Strathcona Timber Supply Area
Timber Supply Review

Data Package

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Overview of the Strathcona TSA Timber Supply Review

Under Section 8 of the *Forest Act* the chief forester must review the timber supply for each of British Columbia's 38 timber supply areas (TSA) and 34 tree farm licences (TFL) at least once every 10 years. Based on this review, the chief forester establishes the allowable annual cut (AAC), i.e., the maximum volume of timber that can be harvested each year. Allowable annual cut determination is one of the chief forester's most important responsibilities because it affects local and provincial economies and the environment – now and in the future.

The main objective of a timber supply review (TSR) is to provide the chief forester with the economic, environmental and social information that must be considered when making AAC decisions. In this lengthy and complex process, the chief forester considers technical reports and analyses, public input, and First Nations interests, as well as government's social and economic objectives. Although technical information is used extensively in AAC determinations, the chief forester's decision is ultimately an independent professional judgment and not a calculation.

Following the chief forester's AAC determination, the Minister of Forests, Lands and Natural Resource Operations (FLNR) apportions the volume to forest licences.

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:

1) a short explanation of the data required;
2) a data table or lists of modelling assumptions; and,
3) 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 it is subject to change. Following the publication of this data package, a review period provides an opportunity for public input and information sharing between the FLNR and First Nations. Any information and assumptions 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. Where the final value is not yet available, the applicable columns are shaded grey. In addition, should any major changes in forest management practices occur during the next few months, the timber supply analysis will attempt to reflect these changes.

1. Introduction

1.1 Overview of the Strathcona Timber Supply Area

Extending across central Vancouver Island from the west coast (Nootka Sound to the Brooks Peninsula) to the east coast (Fanny Bay to Sayward) and adjacent areas on the coastal mainland and islands of British Columbia, the Strathcona TSA covers approximately 407 000 hectares. Administered by the FLNRO Campbell River Natural Resource District office, the TSA includes the communities of Campbell River, Comox, Courtenay, Cumberland, Gold River, Kyuquot, Sayward, Tahsish and Zeballos.

In the previous timber supply analysis, the total productive forest area in the TSA was reported to be approximately 347 000 hectares, of which less than half was considered suitable and available for timber harvesting. The TSA comprises three timber supply blocks (TSB): the Kyuquot on western Vancouver Island, the Sayward on eastern Vancouver Island and the Loughborough on the mainland. A significant number of large provincial parks, including Strathcona, Tahsish-Kwois and Brooks-Nasparti are located partially or wholly within the boundaries of the TSA.

The TSA overlaps three biogeoclimatic zones: the Coastal Western Hemlock (CWH), Mountain Hemlock (MH) and Coastal Mountain-heather Alpine (CMA), in a mosaic of wet, mountainous terrain bisected by streams and rivers. 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. Species of particular management concern are those that rely on the characteristics of old-growth forests because these stands may become fragmented as these forests are harvested and converted to younger stands, fragmentation and loss of habitat may occur.

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 and grizzly bear, mountain goat, wolf, beaver, pine marten, wolverine and weasel. Native and migratory birds in the forests of the area include species of management concern such as marbled murrelets, Queen Charlotte Island goshawks, great blue herons and pileated woodpeckers. Adjacent marine habitats and estuaries support populations of Peale's peregrine falcons, bald eagles, trumpeter swans, harlequin ducks and over-wintering birds.

The most recent economic dependency estimates provided by BC STATS show that the main sources of employment in the Strathcona TSA are the public sector, tourism and forestry. In 2006, the forestry and forest manufacturing sector accounted for about 16% of the employment in the district. Since then, there have been permanent closures of the Catalyst Elk Falls pulp and paper mill and the TimberWest Elk Falls sawmill in Campbell River and the Interfor Field sawmill in Courtenay.

The chief forester last determined the AAC on July 28, 2005, setting it at 1 217 000 cubic metres effective August 1, 2005. On December 9, 2005, he temporarily reduced the AAC by 16 000 cubic metres under Section 173 of the *Forest Act* to account for the establishment of the Maa-nulth Designated Area. On September 28, 2006 the chief forester further reduced the AAC by 8000 cubic metres to account for the Central Coast Designated Area No. 2. The Central Coast Designated Area No. 2 was created by order April 7, 2006 and expired on May 22, 2010.

On April 1, 2011 the Maa-nulth Treaty took effect and the Maa-nulth Designated Area was repealed to become Maa-Nulth Treaty Settlement Lands.

The AAC reverted to 1 217 000 upon repeal of these designated areas. The next AAC determination must be done within two years from the repeal of the Maa-nulth Designated Area, that is by April 1, 2013.

For more information about the Strathcona TSA please visit the following internet site:
http://www.for.gov.bc.ca/hts/tsa/tsa37/

1.2 First Nations

Fifteen First Nations have traditional territory in the Strathcona TSA. Ten of these First Nations also have reserve lands; they are the Wei Wai Kum (Campbell River) First Nation, We Wai Kai (Cape Mudge) First Nation, Ehattesaht Tribe, Homalco First Nation, Ka:'yu:'k't'h/Che:k:tles7et'h' First Nation, K'omoks First Nation, Kwiakah First Nation, Mowachaht/Muchalaht First Nation, Nuchatlaht Tribe, and the Tlowitsis Tribe. The other five First Nations with traditional territory are the Da'naxda'xw First Nation, Klahoose First Nation, Mamalilikulla-Qwe'Qwa'Sot'em First Nation, Namgis First Nation and the Sliammon First Nation.

Additionally, the Nanwakolas Council Referrals Office and Laich Kwil Tach Treaty Society assist their member First Nations with referrals or treaty negotiations.

Since the last TSR, the Maa-nulth First Nations have concluded the Maa-nulth Treaty. The treaty provides rights to harvest fish, wildlife and migratory birds to each of the five Maa-nulth First Nations within the collective area of their traditional territories. The Maa-nulth First Nations are the Ka:'yu:'k't'h/Che:k:tles7et'h' First Nation in the Strathcona TSA, and the Huu-ay-aht First Nations, Toquaht Nation, Uchucklesaht Tribe and Ucluelet First Nation, located in the Arrowsmith TSA.

Treaty negotiations are ongoing with the Homalco First Nation, the K'omoks First Nation, and the Tlowitsis Tribe.

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. Known archaeological sites will be considered in the timber supply review. Land base reductions for First Nations' cultural heritage resources are discussed in more detail in the section on the THLB definition.

First Nations' members also participate in the forest sector and several First Nations have obtained area or volume-based forest tenures within the Strathcona TSA.

1.3 Treaty Settlement Lands

The Maa-nulth First Nations Final Agreement was negotiated by the Government of Canada, the Government of British Columbia (BC) and the five Maa-nulth First Nations made up of the Huu-ay-aht First Nations, Ka:'yu:'k't'h/Che:k:tles7et'h' First Nations, Toquaht Nation, Uchucklesaht Tribe and Ucluelet First Nation. On April 1, 2011, the Maa-nulth Final Agreement removed approximately 5900 hectares of former provincial Crown land within the Strathcona TSA as Maa-nulth First Nations lands. The Maa-nulth First Nations lands are estate in fee simple including all forest resources and therefore are no longer part of the Strathcona TSA.

An Agreement-in-Principle with the K'omoks First Nation has been signed by the Provincial Government and ratified by the K'omoks members. As of March 2012, the total land package is approximately 2000 hectares.

2. Current Forest Management Considerations and Issues

2.1 Base case management assumptions

These 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 is used as a reference to which other scenarios are compared. While there may be uncertainty associated with the assumptions used to develop the base case, these uncertainties are examined by conducting sensitivity analysis (see Section 7).

