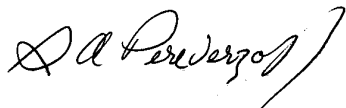


Invermere Timber Supply Area Timber Supply Review

Data Package

March 2000



District Manager
Invermere 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 Invermere Timber Supply Area (TSA) timber supply analysis.

The completed data package contains information on inputs that represent current performance in the timber supply area. For the timber supply review, "current performance" can be defined by:

- the Forest Practices Code (FPC);
- the current forest management regime — the productive forest land available for timber harvesting, silviculture treatments, harvesting systems and integrated resource management guidelines used in the area;
- the District Manager's instruction letter directing the formulation of the current round of forest development plans (5-year development plans);
- fully implemented land-use plans;
- land-use decisions approved by Cabinet;
- approved higher level plans under the Forest Practices Code;
- the Enhanced Forest Management Pilot Project (EFMPP) ongoing in the White River portion of the TSA;
- other approved B.C. Forest Service and joint agency forest management practices and policies.

The purpose of the timber supply review (TSR) program is to model "what is" not "what if". Changes in forest management objectives and data, when and if they occur, will be incorporated in future timber supply analyses. Many of the modelling assumptions come from the most recent analysis work of the EFMPP of 1997 with modifications to reflect shifts in forest management practices since that time.

Each section of this data package includes:

- 1) a short explanation of the data needed to model the specified management practices;
- 2) a data table; and
- 3) a discussion of data sources and other relevant considerations.

The information in this data package, represents the best currently available knowledge and information, but 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 some cases the criteria are shown but the final value is not yet filled in. In these cases the table columns are shaded gray. In addition, if any major changes to management regimes occur over the next few months, attempts will be made to incorporate them in the timber supply analysis. 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 base case harvest forecast developed using these assumptions will be used as a baseline reference. Section 7, "Sensitivity Analyses," highlights areas of uncertainty with the assumptions, and outlines intended sensitivity analysis.

The *Kootenay-Boundary Land Use Plan Implementation Strategy* (KBLUPIS) has been approved by government as a policy statement. The District Manager of the Invermere Forest District has provided direction to licensees for the preparation of forest development plans (FDPs) for submission in the spring of 2000. This direction is generally consistent with KBLUPIS and reflects those parts which the forest district is implementing in the short term. This data package reflects these directives either in the base case or as 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, and can be represented in the computer model, they will be incorporated into the base case. 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 (AAC) determination.

2. Current Forest Management Considerations and Issues

Table 1. Major forest management considerations and issues

Consideration/issues	Comments
Scenic corridors	
1. Highway corridors and important lakes	Tourism and recreation are important industries in the Invermere TSA. The main highway corridor has also been “made known” pursuant to the FPC in 1998 as a visually sensitive area. The area of visible disturbance will be limited in areas with retention and partial retention visual quality objectives (VQOs) according to provincial visual management guidelines.
Water conservation	
1. Community watersheds	There are nine community watersheds in the Invermere TSA. Forest cover guidelines will restrict the amount of disturbance in these watersheds.
Habitat requirements	
1. Ungulate winter range (UWR)	Ministry of Environment, Lands and Parks (MELP) biophysical mapping completed in the early 1970s defines important ungulate winter range. This mapping was the basis of the UWR map “made known” in 1998. Maintenance of forest cover in desirable age classes and crown closure throughout this zone is an important management consideration.
2. Fish habitat	Riparian reserve zones (RRZs) were mapped and digitized for this analysis and removed from the timber harvesting land base (THLB). Riparian management zones (RMZs) provide additional protection to areas adjacent to streams, rivers and lakes. Their extent has been approximated from the mapped reserve zones. Inlet Creek is a significant fisheries watershed where special management will be undertaken to protect fish habitat and water quality.
3. Ungulate summer range	Green-up rules to be used in the analysis are based on providing hiding cover for wildlife where clearcutting is practiced.
4. Caribou habitat	Old-growth requirements for caribou habitat management will be applied in a portion of the Skookumchuk drainage.
Biological diversity	
1. Old growth	Objectives for maintaining forest in all seral classes will be modelled in the analysis. The <i>B.C. Forest Practices Code Landscape Unit Planning Guide</i> outlines relevant mature- and old-seral requirements for various biogeoclimatic subzones. Currently there are 34 draft landscape units (LUs) that may soon be formally designated by the District Manager together with associated biodiversity emphasis options (BEOs) determined through discussions with MELP. These requirements will be incorporated in the base case if they have been formally established; otherwise average requirements will be applied (see Section 6.4.1, “Forest cover requirements”).
2. Wildlife tree patches (WTPs)	The wildlife tree requirements as specified in the <i>FPC Landscape Unit Planning Guide</i> define current management and will be incorporated in the analysis.
Insects and disease	
1. Mountain pine beetle	Damage to standing timber by beetle attack is cyclic and can be considerable at times. Some unsalvaged losses in lodgepole pine forest types are anticipated and an estimate of the unsalvaged losses will be included in this analysis.
Other bark beetles (spruce, Douglas-fir, balsam)	Small outbreaks in high quality stands are common. Management concerns are similar to the mountain pine beetle. An estimate of the unsalvaged losses will be included in this analysis.
3. Root rot	Potential losses in regenerated stands due to increased post-logging infection are a major concern. Root rot survey data was used to estimate volume losses as stands age. These losses will be incorporated into the analysis by applying operational adjustment factors to managed stand yield tables.
4. Mistletoe	Potentially large productivity losses from infection of plantations can occur. An estimate of the unsalvaged losses will be included in this analysis.

(continued)

2. Current Forest Management Considerations and Issues

Table 1. Major forest management considerations and issues (concluded)

Consideration/issues	Comments
Logging practices	
1. Logging / fire history	The <i>EFMPP Strategy</i> includes the “large patch pine” strategy, which allows for large to very large clearcuts, to emulate natural disturbance pattern in pine-leading stands. These stand types are therefore exempt from green-up restrictions and harvesting will be modelled to be consistent with the current Forest Development Plan.
2. Steep slope harvesting	Steep slopes within the operable area (area below the operability line) currently being bypassed for logging will be excluded from the timber harvesting land base. Reductions to the operable land base will be based on slope and site index data contained in the forest inventory.
3. Partial cutting	Partial cutting is used in many parts of the TSA. Growth and yield of partial harvest analysis units will be projected with modified volume-age curves to emulate a two-entry harvest system. For analysis units commonly managed by the seed tree silviculture system, the volume of seed trees that will not be harvested will be estimated for the analysis.
4. Problem forest types (PFT)	Some Douglas-fir, larch, and yellow pine stands with trees of small diameter and poor form will be excluded from the timber harvesting land base because they are currently uneconomical to harvest. Some lodgepole pine stands of similar description will also be excluded.
Size of land base	
1. Operability line review	A district review of the operability lines was partially completed through total resource plan (TRP) submissions, and findings are included in the forest inventory used for this analysis.
Rocky Mountain Trench Plan	
1. Ecosystem restoration	Green-up requirements will be applied to only a portion of the area found within this plan to take into account domestic range and wildlife habitat management objectives included in the <i>Rocky Mountain Trench Ecosystem Restoration Plan</i> .

