

Fraser Timber Supply Area Timber Supply Review

Data Package

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1. Overview of the Fraser TSA timber supply review

Under Section 8 of the *Forest Act* the chief forester must review the timber supply for each timber supply area (TSA) at least once every 10 years. Under the same section the chief forester may extend the current allowable annual cut (AAC) up to 15 years if the current timber supply is stable and any new developments would unlikely change the AAC. For more information about the AAC process please visit the following internet site:

<http://www.for.gov.bc.ca/hts/pubs/tsr/tsrbackgrounder.pdf>

The completed data package contains those inputs that represent current performance for the TSA. For the purpose of the timber supply review (TSR), “current performance” can be 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;
- fully implemented land-use plans;
- land-use decisions approved by Cabinet;
- orders issued through the *Government Actions Regulation (GAR)* of the *Forest and Range Practices Act (FRPA)*;
- the order establishing provincial non-spatial old growth objectives and landscape units pursuant to the *Forest Practices Code of British Columbia Act*; and,
- approved higher level plans under the *Forest Practices Code of British Columbia Act*.

The primary purpose of the timber supply review program is to model “what is” not “what if”. Changes in forest management objectives and data, when and if they occur, will be captured in future timber supply analyses.

Each section of this data package includes:

- A short explanation of the data required;
- A data table or lists of modelling assumptions;
- A description of data sources and other comments.

The information in this data package represents the best available knowledge at the time of publication, but is subject to change. A First Nations consultation and public review period has been established to allow submission of comments and concerns about the data package to the Ministry of Forests, Lands and Natural Resource Operations (FLNR). The information and assumptions in the data package that have been revised to incorporate First Nations and public input will be used to determine the timber harvesting land base (THLB) - the productive Crown forest land in the TSA available for timber harvesting. Until the THLB is determined, it is not possible to finalize the values shown in some of the tables in this document. In addition, should any major changes in management practices occur during the next few months, the timber supply analysis will attempt to capture them.

2. Introduction

2.1 Overview of the Fraser Timber Supply Area

The Fraser TSA covers approximately 1.4 million hectares and is located in the southern mainland portion of the South Coast Region. Administered by the FLNR Chilliwack Natural Resource District office, the TSA is the most densely populated TSA in the province, encompassing the major population centres of the Lower Mainland and the Fraser Valley.

Although much of the timber processed in the TSA is harvested elsewhere, timber harvesting is an important part of the local economy, especially in the smaller communities. Primary sectors such as agriculture, forestry, fishing and mining are more important east of Metro Vancouver, especially in the Upper Fraser Valley and Fraser Canyon. For example, these sectors account for one percent of the total experienced labour force in Metro Vancouver and nine percent in the Fraser Valley Regional District.

In the previous timber supply analysis, the total productive forest area in the TSA was reported to be approximately 636 000 hectares, of which less than half was considered suitable and available for timber harvesting. A significant number of large provincial parks, including Golden Ears, Garibaldi, Mehatl, Manning, Skagit Valley, Cultus Lake, Chilliwack Lake, Pinecone-Burke, Seymour, and Indian Arm are located partially or wholly within the boundaries of the TSA.

Tourism, recreation, biodiversity and conservation values are also very important in the Fraser TSA. The area provides easy accessible forest recreation opportunities for people living in the Lower Mainland, and scenic values along several major highway corridors that transect the TSA.

There is a diverse range of ecosystems in the TSA. Three broad physiographic units shape the area: the Coast Mountains border the TSA on the north and east; the Fraser lowland, a broad plain of riverine and glacial deposits, extends east from Vancouver to the community of Hope; and the Fraser estuary which includes the delta and tidal areas surrounding the outlet of the Fraser River. Within these physiographic units are five biogeoclimatic zones: Coastal Western Hemlock (CWH), Mountain Hemlock (MH), Interior Douglas-fir (IDF), Engelmann Spruce-subalpine fir (ESSF), and Alpine Tundra (AT).

The TSA's varied topography and climate support a rich variety of wildlife. More than 300 species of migratory and resident birds, 45 species of mammals and 11 species of amphibians and five species of reptiles range throughout the area. Native mammals include black-tailed deer, black and grizzly bear, mountain goat, beaver, wolverine and weasel. Native and migratory birds in the forests of the area include species of management concern such as spotted owl, marbled murrelet, northern goshawk, and great blue heron. Adjacent marine and foreshore habitats and estuaries, and river riparian ecosystems support populations of bald eagles, peregrine falcons, trumpeter swans, harlequin ducks and over-wintering birds. Several river systems support salmon, steelhead, trout, white sturgeon and numerous other fish species.

The chief forester last determined the AAC for the Fraser TSA on July 27, 2004, setting it at 1 270 000 cubic metres effective August 1, 2004. On July 11, 2008, the chief forester postponed the next AAC determination to a date prior to August 1, 2014, which is 10 years since the last determination's effective date.

2.2 First Nations

There are 38 First Nations Bands and five tribal organizations that have asserted traditional territories within the Fraser TSA. In addition, 14 First Nations and seven tribal organizations are located outside the TSA whose traditional territories extend into the Fraser TSA. A key to reconciliation and relationship building are many collaborative understandings between government and First Nation communities through, but limited by, agreements, tenures, and treaties. Conducting assessments pertaining to heritage and cultural use are also a means to build relationships and reach reconciliation by recognizing possible important areas of aboriginal interests.

2.2.1 Treaties and treaty negotiations

There are several First Nations within the Fraser TSA that are in treaty negotiations and one First Nation with a signed treaty, the Tsawwassen First Nation.

On April 3, 2009, the Tsawwassen First Nation Treaty came into effect. It is the first urban treaty in British Columbia and the first treaty negotiated under the British Columbia Treaty Commission (BCTC) process. The treaty brings certainty with respect to all of Tsawwassen First Nation's Aboriginal rights throughout the Tsawwassen First Nation claimed traditional territory, which covers approximately 279 600 hectares including the waters of the southern Strait of Georgia. The treaty land package consists of approximately 724 hectares of treaty settlement land for Tsawwassen First Nation. This includes approximately 290 hectares of former reserves and 372 hectares of former provincial Crown land.

The Yale First Nation Agreement-in-Principle (AIP) was approved by the Yale First Nation community, the BC Cabinet and the federal Cabinet between 2005 and 2006. A final agreement was approved by Yale First Nations members in March 2011 and the *Bill 11 – 2011: Yale First Nations Final Agreement Act* was passed by the BC Legislature on June 2, 2011. On June 19, 2013, through Bill C-62, the Yale Final Agreement Act received Royal Assent from the federal government. The Yale First Nation is now negotiating implementation of the treaty. Together with other provisions, the Yale First Nation Final Agreement provides for 1966 hectares of proposed treaty lands, including 1749 hectares of provincial Crown land and 217 hectares of existing reserve land.

The Katzie First Nation entered the treaty process in February 1994, and is now in Stage 4 of the six-stage process, negotiating an AIP which includes the identification of an area of interest. Negotiations with the Katzie First Nation are currently focused on land identification, fish and forest resources.

In addition to the Katzie First Nation, the Sto:lo Nation (which includes Aitchelitz, Leq'a:mel, Popkum, Skawahlook, Skowkale, Tzeachten, and Yakwekwioose First Nations), Musqueam First Nation, and Tsleil-Waututh Nation are in Stage 4 negotiations.

2.2.2 Agreements and tenures

Since 2010, approximately 31 of the 38 First Nations with asserted traditional territories within the Fraser TSA have signed Forest Consultation and Revenue Sharing Agreements (FCRSA). This agreement provides First Nation communities with economic benefits returning directly to their community based on harvest activities in their traditional territory.

As well, several First Nations have obtained area or volume-based forest tenures within the Fraser TSA allowing them to increase their participation in the forest sector.

In June, 2008, the Kweh-Kwuch-Hum (Mt Woodside) Spiritual Areas were identified as cultural heritage resource features by a *Government Action Regulation* (GAR) Order. The Kweh-Kwuch-Hum protects and conserves spiritual areas as noted in the order.

In June, 2012, 12 Stó:lō First Nations and the BC Government signed a Stó:lō First Nations Strategic Engagement Agreement (SEA) Pilot - to create more streamlined consultation processes and promote more effective engagement between the BC Government and First Nations in the upper Fraser Valley. Since this date, two more First Nations have been added to the pilot agreement, bringing the total number of bands under the agreement to 14.

2.2.3 Archaeological assessments

Archaeological overview assessments (AOAs) have been completed for the TSA. AOAs are the basis for determining areas and sites that may require further assessment in the form of an archaeological impact assessment (AIA). AIAs are carried out as part of operational planning. The modelling assumptions for known archaeological and other First Nations' cultural heritage resources are discussed in more detail in the section on the THLB definition.

3. Current Forest Management Considerations and Issues

3.1 Base case management assumptions

The timber supply analysis base case assumptions reflect current performance with respect to the status of forest land, forest management practices, and knowledge of timber growth and yield. The harvest forecast developed from these assumptions is termed the base case harvest forecast and will be used as a reference to which other development scenarios are compared. Uncertain assumptions will be quantitatively examined through sensitivity analysis which assesses the potential timber supply implications of different assumptions (see Section 8).

3.2 Major forest management considerations and issues

The major forest management issues to be considered in this timber supply review are listed in the table below. Where possible, the issues will be assessed directly in the timber supply analysis. If an issue does not fall within the definition of current management as described in Section 1, the related timber supply impacts will be considered during the AAC determination.

