

Bulkley Timber Supply Area Timber Supply Review

Data Package

June 1998

District Manager
Bulkley / Cassiar Forest District

Director
Timber Supply Branch

Table of Contents

1. INTRODUCTION	1
2. CURRENT FOREST MANAGEMENT CONSIDERATIONS AND ISSUES.....	2
2.1 BASE CASE MANAGEMENT ASSUMPTIONS	2
2.2 STATEMENT OF MAJOR FOREST MANAGEMENT CONSIDERATIONS AND ISSUES.....	2
3. INVENTORIES.....	4
3.1 BACKGROUND INFORMATION.....	4
4. DIVISION OF THE AREA INTO MANAGEMENT ZONES.....	7
4.1 MANAGEMENT ZONES AND TRACKING OF MULTIPLE OBJECTIVES (GROUPING)	7
4.2 ANALYSIS UNITS	9
5. TIMBER HARVESTING LAND BASE DEFINITION.....	11
5.1 IDENTIFICATION OF THE TIMBER HARVESTING LAND BASE	11
5.2 DETAILS ON LAND BASE CLASSIFICATION.....	11
5.2.1 Land not administered by the British Columbia Forest Service for timber supply purposes.....	11
5.2.2 Grazing and agriculture leases	12
5.2.3 Land classified as non-forest	12
5.2.4 Non-commercial cover	12
5.2.5 Environmentally sensitive areas.....	12
5.2.6 Areas considered inoperable	13
5.2.7 Roads, trails and landings.....	17
5.2.8 Cultural heritage resource reductions	18
5.2.9 Riparian management areas.....	20
5.2.10 Exclusion of specific, geographically defined areas	21
6. CURRENT FOREST MANAGEMENT ASSUMPTIONS.....	22
6.1 HARVESTING.....	22
6.1.1 Utilization levels	22
6.1.2 Volume exclusions for mixed species stands	22
6.1.3 Minimum harvestable age derivation.....	23
6.1.4 Harvest scheduling priorities	24
6.1.5 Logging method and silvicultural systems	25
6.2 UNSALVAGED LOSSES	25
6.3 SILVICULTURE.....	27
6.3.1 Regeneration activities in managed stands.....	27
6.3.2 Immature plantation history.....	29
6.3.3 Rehabilitation areas	31
6.3.4 Not satisfactorily restocked (NSR) areas	32
6.4 INTEGRATED RESOURCE MANAGEMENT.....	32
6.4.1 Objectives which require forest cover requirements.....	32
6.4.2 Wildlife tree patches (WTP)	35
7. SENSITIVITY ANALYSES TO BE PERFORMED.....	37

Table of Contents

Tables

1.	Major forest management considerations and issues.....	3
2.	Inventory information.....	4
3.	Objectives to be tracked.....	8
4.	Definition of analysis units.....	9
5.	Description of environmentally sensitive area.....	13
6a.	Inclusion/exclusion operability code combinations.....	14
6b.	Operability codes.....	15
6c.	Parameters for operability codes.....	16
7.	Estimates for existing and future roads, trails, and landings.....	17
8.	Estimate for existing roads.....	18
9.	Riparian management areas.....	20
10.	Utilization levels.....	22
11.	Volume exclusions for mixed species types.....	22
12.	Minimum harvestable age criteria.....	24
13.	Priorities for scheduling the harvest.....	25
14.	Unsalvaged losses.....	26
15.	Regeneration assumptions by analysis unit.....	28
16.	Immature plantation history.....	30
17.	Density control schedule for presently immature, overdense stands.....	31
18a.	Forest cover requirements — biogeoclimatic units and natural disturbance types (NDTs) within the Bulkley TSA.....	33
18b.	Forest cover requirements.....	34
19.	Reductions to reflect volume retention in cutblocks.....	36
20.	Sensitivity issues specific to the Bulkley TSA.....	37
21.	Standard sensitivity issues.....	38

1. Introduction

This data package outlines the basic information and assumptions that are required for the Bulkley 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" is 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 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
- other approved B.C. Forest Service and joint agency forest management practices and policies.

The purpose of the timber supply review program is to model "what is" not "what if". Changes in forest management objectives and data, when and if they occur, will be included in future timber supply analyses.

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

- 1) A short explanation of the data required;
- 2) Data table; and
- 3) The source of the data and comments.

This data package, while representing the best available knowledge and information at the time it was written, is subject to change. As noted in several sections, until the timber harvesting land base is determined it is not possible to finalize the values shown in some of the tables. In some cases the criteria are shown but the final value is not yet filled in. These appear as gray shaded columns 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," identifies areas of uncertainty with respect to the data and assumptions and outlines sensitivity analyses intended to be performed.

2.2 Statement of major forest management considerations and issues

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

2. Current Forest Management Considerations and Issues

Table 1. Major forest management considerations and issues

Consideration/issue	Description
Bulkley land and resource management plan (LRMP)	The Bulkley LRMP has recently been approved by Cabinet as ministerial policy. The parts of the Bulkley LRMP which are current management will be included in the base case.
Proposed protected areas	An order-in-council (OIC) must be passed before proposed protected areas are removed from contributing to the allowable annual cut (AAC). If the OIC is passed before the AAC determination is completed, the protected areas will be removed.
Agricultural land reserve (ALR)	The mapping within the ALR was refined and divided the ALR into areas of agricultural capability, which are placed in the agriculture/wildlife zones, and the remaining Crown land which is placed into the integrated resource management (IRM) zone. Management within these areas shall be as specified by the Bulkley LRMP.
Partitioned cut	To ensure the harvest profile matches the inventory stand profile, 367 000 m ³ of the current AAC is harvested in marginal sawlog or pulplog quality stands.
Community watersheds	Forest management guidelines associated with community watersheds will be considered in the analysis.
Visual quality objectives (VQO)	Forest cover constraints associated with approved visual quality objectives will be considered in the analysis.
Landscape-level biodiversity	Draft landscape unit (LU) boundaries have been defined, and in the analysis a weighted biodiversity emphasis option assignment will be used. A sensitivity analysis will examine the impact of applying draft biodiversity emphasis options.
Stand-level biodiversity	The wildlife tree requirements of the <i>Biodiversity Guidebook</i> will be addressed, as per current practice.
Site index	Site index is generally underestimated for regenerating stands in the Bulkley TSA. Two processes are underway to provide site index correction factors for these stands: old-growth site index (OGSI) and operational adjustment to site index study (OASIS). The sensitivity of timber supply to the OASIS results and the OGSI results will be examined.

