Williams Lake Timber Supply Area
Timber Supply Review

Data Package

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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 Williams Lake 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 timber supply area (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.

In 2015, the current AAC was set by the chief forester at 3 000 000 cubic metres. This AAC includes a partition of a maximum of 1 500 000 cubic metres per year for live volume which means the remainder of the AAC is for salvaging dead trees. The chief forester set the expectation that non-pine leading stands will contribute a maximum of 880 000 cubic metres to the AAC of this TSA. 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 subsequently amended in May 2011, November 2015, January 2017, and September 2018, 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 Williams Lake TSA

2.1 Description of the Williams Lake TSA

The Williams Lake TSA is located in the central part of the Cariboo Region, lying in the Fraser Basin and the Interior Plateau between the Coast Mountains to the west and the Cariboo Mountains to the east. The TSA is bounded by the Quesnel TSA to the north, and 100 Mile House and Lillooet TSAs to the south.

The climate, terrain and forests of the TSA are varied with three general landscape types. The Chilcotin Plateau, west of the Fraser River, is characterized by a drier climate with extensive lodgepole pine forests and some Douglas-fir, and extends to the west to the Coast Mountains. The central portion of the TSA, both east and west of the Fraser River, has mixed species forests, primarily Douglas-fir and lodgepole pine, interspersed with open range lands. The eastern portion of the TSA consists of a rolling plateau that increases in elevation to meet the Cariboo Mountains and Quesnel Highlands where forests of spruce, pine, western redcedar, western hemlock, and subalpine fir occur.

The total population within the area bounded by the Williams Lake TSA is about 23,600 with nearly 11,000 residing in Williams Lake. Other communities such as Horsefly, Likely, Miocene, Alexis Creek, Anahim Lake, Tatla Lake, Riske Creek, Big Creek, Nimpo Lake, 150 Mile House, Big Lake, and McLeese Lake contribute to the area's population. Some residents from these outlying communities commute daily for employment or to use services available in Williams Lake.

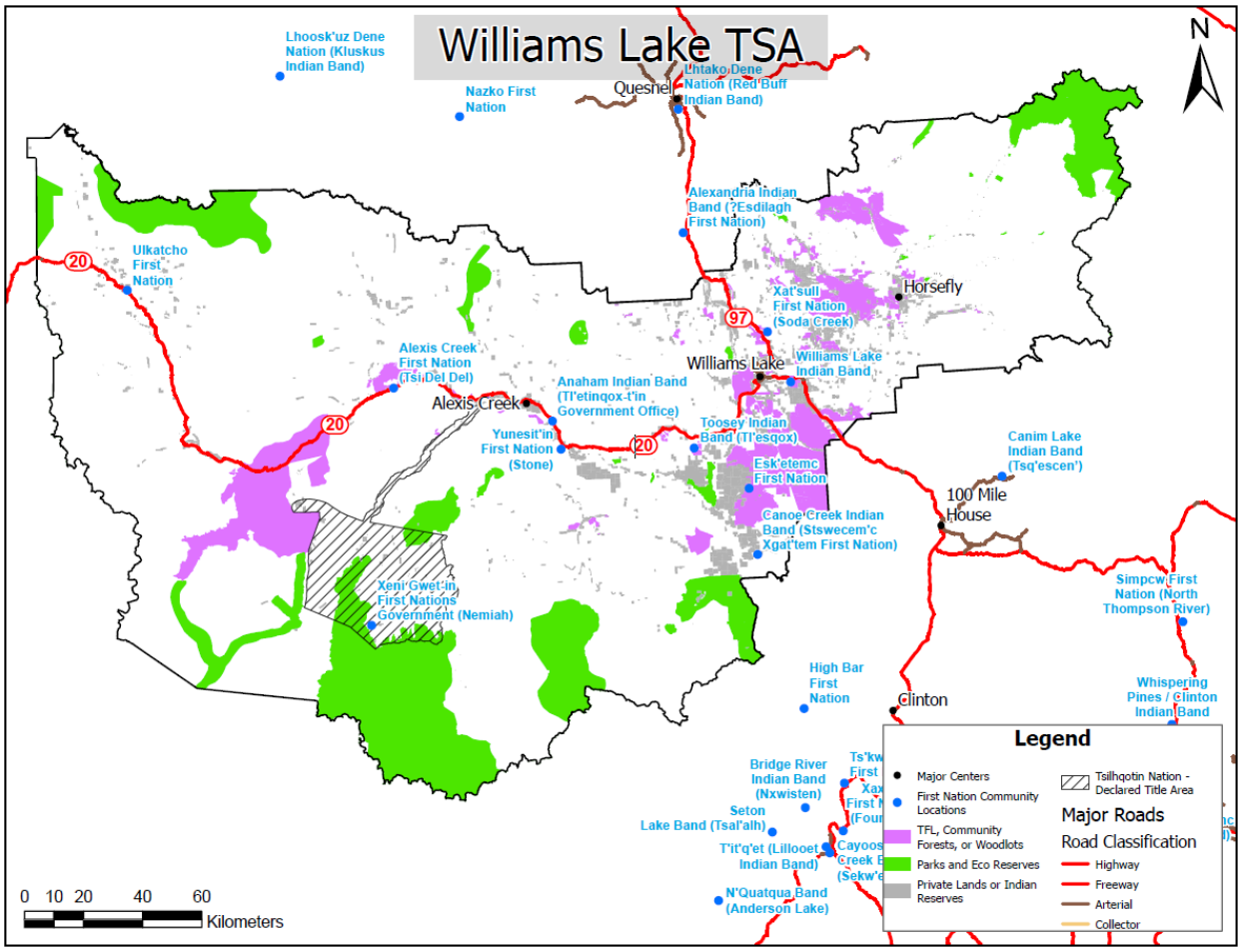

Figure 1. Williams Lake Timber Supply Area.

The varied landscapes of the Williams Lake TSA provide for a diversity of habitats including grasslands, wetlands, forests, and alpine. Large mammals in the TSA include mule deer, moose, mountain goat, caribou, bighorn sheep, cougar, lynx, black bear, grizzly bear, coyote and wolf. Many smaller furbearing species occur in the TSA such as snowshoe hare, pine marten, fisher, and squirrel.

The TSA has numerous rivers, lakes and streams that support many species of fish such as sockeye and chinook salmon, steelhead, sturgeon, rainbow trout, kokanee and bull trout.

2.2 First Nations

There are rich, diverse Indigenous cultures within the Williams Lake TSA. Ten First Nations communities are located within the area bounded by the Williams Lake TSA: Tl'etinqox (Anaham Band), Tsi Del Del (Alexis Creek First Nation), Yunesit'in (Stone Band), Xeni Gwet'in (Nemiah Valley Band), Tl'esqox (Toosey First Nation), Esk'etemc (Alkali Lake Band), Xat'sūll (Soda Creek Band), Williams Lake First Nation (T'exelc), Ulkatcho First Nation, and Stswecem'c Xget'tem First Nation (Canoe/Dog Creek Band).

Other First Nations with asserted aboriginal rights and title (aboriginal interests) and asserted territories in the Williams Lake TSA include: ?Esdilagh (Alexandria Band), Xwisten (Bridge River), Tsq'escen'(Canim Lake Band), Da'naxda'xw/Awaetlala, High Bar First Nation, Whispering Pines/Clinton Indian Band, Homalco First Nation, Lhoosk'uz Dene (Kluskus First Nation), Lheidli T'enneh Nation, Lil'wat Nation, Nazko First Nation, Nuxalk Nation, Lhtako Dene (Red Bluff Band), Simpcw First Nation, Skin Tyee Nation, T'it'q'et First Nation, Tsal'alh First Nation, and Ts'kw'aylaxw First Nation (Pavilion).

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 Williams Lake 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.

Two Collaborative Technical Working Groups (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. One working group, formed in October 2022, includes representatives from the Tsilhqot'in Nations. The other working group, formed in January 2023, includes representatives from Secwepemc First Nations with communities, aboriginal interests, and asserted territories within the WLTSA. These groups were meeting biweekly to collectively review and contribute to the content of this *Data Package* and will continue to collaborate through the remaining timber supply review process. All First Nations with communities in the WLTSA were invited to join collaborative working groups. Some of those Nations chose to participate in the *Data Package* development through the consultation 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 Williams Lake area has a large processing sector with three major lumber mills, one veneer/plywood plant, a smaller lumber mill, two log home manufacturers, a remanufacturing plant, and a pellet mill. There are other small processing plants in some outlying areas, but their operations are intermittent. 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 17.7% of total basic employment in the Cariboo-Chilcotin Natural Resource District. Other sectors providing employment in the district include: public sector (19.3%); tourism (1.4%); construction (7.1%); agriculture and food (1.5%); and mining and mineral production (9.6%).

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 (SRMP). 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 ungulate winter range (mule deer) and wildlife habitat areas (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

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 and will be prepared following the development of this *Data Package*.

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 9.3 – '*Sensitivity analysis*'.

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. 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 underway in ecosystems across the region to guide activities to improve resiliency. 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.

These changes 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 warming temperatures across all seasons, increased precipitation across all seasons except summer where a decrease is expected resulting in a higher drought risk and a longer wildfire season with larger areas burnt. 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, connectivity corridors and forest biodiversity that are approved for implementation. At this time, assessments in the Williams Lake 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.

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	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.
Climate change	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. Known climate change information will be incorporated into the TSR within all relevant factors.
Wildfire	The Williams Lake TSA was heavily impacted by wildfires in 2017, 2018, 2021, and 2023. 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.
Wildfire risk reduction	Wildfire risk reduction activities have been ongoing such as understory thinning and selection harvesting to reduce the fuel load and canopy density of stands within the wildland urban interface.
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 analysis confirms that except for fire salvage, a disproportionately low area within MDWR has been harvested over the past 10 years.
Woodland Caribou	Caribou is a species of high concern throughout the TSA and has been listed as threatened under the federal *Species at Risk Act.* Population numbers have dropped significantly due to multiple factors. Timber harvesting and associated road building are considered to be important factors contributing to habitat quality.
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).
Marginally economic forest types	The report by the Special Committee on Timber Supply, *Growing Fibre, Growing Value* recommends investigating the opportunities for marginally economic forest types to mitigate mid-term timber supply deficits. For the future, the Forest Landscape Planning process will identify district and regionally specific opportunities.