Table 1. Major forest management considerations in the Fraser TSA

Consideration/issue	Description
Land base designations	Private land and established area-based forest tenures including woodlots, community forests, and First Nation's Woodland Licences (FNWL) will be excluded from the timber supply analysis. Provincial protected areas and regional parks will be considered no-harvest areas but will contribute to non-timber objectives tracked in the analysis.
Treaty settlement lands	<p>The Tsawwassen First Nation treaty took effect on April 3, 2009. The land component of the treaty includes 372 hectares of provincial Crown land within urban areas which will not be included in timber supply analysis.</p> <p>On June 19, 2013, Bill C-62, the Yale Final Agreement Act received Royal Assent from the federal government. The Yale First Nation Final Agreement provides for 1966 hectares of proposed treaty lands, including 1749 hectares of provincial Crown land and 217 hectares of existing reserve land. This land will not be included in the timber supply analysis.</p>
Landscape-level biodiversity	<p>Landscape-level biodiversity objectives involve maintaining forests with a variety of patch sizes, seral stages, forest stand attributes and structures, across ecosystems.</p> <p>In 21 of the 24 landscape units (LUs) within the Fraser TSA, landscape-level biodiversity objectives are achieved through the establishment of old growth management areas (OGMAs). The analysis will assume no timber harvesting in OGMAs.</p> <p>In the three LUs without OGMAs, old-forest retention targets required by the 2004 Order Establishing Provincial Non-Spatial Old-Growth Objectives (NSOGO) are achieved in the large tracts of forests reserved in parks and watershed conservancies. In the timber supply analysis, non-spatial old-growth objectives will be applied in these three LUs.</p>

(continued)

Table 1. Major forest management considerations in the Fraser TSA (continued)

Consideration/issue	Description
Stand level-biodiversity	<p>Stand-level biodiversity is managed in part by retaining mature trees or mature tree patches within cutblocks to provide structural diversity and wildlife habitat.</p> <p>In the Fraser TSA, landscape unit plans (LUP) set out targets for wildlife tree retention (WTR) or default to legislative requirements as required. Where there is no approved LUP or a LUP with no stand level biodiversity objective, harvested areas will be retained in WTR as per the <i>Forest and Range Practices Act</i> and associated regulations.</p>
Spotted owl wildlife habitat areas	<p>In 1997, a Spotted Owl Management Plan (SOMP) was approved by the BC Government to guide management of spotted owl habitat on provincial Crown forests. Under SOMP, Special Resource Management Zones (SRMZs) were established throughout the known range of the spotted owl within the Chilliwack and Squamish Natural Resource Districts. In 2008, the province revised the spotted owl management plan (SOMP 2) to improve habitat protection for spotted owls. Under SOMP 2, two land designations were identified to manage Crown forests within SRMZs: Long-Term Owl Habitat Areas (LTOHA) and Managed Future Habitat Areas (MFHA).</p> <p>On March 1, 2011 the SOMP 2 land designated areas were legally established as 17 approved wildlife habitat areas (WHAs). The base case forecast will assume timber harvesting is consistent with the general wildlife measures (GWM) for the wildlife habitat areas.</p> <p>The primary purpose of the LTOHA is to recover and sustain the spotted owl population. The timber supply analysis will assume the LTOHA are reserved from timber harvesting with the exception of exemption areas specified under Section 2 of the GWM which allow for a one-time harvest, provided that a minimum of 10% of the cutblock area is retained as untreated WTR.</p> <p>Based on the GWM, the timber supply analysis will assume timber harvesting will occur in the MFHA provided that a minimum of 10% of the cutblock area is retained as untreated WTR. For MFHA in drier ecosystems, a minimum average of 40 large-diameter trees per hectare will be assumed to be retained as single trees or groups of trees within the cutblock. For MFHA in wetter ecosystems, a minimum average of 15 large-diameter trees per hectare will be assumed to be retained as single trees or groups of trees within the cutblock. In both cases no more than 40% of the trees within the cutblock are retained within WTR and other reserves.</p>
Wildlife habitat areas	<p>In addition to spotted owl, WHAs and associated GWM have been established to protect habitat of rare and/or endangered plant and animal species. These include WHAs for grizzly bear, Pacific water shrew, mountain beaver, Pacific giant salamander, and tall bugbane. The GWM of all established WHAs will be modelled in the timber supply analysis.</p>
Ungulate winter range	<p>A <i>Government Action Regulation</i> (GAR) Order established over 35 000 hectares of ungulate winter range for mountain goat (U-2-001) and over 31 000 hectares of winter range for black-tailed deer and mule deer (U-2-006), approved on March 10, 2008 and August 22, 2009 respectively. In May 12, 2011, the ungulate winter range order U-2-006 was also amended to add two additional ranges (B26 and CH 9-11). The GWM of all established UWRs will be modelled in the timber supply analysis.</p>

(continued)

Table 1. Major forest management considerations in the Fraser TSA (continued)

Consideration/issue	Description
Resource features	<p>A GAR order was established to protect surface and subsurface elements of a karst system (caves) within the area shown on the Karst GAR Order map, dated April 28, 2010. The Karst order is non-spatial and covers the Chilliwack River Valley and Silverhope Creek LUs. Karst features provide the anchor for co-location of a wildlife tree retention (WTR) providing stand-level biodiversity. The analysis will assume that stand-level retention needed for karst features is captured by the WTR reserve areas.</p> <p>The Kweh-Kwuch-Hum (northwest part of Mt Woodside) Spiritual Areas were identified as cultural heritage resource features by a GAR order, dated June 23, 2008. The Kweh-Kwuch-Hum will be considered a no-harvest area (100% netdown) in the "High Cultural Features and Use Area" areas only for the analysis.</p>
Community watershed	<p>There are 77 community watershed areas within the Fraser TSA. The timber supply analysis will assume a rate-of-harvest in these watersheds that is consistent with the recommendations in the <i>Community Watershed Guidebook</i>.</p>
Riparian management	<p>The Fraser TSA, like other coastal management units, contains an enormous network of freshwater streams, lakes and rivers, providing valuable habitat for resident and anadromous fish species. Wetlands are also numerous and provide valuable fish, amphibian and bird habitat.</p> <p>A predictive geographic classification model has been used to assign stream classifications which have prescribed management regimes. Lakes and wetlands already have assigned classifications with prescribed management regimes.</p> <p>Riparian management areas (RMAs) will be defined along streams, lakes and wetlands consistent with management practices and removed from the THLB.</p>
Visual resource management	<p>Management for visual quality is a key consideration in the Fraser TSA given the proximity of a large population base with Metro Vancouver and communities of the Upper Fraser Valley and increasing recreational and tourism use of the area. Scenic areas and visual quality objectives (VQOs) were continued for the Chilliwack Natural Resource District in 2005 under Section 17 of the GAR.</p> <p>As well, significant portions of the visual inventory and objectives were revised under an approved Order under Section 7(1) and (2) of GAR, in 2013. The timber supply analysis will apply forest cover objectives that are consistent with the established VQOs.</p>
Variable retention and partial harvesting	<p>The reduced yields associated with the increased use of the partial retention silvicultural system will be modelled. The Forest Analysis and Inventory Branch (FAIB) within the FLNR has developed estimates regarding regeneration impacts associated with these practices which will be utilized to predict stand yields in areas managed under the partial retention silviculture system.</p>
Shifting harvest profiles	<p>Within the Fraser TSA, there has been a shift from harvesting older growth hemlock/balsam to second-growth Douglas-fir and cedar forests. The influence on long-term productivity with increased harvesting of second-growth stands and the associated influence of lower harvest ages will be examined in the timber supply analysis.</p>

(continued)

Table 1. Major forest management considerations in the Fraser TSA (concluded)

Consideration/issue	Description
Archeological sites and traditional use	Archaeological Overview Assessments (AOA) and Archaeological Impact Assessments (AIA) are used to identify potential archaeological sites which include cultural and historic use sites. Once they have been field verified, archaeological sites, including buffer strips, are protected and recorded in the Remote Access to Archaeological Data (RAAD). For the analysis, the buffered sites indentified in the RAAD are excluded from the THLB.
Cutblock size and adjacency	A forest cover constraint will be incorporated into the base case forecast to account for cutblock adjacency limitations.
Site productivity	The site index assigned to old-growth stands has been shown to underestimate the productivity of regenerated stands. To address this, the timber supply analysis will use site productivity estimates derived from a provincial biophysical site index model to project growth rates of managed stands.
Operability	Inoperable areas are forested lands that are deemed to be unavailable for harvest due to terrain-related or economic reasons. Characteristics used to define operability include: slope, topography (e.g., presence of gullies or exposed rock), difficulty of road access, soil stability, elevation and timber quality in the Fraser TSA. Inoperable areas will be removed from the THLB.
Complex Operating Areas	Complex Operating Areas, such as Bowen Island, are areas where urban development or other non-timber factors increase the complexity of forest operations. A low level of operating performance has been demonstrated within the provincial forest lands in these areas. Since no land use decisions have been made regarding the areas, they will be assumed to contribute to the TSA timber supply. The timber supply analysis will include an assessment of harvest activity in the areas and will report the forecasted contribution of them to the TSA timber supply.

4. Inventories

4.1 Background information

Table 2 lists the inventories that will be used to determine the THLB and to model forest management activities.

