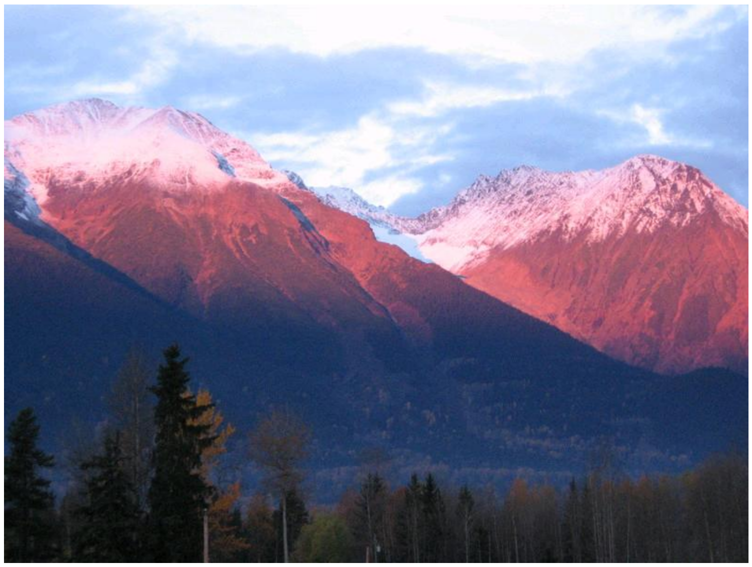
Bulkley
Timber Supply Area



Higher Level Plan Order Analysis

December 14, 2011

Prepared for:

Government and Forest Licensees Operating within the Bulkley TSA

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- Canadian Forest Products Ltd.
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Executive Summary

This document summarizes the results of ten analyses for the Bulkley Timber Supply Area to report on the current and near-future status of strategies that address various landscape-level objectives set by government or established within forest stewardship plans. The report describes the approach for setting up the analyses and details each analysis as separate sections.

The specific analyses undertaken are listed below along with the total area of crown forest land base where the constraint status currently exceeds the established limits for that indicator.

- Seral stage distribution (Limits exceeded on 100,000 hectares)
- Core ecosystems (Limits exceeded on 0 hectares)
- Landscape riparian corridors (Limits exceeded on 14,000 hectares)
- Key forested caribou habitat (Limits exceeded on 0 hectares)
- DRAFT Telkwa caribou wildlife habitat area (Limits exceeded on 26,000 hectares)
- High-value grizzly bear habitat (Limits exceeded on 1,000 hectares)
- Mixed forest grizzly bear habitat (Limits exceeded on 100 hectares)
- Sensitive watersheds(ECA Limits exceeded on 0 hectares)
- Patch size distribution (Limits exceeded on 85,000 hectares)
- Combined constraint status (Limits exceeded on 110,000 hectares - 21%)

It is emphasized that further harvesting will not necessarily be curtailed where limits are exceeded. Rather, this category identifies that closer examination is required to determine an appropriate strategy to address the established criteria.

This report also includes recommendations to consider for implementing the results and improving future analyses.

Two additional products are associated with this report: 1) an excel workbook that provides detail summaries for each analysis allowing users to sort and filter data, and 2) a set of digital maps (Biodiversity, Wildlife, Watershed, Patch Size and Status) that are explored using Adobe Reader™ that allows users to pan, zoom, turn on/off spatial layers and print any desired view. Altogether, these products present information that planners and observers can consider at various scales and extents.

Acknowledgements

The following individuals and organizations provided significant support to this project that was instrumental in preparing this document and other associated products:

- Alan Baxter and Dave Ripmeester of Pacific Inland Resources Ltd., for providing clear and timely direction on all aspects of these analyses.
- All Bulkley TSA licensees for collecting spatial data for recent operational development activities (e.g., roads and blocks).
- Cindy Barden of BC Timber Sales for gathering and integrating the operational spatial data into a common standard format.
- Glen Buhr and Hubert Burger of the Ministry of Forests, Lands and Natural Resource Operations for providing insight and advice relating to the timber supply review process currently underway.

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1 Introduction

Forest licensees operating within the Bulkley TSA require access to baseline and periodic analyses that report on the current and future status of various landscape-level objectives set by government through the Ministry of Agriculture and Lands Order Establishing Land Use Objectives: Bulkley TSA (Bulkley HLPO – November 2006). For further direction, this project also considers earlier objectives set in the 2005 Bulkley Valley Sustainable Resource Management Plan, as well as, the 2000 Bulkley LRMP and associated Landscape Unit Plans (Bulkley LUPs – September 1999) approved for twelve of the fourteen Landscape Units (LU). As well, this project considers fisheries sensitive watersheds established through a government action regulation (December 2005) and sensitive watersheds identified by the forest district manager and regional fish, wildlife and habitat manager (February 2000). Analyses from this project will help to provide guidance on future development opportunities in the Bulkley TSA.

1.1 Project Objectives

The objectives for this project are:

1. To analyze the current and future planned state of several key indicators:
    - Seral stage distribution by LU and Biogeoclimatic Ecosystem Classification (BEC)
    - Harvest disturbance within Core Ecosystems (CE) since January 1998
    - Distribution of stands greater than 80 years old in Landscape Riparian Corridors (LRC)
    - Patch size distribution by LU and Natural Disturbance Type (NDT)
    - Distribution of stands greater than 50 years old in high-value grizzly bear habitat (GB)
    - Distribution of stands less than 3 meters tall in mixed forest grizzly bear habitat (GBA)
    - Distribution of stands greater than 90 years old in key forested caribou habitat (KFCH)
    - Seral stage distribution in the Telkwa Caribou Recovery Area (TCRA) as proposed in the DRAFT Telkwa Caribou wildlife habitat area (WHA)
    - Indicator status for sensitive watersheds
    - Wildlife tree retention by LU and BEC for blocks harvested since inception of the Forest Stewardship Plan (FSP) in January 2007
2. To develop a product that identifies areas where planned harvest activities exceed or nearly exceed constraints imposed by legislated government objectives. It is emphasized that further harvesting must not necessarily be curtailed where limits are exceeded. Rather, this category identifies that closer examination is required to determine an appropriate strategy to address the established criteria.
3. To inform or confirm approaches and results from the timber supply review (TSR) process currently underway for the Bulkley TSA.

1.2 Study Area

The study area covers operating areas for all major licensees within the Bulkley TSA as of April 2011 (see Figure 1). While objectives for shared LU/watersheds are not currently applied on a prorated basis, licensees may consider this approach as development progresses.

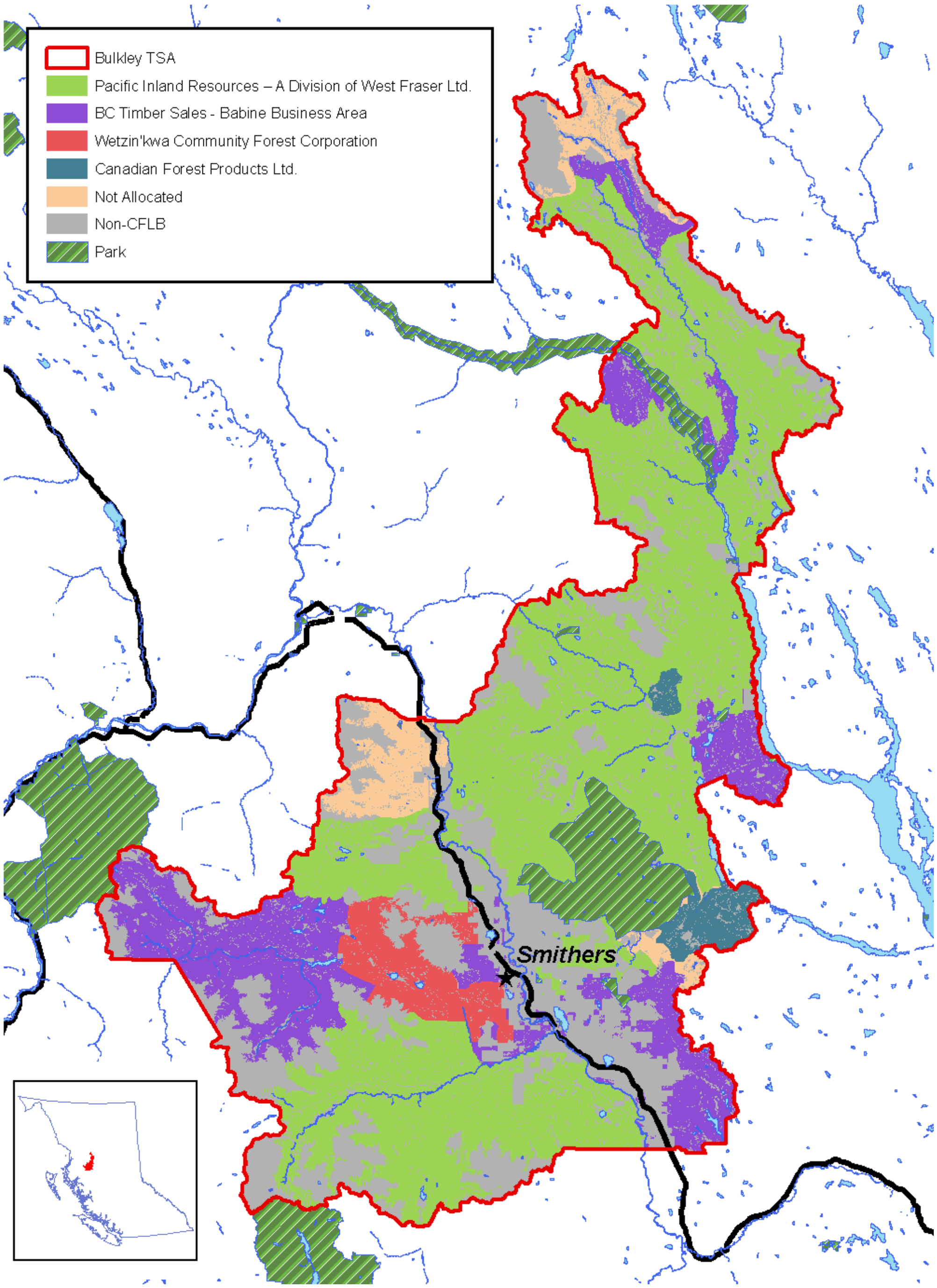

Figure 1 Operating Areas of Major Licensees

1.3 Date of Record

The statistics produced in this report are current to March 31, 2011. The forest inventory was adjusted to reflect areas recently disturbed but not already captured. This update information was provided by the TSA licensees in May 2011.

2 Approach

This section describes the data, methods and objective criteria used for these analyses. Additional details specific to each analysis are provided in subsequent sections.

2.1 Confirming Objectives

With any successful project, it is important to establish focus and clarity early in the project by defining the purpose, breaking the various analyses down into smaller parts, identifying how progress is measured and illustrating the key deliverables. This provides context for developing an appropriate and efficient approach to achieve the desired results. Two related items are used to confirm the project objectives and describe how the analyses will be carried out.

A sample summary is prepared as an Excel workbook that is intended to provide a preliminary look at the format for summarizing project results. Although it contains no actual data, the sample summary provides users with a product to examine to help generate discussion and ensure that the analyses meet the project objectives. Ultimately, it is used as a foundation for building our analyses (i.e., our limit).

Similarly, a sample report is prepared to provide users with a preliminary look at the approach used to undertake the analyses and how the results are planned for presentation.

2.2 Data Gathering and Preparation

The basic approach for this project is to gather and prepare data, and then create a resultant database that incorporates all the pertinent information for the various analyses. Each subsequent analysis is derived from queries of the resultant database.

2.2.1 Data Sources

Many spatial data layers are combined as input to the analysis described in this report. For reference, these data are listed in Table 1.

Table 1 Data layers

Feature	Name	Source	Current	Acquired	Result (1)
Biogeoclimatic ecosystem classification (V7)	BEC_POLY	GeoBC	Mar 2008	Apr 2011	No
Parks	TA_PEP_SVW	GeoBC	Nov 2008	Apr 2011	No
Landscape Units	RMP_LU_SVW	GeoBC	Jan 2008	Apr 2011	No
Freshwater atlas – lakes	FWLKSPL	GeoBC	Sep 2008	Apr 2011	No
Freshwater atlas – wetlands	FWWTLNDSPL	GeoBC	Sep 2008	Apr 2011	No
Freshwater atlas – rivers	FWRVRSPL	GeoBC	Sep 2008	Apr 2011	No
Freshwater atlas – streams	FWSTRMNTWR	GeoBC	Sep 2008	Apr 2011	Yes
Core ecosystems	econet_dbu_v2	ILMB (2)	Jul 2007	Apr 2011	No
Landscape riparian corridors	econet_dbu_v2	ILMB (2)	Jul 2007	Apr 2011	No
High value grizzly bear habitat	wild_2000a	ILMB (2)	Jun 2006	Apr 2011	No
Mixed forest grizzly bear habitat	wild_2000a	ILMB (2)	Jun 2006	Apr 2011	No
Key forested caribou habitat	wild_2000a	ILMB (2)	Jun 2006	Apr 2011	No
Telkwa caribou recovery area	BulkleyStudyAreaV2	PIR	Apr 2009	Apr 2011	No
Sensitive Watersheds - IWAP	PIR_Watershed_Pierre	PIR	Aug 2008	May 2011	Select
Sensitive Watersheds - FSW	FSW	ILMB (2)	Apr 2007	May 2011	Select
Sensitive Watersheds - Atlas	FTHO_WTR	resultant38_v2	Feb 2011	May 2011	Select
Operating Areas	DSS_OperatingAreas	PIR	Apr 2011	Apr 2011	No
Forest Development Units	FDU	Licensees (3)	Apr 2011	May 2011	Yes
Existing roads	District_roads_20k	MNFLR-District	Dec 2010	Apr 2011	Yes
Proposed roads	Planned_Roads	Licensees (3)	Apr 2011	May 2011	Yes
Existing blocks	Blocks	Licensees (3)	Apr 2011	May 2011	Yes
Proposed blocks	Proposed_Blocks	Licensees (3)	Apr 2011	May 2011	Yes

Feature	Name	Source	Current	Acquired	Result [1]
Retention / leave areas	Leaves	Licensees [3]	Apr 2011	Jun 2011	Yes
TSR3 Preliminary Resultant (no VRI)	resultant38_v2	MNFLR-District	Feb 2011	Feb 2011	Yes
Vegetation Resources Inventory	VRI_adj_may3	MNFLR-District	Jan 2009	Feb 2011	Yes
Forest Cover (FC1)	LVEG_R1_PLY_Nov07	PIR	Nov 2007	Jun 2011	Yes

(1) Indentifies features incorporated into the project resultant (Yes) and those used for checking/mapping (No).
(2) http://www.ilmb.gov.bc.ca/slrp/lrmp/smithers/bulkley/legal_documents/index.html
(3) Operational data is gathered, integrated and cleaned by Cindy Barden of BC Timber Sales.

2.2.2 Preparation

As data is gathered, appropriate features are examined and verified that they are appropriate for use in these analysis. At the same time, appropriate fields are identified and documented. Where necessary, data is cleaned to eliminate topological errors – typically gaps, overlaps and closed polygons.

The input data is converted into features in a single geodatabase. This provides easy access in the future and ensures the format remains constant. A schema for the input layers is provided in Appendix I. For future reference, it is imperative that the schema remain unchanged so that the results can be replicated. In this case, copies of both the resource resultant file and, where available, original input features are included for reference.

2.2.3 Forest inventory update

Previous analyses for these objectives utilized an earlier forest cover inventory. The new VRI for the Bulkley TSA was completed in 2008 and this project is among its first applications. In preparation for these analyses, it was discovered that approximately 10,000 hectares of harvested area was not accurately represented in the VRI. As well, historic data is unavailable or inaccurate in many cases. To ameliorate these discrepancies, licensees provided spatial harvest data that was incorporated into the analyses.

Until we are confident that the VRI update routines are spatially accurate, current and complete, the forest inventory must be checked and, where necessary, updated for recent disturbance and projected for age and height. Spatial data for harvesting and retention areas is provided by licensees and collated into a single layer. This includes blocks that are recently harvested, as well as, those planned for harvest in the near future. Similarly, any available information on recent wildfire disturbance is acquired and merged.

It should be noted that internal retention areas associated with planned, or near-future, harvest areas are typically not identified which over-estimates the near-future harvest areas. Because a near-future period was not implemented, analyses that explored the near-future status of specified criteria only used the disturbance information and did not "grow" the remaining forest.

After cleaning and verifying, the updated linework is incorporated into the forest inventory and various attributes are adjusted. If necessary, the entire inventory is projected to the date of record (see section 1.3) to produce new ages, volumes, heights and site indices for each record.