(continued)

Table 1. Major forest management considerations and issues

Management objectives considerations	Description
Tsilhqot'in Nation proven and declared Aboriginal Title and proven Aboriginal Rights area	On June 26, 2014, the Supreme Court of Canada released its decision on Tsilhqot'in Nation v. British Columbia (Tsilhqot'in decision). In that decision the SCC outlined areas over which the Tsilhqot'in Nation had proven and declared Aboriginal title and are therefore excluded from this analysis. The Tsilhqot'in 2012 BC Supreme Court decision confirmed a proven Aboriginal rights area where Tsilhqot'in people hold rights to hunt and trap birds and animals. Deep consultation is required when considering proposed authorizations in this area and since 2014, very few provincial authorizations have been made in this area because management expectations are unique.
Treaty negotiations	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.
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.
Short rotation management and commercial thinning	Licensees have been exploring utilization of second growth or younger age class stands. Second-growth stands, which are generally found nearer to existing wood processing facilities have become increasingly more economical for harvest. Licensees have conducted some commercial thinning treatments in second-growth pine-leading stands.
Broadleaf deciduous	Some broadleaf deciduous species are merchantable and are harvested in small volumes. However, broadleaf-leading stands are not currently being targeted for harvest in this TSA and incidental broadleaf-deciduous species in coniferous-leading stands are generally being reserved for biodiversity and wildlife values.
Dry-belt Douglas-fir harvest outside MDWR	Dry-belt Douglas-fir forests have ecological limitations and regeneration requirements which require special consideration. A Dry-belt Douglas-fir Management Strategy is currently under development in collaboration with MoF staff, First Nations and forest practitioners. Uneven-aged silvicultural systems improve Dry-belt Douglas-fir establishment, growth, and multi-storey development by mitigating risks of frost and drought. These silvicultural systems promote stand resilience, and this is of increased importance with climate change where sites could experience more extreme wildfire and drought events.
Mountain Pine Beetle salvage	The majority of lodgepole pine in the district was killed by MPB between 2003 and 2008. Licensees have focused their harvest on the dead pine up until 2017 when the focus shifted to salvaging burned wood. The vast majority of merchantable dead pine stands have been harvested, however incidental dead pine is still being harvested within non-pine leading stands.

(continued)

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

Management objectives considerations	Description
Landscape-level planning	Forest Landscape Planning (FLP) has been initiated across the TSA. These plans will spatialize objectives across the landscape and will be developed collaboratively by provincial government, First Nations, communities, and stakeholders. It is anticipated that data will be updated as strategies are developed. Information that comes from the planning process will be included in the analysis as appropriate within this process.

5. Inventories

5.1 Background information

Table 2 lists the spatial data that will be used to define the Williams Lake 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
TSAs	BCGW	WHSE_ADMIN_BOUNDARIES.FADM_TSA	2023
Landscape units	BCGW	WHSE_LAND_USE_PLANNING. RMP_LANDSCAPE_UNIT_SVW_NO_MULTIPLES	2023
Ownership	BCGW	WHSE_FOREST_VEGETATION.F_OWN	2023
Ownership	BCGW	WHSE_TANTALIS.TA_CROWN_TENURES_SVW	2023
Protected areas: parks and ecological reserves	BCGW	WHSE_TANTALIS.TA_PARK_ECORES_PA_SVW	2023
Wildlife	BCGW	WHSE_TANTALIS. TA_WILDLIFE_MGMT_AREAS _SVW	2023
Community watersheds	BCGW	WHSE_WATER_MANAGEMENT. WLS_COMMUNITY_WS_PUB_SVW	2023
Managed licences	BCGW	WHSE_FOREST_TENURE.FTEN_MANAGED_LIC _POLY_SVW	2023
Indian reserves	BCGW	WHSE_ADMIN_BOUNDARIES.CLAB_INDIAN _RESERVES	2023
Tree farm licence	BCGW	WHSE_ADMIN_BOUNDARIES.FADM_TFL	2023
Private land	BCGW	WHSE_CADASTRE.CBM_CADASTRAL_FABRIC _PUB_SVW	2023
First Nations agreement boundaries	BCGW	WHSE_HUMAN_CULTURAL_ECONOMIC.FNIRS_ AGREEMENT_BOUNDARY_SVW	2023
BCTS operating area	BCGW	WHSE_ADMIN_BOUNDARIES.FADM_BCTS_AREA _SP	2023
Biogeoclimatic ecosystem classification	BCGW	WHSE_FOREST_VEGETATION.BEC_ BIOGEOCLIMATIC_POLY	2023
Provincial site productivity layer	FAIB	SITE_PROD_BC	2023
Vegetation resource inventory (VRI)	BCGW	WHSE_FOREST_VEGETATION. VEG_COMP_LYR_R1_POLY	2023
RESULTS reserves	BCGW	WHSE_FOREST_VEGETATION.RSLT_FOREST_ COVER_RESERVE_SVW	2023
Forest depletions	FAIB	CONSOLIDATED_CUTBLOCKS_2020	2023
Terrain stability mapping	BCGW	REG_LAND_AND_NATURAL_RESOURCE.STE_TER_ STABILITY_POLYS_SVW	2023
Mule Deer winter range	BCGW	WHSE_WILDLIFE_MANAGEMENT.WCP_UNGULATE_ WINTER_RANGE_SP	2023
Mule Deer winter range	BCGW	REG_LAND_AND_NATURAL_RESOURCE.L_MULE_DEER_ WR_CAR_POLY	2023
Visual landscape inventory	BCGW	WHSE_LAND_USE_PLANNING.RMP_PLAN_LEGAL_POLY_ SVW	2023
Recreation sites	BCGW	WHSE_FOREST_TENURE.FTEN_RECREATION _POLY_SVW	2023
Research plots	BCGW	WHSE_FOREST_VEGETATION.GRY_PSP_STATUS_ ACTIVE	2023

(continued)

Table 2. Inventory information (concluded)

Spatial data	Source	Feature name	Vintage/download
WHAs	BCGW	WHSE_WILDLIFE_MANAGEMENT.WCP_WILDLIFE _HABITAT_AREA_POLY	2023
Proposed WHAs	BCGW	REG_LAND_AND_NATURAL_RESOURCE.WLD _WHA_PROPOSED_SP	2023
OGMAs	BCGW	WHSE_LAND_USE_PLANNING.RMP_OGMA_LEGAL _CURRENT_SVW	2023
CCLUP community areas of special concern	BCGW	WHSE_LAND_USE_PLANNING.RMP_PLAN_LEGAL _POLY_SVW	2023
CCLUP critical fish habitat	BCGW	WHSE_LAND_USE_PLANNING.RMP_PLAN_LEGAL _POLY_SVW	2023
CCLUP Grizzly Bear capability	BCGW	WHSE_LAND_USE_PLANNING.RMP_PLAN_LEGAL _POLY_SVW	2023
CCLUP L3/L1 lakes	BCGW	WHSE_LAND_USE_PLANNING.RMP_PLAN_LEGAL _POLY_SVW	2023
CCLUP lake management classes	BCGW	WHSE_LAND_USE_PLANNING.RMP_PLAN_LEGAL_POLY_ SVW	2023
CCLUP high value wetland s for moose	BCGW	WHSE_LAND_USE_PLANNING.RMP_PLAN_LEGAL _POLY_SVW	2023
CCLUP scenic areas	BCGW	WHSE_LAND_USE_PLANNING.RMP_PLAN_LEGAL _POLY_SVW	2023
CCLUP legal order boundary	BCGW	WHSE_LAND_USE_PLANNING.RMP_STRGC_LAND_ RSRCE_PLAN_SVW	2023
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_LEGAL_POLY_ SVW	2023
Stream management zones (buffers)	BCGW	WHSE_LAND_USE_PLANNING.RMP_PLAN_LEGAL _POLY_SVW	2023
Lake management zones (buffers)	BCGW	WHSE_LAND_USE_PLANNING.RMP_PLAN_LEGAL _POLY_SVW	2023
Lake classification	BCGW	WHSE_BASEMAPPING.FWA_LAKES_POLY	2023
Forest Service road	BCGW	WHSE_FOREST_TENURE.FTEN_ROAD_SECTION_LINES_ SVW	2023
Road permit road	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 area	BCGW	WHSE_LAND_USE_PLANNING.FADM_DESIGNATED_ AREAS	2023
Wildfire	BCGW	WHSE_FOREST_VEGETATION.VEG_BURN_SEVERITY _SP	2023
Tsilhqot'in Nation	BCGW	WHSE_ADMIN_BOUNDARIES.PIP_CONSULTATION _AREAS_SP	2023
Historic vegetation resource inventory	BCGW	WHSE_FOREST_VEGETATION. VEG_COMP_LYR_R1 _POLY	2002

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.

5.2 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.

The original forest cover inventory for the western portion of the TSA was developed from air photos acquired in the 1980s and 1990s and along the western boundary of the TSA some inventory dates from the 1960s. The forest cover attributes conform to the FIP standard but have since been rolled over to the VRI format. In the eastern portion of the TSA a VRI re-inventory was completed in early 2013. This new inventory implemented the recently developed Landscape Vegetation Inventory (LVI) approach which now accounts for approximately 23% of the current forested inventory in the TSA.

The inventory data has been updated to 2022 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 Cariboo fire and 2018 Nadina fires. 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.

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). In the western portion of the TSA there are 35 fixed area monitoring samples established on a 10 kilometer by 20 kilometer National Forest Inventory grid that were last measured in 2013. In the eastern portion of the TSA there are 67 temporary sample clusters established through VRI Phase 2 sampling that were also last measured in 2013.

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 Williams Lake TSA, all differences were found to be inconclusive except for height in measured in the Phase 2 plots where no practical difference was found between the VRI estimates and the ground sample.