2.2 Major forest management considerations and issues

The following table lists major forest management issues and considerations. Where possible, the issues will be assessed directly in the timber supply analysis. If the 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. There may be significant uncertainties in defining some current management issues. In such cases, sensitivity analysis can assist in assessing the potential timber supply implications and assigning degrees of risk to timber supply during the AAC determination.

Table 1. Major forest management considerations in the Strathcona TSA

Consideration/issue	Description
Vancouver Island Land Use Plan	The 2000 *Vancouver Island Land Use Plan* (VILUP) increased the amount of protected area on Vancouver Island from 6 to 13%. Protected areas do not contribute to the projected timber supply. The *VILUP Higher Level Plan Order* established resource management zones and objectives for timber and other resource values. Management zones are delineated as Special (SMZ), General Resource (RMZ) or Enhanced Forestry (EFZ). SMZs including South Quadra Island in the TSA, have objectives for biodiversity and visual management. In EFZs the objective is to increase the short-term availability of timber through flexibility in cutblock size and green-up requirements.
Coast Land Use Decision/South Central Coast Land Use Order	The 2006 *Coast Land Use Decision* (CLUD) affects the TSA's Loughborough timber supply block, on the mainland and adjacent islands (with the exception of Quadra Island). The CLUD established five new conservancy areas within the Strathcona TSA which were permanently removed from the TSA through Bill 24 of the *Parks and Protected Areas Statutes Amendment Act*, (2007). The CLUD was implemented under the *South Central Coast Land Use Objective Order* (SCCLUOR) which sets out objectives for Ecosystem-Based Management (EBM), including objectives for First Nation's traditional forest resources and features, aquatic habitats and biodiversity.
Sayward Landscape Unit Plan	The 2003 *Sayward Landscape Unit Plan - Higher Level Plan Order* established legal objectives for biodiversity, wildlife, riparian values and recreation for the Sayward Landscape Unit. These objectives will be modelled through a combination of decreases to the timber harvesting land base (THLB or 'netdowns') and forest cover requirements to reflect current management practices consistent with the objectives.
Maa-nulth Treaty Settlement Lands	The *Maa-nulth Final Agreement* removed approximately 5900 hectares of provincial Crown land from the Strathcona TSA.

(continued)

Table 1. Major forest management considerations in the Strathcona TSA

Consideration/issue	Description
Land Base Designations	The *Seal Bay Regional Park* will be excluded from timber harvesting in the analysis. 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 and are excluded from the THLB.
Landscape-level Biodiversity	Landscape-level biodiversity objectives involve maintaining forests with a variety of patch sizes, seral stages, and forest stand attributes and structures, across ecosystems. Landscape Unit (LU) boundaries and Biodiversity Emphasis Objectives (BEO) were established under the 2004 Order Establishing Provincial Non-Spatial Old-Growth Objectives (NSOGO). VILUP: landscape-level biodiversity objectives focus primarily on the retention of old-growth forest. LU Plans (LUP) have been completed and Old Growth Management Areas (OGMA) established in two LUs. In three other LUs draft OGMAs have been identified. Established and draft OGMAs will not be available for timber harvest. In LUs where no OGMAs have been identified the NSOGO will apply. The SCCLUOR sets out landscape-level biodiversity objectives for old forest and mid-seral age classes for the LUs in the Loughborough TSB.
Stand-level Biodiversity	Stand-level biodiversity is managed in part by retaining reserves of mature timber within cutblocks to provide structural diversity and wildlife habitat. In areas covered by approved LUPs, including the Sayward Higher Level LUP, the specified wildlife tree patch retention percentage will be used in the analysis. Where there is no approved LUP, 7% of harvested areas will be retained in wildlife tree patches as per the *Forest and Range Practices Act*. The SCCLUOR includes a stand-level biodiversity objective requiring stand retention to be at least 15% of the cutblock area.
Riparian Management	The Strathcona 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. The SCCLUOR sets out objectives for aquatic habitat that will be modelled as a combination of THLB reductions and forest cover constraints.
Conservation of Ungulate Winter Range	A Section 7(2) of the *Forest Planning and Practices Regulation (B.C. Reg. 14/04)* Notice provides for the establishment of up to 13 280 hectares of ungulate winter ranges for black-tailed deer, Roosevelt elk and mountain goat, of which a maximum of 7448 hectares could otherwise have contributed to the THLB. A *Government Action Regulation (BC Reg. 582/2004)* Order established over 10 000 hectares of ungulate winter range (U-1-005) for black-tailed deer, Roosevelt elk and mountain goat. Timber harvesting is not permitted in these areas unless approved by the Ministry of the Environment.

(continued)

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

Consideration/issue	Description
Protection of Archaeological Sites	Archaeological Overview Assessments (AOA) and Archaeological Impact Assessments (AIA) are used to identify potential archaeological sites which include cultural and historic use sites. When field verified, buffers are applied to protect the sites and the subsequent areas are recorded in the Remote Access to Archaeological Data (RAAD). For the analysis, the buffered sites identified in the RAAD are excluded from the THLB.
Protection of Water Quality within Community Watersheds	The management practices needed to protect water quality in the John Hart, Andrews and Barton Community Watersheds, which have been designated by the Ministry of Environment within the Strathcona TSA Management Unit, will be modelled in the analysis using forest cover requirements.
Visual Landscape Management	Management for visual quality is an issue in the Strathcona TSA given the large amount of coastline and the increasing recreational and tourism use of the area. Scenic areas and visual quality objectives (VQOs) were established for the Campbell River Forest District in 2005 through a Section 7 (1) of the *Government Actions Regulation* Order. The timber supply analysis will apply forest cover objectives that are consistent with the established visual quality objectives (VQO).
Site Productivity	The site productivity of old-growth stands has been shown to underestimate the productivity of regenerated stands. To address this, the timber supply analysis will use ecologically-based site index (SI) estimates derived using terrestrial ecosystem mapping (TEM), where available, and site index biogeoclimatic ecosystem classification (SIBEC). This methodology correlates ecosystem classification to site productivity. Where TEM is not available the vegetation resource inventory (VRI) site index will be used.
Operability	Economic operability consists of two distinct zones; conventional and helicopter logging. The economic operabilty assessment (EOA) completed by licensees and the district in 2010 defined the criteria (stand value and cost) used in a spatial model to classify the land as Operable–Conventional (C), Operable-Helicopter (H), Inoperable (I) or not reported (N). Only areas classified as C and H will be included in the THLB used in the base case.

3. Inventories

3.1 Background information

Table 2 lists the inventories that will be used to determine the timber harvesting land base and to model forest management activities.