Data source and comments:

The table is formulated from review of issues raised during the previous TSR (completed in early 1996), the *EFMPP* conducted in 1997-1998, and current input from local staff and licensees.

3. Inventories

3.1 Background information

Table 2 lists the inventories that will be used to define the timber harvesting land base and to represent forest management activities in the analysis. The data source and any other relevant details about the data and assumptions are discussed after the table.

Table 2. Inventory information

Data	Source	Vintage	Update	Source scale
Forest cover	Ministry of Forests (MoF) standard inventory files	01/98	01/98	1:20 000
Ownership	Crown lands	02/96	02/96	1:20 000
Woodlots	District source files	03/99	03/99	1:20 000
Biogeoclimatic ecosystem classification (BEC)	Provincial base data file with regional updates	1994	11/96	1:50 000
NSR data	Major License Silvicultural Information System (MLSIS) and Integrated Silviculture Information System (ISIS)	04/99	04/99	N/A
Provincial parks forest cover	KBLUP file — regional non-standard inventory files	1972	1999	1:20 000
Caribou habitat	MELP biophysical mapping with reference to KBLUPIS	05/97	05/97	1:50 000
Ungulate winter range (other than caribou)	MELP biophysical mapping	1979	1998	1:50 000
Community watersheds	MoF non-standard file taken from MELP CW source	1997	N/A	1:20 000
Riparian areas	MoF non-standard file generated using orthophoto mapping interpretation	1998	1998	1:20 000
Visual landscape inventory	MoF standard recreation files (VQO component) within KBLUP scenic corridor only	1993	1998	1:50 000
Eco-restoration emphasis	MoF non-standard file from ground and photo inventories	1998	1998	1:20 000
Operability	MoF standard file	1987	1997	1:50 000
Silviculture practices; not satisfactorily restocked (NSR) area	ISIS / MLSIS	ongoing	May 1999	1:20 000
Draft landscape unit boundaries	MoF non-standard file	1996	1998	1:20 000
Draft biodiversity emphasis	MoF-MELP agreement	10/96	1997	1:20 000

(continued)

3. Inventories

Table 2. Inventory information (concluded)

Data	Source	Vintage	Update	Source scale
Slope	MoF standard inventory files	05/97	05/97	1:20 000
Forest ecosystem network (FENS)	MoF non-standard layer from several years of total resource plan submissions and contract photo interpretation for non-mapped areas	—	1998	1:20 000
Columbia River wetland management area	KBLUP file — regional non-standard inventory file	05/97	—	1:50 000

Data source and comments:

The photo interpretation and field work for the Invermere TSA forest cover re-inventory was completed in 1992 to the NAD83 TRIM base. The last forest cover update includes all changes from timber harvesting, wildfire, re-establishment of commercial tree species, and forest growth up to December 31, 1997.

All protected areas in the Invermere Forest District have forest cover information in the standard forest inventory file. These areas include: the Purcell Wilderness Conservancy, and the Top of the World, Height of the Rockies, Bugaboo and Assiniboine Parks. Forested areas in parks do not contribute directly to timber supply (are not part of the area available for harvest), but contribute to seral-stage targets for biodiversity in the landscape unit to which the park belongs.

The caribou habitat mapping is part of B.C. Environment's biophysical mapping with reference to the approved KBLUPIS.

The linework for the ungulate winter range is based on B.C. Environment's biophysical mapping and was further refined in 1998 to more accurately correspond to the existing wildlife biophysical inventory.

Draft landscape unit boundaries and biodiversity emphasis options (BEOs) were determined jointly by the Ministry of Forests (MoF) and the Ministry of Environment, Lands and Parks (MELP) as per the KLUPIS. The District Manager has made reference to these boundaries in his last two letters of FDP instructions to licensees. In all, 34 draft landscape units have been delineated within the Invermere TSA and are defined by a separate landscape unit overlay. It is expected that these landscape units and the corresponding KBLUP biodiversity emphasis options will be established soon.

Riparian reserve areas — this non-standard layer was mapped using orthophotos in 1998. They will be removed from the timber harvesting land base.

FENs were originally derived as all areas within the timber harvesting land base with no harvesting scheduled in previously approved Total Resource Plans (TRPs). Additional mapping was required in areas where TRPs were absent, then reviewed by MoF and MELP staff as well as licensees.

4. Division of the Area into Management Zones

4.1 Management zones, groups and multiple objectives

Management zones represent areas with distinct management emphasis. For example, a management zone may be based on a harvesting system, silviculture system, visual quality objective, or wildlife consideration. Some areas may be subject to more than one management objective. For simulation modelling, a "group" function enables application of overlapping constraints. After assessing the inventory data, the timber supply analyst will determine whether to put an objective into a group or a mutually exclusive management zone.

The non-contributing forest (land considered unavailable for timber harvesting) is included for consideration in attaining forest cover objectives for landscape level biodiversity and visual quality.

Section 6.4, "Integrated resource management" includes further information on the forest cover requirements to be applied.

See Section 3.1, "Background Information," for the sources of mapping and zones referenced in Table 3.

Table 3. Objectives to be tracked

Description	Inventory definition	Objectives
All forested land by landscape unit (LU)	MoF non-standard layer	Reporting. Provide an assessment of the total forest by landscape unit (LU). All Crown forested area (including Provincial Parks if in the LU).
Timber harvesting land base (THLB) by landscape unit (LU)	MoF non-standard layer	Reporting. Provide an assessment of the total timber harvesting land base by landscape unit.
Biodiversity	Biogeoclimatic ecosystem classification (BEC) from MoF standard layer	Applying seral stage requirements for biodiversity at the LU / BEC subzone level. All Crown forested area included.
Visuals	MoF standard layer : Within mapped scenic corridor	Application of green-up requirements according to provincial guidelines (<i>Procedures for factoring visual resources into timber supply analyses</i>). All Crown forest by visual zone (retention or partial retention) by LU.
Watershed	MoF non-standard layer	Application of green-up requirements as per Nelson regional analysis. All timber harvesting land base by LU by watershed zone.
Ungulate winter range	MELP biophysical mapping	Application of cover requirements to provide snow interception cover as per <i>EFMPP Strategy Report</i> . All timber harvesting land base by LU by UWR zone.
Trench Plan: Eco Restoration	MoF non-standard layer — from Eco Restoration Plan	Portions of forest produce half of normal yields to promote forage production. All timber harvesting land base by LU by trench zone.

(continued)

4. Division of the Area into Management Zones

Table 3. Objectives to be tracked (concluded)

Description	Inventory definition	Objectives
Integrated resource management	Area outside all other defined zones	Application of 3-metre green-up requirement to approximate FPC cutblock adjacency requirements, except Pine leading in ESSF as per EFMPP large-patch pine strategy. Applied by LU to timber harvesting land base not in other zones.
Caribou	MELP biophysical mapping and reference to KLUPIS	Application of mature and old-growth requirements for caribou habitat across the specified extent of each zone. All timber harvesting land base by LU by caribou zone.

