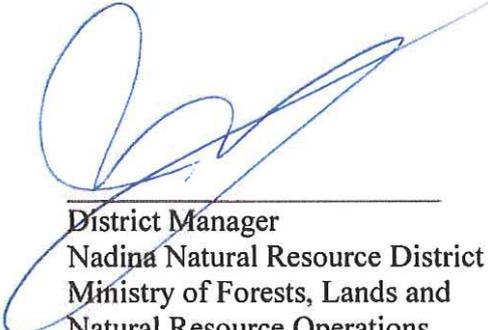


Morice Timber Supply Area Timber Supply Review

Data Package

July 2013



District Manager
Nadina Natural Resource District
Ministry of Forests, Lands and
Natural Resource Operations



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Table of Contents

1. INTRODUCTION.....	1
1.1 Timber supply review	1
1.2 Purpose of the data package	1
1.3 Contact information for submission of comments	2
2. CURRENT FOREST MANAGEMENT CONSIDERATIONS AND ISSUES.....	3
2.1 Base case management assumptions.....	3
2.2 Statement of major forest management considerations	3
3. INVENTORIES.....	6
4. DIVISION OF THE AREA INTO MANAGEMENT ZONES	10
4.1 Management zones	10
4.2 Analysis units	10
5. TIMBER HARVESTING LAND BASE DEFINITION	12
5.1 Identification of the timber harvesting land base.....	12
5.2 Details on land base classification	13
5.2.1 Land not administered by FLNR for timber supply purposes	13
5.2.2 Land classified as non-forest.....	13
5.2.3 Environmentally sensitive areas.....	13
5.2.4 Unstable terrain	13
5.2.5 Areas considered physically inoperable	13
5.2.6 Marginally-economic stands	14
5.2.7 Sites with low timber growing potential	14
5.2.8 Problem forest types.....	14
5.2.9 Roads, trails and landings.....	15
5.2.10 Wildlife habitat reductions	15
5.2.11 Cultural heritage resource reductions.....	16
5.2.12 Riparian reserve zones	16
5.2.13 Exclusion of specific, geographically defined areas	17
5.2.14 Economic operability	17
6. CURRENT FOREST MANAGEMENT ASSUMPTIONS	18
6.1 Harvesting.....	18
6.1.1 Utilization levels	18
6.1.2 Volume exclusions for mixed-species stands.....	18
6.1.3 Minimum harvestable volume.....	18
6.1.4 Harvest scheduling priorities.....	19
6.1.5 Logging method	19
6.1.6 Silvicultural systems	19
6.2 Unsalvaged losses.....	19
6.3 Silviculture	20
6.3.1 Managed stand yields and regeneration assumptions.....	20
6.3.2 Immature plantation history	22
6.4 Integrated resource management	22
6.4.1 Objectives which require forest cover constraints.....	22
7. SENSITIVITY ANALYSES TO BE PERFORMED	26

Table of Contents

Table 1.	Major forest management considerations	3
Table 2.	Inventory information	6
Table 3.	Objectives to be tracked.....	10
Table 4.	Definition of analysis units	11
Table 5.	Description of environmentally sensitive areas	13
Table 6.	Description of sites with low timber growing potential.....	14
Table 7.	Problem forest types criteria	15
Table 8.	Estimates for existing and future roads, trails, and landings.....	15
Table 9.	Estimates for wildlife habitat core no harvest areas.....	16
Table 10.	Riparian reserve zones and riparian management zones.....	16
Table 11.	Exclusion of specific, geographically defined areas	17
Table 12.	Utilization levels	18
Table 13.	Volume exclusions for mixed-species types	18
Table 14.	Minimum harvestable age criteria.....	18
Table 15.	Unsalvaged losses – information is not yet available	19
Table 16.	Regeneration assumptions for future managed stands	20
Table 17.	Not satisfactorily restocked (NSR) areas	21
Table 18.	Immature plantation history	22
Table 19.	Old seral requirements by landscape unit and BEC zone — targets in low to be reduced by 2/3	23
Table 20.	Forest cover requirements for the Telkwa Caribou recovery plan area	24
Table 21.	Takla Caribou.....	25
Table 22.	Forest cover requirements for visual quality objectives.....	25
Table 23.	Sensitivity analyses	26

1. Introduction

1.1 Timber supply review

Section 8 of the *Forest Act* requires the chief forester to review the factors that affect timber supply and to determine a new allowable annual cut (AAC) for every timber supply area (TSA) and tree farm licence (TFL) in British Columbia at least once every 10 years.

Timber supply is dynamic, not only because trees naturally grow and die, but also because conditions that affect tree growth, and the social and economic factors that affect the availability of trees for harvest, change through time. Assessing the timber supply involves considering physical, biological, social and economic factors for all forest resource values, not just for timber. Before an estimate of timber supply is interpreted, the set of physical, biological and socio-economic conditions on which it is based, and which define current forest management — as well as the uncertainties affecting these conditions — must first be understood.

Timber supply analysis is the process of assessing and projecting the current and future timber supply for a management unit (a geographic area). The timber supply projections look far into the future – 100 years or more. However, these projections are only relevant as long as the information upon which they are based remains relevant. Therefore, in order to assess the ongoing effects of and responses to climate change, evolving resource management practices, and changes in information, it is important that re-analysis and if necessary, re-determination of the AAC occur regularly.

1.2 Purpose of the data package

This data package summarizes the information and assumptions that are used to conduct timber supply analysis for the Morice Timber Supply Area (TSA). The information and assumptions represent current legal requirements and performance, which 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 practices used in the area, including objectives and practice requirements contained in the *Forest and Range Practices Act*;
- land-use plans approved by Cabinet (*Higher Level Plan Orders*); and
- legal objectives established under the *Forest and Range Practices Act* and the *Land Act*.

Allowable annual cut decisions reflect the current land use decisions that government has established under legislation, i.e., the chief forester does not make land use decisions nor speculate on land use decisions that government has yet to implement as part of the AAC determination. Therefore, the timber supply analysis model is based on “*what is*” as opposed to “*what if*”. Changes in resource management objectives and data, when and if they occur, are captured in future timber supply analyses.

Each section of this data package contains:

- 1) a short explanation of the data required;
- 2) a data table or list of modelling assumptions;
- 3) a description of data sources and other comments.

The data package is released for public review and comment. Significant comments that change data inputs or descriptions of current practices that influence the analysis will be noted in the final timber supply review (TSR) documents such as the *Timber Supply Analysis Public Discussion Paper*, which will also be released for review and comment, and the Chief Forester’s *Rationale for the Allowable Annual Cut Determination*.

