and insectivorous vertebrates are more direct. Although changes of microclimate variables are detectable over 150 m–200 m, responses of organisms studied to date are concentrated within the first 50 m.
- 2) There is little evidence of negative effects of edges in western coastal forests. Evidence for positive edge effects is similar in all studies (species richness generally increases with edge and more species are positively associated with edges than are negatively associated with edges). Evidence of negative edge effects differs starkly between eastern or mid-western North America and coastal montane forests. In the east and midwest many studies document increased predation and parasitism near edges; in the Pacific Northwest researchers have found little effect of patch area or negative edge effects. Parasitism by cowbirds in western forests is largely undocumented. Predation of marbled murrelet nests and songbird nests by jays and corvids has been observed around high-contrast edges. No species is consistently associated with forest interior. Table includes the species (e.g. brown creeper) most likely associated with forest interior for NVIR. Unfortunately, studies on bryophytes and lichens are lacking and these species may be the most sensitive to edges and interior. These groups should be the focus of further study.
- 3) The largest effect appears within 50 m of the edge. Reported edge effects range from 0 to several hundred meters into forests. Microclimatic effects generally extend about 1 to 3 tree heights into the forest, but edge influences on distributions of organisms or factors affecting organisms (such as predation and nest parasitism) are concentrated within 50 m of the edge. Effects have been reported as extending much farther, but these studies are usually either flawed or otherwise unconvincing (see Paton 1994 and Kremsater and Bunnell 1999). Effects of disturbance from road traffic can extend farther (e.g., 400 m on deer and elk, particularly where roadside cover is low).
- 4) The kinds of edge effects important to forest management in the Pacific Northwest are largely undocumented, and must be inferred. Most studies have focused on forest to field edges; fewer have examined forest to clearcut edges. All available data suggest

relatively little effect across forest age classes as compared to forest to field contrasts. The difference occurs simply because there is less difference in vertebrate communities between a clearcut and adjacent forest than between a field and adjacent wooded area. Also, unlike fields, clearcuts grow into taller second growth so the abrupt edge is transitory. Similarly, there are no applicable data on potential edge effects in the small openings induced by partial cutting, or on edges between old growth and second growth stands. Neither of these effects is likely to be large. Openings may be too small in the first instance; in both instances the structural contrasts are relatively small. It is these contrasts that appear most strongly associated with edge effects. Data on edges induced by roads and most inherent edges such as streams and wetlands are sparse. Most inherent edges around streams and wetlands contain a large deciduous component that appears to contribute to their greater vertebrate richness. The available evidence suggests that as with induced forest edges, the greatest effect around streams occurs within the first 50 m (e.g., Darveau 1995; Kinley and Newhouse 1997).

Although many of the above points suggest edge effects are not dramatic in western forests, that conclusion must be tempered. Studies on organisms most likely affected negatively by edges are sparse (e.g., lichens, bryophytes, invertebrates, and amphibians). As well, harvesting has a relatively recent history in western forests and edge effects may become more apparent with time. Known effects of road edges do apply in western forests and extend a considerable distance.

Small patches of old growth will provide habitat for many species. Patches that are 200 meters across will provide interior conditions for most organisms. Where retaining late successional or forest interior species is a dominant objective some large areas of old contiguous forest (>600 m diameter) should be retained. The value of 600 m is a conservative estimate that should allow for biological effects that are currently unknown.

Connectivity: It is clear that isolated populations undergo much higher rates of extinction than do those that experience immigration and emigration. Small populations are threatened by several events including inbreeding depression and chance environmental catastrophes. In eastern parts of United States where forests are surrounded by rural and suburban areas, there is growing and compelling evidence that forested strips (corridors) are a useful tool to link populations of vertebrates. In western forests the evidence is to the contrary. As yet forests in the west are not disconnected. Exceptions may be for large carnivores that typically range over large areas and are likely restricted in movement by human population expansion in the Okanagan valley, the Columbia River Valley and the east side of Vancouver Island. Crossing early seral habitats is only a problem for a few vertebrate species for a short time. Second growth does not seem to be a barrier to vertebrates.

Corridors may be useful for creatures besides vertebrates. But these smaller creatures may also benefit more from management that makes the harvested matrix more favourable. At present data are insufficient to evaluate whether forested corridors or matrix management are more useful approaches to maintain connectivity in forested landscapes. Landscape context can provide an initial guide. If areas have been largely converted to young seral stages, then connections of old forest habitat should use corridors. In areas where early seral habitat constitutes a small percent, and natural linkages still exist, then matrix management should be a priority. Where valley bottoms have been progressively logged, establishing streamside buffers of old forest (letting them grow) would be useful to establish future connections.

Roads: Roads have dramatic effects on wildlife. Direct mortality of large and small mammals can be significant in heavily roaded areas. Roads allow access for hunters and poachers. Roads also allow disturbance by traffic and by people; disturbance is a key factor affecting some species. Predation by natural predators may also concentrate along roads. Roads are also avenues for the transfer and spread of exotic species. Roads can facilitate movement of some species and impede others. They have been documented as barriers to invertebrates, small mammals, and, depending on the road size and use, to some larger furbearers and ungulates. Roadside seeding can provide forage that attracts bears, ungulates and small mammals.

A number of 'listed' species are sensitive to access. For these species-controlling access is the key conservation activity. Reducing the amount of roads and restricting the distribution of roads will affect poaching and hunting effort. Although not popular with recreationists, control of road access to key areas is prudent for management of some wildlife species. Forest practices influence the amount of road required. In areas with concentrations of species that are sensitive to access and disturbance, cutblocks and harvest patterns (green up) should be planned to minimize road densities.

A few species may be affected by booming ground operations: red-throated loon, Brandt's cormorant, Double-crested cormorant and Pelagic cormorant.

Actions for tactic 1: For NVIR, coarse filter management strategies have been set out in the Biodiversity Guidebook and Riparian Management guidebook. Direction can also be taken from documents written for other areas (e.g., CSP 1995; Bunnell et al. 1998a,b) provided that the recommendations are taken in context. Details from these documents should be considered and included during landscape planning. In general, the most important aspects of a coarse filter strategy for NVIR would be in order of importance 1) To ensure riparian protection of fish-bearing streams and ensure practices around smaller non-fish bearing streams do not impact water quality downstream; 2) To implement access control in areas where poaching of elk or bear occurs; 3) To implement stand level retention of structures characteristic of old forests; and 4) To summarize amounts and distribution of old growth remaining and then designate old growth areas that encompass key habitats, help build connectivity and forest interior, and provide representation of major ecosystem types (see next section).

Tactic 2. Ensuring representation of ecologically distinct habitat types across Western's tenure, to maintain lesser known species and ecological functions: a coarse filter.

Whereas the needs of most species will be accommodated by management of habitat structures and patterns (tactic 1), and others will be managed directly (tactic 3), some organisms may be closely tied to particular habitat types. Therefore, it is important that the range of habitat types be represented, to maintain the known or unknown species that are dependent on them. Representation can be of ecosystems or of forest ages.

"Representation" of forest ages means that the full natural range of seral stages and conditions should occur in an area. However, the main concern for biodiversity monitoring is for late seral stages, because management generally creates abundant early and mid-seral forest.

Representation of ecosystem types would ideally be based on habitat types that encompass the range of organisms in NVIR. Determining those habitat types would be a difficult, perhaps impossible empirical question that would require extensive geographic sampling of a wide range of organisms. Instead, representation should focus on ecosystems defined

according to the Biogeoclimatic Ecosystem Classification (BEC) system. BEC zones are the broadest classification unit, generally differentiated by the dominant climax forest tree species. Subzones within zones are distinguished by climatic differences, including temperature and moisture regimes. Subzone variants contain different plant communities within the same subzonal climate regime. Within variants, site series reflect different local soil moisture and productivity gradients. BEC zones clearly differ in their species composition, and subzones or variants undoubtedly contain unique organisms. It is less clear that each individual site series is distinct, but organisms do respond to the range of site series (e.g., organisms in xeric sites differ from those in subhydric sites).

Action for tactic 2: Planning of representation should be at the subzone or variant level, with some consideration given to broad groupings of site series (i.e., xeric, mesic, and hydric) represented within subzones. Some organisms have restricted ranges, so the geographic distribution of representative units also should be considered.

Tactic 3. Maintaining the distribution and abundance of known sensitive species in the main geographic areas of North Vancouver Island Region: a fine filter.

In British Columbia, wildlife species on the red list²⁷, blue list²⁸ and those discussed in the Identified Wildlife Strategy require specific attention during planning of forestry activities. Not all listed species inhabit NVIR; not all are affected by forestry practices; and not all are well enough known to allow more than cursory consideration during development of management plans. As well, available funds and time do not allow all species to be studied or monitored. We rank the red, blue and identified wildlife species in terms of priority for research, monitoring and management consideration. We also note species that may not be on any of those lists that may be useful foci for monitoring and management efforts.

We list vertebrate species that inhabit NVIR and indicate the status of each of those species (red listed, blue listed, identified wildlife, or significant for other reasons). For each listed species we discuss reasons for their listing. We also indicate which species are affected by forest practices and indicate the habitat elements or habitat patterns to which they are sensitive. The quality of information available differs markedly among species. When possible, we indicate the quality of information available. For those listed species affected by forest practices, we will indicate the priority for management consideration, research, and monitoring activities. As further information on each species becomes available the ranks will change -- the management priorities will need frequent updating and revisiting.

Red- and blue-listed in NVIR and affected by forest practices. The following paragraphs briefly outline the habitat requirements, potential threats, and any suggested management for the red- and blue-listed species (in taxonomic order) and identified wildlife that are associated with forests in NVIR. Table 1 summarizes the red/blue-listed and regionally significant species.

²⁷ Includes any indigenous species or subspecies (taxa) considered to be Extirpated, Endangered, or Threatened in British Columbia. Extirpated taxa no longer exist in the wild in British Columbia, but do occur elsewhere. Endangered taxa are facing imminent extirpation or extinction. Threatened taxa are likely to become endangered if limiting factors are not reversed. Red-listed taxa include those that have been, or are being, evaluated for these designations. B.C. Ministry of Environment Classification.

²⁸ Includes any indigenous species or subspecies (taxa) considered to be Vulnerable in British Columbia. Vulnerable taxa are of special concern because of characteristics that make them particularly sensitive to human activities or natural events. Blue-listed taxa are at risk, but are not Extirpated, Endangered or Threatened.

Table 1: Summary of red-listed, blue-listed, and Regionally Important Species

Red-Listed Species	
	Pacific water shrew Keen's long-eared myotis Northern goshawk Marbled murrelet
Blue-Listed Species	
	Ermine <i>anguinae</i> Vancouver Island wolverine Roosevelt elk Great blue heron Peregrine falcon <i>pealei</i> White-tailed ptarmigan Western screech owl <i>kennicottii saturatus</i> Northern pygmy owl <i>swarthy</i> Huttin's vireo Sandhill crane
Regionally Important Species	
	Black bear Black-tailed deer

Water shrew (*Sorex palustris brooksi*): Red listed and included in Identified Wildlife Management Strategy (IWMS). Not addressed by COSEWIC. Only the *brooksi* subspecies, confined to Vancouver Island, is red listed. The water shrew is limited to areas within a few metres of small fast flowing streams or along margins of wetlands. Their habitats range from valley bottoms to alpine areas. Under interim measures of the IWMS, 30 m on both sides of stream to a maximum of 18 ha along an occupied stream reach should be included in a WHA. The IWMS further specifies that WHAs along high suitability streams should include a 30 m core area and 45 m buffer. In the core areas there should be no roads, no recreation trails, and no salvage of timber. In the buffer, harvesting should maintain 80% of the original stand's basal area. Landscape guidelines recommend maintaining riparian linkages.

There is no information on population trends for this species, but numbers are probably declining due to habitat loss on eastside of Vancouver Island.

Implications to WFP's forest management: Water shrew is limited in distribution to Vancouver Island and may be found in both southern and northern areas of the island. The riparian protection suggested under the coarse filter management should suffice in providing habitat for this species.

Keen's long-eared myotis: Red listed and included in Identified Wildlife Management Strategy. Rated as vulnerable by COSEWIC. Little information is available about the basic biology of the solitary Keen's long-eared myotis. This bat may use tree cavities in mature or old growth forests for roosts. One has been found hibernating in a cave. No information is available on habitat needs, let alone on useful amounts of specific attributes to maintain.

The IWMS recommends protecting any known roost sites, protecting some old growth, and avoiding activity around caves that may be roost areas. Under interim measures of the IWMS, 12 ha or 200 m radius around hibernaculum should be protected.

Implications to WFP's forest management: Keen's long-eared myotis could inhabit NVIR. Sightings are so rare, and so little is known about the biology of this species, that the most

useful forest management strategies would be to buffer cave mouths, maintain a supply of snags and decadent trees, and protect some old growth. Most of these activities are undertaken during coarse filter management. Buffering cave mouths with a fringe of timber may be useful, but may be unnecessary – too little is known to assess the practice, but erring on the conservative side would suggest buffers be provided. The low abundance of this species makes it difficult to research or to monitor.

Ermine *anguinae*: Blue listed but not included in the Identified Wildlife Management Strategy. Not addressed by COSEWIC. This mustelid dens in burrows or hollow logs. Its range is restricted to Vancouver Island and Saltspring Island, although no recent records have been made on Saltspring. Fewer than 20 occurrences have been documented, so no data on population trends are available. These ermine have been photographed in settings laid for research on wolverine. Urban expansion is reducing their habitat. Effects of forestry are speculative: harvesting may reduce woody debris to unacceptable levels and alter forest understories in negative ways.

