

MANAGEMENT PLAN NO. 8
1995 - 1999

Tree Farm Licence 19

September 1995

PREAMBLE

Management Plan 8 has been duly prepared and submitted to fulfil the licensee's obligation under section 2 of the tree farm licence agreement and according to the conditions stipulated by the chief forester of British Columbia.

The management plan was prepared by Pacific Forest Products Limited, Gold River. Sterling Wood Group Inc., forestry consultants, undertook the timber supply analysis and assisted in the plan preparation. Personnel who made significant contributions towards completing the plan were L.A. Henkelman, MF, RPF; B. McCutcheon RPF; R.G. Fraser, MPM, RPF; H.J. Sutcliffe, RPF, PEng; S.M. Smith, PhD, RPF; S.J. Macpherson, RPF.

Professional Forester certification

I certify that this work fulfils accepted standards and that I did personally supervise the work.

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Date

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1.0 INTRODUCTION

Tree Farm Licence (TFL) 19 was originally awarded in 1954 to Tahsis Company Ltd. A continuous forest management program for the licence area has been in place for nearly 40 years. This is the eighth management plan for TFL 19. The term of this plan is the five-year period from 1995 to 1999. It outlines the commitments and obligations Pacific Forest Products Limited (Pacific) has as the licence holder of TFL 19.

The format of the plan is outlined in the table of contents and organized as follows.

Chapter 1.0 outlines the purpose of the management plan, the role of the government resource agencies, describes the characteristics of TFL 19 and basic information about Pacific.

Chapter 2.0 provides the management objectives for both timber and non-timber resources and summarizes the goals and commitments made for the term of the plan.

Chapter 3.0 describes the management strategies for the timber resource. It includes the allowable annual cut (AAC), status of resource inventories and outlines the strategies and goals for planning, public involvement, road development, harvesting, basic and incremental silviculture, forest health, fire protection and research.

Chapter 4.0 describes the management strategies for non-timber resources including recreation, forest landscape, water, fisheries and wildlife.

Chapters 5.0 to 8.0 describe administrative provisions for contract obligations, revisions to the plan and the submission of an annual report.

1.1 PURPOSE

This management plan provides the goals, objectives and strategies for TFL 19 over the long term. It describes the resource management activities that will take place over the next five years and provides a general indication of where harvesting will take place for the next 20 years.

The management plan is prepared at a forest landscape level to provide direction for the more specific planning required for the operations. It has been designed to provide a balanced forest land management strategy that considers the different kinds of resources found in the licence area and their level of use.

Preparation has been within the framework of the present integrated resource planning guidelines and regulations administered by the Ministry of Forests (MoF). The standards, specifications and guidelines that are to be followed at an operational level are referred to in the plan. The implementation of the strategies and direction in this plan is provided through a number of

operational and site-specific plans that are continuously being prepared and updated. Notably, these are a five-year forest development plan, five-year silviculture plan, silviculture prescriptions, stand management prescriptions, fire preparedness plan and access management plans. The sequence of operations and plans that are needed are described in section 2.3.

1.2 ADMINISTRATION

TFL 19 is gazetted as a provincial forest. As such, the Crown forest land is administered by the MoF according to the Forest Act and its regulations. The annual harvest level allowed for TFL 19 is re-examined and set every five years by the provincial chief forester. The district manager for the Campbell River Forest District is responsible for ensuring that forest policy and procedures for the Vancouver Forest Region, with respect to timber, recreation and wildlife resources, are followed on TFL 19. The Ministry of Environment, Lands and Parks (BC Environment) and the federal Department of Fisheries and Oceans (DFO) are responsible for managing the wildlife and fisheries resources. This is done in co-operation with Pacific and the MoF. The district manager has the final authority to approve all harvesting plans, which include five-year forest development plans, cutting permits and road permits. These plans are jointly reviewed with the other government resource agencies and the public before approval for harvesting new areas is given. Forest Service, Environment and DFO staff are based in Campbell River and Port Alberni.

Pacific manages the operation of TFL 19 from its woodlands offices at Gold River and Zeballos. Company logging crews are based at Gold River and Zeballos, and independent logging contractors work from various locations within the TFL.

1.3 LOCATION AND DESCRIPTION

TFL 19 is located on the west side of Vancouver Island in the vicinity of Nootka Sound. It is 80 kilometres due west of Campbell River. The total area is 192,559 hectares of which 190,382 hectares are Crown land including timber licences and 2,188 hectares are fee simple lands owned by Pacific. The eastern boundary abuts onto Strathcona Provincial Park, while to the west it borders Tahsis Inlet on the east side of Nootka Island. The western boundary has a diverse shoreline by virtue of several inlets (Espinosa, Zeballos, Tahsis, Tlupana and Muchalat) which dissect the coastal landscape.

The topography is mountainous and steep with massive limestone outcrops and formations dominating the landscape. The licence area is drained by numerous rivers and streams. Most of them support significant anadromous fish populations. Large animals, notably Roosevelt elk, Columbian black-tailed deer and black bear, are abundant throughout the licence area. Numerous other large and small animals, reptiles, amphibians and birds can also be found.

The forests of TFL 19 lie within the wetter maritime coastal western hemlock biogeoclimatic zone. Annual precipitation levels reach 3,000 to 5,000 mm. The climate is characterized by short winters with intermittent wet snow storms. The summer period from July to September can be dry and hot. The dominant timber species is western hemlock, which occurs in conifer stands mixed with varying amounts of amabilis fir, western red cedar and Douglas-fir. Lesser amounts of Sitka spruce, yellow cedar and mountain hemlock also occur.

There are six communities within the licence area. Their livelihood and stability depends on the economic activities generated in the Nootka Sound region. These are the communities of Gold River, Ahaminaquus (Mowachaht-Muchalaht Band), Tahsis, Zeballos, Ehatis (Ehattesaht Tribe) and Oclugje (Nuchatlaht Band). Harvesting operations of Pacific in TFL 19 and adjacent forest licence tenures, and the associated manufacturing, form the basis of employment in Nootka Sound. There is also some economic activity from seasonal commercial and recreational fishing, and boating.

Gold River is connected to Campbell River by Highway 28. Tahsis is accessed by an all-weather gravel road from Gold River. Zeballos is served by a gravel road connected to Highway 19 in the Nimpkish Valley.

1.4 DESCRIPTION OF LICENCE HOLDER

Pacific is a forest products company based in British Columbia that has been in the business of producing lumber products for over 40 years through its predecessors, Tahsis Company Ltd. and Pacific Logging Ltd. A publicly listed company (in July 1993), it is owned 51 percent by Avenor (formerly Canadian Pacific Forest Products Limited) and 49 percent by public shareholders. Pacific's head office is in Vancouver.

Pacific is a leading coastal producer of specialty lumber products destined primarily for the Japanese market. It operates three technologically advanced sawmill facilities located on Vancouver Island. A unique feature is that the processing of most of the timber logged on TFL 19 takes place in manufacturing facilities located within the TFL boundary.

At Tahsis a modern sawmill complex focuses on producing lumber products for traditional Japanese housing. The facility was completed in 1989 at a capital cost of \$54 million. Sawmills have been operating at the existing site since 1945. The sawmill complex has an annual production capacity of 270,000 m³ of lumber and 200,000 m³ of woodchips. The mill is located on tidewater and it has its own deep-sea dock which allows direct shipping of products to the world market.

At Gold River, Avenor operates a kraft pulp mill with an annual production capacity of 230,000 tonnes. Between 1989 and 1991 in excess of \$500 million was invested in constructing a new CTMP pulp mill, a newsprint machine and in installing a state-of-the-art effluent treatment facility. Pacific supplies the Gold River pulp mill with all the wood chips produced as a by-product of its sawmill operations as well as lower grade or pulp quality logs produced from harvesting operations on TFL 19 and adjacent tenures. Pacific also sells and trades logs to provide logs and

chips for the pulp mill. In order to supply the Gold River pulp mill, Pacific is a significant net importer of fibre to the Nootka Sound area. The newsprint mill is not currently operating and would require a further purchase of 500,000 m³.

2.0 MANAGEMENT OBJECTIVES

TFL 19 has provided a continuous supply of timber to the company's locally-based manufacturing facilities through seven successive management plan periods since 1954. From the outset, the management strategy had been to distribute and diversify the development and cutting pattern over the whole licence area. This approach was adopted in order to provide an economical timber supply over the long term and to identify and consider all resource values along with the social, economic and environmental needs.

2.1 MANAGEMENT OBJECTIVES

The management objectives provide a comprehensive direction of how the licence area is to be managed. These objectives are a continuation and refinement of those set for TFL 19 in previous management and working plans. The specific goals for the next five years are in the relevant sections of this plan.

Corporate

Develop and manage the forest resources to provide the maximum sustainable supply of quality fibre at a competitive cost in an environmentally sound manner.

Meet public demand for the maintenance, enjoyment and use of non-timber resources.

Work with local residents and the provincial government toward a realistic balance of the social, environmental and economic benefits which flow from the resources of TFL 19.

Provide a competitive return on investments to our shareholders.

Establish Pacific as an internationally competitive producer of quality forest products through the operation of efficient manufacturing facilities.

Land Use

Manage the total licence area guided by the principles of integrated resource management to meet the needs of both timber and non-timber resource users. Maximize the net operable area available to provide a sustainable timber supply and sustain environmental values.

Promote balanced resource management emphasizing planning that ensures that the area of productive forest land sustains economic activity and local community stability.

Timber

Maintain the AAC of 978,000 m³/year in concert with attaining other resource management goals.

Regenerate all harvested or denuded forest lands promptly to maintain the productive capacity of the working forest. Stand establishment strategies will favour regeneration of hemlock where it is one of the ecologically preferred species. Hemlock is the primary species utilized in the Tahsis sawmill and Gold River pulp mill.

Manage the forest stand structure on economic rotations that produce a continuous log flow. Based on a projection of current fibre utilization, the approximate distribution will be two-thirds sawlogs and one-third pulplogs. This log mixture is planned to be maintained over the period of the management plan.

Public Involvement

Increase the participation of the local communities of Gold River, Tahsis, Zeballos and the Native communities in key decisions that affect resource management on the TFL.

Advise local residents, Native Bands and business of all decisions affecting the forest economy and management of the licence area.

Co-operate with a local resource management committee such that:

- local residents participate in developing plans and recommendations that will influence decision making on how the resources in the area will be managed;
- good stewardship of all resources is encouraged and practised;
- Native people have a forum which enables them to participate and benefit from resource management.

Native Training and Employment

Work with local Native Bands; Mowachaht-Muchalahts, Ehattesahts and Nuchatlahts, and provide training in silviculture, recreation and logging activities with the goal of self-employment as contractors or in joint ventures with the company. Seek government agency funding assistance and co-operation in developing these programs.

Protection

Protect the forest resources from damage and losses caused by wildfires by maintaining an effective fire prevention and control organization.

Forest Health

Protect, maintain and enhance forest resources from insect, disease and animal damage by employing integrated pest management strategies.

Recreation

Maintain and improve existing recreation facilities and opportunities in co-operation with the MoF.

Co-operate with caving associations and the MoF to locate, maintain and protect significant caves and karst features.

Soils

Protect and maintain the productive capacity of the forest land by using harvesting systems and road building techniques to minimize the permanent loss of productivity.

Water

Continue to follow planning and operating procedures that will preserve the integrity of streamside habitat and water quality.

Fisheries

Maintain and protect the fisheries habitat of the river and stream systems.

Wildlife

Provide habitat suitable for supporting populations of existing wildlife species, to maintain natural distribution and habitat ranges, through a system of habitat management. This will include planning at a forest landscape level that maintains existing biological diversity of animal habitat and other ecological communities.

Landscape

Carry out visual impact assessments where operations are proposed in scenic areas and ensure that forest practices will satisfy the visual quality objectives established for the area. Visual quality objectives will be based on a balance of social, economic and environmental considerations derived by a public consultation process including the Nootka Area Land Use Advisory Board.

3.0 TIMBER RESOURCE MANAGEMENT STRATEGIES

3.1 ALLOWABLE ANNUAL CUT

A detailed wood supply analysis was made for TFL 19 using a forest estate model. Figure 1 illustrates the process into which the technical analysis fits. A complete description of the analysis approach, the management assumptions and the results are documented in Appendix V.

Forest management objectives and community priorities for TFL 19 produce a set of landbase and management assumptions. Together with separately derived growth and yield assumptions, these are input to the technical wood supply calculations (yield analysis). The wood supply analysis simulates a wide range of technically feasible harvest rates under a variety of chosen constraints. While the simulation models timber supply for 200 years, the chief forester chooses an allowable cut for only the next five years. The choice of AAC reflects the management strategy selected, the socio-economic impacts on the dependent communities and on the technically feasible harvest rates for TFL 19.

Many different computer runs were made to determine the range of wood supply potentially available from the TFL. The runs were grouped into three general options:

- present management
- planned management
- additional withdrawals.

Within each general option many specific cases were examined.

Present Management

This option represents the kind of management approved under Management Plan 7 (1988-92). No accessible areas were permanently excluded from harvesting and reforestation. Extensive rules and regulations to integrate timber management with fisheries, wildlife, recreation, and other non-timber resource values were incorporated in planning and harvesting. The TFL is considered to have been managed well by this option, having taken care of all resources.

Planned Management

This option is based on present management updated to include approaches to integrated management that are now in use. Areas that are potentially sensitive for wildlife, stream side management zones, soils, avalanche tracks, regeneration difficult sites, recreation areas, and sensitive viewscapes are all identified in the database. In the forest estate model restrictions were placed on the amount of harvesting that was allowable in these areas, and virtually no harvesting was allowed

on sensitive soils. Significant harvesting constraints were placed on prominent views seen from the three townsites.

It is reasonable to assume that some of the productive forest land outside the current operability lines will become operable in the future. Although these areas are considered a marginal wood supply source today, over time logs will become more valuable, and logging technology and log use will make these areas operable. This trend is a logical extension of what has happened in the past and, as such, is a component of the status quo. The cumulative effect will be to increase the operable area for timber harvesting. This is particularly significant on TFL 19 where about a third of the productive landbase is currently not delineated as economically operable.

