

# *Appendix I*

## *MB Philosophy, Woodlands Objectives, Policies and Procedures*

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MB PHILOSOPHY ON  
MANAGING FOREST LANDS FOR THE FUTURE

Our commitment and responsibility to the forests under our care has always been strong. We have matched the historical challenges of harvesting this timber resource with a program of forest management and research unique in Canada. Increasingly, the challenge is to meet, on a sustained basis, a growing diversity of demands on the forest resource while contributing to the communities in which we operate and providing an acceptable return to the Company shareholders.

FORESTRY IN TRANSITION

Society expects us to be more than efficient managers of timber, or fish and wildlife habitat. We must ensure that our forest management practices result in the sustenance of forest resources by integrating our growing knowledge of the integrity and complexity of the forest into our decisions on resource development. We will learn to intensively cultivate forest stands and to manage a broader variety of forest values on the land base under our stewardship. Our goal is balanced management of multiple resources, ensuring a continuous supply of those resources at a price society can afford.

EXCELLENCE IN FOREST LAND MANAGEMENT

To achieve this goal, MacMillan Bloedel is committed to an ecologically and financially sustainable program of excellent forest land management. Achieving this will require our dedication and the involvement and trust of the public whose forests we help manage.

The essential components of our forest land management program are protection of the forest's natural resources, promotion of environmentally sensitive harvesting and silvicultural practices, enhancement of recreational opportunities, and conduction and application of forest management research.

**Protection of Natural Resources**

Protection of the forest's natural resources is a prerequisite for good forest land management. These resources include not only trees but other plants, animals, water and soils. We will identify and assess the presence and potential value of all forest resources before any harvesting occurs. We will minimize potential adverse impacts of harvesting on forest resources, and we will continue to work closely with government agencies, interested groups and the public in support of this objective.

We will manage the forest resource to maintain or enhance soil fertility, stream water quality and species habitat. We will continue to identify areas too sensitive for harvesting and ensure they are removed from the commercial forest land base. The management of fish populations and fish habitat remains a priority under the cooperative planning process developed between industry and government on the coast. Our concern for wildlife is focused on sustaining healthy

populations of animal species and on maintaining adequate habitat diversity for a wide range of species.

May 22, 1991

Old growth forests are important in supporting habitat and species diversity. We have set aside, and will continue to conserve, old growth forests for deer winter range, for protection of fish habitat and for soil stability on sensitive sites. We will continue to develop our program to preserve and maintain perching and nesting trees for birds. We will protect the habitat of rare or endangered wildlife and fisheries species, and we will maintain biologically and socially acceptable species diversity within watersheds.

Disease, insects and fire are integral components of the forest ecosystem, but annual losses to these agents can be staggering. We will base our pest management program on ecological principles, which emphasize managing the forest as a whole rather than managing the pest. An active program to reduce fire and pest problems will concentrate on managing forest activities to prevent or minimize these problems. This will reduce our reliance on traditional remedial controls and shift our management to one of anticipating problems.

### **Silviculture**

Silviculture is the art and science of growing and tending forests to assure their use for the future. MacMillan Bloedel regenerates all harvested areas with ecologically suitable tree species, either through natural regeneration or by planting. We strive for mixed species stands that optimize ecological and economic flexibility.

We emphasize growing and planting quality seedlings from genetically improved seed. Protection of young forests from competing vegetation will be necessary in some areas. Although we believe government approved herbicides can be safely used, we prefer to use non-chemical control methods where the results are expected to be economically and biologically comparable to those of herbicides.

Our efforts to ensure the use of these forests for the future do not end with regeneration. Depending on society's future wood requirements, we will tend these new forests by spacing, thinning and fertilization to produce the wood volume and quality we require. Whether forests are managed extensively or intensively, we will audit all silviculture activity to ensure that we meet management goals for the new forest.

### **Recreational Development and Other Special Uses**

We support the principle of recreational use and development on the public and private lands we manage. All forests have some recreational value, but some have very special values. We will identify, protect and develop those values where appropriate for the enjoyment of all. Roads will be open to non-commercial users on both public and private lands, subject to limitations for safety, fire or property protection.

We will maintain and enhance the distinctive values of significant heritage sites.

### **Timber Development and Harvesting**

Harvesting the timber resource is the first step in the renewal of the forest. Successful forest renewal is part of our commitment to do our part in maintaining stable and sustainable forest-based communities.

We will harvest in a manner that safeguards the natural resources and recreational values of the forest land. We will meet or exceed current environmental standards, and manage harvesting impacts in areas where visual esthetics is important. We will audit all land use activities to ensure we meet management goals and policies.

We will maintain accurate and up-to-date ecological and forest inventory data to ensure effective management of the timber resource. We will assess the impacts forest management practices and possible environmental changes may have on the growth and yield of the timber resources to ensure continuous harvests.

### **Forest Research**

Development of better methods of forest resource management through a well-planned and coordinated research program is essential in meeting our goal of excellence. We will continue to be leaders in the area of operational forest management research and to cooperate with other industry members, universities and government in the planning, implementation and communication of research programs.

### THE FOREST PARTNERSHIP

A partnership in managing the forest land base has three components--society, industry and the employee. To ensure forest resources are managed to meet the expectations of all three components requires commitment, involvement and continuous education of all concerned.

We are committed to sustainable management of forest land to help provide economic stability to the communities in which we operate. We recognize that public involvement in managing public forests is essential. We will listen to people's concerns and work together in developing forest management programs and policies. Through these actions we hope to gain public support for our stewardship of the forest land.

This continuing program of education and communications involving the community and the company extends to our employees as well. Our commitment to excellent forest land management requires trained and motivated employees, partners in development and communication. We believe that well-trained employees, working in an atmosphere of cooperation with the community, will serve society and the environment to the betterment of all.

# **MacMillan Bloedel Limited**

## **Woodlands Objectives and Policies**

# Woodlands Objectives

Our goal at MacMillan Bloedel is to protect and enhance forest resource values and promote community stability, while managing our forest lands for continuous production of an economic flow of timber.

In pursuing our goal we are committed to forest land management practices which will:

- Safeguard the soil and water resources, maintain habitat for fish and wildlife and preserve representative examples of unique or special ecosystems.
- Provide continuity of employment and the opportunity for public enjoyment from the forest lands under our care.
- Maintain a sustained economic yield of timber from diverse and healthy forests.
- Maintain visual quality in scenic corridors while maintaining a sustainable level of harvest.

To this end, we have five specific objectives:

## **1. Timber Development & Harvesting**

Our objective, while observing good forest practices, land stewardship, community stability and the needs of the other resources, is to harvest from each management unit a sustainable annual cut safely and profitably.

## **2. Forest Protection**

Our objective is to protect our forests from damage by the ravages of fire, insects and disease safely and effectively.

## **3. Silviculture**

Our objective is to regenerate and manage the new forests at the standard necessary to sustain the productivity of the land.

## **4. Resources Conservation**

Our objective is to maintain plant, animal, soil and water resources at a standard commensurate with society's consensus of their specific values.

## **5. Forest Recreation**

Our objective is to enhance the recreational potential of forest lands in our care in keeping with the value assigned to each area and its projected level of use.

# Woodlands Policies

Our woodlands policies provide the framework for achieving our management objectives in timber harvesting; the care of visual, recreation, fisheries, wildlife, and water resources; regeneration and tending of new forests; and protection of our forest resources from fire, insects, and disease.

The policies express our commitment to sustainable timber production and the concurrent protection of site productivity and other resource values.

## **Timber Development and Harvesting Policies**

MacMillan Bloedel's timber development and harvesting policies outline our position on the flow of timber from the forest, the conservation of other resource values, the maintenance of site productivity, and the provisions for public access.

### **— Harvest Planning and Management**

We will plan and conduct our development and harvesting activities in such a way as to conserve soil and water resources and maintain plant, fisheries, wildlife and public recreation values.

We will manage the forest lands visible from recreational waterways, communities and highways in consideration of the area's visual quality objectives, with the purpose of matching the visual impacts of harvesting with the scenic value of the site.

We will manage our harvest levels from forests adjacent to forest-based communities to provide a flow of timber that will support forest-related employment and contribute to community stability.

