100 Mile House Timber Supply Area
Timber Supply Review

Data Package

January 2024

Sarah Szatmari, District Manager
100 Mile House Natural Resource District
Ministry of Forests

Jim Brown, Director
Forest Analysis and Inventory Branch
Ministry of Forests

BRITISH COLUMBIA
Ministry of Forests

TABLE OF CONTENTS

Tables

Figures

1. Introduction

This *Data Package* summarizes the information and assumptions that are proposed to be used to conduct a timber supply analysis for the timber supply review (TSR) of the 100 Mile House Timber Supply Area (TSA).

Under Section 8 of the *Forest Act* the chief forester must review the timber supply and determine a new allowable annual cut (AAC) for each TSA at least once every 10 years. The chief forester may also extend the current AAC for an additional five years if the current timber supply is stable and recent developments would unlikely change the AAC.

The last determination, effective November 7, 2013, set the AAC at two million cubic metres, with no more than 500 000 cubic metres attributable to live trees. The determination specified that from November 7, 2018 until the next determination, the AAC would decrease to one million cubic metres, of which no more than 500 000 cubic metres are attributable to live trees. The Clinton Community Forest Agreement (CFA) was established on June 11, 2014, and AAC was adjusted in accordance to the Allowable Annual Cut Administration Regulation. The resulting current AAC for the 100 Mile House TSA is 967 805 cubic metres, of which no more than 477 707 cubic metres are attributable to live trees. A new AAC determination is now required to reflect new information and changes that have occurred since the previous determination and to comply with the requirements of the *Forest Act*.

The timber supply review process, which includes opportunities for First Nations and the public to provide input, provides the chief forester with information required under the *Forest Act* to make an AAC determination. This process involves:

1) public release of this *Data Package* that describes known information and management;
2) completion of a timber supply analysis based on the information presented in the *Data Package*;
3) public release of a *Discussion Paper* that outlines the results of the timber supply analysis;
4) presentation to the chief forester of technical information, First Nations consultation information, and public review information; and,
5) public release of a *Rationale* that describes the chief forester's AAC determination.

The information and assumptions described in this document represent the current legal requirements and performance for the TSA and for the purpose of TSR are defined by:

- the current forest management regime — the productive forest land available for timber harvesting, the silviculture treatments, the harvesting systems and the integrated resource management practices used in the area; the standards used to approve or reject operational plans or prescriptions;
- land-use plans approved by Cabinet [e.g., Cariboo-Chilcotin Land-Use Plan (CCLUP)];
- legal objectives established under the *Forest and Range Practices Act* (FRPA) and the June 2010, Land Use Objectives established by the *Land Act* Order (LAO) under the Land Use Objectives Regulation. These objectives were amended as Land Use Objectives for the CCLUP, in the May 2011, LAO, and consolidated on September 6, 2018; and
- other approved provincial government and joint agency natural resource management practices and policy.

The primary purpose of the timber supply review is to gather, and model information based on "what is" as opposed to "what if". The information in this *Data Package* represents the best available knowledge at the time of publication but is subject to change. Future changes in forest management and data, when and if they occur, will be captured in future timber supply analyses.

A First Nations consultation and public review period has been established to allow submission of comments and concerns to the Ministry of Forests ('the Ministry') for the consideration of the chief forester in determining the AAC. Input from the consultation or public review that has timber supply

implications may be incorporated into the timber supply analysis or identified to the chief forester for consideration in the AAC determination. How the chief forester has considered information in the AAC determination will be documented through a publicly released *AAC Determination Rationale*.

As part of the public review and First Nations consultations, comments around the *Data Package* are being requested from First Nations and the public during a 60-day review period. Following the release of the *Discussion Paper* that describes the timber supply analysis results based on an updated *Data Package*, a further 60-day review period will ensue. Section 14 – 'Your input is needed' of this document describes details around the *Data Package* review process and comment submission.

2. Overview of the 100 Mile House TSA

2.1 Description of the 100 Mile House TSA

The 100 Mile House TSA is bounded on the west by the Fraser River, on the east by the Cariboo Mountains and Wells Gray Provincial Park, and TFL 18, on the north by the Williams Lake TSA, and on the east and south by the Kamloops TSA. The TSA has varied topography and climate. The flat, dry interior plateau separates two mountain ranges – the Marble Range to the southwest and the Quesnel Highlands to the northeast. The western part along the Fraser River has a hot, dry climate while the Cariboo Mountains to the east have a wetter climate and steep slopes. The main communities within the TSA are 100 Mile House, 108 Mile Ranch and Clinton. Smaller communities include Lac la Hache, Forest Grove, 70 Mile House, Lone Butte and Bridge Lake.

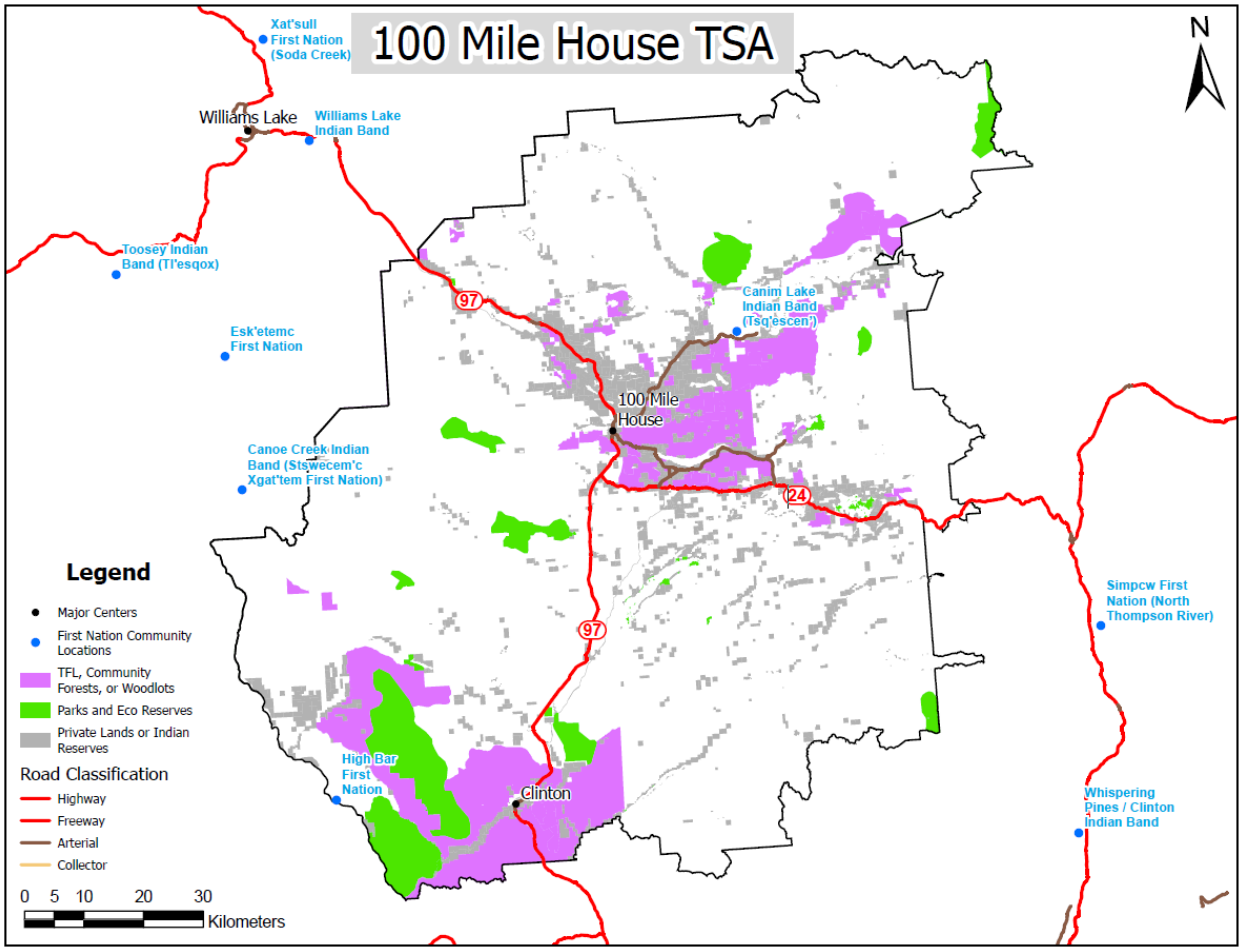

Figure 1. Map of the 100 Mile House TSA.

The dominant tree species in the TSA are lodgepole pine and Douglas-fir. Several other tree species occur including: spruce, subalpine fir (balsam), western redcedar, western hemlock and various deciduous (hardwood) species.

The 100 Mile House TSA provides habitat for a wide variety of wildlife including: mule deer, moose, black bear, lynx, marten, owls, as well as many fish species. Species at risk in the TSA include: mountain caribou, grizzly bear, bighorn sheep, and the prairie falcon.

2.2 First Nations

There is a rich, diverse Indigenous history in the 100 Mile House TSA. Four First Nation communities, which are home to the Tsq'escen First Nation (Canim Lake Band), Stswecem'c Xget'tem First Nation, High Bar First Nation and Whispering Pines/Clinton Indian Band are located within the 100 Mile TSA. Other First Nations whose traditional territories extend into the 100 Mile House TSA include: Ashcroft Indian Band, Bonaparte First Nation, Boothroyd Indian Band, Coldwater Indian Band, Cook's Ferry Indian Band, Esk'etemc, Lower Nicola Indian Band, Lytton First Nation, Neskonlith, Nicomen Band, Nooaitch Indian Band, Oregon Jack Creek Indian Band, Shackan Indian Band, Simpcw First Nation, Siska First Nation, Skeetchestn Indian Band, Skuppah Indian Band, Spuzzum First Nation, Tit'q'et First Nation, Tk'emlups Band te Secwepemc, Tsilhqot'in Nation, Ts'kw'aylaxw First Nation, and Williams Lake First Nation.

2.3 Reconciliation with Indigenous Peoples

The government has committed to true, lasting reconciliation with Indigenous Peoples. The *Declaration on the Rights of Indigenous Peoples Act* of 2019 (the '*Declaration Act*') creates the path forward for aligning provincial laws with the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP). While changes to policies, programs, and legislation are underway, timber supply review processes will be consistent with relevant agreements that are in effect between First Nations and the Province of British Columbia and court decisions that define Aboriginal title and rights.

First Nations whose traditional territories are overlapped by the 100 Mile House TSA have received invitations to engage and to explore opportunities to work collaboratively to ensure that their interests and all relevant information is incorporated in the timber supply process. Capacity funding to enable First Nations to participate was also offered and where requested, provided.

A Collaborative Technical Working Group (CTWG) made up of First Nations' representatives and government staff has been formed to serve as a forum for engagement and to exchange ideas throughout this TSR process. This group has held meetings in late 2022 and early 2023 and will continue going forward through the timber supply review process.

Based on this early engagement, this *Data Package* includes enhanced content and sensitivity analyses around wildlife, biodiversity, and cultural heritage resources. Additional analysis scenarios may be developed based on ongoing First Nations engagement.

Treaty Rights or Aboriginal Interests that may be impacted by AAC determinations will be addressed consistent with the scope of authority granted to the chief forester under Section 8 of the *Forest Act*. All input communicated by First Nations will be documented. Any input that cannot be addressed by the TSR process and an AAC determination will be forwarded to other parts of government for consideration. The Ministry will continue to engage with First Nations throughout this TSR process and provide documentation on how concerns are being addressed. The published *AAC Rationale* will specify how concerns relevant to the AAC determination have been considered.

2.4 Forest industry

The BC Input-Output Model is used to generate regional economic dependency figures, as well as employment and revenue multipliers. It is used to assess the regional impact of various projects and economic events. The model is combined with BC Stats data to produce Economic Dependency Tables reporting the contribution of various industries to local economies. In the 2020 tables, the forest sector accounts for 10.3% of total basic employment in the 100 Mile House Natural Resource District. Other sectors providing employment in the district include: public sector (12.2%); tourism (1.7 percent); construction (7.5%); agriculture and food (1.6 percent); and mining and mineral production (1.3%).

Mills receiving timber from 100 Mile House TSA include: West Fraser Mills Limited's 100 Mile Lumber Sawmill, Tolko Industries Limited's Williams Lake Sawmill, West Fraser Mills Limited's Williams Lake Plywood Plant, and Interfor's Adams Lake Lumber Mill. West Fraser Mills Limited's Chasm Sawmill recently closed in 2019 and Ainsworth Lumber Company Limited's 100 Mile House Oriented Strand Board Plant closed in 2020. Four large and several small log home builders in the area also rely on timber from the timber supply area.

2.5 Land use planning

The Cariboo Chilcotin Land Use Plan (CCLUP) was completed for the Cariboo Region in 1994 and declared a higher-level plan under the *Forest Practices Code of British Columbia Act* in 1996. Between 1996 and 2006, the CCLUP aspatial objectives were integrated aspatially including a revision to the CCLUP Timber Targets, and then spatialized under the Biodiversity Conservation Strategy, Caribou and Mule Deer Winter Range (MDWR) Strategies, and seven sub-regional planning processes (SRMPs). In 2006, the CCLUP objectives were carried forward as objectives set by government (OSBG) under FRPA by *Land Act* Section 93.8. Between 2004 and 2011, orders under the Government Action Regulation (GAR) for UWR (mule deer) and WHAs (caribou and other species) were established.

In 2010, resource objectives were established under *Land Act* Section 93.4 by a LAO for 34 key objectives selected from CCLUP and the SRMPs. These objectives and practice requirements are incorporated into the information and assumptions in this *Data Package*.

3. Current Forest Management Considerations and Issues

3.1 Base case management assumptions

Section 8 of the *Forest Act* requires the chief forester, in determining AACs, to consider biophysical, social and economic information. One component of this information is in the form of a timber supply analysis – called the base case – that projects the harvest level over several decades or centuries.

The role of the base case projection is to reflect current knowledge with respect to the status of the forested area, forest management practices and timber growth and yield. The considerations contained in this data package describe the current information and modelling assumptions that are intended to be used to prepare the base case projection.

These considerations are consistent with current legislation, forest management practices and known data and will be modelled as best as possible within the base case harvest projection. However, no timber supply projection can incorporate all the environmental, cultural, social and economic factors that are relevant to forest management.

Further, given the complex and dynamic nature of forest ecosystems and forest management, knowledge is constantly evolving and there may be significant uncertainty associated with some forest management considerations. Where information exists, it may be possible to quantify the degree of uncertainty and the potential timber supply impact may be assessed in sensitivity analyses as outlined in Section 8.2 – '*Sensitivity analyses*'.

3.2 Climate change

There is substantial scientific agreement that climate is changing and that the changes will affect forest ecosystems. Forest management practices will need to be adapted to the changes and can contribute to climate change mitigation by promoting carbon uptake and storage. Deciding on the preferred management approach will involve consideration of established climate change strategies, and available adaptation and mitigation options together with social, economic, cultural, and environmental objectives.

Future climate change projections for the 100 Mile House TSA are expected to have an impact on the mid- and long-term timber supply due to an increase in disturbance and declines in tree survival and growth. For example, warmer winters are more conducive to forest pest overwinter survival while large increases in both spring precipitation and spring minimum temperatures are conducive to increasing rust incidence. Future climate trends indicate a higher drought risk in the summer. Increases in growing degree days and frost-free period may mean some vegetation will see enhanced growth, but moisture availability in the summer months may limit that potential.

Tree regeneration, productivity and future tree species distribution will be impacted by climate change. Drought stress will make trees more susceptible to a wider range of insects and disease and it is expected to result in more frequent, intense, and longer insect and pathogen outbreaks. In general, insects and pathogens are likely to have an increased downward pressure on timber supply.

Future climate related impacts such as increased drought or changes to tree growth are not explicitly captured in the base case as there is uncertainty about both the impact of climate change on timber supply and the appropriate response in timber supply decisions. This uncertainty means that it is not yet possible to confidently predict the specific, quantitative impacts on timber supply. Ongoing observations, data collection, analysis and discussions through various working groups will enable a quantitative understanding of the timber supply implications and possible mitigation measures in future timber supply reviews.

In the base case, past and current climate related impacts are indirectly captured under assumptions related to forest health, regeneration, growth and yield, and natural disturbances. Sensitivity analyses that examine the impact of uncertainties about natural and managed stand yields and disturbance frequency will provide information on timber supply pressures over time. The results of these analyses are not

predictions of the future under climate change and as more information becomes available, it will be possible to assess timber supply implications more accurately in subsequent timber supply reviews.

3.3 Cumulative effects

Cumulative effects are changes to environmental, social, cultural and economic values caused by the combined effect of past, present and potential future human activities and natural processes. The need to measure the effects of all natural resource activities on the values important to British Columbians led the provincial government into establishing a Cumulative Effects Framework (CEF) to guide the assessment of cumulative effects across natural resource sectors. The framework incorporates the combined effects of all activities and natural processes into decision-making to help avoid unintended consequences to identified economic, social, cultural and environmental values. The CEF and TSR both provide landscape-level assessments that report on the state of values to support decision making.

