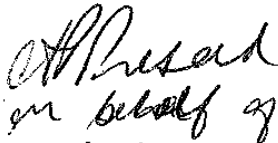


# Quesnel Timber Supply Area Timber Supply Review

Data Package

April 2009

  
District Manager  
Quesnel Forest District

  
in behalf of  
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Acting Director  
Forest Analysis and Inventory Branch



# Table of Contents

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|                         |   |           |
|-------------------------|---|-----------|
| <b>1.</b>               | <b>Introduction .....</b>   | <b>1</b>  |
| <b>2.</b>               | <b>Current Forest Management Considerations and Issues.....</b>       | <b>2</b>  |
| 2.1                     | Base case management assumptions.....                                 | 2         |
| 2.2                     | Statement of major forest management considerations and issues .....  | 2         |
| <b>3.</b>               | <b>Inventories.....</b>   | <b>6</b>  |
| 3.1                     | Background information.....   | 6         |
| <b>4.</b>               | <b>Division of the Area into Management Zones.....</b>                | <b>8</b>  |
| 4.1                     | Management zones and tracking of multiple objectives (grouping) ..... | 8         |
| 4.2                     | Analysis units.....   | 10        |
| <b>5.</b>               | <b>Timber Harvesting Land Base Definition .....</b>                   | <b>11</b> |
| 5.1                     | Identification of the timber harvesting land base .....               | 11        |
| 5.2                     | Details on land base classification.....                              | 11        |
| 5.2.1                   | Crown land administration for timber supply.....                      | 11        |
| 5.2.2                   | Land classified as non-forest .....                                   | 12        |
| 5.2.3                   | Non-commercial cover .....  | 12        |
| 5.2.4                   | Environmentally sensitive areas .....                                 | 12        |
| 5.2.5                   | Areas considered physically inoperable .....                          | 13        |
| 5.2.6                   | Roads, trails and landings (RTL) .....                                | 13        |
| 5.2.7                   | Wildlife habitat reductions .....                                     | 14        |
| 5.2.8                   | Cultural heritage/archaeological resource reductions .....            | 15        |
| 5.2.9                   | Riparian reserve zones .....  | 15        |
| 5.2.10                  | Lower Blackwater LRUP (1996).....                                     | 15        |
| 5.2.11                  | Cariboo River management area.....                                    | 16        |
| 5.2.12                  | Area inclusion factors.....   | 16        |
| 5.2.13                  | Low site exclusions .....   | 17        |
| <b>6.</b>               | <b>Current Forest Management Assumptions.....</b>                     | <b>18</b> |
| 6.1                     | Harvesting.....   | 18        |
| 6.1.1                   | Merchantable timber specifications.....                               | 18        |
| 6.1.2                   | Volume exclusions for mixed-species stands .....                      | 19        |
| 6.1.3                   | Minimum harvestable age .....   | 19        |
| 6.1.4                   | Silviculture systems.....   | 20        |
| 6.2                     | Unsalvaged losses.....  | 24        |
| 6.2.1                   | Current unsalvaged losses .....                                       | 24        |
| 6.2.2                   | Shelf life of MPB impacted timber .....                               | 24        |
| 6.2.3                   | Condition of MPB-impacted young stands.....                           | 25        |
| 6.3                     | Silviculture.....   | 26        |
| 6.3.1                   | Regeneration activities in managed stands .....                       | 26        |
| 6.3.2                   | Immature plantation history.....                                      | 27        |
| 6.3.3                   | Selection harvesting.....   | 28        |
| 6.3.4                   | Not satisfactorily restocked (NSR) areas.....                         | 28        |
| 6.3.5                   | Non-salvaged MPB impacted stands.....                                 | 28        |
| 6.4.1                   | Objectives managed using forest cover requirements.....               | 29        |
| 6.4.2                   | Reductions to reflect volume retention in cutblocks.....              | 30        |
| <b>7.</b>               | <b>Sensitivity Analyses .....</b>                                     | <b>32</b> |
| <b>Appendix A .....</b> | <b>.....</b>  | <b>34</b> |
|                         | Timber Supply Review process .....                                    | 34        |
|                         | The chief forester's responsibility .....                             | 34        |
|                         | Principles of the timber supply review .....                          | 35        |

# Table of Contents

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## Tables

---

|               |  |    |
|---------------|--|----|
| TABLE 1.      | FOREST MANAGEMENT CONSIDERATIONS .....   | 3  |
| TABLE 2.      | INVENTORY INFORMATION.....   | 6  |
| TABLE 3.      | OBJECTIVES TO BE TRACKED .....   | 9  |
| TABLE 4.      | DESCRIPTION OF ENVIRONMENTALLY SENSITIVE AREAS.....  | 12 |
| TABLE 5.      | ESTIMATES FOR EXISTING AND FUTURE RTLs .....   | 13 |
| TABLE 6.      | AREA INCLUSION FACTORS .....   | 16 |
| TABLE 7.      | LOW SITE EXCLUSIONS <sup>A</sup> .....   | 17 |
| TABLE 8.      | MERCHANTABLE TIMBER SPECIFICATIONS .....   | 18 |
| TABLE 9.      | VOLUME EXCLUSIONS FOR MIXED-SPECIES TYPES .....  | 19 |
| TABLE 10.     | MINIMUM HARVESTABLE AGE CRITERIA.....  | 20 |
| TABLE 11A.    | THE ORDER FOR THE SHALLOW AND MODERATE SNOWPACK ZONES IDENTIFIES THE FOLLOWING<br>DIFFERENT STAND CONDITIONS THAT REQUIRE DIFFERENT TYPES OF TREATMENT ..... | 21 |
| TABLE 11B.    | THE ORDER FOR THE TRANSITION AND DEEP SNOWPACK ZONES IDENTIFIES THE FOLLOWING DIFFERENT<br>STAND CONDITIONS THAT REQUIRE DIFFERENT TYPES OF TREATMENT .....  | 22 |
| TABLE 11B(i). | HARVEST PROPORTIONS AND CUTTING CYCLES FOR EACH STAND STRUCTURE HABITAT CLASS FOR THE<br>TRANSITION AND DEEP SNOWPACK ZONES .....                            | 23 |
| TABLE 12.     | SILVICULTURE SYSTEMS-CARIBOU AREAS.....  | 24 |
| TABLE 13.     | UNRECOVERED LOSSES .....   | 24 |
| TABLE 14.     | REGENERATION ASSUMPTIONS BY LEADING SPECIES AND SITE QUALITY .....   | 26 |
| TABLE 15.     | IMMATURE PLANTATION HISTORY .....  | 27 |
| TABLE 16.     | FOREST COVER REQUIREMENTS .....  | 29 |
| TABLE 17.     | SENSITIVITY ANALYSES SPECIFIC TO THE QUESNEL TSA.....  | 32 |
| TABLE 18.     | STANDARD SENSITIVITY ANALYSES.....   | 33 |

# 1. Introduction

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This data package outlines the basic information and assumptions that are required for the Quesnel Timber Supply Area (TSA) timber supply analysis. For information regarding the timber supply review process and allowable annual cut (AAC) determination see Appendix A.

The completed data package contains those inputs that represent current performance for the Quesnel Timber Supply Area (TSA). For the purpose of the timber supply review (TSR), "current performance" can be defined by:

- the current forest management regime — the timber harvesting land base (THLB) – the productive Crown forest land available for timber harvesting often accounting for biophysical and socio-economic factors, the silviculture treatments, the harvesting systems and the integrated resource management guidelines used in the area;
- the standards used to approve or reject forest stewardship plans (FSP);
- fully implemented land-use plans;
- land-use decisions approved by Cabinet;
- approved higher level plans under the *Forest and Range Practices Act* (FRPA); and
- other approved British Columbia Forest Service and joint agency forest management practices and policy.

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

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

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

This data package, while representing the best knowledge and information available today, is subject to change. As noted in several sections, until the THLB is determined, it is not possible to finalize the values shown in some of the tables in this package. In some cases the criteria are shown but the final values are not yet provided. Where this occurs, the table columns are shaded gray. In addition, if any major changes to management regimes occur over the next few months, an attempt will be made to incorporate them into the timber supply analysis. The final timber supply analysis report will include an appendix that highlights any changes made to this data package.

The dominant factor influencing forest management and harvest activities in the TSA is the unprecedented Mountain Pine Beetle (MPB) infestation. This infestation has devastated hundreds of thousands of hectares of mature lodgepole pine stands. In 2001, the allowable annual cut was increased to 3.248 million hectares to assist in control measures. The AAC was increased again to the current level of 5.283 million cubic metres in 2004 to support efforts to salvage the dead pine before it is unmerchantable.

Several years of epidemic populations of MPB have resulted in a scarcity of mature lodgepole pine, the preferred host of MPB. This has resulted in extreme behaviors, such as the infestation and mortality in immature pine stands — as young as 25 years of age — and the attack of spruce trees. Although MPB infestation kills immature pine, the broods in these trees often die during the winter. In contrast, spruce attacked by MPB usually survives, as those trees produce pitch, which “pitches” the beetles out of the tree.

## **2. Current Forest Management Considerations and Issues**

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### **2.1 Base case management assumptions**

These assumptions reflect current performance with respect to the status of forest land, forest management practices and knowledge of timber growth and yield. The base case harvest forecast developed from these assumptions, is used as a baseline reference. Section 7, of this document, "Sensitivity Analyses," identifies areas of uncertainty in data and assumptions, and outlines additional analyses used to examine the response or "sensitivity" of the projected timber supply to variations in these data or assumptions. These harvest forecasts are referred to as "sensitivity analysis."

The *Cariboo-Chilcotin Land Use Plan* (CCLUP) was announced by government in October of 1994. The *Cariboo-Chilcotin Land Use Plan 90-Day Implementation Report* was released on March 3, 1995 and includes land-based targets, objectives and strategy statements. A higher level plan order dated January 23, 1996 gives higher level planning status to the provisions regarding management zones, objectives, targets and strategies, where they are applicable to operational planning.