Table 2. Inventory information

Data	Source	Vintage	Date of compilation
Strathcona TSA Administrative Boundary and Timber Supply Blocks	FLNR Forest Tenures Branch (FTB)	-	2012
Woodlots and Community Forest Agreement Areas	FTB	-	2012
Tree Farm Licences	FTB	-	2012
Parks and Protected Areas	FLNR Crown Registry and Geographic Base Branch (CRGB)	-	2012
Ownership and Land Administration (Forest Cover Ownership)	Forest Analysis and Inventory Branch (FAIB) and CRD	2010	2012
Timber Licences	FTB	-	2012
Vegetation Resources Inventory (VRI) — Forest Cover	FAIB	2011	2012
Inventory Disturbance Update – Non-standard Overlay	FAIB	2012	2012
Operability Mapping	Campbell River District (DCR)	2010	2011
Archeological Sites	RAAD	-	2012
Terrain Stability Mapping	DCR	1992-1998	1992-1998
TEM	Ministry of the Environment (MOE) Ecosystems Branch	2004	2012
Established Recreation Sites and Trails	FTB	-	2012
GAR Identified Recreation Resource Features	BC Geographic Warehouse (BCGW)	1991-2001	2012
Karst Inventory	DCR	1995	2012
VILUP Management Zones	FLNR Resource Management Objectives Branch (RMOB)	2000	2000
Approved Wildlife Habitat Areas (WHAs)	MOE	-	2012
Ungulate Winter Range	MOE	2001	2012
Approved and Draft Old-Growth Management Areas (OGMAs)	RMOB	-	2012

(continued)

Table 2. Inventory information (concluded)

Data	Source	Vintage	Date of compilation
Permanent Sample Plots (PSP)	FAIB	-	2012
Landscape Unit Boundaries	RMOB	1997	2012
Biogeoclimatic Classification	MOE Ecosystems Branch	-	2012
Community Watersheds	MOE Water Protection & Sustainability Branch	1997	2012
Visual Quality Objectives and Known Scenic Areas	DCR	2005	2005
VILUP Resource Management Zones	RMOB	2000	2000
SCCLUOR - Important Fisheries Watersheds	RMOB	2009	2009
SCCLUOR- Grizzly Bear Habitat	RMOB	2009	2009

Data source and comments:

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

Reconnaissance level terrain stability mapping was completed for the entire TSA over a period between 1992 and 1998. This mapping delineates areas of unstable and potentially unstable terrain.

In 2010, the Strathcona TSA Licensee/Agency Group undertook a new operability study (*Strathcona TSA Economic Operability Assessment (EOA)*, Forsite, March 2010) to define a land base that is likely to be economically viable for harvest throughout a market cycle. The EOA is discussed in more detail in the Section 5, "Timber Harvesting Land base Definition".

The inventory of known archaeological features is maintained in RAAD.

The visual landscape inventory for the Campbell River District has undergone a number of updates since it was first completed in 1995. The most recent update was completed in 2005 in support of the legal establishment of visual quality objectives for the district.

A *GAR* Order, for 'Identified Recreation Resource Features' for the Campbell River Forest District (2006) identifies significant recreation resource features for the purposes of the *Forest Planning and Practices Regulation.*

Another GAR Order, for 'Identified Karst Resource Features' in the Campbell River Forest District (2007) protects specific elements of karst ecosystems identified in the Karst Inventory. Certain karst features that have recreational attributes are also identified recreation resource features, or established recreation sites**.**

4 Division of the TSA into Management Zones

4.1 Management zones and tracking of multiple objectives (grouping)

Management zones are used to differentiate areas with distinct management objectives. For example, a zone may be based on a harvesting or silviculture system, visual quality objective or wildlife consideration. Sometimes an area of forest is subject to more than one management objective. In the timber supply model, 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 6.4, "Integrated resource management".

Table 3. Objectives to be tracked

Objectives	Inventory definition
Landscape Units, Biodiversity Emphasis Options (BEOs) and Biogeoclimatic (BEC) Inventory	Approved and draft OGMAs will be used in the base case where they have been identified. Where they have not been, the recommended seral stage distribution for the biogeoclimatic unit will be modelled. In the CLUD plan area, Objective 14 of the SCCLUOR is to maintain a minimum amount of old forest in each Site Series Surrogate (SSS) by LU as per Schedules 4, 4b, 4c, 4d of the order. In addition, the amount of mid-seral forest in each LU/SSS is limited to 50% of the LU/SSS area.
Community Watersheds	Community watersheds have been identified where modified harvesting practices apply.
Visuals	Visual quality objectives include preservation, retention, partial retention and modification. Visual absorption capacity (VAC) classes include low, medium and high.
SCCLUOR Important Fisheries Watershed	Important fisheries watersheds are identified in Schedule 3 of the SCCLUOR. Objective 8 of the order is to maintain an equivalent clearcut area of less than 20% in important fisheries watersheds.
SCCLUOR Upland Streams	Objective 12 of the SSCLUOR is to maintain the natural ecological function of upland streams within the watersheds identified in Schedule 3 of the order. The objective requires that functional riparian forest be maintained on at least 70% of upland portions of the identified watersheds.
VILUP Special Management Zones	The SMZs are designed to maintain mature and old forest conditions to zone specific targets. For green-up in SMZs the 3-metre green-up constraint is applied.
VILUP Enhanced Forestry Zone	Enhanced Forestry Zone (EFZs) are designed to increase the short term availability of timber by applying a 1.3-metre green-up constraint.
Integrated Resource Management Zone	Integrated Resource Management Zone (IRM) objectives for cutblock adjacency apply in non-visual areas outside of the EFZ. A 3-metre green-up constraint will be applied.
Wildlife Habitat Areas	Forest cover constraints will be applied to WHAs where that type of constraint is specified in the general wildlife measures for the WHA.

4.2 Analysis units

An analysis unit is composed of forest stands with similar tree species composition, timber growing potential and treatment regimes. Each analysis unit is assigned its own timber volume projection (yield tables) for future stands. A yield table for each 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).

In the Strathcona TSA, Douglas-fir (Pseudotsuga menziesii) redcedar/cypress (Thuja plicata/Chamaecyparis nootkatensis), Sitka spruce (Picea sitchensis), hemlock (Tsuga heterophylla and Tsuga mertensiana), balsam (Abies spp.) and red alder (Alnus rubra) stands are grouped into analysis units on the basis of leading species and site index class. The analysis units to be defined in the analysis are listed in Table 4.

Table 4. Definition of analysis units

Leading species group	Site index class
1. Fir (F,FD,FDC)	< 15 >= 15 and < 20 >= 20 and < 25 >= 25 and < 30 >= 30 and < 35 >= 35
2. Redcedar/Cypress (C,CW,Y,YC)	< 15 >= 15 and < 20 >=20 and < 25 >=25 and < 30 >= 30
3. Hemlock/Balsam (H,HW,HMB,BA,BG,BL)	< 15 >= 15 and < 20 >=20 and < 25 >=25 and <30 >= 30
4. Spruce (S,SE,SS)	All
5. Alder (D,DR)	All

Data source and comments:

Site index is defined as: the height of the tree in metres when its breast height (1.3 metres from the point of germination) age is 50 years.

5. Timber Harvesting Land Base Definition

This section outlines the steps that will be used to identify the timber harvesting land base, which is the productive forest expected to support timber harvesting, within the TSA. Land may be unavailable for timber harvesting for three principal reasons:

- it is not administered by the BC Forest Service for TSA timber supply purposes (e.g., private land, parks, other timber supply management units);
- it is not suitable for timber production purposes; or
- it is unavailable for timber harvesting due to other resource management objectives.

Land may 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
- through the acquisition of productive forest land (e.g., timber licence reversions).

The timber harvesting land base for the TSA is derived by a process of delineating the categories of land (described in the sub-sections below) that are not expected to contribute to timber harvesting in the TSA. Land is considered outside the THLB only where no harvesting is expected; any area in which some timber harvesting will occur remains in the THLB, even if the area is subject to other management objectives, such as wildlife habitat and biodiversity. These objectives are then modelled in the timber supply analysis. The Crown forested land base outside of the THLB also contributes to these non-timber objectives.

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

5.1 Land outside the core TSA

The legal boundary of the Strathcona TSA encompasses several large areas that do not contribute to TSA timber supply and do not contribute to other objectives for the Strathcona TSA when assessing timber supply. These areas are: Tree Farm Licence (TFL) 19, TFL 25, TFL 39, TFL 45 and TFL 47.

5.2 Non-forest

Areas classified as 'not forest management land base' (FMLB = 'N') in the VRI will be will be excluded from the forest land base. This means that, except where the area has been previously logged, areas classified as 'non-treed' 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 are also excluded where the site index is less than 5 metres.