Data source and comments:

WHSE_FOREST_VEGETATION. VEG_COMP_LYR_R1_POLY

Mature Inventory Assessment for Management Unit TSA29 Williams Lake (Aug 15, 2022).

5.3 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.

Data source and comments:

SITE_PROD_BC

5.4 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 Williams Lake TSA, 167 sample plots have been established between 2012 and 2018. Of these plots, 71 have been revisited for a second measurement that allows for an evaluation of growth increment. Some of the preliminary results are described below.

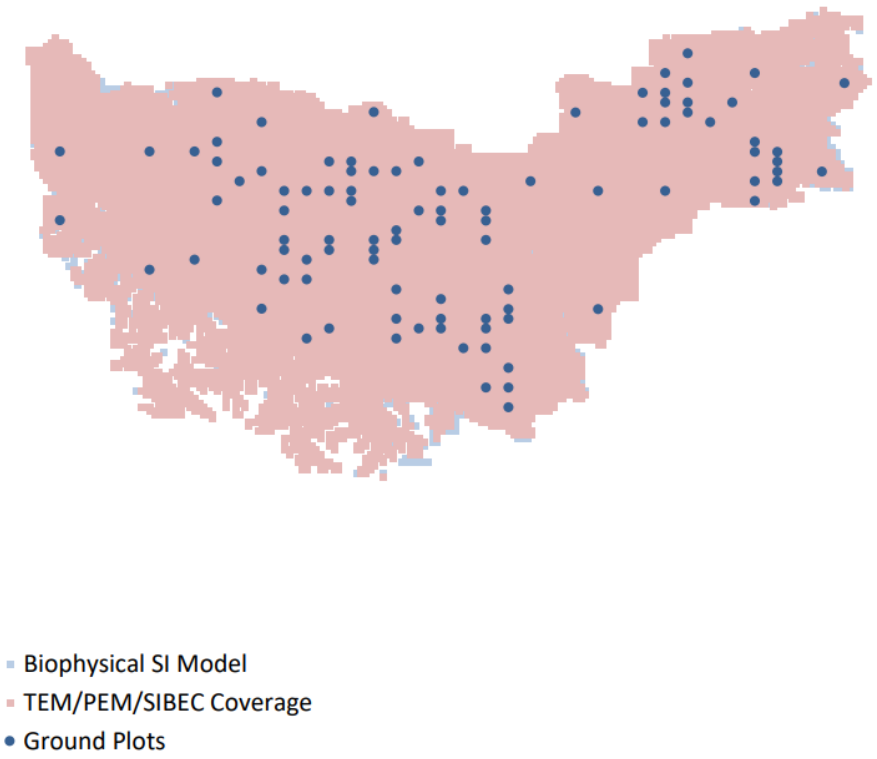

Figure 2. YSM plot locations.

The leading species from the YSM ground samples were compared to the interpreted leading species in the VRI and were found to have 68% 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 5%. Yield projections based on TSR assumptions were compared against yield projections created using YSM

measurements to test if TSR assumptions will meet future expectations. For the first 70 years of the projections, the TSR yields are slightly underestimated but from 80 years onward the TSR yields significantly exceed the YSM yields and are considered optimistic.

Data source and comments:

Williams Lake TSA Young Stand Monitoring Program Technical Handout (Feb 13, 2023).

6. Timber Harvesting Land Base Definition

6.1 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 Williams Lake 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 Williams Lake TSA.

The AFLB includes all forested areas within the portion of the Williams Lake 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 3, below, illustrates the land base classification process used in TSR.

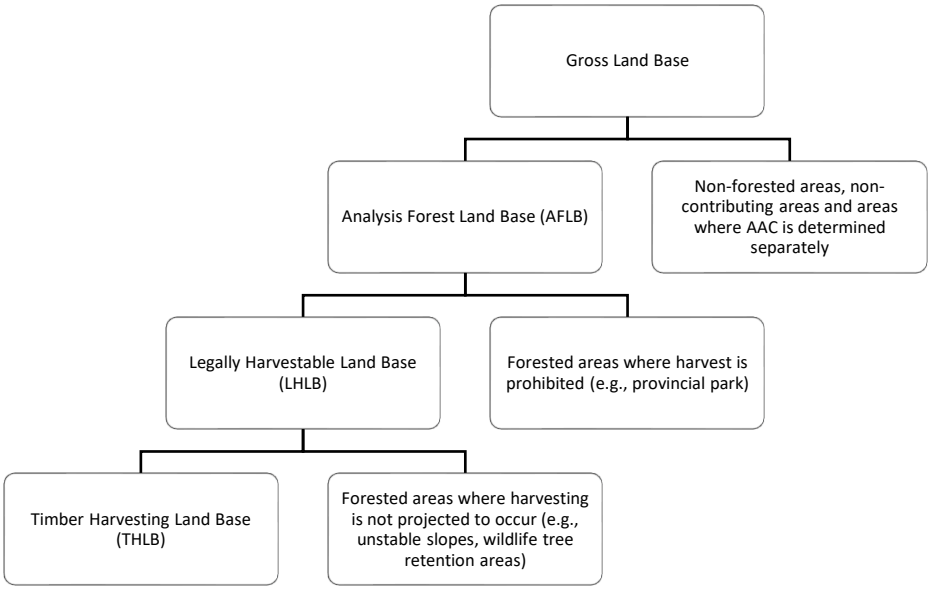

Figure 3. Land base classification definition.

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. The preliminary land base classification summary for the Williams Lake TSA is provided below with the understanding that the numbers are subject to change based on the information received during the review period for this *Data Package*. A description of each classification step is detailed in the following sections.

Table 3. Preliminary land base classification summary for the Williams Lake TSA

Land classification	Area net of overlaps with prior items				
	Total area (ha)	**Forested area (ha)**	**Net area removed (ha)**	**Percent (%) of total TSA**	**Percent (%) of AFLB**
Total TSA area	4,933,635				
Land not administered by the Province	697,033		697,033	14.13	
Non-forest	1,284,855	1,105,908	1,105,908	22.42	
Roads and landings	50,434		32,526	0.66	
Analysis forest land base	3,098,168			0.00	100
Parks, protected areas, area-base tenures	935,744	504,260	306,327	6.23	9.93
Old growth management areas	292,759	211,183	210,719	4.27	6.80
Wildlife habitat areas	208,893	163,240	154,056	3.13	4.98
Critical habitat for fish	51,553	21,303	11,521	0.23	0.37
Lakeshore management	18,988	13,060	327	0.01	0.01
Community areas of special concern	436,210	69,346	62,460	1.27	2.02
Proven Aboriginal Rights areas	432,155	139,846	68,401	1.39	2.21
Areas considered inoperable	506,513	96,671	33,533	0.68	1.08
Sites with low growing timber potential	601,655	542,518	321,044	6.50	10.36
Non-merchantable timber profiles	172,157	107,667	49,052	0.99	1.58
Recreation features	42,977	30,337	9,598	0.20	0.31
Growth and yield permanent sample plots	6,290	5,501	3,577	0.07	0.12
Riparian areas	190,378		54,833	0.93	1.49
Buffered trails	46,020	25,372	8,039	0.16	0.26
Wildlife tree retention areas			94,417	1.92	3.06
Cultural heritage and archaeological resources			34,205	0.70	1.11
Timber harvesting land base	1,682,843			34.11	54.32
Future roads			22,754		
Long-term THLB	1,660,053				53.66

6.2 Identification of the analysis forest land base

The gross area of the Williams Lake TSA is 4 933 635 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 3 098 169 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*.

6.2.1 Land not administered by the Province 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. Area-based licences such as community forest agreements and First Nations woodland licences (FNWL) are expected to manage for landscape-level biodiversity objectives within their tenured areas, therefore they are removed from the AFLB. Woodlots 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 Province 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.

On June 26, 2014, the Supreme Court of Canada (SCC) released its decision on Tsilhqot'in Nation v. British Columbia (Tsilhqot'in decision). In that decision the SCC outlined areas over which the Tsilhqot'in Nation has proven and declared Aboriginal title. Proven and declared Aboriginal title lands are not considered Crown land. As such, those lands do not contribute to timber supply in the Williams Lake TSA and are excluded from the AFLB.

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 Province 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 4. Land ownership types

Land ownership type	Total area	Area excluded
Private	186,582	186,582
Federal	71,825	71,825
CFA and FNWL	244,692	244,692
Municipal and Leases	2,688	2,688
NStQ Interim Treaty Agreement	2,796	2,702
Tsilhqot'in Nation Title	193,216	188,544

Data source and comments:

WHSE_FOREST_VEGETATION.F_OWN

6.2.2 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% 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 5. Land classified as non-forest

Attributes	Description	Logging history	Total area (hectares)
Missing leading species and site index	VRI leading species and site index are none, while FMLB = 'Y'	No	9,374
Wetlands	VRI FMLB defined as 'Y'	No	50,191
Lakes	VRI FMLB defined as 'Y'	No	4,455
Rivers	VRI FMLB defined as 'Y'	No	741
Crown closure < 10%	VRI FMLB defined as 'Y'	No	4,413
Non-FMLB	VRI FMLB defined as 'N'	No	976,656

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.

6.2.3 Roads 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.

On-block (temporary) roads are those roads that are only used to access cutblocks for harvesting or silviculture operations. They are assigned a width of zero metres, as these temporary roads are either reforested by planting or fill in over time as stands regenerate.

Table 6. Width and area of existing road to calculate reductions

Road class	Width (m)	Hectares
Forest Service roads	25	8,343
Ministry of Transportation and Infrastructure	25	6,280
Road permit and landings	15	19,641
Mapped non-status roads	5	16,169

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.

In total, 32 526 hectares will be excluded for all roads.

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.

In total, 22 754 hectares will be excluded from the forested land base at the time of first harvest to represent the area lost due to future road development.

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.

6.3 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.

