

BURNS LAKE COMMUNITY FOREST AGREEMENT

TIMBER SUPPLY ANALYSIS

*DATA PACKAGE
(Version 1.4)*

Prepared for:

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March 2010

DOCUMENT HISTORY

| Document Version | Date | Description |
|-------------------------|----------------------------------|---|
| 1.0 | February 15 th , 2010 | 1 st draft |
| 1.1 | February 18 th , 2010 | Minor edits |
| 1.2 | March 5 th , 2010 | Adjust MPB percentages + minor change to netdown + minor text edits |
| 1.3 | March 10 th , 2010 | Minor edits |
| 1.4 | April 28 th , 2010 | Submission for public review |
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1.0 Introduction

The community of Burns Lake was awarded a pilot Community Forest Agreement (CFA) in July 2000, with an allowable annual cut (AAC) of 23,677 m³. The AAC was increased to 54,026 m³ between 2002 and 2005. A 25 year Long-Term Community Forest Agreement was signed April 21, 2005. In 2005 the AAC was increased to 300,000 m³, with subsequent uplifts in 2006 and 2007 to 500,000 m³ to address the impacts of the mountain pine beetle (MPB). The CFA has increased in size through several expansions, with an uplifted AAC of 250,000 m³ for 2008 and 2009. Since inception, the community forest has completed numerous inventories on the CFA and has now begun a formal timber supply review process with the objective of determining a new AAC that reasonably reflects current management as well as the productive capacity of the land base.

The purpose of this Data Package is to document the information sources and assumptions to be used in the base case timber supply analysis and to discuss potential sensitivity analysis scenarios.

2.0 Inventory Information

Table 1 provides a list of data sources used in this analysis.

Table 1: Data Sources

| Description | Coverage Name | Data Source / Custodian | Date Received | Vintage of Data | Comments |
|---|-----------------------------|---|---------------|-----------------|---|
| Biogeoclimatic Zones | bec_poly | LRDW / Research Branch MOF | 28-Aug-09 | 15-May-08 | |
| Biodiversity Overlaps | biodiv_ovlp | BLCF | 2-Sep-09 | 31-Oct-09 | |
| Community Forest Boundary | commfor_bdy | BLCF | 8-Oct-09 | 13-Jan-10 | |
| Draft Visual Landscape Inventory | dva_vli | BLCF | 5-Oct-09 | 5-Oct-09 | Use all but "Project" = 'Burns Lake Comfor' |
| Environmentally Sensitive Areas | esa | BLCF | 2-Sep-09 | 26-Sept-01 | |
| Existing Road Buffers | exist_buf | Generated | 27-Nov-09 | 5-Dec-09 | Roads compiled from s_rd, f_hwys, TRIM and As Built Roads |
| FSP Trail Buffers | fsp_trbuf | Generated | 27-Nov-09 | 5-Dec-09 | FSP_Trails20mBuff source trails data |
| Young Pine Mortality | ibm | BLCF | 29-Oct-09 | 16-Nov-06 | |
| Deer Winter Habitat | lakes_deer | BLCF | 2-Sep-09 | 3-Feb-05 | |
| Mountain Goat Draft Ungulate Winter Range | lakes_goats | MOFR | 14-Sep-09 | 3-Feb-05 | |
| Moose Winter Habitat | lakes_moose | BLCF | 2-Sep-09 | 3-Feb-05 | |
| Lakes South Old Growth Management Areas | ogma_leg_c | LRDW / Strategic Land Policy and Legislation Branch (MAL) | 28-Aug-09 | 16-Jul-09 | |
| Private Land | private | BLCF | 4-Nov-09 | 4-May-05 | |

Burns Lake Community Forest Agreement - Timber Supply Review - Data Package

| Description | Coverage Name | Data Source / Custodian | Date Received | Vintage of Data | Comments |
|--|------------------------------|---|----------------------|------------------------|---|
| Recommended VQO's | rec_vlnd | LRDW / BCGOV FOR Forest Practices Branch | 31-Aug-09 | 15-Jan-04 | |
| Riparian Management | rip_final | Generated | 4-Dec-09 | 5-Dec-09 | BFPFishdata.mdb - waterbodies and FPCStreamColour classified and buffered |
| Lakes South Connectivity Corridors | rmp_lg_pl | LRDW | 15-Sep-09 | 31-Mar-09 | |
| Landscape Units | rmp_lu_svw | LRDW | 28-Aug-09 | 22-Jan-08 | |
| RESULTS Reserves | rslt_fcres | LRDW / BCGOV FOR Forest Practices Branch | 28-Aug-09 | 9-Dec-09 | |
| RESULTS Openings | rslt_opngs | LRDW / BCGOV FOR Forest Practices Branch | 28-Aug-09 | 9-Dec-09 | |
| Lakes North Connectivity Corridors | s_bens | BLCF | 2-Sep-09 | 12-Dec-08 | |
| BLCF Blocks | s_blk | BLCF | 11-Sep-09 | 11-Sep-09 | |
| BLCF Reserves | s_blk_res | BLCF | 22-Sep-09 | 22-Sep-09 | |
| Lakes North Old Growth Management Areas | s_cogma | BLCF | 2-Sep-09 | | Not required - OGMA exist in ogma_leg_c |
| Grizzly Bear Habitat | s_grizzly | BLCF | 11-Sep-09 | 18-Dec-06 | |
| Seed Planning Zones | spz_gomtry | BLCF | 10-Sep-09 | 11-Apr-08 | |
| Utility Buffers | util_buf | Generated | 4-Dec-09 | 5-Dec-09 | f_ea source for buffers |
| Visual Design Unit Blocks (Units A and D) | vdu_ad_pblk | BLCF | 10-Sep-09 | 17-Mar-08 | |
| Visual Design Unit Areas | vdu_areas | BLCF | 10-Sep-09 | 17-Mar-08 | |
| Visual Design Unit Blocks (Units B and C) | vdu_bc_pblks | BLCF | 10-Sep-09 | 17-Mar-08 | |
| Visual Design Unit WTP's | vdu_bc_pwtp | BLCF | 10-Sep-09 | 17-Mar-08 | |
| VRI in Community Forest | vri_cf | TNRG | 28-Aug-09 | 31-Dec-09 | |
| VRI outside Community Forest (Woodlots and Gaps) | vri_cfout | LRDW / BCGOV FOR Forest Analysis and Inventory Branch | 15-Sep-09 | 15-Oct-06 | |
| PEM in Community Forest | pem_4510_ecp | Timberline Natural Resource Group | 28-Aug-09 | 31-Mar-09 | |
| PEM not in CF PEM or Woodlots TEM | pem_gap | LRDW | 1-Dec-09 | 24-Apr-03 | |
| TEM in Woodlots | tem_wl | TNRG | 4-Sep-09 | 19-Jun-08 | |
| Public Sustained Yield Units | psyu | LRDW / BCGOV FOR Resource Tenures and Engineering (RTEB) | 10-Dec-09 | 9-May-03 | |
| Region Compartment | rc | LRDW / BCGOV FOR Resource Tenures and Engineering (RTEB) | 10-Dec-09 | 9-May-03 | |

3.0 Timber Harvesting Land Base Definition

The timber harvesting land base is determined by removing components of the land base that are not considered harvestable. The following sections describe assumptions associated with each of these exclusions. The results of the netdown are summarized in Table 2.

Table 2: Timber Harvesting Land Base Definition

| Land Base Classification | Area (ha) | % of CFLB | % of Gross Area |
|--|---------------|-------------|-----------------|
| Gross Area | 87,088 | | 100% |
| Area Outside the CFA Boundary | 305 | | 0% |
| Private / Non-Crown Ownership | 2 | | 0% |
| Non-Forest | 1,959 | | 2% |
| Non-Productive Forest | 4,685 | | 5% |
| Existing Roads | 1,675 | | 2% |
| Crown Forested Land Base (CFLB) | 78,462 | 100% | 90% |
| Old Growth Management Areas | 5,525 | 7% | 6% |
| Blue/Red-listed Ecosystems in the LCM | 143 | 0% | 0% |
| Physically Inoperable | 1,168 | 1% | 1% |
| Riparian Reserve Zones | 1,364 | 2% | 2% |
| Recreation Trails | 12 | 0% | 0% |
| Non-Commercial Cover | 27 | 0% | 0% |
| Deciduous Leading Stands | 5,743 | 7% | 7% |
| Low Volume Pine Leading | 2,249 | 3% | 3% |
| Low Volume Other Conifer | 4,174 | 5% | 5% |
| Low Site Immature | 75 | 0% | 0% |
| <i>Total CFLB Reductions</i> | <i>20,488</i> | <i>26%</i> | <i>24%</i> |
| Current Timber Harvesting Land Base | 57,973 | 74% | 67% |

3.1 Area Excluded From the CFA

Areas outside the CFA and private land within the CFA boundary is excluded from the THLB (Table 3) This does not include Schedule A lands which are included in the THLB.

