

Lakes Timber Supply Area Timber Supply Review

Data Package

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District Manager
Lakes Forest District

Director
Timber Supply Branch

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1. Introduction

This data package outlines the basic information and assumptions that are required for the Lakes 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;
- the standards used to approve or reject forest development (5-year development) plans;
- fully implemented land-use plans;
- land-use decisions approved by Cabinet;
- approved higher level plans under the Forest Practices Code; and
- other approved B.C. Forest Service and joint agency forest management practices and policies.

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) A data table; and
- 3) A discussion of data sources, and other 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 shaded gray 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 that 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," identifies areas of uncertainty with respect to the data and assumptions and outlines sensitivity analyses intended to be performed.

2.2 Statement of major forest management considerations and issues

The major forest management issues and considerations in the Lakes TSA are listed in the table below. Where issues are defined within legislation, regulations or standards, a timber supply assessment will be made. In cases of important uncertainties in defining current management, critical issues analysis may be done. Also, it may be difficult to quantify some issues for computer modeling, in which case sensitivity analysis may assist in assessing the timber supply implications and assigning degrees of risk to timber supply during allowable annual cut determination.

2. Current Forest Management Considerations and Issues

Table 1. Major forest management considerations

Consideration/Issue	Description
Stand yield curves	Lakes Forest District staff are concerned that the volume predictions for very old (> 250 years) stands overestimate actual volumes. This believe is based on the view that stand volumes are decreasing in these stands rather than increasing as predicted by yield models. A sensitivity analysis will test the effect of lower volumes for very old stands.
Site productivity (adjustments from paired plot studies of managed pine stands)	Site index adjustments based on paired plot results will be applied to those management zones that are expected to exhibit management conditions similar to those sampled.
Landscape-level biodiversity	Draft landscape unit (LU) boundaries have been defined, and in the analysis a weighted biodiversity emphasis option assignment will be used. A sensitivity analysis will examine the impact of applying draft biodiversity emphasis options.
Stand-level biodiversity	The wildlife tree requirements of the <i>Forest Practices Code Biodiversity Guidebook</i> will be represented, as per current practice.
Riparian areas	Requirements from the Forest Practices Code for riparian reserve zones and riparian management zones will be included in the analysis.
Caribou migration corridor	The migration corridor has been identified and management prescriptions developed for this area. Both will be included in the analysis.
Ungulate winter range	Requirements for security cover, thermal cover and forage for moose and deer, as prescribed in development plans within winter range areas, will be modeled.
Caribou winter range	Currently no commercial timber harvesting occurs in the caribou winter range. The entire winter range area south of Tetachuck Lake is recommended for protection by the <i>Lakes Land and Resource Management Direction Report (1997)</i> . This area will be modeled to conserve caribou habitat based on recommendations contained in <i>Management Strategy and Options for the Tweedsmuir-Entiako Caribou Winter Range</i> — Cichowski & Banner 1993
Problem forest types (Height Class 2 pine)	Components of problem forest types that are being utilized will be included in this analysis.
Lakes Land and Resource Management Plan (LRMP) Draft	The Lakes community resource council prepared a <i>Lakes Land and Resource Management Direction Report (1997)</i> . The timber supply effects of proposed management zones and corresponding management requirements, and proposed protected areas will be examined by sensitivity analysis.
Transfer of forest land to agriculture	Lands with agriculture potential surrounding settlement areas and within the timber harvesting land base (THLB) will be harvested and then removed from the THLB at a rate of 50 ha/yr to a maximum of 2000 ha.

3. Inventories

3.1 Background information

The inventories that 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 (1995 update, projected to 1998 — note: disturbance generally updated to the end of 1994 in the 1995 update)	MoF standard inventory file	1989 & 1990	1995	1:20,000
The following inventories are all Lakes Forest District non-standard inventory files				
Visual resource inventory — scenic areas, visual inventory, VQOs	MoF District	1993	1997	1:50,000
Caribou winter range and management zones	MoF District	1993		1:50,000
Caribou migration corridor	MoF District	1996		1:50,000
Ungulate high value winter range	MoF District	1975	1993	1:50,000
Recreation areas	MoF District	1996		1:150,000
Backcountry lakes	MoF District	1996		1:150,000
Biological ecosystem networks – BENs (Landscape level habitat connectivity)	MoF District	1996		1:150,000
Grizzly bear areas	MoF District	1996		1:150,000
Special geographic areas (Sutherland, Uncha, Entiako)	MoF District	1996		1:150,000
Landscape units	MoF District	1997		1:150,000
Biogeoclimatic ecosystem classification (BEC) zoning	MoF Research Branch	1997		1:250,000
Updated woodlot license file	MoF District	1997		1:20,000

3. Inventories

Data Source and Comments:

- Backcountry lakes (walk-in lakes) — Digital file derived from Interim IRM Strategies and Harvesting Guidelines for the Lakes Forest District — 1993.
- BEC zoning — Updated from most recent file available from Research section in Prince Rupert Forest Region (PRFR).
- Biological ecosystem networks BENs — Mapping and digitizing contract completed in 1994. Mapping used by BC Environment (BCE) staff when reviewing development plans.
- Caribou migration corridor (VH, H, M, L) — Data obtained from Land Management Handbook, 37 “Caribou Habitat Use in the Chelaslie River Migration Corridor and Recommendations for Management” by Steventon, J. Douglas. 1996. Translated to digital form. VH, H, M, and L refer to very high, high, moderate and low value corridors, respectively.
- Caribou winter range and management zones — Data obtained and digitized from Land Management Report, 83 “Management Strategy and Options for the Tweedsmuir-Entiako Caribou Winter Range” by Cichowski, D.B., and A. Banner. 1993.
- Grizzly bear areas — Mapping derived from Klaytunkut and Sutherland land and resource use plans (LRUPs) completed in 1992.
- Landscape units — Established and digitized for the Regional Landscape Unit Planning Strategy (approved by Forest District Manager and BCE designate – November, 1997)
- Recreation areas — Digital file derived from Interim IRM Strategies and Harvesting Guidelines for the Lakes Forest District – 1993 and refined during the LRMP process in 1996.
- Special geographic areas (Sutherland, Uncha, Entiako) — derived from Interim IRM Strategies and Harvesting Guidelines for the Lakes Forest District – 1993 and LRMP (proposed protected areas)
- Ungulate high value winter range — Data obtained from Habitat Mapping and digitizing contract done in 1993 by Silvicon Services Ltd.
- Updated woodlot license file — Most recent digital version of approved Woodlot Licenses in the district. Obtained from district mapping and design section in September, 1998.
- Visual resource inventory — District-wide coverage of visual resources. This inventory was established and digitized in the early 90s and has been upgraded several times since. The inventory is the basis for establishment of District scenic areas and appurtenant VQOs.

4. Division of the Area into Management Zones

4.1 Management zones and tracking of multiple objectives (grouping)

Management zones are used to differentiate areas with distinct management emphasis. 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 application of management requirements to combinations of variables or zones. Groups may be thought of as layers of different objectives that may be tracked over time. Whether to put an objective into a group, the area of which any overlap with other groups, or into 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
Visual and scenic area objectives: VQOs — for retention and partial retention	Non-standard mapped layer
Caribou winter range objectives	Non-standard mapped layer
Caribou migration corridor objectives	Non-standard mapped layer
Ungulate high value winter range objectives	Non-standard mapped layer
Recreation objectives	Non-standard mapped layer
Backcountry (walk-in) lakes objectives	Non-standard mapped layer
Key grizzly bear habitat objectives	Non-standard mapped layer
Riparian management objectives	Based on biodiversity ecosystem network information
Integrated resource management (IRM)	Areas not subject to other specified management objectives
Landscape-level biodiversity by landscape unit and BEC variant	Non-standard mapped layer
Agriculture and settlement area for removals from timber harvesting landbase	Non-standard mapped layer
Chelaslie landscape unit (beetle salvage)	Non-standard mapped layer

Data Source and Comments:

Riparian management objectives — Connectivity corridors, as represented by strong and weak links in the biodiversity ecosystem network (BEN) inventory, generally overlap riparian areas and therefore provide a good basis for estimating riparian zone requirements.

Objectives for ungulate winter range apply only outside of areas with objectives for caribou winter range and the caribou migration corridor.

