# Tree Farm License 18 – Management Plan #12

## INFORMATION PACKAGE

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# Acknowledgements

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# List of Acronyms

**AFLB –** Analysis Forest Landbase

**AAC –** Allowable Annual Cut

**BEC –** Biogeoclimatic Ecosystem Classification

**ESA –** Environmentally Sensitive Area

**ESSF –** Engelmann Spruce–Subalpine Fir

**FMLB -** Forest Management Landbase

**FRPA –** Forest and Range Practices Act

**FTA –** Forest Tenure Administration

**ICH –** Interior Cedar Hemlock

**LHLB –** Legally Harvestable Landbase

**LMZ –** Lakeshore Management Zone

**OAF –** Operational Adjustment Factor

**PSP –** Permanent Sample Plot

**RESULTS –** Reporting Silviculture Updates and Land Status Tracking System

**RFT –** Registered Forest Technologist

**RPF –** Registered Professional Forester

**SBS –** Sub-Boreal Spruce

**SPAR –** Seed Planning and Registry

**TFL –** Tree Farm Licence

**THLB –** Timber Harvesting Landbase

**TIPSY –** Table Interpolation Program for Stand Yields

**VAC –** Visual Absorption Class

**VDYP –** Variable Density Yield Projection

**VQO –** Visual Quality Objective

**VRI –** Vegetation Resource Inventory

**WTP –** Wildlife Tree Patch

# 1. Introduction

## 1.1 Timber Supply Review Process

This information package is the first major step in the broader timber supply review process for TFL 18, associated with Management Plan # 12. Under Section 8 of the *Forest Act* (2024), the Chief Forester is required to determine the allowable annual cut (AAC) for each TFL at least once every 10 years. Since the last determination was made in July 2017, the next determination is due in July 2027. The allowable annual cut limits the amount of volume that a TFL tenure holder can harvest annually (averaged over a five-year period).

To assist the Chief Forester in their determination, the Ministry of Forests conducts a timber supply review in collaboration with the TFL holder. This review aims to provide the Chief Forester with the information required to make the AAC determination. The review is an involved process with five major phases:

1. Preparation of an information package
2. Timber supply analysis, conducted using a forest estate model constructed using the assumptions detailed in the information package
3. Completion of a draft analysis report which details the results of the timber supply analysis
4. Compilation and submission of all relevant information to the Chief Forester
5. AAC determination and publication of a rationale document, describing the Chief Forester's considerations.

## 1.2 Information Package Overview

This information package details the proposed assumptions that will be used to conduct the timber supply analysis. These assumptions fall into several major categories:

- Landbase assumptions that describe how the landbase netdown will be conducted, ultimately identifying the timber harvesting landbase
- Assumptions regarding non-timber objectives, such as visual quality and critical moose winter range
- Proposed model rules that will guide modelled timber harvesting such as minimum harvest ages and silviculture systems.
- Proposed methods for generating growth and yield curves for the timber supply analysis.

This information package is prepared in accordance with Forest Analysis & Inventory Branch's *Provincial Guide for the preparation of Information Packages and Analysis Reports for Area-based Tenures* (2021).

## 1.3 Licence Description

Tree Farm Licence 18 (TFL 18) is a single, 74,285-hectare parcel located northwest of Clearwater in the Thompson Rivers Natural Resource District, as shown in Figure 1. It is bordered to the north and east by Wells Gray Provincial Park and to the south by Taweel Provincial Park. The most common tree species within the TFL are lodgepole pine, Engelmann spruce, and subalpine fir. Smaller components include Douglas-fir, western hemlock, western red cedar, paper birch, cottonwood, and trembling aspen. The primary biogeoclimatic zones in the TFL are Engelmann spruce–subalpine fir (ESSF) at higher elevations, and interior cedar–hemlock (ICH) and sub-boreal spruce (SBS) at lower elevations. There are no privately owned Schedule A lands associated with the TFL.

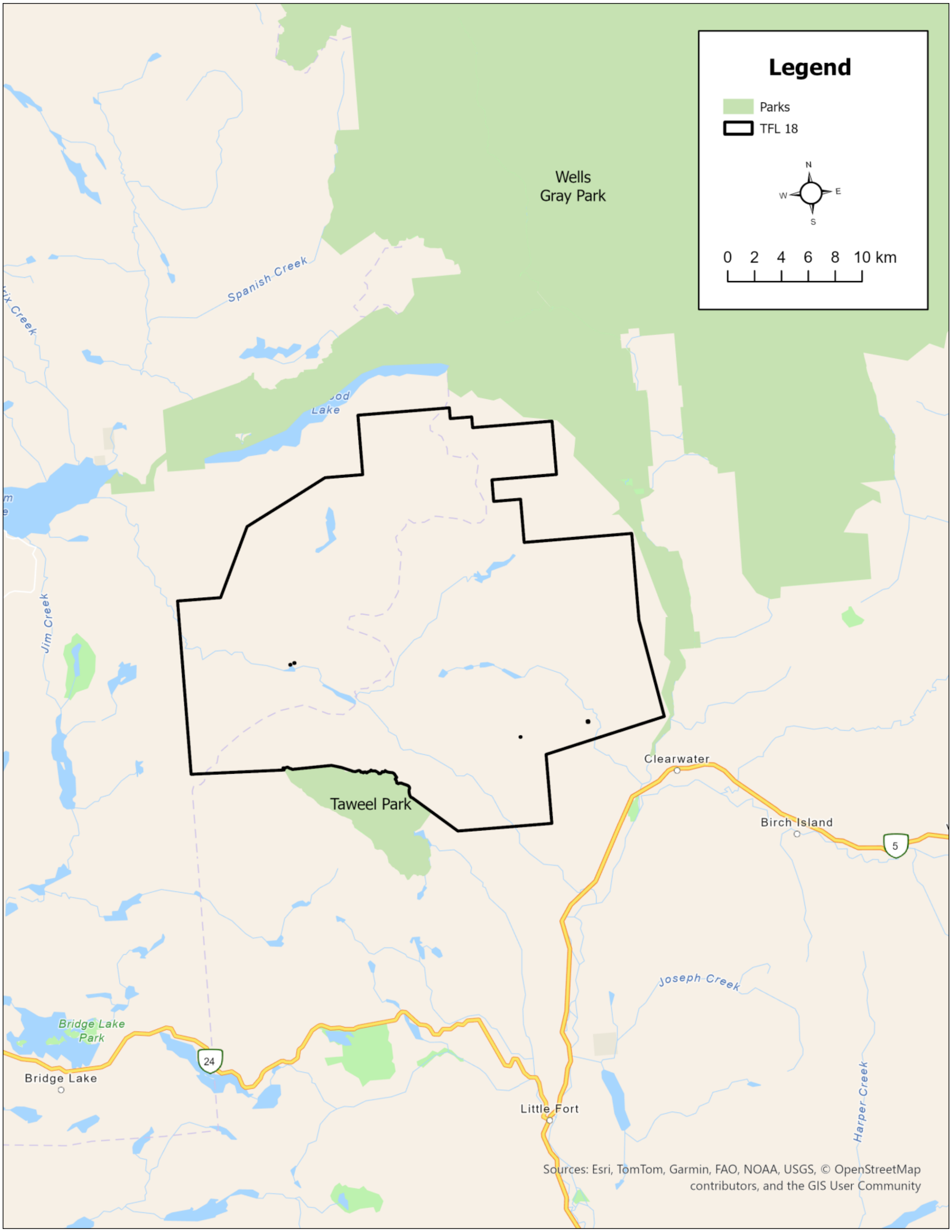


*Figure 1. Tree Farm Licence 18 location*

TFL 18 is a relatively old tenure, with the original licence issued in 1954 (BC Gov). It has been held by Clearwater Timber Products, Slocan Forest Products, and Canfor (Nicholls 2017). The current tenure holder is Interfor Corporation, which acquired the tenure from Canfor in 2020.

In 1954, the original allowable annual cut (AAC) was set at 70,792 $m^3$/year and was gradually increased to 210,000 $m^3$/year by 1988, due to increased utilization of lodgepole pine, improved utilization standards, and better forest inventory (Nicholls 2017). The AAC then decreased to 177,650 $m^3$/year by 2000 (Nicholls 2017). In 2006, there was an AAC uplift to 290,000 $m^3$/year to address the significant mountain pine beetle infestation in the TFL (Nicholls 2017). The previous AAC determination set the AAC at 175,000 $m^3$/year from 2017 to 2022 to allow continued salvage harvesting, before decreasing it to 137,000 $m^3$/year in 2022 (Nicholls 2017).

## 1.4 First Nations Territories

The following First Nations have asserted traditional territory that overlaps TFL 18:

- Adams Lake Indian Band
- Tsq?éscen? First Nation (Canim Lake Band)
- Neskonlith Indian Band
- Simpcw First Nation
- Whispering Pines / Clinton Indian band

## 1.5 Model Used

The Patchworks™ modeling software will be used for forecasting and analysis. This suite of tools is sold and maintained by Spatial Planning Systems Inc. of Deep River, Ontario (www.spatial.ca).

Patchworks is a fully spatial forest estate model that can incorporate real-world operational considerations into a strategic planning framework. It utilizes a practical, goal-seeking approach to simulate forest growth and schedule activities such as harvesting and silviculture across the landbase, finding a solution that best balances the targets and goals defined by the user. Realistic spatial harvest allocations can be optimized over long-term planning horizons because Patchworks integrates operational-scale decision-making within a strategic analysis environment.

The Patchworks model continually generates alternative solutions until the user determines that a stable solution has been found. Solutions with attributes that fall outside specified ranges (targets) are penalized, and the goal-seeking algorithm works to minimize these penalties, resulting in a solution that reflects the user's objectives and priorities.

Targets can be applied to any aspect of the problem formulation. For example, the solution can be influenced by issues such as desired mature or old forest retention levels, young seral disturbance levels, patch size distributions, conifer harvest volume, growing stock levels, and visual quality objectives. For this analysis, Patchworks will be configured to consider the range of non-timber values present on TFL 18 while evaluating possible harvest flows.

## 1.6 Data Sources

Table 1 shows the data sources to be used in the analysis. The data come from three primary sources: Data BC, a publicly available data warehouse maintained by the BC Government; Interfor's internal files; and BC

Government file transfer protocol (FTP) servers. The analysis will use the most up-to-date version of each data source as of the start of the analysis in spring 2025.

*Table 1. Data sources to be used in the analysis*

| Dataset Name | Source | Accessed | File Name |
|---|---|---|---|
| BEC Version 12 | Data BC | 2025 | BEC_BIOGEOCLIMATIC_POLY |
| Canopy Height Model | Interfor | 2025 | CHM_1m1 |
| Consolidated Cutblocks | Data BC | 2025 | VEG_CONSOLIDATED_CUT_BLOCKS_SP |
| Environmentally Sensitive Areas | Interfor | 2025 | ESA |
| Forest Ownership | Data BC | 2025 | F_OWN |
| Forest Tenures: Cutblocks | Data BC | 2025 | FTEN_CUT_BLOCK_POLY_SVW |
| FWA Rivers | Data BC | 2025 | FWA_RIVERS_POLY |
| FWA Wetlands | Data BC | 2025 | FWA_WETLANDS_POLY |
| Historic Fires | Data BC | 2025 | VEG_BURN_SEVERITY_SP |
| Kamloops TSR Classified Streams | Forsite | 2025 | classifed_streams |
| Lakeshore Management Zones | BC Gov FTP | 2025 | lrup_lmz |
| OGDA Replacements | Interfor | 2025 | OGDA_Replacement |
| Old Growth Deferral Areas (Current) | Data BC | 2025 | OGSR_PRIORITY_DEF_AREA_CUR_SP |
| Old Growth Management Areas | Data BC | 2025 | RMP_OGMA_LEGAL_CURRENT_SVW |
| Parks/Ecological Reserves | Data BC | 2025 | TA_PARK_ECORES_PA_SVW |
| Pest Infestation Points | Data BC | 2025 | pest_infestation_point |
| Pest Infestation Polygons | Data BC | 2025 | pest_infestation_poly |
| Provincial Site Productivity Layer | BC Gov | 2025 | sprod_11 |
| PSPs | Data BC | 2025 | GRY_PSP_STATUS_ACTIVE |
| Recreation Sites | Data BC | 2025 | FTEN_RECREATION_POLY_SVW |
| Resource Management Plan | Data BC | 2025 | RMP_PLAN_LEGAL_POLY_SVW |
| RESULTS Forest Cover Inventory | Data BC | 2025 | RSLT_FOREST_COVER_INV_SVW |
| RESULTS Forest Cover Reserves | Data BC | 2025 | RSLT_FOREST_COVER_RESERVE_SVW |
| RESULTS Openings | Data BC | 2025 | RSLT_OPENING_SVW |
| RESULTS Tabular Planting Data | BC Gov | 2025 | RDD003 |
| Roads | Interfor | 2025 | Road_Class |
| Simpcw Stewardship Zones | Interfor | 2025 | SISP_DataUnion |
| Slope Classes | Forsite | 2025 | slope_classes |
| SPAR Extract Report | BC Gov | 2025 | spar_extract |
| Terrain Stability Mapping | Data BC | 2025 | STE_TER_STABILITY_POLYS_SVW |
| TFL Boundary | Data BC | 2025 | FDM_TFL_ALL_SP |
| VDYP Inputs | Data BC | 2025 | veg_comp_VDYP7_input_poly_and_layer_2024 |
| Vegetation Resource Inventory | Data BC | 2025 | VEG_COMP_LYR_R1_POLY |
| Visual Landscape Inventory | Data BC | 2025 | REC_VISUAL_LANDSCAPE_INVENTORY |

# 2. Response to Previous Determination

## 2.1 Volume Estimates for Mature Stands

In the rationale for the previous AAC determination, the Chief Forester directed the tenure holder to improve inventory volume estimates. In 2023, Interfor created a lidar-enhanced forest inventory that provides alternative volume estimates for mature stands. This enhanced inventory updated crown closure and tree height estimates for natural stands and used this information to estimate stand volumes, using VDYP. The enhanced inventory did not modify the VRI species compositions or polygon definitions. Overall, volume estimates for mature stands (>60 years of age) were approximately 2.2% lower in the enhanced inventory than in the VRI. More information about the lidar-enhanced forest inventory will be provided in the section of the timber supply analysis report that discusses the sensitivity associated with the lidar-enhanced forest inventory.