Table 3: Non-CFA Area

| Description | Data Source | Reduction % |
|--|-------------|-------------|
| Area outside the CFA boundary | commfor_bdy | 100 |
| Private Land (excluding CFA schedule A land) | private | 100 |

Data Source and Comments:

- *commfor_bdy* is the final approved CFA boundary
- *private* was updated by BLCF

3.2 Non-Forest / Non-Productive Forest

Non-forest and non-productive areas are defined using both the VRI and the TEM. Table 4 summarizes the VRI criteria for non-forest and non-productive classification. Areas with a logging history are assumed to be forested or capable of supporting a forest stand and are therefore not removed from the THLB. There are no areas within the community forest that are specifically classified as NSR in the inventory. However, areas with recent logging history that are mature stands in the inventory or have no species information are considered to be young stocked stands. Regeneration assumptions associated with these stands are addressed in Section 5.2. Table 5 shows the site series from the TEM that are classed as non-productive and are removed from the THLB. These exclusions occur regardless of logging history.

Table 4: Non-Forest and Non-Productive - VRI

| Logging History | BC Land Cover Classification Scheme (Level 1 and 2) | Description | Reduction (%) | Reduction Category |
|------------------------|--|-------------------------|----------------------|---------------------------|
| No | VT | vegetated - treed | 0 | None |
| | VN | vegetated - non-treed | 100 | Non-Productive |
| | NL | non-vegetated - lake | 100 | Non-Forest |
| | NW | non-vegetated - wetland | 100 | Non-Forest |

Table 5: Non-Forest and Non-Productive - PEM / TEM

| BGC Label | Leading Site Series | Gross Area (ha) | BGC Label | Leading Site Series | Gross Area (ha) |
|-----------|---------------------|-----------------|-----------|---------------------|-----------------|
| ESSFmc | 12 | - | SBS dk | RW | 2 |
| ESSFmc | 31 | 173 | SBS dk | RZ | 121 |
| ESSFmc | 09_10 | 126 | SBS dk | TA | 2 |
| ESSFmc | LA | 37 | SBS dk | UR | 20 |
| ESSFmc | OF | 23 | SBS dk | WE | 15 |
| ESSFmc | OW | 2 | | | |
| ESSFmc | PD | 11 | SBS dw 3 | 10 | 32 |
| ESSFmc | RO | 1 | SBS dw 3 | 32 | 1 |
| ESSFmc | RZ | 58 | SBS dw 3 | CP | - |
| | | | SBS dw 3 | FE | 40 |
| SBS dk | 09 | 1 | SBS dw 3 | LA | 84 |
| SBS dk | 10 | 4 | SBS dw 3 | OB | 2 |
| SBS dk | 12 | 1 | SBS dw 3 | OS | 19 |
| SBS dk | 31 | 40 | SBS dw 3 | RZ | 2 |
| SBS dk | 32 | 908 | | | |
| SBS dk | 81 | 77 | SBS mc 2 | 09 | 26 |
| SBS dk | 82 | 26 | SBS mc 2 | 10 | 25 |
| SBS dk | 09_10 | 1,508 | SBS mc 2 | 12 | 367 |
| SBS dk | 81_82 | - | SBS mc 2 | 31 | 298 |
| SBS dk | CB | 3 | SBS mc 2 | 32 | 1 |
| SBS dk | CF | 59 | SBS mc 2 | 09_10 | - |
| SBS dk | CP | - | SBS mc 2 | GP | 10 |
| SBS dk | DEV | 19 | SBS mc 2 | LA | 21 |
| SBS dk | GP | 16 | SBS mc 2 | OW | 9 |
| SBS dk | LA | 1,035 | SBS mc 2 | PD | 219 |
| SBS dk | OW | 11 | SBS mc 2 | RZ | 37 |
| SBS dk | PD | 208 | SBS mc 2 | TA | 1 |
| SBS dk | RO | 1 | | | |

Data Source and Comments:

- BC Land Cover Classification Scheme (Level 1 and 2) are VRI attributes.
- Areas outside the original CFA boundary utilize an old forest cover inventory. In some of these areas stands were classified as 'VN' even though they contained species information. Based on this stands were only classified as non-forest if they did not contain any tree species information.
- Site series are defined from the TEM.

3.3 Existing Roads and Right of Ways

Existing roads, transmission lines and pipe lines are assumed to be completely removed from the THLB. Road widths have been buffered according to the road classes in Table 6.

Table 6: Existing Roads

| Road Class | R/W Width (m) | Reduction (%) |
|--------------------|----------------------|----------------------|
| Highways | 60 | 100 |
| Secondary Highways | 30 | 100 |
| Forestry Mainlines | 30 | 100 |
| Operational | 18 | 100 |
| Cutblock | 10 | 100 |
| Transmission Lines | 90 | 100 |
| Pipe Lines | 30 | 100 |

Data Source and Comments:

- road data was compiled from TRIM as well as BLCF's corporate road database. Road buffers are applied based on the TRIM road class

3.4 Crown Forested Land Base

The crown forested land base (CFLB) represents the portion of the land base that contributes to meeting biodiversity objectives. The CFLB includes all forested crown land within the CFA and excludes the areas identified in Sections 3.1 to 3.3 above.

3.5 Parks and Protected Areas

There are currently no parks or protected areas within the Community Forest Area.

3.6 Old Growth Management Areas

Higher Level Plan Result 2:

Within all Forest Development Units, the licensee, during the term of this FSP, shall:

- not conduct timber harvesting or road construction in Old Growth Management Areas (OGMAs), except as listed below, and only where these activities will not diminish the overall effectiveness of old forest conservation, or if the area harvested has been declared prior to January 29, 2009 as per section 14 (4) of the Forest and Range Practices Regulation.

Timber harvesting in OGMAs is allowed for one or more of the following purposes, provided an alternate area or areas is identified and reserved from harvesting in the same Landscape Unit/BEC variant unit as in the original OGMA:

New road development and maintenance where no practicable alternatives exist, and subject to these roads being deactivated once operational activities are complete.

To address a substantiated forest health factor within an OGMA where this poses a significant and substantiated forest health risk to forests outside the OGMA and where harvesting constitutes an appropriate and effective control action.

To address a public or industrial safety concern, or an environmental hazard where no practicable alternative exists.

Boundary adjustments to the OGMAs are allowed, provided that an alternate area or areas is identified and reserved from harvesting in the same Landscape Unit/BEC variant unit as in the original OGMA, and that old growth attributes of the replacement OGMA meet or exceed the attributes of the original OGMAs.

Areas identified as OGMA are removed from the THLB.

Data Source and Comments:

- OGMA are defined in the ogma_leg_c layer

3.7 Red and Blue-Listed Ecosystems

Consistent with the *Lakes North SRMP*, Higher Level Plan Result 4 of the FSP, identifies the following result for addressing ecosystem connectivity and rare or endangered ecosystems.

Higher Level Plan Result 4:

Within all Forest Development Units, the licensee during the term of this FSP, shall conform to the following requirements for habitat connectivity within the Landscape Connectivity Matrix (LCM) as shown on Map 4:

- (a) Defer the harvest of the following stands for a period of 7 years following the January 29, 2009:
 - (i) Stands listed in Table 2.0 if they are made up of less than 70% pine.
 - (ii) Stands in hydro-riparian areas if they are in the site series listed in Table 3.0 and are made up of less than 70% pine.
- (b) Avoid harvesting in rare and/or endangered plant communities.¹
- (c) Despite (a), timber harvesting is permitted in the deferred areas for the following reasons:
 - (i) Where required for new road development and maintenance and where no practicable alternative exists, and subject to these roads in the deferred areas being deactivated once forestry operational activities are complete.
 - (ii) Where required to address a substantial forest health factor other than Mountain Pine Beetle where it poses a significant forest health risk to forests outside of the deferred areas and where harvesting constitutes an appropriate and effective control action.

The blue or red-listed ecosystems listed in Table 7, occurring as the leading site series for a particular TEM polygon, will be excluded from the THLB.

