

Soo Timber Supply Area Timber Supply Review

Data Package

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1. Introduction

This data package outlines the basic information and assumptions that are required for the Soo Timber Supply Area (TSA) timber supply analysis.

The completed data package contains those inputs that are a part of current performance for the timber supply area. For the purpose of the timber supply review, "current performance" can be defined:

- by the current forest management regime — the productive forest land available for timber harvesting, the silviculture treatments, the harvesting systems and the integrated resource management guidelines used in the area;
- by the standards used to approve or reject forest development (5-year development) plans;
- by fully implemented land-use plans;
- by land-use decisions approved by Cabinet;
- by approved higher level plans under the Forest Practices Code; and
- other approved B.C. Forest Service and joint agency forest management practices and policies.

This idea of current performance should be kept in mind at all times when completing the data package. In other words, the purpose of the timber supply review program is to model "what is" not "what if." Changes in forest management objectives and data, when and if they occur, will be captured in future timber supply analyses.

Each section of this data package is organized in the following way:

- 1) A short explanation of the data required;
- 2) Data table; and
- 3) The source of the data and comments.

This data package while representing the best available knowledge and information today is subject to change. As noted in several sections, until the timber harvesting land base is determined it is not possible to finalize the values shown in some of the tables in this package. In some cases the criteria are shown but the final value is not yet filled in. In these cases the columns show as gray shaded in the tables. In addition, if any major changes to management regimes occur over the next few months the timber supply analysis will attempt to capture these changes. The final timber supply analysis report will include a technical appendix which will highlight any changes made to this package.

2. Current Forest Management Considerations and Issues

2.1 Base case management assumptions

These assumptions reflect current performance with respect to the status of forest land, forest management practices and knowledge of timber growth and yield. The harvest forecast developed from these assumptions is termed the base case harvest forecast and is used as a baseline term of reference. Section 7, "Sensitivity Analyses to be Performed," outlines areas where it is felt there is uncertainty with respect to any of the assumptions and outlines sensitivity analysis intended to be performed.

2.2 Statement of major forest management considerations and issues

The major forest management issues and considerations are listed in the table below. Where issues are defined within legislation, regulations or standards, a timber supply assessment will be made. Issues and factors that are difficult to quantify or assess using a timber supply model may be either analysed separately or noted as upward or downward pressure on the timber supply.

Table 1. Major forest management considerations

Consideration/issue	Description
Visual quality objectives (VQO)	VQO inventory updated
Community watersheds	Designated community watersheds mapped by the Ministry of Environment, Lands and Parks (MELP), Water Management Branch
Botanical forest products	Modelling of forest management prescriptions to maintain mushroom habitat
Stand and landscape level biodiversity	Forest practices code (FPC) requirements
Riparian requirements	Forest practices code (FPC) requirements
Deer management plan	Modelling of deer management prescriptions
Spotted owl	Modelling of owl management prescriptions
Protected areas (P.A.)	Several new parks announced as part of the Lower Mainland protected areas strategy

3. Inventories

3.1 Background information

The inventories which will be used to determine the timber harvesting land base and the associated management themes to be used in defining forest management activities are listed in Table 2. The data source and reliability of the information, including any irregularities in the data and assumptions used in deriving the information and quality assurance measures taken for non-standard data are also shown.

Table 2. Inventory information

Data	Source	Vintage	Update	Scale
Forest cover	Ministry of Forests (MoF)	1991	1996	1:20 000
Operability	MoF	1992	1996	1:20 000
Community watersheds	MELP	1996	1997	1:20 000
VQOs	MoF	1997	N/A	1:20 000
New protected areas	MoF	1996	N/A	1:20 000
Deer management zones	MELP/MoF	1997	N/A	1:20 000
Spotted owl SRMZs and nesting sites ^a	MoF	1996	N/A	1:20 000
Draft landscape units	MELP/MoF	1997	N/A	1: 20 000

(a) Nesting sites refers to matrix activity centres.

Data source and comments:

The forest inventory planning file provides the location of community watershed reserves. In some cases these reserves may differ from the community watersheds identified by the Ministry of Environment, Lands and Parks (MELP). Management requirements identified by the *Community Watershed Guidebook* will only be applied to the community watersheds designated by MELP.

The Ministry of Forests has designated the Blackwater Creek drainage, near Birkenhead, as a wild mushroom harvesting reserve. For this analysis, the area will be located on the forest cover inventory and managed through forest cover requirements as a botanical forest products zone.

Spotted owl SRMZs and nesting sites, new protected areas, draft landscape units, deer management areas, community watershed designations and some revised visual quality objective codes used in this analysis do not appear on the current MoF inventory file. This information will be digitized and merged with the standard inventory file to produce the inventory file to be used in this analysis.