The Inter-Agency Management Committee (currently referred to as the Cariboo Management Committee (CMC)), in consultation with the Regional Resource Board (currently referred to as the Regional Resource Committee (RRC)), was tasked by government to direct and monitor the implementation of the CCLUP. Under this mandate the *Cariboo-Chilcotin Land Use Plan Integration Report* (CCLUPIR) was completed and endorsed by RRC and CMC. The CCLUPIR contains management strategies designed to meet the long- and short-term targets of the CCLUP.

The Statutory Decision Makers (SDM) of the day for the Ministries of Forests (MoF) and of Environment, Lands, and Parks (MELP) referred to the findings in the CCLUPIR in letters dated April 30, 1998 and January 15, 1999, which provided direction to forest development plan (FDP) proponents for the preparation of the 1999-2003 and 2000-2004 FDP submissions, respectively. To achieve consistency with the CCLUPIR, ministries, additional guidance on the application of wildlife tree patches in partial cutting was provided by these in a letter dated September 23, 1998. While the preceding is historical information, this guidance is still relevant and is reflected in currently approved Forest Stewardship Plans.

The CCLUPIR provided direction to further levels of strategic planning through completion of the various strategies outlined in the report. The Quesnel Sustainable Resource Management Plan is under development and once completed will refine how resource values are balanced to achieve CCLUP targets. Any additional changes that occur to the current management regime before the allowable annual cut (AAC) determination takes place, as a result of the CCLUPIR strategies or the sub-regional plan implementation, will be presented to the chief forester for his consideration in his AAC determination.

### **2.2 Statement of major forest management considerations and issues**

Table 1 lists the forest management considerations for the Quesnel TSA. Considerations that reflect current management, as directed within legislation, regulations or standards, are incorporated in the base case. Where there is significant uncertainty in defining current management, sensitivity analysis may assist in assessing the potential effect on timber supply.

## 2. Current Forest Management Considerations and Issues

Table 1. Forest management considerations

| Consideration/issue           | Description   |
|-------------------------------|---|
| CCLUP                         | The CCLUP has been accepted by government and the objectives have been reflected in a higher level plan order. In addition, the CCLUPIR has been accepted by RRC and CMC. Numerous issues contained in these reports have been addressed in the 1998 and 1999 forest development plan direction letters. These reports and letters provide direction for current management and will be reflected in the base case.   |
| Landscape-level biodiversity  | Landscape units (LUs) and biodiversity emphasis options (BEOs) were developed by the Regional Biodiversity Conservation Strategy Committee. The draft LUs were revised in accordance with <i>Cariboo Region Landscape Unit Planning Strategy</i> (CRLUPS) to better align with administrative boundaries. Using the same draft LUs developed by the biodiversity conservation strategy committee, seral stage target draw-downs were defined in the CCLUPIR (see Section 6.4.1, "Objectives managed using forest cover requirements"). The landscape-level biodiversity direction provided in the 1998 FDP letter reflects current practices, and will be used in developing the base case. Essentially, the Ministries of Forests and Range and Environment require FDPs to be consistent with the <i>CCLUP Biodiversity Conservation Strategy</i> as influenced by the CCLUPIR and the CRLUPS.  |
| Pulpwood agreement (P.A.) # 5 | <p>Pulpwood Agreement #5 (the agreement), held by Cariboo Pulp and Paper Company Ltd. (CPP), was last replaced on December 16, 1996 and has a 25-year term ending on December 15, 2021. The agreement allows for the harvest of up to 1 510 000 cubic metres per year in the form of Timber Sale Licences (TSL) within approximately half the Quesnel Forest District and a large portion of the Williams Lake TSA east of Williams Lake. The agreement requires CPP to utilize, trade or purchase all available pulp logs or wood residue suitable for processing in the pulp mill first before invoking the agreement. CPP must satisfy the applicable district manager that the requirements of the agreement have been met before applying for TSLs.</p> <p>West Fraser Mills Ltd., which jointly owns CPP, has amended their Forest Stewardship Plans to include P.A. #5 and are preparing to utilize the agreement. West Fraser is concerned that recent sawmill shutdowns and curtailments have decreased the availability of pulp logs and residue. In addition, they are concerned that the recent bioenergy initiatives will further reduce fiber availability.</p> |
| Problem forest types (PFT)    | In order to assess the potential timber supply impacts of PFTs (see Quesnel TSA Timber Supply Analysis 1994) the forest cover information for these stands was adjusted based on the results of a 1997 PFT inventory (see Quesnel Forest District Problem Forest Type Inventory – 1998). The adjusted forest cover information will be used in the base case.   |
| Deciduous component           | A re-inventory of a portion of the TSA was completed in 1997. The re-inventory provides improved information for assessment of the deciduous component in the TSA.  |

(continued)

## 2. Current Forest Management Considerations and Issues

Table 1. Forest management considerations

| Consideration/issue                       | Description  |
|---|--|
| Site productivity                         | A sensitivity analysis will be prepared using biogeoclimatic ecosystem classification site index (SIBEC) and site index adjustment (SIA) information if it is available at the time of analysis.   |
| Not satisfactorily restocked (NSR)        | There are currently 2977 hectares of backlog NSR area and 48 920 hectares of current NSR area (May 2008). Restocking of NSR areas will be modelled in the analysis.  |
| Lower Blackwater LRUP                     | The base case will reflect the local resource use plan (LRUP) Zone 1 fish, wildlife and recreation priorities, which are addressed through a specific management prescription (see Section 5.2.10, "Lower Blackwater LRUP").   |
| Roads, trails and landings (RTL)          | In order to account for the loss of productive forest land due to the development of RTLs, the gross productive forest area will be reduced by 3% for existing RTL and 1% for future RTL. These factors have been reviewed and confirmed by district staff.  |
| Inventory audit                           | An inventory audit of the Quesnel TSA was completed by the MFR, Forest Analysis and Inventory Branch, and the results will be incorporated into the analysis and provided to the chief forester for his consideration.   |
| Cariboo River management area             | The Cariboo River Protected Area and the Quesnel Highlands Special Resource Development Zone (QHSRDZ) remain as objectives set by government under FRPA. Constraints applied for the QHSRDZ, in addition to the protected area, will meet the original goals of the Cariboo River management area. Additional constraints are not necessary.   |
| Candidate Goal 2 Protected Areas          | Given that these areas have not been established by government through an "order-in-council" and may be relocated through sub-regional planning, the Goal 2 areas will not be incorporated into the base case. The potential impact on the THLB will be assessed through sensitivity analysis. There is a pending amendment to the proposed Goal 2 areas that would remove the Wentworth and Narcolsi Lake areas, and adjust the Dragon Mountain area boundary.  |
| Alexander Mackenzie Heritage Trail (AMHT) | The AMHT was designated a Heritage Site under the <i>Heritage Conservation Act</i> in 1987. A heritage management plan was developed for the Crown land portion of the trail in 1993 for the purpose of protecting the trail's provincially and nationally significant heritage values. The CCLUP sub-unit targets specify that the measures in the "AMHT Management Plan" should be implemented. The measures specify a 200-metre management zone with no harvesting allowed except for forest health treatments, or along those trail sections that are a gravel road. The management zone polygon was given a visual quality objective of preservation and is included in the visual landscape inventory for the district. Additional constraints are not required. |

(continued)

## 2. Current Forest Management Considerations and Issues

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Table 1. Forest management considerations (concluded)

| Consideration/issue                              | Description   |
|--|---|
| Contribution of Kluskus supply block to the THLB | This area has been the subject of a draft sub-regional plan, included in the Quesnel Sustainable Resource Management Plan, and portions of the area are included in a proposed Land Order. Licensees have proposed operations in the Kluskus supply block, but relatively little harvesting has happen over the last few years. A sensitivity analysis will examine the contribution of the Kluskus supply block to the overall timber supply and the implications of an AAC partition for this area.   |
| Mountain Pine Beetle infestation                 | <p>The TSA is significantly impacted by the current MPB infestation. The vast majority of the mature and over-mature pine is dead as a result of this infestation. Since 1996, harvest activities were directed at known outbreaks in an attempt to control or hold the populations until natural controls (winter cold) could suppress the populations. Winter temperatures have not been effective at controlling the infestation. Two expedited AAC determinations increased the harvest level, first to assist in control and later to improve salvage capabilities.</p> <p>High MPB population levels have resulted in extreme beetle behavior, including various levels of infestation of younger (age class 2) pine stands.</p> <p>District staff have not detected any measurable levels of MPB activity in age class 1 stands.</p> |

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## 3. Inventories

### 3.1 Background information

The inventories that will be used to define the THLB and model forest management activities are listed in Table 2. The source, date and scale of the information are also shown.

Table 2. Inventory information

| Digital data                                 | Source | Vintage | Scale    |
|--|--------|---------|----------|
| Forest District/Timber Supply Area           | LRDW   | 2003*   | 1:20,000 |
| Vegetation Cover                             | LRDW   | 2005*   | 1:20,000 |
| Lake Management Zones                        | ILMB   | 2005*   | 1:20,000 |
| Stream Management Zones                      | ILMB   | 2005*   | 1:20,000 |
| Caribou Habitat                              | LRDW   | 2008    | Unknown  |
| Terrain Stability                            | ILMB   | 2005*   | 1:20,000 |
| Resource Management Zones (CCLUP)            | ILMB   | 2005*   | 1:20,000 |
| Parks and Protected Areas                    | LRDW   | 2004*   | 1:20,000 |
| Old Growth Management Areas                  | LRDW   | 2008*   | Unknown  |
| Predictive Ecosystem Mapping                 | MFR    | 2008    | 1:20,000 |
| Goal 2 Protected Areas                       | MFR    | 1997    | 1:20,000 |
| Caribou Habitat (eastern and Itcha Ilgachuz) | LRDW   | 2005*   | 1:20,000 |
| Mule Deer Winter Ranges                      | ILMB   | 2005*   | Unknown  |
| Interim Class A Lakes Classification         | ILMB   | 2005*   | 1:20,000 |
| Landscape Units                              | LRDW   | 2008*   | 1:20,000 |
| Biogeoclimatic Zones                         | LRDW   | 2008*   | Unknown  |
| Established Visual Quality Objectives (VQO)  | LRDW   | 2004*   | 1:50,000 |
| Tree Farm Licence Boundaries                 | LRDW   | 2003*   | 1:20,000 |
| Lower Blackwater LRUP Boundary               | LRDW   | 2005    | 1:50,000 |

MFR = Ministry of Forests and Range;

ILMB = Integrated Land Management Bureau;

LRDW = Land and Resource Data Warehouse;

\* The vintage date is the date of data obtained from the Discovery Service Metadata.

