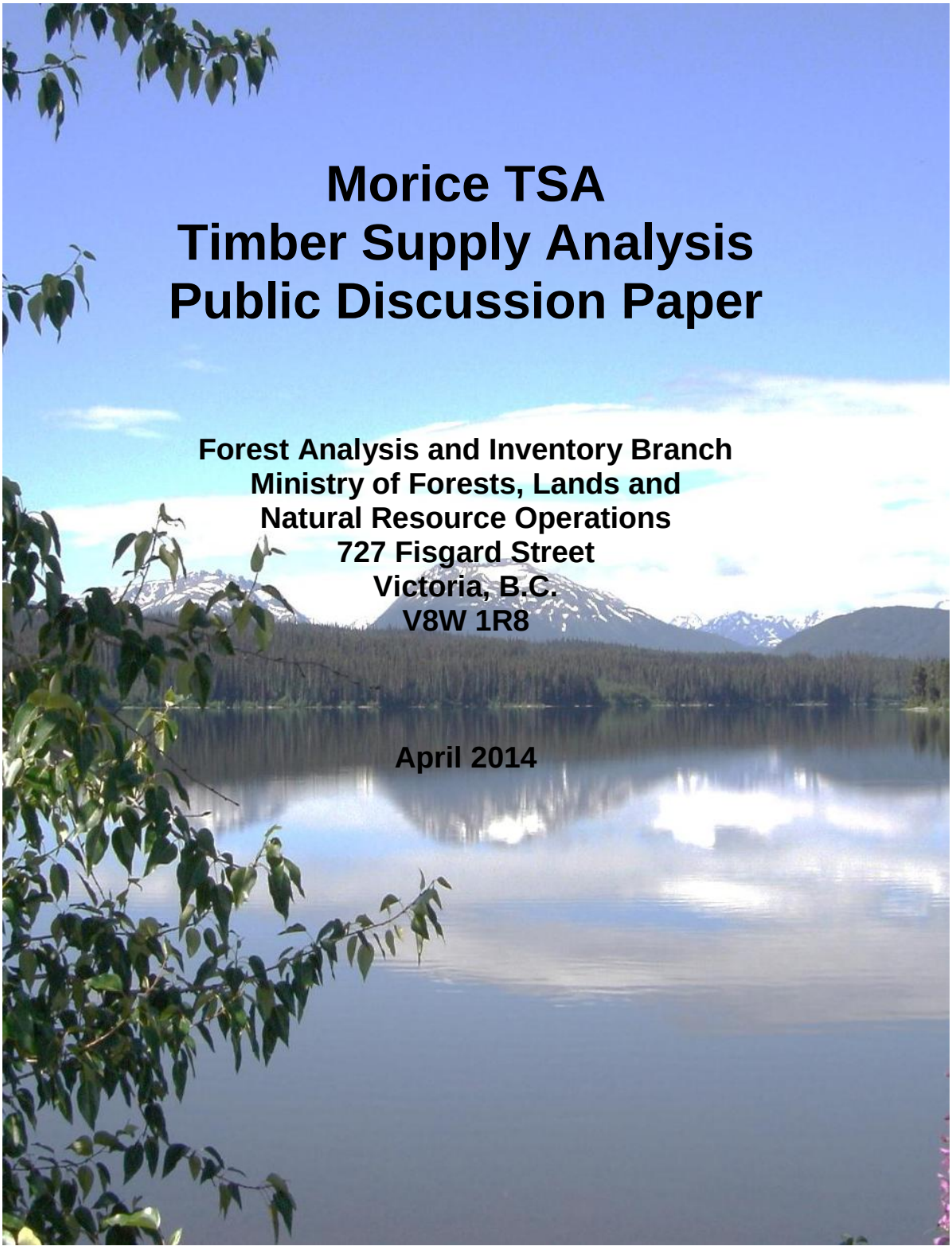

Morice TSA
Timber Supply Analysis
Public Discussion Paper

Forest Analysis and Inventory Branch
Ministry of Forests, Lands and
Natural Resource Operations
727 Fisgard Street
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BRITISH COLUMBIA
Ministry of
Forests, Lands and
Natural Resource Operations

Cover photograph courtesy of Rilla Middleton
Ministry of Forests, Lands and Natural Resource Operations
Nadina Natural Resource District
McBride Lake and Tableland Mountain

Introduction

The British Columbia Ministry of Forests, Lands and Natural Resource Operations (FLNR) regularly reviews the timber supply[a] for all timber supply areas[b] (TSA) and tree farm licences[c] (TFL) in the province. This review, the fourth for the Morice TSA, examines the impacts of current forest management practices on the timber supply, economy, environment and social conditions of the local area and the province. Based on this review the chief forester will determine a new allowable annual cut[d] (AAC) for the Morice TSA.

According to Section 8 of the *Forest Act* the chief forester must regularly review and set new AACs for all 38 TSAs and 34 TFLs in the Province of British Columbia (BC).

The objectives of the timber supply review are to:

- examine relevant forest management practices, environmental and social factors, and input from First Nations, forest licensees and the public;
- set a new AAC; and
- identify information to be improved for future timber supply reviews.

This public discussion paper provides a summary of the results of the timber supply analysis for the timber supply review of the Morice TSA. Details about the data and assumptions used in the analysis were provided in a data package (July 2013). Updates to the information used and technical details regarding the analysis are available on request from the Ministry of Forests, Lands and Natural Resource Operations, Forest Analysis and Inventory Branch. The timber supply analysis should be viewed as a "work in progress". Prior to the chief forester's AAC determination for the TSA, further analysis may need to be completed and existing analysis reassessed as a result of input received during this review.

In May 2012, a Special Committee on Timber Supply (special committee) was appointed by the Legislative Assembly of British Columbia to make recommendations to address the loss of mid-term timber supply due to mountain pine beetle (MPB) in the central interior of BC. Following its review of technical information and public, stakeholder and First Nations input, the special committee issued a report entitled *Growing Fibre, Growing Value* (August 2012). As described in *Beyond the Beetle: A Mid-term Timber Supply Action Plan* (October 2012), the FLNR has responded to the special committee's recommendations. Key ministry responses related to the provincial timber supply review program include:

- Review marginally economic forest types within each timber supply area (TSA) and quantify the types and areas of forest that might justifiably be included in a partition within the timber harvesting land base (THLB), while respecting resource objectives for other values, such as wildlife and water.
- Where feasible and appropriate, provide information from the timber supply review to enhance public discussion of resource management objectives.

[a] **Timber supply**
The amount of timber that is forecast to be available for harvesting over a specified time period, under a particular management regime.

[b] **Timber supply areas (TSAs)**
An integrated resource management unit established in accordance with Section 7 of the Forest Act.

[c] **Tree farm licences (TFLs)**
Provides rights to harvest timber and outlines responsibilities for forest management in a particular area.

[d] **Allowable annual cut (AAC)**
The maximum amount of timber harvest permitted each year from a specified area of land, usually expressed as cubic metres of wood.

Information regarding the potential contribution of marginally-economic stand types to fibre supply is presented in this document under 'Key sensitivity analyses'. It is expected that this public discussion paper will stimulate discussion of resource management objectives and practices within the Morice TSA and relevant information will be provided to the chief forester for consideration in determining a new AAC.

Timber supply reviews undertaken in support of AAC determinations are based on the current resource management objectives established by government in legislation and by legal orders. For the purposes of the Morice TSA timber supply review, forest management objectives are provided by the *Forest and Range Practices Act* and the Morice Land and Resource Management Plan (LRMP) approved by Cabinet in 2007. The information compiled to support this timber supply review can be made available to support land use planning as required. However, land use planning and land use decisions are outside the scope of the chief forester's AAC determination. In the event that resource management objectives and practices change, these changes can be reflected in future timber supply reviews.

Timber supply review in the Morice TSA

On February 1, 2008, following an urgent timber supply review in response to the MPB infestation, the chief forester set the AAC for the Morice TSA at 2 165 000 cubic metres, including a partition[e] of 550 000 cubic metres attributable to non-pine volume. The intent of the non-pine partition is to encourage the salvage of dead pine while conserving non-pine volume to mitigate the projected decrease in mid-term timber supply.

In July 2013, a data package documenting the data and forest management assumptions to be used in this timber supply analysis was released for public review and to assist with First Nations consultation. This discussion paper is being released in order to provide an overview of the timber supply review and to highlight the key findings of the timber supply analysis for the Morice TSA. Before setting a new AAC, the chief forester will review all relevant information, including the results of the timber supply analysis and input from government agencies, the public, licensees and First Nations. Following this review, the chief forester's determination will be outlined in a rationale statement that will be publicly available. The actual AAC that is determined by the chief forester during this timber supply review may differ from the harvest projections, including the base case, presented in this public discussion paper as the chief forester must consider a wide range of information, some of which cannot be quantified. Ultimately, the chief forester's AAC determination is an independent, professional judgement based on the legal requirements set out in Section 8(8) of the *Forest Act.*

Once the chief forester has determined the new AAC, the Minister of Forests, Lands and Natural Resource Operations will apportion the AAC to the various licence types and programs as per Section 10 of the *Forest Act*. Based on the minister's apportionment, the regional executive director will establish a disposition plan that identifies how the available timber volume is assigned to the existing forest licences and, where possible, to new opportunities.