Table 7: Red and Blue-Listed Ecosystems

| Subzone | Site Series | Status ² | Reduction (%) |
|---------|-------------|---------------------|---------------|
| SBSdk | 02 | Blue | 100 |
| | 04 | Blue | 100 |
| | 08 | Red | 100 |
| | 09 | Blue | 100 |

¹ Rare and endangered plant communities are defined as the Conservation Data Centre's Red List and Blue List ecological communities. Reference: <http://www.env.gov.bc.ca/atrisk/red-blue.htm>

Data Source and Comments:

- the LCM is defined according to the s_bens layer where bensv2_ins>0
- red and blue-listed ecosystems are located according to the TEM
- status designations come from the Conservation Data Centre

3.8 Physically Inoperable Stands

Physically inoperable stands are stands that are unharvestable due to terrain and / or access. This information comes from a compilation of Environmentally Sensitive Area (ESA) and slope data.

Table 8: Physically Inoperably Stands

| Logging History | Description | Reduction (%) |
|-----------------|---|---------------|
| NO | ESA High - Sensitive Soils | 100 |
| | ESA Low - Sensitive Soils and Slope > 40% | 100 |

3.9 Riparian Retention

Table 9, taken from both the *Forest Planning and Practices Regulation* and the FSP, defines the riparian management area (RMA), riparian reserve zone (RMZ) and riparian management zone (RMZ) for each type of riparian feature. Riparian reserve zones have been excluded from the THLB. Riparian management zone retention requirements are addressed as volume reduction factors in the forest estate model.

Table 9: Riparian Management

| Riparian Class | Riparian Management Area (m) | Riparian Reserve Zone (m) | Riparian Management Zone (m) | RMZ Minimum Basal Area Retention (%) |
|----------------|------------------------------|---------------------------|------------------------------|--------------------------------------|
| S1-A | 100 | 0 | 100 | 20 |
| S1-B | 70 | 50 | 20 | 20 |
| S2 | 50 | 35 ¹ | 0 | 0 |
| S3 | 40 | 25 ¹ | 0 | 0 |
| S4 | 30 | 0 | 30 | 10 |
| S5 | 30 | 0 | 30 | 10 |
| S6 | 20 | 0 | 20 | 0 |
| L1-A | 0 | 0 | 0 | 10 |
| L1-B | 10 | 10 | 0 | 10 |
| L2 | 30 | 10 | 20 | 10 |
| L3 | 30 | 0 | 30 | 10 |
| L4 | 30 | 0 | 30 | 10 |
| W1 | 50 | 15 ¹ | 0 | 0 |
| W2 | 30 | 15 ¹ | 0 | 0 |
| W3 | 30 | 5 ¹ | 0 | 0 |
| W4 | 30 | 0 | 30 | 10 |
| W5 | 50 | 15 ¹ | 0 | 0 |

¹ RRZ widths have been increased by 5 m to reflect no RMZ retention. This best reflects current management in these areas.

Data Source and Comments:

- riparian features were identified and buffered from the stream data provided by the BLCF

3.10 Recreation Site, Recreation Trail or Interpretive Forest Site

In the Order entitled “Order to Establish Objectives For a Recreation Site, Recreation Trail or Interpretive Forest Site” (dated the 31st day of October, 1997), The Ministry of Forests established objectives as follows:

Bear Dens Recreation Trail, Recreation Project File 900-5937

“The objectives are, to manage the Bear Dens recreation trail for a natural recreation experience. The bed rock formations will be protected and all over story vegetation will be maintained within the site boundaries and 10 m on either side of the trail. The trail is to provide the opportunity for hiking, horseback riding and mountain biking activities. Motorized vehicles will not be permitted.”

Guyishton Lake Recreation Trail, Recreation Project File 900-6474

“The objectives are, to manage the Guyishton Lake recreation trail for a natural recreation experience. The coniferous vegetation features will be maintained within 10 m of the trail. The trail is to provide the opportunities for hiking, mountain biking, horse back riding, and snowmobiling activities.”

The FSP defines the following results for objectives set for a Recreation Site, Recreation Trail or Interpretive Forest Site:

Recreation Site, Recreation Trail or Interpretive Forest Site: Result 1

During the term of the plan the licensee shall ensure that no roads are constructed or cut blocks harvested within the site boundary and within 10 m on either side of the Bear Dens Trail, Recreation File Project 900-5937.

Recreation Site, Recreation Trail or Interpretive Forest Site Result 2:

During the term of the plan the licensee shall ensure that no roads are constructed or cut blocks harvested within 10 m on either side of the Guyishton Lake Recreation Trail, Recreation File Project 900-6474.

These areas will be removed from the THLB.

Data Source and Comments:

- trail data was provided by the BLCF and buffered accordingly

3.11 Non Commercial Cover

Stands with leading species that are considered to be non-commercial, including deciduous, are excluded from the THLB.

3.12 Economically Inoperable Stands

Table 10 describes the criteria to exclude mature stands that are considered to be uneconomical.

Table 10: Economically Inoperably Stands - Mature

| Logging History | Leading Species | Minimum Age (years) | Minimum Volume (m ³ /ha) | Reduction (%) |
|-----------------|-----------------|---------------------|-------------------------------------|---------------|
| NO | PL, PLI | >60 ² | <140 | 100 |
| | Other conifer | >80 | <140 | 100 |

Table 11 describes the criteria used to exclude immature stands that are not expected to become economical. The site index values in Table 11 reflect the maximum site index in TIPSy where yields do not reach 140m³/ha by age 200.

Table 11: Economically Inoperably Stands - Immature

| Logging History | Leading Species | Minimum Age (years) | Minimum Site Index | Reduction (%) |
|-----------------|-----------------|---------------------|--------------------|---------------|
| NO | PL, PLI | <=60 ² | 7.8 | 100 |
| | SX, SW, SE, BL | <=80 | 5.0 | 100 |
| | Other Conifer | <=80 | 9.0 | 100 |

4.0 Current Forest Management Assumptions

Consistent with the Lakes North SRMP and the Lakes South SRMP, The *Burns Lake Community Forest Ltd. Forest Stewardship Plan* (2010) (the FSP) documents strategies for achieving the management objectives on the community forest area. Wherever possible, strategies documented in the FSP are incorporated into the forest-estate model as described below.

4.1 Mountain Pine Beetle

The MoFR's *BC MPB Version 5³* was used to assess the impacts of MPB on the land base. This data reflects current aerial overview assessments and projects the spread of MPB into the future. Figure 1 shows that by 2007, the majority of the CFA had been attacked by MPB and that very little spread is projected to occur after that. Based on local knowledge of the CFA and supported by this data, this analysis assumes that all pine leading stands age class three or greater were killed by MPB in 2005. For the purpose of calculating shelf life it is assumed that all stands were attacked and killed in 2005.

² It is assumed that the majority of pine volume older than 60 years of age has been killed. Any stands older than 60 years that has not achieved 140m³/ha will likely never achieve that volume and are therefore excluded from the THLB.

³ <http://www.for.gov.bc.ca/hre/bcmpb/Year5.htm>

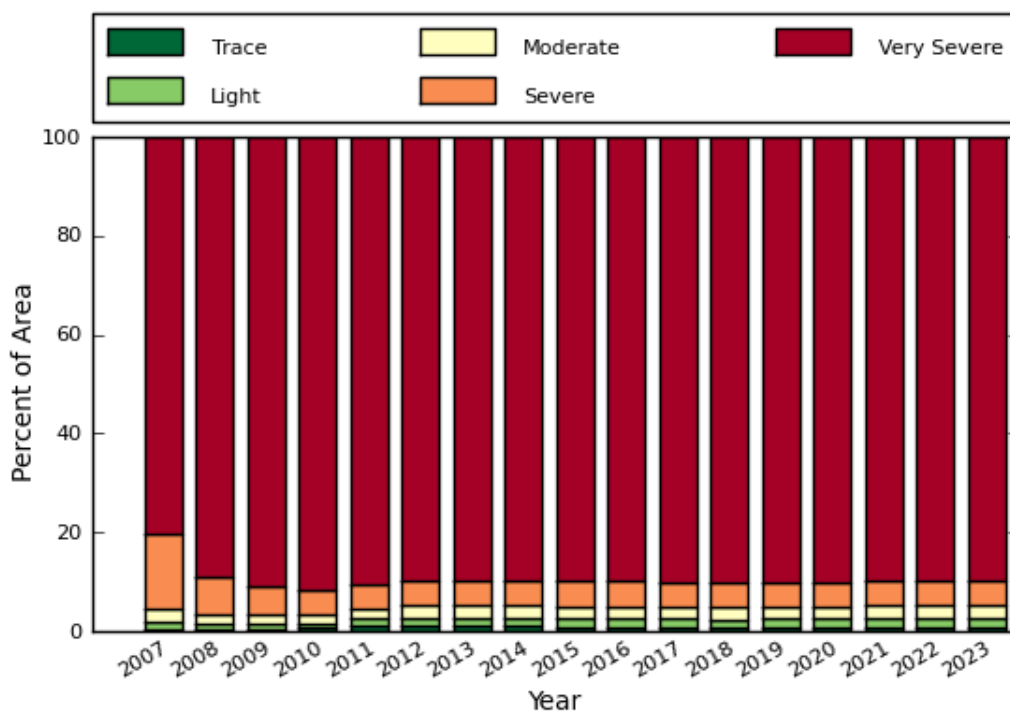


Figure 1: BC MPB version 5 Projections for the CFA.