Data source and comments:

The established visual quality objectives linework is currently on the LRDW; however, there is currently no attribute data associated with it. This is being rectified.

LRDW Data connects to slkux1.gov.bc.ca database (idwprod1) and ILMB Data connect to slkux12.gov.bc.ca database (srmprod1).

Here is a list of the names of the data found in either the ILMB or LRDW databases:

- **Timber Supply Area:** WHSE\_ADMIN\_BOUNDARIES.FADM\_TSA
- **Vegetation Cover:** WHSE\_FOREST\_VEGETATION.VEG\_COMP\_POLY
- **Lake management zones:**  
REG\_LAND\_AND\_NATURAL\_RESOURCE.LAKE\_MANAGEMENT\_ZONES\_CAR\_POLY
- **Stream management zones:**  
REG\_LAND\_AND\_NATURAL\_RESOURCE.STREAM\_MANAGEMENT\_CAR\_POLY
- **Terrain Stability:**  
REG\_LAND\_AND\_NATURAL\_RESOURCE.TERRAIN\_STABILITY\_CAR\_POLY

### 3. Inventories

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- **Resource Management Zones (CCLUP):**  
REG\_LAND\_AND\_NATURAL\_RESOURCE.LAND\_USE\_PLAN\_DRAFT\_CAR\_POLY
- **Parks and protected areas:** WHSE\_PARKS.PA\_PROTECTED\_AREA\_POLY
- **Old growth management areas:**  
WHSE\_LAND\_USE\_PLANNING.RMP\_OGMA\_NON\_LEGAL\_CURRENT\_SVW
- **Caribou habitat:**  
WHSE\_WILDLIFE\_MANAGEMENT.WCP\_WILDLIFE\_HABITAT\_AREA\_POLY
- **Mule Deer winter range:**  
REG\_LAND\_AND\_NATURAL\_RESOURCE.L\_MULE\_DEER\_WR\_CAR\_POLY
- **Class A Lake Classification:**  
REG\_LAND\_AND\_NATURAL\_RESOURCE.LAKE\_CLASSIFICATION\_CAR\_POLY
- **Landscape Units:** WHSE\_LAND\_USE\_PLANNING.RMP\_LANDSCAPE\_UNIT\_SVW
- **Biogeoclimatic Zones:** WHSE\_FOREST\_VEGETATION.BEC\_BIOGEOCLIMATIC\_POLY
- **VQO:** WHSE\_FOREST\_VEGETATION.REC\_VISUAL\_LANDSCAPE\_INVENTORY
- **Tree Farm Licence boundaries:** WHSE\_ADMIN\_BOUNDARIES.FADM\_TFL

#### Forest cover inventory

The forest cover inventory maps, which were completed in the late 1980s and early- to mid-1990s, have been updated to a Vegetation Resource Inventory layer in the Land and Resource Data Warehouse (LRDW) in 2005. This information is updated annually to reflect the harvest and regeneration activities of the previous year.

The results of the problem forest type inventory completed in 1997 are available and will be used in this review (*Quesnel Forest District Problem Forest Type Inventory, March 1998, J.S. Thrower & Associates Ltd*).

An inventory audit was completed by MFR, Resources Inventory Branch. The audit revealed that the pine volume in the western portion of the TSA was over estimated by 12% (*Quesnel TSA Inventory Audit, June 1999, Ministry of Forests and Range, Resources Inventory Branch*).

#### CCLUP resource development zones

The CCLUP provides higher level plan targets for defined development zones. Development zone boundaries may extend beyond the Quesnel TSA boundary into the Williams Lake TSA and the targets are applied to the entire zone. While there are no specific constraints applied to the CCLUP zones in this timber supply review, the zones were incorporated into the previous analyses to allow reporting on timber supply levels by these zones for monitoring and planning purposes. Current harvesting practices are considered adequate to address zone objectives for conventional and modified harvesting, and no monitoring is planned for this analysis.

#### Additional resource inventory information

The additional inventory information listed in Table 2 defines the location of other resources to be managed over the landscape. The mule deer winter ranges, Itcha Ilgachuz and eastern caribou habitat, pelican lakes, watershed management objectives, scenic areas, biodiversity requirements, and refinements to biogeoclimatic zones were all developed over the last 10-15 years, from various data sources by the MoE and the MFR. The analysis will reflect modifications to timber management activities, (including land base deductions and forest cover requirements, in the wildlife and other resource zones) and any Government Action Regulation orders impacting access to timber.

## 4. Division of the Area into Management Zones

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### 4.1 Management zones and tracking of multiple objectives (grouping)

Management zones represent areas with distinct management emphasis. For example, a zone may be based on a harvesting system, silvicultural system, visual quality objective or wildlife consideration. Sometimes one area of forest is subject to more than one management objective. In the simulation model, groups can be used to represent and track different combinations of areas, and thereby allow application of overlapping management objectives. The timber supply analyst will decide whether to put an objective into a group or a mutually exclusive management zone after data assessment.

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

Table 3 provides a summary of the management objectives to be tracked.

## 4. Division of the Area into Management Zones

Table 3. Objectives to be tracked

| Group   | Inventory definition  | Issue   |
|---|---|---|
| LUs as per CRLUPS and seral stage target draw-downs as defined by the CCLUPIR.  | Non-standard mapped layer.  | Managing for biodiversity.  |
| CCLUP resource development management zone targets as per integration report:<br>Integrated resource management<br>Enhanced resource development<br>Special resource development. | Non-standard mapped layer.  | Area-based summary for reporting purposes only.   |
| PFT   | MFR non-standard layer forest cover data.   | The information is provided to facilitate a decision on how to address PFTs within the determination.   |
| Mule deer winter range  | MoE non-standard, mapped data layer.  | Managing mule deer winter ranges.   |
| Itcha Ilgachuz and eastern caribou habitat  | MoE non-standard, mapped data layer.  | Managing for caribou.   |
| Scenic areas under <i>FPC Act</i> .   | Non-standard mapped layer produced by the Quesnel Forest District.  | Managing for visual quality.  |
| Class "A" lakes classification  | MFR data, non-standard mapped layer.  | Managing for riparian area.   |
| Deciduous-leading stands  | MFR   | The information is provided to facilitate a decision on how to address deciduous volume within the AAC. |
| Lower Blackwater LRUP   | QSRMP layer.  | Management prescription for zone 1 to address fish, wildlife and recreation priorities.                 |
| Multiple use zone   | All areas within the THLB where harvesting operations are not constrained for specific resource management issues such as visual quality, wildlife or watersheds. | Integrating timber and other resources.   |
| CCLUP no harvest targets  | The CCLUP establish no-harvest expectations for each resource management zone.  | Confirm that no-harvest expectations are being achieved.  |
| Sensitive watersheds  | Watersheds identified as hydrologically or environmentally sensitive to change  | Water quality/quantity and critical fish habitat.   |
| Chief Forester direction on retention   | Enhanced retention during MPB salvage.  | Stand-level biodiversity.   |

## 4. Division of the Area into Management Zones

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Data source and comments:

Sources for mapping and zones referenced above included MFR, MoE and LUCO standard and non-standard data (see Section 3.1, "Background information").

### 4.2 Analysis units

An analysis unit represents a combination of stands dominated by specific ecosystem classification or a silvicultural regime, within a set range of timber growing capability as indicated by the Predictive Ecosystem Mapping (PEM) classification and site index obtained from SIBEC or SIA. Each analysis unit is assigned timber volume projections for both existing and future stands. Draft analysis units will be created for specific PEM classification and site index combinations. The timber supply analyst will determine the final analysis unit definitions after determining the THLB.

Data source and comments:

Analysis units were based on groupings of inventory type groups and site classes in previous TSRs. The site classes were 'good, medium, poor and low'. Site index ranges rather than site classes were used. Labels of good, medium and poor were not those included in the inventory, but rather apply only to the ranges that will be defined for the timber supply analysis. A similar grouping of site classes is anticipated for this TSR, but to date no pre-analysis has occurred to estimate preliminary site index ranges. The analysis will start after the data package receives public review and, at that point, the ranges of site index will be defined for each analysis unit. In addition to defining analysis units on the basis of site index ranges, additional analysis units may be required if the difference in mean site index between thrifty stands (age greater than 30 years and less than 141) and old-stands (age greater than 141 years) is greater than two metres.

The definition for PFT to be used in this TSR will be the merchantable timber standards reflected in the current PFT licences; however, area inclusion factors will not be applied to the PFT population. PFTs eligible stands in the Quesnel TSA are described as greater than 70% pine with an average piece size of less than 0.2 cubic metres per stem. There is a further condition that no more than 135 000 cubic metres per year can be harvested in the area between the Nazko River and the Fraser River.

After harvest, the PFT stands are regenerated to sawlog stands.

## 5. Timber Harvesting Land Base Definition

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### 5.1 Identification of the timber harvesting land base

This section outlines the steps used to identify the THLB (the productive forest expected to support timber harvesting) within the timber supply area. The THLB for the Quesnel TSA is determined by removing categories of area that do not contribute to timber harvesting in the area. Land may be unavailable for timber harvesting for three principle reasons:

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

Land may also be added to the THLB:

- 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 license and agricultural lease reversions).

The classification "unavailable for timber harvesting" is applied only to land where no harvesting is anticipated to occur. Any area in which some timber harvesting will occur remains in the THLB, even if the area is subject to harvesting restrictions. Any such restrictions will be reflected in the analysis.

The area remaining after identifying all areas that do not contribute to timber supply, and adding any suitable area, is defined as the "current THLB" for the TSA.