[e] **Partition**
Under Section 8(5) of the Forest Act *the chief forester in determining an AAC can specify a portion of the AAC that is attributable to certain types of timber, terrain or areas of the TSA.*

Description of the Morice TSA

The Morice TSA is situated on the western edge of British Columbia's central interior plateau and extends from the most northerly tip of Babine Lake in the north to Ootsa and Whitesail Lakes in the south. The TSA has a gentle, rolling landscape in the north and east that becomes more mountainous in the southwest.

The overall climate, which includes cool summers and cold winters, reflects the transition between coastal and interior conditions. This climate supports forests that are dominated by lodgepole pine, hybrid spruce and subalpine fir (balsam). Minor amounts of trembling aspen, amabilis fir, western hemlock and mountain hemlock also occur in the TSA.

The TSA covers about 1.5 million hectares, of which approximately 932 000 hectares is Crown forest land base[f] (CFLB). After accounting for areas that are either unsuitable for harvesting or have been reserved from harvest to provide for other resource values (e.g., riparian areas, wildlife tree patches, wildlife habitat, etc.) a total of 648 956 hectares - or 43 percent of the total TSA area - are suitable and available for timber harvesting. This area is referred to as the 'timber harvesting land base[g]' (THLB).

[f] **Crown forest land base (CFLB)**
The forested area of the TSA that the provincial government manages for a variety of natural resource values. This excludes non-forested areas (e.g., water, rock and ice), non-productive forest (e.g., alpine areas, areas with very low productivity), and non-commercial forest (e.g., brush areas). The CFLB does include federal protected areas because of their contribution to biodiversity.

[g] **Timber harvesting land base (THLB)**
The portion of the Crown forest land base (CFLB) that is managed for timber supply by the Ministry of Forests, Lands, and Natural Resource Operations where timber harvesting is both legally allowed and economically feasible, while meeting objectives for all relevant forest values, existing timber quality, market values and applicable technology.

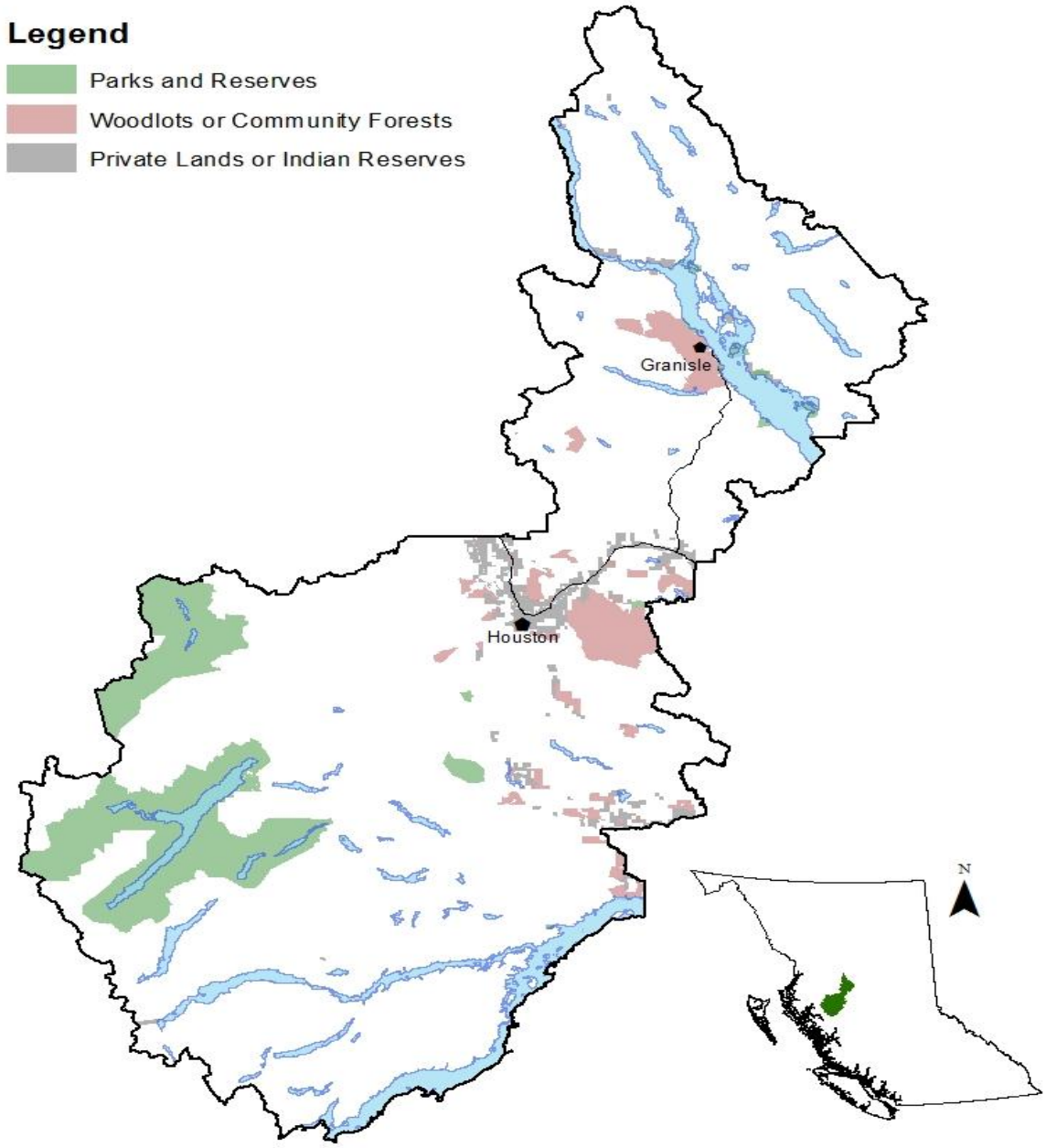

Figure 1. Map of the Morice TSA.

The Morice TSA is administered by the FLNR, Nadina Natural Resource District office located in Burns Lake. Thirty-seven woodlot licences and two community forest agreements have been issued for areas within the boundaries of the TSA. The AAC for these area-based tenures are determined through a separate process and they do not contribute to the AAC for the TSA. The information provided in this discussion paper pertains to the remainder of the TSA only, unless otherwise specified.

Houston, with a population of 3129 (BC Stats, 2013), is the largest community in the TSA. The remainder of the population lives in smaller communities such as Topley and Granisle, or on the many ranches and farms along the Highway 16 corridor and in the area from Owen Lake to Francois Lake.

First Nations

Eight First Nations have traditional territories that overlap the Morice TSA. Yekooche FN, Cheslatta Carrier Nation, Lake Babine Nation, Moricetown Band, Office of the Wet'suwet'en, Nee Tahi Buhn Band, Skin Tyee Nation and Wet'suwet'en First Nation.

First Nations have identified the importance of wildlife in the Morice TSA and the need for the chief forester to consider the impact of the rate of harvest on their aboriginal interests. To assist with this understanding, a wildlife habitat supply analysis is currently underway. The results of this analysis will be made available for discussion with First Nations communities and other interested parties prior to the chief forester's AAC determination.

Regional economy

The District of Houston is located within the Regional District of Bulkley Nechako. The forest industry is the main economic driver of the TSA. According to the *British Columbia Local Area Economic Dependencies: 2006*, the forest sector accounts for 31 percent of the after-tax income of Houston residents. Other sectors providing employment in the Houston area include: the public sector (23 percent), mining (nine percent), construction (five percent), tourism (five percent) and agriculture (two percent).

Timber processing facilities associated with the Morice TSA, which are located in the Houston area, include a large lumber mill, a small portable sawmill, a pellet mill and a small lumber remanufacturing plant. In total, the two sawmills and the pellet plant have the capacity to process about three million cubic metres of wood annually.

Since the last TSR, one sawmill in Houston has announced a permanent closure due to the decreasing availability of salvageable pine and the projected decrease in mid-term timber supply.

In addition to timber processing, there is one copper/molybdenum mine in the TSA.

Land use planning

The Morice Land and Resource Management Plan (LRMP) was approved by Cabinet in 2007. The plan provides guidance for the development and implementation of natural resource objectives, such as hunting and fishing, minerals and energy, air quality and biodiversity. Work is currently underway to establish land use objectives for biodiversity, including the establishment of no-timber harvesting zones, old growth management areas, seral stage distribution, and wildlife tree retention.

