Kootenay Lake Timber Supply Area
Timber Supply Review

Data Package

November 2020

Tara DeCourcy, District Manager
Selkirk Natural Resource District
Ministry of Forests, Lands, Natural Resource Operations and Rural Development

Albert Nussbaum, Director
Forest Analysis and Inventory Branch
Ministry of Forests, Lands, Natural Resource Operations and Rural Development

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1. Introduction

This data package summarizes the information and assumptions required for the Kootenay Lake Timber Supply Area (TSA) timber supply analysis.

Under Section 8 of the *Forest Act* the chief forester must review the timber supply for each TSA at least once every 10 years and determine an appropriate allowable annual cut (AAC). For more information about the timber supply review (TSR) process please visit the following website: www2.gov.bc.ca/gov/content/industry/forestry/managing-our-forest-resources/timber-supply-review-and-allowable-annual-cut/timber-supply-areas.

The data package contains those inputs that represent current legal requirements and performance for the TSA and for the purposes 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 approved by Cabinet (e.g., Kootenay Boundary Higher Level Plan Order);
- legal objectives established under the *Forest and Range Practices Act* and the *Land Act* (e.g., visual quality objectives (VQOs), wildlife habitat areas (WHAs), and ungulate winter ranges (UWRs)).

The primary purpose of the TSR program is to identify, and if reasonable, model the "what is", not the "what if" for forest management on the TSA. Changes in forest management objectives and data, when and if they occur, will be captured in future TSRs.

A First Nation consultation and public review period has been established to allow submission of comments and concerns to the Ministry of Forests, Lands, Natural Resource Operations and Rural Development (FLNRORD) 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 her AAC determination. The chief forester's AAC determination will be documented through the public release of an 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 process. This data package, with revisions if required, forms the base for the timber supply analysis. Once that analysis is complete, a discussion paper summarizing the analysis and related issues is released and a further 60-day comment period will commence. Section 12 describes details around the review process and comment submissions, and Section 15 has details on how to submit comments.

2. Background

2.1 General

The Kootenay Lake TSA is located in south-eastern British Columbia. The Kootenay Lake TSA is in the Selkirk and Purcell Mountain ranges and encompasses three major drainage systems, Kootenay Lake, Duncan River, and Lardeau River. To the north is Glacier National Park and to the south is the Canada-United States international border.

The TSA covers approximately 1.24 million hectares of gross land base, of which about 0.684 million hectares are the Crown Forest Land Base (CFLB). After accounting for land base exclusions for environmental, economic and operability issues, approximately 182 990 hectares is considered timber harvesting land base.

The Kootenay Lake TSA includes both moist and wet climatic regions and is commonly referred to as part of the Interior Wet Belt. The moist climatic region covers most of the TSA, except for a wet region north of the Purcell Wilderness Conservancy. Varied ecological features and species diversity contributes to the high biodiversity values in this TSA.

Two biogeoclimatic zones cover almost 95% of Kootenay Lake TSA. The Interior Cedar Hemlock (ICH) zone covers about 40% of the TSA and occupies valley bottoms and lower slopes to about 1400 metres. In general, the ICH zone has wet, cool winters and warm, dry summers, and is the most productive forest zone in the interior of BC. The ICH has a high diversity of tree species including western redcedar, western hemlock, grand fir, Engelmann spruce, subalpine fir, western larch, Douglas-fir, western white pine, western yew, Ponderosa pine and lodgepole pine.

The Engelmann Spruce-Subalpine Fir (ESSF) zone covers over 50% of the TSA and is the uppermost forested zone in the Kootenay Lake TSA, typically occurring at elevations between 1400 and 2500 metres. The ESSF zone has a relatively cold, moist and snowy continental climate. Growing seasons are cool and short, while winters are long and cold. Engelmann spruce and subalpine fir are the dominant climax tree species, while alpine larch and whitebark pine also occur. At the lower elevations of this zone, lodgepole pine, Douglas-fir, western hemlock and western redcedar can be found.

At the upper elevations, the ESSF forests grade into the parkland ecosystems and the alpine zone. The Interior Mountain-heather Alpine (IMA) zone occurs at elevations greater than 2250 metres; the climate is cold, windy and snowy with a short, cool growing season. This zone is largely treeless and consists mainly of rock, ice and snow. Vegetated areas are dominated by shrubs, herbs, mosses and lichens.

The diverse forest of the Kootenay Lake TSA supports a wide variety of wildlife species in abundance. Large mammals include black bear, grizzly bear, moose, mule deer, white-tailed deer, elk, mountain goat, bighorn sheep, caribou, cougar, lynx, wolverine, badger, and bobcat.

The Kootenay Lake TSA supports a diverse range of bird species, including year-long residents and migratory birds such as woodpeckers, songbirds, waterfowl, raptors and shorebirds. The West Kootenays is part of a great migratory corridor, with Creston flats at the south end of Kootenay Lake being particularly rich in birdlife. In 1968, the *Creston Valley Wildlife Act* was passed, delegating a - management authority to manage the Creston Valley Wildlife Management Area, which covers 7000 hectares along the Kootenay River system.

Water is a primary and fundamental resource of the Kootenay Lake TSA. Hydro development has a long history in the TSA; the first hydroelectric plant was built in Nelson in 1896. Duncan Dam was completed in 1967, the first of three Columbia Treaty dams built on the Canadian side of the Columbia River Basin. Whether occurring as surface or groundwater, water is a crucial component of the ecosystems found in the TSA. The rivers and lakes of the TSA are home to numerous fish species including kokanee, Gerrard rainbow trout, Westslope cutthroat, bull trout, whitefish, eastern brook trout, burbot and white sturgeon. Approximately 30% of the TSA falls within watersheds providing water for consumptive uses.

The 2016 census estimates the population of the Kootenay Lake TSA at approximately 34,000. The three largest communities are Nelson, Creston and Kaslo, with numerous smaller communities across the TSA.

The economy of the area is diversified and includes tourism, retail trade, forestry, agriculture, education, health care and construction, with technology identified as an emerging sector. The natural resources of the TSA are primarily administered by the Selkirk Natural Resource District.

The current AAC for the Kootenay Lake TSA, effective August 12, 2010, was set at 640 000 cubic metres.

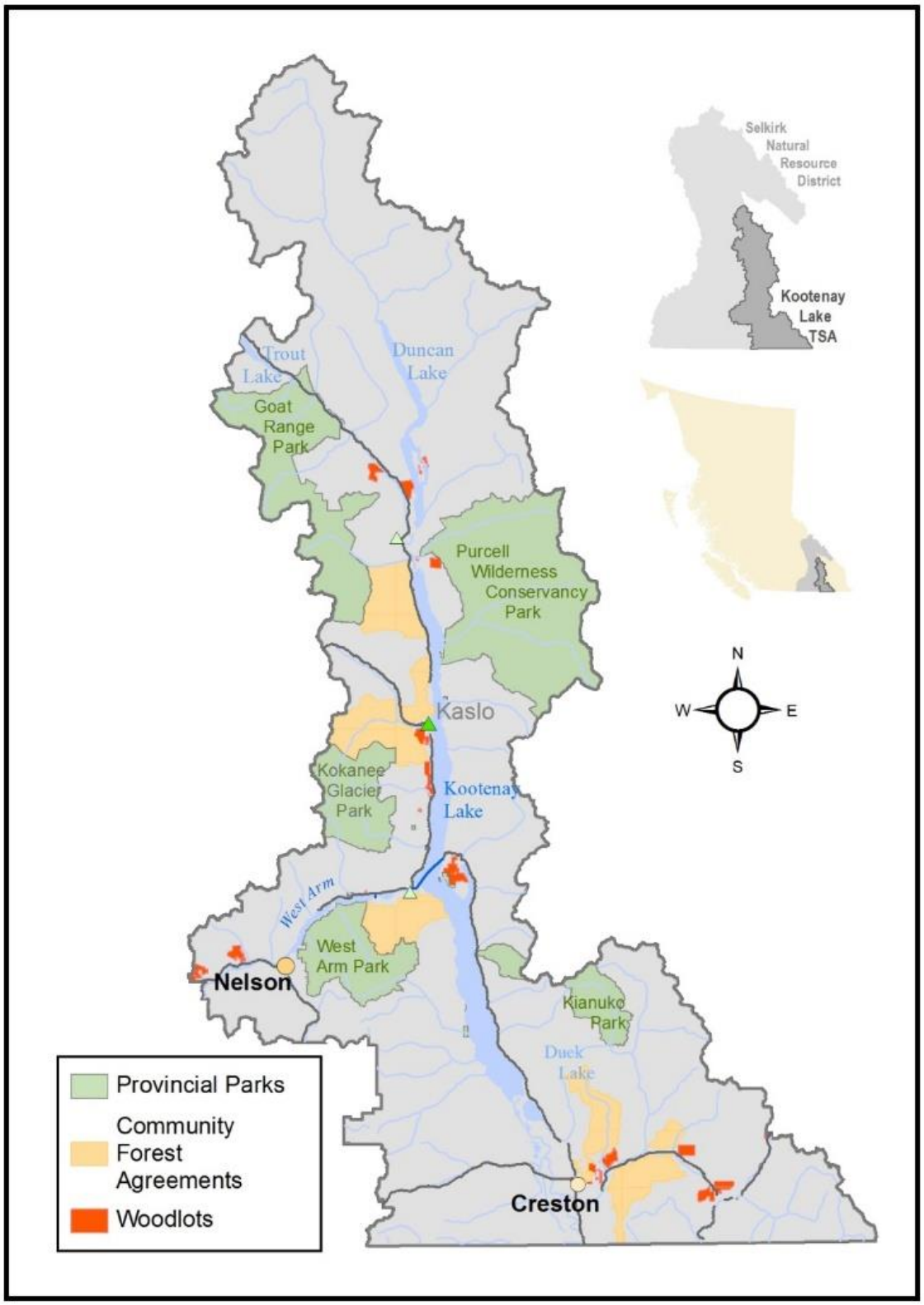

Figure 1. Kootenay Lake Timber Supply Area.

2.2 Land use planning

Land use planning initiatives in the 1990's resulted in the development of the Kootenay-Boundary Land Use Plan (KBLUP). The West Kootenay Boundary Land-Use Plan was completed in 1995 and established commercial resource use areas, new protected areas and an economic strategy to mitigate economic impacts from the plan.

The Kootenay Boundary Higher Level Plan Order (KBHLPO) was originally approved on January 31, 2001 and was updated and replaced on October 26, 2002. The plan and associated variances legally establish land and resource management objectives and strategies that apply to the entire Crown land base and to resource management zones (RMZ). Several variances of the order have been made over time.

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

1. Biodiversity Emphasis;
2. Old and Mature Forest;
3. Caribou;
4. Green-up;
5. Grizzly Bear Habitat and Connectivity Corridors;
6. Consumptive Use Streams;
7. Enhanced Resource Development Zones – Timber;
8. Fire-Maintained Ecosystems;
9. Visuals;
10. Social and Economic Stability.

Licensee Forest Stewardship Plan (FSP) commitments meet these objectives and current practices are consistent with FSP results and strategies.

2.3 Forest industry

Operating within the Kootenay Lake TSA are six forest licensees, three community forests, fourteen woodlots and British Columbia Timber Sales (BCTS). There are two sawmills located in Creston which are owned by major tenure holders, Canfor (previously Wynndel Box & Lumber sawmill), and J.H. Huscroft. Three other major tenure holders, Atco Wood Products Ltd., Kalesnikoff Lumber Company, and Porcupine Wood Products Ltd., own processing facilities in the adjacent Arrow TSA.

Nearly all these facilities are independently owned, and all have been in operation for decades; Atco (72 years, 1947), Kalesnikoff (79 years, 1940), J.H. Huscroft (92 years, 1927), and Wynndel Box, now Canfor (106 years, 1913). Collectively, the diverse products these mills produce have been pivotal in maintaining a viable timber industry in the area. Since the last TSR was conducted, one mill facility in Meadow Creek has ceased operation.

There are also several small mill operations which process custom lumber located in Harrop-Proctor, Meadow Creek and Kaslo. Additionally, other businesses within the TSA make value-added products such as timber frame homes, posts and rails, and products for musical instruments.

Supplemental volume required by these milling facilities is partially supplied by BCTS, Tree Farm Licences (TFLs), Community Forest Agreements (CFA) Licences, Woodlots, Small Scale Salvage, Non-replaceable Forest Licence agreements, and outside TSA purchases or trades.

The current AAC is apportioned between five Replaceable Forest Licenses (66%), Non-replaceable Forest Licences (2%), BCTS Licences (28%), and Forest Service Reserve (2%). The Ktunaxa Nation hold one non-replaceable forest licence.

3. First Nations

3.1 First Nations Territories

The member bands of three Nations have territories that overlap, in whole or in part, with the Kootenay Lake TSA; the Ktunaxa Nation Council, the Shuswap Nation Tribal Council and the Okanagan Nation. This area includes 12 *Indian Act* Bands, four of which are represented by Ktunaxa Nation Council.

3.1.1 Ktunaxa Nation Council

Ktunaxa have four *Indian Act* Bands, with one, the Lower Kootenay Indian Band, located in the TSA near Creston. Ktunaxa member bands do not have territories separate from the Nation Council. The Ktunaxa Nation territory encompasses the entire TSA.

Ktunaxa Nation represented by the Ktunaxa Nation Council have been in treaty negotiations since 1993. Negotiations are currently in Stage 5, negotiating to finalize a treaty.

Ktunaxa have multiple agreements with the Province of BC including a Strategic Engagement Agreement, Forest Consultation and Revenue Sharing Agreements, and Forest Tenure Opportunity Agreements. The Ktunaxa Nation hold one non-replaceable forest licence within the Kootenay Lake TSA.

3.1.2 Okanagan Nation (Syilx)

The territory of the Okanagan Nation member bands, or Syilx, encompasses approximately the western half of the TSA. There are five-member bands in Okanagan Nation whose territories are within a portion of the TSA. These include the: Okanagan Indian Band, Lower Similkameen Indian Band, Penticton Indian Band, Upper Nicola Band and Westbank First Nation. All the Okanagan Nation member band reserves and main communities are situated outside of the TSA. The majority of these Okanagan Nation member bands have an affiliation with the Okanagan Nation Alliance.

The Okanagan Nation is not involved in the BC treaty process. The Okanagan Nation and the Province of BC currently do not have a government to government agreement but work on various agreements is underway at the band level. A majority of the Okanagan Nation bands in the TSA have current Forest Consultation and Revenue Sharing Agreements with FLNRORD. None of the bands hold a forest tenure in the TSA.

3.1.3 Secwepemc Nation

Five of the Secwepemc Nation member bands have territories which overlap the Kootenay Lake TSA. Four of the five are signatories to the Secwepemc Letter of Agreement: Adams Lake Indian Band, Little Shuswap Lake Indian Band, Shuswap Indian Band and Splatsin First Nation. The fifth, Neskonlith Indian Band, is not a signatory to that agreement. These member bands are not involved in the BC treaty process. None of the Secwepemc member band reserves or main communities are situated within the Kootenay Lake TSA.

Each of the five Secwepemc Nation member bands have Forest Consultation and Revenue Sharing Agreements and Forest Tenure Opportunity Agreements with FLNRORD. None hold a forest tenure in the TSA. The Secwepemc Letter of Commitment overlaps a significant portion of the TSA.

3.2 Engagement and consultation with First Nations

The Province is working to engage First Nations throughout this TSR process, from the start of data gathering up to the time that the allowable annual cut decision is made by the chief forester. Commencement of formal consultation will start with the release of this document. The public documents, to the extent possible, will reflect First Nations' interests as expressed to FLNRORD; analysis will be mindful of those interests.

Pre-consultation engagement on the TSR began in November 2018 with a letter to all First Nations whose traditional territories overlap with the Kootenay Lake TSA. Documentation of communication with First

Nations, and a review of some communication from previous TSRs has been and will continue to be tracked so FLNRORD staff can ensure concerns are addressed by government.

As these issues are being addressed or shared with appropriate staff in other agencies/ministries, FLNRORD will continue to track their status, share those updates with First Nations and work on issues with First Nations. At the end of the TSR process, the concerns and how they were addressed will become part of the consultation record prepared for and presented to the decision maker. A summary of First Nation's concerns will be shared, upon request, with their offices when the rationale is complete.

The formal consultation process will commence with the release of the *Data Package* (i.e., this document). The *Data Package* identifies the best available information on the forest inventory and management practices. The formal review period for the *Data Package* will last 60 days.

An analysis that includes a base case harvest forecast and sensitivities around uncertainties will be completed based upon the draft *Data Package* and information obtained during the review. Following completion of the analysis, a *Discussion Paper*, that summarizes the analysis and related issues, will be released. A second 60-day formal review period will commence at that time.

Following this second formal review period, ministry staff will collate and obtain clarification of comments received, and if necessary, update analysis to reflect concerns. This information will then be presented to the chief forester to assist with her AAC determination. The AAC determination is released as a formal rationale document that will be provided to all First Nations bands.

3.3 Resource values assessment - wildlife habitat supply

In its 2007 William decision (Tsilhqot'in Nation v. British Columbia), the BC Supreme Court ruled that decision makers must consider information on wildlife values associated with Aboriginal rights and Interests (e.g., hunting, trapping, fishing, and trading), and the potential implications of the decision on wildlife and First Nations' interests. In this regard, FLNRORD seeks to collaborate with First Nations to identify values for assessment and decision support in the TSR, as well as to review past consultation records for key values that could be evaluated. In some cases, existing assessment procedures available through the Cumulative Effects Framework will be leveraged for this purpose.

Recent TSRs in the Kootenay Boundary Region conducted wildlife habitat supply reviews. The Ktunaxa were heavily involved in the selection of the wildlife species included in the resulting habitat supply modelling: American marten, northern goshawk and grizzly bear. These species are dependent on old forests and are sensitive to road development. Modelling of the habitat supply was carried out by FLNRORD staff. Some weaknesses in the model have been identified, however an improved model has not been developed and will not be available for this determination. Therefore the original model will not be run for this TSA but additional available information on old growth forests, wildlife, cumulative affects data and information provided by First Nations will be presented to the chief forester for her consideration at the time of the determination.

Assessments for key values cannot address all the issues communicated by First Nations, however their concerns are being documented and if concerns cannot be addressed during TSR and AAC determination, they will be communicated to other parts of government for consideration. FLNRORD will continue to engage with First Nations throughout the TSR process and provide documentation on how concerns are being addressed. The published *AAC Rationale* will identify how concerns relevant to the AAC determination have been considered.

4. Current Forest Management Considerations and Issues

4.1 Base case management assumptions

The information described in this data package is the best available data and reflects current performance and knowledge with respect to the status of forest land, forest management practices, and timber growth and yield. The harvest forecast developed from these assumptions is termed the base case harvest forecast and is used as a reference when examining the effects of uncertainties. Section 10.3 identifies areas of uncertainty in the data and assumptions and outlines intended sensitivity analyses, the additional timber supply forecasts that are carried out to explore alternative assumptions. The forecast of the base case scenario and the sensitivity analyses together are one component of the information presented to the chief forester for a Section 8 AAC determination.

4.2 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.

Climate change projections for the West Kootenay suggest that climate change is 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.

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.

There is uncertainty about both the impact of climate change on timber supply and the appropriate response in timber supply decisions. Opposing timber supply decisions may be reasonable depending upon management response to potential or actual impacts of climate change. Harvest levels could be increased to capture mortality or decreased to provide a buffer against the possibility of increased disturbance.

Impacts of climate change will be modelled in a sensitivity by increasing the total non-recoverable losses (NRL) across the timber supply modelling time frame. A linear increase in non-recoverable losses will demonstrate the potential impacts of increased disturbance on timber supply. The total NRL will be increased by 10% per decade over the time of the timber supply analysis such that in the first decade, the change will be 10% of the base case NRL, in the second decade, the change will be 20% of the base case NRL, and so on. Section 8.4.2 provides more details on NRLs.

The results of these analyses are not predictions of the future under climate change. Instead, they are a way to examine pressures on timber supply caused by climate change over time. As more research and information become known, future timber supply reviews will be able to more accurately model and adjust the allowable annual cut appropriately.

4.3 Major forest management considerations

Table 1 identifies the major forest management considerations and issues that drive the current Kootenay Lake TSA TSR analysis. Each of these items listed below are discussed in further depth in their own sections of this document.

Forest management considerations that both fall within the definition of current management, and are clearly defined, are modelled within the base case harvest forecast. If the issue does not fall within the definition of current management as described in Section 1, or modelling presents challenges, the related timber supply impacts will be assessed in a sensitivity analysis. There may be significant uncertainties in

defining some current management issues. In such cases, sensitivity analysis can assist in assessing the potential timber supply implications and assigning degrees of risk to timber supply during the AAC determination.