1.3 Contact information for submission of comments

Please submit comments about the data package to:

Agathe Bernard, Stewardship Officer
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Ministry of Forests, Lands, and Natural Resource Operations
Box 999,
Burns Lake, BC V0J 1E0

or via e-mail at:

<mailto:agathe.bernard@gov.bc.ca>

Comments will be received until September 18, 2013.

2. Current Forest Management Considerations and Issues

2.1 Base case management assumptions

The assumptions described in this data package reflect current legal requirements and 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” and is used as a baseline for assessing the impacts of uncertainties. Section 7, “Sensitivity Analysis” identifies areas of uncertainty in the data and assumptions and outlines the intended sensitivity analyses for this timber supply analysis. The sensitivity analyses actually prepared may vary from those described in this document and additional sensitivity analyses may be performed if the initial results highlight areas of risk to timber supply.

2.2 Statement of major forest management considerations

Where possible, forest management considerations are assessed directly in the base case. If the management practice or requirement does not fall within the definition of current management as described in Section 1, “Introduction”, the related timber supply impacts are assessed in a sensitivity analysis. There may be significant uncertainties in defining some current management issues. In such cases, sensitivity analysis can assist in assessing the timber supply implications and assigning degrees of risk to timber supply for consideration during the allowable annual cut (AAC) determination.

Table 1. Major forest management considerations

Consideration/issue	Description
Biodiversity (R3)	The Morice Land and Resource Management Plan (LRMP), approved by Cabinet in 2007, provides guidance for the development and implementation of biodiversity objectives. These objectives include: establishment of no-timber harvesting zones, old growth management areas, seral stage distribution targets, and wildlife tree retention targets. Currently, work is underway to legally establish biodiversity objectives consistent with the LRMP. In the event that legal objectives are established prior to the chief forester’s AAC decision, sensitivity analysis will be used to assess the impact, if any, on the base case.
Conservation of timber to support mid-term harvest levels (R4)	<p>At the beginning of the base case, most of the dead pine in the Morice TSA will already have been dead for five years. For the first five years of the base case, dead pine will be prioritized for harvest. After five years, it is assumed that the dead pine will no longer be an economically-viable source of wood fibre (for the purposes of timber, pulp or bioenergy production).</p> <p>In order to conserve non-pine volume to support timber harvesting in the mid-term, when dead pine is no longer an economically viable source of fibre, the chief forester established a non-pine partition of 550 000 cubic metres in the current allowable annual cut.</p> <p>Since 2009, the average annual non-pine harvest has been 803 628 cubic metres, which is about 46 percent higher than the current non-pine partition.</p> <p>The contribution of each commercial species, as well as the proportion of dead pine and live pine volumes contributing to the base case will be reported. Sensitivity analyses and alternative harvest forecasts will be used to examine the effect of current harvest performance on timber supply.</p>

(continued)

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

Consideration/Issue	Description
Wildlife management (R5)	<p>There is a recovery plan in place for the Telkwa caribou herd which contains best management practices guidelines for the plan area. These management guidelines are identified in a Notice issued under Section 7 of the Forest Planning and Practices Regulation (FPPR) and approved Forest Stewardship Plans (FSP) are consistent with the Notice. Forest cover guidelines for the recovery area, including key forested habitat will be included in the base case.</p> <p>The Notice issued under Section 7 of the FPPR also identifies areas and area attributes for mountain goat and the Takla caribou herd. On May 30, 2013 government issued a Government Actions Regulations (GAR) Order establishing new mountain goat ungulate winter ranges (UWR) and general wildlife measures (GWM) for goats. The new UWR and GWM replace the previous provisions for mountain goats. Therefore, the base case will reflect the requirements for the Takla caribou herd identified in the Section 7 notice and the mountain goat UWRs and GWMs established in the recent GAR Order.</p> <p>In order to account for stand-level biodiversity a 3.2 percent area reduction will be applied to the entire timber harvesting land base (THLB).</p>
Land base changes	<p>Since the last TSR, the timber harvesting land base has decreased due to the creation of new parks and protected areas, community forests and changes to woodlots. These areas will now be excluded from the timber harvesting land base used in the base case.</p>
No harvest zones	<p>In previous timber supply reviews, several areas within the Morice TSA were not accessed for timber harvesting due to low economic operability, steep and sensitive terrain and for the management of non-timber resources.</p> <p>In 2004, these areas were established as “designated areas” by ministerial order, as allowed under Section 167, Part 13 of the <i>Forest Act</i>, with the expectation that these areas would be established as “no harvest zones” under the Morice LRMP.</p> <p>Following the LRMP, these ‘no harvest zones’ were the subject of government-to-government discussion with First Nations and some of the areas were established as parks (e.g., Morice Lake Park). The remaining areas have not been legally established as areas in which timber harvesting is prohibited or constrained and the area designation under Section 167 has expired. Consequently, the no-harvest zones will be included in the base case. However, after accounting for other factors, such as low productivity, low economic operability, steep slope and sensitive terrain, etc. the actual contribution of the no-harvest zones to the THLB will likely be minimal.</p> <p>In addition to the limitations described above, there is no history of harvesting in the no-harvest zones and road access is severely limited. Therefore, if the THLB attributable to these zones is found to be significant, a sensitivity analysis can be prepared to assess the potential timber supply risk.</p>

Data source and comments:

In his AAC rationale for the Morice TSA (2008), the chief forester provided the following implementation recommendations to ministry staff and licensees in order to reduce the risks and uncertainties around key timber supply factors. The considerations or issues in Table 1 that relate to these recommendations are identified by a recommendation number (R1, R2, etc.).

- R1. Request region and district staff to obtain the predictive ecosystem mapping (PEM) data from the Innovative Forest Practices Agreement holders and if need be, complete an acceptable PEM to confirm the future use of SIBEC in yields.
- R2. Request district staff to report out on the performance within the visual quality class areas for the next timber supply review.
- R3. Request district staff to monitor retention of old growth biodiversity relative to targets and report out for the next timber supply review.
- R4. Urge district staff and licensees to work together to develop pine harvesting guidelines and adapt an interim policy to focus harvesting outside deer winter ranges.