In the event that legal objectives are established prior to the chief forester's AAC determination, sensitivity analyses will be used to assess the impact, if any, on the base case. Any changes in legal objectives that occur following the determination can be addressed in subsequent timber supply reviews or earlier if it is thought that those changes could significantly affect timber supply.

Natural resources

Numerous natural resources are associated with the forests of the Morice TSA, including forest products (timber and non-timber), forage, minerals, and recreation, as well as a variety of fishery and wildlife habitats.

The TSA lies within the Fraser Plateau Ecoregion. The climate is sub-continental, with precipitation resulting from the vast areas of wetlands, lakes and streams; however there is also additional moisture brought into the areas by way of the low Kitimat Ranges. Five biogeoclimatic zones are represented in the TSA: Sub-Boreal Spruce (SBS); Engelmann Spruce Subalpine Fir (ESSF); Coastal Western Hemlock (CWH); Mountain Hemlock (MH) and, Alpine Tundra (AT). Lodgepole pine, hybrid spruce, and subalpine fir are the main tree species occurring in the TSA and frequently grow together as mixed-wood stands.

The forests of the TSA provide a wide range of natural resource benefits, including forest products, minerals, recreation and tourism amenities, fish and wildlife habitats. In addition, the beef ranching industry depends heavily for summer forage on Crown land in major valleys of the TSA. Parks, recreation sites and trails, and roaded and non-roaded areas provide opportunities for numerous outdoor activities including mountain biking, all terrain-vehicle use, hiking, hunting, camping, boating, cross-country skiing and snowmobiling. Parks and protected areas within the TSA include Nadina Mountain, Neineikekh/Nanika-Kidprice, Morice Lake, Atna River, Tazdli Wyiez Bin/Burnie-Shea, Topley, Red Bluff, Little Andrews Bay Marine Provincial Parks, Burnie River, and Morice River Ecological Reserve.

Environmental values

Current forest management follows the legislative requirements of the *Forest and Range Practices Act* (FRPA) and associated regulations. All forested lands, whether they contribute to timber supply or not, help to maintain critical habitats for many species. In the Morice TSA, about 30 percent of the CFLB is not considered suitable or available for timber harvesting and support a range of environmental values.

The *Forest and Range Practices Act* designates wildlife habitat areas with specific management practices for species at risk. Currently, species identified as 'at risk' in the Morice TSA are grizzly bear, mountain caribou and northern caribou. In addition, protecting water quality and quantity is an important management objective in the TSA. Significant demands are placed on water resources for the maintenance of fisheries values and aquatic ecosystems.

This timber supply analysis reflects the current land use and management practices designed to maintain biodiversity, wildlife habitat, visual quality, water quality, recreation areas, riparian areas, and protection of unstable terrain.

Forest management

Timber harvesting land base

As part of the process used to define the timber harvesting land base (THLB) in the timber supply analysis, a series of deductions are made from the TSA land base. Due to overlaps, the area excluded from the THLB under each factor may be less than the total area associated with that factor.

The land base assumed to be available for timber harvesting represents 43 percent of the total land area of the Morice TSA. The remaining 57 percent of the TSA is either unsuitable or unavailable for timber harvesting, because of ecological, economic or social considerations.

The total area within the boundaries of the Morice TSA is 1 501 711 hectares. After accounting for lands that are not Crown-owned or are under area-based forest tenures, non-productive land (e.g., rocks, swamps), and existing roads, the remaining CFLB is 932 612 hectares. Approximately 31 percent of the CFLB is excluded from harvesting because it occurs in parks, fish and wildlife habitat, or riparian areas (see Table 1). In the timber supply analysis, these areas are assumed to be available for other forest values. The current THLB is 648 956 hectares.

Table 1. Morice TSA land base classification

Land classification	Total area	Percent of total area	Net area removed	Percent of CFLB
Total area (including parks)	1,501,711	100.0%	1,501,711	
Land not managed by FLNR	77,382	5.2%	77,382	
Non-productive areas (including water)	496,750	33.1%	481,006	
Existing roads	10,711	0.7%	10,711	
Total Crown forest land base	932,612	62.1%		100.0%
Parks and protected areas	137,785	9.2%	54,261	5.8%
Northern Caribou calving range	2,688	0.2%	1,648	0.2%
Preservation VQO areas	33,754	2.2%	4,062	0.4%
Northern Caribou (Telkwa) core area	40,404	2.7%	1,479	0.1%
Goats UWR core area	111,433	7.4%	17,085	1.8%
Environmentally sensitive area	73,187	4.9%	39,808	4.2%
Unstable terrain	16,908	1.1%	3,776	0.4%
Physically inoperable areas	215,448	14.3%	16,110	1.7%
Low site areas	121,088	8.1%	66,807	7.1%
Problem forest types (deciduous, hemlock)	72,174	4.8%	36,451	3.9%
Partial reductions				
Steep slopes	15,063	1.0%	66	0.0%
Riparian reserve zones	35,897	2.4%	17,279	1.8%
Riparian management zones	41,246	2.7%	6,053	0.6%
Wildlife tree retention area			21,453	2.3%
Current timber harvesting land base			648,956	69.5%

The following figure (Figure 2) shows the current age class distribution for forests in the CFLB separated by THLB and non-THLB. The large amount of young forest in the THLB reflects the recent increase in harvesting to salvage MPB-killed pine.

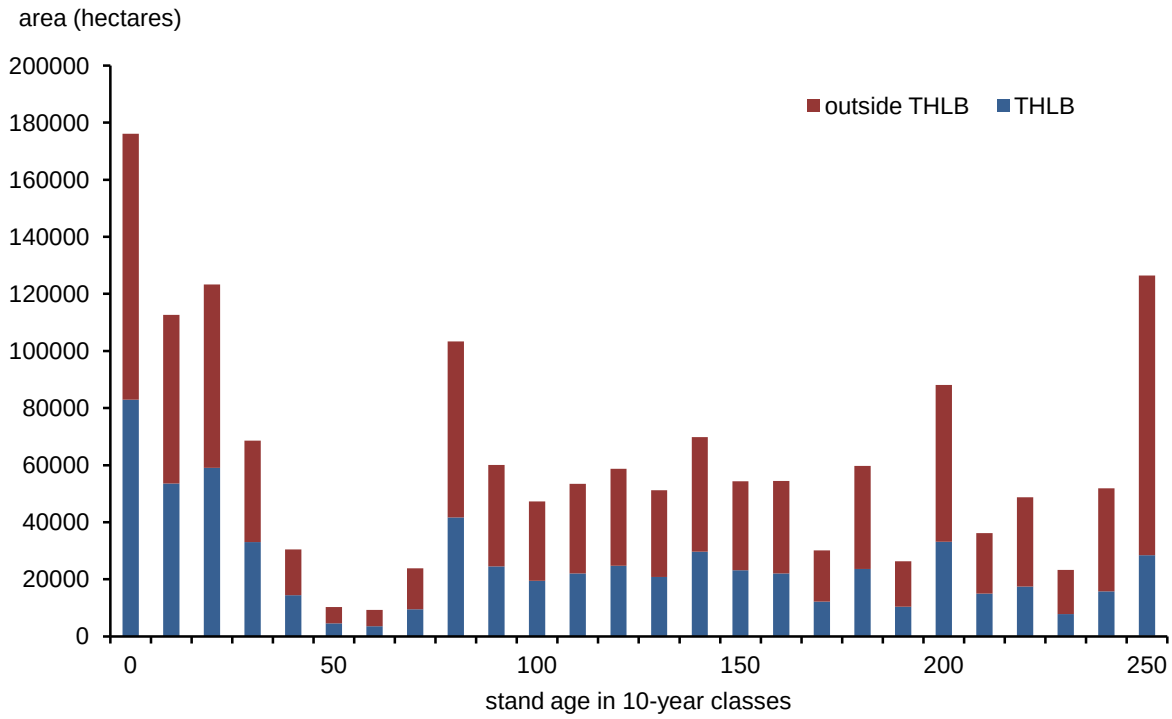

Figure 2. Age class distribution for the Crown forest land base in the Morice TSA.

Figure 3 shows the composition of the THLB by leading species.