Implications to WFP forest management: The *anguinae* subspecies is only found on Vancouver Island. Historical records indicate ermine are present near Cape Scott, Port Hardy, and Quatsino (Materi et al. 1996 reported these records from Cowan and Guiget 1965). Cowan and Guiget (1965) also indicate records from other areas of Vancouver Island. Materi et al. (1996) reported no evidence of ermine in the TFL areas of northern Vancouver Island from trapping records from 1989 to 1994. The ermine's preference for woody debris and thick understories near water make it prudent to keep these attributes in managed forests.

Wolverine *vancouverensis*: Red-listed but not included in Identified Wildlife Management Strategy and not addressed by COSEWIC. The *vancouverensis* subspecies is found only on Vancouver Island. Few sightings have been recorded since the 1970s. This wolverine formerly ranged across Vancouver Island but now is restricted to inaccessible mid Island mountainous areas and the west coast. Only 4 sightings have been recorded since 1980.

Only 5 major field studies have been carried out on the wolverine in North America and none of these have been done in B.C. The wolverine is a solitary, wide-ranging species. Daily movements may exceed 30 km. They are extremely sensitive to human disturbance and abandon nests if disturbed. They are also reluctant to cross roads so transportation corridors are barriers to movement. The availability of prey is likely the key feature determining habitat preference. Wolverine prey on large and small herbivores and rely to an extent on carrion. Because of their sensitivity to human disturbance they may be threatened by increasing recreation activities at the high elevations where breeding occurs.

Implications to WFP forest management: Very few records exist. If any breeding occurrences are ever found in NVIR, then those areas should be protected from frequent high-elevation recreation activity. Access management to provide areas free from human disturbance and to reduce the extent of roaded areas is the most potentially useful management strategy for this species. Since prey include deer and elk, management for these ungulates may affect wolverine.

Roosevelt elk: Blue listed but not in Identified Wildlife Management Strategy. Not addressed by COSEWIC. Threats to Roosevelt elk include predation by wolves, poaching, and over-winter mortality. The potential negative effects of forest management is eliminating winter ranges and providing access for poachers (and predators). Elk requirements have been discussed at length by Nyberg and Janz (1990).

Implications to WFP forest management: Elk herds inhabit the Victoria and Stranby watersheds. A herd of up to 25 animals frequents the lower Waukwaas Creek watershed and some elk have been sighted in the Mahatta and Koprino watersheds at times. Campbell (1995) identified extensive areas of suitable elk habitat in the Waukwaas Creek area. Unsuccessful efforts to radio collar elk in this area has been attempted to determine the full range of habitat use. A model by Brunt is useful for identifying elk winter ranges and has been applied in the TFL. Protecting winter ranges and restricting access are the two most important management activities for WFP to undertake. A first step is to gather information on locations of elk herds.

Great blue heron: Blue listed but not included in Identified Wildlife Management Strategy. The coastal subspecies *Ardea herodias fannini* is designated as vulnerable by COSEWIC. The species is sensitive to environmental contaminants and human disturbance at colonies. The heron's range overlaps with heavily populated areas of the Georgia Depression.

During March to August activity near breeding colonies should be avoided. Breeding usually occurs between early April to early June. Colonies are usually located in cottonwood and alder trees so maintaining large deciduous trees is important. Herons may move colonies in response to predation. Providing a buffer of trees around colonies may be important to reduce predation.

Implications to WFP forest management: Although no breeding records are known for the area, nesting colonies are likely in NVIR.

Northern goshawk *laingi*: Red listed and included in the Identified Wildlife Management Strategy (IWMS). Listed by COSEWIC as vulnerable. The *laingi* subspecies is restricted in range to the Queen Charlotte Islands and Vancouver Island and breeds in low to mid elevation mature and old growth forests. It is red-listed because of expected impacts of logging of old growth. Models projecting population trends suggest that 40% of northern goshawk populations have been lost. The model is based on the assumption that old growth is required as nesting habitat. Other than the model projections, no information on population trends is available. These hawks are also sensitive to human disturbance at nest sites. Their prey base includes mostly birds (including blue grouse, woodpeckers, varied thrush) and some small mammals.

The mainland subspecies (*atricapillus*) is known to use many habitats from deciduous forests to man-influenced habitats. Sweden has large populations of goshawk in heavily harvested areas – they use buildings as nest sites and disturbance does not appear to be an issue. They do not frequent residential areas.

The IWMS suggests establishing a three-tiered WHA. The entire WHA should be 2400 ha and include nest areas, post fledging areas, and foraging areas. The post fledging area should be 240 ha and should include six 12 ha nest areas, one of these should be an active nest. The entire WHA should include as much area of large trees and >60% canopy closure as possible. Roads should not be built in the 12 ha nest area. No harvesting is allowed in the nest areas except to improve stand structure and that harvesting cannot be carried out during the breeding season (March 15 to September 1). In the WHA, harvesting should retain 20% old growth in closed canopy and 40% mature forest. The remaining 40% of the area should contain no more than 20% early seral conditions. Other recommendations include limiting hauling to not more than 3 consecutive days between March 15 and September 1 and minimizing road density. Interim measures for the IWS protect 12 ha or 200 m radius around nest site.

Implications to WFP forest management: Northern goshawk has been found near Cape Scott, the Quatse River, and Port Hardy (Materi et al. 1996). Ministry of Environment Lands and Parks have additional records that may include other areas of NVIR. A first step in determining how to manage for this species is to gather known nest locations for the area. Following IWS recommendations around nest sites is legislated. On other areas, maintaining seral distributions and maintaining a supply of large trees is important. Assessing the goshawk studies and up to date information for this species is also important for future decisions.

Peregrine falcon *pealei*: Blue listed but not included in Identified Wildlife Management Strategy. Designated by COSEWIC as vulnerable. This subspecies is not as affected by the pesticides DDT or DDE as *anatum* subspecies because of its more marine distribution. Its range is restricted to northern Vancouver Island and the Queen Charlotte Islands. Populations are low but stable and sensitive to declines in their colonial seabird prey base (e.g., ancient murrelet). These falcons nest on rocky ledges with overhanging vegetation. The primary management action is to locate and protect nesting habitat from disturbance.

Implications to WFP forest management: There are no breeding records from the TFL, but nearby occurrences are documented by Campbell et al. (1990). Four nests were located in Cape Scott, Scott Islands, and Brooks Peninsula.

White-tailed ptarmigan *saxatilis*: Blue listed but not in Identified Wildlife Management Strategy. Not addressed by COSEWIC. This species is restricted to Vancouver Island. Population trends are undetermined. Although it is known that white-tailed ptarmigan sometimes winter well below treeline (down to 500 m), it is not known if logging adjacent to its high elevation habitat affects the Ptarmigan.

Implications to WFP forest management: Management recommendations include leaving trees next to known breeding habitat for use as winter range. No breeding areas are known in NVIR.

Sandhill crane: Blue listed and included in Identified Wildlife Management Strategy (IWMS). Designated not at risk by COSEWIC. The sandhill crane nests in wetlands with heavy emergent vegetation (hardhack, sedges, bullrushes). Nesting areas tend to be >2 ha. This species may avoid wetlands with adjacent harvesting so buffers are useful but appropriate widths are as yet undetermined. Interim measures of the IWMS suggest 50 m around each nest site be protected (up to 0.8 ha). The IWMS requires that no roads be constructed during breeding season (early April to late August). As well, roads should be gated to limit recreation access during breeding season. Harvesting within 50 m of the wetland edge should retain at least 40% of codominant and dominant trees and as much of the understory as possible. Harvesting or salvage is not allowed during the breeding season. Major staging areas are not known but if located they would also benefit from protection with buffers.

Implications to WFP forest management: A record near the Cluxewe River estuary indicates the sandhill crane may breed in NVIR. Historical breeding areas included areas close to the Naka Creek, but no populations currently use that area. If breeding areas are discovered they should be buffered according to IWMS guidelines.

Marbled murrelet: Red listed and included in the Identified Wildlife Management Strategy (IWMS). Designated as threatened by COSEWIC. Marbled murrelets are the only alcids that nest on large branches of old trees. These murrelets do not make nests but rather lay

eggs on platforms, usually on branches that are greater than 15 cm diameter. The populations are assumed to be declining. Two counts, ten years apart, on the B.C. coast indicate that numbers may be dropping. Marbled murrelet are threatened by gill nets; conditions at sea, oil spills, and logging of old growth.

Under interim measures of the IWMS, 113 ha or 600 m around nest site should be protected. The IWMS is more conservative than the interim measures and suggests that WHAs should be minimally 200 ha and a minimum of 600 m width. Management guidelines within the WHA include not exposing more than 50% of WHA boundary to early seral conditions; not building roads through WHAs; protecting WHAs from fire; and encouraging development of structure in second growth. Harvesting activities adjacent to WHAs should be limited during nesting season, April 15 to September 15.

Implications to WFP forest management: During 1991 road and fixed station surveys for marbled murrelet occurred in 12 stations in NVIR. Murrelets were recorded at 10 of the 12 stations. Although detection frequencies were low relative to other areas on Vancouver Island, more than 50 detections occurred in the Teeta, Simpson and Cayeghle watersheds. WFP has a model that predicts suitable nesting habitat for marbled murrelet in the TFL. Ideally identification of nesting areas would be based on model results combined with surveys to locate nesting habitat by seeing nesting behaviour. Population trends should be tracked over time, the two years of data so far do not provide reliable trends.

Western screech owl *kennicottii saturatus*: Blue listed but not included in Identified Wildlife Strategy. Designated as 'indeterminate' by COSEWIC. Their range is limited mainly to southeastern Vancouver Island and the Gulf Islands. There is some debate to whether *saturatus* is really a different subspecies from *O.k. kennicottii*. The *saturatus* subspecies is threatened by expanding human settlement. Predation by barred owls and great horned owls has apparently increased in those areas and may also threaten populations. The western screech owl nests in cavities of trees or snags greater than 25 cm dbh, so maintaining supply of cavity sites is an important management tactic. Open deciduous or coniferous woodlands and riparian habitats are preferred areas for breeding. Most nests are found near water and none have been located above 540 m elevation.

Implications to WFP forest management: Campbell et al. (1990) report no breeding of western screech owls (of any subspecies) on northern Vancouver Island and no convincing records of occurrence of western screech owl on the Queen Charlotte Islands. They breed primarily on southern Vancouver Island and the southern mainland. Materi et al. (1996), however, reported that the *kennicotti* subspecies was found in Quatsino Sound area throughout the year and probably nests there. It is unlikely that the *saturatus* subspecies is on the tenure. Coarse filter approaches that maintain a supply of cavity sites and declining trees to provide future large cavity sites should provide adequate habitat for this species.

Northern pygmy owl *swarhi*: Blue listed but not included in Identified Wildlife Management Strategy. Not addressed by COSEWIC. This subspecies, found only on Vancouver Island, may not actually be different than the subspecies (*G. g. grinnelli*) on the mainland. Nests are in cavities in mixed coniferous woodlands. For the entire species, only 5 nests were located prior to 1990; all of these were in conifers in old woodpecker holes (Campbell et al. 1990). For the *swarhi* subspecies, all nests have been above 490 m elevation in woodpecker holes on southeast coast of Vancouver Island (Materi et al 1996). These owls seem to prefer to forage along edges. Deal and Lamont (in Materi et al 1996) noted that 28 of their 38 locations for this subspecies were below 500 m. They also noted preliminary indications of preference for old growth over second growth, preference for dry Coastal Western Hemlock

(CWH) compared to very wet CWH, and avoidance of the Mountain Hemlock Zone. Populations of this subspecies are thought to be declining but empirical data are lacking. They are threatened by loss of snags and maybe also declining due to predation by increasing barred owl populations.

Implications to WFP forest management: Northern pygmy owls may be found in NVIR. Maintaining cavity sites and providing for an ongoing supply of dead and declining trees will be important for this species. Recent studies should be examined for further information on preferred owl habitat. Until more is known, the coarse filter management tactics suggested here will likely provide sufficient habitat for these owls.

Hutton's vireo: Blue listed but not included in Identified Wildlife Management Strategy. Not addressed by COSEWIC. Hutton's vireo ranges throughout Vancouver Island and the mainland. It usually breeds below 250 m in mid- to late-successional forests that have thick understory vegetation. This vireo is a leaf gleaner and some populations in B.C. may be migratory. Populations are probably stable in the province and may be increasing globally, but trend data are sparse. Hutton's vireo will use 30-year-old second growth and are often present in small patches so it is likely not affected by fragmentation (but may be affected by habitat loss). It is unclear why this species is listed except that its basic biology is relatively unknown.

Implications to WFP forest management: Hutton's vireo is likely present in NVIR. No special management seems to be required to maintain habitat for this species.

Other species in the Identified Wildlife Management Strategy: The Identified Wildlife Management Strategy includes the Vaux's swift (which is not listed as red or blue). The swift likely occurs in NVIR but its breeding areas are poorly known. They are suspected of using old broken top or hollow top cedars for nesting sites. Of 13 nests found, 8 were in unused chimneys of vacant houses, 1 under a roof, and 2 in hollow bigleaf maple. It also roosts in chimneys and hollow trees. In natural setting hollow trees are important. This swift forages in open areas and over water but needs structure of big decadent hollow trees for roosting or nesting.

Other regionally significant wildlife: The red and blue listed species and species included in the Identified Wildlife Management Strategy are not the only species that may require individual attention in the management plan. Although concern for a wide range of species is becoming a high priority for many of the general public, a number of game species are still regionally important. Of those black-tailed deer and black bear warrant special management consideration. WFP has constructed habitat models for black bear and black-tailed deer.