4.2 Analysis units

An analysis unit represents forest stands with similar tree species (as indicated by the inventory type group), similar timber growing capability (as indicated by the site index in the forest inventory file) and similar management regimes. Each analysis unit will be assigned its own timber volume projections (growth curves) for existing and future stands.

Yield tables for existing natural stands will be derived using the variable density yield prediction (VDYP) yield model. Yield tables for recent plantations and future stands will be derived using the table interpolation program for stand yields (TIPSY).

4. Division of the Area into Management Zones

Table 4. Definition of analysis units

Analysis unit number	Species	Site index range (m @ 50 years)	Inventory type groups	Slope (%)	BEC/NDT
01	Douglas-fir/Py	> 15.5	1-8, 32	—	All
02	Douglas-fir/Py	13-15.5	1-8, 32	—	All
03	Douglas-fir/Py	< 13	1-8, 32	—	All
04	Larch	> 17	33, 34	—	All
05	Larch	13.5-17	33, 34	—	All
06	Larch	< 13.5	33, 34	—	All
07	Spruce, balsam	> 15	18-26	—	All
08	Spruce, balsam	12-15	18-26	—	All
09	Spruce, balsam	< 12	18-26	—	All
10	Cedar, hemlock	All	9-17	—	All
11	Lodgepole pine – flat	> 16	27-31	≤ 40%	All
21	Lodgepole pine – steep	> 16	27-31	> 40%	All
12	Lodgepole pine – flat	13-16	27-31	≤ 40%	All
22	Lodgepole pine – steep	13-16	27-31	> 40%	All
13	Lodgepole pine – flat	< 13	27-31	≤ 40%	All
23	Lodgepole pine – steep	< 13	27-31	> 40%	All
31	Part cut FdLwPy >30%	> 16	Not 33, 34	≤ 40%	Non-ESSF
32	Part cut FdLwPy >30%	13-16	Not 33, 34	≤ 40%	Non-ESSF
33	Part cut FdLwPy >30%	< 13	Not 33, 34	≤ 40%	Non-ESSF

Data source and comments:

Stands must have at least 30% composition of Douglas-fir, larch and yellow pine to be assigned to partial cut analysis units (31-33). Larch-leading sites (inventory types groups 33 and 34) are not partially cut.

Growth of stands younger than 31 years of age as of January 1st 1998 will be projected with managed stand yield tables generated using TIPSYS. Managed stands will be identified for the analysis according to the above table, except with a "100" prefix (for example 101, 102, 103 and so on).

Some analysis units may be split or combined after examining the amount and distribution of area within each analysis unit.

5. Timber Harvesting Land Base Definition

5.1 Identification of the timber harvesting land base

This section outlines the steps used to identify productive forest that is expected to support timber harvesting (the timber harvesting land base) within the timber supply area. The timber harvesting land base is the area remaining after removing areas unavailable for harvesting. 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:

- improving productivity or operability (e.g., the stocking of land currently classified as non-commercial brush);
- including previously excluded productive forest land (e.g., timber licence reversions).

No opportunities to increase the timber harvesting land base are presently anticipated in the Invermere TSA.

Only land where no harvesting is anticipated will be excluded from the timber harvesting land base. Areas where some timber harvesting is anticipated remain in the timber harvesting land base, even if the area will be subject to stringent constraints. Any such constraints will be reflected in the analysis.

After all areas that do not contribute to the timber harvesting land base have been identified, the resulting area is defined as the "current timber harvesting land base" for the Invermere TSA.

5.2 Details on land base classification

5.2.1 Land not owned and administered by the province of British Columbia

Land must be British Columbia Crown land under provincial administration for it to contribute to the land base used to determine timber supply. Private lands (Crown granted lands — ownership code 40N) and federal Crown lands (Indian Reserves — ownership code 52N) do not contribute to the timber harvesting land base or other forest management objectives in the TSA, and will be deducted from the land base that will be modelled in the analysis. Land under provincial Crown administration may contribute to forest management objectives even if it is not available for timber harvesting. For example, provincial park land could provide wildlife habitat, or old growth to help achieve biodiversity objectives.

5.2.2 Land classified as non-forest or non-productive forest

Alpine, lakes, rock, etc., represented by inventory type identities 6 and 8, will be excluded from the timber harvesting land base.

5.2.3 Non-commercial cover

Inventory type identity 5 represents areas currently occupied by non-commercial brush species. These areas are considered unlikely sites for timber production and are excluded from the area available for timber harvesting.

5. Timber Harvesting Land Base Definition

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

The total land base is stratified into various ownership codes. Of the provincial Crown ownership codes, only three are considered to contribute to timber supply for harvest forecast and AAC determination purposes: ownership code 62C (Crown land in a forest management unit), ownership code 69C (Crown land in miscellaneous reserves), and ownership 61C (contributing UREP areas).

UREP areas (areas set aside for the Use, Recreation, and Enjoyment of the Public — ownership code 61) smaller than 100 hectares will be removed from the timber harvesting land base.

5.2.5 Woodlot licences

These areas are managed for timber production. However, they are administered separately from the TSA. While the Minister of Forests initially apportions a part of the TSA AAC to woodlots, once an AAC is allocated to a specific woodlot licence, the area and the associated AAC are no longer administered as part of the TSA. Consequently, allocated woodlots do not contribute to the timber harvesting land base.

5.2.6 Roads, trails and landings

Estimates are made to reflect the loss of productive forest land to existing and future roads, trails and landings (RTLs).

5.2.6.1 Existing mapped roads, trails and landings

All existing mapped roads will be deducted from the timber harvesting land base (not including roads mapped as double line features in the inventory, which are deducted as non-forest). The deduction will be based on a geographic information system (GIS) linear overlay assuming an average road width of 20 metres for all secondary and logging roads, and 10 metres for trails. The area to be removed totals 2.6 % of the timber harvesting land base.

5.2.6.2 Existing non-classified in-block trails and landings

Table 5a. Estimates of non-classified existing roads, trails and landings

RTL category	Area equivalent of all losses (%)	Rationale/source
Skid trails (including old historic trails), and other detrimental disturbance on the net area to reforest	4.5	Small Business Forest Enterprise Program (SBFEP) soil disturbance surveys in 1994, 1995.
Landings	3.0	Based on one quarter-hectare landing per eight hectare harvested.
Total	7.5	Includes estimated 1% overlap of mapped roads already excluded (see notes).

5. Timber Harvesting Land Base Definition

Data source and comments:

These estimates are from 1994-1995 site disturbance surveys conducted throughout the TSA on SBFEP blocks. The subsequent GIS overlay done in 1999 includes some roads through cutblocks. The overlap is estimated to be approximately 1%, therefore existing in-block trails and landings will be accounted for using an operational adjustment factor (OAF) of 6.5% with the Volume-age curves for existing regenerated stands.

5.2.6.3 Future roads, trails and landings

Table 5b. Estimates of productivity losses due to future roads, trails and landings

RTL category	Productivity reduction (%)	Rationale
Roads	0.6	Soil disturbance surveys from Invermere, Golden and Cranbrook districts – 1994.
Skid trails (including old historic trails), and other detrimental disturbance on the net area to reforest	4.5	SBFEP soil disturbance surveys in 1994, 1995.
Landings	3.0	Based on one quarter-hectare landing per eight hectare harvested.
Total	8.1	

Data source and comments:

This reduction applies to future stands on areas currently not harvested and is a one time reduction to reflect areas that will be occupied by future roads, trails and landings once harvest is complete.