## 2.2 Harvest Performance in Sub-Alpine Fir Stands

In the implementation direction of the last timber supply determination, the Chief Forester expressed concern that high-value, spruce-leading stands might be disproportionately targeted for harvest at the expense of lower-value, subalpine fir-leading stands.

To address this concern, an analysis of harvest since the last AAC determination was conducted by overlaying the 2017 Vegetation Resource Inventory with blocks harvested between 2018 and 2024 (inclusive). Figure 2 shows the results of this analysis, with the proportion of FMLB area by leading species in blue, and the proportion of area harvested by leading species in orange. Harvest has not been avoided in subalpine fir-leading stands during this period. In fact, the proportion of area harvested in subalpine fir-leading stands during this period exceeded the proportion of area that is subalpine fir-leading throughout the TFL.

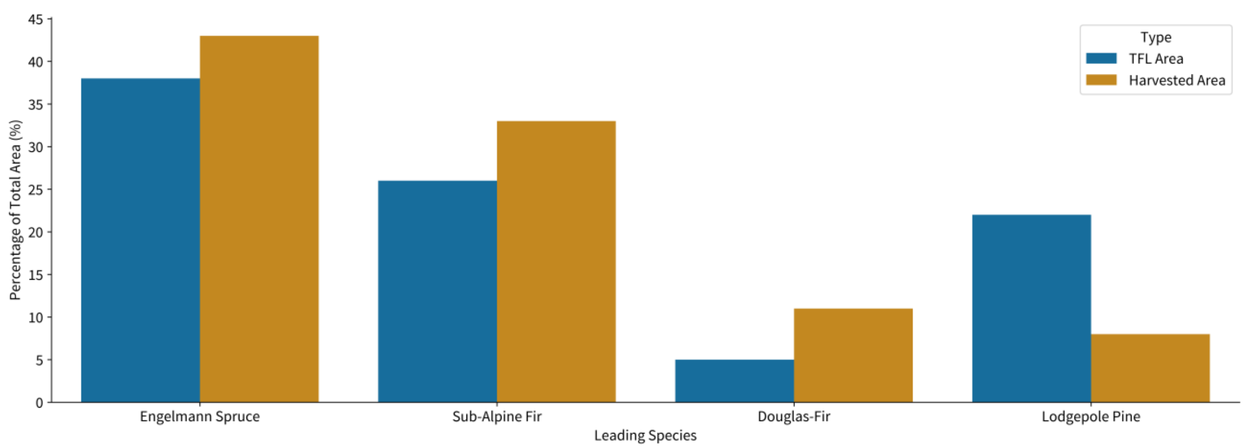


*Figure 2. Historical harvest area by leading species vs FMLB area by leading species*

*Datasets used: 2017 VRI, Consolidated Cutblocks, Results Openings, FTA Cutblocks, RESULTS Reserves*

## 2.3 Growth of Managed Stands

In the rationale document for the last timber supply determination, the Chief Forester directed the TFL holder to monitor the rate of growth for existing managed stands. In 2023, Interfor created a lidar-enhanced forest inventory for the TFL, as described in Section 2.1. As part of this inventory, a lidar-derived site index was calculated using the lidar-derived heights and the provincial SiteTools site index calculator. For existing managed stands (<61 years of age), the average lidar-derived site index was 21.1 m, representing an approximately 17% increase from the VRI site index of 18.0 m. The average of the lidar-derived site index was also significantly greater than the average site index derived from the provincial site productivity layer, which is 17.5 m. More information about the lidar-enhanced forest inventory will be provided in the section of the timber supply analysis report that discusses the sensitivity associated with the lidar-enhanced forest inventory.

## 2.4 Harvest Performance in Low Volume Stands

In the previous timber supply review, a minimum harvest volume of 200 $m^3$/ha was used in the base case. However, the licensee also presented a preferred scenario that used a minimum harvest volume of 160 $m^3$, which was used by the Chief Forester in making their AAC determination. In accepting this lower minimum harvest volume, the Chief Forester also requested that the licence report on harvest performance in lower volume stands.

To address this request, harvest performance was examined by overlaying the 2017 VRI with blocks harvested between 2018 and 2024 (inclusive). As shown in Figure 3, a significant amount of volume was harvested in this volume class during this period. Over that seven-year period, an average of approximately 139,087 $m^3$ of live volume was harvested annually. Of this volume, about 22,795 $m^3$, or 16.3%, came from stands with less than 200 $m^3$/ha, and 5,420 $m^3$or 3.9%, came from stands with less than 100 $m^3$/ha.

The volume coming from very low-volume areas (<80 $m^3$/ha) is a consequence of inaccuracies in the VRI or small segments of low-volume areas being included in cutblocks to help form reasonable block shapes.

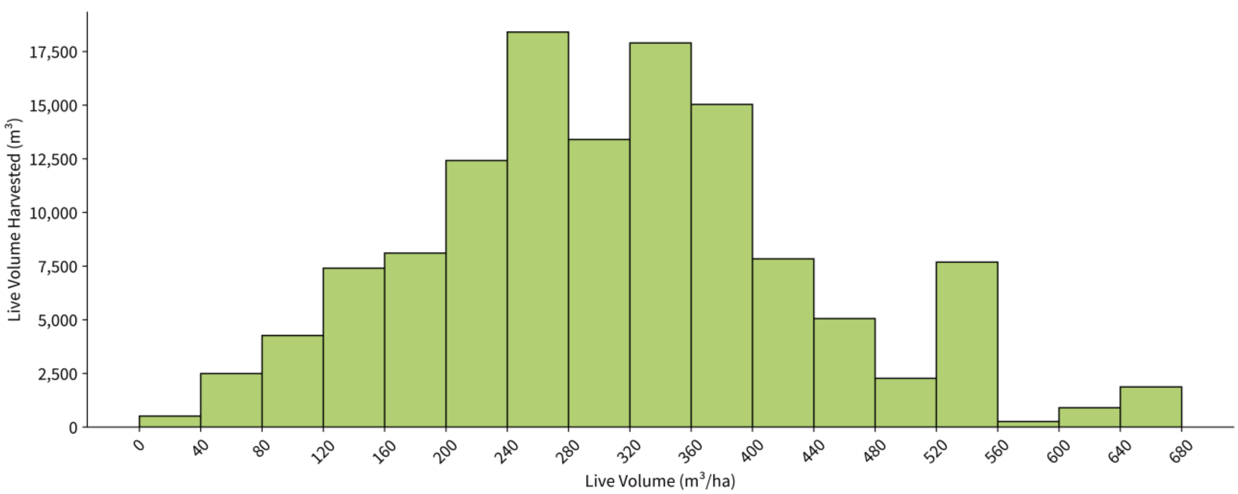


*Figure 3. Historical volume harvested by $m^3$/ha class (annualized)*

*Datasets used: 2017 VRI, Consolidated Cutblocks, RESULTS Openings, FTA Cutblocks, RESULTS Reserves*

## 2.5 Dead Volume Harvest Performance

In the previous AAC determination, the Chief Forester directed the tenure holder to annually report the amount of dead volume harvested. In the text of the determination, the Chief Forest indicated that this was to help ensure that actual harvest met the modelled focus on dead volume.

In this analysis, dead volume present in the VRI is not included in the available harvest volume, as the salvage window for mountain pine beetle killed stands has largely ended. Thus, dead volume harvest performance is less relevant for this management plan.

## 2.6 Forest Health

In the previous AAC determination, the Chief Forester directed the tenure holder to continue monitoring forest health conditions across the TFL. Interfor monitors forest health factors throughout its timber development process, informed by the Regional Entomologist's annual report and the provincial aerial overview surveys. Interfor proactively addresses emerging forest health issues with sanitation and salvage harvests.

The first step in the analysis is to complete a model that represents the current state of the forest, projected growth, and both timber and non-timber objectives. After the model is created, various model runs will be conducted to examine different harvest flows and model assumptions.

## 2.7 Base Case

The base case model run serves as the basis of comparison for other model runs. The base case model is constructed to reflect current practice on the TFL, as determined by current regulations, forest stewardship plan commitments, and past harvest performance. The base case does not necessarily reflect future management intentions, nor is it an AAC recommendation. Unless otherwise noted, model components described in the information package refer to the base case.

## 2.8 Alternative Harvest Flows

These model runs will model the forest inventory, projected growth and timber and non-timber objectives in the same manner as the base case. They will examine the implications of exploring different harvest flow policies in the model. The alternative harvest flows to be presented will be determined during the modelling process, based on preliminary modelling results but may include:

- Even Flow: This harvest flow is the maximum constant harvest rate that can be sustained across the entire planning horizon of 300 years.
- Maintain Current AAC: This harvest flow will examine the potential to maintain the current AAC of 137,000 $m^3$ / year for the next 10 years.

## 2.9 Sensitivity Analyses

Sensitivity analyses examine the impact of modifying one aspect of the model to help understand the sensitivity of the harvest flow to uncertainty with regards to that aspect.

### 2.9.1 Natural Stand Yields +/- 10%

These two sensitivity analyses will increase and decrease the yield of natural stands by 10%. Natural stands are defined as all stands modelled with the Variable Density Yield Projection (VDYP) model. Minimum harvest ages will by modified to account for the change in the yield tables.

### 2.9.2 Managed Stand Yields +/- 10%

These two sensitivity analyses will increase and decrease the yield of managed stands by 10%. Managed stands are defined as all stands modelled with the Table Interpolation Program for Stand Yields model (TIPSY). Minimum harvest ages will by modified to account for the change in the yield tables.

### 2.9.3 Minimum Harvest Ages +/- 10 years

These two sensitivity analyses will increase and decrease the modelled minimum harvest ages by 10 years, without changing the modelled stand volumes

### 2.9.4 Ancient Forest and Remnant Old Ecosystem Areas Removed from the THLB

In this sensitivity analysis, the ancient forest and the remnant old ecosystem areas identified in the provincial old growth deferrals will be removed from the timber harvesting landbase. Areas that are only classified as priority big tree old growth areas will not be removed from the THLB. Interfor has also identified some replacement old growth deferral areas and associated deletions from the provincial layer. These additions and deletions will be included in this sensitivity.

Datasets used: Old Growth Deferral Area Replacement, Old Growth Deferral Areas (Current)

### 2.9.5 All Old Growth Deferral Areas Removed from the THLB

In this sensitivity analysis, all old growth deferral areas are removed from the THLB. This differs from the above sensitivity by also removing priority big tree old growth areas from the THLB. This sensitivity will also take into account deletions and replacements, as above.

Datasets used: Old Growth Deferral Area Replacement, Old Growth Deferral Areas (Current)

### 2.9.6 Simpcw Interim Stewardship Plan

In collaboration with the Simpcw First Nation, Interfor has identified Simpcw Stewardship zones. These stewardship zones are divided into three categories: connectivity corridors, lake and wetland buffers, and stream buffers. Interfor is currently implementing increased in block retention in these areas and estimates that this results in a 25% reduction to the available volume in these areas. In this sensitivity analysis, the timber harvesting landbase in these areas will be reduced using an aspatial reduction of 25% (in addition to the existing reduction for wildlife tree patches).

Datasets used: Simpcw Stewardship Zones

### 2.9.7 Lidar Enhanced Forest Inventory Used

Forsite Consultants has generated a lidar enhanced forest inventory for the TFL. This inventory modified height and crown closure using a lidar generated canopy height model. These revised height and crown closure estimates were then used to recalculate the model’s yield curves. This sensitivity uses these revised yield curves.

Datasets used: Canopy Height Model

### 2.9.8 Increase Natural Disturbance

Climate change is likely to cause an increase in natural disturbance in the Thompson-Okanagan region and BC as a whole (MFLNRO 2016). This sensitivity examines the impact of doubling the modelled rates of natural disturbance. This sensitivity has two components: First, the non-recoverable losses used in the base case will be doubled (Section 8.1), second the amount of area disturbed on the non-THLB will be doubled (Section 8.2).

# 3. Forest Cover Inventory

## 3.1 Updates for Harvesting

To ensure that all harvesting has been accounted for in the VRI, Forsite has developed a process using the provincial consolidated cutblocks layer, RESULTS openings and reserves, and Forest Tenure Administration (FTA) data along with a review of recent satellite imagery to complete additional updates for depletions not already captured in the regular annual updates. This process incorporated disturbances up to Spring 2025.

Datasets used: VRI, Consolidated Cutblocks, RESULTS Openings, RESULTS Forest Cover Inventory, RESULTS Forest Cover Reserves, Forest Tenures: Cutblocks

## 3.2 Updates for Wildfire

The only recent wildfire in the TFL is the small, 2021 fire K21867, on the southern border of the TFL. The fire burned about 164 hectares in the TFL, a portion of which was salvaged. Most of the remaining area is within an old growth management area. Because of the relatively small area and location of the fire no age adjustments will be conducted for this fire.