Summary of fine filter approach for NVIR

The North Vancouver Region is home to two red-listed mammals. One needs riparian (water shrew) and one probably needs cavities (Keen's long-eared myotis). Because Keen's long-eared myotis are rare and their locations and habitat requirements unknown, the water shrew is the red-listed mammal that merits the most management attention. It is closely associated with riparian zones so riparian protection will be important for this species.

Two red-listed birds breed in NVIR, the northern goshawk *laingi* and the marbled murrelet. Both are associated with mature and old growth forests. Models that predict marbled murrelet nesting habitat have been developed and applied in the TFL, but nesting surveys

have not yet been done to further refine locations of useful Wildlife Habitat Areas for murrelet.

Three blue-listed mammals occur on this portion of the Island: ermine *anguinae*, Vancouver Island wolverine, and Roosevelt elk. Access control is key for the elk and wolverine. Riparian protection is also critical for elk winter ranges. Maintaining down wood is important for the ermine.

Seven blue-listed birds are likely found in this area of Vancouver Island (great blue heron, peregrine falcon *pealei*, White-tailed ptarmigan, Western screech owl *kennicottii saturatus*, northern pygmy owl *swarthi*, and Hutton's vireo). If nests sites are located for the falcon they need to be buffered from forestry activity and human disturbance. Similarly, the ptarmigan would benefit from a forested buffer near nest areas that would provide winter cover. The owls require cavities and the heron requires large live trees. Clearly retaining old structures is important for these species. The sandhill crane is associated with riparian areas. No management action likely is necessary for Hutton's vireo.

The unlisted black bear merits management attention. Models that predict black bear habitat have been developed for WFP. These should be assessed and refined. Bear dens should continue to be located and protected and a supply of large trees maintained for den recruitment.

Conclusion:

Attention should be directed not just at the fine filter species but also at monitoring how species are associated with various stand attributes. Thus considering the regionally important species, the species associated with large live trees, cavities, down wood, and forest interior, and species affected by booming is also important in developing plans and subsequent monitoring strategies.

In addition to maintaining the stand attributes, landscape elements, and habitats for specific species, management to retain wildlife and biological diversity must also ensure that the heterogeneity of forest stands and landscapes is not substantially reduced. No single management action will maintain diversity, because there are both species that benefit and species that suffer in every option. For example, green-tree retention can benefit some canopy-dwelling birds, but reduce shrub-nesting birds (Bunnell et al. 1998). Heterogeneity across a wide range of scales is therefore required (Bunnell and Huggard 1999).

For many habitat elements, the greatest effects of management will occur many decades, or even several rotations, after harvest. Downed wood, for example, may be abundant immediately after harvest, but will decline subsequently as it decays. Under some short-rotation management systems, downed wood may not be recruited prior to the next harvest, leading to severe depletion after several rotations (Angelstam 1997). Changes in landscape patterns also may not be apparent for many decades, nor can they be changed quickly (Wallin et al. 1994). Projecting the long-term effects of management actions on habitat and landscape element is therefore a requirement for planning to maintain forest biodiversity. Spatial models will be a useful tool to help assess impacts before they are expressed on the ground. These tools will be important in monitoring programs that are required to allow management to be adaptive and change as new information is gathered.

Native terrestrial forest-dwelling vertebrates potentially breeding within NVIR.

Table 2 indicates for all forest-dwelling vertebrates on northern Vancouver Island, their geographic distribution by biogeoclimatic zone, their association with various successional stages, their status in B.C (e.g., red or blue), their association with important stand attributes, and their association with landscape features such as edge, forest interior and riparian areas. For birds, the table also notes whether they are shrub nesters or neotropical migrants.

Table 2: NVIR Species List

Common Name ¹	CWH	MH	BC ³	T ³	Neo ⁴	Shr ⁵	G ⁶	E ⁶	M ⁶	L ⁶	Cav. ⁷	DW ⁷	Dec ⁸	Con ⁸	R ⁷	Edg ⁹	Int ¹⁰
Roughskin Newt	X	X					Y							Y	Y	Y	
Long-toed Salamander	X	X					Y								Y		
Northwestern Salamander	X	X					Y							Y	Y		
Clouded Salamander	X									Y		Y		Y			
Ensatina Salamander	X									Y		Y	Y		Y		Y
Western redback salamander	X						Y					Y					Y
Western Toad	X	X					Y										Y
Pacific Treefrog	X						Y										Y
Red-legged Frog	X	X								Y							
Northern Alligator Lizard	X	X						Y									Y
Common Garter Snake	X	X					Y								Y	Y	
Northwestern Garter Snake	X	X						Y							Y	Y	
Western Garter Snake	X	X						Y							Y	Y	
Great Blue Heron	X		B	B						Y			Y		Y		
Barrow's Goldeneye	X									Y	2		Y		Y		
Bufflehead	X									Y	2		Y		Y		
Canada goose	X						Y								Y		
Common Goldeneye	X									Y	2				Y		
Common Merganser	X						Y				2				Y		
Harlequin Duck	X						Y								Y		
Hooded Merganser	X									Y	2				Y		
Wood Duck	X									Y	2				Y		
Bald Eagle	X									Y					Y		
Cooper's Hawk	X				Y					Y			Y				
Golden Eagle	X									Y							
Northern Goshawk	X		R	R						Y				Y			
Osprey	X				Y					Y				Y	Y		
Red-tailed Hawk	X				Y					Y							R+
Sharp-shinned Hawk	X	X			Y	Y								Y			
American Kestrel	X				Y	Y					2						Y
Merlin	X									Y	2						
Peregrine Falcon	X		B	B	Y												
Blue Grouse	X	X						Y					O	Y			R+
Ruffed Grouse	X						Y						O	Y			R+
White-tailed Ptarmigan	X	X	B	B		Y									?		
Sandhill Crane			B	B		Y									Y		
Ancient Murrelet	X		B	B						Y							
Cassin's Auklet	X		B	B		Y											
Marbled Murrelet	X		R	R						Y				Y			
Rhinoceros Auklet	X						Y										



Common Name ¹	CWH	MH	BC ³	T ³	Neo ⁴	Shr ⁵	G ⁶	E ⁶	M ⁶	L ⁶	Cav. ⁷	DW ⁷	Dec ⁸	Con ⁸	R ⁷	Edg ⁹	Int ¹⁰
Band-tailed Pigeon	X						Y						Y				
Mourning Dove	X				Y			Y					Y			R+	
Barn Owl	X		B	B				Y				2					
Barred Owl	X	X								Y	2						Y
Great Horned Owl	X									Y				Y		R+	
Northern Pygmy-Owl	X	X	B	B						Y	2			Y	Y	Y	
Northern Saw-whet Owl	X	X	B	B						Y	2			Y			
Western Screech-Owl	X		B	B						Y	2		Y		Y	Y	
Common Nighthawk	X				Y			Y									
Vaux's Swift	X				Y					Y	2			Y			
Anna's Hummingbird	X				Y	M	Y						Y			R+	
Rufous Hummingbird	X	X			Y		Y								Y		
Downy Woodpecker	X									Y	1		Y			Y	
Hairy Woodpecker	X	X	B	B						Y	1			Y		Y	
Northern Flicker	X	X			Y		Y				1					Y	
Pileated Woodpecker	X	X								Y	1			Y			
Red-breasted Sapsucker	X	X			Y					Y	1		Y				
Dusky Flycatcher	X				Y	H		Y					Y		Y	Y	
Eastern Kingbird	X				Y	M		Y							Y	Y	
Hammond's Flycatcher	X	X			Y					Y				Y	Y	R+	
Least Flycatcher	X							Y									
Olive-sided Flycatcher	X	X			Y					Y				Y	Y	Y	
Pacific-slope Flycatcher	X	X			Y					Y	2		Y		Y		
Western Wood-pewee	X	X			Y		Y						Y		Y		
Willow Flycatcher	X				Y	H		Y					Y		Y	R+	
Purple Martin	X		R	R	Y		Y				2						
Tree Swallow	X	X			Y			Y			2						
Violet-green Swallow	X	X			Y			Y			2				Y	Y	
Clark's Nutcracker		X								Y							
Common Raven	X	X								Y							
Gray Jay	X	X								Y				Y			
Northwestern Crow	X						Y										
Steller's Jay	X	X	B	B						Y				Y			
Chestnut-backed Chickadee	X	X								Y	1						Y
Bushtit	X					M		Y					Y		Y		
Red-breasted Nuthatch	X	X								Y	1			Y			
Brown Creeper	X	X								Y	C			Y			Y
Bewick's Wren	X					S		Y								R+	
House Wren					Y			Y			2	O				R+	
Winter Wren	X	X					Y				O	O		Y			Y
American Dipper	X	X					Y								Y		
American Robin	X	X			Y		Y						Y			Y	
Golden-crowned Kinglet	X	X			Y					Y				Y			Y
Hermit Thrush	X	X			Y		Y							Y			Y
Ruby-crowned Kinglet [not confirmed]	X	X			Y					Y					Y		
Swainson's Thrush	X	X			Y	H	Y						Y		Y		
Townsend's Solitaire	X	X			Y		Y					O					Y
Varied Thrush	X	X								Y				Y			Y



Common Name ¹	CWH	MH	BC ³	T ³	Neo ⁴	Shr ⁵	G ⁶	E ⁶	M ⁶	L ⁶	Cav. ⁷	DW ⁷	Dec ⁸	Con ⁸	R ⁷	Edg ⁹	Int ¹⁰
Western Bluebird					Y		Y				2			Y			
Cedar Waxwing	X	X			Y		Y						Y				
Hutton's Vireo	X		B	B			Y								Y	R+	
Red-eyed Vireo	X				Y	H	Y						Y		Y		
Cassin's vireo	X	X				M	Y								Y		
Warbling Vireo	X	X			Y	M	Y						Y			Y	
Black-headed Grosbeak	X				Y	M			Y				Y				Y
Brown-headed Cowbird	X	X			Y		Y									Y	
Chipping Sparrow	X	X			Y		Y									Y	
Common Yellowthroat	X	X			Y	H		Y					Y		Y	Y	
Dark-eyed Junco	X	X				S	Y								Y		
Fox Sparrow	X	X			Y	M		Y							Y	R+	
Golden-crowned Sparrow	X	X						Y									R+
Lincoln's Sparrow	X	X			Y			Y					Y		Y	R+	
MacGillivray's Warbler	X	X			Y	H		Y					Y		Y	Y	
Northern Oriole	X				Y		Y						Y		Y		
Orange-crowned Warbler	X	X			Y	S		Y									R+
Spotted Towhee	X				Y	M		Y					Y			Y	
Townsend's Warbler	X	X			Y				Y					Y	Y		
Western Tanager	X	X			Y				Y					Y	Y		
White-crowned Sparrow	X	X			Y	M	Y									Y	
Wilson's Warbler	X	X			Y	S		Y					Y		Y	Y	
Yellow Warbler	X	X			Y	H		Y					Y		Y		
Yellow-rumped Warbler	X	X			Y		Y							Y	Y	R+	
Evening Grosbeak	X	X							Y					Y			
Pine Grosbeak	X	X	B	B					Y						Y		
Pine Siskin	X	X			Y		Y							Y			
Red Crossbill	X	X							Y					Y			
Dusky Shrew	X	X					Y					Y					
Vagrant Shrew	X	X					Y					Y	Y				R+
Water Shrew	X	X	R	R			Y					Y			Y		
Big Brown Bat	X	X					Y				2						
California Myotis	X	X					Y				2						
Keen's Long-eared Myotis	X	X	R	R					Y	2				Y	?		
Little Brown Myotis	X	X							Y	2			Y		Y	Y	
Long-legged Myotis	X	X							Y	2			Y				R+
Yuma Myotis	X	X							Y	2			Y		Y		
Townsend's Vole	X	X	R					Y				Y	Y				
Beaver	X	X					Y						Y		Y		
Deer Mouse	X	X					Y					Y				Y	
Red Squirrel	X	X							Y	2				Y			
Vancouver Island Marmot		X	R	R				Y									
Gray Wolf	X	X					Y										
Cougar	X	X					Y					Y		Y			
Ermine	X	X	R/B	R/B			Y					Y					
Marten	X	X							Y	2		Y		Y		Y	
Mink	X	X					Y					Y					
River Otter	X	X					Y				O	O			Y		

Common Name ¹	CWH	MH	BC ³	T ³	Neo ⁴	Shr ⁵	G ⁶	E ⁶	M ⁶	L ⁶	Cav. ⁷	DW ⁷	Dec ⁸	Con ⁸	R ⁷	Edg ⁹	Int ¹⁰
Wolverine	X	X	R/B	R/B						Y	O	O					
Raccoon	X						Y				O	O	Y				
Black Bear	X	X					Y				O	Y					Y
Black-tailed Deer	X	X					Y										Y
Roosevelt elk	X	X	B	B				Y									Y

¹ Species are ordered alphabetically by common name within families presented in conventional taxonomic order.

³ "BC" indicates species status in the province of British Columbia; "T" indicates species status in WFP's forest tenure; "R" denotes red listed;

"B", blue listed; as determined by the Conservation Data Centre from the B.C. Ministry of Environment; last updated December 1, 1998.

⁴ "Y" indicates species is a neotropical migrant; Carter and Barker (1993).

⁵ Shrub nester; "H" indicates high requirement of shrubs for nesting; "M" indicates medium requirement of shrubs for nesting Ehrlich et al. (1988); Campbell et al. (1990 a, b, 1997).

⁶ G=generalist species, showing little response to seral stage; species favored by particular seral stages are designated "E"(early), "M"(middle), and "L"(late).

