Cranbrook Timber Supply Area
Timber Supply Review

Data Package

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1. Introduction

This data package outlines the basic information and assumptions that are required for the Cranbrook 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 policy.

Current performance forms the basis of the data package. 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 needed to model the specified management practices;
2) Data table;
3) The source of the data and comments.

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

2. Current Forest Management Considerations and Issues

2.1 Base case management assumptions

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

The *Kootenay-Boundary Land Use Plan Implementation Strategy* has been approved by government as a policy statement. The District Manager of the Cranbrook Forest District has provided direction to licensees for the preparation of forest development plans in 1998. This direction is consistent with the *Kootenay-Boundary Land Use Plan* (KBLUP) 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, a timber supply assessment will be made. In cases of important uncertainties in defining current management, critical issues analysis may be done. Also, it may be difficult to quantify some issues for computer modelling. In such cases, standard sensitivity analysis may assist the Chief Forester is his AAC determination.

2. Current Forest Management Considerations and Issues

Table 1. Major forest management considerations and issues

Consideration / issue	Description
Growth and yield	
Growth of high elevation forests	At high elevations, forest stands are often characterized by slow growth, due to short growing seasons and frequent damage due to heavy snow-loading and other harsh environmental conditions. These concerns are considered in this timber supply review by establishing a separate analysis unit for stands growing above 1800 metres in elevation and applying representative growth and yield curves to them for sensitivity analysis, to examine the importance of these stands to timber supply.
Root rot	Growth of stands is significantly affected by a type of root rot called *Armillaria ostoyae* (Armillaria). In general, it is believed that timber yields projected for existing stands over 30 years old by the variable density yield prediction (VDYP) model account for volume losses to diseases such as *Armillaria*; therefore no unsalvaged losses have been attributed to this disease. However, concerns that VDYP may not capture all of the losses caused by *Armillaria* will be considered in this timber supply review through a sensitivity analysis. For the sensitivity analysis the unsalvaged loss estimate will be increased by 19 786 cubic metres/year which is the current estimate of loss to *Armillaria* on the timber harvesting land base in the Cranbrook Forest District. An operational adjustment factor (OAF 2) of 2% will be applied to account for growth losses due to *Armillaria* in managed stands.
Size of the timber harvesting land base	
Problem forest types	The major problem forest types identified in the last timber supply review, were re-examined through extensive, statistically-designed field work. The merchantability and/or potential merchantability of each sampled stand within each problem forest type was examined, allowing a much more accurate determination of the percentage of the previously defined problem forest types that should be classified as a problem forest type.
Kootenay-Boundary land use plan implementation strategy	The *Kootenay-Boundary Land Use Plan Implementation Strategy* has been approved by the provincial government. All aspects of this strategy are considered to be current management, except for biodiversity emphasis implementation which requires the formal establishment of landscape unit objectives under the Forest Practices Code before being integrated into the base case. This is expected to occur in June 1999.

(continued)

2. Current Forest Management Considerations and Issues

Table 1. Major forest management considerations and issues

Consideration / issue	Description
Biodiversity, ungulate and riparian habitat	
Landscape-level biodiversity	For analysis purposes, a weighted biodiversity emphasis option assignment is used. A sensitivity analysis will be conducted to reflect *Kootenay-Boundary Land Use Plan Implementation Strategy* biodiversity emphases and the pending landscape unit (LU) objectives.
Stand-level biodiversity	The wildlife tree requirements specified in a sample of current silviculture prescriptions will be assumed to represent current practice.
Ungulate winter range (UWR) (other than Caribou)	Winter range areas for ungulates other than caribou have been updated for this timber supply review as per the *Kootenay-Boundary Land Use Plan Implementation Strategy* and will be modelled as per the KBLUP guidelines. A sensitivity analysis will examine the effects of the pending revisions to the UWR guidelines.
Caribou habitat	Caribou habitat management will be modelled as outlined in the *Kootenay-Boundary Land Use Plan Implementation Strategy*.
Riparian habitats	Riparian management area (RMA) classifications have been determined from existing stream inventories where available. Where stream inventories do not exist, RMA classifications were estimated in a geographic information system (GIS) modelling exercise based on the watershed atlas. Riparian reserve and riparian management zone widths have been applied as per the Forest Practices Code (FPC) requirements.
Hydrological concerns	Hydrological considerations may be a concern in some areas with extensive past harvesting or road building, potentially limiting the timing of future harvest. Within community and domestic watersheds, equivalent clearcut area (ECA) limits and interior watershed assessment procedure restrictions will be modelled. In other areas, forest cover requirements for biodiversity and other resource emphasis values are assumed to be sufficient to address general hydrological concerns

(continued)

2. Current Forest Management Considerations and Issues

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

Consideration / issue	Description
Fire maintained ecosystem restoration	The KBLUP calls for a Fire Maintained Ecosystem Restoration (FMER) program which has the objective of converting areas of generally overstocked forest in areas subject to frequent stand-maintaining fires (natural disturbance type (NDT) 4) to a mosaic of open range, open forest, and managed forest in defined proportions. The target vegetation cover has been spatially defined through a GIS process. The conversion of the existing vegetation cover to the target vegetation cover will be modelled using specific management zones, and analysis units for open forest and open range conversion areas.

3. Inventories

3.1 Background information

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

Table 2. Inventory information

Data	Source	Vintage	Update	Source scale
Cranbrook TSA forest cover FC1 files	Ministry of Forests (MoF) standard inventory files	1992	1996/12/31	1:20,000
Provincial park forest cover except for mapsheets 82F097, 82F098, 82F099	MoF standard inventory files	1992	1996/12/31	1:20,000
Provincial park forest cover for mapsheets 82F097, 82F098, 82F099 only	KBLUP file — regional non-standard inventory file	06/95	05/97	1:50,000
Fire Maintained Ecosystem Restoration (FMER)	MoF District non-standard inventory files	1998		1:20,000
Caribou habitat	KBLUP file — regional non-standard inventory file	05/97		1:50,000
Ungulate winter range (other than caribou)	MoF District non-standard inventory files	1979	1998	1:20,000
Community watersheds and domestic watersheds	Planning cell lists based on Ministry of Environment, Lands and Parks (MELP) Watershed Atlas	1997	N/A	1:20,000
Draft landscape unit boundaries	Cranbrook Forest District mapping based on planning cells	1996	1997	1:20,000
Riparian management areas	GIS project by GeoSense Consulting using MELP watershed atlas	1998		1:50,000
Visual landscape inventory	MoF standard landscape inventory files	1993	1993	1:20,000
Recreation inventory	MoF standard recreation inventory files	1993	1998	1:50,000
Draft biodiversity emphasis	Defined by planning cell as per KBLUP, former MoF-MELP MOU, and current FDP instructions	10/96	1997	1:20,000
Slope, elevation, aspect	KBLUP file — regional non-standard inventory file created from NAD83 TRIM files (20 metre pixel resolution)	05/97		1:20,000
KBLUP resource management zones	KBLUP file — regional non-standard inventory file	05/97		1:50,000

3. Inventories

Data source and comments:

The photo interpretation and field work for the Cranbrook TSA forest cover re-inventory was completed in 1992 to the NAD83 TRIM base. The last forest cover update includes changes to forest cover up to December 31, 1996 reflecting timber harvesting, wildfire, the re-establishment of commercial tree species, and forest growth. The updates also included the review and updating of planning cell boundaries, and the ownership level.

The update includes the addition of Galloway Lumber Company Limited's TFL which reverted back to the Cranbrook TSA.

With the exception of those portions of the Purcell Wilderness Conservancy and St. Mary's Alpine Park which are on mapsheets 82F097, 82 F098, and 82F099, all the protected areas in the Cranbrook Forest District have forest cover information in the standard forest inventory file. The forest cover information for those portions of the Purcell Wilderness Conservancy and St. Mary's Alpine Park which are on mapsheets 82F097, 82F098, and 82F099 is available from the *Kootenay-Boundary Land Use Plan* (KBLUP) files. Forested area in parks does not contribute to the area available for harvest, but it does contribute to the total forest cover area that is used to calculate seral-stage targets for biodiversity.

The caribou habitat mapping is derived from the approved *Kootenay-Boundary Land Use Plan Implementation Strategy*.

The linework for the ungulate winter range is based on the *Kootenay-Boundary Land Use Plan Implementation Strategy* and was further refined in 1998 to more accurately correspond to the existing wildlife biophysical inventory.

Draft biological diversity emphasis options are outlined in the *Kootenay-Boundary Land Use Plan Implementation Strategy*.

In 1997 separate visual landscape and recreation inventories were done for the Cranbrook TSA but are not available in the appropriate digital standard for this timber supply review. The existing recreation resultant level from the forest inventory will be used for the analysis.

Draft landscape unit boundaries are those determined jointly by the Ministry of Forests (MoF) and the Ministry of Environment, Lands and Parks (MELP) for the purposes of administering according to the *Biodiversity Guidebook* and to assist strategic planning. These landscape unit boundaries, although not formally established by the forest district manager at the time of writing this report, have been in place for some years. The forest district manager has made reference to these boundaries in his last two sets of development plan instructions to licensees. In all, 38 landscape units have been delineated within the Cranbrook TSA and are defined as groups of planning cells. It is expected that these landscape units and the KBLUP biodiversity emphasis options for these units will be formally established by June 30th, 1999.

Riparian management areas — this non-standard layer contains streams, wetlands and lakes that have been classified by a consultant as per Forest Practices Code classifications. This layer will be used for determining areas in riparian reserve zones and riparian management zones.

4. Division of the Area into Management Zones

4.1 Management zones and tracking of multiple objectives (grouping)

Management zones are used to differentiate areas with distinct management emphasis. For example, a management zone may be based on a harvesting system, silviculture system, visual quality objective (VQO), or wildlife consideration. The forest cover data set can also be grouped by different variables. In addition, the non-contributing forest (land considered unavailable for timber harvesting) may be included for consideration in attaining forest cover objectives. Grouping enables application of management requirements to different combinations of variables or zones. Groups may be thought of as different objectives that may be tracked over time. Whether to put an objective into a group, the area of which could overlap with other groups, or into a mutually exclusive management zone will be decided after data assessment by the timber supply analyst.

