Golden Timber Supply Area
Timber Supply Review

Data Package

September 1997

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1. Introduction

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

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

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

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

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

1) A short explanation of the data needed to properly fill out the data table;
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 is termed the base case harvest forecast and is used as a baseline term of reference. Section 7, "Sensitivity Analyses to be Performed", outlines areas where it is felt there is uncertainty with respect to any of the assumptions and outlines sensitivity analysis to be performed.

The Kootenay Boundary Land Plan Use Implementation Strategy has just been approved by government as a policy statement. Before the Chief makes his determination, the District Manager will have issued Development Plan direction for the 1998 Development Plan. This direction must be considered by the Chief when he makes his determination. A Memorandum of Understanding and directions to licensees will be released in October 1997. This data package reflects the direction of these initiatives albeit further refinements may be necessary.

2.2 Statement of major forest management considerations and issues

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

2. Current Forest Management Considerations and Issues

Table 1. Major forest management considerations and issues

	Description
Growth and yield	
1. Mature volumes in existing stands	An ongoing study to update the 25-year old decay and breakage factors which affect the standing gross volumes in the inventory. Sensitivity analysis will be performed when results are available.
2. Growth of high elevation forests	At high elevations forest stands are frequently characterized by slow growth due to short growing seasons. These concerns will be considered in this timber supply review through sensitivity analysis of 'green-up' periods..
3. Minimum harvestable ages	The previous timber supply review used culmination age as the minimum harvestable age. Based on assumptions using managed stand yield tables and minimum timber product objectives, this analysis will incorporate minimum harvestable ages that are different from culmination age.
4. Root rot	Growth of some lower elevation forests are affected by root rot. This may make the growth rates indicated by the MSYT's optimistic. These concerns will be considered in this timber supply review through sensitivity analysis.
Size of timber harvesting land base	
1.· Operable land base	The operability line, was revisited in part, based upon past and proposed harvesting.
2.· Problem forest types and low sites	The amount of problem forest types and low sites used in the last timber supply was reviewed based upon past harvest performance and estimated timber quality and quantity on these sites.
3.· Cummins River drainage	Government has announced the establishment of a new protected area within the lower Cummins River drainage.
Kootenay-Boundary land use plan Implementation Strategy	The Kootenay-Boundary land use plan Implementation Strategy has been approved by government.

(continued)

2. Current Forest Management Considerations and Issues

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

	Description
Biodiversity, ungulate and riparian habitat	
1. Landscape level biodiversity	For analysis purposes, a weighted biodiversity emphasis option assignment is used. A sensitivity analysis will be conducted to review the Kootenay-Boundary Land Use Plan Implementation Strategy assignments.
2. Stand-level biodiversity	The wildlife tree requirements of the biodiversity guidebook will be addressed, as per current practice.
3. Winter habitat and riparian habitats	The non-caribou ungulate habitat information has been updated for this timber supply review. Caribou habitat management will be formally modeled as outlined in the Kootenay-Boundary Land Use Plan Implementation Strategy. For riparian, the Forest Practices Code requirements will be modeled.
Hydrological concerns	Hydrological threshold to timber harvesting/road building may be a concern in some areas which have already been extensively cut-over, potentially limiting the timing of future harvest. This concern will be addressed through both the biodiversity considerations; and through application of resource emphasis values.
Operational Planning	District staff are having difficulty locating wood supplies to meet the AAC. A project examining the spatial aspects governing timber supply analysis is under way. The results from this project may be used to guide operational planning in this TSA.

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
Golden TSA forest cover FC1 files	MoF (Ministry of Forests) standard inventory files	1967	1993	1:20,000
Hamber Provincial Park forest cover	MoF standard inventory files	1967	10/94	1:20,000
Federal (National) Park forest cover	Nelson Forest Region files	1956		1:32,000
Operability	MoF standard inventory files	1989	10/94	1:20,000
Biogeoclimatic subzone	MoF standard inventory files	1980's		1:250,000
Road systems	MoF standard inventory files	1967	10/94	1:20,000
Caribou habitat	MoF District non-standard inventory files	06/95	05/97	1:50,000
Ungulate winter habitat (non-caribou)	MoF District non-standard inventory files	1980's	01/97	1:20,000
Watershed atlas (community and domestic watersheds)	MoF Nelson Region files	1997	N/A	1:20,000
New (1995-1997) protected Areas	MoF Nelson Region files	1997-97	N/A	1:20,000
Draft Landscape unit boundaries	MoF District non-standard inventory files	1996	04/97	1:40,000
Visual landscape inventory	MoF District non-standard inventory files	1993	1996	1:20,000
Natural disturbance types	Biodiversity guidebook	09/95	1995	1:250000
Draft Biodiversity emphasis	FDP MOU and KBLUP	10/96	1997	1:40000
Timber license areas	MoF standard inventory files	1967	10/94	1:20,000
Land ownership	MoF standard inventory files	1967	10/94	1:20,000

3. Inventories

Data source and comments:

The original TSA forest cover inventory was completed in 1967 for the Golden TSA. Since then, there have been a number of regular updates to this forest cover to reflect denudation from timber harvesting, wildfire and flooding and regrowth due to silviculture activities. The last forest cover update was completed in October 1994, where all denudation up to 1993 was incorporated. Forested area in parks do not contribute to the area available for harvest, but are used to contribute to required seral stage targets

The caribou habitat mapping is derived from the recently approved Kootenay-Boundary land use plan.

The line work for the ungulate (non-caribou) winter range was refined in 1997 and is illustrated in the Kootenay-Boundary Land Use Plan Implementation Strategy.

Natural Disturbance type is derived from the Biogeoclimatic classification.

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

In 1996 the visual landscape inventory for the Golden TSA was updated

Draft landscape unit boundaries are those determined jointly by the Ministry of Forests (MoF) and BCE for the purposes of administering the biodiversity guidebook and strategic planning. These landscape unit boundaries have not been formally established by the district manager but reference has been made to them in the last set of development plan directions approved by the forest district manager. In all, 29 landscape units have been designated within the Golden TSA.