In the planned management option and for special cases of the present management and additional withdrawal options, an expanded operable landbase is utilized. This additional operable land came from good and medium growing sites only and was not used by the forest estate model until the fourth decade (30 years) from now. None of the areas in the expanded operable landbase carried any environmentally sensitive labels. As such, the amount of expanded landbase utilized in the simulation is considered to be a conservative estimate of the actual expansion that will occur.

Depending on the choices made, visual quality and recreation values can place significant constraints on harvest levels. As these represent social objectives, Pacific consulted with local communities at the time the SMOOP and analysis data inputs were being prepared, to assess the communities' opinions. The communities told us that their main concern was with the prominent views seen from Gold River, Tahsis and Zeballos town sites. This strategy also utilizes many visual landscape techniques in areas visible from waterways and main roads, but not to the extent that would significantly impact the long term availability of timber.

Additional Withdrawals

This kind of management uses the planned management as a starting point and then a considerable area in the potentially environmentally sensitive categories is completely withdrawn from harvesting. The designation of major travel corridor results in extensive constraints on harvesting for visual quality which are extended to include the shoreline visible from the marine inlets, and the logging roads used by the public. This option assumes that the waterways and main gravel roads are considered to be major travel corridors. All the other technical inputs used for the three options are similar.

As we go from present management to additional withdrawals, the constraints on the landbase are increased. This increased regulation lowers the timber volume available for harvesting.

Discussion on AAC Options

Three results from the timber supply analysis were presented at the public viewings of the management plan in open-houses held on September 26-28, 1994. Each option presented was modelled in the same way. We chose an initial annual harvest rate of 978,000 m³ for 20 years, then lowered the harvest at the end of the 30 years to an even flow for the next 170 years. These three results are shown below.

	Initial harvest for 20 years m ³ /year	Even flow after 30 years m ³ /year	Landbase (hectares)	Maximum even flow m ³ /year
Present Management	978,000	926,000	109,188	929,000
Planned Management	978,000	833,000	105,133	847,000
Additional Withdrawals	978,000	775,000	98,017	802,000

The options cover a wide range of management strategies. Each management strategy and each resultant timber supply option is technically feasible. Pacific has chosen the planned management strategy for a number of reasons. It is the best reflection of a balance integrated management strategy that models today's guidelines, while at the same time is not foreclosing on future options. It recognizes the environmental importance of sensitive areas. It maintains the present AAC and allows adequate time to develop a strategy to handle the progression to harvesting more second growth. The planned management option is very strongly supported by the public who attended the open-houses at Gold River, Tahsis and Zeballos. The planned management option is the strategy that Pacific intends to utilize and would be the option selected upon the chief forester's approval of this plan. There was essentially no public support for the additional withdrawal option, to a large extent because the public does not feel major constraints on timber supply for recreation and visual quality are warranted. There is a strong feeling that recreation and forestry have worked together well on TFL 19. In other words, the planned management option reflects the social objectives of the local communities, and satisfies the needs of the people who live and work in the area.

For the timber supply analysis, the database used incorporated a new timber inventory and the best possible information available for all non-timber resources. This information will continue to be refined during the five years and an updated database will be used in the next timber supply analysis to be done again in five years' time. At that time, there will be an opportunity to revisit the timber supply strategy outlined in this plan and to verify it.

The proposed AAC for the period of the management plan is 978,000 m³ per year for the next five years. This volume is net of decay, waste and breakage, and excludes any commercial thinning volume. This AAC includes the volume allocated to the MoF Small Business Forest Enterprise Program on TFL 19.

	Schedule A	Schedule B	Total (m ³)
Pacific	44,154	887,978	932,132
MoF SBFEP	-	45,868	45,868
Total	44,154	933,846	978,000

Specific Cases Within Each General Option

In our analysis we examined many specific cases within the three general options. Tables 1, 2 and 3 list the cases examined for each option. In Table 2, cases 2b to 2k are *sensitivity analyses* around the planned management (case 2a). In Table 3, cases 3c to 3j are *sensitivity analyses* around the additional withdrawals option with present operable landbase style management (case 3b).

Table 1: Specific cases for the Present Management Option

Case #	Description
1a	Total productive forest area
1b	Present operable landbase
1c	Conventional operable landbase
1d	Expanded operable landbase

Table 2: Specific cases for the Planned Management Option

Case #	Description
2a	Expanded operable landbase.
2b	Expanded landbase - increased visual sensitivity.
2c	Expanded landbase - existing stand volumes increased by 10%.
2d	Expanded landbase - existing stand volumes decreased by 10%.
2e	Expanded landbase - regenerated stand volumes increased by 10%.
2f	Expanded landbase - regenerated stand volumes decreased by 10%.
2g	Expanded landbase - increase minimum harvestable volume to 400 m ³ /ha.
2h	Expanded landbase - decrease minimum harvestable volume to 300 m ³ /ha.
2i	Expanded landbase - increase effective green-up age by five years.
2j	Expanded landbase - decrease effective green-up age by five years.
2k	Expanded landbase - no site index adjustment for balsam and cedar.
2l	Present operable landbase.
2m	Conventional operable landbase.

Table 3: Specific cases for the Additional Withdrawals Option

Case #	Description
3a	Expanded operable landbase - long rotation forestry replaced by land withdrawals from wildlife and recreational areas, increased visual sensitivity.
3b	Present operable landbase style management - as in 3a, plus four-pass harvest, further visual constraints, no balsam/cedar old growth site index adjustment. Present operable style - existing stand volumes increased by 10%.
3c	Present operable style - existing stand volumes decreased by 10%.
3d	Present operable style - regenerated stand volumes increased by 10%.
3e	Present operable style - regenerated stand volumes decreased by 10%.
3f	Present operable style - increase minimum harvest volume to 400 m ³ /ha.
3g	Present operable style - decrease minimum harvest volume to 300 m ³ /ha.
3h	Present operable style - increase effective green-up age by five years.
3i	Present operable style - decrease effective green-up age by five years.
3j	

The results of our wood supply analysis support the maintenance of the harvest from TFL 19 at the present rate of 978,000 m³ per year for the next five years.

3.2 FOREST RESOURCE INVENTORIES

This section outlines the present status of the inventories for timber and non-timber resources.

3.2.1 Timber Inventory

Timber inventory data are available from two types of inventories: a TFL level inventory that provides statistics for the TFL as a whole, and an operational level that provides statistics for individual cutblocks.

3.2.1.1 TFL Inventory

A new TFL inventory was completed in 1989 to replace the previous 1965 inventory. The purpose was to update the forest cover labels to new standards, to refine and improve the classification of timber types near the economic accessibility limits, and to re-stratify stands between 61 and 120 years of age. The resulting forest cover maps have been entered into a digital cartographic information system and the inventory statistics are accessed on an electronic database. The inventory report and summary of statistics, updated to January 1, 1991, are found in Appendix II.1.

The inventory consists of:

- 78 forest cover map sheets (1:10000 scale) available in hard copy format;
- environmentally sensitive area information;
- operability information;

The area in each land category is shown in Table 4.

Table 4: TFL 19 Land Categories

	Area (ha)
Total area	192,551
Alpine/non forest	47,016
Productive forest	145,535
current inoperable	44,520
gross operable	101,015

The inventory database will be updated for timber depletion and other disturbances periodically during the planning period. The updated inventory will be given to the MoF in the digital format they require.

3.2.1.2 Operational Inventory

Timber cruising of individual cutblocks is carried out to provide more detailed statistics of volume and species by log grade and size. The Vancouver Forest Region Timber Cruising Specifications are followed. The data compiled will be used in cutting permit applications and timber appraisal.

3.2.1.3 Growth and Yield

Pacific is a participating member of the Coastal Forest Productivity Council of BC (CFPC) and co-operates with the MoF Inventory Branch in maintaining the provincial growth and yield program. As of December 1993, there are 207 active growth and yield plots on TFL 19. These plots are mainly located in immature stand types, both natural and managed. The plots are remeasured and data summarised regularly in accordance with CFPC standards. Some of these plots have been measured six times in 25 years. The database enables the company to make reliable estimates of growth rates and volume yield of the second growth stands on TFL 19. The information is shared with the MoF Inventory Branch which maintains the coastal growth and yield plot matrix. The growth and yield plots are concentrated in the following stand types: Douglas-fir, western hemlock, amabilis fir and mixtures of these types. There is also a limited number of plots established in red alder and western red cedar stands.

Table 5 outlines remeasurement schedule guidelines for plots already established. The schedule is based on the age and site index of the stands as follows:

Table 5: Growth and Yield Remeasurement

Stands	Interval (yrs)
(a) <40 years	10
(b) ≥40 years	
S1 >35 m	5
S1 <35 m	10

If an area is to be treated, ie, a commercial thinning or juvenile spacing, a remeasurement should be made two years after treatment. When new plots are installed, their locations will be identified on the 1:20000 scale operational maps so that they can be protected from disturbance. Control plots located within candidate stands for commercial thinning will be remeasured and buffered.

The company will continue its growth and yield program. It is expected that MoF cost share funding will continue to be provided. Pacific intends to establish additional plots in natural and planted amabilis fir stands during the next five years. New plots will also be placed in western red cedar and yellow cedar stands as there are presently very limited data on the growth of these species.

A considerable investment has been made by Pacific in developing information on site productivity. Field data collected from paired plots have shown that when MoF site index curves are applied to stands greater than 150 years old the productivity is under-estimated. New site index assignments for age class eight and nine Douglas-fir and western hemlock type groups were prepared for this plan. Pacific will be carrying out additional field sampling to refine site index estimates for western red cedar and amabilis fir. The company will consult with MoF Research Branch concerning the results of this study. The new revised site productivity estimates will be used in timber supply analysis and for assessing silviculture treatment options.

3.2.1.4 Environmentally Sensitive Areas

As part of the 1988/89 re-inventory project, soils, regeneration and avalanche environmentally sensitive areas (ESAs) were identified by photo interpretation and ground checking. This was completed to MoF Inventory Manual standards in place at that time. Classification of recreation sensitive areas was conducted as per the Recreation Resource Inventory of TFL 19 (J.G. Webb, 1989). Wildlife sensitive areas were identified by BC Environment and fisheries sensitive areas were based on the stream classification maps for TFL 19. The ESA classification serves as a relative rating system of sensitivity and requires more detailed ground level inspection when operational planning is being done.

Table 6 lists the area of each ESA category in the gross productive forest. Many polygons have more than one ESA label. The areas listed in Table 6 represent sites having multiple use and sensitivity.

**Table 6: Environmentally Sensitive Area Categories
(hectares)**

Category	Symbol	Description	Area (ha)
Soils	Es ₁	Areas of extremely unstable or fragile soils.	6,628*
	Es ₂	Areas of moderately unstable soils, and sensitive to disturbance.	27,899*
Regeneration	Ep ₁	High potential severe regeneration problems due to climatic factors.	10,541
	Ep ₂	Moderate severe regeneration problems due to biotic factors.	9,012
Avalanche	Ea	Areas with severe snow avalanche problems.	188
Wildlife	Ew ₁	Areas of critical habitat for wildlife.	4,752
	Ew ₂	Areas of significant habitat value for wildlife.	4,956
Recreation	Er ₁	Areas requiring special management to maintain recreation values.	6,148
	Er _{2N}	Areas having important recreation values.	7,035
	Er _{2C}	Areas requiring forest cover constraints to maintain recreation values.	4,889
Watershed	Eh ₁	Areas with extreme sensitivity.	0
	Eh ₂	Areas with high sensitivity requiring special plan.	2,129
Fisheries	Ef ₁	Streamside management zone adjacent to class A, major class B and C streams, class A lakes and all estuaries.	2,883
	Ef ₂	Fisheries sensitive areas suitable for fish habitat.	183

* These figures reflect a doubling of the forest inventory file in order to better predict the sensitive soil area.

When the ESA category is assigned to each polygon and when the higher ESA has priority the single use area in each category can be determined (Table 7).

Table 7: Environmentally Sensitive Areas by single use (hectares)

ESA	Operable	Inoperable	Total
Es ₁	604	4,806	5,410
Es ₂	4,908	16,124	21,032
Ep ₁	153	2,244	2,397
Ep ₂	1,047	3,059	4,106
Ea	19	169	188
Ew ₁	2,728	630	3,358
Ew ₂	2,615	701	3,316
Er ₁	608	300	908
Er _{2n}	2,489	618	3,107
Er _{2c}	2,977	429	3,406
Ef ₁	2,877	6	2,883
Ef ₂	111	5	116
Eh ₁	-	-	-
Eh ₂	695	77	772
Total	19,151	29,168	50,999

Table 7 illustrates that 20 percent of the operable land base has been classified as having some environmental sensitivity. The strategies for special management of these areas are described in the appropriate sections of the plan.

3.2.1.5 Operability

The productive forest area, as determined from the re-inventory, was assessed in 1993 to determine the portion suitable as a working forest. Operability categories were defined and mapping was completed (at 1:10000 scale) for the entire TFL. The operable productive forest landbase was delineated into sub-categories by type of logging system, as summarized in Table 8.

Table 8: Operability Categories (hectares)

Category	Definition	Area* (ha)
Productive Forest	Total area of merchantable forest	145,535
· Inoperable	Merchantable stands physically or economically** inaccessible	44,520
· Operable	Stands physically and economically accessible	101,015
Conventional		82,594
	· Cable/grapple and ground yarding	76,224
	· Skyline yarding	6,370
Non-conventional		
	· aerial-helicopter, balloon and multi-span yarding	18,520

* Inclusive of ESAs, excluding low site.

** Based on current economic conditions for the ten-year period prior to 1993.

The area classification is the best estimate of merchantability and accessibility under the prevailing economic conditions of the past ten-year operating period. Increases in product prices and developments in aerial logging systems will influence the economic margin and increase the operable area. This operability definition will be reviewed in five years and revised.

3.2.2 Recreation Inventory

An inventory of the recreation features in the licence area was completed in 1989 and updated in 1993. It was completed to MoF recreation inventory standards. The inventory consists of seven map sheets showing recreation feature classes and a report describing the recreation features, the significant biophysical features and a management classification (*Recreation Resource Inventory TFL 19 - Canadian Pacific Forest Products, 1989.*)

This inventory has classified and mapped the licence area into five Recreation Opportunity Spectrum (ROS) classes based on access, feature significance and potential recreational use.