Table 1. Major forest management considerations and issues

Consideration/issue	Description
Vegetation resource inventory	There has been a new inventory in the Kootenay Lake TSA since the last TSR. In the last TSR, the inventory was rolled over from legacy forest cover files based on aerial photography from 1968 to 1972. The current inventory is based on aerial photography taken between 2005 and 2006. See Section 5.1.
Land use objectives	Licensees within the Kootenay Lake Timber Supply Area are required to practice forest management consistent with the KBHLPO. KBHLPO established Resource Management Zones corresponding to the old district boundaries. Objectives for the Kootenay Lake zone are included in the TSR under the applicable sections.
Old growth management areas	Within the Kootenay Lake TSA, licensees and FLNRORD staff agreed on non-legal old growth management areas (OGMAs). These were spatially defined and available through the BCGW. These OGMAS are agreed to in FSPs of licensees operating within the Kootenay Lake TSA. The Kootenay Boundary Region is currently undertaking a project to update and evaluate the non-legal OGMA boundaries and aspatial targets, defined in the KBHLPO, for old growth retention. In the base case, this updated district layer will be removed from the THLB to model old growth management areas. See Section 7.5.2.
Fish and wildlife	The TSR process accounts for specific management objectives for wildlife. These are detailed within the document and include sections on: • Ungulate Winter Range • Southern Mountain Caribou • Wildlife Habitat Areas • Wildlife Management Areas • Wildlife Habitat Supply • Wildlife Habitat Features • Stand Level Biodiversity • Landscape Biodiversity • Riparian Reserves and Management Areas
Visual resources	In 1999, the District Manager formally established 'scenic areas' and visual quality classes that became legal with the passing of the Kootenay Boundary Higher Level Plan Order in October 2002. In March 2014, under Section 7(1) and (2) of the Government Action Regulation, the District Manager of Kootenay Lake Forest District amended the scenic areas and visual quality objectives in the Kootenay Lake TSA. The spatial data layer representing this amendment will be used for this analysis. See Section 8.3.6.
Site productivity	The provincial site productivity layer provides site index by tree species for commercial tree species. The estimates are based on available ecosystem data. in areas where no data is available site index estimates are based on biophysical data and species ranges. See Section 5.4.3.
Current harvest levels	Harvest in the Kootenay Lake TSA in the period 2011 to 2018 has averaged 614 485 cubic metres per year. This consideration is discussed further in Section 8.1.

(continued)

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

Consideration/issue	Description
Insects and diseases	Many forest health damaging agents are present within the Kootenay Lake TSA. These agents include insects, pathogens, and animals. Many of them have the potential to cause significant timber losses. This consideration is discussed in further detail in Section 8.4.
Fire	Fire impacts on the TSA increased in 2017 and 2018. Fire damaged stands should be considered for immediate salvage in order to recover useable timber and to reduce future damaging agents such as Douglas-fir or Spruce bark beetle. Harvest within a year of damage is recommended for wood quality and reduction of other pests. This consideration is discussed in further detail in Section 8.4.2.
Volume estimates for regenerated managed stands	In the last determination, the chief forester requested that second-growth stands be monitored so this factor can be appropriately modelled. A young stand monitoring program has been established within the TSA. See Section 8.2.3 and Section 8.4.

5. Inventories

5.1 Vegetation resource inventory

A Vegetation Resources Inventory (VRI) photo interpretation project (Phase 1) was completed between 2008 and 2011. The aerial photographs used for this inventory were acquired between 2005 and 2006. VRI Phase 2 samples were collected in the 2012 field season, and two separate populations of interest were identified: young stands between 15 and 50 years, and mature stands over 50 years.

Overall, for the mature stratum, the relationship between important inventory attributes and ground data for height, basal area, and volume are strong, with ratios very close to 1.0. The average Phase I inventory age tends to be older than the average Phase II ground age. Given the strong relationship between ground and inventory heights, a Phase I overestimation in the age attribute suggests a potential underestimation trend in the Phase I site index. Results for leading species show considerable variability.

For the immature stratum, the age is very good while height is underestimated leading to an underestimate of site index. The site productivity layer site index estimate is slightly closer than the VRI site index to the ground estimate.

The agreement between the Phase I and Phase II leading species is 57% for the immature stratum and 66% for the mature stratum. This may be due in part to the heterogeneity within the Kootenay Lake and the sample polygons, with most having three or more species.

The 2018 data set used for the timber supply analysis was published in British Columbia Geographic Warehouse[1] (BCGW). This data is updated annually with harvest depletion updates from Reporting Silviculture Updates and Land Status Tracking System (RESULTS) and wildfire losses.

The previous TSR was completed using an inventory rolled over from the legacy forest cover Forest Inventory Planning (FIP) files based on aerial photography from 1968-1972, with tree growth projected to January 2007. Significant changes in the data models exist between the two inventories, with a FIP roll over mapping as closely as possible attributes in FIP to the new VRI attributes. However, with different definitions used to populate the attributes there are noticeable differences in results. For example, the Alpine designation in FIP covered almost 300 000 hectares, and in VRI, the same definition covers less than 150 000 hectares. In the FIP based inventory, large polygons were identified as Alpine, and in the new VRI, these Alpine polygons were broken up to identify very sparse forests. In the current analysis, these areas were identified using the parkland definition in PEM, identified as PEM natural disturbance type 5.

In the last TSR, there was 569 620 hectares of CFLB and 199 282 of THLB. In this analysis, there is 684 273 hectares of CFLB and 182 990 hectares of THLB.

Data sources and comments:

The VRI data used for the Kootenay Lake TSA TSR was projected to 2017 and updated in 2018. The current VRI version is available through the BCGW.

BCGW File: WHSE_FORESTVEGETATION.VEG_COMP_LYR_R1_POLY

[1] The British Columbia Geographic Warehouse is the source for land and resource spatial data managed and made available by the BC government. See https://www2.gov.bc.ca/gov/content/data/geographic-data-services.

5.2 Cutblock update

A separate 10-year harvest depletion layer will be created using the consolidated cutblock layer from Forest Analysis Inventory Branch (FAIB), with the RESULTS data for the years between 2008 and 2018 inclusive. RESULTS submissions are submitted by June 1st, and minimally include harvesting for that year to March 31.

Data source and comments:

BCGW file: WHSE_FOREST_VEGETATION.VEG_CONSOLIDATED_CUT_BLOCKS_SP
Access date: September 6, 2019.

5.3 Ownership

A spatial data set of land ownership has been developed by FAIB using information from the Crown land registry, the Integrated Cadastral Information Society, and other data sources, with each ownership category given its own unique code. These ownership codes are referenced in the discussion below.

Data sources and comments:

BCGW file: WHSE_FOREST_VEGETATION.F_OWN

The ownership data layer used was updated in August 2019 by FAIB. The ownership data layer is available on the BCGW. Prior to analysis, this ownership layer was updated based on source data. The updated ownership is used in this analysis.

5.4 Ecosystem mapping

5.4.1 Biogeoclimatic ecosystem classification (BEC)

British Columbia has an extensive biogeoclimatic ecosystem classification (BEC) program. In the Kootenay Lake TSA, mapping of climatic zonal and subzonal classification (BGC) is available on the BCGW and has been updated as of 2016. The 2016 biogeoclimatic mapping (BEC v11) is used in the base case scenario, except for KBHLPO targets which were established using BEC v3 (see Section 7.5.2).

Data source and comments:

BCGW file: WHSE_FOREST_VEGETATION.BEC_BIOGEOCLIMATIC_POLY
Access date: August 8, 2018.

5.4.2 Predictive ecosystem mapping (PEM)

Predictive ecosystem mapping (PEM) is a type of expert system that has been applied to large-scale classification and mapping of ecosystems across British Columbia. An interim draft PEM was completed for the Kootenay Lake TSA in 2015 and met the minimum provincial accuracy assessment standards (Meidinger and Moon protocols where applicable) with an overall score of 65.1%, including alternate calls. While the PEM achieves the 65% threshold for use in TSR for the alternate overlap test, there are several known issues with this PEM, hence its interim, draft status.

Issues are:

1) the primary overlap and dominant entity correct tests did not reach the 65% threshold, and the PEM does not meet the precision criteria - there are a few transects with very high scores and also a few with very low scores.

2) The PEM performs poorly on non-forested sites, and there is a known problem with attribution of polygons in areas with avalanche terrain. Instead of accurately mapping avalanche features, large areas of CFLB are included in over-mapping of avalanche tracks and runout zones. There are similar concerns with areas of large rock outcroppings, forested areas with shallow, rocky soils, and urban/rural properties.

PEM is used to derive data critical to the timber supply model. The PEM issues stated have an effect on the PEM's ability to assess CFLB and for application of the BEC derived site index in TSR models. The new PEM data use updated BEC mapping and site classification for forested site series, which were published in 2016. The PEM also mapped non-forest ecosystems using the BEC of Non-forested Ecosystems of British Columbia framework (TR068; MacKenzie 2012).

Data source and comments:

The PEM data used for the timber supply analysis was accessed from an internal government server.

5.4.3 Site productivity

Site index is the most common measure of forest site productivity and forest growth used in British Columbia and enables forest managers to predict forest stand growth and yield. Site index is reported as the expected height of the largest diameter tree at age 50.

An extensive field program to collect and derive Site Index by BEC (SIBEC) estimates of productivity was initiated as a parallel project to the PEM (see Section 5.4.2 above). SIBEC sampling met all provincial standards. New SIBEC approximations include calculated values (2nd approximations) for 89 tree species by site series combinations. New sampling focused on the most common sites series (typically submesic, mesic, subhygric) and covered the ICHdm, ICHdw1, ICHmw2, ICHmw4, ESSFwh1, ESSFwh2, ESSFwh3, ESSFwm2, ESSFwm3, ESSFwm4, ESSFwc4. It did not include the ICHxw, ICHwk1 or woodland and parkland areas, and it does not include less common site series or less common species in common site series. For these species and site series, SIBEC values are based on first approximations (at three metre intervals).

The new SIBEC data updated BEC mapping and site classification for forested site series, which were published in 2016. A small amount of additional SIBEC data were collected in 2016-2018 but have not been incorporated into new SIBEC tables. If available, updated data will be used in analyses. New data are not expected to lead to a measurable difference in the base case.

In the Kootenay Lake TSA, the provincial site productivity layer is based upon SIBEC. For the timber supply analysis, that layer is used as input to the growth and yield model TIPSY to derive the volume tables of managed stands. Volume tables for existing natural stands are based upon attributes from the forest inventory using the growth and yield model VDYP. See Section 9.4 for further discussion on the role of site productivity in the model and base case.

Data source and comments:

The site productivity layer was accessed from:

https://catalogue.data.gov.bc.ca/dataset/site-productivity-site-index-by-tree-species

file: Site_Prod_BC.gdb.zip.

6. Division of the Area into Management Zones

6.1 Modelling zones and tracking of multiple objectives

The concept of management zones is used to differentiate areas with distinct management objectives. For example, a zone may be based on a harvesting system, silviculture system, visual quality objectives or wildlife habitat consideration. An area of forest may be subject to more than one management objective. Each objective can be tracked separately in the timber supply model. Land considered unavailable for timber harvesting can contribute to the achievement of other forest management objectives.

Table 2 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 THLB (e.g., riparian areas and wildlife tree areas). Further information on the modelling of these areas can be found in Section 8.3.

Table 2. Management zones and objectives to be tracked

Modelling zone/objective	Data source or inventory definition	Issue
District and supply block	BCGW	Harvest performance and mid-term timber supply
Ungulate winter range	BCGW – as per the KBHLPO.	Habitat
Scenic areas	BCGW – as per Visual Quality Objectives Government Actions Regulation order December 31, 2005.	Visual quality objectives
Community watersheds	BCGW	Forest cover constraint
Integrated resource management areas	Areas where harvesting operations are allowed unless otherwise constrained by non-timber resource objectives.	A forest cover constraint is applied in each landscape unit within the THLB but outside ungulate winter range (U-4-001), community watersheds and scenic areas. See Section 8.3.2
Landscape units by BGC, biodiversity emphasis option, and natural disturbance type	BCGW	KBHLPO seral stage requirements, see Section 7.5.2

7. Land Base Definition

7.1 Introduction

This part of the data package outlines the steps used to identify the CFLB and THLB. The CFLB is the portion of the total area with forest cover that contributes to Crown forest management objectives in the context of TSA timber supply, such as landscape-level biodiversity or visual quality objectives.

The CFLB excludes:

Non-provincial lands that are not within the decision land base such as:

- private lands;
- lands under federal or municipal jurisdiction (e.g. National parks, Indian Reserves);
- lands under municipal jurisdiction (e.g. Municipal parks);
- long-term leases;

Provincial lands not included in TSA AAC determination such as:

- area-based forest tenures (e.g. TFLs, CFAs, Woodlot Licences);
- alpine ski areas; and,
- non-forested lands with no impact on forest management objectives.

The THLB is the portion of the CFLB where timber harvesting is projected to occur over the long term.

The THLB excludes:

Areas where management objectives are incompatible with timber harvesting but that are capable of meeting other forest management objectives:

- provincial parks and protected areas;
- areas with legally established boundaries where timber harvesting is incompatible with management objectives for other resource values.

Areas where harvesting is not expected to occur:

- areas that are not suitable or uneconomic for timber production; and,
- areas that are non-productive for timber harvesting but are capable of meeting other objectives.

Land is considered outside the THLB only where harvesting is not expected to occur. Any area in which timber harvesting will 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 constraints. The CFLB outside of the THLB also contribute to these other objectives.

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., future permanent roads, grassland restoration);
- timber harvesting fails to occur consistently in previously included stand types. These increases and decreases in THLB are generally captured as they occur in time and are modelled in subsequent timber supply review processes;
- land use objectives are introduced by government that reduce the land base available for harvesting.

The above definition for THLB and its complement, non-THLB, are model simplifications. Operationally, areas classified as non-THLB are sometimes harvested and some areas classified as THLB may never be harvested. These land base simplifications are used for analysis purposes and do not confer or imply additional management restrictions.

The THLB is further divided into that area where timber harvesting can legally occur, the legally harvestable land base, and that area where, although legally harvestable, harvesting is unlikely to occur for operational or economic reasons.

For the Kootenay Lake TSA timber supply analysis, the land base will be rasterized into one-hectare cells rather than maintained as vector-based polygons. Linear features such as roads and riparian areas will be modelled as aspatial reductions to the THLB and/or CFLB, and applied as a percentage reduction to the one-hectare cells they fall within.

Table 3. Netdown table

Netdown factor	[1]Within gross land base (ha)	[2]CFLB (ha)	[3]Sequential netdown (ha)	[4]Unique netdown (ha)
Kootenay Lake TSA gross	1 240 878			
Non provincial lands	141 667	0	-141 667	33 404
Not managed within TSA AAC	74 756	0	-74 734	32 843
Non forest and non-productive	393 327	0	-335 671	48 882
[5]Roads and permanent infrastructure	10 915	0	-4 533	304
Crown forest management land base		**684 273**		
Provincial parks, reserves, and PAS2	220 128	124 081	-124 081	11 228
Caribou no harvest areas	212 547	136 602	-136 584	21 652
Landscape-level biodiversity – OGMA	264 791	151 800	-44 424	8 943
Wildlife management areas	21 749	14 538	-10 940	4 729
Crown conservation lands	921	378	-322	214
Wildlife habitat areas	681	559	-524	380
[5]High recreation values	70	47	-24	19
[5]Riparian	36 407	19 358	-9 361	3 494
Legally harvestable land base		**358 014**		
Research installations	153	130	-104	74
[6]Terrain stability	97 248	68 614	-35 573	3 921
Inoperable & uneconomic	710 370	349 727	-105 988	46 416
Deciduous	20 791	12 305	-4 585	4 577
Low productivity sites	153 052	89 806	-2 969	1 791
Underutilized forest types (non-deciduous)	596 021	286 973	-25 833	28 079
[7]Stand level biodiversity – WTR	TBD	TBD	TBD	TBD
Timber harvesting land base		**182 963**		

Data source and comments:

[1]**Within gross land base** is total land base of the factor within the TSA boundary, calculated on the rasterized data.

[2]**CFLB** is the gross area of a factor within the CFLB as described in above in in this section.

[3]**Sequential netdown** shows the area for each factor that was excluded from the REMAINING THLB, not accounting for the overlaps with the THLB excluded previously in the table.

[4]**Unique netdown** shows the area for each factor that was uniquely excluded from the THLB because no other exclusion factor applies to that area. For the partial netdown factors, only those that cover at least 50% of the pixel are considered.

[5]**Roads, riparian, and high recreation** netdown areas are calculated as the percentage of area the buffered linework covers within each one hectare square cell the buffered linework intersesects. The total THLB is calculated using a merged layer of all partial netdown layers.

[6] **Terrain stability** netdown area is calculated as a percentage netdown of each of the one hectare squares identified as *unstable* or *potentially unstable* in the terrain stability layer. See Section 7.4.6.

[7]**Stand level biodiversity - WTR** netdown is calculated across the TSA, with the same percentage netdown applied to each one hectare square of the THLB, or percentage of THLB where a partial netdown has already been applied (e.g., if a 5% netdown has been applied to a one-hectares square area, the wildlife tree retention netdown is applied to the remaining 95%, not the entire one hectare).

7.2 Timber supply area boundary

The gross size of the Kootenay Lake Timber Supply Area is 1 240 878 hectares. Within the TSA boundary there are areas such as community forest agreements and provincial parks that do not contribute to the AAC as determined under the *Forest Act* Section 8 for timber supply areas. Table 3 provides further information on areas that do not contribute to the AAC.

Data source and comments:

BCGW file: WHSE_ADMIN_BOUNDARIES.FADM_TSA.

7.3 Land excluded from the crown forest land base

7.3.1 Non-provincial lands

Lands not administered by FLNRORD for timber supply in the TSA includes non-provincial lands (e.g., private land, municipal land, federal land, Indian Reserves).

Table 4 shows the contribution of each ownership category to the CFLB and the THLB based on the updated 2019 FAIB compilation of land ownership layer (see Section 5.3).

Table 4. Lands not administered by the province of BC

Ownership Code	Description	Gross land base (ha)	CFLB	THLB
40N	Private	116,419	No	No
51N	Federal - National Park	726	No	No
52N	Federal - Indian Reserve	2 443	No	No
54N	Federal - Dominion government Block/Federal Parcels	140	No	No
80N	Municipal parcels	1 804	No	No
81U	Local	514	No	No
99N	Crown Lease - Misc. lease	44	No	No
	Total	**122 090**		

Data source and comments:

BCGW File: WHSE_FOREST_VEGETATION.VEG_COMP_LYR_R1_POLY
See Section 5.1.

7.3.2 Ktunaxa Treaty Parcels

Ktunaxa Nation Council is currently 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 THLB. The treaty is entering Stage 5 – Negotiation to Finalize a Treaty. These parcels were excluded from both the CFLB and THLB.

Table 5. Ktunaxa Treaty Parcels

Description	Gross land base (ha)	CFLB	THLB
Ktunaxa Parcels	19 577	No	No

The boundaries for the Ktunaxa treaty land offer are represented in the Crown Tenures layer, crown land dispositions that are issued for specific purposes and periods of time. In this analysis, the source for the treaty parcels is the Crown Tenures layer.

Data source and comments:

BCGW file: TA_CROWN_TENURES_SVW
Access Date: April 4, 2019.

7.3.3 Area-based forest tenures

Within the Kootenay Lake TSA there are several area-based tenures including three Community Forest Agreements and 14 woodlots. These land bases are excluded from contributing to all forest management objectives considered in determining the AAC for the TSA and separate AAC determinations are made for these excluded tenures.

Table 6. Tenures not managed within the TSA allowable annual cut

Description	Gross land base (ha)	CFLB	THLB
*Tree Farm Licence	67	No	No
Woodlot Licence	8 474	No	No
Community Forest Agreement	64 905	No	No
Total	**73 446**		

Data source and comments:

*Tree Farm Licence: Two Tree Farm Licences managed from neighbouring TSAs overlap along the boundary into Kootenay Lake TSA.

Tree Farm Licence:

BCGW file: WHSE_ADMIN_BOUNDARIES.FADM_TFL_ALL_SP
Access date: August 1, 2019.

Woodlots and Community Forest Agreements:

BCGW file: WHSE_FOREST_TENURE.FTEN_MANAGED_LICENCE_POLY_SVW
Access date: August 30, 2019.

7.3.4 Alpine ski - controlled recreation areas

Within the Kootenay Lake TSA there are two alpine ski areas. Whitewater Ski Resort lies entirely within the Kootenay Lake TSA, Jumbo Glacier Resort crosses the TSA boundary in the north east corner.

Both these resorts are designated by regulation under Section 4 of the *Resort Timber Administration Act* and are administered under that *Act*. This *Act* allows Mountain Resort Branch statutory decision makers the authority over timber harvesting, and therefore these areas are removed from both the CFLB and THLB.

Table 7. Controlled recreation areas

Alpine Ski Hill Name	Order in council file number	Gross land base (ha)	CFLB	THLB
Whitewater Ski Resort	12165-20/Whitewater-OIC	1 301	No	No
Jumbo Glacier Resort	12165-20/Jumbo	9	No	No
Total		**1 310**		

Data source and comments:

BCGW file:
REG_LEGAL_AND_ADMIN_BOUNDARIES.REC_TENURE_ALPINE_SKI_AREAS_SP
Access Date: Aug 28, 2019.