5.3 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, tree farm licences (TFL), community forest agreements, woodlot licences, parks, ecological reserves, and the Beaver Lodge lands. TFLs will be excluded from the core TSA as described in Section 5.1.

Forest Analysis and Inventory Branch (FAIB) ownership codes will be used to identify whether or not land contributes to the timber supply for the TSA. FAIB ownership will be augmented with other tenure boundaries where necessary, such as to delineate the Beaver Lodge lands and Seal Bay Regional Park.

Parks and protected areas (ownership codes 61N, 63N, 67N and 69N) within the core TSA are part of the Crown forested land base and do contribute to biodiversity and wildlife objectives. However, they are not administered by FLNR for timber supply, so they are excluded from the THLB. Crown land in forest management units (ownership code 62C) and miscellaneous reserves (code 69C) are included in the THLB. 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 5.19, "Timber Licence Reversions". Areas with other ownership codes will be removed from the THLB.

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

Table 5. Ownership contributions

Ownership code		Crown forested land base	Timber harvesting land base
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: Yes Schedule N: No
72	Crown and Private Schedule "A" and "B" Lands in a TFL	No	No
75	Crown Christmas tree permit	Yes	No
77	Crown and Private Woodlot Licence	No	No
79	Community Forest	No	No
99	Crown Misc. lease (e.g., fairground, R&G Club site, recreation cottage 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.

5.4 Inoperable areas

As previously mentioned, the Strathcona TSA Licensee/Agency Group undertook a new 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^3) to the Crown over time. The operable land base determined in the study is 7% larger than the operable land base used in last TSR.

To be consistent with the EOA approach, the base case will exclude any areas where previously-harvested cutblocks were not included in the economically operable land base selected using the Patchworks model. This circumstance (inoperable-logged) might occur where the projected future stand value, relative to harvest cost, was not sufficient to meet the economic criteria. This is a change from the operable land base used in TSR 3, which allowed that all harvested areas would be economically operable in the future.

District staff indicate that there is uncertainty regarding the feasibility of harvesting in certain hemlock-leading stands, lower-volume stands and unstable terrain included in the modelled EOA land base. This uncertainty will be examined in this timber supply review by preparing sensitivity analyses using different market scenarios and through comparison of the actual operational harvest profile observed in the TSA with the Patchworks-modelled economic stand profile over the same time frame.

Table 6. Description of operable areas

Operability class	Reduction (%)
Operable	0
Inoperable	100
Inoperable - logged	100
Not mapped	100

5.5 Sites with low timber growing potential and problem forest types

Sites may have low productivity either because of inherent limiting site factors (poor nutrient availability, exposure, excessive moisture, etc.), or because they are not fully occupied by commercial tree species. These types of stands were identified in the EOA as stands that are not capable of producing 300 m^3/hectare or have a site index of less than 10 metres. They are considered inoperable in the timber supply analysis.

Problem forest types are stands that are physically operable and exceed low site criteria but that are not currently utilized or have marginal merchantability. Where logging has not occurred, these types are excluded from the THLB. Table 7 lists the stand types that will be excluded due to low volume and productivity. Alder plantations established in the Sayward and Loughborough supply blocks are included in the THLB.

Table 7. Definition of problem forest types

Species	Reduction percent (%)
Leading pine	100
Leading deciduous - Kyuquot TSB	100
Leading deciduous (non-Alder) - Sayward and Loughborough TSBs	100

5.6 Cultural heritage resource reductions

Land base reductions for First Nations cultural heritage resources

Archaeological sites, and culturally modified trees (CMT) that pre-date 1846, are protected under the *Heritage Conservation Act*. In the Strathcona TSA, archaeological resource values relate primarily to First Nations' historic village sites, shell middens and CMTs. Historic village sites and shell middens are usually identified near marine shorelines and CMTs are generally found in remaining old-growth forest, most often in stands of predominantly redcedar or yellow cedar.

Archaeological overview assessments have been completed for the TSA, providing baseline information on archaeological resource potential, to guide field-level archaeological impact assessments (AIA). Where AIAs identify archaeological sites, they are catalogued in the RAAD; newly identified sites in the TSA have been added since the previous TSR.

The protection of sites with First Nations' cultural heritage resources will be accounted for in the analysis by delineating RAAD-catalogued traditional use and archaeological areas as buffered polygons and points and excluded from the THLB. Based on advice from district staff, a 50-metre buffer will be applied to each known feature in order to capture the area needed to protect known and undiscovered sites.

EBM objectives for First Nations

The SCCLUOR contains objectives to manage for issues important to First Nations. Within the Strathcona TSA the EBM objectives apply only to the Loughborough TSB. The EBM area covers roughly 20% of the gross TSA area. The objectives are as follows:

Objective 3 for First Nations' traditional forest resources

The intent of Objective 3 is to maintain forest resources in a manner that supports First Nations' food, social, treaty and ceremonial use of the forest.

In the Strathcona TSA, First Nations' may access timber free of stumpage for traditional and cultural uses, with the expectation that the volume required for traditional use will be charged to the AAC apportioned to the Forest Service Reserve. District staff report that requests for First Nations' traditional use volumes have been in the range of 250 m^3 to 400 m^3 in total annually, for all First Nations collectively. Although recent Court decisions have expanded the scope of cultural and domestic use, staff note that the Forest Service Reserve has had sufficient volume to meet all requests, although requests for very large monumental cedar require additional logistics and time. Requested volumes may also be sourced from outside the THLB, for example, from conservancies, parks and other types of Crown forest reserves. District staff believe that current operational practices remain sufficient to supply First Nations' traditional forest resources.

Objective 4 for First Nations' traditional heritage features

The intent of Objective 4 is to protect traditional heritage features, other than CMTs, and include a management zone of sufficient size to protect the integrity of the traditional resource feature.

Traditional heritage features include: CMTs and the other archaeological and historical artifacts, sites and locations which are important to the cultural practices, knowledge and heritage of a First Nation, but do not include traditional forest resources.

Objective 5 for culturally modified trees

The intent of Objective 5 is to identify and protect CMTs in areas proposed for road construction and timber harvesting, and to include a management zone of sufficient size to protect the integrity of the CMT.

A culturally modified tree is defined as "a tree that has been modified by First Nations people as part of their cultural use of the tree". CMT areas are defined as areas where more than 10 CMTs are found within one tree length of each other.

Objective 6 for monumental cedar

The intent of Objective 6 is to maintain sufficient volume and quality of monumental cedar to support its present and future cultural use by the applicable First Nations. The order defines "monumental cedar" as western redcedar and yellow-cedar that will meet First Nations cultural needs.

Objective 7 for stand level retention of redcedar and yellow-cedar

The intent of Objective 7 is to maintain a sufficient volume and quality of redcedar and yellow-cedar to support its cultural use by applicable First Nations.

A survey of current management practices by Strathcona TSA licensees operating within the area of the South Central Coast Order indicates that the objectives for First Nations' traditional heritage features, culturally modified trees, monumental cedar and stand-level retention of redcedar and yellow-cedar are being achieved through operational flexibility in co-locating these values with other required reserve types, such as those set out under SCCLUOR objectives for managing different types of aquatic habitats as well as for biodiversity.

In this analysis, management for First Nations' SCCLUOR objectives will be modelled through the spatial and forest cover requirements associated with the SCCLUOR for Aquatic Habitat and Biodiversity. Land base reductions for First Nations' cultural heritage resources, using RAAD also apply to the Loughborough TSB.

5.7 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.

5.8 Sites with unstable terrain

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.