Figure 2 and Table 12 show the BC MPB attack projections for the year 2012 by age class for the CFA. As shown above there is very little change in the MPB infestation projected past 2012. These percentages will be applied (by age class) to stand volumes for age classes two to nine to identify the amount of dead pine volume at the stand level. This volume will then follow the shelf life projections described below. These yield components will be tracked separately in the model (See Section 5.0).

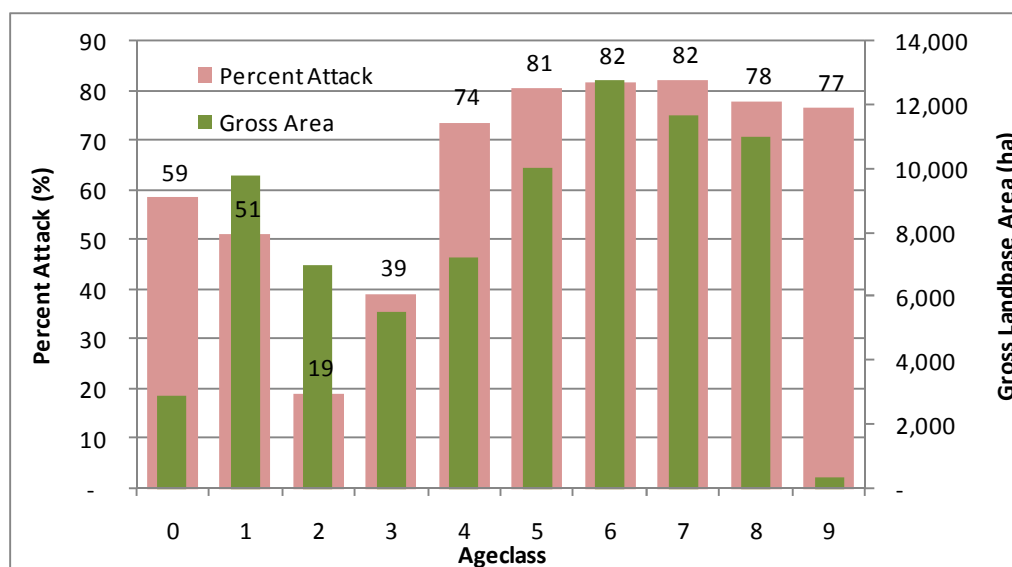


Figure 2: Percent MPB Attack Based on BC MPB Version 5 (2012)

Table 12: Percent MPB Attack Based on BC MPB Version 5 (2012)

| Age Class | CFLB Area (ha) ⁴ | Percent Attack |
|---------------------------|-----------------------------|----------------|
| 0 | 2,910 | 59 |
| 1 | 9,782 | 51 |
| 2 | 7,023 | 19 |
| 3 | 5,560 | 39 |
| 4 | 7,236 | 74 |
| 5 | 10,063 | 81 |
| 6 | 12,775 | 82 |
| 7 | 11,696 | 82 |
| 8 | 10,991 | 78 |
| 9 | 366 | 77 |
| Total | 78,402 | 67 |
| Total Age Class 5+ | 45,892 | 81 |
| Total Age Class 6+ | 35,829 | 81 |

As documented in the Lakes TSA Data Package (MoFR, 2009), 21,019 ha of pine leading stands less than 60 years of age have been surveyed between 2006 and 2008. The results of these surveys are replicated in Table 13. For age class two and three, the results of this study are similar to the information from the BC MPB Version 5 results shown above.

⁴ MPB percentages were calculated separately from the netdown and therefore the areas do not exactly match the CFLB area in Table 2.

Table 13: Summary of 2006 - 2008 Pine Leading Plantation Survey - Lakes TSA (MoFR, 2009)

| Age Class | Total Area Surveyed (ha) | Total Area with MPB (ha) | MPB % | NSR % (MPB) |
|-----------|--------------------------|--------------------------|-------|-------------|
| 1 | 6,140 | 270 | 0.04 | 0 |
| 2 | 10,874 | 3,144 | 29 | 1 |
| 3 | 1,699 | 819 | 48 | 24 |

4.2 Utilization Levels

The utilization specifications define the minimum diameter breast height (DBH), the maximum stump height, the minimum top diameter and the minimum log length by species. These values are used to determine gross merchantable volume.

Table 14: Utilization Standards

| Species | Maximum Stump Height (cm) | Minimum DBH (cm) | Minimum Top Diameter (cm) |
|-------------------|---------------------------|------------------|---------------------------|
| Pine | 15.0 | 12.5 | 10.0 |
| Spruce | 15.0 | 15.0 | 10.0 |
| All other conifer | 15.0 | 17.5 | 10.0 |

4.3 Deciduous Volume

Deciduous leading stands have been excluded from the THLB. In addition, the deciduous volume from natural stands will be excluded from the merchantable volume portion of natural stand yield curves.

4.4 Minimum Harvestable Volume

In the base case, stands will be harvested only once they have achieved a net merchantable volume of 140m³/ha.

4.5 Silviculture Systems

The base case will assume clear cut harvesting with reserves in all stands.

4.6 Natural Disturbances

The impacts of natural disturbances will be assessed based on stand disturbance information from the *Biodiversity Guidebook* using the guidance provided in the MoFR document, *Modelling Options for Disturbance of Areas Outside of the Timber Harvesting Land Base*.

4.7 Not Satisfactorily Restocked (NSR)

There is no backlog NSR on the land base and any NSR areas will be assumed to be stocked based on regeneration assumptions in Table 21.

4.8 Unsalvaged Losses

Unsalvaged losses account for loss of merchantable volume due to wind, fire or epidemic insect events that is not otherwise captured through this analysis. Losses attributed to MPB are modelled explicitly using shelf life assumptions (Section 5.3) and are therefore not included here. For this analysis, unsalvaged losses will be calculated pro-rata based on the figures from Table 15 in the *Lakes Timber Supply Area Timber Supply Review Data Package (April 2009)*⁵. Unsalvaged losses are deducted from the harvest volume from each timber supply scenario as described in Table 15.

Table 15: Unsalvaged Losses

| Cause of Loss | TSA Annual Unsalvaged Loss (m ³ /yr) | CFA / TSA THLB Ratio ⁶ | Pro-Rated Annual Unsalvaged Loss for the CFA |
|--------------------|---|-----------------------------------|--|
| Blowdown | 0 | | 0 |
| Spruce Bark Beetle | 5,186 | | 514 |
| Balsam Bark Beetle | 10,347 | 0.0992 | 1,026 |
| Spruce Budworm | 317 | | 31 |
| Fire | 7,418 | | 736 |
| Total | 23,268 | | 2,308 |

⁵ http://www.for.gov.bc.ca/hts/tsa/tsa14/current_tsr_2009/14ts09dp.pdf

⁶ Current CFA THLB (Table 2) of 58,522 ha / TSR II current THLB of 589,988 ha (<http://www.for.gov.bc.ca/hts/tsa/tsa14/tsr2/analysis.pdf>). TSR II THLB was used because the current THLB was not reported in the 2009 version of the data package.

4.9 Forest Cover Constraints

Modelling integrated resource management objectives will be accomplished through the use of forest cover constraints. These constraints are summarized in Table 16 and are described in greater detail in the sections below.