CEF has assessment protocols for aquatic ecosystems, grizzly bears, moose, old growth forests, and forest biodiversity that are approved for implementation. At this time, assessments in 100 Mile House TSA have only been completed for individual watersheds on a cutting permit basis. However, should any TSA level assessments be completed prior to the AAC determination, these will be made available for consideration by the chief forester.

3.4 Major forest management considerations and issues

Table 1 lists major forest management considerations and issues. Where possible, the issues are assessed directly in the timber supply analysis. If the issue does not fall within the definition of current management the related timber supply impacts will be assessed in a sensitivity analysis. There may be significant uncertainties in defining some current management issues**.** In such cases, sensitivity analysis can assist in assessing the timber supply implications and assigning degrees of risk to timber supply during the AAC determination.

Table 1. Major forest management considerations and issues

Management objectives considerations/issues	Description
Replacement Forest Stewardship Plans	In 2016, the chief forester issued guidance for replacing Forest Stewardship Plans (FSP). Between 2016 and 2020, the Cariboo Natural Resource Region (CNRR) implemented an FSP replacement process that included issuing district manager expectations for improved consistency with OSBG, and improved measurability and verifiability of results and strategies. All FSPs within the CNRR have been updated to be consistent with OSBG.
Wildfire	The 100 Mile House TSA was heavily impacted by wildfires in 2017, 2018, and 2021. Wildfires are anticipated to have a significant impact to mid-term timber supply, impacting mature forests as well as plantations at various levels of burn intensity.
Mule Deer	Harvesting has shifted away from mountain pine beetle (MPB) salvage and into live stands. District staff have observed that much of the live stand harvest has been concentrated outside of the Mule Deer Winter Range (MDWR). A recent GIS analysis confirms that except for fire salvage, a disproportionately low area within MDWR has been harvested over the past 10 years.
Moose	The OSBG for moose come from the CCLUP 90 Day Report and LAO objective 32. Major licensees and BCTS have committed in FSPs to managing moose by retaining sufficient vegetation to provide security and thermal cover for wintering moose adjacent to high value wetlands, and adjacent to wetlands (including shrub-carrs).
First Nation Areas (Treaty Lands)	The Northern Secwepemc te Qelmucw (NStQ) Treaty Negotiations Agreement in Principle was signed on July 22, 2018, and the Parties are in Stage 5 negotiations to conclude treaty. NStQ Interim Treaty Agreement Phase 1 land parcels have been transferred and will be excluded from this analysis. Additional NStQ Agreement in Principle lands which are detailed in the signed AIP may also be transferred soon and the timber supply implications will be explored.
Canim Key Interest Area	In 2006, the Canim Lake Band delineated a Key Interest Area (KIA). The Canim Lake Band has not supported logging within this area and as such, no significant logging has occurred within this boundary over the past 10 years. The Canim Lake Band has requested that this area be added to their First Nation Woodland Licence.
VRI and Forest Inventory	A new vegetation resources inventory (VRI) has been completed since the previous TSR. In addition, the VRI has been adjusted to account for the losses resulting from the 2017 and 2018 wildfires.
AAC Losses due to Under Reporting Utilization	District staff, supported by fibre studies completed in the region, have identified significant non-sawlog volume that could be better utilized if local fibre market capacity increased.
Habitat supply modelling and Cumulative Effects	Independent of the timber supply analysis, agencies including the Ministry of Forests and the Ministry of Environment and Climate Change Strategy, in conjunction with the Forest Analysis and Inventory Branch, are developing an approach to modelling habitat supply that will assess habitat availability for a number of wildlife species. Habitat supply modelling will be used to assess the effect of projected harvest levels on the habitat for several wildlife species.
Broadleaf Deciduous	Some broadleaf deciduous species are merchantable and may be included in the AAC. However, broadleaf-leading stands are not currently being targeted for harvest. The contribution of broadleaf deciduous species to timber supply will be explored.

Management objectives considerations/issues	Description
Fisheries Sensitive Watersheds	Two Fisheries Sensitive Watersheds, Horsefly River and Deadman River have been established under the Government Actions Regulation (GAR). Maximum Equivalent Clearcut Area (ECA) objectives have been established for basins and sub-basins within these watersheds. Licensees have written Results and Strategies consistent with the GAR in their replacement FSPs.
Wildfire Risk Mitigation	In 2016, a Landscape Fire Management Plan was completed for the district utilizing a threat analysis to identify wildfire threats to priority values at risk from wildfire and then identify operational activities to mitigate wildfire behavior. Wildfire risk mitigation practices reduce surface and ladder fuels, increases crown spacing, and promotes larger, more fire resilient species. Over the past five years, several fuel treatments have been completed in the 100 Mile TSA and significant planning is underway to implement more interface and landscape level fuel breaks in the coming years.
Commercial Thinning	In recent years, commercial thinning has been completed within the CNRR. Approximately 220 ha of commercial thinning has been completed in the TSA and more area is currently being planned by licensees.

4. Inventories

4.1 Background information

Table 2 lists the spatial data that will be used to define the 100 Mile House TSA land base, areas where specific forest management activities are currently applied, and areas where specific forest resource objectives must be accounted for in the timber supply analysis. Most data are available within the British Columbia Geographic Warehouse (BCGW) and the BC Data Catalogue provides further information on these data sets.

Table 2. Inventory information

Spatial data	Source	Feature name	Vintage/download
TSA	BCGW	WHSE_ADMIN_BOUNDARIES.FADM_TSA	2020
Landscape units	BCGW	WHSE_LAND_USE_PLANNING. RMP_LANDSCAPE_UNIT_SVW_NO_MULTIPLES	2020
Ownership	BCGW	WHSE_FOREST_VEGETATION.F_OWN	2023
Occupant Licence to Cuts	BCGW	WSE_FOREST_TENURE.FTEN_HARVEST_ AUTH_POLY_SVW	2023
Protected areas: parks and ecological reserves	BCGW	WHSE_TANTALIS.TA_PARK_ECORES_PA_SVW	2020
Wildlife	BCGW	WHSE_TANTALIS.TA_WILDLIFE_MGMT_AREAS_SVW	2020
Community watersheds	BCGW	WHSE_WATER_MANAGEMENT.WLS_COMMUNITY_ WS_PUB_SVW	2020
Managed licences	BCGW	WHSE_FOREST_TENURE.FTEN_MANAGED_LIC_ POLY_SVW	2020
Indian reserves	BCGW	WHSE_ADMIN_BOUNDARIES.CLAB_INDIAN_RESERVES	2020
Tree farm licence	BCGW	WHSE_ADMIN_BOUNDARIES.FADM_TFL	2020
Private land	BCGW	WHSE_CADASTRE.CBM_CADASTRAL_FABRIC_PUB_SVW	2020
First nations agreement boundaries	BCGW	WHSE_HUMAN_CULTURAL_ECONOMIC.FNIRS_ AGREEMENT_BOUNDARY_SVW	2020
BCTS operating area	BCGW	WHSE_ADMIN_BOUNDARIES.FADM_BCTS_AREA_SP	2020
Biogeoclimatic ecosystem classification	BCGW	WHSE_FOREST_VEGETATION.BEC_BIOGEOCLIMATIC_ POLY	2020
Provincial site productivity layer	FAIB	SITE_PROD_BC	2020
Vegetation resource inventory	BCGW	WHSE_FOREST_VEGETATION. VEG_COMP_LYR_R1_POLY	2020
RESULTS reserves	BCGW	WHSE_FOREST_VEGETATION.RSLT_FOREST_COVER_ RESERVE_SVW	2020
Forest depletions	FAIB	CONSOLIDATED_CUTBLOCKS_2020	2020
Terrain stability mapping	BCGW	REG_LAND_AND_NATURAL_RESOURCE.STE_TER_STABILITY_ POLYS_SVW	2020
Mule Deer winter range	BCGW	WHSE_WILDLIFE_MANAGEMENT.WCP_UNGULATE_WINTER_ RANGE_SP	2020
Visual landscape inventory	BCGW	WHSE_FOREST_VEGETATION.REC_VISUAL_LANDSCAPE_ INVENTORY	2020

Spatial data	Source	Feature name	Vintage/download
WHA	BCGW	WHSE_WILDLIFE_MANAGEMENT.WCP_WILDLIFE_HABITAT_AREA_POLY	2020
Proposed WHA	BCGW	REG_LAND_AND_NATURAL_RESOURCE.WLD_WHA_ PROPOSED_SP	2020
OGMA	BCGW	WHSE_LAND_USE_PLANNING.RMP_OGMA_LEGAL_ CURRENT _SVW	2020
CCLUP community areas of special concern	BCGW	WHSE_LAND_USE_PLANNING.RMP_PLAN_LEGAL_POLY_SVW	2020
CCLUP critical fish habitat	BCGW	WHSE_LAND_USE_PLANNING.RMP_PLAN_LEGAL_POLY_SVW	2020
CCLUP Grizzly Bear capability	BCGW	WHSE_LAND_USE_PLANNING.RMP_PLAN_LEGAL_POLY_SVW	2020
CCLUP L3/L1 lakes	BCGW	WHSE_LAND_USE_PLANNING.RMP_PLAN_LEGAL_POLY_SVW	2020
CCLUP lake management classes	BCGW	WHSE_LAND_USE_PLANNING.RMP_PLAN_LEGAL_POLY_SVW	2020
CCLUP high value wetland s for moose	BCGW	WHSE_LAND_USE_PLANNING.RMP_PLAN_LEGAL_POLY_SVW	2020
CCLUP scenic areas	BCGW	WHSE_LAND_USE_PLANNING.RMP_PLAN_LEGAL_POLY_SVW	2020
CCLUP legal order boundary	BCGW	WHSE_LAND_USE_PLANNING.RMP_STRGC_LAND_RSRCE_ PLAN_SVW	2020
Digital elevation model	BCGW	WHSE_BASEMAPPING.TRIM_CONTOUR_POINTS	2011
Slope classification	FAIB	Derived using TRIM elevation points	2011
Wetland management zones (buffers)	BCGW	WHSE_LAND_USE_PLANNING.RMP_PLAN_NON_LEGAL_ POLY_SVW	2020
Stream management zones (buffers)	BCGW	WHSE_LAND_USE_PLANNING.RMP_PLAN_NON_LEGAL_ POLY_SVW	2020
Lake management zones (buffers)	BCGW	WHSE_LAND_USE_PLANNING.RMP_PLAN_NON_LEGAL_ POLY_SVW	2020
Lakes	BCGW	WHSE_BASEMAPPING.FWA_LAKES_POLY	2023
Fire Severity	BCGW	WHSE_FOREST_VEGETATION.VEG_BURN_SEVERITY_SP	2023
Wetlands	BCGW	WHSE_BASEMAPPING.FWA_WETLANDS_POLY	2023
Rivers	BCGW	WHSE_BASEMAPPING.FWA_RIVERS_POLY	2023
Forest Service roads	BCGW	WHSE_FOREST_TENURE.FTEN_ROAD_SECTION_LINES_SVW	2020
Road permit roads	BCGW	WHSE_FOREST_TENURE.FTEN_ROAD_SECTION_LINES_SVW	2020
Other roads (non-status)	BCGW	WHSE_BASEMAPPING.DRA_DGTL_ROAD_ATLAS_MPAR_SP	2020
Designated areas	BCGW	WHSE_LAND_USE_PLANNING.FADM_DESIGNATED_AREAS	

Data source and comments:

There are generally three sources of data for the analysis: corporate-level data that reside in the provincial geographic data warehouse (BCGW), data maintained by the Forest Analysis and Inventory Branch and

local data that are stored at the branch, region or district level. One exception is the RESULTS information which is maintained by Forest Science, Planning and Practices Branch.

4.2 Forest cover inventory

The Vegetation Resources Inventory (VRI) is a strategic-level inventory that describes the location and attributes of the forest vegetation. Some of the key attributes described in the VRI include tree species, age, height and volume. The inventory is updated annually for depletions, such as harvesting, and projected annually for growth. Recent aerial photography over the entire TSA was completed in 2010/2011, and a VRI Phase I re-inventory was completed in December 2013. Over 96% of the land base has been updated with new inventory since the last TSR.

The inventory data has been updated to 2019 for recent harvest depletions and major disturbances. To identify any harvested or disturbed areas not yet recorded in the inventory the consolidated cutblock layer developed by Forest Analysis and Inventory Branch (FAIB) was used. In addition to existing Ministry databases the consolidated cutblock layer also includes satellite change detection data to identify any recent major disturbance areas not recorded in any of the other data sources.

The VRI was adjusted to reflect wildfire losses using fire severity mapping. The fire mapping was created using satellite imagery which classified burned areas into four distinct severity classes: high, medium, low, and unburned. The inventory adjustments were based on ground samples collected following the 2017 and 2018 fires in the Cariboo. The resulting reduction adjustments factors on high, medium, low, and unburned were 95%, 50%, 20% and 10%, respectively. Finally, the reduction factors were applied to key VRI attributes (basal area, stem per hectare, and crown closure). The VRI volume attribute was then recalculated based on the adjusted attributes so that the VRI volume estimates better approximate the stand volume following the fires. The losses due to the 2021 fires are not yet reflected in the current VRI so adjustments were applied by FAIB staff using provincial burn severity mapping.

Mature inventory assessment reports are prepared by FAIB for each TSA. The reports provide a comparison between FAIB ground sample data and the VRI. The attributes compared include total age, height, basal area, net merchantable volume and species, from design-based ground samples in the mature inventory population (forested stands greater than 50 years old). For the 100 Mile House TSA there are 115 fixed area monitoring samples established on a 10 kilometer by 20 kilometer National Forest Inventory grid that were last measured in 2016.

A ratio of means (ROM) is calculated for each of the attributes and a region of practical equivalence (ROPE) is pre-determined at 0.9 - 1.1 to assess if there is a practical difference with the attribute assessed. For 100 Mile House TSA, all differences were found to be inconclusive except for basal area which was overestimated in the VRI (ROM 0.77) and dead merchantable volume which was found to be almost twice as much in the ground sample compared to the VRI estimate (ROM 1.97).

Data source and comments:

WHSE_FOREST_VEGETATION. VEG_COMP_LYR_R1_POLY

Mature Inventory Assessment for Management Unit TSA23 100 Mile House (Aug 15, 2022)

WHSE_FOREST_VEGETATION.VEG_BURN_SEVERITY_SP

4.3. Provincial site productivity layer

Site index is the estimated tree height at a reference age of 50 years and is used to measure forest site productivity in BC. Although the term "site index" is derived and used in a variety of contexts, the Ministry has developed formalized standards for deriving site index for the potential productivity of a site.

The provincial site productivity layer (PSPL) provides site index estimates for commercial tree species for the base case. The estimates are based on ecosystem data from existing Predictive Ecosystem Mapping (PEM) or Terrestrial Ecosystem Mapping (TEM) coupled with Site Index Estimates by Biogeoclimatic

Ecosystem Classification Site Series (SIBEC). Data from various growth and yield projects were used to create a biophysical model that provides site productivity estimates where PEM or TEM data are not available. Where the PSPL does not have complete coverage in each management unit, the BEC zone subzone averages will be used. However, a PEM was completed for the entire CCLUP area in 2008 so the productivity estimates provided by the PSPL will be based on the PEM using SIBEC.

4.4 Young stand monitoring

Developing the ability to report on the current status of the forest resource in BC and monitor changes in the forest has become an urgent need in the last few years. The Young Stand Monitoring (YSM) program was established by FAIB with the objective to describe the characteristics and structure of young stands, report on forest health, assess the accuracy of predicted attributes and spatial coverages, and compare against growth models to help evaluate if young stands will meet future timber supply expectations. Ground samples are established on a 5 kilometer by 10 kilometer grid in forested stands between 15 and 50 years old, with trees tagged in 0.04 hectare permanent plots with a planned five-year re-measurement cycle.

In 100 Mile House TSA, 21 sample plots have been established between 2013 and 2015. This small sample size only allows for a preliminary evaluation of growth trends in the TSA until a sufficient number of plots are established to produce statistically reliable results. Some of the preliminary results are described below.