⁷ "Cav" indicates cavity user (1=primary, 2=secondary, C=crevice or cave, O=opportunistic); DW" indicates down wood use for reproduction and/or feeding;

"R" represents riparian association. "Y" indicates habitat association. "?" indicates that habitat association is unknown or not strongly expressed.

Riparian associations are based on statistical tests of relative abundance.

⁸ Strongly associated with deciduous (Dec=Y) or coniferous (Con=Y) Hagar et al. (1995); Campbell et al. (1990 a, b, 1997);

⁹ "Edg" indicates use of edge environments. "Y" represents statistically documented preference; "R+" indicates anecdotal evidence without statistical support.

¹⁰ "Int" indicates forest-interior species. "Y" represents statistically documented avoidance of edge (Kremsater and Bunnell, 1998).

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Appendix XXIII

Statement of Management Objectives, Options and Procedures

**STATEMENT OF MANAGEMENT
OBJECTIVES, OPTIONS AND PROCEDURES
(SMOOP)**

for

**QUATSINO TREE FARM LICENCE 6
MANAGEMENT PLAN 9
(2000 – 2005)**

*Including public and private lands in the vicinity
of Port McNeill, Port Hardy, Port Alice,
Holberg, Winter Harbour, Quatsino
and Coal Harbour*

August 1999
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10.0 TFL 6 Background

10.1 History

Western Forest Product's Quatsino Tree Farm Licence 6 (TFL 6) is made up of two management areas located on northern Vancouver Island (see map). Block 1 is the largest management unit and includes watersheds that drain either into Quatsino Sound or the Pacific Ocean between Quatsino Sound and San Josef Bay. Block 2 includes watersheds that drain into Queen Charlotte Strait between Fort Rupert and Port McNeill.

Block 1 is the original TFL 6 area granted to Western's predecessor, British Columbia Pulp & Paper Company Limited as Quatsino Forest Management Licence 6 on October 26, 1950. Block 2 is the former Block 4 of Tree Farm Licence 25 which was granted to another predecessor company, Alaska Pine and Cellulose Limited, on May 21, 1958. On October 1, 1998 these two areas were consolidated into a new TFL 6 made up of Block 1 (former TFL 6) and Block 2 (former TFL 25 Block 4).

The Licence covers approximately 201 500 hectares. Just under 50% of the TFL's forested area is old growth. About 63,000 ha are classed as mature operable and 94,000 ha as immature operable for a total operable land base of approximately 157 000 ha (78% of total area).

In 1997 forestry and milling activities supported by logging in TFL 6 sustained more than 1200 direct jobs in coastal B.C.. Operations in TFL 6 are critical to the local economies of Port Alice, Winter Harbour, Holberg, Port McNeill, Coal Harbour and Port Hardy.

10.2 Special Management Zones

Approximately 10% of Tree Farm Licence 6 lies within two Special Management Zones: West Coast Nahwitti (SMZ 2) and Koprino (SMZ 4). While these SMZs have not been designated through the Vancouver Island Land-Use Plan, management within the proposed boundaries follows the spirit and intent of the SMZ designation. Management practices are guided by three documents: Planning Framework Statements for Vancouver Island's Special Management Zones (Nov. 1997), Resource Management Zones for Vancouver Island (Nov. 1997) and Low Intensity Areas for the Vancouver Island Region (Jan. 1995).

10.3 Protected Areas

The boundary of Tree Farm Licence 6 encompasses four Protected areas: Raft Cove Provincial Park, Marble River Protected Area, Quatsino Protected Area and Misty Lake Protected Area. All of these Parks and Protected Areas were created out of the TFL 6 landbase. Cape Scott Provincial Park, the recent Cape Scott Park extension and the Scott Islands Provincial Park are adjacent to the TFL. The total protected upland and foreshore area in these parks is approximately 31,000 ha.

10.4 Management Plan 8

Every five years a Tree Farm Licence holder is required to submit a new Management Plan to the Ministry of Forests for review and approval. The Management Plan must contain commitments to coordinate and integrate the harvesting of timber and the protection and management of other resource values in concurrence with the activities and broad objectives of the Ministry of Forests (MOF). Management Plan (MP 8) was approved by the Chief Forester on November 30, 1995 for the period December 1, 1995 to November 30, 2000.

10.5 Small Business Forest Enterprise Program

In 1995 an agreement was reached between the Ministry of Forests and Western Forest Products Limited, for WFP to relinquish Forest Licence AAC in the Strathcona Timber Supply Area and delete a small area from TFL 6. In return WFP received the volume in TFL 6 that had been allocated to the Small Business Forest Enterprise Program. This agreement simplified administration of TFL 6 and increased the employment security of WFP employees and contractors.

10.6 Statement of Management Objectives, Options and Procedures

The initial step in the preparation of a new Management Plan is the development of a draft Statement of Management Objectives, Options and Procedures more commonly referred to as a SMOOP. The draft SMOOP combines input from the Ministry of Forests and comments received from the public with the results of a corporate review of objectives, options and procedures.

The public process began in August 1998 with advertisements placed in the North Island Gazette. These ads requested public comment on WFP's TFL 6 performance to date under Management Plan 8 as well as the identification of issues relevant to the tenure. In addition to these ads, a total of 242 stakeholders were contacted directly by mail requesting input.

10.7 Management Performance

Western Forest Products Limited's history of good forest stewardship has established our capability to fulfill forest management objectives. TFL 6 has been in existence since 1950 and is in its fifth decade of operation. During this time WFP and its predecessors have responsibly managed the licence for its long term continuance. We are proud of the efforts of our employees and contractors in helping to sustain this important employment and crown revenue generating TFL.

The following accomplishments indicate the licensees willingness and ability to manage the more than 201 500 hectares of lands and forests in Tree Farm Licence 6 in cooperation with government agencies, its employees and the public.

Timber Harvesting

- In the 49 years since the TFL was issued, the licensee has harvested the available Allowable Annual Cut (AAC) in compliance with cut control regulations.
- Harvesting the timber profile has been achieved as directed by the Ministry of Forests.

- Compliance with contracting regulations has always been met.
- Management Plan 8 approved a partitioned AAC for helicopter volume (10 200 m3) and medium/low/very low ecosite volume (52 000m3). While the helicopter partition target has not been met due to date due to depressed markets, the low ecosite volume has been exceeded. Since December 1, 1995 WFP operations have performed as follows:

TFL 6 Summary of Partitioned AAC

Year	Helicopter m3	% of Target	Low Site m3	% of Target
1995/6	16,920	153%	246,844	438%
1997	0	0	136,688	264%
1998	0	0	122, 476	236%
To Date	16,920	54%	506,008	316%

Basic Silviculture

- Reforestation has kept pace with harvesting since the TFL was granted in 1950.
- The Licensee has logged just over 71 000 hectares.
- Over one third of the harvested area has been site prepared for reforestation.
- To the end of 1998, 37 000 000 trees have been planted on 40 000 hectares. The balance of the harvested area has been stocked naturally.
- The running balance of Not Satisfactorily Restocked (NSR) area represents less than two years of harvest. This is mostly comprised of recently harvested cutblocks.
- Since 1990, more than half of the planting stock has been selected for superior performance.
- More than 24 000 hectares of vegetation management have been completed to ensure young stands remain free growing.

Enhanced Silviculture

- A program to space young stands of hemlock, fir and other species within the TFL was initiated in 1965. More than 10 000 hectares have had stocking reduced to between 700 and 1 000 stems per hectare.
- Since 1984 pruning has been completed on 2 600 hectares of previously spaced stands.
- More than 6 000 hectares of second growth were fertilized in TFL 6 between 1986 and 1998.

First Nations

- WFP has implemented a policy of First Nations consultation and involvement in harvesting and silviculture activities.
- WFP has encouraged the Quatsino Band's development of a logging and silviculture capability. The Band holds a 30,000 m3 renewable logging contract and receives direct awarded silviculture contracts.
- WFP supports a Kwakiutl Band Forestry Coordinator and has encouraged the development of a Kwakiutl silviculture crew.

Community Involvement

- Forestry operations have sustained a stable TFL 6 work force. In 1997 101 000 person-days of direct employment, excluding manufacturing, were maintained. The Objectives and Strategies for Employment and Economic Opportunities (OSEEO) attached as Appendix I provides details.
- WFP has been a long time supporter of the communities of Port McNeill, Port Alice, Holberg and Winter Harbour. Other communities that are directly dependent on forestry operations in TFL 6 include Port Hardy, Coal Harbour and Quatsino.

- WFP holds numerous Open Houses each year to present its logging and silvicultural plans in communities near and within TFL 6. WFP staff are active on community boards and in local government.

Recreation

- WFP has established 12 recreation sites and 3 trails on both private and public land within the TFL. These sites are maintained at WFP's expense and are provided to the public at no charge. Some sites are over thirty years old. In 1997 we estimate there was more than 41 000 person-days of recreational use.
- WFP has presented a proposal for subzoning of Special Management Zone 2 that would create a coastal recreation and biodiversity reserve that would run from the mouth of Quatsino Sound to Cape Scott Provincial Park.
- A Recreation Inventory of TFL 6 was completed in 1990 and special studies are commissioned to guide future recreation developments.
- Each year hundreds of TFL visitors participate in guided tours to view harvesting and forestry activities.
- Numerous Provincial Parks or Protected Areas have been established on former TFL 6 lands with the involvement and cooperation of WFP. These include Raft Cove, Quatsino and Marble River Provincial Parks and the Misty Lake Protected Area. WFP works closely with BC Parks staff on issues related to these reserves as well as Cape Scott Provincial Park. WFP maintained roads on both Crown and private land provide access to these areas.

Research

- WFP maintains an active research program in TFL 6 with specific resources dedicated to research on regeneration problems, wildlife habitat, stream protection and other integrated resource issues.
- WFP has been a major sponsor of the Salal Cedar Hemlock Integrated Research Program (SCHIRP) which studies old growth ecosystems that are dominated by cedar and salal.
- The Licensee established the Lost Lake Seed Orchard in 1973 to provide genetically improved planting stock for reforestation in WFP's tenures. With the purchase of Pacific Forest Products in late 1997, the Lost Lake genetic program has been centralized at WFP's new Saanich Forestry Center. This centre concentrates on genetic improvement of western hemlock, western red cedar, yellow cedar and sitka spruce.

Fire Prevention and Forest Health

- There have only been minor forest health and protection issues over the history of TFL 6.
- The most visible damage has been cyclical infestations of black-headed budworm. This pest has caused significant defoliation but little tree mortality. WFP has cooperated in tests of biological control agents for this pest.
- The sitka spruce shoot weevil has seriously affected the range in which sitka spruce can be planted. This issue is being addressed through the Saanich Forestry Centre tree improvement program.
- The most serious abiotic forest health issue is windfall as wildfire is almost unknown. The licence has a history of catastrophic windfall (16 000 ha in 1906). The licensee will continue to explore local Best Management Practices that will recognize this abiotic issue.

11.0 COMMITMENTS

11.1 Licence Appurtenance Commitments

Tree Farm Licence 6 commitments are contained in both the original TFL 6 and TFL 25 documents. The original TFL 6 licence was issued in 1950 and replaced in 1980 and 1995. The following is a brief synopsis of TFL 6 commitments:

- **TFL 6 Agreement – October 26, 1950- BC Pulp & Paper Company** – Licensee will process 15,000,000 cubic feet of fiber suitable for pulp and paper production in the licensee's mills on Quatsino Sound.
- **TFL 6 Agreement – January 1, 1980 – Rayonier Canada (B.C.) Ltd** – No milling requirements. Minister requires a notice of mill closure or production curtailment that will last longer than 90 days.
- **TFL 6 Agreement – March 1, 1995 – Western Forest Products Limited** – Licensee to process licence or equivalent volume through owned or affiliated mills. Minister requires notice of mill closure or production curtailment that will last longer than 90 days.

Tree Farm Licence 25 was issued in 1958. The agreement was replaced in 1979 and again in 1989. Timber processing requirements are as follows:

- **TFL 25 Agreement – May 21, 1958 – Alaska Pine and Cellulose Limited** – Licensee will maintain manufacturing plants capable of using the allowable cut from the licence area.
- **TFL 25 Agreement – May 21, 1979 – Rayonier Canada (B.C.) Limited** – Timber processing facilities cannot be closed or capacity reduced without prior approval from the Minister.
- **TFL 25 Agreement – May 21, 1989 – Western Forest Products Limited** – The Minister requires three months notice of mill closure or a major reduction in mill capacity.

Performance

Through to the end of 1997, individual harvest volumes for TFL 6 and TFL 25 were within 5% of cut control target for the current five year period. The TFL 6 harvest volume since 1951 is within 1% of target. The TFL 25 harvest volume since 1958 is also within 1%.

TFL 6 produced 1.223 million m³ of logs in 1997. Seventy-nine percent was used in Doman or Western Pulp (WP) mills while the balance was traded. TFL 6 could provided 30% of the Port Alice mill pulp log needs.

TFL 25 produced 648,000 m³ of logs in 1997. Seventy-one percent was used in Doman or WP mills while the balance was traded. TFL 25 provided 5% of the Port Alice mill pulp log needs. The balance of the Port Alice mill's volume came from other WFP tenures and log purchases.

Overall, WFP tenures provided 70% of WP and Doman mill needs in 1997 (2.4 vs 3.4 million m³). Log sales of 545,000 m³ were off-set by 1.44 million m³ in purchases. Chip sales of

35,000 BDUs were off-set by purchases of 329,000 BDUs. The timber processing commitments contained within the TFL 6 agreement were met or exceeded through log and chip purchase.

11.2 Jobs and Timber Accord March 9, 1999 Operating Plan

Doman Industries committed to create 162 new jobs under the terms of the Jobs and Timber Accord. Since March 1996 104 of these jobs have been created. It is anticipated that by the conclusion of the accord in December 2001 an additional 80 to 90 jobs will have been created.