Table 2. *Inventory information*

Data	Source	Vintage	Date of compilation (last update)
Fraser TSA administrative boundary and timber supply blocks	FLNR Forest Tenures Branch (FTB)	2013	2013
Woodlots and community forest agreement areas	FTB	2013	2013
Tree Farm Licences	FTB	2013	2013
Parks and protected areas	FLNR Crown Registry and Geographic's Base Branch (CRGB)	2013	2013
Ownership and land administration	FLNR Forest Analysis and Inventory Branch (FAIB) and Chilliwack Natural Resource District (DCK)	2012	2013
Timber licences	FTB	2013	2013
Vegetation Resources Inventory (VRI) – forest cover	FAIB	Projected to 2012	2013
Harvest depletion mapping	FAIB	2012	2013
Operability mapping	DCK	1996	1996
Registered archaeological sites	Remote Access to Archaeological Data (RAAD)	2013	2013
Established recreation sites and trails	FTB	2013	2013
Approved old-growth management areas	FLNR	2013	2013
Approved wildlife habitat areas (WHAs)	FLNR	2005-2011	2013
Spotted owl wildlife habitat areas (WHAs)	FLNR	2012	2013
Resource features – Mt. Woodside (Kweh-Kwuch-Hum) GAR Order – cultural heritage resource	FLNR	2008	2013

(continued)

Table 2. Inventory information (concluded)

Data	Source	Vintage	Date of compilation (last update)
Resource features – karst area	FLNR	2010	2013
Recreation trails (Section 56) – Chilliwack River Valley	FLNR	2012	2013
Ungulate winter range UWR 2-006 and amendment(s) - Deer	FLNR	2009	2013
Ungulate winter range (UWR) U-2-001-Goat	FLNR	2008	2013
Permanent sample plots (PSP) and research plots	FAIB	2013	2013
Landscape unit boundaries	FLNR Resource Management Objectives Branch (RMOB)	2012	2013
Visual landscape inventory and visual quality objectives and scenic areas (updated 2013)	FLNR	1996	2005, 2013
Community watersheds	Ministry of the Environment (MOE)	1997	N/A
Roads, trails and landings	FLNR	2013	2013
Powerlines, hydrolines, transmission lines	Tantalis	2013	2013
Yale Designated Area No. 3	FLNR	2012	2013
Environmentally sensitive areas	FLNR	1978	1978
Riparian management area	FAIB	2000	2013
Tsawwassen First Nation treaty land	FLNR	2009	2009

Data source and comments:

Spatial data for the Fraser TSA will be extracted from the BC Geographic Warehouse, formerly the Land and Resource Data Warehouse (LRDW), or from the Chilliwack Natural Resource District (DCK) data library (non-standard) and converted to ESRI's Arc GIS feature classes format in preparation for the timber supply analysis.

A vegetation resource inventory (VRI) was completed for the Fraser TSA based on 1996 aerial photography. The VRI file has had stand attributes projected to 2012 and stand disturbances (including harvesting) updated to 2012. Information from the change detection imagery was used for this process. Note that Phase 1 of the Fraser TSA VRI did not include all of the historical information that has been traditionally recorded on the forest cover (FC1 coverage). This was collected in Phase 2 by establishing ground sample plots to determine the accuracy of the photo-interpreted labels established during Phase 1. The specific age, height and volume adjustment factors applied to each species group and the associated statistical data was compiled by FAIB.

The inventory of known archaeological features is maintained in RAAD.

The visual landscape inventory for the Chilliwack Natural Resource District has undergone some changes with the last visual inventory update completed in 2012 in support of the legal establishment of a significant portion of visual quality objectives for the district in 2013.

A GAR Order, for “Identified Karst Resource Features” in the Chilliwack Natural Resource District (2010) protects in a non-spatial manner elements of karst ecosystems identified in the karst inventory.

Additionally, GAR Order, for “Cultural Heritage Resource” in the Mt. Woodside area (Kweh-Kwuch-Hum) was approved, in 2008. As well, a GAR Order, for “Recreation Trails” in the Chilliwack River Valley, and Mission area were established in 2012.

As the VRI maps contain only vegetation data, information on other resources and values such as operability mapping, environmentally sensitive areas (ESA), visual quality objectives, wildlife habitat area, established landscape unit boundaries, old-growth management areas (OGMAs), community watershed designations, etc., will be merged with the VRI file to produce a set of resultant data files for use in the timber supply analysis.

5. Division of the Area into Management Zones

5.1 Management zones and tracking of multiple objectives (grouping)

The concept of management zones is used to differentiate areas with different management objectives. For example, a zone may be based on a harvesting or silviculture system, visual quality objective or wildlife consideration or more than one management objective. In the timber supply analysis, each type of zone can be tracked separately, thereby allowing application of overlapping management objectives. Forest land that is unavailable for timber harvesting may contribute toward meeting objectives for other forest values.

Table 3 outlines the zones or objectives incorporated into the timber supply model. Further information on the forest cover requirements to be applied to these areas can be found in Section 7.5, “Objectives with forest cover requirements”.

Table 3. Objectives or zones to be tracked

Objective or zone	Inventory definition
Landscape-level biodiversity	Approved OGMA's will be used in the base case where they have been legally established. Elsewhere, the recommended seral stage distribution for the biogeoclimatic unit will be modelled.
Visual quality objectives (VQO)	Visual polygons will be modelled by VQO and assigned visual absorption capacities (VAC). VQOs include retention, partial retention and modification. VAC include low, medium and high.
Cutblock adjacency	Integrated Resource Management (IRM) Zone objectives for cutblock adjacency will be applied in areas of each LU outside of visual polygons.
Wildlife habitat areas	Forest cover constraints will be applied to WHAs (including spotted owl MFHA), where that type of constraint is specified in the GWM for the WHA.
Deer and goat winter range	Forest cover constraints will be applied to most of the black-tailed deer ungulate winter ranges where that type of constraint is specified in the GWM for the Order.
Second-growth harvesting	Stands above the minimum harvest age and younger than 105 years old (current stands < 105 years will be called second growth).
Community watersheds	Community watersheds will be modelled with a reduced rate of harvest consistent with the <i>Community Watershed Guidebook</i> .
Complex Operating Areas	The timber supply contribution from Complex Operating Areas will be tracked in the analysis.
Heli-logging	Heli-logging areas where operability mapping code was set to 'H' will be tracked in the analysis.

5.2 Analysis units

An analysis unit is a combination of stands with similar tree species composition, timber growing potential and treatment regimes. Table 4 describes how analysis units will be defined in the base case forecast. Each analysis unit will be assigned its own set of timber volume projections (yield tables) for existing and for future stands. Yield tables for existing natural stands will be derived using the Variable Density Yield Prediction (VDYP) version 7. Yield tables for existing managed stands and future stands will be derived using the Table Interpolation Program for Stand Yields (TIPSY).

Table 4. Definition of analysis units

Analysis unit	Inventory type groups	Inventory site index group
Fir – SI less than 17.4	1 - 8	< 17.4
Fir – SI 18 to 34 (multiple groups)	1 - 8	1 metre increments
Fir – SI 35+	1 - 8	>34.5
Cedar – <101 years	9 -11	All sites
Cedar – 101+ years	9 -11	All sites
Hemlock/Balsam – SI less than 10.4	12 - 20	<10.4
Hemlock/Balsam – SI 10 to 29 (multiple groups)	12 - 20	1 metre increments
Hemlock/Balsam – SI 30+	12 - 20	> 29.5
Pine/Larch	27 - 31	All sites
Spruce	21 - 26	All sites
Alder	37 - 38	All sites

Data source and comments:

Site index is a measure of forest site productivity and is defined as the height of the tree in metres at age 50 years.

For Douglas-fir and hemlock/balsam stands, multiple analysis units will be created for each one-metre increment in site index.

6. Timber Harvesting Land Base Definition

This section outlines the steps used to identify the timber harvesting land base (THLB) which is the productive forest expected to support timber harvesting within the Fraser TSA. Land may be unavailable for timber harvesting for three principle reasons:

- it is not administered by the FLNR for TSA timber supply purposes (e.g., private land, parks, etc.);
- it is not suitable for timber production purposes (e.g. non-forested areas); or
- it is unavailable for timber harvesting (e.g. recreation areas).

Land may also be added to the THLB in the following situations:

- by management activities or changed conditions which improve productivity or operability (e.g., the stocking of land currently classified as non-commercial brush); or
- by the acquisition of productive forest land (e.g., timber license reversions).

The THLB for the Fraser TSA will be determined by a process of delineating the categories of land (described in subsections below) that are not expected to contribute to timber harvesting in the TSA. Land will be considered outside the THLB only where no harvesting is expected. Any area in which some timber harvesting will occur will remain in the THLB, even if the area is subject to other management objectives such as wildlife habitat and biodiversity objectives. The management objectives will be modelled in the timber supply analysis. In most cases the Crown forested land base outside of the THLB will also contribute to management objectives.

It is not uncommon for specific areas to be identified by more than one land category; for example, deciduous stands within riparian reserve zones. These areas will be classified as deciduous, prior to the riparian classification. Another example is where a patch of culturally modified trees (CMT) provides the “anchor” for co-location of a wildlife tree retention (WTR). Therefore, in most cases the net area reduction for a particular category will be less than its gross area due to overlap with areas previously excluded from the THLB under other categories.

6.1 Land outside the core TSA

The legal boundary of the Fraser TSA encompasses several large areas that do not contribute to TSA timber supply and do not contribute to the achievement of non-timber objectives for the Fraser TSA. These areas include the following: Tree Farm Licences 26 (TFL 26) and TFL 43; and a Community Forest Agreement (CFA): Cascade Lower Canyon Community Forest Agreement (CFA #K3J).

6.2 Non-forest

Areas classified as not forest management land base (FMLB= ‘N’) in the VRI will be excluded from the forest land base unless they have been previously harvested. This means that unharvested areas classified as ‘non-treed’ as well as alpine forest, wetland, lakes, rocks, shrubs, etc. are excluded from the forest land base wherever these attributes are available in the inventory. Areas are also excluded where the site index is less than five metres.