6.3.1 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 7. Parks, protected areas, and small area-based tenures

Designations	Total (ha)	Forested (ha)	Excluded (ha)
Conservancy areas	596,471	260,215	260,028
Wildlife management areas	521	221	221
Heritage sites	106	81	78
Miscellaneous reserves	271,808	184,769	11,586
Woodlots	35,789	34,133	33,217
Crown and miscellaneous leases	31,049	24,842	1,197

6.3.2 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 8. Old growth management areas

Designations	Total (ha)	Forested (ha)	Excluded (ha)
Permanent and rotating	292,759	211,183	210,719
Transitional	105,888	80,835	

6.3.3 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 (UWR), 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 GWMs as "no harvest" will be excluded from the LHLB. Areas designated as "conditional harvest zone" will be addressed in Section 7 – '*Current forest management assumptions*' and Section 7.1.8 – '*Silviculture systems*'.

Table 9. Wildlife habitat areas

Designations	Total (ha)	Forested (ha)	Excluded (ha)
UWR no-harvest area	25	23	23
Caribou no-harvest area	208,868	163,217	154,033

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.

6.3.4 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 10. Critical habitat for fish

Designations	Total (ha)	Forested (ha)	Excluded (ha)
Critical habitat for fish	51,553	20,501	11,521

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.

6.3.5 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 and are classified are considered to be no harvest areas when they overlap with visual quality objective class 'preservation'. These areas of overlap will be excluded from the LHLB.

The management of Class B to E lakes through limits on allowed disturbance area will be discussed in Section 7.2.6 – '*Lakeshore management*'.

Table 11. Class A lakes

Designations	Total (ha)	Forested (ha)	Excluded (ha)
Class A Lakes	18,988	13,060	327

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.

6.3.6 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 12. Buffered trails

Designations	Total (ha)	Forested (ha)	Excluded (ha)
LAO buffered trails	46,020	25,372	8,039

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.

6.3.7 Community areas of special concern (CASC)

Community areas of special concern are spatially delineated areas that have been designated as no-harvest areas in the LUO to address a mix of CCLUP objectives. Community areas of special concern are excluded from the THLB.

Table 13. Community areas of special concern

Designation	Total (ha)	Forested (ha)	Excluded (ha)
Community areas of special concern	436,210	69,346	62,460

Data source and comments:

The community areas of special concern boundaries are from the Land Use Order Objectives for the Cariboo-Chilcotin Land Use Plan, May 19, 2010, Map 5. No changes were made to the mapped boundaries for CASC in the 2011 amendment.

6.4. 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.

6.4.1 Proven Aboriginal Rights area

The Tsilhqot'in 2012 BC Supreme Court decision confirmed a proven Aboriginal rights area (PRA) where Tsilhqot'in people hold rights to hunt and trap birds and animals. This area overlaps the Tsilhqot'in proven and declared Aboriginal title area and extends beyond encompassing the entire court case area. This area, outside the title area, is still administered by the Province and contributes to timber supply within the Williams Lake TSA. Deep consultation is required when considering proposed authorizations in this area and since 2014, very few provincial authorizations have been made in this area because management expectations are unique. The PRA will be excluded from the THLB to reflect the lack of commercial forestry activity in the last nine years.

Table 14. Proven Aboriginal Rights areas

Designations	Total (ha)	Forested (ha)	Excluded (ha)
Proven Aboriginal Rights areas	432,155	123,369	68,401

6.4.2 Riparian areas

Riparian areas along streams and around wetlands will be modelled as managed according to the *Forest Practices Code Riparian Management Area Guidebook* (1995). Table 15 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 15 criteria to create a riparian area to be modelled in the analysis. Limited harvesting is permitted in riparian management zones so the zone width was adjusted by the percentage of required retention to derive a modelled equivalent area where harvesting is fully excluded. The reserve widths and percent retention amounts are listed in Table 15 along with the calculated area excluded from the THLB to represent riparian areas.

Table 15. Riparian areas

Description	Class	Reserve zone width (metres)	Reduction (%)	Management zone width (metres)	RMZ retention (%)	Riparian area width (metres)
Streams						
	S1	50	100	20	50	60
	S2	30	100	20	20	34
	S3	20	100	20	20	24
	S4/S5	0	-	30	30	10
	S6	0	-	20	30	6
Wetlands	W1/W5	10	100	40	20	18
	W2	10	100	20	20	14
	W3/W4	0	-	30	20	6
Lakes	L1-B	10	100	0	-	10
	L2	10	100	20	25	15
	L3/L4	0	-	30	25	7.5

The management of fisheries sensitive watersheds will be discussed later under Section 7.2.10 – '*Fisheries sensitive watersheds*'. However, the management requirements for the protection of dolly varden trout habitat are accounted for in this netdown through increased riparian reserve zone widths. Licensee FSPs specify that within the Niut SRDZ and the South Chilcotin SRDZ, a 20-metre riparian reserve zone will be maintained on streams classified as S4 to protect dolly varden trout populations. For the analysis, the riparian area width applied to S4 streams in these landscape units was increased to 30 metres.

In total, 54 833 hectares will be excluded to account for the total riparian areas of 199 820 hectares.

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.

6.4.3 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 16. Areas considered inoperable

Designations	Total (ha)	Forested (ha)	Excluded (ha)
Steep slopes	491,492	92,748	31,974
Unstable terrain	15,051	3,923	1,559

Data source and comments:

Slope angle is derived from the provincial digital elevation model.

6.4.4 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 7.1.6 – '*Minimum harvestable criteria*', the minimum threshold is 80 cubic metres per hectare except for steep slopes where the threshold increases to 250 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 Williams Lake TSA were produced at increasing increments of site index until a yield table that achieved the minimum harvestable criteria was identified for each species and each BEC zone.

Table 17. Site index threshold for sites with low timber growing potential

Leading species	BEC zone	Total (ha)	AFLB (ha)	SI (m) at 80 m^3/ha	SI (m) at 250 m^3/ha
Bl	BAFA	111	111		
Bl	CWH	897	897	4.73	7.01
Bl	ESSF	124,601	124,299	5.82	9.96
Bl	ICH	5,375	5,300	5.76	9.99
Bl	IDF	321	321	5.56	9.40
Bl	IMA	478	478		
Bl	MH	2,020	2,020	4.61	6.76
Bl	MS	3,114	3,098	5.91	10.38
Bl	SBPS	254	252	5.60	9.82
Bl	SBS	3,283	3,217	5.73	9.82
Cw	CWH	157	157	5.94	8.47
Cw	ESSF	3,986	3,976	5.13	8.25
Cw	ICH	43,254	42,937	5.49	8.09
Cw	SBS	83	83	4.52	6.83
Deciduous	BG	215	214		
Deciduous	CWH	471	471	7.75	16.36
Deciduous	ESSF	486	486	8.62	16.85
Deciduous	ICH	9,033	8,889	8.82	17.3
Deciduous	IDF	20,712	20,471	9.28	20.11
Deciduous	MS	1121	1,114	9.01	16.76
Deciduous	SBPS	19,436	19,232	9.03	19.08
Deciduous	SBS	21,515	21,151	8.88	17.46
Fd	BG	26,405	26,351		
Fd	CWH	8,006	8,006	7.89	12.33
Fd	ESSF	6,194	6,178	9.39	14.48
Fd	ICH	56,684	55,967	8.98	13.9
Fd	IDF	355,725	352,157	8.65	13.96
Fd	MH	458	458	7.75	12.00
Fd	MS	3,231	3,223.425	9.26	14.47
Fd	SBPS	13,990	13,872	8.64	13.62
Fd	SBS	63,975	62,771	9.06	14.08
Pl	BAFA	14	14		
Pl	BG	272	272		

(continued)

Table 17. Site index threshold for sites with low timber growing potential (concluded)

Leading species	BEC zone	Total (ha)	AFLB (ha)	SI (m) at 80 m^3/ha	SI (m) at 250 m^3/ha
Pl	CWH	4,570	4,570	6.69	12.36
Pl	ESSF	139,272	138,717	8.69	15.53
Pl	ICH	44,850	44,279	7.79	14.96
Pl	IDF	215,072	212,472	6.93	13.11
Pl	IMA	1	1		
Pl	MH	1,212	1,212	6.76	11.98
Pl	MS	476,984	473,526	8.64	16.49
Pl	SBPS	937,325	926,646	6.66	12.54
Pl	SBS	67,624	65,310	8.25	16.04
Sx	BAFA	40	40		
Sx	BG	5	5		
Sx	CWH	996	996	4.86	7.99
Sx	ESSF	131,173	130,175	9.19	16.47
Sx	ICH	68,280	67,069	8.50	15.21
Sx	IDF	52,276	51,494	7.42	13.18
Sx	IMA	46	46		
Sx	MH	918	918	4.52	7.25
Sx	MS	54,171	53,886	9.33	16.64
Sx	SBPS	95,107	94,285	8.00	14.00
Sx	SBS	44,895	44,075	9.01	15.92

All stands with a site index below the values listed above in FMLB without harvest history, matched by corresponding leading-species and BEC zone, were excluded from the THLB.

Table 18. Sites with low timber growing potential

Designations	Total (ha)	Forested (ha)	Excluded (ha)
Sites with low timber growing potential	601,655	542,518	321,044

Data source and comments:

Yield tables were produced using VDYP 7 by FAIB growth and yield experts using default stocking criteria for Williams Lake TSA.

6.4.5 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 Williams Lake 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. The deciduous component of conifer-leading stands is discussed under Section 7.1.5 – '*Volume exclusions for broadleaf species*'.

Table 19. Broadleaf-leading stands

Designations	Total (ha)	Forested (ha)	Excluded (ha)
Aspen-leading stands	160,809	99,616	45,113
Birch-leading stands	11,278	8,051	3,939

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

6.4.6 Recreation features

Recreation sites and trails have been legally established within the Williams Lake TSA under the FRPA. These include campsites and trails as well as sites created for a variety of education and recreation activities. Approved FSPs include a strategy related to legally established recreations sites and trails. This strategy is to refer proposed harvesting and road construction to the ministry responsible for recreation requesting input on the proposal. Any input received will be incorporated into the harvesting and road construction management strategy. While logging is possible, it is likely that harvesting of recreation sites will be very limited so identified recreational areas and features will be excluded from the THLB.

