# North Island Timber Supply Area Timber Supply Review

# **Data Package**

July 2020

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# 1. Introduction

This data package summarizes the information and assumptions that are used to conduct timber supply analysis for the Timber Supply Review (TSR) of the North Island (NI) Timber Supply Area (TSA). 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). The area to which this AAC decision is applied is referred to throughout the document as the Section 8 Decision Area. For more information about the TSR please visit the following website:

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

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., Vancouver Island Land Use Plan (VILUP));
- legal objectives established under the *Forest and Range Practices Act* (FRPA) and the *Land Act* (e.g., visual quality objectives (VQOs), wildlife habitat areas (WHAs), ungulate winter ranges (UWRs), and old growth management areas (OGMAs)).

The primary purpose of the timber supply review is to gather, and model information based on "what is" as opposed to "what if". Licensee operational practices drive the assumptions made in TSR. The information in this draft data package represents the best available knowledge at the time of publication, but is subject to change. Future changes in forest management, data, and licensee practices, when and if they occur, will be captured in future timber supply analyses.

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. Beyond the formal review period, to support the AAC determination, the ministry has endeavored to have engagement and collaboration throughout the TSR period with both First Nations and licensees in the TSA, about the AAC determination, forest management, and their rights and interests. 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. Following the release of the discussion paper that discusses the timber supply analysis results based on the data package after any revisions, a further 60-day comment period will be available. Section 12 describes details around the review process and comment submissions.

# 2. Background

# 2.1 General

The North Island TSA, located on the northern half of Vancouver Island, was created in January 2017 when the *Great Bear Rainforest (Forest Management) Act* (GBRFMA) and regulations came into effect. Under the regulations, this new TSA was created from the Vancouver Island portions of the former Kingcome and Strathcona TSAs. Segments of the Pacific TSA are interspersed throughout the TSA, as well as Tree Farm Licences (TFLs) 6, 19, 37, 39 and 47. The total TSA land base area is approximately 1 749 460 hectares and it is administered by the Campbell River Natural Resource District (DCR) office in Campbell River, and the North Island-Central Coast Natural Resource District (DNI) office in Port McNeill.

The western and northern Vancouver Island areas are characterized with rugged marine coastlines, steep mountainous terrain, and deep river valleys and inlets that extend into the Pacific Ocean. The eastern TSA and some interior northern areas have terrain ranging from rugged mountains to poorly drained lowlands. The TSA overlaps three biogeoclimatic zones: the Coastal Western Hemlock (CWH) located between sea level and 1000 metres of elevation, and the higher elevation zones of Mountain Hemlock (MH) and Coastal Mountain-heather Alpine (CMA). Dominant tree species are western hemlock (Hw) and amabilis fir (more often called balsam (Ba) – HwBa together referred to as "hembal"), western redcedar (Cw) and yellow cedar (Yc), mountain hemlock (Hm), Douglas-fir (Fd) and small amounts of alder (Dr) and spruce (Ss).

The TSA's varied topography and climate support a rich variety of wildlife. Of particular importance are the old-growth forests of the CWH zone and the protected, nutrient-rich estuaries that provide critical habitat for over-wintering water birds, many species of mammals, and young salmon. More than 300 species of migratory and resident birds, 45 species of mammals and 13 species of amphibians and reptiles occur in the TSA. Native mammals include black-tailed deer, Roosevelt elk, black bear, wolf, beaver, pine marten, wolverine and weasel. Native and migratory birds in the forests of the area include species identified as being at risk, such as marbled murrelets, northern goshawks, and great blue herons. The marine habitats and estuaries support populations of red-legged and coastal tailed frog, Peale's peregrine falcons, bald eagles, trumpeter swans, harlequin ducks and over-wintering birds. Some of the major drainages within the TSA include the White River, Artlish River, Kaouk River, Salmon River, Nimpkish River, Elk River, Ououkinsh River, Kashutl River, Malkesope River, Tahsish River, Kauwinch River, Nahwitti River, San Joseph River, Stranby River, Mahatta Creek and East Creek.

The major communities and corresponding populations (2016 census data) include Campbell River (32 588), Courtenay (25 599), Comox (14 028) and smaller communities of Port Hardy (4132), Cumberland (3753), Port McNeill (2337), Gold River (1212), Port Alice (664), Sayward (311), Tahsis (248), Kyuquot (200) and Zeballos (107). Economic activity includes forestry, mining, commercial and recreational fishing, aquaculture, public sector and tourism. Land use planning for the TSA area is guided by the Vancouver Island Land Use Plan (VILUP) (https://www2.gov.bc.ca/gov/content/industry/crown-land-water/land-use-planning/regions/west-coast/vancouverisland-lup), approved in 2000.

Twenty-five First Nations have Aboriginal Interests within the North Island TSA. Cowichan Tribes, Ehattesaht Chinehkint First Nation, Gwa'sala-'Nakwaxda'xw Nation, Halalt First Nation, Xwemalhkwu (Homalco) First Nation, Ka:'yu:k'tkh\_Che:k:tles7et'h' First Nation, Klahoose First Nation, K'omoks First Nation, Kwakiutl First Nation, Lake Cowichan First Nation, Lyackson First Nation, Mamalilikulla First Nation, Mowachaht/Muchalaht First Nation, 'Namgis First Nation, Nuchatlaht First Nation, Penelakut Tribe, Qualicum First Nation, Quatsino First Nation, Stz'uminus First Nation, Tla'amin Nation, Tlatlasikwala Nation, Tlowitsis First Nation, Tseshaht First Nation, We Wai Kai Nation and the Wei Wai Kum First Nation. All but the Kwakiutl First Nation, 'Namgis First Nation, Ehattesaht Chinehkint First Nation, Klahoose First Nation, and the Qualicum First Nation have signed or pending agreements with government, such as the Nanwakolas Strategic Engagement Agreement, Forest Consultation and Revenue Sharing Agreements (FCRSA), or Treaty Reasonable Opportunity Agreements.

This is the first TSR to be completed on the North Island TSA. The initial AAC was set in the *Great Bear Rainforest (Forest Management) Regulation*. The *Act* specifies that subsequent (non-GBR) AAC determinations must be made by the chief forester. Estimated contributions to the initial AAC from former TSAs are shown in Table 1.

Management unit	AAC effective date	AAC (total) m³/year	AAC (North Island TSA) m³/year
Strathcona	December 17, 2015	1 138 000	986 000 (partitioned)
Kingcome	February 2, 2010	1 100 000 m³ (14 000 m³ deciduous)	209 000 (estimated)
North Island	January 1, 2017	1 248 100	1 248 100 (legislated)

Table 1. Historic AAC

#### Data source and comments:

Strathcona AAC was set in 2015. Sayward and Kyuquot TSBs had an AAC of 986 000 m<sup>3</sup>, and the GBR areas were partitioned.

Kingcome AAC was set in 2010. Vancouver Island was described as contributing 19% of the THLB, resulting in proportional AAC of  $209\ 000\ m^3$ .

Legislation creating the new TSA and setting the initial cut is the Great Bear Rainforest (Forest Management) Regulation: <u>http://www.bclaws.ca/civix/document/id/lc/statreg/327\_2016</u>



Figure 1. North Island Timber Supply Area.

# 2.2 Land use planning

The Vancouver Island Land Use Plan is a strategic Crown land use plan for Vancouver Island (excluding Clayoquot Sound area). The plan covers all of the Crown land and resources, including lakes and rivers in the plan area, nearshore coastal zone and some offshore islands. The plan contains land and resource management objectives and strategies that apply to the Crown land base and to identified mapped resource management zones (including special management, enhanced management, and general management zones).

The provincial government initiated the VILUP process in 1995. The work of various groups and public input led to the release of the Vancouver Island Summary Land Use Plan release in 2000. The plan created new protected areas, established resource management zones, and outlines the management intent for each of the zones identified.

Effective December 1, 2000, an order establishing objectives set by government with respect to the VILUP made legal specific objectives from VILUP pursuant to the *Forest Practices Code* (FPC) Sections 3(1) and 3(2).

Landscape unit plans (LUPs) for certain landscape units (LUs) were subsequently completed providing direction for managing old growth forest, wildlife trees and other values important to sustaining biological diversity. Some of the plans have associated legal orders outlining various objectives which are summarized here:

- Sayward Landscape Unit Plan (SLUP);
  - Order Establishing Sayward LUP and Biodiversity and Wildlife Objectives (2003);
    - Order Establishing a Recreation Trail Objective (2003);
    - Order Establishing Riparian Reserve Zones (RRZ) and Riparian Management Zones (RMZ) for Lakes (2003);
- Johnstone Straits Landscape Unit Plan;
- Order Establishing Old Growth Management Areas (OGMAs)in Tsitika, Naka, Adam-Eve, White, and Salmon Landscape Units in the Campbell River District (2010);
- San Josef Legal Order and Objectives (2016);
- Nahwitti, Tsulquate and Marble Legal Order (2010);
- Lower Nimpkish Legal Order and Objectives (2005);
- Shushartie Legal Order and Objectives (2005);
- Upper Nimpkish Legal Order and Objectives (2005);
- Malcolm Legal Order and Objectives (2004);
- Order Establishing a Sensitive Area and Objectives;
  - Nootka Trail (2003);
  - Heriot Ridge (2003);
  - Hyacinthe Point (2003);
  - Saltwater Lagoon (2003).

# 2.3 Forest industry

The most recent economic dependency estimates provided by British Columbia (BC) Stats show the main sources of employment in the North Island TSA area are health care and construction. Forestry and logging, support activities and wood product and paper manufacturing account for 3,055 local jobs. Permanent closures of several wood product manufacturing facilities in the TSA area have reduced the number of direct jobs over time.

Currently, within the North Island TSA there is a small processing sector consisting of 10 small lumber mills, 2 chip facilities, 5 shake and shingle mills, and a utility pole facility. The current capacity of these facilities is as follows:

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Facility type	Estimated annual capacity	Units
Chip	144	Thousand bone dry units (bdu)
Lumber	19	Million board feet (mmbf)
Shake and Shingle	126	Thousand of squares
Utility/Poles	14	Thousand pieces

Table 2.Wood processing facilities in the North Island TSA

Most of these facilities are not associated with the tenure holders. The volume produced by the NI TSA AAC surpasses the volume the local facilities can process. Beyond what is supplied locally, wood flows out of the TSA primarily to Fraser River processing facilities. A lesser amount is moved on Vancouver Island to South Island processing facilities. In addition, a proportion of the volume from some of the larger licensees is sold on the export market.

The current AAC is apportioned to Replaceable Forest Licences (64%), Non-replaceable Forest Licences (4%), First Nations Woodlands Licence (1%), First Nations Non-replaceable Forest Licence (1%), BC Timber Sales Licences (29%), and Forest Service Reserve (1%).

#### Data source and comments:

Economic Services Branch, FLNRORD: Mill List Data (2017), Census Data 2016 (2015 data).

# 3. First Nations Considerations

# 3.1 First Nations

Multiple First Nations assert Aboriginal Interests within the North Island TSA. These First Nations include: Cowichan Tribes, Ehattesaht Chinehkint First Nation, Gwa'sala-'Nakwaxda'xw Nation, Halalt First Nation, Xwemalhkwu (Homalco) First Nation, Ka:'yu:k'tkh\_Che:k:tles7et'h' First Nation, Klahoose First Nation, K'omoks First Nation, Kwakiutl First Nation, Lake Cowichan First Nation, Lyackson First Nation, Mamalilikulla First Nation, Mowachaht/Muchalaht First Nation, 'Namgis First Nation, Nuchatlaht First Nation, Penelakut Tribe, Qualicum First Nation, Quatsino First Nation, Stz'uminus First Nation, Tla'amin Nation, Tlatlasikwala Nation, Tlowitsis First Nation, Tseshaht First Nation, We Wai Kai Nation and the Wei Wai Kum First Nation.

Overlapping with the North Island TSA are two modern-day treaties, the *Maa-nulth Treaty* and the *Tla'amin Treaty*.

On April 1, 2011, the *Maa-nulth Treaty* came into effect. The Maa-nulth Treaty Nation that overlaps the North Island TSA is the Ka:'yu:k'tkh\_Che:k:tles7et'h' First Nation. The terms of the *Maa-nulth Final Agreement* provide self-government, 24 550 hectares of land, and various monetary components. It also defines each Maa-nulth First Nation's rights to resources such as wildlife, fish, timber, and sub-surface minerals. On May 22, 2014, the Maa-nulth Nations and the Province signed a *Reasonable Opportunity Agreement* with the objective of defining the collaborative process to evaluate the impact of authorized uses or dispositions of Crown land on each Maa-nulth First Nation's reasonable opportunity to harvest fish and aquatic plants, wildlife, and migratory birds in the Maa-nulth Harvest Areas. Engagement on this TSR with the Ka:'yu:k'tkh\_Che:k:tles7et'h' First Nation will follow the spirit and intent of the *Maa-nulth Final Agreement* and the commitments outlined in the *Reasonable Opportunity Agreement*.

On April 5, 2016 the *Tla'amin Treaty* came into effect. The North Island TSA overlaps the Tla'amin Nation Final Agreement Areas on Quadra Island. Vancouver Island overlap areas remain outside of the timber harvesting land base (THLB). The Tla'amin Nation and the Province signed a *Reasonable Opportunity Agreement* with the objective of ensuring that the Tla'amin Nation continues to have a reasonable opportunity to exercise their right to harvest fish and aquatic plants, wildlife and migratory birds and to gather plants within the areas identified in the *Tla'amin Final Agreement*. Consultation and engagement with the Tla'amin Nation will be consistent with the *Tla'amin Final Agreement* and the Appendices; the *Reasonable Opportunity Agreement* and the *Tla'amin First Nation Forest Consultation and Revenue Sharing Agreement*.

There are also two Douglas Treaties that overlap with the North Island TSA. The Kwakiutl First Nation are signatory to both, signed in 1851, and they have the right to hunt over unoccupied lands and to carry on their fisheries as formerly. Moreover, in *Chartrand v. The District Manager (2013)*, the BC Supreme Court found that the Kwakiutl First Nation have a credible claim to unextinguished Aboriginal rights and title in addition to their Treaty Rights. Consultation with the Kwakiutl First Nation will be informed by considering how their Treaty rights and Aboriginal rights and title may be impacted as a result of the proposed Timber Supply Review.

There are several Nations in Stage 5 treaty negotiations, including: K'omoks First Nation, Laich-Kwil-Tach Treaty Society, Wei Wai Kum Kwiakah Treaty Society, and Hul'qumi'num Treaty Group. Engagement throughout this TSR will reflect these ongoing tripartite negotiations.

The Mamalilikulla First Nation, K'omoks First Nation, Tlowitsis First Nation and Wei Wai Kum First Nation are signatory to the *Nanwakolas/British Columbia Framework Agreement (2016 Amending Agreement)*. These same Nations are also signatory to the *Nanwakolas Reconciliation Protocol*.

The Nanwakolas/British Columbia Framework Agreement (2016 Amending Agreement) outlines the process by which consultation is undertaken with the signatories under various pieces of legislation, including the Forest Act.

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Under the *Nanwakolas Reconciliation Protocol* the Province and the signatories have agreed to undertake discussions on shared decision-making measures for land and natural resource management. In relation to the North Island TSA TSR, the discussions on shared decision-making measures will be led by the Forest Analysis and Inventory Branch (FAIB).

Many of the First Nations that assert Aboriginal Interests within the North Island TSA have signed Forest Consultation and Revenue Sharing Agreements. This type of agreement outlines consultation engagement expectations, as well as provides First Nation communities with economic benefits returning directly to their community based on harvest activities in their traditional territory. See Table 3 for a list of Nations that are signatory to Forest Consultation and Revenue Sharing Agreements, and a summary of other agreements described above.

In addition to the agreements listed below, several First Nations have obtained area or volume-based forest tenures within the North Island TSA increasing their participation in the forest sector.

First Nation	Agreement or Treaty (or Other)
Cowichan Tribes	Member of the Hul'qumi'num Treaty Group
Ehattesaht Chinehkint First Nation*	
Gwa'sala-'Nakwaxda'xw Nation	Gwa'sala-'Nakwaxda'xw Nation Consultation
	Engagement Framework
Halalt First Nation	Member of the Hul'qumi'num Treaty Group
Xwemalhkwu (Homalco)	Xwemalhkwu (Homalco) Forest Consultation and
	Revenue Sharing Agreement
Klahoose First Nation*	
K'omoks First Nation	Nanwakolas/British Columbia Framework
	Agreement (2016 Amending Agreement)
	Nanwakolas Reconciliation Protocol
Kwakiutl First Nation*	Douglas Treaties
Ka:'yu:k'tkh_Che:k:tles7et'h' First Nation	Maa-nulth Treaty
Lake Cowichan First Nation	Member of the Hul'qumi'num Treaty Group
Lyackson First Nation	Member of the Hul'qumi'num Treaty Group
Mamalilikulla First Nation	Nanwakolas/British Columbia Framework
	Agreement (2016 Amending Agreement)
	Nanwakolas Reconciliation Protocol

Table 3. Summary of First Nations in the North Island TSA

(continued)

<b>First Nation</b>	Agreement or Treaty (or Other)
Mowachaht/Muchalaht First Nation	Mowachaht/Muchalaht Forest Consultation and Revenue Sharing Agreement
'Namgis First Nation*	
Nuchatlaht First Nation	Nuchatlaht Forest Consultation Revenue Sharing Agreement
Penelakut Tribe	Member of the Hul'qumi'num Treaty Group
Qualicum First Nation*	
Quatsino First Nation	Quatsino First Nation Forest & Range
	Consultation and Revenue Sharing Agreement
Stz'uminus First Nation	Member of the Hul'qumi'num Treaty Group
Tla'amin Nation	Tla'amin Final Agreement Act; Tla'amin Nation (Sliammon) Forest Consultation and Revenue
	Sharing Agreement
Tlatlasikwala First Nation	Tlatlasikwala First Nation Forest & Range
	Consultation and Revenue Sharing Agreement
Tlowitsis First Nation	Nanwakolas/British Columbia Framework Agreement (2016 Amending Agreement) Nanwakolas Reconciliation Protocol
Tseshaht First Nation	Tseshaht First Nation Forest & Range
	Consultation and Revenue Sharing Agreement
Wei Wai Kum First Nation	Nanwakolas/British Columbia Framework Agreement (2016 Amending Agreement)
	Nanwakolas Reconciliation Protocol
We Wai Kai Nation	We Wai Kai Forest Consultation and Revenue
	Sharing Agreement

Table 3. Summary of First Nations in the North Island TSA (concluded)

\*Several First Nations that assert Aboriginal Interests within the North Island TSA do not have a consultation agreement with the Province. The *Interim Updated Procedures for Meeting Legal Obligations When Consulting First Nations* will guide consultation with these First Nations. These First Nations include: Kwakiutl First Nation, 'Namgis First Nation, Ehattesaht Chinehkint First Nation, Klahoose First Nation, and the Qualicum First Nation.