Table 9: Recreation Opportunity Spectrum Classes (hectares)

ROS Class	Remoteness Criteria	Area (ha)
Primitive	8 km from 2-wheel roads	0
Semi-Primitive Non Motorized	1 km from 2-wheel roads	68.571
Roaded Resource	within 1 km of road	126.429
Rural	not remote	0
Urban	not remote	0

An analysis of the recreation inventory information was completed in 1994 (Appendix VI, Recreation Analysis Report). It provides the basis and direction to recreation planning for the licence area.

3.2.3 Landscape Information

Initial landscape mapping of viewsapes on the licence area was completed in 1992. It covered 53,000 hectares which can be viewed from the road corridors between Gold River to Tahsis, Pinder Pass to Zeballos and the marine corridor from Gold River to Tahsis.

The information consists of:

- report entitled *Tree Farm Licence 19 - Landscape Inventory and Analysis*¹
- seven maps at 1:50000 scale
- illustrative photographic folio.

¹ Recreation Resources Limited, August 1994

Pacific recently completed landscape mapping for other selected viewsapes. These include areas in Matchlee Inlet, Espinosa Inlet, the lower Gold River, Muchalat Lake and Zeballos to Rowland Creek.

The landscape report was based on MoF landscape standards. This approach is applied to primary and secondary corridors, with landscape sensitivity and VQOs assigned accordingly. In the case of TFL 19, Pacific identified the roads and marine routes to Gold River and Tahsis as secondary corridors. The public consultation process supported this position. Operational strategies will include visual design techniques and alternative silviculture systems. The landscape information provided is used to prepare a management strategy which is responsive to the expectations of the public, including local communities. Operational level planning strategies such as vegetative screening, limits in technical modelling capabilities such as stand and cutblock distribution, and planimetric versus perspective views, also provide for a great deal of latitude in meeting VQOs. Pacific understands that the landscape strategy is integral to the chief forester's approval of the plan.

3.3 PLANNING

Planning for the development and harvesting of the timber resource is an extensive process. It is a detailed hierarchical process that covers both strategic and operational levels of planning. Full consideration of non-timber resources is required. The company completes a number of different plans, which are approved by the MoF and other government agencies before cutting permits are issued by the MoF district manager.

The main features of this process are as follows:

- planning considers all forest values using integrated resource management principles;
- the licence area is subdivided into 26 planning units with resource data maintained and updated for each unit;
- MoF planning guidelines are followed;
- an open-planning process allows all stakeholders, Native Bands, and local residents to participate;
- the different levels and types of plans are revised regularly as scheduled;
- all plans are reviewed with the government agencies (MoF, DFO, BC Environment) before they are finalized.

Table 10 lists the types of plans that the company prepares and keeps updated.

Table 10: Types of Strategic and Operational Forest Resource Plans

Type	Purpose	Renewal
Strategic Level		
Management Plan	Details the objectives, goals and strategies for managing the TFL.	Updated every five years
Twenty-year Strategic Plan	Outlines the proposed pattern of harvesting and protection of the licence area for a 20 year period.	Updated every five years
Local Resource Use Plan	Detailed resource management plan for a specific area.	Prepared if needed
Fuel Management Plan	Details the objectives, goals and strategies for fuel management on the TFL	Updated every five years
Operational Level		
Five-year Forest Development Plan	Indicates new proposed harvesting cutblocks and road construction scheduled for five or more years.	Updated annually
Five-year Silviculture Plan	Maps and schedules for silvicultural treatments.	Update annually
Silviculture Prescription	Prescribes the logging and regeneration plan for every cutblock until free-growing.	Amendments as needed
Logging Plans	Describes road construction and timber harvesting operations, resource identification and protection measures, and rehabilitation activities.	Amend as required.
Cutting Permit	Application for an operational logging plan for a group of cutblocks.	Extended as required
Road Permit	Application to harvest and construct a forest access road in a defined road corridor.	Amendments as needed.
Special Use Permit	Application to use or occupy Crown land for logging camps, sort yards, gravel pits etc.	Extended as required
Access Management Plan	Identifies operational roads to be maintained or deactivated.	Updated annually
Road Deactivation Prescriptions	Describes road deactivation activities.	Amend as required
Fire Preparedness Plan	Details the operational readiness to prevent, detect and suppress forest fires.	Updated annually
Stand Management Prescriptions	Prescribes actions to be carried out on free growing stands.	Amend as required

In the course of preparing the plans an array of planning guidelines and documents are consulted. Vancouver Forest Region outlines for these plans will be followed when they are available. Some are MoF policy, while others are recommended guidelines. The Forest Practices Code regulations will update many of the guidelines already in place, as well as introducing new guidelines.

3.3.1 Total Chance

The TFL is divided into 26 compartments (A-Z). Their boundaries are shown on the TFL map (enclosed). This enables detailed operational planning for development plans and cutting permit applications. It also enables resource issues to be dealt with specifically at a planning unit level.

The operability mapping has defined the logging chance by logging system. The twenty-year strategic development plan (section 3.3.6) provides an approximation of total chance development for TFL 19 based on present standards and guidelines.

3.3.2 Public Involvement

The local communities in the Nootka Sound area have a keen interest in how TFL 19 is managed. They are concerned that a sustainable fibre supply is maintained and that their communities continue to receive economic benefits from forestry operations.

In 1993 residents of Gold River, Tahsis, Zeballos, the Mowachaht-Muchalaht Band, and the Ehattesaht Tribe formed the Nootka Sound Stability Coalition specifically to participate in planning, resource use allocations and decision-making that affects the Nootka Sound area. A membership list for the coalition has been included as Appendix IX.

As a result of the Vancouver Island Land Use Plan the Nootka Area Land Use Advisory Board is currently being formed. It's purpose is to:

- provide an avenue for local input and involvement in provincial government decisions;
- provide input on local implementation of the provincial government's Vancouver Island Land Use Plan and related resource management issues;
- make recommendations on provincial land use planning and resource management issues.

Pacific fully supports this initiative and is committed to interact with the public, on topics such as establishing visual quality objectives, through a cumulative process. The Minister of Forests has made a commitment to the communities for public input, specifically to the matter of visual quality objectives and the advisory role of the Board. Consideration of broader regional and provincial public values and interest in the area are represented by the government agencies that interact with Pacific. Specific consultation measures with the public include:

- provide for review of strategic plans (management plan, recreation plan, etc.);
- review of five-year forest development plans;

- provide for review of silviculture prescriptions and pesticide use permit applications;
- make the annual report, audit reports and other resource plans available for public comment.

Public Education

- in co-operation with the Gold River Tourism Centre, provide forestry and Tahsis sawmill tours;
- provide news releases and information articles to the local newspapers regularly;
- erect information signs about forestry practices and benefits to the local economy;
- promote forestry education in local schools;
- provide interpretive forest walks;
- provide free recreational maps (*Pacific's Recreation and Logging Road Guide to the Forest Lands of West Vancouver Island*).

A summary of the public consultation process followed in preparing this management plan is in Appendix III.

3.3.3 Native Band Consultation

Nootka Sound has a rich history of native occupation and culture. Today, there are three native bands living in villages which are within the TFL boundaries. These are the Mowachaht-Muchalaht and Nuchatlaht Bands and the Ehattesaht Tribe. The company has an open dialogue with the Bands and frequently consults with them concerning the operation of the TFL as well as on cultural and economic development matters.

Pacific supports the efforts of the Mowachaht-Muchalaht Band and the Ehattesaht Tribe in securing jobs and developing business opportunities. The company provides training in forestry work and participates in job creation programs with the Bands. This would include logging, stream cleaning, road rehabilitation, recreation and reforestation work. Assistance will be given in finding employment either as individuals or self-employed contractors.

The Mowachaht-Muchalaht Band is presently relocating its village to a new 125 hectare site four kilometres north of the Gold River townsite on the west bank of the Gold River. Pacific is co-operating with the Band, and the federal and provincial agencies that are facilitating this relocation.

The company will continue to consult with the Bands concerning forest development plans. The Bands receive notification of when plans are available for public review. The identification and protection of native cultural sites receives special attention. The company has an agreement with the Bands and the MoF that the location of known archeological sites will be kept confidential. The impact of proposed development on cultural resources will be reviewed. Changes to these plans or mitigation measures will be discussed.

3.3.4 Local Resource Use Plans

A Local Resource Use Plan (LRUP) may be needed if a specific resource issue requires detailed public input to prepare an acceptable development plan for a compartment. It involves establishing a planning committee comprised of public interest groups, government agency and company representatives. Their deliberations follow the terms of reference prepared by the committee.

A LRUP has not been done for any compartment on TFL 19 as the established planning process has been adequate. In 1988 a resource plan was prepared for the Conuma River drainage to guide planning for a 25-year period. Pacific is willing to participate in the preparation of a LRUP should the need arise during this planning period. Weymer Creek is a potential candidate area due to its cave/karst resources and viewscape from the Village of Tahsis.

3.3.5 MoF Small Business Forest Enterprise Program

In 1988 an amendment to the Forest Act enabled the MoF to start a small business program within major forest tenures. The program was allocated an annual volume of 45,868 m³ from the TFL AAC. The Campbell River forest district manager is responsible for administering the small business program within TFL 19. The MoF has committed the majority of this volume to a ten-year timber sale licence. The balance is sold competitively as short term timber sale licences. Currently McCurdy Creek and Aston Creek are active locations for SBFEP operating areas. No particular areas or drainages have been identified as specific long term operating areas for the small business program. Long term operating areas will be identified with the MoF. Timber sold through the SBFEP will have an average net value not materially different than that of TFL 19's Schedule B land average. As long as the SBFEP timber sale licences remain as contributing areas within the TFL landbase, small business planning and implementation must follow the strategies of this management plan.

Within this context the MoF's responsibilities in administering the program are to:

- prepare five-year forest development plans that comply with management objectives and strategies of TFL 19;
- ensure that timber sale licence forest practices are in compliance with operating standards;
- prepare silviculture prescriptions and perform basic silviculture; this includes slash disposal, site preparation, planting, silviculture surveys and brushing;
- ensure adequate fire protection;
- enter into road construction cost-sharing and maintenance agreements for primary access roads to be used jointly with the company;
- consult with Pacific on operational topics that may affect other areas of the TFL (eg, prescribed burning plans, forest pesticide applications, road deactivation);
- provide the company with data on small business program activities completed for the previous year for inclusion in the TFL annual report.

Pacific becomes responsible for the long term management of the small business areas after the timber sale licences have expired and have been satisfactorily regenerated to the free growing stage.

3.3.6 Twenty-year Strategic Development Plan

A twenty-year development plan has been prepared for the period 1993 to 2012. This plan is linked to the harvest level indicated in the yield analysis of 978,000 m³/year. It illustrates, at a cutblock level, the general pattern of development and harvesting for all compartments in the TFL. The selection and location of proposed cutblocks follow the Coast Planning Guidelines and cutting permit development protocol, including allowances and constraints for non-timber values. Appendix VII contains the terms of reference and the detailed results. Blocks included in the first five-year period of the plan (1993-97) were those in the approved 1993-97 five-year forest development plan. Some blocks did not adhere to the Coast Planning Guidelines, or VQOs, because they were previously approved for harvest. The remaining 15 years were based on a mapping exercise using aerial photographs, operational maps, and the local experience of company forest engineers. The twenty-year development plan has been approved by the MoF.

Table 11 summarizes the volumes scheduled by five-year period. The spatial distribution and harvesting patterns are illustrated in the map folio that accompanied the twenty-year strategic development plan.

Table 11: Twenty-year Plan Volume Summary

Compartment	Volume by Period (000s m ³)				Total
	1993-97	1998-2002	2003-07	2008-12	
A Silverado	148	228	197	170	744
B Jacklah	271	742	194	273	1,480
C Burman	0	270	10	100	380
D Matchlee	0	338	36	57	432
E Ucona	212	153	165	97	628
F McCurdy	562	344	251	276	1,433
G Kleeptee	259	104	338	188	889
H Hanna	195	39	117	251	602
I Lower Zeballos	162	281	189	136	767
J Tlupana	540	228	298	200	1,266
K Lower Gold	490	272	230	100	1,092
L Nomash	204	145	243	103	695
M Saunders	259	134	97	218	709
N Upper Gold	315	255	183	80	834
O Zeballos Lake	28	12	30	352	423
P Muchalat	459	457	458	179	1,554
Q Conuma	316	142	404	148	1,010
R Sucwoa	181	142	299	123	745
S Hisnit	335	38	108	352	832
T Hoiss	182	112	122	309	726
U Tsowwin	302	32	14	414	762
V Santiago	263	69	51	190	572
W Perry	49	117	271	263	699
X Upper Zeballos	94	233	225	129	682
Y Tahsis	101	572	335	465	1,473
Z Espinosa	152	245	284	144	825
Total*	6,081	5,706	5,150	5,318	22,255

* Numbers may not add due to rounding

3.3.7 Five-year Forest Development Plan

The five-year forest development plan is updated annually. The format will follow the *Operational Planning Regulation* and associated *Forest Development Plan Guidebook*. The development plan submission will include:

- a development plan map showing proposed cutblocks;
- an access management plan.

Silviculture prescriptions for the cutblocks in the first two years of the development plan will have been submitted to the MoF for approval. Each year the plan is updated by adding a fifth year and revising blocks proposed previously to reflect new information gained from reconnaissance and layout work as well as from referral comments.

The draft plan is referred to government resource agencies for comment. The plan is redrafted after an all-agency meeting and comments have been received from each agency. The plan is then advertised for public viewing. It is also referred to local residents. All comments, issues and topics raised by the public and other interest groups will be considered and dealt with before finalising the plan. District manager approval is expected six months after the draft plan is submitted.

3.3.8 Cutting Permits

Pacific's goal is to have a timber volume equivalent to two years of AAC in approved cutting permits. This will provide some operational flexibility in dealing with changing conditions which arise from time to time. Cutting permit applications will be prepared based on the first three years of the approved five-year forest development plan. They will be submitted regularly to the district manager. Amendments to approved cutting permits will be made when needed. As the operation progresses, cutting permits not in the development plan may become necessary. This may be to salvage timber damaged by fire or windthrow.