Table 20. Recreation features

Land classification	Total (ha)	Forested (ha)	Excluded (ha)
Use, Recreation and Enjoyment of the Public (UREP)	3,551	2,356	1,320
Forest recreation	15,699	13,058	8,051
Recreation features	23,727	14,774	227

Data source and comments:

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

6.4.7 Growth and yield permanent sample plots and research installations

The ministry maintains a network of growth and yield permanent sample plots (PSP) across the province for the purposes of understanding forest growth and calibrating growth and yield models. Objectives for these plots have not been established under FRPA. However, harvesting within these active research sites is currently avoided and only occurs after consultation with the research team. Research scientists from within the ministry confirm that these areas should be excluded from the THLB.

Table 21. Growth and yield permanent sample plots

Land classification	Total (ha)	Forested (ha)	Excluded (ha)
Growth and yield permanent sample plots	6,290	5,156	3,577

6.4.8 Wildlife tree retention areas

Wildlife tree retention areas (WTRA) are established within and adjacent to cutblocks to maintain stand-level biodiversity and are discussed in more detail in Section 7.2.4 – '*Stand-level biodiversity*'. Currently mapped WTRA are recorded in RESULTS (identified by Type = 'Group' and Objective = 'WTR'). Harvesting of WTRA is only restricted until the regenerating cutblock has reached maturity so the existing mapped WTRA will be included in the THLB but will be deferred from harvest for 80 years.

Although individual WTRA can eventually be harvested there will always be WTRA established in conjunction with every cutblock harvested. In the base case, the land base that will continually be required for WTRA will be modelled as an aspatial THLB reduction factor.

In total, 94 417 hectares will be excluded to represent future WTRA.

6.4.9 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 most common practice by licensees is to manage for these sites by excluding them from the harvest area through boundary amendments and the placement of wildlife tree retention and/or cultural resource management zones. The incremental excluded area required to protect these sites in current practices was discussions with licensees and the Tsilhqot'in National Government. It was estimated that, on average, an additional two percent of the cutblock area was now included in these expanded exclusions and/or reserves. This will be modelled as an aspatial reduction to the THLB.

In total, 34 205 hectares will be excluded to represent cultural heritage resources.

Data source and comments:

Tsilhqot'in National Government

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

7. Current Forest Management Assumptions

7.1 Harvesting

After the late 1990's, harvesting in the CNRR was predominantly 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.

7.1.1 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 Williams Lake TSA presents recent harvest performance from 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 2012 and 2022, the annual harvest level has been 78% of the AAC.

The current AAC was set at 3.0 million cubic metres in 2015 and includes a partition that limits the live volume harvest to no more than 1 500 000 cubic metres per year. It also includes a chief forester expectation that non-pine leading stands will contribute a maximum of 880 000 cubic metres per year to the AAC. In 2017, following the establishment of the Esk'etemc FNWL (N2K), the AAC was adjusted by the AAC Administration Regulation to 2 937 509 cubic metres. District staff have monitored the annual harvest of live volume and non-pine leading stands from the Electronic Commerce Appraisal System (ECAS) data. The partition direction has been followed between 2015 and 2022 with an average annual live volume harvest of 1 280 000 cubic metres. However, the expectation for the harvest of non-pine leading stands appears to have only been followed for the first two years the AAC was effective. Since 2017 the volume harvested from non-pine leading stands has exceeded that maximum specified by the chief forester due to abundance of Douglas-fir stands that were salvaged following the 2017 fires.

Table 22. Recent harvest performance for the Williams Lake TSA

Year	AAC (m^3)	Harvest volume (m^3)	Percent of AAC (%)	Live volume (m^3)	Non-pine leading volume (m^3)
2012	5,770,000	2,725,544	47%		
2013	5,770,000	2,717,358	47%		
2014	5,770,000	2,335,872	40%		
2015	3,424,986*	3,000,294	88%	1,211,214	503,887
2016	3,000,000	2,556,970	85%	1,163,795	657,237
2017	2,953,431*	2,086,103	71%	1,183,050	1,061,832
2018	2,937,509	2,690,922	92%	1,426,313	1,848,622
2019	2,937,509	1,817,128	62%	1,049,639	1,272,519
2020	2,937,509	2,587,560	88%	1,499,563	1,929,969
2021	2,937,509	2,151,243	73%	1,420,970	1,690,147
2022	2,937,509	1,964,085	67%	1,279,116	1,410,773

* These values have been prorated to reflect the adjustment applied part way through the year.

7.1.2 Administration of accumulated volume

Ministry tenures staff maintain records on the administration of unharvested volumes, uncommitted volumes and unused BCTS Volumes (collectively referred to as accumulated 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 the provisions of the *Forest Act*, the minister may, but is not obliged to, dispose of unharvested volume by issuing new tenures.

Currently there are nine active licences that have been issued from unharvested volume which are directed to salvage harvesting. Two of the licences are restricted to harvesting stands with at least 70% dead volume while the rest are restricted to at least 50% dead volume. The licences total to 1 642 346 cubic metres but would only allow for the harvest of 724 374 cubic metres of live volume based on the minimum dead composition limits.

The volume that is reserved as uncommitted volume in the apportionment of the AAC can be used during the term of the AAC to allow for harvesting in special circumstances. This volume is typically issued through a Forestry Licence to Cut or Occupant Licence to Cut. In Williams Lake TSA, these types of licences were issued every year in excess of the amount that was apportioned as uncommitted volume mainly to allow for salvage harvesting following the major wildfires. Tenures staff estimate that, in total, these licences allow for the harvest of an additional 500 000 cubic metres of live volume. Similarly, tenures staff also noted that licences issued to reduce fire risk in the wildland urban interface (Section 7.1.8.3 – '*Wildfire risk reduction*') now total 150 000 cubic metres.

Licences issued through the accumulated volume will be harvested over the next term of the AAC but do not contribute to the AAC. Therefore, this harvest activity must be accounted for in the analysis to ensure the projected timber supply is sustainable when combined with the concurrent licence harvest. In the analysis, the initial merchantable growing stock will be depleted by 1 374 374 cubic metres to represent the volume anticipated to be harvested through licences issued from accumulated volume.

Tenures staff provided a summary of the records of accumulated volume prior to the analysis. At this time, there is no additional accumulated volume for consideration to issue new licences in the Williams Lake TSA.

7.1.3 Merchantable timber specifications and utilization

The *Interior Timber Merchantability Specifications of the Provincial Logging Residue and Waste Measurement Procedures Manual – Interior Version* 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 23.

Table 23. 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

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

a) Grade 1 Sawlog;
b) Grade 2 Sawlog;
c) Grade 4;
d) Grade 7; and,
e) Grade 8.

In addition, all volume wasted or damaged under licences and road permits count as volume of timber harvested.

7.1.4 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 Williams Lake 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 2539 cubic metres has qualified for grade 4 credit in the Williams Lake TSA. Table 24 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 24. Grade 4 credit approvals

	2015	2016	2017	2018	2019	2020	2021
Grade 4 credit (m^3)	842	574	1123	0	0	0	0

7.1.5 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 not always harvested. The majority of broadleaf-deciduous is left unharvested and HBS data shows insignificant volume (less than one percent of AAC) is billed in the WLTSA. This practice will be modelled by excluding the broadleaf volume component of natural stand yield estimates in conifer-leading stands.

The LAO specifies protection of 40% of mature birch to allow for First Nations cultural use within cutblocks in the Beaver Valley, Polley, Lower Cariboo and Cariboo Lakes landscape units. Since 100% of broadleaf volume will be excluded it can be assumed that this objective is accounted for in the analysis.

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 Section 7.2.4 – '*Stand-level biodiversity*'.

LAO objective 24 – Mature Birch Retention

7.1.6 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 of the 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 83 cubic metres per hectare. Considering the inconsistencies in mapping observed, the MHV was set at 80 cubic metres per hectare as a reasonable approximation of current practice.

The analysis data included a very limited pool of cutting permits representing harvesting on steep slopes 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 250 cubic metres per hectare and will be modelled in the base case as the MHV for steep slopes.

Table 25. Minimum harvestable criteria

Harvest system	Minimum volume (m^3/ha)
Ground	80
Steep slope	250

A series of sensitivity analyses will explore changes in timber supply resulting from adjusting the MHV above and below the base case limits. There is economic demand for young, small dimension trees that makes short rotation management feasible in the TSA. The use of short-rotation management is expected to increase in the future to address the large age cohort of pine trees resulting from the MPB infestation. The timber supply implications of managing a portion of the TSA under a short-rotation silviculture system will be explored through sensitivity analysis.

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).

Steep slope harvesting minimum volume was obtained from West Fraser Mills Ltd. – personal communication.

7.1.7 Harvest scheduling

For various reasons, it may be important to set priorities or harvest levels within certain management zones or types of stands to reflect insect infestations, salvage operations or other forest management objectives. Setting harvest levels on individual management zones will also facilitate the determination of an AAC that may be partitioned by these management zones.

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 is specified.

7.1.8 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 33% of the basal area is removed in patches or by single tree selection every 40 years. This selection harvesting system will be modelled in Douglas-fir leading stands, using area as surrogate for basal area, 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. Stands with very low basal area are not suitable for harvesting and should be retained to continue to develop stand structure. All stands with a basal area below 20 square metres per hectare will initially be reserved from harvesting for one cutting cycle in the timber supply projection.

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.

Licensees have been exempted from the requirement to retain 7% wildlife tree retention under Section 66 of the FPPR because they have adopted alternative results and strategies in their FSPs that follow the CCLUP's stand-level biodiversity targets. Reductions for stand-level retention will not be applied to stands modelled under selection silviculture systems.

7.1.8.1 Selection systems in Mule Deer Winter Range

Mule Deer Winter Range (MDWR) boundaries were legally designated as WHA 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).

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 7.3.1 – '*Regeneration*'.

