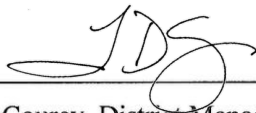# Revelstoke Timber Supply Area
# Timber Supply Review

# Data Package

# September 2022

Tara DeCourcy, District Manager
Selkirk Natural Resource District
Ministry of Forests

Albert Nussbaum, Director
Forest Analysis and Inventory Branch
Ministry of Forests

BRITISH COLUMBIA | Ministry of Forests

# Table of Contents

## Tables

## Figures

# 1.    Introduction

This *Data Package* summarizes the information and assumptions that are proposed to be used to conduct a timber supply analysis for the timber supply review (TSR) of the Revelstoke 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.

The current AAC for the Revelstoke TSA is 225 000 cubic metres.  This level has been in effect since July 28, 2011, and a new AAC determination is needed to reflect new information and changes that have occurred since then and 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;
- land-use plans including the Revelstoke Higher Level Plan Order (RHLPO);
- legal objectives established under the *Forest and Range Practices Act* or the *Land Act* (e.g., visual quality objectives, ungulate winter ranges).

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 Revelstoke Timber Supply Area

### 2.1   General

The Revelstoke TSA, located in the mountains of southeastern British Columbia, straddles the Columbia River in the Monashee and Selkirk Mountain Ranges from Galena Bay in the south to Mica Dam in the north (Figure 1).  The TSA lies within the ancestral territories of the Ktunaxa Nation, Secwepemc Nation, Syilx and Sinixt.

Alpine tundra and subalpine parkland ecosystems are found at higher elevations while forested ecosystems classified as the Engelmann Spruce-Subalpine Fir (ESSF) and Interior Cedar-Hemlock (ICH) Biogeoclimatic zones (BEC) are found at lower elevations.  The forests of the Revelstoke TSA are dominated by stands containing Engelmann spruce, western hemlock, western redcedar and Douglas-fir.  These ecosystems provide a variety of habitat for wildlife, including important habitat for caribou, black bear, grizzly bear, moose, mule deer, and mountain goat.

The City of Revelstoke is the TSA's largest and only incorporated community and accounts for approximately 90 percent of the TSA's relatively small population of about 8,000.  Within the northern portion of the TSA, a small number of residents live in the small village of Mica Creek.  Although there are no Indigenous communities in the TSA, the TSA overlaps with the territories of four Indigenous Nations.

Due to its rugged topography, abundance of national and provincial parks and relative proximity to the large population centres of Vancouver and Calgary, the TSA attracts many visitors.

Employment data from the 2021 census is not yet available.  According to the 2016 census data, about 23% of the total employment is in the recreation, accommodation, and food sectors.  Forestry, together with the manufacturing sector, provides approximately 21% of the total employment.  Health care, transportation and warehousing, and retail are also important employment sectors, each providing approximately 9% of the total employment.



*Figure 1.    Overview of the Revelstoke timber supply area.*

## 2.2  First Nations

The Revelstoke TSA overlaps the ancestral territories of the following Indigenous Nations: Ktunaxa Nation Council; Secwepemc Nation; Syilx (Okanagan Nation); and the Sinixt (Lakes Tribe of the Colville Confederated Tribes).  As such, these Indigenous Nations, and their member bands with territories that overlap the Revelstoke TSA, have been invited to engage during the timber supply review process.  There are no First Nations reserves or communities within the Revelstoke TSA.

**Ktunaxa Nation Council** Members include ʔakisq̓nuk First Nation (Invermere), Tobacco Plains Indian Band (Grasmere), yaqan nuʔkiy (Creston), and ʔaq̓am (Cranbrook).

Ktunaxa have several agreements with the Province which include a Strategic Engagement Agreement (SEA), the Letter of Agreement (extending the SEA until October 22, 2022), Ktunaxa Economic, Community & Development Agreement (ECDA), Forest Consultation and Revenue Sharing Agreements (FCRSAs) and Forest Tenure Opportunity Agreements (FTOAs).

Ktunaxa Nation Council has been in treaty negotiations since 1993.  These negotiations are currently in suspension as of the fall of 2021, initiated by Ktunaxa Nation Council.

**Secwepemc Nation (as represented by Shuswap Nation Tribal Council)** offices are in Kamloops and the members of the nation engaged here include Adams Lake Indian Band (Chase); Splatsin First Nation (Enderby); Shuswap Band (Invermere); Skw'lax (Little Shuswap Lake Band) (Chase); Simpcw First Nation (Barriere) and Neskonlith Indian Band (Chase).

Four of the six are signatories to the Qwelminte-Secwepemc (QS) Letter of Commitment (LOC) which guides consultation: Adams Lake Indian Band, Splatsin First Nation, Skw'lax and Simpcw First Nation. Neskonlith Indian Band is not a signatory to the LOC, and as of April 26, 2022, Shuswap Band informed the Province that they were withdrawing from the LOC and related engagement processes.  For greater certainty, Shuswap Band will continue to support the collective Secwepemc territorial rights and title assertions.   Ministry of Forests (FOR) and Ministry of Indigenous Relations and Reconciliation (MIRR) in Kootenay Region will work with Shuswap Band to determine a new strategic forum going forward.

Each of these bands have FCRSA's and FTOA's with the ministry.   These member bands are not involved in the BC Treaty process.

**Syilx (Okanagan Nation)** includes the Okanagan Nation Alliance and members of the nation include Penticton Indian Band, Lower Similkameen Indian Band (Keremeos), Okanagan Indian Band (Vernon) and Upper Nicola Indian Band (Merritt).

None of the bands in the ONA are actively involved in the BC treaty process; rather, ministry staff work with non-treaty First Nations through engagement and economic agreements, working groups, and other non-treaty processes.

All members of the nation have FCRSAs, except Upper Nicola Indian Band.

**Lakes Tribe of the Colville Confederated Tribes (CCT)**.  On April 23, 2021, the Supreme Court of Canada (SCC) released its decision on the Desautel case and found that the Lakes Tribe of Colville Confederated Tribes (CCT) – a modern day successor of the Sinixt – are an "Aboriginal Peoples of Canada" who have an Aboriginal right to hunt in Canada under s. 35 (1) of the *Constitution Act*, 1982. The court left open the possibility that there may be other modern-day successors of the Sinixt. Currently, the Province of BC is in the process of analyzing the above-mentioned decision and is reaching out to CCT as well as other Indigenous Nations as an approach to consultation development in response to that decision.

Lakes Tribe of the Colville Confederated Tribes, in Washington State, is being engaged because the Revelstoke TSA overlaps Sinixt territory.

Pre-consultation engagement for the TSR began in November 2019 with a letter to all First Nations whose territories overlap with the Revelstoke TSR. A re-start letter went out in October 2021. All will be consulted in two distinct phases. The formal consultation process will commence with the release of the *Data Package* (i.e. this document). Following completion of the analysis, a *Discussion Paper*, that summarizes the analysis results, will be released in a second formal review period. Following this second formal review period, ministry staff will collate and obtain clarification of comments received, and if necessary, update the analysis to reflect concerns. The AAC determination is released as a formal document that will be provided to all First Nation groups.

Aboriginal Interests expressed by First Nations in the past include fish and wildlife habitat (e.g. salmon, moose, caribou, grizzly bear, black bear, northern goshawk, northern myotis, silver-haired bat, fisher and marten), road access and access management, old growth management, riparian habitat, hunting, trapping and fishing. Concerns regarding water, cumulative effects, biodiversity and road density have also been expressed.

Engagement with First Nations will be continuing throughout the timber supply review process.

## 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.

All First Nations whose traditional territories overlap the Revelstoke TSA have received invitations to engage (November 28, 2019, and October 12, 2021) 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. Based on this early engagement, this *Data Package* includes enhanced content and sensitivity analyses around wildlife, biodiversity, cultural heritage resources and climate change. 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

Within the total boundary of the Revelstoke TSA are two major forest licence holders, two tree farm licences (TFL), three woodlot licences and the British Columbia Timber Sales (BCTS) program. The TFLs and woodlots are excluded from this timber supply review as a separate process is in place to determine an AAC for these licences.

There are four lumber processing facilities located near the city of Revelstoke with an estimated collective milling capacity of 126 million board feet. In addition, there are pole, utility and post, shake and shingles, specialty products and tonewood facilities in the TSA. Timber that is harvested from within and outside of the Revelstoke TSA is processed in these facilities. Similarly, some of the timber harvested within the TSA is processed in mills located in other timber supply areas (e.g., Okanagan and Arrow TSAs).

Harvest is primarily focused on cedar, hemlock and Douglas-fir followed by spruce and balsam.  Total harvest levels fluctuate on an annual basis and since 2011, an average of 80% of the AAC – or 179 000 cubic metres per year – was harvested.

## 2.5   Land use planning

In 1992, the B.C. government directed that a strategic land use plan be prepared to identify a comprehensive and integrated vision for land and resource use in the Kootenay-Boundary region. Recommendations resulting from two land use tables were used to develop the East Kootenay and West Kootenay-Boundary Land Use Plans released in 1995.  The latter plan included a commitment to provide the community of Revelstoke with the opportunity to advise on specific resource management guidance for the Revelstoke District.  The Revelstoke and Area Land Use Planning Final Recommendations were completed in 1999.

In 2005, selected recommendations for the Revelstoke Resource Management Zone were established as a higher-level plan under the *Forest Practices Code of B.C. Act* (i.e., the Revelstoke Higher Level Plan Order or RHLPO).

Two orders varying the objectives have been approved since 2009.  The Caribou habitat management objective (objective 3) was cancelled in 2009 to eliminate duplication or conflicts with the 2007 Mountain Caribou Recovery Implementation Plan, as well as caribou ungulate winter range and wildlife habitat areas designated under the Government Actions Regulation of the *Forest and Range Practices Act*.

In 2011, the definitions, and the biodiversity emphasis assignment and the mature and old provisions of the order amended.

Specific objectives within the RHLPO are discussed in other relevant sections of this document and will be included in the base case:

- Biodiversity Emphasis;
- Old Forest;
- Grizzly Bear Management.

Approved forest stewardship plans (FSP) include commitments in relation to these objectives and by law, management practices must be consistent with FSP results and strategies.

## 3.    Current Forest Management Considerations and Issues

### 3.1   Base case management assumptions

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

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

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

Further, given the complex and dynamic nature of forest ecosystems and forest management, knowledge is constantly evolving and there may be significant uncertainty associated with some forest management considerations.  Where information exists, it may be possible to quantify the degree of uncertainty and the potential timber supply impact may be assessed in sensitivity analyses as outlined in Section 9.3 – *'Sensitivity analysis'*.

The following sections describe major forest management considerations for the current timber supply review for the Revelstoke TSA.

### 3.2   Climate change

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

Based on a report produced by the ministry's research climatologist (Foord, 2021) for the Revelstoke TSA, climate trends for the 1945 to 2012 period suggest that there has not been a significant change in mean annual precipitation; however, winter precipitation has decreased significantly while spring and fall precipitation has increased.  Mean annual temperature has increased by 1.0°C.  Seasonally, winter has warmed the most (+2.1°C) and summer has warmed by 0.8°C.

Future climate change projections for the Revelstoke TSA suggest that between 2041 and 2070, spring precipitations may increase, and summer may be drier.  Annual precipitation as snow is projected to decrease by 21.5 percent.  Mean annual temperatures may increase by 3.1°C with summer increasing the most and winter and fall the least.

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 a higher drought risk in the summer.  Increases in growing degree days and frost-free period may mean some vegetation will see enhanced growth, but moisture availability in the summer months may limit that potential.

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

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

In the base case, past and current climate-related impacts are indirectly captured under assumptions related to forest health, regeneration, growth and yield, and natural disturbances.  Sensitivity analyses that examine the impact of uncertainties about natural and managed stand yields and disturbance frequency will provide information on timber supply pressures over time.  The results of these analyses are not predictions of the future under climate change and as more information becomes available, it will be possible to assess timber supply implications more accurately in subsequent timber supply reviews.

## 3.3   Cumulative effects

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

CEF has assessment protocols for aquatic ecosystems, grizzly bears, moose, old growth forests, and forest biodiversity that are approved for implementation.  Currently, no CEF assessments have been completed for the Revelstoke TSA, however, should any be completed prior to the AAC determination, these will be made available for consideration by the chief forester.

## 3.4   Major changes since the previous TSR

The previous timber supply review for the Revelstoke TSA concluded on July 28, 2011.  Since then, the following changes have taken place:

- The Revelstoke Higher Level Plan Order Objective 1 (Biodiversity Emphasis) and 2 (Old and Mature Forest) were amended on December 22, 2011.

- An ungulate winter range (UWR) for mule deer was amended on November 28, 2019.

- BEC has been updated to version 12.

### 3.5   Major forest management modelling considerations

The major forest management considerations for the current timber supply review are identified in Table 1, below and are described in depth in relevant sections of this document.  These considerations include projects deemed as important in the last AAC determination to help reduce the risk and uncertainty associated with key factors that affect the timber supply in the TSA.

*Table 1.     Major forest management considerations and response to the 2011 AAC implementation instructions for the Revelstoke TSA*

| Consideration/Issue | Description |
|---|---|
| Existing stand volume | In the last AAC determination, the chief forester noted an apparent discrepancy between inventory cedar volumes and post-harvest cedar volumes and requested the undertaking of a study to examine the potential impact.  This consideration is discussed in further details in Section 7.1.1 – *'Harvesting - Recent Performance'*. |
| Grizzly bear | In the last AAC determination, the chief forester encouraged the Ministry of Environment to complete the mapping of avalanche chutes to increase understanding of the areas used by grizzly bears.  To date, this work remains incomplete, and in the absence of new information, the base case will address grizzly bear as described in Section 7.3.4.3. |
| Harvest practices | Harvest in the Revelstoke TSA in the 2011 to 2021 period has averaged 179 000 cubic metres per year, which is approximately 20% below the AAC.  Although cedar represents about 18% of the mature inventory volume, about 30% of the volume harvested since 2011 was cedar.  Harvest practices inform current forest management assumptions – described in Section 7.1 - *'Harvesting'* - and sensitivity analyses. |
| Mountain caribou | Timber harvesting is prohibited over large areas within the Revelstoke TSA and as described in Section 6.3.2 – *'Wildlife habitat – no-harvest areas'*, the corresponding areas do not contribute to timber supply.  Work is currently underway to develop and implement new management strategies for caribou.  Changes to management for caribou will be considered if this work is completed and implementation planned during this timber supply review. |
| | In the last AAC determination, the chief forester encouraged the ministry and licensee staff to continue to seek opportunities to minimize the impact of caribou habitat on timber supply, while continuing to ensure that the habitat requirements of caribou herds are met.  The work currently underway to develop and implement new management strategies for caribou, and a proposed sensitivity analysis, address this AAC implementation instruction. |

| Consideration/Issue | Description |
|---|---|
| Old growth | Old growth is an important natural resource value and British Columbia is undergoing a paradigm shift in how old growth forests are being managed.  The Province is making progress on the implementation of the recommendations of the *Strategic Review of How British Columbia Manages for Old Forests Within its Ancient Ecosystems (2020)*.  The Province and First Nations across B.C. are working in partnership to defer logging of old growth while developing a new approach to sustainable forest management.  Province-wide, deferrals have been implemented on nearly 1.7 million hectares of old growth, including approximately 1.05 million hectares of BC's forests most at risk of irreversible loss, which are ancient, remnant and priority large stands identified by the Old Growth Technical Advisory Panel (TAP).  These logging deferrals are a temporary measure to prevent irreversible biodiversity loss while the Province, First Nations and other partners develop a new, long-term approach to old growth management.<br><br>Currently, legal old growth targets are specified in the Revelstoke Higher Level Plan Order (RHLPO).  Non-legal spatial old growth management areas (OGMAs) have been defined and adopted in approved Forest Stewardship Plans (FSPs).  These non-legal OGMAs are used to meet the old-seral requirements specified in the RHLPO.<br><br>Should the old growth management objectives change during this timber supply review, the modelling approach will be updated to reflect these new legal requirements. |
| Non-merchantable timber profiles | The past definition of the timber harvesting land base (THLB) included timber profiles with very limited historic utilization (Balsam-leading, Balsam-leading/Hemlock second, Hemlock-leading).  In the period leading to the last AAC determination, a decrease in harvesting of hemlock-leading stands where hemlock accounts for at least 80 percent of the volume was noted.  The chief forester requested to monitor the harvest performance in these stands and as a result of this monitoring, unutilized stands will be removed from the THLB, as described in Section 6.4.5 – '*Non-merchantable timber profiles*'. |
| Scenic areas | In the last AAC determination, the chief forester encouraged licensees to improve the visual design of cutblocks in scenic areas and requested that district staff continue to monitor visual effectiveness and to provide this information for the next determination.  Monitoring findings and modelling assumptions for visual resources are described in Section 7.3.6. |

| Consideration/Issue | Description |
|---|---|
| Stand-level biodiversity | In the last AAC determination, the chief forester requested that district staff work with licensees to ensure that the wildlife tree retention is appropriately reported, and the results used to inform the next timber supply review.  For this TSR, wildlife tree retention reported through the Reporting Silviculture Updates and Land Status Tracking System (RESULTS) database will be used.  A sensitivity analysis will also be performed to reflect wildlife tree retention levels observed through monitoring (see Section 6.4.8). |
| Unharvested volume | A disposition plan is under consideration for 237 538 cubic metres of unused volume that has accrued in Revelstoke TSA since 2006.  Hemlock, spruce and balsam volume on steep slopes is being targeted for disposition and sensitivity analyses will examine the timber supply impact of removing this volume from the growing stock. |
| Vegetation Resource Inventory (VRI) | The current inventory for most of the Revelstoke TSA is based on the Forest Inventory Planning (FIP) inventory standard.  This inventory has been updated to account for timber harvesting and key attributes (i.e., age, height, volume) and has been projected to January 1, 2019.  A new inventory project is currently underway.  However, the finished product is not expected to be available prior to 2023.  Sensitivity analyses will examine the impact of uncertainty in volume projection, based on statistical comparisons between the current and new inventory. |
| Wildfire | Considerable wildfires impacted the TSA in 2017, 2018 and 2021.  This consideration is discussed in further detail in Section 7.4.1 |
| Young Stand Monitoring | In the last AAC determination, the chief forester commented that timber supply modelling of managed stands requires accurate regeneration inputs that reflect actual stand conditions and stated support for continued stand development monitoring as a mechanism to validate Table Interpolation Program for Stand Yields (TIPSY) regeneration inputs for future yield predictions.

As a result, a young stand monitoring (YSM) ground sample program has been initiated in the Revelstoke TSA.  To date, a total of seven YSM ground sample plots have been established and once more plots are established, their periodic re-measurements will help evaluate whether young stands will meet future timber supply expectations. |

## 4.    Inventories

### 4.1    Background information

Table 2 lists the spatial data that will be used to define the Revelstoke 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 at https://catalogue.data.gov.bc.ca.

*Table 2.    Inventory information*

| Data | Source | File name |
|---|---|---|
| Archaeological sites | BCGW | WHSE_ARCHAEOLOGY.RAAD_TFM_SITES_SVW |
| Biodiversity emphasis options (BEO) | BCGW | WHSE_LAND_USE_PLANNING.RMP_LANDSCAPE_UNIT_POLY_SVW |
| Biogeoclimatic zones - current | BCGW | WHSE_FOREST_VEGETATION.BEC_BIOGEOCLIMATIC_POLY |
| Biogeoclimatic zones - v7 | | https://www.for.gov.bc.ca/hre/becweb/resources/maps/PastVersions.html |
| | | https://www.for.gov.bc.ca/ftp/HRE/external/!publish/becmaps/GISdata/PreviousVersions/ |
| | | abgcv7_bc.e00.zip - Version 7 of the biogeoclimatic subzone variants of British Columbia, Canada.  Published in March 2008 |
| Conservation Lands | BCGW | WHSE_LEGAL_ADMIN_BOUNDARIES.WCL_CONSERVATION_LANDS_SP |
| Controlled recreation area | BCGW | REG_LEGAL_AND_ADMIN_BOUNDARIES.REC_TENURE_ALPINE_SKI_AREAS_SP |
| Crown reserves | BCGW | WHSE_TANTALIS.TA_CROWN_RSRV_NOTATIONS_SVW |
| Crown tenures | BCGW | WHSE_TANTALIS.TA_CROWN_TENURES_SVW |
| Federal – National Park | BCGW | WHSE_ADMIN_BOUNDARIES.CLAB_NATIONAL_PARKS |
| Forest cover openings (recent) | BCGW | WHSE_FOREST_VEGETATION.VEG_CONSOLIDATED_CUT_BLOCKS_SP |
| Fish Surveys | | |
| Harvested Areas of BC (Consolidated Cutblocks) | BCGW | WHSE_FOREST_VEGETATION.VEG_CONSOLIDATED_CUT_BLOCKS_SP |
| Landscape units | BCGW | WHSE_LAND_USE_PLANNING.RMP_LANDSCAPE_UNIT_POLY_SVW |
| Natural Disturbance Type (NDT) | BCGW | WHSE_FOREST_VEGETATION.BEC_BIOGEOCLIMATIC_POLY |
| Old growth management area – non-legal | BCGW | WHSE_LAND_USE_PLANNING.RMP_OGMA_NON_LEGAL_CURRENT_SVW |
| Operability | BCGW | REG_LAND_AND_NATURAL_RESOURCE.OPERABILITY_TRV_POLY |
| Ownership | BCGW | WHSE_FOREST_VEGETATION.F_OWN |

| Data | Source | File name |
|---|---|---|
| Permanent Sample Plots - active | BCGW | WHSE_FOREST_VEGETATION.GRY_PSP_STATUS_ACTIVE |
| Protected areas | BCGW | WHSE_TANTALIS.TA_PARK_ECORES_PA_SVW |
| Provincial site productivity layer | FAIB | SITE_PROD_BC |
| Recreation sites & reserves | BCGW | WHSE_FOREST_TENURE.FTEN_RECREATION_POLY_SVW |
| Research Installations | BCGW | WHSE_FOREST_VEGETATION.RESPROJ_RSRCH_INSTLTNS_GOV_SVW |
| Roads | CEF | BC_CE_Integrated_Roads_2019_20190307.gdb\integrated_roads_buffer |
| Riparian - Streams | BCGW | WHSE_BASEMAPPING.FWA_STREAM_NETWORKS_SP |
| Riparian – Rivers (S1A) | BCGW | WHSE_BASEMAPPING.FWA_RIVERS_POLY |
| Terrain Data | BCTS | rtsa_terrain.shp |
| Timber supply areas | BCGW | WHSE_ADMIN_BOUNDARIES.FADM_TSA |
| Vegetation resources inventory (VRI) | BCGW | WHSE_FOREST_VEGETATION.VEG_COMP_LYR_R1_POLY |
| Visual landscape inventory | BCGW | WHSE_FOREST_VEGETATION.REC_VISUAL_LANDSCAPE_INVENTORY |
| Watersheds – Community Watersheds | BCGW | WHSE_WATER_MANAGEMENT.WLS_COMMUNITY_WS_PUB_SVW |
| Wetlands | BCGW | WHSE_BASEMAPPING.FWA_WETLANDS_POLY |
| Wildlife tree retention (WTRA) | BCGW | WHSE_FOREST_VEGETATION.RSLT_FOREST_COVER_RESERVE_SVW |
| Wildlife Habitat Areas (WHA) | BCGW | WHSE_WILDLIFE_MANAGEMENT.WCP_WILDLIFE_HABITAT_AREA_POLY |
| Wildlife – Ungulate winter ranges (UWR) | BCGW | WHSE_WILDLIFE_MANAGEMENT.WCP_UNGULATE_WINTER_RANGE_SP |

**Data source and comments:**

BCGW: BC Geographic Warehouse;

CEF: Cumulative Effects Framework;

FAIB: Forest Analysis and Inventory Branch.