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

4. Division of the Area into Management Zones

Table 3. Objectives to be tracked

Group level	Description	Inventory definition	Function
1	Timber harvesting land base by landscape unit (LU) and licensee operating area	Defined by planning cells found in FC1 file on level 24.	Reporting purposes. Provide an assessment of the total timber harvesting land base by landscape unit and licensee operating area. All timber harvesting land base included.
2	All forested land by landscape unit (LU) and licensee operating area	Defined by planning cells found in FC1 file.	Reporting purposes. Provide an assessment of the total forest by landscape unit and licensee operating area. All Crown forested area included.
3	Biodiversity — all forest	Biogeoclimatic ecosystem classification (BEC) defined in FC1 file.	Provides a means to model biodiversity management at the LU / operating area / biodiversity emphasis / biogeoclimatic subzone-variant level. All Crown forested area included.
4	Caribou	From MELP data — non-standard mapped layer.	Resource emphasis areas — Caribou ESSF and ICH. Provides a means to model caribou guidelines by BEC and LU. All Crown forested area included.
5	Watersheds	Defined by list of planning cells using MELP watershed atlas.	Resource emphasis areas — community and domestic watersheds. Provides a means to model watershed guidelines by LU. All Crown forested area included.
6	Visual quality	Defined by visual quality objective (VQO) attribute in the FIP file.	Resource emphasis areas — visual quality. Provides a means to model VQO guidelines by VQO by LU. All Crown forested area included.

(continued)

Table 3. Objectives to be tracked (concluded)

Group level	Description	Inventory definition	Function
7	Recreation	Defined by management class and feature significance attributes in FIP file.	Resource emphasis areas — high value recreation. Provides a means to model recreation management guidelines by recreation inventory sensitivity rating by LU. All Crown forested area included.
8	Ungulate winter range (UWR)	From MELP data — non-standard mapped layer.	Resource emphasis area — ungulate winter range (UWR). Provides a means to model UWR guidelines by LU. All Crown forested area included.
9	Integrated resource management (IRM)	All other areas where harvesting operations are not constrained for specific resource management issues such as watersheds, wildlife, and visual quality.	Resource emphasis area — integrated resource management (IRM). Provides a means to model cutblock adjacency restrictions on remaining areas by LU. Only timber harvesting land base included.
10	Fire maintained ecosystem restoration (FMER)	Defined by non-standard map layer.	Resource emphasis areas — fire maintained ecosystem restoration: open range, open forest, managed forest. Provides a means to model the KBLUP FMER guidelines. All Crown forested area included.
11	KBLUP resource management zones	Non-standard mapped layer.	For reporting purposes only.
12	Steep slopes	From TRIM data.	For reporting purposes only.

Data source and comments:

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

4. Division of the Area into Management Zones

4.2 Analysis units

An analysis unit represents a grouping of forest stands that grow similarly. Each analysis unit is composed of groups of forest stands that have similar tree species composition (as indicated by the inventory type group) and similar timber growing capability (as indicated by the site index in the forest inventory file). Each analysis unit is assigned its own timber volume projection (growth curves) for existing stands, and for future stands.

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

Table 4. Definition of analysis units

Analysis unit	Species description	Site index range (m@50 years)	Inventory type groups	Elevation (metres)	Slope (%)	Age @ 96-12-31	Comments
0111	Pl (pure)	> 19	28	< 1800	< 40	> 30	
0121	Pl (pure)	14-19	28	< 1800	< 40	> 30	
0131	Pl (pure)	10 – < 14	28	< 1800	< 40	> 30	
0112	Pl (pure)	> 19	28	< 1800	40 +	> 30	
0122	Pl (pure)	14-19	28	< 1800	40 +	> 30	
0132	Pl (pure)	12 – < 14	28	< 1800	40 +	> 30	
0161	Pl (pure)	10+	28	< 1800	< 40	≤ 30	TIPSY
0162	Pl (pure)	12+	28	< 1800	40 +	≤ 30	TIPSY
0211	Pl (leading), Pa	> 19	29-31, SPCS1=Pa	< 1800	< 40	> 30	
0221	Pl (leading), Pa	14-19	29-31, SPCS1=Pa	< 1800	< 40	> 30	
0231	Pl (leading), Pa	10 – < 14	29-31, SPCS1=Pa	< 1800	< 40	> 30	
0212	Pl (leading), Pa	> 19	29-31, SPCS1=Pa	< 1800	40 +	> 30	
0222	Pl (leading), Pa	14-19	29-31, SPCS1=Pa	< 1800	40 +	> 30	
0232	Pl (leading), Pa	12 – < 14	29-31, SPCS1=Pa	< 1800	40 +	> 30	
0251	PFT – Pl leading	10+	28-31	< 1800	< 40	> 30	PFT extended rotation
0252	PFT – Pl leading	12+	28-31	< 1800	40 +	> 30	PFT extended rotation
0255	PFT – Pl leading	10+	28-31	< 1800	All	≥ 30	"True" PFT (see Section 5.2.12)
0261	Pl (leading), Pa	10+	29-31, SPCS1=Pa	< 1800	< 40	≤ 30	TIPSY
0262	Pl (leading), Pa	12+	29-31, SPCS1=Pa	< 1800	40 +	≤ 30	TIPSY
0298	Open forest with Pl leading	10+	28-31	< 1800	All	> 30	
0311	SB types, FS, Pw	> 19	4, 18-26, 27 (SPCS1=Pw)	< 1800	< 40	> 30	
0321	SB types, FS, Pw	14-19	4, 18-26,27 (Pw leading only)	< 1800	< 40	> 30	
0331	SB types, FS, Pw	8 – < 14	4, 18-26, 27 (Pw leading only)	< 1800	< 40	> 30	
0312	SB types, FS, Pw	> 19	4, 18-26, 27 (Pw leading only)	< 1800	40 +	> 30	

(continued)

4. Division of the Area into Management Zones

Table 4. Definition of analysis units

Analysis unit	Species description	Site index range (m@ 50 years)	Inventory type groups	Elevation (metres)	Slope (%)	Age @ 96-12-31	Comments
0322	SB types, FS, Pw	14-19	4, 18-26, 27 (Pw leading only)	< 1800	40 +	> 30	
0332	SB types, FS, Pw	8 – < 14	4, 18-26, 27 (Pw leading only)	< 1800	40 +	> 30	
0361	SB types, FS, Pw	8+	4, 18-26, 27 (Pw leading only)	< 1800	< 40	≤ 30	TIPSY
0362	SB types, FS, Pw	8+	4, 18-26, 27 (Pw leading only)	< 1800	40 +	≤ 30	TIPSY
0411	Larch (leading)	> 19	33, 34	< 1800	< 40	> 30	
0421	Larch (leading)	14-19	33, 34	< 1800	< 40	> 30	
0431	Larch (leading)	10 – < 14	33, 34	< 1800	< 40	> 30	
0412	Larch (leading)	> 19	33, 34	< 1800	40 +	> 30	
0422	Larch (leading)	14-19	33, 34	< 1800	40 +	> 30	
0432	Larch (leading)	10 – < 14	33, 34	< 1800	40 +	> 30	
0461	Larch (leading)	10+	33, 34	< 1800	< 40	≤ 30	TIPSY
0462	Larch (leading)	10+	33, 34	< 1800	40 +	≤ 30	TIPSY
0498	Open forest with larch leading	10+	33,34	< 1800	All	> 30	
0511	Fir (leading)	> 19	1, 5, 7, 8	< 1800	< 40	> 30	
0521	Fir (leading)	14-19	1, 5, 7, 8	< 1800	< 40	> 30	
0531	Fir (leading)	10 –< 14	1, 5, 7, 8	< 1800	< 40	> 30	
0512	Fir (leading)	> 19	1, 5, 7, 8	< 1800	40 +	> 30	
0522	Fir (leading)	14-19	1, 5, 7, 8	< 1800	40 +	> 30	
0532	Fir (leading)	13 –< 14	1, 5, 7, 8	< 1800	40 +	> 30	
0551	PFT – Fir (leading)	10+	1, 5, 7, 8	< 1800	< 40	> 30	PFT extended rotation
0552	PFT – Fir (leading)	13+	1, 5, 7, 8	< 1800	40 +	> 30	PFT extended rotation
0555	PFT – Fir (leading)	10+	1, 5, 7, 8	< 1800	All	> 30	"True" PFT (see Section 5.2.12)
0561	Fir (leading)	10+	1, 5, 7, 8	< 1800	< 40	≤ 30	TIPSY
0562	Fir (leading)	13+	1, 5, 7, 8	< 1800	40 +	≤ 30	TIPSY
0598	Open forest with Fir leading	10+	1, 5, 7, 8	< 1800	All	> 30	
0620	Py, PyF, FPy	14+	6, 32	< 1800	All	> 30	
0630	Py, PyF, FPy	10 – < 14	6, 32	< 1800	All	> 30	
0660	Py, PyF, FPy	10+	6, 32	< 1800	All	≤ 30	TIPSY
0698	Open forest with Py, PyF, or FPy	10+	6,32	< 1800	All	> 30	
0720	CH types, FC, FH	10+	2, 3, 9-17	< 1800	All	> 30	
0760	CH types, FC, FH	10+	2, 3, 9-17	< 1800	All	≤ 30	TIPSY
0823	High elevation sites – Pl leading	14+	28-31	1800+	All	> 30	

(continued)

4. Division of the Area into Management Zones

Table 4. Definition of analysis units (concluded)

Analysis unit	Species description	Site index range (m@ 50 years)	Inventory type groups	Elevation (metres)	Slope (%)	Age @ 96-12-31	Comments
0824	High elevation sites – non-Pl leading	14+	1-27, 32-34	1800+	All	> 30	
0833	High elevation sites – Pl leading	10 – < 14	28-31	1800+	All	> 30	
0834	High elevation sites – non-Pl leading	8 - < 14		1800+	All	> 30	
0860	High elevation sites	10+	All	1800+	All	≤ 30	TIPSY
0968	Open forest	10+	All	< 1800	All	≤ 30	TIPSY
0970	Deciduous	10+	35-42	< 1800	All	All	Non-contributing deciduous stands
0986	Backlog NSR[a] < 420 stems/hectare	All	All	All	All	All	< 420 stems /hectare
0987	Backlog NSR[a] > 420 stems/hectare	All	All	All	All	All	> 420 stems /hectare
0998	Open forest with leading species other than Pl, F, L, Py, or deciduous	10+	9-27	< 1800	All	> 30	
1999	FMER open range		All	< 1800	All	All	Regenerated curve only

(a) Backlog not satisfactorily (NSR) areas are those that have been type identity 4 since 1987 or earlier.