The protected areas boundaries resulting from the Kootenay-Boundary Land Use Plan (1995) and the Implementation Strategy (1997) are stored in a non-standard Regional file.

Watershed atlas — this non-standard layer contains streams, wetlands and lakes. It will be the source for determining areas in riparian reserve zone. This overlay also contains the boundaries of community and domestic watersheds.

4. Division of the Area into Management Zones

4.1 Management zones and tracking of multiple objectives (grouping)

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

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

Table 3. Objectives to be tracked

Group Level	Group Numbers	Description	Function
1	101000 to 129000	Timber Harvesting Land Base by LU	Reporting purposes Provide an assessment of the total forest by landscape unit All Crown forest included
2	151000 to 179000	All forested land by LU	Reporting purposes Provide an assessment of the total forest by landscape unit All Crown forest included
3	101110 to 129390	Biodiversity - all forest	Biodiversity Guide Book Assessment Provides a means to implement biodiversity at the LU/Emphasis/biogeo zone-variant level All Crown forest included
4	101001 102001… 129001	Caribou - ESSF	Resource Emphasis area - Caribou ESSF Provides a means to implement ESSF caribou guidelines by LU ONLY *Operable* forest included
5	101002 102002… 129002	Caribou - ICH	Resource Emphasis area - Caribou ICH Provides a means to implement ICH caribou guidelines by LU ONLY *Operable* forest included
6	101003 102003… 129003	Visual Quality	Resource Emphasis area - Visual Quality Provides a means to implement VQO guidelines by LU ONLY *Operable* forest included
7	101004 102004… 129004	Watersheds	Resource Emphasis area - Domestic Watershed Provides a means to implement watershed guidelines by LU ONLY *Operable* forest included
8	101005 102005… 129005	Ungulate Winter Range	Resource Emphasis area - Ungulate Winter Range (UWR) Provides a means to implement UWR guidelines by LU ONLY *Operable* forest included
9	101006 102006… 129006	Integrated Resource Management	Resource Emphasis area - Integrated Resource Management (IRM) Provides a means to implement adjacency concerns on remaining areas by LU - ONLY *timber harvesting land base* forest included

4. Division of the Area into Management Zones

Data Source and Comments:
Numbering system example 101001:

1	01	0	0	1
Place Holder	Landscape Unit	Biodiv Emphasis	Biogeo Unit	Resource Emphasis

Groups 2 and 4 have 50 added to the LU (LU 1 becomes 51 while LU 29 becomes 79)

4.2 Analysis units

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

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

Table 4. Definition of analysis units

Analysis Unit	Species	Site class[a]	Inventory type groups	Site index range (metres)	Age
Existing					
11	F, FPI FL	1	1,5,7,8,33,34		>20
12	F, FPI FL	2	1,5,7,8,33,34		>20
13	F, FPI FL	3	1,5,7,8,33,34		>20
14	FC, FH,FS	1	2-4,		>20
15	FC, FH,FS	2	2-4,		>20
16	FC, FH,FS	3	2-4,		>20
21	H	1	13 - 17		>20
22	H	2	13 - 17		>20
23	H	3	13 - 17		>20
24	C	1	9 - 11		>20
25	C	2	9 - 11		>20
26	C	3	9 - 11		>20
31	S,B	1	21, 24		>20 - ≤140
32	S,B	2	21, 24		>20 - ≤140
33	S,B	3	21, 24		>20 - ≤140
34	S,B	1	21, 24		> 140
35	S,B	2	21, 24		> 140
36	S,B	3	21, 24		> 140

Continued ……

4. Division of the Area into Management Zones

Table 4. Definition of analysis units (continued)

Analysis Unit	Species	Site class[a]	Inventory type groups	Site index range (metres)	Age
Existing					
41	SF, SH, SPl, BS	1	20,22,23,25,26		>20 - ≤140
42	SF, SH, SPl, BS	2	20,22,23,25,26		>20 - ≤140
43	SF, SH, SPl, BS	3	20,22,23,25,26		>20 - ≤140
44	SF, SH, SPl, BS	1	20,22,23,25,26		>140
45	SF, SH, SPl, BS	2	20,22,23,25,26		>140
46	SF, SH, SPl, BS	3	20,22,23,25,26		>140
51	Pw, Pa, Pl	1	27-31		>20 - ≤140
52	Pw, Pa, Pl	2	27- 31		>20 - ≤140
53	Pw, Pa, Pl	3	27-31		>20 - ≤140
54	Pw, Pa, Pl	1	27-31		>140
55	Pw, Pa, Pl	2	27- 31		>140
56	Pw, Pa, Pl	3	27-31		>140

Table 4. Definition of analysis units (continued)

Analysis Unit	Species	Site class[a]	Inventory type groups	Site index range (metres)	Age
Second growth					
111	F, Pl, L	1	1 - 8, 33,34		<20
112	F, Pl, L	2	1 - 8, 33,34		<20
113	F, Pl, L	3	1 - 8, 33,34		<20
114	F, Pl, L	1	1 - 8, 33,34		<20
115	F, Pl, L	2	1 - 8, 33,34		<20
116	F, Pl, L	3	1 - 8, 33.34		<20
121	H	1	13 - 17		<20
122	H	2	13 - 17		<20
123	H	3	13 - 17		<20
124	C	1	9 - 11		<20
125	C	2	9 - 11		<20
126	C	3	9 - 11		<20
131	S, B	1	20 - 26		<20
132	S, B	2	20 - 26		<20
133	S, B	3	20 - 26		<20
141	Pw, Pa, Pl	1	27-31		<20
142	Pw, Pa, Pl	2	27-31		<20
143	Pw, Pa, Pl	3	27-31		<20

(a) Based on site index range.

Data source and comments:

The site index ranges used to define the analysis units will be determined after examining natural breaks in the distribution of THLB area by site index for each inventory type group combination.