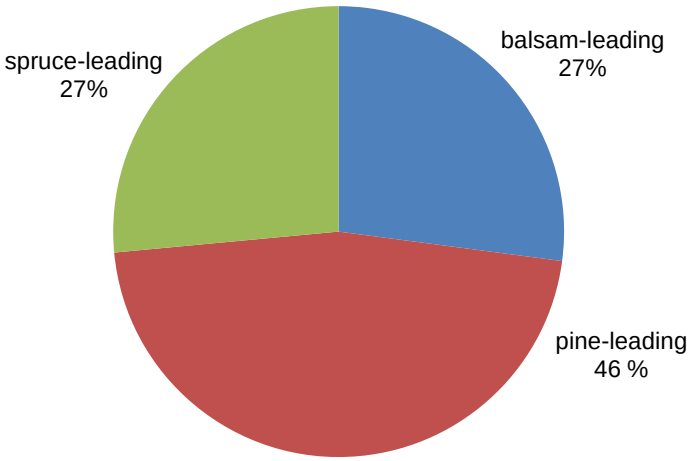

Figure 3. Leading species composition of the THLB.

Land base and forest management changes since 2008

The last AAC determination for the Morice TSA on February 1, 2008 was an urgent decision in response to the MPB epidemic sweeping the central interior. The timber supply analysis for that decision used data mainly from the analysis conducted for the Morice LRMP in 2006. Since then, several changes have occurred to the land base and forest management data and practices, including:

- updated pine mortality estimates using the BC Mountain Pine Beetle (BCMPB) model version 10 which shows that the infestation is largely over and total mortality has stabilized at about 56 percent;
- establishment of new parks and protected areas;
- improved site productivity estimates based on ecosystem mapping;
- establishment of new mountain goat ungulate winter ranges (UWR) and general wildlife measures (GWM); and
- establishment of the Dungate and the Babine Lake Community Forests and new woodlots.

Mountain pine beetle

The mountain pine beetle (MPB) is a species of bark beetle that occurs naturally at endemic levels throughout western North America. Epidemic outbreaks have occurred periodically throughout the Interior of BC and have played a vital role in the natural disturbance of pine forests, contributing to biodiversity and variation across the landscape. The magnitude of the current outbreak has been attributed to two factors. First, due to the success of fire suppression over the past century, there was an accumulation of mature lodgepole pine stands on the land base. The second factor is climate. Historically, beetle populations have been limited by cold winters; however, the absence of extreme cold temperatures in the Interior has allowed large populations of beetles to survive the winters under the bark of pine trees.

Prior to 2005, the average unsalvaged losses from pine mortality in the TSA were limited to about 9000 cubic metres per year largely due to insect population dynamics and treatment efforts. In 2005, beetle populations and annual mortality volumes began to rise sharply. From 2005 to 2012, about 29 million cubic metres of pine, or about 29 percent of the mature growing stock within the THLB, was killed by MPB. The infestation, which spread from the south of the TSA to the north, peaked in 2007 when about seven million cubic metres of pine were killed. There has been very little new beetle attack since 2012.

Ministry and licensees response to the beetle infestation

Forest licensees and government have made significant efforts in the Morice TSA to salvage MPB-infested stands. At the start of the epidemic, harvesting was quickly redirected towards affected stands. As a result, pine accounted for about 71 percent of the total harvested volume between 2005 and 2008 and about 74 percent of the total harvested volume between 2008 and 2010. Since 2010, the amount of pine salvaged has been decreasing and in 2013 only 60 percent of the total harvested volume consisted of pine. In May 2013, the licensees collectively produced a revised harvesting plan that increased the focus on salvaging pine. Ministry staff are actively monitoring harvest performance; to date the licensees are compiling with the harvesting plan.

History of the allowable annual cut

In 1981, the Morice TSA allowable annual cut (AAC) was set at 2 000 000 cubic metres. In 1996, the chief forester set the AAC at 1 985 815 cubic metres, a level which essentially maintained the previous AAC after accounting for volume issued under woodlot licences. In October 2002, a new AAC of 1 961 117 cubic metres was established which accounted for 24 698 cubic metres for additional woodlots.

On February 1, 2008 the AAC was set at 2 165 000 cubic metres, which included a 550 000-cubic metre partition attributable to non-pine species. The chief forester indicated that the intent of the partition was to enable the ongoing salvage of dead pine, while ensuring that non-pine species were conserved to support mid-term timber supply. In MPB-impacted management units, such as the Morice TSA, 'mid-term' refers to that period of time in a timber supply forecast that begins when dead pine is no longer a commercially-viable source of wood and ends when regenerating pine stands reach merchantable condition. During this period, timber supply is dependent on the mature pine and non-pine species that were not killed by the MPB.

Data from the Ministry's Harvest Billing System show that the volume harvested from the Morice TSA since the last AAC determination (2008-2013) averaged 2.42 million cubic metres per year, which is 12 percent above the current AAC. During the same period, the average volume harvested from non-pine stands was 794 000 cubic metres per year or 44 percent above the non-pine partition.

Timber supply forecast

For most AAC determinations, a timber supply analysis is carried out using three categories of data: land base inventory, timber growth and yield, and management practices. Using this data and a computer model, a series of timber supply forecasts are produced to reflect different starting harvest levels, rates of decrease or increase, and potential trade-offs between short- and long-term harvest levels.

From a range of possible forecasts, one is chosen which attempts to avoid both excessive changes from decade to decade and significant timber shortages in the future, while ensuring the long-term productivity of forest lands. This is known as the "base case" forecast and forms the basis for comparison when assessing the effects of uncertainty on timber supply. The base case is designed to reflect current management practices.

Because it represents only one in a number of possible forecasts, and because it incorporates information about which there may be some uncertainty, the base case is not an AAC recommendation. Rather, it is one possible timber supply forecast, whose validity - as with all the other forecasts provided - depends on the validity of the data and assumptions incorporated into the computer model used to generate it.

Due to the existence of uncertainty in the information used in timber supply analysis, additional forecasts are usually prepared to test the effect of changing some of the assumptions or data used in the base case. These harvest forecasts are referred to as 'sensitivity analyses'. Both the base case and sensitivity analyses are prepared using a computer model that projects the future availability of timber for harvesting based on the growth of the forest and the level of harvesting, while staying within the legal land use objectives established by the provincial government.

The base case forecast

In the base case (Figure 4), an initial harvest level of 2.165 million cubic metres per year can be maintained for five years before decreasing by 26 percent to a mid-term level of 1.60 million cubic metres per year for 55 years. Starting in the sixth decade, the harvest level is projected to increase to a stable long-term level of 1.96 million cubic metres per year, which is almost the same as the pre-beetle AAC determined in 2002.

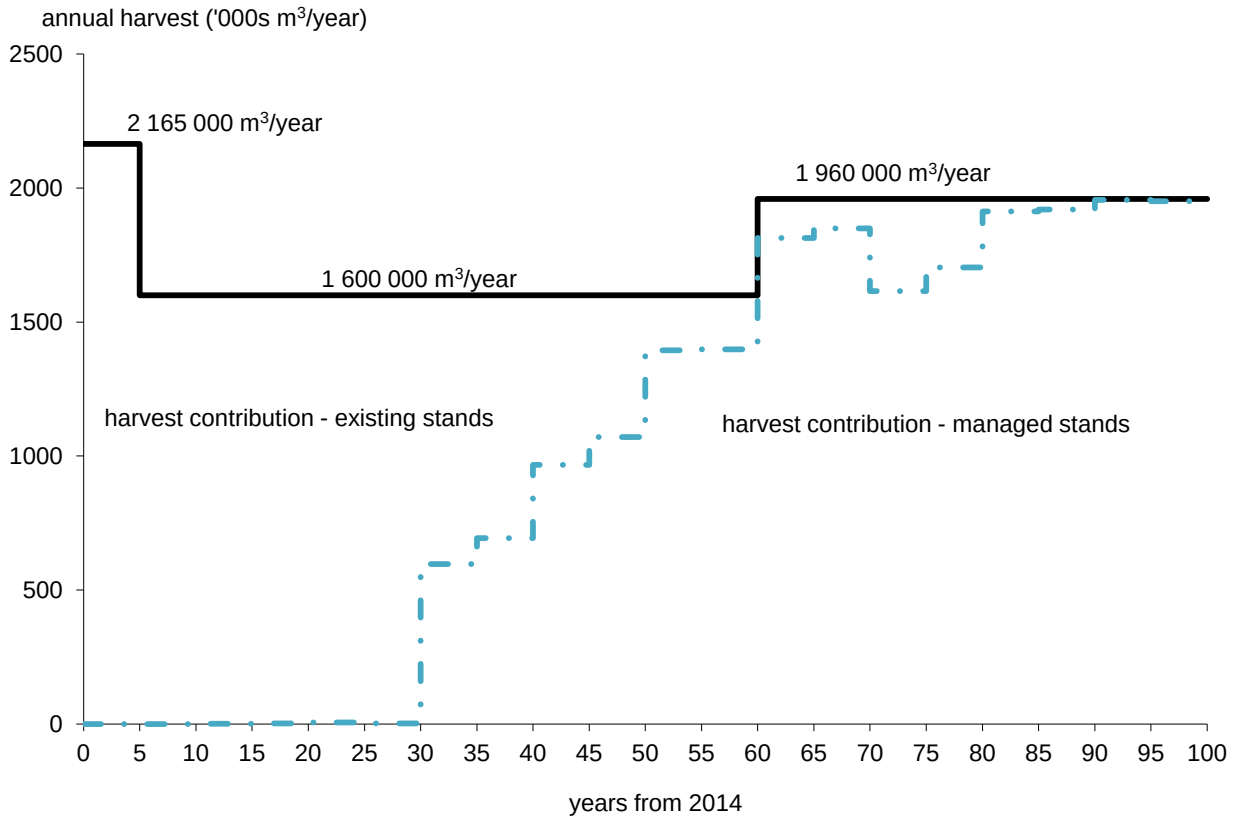

Figure 4. Base case — Morice TSA, 2014.

