



# Okanagan TSA Timber Supply Analysis Public Discussion Paper

Okanagan Shuswap District  
Ministry of Forests, Lands and  
Natural Resource Operations  
2501 - 14<sup>th</sup> Avenue  
Vernon, BC  
V1T 8Z1

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# Okanagan TSA Public Discussion Paper

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## Introduction

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The British Columbia Ministry of Forests, Lands and Natural Resource Operations (FLNR) regularly reviews the timber supply<sup>a</sup> for all timber supply areas<sup>b</sup> (TSA) and tree farm licences<sup>c</sup> (TFL) in the province. This review, the fourth for the Okanagan TSA, examines the effects of 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 (AAC)<sup>d</sup> for the Okanagan 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.

The objectives of the timber supply review are to:

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

This discussion paper provides a summary of the results of the timber supply analysis for the timber supply review of the Okanagan TSA. Details about the information used in the analysis are provided in an April 2010 data package <http://www.for.gov.bc.ca/hts/tsa/tsa22/tsr3/22ts10dp.pdf>. Questions regarding the technical details of the analysis should be directed to the Forest Analysis and Inventory Branch, FLNR. 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 inputs received during this review process.

## Timber supply review in the Okanagan TSA

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The current AAC for the Okanagan TSA, effective January 1, 2006, is 3 375 000 cubic metres. In his determination the chief forester specified (often referred to as “partitions”) that 80 000 cubic metres may only be used for small-scale salvage operations and 20 000 cubic metres for harvesting of deciduous species. Since the previous timber supply review, improved information has become available regarding the Mountain Pine Beetle (MPB) infestation and the extent of beetle-killed pine volume available for salvage harvesting.

This discussion paper is intended to provide an overview of the timber supply review process and to highlight the results of the timber supply analysis, including harvest forecasts for the Okanagan TSA.

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### <sup>a</sup> **Timber supply**

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

### <sup>b</sup> **Timber supply areas (TSAs)**

*An integrated resource management unit established in accordance with Section 7 of the Forest Act.*

### <sup>c</sup> **Tree farm licences (TFLs)**

*Provides rights to harvest timber and outlines responsibilities for forest management in a particular area.*

### <sup>d</sup> **Allowable annual cut (AAC)**

*The rate of timber harvest permitted each year from a specified area of land, usually expressed in cubic metres of wood per year.*

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Before determining a new AAC, the chief forester will review all relevant information, including the results of the timber supply analysis, and input from government staff, stakeholders, the public and First Nations.

Following this review, the chief forester will describe his considerations and reasons leading to his determination in a rationale statement that will be publicly available.

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. 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.

## Description of the Okanagan Timber Supply Area

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The Okanagan TSA is located in south-central British Columbia and covers approximately 2.25 million hectares of the Thompson/Okanagan Region. The TSA is approximately 320 kilometres long and 140 kilometres wide and stretches from the Seymour River/Shuswap Lake in the north to the Canada-United States border in the south, and from the Monashee Mountains in the east to the Okanagan Mountains in the west. The climate and terrain produce a wide range of vegetation, from wet interior hemlock and cedar forests in the north to semi-arid sagebrush grasslands in the south.

In 2006 the population in the TSA was approximately 356,000. Over 55 percent of the population lives in the major population centres in the TSA including the city of Kelowna with a population in 2010 of 121,306, Vernon/Coldstream (population 49,1846), Penticton (33,078), Salmon Arm (17,128) and Summerland (11,007).

The area is known for its dry, sunny summer climate and mild winters with abundant snowfall which make the area a prime destination for all-season tourism activities such as water sports, golf, hiking, skiing and snowmobiling. The main employment sectors include tourism (16%), forestry (9%), agriculture and food (9%) and construction (17%). (BC Stats 2006).

Administered by the Okanagan Shuswap District located in Vernon, with field offices in Penticton and Salmon Arm, the Okanagan TSA is one of the largest, most diverse management units in British Columbia. Approximately 55 percent of the area within the TSA is considered productive forest land (1.4 million hectares). About 59 percent of the productive forest, or 32 percent of the total area of the TSA, is currently considered available for timber harvesting. This area is referred to as the timber harvesting land base (THLB).

The Okanagan Shuswap District has a large processing sector with sawmills located in Armstrong, Lavington, Kelowna and Westbank, and plywood/veneer plants in Armstrong and Salmon Arm. With the changing economy, processing facilities have closed in Kelowna, Salmon Arm and Okanagan Falls over the last few years.