4. Division of the Area into Management Zones

The objective to be represented in the IRM zone is cutblock adjacency. The IRM zone includes all areas outside of those managed for visual quality objectives, caribou winter range objectives, caribou migration corridor objectives, high value ungulate winter range objectives, backcountry lake objectives and grizzly habitat objectives. The IRM zone includes portions of the BENs that are not contained within other resource management zones.

The loss of forested land to agriculture will be restricted to those portions of the agriculture/settlement zone outside of recreation areas, backcountry lakes, and caribou, grizzly, and most moose habitat areas. See Section 6.1.4 "Harvest scheduling priorities" for more detail.

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

4.2 Analysis units

An analysis unit represents a combination of stands that grow or are treated similarly. Each analysis unit is composed of groups of forest stands that have similar tree species composition (as indicated by the inventory type group), and similar timber growing capability (as indicated by the site index in the forest inventory file). Each analysis unit is assigned its own timber volume projections (yield tables) for existing and future stands. The following tables define the analysis units to be used for existing stands.

Yield tables for existing natural stands are derived using the variable density yield projection (VDYP) growth and yield model. Yield tables for recent plantations and future stands are derived using the table interpolation program for stand yields (TIPSY). The following species symbols are used: F (Douglas-fir); B (balsam); S (spruce); Pl (lodgepole pine).

Table 4. Definition of analysis units

Analysis Unit	Criteria			
	Species	Inventory Type Groups	Site Index Range (m @ 50 yrs)	Age (yrs)
1	F, B	1,4,5,8,18-20	all	0 - 140
401	F, B	1,4,5,8,18-20	all	141 +
2	S	21-26	>=18	all
3	S	21-26	12 - 17.9	0 - 140
403	S	21-26	12 - 17.9	141 +
4	S	21-26	<= 11.9	0 - 250
404	S	21-26	<= 11.9	251 +
5	Pl	28	>=18	all
6	Pl	28	12 - 17.9	all
7	Pl	28	<= 11.9	all
8	Pl with F/S	29-31	>=18	all
9	Pl with F/S	29-31	12 - 17.9	all
10	Pl with F/S	29-31	<= 11.9	all

4. Division of the Area into Management Zones

Data Source and Comments:

Balsam and fir stands are grouped because of the small area occupied by these species in the Lakes TSA.

Analysis units 401-404 consist of older age classes in spruce, balsam and fir stands, which have an average site index lower than that for younger age classes. It is recognized that site index derived using existing inventory information from these sites may underestimate their actual productivity, but there are currently no site index adjustments available for these species in the Lakes TSA. A sensitivity analysis will examine the use of the province-wide site index adjustment equations for spruce (Nussbaum, A.F. 1998. Site index adjustments for old-growth stands based on paired plots. Working paper 37/1998, B.C. Ministry of Forests, Research Branch. Victoria, B.C.).

Site index ranges are based on a breakdown of the existing range of site indices.

5. Timber Harvesting Land Base Definition

5.1 Identification of the timber harvesting land base

The timber harvesting land base for the Lakes TSA is determined by separating out categories of area which do not contribute to timber harvesting. 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 principle reasons:

- it is not administered by the British Columbia Forest Service for timber supply (e.g., private land, parks, etc.);
- it is not suitable for timber production; 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' applies only to land where no harvesting is anticipated to occur. Any area in which some timber harvesting will occur remains in the timber harvesting land base, even if the 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 Lakes TSA.

5.2 Details on land base classification

5.2.1 Land not administered by the BCFS for timber supply

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 AACs are determined independently of the timber supply review process. This analysis accounts for all Woodlot licenses issued prior to May 1998. The area in Woodlot licenses is 22 527 hectares with an estimated AAC of 52 600 m³, of which 38 000 m³ were issued since the last AAC determination.

5.2.2 Land classified as non-forest

Areas with projected type identity 6 are non-forested, and areas with projected type identity 8 have no typing available. These categories include alpine areas, rock and ice, lakes, swamps and rivers, which do not contribute to timber supply, and are excluded from the area considered available for timber harvesting.

5.2.3 Non-commercial cover

Areas with projected type identity 5 are occupied by non-commercial brush species. These areas are considered to be unlikely sites for timber production and are excluded from the area considered available for timber harvesting.

5. Timber Harvesting Land Base Definition

5.2.4 Environmentally sensitive areas

Some forest land is 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), wildlife (Ew), water (Eh) and fisheries (fisheries symbols). With the exception of avalanche and fisheries, 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 management of ESAs are: percent area reductions, and specific evaluation of individual ESA polygons for harvesting opportunity.

As noted previously only those areas where harvesting is expected to take place contribute to the timber harvesting land base. Thus it is important to separate the areas in which some limited harvesting will take place from those areas which are completely unavailable. Table 5 identifies how much area will be unavailable for harvesting due to ESAs.

Table 5. Description of environmentally sensitive areas

Location	ESA Category	ESA Description	Reduction percent
Babine PSYU ^a # 134	R 1 & 2	High value localized recreation areas	90
	S 1	Highly sensitive soils	90
	S 2	Moderately sensitive soils	70
	P 1 & 2	Regeneration difficulty	60
Burns Lake PSYU # 154 & Ootsa PSYU # 155	R 1 & 2	High value localized recreation areas	90
	S 1	Highly sensitive soils	70
	S 2	Moderately Sensitive soils	60
	P 1 & 2	Regeneration difficulty	60
Ootsa PSYU #155	Wildlife (Entiako Caribou)	Dry Lichen-Lichen moss (winter range 1 and 2) in the moderate value caribou management zone (zone 2 & 10)	100
		High caribou management zone (zone 4 & 9)	100

(a) PSYU – public sustained yield unit. Used here to denote general location within the TSA.

Data source and comments:

A GIS query of harvesting activities within ESAs was undertaken for harvesting occurring after 1990. This query revealed no harvesting activity within these areas. More detailed checks of harvested blocks revealed that some harvesting has occurred in ESA polygons. This difference appears to be due to the district disturbance updating process in which all existing ESA linework may not be maintained as disturbances are updated. The reduction percentages presented in Table 5 above represent current practice, based on input from experienced forest district staff.

5. Timber Harvesting Land Base Definition

Since the last timber supply review, reduction percentages for sensitive soil and recreation areas have been refined as requested in the Chief Forester's 1996 AAC Rationale. The resulting reductions are lower than those used in the previous TSR. For high-value localized recreation areas, a 90% reduction is used because some harvesting may occur in these areas. Reductions for sensitive soils have been adjusted to account for the different sensitivity of S1 and S2 areas and for sensitivity differences between PSYUs. In general, the Babine PSYU contains a higher proportion of salmon-bearing streams and areas of fine-textured erodible soils (Twain Creek, Pierre Creek, Sutherland River valley) than other areas within the TSA. Areas with sensitive soils in the Babine PSYU are therefore assigned a slightly higher reduction percent than are such areas in other PSYUs.

Entiako Caribou — Caribou winter range mapping replaces Ew mapping. Current management is most similar to option 3 described in *Management strategy and options for the Tweedsmuir-Entiako caribou winter range* by Cichowski and Banner (1993). Under current practice, management occurs as follows:

- Harvesting is kept out of the highly sensitive zones 4 and 9. Access, into these zones for resource development is seen as incompatible with caribou winter range values. The lichen habitats (Dry Lichen-Lichen moss) are also highly sensitive to disturbance and depend on the maintenance of old forest. The impact to timber values is relatively low as these zones are rich in habitat types with low timber values.
- Some mountain pine beetle control “snip and skid” logging is currently allowed along the south shores of Tetachuck Lake and Echu Reach. This area corresponds to zones 2, 10 and 9. While option 3 does not permit harvesting in zone 9, this extra harvesting in current practice is balanced by the fact that currently no development is permitted or occurring in zone 8, which would be allowed under option 3. Further, the interior portions of zones 2, 10 and 9 would not be accessible under either option 3 or through the current beetle control strategies.
- Note: Caribou habitat value for the zones referred to above are:
4 & 9 - High; 2 & 10 - Moderate; 8 - Low

5.2.5 Areas considered inoperable

Operability codes are generally based on the presence or absence of physical barriers or limitations to harvesting, logging methods (e.g. cable) and the merchantability of stands. Given the relatively easy terrain in the Lakes TSA, no areas are classified as inoperable due to terrain. Table 6 lists areas that are inoperable due to soils and access limitations.