### 5.2 Details on land base classification

#### 5.2.1 Crown land administration for timber supply

Ownership codes are generally used to identify whether the land can be considered to potentially contribute to timber supply. Ownership codes 62C and 69C indicate Crown land in a forest management unit and miscellaneous reserves, respectively. All areas with other ownership codes will be excluded from the land base considered available for timber harvesting. Areas allocated to woodlot licenses do not contribute to the TSA timber supply since their AACs are determined independently of the timber supply review process.

The CCLUP included the official designation of 17 new parks within the Cariboo Forest Region, four of which are found in the Quesnel TSA. These areas have an ownership code other than 62C or 69C and thus are removed from the THLB. Park lands contribute to non-timber resource requirements such as biodiversity targets when the landscape unit crosses the park boundary. The Goal 2 candidate protected areas have not been declared, and will be retained in the land base until official designations are made, as discussed in Table 1 above.

## 5. Timber Harvesting Land Base Definition

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### 5.2.2 Land classified as non-forest

Type identity code 6 areas such as alpine, lakes, rocks, and swamp, and type identity code 8 areas, where no typing is available, are removed from the THLB.

### 5.2.3 Non-commercial cover

Type identity code 5 represents areas currently occupied by non-commercial brush species. These areas are considered to be unlikely sites for timber production, and no rehabilitation of these sites is planned; thus they are removed from the land base considered available for timber supply.

### 5.2.4 Environmentally sensitive areas

Some forest lands are environmentally sensitive and/or significantly valuable for other resources. Many of these areas are identified and delineated during a forest inventory and are called environmentally sensitive areas (ESAs). The ESA classifications currently applicable or relevant to the Quesnel TSA are: soil (Es), and snow avalanche (Ea). Other ESA classifications, for example, wildlife and recreation, used in the past for the Quesnel TSA have been replaced with more current information for the present timber supply review (see Sections 5.2.7, "Wildlife habitat reductions" and 6.4, "Integrated resource management").

ESAs may result in a reduction in the timber harvesting opportunity on these sites. Two possible strategies for accounting for this are: percent area reductions, and specific evaluation of individual ESA polygons for harvesting opportunity. The first approach will be used for the Quesnel TSA.

The proportions of ESAs unavailable for timber harvesting for the Quesnel TSA are listed in Table 4.

*Table 4. Description of environmentally sensitive areas*

| <b>ESA description</b>   | <b>Per cent (%) reduced</b> |
|--------------------------|-----------------------------|
| Highly sensitive soils   | 90                          |
| Moderate sensitive soils | 50                          |
| High avalanche hazard    | 90                          |

Data source and comments:

ESA reduction factors were reviewed by MFR staff. The recommended reductions in the above table reflect site sensitivities to forest management and account for values for other resources in current management practices.

## 5. Timber Harvesting Land Base Definition

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### 5.2.5 Areas considered physically inoperable

Quesnel Forest District staff estimate that, with today's logging methods, approximately 2000 hectares may be physically inoperable over the entire TSA. Given uncertainty regarding locations and practices, it is not possible to make area-specific land base deductions across the entire TSA. Since the area involved is small, the planned approach is to deduct only the unstable and potentially unstable areas identified in the 2005 Terrain Stability Assessment. If new, more specific information becomes available prior to the analysis, it will be incorporated.

Data source and comments:

Parts of the TSA east of the Fraser and Quesnel Rivers had a Terrain Stability Assessment completed in 2005. This information is on the LRDW. There are 16 114.2 hectares of potentially unstable terrain in this area of the TSA; proposed or actual harvesting covers 441.8 hectares or 0.27% of the area. There are 3122.9 hectares of unstable terrain in this area of the TSA with 11.14 hectares, or 0.35% of the area, as proposed or actual harvesting (this area may be historic or proposed area).

Following the advice of district, 100% of the unstable and the potentially unstable area be excluded from the THLB in this analysis.

### 5.2.6 Roads, trails and landings (RTL)

Separate estimates are made to reflect the loss of productive forest land due to existing and future RTLs. Existing RTL estimates are applied as reductions to the current productive forest considered available for harvesting, and future RTLs reductions are applied after stands are harvested for the first time in the simulation model. Estimates account only for the area on which timber production will not occur in the future, and include effective reductions to the THLB. Table 5 shows the reductions for existing and future RTLs.

Table 5. *Estimates for existing and future RTLs*

| Location      | Reduction area (hectares or per cent)          |
|---------------|--|
| Existing RTLs | 3.0% area reduction to the gross TSA land base |
| Future RTLs   | 1.0% area reduction to the gross TSA land base |

Data source and comments:

District engineering staff determined in May, 2008 that there are 487 kilometres of non-industrial Forest Service Roads (FSR), 627 kilometres of industrial FSRs, 7383 kilometres of active road permits and 18 121 kilometres of non-status roads in the District. FSRs are assumed to have a 25-metre clearing width and other roads are assumed to have a 20-metre clearing width. Applying the assumed clearing width to the road network results in an estimated 53 793 hectares not available due to current roads. The recent Information Package for TFL 52 indicates that 4749 hectares were removed from the TFL land base to account for existing access structures. Subtracting the TFL 52 road area from the total district road area results in an estimated net area of 49 044 hectares of current access structures within the TSA.

## 5. Timber Harvesting Land Base Definition

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### Existing RTLs

A 3.0% reduction will be applied to the productive forested land base to account for the estimated 49 044 hectares of access structures.

### Future RTLs

The Quesnel TSA is presently 75% accessed by roads. Assuming that access to the remaining 25% will entail construction of structures similar to those presently in place, an area reduction for future RTLs of 1.0% (= 3.0% X 25/75) is made in the analysis. The future RTL areas contribute to the initial harvest volume, and are assumed to be non-productive thereafter. Therefore, the future RTL reduction is applied to all stands after the initial harvest.

#### 5.2.7 Wildlife habitat reductions

Mule deer winter ranges (MDWR) will be maintained in the land base. Selection and even-aged harvest methods will be applied to achieve the objectives and strategies for MDWRs included in the Cariboo-Chilcotin Land Use Plan (CCLUP) and forest management directions, including the CCLUP Integration Report (1998) and the Identified Wildlife Management Strategy (1999). The winter range boundaries were legally designated in 2004 under *Government Action Regulations*, and General Wildlife Measures for MDWRs were established in 2007. See Section 6.1.4, "Silviculture systems," for management prescriptions.

Eastern and Itcha Ilgachuz caribou habitat will be modelled in accordance the *CCLUP Caribou Strategy*, CCLUP Integration Report and the management recommendations of the *Mountain Caribou Strategy, October 2000* and the *Northern Caribou Strategy, March 2002*. The silviculture systems for caribou areas are summarized in Table 12. The caribou habitat boundaries were legally designated as a WHA in 2004 and General Wildlife Measures were established in 2005 under the *Government Action Regulations*

The CCLUP lists the three Kluskus lakes and Pantage Lake as important pelican feeding lakes. The Kluskus lakes were classified as "Class A" lakes (with 200-metre buffer) in the recent interim lakes classification completed for the district. Pantage Lake will also have a 200-metre buffer modelled in this timber supply analysis. In January of 2003, the Ministry of Water, Land and Air Protection signed orders establishing Wildlife Habitat Areas (WHA) for American White Pelicans in the Quesnel Forest District. The orders contained general wildlife measures that limited new permanent forest service roads or new operational main haul roads and required all current and future road be rendered impassable to cars and trucks from April 1 to August 31. In addition, harvesting and silviculture work using motorized equipment is not allowed within the WHA from April 1 to August 31. The WHA and general wildlife measures should not affect access to timber.

A Forest and Range Evaluation Program (FREP) assessment report of cutblocks sampled for stand-level biodiversity during 2005 and 2006 in the Quesnel Forest District found that 44% of wildlife tree patches (WTP) are larger than two hectares. This assessment also determined that total stand-level retention averaged 14.7%, of which 6.2% was dispersed retention. The balance was patch retention, of which 54.4% was considered constrained. FRPA requires a 7% WTP retention on average, with a minimum of 3.5% on each cutblock. The FREP results indicate that WTP retention is complying with the FRPA requirements. The additional retention is reflective of, but somewhat less than, the expectation for enhanced retention during the salvage phase of addressing the MPB infestation.

## 5. Timber Harvesting Land Base Definition

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The Quesnel Forest District prepared a *Quesnel Forest District Enhanced Conservation Strategy (2006)*. This document provided guidance on increasing the amount of stand-level retention during large-scale salvage operations for the recovery of MPB-damaged timber. The landscape-level objective is to retain an average of 20% of the cutblock area; resulting in an expected 13% increase over the legislated WTP requirement. These areas are classified as Conservation Legacy Areas (CLAs). The CLAs recommended by the strategy are expected to persist for 30 years to allow salvage areas to recover to a point where harvest of the CLAs will not compromise wildlife or hydrological values.

Modelling assumptions for WTPs and CLAs are presented in Section 6.4.2 of this data package.

Work is currently underway to identify key wetlands for moose, consistent with the CCLUP. No modelling of these areas will be included in the analysis at this time.

### 5.2.8 Cultural heritage/archaeological resource reductions

An Archaeological Overview Assessment (AOA) for the Quesnel Forest District was completed in 1998. The assessment was used extensively over the last 10 years to determine where Archaeological Impact Assessments were to be performed. All of the licensees have committed to using the assessment in approved Forest Stewardship Plans for the next 5 years.

Most archaeological sites are found on gentle slopes and near water bodies. Thus, an area of high archaeological potential is often excluded from the THLB for other reasons, such as riparian reserve zones and wildlife tree patches.

A GIS query in July, 2008 identified 1,338 known archaeological sites in the district, the vast majority being surface and subsurface lithics. It is not yet known if there will be any impact to the THLB, however current practice is to incorporate any identified sites in wildlife tree patches or harvested on a snowpack. Any impact to the THLB will be monitored and considered in future TSRs.

### 5.2.9 Riparian reserve zones

Riparian reserve zones are those available on the Land and Resource Data Warehouse.

Data source and comments:

Wetland reserves were created by MoE by applying the *Riparian Management Guidebook* wetland classifications to wetland polygons taken from the non-productive field of the FC1/FIP files.