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	Vintage	Update	Source scale
Standard			
Biogeoclimatic	1993	—	1:250 000
Forest cover	1994	—	1:20 000
Ownership status	1994	1997	1:250 000
Planning cell C7	1989	—	1:50 000
TRIM	1995	—	1:20 000
Non-standard			
Management zones (from Bulkley LRMP)	1995	—	1:50 000
Draft landscape units	1993	1997	1:50 000
Harvest method mapping (HMM)	1998		1:20 000
Grazing leases, agriculture leases, Telkwa Bulbous Toe	1998	—	1:20 000
Stream inventories	1997	—	inventory
Terrain stability mapping	1996	—	1:20 000
Visual landscape inventory	1992	1997	1:50 000
Woodlots	1995	1998	1:20 000
Community watersheds	1993	—	1:250 000
Areas of high and moderate value for grizzly bear (Babine LRUP)	1993	1998	1:50 000

Data source and comments:

Biogeoclimatic ecosystem classification (BEC)

BEC information on the inventory file is based on information supplied by biophysical habitat inventory maps (Ministry of Environment, Lands and Parks (MELP) non-standard maps 1992–1993).

3. Inventories

Forest cover

The forest inventory planning (FIP) file is current to 1994, with volumes projected to 1998.

Planning cell C7

Planning cell C7, which is in the north end of the Bulkley TSA, will be provided as a digital overlay. All timber within cell C7 is classified as marginal quality due to the relative remoteness of the area.

Terrain resource information mapping (TRIM)

TRIM mapping was completed in 1995.

Management zones

This is a complete list of the management zones from the Bulkley LRMP.

Draft landscape units

Draft landscape units replace former planning units, which were used for the Bulkley LRMP.

Harvest method mapping (HMM)

See Section 5.2.6, "Areas considered inoperable."

Grazing leases, agriculture leases, Telkwa Bulbous Toe

Grazing lease areas will be included in the timber harvesting land base. Agriculture lease areas and the Telkwa Bulbous Toe will be excluded from the timber harvesting land base.

Stream inventories

A stream sampling inventory was completed by Pacific Inland Resources (PIR) in 1997. Riparian reserve and management zones were derived using the HMM algorithm.

Terrain stability mapping (TSM)

TSM is available for parts of the Copper landscape unit. The TSM information will be merged into the analysis data set.

Visual landscape inventory

Visual quality objectives (VQOs) for visually sensitive areas around Babine Lake are current forest management, and will therefore be included in the analysis.

3. Inventories

Woodlots

Existing woodlots will be provided as a digital layer merged into the analysis data set. Existing woodlots will be excluded from the timber harvesting land base as their AAC is determined through a separate process.

Community watersheds

Forest cover constraints associated with community watershed management will be included in the analysis.

Grizzly habitat

Treatment units 4, 4a, and 5, as described in the Babine Local Resource Use Plan (LRUP), will be included as a digital layer and merged into the analysis data set.

4. Division of the Area into Management Zones

4.1 Management zones and tracking of multiple objectives (grouping)

The concept of management zones is used to differentiate areas with distinct management emphasis or homogenous forest cover. For example, a zone may be based on a harvesting system, silviculture system, visual quality objective or wildlife consideration. The forest cover data set can also be grouped by different variables. In addition, the non-contributing forest (land considered unavailable for timber harvesting) may be included for consideration in attaining forest cover objectives. Grouping enables constraints to apply to different combinations of variables or zones as well as enhancing reporting structures. Groups may be thought of as layers of different objectives that must be tracked over time. 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."

4. Division of the Area into Management Zones

Table 3. Objectives to be tracked

Objectives	Inventory definition
Management zones	Non-standard mapped layer
Babine SMZ	
IRM	
Enhanced timber	
SMZ 2	
Agriculture/wildlife	
Grizzly habitat (outside Babine LU)	
Mule deer habitat	
Caribou habitat	
Core ecosystems	Non-standard mapped layer
Landscape corridors	Non-standard mapped layer
Treatment unit 4, 4a, 5 grizzly bear habitat	Non-standard mapped layer
Landscape-level biodiversity	Non-standard mapped layer, draft landscape units and biogeoclimatic zones, subzone, variant
Community watersheds	Non-standard mapped layer
Retention visual quality	Non-standard mapped layer
Partial retention visual quality	Non-standard mapped layer

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 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. The following table identifies draft analysis units. After determining the timber harvesting land base, the timber supply analyst will determine the final analysis unit definitions.

Table 4. Definition of analysis units

Analysis unit (AU)	Criteria		
	Inventory type groups	Site index range	Equivalent HMM stand quality code
Sawlog			
Spruce — G	21, 23–26	> 19	S
Spruce — M	21, 23–26	15 – 19	S
Spruce — P	21, 23–26	≥ 10 < 15	S
Pine — G, M	28, 30, 31	≥ 15	S
Pine — P	28, 30, 31	≥ 12 < 15	S
Balsam — G	18, 20	≥ 18	S
Balsam — M	18, 20	≥ 15 < 18	S
Marginal sawlog			
Balsam — MS	18, 20	≥ 11 < 15	M
Spruce/pine — MS (planning cell C7)	18–21, 23–26, 28, 30, 31	≥ 10	M
Pulplog			
Hemlock — Pulp	12, 14–17, 19	≥ 11	P
Balsam/spruce — Pulp	18, 20	≥ 11	P

Data source and comments:

The 'Equivalent HMM stand quality code' column lists the stand quality codes from Tables 6b and 6c.

4. Division of the Area into Management Zones

Marginal sawlog and pulplog analysis units (AUs), see Section 5.2.6, "Areas considered inoperable" for a full definition of these types.

The 'Spruce / pine — MS' analysis unit identifies conifer -leading stands in planning cell C7 which are assigned to the marginal sawlog category because of their remoteness.