Datasets used: Historic Fires, VRI

# 4. Landbase Netdown

A key step in constructing the timber supply model is identifying the landbase classification of all areas in the TFL. There are four landbase classifications:

- **Gross landbase:** This includes all area within the TFL boundary, including private lands, and non-forested areas such as rocky outcrops and lakes.
- **Analysis forest landbase (AFLB):** This includes all area within the gross landbase that is both forested and managed by the TFL holder. All areas within the analysis forest landbase potentially contribute to non-timber objectives such as visually quality objectives; however, they do not necessarily contribute to timber supply. Areas typically excluded from the analysis forest landbase include private land and alpine areas, but forested areas where harvest is prohibited are included, such as old growth management areas
- **Legally harvestable landbase (LHLB):** This includes all areas within the AFLB where timber harvest is legally permitted, however these areas are not necessarily physically or economically operable.
- **Timber harvesting landbase (THLB):** This includes all areas where timber harvesting is expected to occur, considering both legal and economic considerations. Note that the timber harvesting landbase is a modelling construction, in reality some harvest will occur outside the timber harvesting landbase and

some areas of the THLB will not be harvested, due to necessary imprecision in the modelling assumptions. However, the total THLB area is expected to be similar in magnitude to the actual TFL area that can be harvested.

Each landbase classification is nested within the broader classification. For example, an area in the THLB is necessarily also within the LHLB and AFLB.

Table 2 summarises the amount of area in each landbase class and details the factors that determined the classification across the landbase. The total area column shows the total area associated with that factor, whereas the effective area column shows the amount of new area removed in that netdown step.

*Table 2. Netdown table*

| Netdown Factor | Total Area (ha) | Effective Area (ha) | Remaining Area (ha) |
|---|---|---|---|
| **TFL Area** | | | **74,285** |
| Non Treed | 3,552 | 3,552 | 70,733 |
| Low Crown Closure | 1,831 | 4 | 70,728 |
| Lake | 1,342 | 49 | 70,679 |
| Roads | 2,053 | 1,998 | 68,681 |
| **Analysis Forest Landbase** | | | **68,681** |
| Old Growth Management Areas | 7,756 | 7,608 | 61,073 |
| Stream Management Zones | 1,904 | 1,403 | 59,670 |
| FRPA Lake Management Zones | 171 | 73 | 59,596 |
| Wetland Management Zones | 1,977 | 719 | 58,878 |
| LMZ Class A Lakes | 466 | 67 | 58,811 |
| **Legally Harvestable Landbase** | | | **58,811** |
| Unstable Terrian | 39 | 37 | 58,773 |
| Steep Slopes | 136 | 61 | 58,713 |
| Permanent Sample Plots | 18 | 13 | 58,699 |
| Difficult Regeneration | 702 | 200 | 58,499 |
| Deciduous leading stands | 466 | 250 | 58,249 |
| Low Volume | 4,151 | 1,730 | 56,519 |
| Recreation Sites | 112 | 65 | 56,454 |
| Existing Wildlife Tree Patches | 2,030 | 1,726 | 54,728 |
| Future Wildlife Tree Patches | | 1,864 | 52,864 |
| **Timber Harvesting Landbase** | | | **52,864** |

Figure 4 maps the location of each netdown factor and displays the final THLB area.

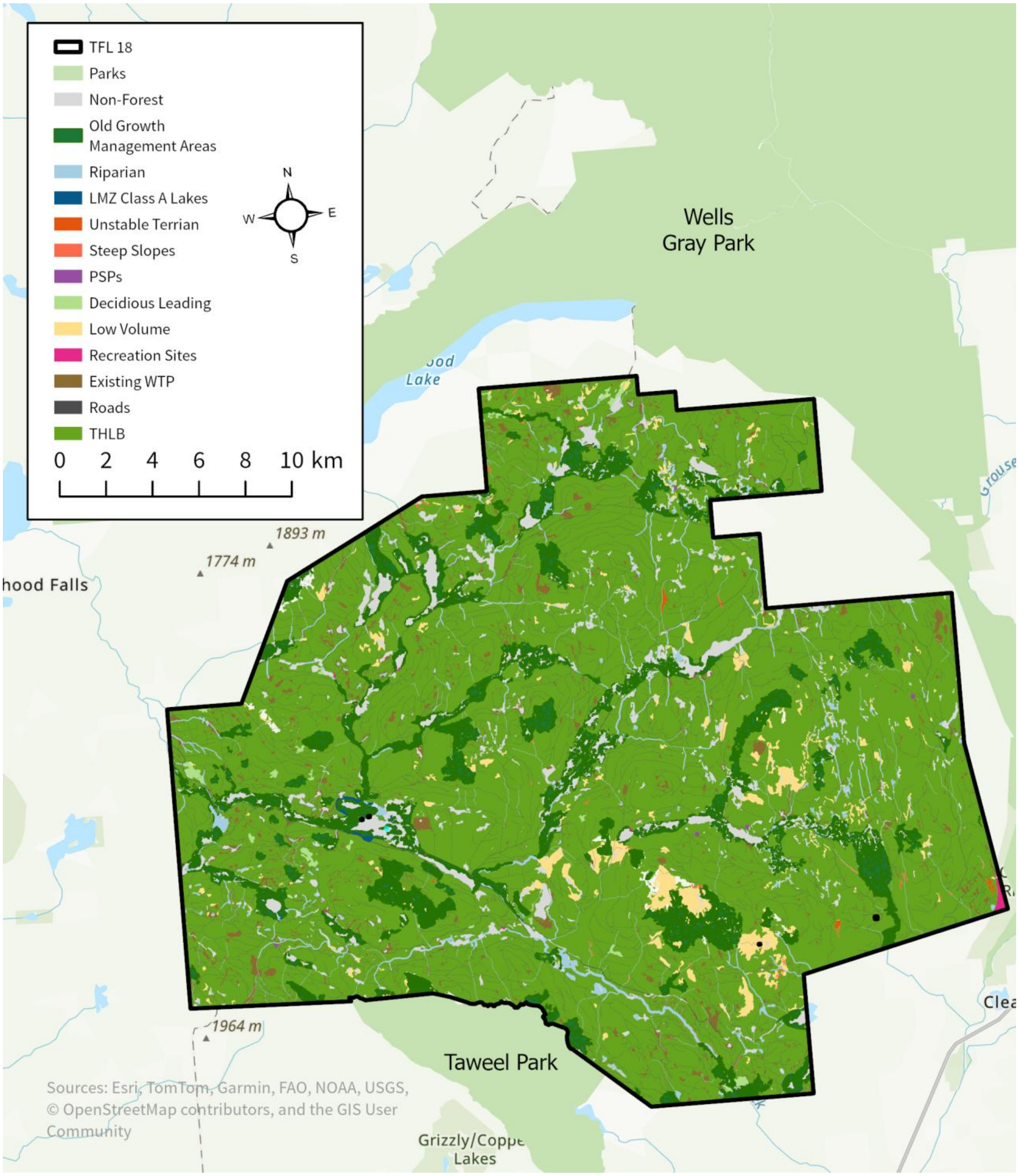


*Figure 4. Map showing netdown factors in TFL 18*

## 4.1 Changes from previous analysis

The most significant changes impacting the landbase definition from the previous analysis are:

- The area removed in riparian management areas has decreased due to differences in the target percentage retention in riparian management zones between Interfor's current FSP and CANFOR's FSP that applied at the time of the last analysis.
- The amount of area removed for unmerchantable stands due to low volume has decreased. This is due to the decrease in minimum harvest volume in this analysis (100 $m^3$/ ha) compared to the last analysis (200 $m^3$ / ha).
- The amount of area removed to account for existing wildlife tree patches has increased due to harvesting since the last management plan was completed.

The spatial THLB in this analysis, 54,728 ha, is similar to the spatial THLB of 53,306 ha in the analysis for management plan #11 (CANFOR 2017). The increase is due to the decreased area removed for non-merchantable stands, caused by the lower minimum harvest volumes. Spatial THLBs are compared here because wildlife tree retention areas were not implemented as an aspatial THLB reduction in the previous analysis.

## 4.2 Removals from the Analysis Forest Landbase

### 4.2.1 Not Managed by the TFL Holder

Areas that are not managed by the TFL holder despite falling within the TFL boundary are typically excluded from the analysis forest landbase. However, a review of the provincial forest ownership dataset indicates that there are no such areas in the TFL.

*Dataset used: Forest Ownership*

### 4.2.2 Non-Forest

Non forested areas are all areas that cannot support forest vegetation of reasonable size, such as lakes or areas of exposed rock. These areas are not included in the forest estate model as they do not contribute to timber supply or forest cover objectives.

The areas described in Table 3 were considered non-forest and were thus removed from the analysis forest landbase.

*Table 3. Non-forested areas identification*

| Description | Query | Total Area(ha) | Effective Area (ha) |
|---|---|---|---|
| Non-Treed | bclcs_level_1 = 'N' | 3,552 | 3,552 |
| Low Crown Closure | crown_closure < 10 | 1,831 | 4 |
| Lakes | lake_waterbody_poly_id != 0 | 1,342 | 49 |

Areas that have a harvest history were never identified as non-forest even if they met one of the above criteria, because logged areas are sometimes classified as non-treed in the VRI and have low crown closure. Since these areas are being reforested, they are still included in the analysis forest landbase.

The areas identified using these criteria were compared against satellite imagery to ensure reasonableness.

*Datasets used: Vegetation Resource Inventory, Freshwater Atlas Lakes*

### 4.2.3 Existing Roads

Existing roads of all kinds are removed from the analysis forest land base, as these areas are also non-forested and will not contribute to timber supply or forest cover objectives. Road center lines were identified using Interfor's internal road dataset. Road widths were modelled according to Table 4.

*Table 4. Road widths*

| Road Type | Total Road Width (m) | Total Area (ha) | Total Length (km) |
|---|---|---|---|
| Boundary Lake Road | 25 | 86.7 | 69.4 |
| Other Mainlines | 15 | 200.1 | 271.8 |
| Operational and Spur Roads | 10 | 1766.2 | 3,611.1 |

These widths were derived by manually measuring apparent roads widths from satellite imagery. Mainlines were similarly identified by reviewing satellite imagery. All other roads were modelled as operational or spur roads. The estimated total area covered by roads in the TFL is 2,053 ha. After accounting for overlaps with non-forested areas, this results in an effective reduction of 1,998 hectares.
*Datasets used: Roads*

## 4.3 Removals from the Legally Harvestable Landbase

### 4.3.1 Provincial Parks and Protected Areas

Provincial parks and protected areas are generally removed from the legally harvestable land base, as timber harvest is prohibited in these areas, but they still contribute to forest cover objectives.

There is a very small overlap with (less than 100 $m^2$) between the TFL and Taweel Provincial Park. Given the very small size of the overlap, it was not considered in this analysis. There are no other parks or protected areas within the TFL.

*Datasets used: Parks/Ecological Reserves*

### 4.3.2 Old Growth Management Areas

The ministerial order *Old Growth Management Objectives for the Kamloops Land and Resource Management Plan Area (*FLNRORD 2013) under the Land Use Objectives Regulation, establishes old growth management areas in TFL 18. These areas help conserve landscape level biodiversity by protecting older forests.

Generally, commercial timber harvesting is prohibited in defined old growth management areas. Thus, all old growth management areas implemented by this order are removed from the legally harvestable landbase. There are 7,756 hectares of old growth management areas within the TFL. These areas result in an effective THLB area reduction of 7,608 hectares, after accounting for previous netdown factors.

*Datasets used: Legal Old Growth Management Areas*

### 4.3.3 Riparian Management

Part 4 Division 3 of the Forest Planning and Practices Regulation (MoF 2024) protects areas around riparian features (lakes, wetlands and streams) with riparian reserve zones and riparian management zones. The regulation also defines the different classes of riparian feature and the size of their reserve and management zones, as shown in Table 5. Harvest is prohibited in reserve zones and limited in management zones. Interfor's Forest Stewardship Plan (Interfor 2015) identifies basal area retention targets for management zones that will be applied in this analysis.

In the model, lakes were identified by using the Freshwater Atlas and were classified according to their areas as defined in Table 5.

Wetlands were similarly identified using the Freshwater Atlas and classified according to their areas. In addition, Wetland Complexes (W5s) were identified using a geospatial analysis according to the specification in Section 48 (2) of the Forest Planning and Practices Regulation (MoF 2024).

Stream classes cannot be straightforwardly determined with the data available in the Freshwater Atlas, which does not contain width estimates or indication of fish presence. However, a dataset with estimated stream classifications was used in the most recent Kamloops Timber Supply Review (FLNRORD 2015 pg. 27). This dataset covers TFL 18 and was used as the stream classification for this analysis.

In the model, reserve zones are removed from the legally harvestable landbase. The modelled width of the reserves zones was as per the Forest Planning and Practices Regulation

Management zones were modelled as an effective buffer by multiplying the FSP basal area retention target by the management zone width. The effective management zone width is then added to the width of reserve zone to arrive at a final effective buffer width for each riparian feature. For example, W1 wetlands have a management zone width of 40 meters and a basal area retention target of 10%, thus the modelled manage zone width was 4 meters. Since the reserve zone width for W1 wetlands is 10 meters the final effective buffer distance is 14 meters

*Table 5. Riparian reserve and management Zones*

| Riparian Feature | Feature Description | Riparian Reserve Zone Width (m) | Riparian Management Zone Width (m) | Retention (% of basal area) | Effective Buffer Distance (m) |
|---|---|---|---|---|---|
| L1-B Lake | Lake between 5 and 1000 ha in area | 10 | 0 | 0 | 10 |
| L3 Lake | Lake between 1 and 5 ha in area | 0 | 30 | 20 | 6 |
| W1 Wetland | Wetland greater than 5 ha in area | 10 | 40 | 10 | 14 |
| W3 Wetland | Wetland between 1 and 5 ha in area | 0 | 30 | 20 | 6 |
| W5 Wetland | Wetland complex greater than 5 hectares in area | 10 | 40 | 10 | 14 |
| S1-B Stream | Fish stream with width between 20 and 100 m | 50 | 20 | 30 | 56 |
| S2 Stream | Fish stream with width between 5 and 20 m | 30 | 20 | 20 | 34 |
| S3 Stream | Fish stream with width between 1.5 and 5 m | 20 | 20 | 10 | 22 |
| S4 Stream | Fish stream with width less than 1.5 m | 0 | 30 | 20 | 6 |
| S5 Stream | Non-fish stream with width greater than 3 m | 0 | 30 | 20 | 6 |
| S6 Stream | Non-fish stream with width less than 3 m | NA | NA | NA | 2 |

*Datasets used: Fresh Water Atlas Rivers, Lakes, Wetlands, Kamloops TSR Classified Streams*

Note that in Table 5, all stream zone widths are the width of the buffer on one side of the stream. There is a total of 1,904 hectares in the buffers associated with stream management zones, effectively removing 1,403 hectares of THLB, after accounting for all previous netdown factors. The buffers associated with lakes cover 171 hectares and effectively remove 73 hectares of THLB. Finally, the buffers associated with wetland management zones cover a total of 1,977 hectares and effectively remove 719 hectares from the THLB.