5. Timber Harvesting Land Base Definition

5.1 Identification of the timber harvesting land base

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

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

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

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

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

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

5.2 Details on land base classification

5.2.1 Land not administered by the BCFS for timber supply purposes

Ownership codes are generally used to identify whether the land can be considered to contribute to timber supply. Ownership codes 62C and 69C indicate Crown land in a forest management unit and miscellaneous reserves respectively. These are generally the only ownership codes which are considered to contribute to timber supply. Timber licence area - ownership code 70N, is considered under Section 5.2.13 Timber licence reversions. For analytical purposes 70% of UREP (use, recreation, enjoyment of the public, ownership 61-C, 61-N) area will be in the timber harvesting land base. The remaining 30% will be excluded from the timber harvesting land base but will contribute to seral targets.

5.2.2 Land classified as non-forest

Type identity 6 and 8, areas such as alpine, lakes, rocks, etc. are removed from the land base considered for timber supply.

5.2.3 Non-commercial cover

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

5.2.4 Areas Considered Inoperable

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

Table 5. Description of inoperable areas

Inventory description	Code	Reduction per cent (%)
Operability	Inoperable (I)	100
	Not typed (N)	100
	Operable (A)	0

Data source and comments:

Operable areas are those parts of the Golden TSA forested land base which are likely to be accessible for timber harvesting when considering ecological, economic and terrain factors. These factors have not been precisely defined, making determination of operable/inoperable areas a relatively subjective task. This information (the 'operability line') was gathered by the forest district (MoF) staff in cooperation with industry in 1989 by photo analysis and flight reconnaissance. Approximately 80 000 hectares of Crown forested land are not operable and 220 000 hectares of Crown forested land are considered operable within the Golden TSA. In the Golden TSA, the most obvious factor correlating with the operability line may be elevation — with the operability line being located consistently below certain elevations.

Since 1989 there have been many operational checks of the operability line, with some areas added and some areas deleted from the operable classification. However, there has been no overall revision to the operability line as established in 1989.

An analysis of the degree of past and future proposed harvest above the operability line within the TSA was completed in 1997. The analysis has shown that, 7.8% of the area of timber harvested over the past 5 years has occurred above the operability line, whereas about 40% of the mature TSA forested land base excluding all ESA 1 occurs above the operability line. The analysis has also indicated that 6.9% of the volume and 9.8% of the area of timber harvesting for the next 5 years is planned to occur above the operability line. However, district field staff indicate that there is likely an equivalent proportion of area (to the above) currently designated below the operability line which will not be logged and which, upon operational checking would be designated as inoperable. An analysis of sample drainages within the TSA which have had the operability line completely reviewed operationally (including field review) verifies this. The analysis sample encompassed 8% of the timber harvesting land base and 16% of the mature timber harvesting land base. The analysis has shown that 11% of areas previously designated as operable were changed to inoperable (almost all mature forest), whereas 10% of areas previously designated as inoperable were changed to operable (40% immature; 60% mature forest).

5.2.5 Exclusion of specific, geographically defined areas

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

Table 6. Exclusion of specific, geographically defined areas

Identifying inventory variables (location descriptors)	Excluded area (hectares)	Reason for exclusion
Upper Cummins Lake provincial park		provincial park

Data source and comments:

The Upper Cummins Lake provincial park has been officially legislated, however, the inventory file does not reflect the change (designated as ownership 62-C).

The Lower Cummins provincial park has been announced by government, but is still in the process of being officially legislated with an Order-in-Council. If legislation is not passed before the timber supply model is set up for the Golden TSA, then the proposed area will be part of the THLB. However, the effect of this announced new park on the timber supply forecast will be examined in a sensitivity analysis.

5.2.6 Roads, trails and landings

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

5. Timber Harvesting Land Base Definition

Table 7. Estimates for existing and future roads, trails and landings

Location	Age class (years)	Road length (metres)	Road width (metres)	Reduction area (hectares or per cent)
Existing RTLs				
Main/secondary roads	4 to 9		16	
Landings	1 to 2			3.0%
Skid trails	1 to 2			2.0%
Future RTLs				
Roads, trails and landings			18	7.34%

Data source and comments:

Almost all existing road systems in the TSA were located via photo transfer, using 1991 and 1993 air photos. These road systems were incorporated digitally into the most recent (October 1994) forest cover maps. Although the roads are on the digital maps, they are not recorded as an "area-based" feature from which to determine hectares occupied by roads. Therefore, a Geographic Information System (GIS) was used to determine the road lengths through the timber harvesting land base — to determine which age classes are covered by roads.

Reductions for roads, landings and skid trails were determined using the following assumptions:

1) Past harvest/salvaged wildfire areas occupy 38% (64 000 hectares) of the timber harvesting land base since the 1960s (from district forest inventory file).
2) Sixty-five per cent of past harvest has been conventional and 35% has been cable.
3) Fifty per cent of past conventional harvest has been winter and 50% has been summer.
4) Fifty per cent of all past conventional harvest has occurred on slopes less than 30%, and 50% has occurred on slopes greater than 30%.
5) Past site disturbance levels from secondary roads, landings and summer skid trails, and the per cent area of logged areas occupied by landings are taken or interpolated from the 1988 report, *Quantification of Soil Disturbance following Logging in the Golden TSA*.
   - 100% growth loss occurs on main and secondary roads and landings.
   - 40% growth loss occurs on summer skid roads.
   - Summer ground skidding with > 25 cm sidecut occupies 7% on < 30% slopes and 24% on steeper slopes.
   - Past harvested areas have an average 3.3% of their timber harvesting land base occupied by landings.
6) Winter conventional harvest areas incur no loss in soil productivity due to detrimental disturbance.

7) Future soil disturbance (mainly skid roads) and permanent access structures (main and secondary roads and landings) will be within the limits recommended in the *Soil Conservation Guidebook.*

   Future harvested areas will have an average of 7.0% of their timber harvesting land base occupied by main and secondary roads and landings.

   Future conventional summer harvested areas will have an average of 7.5% of their timber harvesting land base occupied by dispersed soil disturbance (including skid trails). This compares to an average of 10% for past harvesting (from above assumptions). Future cable harvested areas will have no dispersed soil disturbance. After 1998, it is assumed that the excavated dispersed soil disturbance from summer conventional harvesting will be rehabilitated, with a net growth loss of 20% on the rehabilitated skid trails. It is assumed that winter conventional harvested areas will not have excavated dispersed soil disturbance, and compaction will result in a 10% net growth loss on skid trails.