5.2.7 Riparian area

Riparian reserve zone

Riparian habitat was mapped for the entire TSA from 1:20 000 orthophoto maps (1995 photos) and represents the area in riparian reserves associated with S3 and larger streams as well as lakes. Riparian reserves amount to a 2.0% reduction to the timber harvesting land base.

Riparian management zone

The extent of riparian management zones (RMZs) was estimated from a GIS buffering exercise of the mapped riparian reserves, using a buffer width of 20 metres, as per the FPC *Riparian Management Area Guidebook*. RMZs cover 1.2% of the timber harvesting land base. The FPC *Riparian Management Area Guidebook*, as well as local knowledge will be used to determine the appropriate forest cover requirements within the riparian management zone, and a corresponding reduction will be applied to the volume yield curves.

5. Timber Harvesting Land Base Definition

5.2.8 Environmentally sensitive areas

Some 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). Table 6 lists the types of ESAs where no harvesting is expected to take place, and which will be excluded from the timber harvesting land base.

Table 6. Description of environmentally sensitive areas

ESA class	ESA description	Site index (m @ 50 years)	% area reduction
E1a	Stands having severe snow chute or avalanche problems.	All	100
E1h	Stands having licensed domestic water intakes within them.	All	100
E1s	Areas having fragile or unstable soils.	< 17 ^a	100
E1p	Areas where severe plantation problems expected.	All	100

(a) Stands on highly sensitive soils (E1s) on good sites (SI > 17) are normally harvested using sensitive harvesting techniques.

Data source and comments:

Reductions for ESAs are based upon district staff and licensee advice and analysis of harvesting activities planned over the next 5 years on areas classified as ESAs.

All moderately sensitive areas (E2s) are included in the timber harvesting land base, since environmental considerations in these areas are normally addressed during operations without any effect on timber availability.

Management in E1r (recreation) and E1w (wildlife) areas will be addressed through specific forest cover constraints.

5.2.9 Sites with low timber growing potential

Low productivity stands that are not expected to produce an economically harvestable crop of trees in a reasonable length of time will be excluded from the timber harvesting land base.

Table 7. Description of sites with low timber growing potential

Species	Inventory type groups	Site index (m @ 50 years)	% area reduction
Spruce	20 – 26	< 8	100
Other	All others	< 10	100

Data source and comments:

The site index cutoffs are based on current harvesting practices, and district staff and licensee input.

5. Timber Harvesting Land Base Definition

5.2.10 Deciduous forest types

All deciduous-leading forest types are excluded as non-merchantable as they are not presently utilized.

Table 8. *Excluded deciduous forest types*

Type group	Species	Age	Height class	% area reduction
35, 36, 40, 41	Deciduous	All	All	100

Data source and comments:

Exclusion of deciduous-leading types also excludes the secondary coniferous component of these stands. However, this is balanced by the fact that deciduous secondary components in coniferous stands are not removed.

5.2.11 Inoperable areas

Operability codes are used to classify areas based on physical or economic considerations that affect the ability to harvest stands. Characteristics used in defining operability include slope, topography (e.g., gullies or exposed rock), difficulty of road access, soil instability, elevation and timber quality. Operability can change over time with new harvesting technologies and changing economics.

Table 9. *Description of inoperable areas*

Operability code	Species	Slope	Site index (m @ 50 years)	% area reduction
Inoperable (I)	All	All	All	100
Operable (A)	Fir, L, Py	> 60%	< 13	100
Operable (A)	PI, S	> 50%	< 13	100
Operable (A)	PI	> 60%	< 14.2	100

Data source and comments:

Operable areas are those parts of the Invermere TSA forested land base which are likely to be accessible for timber harvesting when considering ecological, economic and terrain factors.

The 'operability line' is reviewed periodically by forest district (MoF) staff based on input from industry. During these reviews, some areas are added and others are deleted from the operable classification. The most recent minor amendments to the operability line were made in 1997. Some harvesting above the operability line is proposed. However, district field staff indicate that there is likely an equivalent proportion of the land base currently designated as operable which, upon operational checking would be inoperable.

Currently, timber harvesting is not considered economically viable on steeper slopes and poorer sites. Table 9 lists the combined thresholds of site, species and slope used to netdown steep slope areas. District staff derived this data with input from licensees. A sensitivity analysis will be done to determine the effect on the timber supply forecast if harvesting were to occur on these areas.

5. Timber Harvesting Land Base Definition

5.2.12 Problem forest types

Problem forest types occupy sites that have the potential to produce merchantable timber, but currently are not utilized due to marginal economics (low volumes and/or quality).

Table 10. Problem forest types criteria

PFT #	Type group	Species	Slope	Age (years)	Height class	Stocking class	Site index (m @ 50 years)	Per cent (%) excluded
1	1, 8, 32-34	Fir, L, Py	All	81 to 120	1, 2	0	< 12.0	100
2	28-31	PI leading	> 30%	41 to 60	1, 2	0	< 16.0	100
3	28-31	PI leading	All	61 to 80	1, 2	0	< 13.5	100

Data source and comments:

All problem forest types will be tracked separately in the model to facilitate sensitivity analyses.

Hugh Hamilton Limited did a problem forest type (PFT) inventory during 1998 which helped guide the PFT definitions. The objective of the inventory was to avoid applying percentage land base exclusions to stand types and determine if specific stands should either be totally included or totally excluded. The project is ongoing and when completed, will refine the thresholds for identifying PFTs and separate the marginally productive stands from the problem stands for the next timber supply review.

Height classes 1 and 2 represent heights of 19.4 metres and less. Stocking class 0 is the code applied to undisturbed immature stands.

5.2.13 Cultural heritage resource reductions

Cultural heritage values include archaeological sites and traditional uses of the land. Archaeological overview assessments (AOA) have been completed for various landscape units in the Invermere TSA. The AOAs classify areas according to high, medium or unranked archaeological potential. Archaeological impact assessments are required in areas identified as medium or high potential prior to proceeding with development. These assessments have resulted in deferral from harvest of a very small portion (less than 10 hectares) of some of the areas classified as having high or medium archaeological potential. Based on current practices, the area of harvest deferred for archeological values is minimal across the timber harvesting land base, and no exclusions will be made for this TSR.

A Traditional Use Study (TUS) is currently being conducted by the Ktunaxa / Kinbasket Tribal Council which will provide extensive information on the traditional uses of the Ktunaxa / Kinbasket peoples. At this time, the district has not been made aware of specific traditionally used resources which are in scarce supply and would require restrictions in timber harvest to provide for future use.

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 11. Utilization levels

Analysis unit	Minimum dbh (cm)	Maximum stump height (cm)	Minimum top dib (cm)
Lodgepole pine	12.5	30	10
All other species	17.5	30	10

Data source and comments:

These levels reflect current interior utilization standards, licence requirements and current performance. Cedar is utilized to a minimum top diameter of 20 cm, but comprises a very minor portion of the timber in the TSA, so the difference is considered inconsequential in the analysis.