### 4.3.4 Class A Lakes

The Clearwater Forest District Lakes Local Resource Use Plan – Lakeshore management guidelines identifies ecologically and recreationally significant lakes in the TFL. The identified lakes are classified from class A to E, with class A lakes receiving the most protection. Each lake has a mapped lakeshore management zone that extends approximately 200 meters from the lake's edge. Interfor's forest stewardship plan (Interfor 2015) commits to not harvesting with the lakeshore management zone of identified class A lakes. Thus, the lakeshore management zone of all class A lakes is removed from the legally harvestable landbase. Lakes with other classifications are modelled with forest cover objectives, as described in Section 6.2.

The identified class A lakes in the TFL are: Deube Lake, Rioux Lake, Lake Windy Lake and Walter Lake. There is a total of 466 ha within the lakeshore management zones of these lakes, which effectively reduces the THLB by 67 hectares after accounting for all earlier netdown factors. Note that class A lakeshore management zones were not removed from the timber harvesting landbase in the previous timber supply review (CANFOR 2017). Instead, they were modelled as a forest cover objective with a disturbance limitation of 0%, which is roughly equivalent to removing them from the THLB.

*Datasets used: Lakeshore Management Zones*

## 4.4 Removals from the Timber Harvesting Landbase

### 4.4.1 Unstable Terrain

Timber harvesting is unpracticable in areas with unstable terrain. Therefore, all areas with unstable terrain are removed from the timber harvesting landbase. Unstable terrain was identified as any area with a terrain stability class of V (5) in the provincial terrain stability mapping dataset. There is only 39 ha of identified unstable terrain within the TFL, which effectively removes 37 hectares of THLB, after accounting for all earlier netdown factors.

*Datasets used: Terrain Stability Mapping*

### 4.4.2 Steep Slopes

Areas with slopes of more than 85% are not suitable for conventional timber harvesting. Thus, all areas greater than 1 hectare with a slope class greater than 85% were removed from the timber harvesting landbase. A total of 136 ha of steep slopes were identified in this way, effectively removing 61 hectares of THLB after accounting for all preceding netdown factors.

Steep areas were identified using a lidar derived digital elevation model. Steep areas smaller than 1 hectare were included in the THLB as such areas can generally be incorporated into cable harvesting blocks. Table 6 compares the total THLB area in several slope classes to the amount of recent harvest in those slope classes. In this context recent harvest includes all areas harvested during and after 2017. While little harvesting occurs in the steepest slope class, this slope class only covers a small portion of the THLB.

*Table 6. Comparison of harvest by slope class and THLB area by slope class*

| Slope Class | THLB Area (ha) | Percent of THLB Area | Recently Harvested Area (ha) | Percent of Recent Harvest |
|---|---|---|---|---|
| <40 | 47,844.1 | 90.5 | 4,496.7 | 91.2 |
| 40-60 | 4,103.4 | 7.8 | 383.3 | 7.8 |
| 60-85 | 912.3 | 1.7 | 49.4 | 1.0 |

*Datasets used: Slope Classes*

### 4.4.3 Permanent Sample Plots

The province maintains a network of permanent sample plots for research purposes. Although these plots are not legally protected, current operational practice is to avoid harvesting in these areas. Thus, all active permanent sample plots are removed from the timber harvesting landbase, as well as their buffers mapped in the BC data catalogue. These areas cover 18 ha within the TFL and effectively reduce the THLB by 13 hectares after accounting for overlaps with earlier netdown factors.

*Datasets used: PSPs*

### 4.4.4 Difficult Regeneration

The environmentally sensitive areas dataset identifies areas where forest regeneration is likely to be unpracticable. Since harvest areas must be reforested, areas that cannot be reforested also cannot be harvested. As such, these areas are removed from the timber harvesting landbase, if they did not have a harvest history. Areas with a harvest history were assumed to have been assessed as practical to reforest at the site level. The environmentally sensitive areas dataset is quite old, having its origin in the 1994 forest inventory. However, in the absence of newer information, it represents the best available information for areas of difficult regeneration so is included in this analysis. There are 702 hectares of difficult regeneration areas in the TFL. This results in an effective THLB area reduction of 200 hectares after accounting for previous netdown factors.

*Datasets used: ESAs*

### 4.4.5 Deciduous Leading Stands

All deciduous leading stands without a harvest history were removed from the timber harvesting landbase as the TFL holder does not target deciduous stands for harvest. Deciduous leadings stand with a harvest history were not removed from the THLB to avoid removing regenerating stand that are temporarily deciduous leading. There are approximately 466 hectares of unharvested deciduous leading stands in the TFL. This results in an effective reduction to the THLB of 250 hectares, after accounting for previous netdown factors.

*Datasets used: VRI*

### 4.4.6 Non-Merchantable Stands

All stands where projected yields never meet the minimum coniferous harvest volume of 100 $m^3$/ha were removed from the timber harvesting landbase as they will never become harvestable in the model. There is a total of 4,151 hectares of area in in this category, however much of this overlaps with existing netdown factors (notably non-forest), so the effective area removed is only 1,730 hectares.

*Datasets used: VRI, VDYP Inputs*

### 4.4.7 Recreation Areas, Sites and Trails

All provincially identified recreation sites were removed the timber harvesting landbase as current operational practice is to avoid timber harvesting in these sites. There are only 112 hectares of recreation areas in the TFL. After accounting for overlaps with previous netdown factors, this results in an effective THLB area reduction of 65 hectares. Some of the larger recreation areas include Clearwater River West, Coldscaur Lake South, Double Lakes and Coldscaur Lake North.

*Datasets used: Recreation Sites*

### 4.4.8 Existing Wildlife Tree Patches

Section 67 of the Forest Planning and Practices Regulation (MoF 2024) prohibits harvesting in wildlife tree retention areas (WTRAs) until the surrounding area is mature. Thus, all existing wildlife tree patches are removed from the timber harvesting landbase. While it will be possible to harvest the WTRA later in the planning horizon, they would have to be replaced with a new wildlife tree area of similar size.

Existing WTRAs were identified as all grouped reserves in the RESULTS reserves dataset, except those with a silviculture reserve objective code of 'TIM'. Reserves with an objective code of 'TIM' are not removed as they represent short term reserves that do not contribute to wildlife tree retention targets. There is a total of 2,030 ha of existing wildlife tree retention areas in the TFL. This effectively removes 1,726 hectares from the THLB, after accounting for previous netdown factors.

*Datasets used: RESULTS reserves*

### 4.4.9 Future Wildlife Tree Patches

Harvesting in the future will require the creation of future wildlife tree patches. In their forest stewardship plan, Interfor commits to retaining 7% of the gross area of each harvested block in wildlife tree patches. However, not all of this area is an effective reduction to the timber harvesting landbase, as a part of these wildlife tree patches will overlap with areas that are already removed from the timber harvesting landbase for other reasons. The effective reduction was calculated by determining the proportion of existing WTP area that would be part of the THLB, if it was not part of the WTP (the incremental existing WTP Area):

$$Effective\ THLB\ reduction\ = 7\% * \frac{Incremental\ Existing\ WTP\ Area}{Existing\ WTP\ Area}$$

The total existing WTP area is 2,030 hectares and the incremental existing WTP area is 1,726 ha. Thus, the effective THLB reduction is:

$$7\% * \frac{1{,}726\ ha}{2{,}030\ ha} = \ 6.0\%$$

Thus, future wildlife tree patches (WTPs) are modelled as a 5.89% aspatial reduction to the timber harvesting landbase. This reduction only applies to areas that have no harvest history, or areas that were harvested prior to 1995 (when the requirements for WTPs was introduced), since these stands do not have existing WTPs.

*Datasets used: RESULTS Reserves, VRI*

# 5. Current Condition

This section describes the current condition of the TFL as of 2025.

## 5.1 Age Class Distribution

Figure 5 shows the age class distribution on the THLB and non-THLB (AFLB areas that are not part of the THLB). On the THLB, there is a concentration of stands in younger age classes reflecting the harvest history in the TFL.

The stands in the non-THLB are concentrated in older age classes, reflecting the lack of recent stand replacing disturbances in the TFL.

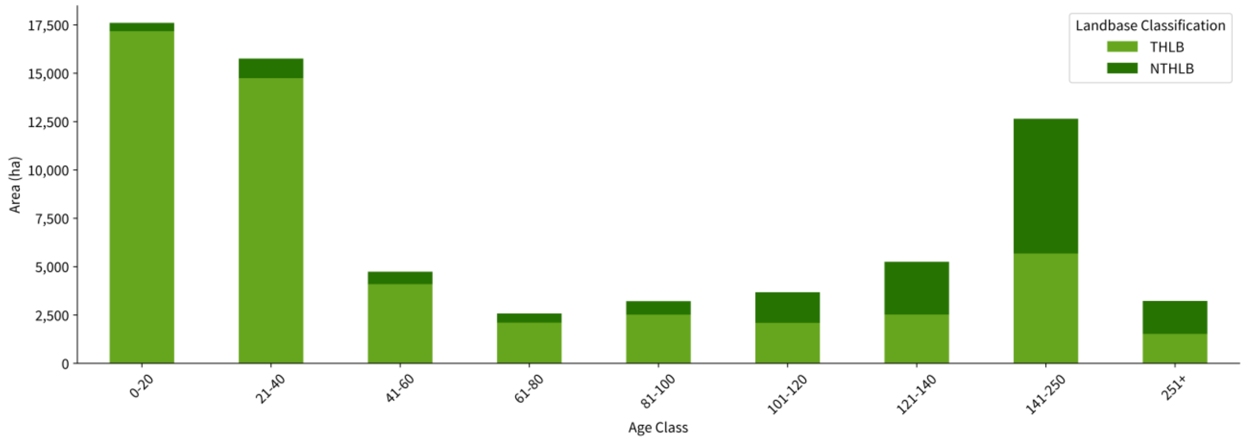


*Figure 5. Distribution of THLB and non-THLB area by age class*

Figure 6 shows a map of the existing age classes across the TFL. The age classes are distributed relatively evenly across the TFL, suggesting that harvesting has not been unduly concentrated in one part of the TFL.

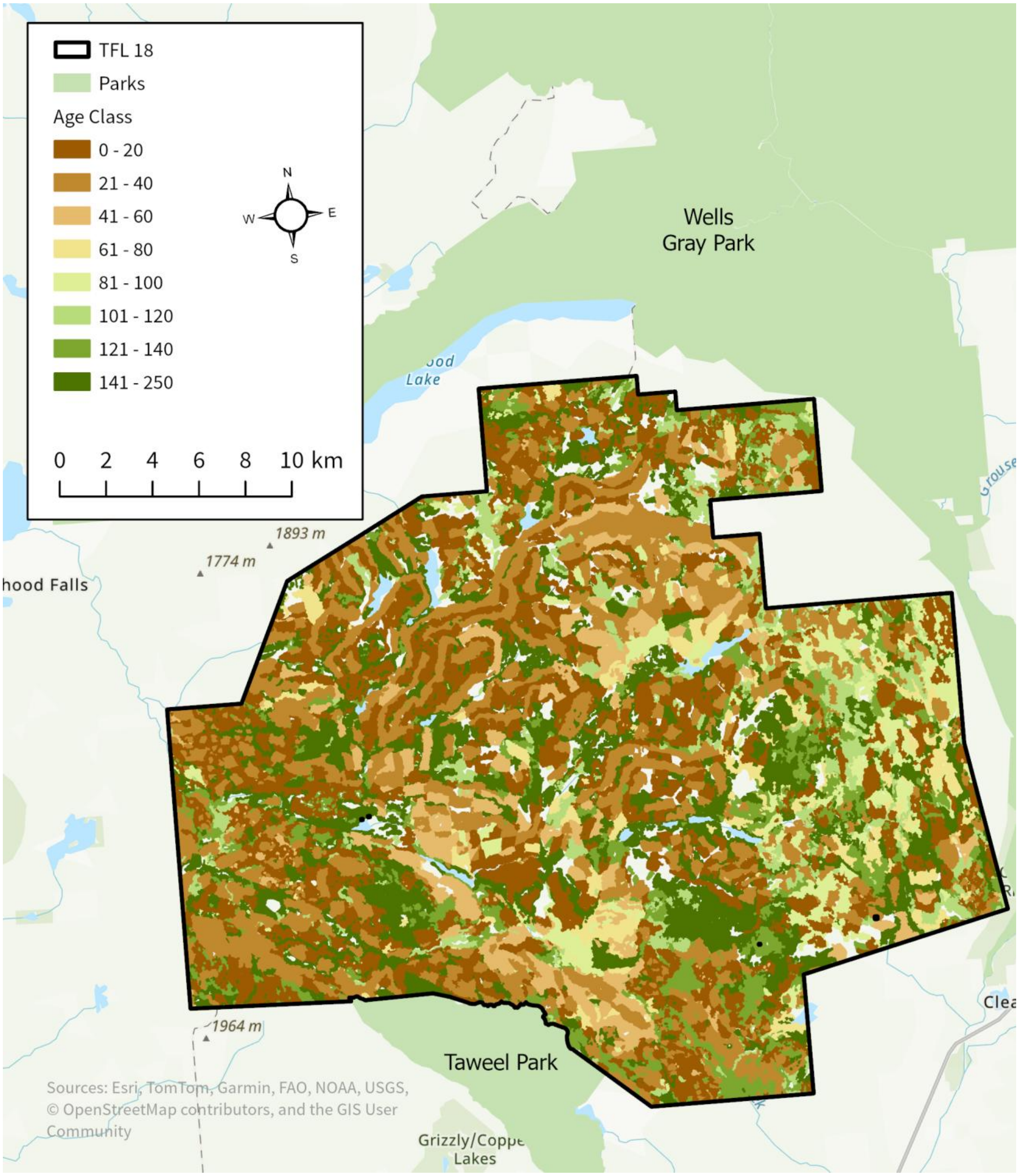


*Figure 6. Map of age classes on the AFLB*

## 5.2 Biogeoclimatic Ecosystem Classification

Figure 7 shows the distribution of BEC zones across the TFL. The major BEC zones are Engelmann spruce – subalpine fir (ESSF) at higher elevations and sub-boreal spruce (SBS) and interior cedar hemlock (ICH) at lower elevations. There is also a small amount of area in the Interior Douglas-fir zone in the south-east corner of the TFL.