Stream reserves were applied to stream classifications developed under contract to Land Use Co-ordination Office (LUCO), and refined during the SRMP process by ILMB.

### 5.2.10 Lower Blackwater LRUP (1996)

The Lower Blackwater LRUP specified a 50-metre no harvest riparian reserve zone (RRZ) adjacent to streams in the plan area. The plan further specified that 10% of zone 1 is available for timber harvesting, and is constrained by partial retention visual quality objectives (no more than 15% under three metre green-up height) to help achieve non-timber objectives. This requirement is incorporated in currently approved FSPs. The combination of the larger RRZ and the visual polygon constraints achieve the Blackwater LRUP objectives.

## 5. Timber Harvesting Land Base Definition

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### 5.2.11 Cariboo River management area

The Cariboo River Protected Area was established within the Quesnel Highlands Special Resource Development Zone (QHSRDZ) and the intent of the Caribou River Management Area remains as an objective set by government under FRPA. Constraints applied for the QHSRDZ in addition to the protected area will meet the original goals of the Cariboo River Management Area. Additional constraints are not necessary.

### 5.2.12 Area inclusion factors

Table 6 describes by inventory type group, the area inclusion factors to be included in the THLB. These inclusion factors describe current merchantability and apply to all supply blocks in the Quesnel TSA.

Table 6. *Area inclusion factors*

| Inventory type group  | Area inclusion factor (%) |
|---|---------------------------|
| 35, 36, 40, 41, 42 (deciduous types)  | 100                       |
| 1-8 (Douglas-fir leading)   | 100                       |
| 9-17 (Cedar/hemlock leading)  | 0                         |
| 18-19 (Balsam-leading)  | 0                         |
| 20 (Balsam-spruce)  | 100                       |
| 21-25 (Spruce-leading)  | 100                       |
| 26 (Spruce-deciduous)   | 100                       |
| 28-30 (Lodgepole pine)  | 100                       |
| 1-31 (residual types—multi-layered stands resulting from non-clearcut logging or natural events such as fire) | 0                         |
| 31 (Lodgepole pine-deciduous)   | 0                         |
| 32-33 (Ponderosa pine and larch)  | 0                         |
| 37-39 (Deciduous/coniferous and maple)  | 0                         |

Data source and comments:

This information was provided by the forest district and represents current performance in the Quesnel TSA, except for the deciduous-leading types. Type group 26 was changed to 100% inclusion to capture the 11 317.3 hectares of spruce-deciduous type in the TSA identified in a 2008 GIS query. The deciduous types are included to allow an assessment of the potential timber supply contribution of deciduous stands. Inventory type group 31 is excluded as it only represents 5683 hectares in the TSA.

## 5. Timber Harvesting Land Base Definition

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### 5.2.13 Low site exclusions

Table 7 presents the minimum site index by leading species or inventory type group, necessary for a stand to be considered eligible for inclusion in the THLB.

Table 7. *Low site exclusions*<sup>a</sup>

| <b>Leading species in the inventory type group</b> | <b>Minimum site index (SI=m @ 50 years)</b> |
|--|---|
| Douglas-fir  | 9   |
| Balsam   | 7   |
| Spruce   | 7   |
| Lodgepole pine                                     | 7   |
| Aspen/cottonwood/birch                             | 8   |

(a) Stands with a logging history will remain eligible for inclusion in the THLB regardless of site index.

#### Data source and comments:

In 1999, the Quesnel Forest District staff assessed the merchantability of naturally-regenerated and planted stands with site index values ranging from 5 to 14 metres. Volume tables were generated over this range of values using the Table Interpolation Program for Stand Yields (TIPSY) model. The estimated feasibility of harvesting stands at each site index value tested was assessed by reviewing factors including; growth rate, minimum volume and diameter produced over a 200-year growing period. Stands not achieving a minimum of 120 cubic metres of merchantable timber by 150 years were deemed not to meet growth requirements. The results of the assessment were minimum site index requirements by leading species for a number of inventory type groups. This information is considered to be still valid.

## 6. Current Forest Management Assumptions

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### 6.1 Harvesting

#### 6.1.1 Merchantable timber specifications

The merchantable timber specifications define the maximum stump height, minimum top diameter inside bark (dib) and minimum diameter at breast height (dbh) by species and is used in the analysis to calculate merchantable volume. The merchantable timber specifications are described in Table 8.

Table 8. *Merchantable timber specifications*

| Analysis unit | Utilization      |                           |                      |
|---------------|------------------|---------------------------|----------------------|
|               | Minimum dbh (cm) | Maximum stump height (cm) | Minimum top dib (cm) |
| Sawlogs       |                  |                           |                      |
| Pine          | 12.5             | 30                        | 10.0                 |
| Other species | 17.5             | 30                        | 10.0                 |
| PFTs          |                  |                           |                      |
| Pine species  | 7.5              | 20                        | 7.0 <sup>a</sup>     |
| Other species | 12.5             | 20                        | 7.0                  |

(a) There are currently 395 000 cubic metres of timber to be harvested per year under the PFT licences.

Data source and comments:

These levels, provided by the Quesnel Forest District staff reflect current merchantability standards, licensee requirements and current performance.

The variable density yield prediction (VDYP) model being used to generate volume projections for this timber supply analysis is limited to a 10 cm minimum top dib.

## 6. Current Forest Management Assumptions

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### 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. The unharvested portion should not contribute to the estimated stand volume. The species that do not contribute and that will be excluded from the estimation of stand volumes are shown in Table 9.

Table 9. *Volume exclusions for mixed-species types*

| Analysis units    | Species                             | Volume exclusion (%) |
|-------------------|-------------------------------------|----------------------|
| Deciduous leading | All coniferous in deciduous leading | 100                  |
| Conifer leading   | All deciduous in conifer leading    | 100                  |

Data source and comments:

The volume exclusions provided by the forest district are based on current practice. There is currently a 20 000 cubic metre deciduous licence in the district and significant interest in deciduous volumes. The district requests that these deciduous volumes be tracked to determine impact on AAC potential in the mid-term.

### 6.1.3 Minimum harvestable age

Minimum harvestable ages reflect the time required for a stand to grow to a harvestable condition. They define the lower limit for harvesting. Harvesting may occur in stands at the minimum age to meet a harvest target for a short period of time, or avoid large and abrupt changes in harvest levels. However, in most cases, stands are not projected for harvest until after the minimum timber production ages because of management objectives for other resource values (e.g., requirements for the retention of older forest), or the objective to maintain reasonably consistent, as opposed to widely fluctuating, timber supply. Table 10 provides age at minimum volume per hectare considered harvestable criteria.

## 6. Current Forest Management Assumptions

Table 10. Minimum harvestable age criteria

|                       | Minimum volume per hectare considered harvestable provided utilization criteria in Table 10 are met (cubic metres/hectare) | Age at minimum volume per hectare considered harvestable |
|-----------------------|--|--|
| Sawlog analysis units | 120  |  |
| PFT analysis unit     | 120  |  |

Data source and comments:

Based on information provided by the forest district, stands will be considered eligible for harvesting at the age where they meet the minimum volume per hectare figures in Table 10, at the utilization criteria described in Table 10. Ages will be determined when the THLB has been defined.

### 6.1.4 Silviculture systems

Due to species composition of forests in the Quesnel TSA, even-aged silvicultural systems are predominant. Uneven-aged selection harvesting is practiced in fir-leading mule deer winter range (MDWR).

The objectives and strategies for MDWRs are included in the Cariboo-Chilcotin Land Use Plan (CCLUP) and forest management directions, including the CCLUP Integration Report (1998) and the Identified Wildlife Management Strategy (1999). The winter range boundaries were legally designated in 2004 under Government Action Regulations, and General Wildlife Measures for MDWRs were established in 2007. The management requirements for various stand conditions and silviculture systems for MDWR areas are summarized in Tables 11a and 11b. The modelling assumptions are summarized in Table 11b(i).

The *CCLUP Caribou Strategy*, CCLUP Integration Report and the management recommendations of the *Mountain Caribou Strategy, October 2000* and the *Northern Caribou Strategy, March 2002* describe how future harvesting will be conducted within caribou habitat. The silviculture systems for caribou areas are summarized in Table 12. The caribou habitat boundaries were legally designated as a WHA in 2004 and General Wildlife Measures were established in 2005 under *Government Action Regulations*.

## 6. Current Forest Management Assumptions

Table 11a. The order for the shallow and moderate snowpack zones identifies the following different stand conditions that require different types of treatment

| Stand conditions/<br>silviculture systems  | Management requirement for stand conditions   |
|--|---|
| OGMAs  | No harvest except very limited bark beetle sanitation or trap tree use as directed by the Ministry of Forests and Range. Primary forestry activities must not result in the construction of roads within OGMAs.   |
| Thinning from below  | Timber harvesting practices that employ thinning from below in stems from 12.5 to 37.5 cm dbh will result in harvest or damage to Douglas-fir stems >37.5 cm dbh that does not exceed 10% of the pre-harvest basal area of the Douglas-fir trees >37.5 cm dbh. Timber harvesting practices must retain a minimum of 75% of the pre-harvest live conifer basal area (counting stems >12.5 cm dbh). Species other than Douglas-fir should be targeted for removal in mixed-species stands.  |
| Clumpy single tree selection   | Harvesting of Douglas-fir in a series of passes resulting in small canopy openings ranging in diameter from 0.3 to 1 times the height of mature trees in the stand (as measured to the stem of trees surrounding the opening) with an average opening diameter of 0.5 times the mature tree height. The result will also be clumps containing 4-10 or more mature Douglas-fir trees with interlocking crowns. Retain a minimum of 80% of the pre-harvest merchantable Douglas-fir basal area for harvesting done before 2026. A minimum cutting cycle of 30 years or greater is required. |
| Salvage treatments due to Mountain Pine Beetle infestation & non-fir harvest in mixed-species stands | In mixed-species stands, non-fir stems should be harvested. Harvest or damage to Douglas-fir should not exceed 15% for stems 22.5-37.5 cm dbh and 5% for stems >37.5 cm dbh (including skid trail development) of the pre-harvest basal area of Douglas-fir stems in each of these diameter class groupings.  |
| Sanitation treatments for Douglas-fir bark beetle  | Primary forest activities involving Douglas-fir bark beetle sanitation to remove currently infested stems will result in the volume of non-target, non-infested stems >27.5 cm dbh removed being <10% of the total volume of infested stems removed. No harvesting of green uninfested Douglas-fir that are >37.5 cm dbh except as required for safety.   |

For details, refer to GAR Order – #U-5-001, U05-002 and U-5-003 – Ungulate Winter Ranges, Cariboo Chilcotin Land Use Plan, Shallow and Moderate Snowpack.