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. The percentage reduction to be applied for a particular class of sensitive soil is outlined in Table 8. These percentages, which were developed on the basis of professional geotechnical advice received during the last timber supply review, are consider to accurately reflect current management.

Table 8. Reductions for unstable terrain

Stability category	Description	Location	Reduction percent (%)
S001 (U)	Unstable	Entire TSA	95
S002 (P)	Potentially unstable	Kyuquot supply block	40
S002 (P)	Potentially unstable	Sayward and Loughborough supply blocks	50

5.9 Established recreation sites and trails and recreation resource features

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. These areas, identified in the Forest Tenure-Recreation in the BCGW will be entirely excluded from the THLB.

In 2006, a *GAR* Order Identified Significant Recreation Features 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*. Although not specifically prohibited, timber harvesting may not 'damage or render ineffective' the recreation feature. For this analysis, 90% of the area occupied by Significant Recreation Features identified in the Order will be excluded from the THLB.

5.10 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 2007, a *GAR* Order established specific elements of karst systems as resource features within the Campbell River District. Like the Recreation Resource Features, this designation results in protection under FRPA's *Forest Planning and Practices Regulation* for specified karst elements.

Identified karst resource features within the Strathcona TSA include:

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

Although the *GAR* Karst Resource Feature Order is aspatial in nature, it reflects current management practices under the *Karst Management Handbook* and Karst Inventories. In this analysis, a minimum of 8% of the forested area having potential karst values will be excluded from the THLB.

5.11 Ungulate winter range reductions

Ungulate winter range (UWR) mapping and general management measures were approved for the Strathcona TSA in 2006. UWRs were subsequently amended and currently cover over 10 000 hectares. The general management measures prohibit timber harvesting and UWR are totally excluded from the THLB.

5.12 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 General Wildlife Measures (GWMs) to protect rare and endangered species. WHAs have been established in the Strathcona TSA.

Table 9. Description of wildlife orders and WHAs for the Strathcona TSA

Type	Species	Description and management activity
Approved WHAs	Grizzly Bear	Three WHAs have been established. No forestry practices should be carried out within these WHAs.
Approved WHAs	Marbled Murrelet	WHAs have been established to manage habitat for Marbled Murrelet. No harvesting and silviculture should be carried out within these WHAs except as per the general wildlife measures listed in the order establishing the each WHA.
Approved WHAs	Northern goshawks and red-legged frogs	WHAs have been established to manage habitat for Northern goshawks and red-legged frogs. No harvesting and silviculture should be carried out within these WHAs.

5.12.1 EBM grizzly bear habitat areas

Sensitive grizzly bear habitat areas identified in Schedule 2 of the SCCLUOR and indicated by the most recent maps available by the MOE will be excluded from the THLB.

5.13 Landscape-level biodiversity

Landscape biodiversity management is done in two ways: through the establishment of spatial old growth management areas (OGMA) and through non-spatial forest cover requirements. Modelling for forest cover requirements is described in Section 6.4.1

Old growth management areas are defined in the *Forest Practices Code of British Columbia Act Operational Planning Regulation* as areas established under a higher level plan that contain or are managed to replace structural old growth attributes. OGMAs have been approved for two of twenty landscape units within the Strathcona TSA. Draft OGMAs have been identified in three other landscape units and current licensee practice is to treat the areas as no-harvest zones. Given the no-harvest status, the identified draft OGMAs will be excluded in the base case. Should the OGMA land base change after the analysis is completed, the impact will be reported to the chief forester so it may be incorporated into his AAC determination.

5.14 Stand-level biodiversity

5.14.1 Stand-level retention on Vancouver Island

The *Biodiversity Guidebook* describes two methods for maintaining stand structure over time, wildlife trees and wildlife tree patches. In the Strathcona TSA, WTP reserves are retained according to the percentages identified in Table A3.1 of the *Landscape Unit Planning Guide* (LUPG). These percentages will be determined for, and applied to each draft landscape unit in the TSA once the timber supply analysis data file is assembled.

District staff are of the opinion that there is sufficient suitable area removed from the THLB for reasons such as riparian reserve zones, terrain stability and low site to provide up to 50% of the required WTP area. Therefore, the timber harvesting land base that will be assumed reserved in WTPs will be 50% of the WTP amounts specified in the LUPG.

Data source and comments:

The percentage of the WTP retention target estimated to be met by areas not in the THLB was derived from a representative sample of silviculture prescriptions approved in the TSA since 1998. A total area of approximately 1000 hectares was reviewed.

Significant uncertainty exists regarding the actual amount of THLB that is being reserved in WTPs. Therefore, the analysis will examine the sensitivity of the Strathcona TSA timber supply to assumptions about WTP retention.

5.14.2 EBM objective for stand-level retention

This objective is intended to maintain stand-level retention. It requires that timber harvesting be conducted so as to maintain a minimum tree retention of 15% of which half should be internal to the cutblock if the block is larger than 15 hectares.

In order to accurately reflect the net effect of stand-level retention on timber supply, areas of overlap with other areas excluded from harvesting or subject to forest cover constraints must be assessed.

It is necessary to determine the net impact of the stand-level retention objective because there is significant overlap with other constraints and reserves. For example, riparian areas are often used to meet stand-level retention requirements and riparian reserves have already been address as a netdown to the THLB.

An assessment described in a report by Symmetree Consulting Group titled, "Implementation Monitoring of EBM in the Central Coast" (Symmetree, Feb 28, 2007) provided an estimate of the amount of stand retention that occurred in harvesting of EBM blocks and roads in the period before 2006. The assessment found that blocks harvested with group retention had a retention level of 21% *versus* the minimum 15% required by Objective 16. Information from the Symmetree (2007) report will be used to estimate the overlap between observed stand retention and other land classes removed from the THLB (e.g., streamside riparian areas and non-merchantable areas) to determine the net impact on the THLB of stand retention in the EBM area. The net land base reduction for stand retention in the EBM area will be derived during the netdown process and reported in the timber supply analysis report.

5.15 EBM objective for red- and blue-listed plant communities

Red-listed plant communities are rare, threatened or extirpated in British Columbia and are set out in Schedule 5 of the SCCLUOR. The objective is to protect red-listed plant communities and a 100% netdown of these areas will be applied.

Blue-listed plant communities are of special concern in British Columbia and are set out in Schedule 6 of the SCCLUOR. The objective is to protect at least 70% of each occurrence of a blue-listed community or to protect at least 70% of each type of blue-listed plant community that occurs in a landscape unit.

In the portion of the EBM area covered by Terrain Ecosystem Mapping (TEM), TEM will be used to predict the occurrence of red-listed and blue-listed plant communities. All red-listed areas and 70% of blue-listed area will removed from the THLB. The blue-listed reduction will be incremental to other land base reductions.

For any EBM area not covered by TEM, a reduction of 3.8% will be applied to all stands. This reduction assumption was developed in the Kingcome TSA TSR 3 and is based on a biophysical model used to predict the spatial location of red- and blue-listed plant communities based on SCCLUOR.

5.16 Riparian reserve and management zones

Riparian habitats occur along streams and around lakes and wetlands. Riparian management in the portion of the TSA within the EBM area is prescribed by SCCLUOR. Other areas are managed according to the FPC.

The FRPA requires the establishment of riparian reserve zones (RRZs) that exclude timber harvesting, and riparian management zones (RMZs) that restrict timber harvesting, in order to protect riparian and aquatic habitats. Stream classes (e.g., S1) described in the *Riparian Management Area Guidebook* are determined based

upon the presence of fish, the presence of a community watershed designation and the average channel width. The stream class is then used to determine RRZs and RMZs requirements.