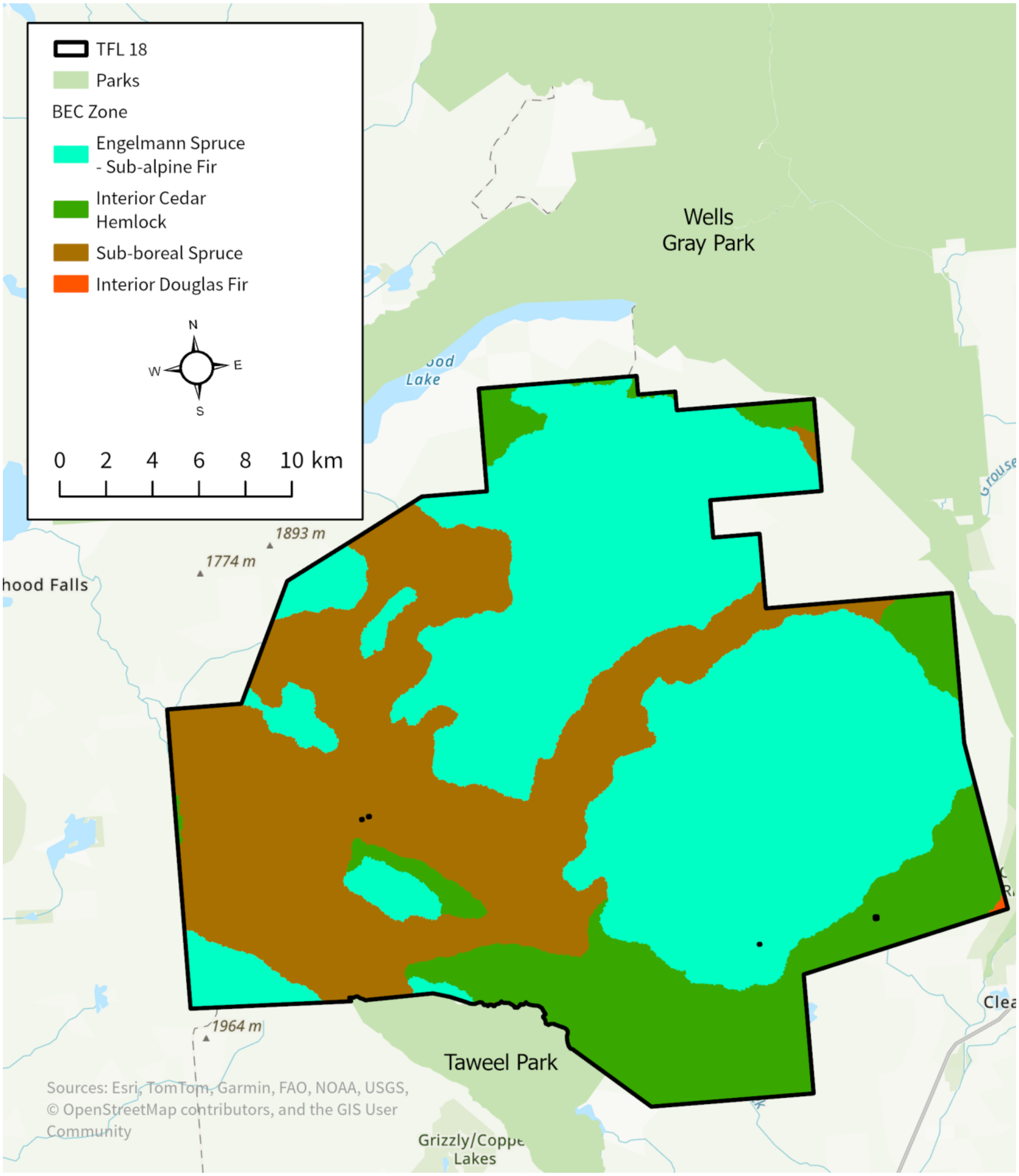


*Figure 7. Map of BEC zones in TFL 18*

## 5.3 Species Distribution

Figure 8 shows stands by VRI leading species across the TFL. Leading species distribution mostly follows the biogeoclimatic zones: ESSF is mostly composed of sub-alpine fir and Engelmann spruce, SBS is a mix of lodgepole pine and Engelmann spruce, and ICH is a mix of lodgepole pine and Douglas fir.

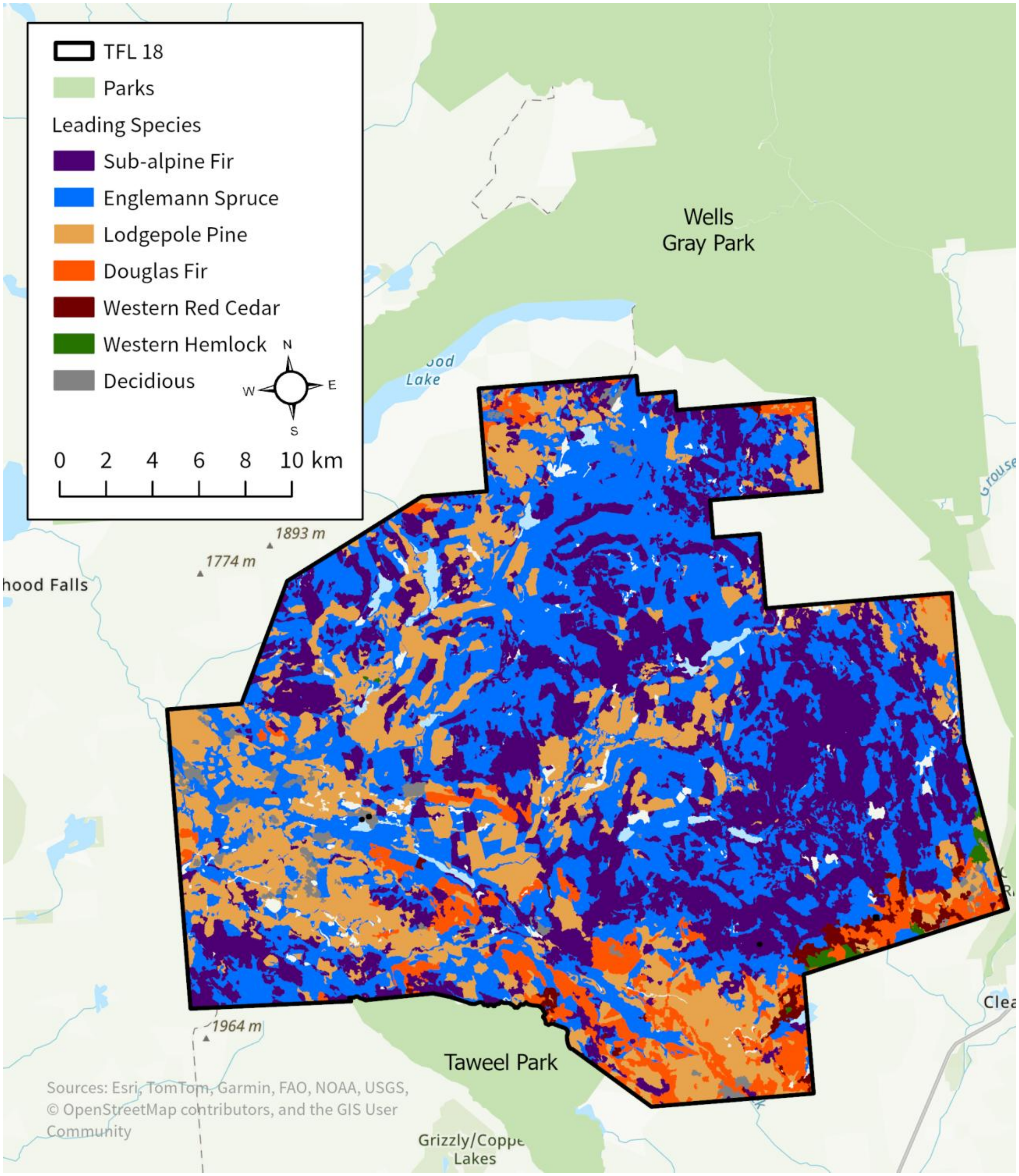


*Figure 8. Map showing the leading species in TFL 18*

Figure 9 shows the total standing volume by species on both the THLB and non-THLB. There are also very small amounts of western larch, ponderosa pine and western white pine, not shown on the chart.

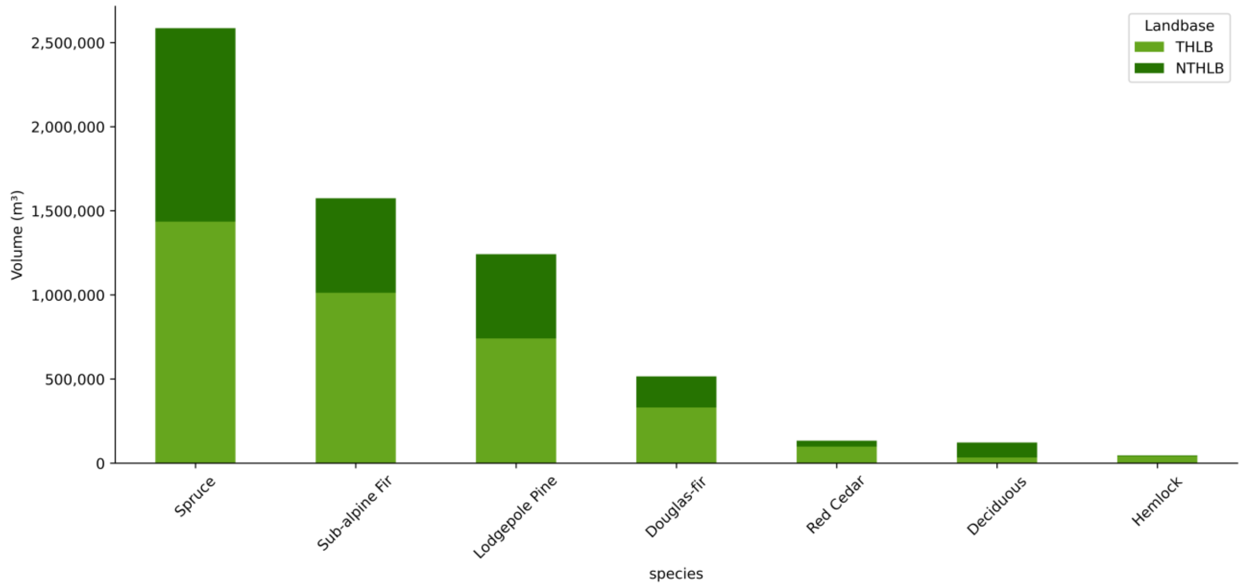


*Figure 9. Standing Volume by Species*

# 6. Forest Cover Objectives

## 6.1 Visual Resource Management

The Kamloops Land and Resource Management Plan and its attendant orders have established visual quality objectives for scenic areas within the TFL (Figure 10). Harvesting practices within these areas must be designed to preserve their scenic value. The timber supply implications of these objectives are modeled according to the 2003 Bulletin – Modelling Visuals in TSR III (Forest Service). The overall approach of this method is to translate operational visual quality requirements into an estimated percent allowable alteration for each scenic area polygon within the TFL. A constraint is then added to the forest estate model that prevents more than that portion of the scenic area from being disturbed at any one time.