## 4.2 Vegetation resources 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.

FAIB has initiated a new forest inventory for the Revelstoke TSA which will provide more current information on critical stand attributes such as species composition, volume, density, age and height. This new inventory will also provide more accurate and current information on depletions from harvesting, wildfire and other disturbances. Digital air photos acquired during the 2017 field season were used for photo interpretation of the inventory in concert with air and ground calls for calibration purposes.

The photo interpretation progressed from south to north over two fiscal years commencing in the spring of 2020. The remaining photo estimation and map production concluded in the 2021/22 fiscal year. All completed VRI data was loaded to the BCGW in the spring of 2022.

The previous VRI for the Revelstoke TSA is mostly based on aerial photos taken in the 1990's and follows the older Forest Inventory Planning (FIP) inventory standard. An audit of this inventory in the operable portion of the Revelstoke TSA was published in March 2011. The audit compared the volumes predicted by the ministry's Variable Density Yield Projection (VDYP) from photo-interpreted inventory attributes to the volumes compiled using ground sample data. The results indicate that overall inventory volumes are underestimated by about 17%. From the overall 17% inventory volume underestimate, the majority (70% underestimate) was coming from Douglas-fir/lodgepole pine leading stands, with a lesser (5% underestimate) coming from spruce/balsam leading stands.

In the last AAC determination, the 2011 audit results were used to compare the base case with a forecast corrected for hemlock, cedar and spruce/balsam stands. The correction excluded Douglas-fir/pine stands due to the high sampling error for these stands. These adjustments resulted in a 7% increase in timber supply in the short term and a 4% increase in the mid term. The chief forester accounted for this in the 2011 AAC determination and concluded that the timber supply projected in the base case was underestimated.

This *Data Package* was developed using an inventory that was projected to January 1, 2019. At the time of publication of this data package, the newer VRI has been published, as described above. Although this newer inventory has not yet been audited as was done in 2011, FAIB's initial review (using the ground sample data from the 2011 audit as a reference) indicates that the volume underestimation remains. However, this newer inventory will be used to model timber supply for the Revelstoke TSA.

The two versions of inventory will be compared to each other and to the 2011 audit. This comparison, along with the results of volume-related sensitivity analyses, will be used to assess the results of the timber supply analysis and the outcome of the assessment will inform the AAC determination.

## 4.3 Biogeoclimatic ecosystem classification

British Columbia has an extensive biogeoclimatic ecosystem classification (BEC) system that groups ecologically similar sites based on climate, soils and vegetation. The first version of the BEC was released in 1995 and was compiled based on hand-drawn maps of varying scale. Overtime, the BEC was updated to a consistent mapping scale and to refine data structure, line work, ecosystem labelling and ecosystem knowledge.

BEC version 12, published in 2021, is the version of the BEC that will be used in the base case except for the RHLPO old seral targets which will be evaluated using BEC version 7 as the RHLPO specifies this older version of the BEC must be used for seral targets. This is described in detail in Section 7.3.1 – *'Old Forest'*.

**Data source and comments:**

BCGW file: WHSE_FOREST_VEGETATION.BEC_BIOGEOCLIMATIC_POLY

19

## 4.4   Provincial site productivity layer

The provincial site productivity layer (PSPL) provides site index estimates for managed stands 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).

Where PEM or TEM data are not available, a biophysical model is used.  This provincial-scale model integrates BEC zone, elevation, latitude, and available growth and yield sample data.  In the Revelstoke TSA, PSPL values are based on PEM for the ICH and the biophysical model for the ESSF.

# 5.    Division of the Area into Management Zones

## 5.1    Modelling zones and tracking of multiple objectives

Management zones are used to differentiate areas for the application of management objectives in the timber supply model.  Zones may be based on legal definitions (e.g., landscape units) or a descriptive definition (e.g., leading species).  Zones may overlap each other and will be tracked separately in the timber supply model.

Table 3 outlines the zones or objectives that will be incorporated in the timber supply model.  It does not list objectives that will be modelled by excluding areas from the timber harvesting land base (e.g., riparian reserve zones).  Further information on the forest cover requirements to be applied to these areas can be found in Section 7.3, '*Resource Management Objectives*'.

*Table 3.    Management zones and objectives to be tracked*

| Management zones objectives | Purpose |
| --- | --- |
| Stand composition, by species and percentage | Stand composition relates to harvest performance, mid-term timber supply and harvest sequencing. |
| Old growth areas | The RHLPO specifies minimum aspatial old growth requirements by natural disturbance type (NDT), BEC and BEO combinations.  This includes old forest within Mount Revelstoke National Park. |
| Wildlife habitat | Forest cover constraints apply in areas identified as critical habitat for wildlife in UWR and WHA. |
| Community watersheds | Harvest contribution over time and equivalent clearcut area (ECA) calculations.  See 7.3.5 – *Community watersheds*. |
| Scenic areas | Within scenic areas, forest cover retention requirements are based on established visual quality objectives.  See 7.3.6 - *Visual quality*. |
| Cutblock adjacency | The rate of harvest will be limited based on the time required for stand green up conditions to be met.  See *7.3.2 – Adjacency, green-up and patch size distribution.* |

## 6.    Land Base Classification

### 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 Revelstoke 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 analyse 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 Revelstoke TSA.

The AFLB includes all forested areas within the portion of the Revelstoke 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 ski areas. Lands under federal jurisdiction are not usually considered AFLB for timber supply review purposes, however for this analysis, Mount Revelstoke National Park will be included in the AFLB because the RHLP specifies that forested areas in this park contribute to the old-seral biodiversity objective. The AFLB also excludes areas where the AAC is determined under separate timber supply review processes (e.g., tree farm licences).

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

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

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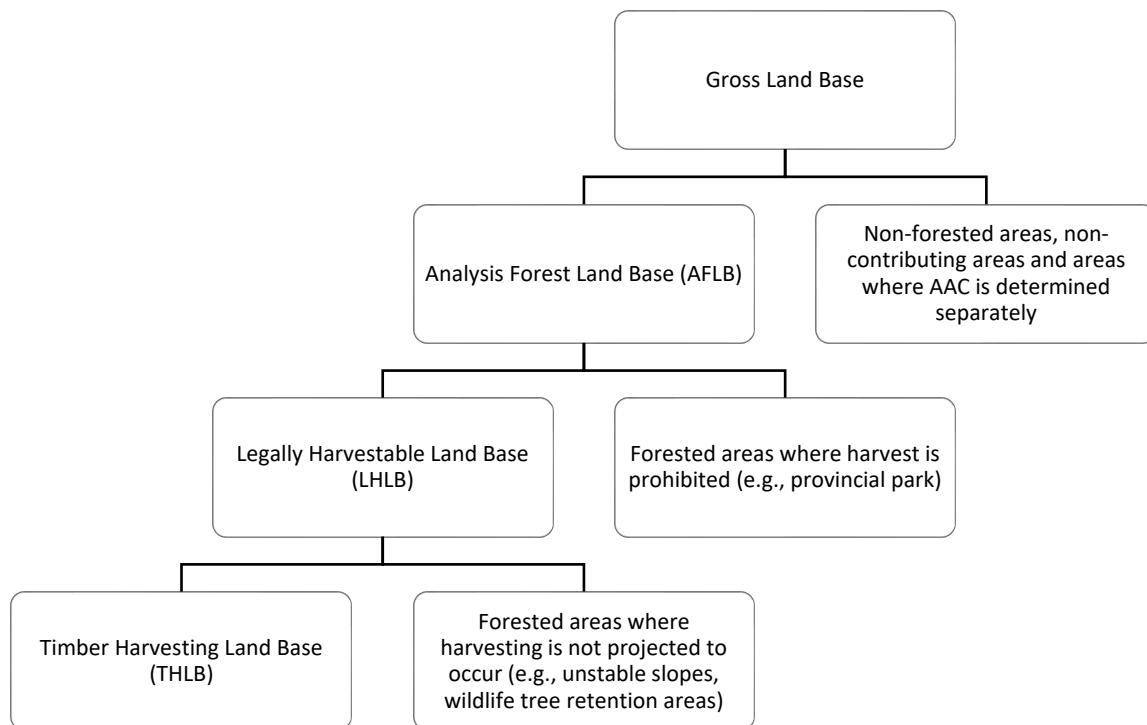
*Figure 2.     Land base classification definition.*

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.

Table 4 below summarizes the four categories and identifies areas that are excluded from each category.

*Table 4.    Classification category definitions and exclusions*

| Classification step | Definition | Exclusions |
|---|---|---|
| Gross land base | All area within the TSA boundary | ▪ None. The Revelstoke TSA is 758 502 hectares. |
| Analysis forest land base (AFLB) | Forested areas that contribute to forest management objectives in the context of the Revelstoke TSA AAC determination | ▪ Private land<br>▪ Some Federal land and reserves<br>▪ Long-term leases<br>▪ Area-based tenures (e.g., woodlot licences, tree farm licences)<br>▪ Municipal Parcels and Local/Regional Parks<br>▪ Non-forested and non-productive forest land; and,<br>▪ Permanent existing roads, trails and landings. |
| Legally harvestable land base (LHLB) | Area within the AFLB where timber harvesting is allowed, subject to forest management objectives and constraints | ▪ Miscellaneous provincial land not contributing to timber supply<br>▪ Provincial protected areas, including conservancies<br>▪ Federal – National Parks (Mount Revelstoke National Park)<br>▪ Biodiversity, mining or tourism areas<br>▪ Areas with legally established boundaries and objectives that prohibit timber harvesting (e.g., caribou ungulate winter range) |
| Timber harvesting land base (THLB) | Area within the LHLB where timber harvesting is permitted, and projected to occur | ▪ Areas that are unsuitable or uneconomic for timber production, such as:<br>  ▪ Environmentally sensitive areas<br>  ▪ Inoperable areas<br>  ▪ Areas with low site productivity<br>  ▪ Non-merchantable forest types<br>▪ Surrogate areas for legally established management objectives for resource values that may prohibit timber harvesting but for which the location is decided operationally (e.g., wildlife tree retention areas, riparian management areas. |

## 6.2   Identifying the analysis forest land base

In developing the base case, the forested area on which timber harvesting is both legally and operationally possible is identified through a classification process.  Thus, this timber supply review – and the allowable annual cut determination that will follow – applies to a specific subset of the TSA.  This subset is described below and in other relevant sections of this document.

The gross area of the Revelstoke TSA is 758 502 hectares.  The AFLB is the forested portion of the Revelstoke 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 220 000 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*, as described in Section 11.1 – *'Timber supply analysis discussion paper'* of this document.

### 6.2.1   Lands not administered by the ministry for timber supply purposes

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 (there are none in Revelstoke TSA), some lands under the jurisdiction of the federal government and area-based forest tenures for which there are separate AAC determination processes.

For analysis purposes, these and other types of lands are collated from various sources into a single spatial data layer file and classified by land ownership types.  Table 5 and Figure 3 below shows ownership type contributions to the land base.
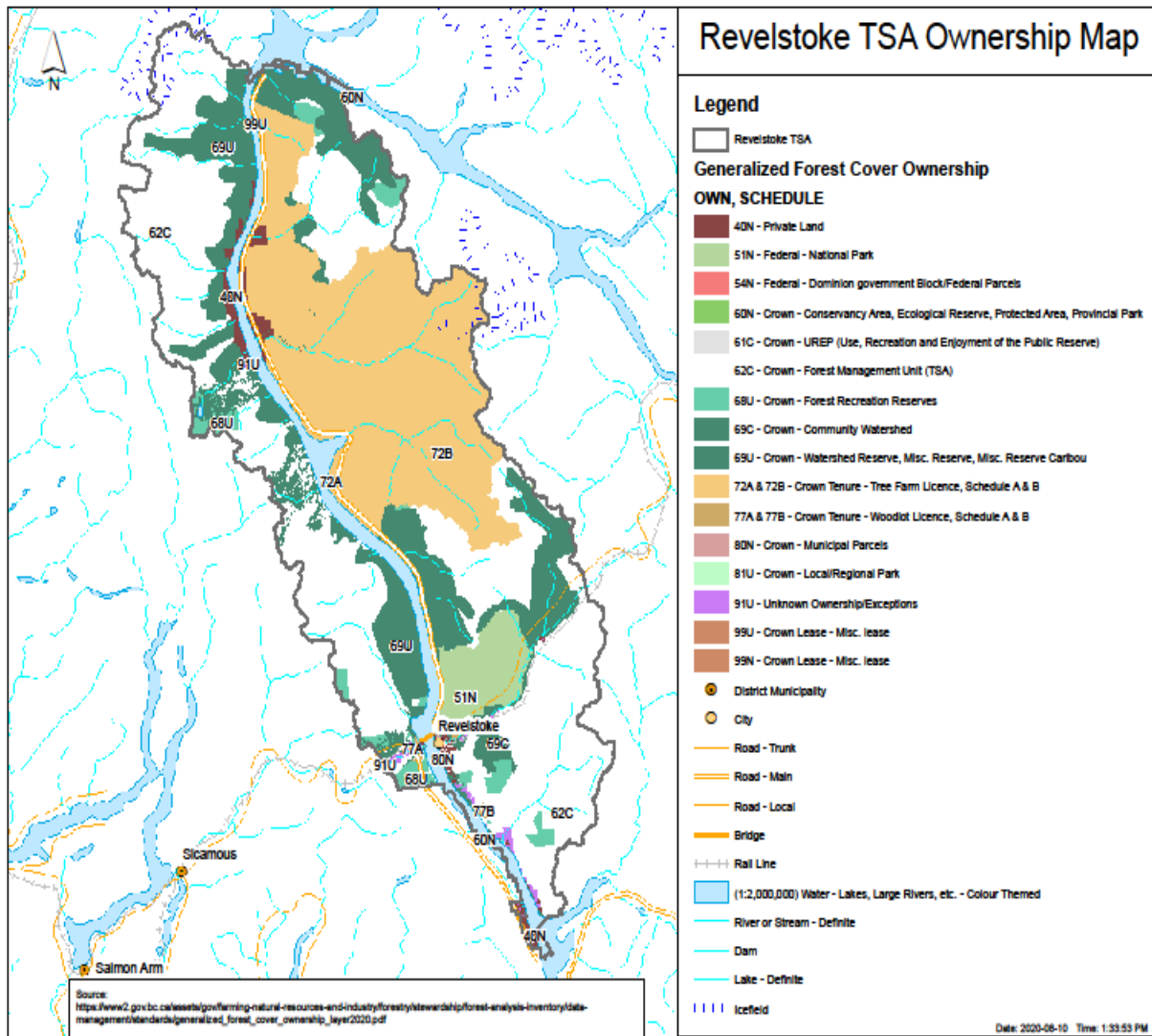
*Figure 3.     Land ownership type within the Revelstoke TSA.*

*Table 5.    Land ownership types within Revelstoke TSA*

| Land ownership code | AFLB | THLB | Gross land base (ha) |
|---|---|---|---|
| 40N – Private Land | No | No | 20,984 |
| 51N – Federal Park (Mount Revelstoke National Park, as per RHLP) | Yes | No | 26,369 |
| 54N – Federal Parcels | No | No | 13 |
| 60N – Crown Conservancy Are, Ecological Reserve, Protected Area, Provincial Park | Yes | No | 448 |
| 61C – Crown Reserves for Use, Recreation and Enjoyment of the Public (UREP) | Yes | Yes | 62 |
| 62C – Crown Forest Management Unit (TSA) | Yes | Yes | 299,728 |
| 68U – Crown Biodiversity, Mining and Tourism Area (BMTA) | Yes | Yes | 18,971 |
| 69C – Crown Community Watershed | Yes | Yes | 2,440 |
| 69U – Crown, Miscellaneous Reserves | Sometimes | Sometimes | 170,558 |
| 72A, 72B – Tree Farm Licences | No | No | 211,999 |
| 77A, 77B – Crown and Private Woodlots | No | No | 1,790 |
| 80N – Municipal Parcels | No | No | 298 |
| 81U – Local/Regional Park | No | No | 84 |
| 91U – Unknown Ownership | No | No | 4,691 |
| 99N – Crown Miscellaneous Leases | No | No | 16 |
| 99U – Crown Miscellaneous Leases | No | No | 51 |
| **Total** | | | **758,502** |

**Data sources and comments:**

BCGW File:    WHSE_ADMIN_BOUNDARIES.FADM_TSA

This dataset shows the TSA boundary.

BCGW File:    WHSE_FOREST_VEGETATION.F_OWN

This dataset is a generalized description of the primary ownership of forest lands that is maintained by Forest Analysis and Inventory Branch for use in strategic decision-making such as timber supply analysis.

BCGW File:    WHSE_TANTALIS.TA_CROWN_TENURES_SVW

This dataset represents crown land dispositions that are issued for specific purposes and periods of time under an agreement between an individual or company and the provincial government for an interest in Crown land.

### 6.3.1.1  Private land, federal land and miscellaneous land

Private land, some federal and other land (e.g., municipal parcels and local or regional parks) are excluded from the AFLB and THLB.

Table 6, below, shows the private land, federal land and miscellaneous land that will be excluded from the AFLB for the Revelstoke TSA.  These lands cover a total of 26 070 hectares.

Mount Revelstoke is a national park under federal jurisdiction and is excluded from the THLB.  However, the forested portion of this park will be included in the AFLB for the purpose of evaluating old seral biodiversity requirements, as specified in the Revelstoke Higher Level Plan Order, as described in Section 7.3.1 – '*Old forest'*.

*Table 6.     Private land, federal land and miscellaneous land*

| Ownership code | Description | Gross land base (ha) | AFLB | THLB |
|---|---|---|---|---|
| 40N | Private | 20,984 | No | No |
| 54N | Federal - Dominion government block/federal parcels | 13 | No | No |
| 80N | Crown - municipal parcels | 298 | No | No |
| 81U | Crown - local/regional park | 84 | No | No |
| 91U | Unknown ownership | 4,691 | No | No |
| | **Total** | **26,070** | | |

**Data source and comments:**

BCGW File: WHSE_FOREST_VEGETATION.F_OWN

### 6.3.1.2  Ktunaxa Treaty Parcels

Ktunaxa Nation Council is in treaty negotiations with the Province of British Columbia and Government of Canada.  In 2012, the Ktunaxa accepted lands as part of a treaty offer, and it is current practice to consider these lands as excluded from the AFLB.  The treaty negotiation is entering Stage 5 – Negotiation to Finalize a Treaty, however the negotiation is currently suspended.  There is only one treaty parcel offered within the Revelstoke TSA, near Clachnacudainn Creek.  This parcel covers a total area of 57 hectares and will be removed from the THLB.

**Data sources and comments:**

BCGW file: TA_CROWN_TENURES_SVW

The boundaries for the Ktunaxa treaty land offer are represented as Section 16 Map Reserves in the Crown Tenures layer which represents crown land dispositions that are issued for specific purposes and periods of time.  In this analysis, the treaty parcel was identified from the Crown Tenures layer using the query, TENURE_SUBTYPE = 'SEC 16 MAP RESERVE' and TENURE_PURPOSE = FIRST NATIONS' and TENURE_SUBPURPOSE = 'TREATY AREA'.

### 6.3.1.3  Area-based forest tenures

In British Columbia, certain forms of forest tenures give the exclusive right to the tenure holder to harvest timber and construct roads within a defined area.  These include tree farm licences (TFLs), community forest agreements (CFAs), First Nation woodland licences (FNWLs) and woodlots (WL).  In contrast, holders of forest licences and British Columbia Timber Sales (BCTS) may exercise the rights associated with their forest tenure over a shared land base, which is a timber supply area.  As area-based tenures have separate TSR processes, the area associated with these tenures is excluded from the TSA's AFLB.

Within the Revelstoke TSA, there are several area-based forest tenures which do not contribute to the AFLB for this timber supply review.  These include two Tree Farm Licences: TFL 55 (Louisiana–Pacific Canada Ltd.) and TFL 56 (Revelstoke Community Forest Corp.) and three woodlots: W0460, W0461 and W1834.  The total area occupied by TFL and woodlots is shown in Table 7, below.

There are no CFA or FNWL within the Revelstoke TSA.  For clarification, TFL 56 is managed by the Revelstoke Community Forest Corp., however the licence is not a CFA, it is a TFL, as discussed above.

*Table 7.    Area-based forest tenures*

| Ownership code | Description | Gross land base (ha) | AFLB | THLB |
|---|---|---|---|---|
| 72A, 72B | Tree Farm Licence | 211 999 | No | No |
| 77A, 77B | Woodlot Licence | 1 790 | No | No |
| **Total** | | **213 789** | | |

**Data sources and comments:**

BCGW File: WHSE_FOREST_VEGETATION.F_OWN

*Tree Farm Licence:*
BCGW file: WHSE_ADMIN_BOUNDARIES.FADM_TFL_ALL_SP

*Woodlots and Community Forest Agreements:*
BCGW file: WHSE_FOREST_TENURE.FTEN_MANAGED_LICENCE_POLY_SVW

**6.3.1.4  Alpine skiing – controlled recreation areas (CRA)**

Revelstoke Mountain Resort (Crown Lands File Number 4403775) is the only alpine ski development within the Revelstoke TSA.  This resort area is designated by regulation under Section 4 of the *Resort Timber Administration Act* and is administered under that *Act*.  This *Act* allows Mountain Resort Branch statutory decision-making authority over timber harvesting, and consequently, a total area of 4594 hectares will be removed from the gross area.

**Data source and comments:**

BCGW file:
REG_LEGAL_AND_ADMIN_BOUNDARIES.REC_TENURE_ALPINE_SKI_AREAS_SP

**6.2.2   Non-forest or non-productive forest areas**

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 logged in the past.  These areas do not contribute to forest management objectives such as seral objectives for landscape-level biodiversity.

The vegetation resources inventory (VRI) includes the British Columbia Land Cover Classification Scheme (BCLCS).  Under the BCLCS, land is first classified based on the presence or absence of vegetation.  Vegetated polygons are then classified by land cover type - as treed or non-treed.  Non-treed polygons are classified as 'non-forested areas' if they correspond to wetlands, alpine areas or have a site index less than 5.0.  Treed wetlands are also classified as non-forested areas.

As the classification may identify recently harvested stands as non-treed, only areas that were not previously harvested are classified as non-forest areas.

The areas shown in Table 8, below, represent the summary of all areas classified as non-forest or non-productive in the Revelstoke TSA.  As these areas may overlap with each other and fall within ownership categories excluded from the AFLB (e.g., a wetland may be within a woodlot), the amount of net area that will be removed from the AFLB to account for non-forest or non-productive areas is different than the sum of the values shown in Table 8.  After accounting for overlap, the net area removed from the AFLB to account for non-forested and non-productive areas is 294 490 hectares.

This area classification is a preliminary estimate based on the 2019 VRI.  The final area classification summary will be presented in a timber supply analysis discussion paper, as described in Section 11 of this document.

*Table 8.    Description of unreported, non-forest and non-productive areas*

| Attributes | Description | Gross land base (ha) |
|---|---|---|
| Non-vegetated alpine & parkland ecosystems* | bclcs_lv_1 = 'N' AND bclcs_lv_3 = 'A' OR bec_ndt = NDT5 and no harvest history** | 258,421 |
| Non-treed shrub | bclcs_lv_4 in ('ST', 'SL') and no harvest history | 75,295 |
| Non-productive: site index | site_index < 5 and no harvest history | 35,124 |
| Non-treed herb | bclcs_lv_2 = 'N' and bclcs_lv_4 not in ('ST', 'SL') and no harvest history | 30,451 |
| Non-vegetated | bclcs_lv_1 = 'N' and no harvest history | 241,920 |
| Lake | bclcs_lv_1 = 'N' AND bclcs_lv_5 = 'LA' | 19,201 |
| Non-treed alpine | bclcs_lv_2 = 'N' AND bclcs_lv_3 = 'A' | 14,843 |
| Alpine forest | np_desc = "AF" and no harvest history | 19,274 |
| Non-productive | np_desc = "NP" and no harvest history | 8,509 |
| Riparian | bclcs_lv_1 = 'N' AND bclcs_lv_5 = 'RI' | 2,076 |
| Non-treed wetland | bclcs_lv_2 = 'N' AND bclcs_lv_3 = 'W' | 976 |
| Wetland | bclcs_lv_3 = 'W' | 24,735 |
| Unclassified | bclcs_lv_1 = 'U' or bclcs_lv_1 is null | 13,117 |
| No species_1 label | bclcs_lv_1 = 'V' AND bclcs_lv_2 = 'T' AND spec_cd_1 is null | 928 |
| Treed wetland | bclcs_lv_2 = 'T' AND bclcs_lv_3 = 'W' | 88 |
| Reservoir | bclcs_lv_1 = 'N' AND bclcs_lv_5 = 'RE' | 25 |

*Within the Revelstoke TSA, the natural disturbance type NDT5 is either ESSF parkland (forest is open with islands of heath and herb meadows), or IMA.