### **— Forest Access**

We will locate, build and maintain logging roads, bridges and culverts which:

- Provide safe access for forest management, protection, and recreation
- Reduce the risk of slope failure
- Meet environmental regulations designed to protect basic resource values

We will maintain access for recreational purposes and ongoing forest management and protection activities.

### **— Land-Use Audit**

We will measure and report our progress by an annual program of land use audits at each Woodland Division.

– **Forest Inventory**

We will review our forest inventory and growth and yield programs every five years to evaluate their adequacy with respect to our current and long-term planning needs.

– **Legal**

We will maintain prominent Private Industrial Road signs at all entry points to MacMillan Bloedel lands.

**Forest Protection Policies**

Our protection policies outline our commitments to ongoing prevention, monitoring and control measures to keep fire, insects and disease losses low.

– **Fire Prevention and Control**

Each Woodland Division will:

- emphasize fire prevention as the primary action to protect against fire loss.
- prepare and maintain a fuel-management plan commensurate with hazard and risk
- maintain a current presuppression plan
- train and organize its staff in methods of fire control
- contain all fires as quickly as possible
- maintain appropriate fire control equipment commensurate with the level of risk, and including a central pool of extra equipment for use on larger fires
- coordinate fire prevention and control activities with adjacent land managers
- regulate its woodland activities according to a Ministry of Forests approved fire danger rating system

Each of our Woodlands Regions will maintain a contingency plan to fight fires too large for a single division to control.

We will carry out prescribed burning activities in accordance with site protection and smoke control constraints as prescribed by the government agencies.

When warranted by fire danger, we will restrict public travel on forest access roads.

– **Prevention and Control of Insects and Disease**

We will manage all forests to reduce susceptibility to insect or disease epidemics.

We will monitor our forest lands on an ongoing basis to identify potential pest problems. Where insect or disease epidemics are discovered, we will consult specialists to determine the appropriate response.

In cases where control using a pesticide is recommended, we will:

- develop an action plan
- discuss the planned activities with the public
- implement the plan according to specifications of the pesticide permit issued by the Ministry of Environment

We will minimize losses due to insect or disease epidemics by:

- expedient salvage of trees and stands already dead, dying or threatened by pest infestations
- maintaining tight inventory control to keep the volume of logs susceptible to ambrosia beetle attack as low as practicable
- trapping insects such as ambrosia beetles where appropriate
- carrying out harvesting and sanitation activities in areas identified as disease centres
- felling mistletoe infected regeneration

## **Silviculture Policies**

Our silviculture policies are designed to sustain timber yields of suitable quality. This requires we know the capability of the land and the yields that can reasonably be expected given the range of soil quality, climate, species and different levels of stocking and management. It also requires conscientious planning and performance and an objective audit of our performance.

### **— Yield Maintenance**

We will carry out regeneration and subsequent stand management treatments at the level and standard necessary to maintain the desired long-run sustained yield (LRSY) considering both present costs and future values.

We will compile the five-year and annual growth targets necessary to sustain the target fibre flow and develop annual silviculture plans to meet the growth target at the tenure and Woodlands Division levels.

We will compare results with planned levels on an ongoing basis.

### **— Reforestation**

We will prescribe, schedule and carry out forest regeneration to meet all commitments and achieve annual growth-targets in a cost-effective manner.

In planting we will:

- Use genetically improved seedlings; species and provenance suitability considered.
- Prescribe for each site one or more species considering ecological suitability, site-specific experience and the corporate value rating of the species.

If an area regenerates naturally with a maladapted species, we will overplant with a suitable species.

## ■ **Managing Competing Vegetation**

Where necessary to achieve the forest crop yield, we will control competing vegetation. Non-chemical methods will be preferred if expected results are economically and biologically comparable to those of herbicides.

When we propose to use herbicides within a domestic watershed, we will review our plans with local authorities or licenced users before seeking a permit and before application.

## ■ **Harvesting Stands Below Culmination Age**

Where we have projected that existing coniferous stands will yield less than 80% of the site's potential at culmination, these stands will be evaluated for early harvest and reforestation to standard.

## ■ **Logging of Hardwood Stands**

We will evaluate all hardwood stands for logging and reforestation to the most appropriate future crop considering site quality, timber and other resource management objectives.

## ■ **Silvicultural and Land Use Research**

We will fund research projects to improve our forest land management decisions.

## ■ **Silviculture Audit**

We will conduct an audit at every Woodland Division at least annually to determine that treatments are carried out in a technically sound manner and results are properly assessed and recorded.

## ■ **Incremental Silviculture**

We will conduct incremental silviculture to improve volume and value\* of the future crop.

On Crown land, we will conduct treatments only if government pays and the Ministry of Forests has approved the project and the estimated costs.

All work will be done to MB targets and standards as set out in Management and Working Plans or the MB Silviculture Guidelines, except where variance is needed to protect or enhance other resource values.

## **Resource Conservation Policies**

We will evaluate sites for the identified important plant, fish, wildlife, water, and other on-site resources prior to the preparation of each five-year Development Plan.

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\* Criteria which contributes to value are assumed to be knot free logs or at least small branches, even growth rates and <ring/cm (6 rings per inch), small taper and diameters over 30 cms small end.

Where significant values have been identified, we will plan our management activities in cooperation with appropriate Federal and Provincial government agencies.

– **Streamside Management**

Our actions to protect water quality and fish habitat will be guided by the Coastal Fisheries-Forestry Guidelines developed by the Department of Fisheries and Oceans in cooperation with the Council of Forest Industries and Ministries of Forests and Environment.

– **Domestic Water Supply**

In watersheds providing domestic water, MB will adjust logging and silviculture treatments to maintain water quantity and quality.

– **Wildlife and Plants**

To protect representative examples of unique or special ecosystems and resource values on forest lands that we manage, MacMillan Bloedel will:

- Defer or modify logging in critical wildlife habitat.
- Preserve nesting and perching sites.
- Designate and protect the habitat of rare and endangered wildlife and fisheries species.
- Cooperate in the establishment of ecological reserves.
- Carry out special treatments to ensure browse is available on crucial ranges.

**Forest Recreation Policies**

As we develop the forest we open access routes to previously inaccessible areas. Our policy is to provide clearly marked, safe access throughout the forest lands we manage for a wide range of forest recreation opportunities.

– **Identification and Designation of Recreational Areas**

We will inventory potential recreation sites on our forest lands and identify the quality sites for protection and development. Demand for recreation use of potential sites will be the guide in designation of recreation site development.

– **Development and Management of Recreational Areas**

We will develop and maintain our public recreation areas to standards comparable to those of the Ministry of Forests.

Each Woodland Division will carry the development and maintenance costs of recreation sites and seek reimbursement from the government for costs associated with sites on Crown land.

## **Identification, Designation and Protection of Special Forest Reserves**

We will:

- Designate as Special Forest Reserves areas with resource values or ecosystems that are deemed so special or spectacular as to warrant their exclusion from the Production Forest.
- Identify sites with special aesthetic and recreation values such as scenic viewscapes, spectacular old-growth stands, caves, special wildlife areas, waterfalls and canyons.
- \_\_\_\_\_ Evaluate these candidate sites and designate the best as Special Forest Reserves based on a subjective comparison of sites and in consideration of the abundance of similar sites. Special Forest Reserves will be marked on development maps.
- \_\_\_\_\_ Develop Special Forest Reserves where a specific commitment has been made in a Management and Working Plan or by special arrangement with the agencies responsible for other values (e.g. Heritage Conservation Branch, or Ministries of Environment or Parks).
- \_\_\_\_\_ Protect caves designated as Special Forest Reserves from road and logging activities.

## **Heritage Sites**

We will:

- Identify and report all heritage sites found on forest lands under our management to the Heritage Conservation Branch.
- Protect designated heritage sites from industrial activity in accordance with agreements with the Heritage Conservation Branch.

## **Public Access**

We will:

- Maintain access to designated recreation sites on forest lands under our management.
- Post and maintain information signs along highways and major forest access routes to highlight forestry activities to the general public.
- Permit open road access for non-commercial public use, subject to limitations for reasons of safety, fire hazard, or the protection of company property. We may charge an entry fee for vehicle access to our privately owned forest lands.
- Post signs to inform visitors of access rules at all major entry points to Woodlands operations.