Table 6. Description of inoperable areas

Inventory Description	Code	Reduction percent
Sutherland Valley (Inaccessible areas in and adjacent to the flood plain)	Planning cell # B011,B012, B013	70%
Low value Caribou Management Zone (Entiako) — inaccessible	Zone # 8	100%

Data source and comments:

Planning cells # B011, B012 and B013 were identified as being high soil hazard by interpretive slope stability and erosion hazard mapping done by regional soil specialists for this planning project. It is considered appropriate to treat these areas similar to ESA soil sensitive areas with a corresponding reduction factor of 70%.

5. Timber Harvesting Land Base Definition

The low value Caribou Management Zone #8 is located at the extreme south end of the district. The high-value zones immediately to the north block access from the rest of the district. Adjacent lands in the Vanderhoof forest district are approved for protection as part of the Vanderhoof LRMP, effectively excluding access from the south, therefore precluding development for timber harvesting. This area is of interest to the Ulkatcho First Nation for economic development and is being recommended for protection in the Lakes LRMP.

The SBFEP in the district is concerned that there are small pockets of forested land that may not be accessible (potentially inoperable) for a number of reasons. Such areas are currently being identified and will be assessed in the next timber supply review.

5.2.6 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.

Table 7. Description of sites with low timber growing potential

Forest type	Characteristics				
	Inventory Type Group	Age (yrs)	Volume (m ³ /ha)	Site Index (m@50yrs)	Reduction percent (%)
Fir	1-8	200	< 140	< 11.0	100
Balsam	18-20	200	< 140	< 7.4	100
Spruce	21-26	200	< 140	< 5.4	100
Pine	28-31	160	< 140	< 7.6	100

Data Source and Comments:

Criteria defining low site stands evolved out of the 1985 timber supply analysis process. At that time the harvest level was based partly on the condition that major licensees would utilize stands of lower volume. The minimum acceptable volume was defined as 140 m³ per hectare. Stands with volumes less than this are not considered harvestable. The minimum volume must be achieved by the age specified in Table 7 for a stand to be considered productive enough to be managed for timber supply. Together, these two criteria (volume and age) were used to define the minimum site index, used to identify which existing stands are unlikely to meet the minimum volume and age criteria.

5. Timber Harvesting Land Base Definition

5.2.7 Problem Forest Types

Problem forest types are stands that are physically operable and exceed low site criteria yet are not currently utilized or have marginal merchantability. In the Lakes TSA these types are excluded from the timber harvesting land base.

Table 8. Problem forest types criteria

Description	Characteristics						
	Inventory Type Group	Species Composition	Age (yrs)	Height (m)	Volume (m ³ /ha)	Site Index (m@50 yrs)	Reduction percent (%)
Deciduous	35-42	—	all	all	all	all	100
Pure balsam types	18-19	—	251+	all	all	all	100
Mixed balsam types	20	< 30% spruce or pine	251+	all	all	all	100
Low height pine	28-30	—	141+	<17.5	<140	< 10.1	100
Low height — other species	1-8	fir	201+	<19.5	all	< 9.8	100
	18-20	balsam				< 8.3	
	21-26	spruce				< 5.9	

Data source and comments:

The threshold height for exclusion of pine from the timber harvesting land base has been lowered since the last TSR based a review of harvesting and utilization. The review showed that mature lodgepole pine stands with heights less than 19.5 metres were being harvested, and the lower height threshold was reduced to 17.5 metres for this TSR.

The minimum height and age criteria are converted to minimum site index criteria, which are used to identify which existing stands will not likely ever meet the minimum height and age criteria.

5. Timber Harvesting Land Base Definition

Table 8a shows harvesting activity in some problem forest types (PFT) especially height class 2 pine, and supports the exclusions listed in Table 8, above.

Table 8a. Recent harvesting history in problem forest types

PFT Category	SBFEP (ha) (1996-1997)	Major Licensees (ha) (1995-1996)	Total (ha)
Low Site	16		16
ITG 28-30 Ht Class 2	74	107	181
ITG 20 Age Class 9 <30% SP or PL	1		1
PI with >30% A or CT			
ITG 18-19 Age Class 9		56	56
Ht Class 2 other species	4		4
Total hectares	95	163	258

Additional information not shown in Table 8a includes logging of 33 hectares of height class 2 pine in TSL A37586 (logging completed in 1996).

Deciduous stands — while harvesting of deciduous stands has been proposed in some woodlot licences, the volumes are small, and actual performance and economic feasibility have not been evaluated.

5.2.8 Roads, trails and landings

Separate estimates are made to reflect the loss of productive forest land 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 reductions are applied after stands are harvested for the first time in the timber supply model.

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

Location	Age Class	Reduction percent
Existing RTLs	< 40 yrs	5.24%
Future RTLs	>=40 yrs	5.24%

5. Timber Harvesting Land Base Definition

Data Source and comments:

The results of a 1994 district survey to determine area lost to roads, trails and landings for the previous timber supply review are still valid. An assessment of 133 SBFEP final harvesting reports from between 1996 and 1998 confirms the 1994 survey results for areas lost within blocks. Table 9a shows the results of the SBFEP assessment and the 1994 study.

Table 9a. Results of area degradation study, 1994 survey and SBFEP blocks

	% of area degraded (SBFEP only from 1998 final harvesting report)	% of area degradation (district total, 1994 survey)
Conventional harvesting	6.17	6.9
Roadside harvesting	4.66	4.2

Data sources for the 1994 study included ground-based surveys, information from silvicultural prescriptions, advice from district engineering staff, and regional estimates by PRFR staff. Additional sources of data for the SBFEP study include:

- Information from Integrated Silviculture Information System (ISIS) records.
- Road lengths determined using the computer program INVSPECTS for PCs. When used in conjunction with road width estimates, road area can be calculated.

A recent forest district study showed an increase in the proportion of roadside versus conventional blocks. Roadside blocks now comprise about 80% of the area harvested, compared to 70% five years ago. This shift is reflected in the roads, trails and landings percentages.

The two-part 1994 survey determined the percentage of contributing land base in roads and landings outside harvested blocks and the percentage of roads and landings lost from contributing land within harvested blocks. The recommended 5.24% reduction for roads, trails and landings is calculated as follows:

Part 1	0.5% of contributing area in roads and landings outside blocks	
Part 2	Roadside	4.2 % of cut block taken up by roads, trail and landings
	Conventional	6.9% of cut block taken up by roads, trail and landings
	Prorated Roadside/Conventional based on the revised 80/20 split = 4.74%	
	Percent area reduction = 0.5% + 4.74% = 5.24%	

5. Timber Harvesting Land Base Definition

5.2.9 Cultural heritage resource reductions

According to the Wet'suwet'en landscape pilot project (undertaken by the forest district in cooperation with the First Nation), cultural heritage resources are generally accounted for through riparian, wildlife tree patch, problem forest type, or other removals from the timber harvesting land base. Recent documentation of significant areas of culturally modified trees may change this assumption as the extent of this information and its impact on harvesting activities are better understood. This new information will be used to augment traditional use surveys and will be factored into the timber supply reviews.

5.2.10 Riparian areas

Since there is no stream inventory available for the Lakes TSA, the findings of the 1996 *Forest Practices Code Timber Supply Analysis* will be applied. This means that 5% of the timber harvesting land base will be excluded for Riparian Reserve Zones, and 2% for Riparian Management Zones. The total reduction of 7% should be applied as follows:

65% (of 7%) applied to AUs 1 to 4, 8 and 9 within biodiversity ecosystem network strong links

25% (of 7%) applied to AU 1 to 4, 8 and 9 within biodiversity ecosystem network weak links

10% (of 7%) applied to AU 1 to 4, 8 and 9 over the remainder of the THLB.

Data Source and comments:

The analysis unit numbers above (1 to 4, 8 and 9) refer to any units with labels ending in those numbers. That is, the reduction percentages will be applied to any areas currently in AUs 101-104, 108, 109, 202-204, 208, 209, 302-304, 308, 309, 401, 403 and 404 as well.

Riparian Management Zones will be treated as an area reduction rather than a yield table reduction. Reductions are focused in the strong and weak links of the BENS because that is where the riparian and wetland areas are located.

The *Forest Practices Code Timber Supply Analysis 1996* (page 29) contains details on how the reserve and management zone area estimates were derived.