- R5. Urge the Ministry of Environment to complete identified wild life management strategy implementation, establishment of wildlife habitat areas and deer winter ranges for the Morice TSA.
- R6. Request range staff to develop a range strategy which can be taken into consideration at the next timber supply review.
- R7. Request district staff to continue to monitor MPB mortality in the 30 – 60 age class stands.
- R8. Request district staff to continue to monitor effects of wind damage events.

3. Inventories

Table 2 lists the inventories and themes that will be used to determine the timber harvesting land base (THLB) and to model forest management activities.

Table 2. Inventory information

Data	Source	File name	Applicable factor
Area-based tenures	BC Geographic Warehouse (BCGW)	WHSE_FOREST_TENURE.FTEN_MANAGED_LICENCE_POLY	THLB definition
Biogeoclimatic zones	BCGW	WHSE_FOREST_VEGETATION.BEC_BIOGEOCLIMATIC_POLY	Various
Environmentally sensitive areas	FLNRO-Skeena	Various (ESA1s, ESA1paw, ESA1r, ESAw, and ESA2)	THLB definition
First Nations lands and reserves	BCGW	WHSE_ADMIN_BOUNDARIES.CLAB_INDIAN_RESERVES	THLB definition
Forest cover depletions	BCGW	Various (RESULTS, FTA, VRI)	Various
Fulton River OIC	FLNRO-Nadina	Fulton_OIC	THLB Definition
Goats	FLNRO-Skeena	WHSE_WILDLIFE_MANAGEMENT.WCP_UNGULATE_WINTER_RANGE_SP	Forest cover requirements
High elevation	FLNRO-Nadina	Elevation_1360_Morice	THLB definition
Landscape unit boundaries and biodiversity emphasis options	BCGW	WHSE_LAND_USE_PLANNING.RMP_LANDSCAPE_UNIT_SVW	Forest cover requirements
No harvest zones (LRMP)	FLNRO-Skeena	NTHA_2011	THLB definition
Ownership information	FLNRO-Nadina	DND_PrivateLand	THLB definition
Parks and protected areas	BCGW	WHSE_TANTALIS.TA_PARK_ECORES_PA_SVW	THLB definition
Riparian reserves and management zones	Northwest Data Sharing Network (NWDSN) / Morice & Lakes Innovative Forest Practices Agreement (IFPA)	RIPARIAN	THLB definition
Roads and road buffers	FLNRO-Nadina	AggRoads_Buffer2_Moclip	THLB definition
Predictive ecosystem mapping	Ministry of Environment, Environmental Stewardship Division	PEM	Various
Slopes	FLNRO-Nadina	Nadina_Slopes	THLB definition

(continued)

Table 2. Inventory information (concluded)

Data	Source	File name	Applicable factor
Takla Caribou	FLNRO-Skeena	Takla_high and Takla_medium	Forest cover requirements
Telkwa Caribou key forested areas	FLNRO-Skeena	DMO_key_forested	Forest cover requirements
Telkwa Caribou recovery plan area	FLNRO-Skeena	TelkwaRecoveryPlanArea	Forest cover requirements
Terrain stability mapping	NWDSN/IFPA	ATSM_MO	THLB definition
Vegetation resource inventory	BCGW	WHSE_FOREST_VEGETATION.VEG	Various
Visual landscape inventory	BCGW	WHSE_FOREST_VEGETATION.REC_VISUAL_LANDSCAPE_INVENTORY	Forest cover requirements

Data source and comments:

Area-based tenures: This inventory is used to determine land base exclusions due to area-based tenures (woodlots and community forests).

Biogeoclimatic zones: This inventory is used to apply forest cover constraints for non-timber values and to define analysis units.

Environmentally sensitive areas: Some areas classified as environmentally sensitive are removed from the THLB. ESA1p contains data for areas where regeneration is difficult following harvest, avalanche areas and some wildlife areas and ESAw contains data related to wildlife habitat. All polygons with codes starting with ESA1p and ESAw will be removed.

First Nations lands and reserves: This inventory is used to determine land base exclusions to account for First Nations lands and reserves.

Forest cover depletions: RESULTS will be used to account for harvesting activities that occurred since the last VRI disturbance update.

Fulton River OIC: A 1987 Order-in-Council (OIC) established a reserve to protect the Fulton River and the Fulton River Spawning Channel operated by the Canadian Department of Fisheries and Ocean. This area will be excluded from the THLB.

Goats: This inventory will be used to apply forest cover requirements identified in a Notice issued under Section 7 of the Forest Planning and Practices Regulation (FPPR) for mountain goat. A sensitivity analysis will also be conducted based on the approved, but not yet legally established, ungulate winter range (UWR) and associated general wildlife measures (GWM) for mountain goat in the Morice TSA.

High elevation: Areas located above 1360 metres in elevation are excluded from the THLB.

Landscape unit boundaries and biodiversity emphasis options: Landscape unit boundaries and their associated biodiversity emphasis options are used to account for old growth and wildlife tree retention forest cover requirements.

No harvest zones (LRMP): Large portions of the Morice TSA have traditionally be considered as economically inoperable (e.g., Troitsa area) or as valuable for recreation and biodiversity (e.g., Morice Lake, Burnie River).

In 2004, the minister issued an order under Section 167, Part 13 of the *Forest Act* establishing these areas as ‘designated areas’ exempt from timber harvesting pending completion of the Morice LRMP. Following the issuance of a Section 167 Order, the chief forester has the option to issue a chief forester’s order under Section 173, Part 13 of the *Forest Act* temporarily reducing the AAC to avoid over-harvesting in areas of the TSA outside of the designated area.

Following the completion of the Morice LRMP, some of these areas have been formally established as parks (e.g., Morice Lake Park) and are excluded from the THLB. The other areas have not yet been legally-established as no timber harvesting areas (e.g., Herd Dome, Morice River Floodplain) and will be included in the base case. However, once overlap with environmentally sensitive areas (ESAs), steep slope etc. has been accounted for, it is unlikely that these areas will contribute significantly to the THLB. A sensitivity analysis will be conducted to assess the timber supply impact not harvesting in these areas.

Ownership information: This inventory is used to exclude non-crown lands from the THLB.

Parks and protected areas: Parks and protected areas are excluded from the THLB. Parks and protected areas include: Nadina Mountain Park, Neineikekh/Nanika-Kidprice Park, Morice Lake Park, Atna River Park, Burnie River Protected Area, Tazdli Wyiez Bin/Burnie-Shea Park, Topley Park, Red Bluff Park, Morice River Ecological Reserve and Little Andrews Bay Marine Park.

Riparian reserves and management zones: This inventory is used to determine land base reductions associated with riparian management areas.