In the base case, shelf life was assumed to be 15 years; however, no assumptions were made about the end use of the dead pine (e.g., sawlogs, pulpwood, biofuel, etc.). 'Shelf life' is the length of time after death that dead pine trees are expected to remain a commercially-viable source of wood. Currently most of the dead pine in the Morice TSA has been dead for about 10 years. In order to salvage as much dead pine as possible before shelf life expires, harvesting in the model targeted 'dead' pine-leading stands for the first five years. For this analysis, dead pine-leading stands are stands in which 60 percent or more of the total volume is dead.

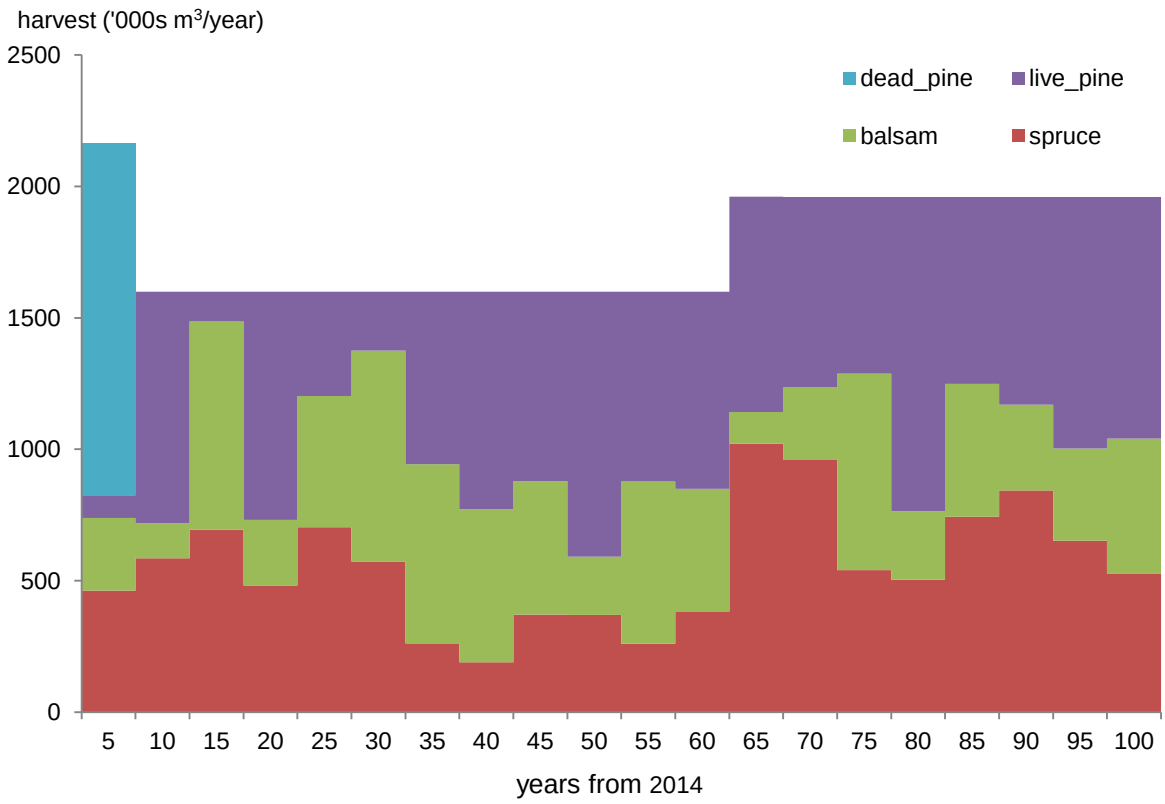

Figure 5. Leading-species composition of the base case.

During the first five years in the base case, about two-thirds of the total harvest volume is attributable to dead pine-leading stands (Figure 5). From year six to year 10, inclusive, about half of the total base case harvest level is attributable to live pine stands (where more than 40 percent of the total stand volume is alive). The remainder comes from non-pine leading species stands.

After the shelf life expires, at the end of year five, there is not enough live pine and non-pine volume available from existing stands to maintain the initial harvest level. Consequently the harvest level declines from 2.165 million cubic metres per year to the mid-term harvest level of 1.60 million cubic metres per year. By year 30, older existing plantations start to become merchantable, and by year 60 there is enough managed stand volume available to support an increase in harvest to the long-term level of 1.96 million cubic metres per year, which is essentially the same as the AAC in effect prior to the MPB infestation.

Key sensitivity analyses

The base case uses a specific set of data and assumptions that are intended to reflect forest composition and growth, legally-established land use objectives and current forest management practices. Sensitivity analysis is used to examine the effect on timber supply of uncertainty in data and assumptions used in the base case.

Shelf life of dead pine

The pine contribution to the total volume harvested annually in the Morice TSA has been declining from a high of 74 percent in 2010 to 60 percent in the last two years (2012-2013). Given this trend and the deteriorating quality of the dead pine, it is uncertain how long dead pine-leading stands will continue to be the focus of harvesting in the TSA.

In order to assess the effect of this uncertainty, two sensitivity analyses were prepared in which the length of time dead pine-leading stands were assumed to be useable (shelf life) was varied by five years (Figure 6). In the base case the shelf life was assumed to be 15 years.

In the first sensitivity analysis the shelf life of dead pine was assumed to be 10 years. Since most of the dead pine in the TSA has been dead for about 10 years, this assumption means there was no further harvesting of dead pine-leading stands. If the current AAC was maintained for five years without any contribution from dead pine-leading stands, the mid-term harvest level would decrease by 120 000 cubic metres per year below the base case level. There was also a small reduction in the long-term harvest level.

In the second sensitivity analysis the shelf life of dead pine was assumed to be 20 years. This increased availability of dead pine-leading stands allowed the mid- and long-term harvest levels to be increased by 44 800 cubic metres per year and 16 700 cubic metres per year above the base case levels, respectively.

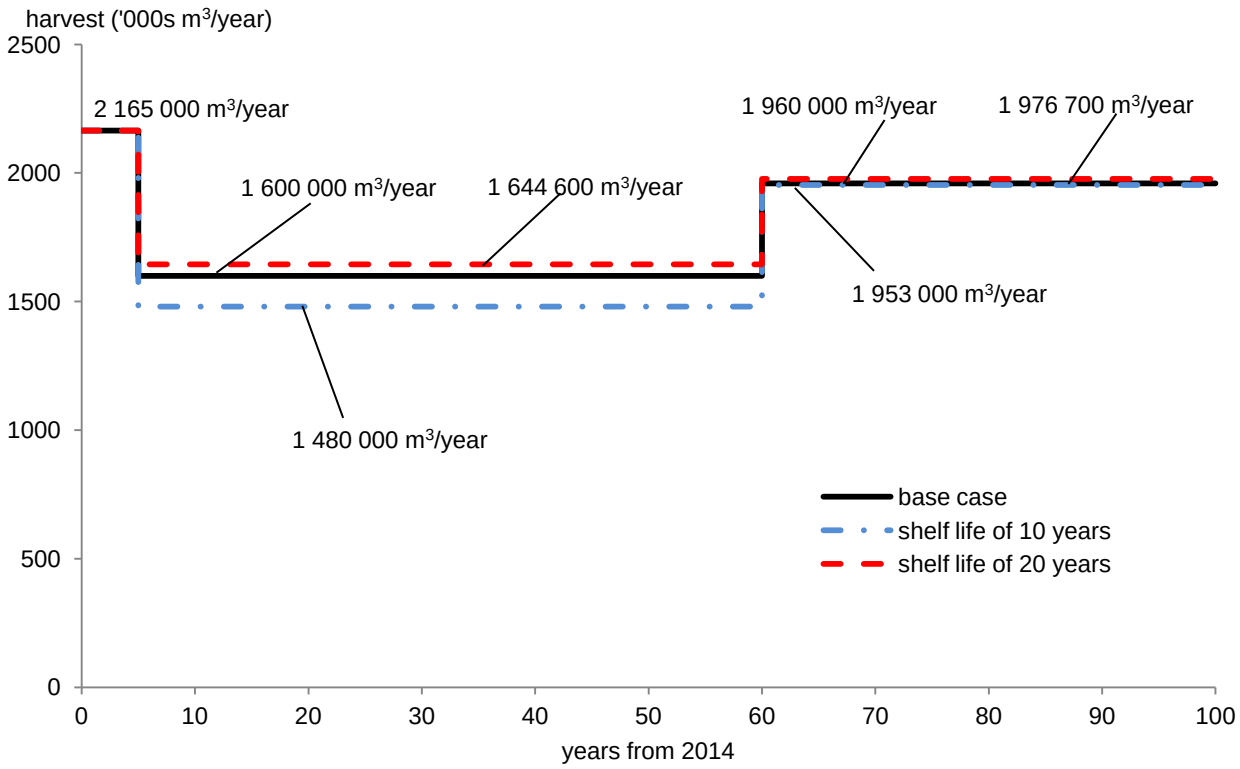

Figure 6. Shelf life of dead pine - Morice TSA, 2014.