5.2.11 Exclusion of specific, geographically defined areas

All parks and reserves designated by Order-In-Council have been excluded from the timber harvesting land base. These include: Tweedsmuir, Wistaria, Ethel F. Wilson, Pendleton Bay, and Dead Mans Island provincial parks. The Lakes Land and Resource Management Direction Report produced by the Lakes LRMP process proposes additional areas for protection. The effect of removing these areas from the timber harvesting land base will be examined in a sensitivity analysis.

6. Current Forest Management Assumptions

6.1 Harvesting

6.1.1 Utilization levels

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

Table 10. Utilization levels

Species	Utilization levels		
	Minimum dbh (cm)	Maximum stump height (cm)	Minimum top dib (cm)
Pine	12.5	30	10
Spruce	15	30	10
All others (BL & F)	17.5	30	10

Data Source and Comments:

Table 10 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 Table 11 below.

Table 11. Volume exclusions for mixed species types

Inventory type group	Species	Volume exclusion (%)
All coniferous-leading	Deciduous	100

Data source and comments:

The exclusion pertains to only the deciduous timber volumes in coniferous leading stands. Deciduous-leading stands are excluded completely from the timber harvesting land base (see section 5.2.7 “Problem forest types”). The deciduous trees may contribute to biodiversity and coarse woody debris objectives at the stand level.

Some woodlot licensees in the district have shown interest in utilizing aspen. To date, only 200 m³/year of annual harvest has been awarded to woodlot licensees on a trial basis for aspen utilization. This volume comprises a very small portion of the TSA harvest, and will not be considered in this TSR. If the deciduous species component of harvests expands, it will be assessed in future TSRs.

6. Current Forest Management Assumptions

6.1.3 Minimum harvestable age derivation

The minimum harvestable age is the time required for a stand to grow to a harvestable size. Minimum harvestable ages are minimum criteria. While harvesting may occur in stands at the minimum ages to meet forest level objectives (e.g., maintaining overall harvest levels for a short period of time, or avoiding large changes in harvest levels), most stands will not be harvested until past the minimum ages because management for other resource values take precedence (e.g., requirements for the retention of older forest).

Table 12a. Minimum harvestable ages

Analysis Unit		Minimum Criteria		
		Minimum Height (m)	Minimum Volume (m ³ /ha)	Minimum Harvest Age (yrs)
1	Balsam/fir	19.5	140	120
401	Old balsam/fir	19.5	140	155
2	Spruce, good	19.5	140	74
3	Spruce, medium	19.5	140	86
403	Old spruce, medium	19.5	140	94
4	Spruce, poor	19.5	140	128
404	Old spruce, poor	19.5	140	161
5	Pure pine, good	17.5	140	53
6	Pure pine, medium	17.5	140	75
7	Pure pine, poor	17.5	140	118
8	Pine mixed, good	17.5	140	55
9	Pine mixed, medium	17.5	140	74
10	Pine mixed poor	17.5	140	118
101	Regenerated balsam/fir	19.5	140	103
102	Spruce regenerated to pine, good	17.5	140	50
103	Spruce regenerated to pine, medium	17.5	140	70
104	Spruce regenerated to pine, poor	17.5	140	113
105	Regenerated pure pine, good	17.5	140	51
106	Regenerated pure pine, medium	17.5	140	74
107	Regenerated pure pine, poor	17.5	140	113
108	Regenerated pine mixed, good	17.5	140	52
109	Regenerated pine mixed, medium	17.5	140	75
110	Regenerated pine mixed poor	17.5	140	108

6. Current Forest Management Assumptions

Table 12b. Minimum harvestable ages for regenerated pine stands with a site index adjustment

Regenerated Pine Analysis Unit (with site index adjustment)		Minimum Criteria		
		Minimum Height (m)	Minimum Volume (m ³ /ha)	Minimum Harvest Age (yrs)
202	Converted from spruce, good — SBS mc2	17.5	140	51
203	Converted from spruce, medium — SBS mc2	17.5	140	51
204	Converted from spruce, poor — SBS mc2	17.5	140	51
205	Pure pine, good — SBS mc2	17.5	140	48
206	Pure pine, medium — SBS mc2	17.5	140	48
207	Pure pine, poor — SBS mc2	17.5	140	48
208	Mixed pine, good — SBS mc2	17.5	140	49
209	Mixed pine, medium — SBS mc2	17.5	140	49
210	Mixed pine, poor — SBS mc2	17.5	140	49
302	Converted from spruce, good — SBS dk	17.5	140	44
303	Converted from spruce, medium — SBS dk	17.5	140	49
304	Converted from spruce, poor — SBS dk	17.5	140	56
305	Pure pine, good — SBS dk	17.5	140	43
306	Pure pine, medium — SBS dk	17.5	140	48
307	Pure pine, good — SBS dk	17.5	140	53
308	Mixed pine, good — SBS dk	17.5	140	47
309	Mixed pine, medium — SBS dk	17.5	140	49
310	Mixed pine, poor — SBS dk	17.5	140	54

Data source and comments:

The criteria used to generate minimum harvest ages represent the current understanding of minimum merchantability and are consistent with land base reductions for low productivity. The minimum harvest age is the age at which both the minimum height and minimum volume criteria are met. For existing natural stands, the ages were derived using the Variable Density Yield Prediction model. For managed, regenerated stands, the Table Interpolation Model for Stand Yields (TIPSY) model was employed. Site index adjustments for pine are discussed in section 6.3.1 “Regeneration activities in managed stands.”

6. Current Forest Management Assumptions

6.1.4 Harvest scheduling priorities

Table 13. Priorities for scheduling harvests

Description	Management Zone or location	Analysis Units	Period (10-year increments starting from present)	Priority 1 (high) – 100 (low) or minimum harvest level
Beetle salvage, beetle proofing and caribou management	Chelaslie landscape unit	5 to 10	1-2	1
Landbase conversion	Agriculture/Settlement zone	all	1-4	1 with maximum harvest of 50 ha/yr

Data Source and Comments:

The Chelaslie landscape unit is under high risk from Mountain Pine Beetle (MPB). MPB is currently moving into this area from the south (Entiako) and south-west (Tweedsmuir Park). Harvest priorities are to reduce risk and salvage existing infestations. The intent is to focus harvest on susceptible pine stands that are impassable to caribou during the first pass (ITG 28 and 30, age class 6, 7, 8 [101-250 years]).

Crown forested land within the agriculture/settlement zone is being harvested and converted to agriculture at an estimated rate of 50 ha/year, which is expected to continue for 4 decades. The total conversion is estimated at 2000 ha. The specific parcels of land that will be converted are unknown, but are likely to be areas that do not have objectives for wildlife or other resource emphases. The area to be converted will be modeled using all of the agriculture/settlement zone outside of recreation areas, backcountry lakes and habitat areas (1494 ha), which falls short of the estimated 2000 ha. It is unlikely that area with deer habitat objectives will be converted, but area with moose habitat objectives may be converted. Therefore, the area modeled for conversion will also include that portion of the agriculture/settlement zone in the draft Intata landscape unit having ungulate winter habitat objectives for moose (531 ha). This area totals 2,025 ha, which is very close to the estimated conversion area. The timber supply model will have a maximum harvest target of 50 ha/year for this area, which will be removed from the timber harvesting land base following harvest and will not contribute to forest cover requirements thereafter.

6.1.5 Silvicultural systems

Modified clearcut is the predominant silvicultural system in use in the Lakes TSA. Under this system a range of opening sizes (1 ha to several thousands of ha) of even-aged forest is being produced. Cutting of adjacent blocks is restricted until green-up conditions are met. A characteristic of this system is the maintenance of older forest remnants within harvest blocks. These remnants are intended to function as wildlife tree patches, riparian reserves and management zones, and island remnants to conserve old growth characteristics.

Partial cutting and selection systems are used but currently account for only 1% of the annual harvest. Horse logging under the SBFEP accounts for the largest proportion of these systems, approximately 10 000 m³ annually. Helicopter, high-lead and small log harvester/forwarding systems (Valmet) have also received some experimentation; however, because of the small volume involved, these systems will not be modelled.

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 on the timber harvesting land base. The unsalvaged loss column reflects only those areas in which the volume will not be recovered or salvaged.