## **Miscellaneous Policies**

### **— Firewood and Minor Forest Products**

MacMillan Bloedel will issue permits to the public to cut firewood, shakeblocks and fence posts in designated areas. A fee may be charged for issuing permits for private lands.

### **— Commercial Users of Other Resources**

Where commercial users of other resources (e.g. trappers, beekeepers, prospectors, etc.) operate on forest lands managed by MacMillan Bloedel, we will:

- grant permits for short-term use of MB roads for exploration and feasibility studies
- inform known and registered users of other resources at the planning stage of all forest management operations that might impact on their operations
- negotiate and charge fees for the commercial use of MB roads or other facilities
- negotiate and enforce agreements with respect to fire hazard, damage to growing stock and other concerns, subject to provisions of the *Mineral Act*, *Forest Act*, and other relevant government acts and regulations.

# Glossary

**allowable annual cut (AAC):** The rate of annual timber harvest from a specified area of land. AACs are normally determined as part of a tree farm licence's Management and Working Plan and are subject to reassessment every five years.

**ambrosia beetles:** A species of beetle which devalues logs by feeding in the sapwood at certain times of the year.

**weed control:** A silvicultural treatment to remove weeds which compete with seedlings for sunlight, water and soil nutrients.

**culmination age:** The age at which a forest stand, for a stated diameter limit and utilization standard, achieves its maximum average rate of volume production. The age at which the mean annual increment (MAI) of stand growth is at its maximum.

**Development Plan:** A specific plan outlining harvesting, road construction, protection and silviculture activities over the short-term (often 5 years) in accordance with the approved Management and Working Plan.

**fire closure formula:** A formula for calculating the fire danger rating and the basis for suspending work for fear of fire.

**fibre flow:** A generic term equivalent to long-run sustained yield.

**fuel-management plan:** A plan outlining the actions to reduce fire hazard and spread rates by reducing volume of fuels and creating corridors of lower risk forest.

**herbicide:** A chemical used to control weeds.

**herbicide application permit:** A permit granted by the Ministry of Environment to holders of a valid Forest Pesticide Applicator Certificate (obtained after completion of a course administered by the Ministry of Forests and passing of an examination set by the Pesticide Control Branch) which regulates the use of forest herbicides for vegetation control.

**heritage site:** A forest site with historical cultural values such as a midden or culturally modified trees, or an unique tree.

**long-run sustained yield (LRSY):** In general terms, a measure of the sustainable productive capacity of a land base under specified management conditions. In forest planning, the LRSY is the level of harvest that can be sustained under a particular management scenario that includes objectives for timber and other resource values such as fish, wildlife, water, aesthetics and recreation, forest management programs, and constraints on the land base. The LRSY is one of the factors considered in the determination of allowable annual cut.

**Management and Working Plan:** A plan required under the Forest Act for the management of a forest area, including the objectives, prescribed management activities, calculation of AAC and standards to be employed to achieve specified goals. Commonly supported with more detailed Development Plans. Management and Working Plans are reviewed and redeveloped every five years.

**merchantable wood:** The sound wood in a stand that is suitable for marketing under given economic conditions. Size, species, quality, market demand, and value will affect what is determined to be merchantable.

**objective:** A measurable step towards achieving a goal.

**pesticide:** A general term for chemicals used to control insects, diseases or weeds.

**policy:** A statement which will provide a basis for judgement in handling repetitive situations to attain specific objectives.

**preharvest assessment:** A survey carried out on a stand prior to logging to collect specific information on the natural features and resource values of the site (e.g. soil, topography, water, timber, wildlife, fisheries, recreation, range, etc.).

**preharvest prescription:** A site-specific plan for the management of a cutblock that is completed in advance of logging. The PHP identifies the harvesting, regeneration, and silvicultural activities to be carried out on the area over the next rotation, in consideration of the existing resource values and characteristics of the site. Preharvest prescriptions are legal prerequisites to logging on all Crown lands. They must be advertised for public inspection, and respond to public concerns before being approved by the Ministry of Forests.

**prescribed burning:** The knowledgeable application of fire to a specified land area to abate the fire hazard or prepare the area for reforestation.

**sanitation activities:** The removal of damaged or diseased stems to prevent the spread of insects or disease.

**site degradation:** A reduction in the productive capacity of forest sites. The susceptibility of a site to degradation is determined by the site's physical, climatic, biological and ecological character. Slope, soil type and depth and the frequency of watercourses and gullies are common indicators of a site's sensitivity to degradation. Major types of site degradation are soil compaction, displacement, erosion and loss of soil nutrients.

**site index curves:** A measure of site productivity based on the relationship of tree height to stand age, usually based on height at 50 years.

**spacing:** The act of removing competing trees from a young stand to favour the crop trees.

**Special Forest Reserve:** An area of forest set aside from harvesting in recognition of other, special values.

**standard:** The criterion of effective performance established before execution of the action that it is designed to measure.

**vegetation management:** The control of unwanted vegetation, usually by fire, cutting or use of herbicides.

**yield maintenance:** A system used by MB to ensure that denuded and reforested lands are managed at the level needed to sustain a long run target yield.

**yield models:** Computer models that forecast the future yields from forest stands or timber types.

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## 1.1 Pre-Harvest Assessment and Prescription

**OBJECTIVE: To develop a Silviculture Prescription (PHSP) for each area proposed for logging that integrates harvesting, non-timber values and subsequent management.**

### 1.11 Definition

Pre-harvest assessment is the gathering and recording of field data and other information necessary to develop a PHSP.

### 1.12 Sources of Information

- Aerial photos.
- Forest cover, topographic and biogeoclimatic maps.
- Divisional index of non-timber information:
  - Existing folio or capability maps.
  - Government (MoF, Wildlife, Fisheries, etc.).
  - Reports, maps and memos for soils, fisheries, wildlife, landscape, recreation, terrain, and heritage resources.
  - List of LUPAT reports and publications.
- Local knowledge.

### 1.13 Procedures

- Consult MoF procedures manuals, circulars and forms (e.g. Appendix 1.8)
- Review available resource information to identify conflicts. If conflicts are apparent, then resolve with appropriate MB staff, resource agencies or specialists.
- Collect site-descriptive data and develop a draft prescription.
- Identify and resolve situations that may adversely affect forest management or conflict with other values (e.g. setting layout, road location or logging sequence).
- Complete the final prescription.

### 1.14 Species Selection

Choice of species for a site is based first on silvics and second on expected economic return.

Identify the species suited to the site using the current MoF field guide. In specific situations, based on knowledge and field experience of similar conditions, alternative species may be prescribed.

For planting, the final choice will be governed by such factors as capability of the species to survive and grow under the specific site conditions, availability of seed, the estimated cost of successful establishment and the anticipated yield, quality and value of the future crop.

MB ranks the species as follows:

Table 1-A. MB Species Value Ranking.	
Cy, Cw	High Value
Ss	↓
Hw, Ba, Bn, Fd, Hm, Bg, Pw, Se	Low Value
Pl, Bl	

### 1.15 Stocking Levels

#### 1.151 Stocking Targets<sup>1</sup>

MB stocking targets vary according to the silvics of the species and the anticipated return on investment for the site index class (Table 1-B). The stocking targets given are a general guide and **may be varied up or down** for reasons specified in the PHSP.

The following are the general targets at the Free Growing Assessment. Planting prescriptions should be based on local conditions and experience.

Table 1-B. Target Stocking Levels at Free Growing Assessment Crop trees per hectare <sup>1</sup> at 90% distribution.		
<u>Site Index Class</u>	<u>Douglas-fir Type</u> <sup>2</sup>	<u>Western Hemlock Type</u> <sup>3</sup>
15-21	800	1000
24+	1000	1200
1	As per Section 1.3.	
2	Fd, Pl, Pw.	
3	Hw, Hm, Bg, Ba, Ss, Cw, Cy. Higher densities are desirable for maximum value Cw and Cy on SI $\geq$ 27.	

Stocking should be at or above these levels at the end of the regeneration delay period. Reliance on natural fill-in between regeneration delay and free growing to achieve targets is unacceptable.