7.3.5 Non-forest and non-productive forest

Non-forested or non-productive lands with no impact on forest management objectives do not contribute or impact timber supply and are therefore excluded from the CFLB in the base case.

Non-forested areas include water and non-vegetated land such as rock, ice and bare land. Non-productive forest includes those that have very low productivity such as stands with a site index less than or equal to five. Within the VRI there are attributes that identify non-vegetated and various classes of vegetated areas based on the British Columbia land classification system (BCLCS). These VRI attributes are used to identify the non-forest and non-productive forest.

As shown in Table 8 specific criteria were used remove non-forested areas and non-productive forest from the CFLB. In some cases, these specific criteria may exclude land that had previously been harvested (e.g., a recently harvested but not yet reforested stand) or may have been otherwise incorrectly classified. As such, stands with a previous harvest record are not excluded from the CFLB.

The gross area is the total area that meets this description, with some area meeting more than one definition (e.g., some area in the parkland ecosystem is also classified as non-vegetated). The sequential area is the total area that meets the definition, that has not already been classified as non-forest /non-productive.

Table 8. Description of non-forest, very low productivity and non-commercial areas

Attributes	Description	Gross area (ha)	Sequential area (ha)	CFLB	THLB
Non-forest					
BCLCS level 3 = 'A' OR ESSF parkland ecosystems (*NDT5) AND no logging history	Alpine & parkland ecosystems	194 847	194 847	No	No
BCLCS level 1 equal 'N' AND no logging history	Non-vegetated	180 852	67 989	No	No
BCLCS level 2 = 'N' or 'T' AND BCLCS level 3 = 'W'' AND no logging history	Wetlands	1 472	1 464	No	No
BCLCS level 2 = 'N' AND BCLCS level 4 not equal to 'ST' or 'SL' AND no logging history	Non-treed herb	88 358	41 943	No	No
Very low productivity forest					
Site index <= 5.0 m or null AND no logging history	Land base that is not productive for timber supply or non-forest objectives.	275 716	33 868	No	No
Non-commercial forest					
BCLCS level 4 = 'ST or 'SL' AND no logging history	Non-treed shrub	84 866	47 650	No	No

(continued)

Table 8. Description of non-forest, very low productivity and non-commercial areas (concluded)

Attributes	Description	Gross area (ha)	Sequential area (ha)	CFLB	THLB
Legacy data					
When np_desc is AF AND no logging history	FC1 AF	5 418	3 371	No	No
np_desc = 'NP' AND no logging history	FC1 NP	2 358	2 136	No	No
BCLCS level 1 = 'U' or NULL AND no logging history	Unclassified	30	0	No	No
FMLB = 'N' and no logging history	Not FMLB	286 272	59	No	No
Total area		**393 327**			

*Within the Kootenay Lake TSA, all the natural disturbance type NDT5 is ESSF parkland (forest is open with islands of heath and herb meadows), and all ESSF parkland is NDT5.

Data source and comments:

BCGW File: WHSE_FOREST_VEGETATION.VEG_COMP_LYR_R1_POLY.
See Section 5.1

7.3.6 Roads, trails, landings, and other linear corridors

Productive forest land is lost due to permanent roads, trails and landings (RTL) and maintained transmission and gas lines. These lands are no longer capable of timber production nor do they meet other forest management objectives, and as such are excluded from both the CFLB and THLB. Separate estimates are made in the base case to reflect the loss in productive forest land due to existing RTL and the losses that will occur as the road network expands over time to access future cutblocks.

Existing RTL

For this TSR, a new roads spatial data layer was created by the district using available data sources (see data sources below). These roads include both public roads and forest resource roads. Other linear features such as hydro lines, railways and pipelines were compiled from BCGW provincial datasets. These roads and linear features were buffered using the total width reported in Table 9.

Existing landings are estimated to cover an area of 2.8% of all polygons representing an existing stand with an age of 50 years or less. This estimate was established in the neighbouring Arrow TSA TSR and the previous Kootenay Lake TSR and has been reduced slightly based on district staff's assessment of the last 10 years of harvest practice.

The portion of the road buffers that overlap with the CFLB will be applied as an aspatial CFLB reduction at the one-hectare raster level, along with the additional 2.8% reduction for landings where applicable.

Table 9. Permanent structure total buffer widths

+Structure type	Length (km)	Modelled total width (m)	Reduction percent	[1]Gross area (ha)	CFLB	THLB
Highway	444	30	100		No	No
Local	1 304	20	100		No	No
Main Line	928	15.3	100		No	No
Secondary	3 208	6.8	100		No	No
Landings	N/A	N/A	2.8		No	No
Railways	232	30	100		No	No
Hydro Lines	622	50	100		No	No
Pipelines	200	30	100		No	No
Total				**10 915**	**No**	**No**

[1]Gross area: The total area within the rasterized buffer after combining all structures (no overlap).

Future RTL

It is assumed that road access will be developed for future stands that currently are not accessible by road.

The percentage of area dedicated to future road access, 5%, was determined by surveying RESULTS data and querying licensees, and a review of approximately the last 10 years of current practice.

In the base case the area reduction of 5% will be applied, at the one-hectare raster level, to all stands currently on the variable density yield prediction (VDYP[2]) model curve that do not have an aspatial reduction for roads applied. This reduction will be applied when the area is modelled as being harvested. A THLB reduction for roads is taken from each one-hectare area once, with future rotations modelled with the smaller THLB.

Table 10. Future roads, trails, and landings

	Reduction percent (%)	[1]Gross land base (ha)
Permanent Access (Roads, Landings, Trails)	5	6,114

[1]The total THLB with a VRI projected age greater than 50 years is 122 275.

Data source and comments:

District roads spatial data layer:

BCGW file: WHSE_BASEMAPPING.DRA_DGTL_ROAD_ATLAS_MPAR_SP

BCGW file: TRIM - WHSE_BASEMAPPING.TRIM_TRANSPORTATION_LINES

Cumulative Effects Provincial: BC_CE_Integrated_Roads_2019_20190307.gdb\integrated_roads

Cumulative Effects Regional: KootenayLake_Roads_2017.gdb\KootenayLake_Roads_2017_CE

District: Roads 07: LakeRoads.zip

[2] VDYP curves are generated by the growth and yield model for stands that are mature and unmanaged, see Section 9.2.1.

Railways:

BCGW file: WHSE_BASEMAPPING.GBA_RAILWAY_TRACKS_SP

Hydro Lines:

BCGW file: WHSE_BASEMAPPING.GBA_TRANSMISSION_LINES_SP

Pipelines:

BCGW files: WHSE_IMAGERY_AND_BASE_MAPS.DRP_OIL_GAS_PIPELINES_BC_SP

WHSE_MINERAL_TENURE.OG_PIPELINE_AREA_PERMIT_SP

WHSE_TANTALIS.TA_CROWN_TENURES_SVW

Local data:

\\spatialfiles2.bcgov\work\FOR\VIC\HPR\Local_Data\Utilities\OilGas\FortisBC_Gas.gdb\
DISTRIBUTION_PIPE

\\spatialfiles2.bcgov\work\FOR\VIC\HPR\Local_Data\Utilities\OilGas\FortisBC_Gas.gdb\
TRANSMISSION_PIPE

\\spatialfiles2.bcgov\work\FOR\VIC\HPR\Local_Data\Utilities\OilGas\OG_Not_ICIS.gdb\
WCGasTransmissionProject

\\spatialfiles2.bcgov\work\FOR\VIC\HPR\Local_Data\WMB\FireManagementPlanning\Local_Omineca\
DSN_FMP_LocalData.gdb\G4_CriticalInfrastructure\DSN_Pipeline_Enbridge_VanJam_1kBuffer

Future structures:

Based on reports generated from the RESULTS application.

7.4 Identification of the timber harvesting land base

7.4.1 Provincial parks and protected areas

There is 217 565 hectares in the Kootenay Lake TSA provincially designated for the protection of its natural environment through the designation of a Class A park or an ecological reserve.

Provincial Class A Parks preserve the natural environment and provide public use and enjoyment. There are 20 parks within the Kootenay Lake TSA, they range in size from Lockhart Beach Provincial Park at seven hectares to Purcell Wilderness Conservancy Provincial Park at 92 637 hectares. Most of Bugaboo Provincial Park lies in Invermere TSA to the east, but there are 114 hectares within the boundary of Kootenay Lake TSA. Stagleap Provincial Park is within Arrow TSA but touches the boundary of Kootenay Lake in the southwest corner.

Lew Creek Ecological Reserve is the only ecological reserve in the Kootenay Lake TSA. It is 900 hectares and lies to the north of Goat Range Provincial Park in the north west corner of the TSA. Ecological reserves preserve representative and special natural ecosystems, plant and animal species, features and phenomena.

These two types of protected areas within the TSA contribute to objectives for biodiversity and wildlife and will be considered part of the CFLB. However, these areas are not administered by FLNRORD for timber supply and will be excluded from the THLB.

In 2000 under the Protected Areas Strategy (PAS) several areas were identified as Goal 2 protected areas. These areas currently have interim protection as reserves under the *Land Act* but have not yet received park status under the *Park Act*. Where applicable they do contribute to forest management objectives and will remain in the CFLB. In this timber supply analysis 2563 hectares of these Goal 2 areas identified by the BC Parks Regional Planning Section Head are excluded from the THLB.

Table 11. Parks and ecological reserves in Kootenay Lake TSA

Protected designation	Gross land base (ha)	CFLB	THLB
Ecological Reserve	900	512	No
Park Class A	216 665	122 101	No
PAS2 Goal 2 Area	2 563	1 468	No
Total	**220 128**	**124 081**	

Data source and comments:

BCGW file: WHSE_TANTALIS.TA_PARK_ECORES_PA_SVW
Access Date: August 1, 2019.

*BCGW file: REG_LAND_AND_NATURAL_RESOURCE.GOAL_2_AREA_KBLUP_POLY
Access date: August 28, 2019.

*Local file: Goal 2 areas were adjusted based on information from the regional parks Planning Section Head.

7.4.2 Areas with high recreation values

Within the Kootenay Lake TSA, Dewdney Heritage Trail is the only trail designated under the *Heritage Conservation Act*, Section 9(1)(a). Dewdney Trail is important for its historical, economic, cultural, social and natural history values. The trail, along with a 100-metre buffer either side, is protected under the *Heritage Conservation Act* Order in Council number 467. The trail along with the buffer is excluded from the THLB.

Under the *Forest and Range Practices Act* (FRPA), there are approximately 170 interpretative forests and recreation reserves, sites and trails that have been established within the Kootenay Lake TSA. 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 very popular activities in the TSA and there is significant pressure from the public and municipalities to maintain and expand recreational opportunities.

The management strategy for recreation sites typically identifies the maintenance of a recreational feature such as a campsite or trail and the conservation of natural vegetation. Although this does not preclude industrial activity or harvesting authorization by a recreation officer is required prior to any industrial activity or harvesting on an established site. While logging is possible, it is likely that harvesting activity will be limited.

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, 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. A review of the contribution of recreation sites and trails to THLB and the harvest history will be completed to understand the impact of harvest on recreation resources. The chief forester will be presented information on the likely impact of current practices related to recreation trails and sites for consideration in making her AAC determination.

Table 12. Recreation sites and trails

Category	Gross land base ([1]ha/km)	[2]CFLB	THLB
Dewdney heritage trail	70	47	No
Active interpretive forests	859	Yes	Yes
Active recreation sites	26 942	Yes	Yes
Active recreation reserves	2 686	Yes	Yes
Active recreation trails	460	Yes	Yes
UREPs	3 583	Yes	Yes
Total	**70**	**47**	

[1] Trails in kilometers, all other categories in hectares.

[2] Area (hectares) given within CFLB, or Yes if included in both the CFLB and THLB.

Data source and comments:

There are no pending recreation sites, reserves, or trails in Kootenay Lake TSA.

The Dewdney Trail buffer was created by applying a 100-metre buffer on either side of the Kootenay Lake TSA portion of the Dewdney Trail protected by the OIC, retrieved from the Historical Trails layer (below).

BCGW file: WHSE_HUMAN_CULTURAL_ECONOMIC.HIST_HIST_TRAILS_GOV_SVW
Access date: November 19, 2019.

BCGW file: WHSE_FOREST_TENURE.FTEN_RECREATION_POLY_SVW
Access date: August 8, 2019.

BCGW file: WHSE_FOREST_TENURE.FTEN_RECREATION_LINES_SVW
Access date: August 23, 2019.

BCGW file: WHSE_TANTALIS.TA_CROWN_TENURES_SVW
Definition Query: TENURE_SUBPURPOSE = 'UREP/RECREATION RESERVE'
Access date: August 1, 2019.

7.4.3 Crown conservation lands

Conservation lands are those lands secured for fish, wildlife, and habitat conservation purposes. **Leased** lands are privately owned lands leased to the Crown to conserve and manage fish and wildlife habitat. **Acquired** lands area areas acquired in fee simple (via purchase, donation or exchange) for administration under the *Wildlife Act* to conserve and manage fish and wildlife habitat. **Transfer of Administration** lands are areas of Crown land transferred for the purposes of administration under the *Wildlife Act* to conserve and manage fish and wildlife habitat.

The following areas will be removed from the THLB for conservation purposes.

Table 13. Crown conservation lands

Category	Gross land base (ha)	CFLB	THLB
Lease	418	6	No
Acquired	312	239	No
Transfer of Administration	191	133	No
Total	**921**	**378**	

Data source and comments:

BCGW file: WHSE_LEGAL_ADMIN_BOUNDARIES.WCL_CONSERVATION_LANDS_SP
Access date: August 1, 2019.

7.4.4 Caribou no-harvest zones

Mountain caribou as a modelled constraint is covered under Section 7.9. This section identifies the caribou no harvest area excluded from the THLB.

Within the Ungulate Winter Range (UWR) spatial data, an attribute Timber Harvest Code indicates whether the area is completely restricted from harvesting as set out in the GAR order. The attribute Unit Number identifies the caribou units in the Government Actions Regulation (GAR) order. The Central Kootenay Planning Units u-4-014 unit number 2, and u-4-13 unit number 17, identified as conditional harvest in the data, no longer meets the conditions required to harvest as set out in the GAR order and are therefore an additional no harvest zone (see Section 7.9 for details). The area within those two units are included in the area totals below.

Table 14. Area identified as caribou no harvest zones in the Kootenay Lake TSA

Category	Gross land base (ha)	CFLB	THLB
No harvest zone	194 876	128 162	No
*No harvest in conditional zone	17 671	8 439	No
Total	**212 547**	**136 602**	

* u-4-014 unit number 2 and u-4-013 unit number 17

Data source and comments:

BCGW File: WHSE_FOREST_VEGETATION.VEG_COMP_LYR_R1_POLY
See Section 5.1.

7.4.5 Whitebark pine

Whitebark pine was added to the endangered list (Schedule 1 under the *Species at Risk Act*) by the federal government in 2012. However, in British Columbia, no GAR order is in place to protect this species. In the Kootenay Lake TSA the District has encouraged licensees to avoid harvesting whitebark pine, and whitebark pine are reserved from harvest, unless safety concerns require it, when issuing minor tenures.

In the base case, whitebark pine will not be excluded from the THLB.

An analysis was completed of all stands with whitebark pine-leading within the Kootenay Lake TSA and all were found to be excluded from the THLB due to other constraints. Below shows the area identified as whitebark pine-leading stands.

Table 15. White bark pine-leading stands

Description	Gross land base (ha)	CFLB	THLB
White bark pine-leading stands	4 409	923	No (other exclusions)

Data source and comments:

BCGW file: WHSE_FOREST_VEGETATION.VEG_COMP_LRY_R1_POLY
See Section 5.1.

7.4.6 Terrain stability and environmentally sensitive areas

Forest management requires landslide hazard information including information on steep, unstable, and potentially unstable terrain. In the 1970s, the BC Ministry of Forests and Range first recognized this need and mapped potentially unstable terrain for forest land-use planning, identifying forest cover polygons that showed evidence of landslides as environmentally sensitive areas (ESA).

Following advancements in methods and identification of unstable terrain, Terrain Stability Mapping (TSM) was introduced. Reconnaissance terrain stability mapping (RTSM) with three hazard classifications (S, P, U), and detailed terrain stability mapping (DTSM) with five hazard classes (I, II, III, IV, V), were introduced in the 1990s. Terrestrial Ecosystem Information (TEI), including TSM and ESA data, is available for the province.

Within the Kootenay Lake TSA, 643 748 hectares have been identified in the provincial TEI or district TEI data as being within a project boundary, or 52% of the TSA. Of that, 424 985 hectares is within the CFLB of Kootenay Lake TSA. The RTSM data is used if there is no DTSM classification available.

Areas classified in TSM as U (unstable) or Class V (very unstable*)* terrain, are generally unsuitable for harvest. However, TSM is inherently conservative to ensure that all unstable areas are identified and subjected to field assessment.

Outside areas covered by TSM project boundaries, ESA mapping was utilized to identify unstable terrain. All ESA polygons with an extremely fragile or unstable soils (S) category in the ESA level 1 (high classification), including polygons with multiple categories (e.g., SA, SPR), were considered very unstable (V), following the *Mapping and Assessing Terrain Stability Guidebook.*

There is a total of 27 313 hectares identified as ESA within the Kootenay Lake TSA that meet the criteria above, of which 18 726 is within the CFLB. Of that, 493 hectares were identified as uniquely excluded from the THLB by the ESA area, excluding partial netdowns.

In the base case, terrain classes U and V are modelled as 90% exclusions from the THLB and potentially unstable classes P and IV are modelled as 30% exclusions from the THLB. Areas outside TSM project boundaries that are classified as ESA level 1 are completely excluded from the THLB.

The netdown percentage used in the base case were provided by district staff. Sensitivity analysis will assess the uncertainty and impact by increasing and decreasing the reduction estimates by 10%.

Table 16 shows the TSM categories and ESA areas excluded from the CFLB. Also shown are the area of unstable, potentially unstable and ESA 1 polygons that have been harvested.

Table 16. Description of terrain stability mapping and environmentally sensitive area deductions

Source	Category	Gross land base (ha)	[1]Harvested	[2]Harvested %	[3]Reduction %	[4]Total exclusion	[5]CFLB exclusion
TSM	Unstable (5, V or U)	40 606	1 680	4	90%	36 545	25 465
TSM	Potential unstable (4, IV, P)	111 300	6 645	6	30%	33 390	24 423
ESA	Esa1	27 313	90	0	100%	27 313	18 726
Total		**179 219**	**8 415**			**97 248**	**68 614**

[1]**Harvested**: the amount harvested within the terrain stability category.

[2]**Harvested %:** the percentage of harvested (harvested / gross land base *100).

[3]**Reduction%**: the % of the gross land base excluded from the THLB.

[4]**Total exclusion**: total gross land base area after percent reduction is applied.

[5]**CFLB**: total CFLB excluded area (after percent reduction is applied).

Data source and comments:

TSM data:

Spatial file: Province of British Columbia, 2016, Terrestrial Ecosystem Information (TEI) Spatial Data - Dist_Pkg_NonPEM_Cariboo_Okanagan_Kootenay_gdb_201609.zip. Data available from the British Columbia Ministry of Environment, Ecosystem Information Section at:
http://www.env.gov.bc.ca/esd/distdata/ecosystems/TEI/TEI_Data/
Access date: July 19, 2019.

ESA data:

ESA data was extracted from the legacy FIP files. Accessed from an internal government server.

7.4.7 Inoperable areas

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

The Kootenay Lake Forest District staff developed the operability dataset in 2007, with input from licensees and consultants. The operability mapping was based on the presence or absence of physical barriers or other limitations to harvesting. This dataset reflects current management within the Kootenay Lake TSA.

Inoperable areas, except for areas that have harvest history, will be removed from the THLB but included in the CFLB.

In the Kootenay Lake TSA, there are isolated areas where no harvesting has occurred. The following drainages, in part or in entirety, have not been allocated to major licensees and are considered uneconomic: East Creek, Giegerich Creek, Hall Creek, Laidlaw Creek, Houston Creek. These areas were excluded from the THLB in the previous TSR.

In the base case, the operable areas surrounded by inoperable in East Creek and Giegerich Creek are excluded from the THLB. Laidlaw, Hall, and Houston Creek are entirely within inoperable and/or the caribou no harvest zone and are already excluded from the THLB.

Table 17. Area identified as inoperable for harvesting in the Kootenay Lake TSA

Category	Gross land base (ha)	CFLB	THLB
Inoperable	708 417	348 168	No
Isolated / uneconomic areas	1 953	1 559	No
Total	**710 370**	**349 727**	

Data source and comments:

BCGW file: REG_LAND_AND_NATURAL_RESOURCE.OPERABILITY_DLK_POLY
Access date: August 22, 2019.

Isolated:

East Creek and Giegerich Creek drainage was created by spatializing a bounding box over the drainage, and then deleting the inoperable (above) from that, leaving the isolated area.