Table 14. Unsalvaged Losses

Location	Analysis units	Cause of loss	Unsalvaged losses for base case (m ³)	Unsalvaged losses for sensitivity analysis of proposed protected areas (PAs) (m ³)
All	All	Fire	2,819	2,819
All	All	Insects (MPB)	1,800	800
All	All	Blowdown	18,357	18,357
Total			22,976	21,976

Data Source and Comments:

Insects

Mountain Pine Beetle (MPB) is the major insect in the Lakes Forest District. No significant losses in excess of those taken into account in yield curves from other pests are believed to occur in this district, according to scaling and field staff. Nearly all identified trees are salvaged under current salvage practices. The only losses to insects are in areas treated using a fall and burn system. Areas treated in a given year will contain current and a certain component of the previous years' infestations that were not identified. Losses are calculated as follows:

- Total Infested Volume = Total Salvaged + Total Fall and Burn
- Unsalvaged Loss = Total Fall and Burn (current and previous years)

The small-scale salvage program in the Lakes forest district has not been active long enough to provide multiple years of data. Available data are shown in Table 14a.

6. Current Forest Management Assumptions

Table 14a. Mountain pine beetle salvage data

	1996	1997	Average
MPB Fall and Burn			
Proposed PAS	594 m ³	1224 m ³	909 m ³
Remaining District	1659 m ³	925 m ³	1292 m ³
Total w/ Pas	2253 m ³	2149 m ³	2201 m ³
MPB Small Scale Salvage			
Infested Wood Salvaged	14896 m ³	4400 m ³	Do not have as 1996 only part year data
Green Wood Harvested	45189 m ³	13200 m ³	(see above)
Total	60085 m ³	17600 m ³	(see above)

The MPB fall and burn operations represent unsalvaged losses. In recent years, the volume of MPB fall and burn has provided a fairly accurate representation of unsalvaged losses. The two years of data available (Table 14a) represent what is thought to be a near peak in the MPB cycle. For that reason, the following values will be used as estimates of unsalvaged losses to MPB over a longer period of time: 1800 m³/year lost for the base case (down from the averaged 2201m³), and 800 m³/year lost when proposed protected areas are removed from the timber harvesting land base (down from 1997 average 1292 m³).

Field staff indicate that all of the fall and burn activities for MPB in 1996 and 1997 occurred within the operable area.

Fire

Fire losses are average volume burned over the last ten years. Values from the previous TSR constitute the best available information:

9746 m³ total loss

6927 m³ salvaged volume

2819 m³ unsalvaged loss

6. Current Forest Management Assumptions

Blowdown (BD)

Losses are calculated as follows:

• Total BD			
Perimeter BD =	$1.8\text{m}^3/\text{ha}$ logged/yr x 5000ha/yr	=	9 000 m^3/yr
Road Right-of-way BD =	$10\text{m}^3/\text{km}$ road/yr x 150 km	=	1 500 m^3/yr
Catastrophic BD =	$2\,500\,000\text{ m}^3 \div 14$ years	=	17 857 m^3/yr
Total		=	28 357 m^3/yr
• Salvaged Losses			
Perimeter and Road RW BD		=	10 000 m^3/yr
• Unsalvaged Loss =	Total Blowdown — Salvaged Losses	=	18 357 m^3/yr

Blowdown notes:

- Blowdown salvaged each year is a mixture of wood that has blown down during a three-year period. Wood from a given year (e.g. 1995) is salvaged over three years (1995, 1996 and 1997).
- The estimated blowdown values indicate how much volume is blown down in a given year.
- Values indicating the total volume salvaged in a year (1-3 year old blowdown) can be used to estimate the total volume of a specific year's blowdown that is harvested over a three-year period.
- The unsalvaged loss is that portion of blowdown in a given year that is not salvaged in the following three years.
- The loss estimates for the past 3 years are considered to be higher than average. Short-term annual salvage volumes are expected to decrease as salvage efforts finish catching up to blowdown accumulated over 3 years. The estimate of long-term salvage was reduced to 10,000 m^3 per year, as discussed below.

A contract completed in 1994 provided estimates of blowdown per hectare logged, and per km of road right of way. The value for openings is $1.8\text{m}^3/\text{ha}$. The value for road right of ways is $15.61\text{m}^3/\text{km}$.

The estimate for blowdown on road right of ways was reduced from $15.61\text{m}^3/\text{km}$ to $10\text{m}^3/\text{km}$ based on:

- insufficient sample size in contract to include variability
- field staff (engineering) observed that roads chosen seemed to be particularly prone to blowdown (7 mile and Square Lake areas)
- Double counting may occur as blocks may be harvested directly adjacent to a road and the road becomes part of the block perimeter.

Where a block is harvested adjacent to a road, the blowdown on one side of the road is generally incorporated into the volume in the block and is therefore not an unsalvaged loss.

As there has not been any significant catastrophic event since the last TSR, the value 250000m^3 is divided by 14 instead of 10, making the unsalvaged catastrophic value 17 857 m^3/year .

Amounts salvaged were 6290 m^3 in 1996 (3 months only) and 12 764 m^3 in 1997. The volume for 1997 was unusually high because of salvaging of blowdown accumulated over 3 years. A figure of 10 000 m^3/yr is the best available estimate of the average amount salvaged per year over the long term.

6. Current Forest Management Assumptions

6.3 Silviculture

6.3.1 Regeneration activities in managed stands

Recent plantations and future stands will be grown on managed stand yield tables (MSYTs) produced using the B.C. Forest Service table interpolation program for stand yields (TIPSY) 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 and species combination) and then aggregated into one table.

The silviculture program reflects the mix of treatments expected to be carried out according to the Lakes TSA Plan. This level of activity assumes basic silviculture on all sites plus incremental silviculture on some sites. Table 15a shows the regeneration assumptions by analysis unit for future stands, existing operable not satisfactorily restocked (NSR) areas, and young plantations that have been managed for density.

Table 15a. Regeneration assumptions by analysis unit

Existing analysis unit	Regenerated analysis unit	Species	Regen delay (yrs)	OAFs ^a (%)		Regeneration method		Regenerated		Density
				1	2	Type	%	species	%	
1, 101	101	Fdi, BI	1	15	5	Plant	100	BI	50	2800
401	101	Fdi, BI	0	15	5	Plant	100	Fd	50	2800
2, 102	102/202/303	S	0	15	5	Plant	100	BI	50	2800
		converted to PI						PI	60	2800
								S	40	
3, 103, 403	103/203/303	S	0	15	5	Plant	100	PI	60	2800
		converted to PI						S	40	
4, 104, 404	104/204/304	S	0	15	5	Plant	100	PI	60	2800
		converted to PI						S	40	
5, 105	105/205/305	PI	0	20	5	Plant	100	PI	100	2800
6, 106	106/206/306	PI	0	20	5	Plant	100	PI	100	2800
7, 107	107/207/307	PI	0	20	5	Plant	100	PI	100	2800
8, 108	108/208/308	PI, S	0	20	5	Plant	100	PI	80	2800
								S	20	
9, 109	109/209/309	PI, S	0	20	5	Plant	100	PI	80	2800
								S	20	
10, 110	110/210/310	PI, S	0	20	5	Plant	100	PI	80	2800
								S	20	

(a) Operational adjustment factors (OAFs) are used to adjust timber yield estimates to account for operational factors. OAF1 is a constant percentage reduction to account for small unproductive areas within stands, uneven stem distribution and endemic losses that do not increase with age. OAF2 accounts for losses that increase with stand age, for example decay due to disease. In this case OAF2 increases from 0 at stand establishment and passes through 5% at 100 years of age.

6. Current Forest Management Assumptions

Data Source and Comments:

The species column in Table 15a refers to the leading species of the existing natural stand. Spruce-leading stands are currently being converted to pine-leading stands. According to the Lakes District Land and Resource Management Direction Report produced by the LRMP process, management should maintain species diversity in accordance with the *Biodiversity Guidebook*. This approach would prohibit the conversion of spruce analysis units to pine analysis units. A sensitivity analysis will examine the impact of this recommendation, by regenerating spruce analysis units to 60% spruce and 40% pine, instead of the specification in Table 15a for analysis units 102/202/302, 103/203/303 and 104/204/304.

Regeneration delay — current practice, in most situations, is to plant one-year-old stock one season after harvest. The zero regeneration delay indicated is a rounded average (district staff estimate the actual average to be 0.25 year).