8) Fifty per cent of future conventional harvest will be winter and 50% will be summer. Seventy per cent of future harvest will be cable and 30% will be conventional.

9) Main/secondary road widths from past and future denudation average 16 metres, and 18 metres respectively, horizontal distance.

Calculation for future roads, skid trails and landings:

- Main and secondary roads = 4% of timber harvesting land base hectares harvested.
- Landings = 3% of timber harvesting land base hectares harvested.
- Skid roads = 30% conventional harvest * 7.5% disturbance * 15% degraded = 0.4% of timber harvesting land base hectares harvested.
- Total = 7.34% of timber harvesting land base hectares harvested.

This reduction is to be made to all areas yet to be harvested. After the model harvests all areas, then this reduction will no longer apply.

5.2.7 Environmentally sensitive areas

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

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

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

5. Timber Harvesting Land Base Definition

Table 8. Description of environmentally sensitive areas

ESA category	ESA descriptions	Reduction per cent (%)
Es1	Highly sensitive soils	90
Ep1	Severe regeneration problems	90
Er1	High recreational values inside UREPS	30
All other ESA1	Avalanche, colluvium	100

Data source and comments:

Reductions to Es1 and Ep1 areas are based upon professional judgment and analysis of the degree of past and future proposed harvest of Es areas within the TSA. The analysis has shown that 1.6% of the area of timber harvested area over the past 5 years has occurred within Es1 and Ep1 areas, whereas 7.2% of the mature timber harvesting land base, including all Es1 and Ep1 areas below the operability line, contain Es1 and Ep1 areas. The analysis has indicated that 1.1% of the area of timber harvesting planned for the next 5 years will occur within Es1 and Ep1 areas. No analysis was conducted on Es2 and Ep2 areas. The above results indicate that while there is timber harvesting in Es1 and Ep1 areas, it is marginal, usually occurring within small portions of the Es1 or Ep1 polygons.

No reduction to Ew1 areas are planned because ungulate winter habitat management will be modeled using forest cover requirements rather than by the use of area exclusions (see section 6.4).

Specific UREPs within the TSA have been removed from the timber harvesting land base for timber supply modeling purposes to reflect current practice. The remaining UREPs will be modeled as 30% unavailable for harvest. All other Er1 areas occurring outside of the previous UREP boundaries are assumed to be available for timber harvest modeling purposes.

5.2.8 Riparian Management Areas

The area of riparian reserve is indicated below and will be excluded from the timber harvesting land base.

Table 9. Riparian management areas

Stream class	Stream length	Reserve zone width (metres)	Management zone width (metres)	Retention in management zone (%)	TOTAL Riparian area reserve (metres)
S1		50	20	50	60
S2		30	20	50	40
S3		20	20	50	30
S5		0	30	25	8
W1		10	40	25	20
W2		10	20	25	15
W3		0	30	25	8
L1		10	0	0	10
L2		10	20	25	15

Data source and comments

Riparian area reserve shall be applied to each side of the water course. 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 slope and width. The resultant data was 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	50 m	} 50 + (20 * 0.5) = 60 m
Management	20 m	
Retention in Management	50%	

On average, the above listed riparian reserve zone widths are not logged. While there are some instances where the zones have been logged, due to various management reasons, there are estimated to be equal areas where the reserve zone has been extended.

5. Timber Harvesting Land Base Definition

5.2.9 Sites with low timber growing potential

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

Table 10. Description of sites with low timber growing potential

		Characteristics				
Inventory type group	**Species**	**Landscape unit**	**Maximum age to achieve minimum volume (years[a])**	**Minimum volume (m^3)**	**Reduction (%)**	**site index S 50**
1-11, 33, 34	Fir and cedar leading	All	250	150	100	
27-31	Pine leading	All	150	150	100	
12-17, 19	Hemlock leading	All	200	150	100	
18, 20	Balsam leading	All	200	200	100	
-21-26	Spruce leading	All	250	150	100	

Data source and comments:

Age and volumes shown are based on minimum merchantability criteria

5.2.10 Problem forest types

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

Table 11. Problem forest types criteria

Inventory type group	Leading species	Age (years)	Reduction per cent (%)
12, 15, 17, 19	H, HB, HDec, BH	> 140	100
35-42	deciduous	all	100

Data source and comments:

Analysis of the past 5 years of harvest indicate that mature Hemlock-Spruce (HS) hemlock-balsam(HB) hemlock-deciduous (Hdec) and hemlock stands have not been harvested.

Deciduous leading stands have not been utilized to any appreciable extent.

5.2.11 Cultural heritage resource reductions

Cultural heritage values include trap lines, and sites of archaeological or traditional use.

An archaeological overview assessment (AOA) was completed for the Golden TSA in 1996. Since then, a number of field-based site specific archaeological impact assessments have been made on some medium to high potential areas identified in the AOA. These assessments have not resulted in any appreciable decrease to the timber harvesting land base.

5.2.12 Timber licence reversions

Timber licences (TL) are old tenure arrangements that give a licensee exclusive rights to harvest merchantable timber within the licence area and do not contribute to the TSA allowable annual cut. The last of these agreements in Golden expires in 2008. Upon expiry, these areas are added to the TSA. Prior to expiry, as these areas have been harvested, regenerated and attain free-growing status, the timber licence area reverts to B.C. Forest Service jurisdiction. Accordingly, these areas are included in the timber harvesting land base after the free-growing status and contribute to the TSA timber supply. Timber licence areas will, however contribute to the seral stage targets before expiry.

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

Table 12. Timber licence reversion schedule

			Area of timber licences to be harvested (hectares) prior to expiry (year of harvest)		
Timber licence #	**Location**	**Expiry year**	**Analysis unit**	**1994-2003**	**2004-2008**
179	Beaver R.	2001	34	98	N/A
541	Palliser	2008	55	71	0
550	Alder Cr.	2003	N/A	0	N/A
564	Rogers	expired	N/A	N/A	N/A
575	W. Columbia	expired	N/A	N/A	N/A
588	E. Columbia	2000	N/A	0	N/A
597	Surprise Rapids	2001	55	37	N/A
606	Blaeberry	2005	54	59	0
613	Encampment Cr.	1998	N/A	0	N/A
630	Wood R.	2000	N/A	0	N/A
759	Molson Cr.	1999	34	96	N/A

5. Timber Harvesting Land Base Definition

Data source and comments:

It is assumed that all past denudation within timber licences has been recorded within the forest inventory file used for this TSR (harvest data for this file is current to 1993).