## 6. Current Forest Management Assumptions

Table 11b. The order for the transition and deep snowpack zones identifies the following different stand conditions that require different types of treatment

| Stand conditions/<br>silviculture stands   | Management requirement for stand conditions  |
|--|--|
| Group selection or thinning from below   | <p>The applicable silviculture systems for stands with <math>\leq 40\%</math> lodgepole pine by composition, and all other mixed stands that are mesic and drier, or that have <math>\geq 40\%</math> Douglas-fir by composition will be thinned from below or group selection.</p> <p>Timber harvesting practices that employ group selection is to be applied to the first pass when the stand basal area is: (i) <math>\geq 45\text{m}^2</math> in the Interior Cedar Hemlock zone, or (ii) <math>\geq 40\text{m}^2</math> in other biogeoclimatic zones. Table 13b(i) refers to the harvest proportions and cutting cycles for each stand structure habitat class for group selection.</p> <p>See below for information regarding thinning from below.</p> |
| Sanitation harvest for Douglas-fir Bark Beetle   | <p>Primary forest activities involving Douglas-fir bark beetle sanitation to remove currently infested stems will result in the volume of non-target, non-infested stems <math>&gt; 27.5</math> cm dbh removed being <math>&lt; 10\%</math> of the total volume of infested stems removed. No harvesting of green uninfested Douglas-fir that are <math>&gt; 37.5</math> cm dbh except as required for safety.</p>   |
| Salvage treatments due to Mountain Pine Beetle Infestation & non-fir harvest in mixed-species stands | <p>In stands with <math>&gt; 40\%</math> lodgepole pine where greater than 50% of the pine component is dead or at high risk of mountain pine beetle mortality, primary forest activities will result in no-harvest or damage (including skid trail development) to Douglas-fir tress that exceed 15% for stems 22.5 to 37.5 cm dbh and 5% for stems <math>&gt; 37.5</math> cm dbh. No cutting of Douglas-fir stems <math>&gt; 22.5</math> cm dbh to access lodgepole pine in patches <math>&lt; 0.1</math> ha.</p>  |
| Thinning from below  | <p>Timber harvesting practices that employ thinning from below in stems from 12.5 to 37.5 cm dbh will result in harvest or damage to Douglas-fir stems <math>&gt; 37.5</math> cm dbh that does not exceed 10% of the pre-harvest basal area of the Douglas-fir trees <math>&gt; 37.5</math> cm dbh. Timber harvesting practices must retain a minimum of 75% of the pre-harvest conifer basal area (counting stems <math>&gt; 12.5</math> cm dbh). Harvesting priority on species other than Douglas-fir should be targeted in mixed-species stands.</p>   |
| Subhygric sites - $< 40\%$ Douglas-fir   | <p>Group selection silviculture systems will not be used for subhygric sites. No other specific silviculture requirements.</p>   |
| OGMAs  | <p>No harvest except very limited bark beetle sanitation or trap tree use as directed by the Ministry of Forests and Range. Primary forestry activities must not result in the construction of roads within OGMAs.</p>   |

For details, refer to GAR Order – #U-5-001, U05-002 and U-5-003 – Ungulate Winter Ranges, Cariboo Chilcotin Land Use Plan, Transition and Deep Snowpack.

## 6. Current Forest Management Assumptions

Table 11b(i). Harvest proportions and cutting cycles for each stand structure habitat class for the transition and deep snowpack zones

| Stand structure habitat class | Area harvested per pass (%) | Min. cutting cycle (years) | Effective rotation (years) | # Different aged patches in the stand mosaic after a full rotation |
|-------------------------------|-----------------------------|----------------------------|----------------------------|--|
| Low                           | 33                          | 40                         | 120                        | 3  |
| Moderate                      | 25                          | 40                         | 160                        | 4  |
| High                          | 20                          | 40                         | 200                        | 5  |

To ensure MDWRs have attained the required crown closure prior to initial harvest, the risk assessment contained in the mule deer strategy will be used to identify winter ranges at greatest risk of not meeting crown closure requirements, and to determine the delay (years) required prior to the first entry. For low risk areas, the delay is 0 years; for moderate 20 years; for high 40 years and for very high 50 years.

### Caribou habitat

Eastern and Itcha Ilgachuz caribou will be modelled in accordance with the *CCLUP Caribou Strategy*, *CCLUP Integration Report* and the management recommendations of the *Mountain Caribou Strategy, October 2000* and the *Northern Caribou Strategy, March 2002*. The silviculture systems for caribou areas are summarized in Table 12. The caribou habitat boundaries were legally designated as a WHA in 2004 and General Wildlife Measures were established in 2005 under *Government Action Regulations*.

Modelling will reflect the General Wildlife Measures and timber harvesting will be restricted to one-third of the forested modified harvest area within a landscape unit during each entry. The analysis will track the volume coming from the modified harvest over time.

As per CCLUPIR, once harvesting has occurred in a specific area of the modified harvest area, that area is assumed to contribute to the "mature" biodiversity targets.

The CCLUPIR provides for "up to 10%" salvage harvest in no-harvest areas. This harvest will not be modelled because location and characteristics of the timber are unknown.

## 6. Current Forest Management Assumptions

Table 12. *Silviculture systems-caribou areas*

| Management emphasis  | Silvicultural system  | Planned rotation (years) | Years between entries | Volume removal per entry |
|--|---|--------------------------|-----------------------|--------------------------|
| Itcha Ilgachuz caribou area — terrestrial lichen sites                       | Irregular group shelterwood (80% of the modified harvest area). | 140                      | 70                    | 50% volume removal       |
| Itcha Ilgachuz caribou area — arboreal lichen sites and Eastern caribou area | Partial cut (20% of the modified harvest area).                 | 240                      | 80                    | 33% volume removal       |

Data source and comments:

This information was verified and confirmed by the MFR caribou management expert in 2008.

### 6.2 Unsalvaged losses

#### 6.2.1 Current unsalvaged losses

Table 13 shows the estimated average annual unsalvaged volume loss to catastrophic events such as insect epidemics, fires, wind damage or other agents over the long term on the THLB. The unsalvaged loss column reflects only those volumes that will not be recovered or salvaged.

Table 13. *Unsalvaged losses*

| Analysis unit | Cause of loss | Annual unsalvaged loss (cubic metres per year) |
|---------------|---------------|--|
| All           | Fire          | 8,000  |
| All           | Insects       | 30,000   |
| All           | Wind          | 10,000   |
|               | Total         | 48,000   |

Data source and comments:

The unsalvaged losses data in Table 13 was revised in 2008 based on a review of the aerial detection mapping over that last several years and on recent fire and windthrow history over the last three years. Losses due to the recent epidemic MPB infestation are not included in the insect unsalvaged loss.

#### 6.2.2 Shelf life of MPB impacted timber

Lodgepole pine trees impacted by MPB start to degrade upon death. The level of degrade impacts the value of the stem and the products that may be produced from the fibre. It is generally accepted that trees move from dimension lumber (lumber) quality through to pulp and secondary products, such as biofuels, as the degrade progresses; this progression is known as “shelf life”.

## 6. Current Forest Management Assumptions

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Shelf life assumptions vary and are generally assumed to be related to site conditions and stand attributes. Recent information from the University of Northern British Columbia indicates that stem diameter may be more indicative of dimension lumber shelf life (shelf life) than other factors, such as site moisture. This information supports a hypothesis that larger stems (greater than 30 cm) have a relatively short shelf life of 3-5 years, while smaller diameter stems (less than 20 cm) have an extended shelf life of 7-10 years. Average stand diameter and stand diameter classes may be more indicative of shelf life than other stand attributes.

Anecdotal information suggests pine stands impacted during the 1980 MPB outbreak are still being harvested 20 years after infestation. According to a recent Forest Practices Board Special Report, two-thirds of the stands infested during the 1980 MPB outbreak were still standing in 2005 — 25 years after attack (*Lodgepole Pine Stand Structure 25 Years after Mountain Pine Beetle Attack, FPB/SR/32, January 2007*).

According to local licensees, the merchantable volumes of MPB-impacted stands decline over time. Starting at the date of maximum stand mortality, the merchantable volume declines by 30%, 50% and 70% after 3-5 years, 10 years and 15 years, respectively (these figures are rough estimates).

While shelf life of individual stands may vary based on the stand attributes, for this analysis shelf life will be modelled on a declining scale from date of maximum mortality; from 0% volume decline in year 1 to 30% volume decline in year 5, 50% volume decline in year 10 and 70% volume decline in year 15. Stands will be transferred to a natural stand regeneration analysis unit, with a 5 year regeneration delay, if the remaining volume drops below 120 cubic metres per hectare at any time during the decline period. All stands will transfer to a natural stand regeneration unit if they remain unsalvaged at the end of the 15-year period. A sensitivity analysis will assess the impact on timber supply of +/- 3 years on date of maximum mortality. Alternate shelf life assumptions proposed during the public review period will also be considered for sensitivity analysis.

### 6.2.3 Condition of MPB-impacted young stands

The previous TSR analysis did not assume appreciable MPB infestation of stands age class 3 and younger. However, the high MPB population levels have resulted in extreme beetle behavior, including significant impact of age class 3 stands and the infestation of younger (age class 2) pine stands. Anecdotal information indicates that stands as young as 25 years of age were impacted by MPB during the later stages of the infestation.