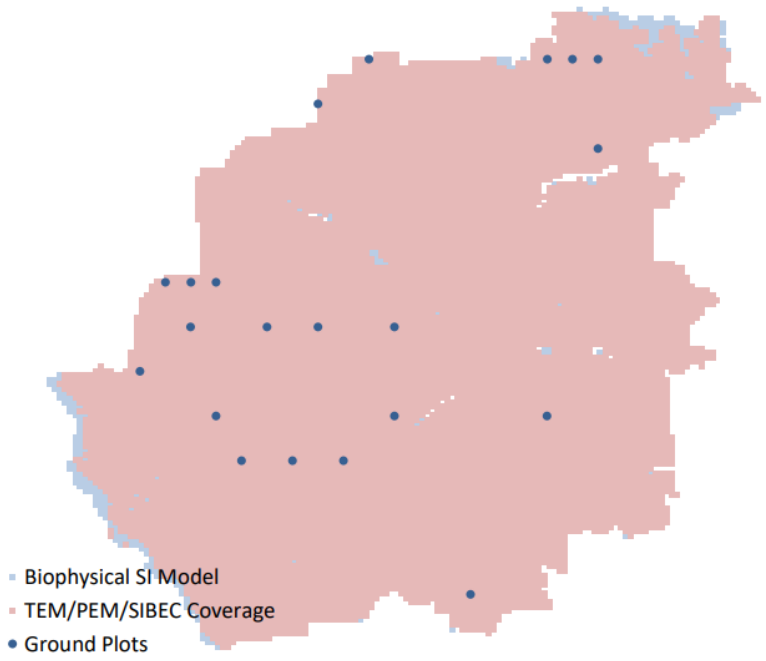

Figure 2. YSM plot locations.

The leading species from the YSM ground samples were compared to the interpreted leading species in the VRI and were found to have 79% agreement. The PSPL site index estimates were evaluated for bias compared to the YSM measurements and it was found that pine site index is overestimated by 11%. Yield projections based on TSR assumptions were compared against yield projections created using YSM measurements to test if TSR assumptions will meet future expectations. There was no significant difference found between the projections and no bias in TSR projections. However, at age 100 years the TSR projections were 11% greater than the YSM projections.

Data source and comments:

100 Mile House TSA Young Stand Monitoring Program Technical Handout (Feb 13, 2023).

5. Timber harvesting land base definition

5.1 Details on land base classification

This part of the *Data Package* outlines the steps used to identify and classify the land base for use in the timber supply analysis.

For analysis and information purposes, the 100 Mile House TSA land base is classified in four nested categories: gross land base, analysis forest land base (AFLB), legally harvestable land base (LHLB) and timber harvesting land base (THLB). These simplifications are used to analyze the land base subject to current forest management in the forest modelling software and they do not imply or indicate additional management restrictions.

The gross land base includes all areas within the boundary of the 100 Mile House TSA.

The AFLB includes all forested areas within the portion of the 100 Mile House TSA under consideration for this timber supply analysis. Forested areas within the AFLB contribute to forest management objectives such as timber supply, landscape-level biodiversity and visual quality. The AFLB excludes non forested areas such as lakes, private lands, and alpine areas. The AFLB also excludes areas where the AAC is determined under separate timber supply review processes (e.g., tree farm licence, FNWL and CFA).

The LHLB is the portion of the AFLB where timber harvesting is legal, subject to forest management objectives and constraints. It excludes protected areas such as national and provincial parks, and legally established areas where timber harvesting is prohibited.

The THLB is the portion of the AFLB where timber harvesting is projected to occur. It includes areas where timber harvesting is limited due to other management objectives (e.g., wildlife habitat, visual quality). It excludes areas that are not suitable for timber production, and areas where timber harvesting is prohibited to manage for other resource values (e.g., riparian reserve zones). Land is excluded from the THLB only where harvesting is not expected to occur. Any area in which timber harvesting is expected to occur remains in the THLB, even if the area is subject to other management objectives, such as wildlife habitat and biodiversity. These objectives are modelled in the timber supply analysis as forest cover requirements.

Figure 2, below, illustrates the land base classification process used in TSR.

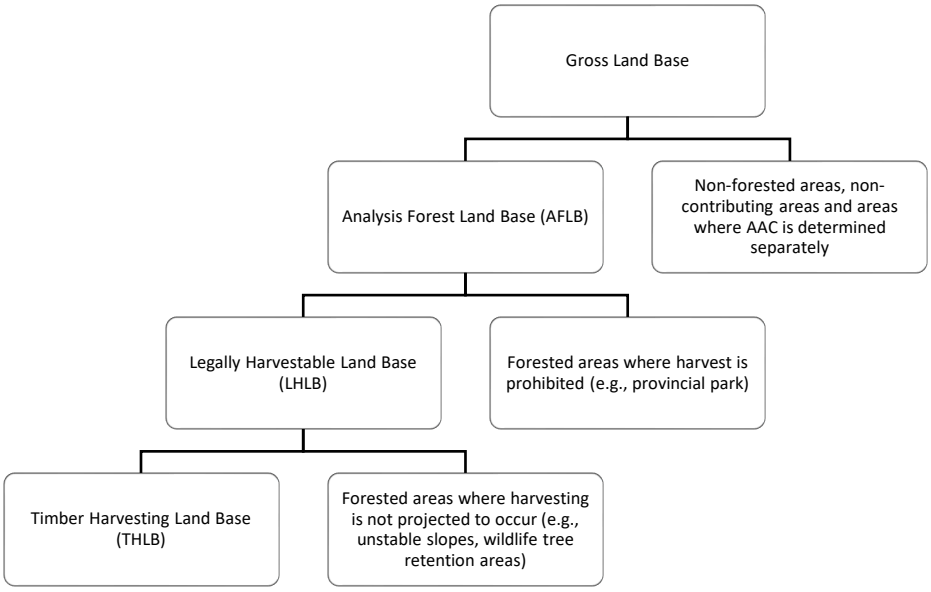

Figure 3. Land base classification definition.

The THLB may increase in size over time in the following situations:

- Where management activities improve productivity or operability (e.g., the stocking of land currently classified as non-commercial brush with commercial tree species);
- Through the acquisition of productive forest land (e.g., timber licence reversions);
- Timber harvesting occurs consistently in previously excluded stand types.

The THLB may also decrease in size where:

- Management activities prevent the re-establishment of a productive forest (e.g., permanent roads);
- Timber harvesting fails to occur consistently in previously included stand types;
- Objectives are established by government that reduce the land base available for harvesting.

The above definition for THLB and its complement, non-THLB, are modelling simplifications. Operationally, areas classified as non THLB are sometimes harvested, and some areas classified as THLB may never be harvested.

5.2 Identification of the analysis forest land base

The gross area of the 100 Mile House TSA is 1 235 960 hectares. The AFLB is the forested portion of the TSA which contributes to forest management objectives in the context of this timber supply analysis. All lands that are excluded from the AFLB are also excluded from the THLB. The AFLB is approximately 878 033 hectares. Lands that do not contribute to the AFLB are identified in the sections below.

All area classification and exclusions presented in this *Data Package* are preliminary estimates. The final area classification summary will be presented in a timber supply analysis *Discussion Paper*.

5.2.1 Land not administered by the Crown for TSA timber supply

Certain types of lands do not contribute to timber supply for the purpose of this timber supply analysis. This includes privately held lands, First Nations reserves, some lands under the jurisdiction of the federal government and area-based forest tenures.

Parks and protected areas are included in the AFLB because they can be relied on to continually contribute to forest cover management objectives such as landscape-level biodiversity, visual quality, and wildlife habitat objectives. The CCLUP specifies that woodlots also contribute to landscape level forest management objectives for biodiversity, although the AAC for these woodlots is determined under a separate process. Licence holders of area-based licences such as community forest agreements and First Nation woodland licences (FNWL) are expected to manage for landscape-level biodiversity objectives within their tenured areas, therefore they are removed from the AFLB. Woodlots licence holders are not required to manage for landscape-level biodiversity objectives, so they are left in the AFLB and removed when defining the LHLB.

The Northern Secwepemc te Qelmucw (NStQ) Treaty Negotiations Agreement in Principle was signed on July 22, 2018, and the Parties are in Stage 5 negotiations to conclude treaty. The NStQ Interim Treaty Agreement (ITA) Phase 1 land transfer parcels are no longer administered by the Crown and will be excluded from the AFLB. Additional NStQ Agreement in Principle (AIP) lands which are detailed in the signed AIP may also be transferred soon. The implications of these additional transfers to timber supply implications will be explored through sensitivity analysis.

In 2006, the Canim Lake Band delineated a Key Interest Area (KIA). The Canim Lake Band has not supported logging within this area and as such, no significant logging has occurred within this boundary over the past 10 years. The Canim Lake Band has requested that this area be added to their FNWL. As this area has not been transferred yet it will remain in the AFLB but the effect on timber supply of excluding the Canim KIA will be investigated through sensitivity analysis.

A spatial data set of land ownership was developed using information from the Crown Land Registry and the Integrated Cadastral Information Society. Areas classified in this data set with ownership codes 62 (Forest Management Unit) or 69 (Community Watershed) are generally administered by the Crown for TSA timber supply. These areas were reviewed by district staff to ensure all categories they contain can appropriately be considered AFLB for purposes of this analysis. Minor areas, including those identified as development project, institutional and residential, were excluded from the AFLB. Otherwise, the remaining area with these ownership codes will be modelled as managed for TSA timber supply. Areas classified with ownership code 99 (crown leases) are not generally managed for TSA timber supply but were similarly reviewed prior to this analysis. Minor areas, including those categorized as grazing leases, will be considered as contributing to TSA timber supply because harvesting that occurs on these lease areas contributes to the TSA harvest level.

Table 3. Land ownership type contributions to the timber harvesting land base

Ownership	Description	AFLB	Gross area (ha)
40	Private	N	115,290
52	Indian Reserves	N	5,414
54	Federal	N	5
60	Park	Y	53,079
61	UREP	Y	1,387
62	Forest Management Unit	Y	853,579
68	Recreation	Y	6,565
69	Community Watershed	Y/N	70,841
77	Woodlots	Y	20,575
78	FNWL	N	22,302
79	CFA	N	80,799
80	Municipal Parcels	N	1,162
81	Local Park	N	22
91	Others	N	2,650
99	Crown Lease	Y/N	2,290

5.2.2 Land classified as non-forest

All land classified as non forest (alpine, lakes, swamp, brush, rock, etc.), non-productive forest (e.g., wetlands and avalanche tracks), or not typed (unreported) are excluded from the AFLB, unless they were harvested in the past. These areas do not contribute to forest management objectives such as seral objectives for landscape-level biodiversity.

The VRI attribute 'Forest Management Land Base' (FMLB) will be used to identify areas of non-forest. The FMLB attribute categorizes land as forested if it is described as 'treed' under the British Columbia Land Cover Classification Scheme (BCLCS) and has a site index greater than or equal to five metres. Where the VRI has no data for site index or species composition, and no history of harvest, the area will be considered non-forest.

In addition to the FMLB criteria, areas with a crown closure less than 10% will also be considered non-forest and will be excluded. Areas with low crown closure resulting from past harvest, losses from MPB (since 2002) or recent fire (since 2017) are exceptions that will remain in the AFLB.

A final check will use data from the Freshwater Atlas (FWA) data to ensure lakes, rivers and wetlands are appropriately excluded.

Table 4. Description of non-forest areas

Attributes	Description	Logging history	Total area (ha)	Excluded area (ha)
None-leading species and none-site index	VRI leading species and site index are none, while FMLB = 'Y'	No	92,542	71,059
FWA_Wetlands	VRI FMLB defined as 'Y'	No	35,426	18,644
FWA_Lakes	VRI FMLB defined as 'Y'	No	59,386	2,920
FWA_Rivers	VRI FMLB defined as 'Y'	No	182	6
Crown closure < 10%	VRI FMLB defined as 'Y'	No	51,623	15,571
Non-FMLB (FMLB = 'N')	VRI FMLB defined as 'N'	No	97,257	9,242

Data source and comments:

Areas with a harvest history are identified using the consolidated harvest depletion layer produced by FAIB.

There are no instances of treed alpine areas within the TSA.

Treed wetlands are removed in the Riparian Reserve and Riparian Management Zones netdown.

5.2.3 Roads, trails and landings

The purpose of this section is to identify the portion of the land base that is occupied by roads, trails, and landings (RTL) that have been constructed to access and facilitate harvest operations. The existing permanent RTL area will be removed from the AFLB and will not contribute to timber supply or biodiversity objectives. Separate estimates are made to reflect the loss in productive forest land due to existing and future RTL.

Existing roads, trails and landings

The area within RTL is typically too small to delineate and track efficiently in a landscape-level model so they will be modelled non-spatially through partial reductions to the AFLB (i.e., the area considered to be AFLB within each hectare will be reduced by a percentage).

To estimate the current contribution of roads, a geographic information system (GIS) was used to buffer all road lines to estimate the area of productive forest land lost to these access features. Forest service roads and public roads were buffered 25 metres (12.5 metres from center line) and active/retired road permit roads were buffered 15 metres (7.5 metres from center line). The mapped non-status roads are known to be inaccurate, and the information is incomplete. Since it is impossible to estimate the future state of these roads, only the mapped non-status roads will be assumed to impact future yield, which assumes that the unmapped non-status roads will not impact future yield. The estimated area within existing RTL maintained clearing widths is categorized below.

Table 5. Width and area of existing road to calculate reductions

Road class	Width (m)	Total area (ha)
Forest Service Roads	25	4,504
Public Road (non-excluded portion only)	25	3,430
Road Permit and Landings	15	7,588
Non-status	5	2,195
Total area		**14,448**

Most harvesting now uses a roadside processing system, and landings are less common in current harvest systems. There are indications that some productivity loss is associated with the use of roadside harvesting systems, but no definitive research to date has quantified a level of productivity loss. In-block roads that are temporary in nature will have no deduction from the THLB.

Future roads, trails and landings

The AFLB area removed to account for future RTL was estimated based on current performance and RESULTS data. The future RTL reduction will be applied to future harvested areas in the timber supply model after stands are harvested for the first time. Reduction factors for future RTL were calculated based on the average amount of on-block road permit structures with an estimated 15 metres width that have been observed in the five-year period from January 2015 to April 2021. The average factor is 2.28% for all three Cariboo TSAs. The yields of all stands aged 70 years and above will be reduced by this factor after they are harvested.

Data source and comments:

Roads will be identified from forest tenure road mapping as roads with a description of 'Forest Service Road' or 'Road Permit' and have a status of 'active', 'retired' or 'pending'. Digital road atlas mapping will also be used but will exclude roads classed as 'resource'. The last five years of road construction in recent cutblocks were examined using existing road permit data for all three TSAs in the CNRR.

Road lengths were derived from the following data sets from the BCGW.

FSR 25 m	WHSE_FOREST_TENURE.FTEN_ROAD_SECTION_LINES_SVW (Active)
Public 25 m	WHSE_IMAGERY_AND_BASE_MAPS.MOT_HIGHWAY_PROFILES_SP
Road Permit 15 m	WHSE_FOREST_TENURE.FTEN_ROAD_SECTION_LINES_SVW (Active)
Non-Status 5 m	WHSE_BASEMAPPING.DRA_DGTL_ROAD_ATLAS_MPAR_SP (Outside of cutblocks)
On Block Roads (temporary) 0 m	WHSE_BASEMAPPING.DRA_DGTL_ROAD_ATLAS_MPAR_SP (roads that are inside cutblocks harvested from 2015 to present using WHSE_FOREST_VEGETATION.VEG_CONSOLIDATED_CUT_BLOCKS_SP)

- Note: Because there is overlap between the different types of roads, the following priority was used: public, FSR, permit, non-status. This means if a public road overlaps with any other type of road the area will be allocated to the public road.
- Removed all roads that fall over managed licences, tree farms, private, federal, and municipal lands.

5.3 Identification of the legally harvestable land base

The LHLB is the portion of the AFLB where timber harvesting is legal, subject to forest management objectives and constraints.

It excludes protected areas such as national parks, provincial parks, protected areas and legally established areas where timber harvesting is prohibited. Areas excluded from the LHLB are also excluded from the THLB. The LHLB is approximately 698 742 hectares.

5.3.1 Parks, protected areas, and small area-based tenures

The parks, protected areas, and woodlots that were included in the AFLB to contribute to forest management objectives in the context of TSA timber supply, will be removed at this stage.

A further check will be performed using current boundary mapping for woodlots, parks, and protected areas to ensure all areas were appropriately excluded. Woodlots that are no longer active will be included in the LHLB.

Table 6. Parks, ecological reserves, and woodlots

Ownership code	Designations	Total area (ha)	AFLB (ha)	Excluded area (ha)
60	Conservancy Area	53,079	42,477	42,477
61	UREP	1,387	923	923
68	Forest Recreation	6,565	5,940	5,940
77	Woodlots	20,575	19,332	19,332

5.3.2 Old growth management areas

Permanent and Permanent - Rotating Old Growth Management Areas (OGMA) are removed from the LHLB as no harvest areas. A limited amount of harvest is permitted in OGMAs for specified exceptions including insect control and wildfire risk reduction treatments.

Loss of OGMAs for other reasons such as *Land Act* tenure overlap must be replaced with equivalent area in the same BEC subzone within the same landscape unit. This replacement process ensures that OGMA targets are maintained over time and result in no impact to timber supply.

Transition OGMAs will cease to exist in 2030. Until then they are available for harvest if conifer mortality exceeds 50%. It is assumed that any such harvest has already occurred in Transition OGMAs, therefore Transition OGMAs will be removed from the LHLB until 2030 after which they will be fully restored to the LHLB.