Table 16: Summary of Forest Cover Constraints

| Objective | Constraint | Applicable Land Base |
|---------------------------|--|---------------------------------------|
| Seral Stage Targets | Table 17 | CFLB |
| Landscape Connectivity | Harvest deferral until 2016 | Table 18 and Table 19 |
| Moose Winter Habitat | >= 30% >101 years <= 33% < 3 m | Moose Winter Habitat Areas (CFLB) |
| Mule Deer Winter Habitat | >= 50% >101 years | Mule Deer Winter Habitat Areas (CFLB) |
| Grizzly Bear Habitat | <= 50% >121 years <= 33% < 5 m tall | Grizzly Bear Habitat Areas (CFLB) |
| Visual Quality Objectives | Table 20 | CFLB |
| Adjacency | <=25% <3 m | THLB |

The age-based results identified in the FSP indicate that stands greater than 80 years of age with greater than 60% pine volume will not grow or age for the purpose of assessing habitat requirements. This may be the case in the short-term however, over the 250 year planning horizon it is expected that natural succession and future growth will occur. For these stands, age will remain constant until 15 years after MPB attack at which time the stand will revert to a natural stand yield curve at age zero.

4.9.1 Seral Stage Targets

Old growth management areas have been established and have been removed from the THLB as per Section 3.6. These areas contribute to meeting the seral stage targets listed below.

Consistent with *The Lakes North SRMP*, the FSP identifies the following results for seral stage distribution on the land base:

Higher-Level Plan Result 1

Within all Forest Development Units, the licensee, during the term of the FSP, shall:

- maintain less than the target percentage of early forest and greater than the target percentage of mature forest plus old forest, and old forest per BEC zone within landscape units as specified in Table 1.0 below.

- participate with other forest tenure holders, including BCTS, in maintaining the target percentage of early forest, mature forest plus old forest and old forest within the portion of BEC zone within landscape units as specified in Table 1.0 below.

Table 17: Seral Stage Distribution Targets

| Landscape Unit | Biodiversity Emphasis Option | BEC Variant | Seral Stage | Age Range (Years) | Target (%) |
|-----------------|------------------------------|-------------------|--------------|-------------------|------------|
| Babine West | Low | SBS(dk,mc2,wk3) | Early | N/A | N/A |
| Burns Lake East | | | Mature + Old | >100 | > 11% |
| Burns Lake West | | | Old | >140 | > 11% |
| Taltapin | | ESSF (mc,mv1,mv3) | Early | N/A | N/A |
| Francois East | | | Mature + Old | >120 | >14% |
| (South SRMP) | | | Old | >140 | >9% |
| Babine East | Intermediate | SBS(dk,mc2,wk3) | Early | <40 | < 54% |
| Bulkley | | | Mature + Old | >100 | > 23% |
| Fleming | | | Old | >140 | > 11% |
| | | ESSF (mc,mv1,mv3) | Early | <40 | < 36% |
| | | | Mature + Old | >120 | >28% |
| | | | Old | >140 | >9% |

4.9.2 Landscape Connectivity

As discussed in Section 3.7 above, the *Lakes North SRMP* identifies areas within the Landscape Connectivity Matrix (LCM) that are to be deferred from harvesting until 2016. These include the stand types listed in Table 18 and the ecosystems listed in Table 19 within the hydro-riparian areas that are less than 70% pine.

Table 18: Vegetative Cover Important for Biodiversity

| Zone | Minimum Age | Leading Species |
|------|-------------|-----------------|
| ESSF | > 140 years | sub-alpine fir |
| ESSF | > 140 years | spruce |
| SBS | > 140 years | Douglas-fir |
| SBS | > 140 years | sub-alpine fir |
| SBS | > 140 years | spruce |

Table 19: Hydro-Riparian Ecosystems Criteria

| Subzone | Site Series | Species |
|----------|----------------|------------|
| SBS dk | 07, 08, 09, 10 | < 70% pine |
| SBS mc2 | 07, 09, 10, 12 | |
| ESSF mc | 07, 08, 09, 10 | |
| ESSF mv1 | 04, 05 | |
| ESSF mv3 | 07 | |

Data Source and Comments:

- The LCM is defined in the s_bens layer where bensv2_ins >0

4.9.3 Objectives set by Government for Wildlife

The FSP identifies the following results required to achieve the objectives set by Government for wildlife.

Wildlife Result – Moose 1: During the term of the plan, the licensee shall maintain the following condition in each of the contiguous areas of Moose Winter Habitat within the Forest Development Unit as shown in Forest Stewardship Plan Map 2:

- a minimum of 30% of the area is comprised of stands greater than or equal to 101 years old at any given time.

Stands greater than 80 years old and where greater than 60% of stand volume is lodgepole pine will not be deemed to grow or age.

Wildlife Result – Moose 2: During the term of the plan, the licensee shall maintain the following condition in each of the contiguous areas of Moose Winter Habitat within the Forest Development Unit as shown in Forest Stewardship Plan Map 2:

- a maximum of 33% of the area is comprised of stands less than 3 m tall or 17 years old at any given time.

Wildlife Result – Mule Deer 1: During the term of the plan, the licensee shall maintain the following condition in each of the contiguous areas of Mule Deer Winter Habitat within the Forest Development Unit as shown in Forest Stewardship Plan Map 2:

- a minimum of 50% of the area will be comprised of stands greater than or equal to 101 years old at any given time

Stands greater than 80 years old and where greater than 60% of stand volume is lodgepole pine will not be deemed to grow or age.

Wildlife Result – Grizzly Bear 1: During the term of the plan, the licensee shall maintain the following condition in the total area of Grizzly Bear Habitat within the Forest Development Unit as shown in Forest Stewardship Plan Map 2:

- a maximum of 50% of the area is comprised of stands greater than or equal to 121 years old at any given time.

Stands greater than 80 years old and where greater than 60% of stand volume is lodgepole pine will not be deemed to grow or age.

Wildlife Result – Grizzly Bear 2: During the term of the plan, the licensee shall maintain the following condition in the total area of Grizzly Bear Habitat within the Forest Development Unit as shown in Forest Stewardship Plan Map 2:

-a maximum of 33% of the area is comprised of stands less than 5 m tall or 28 years old at any given time.

-a minimum of 50% of the area will be comprised of stands greater than or equal to 101 years old at any given time

Stands greater than 80 years old and where greater than 60% of stand volume is lodgepole pine will not be deemed to grow or age.

These objectives will be incorporated as targets in the timber supply model.

Data Source and Comments:

- Moose habitat is defined in the lakes_moose layer where winter in (M1,M2)
- Mule deer habitat is defined in the lakes_deer layer where dwinter = D2
- Grizzly bear habitat is defined in the s_grizzly layer where f_area >0

4.9.4 Visual Quality Objectives

Visually effective green-up (VEG) heights and plan-to-perspective (P2P) ratios will be used to model scenic areas and visual quality objectives (VQO), as per the *Procedures for Factoring Visual Resources into Timber Supply Analyses*, and the update bulletin, *Modelling Visuals in TSR III*.

A digital elevation model was used to derive average slope for each VQO polygon. The predicted P2P ratios and VEG heights are based on Table 28 *Lakes Timber Supply Area Timber Supply Review Data Package (April 2009)*. According to the data package P2P ratios were calculated from *Predictive Models for Plan-to-Perspective (P2P) Ratios* and VEG tree heights were derived based on Table 6 of *Procedures for Factoring Visual Resources into Timber Supply Analyses*. Table 20 shows the P2P ratios and the VEG tree heights calculated for this analysis.

Consistent with the *Lakes TSA Data Package*, maximum percent visible disturbance for each VQO is calculated based on the approach detailed in *Modelling Visuals in TSR III*. To determine maximum permissible disturbance in plan view, the perspective number was converted to an area weighted average slope for each VQO category and the corresponding P2P ratio for that slope class is applied. This number is then multiplied by the percent alteration, to derive a planimetric number for modelling purposes. Finally, an area-weighted average VEG tree height was determined for each VQO as well. These values are also displayed in Table 20.

Visual quality objective targets will be modelled for each landscape unit / vqo class combination using the maximum percent alteration percentages (plan view) and VEG heights from Table 20.