2.2.4 Road Inventory

A road inventory is required to define the CFLB and for the analysis of sensitive watersheds. Like the block information discussed above, this is a dynamic layer that is difficult to keep updated with linework and status for the entire TSA. Spatial data for recently built and planned roads is provided by licensees and collated into a single layer. The current district road layer does not identify the road type or classification so road segments are identified in this feature based on the assigned buffers.

2.2.5 Resultant

The resultant for this project is the primary database for undertaking the various analyses. It is the spatial union of appropriate features. In this project, a recent resultant of various resource information is available through the Ministry of Forests Lands and Natural Resource Operations (MFLNR). The resource resultant is combined with the updated forest inventory and a few other layers (e.g., sensitive watersheds) to produce the preliminary project resultant. It is important to note that this approach may be less effective for incorporating future changes to the resource data as the process will require more significant reprogramming.

Typically, a union of spatial data creates slivers where the linework for the input features is slightly different. Slivers are identified as extremely thin and irrelevant polygons to the overall analysis. These are systematically eliminated through another spatial process.

2.3 Data Processing and Analysis

2.3.1 Generalize the landbase

Once the data is integrated into a single resultant file, fields are added to assist in preparing summaries. The following steps are applied:

1. The Crown Forested Land Base (CFLB) is identified as the productive forested land that contributes towards meeting various forest cover constraints. This is derived based on forest cover and ownership attributes. Areas excluded from the CFLB are described in Table 2.

Table 2 Description of areas excluded from the Crown Forested Land Base

Description	Attributes	Area (Ha)
Total Area		765,373.2
Non-Crown Land	OWN = 40 Private, 50 Federal Reserve, 52 Indian Reserve, 77 Crown and Private Woodlot, 99 Crown Misc. Lease	65,580.9
Non-vegetated	BCLCS level 1 equal to 'N' and no logging history	64,341.4
Non-treed	BCLCS level 2 = 'N' and no logging history	80,661.6
Alpine	BCLCS level 3 = 'A' and no logging history	-
Stand height < 5m	PROJ_HEIGHT < 5 and no logging history (Rank 1 only)	2,935.2
Crown closure <20%	CC_L1_L2 <20 and no logging history	18,086.8
Roads	Excluded based on road class buffers (one-sided): Paved - 20 m, 2 Lane Gravel – 15 m, 1 Lane Gravel - 10 m, Unimproved - 5 m.	7,336.8
	Net CFLB	526,430.4

2. Natural disturbance is assigned based on BEC variant according to the LU Planning Guide. All NDT 3 polygons are considered to be 3A (Fd absent).
3. Seral stage is assigned to stands based on age ranges and BEC Variant (see Table 3). Where the status indicates that the polygon is NSR or approved for harvest, the seral stage is set to early.

Table 3 Criteria for assigning seral stage

	Seral Stages (Age Ranges)			
BEC Variant	**Early**	**Juvenile (1)**	**Mature**	**Old**
CWHms2/ws2	< 40 years	40 to 79 years	≥ 80 years	≥ 250 years
ICHmc1/mc2	< 40 years	40 to 100 years	≥ 100 years	≥ 250 years
SBSdk/mc2	< 40 years	40 to 100 years	≥ 100 years	≥ 140 years
MHmm2	< 40 years	40 to 120 years	≥ 120 years	≥ 250 years
ESSFmc/mk/wv	< 40 years	40 to 120 years	≥ 120 years	≥ 250 years

(1) Juvenile seral stages are additional classes specific to this project.

4. Patches are assigned according to 20-year age classes and relative size. As this is specific to only one analysis, the steps used to assign patch size to each polygon are described in section11.

5. Equivalent clearcut area (ECA) is an indicator related to hydrologic recovery of a watershed. ECAs assigned according to stand heights. As this is specific to only one analysis, the steps used to assign ECA to each polygon are described in section10.

2.3.2 Define assumptions

With each analysis described in the sections below, the methods include one or more set of assumptions used to carry out and report on the analysis. Limits are specified in some cases, while others simply report on the current and/or the near future status.

2.3.3 Prepare and run queries

For each assumption, one or more queries are prepared and stored in the reporting geodatabase. These queries are used to summarize and organize information so that it is easily imported into the summary of statistics workbook.

2.4 Summary of Statistics

The results for each analysis are provided in an Excel workbook and enable most users to create custom summaries by applying various highlighting, sorting and filtering techniques. This also improves the presentation of this report by focusing on specific results and referencing the table rather than including all the results in appendices that are less flexible for conducting further exploration. If necessary, specified results in the workbook can be locked, or prevented from being revised, but unfortunately this shuts key features like sorting and filtering off.

2.5 Mapping

The geodatabase (Reporting.mdb) contains the appropriate features for this analysis. These are used with a series of ArcMap files (.mxd) formatted to illustrate each analyses (e.g., seral stage by landscape unit). After saving the files, it is necessary to re-establish links between the features in the Reporting.mdb geodatabase and the layers in the ArcMap files using the new data directories.

These mapping tools allow the user to zoom to any area of interest and generate a map based on themed data to provide additional context for the reported statistics.

2.6 Quality Assurance

Quality assurance (QA) is the systematic monitoring and evaluation of various aspects of a project. The QA is intended to check that the process and results are suitable for the intended purpose and that mistakes are eliminated. For this project, the processes employed for QA is described in Table 4.

Table 4 Quality assurance processes

Stage	Process
Input Data	Assess the input data using standard geographic information system (GIS) topology rules.
Resultant	Assess the resultant using visual comparisons of symbolized fields relative to input features and using quantitative summaries of various fields (e.g., area comparisons). As well, review the process used to prepare the resultant.
Maps	Visually assess the maps for standard features (e.g., legend, scale, description), and general presentation (e.g., symbology, labelling, complexity).
Report	Review the final report for general presentation and comprehension, concision, grammar and standard document features (e.g., links, appropriate sections).

2.7 Summary of Data Limitations

Table 5 summarizes the data limitations identified throughout these analyses and how each was addressed. This is intended to provide users with a better understanding of the affect these data limitations might have on the results.

Table 5 Summary of data limitations

Data	Limitations	Considerations	Affect on Results
VRI	Approximately 10,000 hectares of harvested areas are not assigned in the VRI (mostly recent openings but some earlier ones as well).	Licensees provided spatial harvest data that was incorporated into the analyses.	Improved accuracy for seral stage conditions.
VRI	Leave areas less than 2.5 hectares are dropped from the VRI.	Licensees provided spatial leave area data that was incorporated into the analyses.	Improved accuracy for seral stage conditions.
VRI	Scattered stands are incorrectly assigned as silviculture openings.	Identified but not adjusted.	Small patch size results are overestimated. CFLB may be slightly overestimated.
VRI	Early stand heights may not be accurate.	Identified but not adjusted.	Results for mixed forest grizzly bear habitat and sensitive watersheds may be overestimated.
Proposed Blocks	Leave areas are not assigned.	Identified but not adjusted.	Near-future disturbance results are overestimated.
Proposed Blocks	Plan period varies by licensee.	Near future results are not time-bound or complete.	Near-future disturbance results are underestimated.
Proposed Blocks	Future exceeded units.	Addressed disturbance only. Remaining forest was not adjusted so some stands may have grown in age and height beyond key criteria within the near-future period.	Constraint status may change for a variety of analyses.
BEC	Mapping is captured at a small scale resolution.	Variant boundaries are not accurate at larger scales. Some areas are grouped.	Possibly erroneous results with small areas for seral stage, TCRA and patch size analyses.
Roads	Road class or type is not accurate (i.e., mainline, branch, spur), however the spatial network appears to be complete.	Except for roads coded as trails, the entire road network was used along with assigned buffers for each section. Some mapped roads appear to be skid trails.	CFLB is slightly underestimated.
Roads	Road status is not accurate (i.e., active/inactive/deactivated)	Except for roads coded as trails, the entire road network was considered to be active.	Road and stream crossing density indicators for sensitive watersheds are overestimated.

Recommendations to improve these data limitations for future analyses are provided below in section 13.

3 Seral Stage Analysis

Biodiversity objective 1.1 in the approved Bulkley LRMP aims to maintain a natural seral-stage distribution and establishes seral stage limits for the forested portions of BEC variants.

Purpose

A seral stage analysis is periodically required to assess the current and near-future status relative to assigned limits and summarized in two ways:

1. By LU and BEC Variant, and
2. By LU, BEC Variant and Forest Development Unit (FDU) approved in existing Forest Stewardship Plans (FSP) under the Forest and Range Practices Act (FRPA)

Methods

Seral stages are assigned to stands within the CFLB based on age ranges. These are summarized relative to established limits by LU and BEC Variant, and then again by FDU, LU and BEC Variant.

Table 6 describes the objective criteria used to summarize results for this analysis.

Table 6 Objective criteria for the seral stage analysis

Reference Feature	Applicable Landbase	Forest Type of Interest	Limit
Each LU by BEC Variant	CFLB for each LU	Stand age criteria (seral stage) by BEC Variant	Designated in the Bulkley LRMP.
Each FDU by LU and BEC Variant	CFLB for each FDU	Stand age criteria by BEC Variant	Designated in the Bulkley LRMP.
Each LU by BEC Variant	CFLB for each LU	Pine Leading stands > 60 years of age	None.

Objective criteria are not currently available for the Kiseguecla LU, so for this LU, limits from the Trout LU were applied. Results

Figure 2 illustrates the overall breakdown of seral stages within the CFLB.

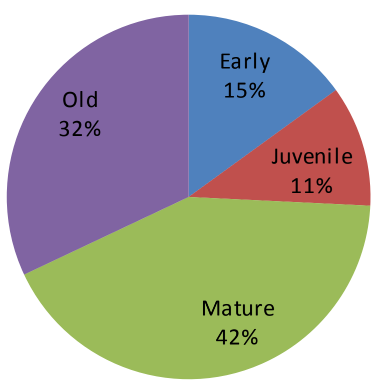

Figure 2 Overall seral stage distribution within the Bulkley TSA

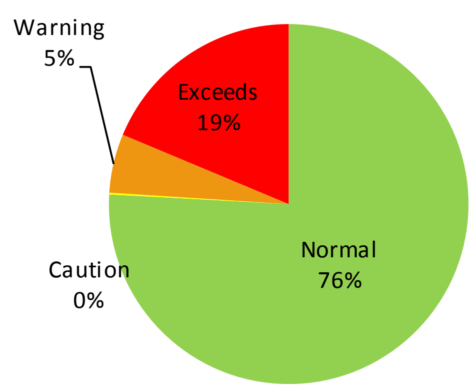

Figure 3 Current constraint status for old seral stage within CFLB

Figure 3 illustrates the current status of old seral stage within the CFLB. Currently 14 individual LU and BEC groups, or 19% of the CFLB, exceed the minimum threshold for this criterion.

Table 7 lists the LU- BEC Subzone units (Grouped) where established seral stage limits are currently exceeded. It also identifies units that are nearly exceeded, as well as, those where planned future development is expected to compromise the established limit.

Table 7 Summary of results for the seral stage analysis

Limit	Current Exceeded Units (1)	Nearly Exceeded Units (2)	Future Exceeded Units (3)
Maximum early seral stage	None	Reiseter-ESSFwv (20.4%) Trout Creek-ESSFmc (0%)	Kitseguecla-ICHmc (36.9%) Reiseter-ICHmc (39.3%)
Minimum mature + old seral stage	None	Reiseter-ESSFwv (72.3%) Trout Creek-ESSFmc (100%)	None
Minimum old seral stage	Bulkley-ESSFmc (7.5%) *Bulkley-ESSFwv (4.2%) *Bulkley-ICHmc (3.2%) Copper-ESSFmc (7.7%) *Corya-ESSFwv (11.8%) *Deep Creek-ESSFmc (0%) Deep Creek-SBSdk (5%) Harold Price-ESSFmc (8.7%) Harold Price-ICHmc (7.6%) Kitseguecla-ESSFwv (18.9%) Reiseter-ESSFmc (7.8%) *Reiseter-ICHmc (2.3%) Torkelson-ESSFmc (6.2%) *Trout Creek-ESSFmc (0%) Trout Creek-ESSFwv (15.9%)	Bulkley-SBSdk (10.2%) Deep Creek-SBSmc (9.7%) Harold Price-ESSFwv (18.5%) Reiseter-ESSFwv (72.3%) Reiseter-SBSdk (21.5%)	Deep Creek-SBSmc (9.7%) Harold Price-ESSFwv (18.5%)

1 Current Exceeded units = results exceed limits (bracketed: current percent for each unit).
2 Nearly Exceeded units = a change of 100 ha in current results will result in limits exceeded (bracketed: current percent for each unit).
3 Future Exceeded units = currently planned development will result in limits exceeded (bracketed: future percent for each unit). Adjacent stands are not projected for age.
* Highlighted units continue to exceed minimum old seral stage limit after 10 years.

Discussion

Through harvesting, licensees have direct influence seral stage distributions by increasing the early seral stage and reducing mature and old seral stages. Consequently, where harvesting is planned within units that have compromised or nearly compromised their limits, it is important to consider stands that are close to transitioning into the next seral stage. For example, stands between 30 and 40 years of age may relieve early seral stage harvest constraints. Similarly, stands that will soon reach mature or old seral stages can contribute to the overall strategy that addresses this objective.

For the Bulkley TSA, the old seral limit is the most constraining of the three seral stage criteria and currently affects nearly 100,000 hectares of CFLB, while the actual THLB area that is constrained will be less. None of the minimum mature plus old seral stage targets are compromised, suggesting that there appears to be sufficient mature stands for future recruitment opportunities. In fact, within 10 years there are already sufficient mature stands that will become old seral to reduce the total area exceeded by over two thirds. After 10 years the, only six units will continue to exceed the limit (see * in Table 7).

To alleviate this constraint on harvest opportunities sooner, a recruitment strategy is required to identify specific mature stands that will contribute towards the old seral targets. For example, assigning 40.5 hectares of mature stands as recruitment area within the Harold Price-ICHmc unit will release a significant number of remaining mature stands for harvest.

Some of the LU and BEC variant combinations identified in this analysis do not have specific targets probably because they are relatively small. To address these units, targets were applied as variants grouped into while BAF/CMA are grouped into ESSFmc, ESSFwk/MHmm. Accordingly, these BEC units should be reviewed and grouped where the small sizes make them unreasonable to manage for seral stages. Clarifying these groupings in FSPs will ensure future analyses are done consistently.

4 Core Ecosystem Analysis

Biodiversity objective 1.2 in the approved Bulkley LRMP aims to avoid range use and harvesting within core ecosystems specified throughout the Bulkley TSA. While there are exceptions, the key objective is to retain representative forests including rare and endangered plant communities in these core ecosystems.

Purpose

A seral stage analysis of core ecosystems is periodically required to assess the amount of harvest disturbance that has occurred since January 1998 when the CE was designated.

Methods

Seral stages are assigned to stands based on age ranges discussed in section 3. Table 8 describes the objective criteria used to summarize results for this analysis.

Table 8 Objective criteria for the core ecosystem analysis

Reference Feature	Applicable Landbase	Forest Type of Interest	Limit
ECONET where DPP = CE and each LU by BEC Variant	CFLB for each CE and LU	Stand age criteria (seral stage) by BEC Variant	None
ECONET where DPP = CE	CFLB for each CE	Age < 50 years	Maximum 50%
ECONET where DPP = CE	CFLB for each CE	Pine-Leading stands and age > 60 years	None

While these objective criteria are not legal, they are assessed for each individual unit to provide a surrogate for maintaining representative ecosystems.

Results

Figure 4 illustrates the overall breakdown of age classes within the CFLB for all CEs combined and shows that a total of 2% of the CFLB area is currently made up of stands less than 50 years in age.

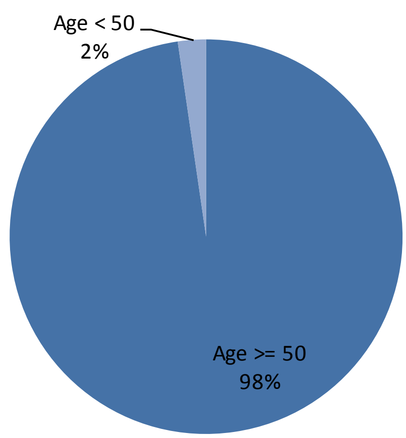

Figure 4 Overall seral stage distribution within Core Ecosystems

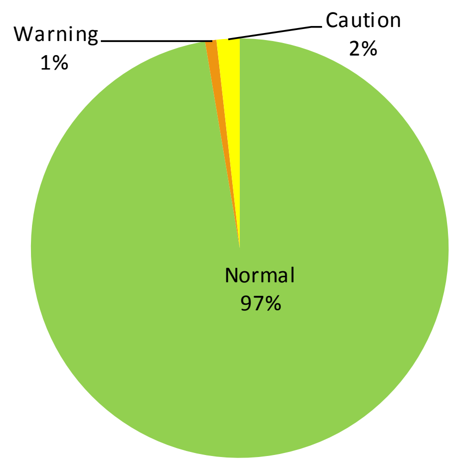

Figure 5 Current constraint status for CFLB within all Core Ecosystems

Figure 5 illustrates the current status of the CFLB within CEs. Currently, no CEs exceed the maximum threshold for this criterion.