** "no harvest history" is defined by the area not having a harvest year in the consolidated cutblock layer.

**Data source and comments:**

*2019 VRI:*
BCGW file: WHSE_FOREST_VEGETATION.VEG_COMP_LYR_R1_POLY

*Harvested Areas of BC (Consolidated Cutblocks):*
BCGW file: WHSE_FOREST_VEGETATION.VEG_CONSOLIDATED_CUT_BLOCKS_SP

This file is used to determine if an area has been harvested.

### 6.2.3   Roads, trails and other transportation corridors

**Existing roads and trails**

Existing roads, trails and other transportation corridors (e.g., railway, pipelines, power lines) are considered non-productive land and are removed from the AFLB.

For the current timber supply analysis, a strategic-level roads database, commonly referred to as the regional cumulative efffects (CE) road layer, will be used.  This database contains linework from multiple sources that has been integrated from a hierarchical process into a single data source.

Estimates of the permanently, non-forested road right-of-way area were derived by buffering road lines in a geographic information system (GIS).  The width of the road buffers were based on suggestions from the provincial CE team.

The road classifications in the CE road layer were grouped into four classes prior to applying the buffers. Tables 9 and 10, below, show the road classification groups and the range of the road right-of-way widths

(on one side of the road) provided by the CE team. The weighted average buffer width corresponds to the weighed average width for the road classes in each group and the total buffer corresponds to the buffer width when applied to both sides of the line feature in the GIS.

*Table 9.     Road summary and modelled buffer width*

| Road classification | Minimum buffer (m) | Maximum buffer (m) | Weighed average buffer (m) | Total buffer applied (two sides) (m) | Gross land base (ha) |
|---|---|---|---|---|---|
| Highway/Arterial (freeway, highway, arterial, collector, ramp, yield) | 10 | 25 | 15 | 30 | 793 |
| Primary - Paved (local, resource, strata, alleyway, lane, driveway) | 5 | 20 | 15 | 30 | 379 |
| Secondary, FSR, Local (FSR, Local, service, recreational, resource, OGC long-term all weather) | 5 | 15 | 11 | 22 | 692 |
| Tertiary, Other (permit roads, in-block, restricted, proposed, seasonal, overgrown, decommissioned, trail, runway) | 2.5 | 30 | 10 | 20 | 8,580 |
| **Gross land base (ha)** | | | | | **10,444** |

The right-of-way corridors that are maintained as non-forested for utilities and other transportation corridors are also excluded from the AFLB. These corridors were identified using provincial base layer mapping.

*Table 10.   Other transportation corridors*

| Corridor classification | Gross land base (ha) | AFLB | THLB |
|---|---|---|---|
| Utility Right of Way (ROW) | 2,132 | No | No |
| Electric Transmission Line | 777 | No | No |
| Railway | 146 | No | No |
| Misc. ROW | 45 | No | No |
| **Total** | **3,099** | | |

**Future roads and trails**

As forest development occurs in the TSA, additional area will become permanently non-forested due to future roads and trails. The volume from the area occupied by the new roads is assumed to be available for an initial harvest and not available for later harvests.

The timber supply model includes a module that projects future road network development from the current road network, represented by the CE road layer, based on slope and estimated water crossings. The area permanently lost to the projected future roads is tracked and adjusted at each time-step of the model projection.

Future cutblocks are modelled along this projected road network so that the area lost to roads within cutblocks is accounted for in the base case harvest projection using this module and the buffer widths associated with the tertiary road grouping listed in Table 9. Recent harvesting has transitioned away from the use of landings and the majority of harvesting currently uses roadside landings. Therefore, any area that will be left permanently disturbed as a result of landing to the roadside in future harvesting will be accounted for by the non-forest right-of-way reduction for future roads.

These road area classifications are a preliminary estimate based on an initial THLB. The final area classification summary will be presented in a timber supply analysis discussion paper, as described in Section 11 of this document.

**Data source and comments:**

Data in the regional cumulative effects (CE) road layer were updated to 2019. This dataset is available from FAIB.

Railway corridor linework was extracted from: WHSE_BASEMAPPING.GBA_RAILWAY_TRACKS_SP

Transmission corridor linework was extracted from: WHSE_BASEMAPPING.GBA_TRANSMISSON_LINES_SP

## 6.3   Identifying the legally harvestable land base (LHLB)

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 timber harvesting land base (THLB).

### 6.3.1   Protected areas and miscellaneous reserves

Harvesting is not permissible in protected areas such as national parks, provincial parks and ecological reserves. These areas correspond to the following protected areas within Revelstoke TSA: Arrow Lakes Park (Shelter Bay Site), Martha Creek Park, Blanket Creek Park and Mount Revelstoke National Park.

These protected areas and miscellaneous reserves contribute to meeting landscape-level targets (e.g., old growth requirements) and remain in the AFLB.

The total area in protected areas which is removed from the LHLB is 26 817 hectares, as shown in Table 11, below.

*Table 11.   Protected areas and miscellaneous reserves*

| Ownership code | Description | Total area (ha) | AFLB | LHLB |
|---|---|---|---|---|
| 51N | Mount Revelstoke National Park | 26,369 | Yes | No |
| 60N | 60N – Crown Conservancy Area, Ecological Reserve, Protected Area, Provincial Park | 448 | Yes | No |
| **Total** | | **26,817** | | |

**Data source and comments:**

BCGW file: WHSE_TANTALIS.TA_PARK_ECORES_PA_SVW

This dataset contains BC parks, ecological reserves and protected areas managed for important conservation and for the use and enjoyment of the public.

BCGW File: WHSE_FOREST_VEGETATION.F_OWN

### 6.3.2   Wildlife habitat – no-harvest areas

In British Columbia, wildlife habitat requirements are managed through several tools, including wildlife habitat areas (WHA), ungulate winter ranges (UWR), notices, or management practices specified in land use plans. Management objectives may prohibit timber harvesting or road construction, or impose conditions on timber harvesting, road construction or silviculture activities.

Where the objective prohibits timber harvesting, these areas are excluded from the LHLB.  In the Revelstoke TSA, timber harvesting is prohibited on approximately 116 830 hectares to address the habitat requirement of mountain caribou and of a data sensitive species, as described in Table 12, below.

*Table 12.   Wildlife habitat exclusions from LHLB*

| Category | Species | Criteria | Gross land base (ha) | AFLB | LHLB |
|---|---|---|---|---|---|
| UWR | Mountain caribou | No harvest | 116 820 | Yes | No |
| WHA | Data sensitive species | No harvest | 9 | Yes | No |
| **Total** | | | **116,829** | | |

The habitat requirements for moose and mule deer allow for conditional harvest and are addressed in Section 7.3.4 – *'Wildlife habitat'*.

**Data source and comments:**

*Wildlife Habitat Areas:*

BCGW File: WHSE_WILDLIFE_MANAGEMENT.WCP_WILDLIFE_HABITAT_AREA_POLY

WHA 4-038, 4-039, 4-040, 4-041, and 4-043.

*Ungulate Winter Ranges:*

BCGW File: WHSE_WILDLIFE_MANAGEMENT.WCP_UNGULATE_WINTER_RANGE_SP

UWR U-3-005

### 6.3.3   Registered archaeological sites

The *Heritage Conservation Act* 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 *Heritage Conservation Act* and must not be altered without a permit.

Within the Revelstoke TSA, a total of 8 sites totalling 18 hectares have been identified as Registry Candidates.  Most Registry Candidate sites are archaeological sites that are automatically protected under the *Heritage Conservation Act*.  They include archaeological sites that pre-date AD 1846, burial places, rock art, plane wrecks, and shipwrecks.  These sites are protected from harvesting and will be removed from the LHLB.

**Data source and comments:**

BCGW File:    WHSE_ARCHAEOLOGY.RAAD_TFM_SITES_SVW

### 6.3.4   Crown conservation lands

Conservation lands are those lands secured for fish, wildlife, and habitat conservation purposes.  Administered conservation lands are lands over which legal administration and management authority have been acquired.  Reserve conservation lands are lands over which a recorded 'interest' has been secured for fish and wildlife, but not administration and management authority.  The majority of these have been obtained through *Land Act* mechanisms that either preclude or constrain certain uses or tenures for a specified period or require that the holder of the interest be contacted regarding proposed changes in land use.

Conservation lands where timber harvesting is precluded are present within the Revelstoke TSA and these lands are excluded from the LHLB, as shown in Table 13.

*Table 13.   Crown conservation lands*

| Category | Gross land base (ha) | AFLB | LHLB |
|---|---|---|---|
| Administered Lands & Reserve Lands | 54 | 11 | No |

**Data source and comments:**

BCGW file:      WHSE_LEGAL_ADMIN_BOUNDARIES.WCL_CONSERVATION_LANDS_SP

Crown conservation lands are given the broad ownership code 69U.  To distinguish Crown conservation lands from other types of lands, the BCGW file listed above was used since 69U is assigned to many types of ownership.

## 6.4   Identifying the timber harvesting land base (THLB)

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.

**Base case land base classification summary**

This section of the *Data Package* summarizes the land classification used in the base case considering inventories currently available and modelling assumptions, as described in Sections 6.1 to 6.4, above.

All area classification and exclusions presented in this *Data Package* are preliminary estimates or may be to be determined (TBD).  The final area classification summary will be presented in a timber supply analysis *Discussion Paper*, as described in Section 11.1 – *'Timber Supply Analysis Discussion Paper'* of this document.

*Table 14.   Revelstoke TSA initial land base classification summary (as of July 2022)*

| Land classification | Gross land base (ha) | Net area removed (ha) | % of total area | % of AFLB |
|---|---|---|---|---|
| Gross land base | 758,502 | | | |
| Land not administered by the ministry for timber supply purposes | 243,648 | 243,325 | 32.13 | |
| Non-forested and non-productive | 407,469 | 294,490 | 53.72 | |
| Roads, pipelines, transmission lines and railways | 11,977 | 4,544 | 1.58 | |
| **Total analysis forest land base** | **216,217** | | **28.85** | |
| Parks and protected areas (incl. Mount Revelstoke National Park) | 26,817 | 15,596 | 3.54 | 7.13 |
| Wildlife – Caribou UWR (no harvest) | 116,820 | 62,892 | 15.4 | 29.1 |
| Wildlife – wildlife habitat area (no harvest) | 9 | 3 | 0 | 0 |
| Protected archaeological sites | 18 | 0 | 0 | 0 |
| Crown conservation lands | 54 | 11 | 0.01 | 0.01 |
| **Total legally harvestable land base** | **137,726** | | **18.16** | |
| Terrain stability/environmentally sensitive areas | TBD | TBD | TBD | TBD |
| Inoperable areas | 632,867 | | 83.44 | 29.78 |
| Low productivity sites | 498,198 | | 65.68 | 1.21 |
| Non-merchantable timber profiles | 85,200 | | 11.23 | 6.31 |
| Riparian areas | 23,335 | | 3.08 | 1.52 |
| Wildlife tree retention areas | 53,854 | | 7.1 | 1.8 |
| **Timber harvesting land base** | **51,454** | | **6.78** | |
| Future reductions | TBD | | TBD | TBD |
| Future roads | TBD | | TBD | TBD |
| Future timber harvesting land base | TBD | | TBD | TBD |

### 6.4.1   Areas with high recreation value

Recreation sites and trails have been legally established within the Revelstoke TSA under the *Forest and Range Practices Act* (FRPA).  These include campsites and trails as well as sites created for a variety of education and recreation activities.  Mountain biking, hiking, snowmobiling and back country skiing are popular activities in the TSA and there is significant pressure from the public to maintain and expand recreational opportunities.

Approved FSPs include a strategy related to legally established recreations sites and trails.  This strategy is to maintain and conserve the natural vegetation around recreational features.  Although this strategy does not preclude industrial activity or harvesting, authorization by a recreation officer is required prior to any industrial activity or harvesting on a legally established site.  While logging is possible, it is likely that harvesting of recreation sites will be limited.  Because logging is possible, no specific reductions other than those described under other sections, such as Sections 6.2.3 – '*Roads, trails and other transportation corridors'* or 6.4.6 – '*Riparian areas'*, will be applied for areas with high recreation values.

Areas designated as Crown Use, Recreation and Enjoyment of the Public (UREPs) fall under *Land Act* reserves without having designation under other legislation and they are not reserved from harvest.  However, in practice, some UREPs may be excluded from harvest due to other designations.

As recreation sites, trails and UREPs do not have legal protection from harvest they will be included in the THLB, unless otherwise excluded.

**Data source and comments:**

BCGW File:    WHSE_FOREST_TENURE.FTEN_RECREATION_POLY_SVW

### 6.4.2   Terrain stability and environmentally sensitive areas

Some forest lands are environmentally sensitive (e.g., for slope stability) and/or significantly valuable for other resources (e.g., wildlife).  These areas may be identified by specific surveys such as terrain stability mapping (TSM) or the older environmentally sensitive area mapping associated with the previous forest cover inventory.  These environmentally sensitive areas may preclude or partially preclude harvesting.

District staff have reviewed the mapped environmentally sensitive areas and noted that these areas overlap with terrain stability data and other areas identified above as unavailable for harvest (e.g., parks, inoperable areas) or overlap with areas that can be managed through other THLB netdowns (e.g., riparian reserves, visual management areas, wildlife tree retention areas).  As such, the district concluded that no specific modelling reduction was necessary for the mapped environmentally sensitive areas.

Areas identified in terrain stability maps usually undergo further assessment prior to road construction or timber harvesting and as a result, some road building and timber harvesting occurs on areas mapped as being unstable or potentially unstable.  For this TSR, to reasonably reflect the amount of area unlikely to support timber harvesting, terrain stability data was used to compare the mapped slope stability of the 2009 THLB to the mapped slope stability of the areas harvested in the past 10 years.

*Table 15.   Proportion of recent cutblocks harvested by terrain stability class*

| Slope stability class | 2010-2020 cutblocks | 2009 THLB |
|---|---|---|
| Stable* | 88.5% | 82.8% |
| Potentially unstable | 8.2% | 14.5% |
| Unstable | 3.3% | 2.7% |

* includes stable terrain, alpine and unmapped areas

Mapped terrain stability data is only available for a portion of the Revelstoke TSA. 'Potentially unstable' and 'unstable' terrain classes will be combined for the purposes of this timber supply review. As shown in Table 15 above, recent harvesting has been demonstrated in some, but not all of these areas. As such, one-third or 33% of these areas will be removed from the THLB to reflect this avoidance. A sensitivity analysis will also be conducted in which 100% of the potentially unstable and unstable terrain classes will be removed from the THLB.

**Data source and comments:**

rtsa_terrain.shp

This data was obtained from BCTS and was compiled from a variety of sources prior to the previous TSR in 2009.

### 6.4.3   Inoperable areas

Areas in the Revelstoke TSA are inoperable where there are physical barriers or limitations to harvesting; for example, where timber harvesting is uneconomic and/or operationally unfeasible due to hauling distance, steep slopes, soil instability, timber quality, and/or environmental concerns. Areas considered inoperable may change over time as a function of changing harvesting technologies and economics.

For this analysis, the operable land base will be based on operability mapping completed in 2002 for the Revelstoke TSA.

The draft netdown table shows a total of 632 867 hectares being identified as inoperable with 64 614 hectares being removed from the timber harvesting land base.

**Data source and comments:**

BCGW File: REG_LAND_AND_NATURAL_RESOURCE.OPERABILITY_TRV_POLY

Operability mapping was first completed in 2002 for the Revelstoke TSA. This operability mapping was updated in 2008.

Currently, only the 2002 version of the operability mapping is publicly available on the BCGW, and this version was compared with the 2008 version. Both versions were compared against each other and against cutblocks areas harvested since 2011. The comparison shows that both versions classify the same type of terrain, as defined by slope and elevation, as operable and only 3% of the harvested areas was mapped as inoperable.

Both versions of the operability mapping are essentially the same and reasonably capture historic practices. Given that the 2002 version is the only version available in the BCGW, it will be used in this timber supply review.

### 6.4.4   Low productivity sites

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.

In the last two timber supply reviews, low productivity sites/stands were defined by minimum site index thresholds. In the current analysis, a yield curve is available for every stand, so it is now possible to identify low productivity sites based on the potential yield produced by the stand.

Therefore, instead of site index, the minimum harvestable volume thresholds defined in Section 7.1.4 will be used to determine low productivity stands. Stands that, at maximum projected volume, fail to meet the minimum volume per hectare threshold of 273 cubic metres per hectare (slopes less than 30%) or 341 cubic metres per hectare (slopes equal to or greater than 30%) are considered to be growing on low productivity sites and will be removed from the THLB.

### 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 Revelstoke TSA, deciduous trees are not utilized, and often left standing as wildlife trees and for biodiversity value.  Therefore, deciduous-leading stands will be removed from the THLB.

Whitebark pine, which is a designated endangered species under the *Species at Risk Act* (SARA), is present within the Revelstoke TSA.  The species is usually found in high elevation and sub-alpine ecosystems and is often present with balsam.  Given whitebark pine is not harvested in the TSA, whitebark pine-leading stands will be removed from the THLB.

Additionally, in the last AAC determination, the chief forester requested that District staff monitor harvest performance in the following timber profiles:

- balsam-leading stands in which more than 80% of the volume is balsam;
- balsam-leading stands in which the next most abundant species is hemlock; and,
- hemlock-leading stands in which more than 80% of the volume is hemlock.

In the past, these timber profiles were assumed to contribute to the THLB because District staff found that licensees were performing in these stands.  However, in the last rationale, the chief forester expressed a concern about decreasing harvest of hemlock due to economics which could lead to an overharvest of other stand types.  As such, the chief forester made an implementation instruction to monitor the harvest of hemlock, particularly hemlock-leading stands with over 80% hemlock volume.

It should be noted that both western hemlock (Hw) and mountain hemlock (Hm) exist in the Revelstoke TSA, and neither are desirable species for harvest, so all hemlock species were used to define non-merchantable timber profiles.

Neither ECAS or HBS differentiate between western and mountain hemlock and the harvest performance relative to each species of hemlock cannot be assessed.  The contribution of western and mountain hemlock to the projected harvest level will be reported in the timber supply analysis.

For this TSR, FAIB assessed harvest performance in these timber profiles using both Harvest Billing System (HBS) scale and ECAS cruise data and found that although these stands do exist on the land base as mapped in the VRI, harvest performance relative to the profile has not been demonstrated and therefore these stands will be removed from the THLB.  The final area classification will be summarized in a timber supply analysis discussion paper, as described in Section 11 of this document.

**Data source and comments:**

2012-2020 ECAS;

2016 VRI.

### 6.4.6   Riparian areas

Riparian areas occur next to the banks or edges of streams, lakes, and wetlands.  Riparian areas frequently contain the highest number of plant and animal species found in forests, and provide critical habitats, home ranges, and travel corridors for wildlife.  Biologically diverse, these areas maintain ecological linkages throughout the forest landscape, connecting hillsides to streams and upper headwaters to lower valley bottoms.

Management requirements for riparian areas are specified in the Forest Planning and Practices Regulation (FPPR).  The intent of these requirements is to minimize or prevent impacts of forestry and range activity on aquatic resource values (e.g., water quality, aquatic ecosystems) and on the values within the surrounding area (e.g., wildlife habitat).

The FPPR specifies riparian classes for streams, wetlands and lakes. For each riparian class, the FPPR specifies the minimum width of the riparian reserve zone (RRZ) and riparian management zone (RMZ). RRZs require full vegetation retention along the stream, wetland, or lake. Within RMZs, tree retention requirements must be met over the length of the stream or perimeter of the water body.

For this analysis, a new riparian reserve GIS layer was created based on riparian classification and "effective" buffer widths as described in the sections below.

### 6.4.6.1 Stream classification

A stream reach is a relatively homogeneous section of a stream having a sequence of repeating structural characteristics (or processes) and fish habitat types. The key physical factors used to determine reaches in the field are channel morphology, channel confinement, gradient, and streambed and bank materials. Stream reaches generally show uniformity in these characteristics and in discharge.

FPPR stream classifications of S1 to S6 are based on stream width and fish presence, and whether the streams are within a community watershed. S1 streams are designated as large rivers (S1A) if they average, over a one-kilometre stretch, either a stream width or an active floodplain width of 100 metres or greater. In the base case, streams in the BCGW rivers polygon layer were classified as S1A. Streams were classified as S1B to S6 based on surrogates for width and fish habitat, and whether they were within the community watershed data layer.

The stream order attribute in the BCGW streams layer was used as a surrogate for stream width.

A modelled fish passage dataset was used as a surrogate for fish presence. This modelled dataset was created for strategic-level analysis by the Ministry of Environment and Climate Change Strategy. This fish passage model is continuously being improved but currently represents the best available data for fish habitat at the strategic level.

In the modelled fish passage data, all streams downstream of a known fish observation site are considered viable fish habitat. Moving upstream from a known fish observation site, a stream is inferred to be potentially fish bearing until a barrier to fish passage is encountered, after which it is considered non-fish bearing. In the base case, a stream is classified as having fish presence if it was modelled as viable fish habitat or potentially fish bearing.

Data layers used in the classification process including those used in the fish passage model are listed below under data sources.

Table 16 lists the FPPR definitions for stream classifications S1B to S6 and their assignment, using the above assumptions, in the base case.

*Table 16.   Stream classification*

| Stream classification | Fish presence | Assumed channel width (m) | Stream order (used as surrogate for channel width) | Within community watershed |
|---|---|---|---|---|
| S1B | Yes | >20 | >=4 | NA |
| S2 | Yes | >5 – 20 | 3 | - |
| S2 | - | >5 – 20 | 3 | Yes |
| S3 | Yes | 1.5 – 5 | 2 | - |
| S3 | - | 1.5 – 5 | 2 | Yes |
| S4 | Yes | <1.5 | 1 | - |
| S4 | - | <1.5 | 1 | Yes |
| S5 | No | >3 | >1 | No |
| S6 | No | <= 3 | 1 | No |

### 6.4.6.2  Lake and wetland classification

There are two types of lakes in the Revelstoke TSA, natural and reservoir (man-made).  Properly functioning lakes store substantial amounts of water, are important in managing floods and droughts, replenish groundwater, positively influence water quality downstream and provide habitat for fish, invertebrates and birds.  Lakes also provide important recreational and tourism opportunities.

A wetland is a swamp, marsh, or other similar area that supports natural vegetation that is distinct from the adjacent upland areas.  More specifically, a wetland is an area where the water table is at, near, or above the surface or where soils are saturated by water long enough that excess water and resulting low oxygen levels are principal determinants of vegetation and soil development.

In the FPPR, lake classification is based on the size of the lake and on the biogeoclimatic unit in which it occurs.  Wetland classification is based on the size of the wetland, the biogeoclimatic unit in which it occurs, and by its proximity to other wetlands (wetland complex).  In Revelstoke TSA, no L2 or W2 are present as only ICH and ESSF zones are found in the unit.  Spatial data layers for both lakes and wetlands are available from the BCGW, and the spatial extent defined in that dataset will be used to classify these features in the base case as listed in Table 17 below.