If the shelf life is closer to 10 years and it is no longer economical to harvest dead pine-leading stands, an alternative approach would be to lower the initial harvest level so as to minimize the depth of the mid-term decline. Figure 7 shows that a harvest level of 1 540 000 cubic metres per year can be maintained for the next 60 years before rising to the long-term level. While this initial harvest level is 29 percent below the base case, the mid-term is less than four percent below the base case.

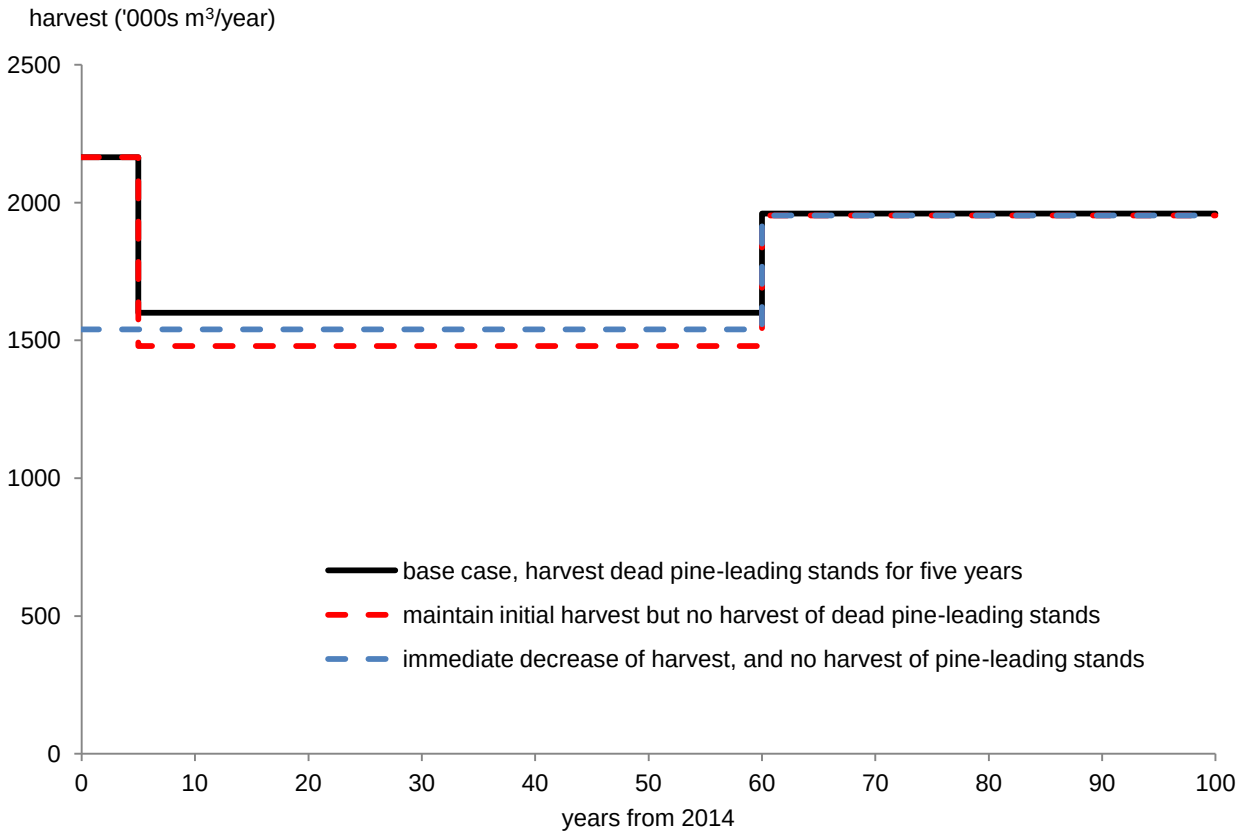

Figure 7. Alternative harvest flow – Morice TSA, 2014.

Minimum harvestable volume

Factors such as the price for various forest products, mill configuration and distance of harvested stands to mills determine the minimum volumes that stands must have in order for harvesting to be economical. In the base case, the minimum harvestable volume for pine- and spruce-leading stands were assumed to be 150 cubic metres per hectare, and for balsam-leading stands the minimum harvestable volume was 200 cubic metres per hectare.

Data from the adjacent Lakes TSA indicates that 83 percent of the stands harvested between 2000 and 2009 had volumes greater than 250 cubic metres per hectare. Through extrapolation this information from the Lakes to the Morice TSA, the minimum harvestable volume was increased to 250 cubic metres per hectare for all stands. This change resulted in a decrease in the mid-term harvest level by 41 percent to 943 000 cubic metres per year (Figure 8). The long-term harvest level was reduced by 19 percent to 1 588 000 cubic metres per year. The decrease in the mid-term was due to fewer stands being available for harvest due to the increased volume requirement. The reduced long-term harvest level occurs because regenerating stands have to grow for a longer time to become harvestable thus increasing the time between harvests.

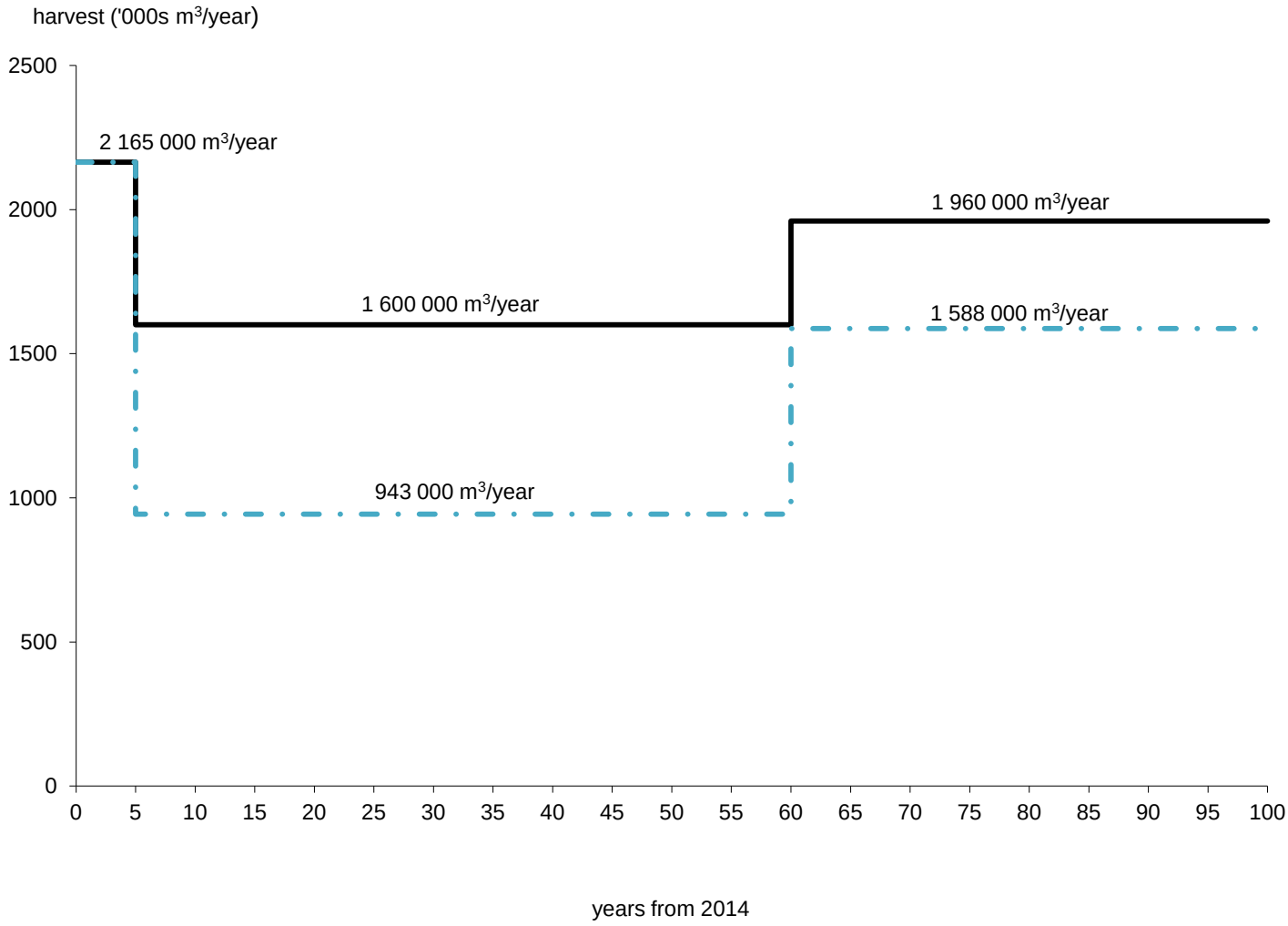

Figure 8. Increase minimum harvestable volume to 250 m^3/ha - Morice TSA, 2014.