In the GWMs, an exception is made for stands with less than 40% Douglas-fir in high and very high frost hazard rated sites. These sites are generally spruce leading stands and can be managed without MDWR management objectives, therefore stands that are composed of greater than 60% spruce will be modelled under the clearcut with reserves silviculture system.

Transition and Deep Snowpack Zone MDWR

The small group selection system is intended to produce a multi-aged forest 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 GWMs prescribe the proportion of area that may be removed during harvesting within the MDWR habitat classes as shown in Table 26. 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 GWMs also specify 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 meters per hectare in all other zones. Stands that currently have a basal area below 40 square metres per hectare will initially be reserved from harvesting for one cutting cycle in the timber supply projection.

Table 26. 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

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 harvest to match the effective rotation lengths.

Shallow and moderate snowpack zone MDWR

The clumpy singletree 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 postharvest increases in Douglas-fir composition.

A multiple pass silviculture system will be modelled following the rate of harvest criteria specified by the GWMs as shown in Table 27. The basal area retained following harvest under the singletree 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. Stands that currently have a basal area below 40 square metres per hectare will initially be reserved from harvesting for one cutting cycle in the timber supply projection.

Table 27. 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 transition and deep snowpack zone MDWR were obtained from the *CCLUP Timber Targets Analysis* conducted by the Mule Deer Winter Range Committee and reflect the requirements of the GAR Amended Order #U5001, U5002 and U5003 – Ungulate Winter Ranges CCLUP, Transition and Deep Snowpack, 2007.

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.

7.1.8.2 Selection system in Caribou habitat

Eastern caribou and Itcha-Ilgachuz caribou will be modelled in accordance with the CCLUP Caribou Strategy, *CCLUP Integration Report* and the management recommendations of the Mountain Caribou Strategy (October 2000) and the Northern Caribou Strategy (March 2002, updated 2011). The Itcha-Ilgachuz caribou habitat boundaries were legally designated as WHA in 2004 and GWMs were established in 2005 and amended in 2011 under GAR. The eastern caribou habitat boundaries were legally established in 2009.

Table 28. Caribou GAR orders

GAR order	No harvest WHA	Modified harvest WHA
Mountain Caribou	5-096, 5-102 to 5-110, 5-112 to 5-115, 5-117	5-111
Northern Caribou	5-118	5-086 and 5-087

The caribou habitat designated as no harvest were removed from the LHLB (Section 6.3.3 – '*Wildlife habitat areas*') and the remaining habitat areas will be modelled as managed under the silviculture systems described below.

Mountain Caribou WHAs (Eastern TSA)

The Eastern caribou area will be modelled following the GAR Order – WHAs #5-088 to 5-117 Mountain Caribou – Quesnel Highlands Planning Unit. The GWMs within the order specify that the modified harvest areas be managed by group selection harvesting that is limited to 33% of each stand, by area, on an 80-year cutting cycle (Table 15).

Northern Caribou WHAs (Western TSA)

The Itcha Ilgachuz caribou area will be modelled following the GAR Amended Order – GWM: WHAs 5-086, 5-087 and 5-118. For WHA 5-086, the GAR Order specifies that 80% of the area of each landscape unit within the WHA be managed as terrestrial lichen sites and 20% as arboreal lichen sites. It then defines arboreal sites as commonly occurring in the MS xv zone adjacent to wetlands, creeks, and other sources of humidity. It defines terrestrial lichen sites as commonly located in the SBPS zone.

The arboreal lichen sites will be modelled by randomly selecting 20% of the MS xv zone within each landscape unit in the WHA. The remainder of the landscape unit, which includes the SBPS mc zone, will be modelled as terrestrial lichen sites (Table 15).

The order specifies that the arboreal lichen sites be managed by group selection harvesting that is limited to 33% of each stand, by area, on an 80-year cutting cycle. Terrestrial lichen sites are specified as managed by irregular shelterwood harvest limited to 50% of each stand, by area, on a 70-year cutting cycle (Table 15).

Table 29. 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
Northern Caribou modified harvest - arboreal lichen sites	Group selection	33	80	240
Northern Caribou modified harvest - terrestrial lichen sites	Irregular shelterwood	50	70	140

For WHA 5-087, the GAR Order requires that harvesting must maintain a range of mature and old forest. The minimum retention targets specified in the order (Table 16) will be applied in the analysis.

Table 30. Caribou habitat mature and old forest retention

Age (years)	Landscape proportion (%)
>80	45
>100	37
>120	30
>140	25

Data source and comments:

The modelling assumptions for eastern and Itcha-Ilgachuz caribou habitat areas are consistent with the following planning documents:

- Cariboo-Chilcotin Land-Use Plan Mountain Caribou Strategy, 2000 and Cariboo-Chilcotin Land-Use Plan — Northern Caribou Strategy, 2002;
- ORDER — Wildlife Habitat Areas #5-088 to 5-117. Mountain Caribou-Quesnel Highlands Planning Unit. December 2009; and,
- AMENDED ORDER — General Wildlife Measures; Wildlife Habitat areas #5-086, 5-087, 5-118, 5-872 and 5-873. May 2011.

7.1.8.3 Wildfire risk reduction

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.

Wildfire risk reduction activities have been ongoing across the TSA for several years. Multiple funding sources have enabled an increase in the amount of work being undertaken. Activities have primarily been focused within the Wildland Urban Interface (WUI) adjacent to homes and critical infrastructure, and along linear features such as roads and powerlines. Most of the treatments are focused on understory thinning and selection harvesting to reduce the fuel load and canopy density of the stands. Some treatments are clearcut harvest where the stand type is not suitable for a selection type treatment. WUI wildfire risk reduction treatments are unlikely to have a large impact on timber supply in the long term but may provide some short-term incentive to small volumes that may not otherwise be harvested.

Over the past five years, several fuel break treatments have been completed in the Williams Lake 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 man-made features, fuel types, and wind patterns.

Proposed fuel treatment units have been developed to prioritize fuel treatment activities throughout the TSA. These areas are included for the purposes of modelling and analysis but may not become the final treatment areas on the ground. In the base case, Douglas-fir leading stands harvested within proposed fuel treatment units will be modelled using an uneven-aged silviculture system (Section 7.1.8 – '*Silviculture systems*'). Pine and spruce-leading types will be modelled using an even-aged silviculture system, and will be reforested, consistent with approved stocking standards.

Table 31. Wildfire risk reduction treatment area

Designations	Total (ha)	Forested (ha)	THLB (ha)
Proposed fuel treatment units	22,155	15,155	9,141

7.1.8.4 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 Williams Lake 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. The implementation of commercial thinning is expected to increase in the future to address the large age cohort of pine trees resulting from the MPB infestation.

A sensitivity analysis will be considered to evaluate the impact that commercial thinning may have on timber supply over time.

Data source and comments:

- *Interim Guidance for Commercial Thinning - Interior British Columbia*, May 2021;
- Section 6.6 *Interior Appraisal Manual* – effective July 1, 2022.

7.2 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 silviculture systems as described in Section 7.1.8 – '*Silviculture systems*'.

7.2.1 Dasiqox Nexwagwezʔan (Dasiqox)

The Tŝilhqot'in communities of Xeni Gwet'in, Yunesît'in, and the Tŝilhqot'in National Government are pursuing the establishment of Dasiqox as an Indigenous-led conservation area. The vision for this area comprises three foundational elements: ecological protection, cultural revitalization, and sustainable livelihoods. Dasiqox partially overlaps the PRA but extends further east to Big Creek Provincial Park and north to Nunsti Provincial Park. A *Forest Management Strategy* was developed by the Xeni Gwet'in First Nations in 2020, and a detailed forest management plan is under development focusing on fuel management, maintaining ungulate winter range, and managing dry-belt Douglas-fir stand types. Based on discussions within the TNG CTWG, application of these management objectives is likely to result in a reduction to the rate of harvest in Dasiqox. This reduced rate of harvest will be represented in this analysis by modelling the harvest rate within the plan area at no more than 5% every 10 years.

Sensitivity analyses will explore the effect on timber supply of restricting all harvesting in the Dasiqox and will explore what the timber supply contribution from the Dasiqox would have been without application of the *Forest Management Strategy*.

7.2.2 Alex Fraser Research Forest

The Alex Fraser Research Forest (AFRF) was established in April 1987 and is held under *Forest Act* tenure by the UBC Faculty of Forestry. It is managed according to a management plan that integrates ecosystem-based management with provincial regulations, the *Cariboo-Chilcotin Land Use Plan* and sub-regional plans. The AFRF operates a self-sufficient forestry enterprise and two accommodation facilities that support education, research and demonstration activities.

Volume harvested within the AFRF contributes to the AAC of the TSA but a *Management and Working Plan* is maintained for the AFRF that identifies the sustainable harvest rate under the ecosystem-based management. The allowable rate of harvest is specified by area but is also evaluated by volume for comparison. In *Management and Working Plan #3* the allowable harvest rate is set at 19 566 cubic metres per year (9532 cubic metres final harvest and 10 034 cubic metres of partial cut). A significant area of the AFRF was burned in the 2018 wildfires so an updated analysis was completed in 2019 to assess the impact on timber supply. The post-fire analysis indicates that the sustainable harvest rate is now approximately 14 200 cubic metres per year.

In the analysis, the volume harvested from within the AFRF will be reviewed and if it significantly differs from the allowable harvest rate a constraint on the rate of harvest may be considered.

7.2.3 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 6.3.2 – '*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 across the province.

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 32 below, were derived from the *Biodiversity Guidebook* and subsequently modified for Natural Disturbance Type 4 (NDT 4) by the *Biodiversity Conservation Strategy* (1996).

Table 32. 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 33. Definition of NDT 4 fir group and pine group

Fir group	Pine group
Douglas-fir or ponderosa pine-leading;	Lodgepole pine-leading and do not have a major component of Douglas-fir or ponderosa pine in principal or secondary canopy layers;
Lodgepole pine-leading with a major component of Douglas-fir or ponderosa pine in the principal or secondary canopy layers; or	Spruce, redcedar, cottonwood, or white birch-leading; 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.	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 32, 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.