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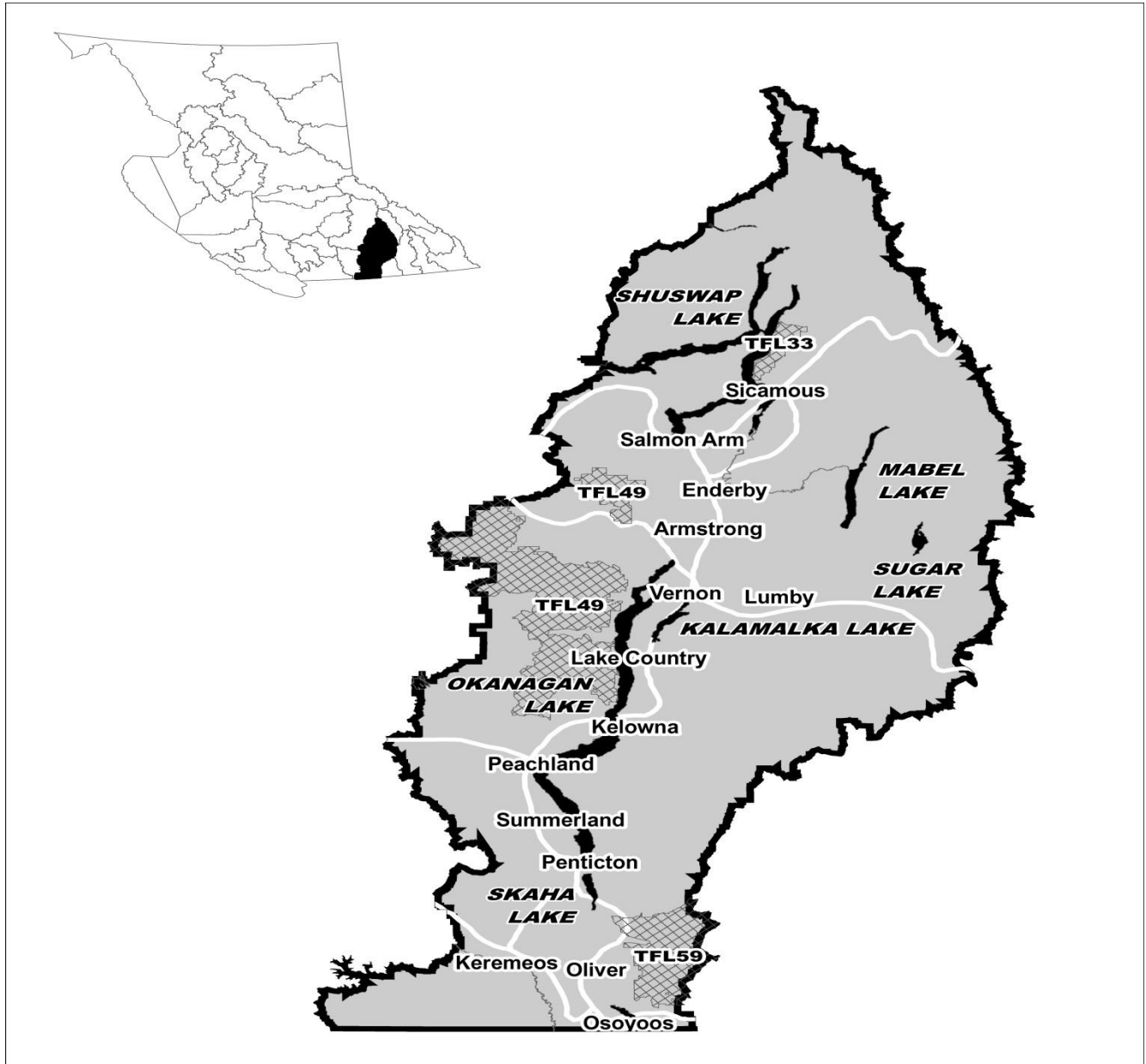


Figure 1. Map of the Okanagan TSA.

## Land-use planning

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The Okanagan-Shuswap Land and Resource Management Plan (OSLRMP) is a strategic Crown land use plan for the Okanagan-Shuswap that was approved by Cabinet January 18, 2001. No specific higher-level plan objectives have been established for the area covered by the Okanagan-Shuswap LRMP; however, forest management by government agencies and licensees have followed the intent of the LRMP.

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## First Nations

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The nineteen First Nations with traditional territory in the Okanagan TSA include Adams Lake Indian Band, Ashcroft Indian Band, Coldwater Indian Band, Cooks Ferry Indian Band, Little Shuswap Indian Band, Lower Nicola Indian Band, Lower Similkameen Indian Band, Lytton First Nation, Neskonlith Indian Band, Nooaitch Indian Band, Okanagan Indian Band, Osoyoos Indian Band, Penticton Indian Band, Shuswap Indian Band, Simpcw First Nation, Spltasin, Upper Nicola Indian Band, Upper Similkameen Indian Band and Westbank First Nation.

There are seven Syilx (Okanagan Nation Alliance) member bands in the Okanagan TSA. Six of these (Lower Similkameen, Okanagan, Osoyoos, Penticton, Upper Similkameen and Westbank) have reserve lands within the TSA boundary. The Upper Nicola Band does not have reserve land within the TSA.

Six of the First Nations, the Adams Lake, Little Shuswap, Shuswap, Neskonlith, Simpcw and Spltasin are members of the Secwepemc (Shuswap) Nation Tribal Council. Four of these bands, the Adams Lake, Little Shuswap, Neskonlith and Spltasin bands, comprise the Lakes Division of the Secwepemc Nation.

The Ashcroft Indian Band and Lytton First Nation are members of the Nlaka'pamux Nation Tribal Council. The Coldwater, Cook's Ferry and Nooaitch Indian Bands, are members of the Nicola Tribal Association and also represented by the Esh-kn-am Cultural Resource Management Services Joint Venture. The Lower Nicola Indian Band is unaffiliated with a tribal group.

All the First Nations, other than the Lytton First Nation, have successfully negotiated Interim Measure Agreements (Forest and Range Opportunities or Forest Consultation and Revenue Sharing Agreements) though many of these have now expired. The Province recently introduced the new Forestry Consultation and Revenue Sharing Agreement (FCRSA) to replace expired agreements and negotiations are ongoing with the First Nations with expired agreements.

Ten bands are managing non-replaceable forest licences within the Okanagan TSA and the Adams Lake, Little Shuswap, Neskonlith, Osoyoos, Spltasin and Westbank First Nations have woodlot licences within the TSA. Further, Westbank First Nation manages a Community Forest Agreement, and Lower Similkameen Indian Band co-management a Community Forest Agreement through the Lower Similkameen Community Forests Limited Partnership.

First Nations people work in forestry activities such as; harvesting, silviculture, watershed restoration and inventory. A number of First Nations have Forestry Departments which provide technical forestry services such as development planning, layout, cruising and appraisals, and associated archaeological and cultural assessments.

## Natural resources

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The forests of the Okanagan TSA are very diverse and provide a wide range of resources including timber, forage, fisheries, wildlife, scenic landscapes, recreation opportunities, and water.