The Southern Interior Forest Region staff conducted surveys of age class 2 pine-leading stands to determine the level of impact. Survey results of 220 age class 2 stands covering 10 224 hectares sampled in 2007 indicate an average mortality rate of 39.1%, with rates exceeding 50% in 32.7 % of the stands. Sixty-five percent of these stands had attack levels over 20%, and 95% of the stands had some level of attack (L. MacLaughlan, 2008).

District staff surveyed about 1000 hectares of recently declared free-growing stands (age class 1) in 2007 and did not detect any measurable levels of MPB activity in these young stands.

This new information will inform the assumptions used in the analysis for MPB-infestation levels on current pine inventory and regeneration delay for unsalvaged or rehabilitated stands.

## 6. Current Forest Management Assumptions

### 6.3 Silviculture

#### 6.3.1 Regeneration activities in managed stands

Stands regenerated after 1959 and in the future will be modelled using managed stand yield tables (MSYTs) produced using the British Columbia Forest Service's Table Interpolation Program for Stand Yields (TIPSY) growth and yield model. Table 14 contains the general regeneration assumptions used as the inputs required to produce MSYTs for this analysis. A MSYT may be built from a number of tables if more than one regeneration method is used within an analysis unit. When this is the case, tables are produced for the different regeneration methods which are then aggregated into one table for the analysis unit.

Table 14. *Regeneration assumptions by leading species and site quality*

| Leading species/site quality      | Regen delay (years) | Regen method      | Per cent regen method (%) | Expected species | Per cent (expected composition %) | Initial density (stems/ha) | Density thinned (stems/ha) |
|-----------------------------------|---------------------|-------------------|---------------------------|------------------|-----------------------------------|----------------------------|----------------------------|
| Fd (poor, non-selection)          | 7                   | Natural           | 100                       | Fd/PI            | 70/30                             | 2200                       | N/A                        |
| Fd (medium, non-selection)        | 3                   | Plant             | 100                       | Fd/PI            | 10/90                             | 3600                       | 2000                       |
| Fd (good, non-selection)          | 3                   | Plant             | 100                       | Fd/PI            | 10/90                             | 2300                       | N/A                        |
| Sx,Ba (poor)                      | 2                   | Plant             | 100                       | Sx/PI            | 80/20                             | 1200                       | N/A                        |
| Sx, Ba (medium)                   | 2                   | Plant             | 100                       | Sx/PI/Ba         | 70/20/10                          | 1400                       | N/A                        |
| Sx, Ba (good)                     | 2                   | Plant             | 100                       | Sx/PI/Ba         | 70/20/10                          | 1400                       | 3500                       |
| PI (poor)                         | 5                   | Plant/<br>Natural | 50/50                     | PI/Sx            | 90/10                             | 3000                       | 3500                       |
| PI (medium)                       | 5                   | Plant/<br>Natural | 50/50                     | PI/Sx/Fd         | 80/15/5                           | 3000                       | 3500                       |
| PI (good)                         | 4                   | Plant/<br>Natural | 50/50                     | PI/Sx/Fd         | 65/25/10                          | 2700                       | 3500                       |
| PFT (pine leading)                | 4                   | Plant/<br>Natural | 50/50                     | PI/Sx/Fd         | 80/15/5                           | 3000                       | 3500                       |
| Deciduous leading (medium)        | 2                   | Natural           | 100                       | At/PI/Sx         | 50/30/20                          | 5500                       | N/A                        |
| Deciduous leading (good)          | 2                   | Natural           | 100                       | At/PI/Sx         | 55/25/20                          | 5100                       | N/A                        |
| Mule deer selection (> = 40% fir) | 4                   | Plant/<br>Natural | 75/25                     | Fd/Sx/PI         | 60/30/10                          | N/A                        |                            |
| Mule deer even-aged (< 40% fir)   | 3                   | Plant             | 100                       | Fd/PI            | 10/90                             | 3600                       | 2000                       |

## 6. Current Forest Management Assumptions

Data source and comments:

Regeneration assumptions were provided by the Quesnel Forest District staff and are based on historic records and represent current and expected performance as of 2008.

In Table 14 “expected species” is a result of planting and expected ingress.

Less than 5% of stands are spaced for density control.

In constructing MSYTs in TIPSY, the operational adjustment factor (OAF) 1 will be 15%, and the OAF 2 will be 5%. OAF 1 is a constant percentage reduction to account for small stocking gaps in stands. OAF 2 accounts for losses that increase with age, for example, due to disease. The value of OAF 2 increases from zero and passes through 5% when the stand is 100 years old.

The selection harvesting analysis units do not have a regeneration delay. Density initial and density thinned numbers are averages for all sites by analysis unit and are not site-specific.

The majority of planting stock is one year old.

The Quesnel Forest District staff currently estimate that 100% of the spruce, 30% of the Douglas-fir and 10% of lodgepole pine seedlings will come from class ‘A’ seedlots. Class ‘A’ seedlots are seedlings with improved genetic worth and result in increased tree growth in the short- and medium-term. Ministry of Forests and Range staff from Forest Analysis and Inventory and Tree Improvement Branches will collaborate to ascertain how the increased tree growth is represented in the managed stand yield curves used in the timber supply analysis.

### 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 which therefore should be assigned to a managed stand yield table (MSYT). Growth of all not satisfactorily restocked (NSR) and future clearcut harvested stands will be projected using MSYTs.

To clarify the types of management that will occur in harvested stands, the following assumptions were made:

- “managed” means that a new stand was established naturally or artificially, and density control was done at or near the free-growing stage, or the established stand had densities not exceeding the desired densities;
- stands created prior to 1959 were too old for density control and therefore will be modelled as natural rather than managed stands.

Managed stand yield tables will be used for existing stands outlined in Table 15 according to the rationale discussed under data source and comments.

Table 15. *Immature plantation history*

| Analysis unit  | Area managed (hectares or per cent) |           |           |           |           |
|----------------|-------------------------------------|-----------|-----------|-----------|-----------|
|                | Age 1-10                            | Age 11-20 | Age 21-30 | Age 31-40 | Age 41-50 |
| Clearcut areas | 100%                                | 100%      | 100%      | 100%      | 75%       |

## 6. Current Forest Management Assumptions

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Data source and comments:

Stands aged 1-10 years (logged since October 1, 1987) must by law be regenerated to defined stocking standards within acceptable time frames as defined in approved silviculture prescriptions (SPs). Stands aged 11-40 years have been closely monitored and many have received density control treatments since 1981. Others either have densities less than maximum density or are eligible for treatment under ongoing forest renewal enhanced forestry and backlog programs. It is assumed that all stands needing treatment will be treated within 20 years.

About 75% of stands aged 41-50 years are assumed to be managed. This is based on stands that have been treated or considered free growing according to historic records.

Immature stands will be modelled with MPB impacts noted in Section 6.2.3.

### 6.3.3 Selection harvesting

Natural stand yield curves will be used for areas logged with a selection system based on historical growth and yield data and professional judgment of MFR staff.

### 6.3.4 Not satisfactorily restocked (NSR) areas

The total area of NSR currently existing in the THLB, and the estimated rate at which the NSR area will be restocked is described in this section.

Forest district silvicultural records (RESULTS report May, 2008) show 2977 hectares of backlog NSR (i.e., harvested prior to 1987) and 48 920 hectares of current NSR. All backlog NSR will be restocked or reclassified within 5 years. Current NSR is assumed to regenerate within the regeneration delays provided in Table 14.

All NSR with a harvesting history is included in the THLB.

The area classified as NSR in the forest inventory file will not be available until processing of the file is complete. Any discrepancy in area between the forest inventory files and district RESULTS records will be assumed to have already been restocked and currently between 1 and 5 years old. This area will be assigned to analysis units in proportion to the distribution of analysis units by biogeoclimatic zone as the previous stand label is no longer available on the inventory file.

### 6.3.5 Non-salvaged MPB impacted stands

Secondary stand structure assessments are underway in the Quesnel TSA to determine the frequency and level of secondary stand structure (non-pine mature and immature stems) in pine-leading stands impacted by MPB. This information will be incorporated into the TSR analysis if results are available with the TSR timeframe.

## 6. Current Forest Management Assumptions

In the absence of additional information on secondary stand structure, natural stand yield curves will be used for MPB impacted stands not salvaged within the shelf life period. A regeneration delay of 5 years post-shelf life (a total delay of 20 years) is assumed for the purposes of this analysis. Sensitivity analysis will assess the timber supply implications of a delayed regeneration period or rehabilitation of these areas.

### 6.4.1 Objectives managed using forest cover requirements

This section describes the analysis methods that will be used to represent management practices for multiple use, scenic areas, wildlife habitat and biodiversity. With the requirement to retain different forest characteristics across the landscape, productive forest area outside of the THLB will also contribute to achieving the forest cover requirements (i.e., maximum allowable disturbance or minimum area retention of mature or old forest).

#### Green-up

Table 16 describes forest cover requirements for multiple use areas, scenic areas, and caribou habitat.

Table 16. Forest cover requirements

|   | Green-up height (metres) | Maximum allowable disturbance (% area) | Area of application   |
|---|--------------------------|--|---|
| Multiple use areas  | 3                        | 35%                                    | Timber harvesting land base   |
| Scenic areas (each known area has visual objectives specified)                | 3                        | 5 to 15%                               | Forested area ( includes timber harvesting land base and non-contributing forest areas) |
| Itcha Ilgachuz Caribou area-terrestrial lichen sites                          | N/A                      | 33% every 20 years                     | Forested "modified" harvest area within landscape unit                                  |
| Itcha Ilgachuz Caribou area -- arboreal lichen sites and Eastern Caribou area | N/A                      | 33% every 20 years                     | Forested "modified" harvest area within landscape unit                                  |

Data source and comments:

All stand heights shown in Table 16 refer to top heights (inventory definition), not average stand height.

Quesnel Forest District staff indicates that the multiple use areas are generally large contiguous patches of harvestable forest and the maximum disturbance of 35% adequately describes the cutting pattern used at this time.

Visual objectives have been established for each known scenic area and those objectives in terms of maximum allowable disturbance will be modelled.

