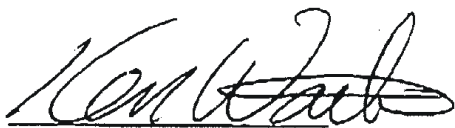


Lillooet Timber Supply Area Timber Supply Review

Data Package

June 1999



District Manager
Lillooet 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 Lillooet 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 to model the specified management practices;
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 that highlights 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 terms of reference. Section 7, "Sensitivity Analyses," outlines areas of uncertainty with respect to data and assumptions, and outlines intended sensitivity analyses.

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. If there are important uncertainties in defining current management, sensitivity analysis may assist in assessing the potential timber supply implications, and assigning degrees of risk to timber supply during allowable annual cut determination.

Table 1. Major forest management considerations

Consideration/issue	Description
Visual quality objectives (VQO)	Visually sensitive areas with objectives of retention, partial retention and modification visual quality along three highway corridors as well as "scenic" areas managed to similar standards. See Section 6.4.1, "Objectives managed with forest cover requirements."
Community watersheds	Community watersheds as defined in the <i>Forest Practices Code Act</i> and mapped by the Ministry of Environment, Lands and Parks (MELP), Water Management Branch. See Section 6.4.1, "Objectives managed with forest cover requirements."
Stand-level biodiversity	Forest practices code (FPC) requirements for retaining wildlife trees and wildlife tree patches. See Section 6.4.2, "Wildlife trees (WT) and tree patches (WTP)."
Landscape-level biodiversity	Forest practices code requirements. Until landscape unit planning is completed, biodiversity impacts will have to be estimated by applying average forest cover requirements to draft landscape units. See Section 6.4.1, "Objectives managed with forest cover requirements."
Riparian requirements	Forest practices code requirements. See Section 5.2.9, "Riparian reserve and management zones."
Critical deer winter range	Critical mule deer winter range as defined by MELP. See Section 6.4.1 "Objectives managed with forest cover requirements."

3. Inventories

3.1 Background information

The inventories that will be used to determine the timber harvesting land base and represent forest management activities are listed in Tables 2 and 3.

Table 2. Forest cover inventory (FC1) information

	Mapsheets / letter block	Year of re-inventory	Re-inventory photo year	Updated to ^a	Projection date
92J:	038, 048, 058	1997	1993	1996	1997
92I:	041, 042, 051, 052	1990	1993	1996	1997
92J:	039, 049, 050, 059, 060, 068, 070, 079, 080				
92I:	002, 003, 011-014, 022-024, 032-034, 043, 053, 054, 061, 071, 072, 081, 082, 091, 092	1989	1993	1996	1997
92J:	029, 067, 077, 078, 087-090, 097-100				
92O:	007-010, 017, 019, 020, 029				
92P:	001				
92J:	056, 065, 066 075, 076, 085, 086, 095, 096	1988	1993	1996	1997
92O:	005, 006, 015, 016				
92I:	063	1992	1993	1992	1997
92J:	069	1990	1993	1990	1997
92I:	001, 021, 031, 044, 062	1989	1993	1989	1997
92J:	019, 020, 030, 040				
92O:	018, 028, 030				
92J:	055, 074, 083, 084, 093, 094	1988	1993	1988	1997
92J:	010, 057, 064, 072, 073, 082, 092	1977	1993	1977	1997
92O:	004, 025				
92P:	011				

(a) The mapsheets are updated to the specified year for depletion.

3. Inventories

Data source and comments:

(Table 2)

All Lillooet Forest District mapsheets have been converted from North American Datum (NAD) 27 to NAD 83 via monorestitution data capture using 1987 re-inventory document photos and 1993 update photos.

Mapsheets 92J 038, 92J 048 and 92J 058 were re-inventoried for the Lillooet side of these shared re-inventory projects using 1993 photography accompanied by an update completed at the end of 1996. Mapsheets indicating year of re-inventory and update years of 1977 are inactive partial mapsheets.

Table 3. Non-corporate inventory information

Data	Source	Date created	Update	Scale
Features inventory	Ministry of Forests (MoF)	1994	1994	1:50 000
Visual inventory	MoF	1994	1998	1:50 000
Operability	MoF	1995	1998	1:15 000
Biogeoclimatic ecosystem classifications (BEC)	MoF, Research Branch	1995	1995	1:100 000
Streams and lakes	MELP(TRIM)	1987	1987	1:40 000
Roads	MoF	1993	1997	1:20 000
Community watersheds	MELP, Water Management Branch	1996	1997	1:20 000
Ownership	MoF	1988	1988	1:50 000
Visual quality objectives (VQOs)	MoF	1994	1998	1:20 000
Terrain hazard classification	MoF/FRBC	1997/98	1998	1:20 000
Ungulate winter range	MELP	1997	1997	1:20 000
Draft landscape units	MELP/MoF	1996	1996	1:50 000
Riparian reserves and management areas	MoF	1998	1998	1:20 000
Woodlots	MoF	1988	1996	1:15 000
Protected areas — approved study areas	MoF/MELP	1996	1996	1:30 000
Protected areas	MoF	1995	1996	1:20 000
Stein Park	MoF	1995	1995	1:100 000