7.4.8 Low productivity sites

Sites may have low productivity because of inherent site factors such as nutrient availability, exposure, excessive moisture, etc. These stands are unlikely to grow a merchantable crop of trees or alternatively provide mature stand non-timber characteristics in a reasonable amount of time.

These low site stands are not considered desirable to harvest but may contribute to other non-timber objectives; they are removed from the THLB but included within the CFLB.

In the last two timber supply reviews, all stands with a site index of less the eight metres at 50 years were excluded from the THLB.

For this review, low productivity sites will be defined by the by site index and minimum harvestable volume one percentile thresholds seen in historical harvest data. Harvesting below the one percent is assumed to be data noise; 99% of harvesting has taken place at a site index or volume per hectare higher than that threshold. Current performance is defined to be above the one percentile.

Site Index

Site index in the VRI can be updated after harvest using site index values from the RESULTS database. To determine a site index cut-off for stands with the forest inventory-based site index estimate originally assigned (see Section 5.4.3), the 2007 VRI site index was used, and only those permits dated after 2008 were included in the analysis. Permits from the Electronic Commerce Appraisal System (ECAS) within the Kootenay Lake TSA land base currently defined as legally harvestable (see Table 3) and with a date between to 2008 and 2018 were used in this analysis. The total number of permits was 212.

The first percentile for site index for these historic permits was 6.94 metres. Figure 2 shows the site index distribution in the 2007 VRI in dark grey, the 2017 VRI in light grey, and the overlap in a medium grey. The site index distribution of the cutting permits analyzed is seen in dark green.

In the base case, based on harvesting data, stands with a site index below the first percentile of 6.94 metres with no history of harvesting will be excluded from the timber harvesting land base.

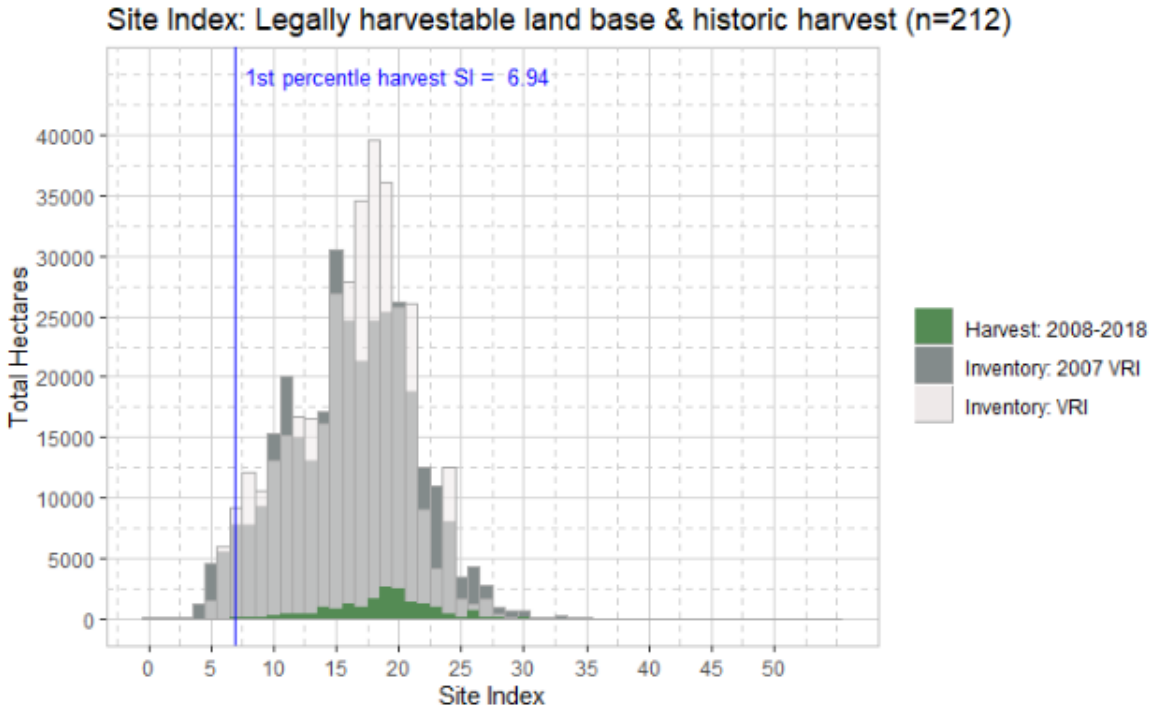

Figure 2. Site index comparison.

Minimum Harvest Volume

The minimum harvestable criteria is the age or volume at which stands are considered harvestable within the timber supply model. If a stand cannot reach this volume, it is not considered part of THLB.

The minimum harvestable volume (MHV) was determined by reviewing the historic harvest. All cutting permits in ECAS within the Kootenay Lake TSA land base currently defined as legally harvestable (see Table 3) between the years 2000 and 2018 were reviewed. The first percentile for volume per hectare reported was 135 cubic metres per hectare.

Figure 3 shows the maximum volume, generated by VDPY, of all stands Kootenay Lake TSA land base currently defined as legally harvestable, excluding those that do not initially start on the VDYP curve. These exclusions represent stands with a RESULTS opening and that are initially on a Table Interpolation Program for Stand Yields (TIPSY[3]) curve. Stands that, at maximum volume, fail to meet the MHV of 135 as defined by the ECAS analysis are to the left of the blue line.

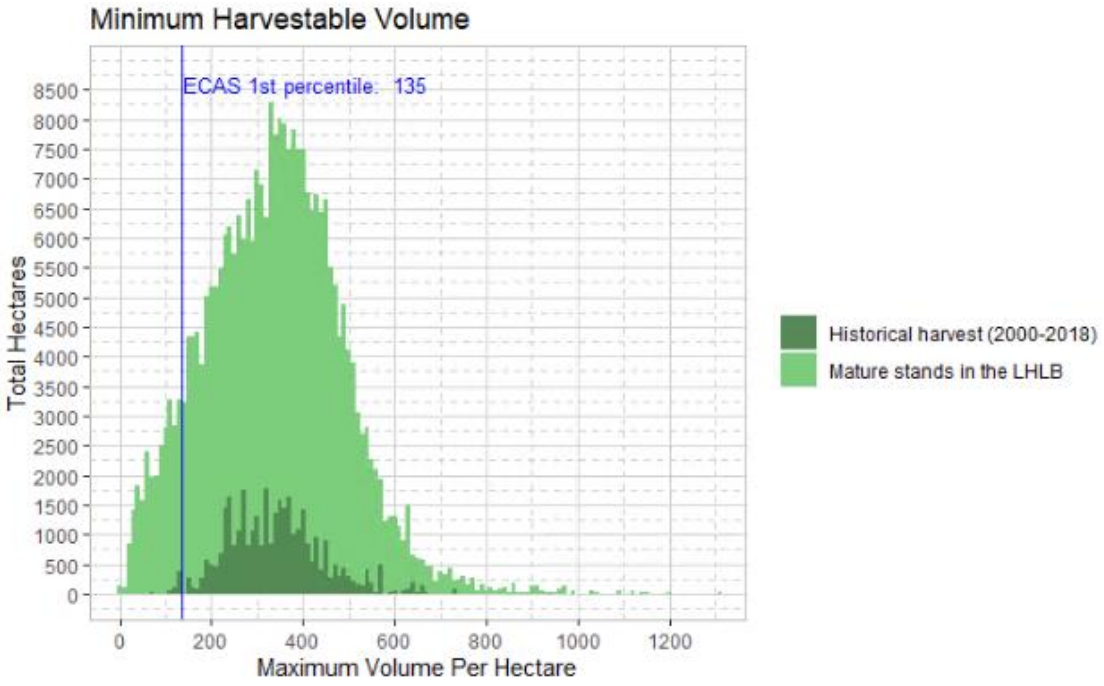

Figure 3. VDYP maximum volume per hectare and historic harvest volume per hectare.

The following table identifies the total area, and total CFLB, that is below the first percentile seen in the historic harvest for site index or volume per hectare and has no history of harvesting. This area will be excluded from the THLB.

Table 18. Low productivity sites

Category	Gross land base (ha)	CFLB	THLB
Site index <= 6.94	93 724	38 204	No
VDYP maximum volume <= 135	96 053	80 819	No
Total area	**153 052**	**89 806**	**No**

[3] TIPSY curves are generated by the growth and yield model for stands that are managed, see Section 9.2.2.

Data source and comments:

Site Index from VRI:

BCGW File: WHSE_FOREST_VEGETATION.VEG_COMP_LYR_R1_POLY
See Section 5.1.

Maximum volume for stands from table generated by the VDYP model (See Section 9.2.1).

ECAS Data: Data sourced from FAIB reports generated from the provincial ECAS database.

7.4.9 Deciduous

The demand for deciduous (broadleaf) sawlogs in the TSA is limited. Current practice for licensees is to leave deciduous stems in conifer-leading stands as wildlife trees or coarse woody debris in order to meet biodiversity objectives.

In the base case, deciduous-leading stands will be excluded from the THLB. Further, as noted within the volume table descriptions, deciduous within conifer-leading stands will be removed from volume tables.

Table 19. Underutilized forest types criteria – deciduous

Description	Gross land base (hectares)	CFLB	THLB
Deciduous-leading stands	20 791	12 305	No

Data source and comments:

BCGW file: WHSE_FOREST_VEGETATION.VEG_COMP_LRY_R1_POLY
See Section 5.1.

7.4.10 Underutilized forest types (non-deciduous)

Underutilized forest types are stands that are physically operable but are not currently utilized or have marginal merchantability and are considered uneconomic. In the Kootenay Lake TSA several underutilized forest types have been historically identified and described within past TSRs. For the current TSR, these forest type definitions were compared to historical harvest, reviewed and evaluated by ministry staff.

Underutilized forest types are excluded from the THLB but included in the CFLB. If an area identified as an underutilized forest type has been harvested in the past it will be included in the THLB.

Conifer species that were identified as underutilized in the last TSR include balsam, hemlock, white pine, and lodgepole pine either growing on low productivity sites or steep slopes. The historic harvest was analyzed for harvest performance on those species, and additionally on slope and elevation, using permits within the Kootenay Lake TSA land base currently defined as legally harvestable (see Table 3) and with a date between to 2008 and 2018. The total number of permits analyzed was 446.

The exception to this was site index and lodgepole pine, where the date range was limited to those permits harvested between to 2008 and 2018 that had a lodgepole pine component. There were 77 permits that met this criterion. For an explanation on why site index requires a reduced data range, please see Section 7.4.8.

Balsam

The 99th percentile for the balsam proportion by volume, per hectare harvested, was 46%. Figure 4 shows the total number of hectares in the legally harvestable land base, and the historic harvest, by balsam proportion of volume.

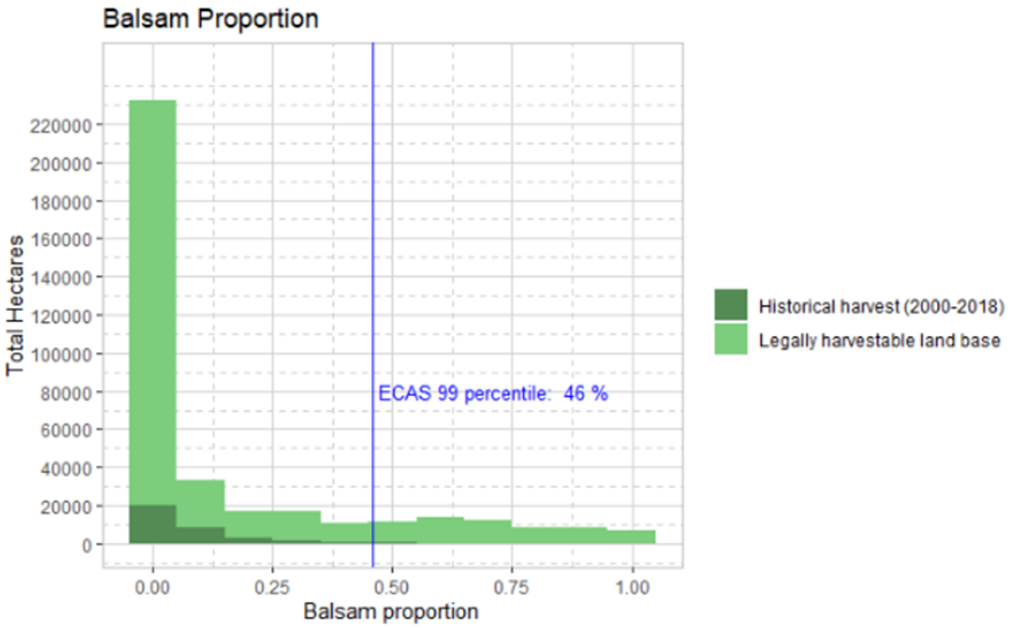

Figure 4. Balsam proportion.

Hemlock

The 99th percentile for the hemlock proportion for volume, per hectare harvested, was 51%. Figure 5 shows the total number of hectares in the legally harvestable land base, and the historic harvest, by hemlock proportion for volume.

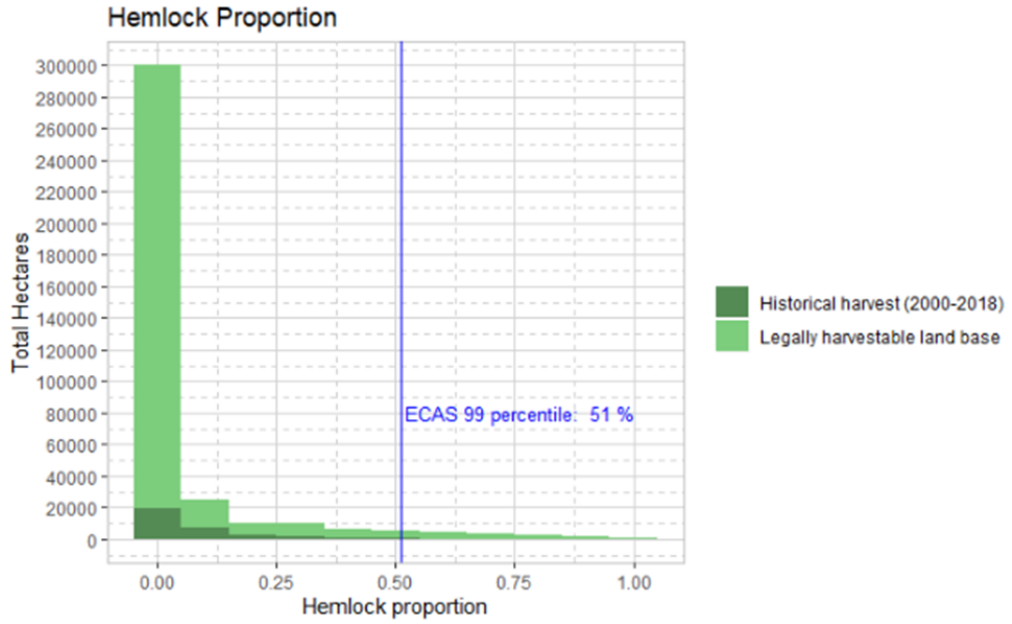

Figure 5. Hemlock proportion.

White pine

The 99th percentile for the white pine proportion for volume, per hectare harvested, was 12% and uniquely excluded an area of 872 hectares. As this low cut-off is unlikely to factor into a decision on whether an area would be harvested, the proportion of white pine volume in a stand was not used to identify stands to be excluded from the timber harvesting land base.

Lodgepole pine

The site index first percentile for those cutting permits with some pine component was 6.7 metres, slightly lower than the overall cut-off of 6.94 metres. The slope 99th percentile for those cutting permits with some pine component was 52%, compared the overall cut-off of 71%. Applying these cut-offs to all stands with greater than 50% lodgepole pine uniquely excludes 5846 hectares.

Steep slope

The 99th percentile for slope, per hectare harvested, was 71%. Figure 6 shows the slope distribution for the Kootenay Lake TSA land base currently defined as legally harvestable is light green and the historical harvest in dark green. The ECAS 99th percentile for slope, 71, is shown in blue. All stands to the right of the blue line will be excluded from the timber harvesting land base.

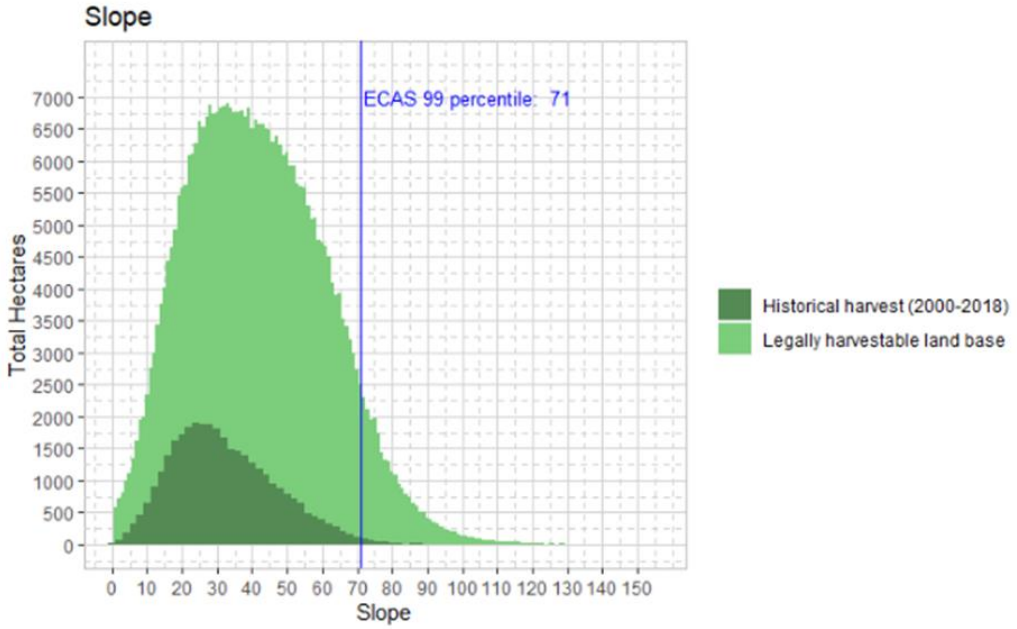

Figure 6. Slope.

High elevation

The 99th percentile for elevation, per hectare harvested, was 1881 metres. Figure 7 shows the elevation distribution for the Kootenay Lake TSA land base currently defined as legally harvestable in light green, and the historical harvest, in dark green. The ECAS 99th percentile for slope, 1881 metres, is shown in blue. All stands to the right of the blue line will be excluded from the timber harvesting land base.

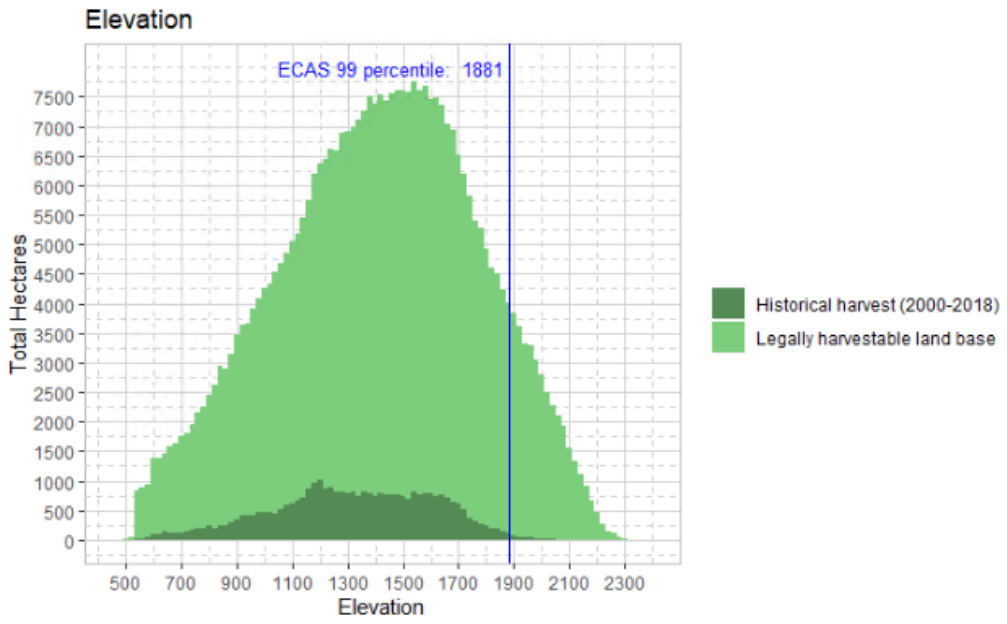

Figure 7. Elevation

Table 20 identifies the total area, and total CFLB, for all categories of underutilized stands with no history of harvesting. This area will be excluded from the THLB.

Table 20. Underutilized forest types criteria

Description	Gross land base (ha)	CFLB	THLB
Balsam proportion of volume >= 46%	256 156	169 240	No
Hemlock proportion of volume >= 51%	38 081	32 294	No
Lodgepole pine proportion of volume >= 50% and SI <= 6.7	3 881	509	No
Lodgepole pine proportion of volume >= 50% and slope >= 52	23 110	16 325	No
Slope >= 71	143 876	70 927	No
Elevation >= 1881	381 918	123 604	No
Total area	**596 021**	**286 973**	

Data source and comments:

The areas identified above excludes any historical harvests.