Provincial average operational adjustment factors (OAFs) values are applied to the managed stand yield curves as recommended by the Ministry of Forests, Research Branch, as no local values are available. A study by the Regional Forest Pathologist shows that stem rusts (comandra blister rust, stalactiform blister rust and western gall rust) reduce yields in pure pine stands (i.e., greater than 80% pine) by 7%. PRFR staff believe, however, that OAF1 may be overestimated in pine analysis units, and this may partially offset the yield reduction caused by stem rusts. Therefore, the Regional Forest Pathologist recommended that OAF1 for pine analysis units be increased from 15% to 20% for stands with a pine component of at least 80% (105/205/305 to 110/210/310). Losses due to stem rusts are negligible in stands with a pine component of 60%, so OAF1 will not be adjusted from the provincial average for analysis units 102/202/302 to 104/204/304. The concern about overestimated OAF1 will be addressed as part of the sensitivity analysis for volume estimates for regenerated stands.

No thinning is expected based on the initial density values. The density of 2800 stems/ha is based on the results of local field surveys. It accounts for planting density of 1400 to 1600 plus ingress which is controlled to an average of 2800 stems/ha.

All values in Table 15a are based on current performance as estimated by the Lakes Forest District staff.

Analysis units 205-210 and 305-310 correspond to analysis units 105-110, but are used for site index adjustments that apply in some areas (Table 15b). Regeneration assumptions for analysis units 205-210 and 305-310 are the same as for the corresponding analysis units 105-110. Areas in analysis units 101-110, 205-210 and 305-310 will remain in the same analysis unit upon regeneration. Site indices for secondary species will be converted from the site index of the primary species using SITETOOLS, a computer program developed by the Ministry of Forests, Research Branch.

The area-weighted mean site index for each existing natural stand analysis unit (i.e., 1-10) will be used to generate timber yield tables for the corresponding regenerated analysis unit (i.e., 101-110). In areas where site index adjustments are available, existing pine analysis units 5-10 (see discussion below), they will be regenerated to corresponding analysis units 205-210 (sub-boreal spruce (SBS) mc2 biogeoclimatic unit) or to analysis units 305-310 (SBS dk biogeoclimatic unit). Where existing pine analysis units are not subject to a site index adjustment, they will be regenerated to the corresponding 105-110 analysis units. Table 15b shows the site indices used to generate timber yield tables for regenerated analysis units.

6. Current Forest Management Assumptions

Table 15b. Site index for regenerated analysis units

Analysis Unit	Species	Biogeoclimatic variant	Location	Site Index (m@50yrs)
101	F, B	all	Everywhere	11.8
102	PI 60% S 40%	all	Within special management areas	20.1
103	PI 60% S 40%	all	Within special management areas	15.7
104	PI 60% S 40%	all	Within special management areas	11.1
105	PI	all	Within special management areas	19.2
106	PI	all	Within special management areas	14.9
107	PI	all	Within special management areas	11.5
108	PI with F/S	all	Within special management areas	19.2
109	PI with F/S	all	Within special management areas	15.0
110	PI with F/S	all	Within special management areas	11.6
202	PI 60% S 40%	SBS mc2	Outside special management areas	20.0
203	PI 60% S 40%	SBS mc2	Outside special management areas	20.0
204	PI 60% S 40%	SBS mc2	Outside special management areas	20.0
205	PI	SBS mc2	Outside special management areas	20.0
206	PI	SBS mc2	Outside special management areas	20.0
207	PI	SBS mc2	Outside special management areas	20.0
208	PI with F/S	SBS mc2	Outside special management areas	20.0
209	PI with F/S	SBS mc2	Outside special management areas	20.0
210	PI with F/S	SBS mc2	Outside special management areas	20.0
302	PI 60% S 40%	SBS dk	Outside special management areas	22.2
303	PI 60% S 40%	SBS dk	Outside special management areas	20.4
304	PI 60% S 40%	SBS dk	Outside special management areas	18.6
305	PI	SBS dk	Outside special management areas	21.8
306	PI	SBS dk	Outside special management areas	20.1
307	PI	SBS dk	Outside special management areas	18.8
308	PI with F/S	SBS dk	Outside special management areas	21.8
309	PI with F/S	SBS dk	Outside special management areas	20.1
310	PI with F/S	SBS dk	Outside special management areas	18.8

Note: The site indexes shown for analysis units 101-110 have received no adjustments

6. Current Forest Management Assumptions

As discussed in the chief forester's 1996 AAC rationale report, a paired-plot study undertaken in the Lakes TSA has provided scientifically derived, statistically reliable estimates of site productivity for this TSA, confirming the site index underestimation for managed lodgepole pine stands in this area. The results of this study — *The Effects of Stocking on Estimated Site index in the Morice, Lakes and Vanderhoof Timber Supply Areas in Central British Columbia* by James W. Goudy, 1996 — were used to adjust the area-weighted mean site index for regenerated pine analysis units within the SBS biogeoclimatic subzone. However, site index was not adjusted within the following special management areas: very high value components of the Caribou Migration Corridor, Backcountry Lakes, Stronglinks and Retention VQOs. These areas have restrictive forest cover requirements and regenerated stands are not expected to achieve the paired-plot site index. Site index adjustments use the following equations:

$$\text{SBS mc2: } \text{MSI} = \text{NSI} + 20.157 - 1.007 * \text{NSI} = 20.157 - 0.007 * \text{NSI}$$

$$\text{SBS dk: } \text{MSI} = \text{NSI} + 14.243 - 0.606 * \text{NSI} = 14.243 + 0.394 * \text{NSI}$$

where: MSI is managed stand site index
 NSI is natural stand site index

The site index adjustments will be applied to both the pine and spruce components of the regenerated analysis units for deriving timber yield tables.

Tables 15a and 15b show the complete range of analysis units that occur as a result of the various regeneration activities in the Lakes TSA. However, regenerated analysis units 205, 206 and 207 have the same site index and species composition, so they will be collapsed into one analysis unit (205) in the timber supply model. Similarly, analysis units 208, 209, and 210 will be collapsed into analysis unit 208. Additional groupings of analysis units may occur where they have similar yield curves.

6.3.2 Immature plantation history

This section identifies areas of existing immature forest where the density (stems per hectare) has been controlled justifying assignment of these stands to managed stand yield tables (MSYTs).

Table 16. Immature plantation history

Analysis Unit	Area Managed (%)			
	Age 1 - 10	Age 11 - 20	Age 21 - 30	Age 31 - 40
All AUs	100%	100%	100%	100%

Data Source and Comments

Stands younger than 41 years are considered to be managed and are assigned to analysis units 101-110. Any young pine stands considered to be managed may be assigned to analysis units 205-210 or 305-310 if a site index adjustment is warranted, as previously described in section 6.3.1 “Regeneration activities in managed stands”.

6. Current Forest Management Assumptions

6.3.3 Not satisfactorily restocked (NSR) areas

Land classified in the Lakes 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 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 (from regional/district silviculture records and 5-year plans) 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

Analysis Unit	Inventory NSR (ha)	Total NSR after deducting NCC ^a (ha)	Current NSR (silvic. file – includes backlog) (ha)	NSR restocking (ha restocked, years from now)		
				restocked	1 – 10 yrs	11 – 20 yrs
101	426	366	326	40	286	—
103	1,899	1,633	1,450	183	1,267	—
106	5,944	5,112	4,537	575	3,962	—
109	4,651	4,000	3,551	449	3,102	—
TOTAL	12,920	11,111	9,864	1,247	8,617	—

(a) NCC – non-commercial cover

Data Source and Comments:

- Total inventory NSR is distributed to AUs using the silviculture file proportions.
- Current NSR is defined as areas not planted by the end of the 1997 planting season.
- Total current NSR includes 606 ha of backlog.
- The total current NSR includes all harvesting that occurred during the 1996 cut control year. During that year harvests were higher than normal.
- Most 1996 blocks have been planted but are not surveyed.
- Lakes District staff believe that approximately 14% of the NSR is actually non-productive brush which is misclassified. This is reflected in Table 17 (NCC column).
- Hectares of NSR restocked equals inventory NSR after accounting for non-productive brush minus current NSR from the silviculture file.
- NSR area to be restocked will be assigned to regenerated analysis units 101-110 having medium productivity (e.g., spruce NSR will be regenerated to analysis unit 103). Where pine NSR is located in an area subject to a site index adjustment, it will be assigned to the corresponding analysis unit 206/306 or 209/309. Table 17 represents all NSR in the Lakes TSA, both within and outside the timber harvesting land base. It is assumed that all NSR area will be restocked regardless of whether it is inside or outside of the timber harvesting land base, but only area inside the timber harvesting land base will be available for future harvesting.