Due to the transitional nature of coastal zones within the Bulkley TSA, similar growth is observed to interior zones. Therefore, there will be no separation in the analysis units between coastal zones and interior zones.

5. Timber Harvesting Land Base Definition

5.1 Identification of the timber harvesting land base

The timber harvesting land base (THLB) for the Bulkley TSA is determined by separating 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 principle 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); and
- by the addition of productive forest land (e.g., timber licence reversions).

The 'unavailable for timber harvesting' classification applies only to land where no harvesting is anticipated to occur. Any area in which some timber harvesting will occur remains in the timber harvesting land base even if the area will be subject to stringent constraints.

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

5.2 Details on land base classification

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

Ownership codes are generally used to identify whether the land can be considered to contribute to timber supply. Areas with ownership codes other than those identified in the following paragraphs will be removed from the land base considered available for timber supply.

Ownership codes 62C and 69C indicate Crown land in a forest management unit and miscellaneous reserves respectively. Agricultural land reserve (ALR) area is included in ownership code 62C.

Ownership code 77N indicates Crown land contained within woodlot licence areas. However the ownership code on the inventory file will not be used because there is a replacement digital coverage which more accurately depicts woodlot licence boundaries. Woodlot licence areas as identified on this digital coverage will be removed from the land base. The woodlot AAC is determined independently of the timber supply review process.

5. Timber Harvesting Land Base Definition

5.2.2 Grazing and agriculture leases

Grazing leases and agriculture leases are not issued by the B.C. Forest Service, and are therefore not shown in the inventory file. Areas associated with these leases have been provided as a digital coverage merged with the analysis data set. Grazing leases have been incorporated into agriculture / wildlife zones, and contribute to the land base considered for harvest. The agriculture leases will be removed from the timber harvesting land base.

5.2.3 Land classified as non-forest

Type identity 6, such as alpine, lakes, rocks, etc., and type identity 8, where no typing is available, will be excluded from the land base considered available for timber supply. However, all type identity 6 areas with a mature coniferous-leading species component will contribute towards biodiversity seral-stage requirements.

5.2.4 Non-commercial cover

Areas which are classified as non-commercial brush species are represented by type identity 5. These areas are unlikely to support timber production and are excluded from the area considered available for timber harvesting.

5.2.5 Environmentally sensitive areas

Some forest lands are environmentally sensitive and / or significantly valuable for other resources. These areas are identified and delineated during a forest inventory 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), avalanche and regeneration problems (Ec), and fisheries (fisheries symbols). With the exception of avalanche and fisheries, two ESA classes are recognized within each category: high and moderate 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 specific evaluation of individual ESA polygons for harvesting opportunities.

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 harvesting, even if limited, will take place and areas which are entirely excluded from harvesting. This table deals with those areas in which harvesting will not occur.

5. Timber Harvesting Land Base Definition

Table 5. Description of environmentally sensitive area reductions

ESA category	Description	Reduction per cent (%)
Es1	Very sensitive soils	20
Ea	Avalanche	100
Ep 1+2	Regeneration problems	50
Ec 1+2	Avalanche and regeneration problems	100

Data source and comments:

Terrain stability assessments have shown that with modified harvesting practices (i.e., high-lead systems) Es1 areas are approximately 80% harvestable.

Within a portion of the Copper Landscape Unit where terrain stability mapping exists, the classification of unstable and potentially unstable will be used as replacements for Es1 and Es2 polygons. The per cent reduction for unstable polygons is 20%, and for potentially unstable polygons there will be no reduction.

ESAs for recreation are not removed as these areas fall within the visually sensitive areas. See Table 18b.

5.2.6 Areas considered inoperable

Operability 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, the methodology used to interpret and map operability is highly variable and district dependent.

'Harvest Method Mapping' (HMM), which was based on physical accessibility and economic feasibility for harvest, was used to determine limits of operability within the Bulkley TSA. Operability polygons have been assigned a 'primary harvest method' code and a secondary 'stand quality' code (Tables 6b and 6c). Codes contributing and not contributing to the operable land base are shown in Table 6a.

5. Timber Harvesting Land Base Definition

Table 6a. Inclusion/exclusion operability code combinations

Combinations contributing to operable land base	Combinations excluded from operable land base
GS, GM, GP, immature ^a GT	GD, GL, remaining GT
CS, CM, immature ^a CT, CP	CD, CL, remaining CT
HS, HM	HP, HD, HL, HT
—	IS, IM, IP, ID, IL, IT
	Riparian reserve zones (RRZ)

(a) Immature: 40 years of age or less.

Data source and comments:

The 'Harvest Method Mapping' GIS algorithm defines the physically accessible and economically feasible operable land base. The methodology used to develop the algorithm was a joint effort of the Bulkley / Cassiar Forest District staff and major licensees.

The product of the algorithm is a database containing the following information for 'operability' polygons:
either:

- 1) an appropriate harvest method code based on slope criteria and stand quality (Tables 6b and 6c);
or,
- 2) appropriate riparian reserve zone (RRZ) and riparian management zone (RMZ) codes, if the 'operability' polygon is associated with a stream, lake, or wetland (see Section 5.2.9, "Riparian management areas").

The following deals with condition 1, i.e., the non-riparian areas. The operable land base was defined by selecting the harvest method / stand quality code combinations considered to be feasible for harvest and that represent current management.

5. Timber Harvesting Land Base Definition

Parameters for the analysis units described in Table 4 are the same as those for 'stand quality' codes, as described in Table 6c.

Table 6b. Operability codes

Primary 'harvest method' codes	Secondary 'stand quality' codes
G — ground	S — sawlog stands
C — cable ^a	M — marginal sawlog stands
H — helicopter	P — pulplog stands
I — inaccessible, forested	D — deciduous-leading stands
	L — sites of low volume and low productivity
	T — sites with density problems (e.g., thick regeneration)

(a) Some H could also be classed as C depending on factors such as block location with respect to access, however only one code is assigned to each polygon.