4. Division of the Area Into Management Zones

4.1 Management zones and tracking of multiple objectives (grouping)

Management zones represent areas with distinct management emphasis. For example, a zone may be based on a harvesting system, silviculture system, visual quality objective or wildlife consideration. Sometimes one area of forest is subject to more than one management objective. In the simulation model, groups can be used to represent and track different combinations of areas, and thereby allow application of overlapping management objectives. In addition, the role of forest land that is unavailable for timber harvesting will be considered when evaluating forest cover objectives. The timber supply analyst will decide whether to put an objective into a group or a mutually exclusive management zone after data assessment.

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

Table 4. Groupings

Field	Values	Contents
Landscape units	1-18	There are 18 landscape units, biodiversity-emphasis option (BEO) recommendations from the LRMP table have not yet been made.
Biogeoclimatic ecosystem classification (BEC) variants / natural disturbance types (NDT)	1-19	Each BEC variant will have its own numeric identifier. These variants can also be classed into natural disturbance types (NDT).
Community watersheds	1-21	Each community watershed will have its own numeric identifier.
Visual quality objectives (VQO)	1-4	Each VQO — preservation, retention, partial retention, modification — will have its own numeric identifier.
Standard management	1	Areas not subject to specific non-timber management objectives.
Deer winter range	1	Critical deer winter range.

Data source and comments:

Table 3 lists the source inventories for these management groupings.

4. Division of the Area Into Management Zones

4.2 Analysis units

An analysis unit represents a combination of stands managed using a specific silviculture regime, or dominated by specified tree species with a specified timber growing capability as indicated by the inventory type group and site index in the forest inventory file. Each analysis unit is assigned separate timber volume projections (yield tables) for existing and future stands. The following table identifies draft analysis units. After determining the timber harvesting land base, the timber supply analyst will determine the final analysis unit definitions.

Table 5. Definition of analysis units

Analysis unit (leading species)		Criteria				
		Inventory type groups	Biogeoclimatic unit	Site class (old)	Site index range ^a	Age (years)
1	Spruce/balsam /cedar/hemlock	9-27	All	Good/ medium	≥ 15.0	< 140
2	Spruce/balsam /cedar/hemlock	9-27	All	Good/ medium	≥ 15.0	≥ 141
3	Spruce/balsam /cedar/hemlock	9-27	All	Poor	< 15.0	< 140
4	Spruce/balsam /cedar/hemlock	9-27	All	Poor	< 15.0	≥ 141
5	Lodgepole pine	28-31	All	Good/ medium	≥ 16.0	< 140
6	Lodgepole pine	28-31	All	Good/ medium	≥ 16.0	≥ 141
7	Lodgepole pine	28-31	All	Poor	< 16.0	< 140
8	Lodgepole pine	28-31	All	Poor	< 16.0	≥ 141
9	Douglas-fir (wet-belt)	1-8	All except for IDFxh, IDFdk2b, PP, BG	Good / medium	≥ 17.0	< 140
10	Douglas-fir (wet-belt)	1-8	All except for IDFxh, IDFdk2b, PP, BG	Good / medium	≥ 17.0	≥ 141
11	Douglas-fir (wet-belt)	1-8	All except for IDFxh, IDFdk2b, PP, BG	Poor	< 17.0	< 140
12	Douglas-fir (wet-belt)	1-8	All except for IDFxh, IDFdk2b, PP, BG	Poor	< 17.0	≥ 141
13	Douglas-fir (dry-belt)	1-8; 32	IDFxh, IDFdk2b, PP, BG	All	All	All

(a) Site index reference age is 50 years.

5. Timber Harvesting Land Base Definition

5.1 Identification of the timber harvesting land base

The timber harvesting land base for the Lillooet TSA will be determined by separating out several categories of land that 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 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 "unavailable for timber harvesting" is applied 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 area will be subject to stringent constraints. Any such constraints will be reflected in the analysis.

The area remaining after identifying all areas that do not contribute to timber supply, and adding any suitable areas is defined as the "current timber harvesting land base" for the Lillooet TSA.

5.2 Details on land base classification

5.2.1 Ownerships contributing to timber supply and biodiversity seral-stage requirements

Ownership codes are generally used to identify whether the land will contribute to timber supply. Ownership codes 61, 62, 69 and 90 indicate Crown land in use, recreation and enjoyment of public (UREP) areas, forest management units, miscellaneous reserves and grazing leases respectively. All areas with other ownership codes will be excluded from the land base considered available for timber supply. This includes areas under woodlot licences as their allowable annual cuts (AAC) are determined independently of the timber supply review process.