Typically, only incidental timber harvesting occurs within these CEs. Since 1998, 42 hectares were harvested from the CEs (see Table 9) where each unit is within the maximum limit for stands less than 50 years.

Table 9 Summary of Core Ecosystems where harvesting has occurred since 1998

Units	Area Harvested (ha)	Current Limit Status
Babine - Bourcher Creek	6.5	Normal
Babine - Nichyeskwa South 1	0.5	Normal
Blunt - Goat Mountain	5.9	Normal
Blunt - Mount Seaton	0.5	Normal
Bulkley - Quick	21.6	Normal
Bulkley - Seymour Lake	0.6	Normal
Chapman - Upper Fulton	0.6	Normal
Copper - Copper River	2.3	Normal
Copper - Sandstone	0.2	Normal
Copper - Serb Creek	1.9	Normal
Telkwa - Hankin	0.7	Normal
Telkwa Microwave	0.5	Normal

Table 10 summarizes CE units where the normal limits for the objective criteria are exceeded. Accordingly, these units may be more sensitive than others to changing seral stages through timber development.

Table 10 Summary of results for core ecosystems

Limit	Current Exceeded Units (1)	Nearly Exceeded Units (2)
Maximum 50% of CFLB where age < 50 years	None	Babine-Nichyeskwa South 2 (21.6%) Bulkley-Coffin Lake (5%) Bulkley-Coffin Lake West (43%) Bulkley-McDowell Creek (0.4%) Bulkley-Reiseter - Bulkley Confluence (22%) Bulkley-Telkwa Airport (29.7%) Kitseguecla-Kitseguecla Lake (10.4%) Kitseguecla-Kitseguecla River (43.3%) Telkwa-Pine Creek (10.4%) Torkelson-Babine Lake Mid 1 (3.3%) Torkelson-Babine Lake North 1 (1.6%) Trout Creek-Beaver Creek (9.1%) Trout Creek-Owen's Creek (46.5%) Trout Creek-Trout Creek (3.5%)

1 Current Exceeded units = results exceed limits (bracketed: current percent for each unit).
2 Nearly Exceeded units = a change of 100 ha in current results will result in limits exceeded (bracketed: current percent for each unit).

Pine-Leading stands greater than 60 years in age constitute a total of 6,037 hectares within the CFLB for all CEs combined.

Three CE units (Hubert Road, Malkow Lookout, and Woodmere) are located completely outside of the crown portion of the TSA and thus do not contribute to the CFLB.

Discussion

Since harvesting is considerably limited within CEs, harvest constraints from exceeded limits are less significant compared to criteria for other values. Currently, no units exceed the established criteria limits.

While there are clear objectives to restrict harvesting, it is acceptable within CEs under certain conditions. In total, 42 hectares were harvested within 12 units since the CEs were recognized in 1998. The most significant harvest occurred in the Bulkley – Quick unit where 21.6 hectares were salvaged from mountain pine beetle attack. Still, all areas harvested maintained acceptable limits for this objective.

It is worth noting that within these CEs, the top ten units of pine-leading stands greater than 60 years old comprise over 6,000 hectares susceptible to damage from mountain pine beetle (area of mature pine in each unit):Deep Creek-McQuarrie Lake (906 ha)

- Babine-Bourcher Creek (556 ha)
- Copper-Hudson Bay Mountain (423 ha)
- Chapman-Fink Creek (400 ha)
- Bulkley-Quick (316 ha)
- Torkelson-Smither's Landing (276 ha)
- Telkwa-Hankin (263 ha)
- Telkwa-Tenas Creek (261 ha)
- Bulkley-Seymour Lake (257 ha)
- Copper-Serb Creek (253 ha)

As disturbance from the mountain pine beetle alter stands by either natural stand mortality or harvesting, stand age and structure are expected to change within CEs. These anticipated changes may eventually prompt alternative strategies to achieve the objectives for core ecosystems.

The TSR underway will to apply significantly different objective criteria. For this analysis, applying a maximum 5% limit for stands less than 50 years in age would result in a total of sixteen units exceeding the limit:

- Trout Creek-Owen's Creek (46.5%)
- Kitseguecla-Kitseguecla River (43.3%)
- Bulkley-Coffin Lake West (43%)
- Bulkley-Telkwa Airport (29.7%)
- Nilkitkwa-O'Nerka Lake (24.3%)
- Bulkley-Reiseter - Bulkley Confluence (22%)
- Babine-Nichyeskwa South 2 (21.6%)
- Torkelson-Babine Lake North 2 (18.2%)
- Babine-Boucher Cr. Headwaters (15.4%)
- Telkwa-Mid Telkwa River (11%)
- Kitseguecla-Kitseguecla Lake (10.4%)
- Telkwa-Pine Creek (10.4%)
- Bulkley-Atrill Creek (9.9%)
- Bulkley-Quick (315.7ha)
- Trout Creek-Beaver Creek (9.1%)
- Bulkley-Coffin Lake (5%)

Since 1998, harvesting has only occurred in one unit to address damage from mountain pine beetle. The other units reflect stand dynamics from earlier disturbance events.

Future exceeded units are not included for this analysis because the planned harvest areas do not accurately represent the potential disturbance within the CEs. Besides, the planned harvest areas typically avoid CEs unless they are considered as salvage operations.

5 Landscape Corridor Analysis

Biodiversity objective 1.3 in the approved Bulkley LRMP aims to maintain habitat connectivity across the landscape by maintaining landscape corridors identified throughout the Bulkley TSA. These landscape corridors are dominated by mature tree cover and containing most of the structure and function associated with old forest.

Purpose

A seral stage analysis of LRCs is periodically required to assess the distribution of stands greater than 80 years old. The amount of harvest disturbance that has occurred since January 1998 when the LRC was designated is also tracked.

Methods

Seral stages are assigned to stands based on age ranges discussed in section 3. Table 11 describes the objective criteria used to summarize results for this analysis.

Table 11 Objective criteria for landscape corridor analysis

Reference Feature	Applicable Landbase	Forest Type of Interest	Limit
ECONET where DPP = LRC and each LU by BEC Variant	CFLB for each corridor element and LU	Stand age criteria (seral stage) by BEC Variant	None
ECONET where DPP = LRC	CFLB for each corridor element	Age > 80 years	Minimum 70%
ECONET where DPP = LRC	CFLB for each corridor element	Pine-Leading stands and age > 60 years	None

Results

Figure 6 illustrates the overall breakdown of age classes within the CFLB for all LRCs combined and shows that a total of 84% of the CFLB area is currently made up of stands greater than 80 years in age.

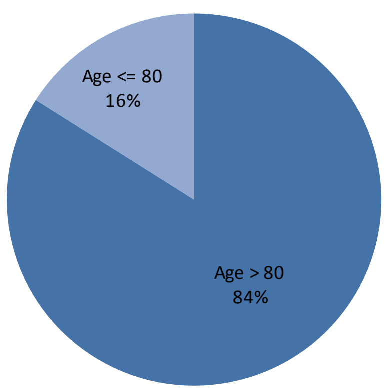

Figure 6 Overall seral stage distribution within Landscape Riparian Corridors

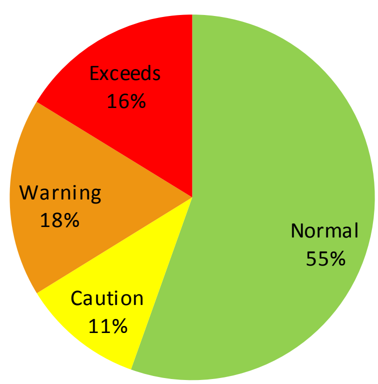

Figure 7 Status of Constraints for CFLB within all Landscape Riparian Corridors

Figure 7 illustrates the current status of the CFLB within LRCs. Currently 27 individual LRCs, or 16% of the CFLB for all LRCs, exceed the minimum threshold for this criterion.

Since 1998, 995 hectares were harvested from the LRCs.

Table 12 summarizes LRC units where the normal limits for the objective criteria are exceeded.

Accordingly, these units may be more sensitive than others to changing seral stages through timber development.

Table 12 Summary of results for landscape riparian corridors

Limit	Current Exceeded Units [1]	Nearly Exceeded Units [2]
Minimum 70% of CFLB where age > 80 years	Babine-Bait Range Meadows (62.6%) Babine-Boucher Creek (37.7%) Babine-Nichyeskwa South 3 (21.6%) Babine-Nilkitkwa East 1 (54.7%) Blunt-Upper Harold Price (61.4%) Blunt-Upper Harold Price - Goat (46.7%) Bulkley-Bulkley River South (63.1%) Bulkley-Coffin Lake (52.5%) Bulkley-Tyhee Lake (60%) Chapman-Chapman Lake (28.6%) Chapman-Fulton River (62.9%) Chapman-Little Joe Creek (46.5%) Chapman-Lower Fulton (66.7%) Chapman-McKendrick Creek (55.9%) Chapman-Nata Creek (49.4%) Copper-Copper River (54.1%) Reiseter-Canyon Creek West (19.7%) Reiseter-Kwun Creek (66.2%) Telkwa-Cumming Creek (68%) Telkwa-Winfield Creek (34.6%) Torkelson-Babine Lake North (61.5%) Torkelson-Bristol Creek (48.6%) Torkelson-Torkelson Creek (59.7%) Torkelson-Torkelson Lake Northwest (54.5%) Torkelson-Tsezakwa Creek (54.2%) Trout Creek-Taltzan Lake (46.8%) Trout Creek-Trout Creek South (68.5%)	80 Units (see Summary of Statistics Workbook)

1 Current Exceeded units = results exceed limits (bracketed: current percent for each unit).
2 Nearly Exceeded units = a change of 100 ha in current results will result in limits exceeded (bracketed: current percent for each unit).

Pine-Leading stands greater than 60 years in age constitute a total of 12,442 hectares within the CFLB for all LRCs combined.

Two LRC units (Driftwood Creek and Tsezakwa) are located completely outside of the crown portion of the TSA and thus do not contribute to the CFLB.

Discussion

Limits established for LRCs significantly constrain this component of the landbase and currently affect over 14,000 hectares of the CFLB. As this area does not reflect the THLB, the actual harvest constrained is likely much less.

The average CFLB area for these LRCs in the Bulkley TSA is just over 500 hectares and as many units are small, a 50 or 100 hectare change (i.e., warning and caution criteria) can have a significant impact on the constraint status. This is demonstrated by the 80 units identified as nearly exceeded. Since openings within these units will likely be significantly smaller than 50 hectares, the nearly exceeded criteria used are not as pertinent here.

Less than 1,000 hectares were harvested within 69 units since the LRCs were recognized in 1998. While there are clear objectives to regulate harvesting on LRCs, openings should be encouraged to address forest health issues and ensure that age classes will be distributed appropriately in the future.

It is worth noting that within these LRCs, the top ten units of pine-leading stands greater than 60 years old comprise almost 4,900 hectares susceptible to damage from mountain pine beetle (area of mature pine in each unit):

- Nilkitkwa-Nilkitkwa North (771 ha)
- Babine-Nichyeskwa Creek (666 ha)
- Telkwa-Pine Creek (616 ha)
- Babine-Nilkitkwa River (597 ha)
- Telkwa-Mooseskin Johnny Lake (538 ha)
- Copper-Copper River (470 ha)
- Torkelson-Babine Lake South 1 (350 ha)
- Blunt-Blunt Creek (303 ha)
- Chapman-Fulton River (290 ha)
- Harold Price-Lyhk Creek (284 ha)

As disturbance from the mountain pine beetle alter stands by either natural stand mortality or harvesting, stand age and structure are expected to change within LRCs. These anticipated changes may eventually prompt alternative strategies to achieve the landscape corridor objectives.

Future exceeded units are not included for this analysis because the planned harvest areas may not accurately represent the potential disturbance within the LRCs.

6 Key Forested Caribou Habitat Analysis

Wildlife objective 2.4 of the approved Bulkley LRMP seeks to provide forests with mature and old characteristics.

Purpose

An analysis of the distribution of stands greater than 90 years old within designated KFCH areas is periodically required to assess whether representative forests of mature and old seral age classes are being retained.

Methods

Table 15 describes the objective criteria used to summarize results for this analysis.

Table 13 Objective criteria for Key Forested Caribou Habitat

Reference Feature	Applicable Landbase	Forest Type of Interest	Limit
Wildlife 2000a where SPECIES=C	CFLB for each habitat unit	Age > 90 years	Minimum 50%

Results

Figure 8 illustrates the overall breakdown of age classes within the CFLB for all KFCHs combined and shows that a total of 89% of the CFLB area is currently made up of stands greater than 90 years in age.

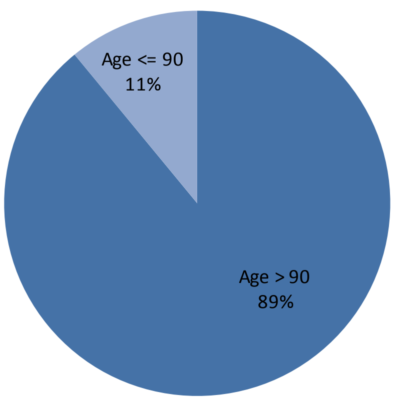

Figure 8 Overall seral stage distribution within Key Forested Caribou Habitat

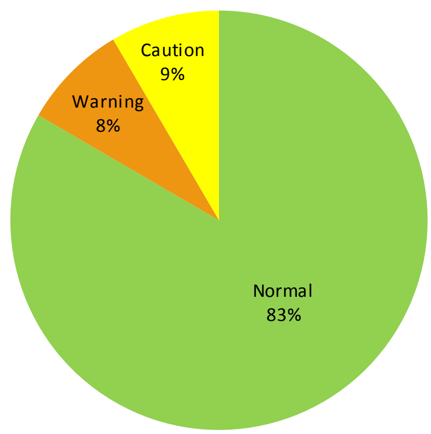

Figure 9 Status of Constraints for CFLB within all Landscape Riparian Corridors

Figure 9 illustrates the current status of the CFLB within KFCHs. Currently no KFCHs exceed the minimum threshold for this criterion.

Table 14 lists the KFCH units where the objective criteria are exceeded. It also identifies units where planned future development is expected to compromise the 50% limit.

Table 14 Summary of results for Key Forested Caribou Habitat

Limit	Current Exceeded Units (1)	Nearly Exceeded Units (2)	Future Exceeded Units (3)
Minimum 50% of CFLB where age > 90 years	None	Coffin Lake KFCH (73.6%) Howson #1 KFCH (100%) Howson #2 KFCH (95.8%) Howson #3 KFCH (73.2%) Hydro Hill #1 KFCH (87.2%) Lawson KFCH (79.7%) Webster KFCH (100%)	Edward Creek KFCH (28.4%) Howson #1 KFCH (32.9%)

1 Current Exceeded units = results exceed limits (bracketed: current percent for each unit).
2 Nearly Exceeded units = a change of 100 ha in current results will result in limits exceeded (bracketed: current percent for each unit).
3 Future Exceeded units = currently planned development will result in limits exceeded (bracketed: future percent for each unit). Adjacent stands are not projected for age.

<u>Discussion</u>

Since harvesting is considerably limited within KFCH units, harvest constraints from exceeded limits are less significant compared to criteria for other values. Currently, no units exceed the established criteria limits.

The average CFLB area for the KFCH units is just less than 400 hectares and as many units are small, a 50 or 100 hectare change (i.e., warning and caution criteria) can have a significant impact on the constraint status. This is demonstrated where half of the units are identified as nearly exceeded. Since openings within these units will likely be smaller than 50 hectares, the nearly exceeded criteria used are not as pertinent here.

Since proposed harvest areas are overestimated because they do not include retention areas, the future exceeded units are slightly overstated. Still, the planned blocks within the two units identified in Table 14 will need to be reconsidered unless many nearly mature stands are expected to soon surpass 90 years in age.

7 Proposed Wildlife Habitat Area for Caribou

The BC Ministry of Environment recently prepared a draft order for a WHA (#6-333) identified as the TCRA. Among the general wildlife measures (GWM) proposed, forestry activities must maintain specific seral stage distribution criteria.

Purpose

A seral stage analysis of the TCRA is required to assess how the proposed WHA will affect forestry activities. These proposed objectives are not legally established but are considered here to explore the associated impacts and opportunities.

Methods

Table 15 describes the objective criteria used to summarize results for this analysis.