5. Timber Harvesting Land Base Definition

Table 6c. Parameters for operability codes

Harvest method mapping codes	Parameters
Primary	
G	≤ 35% slope
C	> 35 < 60% slope
H	60%–90% slope
I	> 90% slope
Secondary	
M — marginal sawlog	Balsam-leading, and, average total tree height < 24 metres and, > 60% subalpine fir by net volume and, net merchantable volume > 150 m ³ /hectare at minimum harvestable age.
P — pulplog	Hemlock-leading, and, > 50% hemlock and < 20% spruce by net volume and, net merchantable volume > 175 m ³ /hectare, at minimum harvestable age; or: balsam-leading, and, > 50% amabilis and < 20% spruce by net volume, and, net merchantable volume > 175 m ³ /hectare at minimum harvestable age; or: > 50% amabilis and hemlock (combined) with < 20% spruce by net volumes and, net merchantable volume > 175 m ³ /hectare at minimum harvestable age.
D — deciduous-leading	All deciduous-leading stands.
L — sites of low volume and low productivity	Coniferous stands on low-productivity sites, site index < 10 for spruce-leading, < 11 for balsam and hemlock-leading, < 12 for pine-leading, with stand volumes ≤ 150 m ³ /hectare at minimum harvestable age.
T — sites with density problems (e.g., thick regeneration)	Coniferous stands with site index ≥ 15 and with density problems (density > 10,000 stems/hectare, or crown closure > 80%) that achieved the volume parameters (net merchantable volume > 175 m ³ /hectare for pulplog-quality, volume > 150 m ³ /hectare for marginal sawlog and sawlog-quality stands) but did not achieve the mean stand diameter criteria (25 cm dbh) by the minimum harvestable age.
S — sawlog	All remaining productive forest, including all immature logged blocks, and all other catastrophic loss blocks where silviculture activities have been conducted

5. Timber Harvesting Land Base Definition

5.2.7 Roads, trails and landings

Separate estimates are made to reflect the loss in productive forest land due to existing and future roads, trails and landings (RTL). Existing RTL estimates are applied as reductions to the current productive forest considered available for harvesting, and future RTL estimates are applied after stands are harvested for the first time in the simulation model.

All highways and larger municipal roads are of a sufficient size to be mapped as polygons and classified as non-forest areas in the forest inventory file. These polygons are thus removed from the timber harvesting land base as non-forest area, as shown in Section 5.2.3, "Land classified as non-forest."

All other roads, trails and landings are depicted only as lines on forest cover maps, and have no associated polygons. These areas are accounted for as follows.

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

Location	Age class	Reduction as area (hectares) or per cent (%)
Existing RTLs	0–4	4 160 hectares
Future RTLs	5–9	6.1%

Data source and comments:

Existing roads, trails, and landings

The total kilometers of existing road and trail were reported for a sample of 12 randomly selected mapsheets. This information was then used to determine the total hectares of roads and trails existing on each mapsheet using an average right-of-way width of 20 metres. In the Bulkley TSA an average mapsheet covers approximately 15 000 hectares. Mapsheets with ALR or development outside the Bulkley TSA were not included to ensure data was not affected by non-road or non-district development practices.

5. Timber Harvesting Land Base Definition

A second database was created for the 12 mapsheets to determine how many hectares of roads (on average) were on the FIP files as polygons. This database road hectares were subtracted from the total value because as noted above FIP road polygons are already removed during the non-forest reduction.

Table 8. Estimate for existing roads

Total average road hectares/mapsheets (hectares)		FIP file average road hectares/mapsheets (hectares)		Average road hectares to be removed/mapsheets (hectares)
98.92	–	20.0	=	78.92

There are 86 mapsheets within the Bulkley TSA however, many are only partially within the TSA. The total area equates to approximately 52.71 full mapsheets; therefore, a reduction of 4160 hectares (78.9 hectares * 52.71 mapsheets) provides a good estimate of area of existing roads in the Bulkley TSA to be removed.

Future roads, trails, and landings

A survey of operational plans (three major licensees) for 53 blocks harvested over the past 24 months showed the total area lost to productivity as well as the total area under permit. These summaries are used to reflect changes as a result of recent harvesting activities.

Total area lost to productivity for 53 blocks = 106 hectares

Total block area for 53 blocks = 1743 hectares

$\frac{(\text{total area lost to productivity})}{\text{total block area}} * 100\% = \text{estimate of future losses}$

$(106 / 1743) * 100\% = 6.1\%$

5.2.8 Cultural heritage resource reductions

The Bulkley TSA is covered by portions of four First Nations traditional territories. These are the Gitksan Nation, the Nat'oot'en Nation, the Wet'suwet'en Nation and the Tsimshian Nation. The largest traditional territory in the Bulkley TSA is that of the Wet'suwet'en Nation, covering approximately two-thirds of the land base.

In March 1997, the Wet'suwet'en Nation completed a Traditional Use Study (TUS) for their entire territory. Two-hundred and twenty-eight traditional use sites were identified. Approximately fifty of these sites are located within the Bulkley TSA. Detailed information on these sites is stored in the Wet'suwet'en Cultural Heritage inventory database. However, only a portion of this information has been made available to government agencies at this time.

The Gitksan, Nat'oot'en and the Tsimshian Nations have not completed any traditional use studies for the portion of their territories within the Bulkley TSA.

5. Timber Harvesting Land Base Definition

An archaeological overview assessment (AOA) has been completed for a portion of the Copper Landscape Unit (LU). Areas for archaeological impact assessments (AIA) in the Copper Landscape Unit were determined, and the assessments will be undertaken upon funding approval. The AOA for the remainder of the Bulkley TSA is still to be completed.

At present, measures to protect cultural heritage resources are determined as issues regarding the sites arise. This most commonly occurs when operational plans (e.g. Five-Year Development Plans) are reviewed with the appropriate First Nation, as per existing consultation protocols. No archaeological impact assessments have been required to date.

There are no areas specifically excluded for protection of cultural heritage resources in the Bulkley TSA.