Additional ownerships which will contribute towards biodiversity / seral-stage requirements but not the timber harvesting land base are ownership codes 51 (national parks), 60 (ecological reserves), and 63-68 (provincial parks).

5.2.2 Land classified as non-forest

Areas classified as inventory type identity 6 (non-productive land), such as alpine, lakes, rocks, and swamp, and type identity 8 (no typing available) will be excluded from the land base considered for timber supply. Type identity 8 area may be included in the land base contributing to biodiversity requirements if any is found to be forested.

5. Timber Harvesting Land Base Definition

5.2.3 Non-commercial cover

Type identity 5 represents areas currently 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.

5.2.4 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 as environmentally sensitive areas (ESAs). The ESA system uses the following classification: soil (Es), forest regeneration problems (Ep), snow avalanche (Ea), recreation (Er), water (Eh) and wildlife (Ew). Two ESA categories are recognized: high (ESA1) and moderately sensitive (ESA2).

Environmental sensitivity may result in a reduction in the harvesting opportunity on these sites. Two strategies for accounting for this are: per cent area reductions, and evaluation of individual ESA polygons for harvesting opportunity. The following table provides percentage area reductions that represent the portion of ESAs where harvesting will not likely occur.

Table 6. Description of environmentally sensitive areas

ESA category	ESA description	Reduction per cent (%)
Es1	Soils — high	90
Er1	Recreation — high	100
Ea1	Avalanche — high	100
Ew1 and 2	Wildlife	0
Es2	Soils — moderate	0
Er2	Recreation	0
Ep1 and 2	Regeneration high/moderate	0
Eh2 and Ef2	Water/fisheries — moderate	0

Data source and comments:

Where Terrain Stability Mapping (TSM) is available (approximately 35% of the TSA), it will be used in place of Es1. Terrain Class V will be 100% netted out, with all other classes remaining in. TSM is an ongoing project; as information becomes available it will be incorporated if possible.

All moderately sensitive areas (ESA2) are fully included in the timber harvesting land base. To facilitate mapping of the forest land base, attempts were made to provide information on site specific availability (that is, either available or unavailable) rather than using partial deductions, where possible. During site specific operational planning, small portions of some ESA2s are likely to be excluded from timber harvesting. It is also likely that minor portions of some ESA1s may be available for harvesting, which offsets the inclusion of all ESA2s. On balance, the approach outlined in Table 6 reflects practices in the Lillooet TSA, while allowing clearer mapping of the timber harvesting land base.

5. Timber Harvesting Land Base Definition

It is assumed that fisheries and water values are adequately protected by the riparian reserves and riparian management areas required by the Forest Practices Code (FPC).

Areas previously believed to have forest regeneration problems are now being regenerated adequately and will not be deducted from the productive forest land base.

Wildlife habitat requirements for deer will be modelled using forest cover requirements rather than exclusions (see Section 6.4.1, "Objectives managed with 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.

5.2.5 Areas considered inoperable

Operability and inoperability codes are generally used to indicate the presence or absence of physical barriers or limitations to harvesting, appropriate logging methods (e.g. cable), and the merchantability of stands.

Table 7. Description of inoperable areas

Inventory description	Operability code	Reduction per cent (%)
Inoperable areas	I	100

Data source and comments:

Operability lines for the Lillooet TSA were delineated by the MoF, in consultation with licensees, as part of the last inventory update.

5.2.6 Forest types not currently being harvested

Problem forest types are stands that are physically operable, but are not currently utilized or have marginal merchantability. These types are wholly excluded from the timber harvesting land base.

5. Timber Harvesting Land Base Definition

Table 8. Forest types not currently being harvested

Species	Characteristics	Per cent (%) excluded
Deciduous	All deciduous-leading stands.	100
Pine (PI)	Mature and immature stands with a site index less than or equal to 9.6 m @ 50 years.	100
Douglas-fir	Mature and immature stands with a site index less than 8.6 m @ 50 years.	100
Balsam, spruce, cedar, hemlock	Mature and immature stands with a site index less than 7.5 m @ 50 years.	100
All coniferous species except fir	Stands classified with residual stocking class.	100
Douglas-fir	Age class 6+ (> 100 years), height class 1 (< 10.5 m).	100
Douglas-fir	Age class 5+ (> 80 years), height < 18.0 m., crown closure class 2 (16-25%).	100
Balsam, spruce, cedar, hemlock	Age class 6+, height class 1.	100
Cedar, hemlock	Age class 6+, height class 2 (10.5-19.4 m).	100
Whitebark pine	Age class 6+, height < 14.0 m.	100
Lodgepole pine	Age class 5+, height < 14.0 m., stocking class 4.	100
Lodgepole pine	Age class 5+, height < 14.0 m., crown closure class < 5 (46-55%), stocking class other than 4.	100
Ponderosa pine	Age class 5+, crown closure class < 5.	100

Data source and comments:

Site index thresholds were based on historical divisions between poor and low site classes. Other problem forest types were determined based on a previous review of forest development plans.