6. Current Forest Management Assumptions

6.4 Integrated resource management

6.4.1 Objectives that require forest cover requirements — base case

As noted in Section 4.1, "Management zones and tracking of multiple objectives (grouping)," forest cover requirements may be applied to a number of different types of areas including landscape units, wildlife habitat, or visual quality areas. 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 help to achieve forest cover requirements (i.e., maximum allowable disturbance or minimum area retention).

Table 18a. Forest cover requirements — base case

Resource emphasis	Maximum allowable disturbance (% area)	Green-up height/ age	Minimum retained area (%)	Minimum age for retention (yrs)	Land base to which constraints apply
VQOs					
— Significant visual retention	3.4	5 m/28 yrs			Crown forested area for all VQOs
— Significant visual partial retention	12.6	4 m/22 yrs			
Caribou migration corridor — very high value	2	20 yrs			THLB
Caribou migration corridor — high value	12.5	20 yrs			THLB
Caribou migration corridor — moderate value	40	40 yrs	16 11	81 141	THLB Crown forested area Crown Forested area
High value winter range — Moose & Deer (thermal & forage)	33	3 m/17 yrs	30	101	THLB Crown forested area
— Deer (very high)	25	5 m/27 yrs	50	101	THLB Crown forested area Crown forested area
Backcountry lakes	5	5 m/29 yrs			
Grizzly areas	33	5 m/28 yrs	50	121	THLB Crown forested area
Integrated resource management	33	3 m/17 yrs			THLB

Data Source and Comments:

District staff have reviewed the above requirements and consider them to represent current practice. These requirements will be applied to each resource emphasis group within each landscape unit with the following exception: only 6 ha of the moderate value caribou migration corridor occurs outside of the Chelaslie landscape unit, so these requirements will be applied to the aggregate area, not by landscape unit.

6. Current Forest Management Assumptions

There is some overlap between caribou habitat and moose/deer habitat. Wherever this occurs, the requirements of caribou will apply; i.e., moose/deer requirements will only be applied outside of caribou habitat areas.

Under “Landbase to which constraints apply”, Crown forested refers to all Crown land, including ownerships 61N (UREP-use, recreation and enjoyment of the public), 62N (timber agreement land), 62C (provincial forest), 63N (provincial park), and 69C/N (miscellaneous reserves).

The average time required for stands to reach green-up height was estimated by the following method:

- determine the regenerated analysis unit for all existing stands
- estimate the green-up age for each regenerated analysis unit using SITETOOLS
- calculate the area-weighted mean of the green-up age for each resource emphasis group.

Green-up ages do not include regeneration delay, which is accounted for separately within the timber supply model.

Visual quality — District objectives for visual quality have been communicated to Major Licensees and SBFEP. Review of current development plans is conducted consistent with the existing inventory and established or recommended visual quality and green-up objectives. Green-up heights were derived using the Lakes District Visual Landscape Management Strategy and are based on an average district slope of 25%. The maximum allowable disturbance values for VQOs are listed in Tables 18a and 18c.

Table 18b. Calculation of maximum allowable disturbance in VQOs

VQO	Low VAC ^a		Medium VAC		High VAC		Maximum allowable disturbance (%)
	% area	% disturb	% area	% disturb	% area	% disturb	
Significant ^b visual retention	40.4	2.0	28.0	3.5	31.6	5.0	3.4
Visual retention	82.2	2.0	15.4	3.5	2.4	5.0	2.3
Significant visual partial retention	21.1	10.0	55.1	12.5	23.8	15.0	12.6
Visual partial retention	77.0	10.0	16.9	12.5	6.1	15.0	10.7

(a) VAC – visual absorption capacity

(b) “Significant” visual quality objectives have been approved by the forest district manager and represent current management, while others not labeled as significant have been recommended by the LRMP table

The maximum allowable disturbance value will be applied to the entire forested landbase, so no adjustment is required for the green:operable ratio. No adjustment is required for dispersion of operable and non-operable forest because Visual Absorption Capacity (VAC) accounts for dispersion.

6. Current Forest Management Assumptions

Caribou migration corridor — These requirements reflect current practice as documented in the Chief Forester's 1996 AAC rationale for the Lakes TSA (page 31). The forest cover requirement for the very high value caribou migration corridor is to allow for mountain pine beetle salvage.

Backcountry lakes — identified as requiring special consideration in the 1993 Interim IRM Strategies and Harvesting Guidelines for the Lakes Forest District (IIRMS). Backcountry lake boundaries and objectives for a non-roaded backcountry experience are reflected in current development plans. As in TSR1, a forest cover requirement that meets a retention VQO will be applied to these areas. There are no current or planned harvesting activities in these areas. It is expected that some harvesting activities would potentially occur in these areas to deal with forest health issues.

Moose and deer winter range — Current practices are guided by requirements to maintain adequate hiding cover, thermal cover and forage (no significant change from TSR I)

Very high value deer winter range — Current practices are guided by requirements to maintain adequate hiding cover, thermal cover and forage.

Grizzly areas — The importance of the Klaytunkut and Sutherland valleys to grizzly bear was first recognized in the Klaytunkut and Sutherland LRUPs developed between 1988 and 1990. Development plan review considerations relate to controlling access and retaining sufficient old forest adjacent to valley feeding areas.

IRM — Over the past 3 years harvesting plans within the TSA have changed somewhat to reflect biodiversity concerns, specifically fragmentation. MOF and BC Environment staff believe that continued fragmentation over the landscape could result in loss of existing interior stand conditions, and threaten their future maintenance, which could prove detrimental to overall landscape-level biodiversity. Consequently, tenure holders have been encouraged to plan larger blocks and amalgamate existing fragmented patches by harvesting within the unharvested (2nd and 3rd pass) areas. Green-up requirements have been waived in these situations where appropriate. The timber supply impacts of approving larger block sizes will be tested by increasing the maximum allowable non-greened up area from 33% to 40% in the IRM zone

6. Current Forest Management Assumptions

6.4.2 Objectives that require forest cover requirements — Lakes LRMP

Table 18c. Forest cover requirements — LRMP sensitivity analysis

Resource emphasis	Maximum allowable disturbance (% area)	Green-up Height/Age	Minimum retained area (%)	Minimum age for retention (yrs)	Land base to which constraints apply
VQOs					
— Significant visual retention	3.4	5 m /28 yrs			Crown forested area for all VQOs
— Visual retention	2.3	4 m /23 yrs			
— Significant visual partial retention	12.6	4 m /22 yrs			
— Visual partial retention	10.7	3 m /18 yrs			
Caribou migration corridor — very high value	2	5m / 29 yrs			THLB
Caribou migration corridor — very high and high value	25	40 years	40 60	141 81	Crown forested area Crown forested area Crown forested area
Caribou migration corridor — moderate value	32	40 years	30 45	141 81	Crown forested area Crown forested area Crown forested area
Caribou migration corridor — low	33 54	3m /17 yrs 40 years	20 30	141 81	THLB Crown forested area Crown forested area Crown forested area
Recreation areas	7.5	5m /27 yrs			Crown forested area
Backcountry lakes	2	7m /38 yrs			Crown forested area
Landscape-level biodiversity	Forest cover requirements for all seral stages (i.e., old, old+mature, early) are to be applied as recommended in the <i>Biodiversity Guidebook</i> .				Crown forested area

Data Source and Comments:

The forest cover requirements listed in Table 18c are contained in or interpreted from the Lakes District Land and Resource Management Direction Report produced by the LRMP process. They will replace the corresponding base case requirements listed in Table 18a for a sensitivity analysis, and will be applied to each resource emphasis group within each landscape unit, with the following exception: only 6 ha of the moderate value caribou migration corridor occurs outside of the Chelaslie landscape unit, so these requirements will be applied to the aggregate area, not by landscape unit.