Species composition

Legal objectives for maintaining species composition were established under the CCLUP, including maintenance of key broadleaf-deciduous and spruce components in specified areas, for which the current CNRR FSPs have specified provisions. These provisions direct the spatial design but not the amount of wildlife tree retention that will occur, which is accounted for in Section 7.2.4 – '*Stand-level biodiversity*', therefore no additional modelling considerations are required for representing these objectives in the analysis.

Data source and comments:

Table 32 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 FOR Land Use Planning staff.

7.2.4 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 to be retained as wildlife tree retention by landscape unit and BEC is specified in Schedule 1 of the LAO. The minimum percentages listed in the schedule typically range between 6 and 10% but some values are as low as 4 and as high as 17%. 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 OGMA and RRZ. 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.

FSP short-term reserves

FSP holders in the CNRR have committed to increased levels of retention in certain locations and circumstances through the establishment of short-term reserves in addition to WTRA. The FSPs set retention targets to 20% or greater where the cutting permit has all the following three attributes:

a) west of Fraser river;
b) within mature+old seral deficit landscape units; and,
c) within either the SBPS, MS, or SBS biogeoclimatic zones.

A short-term reserve is defined as a retention area prescribed to be in place until the associated cutblock reaches free growing. Since the reserve area is intended to eventually be harvested along with the original cutblock this small difference in timing of harvest does not require additional modelling consideration.

Data source and comments:

Land Use Order Objectives for the Cariboo-Chilcotin Land-Use Plan, May 19, 2010. Amended April 18, 2011, November 12, 2015, and January 26, 2017. Consolidated to September 6, 2018.

7.2.5 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 procedure to translate objectives from a perspective-view to a plan-view makes the following 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 34 below.

Table 34. 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 35. The mid-point percent alteration will be used for the base case for both clearcut and partial harvesting systems.

Table 35. 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 35 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.

7.2.6 Lakeshore 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 shown in Table 36 below. The timber supply model does not project basal area so area will be used as a surrogate in modelling the maximum disturbance limits for partial cutting.

Table 36. 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.

7.2.7 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 7.2.3 – '*Landscape biodiversity*', 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.

7.2.8 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.

The TNG indicated that management of moose populations is a highly important issue directly linked to aboriginal interests. There is an interest to conduct cumulative effects analysis to explore the implications of current management practices on moose populations.

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.

7.2.9 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 following Best Management Practices within Grassland Benchmark Areas for modified harvesting and silviculture have been written into FSPs:

- Retain conifers greater than 65 centimetres DBH;
- Retain 1 to 4 conifers greater than 12.5 centimetres DBH adjacent to each stem greater than 65 centimetres DBH;
- Retain broadleaf stems greater than 12.5 centimetres DBH; and,
- No reforestation following harvest.

The grassland benchmark areas, covering 25 365 hectares, 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.

7.2.10 Fisheries sensitive watersheds

Fisheries sensitive watersheds (FSW) have been established within the Williams Lake 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 overall forested land base 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 the type of disturbance that occurred. The maximum ECA thresholds 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 the maximum ECA limits listed in Table 37. Stands will be considered disturbed and contributing 100% to the ECA while regeneration is below nine metres in height and 0% once nine metres or taller.

Table 37. Fisheries sensitive watershed and maximum ECA limits

Feature	Code	Local name	Total (ha)	AFLB (ha)	THLB (ha)	Maximum ECA
Sub-basin	F-5-001	Bassett Creek	4,072	3,857	2,407	20
Basin	F-5-001	Black Creek	2,194	2,022	843	20
Sub-basin	F-5-001	Blue Moon Creek	3,563	2,380	1,972	40
Basin	F-5-001	Club Creek	885	864	503	25
Basin	F-5-001	Deerhorn Creek	3,748	3,279	2,354	30
Basin	F-5-001	Doreen Creek	1,941	1,909	1,458	25
Basin	F-5-001	Harvie Creek	793	698	432	25
Watershed	F-5-001	Horsefly River	27,396	20,223	10,710	n/a
Basin	F-5-001	Little Horsefly River	48,746	37,246	24,122	35
Basin	F-5-001	MacKay River	14,359	10,151	3,235	20
Sub-basin	F-5-001	McIntosh Lakes	10,050	7,851	5,773	40
Basin	F-5-001	McKinley Creek	25,040	21,918	15,594	20
Sub-basin	F-5-001	McKinley Creek above Bosk Lake	10	9	7	30
Basin	F-5-001	McKusky Creek	13,585	10,909	6,417	20
Basin	F-5-001	Moffat Creek	17,072	13,558	10,115	20
Sub-basin	F-5-001	Moffat Lakes	12,345	11,253	7,353	20
Sub-basin	F-5-001	Molybdenite Creek	4,197	3,947	1,699	20
Sub-basin	F-5-001	Mussel Creek	4,171	3,612	2,809	40
Sub-basin	F-5-001	North McKusky Creek	2,670	1,655	767	20
Basin	F-5-001	Patenaude Creek	1,068	999	218	20
Basin	F-5-001	Prairie Creek	3,769	3,550	2,912	20
Basin	F-5-001	Sawley Creek	1,167	1,120	789	25
Sub-basin	F-5-001	Sky Creek	1,930	1,823	1,288	20
Basin	F-5-001	South Horsefly 1	704	685	340	20
Basin	F-5-001	South Horsefly 2	1,578	1,496	1,158	20
Basin	F-5-001	South Horsefly 3	1,680	1,628	1,370	25
Basin	F-5-001	Sucker Creek	3,026	2,593	1,614	40
Basin - lower portion	F-5-001	Lower Tisdall Creek	1,679	1,553	887	20
Basin - upper portion	F-5-001	Upper Tisdall Creek	5,566	4,818	3,367	30
Basin	F-5-001	Upper Horsefly River	14,122	8,740	2,223	20
Sub-basin	F-5-001	Upper McKusky Creek	12,932	10,405	646	30
Sub-basin	F-5-001	Upper Moffat Creek	7,335	6,740	5,102	20
Basin	F-5-001	Wilmot Creek	1,194	1,082	331	40
Basin	F-5-001	Woodjam Creek	9,155	8,378	6,070	20

Data source and comments:

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

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

7.2.11 Fisher habitat management

Fisher is now a red-listed species and all FSPs within TSA have committed to using the BCFisherHabitat.ca spatial tools for planning the management of habitat for fisher. The resting habitat requirements associated with spruce rust brooms will likely result in the need to retain more spruce trees where existing reserves don't meet the minimum number of stems with spruce brooms. These trees must be distributed across the landscape and cannot be combined in a fixed area similar to WHAs or other reserves. The management of fisher habitat and habitat tree selection is assumed to be met at the operational level during harvest planning and no accounting is required in this analysis.

Data source and comments:

BCfisherhabitat.ca

7.3 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.

7.3.1 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.

7.3.3 Not satisfactorily restocked areas

Areas that are not satisfactorily restocked (NSR) are identified in the RESULTS data. 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.

7.4 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.

7.4.1 Mountain pine beetle

The extent and severity of the MPB infestation was projected in previous analyses using the BC Provincial Scale Mountain Pine Beetle Model (BCMPB). 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 BCMPB model has not substantially changed since 2007. Therefore, the BCMPB 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 BCMPB 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.

7.4.1.1 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. In the timber supply model, reduction factors starting in 2020 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 2005. 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 38 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 expired 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 38. 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.

7.4.1.2 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 8.4 – '*MPB and fire disturbed stands*'.

7.4.2 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 recent salvage in the region has been focused on burnt Douglas-fir stands, however the shelf life for Douglas-fir sawlogs 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.

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.

WHSE_FOREST_VEGETATION.VEG_BURN_SEVERITY_SP

7.4.3 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 5% 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 each 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 39. Non-recoverable losses

Year	**Fire** (m^3)	**Flooding** (m^3)	**Drought/ windthrow** (m^3)	**Douglas-fir beetle** (m^3)	**Spruce beetle** (m^3)	**Western balsam bark beetle** (m^3)	**Non-recoverable loss** (m^3)
1999	0	4,396	659	4,873	3,388	8,460	21,776
2000	0	2,263	0	3,448	157	10,108	15,976
2001	727	6,032	0	33,860	468	9,770	50,857
2002	0	4,500	0	3,901	1,339	67,731	77,471
2003	184,373	531	0	24,951	49,626	51,674	311,155
2004	407,622	1,513	176,260	11,132	318,151	22,852	937,530
2005	3,712	159	18,606	93,484	75,903	3,765	195,629
2006	182,628	63	35,746	50,803	64,980	6,897	341,117
2007	1,539	0	3,097	68,482	43,735	6,209	123,062
2008	169	0	18,415	69,938	15,846	1,170	105,538
2009	426,469	0	4,320	57,327	83,039	207	571,362
2010	556,699	133	0	4,067	111,028	907	672,834
2011	1,901	255	310	5,447	9,786	1,970	19,669
2012	30,328	5,720	4	25,094	77,012	8,918	147,076
2013	702	4,917	149	2,559	16,136	1,842	26,305
2014	7,125	6,371	26	32358	1,730	3,133	50,743
2015	32,205	1462	20,312	33,318	3,154	656	91,107
2016	1,080	1,614	7,324	110,435	17,144	5,301	142,898
2017	(2,579,938)*	427	0	169,983	36,047	2,199	208,656
2018	(164,425)*	3,598	1,175	86,514	1,195	6,800	99,282
2019		2,060	6,410	36,268	3,492	1,819	50,049
Annual Average	102,071	2,191	13,943	44,202	44,446	10,590	115,372

* Catastrophic fire years were excluded from the calculation of the annual averages.

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 115 372 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.

7.4.4 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.

8. Growth and Yield

8.1 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 timber 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.

8.1.1 Variable density yield prediction model (VDYP)

VDYP is the base model for projecting BC's forest inventories and is currently at version 7. 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 VDYP model is based on VRI attributes, typically at the individual stand level. Decay, waste and breakage estimates are incorporated within VDYP and are based on BEC loss factors using a decay sample tree database which consists of over 82,000 trees.