5.2.7 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. Existing roads, trails and landings estimates are applied as reductions to the current productive area considered available for harvesting. Reductions for future roads, trails and landings are applied after stands are harvested for the first time in the simulation model. Table 9 shows the estimates for percentage reductions for different age classes. Estimates represent the area that will be permanently removed from timber production.

5. Timber Harvesting Land Base Definition

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

Location	Age class	Reduction area (hectares) or per cent (%)
Existing roads, trails and landings	1 and 2	9.0%
Existing roads, trails and landings	3+	1.5%
Future roads, trails and landings (within 100 years)	3+	7.5%

Data source and comments:

The estimate for existing roads, trails and landing is based on a survey of several watersheds (comprising approximately 25 000 hectares or 2.5%) in the Lillooet TSA. Reductions due to future roads, trails and landings were reduced by 1.5% ($9\% - 1.5\% = 7.5\%$) to account for areas already accessed by existing mainline roads.

5.2.8 Cultural heritage resource reductions

Archaeological overview and cultural heritage value inventories for the entire Lillooet TSA are yet to be completed or are not comprehensive. The impacts of measures required to protect known sites remain unquantified at this time. As studies are completed and operational implications better understood, the impacts of cultural heritage resources will be incorporated into future timber supply reviews.

5.2.9 Riparian reserve and management zones

Specific areas will be removed from the productive forest land base to account for riparian reserve and management zones, as outlined in the following table.

5. Timber Harvesting Land Base Definition

Table 10. Estimates for riparian reserve and management zones

Reserve zones to be excluded from the timber harvesting land base				
Riparian classification	Reserve zone (RRZ) width (metres each side)	Management zone (RMZ) width (metres each side)	RMZ maximum basal area retention (%)	Combined riparian zone width
Streams and rivers				
Fraser River (S1)	0	100	50	50
S1 streams	50	20	50	60
S2 streams	30	20	50	40
S3 streams	20	20	50	30
S4 streams	0	30	25	8
S5 streams	0	30	25	8
S6 streams	0	20	5	0
Wetlands				
W1	10	40	25	20
W2	10	20	25	15
W3	0	30	25	8
W4	0	30	25	8
W5	10	40	25	20
Lakes				
L1 lakes > 1000 hectares	0	0	0	0
L1 lakes	10	0	25	10
L2 lakes	10	20	25	15
L3 lakes	0	30	25	8
L4 lakes	0	30	25	8

Data source and comments:

Riparian reserve areas were specifically removed from the productive forest land base through a buffering and overlay process in a Geographic Information System (GIS). Riparian zone widths accounted for both the reserve zone and a portion of the management zone according to the recommended maximum basal area retention in each management zone type (i.e., a management zone of 20 metres with recommended 50% basal area retention was modelled as a 10 metre reserve, which was added to the reserve zone for that class of stream, lake or wetland). S6 streams are assumed to contain no reserve buffer even though 5% of a 20-metre management zone equates to a one metre reserve. One-metre buffers are too small to be efficiently analysed within the GIS, and furthermore, the impact on the timber harvesting land base would be very small; for example, 100 km of S6 stream with a one-metre buffer would be equivalent to a 10-hectare land base deduction.

Lakes were classified according to size and biogeoclimatic zone in which they are located.

5. Timber Harvesting Land Base Definition

5.2.10 Exclusion of specific, geographically defined areas

This section specifies 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 other categories discussed above.

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. Any changes in official designation will be incorporated in the next timber supply review, or in the AAC determination if the changes are made subsequent to the analysis but prior to the determination.

Table 11. *Exclusion of specific, geographically defined areas*

Identifying inventory variables (location descriptors)	Excluded area (hectares)	Reason for exclusion
Water intakes for community watersheds (20 intakes)	1.57 hectare/intake	<i>Timber Harvesting Practices Regulation Section 17.1</i>

Data source and comments:

Water intakes located within defined community watersheds were identified from MELP maps. Intakes not already accounted for through exclusions due to ownership codes (i.e., intakes located on Indian Reserve or private land) had a semi-circular reserve zone calculated.