Roads and road buffers: This inventory is used to remove areas associated with roads from the THLB.

Predictive ecosystem mapping (PEM): To be approved for use in timber supply analysis, PEM must meet rigorous standards for accuracy assessment. The accuracy of the PEM significantly affects the application of the SIBEC estimates and, in turn, the confidence in the site productivity estimates.

The PEM for the Morice TSA was completed by Timberline Natural Resource Group and the accuracy of the PEM was assessed by Bio-Geo Dynamics Limited, as reported in *Morice TSA Level 4 Predictive Ecosystem Mapping (PEM) Accuracy Assessment: 2008 – 2009 Revision Report*. According to the report, the Morice TSA PEM meets the minimum accuracy assessment standard of 65 percent only by using some site series clumping. However, following a review of the PEM and accuracy assessment, provincial experts confirm that the PEM is “of sufficient quality for use in a SIBEC-based timber supply analysis.” As a result, the PEM will be used in the base case.

A sensitivity analysis using managed stand yields based on inventory attributes will be prepared.

Slopes: Timber located on slopes greater than 40 percent is rarely harvested because harvesting on these slopes requires cable-based systems. These systems are not used in the Morice TSA. Areas with slopes greater than 40 percent will be excluded from the THLB.

Takla Caribou: A Notice has been issued under Section 7 of the FPPR to address the winter survival of the Takla caribou herd. Forest cover requirements will be applied in the base case to reflect the habitat requirements identified in the Notice.

Telkwa Caribou key forested areas: A Notice has been issued under Section 7 of the FPPR to address the winter survival of the Telkwa caribou herd. Forest cover requirements will be applied in the base case to reflect the habitat requirements identified in the Notice for the key forested areas.

Telkwa Caribou recovery plan area: The Notice issued under Section 7 of the FPPR to address the winter survival of the Telkwa caribou herd also specifies requirements for the entire recovery area. Therefore, these habitat requirements will be reflected in the base case.

Terrain stability mapping: This mapping identifies areas with unstable and potentially unstable terrain. It is used to define THLB reductions.

Vegetation resource inventory: Contains vegetation inventory information.

Visual landscape inventory (VLI): A detailed VLI has been completed for most designated scenic areas. This VLI will be used in the base case to model the forest cover requirements associated with visual landscape management.

4. Division of the Area into Management Zones

4.1 Management zones

Management zones are used to differentiate areas with distinct management emphasis. For example, a zone may be based on a harvesting system, visual quality objective (VQO) or wildlife consideration. An area of forest may be subject to more than one management objective. Each objective can be tracked separately in the timber supply model. Land considered unavailable for timber harvesting can contribute to the achievement of other forest management objectives.

Table 3 outlines the zones or objectives incorporated in the timber supply model. 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

Objectives	Applicable forest management factors
Landscape units and seral stage targets by BEC zones and subzones	Landscape-level biodiversity and stand-level biodiversity
Wildlife habitats	Forested land base (crown and timber harvesting land base) by habitat area by species
Visual quality objectives	Crown forested land base by visually sensitive polygon
Forest outside THLB	Crown forested land base by BEC zone and subzone
Non-pine leading stands	THLB and volume within non-pine stands
Pine-leading stands	THLB and volume within pine-leading stands
Pine mortality	THLB and volume within pine-leading stands
Harvest by LU over time	THLB and volume within pine-leading stands

Data source and comments:

Section 3, “Inventories”, details the sources of mapping and zones for the objectives and factors listed above. Information on the forest cover requirements to be applied to these areas can be found in Section 6.4, “Integrated Resource Management”.

4.2 Analysis units

An analysis unit is composed of forest stands with similar tree species composition and timber growing potential. Each analysis unit is assigned its own timber volume projections (yield tables) for existing and future stands. Yield tables for existing unmanaged stands are derived using the Variable Density Yield Prediction (VDYP) model. Yield tables for managed stands are derived using the Table Interpolation Program for Stand Yields (TIPSY).

Analysis units for the Morice TSA will be created by grouping stands by tree species groups, site index and age class. Table 4 shows the criteria proposed for the analysis.

Table 4. Definition of analysis units

Analysis unit	Description	Site index range	Criteria age class	Other
100	Balsam	Poor	>45	
101	Balsam	Medium	>45	
102	Balsam	Good	>45	
110	Balsam	Poor	<=45	
111	Balsam	Medium	<=45	
112	Balsam	Good	<=45	
200	Pine	Poor	>45	
201	Pine	Medium	>45	
202	Pine	Good	>45	
210	Pine	Poor	<=45	
211	Pine	Medium	<=45	
212	Pine	Good	<=45	
300	Spruce	Poor	>45	
301	Spruce	Medium	>45	
302	Spruce	Good	>45	
310	Spruce	Poor	<=45	
311	Spruce	Medium	<=45	
312	Spruce	Good	<=45	

Data source and comments:

The analysis units definitions listed in Table 4 may be modified once the THLB has been determined.

5. Timber Harvesting Land Base Definition

5.1 Identification of the timber harvesting land base

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 Ministry of Forests, Lands and Natural Resource Operations (FLNR) for timber supply purposes (e.g., private land, parks, etc.).
- It is not suitable for timber production purposes.
- It is unavailable for timber harvesting.

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 timber harvesting land base for the TSA is determined by separating out the following categories of area which do not contribute to timber harvesting in the area. Please note, that this list is not exhaustive or mandatory thus issues may be added or removed as needed:

1. Land not administered by the forest service for the purpose of timber supply.
2. Non-forest types.
3. Environmentally sensitive areas (ESA).
4. Inoperable forest.
5. Sites with low timber growing potential.
6. Problem forest types.
7. Margially-economic stands.
8. Roads, trails and landings.
9. Specific wildlife habitat areas considered unavailable for timber harvesting.
10. Specific cultural heritage resources which result in areas being unavailable for timber harvesting.
11. Riparian reserve area considerations. These may include riparian management zone considerations if warranted. See Section 5.2.11.
12. Specific, geographically defined areas.
13. Timber licence reversions.

The above categories should apply to land where no harvesting is anticipated to occur. Forest cover requirements should be used in cases where forest management objectives are known. In addition, while the tables and discussion portions are onerous to complete, it is paramount that the timber supply analyst understand the assumptions used in deriving the information in order to avoid double counting for issues which apply to the same land base.

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 TSA.