3.4 TRANSPORTATION

A transportation system has been developed over the past 30 years to deliver logs by truck and by water to the manufacturing facilities at Tahsis and Gold River. An estimated 500 kilometres of main and branch roads and 1,600 kilometres of spur roads have been constructed. As the main road infrastructure is substantially in place, a program of upgrading and maintenance will be carried out to ensure that the roads are kept to a safe operating standard.

Specifications for the transportation system to be designed and maintained will follow the MoF Forest Road and Logging Trail Engineering Practices (Interim) 1993.

3.4.1 Roads

Roads constructed during the next five years will be extensions to road systems already in place. The planned design and construction activity by compartment is given in Table 12.

Table 12: Road Construction Summary

Compartment	Drainage	Road No.	Access Distance (km)
A Silverado	Catherine Lake/Silverado Creek	S-ML	12
	north side Silverado Creek	S-16	4
B Jacklah	Jacklah Creek	J-ML	14
	Lillian Lake	L-ML	2
D Matchlee	Black Creek	B-ML	3
E Ucona	Ucona River	U-ML	2
F McCurdy	Ashton/Sylvia Creeks	S-ML	9
	Williams Creek	M-8	3
	Mirror Creek	M-19A	2
	north fork McCurdy Creek	NF-ML	4
G Kleeptee	Upper Kleeptee Creek	N-30	7
H Hanna	Galiano Creek	G-25	4
	Hanna Creek	G-50	2
J Tlupana	Nesook River	N-ML	7
	north fork Tlupana River	H-60M	2
	West Nesook fork	N-39	3
K Lower Gold	Bull Lake	H-27A	2
	Cala Creek	H-14F	2
	East Cala Creek	H-14C	3
	North Upana Lake	H-27C1	2
L Nomash	Rugged Creek	N-8	4
	Nomash Mountain	N-ML	2
M Saunders	West Saunders	S-19/S-54A	4
	east side Saunders	S-40C	3
N Upper Gold	West Waring Creek	WW-8	2
	East Waring Creek	EW-3/EW-3D2	2
	east side Gold Valley	E-65	5
O Zeballos Lake	Maraude Creek	N-1	2
P Muchalat	south side Muchalat Lake	L-ML	4
	north fork Muchalat River	MU-ML	1
	south fork Muchalat River	MU-80C2C	1
	north side Muchalat Lake	MU-50	3
Q Conuma	Conuma River	C-ML	2
	north fork Conuma River	C-60/C-60D	5
	Conuma Peak	C-15	4
	Norgate River	C-22/H-27C	8
R Sucwoa	West Canton Creek	WC-ML	2
T Hoiss	Walker Creek	W-ML	4
	Hoiss Creek	S-16000	4
V Santiago	Green/Weymer Creeks	G-ML/G-7 (reactivate)	12
Y Tahsis	McKelvie Creek	M-ML	4

3.4.2 Bridges

Bridge design and construction/replacement activity is planned for:

Table 13: Major Bridge Construction Summary

Compartment	Structure	Road No.	Location (km)	Description
A Silverado	Silverado #1	S-ML	7.5	New permanent structure
	Silverado #2	S-ML	7.7	" "
	Silverado #3	S-ML	10.0	" "
B Jacklah	Houston #1	H-30	4.0	Temporary (steel) replacement
	Hack #1	J-ML	6.0	New permanent structure
	Jacklah #1	J-ML	14.0	New log structure
	Lillian #2	L-ML	1.5	Log replacement
	Lillian #3	L-ML	4.0	New log structure
	north fork Houston #1	H-63	0.6	Log replacement
D Matchlee	Houston #3	S-ML	1.5	New permanent structure
	Black #1	B-ML	1.4	New log structure
F McCurdy	Black #2	B-ML	2.0	"
	McCurdy #4	M-ML	10.7	Log replacement
G Kleeptee	McCurdy #5	M-ML	12.5	"
	north fork McCurdy #1	NF-ML	2.4	Temporary (steel) replacement
	Kleeptee #2	N-30N	0.1	New log structure
I Lower Zeballos	Lime #1	Z-ML	9.0	Log replacement
	Manning #1	Z-ML	6.5	"
J Tlupana	Nesook #5	N-40	0.2	New temporary (steel)
	Nesook #1	T-ML	3.5	Steel replacement
K Lower Gold	Upana #2	HB-FR	7.6	Temporary (steel) replacement
	Magee #4	H-11F1	9.1	Log replacement
	Cypress #2	M-16	5.2	"
	Upana #4	H-27	0.2	"
	Siwash #1	G-ML	1.4	"
	Siwash #2	ZM-4G	0.3	"
M Saunders	Saunders #4	S-19	0.6	New temporary (steel)
N Upper Gold	Gold #4 - Span #2	E-68	0.3	Steel replacement
	Twaddle #1	T-ML	0.1	Temporary (steel) replacement
P Muchalat	South Muchalat #1	MU-80C	0.8	Temporary (steel) replacement
	Lake #2	L-ML	9.0	New permanent structure
Q Conuma	Conuma ML #2	C-ML	10.4	New temporary (steel)
	north fork Conuma #1	C-ML	11.2	"
	Norgate #2	C-22	5.0	New log structure
S Hisnit	Deserted #1	H-ML		New permanent structure
	S-900 #1	S-900	0.6	New temporary (steel)
T Hoiss	Argonaut #1	A-ML	2.6	Steel replacement
	Hoiss #3	S-16000	2.2	New log structure
U Tsowwin	Tsowwin #3	BCFP Acc.	0.3	Steel replacement
V Santiago	Green #1	G-7	0.2	Log replacement
	Weymer #1	G-7C	1.6	New log structure
	Weymer #2	G-7	5.4	Log replacement
	Weymer #3	G-7	5.9	"
X Upper Zeballos	Hemlock #1	Z-ML	21.0	Steel replacement
	Artlish Jct.	Z-ML	18.3	"
Y Tahsis	McKelvie #1	M-1	0.1	New temporary (steel)
	Sishat #1	EX-ML	1.4	Log replacement
Z Espinosa	Mamat #1	FH-ML	6.3	Steel replacement

3.4.3 Log Dumps

There are ten active log dumps and dryland sorts on the foreshore of the TFL. Their locations are shown on the TFL map. These dumps handle approximately 1,100,000 m³ per year. The Gold River and Nesook dryland sorts were paved recently.

Table 14: List of Dryland Sort Facilities

Location	Operation(s)	Towing Distance to Tahsis (km)	Towing Distance to Gold River (km)
Houston River	Houston/Silverado	51	12
Wilson Creek	Wilson/Jacklah	59	4
Pierce Creek	(inactive)	72	9
Burman River	(inactive)	72	9
Black Creek	Black (proposed)	67	4
Gold River	Ucona/Gold/Upana/Saunders/Muchalat	63	0
McCurdy Creek	McCurdy	59	4
Aston Creek	Aston (SBFEP)	51	12
Kleptee Creek	Lower Kleptee	43	20
Nesook	Upper Kleptee/Hanna/Tlupana/Nesook	43	44
Head Bay	Sucwoa/Conuma/Petty/Hisnit/Hoiss	47	48
Tsowwin River	Tsowwin/South Santiago	18	45
Green Creek	North Santiago (proposed)	5	58
West Tahsis	West Tahsis	5	58
Zeballos	Zeballos/Nomash/Espinosa	29	80

3.4.4 Road Maintenance

The road network will be maintained regularly to keep active roads in a safe operating condition. This involves grading of the running surface and turnouts, periodic maintenance of culverts and bridges, and grooming of the cutbanks. Brush regrowth that impedes the line of sight will be cleared.

Road systems not required once active operations have been completed will be maintained or deactivated, as based on the access management plan and road deactivation prescriptions. A road access, maintenance and deactivation plan is prepared annually and submitted to the MoF with the five-year forest development plan. Roads are coded as follows:

General maintenance

Active harvesting/forestry/recreation use. Fully maintained, ditches/culverts inspected and cleaned, unstable fill slopes will be stabilized (ie, pullback);

Temporary deactivation

Roads that are currently active but will be deactivated for winter. This usually involves stabilizing fill slopes and installation of cross ditches. Includes roads that will be required for the following year for active hauling or for silviculture projects;

Semi-permanent deactivation

Roads put-to-bed. This usually involves stabilizing fill slopes, removal of culverts and installation of cross-ditches. Roads are not required for active use but remain accessible to two or four-wheel drive;

Permanent deactivation/rehabilitation

Road is unusable for vehicles. Culverts/bridges are removed, cross-ditches installed, fill slopes stabilized, possible debuilding of road and recontouring of slopes. These roads are rehabilitated and the land replanted, unless no rehabilitation potential exists.

3.5 HARVESTING

Silvicultural systems and harvest methods used on TFL 19 are providing a steady transition from unmanaged forests to a mosaic of even-aged, managed stands. The coastal western hemlock stands of the TFL are well suited to an even-aged harvesting system. Harvesting during the planning period will continue to be mainly in old growth forest stands greater than 120 years old. Pacific also plans to begin a limited amount of harvesting in second growth stands using a selection system. Harvesting in the limited area of stands 60 to 120 years old will be avoided during this planning period unless it fits with a site specific plan to alter the forest cover to create favourable wildlife habitat.

3.5.1 Silvicultural Systems

Two systems will be used in TFL 19; clearcutting and selection cutting. Clearcutting has proven to be a successful silvicultural system for hemlock/balsam, Douglas-fir and cedar stands. There are many types of clearcutting. Progressive clearcutting has been used on a limited basis in areas with a high risk of blowdown. Patch clearcutting will continue to be the dominant system used. The wider use of different logging systems will influence block size and shape. The intent of the *Coast Planning Guidelines* will be followed. Under usual circumstances, the maximum clearcut or seed tree block size will be 40 hectares.

Cutblock size may exceed 40 hectares if:

- harvesting is being carried out to recover timber that was damaged from fire, insects, wind or other similar events and wherever possible, the cutblock incorporates structural characteristics of natural disturbances, or
- the silvicultural system proposed for the area

A	Silverado	0	32	45	70	68	46	
B	Jacklah	59	71	68	113	149	148	
C	Burman	0	0	0	0	0	54	
D	Black Creek	0	0	0	0	41	68	
E	Ucona	50	44	50	103	76	31	
F	McCurdy	50	41	26	40	15	69	
G	Kleeptee	70	54	58	41	20	21	
H	Hanna	73	23	70	56	46	8	
I/L	Zeballos	61	30	27	57	0	85	
J	Tlupana	190	128	96	86	162	46	
K	Lower Gold	118	112	70	135	98	54	
M	Saunders	45	13	53	86	51	27	
N	Upper Gold	107	58	113	72	82	51	
P	Muchalat	54	58	56	140	85	91	
Q	Conuma	74	45	54	106	97	28	
R	Sucwoa	36	44	34	15	57	28	
S	Hisnit	46	47	30	13	0	8	
T	Hoiss	35	58	6	39	132	22	
U	Tsowwin	15	59	22	77	21	6	
V	Santiago	65	44	97	42	0	14	
W	Perry	32	6	49	0	0	23	
O/X	Upper Zeballos	22	0	36	0	9	49	
Y	West Tahsis	53	0	0	26	49	114	
Z	Espinosa	14	25	42	33	53	49	
Totals		1,269	992	1,102	1,350	1,311	1,141	5,896

3.5.3 Harvesting Patterns

For the past 35 years the harvest of the AAC has been spread geographically over all 26 compartments. The strategy has been to diversify the harvesting impact so that all areas of the TFL were accessed and brought under an active management regime. As a result the harvesting pattern has been widely distributed in a blended pattern of old growth stands and regenerated second growth. This strategy will continue. The proposed harvesting pattern is illustrated on the twenty-year plan maps.

The harvesting pattern will also be influenced by several principles and guidelines for managing non-timber resources. They all have an influence on the locations and design of cutblock boundaries, size, shape and frequency of passes. These are:

- Coast Planning Guidelines

- Coastal Fisheries/Forestry Guidelines
- location of environmentally sensitive areas
- visual landscape management
- habitat linkages
- harvesting system
- Forest Practices Code regulations

3.5.4 Logging Methods

At present, several different logging systems are in use. The variety of logging equipment owned by the company and its contractors enables logging configurations to be matched to the ground conditions and the requirements. All logging methods use hand falling and log length yarding. The approximate distribution of logging methods is projected in the following table.

Yarding method	Percent of total production (approx)				
	Historical	1993-97	1998-2002	2003-2007	2008-2012
Ground-based and cable · hoe-chuck forwarding/line skidding · mobile highlead tower/mobile grapple yarder	86	87	77	74	72
Skyline	11	3	8	8	10
Aerial · helicopter/balloon · multi-span skyline	3	10	15	18	18

The use of conventional logging methods will continue but there will be an increase in the use of aerial systems and the introduction of new, innovative systems. During this planning period Pacific plans to increase the amount of harvesting in the non-conventional operability zone through the use of helicopter logging and multi-span skyline systems. The company also intends to introduce a balloon yarding system which has been operating on our private forest lands.

Selection harvesting and partial cutting will include use of a mechanised shortwood forwarding system. It uses an articulated grapple chainsaw, falling head mounted on a low ground pressure tracked skidder, to fall, limb and buck the trees into six metre lengths. The decked logs are then forwarded to the roadside by a self-loading clambunk forwarder. Selection harvest by cable yarding systems will be examined and implemented where feasible.

3.5.5 Cutting Priority

Under normal stable forest conditions, stands will be scheduled for cutting, providing they are greater than 120 years old. This is done to cover the range of the type group profile of the working forest. However, the forest health condition will be given first priority in considering candidate stands for cutting. Areas damaged from blowdown or fire will be scheduled for salvage harvesting. Equally, priority will be given to stands showing symptoms of insect or disease attacks. It will include second growth stands below or above culmination age with a root disease level exceeding 15 percent of the stand area. The remainder of the cutting priority will be determined through the scheduling sequence outlined in the forest development plan.