The Okanagan timber supply area contains seven biogeoclimatic zones; bunchgrass (BG), ponderosa pine (PP); interior Douglas-fir (IDF), interior cedar hemlock (ICH), montane spruce (MS), Englemann spruce subalpine fir (ESSF) and alpine tundra (AT). Four of these, ESSF, ICH, IDF and MS, comprise 88 percent of the total TSA land base. The varied ecological features as well as the unique nature of the area contribute to high biodiversity values found within this timber supply area.

Common tree species include lodgepole pine, Douglas-fir, Englemann spruce, subalpine fir (balsam), western redcedar, western hemlock and larch, while white pine, yellow pine, ponderosa pine, larch, aspen, birch and cottonwood also occur. The percent-leading species composition of the Crown forested land base (CFLB) and THLB are shown in Figure 2.

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Due to the varied topography and climate found throughout the timber supply area, the flora and fauna that reside here are quite diversified. Large mammals include black bear, grizzly bear, moose, mule deer, white-tailed deer, cougars, elk, mountain goat, bighorn sheep and mountain caribou.

The Okanagan TSA contains a number of ecosystems which are either unique to the area or sparse provincially, thereby making it home to a number of species which are considered endangered or threatened. These include bull trout, rubber boa, mountain caribou, northern goshawk, grizzly bear, fisher and mountain goat.

Residents and tourists enjoy outdoor recreation activities such as skiing, snowmobiling, biking, hiking, camping, fishing and hunting.

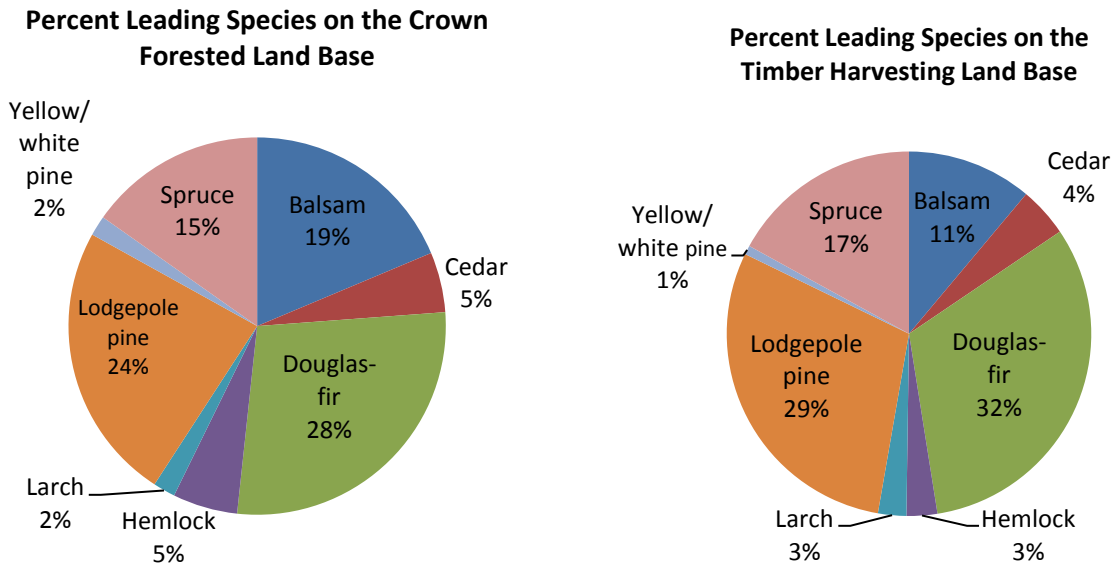


Figure 2. Proportion of leading species on the Crown forested land base and the timber harvesting land base of the Okanagan TSA 2011.

## Environmental values

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Current forest management must be consistent with the requirements of the *Forest and Range Practices Act* (FRPA) and associated regulations, which are designed to maintain a range of environmental values, including biodiversity, wildlife, and riparian areas. These values are accounted for in the analysis conducted for this timber supply review.

## Mountain Pine Beetle epidemic

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Mountain pine beetle is native to British Columbia (BC) and usually occurs at endemic levels. 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 variability across the landscape.

Prior to the current epidemic, the largest outbreak in recorded history occurred between 1930 and 1936 on the Chilcotin Plateau. At its peak, this infestation affected 650 000 hectares. In the early 1980's another severe MPB epidemic swept across the Chilcotin Plateau. It was subdued by extremely cold early winter weather in 1984 and 1985. The current beetle epidemic is much larger than any previously recorded outbreaks. In 2010, MPB was estimated to have killed a cumulative total of 726 million cubic metres of pine in BC. The cumulative area of the province affected by beetles was estimated to be 17.5 million hectares – an area more than five times the size of Vancouver Island.

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On a provincial level, the rate of infestation peaked in 2005 and has slowed considerably since then. This decline is due to the decreasing level of suitable live-host trees. In the Interior (including the Okanagan TSA), the rate of spread has been slowed by the terrain and the greater diversity of tree species.

The magnitude of the current outbreak has been attributed to two factors. First, due to the success of fire suppression over the past century, the area of mature lodgepole pine — the beetle's preferred host — has increased six-fold since 1910. Second, climate change has resulted in warmer winter temperatures over the last several years. Beetle populations die off during extended periods of extremely cold temperatures; however, the recent absence of sufficiently-cold temperatures in the Interior has allowed large populations of beetles to survive the winters under the bark of the pine trees.

It is currently projected that about 59 percent of the commercial pine across the BC Interior will be killed by 2016. If not harvested, 40 percent of the 56 million cubic metres of merchantable pine in the TSA at the start of the epidemic are at risk of becoming unmerchantable. Based on expert opinion the actual percentage will likely be significantly lower.

These current and future projected impacts of the MPB epidemic were modelled in all the timber harvest forecasts presented in this paper. The major assumptions common to all the scenarios presented in the public discussion paper are summarized in Appendix 1.