4. Division of the Area into Management Zones

4.1 Management zones and tracking of multiple objectives (grouping)

The concept of management zones is used to differentiate areas with distinct management emphasis and homogenous forest cover. For example, a zone may be based on a harvesting system, silviculture system, visual quality objective or wildlife consideration. The forest cover data set can also be grouped by different variables. In addition, the non-contributing forest (land considered unavailable for timber harvesting) may be included for consideration in attaining forest cover objectives. Grouping enables constraints to apply to different combinations of variables or zones as well as enhancing reporting structures. Groups may be thought of as layers of different objectives which must be tracked over time. Whether to put an objective into a group or a mutually exclusive management zone will be decided after data assessment by the timber supply analyst.

Further information on the forest cover requirements to be applied to these areas can be found in Section 6.4, "Integrated resource management."

Table 3. Objectives to be tracked

Objectives	Inventory definition
Level 1 groupings	
Non-VQO	No VQO assigned
VQO = Retention	VQO code = R
VQO = Partial retention	VQO code = PR
VQO = Modification	VQO code = M
Level 2 groupings	
Deer management zones	Deer management zones as indicated on deer SRMZ mapping
Spotted owl SRMZs	SRMZs as indicated on spotted owl SRMZ mapping
Botanical forest products	Listing of forest stand polygon numbers
Community watersheds	Community watershed numbers as indicated on mapping
Level 3 groupings	
Draft landscape units	Draft landscape unit number as indicated on mapping

Data source and comments:

See Section 3.1, "Background information," for the sources of mapping and zones referenced above.

4. Division of the Area into Management Zones

4.2 Analysis units

An analysis unit represents a combination of stands dominated by specific tree species or a silvicultural regime with a specific timber growing capability — as indicated by the inventory type group and site index in the forest inventory file. Each analysis unit is assigned its own timber volume projections (yield tables) for existing and future stands.

Table 4. Definition of analysis units

Analysis unit (leading species)	Criteria		
	Inventory type groups	Site index	Site index range ^a
Douglas-fir (Fd)	1 - 8	Good	> 27
Douglas-fir (Fd)	1 - 8	Medium	20 through 27
Douglas-fir (Fd)	1 - 8	Poor	< 20
Hemlock/balsam (Hw/Ba)	12 - 20	Good	> 23
Hemlock/balsam (Hw/Ba)	12 - 20	Medium	16 through 23
Hemlock/balsam (Hw/Ba)	12 - 20	Poor	< 16
Cedar/spruce (Cw/Sx)	9-11, 21-26	Good	> 21
Cedar/spruce (Cw/Sx)	9-11, 21-26	Medium	16 through 21
Cedar/spruce (Cw/Sx)	9-11, 21-26	Poor	< 16
Pine	27-32	Medium/good	> 20
Cottonwood (At)	35 & 36	All	All sites

(a) Site index reference age is 50 years.

Data source and comments:

The site index ranges used to define the analysis units are approximate. The ranges are estimated natural breaks in the distribution of area by site index for each species. Once the timber harvesting land base has been defined a more detailed analysis will be performed to confirm the values shown.

Harvesting operations have been limited in pine stands in the past; mostly confined to salvage operations due to mountain pine beetle infestations. Pines stands of better productivity are included in this analysis given the increased harvesting activity in these stands.

5. Timber Harvesting Land Base Definition

5.1 Identification of the timber harvesting land base

The timber harvesting land base for the Soo TSA is determined by separating out the following categories of area which do not contribute to timber harvesting in the area. This section outlines the steps used to identify the timber harvesting land base (the productive forest expected to support timber harvesting) within the timber supply area. Land may be unavailable for timber harvesting for three principal reasons:

- it is not administered by the British Columbia Forest Service for timber supply purposes (e.g., private land, parks, etc.);
- it is not suitable for timber production purposes; and
- it is required for other forest values.

Land may also be added to the timber harvesting land base:

- by management activities which improve productivity or operability (e.g., the stocking of land currently classified as non-commercial brush);
- by the addition of productive forest land (e.g., timber licence reversions).

The classification of unavailable for timber harvesting should apply only to land where no harvesting is anticipated to occur. Any area in which some timber harvesting will occur should remain in the timber harvesting land base, even if area will be subject to stringent constraints.

After all areas that do not contribute to the timber harvesting land base have been identified, any additional lands are added to the land base. The resulting productive forest land base is defined as the "current timber harvesting land base" for the TSA.

5.2 Details on land base classification

5.2.1 Land not administered by the British Columbia Forest Service for timber supply purposes

Ownership codes are generally used to identify whether the land can be considered to contribute to timber supply. Ownership codes 62C and 69C indicate Crown land in a forest management unit and miscellaneous reserves respectively. All areas with other ownership codes will be removed from the land base considered available for timber supply. This includes areas under woodlot licence as their AAC is determined independently of the timber supply review process. Timber licence area - ownership code 70N - is considered under Section 5.2.13, "Timber licence reversions."

Results of a review of Crown land (62C and 69C) coded as non-provincial forest show that the area is provincial forest. This area will be included in the land base considered available for timber supply.

5.2.2 Land classified as non-forest

Type identity 6 areas such as alpine, lakes, rocks, etc. and type identity 8 area will be excluded from the land base considered for timber supply.

5. Timber Harvesting Land Base Definition

5.2.3 Non-commercial cover

Type identity 5 represents those areas which are classified as having non-commercial brush species growing on them. These areas are considered to be unlikely sites for timber production and are excluded from the area considered available for timber harvesting.