All timber licences will revert to the TSA upon the listed expiry date.

The mature timbered areas that will remain within some timber licences at time of expiry are largely problem forest types currently considered to be too poor in quality for harvest.

All timber licence areas will contribute to the biodiversity seral stage requirements prior to reversion to the TSA.

6. Current Forest Management Assumptions

6.1 Harvesting

6.1.1 Utilization levels and waste and breakage (W2B) factors

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

Table 13a. Utilization levels

Analysis unit	Minimum dbh (cm)	Maximum stump height (cm)	Minimum top dib (cm)
Pine	12.5	30	10
Cedar > 140 years old	17.5	30	15 [a]
Cedar < 140 years old	17.5	30	10
All other species	17.5	30	10

[a] Although listed as 15 cm - it will be modeled as 10 cm

Data source and comments:

These levels reflect current interior utilization standards, licence requirements and current performance.

An ongoing study of decay and breakage factors in the Golden TSA is still incomplete at the time of publishing this data package. However, if the results of the study are completed prior to completion of the TSR2 analysis, a waste and breakage sensitivity analysis will be conducted.

Table 13b. Waste and breakage (W2B) factors by age range and species

Age range	Utilization level (cm)	F	C	H	B	S	Pw	Pl	Pa
Older[a]	12.5	2.0	4.1	3.0	2.0	2.0	2.0	2.4	3.4
Immature	17.5	2.0	4.2	2.0	2.0	2.0	2.0	2.4	3.6
Mature	12.5	2.0	20.5	17.9	10.5	3.0	3.4	2.7	3.4
Mature	17.5	2.4	21.2	17.9	10.5	3.0	3.6	3.1	3.6

(a) Lodgepole pine: age classes 4-6;
Other species: age classes 5-6.

Data source and comments:

The yield tables used in this analysis are reduced for waste and breakage. Aggregated waste and breakage (W2B) factors are developed from the inventory metric diameter class loss factors manual by averaging over diameter class and risk group and combining the separate factors for waste and breakage.

6.1.2 Volume exclusions for mixed species stands

One or more species in mixed species stands may be unmerchantable. For example, the deciduous species in a predominantly coniferous stand may not be harvested, or may only be partially harvested. The unharvested portion should not contribute to the estimated stand volume.

Table 14. Volume exclusions for mixed species types

Inventory type group	Species	Volume exclusion (%)
F-Decid	All deciduous	100
H-Decid	All deciduous	100
S-Decid	All deciduous	100
Pl-Decid	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 are simply minimum criteria. While harvesting may occur in stands at the minimum requirements in order to meet forest level objectives (e.g., maintaining overall harvest levels for a short period of time or avoiding large interdecadal changes in harvest levels), most stands will not be harvested until well past the minimum timber production ages because of other resource values take precedence (e.g., requirements for the retention of older forest).

The criteria used to define minimum harvestable ages for this analysis include: 90% of culmination age; a 25 cm minimum diameter; minimum volume per hectare; and professional judgment.

6. Current Forest Management Assumptions

Table 15a. Minimum harvestable age criteria

Analysis unit	Minimum Diameter	Minimum volume m^3/hectare	culmination age	Minimum harvestable age natural stands	Minimum harvestable age regenerated stands
11 Fir dry, good site	25	150			
12 Fir dry, medium site	25	150			
13 Fir dry, poor site	25	150			
14 Fir wet, good site	25	150			
15 Fir wet, medium site	25	150			
16 Fir wet, poor site	25	150			
24 Cedar, good site	25	200			
25 Cedar, medium site	25	200			
26 Cedar, poor site	25	200			
21 Hemlock, good site	25	200			
22 Hemlock, medium site	25	200			
23 Hemlock, poor site	25	200			
31,34 Spruce, good site	25	150			
32,35 Spruce, medium site	25	150			
33,36 Spruce, poor site	25	150			
41,44 Pine, good site	25	150			
42,45 Pine, medium site	25	150			
43,46 Pine, poor site	25	150			

Data source and comments:

Minimum harvestable ages were also set so that they would not be harvested prior to 90% of the time required to achieve the culmination age (it has been district practice to limit harvesting in younger age classes, based upon knowledge that the achievement of culmination age will maximize the long-term harvest level).

For pine leading stands, if any of the above criteria results in a minimum harvest age of greater than 120 years, then 120 will be used. Professional judgment will also used in reviewing the culmination ages. For instance, if culmination occurs where the yield curve levels - then off more latitude in setting minimum harvestable ages is allowed.

In operational practice, harvest of stands below the stated minimum harvestable ages may occur due to salvage of damaged stands or management of stands susceptible to bark beetle attack.

6.1.4 Harvest Scheduling Priorities

For the Golden TSA, the timber supply model will choose stands to log randomly, rather than by oldest first. The age range of stands harvested with this random method will likely extend down to the minimum harvestable ages.

The random harvest age method was chosen after an analysis of harvesting over the last 5 years and recently submitted forest development plans. The analysis results are indicated below. The harvesting of younger age classes is occurring predominately in the pine, fir and spruce leading (except spruce-balsam) types. This harvest profile will not be modeled, per se, in the analysis, however, it was used in the decision to choose the random harvest rule rather than the other harvest rules available.

Table 15b. Analysis of Past 5-Year Harvest Ages

Description	% of past timber harvest (by equivalent clear cut area)	% of annual timber harvest (FDP volume)
Age classes 8+9	69	75
Age classes 6-7	17	13
Age classes < 6	14	12

6.1.5 Logging methods and silvicultural systems

The logging methods employed in the Golden TSA are conventional (65%), cable (35%). The per cent figures are based on the average amount of volume harvested per year by all licensees. These methods are now considered current performance and special partitioning of the harvest is not required.