As discussed in Appendix 1, for this timber supply review, shelf life is defined as the length of time a tree is assumed to remain standing after attack by the MPB. No assumptions are made about the potential end use of the dead pine (i.e., whether or not the fibre is of sufficient quality for use as sawlog, pulp or for bioenergy). All scenarios presented in this analysis assume that beetle-killed trees will remain standing for 20 years. It is unlikely that the dead pine trees will provide sawlogs for as long as 20 years. This shelf life was assumed for the analysis to provide an estimate of volume available for potential biomass products after logs have deteriorated to the extent that they can no longer be used as sawlogs.

## **Ministry and licensees response to the beetle infestation**

There has been a sustained effort by government and forest licensees within the Okanagan TSA to salvage MPB-infested stands. This has been accomplished through the following beetle management strategy:

- annual monitoring of MPB populations;
- targeted harvesting of stands with active beetle infestation to facilitate population control;
- harvesting of affected stands before their economic value is degraded while managing current and future forest values in the context of sustainability; and
- increasing the AAC to allow for increased harvesting capacity to support beetle population management and salvage damaged timber.

## **Recent history of the allowable annual cut**

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The AAC for the Okanagan TSA from 1980 to 1986 was 2 700 000 cubic metres. Temporary increases to the AAC were made in 1987 to 2 804 000 cubic metres and in 1993 to 3 200 000 cubic metres to enable harvesting of timber affected by MPB infestations. In 1994, after the MPB infestation ended, the AAC was set at 2 615 000 cubic metres. In 2001, the AAC was determined at 2 655 000 cubic metres, and it included an 80 000 cubic metre partition for small-scale salvage.

For the last AAC determination in 2006 the chief forester considered the onset of the current MPB infestation and set the AAC at 3 375 000 cubic metres. It included a partition of 80 000 cubic metres for small-scale salvage and 20 000 cubic metres for deciduous harvest.

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## Historic harvest performance

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Table 1 shows the actual amount of timber harvested since the 2006 determination (from FLNR records of timber volume harvested).

*Table 1. Current harvest performance*

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Year	Total harvest	Pine content	Pine-leading stands
2006	3,300,803	48%	66%
2007	3,149,165	50%	67%
2008	3,159,036	56%	75%
2009	2,407,858	54%	75%
2010	2,925,690	57%	78%
Average	2,988,510	53%	72%

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The Okanagan TSA is diverse with pine stands making up 29 percent of the total growing stock on the THLB. Over the last five years 72 percent of the harvest came from pine-leading stands. Currently there are 39 million cubic metres of pine remaining.

## Forest management

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Management of the forests in the Okanagan TSA for environmental values and other operational constraints is accounted for in the timber supply analysis by either excluding areas from the THLB or by applying forest cover constraints that are applied to ensure sufficient cover is maintained over time to provide for the protection of resources that require varying amounts of forest cover. All forested lands, whether they contribute to timber supply or not, help to maintain critical habitats for many species.

In the analysis approximately 41 percent of the CFLB is excluded from the THLB because it occurs in parks, riparian reserves, environmentally sensitive areas, old-growth management areas for biodiversity or is not suitable for harvesting for other reasons. The timber supply analysis also includes forest cover constraints applied to the CFLB to account for management for visual quality objectives, wildlife habitat, and green-up requirements in cutblocks before adjacent areas may be harvested.

The total area of the Okanagan TSA is 2 249 640 hectares of which the CFLB is 1 345 968 hectares. The THLB is 795 948 hectares.

The CFLB is 93 684 hectares less than estimated for the 2006 determination, primarily due to an increase in the area estimated to be covered by roads (derived from road maps for the current analysis compared to an estimated percent reduction used in 2006), a new Vegetation Resources Inventory (VRI) and a new definition of non-productive land.

The THLB is 226 394 hectares less than in 2006 primarily because in the current analysis, landscape-level biodiversity constraints were accounted for by excluding 125 691 hectares of old-growth management areas (OGMA) from the THLB while in the 2006 analysis forest cover constraints were used. Similarly, 38 113 hectares were excluded for ungulate winter ranges that were accounted for using forest cover constraints in the 2006 analysis. In addition, the 52 319 hectares were excluded from the THLB to account for wildlife tree patches, while in the 2006 analysis they were modelled as a reduction to the yield tables used in the analysis. Finally, using improved terrain stability information reduced the THLB by 39 709 hectares more than the deduction used in the 2006 analysis.

The total inventory volume on the THLB is 149 million cubic metres which is 25 percent lower than in 2006. This is primarily due to the decreased THLB and past timber harvesting.

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## Timber supply analysis

The chief forester reviews many sources of information for the AAC determination, including a timber supply analysis that projects the development of the forest through time, and its response to harvesting, while respecting government's many timber and non-timber objectives. This section highlights some of the important findings from the timber supply analysis.

### The base case

A timber supply analysis provides an assessment of harvest levels that may be sustained given the existing land base and forest management information. The assessment includes a timber supply forecast that FLNR staff believe reflects the best available data and current forest management practices. This forecast is called the base case, and it forms the basis for comparison when the chief forester assesses the effects of uncertainty in information on timber supply. The AAC determined may be greater or less than the initial level forecasted in the base case.

The current AAC is 3 375 000 cubic metres, including a partition of 20 000 cubic metres for harvesting deciduous species. The deciduous species were assumed not to contribute to timber supply in this analysis so the initial harvest level in the base case (Figure 3) is set at 3 355 000 cubic metres per year. This level can be maintained for 10 years before decreasing to 2 354 600 cubic metres per year. After 60 years the harvest increases to the long-term harvest level of 2 469 400 cubic metres per year.

In the chief forester's 2006 AAC determination he increased the AAC due to the onset of the MPB infestation. The current base case is also predicated on harvesting as much of the pine-leading stands as possible in the short term. During the first 15 years in the base case pine volume accounts for 54 percent of the harvest. After 15 years the pine contribution is less than 10 percent. Stands with a minor component of pine were not targeted in the short term as the volume from other tree species in these stands will be needed to ensure reasonable harvest levels can be maintained in the mid-term.