Table 7. Old growth management areas

Designations	Total area (ha)	AFLB (ha)	Excluded area (ha)
Permanent	113,557	91,842	90,184

5.3.3 Wildlife habitat areas

Wildlife habitat reductions may be identified and managed through several processes including the Identified Wildlife Management Strategy, identification, and approval of ungulate winter range and management practices specified in plans such as the CCLUP that establish legal wildlife habitat objectives. Management practices may include no harvesting in core areas as well as modified harvesting in associated management zones. Several approved wildlife habitat areas (WHA) are designated within the CNRR. The associated General Wildlife Measures (GWM) established by ministerial order under the GARs guide harvest practices in WHAs.

Areas designated through the GWMs as "no harvest" within WHAs for caribou habitat and mule deer winter range will be excluded from the LHLB. The other GWM requirements for these WHAs will be addressed in Section 6.1.8, '*Silvicultural systems*'.

Table 8. Wildlife habitat areas

Designation	Total area (ha)	AFLB (ha)	Excluded area (ha)
MDWR No Harvest	19,527	13,299	12,892
WHA No Harvest	4,873	3,294	2,843

There is a Caribou Herd Planning process currently ongoing within the CNRR. The outcome of additional area protection through no harvest or modified harvest resulting from this process are currently unknown. There may potentially be additional protections put in place for caribou that will have a downward pressure on the timber supply. Ministry staff will stay informed on the progress of this working group and inform the TSR throughout the process.

5.3.4 Critical habitat for fish

Areas of critical habitat for fish that require protection and site-specific management actions were identified as part of the LAO. The LAO specifies that the areas are to be maintained as no-harvest areas. Critical fish habitat will be excluded from the LHLB.

Table 9. Critical habitat for fish

Designations	Total area (ha)	AFLB (ha)	Excluded area (ha)
Critical habitat for fish	3,221	1,505	1,176

Data source and comments:

Critical Fish Habitat Area Boundaries are from the Section 93.4 LAO establishing objectives for the CCLUP, May 19, 2010, amended April 18, 2011, and consolidated to September 6, 2018. Map 4.

5.3.5 Lakeshore management

The LAO designates a selection of lakes as Class A lakes which includes a legal spatial data set that defines buffers around these lakes that are classified as no harvest. These buffer areas will be excluded from the LHLB.

The management of Class B to E lakes through limits on allowed disturbance area will be discussed in the Lakes Management section.

Table 10. Class A lakes

Designations	Total Area (ha)	AFLB (ha)	Excluded area (ha)
Class A Lakes	6,070	4,339	1,872

Data source and comments:

The Class A lakes are identified in the Section 93.4 LAO establishing objectives for the CCLUP, May 19, 2010, amended April 18, 2011, and consolidated to September 6, 2018. Map 6.

Lake Management Zone boundaries are provided by the lake buffer mapping that also provides Riparian Management and Reserve Zones for lakes used in Section 5.4.1.

5.3.6 LAO buffered trails

The LAO identifies regionally important trails and defines a 50-metre management zone on either side of the trail. The LAO specifies that at least 85% of the current forest basal area must be maintained within the buffer. At least 85% of the area within the 100-metre corridor along trails will not be available for harvest.

Table 11. LAO buffered trails

Designations	Gross area (ha)	AFLB (ha)	THLB (ha)
LAO buffered trails	13,561	8,906	4,434

Data source and comments:

The land base reduction for identified trails reflects the Section 93.4 LAO establishing objectives for the CCLUP, May 19, 2010, amended April 18, 2011, and consolidated to September 6, 2018. Map 10.

5.4 Identification of the timber harvesting land base

The THLB is the portion of the LHLB where timber harvesting is expected to occur in the context of the timber supply analysis supporting this AAC determination. The THLB is approximately 579 637 hectares.

5.4.1 Riparian reserve and riparian management zones

Riparian habitat along streams and around wetlands will be modelled as managed according to the *Forest Practices Code Riparian Management Area Guidebook* (1995). Table 12 lists the area reductions to be applied to account for Riparian Reserve Zones (RRZ) and Riparian Management Zones (RMZ). The zone widths are consistent with those specified under FPPR and current FSPs.

Each stream, lake, and wetland class were spatially identified, classified, and then buffered using GIS in accordance with Table 12 criteria to create a reserve zone and management zone. The reserve widths and percent retention amounts listed in Table 12 were used to calculate the proportion of each stand excluded from the THLB for riparian management.

Table 12. Riparian management areas

Description	Class	Reserve zone width (metres)	Reduction (%)	Management zone width (metres)	RMZ reduction (%)
Streams	S1	50	100	20	50
	S2	30	100	20	20
	S3	20	100	20	20
	S4/S5	0	--	30	30
	S6	0	--	20	30
Wetlands	W1/W5	10	100	40	20
	W2	10	100	20	20
	W3/W4	0	--	30	20
Lakes	L1-B	10	100	0	--
	L2	10	100	20	25
	L3/L4	0	--	30	25

Table 13. Riparian reserve and riparian management zones

Designations	Gross area (ha)	AFLB (ha)	THLB (ha)
Riparian	149,741	92,587	42,369

In addition to the management zones listed in Table 12 Skeetchestn Indian Band has directed licensees to implement a 50-metre management zone on all riparian features within their territory. These areas are called Cultural Resource Management Zones (CRMZ). The intent is that 50% of the zone be maintained as forest throughout the harvest cycle to maintain cultural resources over time. The CRMZs are not intended to be static reserves and may be harvested over the rotation using either partial cutting or temporary reserves. In practice CRMZs are generally being managed by establishing 25-metre reserve zones. Although, CRMZs are not a legal requirement this practice is consistent with Results and Strategies for protecting Cultural Heritage values written in current FSPs. Within Skeetchestn Traditional Territory, a 25-metre reserve zone will be applied to all streams, wetlands and lakes and excluded from the THLB.

Data source and comments:

A previously conducted GIS project mapped RRZs and RMZs for streams, lakes, and wetlands in the CNRR.

Riparian Classification, RMZs and Riparian Management Areas are derived from the LAO Objectives 20 and 23; CCLUP Objectives for Riparian Management; and the FPPR Sections 47, 48, 49, 50, 52(2) and 53.

RMZ reductions are derived from: LAO objectives 21 and 22 - Retention of Trees in a RMZ as well as FSP commitments from the three major licensees (Tolko Industries Ltd., FSP #780; West Fraser Mills Ltd., FSP #755 and BCTS, FSP #828) within the CNRR.

5.4.2 Areas considered inoperable

Areas that are inoperable within the TSA are generally associated with steep slopes. Steep slopes are unlikely to be harvested because of unstable terrain and sensitive soils. Also, steep slopes require the use of different harvest systems such as cable logging which may be uneconomic depending on volume per hectare. Inoperable areas will be identified as follows:

- Slopes that exceed 70% east of Highway 97. Harvesting on slopes between 40% and 70%, and cable harvesting has been employed as a past practice east of Highway 97.
- Slopes that exceed 40% west of Highway 97. These slopes typically have lower volume per hectare which generally makes these types unsuitable for harvesting.
- Slopes classified as Unstable (U) or Terrain Class 5.

Table 14. Areas considered inoperable

Designations	Gross area (ha)	AFLB (ha)	THLB (ha)
Steep slope	32,886	15,903	4,569
Unstable terrain	1,877	1,436	953

Data source and comments:

Slope angle is derived from the provincial digital elevation model.

5.4.3 Sites with low timber growing potential

Sites may have low productivity because of inherent site factors such as nutrient availability, exposure or excessive moisture. Stands on these sites may contribute to non-timber objectives even though they are unlikely to grow a merchantable crop of trees in a reasonable amount of time. As such, low productivity stands are removed from the THLB.

Low productivity stands were identified as stands that are not capable of achieving the minimum harvestable volume applied in this analysis by 160 years. As discussed in Section 6.1.6, '*Minimum harvestable criteria*', the minimum threshold is 100 cubic metres per hectare except for steep slopes here the threshold increases to 200 cubic metres per hectare.

The VRI has been adjusted to reflect losses due to the MPB epidemic and recent catastrophic fires. It is now difficult to discern low productivity stands from recently disturbed stands based on the current adjusted attributes and yield projections created from these attributes are no longer reliable as they do not account for stand recovery and release of understory regeneration. Site index was not adjusted and remains a reliable identifier of low productivity stands and will be used in this analysis.

In order to utilize site index, an exercise was conducted to find the correlation between site index and the minimum harvestable criteria. Representative yield tables for the major leading species within 100 Mile House TSA were produced at increasing increments of site index until a yield table that achieved the minimum harvestable criteria was identified for each species.

Table 15. Site index threshold for sites with low timber growing potential

Leading species	Regular terrain (m)	Steep slopes (m)
At	9.8	14.0
Ep	9.0	16.0
Bl	5.5	8.3
Cw	5.3	7.1
Fd	10.3	13.3
Pl	8.0	11.0
Sx	7.5	10.6

All stands with a site index below the values listed above, matched by corresponding leading-species and slope, were excluded from the THLB.

Table 16. Sites with low timber growing potential

Designations	Gross area (ha)	AFLB (ha)	THLB (ha)
Low sites	148,280	24,153	9,919

Data source and comments:

Yield tables were produced using VDYP 7 by FAIB growth and yield experts using default stocking criteria for 100 Mile House TSA.

5.4.4 Non-merchantable timber profiles

Non-merchantable timber profiles are stands that are physically operable, meet minimum harvestable criteria for age and volume, yet contain tree species that are not currently utilized.

In the 100 Mile House TSA, stands predominately composed of broadleaf species are not utilized, and often left standing for biodiversity value. Therefore, broadleaf-leading stands will be excluded from the THLB.

Table 17. Broadleaf-leading stands

Designations	Gross area (ha)	AFLB (ha)	THLB (ha)
AT	74,225	38,679	30,679
EP	2,058	1,228	985

The potential contribution of broadleaf-deciduous leading stands to timber supply will be explored through sensitivity analysis.

5.4.5 Cultural heritage and archaeological resources

The *Heritage Conservation Act* (HCA) recognizes the historical, cultural, scientific, spiritual, and educational value of archaeological sites to First Nations, local communities, and the public. Archaeological sites on both public and private land are protected under the HCA and must not be altered without a permit.

A cultural heritage resource is an object, site or location of a traditional societal practice that is of historical, cultural, societal or archaeological significance to the province, community or an Aboriginal People. This can include archaeological sites, structural features, heritage landscape features and traditional use sites. Cultural heritage resources not applicable to the HCA are managed for by the licensees through the cultural heritage resource sections in the applicable FSPs as per FPPR Section 10.

Cultural heritage resources are identified by the licensees through information sharing prior to the submission of cutting permit and road permit applications to the Ministry. The more common practice by licensees is to manage for these sites through exclusion from the harvest area through boundary amendments and the placement of wildlife tree retention and/or cultural resource management zones.

Most of these sites are small, and many are found in areas with additional ecological or environmental constraints. These sensitive lands are typically removed from the timber harvest land base through the placement of reserve or no harvest zones. Therefore, no specific additional land base reduction will be applied for cultural heritage resources.

Data source and comments:

Tolko Industries Ltd. - FSP #780;
West Fraser Mills Ltd. - FSP #755; and,
BCTS - FSP #828.

6. Current forest management assumptions

6.1 Harvesting

Since the late 1990's, harvesting in the CNRR has predominantly been concentrated in MPB-impacted pine-leading stands. Although MPB salvage is still occurring in the region, recent trends in harvesting have seen a switch to fire damaged stands, Douglas-fir beetle impacted stands, and non-pine leading live stands as the MPB-killed stands decline in quality and availability.

The analysis will attempt to address the uncertainty in future practices when the projected supply of MPB salvage stands has been depleted. Various sensitivity analyses will explore the timber supply through the mid-term. However, the base case will be established using the current practices documented in the following sections.

6.1.1 Recent harvest performance

The Provincial Timber Management Goals, Objective & Targets (PTMGOT) aligns provincial objectives for timber with government planning and forest legislation and aids in monitoring performance on the ground using nine measurable provincial targets and thirteen local management unit targets. The thirteen local management unit targets are reported annually for each TSA and TFL in the province to present a current "state of affairs" for the local timber management targets.

The PTMGOT report for 100 Mile House TSA presents recent harvest performance from the Ministry's Harvest Billing System (HBS). It is presented in the table below in comparison with the AAC in effect for that year. On average, between 2013 and 2022, the annual harvest level has been 83% of the AAC. The previous AAC was set with the expectation that the focused salvage of MPB-killed stands could only be maintained for an additional five years so the AAC was determined to step down near the end of 2018 to a post-salvage sustainable level. The average annual harvest level since this transition has been 93% of the AAC.

The current AAC includes a partition that limits the harvest attributable to live trees to no more than 500 000 cubic metres per year. District staff have monitored the annual harvest of live trees from the Electronic Commerce Appraisal System (ECAS) data. The partition was exceeded in 2017 and 2018 but the average annual live tree harvest between 2014 and 2022 is 468 170 cubic metres.

Year	AAC (m^3)	Harvest volume (m^3)	Percent of AAC	Live tree volume (m^3)
2013	2 000 000	1 711 508	86%	
2014	1 970 938	1 672 279	85%	439 083
2015	1 948 002	1 663 924	85%	429 214
2016	1 948 002	1 448 239	74%	477 461
2017	1 948 002	1 384 162	71%	603 706
2018	1 800 301	1 350 802	75%	609 601
2019	967 805	836 917	86%	332 680
2020	967 805	892 932	92%	418 978
2021	967 805	917 009	95%	493 235
2022	967 805	956 711	99%	409 565

6.1.2 Administration of unharvested volume

Unharvested volume is volume that tenure holders had the rights to harvest but did not utilize within a previous and completed cut control period. According to provisions of the *Forest Act*, the minister may, but is not obliged to, dispose of unharvested volume by issuing new tenures.

Currently there is only one active licence that has been issued from unharvested volume. A forestry licence to cut was issued to salvage harvest 70 000 cubic metres from fire damaged stands following the Flat Lake fire. This volume is being harvested in addition to the volume being harvested under the current AAC. Therefore, an area supporting 70 000 cubic metres of harvest in the Flat Lake burn area will be depleted from the inventory growing stock prior to running the base case to account for this licence.

The Regional Executive Director, on behalf of the Minister, has approved for disposal of 2.0 million cubic metres of the unharvested volume through issuing additional licences for fire salvage. A licence for 500 000 cubic metres of salvage is currently under development but conditions that would restrict the licence to salvage harvesting only are unknown so the effect on timber supply cannot be estimated.

These volumes that are planned and approved are additional pressures on the AAC. There is no additional unharvested volume for consideration in the 100 Mile House TSA.

6.1.3 Merchantable timber specifications and utilization

The Interior Timber Merchantability Specifications of the Provincial Logging Residue and Waste Measurement Procedures Manual – Interior Version ('Manual') specifies the utilization levels for the billing of harvested timber.

The utilization levels define the maximum stump height, minimum top diameter (inside bark) and the corresponding minimum diameter at breast height (DBH). However, for yield table projections, the specifications for minimum stump diameter are converted to a corresponding breast height diameter. The merchantable timber specifications are described in Table 18.

Table 18. Merchantable timber specifications

	Description	All stands
Stumps	• no higher than	30 cm
Diameter (outside bark) at stump height	• Lodgepole pine: all timber that meets or exceeds	15 cm
	• All other species: all timber that meets or exceeds	20 cm
Minimum diameter at breast height	• Lodgepole pine: all timber that meets or exceeds	12.5 cm
	• all other species: all timber that meets or exceeds	17.5 cm
Top diameter (inside bark or slab thickness)	• for all species and ages, except cedar older than 141 years, all timber that meets or exceeds	10 cm
	• for Cedar older than 141 years	15 cm
Minimum length	• log or slab	3 m

**Measured on the side of the stump adjacent to the highest ground.

Major licensees operating in the CNRR have the following grades count as volume of timber harvested on their forest licences:

Grade 1 Sawlog;

Grade 2 Sawlog;

Grade 4;

Grade 7; and

Grade 8.

All volume wasted or damaged under licences and road permits is counted towards the evaluation of harvest performance. Waste calculations based on ocular estimates were eliminated in 2023 and more reliable methods of estimating waste are now employed.

The wood fibre from the portion of the trees outside sawlog utilization specifications or from entire trees below merchantability diameter limits is generally left to be burned in the 100 Mile House TSA. However there has been increased utilization of fibre in recent years for pulp and bioenergy. This analysis provides data to determine an AAC based on saw log volume but an analysis of the volume available in addition to the saw log volume is required to support the growth of local fibre industry.

A sensitivity analysis will be completed to determine the potential increase to timber supply resulting from the utilization of non-pine species to lower merchantability diameter limits. The sensitivity analysis will model a utilization limit of 12.5 centimeters diameter at breast height for all species.