Gross land base includes all lands within the TSA boundary including ownership and tenures not included within the Section 8 AAC determination for the TSA.

BCGW file: WHSE_FOREST_VEGETATION.VEG_COMP_LRY_R1_POLY
See Section 5.1.

ECAS Data: Data sourced from FAIB reports generated from the provincial ECAS database.

7.5 Landscape biodiversity

7.5.1 Seral-stage requirements

Maintaining and managing for old- and mature-forests contributes to the conservation of landscape-level biodiversity. The Kootenay Boundary HLPO has legal requirements, called biodiversity targets, for old- and mature-forests that must be retained on the landscape. These targets are expressed as the amount of area (percent) that must retain old- and mature-seral stage characteristics within the CFLB for each

biogeoclimatic variant for specific landscape units (LUs).

These targets are established by using the seral stage distribution for the natural disturbance type (NDT). To mitigate timber supply impacts and as part of the governments planning and implementation for biodiversity, landscape units or defined areas within landscape units were assigned a biodiversity emphasis option (BEO) of low, medium or high. The target percentage required in a unit varies depending on the BEO assigned to that unit. The following section discussed this in more detail.

Additional seral-stage targets exist for ungulate winter range, adjacency and community watersheds. These are discussed in further details in the applicable section of this document.

7.5.2 Old growth management areas (OGMA)

Old growth forests are considered a key biodiversity component and a coarse filter for maintaining ecological diversity at the landscape level over time. It is recognized that OGMAs are only one tool in maintaining biodiversity. Old growth attributes are also managed across the landscape at a stand level and may be included via other fine filter tools such as wildlife tree patches, wildlife habitat areas, or other tools used to capture specific features important to old growth and biodiversity goals.

In the Kootenay Lake TSA, draft OGMAs were spatially identified to meet the targets but were not legalized. Their location was determined through negotiations between the Ministry, forest industry representatives and Environmental Non-governmental Organizations (ENGOs).

Forest licensees have incorporated language to manage and respect the spatial, non-legalized OGMAs in their respective FSPs. This language allows for the adjustment of boundaries for harvesting to take place to address insect outbreaks, forest fires, or other changes which may affect their permanency. Any incursions within OGMAs are to be replaced with areas of equivalent size and stand attributes so that the target amount of area is maintained. When the draft OGMAs were finalized, government made no commitment to maintain these draft OGMAs though updates did occur. An updated draft OGMA layer was uploaded to the BCGW in March 2019 with data submitted by licensees, including all who operate in the Kootenay Lake TSA. Going forward, a process is being developed to update the BCGW annually.

As a measure to reduce impacts to timber supply for landscape units in low biodiversity emphasis option areas, government enabled the old-growth targets in those units to be reduced by up to two-thirds. KBLUPO targets reflect this two-thirds reduction (referred to as “drawdown by two-thirds”), with the requirement that the full targets are to be met after the third rotation, approximately 240 years.

The Kootenay Boundary Region is currently undertaking a review of old-growth management in the region, including the use of BEC version 11 in evaluating HLPO targets. When this process is complete, HLPO targets will be evaluated based on that version. Until then, those targets are evaluated using BEC version 3, the version in place when the HLPO targets were established. In the base case, given current practice, BEC version 3 will be used for modelling HLPO targets and a sensitivity will be run using BEC version 11.

In the base case the draft OGMA spatial layer will be used to model seral targets, given the historic use of this layer by licensees within the Kootenay Lake TSA in their FSPs. In the low BEO units the requirement to meet full targets after three rotations will be modelled aspatially, using stand age as the surrogate to identify old stands to meet the additional target requirements.

Two sensitivities, in addition to using BEC version 11, will be completed for seral-stage requirements. The first will substitute aspatial targets for the OGMA layer, and the second, also using aspatial targets, will immediately implement the full targets in low BEO units, rather than waiting until the end of the third rotation.

Table 21. Old growth management areas in the Kootenay Lake TSA

Description	Gross land base (hectares)	CFLB	THLB
Old growth management areas	264 791	151 800	No

Data source and comments:

BCGW file: WHSE_LAND_USE_PLANNING.RMP_OGMA_NON_LEGAL_CURRENT_SVW
Access date: Aug 22, 2019.

BCGW file: WHSE_LAND_USE_PLANNING.RMP_LANDSCAPE_UNIT_SVW
A corrected data layer was accessed from an internal government server August 20, 2019.

7.5.3 Disturbance outside of the THLB

The forested land base outside of the THLB contributes towards several forest cover objectives such as biodiversity and visuals. It may be disturbed by many factors including natural events such as fire, pests, and wind and anthropological events such as forest harvesting and road building. These disturbances influence both timber supply and requirements for non-timber objectives. Natural disturbance outside the THLB should be accounted for to prevent the forest from aging continuously and contributing inappropriately to forest cover requirements of non-timber objectives.

The base case scenario will model natural disturbance using return intervals defined in the 1995 *Forest Practices Code of British Columbia Biodiversity Guidebook* and as shown in Table 22 below.

Table 22. Kootenay Lake TSA BEC Zone NDT return intervals within CFLB

BGC unit	NDT	Mean return interval	Old growth threshold age
ESSF	NDT1	350	>250
ICH	NDT1	250	>250
ESSF	NDT2	200	>250
ICH	NDT2	200	>250
ICH	NDT3	150	>140
ICH	NDT4	250	>250

Data source and comments:

Note: NDT5 is excluded from the CFLB and is therefore not included in the table above.

7.5.4 Stand-level biodiversity - wildlife tree retention

The FRPA establishes an objective to maintain structural diversity in managed stands by wildlife tree retention (WTR) in each cutblock. The *Forest Planning and Practices Regulations* (FPPR) identifies that the total amount of wildlife tree retention areas 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 areas that relates to the cutblock is a minimum of 3.5% of the cutblock.

Licensees may vary the requirement by specifying an acceptable alternative in their FSP however these targets are adopted within most FSPs in the Kootenay Lake TSA. WTRs are often located within areas that are otherwise constrained, such as riparian areas or sensitive or inoperable terrain, therefore the impact to the THLB could be less than 7% minimum retention requirement.

A final percentage of WTRs in the THLB will be calculated using information from the RESULTS database for cutblocks harvested in the last 10 years and presented to the chief forester for consideration in making her AAC determination. Findings from stand-level biodiversity monitoring done as part of the Forest and Range Evaluation Program (FREP) will also be considered.

An analysis will be completed to determine how much of the WTR area is overlapping with other constrained area, such as inoperable, riparian management areas, and OGMAs to assist with calculating the netdown percentage.

Data source and comments:

RESULTS: summary reports
BCGW file: WHSE_FOREST_VEGETATION.RSLT_FOREST_COVER_RESERVE_SVW

7.6. Riparian reserve and management areas

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.

Riparian management objectives have been established to minimize or prevent impacts of forestry and range activity directly on these aquatic resource values (e.g., water quality, aquatic ecosystems) and on the values within the surrounding area (e.g., wildlife habitat). Objectives for riparian management are identified under the FPPR and are incorporated into FSPs.

Implementation of objectives include establishment of riparian reserve zones (RRZ) and/or riparian management zones (RMZ). RRZs require full cover retention along the stream, lake, or wetland. RMZs identify some retention requirements that must be met over the stream length or water body perimeter.

The district has legacy riparian data that was improved upon for the current base case. For this analysis, a riparian layer was created using updated models.

7.6.1 Streams

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 pattern, channel confinement, gradient, and streambed and bank materials. Stream reaches generally show uniformity in these characteristics and in discharge.

FPPR stream classifications of S1 – 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 have, over a one-kilometre stretch, an average channel width of one-kilometre and an active floodplain width of 100 metres or greater.

In the base case, streams in the BCGW rivers layer were classified as S1A. Streams were classified as S1B-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. Stream width assumptions are identified in Table 23.

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. This 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 known fish observation sites are considered viable fish habitat. Moving upstream from known fish observation sites, 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 23 lists the FPPR definitions for stream classifications S1B – S6 and their assignment, using the above assumptions, in the base case.

Table 23. Stream classification

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

7.6.2 Lakes and wetlands

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

Kootenay Lake TSA is part of the Columbia Basin and is within the area covered by the Columbia River Treaty, a Canada – USA water management agreement. Duncan Dam, in the north end of the TSA, was the first of the three Columbia Treaty dams built on the Canadian side of the Columbia River Basin.

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 water-saturated for a sufficient length of time that excess water and resulting low oxygen levels are principal determinants of vegetation and soil development.

FPPR lake classification is based on lake size 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. In the Kootenay Lake TSA, the specific biogeoclimatic units used to define lakes and wetlands are not present, and therefore were not used in the classification process in the base case. Spatial data layers for both lakes and wetlands are available from the BCGW and the spatial extent defined in that dataset was used to classify these features in the base case as listed in Table 24.

7.6.3 Riparian buffers

The FPPR defines the RRZ and RMZ widths of streams, lakes, and wetlands; these correspond to the older Forest Practices Code (FPC) *Riparian Management Area Guidebook* widths. In the Kootenay Lake TSA, licensees FSPs are consistent with the RMZ retention described in Section 52 of the FPPR legislation and listed in column RMZ basal area retention in Table 24 below.

Streams, wetlands, and lakes are buffered according to classification and based on the total reserve zone width plus the percentage of retention in the management zone. The resulting riparian layer is then excluded from the THLB, applied as an aspatial reduction at the one-hectare raster level and calculated on the overlap of the riparian buffer with the THLB raster.

Table 24. Streams, lakes, and wetlands riparian widths (FPPR)

Stream, wetland, or lake class	RRZ width[1] (metres)	RMZ width[1] (metres)	RRZ percent (%) retention[1]	RMZ basal area retention[2]	Total 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
W5	10	40	100	10	14
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

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

[2] Consistent with licensees and BCTS FSPs.

[3] Total reserve width: reserve zone width + (management zone width X retention % / 100). Buffer is applied to both sides of centre line streams, outside polygon of rivers, lakes, and wetlands.

Table 25 below shows the total reduction applied to the CFLB for riparian areas.

Table 25. Riparian areas

Description	Gross land base (ha)	CFLB	THLB
Riparian areas	36 407	19 358	No

Data source and comments:

Rivers (S1A):

BCGW file: WHSE_BASEMAPPING.FWA_RIVERS_POL
Access date: September 13, 2019.

Community Watersheds:

BCGW file: WLS_COMMUNITY_WS_PUB_SVW
Access date: August 1, 2019.

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
Access date: October 19, 2019.

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.
Access date: October 19, 2019.

7.7 Lakeshore management

Lakeshore management zones have not been established for the Kootenay Lake TSA. In general, there is very little harvesting near lakes. Where it occurs, the *Nelson Regional Guidelines for Lakeshore Management Zones* are referenced to determine appropriate management measures.

7.8 Wildlife habitat areas

Wildlife habitat may be identified and managed through several processes under the Identified Wildlife Management Strategy (IWMS). Within the IWMS framework, wildlife habitat areas can be established under the GAR or grandparented under the repealed *Forest Practices Code Act*.

Since 2005, a total of 28 wildlife habitat areas have been established in the Kootenay Lake TSA for a variety of mammals, birds and amphibians. Most wildlife habitat areas (WHAs) range in size from one hectare to 85 hectares, although the largest WHA is over 19 000 hectares in size. The impact to timber supply varies among WHAs due to the associated General Wildlife Measures (GWM) and the forest composition; however, most WHAs are expected to have minimal impact to timber supply given that they are either located outside the THLB, permit some form of harvesting or are small in area.

Table 26 lists the established WHAs for identified wildlife. The WHAs for most species are small areas except for grizzly bear, which has been defined as a large specified area. The grizzly bear WHA covers a large portion of the Kootenay Lake TSA and was designed to account for the large territorial ranges for this species. GWMs within the specified area were created to protect important forage areas and minimize disturbance vectors by restricting road and trail location and by requiring the retention of large coarse woody debris and visual screens. Given that there are no forest harvest restrictions within the Order, this specified area was included in the THLB base case with no constraints.

Table 26. Wildlife habitat areas in Kootenay Lake TSA

Wildlife species and communities	Number of WHAs	Potential for harvest	Gross land base (hectares)	CFLB (hectares)	THLB
American Badger	1	Yes	3	0	No
Data Sensitive	23	Yes	99	80	No
Grizzly Bear	1	Yes	19 171	19 031	Yes
Rocky Mountain Tailed Frog (Active)	1	Yes	7	7	No
Rocky Mountain Tailed Frog (Proposed)	2	Yes	417	410	No
Western Screech Owl	2	Yes	155	62	No
Total (excluding Grizzly Bear)			**681**	**559**	

The Coeur d'Alene Salamander is the only remaining Identified Wildlife Species with current Section 7 (FPPR) and Section 9 (Woodlot Licence Planning and Practices Regulation) wildlife objectives. The proposed maximum mature THLB impact for the management of this species is 150 hectares, some of which is accounted for in WHAs above. The remaining areas in the Section 7 and 9 notice will not be modelled in the base case.

Table 27. Species at risk notices - section 7 (FPPR)

	Amount included in the current notice			Amount remaining following exemption		Remaining amount intended to address		
Species	Total area (ha)	Mature THLB impact (ha)	Exemption from objective	Total area (ha)	Mature THLB impact (ha)	Proposed WHAs	Future WHAs	WHA orders providing exemption
Coeur d'Alene Salamander	250	150	Partial	182	Not yet available		9	Data Sensitive

Data source and comments:

Wildlife habitat areas:

BCGW file: WHSE_WILDLIFE_MANAGEMENT.WCP_WILDLIFE_HABITAT_AREA_POLY
Access date: August 8, 2019.

Proposed wildlife habitat areas:

BCGW file: WHSE_WILDLIFE_MANAGEMENT.WCP_WHA_PROPOSED_SP
Access date: October 28, 2019.

7.9 Southern mountain caribou

Three Southern mountain caribou populations and five herds occur within the Kootenay Lake TSA: Central Selkirks (Naksup and Duncan herds), South Purcells (North and South Purcell herds) and South Selkirks (South Selkirk herd). Southern Mountain caribou populations are listed as Threatened under the Government of Canada's *Species at Risk Act* (SARA) and are provincially red listed (e.g., species at risk of extinction or extirpation). The recovery strategy for these populations were developed by Environment Canada and consists of two components:

- legal objectives for sustaining the distribution and abundance of all southern mountain caribou populations; and,

- spatially delineated caribou critical habitat (low elevation winter range, high elevation winter or summer range and matrix types).

Environment Canada set an objective of maintaining greater than 65% undisturbed habitat in low elevation winter range and no disturbance in high elevation winter or summer range. Disturbed habitat is defined as areas burned within the last 40 years, or areas that that are within 500 metres or less of either 40-year old logged forest (i.e., cutblocks) or linear feature created by humans (i.e., roads, trails and pipelines).

Three GAR Orders, were established on December 9, 2009 within the Kootenay Lake TSA. These include u-4-012 (Southwest Kootenay Planning Unit), u-4-013 (Rocky Mountain Kootenay Lake Planning Unit and u-4-014 (Central Kootenay Planning Unit).

Timber harvesting and road construction must not occur within these GAR areas other than for certain exceptions. Areas are identified in the GAR as no harvest or conditional harvest, and for some conditional areas, these conditions are no longer met.

In the base case, no harvest zones will be excluded from the THLB. The following two areas fail to meet the conditions required for conditional harvest as stated in the GAR order:

- In u-4-013, unit number 17, the total area of timber harvesting must not exceed 80 hectares.
- In u-4-014, unit number 2, timber harvesting must be completed before June 30, 2010.

In u-4-013, unit number 17, 145 hectares have logging history and therefore this unit fails to meet the harvesting condition. In u-4-014, unit number 2, the date harvesting must be completed by has past. These two units will be excluded from the THLB.

In u-4-014, unit number 19, timber harvesting must not exceed 750 hectares. Within this unit, 547 hectares have logging history, leaving 203 hectares available to log. There is 225 hectares in this unit in THLB that has not been logged, and therefore 22 hectares should be excluded from the THLB. Given these hectares are not geographically identified, and the area is small, this exclusion will not be modelled.

Those GAR units where harvesting is permitted until 2028 will be available for harvest until 2028 and then excluded from the THLB by the model. Current and future exclusions are summarized in Table 28.

The provincial Caribou Recovery Program intends to release guidance for forest operations occurring in Caribou Core and Matrix habitat. Should this guidance become available, it will be used to inform a sensitivity analysis. If not, a sensitivity analyses will be completed to explore the implications for timber supply of implementing Environment Canada's critical habitat protections for caribou, and of current management practices on habitat disturbance levels in caribou matrix range. Specifically, the sensitivity will model scenarios that allow no habitat disturbance in high elevation winter or summer range areas and maximum 35% habitat disturbance in low elevation winter range and matrix areas. The sensitivity analyses will explore the implications of current forestry practices and alternative scenarios with limitations on forestry for caribou and timber supply in the future.

Table 28. Government action regulation orders for Mountain Caribou

Order	Gross land base (ha)	CFLB	THLB
u-4-012	42 819		
No harvest	42 539	35 165	No
Restricted harvest	280	278	Yes
u-4-013	70 311		
No harvest	70 038	48 189	No
Restricted harvest	273	268	Yes
u-4-014	102 627		
No harvest	99 970	53 249	No
Restricted harvest	2 657	2 325	Yes
Total no harvest	**212 547**	**136 602**	**No**
Additional future no harvest (2028)	**3 210**	**2 871**	**1 527**

Data source and comments:

No harvest areas above include the conditional harvest areas that no longer meet conditions necessary to harvest **(**u-4-013, unit number 17 and u-4-014, unit number 2), and those areas are not included in the restricted harvest totals.

Data:

BCGW file: WHSE_WILDLIFE_MANAGEMENT.WCP_UNGULATE_WINTER_RANGE_SP
Access date: August 7, 2019.

7.10 Wildlife management areas

Wildlife management areas (WMA) may be designated under the Section 4 of the *Wildlife Act*. Activities that involve use of land or resources in a WMA require written permission of the designated regional manager and must be consistent with the objectives of the WMA management plan. Two WMAs have been designated within the Kootenay Lake TSA: Creston Valley and Midge Creek.

Creston Valley WMA was created in 1968 and is administered under the *Creston Valley Wildlife Management Act*. This *Act* empowers a Management Authority (crown agency) to govern the approximately 7000 hectares of wetland complex that encompasses the traditional floodplain of the Kootenay and Goat Rivers at the southern extent of Kootenay Lake.

Midge Creek WMA was created in 1998 to maintain and increase the biological diversity of the West Arm Wilderness Park and helps to protect important ungulate and grizzly bear migration corridors along the western shore of Kootenay Lake's South Arm, and Midge and Seeman Creeks represent important bull trout spawning and rearing habitats. The creation of the Midge Creek WMA complemented restoration efforts for the internationally significant South Selkirk caribou herd.

There is no history of harvesting within Creston Valley WMA. Within Midge Creek WMA, harvesting is permitted only with approval from the Habitat Section in the region. Access is an issue within this area as six bridges need to be installed and that requires permission from the Nature Conservancy for access. There is 99 hectares with harvesting history, 61 hectares since the establishment of the WMA.

In the base case, both the Creston Valley WMA and Midge Creek WMA are excluded from the timber harvesting land base. Both WMAs were excluded from the THLB in the previous TSR.

Table 29. Wildlife management areas in Kootenay Lake TSA

Wildlife management area	Gross land base (ha)	CFLB	THLB
Creston Valley	6 902	1 292	No
Midge Creek	14 847	13 247	No
Total	**21 749**	**14 538**	**No**

Data source and comments:

BCGW file: WHSE_TANTALIS.TA_WILDLIFE_MGMT_AREAS_SVW
Access date: August 7, 2019.

7.11 Wildlife habitat features

The Wildlife Habitat Features Order was introduced by the Minister of Environment and Climate Change Strategy on July 1, 2018 as a regional Ministerial Order in the Kootenay-Boundary. The Order lists 14 wildlife habitat features that are defined under Section 70(2) of FPPR, which requires that FRPA agreement holders must not damage or render ineffective a wildlife habitat feature (WHF). The Order does not require specific practices but rather provides guidance for each wildlife habitat to ensure compliance with the FPPR legislation. The Order also contains a requirement to annually report new WHFs to a regional (ultimately provincial) GIS layer and applies to major and minor tenures, woodlots, community forests and range users.

It was intended that the management of WHFs would be captured using existing forest management tools and retention requirements, e.g., wildlife tree retention areas, OGMAs, riparian management and reserve areas or silvicultural unit harvest prescriptions. As such, it is not anticipated that the management of WHFs will have an impact on timber supply.

The regional WHF feature layer is currently active but information is restricted to FRPA licence-agreement holders. As such, a summary of WHFs identified within the Kootenay Lake TSA will not be described in this data package.