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 12. Utilization levels

Analysis unit / species	Utilization		
	Minimum dbh (cm)	Maximum stump height (cm)	Minimum top dib (cm)
Lodgepole pine	12.5	30	10
Douglas-fir (wet-belt)	17.5	30	10
Douglas-fir (dry-belt)	12.5	30	10
All other coniferous species	17.5	30	10

Data source and comments:

Table 12 reflects current regional standards, licence requirements and current performance. Part of Pulpwood Agreement 16, which could involve different utilization standards, lies within the Lillooet TSA, but no harvesting has taken place or is currently expected.

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. Table 13 lists the species that do not contribute to timber supply and that will be excluded from the estimation of stand volume.

Table 13. Volume exclusions for mixed species types

Species	Volume exclusion (%)
Whitebark pine	100
Deciduous volumes in all coniferous analysis units	100

Data source and comments:

Table 13 reflects current regional utilization standards, licence requirements and current performance. Deciduous-leading stands are excluded from the timber harvesting land base (Section 5.2.6, "Forest types not currently being harvested").

6. Current Forest Management Assumptions

6.1.3 Minimum harvestable age derivation

Minimum harvestable ages denote the estimated time required for stands to grow to a harvestable condition. They define the lower limit for harvesting. 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 inter-decadal changes in harvest levels). However, most stands will not be harvested until well past the minimum timber production ages because management objectives for other resource values take precedence (e.g., requirements for the retention of older forest).

Table 14. Minimum harvestable ages

Species	Priority age	Volume (m ³ /hectares)
All except dry-belt fir selection	81 years for Pli and wet-belt Douglas-fir	150
	101 years for spruce, balsam, cedar, and hemlock	
Selection dry-belt fir (AU 13)	N/A	N/A

Data source and comments:

The minimum volume required for clearcut harvesting is 150 cubic metres per hectare. Minimum age criteria must also be met. The minimum ages in Table 14 are based on current practice.

6.1.4 Harvest scheduling priorities

Generally, older available stands are favored for harvesting when all other objectives have been met. Table 15 reflects average per cent harvested by species in the Lillooet TSA, over the last 5 years.

Table 15. Harvest scheduling history

Analysis units	Species	Per cent (%) of total harvest over last 5 years
1 — 4	Balsam, spruce, cedar, hemlock	46
5 — 8	Lodgepole pine	29
9 — 12	Douglas-fir (wet-belt)	17
13	Douglas-fir (dry-belt)	8

6. Current Forest Management Assumptions

Data source and comments:

(Table 15)

Figures in the above table refer to historical volume harvests, and are presented for information only. Selection management is practiced on approximately 14% of the land base. However, on average only approximately 50% of the stand volume is removed; hence the 8% volume contribution referred to in the table.

6.1.5 Logging method

The following table, provided for information only, shows the logging methods currently in use in the Lillooet TSA. In the past four years the proportion of cable and helicopter harvest has been increasing.

Table 16. *Logging method*

Logging method	Per cent (%) of total annual harvest
Skidder	53.5
Cable	38.2
Helicopter	3.3
Other	5.0

Data source and comments

The above table is based on harvest data since 1990 from licensees and the Integrated Silviculture Information System (ISIS). Over the past four years, the cable proportion was 48.6% and the helicopter harvest was 4.5% of the total harvest. The "Other" category includes systems such as horse logging and hand logging.

6.1.6 Silvicultural systems

Table 17 lists the silvicultural systems currently used in the TSA and the respective silvicultural regime.

Table 17. *Silvicultural systems*

Silvicultural system	Per cent (%) of harvest (by area)	Per cent (%) retention	Number of entries	Time between entries (years)
Clearcut	72.6	0	1	Full rotation
Seed tree	8.8	< 1	1	Full rotation
Shelterwood	4.5	66	3	30
Selection	14.1	40 — 75	up to 4	35

6. Current Forest Management Assumptions

Data source and comments:

(Table 17)

This table describes the district-wide historic proportion of the annual harvest, since 1987, by silvicultural system, and is based on ISIS and supplementary data supplied by licensees. It is for information purposes only at this time.

6.2 Unsalvaged losses

Table 18 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 reflects only the volume that will not be recovered or salvaged.

Table 18. Unsalvaged losses

Cause of loss	Annual unsalvaged loss (m ³ /year)
Insects	4 134
Fire	12 746
Windthrow	8 200
Miscellaneous	1 000
Total	26 080

Data source and comments:

Current and projected volume losses can be expected in Douglas-fir stands due to the western spruce budworm. Historic epidemic and ongoing endemic mountain pine beetle and spruce bark beetle losses have been accounted for in the district inventory. It is expected that future unsalvaged losses to these insects will be minimal within the operable land base.

Unsalvaged losses due to fire are based on 10 years of district fire reports and are reduced by 50% to account for the incidence of fire in problem forest types and stands located on inoperable ground.

Windthrow losses relate to small isolated patches or individual trees on the edge of a cutblock that may blow down but are not salvaged.