6.1.4 Grade 4 credit

Operationally, the harvest level within a TSA is monitored through various tenure decisions and billing of harvest to those tenures. However, Section 17 (6) of the Cut Control Regulation allows licensees to apply to have grade 4 logs that are delivered to a non-lumber or veneer facility not count towards the volume attributed to their licence (referred to as "grade 4 credit"). This allows the licensee to harvest an additional cubic metre of timber for each cubic metre that is approved under Section 17(6). In the 100 Mile House TSA, grade 4 logs are mostly harvested from dead pine stands but can also originate from other species and be either live or dead. Grade 4 credit is a tool that was developed to provide an incentive for the salvage of dead pine or harvest of low quality logs and to promote higher levels of fibre utilization. The application of grade 4 credits to live trees presents a potential risk to the sustainability of the AAC because these trees were assumed to support the current and future timber supply.

District staff conducted a review of harvest records which indicated that during the period 2015 to 2021 approximately 487 557 cubic metres has qualified for grade 4 credit in the 100 Mile House TSA. Table 18 shows the credits reasonably accumulated during the peak of MPB salvage and have accordingly decreased to minimal values in recent years as salvage is near completion.

Table 19. Grade 4 credit approvals

TSA	2015	2016	2017	2018	2019	2020	2021	2022	Grand total
100 Mile House	268 607	108 687	63 841	32 393	317	10 498	3 214	0	487 557

6.1.5 Volume exclusions for broadleaf-species in coniferous stands

One or more species in mixed-species stands may be unmerchantable. For example, broadleaf species in a predominantly coniferous stand are typically not harvested. District staff estimate that 80% of the broadleaf species volume within a coniferous-leading stand is usually left standing and the remaining 20% is harvested. This practice will be modelled by reducing the broadleaf volume component of natural stand yield estimates by 80% in conifer-leading stands.

Although broadleaf species are not presently being targeted by licensees, these stands could become important as local industries diversify beyond softwood lumber. A sensitivity analysis will be completed to determine the implications of harvesting broadleaf leading species to timber supply.

Data source and comments:

The reserved standing broadleaf volume is left in addition to the wildlife tree retention area requirements. It will not be considered to contribute to the wildlife tree retention targets discussed under '*Silvicultural systems*' in Section 6.1.8.

6.1.6 Minimum harvestable criteria

Minimum harvestable criteria are modelling assumptions that are designed to reflect the minimum development conditions that a stand must meet to be eligible for harvesting in the timber supply model. These conditions are generally based on current practices observed in the TSA. Timber is considered merchantable and harvestable when it meets both the lower thresholds of minimum harvestable stand volume per hectare (MHV) and minimum harvestable age (MHA). Stands currently below either minimum threshold are restricted from harvesting in the timber supply model until both thresholds are achieved.

While harvesting may occur in stands at minimum volume and age thresholds to meet forest level objectives (e.g., maintaining overall harvest levels for a short period of time or avoiding large changes in harvest levels), most stands will not be harvested until the volume and ages have well surpassed the minimum thresholds due to the management objectives for other resource values (e.g., requirements for the retention of older forest).

Minimum harvestable volume

District staff performed an analysis that combined recent cutting permit boundaries (2014 to 2019) with the VRI to identify the current trends in harvesting in terms of the previous inventory volume estimates. The cutting permit boundaries were overlayed with a historic version of the VRI from the projection year prior to harvesting and the total inventory volume within the boundaries was summarized. The objective was to identify the frequency of low volume stands observed within harvest boundaries.

A large amount of variation was found in the lowest volume per hectare classes due to inconsistencies between cutting permit mapping and VRI stand mapping. The volume per hectare found at the lowest tenth percentile of VRI polygons that are overlapped by cutting permit boundaries greater than five hectares was 59 cubic metres per hectare. This estimate was reviewed with licensees and the feedback received was that this estimate did not match their current practices. Considering the inconsistencies in mapping observed and the licensee feedback, the cutting permit boundary analysis was rejected and the MHV was set at 100 cubic metres per hectare which the licensees generally agreed was a reasonable approximation of current practice.

The analysis data included a very limited pool of cutting permits representing harvesting on steep slope that require cable harvesting systems (40 to 70% slope angle). This was attributed to the fact that recent harvesting has avoided steep slopes to focus on salvage of MPB-impacted stands that generally occur on less steep terrain. Use of cable systems on steeper terrain is anticipated to increase as harvesting transitions to these areas while the salvage areas regenerate. Licensees that are currently harvesting on steep slopes were requested to provide an estimate of the minimum volumes currently required to consider a stand to merchantable using cable systems. The response was generally consistent at approximately 200 cubic metres per hectare and will be modelled in the base case as the MHV for steep slopes.

Table 20. Minimum harvestable criteria

Harvest system	Minimum volume (m^3/ha)
Ground	100
Steep slope	200

A series of sensitivity analyses will explore changes in timber supply resulting from adjusting the MHV above and below the base case limits.

Minimum harvestable age

The MHA is derived based on the mean annual increment (MAI) which represents the average yearly growth increment of a tree or stand of trees. It is calculated by dividing the stand volume by the stand age at each time step in the yield projections. The culmination age is the age at which the MAI reaches a maximum and thereafter begins to decrease. Harvesting a stand at the age at which it reaches 95% of its culmination MAI ensures that the stand can grow to an age that provides optimal volume production over time. Therefore, in the base case, the MHA will be modelled as the age at which 95% of the culmination is achieved.

Data source and comments:

VRI and forest depletions (CONSOLIDATED_CUTBLOCKS_2020).

6.1.7 Harvest scheduling

Priorities and limits will be placed on the harvest within certain stand types, management zones, or regions of the TSA to reflect salvage operations and other forest management objectives. Setting harvest level targets on individual management zones will also facilitate the determination of an AAC that may be partitioned by these management zones. Table 21 describes the harvest scheduling priorities and limitations that will be modelled in the analysis.

Licensees are currently working to salvage the volume remaining in the areas burned during the 2021 fires with a focus on Douglas-fir stands that remain merchantable after the fire. A harvest priority on the salvage of high burn severity Douglas-fir leading stands in the IDF zone will be applied during the first decade. A second priority will be applied at the same time to the Douglas-fir leading stands with moderate burn severity in IDF zones. Within each priority grouping stands will be harvested in order that is optimized by the timber supply model.

Table 21. Priorities for scheduling the harvest

Priority	Stand types	Description or Objective
1	High Severity Burn 2021 Fires	Burn salvage
2	Moderate Severity Burn 2021 Fires	Burn salvage

The analysis will be conducted using REMSOFT's Woodstock model. The optimization function of Woodstock sequences stands in the way that is optimal for the harvest flow while following all rules the analyst has defined such as meeting minimum harvestable criteria. As such, no specific harvest sequence beside the priorities listed above will be specified.

Data source and comments:

2021 Burn Severity Mapping.

6.1.8 Silvicultural systems

The two primary silvicultural systems used in the TSA are clearcut with reserves and selection harvesting.

Clearcut harvesting is used in conjunction with wildlife tree retention established to meet stand-level biodiversity objectives. The LAO specifies that when harvesting removes more than 50% of the pre-harvest basal area or where the harvest is part of a shelterwood system, wildlife tree retention areas must be established. The minimum percentage of harvested areas for wildlife tree retention by landscape unit and BEC is specified in Schedule 1 of the LAO.

Selection harvesting is currently used throughout the IDF zone due to the ecological limitations and regeneration requirements of Douglas-fir. Uneven aged management is the preferred silvicultural system where one-third of the basal area (area as surrogate) is removed in patches or by single tree selection every 40 years. This selection harvesting system will be modelled in Douglas-fir leading stands within the following BEC subzones: IDFdk, IDFxh, IDFxm, IDFdw, IDFxw, IDFww, BGxw, BGxh. An

exception is made for Mule Deer Winter Range and Ungulate Winter Range area which have differing selection systems applied as described below.

Data source and comments:

The timber supply model creates a proportional reserve area at the time of harvest using a probability function. The reserve areas are restricted from harvest until the re-entry period has passed. The age and volume of the forest in reserve areas are maintained and the forest continues to contribute management objectives such as landscape-level biodiversity.

6.1.8.1 Selection systems in mule deer winter range

Mule Deer Winter Range (MDWR) boundaries were legally designated as WHAs in 2004 under GAR, and GWMs in 2007. Objectives and strategies for maintenance of MDWR are included in the CCLUP and forest management directions, including the CCLUPIR (1998) and the Identified Wildlife Management Strategy (1999). The areas designated as no harvest zones under GWMs (U-5-001, U-5-002, U-5-003) were removed from the LHLB (Section 5.3.3). The remaining conditional zones will be modelled under the selections described below.

Forests within winter range are managed using site plans that maintain or promote Douglas-fir and maintain or enhance the number of large old trees that provide the best snow interception and litterfall that are essential to winter habitat. Two variants of the selection system are prescribed:

- small group selection systems are used in the transition and deep snowpack zones; and,
- clumpy single-tree selection systems are used in the shallow and moderate snowpack zones.

Both systems prescribe regeneration silviculture that enhances the amount of Douglas-fir within the stand relative to the preharvest composition. Regeneration assumptions for these selection systems are discussed in Section 6.3.1.

In the GWM, an exception is made for stands comprised of less than 40% Douglas-fir on sub-hygric sites within MDWR. These sites are generally spruce-leading stands and can be managed without MDWR management objectives, therefore stands that are composed of 60% or greater spruce will be modelled under the clearcut with reserves silviculture system.

Transition and deep snowpack zone

The small group selection system is intended to produce a multi-aged stand made up of small even-aged patches. The small harvest openings will produce shrub forage and make it more accessible in deeper snow conditions. The openings are intended to be large enough to allow Douglas-fir regeneration and still be small enough to minimize frost problems. This is accomplished by harvesting the MDWR in multiple passes that only remove a proportion of the area.

The GWM prescribes the proportion of area that may be removed during harvesting within the MDWR habitat classes as shown in Table 22. The combination of the prescribed cutting cycle and the proportion of area harvested per pass results in the effective rotation length that increases across the habitat classes. The GWM also specifies that stands are only available for harvest if the basal area is a minimum 45 square metres per hectare or greater in the Interior Cedar Hemlock Zone and a minimum 40 square metres per hectare in all other zones. Stands that currently have a basal area below 40 square metres per hectare basal area will initially be reserved from harvesting for one cutting cycle in the timber supply projection.

Table 22. MDWR small group selection cutting cycle

Stand structure habitat class	Area harvested per pass (%)	Minimum cutting cycle (years)	Effective rotation (years)
Low	33	40	120
Moderate	25	40	160
High	20	40	200

Data source and comments:

The stand structure data is located at https://www.env.gov.bc.ca/esd/distdata/ecosystems/frpa/uwr/

Timber supply modelling of MDWR in the CCLUP area has historically relied on harvest volume adjustment factors to represent the limiting effects of longer rotations on timber availability. These adjustments are no longer required in the current analysis since the timber supply model will be regulating the rate of the harvest to match the effective rotation lengths.

Shallow and moderate snowpack zone

The clumpy single-tree selection system is intended to maintain a stand structure that is beneficial to MDWR over time through limits placed on the minimum basal area retained following harvest and requirements for post-harvest increases in Douglas-fir composition.

A multiple pass silviculture system will be modelled following the rate of harvest criteria specified by the GWM as shown in Table 23. The basal area retained following harvest under the single-tree selection system will be modelled by applying harvest volume reduction factors. The reduction factors used were developed for the *CCLUP Timber Targets Analysis* conducted by the MDWR Committee. These factors represent the expected loss in volume as compared to a Douglas-fir stand managed under a multiple pass silviculture system with no MDWR requirements.

Table 23. MDWR single tree select volume retention

Stand structure habitat class	Volume harvested per pass (%)	Minimum cutting cycle (years)	Effective rotation (years)	Volume retention Reduction (%)
Low	25	30	120	0
Moderate	25	30	120	11
High	25	30	120	44

The *Timber Targets Analysis* estimated that the GWM basal area retention targets for low stand structure habitat class could be achieved just by managing a stand under a multiple pass silviculture system. Therefore, no volume reduction factor will be applied in low stand structure habitat class and only the multiple pass system will be modelled.

Data source and comments:

The volume retention reduction assumptions for shallow and moderate snowpack zone MDWR were obtained from the *CCLUP Timber Targets Analysis* conducted by the Mule Deer Winter Range Committee and reflect the requirements of Government Actions Regulation Amended Order – #U5001, U05002 and U5003 – Ungulate Winter Ranges, CCLUP, Shallow and Moderate Snowpack, 2007.

6.1.8.2 Selection system in caribou habitat

Mountain caribou habitat within the 100 Mile House TSA will be modelled in accordance with the CCLUP Caribou Strategy, *CCLUP Integration Report* and the management recommendations of the Mountain Caribou Strategy (October 2000). The legal management objectives for this area are specified in GAR Order – WHAs #5-115 to 5-117 Mountain Caribou – Quesnel Highlands Planning Unit (2009).

The caribou habitat areas designated as no harvest (WHA 5-115 and 5-117) were removed from the LHLB (Section 5.3.3) and the remaining modified harvest area (WHA 5-116) will be modelled as managed under a group selection harvesting silviculture system. The GWMs in the GAR order specify that harvesting in the modified harvest areas is limited to 33% of each stand, by area, on an 80-year cutting cycle.

Table 24. Caribou habitat silviculture systems

WHA	Silvicultural system	Area harvested per pass *(%)*	Minimum cutting cycle *(years)*	Effective rotation *(years)*
Mountain Caribou	Group selection	33	80	240

Data source and comments:

Cariboo-Chilcotin Land-Use Plan Mountain Caribou Strategy, 2000.

GAR Order — Wildlife Habitat Areas #5-088 to 5-117 Mountain Caribou-Quesnel Highlands Planning Unit. December 2009.

6.1.8.3 Wildfire risk reduction

In 2016, a Landscape Fire Management Plan was completed for the district utilizing a threat analysis to identify wildfire threats to priority values at risk from wildfire and then identify operational activities to mitigate wildfire behavior. Wildfire risk reduction activities focus on reducing surface and ladder fuels, increasing crown separation, and maintaining large fire resistant species over time. In Douglas-fir leading stands, thinning from below followed by surface and ladder fuel treatment is generally prescribed to achieve appropriate stand structure. In pine- and spruce-leading stands, clearcutting and reforesting to more fire resistant species such as aspen and Douglas-fir may be prescribed to achieve a more fire resilient stand. Once treated, maintenance treatments will be scheduled to maintain density and manage surface fuels.

Over the past five years, several fuel treatments have been completed in the 100 Mile House TSA and significant planning is underway to implement more interface and landscape-level fuel breaks in the coming years. These fuel breaks are located to create a fire suppression option that is part of a multi-barrier approach to reduce risk to values. Interface fuel breaks are generally 100 metres wide and immediately adjacent to private land or critical infrastructure. Landscape fuel breaks are generally 300 metres wide, strategically located beyond the interface, designed to take advantage of existing natural and manmade features, fuel types, and wind patterns.

In the base case, Douglas-fir leading stands within interface fire breaks and landscape fire breaks will be modelled using an uneven-aged silviculture system in the first entry and then applying a 50% reduction to volume on future harvest entries of every 50 years to reduced stand densities. Pine- and spruce-leading types will be modelled using an even-aged silviculture system, reforesting to fire-resistant deciduous species, consistent with wildfire risk reduction stocking standards.

Table 25. Wildfire risk reductions

Designations	Gross area (ha)	AFLB (ha)	THLB (ha)
Interface fire breaks	4,730	4,528	4,251
Landscape fire breaks	4,926	4,633	4,329

6.1.8.4 Commercial thinning

Commercial thinning is a partial cutting treatment applied to immature even-aged stands where the value of the volume harvested exceeds the cost of the treatment. In recent years, commercial thinning has been successfully completed by licensees within the 100 Mile House TSA consistent with the guidance document *Interim Guidance for Commercial Thinning - Interior British Columbia* released by the Office of the Chief Forester in May 2021.

A sensitivity analysis will be completed to evaluate the impact that commercial thinning may have on timber supply over time. Stands suitable for commercial thinning are generally less than 45 years old and located on slopes less than 45%. In this scenario stands must have a minimum of 50 cubic metres per hectare to be eligible for thinning and 20 square metres basal area (approximately 80 to 100 cubic metres per hectare) is retained. The next harvest entry will occur 30 years after the thinning. Only highly productive BEC zones in the TSA are considered capable of producing sufficient immature stand volume to make commercial thinning viable so commercial thinning will only be modelled within the SBS, ESSFwk1, and ICH zones.

Data source and comments:

Interim Guidance for Commercial Thinning - Interior British Columbia, May 2021;

Section 6.6 Interior Appraisal Manual – effective July 1, 2022.

6.2. Integrated resource management

The modelling of management objectives for biodiversity, visual quality, and hydrologic values will be discussed in this section. Management objectives for mule deer winter range and caribou habitat are achieved through application of a range of silvicultural systems as described in Section 6.1.8.