Data source and comments:

BCGW file (restricted):

WHSE_WILDLIFE_INVENTORY.SPI_FEATURE_OBS_NONSENS_SP

WHSE_WILDLIFE_INVENTORY.SPI_WHF_INCIDENT_OBS_NS_SV

WHSE_WILDLIFE_INVENTORY.SPI_WHF_SURVEY_OBS_NS_SV

7.12 Archaeological sites

Archaeological sites are locations where there is physical evidence of past human activity. Such sites are identified and receive protection under the *Heritage Conservation Act* (HCA). A permit issued by FLNRORD's Archaeology Branch is required to conduct activities within the boundaries of an archaeological site.

Within the Kootenay Lake TSA there are 266 archaeological sites that have been recorded within the government's archaeological database. These include a wide range of sites located both within the urban and forest land base.

The vast majority of archaeological sites are located under the surface of the ground, and most have not been recorded. Therefore, it is difficult to estimate the full number of sites in a management unit. However, protection under the HCA is automatically provided to sites such as those containing physical evidence of human use or activity pre-dating 1846, burial places, and Aboriginal rock carvings or paintings when the sites are identified.

Archaeological sites are excluded from timber harvesting. Operationally these identified sites may serve complementary retention objectives (e.g., wildlife tree patches, riparian areas).

In the base case, archaeological sites will not be excluded from the THLB in the base case but will be presented to the chief forester prior to the determination. Archaeological sites often overlap with other retention features that are excluded from the THLB. Archaeological sites average less than 0.5 hectares, and modelling is base based on one-hectare raster cells, if archaeological sites were to be deducted from the THLB, this would be done aspatially. Table 30 summarizes the one-hectare raster cells that intersect with archaeological sites. There is a total of 28 hectares that have archaeological sites and that are within the THLB.

Table 30. Known archaeological sites in the Kootenay Lake TSA

Description	Gross land base (ha)	CFLB	THLB
Archaeological sites	121	46	Yes

Data source and comments:

BCGW file (restricted): WHSE_ARCHAEOLOGY.RAAD_TFM_SITES_SVW
Access date: August 29, 2019.

7.13 Cultural heritage sites

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 currently unknown and is not tracked. 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.

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.

7.14 Karst

Karst is a distinctive topography in which the landscape is largely shaped by the dissolving action of water on carbonate bedrock (usually limestone, dolomite, or marble). This geological process, occurring over many thousands of years, results in unusual surface and subsurface features ranging from sinkholes, vertical shafts and disappearing streams and springs, to complex underground drainage systems and caves.

Karst is recognized as a highly valuable, non-renewable resource that can be especially vulnerable to disturbance, more so than many other land resources.

Surface or subsurface elements of a karst system is one of the listed resource features under GAR Section 5 that may be identified by the Minister. Under FPPR Section 70 it states that, unless exempted by the Minister, primary forest activities must not damage or render ineffective resource features.

Currently, there is no GAR Order that addresses karst in the Kootenay Lake TSA, and the spatial data available from the district is not in an accessible format. Therefore, karst will not be modelled in the base case.

Data source and comments:

Government Actions Regulation (Section 5):
http://www.bclaws.ca/civix/document/id/complete/statreg/582_2004#section5
(Accessed June 20, 2020).

FPPR (Section 70): http://www.bclaws.ca/civix/document/id/complete/statreg/14_2004#section70
(Accessed June 20, 2020).

7.15 Growth and yield permanent sample plots and research installations

FLNRORD maintains a network of growth and yield permanent sample plots (PSPs) across the province for the purposes of understanding forest growth and the calibration of growth and yield models. Objectives for these plots have not been established under FRPA. Within the Kootenay Lake TSA, however, harvesting is avoided on active and protected PSPs.

FLNRORD FAIB staff report that there are 110 active and protected PSP sites within the Kootenay Lake TSA, and that on average a buffer of 68 metres radius is the area protected for each plot, resulting in a total of 160 hectares being excluded from the THLB. Unprotected PSPs are released for harvest if a request is made. Given the small impact to the timber supply, and that the active and protected PSPs are not spatially identifiable in the BCGW PSP layer, the PSPs will not be modelled in the base case.

There are 26 active government research installation sites connected to 16 research projects in the Kootenay Lake TSA. The total area of all active research installations is 153 hectares. Harvesting within these active research sites is currently avoided and only done after consultation with the research team. Research scientists with FLNRORD confirm that these areas should be excluded from the THLB.

A demonstration forest was established in the Kootenay Lake TSA in 1992, the West Arm Demonstration Forest. This area will be included in the THLB.

The Ministry of Environment maintains three snow pillows in the Kootenay Lake TSA. Each location requires about 10 square metres for the station. With an estimated buffer of 50 metres radius around each location, the total area for three stations is 3.5 hectares. Given the small impact to timber supply, these snow pillows will not be modelled in the base case. Table 31 summarizes the total area and CFLB exclusion for installation in the Kootenay Lake TSA.

Table 31. Installations in the Kootenay Lake TSA

Installations	[1]Gross land base (ha)	CFLB ([2]ha)	THLB
GY PSP	160	Yes	Yes
Other research installations	153	130	No
West Arm Demonstration Forest	*135,000	Yes	Yes
Snow pillows	3.5	Yes	Yes

[1] Gross area for GY PSP is reported area from FAIB staff.
Gross area for other installations is from rasterized data.
Gross area for West Arm Demonstration Forest is from the website below.
Gross area for snow pillows is estimated buffers.

[2] Area (hectares) given within CFLB, or Yes if included in both the CFLB and THLB.

*The area for WADF was reported from the West Arm Demonstration Forest https://www.for.gov.bc.ca/rsi/research/WADF/WADF.htm (Accessed October 2, 2019).

Data source and comments:

BCGW file: WHSE_FOREST_VEGETATON.GRY_PSP_STATUS_ACTIVE
Access date: August 29, 2019.

Note: The total number of active, protected PSP plots was obtained from FAIB staff.

BCGW file: WHSE_FOREST_VEGETATION.RESPROJ_RSRCH_INSTLTNS_GOV_SVW
Access date: August 29, 2019.

BCGW file: WHSE_WATER_MANAGEMENT.SSL_SNOW_ASWS_STNS_SP
Access date: October 1, 2019.

8. Current Forest Management Assumptions

8.1 Harvesting

8.1.1 Recent harvest performance

Effective August 12, 2010, the AAC for the Kootenay Lake TSA was 640 000 cubic metres. The harvest performance for the years 2009 – 2018 was examined using two sources: one, the Harvest Billing System and two, a compilation of the Cut Control letters. The base case accounts for the past harvesting by incorporating depletions up to 2018.

Table 32 provides a summary of AAC and the total volume harvested that is counted towards the AAC in the TSA. The volume harvested column reports the total volume harvested including grade 4 credit volumes (see Section 8.1.4). Grade 4 credits are not counted against AAC.

Table 32. Allowable annual cut billed in the Kootenay Lake TSA from 2008 to 2018

Year	AAC (m^3)	Volume harvested (m^3)
2009	681 000	507 321
2010	681 000	628 054
2011	640 000	633 984
2012	640 000	436 083
2013	640 000	568 376
2014	640 000	702 893
2015	640 000	597 184
2016	640 000	758 382
2017	640 000	585 061
2018	640 000	727 511
Total	**6 482 000**	**6 144 849**

Data source and comments:

Harvest Billing System and Cut Control letters.

8.1.2 Merchantability specifications

The Interior Timber Merchantability Specifications of the *Interior Appraisal Manual* specifies the utilization levels for the billing of harvested timber used in the monitoring of AAC.

The utilization levels define the maximum stump height, minimum top diameter (inside bark) and the minimum diameter (outside bark) at stump height.

In the southeast corner of Kootenay Lake TSA, timber is used for fence posts and therefore utilization exceeds utilization standards. Given the limited geographic area within which this is occurring, and the minimal volume differences involved, this will not be modelled in the base case.

For yield table projections in the timber supply analysis, the specifications for minimum stump diameter are converted to a corresponding breast height diameter (Table 33).

Table 33. Harvest merchantability specifications within the Kootenay Lake TSA

Species	TSR Modelled	Merchantability Specification		
	Corresponding minimum DBH (cm)	Minimum diameter at stump height (cm)	Maximum stump height (cm)	Minimum top DIB (cm)
Pine	12.5	15.0	30	10
Cedar > 141 years	17.5	20.0	30	15
All other	17.5	20.0	30	10

Data source and comments:

The specification for minimum top diameter inside bark will be modelled as 10 cm for age classes of cedar due to limitations of the growth and yield models.

Interior Appraisal Manual: https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/forestry/timber-pricing/interior-timber-pricing/interior-appraisal-manual/2020_iam_master.pdf (Accessed June 20, 2020).

8.1.3 Minimum harvestable criteria

The minimum harvestable volume is the minimum volume considered economic to harvest. While harvesting may occur in stands at the minimum volume in order to meet forest level objectives (e.g., maintaining overall harvest levels for a short period of time or avoiding large inter-decadal changes in harvest levels), most stands are harvested with volumes well in excess of the minimum because of management objectives (e.g., requirements adjacency and green-up, see Section 8.3.2).

The minimum harvest volume assumed in the base case will be the same as that calculated to derive the timber harvesting land base: 135 cubic metre a hectare (see Section 7.4.8). Where deciduous is a minor component in the stand the deciduous component will be allowed to contribute to the harvest volume, but the minimum harvest volume requirement will be based on the coniferous component.

Sensitivity analyses will investigate the impact of lowering and raising the minimum harvestable criteria by 10%.

Harvest scheduling priorities:

The order in which stands are harvested can impact timber supply. Licensees select stands to harvest through consideration of many factors. For the current timber supply analysis, the forest estate model provides several methods in which to control the harvest scheduling.

The mountain pine beetle epidemic peaked in 2006 within the TSA and is now considered endemic and will therefore not influence the harvest scheduling priority in the model.

In the base case, the harvesting schedule will be modelled as relative oldest first harvest priority.

8.1.4 Log grade 4

The Section 8 AAC is tracked by monitoring harvest billed against the volume of AAC awarded to forest licences. Harvest billed includes both the volume of timber used and the volume identified as waste. *Waste* means timber, except timber reserved from cutting, whether standing or felled, which meets or exceeds the timber merchantability specifications described in the *Provincial Logging Residue and Waste Measurement Procedures Manual* that was not removed from the cutting authority area.

At the time of the introduction of new log grades, licensees argued that not all grade 4 was economic to harvest. To address this issue, the ministry agreed to create a dry-grade 4 category (effectively the old grade 5 category) that if left on site would not be counted as waste (though it is captured under cruised based authorities). Further, to encourage all grade 4 use, exclusions (i.e., not billed against a licensee's

AAC) have been permitted for grade 4 where this volume is shipped to a facility other than a sawmill or veneer plant. This describes the grade 4 credit. The Minister may determine a limitation on the amount of grade 4 volume that is credited in a management unit such as a TSA.

In the base case, no specific modelling considerations for log grade 4 waste exemptions or for Grade 4 credit are made. Available information on dry grade 4 waste and grade 4 credit will be presented to the chief forester for her consideration in the AAC determination.

8.2 Silviculture

Since 1987 major licensees have had a legal responsibility for basic silviculture. To enable assessment of this responsibility, licensees conduct surveys for the regeneration and establishment of free-growing status on a cutblock. This information is reported as forest cover information in the FLNRORD RESULTS database, and used as input when generating TIPSY curves for managed stands.

8.2.1 Silviculture systems

In Kootenay Lake TSA, clearcuts and clearcut with reserves have been the primary silviculture systems used for the last 10 years, with 93% of the total area harvested using one of these silviculture systems, as can be seen in Table 34.

Table 34. Silviculture systems by hectares (2009-2018)

Description	Area (ha)	Percentage
Clearcut & Clearcut with reserves	16 834	93
Other	1 289	7

The data shows that harvesting using clearcut and clearcut with reserves has been increasing since 2016, and the use of other silviculture systems is decreasing, as shown in Figure 8 below.

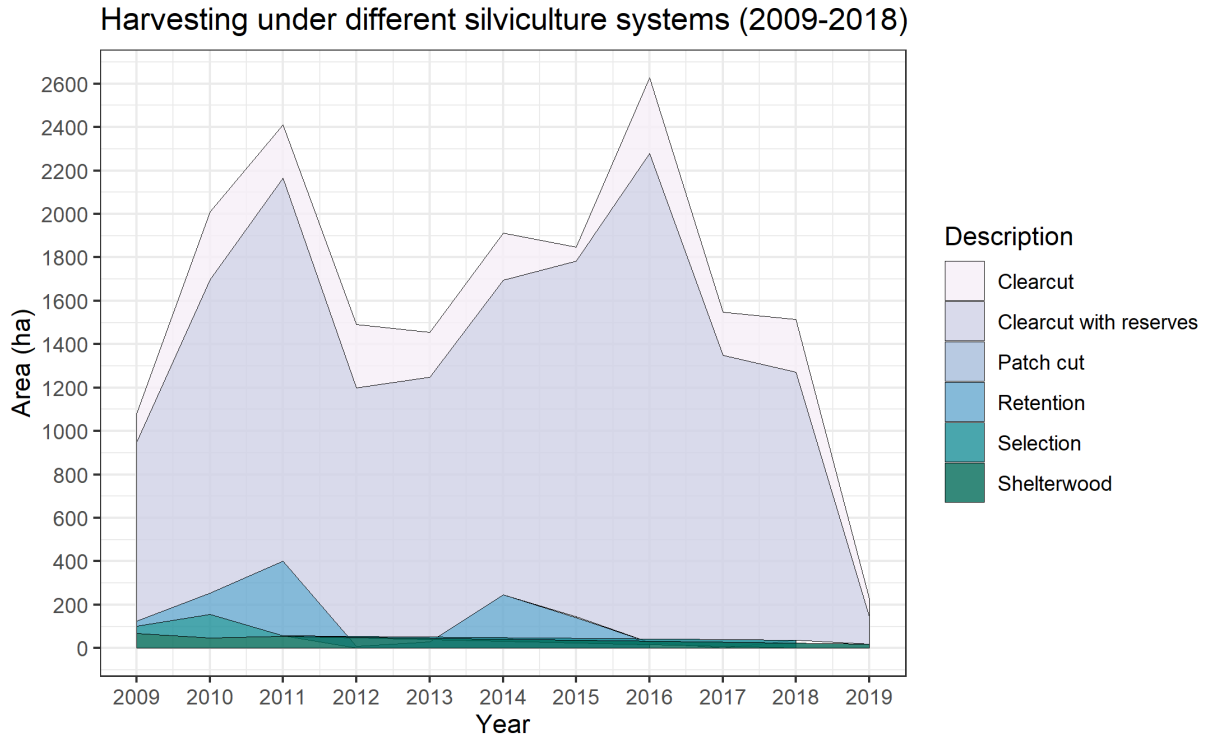

Figure 8. Silviculture systems.

In the base case, all stands will be modelled using a clearcut silviculture system assumption.

Other silviculture systems are used within wildfire urban interface areas, and Selkirk Natural Resource District and BCTS staff expect an increase in the use of other silviculture systems along with the anticipated Wildfire Urban Interface (WUI) treatments.

As described in Section 8.4.1, a sensitivity will be run where all stands within the wildfire urban interface areas will be modelled as being harvested as partial cuts with multiple entries.

Data source and comments:

BCGW file: WHSE_FOREST_VEGETATION.RSLT_OPENING_SVW
Access date: October 29, 2019.

8.2.2 Regeneration impediments

A short delay usually exists between the date of harvest and the date a site is planted. This delay may be due to operational reasons (e.g., access to appropriate planting stock) or site considerations (e.g., natural regeneration or addressing impediments to regeneration).

In the Kootenay Lake TSA, most licensees practice prompt reforestation. However, quite a few sites have impediments to successfully retaining that regeneration; these include cold sites at high elevation, increasing levels of drought at lower elevations, and brush competition. The Kootenay Lake TSA has also experienced several large wildfires, particularly since 2003. Delays associated with plantations that are burnt and subsequently replanted are captured in RESULTS.

Although regeneration delay may be met promptly, the trees planted are not necessarily the ones that survive to successfully meet regeneration establishment. While an area may initially be planted at a given density, the planted trees may die within 2-15 years and beyond, changing the initial planting density and the distribution between natural and planted trees. These delays, densities, and distributions are reflected in the information entered into the RESULTS database.

In the base case, a regeneration delay is calculated from RESULTS data for each aggregated BEC sub-zone for future managed stands. It is assumed that one-year old stock is typically used when planting, reducing the regeneration delay by one year. For existing stands that have an identified harvest date, but the projected age is zero, the projected age will be assigned the difference between 2017 and the year of harvest less regeneration delay.

8.2.3 Immature plantation history

Stand Development Monitoring (SDM) is a mid-rotation survey protocol that collects data on stand attributes such as tree age, species composition, and forest health factors.

In response to observations of unexpected mortality and damage occurring at time of free growing, or in the 10-15 years after free-growing declarations occurred, in 2008 the District initiated a Stand Development Monitoring assessment. Those results were presented during the previous TSR. The District continued with a new assessment on a subset of those stands in 2018.

FAIB undertook a parallel process with the Young Stand Monitoring (YSM) program (an independent random sample of permanent sample plots) in the Kootenay Lake TSA in 2012 and a re-measurement in 2017. All those reports, including similar work done in the adjacent and biologically similar neighbouring TSA (Arrow TSA), will be used to evaluate the yield curves used in the base case. If these results show significant differences, a sensitivity will be completed.

For the AAC determination, information on the status of immature plantation health will be presented to the chief forester for her consideration.

8.2.4 Pre-1987 backlog not satisfactorily restocked (NSR) areas

The Ministry backlog policy defines backlog NSR as productive forest land denuded prior to 1987 that has not been regenerated to the desired stocking standards for the opening.

It is anticipated that most of the pre-1987 NSR backlog areas have been assessed and found to be stocked or were reclassified in RESULTS. Volume projections for those remaining stands will be based on the VRI attributes and projections using the growth and yield model VDYP.

8.2.5 Incremental silviculture

Incremental silviculture practices are activities that provide benefit to stands beyond the practices required to meet basic silviculture obligations such as juvenile spacing and fertilization. In the Kootenay Lake TSA, these activities have occurred in a small area. Of the 127 907 hectares within the Kootenay Lake TSA CFLB with a RESULTS opening, a total of 3066 hectares had a fertilization completion date, and 2295 had a pruning completion date. Given the small area benefiting from incremental silviculture it will not be modelled in the base case scenario.

8.3 Integrated resource management

The Crown forests of the Kootenay Lake TSA are managed for many values. The objective and management of these values are identified within various instruments including legislation, higher level plans, FRPA or the *Land Act* orders and approved FSPs. An extensive land-use planning process was conducted which resulted in the Kootenay Boundary Higher Level Plan.

Within the Kootenay Lake TSA all approved FSPs prepared by major forest licence holders are required to state results and strategies that meet the 11 objectives set by government under FRPA Section 149(1). Objectives that impact timber supply are modelled in the base case (e.g., ungulate winter range, visual management). These objectives are described within this document in specific sections. Objectives that do not impact timber supply are not modelled in the base case.

8.3.1 Forage supply and livestock use

Managing and conserving range and forest resources to encourage maximum productivity of these resources while maintaining healthy ecosystems are important in meeting the economic and social objectives of BC. Growing trees and forage together on cutblocks helps to sustain a viable and competitive beef industry in addition to the forest industry. Livestock grazing on cutblocks can be successfully integrated through effective livestock management and obstacle tree planting and with successful integration there is minimal to no impact to timber supply.

There is relatively little grazing in the TSA, and it is primarily limited to the southeastern portion with some grazing use by guide outfitters taking place in the northern portion of the TSA. Table 35 summarizes the area covered by active range tenures. The impacts to timber supply by grazing are not considered significant and will not be modelled in the base case.

Table 35. Active range tenures

Description	[1]Gross area (ha)	[2]CFLB (ha)	[3]THLB (ha)
Active range tenures	34 717	33 571	27 726

[1]Gross hectares for the active range tenures area that falls within the outer boundary of Kootenay Lake TSA.

[2,3]CFLB and THLB hectares within the Kootenay Lake TSA.

Data source and comments:

BCGW file: WHSE_FOREST_TENURE.FTEN_RANGE_POLY_SVW
Access date: June 6, 2020.

8.3.2 Adjacency, green-up, and patch size distribution

Maximum cutblock size and adjacency constraints in the Kootenay Lake TSA are governed by 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. Most licensees have also chosen to comply with Section 65, which limits harvesting adjacent to an existing cutblock that has not achieved green-up.

In the base case, the block size constraint is applied to the integrated resource management (IRM) area outside of ungulate winter range (U-4-001), community watersheds and scenic areas. IRM areas are generally large contiguous areas of harvestable forest.

In the base case, adjacency and green-up are modelled using an adjacency proxy. A forest cover constraint is applied in each landscape unit which limits the amount of harvesting such that no more than 33% of the stands in the THLB are less than the green-up height of 2.5 metres.