Miscellaneous losses refer to landslides and other minor factors.

6. Current Forest Management Assumptions

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 in the Lillooet TSA. This level of activity assumes basic silviculture on all sites. Table 19 shows the proportion of each analysis unit to be treated under each silviculture regime and the expected average regeneration delay.

Growth of recent plantations and future stands will be projected with 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) are then aggregated into one table.

6. Current Forest Management Assumptions

Table 19. Regeneration assumptions by analysis unit

Analysis unit	Leading species	Site class / age (years)	Regen delay (years)	Method		Density (planted)		
				Type	%	Species	Spp. %	Stems / hectare
1	Sx/Bl/ Cw/H	G/M – < 140	3	Plant	100	Sx	70	1200
						Pl	30	1400
2	Sx/Bl/ Cw/H	G/M – ≥ 141	3	Plant	100	Sx	70	1200
						Pl	30	1400
3	Sx/Bl/ Cw/H	P – < 140	3	Plant	100	Sx	70	1000
						Pl	30	1200
4	Sx/Bl/ Cw/H	P – ≥ 141	3	Plant	100	Sx	70	1000
						Pl	30	1200
5	Pl	G/M – < 140	3	Plant	100	Pl	90	1400
						Sx	10	1200
6	Pl	G/M – ≥ 141	3	Plant	100	Pl	90	1400
						Sx	10	1200
7	Pl	P – < 140	4	Plant	80	Pl	100	1200
				Natural	20	Pl	100	1000
8	Pl	P – ≥ 141	4	Plant	80	Pl	100	1200
				Natural	20	Pl	100	1000
9	Fir / wet	G/M – < 140	3	Plant	100	Fd	80	1000
						Pl	20	1400
10	Fir / wet	G/M – ≥ 141	3	Plant	100	Fd	80	1000
						Pl	20	1400
11	Fir / wet	P – < 140	3	Plant	100	Fd	60	1000
						Pl	40	1200
12	Fir / wet	P – ≥ 141	3	Plant	100	Fd	60	1000
						Pl	40	1200

Data source and comments:

All values in Table 19 are based on current performance as described by Lillooet Forest District staff. Age of planting stock is estimated at one year on average, and will be subtracted from the regeneration delay. Operational adjustment factors (OAF) of 15% (OAF1) and 5% (OAF2) will be applied to all managed stand yield curves to account for natural spatial patchiness, and decay waste and breakage, respectively. OAF 1 is a constant percentage reduction to account for small stocking gaps. OAF 2 accounts for losses that increase with age. The value of OAF 2 increases from zero and passes through 5% when the stand is 100 years old.

The dry-belt fir analysis unit (13) is assumed to be stocked at all times.

The four-year regeneration delay for analysis units 7 and 8 accounts for the longer delay associated with natural regeneration.

Prior to the analysis, information on the proportion of planted stock that is class A (genetically improved) will be compiled to allow assessment of the potential timber supply implications through sensitivity analysis.

6. Current Forest Management Assumptions

6.3.2 Immature plantation history

For this analysis, all stands aged 20 years and younger, and a percentage of 21-40 year-old stands will be assigned to managed stand yield curves. These stands have a history of density control and stand tending, and will be assumed to grow according to estimates for managed stands.

Table 20. Immature plantation history

Analysis units	Area managed — per cent (%)		
	1 – 20 years	21 – 30 years	31 – 40 years
1 and 2	100	80	50
3 and 4	100	50	50
5 and 6	100	80	50
7 and 8	100	50	30
9 and 10	100	80	50
11 and 12	100	50	25

Data source and comments:

Lillooet Forest District silviculture staff and licensee input were used in approximating managed areas by analysis unit for stands aged 21-30 years and 31-40 years. The Spruce Lake area has no history of silvicultural management, therefore existing immature types in this area will not be assigned to managed stand yield curves.

6.3.3 Not satisfactorily restocked (NSR) areas

NSR land, that is, land classified as type identity 4 or 9, is included in the Lillooet TSA current timber harvesting land base. This section identifies 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 Table 21 (from the most recent available forest district silviculture records) differ from the NSR area showing on the inventory file, the figures in this table will be used to model the NSR total area.

Table 21. Not satisfactorily restocked (NSR) areas

Forest district	Backlog NSR area (hectares)	Current NSR area (hectares)
Lillooet Forest District	766	2 771

6. Current Forest Management Assumptions

Data source and comments:

(Table 21)

The data for backlog NSR was derived from the Integrated Silviculture Information System (ISIS) and the Major Licensee Silviculture Information System (MLSIS). Current NSR reflects roughly 1.5 years of harvest area, which has not yet been planted. It will be assumed to be reforested according to the standard regeneration delays listed in Table 19. Backlog NSR target date to be restocked is the year 2001.