3.5.6 Utilization

Logging practices will emphasize the maximum recovery of sawlogs and pulplog grades. Log recovery will conform with the Vancouver Forest Region Close Utilization Standards as a minimum. These standards are:

	Old growth	Second growth
Diameter breast height(cm)	17.5	17.5
Maximum stump height (cm)	30	30
Minimum top diameter (cm)	15	10
Minimum log length (m)	3	3

The company may exceed these minimum standards by recovering low grade pulp quality logs. Generally, these logs are marginal Y grade specifications whose utilization is optional. Small diameter pulplogs and chunk pieces are currently processed by a mobile Peterson roadside chipper. Utilization is also kept high by the salvage of cedar and cypress shake blocks from logged blocks.

Utilization levels will be monitored by conducting residue surveys to determine the volume of avoidable and unavoidable fibre left on logged blocks. The estimate of avoidable waste to be billed is reported to the MoF. Avoidable and unavoidable waste is entered by the MoF into the cut control record.

Hardwood species, alder and cottonwood, have not been utilized from TFL 19 and are not included in the AAC. The merchantable volume available is minimal. Nevertheless, coastal hardwood log values have been steadily increasing in recent years. The company will consider sales of hardwood volumes if the opportunity arises.

3.5.7 Site Disturbance

Harvesting practices and road construction will be carried out to minimize site disturbance impacts and decreases in productivity. Levels stated in each cutblock silviculture prescription (SP) are the maximum allowable. Road deactivation prescriptions are to be prepared and submitted to the MoF district manager prior to deactivation work being initiated.

Rehabilitation treatments may be needed after logging to ensure compliance with site disturbance targets. The level will be assessed within three months after logging is complete and rehabilitation measures determined where necessary. Such treatments will be carried out within six months. Rehabilitation covers temporary roads, back spar trails, spur roads, skid trails and landings. The recovered areas are also planted and grass-seeded in many cases.

3.6 SILVICULTURE

The silviculture program on TFL 19 during the past 35 years has emphasized prompt restocking of harvested blocks, and stand tending to maintain the growth and productivity of the regenerated areas. Reforestation has been kept in step with harvesting and there is no backlog of not sufficiently restocked (NSR) areas needing planting. This performance is shown in Table 16. Pacific will continue with the same strategy during the next five years.

Table 16: Area of Silviculture Activities Completed (hectares)

Activity	Five Years (1988-92)	Cumulative Total 1954-92
Basic		
· site preparation	26	8,660
· reforested	5,434	32,827
· brushed	870	4,328
Incremental		
· spaced	1,988	7,607
· fertilized	-	4,380
· sanitized	1,536	23,977
· pruned	67	67
Total Basic/Incremental	9,921	81,846
Harvested Area	5,196	31,863

3.6.1 Basic Silviculture

Pacific will maintain a basic silviculture program in compliance with the Silviculture Practices Regulation. All basic silviculture activities needed for cutblocks harvested after October 1987 will be funded by the company. The MoF is responsible for funding treatments on cutblocks harvested prior to October 1987.

The goals are to:

- establish free growing regeneration within the prescribed period;
- plant all cutblocks usually within 18 months after harvesting to comply with prescribed regeneration delays;
- manage regenerated cutblocks to target stocking standards.

The silviculture activity goals outlined in Table 17 have been set for program planning. They are based on harvesting 978,000 m³ annually and regeneration success greater than 85 percent. These goals are reviewed and updated every year.

Table 17: Five-year Silviculture Activity Goals (hectares)

Activity	1994	1995	1996	1997	1998	1999
SPs	1,500	1,500	1,500	1,500	1,500	1,500
Planting	1,200	1,200	1,200	1,200	1,200	1,200
Site preparation	0	50	0	50	0	50
Silvicultural surveys	2,400	2,400	2,400	2,400	2,400	2,400
Brushing	200	100	200	100	200	100
Cone collection (<i>hl</i>)	50	100	50	100	50	100
Free growing surveys	400	500	800	1,100	1,500	2,000

Progress towards completing basic silviculture will be reported to the MoF through the MLSIS reporting system. MLSIS forms will be submitted for each block when an activity is completed, within the time period required by the Silviculture Practices Regulation.

3.6.1.1 Stand Establishment

Reforestation experience with the TFL has shown that natural regeneration is recruited easily but it is not always guaranteed that full stocking and even distribution will be achieved. Pacific's approach is to plant 90 percent of the logged areas even though natural regeneration can be anticipated. This strategy of planting almost all logged areas realizes several benefits:

- minimizes the regeneration delay;
- regenerates a mixture of conifer species ecologically acceptable to the specific growing site;
- obtains the yield gain from using genetically improved seed;
- achieves the target stocking standard of well distributed conifer seedlings;
- provides maximum opportunity for the conifers to compete with brush regrowth;
- minimizes the use of herbicides for suppression of brush competition.

Natural regeneration by western hemlock is prolific on most sites. Ecological forces and natural sequences usually result in leading red cedar and amabilis fir stands regenerating to stands of mixed leading hemlock after logging.

Ecologically, the licence area lies within the southern hypermaritime coastal western hemlock zone. Five biogeoclimatic units occur in the area.

Coastal Western Hemlock Zone

CWH _{vh1}	<i>Southern</i> Very Wet Hypermaritime Variant
CWH _{vm1}	<i>Submontane</i> Very Wet Maritime Variant
CWH _{vm2}	<i>Montane</i> Very Wet Maritime Variant
CWH _{xm}	Very Dry Maritime Subzone

Mountain Hemlock Zone

MH _{mml}	<i>Windward</i> Moist Maritime Variant
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The first step in preparing the regeneration plan for a cutblock is the identification of the ecological site series present. The MoF handbook (number 28) *A Field Guide for Site Identification and Interpretation for the Vancouver Forest Region* is followed.

3.6.1.2 Silviculture Prescription

The initial step in the stand establishment strategy will be to prepare ecologically based silviculture prescriptions specific for each cutblock prior to harvesting commencing. Each prescription will outline the proposed and alternate regeneration methods. Draft silviculture prescriptions will be advertised as being available for public review. Silviculture prescriptions will be signed and sealed by a Registered Professional Forester, and then submitted to the district manager for approval. The *Guidelines for Tree Species Selection and Stocking Standards for British*

Columbia is used to prepare the standards for each cutblock. Deviations from recommended standards may be prescribed for specific cutblocks. Amendments to a silviculture prescription will be prepared if a significant change to the approved prescription becomes necessary.

3.6.1.3 Site Preparation

Most cutblocks can be planted directly without site preparation. Locating adequate plantable spots on a cutblock generally is not difficult.

Prescribed spot burning to reduce the slash loading and to clear the planting site is used sparingly. It amounts to less than 100 hectares annually. It is considered only for sites where it is ecologically acceptable. This strategy contributes to maintaining wildlife habitat values and biodiversity at a stand level. The Vancouver Region *Site Diagnosis, Tree Species Selection and Slash-burning Guidelines* handbook identifies ecological site series for which burning is not recommended.

Mechanical site preparation with back-hoes may be used to create plantable spots and break-up slash accumulations on alluvial sites where dense thickets of salmonberry and salal grow after the site disturbance caused by harvesting. Rehabilitation of landings, back-spar trails and temporary roads, and the piling of woody debris along roadsides is also done by back-hoe prior to planting.

3.6.1.4 Reforestation

Planting is carried out from January to May at low elevations and April/May at the higher elevations. An estimated four million seedlings will be planted during the five-year period. The distribution of species to be planted is approximately Douglas-fir 10 percent, western hemlock 38 percent, red cedar 20 percent, amabilis fir 25 percent, cypress seven percent. Planting of Sitka spruce will be minimized until stock resistant to spruce terminal weevil can be produced, or suitable protection strategies for susceptible regeneration are developed.

Most of the seedlings needed are grown by Pacific's nursery at the Saanich Forestry Centre, near Victoria. Balsam seedlings are ordered from private nurseries near Campbell River to comply with the balsam woolly aphid quarantine zone regulation. Container grown plug styroblock stock types are used exclusively. The preferred plug size is either a PSB 313 or regular 415 grown as one year old stock. Larger PSB 415 and 615 sizes are ordered to provide large stock for planting on brush sites.

The *Provincial Seed and Vegetative Material Guidebook* (April 1995) is used in conjunction with local experience to prepare nursery seedling orders. Sufficient seedlings are planted to meet the target stocking standards, when combined with the natural regeneration. On average about 600 seedlings per hectare are planted.

On sites browsed frequently by elk, seedlings will be protected through survival techniques such as caging, delayed planting and cluster planting. On some heavily browsed sites it may be necessary to prescribe a variance to the stocking standards.

3.6.1.5 *Silvicultural Surveys*

Silvicultural surveys are performed on all regenerating cutblocks to monitor progress towards achieving free growing status. The information collected includes species, total and well-spaced number of seedlings, distribution, brush species and qualitative remarks. The results are used to prescribe follow-up silviculture treatments if necessary.

For the site series found on TFL 19 the allowable regeneration delay periods range from three to six years, and the free growing assessment periods spans from eight years at the earliest to 14 years at the latest.

Free growing surveys will be commencing in 1994, beginning first with areas regenerated in 1982. Free growing surveys will also be undertaken where green-up assessment is needed prior to scheduling harvesting of adjacent cutblocks. The results of regeneration delay surveys and free growing surveys will be reported to the MoF. Where free growing surveys, on post-April 1, 1994 blocks, indicate that stand densities exceed 5,000 stems per hectare, Pacific will conduct juvenile spacing treatments.

The types of silvicultural surveys used are described below:

Table 18: Silvicultural Surveys

Survey	Purpose	Timing	Intensity
Plantability	Assess plantable spots	Within 1 yr after logging as required	1 plot per 1-2 ha
Silvicultural	Determine stocking levels and regeneration delay	1 yr and 3 yrs after planting	1 plot per block ha
Brushing	Determine brush competition	In conjunction with silvicultural and/or pre-stand tending surveys	1 plot per 2 ha 1 plot/ha or 5 plots per stratum
Stand tending	Free growing assessment or pre-stand tending	8-14 yrs post-harvest	1 plot per ha or 5 plots per stratum

The silviculture surveys will be done to MoF standards, to provide the information required for the MLSIS reports.

3.6.1.6 Brushing

Pockets of dense salmonberry, thickets of salal, alder and maple coppice can affect plantation establishment. The areas of plantation requiring brushing treatment to control vegetation competition are relatively minor. Typically, only about ten percent of the gross area harvested each year subsequently needs brush control treatment. Normally areas likely to grow back in dense brush thickets after harvesting can be identified and the potential treatment prescribed in the silviculture prescription. Where this occurs the initial strategy is to prescribe immediate planting with larger plug stock types.

Brush regrowth will be monitored by brushing surveys. If a brush treatment is required, the technique used will be specific to the cutblock. Treatments used are applications of herbicides registered for forestry use or mechanical methods. When a forest herbicide treatment is proposed, the protocol for obtaining a pesticide use permit from BC Environment will be followed. Forest herbicides are also used to keep road rights-of-way clear of red alder and salmonberry regrowth. Streambanks and riparian areas will be protected by establishing pesticide-free zones on a site specific basis.

3.6.1.7 Seed Collection

Conifer seed for the reforestation program is supplied from both the company's Saanich Forestry Centre seed orchards and from cone collections made from natural stands on the licence area. The goal is to maintain a potential ten-year seed supply. At present, seed requirements are short for cypress (Yc) and red cedar (Cw). Blister rust resistant white pine (Pw) will also be introduced into the planting program as seed becomes available.

The rules for seed and seedling transfer within the Maritime Seed Planning Zone will be followed. As at December 31, 1993 the seed inventory was as follows:

Table 19: Seed Inventory

P.Zone	Species	Gen Class	Elev. (m)	Wt. (gms)	Potential Seedlings (mill)	Potential Years
Maritime	Ss	A	0-600	30,061	7.42	60
	Pw	B	0-600	1,515	0.02	-
	Hw	B	0-600	0	-	0
	Hw	B	600+	21,067	2,418	-
	Hw	A	0-600	28,385	6.71	14
	Hw	A	600+	854	0.236	-
	Hm	B	600+	9,245	1.30	46
	Fc	A	0-600	94,440	4.65	6
	Fc	A	600+	245,539	11.38	12
	Cw	B	0-600	3,550	0.66	1
	Ba	B	0-600	392,450	0.79	15
	Ba	B	600+	326,770	0.41	13
	Bg	B	0-600	4,400	0.01	-
	Yc	B	600+	1,008	0.19	-

A = orchard seed

B = wild seed

Collections will be made to increase the seed inventories of red cedar and cypress. Seed supply needs will also be maintained by purchases and trades with other companies and the MoF. Cone collections will be made in accordance with the *Tree Cone, Seed and Vegetative Material Regulation* (BC Reg. 164/95).

3.6.1.8 Tree Improvement

Pacific is a member of the Coastal Tree Improvement Council and co-operates with the Council in carrying out research in forest genetics and tree improvement. The company is also a participant in the Pacific Northwest Hemlock Tree Improvement Co-operative Program (HemTIC). Pacific conducts this work from its Saanich Forestry Centre. The tree improvement program represents over 30 years of applied genetic research. The Douglas-fir, western hemlock, Sitka spruce and amabilis fir tree improvement programs began in 1959, 1966, 1969 and 1976 respectively.

The company has established a total of nine seed orchards representing low and high elevations for Douglas-fir, western hemlock, as well as western red cedar, western white pine, yellow cedar, and Sitka spruce. The orchards cover 20.01 hectares. The first seed production began in 1974 with Douglas-fir, and by 1992 a total of 1,176 kg had been produced. Out-planting and progeny testing has been underway for 21 years. The company has one of two second-generation Douglas-fir orchards in BC. Seed production from this orchard will occur in 1995. An advanced generation western hemlock orchard is expected to begin seed production in 1999. The seed orchard licenses are included in Appendix 1(c).

During this planning period the plans for the tree improvement program include to:

- Df · rogue and move low elevation orchard #111 to Saanichton and interplant with orchard #109;
- Hw · move orchard #136 to Saanichton and include clonal representation of high breeding value clones from other BC orchards and HemTIC breeding program;
- Ss · continue plans to change breeding strategy to incorporate terminal weevil resistance and carry out testing of parent tree population;
- Cw · increase hedge seed orchard to 40 parents;
- Yc · manage one seed orchard and one seed production area;
- Pw · complete orchard design with rust resistant parents
- Ba · drop due to lack of tree improvement support and unsuitable climatic characteristics.