6.1.2 Minimum harvestable age derivation

Minimum harvestable ages (MHAs) provide an estimate of the minimum age a stand must reach before it can be harvested. Tables 12 and 13 provide statistics related to the definition of MHAs for existing and regenerated stands.

6. Current Forest Management Assumptions

Table 12. Minimum harvestable age criteria for existing natural stands using VDYP

Analysis unit	Species	SI range (m @ 50 years)	Slope (%)	Minimum volume (m³/hectare)				Minimum average DBH (cm)				Culmination age (max MAI)	95% of max MAI age	MHA for analysis
				≤ 40% Slope		>40% Slope		≤ 40% Slope		>40% Slope				
				Volume	Age	Volume	Age	DBH	Age	DBH	Age			
01	Fd/Py	> 15.5	—	100	58	250	110	22.5	55	27.5	81	100	80	100
02	Fd/Py	13-15.5	—	100	72	250	162	22.5	60	27.5	92	120	90	120
03	Fd/Py	< 13	—	100	92	250	250	22.5	69	27.5	105	130	100	100
04	Larch	> 17	—	200	82	250	98	22.5	50	27.5	86	110	80	100
05	Larch	13.5-17	—	200	113	250	140	22.5	66	27.5	104	130	100	120
06	Larch	< 13.5	—	200	>300	250	>300	22.5	80	27.5	130	140	120	120
07	Spruce, balsam	> 15	—	150	65	250	90	22.5	53	27.5	79	100	80	100
08	Spruce, balsam	12-15	—	150	83	250	125	22.5	65	27.5	95	120	90	120
09	Spruce, balsam	< 12	—	150	118	250	180	22.5	88	27.5	128	160	130	130
10	Cedar, hemlock	All	—	200	110	250	139	22.5	58	27.5	87	90	75	90
11	Lodgepole pine – flat	> 16	≤ 40	150	58	—	—	17.5	46	—	—	90	65	65
21	Lodgepole pine – steep	> 16	> 40	—	—	250	88	—	—	22.5	87	90	65	85
12	Lodgepole pine – flat	13-16	≤ 40	150	75	—	—	17.5	58	—	—	110	80	80
22	Lodgepole pine – steep	13-16	> 40	—	—	250	118	—	—	22.5	108	110	80	105
13	Lodgepole pine – flat	< 13	≤ 40	150	108	—	—	17.5	75	—	—	130	110	90
23	Lodgepole pine – steep	< 13	> 40	—	—	250	250	—	—	22.5	137	130	110	125
31	Part cut FdLwPy > 30%	> 16	≤ 40	100	58	250	110	22.5	50	27.5	76	100	70	95
32	Part cut FdLwPy > 30%	13-16	≤ 40	100	72	250	162	22.5	58	27.5	89	120	90	115
33	Part Cut FdLwPy > 30%	< 13	≤ 40	100	92	250	250	22.5	68	27.5	105	140	110	105

6. Current Forest Management Assumptions

Table 13. Minimum harvestable age criteria for regenerated stands using TIPSy

Analysis unit	Species	SI range (m @ 50 years)	Slope (%)	Culmination age (max MAI)	95% of max MAI age	MHA for analysis
101	Fd/Py	> 15.5	—	100	75	100
102	Fd/Py	13–15.5	—	120	85	110
103	Fd/Py	< 13	—	130	110	110
104	Larch	> 17	—	110	75	110
105	Larch	13.5–17	—	130	95	120
106	Larch	< 13.5	—	140	125	120
107	Spruce, balsam	> 15	—	100	80	100
108	Spruce, balsam	12–15	—	120	90	110
109	Spruce, balsam	< 12	—	160	120	120
110	Cedar, hemlock	All	—	90	65	80
111	Lodgepole pine — flat	> 16	≤ 40	90	60	70
121	Lodgepole pine — steep	> 16	> 40	90	60	80
112	Lodgepole pine — flat	13–16	≤ 40	110	75	80
122	Lodgepole pine — steep	13–16	> 40	110	75	100
113	Lodgepole pine — flat	< 13	≤ 40	130	110	110
123	Lodgepole pine — steep	< 13	> 40	130	110	130
131	Part cut FdLwPY > 30%	> 16	≤ 40	100	75	95
132	Part cut FdLwPY > 30%	13–16	≤ 40	120	85	115
133	Part cut FdLwPY > 30%	< 13	≤ 40	140	110	115

Data source and comments:

The criteria considered to define minimum harvestable ages (MHAs) for existing mature forest (Table 12) were: minimum volume per hectare, minimum piece size, and achievement of 95% of culmination mean annual increment (MAI). MHA criteria were area-weighted for each specific analysis unit and a final MHA chosen. The choices were based on local experience, including different expectations regarding the different product types and values from various sites and species.

The criteria used to choose MHAs for regenerated stands in Table 13 were culmination age, age at 95% of maximum MAI, as well as site class of specific species.

6. Current Forest Management Assumptions

6.1.3 Harvest scheduling priorities

For the Invermere TSA, the Forest Service Simulator (FSSIM) timber supply model will select stands to harvest based on relative oldest first (highest priority given to stands that are furthest above their respective MHA). Current management of harvest priority may more closely resemble a random distribution of ages above the minimum harvest age rather than relative oldest first. Sensitivity analysis will examine the effect of using a random stand selection in the model.

6.1.4 Logging methods and silviculture systems

Table 14. *Harvesting methods trends*

Harvest system	Percentage of harvest by area (%)	
	1987 to 1998	1996 to 1998
Ground based	91.1	91.2
Cable	8.7	8.6
Helicopter	0.04	0.2
Horse	0.2	0

Table 15. *Silviculture system trends*

	Percentage of harvest by area (%)	
	1987 to 1998	1996 to 1998
Clearcut	46.7	30.6
Clearcut with reserves	4.9	15.5
Seedtree	20.4	7.5
Shelterwood	19.8	44.1
Selection	8.2	2.3

Data source and comments:

The data in these tables was generated from the Forest Tenure Administration System (FTAS) and the Integrated Silviculture Information System (ISIS). It is current to April 1999 and is provided for information only.

6. Current Forest Management Assumptions

6.2 Unsalvaged losses

This section provides an estimate of average annual volume of timber on the timber harvesting land base that is damaged or killed and not salvaged. These losses are attributable to a number of factors which result in tree mortality including: insects, disease, blowdown, snowdown, and wildfires.