4. Division of the Area into Management Zones

Analysis unit numbering:

Rotation	Forest type	Site, etc.	Other factors
0 — first rotation (existing)	1 — Pure Pl	1 — Good sites	1 — < 40% slope
1 —regenerated rotation	2 — Pl or Pa leading	2 — Medium sites	2 — > 40% slope
	3 — S, B, or Pw leading	3 — Poor sites	3 — Pl leading in high elevation
	4 — Larch leading	4 — Low sites	4 — Non-Pl leading in high elevation
	5 — Fir leading	5 — Problem forest types	5 — Problem forest type
	6 — Py leading or FPy	6 — ≤ 30 years old	6 — < 420 stems/hectare
	7 — CH types, FH, FC	7 — Deciduous	7 — > 420 stems/hectare and less than minimum stocking standard
	8 — High elevation stands	8 — NSR	8 — FMER open forest
	9 — Other units (e.g., NSR, FMER open forest, FMER open range, deciduous, etc.)	9 — Other (e.g., FMER open forest, etc.)	9 — FMER open range

Data source and comments:

Some aggregation or splitting of analysis units may occur after examining the amount and distribution of area within each analysis unit.

Analysis units 0251, 0252, 0551, and 0552 are extended rotation units for a proportion of the problem forest types. They include a percentage of the area with the problem forest type definition (see Section 5.2.10, "Specific excluded forest types"). Analysis unit 0255 is a non-contributing analysis unit including a percentage of the area with lodgepole pine-leading problem forest types (see also Section 5.2.10). Analysis unit 0970 is a non-contributing analysis unit for deciduous forest types. The purpose of the non-contributing analysis units is to allow for sensitivity analyses examining the possible timber supply contribution of these types should they ever contribute to the timber harvesting land base.

5. Timber Harvesting Land Base Definition

5.1 Identification of the timber harvesting land base

This section outlines the steps that are used to identify productive forest that is expected to support timber harvesting (the timber harvesting land base) 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 inclusion of previously excluded productive forest land (e.g., timber licence reversions).

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

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

5.2 Details on land base classification

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

Only British Columbia provincial Crown Land contributes to the land base used to determine timber supply. Private lands (Crown granted lands) ownership code 40N and federal Crown lands (Indian Reserves and Dominion Government Blocks) ownership codes 52N and 54N do not contribute to the net timber harvesting land base.

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

Alpine, lakes, rock, etc. — type identity 6 and 8 — do not contribute to the timber harvesting land base.

5.2.3 Non-commercial cover

Areas classified as having non-commercial brush species growing on them — type identity 5 — do not contribute to the timber harvesting land base.

5.2.4 Provincial land not administered by the British Columbia Forest Service for timber supply purposes

The total land base is stratified into various ownership codes. Of the provincial Crown ownership codes, only three codes 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 61C) and areas identified of recreational significance in the recreation inventory will be managed for recreation purposes subject to specific forest cover constraints.

5.2.5 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 a part of current forest management but which have not been accounted for in the inventory file.

While areas recognized in legislation or by Order-in-Council as not contributing to the timber harvesting land base may be 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.

The only specific, geographically-defined Crown forest areas to be excluded from the timber harvesting land base are 614 hectares of recently allocated woodlot licence areas that have not been incorporated into the forest inventory. Table 5 outlines the locations and areas affected.

5. Timber Harvesting Land Base Definition

Table 5. Mapsheet polygon listing for woodlot licence area to be excluded

Mapsheet #	Forest cover polygon #	Area within woodlot that has not been deleted from the TSA land base in the inventory files (hectares)
82G043	84	1.0
82G043	95	1.9
82G043	97	13.4
82G043	102	9.6
82G043	103	23.0
82G043	104	11.0
82G043	105	23.9
82G043	112	40.2
82G043	113	31.6
82G043	114	16.3
82G043	117	3.8
82G043	451	3.5
82G043	483	7.8
82G043	484	7.0
82G043	489	2.2
82G043	490	1.7
82G043	491	8.3
82G043	492	10.4
82G043	494	3.0
82G043	495	4.8
82G043	496	7.4
82G043	497	7.8
82G043	498	12.6
82G043	499	4.3
82G043	506	2.2
82G043	620	2.9
82G043	621	1.9
82G043	676	2.2
82G043	682	2.2
82G043	683	3.5
82G043	684	1.7
82G043	685	98.3
82G043	686	3.9
82G043	687	1.3
82G043	689	3.9
82G053	592	19.5
82G086	32	1.8
82G086	36	4.4
82G086	37	8.0
82G086	38	27.4
82G086	39	10.6
82G086	40	2.7
82G086	41	0.9

(continued)

Table 5. Mapsheet polygon listing for woodlot licence area to be excluded (concluded)

Mapsheet #	Forest cover polygon #	Area within woodlot that has not been deleted from the TSA land base in the inventory files (hectares)
82G086	42	4.4
82G086	43	0.9
82G086	44	14.1
82G086	49	2.7
82G096	155	1.3
82G096	283	2.7
82G096	284	2.7
82G096	285	3.5
82G096	286	8.8
82G096	290	3.5
82G096	291	14.6
82G096	292	13.7
82G096	294	1.8
82G096	295	4.4
82G096	298	3.5
82G096	301	0.9
82G096	302	4.4
82G096	308	2.7
82G096	309	0.9
82G096	310	4.4
82G096	311	3.5
82G096	312	4.4
82G096	327	4.0
82G096	369	0.9
82G096	370	1.8
82G096	374	1.8
82G096	375	0.4
82G096	379	2.2
82G096	381	0.4
82G096	382	1.8
82G096	383	31.8
82G096	386	8.8
82G096	387	0.4
Total		614

Data source and comments:

The woodlot licence expansion areas noted above have not been updated for ownership in the inventory. The area of each forest cover polygon within these woodlots was estimated from forest cover maps by using a dot grid and then proportionally adjusting the estimated area in each polygon to ensure that the total area removed corresponded to the known area of each woodlot licence expansion.

5.2.6 Roads, trails and landings

Separate estimates are made to reflect the loss in productive forest land due to existing roads trails and landings and future roads, trails and landings (RTL).

5.2.6.1 Existing roads, trails and landings

Existing classified roads and resource access trails

All area covered by classified roads and trails not already removed as "urban" (non-forest) category, will be excluded by creating buffers using a geographic information system (GIS) along existing mapped roads, trails, highways, and pipelines, which are represented as lines in the inventory.

The area to be deducted in each category will be calculated using right-of-way widths listed in Table 6a.

Table 6a. Right-of-way widths for existing classified roads, resource access trails and other infrastructure categories

Category	Right-of-way width (metres)
Highway	40.0
Secondary road	15.9
Logging road	8.5
Trail	3.0
Railway	33.8
Powerline	49.0
Pipeline	30.8

5. Timber Harvesting Land Base Definition

Existing non-classified in-block trails and landings

Existing trails and landings will be accounted for using an OAF as per the following table.

Table 6b. Estimates of non-classified existing roads, trails and landings

RTL category	Productivity reduction on previously harvested sites (per cent)
Skid trails (including old historic trails), and other detrimental disturbance on the net area to reforest	5.76
Landings	3.71

Data source and comments:

In general, the area covered by mapped roads and trails will be represented by geographically-specific deductions. Trails and landings within blocks with forest cover less than 30 years old are assumed to reduce productivity, and will be represented as timber yield reduction applied to TIPSY curves (< 30 years).

All existing roads will be deducted from the land base using a geographic information system (GIS) linear overlay by applying estimates of average road width by road class to the lengths of the features.

Existing trails include old historic trails that were used in harvesting operations earlier in this century (that are not re-used for subsequent harvesting operations and continue to be unproductive) which amounted to 0.43% of the area harvested. These existing trails were added to the trails from current harvesting operations. Trails from current harvesting operations were estimated for conventional harvesting and cable harvesting based on advice from the Regional Pedologist for four time periods when different standards applied. There was a clear trend of decreasing area occupied by trails for each subsequent time period. The area occupied by trails was multiplied by 30% to determine the average productivity loss attributable to these trails (assumes that 50% of logging occurs during summer and 50% occurs in winter, and that average productivity loss in winter logging is 20% and average productivity loss in summer logging is 40%).

Area in existing landings from current harvesting operations was estimated for conventional harvesting and cable harvesting based on advice from the Regional Pedologist for four time periods when different standards applied. There was a clear trend of decreasing area occupied by landings for each subsequent time period. The area occupied by landings was assumed to be non-productive. It was assumed that all existing and future landings constructed during right-of-way clearing would eventually be used for harvesting of cutblocks and therefore no additional netdown for right-of-way landings was made.

5.2.6.2 Future roads, trails and landings

Table 6c. Estimates of productivity losses due to future roads, trails and landings

RTL category	Productivity reduction (%)
Roads	3.70
Skid trails (including old historic trails), and other detrimental disturbance on the net area to reforest	1.93
Landings	2.3
Total	7.93

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

Data source and comments:

Future road requirements were estimated by stratifying the operable forest land base into slope classes applicable to various harvest methods and determining the proportion of the area where each type of harvesting method would likely occur. For each of the harvest methods, average road width of 20 metres was divided by estimated average road spacing for the applicable harvest method to determine the estimated proportion of the area occupied by future roads. A weighted average for the road requirements for each of harvest methods was calculated.

Future bladed trail's are assumed to be fully rehabilitated and restored to 100% productivity. The losses attributed to this category are productivity losses due to dispersed detrimental soil disturbance (typically concentrated in unbladed skid trails) which is estimated to be approximately 1.93%.