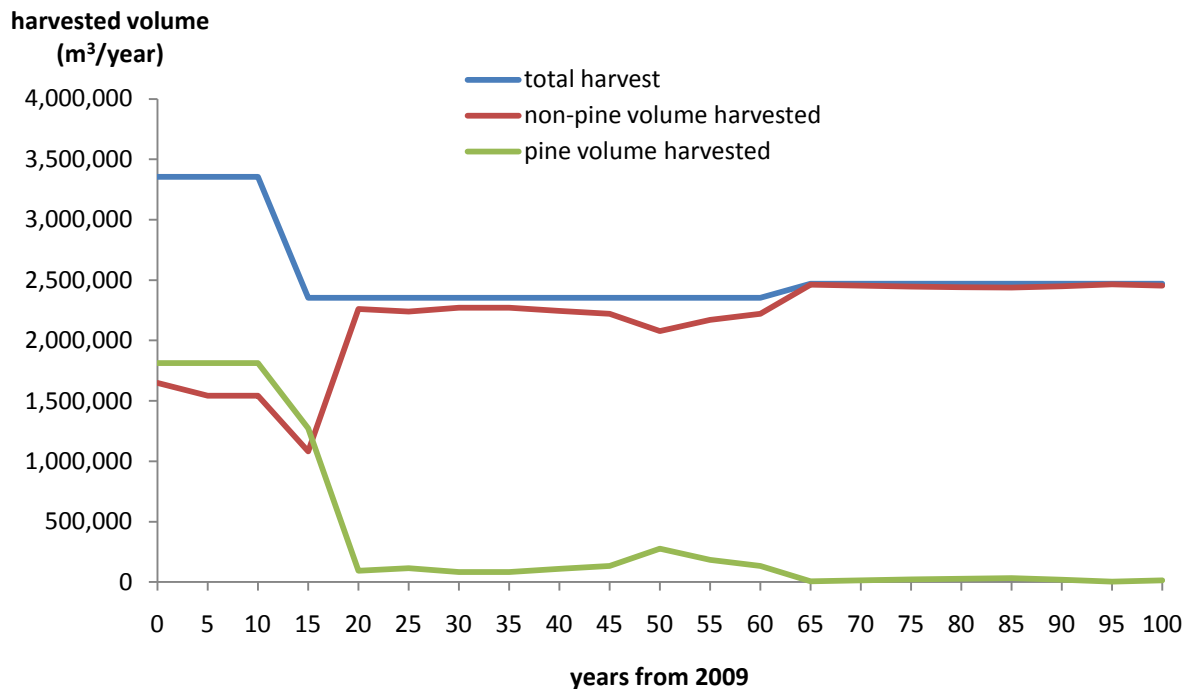


Figure 3. Base case harvest forecast — Okanagan TSA 2011.

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Figure 4 shows the total volume of standing timber (growing stock) within the THLB, and a breakdown of the merchantable volume (of all tree species) and pine volume over time. The immediate reduction in growing stock corresponds to the increase in pine harvest to salvage MPB-killed pine.

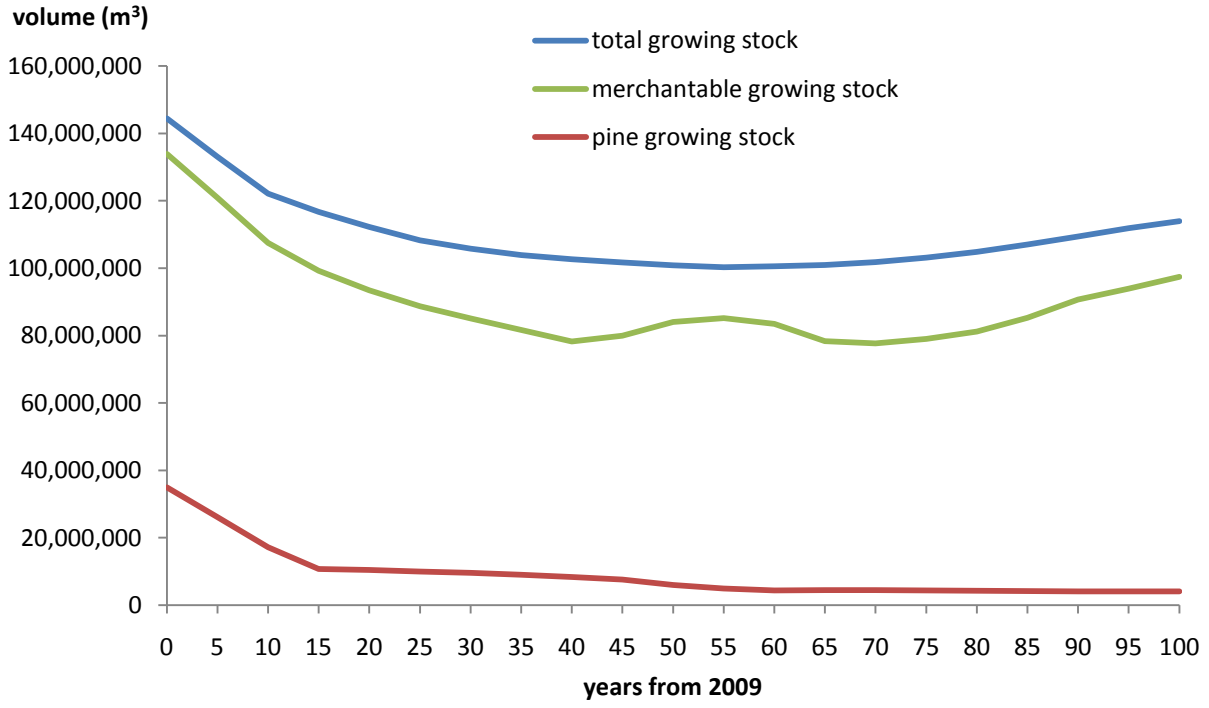


Figure 4. Total, merchantable and pine growing stock within the timber harvesting land base — Okanagan TSA 2011.