#### **Data source and comments:**

BC Geographic Warehouse (BCGW) file WHSE\_ADMIN\_BOUNDARIES.CBD\_BOUNDARY\_POLY\_SVW , which was verified to be the same as the new layer: WHSE\_ADMIN\_BOUNDARIES.PIP\_CONSULTATION\_AREAS\_SP

# 4. Current Forest Management Considerations and Issues

## 4.1 Base case management assumptions

The assumptions described in this data package reflect current performance and knowledge with respect to the status of forest land, forest management practices, and timber growth and yield. These assumptions are used to model a timber supply forecast that is called the base case scenario. The forecast of the base case scenario is 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.

It is not possible to confidently predict the specific quantitative impacts on timber supply of climate change given both the uncertainty of the rate and specific characteristics of climate change and the uncertainty around the impact to the forest and how management will respond. Therefore, the base case will not include specific accounting for climate change projections. However, current changes (e.g., recent natural disturbances, silvicultural practices, forest growth monitoring) that may relate to climate change are captured as part of existing data collection processes and incorporated into the timber supply review.

A Vancouver Island-specific report on climate trends is not currently available. If information becomes available on climate trends and projections, and potential implications for the North Island during this TSR timeline, it will be compiled for consideration in the chief forester's AAC decision.

# 4.3 Cumulative effects

The need to measure the effects of all natural resource activities on the values important to British Columbians led to the provincial government establishing a Cumulative Effects Framework (CEF) to guide the assessment of cumulative effects across natural resource sectors. The CEF and TSR both provide landscape-level assessments that report on the state of values to support decision making. Currently, CEF has assessment protocols for aquatic ecosystems, grizzly bear, moose and old growth forests that are approved by the Natural Resource Sector for implementation. Indicators under these protocols relevant to the North Island TSA that have been completed prior to the AAC determination will be presented to the chief forester.

# 4.4 Major changes since the previous TSR

Below are the major forest management considerations and issues for the current North Island TSA TSR. Issues that fall within the definition of current management are modelled as best possible within the base case harvest forecast. Other issues that may infer significant uncertainties in current management may be assessed in sensitivity analyses as outlined in 9.3Sensitivity analysis. Sensitivity analysis provides information about the timber supply implications around the uncertainties in data and management.

### North Island TSA Timber Supply Review Data Package

- The former Strathcona and Kingcome TSAs were split and recombined, with the areas on Vancouver Island merged into the North Island TSA. The new TSA was created and AAC set in legislation in January 2017. This is the first timber supply review on the new TSA.
- Major datasets used in this TSR are either a combination of a portion former Kingcome TSA data and a portion of the former Strathcona TSA data or a new contiguous dataset (not previously used). Either way, comparison of areas to previous TSR assumptions is difficult.
- For the areas of the former Kingcome TSA, the unadjusted Vegetation Resource Inventory (VRI) was used in this analysis, in comparison to using the adjusted VRI in the previous analysis. The previously used adjustment resulted in an overall increase of 9% in volume and decrease of 10% in site index (SI).
- The VRI in a portion of the TSA had certain attributes updated based on Light Detection and Ranging (LiDAR). Approximately 4.7% of the crown forest management land base (CFMLB see Land Base Definition section for more information) was updated.
- The provincial site productivity layer (PSPL) is used in this TSR for all managed stands. In the former Kingcome TSA, inventory site index was adjusted based on a site index adjustment (SIA) study, while in the former Strathcona TSA, VRI site index was used. Overall, the PSPL and SIA have higher site indices than the VRI.
- An overall dataset of roads was categorized and buffered for use in the road netdown (applied semi-spatially). Previously, the Strathcona used a percent reduction, while the former Kingcome used a road layer with buffering based on two side slope classes.
- A slope-based approach for the terrain netdown was used for the former Kingcome TSA, in combination with past harvest performance, as opposed to using older environmentally sensitive area (ESA) soil sensitivity data. For the former Strathcona areas, terrain coverage was more recent, and used again.
- Two different approaches were used in the previous TSRs for stands with low site productivity (Strathcona used a low site cutoff of 300 m<sup>3</sup>/ha and SI<10, while Kingcome used a species-based SI cutoff). For the North Island, a consolidated approach, based on past harvest performance will be used, removing those stands that do not reach 300 m<sup>3</sup>/ha by the age of 150 years, and 450 m<sup>3</sup>/ha for heli.
- Old growth management areas have been either legally established or established in draft for most LUs and will be modelled spatially, as current practice where available.
- An adjusted stand-level biodiversity approach for wildlife tree retention areas (WTRAs) is used that will unify the approach across the TSA, based on past harvest performance and accounting for other forested reserves. Formerly, the Kingcome applied LU targets where they existed, and 6% everywhere else. Strathcona applied an approach of the target, reduced by 50%.
- A contiguous data set for semi-spatial riparian netdowns was used this time, with buffers applied based on FRPA targets and licensee practice. Previously the Strathcona used an aspatial netdown based on operation inventory extrapolation, while Kingcome used a spatial netdown.
- Additional WHAs and draft WHAs have been established for Marbled Murrelet and Northern Goshawk. Further protection of this habitat was announced and is expected to be implemented in the next 5-7 years.
- Minimum harvest age for the Kingcome was the greater of the age at 95% of culmination mean annual increment (CMAI) and the age at minimum volume (350 m<sup>3</sup>/ha for Cw-leading, 500 m<sup>3</sup>/ha for other conifer, 250 m<sup>3</sup>/ha for deciduous), while minimum harvest criteria for the Strathcona was a stand must meet 95% of CMAI and a minimum volume of 350 m<sup>3</sup>/ha. For this TSR it will be 95% of CMAI.
- Managed stand Table Interpolation Program for Stand Yields (TIPSY) yield curves for individual forest polygons will be generated from forest opening level silviculture data in the ministry Reporting Silviculture Updates and Land Status Tracking System (RESULTS) database. Future

stands will be on aggregate curves. Historically, existing managed and future stands were on aggregate TIPSY curves by analysis unit (species, SI and biogeoclimatic ecosystem classification (BEC) based).

• An increased operational adjustment factor (OAF) 2 adjustment will be applied to existing managed and future Douglas-fir stands in subzones where laminated and armillaria root diseases are prevalent (CWHmm1, xm1, xm2).

# 5. Inventories

# 5.1 Vegetation Resource Inventory

The Vegetation Resource Inventory (VRI) for the North Island TSA is a combination of two VRI projects; one completed for the Kingcome TSA and the other completed for the Strathcona TSA.

The Strathcona Phase I VRI was completed by Timberline on behalf of the Strathcona TSA licensees between 2005 and 2007. This re-inventory was based on aerial photography taken in 2003. In 2007, when the inventory was submitted for review, a number of failings were found, including:

- Third party quality assurance had not been done and thus the quality of the data could not have been adequately assessed.
- There was insufficient quantity and quality of calibration data collection resulting in lower confidence in the attribute data.
- Stand delineation had been copied from the 1993 inventory where 2003 photo coverage was not available.

In 2006 and 2007, VRI Phase II sampling was completed in 100 plots with stands greater than 30 years of age. The results suggest that stand volumes could be underestimated by 14% for all species. However, due to the high variability in the Phase II analysis, the adjustment factor ranged from 95% to 134% at a 95% confidence level. FAIB, at the time of the last TSR, recommended that the unadjusted inventory be used for the base case and a sensitivity analysis on volume be performed where the adjustment ratio of 1.143 is applied to create adjusted volume for comparison against unadjusted values.

In 2015, an update was made to three VRI attributes (projected height of species 1, basal area, live stems) based on a study completed using LiDAR in the North Island Central Coast Natural Resource District. Twenty-five metre LiDAR rasters were used to update VRI polygons within the study area; polygon delineations remained unchanged. The models were calibrated and validated using over 230 ground samples in the study area. Stands over 40 years were updated based on LiDAR enhanced forest inventory (LEFI) outputs re-modelled to 7.5 cm utilization as the VRI standard. The total area of VRI updated within the Section 8 Decision Area was 25 798 hectares (3.6% of total area). The affected area is 4.7% of the CFMLB (see Land Base Definition section for more information) and 3.6% of the THLB. The updates made are as follows:

- Projected height of species 1: In each VRI polygon, compute mean of (LiDAR maximum height \*0.8) within the polygon to mimic what the photo-interpreter sees.
- Basal area: Compute the mean of (basal area 7.5 cm) within the polygon.
- Live stems (per hectare): compute the mean of (tph 7.5 cm) within the polygon.

The height update resulted in an overall average height adjustment of 5-10%. Testing of the update to the projected height of species 1 was completed against other methods which have been refined since 2015. It was found that this update resulted in heights generally overestimated by approximate two metres on a 30 metre tall stand. One other item of note in the testing was some error in scenarios where the height of species 2 is taller than species 1. In areas on the coast, this issue was noted in stands where Hw was species 1 and Fd was species 2. For example, Hw80/Fd20 stands were being updated incorrectly because the Fd was actually taller than the Hw by six metres. So the VRI polygon PROJ\_HT1 would be updated to 42 metres where in fact this was the Fd height (Hw, the leading species, had a height of 36 metres). There are less than 50 hectares within the LiDAR CFMLB area where Fd is the secondary species and Hw was the leading species.

This update was incorporated into the published 2015 BCGW VRI, along with subsequent years. The LEFI area is shown below:



#### Figure 2. LiDAR enhanced forest inventory area.

The Kingcome Phase I VRI was completed in 2003 and was based on aerial photography taken in 1996. Phase II ground sampling and net volume adjustment factor (NVAF) sampling were completed in 2004. Phase II inventory analysis indicated that the unadjusted volume in the THLB was underestimated by approximately 9% with a sampling error (at the 95% probability level) of 12.3%. Phase II adjustments (using Variable Density Yield Projection (VDYP) 6) were applied in the previous analysis.

For this TSR, for both the Kingcome and Strathcona portions of the North Island TSA, FAIB is recommending using the unadjusted Phase I data. Since each of the VRIs have been undertaken, the original Strathcona and Kingcome TSAs were split, with the Vancouver Island portions recombined as the North Island TSA. The population combinations and old Phase II audit data from the old TSAs make the application of Phase II information difficult, and may increase uncertainty of the TSR.

FAIB has completed an audit of the mature inventory within the North Island TSA. The audit compares the stand age, stand height and net merchantable volume between Phase I VRI and ground sample data collected since the VRI. The summary includes 6 Change Monitoring Inventory (CMI) plots, 19 Phase II VRI samples in the former Kingcome TSA area, and 50 Phase II VRI samples in the former Strathcona TSA area. Though the sample size is relatively small, the review shows that inventory age, height and volume are not significantly different from ground measurements, at a 95% level of probability; however, all sample groups suggest a consistent trend to underestimate volume.

Post-stratification of live volume by leading inventory species also show no significant differences across all samples, except for the Strathcona TSA, where the 'other' species group (comprising mostly Cw leading) shows a significant inventory volume underestimate in this category. This is caused by both an underestimate of Cw volume combined with leading species mismatches between the VRI and ground samples. There is a 79% agreement in the live leading species classification with the Kingcome samples, and a 60% agreement with the Strathcona samples.

The forest inventory data set to be used for the timber supply analysis was published in January 2018 on the British Columbia Geographic Warehouse<sup>1</sup> (BCGW). Inventory attributes (e.g., age, height, volume) in this data were projected to 2018. This data set incorporated harvest depletion updates from RESULTS. Further to the BCGW depletions, the cutblock layer (produced by FAIB) was used to deplete cutblocks to 2020.

#### Data source and comments:

BCGW file WHSE\_FOREST\_VEGETATION.VEG\_COMP\_LYR\_R1\_POLY (LiDAR areas = where project = 'LIDAR\_UPDATE\_2015), WHSE FOREST VEGETATION.VEG CONSOLIDATED CUT BLOCKS SP

# 5.2 Ecosystem mapping

British Columbia has an extensive biogeoclimatic ecosystem classification (BEC) program. In the North Island TSA, mapping of climatic zonal and subzonal classification is available. In addition to the BEC layer, terrestrial ecosystem mapping (TEM) is available for most of the TSA. A combined BEC/TEM layer coverage was created for use in any analysis requiring subzone management units. The TEM layer was used where available, with BEC filling in where the TEM was not available.

#### Data source and comments:

BCGW files WHSE\_FOREST\_VEGETATION.BEC\_BIOGEOCLIMATIC\_POLY and WHSE\_TERRESTRIAL\_ECOLOGY.STE\_TEM\_ATTRIBUTE\_POLYS\_SVW. TEM projects without variant were excluded. In areas where there were multiple TEM projects overlapping, the most recent one was used.

## 5.3 Site productivity

Site index is a measure of site productivity based on the top height (m) of a stand at breast-height age 50. In the North Island TSA several sources of information on site productivity exist that may be used as input to growth and yield models for deriving managed stand volume tables.

<sup>&</sup>lt;sup>1</sup> The British Columbia Geographic Warehouse is the source for land and resource data managed and made available by the BC government. See <u>https://www2.gov.bc.ca/gov/content/data/geographic-data-services.</u>

- Forest inventory site index-based estimates of height and age from aerial photography.
- A provincial site productivity layer developed by FLNRORD (led by FAIB) based on either Site Index Estimates by Biogeoclimatic Ecosystem Classification Site Series (SIBEC) relationships or default biophysical model.

Site index based on forest inventory attributes is believed, as determined in other management units, to underestimate the potential site productivity for younger and older stands. In the base case, the provincial site productivity layer estimates will be used. For the North Island TSA, the provincial site productivity layer site index estimates are based on a SIBEC approach. The SIBEC approach assigns a potential site index to the site series identified from ecosystem mapping. The potential site index to site series values are derived from an extensive standardized field base sampling and compilation process.

#### **Data source and comments:**

Information and data associated with the site productivity layer can be found here: <u>https://www2.gov.bc.ca/gov/content/industry/forestry/managing-our-forest-resources/forest-inventory/site-productivity</u>

# 6. Land Base Definition

## 6.1 Introduction

This part of the data package outlines the steps used to identify the Crown Forest Management Land Base (CFMLB) and the timber harvesting land base (THLB). These land base simplifications are used for analysis purposes and do not confer or imply additional management restrictions.

The CFMLB consists of provincial Crown land with forest cover that is managed by FLNRORD for timber supply and/or other forest management objectives that impact timber supply within the TSA. The CFMLB excludes:

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

- private lands; and,
- lands under federal jurisdiction (e.g., National Parks and Indian Reserves).

Provincial lands not included in TSA AAC determination, such as:

- community forests (CFs);
- tree farm licences (TFLs);
- controlled recreation areas;
- woodlot licences (WLs);
- First Nations woodland licences (FNWLs); and,
- non-forested and unproductive lands with no impact on forest management objectives.

The THLB is that portion of the CFMLB that is modelled as available for timber harvesting. Any area in which some (modelled) timber harvesting will occur remains in the THLB, even if the area is subject to other management objectives such as wildlife habitat that limits timber harvesting. The THLB excludes:

- parks and protected areas;
- areas that are not suitable for timber production; and,
- areas where timber harvesting is fully incompatible with management objectives for other resource values.

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.

For the North Island TSA timber supply analysis, the land base will be rasterized into one hectare cells rather than maintained as a vector-based polygons. Linear features such as roads and riparian area will be modelled as aspatial reductions of THLB and/or CFMLB that are distributed at the raster level (i.e., semi-spatial).

The table below, which is commonly called the netdown table, summarizes the classification of the CFMLB and THLB. The netdown table is a draft and is subject to change based on input during the review and comment period for the draft data package. Each factor in this table is further described in following sections.

The following definitions clarify terms used in the table below:

- "NI TSA Boundary Area" is the total area of the factor within the TSA boundary; Ocean is the first reduction, to "NI TSA Gross Area"; Other water features are excluded under the non-forest factor.
- "Within Section 8 Decision Area" is the gross area of the factor less the area of non-provincial lands and lands not managed within the TSA AAC (i.e., the area that the chief forester will consider in her Section 8 AAC decision).
- "Unique area excluded from THLB" shows the area for each factor that was uniquely excluded from the THLB (i.e., not overlapping with other netdown factors).
- "Future Timber Harvesting Land Base" is the THLB after the first future harvest rotation when future roads (not yet built) and future WTRAs (not yet set aside) are removed.