Since inception of the FRBC program Doman Industries has more than fulfilled the company's share of the new job target for the program.

Since inception of the JTA Operating Plan, Doman Industries has increased the volume used in the remanufacturing sector by making available close to 18% of Doman's AAC for value added processing.

11.3 Management Plan 8 Commitments

The Chief Forester's approval letter for Management Plan 8 identified seven items that were to be addressed during the Management Plan period. In addition, other items were identified in the Ministry pre-SMOOP review. These commitments have been addressed in earlier correspondence to the Ministry and where applicable have been noted in the draft SMOOP.

12.0 RESOURCE INVENTORIES

12.1 Inventory Overview

Approval letters for specific inventories are not always available, in part because of the age of the inventory work. Earlier inventory programs did not always require Ministry review and approval. Specific advance approval letters were not required where the results and methodology were subject to MOF scrutiny. Approval of previous Management Plans is taken to be tacit approval of the inventories used except where specific comments were made. We expect that as new inventories are completed, this issue will be addressed.

12.2 Forest Cover

The most recent field inventory was done between 1968 and 1970. Subsequently, this inventory has been updated to account for the area harvested and regenerated as well as other changes. This updated inventory was used for MP 8. Because of its age, it has no formal letter of approval. However at the time it was done, methodology followed MoF recommendations.

WFP has recently begun a new VRI project for TFL 6 that is planned for completion in 2001. Preliminary discussions with the MoF Region have been undertaken (May 11, 1999). Phase 1 will be carried out in 1999/2000 and Phase 2 in 2000/2001.

12.3 Ecosystems

An inventory completed by Dr. T. Lewis has been used as a guide for reforestation activities and site productivity since 1985.

The use of the ecological information for estimation of site productivity was raised as an issue in the approval of MP8. A project was undertaken by J. S. Thrower in 1996 to assess the validity of this approach. The report confirmed the approach used in MP 8. The average site index Thrower obtained was 0.3 m higher than that used in MP 8. A letter approving the Thrower report was received from A. Nussbaum of Research Branch on April 18, 1997. This letter confirmed that this approach was suitable for use in MP 9.

12.4 Riparian Classification

A comprehensive riparian inventory has not been completed for the entire TFL. However, operational stream inventories have been conducted since 1988 and a Resource Inventory Committee project is underway. These two sources will provide a great deal of site specific survey information for Management Plan use. WFP intends to utilize this detailed work in conjunction with GIS modeling to obtain an overall estimate of riparian classes for the TFL. This approach will be outlined in detail in the timber supply analysis information package.

12.5 Wildlife Habitat

Until recently wildlife inventories focused on only a handful of species. In the late 1970's and early 1980's fourteen deer winter range areas totaling 2040 ha were established in TFL 6. In 1998 the majority of these sites were grandfathered as Ungulate Winter Ranges. A regular inventory of eagle nests was also maintained for operational planning purposes.

As the interest in wildlife broadened, so did the inventory efforts. D. Blood & Associates completed a TFL 6 biodiversity overview in 1996. In 1998 and 1999 the fourteen deer winter ranges mentioned above as well as other potential wildlife habitat areas were evaluated to identify and classify potential habitat for ungulates as well as several other species. A final report will be available in mid-1999.

For purposes of MP 9, WFP intends to maintain a wildlife habitat commitment comparable to that used in MP 8.

12.6 Range

There is no range in the TFL.

12.7 Cultural Heritage Resources

WFP operations utilize an Archaeological Overview Assessment of the Port McNeill Forest District completed by I.R.Wilson and Associates in 1995 as well as site specific Archaeological Impact Assessments conducted by WFP funded consultants who work closely with the Quatsino and Kwakiutl Bands. In addition, there is information on file from the MOF, the Archaeology Branch and First Nations sources.

WFP supported FRBC funding of the Quatsino First Nation Traditional Use Study (TUS). We are currently in discussions with the Quatsino First Nation for access to the less sensitive portions of this Study. WFP also provided letters of support for the Galgalis Traditional Use Study that would have classified the traditional territory of the Kwakiutl First Nation. To date this study has not produced useable information.

12.8 Landscape

The TFL 6 Landscape Inventory was completed in 1994 to MOF standards. In early 1995, the unofficial designation of two Low Intensity Areas within the TFL required that the area of the original inventory be expanded to include portions of the LIAs not covered by the original work. This additional inventory work was completed in late 1995.

In late 1998 and early 1999 Western Forest Products and Ministry staff cooperated on a strategy to mitigate the impacts of visual restrictions on timber supply. Out of this strategy came the designation by the Port McNeill District Manager of "known" scenic areas.

The known scenic areas map was large scale and not suitable for operational planning. It is currently being reviewed and will be reproduced by the District. The final version of the known scenic areas map will be used for the MP timber supply analysis.

12.9 Terrain Stability

The terrain stability inventory for Block 1 was completed to MOF standards in 1995. The terrain stability inventory for Block 2 was completed in 1992 and updated to MOF standards in 1998 as directed by the Chief Forester in his review of TFL 25 Management Plan 8. This higher level inventory is supplemented by individual field terrain assessments.

12.10 Operability

The reclassification of TFL 6 operability was completed in early 1999. The methodology used was approved by the Port McNeill District on September 29, 1998. The final maps and report are complete and will be submitted to the Port McNeill District office.

12.11 Recreation

The TFL recreation inventory was completed in February 1990. Since 1990 access to the west coast has improved and WFP has developed additional recreation sites. However, the overall patterns of use and the types of use have not changed significantly. During the term of MP 9 WFP staff will review the current inventory with District staff and determine whether or not the expense of a new inventory is warranted.

12.12 Karst

A review of karst features was completed by P.Griffith for TFL 6 in 1979. This inventory was developed for forest management purposes and was not released to the public at the request of the BC Speleological Society. Since 1979, new karst features have been recorded and dealt with on an individual basis incorporating local users input and taking District direction.

13.0 MANAGEMENT OBJECTIVES

Western Forest Product's goal is to have forest operations and practices that are economically viable, environmentally appropriate and socially acceptable. The following objectives aim to achieve these three goals:

13.1 Timber Resource Management and Utilization Objectives

- Economically harvest the Licensee's portion of the basic TFL 6 AAC of approximately 1 476 758 m³ in accordance with the principles of Integrated Resource Management (IRM) and the Forest Practices Code. The Licensee's portion of the proposed AAC is about 1 464 264 m³. The Small Business Forest Enterprise Program AAC is about 13 242 m³.
- Develop and implement alternative harvest systems to utilize all levels of operability including a partitioned AAC of approximately 10 200 m³ for helicopter harvesting.
- Continue to harvest medium, low and very low ecosite lands so that the partitioned harvest AAC (52 000 m³) is met or exceeded.
- Explore the use of alternative silviculture systems. Areas where alternative systems may be employed are: older second growth stands scheduled for commercial thinning; high elevation montane stands where regeneration of *Abies* species has been difficult; riparian areas where other resource values outweigh timber values; wildlife areas where certain structural features need to be retained and finally visually sensitive areas.
- Maintain economically viable forestry and manufacturing operations based on optimum utilization of timber values through internal manufacture and trading of logs to gain the highest value and margin.
- Harvest the optimum quantity and quality of pulp and sawlogs from over mature, mature and rotation age timber stands within the constraints imposed by cut control regulations, approved harvesting plans, market demand and forest inventory profile.
- Optimize the opportunity to harvest special forest products generated through prime logging activities in the TFL.
- Commercial thinning trials conducted during the term of MP 8 were not encouraging from either an economic or forest health perspective. The partitioned AAC for commercial thinning (5,000 m³) will be explored but not implemented until suitable harvesting systems are developed and markets are favorable.
- Meet or exceed the requirements of the Timber Harvest Contracting Regulation.
- Manage developing immature stands with consideration for site productivity, ecosystem capability and species suitability for optimum volume production while ensuring a suitable mixture of sawlogs and pulplogs are produced.
- Refine the profile of the products to be produced in the yield analysis and Management Plan to guide long range planning.

13.2 Recreational Use and Visual Aesthetics Objectives

- Integration of TFL recreational plans with Ministry of Forests District plans, the Regional District of Mount Waddington, BC Parks and private operators. Provide recreational opportunities that compliment rather than compete with these other providers. WFP's focus will be on low maintenance access to natural features (i.e. West Coast recreational beaches).
- Maintain public access to WFP recreational sites and cooperate on access to provincial and private sites.
- Work with recreational license holders to ensure that recreational crown land use is coordinated with forest management.
- Maintain visual landscape quality by integrating landscape inventories and analysis with forest harvest planning.
- Integrate the recreation objectives of Special Management Zones (SMZ) and Protected Area (PAs) established under the Vancouver Island Land Use Plan (VILUP) into the recreation spectrum of the TFL.
- Manage the full spectrum of recreation opportunities based on the capability of the land base.
- Work with Ministry staff and cave/karst groups to ensure that forest management activities do not impact on significant cave/karst resources.
- Incorporate known scenic values into landscape level planning. Work with Ministry staff to mitigate the potential impact of landscape inventory restrictions on Timber Supply.
- Sustain the current 41 000 user days of recreation in the TFL.

13.3 Biological Diversity Objectives

- Maintain biological diversity at both a stand and landscape level.
- Stand level structure and biodiversity will be addressed through the retention of riparian reserves, wildlife tree patches and coarse woody debris where their respective retention can be expected to provide rotational value.
- Landscape level biodiversity will be maintained through the designation of Old Growth Management Areas, Wildlife Habitat Areas and other landscape level reserves. Guidance will be provided by integrating the Identified Wildlife Management Strategy with the Landscape Unit Planning Guidebook.
- Patch size distribution will be varied over time to meet Landscape Unit targets that match Natural Disturbance Type and Biogeoclimatic variant.

13.4 Fish and Wildlife Habitat Objectives

- Stream protection measures identified in the FPC Act and Regulations will be adhered to until Best Management Practices suited to TFL 6 biogeoclimatic conditions are developed and approved.
- WFP will cooperate in the collection of fish and wildlife resource information needed to develop Total Resource Plans for the licence area.
- Integrate wildlife objectives in forest management planning by implementing the Identified Wildlife Management Strategy and Landscape Unit Planning guidebooks and other proposals for maintaining biological diversity.
- Assess status of important wildlife species habitat through landscape level inventories, mapping and modeling projects.
- Protect important fish and wildlife habitat through referral of plans and consultation with the appropriate agencies, First Nations and interest groups. Continue operational updating of existing stream classification in TFL 6.
- Maintain the productive capability of streams for fisheries values by restoring or enhancing habitat through the Watershed Restoration Program.
- Cooperate with fishery and wildlife agencies in enhancement projects where opportunities exist. Current enhancement programs support the Cordy, Colonial and Marble River hatcheries.

13.5 Integration with Other Licence or Permit Holders

Trappers

Provide advance notice of potential development through the Ministry of Environment Lands and Parks to allow trapline interests to adjust their harvesting plans. MELP maintains a confidential list of trapline holders.

Guide Outfitters

- Provide advance notice of potential development through the Ministry of Environment Lands and Parks to allow guide outfitters to adjust their hunting and fishing plans. MELP maintains a confidential list of guide outfitters.

Recreational Licensees

- While no backcountry recreational licences have been issued in TFL 6, some future use can be expected. WFP will work with these commercial licence holders to ensure that public recreational opportunities are not compromised and their use is coordinated with forest management.

Other Forest Licensees

- Provide other forest licensees with data on WFP harvest plans in order to allow accurate presentation of adjacent development. Cooperate on the issuance of Road Use Permits and Road Use Agreements.

Other Users

- Other license or permit holders who may be affected by WFP operations (water licence, aquaculture, mineral, etc) will be provided with advance notice of development as required to ensure that their interests are recognized in operational plans.

13.6 Forest Fire Prevention Objectives

- Limit fire losses through active fire prevention and suppression activities.
- Use prescribed burning to meet site establishment goals as well as to address fuel hazard issues.
- Monitor forest resource losses from fire.

13.7 Forest Health Objectives

- Monitor forest health through periodic surveys.
- Use forest practices that will not make stands more susceptible to disease or insect attack.
- Protect and enhance the productivity of TFL 6 forest resources through management practices that minimize losses from insects, disease and other damaging agents including abiotic factors such as wind.
- Monitor forest resource losses from insects, disease and other damaging agents to ensure they are maintained at levels below socially and environmentally acceptable thresholds.
- Ensure forest health issues are managed in a manner that maintains, recovers or confirms the short and long term productivity of TFL 6 forests.
- Enhance the health of planted trees through genetic selection of parent trees exhibiting pest and disease resistance.

13.8 Basic Silviculture Objectives

- Meet or exceed basic silviculture obligations in accordance with the various Acts and Regulations.
- Explore “enhanced” basic silviculture opportunities at both the crop establishment and maintenance stages.
- Regenerate all harvested areas promptly with ecologically suitable species. Encourage natural regeneration and whenever possible utilize genetically improved planting stock.
- Use appropriate vegetation management strategies to ensure early free growing status and minimize the use of herbicides.

13.9 Enhanced Silviculture Objectives

- Fertilize new forests with the goal of enhancing second growth production.
- Provide stocking control or prune stands to meet social and other resource objectives.
- Continue drainage trials to explore opportunities to increase the productivity of wet sites.

13.10 Community and Employment Objectives

- Maintenance of communities economically dependent on TFL operations.
- Continue the WFP corporate commitment to sustaining employment and community stability subject to technological change and maintenance of AAC.