Table 15 Objective criteria for Proposed Telkwa Caribou Recovery Area WHA

Applicable Landbase	BEC	Forest Type of Interest	Limit
CFLB for the proposed TCRA WHA	ESSF Zone and SBSmc Subzones	Early: Stand age <40 years	<28%
		Mature: Stand age >80 years	>60%
	SBSdk Subzone	Early: Stand age <40 years	<39%
		Mature: Stand age >80 years	>45%

It should be noted that the analysis did not apply GWMs for woodlots or mineral exploration activities.

Results

Figure 10 illustrates the seral stage distributions for SBSmc and SBSdk BEC units within the proposed WHA and shows that early stages represent 28.0% and 39.7% of the CFLB, respectively that just exceed the limits of 28% and 39%.

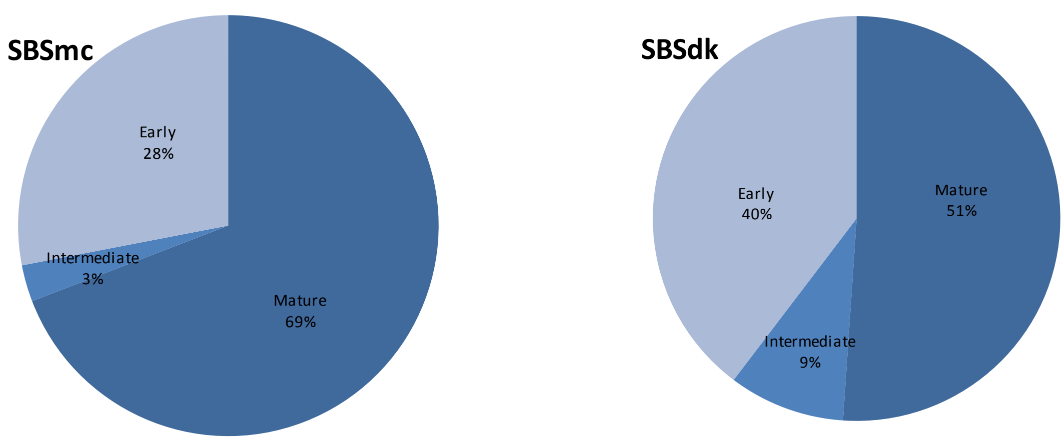

Figure 10 Seral stage distributions within the proposed wildlife habitat area for caribou

Figure 11 illustrates the current status for early seral stage within the CFLB for all of the proposed WHA. Currently, areas within the SBSmc and SBSdk BEC subzones, or 43% of the CFLB, exceed the minimum threshold for this criterion.

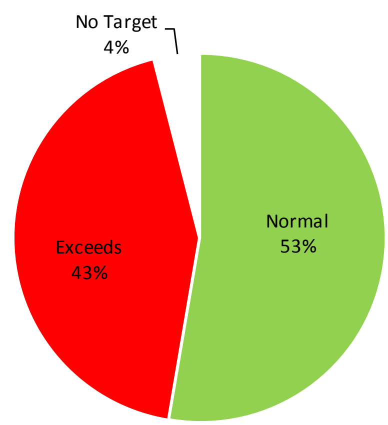

Figure 11 Status of Constraints for early seral stage within the proposed WHA for caribou

Table 16 lists the BEC units where the normal limits for the objective criteria are exceeded.

Table 16 Summary of results for the proposed Telkwa Caribou Recovery Area WHA

Limit	Current Exceeded Units (1)	Nearly Exceeded Units (2)	Future Exceeded Units (3)
Early: Stand age <40 years	SBS mc 2 (28.0%) SBS dk (39.7%)	None.	None.
Mature: Stand age >80 years	None.	None.	None.

1 Current Exceeded units = results exceed limits (bracketed: current percent for each unit).
2 Nearly Exceeded units = a change of 100 ha in current results will result in limits exceeded (bracketed: current percent for each unit).
3 Future Exceeded units = currently planned development will result in limits exceeded (bracketed: future percent for each unit). Adjacent stands are not projected for age.

Discussion

Exceeded limits in the proposed Telkwa WHA significantly constrain the landbase within the SBS zone and currently affect nearly 26,000 hectares of the CFLB. As this area does not reflect the THLB, the actual harvest constrained is likely much less.

The current limits specified in the draft GWMs would effectively prohibit harvesting within the SBS BEC zone of the proposed WHA, representing 43% of its CFLB. Over the next decade, nearly 800 hectares will transition from early to intermediate stands greater than 40 years old.

The proposed WHA indicates[1] that mature standing dead conifers greater than 80 years old and at least 50% stand mortality can contribute to forest seral retention targets for 20 years from the date of disturbance – not including fire. Afterwards, stands are considered to be not sufficiently stocked and revert to early seral. Within the SBS zone, there are over 2,300 hectares (~720,000 m3) of pine leading stands greater than 60 years old. Accordingly, exceeding seral stage limits to salvage beetle-attacked stands is not permissible under the draft GWMs.

Under the proposed order, the current limits require that harvesting opportunities within the SBS zone depend on the careful tracking and consideration of both stand ages and the occurrence of forest health issues.

[1] Section 7, Appendix 1 – General Information of the draft WHA Order #6-333 for Northern Caribou – Skeena-Stikine, Morice TSAs

8 Grizzly Bear High Value Habitat Analysis

Wildlife objective 2.5 of the approved Bulkley LRMP aims to provide high-value grizzly bear habitat in locations identified for security and bedding.

Purpose

A seral stage analysis of the identified GB is periodically required to assess whether representative forests of mature and old seral age classes are being retained.

Methods

Table 17 describes the objective criteria used to summarize results for this analysis.

Table 17 Objective criteria for the grizzly bear analysis

Reference Feature	Applicable Landbase	Forest Type of Interest	Limit
Wildlife 2000a where SPECIES=GB [(1)]	CFLB for each habitat unit	Age > 50 years	Minimum 80%

1. GB – High Value Grizzly Bear Habitat

Results

Figure 12 illustrates the overall breakdown of age classes within the CFLB for GB units combined and shows that a total of 93% of the CFLB area is currently made up of stands greater than 50 years in age.

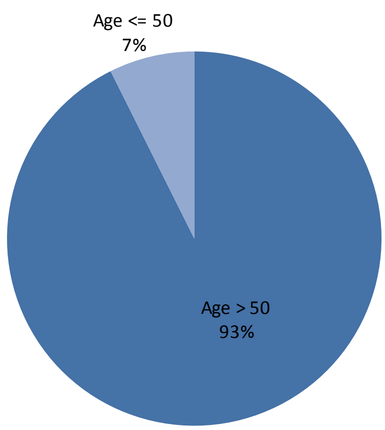

Figure 12 Age class distribution for CFLB within all High Value Grizzly Bear Habitat units

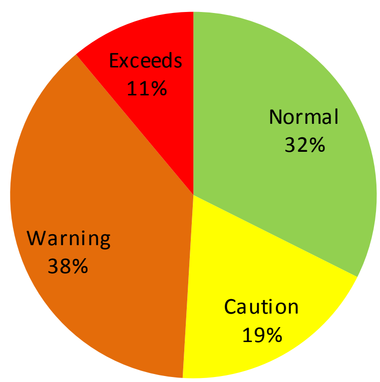

Figure 13 Status of Constraints for CFLB within all High Value Grizzly Bear Habitat units

Figure 13 illustrates the current status of the CFLB within GB units. Currently 9 individual GB units, or 11% of the CFLB for all GB units, exceed the minimum threshold for this criterion.

Table 18 lists the GB units where the normal limits for the objective criteria are exceeded.

Table 18 Summary of results for High Value Grizzly Bear Habitat units

Habitat Type and Limit	Current Exceeded Units (1)	Nearly Exceeded Units (2)	Future Exceeded Units (3)
Minimum 80% of CFLB where age > 50 years	Babine - 489 Road #4 (13%) Babine - 455 Road #2 (41%) Babine - 455 Road #1 (42%) Babine - 467 Road #1 (62%) Torkelson - 437 Road #1 (70%) Babine - 448 Road #3 (76%) Babine - 489 Road #5 (77%) Babine - 489 Road #1 (79%) Babine - 455 Road #3 (80%)	43 Units (see Summary of Statistics Workbook)	Babine - 455 Road #4 (62%) Babine - 455 Road #5 (53%) Babine - 455 Road #6 (64%) Babine - 459 Road #2 (68%) Babine - 459 Road #3 (80%) Babine - 465 Road #1 (69%) Babine - 465 Road #2 (70%) Babine - 480 Road #2 (75%) Babine - 486 Road #3 (13%) Babine - 487 Road #1 (62%) Babine - 489 Road #2 (66%) Harold Price - Harold Price #1 (77%)

1 Current Exceeded units = results exceed limits (bracketed: current percent for each unit).
2 Nearly Exceeded units = a change of 100 ha in current results will result in limits exceeded (bracketed: current percent for each unit).
3 Future Exceeded units = currently planned development will result in limits exceeded (bracketed: future percent for each unit). Adjacent stands are not projected for age.

Discussion

Exceeded limits for GB units are moderately constraining to this component of the landbase currently at 11% of the CFLB and affecting over 1,000 hectares. As this area does not reflect the THLB, the actual constrained harvest area is likely less.

The CFLB definition discussed in section 2.3.1 is applied consistently for each analysis. Yet this definition may not completely reflect the high value habitat for grizzly bear that are often observed within black spruce stands outside of the CFLB. For example, estimates of crown closure classified in the VRI appear to be underestimated for black spruce stands within areas like the Boucher Creek watershed.

9 Grizzly Bear Mixed Forest Habitat Analysis

Wildlife objective 2.5 of the approved Bulkley LRMP aims to provide diverse understory within locations identified as mixed forest habitat.

Purpose

A seral stage analysis of the identified mixed forest habitat is periodically required to assess whether representative forests of early seral age classes are being retained.

Methods

Table 19 describes the objective criteria used to summarize results for this analysis. Projected heights available with the VRI data are applied in this analysis.

Table 19 Objective criteria for the grizzly bear analysis

Reference Feature	Applicable Landbase	Forest Type of Interest	Limit
Wildlife 2000a where SPECIES=GBA (1)	CFLB for each habitat unit	Height < 3 meters	Maximum 25%

1. GBA – Mixed Forest Grizzly Bear Habitat

Results

Figure 14 illustrates the overall breakdown of age classes within the CFLB for GBA units combined and shows that a total of 93% of the CFLB area is currently made up of stands greater than 50 years in age.

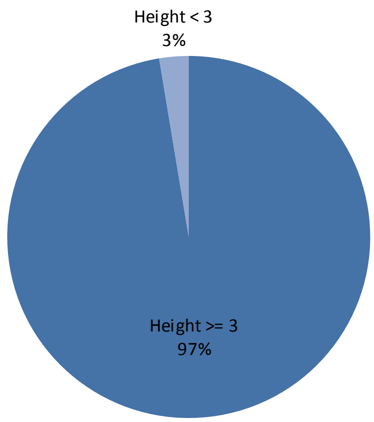

Figure 14 Age class distribution for CFLB within all Mixed Forest Grizzly Bear Habitat units

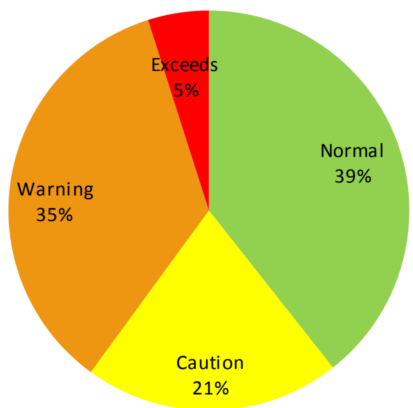

Figure 15 Status of Constraints for CFLB within all Mixed Forest Grizzly Bear Habitat units

Figure 15 illustrates the current status of the CFLB within GB units. Currently 1 individual GBA unit, or 5% of the CFLB for all GB units, exceeds the minimum threshold for this criterion.

Table 20 lists the Grizzly Bear units where the normal limits for the objective criteria are exceeded.

Table 20 Summary of results for Mixed Forest Grizzly Bear Habitat units

Habitat Type and Limit	Current Exceeded Units (1)	Nearly Exceeded Units (2)	Future Exceeded Units (3)
Maximum 25% of CFLB where height < 3 meters	Babine - 480 Road #1 (43%)	10 units (see Summary of Statistics Workbook)	Fort Babine #4 (28%) Fort Babine #5 (47%)

1 Current Exceeded units = results exceed limits (bracketed: current percent for each unit).
2 Nearly Exceeded units = a change of 100 ha in current results will result in limits exceeded (bracketed: current percent for each unit).
3 Future Exceeded units = currently planned development will result in limits exceeded (bracketed: future percent for each unit). Adjacent stands are not projected for age.

Discussion

Exceeded limits for GBA units are slightly constraining to this component of the landbase, currently at 5% of the CFLB and affecting just over 100 hectares of the CFLB. As this area does not reflect the THLB, the actual constrained harvest area is likely less.

The average CFLB area for these GBA units is just over 185 hectares and as many units are small, a 50 or 100 hectare change (i.e., warning and caution criteria) can have a significant impact on the constraint status. This is demonstrated by the 10 of 12 units identified as nearly exceeded. Since openings within these units will likely be smaller than 50 hectares, the nearly exceeded criteria used are not as pertinent here.

The CFLB definition discussed in section 2.3.1 is applied consistently for each analysis. Yet this definition may not completely reflect the high value habitat for grizzly bear that are often observed within black spruce stands outside of the CFLB.

While early stand heights projected in the VRI at a forest level are the best available information, it is uncertain whether these accurately reflect the current condition of stands within GBA units. Height estimates are typically derived from silviculture surveys or captured photogrammetrically at some reference date. The uncertainty with these estimates is based on the VRI update process that can result in data that is not current for the application and since VRI height projections reflect natural rather than managed stand activities, benefits attributed to basic silviculture activities are not incorporated.

This source of uncertainty may eventually prompt alternative strategies to achieve this grizzly bear objective for mixed forest habitat. In the meantime, licensees approaching the maximum 25% threshold should develop appropriate methods for confirming stand height of managed stands.

10 Sensitive Watershed Analysis

Objective 8.1 in the FRPA FPPR requires licensees with FSPs to prevent cumulative hydrological effects of primary forest activities from resulting in a material adverse impact on the habitat of the fish species for which the fisheries sensitive watershed (FSW) was established.

Guidance for undertaking assessments within sensitive watersheds was also provided by the District Manager for the Bulkley/Cassiar Forest District and the Regional Fish, Wildlife and Habitat Manager for the Skeena Region in a letter dated February 17, 2000.

Purpose

An equivalent clearcut area (ECA) analysis is periodically required to assess the current and near-future status for identified watersheds. In addition, road and stream crossing densities are periodically calculated to provide indicators that can predict sediment delivery into watercourses.

Methods

ECAs are calculated for identified sensitive watersheds incorporated into the resultant dataset (see section 2.2.4). For this analysis, ECAs relate to stand height that reflects a progressive improvement in hydrological recovery with stand growth. Accordingly, projected heights available with the VRI data are used to assign ECA values.

The steps used to calculate and summarize ECAs include:

1. Identify and determine the gross area for each identified sensitive watershed.
2. ECAs are calculated for the total watershed area and then summarized by ownership category and FDU.
3. Identify non-forested areas. Those created by humans (e.g., urban, meadow, buffered roads) are considered to contribute 100% of their area toward ECA values. Whereas all other non-forested areas (e.g., alpine, rock, water, open range,), are considered to contribute 0% toward ECA values.
4. Assess all productive portions of the land base relative to each stand's projected height (see Table 21). These hydrologic recovery levels follow Interior Watershed Assessment Procedures (IWAP) except 100% recovery is assumed at stand heights of 12 meters.

Table 21 Criteria for assigning equivalent clearcut area

Stand Height (m)	% Recovery
0 – 3	0%
3.1 – 5.0	25%
5.1 – 7.0	50%
7.1 – 9.0	75%
9.1 – 12.0	90%
>12.0 (1)	100%

(1) Supported by hydrologists in similar projects

5. Account for recent disturbance. Areas designated within the CFLB but with no age or height information are assigned 100% ECA. These areas typically reflect logged blocks that are not successfully captured in the VRI update process.
6. Calculate an area-weighted ECA for each watershed.
7. Determine the current and near-future road density and stream crossing density associated with each watershed. These are assessed for the total watershed area and then summarized by ownership category and FDU. As road status information is unavailable, deactivated roads cannot be removed for this assessment.

Road density is simply the length of road per square kilometre of a watershed. This is determined through an overlay process of existing and planned roads and watersheds.

Stream crossing density, the number of stream crossings per square kilometre of a watershed, is determined through an overlay process of existing and planned roads and streams. A stream crossing is assumed to exist wherever these two sets of lines intersect. Of course, the quality of these results at a landscape level depends on how well each input layer has been mapped.