Detailed stream inventories are not available for the entire Strathcona Coast TSA but there are operational inventories covering some assessment watersheds. An analysis of these sample watersheds will be done to determine the percentage of its area is in riparian reserves. This percentage will be extrapolated and applied aspatially in the assessment watersheds where detailed inventories are not available.

Table 10 summarizes the stream categories and the buffer widths that will be applied to each side of the rivers and streams in the sample watersheds.

Table 10. Riparian reserve and management zone buffer widths for river and streams

River/stream class	Reserve width (metres)	Management zone width (metres)	RMZ retention (%)	Effective buffer width (m)
S1 large rivers	0	100	50	50
S1 fish streams	50	20	50	60
S2 fish streams	30	20	50	40
S3 fish streams	20	20	50	30
S4 fish streams	0	30	25	7.5
S5 non-fish streams	0	30	15	4.5
S6 non-fish streams	0	20	5	1

Lakes and wetlands were classified using the *Riparian Management Guidebook* and Table 11 outlines the reserve and management zone buffers that have been applied to the features in the GIS file.

Table 11. Riparian reserve and management zone buffer widths for lakes and wetlands

Feature class	Reserve zone width (m)	Management zone width[(a)] (m)	RMZ retention (%)	Effective buffer width (m)
L1[(a)]	10	0	N/A	10
L2	10	20	25	15
L3	0	30	25	7.5
L4	0	30	25	7.5
W1	10	40	25	20
W2	10	20	25	15
W3	0	30	25	7.5
W4	0	30	25	7.5
W5	10	40	25	20

a) L1 lakes < 1000 hectares gave a 10-metre reserve zone and the management zone is determined by the district manager.
L1 lakes >1000 hectares only have a management zone determined by the district manager.

5.17 EBM objectives for aquatic habitats

5.17.1 EBM objectives for important fisheries watersheds

The objective is to maintain an equivalent clearcut area (ECA) of less than 20% in important fisheries watersheds. Important fisheries watersheds are indentified in Schedule 3 of the SCCLUOR.

Following recommendations from FAIB this will be modelled through a disturbance constraint whereby a maximum of 16% of the forested area will be less than 6 metres.

5.17.2 EBM objectives for high value fish habitat

This objective is to maintain a reserve zone adjacent to high value fish habitat (HVFH). HVFH is defined as "*critical spawning and rearing areas for anadromous and nonanadromous fish*" and includes estuaries, floodplains and marine interface areas. It occurs in a subset of streams and portions of the ocean shoreline.

HVFH along alluvial streams will be identified using the MOE 1:50,000 HVFH stream mapping and selecting streams with a gradient of <= 5% on terrain with <= 5% slope and under 900 metres in elevation. A buffer of 60 metres (40 m x 1.5) will be applied to both sides of the HVFH streams and the resulting area will be removed from the THLB.

5.17.3 EBM objectives for aquatic habitat that is not high value fish habitat

The objective is to retain 90% of the functional riparian forest in a management zone 1.5 times the height of dominant trees adjacent to S1 to S3 streams, lakes greater than 0.25 hectares and marsh and fen wetlands greater than 0.25 hectares.

Aquatic non-HVFH will be derived from TRIM 1:20 000 scale stream maps and FRPA stream classifications for a sample of watersheds where stream have been classified. A 1.35 tree length buffer around non-HVFH will be used to reflect the objective of retaining 90% of the land base with a 1.5 tree length buffer. Within the buffer, a 100% netdown will be applied. Where streams have not been classified, an aspatial netdown will be applied.

5.17.4 EBM objectives for forested swamps

The objective is to retain 70% of the functional forest reserve in a management zone the width, on average equal to 1.5 times the height of dominant tress adjacent to forested swamps greater than 0.25 hectares. A forest swamp is defined as "*a forested mineral wetland or forested peatland with standing or gently flowing, nutrient rich water in pools or channels and where the water is "usually at or near the surface"*."

Potential forest swamps will be identified from TRIM features as described in the SCCLUOR. Only those within the CWHvm1, CWHws2, and CWHds2 BEC subzones will be buffered as swamps in other subzones are not considered to be nutrient rich. A 100% netdown will be applied rather than a 70% netdown within the buffered areas to account for unmapped forest swamps.

5.17.5 EBM objectives for upland streams

Objective 12 SCCLUOR is for the maintenance of forests associated with upland steams as functional riparian forest. The objective requires that functional riparian forest exist on at least 70% of upland portions of watersheds.

Upland streams are defined as "streams with slope greater than 5% that are classified as S4 to S6 streams in Section 47 of the *Forest Planning and Practices Regulation*", and are to be managed in watersheds identified in Schedule 3 of the SCCLUOR.

The timber supply forecast will apply a rule that will ensure harvesting is not conducted at a rate that would cause more than 30% of the upland forest within the watersheds to to be below the hydrologically effective green-up height of 9 metres. This height comes from the *Coastal Watershed Assessment Procedure Guidebook* which states that 9 metre tall stands are assumed to be 90% hydrologically recovered.

5.17.6 EBM objectives for alluvial fans

Objective 13 of the SCCLUOR is to maintain 90% of the functional riparian forest on active fluvial fans. Active fluvial units are active floodplains where water flows over land in a normal flood event.

Floodplain (active fluvial units) areas will be identified using TEM but will not include areas occupied by coniferous stands at least 200 years old (> 80% coniferous), which are assumed to be stable, high-bench floodplains. Ninety percent of the total area within the selected floodplains will be reserved from harvesting– selected first from constrained lands and then unconstrained lands.

5.18 Roads, trails and landings

Roads, trails and landings will be accounted in the analysis in one of two ways. Large roads, such as a highway having a wide right-of-way, are categorized in the forest cover inventory as non-forest land polygons, and will be removed from the land base considered available for timber supply (see Section 5.2). Smaller roads, as well as trails and landings, are considered unproductive area within a forest cover polygon and will be factored out of the land base considered available for timber supply. These features do not get classified in the 1:20,000 scale forest cover inventory because of their linear shape and small size.

Separate estimates are made to reflect the loss in productive forest land due to existing and future roads, trails and landings (RTL). Existing RTL estimates are applied as reductions to current productivity and future RTL reductions are applied after stands are harvested for the first time in the simulation model. Estimates will be applied as land base reductions to operable stands as indicated in Table 12.

Table 12. Reductions for roads, trails and landings

Location	Harvest system class	Reduction percent (%)
Existing roads, trails and landings	All	6.6
Future roads, trails and landings	All	3.9

Data source and comments:

The estimated area of existing RTLs was derived from a review of historic audit and monitoring measurements from 1991 to 1994 and information supplied in the Integrated Silviculture Information System (ISIS) data base of licensee reported non-productive natural area from 1994 to 1997. The area reviewed covered approximately 7600 hectares of which 6.6% was roads trails and landings.

The estimate for future RTLs was derived from a representative sample of silviculture prescriptions approved in 2001-2002 covering 1100 hectares of the TSA. These data indicate the percent area of permanent roads in conventional and helicopter logging areas is 5.0% and 0.5%, respectively. The site degradation associated with helicopter logging is an estimate based upon off-site expansion of road surfaces and landings to accommodate helicopter logging operations.

Since approximately 75% of the harvestable land base remaining to be accessed is operable by conventional systems, and 25% by non-conventional systems, the mean area-weighted deduction for future roads, trails and landings is estimated to be 3.9%.

The percent reduction to be applied for future roads will be finalized once the timber supply analysis data file is assembled.

5.19 Timber licence reversions

Timber Licences (TLs) are a form of historic tenure that gave the licensee exclusive right to harvest mature timber within the license area. Once the mature timber in the area of the TL has been harvested, regenerated and attain free growing status, the timber license area reverts to Forest Service jurisdiction. Accordingly, timber licences within the TSA are included in the THLB after the first harvest where they contribute to the mid- and long-term timber supply.