Table 20: VQO Assumptions

| Landscape Unit | VQO Class | CFLB Area (ha) | Average Slope (%) | P2P Ratio | Max. Percent Alteration (Perspective View) | Max. Percent Alteration (Plan View) | VEG Height (m) |
|-----------------|-----------|----------------|-------------------|-----------|--|-------------------------------------|----------------|
| Bulkley | m | 173 | 10.4 | 3.77 | 18.0 | 67.9 | 3.75 |
| Bulkley | pr | 1,481 | 14.8 | 3.77 | 7.0 | 26.4 | 3.75 |
| Bulkley | r | 1,215 | 11.3 | 3.77 | 1.5 | 5.7 | 3.75 |
| Burns Lake East | m | 684 | 11.6 | 3.77 | 18.0 | 67.9 | 3.75 |
| Burns Lake East | pr | 10,357 | 16.3 | 3.04 | 7.0 | 21.3 | 4.75 |
| Burns Lake East | r | 7,516 | 18.4 | 3.04 | 1.5 | 4.6 | 4.75 |
| Burns Lake West | m | 2,718 | 13.1 | 3.77 | 18.0 | 67.9 | 3.75 |
| Burns Lake West | pr | 6,772 | 15.5 | 3.04 | 7.0 | 21.3 | 4.75 |
| Burns Lake West | r | 2,573 | 20.0 | 3.04 | 1.5 | 4.6 | 4.75 |
| Francois East | m | 87 | 14.4 | 3.77 | 18.0 | 67.9 | 3.75 |
| Francois East | pr | 1,533 | 17.2 | 3.04 | 7.0 | 21.3 | 4.75 |
| Francois East | r | 246 | 14.0 | 3.77 | 1.5 | 5.7 | 3.75 |
| Taltapin | m | 798 | 14.7 | 3.77 | 18.0 | 67.9 | 3.75 |
| Taltapin | pr | 319 | 15.0 | 3.04 | 7.0 | 21.3 | 3.75 |

Data Source and Comments:

- VQO classifications from the rvqc_cd field of the rec_vlnd layer are used in the base case

4.9.5 Adjacency

Cutblock adjacency constraints are used to ensure that the timber supply reflects management towards a patch size distribution that mimic natural disturbances. This analysis uses the same approach to modelling this as was used in the Lakes TSA; ensuring that a maximum of 25% of the THLB is less than 3m in height at any particular point in time.

5.0 Growth and Yield

5.1 Natural Stand Yield Tables

Projected height, projected age, basal area, and species composition from the VRI are used to generate the yield tables for each polygon. These polygon-level yield tables are then carried into the timber supply model. Due to the large number of yield tables produced it is not feasible to include them in this data package. Digital versions of the yield tables can be provided.

5.2 Managed Stands

Growth and yield for all recently harvested stands not accurately reflected in the VRI as well as all future regenerated stands will be modelled with the Table Interpretation Program for Stand Yields (TIPSY) 4.1d.

Managed stand analysis units are defined using TEM site series and existing leading species as defined in the regeneration assumptions from Table 21.

Table 21: Base Case Regeneration Assumptions

| BGC Variant | Leading Site Series | SP1 | SP1 % | SP2 | SP2 % | SP3 | SP3 % | Initial Density | Regen Delay |
|-------------|---------------------|-----|-------|-----|-------|-----|-------|-----------------|-------------|
| ESSFmc | 01 | SX | 100 | | | | | 1400 | 2 |
| ESSFmc | 02 | PL | 100 | | | | | 1400 | 2 |
| ESSFmc | 03 | PL | 100 | | | | | 1400 | 2 |
| ESSFmc | 04 | PL | 50 | SX | 50 | | | 1400 | 2 |
| ESSFmc | 05 | SX | 100 | | | | | 1400 | 2 |
| ESSFmc | 06 | SX | 100 | | | | | 1400 | 2 |
| ESSFmc | 07 | SX | 100 | | | | | 1400 | 2 |
| ESSFmc | 08 | SX | 100 | | | | | 1400 | 2 |
| ESSFmc | 09 | SX | 100 | | | | | 1400 | 2 |
| ESSFmc | 10 | SX | 100 | | | | | 1400 | 2 |
| SBSdk | 01 | PL | 50 | SX | 50 | | | 1400 | 2 |
| SBSdk | 02 | PL | 100 | | | | | 1400 | 2 |
| SBSdk | 03 | PL | 100 | | | | | 1400 | 2 |
| SBSdk | 04 | PL | 50 | SX | 50 | | | 1400 | 2 |
| SBSdk | 05 | PL | 50 | SX | 50 | | | 1400 | 2 |
| SBSdk | 06 | PL | 50 | SX | 50 | | | 1400 | 2 |
| SBSdk | 07 | SX | 100 | | | | | 1400 | 2 |
| SBSdk | 08 | SX | 100 | | | | | 1400 | 2 |
| SBSdk | 09 | PL | 100 | | | | | 1400 | 2 |
| SBSdk | 10 | PL | 50 | SX | 50 | | | 1400 | 2 |
| SBSmc2 | 01 | PL | 50 | SX | 50 | | | 1400 | 2 |
| SBSmc2 | 02 | PL | 100 | | | | | 1400 | 2 |
| SBSmc2 | 03 | PL | 50 | SX | 50 | | | 1400 | 2 |
| SBSmc2 | 05 | PL | 50 | SX | 50 | | | 1400 | 2 |
| SBSmc2 | 06 | PL | 50 | SX | 50 | | | 1400 | 2 |
| SBSmc2 | 07 | PL | 50 | SX | 50 | | | 1400 | 2 |
| SBSmc2 | 08 | PL | 50 | SX | 50 | | | 1400 | 2 |
| SBSmc2 | 09 | SX | 100 | | | | | 1400 | 2 |
| SBSmc2 | 10 | SX | 100 | | | | | 1400 | 2 |
| SBSmc2 | 12 | SX | 100 | | | | | 1400 | 2 |

5.2.1 Operational Adjustment Factors

An OAF 1 value of 80% will be used for pine-leading plantations ($\geq 50\%$ pine) to reflect the impacts of rust. All other planted stands will be modelling used a standard OAF 1 value 85%. An OAF 2 value of 95% will be used for all stands.

5.2.2 Site Productivity Estimates

The Burns Lake Community Forest completed a TEM project in 2007 which provides site series information for the entire CFA area.

The provincial SIBEC database, correlated with TEM site series will be used to provide site productivity estimates for each TEM polygon. SIBEC values from the leading site series and leading regenerated species will be used wherever possible. Inventory site index values will be area-weighted across the analysis unit where SIBEC values do not exist.

Table 22: SIBEC Values⁷

| BGC Variant | Site Series | SIBEC Site Index Value (m) |
|-------------|-------------|----------------------------|
| ESSFmc | 01 | 15.4 |
| ESSFmc | 02 | 9.0 |
| ESSFmc | 03 | 15.9 |
| ESSFmc | 04 | 15.0 |
| ESSFmc | 05 | 17.6 |
| ESSFmc | 06 | 19.6 |
| ESSFmc | 07 | 15.0 |
| ESSFmc | 08 | 9.0 |
| ESSFmc | 09 | 9.0 |
| ESSFmc | 10 | 16.3 |
| SBSdk | 01 | 19.5 |
| SBSdk | 02 | 15.9 |
| SBSdk | 03 | 16.2 |
| SBSdk | 04 | 15.0 |
| SBSdk | 05 | 18.6 |
| SBSdk | 06 | 21.9 |
| SBSdk | 07 | 19.4 |
| SBSdk | 08 | 21.0 |
| SBSdk | 09 | 12.0 |
| SBSdk | 10 | 12.0 |
| SBSmc2 | 01 | 17.9 |
| SBSmc2 | 02 | 16.2 |
| SBSmc2 | 03 | 14.7 |
| SBSmc2 | 05 | 19.1 |
| SBSmc2 | 06 | 19.9 |
| SBSmc2 | 07 | 12.0 |
| SBSmc2 | 08 | 21.0 |
| SBSmc2 | 09 | 20.4 |
| SBSmc2 | 10 | 18.9 |
| SBSmc2 | 12 | 11.2 |

⁷ Site index values are based on the 2nd Approximation SIBEC Database (2008) from <http://www.for.gov.bc.ca/HRE/sibec/reports/sisuByRegion2008.xls>.

5.2.3 Genetic Gains

The Burns Lake Community Forest uses genetically improved stock for all planted spruce seedlings. Pine seedlings are sewn from locally harvested and processed seed stock. Based on the Ministry of Forest and Range species plans for Seed Planning Unit (SPU) #35⁸ (interior spruce Bulkley Valley Low), spruce managed stand volumes are modelled using 21% genetic gains for all stands except those in the ESSF. These represent the average projected gains between 2010 and 2014.