Results

Figure 16 illustrates the breakdown of crown and non-crown area for all sensitive watersheds combined and shows that a total of 97% of these units are within the crown area. To remain consistent with previous analyses, some watersheds overlap so these areas and distributions are exaggerated.

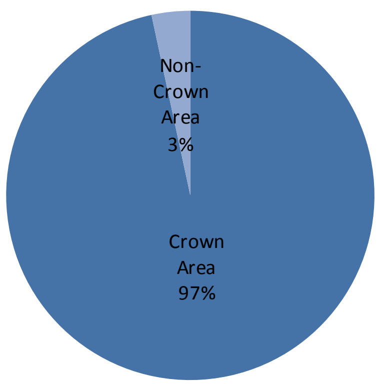

Figure 16 Distribution of ownership within sensitive watersheds

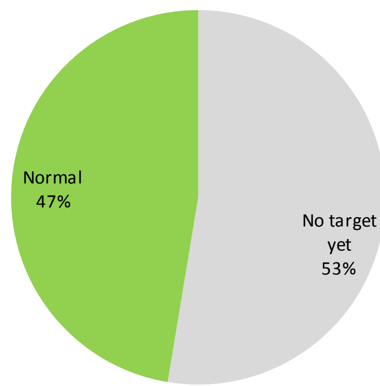

Figure 17 Status of ECA constraints for crown area within all sensitive watersheds

Figure 17 illustrates the current status of the crown area within sensitive watersheds. Currently no units exceed the minimum threshold for the ECA criterion. For 53% of the CFLB, ECA targets have not yet been established through a detailed watershed assessment. Currently, 10% of this area exceeds the ECA trigger for undertaking an assessment (see Table 22).

Table 22 lists the sensitive watersheds where the normal limits for the objective criteria for ECA, road density and stream crossing density are exceeded. These results are summarized for the crown area portion of the watersheds where forest licensees have direct influence on these indicators.

For the 16 units where a stream crossing density limit was established through an IWAP, the analysis indicates that all but one unit is currently exceeding. This trend is likely due to the differences in approaches for determining stream crossings. For an IWAP, actual stream crossings are carefully inventoried and summarized for watershed. These inventories were not readily available so this analysis identified stream crossings through a GIS exercise using the best datasets available.

Table 22 Summary of results for the analysis of sensitive watersheds

Assessment Type and Limit	Current Exceeded Units [1]	Nearly Exceeded Units [2]	Future Exceeded Units [3]
Assessment triggered	Fulton – Residual South - (29.6%) Jonas Creek - (30%)	Res 1 - (10.2%) Res 4 - (2%) Res 5 - (13%)	Fulton – Residual South - (29.6%) Hankin - (30.7%) Jonas Creek - (29.8%) Res 1 - (46.6%) Res 3 - (44.8%)
Maximum ECA established through an IWAP	None.	None.	Gramaphone Creek - (25.6%) Heal Creek - (34.1%) Netazul Creek - (28.2%) Tsak Creek - (38.3%)
Maximum Road Density (km/km^2) established through an IWAP	Five Mile –(1.4) Wtsd "4888" - (1.4)	Bairnes - (1.2) Cumming Creek - (1.1) Goathorn - (1) Gramaphone Creek - (1.3) Heal Creek - (1.1) Netazul Creek - (0.8) Nilkitkwa-1 - (1.5) Pine - (1) Tsak Creek - (1.1) Williams Creek - (0.9)	Five Mile - (1.4) Heal Creek - (1.4) Netazul Creek - (1.3) Tsak Creek - (1.4) Wtsd "4888" - (1.8)
Maximum Stream Crossing Density (#/km^2) established through an IWAP	Bairnes - (1.4) Clota - (0.5) Cumming Creek - (1.3) Five Mile - (1.1) Goathorn - (0.7) Gramaphone Creek - (1.9) Heal Creek - (1.1) Netazul Creek - (0.6) Nilkitkwa-1 - (1.5) Nilkitkwa-2 - (0.9) Pine - (0.8) Reiseter - (0.6) Tsak Creek - (1.2) Williams Creek - (0.5) Wtsd "4888" - (1.2)	Boucher - (0.7)	Bairnes - (1.4) Boucher - (0.6) Clota - (1) Cumming Creek - (1.3) Five Mile - (1.1) Goathorn - (0.8) Gramaphone Creek - (2) Heal Creek - (1.3) Netazul Creek - (1.3) Nilkitkwa-1 - (1.5) Nilkitkwa-2 - (0.9) Pine - (0.9) Reiseter - (0.8) Tsak Creek - (1.5) Williams Creek - (0.6) Wtsd "4888" - (1.7)

1 Current Exceeded units = results exceed limits (bracketed: current percent for each unit).
2 Nearly Exceeded units = a change of 100 ha in current results will result in limits exceeded (bracketed: current percent for each unit).
3 Future Exceeded units = currently planned development will result in limits exceeded (bracketed: current percent for each unit). Adjacent stands are not projected for age.

Discussion

Established ECA limits do not currently constrain this component of the objectives but two units (Fulton – Residual South and Jonas Creek) have currently triggered a detailed watershed assessment.

This analysis is intended as a coarse approach to identify watersheds that require more detailed analysis. Ideally, information collected from these detailed analyses would be incorporated but it is not readily available. Accordingly, the current status of roads (active and deactivated) and stream crossing densities are not considered to be accurate so where available, results from IWAP reports are more appropriate to use.

Triggers for undertaking watershed assessments are specified in the District Manger's February 17, 2000 letter. For some units, these limits were stated as the percentage of total watershed area less than 25 years old, whereas more recently, these are stated ECAs. Moreover, FSPs recommended trigger levels for further watershed assessments are not readily available for some sensitive watersheds. For this analysis, these watersheds were assigned a trigger of 30% ECA. .

While early stand heights projected in the VRI at a forest level are the best available information, it is uncertain whether these accurately reflect the current condition of stands within sensitive watersheds. Height estimates are typically derived from silviculture surveys or captured photogrammetrically at some reference date. The uncertainty with these estimates is based on the VRI update process that can result in data that is not current for the application and since VRI height projections reflect natural rather than managed stand activities, benefits attributed to basic silviculture activities are not incorporated.

11 Patch Size Analysis

Landscape level wildlife and biodiversity objective 9 in the FRPA Forest Planning and Practices Regulation (FPPR) requires licensees with FSPs to design cut blocks that resemble, both spatially and temporally, the patterns of natural disturbance that occur within the landscape. The Bulkley LUPs provide some direction in addressing this objective.

Purpose

A patch size analysis is periodically required to assess the current and near-future status of small, medium and large patch sizes relative to specified targets and summarized by LU.

Methods

For this analysis, patch size classes are defined as follows:

- A patch size class is comprised of areas recently disturbed by either harvesting or fire, that are contiguous and within the same 20-year age class.
- Areas within the same 20-year age class are considered to be contiguous if they are immediately adjacent to each other (i.e., share a boundary) or are separated only by a narrow, permanently denuded polygon like a road, hydro line, or gas line.
- Patch Size targets are applied according to Natural Disturbance Type (NDT) (see Table 23).

Table 23 Criteria for defining patch size

Natural Disturbance Type	Patch Size Distribution and Target		
	Small Patch	Medium Patch	Large Patch
NDT 1 and 2 [a]	<40 hectares Target 30%-40%	40-80 hectares Target 30%-40%	> 80 hectares Target 20%-40%
NDT 3 [b]	<40 hectares Target 10%-20%	40-250 hectares Target 10%-20%	> 250-1000 hectares Target 60%-80%

a. includes ESSFmk/wv, MHmm2, CWHws2, ESSFmc and ICHmc1/mc2
b. includes SBSdk/mc2

The steps used to create and assign patch sizes include:

1. Dissolve the CFLB designated in the resultant (see section 2.2.4) into 20 year age classes based on projected stand ages in the VRI.
2. Calculate and capture the geometric area for each patch.
3. Reintroduce the LU, BEC/NDT, and CFLB features.
4. Using the areas captured for each patch and their NDTs, assign patch size classes according to the criteria in Table 23.
5. Summarize the current and near future patch size statistics for each LU.
6. Compare results relative to the Landscape Unit Planning Guide.

This methodology ensures patches are not split by lines that are difficult to recognize in the field (e.g., BEC variant/NDT, LU). These layers are included after the patch size is assigned and is used only for compiling statistics. Patch areas that span these layers are simply prorated into both administrative units. For example, a 250 ha patch that straddles two LUs (e.g., 30ha in one LU and 220ha in another), is designated as “large” for both patches.

Patch sizes were undertaken using two different ways. In one approach, patches were assigned to the entire landbase while another approach only assigned patches for areas that were harvested with ages less than the appropriate mature seral stage criteria. The summaries and discussion below are based on the second approach considering the harvested landbase.

Table 24 describes the objective criteria used to summarize results for this analysis.

Table 24 Objective criteria for the patch size analysis

Reference Feature	Applicable Landbase	Forest Type of Interest	Target
Projected ages in VRI and NDT	CFLB for each LU	20-year age classes by LU and NDT	See Table 23

Only the upper limits were used for determining the current status of each patch category. This provides better direction to planners considering strategies for influencing patch size distribution. For instance, harvesting in units where small patches have exceeded the upper limit should attempt to create more medium and/or large patches.

Results

Table 25 summarizes the units that currently meet targets for small, medium and large patches as percentage of CFLB. As targets are only set for NDTs 1 to 3, NDT 5 units are excluded from these results.

Table 25 Results for the patch size analysis

Patch Size	Current Exceeded Units (1)	Nearly Exceeded Units (2)	Future Exceeded Units (3)
Small	13 Units 11,316 ha (13%)	7 Units 1,914 ha (2%)	11 Units 10,987 ha (12%)
Medium	11 Units 19,015 ha (21%)	6 Units 1,489 ha (2%)	10 Units 18,627 ha (21%)
Large	14 Units 20,203 ha (23%)	4 Units 385 ha (0%)	15 Units 20,203 ha (23%)

1 Current Exceeded units = results exceed limits (bracketed: current percent for each unit).
2 Nearly Exceeded units = a change of 100 ha in current results will result in limits exceeded (bracketed: current percent for each unit).
3 Future Exceeded units = currently planned development will result in limits exceeded (bracketed: current percent for each unit). Adjacent stands are not projected for age.

Discussion

Currently, 85,042 hectares or 96% of the disturbed landbase is identified as exceeding one of the three patch size targets. This is not surprising given the balance of targets for small, medium and large patches. The Copper and Corya LUs (NDT2) are currently within the target range for all patch sizes. The targets are intended to be met by the end of the rotation period (typically 60 to 100 years). Results only represent a snap-shot in time whereas consecutive results over time will show trends relative to the targets.

As discussed above, patch sizes were assigned in two ways: the entire landbase and harvested landbase. The most common approach taken considers the entire landbase as this provides periodic *snap-shots* of patch size distribution that considers all disturbance types. The approach using the harvested landbase is consistent with previous analyses done in the Bulkley TSA and reflects the emerging harvest history and pattern. Interestingly, the result using the harvested landbase identifies four more units that currently exceed the patch size limits than the result using the entire landbase. Future analysis might only use one approach.

After the analysis was completed for the harvested landbase it was discovered that a number of stands identified in the VRI as silviculture openings (e.g., Copper and Telkwa watersheds) do not appear to have been harvested. Since VRI was used consistently in all analyses with no modifications to the data, it was decided to note this discrepancy in the data so that it might be addressed in the future.

12 Constraint Status

Purpose

The constraint status analysis produces an overview map that illustrates the current status of thresholds associated with the various objectives as they overlay across the landbase. The purpose of this map is to assist forest planners to efficiently plan harvest blocks while remaining consistent with landscape level objectives associated with sustainable forest management.

It is emphasized that further harvesting must not necessarily be curtailed where limits are exceeded. Rather, this category identifies that closer examination is required to determine an appropriate strategy to address the established criteria.

Methods

The landscape level objectives addressed in the combined status of constraints map are listed in Table 26.

Table 26 Objectives shown for the Combined Constraint Status

Constraints	Criteria	Units	Theme/Harvest Availability
Seral Stage	Min Mature+Old	LU/BECSubzone	Red: Over/Under the limit Orange: <50ha Yellow: <100 ha Green: >= 100ha White: No limit or CFLB
Seral Stage	Min Old	LU/BECSubzone	
Core Ecosystems	Max 50% CFLB @ Age<50	CE	
Landscape Corridors	Min 70% CFLB @ Age>80	LRC	
Grizzly Bear – High Value	Min 80% CFLB @ Age>50	GB	
Grizzly Bear – Mixed	Max 25% CFLB @ Ht<3m	GBA	
Telkwa Caribou Recovery Area	Max Early (Age<40)	TCRA/BECVariant	
Telkwa Caribou Recovery Area	Min Mature (Age>=80)	TCRA/BECVariant	
Key Forested Caribou Habitat	Min 50% CFLB @ Age>90	KFCH/BECVariant	
Watershed Sensitivity	Max ECA (IWAP)	Watershed	

The appropriate constraint status is reported with each table in the summary of statistics workbook.

Harvest availability is shown on the map by identifying the limiting status of all constraints applied to a given area. Future harvest opportunity is determined by assessing how close we are to exceeding the minimum or maximum threshold. Based on this assessment of current and future harvest opportunity, the following themes are assigned:

1. Non-CFLB (grey): Areas identified as outside the CFLB for the Bulkley TSA. This includes non-forest (lakes, rock, NP), non-productive forest (crown closure less than 20%, stand height less than 5 meters) and non-TSA land (woodlots, private land, etc).
2. Exceeded (red): Any unit where one or more constraints have exceeded the established threshold for the criteria. Harvesting within these units is therefore restricted.
3. Caution (orange): Any unit where a reduction/addition of up to 50 hectares will exceed the established threshold for the criteria. The future harvest opportunity is less than 50 hectares for these units.
4. Warning (yellow): Any unit where a reduction/addition of up to 100 hectares will exceed the established threshold for the criteria. The future harvest opportunity is less than 100 hectares for these units.
5. Normal (green): Any unit where over 100 hectares of reduction/addition is required before the established threshold for the criteria is exceeded. The future harvest opportunity is more than 100 hectares for these units.
6. No CFLB or target not available (white): Any unit that is completely outside of the CFLB or has no established threshold for the criteria.

Some established objective constraints are not included with the combined status analysis: maximum early seral stage, wildlife tree retention, watershed assessment trigger and patch size distribution. While they are considered throughout the development planning, process, these constraints are unlikely to significantly influence harvest opportunities. Still, these constraints are included as individual layers hidden but accessible within the digital map.

Results

A summary of the constraint status classes is provided in Table 27. This suggests that, for the foreseeable future, harvesting may be restricted over 21% of the CFLB. This is likely over-estimate the effect on current harvest opportunity within the TSA as THLB-related constraints are not considered in this analysis.

Table 27 Distribution of constraint status class by area

Status	Area (ha)	% of CFLB
Non-CFLB	239,700.2	
Exceeded limit	111,063.7	21%
Caution (limit within 50 ha)	36,410.3	7%
Warning (limit within 100 ha)	29,521.8	6%
Normal (limit beyond 100 ha)	329,652.0	63%
Not Available (No constraint criteria)	19,025.3	4%

Discussion

Intended as a coarse tool to assist forest planners to efficiently plan harvest blocks while remaining consistent with landscape level objectives associated with sustainable forest management. Users are aware that this is done at a landscape level and the status of specific units may differ with more site-specific information. This particular analysis is not appropriate for compliance and enforcement purposes. Rather, it provides forest managers with a good representation of objective criteria that are approaching or have exceeded a threshold, thereby indicating that more detailed analysis and/or changes in management strategies are needed.

It must also be emphasized that this analysis does not consider reductions to the landbase beyond the CFLB. Any spatial harvest constraints applied to the THLB, such as parks, environmentally sensitive areas and wildlife habitat areas, are not shown on the map or presented in the tables. This analysis may be further enhanced once the appropriate THLB is defined through the TSR process underway for the Bulkley TSA.

13 Recommendations

As analyses are undertaken, opportunities to improve are recognized for future implementation. For the studies described above, several limitations with the input data were identified; some limitations are highlighted in section 2.7. Recommendations to review and improve these data sources prior to the next analysis are discussed below.

Clarify BEC Units

Some of the LU and BEC variant combinations identified do not have specific targets identified probably because they are relatively small. These BEC units should be reviewed and grouped where the small sizes make them unreasonable to manage for seral stages. Clarifying these groupings in FSPs will ensure future analyses are done consistently.

The available BEC layer was captured at scales between 1:50,000 and 1:250,000 whereas the VRI was captured at a 1:20,000 scale. At a stand level, the VRI is typically more reliable than the BEC mapping for defining attributes for the CFLB. For this the seral stage analysis, BEC variants were grouped into appropriate subzones. The approach for grouping these variants should be confirmed, particularly as they relate to subzones without limits (e.g., NDT5).