5.2.4 Environmentally sensitive areas

Some forest lands are environmentally sensitive and/or significantly valuable for other resources. These areas are identified and delineated during a forest inventory and are called environmentally sensitive areas (ESAs). The ESA system uses the following classification: soil (Es), forest regeneration problems (Ep), snow avalanche (Ea), recreation (Er), and wildlife (Ew). With the exception of avalanche for the Soo TSA, two ESA categories are recognized: high and moderately sensitive.

In the context of timber supply analysis, ESAs may result in a reduction in the harvesting opportunity on these sites. Two strategies for accounting for this are: per cent area reductions, and the specific evaluation of individual ESA polygons for harvesting opportunity.

As noted previously it is important to ensure that only areas in which harvesting is expected to take place are allowed to contribute to the timber harvesting land base. Thus, it is important to separate the areas in which some limited harvesting will take place and those areas which are unavailable. This table deals with those areas in which harvesting will not occur.

Table 5. Description of environmentally sensitive areas

ESA category	ESA description	Reduction per cent (%)
S1	Soils - high	90
S2	Soils - moderate	60
R1	Recreation - high	90
W1g, W1m, W1o	Wildlife (mountain goat, moose and birds) - high	90
P1	Regeneration - high	90
A1	Avalanche - high	60
W2g	Wildlife (mountain goat) - moderate	90

Data source and comments:

Wildlife habitat requirements for deer and spotted owl will be modelled using forest cover requirements rather than exclusions (see Section 6.4.1, "Objectives which require forest cover requirements.")

Environmentally sensitive area reductions were established by the Ministry of Forests (MoF) staff in collaboration with specialists from the Ministry of Environment Lands and Parks (MELP). The percentages reflect site sensitivity to forest management, value for other resources, and current management practices.

5. Timber Harvesting Land Base Definition

5.2.5 Areas with high recreation values

In addition to ESA recreation reductions, there are visual quality objective inventory recreation area reductions. Areas with a recreation management class code '0' are identified as high value areas and will be 100% excluded from the area available for timber harvesting.

Areas with a recreation management class code of '1' are predominantly visually sensitive areas in which harvesting is expected to occur. These stands are dealt with in the analysis by applying forest cover requirements rather than excluding the areas from the timber harvesting land base. (See Section 6.4.1, "Objectives which require forest cover requirements.")

5.2.6 Areas considered inoperable

Operability and inoperability codes are generally used to describe the presence or absence of physical barriers or limitations to harvesting, logging methods (e.g. cable), and the merchantability of stands. Since physical and economic conditions are highly variable across British Columbia, methodology, interpretation and mapping of these factors is highly variable and district dependent.

Table 6. Description of inoperable areas

Inventory description	Code	Reduction per cent (%)
Inoperable	I	100

Data source and comments:

Operability mapping was updated in 1996.

Douglas-fir stands that are height class 4 or greater, and were originally classified as inoperable, were reassessed to determine their heli-log potential. If the stands are within operating distance to roads and have sufficient volume, 50% of the area was reclassified as operable.

5.2.7 Sites with low timber growing potential

Sites may have low productivity either because of inherent site factors (nutrient availability, exposure, excessive moisture, etc.), or because they are not fully occupied by commercial tree species. Typically, these stands are intermixed with other stands within the forested land base. As these stands are not considered to be harvestable, they need to be identified and removed from consideration for the timber harvesting land base.

5. Timber Harvesting Land Base Definition

Table 7. Description of sites with low timber growing potential

Species	Characteristics	SI limit	Per cent (%) excluded
Fir	Existing stands with volumes less than 350 m ³ /hectare and sites projected not capable of producing 350 m ³ /hectare by age 140.		100
Cedar	Existing stands with volumes less than 350 m ³ /hectare and sites projected not capable of producing 350 m ³ /hectare by age 140.		100
Hemlock/balsam	Existing stands with volumes less than 350 m ³ /hectare and sites projected not capable of producing 350 m ³ /hectare by age 140.		100
Spruce	Existing stands with volumes less than 300 m ³ /hectare and sites projected not capable of producing 300 m ³ /hectare by age 140.		100
Pine	Existing stands with volumes less than 300 m ³ /hectare and sites projected not capable of producing 300 m ³ /hectare by age 140.		100
Cottonwood	Existing volume less than 150 m ³ /hectare.		100

Note: Shaded cells indicates information only available after the start of the timber supply analysis.

Data source and comments:

All areas with an activity code of 'L' (logging history) or stands that currently have more than the required existing volume (indicated in the above table by leading species type) will be retained in the timber harvesting land base regardless of site index. Criteria were developed from current performance of licensees.

5.2.8 Problem forest types

Problem forest types are stands which are physically operable and exceed low site criteria yet are not currently utilized or have marginal merchantability. These types are wholly or partially excluded from the timber harvesting land base.