### 6.4.6.3  Riparian buffers

The FPPR defines the RRZ and RMZ widths of streams, lakes, and wetlands and requires forest tenure holders to address the retention of trees in a RMZ in their FSP.  In the Revelstoke TSA, the minimum percentage of basal area to be retained in a RMZ specified in FSPs is shown in Table 17 below.

Riparian reserve strategies were implemented in the model by establishing "effective" reserve buffers around the riparian features for streams, wetlands and lakes according to the riparian feature classification.  To accommodate modelling requirements, the RMZ specifications were converted to an equivalent width with full retention.  Thus, a 10% minimum retention commitment in the 30 metres wide RMZ for a S4 became a three metre wide 100% retention on one side of the creek.  The "effective" reserve buffer width was calculated as (RRZ Width (m) + (RMZ Width (m) * Percentage of Basal Area to be Retained within the RMZ)).

The resulting riparian layer will be excluded from the THLB.

*Table 17.   Streams, wetlands and lakes riparian widths (based on FPPR defaults)*

| Stream, wetland, or lake class | RRZ width[1] (metres) | RMZ width[1] (metres) | RRZ percent (%) retention[1] | RMZ percent (%) basal area retention[2] | Effective reserve width[3] (metres) |
|---|---|---|---|---|---|
| S1-A | 0 | 100 | N/A | 20 | 20 |
| S1-B | 50 | 20 | 100 | 20 | 54 |
| S2 | 30 | 20 | 100 | 20 | 34 |
| S3 | 20 | 20 | 100 | 20 | 24 |
| S4 | 0 | 30 | N/A | 10 | 3 |
| S5 | 0 | 30 | N/A | 10 | 3 |
| S6 | 0 | 20 | N/A | 0 | 0 |
| W1 | 10 | 40 | 100 | 10 | 14 |
| W3 | 0 | 30 | N/A | 10 | 3 |
| W4 | 0 | 30 | N/A | 10 | 3 |
| W5 | 10 | 40 | 100 | 10 | 14 |
| L1 Designated (area <5)[4] | 10 | 100 | 100 | 10 | 20 |
| L1-A (area > 1000 ha) | 0 | 0 | N/A | 10 | 0 |
| L1-B (area > 5 ha) | 10 | 0 | 100 | 10 | 10 |
| L3 (area 1-5 ha) | 0 | 30 | N/A | 10 | 3 |
| L4 (area 0.5-1 ha) | 0 | 30 | N/A | 10 | 3 |

[1] Consistent with FPPR Section 47, 48, 49 and 51.

[2] Consistent with licensees' and BCTS' FSPs.

[3] Effective reserve width: reserve zone width + (management zone width X retention % / 100).  Buffer is applied to each side of stream centre line and outside polygon of rivers, lakes, and wetlands.

[4] Lakeshore management zones have been designated under the Code and grandfathered under FRPA for Begbie Lake and Wetask Lake.

**Data source and comments:**

**Rivers (S1A):**

BCGW file: WHSE_BASEMAPPING.FWA_RIVERS_POLY

**Community watersheds:**

BCGW file: WLS_COMMUNITY_WS_PUB_SVW

**Fish passage:**

Fish Passage GIS Analysis (Version 2.2, BC Ministry of Environment), which is based on the following layers:

**Streams (S1B-S16):**

BCGW file: WHSE_BASEMAPPING.FWA_STREAM_NETWORKS_SP

Point locations of known and recorded fish observations

BCGW file: WHSE_FISH.FISS_FISH_OBSRVTN_PNT_SP

Point locations of water obstacles

BCGW file: WHSE_BASEMAPPING.FWA_OBSTRUCTIONS_SP

Point locations of all known obstacles to fish passage from several fisheries datasets.

BCGW file: WHSE_FISH.FISS_OBSTACLES_PNT_SP

**Lakes:**

BCGW file: WHSE_BASEMAPPING.TRIM_EBM_WATERBODIES

**Wetlands:**

Individual wetlands were classified using a GIS process to determine their size and whether they were a wetland complex.

BCGW file: WHSE_BASEMAPPING.TRIM_EBM_WETLANDS.

### 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, due to increased interest in modelling forest recovery after disturbances, PSPs with natural damage (insects, disease, windthrow, fire, snow, or animal) may be protected and re-measured.

Within the Revelstoke TSA, there are currently 46 active PSPs covering a total of 187 hectares.  Of these, 6 PSPs (30 hectares) are protected from harvest and 7 hectares will be removed from the THLB to protect these PSPs.

There are 12 active government research installation sites in the Revelstoke TSA.  The total area of all active research installations is 51 hectares, and their sizes range from 0.9 hectares to 10.4 hectares. 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.  Therefore 30 hectares will be removed from the THLB to protect these research installations.

In the timber supply analysis, 37 hectares will be removed from the THLB to account for PSPs and research installations.

### 6.4.8   Wildlife tree retention

The *Forest and Range Practices Act* (FRPA) includes an objective to retain wildlife trees in each cutblock.  The FPPR specifies that the total amount of wildlife tree retention area (WTRA) that relates to the cutblocks in a year is a minimum of 7% of the total area of the cutblocks; for an individual cutblock, the total amount of wildlife tree retention area that relates to the cutblock is a minimum of 3.5% of the cutblock.  These practice requirements have been adopted in approved FSPs in the Revelstoke TSA.

Operationally, the amount of wildlife tree retention associated with a cutblock usually exceeds the minimum requirements.  By law, FSP holders must report, annually, the amount of area that was harvested and the location and size of all associated WTRA.  The effectiveness of the WTRA to provide a range of habitat with the structural attributes understood as necessary for maintaining the species dependent on wildlife trees and coarse woody debris (CWD) is assessed by the Forest and Range Evaluation Program (FREP).

The percentage of WTRA retention associated with all cutblocks harvested since 2012 was calculated using information from RESULTS data for cutblocks harvested in the last 10 years.  Only cutblocks harvested in the AFLB by volume-based forest tenure holders and British Columbia Timber Sales (BCTS) were considered.  The information from RESULTS shows that on average, WTRA account for 11%+ of the cutblock area.

WTRAs are often located within areas that are otherwise constrained, such as riparian areas, sensitive or inoperable terrain.  Therefore, the impact to the THLB may be different than the 7% minimum legal retention requirement or the reported average of 11% retention.

To investigate this practice, a randomly selected sample of approximately 10% of the mapped WTRA in RESULTS was overlaid with other constrained areas within the AFLB, such as inoperable and riparian reserve areas to assess the overlap between WTRA and other THLB netdowns.  The following table details the contribution of various land classes to the WTRA sample.

*Table 18.   RESULTS sampled retention netdown*

| Land class | Net area removed (ha) | Netdown summary (ha) |
| --- | --- | --- |
| **Analysis Forest Land Base = 435 ha** | | |
| Ungulate winter range or wildlife habitat area | 54 | 381 |
| Inoperable areas | 73 | 308 |
| Non-merchantable timber profiles | 15 | 293 |
| Riparian areas | 14 | 279 |
| **Net WTRA** | **156** | **279** |

The sample indicates that 279 hectares of the 435 hectares (64%) of WTRA were established in areas considered to be THLB.  It was therefore assumed that, of the 11% average cutblock area in WTRA reported in RESULTS, only 7.1% would be expected to overlap with THLB area.

In timber supply analysis, stand-level retention in the netdown process can be modelled as an aspatial adjustment factor and applied to each hectare in the THLB based on the current management practice.  This approach recognizes that although retention is not dispersed evenly across the land base the spatial variation in retention levels can be generalized across the land base without undue risk to yield estimation and forms a reasonable approximation for modelling timber supply in a TSA.

Consequently, to account for established and future WTRA, an aspatial reduction of 7.1% will be applied to all stands within the THLB that are not overlapped by riparian areas.

There has been very little FREP sampling for stand-level biodiversity within the Revelstoke TSA since 2012.  Consequently, information about the effectiveness of the WTRA is not yet available.

A sensitivity analysis exploring the implications of increasing the amount of WTRA will be performed.

**Data source and comments**:

BCGW file:     WHSE_FOREST_VEGETATION.RSLT_FOREST_COVER_RESERVE_SVW

BCGW file:     WHSE_FOREST_VEGETATION.RSLT_OPENING_SVW

FREP Data:     Forest Science, Planning and Practices Branch

### 6.4.9   Cultural heritage resources

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.  Archaeological sites are discussed in the previous section.

Licensees receive information about cultural heritage sites through information sharing and consultation with First Nations and are encouraged to work together with First Nations to develop plans to mitigate impact to these sites.  In some cases, licensees may alter locations of roads and cutblocks or take other steps to minimize or eliminate impacts on cultural heritage resources.  The frequency and extent to which forest licensees alter plans and the impact of these actions on timbers supply is not tracked by the ministry and is unknown.  Some assessments have been conducted to a limited extent throughout the Selkirk Resource District as part of FREP.  Results of these assessments within the TSA will be reviewed and may help to quantify these impacts.

Many cultural heritage concerns and smaller archaeological sites can be addressed through current management practices or through changes to the harvest plans.  For example, cultural heritage resources are often situated near water bodies and can therefore be protected by using a riparian management area or creating a wildlife tree patch where wildlife values also exist.  These two management tools are accounted for separately in the timber supply analysis.  In other cases, sensitive areas can be protected by using management practices such as winter logging.  For this reason, no additional land base reductions will be applied for cultural heritage resources.

Consultation with First Nations will take place regarding this document and the *Discussion Paper* that will be released following the timber supply analysis.  Information brought forward by First Nations during consultation will be considered by the chief forester prior to a decision being made and may also influence modelling or sensitivity analysis that is to be conducted.

# 7.   Current Forest Management Assumptions

## 7.1   Harvesting

This section of the *Data Package* contains the timber supply analysis assumptions related to timber harvesting activities and practices.

### 7.1.1   Recent harvest performance

**Allowable Annual Cut**

In 1985, the AAC for the Revelstoke TSA was set at 269 000 cubic metres.  This AAC remained in effect until 1995, when the AAC was decreased to 230 000 cubic metres.  The AAC was further reduced on July 28, 2011, to its current level of 225 000 cubic metres.

The Ministry's Harvest Billing System (HBS) was used to examine the harvest performance relative to the AAC from 2009 to 2021.  As seen in Figure 4 and Table 19, below, harvest levels fluctuate on a yearly basis and are generally below the AAC.
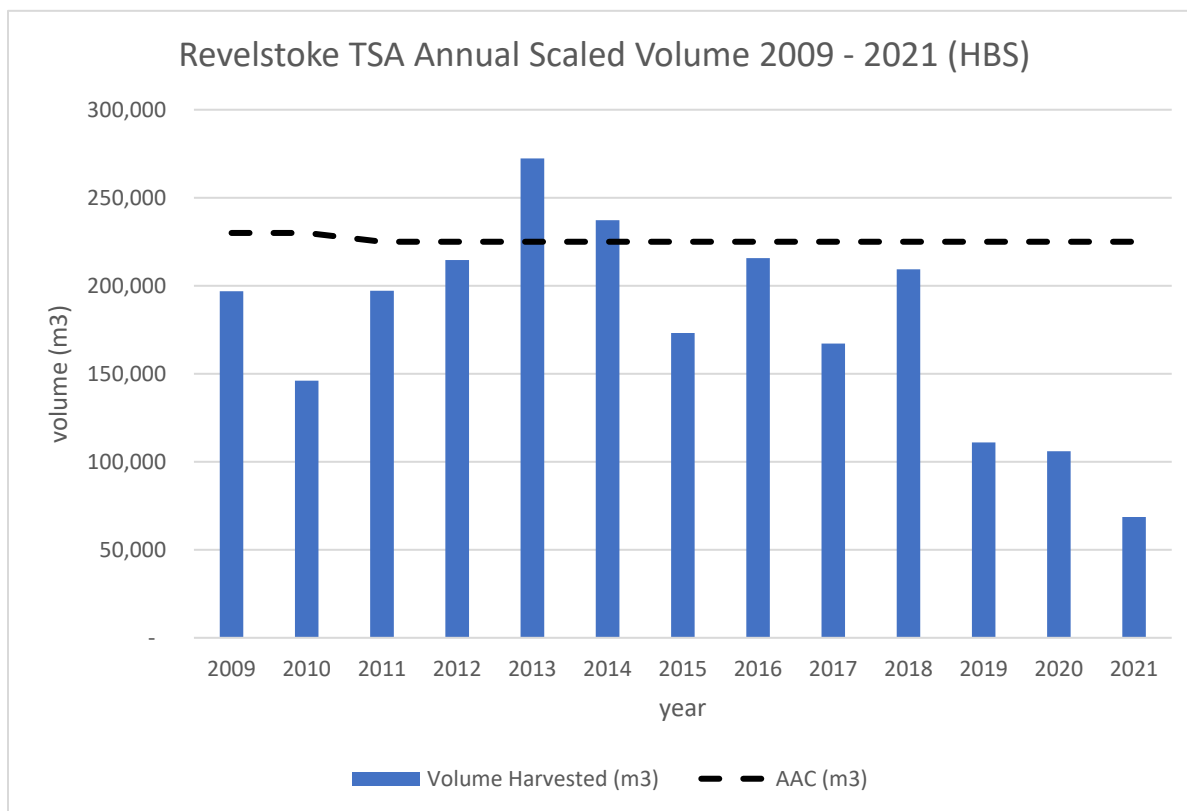


*Figure 4.    Annual scaled volume in the Revelstoke TSA from 1995 to 2019.*

*Table 19.   Volume harvested in the Revelstoke TSA from 2009 to 2021*

| Calendar year | AAC (m³) | Volume harvested (m³) | Percent of AAC harvested |
|---|---|---|---|
| 2009 | 230 000 | 196 891 | 86% |
| 2010 | 230 000 | 146 057 | 64% |
| 2011 | 225 000* | 197 163 | 88% |
| 2012 | 225 000 | 214 580 | 95% |
| 2013 | 225 000 | 272 294 | 121% |
| 2014 | 225 000 | 237 225 | 105% |
| 2015 | 225 000 | 173 142 | 77% |
| 2016 | 225 000 | 215 721 | 96% |
| 2017 | 225 000 | 167 131 | 74% |
| 2018 | 225 000 | 209 355 | 93% |
| 2019 | 225 000 | 110 977 | 49% |
| 2020 | 225 000 | 105 994 | 47% |
| 2021 | 225 000 | 68 608 | 30% |
| **Total** | **2 935 000** | **2 315 138** | **79%** |

(*) the AAC was 230 000 cubic metres until July 27, 2011.

Since the last AAC determination in 2011, the average proportion of the AAC harvested was approximately 80%.  This equates to an average realized harvest level of 197 219 cubic metres per year.

**Harvest Species**

As shown in Figure 5, below, the largest proportion of the volume harvested by species is from cedar. Since 2011, cedar volume has averaged 30% of the annual harvest volume, followed by hemlock (25%) and Douglas-fir (21%) and other species such as spruce, pine or balsam (24%).
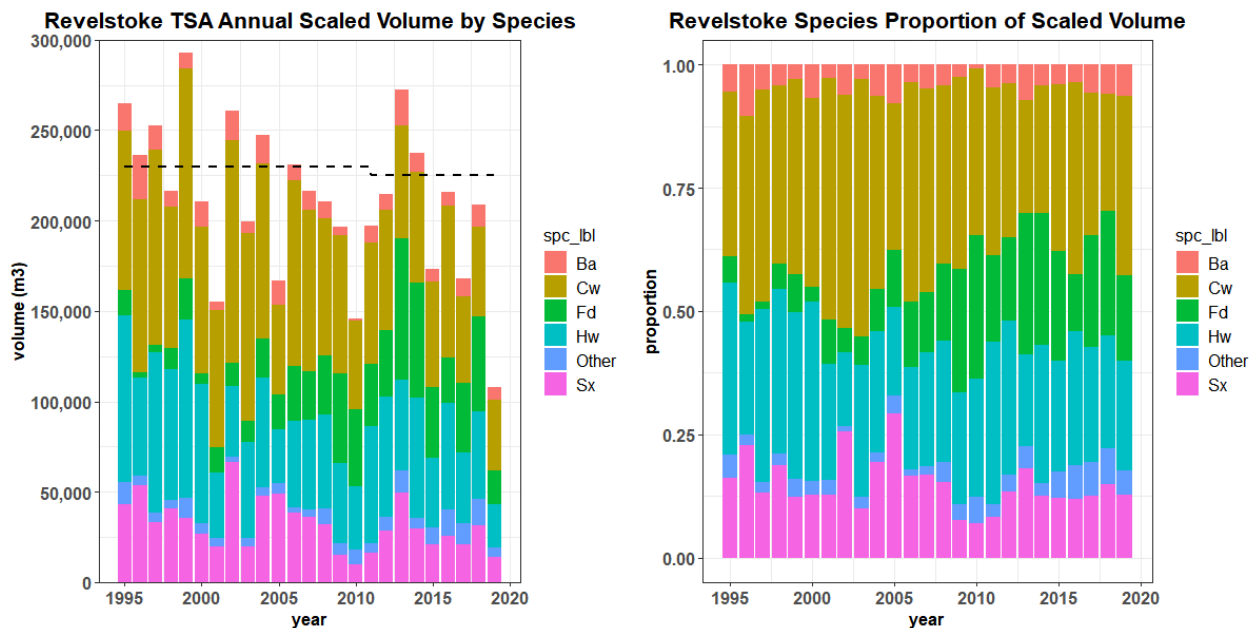


*Figure 5.   Annual scaled volume by species and species proportion of scale volume – Revelstoke TSA.*

In contrast, the VRI shows that about 28% of the volume greater than 60 years of age is hemlock, followed by spruce (25%), cedar (18%), Douglas-fir (15%) and other species (14%).

In the previous *AAC Determination Rationale* (2011), the chief forester noted an apparent discrepancy in inventory cedar volume and scaled cedar volume and recommended further study to examine the potential impact of cedar volume on timber supply. For this timber supply analysis, the projected species to be harvested will be compared against the recently harvested species profile. Alternative harvest scenarios and/or sensitivity analyses will be conducted, if required.

**Harvest Slope**

The terrain of the Revelstoke TSA is relatively steep and rugged and most of the mature forested area is found on terrain with an average slope of 21 to 50%. As shown in Figure 6, below, harvesting has occurred in almost all slope classes over the past five years.
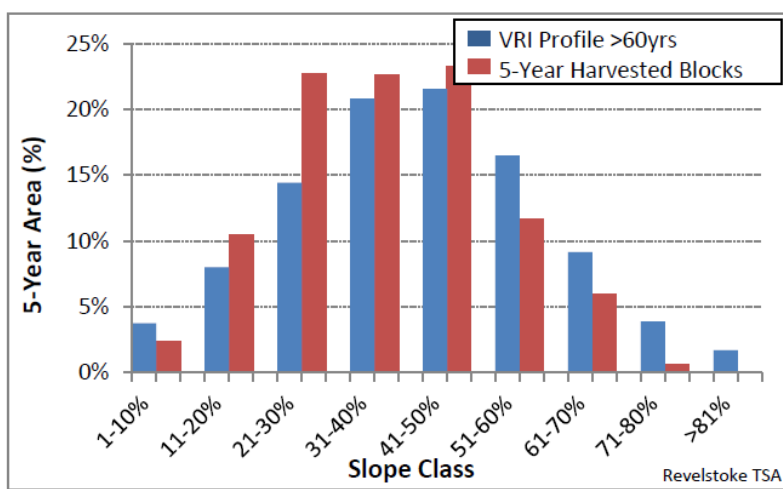


*Figure 6.    VRI profile vs. 5-year harvested blocks by slope class.*

For this timber supply analysis, assumptions related to unstable, inaccessible or inoperable slopes are described under Sections 6.4.2 and 6.4.3. The analysis report will describe the projected harvest volume by slope classification.

**7.1.2 Administration of unharvested volume**

Unharvested volume is volume that tenure holders had the rights to harvest but did not utilize within a previous and completed cut control period. According to provisions of the *Forest Act*, the minister may, but is not obliged to, dispose of unharvested volume by issuing new tenures. Unharvested volume has accumulated within the Revelstoke TSA and a disposition plan is currently under development for 237 538 cubic metres.

For the timber supply analysis, this unharvested volume will remain in the growing stock available for harvest in the base case. The implication of issuing a future tenure from the unharvested volume will be investigated in a sensitivity analysis.

### 7.1.3   Utilization levels

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

The utilization levels define the maximum stump height, minimum top diameter (inside bark) and the corresponding minimum DBH.  However, for yield curve projections, the specifications for minimum stump diameter are converted to a corresponding breast height diameter.

Table 20 shows the utilization levels used in the base case of the timber supply analysis for the Revelstoke TSA.

*Table 20.   Harvest merchantability specifications utilized within the Revelstoke TSA*

| Leading species | Minimum DBH (cm) | Maximum stump height (cm) | Minimum top diameter (cm) |
|---|---|---|---|
| Lodgepole pine | 12.5 | 30.0 | 10.0 |
| Cedar older than 141 years | 17.5 | 30.0 | 15 |
| All other species except cedar older than 141 years | 17.5 | 30.0 | 10.0 |

### 7.1.4   Minimum harvestable criteria

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

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

**Minimum harvestable volume (MHV)**

The minimum harvestable volume per hectare used in the base case was defined using appraisal data in the Electronic Commerce Appraisal System (ECAS).  The volume per hectare recorded from stands that were timber cruised between 2010 to 2021 was summarized by harvest system and select percentiles.  The merchantability of a stand can be correlated with the required harvest system because a higher harvest volume is necessary to compensate for more expensive harvest systems such as cable harvesting.  The MHV applied in the base case will vary by the slope classes shown to represent the different harvest systems required to operate in each type of terrain, as shown in Table 21, below.

*Table 21.   Volume per hectare distribution by percentile from 2010 - 2020 ECAS data*

| Harvest system (slope range) | Number of timber marks sampled | Volume distribution (m³/ha) by percentile | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Minimum 0% | 1% | 5% | 10% | 25% | Median 50% | 75% | Maximum 100% | Mean | SD |
| Ground (<30%) | 27 | 272 | 273 | 279 | 295 | 346 | 395 | 476 | 553 | 408 | 89 |
| Mixed (30% to <50%) | 55 | 343 | 348 | 376 | 388 | 416 | 465 | 506 | 661 | 469 | 70 |
| Cable (>=50%) | 10 | 341 | 347 | 371 | 401 | 430 | 498 | 534 | 623 | 485 | 80 |

The slope class range associated with each harvest system was derived using the 25 metre provincial digital elevation model (DEM).  DEM slopes were generally lower than the slope values recorded in ECAS.

Based on the information shown in Table 21, above, the MHV will be set at the first percentile value for each slope range.  The related assumption summary is shown in Table 22, below.  Sensitivity analysis will examine the impact of using higher thresholds.