5.3 Log Grades and Mountain Pine Beetle

Mountain pine beetle-killed volume represents a significant component of the existing growing stock of the CFA, and salvage of this volume is important in the short-term. Beyond this it is also important to understand how the grade profile of the community forest might change over time. While understanding the rate at which the sawlog component will deteriorate over time is important, it is also important to understand the alternative products that will result and the economics associated with delivering these to market.

Timberline has been involved in a number of shelf life and stand quality projects over the last five years. Through work completed on behalf of the MoFR as well as the Merrit TSA licensee group, a shelf-life curve has been developed that identifies the grade proportion (using standard MoFR grade criteria) and merchantable net volume for pine as it relates to time since attack⁹. The curve is derived from data collected through two projects in which 461 trees were destructively sampled throughout B.C. (Table 23) through a contract with the Ministry of Forests and Range in 2006 and 2007. The trees were bucked to 5m log lengths or longer and from stump height up to 10cm utilization and scaled in the bush to determine grade and merchantable volumes. Scaling was completed by a certified scaler on the same day the trees were fallen. The estimated age of MPB attack sampled was from 1 to 9 years.

Table 23: Log Data Used for Shelf-Life Analysis

| Geographic Location | Sample Year | Log Count | Net Volume (m³) |
|----------------------------------|--------------------|------------------|-----------------------------------|
| Burns Lake | 2006 | 440 | 76.7 |
| North (Quesnel and area) | 2007 | 239 | 42.9 |
| Quesnel | 2006 | 471 | 79.6 |
| South (Kamloops and Monte Creek) | 2007 | 92 | 19.1 |
| Vanderhoof | 2006 | 456 | 78.1 |
| Total | | 1698 | 296.3 |

⁸ <http://www.for.gov.bc.ca/hti/speciesplan/SPU35.pdf>

⁹ Webb, Jim. Timberline. Shelf-life Curve Update. May 2009.

In general terms, the majority of the net volume scaled in the shelf-life projects was grade 2. Grade proportion in the initial two years after MPB attack reflect a non-MPB attacked stand and grade proportion from year three onwards reflect degrade as trees dry (Figure 3). The data shows that relative to a green tree, little degradation occurs in year one due to checking although this is more noticeable in year two. Merchantable percent for grades one and two remains relatively consistent in the initial six years after MPB attack and starts to decline as of year seven (Figure 4). The merchantable percent of grade four declines steadily over all years sampled. The sample size sampled seven to nine years after attack was small relative to other years sampled.

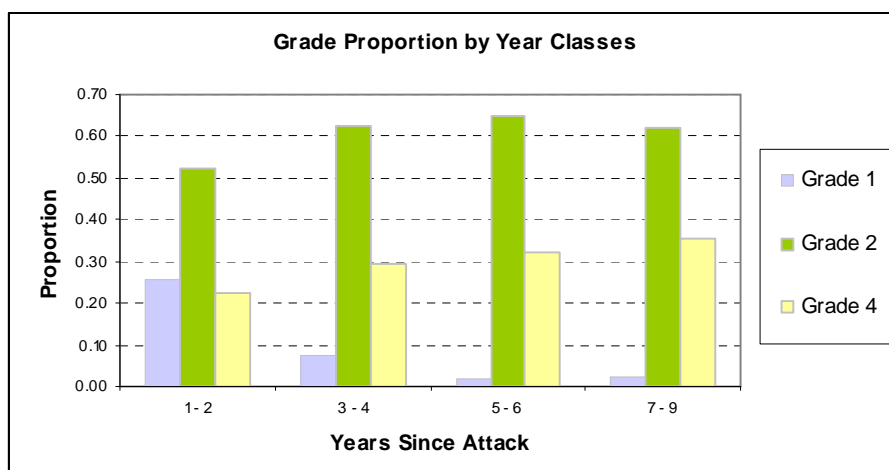


Figure 3: Proportion of Grade by Field Estimated Year of MPB Attack

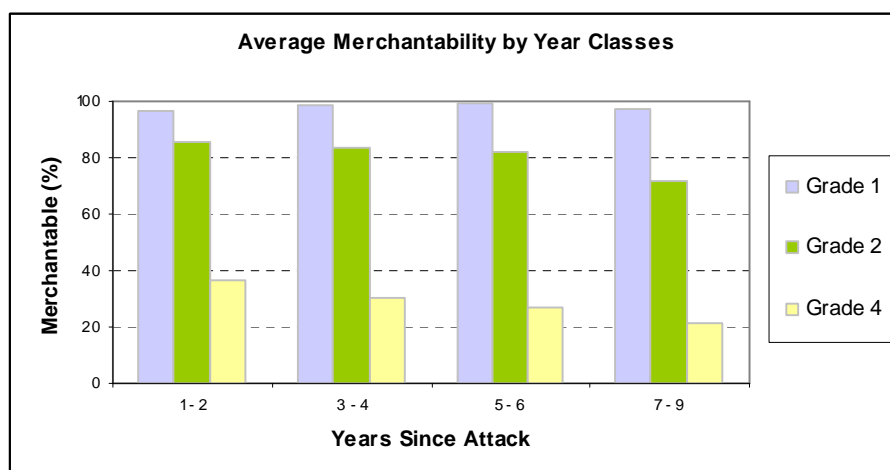


Figure 4: Merchantability of Grade by Field Estimated Year of MPB Attack

The shelf-life curve developed (see Figure 5) reflects the net stand volume in grades 1, 2 and 4 as well as decay or non-recoverable volumes. The following assumptions were used in developing the shelf-life curve.

Assumptions:

1. These curves reflect a combination of observed data and expert opinion. Data was collected for stands up to nine years since attack. Beyond nine years the curve is based on expert opinion.
2. Net merchantable volume is for the pine component in a stand based on the predominant year of attack. It is weighted for each grade by the proportion of the grade sampled in the year of attack.
3. In many stands, several years of multiple attacks occur. Year of attack was calculated based on the average (volume-weighted) year of attack for a stand.
4. Grade 1 volume, while scaled in the field in trees up to eight (8) years after attack, no longer exists in the mill output data five (5) years after attack and has been modelled accordingly.
5. Decay in standing trees sampled was <2% on average in stands up to 9 years after attack. Decay and non-recoverable proportions increase as fallen trees in contact with the ground decay more rapidly than trees standing.
6. While minor amounts of deadfall will occur, the extent of deadfall is projected to increase 15 to 20 years after attack. Fallen trees become part of the non-recoverable proportion.
7. Grade 4, while <50% merchantable, includes a component that can be milled.
8. Averages are for the province.
9. Averages are for all piece sizes.

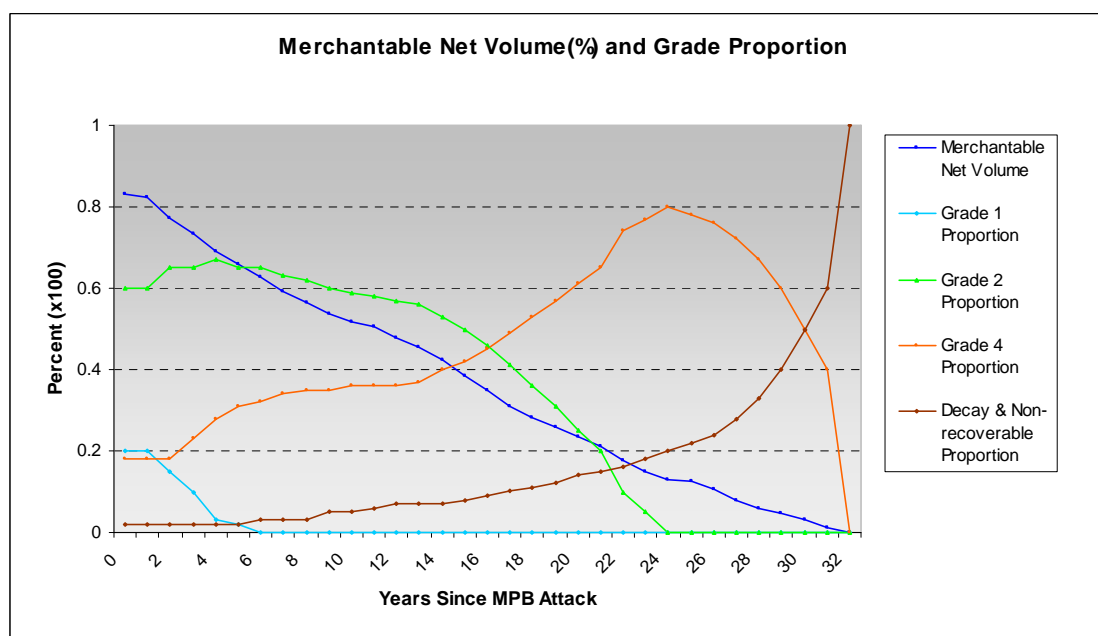


Figure 5: Shelf-life by Grade Proportion and Merchantable Net Volume

The shelf-life grade distributions shown in Figure 5 will be applied to the pine component of the volume curve for all existing stands impacted by mountain pine beetle. Using this approach the model will track the individual grade components of the volume curves. Unless otherwise utilized, the decay and non-recoverable proportion of the stand volume will be considered as unsalvaged loss to be reported out of the model separately. Only the merchantable portion of the volume will contribute achieving stand-level merchantability limits.