5. Timber Harvesting Land Base Definition

Table 8. Problem forest types criteria

Species	Inventory type groups	Reduction per cent (%)
Larch and all deciduous except cottonwood	32-34, 37-42	100

Data source and comments:

Problem forest types are defined as species currently not utilized in the Soo TSA.

5.2.9 Roads, trails and landings

Separate estimates are made to reflect the loss in productive forest land due to existing and future roads, trails and landings (RTL). Existing RTL estimates are applied as reductions to the current productive forest considered available for harvesting and future RTL are applied after stands are harvested for the first time in the simulation model. Estimates can be applied as the amount or percentages of area to be removed from specified age classes and zones. Estimates should only account for the area that will be permanently removed from the timber harvesting land base.

Table 9. Estimates for existing and future roads, trails and landings

Location	Age class	Road length (km)	Road width (m)	Reduction area (hectares) or per cent (%)
Existing RTLs				
Roads	0 to 4	4 800	15	7 200 hectares
Future RTLs				
Roads, trails and landings	5 to 9			5.4%

Data source and comments:

Existing roads reductions are based on estimated length of road (Forest Service, road permit and non-status roads) in the Soo TSA of 4800 kilometres and an average right of way width of 15 metres, for a total estimated road area of 7200 hectares. The 15 metre width also accounts for landing area that will not be rehabilitated. The estimated length of forest road in the TSA was derived by MoF staff from road lengths shown on current forest inventory maps.

5. Timber Harvesting Land Base Definition

Future roads, trails and landings reductions are based on a survey of ISIS and MLSIS reports from areas logged since 1987. Forest district staff estimated that losses to be 5.4% of the available timber harvest land base. All existing stands currently age class 5 or greater will be subject to a 5.4% land base reduction after harvest.

5.2.10 Cultural heritage resource reductions

Archaeological overview and cultural heritage value inventories for the entire Soo TSA are yet to be completed or are not comprehensive. The impacts of measures required to protect known sites remain unquantified at this time.

5.2.11 Riparian reserve zones

In order to account for riparian reserve zones the timber harvesting land base will be reduced by 4.8%. This figure is based on coastal average figures for stream length by stream class, estimated in a 1994 study completed by Wild Stone Resources and the riparian reserve width specifications for each stream class found in the *Riparian Management Area Guidebook*. The per cent area excluded from the timber harvesting land base is calculated by multiplying the specified reserve width for each stream class by the lengths of stream of each class found on the cutblocks sampled (92 coastal cutblocks), then dividing by the total area of cutblocks sampled. The information to be used in the analysis to capture the effect on timber supply from the riparian management zone is dealt with in Section 6.4.2, "Riparian management zones (RMZ)."

5.2.12 Exclusion of specific, geographically defined areas

The purpose of this section is to specify the location and total area to be excluded from the timber harvesting land base to account for any area exclusions that are part of current management but have not already been accounted for in the inventory file.

While areas recognized by legislation or Order-in-Council as not contributing to the timber harvesting land base are excluded, areas which have been deferred from harvesting because they are contentious or are under study (e.g., planning deferrals, potential parks) are considered available for timber harvesting.

5. Timber Harvesting Land Base Definition

Table 10. Exclusion of specific, geographically defined areas

Identifying inventory variables (location descriptors)	Excluded area	Reason for exclusion
Whistler Municipal boundary	All	Whistler LRUP
East Howe Sound	All	Access and Terrain concerns
Stawamus P.A.	All	Recently announced park
Indian Arm P.A.	All	Recently announced park
Upper Lillooet P.A.	All	Recently announced park
Sockeye P.A.	All	Recently announced park
Callaghan P.A.	All	Recently announced park
Tantalus P.A.	All	Recently announced park
Brackendale P.A.	All	Recently announced park

Data source and comments:

The East Howe Sound has limited harvesting opportunities, most of which would have to be conducted using heli-log operations. Heli-log operations would require timber to be flown over highways and railroads which would endanger public safety.

The new protected areas identified in the above table have been announced by government, but are still in the process of being officially legislated. If legislation does not occur before the timber supply model is set up for the Soo TSA, the exclusion of the new protected areas will not form part of the base case. However, the effect of these announced new parks on the timber supply forecast will be examined in a sensitivity analysis.

5.2.13 Timber licence reversions

Timber licences (TLs) are old tenure arrangements that give a licensee exclusive rights to harvest merchantable timber within the licence area and do not contribute to the TSA allowable cut. Once these areas have been harvested, regenerated and attain free-growing status, the timber licence area reverts to B.C. Forest Service jurisdiction. Accordingly, these areas are included in the timber harvesting land base after the first harvest and contribute to the TSA harvests in mid- to long-term timber supply.

Timber licence areas need to be accounted for from the time stands have been harvested, and/or from the time stands are estimated to be harvested. Time of harvest is used as the reference point so that impact of these harvests on forest cover requirements is given full consideration in the timber supply analysis. In some cases stands that have been harvested and legally reverted have not had the necessary ownership change on the inventory file (e.g., change from 70-N to 62-C).