5.2 Details on land base classification

5.2.1 Land not administered by FLNR for timber supply purposes

Private lands, First Nations reserves, woodlots and community forests will be excluded from the area considered available for timber harvesting. Since the TSR 3 analysis, a number of new woodlots have been issued within the Morice TSA, and two new community forest agreements (CFA) have been granted (Dungate and Babine Lake CFA).

5.2.2 Land classified as non-forest

Non-forested areas, such as alpine, lakes, rocks and ice do not contribute to timber supply.

5.2.3 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 categories: 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.

Environmental sensitivity may reduce or preclude harvesting on identified sites, which can be accounted for through percent area reductions or specific evaluation of individual ESA polygons for harvesting opportunity.

Table 5 identifies the proportion of ESAs in various categories that are unavailable for harvesting.

Table 5. Description of environmentally sensitive areas

ESA category	ESA description	Reduction percent
Ep1	Areas where regeneration is difficult following harvest	100%
Ea1	Avalanche areas	100%
Ew1	Wildlife areas	100%

Data source and comments:

With the exception of the ESA categories listed in Table 5, ESA categories in the Morice TSA overlap areas that are unavailable for harvest (e.g., parks, inoperable areas) or are constrained for other values (e.g., visual management, riparian areas). Therefore, only ESA categories associated with regeneration, avalanches and wildlife will be removed from the THLB.

5.2.4 Unstable terrain

Terrain stability mapping (TSM) has been available for the Morice TSA for more than one decade. All areas classified as unstable (TSM class V) will be excluded from the THLB (100 percent netdown) as well as area classified as potentially unstable (100 percent netdown for class IV).

5.2.5 Areas considered physically inoperable

Physical barriers sometimes limit harvesting or the merchantability of stands. In the Morice TSA, high elevation stands located above 1360 metres in elevation are considered to be physically inoperable and will be excluded from the THLB (100 percent netdown).

5.2.6 Marginally-economic stands

In May 2012, a Special Committee on Timber Supply was appointed by the BC Legislature to make recommendations to address the reduction of mid-term timber supply due to mountain pine beetle (MPB) in the central interior of BC. Following its review of technical information and public, stakeholder and First Nations' input, the committee issued a report entitled *Growing Fibre, Growing Value* (August 2012). As described in *Beyond the Beetle: A Mid-term Timber Supply Action Plan* (October 2012), the Ministry of Forests, Lands and Natural Resource Operations (FLNR) has responded to the committee's recommendations. One of these responses includes a commitment to:

review marginally economic forest types within each timber supply area (TSA) and quantify the types and areas of forest that might justifiably be included in a partition within the timber harvesting land base (THLB), while respecting resource objectives for other values, such as wildlife and water.

Based on these FLNR commitments, the Morice TSA timber supply review will provide the chief forester with information about the potential contribution from marginally economic forest types. This will include an assessment of the potential gains in timber supply from harvesting in stands removed from the THLB as sites with low timber growing potential, as described in Table 6, and capable of achieving 100 cubic metres per hectare.

5.2.7 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 THLB.

Table 6. Description of sites with low timber growing potential

Leading species	Age \geq (years)	Volume \leq (m ³ /ha)	Site index	Reduction %
Balsam	200	200		100
Spruce	150	150		100
Pine	150	150		100

Data source and comments:

The site index criteria used to identify sites with low timber growing potential will be selected by the timber supply analyst after the THLB is determined.

The volume criteria shown in this table reflect the minimum volume a stand must currently have to be productive enough to be considered for forest management. Stands must achieve the minimum volume by the time they reach 'old growth' status to be considered productive.

Previously harvested areas are to be included in the THLB, even if their site index falls below the productivity thresholds.

5.2.8 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 wholly or partially excluded from the THLB.

Table 7. Problem forest types criteria

Description	Leading species code	Reduction percent
Whitebark pine stands	PA	100
Douglas-fir stands	FD	100
Hemlock stands	H, HW, HM	100
Deciduous	EP, AC, AT	100

Data source and comments:

There are a number of whitebark pine stands along the southwestern edge of the TSA. This species is a rare species and is consequently excluded from the THLB.

Douglas-fir is not a native species within the Morice TSA. There are however about 10 hectares of trial sites that were planted with Douglas-fir and these sites will be removed from the THLB.

All deciduous and hemlock-leading stands will also be removed from the THLB because they collectively represent a small portion of the TSA and they are generally located in small, isolated patches. Hemlock-leading stands also tend to be located in high elevation areas that are more difficult to access. There are no processing facilities for deciduous stands and these stands have high habitat value.

5.2.9 Roads, trails and landings

Separate estimates are made 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. Future RTL reductions are applied after stands are harvested for the first time in the simulation model.

Table 8. Estimates for existing and future roads, trails, and landings

Existing and future RTLs	Road width (m)	Reduction percent
Highways	60	100
Mainline roads	27.3	100
Operational roads	19.0	100
In-block (spur) roads	8.4	100

Data source and comments:

Road widths shown in Table 8 correspond to clearing widths measured within the neighboring Lakes TSA. These average widths include existing landings.

As wood processing now occurs at roadside rather than on landings, specific reductions will not be applied to account for landings.

Future reductions for roads and trails will be estimated by the timber supply analyst based on the proportion of harvested *versus* unharvested THLB.

5.2.10 Wildlife habitat reductions

In the “Managed Identified Wildlife Guidebook”, management prescriptions include core “no harvesting” areas around nesting sites or other valuable habitats for endangered species.

Table 9. Estimates for wildlife habitat core no harvest areas

Identifying inventory variables (location descriptors)	Excluded area (hectares)	Species under consideration
Forested islands in Ootsa & Whitesail Lakes	100%	Northern Caribou
Takla Caribou – high	100%	Mountain Caribou

Data source and comments:

Natal areas located on forested islands in Ootsa and Whitesail Lakes are important to the survival of northern caribou. Consistent with approved forest stewardship plans (FSP), these areas will be excluded from the THLB.

A notice has been issued under Section 7 of the FPPR for the Takla caribou and a draft ungulate winter range (UWR) and associated general wildlife measures (GWM) has been prepared to address the winter habitat requirement of this ungulate. The area identified as “high” is currently excluded from operational forestry.

5.2.11 Cultural heritage resource reductions

Cultural heritage resources are continually being noted and documented throughout the Morice TSA. In timber supply analysis, these resources are generally accounted for through riparian, wildlife tree patch or other removals from the THLB. The magnitude of this assumption may change as the extent of cultural heritage resources and their impact on timber harvesting activities becomes better understood.