<sup>1</sup> All numbers of trees per hectare in Section 1.15 are stated using MB survey methods and calculations and are used for using internal purposes.

1.152 Minimum Stocking Standards

The maximum area that may be left NSR is 0.25 ha at roadside. Elsewhere on an opening, relevant factors such as shape, economics, site and best management practices shall be considered, and the maximum left NSR shall be the lesser of 1 ha or 2% of the opening.

The minimum acceptable stocking on MB tenures is:

- 600 stems of acceptable species per productive hectare (i.e. excluding non-productive land).
- 80% distribution (i.e. 80%+ of all productive 1/550 ha plots has at least one established tree of an acceptable species).
- On land greater than Site Index 21, stocking less than 800 stems per ha must be the exception, not the norm.

1.16 Regeneration Targets

1.161 Delay Allowances

Natural regeneration is favored wherever it is feasible within the allowable time frame.. The delay allowances, in growing seasons since start of felling are:

Table 1-C. Regeneration Delay Allowances

		Normal Sites		
Regeneration Prescription	Critical Sites Brush, Unstable, Aesthetics <sup>2</sup>	SI>=30	SI 24-27	SI<=21
Plant	As soon as possible, but before 2 <sup>nd</sup> growing season (gs)	Before 2 <sup>nd</sup> gs	Before 3 <sup>rd</sup> gs	Before 4 <sup>th</sup> gs
Natural (+ fill plant)	Not applicable	Before 4 <sup>th</sup> gs	Before 5 <sup>th</sup> gs	Before 6 <sup>th</sup> gs

The delay allowances given in Table 1-C above are meant to guide decisions on reforestation timing. Because our records do not include growing seasons, they are not a standard that can always be measured. These guidelines, specified in Table 1-C, shall be reflected in the regeneration delay stated in the PHSP, and shall be the criterion for determining reforestation timing.

1.162 NSR/Year of Logging

An opening shall be deemed NSR upon completion of harvesting. Partially harvested openings may be recorded as NSR as deemed expedient or practical by the Division. It is important to recognize that NSR date does not alter the PHSP regeneration delay obligation that is based on initiation of felling.

<sup>2</sup> Salal sites are considered to be brush sites.

1.163 Seedling Growth Targets

Target heights and leader growth (minimal browsing) are based on site index, species and ecological unit.

The growth targets in Table 1-D may be used in a PHSP where MoF approval is not required. Otherwise, MoF leader growth standards apply.

**Table 1-D. Seedling Growth Targets.<sup>1</sup>**

Site Class	CDFmm/CwHxm//CwHdm/CwHmm1-2		CwHvm1-2/CwHvh1		MHmm1	
	Ba.Bp	Other Species	Ba.Bp	Other Species	Ba.Bp	Other Species
36+	100/30	100/30	100/30	200/50	-	-
30-33	70/20	75/20	70/20	150/40	70/20	90/25
24-27	40/10	60/15	50/15	100/30	50/15	70/20
<21	30/5	50/10	40/10	75/10	40/10	50/10

<sup>1</sup> Figures are height/leader at 3 years after planting or age 5 for natural seedlings (cm).

1.17 Free Growing Assessment

- **The earliest acceptable time to declare a stand free growing** to meet MoF commitments is 5 years after regeneration establishment. For MF 19, the earliest is at the regeneration performance survey (i.e., three years) on sites, which clearly present no brush hazard. On all sites, prescribe the date for free growing assessment.
- **Latest acceptable time** to declare a stand free growing is that shown on MoF grids as summarized below:

**Table 1-E. Latest Acceptable Free-Growing Declaration in Years Since Commencement of Felling.**

Sub-zone	Site Units										
	1	2	3	4	5	6	7	8	9	10	
MHa	-	20	20	20	20	20	-	20	-	-	yr
CDF	-	14	11	11	11	11	11	-	11	-	yr
CWHa1	-	11	11	11	11	14	11	11	-	11	yr
CWHa2	-	11	11	11	11	14	11	11	-	11	yr
CWHb1	-	14	14	14	14	11	11	-	11	-	yr
CWHb2	-	14	14	11	14	11	-	14	-	-	yr
CWHb3	-	11	11	11	11	14	11	11	-	11	yr
CWHb4	-	11	11	14	14	14	14	-	11	-	yr
CWHd1	-	11	14	11	14	11	-	11	-	-	yr

Note: Use MoF definitions for free growing, i.e., conifers 50% + taller than brush and expected to remain free growing.

1.18 Recordkeeping

- Data to substantiate each prescription must be recorded in FORKS.
- Maintain a copy of all prescriptions.

## 1.2 Post-Harvest Assessment and Prescription

**OBJECTIVE: To confirm basic site data and amend the Pre-Harvest Prescription, if necessary.**

### 1.21 Procedures

- Confirm or re-map strata (ecological units, site index, treatments).
- Review site information for accuracy and completeness.
- Determine for each stratum:
  - Slash, drainage and brush conditions.
  - Proportion of N.P. (Non-Productive area).
  - Amount of site degradation (consult MoF guidelines).
  - Amount and condition of advanced stocking.
  - Number of germinants.
  - Potential for natural regeneration in accordance with standards.
  - Number of hardwood seed trees, if not already treated.
  - Need for sapling felling.
- Conduct a Stocking (plantability) Survey where required for pre-brush planting, to determine the need for site preparation, or to determine stocking.
- Assess the need to treat roadside slash accumulations and landings.
- Assess the need for site rehabilitation for degraded areas.
- Note road maintenance needs and inform appropriate Divisional staff.
- Confirm or revise prescription. If changes affect the approved Pre-Harvest Prescription, revise and resubmit to MoF.
- Update FORKS.

## 1.3 Reforestation Assessments and Sampling

**OBJECTIVE: To measure stocking, survival and performance; and, determine the success of the reforestation prescription.**

### 1.31 General Procedures

This section describes the standard sampling (1.311) and survey procedures for:

- Stocking Surveys (1.32), to determine stocking status and plantability of areas currently classed as NSR.

- Survival Surveys (1.33), to determine plantation success and stocking one year after planting, but may be done after one growing season.
- Regeneration Performance Surveys (1.34), to confirm stocking status three years after planting or date of natural regeneration.
- Free Growing Surveys (1.35), to confirm free growing status and assess the need for treatment.

At the discretion of the Divisional Forester, survival and Regeneration Performance surveys may be combined as a single survey on land Site Index 18 or below.

### 1.311 Sampling

- For each unit to be surveyed, either:
  - Stratify into practical subunits, such as site associations, burned or unburned, etc., and sample each one, or
  - Run sample lines to sample the entire unit; ideally, lines should be 100 m apart and at right angles to contours. Identify subunit boundaries on cards and/or map.
- For roadside slash accumulations, determine if it is necessary or practical to map the area as separate strata. Residue maps can be used for preliminary stratification. Depending upon the size involved, these areas should be:
  - treated to create plantable spots, or
  - if stocked, average proportionally into the overall stocking for adjacent strata.
- Where sampling must meet the accuracy standards specified in Section 1.3111, a Coefficient of Variation (CV) for the area is determined in order to calculate the number of samples required.
  - The CV may be assumed from experience on similar areas.
  - The CV may be calculated from a minimum of ten plots per stratum.
- The standard plot is circular with a 2.4 m radius (1/550 ha). Refer to Section 1.3111 for procedures to calculate the number of plots required.

### 1.3111 Sampling Intensity/Error

The following sampling intensity and error standards must be met for all surveys where:

- Surveys are to verify that MB's restocking commitments are completed.
- Surveys are carried out as a government funded project.

### Assessment Survey Standards

Strata of less than 2 ha in size need not be surveyed to standard since for inventory maintenance purposes such areas will be included in adjacent stands.

The sampling intensity standard is a sample size that gives the number of trees/ha to a sampling accuracy of  $\pm 15\%$ , 19 times out of 20, subject to:

- The whole stratum being uniformly sampled.
- A minimum of 10 plots in any stratum larger than 2 hectares.

**Note:** If you plan to change the sampling intensity because the calculated CV indicates that a change can be made, a uniform sample over the whole stratum is required, including the portion already sampled.