5. Timber Harvesting Land Base Definition

Table 11. Timber harvest reversion schedule

Area of timber licence (TL) harvested (hectares) (year of harvest)	
1997 - 1999	2000 - 2030
233.33 hectares each year	53.33 hectares each year

Data source and comments:

The forest inventory file shows a total of 15 802 hectares of TLs in the Soo TSA. After accounting for land base that has reverted to the TSA and area removals such as ESAs and protected areas, forest district staff estimate that approximately 2300 hectares remain in the area considered available for harvesting in the Soo TSA. Of the 2300 hectares, 700 hectares are expected to be harvested by 1999. It is assumed that the remainder of the area will be harvested proportionately over the next 30 years. Summaries by species and age classes of the actual area in the timber harvesting land base, derived from the inventory files, will be presented in the timber supply analysis report.

6. Current Forest Management Assumptions

6.1 Harvesting

6.1.1 Utilization levels

The utilization levels defines the maximum stump height, minimum top diameter inside bark (dib) and minimum diameter at breast height (dbh) by species and is used in the analysis to calculate merchantable volume.

Table 12. Utilization levels

Analysis unit	Utilization		
	Minimum dbh (cm)	Maximum stump height (cm)	Minimum top dib (cm)
Pine	12.5	30	10
Cottonwood	12.5	30	10
All others	17.5	30	10

Data source and comments:

Table 12 reflects current regional standards, licence requirements and current performance.

6.1.2 Volume exclusions for mixed species stands

One or more species in mixed species stands may be unmerchantable. For example, the deciduous species in a predominantly coniferous stand may not be harvested, or may only be partially harvested. The unharvested portion should not contribute to the estimated stand volume. The species that do not contribute and that will be excluded from the estimation of stand volume are shown in the table below.

Table 13. Volume exclusions for mixed species types

Species	Volume exclusion (%)
Larch and all deciduous except cottonwood	100

Data source and comments:

Table 13 reflects current regional utilization standards, licence requirements and current performance.

6. Current Forest Management Assumptions

6.1.3 Minimum harvestable age derivation

Minimum harvestable ages are simply minimum criteria. While harvesting may occur in stands at the minimum requirements in order to meet forest level objectives (e.g., maintaining overall harvest levels for a short period of time or avoiding large interdecadal changes in harvest levels), most stands will not be harvested until well past the minimum timber production ages because of other resource values take precedence (e.g., requirements for the retention of older forest).

The criteria used to define minimum harvestable ages for this analysis is 90% of culmination age (e.g., for a species with a culmination age of 100 years, the minimum harvestable age will be 90 years).

Data source and comments:

In 1994 the Soo Timber Supply Area management strategy was approved by the District Manager of the Squamish Forest District. A component of the management strategy is the establishment of harvest ages based on financial and timber product returns. Stands selected for the application of these harvest ages consist of those being specifically managed for a range of pre-determined end products. The strategy document also contains provisions for the modification of the harvest ages when appropriate for the management of non-timber values.

Forest district staff reviewed yield tables for a range of site indices (10 to 36 in 2 metre increments) for the commercial species in the district. The results of the review were that stands would be marketable when they are 90% of culmination age.

Once the analysis has started the timber harvesting land base will be defined and yield tables, by analysis units, will be developed. Minimum harvestable ages will then be calculated. The minimum harvestable ages by analysis units will be presented in the timber supply analysis report.

6.1.4 Harvest scheduling priorities

The 1994 Soo TSA management plan strategy specifies that 25% of the AAC must come from "difficult or decadent stands" (a stand qualifies if there is 30% or greater decay). Implementation of this strategy has reduced the amount of affected stands to the extent that special harvesting priorities are no longer needed.

The management plan also specifies that at least 10% of the annual harvest come from non-clearcut or partial harvests systems. As second growth or managed stands start to mature it is expected that an additional 10% of the annual harvest will come from commercial thinnings.

6.1.5 Logging methods and silvicultural systems

The logging methods employed in the Soo TSA are conventional (85%), cable (10%) and heli-logging (5%). The per cent figures are based on the average amount of volume harvested per year by all licensees. These methods are now considered current performance and special partitioning of the harvest is not required.

The majority of the Soo TSA is being harvested utilizing clearcut harvesting methods. Forest District staff anticipate increased usage of partial or selection harvest systems, especially in the spotted owl management zone. However, there is little current performance and factoring partial or selection harvest silvicultural systems into the TSA timber supply is not an issue at this time.

6. Current Forest Management Assumptions

6.2 Unsalvaged losses

Table 14 shows the estimated average annual unsalvaged volume loss to catastrophic events such as insect epidemics, fires, wind damage or other agents over the long term on the timber harvesting land base. The unsalvaged loss column only reflects those areas in which the volume will not be recovered or salvaged.

Table 14. Unsalvaged losses

Cause of loss	Annual unsalvaged loss (m ³ /year)
Insects	4 000
Fire	30 000
	34 000

Data source and comments:

Insects

Current and projected volumes losses can be expected in Douglas-fir stands due to western spruce budworm and Douglas-fir bark beetle. The volume loss estimate was derived by applying a loss factor to the volume of stands currently under attack. Estimates of losses in pine stands attributable to the mountain pine beetle are unknown.