5.2.12 Riparian reserve zones

Table 10 lists the area reductions that will be applied to account for riparian reserves zones (RRZ) and riparian management zones (RMZ) along streams and around lakes and wetlands.

Table 10. Riparian reserve zones and riparian management zones

Stream class	Description	Riparian reserve zone (m)	Reduction %	Management zone width (m)	Reduction %
S1	Fish stream, width > 20m	50	100	20	50
S2	Fish stream width, > 5m	30	100	20	50
S3	Fish stream, width > 1.5m	20	100	20	50
L1	Lake between 5-1000 ha	10	100	0	0
W1	Wetland >5 ha	10	100	40	25
W5	Complex of wetlands	10	100	40	25

Data source and comments:

Reductions to the THLB will only be applied for those classes of riparian areas that require a riparian reserve zone (RRZ) and a riparian management zone (RMZ). Reductions will not be applied for riparian classes where a riparian reserve zone is not required (e.g., S4 streams) as current practice in these riparian areas mainly consist in retaining non-merchantable conifer trees, deciduous trees, shrubs, and herbaceous vegetation within 10 metres of the channel or edge.

The current management practice is to retain 100 percent of the vegetation in areas designated as riparian reserve zones. Approved Forest Stewardship Plans, indicate that a minimum of 5 to 20 percent of the RMZ will be retained along streams where a RRZ is required. For lakes and wetlands where a RRZ is required, these plans indicate that a minimum of 3 to 17 percent of the RMZ will be retained.

To accommodate for modelling requirements, an area weighted netdown is applied to account for reductions associated with RRZ and RMZ requirements. The area weighted netdown is based on approved FSP commitments prorated to existing AAC apportionment.

5.2.13 Exclusion of specific, geographically defined areas

On November 10, 1987, an Order-in-Council was issued for the purpose of providing a buffer area to protect the Fulton River and the Fulton River Spawning Channel. Any work in the reserve requires approval by the Canadian Department of Fisheries and Oceans. With the exception of small patches harvested for beetle control, there is no harvesting history within the reserve. Therefore, it will be removed from the THLB.

Table 11. Exclusion of specific, geographically defined areas

Area description	Excluded area (%)	Reason for exclusion
Fulton River Buffer Corridor	100	Order-in-Council requires buffer area

5.2.14 Economic operability

Slopes greater than 40 percent are typically not harvested in the Morice TSA because they are considered unsafe for conventional ground-based systems. There has been very little to no cable systems used in the TSA in the past 40 years. Therefore, stands located on slopes greater than 40 percent will be excluded from the THLB.

6. CURRENT FOREST MANAGEMENT ASSUMPTIONS

6.1 Harvesting

6.1.1 Utilization levels

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

Table 12. Utilization levels

Analysis unit	Minimum dbh (cm)	Utilization maximum stump height (cm)	Minimum top dib (cm)
Lodgepole pine	12.5	30.0	10.0
Balsam	17.5	30.0	10.0
Spruce	17.5	30.0	10.0

Data source and comments:

The table above reflects current practices and is consistent with the *Provincial Logging Residue & Waste Measurement Procedures Manual*.

6.1.2 Volume exclusions for mixed-species stands

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

Table 13. Volume exclusions for mixed-species types

Inventory type group	Species	Volume exclusion (%)
All coniferous leading	Deciduous	100

Data source and comments:

In practice, deciduous-leading stands are not harvested in the Morice TSA and are thus excluded from the land base. Deciduous volume within conifers-leading stands is also not harvested as a rule. Therefore, deciduous volume within coniferous stands will also be excluded from yield tables used in the analysis.

6.1.3 Minimum harvestable volume

Table 14 shows the volume criterion to be used. While harvesting may occur in stands at the minimum volume to meet forest level objectives (e.g., maintaining overall harvest levels for a short period of time or avoiding large changes in harvest levels), most stands will not be harvested until past the minimum volume because of management objectives for other resource values.

Table 14. Minimum harvestable age criteria

Species	Minimum volume criteria (m ³ /ha)
Pine and Spruce	150
Balsam	200

Data source and comments:

The thresholds shown in Table 14 are consistent with current practices; however the vast majority of stands currently harvested yield greater than 250 cubic metres per hectare. Consequently, a sensitivity analysis will examine the impact of changes to minimum harvestable levels.

6.1.4 Harvest scheduling priorities

Pine stands in which more than 70 percent of the volume is pine and at least 50 percent of the total stand volume is dead are targeted for harvest for the first five years. For all other species volume is the primary consideration for harvest.

6.1.5 Logging method

Conventional ground skidding is the harvest method in the Morice TSA.

6.1.6 Silvicultural systems

Clearcut with reserves is the silvicultural system used in the Morice TSA.

6.2. Unsalvaged losses

Table 15 shows the estimate of average annual unsalvaged volume loss due to insects, diseases, fires, wind damage or other agents on the THLB. The unsalvaged loss column reflects only areas where the volume is not expected to be recovered or salvaged.

Table 15. Unsalvaged losses – information is not yet available

Cause of loss	Annual unsalvaged loss (m ³ /year)
Mountain pine beetle - endemic	
Spruce Bark Beetle	
Balsam Bark Beetle	
Spruce 2-year Budworm	
Fire	

Data source and comments:

Estimates of unsalvaged losses will be derived prior to completion of the analysis and will consider the following forest health factors.

1. Insects

Mountain Pine Beetle

The mountain pine beetle (MPB) is a species of bark beetle present throughout western North America. Until about 2004, due to insect population dynamic and concerted treatment efforts, the annual unsalvaged loss was limited to approximately 9000 cubic metres.

Beetle populations and annual volume mortality figures began to rise sharply in 2005. From 2005 to 2012, about 29 million cubic metres of pine was killed by the MPB. The infestation, which spread from the south of the TSA to the north, peaked in 2007 when about seven million cubic metres of pine was killed. The majority of the volume killed was in mature pine-leading stands where pine accounted for more than 70 percent pine of the total volume. Since then, annual mortality has been declining and is now back to pre-2005 levels.

Harvest activities have been focused in pine: between 2005 and 2012, about 11.6 million cubic metres of pine were harvested, which represent about 70 percent of the total harvest for that period.

Spruce Bark Beetle, Western Balsam Bark Beetle, and Spruce 2-year Budworm

The spruce bark beetle, the western balsam bark beetle and the 2-year budworm are found throughout British Columbia’s Interior. Results from forest health aerial overview surveys for the previous five years, together with grade billing information, will be used to estimate the amount of unsalvaged losses prior to the start of the timber supply analysis.