Future in-block landing requirements were based on the Regional Pedologist's estimate of current practice, and an assumption that this level of loss would likely continue into the future.

5.2.7 Riparian management areas

The information needed to estimate the area of riparian reserves, and the reserved portions of riparian management zones is indicated in Table 7. The reserved area will be excluded from the timber harvesting land base.

Table 7. Riparian management areas

Stream class	Stream length	Reserve zone width (metres)[a]	Management zone width (metres)[a]	Retention in management zone (%)	Equivalent total riparian area reserve for TSR (metres)
S1		50	20	50	60
S2		30	20	50	40
S3		20	20	50	30
S4		0	30	25	8
S5		0	30	25	8
S6		0	20	5	1
W1		10	40	25	20
W2		10	20	25	15
W3		0	30	25	8
W4		0	30	25	8
L1		10	200	50	110
L2		10	20	50	20
L3		0	30	25	8
L4		0	30	25	8

(a) Slope distance applied planimetrically is assumed to compensate for width of single line stream and unmapped streams.

Data source and comments:

The riparian area reserve for timber supply modelling purposes, shall be applied to both sides of the water course, or along wetland or lake shores. The riparian area reserve consists of the riparian reserve zone plus the retention portion of the riparian management zone.

A GIS analysis was performed to classify all streams, wetlands and lakes on the basis of existing stream inventories or slope and width, or area. For mapped but not stream-inventoried streams, slope and width information was taken from the MELP watershed atlas. Detailed methodologies are described in the report.

Riparian Management Area Classification for Cranbrook Forest District, March 1998. The resultant data has been produced by stream class, and length through the timber harvesting land base.

The total riparian area reserve is made up of the reserve zone plus the management zone multiplied by the retention. For example:

Reserve zone	50 metres
Management zone	20 metres
Retention in management zone	50%
Implied reserve in management zone	(20 * 0.5) = 10 metres
Total riparian reserve	60 metres (reserve zone – 50 metres plus implied management zone 10 metres)

On average, the above listed riparian reserve zone widths are not logged. While there are some rare instances where riparian reserve zones have been logged since riparian management requirements in the Forest Practices Code were implemented, there are other areas where the reserve zones are wider than the minimums specified in Forest Practices Code requirements. Forest district staff estimate that the areas where the reserve zone width is wider than the minimums specified is significantly larger than the area of logged riparian reserve zone.

5.2.8 Environmentally sensitive areas

In the context of the timber supply analysis, environmentally sensitive areas (ESAs) may result in a reduction in the harvesting opportunity on these sites. It is important to ensure that only areas in which harvesting is expected to take place contribute to the timber harvesting land base. Therefore, it is necessary to identify those areas in which harvesting is expected to be limited and those in which no harvesting is expected to occur.

5. Timber Harvesting Land Base Definition

Table 8. Description of environmentally sensitive areas

ESA class	ESA description	% area reduction
E1a	Areas having severe snow chute or avalanche problems.	100
E1h	Areas having very high water values and extreme sensitivity to harvesting.	100
E1s	Areas having extremely fragile or unstable soils.	100
E2s within community watersheds and domestic watersheds.	Areas having significantly fragile or unstable soils.	50
E2s outside of community watersheds and domestic watersheds.	Areas having significantly fragile or unstable soils.	0 (see discussion below)
E1p outside NDT4	Areas having severe regeneration problems caused by biotic factors.	100
E1p within NDT4	Areas having severe regeneration problems caused by biotic factors.	0 (see discussion below)
E2p	Areas having significant regeneration problems caused by biotic factors.	0 (see discussion below)

Data source and comments:

Area-based reductions for ESAs are based upon professional judgment and analysis of harvesting activities planned on ESA areas in the next 5 years. Where reasonable, deductions were stated as 100% or 0% of specific areas to enable them to be spatially explicit.

One-half (50%) of E2S areas in community and domestic watersheds are deducted to reflect the fact that the FPC is more restrictive on Class IV terrain hazard areas within community and domestic watersheds than similar areas outside of community and domestic watersheds.

No E1P area within the NDT 4 is deducted because these areas are assumed to be harvestable for conversion to open range. Most E2s, outside of watersheds and E2p sites can be harvested with due care to soils and recognition of possible regeneration problems.

Areas identified as being sensitive for recreational concerns, visual quality concerns, and wildlife concerns will be addressed through management zones with specific forest cover constraints (see Section 6.4.1 "Objectives which require forest cover requirements").

5.2.9 Sites with low timber growing potential

Sites are generally classified as having low productivity because of inherent site factors (nutrient availability, moisture availability, lack of soil, extreme climatic conditions, etc.) which results in there being a low probability of growing a merchantable crop of trees in a reasonable amount of time. These stands are not considered to produce an economically harvestable crop of trees and are excluded from the timber harvesting land base.

Table 9. Description of sites with low timber growing potential

Species	Inventory type groups	Site index (m@50 years)	Slope (%)	Reduction (%)
Pl leading	28-31	< 10	< 40	100
Pl leading	28-31	< 12	40+	100
F leading except FS	1-3, 5-8	< 10	< 40	100
F leading except FS	1-3, 5-8	< 13	40+	100
L, C, H, Py, Pa deciduous leading and F leading except (FS)	9-17, 27 where Pa leading, 32-42	< 10	All	100
S leading, B leading, Pw leading, FS	4, 18-26, 27 where Pw leading	< 8	All	100

Data source and comments:

This deduction applies to stands of all ages, based on district experience that these stands do not produce sufficient volumes to be harvestable.

5.2.10 Specific excluded forest types

Some forest types are excluded to reflect that they are not available to the timber harvest land base due to decadence, non-merchantable characteristics, high elevation, and/or high significance for other environmental resource values. The forest types or areas referred to in Table 10 are excluded entirely from the timber harvesting land base.

Table 10. Description of excluded forest types (EFT)

Description	Type group	Species	Age	Comments
Old cedar- and hemlock stands	9-17	C, CF, CH, H, HF, HC, HB, HS, HDecid.	> 200	High degree of decay; important for biodiversity
Old balsam–leading stands	18, 19, 20	B, BH, BS	> 200	High degree of decay; important for biodiversity
Deciduous stands	35-42	Deciduous	Any	Not currently utilized; important for wildlife
High elevation “parkland” forest	ESSFdk-p	Any	Any	High elevation sites; sensitive and important for wildlife and biodiversity
High elevation “parkland” forest	ESSFwm-p	Any	Any	High elevation sites; sensitive and important for wildlife and biodiversity

5.2.11 Areas considered inoperable

Operability codes are used to describe the presence or absence of physical barriers or limitations to harvesting and the merchantability of stands. Inoperable areas are defined as areas unavailable for harvest for terrain-related or economic reasons. Characteristics used in defining operability include slope, topography (e.g., the presence of gullies or exposed rock), difficulty of road access, soil instability, elevation and timber quality. Operability can change over time as a function of new harvesting technologies and changing economics.

5. Timber Harvesting Land Base Definition

Table 11. Description of inoperable areas

Inventory description	Code	Reduction per cent (%)
Inoperable	Operability (I)	100
Not typed	Operability (N)	100
Operable	Operability (A)	0
Slopes greater than 70% where species other than lodgepole pine are the leading species.	As per TRIM file data and FIP file where SPCS is not Pl.	100
Slopes greater than 65% where lodgepole pine is the leading species.	As per TRIM file data and FIP file where SPCS is Pl.	100

Data source and comments:

Operable areas are those parts of the Cranbrook TSA forested land base which are likely to be accessible for timber harvesting when considering ecological, economic and terrain factors. These factors are not precisely defined, making determination of operable/inoperable areas a relatively subjective task.

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

Currently, local industry representatives have indicated that timber harvesting is not economically viable on slopes over 65% in lodgepole pine-leading stands, or on slopes over 70% where the forest cover is any species other than lodgepole pine. Therefore, areas with slopes greater than these break points have been excluded from the timber harvesting land base. A sensitivity analysis will be done to determine the effect on the timber harvest forecast if harvesting were to occur on steeper areas.

5.2.12 Problem forest types

Problem forest types occur within the operable land base and occupy sites that have the potential to produce merchantable timber but are not currently utilized due to marginal merchantability. The stand types identified as problem forest types will in most cases include some merchantable and some unmerchantable stands in varying proportions. Each problem forest type must be evaluated separately to determine the proportion that should be excluded from the timber harvesting land base.

Table 12. Problem forest types criteria

PFT #	Type group	Species	Age (years)	Height (metres)	Per cent (%) excluded
1[a]	28-31	Pl leading	> 40	< 10.5	80
2[a]	28-31	Pl, PlF, PlS, PlDecid.	> 40 and ≤ 60	10.5-19.4	35
3[a]	28-31	Pl, PlF, PlS, PlDecid.	> 60 and ≤ 80	10.5-9.4	18
4[a]	28-31	Pl, PlF, PlS, PlDecid.	> 80	10.5-19.4	29
5[a]	6, 32	FdPy, Py leading	> 80	10.5-19.4	6

(a) Indicates that an statistically-designed inventory has been completed for this problem forest type in 1997.

Data source and comments:

For problem forest types 1 to 4 above, the per cent excluded has been assigned to analysis unit 0255 for potential sensitivity analyses. For problem forest type 5 above, the per cent excluded has been assigned to analysis unit 0555 for potential sensitivity analyses.

For problem forest types 2, 3 and 4 above, an additional percentage has been assigned to separate analysis units 0251 (slope less than 40%) and 0252 (slope 40% and over) to reflect the longer period of time required for these stands to meet minimum product objectives. The percentages of these problem forest types assigned to analysis units 0251 and 0252 are as follows: inventory type groups 28-31, age class 3 / height class 2: 10%; age class 4 / height class 2 – 24%, and age class 5+ / height class 2 – 57%. These analysis units will be part of the timber harvesting land base and will have an OAF applied to the growth and yield curve to account for the poor productivity in these sites that will extend the time required to meet current minimum economic criteria.