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Netdown factor	Within gross land base (ha)	Within TSA Section 8 decision area (ha)	Percent of Section 8 decision area (%)	Unique area excluded from THLB (ha)
North Island TSA Boundary Area	2 426 749			
Ocean	677 289			
North Island TSA Gross Area	1 749 460			
Non-provincial lands	244 982			
Not managed within TSA AAC	789 755			
Section 8 Decision Area <sup>1</sup>		714 726		
Non-forest <sup>2</sup>		184 783	25.9	184 783
Roads, trails, landings*		8 180	1.1	7 386
Crown forest management land base (CFMLB)		522 557		
Provincial parks & reserves		275 500	38.5	137 685
Recreation sites		11 507	1.6	8 067
Recreation trails*		35	0.0	33
Inoperable		110 023	15.4	72 256
Terrain stability <sup>3</sup>		78 894	11.0	38 715
Sites with low growing potential		211 148	29.5	58 401
Problem forest types		7 833	1.1	249
Landscape-level biodiversity - Old Growth Management Areas (OGMA)		47 828	6.7	13 996
Stand-level biodiversity - Wildlife tree Retention Areas (WTRA)*		1 166	0.2	759
Wildlife habitat areas		13 345	1.9	1 568
Ungulate winter range		13 456	1.9	314
Riparian reserves & management areas*		21 532	3.0	9 155
Archaeological sites		3 908	0.5	1 892
PSP & Research Installations		827	0.1	708
Karst		3 542	0.5	1 254
Current timber harvesting land base		177 505		
Future WTRA		9 609		
Future roads		TBD		
Future timber harvesting land base		TBD		

Table 4.Draft netdown table to identify crown forest management land base (CFMLB) and timber<br/>harvesting land base (THLB) for the North Island TSA

\*These factors (Roads, trails, and landings; Riparian reserves and management areas; Lakeshore management zone reserves; and Stand-level biodiversity) are to be modelled by a semi-spatial netdown given the raster format used for the analysis.

#### Data source and comments:

- 1. Section 8 Decision Area includes Timber Licence areas which will revert to TSA once harvested (70C).
- 2. Non-forest gross area is exluding ocean area.
- 3. Terrain stability includes a variety of netdowns from 100% netdown for unstable and environmentally sensitive areas and 40% netdown for potentially unstable areas; the netdown areas have been reduced to reflect these values.

# 6.2 Timber supply area boundary

The total area of the North Island Timber Supply Area is 2.43 million hectares. Within the TSA boundary there are areas such as water, TFLs, and provincial parks that do not contribute to the AAC as determined under the *Forest Act* Section 8 for timber supply areas.

The boundary of the North Island TSA encompasses several islands (and as a result extends quite far into the ocean). Because of the expanded boundary of the TSA, the reduction due to ocean is substantial (677 289 hectares). Ocean will be netted out first to arrive at a TSA land area of 1 749 460 hectares. The netdown table provides further information on areas that do not contribute to the AAC.

#### Data source and comments:

BCGW files:

WHSE\_ADMIN\_BOUNDARIES.FADM\_TSA

The spatial layer used is f\_own\_updated produced in April 2017 by FAIB. Ocean is where ownership IS NULL.

### 6.3 Non-provincial Crown lands

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

Table 5 shows the contribution of each ownership category to the CFMLB and the THLB based on the 2017 FLNRORD FAIB compilation of land ownership from the Crown land registry and the Integrated Cadastral Information Society. Private land is updated based on the 2017 integrated cadastral fabric. Updates to the layer were made by the Districts.

Ownership code - Description	Gross land base (hectares)	Within CFMLB	Within THLB
40N: Private	229 992	No	No
41N: Land Claim Settlement Area	6 343	No	No
50N: Federal Reserve	73	No	No
52N: Indian Reserve	6 599	No	No
53N: Federal – Military Reserve	103	No	No
54N: Federal – Dominion Government Block	1 856	No	No
99N: Crown Misc. Lease (Fairground, R&G Club site, recreation cottage site)	16	No	No
Total	244 982		

Table 5. Non-provincial Crown lands in the North Island TSA based on FAIB ownership compilation

#### Data source and comments:

The spatial layer used is f\_own\_updated produced in April 2017 by FAIB. Non-provincial Crown lands includes eight ownership codes, seven of which occur in the TSA as described in the table and one that does not occur in the TSA. The ownership code not in the TSA is 51N - Federal - National Park. F\_own areas classified at '91U' were updated to the appropriate code, as reviewed by the Districts.

# 6.4 Not managed within TSA AAC

A variety of area-based tenures exist within the boundary of the North Island TSA but are not considered in the Section 8 AAC determination for the TSA: tree farm licences, community forest agreements, woodlot licences, and First Nations Woodland Licences. For these tenures, there are separate AAC determination processes. For the current analysis these tenures are excluded from the CFMLB and THLB.

There is one controlled recreation area found within the North Island TSA. It is excluded from the CFMLB and THLB as harvest that occurs within the controlled recreation area is not recorded as part of the cut control of the TSA.

Table 6 shows the contribution to the CFMLB and THLB of the tenure categories that are not managed within the TSA AAC.

Ownership code - Description	Gross land base (hectares)	Within CFMLB	Within THLB
70C: Crown - Active Timber Licence in TSA	15 126*	No	Yes*
70U: Crown - Active Timber Licence in TFL	82	No	No
72A&B: Crown and Private Schedule "A" & "B" lands in TFL	752 855	No	No
75N: Crown - Christmas Tree Permits	0	No	No
77A&B: Crown - Awarded Woodlot Licence	29 348	No	No
78B - Crown Tenure - First Nations Woodland Licence	2 022		
79B: Community Forest	2 375		
80N - Municipal Parcels	2 350		
81U - Local, Regional Park	580	No	No
Controlled Recreation Areas	143	No	No
Total	789 755		

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

\* For the TSR analysis, the timber licences will be included in the THLB layer but will not contribute to the THLB until the expiry of the TL. They are excluded here from the total netdown area.

#### Data source and comments:

The spatial layer used is f\_own\_updated produced in April 2017 by FAIB. Controlled recreation areas are found in the BCGW file

 $REG\_LEGAL\_AND\_ADMIN\_BOUNDARIES.CONTROLLED\_REC\_AREAS\_BC.$ 

## 6.5 Timber licence reversions

Timber licences (TLs) are a form of timber tenure that gives the holder exclusive right to harvest merchantable timber from defined areas of Crown land; as such the harvest from a timber licence is not considered part of the TSA AAC. The land base associated with a timber licence reverts back to the TSA following the licence expiration; or after the merchantable timber is harvested and the licensee has requested that the lands be removed from the timber licence.

There are currently 17 timber licences within the North Island TSA. Eighty-two hectares are within the boundaries of the TFLs (and will revert to TFL). The remainder of the area (15 126 hectares) are within the boundaries of the TSA (Section 8 decision area). For the TSR analysis, the timber licences will be included in the THLB layer but will not contribute to the THLB until the expiry of the TL.

Timber licence number and holder	Net area remaining in licence (hectares)	Within CFMLB	Within THLB
TLs within TFL	82	No	No
TLs within TSA	15 126	Yes	Yes
Total	15 208	Yes	Yes

#### **Data source and comments:**

BCGW file WHSE\_FOREST\_TENURE.FTEN\_TIMBER\_LICENCE\_POLY\_SVW (for expiration) and Tenures Branch (for list of active TLs).

### 6.6 Non-forest

Non-forested lands with no impact on forest management objectives do not contribute or impact timber supply, as such, for modelling of the base case, these lands are excluded from the CFMLB.

Areas classified as 'not forest management land base' (FMLB = 'N') in the VRI will be excluded from the forest land base. This means that, except where the area has been previously logged, areas classified as 'non-treed', areas with a site index less than five metres, as well as ocean, alpine, wetland, lakes, rocks, shrubs, etc., are excluded from the forest land base wherever these attributes are available in the inventory.

Areas which were still considered FMLB in the VRI, but were also classified as lakes and wetlands in the riparian layer were also removed as non-forest.

Description	Total (hectares within Section 8	Within CFMLB	Within THLB
	Decision Area)		
FMLB = N	183 063	No	No
Lakes where FMLB = Y	235	No	No
Wetlands where FMLB = Y	1 486	No	No
Total	184 783		

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

#### Data source and comments:

BCGW file WHSE\_FOREST\_VEGETATION.VEG\_COMP\_LYR\_R1\_POLY (2017 projection), WHSE\_BASEMAPPING.TRIM\_EBM\_WATERBODIES, WHSE BASEMAPPING.TRIM EBM WETLANDS.

# 6.7 Roads, trails, and landings

Productive forest land is lost due to permanent roads, trails and landings (RTL) and maintained transmission lines. 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**

Several provincial sources of information on roads are available for the North Island TSA. The Provincial Consolidated Roads layer is a composite of multiple spatial data sources (Digital Road Atlas, Forest Tenures, Terrain Resource Information Management (TRIM), Oil and Gas Commission, and RESULTS) that was created for use in provincial cumulative effects projects. It will be used in the base case as the most comprehensive source for road network information.

The roads are represented by lines in the spatial data and the area permanently maintained as cleared right of way must be estimated. In the base case, the non-forested area around roads will be approximated by applying a buffer around the road lines to represent the average width of the right of way.

Highways were classified based on the digital road atlas layer and road class: freeway, highway, arterial, collector, local, or if the road surface was paved. Mainlines were delineated using a script developed by FAIB staff for another project where main roads were required. Based on a comparison with known mainlines within the TSA, district staff confirmed the accuracy of the mainlines delineated with this script. The remaining roads in the bc\_ce\_roads layer were assumed to be branch/spur roads.

Road buffers were determined based on past widths used in the TSA, comparison to other TSAs and licensee input (weighted according to chart proportion). The table below shows the proposed buffer widths to be used in the base case. The analysis is done using a one hectare rasterized land base, so RTL will be incorporated semi-spatially by reducing the THLB and CFMLB by an appropriate aspatial reduction factor based on the calculated percent overlap of the buffered road, on a raster by raster basis.

Other linear features such as transmission lines, railways and pipelines have been included in the Other RoW category, and have been removed in the same way as the roads. The total area removed from the Section 8 decision area, as a result of existing RTL, was 8180 hectares.

Roads use classes	Modelled buffer width (metres)	Within CFMLB	Within THLB
Highway	8 (16m total)	No	No
Mainline	5 (10m total)	No	No
Branch/Spur	4 (8m total)	No	No
Other RoW	As mapped (no buffer)	No	No

#### Table 9. Roads within the North Island TSA

#### **Data source and comments:**

Highways from WHSE\_BASEMAPPING.DRA\_DGTL\_ROAD\_ATLAS\_MPAR\_SP Mainlines from TSA\_48 CLUS layer (CLUS\_ProcessCEFIntegratedRoads.py) Branch/Spur Roads: BC\_CE\_IntegratedRoads\_2017\_v1\_20170214.gdb was created by FLNRORD geospatial services staff in February 2017.

The integrated roads include BCGW files DRA\_DGTL\_ROAD\_ATLAS\_MPAR\_SP, TRIM\_TRANSPORTATION\_LINES, ABR\_ROAD\_SECTION\_LINE, FTEN\_ROAD\_SECTION\_LINES\_SVW, RSLT\_FOREST\_COVER\_INV\_SVW.

Summaries are based on separated layers, but resultant incorporates combined layer of all road netdowns proportionalized by raster.

Transmission Lines (Other RoW) are from this layer: WHSE\_TANTALIS.TA\_CROWN\_RIGHTS\_OF\_WAY\_SVW

#### **Future RTL**

As development occurs in the TSA, additional area will become permanently non-forested due to future RTLs. The timber volume from the area occupied by the new roads and trails would be assumed available for an initial harvest and not available for later harvests. A review of permanent access structures in RESULTS will be completed and an aspatial percent netdown applied after the first harvest to account for future roads.

# 6.8 Provincial parks and miscellaneous reserves

Over 15.7% of the gross land base in the North Island TSA is provincially designated for the protection of its natural environment. Such protection is afforded under various designations including Crown Ecological Reserve, Crown Provincial Park Class A, B and C, Crown Provincial Park Equivalent or Reserved, Crown Biodiversity, Mining and Tourism Area, and Crown Miscellaneous Reserves.

Provincial Class A Parks preserve the natural environment and provide public use and enjoyment. There are 58 Class A parks in the North Island TSA; they range in size from 28 hectares (Loveland Bay Provincial Park) to 162 416 hectares (Strathcona Provincial Park).

Provincial Class B parks differ from Class A parks in that a Class B park may permit a broader range of activities and uses provided that such uses are not detrimental to the recreational values of the park. There is one Class B park (Strathcona-Westmin Park) in the North Island TSA, totalling 3086 hectares.

The requirements for the management of Class C parks with respect to restricting the alienation of interests and protecting natural resources is identical to those for Class A parks. Class C parks differ from Class A parks in that a Class C park must be managed by a local board appointed by the minister. They are generally small parks providing local recreational amenities. There are two Class C Parks in the North Island TSA, ranging from 3 to 10 hectares in size (Kin Beach, Kitty Coleman Beach).

Protected areas generally have one or more existing or proposed activities that are not usually allowed in a park (e.g., industrial roads). There are three protected areas in the North Island TSA, ranging in size from 15 to 1680 hectares (Elk Falls, Small Inlet, Hisnit River Watershed).

Ecological reserves preserve representative and special natural ecosystems, plant and animal species, features and phenomena. There are 16 in the North Island TSA; they range in size from 11 hectares (Solander Island) to 29 590 hectares (Checleset Bay – 474 hectares in the Section 8 Decision Area).

Parks, Protected Areas, Ecological Reserves and Miscellaneous Reserves will be 100% netdowns in the TSR. The areas reflected in the table below include land areas within the Section 8 Decision Area only.

Ownership code	Total (hectares within Section 8 Decision Area)	Within CFMLB	Within THLB
60N – Provincial Park/Protected Area/Ecological Reserve	274 897	Yes	No
69N/U – Misc. Reserves	603	Yes	No
Total	275 500		

Table 10. Protected areas not managed within the North Island TSA allowable annua	ıl cu
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#### Data source and comments:

BCGW file WHSE\_TANTALIS.TA\_PARK\_ECORES\_PA\_SVW and f\_own\_updated. Areas used were from f\_own\_updated, as they exclude water areas included in park/reserve total areas.

There are a large number of parks and protected areas within the North Island TSA, the 10 parks with the largest areas are listed below:

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Name	Total (hectares within Section 8 Decision Area)	Within CFMLB	Within THLB
Strathcona Park	162 416	Yes	No
Brooks Peninsula Park (Muqqiwn)	35 997	Yes	No
Cape Scott Park	16 901	Yes	No
Tahsish Kwois Park	10 963	Yes	No
Schoen Lake Park	8 779	Yes	No
Woss Lake Park	6 497	Yes	No
Nimpkish Lake Park	3 888	Yes	No
Lowe Tsitika River Park	3 603	Yes	No
Main Lake Park	3 472	Yes	No
Strathcona – Westmin Park	3 086	Yes	No
Other Parks and Protected Areas	19 898	Yes	No
Total	275 500		

#### Table 11. Largest parks and protected areas within the North Island TSA

### 6.9 Recreation sites and trails

Recreation features are features on the land base that are important for public and commercial recreation activities. These features, such as wildlife viewing areas, camp sites, and sheltered moorage areas, can result in the exclusion of harvest activities.

In 2006, a Government Actions Regulation (GAR) Order identified Significant Recreation Features (sites and trails) within the Campbell River Forest District. The Order identifies recreational features from the Recreation Features Inventory having significant recreation value. The designation results in protection under FRPA's Forest Planning and Practices Regulation (FPPR). Although not specifically prohibited, timber harvesting may not 'damage or render ineffective' the recreation feature. For this analysis, Significant Recreation Sites identified in the Order will be excluded from the THLB.

The trails under the DCR GAR Order do not require a buffer and licensees are encouraged to log over the trail and restore it to working condition in most cases. The only trail of high value that the Recreation Officer has suggested buffering is the Kusam Climb trail, which he suggested be buffered by 1.5 tree lengths, and that area removed from the THLB. Only 1.5 km of the full 17 km trail fall within the area subject to this determination, hence the impact will be negligible will not be modelled.

Additional areas within the TSA are managed for recreation purposes, and are identified in the BCGW layer (FTEN\_RECREATION\_POLY\_SVW). Some of these areas have objectives which are grandfathered, and legal under FRPA Section 180 and 181. These polygons (both with grandfathered objectives and without), have limited harvest as approved by the Recreation Officer, only if harvest does not damage or render ineffective the recreational experience. Current practice is to retain the recreational areas to maintain social license. For this analysis these polygons will be removed from the THLB.

Additional trails in use are identified in the BCGW layer (FTEN\_RECREATION\_LINES\_SVW). These trails do not have legal protection from harvest and will not be buffered or removed from the THLB for this analysis.

There are four Orders Establishing a Sensitive Area and Objectives in DCR (2003) (Nootka Trail, Heriot Ridge, Hyacinthe Point, and Saltwater Lagoon). All have recreation and other objectives associated with biodiversity and visual management. It is anticipated that the other values will be the most constraining. For this analysis no netdown will be made to the THLB under recreation.

Areas designated as Crown Use, Recreation and Enjoyment of the Public (UREPs) fall under *Land Act* reserves, without having designation under other legislation they are not reserved from harvest. There is one area that falls under this designation in the TSA (Mount Cain Alpine Park). This area falls within the TFL (Removed from the CFMLB and THLB under 'Not managed within TSA AAC').

The Beaver Lodge Forest Trust Lands in Campbell River are managed according to the terms of the *Beaver Lodge Lands Trust Renewal Act* for experimental work in reforestation and forest management. There has been no harvest in recent history and no immediate harvest is planned. These lands are removed as 68U – Forest Recreation Reserves.