*Table 22.   MHV summary for the Revelstoke TSA*

| Harvest system (slope range) | MHV (m³/ha) |
|---|---|
| Ground (<35%) | 273 |
| Mixed (30% to <50%) | 348 |
| Cable (>=50%) | 347 |

**Minimum harvestable age (MHA)**

The minimum harvestable age (MHA) is the minimum age at which a stand is considered to be merchantable for harvest.  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.  The culmination age is the age at which the mean annual increment (MAI) reaches a maximum and thereafter begins to decrease.  Harvesting a stand at the age at which it reaches 95% of its culmination MAI (CMAI95) 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.
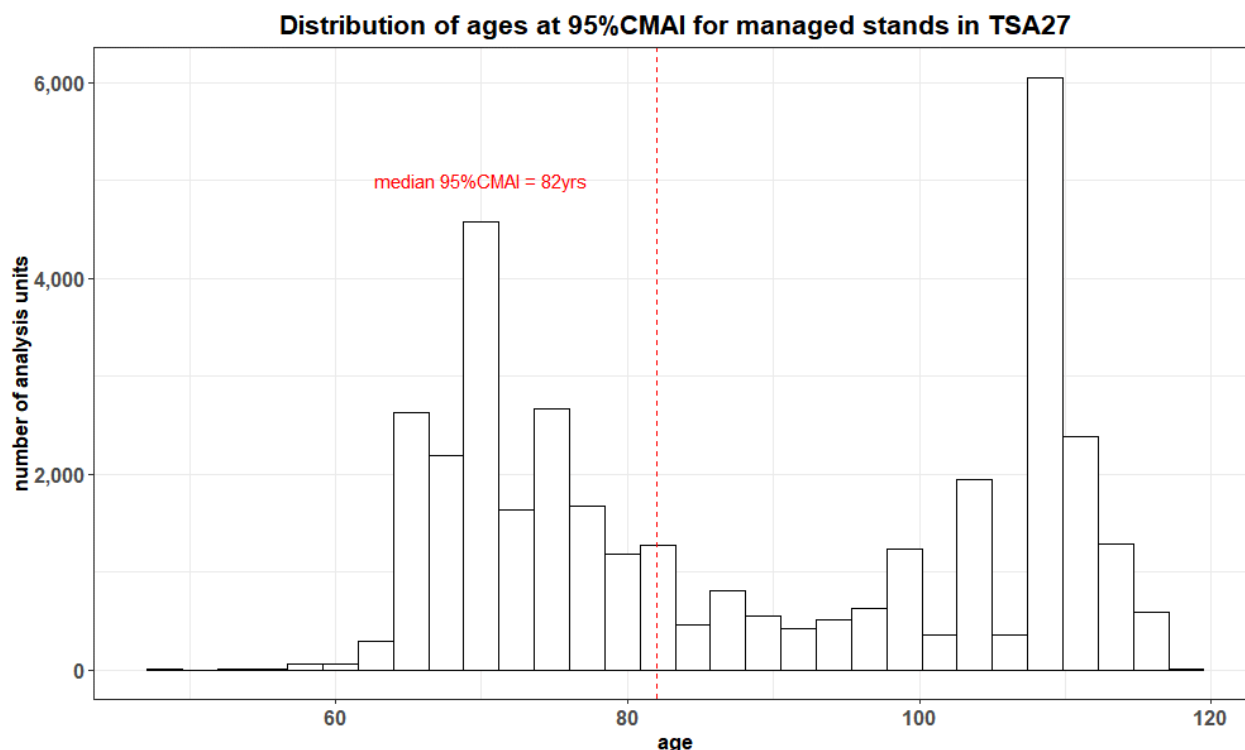
*Figure 7.    Distribution of 95% culmination ages of existing and future managed stands in the Revelstoke TSA.*

**Data source and comments**:

ECAS (2012 – 2021);

Consolidated cutblocks.

### 7.1.6    Volume exclusions for the deciduous and whitebark pine component of conifer-leading stands

In the Revelstoke TSA, deciduous volume within conifer-leading stands and the whitebark pine volume component of conifer stands are typically not harvested.  As such, the deciduous and whitebark pine volume will not be considered to contribute to the timber supply of the Revelstoke TSA.

## 7.2    Silvicultural systems

In the Revelstoke TSA, clearcut with reserves is the silvicultural system that is primarily used and will be modelled in the base case.  Under this system, a range of patch sizes of even-aged forest is produced. A characteristic of this system is the maintenance of older forest remnants within harvest blocks.  These remnants are intended to function as wildlife tree retention areas, riparian reserves and management zones.  Cutting of adjacent blocks is restricted until green-up conditions are met.

## 7.3    Resource management objectives

The legal direction for the management of resource values for the Revelstoke TSA is provided by the Revelstoke Higher Level Plan Order (RHLPO) and the *Forest and Range Practices Act* (FRPA).

The RHLPO, which was first approved under the *Forest Practices Code of British Columbia Act* in 2005 and amended pursuant to the *Land Act* in 2009 and 2011, describes management requirements for the protection of old growth and high value grizzly bear habitat.

Resource management objectives for identified values, including caribou, moose, deer and elk, are established under FRPA.

Intended results and strategies in relation to objectives established or continued under the *Land Act* or FRPA are specified in FSPs prepared by forest tenure holders.

Management objectives that result in the exclusion of harvesting from an area are addressed in the previous sections of this document, whereas those which require the retention of different forest characteristics across the landscape, but do not fully exclude harvesting, are addressed below.

### 7.3.1   Old forest (landscape-level biodiversity)

Old forest is 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.

The RHLPO contains management objectives for old forest retention specific to each ecosystem depending on the assigned biodiversity emphasis option (BEO) and natural disturbance type (NDT).  In the Revelstoke TSA, the forested BEC zones are the Interior Cedar Hemlock (ICH) and the Engelmann Spruce Subalpine Fir (ESSF), and the NDT are 1 (rare stand-initiating events) and 2 (infrequent stand-initiating events).  Old forest is defined as all stands of trees older than 250 years of age.

The old forest requirements are summarized in Figure 8 and Table 23, below.  The RHLPO specifies that except for Landscape Unit R3 (Akolkolex), the old-seral requirements are reduced to one-third of the seral requirements in areas identified as low biodiversity emphasis.  The RHLPO also specifies that the full old-seral requirements must be achieved within 240 years – or by year 2251.

In 2007 non-legal OGMAs were spatially mapped by Integrated Land Management Bureau (ILMB) staff to reserve the area required to meet higher level plan biodiversity objectives for old forest.  These non-legal OGMA have been adopted by the licensees to account for the required old forest conservation amounts.

In the base case for this timber supply analysis, all forested areas within the non-legal OGMAs will be retained toward the minimum old growth requirement amount.  Where the minimum required amount is not fully met using OGMA, additional old outside of OGMA will be retained using an oldest first approach.  Where the minimum required amount is still not fully met using all old forest, recruitment from the oldest available younger age classes will be used to meet the target.
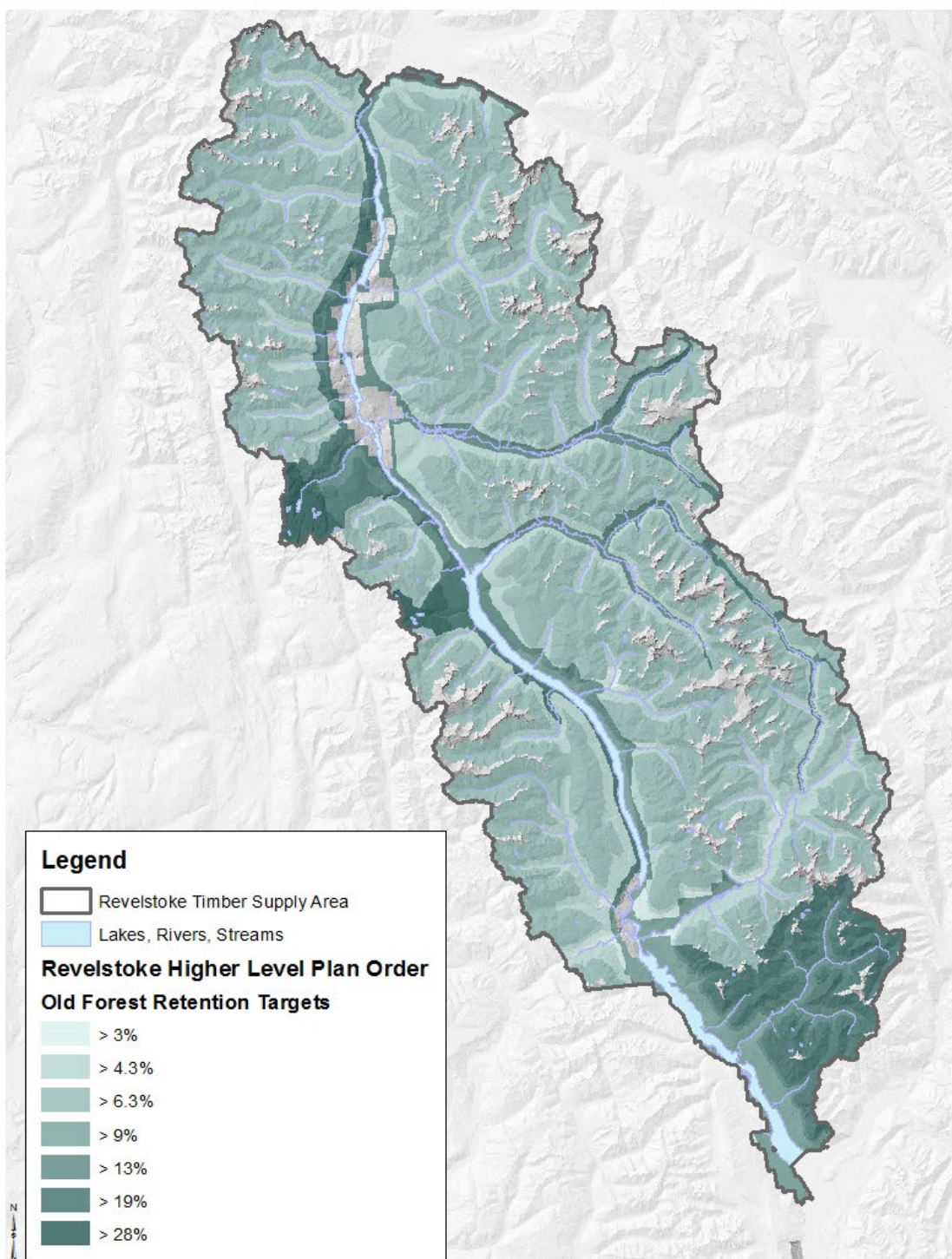
*Figure 8.    Old forest minimum retention requirements within the Revelstoke TSA (private lands and other land designations not shown).*

*Table 23.   Old forest requirements in the Revelstoke TSA are to be met using the biogeoclimatic subzone variants mapped on June 30, 2011 (BEC v7)*

| Landscape unit | NDT | BEC | BEO | Old target 2011 - 2251 | Old target 2251-beyond |
|---|---|---|---|---|---|
| Akolkolex | NDT1 | ESSF | Intermediate | 19 | 19 |
| | NDT1 | ESSF | Low | 19 | 19 |
| | NDT1 | ICH | Low | 13 | 13 |
| | NDT2 | ICH | Low | 9 | 9 |
| Other units | NDT1 | ESSF | High | 28 | 28 |
| | NDT1 | ICH | High | 19 | 19 |
| | NDT2 | ICH | High | 13 | 13 |
| | NDT1 | ESSF | Intermediate | 19 | 19 |
| | NDT1 | ICH | Intermediate | 13 | 13 |
| | NDT2 | ICH | Intermediate | 9 | 9 |
| | NDT1 | ESSF | Low | *6.3 | 19 |
| | NDT1 | ICH | Low | *4.3 | 13 |
| | NDT2 | ICH | Low | *3 | 9 |

(*)   refers to 1/3 drawdown target.

Table 24, below shows current old-seral distribution by landscape unit, NDT/BEC and BEO combinations for the ALFB.  Overall, the total amount of old growth (58 460 hectares) exceeds the minimum amount required (36 667 hectares).  However, in some landscape units, there are NDT/BEC combinations where the amount of old growth is below the minimum amount required by the RHLPO.  In most cases, these combinations correspond to relatively small AFLB units (i.e., 100 hectares or less) or units with a low BEO.

In the timber supply analysis, old growth stands will only contribute to the harvest level in units where the amount of old growth area exceeds the minimum amount required by the RHLPO and where no other requirements, such as wildlife habitat, are in place.  This will be done by ensuring that all forested areas within the non-legal OGMAs are retained toward the minimum old growth requirement amount.  Where the minimum required amount is not fully met using OGMA, additional old outside of OGMA will be retained using an oldest first approach.  Where the minimum required amount is still not fully met using all old forest, recruitment from the oldest available younger age classes will be used to meet the target.

*Table 24.   Current old seral distribution within the AFLB of the Revelstoke TSA*

| Landscape unit | BEC7 NDT | BEC7 zone | BEO | AFLB (ha) | RHLPO old seral target percent | RHLPO old seral target area (ha) | Old seral (ha) | Area not meeting target (ha) | Area exceeding target (ha) |
|---|---|---|---|---|---|---|---|---|---|
| Akolkolex | NDT1 | ICH | Low | 8135 | >13% | 1058 | 2251 | | 1193 |
| Akolkolex | NDT1 | ICH | Intermediate | 14 | >13% | 2 | 0 | 2 | |
| Akolkolex | NDT1 | ESSF | Low | 10386 | >19% | 1973 | 2006 | | 33 |
| Akolkolex | NDT1 | ESSF | Intermediate | 1 | >19% | 0 | 0 | | |
| Akolkolex | NDT2 | ICH | Low | 4874 | >9% | 439 | 353 | 86 | |
| Akolkolex | NDT2 | ICH | Intermediate | 3323 | >9% | 299 | 48 | 251 | |
| Big Eddy | NDT1 | ICH | Low | 4482 | >13% | 583 | 1411 | | 828 |
| Big Eddy | NDT1 | ICH | High | 1667 | >19% | 317 | 362 | | 45 |
| Big Eddy | NDT1 | ESSF | Low | 3587 | >19% | 682 | 871 | | 189 |
| Big Eddy | NDT1 | ESSF | High | 92 | >28% | 26 | 59 | | 33 |
| Bigmouth | NDT1 | ICH | Low | 7329 | >13% | 953 | 2663 | | 1710 |
| Bigmouth | NDT1 | ESSF | Low | 8976 | >19% | 1705 | 1985 | | 280 |
| Cranberry | NDT2 | ICH | Low | 7 | >9% | 1 | 0 | 1 | |
| Cranberry | NDT2 | ICH | Intermediate | 399 | >9% | 36 | 8 | 28 | |
| Downie | NDT1 | ICH | Low | 54 | >13% | 7 | 2 | 5 | |
| Downie | NDT1 | ICH | Intermediate | 10 | >13% | 1 | 7 | | 6 |
| Downie | NDT1 | ESSF | Low | | >19% | | 0 | | |
| Downie | NDT1 | ESSF | Intermediate | | >19% | | 0 | | |
| Downie | NDT2 | ICH | Low | | >9% | | 0 | | |
| Downie | NDT2 | ICH | Intermediate | 172 | >9% | 15 | 107 | | 92 |
| French | NDT1 | ICH | Low | | >13% | | 0 | | |
| French | NDT1 | ICH | Intermediate | | >13% | | 0 | | |
| French | NDT1 | ESSF | Low | | >19% | | 0 | | |
| French | NDT1 | ESSF | Intermediate | | >19% | | 0 | | |
| Frisby Ridge | NDT1 | ICH | Low | 5003 | >13% | 650 | 1880 | | 1230 |
| Frisby Ridge | NDT1 | ICH | High | 1424 | >19% | 271 | 284 | | 13 |
| Frisby Ridge | NDT1 | ESSF | Low | 5708 | >19% | 1085 | 2264 | | 1179 |
| Frisby Ridge | NDT2 | ICH | High | 76 | >13% | 10 | 19 | | 9 |
| Goldstream | NDT1 | ICH | Low | 114 | >13% | 15 | 27 | | 12 |
| Goldstream | NDT1 | ICH | Intermediate | 281 | >13% | 37 | 34 | 3 | |
| Goldstream | NDT1 | ESSF | Low | | >19% | | 0 | | |
| Goldstream | NDT1 | ESSF | Intermediate | | >19% | | 0 | | |
| Goldstream | NDT2 | ICH | Intermediate | 65 | >9% | 6 | 34 | | 28 |
| Horne | NDT1 | ICH | Low | 5058 | >13% | 658 | 1982 | | 1324 |
| Horne | NDT1 | ICH | Intermediate | 1406 | >13% | 183 | 689 | | 506 |
| Horne | NDT1 | ICH | High | 2213 | >19% | 420 | 967 | | 547 |
| Horne | NDT1 | ESSF | Low | 9807 | >19% | 1863 | 2368 | | 505 |
| Horne | NDT1 | ESSF | Intermediate | 1613 | >19% | 306 | 928 | | 622 |
| Horne | NDT1 | ESSF | High | 200 | >28% | 56 | 121 | | 65 |

| Landscape unit | BEC7 NDT | BEC7 zone | BEO | AFLB (ha) | RHLPO old seral target percent | RHLPO old seral target area (ha) | Old seral (ha) | Area not meeting target (ha) | Area exceeding target (ha) |
|---|---|---|---|---|---|---|---|---|---|
| Illecillewaet | NDT1 | ICH | Low | 16801 | >13% | 2184 | 3746 | | 1562 |
| Illecillewaet | NDT1 | ICH | Intermediate | 1318 | >13% | 171 | 778 | | 607 |
| Illecillewaet | NDT1 | ESSF | Low | 20351 | >19% | 3867 | 3122 | 745 | |
| Illecillewaet | NDT1 | ESSF | Intermediate | 389 | >19% | 74 | 204 | | 130 |
| Illecillewaet | NDT2 | ICH | Low | 3479 | >9% | 313 | 145 | 168 | |
| Jordan | NDT1 | ICH | Low | 6586 | >13% | 856 | 1813 | | 957 |
| Jordan | NDT1 | ICH | Intermediate | 125 | >13% | 16 | 9 | 7 | |
| Jordan | NDT1 | ESSF | Low | 7750 | >19% | 1472 | 2460 | | 988 |
| Jordan | NDT2 | ICH | Low | 852 | >9% | 77 | 90 | | 13 |
| Jordan | NDT2 | ICH | Intermediate | 1211 | >9% | 109 | 26 | 83 | |
| Jordan | NDT2 | ICH | High | 92 | >13% | 12 | 6 | 6 | |
| LaForme | NDT1 | ICH | Low | 5642 | >13% | 733 | 2086 | | 1353 |
| LaForme | NDT1 | ICH | Intermediate | 2281 | >13% | 297 | 316 | | 19 |
| LaForme | NDT1 | ESSF | Low | 13701 | >19% | 2603 | 4045 | | 1442 |
| LaForme | NDT1 | ESSF | Intermediate | 216 | >19% | 41 | 40 | 1 | |
| LaForme | NDT2 | ICH | Low | 1094 | >9% | 98 | 223 | | 125 |
| LaForme | NDT2 | ICH | Intermediate | 2507 | >9% | 226 | 69 | 157 | |
| Liberty | NDT1 | ICH | Low | 2861 | >13% | 372 | 1219 | | 847 |
| Liberty | NDT1 | ICH | Intermediate | 3913 | >13% | 509 | 1190 | | 681 |
| Liberty | NDT1 | ICH | High | 4650 | >19% | 884 | 1121 | | 237 |
| Liberty | NDT1 | ESSF | Low | 4478 | >19% | 851 | 1991 | | 1140 |
| Liberty | NDT1 | ESSF | Intermediate | 3188 | >19% | 606 | 914 | | 308 |
| Liberty | NDT1 | ESSF | High | 3908 | >28% | 1094 | 2165 | | 1071 |
| Liberty | NDT2 | ICH | High | 2 | >13% | 0 | 0 | | |
| Mica | NDT1 | ICH | Low | 5 | >13% | 1 | 1 | | |
| Mica | NDT1 | ICH | Intermediate | 314 | >13% | 41 | 34 | 7 | |
| Mica | NDT1 | ESSF | Low | | >19% | | 0 | | |
| Mica | NDT1 | ESSF | Intermediate | | >19% | | 0 | | |
| Mulvehill | NDT2 | ICH | Intermediate | 201 | >9% | 18 | 0 | 18 | |
| Redrock | NDT1 | ICH | Low | 3328 | >13% | 433 | 854 | | 421 |
| Redrock | NDT1 | ICH | Intermediate | 2119 | >13% | 275 | 348 | | 73 |
| Redrock | NDT1 | ESSF | Low | 3660 | >19% | 695 | 122 | 573 | |
| Soards | NDT1 | ICH | Low | 7482 | >13% | 973 | 2751 | | 1778 |
| Soards | NDT1 | ICH | Intermediate | 394 | >13% | 51 | 127 | | 76 |
| Soards | NDT1 | ICH | High | 1396 | >19% | 265 | 533 | | 268 |
| Soards | NDT1 | ESSF | Low | 14510 | >19% | 2757 | 2158 | 599 | |
| Soards | NDT1 | ESSF | Intermediate | 185 | >19% | 35 | 22 | 13 | |
| Soards | NDT1 | ESSF | High | 2 | >28% | 1 | 2 | | 1 |
| **Total** | | | | **227,467** | | **36,667** | **58,460** | **2753** | **24,545** |

To be consistent with the RHLPO, the old forest requirements will be applied to the AFLB, including the forested area covered by provincial parks and Mount Revelstoke National Park.

Four sensitivity analyses will be considered for old forest.  The first will examine the impact of applying the old forest requirements using the latest version of BEC (v12), the second will examine the impact of applying the full old forest retention targets immediately (not use the one-third drawdown in most low BEO), the third will examine the impact of not using the OGMA and evaluating the old targets aspatially, and the fourth will examine the impact of removing federal parks from the AFLB.

### 7.3.1.1 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.  Of this amount, the Old Growth Technical Advisory Panel identified a total area of 45 173 hectares of old growth forest in the Revelstoke TSA.

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.

### 7.3.2  Adjacency, green-up and patch size distribution

Cutblock adjacency and patch size distribution is used to ensure that the structural characteristics left after harvest are consistent with the temporal and spatial distribution of an opening that would result from a natural disturbance.  This is an important consideration for values related to hydrology and landscape level-biodiversity.

Requirements for harvesting adjacent to an existing cutblock are specified in the Forest Planning and Practices Regulation (FPPR) and approved FSPs.  The general practice is that new cutblocks are to be at least two tree lengths from existing cutblocks that have not met stocking and height requirements.  Further qualifications relate to distance from groups of reserved trees, basal area retention, and forest health exclusions.

Modelling a specified range of opening sizes and related locations is a complex task that is not well addressed by the current timber supply model.  As a surrogate to the spatial adjacency requirements, a disturbance limit will be modelled that approximates a four-pass harvest plan.  In the base case, a maximum of 25% of the THLB will be permitted to be below two metres in height within a landscape unit and BEC subzone combination.