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

6. Current Forest Management Assumptions

6.2 Unsalvaged losses

The purpose of this section is to provide an estimate of average annual unsalvaged volume loss to insect and disease epidemics, fires, wind damage or other agents on the timber harvesting land base. The unsalvaged loss column only reflects those areas in which the volume will not be recovered or salvaged.

Table 16. Unsalvaged losses

Cause of loss	Annual unsalvaged loss (hectares)	Average Volume per hectare	Annual unsalvaged loss (m^3/year)
Wildfire	36.8	350	12 880
Broadcast/fringe burn	35.2	300	10 560
Total fire	72.0	350	23 440
Spruce bark beetle	0		0
Douglas-fir bark beetle	0		0
Mountain pine bark beetle	2	350	700
Total insects	2	350	700
Windthrow/blowdown	1.5	350	525
Avalanche	0		0
Total loss	75.5		24 700

Data source and comments:

All unsalvaged losses indicated are from the timber harvesting land base.

Information regarding unsalvaged losses was collected from forest district staff, licensee annual reports, the protection fire reporting system, MLSIS/ISIS (silviculture databases), and *Forest Insect Disease Survey* (FIDS) reports. The best data available was used for the analysis which often consisted of 'professional judgment' as data sources. Data was pooled from different sources, often in different units and brought together to form a unified product.

6. Current Forest Management Assumptions

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 Golden TSA. Table 19 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 (MSYTs) produced using the B.C. Forest Service table interpolation program for stand yields (TIPSY) growth and yield model. A MSYT may be built from a number of tables if more than one regeneration method is used within an analysis unit. When this is the case, tables are produced for the different regeneration methods (each method x species combination) are then aggregated into one table.

Table 17. Regeneration assumptions by analysis unit

Natural stand analysis unit	Composition	Natural stand site index	Regen delay	OAFs 1	OAFs 2	Regen method	Regen species	%	Density initial
11	F, FPl, FL, FDecid, LF, L		4	15	5	Plant	F Pl S	40 40 20	1200
12	F, FPl, FL, FDecid, LF, L		4	15	5	Plant	F Pl S	40 40 20	1200
13	F, FPl, FL, FDecid, LF, L		4	15	5	Plant	Pl F	80 20	1200
14	FC, FH, FS		4	15	5	Plant	F S	50 50	1200
15	FC, FH, FS		4	15	5	Plant	F S	50 50	1200
16	FC, FH, FS		4	15	5	Plant	F Pl	80 20	1200
24	C, CF, CH		4	15	5	Plant	C S H	20 60 20	1200
25	C, CF, CH		4	15	5	Plant	C S H	20 60 20	1200
26	C, CF, CH		4	15	5	Plant	S F Pl	70 20 10	1200
21	HC, HF, HS, H, HB, HDec, B, BH		4	15	5	Plant	C S H	20 60 20	1200
22	HC, HF, HS, H, HB, HDec, B, BH		4	15	5	Plant	C S H	20 60 20	1200
23	HC, HF, HS, H, HB, HDec, B, BH		4	15	5	Plant	S F Pl	70 20 10	1200

(continued)

6. Current Forest Management Assumptions

Table 17. Regeneration assumptions by analysis unit (continued)

Natural stand analysis unit	Composition	Natural stand site index	Regen delay	OAFs 1	OAFs 2	Regeneration method	Regenerated species	%	Density initial
31	S, B		4	15	5	Plant	Pl S B	20 70 10	1200
32	S, B		4	15	5	Plant	Pl S B	20 70 10	1200
33	S, B		4	15	5	Plant	Pl S	20 80	1200
34	S, B		4	15	5	Plant	Pl S B	20 70 10	1200
35	S, B		4	15	5	Plant	Pl S B	20 70 10	1200
36	S, B		4	15	5	Plant	Pl S	20 80	1200
41	S, SB SF, SH, SPl, SDec		4	15	5	Plant	S F Pl	70 20 10	1200
42	S, SB SF, SH, SPl, SDec		4	15	5	Plant	S F Pl	20 20 60	1200
43	S, SB SF, SH, SPl, SDec		4	15	5	Plant	S F Pl	20 20 60	1200
44	S, SB SF, SH, SPl, SDec		4	15	5	Plant	S F Pl	70 20 10	1200
45	S, SB SF, SH, SPl, SDec		4	15	5	Plant	S F Pl	70 20 10	1200

(continued)

6. Current Forest Management Assumptions

Table 17. Regeneration assumptions by analysis unit (concluded)

Natural stand analysis unit	Composition	Natural stand site index	Regen delay	OAFs 1	OAFs 2	Regeneration method	Regenerated species	%	Density initial
46	S, SB SF, SH, SPl, SDec		4	15	5	Plant	S F Pl	20 20 60	1200
51	PwPa, Pl PlF, PlS, PlDec		4	15	5	Plant	S F Pl	20 20 60	1200
52	PwPa, Pl PlF, PlS, PlDec		4	15	5	Plant	S F Pl	20 20 60	1200
53	PwPa, Pl PlF, PlS, PlDec		4	15	5	Plant	Pl	100	1200
54	PwPa, Pl PlF, PlS, PlDec		4	15	5	Plant	S F Pl	20 20 60	1200
55	PwPa, Pl PlF, PlS, PlDec		4	15	5	Plant	S F Pl	20 20 60	1200
56	PwPa, Pl PlF, PlS, PlDec		4	15	5	Plant	Pl	100	1200

Data source and comments:

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

Provincial average operational adjustment factors (OAFs) values are applied to the managed stand yield curves as recommended by the Ministry of Forests, Research Branch — as no local values are available. It should be noted that there is concern that these OAFs underestimate the losses expected on some stands due to root rot disease. The impact of this under estimate will be examined through sensitivity analysis.

6. Current Forest Management Assumptions

6.3.2 Immature plantation history

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

Table 18. Immature plantation history

	Area managed (%)	
Analysis unit	**Age 1 - 10**	**Age 11 - 20**
All	100	100

Data source and comments:

Recently regenerated areas (under 20 years old) are assumed to be growing as managed stands due to increased silvicultural activities during that time.