8.1.2 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.

8.1.3 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 Williams Lake 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 OAFs used for estimating volume losses due to factors affecting growth.

8.2 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.

8.3 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 (yield table) 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 40. Definition of analysis units

Code	Leading species	BEC zone	Site index range
bl_alla	balsam	all	all
cw_allg	cedar	all	>= 15
cw_allm	cedar	all	>=10 < 15
cw_allp	cedar	all	<= 10
fd_allg	Douglas-fir	all	>= 15
fd_allm	Douglas-fir	all	>=10 < 15
fd_allp	Douglas-fir	all	<= 10
pl_msg	pine	ms	>= 15
pl_msm	pine	ms	>=10 < 15
pl_msp	pine	ms	<= 10
pl_sbsg	pine	sbs	>= 15
pl_sbsm	pine	sbs	>=10 < 15
pl_sbsp	pine	sbs	<= 10
sx_msg	spruce	ms	>= 15
sx_msm	spruce	ms	>=10 < 15
sx_msp	spruce	ms	<= 10
sx_sbsg	spruce	sbs	>= 15
sx_sbsm	spruce	sbs	>=10 < 15
sx_sbsp	spruce	sbs	<= 10

8.4 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 tables for MPB or fire-disturbed stands that have been adjusted in the VRI and are no longer capable of contributing to timber supply 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 and are below current minimum harvestable volume. The fire-disturbed stands requiring an aggregate yield table were identified as areas burned since 2015 with burn severity classes ‘moderate’ and ‘severe’ and are below current minimum harvestable volume.

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 stands were reset to zero and the remaining MPB stands, between 40 to 80% killed, were reset in proportion to the percent killed. To ensure the timber supply model does not harvest the remaining live component of the stands a harvest deferral of 60 years was placed on all MPB and fire-disturbed stands that were assigned replacement aggregate yield projections.

8.5 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.

8.5.1 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.

8.5.2 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 Williams Lake TSA, select seed is currently available for hybrid spruce, interior Douglas-fir, western larch and lodgepole pine. 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 6.6%. During this time, 80% of all trees planted have been planted with improved stock.

8.5.3 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. In areas where natural seeding is relied on for regeneration planting may not occur for up to seven years.

Planting delay is incorporated into the timber supply analysis as a TIPSY model input. The average planting delay in the Williams Lake TSA is 3.6 years.

9. Forest Estate Modelling

9.1 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.

9.2 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 41 presents the standard sensitivity analyses that are generally performed to support the TSR process along with some analyses to explore issues unique to the TSA. Additional sensitivity analyses may be included after the base case has been completed if new uncertainties are identified.

Table 41. Sensitivity analyses to be performed

Issue	Sensitivity levels
Abandon MPB salvage	Harvest in live stands only
Broadleaf-stocking standards	Include broadleaf-leading stands and broadleaf as an acceptable species in yield curves
Commercial thinning	Early harvest entry
Existing managed stand yields	+ / - 10%
Fibre AAC	Use VRI inventory biomass as utilization standards
Future managed stand yields	+ / - 10%
Minimum harvestable age	+ / - 10 years
Minimum harvestable volume	70 m^3/ha, 90 m^3/ha, 100 m^3/ha
Mule Deer winter range	Remove moderate to shallow MDWRs from the THLB
Natural stand yields	+ / - 10%
Patch size	No more than 25% below 5 m height
Steep slopes	60% and 80% steep slope upper limit for cable systems
Timber harvesting land base	Use LHLB
Utilization	All species at 12.5 cm DBH
Visually sensitive areas	Lower and upper disturbance limits
Dasiqox excluded	Exclude from the THLB
Dasiqox current practice	Managed without Forest Management Strategy
Unharvested volume	Account for potential licences issued from unharvested volume
Catastrophic wildfire	Model average of unsalvaged fire losses over last 10 years

9.3 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, belowground 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 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 greenhouse gases (e.g., methane, nitrous oxide) comparable in carbon accounting, carbon dioxide equivalent (CO_2e) is adopted, and the global warming potential 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 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.

10. Associated Analysis and Reporting

The primary focus of the TSR will be to develop a timber supply analysis of the current TSA land base and forest management practices. The data package is an initial document that describes available information and the direction for future analysis and information collection.

To summarize the results of the timber supply analysis a *Discussion Paper* will be released for public review. Information used in the analysis is described in the *Data Package* and updated based on information identified during the consultation, public review, and the analysis process.

The timber supply analysis should be viewed as a "work in progress". As such, following the release of the *Discussion Paper,* further analysis may be needed to complete, refine existing analysis, or address issues identified during the consultation and review process.

A public review period has been established to allow submission of comments and concerns about the *Data Package* and subsequently the *Discussion Paper* to MoF. Submissions and new information made available prior to the analysis may lead to changes in the data listed in this package. Until the THLB is determined, it is not possible to finalize the values shown in some of the tables in this document. The *Updated Data Package* will incorporate the finalized values.

First Nations engagement and consultation is an important component of the information considered by the chief forester. Information received from First Nations timber supply review, where possible, is incorporated into the *Data Package* and analysis. All information and comments received from First Nations are documented and presented in a summary document to the chief forester for consideration.

The chief forester's AAC determination will be documented through the public release of an *AAC Determination Rationale*. This rationale identifies reasons for the decision and discusses specific considerations; further the rationale provides recommendations where the chief forester has identified deficiencies in information or a need for improved stewardship.

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12. Acronyms

AAC	Allowable Annual Cut
AFLB	Analysis Forest Land Base
BCGW	British Columbia Geographic Warehouse
BCLCS	British Columbia Land Classification System
BCTS	British Columbia Timber Sales
BCMPB	BC Provincial Scale Mountain Pine Beetle Model
BEC	Biogeoclimatic Ecosystem Classification
BEO	Biodiversity Emphasis Option
BGC	BEC climatic zonal and subzonal classification
CCLUP	Cariboo Chilcotin Land Use Plan
CEF	Cumulative Effects Framework
CFA	Community Forest Agreements
CNRR	Cariboo Natural Resource Region
CTWG	Collaborative Technical Working Group
DBH	Diameter at Breast Height
DTSM	Detailed Terrain Stability Mapping
ECA	Equivalent Clearcut Area
ECAS	Electronic Commerce Appraisal System
ESA	Environmentally Sensitive Areas
ESSF	Engelmann Spruce-Subalpine Fir
FAIB	Forest Analysis Inventory Branch
FIP	Forest Inventory Planning
FLP	Forest Landscape Planning
FNWL	First Nation Woodland Licence
FPC	Forest Practices Code
FPPR	Forest Planning and Practices Regulation
FREP	Forest and Range Evaluation Program
FRPA	Forest and Range Practices Act
FSP	Forest Stewardship Plan
FSW	Fisheries Sensitive Watersheds
FWA	Fresh Water Atlas
GAR	Government Actions Regulation
GIS	Geographic Information Systems
GW	Genetic Worth

GWM	General Wildlife Measures
HBS	Harvest Billing System
HCA	Heritage Conservation Act
HVMW	High Value Moose Wetland
IBM	Mountain Pine Beetle forest damage code
ICH	Interior Cedar Hemlock
IMA	Interior Mountain-heather Alpine
IRM	Integrated Resource Management
IWMS	Identified Wildlife Management Strategy
LAO	Land Act Order
LHLB	Legally Harvestable Land Base
LU	Landscape Units
MAI	Mean Annual Increment
MDWR	Mule Deer Winter Range
MHV	Minimum Harvestable Volume
MPB	Mountain Pine Beetle
NDT	Natural Disturbance Type
NECB	Net Ecosystem Carbon Balance
NRL	Non-Recoverable Losses
NSR	Not Satisfactorily Restocked
OAF	Operational Adjustment Factor
OGMA	Old Growth Management Areas
OSBG	Objectives Set By Government
P2P	Plan to Perspective
PAS	Protected Areas Strategy
PEM	Predictive Ecosystem Mapping
PSP	Permanent Sample Plots
PSPL	Provincial Site Productivity Layer
PTMGOT	Provincial Timber Management Goals, Objective & Targets
RESULTS	Reporting Silviculture Updates and Land Status Tracking System
RRZ	Riparian Reserve Zones
RMZ	Resource Management Zones
ROM	Ratio of Means
ROPE	Region of Practical Equivalence
RTL	Roads, Trails and Landings

RTSM	Reconnaissance Terrain Stability Mapping
SARA	Species at Risk Act
SDM	Stand Development Monitoring
SIBEC	Site Index by BEC
SPAR	Seed Planning and Registry
SRMP	Sub-regional Planning Processes
TASS	Tree and Stand Simulator
TEM	Terrestrial Ecosystem Mapping
TFL	Tree Farm Licences
THLB	Timber Harvesting Land Base
TIPSY	Table Interpolation Program for Stand Yields
TSA	Timber Supply Area
TSM	Terrain Stability Mapping
TSR	Timber Supply Review
UNDRIP	United Nations Declaration on the Rights of Indigenous Peoples
UREP	Use, Recreation and Enjoyment of the Public
UWR	Ungulate Winter Range
VDYP	Variable Density Yield Prediction
VEG	Visually Effective Green-up
VQO	Visual Quality Objectives
VRI	Vegetation Resources Inventory
WHA	Wildlife Habitat Areas
WMA	Wildlife Management Areas
WTRA	Wildlife Tree Retention Areas
WUI	Wildland Urban Interface
YSM	Young Stand Monitoring

13. 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 Williams Lake TSA.

Ministry staff would be pleased to answer questions to help you prepare your response. Please send your comments to the contact below.

Your comments will be accepted until November 25, 2024 for consideration with respect to the *Data Package*. A further comment period will be made available following the release of a *Public 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:

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For information on the Timber Supply Review visit the Timber Supply Review and Allowable Annual Cut web site at https://www2.gov.bc.ca/gov/content/industry/forestry/managing-our-forest-resources/timber-supply-review-and-allowable-annual-cut

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