The use of a maximum disturbance of 33% as the patch size proxy adequately describes the cutting pattern used at this time.

The patch size distribution cover constraint only applies in areas outside of ungulate winter range (U-4-001), community watersheds and scenic areas as these specific areas have their respective cover constraints.

Data source and comments:

Data used to model this factor has been identified under previous sections.

8.3.3 Community watersheds

Water in community watersheds is a value identified under FRPA; objectives are established under FRPA Section 8.2. Under FRPA, licensees are required to specify results and strategies that meet the objective set by government for water quality.

There are 54 designated community watersheds that fall within the greater boundary of the Kootenay Lake TSA. Of those, 47 are within the CFLB covering about 8% of the Kootenay Lake TSA CFLB, and are listed in Table 36. Management constraints for community watersheds are not standardized but rather are typically based on a hydrological assessment of the watershed. Licensees have FSP commitments requiring them to complete hydrologic assessments and to abide by the recommendations of the assessment.

Current hydrological recovery estimates assume that harvested stands have a 60% recovered hydrological function at six metres in height and full hydrologic recovery is attained when stands reach nine metres in height. These recovery estimates are used for operational purposes and originate from the 1995 *Interior Watershed Assessment Procedure.* Other studies suggest that hydrologic recovery is not attained until stands reach a greater height.

In the base case the CFLB within each community watershed will be constrained such that a maximum of 30% of the watershed will be less than six metres in height at any one time during the forecast period. Two sensitivity analyses will be run that increases the height constraint of six metres to nine and 15 metres respectively.

Table 36. Community watersheds within the Kootenay Lake TSA CFLB

[1]Community watershed	[2]Gross area (ha)	[3]CFLB (ha)	[3]THLB (ha)
Anderson Community Watershed	1 308	1 052	81
Arrow Community Watershed	7 862	32	10
Bird Community Watershed	780	700	675
Bjerkness Community Watershed	2 502	131	4
Blunt Community Watershed	7	6	0
Bourke Community Watershed	125	117	105
Bradley Community Watershed	322	316	66
Brooks Community Watershed	4	0	0
Cameron Community Watershed	91	86	7
Camp Run Community Watershed	6	0	0
Clayton Community Watershed	13	7	7
Davis Community Watershed	6 286	2	0
Duck Community Watershed	5 201	3 763	1 608
Duhamel Community Watershed	5 671	5 247	727
Eagle Community Watershed	575	533	373
Falls Community Watershed	3 366	3 088	963
Five Mile Community Watershed	4 698	4 089	0
Fletcher Community Watershed	1 453	571	225
Floyd Community Watershed	1 784	37	12
*Forster Community Watershed	12	0	0
Foster Community Watershed	111	96	6
Four Mile Community Watershed	333	327	56
Glade Community Watershed	18	18	0
Hansen Community Watershed	24	15	1
Hendryx Community Watershed	521	494	316
Indian Community Watershed	485	474	217
Jarvis Community Watershed	4	3	1
Kemp Community Watershed	1 178	0	0

(continued)

Table 36. Community watersheds within the Kootenay Lake TSA CFLB (concluded)

[1]Community watershed	[2]Gross area (ha)	[3]CFLB (ha)	[3]THLB (ha)
Kleef Community Watershed	60	57	43
*Kuskanax Community Watershed	14	0	0
La France Community Watershed	5 563	5 271	478
Lockhart Community Watershed	3 722	3 390	6
Longueval Community Watershed	4	1	0
Mcdonald Community Watershed	213	2	1
Mcgregor Community Watershed	383	345	210
Mortimer Community Watershed	48	47	0
Procter Community Watershed	826	1	1
Rover Community Watershed	4 251	3 975	2 426
Russell Community Watershed	2 348	11	3
Sanca Community Watershed	10 879	9 894	2 708
Sandy Community Watershed	1 221	1 157	594
Selous Community Watershed	1 516	1 459	263
Sitkum Community Watershed	2 695	2 500	1063
Smallwood Community Watershed	1 738	1 381	630
Smoky Community Watershed	430	67	38
South Blunt Community Watershed	72	72	22
South Rykert Community Watershed	7	0	0
Sullivan Community Watershed	620	4	2
Sutherland Community Watershed	146	126	14
Teetzel Community Watershed	701	657	19
The Rivulet Community Watershed	11	0	0
Twin Bays Community Watershed	1 138	1 111	833
Urmston Community Watershed	685	675	394
Watts Community Watershed	32	6	6
Total	**84 063**	**53 411**	**15 216**

[1]All community watersheds that fall wholly or partly within the Kootenay Lake TSA are listed.

[2]Gross hectares for area that falls within the outer boundary of the Kootenay Lake TSA.

[3]CFLB and THLB within the Kootenay Lake TSA only.

Data source and comments:

BCGW file: WHSE_WATER_MANAGEMENT.WLS_COMMUNITY_WS_PUB_SVW
Access date: August 8, 2019.

8.3.4 Domestic watersheds

Streamside management provisions within consumptive use streams are legally established under Objective 6 of the KBHLPO. S5 and S6 streams that are upstream from water intakes are required to have a 30-metre management zone within which site specific measures to safeguard water used for human consumption are to be taken. Minimum retention targets within the management zones are consistent with Section 8 of the FPPR and are described in Section 7.6 and Table 24.

Hydrological assessments may be completed by licensees in domestic watersheds similar to community watersheds.

In the base case, domestic watersheds will not be modelled. Where available specific examples of harvest limitations due to hydrological concerns will be collated and presented to the chief forester.

A sensitivity analysis will model domestic watersheds using the same constraint as is used for community watersheds, see Section 8.3.3.

8.3.5 Ungulate winter range (excluding caribou)

GAR Order U-4-001 was established on December 13, 2005 for the protection of winter habitat for mule deer, white tailed deer, rocky mountain elk and moose in the Arrow, Kootenay Lake and Cascadia TSAs. The area covered by GAR Order U-4-001 is generally located in low elevation areas (below 1200 metres) throughout the Kootenay Lake TSA.

The Order establishes objectives for the retention of snow interception cover and forage areas using minimum requirements for mature seral stand structure and maximum levels of harvest. Table 37 details the minimum forest cover requirements for UWR management units, applied as a percentage of the ungulate winter land base within each unit. The ungulate winter land base is defined within Schedule 1 of the Order and excludes specific land ownership classifications and deciduous vegetation components.

GAR Order U-4-001 was updated in 2019 to include woodlots and community forests within the ungulate winter land base.

Table 37. UWR Order U-4-001 forest cover objectives

Ungulate winter range	Priority ungulate species	BEC zones/ subzones	Minimum forest cover area (%)	Forest characteristics	
				Age (years)	Crown closure (%)
Snow interception cover	Mule Deer	ICHxw	20	≥ 81	≥ 20
		ICHdw	30	≥ 81	≥ 40
		ICHmw ICHwk	40	≥ 101	≥ 40
	White-tailed deer	ICHdw	40	≥ 81	≥ 40
	Elk	ICHdw	20	≥ 81	≥ 40
		ICHmw	30	≥ 101	≥ 40
	Moose	All subzones	20	≥ 61	≥ 40
Early seral	All species	All subzones	60	≥ 21	N/A
Forage	All species	All subzones	10	≥ 81	Dispersed patches

In the base case, GAR Order U-4-001 will be modelled using the minimum forest cover constraint and stand age at the BEC zone/subzone level. Table 38 summarizes the area covered by that order.

Table 38. Ungulate winter range

Description	Gross land base (ha)	CFLB (ha)	THLB (ha)
U-4-001	72 275	42 386	27 734

Data source and comments:

BCGW file: WHSE_WILDLIFE_MANAGEMENT.WCP_UNGULATE_WINTER_RANGE_SP
Access date: August 7, 2019.

8.3.6 Visual quality objectives

Visual quality is a value identified under FRPA. The authority to establish or amend scenic areas and visual quality objectives is under FRPA Section 150.3 and Section 7(1) and (2) of the GAR. This authority has been delegated to the District Manager.

On February 12, 2014 the District Manager established revised visual quality objectives (VQO) for the Kootenay Lake TSA scenic area. Licensees have committed in their FSP's to meeting the visual quality objectives. Table 39 shows the area in the VQO categories in Kootenay Lake TSA.

Table 39. Visual quality objectives

Established VQO	Gross land base (ha)	CFLB (ha)	THLB (ha)
Retention	28 738	12 132	5 349
Partial retention	151 443	98 527	43 600
Modification	63 619	49 112	22 465
Total	**243 800**	**159 772**	**71 414**

In the base case, scenic areas and VQOs will be modelled as follows. Plan to Perspective (P2P) ratios and Visually Effective Green-up (VEG) heights will be determined for 5% slope class increments for each individual scenic area polygon. The P2P ratios will then be applied in the analysis to adjust the percent allowable alteration by visual quality objective. VEG tree heights will be modelled for each scenic area polygon individually.

The following documents detail the modelling processes:

- *Procedures for Factoring Visual Resources into Timber Supply Analyses* (March 17, 1998);
- *Bulletin-Modelling Visuals in TSR III* (December 12, 2003).

Table 40 shows the P2P ratios and VEG heights by slope class that will be applied in the analysis.

Table 40. P2P ratios and VEG heights

	Modified visual unit slope classes for plan-to-perspective ratios (P2P) and visually effective green-up (VEG) tree height input into TSRs[1]														
Slope %	0- 5	5.1-10	10.1-15	15.1-20	20.1-25	25.1-30	30.1-35	35.1-40	40.1-45	45.1-50	50.1-55	55.1-60	60.1-65	65.1-70	70+
P2P ratios[2]	4.68	4.23	3.77	3.41	3.04	2.75	2.45	2.22	1.98	1.79	1.6	1.45	1.29	1.17	1.04
VEG tree height (metres)[3]	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	6.5	7.0	7.5	8.0	8.5	8.5	8.5

[1]Adapted from *Procedures for Factoring Visual Resources into Timber Supply Analysis* manual (1998) and *Modelling Visuals in TSR III Bulletin* (2003) in preparation for TSR 4 (by Luc Roberge, Visual Resources Specialist, FLNR-December 2007).

[2] A recent study shows a first approximation of the predicted P2P ratios for absolute slope classes in 10% increments. Although P2P ratios and slope classes did not show a linear relationship, the median value was used in this table to determine the ratios for slope classes in 5% increments.

[3]Tree heights required to meet VEG by percent slope for well stocked stands from *Procedures for Factoring Visual Resources into Timber Supply Analysis* manual (1998).

Table 41 identifies the percent allowable alteration in perspective view by VQO.

Table 41. Predicting VQO objectives based on percent alterations

VQO	Permissible % alteration in perspective view	Proposed % alteration in perspective view for this TSR (mid-point of range)
Retention	0 – 1.5	0.8
Partial retention	1.6 – 7.0	4.3
Modification	7.1 – 18.0	12.6

Note: These percentages apply to the visible treed portion of the landscape in perspective view. Rock, snow and ice patches are excluded from the calculation.

To determine available denudation in plan view for an individual visual unit, the perspective percent alteration number must be converted by a P2P ratio for the average slope class of that unit. For example, assume a partial retention (PR) visual unit is managed in the field at the mid-range of the permissible percent alteration in perspective view, 4.3%, and has an average slope of 20% resulting in a P2P ratio of 3.41. The corresponding percent denudation value in plan view would be: 4.3% x 3.41=14.7%. Therefore, if this PR visual unit is 5000 hectares (THLB) in size and has no prior harvesting, or any past harvesting has reached VEG, 735 hectares is available for harvesting (5000 hectares x 14.7%) and this is the number that would be used for modelling.

Data source and comments:

BCGW file: WHSE_FOREST_VEGETATION.REC_VISUAL_LANDSCAPE_INVENTORY
Access Date: August 8, 2019.

8.4 Forest health

Forest health issues in the Kootenay Lake TSA over the last 10 years include insects, disease and abiotic factors. The largest measured 10-year impacts were from Bark Beetles (Mountain Pine Beetle, Douglas-fir Bark beetle) and wildfire. Rusts and blights on Lodgepole pine, bear damage, drought and Armillaria root disease have also been observed, mostly impacting younger plantations. These impacts are captured in the operational adjustment factor (OAFs), discussed in Section 9.6.

Western Hemlock Looper has not had a recent outbreak and there has been very low Spruce Bark Beetle activity for the last two decades, but both are potential forest health factors in the Kootenay Lake TSA.

Mountain Pine Beetle (MPB) has been active in the Kootenay TSA for about two decades and is still the largest cause of non-recoverable losses. Infestation levels were highest between 2001 and 2012 and peaked in 2006. Since 2012 MPB infestations, localized due to topographic constraints, have been varied and are assumed to be at a more endemic level. Suppression activities are still implemented in the three Beetle Management Units near the community of Yahk: Hawkins, Kidd and Little Moyie.

The quality of wood in pine trees killed by MPB is compromised, and in the years following death the timber is downgraded, moving from supplying producers of dimensional lumber to pulp and other secondary products such as biofuels.

The VRI used in this timber supply review includes adjustments for the MPB infestations and provides separate live and dead volumes. The dead volumes are based upon the provincial mountain pine beetle model that uses aerial survey information, and the live volumes are updated accordingly.

The SDM project completed in 2018 identified some significant forest health issues, particularly in Lodgepole pine plantations. These included bear and snow damage, and Dothistroma needle blight, which damaged 184 hectares. There has been an increasing trend of drought causing mortality in plantations at the post-free-growing stage.

Abnormal or catastrophic infestations and devastations are unpredictable and highly variable from year to year. The capture of catastrophic losses (e.g., fire, epidemic infestations) is described in Section 8.4.2.

In the base case the endemic level of pests is modelled through both the volume tables (e.g., empirical basis of growth and yield model VDYP and operational adjustments in TIPSY) and the identification of non-recoverable losses. Additional information summaries, such as those from young stand monitoring and stand density monitoring programs, and advice from forest health experts, are presented to the chief forester for consideration. Unpredictable and large catastrophic events are addressed in the timber supply review process through the ability of the chief forester to re-determine an AAC when the short-term timber supply is not stable, and to ensure it incorporates current information.

Fire

Table 42 shows the area burnt by fire year in the Kootenay Lake TSA. These areas reflect the area within mapped fire perimeters. Given the nature of fire behavior and fire severity the amount of actual area damaged by fire is less, and fire boundaries between years can, and do, overlap.

Table 42. Hectares burned in the TSA

Year	[1]Gross area (ha)	[2]CFLB (ha)	[3]THLB (ha)
2009	175	127	0
2010	134	111	12
2012	77	11	9
2013	252	244	37
2014	216	104	2
2015	2 215	1 817	520
2016	6	6	1
2017	11 222	6 264	112
2018	12 427	8 750	3 271
[4]Total	26 529	17 255	3 964

[1]Gross hectares for the area that falls within the outer boundary of the Kootenay Lake TSA.

[2,3]CFLB and THLB hectares within the Kootenay Lake TSA.

[4]The total area within the historical fire boundaries in years listed, overlaps are only counted once.

Data source and comments:

Provincial Aerial Overview Survey data and local detailed IBM & IBD helicopter surveys.

Fire:

BCGW file: WHSE_LAND_AND_NATURAL_RESOURCE.PROT_HISTORICAL_FIRE_POLYS_SP
Access date: 2019-08-29.

8.4.1 Wildfire urban interface

The Kootenay Lake TSA is in the Regional District of Central Kootenay (RDCK). Within the RDCK, a number of Community Wildfire Protections Plans have been created which identify the wildfire risks within and surrounding a community. These documents also describe the potential consequences if a wildfire was to impact the community and examine possible ways to reduce the wildfire risk.

Various funding sources have provided for the development of fuel management prescriptions as well as operational fuel treatments. These treatments are primarily oriented to reduce fuel loads within the WUI and promote retention of tree species that are less susceptible to wildfire. The WUI is defined as the area within two kilometers of a community with a minimum density of six structures per square kilometer.

Potential treatments vary depending on local site conditions. They may include reducing mature or understory tree densities, removing flammable understory vegetation and debris, pruning branches, or reducing slash accumulations post-harvest. In order to maintain the objective of fire hazard reduction

some of these treatments must be conducted on a regular basis, however there is no certainty that they will continue into perpetuity.

Impacts to timber supply will differ depending on the treatment type and frequency which they occur. Prescriptions could result in a permanent or temporary reduction in stand densities and volumes.

Many of these areas are also located where there are already constraints on timber supply such as those for visual quality, community watersheds or ungulate winter range. In some cases, harvesting consistent with these values may also be beneficial for fire reduction. By removing some of the volume of the stand and increasing the distance between the remaining trees, the amount of fuel is reduced as is the ability of a fire to spread. This would have no additional impacts on timber supply. Conversely harvest levels could possibly be increased in some of these areas if it is determined that mitigating the fire risk is a priority over other objectives.

Many of these treatments are expensive to implement and require secured funding before they take place. Therefore, it is difficult to predict how many projects will be implemented in the short- or long-term.

Given the small area of treatments to date WUI will not be modelled as part of the base case. As more work is conducted in the WUI, future timber supply reviews will be able to more accurately model and adjust the allowable annual cut appropriately.

In April 2019 the Selkirk District Manager approved stocking standards that can be used for reforesting areas within the WUI. This mainly consists of planting seedlings at lower densities and with more fire-resistant tree species. Licensees can choose to use these standards at their discretion based on specific site conditions and objectives. These standards have not been used to date and will not be part of the base case.

Sensitivity analysis will be conducted to consider the potential impact of the WUIs on timber supply. These include the impacts of using WUI stocking standards, and alternative harvest levels. Table 43 summarizes the WUI area in the Kootenay Lake TSA.

Table 43. Wildfire urban interface polygons

Description	[1]Gross area (ha)	[2]CFLB (ha)	[3]THLB (ha)
WUI	152 365	52 746	28 468

[1]Gross hectares for the WUI area that falls within the outer boundary of the Kootenay Lake TSA.

[2,3]CFLB and THLB hectares within the Kootenay Lake TSA.

Data source and comments:

WUI were accessed directly from an internal government server.

8.4.2 Non-recoverable losses

Non-recoverable losses (NRLs) are timber volumes destroyed or damaged on the THLB by natural causes such as fire, wind, and disease that are not recovered through salvage operations and remain unutilized. These timber volumes do not include endemic losses that are incorporated within growth and yield model projections or epidemic losses specifically modelled (such as how the MPB epidemic was modelled in past timber supply reviews).

In the base case, future non-recoverable losses are accounted for by estimating an average annual non-recoverable loss and deducting this amount from the harvest projection throughout the planning horizon of the TSR (Table 44). Values were calculated based on procedures outlined by the FLNRORD Resource Practices Branch. MPB mortality is captured in this analysis however endemic losses into the future are not captured; future TSRs will incorporate MPB into non-recoverable losses.

Table 44 shows the estimated average annual unsalvaged volume loss (based on the 2009-2018 Aerial Overview Survey data) to insect and disease epidemics, fires, wind damage or other agents on the timber harvesting land base. The unsalvaged loss column only reflects those areas in which the volume is not recovered or salvaged.

The annual NRL for MPB damage ([4]IBM) was based on 2013-2018 data only to remove the effect of the epidemic outbreak from previous years

Table 44. Unsalvaged losses

Cause of loss	Annual unsalvaged loss (m³/year)
Mountain Pine Beetle	11 512
Spruce Bark Beetle	13
Douglas-fir Bark Beetle	4 133
Western Balsam Bark Beetle	156
Western Pine Beetle	15
Drought	640
Blowdown, Flooding and Landslides	[1]500
Wildfire	20 682
Total	**37 651**

[1]Includes actual plus an estimated value.

Data source and comments:

Unsalvaged losses are calculated using cumulative years (2009-2018) of annual Aerial Overview Survey flight information. Each disturbance polygon within the THLB that is not salvaged is tallied only once. Polygons that intersect with a harvesting unit do not contribute to the tally. The volume loss is determined using only the tree species volume that is susceptible to the disturbance type. Volumes are adjusted based on local knowledge of disturbance severity and likelihood of future salvage.

Harvested volume under all licences in the THLB has been calculated at 58 425 cubic metres over the last 10 years for an average of 5843 cubic metres per year. The years 2009 and 2010 had significantly higher salvage volume likely as part of the IBM salvage operations at the time.

The Small Scale Salvage program issues an average of 588 cubic metres per year in the Kootenay Lake TSA. Not all of this volume would be NRLs as green timber is usually removed in order to access salvage areas. Because small scale salvage openings are typically less than a hectare, they are not subtracted from the gross area of the infestation.

Small scale salvage volume was summarized from Harvest Billing System annual reports.

[4] IBM is the damage agent code for Mountain Pine Beetle.

Documents for the provincial level projection of the current mountain pine beetle outbreak developed by the Ministry of Forests, Lands, Natural Resource Operations and Rural Development are found at https://www2.gov.bc.ca/gov/content/industry/forestry/managing-our-forest-resources/forest-health/forest-pests/bark-beetles/mountain-pine-beetle. Data was accessed from an internal government server.