6.2.1 Landscape biodiversity

Old forests are an important component of biodiversity. Old forests contain unique attributes that have developed over centuries and provide for a wide range of landscape-level values such as habitat for specialist species or carbon sequestration. Old forests also contain high value timber.

Old growth management areas

As described in Section 5.3.2 '*Old Growth Management Areas*', permanent and permanent-rotating OGMAs are removed from the THLB as no harvest areas. A limited amount of harvest is permitted in permanent and permanent-rotating OGMAs for specified exceptions in the LAO including for insect control and wildfire risk reduction treatments.

Loss of OGMAs for other reasons such as *Land Act* tenure overlap must be replaced with equivalent area in the same BEC subzone within the same landscape unit. This replacement process ensures that OGMA targets are maintained over time and results in no change to timber supply.

Transition OGMAs will be modelled according to the LAO criteria as available for harvest if conifer mortality exceeds 50%, until 2030 when they will cease to exist and be fully restored to the THLB.

Old growth deferral areas

On November 2, 2021, the provincial government announced its intention to work in partnership with First Nations to temporarily defer harvest of ancient, rare and priority large stands of old growth within 2.6 million hectares of old growth forests.

It is expected that First Nations, the Province and other partners will develop a new approach for old growth forest management and continue to implement the recommendations outlined in the *Independent Strategic Review of Old Growth Management*. As this work is ongoing, there is uncertainty as to the long-term protection status of the priority deferral areas. Once a decision is made regarding old growth management, adjustments to the AAC will be considered by the chief forester. No consideration of these areas will be applied in the base case.

Should the old growth management objectives change during this timber supply review, the modelling approach will be updated to reflect these new legal requirements.

Mature plus old seral targets

Legal objectives for maintaining minimum amounts of mature and older forest (M+O) across the landscape were established under the CCLUP. The M+O seral stage age definitions and targets, listed in Table 26 below, were derived from the *Biodiversity Guidebook* and subsequently modified for Natural Disturbance Type 4 (NDT 4) by the Biodiversity Conservation Strategy (1996).

Table 26. Mature plus old-seral stage age definitions and targets

NDT	BEC zone	Seral stage age definition (stand age in years)	Target minimum % of total productive forest area in seral assessment unit		
			Low BEO	Intermediate BEO	High BEO
		Mature + Old	Mature + Old min.		
1	ESSF	>120	19	36	54
1	ICH	>100	17	34	51
1	MH	>120	19	36	54
2	CWH	>80	17	34	51
2	ESSF	>120	14	28	42
2	ICH	>100	15	31	46
2	SBS	>100	15	31	46
3	ESSF	>120	14	23	34
3	MS	>100	14	26	39
3	SBPS	>100	8	17	25
3	SBS	>100	11	23	34
3	ICH	>100	14	23	34
4	IDF – Fir group	>100	22	43	65
4	IDF – Pine group	>100	11	23	34

The CCLUP Biodiversity Conservation Strategy defined landscape units and biodiversity emphasis options (BEO) for application of the seral-stage targets.

In the CNRR, the targets for old seral were used as the basis for mapping spatial OGMAs. After first accounting for other no harvest areas toward the old-seral targets, spatial OGMAs were mapped to meet the remainder of the target by seral assessment unit. In this way, the intent of the aspatial old-seral targets has been met instead by spatial no harvest areas, and pursuant to FPPR Section 12(5) FSP holders have been exempted from achieving the old-seral targets. Therefore, no modelling considerations are required for maintaining old-seral targets in the analysis.

The Biodiversity Conservation Strategy noted that non-valley bottom LU/BEC units less than 5000 hectares in size (and valley bottom units less than 1000 hectares in size) within a landscape unit are not required to meet seral-stage targets within that specific area. This is because natural disturbances could potentially alter the seral condition across a large part of a small NDT-BEC unit. *Update Note #2: Amalgamation of Small NDT-BEC Units in Relation to Assessment of Seral Objectives and Old Growth Management Area Planning* provides guidance on the grouping of small units to meet landscape unit targets. The amalgamations listed in *Schedule 2 BEC Unit Amalgamations Applicable to Implementation of Mature + Old Seral Targets* (*Schedule 2 of the CCLUP Seral Distribution Assessment*, 2007) will be modelled in the analysis.

The regional Biodiversity Conservation Strategy subdivides forests within NDT 4 into two ecological groups, the fir group, and the pine group, for purposes of seral-stage assessments. Seral-stage retention targets must be met separately within each group. The fir group includes forests where natural disturbances are characterized by stand maintaining events and late seral or climax forests are dominated by Douglas-fir or ponderosa pine. The pine group includes forests where natural disturbances are predominantly stand replacing events and the late seral or climax forests are dominated by other species, primarily lodgepole pine or spruce. The Biodiversity Conservation Strategy specifies different old seral age criteria and different minimum seral stage retention targets to the two groups.

Table 27. Definition of NDT 4 fir group and pine group

Fir group	Pine group
• Douglas-fir or ponderosa pine-leading; • Lodgepole pine-leading with a major component of Douglas-fir or ponderosa pine in the principal or secondary canopy layers; or • Trembling aspen-leading with a major component of Douglas-fir or ponderosa pine and no species characteristic of wet sites such as spruce or cottonwood in principal or secondary canopy layers.	• Lodgepole pine-leading and do not have a major component of Douglas-fir or ponderosa pine in principal or secondary canopy layers; • Spruce, redcedar, cottonwood, or white birch-leading; or • Trembling aspen-leading and do not have a major component of Douglas-fir or ponderosa pine or a minor or greater component of spruce, redcedar, cottonwood, or birch in principal or secondary canopy layers.

Mature-plus-old biodiversity requirements will be modelled in the analysis using the mature-plus-old seral targets listed in Table 26, applied to the current seral condition of the AFLB, using BEC variant portions of landscape units (LU/BEC) as the assessment units. If an LU/BEC unit is currently in deficit of the targets, the timber supply model will temporarily reserve from harvest the remaining M+O stands in the LU/BEC unit, as well as a sufficient area of the oldest mid-seral stands in the area to recruit to mature to meet the target. Any merchantable stands remaining after, outside the above reserved stands, in the LU/BEC unit will continue to contribute to timber supply, until a M+O surplus is restored at which time all merchantable stands will contribute.

As specified in the current CNRR FSPs, harvest is permitted in M+O deficit units according to specified criteria for salvage, partial cutting that retains mature seral attributes, fuel management treatments, or insect control. Harvest under the salvage criteria must not draw down current M+O below the equivalent of the old-seral target and be accompanied by reservation from harvest of sufficient mid-seral forest for recruitment to restore a M+O seral surplus.

Landscape connectivity and distribution of cutblocks

Legal objectives for landscape connectivity and distribution of cutblocks were established under the CCLUP. These were specified to be based on the *Biodiversity Guidebook* guidelines for patch size distribution and natural connectivity characteristics frequency, for which the current CNRR FSPs have specified provisions. These provisions direct the spatial design but not the amount of harvest that will

occur; therefore, no modelling considerations are required for representing these objectives in the analysis.

Data source and comments:

Table 26 derived from the *Biodiversity Conservation Strategy for CCLUP*, July 1996 (Table 7, pg. 40).

Landscape unit area data will be compared to *Area of Mature plus Old and Old Forest above Minimum Guidelines - Seral Run 2018 – Crown Forest Area*. Any significant differences will be discussed with the Ministry land use planning staff.

6.2.2 Stand-level biodiversity

LAO Section 6 specifies that when harvesting removes more than 50% of the pre-harvest basal area or where harvest is part of a shelterwood (i.e., northern caribou terrestrial lichen sites), wildlife tree retention areas (WTRA) must be established. The minimum percentage of harvested areas for wildlife tree retention by landscape unit and BEC is specified in Schedule 1 of the LAO. Licensees have approved results or strategies in their FSPs that are consistent with the LAO objectives.

A portion of the WTRA may be located adjacent to the cutblock in areas outside of the THLB. A GIS analysis of the CNRR has shown that between the years 2015 and 2020, approximately 20% of the WTRA is placed in already constrained areas, such as OGMAs and RRZs. Therefore, 80% of the LAO retention target will be reserved within the area selected for harvest by the model. The WTRA will be retained for the full rotation length.

LAO Section 7 requires that in partially cut stands, where harvesting removes less than 50% of the pre-harvest basal area, high-value wildlife trees must be retained up to the limits in Schedule 1 of the LAO. High value wildlife tree means a tree over 37.5 centimeters DBH among the target residual conifer species or over 20 centimeters DBH for deciduous species, and that falls within one of the Wildlife Tree Classes of 2 through 8 as shown in LAO Table 1. The retention of high value wildlife trees will not be modelled because this volume is accounted for in the retained portion of the stands.

6.2.3 Scenic areas

The spectacular natural beauty of BC is an important component of many recreation and tourism activities and the Government of BC is entrusted with ensuring that these scenic quality expectations are met.

Management of known scenic areas are guided by visual quality objectives (VQO) that have been legally established for each TSA through the LAO. Each visual polygon has been assigned one of four VQO ratings: preservation, retention, partial retention, and modification. Forest cover requirements will be applied to limit the amount of disturbance (denudation) for each visual polygon.

Operationally, the management of visual quality objectives for a scenic area is based on meeting alteration criteria from specific viewpoints (i.e., a perspective view). However, for strategic modelling, such as timber supply analysis, these objectives must be translated to a planimetric ("plan") view. To model in a plan view, visual management specialists in the Ministry have developed procedures that are described in the *Procedures for Factoring Visual Resources into Timber Supply Analyses*, and the update bulletin, *Modelling Visuals in TSR III*.

The procedures to translate requirements from a perspective to a plan view make several assumptions. First it is assumed that the height at which a stand is in an acceptable visual condition is dependent on the slope on which the stand is found; the greater the slope the less a tree blocks the view of the stand behind it. Secondly, that given the slope there is a relationship between the perspective and plan views (i.e., a plan-to-perspective – or P2P – ratio).

For this timber supply analysis, the area occupied by slope classes within each VQO category will be calculated. From this, an area-weighed P2P and visually effective tree height will be calculated for each of the four VQO category according to heights and P2P summarized in Table 28 below.

Table 28. Predicted P2P ratios and visually effective green-up height by percent slope for well stocked stands

Slope	0%	10%	20%	30%	40%	50%	60%	70%
P2P	4.68	3.77	3.04	2.45	1.98	1.60	1.29	1.04
VEG height (metres)	3.0	3.75	4.75	5.75	6.5	7.25	8.25	8.5

The area-weighed P2P will then be applied to the permissible percent alteration in perspective view listed in Table 29. The mid-point percent alteration will be used for the base case for both clearcut and partial harvesting systems.

Table 29. Disturbance limits for scenic areas

VQO	Allowable range of percent denudation less than green-up height (%)	Mid-point of range applied in base case (%)
Preservation	0-1	0.5
Retention	1.1 – 5.0	3.0
Partial retention	5.1 – 15.0	10.0
Modification	15.1 – 25.0	20.0

Scenic corridors have been spatially identified through the LAO. Harvest design is intended to mimic natural openings and vegetation patterns. There is no harvesting reduction applied to these areas and they are not excluded from the THLB.

Data sources and comments:

Scenic polygon boundaries and VQO assignments are consistent with the LAO objectives for the CCLUP (May 19, 2010, amended April 18, 2011).

The VQO denudation ranges listed in Table 29 were derived from the document *Procedures for Factoring Visual Resources into Timber Supply Analysis* (1998).

Results of preliminary modelling for partial cut harvesting showed similar results as those for clearcut harvesting with reserves and the decision was made that this analysis would model clearcut harvest across all VQO areas.

6.2.4 Lakes management

The LAO defines Lakeshore Management Zones (LMZ) as the zone of a specified width adjacent to a classified (Class A to E) lake. Schedule 2 of the LAO specifies limits to the area disturbed when either partial harvesting or clearcut harvesting within the LMZ. A re-entry period of 20 years is specified in place of visually effective green-up height. The Class A lake LMZ are designated as no harvest and were removed from the THLB. The other lake classes will be modelled following the Schedule 2 disturbance limits under clearcutting and partial cutting (as defined in the silviculture section of *Data Package*) shown in Table 30 below.

Table 30. Disturbance limits for LMZs

Lakeshore management class	Forest disturbance and retention in the LMZ	
	Partial cutting	Clearcutting
A	No harvest	
B	Maximum disturbed area is 20% of the LMZ every 20 years with a minimum basal area retention of 50%.	Maximum disturbed area is 10% of the LMZ every 20 years with openings smaller than 5 ha.
C	Maximum disturbed area is 40% of the LMZ every 20 years with a minimum basal area retention of 50%.	Maximum disturbed area is 20% of the LMZ every 20 years with openings smaller than 10 ha.
D	Maximum disturbed area is 60% of the LMZ every 20 years with a minimum basal area retention of 50%.	Maximum disturbed area is 30% of the LMZ every 20 years.
E	Maximum disturbed area is 100% of the LMZ every 20 years with a minimum basal area retention of 50%.	Maximum disturbed area is 50% of the LMZ every 20 years.

Data source and comments:

LMZ assumptions are from the LAO for the CCLUP, May 19, 2010.
Amended April 18, 2011. Maps 6a and 6b.

6.2.5 Adjacency and cutblock size

Adjacency and cutblock size restrictions are specified by the Forest Planning and Practices Regulation (FPPR). Sections 64 and 65 require that recently harvested areas must achieve a desired condition (green-up) before nearby or adjacent areas can be harvested and that the size of the net area to be reforested for the cutblock does not exceed 60 hectares. However, recent FSPs have allowed the requirement for landscape-level biodiversity and patch assessment to be used in place of meeting adjacency and cutblock size requirements.

As described in Section 6.2.1, legal objectives for landscape connectivity and distribution of cutblocks were established under the CCLUP. These were specified to be based on the *Biodiversity Guidebook* guidelines for patch size distribution and natural connectivity characteristics frequency, for which the current CNRR FSPs have specified provisions. These provisions direct the spatial design but not the amount of harvest that will occur; therefore, no modelling considerations are required for achieving these objectives in the analysis.

A sensitivity analysis will be completed to evaluate if a general disturbance limit applied to each landscape unit (as a surrogate for patch size) creates an additional constraint to timber supply beyond the other integrated resource management objectives already modelled.

6.2.6 Moose habitat management

Moose habitat will be modelled in alignment with the moose strategy developed in the FSPs of the major licensees. These results and strategies were developed based on direction from the district managers and scientific reports developed by Larry Davis and Keystone. Licensees have committed in their FSPs to manage important habitat for moose that includes the High Value Moose Wetland (HVMW), HVMW Management Zone, and Moose Management Units.

HVMWs are defined in the CCLUP LAO spatial data set as Cariboo-Chilcotin High Value Wetlands for Moose. HVMW Management Zones are the areas surrounding the HVMWs with a width of 200 metres measured from the physical edge of the wetland. The Moose Management Units are areas surrounding W1, W3, W5 or shrub-carr wetlands with a width of 100 metres measured from the physical edge of the wetland.

The following moose habitat strategy is contained in approved CNRR FSPs and will be modelled in the base case:

Within SBPS, IDF or MS BEC zones the licensees will not cause the area to have less than 30% of the area as thermal cover and 60% of the area as security cover.

Within the SBS BEC zone the licensees will not cause the area to have less than 33% of the area as thermal cover and 66% of the area as security cover.

Within the ICH or ESSF BEC zones the licensees will not cause the area to have less than 60% of the area as thermal cover and 80% of the area as security cover.

Thermal cover is defined as stands of sufficiently stocked live conifers greater than or equal to 15 metres tall with greater than 40% crown closure. For the SBPS, IDF or MS BEC zones, if stands that are 15 metres or taller are not available, then stands greater than or equal to eight metres tall with greater than 40% conifer crown closure will be acceptable as thermal cover. Crown closure is not projected in the VRI or yield tables so only the green-up height requirement of eight metres in SBPS, IDF or MS BEC zones and 15 metres in all other zones will be modelled. Security cover is defined as stands with sufficiently stocked live conifers averaging greater than three metres in height.

Data source and comments:

Tolko Industries Ltd. - FSP #780, West Fraser Mills Ltd. - FSP #755, and BCTS - FSP #828;

CCLUP Act Order spatial data set: Cariboo-Chilcotin High Value Wetlands for Moose;

Riparian Guidebook, 1995;

Chilcotin Moose Recovery Plan, May 2, 2017. Prepared by: Larry R. Davis, MSc., RPBio., Davis Environmental Ltd.;

Identification and Management of Moose Winter Habitat in the Cariboo Region: Literature Review And Mapping Pilot Study, Keystone Wildlife Research Ltd., March 2006;

South Chilcotin Moose Habitat and Moose Vulnerability Management Plan, October 28, 2013 Prepared by: Larry R. Davis, M.Sc., RPBio., Davis Environmental Ltd and Shawn Meisner, EP, RPF, SM Meisner Consulting;

Extension Note: BC Journal of Ecosystems and Management, Volume 11, Number 3, British Columbia's Interior Moose Wildlife Habitat Decision Aid, Wayne B. Wall, Myriam Belisle, and Lindsay A. Luke.