6.4 Integrated resource management

6.4.1 Objectives managed with forest cover requirements

Objectives for community watersheds, visual quality, deer habitat, standard integrated resource management, and biodiversity will be accounted for in the analysis by forest cover requirements (maximum area of recent disturbance, minimum amount of older forest). The role of forest outside the timber harvesting land base in achieving forest cover requirements will be recognized. Tables 22, 23 and 24 list the forest cover requirements to be applied.

Table 22. Forest cover requirements

Management zone	Maximum % younger than minimum tree height / age		Minimum tree height / age		Minimum % area older than mature cover height/age		Minimum mature cover height/age	
	Gross forested area	Timber harvesting land base	Height (metres)	Age (years)	Gross forested area	Timber Harvesting land base	Height (metres)	Age (years)
Community watersheds	20		6.6					
Visually sensitive	Refer to Table 23							
Critical deer winter range					20			80
Standard management		33	3.0					

Data source and comments:

Community watersheds

These numbers are based upon advice of the Regional Hydrologist and will applied to each community watershed.

6. Current Forest Management Assumptions

Visually sensitive areas

Visually sensitive areas will have constraints determined for each polygon, according to the procedures set out in Table 23.

Critical deer winter range

This area is managed to ensure sufficient thermal cover is maintained. At least 20% of the gross forested area must be greater than 80 years of age.

Standard management

In the standard management zone a 3-pass harvesting sequence will be assumed, whereby no more than 33% of the timber harvesting land base may be less than three metres in height at any time, within each landscape unit/ biogeoclimatic ecosystem classifications (BEC) variant combination.

Recreation

Areas classified as highly sensitive for recreation values (Er1) which are not part of some other management zone are operationally managed on a 4-pass system. This area is approximately 500 hectares in size and will not be modelled separately as part of the Timber Supply Review.

Table 23. Forest cover requirements for visually sensitive areas

Visual quality objective	Maximum % younger than green-up height								
	Low VAC			Intermediate VAC			High VAC		
	Green-up height (metres)	% removal range	% removal mid-point	Green-up height (metres)	% removal range	% removal mid-point	Green-up height (metres)	% removal range	% removal mid-point
Preservation	3	1	1	3	2	2	3	3	3
Retention	5	3-4.5	3.8	4	4.5-6.5	5.5	3	6.5-8	7.2
Partial retention	5	8-12	10	4	12-16	14	3	16-20	18
Modification	5	15-20	17.5	4	20-25	22.5	3	25-30	27.5

Data source and comments:

Constraints for visually sensitive areas have been determined for each visually sensitive polygon, based on the *Kamloops Land and Resource Management Plan VQO Matrix*, modified for the Lillooet Forest District current management practices. The range of maximum per cent area removal (maximum per cent area below visual green-up height) was determined based on the existing visual absorption capacity and the visual quality objective for each polygon. The mid-point of this per cent removal range was determined for each VQO polygon, and each polygon will be modelled separately in the analysis. There is currently no preservation VQO within the Lillooet TSA.

6. Current Forest Management Assumptions

Retention of old-growth forest in every landscape unit and natural disturbance type (NDT) is a requirement under the Forest Practices Code. Table 24 summarizes the percentage of old forest required for each NDT, which will be modelled in this analysis. Requirements for retention of mature forest and limits on the area of early-seral forest will be considered in a sensitivity analysis.

Table 24. Old-seral requirements by landscape unit and natural disturbance type (NDT)

NDT	Biogeo-climatic unit	Minimum age (years)	% area retention of old-seral forest				
			Low emphasis 0-80 years	Low emphasis 81-160 years	Low emphasis 161-240+ years	Intermediate emphasis	High emphasis
2	CWH	250	3	6	9	9	13
2	ESSF	250	3	6	9	9	13
3	ESSF	140	5	10	14	14	21
3	MS	140	5	10	14	14	21
4	PP	250	5	9	13	13	19
4	BG	N/A	N/A	N/A	N/A	N/A	N/A
4	IDF	250	5	9	13	13	19

Data source and comments:

The percentages for old-forest retention are based on recommendations in the *Biodiversity Guidebook*. Since biodiversity-emphasis options (BEOs) have not been established, a weighted average requirement will be applied within each landscape unit. The requirement will reflect the expectation that the eventual mix of BEOs will be 10% higher, 45% intermediate, and 45% lower. In keeping with the Deputy Minister's letter of August 27, 1997, and the *Landscape Unit Planning Guide* of March 1999, it will be assumed that the old-forest retention requirements will be phased in over three rotations in landscape units assigned a low BEO (this phase-in will be factored into the weighted average requirements). See also, Section 7, "Sensitivity Analyses".