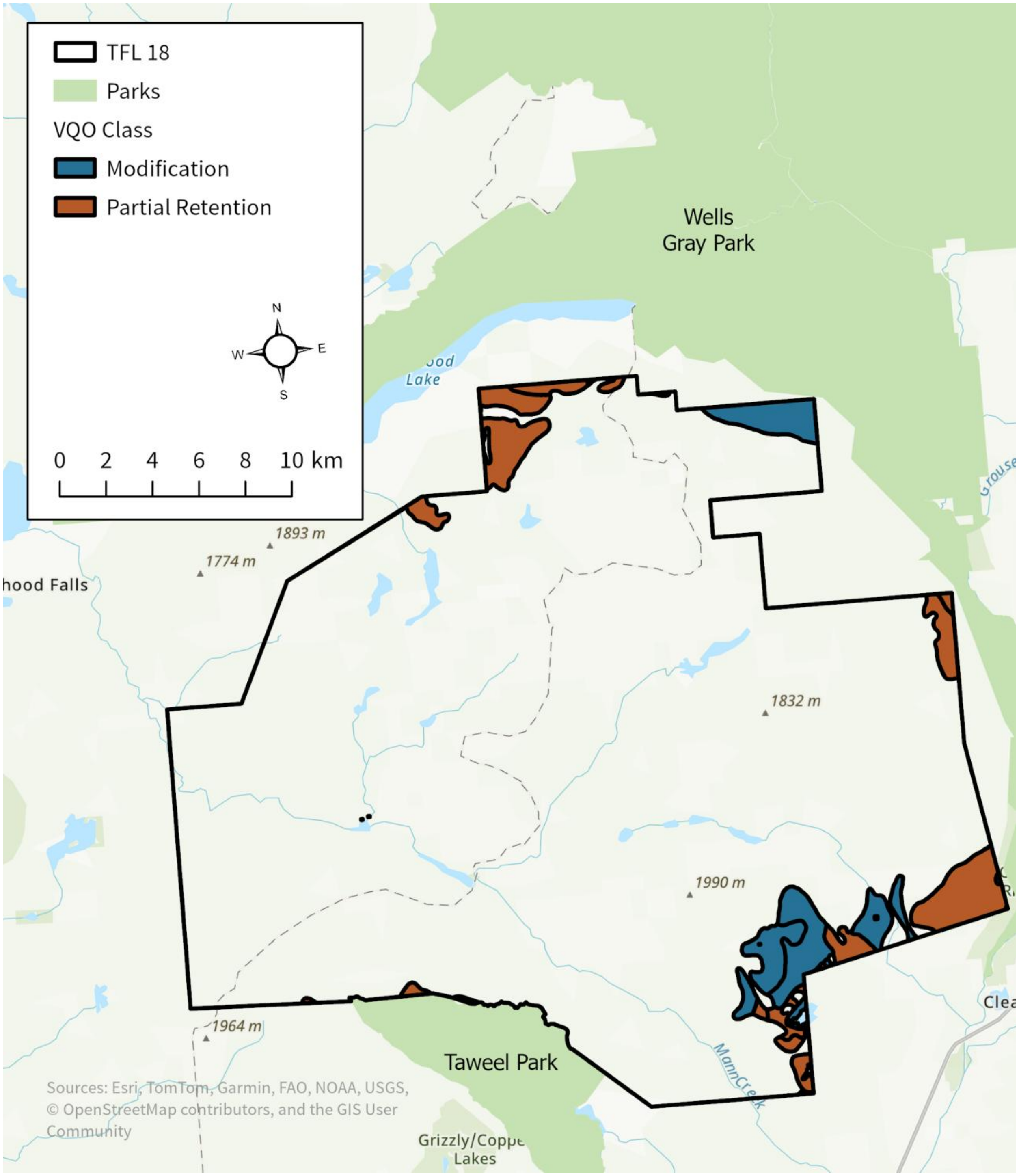


*Figure 9. Map of scenic areas in TFL 18*

Several attributes of each scenic area are relevant to this methodology:

- The visual quality objective (VQO) class, a measure of how much visual disturbance is allowed in a scenic area

- The visual absorption class, a measure of how much timber harvesting impacts the visual quality of the area.
- The allowable percent alteration in perspective view, a measure of the portion of a given scenic area that may be disturbed, when viewed in perspective. This value is determined by the VQO class and visual absorption class, as given in Table 7.
- The effective green-up height of the area, the height at which regenerating trees are deemed to have restored the visual impact of harvesting. This attribute varies depending on the average slope of the scenic area (Table 8)
- The plan to perspective ratio, an adjustment factor to account for the difference of area in perspective as compared to a bird's eye view. This also varies with slope (Table 8)

The final allowable percent alteration for a given visual quality polygon is then given by the plan to perspective ratio multiplied by the maximum % alteration in perspective view.

*Table 7. Allowable percent alteration used to model visual quality objectives*

| VQO Class | % Alteration in perspective view by VAC | | |
|---|---|---|---|
| | Low | Medium | High |
| Preservation | 0 | 0 | 0 |
| Retention | 2 | 3 | 4 |
| Partial Retention | 7 | 10 | 13 |
| Modification | 17 | 20 | 23.3 |

*Table 8. Greenup heights and plan to perspective ratios used to model visual quality objectives*

| Slope Class Upper Bound (%) | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 68 | 70 | >70 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P2P Ratio | 4.7 | 4 | 4 | 3.4 | 3 | 3 | 3 | 2.2 | 1.98 | 2 | 2 | 1.5 | 1.3 | 1 | 1 |
| Greenup height (m) | 3 | 4 | 4 | 4.5 | 5 | 6 | 6 | 6.5 | 6.5 | 7 | 8 | 8 | 8.5 | 9 | 9 |

Dataset used: Visual Landscape Inventory

## 6.2 Lakeshore Management Zones

The province has identified lakeshore management zones around many of the lakes in TFL 18 for special management. The management zones extend approximately 200 m from the edge of the lake and are shown in Figure 10. These lakes have received a classification from 'A' to 'E', with class A lakes receiving the highest degree of protection.

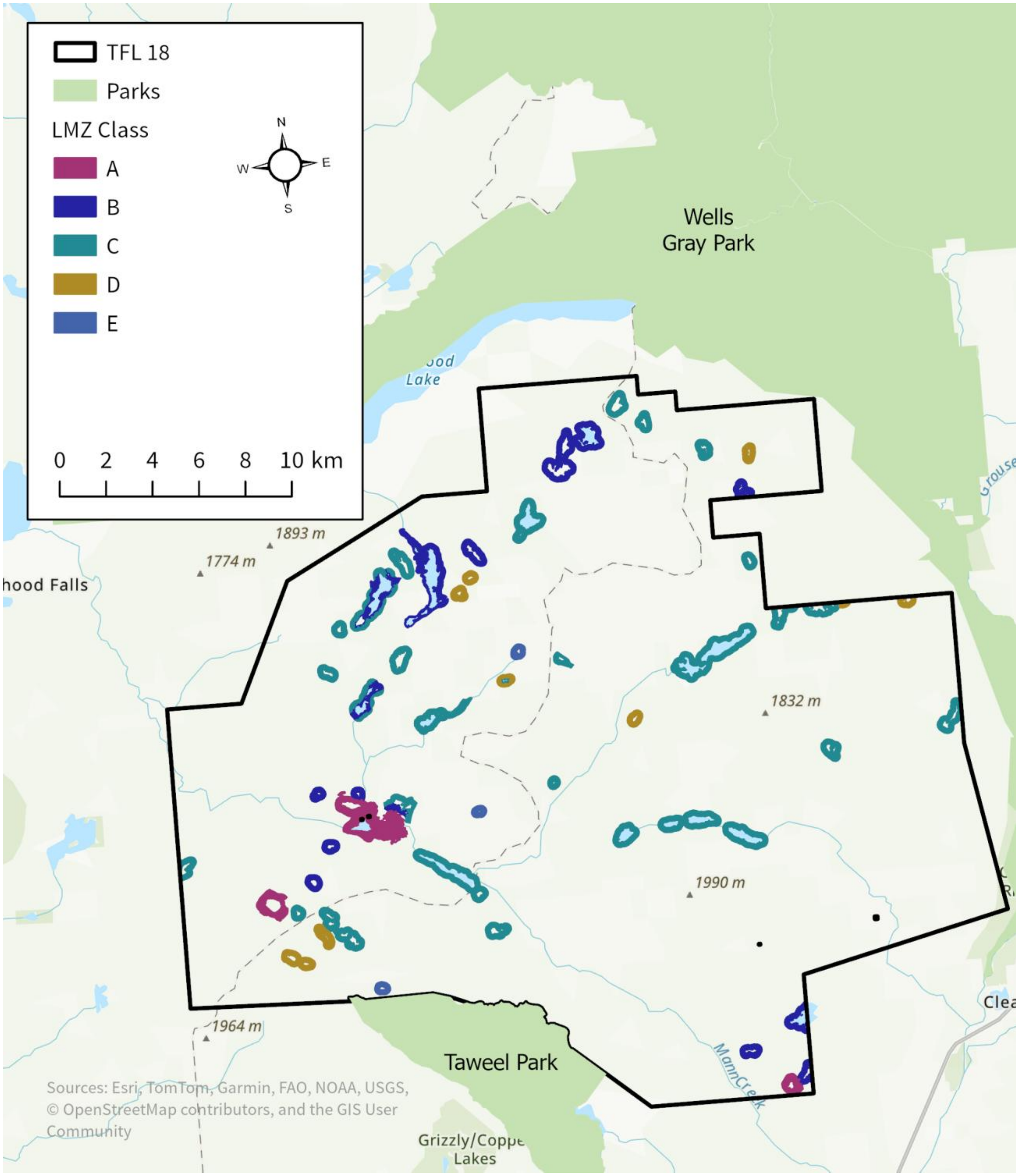


*Figure 10. Lakeshore management zones by class*

In their forest stewardship plan (Interfor 2015), Interfor commits to managing certain classified lakes as outlined in the Clearwater Lakes Local Resource Use Plan – Lakeshore Management Guidelines (Forest Service 2001). Under these guidelines, harvest is prohibited in the lakeshore management zones of class A lakes which are removed from the THLB (Section 4.3.4). The lakeshore management zones of the other classified lakes are to be managed according to the visual quality objectives shown in Table 9 . These lakeshore management zones are modelled in the same way as scenic areas, as described above.

*Table 9. Modelled visual quality objective by lake class*

| LMZ Class | Visual Quality Objective | Modeled % Alteration in perspective view |
|---|---|---|
| B | Retention | 3 |
| C | Partial Retention | 10 |
| D | Modification | 20 |
| E | Modification | 20 |

The precent alteration figures are derived in the same way as for the scenic areas, except that all LMZs are assumed to have a visual absorption class of moderate, as they have not been assigned a specific class.

Datasets used: Lakeshore Management Zones

## 6.3 Critical Moose Winter Range

The Kamloops Higher Level Plan Ministerial Order established a critical moose winter range in the southern part of the TFL, shown in Figure 11. This order further establishes moose management units, 200-meter zones surrounding classified lakes and wetlands within the winter range.

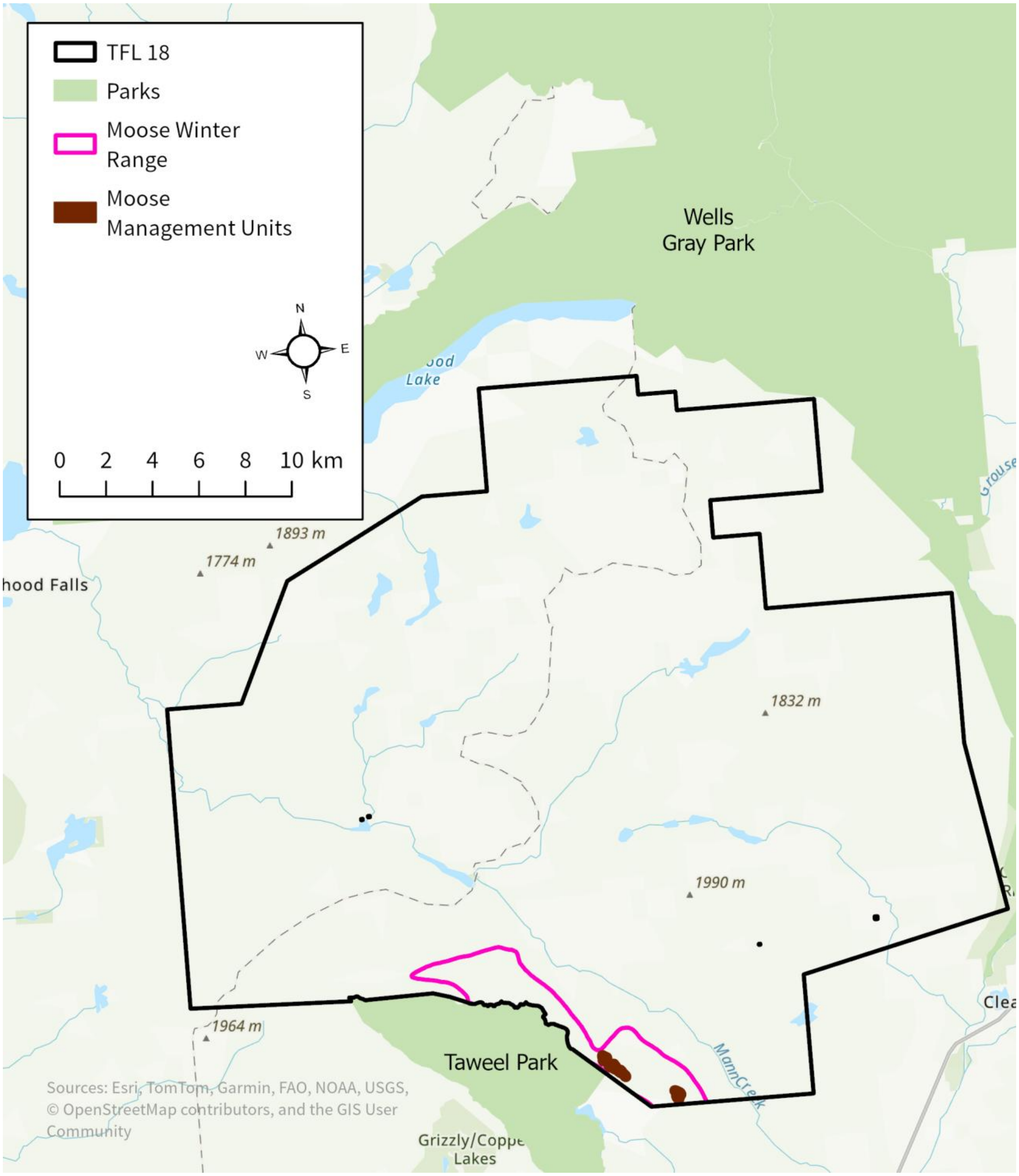


*Figure 11. Moose winter range and moose management units*

In section 5.62 of their forest stewardship plan, Interfor commits to limit the amount of area under 10 meters tall to 50% of the forested area of each moose management unit. This is implemented as a forest cover objective in the forest estate model.