Improve Road Information

The district road layer is used as a source layer to buffer and apply as non-productive areas for reducing the CFLB. For a significant number of road sections FCODE appears to be incorrect – particularly for the "Rough Road" classification. This affects both the locations and buffers assigned in defining the CFLB.

As well, the district road layer does not capture road status so any deactivated roads are still included in determining road density and stream crossing density measures for the analysis of sensitive watersheds. Alternatively, for the sensitive watersheds, it might be more appropriate to build an inventory layer of structures as they currently exist.

Improve Disturbance Information

Several inconsistencies between the current VRI and other datasets were observed. This is particularly disconcerting where areas known to be harvested are identified as mature or old. Such inconsistencies affect the CFLB and stand ages used for various seral stage analyses and can lead users to become sceptical with the results.

A number of stands throughout the TSA (e.g., Copper and Telkwa watersheds) were identified in the VRI as being silviculture openings but do not appear to have been harvested. These errors affect the patch size analysis (disturbed) results. Also, while the orthophotos suggest the CFLB looks appropriate, these errors may have influenced the CFLB.

Planned harvest areas are used to assess the near-future condition for various analyses. Initially, this was intended to identify planned harvesting disturbance over the next 10 years but licensees were not able to provide this in all cases. Preparation of this in advance of future analyses should assist licensees in identifying areas where close examination of these indicators is required. Moreover, specifying years of future disturbance or specifying the near-future period will allow analysts to consider stand growth with near-future results.

The CE and LRC analyses did not examine future conditions because the planned harvest areas may not accurately represent the potential disturbance within the CEs. This should be addressed in the next analysis.

Improve Leave Area Information

Leave areas are typically managed by licensees as small polygons whereas the VRI update process removes these retention patches and merges them within the harvested area. To take advantage of the more detailed data, these analyses effectively "stood up" the trees within these patches that were eliminated in the VRI. While it is highly unlikely that the VRI update process will change, there is an opportunity to manage these leave areas better. For example, using the orthophoto layer, there appears to be additional leaves that have not yet been captured.

No stand-related attributes were available for the patches that are not available in the VRI. For this analysis, a coarse assumption – that could be improved – was used to assign ages. While leave areas are managed at a stand level, the benefits of these are ultimately applied at a landscape-level. Consequently, leave areas should be managed carefully.

Incorporate TSR Results

For comparison purposes, it would be desirable to apply the same approach for defining the CFLB as was applied in the TSR that is currently underway. Once this agency-led project is completed, it might be important to check that the CFLB definitions and subsequent analyses are consistent and adjusted where appropriate.

As well, these analyses did not incorporate a THLB for identifying future harvest opportunities. This may be particularly helpful for illustrating harvest availability within the constraint status map.

Align Layers

While some might consider this a housekeeping issue, there are opportunities to eliminate redundant information when key layers are adjusted to align. To clarify, spatial data was not changed in this analysis but some results show relatively tiny areas that cannot be effectively managed on their own. While many layers are fixed by classification or legal definitions, minor alterations to FDUs to align better with watersheds and/or landscape units would help to streamline results.

Incorporate Watershed Assessment Information

The analysis of sensitive watersheds could be improved by incorporating key information compiled when detailed watershed assessments are done. Specifically, information on stream crossings and road deactivation information would be current and readily available. A process for compiling this information would be advantageous for this and likely other analyses.

Improve Early Stand Heights

The grizzly bear mixed forest habitat analysis (section 9) and the sensitive watershed analysis (section 10) both rely on early stand height attributes. Approaches for assigning early stand heights to stands within these areas should be explored to compare against those generated with the VRI. This may involve TIPSY-generated curves, which are also suspect, or deriving early height curves directly from existing silviculture data for the TSA.

Implement Results Carefully

The analyses done for this project apply across the Bulkley TSA and rely largely on forest-level datasets. As demonstrated above, a number of issues with these datasets have been identified so it behoves the user to carefully consider how these results should be implemented. Subsequent or unit-specific analyses that use more current or possibly field-verified data will provide better results.

Licensee Review and Management

Many of the indicators in these analyses are measured across operating areas for multiple licensees. Where indicators exceed targets or are approaching targets, it is strongly recommended that licensees review these areas collaboratively to determine why the target is exceeded and develop a management strategy to adapt. A collaborative approach ensures that criteria assessments and management strategies are consistently applied across the Bulkley TSA. For example, establishing a recruitment strategy to address a deficit with old seral stage stands will be more successful if all affected licensees are involved.

Adopt A Review Frequency

This project was designed to provide a baseline set of results to compare with results from future analyses. It is presumed that each year, licensees operating it the Bulkley TSA will meet to review the current status of indicators and decide whether an analysis update is required. This decision will consider: changes in strategies intended to address objectives, changes in disturbance and growth that has occurred, availability of improved information and results that conflict with anticipated harvest opportunities.

The frequency of these analyses ultimately depends on the cost to update the information relative to the benefits these results might provide. To inform similar planning processes, updates are normally done every year or two to address the needs of licensees, government and the public.

These analyses could also be incorporated into a semi-automatic update process called a Landbase Reporting Tool. This tool provides a flexible and cost-effective solution for generating updates by incorporating the process developed in this project.

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Appendix I List of Acronyms

The following is a list of acronyms used throughout this report:

BEC	Biogeoclimatic Ecosystem Classification (system)
CE	Core Ecosystem
CFLB	Crown Forested Land Base
ESA	Equivalent Clearcut Area
ESSF	Englemann Spruce Subalpine Fir Zone – Biogeoclimatic Ecosystem Classification
FC1	Forest Cover (earlier version)
Fd	Douglas-fir
FDU	Forest Development Unit
FPPR	Forest Planning and Practices Regulation
FRPA	Forest and Range Practices Act
FSP	Forest Stewardship Plan
FSW	Fisheries Sensitive Watershed
GB	High value Grizzly Bear Habitat
GBA	Mixed Forest Grizzly Bear Habitat
GIS	Geographic Information System
GWM	General Wildlife Measures
HA	Hectares (ha)
HLPO	Higher Level Plan Order
ICH	Interior Cedar Hemlock Zone – Biogeoclimatic Ecosystem Classification
IWAP	Interior Watershed Assessment Procedures
KFCH	Key Forested Caribou Habitat
LRC	Landscape Riparian Corridor
LRMP	Land and Resource Management Plan
LU	Landscape Unit
LUP	Land Use Plan
MFLNR	Ministry of Forests Lands and Natural Resource Operations
NDT	Natural Disturbance Type
QA	Quality Assurance
SBS	Sub Boreal Spruce Zone – Biogeoclimatic Ecosystem Classification
TCRA	Telkwa Caribou Recovery Area
THLB	Timber Harvesting Land Base
TSR	Timber Supply Review
VRI	Vegetation Resources Inventory
WHA	Wildlife Habitat Area

Appendix II Input Schema

The following table represents the schema of the input data in the three geodatabases that house the project data. All of the fields are required to be present for the queries to work properly; extra fields will not affect the process.

Geodatabase	Feature Class	Field Name	Field Type	Field Width
Bulkley	vri_adjinv_may3	OBJECTID_1	OID	4
		FEATURE_ID	Integer	4
		MAP_ID	String	7
		POLYGON_ID	Integer	4
		OPENING_IN	String	1
		OPENING_SO	String	5
		OPENING_NU	String	4
		FEATURE_CL	Integer	4
		INVENTORY_	String	10
		POLYGON_AR	Double	8
		NON_PRODUC	String	5
		NON_PROD_1	String	10
		INPUT_DATE	Date	8
		COAST_INTE	String	1
		SURFACE_EX	String	10
		MODIFYING_	String	10
		SITE_POSIT	String	10
		ALPINE_DES	String	10
		SOIL_NUTRI	String	10
		ECOSYS_CLA	String	10
		BCLCS_LEVE	String	10
		BCLCS_LE_1	String	10
		BCLCS_LE_2	String	10
		BCLCS_LE_3	String	10
		BCLCS_LE_4	String	10
		INTERPRETE	String	30
		INTERPRETA	Date	8
		PROJECT	String	100
		REFERENCE_	SmallInteger	2
		SPECIAL_CR	SmallInteger	2
		SPECIAL__1	String	1
		INVENTORY1	SmallInteger	2
		COMPARTMEN	SmallInteger	2
		COMPARTM_1	String	1
		FIZ_CD	String	1
		FOR_MGMT_L	String	1
		ATTRIBUTIO	Date	8
		PROJECTED_	Date	8
		SHRUB_HEIG	Single	4
		SHRUB_CROW	SmallInteger	2
		SHRUB_COVE	String	10
		HERB_COVER	String	10
		HERB_COV_1	String	10
		HERB_COV_2	SmallInteger	2
		BRYOID_COV	SmallInteger	2
		NON_VEG_CO	String	10
		NON_VEG__1	SmallInteger	2
		NON_VEG__2	String	10
		NON_VEG__3	String	10
		NON_VEG__4	SmallInteger	2
		NON_VEG__5	String	10
		NON_VEG__6	String	10
		NON_VEG__7	SmallInteger	2
		NON_VEG__8	String	10
		LAND_COVER	String	10

Geodatabase	Feature Class	Field Name	Field Type	Field Width
		EST_COVERA	SmallInteger	2
		SOIL_MOIST	String	10
		LAND_COV_1	String	10
		EST_COVE_1	SmallInteger	2
		SOIL_MOI_1	String	10
		LAND_COV_2	String	10
		EST_COVE_2	SmallInteger	2
		SOIL_MOI_2	String	10
		AVAIL_LABE	Integer	4
		AVAIL_LA_1	Integer	4
		FULL_LABEL	String	254
		LABEL_CENT	Integer	4
		LABEL_CE_1	Integer	4
		LABEL_HEIG	Integer	4
		LABEL_WIDT	Integer	4
		LINE_1_OPE	String	4
		LINE_1_O_1	String	1
		LINE_2_POL	String	10
		LINE_3_TRE	String	50
		LINE_4_CLA	String	12
		LINE_5_VEG	String	11
		LINE_6_SIT	String	10
		LINE_7_ACT	String	1
		LINE_7A_ST	String	39
		LINE_7B_DI	String	40
		LINE_8_PLA	String	80
		PRINTABLE_	String	1
		SMALL_LABE	String	200
		OPENING_ID	Integer	4
		ORG_UNIT_N	Integer	4
		ORG_UNIT_C	String	6
		ADJUSTED_I	String	1
		BEC_ZONE_C	String	4
		BEC_SUBZON	String	3
		BEC_VARIAN	String	1
		BEC_PHASE	String	1
		EARLIEST_N	String	10
		EARLIEST_1	Date	8
		STAND_PERC	SmallInteger	2
		FREE_TO_GR	String	1
		HARVEST_DA	Date	8
		LAYER_ID	String	10
		FOR_COVER_	String	10
		NON_FOREST	String	10
		INTERPRE_1	String	10
		QUAD_DIAM_	Double	8
		QUAD_DIAM1	Double	8
		QUAD_DIA_1	Double	8
		EST_SITE_I	String	10
		EST_SITE_1	Single	4
		EST_SITE_2	String	10
		CROWN_CLOS	SmallInteger	2
		CROWN_CL_1	String	2
		REFERENCE1	Date	8
		SITE_INDEX	Single	4
		DBH_LIMIT	SmallInteger	2
		BASAL_AREA	Double	8
		DATA_SOURC	String	10
		VRI_LIVE_S	Integer	4
		DATA_SRC_V	String	10
		VRI_DEAD_S	Integer	4
		TREE_COVER	String	10

Geodatabase	Feature Class	Field Name	Field Type	Field Width
		VERTICAL_C	String	10
		SPECIES_CD	String	10
		SPECIES_PC	Single	4
		SPECIES__1	String	10
		SPECIES__2	Single	4
		SPECIES__3	String	10
		SPECIES__4	Single	4
		SPECIES__5	String	10
		SPECIES__6	Single	4
		SPECIES__7	String	10
		SPECIES__8	Single	4
		SPECIES__9	String	10
		SPECIES_10	Single	4
		PROJ_AGE_1	SmallInteger	2
		PROJ_AGE_C	String	1
		PROJ_AGE_2	SmallInteger	2
		PROJ_AGE_3	String	1
		DATA_SOU_1	String	10
		PROJ_HEIGH	Single	4
		PROJ_HEI_1	String	1
		PROJ_HEI_2	Single	4
		PROJ_HEI_3	String	1
		DATA_SOU_2	String	10
		LIVE_VOL_P	Double	8
		LIVE_VOL_1	Double	8
		LIVE_VOL_2	Double	8
		LIVE_VOL_3	Double	8
		LIVE_VOL_4	Double	8
		LIVE_VOL_5	Double	8
		LIVE_VOL_6	Double	8
		LIVE_VOL_7	Double	8
		LIVE_VOL_8	Double	8
		LIVE_VOL_9	Double	8
		LIVE_VO_10	Double	8
		LIVE_VO_11	Double	8
		LIVE_VO_12	Double	8
		LIVE_VO_13	Double	8
		LIVE_VO_14	Double	8
		LIVE_VO_15	Double	8
		LIVE_VO_16	Double	8
		LIVE_VO_17	Double	8
		DEAD_VOL_P	Double	8
		DEAD_VOL_1	Double	8
		DEAD_VOL_2	Double	8
		DEAD_VOL_3	Double	8
		DEAD_VOL_4	Double	8
		DEAD_VOL_5	Double	8
		DEAD_VOL_6	Double	8
		DEAD_VOL_7	Double	8
		DEAD_VOL_8	Double	8
		DEAD_VOL_9	Double	8
		DEAD_VO_10	Double	8
		DEAD_VO_11	Double	8
		DEAD_VO_12	Double	8
		DEAD_VO_13	Double	8
		DEAD_VO_14	Double	8
		DEAD_VO_15	Double	8
		DEAD_VO_16	Double	8
		DEAD_VO_17	Double	8
		LIVE_STAND	Double	8
		LIVE_STA_1	Double	8
		LIVE_STA_2	Double	8

Geodatabase	Feature Class	Field Name	Field Type	Field Width
		DEAD_STAND	Double	8
		DEAD_STA_1	Double	8
		DEAD_STA_2	Double	8
		feature__1	Integer	4
		adjusted	String	254
		proj_year	Integer	4
		age	Integer	4
		height	Double	8
		sp01	String	254
		sp02	String	254
		sp03	String	254
		sp04	String	254
		sp05	String	254
		sp06	String	254
		pct1	Integer	4
		pct2	Integer	4
		pct3	Integer	4
		pct4	Integer	4
		pct5	Integer	4
		pct6	Integer	4
		qmd_75	Double	8
		qmd_125	Double	8
		lorey_ht_7	Double	8
		lorey_ht_1	Double	8
		ba_7	Double	8
		ba_125	Double	8
		tph_75	Double	8
		tph_125	Double	8
		v_wsv_125	Double	8
		v_cu_125	Double	8
		v_d_125	Double	8
		v_dw_125	Double	8
		v_dwb_125	Double	8
		v_wsv_mix	Double	8
		v_cu_mix	Double	8
		v_d_mix	Double	8
		v_dw_mix	Double	8
		v_dwb_mix	Double	8
		GEOMETRY_L	Double	8
		GEOMETRY_A	Double	8
		CFLB_05217	String	8
		LOGGED	String	8
		FMLB	String	8
	resultant38_v2	RES_ID1	SmallInteger	2
		RES_ID2	SmallInteger	2
		RES_ID3	Integer	4
		MAP_TILE	String	32
		TSA	Double	8
		SB	String	1
		TSB	String	5
		LU	String	20
		BEO	String	15
		ID	Double	8
		FEN	String	10
		FEN_NAME	String	30
		BAB_SMU	String	5
		WILD1	String	5
		WILD1_NAME	String	30
		WILD2	String	5
		WILD3	String	10
		FSW_TAG	String	14
		FSW_NAME	String	20