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The transition from existing natural stands to managed stands starts about 55 years from now and is shown in Figure 5.

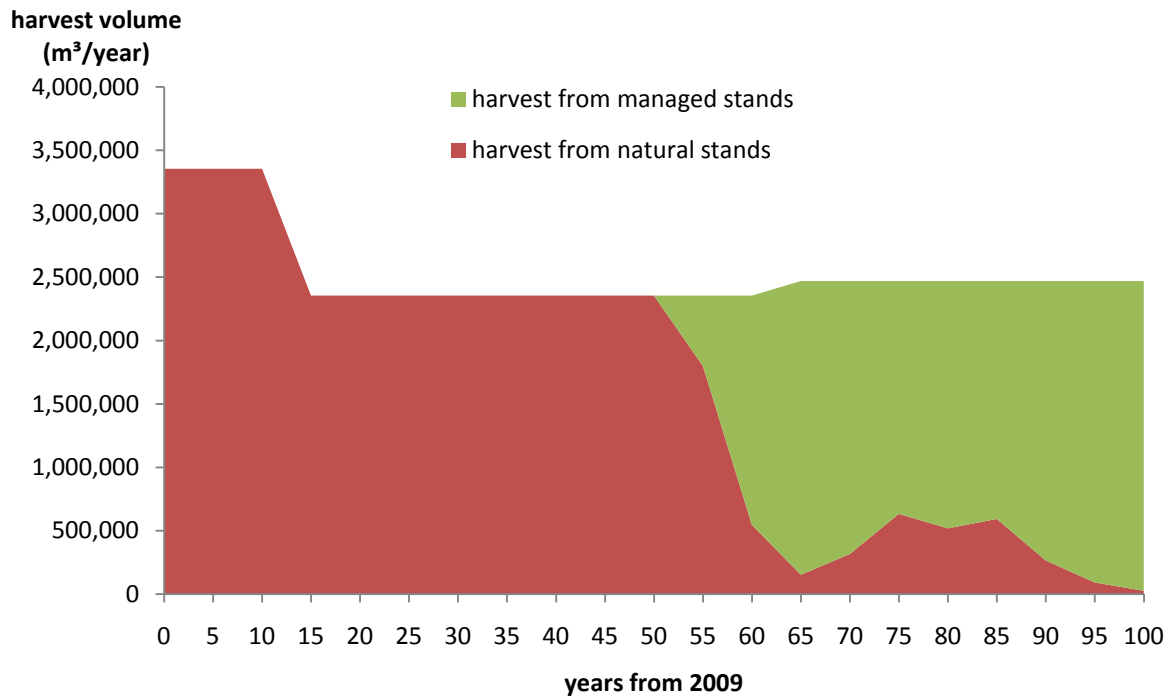


Figure 5. Transition from existing natural stands to managed stands — Okanagan TSA 2011.

The average age at harvest projected to occur in the base case forecast is shown in Figure 6. Since the AAC increase in 2006, pine stands have been targeted for harvesting, and consistent with this trend, in the base case a priority was placed on harvesting pine stands for the first 10 years. As pine is generally harvested at younger ages than other species, the average harvest age is lower in the first 10 years of the forecast. After 10 years, a greater proportion of older, non-pine stands are harvested in the model resulting in a slight increase in the average age of harvested stands until year 40 in the forecast. After that the average age falls significantly as the younger natural stands are harvested. From year 56 onwards the harvest is primarily from managed second-growth stands.

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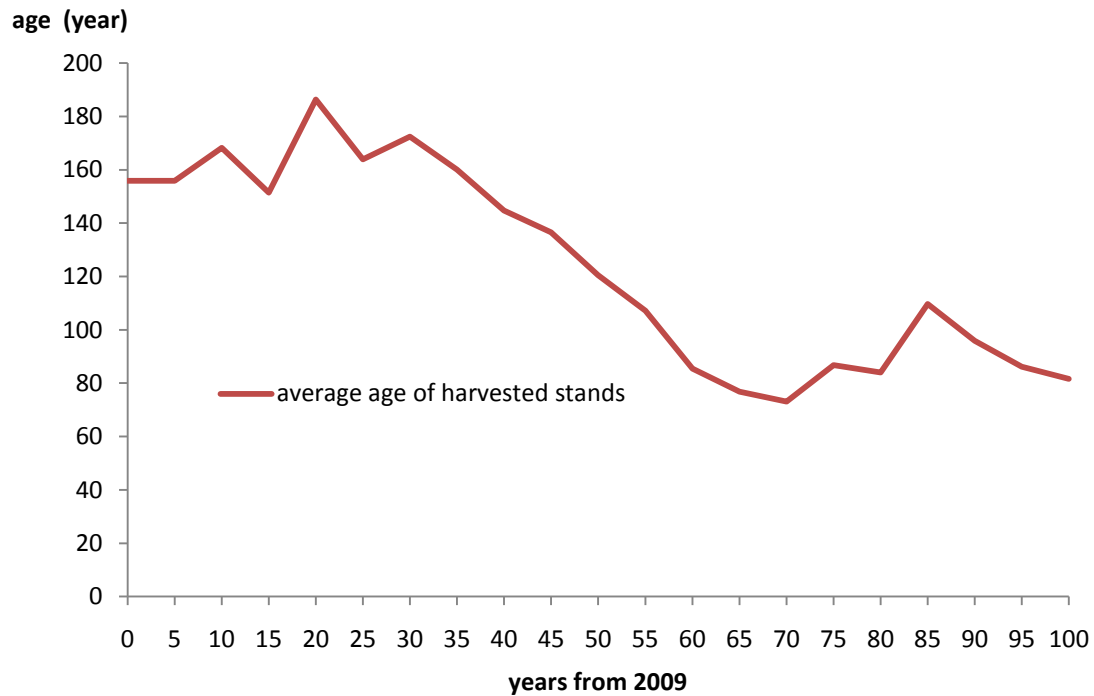


Figure 6. Average harvest age over time — Okanagan TSA 2011.