Fire

The unsalvaged loss estimate due to fire is based on 10 years of district fire reports. The total losses were reduced so that only volume loss that occurred in the timber harvesting land base is included in the estimate.

6.3 Silviculture

6.3.1 Silviculture and regeneration activities in managed stands

The silviculture program reflects the mix of treatments expected to be carried out according to the Soo TSA Plan. This level of activity assumes basic silviculture on all sites plus incremental silviculture on some sites. Table 15 shows the proportion of each analysis unit to be treated under each silviculture regime and the expected average regeneration delay.

Recent plantations and future stands will be grown on managed stand yield tables (MSYT) produced using the B.C. Forest Service table interpolation program for stand yields (TIPSY) growth and yield model. Stands where fertilization treatments are to be applied will have MSYT produced using the B.C. Forest Service tree and stand simulator (TASS) growth and yield model. A MSYT may be built from a number of tables if more than one regeneration method is used within an analysis unit. When this is the case, tables are produced for the different regeneration methods (each method x species combination) are then aggregated into one table.

6. Current Forest Management Assumptions

Table 15. Regeneration assumptions by analysis unit

Analysis unit	Zone	Site index	Regen delay	OAFs		Method		Density	
				1	2	Type	%	Initial	Space
Fir - G	Deer		3	15	5	planted	100	2500	500
Fir - M	Deer		3	15	5	planted ^F	100	2500	500
Fir - P	Deer		3	15	5	planted	75	1500	500
Fir - P	Deer		3	15	5	planted ^F	25	1500	500
Fir - M	Botanical		3	15	5	planted ²	100	2500	600
Fir - P	Botanical		3	15	5	planted	40	1500	
Fir - P	Botanical		3	15	5	planted	60	1500	500
Fir - G	Remaining		3	15	5	planted ¹	100	2500	600
Fir - M	Remaining		3	15	5	planted ^F	25	2500	600
Fir - M	Remaining		3	15	5	planted ^{1F}	75	2500	600
Fir - P	Remaining		3	15	5	planted	40	1500	
Fir - P	Remaining		3	15	5	planted ^F	35	1500	500
Fir - P	Remaining		3	15	5	planted	25	1500	500
H/B - G	Remaining		3	15	5	natural	100	4000	700
H/B - M	Remaining		3	15	5	natural	30	4000	600
H/B - M	Remaining		3	15	5	natural	70	2000	
H/B - P	Remaining		3	15	5	natural	100	1800	
C/S - G	Remaining		3	15	5	planted	100	3000	700
C/S - M	Remaining		3	15	5	planted	50	2000	
C/S - M	Remaining		3	15	5	planted	50	3000	700
C/S - P	Remaining		3	15	5	planted	100	2000	

planted¹ means that genetically improved stock is used and at least a 3% volume increase (first generation stock from Dewdney Seed Orchard) is applied in the yield curves developed for these regimes.

planted² means that 25% of the stock planted is genetically improved. Same gain as above.

planted^F means fertilization is applied at ages 20, 30 and 40 years at 200 kg/hectare. TASS growth and yield model will be used to generate yield tables.

Cottonwood regenerates along VDYP curves as there are no MSYTs for cottonwood.

C/S medium and poor assumed a hybrid of Sitka and Engelmann which is represented by White Spruce yield curve.

No planting of Sitka on good sites because of Sitka spruce weevil.

6. Current Forest Management Assumptions

Data source and comments:

All values in the above table are based on current performance as estimated by forest district staff.

6.3.2 Immature plantation history

This section identifies areas of existing immature forest where the density (stems per hectare) was controlled and therefore should be assigned to a managed stand yield table curve (MSYT). All NSR and future harvested stands will be managed under MSYTs.

Table 16. Immature plantation history

Analysis unit	Area managed (%)		
	Age 1 - 10	Age 11 - 20	Age 21 - 30
All Douglas-fir	100	100	100
All hemlock balsam	100	100	
All cedar/spruce	100		

Data source and comments:

The proportion of immature stands that are considered "managed" is based on the best professional estimate of forest district silviculture staff. Douglas-fir stands less than 30 years old and hemlock/balsam leading stands less than 20 years old are considered managed stands due to the longer history of management (control of density at establishment and through stand tending) in these stands. Density control and tending has only occurred over the last 10 years in all other stands in the Soo TSA.

6.3.3 Not satisfactorily restocked (NSR) areas

Land classified in the Soo TSA FIP file as type identity 4 or 9 is included in the current timber harvesting land base. These type identities indicate not satisfactorily restocked (NSR) land base. The purpose of this section is to identify the total area of NSR currently existing in the timber harvesting land base, and the estimated rate at which the NSR area will be restocked. If the figures provided in this table (usually from forest district silviculture records) differ from the NSR area showing on the inventory file, the figures in this table will be prorated to match the inventory file NSR total area.