6.3 Land not administered by FLNR for TSA timber supply

Land not administered by FLNR for timber supply in the TSA includes private, municipal and federal lands, Indian Reserves, woodlot licences, parks and ecological reserves. TFLs and CFAs will be excluded from the core TSA as described in Section 6.1. FAIB ownership codes, augmented with tenure boundary maps (i.e., regional parks, provincial parks, and protected areas), will be used to identify whether or not land contributes to the timber supply for the TSA. Parks, protected areas and other miscellaneous reserves within the TSA will be excluded from the THLB but will be included within the crown forested land base (CFLB) and will contribute to the achievement of non-timber objectives (e.g., biodiversity and wildlife habitat objectives).

Table 5 shows the potential contribution of each ownership class to the CFLB and the THLB. Some ownership classes may not occur in the Fraser TSA.

Table 5. Land ownership classification and THLB contribution

	Ownership code	Crown forested land base	THLB
40	Private Crown Grant	No	No
50	Federal Reserve	No	No
52	Indian Reserve	No	No
53	Military Reserve	No	No
60	Crown Ecological Reserve	Yes	No
61	Crown Use, Recreation and Enjoyment of the Public (UREP) Reserves	Yes	Schedule C: Yes Schedule N: No
62	Crown Forest Management Unit (TSA) or Crown Timber Agreement Lands	Yes	Yes
63	Crown Provincial Park Class A	Yes	No
67	Crown Provincial Park equivalent or Reserve	Yes	No
69	Crown Miscellaneous Reserves	Yes	Schedule C: Yes Schedule N: No
70	Crown Active Timber Licence in a TSA or TFL	Yes	Schedule C: No Schedule N: Yes
72	Crown and Private Schedule "A" and "B" Lands in a TFL	No	No
75	Crown Christmas tree permit	Yes	No
77N	Crown and Private Woodlot Licence	No	No
77C	Proposed Crown and Private Woodlot Licence	Yes	Yes
79	Community Forest	No	No
99	Crown Misc. lease (e.g. recreation cottage site, club site)	No	No

Data source and comments:

The ownership and land administration data set, along with the vegetation resource inventory are the primary data sets used to determine land classified as Crown forest.

Areas covered by timber licences (code 70N) are not administered by the government until they have been harvested and reverted to the Crown, as described in Section 6.21, "Timber licence reversions".

6.4 Exclusion of geographically defined areas

The land component of the Tsawwassen First Nation treaty, which includes 372 hectares of provincial Crown land, and the Yale Designated Area No. 3 will be removed from the THLB for the analysis.

6.5 Inoperable areas

Operability codes are generally used to describe the presence or absence of physical and economic barriers that limit harvesting. Since physical and economic conditions are highly variable throughout British Columbia, interpretation and mapping of these areas is susceptible to change. The currently available assessment of operability in the Fraser TSA was conducted in 1996 by licensees, the BC Forest Service and a consultant, and is based on the presence or absence of physical barriers or limitations to harvesting, on the use of appropriate logging methods including cable or helicopter, and on the merchantability of the stands. The reductions listed in Table 6 will be applied to account for operability though all previously harvested stands will be considered operable in the analysis irrespective of operability coding.

District staff advise that in the last two decades there has been minimal harvesting within complex operating area of Bowen Island. Since government has not made a land-use decision that would remove some or all of these affected areas from the THLB or restricted harvesting rates within the areas the timber supply analysis will assume that this area continues to contribute to the THLB. However the analysis will include an assessment of the amount of past harvest activity in these areas and the contribution of the areas to the future timber supply for the TSA.

Table 6. Description of operable areas

Operability class	Code	Reduction (%)
Operable areas - conventional	A	0
Operable areas - helicopter	H	0
Inoperable areas	I	100

Data source and comments:

As indicated above, operability mapping was completed in 1996 by TSA licensees and the BC Forest Service. A 2007 report on the economic operability assessment of the Fraser Timber Supply Area, which was produced by a consultant for the Fraser TSA Cooperative Association, concluded that the 1996 operability mapping in the TSA is conservative and underestimates the economically available mature timber supply.

All previously harvested stands will be identified using the FAIB 2013 consolidated cutblock layer and will be considered to be operable regardless of operability class.

6.6 Sites with low timber growing potential and problem forest types

Sites may have low productivity either because of inherent site factors (e.g., poor nutrient availability or excessive moisture) or because they are not fully occupied by commercial tree species. Typically, these stands are inter-mixed with other stands within the forested land base. As these stands are not considered to be harvestable, they need to be identified and removed from the THLB. This will be done by evaluating the yield and growth rate of each stand as outlined in Table 7.

Table 7. Description of sites with low timber growing potential

Leading species	Characteristics used to identify unharvested stands with low timber potential
Fir	Existing volume less than 350 m ³ /hectare and site index at breast height (SI50) less than 16 metres (projected not to produce 350 m ³ /hectare by age 150 years). In heli-log areas (operability = "H") volume and SI criteria will be based on achieving 400 m ³ /hectare by age 150 years.
Cedar	Existing volume less than 350 m ³ /hectare and SI50 less than 13 metres (projected not to produce 350 m ³ /hectare by age 150 years). In heli-log areas (operability = "H") volume and SI criteria will be based on achieving 400 m ³ /hectare by age 150 years.
Hemlock/Balsam	Existing volume less than 350 m ³ /hectare and SI50 less than 11 metres (projected not to produce 350 m ³ /hectare by age 150 years). In heli-log areas (operability = "H") volume and SI criteria will be based on achieving 400 m ³ /hectare by age 150 years.
Spruce (FIZ D)	Existing volume less than 300 m ³ /hectare and SI50 less than 11 metres (projected not to produce 300 m ³ /hectare by age 150 years). All heli-log areas (operability = "H").
Sitka spruce (FIZ A,B,C)	Existing volume less than 350 m ³ /hectare and SI50 less than 11 metres (projected not to produce 350 m ³ /hectare by age 150 years). In heli-log areas (operability = "H") volume and SI criteria will be based on achieving 400 m ³ /hectare by age 150 years.
Pine	Existing volume less than 300 m ³ /hectare and SI50 less than 13 metres (projected not to produce 300 m ³ /hectare by age 150 years). All heli-log areas (operability = "H").
Alder	Existing volume less than 150 m ³ /hectare.

Data source and comments:

Areas that have been previously logged will not be removed from the THLB as stands with low timber potential.

The above criteria were selected to broadly identify low potential stands for the purposes of the strategic timber supply analysis. It is recognized that at the operational level there are stands below the specified thresholds that are harvested and stands above the thresholds that are not harvested. The expectation is that these thresholds reasonably reflect the general productivity levels of stand currently harvested in the TSA.

6.7 Unmerchantable forest types

Unmerchantable forest types are stands which are physically operable and exceed low site criteria yet are not currently utilized. These types are wholly or partially excluded from the THLB.

Table 8. Unmerchantable forest types criteria

Leading species	Inventory type group
Cottonwood, Aspen, Birch, Maple	35, 36, 39, 40, 41, 42

6.8 Environmentally sensitive areas

An environmentally sensitive area (ESA) is an area that is susceptible to disturbance (e.g., unstable terrain, or areas that are difficult to reforest). ESA values are used to exclude areas from the THLB where more specific and detailed information is not available about a particular forest resource. Areas can be identified as either very sensitive (E1) or moderately sensitive (E2) to disturbance, and are entirely or partially removed from the THLB.

ESA in the Fraser TSA were identified by transferring and overlaying the sensitive area attributes from the previous forest cover inventory since these attributes are not incorporated in VRI. This is currently the best available means of identifying ESA for sensitive soils, avalanche hazard, and tree regeneration reasons in the Fraser TSA.

Current management of sensitive wildlife habitat areas is dealt with by the GWM that apply to WHAs and UWRs so there is no ESA reduction for wildlife. Similarly, sensitive recreation values are accounted for by land reductions for established trails and recreation sites so there is no ESA reduction for recreation. Table 9 lists the land base reductions that are applied for ESA.

Table 9. Description of environmentally sensitive areas (ESA)

ESA category	ESA description	Reduction (%)
S1	Highly sensitive soils	100
A1	Avalanche hazard	100
P1	Severe regeneration problems	100

Data source and comments:

The previous forest inventory also includes ESA category S2 areas (moderate sensitive soils). Since land base reductions for low-site productivity eliminates a large portion of the S2 area and timber harvesting occurs in the balance of the S2 area, no specific reduction is applied for S2 areas. This assumptions will also off set the 10 percent of ESA S1 areas that were assumed to be harvestable in the previous timber supply analysis and are now completely removed from the THLB.

6.9 Cultural heritage resource reductions

Cultural heritage values include archaeological sites and will be removed from the THLB as indicated in Table 10.

Table 10. Cultural heritage resources

Identified inventory variables	Excluded area (ha)
Known archaeological feature - point	One hectare per occurrence within a forest cover polygon
Known archaeological feature - area	Archaeological feature polygon area

6.10 Experimental and permanent sample plots

Each experimental and permanent sample plot will receive a 100-metres buffer and the total area will be excluded from the THLB.

6.11 Established 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, sheltered moorage areas, can result in the exclusion of harvest activities.

Legally established recreation sites, trails and interpretive forests have very high recreation values. In the timber supply analysis, small recreation sites identified in the Forest Tenure Recreation map layer in the BCGW will be excluded from the THLB. No incremental THLB reductions for recreation will be applied in the Blue Mountain Recreation site or the planned Vedder Mountain Interpretive Forest since recreation features in these areas are often managed in conjunction with other non-timber objectives. The analysis will assume that the rate of timber harvesting within a 20-meter buffer zone along established recreation trails will be limited to one percent of the productive forest area per year.