The area-weighted average volume per hectare harvested is shown in Figure 7. The remaining pine stands harvested in the first 10 years have less volume than the non-pine stands. After the first 10 years the older non-pine stands with more volume are harvested. Average volume per hectares spikes at around year 56 when the older, faster growing managed stands become available for harvest.

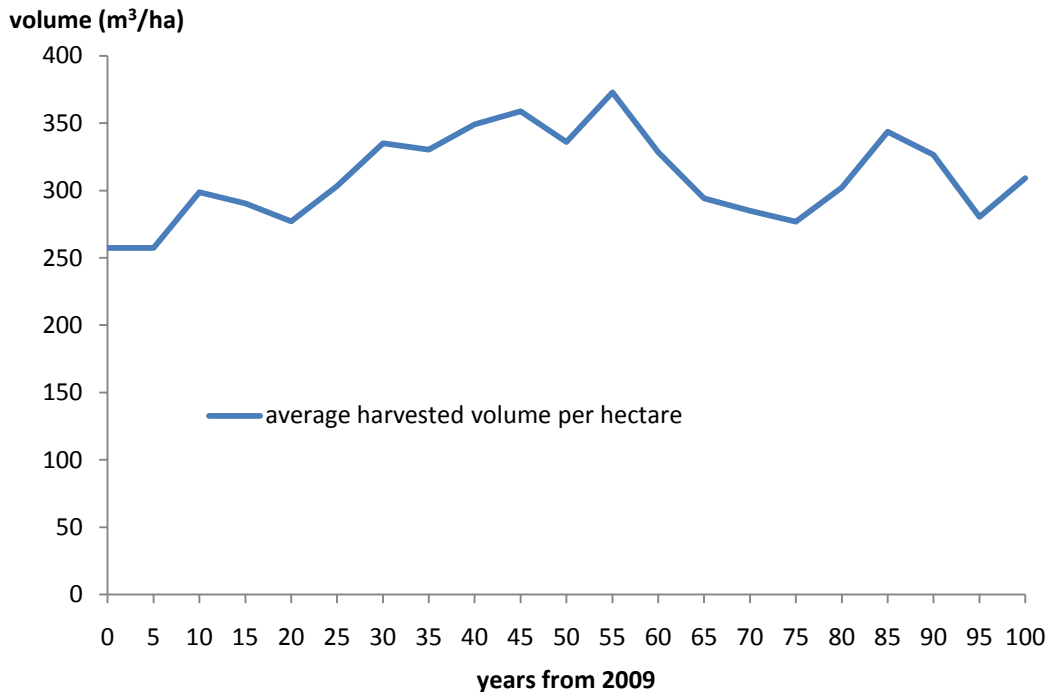


Figure 7. Average volume per hectare harvested over time — Okanagan TSA 2011.

## Sensitivity analysis

Two sensitivity analyses were undertaken to assess the uncertainty with harvest performance in pine stands and the impact of the MPB. The first assesses the impact of not harvesting dead pine and the second assesses the impact of not harvesting the mature pine.

Figure 8 shows that if the initial harvest is maintained at the base case level and the dead pine is not harvested, the mid-term harvest drops from 2 354 600 cubic metres per year to 2 138 500 cubic metres per year (-9.2%). In the second sensitivity analysis, where all mature pine is not harvested, the mid-term drops to 1 805 500 cubic metres per year (-23.3%). These sensitivity analyses show that if the initial base case harvest level is maintained and there is no harvesting of pine in MPB-impacted stands, the mid-term timber supply will be severely reduced.

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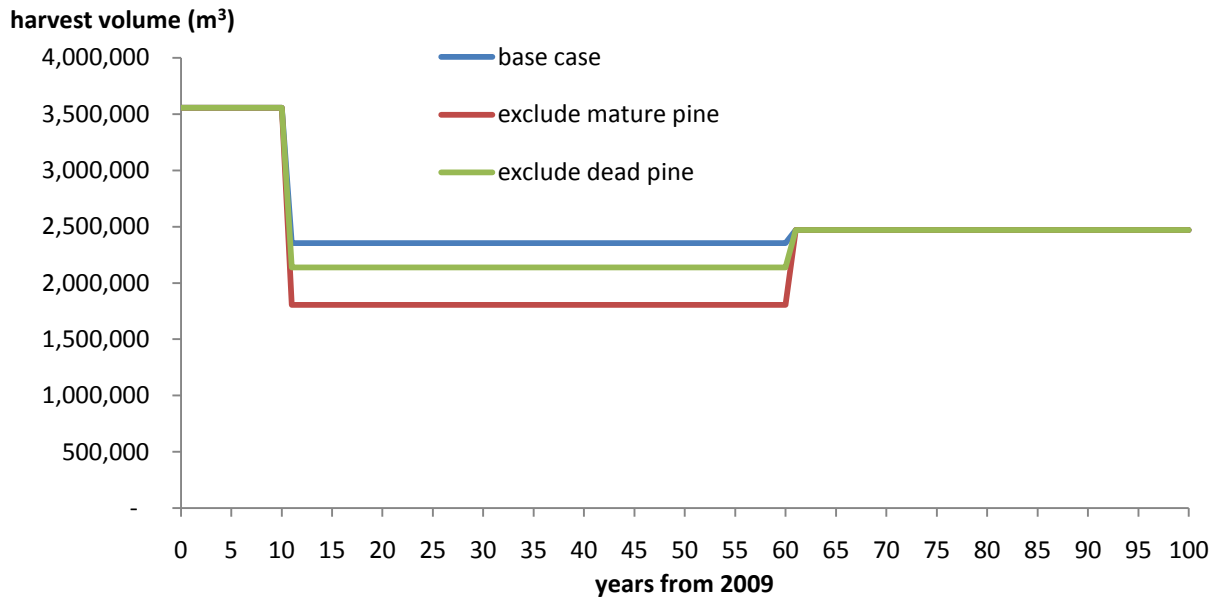


Figure 8. Pine component sensitivity analysis — Okanagan TSA 2011.