3.6.2 Incremental Silviculture

Incremental silviculture is any timber stand treatment that will maintain or increase the value of a timber stand some time in the future. Potential treatments include juvenile spacing, pruning, fertilization, commercial thinning, and genetic improvement. These treatments are additional to basic silviculture and are not a mandatory requirement of the Silviculture Practices regulation (except for post-April 1, 1994 regenerated stands with more than 5,000 stems per hectare at free growing, in which case juvenile spacing is considered a basic activity). The AAC, associated with Pacific's planned management option, is predicated on a commitment to incremental silviculture and, with the exception of genetic improvement, is conditional upon funding availability (see page 105, Appendix V).

The underlying rationale for an incremental program on TFL 19 is to improve the quality and yield from the regenerated stands and to compensate for the forest age class imbalance by treatments that will increase the timber supply availability in 40-60 years. The approach will broaden the fibre supply options in the mid-term on the TFL, as well as providing a marginal supply from commercial

thinning volumes in the near term. The incremental silviculture treatments will consist of genetic improvement, juvenile spacing, commercial thinning, pruning and fertilization.

Benefits sought from an incremental silviculture program will be:

- increases in timber stand value;
- improvement in volume yield;
- shortened rotation ages;
- enhanced biodiversity capability;
- improved security and thermal cover for wildlife;
- creation of potential local forestry employment opportunities.

When fully implemented at a stand level, the strategy consists of:

- planting Douglas-fir and western hemlock seedlings from genetically improved seed;
- pre-commercial thinning;
- commercial thinning approximately 20-25 years later.

This regime will be implemented on approximately 20 percent of the landbase. In other areas, tree improvement, juvenile spacing, pruning and fertilization will take place. Fertilization treatment would be applied to spaced and/or thinned stands. Proposals for funding these types of activities will be submitted to Forest Renewal BC.

Second growth stands are currently targeted for maximum fibre production in smaller diameter sawlog (ie, quad) and chipper grades. Opportunities for enhancing timber quality, in terms of reducing defect and providing clear, knot-free fibre, are enhanced by Pacific's incremental silviculture program (ie, genetic improvement, pruning). However, future markets cannot be predicted with any certainty beyond five years. Based on Pacific's current and projected fibre requirements, harvest production is split two-thirds sawlog and one-third pulplog. This may change dramatically based on market responses to consumer demand, product innovation, etc.

A secondary benefit from these treatments is that it will enhance the suitability of regenerated stands as deer and elk habitat. There is also the potential to treat areas adjacent to critical wildlife habitat with the specific objective of habitat enhancement ie, forage production, thermal and security cover. Pacific will refer incremental silviculture project plans adjacent to identified wildlife sensitive areas to BC Environment for review.

3.6.2.1 Genetic Improvement

All of the Douglas-fir and 80 percent of the hemlock seedlings planted in TFL 19 are from Pacific's genetically improved seed produced by first generation seed orchards (see Section 3.6.1.8). Anticipated gains in volume yields are five percent for first generation Douglas-fir and 2.5 percent for first generation hemlock. Additional yield increases are expected to occur in 10 years when seed

from second generation orchards starts becoming available after 1997. These cumulative gains are expected to be nine percent for Douglas-fir and 7.5 percent for hemlock.

3.6.2.2 Juvenile Spacing

Stands will be assessed for juvenile spacing once they have reached sufficient age and height. Selection will be based on site index, height and density, ie, the number of competing stems per hectare. Candidate stands will have average or better productivity and experience competition for growing space that would benefit from spacing. The regime will be designed to maintain the growing space for the crop trees while leaving enough stems to allow a commercial thinning in the future, ie, spaced to 800-850 sph for western hemlock, and 650-700 sph for Douglas-fir. These post spacing densities will remain whether commercial thinning is anticipated or not. It is expected that 10-15% of regenerated stands will be spaced.

Potential candidate stands would have the following attributes:

Site Index	> 25 metres
Age	12-18 years
Height	4-7 metres
Density	> 3000 sph

Pre-stand tending surveys will be completed for candidate areas. A stand management prescription is then prepared for the stands selected. Prescriptions will include management practices designed to maintain desirable wildlife habitat features. Specifics for managing juvenile stands for providing forage, security, thermal and snow interception cover are listed in the terms of reference for wildlife ESA management, described in Appendix V. The MoF publication *Guidelines for Maintaining Biodiversity during Juvenile Spacing* will be used as a reference. The potential area suitable for juvenile spacing during the next five years is 1,000 hectares. The size of the program will depend on funding obtained from the government. This will include applications to the BC Forest Renewal Plan announced by the government in 1994. Proposed project regimes for pruning or fertilization will be described in the stand management prescription for each stand.

3.6.2.3 Commercial Thinning

There are now approximately 3,400 conventionally accessible hectares of western hemlock and Douglas-fir stands between 35 and 45 years old on TFL 19. These are some of the first regenerated stands from the earliest logging on the licence. They occur on favourable terrain in the Nomash, Zeballos and Gold River valleys. The stands on medium to good site classes have been intensively managed. Most have been planted, spaced and fertilized. These stands have now grown to an adequate size for commercial thinning to be feasible.

Pacific intends to begin commercial thinning on a small scale operational trial basis. The purpose is to gain experience with thinning in a range of stand types and conditions. These trials will

test thinning equipment, methods and provide information on production costs. Fibre recovery as lumber and pulp chips will also be examined. The long term goals of the commercial thinning program are to increase timber stand value, improve security and thermal cover for wildlife, and to create employment opportunities.

Stands chosen will be on favourable ground of better than average productivity. The basic prescription will prescribe thinning from below, in most cases, removing about 25-40 percent of the basal area, and about 80-120 m³ per hectare. This approach essentially salvages volume from the subdominant trees that would have succumbed to competition before the final harvest plus a small percentage of codominant trees. Stocking after thinning would be about 350 to 400 sph. Several variations of this thinning regime will be tested so that growth response can be evaluated. Thinning prescriptions will be specific for each stand. Potential candidate stands are:

Site Index	> 25 metres
Age	35-45 years
Height	18-25 metres
Volume	350-500 m ³ /ha
Density	> 650 sph

During the next five years it is planned to thin approximately 50 to 100 hectares per year. This will yield about 20-25,000 m³. Pacific anticipates that the commercial thinning program will expand to 100 to 200 hectares per year after 2000. The areas chosen will be indicated in the five-year forest development plan. Cutting permit applications and stand management prescriptions will be submitted to the MoF. It is critical that this thinning be economical. In order for the company to have an incentive to develop commercial thinning as a economically viable wood supply source, Pacific proposes that for the first five years the volume recovered be incremental to the AAC and be billed at minimum stumpage. Stand parameters before and after thinning and data on piece size and volume removed will be collected to demonstrate that the volume is incremental.

3.7 FOREST HEALTH

Pacific will maintain a forest health program that is designed to protect the licence area from damage by insects and disease. A pro-active strategy will be pursued in detection and control. The incidence and types of diseases differ between the mature timber stands and the immature second growth stands. The goals of the program are to:

- minimize the loss of timber in operable merchantable stands;
- maintain the forest productivity health of immature stands by monitoring pest and disease activity and implementing control action when needed;
- salvage pest damaged or wind damaged timber quickly;
- minimize the time between felling and processing of timber.

Historical Occurrence

The forests of TFL 19 have been relatively stable and free from major infestation of diseases or pests. There have been no major catastrophic outbreaks causing significant unsalvaged mortality or volumes losses. The main active agents has been various defoliators and beetles. Root diseases have been insignificant.

Some outbreaks of western black-headed budworm occurred in 1955-56 and 1972-73 above 600 metres in elevation near Zeballos, Tahsis and Nomash Rivers, and in the Kyuquot area. The green striped forest looper occurred along the Muchalat and Zeballos Inlets in 1959-62. In 1960 this looper defoliated 10,500 hectares of hemlock and cedar types.

Douglas-fir beetles have occasionally caused pockets of mortality after drought conditions in Gold River. Mountain pine bark beetle activity was noted in 1962-63 near Muchalat Inlet along the Houston River.

The spruce terminal weevil (*Pissodes strobi*) has severely infected Sitka spruce plantations. Long term control measures has been unsuccessful and as a consequence Sitka spruce is no longer established in single species plantations. White pine blister rust (*Cronartium ribicola*) has also prevented reestablishment of white pine. This is unfortunate as both spruce and white pine are important niche species. Pacific is developing seed orchards with resistant parent trees for both of these species.

Hemlock dwarf mistletoe is widespread throughout merchantable size stands. A sanitation treatment is often required to minimize the incidence in regenerated western hemlock stands. White pine blister rust commonly infests white pine. Other than these periodic outbreaks described, the forest health situation has remained relatively stable. Listed below are the known pests and diseases presently having some impact on TFL 19.

Table 20: Pests and Diseases on TFL 19

	Agent	Occurrence	Incidence	Susceptible Species	Management Risk
Root Disease					
Armillaria root rot	<i>Armillaria ostoyae</i>	occasional	light	Fd, Hw, Ba, (Cw, Ss)	M
Annosus root rot	<i>Heterobasition assosum</i>	occasional	light	Fd, Cwt (Hw, Ba, Ss)	L
<i>Phellinus</i> Root rot	<i>Phellinus weirii</i>	occasional	light	Fd, Ba, (Hw, Ss)Cw	M
Stem/Branch Diseases					
Hemlock Dwarf Mistletoe	<i>Arceuthobium tsugense</i>	frequent	medium	Hw, (Ba, Ss)	L
White Pine Blister Rust	<i>Cronartium ribicola</i>	common	heavy	Pw	H
Insects					
Douglas-fir beetle	<i>Dendroctonus pseudotsugae</i>	infrequent	light	Fd	L
Spruce terminal weevil	<i>Pissodes strobi</i>	common	heavy	Ss	H
Western black-headed Budworm	<i>Acleris gloverana</i>	infrequent	light	Hw, Ss, Ba	M
Ambrosia beetles	<i>Trypodendron lineatum</i>	common	heavy	(Hw, Ss, Ba, Fd)	H
Root collar weevil	<i>Steremnius carinatus</i>	infrequent	light	(Fd, Ss), Ba, Hw	L
Mammals					
Roosevelt elk	<i>Cervus elaphus roosevelti</i>	frequent	light	Cw, Fd, (Hw, Ba)	L
Black-tailed deer	<i>Odocoileus hemionus Columbianus</i>				

Detection

As long as pest activity in mature stands remains low evidence of pest incidence will be assessed when collecting field data for silviculture prescriptions. Completed silviculture prescriptions will include proposed action for dealing with pests noted.

Increased incidence of any pest will be noted by observations during the course of regular operations. Expertise in assessing pest activity is provided by company personnel at Gold River and Saanich Forestry Centre. Catastrophic outbreaks will be dealt with by a specific action plan. Assistance from specialists at the Canadian Forest Service including FIDS (Forest, Insects & Disease Survey), MoF and universities will also be requested if required.

Ground-based surveys will be carried out when warranted to assess the incidence of root rot, mistletoe and spruce weevil in specific areas. Pest incidence in regenerated stands will be monitored by collecting pest data when carrying out silviculture surveys, or other stand assessments.

Control

Control measures are specific for each issue. Pest damaged mature timber will be salvaged whenever possible. Pacific will continue to implement control tactics as outlined.

- | | |
|-------------------------|--|
| Hemlock dwarf mistletoe | · clearcutting and felling of all residual trees to minimize re-infection of hemlock regeneration. Burning slash if infection level is high in advanced regeneration. Sanitation spacing to be emphasised for immature stands. |
| Bark beetles | · disposal of residual logging slash to reduce food source and potential for population build-up. |
| Spruce weevil | · plant Sitka spruce in mixtures with other conifers at less than 20 percent stocking; continue research with chemical control and resistance. |
| Balsam woolly aphid | · only order Abies seedlings from nurseries in non-infested zones. |
| Ambrosia beetle | · manage log inventory of felled and bucked, install traps at log storage areas, dry land sorts, and sawmill lumber yards. |

In the event of increased pest activity or population outbreaks action plans that outline the specific control measures will be prepared. The company would consider spraying to control severe defoliation outbreaks, preferably with some type of biological insecticide.

3.7.1 Non-recoverable Losses

Volume losses caused by disease, blowdown or fires have been insignificant. When this occurs, the majority of the volume is recovered by salvage logging. Most non-recoverable losses are accounted for within the general inventory sampling system. Approximately 1,800 hectares of TFL 19 have suffered accidental burns and any significant operable stands have typically been harvested. Blowdown areas are harvested promptly unless it is environmentally unsound.

3.8 FIRE PROTECTION

The company will continue to maintain a pro-active fire protection program. Since the creation of the TFL there have been only two major fires; Upana Mountain in 1958 and Muchalat Lake in 1966. As the licence area is situated on the west coast of Vancouver Island, in the wetter maritime zone, typically the fire danger reaches extreme only in some of the interior drainages on the east side.

The goal is to minimize and suppress all fires in the operable forest, and to maximize the salvage of fire damaged timber. Pacific will comply with Part 10 of the Forest Act and the Regulations, with respect to fire prevention, slash and snag disposal, and suppression. The fire protection program has four components; prevention, preparedness, detection and suppression.

3.8.1 Prevention

The risk of forest fires will be minimized by reducing the amount of slash and roadside accumulations left by harvesting operations. A fuel management plan will be updated and submitted every five years to the MoF. A five-year silviculture plan is submitted annually. These plans will identify the active operations, areas with slash accumulations and measures to reduce the hazard.

3.8.2 Preparedness

A fire preparedness plan will be submitted annually by April 1 to the district manager in accordance with MoF guidelines. Key company operations personnel and the logging contractors receive a copy of the plan.

Fire fighting equipment is maintained in working condition in fire warehouses at Gold River, Tahsis and Zeballos, and at all contract logging operations.

All company operations personnel will be kept advised of the increase in fire hazard and a high awareness of the FWI will be encouraged amongst the staff. Logging contractors' crews are an important component of any initial fire attack complement. The contractors will be checked during the fire season to ensure they are equipped with the required complement of fire tools, and certified as being in compliance with the forest fire prevention regulations. Company and contract crews are trained in fire tool maintenance, fire line safety and fire fighting techniques.