Based upon a statistically-designed inventory, a portion of the FPl, FPy, FL, Fdecid, Py forest types previously identified as problem forest types in the 1995 timber supply review have been left as part of the timber harvesting land base and have been assigned to separate analysis units (0551 and 0552), except for those stands included in problem forest type 5 noted in Table 12. These analysis units will have an OAF applied to the growth and yield curve to account for the extended time required to meet current minimum economic criteria. The proportions assigned to these analysis units are as follows for inventory type groups 5-8, 32: age class 3 / height class 2 – 12%; age class 4 / height class 2 – 11%; and age classes 5+/ height class 2 – 12%.

As an example: for inventory types groups 5-8 and 32 (Douglas-fir and Ponderosa pine leading types), with age class 5 and over (older than 80 years) and height class 2 (10.5-19.4 metres), 6% would be deducted (Table 12), 12% would be subject to an OAF (previous paragraph), and the remaining 82% would be in an analysis unit according to Table 4.

5.2.13 Cultural heritage resource reductions

Cultural heritage values include archaeological sites, and traditional uses of the land base.

Archaeological overview assessments (AOA) have been completed for various landscape units in the Cranbrook TSA. The AOAs classify areas as having high or medium archaeological potential, or as having unranked potential. Areas identified as having medium or high potential are required to have archaeological impact assessments prior to proceeding with development. These assessments have resulted in a very small portion of some of the areas classified as having high or medium archaeological potential being deferred from harvest (a total of less than 10 hectares). Based on the current relationship between the proportion of the land base classifies as having high or medium archaeological potential and the discovery of archaeological sites which require deferred harvest, the net result is a very small decrease to the timber harvesting land base. Usually archaeological sites are accommodated within existing wildlife tree patch requirements.

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 land base by the Ktunaxa / Kinbasket peoples. At this point there is no indication that specific resources traditionally used by this first nation are in scarce supply and would require restrictions in timber harvest to provide for this traditional 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 when deriving projections of merchantable volume.

Table 13. Utilization levels

Analysis unit	Minimum dbh (cm)	Maximum stump height (cm)	Minimum top dib (cm)
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.

6.1.2 Volume exclusions for mixed deciduous / coniferous stands

The deciduous component of mixed deciduous / coniferous stands is for the most part not harvested in the Cranbrook TSA and should not contribute to the estimated stand volume.

Table 14. Volume exclusions for mixed species stands

Inventory type group	Species	Volume exclusion of deciduous component (%)
FDecid, HDecid, Sdecid, PlDecid,	All deciduous	100

Data source and comments:

The exclusion pertains to only the deciduous portions of these types.

6.1.3 Minimum harvestable age derivation

Minimum harvestable ages indicate the minimum age a stand must reach before it can be harvested.

The criteria used to define minimum harvestable ages for this analysis will be: minimum volume per hectare, and minimum piece size for pure pine, pine leading, FMER open range, and FMER open forest analysis units; and, minimum volume per hectare, minimum piece size, and achievement of 95% of culmination mean annual increment (MAI) for all other analysis units.

6. Current Forest Management Assumptions

Table 15. Minimum harvestable age criteria

Analysis unit	Species description	Site index range (m@ 50 years)	Slope (%)	Minimum volume (m^3/ha)	Minimum average DBH (cm)[a]	Age at 95% of CMAI (years)	Culmination age (years)	Minimum harvestable age natural stands (years)	Minimum harvestable age regenerated stands (years)
0111	Pl (pure)	> 19	< 40	100	20				
0121	Pl (pure)	14-19	< 40	100	20				
0131	Pl (pure)	10-< 14	< 40	100	20				
0112	Pl (pure)	> 19	40+	150	25				
0122	Pl (pure)	14-19	40+	150	25				
0132	Pl (pure)	12-< 14	40+	150	25				
0161	Pl (pure)	10+	< 40	100	20				
0162	Pl (pure)	12+	40+	150	25				
0211	Pl (leading), Pa	> 19	< 40	100	20				
0221	Pl (leading), Pa	14-19	< 40	100	20				
0231	Pl (leading), Pa	10-< 14	< 40	100	20				
0212	Pl (leading), Pa	> 19	40+	150	25				
0222	Pl (leading), Pa	14-19	40+	150	25				
0232	Pl (leading), Pa	10-< 14	40+	150	25				
0251	PFT – Pl leading	10+	< 40	100	20				
0252	PFT – Pl leading	12+	40+	150	25				
0255	PFT – Pl leading – excluded	10+	All	100	20				
0261	Pl (leading), Pa	10+	< 40	100	20				
0262	Pl (leading), Pa	12+	40+	150	25				
0298	Open forest with Pl leading	10+	All	100	25				
0311	SB types, FS, Pw	> 19	< 40	120	25				
0321	SB types, FS, Pw	14-19	< 40	120	25				
0331	SB types, FS, Pw	8-< 14	< 40	120	25				
0312	SB types, FS, Pw	> 19	40+	180	28				
0322	SB types, FS, Pw	14-19	40+	180	28				
0332	SB types, FS, Pw	8-< 14	40+	180	28				
0361	SB types, FS, Pw	8+	< 40	120	25				
0362	SB types, FS, Pw	8+	40+	180	28				
0411	Larch (leading)	> 19	< 40	100	25				
0421	Larch (leading)	14-19	< 40	100	25				
0431	Larch (leading)	10-< 14	< 40	100	25				
0412	Larch (leading)	> 19	40+	180	28				
0422	Larch (leading)	14-19	40+	180	28				
0432	Larch (leading)	10-< 14	40+	180	28				

(a) Used to approximate minimum average merchantable tree volume requirements.

continued

6. Current Forest Management Assumptions

Table 15. Minimum harvestable age criteria

Analysis unit	Species description	Site index range (m@ 50 years)	Slope (%)	Minimum volume (m^3/ha)	Minimum average DBH (cm)[a]	Age at 95% of CMAI (years)	Culmination age (years)	Minimum harvestable age natural stands (years)	Minimum harvestable age regenerated stands (years)
0461	Larch (leading)	10+	< 40	100	25				
0462	Larch (leading)	10+	40+	180	28				
0498	Open forest with larch leading	10+	All	100	25				
0511	Fir (leading)	> 19	< 40	100	25				
0521	Fir (leading)	14-19	< 40	100	25				
0531	Fir (leading)	10-< 14	< 40	100	25				
0512	Fir (leading)	> 19	40+	180	28				
0522	Fir (leading)	14-19	40+	180	28				
0532	Fir (leading)	13-< 14	40+	180	28				
0551	PFT – Fir (leading)	10+	< 40	100	25				
0552	PFT – Fir (leading)	13+	40+	180	28				
0555	PFT – Fir (leading)	13+	All	100	25				
0561	Fir (leading)	10+	< 40	100	25				
0562	Fir (leading)	13+	40+	180	28				
0598	Open forest with fir leading	10+	All	100	25				
0620	Py, PyF, Fpy	14+	All	100	25				
0630	Py, PyF, Fpy	10-< 14	All	100	25				
0660	Py, PyF, Fpy	10+	All	100	25				
0698	Open forest with Py, PyF, or Fpy	10+	All	100	25				
0720	CH types, FC, FH	10+	All	150	28				
0760	CH types, FC, FH	10+	All	150	28				
0823	High elevation sites Pl leading	14+	28-31	150	25				
0824	High elevation sites – non-Pl leading	14+	1-27, 32-34	180	25				
0833	High elevation sites – Pl leading	10-<14	28-31	150	25				
0834	High elevation sites – non-Pl leading	10-< 14	1-27, 32-34	180	25				

(a) Used to approximate minimum average merchantable tree volume requirements.

continued

6. Current Forest Management Assumptions

Table 15. Minimum harvestable age criteria (concluded)

Analysis unit	Species description	Site index range (m@ 50 years)	Slope (%)	Minimum volume (m^3/ha)	Minimum average DBH (cm)[a]	Age at 95% of CMAI (years)	Culmination age (years)	Minimum harvestable age natural stands (years)	Minimum harvestable age regenerated stands (years)
0860	High elevation sites	10+	All	200	25				
0968	Open forest	10+	All	100	25				
0970	Deciduous	10+	All						
0986	Backlog NSR < 420 stems/ha	All	All	150	25				
0987	Backlog NSR > 420 stems/ha	All	All	150	25				
0998	Open forest with leading species other than Pl, F, L, Py, or deciduous	10+	All	100	25				
1999	FMER open range		All	100	20				

(a) Used to approximate minimum average merchantable tree volume requirements.

Data source and comments:

Based on current management practices, the minimum harvestable age will be set at the age at which all three criteria of minimum volume, minimum average DBH, and 95% of the culmination MAI are met.

6.1.4 Harvest scheduling priorities

For the Cranbrook TSA, the Forest Service Simulator (FSSIM) timber supply model will set highest harvest priority to stands that are the oldest relative to their minimum harvestable age. 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 be done to determine the effect of assigning harvest priority randomly. Using relative oldest first as the harvest scheduling priority will allow better comparability between sensitivity analyses.

6.1.5 Logging methods and silviculture systems

Based on Major Licensee Silviculture Information System (MLSIS) and Integrated Silviculture Information System (ISIS) records from 1987 to 1997, the logging methods employed in the Cranbrook TSA are ground-based (93%), cable (6%), helicopter (1%), and horse (< 1%). The per cent figures refer to the average volume harvested per year by all licensees. The proportion of each harvesting method is generally representative of current management, although the trend is that cable harvest and helicopter harvest are gradually increasing.

The majority of harvesting in the Cranbrook TSA was done using clearcut harvesting systems (clearcut – 52%, seed tree – 28 %, clearcut with reserves 2 %). The other 18% of the harvest was made up of partial cutting (12%), shelterwood (4%), and group selection (2%). The per cent figures are based on the area logged using each silviculture system from 1987 to 1997.