Category	Total (hectares within Section 8 Decision Area)	Within CFMLB	Within THLB
DCR – GAR polygons	9 249	Yes	No
Active recreation sites	3 074	Yes	No
Active and pending recreation reserves	988	Yes	No
Sayward LUP - 100% recreation netdown	Covered under DCR - GAR	Yes	No
Sensitive Areas	1 070	Yes	Yes
61C - UREPs	112	No	No
68U - Forest Recreation Reserves	3 946	Yes	No
Total*	11 507		

Table 12. Considerations for recreation areas

\*Note that hectares in each category are not additive as some classifications overlap. The total at the bottom accounts for the overlap.

#### **Data source and comments:**

 $f\_own\_updated \ and \ BCGW \ files \ WHSE\_FOREST\_TENURE.FTEN\_RECREATION\_POLY\_SVW \ and \ WHSE\_FOREST\_TENURE.FTEN\_RECREATION\_LINES\_SVW.$ 

Category	Trail km	Total (hectares within Section 8 Decision Area)	Within CFMLB	Within THLB
DCR – GAR trails	139 km	0	Yes	Yes
Active recreation trails	317 km	0	Yes	Yes
Sayward LUP – Snowden trails	36 km	36	Yes	5m buffer (10m full)
Total		36		

Table 13. Recreation trails

#### Data source and comments:

f\_own\_updated and BCGW file WHSE\_FOREST\_TENURE.FTEN\_RECREATION\_LINES\_SVW.

Data layers sourced from <u>https://www2.gov.bc.ca/gov/content/industry/crown-land-water/land-use-planning/regions/west-coast/vancouverisland-lup/campbell-river</u> (Sayward Raw Data - say\_snow for boundary of Snowden Demonstration Forest, and say\_snow\_trails for the trails to which the order applies).

### 6.9.1 Sayward – Snowden Recreation Trails

Under the Sayward Landscape Unit Plan (SLUP), an Order Establishing a Recreation Trail Objective (2003) requires harvesting and/or road building within 10 metres of an established trail within the Snowden Forest to be approved by a Statutory Decision Maker (SDM). Harvest is not prohibited but has not yet been approved on any occasion. Because of the requirement for approval, it is assumed that there would be situations where it would not be approved. For this analysis a 10 metre buffer will be applied to the trails and 50% of that area will be removed from the THLB (a five metre effective buffer). This is accounted for in Table 13 above.

### 6.9.2 Sayward – Snowden Recreation Area

Within the Snowden Recreation Area, BC Timber Sales (BCTS) has agreed to operate under a harvest restriction where harvest is limited to 50 hectares over five years (10 hectares/year). The Snowden Recreation Area makes up less than 1% of the total CFMLB. This agreement will be modelled using a disturbance constraint that limits the rate of harvest from this area. Based on draft THLB area in the Snowden (2068 hectares), no more than 2.4% of the THLB can be less than five years at any given time.

### 6.10 Inoperable areas

Operability is based on the presence or absence of physical barriers or limitations to harvesting, applicable logging methods and the merchantability of stands. For the areas of the North Island TSA previously in the Strathcona TSA, the Strathcona TSA Licensee/Agency Group undertook an operability study in 2010 to define a land base that is likely to be economically viable for harvest throughout a full market cycle. The study methodology included the development of road networks, harvest system classification, harvest cost and net stand value estimates jointly developed by licensees as inputs to the Patchworks Forest Estate Model to find the largest land base possible while still generating a reasonable economic return (\$/m<sup>3</sup>) to the Crown over time. The operable land base determined in the study was 7% larger than the operable land base used in the previous TSR.

In the last Strathcona TSR there were concerns expressed by district staff, licensees and BCTS staff. The district staff had reservations about the reliability of future road projections used in areas of sensitive soils. The licensees expressed concern that some previously logged areas were identified as inoperable. BCTS staff expressed concern that the operability may be overestimated. The operability assessment was accepted as an improvement over the previous mapping, however, the chief forester requested that district, BCTS and licensee staff review the operability assumptions and either confirm or adjust prior to the next TSR.

For the areas of the North Island TSA, previously in the Kingcome TSA, a different methodology was used. In TSR 2, it was noted that the operability assessment significantly understated the economic availability of timber on the TSA. To address this in TSR 3, *The Kingcome TSA Economic Operability Study* was completed in 2006 (*Kingcome TSA Economic Operability Assessment*, Timberline, 2006). This model was applied to all commercial species including cottonwood and alder, and was based on a value index, i.e., the difference between timber values and delivered wood costs for each stand of timber. The model was based on 2006 delivered wood costs, 10-year median log price selling price table and representative log grade distributions. It was necessary to establish a value index threshold to determine profitability. A review of cutting permits was used to determine the value index cut-off. The review showed that higher value stands frequently offset the cost of development of marginal (negative margin) stands, making them economically viable under some market conditions. A value index cut-off of -\$10 was determined appropriate, consistent with the review of the cutting permits.

Several sensitivities were done to address operability concerns in the last Kingcome TSR, along with specific comments in the AAC rationale. The area of the Kingcome now in the North Island is a small proportion of the previous TSA (19% contribution to THLB). The issues identified with the operability were related to the mainland, remote areas of the TSA which were under ecosystem based management. These areas are not in the North Island TSA.

For this TSR, a review of harvest performance was completed, to assess how much past harvest was within the economically operable land base as defined by the Kingcome and Strathcona operability assessments. Approximately 25% of the CFMLB (less Provincial Parks and Miscellaneous Reserves) is considered inoperable. Less than 5% of harvesting since 2000 has occurred in areas not considered operable.

Based on the harvest performance review, the operability assessments for both the Kingcome and Strathcona adequately capture and represent the lower bound of operability within this unit. The sites with low timber growing potential, problem forest types and non-productive have been reviewed/refined to capture any areas that may be overstated in the economically operable land base.

Areas classified as inoperable which have been logged since 2000, have been reclassified as operable. Areas previously identified as helicopter operable, which have since had roads built in them, have been reclassified with a harvest system of conventional.

There is a small area (3573 hectares) which are within the Section 8 Decision Area, not removed from the THLB under other factors, but are classified as 'NotMapped' in the Strathcona operability layer. These areas were reviewed, and look more operable than not operable. They were left in the THLB.

Category	Operability layer (hectares within Section 8 Decision Area)	Harvested since 2000 (hectares)	Total (hectares within Section 8 Decision Area)	Within CFMLB	Within THLB
Inoperable (Kingcome)	63 232	807	62 425	Yes	No
Inoperable (Strathcona)	45 372	161	45 211	Yes	No
Inoperable (previously logged – Strathcona)	3 373	986	2 387	Yes	No
Total inoperable	111 977	1 954	110 023		

Table 14. Area identified as inoperable for harvesting in the North Island TSA

#### Data source and comments:

Data from Strathcona TSR dataset – oper\_cls, and Kingcome dataset – WHERE op\_ald\_40=-999999 OR op\_ald\_40<-10

# 6.11 Unstable terrain

Terrain stability mapping (TSM) provides an assessment where existing or potential development may be affected by landslide hazards or slope stability. TSM has replaced environmentally sensitive area (ESA) mapping that was a component of the older forest cover inventory.

Different terrain data exists for different areas of the North Island TSA. In the former Strathcona areas of the TSA, reconnaissance level mapping of terrain stability for areas with sensitive soils was completed by a qualified registered professional for the whole TSA between 1992 and 1998. District staff have accepted the accuracy of the mapping.

For the former Kingcome areas of the TSA, the 1978 ESA mapping for areas of sensitive terrain was used in the last TSR, and is known to have some limitations. In particular, no areas of moderately sensitive terrain (Es2) have been mapped. Es2 is roughly the equivalent of terrain class IV. In previous TSRs, forest district staff conducted a study of detailed terrain stability to attempt to quantify the potential mapping problem. That study indicated that while there appeared to be only a slight underestimation of Class V areas (Es1), a large area of potential Class IV (Es2) area is not been identified. While the ESA data is the most recent strategic terrain coverage available in the former Kingcome TSA, the issues are known. Current slope-based factors will be used for the terrain netdown in the former Kingcome, correlated with harvest performance since 2000. This will more accurately capture the potential class IV terrain, while still capturing class V terrain as well. Areas above the 95<sup>th</sup> percentile of slopes where harvesting has occurred will be removed (areas > 60% slope).

Harvesting occurs on some areas with sensitive soil, in accordance with the requirements of the *Forest* and *Range Practices Act* (FRPA); therefore, their complete removal from the THLB would not reflect current practice. Table 15 shows the categories that are excluded from the THLB within the former Strathcona and Kingcome TSA areas. Ministry staff expect harvest to increase within the potentially unstable polygons as licensees move out of the more accessible areas.

Source	Description (stability category)	Total (hectares within Section 8 Decision Area)	Percent reduction	Area reduction (hectares within Section 8 Decision Area)	Within CFMLB	Within THLB
Reconnaissance	Unstable (S001 - U)	34 868	95	33 125	Yes	No
TSM (Former Strathcona TSA area)	Kyuquot Potentially unstable (S002 - P)	68 648	40	27 459	Yes	No
	Other Potentially unstable (S002 - P)	8 012	50	4 006	Yes	No
Slope raster (Former Kingcome TSA area)	> 60 slope based on one hectare raster	14 304	100	14 304	Yes	No
Total		125 832		78 894		

Table 15.	Description o	f unstable terro	in deduction.	s within the	former	Strathcona	TSA areas

#### **Data source and comments:**

Terrain data (Reconnaissance TSM) from previous Strathcona TSRs. FAIB cutblocks (2018) layer for harvest performance, and one hectare slope raster, for former Kingcome TSA area.

## 6.12 Sites with low timber growing potential

Sites may have low productivity because of inherent site factors such as nutrient availability, exposure, excessive moisture, etc. Some of these stands are unlikely to grow a merchantable crop of trees. There is variability between harvest areas in what is considered 'low' based on site conditions relating to operating costs.

Harvest performance was reviewed for the last five years of harvest, through a spatial overlay of harvest areas on the VRI. Approximately 5% of harvest occurred in stands with VRI volumes less than  $300 \text{ m}^3$ /hectare, and there was no significant difference in this between ground-based (< 40 percent slope) and cable-based slopes (> 40 percent slope).

For the base case, in conventional areas (as defined by operability layer), mature stands that do not reach a volume of 300 m<sup>3</sup>/hectare by the time they reach an age of 150 years will be removed from the THLB. This cut-off is consistent with maintaining areas where 95% of past harvest occurred, in the THLB.

On the coast, there are often challenges associated with harvest of helicopter stands, particularly lower value hemlock-balsam stands. Helicopter harvested stands are often higher volume, with a higher Cw component to be profitable enough to cover costs of harvest. In helicopter areas, all stands that do not reach a volume of  $450 \text{ m}^3$ /ha by the time they reach 150 years will be removed. This is consistent with what has been included in other coastal TSRs. The contribution of helicopter stands with low Cw component will be examined in the next factor.

These low volume 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 CFMLB.

Source	Total (hectares within Section 8 Decision Area)	Within CFMLB	Within THLB
Conventional - VDYP volume at age 150 < 300 m <sup>3</sup>	115 634	Yes	No
Helicopter - VDYP volume at age 150 < 450 m <sup>3</sup>	83 465	Yes	No
Helicopter - TIPSY volume at age 150 < 450 m <sup>3</sup>	12 049	Yes	No
Total	211 148		

#### Data source and comments:

WHSE\_FOREST\_VEGETATION.VEG\_COMP\_LRY\_R1\_POLY (2012), ECAS, Data from Strathcona TSR dataset – harv\_sys, and Kingcome dataset – r1\_acc\_des, modified based on buffering existing roads.

## 6.13 Problem forest types (non-deciduous)

Problem forest types are stands that are physically operable but are not currently utilized or have marginal merchantability. Problem forest types are excluded from the THLB but included in the CFMLB. Deciduous species are discussed separately in a below section.

In previous TSRs for both the Strathcona and Kingcome TSAs, pine-leading stands were removed. In this analysis, pine-leading stands will be removed.

There has been some concern on the coast about the viability of harvesting hemlock stands with little cedar component, where the harvest system is identified as helicopter. In order to understand the possible contribution of heli-hembal problem forest types to the timber supply, it will be tracked, and if necessary, a sensitivity analysis excluding these areas (or a portion of the areas with lower Cw component) will be completed.

Description	Total (hectares within Section 8 Decision Area)	Within CFMLB	Within THLB
Pine	7833	Yes	No

Table 17. Problem forest types criteria

#### Data source and comments:

WHSE\_FOREST\_VEGETATION.VEG\_COMP\_LRY\_R1\_POLY

## 6.14 Deciduous

The demand for deciduous (broadleaf) sawlogs in the TSA is limited, but present. Some Red Alder is harvested and some re-planting of alder occurs. There are a limited number of areas with other deciduous species leading, which are likely associated with riparian areas. For the current TSR, deciduous-leading stands will not be excluded from the THLB and will be modelled separately to determine contribution. It is assumed that most of the non-alder deciduous-leading stands will be removed in the riparian factor.
Table 18. Deciduous

Description	Total (hectares within Description Section 8 Decision Area)		Within THLB
Deciduous-leading stands	6735 (96% Dr)	Yes	Yes

#### **Data source and comments:**

WHSE\_FOREST\_VEGETATION.VEG\_COMP\_LRY\_R1\_POLY. A deciduous-leading stand is where the spec\_cd\_1 is a deciduous species.

### 6.15 Landscape level biodiversity

### 6.15.1 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. OGMAs are usually comprised of "old forests" but may also capture younger forests or unusual/rare features that have importance to the landscape as a whole.

Landscape-level biodiversity objectives for old-seral forest types originate from the Order Establishing Provincial Non-Spatial Old Growth Objectives (NSOGO). Following that order, spatial OGMAs have been established through Ministerial Orders for Land Use Objectives. Some LUs have legal OGMAs, some have Section 8 draft OGMAs (meeting the intent of the NSOGO), and others continue to follow the NSOGO either aspatially according to Biodiversity Emphasis Option (BEO) and Natural Disturbance Type (NDT) or spatially, through licensee draft OGMAs that meet the NSOGO. The following table shows which LUs fall into each category:

Legal Order	Section 8 (Draft)	Licensee Draft	NSOGO (BEO)
Lower Nimpkish	Artlish	Burman	Bonanza (Intermediate)
Malcolm	Kashutl	Eliza	Holberg (Low)
Marble	Tahsish	Gold	Keogh (Low)
Nahwitti		Kaouk	Klaskish (High)
Salmon		Mahatta	Nigei (Low)
San Joseph		Neroutsos	Oyster (Low)
Sayward		Nootka	Puntledge (Low)
Shushartie		Tahsis	Trent (Low)
Tsulquate		Tlupana	Tsolum (Low)
Upper Nimpkish			
White			

Table 19. Old growth management areas in the North Island TSA

Within the legal and Section 8 OGMAs, certain operational activities are generally permissible if necessary, however incursions must be replaced. The same approach applies for the licensee draft OGMAs.

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The VILUP Higher Level Plan Order has old growth-specific objectives for one special management zone (SMZ) and five enhanced forestry zones (EFZs), in addition to the mature and old-seral requirements in the next section. The Pinder-Atluk SMZ is within the Lower Nimpkish LU which has legal OGMAs established (Objective 12). The Nimpkish EFZ (Objectives 13, 13.1) and Salmon EFZ (Objective 14) are within the Lower Nimpkish and Salmon LU, respectively, and both have OGMAs established. The Bonanza EFZ (Objective 10) is within the Bonanza LU. Objective 10 allows for the full target of 13% old growth retention in CWHvm1 to be reduced by up to one-third to avoid severe social and economic consequences, provided that second-growth recruitment is identified.

For the base case, all legal, Section 8 and draft OGMAs will be removed from the land base. For the areas without draft OGMAs, an aspatial approach will be used to model the targets set out in the NSOGO. The base case will model the full targets set out in the NSOGO. A sensitivity will be done to examine the impact of implementing a 2/3 drawdown of those LUs with a low BEO, and in the case of the Bonanza (Intermediate BEO), 1/3 drawdown (from full 13%) in accordance with VILUP objective 10.

Description	Total (hectares within Section 8 Decision Area)	Within CFMLB	Within THLB
OGMAs (legal)	18 608	Yes	No
OGMAs (non-legal - Section 8)	7 771	Yes	No
OGMAs (licensee draft)	21 449	Yes	No
Aspatial management (NSOGO)	To be modelled		
Total	47 828		

Table 20. Old growth management areas in the North Island TSA

#### **Data source and comments:**

BCGW file WHSE\_LAND\_USE\_PLANNING.RMP\_OGMA\_NON\_LEGAL\_CURRENT\_SVW, WHSE\_LAND\_USE\_PLANNING.RMP\_OGMA\_LEGAL\_CURRENT\_SVW, Licensee draft OGMAs.

#### 6.15.2 VILUP SMZ mature and old seral requirements

VILUP legal order (Objective 1) requires mature and old forest cover retention for all special management zones (SMZs). There is a requirement to retain, if it is available, or recruit within 50 years, mature and old seral forest to meet the specified target of 25 to 33% of the forested area of each SMZ. Mature seral stage is defined as 81 to 121 years depending on the stand type, while old is defined as greater than 250 years. Some LUs have further VILUP old growth objectives which are covered in the next section.

For this analysis, 25% of the CFMLB of each SMZ will be maintained as mature/old to meet the VILUP SMZ target.