All survey results are to record the confidence limits.

Calculation of Coefficient of Variation (CV)

$$CV = \frac{\text{Standard Deviation}}{\text{Mean No. of Crop Trees}}$$

Calculation of Number of Plots Required

$$n = \left( \frac{CV \cdot t}{A\%} \right)^2$$

where A% = desired sampling error (0.15)  
t = value from Student's tables (Appendix 1.7)  
n = number of plots

The following table shows the required number of plots for a range of CVs:

<u>If CV is this amount</u>	<u>then the following number of plots are required</u>
.2	10
.3	19
.4	30
.5	46
.6	64
.7	87
.8	112
.9	138

Calculation of Confidence Interval (CI)

$$CI\% = \pm \left( \frac{CV}{\sqrt{n}} \right) t$$

CI (trees) =  $\pm$  CI% Average number of trees per ha.

### 1.3112 Field Data Collection

The following procedures are for use with the Regeneration Assessment Card (01.03). An example is appended to illustrate correct usage and the related data compilation (Appendix 1.1). **If on a TL or FL, see 1.322 for special procedures.**

Base procedure is as follows:

- Tally plot as N.P. if the plot is primarily rock or water, and there is no crop tree capable of growing to merchantable size.
- In the crop tree column, tally up to five crop trees per plot by species. **A crop tree is defined in Section 1.3113.**
- If there are less than target crop trees per plot, determine if more trees are needed by examination of the plot for "vacancies". Consider adjacent trees on and off the plot. Record up to three vacancies under the "no. needed" column of the "plantable spots" section.
- Classify and tally each "vacancy" as plantable or unplantable by type in the appropriate column. Actual locations may be modified according to planting spot selection/spacing criteria in Section 4.5.
- Tally all competing trees. Competing trees are defined in Section 1.3114.
- Rate difficulty of each plantable spot as easy (E), moderate (M), or difficult (D) using the following criteria:
  - **Easy**            Easy to select site and plant tree, essentially little or no brush, slash, rock or duff.
  - **Moderate**      Moderately easy selection, planter must either search for spot or do some spot preparation.
  - **Difficult**        Difficult or severely difficult spot selection and planting due to:
    - ❖ slash cover,
    - ❖ deep organic layer (10 cm+), either drought prone or unsuitable planting medium for the site association,
    - ❖ brush cover, site must be scalped,
    - ❖ shallow soil (10 cm over bedrock or till) or excessively stoney and well-drained.

**Note:** Plantability data is only collected where it is needed for preparing planting plans, to substantiate site preparation prescriptions, and for planting productivity estimates in Industry Outstanding project proposals.

- **Under remarks:** record number and need to treat any hardwood seed trees or seedlings either on the opening or in the adjoining stand.

Note boundaries of vegetation types, or sub-units (strata).

### 1.3113 Crop Trees

Crop (or Count) trees are defined as:

- An acceptable species ecologically suited to the site.
- Spaced at least 2.0 m from any other crop trees on or off (i.e., influence trees) the plot. This optional distance may be reduced by the Divisional Forester in those areas where obstacles are present and a lesser distance is approved in the SP.
- Free from disease or severe damage, and of good form.
- Established and judged capable of surviving to free growing.

#### Notes:

- 1) In the case of germinants and very small seedlings, judgment is essential. Normally, three healthy germinants (three to nine months old) are equated to one established seedling. In the case of six or more germinants, the 2.0 m spacing rule must be carefully considered. An experienced assessor should use judgment in interpreting this rule, e.g., discount even healthy germinants unlikely to survive, or count as few as one or two as adequate in late winter/early spring surveys. Where stocking is composed primarily of germinants, a follow-up survey is needed to confirm their continued survival.
- 2) In strata that are heavily stocked, i.e., consistently three or more crop trees per plot, Influence Trees may be ignored.

### 1.3114 Competing Trees

Competing trees are defined as:

- A coniferous or deciduous tree that will continue to compete with the crop trees until at least the free growing stage.
- Trees whose height is within 0.5 m of the height of the crop trees. For trees with a height difference greater than 0.5 m of the crop trees, judgement must be used. See also Section 1.524 for crop and competing tree relationships for situations where crop trees are greater than two meters in height.

### 1.312 Survey Compilation

#### 1.3121 Stand Stratification

If not previously stratified, examine survey cards and map; compile data for each recognized stand. Stratification may be based on:

- Species differences, e.g., HF, FH, etc. (recognize each species with 20% plus crop tree count), or
- Significantly different ecological units, or

- Site index (3 m classes, maximum range approximately  $\pm 5$  m), or
- Age/date of germination (greater than two year variation), or
- Stocking (greater than 20% variation).

Stands should be kept as large as is realistic. Follow inventory guidelines on minimum size (2 ha between classes-of-type and 5 ha within classes-of-type).

1.3122 Stand Compilation Detail on Cards

For each stand, compile as necessary for the type of survey done:

- number of crop trees/ha:
 

$\frac{\text{total crop trees}}{\text{total productive plots}}$	x	550
---	---	-----
  
- percent occupancy or distribution:
 

$\frac{\text{number of productive plots with 1+ crop trees}}{\text{total productive plots}}$	x	100
--	---	-----
  
- percent productive land:
 

$\frac{\text{number of productive plots}}{\text{total plots}}$	x	100
--	---	-----
  
- number of plantable spots/ha:
 

$\frac{\text{total plantable spots}}{\text{total plots}}$	x	550
---	---	-----

**Notes:**

- 1) Plantable spots are based on total plots since the objective is to determine the number of planting spots/ha on the area to be covered by the planting crew.
- 2) Compilation detail will depend on degree of stocking present and level of answer required, e.g., if planting is difficult, but stand partially stocked cf. difficult planting and zero stocking. In the latter case, site preparation is clearly indicated and compilation unnecessary, in the former a partial planting may be justified.

- number of competing trees/ha:
 

$\frac{\text{total competing trees}}{\text{total productive plots}}$	x	550
--	---	-----

In certain situations, determination of AAR may be based upon MoF stocking. To determine MoF stocking from MB 1/550 ha plot data use the following formula:

$$\text{MoF} = \frac{[\# \text{ fully stocked plots} * \text{factor}] + [\# \text{ trees from partially stocked plots}]}{\text{total productive plots}}$$

Stocking = total number of plots

Factors for fully stocked plots are as follows:

2.73	for	1500 sph	target stocking
2.18	for	1200 sph	target stocking
2.00	for	1100 sph	target stocking
1.82	for	1000 sph	target stocking
1.64	for	900 sph	target stocking
1.45	for	800 sph	target stocking

### 1.3123 Stand Formula

For each stand, compile and submit data according to the requirements in the MB Standard Practice Woodlands—Inventory Maintenance manual.

Inventory Section will maintain the full formula in the database. Maps will show an abbreviated formula.

### 1.3124 Minimum Satisfactory Stocking Levels

#### MF and TFLs

Stands are satisfactorily stocked if the survey results using the MB compilation method show:

- For all acceptable species
  - (1) more than an average of 600 crop trees/productive hectare,
  - (2) 80% distribution, and
  - (3) the confidence interval (19/20) is 15% or less, or the lower confidence level is above 600 sph.

Declare all stands that do not meet MB stocking levels as AAR and prescribe necessary site preparation and reforestation actions to achieve restocking standard.

On TFL's if the minimum and target stocking in the Management and Working Plan differs from the current MB standard or compilation method, use the standard stated in the Management and Working Plan.

#### FLs and Unregulated TLs

Using MoF compilation method, classify the stand as satisfactorily stocked when the average number of trees per hectare exceeds the MoF minimum of 600 sph and the confidence interval is 10% or less (19 times out of 20), or the lower confidence level exceeds the MoF minimum.

1.32 Stocking Surveys

**OBJECTIVE:** To determine restocking status; to prescribe planting, site preparation, brushing and weeding or other future activities; and, to schedule the next survey.

1.321 Preparation

- Obtain list of areas from FORKS.
- Analyze regeneration delay periods.

1.322 Field Examination and Compilation

- On MF 19 and TFLs, use the procedures in Section 1.31. Where MB targets and minimums are not accepted, use the MoF compilation method.
- On FLs and Unregulated TLs, use MoF procedures as set out in the Silviculture Manual, Section 4. For a compilation example, see Silviculture Manual Appendix 4-30.