6.2.7 Restoration of grassland benchmark areas

The CCLUP and the LAO specify silvicultural practices that facilitate the restoration of open grassland condition in the mapped grassland benchmark area. The grassland benchmark areas will be modelled with no regeneration and will be excluded from the THLB and AFLB following the first harvest.

Data source and comments:

Tolko Industries Ltd. - FSP #780;
West Fraser Mills Ltd. - FSP #755; and,
BCTS - FSP #828.

6.2.8 Fisheries sensitive watersheds

Fisheries sensitive watersheds (FSW) have been established within the 100 Mile House TSA to protect watershed sensitivities to significant downstream fisheries values. FSWs have been established under GAR to minimize impacts to fish from primary forest activities. FSPs have included results and strategies consistent with the objectives in GAR.

The objectives set for hydrology within the FSWs establish maximum equivalent clearcut areas (ECA) for specified basins and sub-basins. ECA is the proportion of the forested area within a watershed or specified basin or sub-basin that has been disturbed (e.g., harvested, burned, killed by insect or disease),

with consideration to hydrologic recovery. Hydrologic recovery is influenced by numerous factors, including the silviculture system used, level of stand regeneration, and burn severity. The maximum ECAs are intended to manage the rate of harvest to protect the quantity and timing of annual and seasonal flows.

FSWs will be modelled in the analysis using maximum ECAs listed in Table 31. Stands will be considered disturbed and contributing to the ECA while the regeneration is below nine metres in height.

Table 31. Maximum equivalent clearcut areas (ECA)

Watershed, basin, sub-basin name	FSW identifier	Maximum ECA percent	Total area	AFLB area	THLB area
McIntosh Lakes	F-5-001	40	288	225	183
McKinley Creek	F-5-001	20	1,410	1,358	622
McKinley Creek above Bosk Lake	F-5-001	30	10,626	9,367	5,458
Moffat Creek	F-5-001	20	155	153	141
Moffat Lakes	F-5-001	20	426	264	108

Data source and comments:

Order-Fisheries Sensitive Watershed Thompson Rivers Forest District, Lemieux Creek F-3-012, Deadman River F-3-013;

Order-Fisheries Sensitive Watershed Cariboo-Chilcotin Forest District, Horsefly River F-5-001;

Cariboo Regional FSPs ID# 780, 755, and 828.

6.3. Silviculture

Silviculture activities are carried out to ensure the regeneration of young forests on harvested areas, enhance tree growth or improve wood quality in selected stands. The following sections describe the modelling assumptions related to silviculture.

6.3.1 Regeneration

Since 1987 major licensees have had a legal responsibility for basic silviculture. To enable assessment of this responsibility, licensees conduct surveys of the regeneration on a cutblock and report this information in the Ministry's database called Reporting Silviculture Updates and Land Status Tracking System (RESULTS). Summary information from RESULTS will be the basis for regeneration assumptions in the base case.

6.3.2 Not satisfactorily restocked areas

Areas that are not satisfactorily restocked (NSR) are identified in the RESULTS data. NSR areas are classified as either backlog NSR (harvested prior to 1987) or current NSR. There is currently no backlog NSR in the TSA. The current NSR is based on the RESULTS Forest Cover Report and is comprised mainly of recently harvested stands but also includes other categories of managed stands that are NSR in the RESULTS database.

6.4 Forest health

The CNRR has experienced forest health impacts to stands of all ages, and across all landscapes. Both the health of young stands and the impact of forest health factors on the short- and mid-term timber supply are being evaluated across the region.

6.4.1 Mountain pine beetle

The extent and severity of the MPB infestation was projected in previous analyses using the BC MPB model. At that time, the analysis was primarily concerned with the spread of the infestation and estimating the progression of mortality losses. Now that the MPB outbreak has subsided, the extent of the mortality projected by BC MPB model has not substantially changed since 2007. Therefore, the BC MPB model is no longer used as a direct input to this analysis and incremental changes in mortality will not be modelled.

The current inventory includes estimates of the live and dead merchantable volume within MPB-impacted stands. The dead volume estimates were derived from annual MPB inventories and BC MPB model projections. The dead merchantable pine volume is combined with the live volume to estimate the current harvest volumes available within impacted stands but the dead volume will be incrementally decreased over time based the shelf-life consideration below.

6.4.1.1 Shelf life

Shelf life is an estimation of the length of time, after death, during which merchantable products can be produced from the dead tree. Shelf life is dependent on several factors, including market access and conditions, and available milling technology. It is assumed that the dead trees have some commercial use while they remain standing. The volume of merchantable dead pine immediately following the MPB outbreak was estimated and recorded in the current VRI. Recent cruise information demonstrates that dead pine from MPB-impacted stands is still a significant component of actual harvest volumes and will remain a harvest component for several years.

Decay of the dead volume is not factored into the annual projection of the VRI, so a shelf-life adjustment must be applied to project the estimated future availability of merchantable dead volume in MPB-impacted stands. For the purposes of this TSR, reduction factors will be applied to the dead volume in the VRI to reflect the volume lost over the 15 years since the peak of the MPB outbreak in 2020. The reductions are based on the recent cruise data and vary between wetter and drier BEC zones. The MPB-killed volume will be adjusted by the shelf-life adjustment factors shown in Table 32 and will be made available for harvest during the first 10 years of the timber supply projection. However, district staff indicate that by 2030, 25 years since the peak of the outbreak, the shelf life of the dead pine will be complete and no merchantable dead volume will remain. Therefore, the reduction factor will exclude all remaining MPB-killed volume through the rest of the timber supply projection.

Table 32. Shelf life of dead volume in MPB-impacted stands

BEC	Current dead volume utilization at 15 years post-MPB (2020)	Projected dead volume utilization at 25 years post-MPB (2030)
SBPS, SBS, MS, IDF	50%	0%
ICH, ESSF	25%	0%

A sensitivity analysis will be conducted to assess the potential impact of immediately excluding all dead volume from the harvest and assuming only the live volume of MPB-impacted stands will be harvested in the future.

Only sawlog volumes are projected in the current TSR. A sensitivity analysis will be conducted to assess the potential for non-sawlog fibre that could be recovered from the low-value dead component of these stands.

Data source and comments:

Harvest volume information was collected from Electronic Commerce Appraisal System to estimate the dead volume being harvested by BEC zone.

Estimates of projected utilization are based on current harvest data and are expected to decline in utilization based on anecdotal evidence and review of the downward trend of dead volume utilization throughout the CNRR since the last TSRs were completed.

6.4.1.2 Unsalvaged MPB stands

MPB-impacted stands that are not harvested will continue to grow and develop as complex stands. Stand structure will be highly variable depending on the number and distribution of residual live trees and the amount of understory advanced regeneration. The ability to model stand development following a major disturbance is currently limited, and the VRI does not provide sufficient stand structure information to provide good estimates of future growth. The modelling of unsalvaged MPB stands will be discussed in Section 7.4, '*MPB and fire disturbed stands*'.

6.4.2 Large scale wildfires

Extreme wildfires in recent years, specifically, 2017, 2018, and 2021, have impacted forests throughout the CNRR and communities remain sensitive to the risks of wildfires. Activities to build community safety and address forest resiliency through primary- and landscape-level fuel breaks, wildland urban interface (WUI) treatments as well as other thinning and fuel reduction treatments are ongoing.

There is substantial scientific agreement that climate is changing, that the changes will affect forest ecosystems, and that forest management practices will need to be adapted. Climate projections for the region include warming temperatures across all seasons, increased precipitation across all seasons except summer where a decrease is expected, and increased potential for extreme weather. The Ministry has an overall goal of adapting BC's forest management practices to foster resilient forests in a changing climate.

Forests across the TSA are in variable stages of resiliency – many of them needing direct action to build their resiliency to future impacts from wildfire, forest health, and climate change. Stand- and landscape-level planning is being conducted by the Ministry in ecosystems across the region to guide activities to improve resiliency.

Most of the salvage in the region has been focused on burnt Douglas-fir stands, however the "shelf life" for Douglas-fir saw logs is generally considered to only be 2-3 years post fire because considerable sap-rot is already evident in the dead standing Douglas-fir. Thin bark conifers such as spruce and pine were more susceptible to charring and checks which resulted in very little opportunity for saw log salvage.

The chief forester expects that when planning retention during salvage logging, there are six points of overarching guidance that should be contemplated in order of priority.

1. Ensure human safety and minimize damage to existing infrastructure.
2. Sustain, restore, or enhance the capacity of ecosystems to provide ecosystem values, such as those related to water quality and wildlife habitat.
3. Consider the collective disturbances on the landscape to mitigate cumulative impacts on environmental and societal values.
4. Facilitate the adaptation of forests to improve resilience to climate change.
5. Minimize impacts to timber supply by shifting logging from undamaged stands to damaged stands wherever possible.
6. Recover value from the burnt timber before the wood quality deteriorates.

In addition to the chief forester's guidance, the Elephant Hill Wildfire salvage principles were developed through a Government to Government table. These principles prioritized the salvage to heavily burned stands with an emphasis on retaining live trees and minimizing risk to riparian areas.

Although there has been no new guidance issued following the 2021 fires, it is expected that licensees will follow the existing guidance provided by the chief forester and principles developed by First Nations.

There are ongoing projects aimed at reforesting areas which have experienced catastrophic wildfire. All areas which were managed forests prior to wildfire are being assessed and treated, as appropriate to ensure ongoing management of these stands.

A sensitivity analysis will be completed to evaluate the timber supply implications if similar catastrophic wildfires occur in the near future. The effect on timber supply of depleting in the first decade an area equivalent to the area lost to high severity burns in 2017, 2018, and 2021 will be evaluated.

Data source and comments:

Adapting natural resource management to climate change in the *Cariboo Region: Considerations for practitioners and Government staff*.

https://www2.gov.bc.ca/assets/gov/environment/natural-resource-stewardship/nrs-climate-change/regional-extension-notes/caribooen160222.pdf

6.4.3 Non-recoverable losses

Periodic natural disturbances caused by extreme weather, fire, or epidemic forest health factors can result in large volume losses if the impacted stands are not salvaged. The CNRR recently endured significant losses from spruce bark beetle and Douglas-fir beetle, the impacts of which have been exacerbated by wildfires. These events are accounted for by averaging the recorded periodic volume losses over the recorded time frame to approximate an average annual volume loss.

This volume is deducted from the growing stock each year in the timber supply model projection.
A summary of the timber volume losses caused by forest health factors was produced by FAIB. The annual forest health aerial overview survey was compared with the annual harvest area mapping. Any THLB area that was identified with a forest health factor and had no record of subsequent salvage harvesting was considered to result in an unsalvaged loss. The volume of the stand at the year the health factor was observed was derived from the inventory. The unsalvaged volume loss was estimated as a percentage of the stand volume according to the forest health severity rating (ranging from 75% for very severe to five percent for low). Endemic pest losses are considered natural processes within stands and are accounted for within the growth and yield models. The annual unsalvaged losses are summarized by health factor in the table below.

The annual unsalvaged loss due to fire is based on recorded fires over the period from 2009 to 2019, excluding 2017 and 2018 fires because these were catastrophic years. All other fire years regardless of size are included in the calculation. Non-THLB (e.g., parks, OGMAs) as well as any salvaged areas have been deducted from this area.

Table 33. Non-recoverable losses

Abiotic and insect non-recoverable losses (m^3/year)						
Year	Windthrow	Fire	Douglas-fir beetle	Spruce beetle	Western balsam bark beetle	Total
2009	695	55,025	39,969	51,287	8	146,984
2010	0	11,354	2,246	74,494	76	88,170
2011	2,806	839	1,253	7,647	1	12,546
2012	5,550	8,927	13,563	98,087	367	126,494
2013	0	36	514	1,282	2	1,834
2014	268	0	6,595	1,823	21	8,707
2015	12,958	22	13,598	143	51	26,772
2016	0	184	34,183	40	56	34,463
2017	4,744	0*	34,713	522	35	40,014
2018	1,673	0*	12,897	0	42	14,612
2019	0		14,461	0	40	14,501
Average	2,609	9,548	15,817	21,393	64	49,431

* Catastrophic fires in 2017 and 2018 are excluded from calculation.

The summary of the timber volume losses caused by forest health factors is no longer produced annually by FAIB so the summary is only current to 2019. The average annual NRL of 49 431 cubic metres will be deducted from the growing stock each year in the base case.

Climate change is increasing the frequency and scale of these natural disturbances in recent years and is projected to continue to increase. Therefore, sensitivity analysis will be conducted to explore the effect on timber supply of continually increasing NRLs.

Data source and comments:

2005 through 2019 Aerial Overview Surveys of Forest Health. Logging history derived from the VRI and Results databases.

6.4.4 Disturbance outside of the timber harvesting land base

Natural disturbances that occur outside of the THLB do not affect the growing stock supporting the timber supply, but they may influence seral stage management objectives such as landscape-level biodiversity. If a major disturbance occurs to a stand outside of the THLB and it no longer provides old-seral values, it may be necessary to reserve additional old stands within the THLB to meet old-seral retention targets. Modelling natural disturbances outside of the THLB also helps provide a reasonable projection of the total growing stock on the land base over time.

Disturbances outside of the THLB will be modelled based on natural disturbance event return intervals from the *Forest Practices Code Biodiversity Guidebook*. The return interval varies by BEC and NDT. A probability function based on the *Biodiversity Guidebook* return interval, old age and young age will be used by the timber supply model to randomly assign disturbance areas outside of the THLB each projection time step.

7. Growth and Yield

7.1 Growth and yield models

Knowledge of the volume available from stands over time is a critical input for timber supply modelling. Growth and yield models are used to generate the volume estimates based on the characteristics of the individual stands.

To quantify the volume of timber available from a stand over time, volume tables are created based on stand attributes, growth characteristics, and the most suitable growth and yield model. Wherever possible yield projections will be developed for individual forest stands or silvicultural openings. Yield projections for stands without the necessary input information (e.g., for future stands) will be built through the aggregation of attributes from similar stands.

For the current analysis, two of the Ministry's growth and yield models will be used. The model VDYP was specifically developed to project the mature forest inventory. The model TIPSY is suitable for projection based on regeneration characteristics of a managed stand.

7.1.1 Variable density yield prediction model (VDYP7)

VDYP7 is the base model for projecting BC's forest inventories. Developed by the Ministry, VDYP is an empirical growth model that has been parameterized based on a large database of temporary sample plots (52,000) and permanent sample plots (9300) collected from mature natural forests in BC. Input information for the VDYP7 model is based on VRI attributes, typically at the individual stand level. Decay, waste and breakage estimates are incorporated within VDYP7 and are based on BEC loss factors using a decay sample tree database which consists of over 82,000 trees.

7.1.2 Table interpolation program for stand yields (TIPSY)

The Table Interpolation Program for Stand Yields (TIPSY) provides yield tables for single species and even-aged stands based on the interpolation of yield tables generated by the individual tree growth model Tree and Stand Simulator (TASS). Mixed species yield tables generated by TIPSY are weighted averages of single species yields and do not directly consider inter species interactions.

Input information for TIPSY is based on stand initiation characteristics including species, initial density, regeneration method (planted or natural), genetic gain, and potential site index. TIPSY also enables consideration for various silviculture treatments, forest health, and general operational adjustment factors.

BatchTipsy Composer version 5.0 will be used for this analysis. This version uses a database of TASS III generated yield tables for lodgepole pine and white spruce and TASS II generated yield tables for all other species.

The Tree and Stand Simulator, version TASS II, developed by the Ministry, is an individual tree level model for commercial species of BC. TASS predicts the potential growth and yield of even-aged and single species stands by modelling individual tree crown dynamics and the crown relationship to bole growth and wood quality. The individual tree and crown focus makes TASS well suited for predicting the response to many silviculture treatments and the exploration of stand dynamics. TASS III is a recently released version that extends TASS into more complex stand structures including multiple species and multi-age cohorts.

7.1.3 Operational adjustment factors

Yield projections in TIPSY are based on potential yields where a site is fully occupied. As a stand may not fully occupy a site or be able to reach its potential growth it is necessary to adjust the potential yields of TIPSY to reflect an operational yield.

In TIPSY, there are two operational adjustment factors (OAF) that are used to modify the potential yields. These OAFs differ in their application. OAF 1 is a static reduction across all time periods and, for example, may reflect non-productive openings within a forest. OAF 2 is a dynamic reduction that increases over time and, for example, may reflect a forest health issue that increases as a stand ages. Standard OAF values of 15% for OAF 1 and 5% for OAF 2 will be used in the base case since localized OAFs have not been developed for the 100 Mile House TSA.