5. Timber Harvesting Land Base Definition

5.2.9 Riparian management areas

Table 9. Riparian management areas

Location	Stream class	Riparian reserve zone (RRZ) width (metres)	Riparian management zone (RMZ) width (metres)	Reduction per cent (%) for RMZ (% RMZ area) ^b
Streams				
Within community watersheds (all slopes)	S1	50	20	10
	S2	30	20	10
	S3	13.4 ^a	26.7 ^a	10
	S4	0	30	5
Outside community watersheds (slopes < 20%)	S1	50	20	10
	S2	30	20	10
	S3, S4	13.4 ^a	26.7 ^a	10
	S6	0	20	5
Outside community watersheds (slopes ≥ 20%)	S5	0	30	5
	S6	0	20	5
Wetlands	W1	10	40	10
	W3, W4	0	30	5
Lakes	L1	10	20	10
	L3, L4	0	30	5

(a) Zone widths shown are weighted averages, calculated using stream class densities (identified in a *Bulkley Stream Inventory Point Sample* summary) and RRZ and RMZ widths from the *Forest Practices Riparian Management Area Guidebook*.

(b) "Reduction per cent" refers to the percentage of basal area across the landscape that will not be harvested within the riparian management zones.

Data source and comments

Harvest method mapping produced a digital overlay in which streams were classed, then buffered with riparian reserve zones and riparian management zones. When this buffer overlay is merged with forest cover, the resultant polygons are tagged as 'in' or 'out' of riparian reserves or riparian management zones.

5. Timber Harvesting Land Base Definition

The reduction per cent shown in Table 9 will be applied to riparian management zones. Per cent reductions within RMZ areas reflect actual management practices of major licensees operating within the Bulkley TSA. Riparian reserve zones will be reduced by 100%.

5.2.10 Exclusion of specific, geographically defined areas

The Telkwa Bulbous Toe is a geographically defined area comprised of sensitive soils on slopes less than 30%. This area is not harvestable and will be excluded from the timber harvesting land base. A separate reduction is being done as ESA mapping has not been completed in this area, therefore the ESA reduction will not have removed this area.

6. Current Forest Management Assumptions

6.1 Harvesting

6.1.1 Utilization levels

The utilization level defines 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 10. Utilization levels

Analysis unit	Utilization		
	Minimum dbh (cm)	Maximum stump height (cm)	Minimum top dib (cm)
Sawlog	15	30	10
Marginal sawlog and pulplog	12.5	30	10
Regenerated stand	15	30	10

Data source and comments:

Table 10 reflects current performance and licence requirements. There is, however, a small proportion of marginal sawlog types harvested at a minimum dbh of 15 cm.

6.1.2 Volume exclusions for mixed species stands

One or more species in mixed 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 Bulkley TSA excludes cedar components of cedar-leading inventory type groups, high elevation pine, and deciduous components of conifer-leading inventory type groups as shown in Table 11.

Table 11. Volume exclusions for mixed species types

Inventory type group	Species excluded	Volume exclusion (%)
1–34	Cedar	100
27	Whitebark pine	100
1–34	Deciduous	100

6. Current Forest Management Assumptions

Data source and comments:

Local mills are currently accepting limited deciduous volumes from private marks (less than 5000 cubic metres per year). However, exclusion of deciduous volumes from consideration for harvest is the current management practice for the Bulkley TSA in general.

Deciduous components of conifer-leading stands are often classified as wildlife trees (WT) or are contained within wildlife tree patches (WTP). Where deciduous trees have been retained within WTPs, they are allowed to contribute towards forest cover requirements (see Table 19). Where they occur as individual WTs, deciduous trees will not contribute towards forest cover requirements.

6.1.3 Minimum harvestable age derivation

The minimum harvestable age is the time required for stands to grow to harvestable size, it defines the lower limit for harvesting. 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 inter-decadal changes in harvest levels), most stands will not be harvested until well past the minimum timber production ages because the management of other resource values take precedence (e.g., requirements for the retention of older forest).

6. Current Forest Management Assumptions

Table 12. Minimum harvestable age criteria

Analysis unit	Minimum criteria		Minimum harvestable age (years)
	Mean stand DBH (cm)	Volume (m ³ /hectare)	
Spruce – G	25	150	
Spruce – M	25	150	
Spruce – P	25	150	
Pine – G, M	25	150	
Pine – P	25	150	
Balsam – G	25	150	
Balsam – M	25	150	
Balsam – MS	25	150	
Spruce/pine – MS (panning cell C7)	25	150	
Hemlock – pulp	25	175	
Balsam/spruce – pulp	25	175	

Data source and comments:

Minimum harvestable stem size and volume criteria were determined by reviewing the minimum stand dimensions currently utilized by mills, as well as a sample of cruise summaries from cutting permits recently submitted by major licensees. The derived minimum harvestable age must satisfy both the mean stand DBH and net merchantable volume / ha criteria.

6.1.4 Harvest scheduling priorities

For various reasons, it may be important to set priorities or minimum harvest levels on certain management zones or analysis units to reflect insect infestations, salvage operations or similar forest management activity. Priorities for scheduling the harvest are shown in Table 13. The following priorities apply to all management zones and locations and will be applied for the first 100 years.

6. Current Forest Management Assumptions

Table 13. Priorities for scheduling the harvest

Description	Analysis unit	Priority ^a
Marginal sawlog analysis units	Balsam – MS; spruce/pine – MS, in planning cell C7	1
Pulplog analysis units	Hemlock – pulp; balsam/spruce – pulp; balsam/hemlock – pulp	2
Remaining analysis units	Remaining analysis units	Normal

^(a) A lower priority number indicates a higher harvesting priority.

Data source and comments:

A harvesting priority is set on pulp and marginal sawlog quality analysis units. A higher emphasis is placed on marginal sawlog analysis units, because low pulp commodity prices generally result in the targeting of marginal sawlog quality stands to meet partition harvest requirements.

In addition to the priorities set on marginal sawlog and pulplog stands the analysis will ensure 367 000 cubic metres per year is harvested from these lower quality stands in order to meet the partition requirements. The analysis will also examine the potential contribution of these forest types to the harvest level throughout the planning horizon.

Also, all areas in the ALR agriculture / wildlife zone will be forced to be harvested within the next 60 years. After this harvest the land base is removed from the timber harvesting land base and becomes range land.

6.1.5 Logging method and silvicultural systems

The use of specific logging methods in specific zones is not enforced by the Bulkley / Cassiar Forest District. Licensees are generally permitted to use the logging method appropriate to on-site terrain characteristics.