6.12 Roads, trails and landings

In this analysis, a 10-metre buffer will be applied to either side of all roads and the buffered area removed from the THLB. The buffered road area is the assumed average loss of growing space due to roads, trails and landings and will be removed from the THLB. A 20-metre total buffer will be applied, instead of the typical 30-metre right-of-way, in order to account for growing space above road edges utilized by regenerating trees and for the small amount of reclaimed (planted with trees) road bed not indicated in the inventory.

For future roads, a review of logging since 1996 showed that the road network represents about five percent of logged areas. Therefore all pixels above 120 years of age that are not currently roaded will have a five percent reduction applied. This will be reviewed upon completing the inventory file preparation.

6.13 Karst

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 features that include fluted rock surfaces, vertical shafts, sinkholes, sinking streams, springs complex sub-surface drainage systems and caves.

In 2010, a GAR Order established specific elements of karst systems as resource features within the Chilliwack District. Like the recreation resource features, this designation results in protection under FRPA's *Forest Planning and Practices Regulation* for specified karst elements.

Although the GAR Karst Resource Feature Order is non-spatial in nature, it reflects current management practices under the *Karst Management Handbook* and Karst Inventories. In operations much of the forest retention around karsts can be co-located with a WTR area as needed. For this reason an assumption in the analysis will be that stand-level retention needed for karst features is captured by the WTR areas as needed.

6.14 Ungulate winter range reductions

As indicated in Table 11, two separate GAR Orders have established winter ranges for mountain goat and black-tailed deer in the Fraser TSA. Each order includes a set of GWM that prohibit or constrain primary forest activities within in each UWR unit. Supporting information supplied with the orders provides background information and support to the legal order. The GWM will be modelled in the timber supply analysis by applying appropriate THLB exclusion factors.

Table 11. Established ungulate winter ranges

Species	Order	Order date	Approximate area (ha)
Mountain Goat	U-2-001	March 10, 2008	35 600
Black-tailed deer/ Mule deer	U-2-006	August 22, 2009	31 800
Black-tailed deer/ Mule deer	U-2-006 amendment	May 12, 2011	200 (including one new unit and additional area in other units)

The GWMs for U-2-001 prohibit primary forest harvesting and require the retention of all forest and vegetative cover within the UWR. Therefore, 100 percent forest retention will be applied in U-2-001 goat winter range.

The GWMs for U-2-006 includes a set of measures that apply to 115 separate deer winter range units located across 17 landscape units in the Chilliwack Natural Resource District. In 17 of the individual winter ranges, timber harvesting is prohibited (i.e., 100 percent retention) due to the small overall size of the unit. For the remaining 98 winter ranges, they are further divided into snow pack zones (i.e., deep, moderate and shallow based on elevation) making approximately 250 individual sub-divisions which are referred to here as deer management

units (DMUs). The GWMs set out deer winter habitat retention targets for each DMU. Generally, higher retention levels are required in deep snowpack DMUs (60-65 percent retention). In moderate snowpack DMUs retention varies from 65 percent to 40 percent; and in shallow snowpack DMUs retention is often 20 percent (or zero percent retention in a few instances). The GWMs also state that, where possible, the habitat targets are to be achieved using currently suitable deer winter habitat, and if there is currently insufficient amounts of suitable habitat, then young-suitable habitat or open-forest habitat or recruitment habitat is to be used to meet the targets. The complex GWMs for U-2-006 winter ranges will be incorporated into the timber supply analysis by calculation of the amount of THLB area in each DMU that must be constrained in order to meet the retention targets after all suitable habitat in non-THLB areas is considered.

6.15 Wildlife habitat area reductions

The Identified Wildlife Management Strategy (IWMS), which was announced in the spring of 1999, outlines a process to identify and establish wildlife habitat areas (WHAs) and associated GWM to protect rare and/or endangered species. One-hundred and eleven WHAs covering a gross area of nearly 120 000 hectares have been established in the Fraser TSA. Table 12 lists the number of WHAs and total gross area by species and provides a description of the management activity prohibited or permitted within the WHAs.

Table 12. Summary of established WHAs for the Fraser TSA

Species	Number of WHAs	Gross area (ha)	Management activity
Grizzly Bear	63	13 418	Within the grizzly bear WHA, harvesting and road construction are to be avoided; although variances may be granted to allow future road reconstruction or extension when necessary. The timber supply analysis will assume the grizzly bear WHAs are reserved from timber harvesting.
Spotted Owl	17	104 812	As described in Section 6.16.
Mountain Beaver	1	79	To protect mountain beaver burrows from damage, harvesting and road construction are to be avoided in the WHA. The timber supply analysis will assume this WHA is reserved from timber harvesting.
Pacific Water Shrew	3	45	The pacific water shrew WHAs contain a core area and a management zone. Harvesting and road construction are not permitted in the core area. Partial harvesting that maintains 70% basal area is permitted in the management zone.
Tall Bugbane	7	460	The tall bugbane WHAs contain a core area and a management zone. Harvesting and road construction are not permitted in the core area. Partial harvesting that maintains 60% of the stand basal area is permitted in the management zone which comprise about 85 percent of the WHA.
Pacific Giant Salamander	20	772	The pacific giant salamander WHAs contain a core area and a management zone. Harvesting and road construction are not permitted in the core area. Partial harvesting that maintains 30% basal area is permitted in the management zone which comprise about one-third of the WHA.
Total	111	119 586	

Data source and comments:

Since some of the WHAs overlap with other WHAs or UWRs, it will be assumed that the most restrictive measures will apply in the overlap areas.

The boundaries of established WHAs have been mapped by Ecosystems Branch of the Ministry of Environment.

A number of new WHAs have been proposed within the Fraser TSA. If established prior to the AAC determination these new WHAs will be accounted for in the timber supply analysis.

6.16 Spotted owl wildlife habitat areas

In 2008, the province released a revised spotted owl management plan (SOMP 2) which reconfigured previously identified owl management areas and management practices to provide improved habitat protection for spotted owls. Under SOMP 2, two designations were identified to manage Crown forests within SRMZs: long-term owl habitat areas (LTOHA) and managed future habitat areas (MFHA). On March 1, 2011 these designated areas were legally established as 17 approved wildlife habitat areas (2-494 to 2-510).

LTOHA within a WHA functions as current or future spotted owl habitat. The primary purpose of the LTOHA is to recover and sustain the spotted owl population. The timber supply analysis will assume the LTOHA is reserved from timber harvesting with the exception of exemption areas specified under Section 2 of the GWM which allow for one-time harvest provided that a minimum of 10 percent of the cutblock area is retained as untreated WTR. The LTOHA may also have special designations for known and active nest or critical roost sites. Where these are identified, an 80 hectare reserve is established around the nest or roost site. This designation requires no special analysis since it will already be accounted for when modelling the LTOHA.

MFHA within a WHA are available for timber harvesting opportunities while retaining structural attributes to maintain options for all or portions of the MFHA to become future spotted owl habitat. Based on the GWM, the timber supply analysis will assume timber harvesting will occur in the MFHA provided that a minimum of 10 percent of the cutblock area is retained as untreated WTR. There are no designations expected for known and active nest or critical roost sites within the MFHA; therefore, timber supply analysis will only consider them in the LTOHA (i.e. 80 hectare reserve). For MFHA in drier ecosystems, a minimum average of 40 large-diameter trees/ha will be assumed to be retained as single trees or groups of trees within the cutblock. For MFHA in wetter ecosystems, a minimum average of 15 large-diameter trees/ha will be assumed to be retained as single trees or groups of trees within the cutblock. In both cases no more than 40 percent of the trees within the cutblock are retained within WTR and other reserves.

6.17 Riparian reserve zones

The information used to capture the effects of riparian management on the TSA timber supply was assembled following the methodology applied in the previous timber supply review. This methodology was applied to estimate the area within riparian management area using available inventory information and the classifications in the *Riparian Management Area Guidebook*. Buffer widths for stream features were developed to reflect limitations in the TRIM data and to capture operational practices in riparian reserve zones and riparian management zones. To follow is a summary of the riparian area mapping method applied.

A coverage of all the TRIM water features was obtained from the District database. Extracting the following features created a separate coverage for each type of water feature to be used in the analysis:

Table 13. *Riparian features and description*

Riparian feature	Description
Double-line river	Left bank/right bank
Lake	Definite/indefinite/intermittent
Marsh (wetlands)	Marsh outline/swamp outline
Island	Outline
Single-line river	Definite/indefinite/intermittent

The coverage for double-line rivers, lakes, marshes and islands were formed into polygons. The island coverage was overlaid with the lake and double-line river coverage to form a water feature coverage that included the appropriate islands.

The lake coverage was overlaid with the biogeoclimatic subzone/variant map since biogeoclimatic classifications are used in categorizing lakes. Lakes were classified into L1 – L4 categories based on surface area and biogeoclimatic zone as outlined in the *Riparian Management Guidebook*. The same process was used to classify marshes (wetlands) into categories W1 – W4. In a separate process wetland complexes (W5) were identified. This process involved producing 60 and 80 metre wide buffers around appropriately sized wetlands and determining which of those wetlands and their buffers formed a “complex”.

Rivers are categorized into six riparian classes (S1 to S6) depending on channel width, the presence/absence of fish, stream gradient, or being located in a community watershed. The S1 class may further be separated into two categories, to distinguish “large rivers” (S1L) from other S1 streams (i.e., large rivers are uncommon and must be: over a one kilometre length of stream, an average channel width or an active floodplain width of ≥ 100 metres as per the *Riparian Management Area Guidebook*). Streams in riparian classes S1, S2, and S3 have riparian reserve zones of varying widths. Other stream classes, including S1L, do not have reserve zones.