NRLs are calculated annually by provincial forest health staff and include harvested and unharvested volume in the THLB. Volume are based on Aerial Overview survey data collected annually.

9 Growth and Yield

9.1 Background

Knowledge of the volume available from a forest stand 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 forest stand.

British Columbia has a strong history in growth and yield modelling. The various models have been important to improving strategic decision making and understanding of the management of British Columbia's forest resources.

To enable modelling of the volume available from a forest stand over time, volume tables are created based on common forest stand inputs, growth characteristics, and the most suitable growth and yield model. Volume tables will be based on information at a forest polygon or silvicultural opening level, where detailed input information is available from the BC government silviculture database RESULTS; however, where detailed information is not available (e.g., for future stands) a volume table that reflects an aggregation of stands at the BGC unit level will be used. The current analysis will make greater use of existing silviculture survey information at a stand level than was used in the previous TSR.

9.2 Growth and yield models

In this analysis, two of the Ministry's growth and yield models will be used. The Variable Density Yield Projection (VDYP) program was specifically developed to project the mature forest inventory. The Table Interpolation Program for Stand Yields (TIPSY) is suitable for projecting yields based on known regeneration characteristics.

9.2.1 Variable density yield prediction model (VDYP7)

The VDYP7 model, developed by the FLNRORD, is an empirical growth model that has been parameterized based on a database of temporary (52,000 plots) and permanent (9300 plots) sample plots collected from mature natural forests in British Columbia.

Input information for the VDYP7 model is based on VRI attributes, typically at the individual forest polygon 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.

Information on VDYP is available at https://www2.gov.bc.ca/gov/content/industry/forestry/managing-our-forest-resources/forest-inventory/growth-and-yield-modelling/variable-density-yield-projection-vdyp

9.2.2 Table interpolation program for stand yields (TIPSY)

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

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

In the analysis, Batch Tipsy Composer (based on TIPSY version 4.4) will be used. This version uses a database consisting of tables generated by TASS III for pine and spruce yields and TASS II for other species yields.

The Tree and Stand Simulator, TASS, developed by FLNRORD, 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 make TASS well suited for predicting the response to many silviculture treatments and the exploration of stand dynamics. TASS III is a recently released version, with limited species (pine and spruce), that extends TASS into more complex stand structures and multiple-species and multi-age cohorts.

9.3 Volume table types

Volume table types are determined by (1) whether and when a stand is harvested; and, (2) the source and the availability of regeneration, forest inventory and management information.

Volume tables for stands that have not been harvested, often referred to as existing natural stands, are modelled with VDYP using input from VRI attributes for the stands.

In the base case, all existing stands that have a history of harvesting or stands harvested in the future will be modelled using TIPSY generated yield curves where appropriate input information is available.

Species composition for existing managed stands comes from RESULTS planting data taking into consideration fill plants and replants. This is augmented with natural composition using total stems from RESULTS survey data. Species composition is adjusted by combining the two sets of data, thus allowing for changes in species composition from the time of planting until the time of survey. Batch TIPSY Composer accepts the site index for each species as an input. Each polygon, through the feature_id, is assigned the site index value for each species within that polygon from the Provincial Site Productivity Layer (PSPL).

In previous TSRs, the use of analysis units were used to simplify the model for computational requirements and because databases mining techniques were not available to create individual polygon yield curves based on RESULTS data. An analysis unit was typically composed of forest stands with similar tree species composition, timber growing potential, treatment regimes, and other management considerations, with each analysis unit assigned its own timber volume projection (yield table).

Using RESULTS data to generate yield curves rather than analysis units increases the consistency of forest estate modelling across the province and improves transparency in the process; the same methodology is used against the same database across the province in all TSA TSRs. Generating a yield curve for each stand, or polygon with a feature_id attribute in the VRI, allows for the field data stored and managed within the RESULTS database to be fully utilized.

9.3.1 Existing

Figure 9 shows how, in the Kootenay Lake TSA, the existing managed stands are assigned yield curves. Polygons identified as Review will be assigned a yield curve prior to analysis.

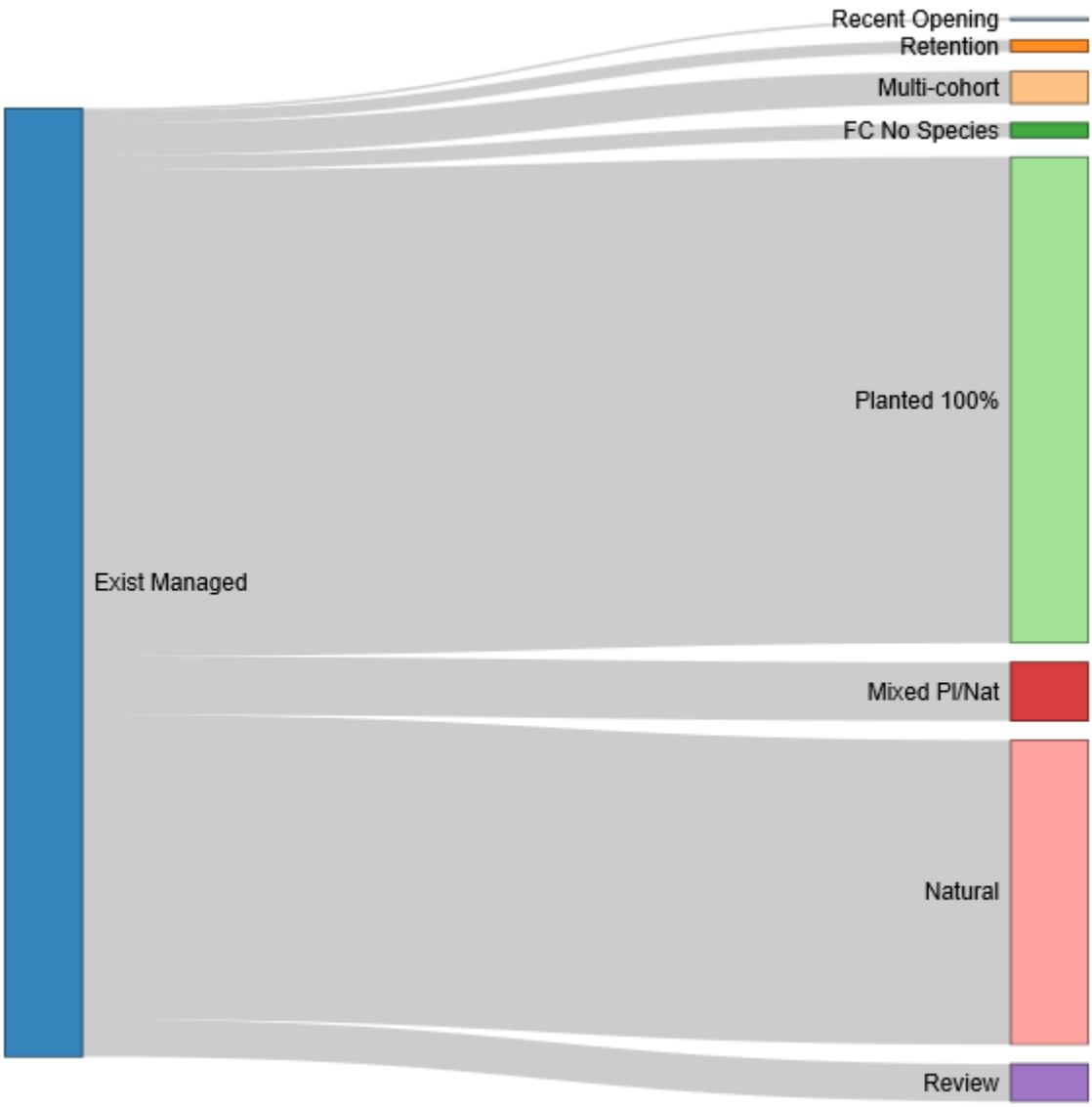

Figure 9. Existing managed stand categories.

9.3.2 Future

In the model, once an existing natural stand is harvested, it is placed on a yield curve based on an aggregate of species at the same BEC subzone level in the RESULTS database, within a time frame window. This window excludes older submissions entered into the database 15 years prior to the analysis and excludes recent submissions, entered within five years, to avoid incomplete data submissions. For each of the species identified in the BEC subzone aggregate, a site index is assigned from the associated feature_id in the PSPL.

For managed stands, the yield curve created from RESULTS data is assigned to the polygon for both the current and future yield curves. Figure 10 shows how existing managed stand polygons are assigned yield curves in the future. The middle bar shows the current curve as depicted above.

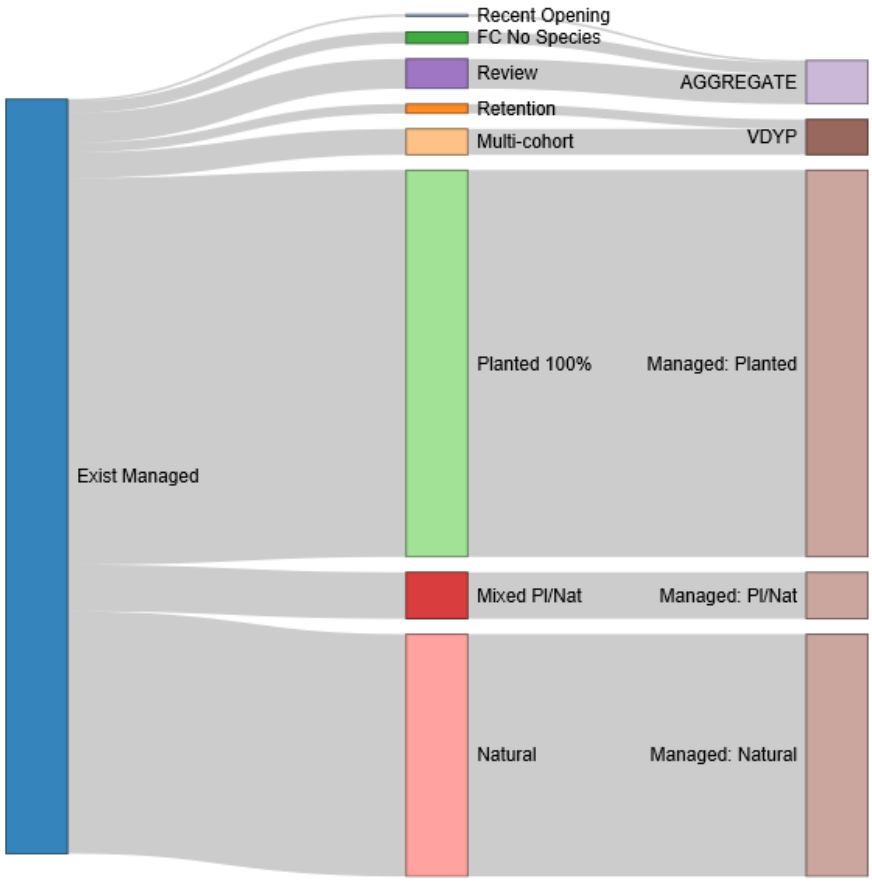

Figure 10. Future existing managed stand categories.

9.4 Site index

Site index, for a reference age of 50 years, is the most common measure of forest site productivity used in British Columbia. The growth and yield models TASS and TIPSY require a species-specific potential site index as input to develop volume tables.

The Ministry has developed formalized standards for deriving site index for the potential productivity of a site. Site indices based on simpler methods (e.g., age and height relationships for forest inventory photo classification) often have biases such that the potential site index is not found.

For the base case scenario, potential site indices are derived from the FLNRORD provincial layer of site productivity. In the Kootenay Lake TSA, the provincial layer is based upon SIBEC based site index estimates tied to site series from PEM, see Section 5.4.2.

To understand the importance of potential site index to the timber supply, two sensitivity analyses will be done, increasing and decreasing the base case site index by two metres.

Data source and comments:

The site productivity layer was accessed from:

https://catalogue.data.gov.bc.ca/dataset/site-productivity-site-index-by-tree-species

File: Site_Prod_BC.gdb.zip.

9.5 Tree improvement

Licensees are obliged to use the best available seed source when regenerating sites with planted stock. Planted stock may have faster growth than natural trees that may regenerate on the site. The faster growth may be due to either use of high-quality genetically improved seed from seed orchards or use of seed harvested from superior wild trees.

Information on the use of select seed in the TSA and the associated genetic gains are available from the Seed Planning and Registry Application (SPAR) of the Forest Improvement and Research Management Branch (see https://www2.gov.bc.ca/gov/content/industry/forestry/managing-our-forest-resources/tree-seed/seed-planning-use/spar). RESULTS information provides a seed source for individual plantations and thus enables linkage to the genetic gain database.

Genetic worth is used as input into the growth and yield model TIPSY for stands where regeneration type is planted. The applicable genetic worth will be calculated based on the aggregation assigned to the volume table. No modelling considerations are made for the expected future improvements in genetic worth.

Recent information captured from both YSM and SDM in both the Kootenay Lake TSA and the adjacent Arrow TSA have indicated that genetic gain may not be fully captured due to some planted trees dying. There is some indication that faster growing trees, i.e., those with genetic gain, may in fact be more vulnerable to terminal weevil, drought, bear, and snow damage. In the base case, if this change is captured in RESULTS survey data, the species composition is adjusted by combining the RESULTS planting data and the natural composition. This allows for changes in species composition from the time of planting until the time of survey and adjusts how genetic worth is applied accordingly. A sensitivity using the both YSM and SDM data will explore the impact of genetic gain beyond the adjustment made in the base case.

9.6 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 (e.g., due to forest health issues) 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 may reflect non-productive openings within a forest. OAF 2 is dynamic reduction that increases over time and may reflect forest health issues that increase as stands age.

In the base case, standard OAF values of 15% for OAF 1 and 5% for OAF 2 will be used.

A sensitivity analysis will be conducted for Armillaria root disease and its impacts on conifer tree species. It incorporates growth and mortality losses for three levels of infection severity: low (L), medium (M), high (H).

10 Forest Estate Modelling

10.1 Forest estate model

The SELES Spatial Timber Supply Model (STSM) will be used for this analysis. STSM is a model developed using the Spatially Explicit Landscape Event Simulator (SELES). STSM has been used for the TSR timber supply analysis of multiple management units. The model will be set to examine spatial forest inventory data on a one-hectare grid level.

10.2 Base case scenario

The objective of the base case scenario is to provide a baseline harvest flow from which the chief forester can understand the dynamics of timber supply in the management unit given current forest management assumptions. In most TSRs the base case scenario has reflected a harvest flow that initiates from the current AAC and transitions to a mid-term level before moving to a stable long-term level.

Several alternative harvest flows based on different initial harvest levels are possible given current forest management assumptions. From these alternatives, a base case scenario will be selected that, along with the sensitivity analyses, will be presented to represent timber supply dynamics.

10.3 Sensitivity analysis

Sensitivity analyses are additional timber supply forecasts 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.

Table 45 details the specific sensitivity analyses that will be completed. Additional sensitivity analyses may be included after the base case has been completed if new uncertainties are identified.

Table 45. Sensitivity analyses

Sensitivity (number)	Description
Natural stand volumes (2)	All volume tables will be changed by +/– 10%.
Managed stand volumes (2)	All volume tables will be changed by +/– 10%.
Minimum harvestable volume (2)	Minimum harvestable volume of 135 cubic metres a hectare in the base case will be changed by +/– 10 years.
Size of the THLB (2)	THLB area will be changed by +/– 10%.
Harvest priorities (1)	An alternative harvest priority available within the timber supply model will be used.
Terrain stability (2)	Percentage of THLB netdown applied to TSM categories will change by +/- 10%.
Hydrological recovery threshold in community watersheds (2)	Assumption of hydrological recovery at 6 metres will be changed to 9 and 15 metres.
Caribou matrix (1)	Implement Caribou Recovery Program guidance for forest operations occurring in Caribou Core and Matrix habitat (if available). OR Implement Environment Canada's objective of maintaining greater than 65% undisturbed habitat in low elevation winter range and no disturbance in high elevation winter or summer range critical habitat.
Wildfire Urban Interface (2)	Harvesting within WUI will be modelled as partial cuts with multiple entries. Fully implement stocking standards within WUIs designed to achieve fire management objectives.
Old seral targets based on BEC v11 (1)	The HLPO old-seral targets are evaluated using BEC version 3, the version in place when the HLPO targets were established. BEC v11 will be replace BEC version 3 in a sensitivity.
Old Growth Management Non-Spatial (1)	Landscape-level biodiversity targets will be modelled using aspatial old growth targets.
Full old seral targets (1)	The 1/3 drawdown described in the KBHLPO will be replaced by full targets.
Domestic watersheds (1)	Domestic watersheds will be constrained to the same degree community watersheds are constrained in the base case.
Armillaria Root Disease (See Section 9.6) (3)	Incorporate growth and mortality losses for three levels of infection severity (low, medium, high).
Climate change (1)	NRL losses will be increased by 10% per decade.

11 Carbon Sequestration

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

The carbon stocks in a given 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.

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

The conversions used in this analysis are: 1 CH_4 = 28 CO_2e; 1 N_2O = 298 CO_2e.

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 Kootenay Lake TSA TSR, a carbon sequestration analysis will be completed using the TSR base case harvest projection.

12 Associated Analysis and Reporting

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

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

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

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

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

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

13. Information Sources

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14. Acronyms

AAC	Allowable Annual Cut
BCGW	British Columbia Geographic Warehouse
BCLCS	British Columbia Land Classification System
BCTS	British Columbia Timber Sales
BEC	Biogeoclimatic Ecosystem Classification
BEO	Biodiversity Emphasis Option
BGC	BEC climatic zonal and subzonal classification
CFA	Community Forest Agreements
CFLB	Crown Forest Land Base
DTSM	Detailed Terrain Stability Mapping
ECAS	Electronic Commerce Appraisal System
ESA	Environmentally Sensitive Areas
ESSF	Engelmann Spruce-Subalpine Fir
FAIB	Forest Analysis Inventory Branch
FIP	Forest Inventory Planning
FLNRORD	Ministry of Forests, Lands, Natural Resource Operations and Rural Development
FPC	Forest Practices Code
FPPR	Forest Planning and Practices Regulation
FREP	Forest and Range Evaluation Program
FRPA	Forest and Range Practices Act
FSP	Forest Stewardship Plan
GAR	Government Actions Regulation
GIS	Geographic Information Systems
GWM	General Wildlife Measures
HCA	Heritage Conservation Act
IBM	Mountain Pine Beetle forest damage code
ICH	Interior Cedar Hemlock
IMA	Interior Mountain-heather Alpine
IRM	Integrated Resource Management
IWMS	Identified Wildlife Management Strategy
KBHLPO	Kootenay Boundary Higher Level Plan Order
KBLUP	Kootenay-Boundary Land Use Plan
LU	Landscape Units
MHV	Minimum Harvestable Volume

MPB	Mountain Pine Beetle
NDT	Natural Disturbance Type
NRL	Non-Recoverable Losses
NSR	Not Satisfactorily Restocked
OAF	Operational Adjustment Factor
OGMA	Old Growth Management Areas
P2P	Plan to Perspective
PAS	Protected Areas Strategy
PEM	Predictive Ecosystem Mapping
PSP	Permanent Sample Plots
PSPL	Provincial Site Productivity Layer
RDCK	Regional District of Central Kootenay
RESULTS	Reporting Silviculture Updates and Land Status Tracking System
RRZ	Riparian Reserve Zones
RMZ	Resource Management Zones
RTL	Roads, Trails and Landings
RTSM	Reconnaissance Terrain Stability Mapping
SARA	Species at Risk Act
SDM	Stand Development Monitoring
SIBEC	Site Index by BEC
SPAR	Seed Planning and Registry
TASS	Tree and Stand Simulator
TEI	Terrestrial Ecosystem Information
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
UREP	Use, Recreation and Enjoyment of the Public
UWR	Ungulate Winter Range
VDYP	Variable Density Yield Prediction
VEG	Visually Effective Green-up
VQO	Visual Quality Objectives
VRI	Vegetation Resources Inventory
WHA	Wildlife Habitat Areas

WHF	Wildlife Habitat Feature
WMA	Wildlife Management Areas
WTR	Wildlife Tree Retention
WUI	Wildfire Urban Interface
YSM	Young Stand Monitoring

15. 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 Kootenay Lake TSA.

Ministry staff would be pleased to answer questions to help you prepare your response. Please send your comments to the resource district manager at the address below.

Your comments will be accepted until **January 18, 2021** for consideration with respect to the *Data Package*. A further comment period will be made available following the release of a *Discussion Paper* that outlines the results of a timber supply analysis.

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

For more information or to send your comments, contact:

Selkirk Natural Resource District
Ministry of Forests, Lands, Natural Resource Operations and Rural Development
1907 Ridgewood Road,
Nelson, B.C. V1L 6K1
Telephone: (250) 825-1100

If you have any comments or questions, contact:

Ian Wiles, Stewardship Officer
Selkirk Natural Resource District
Ministry of Forests, Lands, Natural Resource Operations and Rural Development
Phone: (250) 825-1170
Electronic mail: Ian.Wiles@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