6. Current Forest Management Assumptions

6.2 Unsalvaged losses

The purpose of this section is to provide an estimate of average annual volume of timber on the timber harvesting land base that is damaged or killed and not salvaged, that is not already accounted for in the forest inventory, and that is unconstrained and available for harvest. These losses are attributable to a number of factors which result in tree mortality including: several mortality inducing insects, blowdown / snowdown, various oil, gas and mining development activities, wildfires, and red-belt damage. An unsalvaged loss to account for tree mortality due to *Armillaria ostoyae* has not been included here given the uncertainty about whether losses to this root rot have been accounted for in the yield prediction model. A sensitivity analysis will be run which includes losses to *Armillaria ostoyae* as an additional unsalvaged loss.

Table 16. Unsalvaged losses

Cause of tree mortality	Estimated average annual volume of unsalvaged loss per year in the timber harvesting land base that is unconstrained and available for harvest, that is not being salvage logged and that is not accounted for in VDYP (m^3 per year)
Mountain pine beetle	43 561
Spruce bark beetle	0
Douglas-fir bark beetle	251
Balsam bark beetle	337
Armillaria ostoyae	0 (not included in base case; uncertainty will be examined in sensitivity analysis)
Dwarf mistletoe	0
Floods	0
Catastrophic blowdown / snowdown in mature stands	11 748
Catastrophic blowdown / snowdown in immature stands	0
Non-catastrophic in-block blowdown / snowdown	4 048
Non-catastrophic blowdown / snowdown immediately adjacent to logged stands	3 893
Non-catastrophic blowdown /snowdown immediately adjacent to roads	5 569
Oil, gas and mineral exploration	50
Coal mine overburden piling	0
Coal mine spoil failures	50
Wildfires	7 384
Red-belt damage	350
Drought	0
Total	77 241

Data source and comments:

All unsalvaged losses noted in the above table occur on the timber harvesting land base.

Information sources regarding unsalvaged losses include 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. As many years of reliable data as possible were used to determine the extent of total losses due to each causal agent. Where possible, the most current performance of the forest licensees and SBFEP in regards to salvaging these losses was then applied against the average historical losses to estimate the future losses to be applied. Local knowledge, estimates and professional judgment from MoF staff are a key part of the estimates of unsalvaged losses. In addition it is recognized that volume projections from VDYP do not likely account for many types of unsalvaged losses (*Measurement of Pest Killed Timber*; Henningman, 1997). Future forest composition and age class distribution and improved future access were considered when developing estimates.

6.3 Silviculture

6.3.1 Silviculture and regeneration activities

The silviculture program reflects the mix of treatments expected to be carried out in the Cranbrook 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 are then aggregated into one table.

6. Current Forest Management Assumptions

Table 17. Regeneration assumptions by analysis unit for stands older than 30 years

Analysis unit	Species description	Regen method (A = artificial, N = Natural)	% of analysis unit regen artificially or naturally	Regen delay (years)	OAF[a] 1 (%)	OAF[a] 2 (%)	Regen species	Regen species (%)	Initial density (sph)	Target density (sph)
0111, 0121, 0131, 0112, 0122, 0132	Pl (pure)	A	60	3	15	7	Pl Sx Bl Fd	83 7 7 3	4500	1600
0111, 0121, 0131, 0112, 0122, 0132	Pl (pure)	N	40	2	15	7	Pl Sx Bl Fd	83 7 7 3	4500	1600
0211, 0221, 0231, 0212, 0222, 0232, 0251, 0252, 0255	Pl (leading), Pa	A	47	3	15	7	Pl Lw Py Fd	83 7 7 3	4822	1600
0211, 0221, 0231, 0212, 0222, 0232, 0251, 0252, 0255	Pl (leading), Pa	N	53	2	15	7	Pl Lw Py Fd	83 7 7 3	4822	1600
0298	Open Forest with Pl leading	N	100	-50 (residual stems)	15	7	Pl Fd Lw Py	50 30 10 10	4910	250
0311, 0321, 0331, 0312, 0322, 0332	SB types, FS, Pw	A	80	3	15	7	Sx Bl Pl Lw	50 20 17 13	4983	1200
0311, 0321, 0331, 0312, 0322, 0332	SB types, FS, Pw	N	20	2	15	7	Sx Bl Pl Lw	50 20 17 13	4983	1200

(a) OAF is operational adjustment factor. OAF 1 is a constant percentage reduction to account for small non-productive areas in stands. OAF 2 accounts for losses that increase with age, for example, due to disease. The value of OAF 2 increases from zero and passes through the shown value when the stand is 100 years old.

continued

6. Current Forest Management Assumptions

Table 17. Regeneration assumptions by analysis unit for stands older than 30 years

Analysis unit	Species description	Regen method (A = artificial, N = natural)	% of analysis unit regen artificially or naturally	Regen delay (years)	OAF[a] 1 (%)	OAF[a] 2 (%)	Regen species	Regen species (%)	Initial density (sph)	Target density (sph)
0411, 0421, 0431, 0412, 0422, 0432	Larch (leading)	A	50	3	15	7	Pl Fd Lw Sx	40 30 20 10	4383	1500
0411, 0421, 0431, 0412, 0422, 0432	Larch (leading)	N	50	2	15	7	Pl Fd Lw Sx	40 30 20 10	4383	1500
0498	Open forest with larch leading	N	100	-50 (residual stems)	15	7	Lw Fd Pl Py	50 30 10 10	4910	250
0511, 0521, 0531, 0512, 0522, 0532, 0551, 0552, 0555	Fir (leading)	A	40	3	15	7	Fd Pl Lw	57 40 3	4910	1200
0511, 0521, 0531, 0512, 0522, 0532, 0551, 0552, 0555	Fir (leading)	N	60	2	15	7	Fd Pl Lw	57 40 3	4910	1200
0598	Open forest with fir leading	N	100	-50 (residual stems)	15	7	Fd Lw Pl Py	70 10 10 10	4910	250
0620, 0630,	Py, PyF, FPy	A	20	3	15	7	Fd Pl Py	50 40 10	4079	1200
0620, 0630,	Py, PyF, FPy	N	80	2	15	7	Fd Pl Py	50 40 10	4079	1200
0698	Open forest with Py, PyF, or Fpy	N	100	-50 (residual stems)	15	7	Py Fd Pl	50 40 10	4910	250

(a) OAF is operational adjustment factor. OAF 1 is a constant percentage reduction to account for small non-productive areas in stands. OAF 2 accounts for losses that increase with age, for example, due to disease. The value of OAF 2 increases from zero and passes through the shown value when the stand is 100 years old.

continued

6. Current Forest Management Assumptions

Table 17. Regeneration assumptions by analysis unit for stands older than 30 years (concluded)

Analysis unit	Species description	Regen method (A = artificial, N = natural)	% of analysis unit regen artificially or naturally	Regen delay (years)	OAF[a] 1 (%)	OAF[a] 2 (%)	Regen species	Regen species (%)	Initial density (sph)	Target density (sph)
0720	CH types, FC, FH	A	60	3	15	7	Sx Lw Hw Cw	60 20 10 10	2742	1400
0720	CH types, FC, FH	N	40	2	15	7	Sx Lw Hw Cw	60 20 10 10	2742	1400
0820, 0830	High elevation sites	A	80	3	15	7	Pl Sx Bl	45 40 15	5256	1400
0820, 0830	High elevation sites	N	20	2	15	7	Pl Sx Bl	45 40 15	5256	1400
0970	Deciduous			N/A	N/A	N/A	N/A	N/A	N/A	N/A
0986	Backlog NSR[b] < 420 stems/ha	A	100	1 to 9	15	7	Pl Sx	50 50	210	1000
0987	Backlog NSR[b] > 420 stems/ha	A	100	1 to 9	15	7	Pl Sx	50 50	560	1000
0998	Open forest with leading species other than Pl, F, L, Py, or deciduous	N	100	-50 (residual stems)	15	7	Fd Lw Pl Py	70 10 10 10	4910	250
1999	FMER open range	N/A	N/A	N/A	N/A	N/A	Fd Py Lw	70 20 10	2455	20

(a) OAF is operational adjustment factor. OAF 1 is a constant percentage reduction to account for small non-productive areas in stands. OAF 2 accounts for losses that increase with age, for example, due to disease. The value of OAF 2 increases from zero and passes through the shown value when the stand is 100 years old.

(b) Backlog NSR includes areas that were logged prior to October 1, 1987 and are below minimum stocking standard.

Data source and comments:

Most of the values in the above tables are based on estimates derived from a joint query of ISIS and MLSIS databases for those stands that had information about previous stand type and site index supplemented by local knowledge. In many cases the sample size is relatively small and the variation in the values is large. For "open forest" analysis units regeneration parameters are based on *KBLUP FMER Guidelines* and best estimates by the Cranbrook Forest District staff. The initial stocking figures shown in Table 17 are averages extracted from the silviculture databases. They may be averaged or rounded when developing timber yield tables for analysis units.

Existing stands that are greater than 30 years old, will be assigned to VDYP curves for the first rotation, and then moved to TIPSY managed yield curves for subsequent rotations.

Operational adjustment factors (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 holes in the stand is 15%. The standard default value of OAF 2 accounts for breakage and waste (2%) and decay (3%) for a total of 5%. OAF 2 has been increased by 2% to account for losses due to *Armillaria ostoyae*. Additional losses due to *Phellinus 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 and 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. The impact of this potential under-estimate will be examined through a sensitivity analysis that assumes that VDYP does not capture losses due to *Armillaria ostoyae.* The estimated losses due to this disease will be 19 786 cubic metres per year for the sensitivity analysis.

For open forest analysis units, regeneration delay is assumed to be -50 years to reflect the fact that residual trees are being left on site. This is an estimate which considers *KBLUP FMER Guidelines* which specify that target stocking is 250 stems per hectare which should include 50 trees within the upper one-third of the existing diameter range plus 200 additional well-spaced stems per hectare.

6.3.2 Immature plantation history

This section identifies areas of existing immature forest where the density (stems per hectare) was controlled and which therefore should be assigned to a managed stand yield table (MSYT). The growth of stand types listed in Table 18a (which are aged 30 years and younger), all NSR areas and stands projected for future harvest will be estimated using MSYTs.