6.3.3 Not satisfactorily restocked (NSR) areas

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

	Hectares in the forest inventory file currently designated as NSR				
Analysis unit	**Total NSR in Inventory file**	**Inoperable NSR**	**NSR stocking 400-700 stems/ha**	**Restocked now**	**Restocked in 1-10 years from now**
S leading		250	520		500
F leading		150	170		300
Pl leading		50	90		400
C leading		70	130		200
Hw leading			390		100
Total		520	1300		1500

6. Current Forest Management Assumptions

Data source and comments:

The district silviculture data (ISIS and MLSIS) indicate that only 1500 hectares of NSR remain to be restocked. The difference between this and the amount of operable NSR on the inventory file will be assumed to have already been restocked.

District data summaries of current stocking of NSR denuded before 1988 were used to derive the amount of inoperable and lower stocking (400-700 stems) area by analysis unit. Almost all of these areas were harvested prior to 1983.

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 be examined at a number of different levels. These may be considered as layers in geographic information systems (GIS) terminology. One possible layer 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 retention).

Tables 20a and 20b indicate the forest cover requirements for group levels 3 to 9. Table 20a figures apply to the total forest area. Table 20b covers the requirements for resource emphasis areas (group levels 4 through 9).

6. Current Forest Management Assumptions

Table 20a. Forest cover requirements for Group Level 3

Biogeoclimatic unit	Time Frame	NDT	Mature and old-seral stage		Old-seral stage	
			Minimum retention area (%)	Minimum age (years)	Minimum retention area (%)	Minimum age (years)
ESSFwc2	now - 70 yrs	1	24.4	120	14.2	250
ESSFwc4	now - 70 yrs	1	24.4	120	14.2	250
ESSFwm	now - 70 yrs	1	24.4	120	14.2	250
ESSFvc	now - 70 yrs	1	24.4	120	14.2	250
ICHwk1	now - 70 yrs	1	22.9	100	9.7	250
ICHvk1	now - 70 yrs	1	22.9	100	9.7	250
ESSFmw	now - 70 yrs	2	19.6	120	6.7	250
ICHmw1	now - 70 yrs	2	20.8	100	6.7	250
ESSFdk	now - 70 yrs	3	15.8	120	10.5	140
ICHmk1	now - 70 yrs	3	15.8	100	10.5	140
MSdk	now - 70 yrs	3	17.7	100	10.5	140
IDFdm2	now - 70 yrs	4	22.9	100	9.7	250
Parkland[*!]	now - 70 yrs	5	24.4	120	14.2	250
ESSFwc2	71 - 140 yrs	1	27.2	120	17.0	250
ESSFwc4	71 - 140 yrs	1	27.2	120	17.0	250
ESSFwm	71 - 140 yrs	1	27.2	120	17.0	250
ESSFvc	71 - 140 yrs	1	27.2	120	17.0	250
ICHwk1	71 - 140 yrs	1	25.4	100	11.6	250
ICHvk1	71 - 140 yrs	1	25.4	100	11.6	250
ESSFmw	71 - 140 yrs	2	22.4	120	8.0	250
ICHmw1	71 - 140 yrs	2	23.0	100	8.0	250

continued.

6. Current Forest Management Assumptions

Table 20a. Forest cover requirements for Group Level 3 -(concluded)

Biogeoclimatic unit	Time Frame	NDT	Mature and old-seral stage		Old-seral stage	
			Minimum retention area (%)	Minimum age (years)	Minimum retention area (%)	Minimum age (years)
ESSFdk	71 - 140 yrs	3	17.9	120	12.6	140
ICHmk1	71 - 140 yrs	3	17.9	100	12.6	140
MSdk	71 - 140 yrs	3	19.8	100	12.6	140
IDFdm2	71 - 140 yrs	4	25.4	100	11.6	250
Parkland[*!]	71 - 140 yrs	5	27.2	120	17.0	250
ESSFwc2	141+ years	1	30.2	120	19.9	250
ESSFwc4	141+ years	1	30.2	120	19.9	250
ESSFwm	141+ years	1	30.2	120	19.9	250
ESSFvc	141+ years	1	30.2	120	19.9	250
ICHwk1	141+ years	1	28.1	100	13.6	250
ICHvk1	141+ years	1	28.1	100	13.6	250
ESSFmw	141+ years	2	25.4	120	9.4	250
ICHmw1	141+ years	2	25.3	100	9.4	250
ESSFdk	141+ years	3	20.1	120	14.7	140
ICHmk1	141+ years	3	20.1	100	14.7	140
MSdk	141+ years	3	21.9	100	14.7	140
IDFdm2	141+ years	4	28.1	100	13.6	250
Parkland[*!]	141+ years	5	30.2	120	19.9	250

[*1] Some timber harvesting land base is typed as parkland due to scale of biogeoclimatic classification mapping. In these instances - values for NDT1 ESSF will be used.

Data Source and Comments:

Biodiversity guidelines will be modeled using information from the *Forest Practices Code Biodiversity Guidebook*. Operationally, the KBLUP - Implementation Strategy biodiversity emphasis applies, as the assignment of draft biodiversity emphasis options is complete. However, because the Implementation Strategy has Draft emphasis assignments, and it is expected that biodiversity emphasis assignment will be completed within 1 to 2 years; the timber supply analysis will use constraints that do not prejudge what may be expected when the emphasis levels have been assigned. As it is unknown at this time which landscape units will be officially assigned low-, intermediate- or high-emphasis a single weighted constraint for each of the old plus mature-seral stage and the old-seral stage will be developed based on the anticipated distribution of 45% low-, 45% intermediate- and 10% high-emphasis. The values shown in Table 20a above reflect the weighted *Biodiversity Guidebook* values.