Table 16. Estimated average annual unsalvaged loss in the timber harvesting land base

Cause of tree mortality	Average annual unsalvaged loss in the timber harvesting land base (m ³ per year)
Mountain pine beetle	11 664
Spruce bark beetle	38
Douglas-fir bark beetle	108
Balsam bark beetle	302
Armillaria ostoyae	6 192
Dwarf mistletoe	1 763
Catastrophic blowdown / snow damage — mature stands	330
Non-catastrophic in-block blowdown / snowdown immediately adjacent to logged stands	5
Non-catastrophic in-block blowdown / snowdown immediately adjacent to roads	27
Wildfires	5 882
Total	26 311

Data source and comments:

All unsalvaged losses noted in the above table occur on the timber harvesting land base. Information regarding unsalvaged losses was collected from forest district staff, forest health overview flight maps, Forest Insect Disease Surveys (FIDS), wildfire maps, industry and Small Business Forest Enterprise Program (SBFEP) forest development plan maps, wildfire reports from the protection fire reporting system, and various other sources. Wherever possible, reliable data from as many years as possible was used to determine the extent of total losses to each causal agent. Where possible, the most current salvage logging performance of the forest licensees and SBFEP was deducted from the average historical losses to determine an estimate of losses. Local knowledge, estimates from staff, and professional judgment are a key part of the estimates of unsalvaged losses. The degree to which VDYP may or may not account for different types of unsalvaged losses (*Measurement of Pest Killed Timber*; Henningman, 1997) was considered. Future forest composition, species age class distribution and improved future access were also considered.

6. Current Forest Management Assumptions

6.3 Silviculture

6.3.1 Silviculture and regeneration activities

The silviculture program guides the mix of treatments to be carried out in the Invermere TSA. Table 17 shows the proportion of each analysis unit to be treated under each silviculture regime and the expected average regeneration delay.

Recent plantations and future stands will be grown on managed stand yield tables (MSYT) which will be produced from 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.

6. Current Forest Management Assumptions

Table 17. Regenerated stand assumptions by analysis unit

Analysis unit	Species description	Site index range (m @ 50 years)	Regen method A = artificial N = natural	% of analysis unit by method	Regen delay (years)	OAF 1 (%)	OAF 2 (%)	Regen species (%)	Initial density (stems per ha – sph)	Thinning density (sph)
101	Fir/Py	> 15.5	A	50	3	15.0	10.8	Lw 40/F 30/PI 30	1600	1800
			N	30		20.0		F 60/Lw 30/PI 10	5000	
			N	20		20.0		F 60/Lw 30/PI 10	3500	
102	Fir/Py	13 – 15.5	A	30	3	15.0	10.8	Lw 40/F 30/PI 30	1600	1800
			N	40		20.0		F 60/PI 30/Lw 10	5000	
			N	30		20.0		F 60/PI 30/Lw 10	3500	
103	Fir/Py	< 13	A	50	3	15.0	8.2	Py 65/F 25/PI 10	1600	1800
			N	25		20.0		F 60/Py 30/PI 10	5000	
			N	25		20.0		F 60/Py 30/PI 10	3500	
104	Larch	> 17	A	40	3	15.0	5.0	Lw 55/F 35/10 PI	1600	1800
			N	60				Lw 60/F 35/PI 5	5000	
105	Larch	13.5 – 17	A	40	3	15.0	5.0	Lw 55/F 35/PI 10	1600	1800
			N	30		20.0		Lw 60/F 35/PI 5	5000	
			N	30				Lw 60/F 35/PI 5	3500	
106	Larch	< 13.5	A	30	3	15.0	5.0	Lw 60/F 35/PI 5	1600	1800
			N	40		20.0		Lw 60/F 35/PI 5	5000	
			N	30				Lw 60/F 35/PI 5	3500	
107	Spruce, balsam	> 15	A	70	3	15.0	5.0	S 60/BI 20/PI 20	1600	1800
			N	30				BI 50/S 30/PI 20	5000	
108	Spruce, balsam	12 – 15	A	50	3	15.0	5.0	S 50/BI 20/PI 30	1600	1800
			N	20				BI 60/S 30/PI 10	5000	
			N	30				BI 60/S 30/PI 10	3500	
109	Spruce, balsam	< 12	A	70	3	15.0	5.0	BI 40/S 30/PI 30	1600	1800
			N	30				S 60/BI 30/PI 10	5000	
110	Cedar, hemlock	All	A	80	3	15.0	5.0	PI 50/S 50	1600	1800
			N	20				PI 30/S 40/C 30	5000	
111	Lodgepole pine	> 16	A	50	3	15.0	8.7	PI 40/Lw 30/F 30	1600	1800
121			N	30		20.0		PI 90/Lw 5/F 5	5000	
			N	20		20.0		PI 90/Lw 5/F 5	4000	
112	Lodgepole pine	13 – 16	A	25	3	15.0	8.7	PI 30/Lw 40/F 30	1600	1800
122			N	40		20.0		PI 90/Lw 5/F 5	5000	
			N	35		20.0		PI 90/Lw 5/F 5	4000	
113	Lodgepole pine	< 13	A	25	3	15.0	8.7	PI 30/Lw 40/F 30	1600	1800
123			N	40		20.0		PI 90/Lw 5/F 5	5000	
			N	35		20.0		PI 90/Lw 5/F 5	4000	
131	Partial cut – FdLwPy > 30%	> 16	N	100	N/A	15.0	5.0	F 60/Lw 25/PI 15	1600	
132	Partial cut – FdLwPy > 30%	13 – 16	N	100	N/A	15.0	5.0	F 60/Lw 25/PI 15	1600	
133	Partial cut – FdLwPy > 30%	< 13	N	100	N/A	15.0	5.0	F 60/Lw 25/PI 15	1600	

6. Current Forest Management Assumptions

Data source and comments:

Most of the values in the above tables are estimates by local staff based on information about previous stand types and site index.

Existing stands over 30 years old will be assigned to VDYP curves for the first rotation, and then moved to TIPSYS managed yield curves for subsequent rotations.

In the Trench Plan Ecosystem Restoration zone, all future regenerated stands will be managed on a continuous selection harvest regime to promote open forest conditions. Under this regime, 15% of the volume from the managed stand yield (TIPSYS) table will be harvested every 45 years.

Operational adjustment factor (OAFs) values are applied to the managed stand yield curves as recommended by the Ministry of Forests, Research Branch. The standard default value of OAF 1, which accounts for stocking gaps in stands, is 15%. The standard default value of OAF 2, which accounts for breakage and waste (2%) and decay (3%), is 5%. OAF 1 has been increased by 5% in analysis units where seed tree silviculture systems are prevalent. OAF 2 has been increased in analysis units by up to 5.8% to account for losses due to *Armillaria ostoyae*. Additional losses due to *Phelinus weirii*, *Tomentosus* root rot, Black Stain root disease, Spruce leader weevil, Pine leader weevil, Pine needle cast, *Elytroderma* needle disease, Douglas-fir needle cast, Western gall rust, White pine blister rust, *Comandra* blister rust, Stalactiform blister rust, Warren's root collar weevil, Turpentine beetle, and animal damage (porcupine, vole, bear, ungulates, rabbit, squirrel) likely exist. The relevance and magnitude of each of these growth loss factors varies by analysis unit. Quantification of losses due to these insects and diseases is very difficult and no additional increases in OAFs to account for these insects and diseases have been included.

These OAFs do not account for losses due to root disease in existing mature stands. Losses in existing mature stands will be accounted for as unsalvaged losses, (see Section 6.2, "Unsalvaged losses").