Streams were classified as follows. All double-line river polygons were assumed to be S1 rivers. The polygons were then buffered internally to determine their width. The result was used to distinguish “large rivers – S1L” from the normal S1 riparian category (i.e., >20 m in width but not S1L). Only the lower portion of the Fraser River starting about 10 kilometres upstream of Hope fell into this S1 large river category. All other double-line rivers are considered S1 streams.

Single-line rivers were classified using the slope of the stream reach (as a surrogate for fish presence) and the distinction between definite/indefinite and intermittent streams. The 25-metre grid digital elevation model (DEM) was used to create a slope layer for the study area. This was formed into polygons with slopes either greater than or less than and equal to 20 percent. The slope attribute was attached to the single line water features and they were classes as follows:

Table 14. Stream class categories

Stream class	Single-line water type	Slope class
S2/S3	Definite & indefinite	<20%
S4	Intermittent	<20%
S5	Definite & indefinite	$\geq 20\%$
S6	N/A	N/A

Buffers were generated along classified riparian features using riparian width guidelines listed in the *Riparian Management Guidebook* as shown in Table 15. In some cases the calculated RMA width differs from the implemented RMA width for stream classes S3 to S6. There is no GIS method to distinguish between S2 and S3 streams so the S2 width was applied to both classes. It is likely that S4 and S5 are underrepresented in TRIM maps compared to their actual occurrence on the landscape so the implemented width assumed a wider management zone (by 10 metres) for these classes to compensate for this underestimate. No S6 streams were identified and were not explicitly included in the riparian management zone delineation. However, the land base implications of best management practices on S6 streams are considered to be negligible.

Table 15. Recommended and implemented riparian management area widths

Feature class	Reserve zone width (m)	Management zone width (m)	Management zone retention (%)	Calculated RMA width (m)	Implemented RMA width (m)
S1L	0	100	50	50	50
S1	50	20	50	60	60
S2	30	20	50	40	40
S3*	20	20	50	30	40
S4	0	30	25	7.5	10
S5	0	30	25	7.5	10
S6	0	20	5	1	N/A
L1	10	0	25	10	10
L2	10	20	25	15	15
L3	0	30	25	7.5	7.5
L4	0	30	25	7.5	7.5
W1	10	40	25	20	20
W2	10	20	25	15	15
W3	0	30	25	7.5	7.5
W4	0	30	25	7.5	7.5
W5	10	40	25	20	20

* There is no GIS method to distinguish between S2 and S3 streams so the S2 width was applied to both classes.

Data source and comments:

The riparian reserve zone and management zone widths listed in Table 15 are consistent with Division 3 - Riparian areas of Part 4 - Practice requirements of the *Forest Planning and Practices Regulation*. All trees are assumed to be retained in reserve zones. Since the regulation does not specify default retention amounts within riparian management zones, except for minor tenures, the stand retention amounts for S2 to S5 stream management zones were specified using data about RMAs collected by the Forest and Range Evaluation Program (FREP) in the Chilliwack Natural Resource District.

The retention amounts for S1 streams and for all lakes and wetlands were taken from the *Riparian Management Guidebook*.

6.18 Landscape-level biodiversity

An old-growth management area (OGMA) is an area established under the *Land Act* which contains or is managed to replace structural old growth attributes. In the Fraser TSA, there are 24 total landscape units; and in 21 of those

OGMAs have been approved. For the base case, it will be assumed that these areas satisfy all old-seral biodiversity requirements in these units and the OGMAs will be considered unavailable for timber supply. The three landscape units where OGMA delineation has not been completed are largely occupied by parks or protected areas or forest stands not contributing to the THLB. Including or excluding these three landscape units from the analysis will make no difference. See also Table 24, Section 7.5.5.

6.19 Stand-level biodiversity

Stand-level biodiversity planning is a requirement under the *FRPA* and is done in accordance with the *Landscape Unit Planning Guide* (MFR, 1999). Objectives for stand structure through wildlife tree retention (WTR) are described in the guide.

The practice of leaving wildlife trees (as individual trees and/or patches) is modelled in the timber supply analysis by reducing the land base available for harvesting to account for trees that must be left standing in harvested areas. Where landscape unit plans exist, allowances for WTR have been specified and are applied in the analysis. For all other landscape units, and BEC variants not specifically addressed within these plans, a seven percent default WTR allowance is applied.

Similar to the previous TSR, the THLB will be reduced where WTR 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 WTR is not required within this 200-metre buffer zone. During the modelling future WTR of various sizes will be randomly placed in cutblocks outside the 200-metre buffer zone. Any WTR smaller than two hectares will not contribute to old growth due to the limited ecological value from such small patches. In the previous TSR this technique was found to adequately account for WTR constraints in the TSA.

6.20 Sites with adequate timber potential but insufficient projected volume

In some areas of the TSA, the growth potential of the site indicates that with sufficient stocking, a merchantable volume will be achieved. However, given that there are multiple forest cover attributes used to project standing volume, an additional consideration is used. Stands under 150 years of age will be evaluated for their ability to attain the volumes found in Table 7. Any stands not projected to attain this minimum volume will be excluded from the THLB.

6.21 Timber licence reversions

Timber licences are old tenure arrangements that give a licensee exclusive rights to harvest merchantable timber within the licence area, and until that harvest occurs they do not contribute to the TSA allowable annual cut. Once these areas have been harvested, regenerated and attain free-growing status, the timber licence area reverts to FLNR jurisdiction. Accordingly, these areas are included in the THLB after the first harvest and contribute to the TSA harvest forecasts in mid- to long-term timber supply.

In the analysis outstanding timber licences will be defined as stands with an ownership code of 70 which are at least 110 years old. Stands in timber licences that are younger than 110 years will be assumed to have already been harvested and reverted. Unreverted timber licences will be assumed to revert to TSA within one decade. When a timber license area reverts to the Crown, it will retain its original resource emphasis and analysis unit assignments.

7. Current Forest Management Assumptions

7.1 Harvesting

7.1.1 Utilization levels

Utilization levels define the maximum stump height, minimum top diameter (diameter inside bark: dib) and minimum diameter at breast height that are used to calculate merchantable volume.

Table 16. Utilization levels

Leading species	Minimum diameter at breast height (dbh)	Maximum stump height	Minimum top diameter inside bark (dib)
Pine/larch	12.5 cm	30 cm	10 cm
Spruce	12.5 cm	30 cm	10 cm
All others < 121 years	12.5 cm	30 cm	10 cm
All others ≥ 121 years	17.5 cm	30 cm	15 cm

Data source and comments:

The volume compilation to be used in the inventory adjustment process will reflect the utilization standards detailed in Table 16.

7.1.2 Minimum harvestable age

Analysis units are developed to achieve management objectives through groupings of stands with similar species associations, levels of productivity and growth characteristics. Minimum harvestable ages can be defined by a product goal which achieve “optimal” stand level management. These are simply minimum criteria. While harvesting may occur in stands when the minimum requirements are achieved, some stands may not be harvested until well past “optimal” timber production ages in order to accommodate other resource values (e.g., requirements for the retention of older forest for wildlife habitat).

The minimum harvestable age for stands in each analysis unit will be defined as: a) the estimated age at which the stand is predicted to reach a required minimum volume; and b) the age at which the stand’s mean annual increment (MAI) achieves a value of 95 percent of the maximum (culmination). In order to be eligible for harvesting a stand must meet both of these criteria. Table 17 shows the minimum volume requirement for conventional and heli-operable stands in each AU group and the anticipated range of culmination age for each AU group. For the analysis, a single MHA will be determined using the above criteria for each individual AU once the final THLB is determined.

Table 17. Minimum harvestable age criteria and desirable stand condition

Analysis unit group	Volume per hectare conventional (Heli-harvested)	Minimum harvestable age based on volume criteria (years)	Culmination age (years)
Fir; site index (SI) ≤ 20	350 m ³ /ha	100-260	100-110
Fir; SI 21+	350 (400) m ³ /ha	40-90	60-100
Cedar – all sites	350 (400) m ³ /ha	60-110	80-90
Hemlock/balsam; SI ≤ 14	350 m ³ /ha	140-350	160-240
Hemlock/balsam; SI 15+	350 (400) m ³ /ha	50-120	100-170
Pine/larch	300 m ³ /ha	90	70
Spruce	350 m ³ /ha	80	130
Alder	150 m ³ /ha	40	N/A

Data source and comments:

Minimum harvestable ages do not apply to commercial thinning and are not intended to dictate actual operational harvesting practice.

In some high-productivity analysis units the minimum volume criteria is achieved at ages lower than the age of maximum growth (culmination age).

As summary of cruise inventory data for the period 2003 to 2012 indicates that 97 percent of cruised stands had a volume per hectares of at least 350 cubic metres.

7.1.3 Harvest scheduling and targets priorities

The Fraser TSA has had significant levels of timber harvest in second-growth stands. This provides for an increase in the available harvest planning area for licensees, a reduced activity in the remaining older forests and an increase in the opportunities to use existing infrastructure for harvesting (i.e., existing road networks). Second growth also tends to be at lower elevations where the gentler terrain characteristics reduce harvesting costs.

In the timber supply analysis base case available stands that are above minimum harvestable age will be queued for harvesting based on age (oldest first). In addition, for the first two decades, at least 50 percent of the harvest will be from stands under 121 years old.