Level 3 encompases ALL Crown forested land

6. Current Forest Management Assumptions

Table 20b. Forest cover requirements for Group Levels 4 through 9

Resource emphasis	Forest cover objective				
	Green-up height (metres)	Green-up age (years)	Maximum area less than green-up age (%)	Minimum older age (years)	Minimum area greater than older age (%)
4 - Caribou ESSF	2		25	140 250	30 10
5 - Caribou ICH	2		25	140 250	40 10
6 - Visual Quality	6		15	n/a	n/a
7 - Watersheds	6		25	n/a	n/a
8 - Ungulate Winter Range	2		25	100	45
9 - Integrated Resource Management	2		25	n/a	n/a

Data source and comments:

All zones or groups will be modeled separately within each landscape unit. For example this applies also to all VQO and ungulate winter polygons (each designated polygon to be modeled separately).

Under the 1996 forest development plan memorandum of understanding, licensees have been given direction by landscape unit to manage for levels of biodiversity. The forest district manager in the next forest development plan memorandum of understanding, intends on directing to manage to the biodiversity emphasis options as per the approved *Kootenay Boundary Land Use Plan Implementation Strategy*. The ages and percentages used are as per the September 1995, *Biodiversity Guidebook*, - therefore a sensitivity analysis will be conducted.

The old-seral requirement within low emphasis biodiversity areas will be modelled based upon achievement of one-third the guidebook requirement but built up to 100% by three rotations

Early-seral age requirements will not be modeled (the green-up requirement within the IRM and other zones replaces the early-seral requirement). The definition of forested land includes alpine forest for the model.

The non-contributing forest within each landscape unit is assumed to age over time.

6. Current Forest Management Assumptions

The *Biodiversity Guidebook* requirement for mature plus old, and old will first be met as much as possible from the non-contributing land base.

Landscape unit boundaries extend into provincial and national park lands where they are the same biogeoclimatic subzone as 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.

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.

The *Kootenay-Boundary Land Use Plan* requires that each 250 to 500 hectare portion of ungulate winter habitat be managed as separate units, with the required forest cover existing within each unit. These units will be modeled for this timber supply analysis - but are suspect due to their small size — however, the effect of managing within these small units will be analysed as a sensitivity.

The *Kootenay-Boundary Land Use Plan Implementation Strategy* has identified specific management guidelines for visual quality areas. The district manager of the Columbia Forest District has determined that these guidelines are current practice, but require better resolution for operations within the forest district. The existing digital linework for visual quality objectives does not exactly match the guidelines expressed in the *Kootenay-Boundary Land Use Plan Implementation Strategy*, but sufficiently approximate them for this timber supply review.

Special resource management zones as described within the *Kootenay-Boundary Land Use Plan Plan Implementation Strategy* are being managed operationally to include the early-seral requirement of the *Biodiversity Guidebook*, as well as certain forest ecosystem networks and guidelines for management of timber adjacent to avalanche paths and the Athabasca Pass heritage trail. These specific requirements are not modeled in this timber supply analysis due to their relatively minor occurrence in the timber harvesting land base (3 - 4 %) and due to modeling complications resulting because these areas often make up only a portion of a landscape unit.

6.4.2 Reductions to reflect volume retention in cutblocks

Retention of volume within cutblocks may occur for a variety of forest management considerations. Provide the combination of groups, zones or analysis units where retention occurs and indicate the percentage or volume. For example, these may include wildlife tree patches, riparian management zones or partial cutting systems. All of the columns do not necessarily need to be completed if one or two of the columns adequately describes the issue (e.g., all fir analysis units must retain 2% of block volume).

6. Current Forest Management Assumptions

Wildlife Trees (WT) and Tree Patches (WTP)

The *Biodiversity Guidebook* describes two methods for providing the maintenance of stand structure over time. One method is wildlife trees while the other is wildlife tree patches. Different silvicultural systems may provide the intended structural diversity through modifying the timing timber is available. Consideration should be given to whether the trees will ever be harvested and whether areas in riparian management zones are regularly being used to produce either wildlife trees or tree patches. Recognizing the overlap between these two objectives will eliminate inappropriate reductions in volume or timber harvesting land base.

The *Guidebook* also indicates that wildlife tree patches (group reserves) larger than two hectares in size within a cutblock boundary can contribute to old-seral stage forest requirements at the landscape level.

Table 21. Reductions to reflect volume retention in cutblocks

Management zone	Analysis unit	Reason for residual volume	Persistence	Residual area on the timber harvesting land base (%)
IRM	All	Wildlife tree patch	Permanent	4.7%
Ungulate winter	All	Wildlife tree patch	Permanent	4.7%
Caribou (ESSF,ICH)	All	Wildlife tree patch	Permanent	4.7%
VQO	All	Wildlife tree patch	Permanent	4.7%

Data source and comments:

Wildlife tree patches greater than two hectares are common in the Golden TSA. Within the model, wildlife tree patches are considered as an area loss from the timber harvesting land base. These areas do, however, contribute to the seral stage targets.

The wildlife tree patch percentage was derived by calculating a weighted average of the wildlife tree requirements as directed in the *Biodiversity Guidebook's Table 20b*, assuming that 25% of the wildlife tree requirement is coming from the non-contributing land base.

7. Sensitivity Analyses to be Performed

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

Table 22. Sensitivity issues specific to the Golden TSA

Issue to be tested	Sensitivity levels
Age when forest achieves "old" forest characteristics	+/- 50 years
Existing stand yields	+/- 25% volume in Cedar / Hemlock due to waste and breakage
KBLUP Implementation Strategy	Perform analysis of draft biodiversity emphasis option assignments
Harvest ages	Test relative oldest first and youngest first
Land base change	Remove Lower Cummins

For the senstivity analysis the timber harvesting land base area in Golden TSA about 11 per cent is considered high emphasis for biodiversity management, 45 percent intermediate and the remaining 44 percent low. The Golden 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.

7. Sensitivity Analyses to be Performed

Table 23. Standard sensitivity analysis

Issue to be tested	Sensitivity levels
Minimum harvestable age	± 10 years
Existing stand yields	± 10%
Regenerated stand yields	± 10 / 20%
Land base changes	± 5 / 10% of mature net operable
Harvest flow alternatives with base case	
Green-up periods	± 5 years
Adjacency	Turn off
Full Biodiversity in Low	turn on / off
Proportional	turn on /off
Early seral	Turn on
Atlas cut blocks	Turn on
Old/mature guidebook ages	Turn on / off
Visual quality objectives	+ / - 10%