The final OAFs will also reflect deductions for riparian management zones and wildlife tree patches (see Sections 5.2.7, "Riparian area" and 6.4.2, "Reduction to reflect volume retention in cutblocks").

A field review of current regeneration performance as part of the EFMPP determined that regeneration delay averages three years for all analysis units. Although legal commitments may range as high as nine years, in the case of the Slocan Forest Products (SFP) Memorandum of Understanding (MOU), the performance is expected to continue to average three years.

6.3.2 Not satisfactorily restocked areas (backlog NSR)

Not satisfactorily restocked (NSR) areas consist of current NSR and backlog NSR, as identified by type identity 4 or 9 in the TSA FIP file. Current NSR areas were logged or disturbed after October 1, 1987 and have legal reforestation obligations. Restocking of current NSR areas will be assumed to occur within the regeneration delays in Table 17. Backlog NSR areas were logged or disturbed before October 1, 1987, and do not have legally required reforestation obligations. Backlog NSR areas in this report were derived from the ISIS database. All NSR remains in the timber harvesting land base.

Table 18. Not satisfactorily restocked (NSR) areas grouped by stocking level

Total backlog NSR in ISIS database (hectares)	Untreatable backlog NSR (hectares)	Restocked in 1-9 years from now (hectares)
2 121	930	1 191

6. Current Forest Management Assumptions

Data source and comments:

The district silviculture data (ISIS) indicates that there are 2121 hectares of backlog NSR. The difference (if any) between the operable portion of this area and the amount of operable NSR on the inventory file will be assumed to have already been restocked.

Approximately 930 hectares of the backlog NSR areas identified in the ISIS database will not be operationally feasible to restock due to unplantable ground (shallow soils, extensive exposed rock and/or talus, excessive debris), or a lack of economic viability (inaccessible, too small to treat, too expensive to treat, etc.). Much of this area should be reclassified from NSR to NP Burn in the next re-inventory.

Of the 1191 hectares of treatable NSR, approximately 400 hectares are close to required stocking levels and will be left to restock naturally. This area should become SR by the time of the next survey. A further 390 hectares of NSR was planted in 1999. This leaves only 401 hectares of backlog NSR which will require treatment. For this analysis it will be treated as current NSR due to the limited extent of the problem (i.e., assigned species from ISIS and standard regeneration delay).

6.3.3 Not satisfactorily restocked areas (current NSR)

Current NSR areas were assigned to analysis units using ISIS source data linked to the forest inventory by the opening number. It is assumed that all current NSR areas will be regenerated within the regeneration delay period. Current NSR areas total approximately 18 182 hectares. Contributing to this total is some administrative delay entering regen survey results, as well as recent wildfires.

6.3.4 Enhanced yields

Improved stock:

Currently, a narrow range of elevation site combinations have available genetically improved stock. A greater proportion of required stock will become available as seed orchards come on line, however, the benefits for future harvest levels are uncertain due in part to natural regeneration (intended or otherwise), and uncertain commitments toward establishing key seed orchards for the TSA. Therefore, the potential gains from improved seed will be examined using sensitivity analysis and will not be reflected in the base case.

Fertilization:

Forest fertilization has been practiced intermittently in the TSA. In 1996, 1500 hectares were completed. Future levels of forest fertilization are highly uncertain and fertilizer use is not assumed in base case future yields.

6.4 Integrated resource management

6.4.1 Forest cover requirements

As noted in Section 4.1, "Management zones, groups and multiple objectives," forest cover requirements will be applied to model management for a number of objectives. The role of non-contributing forest (forest that does not contribute to the timber harvesting land base) will be considered for some of the forest cover requirements (i.e., maximum allowable disturbance or minimum area retention). The forest cover requirements specified in Tables 19a and 19b (landscape biodiversity) apply to the total Crown forest area. All forest cover requirements in Table 19c, except for visual quality apply to the timber harvesting land base.

6. Current Forest Management Assumptions

Table 19a. *Blended¹ biodiversity forest cover requirements to be used if landscape units and biodiversity emphasis options (BEO) not established*

BEC	Non-disturbance types (NDT)	Time frame	Mature plus old minimum retention area (%)	Mature plus old minimum age (years)	Old seral minimum retention area (%)	Old seral minimum age (years)
ESSFdk	3	Now – 80years	15.8	121	10.5	141
ESSFwm	2	Now – 80years	0	121	6.7	251
ICHmk1	3	Now – 80years	15.8	101	10.5	141
IDFdm2	4	Now – 80years	24.1	101	9.7	251
MSdk	3	Now – 80years	17.7	101	10.5	141
PPdh2	4	Now – 80years	24.1	101	9.7	251
ESSFdk	3	81 – 160 years	18.0	121	12.6	141
ESSFwm	2	81 – 160 years	0	121	8.1	251
ICHmk1	3	81 – 160 years	18.0	101	12.6	141
IDFdm2	4	81 – 160 years	26.1	101	11.7	251
MSdk	3	81 – 160 years	19.8	101	12.6	141
PPdh2	4	81 – 160 years	26.1	101	11.7	251
ESSFdk	3	161+ years	20.1	121	14.7	141
ESSFwm	2	161+ years	0	121	9.4	251
ICHmk1	3	161+ years	20.1	101	14.7	141
IDFdm2	4	161+ years	28.1	101	13.6	251
MSdk	3	161+ years	21.9	101	14.7	141
PPdh2	4	161+ years	28.1	101	13.6	251

(1) Blended refers to a weighted average, assuming 45% of the unit will have lower biodiversity emphasis, 45% intermediate emphasis, and 10% higher. As per the LUPG, no mature and old target is used in NDT2.

6. Current Forest Management Assumptions

Table 19b. Biodiversity forest cover requirements to be used if landscape units (LU) and biodiversity emphasis options (BEOs) established

BEC	NDT	BEO	Mature + old minimum retention (%)	Mature + old minimum age (years)	Old seral minimum retention (%)	Old seral minimum age (years)
ESSFdk	3	High	34	121	21	141
ESSFdk	3	Moderate	23	121	14	141
ESSFdk	3	Low	14	121	14	141
ESSFwm	2	High	0 ^a	121	13	251
ESSFwm	2	Moderate	0	121	9	251
ESSFwm	2	Low	0	121	9	251
ICHmk1	3	High	34	101	21	141
ICHmk1	3	Moderate	23	101	14	141
ICHmk1	3	Low	14	101	14	141
IDFdm2	4	High	51	101	19	251
IDFdm2	4	Moderate	34	101	13	251
IDFdm2	4	Low	17	101	13	251
MSdk	3	High	39	101	21	141
MSdk	3	Moderate	26	101	14	141
MSdk	3	Low	14	101	14	141
PPdh2	4	High	51	101	19	251
PPdh2	4	Moderate	34	101	13	251
PPdh2	4	Low	17	101	13	251

(a) Reflects direction in *Landscape Unit Planning Guide* not to apply mature plus old seral requirements.