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SMZ	#	Total (hectares within Section 8 Decision Area)	Within CFMLB	Within THLB
Goletas Channel	1	10 536	Yes	Yes
West Coast Nahwitti Lowlands	2	511	Yes	Yes
Brooks Bay	3	9 967	Yes	Yes
South Brooks-Bunsby	5	4 639	Yes	Yes
Woss-Zeballos	6	10	Yes	Yes
Johnstone Strait	7	1 750	Yes	Yes
Tsitika River	8	21	Yes	Yes
Tsitika-Woss	9	129	Yes	Yes
Pinder-Atluck	10	39	Yes	Yes
Schoen-Strathcona	11	4 446	Yes	Yes
Western Nootka Island	12	16 981	Yes	Yes
Quadra	19	969	Yes	Yes

Table 21. Special management zones with mature/old seral targets

#### Data source and comments:

WHSE\_LAND\_USE\_PLANNING.RMP\_PLAN\_LEGAL\_POLY\_SVW. Legal order can be found on this website: <u>https://www2.gov.bc.ca/gov/content/industry/crown-land-water/land-use-planning/regions/west-coast/vancouverisland-lup</u>

#### 6.15.3 Disturbance outside of the THLB

The forested land base 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 not model natural disturbance but a sensitivity analysis will be completed that incorporates natural disturbance based on return intervals defined in the 1995 *Forest Practices Code of British Columbia Biodiversity Guidebook*.

### 6.16 Stand-level biodiversity - wildlife tree retention

LUPs completed in certain LUs covered by VILUP specify WTRA target requirements by biogeoclimatic zone. These targets must generally be met over a five-year period, and meet the distribution and structural targets specified in the LUPs. The targets are specified based on biogeoclimatic zone and subzone.

For those areas without LUP WTRA objectives, the *Forest and Range Practices Act* (FRPA) establishes an objective to maintain structural diversity in managed stands by WTRA 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 forest stewardship plan (FSP). WTRAs are often located within areas that are otherwise constrained, such as riparian areas, sensitive or inoperable terrain, therefore the impact to the THLB could be less than the target retention requirement.

In addition to specific targets for WTRA, in VILUP SMZs (Objective 1) there is a cutblock size maximum of:

- 5 hectares clearcut, clearcut with reserves or seed tree silvicultural systems
- 40 hectares shelterwood, selection or retention silvicultural systems

The additional retention associated with different silvicultural systems will be captured by modelling the average (actual) historic retention percentages, summarized below.

Past WTRAs will be modelled by removing spatial polygons identified in RESULTS from 2014-2019. Spatial data input into RESULTS for WTRA prior to 2014 is not reliable and has therefore not been accounted for. Total THLB reduction for past WTRAs is 1166 hectares. Overlaps with other factors are accounted for by the netdown process.

For future WTRAs, after the first rotation, the THLB will be reduced where WTRAs must occur. This will take into consideration a 200-metre buffer placed around forested stands that are not part of the timber harvesting land base. It is assumed that WTRAs are not required within this 200-metre buffer zone.

In the remaining THLB area, future WTRAs will be applied as a semi-spatial reduction. The semi-spatial reduction is an aspatial reduction applied at the one hectare raster level based on the historic actual WTRA percentage for that LU/BEC combination. In cases where the actual WTRA % is less than the target, the target is used. RESULTS WTRAs used are shown, averaged by LU and BEC, since 2014 (when RESULTS WTRA information is considered reliable). The proportional reductions would apply to 80 265 hectares (THLB outside of the buffered area), a reduction of 9609 hectares total.

Percent WTRA applied (for areas in the THLB, and outside of the 200 metre buffer) is shown in the table below.

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Landscape unit	BEC	WTRA target (%)	Actual WTRA (%)
Adam-Eve	All	7	12.15
Artlish	All	7	11.11
Burman	All	7	16.09
Eliza	All	7	7.64
Gold	All	7	9.50
Holberg	All	7	7.15
Kaouk	All	7	13.40
Kashutl	All	7	8.11
Klaskish	All	7	22.19
Lower Nimpkish	CWHxm	11 <sup>1</sup>	9.89
	CWHvm	9	10.26
	MHmm	1	No harvest
Mahatta	All	7	9.44
Malcolm	CWHvm	10	No harvest
Marble	All	7	10.12
Nahwitti	All	7	8.81
Neroutsos	All	7	8.41
Nootka	All	7	12.37
Quadra	All	7	13.64
Quinsam	All	7	8.95
Salmon	All	7	13.08
San Josef	All	7	11.04
Sayward	CWHmm1	13 <sup>1</sup>	12.95*
	CWHmm2	10	12.95
	CWHxm	14 <sup>1</sup>	12.42*
	MHmm1	2	No harvest
Shushartie	CWHvh (within SMZ 1)	1	9.19
	CWHvh (outside SMZ 1)	0	9.19
Tahsis	All	7	8.05
Tahsish	All	7	14.58
Tsulquate	All	7	8.82
Upper Nimpkish	CWHxm	13	17.10
	CWHmm	14	No harvest
	CWHvm	9	11.10
	MHmm	3	11.13
White	All	7	9.17
All other LUs	All	7	

#### Table 22. WTRA targets in the North Island TSA

<sup>1</sup>The actual WTRA is lower than the target in these BEC zones, so target was used.

\*Data reporting for CWHmm1 and mm2 were combined (so they have the same value) but split to align with LUP target, while CWHxm 1 and 2 were split based on the data, but combined for alignment with LUP.

#### **Data source and comments:**

BCGW files WHSE\_FOREST\_VEGETATION.RSLT\_FOREST\_COVER\_INV\_SVW, WHSE\_LAND\_USE\_PLANNING.RMP\_LANDSCAPE\_UNIT\_SVW, WHSE\_FOREST\_VEGETATION.BEC\_BIOGEOCLIMATIC\_POLY and WHSE\_TERRESTRIAL\_ECOLOGY.STE\_TEM\_ATTRIBUTE\_POLYS\_SVW.

### 6.17 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 forest and range directly on aquatic resources values (e.g., water quality, aquatic ecosystem) and on the values within the surrounding area (e.g., wildlife habitat). Objectives for riparian management are identified under the Forest Planning and Practices Regulation (FPPR) and incorporated into FSPs.

Implementation of objectives include establishment of riparian reserve zones and/or riparian management zones based on riparian classification. Classification is done for lakes, wetlands and streams. For streams, the classification is dependent on stream width, fish presence and community watershed status. For lakes and wetlands, classification is based feature size and BEC. Riparian reserves require full cover retention along the stream, lake, or wetland. Riparian management zones identify some retention requirements that must be met over the stream length or water body perimeter.

At this time some data are available which assigns a classification to specific portions of specific streams but there is no single dataset which provides a stream class for each stream within the TSA. A full, classified coverage will be created, using various data sources for streams, lakes and wetlands, for use in the analysis.

### 6.17.1 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. The FPPR classification for streams takes a simpler approach and is based on stream width and fish presence, and whether the streams are within a community watershed.

As limited collation of stream classification is available for this analysis, a modelled fish passage dataset will be used in the stream classification process. This modelled dataset was created for strategic level analysis by the Ministry of Environment. This is the best overall data available, and has some known limitations.

The dataset is based on the freshwater atlas stream network which is derived from TRIM I stream linework (TRIM II streams are not included). TRIM features are delineated through airphoto interpretation and have varying degrees of accuracy - particularly when it comes to smaller streams. TRIM commonly under-represents the number of streams in the wetter, coastal areas of the province and field surveyors may regularly find small streams which do not exist in the model. The modelled fish classifications were originally created for the purposes of prioritizing sites for culvert assessment and remediation.

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. Data layers used in the fish passage model are listed below in data sources.

The fish passage data was used, in combination with stream order data and the community watersheds layer, to classify streams into FPPR classifications of S1B - S6 as shown in the table below. The linkage of stream order to classification is based on orthophoto review of stream order, and licensee operational stream classifications. The stream order divisions below aligned the most closely in the areas where they could be correlated with field information. S1A streams were derived from a separate data layer showing double line rivers (see data source, below).

Stream classification	Within community watershed	Fish habitat	Stream order
S1B	NA	Yes	>=5
S2	NA	Yes	4
S3	No	Yes	2, 3
S3	Yes	No	2, 3
S4	No	Yes	1
S4	Yes	No	1
S5	No	No	>=4
S5	No	No	2, 3
S6	No	No	1

#### Table 23. Stream classification

#### 6.17.2 Lakes and wetlands

There are two types of lakes in the North Island 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 also provide important recreational and tourism opportunities in the North Island.

Lakes are well mapped in the province and spatial data is readily available on the BCGW. Lake classification is based on lake size and the biogeoclimatic unit in which they occur.

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 a 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. Wetlands are mapped by the province and spatial data is readily available on the BCGW. FPPR wetland classification is based on the size of the wetland, the biogeoclimatic unit in which it occurs, and by its proximity to other wetlands.

#### 6.17.3 Sayward – critical stream reaches

In the Order Establishing Sayward Landscape Unit and Biodiversity and Wildlife Objectives in the Campbell River District (2003), there is a requirement to manage stand structure and protect Critical Stream Reaches (small spawning and rearing streams(S4)). The order applies to all streams identified on the map, titled Lakes Classification, requiring retention of all windfirm trees, and for S4 Streams, retaining 50% of stems within 10 metres of the channel. The buffers applied to the streams as described in the '*Riparian buffers*' section below ensure this objective is accounted for.

#### Data source and comments:

Data layers sourced from <u>https://www2.gov.bc.ca/gov/content/industry/crown-land-water/land-use-planning/regions/west-coast/vancouverisland-lup/campbell-river</u> (Sayward Raw Data).

#### 6.17.4 Sayward – Lakeshore reserve and management zones

In conjunction with the Order Establishing Sayward Landscape Unit and Biodiversity and Wildlife Objectives in the Campbell River District (2003), an Order establishing Riparian Reserve Zones and Riparian Management Zones for Lakes was also approved. This order establishes RRZs which prohibit timber harvesting in the areas identified on the Lakeshore Management map. These areas will be removed from the THLB.

The order also establishes RMZs on listed lakes, which require that, for a distance of 50 metres from the timbered edge surrounding the following lakes within the Sayward Landscape Unit: *McIvor, Beaver, Comeback, Hemp, Lawnchair, Lily, Little Mud, Pocket, Reed, Sedge, Shadow, Smolt, Star, and Whistlepunk*, that no more than 25% of the forested area be less than five metres in height. It is not expected that this will have a significant impact on timber supply, therefore, it will not be modelled.

#### Data source and comments:

Data layers sourced from <u>https://www2.gov.bc.ca/gov/content/industry/crown-land-water/land-use-planning/regions/west-coast/vancouverisland-lup/campbell-river</u> (Sayward Raw Data).

### 6.17.5 Riparian buffers

The FPPR defines the riparian reserve and riparian management zone widths of streams, lakes, and wetlands; these correspond to the older FPC *Riparian Management Area Guidebook* widths. Once classified, streams, wetlands, and lakes were buffered according to the FPPR, Forest and Range Evaluation Program (FREP), and licensee current practice, as per the table below. The table shows the total reserve zone width plus the percentage of retention in the management zone. The total buffer applied in the analysis is the combination of both. In the timber supply analysis, riparian areas will be applied as a semi-spatial THLB reduction. The semi-spatial reduction is an aspatial reduction applied at the one hectare raster level based on the calculated percent overlap of the riparian buffer zone with otherwise THLB in the raster.

These buffers represent the average buffer used operationally over the entire TSA. They can be variable between blocks. The reserve zone is required on both sides of a stream where it is applicable, unless varied in an operational plan. The management zone is flexible and determined on a site by site basis by the forest professionals. In some cases, no RMZ is left; in some cases, it is left fully on one side of a stream, and in some cases both sides have a management zone retained. The width left may also be variable depending on site conditions.

	Within a community watershed or fish bearing						
Stream class	Riparian reserve zone (metres)	Management zone width (metres)	Total riparian management area width (metres)	Percent of RMZ retention	Buffer applied to both sides of stream in analysis (metres)	Within CFMLB	Within THLB
S1A	0	100	100	60	60	No	No
S1B	50	20	70	50	60	No	No
S2	30	20	50	25	35	No	No
<b>S</b> 3	20	20	40	50	30	No	No
S4	0	30	30	25	7.5	No	No
	Not within a community watershed or fish bearing						
<b>S</b> 5	0	30	30	25	7.5	No	No
S6	0	20	20	5	1	No	No

#### Table 24.Stream buffer widths

Feature size and BEC	Class	FPPR Sec49 reserve width (metres)	FPPR Sec 49 management zone width (metres)	Percent (%) retention	Modelled buffer width (metres)	CFMLB	THLB
> 1000 hectares	L1L	0	0	0	10	No	No
> 5 hectares	L1	10	0	0	10	No	No
1-5 hectares CDF, CWH xm, CWH dm, CWH ds	L2	10	20	25	15	No	No
1-5 hectares in other BEC	L3	0	30	50	15	No	No
0.5-1 hectare CDF, CWH xm, CWH dm, CWH ds	L4	0	30	25	7.5	No	No

### Table 25. Lake based riparian management areas buffer width

Table 26. Wetlands based riparian management areas buffer width

Feature size and BEC	Class	FPPR Sec 48 reserve width (metres)	FPPR Sec 48 management zone width (metres)	Percent (%) retention	Modelled buffer width (metres)	Within CFMLB	Within THLB
Wetland complex	W5*	10	40	50	30	No	No
> 5 hectares	W1	10	40	25	20	No	No
1-5 hectares in CDF, CWH xm, CWH dm, CWH ds	W2	10	20	50	20	No	No
1-5 hectares in other BEC	W3	0	30	25	7.5	No	No
0.5-1 hectares in CDF, CWH xm, CWH dm, CWH ds	W4	0	30	25	7.5	No	No

The total area removed from the THLB for riparian (streams, lakes, and wetlands) buffers is shown in the table below.

#### Table 27. Riparian areas

Description	Area (hectares) (within Section 8 Decision Area)	Within CFMLB	Within THLB
Stream and river RMA*	19 243	Yes	No
Lake RMA*	1 069	Yes	No
Wetland RMA*	1 035	Yes	No
Sayward lakes RRZ*	382	Yes	No
Sayward lakes RMZ	423	Yes	Yes
Riparian areas*	21 532	Yes	No

\*Areas are not additive, there are some overlaps which are accounted for in the total for riparian areas. The Sayward lakes RMZ is not being modelled (not removed from the land base) as per description above.

#### Data source and comments:

Rivers: BCGW file WHSE\_BASEMAPPING.FWA\_RIVERS\_POLY

Community Watersheds: WHSE\_WATER\_MANAGEMENT.WLS\_COMMUNITY\_WS\_PUB\_SVW

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

- Stream lines: 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

BCGW file WHSE\_BASEMAPPING.TRIM\_EBM\_WATERBODIES. Lakes were classified according to criteria above. NCL are all lakes less than the minimum size criteria.

BCGW file WHSE\_BASEMAPPING.TRIM\_EBM\_WETLANDS.

\*Wetlands that meet the proximity legislation for W5 classification were classified accordingly, however the buffers were still applied on the individual wetlands, not the outer perimeter of the complex (assumption that identified buffers, merged would approximate W5 retention).

### 6.18 Wildlife habitat areas

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

Since 2001 wildlife habitat areas have been established in the North Island TSA for Northern Goshawks, Marbled Murrelet, and Red-legged frogs. The impact to timber supply varies among WHAs due to the associated general wildlife measures (GWM) and the forest composition. The majority of WHAs are no harvest areas, however some WHA have conditional harvest GWMs.

In February 2018, the Province announced a plan for further protection of marbled murrelet and northern goshawk nest/breeding areas through the release of implementation plans for each species. The implementation plans commit to increasing protected areas for both species over the next 5-7 years. A goal of an additional 168 goshawk breeding areas (200 hectares each) has been identified for the coast region, along with setting aside an additional 70 000 hectares of marbled murrelet nesting habitat. The distribution of these new protected areas has yet to be determined, but the existing proposed WHAs in the North Island TSA would be considered likely candidates to help meet the additional objectives for both species.

The table below summarizes the established WHAs, and the following table summarizes the proposed WHAs. Of the established WHAs, most areas do not allow harvesting and the remainder allow conditional harvesting. The breakdown is outlined in Table 28. The no-harvest WHAs will be removed from the THLB. Of the conditional harvest WHAs, only one falls within the TSA Section 8 Decision Area (1-005). For this area, a portion of it is covered by UWR 1-005 polygons – these areas will not be harvested. The order requires the following seral distribution is achieved in the next 60-80 years:

- A target of 25% of the forested area in 0-20 year old stands;
- A target of 15% of the forested area in 21-40 year old stands;
- A target of 15% of the forested area in 41-60 year old;
- A target of 15% of the forested area in 61-80 year old stands.

This area will be modelled using a disturbance constraint that limits the rate of harvest from this area to no more than 25% of the forested area below the age of 20 at any given time. Given full harvest of the THLB, this would approximate the seral targets above.

Category	Area (hectares) (within Section 8 Decision Area)	Within CFMLB	Within THLB
WHA – Legal (No Harvest)	11 800	Yes	No
WHA – Data Sensitive	1 446	Yes	No
Total	13 246	Yes	No
WHA – Legal (Conditional Harvest)	1 752	Yes	Yes

### Table 28. Wildlife habitat areas in the North Island TSA

#### Data source and comments:

BCGW file: WHSE\_WILDLIFE\_MANAGEMENT.WCP\_WILDLIFE\_HABITAT\_AREA\_POLY. Individual wildlife habitat area information (spatial data set, approved order and general wildlife measures) is available from <u>https://www.env.gov.bc.ca/wld/frpa/iwms/wha.html</u>.

The WHAs that are proposed but not yet established will remain in the land base for the base case but will be examined in a sensitivity analysis. The proposed WHA layer includes likely candidates for marbled murrelet WHAs. An additional layer with the areas proposed as goshawk WHAs has also been included in Table 29, and will be included in a sensitivity analysis.