2. Fire

Unsalvaged losses due to fire will be calculated based on the total area affected by wildfires in the past decade and based on estimates of mortality gathered by district staff from field surveys and overview flights.

3. Wind

Catastrophic wind events are a rare occurrence in the Morice TSA. Therefore, there will be no specific accounting for wind throw losses in the base case.

6.3 Silviculture

6.3.1 Managed stand yields and regeneration assumptions

The growth of existing managed stands, which are less than 45 years old, and future managed stands will be projected using Managed Stand Yield Tables (MSYTs) produced using the Forest Service TIPSY growth and yield model. Existing managed stands will be assigned to MYSTs produced using the species composition and stand density assumptions listed in the forest cover inventory. Future managed stands will be grouped into analysis units and a MYST will be produced for each analysis unit using the regeneration assumptions listed in Table 16.

Table 16. Regeneration assumptions for future managed stands

Composition	Site index	Regen delay (years)	OAFs		Method		Species		Density initial
			1	2	Type	%	code	%	
Balsam Leading		2	20	5	Plant	100	S5P5	16	1400
Balsam Leading		2	15	5	Plant	100	S8P2	23	1400
Balsam Leading		2	15	5	Plant	100	S75P20B05	61	1400
Spruce Leading		2	20	5	Plant	100	P6S3B1	10	1400
Spruce Leading		2	15	5	Plant	100	S6P4	55	1400
Spruce Leading		2	20	5	Plant	100	S5P5	35	1400
Pine Leading		2	20	5	Plant	100	S5P5	49	1400
Pine Leading		2	15	5	Plant	100	S6P4	51	1400

Data source and comments:

The species composition column in Table 16 refers to the leading species of existing natural stands before harvest and regeneration. All values in Table 16 are based on current regeneration practices as determined using RESULTS reports. Assumptions regarding species composition, regeneration method and initial density may be revised prior to completion of the analysis once analysis unit are defined.

It is assumed that all stands under the age of 45 are managed.

Operational adjustment factors (OAFs) are used to adjust timber yield estimates to account for operational conditions. OAF is a constant percentage reduction to account for small unproductive areas within stands, uneven stem distribution, endemic losses and other random risk factors such as snow press. OAF 2 increases over time, in this case five percent per 100 years, accounting for decay, waste and breakage. Based on findings from forest health surveys, monitoring results and recommendations from regional research staff, the OAF 1 value has been increased to 20 in analysis units with at least 50 percent pine to account for high and widespread pine rust disease levels.

Regeneration delay is based on the Biological Regeneration Delay report from the RESULTS database, which provides a consistent methodology to determine the 'biological' regeneration delay. This is different than a 'regeneration declaration' delay which is a legal maximum limit.

At the time of planting, the stock is one year old, on average.

The species percentages and densities reflected in this data package are a direct reflection of information submitted by licensees.

Genetic gain for pine is 10.4 percent. About 69 percent of the pine seedlings currently being planted are from class 'A' seeds with proven genetic gain. Planting with seedlings from these seed orchards is recent and seed availability is limited; therefore the gain will only be applied to 69 percent of the pine planted from 2012 and to all future stands.

Genetic gain for spruce is 17.23 percent. All spruce seedlings planted in the past four years are from class 'A' seeds, therefore, in the base case, the genetic gain will apply to all spruce stock planted from 2008 and to all future stands.

RESULTS show a total of 16 946 hectares of cutblocks as being not satisfactorily stocked (NSR). Of this, 15 787 hectares corresponds to areas with recent harvesting activities and will be restocked. Approximately 30 percent of the remaining 1159 hectares is expected to yield volumes exceeding 140 cubic metres per hectares and contribute to future harvest levels without further treatments. A further 30 percent is just below current stocking standards, but is expected to contribute to future harvest levels.

The remaining 464 hectares is considered 'true' NSR and will remain so unless treated.

Table 17. Not satisfactorily restocked (NSR) areas

Description	Total area (hectares)
Liability ground	15 787
Pre-87, backlog (gov)	923
Post-87, backlog (gov)	236
Total	16 946

6.3.2 Immature plantation history

The purpose of this section is to identify areas of existing immature forest where the density (stems per hectare) was controlled and therefore should be assigned to a managed stand yield curve (TIPSY). Licensees are encouraged to contact the district, if current managed stands (e.g., 10-20 years of age) were regenerated under a different silvicultural regime than plantation activities occurring on current NSR, as additional yield tables may be appropriate.

Table 18. Immature plantation history

District Nadina Morice TSA activity	1960-70 area (ha)	1970-80 area (ha)	1980-90 area (ha)	1990-2000 area (ha)	2000-2010 area (ha)	2010-2012 area (ha)	Total
Planting	1 549	13 831	52 725	57 943	46 921	18 978	191 946
Fill plant/replant			22	7 664	6 123	656	14 465
Brushing			7528.3	8 543	14 043	885	30 999
Spacing basic		27	290	2 264	100	0	2 681
Spacing incremental		65	2 149	2 560	2 235	0	7 008
Pruning				755	140	0	895
Fertilization			2 346	977	822	1 673	5 818

Data source and comments:

The information above was derived from the RESULTS database. The spaced stands were pine-leading stands aged between 15 and 65 years. Some pine stands younger than 35 years have not been planted, but due to density control that occurred (e.g., spacing), they will be considered managed.

6.4 Integrated resource management

6.4.1 Objectives which require forest cover constraints

Forest cover requirements identified in this section are defined through legislative requirements and forest stewardship plan commitments.

As noted in Section 4.1, the discussion on multiple objectives, forest cover requirements may be examined at a number of different levels. These may be considered as layers in 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 (productive forest which does not contribute to the THLB) may be considered in the forest cover requirements (i.e., maximum allowable disturbance or minimum area retention).

The Morice LRMP, approved by Cabinet in 2007, provides policy direction for the implementation of biodiversity objectives. A draft land use order that includes objectives for seral stage distribution, old-growth management areas, wildlife tree retention and no-timber harvesting zones is being prepared; however, at the time of this data package, this order has not been finalized. Consequently, these biodiversity objectives will not be included in the base case. If there is agreement on the content of a land use order before the AAC determination meeting, a sensitivity analysis will be conducted to show the effect of that order on the base case timber supply.