6. Current Forest Management Assumptions

Data source and comments:

Biodiversity management will be modelled using information from the *Landscape Unit Planning Guide* (LUPG). As per the *Regional Landscape Unit Planning Strategy*, it is anticipated that landscape units and biodiversity emphasis will be established prior to the Chief Forester's AAC determination. Table 19b of the data package will be used for the base case if landscape units (LU) and biodiversity emphasis options (BEO) have been formally established. Sensitivity analyses will examine the effect of the phase-in of seral requirements together with an assumed distribution of 45% low, 45% intermediate, and 10% high BEO across the TSA, as well as of the *KBLUPIS* draft biodiversity emphasis option. If LUs and BEOs have not been established by the district manager, the requirements shown in Table 19a (weighted average forest cover requirements) will be used for the timber supply analysis base case, which does not prejudge the outcome of this legal process. In that case, the requirements in Table 19b will be used in a sensitivity analysis.

In this analysis, the *Biodiversity Guidebook* seral stage requirements for mature plus old, and the *LUPG* requirements for old will first be met wherever possible from the non-contributing land base. Where LU boundaries extend into provincial park lands adjacent to the TSA, the park will not contribute to the timber harvesting land base, but will contribute to biodiversity forest cover.

A sensitivity analysis will also model the effects of implementing early seral requirements for biodiversity. Biodiversity forest cover requirements apply to all Crown forested land, both above and below the operability line. The forest not contributing to the timber harvesting land base within each landscape unit is assumed to age over the duration of the harvest forecast.

6. Current Forest Management Assumptions

Table 19c. Forest cover requirements for specific resource emphases

Resource emphasis	Green-up height (m)	Green-up age (years)	Maximum area < green-up age (%)	Mature age (years)	Minimum area > mature age (%)	Old forest age (years)	Minimum area > old age (%)
IRM ^a –adjacency	3	12	25	—	—	—	—
Ungulate winter range (UWR)	—	—	—	121	40	N/A	N/A
Caribou	—	—	—	141	30	251	10
Community watersheds	6	26	20	—	—	—	—
VQO — retention	4.0-8.5	24-39	5	—	—	—	—
VQO — partial retention	4.0-8.5	24-39	15	—	—	—	—
Trench	3	12	35	—	—	—	—

(a) Pine analysis units in the ESSF and partial harvest analysis units are exempt.

Data source and comments:

All constraints will be applied by landscape unit and resource emphasis zone.

Early seral requirements for biodiversity will not be modelled as part of the base case. The maximum area less than green-up age within the watershed zones represents hydrological green-up constraints. The maximum area less than green-up age within the VQO and recreation zones reflects current management practices limiting the area of recent disturbance.

The maximum area less than green-up age within the IRM zone is intended to model block adjacency constraints. The integrated resource management zone (IRM) encompasses that portion of that timber harvesting land base not occupied by any other zone or group, aside from biodiversity emphasis. Partial harvesting analysis units 31 – 33 and 131 – 133 are exempt from the green-up constraint, which reflects field operations.

To ensure an appropriate distribution of winter habitat, the *KBLUPIS* requires that each 250 to 500 hectare portion of ungulate winter range be managed as a discrete unit, with the forest cover requirements being met within each unit. This will not be modelled as part of the base case as it is beyond the resolution of the data. To ensure that the model reflects operational practices and that ungulate winter range is adequately distributed, the forest cover requirement will be applied on the timber harvesting land base portion of each landscape unit.

The visual quality objective (VQO) zones are wholly within the visually sensitive area "made known" in 1998. Licensees use the existing VQO inventory within this area to guide current management as evidenced in recent FDPs.

The *EFMPP Strategy Report* outlines the large patch pine strategy, which is currently being implemented in the TSA. Pine analysis units in the ESSF BEC zone are therefore exempt from green-up constraints. A limit on the annual harvest of pine will be applied in the model to correspond with current pine harvest rates.

6. Current Forest Management Assumptions

6.4.2 Reductions to reflect volume retention in cutblocks

Wildlife tree patches (WTPs) reserved within cutblocks operationally will be accounted for in the analysis. Tables A.3.1 and A.3.2 of the *Landscape Unit Planning Guide* recommend that the distance between WTPs within blocks does not exceed 500 metres. The guide also allows that any areas excluded from harvest for other reasons can serve as WTPs, and are expected to satisfy as much as 50% of this requirement. A GIS exercise will be used to determine the ratio of timber harvesting land base within 250 metres of all other forest areas outside the timber harvesting land base, except private land, specific to each analysis unit. The appropriate guidebook percentage will then be reduced to reflect the ratio and applied as an operational adjustment factor (OAF) to the volume curves. In general, WTPs are too small in size to contribute to landscape unit biodiversity.

7. Sensitivity Analyses

Sensitivity analysis provides a measure of the timber supply impact of uncertainty in management assumptions and/or data. By developing and performing a number of sensitivity analyses, it is possible to determine which variables most affect analysis results. The first table shows standard sensitivity analyses that are carried out for most TSAs, while the second table lists issues that are particular to the Invermere TSA.

Table 20. *Intended standard sensitivity analysis*

Issue to be tested	Sensitivity levels
Minimum harvestable age	± 10 years
Minimum harvestable age	Culmination age
Existing stand yields	$\pm 10\%$
Regenerated stand yields	$\pm 10 / 20\%$
Land base changes	$\pm 5 / 10\%$ of mature timber harvesting land base
Harvest priority	Test oldest first, youngest first, and random rules
Unsalvaged losses	Treat as a percentage of standing inventory
Unsalvaged losses	$\pm 50\%$
Regeneration delay	± 2 years
Green-up heights	± 1 metre
Adjacency green-up	± 5 years
Biodiversity — old-seral requirements in low emphasis areas	Apply full requirement immediately (no phase-in)
Biodiversity — early seral constraint	Apply early seral requirement
Old/mature guidebook ages	— Apply mature requirements in NDTs where not applied in base case — Do not apply mature requirements in NDTs where they are applied in base case
Resource emphasis zones	Test each zone with same forest cover requirement as in IRM zone
Old-growth site index (OGSI) yield adjustments	As per provincial adjustment factors

7. Sensitivity Analyses

Table 21. Intended sensitivity analysis related to issues specific to the Invermere TSA

Issue to be tested	Sensitivity levels
Partial harvest	Vary the rate of harvest in the partial harvest analysis units.
Large patch pine	Test with normal 3-metre green-up requirement.
Biodiversity	Apply biodiversity requirements by BEC variant to the entire forest district (not by LU) as per KBLUP.
Biodiversity	Apply biodiversity seral stage requirements to the operable area within each landscape unit, as well as to all forested area (i.e., "proportional representation").
Land base	Include steep slopes (turn off steep slope netdown).
Species mix	Limit harvest in various analysis units to current harvest levels.
Commercial thinning	Assume commercial thinning in candidate stands as derived by district staff.
Forest ecosystem networks (FENs)	Treat mapped FENs as a distinct zone with a harvest deferral, with some partial harvesting of old growth allowed.
Unsalvaged losses	Increase unsalvaged losses by 19 786 cubic metres in the first 70 years to account for <i>Armillaria</i> root rot.

Data source and comments:

These sensitivity analyses were identified as issues in Table 1, "Major forest management considerations and issues" or requested by staff during the formulation of this document. Other sensitivity analyses may be performed if considered a priority based on preliminary analysis results.