Emphasis has been placed on the harvesting of younger stands in the Fraser TSA. The timber supply analysis will explore the consequences of harvesting certain stand types earlier than the culmination age and the volume reduction incurred if such a strategy were consistently applied.

7.1.4 Logging method

Conventional logging methods (i.e., ground base or cable) are the dominant harvesting systems within the Fraser Timber Supply Area. Heli-logging is employed but no specific volume target has been assigned to this method of extraction. Heli-logging volumes will be monitored separately during this timber supply review.

7.2 Silvicultural systems

Although the majority of the TSA will be harvested by clearcut or clearcut with reserves, some licensees within the Chilliwack Natural Resource District have been practicing variable retention (VR) silviculture over the past decade.

Estimates of the percent of volume being retained are not currently available but will be gathered in time to be incorporated in the analysis. Researchers at FAIB have developed volume adjustment factors for use in modelling the growth of stands managed with this silvicultural system. An assumption of the timber supply analysis is that the area designated as VR reserves will be reserved for the entire forecast.

7.3 Unsalvaged losses

Table 18 shows the estimated average annual unsalvaged volume loss due to catastrophic events such as insect epidemics, fires, wind damage or other agents. The unsalvaged loss column only reflects those areas in which the volume will not be recovered.

Table 18. *Unsalvaged losses*

Cause of loss	Annual loss within the THLB	Salvage rate	Annual unsalvaged loss within the THLB
	(m ³ /year)	%	(m ³ /year)
Wind	3 120	25%	2 340
Fire	16 500	0%	16 500
Mountain Pine Beetle	400	0%	400
Douglas-fir Bark Beetle	8 800	50%	4 400
Spruce Beetle	200	0%	200
Western Balsam Bark Beetle	3 100	0%	3 100
Total	32 120		26 940

Wind

With the increase in alternate harvesting method there has been an increase in blowdown within harvested areas and leave trees and reserves. Loss to windfall was based on 30 m³ per opening for clearcut harvested blocks and an estimated 104 blocks created per year based on historic harvest rates. It was assumed 25 percent of the windthrow is recovered.

Fire

Data from Wildfire Management Branch indicate that on average over the last 20 years 345 hectares was burned by wildfire each year in the TSA, which amounts to 0.024 percent of the TSA area. Most of the burned stands are located outside of the THLB and little of the fire-killed volume it is recovered. This percentage was multiplied by THLB growing stock volume to estimate annual unsalvaged volume loss in the THLB (16 500 m³). This estimate is similar to the loss assumed in the previous TSR.

Douglas-fir, Western Balsam Bark Beetle and Spruce Beetle

The annual areas damaged by Douglas-fir, Western Balsam Bark Beetle and Spruce Beetle were estimated in forest health overview assessments conducted between 2008 and 2012. Volume losses in damaged stands within the THLB were estimated from cruise summaries.

Mountain Pine Beetle

Although annual volume loss from Mountain Pine Beetle (MPB) were quite high (>10 000 cubic metres) in the recent outbreak period between 1999 and 2012, the MPB outbreak is expected to subside significantly in the

Fraser TSA. Estimates of future annual volume loss for the next decade, derived using the Provincial-Level Mountain Pine Beetle Infestation Projection model, is 400 cubic metres per year.

7.4 Silviculture

7.4.1 Regeneration activities in managed stands

Recent plantations and future stands will be grown on managed stand yield tables (MSYTs) produced using the Forest Service TIPSy growth and yield model. Table 19 lists the inputs required to produce MSYTs for this analysis. A MSYT may be built from a number of tables if more than one regeneration method is used within an analysis unit. When this is the case, tables are produced for the different regeneration methods (each method x species combination) are then aggregated into one table.

Table 19. Regeneration assumptions by analysis unit

Analysis unit	Site index	Regen delay (years)	OAF (%)		Regeneration distribution		Species		Density (stems per hectare)
			1	2	Pattern	%	Code	%	
Cedar – <100 years	All	1	15	5	Plant	100	Cw	35	1240 planted
							Fd	30	
							Hw	30	
							Ba	5	
Cedar – 100+years	All	1	15	5	Plant	100	Hw	32	1045 planted
							Cw	30	
							Fd	16	
							Ba	22	
Fir leading	<24	1	15	5	Plant	100	Fd	54	1260 planted
							Cw	18	
							Hw	16	
							Ba	12	
Fir leading	25-30	1	15	5	Plant	100	Fd	75	1200 planted
							Cw	25	
Fir leading	30+	1	15	5	Plant	100	Fd	76	1170 planted
							Cw	24	
							Hw	1	

(continued)

Table 19. Regeneration assumptions by analysis unit (concluded)

Analysis unit	Site index	Regen delay (years)	OAF (%)		Regeneration distribution		Species		Density (stems per hectare)
			1	2	Pattern	%	Code	%	
Hemlock/Balsam	<14	1	15	5	Plant	100	Ba	60	1140 planted
							Sx	30	
Hemlock/Balsam	15-21	1	15	5	Plant	100	Ba	60	1100 planted
							Sx	20	
							Hw	10	
							Cw	10	
Hemlock/Balsam	>21	2	15	5	Natural	100	Ba	30	2800 total
							Hw	20	
							Fd	20	
							Cw	20	
							Ss	10	
Pine/Larch	All	1	15	5	Plant	100	Ss	50	1200 planted
							Fd	40	
							PI	10	
Spruce	All	1	15	5	Plant	100	Sw	90	1200 planted
							Fd	10	
Alder/Fir	All	1	15	5	Plant	100	Fd-leading	75	1200 planted
	All	1	15	5	Plant	100	Dr-leading	25	1200 planted

Data source and comments:

Each row describes the stand conditions to be applied to all analysis units in the respective SI range.

Species composition and regeneration density assumptions are based on regeneration and free-growing surveys conducted in areas harvested within the Fraser TSA since 2003 and reported in the RESULTS (Reporting Silviculture Updates and Land status Tracking System).

7.4.2 Immature plantation history

This section identifies areas of existing immature forest where the density (i.e., stems per hectare) is controlled and therefore should be assigned to a managed stand yield table curve (MSYT). All Not Satisfactorily Restock (NSR) areas and stands harvested in the future will be managed under MSYTs.

Table 20. *Immature plantation history*

Analysis unit	Stand age at which MSYT will be applied
All Douglas-fir	<= 45 years
All Hemlock/Balsam	<= 35 years
All cedar	<= 25 years
All pine/larch	<= 25 years
All spruce	<= 25 years

Data source and comments:

These criteria will be reviewed against the silviculture history information derived from RESULTS.

7.4.3 Not satisfactorily restocked (NSR) areas

All NSR is considered current and is assumed to regenerate within specified regeneration delay periods as per Table 19. All NSR within conventional or helicopter accessible portions of the operable land base is included in the THLB.

7.4.4 Fertilized areas

Approximately 870 hectares of managed forest has been fertilized each year in the Fraser TSA over the last two decades. Fertilization is typically targeted Douglas-fir leading stands on medium productivity sites at ages around 40 years old. The average gain in volume at rotation estimated per application is 30 cubic metres per hectare. Fertilization information from RESULTS will be used to determine which stands receive an increase in stand volume due to this treatment.

7.4.5 Genetic gain through tree improvement

Data from RESULTS indicate that Class A seed has been employed for western redcedar, Douglas-fir and spruce stands. Based on seed-use, estimated genetic worth of Class A seed and planting levels reported for the last decade, the realized volume gain from tree improvement in the Fraser TSA reported through RESULTS is 4.5 percent for planted Douglas-fir on good sites, 2.8 percent for planted Douglas-fir on poor sites, and 1.3 percent for planted spruce. These values will be applied in the current and future managed stand yield tables. Seed with higher genetic worth is becoming available in the TSA but the volume gain, seed use and planted-to-natural weightings need to compute future genetic gains cannot be reliably projected. Therefore, currently observed genetic gain will be applied to future stands.

7.5 Objectives with forest cover requirements

As noted in Section 5.1, the discussion on multiple objectives and forest cover requirements may be examined at a number of different levels. These may be considered as layers in GIS terminology. One possible layer may be landscape units, another may be wildlife habitats, while another may be associated with a different resource emphasis. With the requirement to retain different forest characteristics across the landscape, it will be important in the analysis to identify how non-contributing forest (productive forest which does not contribute to the THLB) may be considered in the forest cover requirements (i.e., maximum allowable disturbance or minimum area retention).

7.5.1 Objectives for visual resources

The recommended visual quality classes for the Chilliwack Natural Resource District were continued as established visual quality objectives (VQOs) under GAR Section 17 in October 2005. On April 18, 2013, amendments were made to about 22 percent of the existing VQO boundaries in the northern portion of the TSA. These changes were based on revised visual inventory data, which considers factors such as public use, visibility and significant viewpoints, as well as comments submitted during the consultation process.

The timber supply analysis will apply forest cover objectives that are consistent with the established VQO. The maximum percent denudation was applied to each visual polygon based on its assigned VQOs and assessed Visual Absorption Capability (VAC) as outlined in Table 21.