Data source and comments:

Systematic Young Stand Monitoring has been undertaken throughout the province to assess regenerating stands. Forest health information from this monitoring is consistent with the Operational Adjustment Factors (OAFs) used for estimating volume losses due to factors affecting growth.

7.2 Natural and managed stands

Individual stands are classified by their stand type to ensure that yield tables are developed using the most appropriate growth and yield model. The 'natural' stand type includes stands without a silvicultural record in the RESULTS database. This may include mature stands that have never been harvested or stands harvested prior to silviculture record keeping. The 'managed' stand type includes stands with a silvicultural record and may include planted or naturally regenerated trees. Natural stand yield tables are developed using the VDYP model while managed stand yield tables are created using the TIPSY model.

Over the timber supply modelling time horizon stands may transition through harvesting from natural to managed, this is to ensure that an appropriate yield is projected for each stand under different conditions throughout the planning horizon.

Natural stands require a VDYP yield table for their current condition, and a TIPSY yield table for their future managed condition. Existing managed stands (stands with a silviculture record) regenerated prior to 1987 require two yield tables created in TIPSY to reflect their current and future conditions. The yield tables for the current condition stands are assumed to be regenerated with a natural irregular distribution because stands regenerated prior to 1987 have limited planting records and were frequently regenerated without stocking standards. The yield table for the future condition reflects current silviculture practices.

In the timber supply model natural stands and managed stands established prior to 1987, that are harvested are then regenerated as a 'future' stand. The regenerated attributes of future stands are based on current management practices in the TSA aggregated by BEC zone and subzone combination. Site index for each stand is sourced from the Provincial Site Productivity Layer (PSPL). In this procedure future stands are assigned a generic species composition but retain their specific site index.

Existing managed stands regenerated after 1987 are expected to be regenerated in a similar silviculture regime to their current conditions. Based on this assumption these stands are assigned to their current yield table in the future.

7.3 Analysis units

An analysis unit is composed of forest stands with similar BEC zones, tree species composition, timber growing potential and silviculture treatment regimes. The analysis unit is primarily used to define which timber volume projection the stand will follow after harvest. Analysis units also act as a logical aggregation of the land base for model reporting. Analysis units will be assigned by primary species, site index and BEC zones.

Table 34. Definition of analysis units

Analysis unit	Species	BEC zone	Site index	Analysis unit	Species	BEC zone	Site index
at_1	Deciduous	All	<10	pl_2_idf	Pine	IDF	>=10, <15
at_2	Deciduous	All	>=10, <15	pl_2_ms	Pine	MS	>=10, <15
at_3	Deciduous	All	>=15, <20	pl_2_sbps	Pine	SBPS	>=10, <15
at_4	Deciduous	All	>20	pl_2_sbs	Pine	SBS	>=10, <15
ep_all	Deciduous	All	all	pl_3_essf	Pine	ESSF	>=15, <20
bl_1_all	Balsam	All	<10	pl_3_ich	Pine	ICH	>=15, <20
bl_2_essf	Balsam	ESSF	>=10, <15	pl_3_idf	Pine	IDF	>=15, <20
bl_2_other	Balsam	Others	>=10, <15	pl_3_ms	Pine	MS	>=15, <20
bl_2_sbs	Balsam	SBS	>=10, <15	pl_3_sbps	Pine	SBPS	>=15, <20
bl_3_essf	Balsam	ESSF	>=15, <20	pl_3_sbs	Pine	SBS	>=15, <20
bl_3_other	Balsam	Others	>=15, <20	pl_4_essf	Pine	ESSF	>=20
bl_4_all	Balsam	All	>=25	pl_4_ich	Pine	ICH	>=20
cw_1	Cedar	Others	<10	pl_4_idf	Pine	IDF	>=20
cw_2	Cedar	SBS	>=10, <15	pl_4_ms	Pine	MS	>=20
cw_3	Cedar	Others	>=25	pl_4_sbps	Pine	SBPS	>=20
fd_1_idf	Douglas-fir	IDF	<10	pl_4_sbs	Pine	SBS	>=20
fd_1_other	Douglas-fir	Others	<10	sx_1_essf	Spruce	ESSF	<10
fd_2_ich	Douglas-fir	ICH	>=10, <15	sx_1_idf	Spruce	IDF	<10
fd_2_idf	Douglas-fir	IDF	>=10, <15	sx_1_other	Spruce	Others	<10
fd_2_ms	Douglas-fir	MS	>=10, <15	sx_2_essf	Spruce	ESSF	>=10, <15
fd_2_other	Douglas-fir	Others	>=10, <15	sx_2_ich	Spruce	ICH	>=10, <15
fd_2_sbps	Douglas-fir	SBPS	>=10, <15	sx_2_idf	Spruce	IDF	>=10, <15
fd_2_sbs	Douglas-fir	SBS	>=10, <15	sx_2_ms	Spruce	MS	>=10, <15
fd_3_essf	Douglas-fir	ESSF	>=15, <20	sx_2_sbps	Spruce	SBPS	>=10, <15
fd_3_ich	Douglas-fir	ICH	>=15, <20	sx_2_sbs	Spruce	SBS	>=10, <15
fd_3_idf	Douglas-fir	IDF	>=15, <20	sx_3_essf	Spruce	ESSF	>=15, <20
fd_3_ms	Douglas-fir	MS	>=15, <20	sx_3_ich	Spruce	ICH	>=15, <20
fd_3_sbps	Douglas-fir	SBPS	>=15, <20	sx_3_idf	Spruce	IDF	>=15, <20
fd_3_sbs	Douglas-fir	SBS	>=15, <20	sx_3_ms	Spruce	MS	>=15, <20
fd_4_ich	Douglas-fir	ICH	>=20,<25	sx_3_sbps	Spruce	SBPS	>=15, <20
fd_4_idf	Douglas-fir	IDF	>=20,<25	sx_3_sbs	Spruce	SBS	>=15, <20
fd_4_other	Douglas-fir	Others	>=20,<25	sx_4_essf	Spruce	ESSF	>=20, <25
fd_4_sbs	Douglas-fir	SBS	>=20,<25	sx_4_ich	Spruce	ICH	>=20, <25
fd_5_all	Douglas-fir	All	>=25	sx_4_idf	Spruce	IDF	>=20, <25
pl_1_idf	Pine	IDF	<10	sx_4_sbps	Spruce	SBPS	>=20, <25
pl_1_other	Pine	Others	<10	sx_4_sbs	Spruce	SBS	>=20, <25
pl_2_essf	Pine	ESSF	>=10, <15	sx_5_all	Spruce	All	>=25
pl_2_ich	Pine	ICH	>=10, <15				

7.4 MPB and fire disturbed stands

The VRI was adjusted in 2016 to reflect the considerable losses resulting from the MPB epidemic. Since 2017, the VRI has also been adjusted each year to reflect losses from major wildfires. The adjustments ensure the inventory and volume estimates more reliably reflect the current conditions. However, VDYP is an empirical model and is not capable of projecting the recovery of these stands following major disturbances. The model cannot account for factors such as release of surviving trees, understory trees and ingress. Where significant adjustments have been applied, VDYP projects these stands to remain in a continuous degraded state through the modelled time horizon and the stands are never capable of contributing to timber supply.

Aggregate yield tables

For the current analysis, the yield table for MPB or fire disturbed stands that have been adjusted in the VRI will be modelled using a replacement aggregate yield projection. The MPB disturbed stands requiring an aggregate yield table were identified as those with greater than 40% dead volume. The fire disturbed stands requiring an aggregate yield table were identified as areas burned since 2015 with burn severity classes 'moderate' and 'severe'. An exception was made for Douglas-fir leading stands within the 2021 burn area because these stands have not yet received an adjustment in VRI and they are prioritized for salvage harvest in the model to reflect current practices.

The aggregate yield tables were produced by averaging the yield tables of all remaining stands that do not require an aggregate. An aggregate yield table was produced for each analysis unit and was assigned to the identified MPB and fire disturbed stands within the same analysis unit.

Age adjustments

After the aggregate yield tables were assigned an age adjustment was applied to represent the losses resulting from the MPB and fire. A proportion of the stands within the identified disturbed areas were randomly selected and their ages were reset to zero. The proportion selected to be reset was guided by the burn severity class or the MPB percent killed. Stands in the 'severe' burn class and the MPB stands greater than 80% killed were all (100%) reset to age zero. In the 'moderate' burn class, 50% of the stands were reset to zero and the remaining MPB stands, between 40 to 80% killed, were reset in proportion to the individual percentages.

7.5 TIPSY input data

Input data for TIPSY is obtained from site specific, field derived silviculture information stored in RESULTS. The RESULTS application tracks silviculture information by managing the submission of openings, disturbances, silviculture activities and obligation declarations as required by the *Forest and Range Practices Act*. Whereas the purpose of the RESULTS data is to track licensee regeneration obligation, for TSR purposes, the data is validated for the purpose of creating an individual yield table for each opening.

Planted species composition and density are derived from RESULTS planting and survey data. Survey data is used to adjust species composition to account for ingress, mortality and to capture changes in species composition from the time of planting to the time of survey.

Genetic gain is incorporated into the timber supply analysis through TIPSY where site specific RESULTS seedlot information is linked to the Seed Planning and Registry Application (SPAR) of the Forest Improvement and Research Management Branch.

Data source and comments:

Public access to Ground Sample Data area approved as OpenData under BC Open Government License.

7.5.1 Planted and natural density in managed stands

The distribution of trees within a stand influences the growth of the stand. While there are many distributional patterns, TIPSY provides two general distribution options: natural and planted. A natural distribution has increased patchiness whereas a planted distribution tends to a more uniform distribution, as would be required under current silviculture obligations.

Within individual silvicultural openings there are planted and naturally regenerated stems. There can also be many overlapping forest cover records. Each of these records represents a unique stratum identified at the time of the inventory survey. The final species composition and density for the opening is derived by weighting the original planting activity numbers to give a planted composition and density for the opening. This is then adjusted for ingress and mortality by using the weighted combination of the inventory survey information. All information is subject to validation rules. If an opening has no record of planting activities, then the species composition and density is based on the weighted inventory survey information only.

7.5.2 Tree improvement

Licensees are obliged to use the best available seed source when regenerating sites by planting. Planted stock may have faster growth than naturally regenerated trees. The faster growth may be due to either use of high quality genetically improved seed (Class A seed) obtained through traditional tree breeding within seed orchards, or the use of seed harvested from superior wild trees (Class B+ seed). Class A seed and Class B+ seed are both referred to as "select seed". Seed harvested from natural stands (Class B seed) is not considered "select seed".

"Genetic worth" (GW) is an indication of the quality of select seed, as represented by a percentage volume increase expected near rotation age. Seedlings grown from Class A and B+ seed are expected to have volume gain or GW relative to Class B seed. As an example, a seedling grown from Class A seed that has been assigned a GW value of 10 is expected to gain 10% more volume by rotation than a tree generated from Class B seed.

Information on the use of select seed and the associated genetic gains is available from SPAR. RESULTS information provides a seed source for individual plantations, and this is linked to the genetic gain database in SPAR to determine the genetic gains associated with individual managed stands.

In the 100 Mile House TSA, select seed is currently available for hybrid spruce (Sx), interior Douglas-fir (Fdi), western larch (Lw) and lodgepole pine (Pli). GW is used as input into the growth and yield model TIPSY for managed stands where the regeneration type is planted. The GW for planted future managed stands is based on the weighted average genetic worth of the trees planted in the past 15 years which is 6.65%. During this time, 73% of all trees planted have been planted with improved stock.

7.5.3 Planting delay

A delay exists between the time that a stand is harvested and the regeneration of that stand. For existing managed stands this delay is determined for individual stands directly from the RESULTS silviculture records. It is calculated as the difference between the disturbance start date and the planting activity completion date. Where more than one valid planting treatment is reported, the completion date from the latest treatment is used. Planting delay is incorporated into the timber supply analysis as a TIPSY model input.

The median planting delay in the 100 Mile House TSA is two years.

8. Forest Estate Modelling

8.1 Forest estate model

The forest estate model Woodstock was developed in the 1990's by Remsoft Inc. With over 20 years of advancement Woodstock is now the core of the suite of Remsoft tools and widely used by many clients in over 14 countries. Woodstock can perform both simulation and optimization, but the optimization function is much more widely used and will be used in this analysis. The model can report volume and area harvested as well as statistics on the multiple constraints applied.

8.2 Sensitivity analyses

Sensitivity analyses are additional timber supply projections that are carried out to explore the implications to the timber supply from uncertainty in management assumptions or data quality. These analyses typically change one variable while holding all others constant to see if there is a disproportionate change in the timber supply. The magnitude of the increase or decrease in a particular variable should reflect the degree of uncertainty surrounding the assumption. Sensitivity analysis may help identify variables that have the potential to alleviate or exacerbate points of constrained timber supply in the projection. By conducting several sensitivity analyses it is possible to determine which variables have the strongest influence on the base case harvest levels.

Table 35 presents the standard sensitivity analyses that are generally performed to support the TSR process along with some analyses to explore issues unique to the 100 Mile House TSA. Additional sensitivity analyses may be included after the base case has been completed if new uncertainties are identified.

Table 35. Sensitivity analyses

Issue	Sensitivity levels
Broadleaf	Include broadleaf-leading stands in THLB
Full fibre timber supply	Use VDYP biomass volume projections, including dead (MPB and fire) volumes
Managed stand yields	+ / - 10%
Visually sensitive areas	Use lower disturbance limits
Minimum harvestable age	+ / - 5 years
Minimum harvestable volume	+ / - 20 cubic metres per hectare
Mule deer winter range	Exclude MDWRs from the THLB
Natural stand yields	+ / - 10%
Steep slopes	+/- 10% steep slope threshold for cable systems
Commercial thinning	Apply commercial thinning to SBS, ESSFwk1, and ICH BEC zones
Terrain stability mapping	Exclude potentially unstable terrain (Terrain Class 4)
Timber harvesting land base	Use LHLB as THLB
Canim Key Interest Area (KIA)	Remove KIA from THLB
Treaty lands	Exclude all treaty AIP selection lands
Catastrophic wildfire	Project equivalent large fires in the first decade

8.3. Carbon sequestration

Forest carbon is of emerging importance in forest management in BC. The implementation of projects under the Forest Carbon Initiative should directly consider the management practice impacts on forest carbon.

The carbon stocks in each forest ecosystem are described by different carbon pools. The five terrestrial carbon pools as defined by the Intergovernmental Panel on Climate Change are aboveground biomass carbon, below ground biomass carbon, dead organic matter, forest floor litter, and soil organic carbon. The sum of all five pools is referred to as total ecosystem carbon.

From a climate change perspective, regardless of what management strategies are implemented on the ground, the goal is to reduce greenhouse gas (GHG) emissions to the atmosphere. The net ecosystem carbon balance (NECB) is used to describe the net change between the given ecosystem and atmosphere. A positive NECB means the atmosphere carbon pool is increasing, thus, the given ecosystem is losing carbon, otherwise referred to as a carbon source ecosystem. A negative NECB means the ecosystem is a carbon sink.

To make different GHGs (e.g., methane, nitrous oxide) comparable in carbon accounting, carbon dioxide equivalent (CO_2e) is adopted, and the global warming potential (GWP) is used to convert each of the greenhouse gases into CO_2e.

The conversions used in this analysis are: 1 CH_4 = 25 CO_2e; 1 N_2O = 298 CO_2e.

The harvested wood product (HWP) 100 years retention factors were used according to *British Columbia Greenhouse Gas Offset Protocol: Forest Carbon Version 2.0*. This analysis will only consider the carbon in-use as defined in the protocol and the carbon in landfill will be treated as immediate emission after harvesting.

9. Your Input is Needed

Public input is a vital part of establishing the allowable annual cut. Feedback is welcomed on any aspect of this data package or any other issue related to the timber supply review for the 100 Mile House TSA. Ministry staff would be pleased to answer questions to help you prepare your response. Please send your comments to the resource district manager at the address below.

Your comments will be accepted until March 16, 2024 for consideration with respect to the *Data Package*. A further comment period will be made available following the release of a *Discussion Paper* that outlines the results of a timber supply analysis.

You may identify yourself on the response if you wish. If you do, you are reminded that responses will be subject to the *Freedom of Information and Protection of Privacy Act* and may be made public. If the responses are made public, personal identifiers will be removed before the responses are released.

For more information or to send your comments, contact:

Kane Copley, RPF, Strategic Land Manager
Ministry of Forests
100 Mile House Natural Resource District
PO Box 129
100 Mile House, BC V0K 2E0

Electronic mail: 100MileHouseTSR@gov.bc.ca

Further information regarding the technical details of the timber supply analysis is available on request by contacting Forests.ForestAnalysisBranchOffice@gov.bc.ca

To obtain further information about the AAC determination process, the Timber Supply Review and past 100 Mile House TSA timber supply review documents visit the BC government website at

https://www2.gov.bc.ca/gov/content/industry/forestry/managing-our-forest-resources/timber-supply-review-and-allowable-annual-cut