1.323 Prescription and Records

- Prescribe and schedule treatment or next survey.
- Update FORKS.

1.33 Survival Survey

**OBJECTIVE:** To confirm stocking status of plantations and assess effectiveness of planting prescription; to prescribe replanting, fill planting, or brush control on all or part of the stand; to correct stand formula; and, to schedule the next survey.

1.331 Preparation

Obtain list of one-year plantations from FORKS. Examination after one growing season is acceptable if work efficiency so dictates.

1.332 Field Examination and Compilation

Conduct a full survey (1.31) of each stratum and estimate whether the plantation is successful and/or the site is stocked as described in the inventory formula. It is optional to tally surviving planted trees separately to compare to record of tree/ha planted for a rough measure of survival. An example is given in Appendix 1.2.

**Note:** If the plantation is surveyed after one growing season, do not count "poor" trees; past research has shown these trees generally die over winter.

On Douglas-fir type Site Indices 15 and 18, make only one attempt with high quality stock and planting to achieve target. If less than 600 sph survive, fill plant to achieve the minimum 600 sph.

1.333 Prescription and Records

- Prescribe and schedule treatment or next survey.
- Update FORKS.

1.34 Regeneration Performance Survey

**OBJECTIVE:** To confirm that the stand is established and the stand formula is correct; to identify areas in need of fill-planting or release to meet targets; to classify as free growing (Section 1.35) or schedule earliest date for free growing survey (for TL reversion, see Section 14.22 of the Forest Administration Manual); and, to compare height of stand with targets.

1.341 Regeneration Performance Stocking Target

Stocking must be at least 80% of target stocking or a revised prescription is required.

1.342 Preparation

Assemble from FORKS:

- A list of the three-year-old natural stands and plantations.
- Any stands scheduled for re-examination.

1.343 Field Examination and Compilation

A reconnaissance of each stratum in a stand is probably sufficient to determine if the stocking level and species composition agree with the descriptive formula. If it appears that the stocking level or species composition has changed more than 20%, conduct a detailed survey, compile and develop the correct descriptive formula/fill plant prescription. An example is given in Appendix 1.3.

1.344 Records

- Compare results to seedling growth targets (Section 1.163).
- Record as satisfactorily established and free growing, or prescribe and schedule treatment or next survey (free growing, release or spacing).
- Update FORKS.

1.35 Free Growing Survey Procedures

**OBJECTIVE:** To determine if a stand meets the free growing criteria; to determine whether vegetation management is necessary; and, to evaluate the original prescription against results.

1.351 Definition of Free Growing

A stand is free growing when there are sufficient free growing crop trees to meet the minimum stocking standard, and the crop trees are 150% of the height of competing vegetation and are growing as fast as or faster than the competing vegetation. To declare a stand free growing, 90% of the productive area must meet the above criteria with no area larger than 1 ha out of compliance.

1.352 Minimum Treatable Area

Patches less than one hectare that are not free growing need not be treated. The necessity to treat will depend upon present and future economic feasibility to treat, and the need to meet MoF District standards.

1.3521 Time of Survey

Free growing surveys shall be made no later than the dates shown in Section 1.17 and the PHSP.

1.3522 Survey Procedures

The Free Growing Assessments may be done by several methods:

- In conjunction with other surveys, determine if the stand meets the free growing definition.
- Conduct a reconnaissance survey where conifers appear obviously free growing and species composition, stems per hectare and stand formula from the previous survey obviously are correct. Check back edges, corners and parts of the opening that are not readily visible. Make a prescription for the next treatment or survey.
- If free growing status is uncertain or the stand formula is suspect, complete a regeneration performance survey (Section 1.34) with sufficient samples to provide a new stand formula. Sufficient trees to meet minimum stocking standards must be free growing.
- If the stand is not free growing or requires additional treatment, make a prescription.

An example survey card is given in Appendix 1.4.

1.3523 Prescription and Records

Record survey results in FORKS, update the Free Growing Status Report (see Appendix 1.9) and ensure that all hectares in an opening are shown on the report until the entire opening has been declared free growing.

1.3524 Reporting

Report the results of free growing surveys to the MoF in accordance with current procedures.

If the stand will not be free growing by the latest date in the prescription, the reasons for the variance and a new prescription must be submitted to the MoF, and the MB Regional Forester where PHSP commitments will not be met.

1.4 Plantation Quality Assessments

**OBJECTIVE: To determine if plantation quality standards are met, and to guide and control planting crews and contractors.**

Plantation quality assessments may be done using either the method outlined below or the Ministry of Forests (MoF) method. The MoF method is outlined in Section 6.82 of the MoF Silviculture Manual.

The fundamental difference between the two systems is how tree espacement is assessed. Either system may be used. MB silviculture audits will use the following system.

1.41 Prescription

Prior to planting, a prescription based on stocking and plantability assessment will estimate the number of trees to be planted considering:

- Existing natural stocking.
- Unplantable spots (brush/slash) - UP.
- Unproductive area (rock/water) - NP.

Departure from standard spacing may be prescribed to allow for:

- Expected mortality (closer spacing than standard).
- Additional natural fill-in within waiting period (further than standard spacing).

The prescription shall be expressed in terms of crop trees per hectare, and as a target intertree spacing. For the purpose of planting supervision, a minimum intertree spacing is specified in accordance with the PHSP (generally 2.0 m).

MB silviculture audits shall evaluate the prescription on the basis of crop trees per hectare, planted plus acceptable natural.

1.42 Procedure

- Plot radius is 3.99 m or 1/200 hectare plot.
- Transects must sample the entire unit. Each day, the distribution and number of samples will be dictated by the crew size and area planted. On a cumulative basis for

a unit, a sampling intensity of 1% of total trees planted or a minimum of 100 trees on small units is recommended. Silviculture audits will generally use a smaller sample. Sampling error can be used to determine if a greater or lesser number of samples is required to give a reliable answer.

These procedures assess two aspects of plantation quality:

- Planting quality, (i.e. root placement, firmness, depth, microsite, etc.) based on the trees exhumed.
- Spacing quality, based on unacceptable variance from the prescribed intertree spacing.

These results are combined in a single measure of plantation quality. This system differs from the MoF system in two key aspects:

- Spacing and planting quality are tracked separately, then combined; whereas, the MoF system combines them during the assessment.
- Crop tree spacing is based on prescribed intertree spacing rather than a specified number of trees per plot.

#### 1.421 Data Recording—Spacing Quality

At each plot the assessor will record the following:

- Number of acceptable crop trees established prior to the planting under assessment that are considered "planter visible".
- Number of newly planted trees.
- Actual number of plantable spots at the prescribed intertree spacing (optional).
- Spacing faults are recorded with a positive or negative sign when trees are either:
  - a) Too close to another potential crop tree (i.e. less than minimum intertree spacing). Record as "+".
  - b) A plantable spot has been missed (i.e. the distance from surrounding crop trees exceeds 80% of the target intertree spacing). Record as "-".

In the case of trees planted too close, the assessor must decide which tree is surplus. The surplus tree is recorded as a spacing fault and not exhumed. This avoids two faults for the same tree, in cases where the surplus tree is also poorly planted.

#### 1.422 Data Recording—Planting Quality

Trees within the plot, with the exception of those classed as spacing faults, are exhumed and assessed for the following quality factors:

- Suitability of microsite. Be specific and consider options available to the planter.

- Planting spot preparation. Consider whether planter met contract prescription or supervisor's instructions.
- Adequacy of planting considering size of planting hole, root distribution, depth, material used to fill hole, firmness and straightness.

Record the number of poorly planted trees in the appropriate column.

**Note:** If the assessor does not exhume all trees in each plot, the number of exhumed trees must be recorded. An unbiased method of selecting trees for digging should be used. MB silviculture audits normally sample the trees within a 2.4-meter radius from plot center.

#### 1.43 Compilation

- Calculate the percentage of spacing faults in relation to total crop trees.

**Note:** Negatives and positives may be summed separately first to help identify underplanting or overplanting. The rationale for compilation, however, is that a surplus tree does not compensate for a miss elsewhere.