Table 18a. Immature plantation history

Analysis unit	Species description	Per cent (%) of area managed — first rotation
0161, 0162	Pl (pure)	30
0261, 0262	Pl (leading), Pa	50

6. Current Forest Management Assumptions

Table 18b. Regeneration assumptions by analysis unit for stands less than or equal to 30 years old

Analysis unit	Species description	Regen method (A = artificial, N = natural)	% of analysis unit regen artificially or naturally	Regen delay (years)	OAF 1 (%)	OAF 2 (%)	Regen species	Regen species (%)	Unmanaged stand total density (sph)	Managed stand target density (sph)
0161, 0162	Pl (pure)	A	60	3	15	7	Pl Sx Bl Fd	83 7 7 3	4500	1600
0161, 0162	Pl (pure)	N	40	2	15	7	Pl Sx Bl Fd	83 7 7 3	4500	1600
0261, 0262	Pl (leading), Pa	A	47	3	15	7	Pl Lw Py Fd	83 7 7 3	4822	1600
0261, 0262	Pl (leading), Pa	N	53	2	15	7	Pl Lw Py Fd	83 7 7 3	4822	1600

Data source and comments:

Stands less that 30 years old will be assigned to managed stand yield tables. The per cent of the area that is managed is shown in Table 18a.

Table 18b shows information pertaining to the regeneration of existing stands with ages less than or equal to 30 years. For existing stands that are less than or equal to 30 years old, the percentage of the analysis unit identified as being actively managed to achieve target stocking will be assigned to TIPSY managed yield curves with the managed stand target stocking density, while the percentage of the analysis unit not identified as being actively managed to achieve target stocking will be assigned to TIPSY curves that assume the higher unmanaged stand density. These percentages include areas where active stocking control has been implemented to achieve stocking levels that are close to target stocking. The information is derived from a subset of ISIS records where there is a linkage between treatment units and forest cover information and has been modified based on district experience.

6.3.3 Not satisfactorily restocked areas (backlog NSR)

Not satisfactorily restocked (NSR) areas consist of current NSR and backlog NSR. Current NSR refers to areas that were logged or disturbed after October 1, 1987 and for which there are legal reforestation obligations. Current NSR areas are accounted for in regeneration delay assumptions. Backlog NSR refers to areas that were logged or disturbed before October 1, 1987, and for which there are no legally required reforestation obligations. Backlog NSR areas in this report are derived from the ISIS database. Land classified in the TSA FIP file as type identity 4 or 9 is included in the current timber harvesting land base. These type identities indicate not satisfactorily restocked (NSR) land base. The purpose of this section is to identify the total area of NSR currently existing in the timber harvesting land base, and the estimated rate at which the NSR area will be restocked.

Table 19. Not satisfactorily restocked (NSR) areas

Analysis unit	Stocking level	Total backlog NSR in ISIS database (hectares)	Inoperable backlog NSR (hectares)	Restocked in 1-9 years from now (hectares)
0986	< 420 sph	3 455	1 727	1 728
0987	≥ 420 sph and < 700 sph	1 925	963	962
Total		5 380	2 690	2 690

Data source and comments:

The district silviculture data (ISIS) indicates that 5380 hectares of backlog NSR remain to be restocked. The difference between the operable portion of this area and the amount of operable NSR on the inventory file (if any) will be assumed to have already been restocked.

It is estimated that approximately 50% of the backlog NSR areas identified in the 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.).

Current rates of backlog reforestation are in the order of 300 hectares per year due to funding constraints. At this rate of reforestation, it will take nine years to reforest the operable backlog NSR areas in the Cranbrook Forest District.

Current NSR areas will be assigned to the analysis units from which they came. It is assumed that all current NSR areas will be regenerated within the regeneration delay period. Current NSR areas total approximately 17 199 hectares.

6. Current Forest Management Assumptions

6.4 Integrated resource management

6.4.1 Objectives which require forest cover requirements

As noted in Section 4.1, "Management zones and tracking of multiple objectives (grouping)," forest cover requirements are to be examined at a number of different levels. One possible level is landscape units, another may be ungulate winter habitat, while another may be biodiversity resource emphasis. With the requirement to retain different forest characteristics across the landscape, it is important to identify how non-contributing forest (forest which does not contribute to the timber harvesting land base) is considered in the forest cover requirements (i.e., maximum allowable disturbance or minimum area to be retained).

Tables 20a through 20e indicate the forest cover requirements for landscape biodiversity, caribou habitat, watersheds, visual quality, recreation, ungulate winter range, general integrated resource management and fire maintained ecosystem restoration (FMER) (group levels 3 to 10). The forest cover requirements for all values except general IRM and FMER apply to the total Crown forest area. Requirements for IRM and FMER (specified in Table 20e) apply to the timber harvesting land base.

6. Current Forest Management Assumptions

Table 20a. Forest cover requirements for landscape biodiversity (group level 3)

BEC[a] subzone	NDT[b]	Time frame	Mature plus old minimum retention area (%)	Mature plus old minimum age (years)	Old seral minimum retention area (%)	Old seral minimum age (years)
ESSFwm	2	Now – 70years	23.1	120	6.7	250
ICHmw2	2	Now – 70years	25.3	100	6.7	250
ESSFdk	3	Now – 70years	20.1	120	10.7	140
ICHmk1	3	Now – 70years	20.1	100	10.7	140
MSdk	3	Now – 70years	21.9	100	10.7	140
IDFdm2	4	Now – 70years	28.1	100	10.0	250
PPdh2	4	Now – 70years	28.1	100	10.0	250
ESSFwm	2	71-140 years	23.1	120	8.1	250
ICHmw2	2	71-140 years	25.3	100	8.1	250
ESSFdk	3	71-140 years	20.1	120	12.9	140
ICHmk1	3	71 - 140 years	20.1	100	12.9	140
MSdk	3	71-140 years	21.9	100	12.9	140
IDFdm2	4	71-140 years	28.1	100	11.8	250
PPdh2	4	71-140 years	28.1	100	11.8	250
ESSFwm	2	141+ years	23.1	120	9.4	250
ICHmw2	2	141+ years	25.3	100	9.4	250
ESSFdk	3	141+ years	20.1	120	14.7	140
ICHmk1	3	141+ years	20.1	100	14.7	140
MSdk	3	141+ years	21.9	100	14.7	140
IDFdm2	4	141+ years	28.1	100	13.6	250
PPdh2	4	141+ years	28.1	100	13.6	250

(a) BEC – biogeoclimatic ecosystem classification.

(b) NDT – natural disturbance type, from the FPC *Biodiversity Guidebook.*

6. Current Forest Management Assumptions

Data source and comments:

Biodiversity guidelines will be modelled using information from the *Forest Practices Code Biodiversity Guidebook*. As per a memorandum of understanding between MoF and MELP and as per the forest district manager's forest development plan instructions, the *Kootenay-Boundary Land Use Plan Implementation Strategy* biodiversity emphasis by draft landscape unit is being operationally applied. However, because the *Kootenay-Boundary Land Use Plan Implementation Strategy* biodiversity emphasis has not been formalized through the legal landscape unit establishment process, the timber supply analysis base case will incorporate forest cover requirements that do not prejudge the outcome of this legal process. For the base case, a single weighted forest cover requirement for each of the old plus mature-seral stage and the old-seral stage will be developed based on the anticipated distribution of 45% low-, 45% intermediate- and 10% high-emphasis. The values shown in Table 20a above reflect the weighted values based on the September 1995, *Biodiversity Guidebook*. The old-seral requirement within low emphasis biodiversity areas will be modelled based upon achievement of one-third of the guidebook requirement in the first rotation, two-thirds in the second rotation, and full old-seral representation by the end of the third, and in subsequent rotations.

As an example, the old-seral forest cover requirements for low emphasis biodiversity areas in the ESSFwm subzone, for each of the time periods, were calculated as follows:

Time 0: old forest % = 9% * 0.33 = 2.97

Time 70: old forest % = 9% * 0.67 = 6.03

Time 140: old forest % = 9% * 1.00 = 9.00

Thus, the old-forest requirements increased over time. However, this increase in older forest cover requirements applies only to low-emphasis biodiversity areas. Given the weighted-average approach being taken in the absence of designated landscape units for the Cranbrook area (45% low-biodiversity emphasis, 45% medium emphasis, and 10% high emphasis), a further calculation must be performed:

Older forest requirement = (0.45* low emphasis older forest requirement)
+ (0.45 * medium emphasis requirement) + (0.10* high emphasis requirement)

So, for example, over time, the old-forest cover requirements for ESSFwm would be calculated as follows:

Time 0: old forest % = (9% * 0.45) * 0.33
+ 9% * 0.45
+ 13% * 0.10
6.69%

Time 70: old forest % = (9% * 0.45) * 0.67
+ 9% * 0.45
+ 13% * 0.10
8.06%

Time 140: old forest % = (9% * 0.45) * 1.00
+ 9% * 0.45
+ 13% * 0.10
9.40%

6. Current Forest Management Assumptions

The *Biodiversity Guidebook* seral stage requirements for mature plus old, and old will first be met as much as possible from the non-contributing land base. Early-seral requirements for biodiversity will not be modelled as part of the base case. A sensitivity analysis will be done to model the effects of implementing early seral requirements for biodiversity.

Landscape unit boundaries extend into provincial park lands where the biogeoclimatic subzones are the same as in the adjacent TSA lands. In such instances, the park lands were assumed to be part of the non-contributing land base within the landscape unit for the model; that is, forest in these areas is considered when evaluating forest cover requirements, but does not contribute to timber supply.

As per the *Kootenay-Boundary Land Use Plan Implementation Strategy* and 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 meeting. Therefore, a sensitivity analysis will be done applying the *KBLUP* biodiversity emphases within each draft landscape unit.

Landscape-level biodiversity requirements apply to and are evaluated for 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 duration of the analysis horizon.

For the IDFdm2 and the PPdh2 biogeoclimatic subzones, the targets in Table 20a apply only to the area within the FMER managed forest management zone and the FMER open forest management zone respectively and do not apply to the FMER open range zone.