Updated marbled murrelet targets are imminent, which will be used for consultation on a Land Use Order and a revised Section 7 notice that will set additional targets for marbled murrelet WHAs and OGMAs. The targets will be at the scale of the landscape unit and landscape unit aggregate.

In addition to the marbled murrelet targets, a nest centroid layer with a combination of known and modelled nests to run a foraging habitat / timber supply analysis is being created for goshawks. The goal is to mimic the federal approach to foraging habitat and run a few other scenarios as well that vary the number of home ranges and amount of foraging habitat to be maintained. If either of these data sets become available during the analysis phase, a sensitivity will be done to determine the impact.

Table 29.	Proposed	wildlife	habitat	areas in	the	North	Island	TSA
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Category	Area (hectares) (within Section 8 Decision Area)	Within CFMLB	Within THLB
WHA Proposed	4 269	Yes	Yes
Areas of Interest for WHA establishment	689	Yes	Yes
Total	4 958		

#### Data source and comments:

BCGW file: WHSE\_WILDLIFE\_MANAGEMENT.WCP\_WHA\_PROPOSED\_SP, NOGO\_AOIs\_pWHAs\_TSA48\_forFAIB\_2018Nov02.zip from West Coast Region (FLNRORD).

### 6.18.1 Section 7 Species at Risk Notices

Notices entitled "Indicators of the amount, distribution and attributes of wildlife habitat required for the survival of species at risk" were issued for the Campbell River District in July 2004 and for the North Island Central Coast District in December 2004. The notice specifies area required to be set aside for species at risk. As areas are set aside, WHAs are created, and the amount remaining in the notice is reduced.

The table below shows the habitat requirements by species by notice.

Species	DCR status	DCR remaining hectares (total hectares/mature THLB impact)	NICC status	NICC remaining hectares (total hectares/mature THLB impact)	Total remaining
Queen Charlotte Goshawk	Complete		Not started	277 (128)	277 (128)
Marbled Murrelet	Partial	NS* (502)	Partial	NS* (1 322)	NS (1 824)
Red-legged Frog	Complete		N/A		0
Keen's Long-eared Myotis	Complete		N/A		0
Great Blue Heron	Not started	80 (20)	Not started	235 (35.2)	315.2 (55.2)
Total					Unknown (2 007.2)

\*NS = total amount not specified.

#### **Data source and comments:**

Section 7 species at risk notices: http://www.env.gov.bc.ca/wld/frpa/notices/sar.html

The remaining WHAs will be identified where the species is found, with the total impact on the THLB being 2007 hectares. Generally, when a WHA is established, the Section 7 notice outstanding amount is reduced by the applicable amount. Given the hectares of proposed WHAs (for both marbled murrelet and goshawk) is substantially more than the outstanding amount on this notice, the remaining notice targets will not be modelled but assumed approximated with the proposed WHA impact.

In addition to the requirements under the Section 7 notice, there is a further requirement under VILUP objective 15/16 to meet old-seral targets and Marbled Murrelet habitat retention in the non-contributing (and if necessary, in the contributing) land base, to the full target from the NSOGO. This requirement is covered by both the OGMA and WHA factors.

### 6.19 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. The regional manager may establish orders restricting certain activities in a WHA.

Three WMAs have been designated within the North Island TSA: Lazo Marsh – North East Comox WMA, Cluxewe WMA, and Quatse Estuary WMA. For the Quatse Estuary WMA, the purpose is to maintain, enhance and rehabilitate the natural integrity of the area's high-value habitats, and provide opportunities for compatible public recreation and education. The Cluxewe WMA has a purpose of conservation of a unique isolated salt marsh and estuary habitats in close proximity, providing an important wetland complex for waterfowl. The Lazo Marsh WMA is for the conservation of habitat for a diverse population of fish, wildlife and indigenous flora and fauna.

While no harvesting restrictions are formally in place for these WMAs, all three areas have very little overlap with the TSA forested land base and as such, for the timber supply review base case, the WMAs will be excluded from the THLB.

Wildlife management area	Area (hectares) (within Section 8 Decision Area)	Within CFMLB	Within THLB
Wildlife Management Areas (WMA)	99	Yes	No

Table 31. Wildlife management areas in the North Island TSA

#### Data source and comments:

BCGW file: WHSE\_TANTALIS.TA\_WILDLIFE\_MGMT\_AREAS\_SVW.

### 6.20 Ungulate winter range

An Ungulate Winter Range (UWR) is an identified area that contains habitat necessary for the winter survival of various ungulate species. In the North Island TSA there are two applicable GAR orders. U-1-005 took effect January 14, 2004 (with several subsequent amendments) and covers Black-tailed deer, Roosevelt elk and Mountain goat. U-1-011 (effective June 29, 2006) covers Black-tailed deer, Roosevelt elk, Mountain goat and Moose.

Under both orders, harvesting and road building are not permitted in accordance with the general wildlife measures, unless an exception is approved. All UWR polygons are removed from the THLB.

Order	Area (hectares) (within Section 8 Decision Area)	Within CFMLB	Within THLB
U-1-005	12 537	Yes	No
U-1-011	839	Yes	No
Incidental from other UWR*	80	Yes	No
Total	13 456		

Table 32. Government action regulation orders for UWR in the North Island TSA

\*Incidental where TSA boundary overlaps other UWR (001, 004, 014).

#### Data source and comments:

BCGW file: WHSE\_WILDLIFE\_MANAGEMENT.WCP\_UNGULATE\_WINTER\_RANGE\_SP.

#### 6.20.1 Sayward - spring forage

In the Order Establishing Sayward Landscape Unit and Biodiversity and Wildlife Objectives in the Campbell River District (2003), there is a requirement to provide for spring forage adjacent to ungulate winter ranges (U-1-005). The order applies to all areas within the Sayward LU, within two kilometres of an UWR, on slopes 40-100%, with an aspect of exposure from 90 through 270 degrees. For these areas, no more than 25% may be younger than 20 years at any point in time. This will be applied as a disturbance constraint. The total area that falls within these criteria is 2113 hectares.

#### **Data source and comments:**

BCTS has created a layer which identifies areas meeting the above criteria, and they will be modelled such that no more than 25% is younger than 20 years at any point (say\_forage\_ where s\_forage IS NOT NULL).

### 6.20.2 Sayward – Elk visual cover

In the Order Establishing Sayward Landscape Unit and Biodiversity and Wildlife Objectives in the Campbell River District (2003), there is a requirement to maintain stand structure and provide hiding cover for elk in the Elk Visual Cover Areas identified on the Biodiversity and Wildlife Map. The order requires at least 50% of the forested area of each Elk Visual Cover Area at greater than five metres in height, and prohibits further harvesting adjacent to a major riparian feature (swamp, lake or stream) within the EVCAs until the forest on the opposite side of the riparian feature. This will be applied as a forest cover constraint. The total area of Elk Visual Cover Area is 4554 hectares.

#### Data source and comments:

Data layers sourced from <u>https://www2.gov.bc.ca/gov/content/industry/crown-land-water/land-use-planning/regions/west-coast/vancouverisland-lup/campbell-river</u> (Sayward Raw Data - say\_cc\_wild\_ where say\_cc\_wild\_\_fid >0).

### 6.21 Archaeological sites

Archaeological sites are locations where there is physical evidence of how and where people lived in the past. Such sites, once identified, are protected under the *Heritage Conservation Act* (HCA). A permit issued by FLNRORD Archaeology Branch is required to conduct activities within the boundaries of an archaeological site. Examples of these sites include, but are not limited to those containing physical evidence of human use or activity predating 1846, burial places, and Aboriginal rock carvings or paintings. These sites, along with overview assessments are recorded within the Province of BC's Remote Access to Archaeological Data (RAAD).

In the North Island TSA, there are approximately 870 archaeological sites that have been recorded in RAAD. These include a wide range of sites located both within urban and forest land base. These sites and a 50-metre buffer around them will be excluded from the THLB in the base case.

If a new potential archaeological site is identified the licensee, along with an archaeologist, operationally assesses the identified area(s), follows-up with First Nations who assert traditional territory in the identified area as appropriate, and FLNRORD, and where required, apply for an alteration permit under the HCA. While these potential areas are not modelled directly in the current analysis, they are expected to be operationally captured under other modelling considerations.

For example, a newly discovered archaeological site may be incorporated into a WTRA or, if adjacent to a stream, be included in a stream reserve area. Licensees, when placing a WTRA, have flexibility on location and generally choose to anchor the reserve on key features (i.e., unique ecosystems, key wildlife trees, archaeological sites). This TSR accounts for future WTRAs (aspatially) and reserves on the full stream network on the land base, so if an archaeological feature coincides with those future reserves, it is addressed. All archaeological sites are recorded in RAAD, and would then be captured spatially in future TSRs.

Area (hectares) (within Section 8 Decision Area)	Within CFMLB	Within THLB
3 908	Yes	No

Table 33. Known archaeological sites in the North Island TSA

#### Data source and comments:

WHSE\_ARCHAEOLOGY.RAAD\_TFM\_SITES\_SVW.

## 6.22 Cultural heritage sites

The *Forest and Range Practices Act* defines a cultural heritage resource as 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. These sites can include but are not limited to; archaeological sites, structural features, linear features such as trails, heritage landscape features, guide outfitter and trapline interests, and traditional use sites, polygons and lines.

First Nations access cultural cedar on both the THLB and CFMLB. There is continued demand for cultural cedar and an expectation that a sustainable supply is maintained into the future.

For the base case, the protection of cultural heritage resources (CHR) will be considered to be addressed through management tools for other values (e.g., wildlife tree retention and riparian) that can be located to also protect CHRs. No land base exclusions will be made to account for cultural heritage resources except for archaeological sites as described above. This analysis will provide statistics on the volume of cedar by age class on the land base over time.

### 6.23 Other reserves

There are several pieces of legislation that allow specified areas to be reserved from harvesting (either conditionally or not), temporarily. The *Forest Act*, Part 13, allows for areas to be classified as a designated area for up to 10 years and either limit harvest or attach conditions. The *Land Act*, Sections 16 and 17, allow for land to be either withdrawn (Section 16) or conditionally withdrawn (Section 17) from having Crown land applications accepted on the identified area. The maximum term for both is 30 years, with a mandatory review every 10 years.

There are four Part 13 designated areas within the North Island TSA, three of which are one hectare reserves associated with trees from the Big Tree Registry. The other area is associated with an ongoing treaty process. The terms are variable, ending in July 2021 and December 2022. There are 14 Crown land files with Section 16 and 17 treaty reserves (all but one hectare in Section 8 Decision Area is Section 17).

All the reserves above are expected to be removed from the North Island TSA within the next 10 years. Because they are not currently out of the TSA, they will remain in the THLB for the base case. A sensitivity will be completed to assess the impact of their removal. The table below summarizes the areas.

Type of reserve	Area (hectares) (within Section 8 Decision Area)	Within CMFLB	Within THLB
Forest Act, Part 13	265	Yes	Yes
Land Act, Section 16/17 Treaty	5 350	Yes	Yes
Total	5 350*	Yes	Yes

Table 34.	Other reserves	in the	North	Island	TSA
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\*The Part 13 overlaps with Section 16/17 reserves.

#### Data sources and comments:

WHSE\_ADMIN\_BOUNDARIES.FADM\_DESIGNATED\_AREAS, WHSE\_TANTALIS.TA\_CROWN\_TENURES\_SVW

### 6.24 Growth and yield permanent sample plots and research installations

A network of growth and yield permanent sample plots (PSP) is maintained by FLNRORD 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.

### North Island TSA Timber Supply Review Data Package

An assessment of harvest practices in and around PSPs indicate that harvesting of active plots is currently avoided (within the plot and its buffer). The objective for the PSP program is to maintain PSPs in perpetuity. In the base case, active plots will be removed from the THLB, using a buffer distance of 100 metres for all (regardless of the buffer identified in the dataset). There is a total of 128 plots in the area subject to this TSR.

A variety of research installations with differing goals exist within the TSA. A review of research goals for each installation was completed, including a summary of the term of research and any harvest deferral. There are a total of 51 research installations in the TSA, of which 23 will be removed from the THLB. The remaining research installations are expected to be tracked to the end of the current rotation at which point they will be available to harvest.

Installations	Area (hectares) (within Section 8 Decision Area)	Within CMFLB	Within THLB
GY PSP	186	Yes	No
Research Installations	649	Yes	No
Total	827*	Yes	No

\*There is one small overlap of eight hectares which accounts for the individual numbers not adding to the total.

#### Data sources and comments:

### WHSE\_FOREST\_VEGETATION.GRY\_PSP\_STATUS\_ACTIVE, WHSE\_FOREST\_VEGETATION.RESPROJ\_RSRCH\_INSTLTNS\_GOV\_SVW

### 6.25 Karst resources

Karst is a distinctive geological feature that develops due to the dissolving action of water on carbonate bedrock, usually limestone, dolomite or marble. This geological process, occurring over thousands of years, results in a unique three-dimensional landscape. Karst functions as a complex hydrogeoecosystem, comprised of four main components – land, water, air and biota. The values associated with karst include hydrology, high biodiversity, mineralogy, scientific values, cultural values, recreational values, and economic values including forestry.

In 2007, GAR Orders established specific elements of karst systems as resource features within the Campbell River District and North Island Central Coast District. Like the Recreation Resource Features, this designation results in protection under FRPA's Forest Planning and Practices Regulation for specified karst elements (FPPR Section 70 – Do not damage or render ineffective).

Identified karst resource features within the North Island TSA include:

- karst caves;
- significant surface karst features; and,
- important features and elements within high or very high vulnerability karst terrain.

A karst potential area data set and a karst inventory dataset are available in the BCGW. Neither of these layers are comprehensive as there is no requirement for licensees to report/record karst features or vulnerability, when found, to government.

A review of the karst data indicates that many of the larger karst areas were either at higher elevation, outside of the THLB, or maintained in long term reserves (WHA/OGMA). Smaller karst areas are generally set aside in wildlife tree retention areas. When karst is found in operations, it is assessed by a qualified professional to determine its significance and how to best manage the area (WTRA, harvest, incremental buffer, or recommend for WHA). In some cases, areas underlain in limestone are harvested, while in others, areas are reserved from harvest based on their significance under the GAR order and best management practices identified in the Karst Management Handbook for BC (2003) for site specific attributes.

Because the karst data that is available is incomplete in assessing the significance of the karst features within, a semi-spatial reduction will be applied to all rasters that fall in the karst potential and karst inventory layers. To account for additional areas reserved, beyond other long term reserves (OGMA/WHAs) and WTRAs, 8% of the limestone area will be excluded from the THLB. This is consistent with other coastal TSR netdowns for karst.

Classification	Total (hectares within Section 8 Decision Area)	Percent reduction	Area Reduction (hectares within Section 8 Decision Area)	Within CFMLB	Within THLB
Karst Inventory	24 292	8	1 943	Yes	No
Karst Potential	33 838	8	2 707	Yes	No
Total	44 274*		3 542*	Yes	No

Table 36. Karst in the North Island TSA

\*There is some overlap in the potential and inventory layers - the total is corrected for any double counted area.

#### **Data source and comments:**

BCGW files WHSE\_FOREST\_VEGETATION.REC\_KARST\_INV\_SVW, WHSE\_LAND\_USE\_PLANNING.RKPM\_KARST\_POTENTIAL\_AREA\_SP

# 7. Current Forest Management Assumptions

## 7.1 Harvesting

### 7.1.1 Recent harvest performance

The North Island TSA was created from the Vancouver Island portions of the former Kingcome and Strathcona TSAs in January 2017 when the *Great Bear Rainforest (Forest Management) Act* and regulations came into effect. Within that legislation, the current AAC for the North Island TSA was set at 1 248 100 cubic metres. The AAC has no partitions. Prior to that, the areas in the North Island TSA were split between the Strathcona and Kingcome TSAs, both of which contained additional areas outside of Vancouver Island.

The following graph provides a five year summary of harvesting that occurred in the areas currently covered by the North Island TSA, in comparison to the current AAC. It should be noted, that from December 2015 to January 2017 there was a partition restricting harvest for the Vancouver Island portion of the Strathcona TSA to 986 000 cubic metres. The Kingcome TSA did not have a geographical partition but had a deciduous partition of 14 000 cubic metres.

During the modelling, the harvest flow coming from each district will be reported. If there are large discrepancies from the current harvest flow in each district, a sensitivity will be completed to assess the impact of specifying volume by district.





### 7.1.2 Merchantability specifications

The Coast Timber Merchantability Specifications in the *Provincial Logging Residue and Waste Measurement Procedures Manual* specify the utilization levels for the billing of harvested timber used in the monitoring of AAC. The utilization levels define the maximum stump height and diameter, minimum top diameter (inside bark), slab thickness and log length.

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

	TSR modelled		Merchantability specification	
Analysis unit	Corresponding minimum DBH (cm)	Slab thickness (cm)	Maximum stump height (cm)	Minimum top DIB (cm)
Immature	12.5	10 (15 for Cedar)	30	10
Mature*	17.5	10 (15 for Cedar)	30	15

Table 37. Harvest merchantability specifications within the North Island TSA

#### Data source and comments:

Mature is where 50+ % of coniferous timber having an average age of 121 years or older, and deciduous timber having an average age of 41 years or older

#### 7.1.3 Minimum harvestable criteria

The minimum harvestable criteria are the earliest age or volume at which stands are considered to be harvestable within the timber supply model. While harvesting in the model may occur in stands at the minimum criteria in order to meet forest level objectives, most stands are not harvested until well beyond the minimum harvestable criteria because of management objectives for other resource values (e.g., requirements for the retention of older forest for mature- or old-seral objectives).

For the base case scenario, in stands considered conventional, the age at which the stand reaches 95% of the culmination mean annual increment (i.e., optimal point for volume production) will be used as the minimum harvestable criteria. Sensitivity analyses will investigate the impact of applying a minimum volume threshold instead, along with a minimum CMAI and volume.