6. Current Forest Management Assumptions

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

Three different methods are used in the Lillooet TSA to maintain stand structure over time: single-tree reserves and wildlife tree patches within cutblocks (WTPs). Single-tree reserves are unlikely to provide harvestable volumes in the future, and are therefore modelled as volume reductions. WTPs are generally smaller than two hectares in size, and are also unlikely to be harvested in the future, and will be modelled as volume reductions.

Table 25. *Reductions to reflect volume retention in cutblocks for wildlife tree patches*

Wildlife tree patch type	Persistence	Anticipated harvest activity	Per cent (%) of annual harvested volumes
Single tree	Permanent	No	0.5
WTP	Permanent	No	5.3

Data source and comments:

Estimates of volumes retained in single-tree reserves and WTPs were derived for the Lillooet Forest District from a review of development plans and silviculture prescriptions. Additional work is being undertaken to determine if the areas being left as WTPs are representative of the areas being harvested.

7. Sensitivity Analyses

Sensitivity analysis provides a measure of the timber supply impact of uncertainty in management assumptions and data. By developing and testing a number of sensitivity analyses, it is possible to determine which variables most affect analysis results. The first table shows issues that are particular to this TSA. This is followed by a list of sensitivity analyses that are standard in most TSAs.

Table 26. Sensitivity issues specific to the Lillooet TSA

Issue to be tested
Biodiversity — old-seral constraint at 100% for low emphasis (no phase-in)
Biodiversity — current draft emphasis assignments ^a
No biodiversity — no seral-stage constraints or wildlife tree patches

(a) Biodiversity emphasis is being discussed in the ongoing LRMP process. If draft BEOs have been defined prior to completion of the timber supply analysis, their timber supply implications will be assessed.

Table 27. 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	PI and S — age class 8 and 9 adjusted after regeneration.
Land base changes	+/- 10%
Visual quality objectives	Altering % disturbance limits.
Harvest flow alternatives	
Green-up periods	+/- 5 years
IRM zone	Change maximum area below green-up age.

Appendix A Numeric Identifiers for Management Zones

Table A-1. *Biogeoclimatic variants / natural disturbance types (NDTs)*

NDT	Subzone/variant	Numeric ID	NDT	Subzone/variant	Numeric ID
2	CWHms1	01	4	PPxh2	11
2	CWHds1	02	4	BGxh2	12
2	ESSFmw	03	4	BGdm	13
2	ESSFxv	04	4	IDFww	14
3	ESSFdv	05	4	IDFxh1	15
3	ESSFdc	06	4	IDFxh2	16
3	ESSFxc	07	4	IDFdk1	17
3	MSdc	08	4	IDFdk2	18
3	MSxk	09	4	IDFwx	19
3	MSdm2	10			

Appendix A Numeric Identifiers for Management Zones

Table A-2. *Landscape units*

Landscape unit #	Landscape unit name	Draft Emphasis	Numeric identifier
1	Bridge	Low	01
2	Carpenter Lake North	Low	02
3	Carpenter Lake South	Low	03
4	Connel Creek	Low	04
5	Duffey Lake	Low	05
6	French Bar	Low	06
7	Gun	Low	07
8	Hurley	Low	08
9	Kwoiek	Low	09
10	Lost Valley	Low	10
11	Murray	Low	11
12	Pavilion	Low	12
13	Siska	Low	13
14	Spruce Lake	Low	14
15	Stein	Low	15
16	Texas Creek	Low	16
17	Watson Bar	Low	17
18	Yalakom	Low	18

Appendix A Numeric Identifiers for Management Zones

Table A-3. Community watershed

Code	Watershed	Status	Numeric ID
100.057	Blackbird Creek	Active	01
100.058	Countless Creek	Active	02
100.060	Dickey Creek	Active	03
100.061	Dicksam Brook	Inactive	04
100.062	Fergusson Creek	Active	05
100.063	Fountain Creek	Active	06
100.064	George Creek	Active	07
120.011	Gladwin Creek	Active	08
100.210	InklyuInkinatko Creek	Active	09
100.067	Intlpalm Creek	Active	10
100.068	Lytton Creek	Active	11
100.085	McIntyre Creek	Active	12
120.021	Murray Creek	Active	13
100.230	Nekliptum Creek	Active	14
100.072	Nepuchin Creek	Active	15
100.073	Nikaia Creek	Active	16
100.211	Omin Brook	Active	17
100.075	President Creek	Active	18
100.076	Retasket Brook	Active	19
120.023	Six Mile Creek	Active	20
100.081	Town Creek	Active	21

Appendix A Numeric Identifiers for Management Zones

Table A-4. *Visual quality objectives (VQOs)*

VQO	Numeric ID
Preservation (P)	01
Retention (R)	02
Partial retention (PR)	03
Modification (M)	04