For the timber supply review TLs, second-growth (managed) stands will be treated as reverted. Old-growth stands will contribute to the mid- and long-term timber supply only after the first harvest.

6. Current Forest Management Assumptions

6.1 Harvesting

6.1.1 Utilization levels

The utilization level defines the maximum stump height, minimum top diameter (inside bark) and minimum diameter at breast height that must be removed from harvested areas. These factors are needed to calculate merchantable stand volume for use in the analysis. The levels used in the analysis reflect current operational practice.

Table 13. Utilization levels

Analysis unit	Minimum dbh (cm)	Maximum stump height (cm)	Minimum top dib (cm)
All stand types 140 years and older	17.5	30	10
All stand types less than 140 years	12.5	30	10

Table 13 reflects current regional utilization standards, license requirements and current performance except for the minimum top dib for stands above 140 years of age. Currently, the utilization standards for stands above 140 years of age is a minimum top dib of 15 cm but the variable density yield projection (VDYP) model only compiles volumes to a 10 cm top dib. FAIB staff have indicated that the difference in yield between a 10 cm top dib and a 15 cm top dib is negligible.

6.1.2 Volume exclusions for mixed-species stands

One or more species may be unmerchantable in mixed-species stands. For example, deciduous species may not be harvested in a predominantly coniferous stand. The unharvested portion should not contribute to estimated stand volume.

Table 14. Volume exclusions for mixed-species stands

Species	Volume exclusion (%)
All deciduous and pine components except alder in the Sayward and Loughborough supply blocks	100

6.1.3 Alder stands

Red alder stands will be excluded from the THLB as indicated in Table 15.

Table 15. Exclusion factors for alder volume by supply block

Supply block	Average stand age (year)	Exclusion	Rationale
Kyuquot	All	100%	Not economic to recover
Loughborough	Over 80	100%	Excessive decadence
Sayward	Over 80	100%	Excessive decadence

6.1.4 Minimum harvestable age and volume

Minimum harvestable ages are, as the term implies, the minimum age at which harvesting is expected to be feasible. While harvesting may occur in stands at the minimum requirements in order to meet forest level objectives (e.g., maintaining over harvest level for a short period of time or avoiding large inter-decadal changes to harvest levels), most stands will not be harvested until well past the minimum ages because other resource values take precedence (e.g., requirements for the retention of older timber).

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 volume; and b) the age at which the stand's mean annual increment (MAI) achieves a value of 95% of the maximum (culmination). In order to be eligible for harvesting a stand must meet both of these criteria. The required minimum stand volumes and minimum MAI are listed in Table 16.

Table 16. Minimum harvestable age criteria

Analysis unit	Volume at minimum harvestable age (m^3/hectare)	Mean annual increment
Fir	350	95% of MAI at culmination
Redcedar/Cypress	350	95% of MAI at culmination
Hembal	350	95% of MAI at culmination
Spruce	350	95% of MAI at culmination
Alder	350	95% of MAI at culmination

6.1.5 Silvicultural systems

The majority of the TSA is currently harvested using the clearcut method. There are no significant amounts of partial cut or selection harvest occurring at this time.

6.2 Unsalvaged losses

Table 17 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 17. Unsalvaged losses

Cause of loss	Total loss (m^3/year)	Annual unsalvaged loss (m^3/year)
Fire	2 500	1 750
Windthrow	60 000	30 000
Disease	11 400	11 400
Total	73 900	43 150

Data source and comments:

The windthrow and fire estimates are based upon district blowdown ledgers, district experience with salvage and district fire occurrence records. There is currently no other information available.

Ongoing monitoring of insect infestations within this TSA reveals that losses are relatively minor and would be accounted for in existing yield models. Key insect species which are monitored in this district are western black headed budworm, western hemlock looper, balsam wooly adelgid, and conifer sawflies.

Laminated root rot (Phellinus weiri) occurs in the drier regions of the district, primarily in younger Douglas-fir forests in the Sayward area, on Quadra Island, and in minor pockets in the Gold River area. Current estimates of annual unsalvaged losses total 11 400 cubic metres.

6.3 Silviculture

6.3.1 Regeneration activities in managed stands

The silviculture program reflects the mix of treatments expected to be carried out.

Managed stands comprising recent plantations and future stands will be grown on managed stand yield tables (MSYTs) produced using the BC Forest Service table interpolation program for stand yields (TIPSY) model. Table 18 includes the criteria used to define existing managed stands.

Table 18. Managed stand age criteria by leading species

Leading species	Age threshold
Douglas-fir	<=60 years
Hemlock/balsam	<= 45 years
Redcedar/cypress	<= 35 years
Spruce	<= 45 years

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 / species combination) are then aggregated into one table. Table 19 shows the silviculture regimes applied to each analysis unit and the expected average regeneration delay.

Table 19. Definition of managed stand analysis units

Analysis unit	Regen delay	OAF 1	OAF 2	Species	%	Regen method	Initial density stems/ha[1]	Genetic gain assumed for planted trees (%)[2]
1. Fir, SI >= 25m	1	15	5	Fd	100	Plant	1000	10
2. Fir, SI >= 15 and < 25	1	15	5	Fd	100	Plant	1000	10
3. Fir, SI < 15 m	1	15	5	Fd	100	Plant	1000	10
4. Redcedar/cypress, SI >= 25m	2	15	5	Cw Ba	30 70	Plant Natural	1000	2.4
5. Redcedar/cypress, SI >=15 and < 25 m	2	15	5	Cw Hw	50 50	Plant Natural	1000	4
6. Redcedar/cypress, SI < 15 m	2	15	5	Cw Hw	50 50	Plant Natural	1000	4
7. Hemlock/balsam, SI >= 25 m	3	15	5	Ba Hw	50 50	Plant Natural	1000	0
8. Hemlock/balsam, SI >=15 and < 25 m	3	15	5	Ba Hw	50 50	Plant Natural	1000	0
9. Hemlock, SI < 15 m	3	15	5	Cw Cy Hw	25 25 50	Plant Plant Natural	1000	7
10. Spruce	1	15	5	Ss Cw Cy	20 40 40	Plant	1000	11.6
11. Alder	1	15	5	Dr	100	Natural	1000	0

[1] This density reflects the initial density of the anticipated crop trees, which is typically higher than a well spaced number and lower than a total stems number.

[2] Genetic gain is applied to the planted component of future managed stands.

6.3.2 Stand fertilization

Since the latest forest cover inventory, 7263 hectares of Douglas-fir and hemlock stands have been fertilized. For this timber supply review the following assumptions are being modelled. The treatment response will be applied to the Douglas-fir component of the stands. The assumed treatment response was estimated using TIPSY with inputs for example stands.

Table 20. Stand fertilization assumptions

Area treated (hectares)	Assumed total treatment response (m^3/hectare)
7263	30

The treatment response applies only to stands that have already been fertilized and it is assumed that the full treatment response will be achieved before the stands are harvested. The potential for future fertilization is uncertain and therefore will not be modelled.

6.3.3 Immature plantation history

This section identifies areas of existing immature forest where the establishment density (i.e., stems per hectare) is controlled and therefore should be assigned to a managed stand yield table curve (MSYT). All NSR and stands harvested in the future will be managed under MSYTs.

Data source and comments:

The proportion of immature stands considered to be managed is based upon the best professional estimate of district silviculture staff. Douglas-fir stands less than 60 years of age are considered to be managed due to the long history of forest management activities in the Sayward supply block.