Table 20b. Forest cover requirements for caribou habitat (group level 4)

Resource emphasis	Green-up height (metres)	Green-up age (years)	Maximum area less than green-up age (%)	Minimum older age 1 (years)	Minimum area greater than older age (%)	Minimum older age 2 (years)	Minimum area older than age 2 %
Caribou — ESSF < 80% slope	3		25	140	30	250	10
Caribou — ICH < 80% slope	3		25	140	40	250	10

6. Current Forest Management Assumptions

Table 20c. Forest cover requirements for community and domestic watersheds, VQOs, and recreation (group levels 5 through 7)

Resource emphasis	Green-up height (metres)	Green-up age (years)	Maximum area less than green-up age (%)
Community watersheds	9		25
Domestic watersheds	9		30
VQO — retention	based on slope from TSR2 file		5
VQO — partial retention	based on slope from TSR2 file		15
VQO — modification	based on slope from TSR2 file		25
Recreation highest	6		5
Recreation high	4		15
Recreation moderate	3		25

Table 20d. Forest cover requirements for ungulate winter range (group level 8)

Landscape unit #	Biogeo subzone	Minimum older age (years)	Minimum area older than older age (%)
1	ICHmw2	121	50.0
1	ICHmk1	121	50.0
1	MSdk	101	30.0
2	MSdk	82	40.0
3	ICHmw2	121	50.0
3	ICHmk1	101	40.0
4	ICHmw2	121	50.0
4	ICHmk1	101	30.0
4	MSdk	101	30.0
5	ICHmw2	121	50.0
5	ICHmk1	121	50.0
6	ICHmw2	121	50.0
6	ICHmk1	121	50.0
7	ICHmw2	121	50.0
7	ICHmk1	121	50.0
8	ICHmw2	121	50.0
8	ICHmk1	101	30.0
8	MSdk	101	30.0
9	ICHmk1	121	50.0
9	MSdk	82	40.0
10	ICHmw2	121	50.0
10	MSdk	101	30.0
11	ICHmw2	121	50.0
11	MSdk	101	30.0
12	MSdk	101	40.0
13	MSdk	101	40.0
14	MSdk	82	40.0
15	ICHmk1	101	30.0
15	MSdk	101	30.0
16	MSdk	82	40.0
17	MSdk	82	40.0
18	MSdk	82	40.0
19	MSdk	101	30.0
20	MSdk	101	30.0
21	ESSFdk	121	50.0
22	ESSFdk	121	50.0
22	MSdk	82	40.0
23	ESSFdk	121	50.0
23	MSdk	82	40.0
24	ICHmk1	101	30.0
24	MSdk	101	30.0
25	ICHmw2	101	30.0
25	MSdk	101	40.0

continued

Table 20d. Forest cover requirements for ungulate winter range (group level 8) (concluded)

Landscape unit #	Biogeo subzone	Minimum older age (years)	Minimum area older than older age (%)
26	ICHmk1	101	30.0
26	MSdk	101	40.0
27	ESSFdk	121	50.0
27	MSdk	82	40.0
28	ICHmw2	121	50.0
28	ICHmk1	101	30.0
28	MSdk	101	40.0
29	MSdk	101	40.0
30	ICHmk1	101	30.0
30	MSdk	101	30.0
31	MSdk	82	40.0
32	MSdk	82	40.0
33	MSdk	101	40.0
34	MSdk	101	40.0
36	MSdk	101	30.0
37	MSdk	101	30.0
38	MSdk	101	30.0

Table 20e. Forest cover requirements for IRM and FMER (group levels 9 and 10)

Resource emphasis	Green-up height (metres)	Green-up age (years)	Maximum area less than green-up age (%)
IRM — ESSFwm	2		33
IRM — ICHmw2	2		33
IRM — ESSFdk	2		33
IRM — ICHmk1	2		33
IRM — MSdk	2		40
FMER (NDT4) managed forest	2		33
FMER (NDT4) open forest	N/A	N/A	N/A
FMER (NDT4) open range	N/A	N/A	N/A

No specific forest cover requirements are applied to the open forest areas within the FMER areas, which will be managed to achieve open forest conditions as quickly as possible.

6. Current Forest Management Assumptions

Data source and comments:

All forest cover requirements for zones or groups will be modelled by landscape unit. This applies also to community watershed, VQO, and ungulate winter range zones.

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 IRM zone is meant to approximate the effects of cutblock adjacency restrictions. The maximum area less than green-up age within the watershed zones represents hydrological green-up constraints. The maximum area less that green-up age within the VQO and recreation zones reflects current management practices which limit the rate of harvest within these areas.

The integrated resource management zone (IRM) encompasses that portion of the timber harvesting land base not occupied by any other zone or group, aside from biodiversity emphasis.

To ensure an appropriate distribution of winter habitat, the *Kootenay-Boundary Land Use Plan* 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. To ensure that the model reflects operational practices and to ensure that ungulate winter range is adequately distributed, the forest cover requirements must, at a minimum, be met by landscape unit and preferably by planning cell. In the base case, forest cover requirements will be applied by landscape unit. During the analysis process, the impacts of applying the requirements at the planning cell level may be examined.

The *Kootenay-Boundary Land Use Plan Implementation Strategy* has identified specific management guidelines for visual quality areas. The district manager of the Cranbrook Forest District has determined that these guidelines are current practice, and has included them as part of forest development plan instructions. The existing inventory and classification of visually sensitive areas do not exactly match the guidelines expressed in the *Kootenay-Boundary Land Use Plan Implementation Strategy*, but the differences are not large. Therefore the existing information will be used in this timber supply review.

6.4.2 Reductions to reflect volume retention in cutblocks

Retention of volume within cutblocks may occur for a variety of forest management considerations. For the purposes of this analysis, only those trees that are expected to remain on site for at least one rotation, and are outside of areas excluded from the timber harvesting land base for riparian reserve zones (RRZ) and riparian management zones (RMZ), are identified as residual volume retention. Timber volumes left standing after employing silviculture systems that involve subsequent re-entry into the stand and removal of those leave-tree volumes (seed-tree, shelterwood, selection and true selection silviculture systems) are excluded from this estimate.

6. Current Forest Management Assumptions

Table 21. Residual volume retention in cutblocks

Analysis unit	Description	Residual area in the timber harvesting land base in patches > 2 hectares net of riparian reserves (%)	Residual individual tree volumes and patches < 2 hectares in the timber harvesting land base net of riparian reserves (%)	Total reduction required (%)
0298, 0498, 0598, 0698, 0968, 0998	Open forest, all species	2.3	30.4	32.7
1999	Open range	0	18.3	18.3
All other analysis units	All other analysis units	1.6	2.3	3.9

Data source and comments:

A sample of silviculture prescriptions approved between January 1st and May 1st, 1998, was examined. All areas within cutblocks that were planned to be left for at least one rotation, that were greater than or equal to two hectares in size, and were outside of the areas removed for RRZs and RMZs were tallied. The majority of these reserve areas were for area-based wildlife tree patches (WTP) — that is, those identified on maps — within the block boundary. Occasionally reserve areas were for other values. It was assumed that some of the identified area-based wildlife tree patches will be used to meet requirements for future adjacent cutblocks. It was also recognized that current management direction is to base wildlife tree patch requirements on Table 20a of the *Biodiversity Guidebook* and that some of the identified area-based wildlife tree patches may be in areas that are not part of the timber harvesting land base. Therefore, part of the guidebook targets are being met by forest outside the timber harvesting land base. All reserve areas greater than or equal to two hectares in size will be tracked and will count towards biodiversity seral stage requirements

All additional reserve trees (to be left singly or in some instances in small groups of a few trees) and reserve areas less than two hectares in size were also tallied. Individual tree reserves and reserve areas less than two hectares in size do not contribute to biodiversity seral stage requirements, and are not mapped in the forest inventory.

7. Sensitivity Analyses to be Performed

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

Table 22. Sensitivity issues specific to the Cranbrook TSA

Issue to be tested	Sensitivity levels
Kootenay-Boundary Land Use Plan Implementation Strategy (see text following table)	Forest cover constraints by LU, BEC and licensee operating area as per the KBLUP biodiversity emphasis assignment and two metre green-up for non-sensitive areas.
Harvest priority	Test oldest first, youngest first, and random harvest rules.
Biodiversity	Apply biodiversity requirements by BEC across the entire forest district rather than by landscape unit.
Biodiversity	Maintain old-seral requirement only.
Biodiversity	Apply landscape biodiversity requirements to the operable area only, as well as to the entire forest area (i.e., “proportional representation”)
Residual volumes within cutblocks	Reduce to 2.5% and increase to 7.9%.
Land base	Include steep slopes (turn off steep slope netdown).
Species mix of harvest	Limit harvest in larch and fir analysis units to 18% of harvest.
High elevation yields	Examine effect of reduced yields for high elevation sites to reflect potentially lower productivity.
Mature volumes	Mature volumes reduced by 5.8%, based on results of inventory audit.
Unsalvaged losses	Increase unsalvaged losses by 19 786 cubic metres in the first 70 years to account for *Armillaria*.

7. Sensitivity Analyses to be Performed

For the KBLUP Implementation Strategy sensitivity analysis, about 11% of the timber harvesting land base in the Cranbrook TSA is considered high emphasis for biodiversity management, 45% intermediate emphasis, and the remaining 44% low emphasis. The Cranbrook TSA biodiversity emphasis management approach is spatially deployed using landscape units and biogeoclimatic subzone as boundaries. The deployment follows that of the recently approved *Kootenay-Boundary Land Use Plan*.

Table 23. Standard sensitivity analysis

Issue to be tested	Sensitivity levels
Minimum harvestable age	± 10 years
Minimum harvestable age	Culmination age (maximum mean annual growth)
Existing stand yields	± 10%
Regenerated stand yields	± 10 / 20%
Land base changes	± 5 / 10% of mature net operable
Harvest flow alternatives with base case data	
Unsalvaged losses	Treat as a percentage of standing inventory
Regeneration delay	± 2 years
Green-up heights	± 1 metre
Adjacency approximation	Remove, and increase constraint to maximum 25% younger than green-up
Biodiversity — full old-seral requirements in low emphasis areas	Apply
Biodiversity — early seral forest cover requirement	Apply
Biodiversity — old/mature seral requirements	None (to examine impact of requirements)
Unsalvaged losses	± 50%