Table 17. Not satisfactorily restocked (NSR) areas

Backlog NSR		Current NSR	
Years to regenerate	Area (hectares)	Years to regenerate	Area (hectares)
Proportionately over 10	597	Proportionately over 10	3 157

6. Current Forest Management Assumptions

Data source and comments:

Forest district silvicultural records (ISIS and MLSIS) show 597 hectares of backlog NSR (i.e., harvested prior to 1987) and 3157 hectares of current NSR. In the analysis these areas will be assumed to be restocked within 10 years. All other NSR areas on the inventory file (type identity 4 or 9) will be assigned to analysis units according to the species, age and site index information on file. At the time of this data package preparation, the Soo TSA inventory file was not available to report land base figures and detailed summaries will be provided in the timber supply analysis report

6.4 Integrated resource management

6.4.1 Objectives which require forest cover requirements

As noted in Section 4.1, "Management zones and tracking of multiple objectives (grouping)," the discussion on multiple objectives, forest cover requirements may be examined at a number of different levels. These may be considered as layers in Geographic Information System (GIS) terminology. One possible layer may be landscape units, another may be wildlife areas, while another may be resource emphasis. With the requirement to retain different forest characteristics across the landscape, it is important to identify how non-contributing forest (forest which does not contribute to the timber harvesting land base) may be considered in the forest cover requirements (i.e., maximum allowable disturbance or minimum area retention).

Table 18a. Forest cover requirements

Note: The following forest cover requirements will be applied to areas that fall into each of the "Level 1" groupings within each landscape unit (Level 3 grouping). VQO prescriptions will be adjusted to account for the non-contributing forest and to account for the dispersion of excluded areas within the timber harvesting land base.

	Green-up height (metres)	Green-up maximum allowable disturbance (% area)
1 IRM (base)	3	33
2 VQO = R (base)	5	5 (of total forested area)
3 VQO = PR (base)	5	15 (of total forested area)
4 VQO = M (base)	5	25 (of total forested area)

6. Current Forest Management Assumptions

Table 18b. Forest cover requirements

Note: The following forest cover requirements will be applied to areas that fall into each of the "Level 2" groupings to model spotted owl management, community watershed, and botanical forest products guidelines.

	Green-up height (metres)	Green-up maximum allowable disturbance (% area)	Minimum older age (years)	Minimum older age retained area (%)
Spotted owl areas	N/A	N/A	100	67
Community watersheds	5	5	N/A	N/A
Botanical forest products	5	25	80	50

Table 18c. Forest cover requirements
(Deer management plan)

Note: To model deer habitat plan requirements, the following forest cover requirements and area removals will be applied to the timber harvesting land base within each draft landscape unit. These requirements are based on habitat management of winter range, spring range and migration corridors at the landscape level. The objective of the plan is to provide deer with resources critical to survival during severe winters. Although winters have been relatively mild in the last two decades and deer have occupied a variety of habitats, only habitats critical to the maintenance of deer have been included in the plan.

	% area removal	Forest cover requirements on remaining area	
		Age (years or height)	Minimum older age retained (%)
Moderate snowpack winter range	0	50 years	50
Moderate/deep snowpack winter range	25	50 years	50
Deep snowpack winter range	100	N/A	N/A
spring range	0	50 years	50
migration corridor ^a	0	≥ 3 metres	80

(a) Only applies to the Upper Lillooet planning cell.

6. Current Forest Management Assumptions

Table 18d. *Forest cover requirements (concluded)*
Biogeoclimatic units and natural disturbance types (NDTs) within the Soa TSA
(based on gross productive forest)

Note: In order to ensure that the maintenance of older forests is spread out within the TSA the following forest cover requirements will be applied to the draft landscape units (Level 3 grouping). The landscape units are not yet finalized, however, as the draft units are available in digital format they will be utilized as a convenient modelling tool. This does not imply these units are final.

Biogeoclimatic unit	NDT	Mature and old-seral stage		Old-seral stage	
		Minimum retention area (%)	Minimum age (years)	Minimum retention area (%)	Minimum age (years)
CWH	1	N/A	N/A	13.6	250
ESSF	1	N/A	N/A	19.9	250
MH	1	N/A	N/A	19.9	250
CWH	2	N/A	N/A	9.4	250
ESSF	2	N/A	N/A	9.4	250
IDF	4	28.1	100	13.6	250

Data source and comments:

Visual quality objectives have been assigned by the Squamish Forest District and the Vancouver Forest Region recreation staff. Community watershed guidelines are taken from the *Forest Practices Code Community Watershed Guidebook*. Spotted owl management guidelines have been developed by the Spotted Owl Management Interagency Team and have been approved by government.

Although the deer habitat management plan has not received final approval there is a memorandum of understanding between the Ministry of Forests and the Ministry of Environment, Lands and Parks that the plan will guide the preparation and approval of management plans. The prescriptions shown in Table 18c are considered current performance and will be modelled as base case.

Biodiversity guidelines will be modelled using information from the *Forest Practices Code Biodiversity Guidebook*. Operationally, low biodiversity emphasis is assumed to apply to all landscape units, as the assignment of biodiversity emphasis options is not complete. However, as it is expected that biodiversity emphasis assignment will be completed within 1 to 2 years the timber supply analysis will use constraints more reflective of what may be expected when the emphasis levels have been assigned. As it is unknown at this time which landscape units will be assigned low-, intermediate- or high-emphasis a single weighted constraint for each of the old plus mature-seral stage and the old-seral stage will be developed based on the anticipated distribution of 45% low-, 45% intermediate- and 10% high-emphasis. The values shown in Table 18d above reflect the weighted *Biodiversity Guidebook* values.