Group selection and clearcut with reserves silviculture systems are commonly used in the Bulkley / Cassiar Forest District. Forest cover constraints and land base reductions associated with these systems are described in other sections.

6.2 Unsalvaged losses

Table 14 shows the estimated annual unsalvaged losses to the timber harvesting land base due to events such as insect epidemics, fires, and wind damage. The unsalvaged loss column reflects volumes which will not be recovered or salvaged.

6. Current Forest Management Assumptions

Table 14. Unsalvaged losses

Cause of loss	Annual unsalvaged loss (m ³ /year)
Windthrow	8 942
Mountain pine beetle	2 978
Wildfire	2 557
Balsam bark beetle	33 556
Total losses	48 033

Data source and comments:

Windthrow

Windthrow unsalvageable losses were calculated using an analysis of transects associated with logged blocks, plus transects associated with undisturbed forest. Windthrow associated with harvested edges accounted for 4.140 cubic metres per hectare of harvesting. The annual harvest in the Bulkley TSA is about 2700 hectares, which results in an total loss due to windthrow of 11 178 cubic metres per year. It is estimated that 20% of this edge-induced windthrow will be salvaged, resulting in an average of 8942 cubic metres per year of unsalvaged windthrow. Catastrophic losses associated with large wind events are generally harvested, and are therefore not considered in this analysis

Mountain pine beetle (MPB)

Aerial overview surveys in the summer of 1997 counted 5,224 unsalvageable lodgepole pine trees dead as a result of the mountain pine beetle activity of 1996. Lodgepole pine has a net average volume of 0.57 cubic metres per stem. Thus, the loss due to mountain pine beetle in the Bulkley TSA is 5,224 trees x 0.57 m³/tree for an unsalvaged loss of 2978 cubic metres / year.

Wildfire

Wildfire records from 1977 to 1996 estimated a total lost volume of 56 818 cubic metres. The annual loss due to wildfire (56 818 cubic metres / 20 years) is 2841 cubic metres / year. It was estimated that 10% of the wildfire killed trees would be salvaged, yielding a net annual loss of 2557 cubic metres / year.

6. Current Forest Management Assumptions

Balsam bark beetle (BBB)

The western balsam bark beetle is recognized as the most serious threat to mature balsam stands in the Bulkley TSA.

A series of operational cruises provided a count of green- (unattacked), red-, and gray-attacked balsam and also older, dead balsam (snags). Mortality associated with red attacked trees was 0.8733 cubic metres/hectares/year. The land base associated with balsam-leading stands which are most susceptible to attack is 51 238 hectares. Applying the annual loss figure of 0.8733 cubic metres/hectare/year results in an annual net loss of 44 746 cubic metres. The annual volume salvaged is 9190 cubic metres. The difference (33 556 cubic metres/year) represents the unsalvaged loss attributable to the balsam bark beetle.

Spruce budworm

There is a recent outbreak of spruce budworm encompassing approximately 4000 hectares of mature forest in the Harold Price draft landscape unit. The effects of this pest are unknown at this time and any losses as a result of spruce budworm will be included in subsequent analyses.

6.3 Silviculture

6.3.1 Regeneration activities in managed stands

The silviculture program reflects the variety of treatments that are carried out in the Bulkley TSA. Table 15 shows the proportion of each analysis unit to be treated under each silviculture regime and the expected 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 MYST 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) and then aggregated into one table.

6. Current Forest Management Assumptions

Table 15. Regeneration assumptions by analysis unit

Analysis unit	Regen delay	OAFs		Method	Species		Density regime			
		1	2	Type	%	Code	%	% area thinned	Stems/hectare	
									Initial	Post thinning
Sawlog										
Spruce – G	2	15	5	Plant	100	Sx	60	100	2200	1000
						PI	40		2200	1200
Spruce – M	2	15	5	Plant	100	Sx	60	100	2500	1200
						PI	40		2500	1200
Spruce – P	2	15	5	Plant	100	Sx	60	0	2500	–
						PI	40		2500	–
Pine – G, M	2	15	5	Plant	100	PI	70	50	2500	1200
						Sx	30		2500	1200
Pine – P	2	15	5	Plant	100	PI	70	0	2500	–
						Sx	30		2500	–
Balsam – G	2	15	5	Plant	95	Sx	50	100	2200	1200
See data source						PI	30		2200	1200
						BI	20		2200	1200
	- 10	15	5	Natural	5	BI	90	100	2500	1200
						Sx	10		2500	1200
Balsam – M	2	15	5	Plant	95	Sx	50	67	4000	1200
See data source						PI	30		4000	1200
						BI	20		4000	–
	- 10	15	5	Natural	5	BI	90	100	4500	1200
						Sx	10		4500	1200
Marginal sawlog										
Balsam – MS	2	15	5	Plant	100	Sx	50	–	4000	–
						PI	30	–	4000	–
						BI	20	–	4000	–
Spruce–pine unit C7	2	15	5	Plant	100	Sx	50	–	2000	–
						PI	30	–	2000	–
						BI	20	–	2000	–
Pulplog										
Hemlock – pulp	2	15	5	Plant	80	Sx	62.5	–	3500	–
See data source						PI	37.5	–	3500	–
				Natural	20	Hw	100		3500	–
Balsam – spruce pulp	2	15	2	Plant	100	Sx	60	–	2500	–
						PI	30	–	2500	–
						BI	10	–	2500	–

6. Current Forest Management Assumptions

Data source and comments:

Queries of the integrated silviculture information system (ISIS) database were conducted to determine the average time between harvest and planting. Current practice is to plant harvested areas as soon after harvest as possible. The query results show an average regeneration delay of two years.

Operational adjustment factors (OAFs) specified are the current provincial averages as no localized data is available.

Regeneration method and species reflect current reforestation practices within the Bulkley TSA.

The initial density figures are based on an analysis of over 750 free-growing stands.

The thinning per cent and density are based on historical practice.

Balsam—good, balsam—medium

It is anticipated that 50% of these sites will have 10% of their restocking supplied by advanced regeneration. Therefore 5% of these analysis units are assigned natural regeneration. A negative regeneration delay was used to indicate the relative on-site age of the retained regeneration.