In addition to the above, each address four different grades of forest products from the land base: deciduous volume (OSB and / or pulp); live pine sawlog; dead pine sawlog; dead pine biomass; and other conifer sawlog based on the following assumptions:

- 1) all pine volume is assumed to have been attacked and killed in 2005;
- 2) biomass volume remains in the stand but does not contribute to either the harvest volume objective or the stand's merchantability threshold of 140m³/ha; and
- 3) a stand ceases to become operable once its merchantable volume drops below 140 m³/ha.

Stands that drop below the minimum merchantability limits may re-achieve merchantability due to the growth of the remaining trees; however natural regeneration under the dead pine has not been modelled.

5.3.1 Natural Regeneration

Unharvested stands that are $\geq 70\%$ pine will maintain their 2005 age until 2020 at which time they will revert to a natural stand at age zero based on the existing stand attributes. All other stands will continue to have their non-pine component continue to grow normally and the pine component will continue to deteriorate according to the shelf life curve above. Stands that fall below the minimum merchantability criteria will become unavailable for harvest.

5.4 Volume Reductions

The following describes reductions that will be applied to volume curves in the forest estate model.

5.4.1 Stand-Level Retention

The *Biodiversity Guidebook* describes two methods for providing the maintenance of stand structure over time. One method is wildlife trees while the other is wildlife tree patches. The Guidebook also indicates that wildlife tree patches (group reserves) larger than 2 hectares in size within a cutblock boundary can contribute to old-seral stage forest requirements at the landscape level.

The CFA is covered primarily by the recently approved *Lakes North Sustainable Resource Management Plan (SRMP)* with a small portion of the Francois East landscape unit covered under the *Lakes South Sustainable Resource Management Plan*. Each of these plans prescribe minimum stand level retention requirements as described in Table 24. Higher Level Plan Result 3 from the current FSP is consistent with the retention target in the *Lakes North SRMP*.

Higher Level Plan Result 3:

Within all Forest Development Units, the licensee during the term of this FSP, shall conform to the following requirements for Wildlife Tree Retention (WTR):

(a) Where the licensee completes harvesting in one or more cutblocks during any 12 month period beginning on April 1 of any calendar year, the holder must ensure that, at the end of that 12 month period, the total area covered by WTR areas that relate to the cutblocks is a minimum of 10% of the total cutblock area of the cutblocks.

Where they harvest a cutblock greater than 3 hectares the licensee must ensure that, at the completion of harvesting, the total amount of WTR areas that relate to the cutblock is a minimum of 5% of the cutblock area.

The licensee must ensure that high wildlife value trees/areas are retained after harvest. Where there are few trees with high value wildlife attributes available, locate retention on a priority basis as follows:

In areas most suitable for long-term wildlife tree recruitment, and

In areas that are representative of the pre-harvest stand.

Operationally, there is significant overlap between WTP retention and other retention areas such as riparian reserve zones, sensitive ecosystems and small and inoperable areas. To avoid double counting these retention requirements previously accounted for netdowns to the land base are subtracted from the stand level retention targets. Where these reductions equate to less than the stand level retention requirements an additional percentage is removed from the THLB.

Field data collected for the between 2005 and 2009 on 73 cutblocks throughout the Nadina Forest District (4 blocks located within the CFA) shows that the average level of retention on cutblocks is 11.5%. This percentage includes WTP and any dispersed retention left on cutblocks. This data shows that 55.4% of that retention is constrained for one or more of the following: riparian reserve, riparian management zone, wet site, rock outcrop, non-commercial brush, non/low merchantability, sensitive terrain or soil, OGMA or visuals.¹⁰ However, the Burns Lake CFA contains a disproportionate amount of harvesting constraints with over 42% (24,362 ha) of the THLB impacted by VQO, wildlife or landscape level biodiversity targets (Table 16). In addition to this, mature+old and old constraints are applied to the entire land base.

As shown in Table 24 the percentage of forested non-thlb within each landscape unit far exceeds the SRMP stand level retention targets. Through a combination of non-THLB and harvesting constraints, it is believed that management for stand level retention is adequately addressed such that any additional reduction would overestimate the timber supply impact of this factor. A 5.5% reduction will be applied as a volume reduction to all existing and future managed stand yield curves.

¹⁰ personal communication Agathe Bernard, March 4th, 2010.

Table 24: Stand Level Retention Targets

| SRMP | Landscape Unit | Subzone | Stand Level Retention Target % | Current % Forested Non-THLB |
|-------------|-----------------|---------|--------------------------------|-----------------------------|
| Lakes South | Francois East | SBS | >14 | 38% |
| | | ESSF | >9 | |
| Lakes North | Bulkley | All | >10 | 26% |
| | Burns Lake East | | | 27% |
| | Burns Lake West | | | 29% |
| | Taltapin | | | 17% |

5.4.2 Future Road Reductions.

Much of the Burns Lake CFA area is already roaded. However some areas will see additional roads as harvesting in undeveloped areas occurs. In the timber supply model these reductions will be applied after a stand in an unroaded area is harvested for the first time. It is assumed that the area occupied by future roads will be similar to the proportion of the land base currently occupied by roads. This percentage is calculated by dividing the road reduction in the currently roaded portion of the land base by the CFLB of that area. For this assessment, all areas within 1000m of an existing road are considered to "roaded".

Table 25 shows that approximately 2.38% of the "roaded" land base is currently occupied by permanent roads. This percentage will be applied as a yield curve reduction to future managed stands as they are harvested in the "unroaded" land base.

Table 25: Future Road Reduction Percentages

| Distance From Existing Road (m) | CFLB Area (ha) | Existing Road Reduction (ha) ¹¹ | Percent Road |
|---------------------------------|----------------|--|--------------|
| <=1000 | 70,499 | 1,675 | 2.38% |
| >1000 | 7,961 | 0 | 0.00% |

6.0 Forest Estate Model

Spatial analysis will be conducted using the Patchworks spatial optimization model. Patchworks is a spatially explicit harvest scheduling optimization model developed by Spatial Planning Systems in Ontario. It is capable of developing spatially explicit harvest allocations that explore trade-offs between a broad range of conflicting management and harvest goals.

For this analysis Patchworks will be formulated to maximize harvest volume while meeting all the required management objectives.

¹¹ Areas removed for transmission and pipeline right-of way are excluded from this number.

Harvest scheduling decisions are based on maximizing the harvest forecast over the long-term subject to meeting non-timber and other management objectives on the land base. As such, there are no explicit harvest rules, other than minimum merchantability limits, applied to the model. Merchantability limits are set up such that no stands may be harvested before they have achieved 140m³/ha. All scenarios must maintain a sustainable growing stock level in the long-term.

Patchworks is approved for use in Timber Supply Review and Management Plan analysis by the Ministry of Forest and Range Forest Analysis and Inventory Branch.

7.0 Sensitivity Analysis

Sensitivity analysis results help quantify the degree to which uncertainty in the analysis might affect the resulting timber supply for the land base. The sensitivities listed in Table 26 are being considered in the analysis. This list will be refined in consultation with other stakeholders as the analysis is conducted.

Table 26: Potential Sensitivity Analysis Scenarios

| Scenarios |
|--|
| Increase the minimum harvestable volume to 200 m ³ /ha. |
| Decrease the minimum harvestable volume to 100 m ³ /ha. |
| Regenerated stand yields +/- 10% |
| OAF 1 - 12% for pine-leading; 7% for everything else |
| Decrease shelf life (increase grade 4 percentage by 10% 5 years post attack). |
| Visual Quality Objectives - assess draft VQO impact. |
| Utilize 100% available genetically improved stock for pine and spruce |
| Fertilize pine (no existing stands) and spruce leading stands between 40 and 60 years of age |
| Rehabilitate stands that fall below 140 m ³ /ha |