Geodatabase	Feature Class	Field Name	Field Type	Field Width
		CMNTY_WTR	String	20
		FTHO_WTR	String	20
		ZONE_	String	12
		SUBZONE	String	9
		VARIANT	String	3
		PHASE	String	3
		BGC_LABEL	String	27
		NAT_DIST	String	10
		OPERABLE	String	5
		PFOR	String	4
		PCODE	String	4
		PCELL	String	4
		GRY_PSP	String	15
		PSP_BUFF	SmallInteger	2
		PROJ_KEY	String	15
		PROJ_ID	Integer	4
		PROJ_STAT	String	10
		PROJ_BUFF	SmallInteger	2
		BORDEN	String	10
		SKEENA2_ID	Double	8
		CLASS	String	3
		R_E_CODE	SmallInteger	2
		FAN	String	5
		WILD4	String	10
		CARIBOU1	String	10
		CARIBOU2	String	10
		FEN_NEW	String	5
		KF_STATUS	String	10
		WILD5	String	10
		VQO_POLYNO	Integer	4
		VAC_FIN	String	10
		EST_VQO	String	6
		VQO_KNOWN	String	10
		BLUP_VQO	String	10
		RVQC_NO	Integer	4
		REC_VQC	String	6
		RMZ_DBU_ID	Integer	4
		RMZ_TYPE2	String	10
		RMZ_SUB	String	10
		WILD_LAKE	String	10
		OWN	Integer	4
		SCHEDULE	String	10
		OWN_SCHED	String	5
		OWN_NAME	String	50
		ADAWHMA	String	10
		GRAZE	String	10
		SLPSTB_CLS	String	15
		SFCERO_POT	String	14
		ERO_PROXY	String	10
		ESA_1	String	3
		ESA_2	String	3
		FSP_NAME	String	15
		FDU_UNIT	String	15
		OW_HOUSE	String	15
		OW_TTY	String	10
		LAXWIIYIP	String	30
		GITX_ADM	String	20
		SOI_FN	String	10
		SOI_FN2	String	10
		REC_TYPE	String	10
		REC_NAME	String	30
	FTHO_topo	OBJECTID_1	OID	4

Geodatabase	Feature Class	Field Name	Field Type	Field Width
	FSW_topo	FTHO_WTR	String	20
		Shape_Leng	Double	8
		Keep	SmallInteger	2
		OBJECTID_1	OID	4
		FSHSNSTVWS	Double	8
		PPRVLDT	String	20
		VLTNNT	String	30
		FTRNTS	String	254
		FSW_TAG	String	14
		GZTTDNM	String	30
		LOCAL_NAME	String	30
		NTCDT	String	20
		WTRSHDCD	String	45
		FTRCD	String	10
		KEEP	SmallInteger	2
	PIR_topo	OBJECTID_1	OID	4
		NAME	String	25
		SIZE_SQ_KM	Double	8
		Shape_Leng	Double	8
		Keep	SmallInteger	2
	FC1_VEG_R1_PLY	FEATURE_ID	String	32
		OBJ_SKEY	Double	8
		MAP_ID	String	7
		POLY_ID	Double	8
		OPEN_IND	String	1
		OPEN_SRC	String	5
		OPEN_NUM	String	4
		FEAT_SKEY	Double	8
		INV_STD_CD	String	1
		POLY_AREA	Double	8
		NP_DESC	String	5
		NP_CODE	Integer	4
		INPUT_DATE	String	20
		CST_INT_CD	String	1
		C_I_SRC_CD	String	3
		SURF_EXP	String	1
		MOD_PROCES	String	1
		SITE_MESO	String	1
		ALPN_DESIG	String	1
		SOIL_NUTR	String	1
		ECO_SRC_CD	Integer	4
		BCLCS_LV_1	String	2
		BCLCS_LV_2	String	2
		BCLCS_LV_3	String	2
		BCLCS_LV_4	String	2
		BCLCS_LV_5	String	2
		PRI_UTL_CD	Integer	4
		SEC_UTL_CD	Integer	4
		INTERPRETR	String	30
		INTRP_DATE	String	20
		PROJECT_ID	String	30
		DATE_PHOTO	String	20
		CRUISE_NO	Integer	4
		CRUISE_CD	String	1
		INV_REGION	Integer	4
		COMPARTMNT	Integer	4
		COMP_LET	String	1
		FIZ_CD	String	1
		MD_SRC_CD	String	10
		MD_CAP_CD	String	10
		MD_ACCURAC	String	3
		MD_OBSERV	String	20

Geodatabase	Feature Class	Field Name	Field Type	Field Width
		MD_RETIRE	String	20
		MD_COMMENT	String	254
		ATRIB_DATE	String	20
		PROJ_DATE	String	20
		ADJST_AREA	Double	8
		SHRB_HT	Double	8
		SHRB_CC	Integer	4
		SHRB_PATT	Integer	4
		HERB_TYPE	String	2
		HERB_COVER	Integer	4
		HERB_PCT	Integer	4
		BRYOID_PCT	Integer	4
		NVEG_COV_1	Integer	4
		NVEG_PCT_1	Integer	4
		NVEG_TYP_1	String	2
		NVEG_COV_2	Integer	4
		NVEG_PCT_2	Integer	4
		NVEG_TYP_2	String	2
		NVEG_COV_3	Integer	4
		NVEG_PCT_3	Integer	4
		NVEG_TYP_3	String	2
		LAND_CD_1	String	2
		COV_PCT_1	Integer	4
		SOIL_MST_1	Integer	4
		LAND_CD_2	String	2
		COV_PCT_2	Integer	4
		SOIL_MST_2	Integer	4
		LAND_CD_3	String	2
		COV_PCT_3	Integer	4
		SOIL_MST_3	Integer	4
		AV_LBL_HT	Double	8
		AV_LBL_WD	Double	8
		FULL_LABEL	String	254
		LBL_CTR_X	Double	8
		LBL_CTR_Y	Double	8
		LBL_HT	Double	8
		LBL_WIDTH	Double	8
		LBL_OPN_NO	String	4
		LBL_OPN_CD	String	1
		LBL_POLYID	String	10
		LBL_SPECIS	String	50
		LBL_CLS_IN	String	12
		LBL_VEGCOV	String	11
		LBL_HIST	String	80
		LBL_DISTUR	String	1
		LBL_HIS_SY	String	39
		LBL_TEND	String	40
		LBL_PLANT	String	80
		PRINTABLE	String	1
		SM_LABEL	String	100
		VIF_HIS_1	Double	8
		VIF_HIS_2	Double	8
		VIF_HIS_3	Double	8
		OPEN_ID	Double	8
		ORGUNIT_NO	Double	8
		ORGUNIT_CD	String	18
		LAYER_ID	String	1
		RANK_CD	String	1
		NFOR_DESC	String	5
		INTERP_CD	Integer	4
		Q_DIAM_125	Double	8
		Q_DIAM_175	Double	8

Geodatabase	Feature Class	Field Name	Field Type	Field Width
		Q_DIAM_225	Double	8
		EST_SI_SPC	String	3
		EST_SI	Integer	4
		SI_DATA_CD	String	1
		REF_YR_ID	Integer	4
		PRJ_TYP_ID	Integer	4
		TYPEGRP_CD	String	1
		TYPEGRP_NO	Integer	4
		VOLUME_ADJ	Double	8
		HIST_S_CD	String	1
		HIST_SS_CD	String	1
		CR_CLOSURE	Integer	4
		STOCK_CLAS	String	1
		STOCK_CODE	String	1
		REF_DATE	String	20
		PRJ_STK_CD	String	1
		SITE_INDEX	Double	8
		YR_ESTAB	String	20
		DBH_LIMIT	Integer	4
		CULMAI_125	Double	8
		CULMAI_175	Double	8
		CULMAI_225	Double	8
		BASAL_AREA	Integer	4
		B_A_DTA_CD	Integer	4
		LIVE_STEMS	Double	8
		STEM_HA_CD	Integer	4
		DEAD_STEMS	Integer	4
		TREE_PATRN	Integer	4
		VERT_COMPL	Integer	4
		LOSS_TYPE	String	3
		SPEC_CD_1	String	4
		SPEC_PCT_1	Integer	4
		SPEC_CD_2	String	4
		SPEC_PCT_2	Integer	4
		SPEC_CD_3	String	4
		SPEC_PCT_3	Integer	4
		SPEC_CD_4	String	4
		SPEC_PCT_4	Integer	4
		SPEC_CD_5	String	4
		SPEC_PCT_5	Integer	4
		SPEC_CD_6	String	4
		SPEC_PCT_6	Integer	4
		AGE_1	Integer	4
		PROJ_AGE_1	Integer	4
		AGE_2	Integer	4
		PROJ_AGE_2	Integer	4
		AGE_DTA_CD	Integer	4
		UPD_AGEDAT	String	20
		HEIGHT_1	Double	8
		PROJ_HT_1	Double	8
		HEIGHT_2	Double	8
		PROJ_HT_2	Double	8
		HT_DATA_CD	Integer	4
		UPD_HTDATE	String	20
		VOLSP1_125	Double	8
		VOLSP1_175	Double	8
		VOLSP1_225	Double	8
		VOLSP2_125	Double	8
		VOLSP2_175	Double	8
		VOLSP2_225	Double	8
		VOLSP3_125	Double	8
		VOLSP3_175	Double	8

Geodatabase	Feature Class	Field Name	Field Type	Field Width
		VOLSP3_225	Double	8
		VOLSP4_125	Double	8
		VOLSP4_175	Double	8
		VOLSP4_225	Double	8
		VOLSP5_125	Double	8
		VOLSP5_175	Double	8
		VOLSP5_225	Double	8
		VOLSP6_125	Double	8
		VOLSP6_175	Double	8
		VOLSP6_225	Double	8
	Resultant	FID_FTHO_topo	Integer	4
		FID_resultant38_v2	Integer	4
		FID_vri_adjinv_may3	Integer	4
		FID_FSW_topo	Integer	4
		FID_FC1_VEG_R1_PLY	Integer	4
		FID_district_roads_20k_buffer	Integer	4
		FID_Planned_Roads_buffer	Integer	4
		FID_Proposed_Blocks	Integer	4
		FID_Operating_Areas	Integer	4
		FID_Non_Forest	Integer	4
		FID_Leaves	Integer	4
		FID_FDU	Integer	4
		FID_Blocks	Integer	4
		FID_PIR_topo	Integer	4
		CC_L1_L2	Double	8
		cflb	Integer	4
		logged	Integer	4
		netdown	String	50
		crown	Integer	4
		CurrentAge	Integer	4
		CurrentHeight	Integer	4
		nearfuture	Integer	4
		FutureHeight	Integer	4
		CurrentSeral	String	50
		FutureSeral	String	50
		CurrentECA	Integer	4
		FutureECA	Integer	4
	CurrentSeral_Logged	logged	Integer	4
		CurrentSeral	String	50
		CurrentLoggedSize	Double	8
	FutureSeral_Logged	logged	Integer	4
		FutureSeral	String	50
		FutureLoggedSize	Double	8
	CurrentSeral	CurrentSeral	String	50
		CurrentSize	Double	8
	FutureSeral	FutureSeral	String	50
		FutureSize	Double	8
	PatchResultant	FID_Resultant	Integer	4
		FID_FTHO_topo	Integer	4
		FID_resultant38_v2	Integer	4
		FID_vri_adjinv_may3	Integer	4
		FID_FSW_topo	Integer	4
		FID_FC1_VEG_R1_PLY	Integer	4
		FID_district_roads_20k_buffer	Integer	4
		FID_Planned_Roads_buffer	Integer	4
		FID_Proposed_Blocks	Integer	4
		FID_Operating_Areas	Integer	4
		FID_Non_Forest	Integer	4
		FID_Leaves	Integer	4
		FID_FDU	Integer	4
		FID_Blocks	Integer	4
		FID_PIR_topo	Integer	4

Geodatabase	Feature Class	Field Name	Field Type	Field Width
		CC_L1_L2	Double	8
		cflb	Integer	4
		logged	Integer	4
		netdown	String	50
		crown	Integer	4
		CurrentAge	Integer	4
		CurrentHeight	Integer	4
		nearfuture	Integer	4
		FutureHeight	Integer	4
		CurrentSeral	String	50
		FutureSeral	String	50
		CurrentECA	Integer	4
		FutureECA	Integer	4
		CurrentSize	Double	8
		CurrentLoggedSize	Double	8
		FutureSize	Double	8
		FutureLoggedSize	Double	8
		PatchSize	String	50
Bulk_Dev	Non_Forest	SHAPE	Geometry	0
		Licensee	String	12
		Block_ID	String	12
		NF_Type	String	6
		SHAPE_Length	Double	8
		SHAPE_Area	Double	8
	Operating_Areas	SHAPE	Geometry	0
		Licensee	String	12
		Op_Area_Name	String	50
		SHAPE_Length	Double	8
		SHAPE_Area	Double	8
	FDU	SHAPE	Geometry	0
		Licensee	String	12
		FDU	String	12
		SHAPE_Length	Double	8
		SHAPE_Area	Double	8
	Blocks	Licensee	String	12
		Block_ID	String	12
		Cut_Permit	String	12
		Blk_Status	String	12
		Harv_SDate	Date	8
		Harv_CDate	Date	8
		Silv_Sys	String	6
	Proposed_Blocks	SHAPE	Geometry	0
		Licensee	String	12
		Block_ID	String	12
		Cut_Permit	String	12
		Blk_Status	String	35
		SHAPE_Length	Double	8
		SHAPE_Area	Double	8
	Leaves	Licensee	String	12
		Year_Avail	String	4
		Leave_Type	String	25
Bulk_Dev_Roads	district_roads_20k	FCODE	String	10
		BCGS_TILE	String	7
		SOURCE_ID	String	52
		GEOMETRY_L	Double	8
		buff	SmallInteger	2
		diss	SmallInteger	2
		Shape_Leng	Double	8
		Comments	String	30
		buffer_distance	Double	8
	Planned_Roads	FCODE	String	10
		BCGS_TILE	String	7

Geodatabase	Feature Class	Field Name	Field Type	Field Width
		SOURCE_ID	String	52
		GEOMETRY_L	Double	8
		buff	SmallInteger	2
		diss	SmallInteger	2
		Shape_Leng	Double	8
		Comments	String	30
		buffer_distance	Double	8
	Planned_Roads_buffer	Planned_Roads_FCODE	String	10
		Planned_Roads_BCGS_TILE	String	7
		Planned_Roads_SOURCE_ID	String	52
		Planned_Roads_GEOMETRY_L	Double	8
		Planned_Roads_buff	SmallInteger	2
		Planned_Roads_diss	SmallInteger	2
		Planned_Roads_Shape_Leng	Double	8
		Planned_Roads_Comments	String	30
		Planned_Roads_buffer_distance	Double	8
		bcelinlt_SYMBOL	Double	8
		bcelinlt_FCODE	String	10
		bcelinlt_SPACE	String	2
		bcelinlt_LABEL	String	100
		bcelinlt_LAYER	String	10
		bcelinlt_SOURCE	String	15
		bcelinlt_REMARKS	String	100
		BUFF_DIST	Double	8
	district_roads_20k_buffer	planned_crossings	FID_trivr	Integer
		TRIVR_ID	Integer	4
		FCODE	String	10
		CLASS	String	40
		TYPE	String	40
		DSP_TYPE	String	18
		FILE	String	40
		mapsheet	String	7
		FID_Planned_Roads	Integer	4
		FCODE_1	String	10
		BCGS_TILE	String	7
		SOURCE_ID	String	52
		GEOMETRY_L	Double	8
		buff	SmallInteger	2
		diss	SmallInteger	2
		Shape_Leng	Double	8
		Comments	String	30
		buffer_distance	Double	8
	district_roads_20k_crossings	FID_district_roads_20k	Integer	4
		FCODE	String	10
		BCGS_TILE	String	7
		SOURCE_ID	String	52
		GEOMETRY_L	Double	8
		buff	SmallInteger	2
		diss	SmallInteger	2
		Shape_Leng	Double	8
		Comments	String	30
		buffer_distance	Double	8
		FID_trivr	Integer	4
		TRIVR_ID	Integer	4
		FCODE_1	String	10
		CLASS	String	40
		TYPE	String	40
		DSP_TYPE	String	18
		FILE	String	40
		mapsheet	String	7
	district_roads_resultant	FID_district_roads_20k	Integer	4
		FCODE	String	10

Geodatabase	Feature Class	Field Name	Field Type	Field Width
		BCGS_TILE	String	7
		SOURCE_ID	String	52
		GEOMETRY_L	Double	8
		buff	SmallInteger	2
		diss	SmallInteger	2
		Shape_Leng	Double	8
		Comments	String	30
		buffer_distance	Double	8
		FID_Resultant	Integer	4
		FID_FTHO_topo	Integer	4
		FID_resultant38_v2	Integer	4
		FID_vri_adjinv_may3	Integer	4
		FID_FSW_topo	Integer	4
		FID_FC1_VEG_R1_PLY	Integer	4
		FID_district_roads_20k_buffer	Integer	4
		FID_Planned_Roads_buffer	Integer	4
		FID_Proposed_Blocks	Integer	4
		FID_Operating_Areas	Integer	4
		FID_Non_Forest	Integer	4
		FID_Leaves	Integer	4
		FID_FDU	Integer	4
		FID_Blocks	Integer	4
		FID_PIR_topo	Integer	4
		CC_L1_L2	Double	8
		cflb	Integer	4
		logged	Integer	4
		netdown	String	50
		crown	Integer	4
		CurrentAge	Integer	4
		nearfuture	Integer	4
		CurrentHeight	Integer	4
		CurrentSeral	String	50
		FutureSeral	String	50
		CurrentECA	Integer	4
		FutureECA	Integer	4
		FutureHeight	Integer	4
	district_roads_crossings_resultant	FID_district_roads_20k_crossings	Integer	4
		FID_district_roads_20k	Integer	4
		FCODE	String	10
		BCGS_TILE	String	7
		SOURCE_ID	String	52
		GEOMETRY_L	Double	8
		buff	SmallInteger	2
		diss	SmallInteger	2
		Shape_Leng	Double	8
		Comments	String	30
		buffer_distance	Double	8
		FID_trivr	Integer	4
		TRIVR_ID	Integer	4
		FCODE_1	String	10
		CLASS	String	40
		TYPE	String	40
		DSP_TYPE	String	18
		FILE	String	40
		mapsheet	String	7
		FID_Resultant	Integer	4
		FID_FTHO_topo	Integer	4
		FID_resultant38_v2	Integer	4
		FID_vri_adjinv_may3	Integer	4
		FID_FSW_topo	Integer	4
		FID_FC1_VEG_R1_PLY	Integer	4
		FID_district_roads_20k_buffer	Integer	4