6. Current Forest Management Assumptions

As per the *Forest Practices Code Timber Supply Analysis* in natural disturbance types 1 and 2 only the old-seral stage constraint will be applied. In natural disturbance type 4 both the mature plus old- and the old-seral stage constraints will be applied. It should be noted that as per the *Biodiversity Guidebook* once the timber harvesting land base is finalized the minimum old-seral stage per cent may be adjusted if required to prevent short-term economic and social disruption. If this adjustment is necessary a recruitment plan will be put in place to ensure the old-seral objective is fully met by the end of three rotations. The modelling process will also ensure the full minimum older retained area will be met by the end of three rotations.

All stand heights shown in Tables 18a and 18b refer to top heights (inventory definition), not average stand height.

6.4.2 Riparian management zones (RMZ)

The appropriate method to account for the timber supply implications of riparian management practices within riparian management zones (RMZs) depends upon the management practices applied in these zones (e.g., harvest pattern) and the availability of inventory information (e.g., FPC riparian management area stream classification).

To account for the timber volume that will be left unharvested in riparian management zones, as specified under the *Forest Practices Code Riparian Management Area Guidebook*, all volume over age curves for both existing and future stands will be reduced by 4.2%. This assumption is based on average stream density figures for the coast, as was noted in Section 5.2.11, "Riparian reserve zones."

6.4.3 Wildlife trees (WT) and tree patches (WTP)

The *Biodiversity Guidebook* describes two methods for providing the maintenance of stand structure over time. One method is wildlife trees while the other is wildlife tree patches. It is important to discuss the anticipated persistence of the particular method in different stand types. For instance, different silvicultural systems may provide the intended structural diversity through modifying the timing when timber is available. Consideration should be given to whether the trees will ever be harvested and whether areas in riparian management zones are regularly being used to produce either wildlife trees or tree patches.

Table 19. Reductions to reflect volume retention in cutblocks for wildlife tree patches

Management zone	Analysis unit	Persistence	Per cent (%) recommended in applicable guidebook	Residual area estimate on the timber harvesting land base (%)
All	All	Long term	12	3

Data source and comments:

The figure of 3% shown in Table 19 is based on the assumption that only 1/4 of the total requirement of 12% must be provided by the timber harvesting land base after considering areas already excluded for other reasons. The figure of 12% is taken from Table 20a of the *Forest Practices Biodiversity Guidebook* using the assumptions (estimated from inventory file summaries) that about 50% of the forested area of the Soo TSA is harvestable, and that 70% of the area has already been harvested once without recommended wildlife tree retention.

6. Current Forest Management Assumptions

An area reduction is used to model wildlife tree patch requirements rather than a volume reduction because it more accurately reflects the area upon which harvesting will occur. These wildlife trees, in conjunction with other riparian reserves and area removals, are generally larger than two hectares in size and are left to maintain stand structure within the landscape over time. As the wildlife tree patches are larger than two hectares in size this area will contribute to meeting old-seral stage forest requirements at the landscape level. It is assumed that these wildlife tree patches will not be economical to harvest at a later date, nor will they be available to harvest in subsequent harvesting of the stand.

7. Sensitivity Analyses to be Performed

Sensitivity analysis provides a measure of the timber supply impact if uncertainty in management assumptions and/or data integrity exists. The magnitude of the increase or decrease in a particular variable should reflect the degree of uncertainty surrounding the assumption. For instance, minimum harvestable age may be developed based on some minimum stand attributes which currently appear to dictate the earliest time stands are eligible for harvest. Sensitivity analysis may indicate that a small reduction in these attributes may alleviate anticipated harvest level reductions in the future. By developing and testing a number of sensitivity analyses, it is possible to determine which variables most affect results. The first table shows issues that are particular to this TSA. This is followed by a list of standard sensitivity analysis that are carried out in all TSAs.

Table 20. Sensitivity issues specific to the Soo TSA

Issue to be tested	Sensitivity levels
Age when forest achieves "old" forest characteristics	+/- 20 years
Existing stand yields – Pemberton PSYU	30% age class 9 (inventory types 15 (HB) and 19 (BH) stands)
Protected areas (if applicable)	P.A. land base

Table 21. Standard sensitivity analysis

Issue to be tested	Sensitivity levels
Existing stand yields	+/- 10%
Regenerated stand yields	+/- 10%
Minimum harvestable age	+/- 10 years
Old-growth site index adjustments	+12 m Fd – age class 8 and 9 after regeneration + 7 m Hw – age class 8 and 9 after regeneration
Land base changes	+/- 10%
Visual quality objectives	Mid-range % denudation
Harvest flow alternatives	
Green-up periods	+/- 5 years and +/- 10 years
IRM zone	Change maximum area below green-up age to 25%