Datasets used: Resource Management Plan Polygons, Fresh Water Atlas Lakes and Wetlands, VRI

## 6.4 Patch Size Objectives

Section 64 of the Forest Planning and Practices regulation limits the maximum size of cutblocks in the Thompson Okanagan Forest Region to 40 hectares. This will be modeled with a surrogate aspatial objective limiting the amount of THLB area in each BEC zone that can be less than 3 meters in height. This objective is sometimes applied per Landscape Unit, BEC zone combination, however there is only one landscape unit in the TFL.

Additionally, the model will be configured to not create cutblocks less than 2 ha in size, due to the operational infeasibility of many small blocks.

Datasets used: BEC Version 12

# 7. Timber Harvesting Rules

## 7.1 Minimum Harvest Age

Stands are only available for harvest in the model once:

- The stand achieves a minimum volume of 100 $m^3$/ha, and
- The stand's mean annual increment is within 90% of its maximum mean annual increment (managed stands only)

A stand's mean annual increment for a given year is equal to the stand's merchantable volume divided by the stand's age.

The first requirement helps ensure that harvested stands are economically feasible to harvest, and the second requirement helps ensure that stands are harvested close to their biological rotation age. The biological rotation age is the harvest age where the mean annual increment is maximized, and that maximizes long-run harvest volume over multiple rotations.

The minimum harvest volume of 100 $m^3$ is consistent with Interfor's current operational practice and the analysis undertaken to address the Chief Forester's implementation direction regarding low volume stands (Section 2.4). This analysis overlaid the 2017 vegetation resource inventory with the area harvested between 2018 and 2024. It showed that during this period, 3.9% of harvested volume came from stands with less than 100 $m^3$/ha. This is also consistent with the minimum harvest volume used in the last timber supply review for the Kamloops timber supply area. Most areas harvested in the model will have a higher volume per hectare, due to forest cover constraints, and the mean annual increment requirement.

## 7.2 Silviculture Systems

Clearcut with reserves will be the only modelled silvicultural system.

## 7.3 Harvest Flow Objectives

The base case harvest flow will maximize the total volume harvested over the 300-year planning horizon subject to the following flow objectives:

- The harvest rate never declines below the even-flow harvest rate (the highest harvest rate that can be sustained throughout the entire planning horizon.)

- The harvest rate never fluctuates by more than 10% from period to period
- The growing stock does not decrease in the last 100 years of the 300-year planning horizon, indicating that the harvest rate is sustainable, with the rate of growth roughly equal to the rate of harvest

## 7.4 Grade 4 Credits

Section 17(6) of the Cut Control Regulation allows licensees to harvest grade 4 logs without counting them against their AAC, if they are sent to a facility aside from a lumber or veneer mill. If a significant amount of grade 4 credits are used, actual harvest rates could increase to an unsustainable level. Table 10 shows the amount of grade 4 credits claimed since 2014. The usage of grade 4 credits has reduced since TFL 18 was transferred to Interfor in 2020.

*Table 10. Total Harvest and Grade 4 Credit Usage*

| | 2014-2018 | 2019-2023 | Total |
|---|---|---|---|
| **Total Harvest ($m^3$)** | 1,247,437 | 766,606 | 2,014,043 |
| **Cut Control Harvest Target ($m^3$)** | 1,397,500 | 766,593 | 2,164,093 |
| **Grade 4 Credit Claimed ($m^3$)** | 93,462 | 13,712 | 107,174 |
| **Grade 4 Credit / Total Harvest** | 7.5% | 1.8% | 5.3% |

# 8. Non-Harvesting Disturbance

## 8.1 Non-Recoverable Losses

Damage to timber caused by fire, wind, insects, diseases, and other pests contribute to loss in harvestable volumes. While endemic losses due to pests and disease are accounted for in the TIPSY and VDYP yield tables, damage due to catastrophic events is not accounted for in this way. When trees subject to catastrophic disturbance events are not salvaged, they represent a loss to the total available harvestable volume, known as non-recoverable losses. In this model, annual non-recoverable losses are estimated using past natural disturbance data and subtracted from the modelled harvest flow. In total, 596.6 $m^3$/year will be subtracted from the harvest flow as shown in Table 11.

Non-recoverable losses were estimated for the TFL by using the information from aerial overview surveys, contained in the BC government's pest infestation datasets. This data was used to estimate the total area impacted by each forest health factor in Table 11 during the last ten years. This area was then reduced by subtracting non-THLB and immature areas to approximate the amount of unsalvaged THLB area impacted by these forest health factors. Finally, the non-recoverable losses were determined by applying a reduction factor to the area impacted associated with the identified infestation severity:

- Very Severe (VS): 75% reduction
- Severe (S): 30% reduction
- Moderate severity(M): 15% reduction
- Low Severity(L): 5% reduction
- Trace/Endemic(T): .05% reduction

For flooding and fire, this reduction factor was applied to all species, but the reduction was only applied to the appropriate tree species for the insect forest health factors.

All values in Table 11 are based on the last ten years of disturbance information but have been annualized to arrive at an annual non-recoverable loss figure.

*Table 11. Estimated annual non-recoverable losses*

| Forest Health Factor | Losses ($m^3$) |
|---|---|
| Balsam Bark Beetle | 390.7 |
| Douglas-fir Beetle | 60.2 |
| Spruce Beetle | 50.0 |
| Flooding | 48.4 |
| Fire | 47.3 |
| Total | 596.6 |

Datasets used: Pest Infestation Polygon, Pest Infestation Point

## 8.2 Disturbance on the Non-Timber Harvesting Landbase

The forested landbase may be disturbed by many factors including natural events such as fire, pests, and wind. These disturbances influence both timber supply and requirements for non-timber objectives. Most non-timber objectives are related to the maintenance of desired forest conditions such as a specified age structure or proportion of old forest and are applied to the entire forested landbase. Accordingly, natural disturbances on the non-THLB and the role they have in altering forest conditions over time should be accounted for, rather than allowing the forest to age continually and contribute inappropriately to non-timber objectives.

A random disturbance schedule will be added to the timber supply model to account for these disturbances. The schedule is generated by running a simulation where each stand has a one divided by its natural disturbance interval chance of being disturbed each year. Note that this random disturbance does not dependy on stand age, thus some stands will be disturbed mutliple times during the modelled planning horizaion and some stands will never by distrubed. The natural disturbance interval depends on BEC variant as outlined in Appendix 8 of the OG TAP Old Growth Deferral: Background and Technical Appendices

*Table 12. Natural disturbance on the non-timber harvesting landbase*

| BEC Variant | NTHLB Area (ha) | Age of Old (years) | % of Area Expected Old | Return Interval (years) | Annual Area Disturbed (ha) |
|---|---|---|---|---|---|
| SBSmm | 5,080.4 | 140 | 33 | 125 | 40.6 |
| ESSFwc2 | 4,978.2 | 250 | 73 | 800 | 6.2 |
| ESSFdc3 | 2,384.3 | 140 | 39 | 150 | 15.9 |
| ICHmk2 | 1,350.0 | 140 | 39 | 150 | 9.0 |
| ESSFwcw | 1,119.9 | 250 | 73 | 800 | 1.4 |
| ICHmw3 | 808.5 | 250 | 29 | 200 | 4.0 |
| ICHdw3 | 73.1 | 140 | 39 | 150 | 0.5 |
| IDFmw2 | 25.0 | 250 | 37 | 250 | 0.1 |
| Total | 15,819.4 | | | | 77.7 |

Datasets used: BEC v12

## 8.3 Climate Change

The provincial government has prepared a set of overview documents that describe potential impacts of climate change in the province's different natural resource regions, including one for the Thompson Okanagan Region (MFLNRORD 2016), which contains TFL 18.

In the Thompson Okanagan Region, mean annual temperatures are projected to increase by approximately 1.8 degrees centigrade by the 2050s. Precipitation is projected to decrease slightly overall, with an increase in the winter, but greater offsetting decreases in the summer. Furthermore, the amount of snowfall is likely to decrease significantly and be replaced by rain, decreasing snowpack. Giving the topographic variability in the region, these changes in precipitation will be quite variable at more local scales. These changes in average temperature and precipitation are likely to be paired with an increased frequency of extreme weather events such as heatwaves and drought.

These climatic changes may have mixed effects on future forest productivity. There will likely be a positive impact from increased carbon dioxide levels and warmer temperatures. However, increased extreme weather events, and general ecosystem disruption will negatively impact growth. Due to the uncertainty of these impacts, they are not modelled directly, but the standard growth and yield sensitivities described in section 2.9 help address uncertainty about future growth.

A major impact of climate change is an increase in natural disturbance events such as wildfire, flooding and bark beetle infestations. These changes are examined in the "Increase Natural Disturbance" sensitivity described in Section 2.9.8.

Interfor is already implementing several adaptation strategies within the TFL including:

- Planting a diversity of species in most harvest blocks
- Increasing riparian retention
- Reviewing stocking standards for climate change resilience
- Planting protocols –
    - Planter training, micro site selection on at risk sites
    - Reduced inter tree distance to improve microsite selection opportunity

  - Site prep with consideration of climate change
  - Increased monitoring of at risk sites
  - Planting density increases where applicable
- Road structure upgrades and upsizing

While the broad impact of climate change in BC is relatively well understood, there is significant uncertainty about the exact magnitude of the impacts, particularly at more local scales. This general uncertainty is partially addressed by regularly revisiting timber supply as the climate changes.

# 9. Growth and Yield

An essential component of the forest estate model is the growth and yield curves that describe how forested areas grow over time. Different kinds of forested stands are modelled in different ways, depending on the stand's characteristics and the available information for each stand. In this model, the yield curves are grouped into natural stand yield curves, which are used for stands 61 years of age or older and managed stand yield curves which are used for stands less than 61 years of age.

## 9.1 Natural Stands

In this analysis, all natural stands are modelled with the Variable Density Yield Projection Model version 7 (VDYP). This is the provincial standard growth and yield model for natural stands. The province also provides a standard set of VDYP inputs for each VRI inventory polygon, which are used in this analysis. Each natural stand in the VRI (by Feature ID) is assigned a unique yield curve. Natural stand yield curves are not aggregated in any way.

### 9.1.1 Definition

For modelling purposes, natural stands are defined as all stands that were established before 1964. 1964 is the that where there begin to be records of planting on the TFL. Thus, stands established before this date are unlikely to have been planted, and are thus most appropriately modelled with VDYP.

### 9.1.2 Deciduous Volumes

Deciduous volumes were not included in the natural stand yield curves in this model, as deciduous volume is not regularly utilized by the TFL holder.

### 9.1.3 Non-primary Layers

The provincial VDYP inputs sometimes include multiple layers for a given VRI polygon. For example, a stand might have several veteran trees that are much older than most of the stand. For this analysis, only volume in the primary layer was included in the yield curves. There is very little volume in non-primary layers in the TFL.

### 9.1.4 Dead Volume

Mountain pine beetle killed volume was not included in the yield curves in this analysis, as almost all dead volume has either already been harvested or is no longer merchantable. Spruce and balsam bark beetle are also a significant concern on the TFL, however volume killed by these pests in the TFL is not currently represented in the VRI's dead volume layer. Thus, no volume from the dead layer was included in this analysis

### 9.1.5 Utilization

The yield curves will be generated with the provincially standard utilization standards:

- Minimum diameter at breast height: 12.5 cm for lodgepole pine and 17.5 cm for all other species
- Maximum stump height: 30 cm
- Minimum top diameter inside bark: 10 cm

## 9.2 Managed Stands

For the purposes of this analysis, managed stands are defined as all stands less than 61 years of age. Managed stands are modelled with the provincial growth and yield program, Table Interpolation Program for Stand Yields (TIPSY) version 4.7. TIPSY creates custom yield curves by combining information from a government-maintained database, based on user provided stand inputs.

This section documents the TIPSY inputs used for this analysis. Some of these inputs are shared across all modelled stands and are described in Section 9.3. Other inputs are determined differently for different kinds of stands, depending on the available data. These inputs are described below. Note that while site indexes and genetic gains are averaged across species for summary purposes in this report, separate values were calculated for each species in the actual generation of the yield curves.

### 9.2.1 Opening Groups

For modelling purposes, managed stands are divided into several opening groups. Stands in each opening group share similar ways of generating the required TIPSY inputs. The opening groups are:

- Managed stands with detailed planting Information. These are openings that have detailed planting information in the RESULTS planting activities table
- Older managed stands with a record of planting in the RESULTS openings table, but no detailed information in the planting activities table.
- Older managed stands with no record of planting
- Recently harvested and future managed stands

Table 13 shows the amount of THLB area in each group. Most area is modelled using the detailed planting information, with the other methods functioning as a fallback when this detailed information is not available.

*Table 13. Managed areas by curve type*

| Curve Type | THLB Area (ha) | % of Managed THLB Area |
|---|---|---|
| Managed Stands - Detailed Planting Information | 27,504 | 76 |
| Managed Stands - No Planting Record | 5,089 | 14 |
| Managed Stands - Recent, No Planting Record | 2,075 | 6 |
| Managed Stands - With Planting Record | 1,334 | 4 |

Stands in the detailed planting Information group have completely unique yield curves generated for each opening, using the detailed planting information available in the RESULTS activities table. Stands in other categories use a hybrid approach: Each stand has a unique yield curve that uses opening specific site index information, however attributes besides site index are based off weighted averages for the relevant BEC variant /

Silviculture Era combination. The method used to generate these weighted averages varies across categories and is described below.