Hemlock pulp

It is expected that hemlock will regenerate naturally on all these sites and will consist of approximately 20% of the site's stocking.

6.3.2 Immature plantation history

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

6. Current Forest Management Assumptions

Table 16. *Immature plantation history*

Analysis unit	Area managed (%)			
	Age 1–10	Age 11–20	Age 21–30	Age 31–40
Sawlog				
Spruce – G, M, P	100	100	100	100
Pine – G, M, P	100	100	100	100
Balsam – G, M	100	100	100	100
Marginal sawlog				
Balsam – MS	100	100	100	100
Spruce/pine – MS in C7	100	100	100	100
Pulplog				
Hemlock – pulp	100	100	100	100
Balsam/spruce – pulp	100	100	100	100

Data source and comments:

All stands under 40 years of age in the Bulkley TSA have had some form of density control or plantability or pre-spacing survey which showed the stands were well spaced or free-growing, and therefore shall be modelled as managed stands.

The Bulkley TSA has approximately 80 years of harvesting history. Most stands harvested 40 to 80 years ago were clearcut or partially harvested using diameter-limit selection systems, and allowed to regenerate naturally. They shall be considered as natural stands.

6. Current Forest Management Assumptions

6.3.3 Rehabilitation areas

Table 17. Density control schedule for presently immature, overdense stands

Present stand age (years)	Spacing schedule (%)		
	1-10 (years from present)	11-20 years	21-30 years
1 – 10	0	0	100
11 – 20	0	40	60
21 – 30	30	45	0
31 – 40	50	0	0
41 +	0	0	0

Data source and comments:

Overly dense stands generally result from wildfires which the harvest method mapping has placed in the 'thick' (T) category, based on current stand conditions. See Section 5.2.6, "Areas considered inoperable."

Due to budget limitations, the Bulkley / Cassiar Forest District will operationally space only a portion of overdense stands of wildfire origin, from 10,000+ stems per hectare to a target density of 1200 stems / hectare. Table 17 indicates that the Bulkley / Cassiar Forest District intends to space 100% of stands currently less than 20 years old, 75% of stands currently 21-30 years old, 50% of stands currently 31-40 years old, and 0% of stands > 40 years old.

Overdense conifer stands which are hemlock-leading (inventory type group 12-17) will regenerate to 100% hemlock after spacing and targeted for pulp production. Target species composition upon regeneration for the remaining overdense conifer stands is pine 50%, spruce 30% and balsam 20%. These stands are expected to contribute to sawlog production upon maturity.

Integrated silviculture information system (ISIS) queries were conducted to develop a historical picture of the relative frequency of stand ages at time of treatment. These frequencies were used to derive the spacing schedule shown in Table 17.

Treated stands shall be grown on a managed stand yield curve.

6. Current Forest Management Assumptions

6.3.4 Not satisfactorily restocked (NSR) areas

Land classified in the Bulkley 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.

Due to the recent re-inventory the Bulkley TSA forest inventory file is up to date for NSR at this time. Within the total NSR there is backlog NSR (i.e., harvested prior to 1987) of 1155 hectares. This backlog is expected to be reforested within 5 years.

NSR is restocked in proportion to the current area of each analysis unit in stands less than 20 years old on the assumption that the overall distribution of harvest within analysis units has not changed significantly over this period of time. All current NSR will be restocked within two years.

All NSR within the operable land base is included in the timber harvesting land base. Any NSR outside of the operable portion of the land base will be reviewed when the forest inventory file is available to determine if this area should contribute to the timber harvesting land base.

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)," the discussion on multiple objectives, forest cover requirements may be examined at a number of different levels. These may be considered as layers in geographic information system (GIS) terminology. One possible layer may be landscape units, another may be wildlife areas, while another may be 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) may be considered in the forest cover requirements (i.e. maximum allowable disturbance or minimum area retention).

6. Current Forest Management Assumptions

Table 18a. Forest cover requirements — biogeoclimatic units and natural disturbance types (NDTs) within the Bulkley TSA

Note: In order to ensure that the maintenance of older forests is spread out within the TSA the following forest cover requirements will be applied to each draft landscape units / biogeoclimatic variant group. The landscape units are not yet finalized, however, as the draft units are available in digital format they will be utilized as a convenient modelling tool. This does not imply these units are final.

Biogeoclimatic unit	NDT	Old-seral stage			Minimum age (years)
		Minimum retention area by decade (%)			
		< decade 7	decade 7 – 14	> decade 14	
ESSFwv	1	18	19	19.9	250
MHm2	1	18	19	19.9	250
CWHws2	2	8.5	9	9.4	250
ESSFmc	2	8.5	9	9.4	250
ESSFmk	2	8.5	9	9.4	250
ICHmc1	2	8.5	9	9.4	250
ICHmc2	2	8.5	9	9.4	250
SBSdk	3	10.4	11	11.5	140
SBSmc2	3	10.4	11	11.5	140

Data source and comments:

Biodiversity guidelines will be modelled using information from the *Forest Practices Code Biodiversity Guidebook*.

A process to establish biodiversity objectives for each landscape unit is currently underway and will be completed over the next several years. As a first step in this process, draft biodiversity emphasis options and landscape unit boundaries for use in the regional landscape unit planning process were approved by the Bulkley / Cassiar Forest District manager and the designated environment official on October 31, 1997. However, landscape unit boundaries and biodiversity emphasis options have not been formally established at this time.

As it is unknown at this time which landscape units will be assigned low-, intermediate-, or high-biodiversity objectives, a single weighted constraint for the old-seral stage requirement will be developed based on the anticipated distribution of a 45% low-, 45% intermediate-, and 10% high-emphasis for each biogeoclimatic (BEC) variant within the Bulkley TSA. The values shown in Table 18a above reflect the weighted *Biodiversity Guidebook* values for each BEC variant.

6. Current Forest Management Assumptions

The values in Table 18a are initially based on achieving one-third of the *Biodiversity Guidebook* old-seral stage requirement in the low emphasis portions. As seen in the table this is built up over time to ensure that the full minimum retention of old-seral forest will be met by the end of three rotations.

The forest cover requirements in Table 18a apply to the total forested land base.