Fire weather stations are operated at four locations during the fire season (from April 15 to October 15). The climate recorded daily is used to calculate and track the fire weather index (FWI) and fire danger class (DGR). After the DGR enters high hazard class, for three consecutive days, operations are placed on early shift, and a woods closure is invoked when the FWI becomes extreme. Closures and access restrictions are discussed with the MoF district manager.

3.8.3 Detection

Aerial patrols are undertaken during periods of upper moderate hazard class or greater, regardless of logging activities. Watchmen are employed by all company and contract operations. MoF lightning locators are also used to assist in fire patrols performed after lightning strikes.

3.8.4 Suppression

Fire suppression activities will be carried out in compliance with the Forest Fire Prevention and Suppression regulations (BC Reg. 169/95). Various functions will be performed during the fire season to enable the early detection and reporting of fire. The goal is to ensure that all wildfires are detected quickly to ensure control with a minimum of delay. The minimum suppression objective is to control a wildfire by 10:00 am of the next day.

3.9 FOREST MANAGEMENT RESEARCH

Pacific conducts a variety of forest research activities at its Saanich Forestry Centre, which was established in 1964. Staff at the centre conduct research in:

- tree improvement;
- nursery culture;
- forest health;
- maintain ambrosia beetle program at Tahsis sawmill, dry land sort and booming ground areas;
- growth and yield; maintain existing plots and establish new plots.

The company will continue to co-operate with the MoF, Canadian Forest Service, university and other research specialists on various research initiatives. Project funding support is often provided by these government agencies. The results of the research is of benefit to all of the company's operations, including TFL 19, as well as to forest management of the province's forests.

Current research projects include:

Tree Improvement

- Assessment of inbreeding and genetic variation in western red cedar seed orchard (funding - MoF).
- Genetic evaluation of seed crop harvesting, handling and seedling production practices (funding - Science Council of BC, STDF/AGAR).
- Assessment of supplemental mass pollination success rate in Douglas-fir seed orchards (funding - MoF).
- Ex-situ conservation of forest biodiversity in BC (funding - FRDA II/Forestry Canada).
- Pacific yew genetic diversity and seed biology (funding - FRDA II/MoF).
- Genetic diversity in mountain hemlock (funding - Forestry Canada Green Plan).
- Reproductive cycle in yellow cedar (funding - FRDA II/MoF).
- Species/genetic diversity in commercial thinning (funding - MoF/Forestry Canada).

Nursery Culture

- Field performance test of 313, 415, 615 plug stock types on the same seedlot.
- Root system development of western red cedar at different sowing dates.

Forest Health

- Outplanting spruce weevil resistant seedlings and grafts.

3.10 ACCESS MANAGEMENT

The forest roads on the licence area are open for use by the public at their own risk. Restrictions rarely apply and will be invoked only with MoF approval (normally during periods of extreme fire danger or for safety reasons). It is recommended (to the public) that they use roads with active hauling outside working hours. Unless a road has been specifically permanently deactivated the company intends to keep roads accessible by four-wheel drive at minimum. An access management plan will be prepared annually which takes into account public access and deactivation requirements.

4.0 INTEGRATED RESOURCE MANAGEMENT STRATEGIES

The use and enjoyment of non-timber resources within TFL 19 attracts a broad public interest. This is mainly from local residents and people living in the adjacent North Island region. The gradual improvement and upgrading of access to the Nootka Sound area has stimulated a steady increase in activity and visitors. Nevertheless the commercial use of these non-timber resources remains fairly limited. Maintenance of these resources is strongly linked to sustaining a healthy forest resource.

The harvesting pattern on TFL 19, over the past 35 years, established the basis for integrated resource management of the licence. The continuous development and management has facilitated and enhanced public use of many resources. Provision of good road access has been fundamental in enabling growth of recreational pursuits. Today the diversity of forest cover types created by the harvesting patterns used clearly demonstrates that wildlife can adapt and thrive in the new habitat which has been created. The company will continue to co-operate with government resource agencies to provide balanced management of all forest resources. Outlined below are the strategies for managing the non-timber values.

4.1 RECREATION

The integration of recreational interests with timber harvesting on TFL 19 has been ongoing for a long time. Traditionally, the main recreational use has been for camping, hiking, fishing and hunting predominantly by local residents. Numerous camping spots and hiking trails have been developed over the years as interest has increased. The location of existing recreational facilities is shown on the TFL map. Campsites are established at:

Muchalat Lake
Leiner River
Cougar Creek
Gold River
Conuma River

Eleven informal hiking trails exist around Gold River, Tahsis and Zeballos. The opportunities offered for marine-related recreation and exploring the Quatsino Limestone Formation have experienced a growing appeal to residents and seasonal tourists. Features, such as caves and limestone formations, and the excellent salmon fishing in the inlets of Nootka Sound, are key attractions. The proximity of Strathcona Park also draws some attention to the potential for recreation on TFL 19.

To provide direction to future recreational development, a recreation analysis report has been prepared for the management plan (Appendix VI). This report has taken the results of the recreation

inventory to assess current recreation use patterns and to project future trends. It provides a full comprehensive list of the recreation activities and describes potential new development activities.

Recreation goals during this planning period will focus on five patterns of recreation use:

- (1) maintain and improve existing camping and picnic facilities associated with lakes and rivers;
- (2) assist in planning of expanded facilities for marine recreation;
- (3) conserve caves and karst resources in co-operation with caving associations (ie, the BC Speleological Federation) and the MoF;
- (4) address access management to recreation features (ie, lakes and rivers);
- (5) formulate a plan to address lake and river management in the next five years.

Specific details of the recreation plans and strategies for each of these goals are outlined in the recreation analysis report.

The key features of this plan for the next five years are:

Marine campsite facilities

- Cougar Creek recreation site would be expanded to a 60 unit site;
- a new recreation site will be developed for Nootka Sound at Hanna Channel where a 20-unit campsite will be constructed commencing in 1995, with an adjacent commercial facility to be operated by the Mowachaht-Muchalaht Band.

Existing lakeshore/river facilities

- Muchalat Lake campsite upgrading and maintenance;
- Upana Lake, improved access for canoe and boat launch;
- Star Lake parking lot development and installation of picnic tables;
- Malaspina Lake upgrade access, construct parking lot, and installation of picnic tables;
- Antler Lake installation of picnic tables.

Cave/Karst Features

- Pacific will conduct surveys for cave entrances and karst features in areas of known limestone formation prior to harvesting;
- the company will co-operate and assist cavers to survey and explore new cave systems;
- the Upana Caves access will be upgraded and maintained for use by the public.

The implementation of the work proposed on Crown land is dependent on MoF funding. The development of the marine recreation facilities should receive highest priority. Pacific will fund development on company-owned land.

Areas having significant value for recreational activity or viewing enjoyment have been designated as potentially environmentally sensitive areas. Separate management regimes have been established for each category. The objective is to maintain managed forest stands that satisfy the recreation values of these areas.

- Er₁** Areas having high value for recreation, educational, ecological, aesthetic or cultural heritage value.
- Er₂ (netdown)** Areas requiring special management considerations to protect or maintain recreation values.
- Er₂ (cover)** Areas requiring forest cover (rate of cut) constraints to maintain recreation values.

Management goals and strategies for the recreation sensitive areas include the following:

- manage Er areas primarily for the protection, maintenance and enhancement of recreation values noted;
- refer all proposed harvesting, road construction and silvicultural activities, within Er₁s and Er₂s, to the MoF for review, comments and approval;
- indicate Er areas on forest development plan maps.

Tourism in the Nootka Sound area is expected to continue to grow. The Municipality of Gold River has a community tourism committee that actively promotes recreation. Pacific will continue to share information with this committee and co-operate with it to increase tourism activity.

4.2 FOREST LANDSCAPE

The resource-based communities of Nootka Sound recognize the value of the working forest and the modified forest cover appearance that results from harvesting. The logging pattern along the coastal inlets (Muchalat and Tahsis) over the past 50 years, in combination with the natural landform, has created a blended mosaic of forest cover. It is possible to continue harvesting in these areas while maintaining the essential landscape appearance. The Minister of Forests has made a commitment to the communities for public input to establish visual quality objectives, through the Nootka Area Land Use Advisory Board. The company feels that the people who live and work in the area should have a direct say on what this should be. Accordingly, the local communities were asked for their opinions on forest landscape sensitivity and whether there were areas where harvesting might be restricted in consideration of this sensitivity. Pacific has learnt that the communities are not opposed to logging within sight of the villages but do not want to see large alterations to the appearance of the landscape.

Pacific will carry out visual impact assessments where operations are proposed in scenic areas. The Tree Farm Licence 19 landscape report and public input has identified the sensitive viewsapes. The viewsapes around the communities of Gold River, Tahsis and Zeballos are the most visually sensitive. Travel corridors, including recreation sites, waterways and roads, are also considered to be scenic areas. Forest landscape design principles apply to all these areas.

The company will ensure that forest practices will meet the visual quality objectives. Generally, this means that cutblock boundaries will be designed to blend in more naturally with the viewscape and the size of clearcuts will be reduced. Alternative silvicultural systems, such as selection cutting, and dispersed small cutblocks will also be considered when appropriate. Harvest blocks planned within the visually sensitive areas will be clearly identified in the five-year forest development plan so that the public is informed. Visual impact assessment, computer aided perspective plots, and photographs will be used for designing harvest blocks proposed within visually sensitive areas. Approval of this management plan establishes planning level VQOs. They will be subject to finalization pending the public consultation process announced by the Minister of Forests.

4.3 WATER

The watersheds in TFL 19 drain a large catchment area on the west coast of Vancouver Island. Maintaining the water quality is vital to preserving the integrity of the aquatic habitat. The company will continue to use operating practices that maintain water quality and stream bank stability.

The Village of Tahsis holds a water licence (#930.015) for McKelvie Creek. The water supply is drawn from a pumping station on the bank of the creek and is not drawn directly from the creek. The importance of this water supply source is recognised by Pacific. The company is proposing development and harvesting in the McKelvie Creek drainage in the foreseeable future. Pacific is committed to ensuring that its actions do not infringe on the ability of the Village of Tahsis to access a quality water supply. This may range from special techniques in harvesting and forestry to relocation and re-establishment in alternate drainages, for example the Leiner, or the development of a well. An integrated watershed management plan will be required for McKelvie Creek when Pacific proceeds with a development plan for this area. The Villages of Gold River and Zeballos both use wells to draw their domestic water supply. The Zeballos River watershed is also designated as a community watershed by water licences held by the Village of Zeballos (#930.026 and #930.027).

Special care will be taken when harvesting adjacent to streamside management zones (SMZs). Site specific standards and specification to maintain water quality are detailed in each cutting permit. In the reforestation phase, if a brush control treatment with herbicides is planned, pesticide-free zones will apply to all areas adjacent to water bodies.

4.4 FISHERIES

The rivers and streams on TFL 19 are used extensively by all species of salmon (coho, sockeye, chinook, chum, pink) and steelhead trout. Freshwater trout are found in numerous small lakes as well as in the streams. Both saltwater fishing and streamside angling has become increasingly popular. Planning and operating practices recognize the sensitivity of stream sides to disturbance from harvesting and other management practices. Management of fisheries sensitive areas has the following goals:

- maintain and protect the productive capacity of fish habitat including water quality and stream channel characteristics;
- maintain the integrity of stream channels and associated vegetation by establishing SMZs;
- prevent erosion of stream banks and sediment transfer or debris or increased stream temperatures to protect downstream habitat;
- plan the use of forest resource so that the management of forest land and fisheries values are co-ordinated and integrated;
- realize opportunities for increased production of both fish and timber from managed forest lands. This includes enhancement and rehabilitation of fisheries habitat.

4.4.1 Fisheries Sensitive Areas

BC Coastal Fisheries Forestry Guidelines have been used to classify all stream reaches as Class A, B, and C. Depending on the fisheries sensitivity, the habitat is assigned into one of two categories; Ef₁ (2,877 hectares) or Ef₂ (183 hectares). There are separate management strategies for each.

Ef₁ This category applies to all Class A and major class B/C streams, Class A lakes and all estuaries. These areas are generally incorporated into SMZs. Areas of extensive channel braiding or active meander bends considered critical for stream stability are included. The width of the SMZ is dependent on the stream width.

Stream Class	Stream Width	SMZ Width
A, major B/C rivers/streams	> 10 metres	if <30 metres: equal to stream width if ≥ 30 metres: 30 metres
	< 10 metres	10 metres
A, lakes/estuaries	-	30 metres

The measures and principles for operations on the SMZs include:

- Harvesting within SMZs must be approved by DFO and BC Environment. Selective tree removal may be approved provided the structural and functional characteristics of the original stand are maintained, and site disturbance is minimal;
- Harvesting will usually not be acceptable within 10 metres of Class A waters and major Class B/C streams;
- All planning and operations for road construction, falling, yarding and silviculture activities are to be in accordance with the BC Coastal Fisheries Forestry Guidelines and cutting permit specifications;
- Stream reaches and lakes classified as Ef₁ are to be clearly shown on 1:5000 scale operational maps.

Ef₂ This category includes aquatic environments important as fish rearing habitat, but may not be defined as streams. They include side and flood channels, valley wall ponds, swamps, seasonally flooded depressions, and lake littoral zones.

Ef₂ fisheries sensitive areas are usually more stable than SMZs. Some harvesting is permissible.

All proposals for harvesting, road construction, and silviculture activities within and adjacent to this category will be referred to DFO and BC Environment for review and approval. Areas classified as Ef₂ are to be clearly shown on 1:5000 scale operational maps.

The *BC Coastal Fisheries Forestry Guidelines* specify that an assessment of the cumulative effects of harvesting should be carried out on watersheds, as required. Classification of riparian management areas will be conducted as per the Operational Planning Regulation (BC Reg. 174-95).

4.5 WILDLIFE

A variety of wildlife species occurs throughout the licence area. Notable large mammals include Columbia black-tailed deer, Roosevelt elk, black bear and cougar. There are also numerous small mammals such as marten, raccoon and squirrel. Various species of birds utilize both the old growth and second growth forests. The dispersed harvesting pattern has provided a spectrum of habitat types suitable for this broad number of wildlife species.