- Calculate the percentage of planting faults in relation to total trees exhumed.
- Calculate the percentage of spacing faults in relation to potential crop trees. Plantable spots are the sum of crop trees and missed spots, based on target intertree spacing. Potential crop trees are the sum of natural crop trees plus plantable spots.
- Plantation quality is calculated by adding the percentage of spacing faults to the percentage of planting faults and subtracting the sum from 100%. Percentages are used because in most cases, the number of trees exhumed will be different from the number of crop trees.

The acceptable standard for MB silviculture audits is 90% plantation quality. Crop trees per hectare should be within 10% of the prescribed total stocking. For contract administration purposes, payment rates and quality standards are included in the planting contract and may be specified in greater detail if desired.

#### 1.431 Sampling Error

Sampling error must be calculated when there is a potential penalty or nonpayment. It can also be used to determine if the sample size is adequate for a desired level of accuracy.

Sample planting quality calculations are given in Appendix 1.6.

### 1.5 Stand Maintenance Assessments and Prescriptions

This section describes the procedures for assessing and prescribing release (inclusive of brushing and weeding) and spacing treatments, and evaluating the success of a treatment.

#### 1.51 Release Surveys

1.511 Objective

To determine if stand needs release from weed competition. If so, what method will be most suitable. The survey will provide the data for prescription, plans and basis for Section 88 funding and/or contract preparation.

1.512 Survey Procedures

Carry out a recce to determine if:

- Conifer stocking is adequate.
- Present brush species will reduce yield significantly (now or in the future) or even suppress and kill the crop trees.
- On skid and back spar trails, alder is beneficial for rehabilitating the site and not a danger to the setting. If alder is beneficial and is prescribed for rehabilitation in the PHSP, plan to leave it.

A detailed survey is only carried out if there is uncertainty about the need for treatment or more specific data is necessary for planning purposes, pesticide permit, etc.

The detailed survey uses:

- The 2.4 m plot and standard rules for sampling (Section 1.31)
- The Stand Maintenance Assessment Card 01.04.

Data to be recorded will depend on the specific site and could include:

- Conifer stocking, spacing and height
- Number, species, dbh, and/or height of weeds
- Evidence of growth suppression or damage
- Obstacles to herbicide use.
- 

1.513 Prescriptions and Records

- Prescribe and schedule treatment or next survey.
- Update FORKS.

1.52 Spacing Surveys

1.521 Objective

**To identify the stands that need spacing.**

To provide the basic data for prescription, annual and five-year planning and the basis for contract preparation.

If the stand does not need spacing, to confirm or revise the stand formula.

1.522 Preparation

- Review Spacing Guidelines and Practices in SPS 5.2.
- Obtain list of stands from:
  - inventory stand listings
  - forward planning ledger.
- All stands will be assessed for stocking level and spacing requirements before they reach a height of 5 m.

**Table 1.52A: Age to Reach 5 m Height**

Site Index	<u>18</u>	<u>21</u>	<u>24</u>	<u>27</u>	<u>30</u>	<u>33</u>	<u>36</u>	<u>39</u>
Douglas-fir	19	18	17	15	14	13	12	11
Western hemlock	19	17	15	13	11	10	9	8

1.523 Survey Procedure

Recce stand to decide whether a detailed survey is necessary, i.e., is stand or portions of stand dense enough to require spacing, or is present stand description no longer accurate? Survey should be rescheduled if the stand is not tall enough.

If a survey is necessary:

- Use 2.4 m plot, Stand Maintenance Assessment Card 01.04 and standard rules for sampling (Section 1.31) OR MoF Sampling System for Spacing.

- Stratify the stand into spaceable and not spaceable on the basis of recce and sampling.
- Count all non-competitors (Section 1.524) and record in "non crop tree" column.



- Count and record all competitor trees (Definition 1.524) by species and record in "potential crop tree" column. If stand is two-storied, make a separate count of trees in dominant storey and note degree of dominance.
- Record wolf trees and undesirable residuals in remarks column.
- Measure height, diameter and total age of largest crop tree on each plot. If this is an "advanced growth", adjust total age to age since release plus adjustment for time to reach height at release under normal conditions. Do not measure a tree not representative of the stand as a sample tree.
- Measure height to live crown on potential leave trees.

For doubtful stands, examine current annual radial increment on a range of trees to assess the degree of competition and the amount of release likely. **Remember, in a fully stocked stand, the maximum possible release in terms of increased c.a.i. on leave trees equals the sum of c.a.i. s of cut trees.** Record your measurements/ impressions in the comments column.

1.524 Definitions of Tree Classes for Spacing Assessment

- **Wolf tree** - a very vigorous tree, but unacceptable as a crop tree because of poor form, excessive branching, etc.
- **Non-competitor** - a tree so small in relation to mean dominant-codominant trees that it is not using sufficient resources to impact the growth rate of the crop trees significantly. See Table 1.52B

**Table 1.52B: Non-competitor Tree Height**<sup>3</sup>

Mean dom-codom height	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u> m
Non-competitors	1	1.5	2	2.5	3	4 m
	33%	38%	40%	42%	45%	50%

- **Competitor** - any tree taller than a non-competitor. Leave trees are selected from this category.

- **Undesirable residual** - any tree with clearly unacceptable characteristics, e.g., unhealed logging damage, curved trunk, disease.

Note: It is not necessary to define or identify leave trees at this point. Only when the stand is being spaced is this choice made.

1.525 Plot Compilation on Card 01.04

- Sum the data and derive or compile:
- Stems/Ha.
- H/D.
- True Age.
- Changes to the stand formula if no spacing is planned in the next two years.

1.526 Evaluation of Data and Formulating Prescription

In evaluating the results of the survey and before formulating a prescription, follow these steps:

- 1) Identify the preferred crop species (1 or more) considering ecology and value (Section 1.527).
- 2) Refer to SPS 5.2 for The Considerations and Guidelines for formulating a prescription.

1.527 Prescription and Records

If a stand does not justify spacing, complete necessary records and prescribe next survey. If necessary, correct formula using competitor trees as count trees to a maximum of 5/plot.

If spacing is justified, make detailed prescription and schedule according to "urgency."

1.7 Fertilizer Assessment

1.71 Decision-Making Procedures for Selecting Operational Fertilization Projects

- 1.711 Does the candidate meet all of the following requirements:
- less than 75 years old
  - greater than 70% volume of Douglas-fir
  - SI<sub>50</sub> 24 and greater for Douglas-fir
  - root rot is not widespread throughout the stand
- No - Stop; evaluate other stands.  
Yes - Proceed to step 2.
- 1.712 Is there a commercial thinning or final harvest scheduled within 10 to 15 years of the application date?
- No - Stop; evaluate stand objectives and other possible stands.  
Yes - Proceed to step 3.
- Note: If there is more than one stand at this point, priority must be given to stands where final harvest is scheduled after 10 years but before 15 years.
- 1.713 Is the height/diameter ratio less than 85?
- No - Stop; response unlikely.  
Yes - Proceed to step 4.
- 1.714 Is the relative SDI between the B&C lines with Density Management Diagram for Douglas-fir?
- No - Stop; proceed only if spacing or thinning the stand will be conducted before fertilization.  
Yes - Proceed to step 5.
- 1.715 Collect foliage samples as per attached procedure and send samples to Woodlands Services Environmental Lab for analysis. The nutritionist will advise on response expectation. Is there an expected response?
- No - Stop; evaluate other stands.  
Yes - Proceed to step 6.
- It is recommended that a screening trial be installed to provide greater assurance of the anticipated magnitude of the response. Screening trial installation methods are attached.
- 1.716 Calculate NPV. If the NPV is positive, does it rank high enough relative to other Divisional investment opportunities necessary to meet fibre flow goal?
- No - Stop; evaluate other stands.  
Yes - Fertilize the stand(s).
- Note: If fibre flow goal cannot be met, then at Regional Manager discretion, stands with least negative NPV may be considered.

1.72 Foliar Sampling

1.721 Type of Foliage

Sample the last foliage to have reached mature length.

1.722 Time of Year

For fertilizer prescriptions and general nutrient assessments, sample during dormant season. This is generally from October to March.