13.11 First Nations Objectives

- Formation of strategic alliances with First Nations interested in economic development for their communities and employment opportunities for their members through increased involvement in the Forest Industry.
- Accommodate aboriginal sustenance and traditional use activities.
- Continue to improve communication and consultation processes with First Nations. Develop strategies that protect First Nation's interests while allowing resource extraction.
- Expand First Nations involvement in cultural assessments, resource inventories, harvesting, silviculture and environmental restoration.

13.12 Soil and Water Objectives

- Maintain slope stability through use of overview terrain stability mapping and field terrain assessments to guide forest operations.
- Use forest practices that maintain or enhance the productivity of forest soils.
- Ensure that forest management activities recognize downstream water quality values including fish bearing waters, licenced use and other domestic use.

13.13 Cultural Objectives

- Protect cultural features considered significant by First Nations and non-First Nations communities.
- Support initiatives to establish and expand cultural inventories (i.e. Traditional Use Studies).
- Explore opportunities to showcase representative examples of cultural features in cooperation with First Nations and non-First Nations groups.

13.14 Road Access Objectives

- Risk manage the deactivation of roads no longer required for timber harvesting.
- Leave roads with low environmental risk open to 2WD and 4WD traffic to facilitate second growth management and provide other users with commercial and recreational access.
- Continue semi-permanent or permanent deactivation of roads that pose a significant environmental hazard.

13.15 Public Involvement Objectives

- Ensure public expectations for good forestry practices are met in the management of the TFL through comprehensive public review processes.
- Promote public understanding of forestry issues and practices by maintaining informational signs on the major public routes in TFL 6 and providing forestry tours during the peak summer visitor period.
- Continue involvement in local Resource Boards and Local Advisory Committees.

13.16 Environmental Monitoring, Awareness and Certification Objectives

- Monitor company compliance with environmental rules and regulations through a program of comprehensive internal forest practice and environmental audits.
- Promote employee and contractor commitment to WFP environmental policy through training programs for workers and the establishment of joint IWA/WFP Environmental Committees where appropriate.

- Continue to pursue domestic and international certification under the Forest Stewardship Council, Canadian Standards Association and the International Standards Organization.

13.17 Planning and Inventory Objectives

- Complete inventories of the resource information and mapping needed for preparation of Total Resource Plans.
- Identify and develop quantitative measures for resource inventories that will be needed over time to monitor and demonstrate compliance with the stated objectives.

13.18 Research Objectives

- Develop techniques that will optimize timber harvest levels while maintaining key environmental values.
- Develop enhanced silviculture techniques and strategies for regeneration of exceptional sites and minor species.
- Continue commitments to monitoring the Salal Cedar Hemlock Integrated Research Program (SCHIRP) research trials.

13.19 Botanical Product Objectives

- Encourage sustainable harvest of botanical products such as yew bark, salal, mushrooms, cedar oil and honey by working with local operators interested in entering these fields.

13.20 Customer Objectives

- Maintain market access for products through customer information programs related to WFP's management of TFL 6.
- Encourage and arrange tours of TFL 6 for customers to view forest operations and see sustainable forestry practices.

14.0 MANAGEMENT ISSUES & OPTIONS

14.1 Harvest Issues

TFL 6 Undercut – At the end of the current cut control period (1995-99) it is anticipated that 90% of the periodic AAC will have been harvested. This is within cut control requirements. Options available for utilizing the remaining volume are to:

- Allow this volume to return to the primary volume pool in order to marginally raise harvest rates in subsequent cut control periods.
- Assume that the 10% undercut will be harvested at a steady (+2%) rate in the subsequent five year cut control period.
- Assume that the 10% undercut will be harvested in first two years of the cut control period as outlined in the Jobs and Timber Accord.

Commercial Thinning – Between 1996 and 1998 a number of commercial thinning trials were conducted in hemlock stands in Block 2 of TFL 6. These trials were disappointing from both an economic and a forest health perspective. In spite of stronger hemlock markets than now being experienced, thinnings were uneconomic. In addition, the residual stand damage was considered unacceptable relative to WFP's extended rotation plans. Options:

- Drop commercial thinning as a silviculture treatment.
- Model for commercial thinning on suitable sites but don't implement operationally until the forest health and economic problems have been resolved.

Deciduous Conversion – No deciduous stands were harvested during the current Management Plan. There has been some interest in the small volume of alder found in TFL 6 from deciduous operators. Options:

- Maintain the status quo with deciduous volumes not contributing to the TFL AAC. Assume these areas will be converted to conifer or managed alder when adjacent conifer development is proposed.
- Determine a partitioned AAC for that portion of the deciduous inventory which is not environmentally restricted.

Small Business Program – Through volume trades and a deletion from the TFL, the Small Business Program has been significantly reduced in size. Options:

- Maintain the current SBFEP program within the TFL.
- Transfer additional area from the TFL into the Kingcome TSA to extinguish the SBFEP.
- Consider creation of a new First Nations Woodlot or Community Forest licence, to be technically managed by WFP that would utilize the SBFEP AAC.

Windfall – The forested area at risk to windthrow has been significantly increased by the spatial and riparian requirements of the Forest Practices Code. The areas at risk include cutblock edges, riparian zones and wildlife tree patches. If harvesting moves to more use of retention systems there will be more areas at risk. Options:

- Maintain the status quo. This will increase unsalvaged losses relative to historic values and potentially impact environmental values.
- Develop localized Best Management Practices that will minimize windthrow and windthrow impacts.

Regardless of the option chosen, work will continue on refining a methodology to determine the non-salvaged losses associated with windfall.

Stumpage Waterbedding – Low timber values combined with the present appraisal system make it very difficult to operate in some coastal areas during economic downturns. Opportunities may exist to allow tenures with higher timber values to “carry” these lower value areas during poor markets. This would benefit coastal communities. Options:

- Maintain status quo that will minimize economic activity in some coastal areas.
- Explore new appraisal policies that would allow a licensee to spread operating costs across a number of operations and tenures in order to maintain operations

14.2 Land

Vacant Crown Land Reversions – Most would agree that area based tenures have been the most successful licenses issued by the Crown due to the greater security provided for investment. Significant Vacant Crown Land areas still exist within the boundaries of TFL 6 that would be more efficiently managed by the licensee. Options:

- Maintain the status quo with isolated Crown lands being managed at a distance by the Crown.
- Add the reverted Timber Licenses found near Port Alice and Holberg Inlet to TFL 6 to allow local management.
- Add the Crown forest land associated with the BHP minesite on Rupert Inlet to TFL 6 once the environmental mitigation measures are complete. This site may be best suited to a rotation of hardwoods prior to establishing conifer stands.
- Add the Crown forest land associated with the former CFS San Josef townsite to TFL 6 once the DND responsibilities have been completed. This site may also be suited to a rotation of hardwoods prior to establishing conifer stands.

Management and Development of Recreation Sites – Over the past thirty years Western Forest Products has funded the development and maintenance of a dozen recreation areas and three additional trails within TFL 6. The majority of these sites were developed under the “umbrella” approval of the Tree Farm Licence and have not been officially designated as recreation areas. In 1999 the Ministry of Forests instituted a policy of charging fees for use of Crown land campgrounds. WFP refused to charge fees for sites the company had developed and maintained at our own cost. Options:

- Maintain status quo with WFP funding and managing existing recreation sites without charging user fees.
- Designate sites under Section 6 of the Forest Practices Code Act with the Ministry assuming responsibility for maintenance and collection of fees.
- Authorize site maintenance and construction under Section 102 of the FPC Act with WFP funding and managing site without charging user fees.

Acknowledgement of other Uses – The Crown has permitted members of the public to illegally establish recreation sites on Victoria Lake. It is time for this illegal use to be addressed. Options:

- Removal of trespass structures.
- Zoning of portions of the Victoria Lake Foreshore with a number of new lease lots setting a market price for trespass sites.
- Consider fee simple sales versus renewable leases.
- Covenants on the legitimized sites that will not encumber adjacent forest development.

14.3 Community Development

Port Alice Community Development – A number of communities are located within the boundaries of TFL 6. While the prime purpose a TFL lands is to produce a sustainable supply of forest products, it is recognized that a higher use of some forest land is for community development. In the case of Port Alice, there are few options remaining to expand the townsite or to provide locations for industrial use. WFP will be receptive to legitimate requests for forest land for community expansion or industrial sites to help diversify the Village economy.

Quatsino Sound Initiative - A fisheries initiative is being proposed to develop and manage wild finfish, farmed finfish and farmed shellfish within Quatsino Sound. WFP will cooperate with any initiatives that can help diversify the economy of Quatsino Sound without impacting on our forest management activities and the economic interests of our company, employees and contractors.

14.4 Public Access

Road Deactivation – Operational and Watershed Restoration road deactivation programs have expanded dramatically since 1994. Aggressive deactivation in the early years of the program resulted in many low risk roads becoming impassable to two wheel drive traffic. This has posed a problem for recreational and commercial users such as beekeepers and special forest products operators. This was raised as a public issue during the review of MP 8.

WFP maintains an “open road” policy and wherever possible tries to maintain access to popular public sites. WFP will continue to promote public access by working with Ministry of Forest staff to minimize deactivation of low risk road systems. Public consultation on deactivation plans will continue to be provided through WRP Access and Forest Development Plan reviews.

Quatsino Road Access – During the term of the next Management Plan forest roads originating from our Holberg Forest Operation will be developed behind the community of Quatsino. Quatsino currently has no road connection to other North Island communities. While WFP has no plans to link up Quatsino to our roads, we will be receptive to the wishes and desires of both the community and the Quatsino First Nation.

Access to Provincial Parks - Public access to the Marble River, Quatsino, Raft Cove and Cape Scott Provincial Parks requires the use of TFL forest roads. In the case of Raft Cove and Cape Scott Parks access is on private roads owned by WFP. BC Parks has not provided funding for public access and has depended on maintenance associated with timber harvesting as well as the good will of WFP. WFP will continue to maintain roads required for forest management purposes but will approach BC Parks for cost sharing of the maintenance of private roads not required for forest management purposes.

14.5 First Nations

First Nations Relations and Capacity Building – WFP is interested in maintaining good relations with First Nations. As a licence holder we believe the best approach is to build economic relationships with First Nations as well as help them build their capacity to deal with forest management issues. This policy will continue with the next Management Plan.

Douglas Treaty – The Kwakiutl First Nation is in discussions with the federal government on the Douglas Treaty. The Treaty area includes a significant portion of Block 2 of TFL 6 between Port Hardy and Port McNeill. WFP suspended harvesting in the Treaty area at the Kwakiutl's request in 1997 pending their discussion with the federal government. It is WFP's intention to deal with this issue outside of the Kwakiutl – federal government discussions and resume limited operations within the Douglas area.

14.6 Landscape Planning

Special Management Zones – The TFL contains the Koprino and the West Coast Nahwitti SMZs. While these zones have not been designated in a higher level plan both WFP and the respective agencies (Forests, Environment, Tourism) have been operating in the spirit and intent of the designation. The TSA analysis will be applying suitable constraints.

Identified Wildlife Management Strategy and Landscape Unit Planning – Both of these new policies are being introduced as this SMOOP is being advertised. The TSA will incorporate values as defined through these two processes.

Scenic Areas – A landscape inventory has been completed for the visible areas of TFL 6. The Ministry of Forests has also identified “known” scenic areas that cover a smaller area than our current analysis. The known scenic area map is being reviewed by Ministry staff. The revised map will be used in the TSA analysis.

14.7 Environment

Fisheries and Riparian Issues – Much of TFL 6 lies on subdued terrain with low gradient streams. These streams have high fisheries values. The provincial riparian management procedures do not adequately address the special environmental conditions found in those portions of the TFL which experience heavy winter storms. WFP will continue to explore alternative riparian management prescriptions that will protect riparian values and minimize windfall.

Biodiversity – WFP funded a biodiversity overview of TFL 6 in 1996 to investigate the current state of biological diversity and integrated resource management. Some of the recommendations from this report were incorporated into WFP operational planning guidelines. Recent government policy changes through the Identified Wildlife Management Strategy and the Landscape Unit Planning process have taken biodiversity management in a different direction than proposed in 1996. Management Plan 9 will incorporate the new biodiversity direction.

14.8 Silviculture

Western Forest Products has a local staff of sixteen foresters whose primary responsibility is to ensure that WFP silviculture responsibilities are met. Western Forest Products basic silviculture practices meet and in many cases exceed government requirements. WFP staff also implement an enhanced silviculture program that balances technical with social objectives. There are three outstanding silviculture issues:

Provincial versus localized standards – Until a TFL Management Plan is accepted as a higher level plan, there will conflict between localized and provincial standards. It is WFP’s intention to have the localized silviculture standards in MP 9 accepted as higher level plan objectives.

Technical versus social objectives – TFL 6 is a “mature” license with a relatively balanced age class distribution. Hemlock and cedar are the main second growth species. As a result ,there is little technical benefit from some socially preferred enhanced treatments such as juvenile spacing or pruning. On the other hand, the high proportion of salal dominated sites means that there are technically preferred treatments (fertilization) which do not have immediate social benefits.

Enhanced basic silviculture – Basic treatments could be “enhanced” in order to yield both social and technical benefits. However, this raises issues with government standards. In Management Plan 9 it is proposed to describe an enhanced basic program.

14.9 Customers

Customer confidence and certification – The international marketplace is becoming increasingly sophisticated. Forest companies must reduce or control costs but at the same time address environmental issues. Key to international market access will be the certification of WFP forest practices and products. Management Plan 9 will outline how WFP proposes to address both market access and certification issues.