Contribution of balsam-leading stands

In the Morice TSA, balsam-leading stands currently account for 27 percent of the THLB area (Figure 3). In the base case as shown in Figure 5, about one-third of the mid-term harvest volume comes from balsam-leading stands. Currently, about 16 percent of the average harvest volume consists of balsam, although not all of this volume comes from balsam-leading stands.

Excluding balsam-leading stands from harvest (Figure 9), decreased the mid-term harvest level to 1 163 000 cubic metres per year, which is about 28 percent lower than in the base case. In addition, the long-term harvest level decreased to 1 5561 000 cubic metres per year, which is 21 percent lower than in the base case.

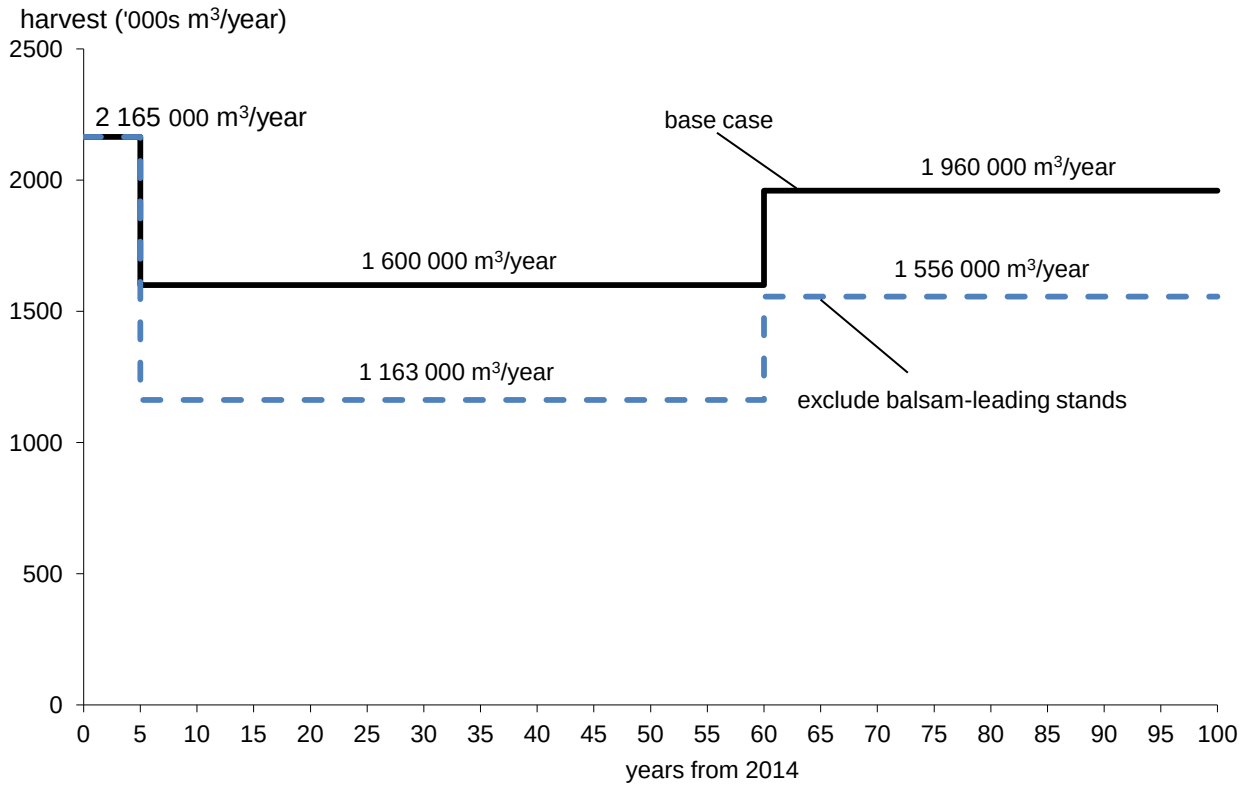

Figure 9. Uncertainty regarding inclusion of balsam-leading stands in the base case.

Marginally economic stands

Stands traditionally excluded from the THLB are increasingly seen as a source of fibre for the emergent bio-energy sector. In addition, the special committee (see 'Introduction') recommended that the chief forester "review marginally-economic forest types within each timber supply area (TSA) that might justifiably be included in a partition within the timber harvesting land base (THLB)." The following sensitivity analysis was prepared in order to provide the chief forester with the necessary information to consider the special committee's recommendation.

For the base case, all stands available for harvesting with site indices of at least eight metres were included in the THLB. In this sensitivity analysis, stands with site indices less than eight metres that currently have volumes greater 100 cubic metres per hectares but were not needed to meet other non-timber values were added to the THLB. The contribution from these stands increased the mid-term harvest level to 1 848 000 cubic metres per year, which is 16 percent higher than the base case (Figure 10). The long-term harvest level increased to 2 141 000 cubic metres per year, which is nine percent higher than the base case level. The majority of the marginally-economic stands included in this sensitivity analysis are also balsam-leading stands.

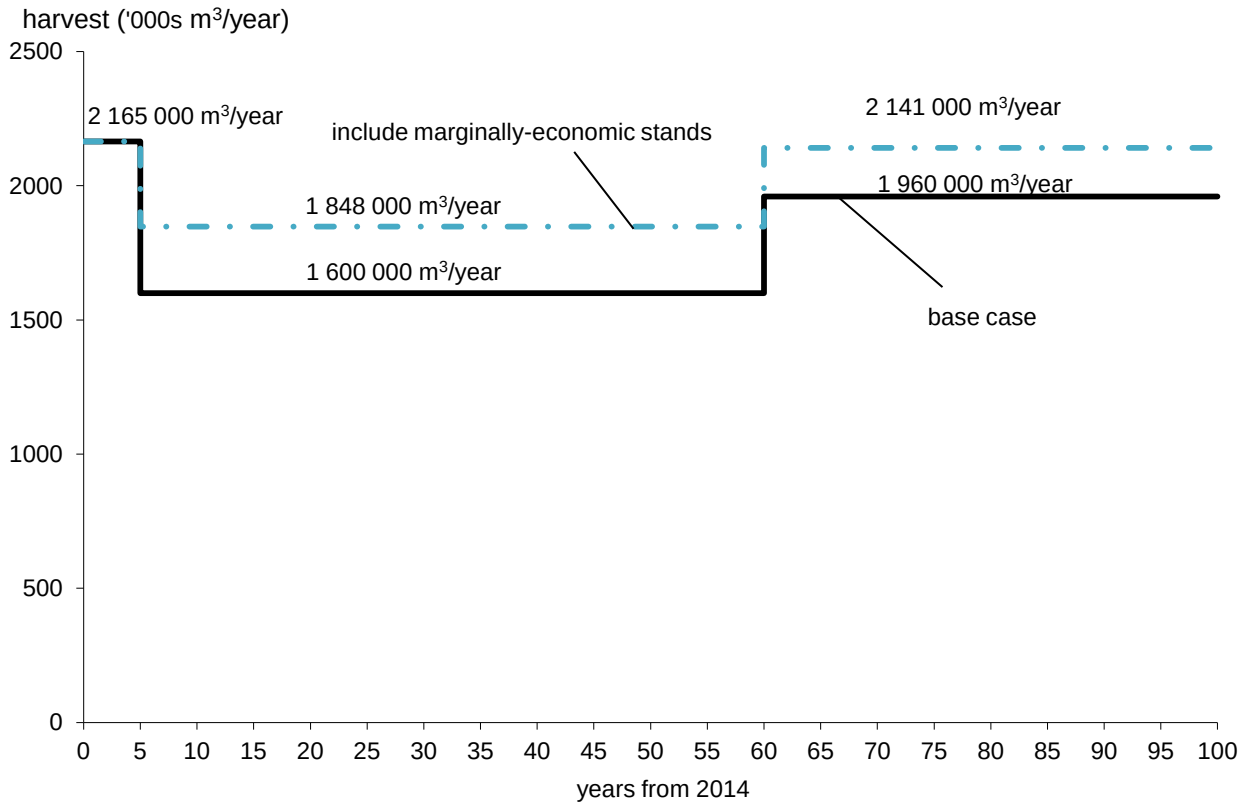

Figure 10. Inclusion of marginally-economic stands in the THLB.