*Table 25.  Cutblock adjacency constraint*

| Zone or group | Maximum allowable disturbance (%) | Green-up height specified in FSP (metres) | Land base to which constraints apply |
|---|---|---|---|
| Cutblock adjacency | 25% | 2 m | THLB, by landscape unit |

### 7.3.3   Cutblock size

In the Revelstoke TSA, maximum cutblock size is governed by Section 64 of the FPPR.  It is current practice that licensees comply with FPPR Section 64 and limit block size to 40 hectares.  Larger blocks may be harvested with an appropriate forest health or natural disturbance rationale.  The following chart depicts the cutblock size distribution based on VRI and RESULTS from the past decade.  The minimum cutblock size was one hectare and the maximum cutblock size was 83 hectares.  The median recorded cutblock size is 15 hectares (mean = 18.6 hectares).
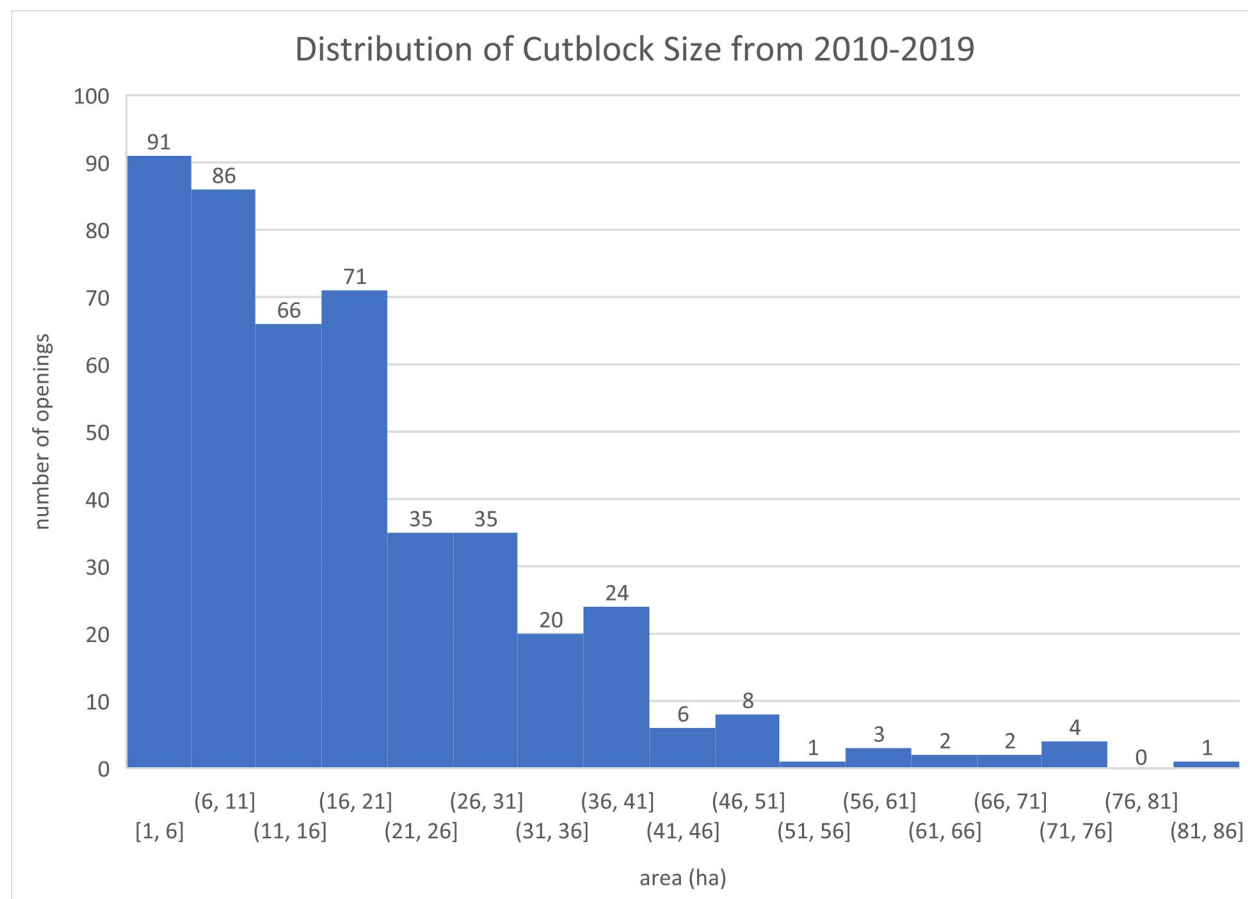


*Figure 9.     Cutblock size distribution.*

For this TSR, the cutblock sizes modelled in the base case will be based on the size of the cutblocks that were harvested from 2010 to 2019.  A minimum cutblock size will be set so that the analysis reflects operational reality by avoiding harvesting of small, isolated stands.  For this TSR, the minimum cutblock size will be one hectare.  The maximum cutblock size will be limited to the 99th percentile of the cutblock size distribution, or 71.5 hectares.

Since the last AAC determination in 2011, a total area of 8602 hectares – or about 860 hectares per year – has been harvested within the Revelstoke TSA.  This harvesting is distributed in smaller cutblocks, as described above.

*Table 26.   Estimated gross area harvested each year since the last TSR*

| Harvest year | Harvested area reported to RESULTS (ha) |
|---|---|
| 2011 | 1,014 |
| 2012 | 1,110 |
| 2013 | 986 |
| 2014 | 1,105 |
| 2015 | 886 |
| 2016 | 965 |
| 2017 | 790 |
| 2018 | 959 |
| 2019 | 352 |
| 2020 | 435 |
| **Total** | **8,602** |

**Data source and comments**:

*Harvested Areas of BC (Consolidated Cutblocks):*
BCGW file: WHSE_FOREST_VEGETATION.VEG_CONSOLIDATED_CUT_BLOCKS_SP

### 7.3.4   Wildlife habitat

Wildlife habitat requirements in the Revelstoke TSA are addressed through the RHLPO and wildlife habitat areas (WHA) and ungulate winter ranges (UWR) established under the Government Actions Regulation (GAR).

Currently, in the Revelstoke TSA, WHAs have been established for a sensitive species (as described in Section 6.3.2) and UWRs have been established for mule deer, moose and mountain caribou.  In addition, the RHLPO includes management objectives for high value grizzly bear habitat.

#### 7.3.4.1  Caribou

Woodland caribou are a species of great ecological importance and have significant cultural value in British Columbia.  Once abundant, many caribou subpopulations (herds) have declined steeply over the past several decades.  The overall population in BC has gone from approximately 40,000 animals to 15,500 currently.  Caribou recovery is a key priority of the Government of BC, and a wide range of recovery actions have been implemented in caribou ranges.

Caribou are adapted to live in mature coniferous forests, mountainous terrain, peatlands, and areas with deep persistent snowpack.  However, habitat disturbance has severely altered the condition of the landscape in caribou ranges.

When forests are harvested the regrowth is initially dominated by leafy shrubs, herbs, and grasses.  This surplus of food leads to more moose, elk, and deer, all of which are the primary prey for wolves.  In addition, industrial roads and other linear area disturbances facilitate the efficient movement of predators such as wolves into caribou habitat.  These result in greater abundance and distribution of wolves within and near caribou habitat, and reduced separation between wolves and caribou (see Figure 10).  Ultimately this leads to more caribou being predated on by wolves.
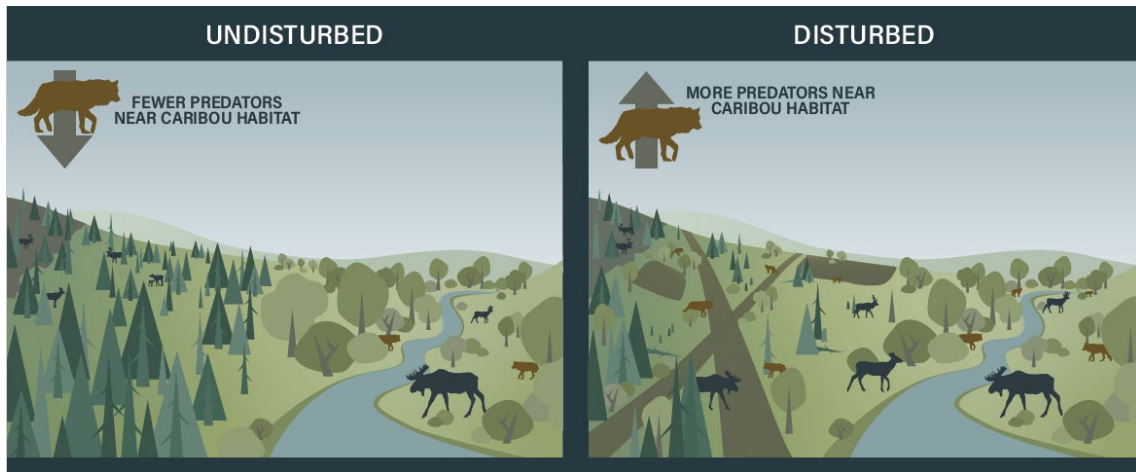
*Figure 10.   Illustration of undisturbed and disturbed caribou habitat and prey/predator dynamic.*

Scientific evidence indicates that habitat change resulting from the extraction of natural resources is the main factor leading to unsustainable predation rates on caribou, and the leading proximate cause of woodland caribou declines.

*Caribou in the Revelstoke TSA*

As shown in Figure 11, below, Revelstoke TSA is almost entirely overlapped by caribou habitat.  This is the most overlap of any TSA in the province.
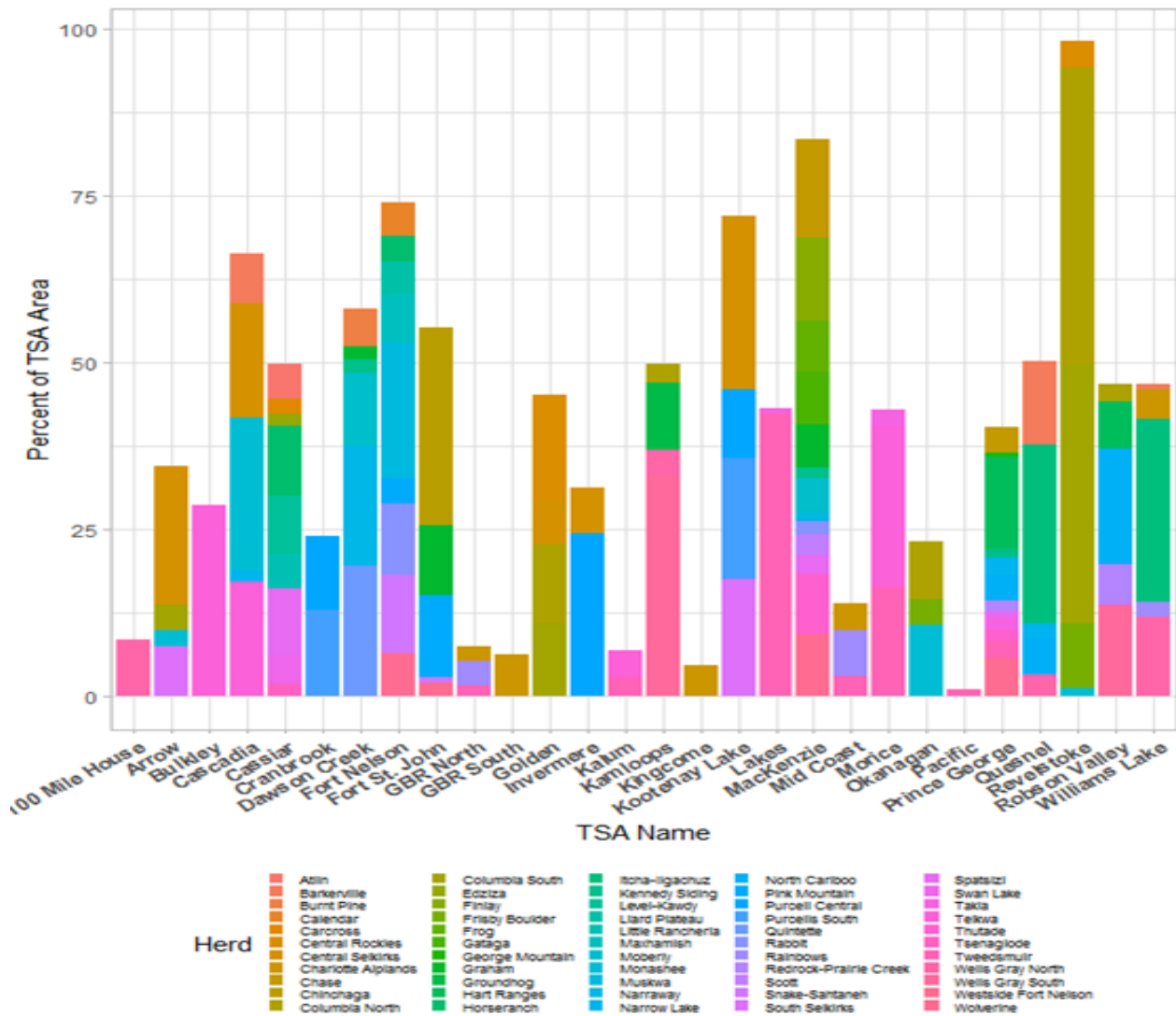


*Figure 11.   Percent of TSA boundaries overlapped by caribou herds.*

Table 27, below, shows the population and trend estimates for the six herds in the Revelstoke TSA.

*Table 27.   Caribou population and trend estimates in the Revelstoke TSA*

| Herd name | Population estimate | Estimate year | Current trend | Past trend |
| --- | --- | --- | --- | --- |
| Central Rockies | 3 | 2008 | Extirpated | Extirpated |
| Columbia North | 184 | 2021 | Increasing | Decreasing |
| Columbia South | 4 | 2020 | Decreasing | Decreasing |
| Frisby Boulder | 6 | 2020 | Decreasing | Decreasing |
| Groundhog | 34 | 2021 | Stable | Decreasing |
| Monashee | 1 | 2016 | Extirpated | Extirpated |

**UWR Protections for Caribou in the Revelstoke TSA**

On December 9, 2009, UWR u-3-005 was established under the GAR to meet the winter habitat requirements for mountain caribou.  This UWR includes general wildlife measures (GWM) that prohibit timber harvesting and road construction, except in some circumstances where no other practicable option exists for the following reasons: road construction, to create guyline tiebacks for timber harvesting or to better utilize a physical feature or administrative boundary.  The UWR also restricts mineral exploration activities and guided adventure tourism activities.  Boundary amendments were enacted in 2010, 2014 and 2020.

In total, the UWR protects about 34% of the herd habitat that is within the Revelstoke TSA.  In the base case for this timber supply analysis, all areas identified within the UWR will be removed from the timber harvesting land base, as described under Section 6.3.2 – *'Wildlife habitat – no harvest areas'*, above.

**Caribou Recovery Planning**

Currently, the BC Provincial Caribou Recovery Program is conducting herd planning and caribou recovery planning outside of the TSR process.  The Revelstoke Working Group, comprised of First Nations and government representatives, is involved in this caribou work in the Revelstoke TSA.

For this TSR, a sensitivity analysis will be done where all "core" caribou habitat in the TSA will be established as "no harvest" area, and where all "matrix" habitat areas in the TSA will have a forest cover constraint of a maximum of 13% of the total area being less than 40 years old.  The matrix forest cover constraint is intended to approximate less than 35% disturbance from forestry, and ultimately low wolf densities from habitat.  Core and matrix habitat locations are consistent with the provincial caribou recovery program definition of caribou habitat.  See 9.3 – *'Sensitivity analysis'*.

**Data source and comments:**

*Ungulate Winter Ranges:*

BCGW File:     WHSE_WILDLIFE_MANAGEMENT.WCP_UNGULATE_WINTER_RANGE_SP

*Caribou Herd Locations for BC:* available from the caribou recovery team.

**7.3.4.2  Mule deer and moose winter range**

An UWR for mule deer, white-tail deer, Rocky Mountain elk and moose was established on December 13, 2005, and was amended on November 28, 2019, under the GAR Order U-4-001.  This UWR applies to numerous TSAs, TFLs, woodlots and community forests and only the mule deer and moose habitat requirements are in effect within the Revelstoke TSA.

The UWR includes management requirements for snow interception cover, forage and early seral forest.  In the analysis, forest cover wildlife habitat requirements will be addressed according to the criteria in Table 28, below.

*Table 28.   Forest cover requirements for mule deer and moose winter range*

| Ungulate winter range attribute | Species | Minimum forest cover area retention (%) | Minimum forest cover age for retention areas (years) |
|---|---|---|---|
| Snow interception cover | Mule deer | ≥ 40% | ≥ 101 years |
| | Moose | ≥ 20% | ≥ 61 years |
| Early seral | Mule deer & Moose | ≥ 60% | ≥ 21 years |
| Forage[1] | Mule deer & Moose | ≥ 10% | ≥ 81 years |

(1)   The UWR requires that the retained area be dispersed within the forage areas or in patches.  This is an operational requirement that will not be modelled in the timber supply analysis.  Rather, the modelling assumptions will be that a minimum of 10% of the forage area be greater than 81 years of age.

The management requirements also include a minimum crown closure requirement.  This is an operational requirement that cannot be modelled at the strategic level.  It is assumed that the minimum crown closure requirement will be met at the operational level.

**Data source and comments:**

Spatial data and attributes for the UWR can be found on the BCGW under CP_UNGULATE_WINTER_RANGE_SP and is represented in Figure 12, adjacent.
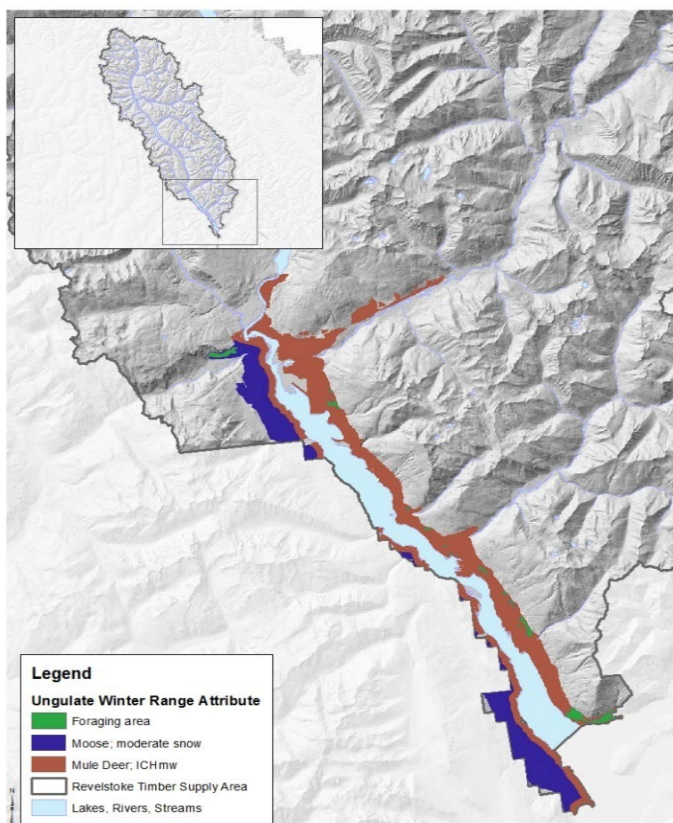


*Figure 12.   Location of UWR habitat for deer and moose within the Revelstoke TSA (private lands and other land designations not shown).*

### 7.3.4.3    Grizzly bear habitat

The RHLPO includes management objectives for forested areas adjacent to high value avalanche chutes for grizzly bear habitat.  However, there is no information available for the TSA to identify high value avalanche chutes at a strategic level.  Grizzly bear habitat is managed operationally through the establishment of wildlife tree retention areas.

*Road density and wildlife habitat.*

Road density is often looked at in conjunction with wildlife (caribou and grizzly bear) habitat. Most known grizzly bear deaths occur within 500 metres of a road or other travel corridor. Grizzly bears near roads die from vehicle collisions, hunting, mistaken identity kills, human-bear conflict, and illegal kills. As road density increases, grizzly bear mortality risk increases, habitat fragmentation and avoidance increases, and populations can decline, although nearby areas of high-quality secure habitat potentially reduce the impact of high road density at a population scale.

Road density refers to the total length of roads (and pipeline corridors, transmission line rights of way, and rail lines) divided by the geographic area (often landscape unit) and is measured as kilometres of road per square kilometre ($km/km^2$).

Habitat specialists and First Nations have expressed concern about road density on grizzly bear habitat in the Revelstoke TSA. Under the BC Cumulative Effects (CE) Framework, road densities less than $0.3\ km/km^2$ are considered low risk to grizzly bear population, densities between 0.31 and $0.6\ km/km^2$ are considered moderate risk, densities between $0.61\ km/km^2$ and $0.75\ km/km^2$ are considered high risk and densities above $0.75\ km/km^2$ are considered very high risk. The mean road density for the TSA is $0.54\ km/km^2$. For this review, a sensitivity analysis will explore the timber supply implications of establishing road density maximum thresholds in each landscape unit.

**Data source and comments:**

BC cumulative effect framework.

### 7.3.4.4 Data sensitive species

Revelstoke TSA has five WHAs for a sensitive species: 4-038, 4-039, 4-040, 4-041, and 4-043. Each WHA is composed of a core no harvest zone and a conditional harvest management zone. Unless an exemption is approved, the core area has a prohibition on timber harvesting and road construction. Additionally, the management zone has restrictions on timing of harvest, basal area and species retention and burning. In this timber supply analysis, only the core area will be removed from the THLB amounting to a net reduction of three hectares, as described under Section 6.3.2 – '*Wildlife habitat – no harvest areas*'.

### 7.3.5 Community watersheds

The management requirements for timber harvesting and road construction in community watersheds are set out in the FPPR and intended results or strategies in relation to harvesting in community watersheds are approved in forest stewardship plans (FSPs).

In the Revelstoke TSA, the approved FSPs include a commitment to communicate with the City of Revelstoke regarding planned activities within community watersheds which supply water to the residents of the city. The city primarily sources its water from Greely Creek. All FSPs commit to assessing the risk of proposed activities and, based on the assessed degree of risk, having a qualified registered professional carry out hydrologic and/or terrain stability assessments. These management practices are operational in nature and will not be modelled as part of this timber supply analysis.

Although harvesting in community watersheds is permitted by the FPPR, there is significant overlap with inoperable areas and very little harvesting activities have occurred in the past. To date, a total of 14 hectares – or 0.3% of the forested area – has been harvested within community watersheds. Community watersheds will be assumed to contribute to the base case harvest level and a sensitivity analysis will examine the effect of limiting the rate of harvest in community watersheds.

**Drinking water intakes**

Water licences have been issued for drinking water use. Water intake points – or point of diversion – are managed by forest licensees through riparian reserve zones or riparian management zones. The timber supply assumptions associated with riparian areas are described in Section 6.4.6 – '*Riparian areas*', above.

### 7.3.6   Visual quality

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

In the Revelstoke TSA, areas south of Revelstoke and west of the Upper Arrow Reservoir, have been designated for visual quality management.  Within these areas, visual quality objectives (VQOs) have been established based on physical attributes such as topography and social attributes such as viewer expectations.  VQOs have been created so that forestry activities (size, shape, and location of cutblocks and roads) fit with the landscape's natural character.

Within a scenic area one or more visual quality objective may apply.  A VQO represents the prescribed extent of forest alteration resulting from the size, shape and location of cutblocks and roads.  Table 29 below describes the categories of visually altered landscapes that may apply along with the total area covered by each category within the Revelstoke TSA.

*Table 29.   Categories of visually altered forested landscape in the Revelstoke TSA*

| Categories of visually altered forest landscape (VQO) | Definition | Gross area (ha) | Harvested area (ha) |
|---|---|---|---|
| Retention (R) | Alteration is difficult to see, small in scale, and natural in appearance. | 8,578 | 498 |
| Partial Retention (PR) | Alteration is easy to see, small to medium in scale, and natural and not rectilinear or geometric in shape. | 23,050 | 3,484 |
| Modification (M) | Alteration is very easy to see, and is: (a) large in scale and natural in its appearance, or (b) small to medium in scale but with some angular characteristics. | 30,749 | 5,390 |
| **Total area inside scenic area (ha)** | | **62,377** | **57,372** |
| Total TSA area (ha) | | 758,502 | 59,662 |

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

The procedures to translate requirements from a perspective to a plan view make several assumptions, which are summarized in Table 30, below.  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, there is a relationship between the perspective and plan views which varies by slope (i.e., a plan-to-perspective – or P2P – ratio).

*Table 30.   Predicted P2P ratios and visually effective green-up (VEG) height by percent slope for well-stocked stands*

| Slope % | 0 - 10% | 10 - 20% | 20 - 30% | 30 - 40% | 40 - 50% | 50 - 60% | 60 - 70% | 70%+ |
|---|---|---|---|---|---|---|---|---|
| P2P ratios | 4.68 | 3.77 | 3.04 | 2.45 | 1.98 | 1.60 | 1.29 | 1.04 |

| VEG tree height (metres) | 3.0 | 3.75 | 4.75 | 5.75 | 6.5 | 7.25 | 8.25 | 8.5 |
|---|---|---|---|---|---|---|---|---|

For the Revelstoke TSA, the area occupied by slope classes within each VQO category is as shown in Table 31.