### 9.2.2 Silviculture Eras

The TIPSY inputs for each stand also vary significantly depending on the silviculture era that a stand belongs to. Silviculture eras depend on the establishment date of the stand and reflect the different silviculture practices associated with the different time periods. The silviculture eras are:

- 1964-1970: This era is characterized by the start of timber harvesting on the TFL, with the amount of planting slowly increasing throughout the period.
- 1971-1986: This era is characterized by more consistent planting (> 50% of harvested area planted)
- 1987-2004: This era is associated with the start of the legislative requirement to establish free growing plantations. It has consistently high planting rates.
- 2005-2014: This era starts with the significant use of genetically improved stock in the TFL. It has consistently high planting rates.
- 2015-2025: This era starts with a spike in the quality of genetic improved stock and continues to the present. This era also forms the basis for future managed stands.

The THLB area associated with each silviculture era is shown in Table 14.

*Table 14. Managed stand area by silviculture era*

| Era | Area (ha) |
|---|---|
| 1964-1970 | 934.8 |
| 1971-1986 | 3,618.6 |
| 1987-2004 | 14,276.9 |
| 2005-2014 | 9,731.7 |
| 2015-2025 | 7,439.6 |

### 9.2.3 Managed Stands with Detailed Planting Information

This category includes all stands that have detailed planting information in the RESULTS activities table. TIPSY inputs for each stand in this group are unique and based directly on the information in the RESULTS activity table. Table 15 outlines how each input attribute was derived

*Table 15. TIPSY input description for stands with detailed planting information*

| Input Attribute | Data source | Description |
|---|---|---|
| Planted Density | RESULTS Planting | Taken directly from planting information for the opening |
| Species Composition | RESULTS Planting | Taken directly from the planting records for the opening |
| Genetic Gain | RESULTS Plant + SPAR | Genetic Gains for the planted seedlot was taken directly from SPAR |
| Regeneration Method | NA | Always Planting |

Table 16 summarizes the average of the modelled TIPSY inputs by era and BEC zone. Each opening (identified by unique opening ID) in this category has a unique yield curve, based on planting, site index and genetic gain information specific to that opening. The information in Table 16 is a summary of the inputs used to generate these unique yield curves.

As expected, genetic gains increase through time. Genetic gains are also significantly higher for ESSF than other BEC zones, largely due to the comparatively greater genetic gains for spruce. There is also a significant increase in the diversity of planted species over time.

*Table 16. Average of TIPSY inputs for managed stands with detailed planting information*

| Era | BEC Zone | THLB Area (ha) | Averge Density (sph) | Average Genetic Gain (%) | Site Index (m) | Species Composition |
|---|---|---|---|---|---|---|
| 1964-1970 | ESSF | 327.5 | 1,127 | 0.0 | 15.2 | SX73 PL27 |
| 1964-1970 | ICH | 21.8 | 1,104 | 0.0 | 18.3 | SX78 PL8 FD13 |
| 1964-1970 | SBS | 139.5 | 849 | 0.0 | 17.6 | SX65 PL22 FD14 |
| 1971-1986 | ESSF | 805.6 | 1,516 | 0.0 | 15.1 | SX53 PL47 |
| 1971-1986 | ICH | 177.9 | 1,037 | 0.0 | 18.1 | SX78 PL18 FD4 |
| 1971-1986 | SBS | 396.3 | 962 | 0.0 | 19.1 | SX41 PL51 FD8 |
| 1987-2004 | ESSF | 4,150.3 | 1,466 | 0.4 | 15.2 | SX48 PL27 BL8 FD8 CW6 LW3 |
| 1987-2004 | ICH | 2,065.9 | 1,263 | 0.5 | 19.8 | SX20 PL34 FD23 CW4 LW10 PW5 PY4 |
| 1987-2004 | SBS | 4,594.0 | 1,396 | 0.4 | 19.1 | SX33 PL38 BL4 FD13 CW5 LW3 PW4 |
| 2005-2014 | ESSF | 3,788.8 | 1,294 | 9.7 | 15.4 | SX52 PL23 BL12 FD6 CW4 LW3 |
| 2005-2014 | ICH | 1,447.0 | 1,248 | 3.4 | 20.2 | SX22 PL42 FD19 CW5 LW6 PW6 |
| 2005-2014 | SBS | 4,225.2 | 1,189 | 4.9 | 19.3 | SX36 PL42 BL7 FD8 CW3 LW4 |
| 2015-2025 | ESSF | 3,049.6 | 1,357 | 11.2 | 15.2 | SX61 PL18 FD7 CW7 PW7 |
| 2015-2025 | ICH | 727.3 | 1,281 | 8.7 | 19.7 | SX28 PL30 FD22 CW8 LW4 PW8 |
| 2015-2025 | SBS | 1,587.2 | 1,330 | 8.3 | 18.7 | SX37 PL20 FD14 CW6 LW23 |

### 9.2.4 Older Planted Stands without Detailed Planting Information

This category includes all stands that have a record of being planted in either the RESULTS opening table or the RESULTS forest cover inventory table, but which do not have detailed planting information in the RESULTS activities table. These stands had most of their inputs populated with weighted averages of the inputs for stands with detailed planting information from the same biogeoclimatic variant and silviculture era (Table 17). However, they still had site indexes assigned individually, based off opening specific site index information from the provincial site productivity layer. This category does not include stands less than 10 years old that do not yet have detailed planting information in RESULTS. These young stands are modelled in the same way as future managed stands and are described in Section 9.2.6.

*Table 17. TIPSY input description for older stands with a record of planting but no detailed planting information*

| Input Attribute | Data source | Description |
|---|---|---|
| Planted Density | RESULTS Planting | Average density associated with BEC variant and silviculture era |
| Species Composition | RESULTS Planting | Average species associated with BEC variant and silviculture era |
| Genetic Gain | SPAR | Average genetic gains associated with BEC variant and silviculture era |
| Regeneration Method | NA | Always Planting |

Table 18 summarizes the TIPSY inputs for these stands. Note that while the yield curves are summarized by BEC zone in the table, unique species composition, planting densities and genetic gain values were calculated for each unique / BEC variant combination. Site index was still calculated separately for each stand but is averaged by Era and BEC zone here for summary purposes. This opening category covers a relatively small portion of the THLB and follows the same patterns as the stands with detailed planting information.

*Table 18. Summary of TIPSY inputs for older planted stands without detailed planting information*

| Era | BEC Zone | THLB Area (ha) | Averge Density (sph) | Average Genetic Gain (%) | Site Index (m) | Species Composition |
|---|---|---|---|---|---|---|
| 1964-1970 | SBS | 28.9 | 1,008 | 0.0 | 19.1 | SX50 PL45 FD4 LW1 |
| 1971-1986 | ESSF | 100.4 | 1,453 | 0.0 | 15.1 | SX86 PL14 |
| 1971-1986 | ICH | 201.8 | 976 | 0.0 | 19.7 | SX66 PL30 FD4 |
| 1971-1986 | SBS | 217.5 | 958 | 0.0 | 18.9 | SX39 PL59 FD2 |
| 1987-2004 | ESSF | 432.9 | 1,465 | 0.6 | 15.1 | SX67 PL30 BL1 FD1 CW1 |
| 1987-2004 | ICH | 49.8 | 1,317 | 0.1 | 19.9 | SX36 PL39 FD18 CW2 LW2 PW3 |
| 1987-2004 | SBS | 35.2 | 1,396 | 0.9 | 19.7 | SX44 PL49 FD6 CW1 |
| 2005-2014 | ESSF | 117.8 | 1,232 | 7.0 | 14.9 | SX69 PL28 FD2 |
| 2005-2014 | ICH | 56.4 | 1,193 | 3.9 | 20.1 | SX35 PL39 FD19 CW4 LW1 PW2 |
| 2005-2014 | SBS | 92.8 | 1,188 | 4.9 | 21.3 | SX46 PL49 FD5 |

### 9.2.5 Older Naturally Regenerated Stands

This category contains all stands under 61 years of age that do not have any record of planting in RESULTS. Species composition and establishment density for these stands were sourced from the VRI instead of RESULTS, as shown in Table 20. Since they were not planted, they were also never given any genetic gain.

*Table 19. TIPSY input description for older naturally regenerated stands*

| Input Attribute | Data source | Description |
|---|---|---|
| Establishment Density | VRI | Average VRI density associated with BEC variant and silviculture era |
| Species Composition | VRI | Average VRI species composition associated with BEC variant and silviculture era |
| Genetic Gain | NA | No genetic gains |
| Regeneration Method | NA | Always Natural |

Table 20 summarizes the TIPSY inputs for these stands for each unique combination of BEC zone and silviculture era.

*Table 20. Summary of TIPSY inputs for managed stands with no record of planting*

| Era | BEC Zone | THLB Area (ha) | Averge Density (sph) | Average Genetic Gain (%) | Site Index (m) | Species Composition |
|---|---|---|---|---|---|---|
| 1964-1970 | ESSF | 68.3 | 1,519 | 0.0 | 16.3 | SX23 PL18 BL36 FD12 CW1 |
| 1964-1970 | ICH | 274.5 | 1,771 | 0.0 | 18.3 | SX15 PL27 BL16 FD25 CW2 |
| 1964-1970 | SBS | 74.5 | 1,402 | 0.0 | 15.7 | SX20 PL16 BL47 FD3 LW1 |
| 1971-1986 | ESSF | 574.0 | 1,619 | 0.0 | 16.8 | SX38 PL15 BL36 FD4 CW2 |
| 1971-1986 | ICH | 577.9 | 2,000 | 0.0 | 21.3 | SX22 PL14 BL15 FD18 CW15 |
| 1971-1986 | SBS | 568.7 | 1,716 | 0.0 | 20.6 | SX30 PL21 BL22 FD4 CW8 |
| 1987-2004 | ESSF | 2,354.7 | 1,843 | 0.0 | 15.7 | SX57 PL22 BL16 |
| 1987-2004 | ICH | 72.4 | 1,265 | 0.0 | 19.9 | SX16 PL26 BL16 FD18 CW4 LW2 |
| 1987-2004 | SBS | 523.1 | 1,429 | 0.0 | 18.3 | SX36 PL17 BL8 FD4 CW1 |

### 9.2.6 Future Managed Stands and Recently Harvested Areas

Recently harvested areas that don't yet have planting information in RESULTS were modelled in the same way as future managed stands. The TIPSY inputs for future managed stands were averages of the TIPSY inputs for stands with detailed planting information harvested in the last 10 years.

*Table 21. TIPSY input description for future managed stands*

| Input Attribute | Data source | Description |
|---|---|---|
| Planted Density | RESULTS Planting | Average for the matching BEC variant in the last 10 years |
| Species Composition | RESULTS Planting | Average for the matching BEC variant in the last 10 years |
| Genetic Gain | SPAR | Average for the matching BEC variant and species in the last 10 years |
| Regeneration Method | NA | Always Planting |

Table 22 summarizes the TIPSY inputs by BEC zone for future managed and recently harvested stands. The THLB areas shown are for recently harvested areas.

*Table 22. Summary of TIPSY inputs for future managed stands*

| Era | BEC Zone | THLB Area (ha) | Averge Density (sph) | Average Genetic Gain (%) | Site Index (m) | Species Composition |
|---|---|---|---|---|---|---|
| Future | ESSF | 1,254.0 | 1,359 | 10.5 | 15.3 | SX88 PL10 FD1 CW1 |
| Future | ICH | 631.2 | 1,296 | 8.0 | 19.7 | SX42 PL26 FD24 CW2 LW4 PW1 |
| Future | SBS | 191.2 | 1,328 | 7.3 | 19.0 | SX60 PL32 FD7 LW1 |

## 9.3 Inputs Shared Across All Managed Stands

This section details TIPSY inputs that are shared across all the different opening categories.

### 9.3.1 Operational Adjustment Factors

TIPSY yield tables are generated assuming ideal stand conditions that are rarely actually achieved. To account for this, TIPSY applies two operational adjustment factors that reduce stand yields to account for operational realities, OAF 1 and OAF 2. OAF 1 reduces stand yields uniformly across all ages and has a default value of 0.85. OAF 1 helps account for the larger number of gaps found in operational stands as compared to the more intensively managed research stands used to inform the development of TIPSY's yield curves. OAF 2 reduces stand yields by progressively greater amounts as the stand ages and has a default value of 0.95. OAF 2 helps account for higher levels of pest incidence in operational stands. These default operational adjustment factors were used for all TIPSY yield curves in this analysis.

### 9.3.2 Site Index

The province maintains a spatial provincial site productivity layer, which estimates the managed stand site index by species for each hectare of the province. This layer was used to derive site index by species for each modelled opening, which was then used as the TIPSY input site index. All yield curves used opening specific site indexes, even those where other attributes, such as species composition, were aggregated.

### 9.3.3 Deciduous Volumes

All incidental deciduous volumes were excluded from the TIPSY yield curves; this is consistent with incidental deciduous volumes being excluded from natural stand yield curves and the current lack of utilization of deciduous volume.

### 9.3.4 Regeneration Delay

Regeneration delay represents the time between timber harvesting and tree planting.

The Provincial Timber Management Goals report for TFL 18 (MoF 2024) shows that the average regeneration delay for stands harvested between 2011 and 2017 was between 1 and 2 years. However, trees are already 1 year old when they are planted. Thus, a regeneration delay of 1 year will be used for all planted stands.

The regeneration delay for naturally regenerated stands cannot be directly inferred from available inventory information it is likely to be higher than for planted stands. Thus, a regeneration delay of 4 years is used for naturally regenerated stands.

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