BC Environment has population management goals for some wildlife species. A degree of control is maintained over the large mammal population by setting bag limits, issuing hunting licences every year and by limited entry hunting permits. The strategy for maintaining wildlife species is to ensure that adequate habitat is provided. The concept is that by ensuring suitable habitat is maintained a viable population will be maintained.

Wildlife habitat is not static and will change over time as the amount of the second growth forest increases and stand structure changes. This suggests that habitats are transitory and change over time as harvesting progresses. Experience from the past 35 years of harvesting on TFL 19 is evidence that

most wildlife flourishes with a changing habitat and take advantage of new forage created. The historical harvesting pattern has provided an ideal combination of forest cover and foraging areas for both ungulate and their predator populations. Today populations are at historically high levels. Since the early 1970s winters have been mild with low snow accumulations. Proper management of the remaining old growth stands, and regenerated stands can ensure that wildlife populations are maintained without compromising timber harvesting.

The company has developed a management strategy for habitat areas critical for wildlife. In 1993 mapping of wildlife sensitive areas was completed with input from BC Environment wildlife specialists. The wildlife (Ew) categories identify areas that have significant value to wildlife as forage, shelter or reproduction.

The categories are:

Ew₁ Areas of critical importance to wildlife for food, shelter, and reproduction. Included are habitat areas where primary function has been identified as providing important winter range for black-tailed deer (generally located in moderate to very deep snowfall zones 300 metres and above in elevation), elk ranges required for forage and visual cover, and other special wildlife areas identified by BC Environment.

These areas are usually delineated based on slope, aspect, old growth forest cover type and elevation.

Other wildlife values may be of equal, greater or lesser importance. Some of the obvious wildlife species which utilize these areas are cougar, black bear, and marten, as well as forest dwelling birds such as pileated woodpeckers and various thrushes, to name a few.

Ew₂ Wildlife habitat areas located in the shallow snowpack zone (usually below 300 metre elevation) where snowpacks are usually shallow and ephemeral.

Ew Zone A wildlife habitat area where opportunity exists for boundary modification. Primary objectives are to locate suitable deer winter range, but flexibility is recognized to address both retention of old growth biodiversity values and some degree of harvest opportunity. Some Ew zones may be composed principally of second growth, but possess sufficient wildlife habitat capability as to warrant silvicultural enhancement to create or sustain forage and cover values.

Designation of wildlife ESAs will change over time as additional information on wildlife habitat requirements becomes available. Forest management techniques which maintain and enhance wildlife habitat attributes in managed stands will also continue to be developed and implemented. As the concept of primary forest ecosystem networks identification depends upon the integration of all ESAs and operability information, no additional management strategy appears to be required to provide core reserves.

Older forests are needed for wildlife habitat because of their stand complexity and provision of quality food and shelter for wildlife, particularly black-tailed deer. Managed second growth stands can

provide suitable character and function as mature forest conditions develop. Substitute areas for Ew replacement may be designated in adjacent managed second growth stands or, as an alternative, some degree of within-stand harvesting may be acceptable.

Management goals and strategies for the wildlife sensitive areas include the following:

- Manage Ew₁ and Ew₂ areas primarily for forage, security cover, thermal cover, and snow interception to maintain and enhance wildlife populations and habitat.
- Delineate Ew zones as 200 metre buffers along the edges of Ew₁ and Ew₂ areas.
- Indicate wildlife management strategies on development plan map:
- Proposals for harvesting with Ew₁ areas, in the next five years, must be acceptable to BC Environment.
- All proposed harvesting, road construction and silvicultural activities within Ew₁, Ew₂, and Ew Zone areas will be referred to BC Environment for review and approval.

Forest modelling in the timber supply analysis has allowed restricted harvesting of these areas over time by assuming specified forest cover constraints. The concept is that a pool of critical wildlife habitat can be maintained. As harvesting progresses, suitable replacement habitat will become available as a result of growth and stand management practices. The underlying objective is to maintain managed forest stands that satisfy wildlife requirements.

The strategies described will contribute to maintaining biodiversity and wildlife habitat at a forest landscape level. At a stand level, the company will follow recommended management practices which will retain existing features considered desirable in maintaining biodiversity. Some of these practices benefit cavity nesting birds and animals such as marten and squirrels which use trees as dens and roosts. These include identifying and leaving wildlife trees, dead snags, deciduous trees, patches of vegetation and coarse woody debris in an area. These practices will be influenced by habitat requirements of species listed by BC Environment as a management concern. These are known as *Red or Blue List* species. Two bird species receive special attention; bald eagle and marbled murrelet. Both are on the Blue List.

Bald eagles are quite common. Eagle nests tend to be found in trees within the SMZs. Disturbance and harvesting in these areas are minimal. Eagle trees will be left standing wherever they occur and buffered whenever feasible. The company will follow BC Environment's recommended protection measures for bald eagle nests and habitat.

Preliminary studies by the Canadian Wildlife Service in 1992 indicated that marbled murrelets are found on TFL 19. The extent of its use of TFL 19 and population size are not known. Research studies of this bird are focused on other locations of the BC coast. The company will co-operate with BC Environment and the Canadian Wildlife Service in conducting further studies on the marbled murrelet.

4.6 CULTURAL VALUES

Historically, native living in the Nootka Sound area was concentrated along the shoreline and coastal inlets. Evidence of native occupation is found in middens adjacent to former village sites and in the nearby forests. The recreation inventory has noted the location of some known native cultural sites. The company has an agreement with the Native Bands and the MoF that the location of these archaeological sites will be kept confidential, and will ensure that they are protected.

Pacific will co-operate with the local Bands in the location and identification of previously undiscovered cultural sites and heritage trails. The company's forest engineers will report the discovery of new archaeological sites and native artifacts to the Native Bands. The impact of proposed development on cultural resources will be reviewed with local Bands. Changes to these plans or mitigating measures will be discussed.

4.7 SOILS

The sensitive soil classification is adequate for broad level planning. The soils on the licence area have proven to be stable and few problems have been encountered with slope stability. In 1992 the company initiated a program to complete terrain stability overview mapping of the licence area. To date, this has been substantially completed for six compartments Silverado, Jacklah, Kleeptee, Hanna, Tlupana and Saunders (A, B, G, H, J, and M). It is planned to complete the balance of the licence area by December 31, 1995.

The sensitive soil categories are:

- Es₁** Unstable terrain undergoing recurrent natural mass movements, and marginally stable terrain that has high potential for mass movement.
- Es₂** Stable terrain that has moderate potential for mass movement. Includes sites sensitive to disturbance.

Management strategies for soil sensitive areas include the following:

- conduct on-site terrain stability evaluations where soil sensitive areas are indicated on overview maps;
- minimize roads through soil sensitive areas as much as possible. Where unavoidable, follow special road construction techniques (endhaul, pullback, control blasting, etc);
- consider Es₁s as protection forests;
- avoid falling lines within Es areas;
- ensure adequate lift during yarding;
- suspend operations during major rainstorms.

5.0 CONTRACTING

Pacific uses logging contractors and forestry consultants extensively in operating TFL 19. The company is obligated, by clause 10 of the tree farm licence agreement and the Timber Harvesting Contract Regulation (BC Reg 258/91), to have a major portion of the AAC harvested annually by independent logging contractors.

The annual volumes harvested by contractors must exceed 50 percent of the portion of the AAC attributed to the Crown land (Schedule B) portion of the TFL, divided by the AAC in effect that calendar year. The base compliance volumes for the planning period are:

a) AAC	932,132 m ³
b) Schedule B AAC	887,978 m ³
c) Minimum allowable contract volume (50% AAC x b/a)	443,989 m ³

The company has complied with the contractor clause regulation each year and will continue to do so. A minimum of 443,989 m³ per year will be harvested by logging contractors over the term of the management plan. A contractor clause report, detailing the precise volume harvested by contractors, is filed with the regional manager annually.

6.0 REVISIONS

Amendments and updates to this management plan will be prepared as needed and submitted to the MoF chief forester for approval. The chief forester is enabled by the licence agreement to request revisions or amendments to the management plan. This may arise from situations or events that require the company to propose a change in direction or strategy in the approved plan.

It is worth noting that a replacement tree farm licence agreement is scheduled to be effective January 1, 1996. The provincial government is in the process of preparing new resource policy initiatives, including the Forest Practices Code, which may necessitate revisions to this management plan after it is approved.

7.0 ANNUAL REPORT

Pacific will continue to submit an annual report each year to the district manager, as required in clause 14.03 of the tree farm licence agreement. It will contain details of all activities and accomplishments for the year including planning, development, reforestation, recreation and protection as well as the result of any forest practices audits conducted by the MoF.

The annual report will outline details of the achievements of the small business program on TFL 19 for the year.

GLOSSARY

This glossary explains words or terms used in a technical forestry sense in this management plan.

Alpine: the high elevation area above the tree line.

Allowable annual cut (AAC): the amount of timber which can be harvested in any given year, as determined by the MoF chief forester.

Basic silviculture: the silviculture treatments used to establish a free-growing crop of commercial trees on a logged area.

Biogeoclimatic zone (subzone): the delineation of forest zones on the basis of regional climate, climax plant associations, soils and topography.

Biological diversity: the variety of plants, animals and other living organisations and their habitats, measured by factors such as genetic variability, number of species and variation in species composition.

Clearcutting: a regeneration system in which an even-aged second growth stand is established by removing all the trees in the previous stand.

Cut control: a set of rules describing the annual and periodic allowable cut allocated to the licensee and the penalties for non-compliance.

Deciduous: trees, commonly broadleaf which shed their leaves annually; also known commercially as hardwoods, eg, cottonwood, birch, aspen.

Firmwood specification: scaled volume of a log that constitutes more than 50 percent of the gross scaled volume.

Fire weather index: an estimate of the potential intensity of a spreading fire on a given day, expressed as energy output rate per unit length of fire front.

Forest health: a forest condition that is naturally resilient to damage from pests, diseases and climate.

Free growing: healthy regeneration that is able to grow freely and is unaffected by competition from surrounding plants, shrubs or other trees.

Geographic Information System (GIS): a computerized mapping system that can store, retrieve and produce maps of resource data.

Growth and yield: a process by which the growth rates and volume yields of stands are measured and predicted.

Incremental silviculture: any practice or treatment which will maintain or increase the yield and value of forest stands in the future.

Integrated resource management: a consultative decision-making process whereby all resources are identified, assessed and compared before resource management decisions are made through the interaction of all stake-holders.

Long run sustainable yield: the amount of timber that can be produced on a continuing basis from a forest estate for the management regime chosen.

Lumber recovery factor (LRF): the board feet of lumber from one cubic metre of round log.

Natural regeneration: new forest created from natural seeding, sprouting or suckering.

Non-timber resources: resources other than timber, such as recreation, aesthetics, wildlife, fish, forage, water and soils.

Not sufficiently restocked (NSR): productive forest land that has been denuded and has failed partially or completely to regenerate naturally, or to be artificially regenerated.

Old growth: natural forest stands that have remained undisturbed for longer than 140 years.

Operability cutline: the upper boundary of merchantable forests based on present harvesting methods and accessibility; shown as a line on a map.

Pre-harvest silviculture prescription: a logging and regeneration plan that prescribes the silvicultural system for a cutblock in advance of logging.

Residue survey: the measurement of logs left behind on a cutblock to estimate the volume of merchantable wood.

Resource unit: a local, distinct geographic unit distinguished by topographic boundaries.

Riparian area: the land adjacent to a stream, river, lake or pond containing a diversity of vegetation influenced by available surface water.

Silviculture: the art and science of controlling the establishment, growth, composition, health and quality of forests.

Silvicultural survey: a sampling procedure to determine the silvicultural condition of a young stand, such as survival, species composition, density.

Silvicultural system: a planned process whereby a stand is tended, harvested and re-established; the system name is based on the number of age classes and for the regeneration method used.

Site series: group of ecosystems within a subzone that have similar environmental and vegetation characteristics.

Site disturbance: any abrupt change in the physical, chemical or biological properties of the soil.

Slash: woody debris left on the ground after harvesting including unused logs, uprooted stumps, broken tops, etc.

Stand: a contiguous group of trees sufficiently uniform in age, composition and structure growing on a site to be a distinguishable unit.

Stocking standards: the optimum or required number of well-spaced trees per hectare.

Stock type: description of kind of seedling grown in a nursery distinguished by the culturing system used.

Timber cruise: a procedure used to measure and estimate, to a specified degree of accuracy, the volume of timber on an area to be harvested.

Utilization: the dimensions and quality of timber that is actually cut and removed from a cutblock.

Visual quality objective: term used in forest landscape management to define the degree of acceptable alteration of the characteristic landscape; restrictions to landscape alterations may influence the location, extent and scheduling of harvesting.

Working forest: an area of forest well suited to growing a crop of commercially valuable trees.

REFERENCE LIST

Pacific uses a large number of technical reports and publications as a guide to managing the TFL. Some of these are listed below.

PLANNING

- 1) BC Ministry of Environment, Lands and Parks. 1990. Guide to applicants: pesticide application. Victoria, BC.
- 2) BC Ministry of Environment, Lands and Parks. 1989. Archaeological impact assessment guidelines. Victoria, BC.
- 3) Archaeology and Outdoor Recreation Branch. 1989. BC Archaeology resource management handbook. Victoria, BC.
- 4) Ministry of Forests, Forest and Range Legislation and Regulations.
- 5) Western Strathcona Local Advisory Council. 1991. A Sustainable Development Strategy for the Western Strathcona Area of Vancouver Island.
- 6) BC Ministry of Forests. Forest Act and Regulations.
- 7) Pacific Forest Products Limited. 1988. Geographic Record System.

SOIL CONSERVATION

- 8) BC Ministry of Forests and BC Ministry of Environment, Lands and Parks. 1993. Coastal fish/forestry guidelines. Victoria, BC.
- 9) BC Ministry of Forests. 1993. Engineering manual. Forest road and logging trail engineering practices (interim) and instructions for its implementation. Timber Harvesting Branch, Victoria, BC.
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