*Table 31.   Area of slope classes within VQO classes for the Revelstoke TSA*

| VQO | Area (hectare) by slope class | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 0-5 | 6-15 | 16-25 | 26-35 | 36-45 | 46-55 | 56-65 | 66+ | Total |
| Retention | 377 | 907 | 1133 | 1005 | 1055 | 1065 | 905 | 2131 | 8578 |
| Partial retention | 349 | 1411 | 2757 | 3192 | 3456 | 3366 | 3017 | 5502 | 23 050 |
| Modification | 294 | 1808 | 3865 | 5318 | 6014 | 4674 | 3457 | 5319 | 30 749 |
| Total | 1020 | 4126 | 7755 | 9515 | 10 525 | 9105 | 7379 | 12 952 | 62 377 |

From this, an area-weighted P2P and visually effective tree height was calculated for each of the three VQO categories present in the TSA according to heights and P2P summarized in Table 32, below.

*Table 32.   Area-weighed P2P and VEG height by VQO category for the Revelstoke TSA*

| VQO | Area-weighted P2P | Area-weighted VEG height (metres) |
|---|---|---|
| Retention | 2.13 | 6.51 |
| Partial Retention | 1.95 | 6.78 |
| Modification | 2.03 | 6.61 |

The area-weighed P2P are used to convert the permissible percent alteration in perspective view to permissible percent alteration in planimetric view.  Within a VQO there are a range of maximum percent alterations that are dependent on the visual absorption capability of the scenic area.  As such, the maximum percent of alteration in planimetric view can also vary depending on which value is used from the permissible percent of alteration in perspective view (Table 33).

*Table 33.   Maximum percent planimetric alteration by VQO category*

| VQO | Permissible percent alteration in perspective view | P2P | Maximum percent alteration in planimetric view using minimum percent alteration in perspective view | Maximum percent alteration in planimetric view using mid-point percent alteration in perspective view | Maximum percent alteration in planimetric view using maximum percent alteration in perspective view |
|---|---|---|---|---|---|
| Retention | 0 – 1.5 | 2.13 | 0 | 1.60 | 3.20 |
| Partial retention | 1.6 – 7.0 | 1.95 | 3.12 | 8.39 | 13.65 |
| Modification | 7.1 – 18.0 | 2.03 | 14.41 | 25.48 | 36.54 |

In the base case, the maximum percent alteration using the mid-point percent alteration from Table 33 will be used.  Specifically, the forest cover requirements that will be applied in the base case in relation to visual quality are as shown in Table 34, below.

*Table 34.   Forest cover requirements for visual quality in the AFLB*

| VQO | Maximum disturbance (% of area) | Minimum visually effective green-up height (metres) | Land base to which constraint applies |
|---|---|---|---|

| Retention | ≤ 1.60% | > 6.51 | AFLB |
| Partial retention | ≤ 8.39% | > 6.78 | AFLB |
| Modification | ≤ 25.48% | > 6.61 | AFLB |

District staff under the Forest and Range Evaluation Program (FREP) assessed the effectiveness of visual management practices for seven cutblocks harvested between 2013 and 2018.  This assessment showed that the visual quality objective was met or well met for six of the seven cutblocks.  Although the number of assessed cutblocks is small, the results indicate that overall, visual quality management is effective within the Revelstoke TSA.

**Data source and comments:**

Scenic polygon boundaries and VQO assignments are consistent with WHSE_FOREST_VEGETATION.REC_VISUAL_LANDSCAPE_INVENTORY

The VQO denudation ranges listed in Table 33 were derived from the document *Procedures for Factoring Visual Resources into Timber Supply Analysis* (1998) and the update bulletin, *Modelling Visuals in TSR III*.
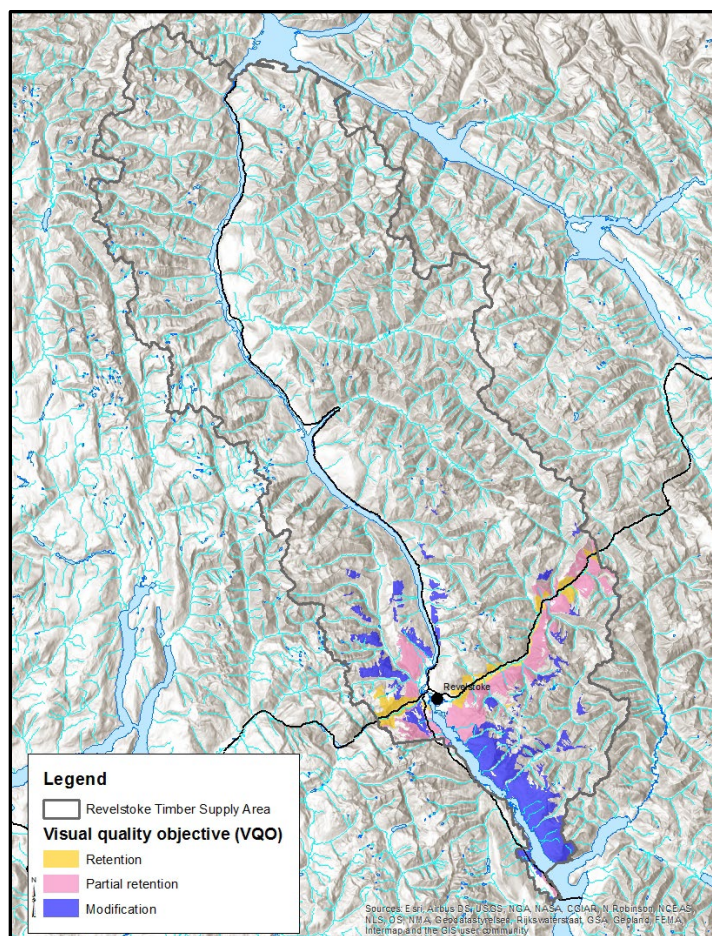
*Figure 13.  Visual quality objectives within the Revelstoke TSA*

Note: Private lands and other land designations not shown in Figure 13.

## 7.4.  Forest health

Forests are influenced by abiotic and biotic agents that can impact the growth and survival of trees. Forest health agents influence the current forest land base and forest management practices, and cause uncertainty around our understanding of future forest conditions.

The forest entomologist for the Kootenay/Boundary Region reported recent forest health trends in the Revelstoke TSA are as follows:

- mountain pine beetle and spruce beetle infestations are decreasing; populations of these bark beetles remain low.

- the area infested by Douglas-fir beetle has increased; Douglas-fir beetle population doubled in 2021.

- the following defoliators are increasing: Western hemlock looper, Aspen serpentine leaf miner and birch leaf miner.  Western hemlock looper populations cycle approximately every 9 to 11 years with the most recent outbreak starting in 2020 and expected to decline by 2022.  The previous Western hemlock looper outbreak peaked in 2013.

- The population of Western balsam bark beetle has increased six-fold between 2020 and 2021.

The timber supply impact of a forest health agent depends on its distribution, level of severity and timing. Some forest health impacts are accounted for within growth and yield model projections such as decay, waste or breakage (DWB) in VDYP for natural stands and operational adjustment factors (OAFs) in TIPSY for managed stands. Epidemic impacts, such as those arising from western hemlock looper infestations, can be documented during the provincial annual aerial overview surveys (AOS). The AOS identify mortality or likely mortality, and this is used in conjunction with past harvesting to determine a non-recoverable loss (NRL) factor for unsalvaged timber. This is discussed in the NRL heading below.

### 7.4.1   Non-recoverable losses (NRL)

Unsalvaged losses reflect epidemic losses on the THLB where the volume is not expected to be recovered or salvaged. Estimates of timber damage, less salvage, are made for the various categories of losses and this volume is subtracted from the volume projected to be harvested by the timber supply model.

In the Revelstoke TSA, the main forest health factors observed in AOS since 2000 have been wildfire, mountain pine beetle (MPB) and Douglas-fir beetle. Windthrow, flooding and drought follow, with lesser amounts of spruce beetle and western balsam bark beetle. As shown in the table below, it is estimated that approximately 3100 cubic metres of timber are killed, and not harvested, by these factors each year. This will be modelled as the NRL in the base case.

*Table 35.   Unsalvaged losses on the THLB for the 20-year period 2000-2019*

| Cause of loss | Total loss (m³ for the 2000-2019 period) | Total harvested (m³ for the 2000-2019 period) | Annual unsalvaged loss (m³/year) |
|---|---|---|---|
| Wildfire | 39,070 | 6,731 | 1,617 |
| Mountain Pine beetle | 16,329 | 4,200 | 606 |
| Douglas-fir beetle | 15,381 | 2,583 | 640 |
| Windthrow | 7,946 | 2,378 | 278 |
| Flooding | 6,698 | - | 335 |
| Drought | 2,168 | - | 108 |
| Spruce beetle | 1,586 | - | 79 |
| Western Balsam bark beetle | 1,284 | 412 | 44 |
| **Total** | **74,133** | **12,104** | **3,101** |

Catastrophic impacts, such as losses due to wildfires, happen relatively suddenly and cause extensive damage. The impact of catastrophic events is captured under the provincial forest inventory update program.

**Data source and comments:**

The estimates for unsalvaged losses for the 2000 to 2019 period were obtained from Forest Science, Planning and Practices Branch, which provides standardized updates to the non-recoverable loss estimates by TSA. These updates are based on aerial overview survey data, VRI data and harvest data (RESULTS). The total volume of affected tree species is adjusted based on the mid-point for each severity class.

### 7.5.  Natural disturbance outside the THLB

Natural disturbance refers to any non-anthropogenic, temporally-discrete event that alters ecosystem, forest community, population structure, and/or changes the physical environment. Viewed over an appropriately long time scale, natural disturbance is part of ecosystem dynamics shaping the stand structure and vegetation composition across a landscape. Forest vegetation, in turn, influences the probability of disturbance, creating a dynamic feedback loop that has evolved though time.

A disturbance regime is characterized by the spatial and temporal nature of landscape disurbances. A disturbance regime is defined by the scale, intensity, pattern, frequency, and return interval of events associated with a given disturbance agent. Different agents and/or types of disturbance (e.g. fire or mountain pine beetle) will have different spatial and temporal regimes, attributes and impacts on the forest. Moreover, disturbance agents may interact with each other, often with additive effects.

Natural disturbances such as insect infestations, wildfires, and blowdown typically occur on the landscape in both the THLB and non-THLB. Disturbances in the THLB are either harvested, or otherwise accounted for with the application of non-recoverable losses. However, unless natural disturbance in the non-THLB is explicitly modelled, stands outside the non-THLB will continuously age throughout the planning horizon and contribute to meeting the requirements for non-timber resources such as wildlife habitat, visual quality, and biodiversity.

The base case will model natural disturbance using return intervals defined in the 1995 *Forest Practices Code of British Columbia Biodiversity Guidebook* and as shown in the table below. Based on input from the ministry's regional ecologist, a sensitivity analysis will examine the impact of modelling a longer mean return interval.

*Table 36.   Revelstoke TSA BEC zone NDT return intervals within the AFLB*

| BEC Zone | NDT | Mean return interval | Old growth threshold age |
|:---:|:---:|:---:|:---:|
| ESSF | NDT1 | 350 | >250 |
| ICH | NDT1 | 250 | >250 |
| ESSF | NDT2 | 200 | >250 |
| ICH | NDT2 | 200 | >250 |

## 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 the volume estimates based on the characteristics of the individual stands.

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

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

### 8.1.1    Variable density yield prediction model (VDYP7)

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

### 8.1.2    Table Interpolation Program for Stand Yields (TIPSY)

The Table Interpolation Program for Stand Yields (TIPSY) provides yield curves for single species and even-aged stands based upon the interpolation of yield curves generated by the individual tree growth model Tree and Stand Simulator (TASS).  Mixed species yield curves 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 curves for lodgepole pine and white spruce and TASS II generated yield curves 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 British Columbia.  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.

**Operational adjustment factors**

Yield projections in TIPSY are based upon 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 (OAFs) 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 Revelstoke TSA.

## 8.2   Analysis units

In previous TSRs, yield curves were generated for similar stand aggregations called analysis units (AU).  An analysis unit was typically composed of stands with similar species composition, site productivity, treatment regimes, and other management considerations.  Timber volume projections (yield curves) were produced for each AU.  AUs were used to simplify the model to compensate for computational limitations at that time.

Unlike past timber supply analyses for the Revelstoke TSA, this analysis builds a unique set of yield curves for each forest cover stand using the VDYP and TIPSY models.

Creating a unique set of yield curves for each stand, rather than AUs, increases the consistency of forest estate modelling across the province and improves transparency in the process; the same methodology is used against the same databases across provincial TSRs.  Generating yield curves unique to each stand allows for the field data stored and managed within the VRI and RESULTS databases to be fully utilized without loss of information due to stand aggregation.

### 8.2.1   Natural and managed stands

Individual stands are classified by their stand type to ensure that yield curves 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 curves are developed using the VDYP model while managed stand yield curves are created using the TIPSY model.

Over the timber supply modelling time horizon stands may transition 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 curve for their current condition, and a TIPSY yield curve for their future managed condition.  Existing managed stands (stands with a silviculture record) regenerated prior to 1987 require two yield curves created in TIPSY to reflect their current and future conditions.  The yield curves for the current condition stands are assumed to be regenerated naturally because stands regenerated prior to 1987 have limited planting records and were frequently regenerated without stocking standards.  The yield curve 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 curve in the future.

### 8.2.2   TIPSY input data

Input data for TIPSY is obtained from site specific, field derived silviculture information stored in the Reporting Silviculture Updates and Land Status Tracking System (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 curve 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.

To assess if managed stands will achieve their projected future yields, FAIB compares the TSR analysis managed stand yield projections with young stand monitoring (YSM) plot yield projections. YSM projections are believed to provide the best estimate of future yields. To date limited YSM data have been collected in the Revelstoke TSA, but interim results suggest that throughout the ranges of ages sampled the average MSYT projection is within the 95% confidence interval of the average YSM projection using TASS II.

**Data source and comments:**

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

### 8.2.3   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 one to many forest cover polygons. Each of these polygons 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.

## 8.3   Site index

Site index is estimated tree height at a reference age of 50 years and is used to measure forest site productivity in British Columbia. 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 and this is reported in the Provincial Site Productivity Layer (PSPL). PSPL version 7 is used in the base case to provide site index estimates for commercial tree species as a required input to develop volume tables in TASS and TIPSY growth and yield models.

### 8.4   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 are available from the Seed Planning and Registry Application (SPAR) of the Forest Improvement and Research Management Branch.  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 Revelstoke TSA, select seed is currently available for hybrid spruce (Sx), interior Douglas-fir (Fdi), western larch (Lw) and lodgepole pine (Pli).  GW is used as input into the growth and yield model TIPSY for managed stands where the regeneration type is planted.  Approximately 30% of all planted trees have been planted with improved stock.  The weighted average genetic worth of all planted trees is 12.02%.

The GW for planted future managed stands is based on the weighed average genetic worth of the trees planted in the past 15 years which is 15.67.  During this time, 73.23% of all planted have been planted with improved stock.

### 8.5   Planting delay

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

The median planting delay in the Revelstoke TSA is two years.

### 8.6   RESULTS data summary

The following table summarizes the RESULTS data used to generate current and future managed stand yield curves.  Stands have been grouped by BEC subzone and leading species.

*Table 37.   RESULTS data summary for the Revelstoke TSA*

| Bec label | Leading species | Area (ha) | Median leading species % | Number of distinct species labels | Most frequent label | Median planting density (sph) | Median leading species planting density (sph) | Median regeneration delay (years) | Median leading species site index (m) | Median leading species genetic worth (%) |
|---|---|---|---|---|---|---|---|---|---|---|
| ESSF_vc | Se | 147,446 | 76.1 | 88 | Se_76.1_Bl_13_Hwi_5_Cwi_5_Fdi_0.9 | 1387 | 1056 | 2 | 15 | 12 |
| ICH_vk | Sw | 84,591 | 55 | 359 | Sw_55_Cwi_31_Fdi_9_Pw_4_Hwi_1 | 1405 | 773 | 2 | 24 | 15 |
| ICH_wk | Sw | 48,807 | 46 | 95 | Sw_46_Fdi_25_Cwi_18_Pw_5.9_Pl_5 | 1362 | 627 | 2 | 23 | 17 |
| ICH_mw | Fdi | 20,591 | 42 | 76 | Fdi_42_Lw_19_Sw_16_Pl_13_Cwi_10 | 1252 | 526 | 2 | 24 | 10 |
| ESSF_wc | Se | 19,968 | 84.1 | 15 | Se_84.1_Pl_11_Bl_3_Fdi_1_Lw_1 | 1332 | 1120 | 2 | 17 | 13 |
| ESSF_wh | Se | 3,876 | 66.1 | 18 | Se_66.1_Pl_23_Fdi_4_Lw_4_Cwi_3 | 1312 | 867 | 2 | 19 | 14 |
| ICH_vk | Cwi | 3,739 | 52.1 | 216 | Cwi_100 | 1397 | 720 | 2 | 20 | 0 |
| ESSF_wcw | Se | 3,948 | 100 | 1 | Se_100 | 1213 | 1213 | 2 | 15 | 12 |
| ICH_wk | Cwi | 1,683 | 53.8 | 97 | Cwi_75.5_Sw_24.5 | 1342 | 655.5 | 1 | 19 | 0 |
| ICH_wk | Fdi | 1,526 | 52.3 | 87 | Fdi_100 | 1243.5 | 647 | 1 | 24 | 0 |
| ESSF_vv | Se | 1,014 | 100 | 1 | Se_100 | 1377 | 1377 | 2 | 12 | 11 |
| ICH_vk | Fdi | 729 | 45.9 | 49 | Fdi_45.9_Cwi_24.3_Sw_17.1_Hwi_12.7 | 1340 | 631 | 2 | 25 | 0 |
| ICH_mw | Cwi | 232 | 50.3 | 19 | Cwi_53.7_Sw_23.7_Fdi_22.5 | 1310 | 595 | 1 | 18 | 0 |
| ICH_mw | Sw | 181 | 40 | 10 | Sw_37_Cwi_35_Fdi_16_Pw_12 | 1283 | 527 | 1 | 25 | 6 |
| ESSF_vc | Bl | 91 | 55 | 4 | Bl_55_Se_45 | 1393 | 766 | 1 | 15 | 0 |
| ICH_mw | Pl | 45 | 54 | 6 | Pl_45.5_Fdi_33.8_Cwi_20.8 | 1242 | 610 | 2 | 24 | 0 |
| ICH_vk | Hwi | 60 | 40.85 | 4 | Hwi_37.9_Sw_33.5_Cwi_28.6 | 1392 | 613.5 | 1.5 | 18 | 0 |
| ICH_wk | Lw | 22 | 33.55 | 2 | Lw_33.3_Fdi_33.3_Cwi_33.3 | 1245 | 417.5 | 2 | 25.5 | 13 |
| ICH_mw | Pw | 24 | 48.9 | 2 | Pw_48.9_Lw_37.8_Cwi_13.3 | 603 | 295 | 1 | 19 | 0 |
| ICH_wk | Hwi | 7 | 44 | 2 | Hwi_44_Sw_32_Cwi_24 | 979 | 431 | 2 | 20 | 0 |
| ICH_wk | Pl | 6 | 31 | 1 | Pl_31_Fdi_24.2_Lw_23.6_Cwi_21.1 | 1685 | 523 | 2 | 22 | 0 |
| ICH_mw | Lw | 29 | 48.45 | 2 | Lw_44.9_Fdi_37.2_Cwi_17.9 | 1103 | 529.5 | 1.5 | 26 | 17 |
| ICH_vk | Pw | 23 | 36.85 | 2 | Pw_32.5_Cwi_32.5_Sw_21.7_Fdi_13.3 | 1450.5 | 528.5 | 2 | 24.5 | 0 |
| ESSF_vc | Cwi | 11 | 44.3 | 1 | Cwi_44.3_Se_33.3_Fdi_11.9_Pw_10.5 | 1223 | 542 | 2 | 15 | 0 |
| ESSF_vcw | Se | 3 | 100 | 1 | Se_100 | 1386 | 1386 | 1 | 16 | 0 |
| ESSF_wc | Fdi | 19 | 35 | 1 | Fdi_35_Se_35_Cwi_30 | 1614 | 565 | 3 | 18 | 5 |
| ESSF_wh | Fdi | 20 | 41 | 1 | Fdi_41_Cwi_26_Se_17_Lw_16 | 1630 | 668 | 2 | 21 | 9 |
| ICH_mw | Hwi | 19 | 55 | 1 | Hwi_55_Sw_29_Pl_16 | 1552 | 854 | 1 | 19 | 0 |
| Totals | | 338710 | | | | 1323 | 717 | 2 | 20 | 6 |

## 9.    Forest Estate Modelling

### 9.1    Forest estate model

A new version of the Spatial Timber Supply Model (STSM), version 2022 (STSM2022), will be used for this analysis. STSM2022 is a general spatial model for analysis of forested landscapes, implemented in the Spatially Explicit Landscape Event Simulator, version 10 (SELES10). STSM and SELES are approved for use in timber supply analysis by FAIB and the results of this analysis will be peer reviewed. The model utilizes raster format spatial data and will be set to examine spatial forest inventory data at a one-hectare resolution.

### 9.2    Initial harvest rate and harvest priorities

Priorities and limits will be placed on certain stand types, management zones, or regions of the Revelstoke TSA to reflect non-timber forest management objectives. Setting harvest level targets on individual management zones will also serve to inform the determination of an AAC that may be partitioned by these stand types, management zones or regions.

The short-term harvest preference will be designed to emulate (as close as possible) harvest practice since the previous timber supply review. The initial TSA harvest level will be set at the average harvest level realized since 2011 (197 219 cubic metres per year – see table in 7.1.1). The harvest queue will be driven by a stand preference function that prioritizes based on highest volume per hectare, lowest cycle-time, and closest distance to an existing or projected road.

**Haul distance (cycle-time)**

Haul distance (cycle-time) is a cost driver for logging in the Revelstoke TSA and has a



significant effect on the stands selected for harvest. To capture the distance effect in harvest preference an approach was needed that reasonably emulated the distance/cost relationship for timber acquisition for mills within the TSA.

A seamless one-hectare resolution surface of cycle-time values was created which can be used in conjunction with other factors to prioritize harvest in the timber supply model.

The objective is to minimize cost by harvesting closest to the mill while reflecting the demand pressures between mills within the TSA (recognizing that timber can travel to any mill in the TSA, not just the closest or most optimal).

The cycle-time data from ECAS was used to approximate the hauling constraints across the unit. In the image to the right, green areas are closest to a mill and red areas are furthest.
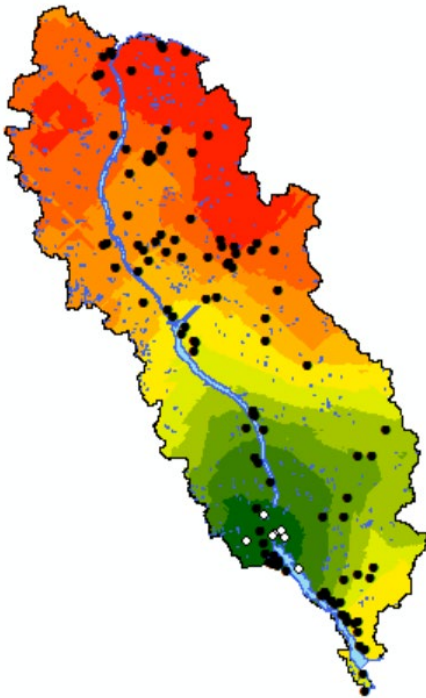
*Figure 14.   Hauling distances based on ECAS.*

Zones in dark green are closest to milling locations while zones in red are the furthest. Black points represent ECAS sampling locations.

## 9.3   Sensitivity analysis

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.  The analyses typically change one variable while holding all others constant to see if there is 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 forecast.  By conducting a number of sensitivity analyses it is possible to determine which variables have the most influence on the base case harvest levels.

The table below lists the initial sensitivity analyses that are proposed.  If new or different uncertainties are identified from engagement with Indigenous people as well as from engagement with the public, stakeholders and ministry staff, this list may change after the base case has been completed.