Geodatabase	Feature Class	Field Name	Field Type	Field Width
		FID_Planned_Roads_buffer	Integer	4
		FID_Proposed_Blocks	Integer	4
		FID_Operating_Areas	Integer	4
		FID_Non_Forest	Integer	4
		FID_Leaves	Integer	4
		FID_FDU	Integer	4
		FID_Blocks	Integer	4
		FID_PIR_topo	Integer	4
		CC_L1_L2	Double	8
		cflb	Integer	4
		logged	Integer	4
		netdown	String	50
		crown	Integer	4
		CurrentAge	Integer	4
		nearfuture	Integer	4
		CurrentHeight	Integer	4
		CurrentSeral	String	50
		FutureSeral	String	50
		CurrentECA	Integer	4
		FutureECA	Integer	4
		FutureHeight	Integer	4
	planned_crossings_resultant	FID_planned_crossings	Integer	4
		FID_trivr	Integer	4
		TRIVR_ID	Integer	4
		FCODE	String	10
		CLASS	String	40
		TYPE	String	40
		DSP_TYPE	String	18
		FILE	String	40
		mapsheet	String	7
		FID_Planned_Roads	Integer	4
		FCODE_1	String	10
		BCGS_TILE	String	7
		SOURCE_ID	String	52
		GEOMETRY_L	Double	8
		buff	SmallInteger	2
		diss	SmallInteger	2
		Shape_Leng	Double	8
		Comments	String	30
		buffer_distance	Double	8
		FID_Resultant	Integer	4
		FID_FTHO_topo	Integer	4
		FID_resultant38_v2	Integer	4
		FID_vri_adjinv_may3	Integer	4
		FID_FSW_topo	Integer	4
		FID_FC1_VEG_R1_PLY	Integer	4
		FID_district_roads_20k_buffer	Integer	4
		FID_Planned_Roads_buffer	Integer	4
		FID_Proposed_Blocks	Integer	4
		FID_Operating_Areas	Integer	4
		FID_Non_Forest	Integer	4
		FID_Leaves	Integer	4
		FID_FDU	Integer	4
		FID_Blocks	Integer	4
		FID_PIR_topo	Integer	4
		CC_L1_L2	Double	8
		cflb	Integer	4
		logged	Integer	4
		netdown	String	50
		crown	Integer	4
		CurrentAge	Integer	4
		nearfuture	Integer	4

Geodatabase	Feature Class	Field Name	Field Type	Field Width
		CurrentHeight	Integer	4
		CurrentSeral	String	50
		FutureSeral	String	50
		CurrentECA	Integer	4
		FutureECA	Integer	4
		FutureHeight	Integer	4
	Planned_Roads_resultant	FID_Planned_Roads	Integer	4
		FCODE	String	10
		BCGS_TILE	String	7
		SOURCE_ID	String	52
		GEOMETRY_L	Double	8
		buff	SmallInteger	2
		diss	SmallInteger	2
		Shape_Leng	Double	8
		Comments	String	30
		buffer_distance	Double	8
		FID_Resultant	Integer	4
		FID_FTHO_topo	Integer	4
		FID_resultant38_v2	Integer	4
		FID_vri_adjinv_may3	Integer	4
		FID_FSW_topo	Integer	4
		FID_FC1_VEG_R1_PLY	Integer	4
		FID_district_roads_20k_buffer	Integer	4
		FID_Planned_Roads_buffer	Integer	4
		FID_Proposed_Blocks	Integer	4
		FID_Operating_Areas	Integer	4
		FID_Non_Forest	Integer	4
		FID_Leaves	Integer	4
		FID_FDU	Integer	4
		FID_Blocks	Integer	4
		FID_PIR_topo	Integer	4
		CC_L1_L2	Double	8
		cflb	Integer	4
		logged	Integer	4
		netdown	String	50
		crown	Integer	4
		CurrentAge	Integer	4
		nearfuture	Integer	4
		CurrentHeight	Integer	4
		CurrentSeral	String	50
		FutureSeral	String	50
		CurrentECA	Integer	4
		FutureECA	Integer	4
		FutureHeight	Integer	4

Appendix III Seral stage objectives

Seral stage and WTR objectives were applied in the analysis according to the table below.

Landscape	BEC		Early		Mature		Old		WTR [2]
Unit	Variant	Source [1]	Age	Limit	Age	Limit	Age	Limit	Limit
Babine	BAFAun	3	<40	36	>120	28	>250	9	
Babine	ESSFmc	1	<40	36	>120	28	>250	9	3
Babine	ESSFmcp	3	<40	36	>120	28	>250	9	
Babine	ESSFmvp	3	<40	36	>120	28	>250	9	
Babine	SBSmc2	1	<40	54	>100	23	>140	11	7
Blunt	BAFAun	3	<40		>120	14	>250	9	
Blunt	ESSFmc	1	<40		>120	14	>250	9	3
Blunt	ESSFmcp	3	<40		>120	14	>250	9	
Blunt	ESSFwv	2	<40		>120		>250		
Blunt	ICHmc1	1	<40		>100		>250		
Blunt	SBSmc2	1	<40		>100	11	>140	11	7
Bulkley	BAFAun	3	<40		>120	14	>250	9	
Bulkley	ESSFmc	2	<40		>120	14	>250	9	5
Bulkley	ESSFmcp	3	<40		>120	14	>250	9	
Bulkley	ESSFwv	2	<40		>120	19	>250	19	
Bulkley	ESSFwvp	3	<40		>120	19	>250	19	
Bulkley	ICHmc1	2	<40		>100	15	>250	9	3
Bulkley	ICHmc2	2	<40		>100	15	>250	9	5
Bulkley	SBSdk	1	<40		>100	11	>140	10	5
Bulkley	SBSmc2	1	<40		>100	11	>140	10	7
Chapman	BAFAun	3	<40		>120	14	>250	9	
Chapman	ESSFmc	1	<40		>120	14	>250	9	5
Chapman	ESSFmcp	3	<40		>120	14	>250	9	
Chapman	SBSmc2	1	<40		>100	11	>140	11	11
Copper	BAFAun	3	<40	36	>120	28	>250	9	
Copper	CMAun	3	<40	22	>120	36	>250	19	
Copper	CWHws2	1	<40	36	>80	34	>250	9	5
Copper	ESSFmc	1	<40	36	>120	28	>250	9	1
Copper	ESSFmcp	3	<40	36	>120	28	>250	9	
Copper	ESSFwv	1	<40	22	>120	36	>250	19	3
Copper	ESSFwvp	3	<40	22	>120	36	>250	19	
Copper	ICHmc1	2	<40	36	>100	31	>250	9	
Copper	MHmm2	1	<40	22	>120	36	>250	19	1
Copper	MHmmp	3	<40	22	>120	36	>250	19	
Copper	SBSmc2	1	<40	54	>100	23	>140	11	5
Corya	BAFAun	3	<40	17	>120	54	>250	28	
Corya	ESSFwv	1	<40	17	>120	54	>250	28	1
Corya	ESSFwvp	3	<40	17	>120	54	>250	28	
Corya	ICHmc1	1	<40	27	>100	46	>250	13	3
Corya	ICHmc2	1	<40	27	>100	46	>250	13	5
Deep Creek	ESSFmc	1	<40		>120	14	>250	9	1
Deep Creek	ESSFmcp	3	<40		>120	14	>250	9	
Deep Creek	SBSdk	1	<40		>100	11	>140	11	1
Deep Creek	SBSmc2	1	<40		>100	11	>140	11	3
Harold Price	BAFAun	3	<40	36	>120	28	>250	9	
Harold Price	ESSFmc	1	<40	36	>120	28	>250	9	3
Harold Price	ESSFmcp	3	<40	36	>120	28	>250	9	
Harold Price	ESSFwv	1	<40	22	>120	36	>250	19	1
Harold Price	ESSFwvp	3	<40	22	>120	36	>250	19	
Harold Price	ICHmc1	1	<40	36	>100	31	>250	9	1
Harold Price	ICHmc2	2	<40	36	>100	31	>250	9	1
Harold Price	SBSmc2	1	<40	54	>100	23	>140	11	7

Landscape Unit	BEC Variant	Source (1)	Early		Mature		Old		WTR (2)
			Age	Limit	Age	Limit	Age	Limit	Limit
Kitseguecla	BAFAun	3	<40	22	>120	36	>250	19	
Kitseguecla	ESSFwv	2	<40	22	>120	36	>250	19	
Kitseguecla	ESSFwvp	3	<40	22	>120	36	>250	19	
Kitseguecla	ICHmc1	2	<40	36	>100	31	>250	9	
Kitseguecla	ICHmc2	2	<40	36	>100	31	>250	9	
Nilkitkwa	BAFAun	3	<40	27	>120	42	>250	13	
Nilkitkwa	ESSFmc	1	<40	27	>120	42	>250	13	1
Nilkitkwa	ESSFmcp	3	<40	27	>120	42	>250	13	
Nilkitkwa	SBSmc2	1	<40	40	>100	34	>140	16	5
Reiseter	BAFAun	3	<40	36	>120	28	>250	9	
Reiseter	ESSFmc	1	<40	36	>120	28	>250	9	1
Reiseter	ESSFmcp	3	<40	36	>120	28	>250	9	
Reiseter	ESSFwv	2	<40	22	>120	36	>250	19	
Reiseter	ESSFwvp	3	<40	22	>120	36	>250	19	
Reiseter	ICHmc1	1	<40	36	>100	31	>250	9	7
Reiseter	ICHmc2	1	<40	36	>100	31	>250	9	5
Reiseter	SBSdk	1	<40	54	>100	23	>140	11	3
Reiseter	SBSmc2	1	<40	54	>100	23	>140	11	5
Telkwa	BAFAun	3	<40	36	>120	28	>250	9	
Telkwa	CWHws2	1	<40	36	>80	34	>250	9	3
Telkwa	ESSFmc	1	<40	36	>120	28	>250	9	3
Telkwa	ESSFmcp	3	<40	36	>120	28	>250	9	
Telkwa	ESSFmk	1	<40	22	>120	36	>250	19	1
Telkwa	ESSFmkp	3	<40	22	>120	36	>250	19	
Telkwa	ESSFwv	1	<40	22	>120	36	>250	19	1
Telkwa	ESSFwvp	3	<40	22	>120	36	>250	19	
Telkwa	ICHmc1	4	<40		>100		>250		
Telkwa	SBSdk	1	<40	54	>100	23	>140	11	3
Telkwa	SBSmc2	1	<40	54	>100	23	>140	11	7
Torkelson	BAFAun	3	<40		>120	14	>250	9	
Torkelson	ESSFmc	1	<40		>120	14	>250	9	3
Torkelson	ESSFmcp	3	<40		>120	14	>250	9	
Torkelson	ESSFwv	4	<40		>120		>250		
Torkelson	SBSmc2	1	<40		>100	11	>140	11	7
Trout Creek	BAFAun	3	<40	36	>120	28	>250	9	
Trout Creek	ESSFmcp	3	<40	36	>120	28	>250	9	
Trout Creek	ESSFwv	1	<40	22	>120	36	>250	19	1
Trout Creek	ESSFwvp	3	<40	22	>120	36	>250	19	
Trout Creek	ICHmc1	1	<40	36	>100	31	>250	9	7
Trout Creek	ICHmc2	1	<40	36	>100	31	>250	9	3
Trout Creek	SBSdk	1	<40	54	>100	23	>140	11	1
Trout Creek	SBSmc2	1	<40	54	>100	23	>140	11	7

(1) Sources for the seral stages are as follows:

1=Higher Level Plan Order,
2=2004 State of the Forest Report,
3=Assigned by grouping variants into subzones and BAF/CMA into ESSFmc, ESSFwk/MHmm,
4=No limits available

(2) Source for WTR limits is Higher Level Plan Order

Appendix IV Patch size objectives

Landscape Unit	Natural Disturbance	Source (1)	Limits			Size (Hectares)	
			Small	Medium	Large	Small	Large
Babine	NDT2	1	30-40	30-40	20-40	<40	>80
Babine	NDT3	1	10-20	10-20	60-80	<40	>250
Babine	NDT5	2	30-40	30-40	20-40	<40	>80
Blunt	NDT1	2	30-40	30-40	20-40	<40	>80
Blunt	NDT2	1	30-40	30-40	20-40	<40	>80
Blunt	NDT3	1	10-20	10-20	60-80	<40	>250
Blunt	NDT5	2	30-40	30-40	20-40	<40	>80
Bulkley	NDT1	1	30-40	30-40	20-40	<40	>80
Bulkley	NDT2	1	30-40	30-40	20-40	<40	>80
Bulkley	NDT3	1	10-20	10-20	50-80	<40	>250
Bulkley	NDT5	2	30-40	30-40	20-40	<40	>80
Chapman	NDT2	1	30-40	30-40	20-40	<40	>80
Chapman	NDT3	1	10-20	10-20	60-80	<40	>250
Chapman	NDT5	2	30-40	30-40	20-40	<40	>80
Copper	NDT1	1	30-40	30-40	20-40	<40	>80
Copper	NDT2	1	30-40	30-40	20-40	<40	>80
Copper	NDT3	1	10-20	10-20	60-80	<40	>250
Copper	NDT5	2	30-40	30-40	20-40	<40	>80
Corya	NDT1	1	30-40	30-40	20-40	<40	>80
Corya	NDT2	1	30-40	30-40	20-40	<40	>80
Corya	NDT5	2	30-40	30-40	20-40	<40	>80
Deep Creek	NDT2	1	30-40	30-40	20-40	<40	>80
Deep Creek	NDT3	1	10-20	10-20	60-80	<40	>250
Deep Creek	NDT5	2	30-40	30-40	20-40	<40	>80
Harold Price	NDT1	1	30-40	30-40	20-40	<40	>80
Harold Price	NDT2	1	30-40	30-40	20-40	<40	>80
Harold Price	NDT3	1	10-20	10-20	60-80	<40	>250
Harold Price	NDT5	2	30-40	30-40	20-40	<40	>80
Kitseguecla	NDT1	1	30-40	30-40	20-40	<40	>80
Kitseguecla	NDT2	1	30-40	30-40	20-40	<40	>80
Kitseguecla	NDT5	2	30-40	30-40	20-40	<40	>80
Nilkitkwa	NDT2	1	30-40	30-40	20-40	<40	>80
Nilkitkwa	NDT3	1	10-20	10-20	60-80	<40	>250
Nilkitkwa	NDT5	2	30-40	30-40	20-40	<40	>80
Reiseter	NDT1	1	30-40	30-40	20-40	<40	>80
Reiseter	NDT2	1	30-40	30-40	20-40	<40	>80
Reiseter	NDT3	1	10-20	10-20	60-80	<40	>250
Reiseter	NDT5	2	30-40	30-40	20-40	<40	>80
Telkwa	NDT1	1	30-40	30-40	20-40	<40	>80
Telkwa	NDT2	1	30-40	30-40	20-40	<40	>80
Telkwa	NDT3	1	10-20	10-20	60-80	<40	>250
Telkwa	NDT5	2	30-40	30-40	20-40	<40	>80
Torkelson	NDT1	2	30-40	30-40	20-40	<40	>80
Torkelson	NDT2	1	30-40	30-40	20-40	<40	>80
Torkelson	NDT3	1	10-20	10-20	60-80	<40	>250
Torkelson	NDT5	2	30-40	30-40	20-40	<40	>80
Trout Creek	NDT1	1	30-40	30-40	20-40	<40	>80
Trout Creek	NDT2	1	30-40	30-40	20-40	<40	>80
Trout Creek	NDT3	1	10-20	10-20	60-80	<40	>250
Trout Creek	NDT5	2	30-40	30-40	20-40	<40	>80

(1) Sources for patch size limits as follows: 1=Landscape Unit Plans (1999), 2=Not discussed with LUPs, so assigned standard limits for NDT1.