Areas which have been classified as having a helicopter harvest system, will have a minimum volume of 450 cubic metres per hectare along with 95% of CMAI.

#### 7.1.4 Harvest scheduling priorities

The order in which stands are harvested can influence the overall timber supply. Licensees select stands to harvest through consideration of many factors. The forest estate model provides several methods in which to control the harvest scheduling, such as maximum volume/hectare, oldest first, most productive first, youngest CMAI age.

The *Provincial Timber Management Goals, Objectives & Targets Management Unit Targets Report* (August 2019) prepared annually by the ministry summarizes the last five years of harvesting in terms of volume class and age class. The profile of the harvest is then compared to the profile of the total mature forested area of the TSA, Figure 4 below, is reproduced from the report. The objective of the report is to identify if recent harvesting is representing the profile of the TSA or if one particular stand type is being disproportionately harvested.

In the past five years, harvesting in the North Island TSA has generally matched the profile of the TSA. Stands will be ordered for harvest based on highest volume first in the base case. The impact of applying a most productive first approach will be investigated in a sensitivity.



Figure 4. Stand volume and age class profile for 2013-2018 harvest in the North Island TSA.

## 7.2 Silviculture

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

### 7.2.1 Silvicultural systems

Clearcut with reserves is the most frequent silviculture systems used in the North Island TSA. Under this system, a range of opening sizes containing even-aged forests is produced. Cutting of adjacent blocks is restricted until green-up conditions are met. The clearcut with reserve system maintains older forest patches within or adjacent to harvest blocks. These remnants are intended as wildlife tree patches, riparian reserve and management zones, and island remnants to conserve old growth characteristics.

In the base case, all harvesting will be modelled as clearcut with reserves silvicultural system. Areas which have increased retention due to a landscape unit plan or land use order will have the increased retention accounted for under those factors.

### 7.2.2 Regeneration delay

Forest licensees are required to reforest harvested stands. A delay may exist between the harvest of a stand and when the site is in a fully regenerated state. In the North Island TSA most sites have no impediments to prompt and successful regeneration, however, some plantations may face challenges associated with cold sites at high elevation or browsing and trampling from wildlife.

In the base case, a regeneration delay was calculated from RESULTS data for each managed stand analysis unit for future managed stands. It was also assumed that stock is typically one year old when planted, as such reducing the regeneration delay by one year. The data indicate that 92% of the logged areas were planted and 8% reforested naturally.

For existing stands that have an identified harvest date but no regeneration information, the projected age will be assigned the difference between 2018 and the year of harvest less regeneration delay.

#### 7.2.3 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. In the current TSR, no consideration will be made for backlog NSR given the low amount present.

#### 7.2.4 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 North Island TSA, RESULTS shows that a total of 41 819 hectares of area within the Section 8 Decision Area were aerially fertilized since 1998. Aerial fertilization is done on the coast to help second-growth stands become merchantable sooner and mitigate timber supply impacts. Increases to timber supply depend on when the fertilization was done and how soon after fertilization the stand is harvested.

The following graph shows aerial fertilization tracked in RESULTS within the area of the North Island Timber Supply Review. Those stands that have been fertilized, but not harvested will be included as fertilized in the base case.

Fertilization	TSR approach	Area (hectares) (within Section 8 Decision Area)
Fertilized and harvested	Not considered	6 256
Fertilized < 9 years after last harvest (data error)	Not considered	8 994
Fertilized 10-29 years after last harvest	Modelled in the base case	6 671
Fertilized > 30 years after last harvest	Modelled in the base case	8 499
Fertilized and not previously harvested	Modelled in the base case	11 149
Total		41 819

Table 38. Aerial fertilization in the North Island TSA

#### Data source and comments:

BCGW file: WHSE\_FOREST\_VEGETATION.RSLT\_ACTIVITY\_TREATMENT\_SVW.

## 7.3 Integrated resource management

The Crown forests of the North Island 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 regional land-use planning process was conducted on the coast. This process resulted in the Vancouver Island Land Use Plan (2000) and the approval of the Vancouver Island Land Use Plan Higher Level Plan Order (VILUP HLPO 2000).

The VILUP HLPO created 18 legal objectives that apply to various resource management zones on Vancouver Island. The objectives specify requirements for biodiversity, water, wildlife, visuals, and other resource values. Several landscape-level plans are also applicable to the area in the North Island TSA, which specify targets for old growth retention, wildlife tree retention and other resource values specific to the landscape unit.

Within the North Island TSA all approved FSPs prepared by major forest licence holders are also required to state results and strategies that meet the 11 FRPA objectives. Objectives that impact timber supply are modelled within the base case scenario of the timber supply analysis (e.g., ungulate winter range, visual management). These objectives are described below in specific sections. Objectives that do not impact timber supply are not modelled.

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

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

The FPPR default maximum cutblock size in the British Columbia Coast is 40 hectares, however, there is also flexibility to create larger openings based on biodiversity patch management where the licensee ensures that the structural characteristics of the cutblock after harvest resembles an opening from a natural disturbance.

The Vancouver Island Land Use Plan and associated landscape unit plans include objectives that identify the desired range of opening sizes (patch size distribution) to be attained by the end of a rotation, depending on the resource management zone objective. This patch size distribution, by natural disturbance type and is applicable at the landscape level. In EFZs, block size may be increased if the block meets certain requirements. In the SMZs, block size is required to be smaller, unless increased retention is left.

Requirements for harvesting adjacent to an existing cutblock are set through Section 65 of the FPPR which specifies that timber must not be harvested on a new cutblock unless the tallest trees on a minimum of 75% of the net area to be reforested on all existing adjacent cutblocks are at least three metres in height. This green-up height requirement is reduced in EFZs to a height of 1.3 metres.

The spatial placement of blocks will be modelled in the base case, limiting block size to 40 hectares. Adjacency will also be modelled limiting harvest of any area within 200 metres of an existing block until after a green-up height of three metres is achieved. The same constraint applies in EFZs, with a green-up height of 1.3 metres. This requirement applies only to THLB not otherwise constrained by another management objective (e.g., visuals, ungulate winter range).

### 7.3.2 Sayward non-constraint areas

Generally, the maximum opening size for a harvest area is 40 hectares. In the Order Establishing Sayward Landscape Unit and Biodiversity and Wildlife Objectives in the Campbell River District (2003), Objective 6 states that to allow a patch size objective and pursue enhanced timber harvesting opportunities, within areas not subject to integrated resource management, and as shown on the non-constraint areas map, blocks of up to 80 hectares (net area to be reforested) are permitted. The variance in the Sayward is not expected to have a significant impact on the timber supply and the entire TSA will be modelled with a maximum opening size of 40 hectares.

#### Data source and comments:

Data layers sourced from <u>https://www2.gov.bc.ca/gov/content/industry/crown-land-water/land-use-planning/regions/west-coast/vancouverisland-lup/campbell-river</u> (Sayward Raw Data - saynonconst where s\_is\_ethlb=1).

### 7.3.3 Community watersheds

Water in community watersheds is a value identified under the *Forest and Range Practices Act*. Under FRPA, licensees are required to specify results and strategies that meet the objective set by government for water quality. Objectives for water in community watersheds are established under Section 8.2 of the Forest Planning and Practices Regulation of the FRPA.

There are six designated community watersheds within the Section 8 decision area of the North Island TSA covering 30 299 hectares. Management constraints for community watersheds are not standardized but are typically based on hydrological assessment of the watershed. At present, licensees in the North Island TSA have FSP commitments requiring them to complete hydrologic assessments and to abide by the recommendations of the assessment.

Community watersheds	Within Section 8 decision area (hectares)	Within CFMLB	Within THLB
Andrews Community Watershed	48	Yes	Yes
Barton Community Watershed	16	Yes	Yes
John Hart Community Watershed	1 940	Yes	Yes
Oyster Community Watershed	5 095	Yes	Yes
Puntledge Community Watershed	18 827	Yes	Yes
Tsulquate Community Watershed	4 373	Yes	Yes
Total	30 299		

Table 39. Community watersheds within the North Island TSA

#### Data source and comments:

BCGW file: WHSE\_WATER\_MANAGEMENT.WLS\_COMMUNITY\_WS\_PUB\_SVW.

### 7.3.4 Fisheries sensitive watersheds

Fish are one of the 11 objectives identified under FRPA. FRPA (e.g., Section 150.1) and in particular the Fisheries Sensitive Watersheds (FSW) portions of the Government Actions Regulation (Section 14) and the Forest Practices and Planning Regulation (Section 8.1) require the management of a watershed that has significant downstream fisheries values.

Fisheries sensitive watersheds may be established to modify management activities to maintain ecosystems. To qualify as an FSW candidate, watersheds must have significant fisheries values as well as watershed sensitivity. The Minister may designate fisheries sensitive watersheds by an Order which sets out management direction to conserve important watershed level attributes protecting fisheries values.

On December 28, 2005 a GAR Order established 11 FSW on Vancouver Island. Two of these FSWs fall in the North Island TSA, Artlish and Memekay. Memekay River FSW falls mainly within TFL 39, with small portions in the area managed within this AAC. The GAR Order provides three objectives:

- 1. Conserve the natural hydrological conditions, natural stream bed dynamics and integrity of the stream channels in the Fisheries Sensitive Watershed;
- 2. Conserve the quality, quantity and timing of water flows required by fish in the Fisheries Sensitive Watershed; and,
- 3. Prevent the cumulative hydrological effects of primary forest activities in the Fisheries Sensitive Watershed from resulting in a material adverse impact on the fish habitat in the watershed.

Information provided by the district indicates that licensees will be managing FSWs in accordance with hydrological assessments completed in these watersheds. The FSP commits licensees to follow the recommendations from the assessments.

Fisheries sensitive watershed	Within Section 8 decision area (hectares)	Within CFMLB	Within THLB
F-1-001 – Artlish River	12 342	Yes	Yes
F-1-009 – Memekay River	319	Yes	Yes
Total	12 661		

Table 40. Fisheries sensitive watersheds

#### Data source and comments:

WHSE\_WILDLIFE\_MANAGEMENT.WCP\_FISH\_SENSITIVE\_WS\_POLY.

#### 7.3.5 ECA watersheds

Several of the community watersheds and FSWs have had hydrological assessments which recommend managing certain sub-basins by equivalent clearcut area (ECA) limits. There are several other watersheds that have also been assessed and have ECA limit recommendations. Additionally, some licensees have committed to voluntary ECA limits.

For the base case, ECA limits for FSW and community watersheds will be applied. In the model, harvesting will not be permitted until logged stands reach hydrologically effective green-up. A sensitivity will be completed to assess the impact of including the additional ECA limits which constitute current practice.

Community watershed	FSW	Sub-basin name	ECA max	Within Section 8 decision area (hectares)
Andrews			N/A	48
Barton			N/A	16
John Hart			N/A	1 940
Oyster			N/A	5 095
Puntledge			N/A	18 827
Tsulquate			20	4 373
	f-1-001	Helen/Lower Sally	25	12
	f-1-001	North Artlish	20	2 316
	f-1-001	Sally	25	58
	f-1-001	South Artlish	20	3 632
	f-1-001	West Artlish	20	6 211
	f-1-001		N/A	113
	f-1-009		N/A	319
		Burman-4	30	159
		Eve 0-0	30	2
		Fairy	25	1 237
		Gold	30	611
		Heber	30	2 168
		Helen/Lower Sally	25	1 622
		Horseshoe	25	2 274
		Jacklah	30	3
		Johnstone Strait	30	1
		Melanie	30	4 280
		Nehemiah	30	984
		North Artlish	20	48
		Peel Creek	30	45
		Sally	25	1 942
		Saunders	25	75
		South Artlish	20	95
		Tashish Residual	30	3 493
		Trio	25	1 465
		Trio East	30	1 080
		Trio South	30	976
		Trio West	30	493
		Tsitika 0-0	30	2 034
		Tsitika 1-0	30	491
		Tsitika 1-A	30	1
		Tsitika 4-0	30	1
		Tsitika 5-0	30	75
		Tsitika 6-0	30	321
		Upper Tashish	30	4 289
		West Artlish	20	61

### Table 41. ECA watersheds in the North Island TSA

### Data source and comments:

TSR\_watersheds.gdb (BCTS, 2020).

### 7.3.6 Visual quality objectives (VQOs)

Visual quality is one of the 11 values to be managed under the *Forest and Range Practices Act*. VQOs ensure that forestry activities are managed so that the size, shape, and location of cutblocks and roads fit with the landscape's natural character. On December 14, 2005, VQOs were established in the Campbell River District which canceled previously established VQOs within the district. On August 31, 2005, VQOs were established for the Kingcome TSA scenic areas which were made known on January 14, 1999.

For the TSR, visual resource management will be modelled according to the *Procedures for Factoring Visual Resources into Timber Supply Analyses* (MOF 1998) using planimetric percent alteration ranges for each VQO modified by Visual Absorption Capability (VAC) rating of each visual polygon (Table 42). This approach is preferred over a single percent alteration for each VQO to better reflect the wide variation in landscape conditions.

	Within Section 8	% alteration by VAC (planimetric view)				
Established VQO	decision area (hectares)	Low	Medium	High		
Preservation	6 659	0	0.50	1		
Retention	28 065	1.1	3.0	5		
Partial retention	79 900	5.1	10.0	15		
Modification	27 534	15.1	20.0	25		
Maximum modification	N/A	25.1	32.5	40		

 Table 42. Assignment of visual quality objectives by planimetric view and visual absorption capability (VAC)

#### Data source and comments:

BCGW file: WHSE\_FOREST\_VEGETATION.REC\_VISUAL\_LANDSCAPE\_INVENTORY. GAR orders can be found online: <u>https://www2.gov.bc.ca/gov/content/environment/natural-resource-stewardship/laws-policies-standards-guidance/legislation-regulation/forest-range-practices-act/government-actions-regulation</u>

The procedures also suggest determining a weighted visually effective green-up (VEG) height for each visual polygon based on slope classes (Table 43). This procedure is used in the base case. The area-weighted average of each slope class will be used to calculate VEG height for each visual quality polygon. The following table shows the overall area-weighted average VEG tree height for the different slope classes.

	Slope classes (%)												
	0- 5.0	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
VEG height (metres)	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

Table 43. Slope classes for calculating VEG height

#### Data source and comments:

*Procedures for Factoring Visual Resources into Timber Supply Analyses* (MOF 1998). Found online at: <u>https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/forestry/visual-resource-mgmt/vrm\_procedures\_for\_factoring\_timber\_supply\_analyses.pdf</u>

## 7.4 Forest health

### 7.4.1 Other forest health issues

Many forest health damaging agents are present within the North Island TSA. These agents include insects, pathogens, animals, and abiotic events; many agents have the potential to cause timber losses. The Forest Health Program of the FLNRORD evaluates the impact of forest health damaging agents on forest resource values and when necessary prescribes and implements management practices to prevent damages.

A review or the 2018 aerial overview surveys (AOS) summary of the North Island TSA, along with the broader summary of 2015-17 Coastal Timber Supply Areas Forest Health Overview indicates the following (note that the latter summary was completed on the previous Strathcona and Kingcome TSA areas, so impact within the North Island TSA is approximated):

- Conifer sawflies defoliate Ba, and periodically reach outbreak levels. Salvage of severely affected timber has occurred in past outbreaks.
- Douglas-fir beetle has limited occurrence in the TSA and is usually associated with trees affected by root disease.
- Hemlock dwarf mistletoe is expected to rise on all ages as there is a move away from clearcutting. Losses associated include growth loss, premature breakage/mortality, reduced lumber quality and impacts on regeneration.
- Mountain pine beetle has historically been reported on western white pine and lodgepole pine. Lodgepole pine stands are removed from the THLB and western white pine is limited in use due to white pine blister rust.
- Laminated root rot occurs in the drier regions of the TSA, primarily in young Fd stands. Losses associated with root rot are accounted for with an increased operational adjustment factor in affected BEC subzones.
- Spruce weevil impact is decreasing due to the avoidance of spruce in the 1990's and use of weevil resistant stock. Nonetheless, significant growth loss associated with weevil is present where spruce was planted in the 1970's and 80's.
- Swiss needle cast damage is present in the TSA, and impacts are not fully understood. Monitoring plots have been established in the CWHdm and xm subzones.
- Western blackheaded budworm defoliation has impacted the TSA in periodic (every 8-15 years) outbreaks since 1944. Most stands recover, however severely impacted stands will have mortality and top kill. Stands that receive >50% defoliation can show 30-60% mortality.
- Western hemlock looper defoliation is present in small areas within the TSA.
- White pine blister rust is difficult to survey aerially. Several large polygons have been mapped at trace intensities in the TSA. Historically the impact of white pine blister rust has resulted in a high mortality rate and nearly discontinued the reforestation of western white pine.
- Windthrow occurs in the TSA at endemic levels, generally 15-35 hectares per year. There is little data on whether the volume associated with the windthrow is salvaged.

Abnormal or catastrophic infestations and devastations are difficult to predict and highly variable from year to year. The principle of regularly revisiting the AAC decision and the ability to revisit a decision earlier are important components of the AAC decision to address unpredictable events. The capture of dead volume following a catastrophic event (e.g., fire, epidemic infestations) is described below under non-recoverable losses.

The impact of endemic levels of pests is considered addressed through stand-level modelling of volume tables. Endemic levels are inherent within the empirical basis of the growth and yield model VDYP, which is used for unmanaged stand yields (see '*Growth and yield*' section). For managed stands, in volumes tables produced by the model TIPSY, endemic levels are considered to be part of the operational adjustments modelled as standard input.