*Table 38.   Proposed sensitivity analyses*

| | Sensitivity analysis type (number of) | Description |
|---|---|---|
| 1 | Natural stand volumes (2) | All volume tables will be changed by +/–10%. |
| 2 | Managed stand volumes (2) | All volume tables will be changed by +/– 10%. |
| 3 | Minimum harvestable volume (3) | MHV will be increased to the 5th, 10th and 25th percentile. |
| 4 | Minimum harvestable age (2) | MHA will be changed by +/– 10 years. |
| 5 | Terrain stability (1) | The reduction applied to TSM class PU and U will be increased to 100%. |
| 6 | Community watersheds (1) | The rate of harvest will be limited in each community watershed by applying a maximum ECA threshold of 30%. |
| 7 | Caribou habitat (1) | Use BC's caribou habitat data to identify all "core" and "matrix" habitat areas. |
| | | Set all high and low elevation core caribou habitat as "no harvest". |
| | | Set a forest cover constraint in all matrix habitat areas as a maximum of 13% of the total area being less than 40 years old. |
| 8 | Old seral targets based on current BEC version (1) | BEC v7 will be replaced with BEC v12. |
| 9 | Old Growth Management Non-Spatial (1) | Landscape-level biodiversity targets will be modelled without consideration of spatial OGMAs. |
| 10 | Full old seral targets (1) | Remove the 1/3 drawdown and immediately meet full targets in all areas. |
| 11 | Federal park (1) | Remove federal park from meeting the biodiversity targets. |
| 12 | Climate change (1) | Increase disturbance frequency in non-THLB. |
| 13 | Wildlife tree retention (1) | Wildlife tree retention will be increased to 10%. |
| 14 | Unharvested Volume and Disposition Plan (1) | Deplete base case growing stock by 237 538 cubic metres to represent licences that may be issued from unharvested volume. |
| 15 | Grizzly bear habitat (1) | Road density limits will be set for each landscape unit. |
| 16 | Natural disturbance outside the THLB (1) | Increase the mean return interval in NDT 1 to 600 years for the ICH and 800 years for the ESSF. |

## 10. Forest Carbon

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 (IPCC) are above ground biomass carbon (ABC), below ground biomass carbon (BBC), dead organic matter (DOM), forest floor litter (FFL), and soil organic carbon (SOC). The sum of all fives pools is referred to as total ecosystem carbon (TEC).

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

To make different GHGs (e.g., methane, nitrous oxide) comparable in carbon accounting, carbon dioxide equivalent (CO2e) is adopted, and the global warming potential (GWP) is used to convert each of greenhouse gases into CO2e.

The conversions used in this analysis are: 1 CH4 = 28 CO2e; 1 N2O = 298 CO2e.

The harvest wood product (HWP) calculator will be used. This tool calculates estimates of wood products logs, lumber, plywood, panels, or paper. In addition to the emissions of carbon and other GHGs, the storage of carbon in different products is also computed over time. An HWP of ~26% will be used for the carbon remaining from wood products after 100 years.

For the current Revelstoke TSA TSR, a carbon sequestration analysis will be completed using the TSR base case harvest projection.

# 11.  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.

## 11.1  Timber supply analysis discussion paper

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.

## 11.2  First Nations consultation and public review

Information collected through First Nations consultation and public review processes provide important information for the AAC determination.  Information received through written and oral presentations are collated and presented to the chief forester.  Relevant information received early in the process may be incorporated into timber supply analysis.

## 11.3  Allowable annual cut determination rationale

The chief forester's AAC determination will be documented through the public release of a written *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.

This document, as is the *Data Package* and *Discussion Paper*, is available on the Government of British Columbia web site at https://www2.gov.bc.ca/gov/content/industry/forestry/managing-our-forest-resources/timber-supply-review-and-allowable-annual-cut/allowable-annual-cut-timber-supply-areas/revelstoke-tsa.

## 12.  Acronyms

| | |
|---|---|
| AAC | Allowable Annual Cut |
| ABC | Above Ground Biomass Carbon |
| AFLB | Analysis Forest Land Base (previously referred to as Crown Forest Land Base) |
| AOS | Aerial Overview Survey |
| BBC | Below-ground Biomass Carbon |
| BCGW | British Columbia Geographic Warehouse |
| BCLCS | British Columbia Land Classification System |
| BCTS | British Columbia Timber Sales |
| BEC | Biogeoclimatic Ecosystem Classification |
| BEO | Biodiversity Emphasis Option |
| BMTA | Biodiversity, Mining and Tourism Area |
| CCT | Lakes Tribe of the Confederated Tribes of the Colville Reservation |
| CFA | Community Forest Agreements |
| CE | Cumulative Effect |
| CEF | Cumulative Effect Framework |
| CMAI | Culmination Mean Annual Increment |
| CRA | Controlled Recreation Area |
| DBH | Diameter at Breast Height |
| DEM | Digital Elevation Model |
| DOM | Dead Organic Matter |
| DWB | Decay, Waste and Breakage |
| ECA | Equivalent Clearcut Area |
| ECAS | Electronic Commerce Appraisal System |
| ECDA | Economic, Community and Development Agreement |
| ESSF | Engelmann Spruce-Subalpine Fir |
| FAIB | Forest Analysis Inventory Branch |
| FCRSA | Forest Consultation and Revenue Sharing Agreement |
| FIP | Forest Inventory Planning |
| FNWL | First Nation Woodland Licence |
| FPPR | Forest Planning and Practices Regulation |
| FREP | Forest and Range Evaluation Program |
| FRPA | Forest and Range Practices Act |
| FSP | Forest Stewardship Plan |
| FTOA | Forest Tenure Opportunity Agreement |

| | |
|---|---|
| GAR | Government Actions Regulation |
| GHG | Greenhouse Gas |
| GIS | Geographic Information Systems |
| GW | Genetic Worth |
| GWM | General Wildlife Measures |
| GWP | Global Warming Potential |
| HWP | Harvest Wood Product |
| HBS | Harvest Billing System |
| ICH | Interior Cedar Hemlock |
| IPCC | Intergovernmental Panel on Climate Change |
| MHA | Minimum Harvestable Age |
| MHV | Minimum Harvestable Volume |
| MPB | Mountain Pine Beetle |
| NAR | Net Area to be Reforested |
| NECB | Net Ecosystem Carbon Balance |
| NDT | Natural Disturbance Type |
| NRL | Non-Recoverable Losses |
| OAF | Operational Adjustment Factor |
| OGMA | Old Growth Management Areas |
| P2P | Plan to Perspective |
| PEM | Predictive Ecosystem Mapping |
| PSP | Permanent Sample Plots |
| PSPL | Provincial Site Productivity Layer |
| RESULTS | Reporting Silviculture Updates and Land Status Tracking System |
| RHLPO | Revelstoke Higher Level Plan Order |
| ROW | Right of Way |
| RRZ | Riparian Reserve Zones |
| RMZ | Resource Management Zones |
| SEA | Strategic Engagement Agreement |
| SCC | Supreme Court of Canada |
| SELES | Spatially Explicit Landscape Event Simulator |
| SIBEC | Site Index by BEC |
| SOC | Soil Organic Carbon |
| SPAR | Seed Planning and Registry |
| STSM | Spatial Timber Supply Model |

| TASS | Tree and Stand Simulator |
|------|--------------------------|
| TEC | Total Ecosystem Carbon |
| 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 |
| VPH | Volume per Hectare |
| VRI | Vegetation Resources Inventory |
| WHA | Wildlife Habitat Areas |
| WTRA | Wildlife Tree Retention Area |
| YSM | Young Stand Monitoring |

# 13.  Information Sources

B.C. Ministry of Agriculture and Lands.  2009.  Order Cancelling the Caribou Objective in the Revelstoke Higher Level Plan Order.  https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/natural-resource-use/land-water-use/crown-land/land-use-plans-and-objectives/kootenayboundary-region/revelstoke-rlup/revelstoke_rlup_luor_12feb2009amend.pdf

B.C. Ministry of Environment.  2004.  Species at Risk Notices FPPR section 7 and WLPPR section 9.  Columbia District.  Coeur d'Alene Salamander.  http://www.env.gov.bc.ca/wld/frpa/notices/sar.html

B.C. Ministry of Environment & Climate Change Strategy.  Knowledge Management Branch.  Terrestrial Ecosystem Data & Information.  https://www2.gov.bc.ca/gov/content/environment/plants-animals-ecosystems/ecosystems

B.C. Ministry of Forests.  1998.  Procedures for Factoring Visual Resources into Timber Supply Analyses.  https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/forestry/visual-resource-mgmt/vrm_procedures_for_factoring_timber_supply_analyses.pdf

B.C. Ministry of Forests.  2003.  Bulletin – Modelling Visuals in TSR III.  https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/forestry/visual-resource-mgmt/vrm_modeling_visuals_bulletin.pdf.

B.C. Ministry of Forests.  2022.  Interior Appraisal Manual Effective July 1, 2021.  https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/forestry/timber-pricing/interior-timber-pricing/interior-appraisal-manual/2021_iam_master_2.pdf

B.C. Ministry of Forests.  2022. Provincial Logging Residue and Waste Measurements Procedure Manual.  https://www2.gov.bc.ca/gov/content/industry/forestry/competitive-forest-industry/timber-pricing/forest-residue-waste/provincial-logging-residue-and-waste-measurements-procedure-manual-interior-version

B.C. Ministry of Forests and Range.  2007.  Government Actions Regulation Order.  Scenic Areas and Visual Quality Objectives within the Columbia Forest District (Selkirk District).  https://www2.gov.bc.ca/gov/content/environment/natural-resource-stewardship/laws-policies-standards-guidance/legislation-regulation/forest-range-practices-act/government-actions-regulation

B.C. Ministry of Forests, Lands and Natural Resource Operations.  Forest Analysis and Inventory Branch.  VRI Relational Data Dictionary (version 5.0).  https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/forestry/stewardship/forest-analysis-inventory/data-management/standards/vegcomp_poly_rank1_data_dictionaryv5_2019.pdf

B.C. Ministry of Forests, Lands and Natural Resource Operations. 2011.  Revelstoke Higher Level Plan Order Amendment to Objectives 1 (Biodiversity Emphasis) and 2 (Old and Mature Forest).  https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/natural-resource-use/land-water-use/crown-land/land-use-plans-and-objectives/kootenayboundary-region/revelstoke-rlup/revelstoke_rlup_luor_22dec2011amend.pdf

B.C. Ministry of Forests, Lands and Natural Resource Operations.  2011. Revelstoke Timber Supply Area.  Rationale for Allowable Annual Cut (AAC) Determination.  https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/forestry/stewardship/forest-analysis-inventory/tsr-annual-allowable-cut/revelstoke_tsa_rationale.pdf

BC Ministry of Forests, Lands, and Natural Resource Operations.  Resources Practices Branch.  March 2013.  A Guide to Visual Quality Objectives: Categories of Visually Altered Forest Landscapes.  https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/forestry/visual-resource-mgmt/vrm_a_guide_to_visual_quality_objectives.pdf

B.C. Ministry of Forests, Lands, Natural Resource Operations and Rural Development. 2018. Policy Regarding the Administration of Unharvested Volumes, Uncommitted Volumes and Unused BCTS Volumes. https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/forestry/timber-tenures/timber-tenure-bulletins-policies-procedure/policy_regarding_the_administration_of_unharvested_volumes_uncommitted_volumes_and_unused_bcts_volumes.pdf?msclkid=ce98124dd0b611ec83aa3a0302d046ce

B.C. Ministry of Forests, Lands, Natural Resource Operations and Rural Development. 2019. Major Timber Processing Facilities in British Columbia. https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/forestry/fibre-mills/2019_mill_list_report_final.pdf

B.C. Ministry of Forests, Lands, Natural Resource Operations and Rural Development. 2019. Order – Ungulate Winter Range #U-4-001 – West Kootenay (Arrow TSA, Kootenay Lake TSA, Revelstoke TSA, Cascadia TSA, TFL 3, TFL 23, Woodlots and Community Forests). https://www.env.gov.bc.ca/wld/documents/uwr/ord_amend_u-4-001_2020.pdf

B.C. Ministry of Forests, Lands, Natural Resource Operations and Rural Development. 2020. Draft Inventory Plan for Photo Interpretation of the Revelstoke TSA. https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/forestry/stewardship/forest-analysis-inventory/forest-cover-inventories/photo-interpretation/planning-reports/tsa-vri-photo-interpretation-project-implementation-plan/revelstoketsa_vpip_2020_02_27.pdf?msclkid=177cb665d0ae11ecbda8ac227a95e5f8

B.C. Ministry of Environment. 2009. Order – Ungulate Winter Range #U-3-005 – Mountain Caribou-Revelstoke Shuswap Planning Unit. https://www.env.gov.bc.ca/wld/documents/uwr/u-3-005_order_09Dec09.pdf

B.C. Ministry of Environment. Predictive Ecosystem Mapping. https://www.env.gov.bc.ca/fia/pem.htm?msclkid=5f02e0cad0b111ec9867e5583f188115

B.C. Ministry of Forests, Lands, Natural Resource Operations and Rural Development. Electronic Commerce Appraisal System (ECAS). https://www2.gov.bc.ca/gov/content/industry/forestry/competitive-forest-industry/timber-pricing/electronic-commerce-appraisal-system.

B.C. Ministry of Forests, Lands, Natural Resource Operations and Rural Development. Forest Stewardship Plan Tracking System. https://www2.gov.bc.ca/gov/content/industry/forestry/managing-our-forest-resources/forest-stewardship-plans/forest-stewardship-plan-tracking-system

B.C. Ministry of Forests, Lands, Natural Resource Operations and Rural Development. Harvest Billing System (HBS) https://www2.gov.bc.ca/gov/content/industry/forestry/competitive-forest-industry/timber-pricing/harvest-billing-system

B.C. Ministry of Forests, Lands, Natural Resource Operations and Rural Development. Seed Planning and Registry Application (SPAR). https://www2.gov.bc.ca/gov/content/industry/forestry/managing-our-forest-resources/tree-seed/seed-planning-use/spar

B.C. Ministry of Forests, Lands, Natural Resource Operations and Rural Development. Reporting Silviculture Updates and Land Status Tracking System (RESULTS) Application. https://www2.gov.bc.ca/gov/content/industry/forestry/managing-our-forest-resources/silviculture/silviculture-reporting-results

B.C. Ministry of Sustainable Resource Management. 2005. Revelstoke Higher Level Plan Order. https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/natural-resource-use/land-water-use/crown-land/land-use-plans-and-objectives/kootenayboundary-region/revelstoke-rlup/revelstoke_rlup_fpc_25mar2005.pdf

Churlish Consulting Ltd & Jahraus & Associates Consulting Inc.  2011. Documentation of Analysis for Net Volume Adjustment Factor and Vegetation Resources Inventory Statistical Analysis for the Revelstoke Timber Supply Area.  Report prepared for Downie Timber Ltd.

Environment Canada. 2014. Recovery Strategy for the Woodland Caribou, Southern Mountain population (Rangifer tarandus caribou) in Canada.  Species at Risk Act Recovery Strategy Series.  Environment Canada, Ottawa. viii + 103 pp.  https://sararegistry.gc.ca/default.asp?lang=En&n=5837FBB5-1

Foord, Vanessa.  2021.  Revelstoke TSA Climate Change Analysis.

Gorley, Al and Merkel, Gary.  2020.  A New Future for Old Forests: A Strategic Review of How British Columbia Manages for Old Forests Within its Ancient Ecosystems.  https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/forestry/stewardship/old-growth-forests/strategic-review-20200430.pdf

MacKillop, Deb, Hopkins, Kathy.  2016.  Adapting natural resource management to climate change in the Kootenay Boundary Region: Considerations for practitioners and Government staff.  Accessed from: https://www2.gov.bc.ca/assets/gov/environment/natural-resource-stewardship/nrs-climate-change/regional-extension-notes/kbren160222.pdf

Mowat, G. and al.  2018.  Grizzly Bear Cumulative Effects Assessment Report.  Elk Valley, Kootenay-Boundary Region.  https://www2.gov.bc.ca/assets/gov/environment/natural-resource-stewardship/cumulative-effects/final_ev-cemf_grizzly_bear_cea_report_edited_20180524.pdf

Penfold, George E.  2012.  A Review of the Range of Impacts and Benefits of the Columbia River Treaty on Basin Communities, the Region and the Province.  https://engage.gov.bc.ca/app/uploads/sites/6/2012/07/A-Review-of-the-Range-of-Impacts-and-Benefits-of-the-Columbia-River-Treaty6.pdf

Province of British Columbia.  1999.  Biodiversity Guidebook.  Victoria, BC.  www.for.gov.bc.ca/hfd/library/documents/bib19715.pdf

Province of British Columbia.  1995. Biodiversity Guidebook.  Biodiversity Guidebook (Forest Practices Code of British Columbia, September 1995) (gov. https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/natural-resource-use/land-water-use/crown-land/land-use-plans-and-objectives/cariboo-region/cariboochilcotin-rlup/biodiversity_guidebook.pdf?msclkid=24a00986d0b811ec9c52fe867b3b6bf2 bc.ca)

Province of British Columbia.  2002.  The B.C. Land Cover Classification Scheme.  https://www.for.gov.bc.ca/hfd/library/documents/bib107006_2002.pdf

Province of British Columbia. 2019. *Declaration on the Rights of Indigenous Peoples Act*.  https://www.bclaws.gov.bc.ca/civix/document/id/complete/statreg/19044?msclkid=8f55688ad0a311ecb0ecbd11be5395d0

Province of British Columbia.  2020. Controlled Recreation Area (*Resort Timber Administration Act*) Regulation.  OIC Orders.  http://www.bclaws.ca/civix/document/id/complete/statreg/681478536

Province of British Columbia.  2020.  Cut Control Regulation.  https://www.bclaws.gov.bc.ca/civix/document/id/complete/statreg/17_578_2004?msclkid=cadf551fd0b711ecb2d25b1c6aae79b6

Province of British Columbia.  2020.  Interim Assessment Protocol for Grizzly Bear in British Columbia.  https://www2.gov.bc.ca/assets/gov/environment/natural-resource-stewardship/cumulative-effects/protocols/cef_grizzly_bear_protocol_oct2020_final.pdf

Province of British Columbia.  Approved Wildlife Habitat Areas (WHAs) in the Kootenay Region.  https://www.env.gov.bc.ca/cgi-bin/apps/faw/wharesult.cgi?search=wlap_region&wlap=Kootenay

Province of British Columbia.  Biogeoclimatic Ecosystem Classification Program.
https://www.for.gov.bc.ca/hre/becweb/?msclkid=4620e4b9d0a111ec8e4a816b9252835a

Province of British Columbia.  BC Columbia River Treaty.  https://engage.gov.bc.ca/columbiarivertreaty/

Province of B.C.  The B.C. Geographic Warehouse.
https://www2.gov.bc.ca/gov/content/data/geographic-data-services/bc-spatial-data-infrastructure/bc-geographic-warehouse

Province of British Columbia.  Caribou in British Columbia.
https://www2.gov.bc.ca/gov/content/environment/plants-animals-ecosystems/wildlife/wildlife-conservation/caribou

Province of British Columbia.  Chief Forester's Standards for Seed Use.
https://www2.gov.bc.ca/gov/content/industry/forestry/managing-our-forest-resources/tree-seed/legislation-standards/chief-forester-s-standards-for-seed-use

Province of British Columbia. Cumulative Effects Framework.
https://www2.gov.bc.ca/gov/content/environment/natural-resource-stewardship/cumulative-effects-framework

Province of British Columbia.  Economic and Community Development Agreements.
https://www2.gov.bc.ca/gov/content/environment/natural-resource-stewardship/consulting-with-first-nations/first-nations-negotiations/economic-and-community-development-agreements

Province of British Columbia.  Forest Health.
https://www2.gov.bc.ca/gov/content/industry/forestry/managing-our-forest-resources/forest-health

Province of British Columbia.  Forest and Range Evaluation Program.
https://www2.gov.bc.ca/gov/content/industry/forestry/managing-our-forest-resources/integrated-resource-monitoring/forest-range-evaluation-program

Province of British Columbia.  Forest Consultation and Revenue Sharing Agreements.
https://www2.gov.bc.ca/gov/content/environment/natural-resource-stewardship/consulting-with-first-nations/first-nations-negotiations/forest-consultation-and-revenue-sharing-agreements

Province of BC.  Provincial Site Productivity Layer.
https://www2.gov.bc.ca/gov/content/industry/forestry/managing-our-forest-resources/forest-inventory/site-productivity/provincial-site-productivity-layer

Province of BC.  Table Interpolation Program for Stand Yields (TIPSY).
https://www2.gov.bc.ca/gov/content/industry/forestry/managing-our-forest-resources/forest-inventory/growth-and-yield-modelling/table-interpolation-program-for-stand-yields-tipsy

Province of BC.  Variable Density Yield Projection (VDYP).
https://www2.gov.bc.ca/gov/content/industry/forestry/managing-our-forest-resources/forest-inventory/growth-and-yield-modelling/variable-density-yield-projection-vdyp

Province of BC.  Permanent Sample Plots (PSPs).
https://www2.gov.bc.ca/gov/content/industry/forestry/managing-our-forest-resources/forest-inventory/ground-sample-inventories/permanent-sample-plot

Province of British Columbia.  RSBC 1996.  *Forest Act*.  Victoria, BC.
https://www.bclaws.gov.bc.ca/civix/document/id/complete/statreg/96157_00_multi

Province of British Columbia.  RSBC 1996.  *Forest Practices Code of British Columbia Act*.
https://www.bclaws.gov.bc.ca/civix/document/id/complete/statreg/96159_01?msclkid=839ad9ead0a211ec92d558ca20acc28f

Province of British Columbia.  RSBC 1996.  *Heritage Conservation Act*.  Victoria, BC.
www.bclaws.ca/civix/document/id/complete/statreg/96187_01

Province of British Columbia.  RSBC 1996.  *Land Act*.
http://www.bclaws.ca/civix/document/id/complete/statreg/96245_01

Province of British Columbia.  RSBC 2004.  *Forest and Range Practices Act*.  Victoria, BC.
http://www.bclaws.ca/civix/document/id/complete/statreg/14_2004

Province of British Columbia.  RSBC 2004.  *Forest and Range Practices Act* Forest Planning and
Practices Regulation.  Victoria, BC.  http://www.bclaws.ca/civix/document/id/complete/statreg/14_2004.

Province of British Columbia.  RSBC 2004.  *Forest and Range Practices Act* Government Actions
Regulation.  Victoria, BC.  http://www.bclaws.ca/civix/document/id/complete/statreg/582_2004

Province of British Columbia.  Strategic Engagement Agreements.
https://www2.gov.bc.ca/gov/content/environment/natural-resource-stewardship/consulting-with-first-
nations/first-nations-negotiations/strategic-engagement-agreements

Supreme Court of Canada.  2021 SCC 17. R. v. Desautel.  https://decisions.scc-csc.ca/scc-csc/scc-
csc/en/item/18836/index.do

Statistics Canada.  Census of Population.  https://www12.statcan.gc.ca/census-recensement/index-
eng.cfm?MM=1

United Nations.  2007.  Declaration on the Rights of Indigenous Peoples.
https://www.un.org/development/desa/indigenouspeoples/wp-
content/uploads/sites/19/2018/11/UNDRIP_E_web.pdf

## 14.  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 Revelstoke TSA.  Comments on this *Data Package* will be accepted until November 8, 2022.

A further comment period will be made available following the release of a *Discussion Paper* that outlines the results of the timber supply analysis.

Ministry staff would be pleased to answer questions to help you prepare your response in respect of the *Data Package* review process.

Please send your comments to the local resource district office at the address below.

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:

Miles Howard, Stewardship Forester
Selkirk Resource District
Ministry of Forests
P.O. Box 9158 RP03
1761 Big Eddy Road
Revelstoke, British Columbia, V0E 3K0

Phone: (250) 805-6746
Electronic mail: Miles.Howard@gov.bc.ca

For information on the Timber Supply Review visit the Timber Supply Review & 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