## Summary

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In 2006 the chief forester increased the AAC in the Okanagan TSA so that pine impacted by the MPB could be harvested while it was still merchantable. Although the infestation peaked in 2006, if not harvested, 40 percent of the merchantable pine volume in the TSA is at risk of becoming unmerchantable. The base case presented in this document indicates a harvest of 3 355 000 cubic metres per year is feasible with minimum impact to mid-term timber supply. However, this is predicated on harvesting dead and mature pine over the next 10 years.

The provincial chief forester’s AAC determination is a judgement based on his professional experience and his consideration of a wide range of information as required under Section 8 of the *Forest Act*. An AAC is neither the result of a calculation nor limited to the results of timber supply analysis; therefore, the new AAC may not be the same as any of the initial harvest levels depicted in any of the scenarios included in this document.

## Implications of changes in the AAC

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### Environmental implications

The current MPB infestation in the Okanagan TSA will inevitably affect forest values such as wildlife habitat, stream hydrology and visual quality. While some animals will lose habitat, dead trees will provide habitat for other animals.

Trees affect stream flow mainly through evapo-transpiration, shading and interception of precipitation. Beetle-killed trees no longer transpire and are less effective in providing shade. Therefore, it is important to consider hydrological impacts during salvage harvesting in watersheds impacted by the beetle epidemic.

Regardless of the AAC determined by the chief forester, district staff will monitor the salvage performance in beetle-killed stands and the effectiveness of management strategies, and report the findings periodically to the chief forester.

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## **First Nations implications**

All First Nations have expressed interest in an environmentally sustainable forest sector. Economic sustainability is also a consideration for many of the First Nations that actively participate in the local forest industry. As noted above, 10 First Nations are managing non-replaceable forest licences in the Okanagan TSA.

The Ministry began its consultation efforts with respect to this timber supply review in July 2009 and will continue to fulfill its legal obligations to consult with First Nations with the release of this public discussion paper.

## **Community implications**

The implications for local communities of changes in the AAC is an important consideration in the timber supply review.

In 2006, in response to the mountain beetle infestation in the Okanagan TSA, the chief forester increased the AAC by 700 000 cubic metres to assist with salvage of potentially affected pine stands. In the same year the volume harvested by the major licences and through non-replaceable forest licences increased by 12 percent. Over the next three years actual harvest declined annually so that only about 70 percent of the volume harvested in 2006 was harvested in 2009. In 2010 the harvest increased again by 15 percent. These fluctuations resulted from changing economic demands at the global scale and have affected the harvesting and processing sectors, including mill shutdowns of various durations. It is noteworthy that the economy of the Okanagan TSA is quite varied with forestry and logging comprising approximately one percent of the labour force.

As the inventory of mature forest volume in the Okanagan TSA is roughly 25 percent lodgepole pine, the existing forest sector structure will be challenged once the beetle-killed pine has been harvested. However the decline in available timber supply will not be as severe as in other TSAs. Some mills currently buy wood from outside of the TSA and this practice will likely continue. Other forest-related opportunities, such as bioenergy, may provide alternative economic activity during the next decade.

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## Your input is needed

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Public input is an important consideration when determining allowable annual cuts. Feedback is welcomed on any aspect of this discussion paper or any other issues related to the timber supply of the Okanagan Timber Supply Area. Ministry staff would be pleased to answer questions to help you prepare your response. Please send your comments to the district manager at the address below.

Your comments will be accepted until October 21, 2011.

You may identify yourself in your response, if you wish. If you do, please note 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, contact and/or mail your comments/questions to:

Mailing Address:

District Manager  
BC Ministry of Forests, Lands and Natural Resource Operations  
Okanagan Shuswap District  
2501 - 14<sup>th</sup> Avenue  
Vernon, BC  
V1T 8Z1

Electronic mail: [OkanaganShuswapDistrictOffice@gov.bc.ca](mailto:OkanaganShuswapDistrictOffice@gov.bc.ca)

For more information, visit our website at <http://www.for.gov.bc.ca/hts>

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## Appendix 1: Major assumptions

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Assumptions common to most of the scenarios presented in this public discussion paper are outlined in the sections that follow. The assumptions used represent the best available information regarding observed forest management.

### **Projection of the beetle epidemic**

For this analysis, the spread of the MPB epidemic over the Okanagan TSA was projected using the computer model (BCMPB.v5) developed by scientists in the Ministry of Forests, Lands and Natural Resource Operations, the Canadian Forest Service and consultants. The computer model was calibrated using provincial infestation maps from 1999 and 2010.

### **Shelf life**

A major assumption related to projecting timber supply for areas affected by MPB is the ‘shelf life’ of the dead lodgepole pine (i.e., the length of time dead pine trees can be used to produce products before they have completely deteriorated). After the shelf life period, in the computer model the dead pine is removed from the inventory that contributes to timber supply and is considered a non-recovered loss (NRL).

The estimate of ‘shelf life’ is subject to significant uncertainty. It is dependent on several factors, including market conditions, the price of the timber and available milling technology. In this analysis, it was assumed that the dead trees will have some commercial use (e.g., sawlogs, chips, bioenergy) as long as the trees are standing. Once the trees fall to the ground it was assumed the stem would quickly rot. It was assumed the trees would remain useable for 20 years after attack.

### **Management for non-timber objectives**

All forest cover constraints to manage for wildlife habitat, old growth and visual quality as well as any area-specific management objectives were modelled in this analysis. These constraints are listed in the Okanagan TSA data package from April 2010.