6.3.4 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 timber harvesting land base. Further to Section 5.4, "Inoperable areas", the base case will exclude any previously harvested cutblocks that operability modelling criteria identified as inoperable.

6.3.5 Genetic gain through tree improvement

Where available, select seed (class A seed from orchards) is used for regeneration because of its superior volume production and, in the case of spruce, resistance to pests. Genetic gains (Table 19) will be applied to future managed stands using the genetic worth by species provided by Tree Improvement Branch staff (Table 22).

Table 22. Genetic worth by species

Species	Availability	Genetic worth
Douglas-fir	100%	10%
Cedar	86%	8%
Cypress	100%	20%
Spruce	100%	2%

6.4 Integrated resource management

6.4.1 Forest cover requirements

Forest cover requirements may be examined at a number of different levels, including landscape units, wildlife areas and visual quality areas. With the requirement to retain different forest characteristics across the landscape, it is important to identify how forest outside of the THLB may be considered in the forest cover requirements (i.e., maximum allowable disturbance or minimum area retention). Table 22 describes the forest cover requirements to be applied.

Table 22. Forest cover requirements for disturbance and mature retention by zone or group

Zone or group	Green-up height (m)	Green-up age (years)	Maximum allowable area below green-up (%)	Minimum retention (% > years or height)	Area to apply constraint
IRM	3	–	25		Timber harvesting land base per landscape unit (LU)
VILUP Enhanced Forestry Zone	1.5	–	25		Timber harvesting land base per LU
RVQC – preservation	5	–	1		Forested area per scenic polygon
RVQC – retention	5	–	5		Forested area per scenic polygon
RVQC – partial retention	5	–	15		Forested area per scenic polygon
RVQC – modification	5	–	25		Forested area per scenic polygon
Community watersheds	–	5	5		Forested area per CWS
Non-spatial old growth	Within landscape units on Vancouver Island without legal or draft OGMAs, management is directed by the Order Establishing Provincial Non-Spatial Old Growth Objectives. These directions will be used to apply old growth retention targets.				Forested area per LU
EBM landscape-level biodiversity	Site series surrogates will be used to apply old growth retention targets as defined in the SCCLUOR.				Forested area per BEC and analysis unit
EBM important fisheries watersheds	6		16		Forested area per watershed
EBM upland streams	9		30		Forested area per upland stream portion of watershed

Data source and comments:

Recommended visual quality classes have been assigned by the Campbell River District and the Coast Region recreation staff.

Green-up height represents the top-height (average height of the 100 largest trees per hectare) for the regenerating forest which is required to meet general integrated resource management objectives associated with hydrology, wildlife, recreation, or other similar concerns.

The green-up height for RVQC areas is the visually effective green-up (VEG). When VEG is achieved, the regenerated forest cover is generally assumed to block views of previously harvested openings. Known scenic areas in the Strathcona TSA are currently managed with a visually effective green-up height of 5 metres.

The forest cover requirement in visually sensitive areas will be modelled at the 'maximum' level of disturbance recommended in *Procedures for Factoring Visual Resources into Timber Supply Analyses*. This is consistent with measures implemented to optimize the timber harvest in the TSA consistent with good visual management, in accordance with policy direction from the Minister of Forests, Lands and Natural Resource Operations.

6.4.2 Visual resources

Management for visual quality is based on legally established Visual Quality Objectives (VQO's) established for the Campbell River District in 2005 through an Order made under Section 7 (1) of the *GAR*.

The four VQO ratings considered in this analysis were preservation (P), retention (R), partial retention (PR), and modification (M). Forest cover requirements that limit the allowable disturbance will be applied to all areas with an established visual objective based the high end of the permissible range for each class. This assumption reflects the current practice of applying landscape design to cutblocks within visually sensitive areas.

A visually effective green-up (VEG) height of 5 metres will be assumed for Strathcona TSA.

6.4.3 Landscape-level biodiversity

In the 21 landscape units where OGMAs have not been established, forest cover constraints will be used to address landscape-level biodiversity requirements. Within landscape units on Vancouver Island without legal or draft OGMAs, management is directed by the Order Establishing Provincial Non-Spatial Old Growth Objectives.

6.4.4 Landscape-level retention for EBM areas

For the six landscape units on the BC mainland portion of the TSA, biodiversity objectives are set out in the SCCLUOR. These objectives require that the amount of old growth in each site series surrogate be maintained at an amount equal to or greater that than a specified target. Where there is less that the default old forest target available in the LU old forest will be recruited to meet the requirements within 250 years

The SCCLUOR also limits the amount of mid-seral forest in each site series surrogate to less than 50% in mid-seral age classes. Where there is more than 50% in any site series surrogate in mid-seral age classes then the amount will be reduced within 80 years.

Patch size distribution

Generally the maximum opening size for a harvest area is 40 hectares. However in the Sayward supply block on an area covering about 50% of THLB the maximum open size is 80 hectares. 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.

The individual blocks average 10 to 15 hectares in size. The timber supply analysis will utilize a block size distribution pattern based on the maximum opening size. Harvesting is limited when adjacent openings have not reached a 3-metre green-up height.

6.4.5 Designated community watersheds

Table 23. Designated community watersheds

Name of the community watershed	Community served	Area (hectares)
John Hart Lake	Campbell River	2520
Barton Creek	Queens Cove	18
Andrews Creek	Kyuquot	126

Data source and comments:

In order to protect water quality a forest cover constraint will be applied which will limit the amount 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 5% of the productive forest area over a 5-year period.

7. Sensitivity Analyses to be Performed

Sensitivity analysis provides a measure of the timber supply impact if uncertainty in management assumptions or data integrity exists. The magnitude of the increase or decrease in a particular variable should reflect the degree of uncertainty surrounding the assumption. For instance, minimum harvestable age may be developed based on some minimum stand attributes which currently appear to dictate the earliest time stands are eligible for harvest. Sensitivity analysis may indicate that a small reduction in these attributes may alleviate anticipated harvest level reductions in the future. By developing and testing a number of sensitivity analyses, it is possible to determine which variables most affect results. Table 24 lists the sensitivity analyses that are to be conducted for this timber supply review.

Table 24. Description of sensitivity analyses to be performed

Issue to be tested	Sensitivity levels
Minimum harvestable age and volume	Assume a minimum volume of 300 m^3/ha for conifer stands and +/- 10 years 95% of MAI at culmination
Existing stand yields	+/- 10%
Regenerated stand yields	+/- 10%
Site index	+/- 10%
Land base changes	+/- 10%
Decreased economic operability	EOA under poor market conditions
Increased economic operability	EOA under good market conditions
Increased operable area	Include all previously logged areas
Visual quality objectives	Mid-range % denudation
Harvest flow alternatives	various scenarios
Green-up periods	+/- 2 years
WTP Requirement	+/- 10%
Seral stage distribution	Apply the early and mature + old-seral stage requirements
Landscape-level biodiversity	No low BEO drawdown

Note: At the time of the analysis the sensitivity levels tested may differ as required to best reflect the range of uncertainty in the assumption being tested.

7.1 Utilizing marginally-economic stands

On August 15, 2012 the Special Legislative Committee on Timber Supply issued a report entitled: "Growing Fibre, Growing Value". In its report, the committee recommended that the FLNR examine ways of utilizing stands that are currently considered to be marginally economic as a means of mitigating the projected decreases in timber supply in many areas of B.C.

In response to this recommendation, this timber supply review will examine the effect of varying the average log values from the Vancouver Log Market used in the base case by one standard deviation (see Table 24 above). Increasing or decreasing average log values may result in a correspondent increase or decrease in the size of the area that is economically-available for harvesting and the base case timber supply.