Information sources such as young stand monitoring and stand density monitoring, as well as advice from forest health experts are presented to the chief forester for consideration in determining if modelled stand volume predictions are appropriate for the level of forest health impacts observed.

#### 7.4.2 Non-recoverable losses

Non-recoverable losses (NRL) 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.

An annual summary of the volume lost to forest health factors is prepared by FAIB staff based on the annual forest health overview flight mapping. The summary uses the flight mapping, the VRI and the previous TSR THLB to estimate the volume lost to each factor and also accounts for any record of salvage harvesting that has occurred following the disturbance. The summary has been prepared for data collected since 1999 and is current to 2019 which provides a 21-year average of non-recovered losses for the North Island TSA (Table 44).

Future NRLs will be accounted for by annually disturbing an area supporting the average NRL volume within the THLB. In the base case, a THLB area with 2921 cubic metres will be reset to age zero each year of the timber supply forecast.

Cause of loss	Annual unsalvaged loss (m³/year)
Douglas-fir Beetle	117
Fire	2 592
Flooding	93
Spruce Beetle	3
Drought	116
Total	2 921

Table 44. Estimated average non-recoverable losses in the North Island TSA

#### Data source and comments:

FAIB summary VolumeLosses ByTSA. 1999-2019. THLB2019.xlsx

# 8. Growth and Yield

### 8.1 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.

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

For this analysis, the yield tables will be divided into two general forest management categories; those stands with a harvest history and those with no harvest history, to reflect the different expected volume growth between these stand types. Those stands with no harvest history will have yield curves developed by VDYP. Those stands with a harvest history will be further divided into planted and naturally established stands, and will have yield curves generated by TIPSY.

## 8.2 VDYP stands (natural stands)

Stands without a previous history of harvest recorded in the Reporting Silviculture Updates and Land Status Tracking System (RESULTS) will have yield curves developed by VDYP.

A yield curve is typically assigned to a forest stand or group of stands with similar tree species composition, timber growing potential and treatment regimes. The VRI delineates stands with similar properties (i.e., forest inventory polygons) and a VDYP yield curve for each of these inventory polygons will be used for stands (with no RESULTS harvest history) in the base case.

After the stands are harvested in the timber supply model, they will be placed on aggregate TIPSY curves based on BEC, as described in the '*Future Managed Stands*' section, below. The figure below shows the breakdown of stands with no RESULTS harvest history and how yield curves will be applied.

Stands that have an indication of being harvested (having a harvest date is one indicator) or were just recently harvested will be placed on aggregate TIPSY curves based on BEC, as described in the '*Future Managed Stands*' section, below.



Figure 5. North Island TSA stands with no RESULTS harvest history.

### 8.2.1 Model

Volume tables for natural stands will be derived using the Variable Density Yield Prediction Model version 7 (VDYP7) developed by FLNRORD. VDYP7 is an empirical model that has been parameterized based on a large permanent sample plot database collected from mature natural forests in British Columbia.

Input information for VDYP7 is provided by the attributes of individual VRI polygons.

#### 8.2.2 Decay, waste, and breakage

Decay, waste and breakage estimates are incorporated within the growth and yield model VDYP7 and are based on BEC loss factors using a decay sample tree database which consists of over 82,000 trees.

VDYP7 output was developed to provide live merchantable volume estimates. Information about the dead potential component of a stand is not included within the VDYP7 yield tables, separate information about the amount will be provided to the chief forester for consideration in the AAC determination.

## 8.3 TIPSY stands (managed stands)

Stands with a harvest history recorded in RESULTS will have yield curves developed by TIPSY. These are stands with a history of silviculture treatments. They are expected to be regenerated and have density managed to specified conditions that better capture site productivity than VDYP (natural) stands. Generally, this includes stands established after the legislative creation of basic silviculture obligations in 1987, although stands established prior to this date with a history of silvicultural management may also be classified as managed. Regeneration of managed stands, though mostly planted, can also include stands that are naturally regenerated to appropriate stocking standards.

Site specific, field derived silviculture information is stored in RESULTS. The RESULTS application tracks silviculture information by managing the submission of openings, disturbances, silviculture activities and obligation declarations as required by the *Forest and Range Practices Act*. Stands harvested prior to 1987 and having RESULTS data are treated as a having random spacing (same as a TIPSY natural). This is due to the lack of stocking standards prior to 1987, differences in planting techniques and differences in actual planting stock quality.

To create the yield curves, data is extracted from RESULTS and synthesized to derive species composition and density for both planted and natural components. For the purposes of TSR, all RESULTS data is aggregated and validated to the individual opening level. Whereas the purpose of the RESULTS data is to track licensee obligation, for TSR purposes, the data is validated for the purpose of creating an individual yield table for each opening.

Planted species composition is derived from planting numbers and any associated genetic worth is linked where appropriate by seedlot. Inventory Survey data is used to adjust species composition to account for ingress and mortality. Where a stand passes yield validation, a yield table is generated. The following data is derived from the RESULTS data:

- planted species composition;
- planted density (total by species);
- genetic worth (by species);
- planting delay;
- percent of the opening that is planted;
- natural species composition;
- natural density (total by species);
- stand age.

Where a stand does not pass validation, it is flagged for an analyst to review and make a yield assignment determination. The following figure shows the breakdown of the RESULTS data in the North Island TSA.



Figure 6. North Island TSA stands with RESULTS harvest history.

### 8.3.1 Model

Yield tables for managed stands are created using the Table Interpolation Program for Stand Yields (TIPSY) BatchTipsy Composer version 5.0 (Dec 20, 2019) developed by FLNRORD. This stand-level model is derived from volume tables generated from the FLNRORD individual tree process model Tree and Stand Simulator (TASS). Pine and Spruce use TASS v3.0 while all other species use TASS v2.07.

Yield models such as TASS and TIPSY require total density for a species. This information comes from the inventory survey information provided to RESULTS and gives an estimate of the total number of stems for each opening. RESULTS has other measures of densities related to the tracking of obligation, but for the purposes of yield generation, total density is required.

### 8.3.2 Site index

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 a measure of site productivity based on the top height (m) of a stand at breast-height age 50. While the Ministry has developed formalized standards for deriving site index for the potential productivity of a site, the term site index is derived and used in a variety of contexts.

The provincial site productivity layer (PSPL, version 7.0) provides, by standard methods, site index estimates of commercial tree species for individual stands with major provincial forest management units. Primarily, the estimates are based on ecosystem data from existing predictive ecosystem mapping (PEM) or TEM coupled with Site Index Estimates by SIBEC. Secondarily, where PEM or TEM data are not available, data from various growth and yield projects were used to create a biophysical model that provides site productivity estimates.

Approved ecosystem mapping is available for the North Island TSA, so the site index estimates found within the provincial productivity layer that are used in the base case originate from SIBEC.

#### Data source and comments:

FLNRORD FAIB All PEM/TEM Data for Site Productivity Layer, Version 7.0 (2019/2020).

#### 8.3.3 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 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. RESULTS information provides a seed source for individual plantations and thus enables linkage to the genetic gain database.

The seed use and its genetic worth recorded in RESULTS for each existing managed stand was considered in producing the yield table for each stand. An area-weighted average of seed use and the associated genetic worth between 2005 and 2015 was used to estimate current performance for each of the aggregate analysis units representing future managed stands. Individual existing stands had actual genetic worth of planted seedlings applied, unless free-growing information indicated that ingress of another species overtook the planted species. In these cases, yield tables were adjusted with most recent species information and genetic gain of planted trees (that are not present at free growing) is not applied. Genetic gain of the species that remain in the stand at free growing (if planted) is still applied.

Below is a summary of the RESULTS information on genetic worth which was input into the yield curves. No modelling consideration was made for expected future improvements in genetic worth.

Species	Weighted genetic worth (yield curves)
Cw (Yc included as TIPSY input)	4.33
Fd	7.63
Hw	5.20
Ss	2.00

Table 45. Genetic gains comparison (by species)

#### **Data sources and comments:**

TIPSY input table - tsa48\_tipsy\_input.

### 8.3.4 Operational adjustment factors

Operational adjustment factors (OAF) are used to adjust volume estimates from TIPSY to account for factors that affect achievement of optimal growth that are not specifically modelled. The yield tables generated by TIPSY reflect the growth relationships observed in research plots established by FLNRORD and industry. Research plots were generally located in fully stocked, even-aged stands of uniform site and in forests with little or no pest activity.

As a result, TIPSY yields reflect the potential yield of a specific site, species and management regime given full stocking. The OAFs are required to adjust these potential yields to better reflect operational considerations.

In TIPSY, there are two OAFs that are used to modify the potential yields with differing application. OAF 1 is a static reduction across all time periods which, for example, may reflect non-productive openings within a forest. OAF 2 is a dynamic reduction that increases over time and, for example, may reflect a forest health issue that increases as a stand ages.

The standard OAF 1 value of 15% will be applied to account for less than ideal tree distributions, small non-productive areas, endemic pests and disease, and random risks such as windthrow. The standard OAF 2 value of 5% to account for decay, waste and breakage will also be applied. These standard OAFs were based on a general assessment from the literature on differences of actual yields and potential yields on managed sites.

Existing and future managed Douglas-fir stands are susceptible to root disease and resulting volume losses. Laminated and armillaria root diseases are more common in the following subzones: CWHmm1, xm1, and xm2. As per the regional pathologist's recommendation, the OAF 2 values for these subzones will be increased from 5% to 12.5% for existing and future managed Douglas-fir stands.

## 8.4 Future managed stands

The future managed stand regeneration assumptions for the initial species composition and density will be based upon summaries from RESULTS. These summaries include planting records, regeneration surveys or free growing surveys for openings identified as non-uneven-aged. Data is generalized to the opening and then assigned to the spatial forest cover polygon.

The set of stands comprising the VDYP Stands (existing natural stands) component of a TSA do not have RESULTS information as they have not had any silviculture treatments applied. Once these stands are harvested, they will need to be assigned a TIPSY (managed stand) yield table. These stands are assigned an aggregate species composition based on the current management practices in the TSA. The species composition is derived from BEC zone and subzone combination. To capture individual site productivity, the site index from the Provincial Site Productivity Layer (PSPL) is used to assign site index by species to that specific spatial object. In this manner, these stands get a generic species composition, but a specific site index.

# 9. Forest Estate Modelling

### 9.1 Forest estate model

The Spatially Explicit Landscape Event Simulator (SELES) Spatial Timber Supply Model (STSM) will be used for this analysis. STSM is a model developed using 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.

### 9.2 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.

For the current TSR in the North Island TSA there is no expectation that the current AAC level, that was implemented as a calculation from splitting two TSAs and merging portions of them, will be maintained. Several alternative harvest flows based on different initial harvest levels are possible given current forest management assumptions. From these alternatives, a base case scenario is selected, that in conjunction with sensitivity analyses, to represent timber supply dynamics.

## 9.3 Sensitivity analysis

Sensitivity analysis can help to understand the implications of uncertainty around data and management assumptions and can be used to determine which variables have the greatest influence on harvest forecasts. Specific issues can also be investigated to enhance understanding of possible impacts on timber supply. Table 46 lists the base sensitivity analyses to be performed. Further sensitivity analyses may be completed as needs are identified.

Issue to be tested	Sensitivity levels
Natural stand volumes	All volume tables will be changed by +/- 10%
Managed stand volumes	All volume tables will be changed by +/- 10%
Minimum harvestable age	Change minimum harvest able ages by +/- 10 years
Minimum harvestable age	Minimum volume instead of age
Minimum harvestable age	Minimum age and volume
Harvest scheduling priority	Most productive stands first
Size of the THLB	The THLB within all polygons will be changed by +/- 10%
Operability	Remove operability layer
Helicopter HwBa problem forest types	Remove helicopter stands with < 30% Cw
Drawdown of NSOGO targets in Low BEO LUs	2/3 drawdown
Natural disturbance	Sensitivity to account for natural disturbance in the landscape
WHAs	Remove proposed WHAs from the THLB
Marbled Murrelet/Northern Goshawk provincial targets	By LU/LU aggregate - if available
Other reserves	Removal of all from THLB
Non-legal ECA limits as per current practices	Voluntary ECA limits

Table 46. Sensitivity analyses to assess influence and issue analyses

## 9.4 Carbon Sequestration

Forest carbon is of emerging importance in forest management in B.C. The implementation of projects under the Forest Carbon Initiative (FCI) 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:  $1 \text{ CH}_4 = 28 \text{ CO}_2\text{e}$ ;  $1 \text{ N}_2\text{O} = 298 \text{ CO}_2\text{e}$ .

The harvest wood product (HWP) calculator will be <u>used</u>.

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 North Island TSA, a carbon sequestration analysis will be completed using the TSR base case harvest projection.
## **10. Associated Analysis and Reporting**

The primary focus of the timber supply review (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. The following work will be completed, and reports will be prepared.

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 analysis is completed, 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, where possible is incorporated into the *Data Package* and analysis. Further, 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.

## **11. Information Sources**

Approved Legal Orders. Ministry of Forests, Lands, Natural Resource Operations and Rural Development. See <u>https://www2.gov.bc.ca/gov/content/industry/crown-land-water/land-use-planning/regions;</u>

Approved Orders. Ministry of Environment. See http://www.env.gov.bc.ca/wld/frpa/;

Archaeology in British Columbia. Ministry of Forests, Lands, Natural Resource Operations and Rural Development. See <u>https://www2.gov.bc.ca/gov/content/industry/natural-resource-use/archaeology;</u>

Biodiversity Guidebook. Ministry of Forests. <u>https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/forestry/frep-docs/biodiversityguidebook.pdf;</u>

*Forest Act.* See Section 8 Allowable Annual Cut http://www.bclaws.ca/civix/document/id/complete/statreg/96157\_02;

*Forest and Range Practices Act.* See <a href="http://www.bclaws.ca/civix/document/id/complete/statreg/02069\_01">http://www.bclaws.ca/civix/document/id/complete/statreg/02069\_01</a>;

Strathcona Timber Supply Area Data Package, Ministry of Forests, October 2012;

Strathcona Timber Supply Area Technical Report, Ministry of Forests, August 2015;

Strathcona TSA Timber Supply Analysis Public Discussion Paper, Ministry of Forests, December 2014;

Strathcona Timber Supply Area Rationale for Allowable Annual Cut (AAC) determination. Effective December 17, 2015. Ministry of Forests, Victoria, BC.

Kingcome Timber Supply Area Data Package, Timberline Natural Resource Group, September 2008;

Kingcome Timber Supply Area Analysis Report, Timberline Natural Resource Group, December 2008;

Kingcome Timber Supply Area Socio-Economic Assessment, Robinson Consulting and Associates Ltd. And Timberline Natural Resource Group, September 2008;

Kingcome Timber Supply Area Rationale for Allowable Annual Cut (AAC) determination. Effective February 2, 2010. Ministry of Forests, Victoria, BC.

B.C. Ministry of Forests, Lands, Natural Resource Operations & Rural Development. Electronic Commerce Appraisal System (ECAS). See <a href="https://www2.gov.bc.ca/gov/content/industry/forestry/competitive-forest-industry/timber-pricing/electronic-commerce-appraisal-system">https://www2.gov.bc.ca/gov/content/industry/forestry/competitive-forest-industry/timber-pricing/electronic-commerce-appraisal-system</a> ;

B.C. Ministry of Forests, Lands, Natural Resource Operations & Rural Development. Provincial Site Productivity Layer. See <u>https://www2.gov.bc.ca/gov/content/industry/forestry/managing-our-forest-resources/forest-inventory/site-productivity/provincial-site-productivity-layer</u>;

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

B.C. Ministry of Forests, Lands, Natural Resource Operations & Rural Development. The B.C. Geographic Warehouse. See <u>https://www2.gov.bc.ca/gov/content/data/geographic-data-services/bc-spatial-data-infrastructure/bc-geographic-warehouse;</u>

B.C. Ministry of Forests, Lands, Natural Resource Operations & Rural Development. 2019. Coast Appraisal Manual. Timber Pricing Branch. Victoria, BC. See <a href="https://www2.gov.bc.ca/gov/content/industry/forestry/competitive-forest-industry/timber-pricing/coast-https://www2.gov.bc.ca/gov/content/industry/forestry/competitive-forest-industry/timber-pricing/coast-https://www2.gov.bc.ca/gov/content/industry/forestry/competitive-forest-industry/timber-pricing/coast-https://www2.gov.bc.ca/gov/content/industry/forestry/competitive-forest-industry/timber-pricing/coast-https://www.competitive-forest-industry/timber-pricing/coast-https://wwww

timber-pricing/coast-appraisal-manual;

B.C. Ministry of Forests, Lands, Natural Resource Operations & Rural Development. 2008. British Columbia's Forest Fertilization Strategy. Forests For Tomorrow. Victoria, BC. See <a href="https://www2.gov.bc.ca/assets/gov/environment/natural-resource-stewardship/land-based-investment/forests-for-tomorrow/provincial\_fertilization\_strategy2008.pdf">https://www2.gov.bc.ca/assets/gov/environment/natural-resource-stewardship/land-based-investment/forests-for-tomorrow/provincial\_fertilization\_strategy2008.pdf</a>;

B.C. Ministry of Forests, Lands, Natural Resource Operations & Rural Development. 2015. 2015-17 Coastal Timber Supply Areas Forest Health Overview. Victoria, BC. See <u>https://www.for.gov.bc.ca/ftp/HFP/external/!publish/Forest\_Health/TSA\_FH\_Strategies/2015-</u> <u>Coast% 20FH% 20Strategy.pdf;</u>

## 12. 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 North Island 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 September 14, 2020 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:

Tom Hartz, RPF, Stewardship Forester Campbell River Natural Resource District Ministry of Forests, Lands, Natural Resource Operations and Rural Development 370 South Dogwood Street, Campbell River, B.C. V9W 6Y7

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

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