The Provincial Non-spatial Old-growth Order represents the current legal requirement in the Morice TSA and will be applied in the base case to address biodiversity values. In the event the land-use order described above is finalized prior to the AAC determination, sensitivity analysis can be used to examine the potential impact on the base case.

A. Old Growth Distribution

*Table 19. Old seral requirements by landscape unit and BEC zone
— targets in low to be reduced by 2/3*

Landscape unit	BEO	BEC zone	Old seral minimum retained area (%)	Age for retention (years)
Buck	Low	SBS	11%	> 140
		ESSF	9%	> 250
Fulton	Low	SBS	11%	> 140
		ESSF	9%	> 250
Gosnell	Intermediate	SBS	11%	> 140
		ESSF	9%	> 250
Granisle	Low	SBS	11%	> 140
		ESSF	9%	> 250
Houston-Tommy	High	SBS	16%	> 140
		ESSF	13%	> 250
Kidprice	Intermediate	SBS	11%	> 140
		ESSF	9%	> 250
Morice Lake	High	SBS	16%	> 140
		ESSF	13%	> 250
Morrison	Intermediate	SBS	11%	> 140
		ESSF	9%	> 250
Nadina	Intermediate	SBS	11%	> 140
		ESSF	9%	> 250
Nanika	High	SBS	16%	> 140
		ESSF	13%	> 250
North Babine	Low	SBS	11%	> 140
		ESSF	9%	> 250
Owen	Intermediate	SBS	11%	> 140
		ESSF	9%	> 250
Parrott	Low	SBS	11%	> 140
		ESSF	9%	> 250
Sibola	High	SBS	16%	> 140
		ESSF	13%	> 250
Tahtsa	Low	SBS	11%	> 140
		ESSF	9%	> 250
Thautil	High	SBS	16%	> 140
		ESSF	13%	> 250
Tochch-Natowite	Intermediate	SBS	11%	>140
		ESSF	9%	> 250

(continued)

Table 19. Old seral requirements by landscape unit and BEC zone
— targets in low to be reduced by 2/3 (concluded)

Landscape unit	BEO	BEC zone	Old seral minimum retained area (%)	Age for retention (years)
Topley	Low	SBS	11%	>140
		ESSF	9%	>250
Troitsa	High	SBS	16%	>140
		ESSF	13%	>250
Valley	Intermediate	SBS	11%	>140
		ESSF	9%	>250
Whitesail	Intermediate	SBS	11%	>140
		ESSF	9%	>250

Data source and comments:

The provincial Non-spatial Old-growth Order applies in the Morice TSA. Consistent with implementation policy, the targets in landscape unit with a low biodiversity emphasis option will be reduced by 2/3.

Sensitivity analyses will be conducted to examine the impact of applying up to the full target amount in landscape units with a low biodiversity emphasis option.

B. Telkwa Caribou

Table 20. Forest cover requirements for the Telkwa Caribou recovery plan area

Zone	Maximum allowable disturbance (% area)	Green-up height (m)	Minimum retained area (%)	Minimum age for retention	Land base to which constraints apply
Telkwa Caribou recovery area – ESSF and SBS			25%	>90 years	Crown forested
Telkwa Caribou recovery area – key forested area	25%	3			THLB

Data source and comments:

The requirements in the table above are consistent with the *Interim Timber Harvesting Guidelines (1999)* for the *Telkwa Caribou Herd Recovery Plan* and with the applicable Section 7 Notice.

C. Takla Caribou*Table 21. Takla Caribou*

Zone	Minimum retained area (%)	Minimum age for retention	Land base to which constraints apply
Moderate value winter habitat	70	80	Crown forested

Data source and comments:

A notice has been issued under Section 7 of the FPPR for the Takla caribou and a draft ungulate winter range (UWR) and associated general wildlife measures (GWM) has been prepared to address the winter habitat requirement of this ungulate. The area identified as “moderate” is currently managed as described above in approved FSP.

D. Visual quality*Table 22. Forest cover requirements for visual quality objectives*

Zone	Maximum allowable disturbance in perspective view (% area)	Green-up height (m)	Land base to which constraints apply
Preservation	0	-	Crown forested
Retention	1.5	5	Crown forested
Partial retention	7	5	Crown forested
Modification	18	5	Crown forested
Maximum modification	30	5	Crown forested

Data source and comments:

Only scenic areas made known and established visual quality objectives will be considered in the base case.

E. Cutblock adjacency

A maximum of 25 percent of the THLB can be less than three metres in height at all times.

F. Stand level biodiversity

The FPPR requires that a minimum of seven percent of the gross area harvested annually be retained for stand-level biodiversity purposes.

Licensees have indicated that the average percentage of wildlife tree retention (WTR) left on cutblocks is 15 percent. This percentage is consistent with results obtained from the Forest and Range Evaluation Program (FREP).

Data collected under FREP also shows that about 54 percent of the WTR areas overlap other constraints such as riparian areas. Consequently, a 3.2 percent (7% x 46%) reduction will be applied in the base case analysis to account for the legally required minimum stand-level retention that does not overlap with already constrained areas. In addition, a sensitivity analysis will be prepared to examine the current practice of leaving 6.9 percent WTR (15% x 46%).

7. Sensitivity Analyses to be Performed

Sensitivity analysis can provide 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. Sensitivity analysis may indicate that a small reduction in these attributes may alleviate or exacerbate 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. Table 23 presents the standard sensitivity analyses that are generally performed in all analyses. Additional sensitivities may be included after the base case has been completed and new uncertainties are identified.

Table 23. Sensitivity analyses

Issue to be tested	Sensitivity levels
Existing stand yields	± 10%
Managed stand yields	± 10%
Site productivity	Replace PEM/SIBEC with inventory based site indices
Changes to minimum harvestable volume	Exclude stands with less than 250 cubic metres per hectares
Assess marginal timber supply opportunities	Include stands with low timber growing potential but can achieve at least 100 cubic metres per hectares
Increased wildlife tree retention	Increase WTR to 6.9 percent
Landscape level biodiversity	Apply full old-growth requirements immediately in low BEO landscape units
Exclude dead pine stands with live volumes less than 150 cubic metres per hectare	Exclude dead pine stands with live volumes less than 150 cubic metres per hectare
Shelf-life of MPB-killed stands	a) Stop dead pine salvage immediately b) Extend dead pine salvage by five years
Harvest flow alternatives	
Assess the potential timber supply impact of no-harvest zones	
Land use practices	Assess the timber supply effect of any potential land use order