1.723 Crown Position

Sample only dominant and co-dominant trees from the upper third of crown, but not leader or first lateral whorl down.

1.724 Representative Sample

The sample should reflect the stand's or treatment's (i.e. plot) nutrient condition. For the stand, 15 to 20 trees should be selected throughout the area and equal amounts collected from each tree (2 branch ends/tree). For research plots, the number of trees/plot and number of samples/tree will vary with requirements. For individual tree analysis, a minimum of 25 grams (1/2 small lunch bag) of fresh foliage from several positions on tree is necessary.

1.725 Bagging and Labeling

Clearly label plastic bags with site identification (i.e. tree/plot or stand/area). Labeling should be done near bottom of bag.

1.726 Lab

If possible, contact Environmental Services Laboratory prior to sampling for further information and/or to give date sample will be submitted. A sample submission sheet must accompany the samples giving sample details and analysis request.

1.727 Avoid

- Trees with heavy cone production, insect or disease damage.
- Sampling foliage near unpaved roads, etc. where dust contamination may be a problem.
- Touching foliage with hands.
- Storage foliage in bags.

For further information call Arlene Gammell, woodlands Services at 755-3433.

**The following was an attachment to a memo from G.v. Westarp to W.N. Cafferata, January 18, 1989.**

**Fertilization Policy**

Operational fertilization may be undertaken where:

- application is compatible with environmental protection guidelines.
- There is a commitment to harvest the increased volume by thinning or clearcut before it is (wholly or partially) lost to mortality.

## 1.8 Disease Surveys

### 1.81 Purpose

To determine the extent of disease in stands scheduled for treatment.

### 1.82 Phellinus Weirii Surveys

- Conduct surveys for Phellinus weirii on all stands scheduled for treatment or logging in which previous estimates show that a significant part of the area is visibly infected with Phellinus.
- It is recommended that surveys be conducted only by trained people since inexperienced crews tend to overestimate disease incidence.
- A line transect survey method is used to survey for Phellinus.

#### 1.821 Procedures for Line Transect Survey

- The treatment unit ground survey is a 100-percent-coverage, sketch- mapping procedure, consisting of one or more baselines and perpendicular transect lines (recommended map scale is 1:2 500 to 1:5 000).
- Baselines may be positioned inside or outside the stand boundary, but must run the full length of the stand to be surveyed. Tie baselines and transect lines into ground points to maintain mapping control.
- A systematic grid coverage at 50 m transect line intervals should provide accurate coverage for most stand conditions. Flag interval points on the baseline and mark with line number before survey commencement. During mapping flag and mark the end of transect lines. Each transect line must run the width of the stand. To minimize coverage of dead ground, round off next transect line to the nearest multiple of 50 m within stand boundary.
- Infection centres should be flagged and at least one tree painted.
- Disease centres (based on visual symptoms only) are sketch mapped on topographic field cards, and then transferred onto 1:5 000 forest cover maps.

The area infected and the surround should be mapped and the percentage of visual area infected computed.

### APPENDIX 1.1

### Example - Stocking Survey Card

MacMILLAN BLOEDEL  
**REGENERATION ASSESSMENT CARD**

PAGE \_\_\_\_ OF \_\_\_\_

PLOT SIZE: 2.4 m.  
 OPENING NO: F044 31 04  
 LOCATION: X line  
 DATE: 06-09-91  
 DONE BY: J.D.

POST-LOGGING  
 STOCKING SURVEY  
 REGENERATION PERFORMANCE  
 YEAR SURVIVAL 1 2 3

✓

PLOT NO.	CROP TREES				PLANTABLE SPOTS				COMPETITORS			REMARKS	
	SPECIES			TOTAL	HT. / AGE	DECID / MOIST	NO.	NO. UNPLANTABLE			SPECIES		
	Hw	D	C					W	R	S			I
1	1	1		2	20y		1						
2	1			1	6/2		1		1				
3	1	1		2	8/2								
4				0			3						
5	1			1	5/1		1		1				
6	1	1		2	12/2		0						
7	1			1	10/2		1						
8				0			3						
9	1	1		2	6/1		0						
10	1	1		2	15/2		1						
↓													
↓													
↓													
↓													
50													
4	1	8	9	68			46	5	9	2			
COMPLICATION:													
Productive Area: (50/50) 100 = 100%													
Stocking: (68/50) 550 = 748 sph													
Plantable Spots: (46/50) 550 = 506 sph													
Slash: (9/50) 550 = 99 sph													
Distribution (41/50) 100 = 82%													

NP - non-productive  
 W - water R - rock D - duff S - slash B - brush I - influence tree

RESULTS/PRESCRIPTION: Slash light - a few roadside accumulations heavy. Expect little additional regen due to aspect and distance from seed source. Order stock for a "fill" plant but resurvey end next season to confirm. Use Cw 1+0p.

## APPENDIX 1.2 Example - Survival Survey Card

PAGE \_\_\_\_ OF \_\_\_\_

### MacMILLAN BLOEDEL REGENERATION ASSESSMENT CARD

PLOT SIZE: 2.4 m. \_\_\_\_\_  
 OPENING NO: L026.14.02  
 LOCATION: Sp E 100  
 DATE: 06 06 91  
 DONE BY: HB

POST-LOGGING  
 STOCKING SURVEY  
 REGENERATION PERFORMANCE  
 YEAR SURVIVAL 1 2 3

✓

PLOT NO.	CROP TREES					PLANTABLE SPOTS					COMPETITORS			REMARKS
	SPECIES		TOTAL	HT. CM	DECD AGE	MORT	NO.	NO. UNPLANTABLE				SPECIES		
	Df	Cw						W	R	S	I			
1	2		2	20										
2	1	1	2	30										
3	1		1	20			1		1					
4	2	1	3	25										
5				27			1							
6	1	1	2	31										
7	2		2	25			1							
8	2		2	15										browsed
9	1	1	2	22										
10	1		1	28										
↓														
30	31	23	5	59			5	2	1	2				
COMPLETION														
Productive Area (30/30) 100 = 100%														
Stocking (59/30) 550 = 1081sph														
Plantable Spots (5/30) 550 = 92 sph														
Distribution (29/30) 100 = 97%														

N# - non-productive  
 W - water      R - rock      D - duff      S - slash      B - brush      I - influence tree

RESULTS/PRESCRIPTION: Df and Cw are plantation trees. Hw are naturals.  
Survival appears very good. Few dead trees and stocking satisfactory. Light  
browsing on Cw.

### APPENDIX 1.3

#### Example - Regeneration Performance Survey Card

#### MacMILLAN BLOEDEL REGENERATION ASSESSMENT CARD

PAGE \_\_\_\_ OF \_\_\_\_

PLOT SIZE: 2.4 m. \_\_\_\_\_  
 OPENING NO: K041.12.02  
 LOCATION: Sp 12-C1  
 DATE: 02-07-91  
 DONE BY: J.S.

POST-LOGGING  
 STOCKING SURVEY  
 REGENERATION PERFORMANCE   
 YEAR SURVIVAL 1 2 3

✓

PLOT NO.	CROP TREES				PLANTABLE SPOTS				COMPETITORS		REMARKS			
	SPECIES			TOTAL	HT. m	DECID	NO.	NO. UNPLANTABLE				SPECIES		
	H	B	C					W	R	S		D	A	B
1				2	.5/4							3	1	
2				3	.6/5								2	
3				3	.5/4								1	2
4				2	.1/6								2	
5				1	.8/6								1	
6				2	.5/4								4	
7				4	.4/4								1	2
8				3	.6									2
9				5	.6/4								1	
10				2	.1/6									3
↓														
↓														
↓														
6296621210				180										
<b>COMPILATION</b>														
Productive area: (59/62)										100	95%			
Stacking : (180/59)										550	1667			
Plantable Spots: 0										0	0			
Distribution (59/59)										100	100%			

I - influence tree  
 W - water      R - rock      D - duff      S - slash      B - brush

RESULTS/PRESCRIPTION: Stand fully stocked. Considerable seed-in since last survey. Future spacing candidate. 2 ha in extreme SW corner requires treatment for salmonberry--some suppression occurring.