Table 18b. Forest cover requirements

Zone or group	Young-cover class			Old-cover class		Application
	Height criteria (metres)	Age criteria (years)	Maximum area (% of total forested)	Age criteria (years)	Minimum area (% of total forested)	
Babine SMZ				140	30	Forested
Enhanced timber, IRM and SMZ2	3		33			Timber harvesting land base
Mule deer habitat		20	20			Forested
Grizzly habitat (outside Babine landscape unit)				80	50	Forested
Caribou habitat				90	50	Forested
Core ecosystems		50	5			Timber harvesting land base
Landscape corridors				80	70	Timber harvesting land base
Grizzly bear treatment unit 4				80	50	Forested
Grizzly bear treatment unit 5				40	50	Forested
Grizzly bear treatment unit 4a	3		25			Forested
Community watersheds	5		5			Forested
Retention visual quality	5		5			Forested
Partial retention visual quality	5		15			Forested

6. Current Forest Management Assumptions

Data source and comments:

Babine special management zone (SMZ) — this is a Bulkley land and resource management plan (LRMP) zone which maintains the integrity of the Babine River corridor, and buffers the Babine River. The forest cover requirements were derived by the Ministry of Forests (MoF) and the Ministry of Environment, Lands and Parks (MELP) staff using concepts from the Babine local resource use plan (LRUP).

Integrated resource management (IRM) zone — all areas not specifically assigned to other zones are included in the IRM zone. Basic management is adjacency with a green-up height of 3 metres.

Wildlife habitat zones (mule deer habitat, grizzly habitat (outside Babine landscape unit), caribou habitat) — these zones are occupied by, and contain prime habitat for the species of interest. Individual species habitat requirements were determined by the Ministry of Environment, Lands, and Parks.

Core ecosystems, landscape corridors — these Bulkley LRMP areas have objectives providing 'direction to lower level plans.' Core ecosystems retain a cross-section of ecosystems and samples of old-growth forest across the landscape; landscape corridors maintain landscape connectivity and reduce habitat fragmentation. Forest cover requirements were derived by the MELP and the MoF staff using the concepts in the *District Manager's Policy for Interim Harvesting Operations in the Proposed Landscape Corridors [and Core Ecosystems] of the Bulkley Forest District (May 30, 1996)*.

Grizzly bear treatment units 4, 4a, 5 — these are areas within the Babine landscape unit (LU) which the Babine LRUP identifies as providing good or moderate grizzly bear habitat. Forest cover requirements were derived in reference to Babine LRUP treatment unit objectives by the MELP and the MoF staff.

Community watersheds — forest cover requirements were derived by the MoF staff using concepts in the *Forest Practices Code Community Watershed Guidebook*.

Visual quality objectives (VQOs) — the Bulkley / Cassiar Forest District has visually sensitive areas along Babine possessing approved retention and partial retention VQOs. Appropriate cover requirements were developed by the MoF staff, using provincial direction on ranges of allowable disturbance levels for each VQO type.

Forest cover requirements for all but grizzly bear within the Babine LU and community watersheds have been agreed upon by the Bulkley / Cassiar Forest District, the MELP, and major licensee staff.

The Babine special management zone is one contiguous area thus its forest cover requirements will apply to the entire group. The remaining groups are dispersed throughout the Bulkley TSA thus their forest cover requirements will apply to the groups within the landscape units.

6.4.2 Wildlife tree patches (WTP)

Wildlife tree patches (WTPs) are the primary method used by major licensees to maintain mature stand structure elements over time. Their persistence is commonly three rotations. If harvested before that time WTPs of comparable size and structure are identified as replacements.

6. Current Forest Management Assumptions

Table 19. Reductions to reflect volume retention in cutblocks

Landscape unit	Residual volume estimate on the timber harvesting land base (%)
Babine River	3.0
Blunt	1.7
Bulkley	2.7
Chapman	3.5
Copper	1.2
Corya	1.7
Deep Creek	1.3
Harold Price	2.2
Nilkitkwa	1.0
Reiseter	2.0
Telkwa	2.1
Torkelson	2.9
Trout Creek	2.3

Data source and comments:

It is assumed that 75% of the requirements for WTPs are met from the areas outside of the timber harvesting land base for the ESSF, MHmm2, and CWH subzones and 50% of requirements are met from areas outside of the timber harvesting land base within the ICH and SBS subzones and through the special management regimes defined for the management zones.

In order to develop Table 19 a weighted average residual area was estimated by landscape unit, factoring in the above assumptions regarding the contribution from the area outside the timber harvesting land base. The impact of wildlife tree patches (WTPs) will be modelled as a merchantable volume loss in individual landscape units. To accomplish this objective, the residual area estimate (weighted average %) figures in the above table will be converted into residual volume estimate (weighted average %) figures. The two estimates are assumed to be directly proportional.

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 the Bulkley TSA. This is followed by a list of standard sensitivity analysis that are carried out in all TSAs.

Table 20. Sensitivity issues specific to the Bulkley TSA

Issue to be tested	Sensitivity levels
Remove proposed protected areas from the timber harvesting land base.	
Remove proposed special management zone 1 areas from the timber harvesting land base.	
Site index adjustment.	Draft OASIS results.
Impact of using the levels of basal area retention for riparian management areas recommended by the <i>Riparian Management Area Guidebook</i> , instead of levels currently used by licensees.	Exchange values in Table 7 with recommended values from the guidebook.
Remove the priority on harvesting marginal sawlog and pulplog stands.	

7. Sensitivity Analyses to be Performed

Table 21. Standard sensitivity issues

Issue to be tested	Sensitivity levels
Existing stand yields	+/- 5 and 10%
Regenerated stand yields	+/- 5 and 10%
Minimum harvestable age	+/- 10 years
Old-growth site index adjustments	Draft OGSi results
Land base changes	+/- 10%
Visual quality objectives	High/low range % denudation
Harvest flow alternatives	
Green-up periods	+/- 5 years
IRM zone/adjacency constraints	Maximum area below green-up at 20% and 25%.
Landscape-level biodiversity	Model draft biodiversity emphasis options as described in the draft <i>Regional Landscape Unit Planning Strategy</i> , October 31, 1997.
Seral-stage distributions	Apply the early and mature + old-seral stage requirements.