Young stand growth and development

In 2012, Forest Analysis and Inventory Branch initiated a young stand monitoring (YSM) program in the Morice TSA. The program was developed to monitor the growth and development of young forest stands between the ages of 15 to 50 years of age. The initial YSM results indicate that, in general, ground volumes of young stands in the Morice TSA are higher than those projected by the yield tables. The results indicate that while inventory age estimates are reasonable, the height of young stands is underestimated. Underestimation of stand heights results in an underestimation of site index, a measure of the productivity of the growing site. The results also indicate that due to mortality and ingress, the species composition of young stands is different from the species composition at the time of planting. For the base case, the site index and species composition of existing managed stands were modified to reflect the YSM results.

The ministry's growth and yield model for managed stands, Table Interpolation of Stand Productivity and Yield (TIPSY) was developed based on information from healthy stands with ideal stem distribution. In order to account for the less than ideal tree distribution, endemic pests and disease and random factors such as wind throw, an operational adjustment factor (OAF1) is applied to reduce the TIPSY estimates. The provincial default OAF1 value is 15 percent. Where local data is available as was the case in the Morice TSA, the default OAF values may be adjusted. In this analysis the OAF1 value used for pine-leading stands was 20 percent.

Various diseases affect coniferous trees throughout British Columbia. Losses in wood volume and in wood quality due to these diseases usually occur in a relatively slow and non-cyclical manner, unlike the damage due to insect infestations. Some pathogens, for example pine stem rusts, can reduce tree growth, reduce wood quality, and cause early mortality. Rusts often play a significant role in early stand development, where they act primarily as mortality agents that naturally thin young stands.

The YSM project provided information that indicates that the incremental forest health impact due to pine stem rusts may not be fully accounted for through the application of the Morice OAF1 of 20 percent. In order to assess the impact of accounting for higher losses due to pine rusts, a sensitivity analysis was prepared in which the volume projections for stands with more than 50 percent pine were developed using an OAF1 of 30 percent (Figure 11). In this sensitivity analysis, increasing the OAF1 value by 10 percentage points decreased the mid-term harvest level to 1 434 000 cubic metres per year, which is about nine percent lower than in the base case. The long-term harvest level was decreased to 1 846 000 cubic metres per year, which is about six percent lower than in the base case.

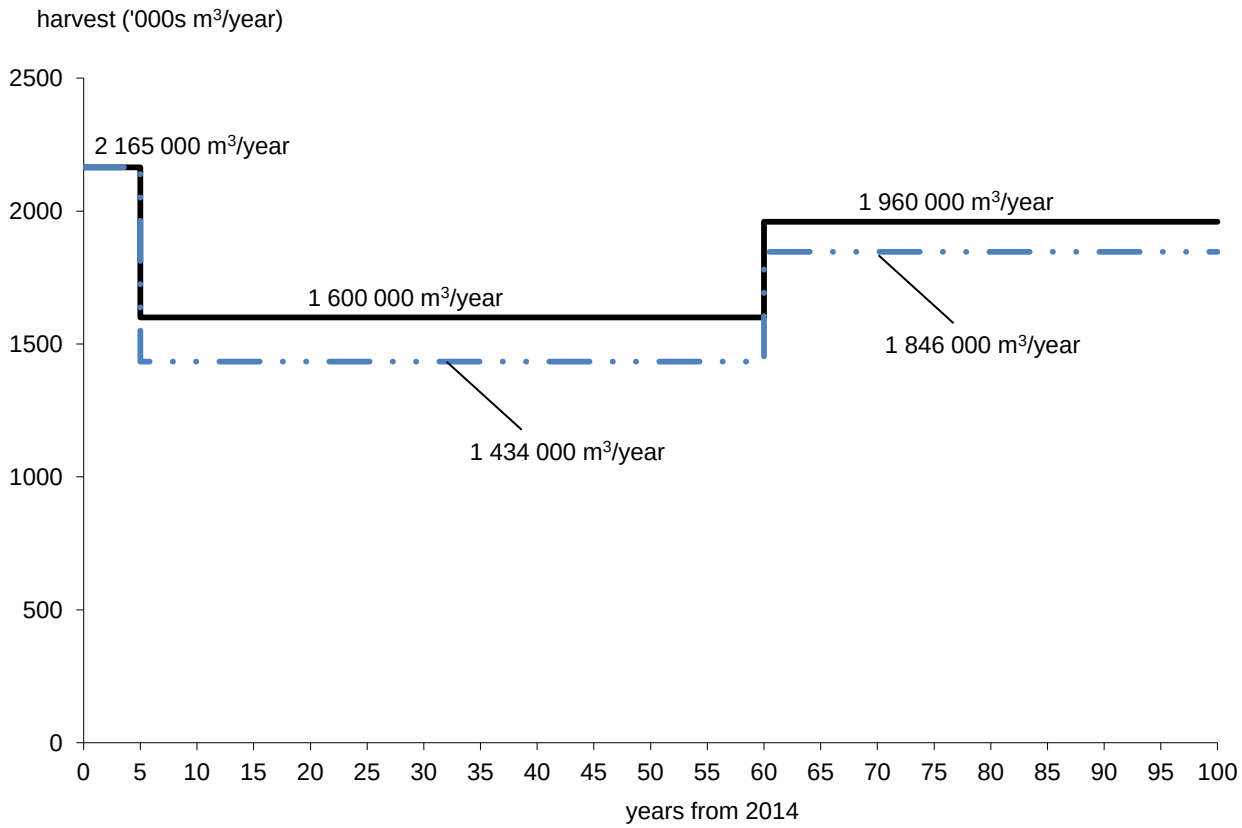

Figure 11. Effect on the base case of increased forest health losses.

Additional sensitivity analyses

Table 2 below shows a summary of some of the other sensitivity analyses conducted for the Morice TSA.

Table 2. Select sensitivity analyses

Short term = decade 1; Mid term = decades 2 to 5; Long term = decades 6 to 20.

Issue	Change analysed	Percent impact		
		Short term	Mid term	Long term
Site index adjustment not based on YSM	Use SIBEC site index for existing managed stands	Nil	-2.6	Nil
Biodiversity	Apply full old-seral requirement - no drawdown	Nil	Nil	Nil
Wildlife tree retention	Increase wildlife tree retention to 6.9 percent	Nil	-1.3	-4.1

Conclusion

In the base case, the current AAC of 2 165 000 cubic metres can be maintained for up to five years if harvesting is focused on the salvage of dead pine-leading stands. These stand types account for 66 percent of the total harvest volume during the first five years in the base case. The remainder of the harvest comes from live pine-leading stands and non-pine leading stands.

After the first five years in the base case the harvest level is projected to decrease to 1 600 000 cubic metres per year - a level that is 26 percent lower than the current AAC. This level is maintained until managed stands have reached merchantable condition, which occurs starting in year 60 of the base case.

The key sensitivity analyses prepared for this timber supply review indicate that the short- to mid-term harvest levels in the base case are dependent on the continued harvesting of dead pine-leading stands for five more years, the economic viability of harvesting stands with less than 250 cubic metres per hectare and balsam-leading stands, and the extent to which young stands will be affected by disease.

Although timber supply analysis and data are significant sources of information provided to the chief forester for consideration, the chief forester's AAC is not a calculation. Instead, it is an independent judgment based on professional experience and consideration of the broad range of social, economic and environmental factors required under Section 8 of the *Forest Act*.

Your input is needed

Public input is a vital part of establishing the allowable annual cut. Feedback is welcomed on any aspect of this public discussion paper or any other issue related to the timber supply review for the Morice TSA. Ministry staff would be pleased to answer questions to help you prepare your response. Please send your comments to the forest district manager at the address below.

Your comments will be accepted until June 20, 2014.

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

For more information or to send your comments, contact:

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Further information regarding the technical details of the timber supply analysis is available on request by contacting Forests.ForestAnalysisBranchOffice@gov.bc.ca

Visit the Forest Analysis and Inventory Branch web site at http://www.for.gov.bc.ca/hts