## 6. Current Forest Management Assumptions

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Eastern and Itcha Ilgachuz Caribou will be modelled in accordance with the *CCLUP Caribou Strategy*, CCLUPIR, the management recommendations of the *Mountain Caribou Strategy, October 2000* and the *Northern Caribou Strategy, March 2002*, the 2004 GAR order and the 2005 GWM's. Forest cover requirements are applied to restrict over-concentration of harvest in a given landscape unit and to simulate anticipated performance. The forest cover requirements are not meant to imply rigid limitations on harvest but are meant to disperse the harvest activity within a caribou modified harvest area.

Green-up adjacency requirements in pine-leading stands will not be imposed during the salvage period, or for 30 years following the end of the salvage period. Enhanced stand level retention (see Section 6.4.2) will compensate for the reduction in the green-up requirement.

### **Landscape-level biodiversity**

The Biodiversity Conservation Strategy was completed in July 1996 and establishes landscape units and biodiversity emphasis across the region. Since 1996 implementation of the CCLUP has raised a number of interpretive issues about biodiversity. Consequently, the Regional Biodiversity Conservation Committee has provided updates to the strategy to more fully explain key aspects. The Biodiversity Conservation Strategy and subsequent updates are being implemented by licensees through the approval of results or strategies in Forest Stewardship Plans. The Compliance and Enforcement program within the Ministry of Forests and Range is inspecting licensees to ensure compliance with approved results and strategies.

The Regional Biodiversity Conservation Committee has spatially identified Old Growth Management Areas (OGMAs) within the Quesnel Forest District, which are key to successfully implementing the strategy. The areas are being honored by the licensees through the approval of Forest Stewardship Plans.

The current MPB infestation has killed most of the mature and old stands of pine in many of the landscape units in the Quesnel TSA. To allow for the economic recovery of losses due to MPB, it was necessary to allow for a one time draw-down of mature+old targets for landscape units heavily impacted by the MPB infestation. The drawdown strategy to facilitate the salvage of dead stands was prepared by the Regional Biodiversity Conservation Committee through Update Note #8 to the Biodiversity Conservation Strategy ([Update Note #8: Strategy for Management of Mature Seral Forest and Salvage of Mountain Pine Beetle-Killed Timber](#)).

### **6.4.2 Reductions to reflect volume retention in cutblocks**

Retention of volume within cutblocks may occur for a variety of forest management considerations. In the Quesnel TSA, volume is retained for Wildlife Tree Patches (WTP), Conservation Legacy Areas (CLA), in riparian management zones (RMZ) and as part of partial cutting systems.

### **Wildlife trees (WT) and wildlife tree patches (WTPs)**

The *Biodiversity Guidebook* describes two methods for maintaining stand structure over time: WTs and WTPs. It is important to discuss the anticipated persistence of the particular method in different stand types. For instance, different silvicultural systems may provide the intended structural diversity through modifying the timing timber is available. Consideration should be given to whether the trees will ever be harvested and whether stands within riparian management zones (RMZ) are regularly being relied on to act as WT or WTP. Recognizing the overlap between these two objectives will in some instances eliminate the need for additional WT or WTP reductions to the THLB.

## 6. Current Forest Management Assumptions

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A FREP assessment report of cutblocks sampled for stand-level biodiversity during 2005 and 2006 in the Quesnel Forest District found that 44% of wildlife tree patches (WTP) are larger than two hectares. This assessment also determined that total stand level retention averaged 14.7%, of which 6.2% was dispersed retention. The balance was patch retention, of which 54.4% was considered constrained by other resource values. FRPA requires a 7% WTP retention on average, with a minimum of 3.5% on each cutblock. The FREP results indicate that WTP retention is complying with the FRPA requirements. The additional retention is reflective of, but somewhat less than, the expectation for enhanced retention during the salvage phase of addressing the MPB infestation.

The Quesnel Forest District prepared a *Quesnel Forest District Enhanced Conservation Strategy (2006)*. This document provided guidance on increasing the amount of stand-level retention during large-scale salvage operations for the recovery of MPB damaged timber. The landscape-level objective is to retain an average of 20% of the cutblock area; resulting in an expected 13% increase over the legislated WTP requirement. These areas are classified as Conservation Legacy Areas (CLAs). The CLAs recommended by the strategy are expected to persist for 30 years to allow salvage areas to recover to a point where harvest of the CLAs will not compromise wildlife or hydrological values.

WTPs will be modelled as a 7% reduction of productive forest area with 50% of the area considered to overlap other constrained areas. Pine-leading analysis units will have a 20% volume reduction applied to account for WTP and CLA requirements.

## 7. Sensitivity Analyses

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Sensitivity analysis provides a measure of the timber supply impact due to uncertainty in management assumptions and/or data. The magnitude of the increase or decrease applied to a particular variable should reflect the degree of uncertainty surrounding the assumption. By developing and performing a number of sensitivity analyses, it is possible to determine which variables most influence analysis results. Table 17 shows issues that are particular to the Quesnel TSA. Table 18 lists standard sensitivity analyses.

Table 17. Sensitivity analyses specific to the Quesnel TSA

| Issue to be tested   | Sensitivity levels   |
|--|--|
| Deciduous-leading contribution to non-timber constraints                       | No harvest of deciduous-leading stands.  |
| Goal 2 protected areas   | Remove areas from the THLB.  |
| Contribution to the timber harvesting land base of Kluskus timber supply block | Deduct from THLB.  |
| Landscape-level biodiversity   | <p>Weighted (45/45/10 low/intermediate/high) versus draft biodiversity emphasis options as modified by CCLUPIR.</p> <p>Full <i>Biodiversity Guidebook</i> seral stage percentages; no application of the drawdowns provided for in the CCLUPIR.</p> <p>No “mature plus old” targets.</p> |
| Site index estimate for regenerated stands                                     | <p>Apply SIA adjustments.</p> <p>Apply SIBEC adjustments.</p>  |
| OAF 1  | Apply OAF1 of 10% (15% in base case).  |
| Green-up height  | 2 metres and 4 metres (3 metres in base case).   |
| Shelf life   | +/- 3 years on date of maximum mortality.  |
| Minimum operable volume  | Reduce to 100 and 80 cubic meters per hectare.   |
| MPB rehabilitation   | Rehabilitate non-salvaged areas within 10 years.   |
| Kluskus Supply Block   | Partitioned cut.   |

## 7. Sensitivity Analyses

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Table 18. Standard sensitivity analyses

| Issue to be tested                       | Sensitivity levels   |
|--|--|
| Existing stand yields                    | +/- 10%  |
| Regenerated stand yields (non-selection) | +/- 10%  |
| Minimum harvestable age                  | +/- 25 m <sup>3</sup> in minimum volume threshold  |
| Land base (THLB) changes                 | +/- 5%   |
| Visual quality objectives                | Lower and higher end of visual quality objective ranges for per cent disturbance.                                  |
| Green-up periods                         | +/- 5 years  |
| Multiple use zone                        | +/- 10% on the maximum per cent area below green-up age. Find level at which short-term timber supply is affected. |
| Regeneration delay                       | Increase and reduce by 2 years.  |

# Appendix A

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The British Columbia Forest Service is required by law to formally review the timber supply in all timber supply areas and tree farm licence areas in the province. Ideally, a review of each area is completed at least once every five years. The main objectives of the five-year reviews are:

- to identify the economic, environmental and social information that reflects the current forest management practices — including their effects on the short- and long-term timber supply;
- to identify where improved information is required for future timber supply forecasts;
- to provide the chief forester with information to make any necessary adjustments to the allowable annual cuts\* for the next five years.

## Timber Supply Review process

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In British Columbia, a process of determining allowable annual cuts has been in place since the late 1940s. However, the process has changed significantly over the years.

Currently, timber supply review process has three main stages: (1) data package preparation, (2) timber supply analysis and (3) AAC determination. First Nations and the public are encouraged to review and comment on the draft documentation prepared for the first two steps. All comments and information obtained from First Nations and the public during the formal review processes will be summarized and presented to the chief forester for his consideration in the AAC determination.

## The chief forester's responsibility

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Determining the allowable annual cuts for Crown forest lands in British Columbia is the responsibility of the province's chief forester. It is one of the chief forester's most important responsibilities since it affects the local and provincial economies and environment—now and in the future. Section 8 of the *Forest Act* requires the chief forester to consider the following factors to determine allowable annual cuts for timber supply areas and tree farm licence areas:

- (a) the rate of timber production that may be sustained from the area, taking into account:
  - the composition of the forest and its expected rate of growth;
  - the time in which the forest will become re-established;
  - silvicultural treatments, including reforestation;
  - standards of timber utilization;
  - constraints on the amount of timber produced from the area due to use of the forest for purposes other than timber production;
  - any other information which relates to the capability of the area to produce timber.
- (b) the short- and long-term implications to the province of alternative rates of timber harvesting from the area.
- (c) the economic and social objectives of the Crown for the area, the region and the province, as expressed by the Minister of Forests and Range.
- (d) abnormal insect or disease infestations and major salvage programs planned for the timber on the area.

Some of these factors can be measured and analyzed—others cannot. Ultimately, the chief forester's determination is an independent, professional judgement based on the best available information. Information that is relevant to the factors listed above is provided to the chief forester by government agencies, the Minister of Forests and Range, and the public.

# Appendix A

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One of the objectives of the timber supply review is to incorporate changes arising from new information, new practices and new government initiatives that may have an impact on timber supply. In the event of significant change, the allowable annual cut may be reviewed in less than the required five years. Following the release of the allowable annual cut determination by the chief forester, the Minister of Forests and Range apportions the cut to the various licences and programs.

## Principles of the timber supply review

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In determining allowable annual cuts—in addition to the requirements outlined in Section 8 of the *Forest Act*—the following principles have been developed.

The Timber Supply Review:

- is a decision-making process for establishing the allowable annual cut for timber supply areas and tree farm licence areas by the chief forester on a five-year cycle, as required under Section 8 of the *Forest Act*; it is not intended to be a process for making land-use decisions;
- incorporates the best information available including all relevant current practices, and identifies where new information is needed;
- reflects the results of implemented plans and land-use decisions;
- involves other agencies, affected groups the public and consultation with First Nations.