15.0 TIMBER SUPPLY ANALYSIS

15.1 Timber Supply Analysis

The Timber Supply Analysis (TSA) to be undertaken will provide estimates of timber harvest levels over time that are a function of land base, timber volumes and growth rates as well as a number of constraints aimed at enhancing various non-timber aspects of the forest.

The TSA analysis provides the vehicle through which various scenarios are developed that integrate this information to assist decision makers in developing recommendations regarding setting an AAC for the TFL.

The timber supply analysis will be an exercise whereby resource inventory information, growth and yield information and harvest levels will be analyzed in a spatially explicit fashion incorporating constraints imposed by the Forest Practices code, to derive sustainable harvest levels.

We propose to use the model ATLAS developed at the University of British Columbia (UBC) to undertake a spatially explicit constrained modeling exercise. Although the analysis will concentrate on the TFL as a whole, we intend to examine individual operating areas within the TFL, which coincide with the major logging centres (Port McNeill, Holberg, and Jeune Landing).

These analyses will also address Resource Management Zones (RMZ) and Special Management Zones (SMZ) as currently identified in the Resource Management Zones for Vancouver Island report (November 1997) and the draft Vancouver Island Summary Land Use Plan (1999). As well, draft Landscape Units (LU) boundaries will be considered in the analysis. On these sub-area analyses, only the base case and the historical options will be evaluated.

An information package will be developed summarizing the supporting information for each analysis.

The structure of the process will be to establish a base case and through various sensitivity analyses establish the expected impacts of various management scenarios designed to meet specified goals.

15.2 Timber

15.2.1 Base Case

The base case will consist of the minimum requirements to meet the legislative requirement for forest management. The operable land base will represent the forest area accessible using conventional harvesting techniques. Constraints applied will represent Forest Practices Code legal requirements. Pure deciduous stands will be deleted and mixed deciduous-conifer stands will only contribute their estimated conifer component to the base case. Planting will be restricted to S3/S4, S13 and S1CH sites. This option will be taken to

represent the basic requirements of the Tree Farm licence and will be used as a basis for assessment of other options.

15.2.2 Historical Performance

This case represents the historical performance of the company during the last management period. As such, it provides a measure of the current management practices and serves as a basis for justification of future management options.

15.2.3 Other Resources

Timber supply is impacted by the needs of other non-timber resources. These other resources are factored into the analysis in two ways, through removal of areas from the operable forest landbase and through incorporation of temporal constraints on the harvest levels. The analyses done will incorporate both these features as aspects of the Forest Practices Code. The form and nature of these constraints will be examined in sensitivity analyses outlined in the following text.

15.3 Sensitivity Analyses

15.3.1 Landbase and Operability

A system of operability classification has been developed for TFL 6 that reflects harvest system, timber quality, terrain stability and economics. The landbase has been classified to reflect these various qualities. The purpose of the analyses is to quantify the impacts of considering the magnitude of the timber supply available under a range of economic conditions.

- i. Base case management practices, conventional operable landbase included.
- ii. Base case management practices, conventional and non-conventional areas included.
- iii. Base case management practices, conventional, non-conventional and economically marginal areas included.

The economic cycle cannot be predicted with an accuracy to permit rational scheduling of the economic viability of these options within a planning horizon of two hundred years. For this reason, it will be assumed that the harvest of the various classes of forest will be according to an unpredictable periodicity and that tiered quotas will be identified for lands classified as above. Harvests from these areas would be charged against the appropriate quota upon verification of areas cut in the various categories. Such an approach would allow flexibility in response to economic pressures. It is proposed that this analysis will replace the use of marginal sites as practiced in the previous Management Plan 8

15.3.2 Special Management Zones (SMZ)

Significant area within the TFL has been identified as SMZ. The base case will be run with a removal of constraints imposed by the SMZ to identify the impacts of these management units.

15.3.3 Volumes

Estimation of timber volumes is an area of uncertainty. Inventory confidence levels are normally at the 10 % level. Therefore, the volume assumptions for both mature (140 years +) and second growth categories will be varied by +/- 10%. Volumes for mature forest will be obtained from the inventory database. Volumes for second growth will be obtained from species volume functions that have been calibrated to the second growth resource. The basal area numbers collected by J. S. Thrower in a random sample of second growth in the TFL will provide an unbiased calibration tool. The consequences of error introduced by volume estimation will be to examine 4 options.

- a. Increase Mature Volume by 10% Second growth as in base case.
- b. Hold mature volume to base case. Increase second growth by 10 %
- c. Decrease mature volume 10%. Second growth as in base case.
- d. Hold mature volume to base case. Decrease second growth by 10%

Site Productivity - Site productivity will be assigned as site index at 50 years at 1.3m height (SI 50). The SI 50 will be assigned on the basis of the ecosystem classification and mapping available for the TFL. A study done by J .S. Thrower in 1996 has identified three productivity classes for the ecosystems of the TFL and assigned appropriate SI 50 values for each class by tree species. Site index variation of +/- 10% will be evaluated for the base case.

Harvest Age - Rate of volume production of a forest area reaches a maximum when the stand volume divided by the age reaches a maximum level (Maximum Mean Annual Increment or MMAI). However, this may not represent the most desirable rotation length since piece sizes may be too small resulting in higher processing costs. Also, requirements for wildlife may involve longer rotations. The effects of rate of return on forest investment, however, may create a need for shorter rotations. The effect of rotation length will be evaluated by evaluating two options:

- a. Assuming 45cm, 40 cm & 35 cm mean stand crop diameter for Good, Medium and Poor sites respectively.
- b. Assuming harvest at MMAI.

15.3.4 Green-Up and Adjacency

The green up height will be varied between 1m and 5m to assess the impact of increased time to green up. The limits that are used will vary in accordance with the visual classification status of the area. On Visually Classified areas, the percentage of area below Visually Effective Green-up (VEG) will be varied from lower to upper limits of recommended percentage area impacted. The analyses will be applied only on defined scenic areas as they are presently delineated with the understanding that the areas will be subject to change in the future.

15.3.5 Alternative Silviculture

Alternative silvicultural systems involving partial harvest offer a means of reducing adjacency and greenup constraints. Such systems may be applicable on windfirm sites with windfirm species. Candidate areas where Douglas-fir and western red cedar exist will have a form of retention harvesting applied. Other species such as western hemlock, sitka spruce and amabilis fir will only have limited areas available for alternative silviculture because of the high risk of windthrow. It is recognized that data are very limited for attempting such analyses and that only very general conclusions will be possible.

15.3.6 Deciduous Stands

The harvest from deciduous stands was raised as an issue in the pre-SMOOP comments. Two approaches will be used in addressing this question. Pure deciduous stands were excluded from the base case. Stands classed as deciduous-conifer had only the conifer volume component included. In the sensitivity analysis, the approaches to be evaluated are:

- a. All pure and mixed deciduous will be included and harvested at a short deciduous rotation length of about 50 years (i.e. stands will be managed as conversion opportunities).
- b. Alder stands will be logged in conjunction with ongoing development of maturing coniferous second growth matrix within which, pure and mixed stands of alder exist. This implies longer rotations based on coniferous species. It does not imply conversion activities.

15.3.7 Biodiversity Emphasis

The effect of the draft bio-diversity options will be evaluated. An initial condition will involve all units being classed as LOW. Subsequently, draft BEO's will be assigned to the appropriate areas and the analysis repeated to evaluate the impacts.

15.3.8 Alternative Harvest Flows

During the transition from mature forest to managed second growth based forest, a number of harvest flow options are available. Two approaches will be assessed:

- a. Even flow from present at long term level.
- b. Declining flow to long term level over different time periods. Rate not to exceed 10 % per decade.

15.3.9 Commercial Thinning

In the previous Timber Supply Analysis, the option of commercial thinning was examined. In TFL 25 Block 4 which was recently incorporated into TFL 6 as Block 2, a thinning component was identified. During the past 5 years, operational level programs in Block 2 were carried out. The results were not satisfactory, either from a delivered cost point of view or from the point of view of forest health. The results suggest that only a very limited number of sites may be suitable. As a result, only one analysis will be done which will only include the most accessible stands on level topography and well-drained soils. The approach will be to remove 30% of the basal area in stands between 40 and 70 years of age on medium or better sites.

15.3.10 Riparian Classification

Code parameters will be applied to all streams and a basic net-down of area to all streams will be generated using linear GIS overlays. S1 and S2 streams can be identified reasonably accurately and a buffer applied. However, S3 and S4 are less well known. Model watersheds will be used to generate an expected proportion between S3 and S4 and a weighted average buffer applied. The sensitivity analysis will involve only the S3 & S4 stream allowances. The base case percentage area split between these classes area will be adjusted upward 10% and downward 10%

15.3.11 Wildlife Habitat

Ungulate winter ranges totaling 2040 ha were identified in the last Management Plan. Since that time, 1390 ha have been grandfathered as Ungulate Winter Ranges. These areas have been field assessed by wildlife personnel as part of a TFL wide habitat classification project (Kremsater, 1999). A number of the grandfathered UWRs were found to be of low value with other non-identified areas receiving a higher rating. It is proposed that the spatial analysis recognize the grandfathered UWRs which have moderate or high ungulate ratings, but that more suitable habitat be proposed in place of lower value units. The intent would be that a total area equivalent or larger to the existing UWRs be retained for wildlife habitat for modeling purposes. As a sensitivity exercise, the total area will be increased and decreased by 10%. It will be assumed that marbled murrelet habitat needs are addressed through general Forest Practices Code requirements for biodiversity. No sensitivity will be done. Eagle nests have been mapped for the TFL and a standard buffer allowance will be made on this basis. No sensitivity will be done.

15.3.12 Non-recoverable Losses

A preliminary study has been done to identify losses associated with cut block edges where significant height differences exist. Where these edges are not associated with a riparian zone or a non-operable area, an allowance per km of edge will be made. This allowance will be varied +/- 10 % to evaluate the impact of an error in estimation.

15.3.13 Silvicultural Opportunities – Fertilization

Over a decade of research has identified significant productivity gains from fertilizing S1 CH ecosystems. This ecosystem occupies between 10 and 25% of the TFL. Productivity gains are based on both trial and operational monitoring data. To date several thousand hectares have been treated. The options to be evaluated will be, fertilization of all S1 CH areas harvested each year and half of all CH areas harvested each year. Volume gains will be set at 80% of trial results and 40% of trial results.

15.3.14 Pre-commercial thinning (PCT)

A substantial area of PCT has been carried out on the TFL. It is proposed to evaluate the impact of no further PCT, and maintaining the current level of PCT activity.

15.3.15 Genetic Stock

Current seed supply from company seed orchards amounts to over 80% of company planting needs. The gain to be expected from these orchards is low, averaging 5%. However, future planting with Douglas-fir, western hemlock and yellow cypress can be expected to reach 15 % in about ten years time. Gains with western red cedar and Sitka spruce will likely remain in the order of 2 to 3% for the foreseeable future while balsam will remain at zero.

The base case will assume zero gain for all species. It is proposed that gains for Douglas-fir, hemlock and cypress be factored in at 5% for plantations established during the next decade and at 15 % for those plantations established after that. Western red cedar and Sitka spruce will remain at 3 % and balsam at zero gains.

15.3.16 Planting Level

Currently, over 90 % of harvested area is planting within 3 years of harvest. It is proposed to reduce this percentage to 50 % as a sensitivity evaluation but only on non-S3/S4, S13 and S1CH sites.

The period of regeneration delay is currently estimated to be about 3 years. We propose to evaluate 3 year and 5 year regeneration delays to assess the impact of less intensive reforestation activity on base case activity where only planting of S3, S13 and S1CH sites is considered necessary.

15.3.17 Unconstrained Option

This option will run the base case with no constraints beyond operability.

15.4 Twenty Year Plan

The purpose of a twenty-year plan is to identify whether a harvest level set in the Management Plan is actually achievable on the ground. The existing spatial 5-year plan will be identified in the planning database and will provide the starting constraints for the 20-year plan. A simulated further 15 years will be generated subject to the constraints imposed by the Code and the subsequent spatial distribution of blocks assessed in terms of operational feasibility. In this way, the 20-year plan can be incorporated as an inherent component of the planning model.

15.5 Landscape Unit Planning

There are 6 landscape units within the TFL and 3 partial units that will be analyzed independently. The partial unit analysis will be done independent of other operators. We will observe constraints proportionally.

The LUP analysis will be run after a preferred option has been identified. This preferred option will be used for the LUP analysis

Because of past harvesting patterns and variation in impacts of constraints among sub-units, the sum of the harvest levels on the individual units may not add to the total obtained when treating the area as a whole. This difference will be identified if and when it occurs and a policy adopted towards dealing with the problem.

16.0 PUBLIC INVOLVEMENT AND REVIEW STRATEGY

Public involvement in TFL 6 management has been a standard practice for the past 20 years through public review of Management and Working Plans, operational plans and letters to the Company or media. As much of the TFL is Crown land, WFP welcomes public involvement in setting management objectives, goals and strategies for TFL 6 management. We are committed to addressing issues of public concern and meeting Ministry of Forests policies with respect to public involvement.

WFP maintains a stakeholder register for TFL 6. This list includes:

- Resource Agencies
- Trappers, Guide Outfitters, and other Licenced Resource Users
- First Nations
- Local Government and Boards
- Employees, Labour Unions, Contractors
- Conservation and Community Groups
- Members of the General Public
- Suppliers
- Forest Licensees
- Miscellaneous Forest Users

16.1 Pre SMOOP Public Review

In August 1998 letters were sent to the TFL 6 stakeholder list (over 242 individuals, organizations and agencies) requesting comments on the existing Management Plan and announcing the commencement of preparation of the SMOOP. Advertising also appeared in the North Island Gazette requesting public input.