Table 21. Forest cover requirements for visual quality objectives

Visual quality objective	Maximum allowable disturbance (%)			Green-up height or age	Area of application
	VAC low	VAC medium	VAC high		
Retention	1.1	3	5	5 m	Forested area in a visual polygon
Partial retention	5.1	10	15	5 m	Forested area in a visual polygon
Modification	15.1	20	25	5 m	Forested area in a Visual polygon

Data source and comments:

A VQO is a resource management objective established for an area that reflects the desired level of visual quality based on the physical characteristics and social concern for the area. Several classes have been defined in the Fraser TSA:

- Modification (M): consisting of an altered forest landscape in which the alteration, when assessed from a significant public viewpoint, (i) is very easy to see, and (ii) is (a) large in scale and natural in its appearance, or (b) small to medium in scale but with some angular characteristics;
- Partial retention (PR): consisting of an altered forest landscape in which the alteration, when assessed from a significant public viewpoint, is (i) easy to see, (ii) small to medium in scale, and (iii) natural and not rectilinear or geometric in shape;
- Retention (R): consisting of an altered forest landscape in which the alteration, when assessed from a significant public viewpoint, is (i) difficult to see, (ii) small in scale, and (iii) natural in appearance;
- VAC is a component of the visual landscape inventory that rates the relative capacity of a landscape to absorb visual alterations and still maintain its visual integrity.

7.5.2 Objectives for adjacent cutblock green-up

Cutblock adjacency constraints limit the amount of harvesting in each landscape unit such that no more than 25 percent of the stands in the THLB are less than green-up age. In the timber supply analysis cutblock green-up will be assumed to occur when stands achieve three metres in height. Spatial blocking or patch size constraints will not be applied in the base case forecast.

Table 22. Forest cover requirements for cutblock adjacency objectives

Maximum allowable disturbance (%)	Green-up height	Area of application
25	3 m	THLB within each LU outside of visual area

7.5.3 Objectives for community watersheds

There are 77 community watershed areas within the Fraser TSA. To reflect current forest management practices in these areas, forest cover constraint will be applied which will limit the rate of harvesting within each watershed to one percent of the productive forest area each year. This constraint was developed based on guidance in the *Community Watershed Guidebook* that indicates that in the absence of a completed Coastal Watershed Assessment Procedure harvesting activity should be limited to five percent of the productive forest area over a five-year period.

7.5.4 Objectives for spotted owl managed future habitat areas

As indicated previously, the timber supply analysis will assume timber harvesting occurs in the MFHA provided that a minimum of 10 percent of the cutblock area is retained as untreated WTR. Table 23 outlines the forest cover retention requirements for spotted owl MFHA.

Table 23. Forest cover requirements for spotted owl MFHA

Group	Area retained (%)	Minimum tree retention	Area of application
Spotted owl WHAs in wet ecosystems	10	15 large-diameter trees per hectare	Each WHA managed future habitat areas
Spotted owl WHA in dry ecosystems	10	40 large-diameter trees per hectare	Each WHA managed future habitat areas

7.5.5 Objectives for landscape-level biodiversity

Management for biodiversity is a requirement under the *FRPA*. To protect biodiversity at the landscape level, old forest is retained in every landscape unit and natural disturbance type. In 21 of the 24 LUs within the Fraser TSA old-forest retention amounts are achieved through the establishment of OGMAs which are assumed to be no-harvest areas in the analysis. In the three LUs without OGMAs old-forest retention will be accounted for by applying the forest cover requirements indicated in Table 24. These requirements are taken from the *Landscape Unit Planning Guide*.

Table 24. Landscape unit old seral forest cover requirements

Natural disturbance type (NDT)	Biodiversity emphasis option	Old growth requirement (%)
NDT 1	Low & Intermediate	13
	High	19
NDT 2	Low & Intermediate	9
	High	13
NDT 3	Low & Intermediate	14
	High	21
NDT 4	Low & Intermediate	13
	High	19

Data source and comments:

In natural disturbance types (NDTs) 1, 2 and 4, old seral forest is defined as stands older than 250 years. In NDT 3, old seral forest is defined as stands older than 140 years.

The three LUs that do not have spatial OGMAs established (Coquitlam, Seymour-Capilano, and Similkameen) are largely covered by conservancies, park, and forest not contributing to the THLB. Including or excluding them from analysis will have no bearing on meeting the old-seral objective.

The timber supply forecast will incorporate natural disturbance in forest areas not within the timber harvesting land base. Natural disturbance will be applied randomly in each biogeoclimatic zone variant at a rate based on the return interval of stand replacing events listed in the *Forest Practices Code Biodiversity Guidebook*. Stands within 100 years of the old-growth age will be eligible for disturbance.

7.5.6 Objectives for stand-level biodiversity

WTR values for each LU/BEC variant have been developed and are shown in Table 25 below. The numbers were taken from approved legal orders and objectives for each of the 15 approved landscape unit plans that include objectives for WTR. For the nine landscape units that do not have legal objectives for stand-level biodiversity a seven percent WTR amount will be assumed, which is consistent with the practice requirements for WTR in the *Forest Planning and Practices Regulation*.

A GIS exercise will be used to reduce the area of THLB where WTR must occur. This exercise will delineate a 200-metre buffer around forested stands that are not considered part of the THLB. It is assumed that this buffer meets all of the requirements for WTR and therefore additional contributions are not needed. In the model, the WTR policy will be randomly assigned to creating various size reserves. Any WTR under two hectares in size will not contribute to biodiversity. This technique was successfully applied in the previous TSR.

Table 25. *Wildlife tree retention report*

Landscape unit	BEC subzone	WTR (%)	Landscape unit	BEC subzone	WTR (%)
Ainslie	CWHds	12	Hatzic	CWHvm	7
Ainslie	CWHms	11	Hatzic	MHmm	7
Ainslie	ESSFdc	9	Manning	CWHms	4
Ainslie	ESSFmw	5	Manning	ESSFmw	0
Alouette	CWHdm	7	Manning	MHmm	2
Alouette	CWHvm	7	Mehatl	CWHds	6
Alouette	CWHxm	7	Mehatl	CWHms	2
Alouette	MHmm	7	Mehatl	ESSFmw	6
Anderson	CWHds	9	Mehatl	IDFww	4
Anderson	CWHms	9	Mehatl	MHmm	8
Anderson	ESSFmw	6	Nahatlatch	CWHds	3
Anderson	IDFww	5	Nahatlatch	CWHms	7
Anderson	MHmm	7	Nahatlatch	ESSFmw	6
Big Silver	CWHds	9	Nahatlatch	IDFww	4
Big Silver	CWHms	9	Nahatlatch	MHmm	8
Big Silver	MHmm	5	Pitt	CWHdm	7
Chehalis	CWHdm	10	Pitt	CWHvm	7
Chehalis	CWHvm	10	Pitt	MHmm	7
Chehalis	MHmm	5	Silverhope	CWHds	6
Chilliwack	CWHdm	13	Silverhope	CWHms	6
Chilliwack	CWHds	11	Silverhope	MHmm	3
Chilliwack	CWHms	11	Spuzzum	CWHds	10
Chilliwack	CWHvm	9	Spuzzum	CWHms	10

(continued)

Table 25. *Wildlife tree retention report (concluded)*

Landscape unit	BEC subzone	WTR (%)	Landscape unit	BEC subzone	WTR (%)
Chilliwack	CWHxm	10	Spuzzum	IDFww	6
Chilliwack	MHmm	8	Spuzzum	MHmm	4
Coquihalla	CWHds	6	Stave	CWHvm	7
Coquihalla	CWHms	7	Stave	MHmm	7
Coquihalla	ESSFmw	0	Tretheway	CWHdm	7
Coquihalla	MHmm	5	Tretheway	CWHds	10
Coquitlam	CWHvm	7	Tretheway	CWHms	6
Coquitlam	MHmm	7	Tretheway	CWHvm	2
East Harrison	CWHdm	9	Tretheway	MHmm	2
East Harrison	CWHms	8	West Harrison	CWHdm	14
East Harrison	CWHvm	12	West Harrison	CWHvm	14
East Harrison	MHmm	7	West Harrison	MHmm	13
FraserValleySouth	CWHdm	7	Widgeon	CWHdm	7
FraserValleySouth	CWHds	7	Widgeon	CWHvm	7
FraserValleySouth	CWHms	7	Widgeon	MHmm	7
FraserValleySouth	CWHvm	7	Yale	CWHds	5
FraserValleySouth	CWHxm	7	Yale	CWHms	8
FraserValleySouth	MHmm	7	Yale	CWHvm	
Hatzic	CWHdm	7	Yale	MHmm	5

Data source and comments:

This information was updated February 2013.

8. Sensitivity analyses to be performed

Sensitivity analysis can provide a measure of the timber supply impact if uncertainty in management assumptions and/or data integrity exists. The magnitude of the increase or decrease in a particular variable reflects the degree of uncertainty surrounding the assumption. For instance, by decreasing the minimum volume threshold of an analysis unit by 50 cubic metres per hectare, the minimum harvestable age of the unit is lowered which in turn may alleviate an anticipated future harvest level reduction. By developing and testing a number of sensitivity analyses, it is possible to determine which variables most affect results. Table 26, 'Sensitivity issues' lists the sensitivity analyses to be undertaken as part of this timber supply review.

Table 26. *Sensitivity issues*

Issue to be tested	Sensitivity levels	Data source / justification
Harvest flow alternatives	Alternative short-term and/or mid-term harvest levels	Section 8.8(b) of <i>the Forest Act</i> assess the short- and long-term implications of alternative rates of timber harvesting.
Minimum harvestable age	Increase minimum volume to 400 m ³ /ha	Recent shift by licensees from low volume hemlock/balsam stands.
Land base changes	Increase / decrease the THLB by 10 percent	Adjustment to test uncertainty in land base classification.
Increase / decrease second-growth harvest levels	Alternative harvest priority and second-growth harvest targets	Based on the District review of second-growth harvest levels.
Site index estimate for older stands	Use inventory site index	Uncertainty with the site index adjustment ratios.
Natural stand yield tables	No Phase II inventory adjustments	Uncertainty with the VRI phase II adjustment ratios.