For the LRMP analysis, the IRM zone excludes areas managed for recreation objectives, and the increased area managed for caribou migration corridor objectives.

6. Current Forest Management Assumptions

There is an overlap between one backcountry lake and one recreation area. Since the forest cover requirements for backcountry lakes are more restrictive than for recreation areas, only the requirements for backcountry lakes will apply to the overlap.

Green-up requirements that only specify an age indicate a desired seral stage distribution, not a green-up requirement for adjacency.

Requirements for landscape level biodiversity will be applied to each biogeoclimatic variant within a landscape unit, using the recommended biodiversity emphasis option (BEO) for the landscape unit. The LRMP recommendations on landscape-level biodiversity preceded the current policy on implementing these requirements, so the LRMP addresses all seral stages and does not contemplate a phase-in of the old-seral requirements in landscape units with a low BEO.

6.4.3 Forest cover requirements for landscape-level biodiversity

Old seral forest cover requirements are specified by biogeoclimatic variant within each landscape unit. Landscape units have not yet been formally established. Draft landscape units will be used for this analysis to represent application and evaluation of biodiversity objectives in a balanced fashion across the TSA. An average old seral requirement will be used assuming a distribution of high, medium, and low biodiversity emphasis options (BEO) of 10:45:45 for each landscape unit. It is further assumed that the old seral requirement of a low BEO will be phased in over 140 years. The old seral requirements by biogeoclimatic variant are listed in Table 18d.

Table 18d. Old seral requirements by biogeoclimatic variant.

Biogeo-climatic variant	Natural disturbance type	Old seral requirement (%)			Age (yrs)	Land base to which constraints apply
		starting in year				
		1	70	140		
ESSF mc ESSF mv1 ESSF mv2 ESSF mv3	2	6.9%	8.8%	10.8%	> 250	Crown forested area
SBPS mc	3	5.2%	6.2%	7.3%	> 140	Crown forested area
SBS dk SBS dw3 SBS mc2 SBS mc3 SBS wk3	3	8.2%	9.8%	11.5%	> 140	Crown forested area

The percentages in Table 18d are calculated as follows:

Year 1: low % *0.333*0.45 + medium % * 0.45 + high % *0.10
Year 70: low % *0.667*0.45 + medium % * 0.45 + high % *0.10
Year 140: low % *0.45 + medium % * 0.45 + high % *0.10

where low %, medium % and high % are the old seral requirements for low, medium and high BEOs contained in the Forest Practices Code *Biodiversity Guidebook*.

6. Current Forest Management Assumptions

Although current policy is not to apply the mature plus old-seral requirement, a sensitivity analysis will examine its impact on timber supply. An average mature+old seral requirement will be applied by biogeoclimatic variant within each landscape unit. This will be calculated in the same manner as the old seral requirement, except that the entire requirement will apply beginning immediately. The mature+old requirements are shown in Table 18e.

Table 18e. Mature+old seral requirements by biogeoclimatic variant.

Biogeoclimatic variant	Natural disturbance type	Mature+old seral requirement (%) (starting in year 1)	Age (yrs)	Land base to which constraints apply
ESSF mc ESSF mv1 ESSF mv2 ESSF mv3	2	23.1%	> 120	Crown forested area
SBPS mc	3	13.8%	> 100	Crown forested area
SBS dk SBS dw3 SBS mc2 SBS mc3 SBS wk3	3	18.7%	> 100	Crown forested area

For a sensitivity analysis, the old and mature+old seral requirements recommended in the *Biodiversity Guidebook* for the draft BEOs outlined in Table 18f, will be applied instead of an average BEO for each landscape unit.

Table 18f. Draft biodiversity emphasis options by draft landscape unit

Landscape unit	Biodiversity emphasis option
Babine East	Intermediate
Babine West	Low
Bulkley	Intermediate
Burns Lake East	Low
Burns Lake West	Low
Chelaslie	High
Cheslatta	Intermediate
Fleming	Intermediate
Francois East	Low
Francois West	Intermediate
Intata	Intermediate
Ootsa	Intermediate
Taltapin	Low
Tetachuk Entiako	High

6. Current Forest Management Assumptions

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

The *Biodiversity Guidebook* describes two methods for maintaining stand structure over time: wildlife trees and wildlife tree patches. Under different silvicultural systems the planned persistence of WTs and WTPs may vary; for example, in partial cutting systems, the trees that are retained may be planned for harvest at later date. Therefore, in estimating the effects of WTs and WTPs, consideration should be given to whether the trees will ever be harvested. In addition, the contribution of riparian management zones to WT and WTP requirements should be considered. Table 19 summarizes how WTs and WTPs will be represented in the analysis.

Table 19. Volume reductions to reflect retention of wildlife tree patches in cutblocks

Management zone	Analysis unit	Persistence	Per cent (%) recommended in applicable guidebook	Residual area estimate on the timber harvesting land base (%)
IRM	All	Long term	6	2

Data source and comments:

WTP requirements were assessed for all landscape units and BEC subzones in 1997. This analysis revealed that based on *Biodiversity Guidebook* criteria (table 20(a) page 65 of the guidebook), the district average WTP requirement (where landscape units have been established) is 6.01%.

Forest district staff estimate that about two-thirds of WTPs will be accounted for from forest outside the timber harvesting land base (e.g., riparian management zone, inoperable forest, etc.). The remaining one-third of WTPs will be treated as a reduction to timber yield curves. The area of WTPs will not contribute to old seral requirements because less than 8% of all WTPs have been assessed to be larger than two hectares. The WTP reduction will be located in the integrated resource management (IRM) zone only, as forest district staff feel that only these areas will require some specific management actions to retain stand structure. The reduction to timber yields will be accomplished by creating two yield curves for each analysis unit — one for the IRM zone and one for all other zones — and applying the reduction only to the curves for the IRM zone. It is assumed that wildlife tree patches will not be economical to harvest at a later date, nor will they be available for harvest during subsequent harvesting of the stand.

7. Sensitivity Analyses to be Performed

Sensitivity analysis can provide a measure of the timber supply impact of uncertainties in management assumptions and/or data. Sensitivity analysis may indicate that a small reduction in some attributes (e.g., minimum harvestable ages or green-up ages) may alleviate anticipated harvest level reductions in the future, while timber supply may prove insensitive to changes in other factors. By developing and performing a number of sensitivity analyses, it is possible to determine which variables most affect results. The following table lists sensitivity analyses that are planned for this timber supply analysis.

Table 20. Sensitivity analysis issues

Issue to be Tested	Sensitivity Levels
Minimum harvestable age	± 10 years
Existing stand yields	± 10%
Very old (>250 yrs) stand yields	flat-line yield curves after age 250
Regenerated stand yields	± 20%
Site index estimate for older stands	± 20%, but only -20% on paired plot results <ul style="list-style-type: none"> • green-up • minimum harvestable age • volume
Site index estimates for older spruce	use results of provincial OGSi project
Age when forest achieves “old” forest characteristics	± 20 years
Land base changes	± 10%
Visual quality objectives	± 5% on area not greened up ± 20% on green-up period
Harvest flow	various alternatives to base case
Adjacency and green-up guidelines	± 5% on area not greened up ± 20% on green-up period
Problem forest type — low height pine	17.5 m @ 200 years (threshold is 140 years in base case)
Amalgamation of harvest blocks to decrease fragmentation	maximum non-greened up area of 40% in IRM zone
Conversion of spruced stands to pine/spruce mix (60% PI, 40% S)	maintain spruce as dominant (60% S, 40% PI)

continued

7. Sensitivity Analyses to be Performed

Table 20. Sensitivity analysis issues (concluded)

Issue to be Tested	Sensitivity Levels
LRMP	proposed protected areas zones and management guidelines (Table 18c)
Landscape level biodiversity — old seral requirements	no drawdown in low BEO (using average BEO)
Landscape level biodiversity — mature+old seral requirements	test requirements using average BEO <ul style="list-style-type: none"> • NDT 3 only • NDT 2 and 3
Landscape level biodiversity — draft biodiversity emphasis options	test draft BEOs <ul style="list-style-type: none"> • old (with drawdown in low BEO) • mature+old in NDT 3 and old (with drawdown in low BEO)

Data source and comments:

Table 20 shows the analyses that are intended at this time. If additional issues become apparent or preliminary analysis results suggest the need, changes to these analyses relative to those proposed in Table 20 may be made.