No responses were received as a result of the initial stakeholder letter and one response dealing with road deactivation was received from the public advertising. The public comment was used to prepare the SMOOP drafts.

16.2 Draft SMOOP Public Review

In accordance with the revised Communications Plan for MP 9 the draft SMOOP was sent to all TFL 6 stakeholders for review and input. As well, advertising announcing the completion of the draft SMOOP and its availability for review at Ministry of Forests and Company Operations offices was inserted in the North Island Gazette. In addition, the draft SMOOP was made available on the WFP website and 50 downloads recorded.

The letter accompanying the draft SMOOP included a commitment that Company staff will be available to make individual presentations to any person or group requesting such a meeting. Only one individual did so. All input received as part of the draft SMOOP review period was summarized and considered in the revision of the draft SMOOP.

16.3 Review of Draft Management Plan

Refer to Appendix in the TFL 6 – Draft Management Plan.

Appendix XXIV
**Statement of Objectives for Employment and
Economic Opportunity**

Objectives and Strategies for Employment and Economic Opportunities (OSEEO)

1.0 Objectives

Western Forest Products Limited is committed to maintaining and wherever possible enhancing employment opportunities and economic development. To do so is of benefit to WFP as well as everyone who has an interest in seeing our operations succeed. These stakeholders include communities, our employees, the contracting industry, First Nations, shareholders, suppliers, our customers and the Crown. In order to maintain and enhance employment and economic opportunities it will be necessary to ensure that our operations are economically viable, environmentally appropriate and socially acceptable.

2.0 Strategies

To date Western Forest Products strategies to enhance employment and economic opportunities has focused on the following opportunities:

Strategic Acquisitions

In December 1997, Doman Industries purchased the Crown Operations of Pacific Forest Products Limited. This acquisition, renamed Doman-Western Lumber Ltd., provided new assets that complemented existing tenures and conversion facilities. The purchase established Western Forest Products as the second largest licensee on the BC coast.

Maintenance of Access to Fibre Supplies

WFP tenures do not supply sufficient fibre to support all of the Doman and Western Pulp mills. As a result WFP has to purchase or trade for a significant volume on the Vancouver log market each year. In 1999 we purchased 1.5 million m³ of logs and 222,000 BDU of chips.

The Doman-Western acquisition significantly expanded the company's tenures and fibre supply from 2.5 million cubic meters to 4.2 million cubic meters. While this lessened our dependency on external fibre supplies we still have to purchase or trade for significant volume.

Pursuit of Production Efficiencies and Economies of Scale

The acquisition of Doman-Western significantly expanded our lumber business and enhanced our position as a major coastal producer of premium wood products. The increased size, marketing resources, production capacity, purchasing leverage and product offerings will create many opportunities for synergies that should result in lower costs through production efficiencies and economies of scale.

Achieving production efficiencies will be vital to our success as several portions of our business are in commodity items where competition revolves around price. Through optimal log allocations and utilization, WFP intends to improve product values and enhance lumber recoveries.

Development of Niche Markets

Western Forest Products is involved in niche markets for dissolving chemical pulp and western red cedar.

The Port Alice dissolving sulphite pulp mill is one of only two such mills in Canada and the only one in British Columbia. The mill is currently being upgraded to further specialize its production into higher value-added grades of dissolving sulphite pulp.

Approximately one-quarter of WFP's forest inventory is made up of western red cedar. The purchase of Pacific Forest Products increased the supply of cedar logs available to Doman mills as PFP had formerly sold or traded away cedar volumes. WFP mills now produce 20% of the coastal supply of this specialty product. Red cedar continues to be in demand and will be a marketing focus for WFP.

Administrative Efficiencies

WFP operations are constantly looking for opportunities to introduce administrative efficiencies. In 1998 many operational functions, formerly centralized at WFP's corporate office in Vancouver were moved to three Regional offices.

Other administrative efficiencies were obtained through a consolidation of various Tree Farm Licences. As part of this consolidation, WFP Tree Farm Licences in the Port McNeill Forest District were consolidated into a single licence (TFL 6). This consolidation did not change WFP's harvest volume within the Port McNeill Forest District. However, it increased the TFL 6 annual allowable cut available to WFP for administrative purposes from a pre-amalgamation total of 1 187 380 m³ to a post amalgamation total of 1 464 264 m³.

Certification of WFP Woodlands

Today's buyers and customers want assurances that forest products are produced from sustainable, well managed forests. WFP sees independent certification of our woodlands as the key to providing that assurance. In 1998 WFP became the first BC company to apply for certification through the Forest Stewardship Council (FSC). To compliment the FSC certification we are also pursuing ISO 14001 registration of the company's forest management systems and certification under the Canadian Standards Association (CSA) Sustainable Forest Management system.

Future Plans

The present state of the economy has placed restraints on strategic plans. There are no plans to permanently shut down any of the Company's manufacturing plants. Assuming that an adequate supply of fibre is available at reasonable cost, it is planned to return to production rates in place prior to the current economic downturn. Plants will be upgraded as required to ensure that they maintain efficient production.

Plans to expand the production of value added products have been put on hold. The projects on hold include the value-added plant proposed for Tahsis and the second stage of the Chemainus value added plant. Both of these projects which could create up to 24 new jobs at Tahsis and 40 at Chemainus will be re-evaluated once the economy rebounds.

The \$24 million upgrade of Western Pulp's Port Alice mill which began in 1998 was completed in 1999. The mill improvements should allow the production of higher value products at reduced cost.

3.0 Manufacturing TFL 6 Volume

The Doman Industries Limited group of companies include Western Forest Products and Western Pulp as wholly owned subsidiaries. In 1998 Doman Industries curtailed both harvest and manufacturing operations by approximately 40% in response to the collapse of Pacific Rim markets and constraints place on BC manufacturers by the Softwood agreement.

Doman Industries operates nine sawmills located in Ladysmith, Nanaimo, Tahsis, Vancouver, Cowichan Bay and Chemainus. These mills can run two shifts per day and process 17,100 m³ of logs which equates to 4.1 million m³ annually.

Each of the sawmills use computer controlled equipment to optimize the lumber recover from each log. The Company's high quality timber supply and particular design of the sawmills enable it to efficiently produce speciality products such as upper grade lumber, lumber with long lengths (over 20 feet) and lumber with wide widths (over 10 inches). These mills produce approximately 1 billion board feet of lumber in a normal market year. In 1999 approximately 928,000 m³ of TFL 6 sawlogs were directed to these mills.

Doman Industries also operates a log-merchandizer at Duke Point. This mill runs two shifts in a normal year and uses 1,300 m³ per day of low grade logs. The merchandizer extracts lumber from pulp grade logs and processes the balance into wood chips. This mill produces approximately 84 million board feet of lumber per year and 186,000 BDU of chips. These chips are shipped to Western Pulp's Squamish mill. Most of the TFL 6 pulp log supply goes directly to the Port Alice mill so little TFL 6 fibre passes through the merchandizer.

Western Pulp operates two pulp mills on the BC coast. When operating at capacity the dissolving pulp mill near Port Alice requires 468,000 BDUs of chips (936,000 m³ of logs) annually. The NBSK pulp mill near Squamish uses 740,000 BDUs of pulp chips (1,480,000 m³) of logs annually. In 1999 TFL 6 produced 263,000 m³ of pulp logs for Port Alice and sawmills utilizing TFL 6 logs sent approximately 82,000 BDUs of chips to Squamish.

A value added manufacturing plant at Chemainus operates a single shift per day. This processing centre has an annual production and drying capacity of 60-80 million board feet of lumber. The plant remanufactures lower grade lumber received from Doman's Ladysmith, Nanaimo, Tahsis, Duke Point and Vancouver divisions. It also dries, cuts, resaws and trims other lumber into various grades and dimensions. This lumber is primarily used in the manufacturing of moulding, panelling, and door and window frames. An additional 100 million board feet of lumber are sold each year to remanufacturing operations.

In 1999 88% of the TFL 6 log volume went directly to Western Pulp or Doman Industries mills. The balance was traded for species and grades more suited to our mills. A proportion of the volume was also made available to local operators on the North Island.

Log flow varies with the market demand for certain species and grades. In 1998 for example, the collapse of the Asian market required diverting log flows to mills better suited to produce for the North American and European markets. The OSEEO information is a snapshot in time of TFL 6 woodflow.

Table 1 summarizes the processing of TFL 6 volume in 1999.

Table 1 Processing of 1999 TFL 6 Volume

Facility	Consumption (000 m ³)	TFL 6 Volume (000 m ³)	Chip Production (000 BDU)	Proportion Mill Consumption
Nanaimo Duke Point Sawmill	294	460*	44	100%
Ladysmith Sawmill Division	353	237	0	67%
Cowichan Sawmill Division	248	33	0	13%
Vancouver Silvertree Sawmill	293	143	22	49%
Tahsis Sawmill Division	328	50	8	15%
Nanaimo Sawmill Division	478	5	1	1%
Nanaimo Duke Point Log Merchandizer	774	16	7	2%
Port Alice Specialty Pulp Mill	568	263	0	46%
Trades		169		
TOTAL (000m3)		916	82**	

* 183,000 m³ of logs were in inventory at the end of 1999

** 82,000 BDU equated to 11.2% of Squamish pulp mill fibre needs in 1999.

4.0 Employment Associated with TFL 6

4.1 Direct Employment

It is estimated that the post-amalgamation TFL 6 volume will support 1,246 direct harvesting and manufacturing jobs. These are primary jobs associated with forest management or manufacturing and based at a forest operation, dryland sort, processing plant or administrative office. The only exception is employment associated with log towing or barging.

The data collected for the OSEEO includes Western Forest Products Limited employment, contract logging and silviculture employment, a proportionate number of Doman Industry positions and a proportionate number of Western Pulp positions dependant on TFL 6 volume.

In 1999 88% of the TFL 6 volume was processed by Doman or Western Pulp mills so no manufacturing labour was associated with 12% of the produced volume. The manufacturing employment figures have been adjusted upwards in the OSEEO to account for this.

Table 2 presents direct employment associated with TFL 6 volume.

Table 2 Direct Employment by Category and Location

Category	Location	FTE	FTE Subtotal
Administration	Port McNeill	7	
	Duncan	23	
	Vancouver	26	56
Silviculture	Holberg	50	
	Jeune Landing	29	
	Port McNeill	52	131
Road Construction	Holberg	34	
	Jeune Landing	11	
	Port McNeill	15	60
Harvesting	Holberg	88	
	Jeune Landing/QDLS	135	
	Port McNeill	87	309
Inventory & Planning	Vancouver	4	
	North Island	2	6
Log Transportation	Vancouver	27	27
Timber Processing	Cowichan	31	
	Ladysmith	30	
	Nanaimo	87	
	Port Alice	167	
	Vancouver	87	
	Squamish	41	
	TFL 25(4) Additive	97	
	Trade Additive	117	657
Total Direct Employment			1246

Both local and distant communities benefit from this direct employment. As would be expected, the majority of the direct harvest and forest management employment is in communities near TFL 6. However, manufacturing employment is split relatively equally between the North Island, the balance of Vancouver Island and the Lower Mainland. Table 3 provides a breakdown of direct employment based on employee residence. As the two manufacturing employment additives are not tied to specific employees they are not applied to a specific region.

Table 3 Direct Employment Summary by Community and Region
Based on Residence

Category	Location	FTE	Total FTE		
North Island	Alert Bay	1	580		
	Coal Harbour	22			
	Holberg	38			
	Port Alice	233			
	Port Hardy	119			
	Port McNeill	162			
	Quatsino	3			
	Winter Harbour	1			
	Central and South Island	Black Creek		1	206
Campbell River		5			
Comox		4			
Courtenay		10			
Cowichan		31			
Duncan		25			
Fanny Bay		1			
Ladysmith		32			
Monte Creek		1			
Nanaimo		86			
Parksville		1			
Port Alberni		6			
Qualicum		2			
Victoria		1			
Mainland		Abbotsford	2	227	
		Burnaby	2		
	Delta	2			
	North Van	7			
	Richmond	2			
	Sechelt	1			
	Squamish	50			
	Surrey	11			
	Vancouver	145			
Whistler	5				
Manufacturing Additives Unknown Origin			233		
Total Direct Employment			1246		

4.2 Indirect Employment

The direct employment described in section 4.1 induces further indirect employment. It is generally agreed that each direct Forest Industry job supports two indirect positions. The 1 246 direct jobs described for TFL 6 will induce an additional 2 492 jobs in the economy for a total employment figure of 3 738.

4.3 First Nations

The majority of the area of TFL 6 lies within the traditional territories of three First Nations. The Quatsino First Nation's traditional territory includes Block 1 and the portion of Block 2 that flows into Quatsino Sound. The Kwakiutl First Nation's traditional territory includes the portion of Block 2 which drains into Queen Charlotte Strait. The Tlatlasikwala First Nation's traditional territory includes the portion of Block 1 that drains into the San Josef watershed.

Western Forest Products recognizes the importance of close ties with First Nations communities and appreciates that First Nations people want a greater share of the economic benefits accruing from resource development.

Western Forest Products is committed to:

- Strengthening relationships with First Nations.
- Ensuring aboriginal rights are protected.
- Developing an ongoing business relationship with Band Councils.
- Entering into arrangements with Band Councils for job training and capacity building.
- Providing permanent employment opportunities for First Nations members.

To this end Western Forest Products will continue to support existing initiatives such as the Quatsino Forestry Company harvest agreement, silviculture initiatives involving both Quatsino and Kwakiutl Band members and capacity building initiatives.

While WFP does not record our employees racial background, we believe we have approximately 25 First Nations members employed in forest management within TFL 6.