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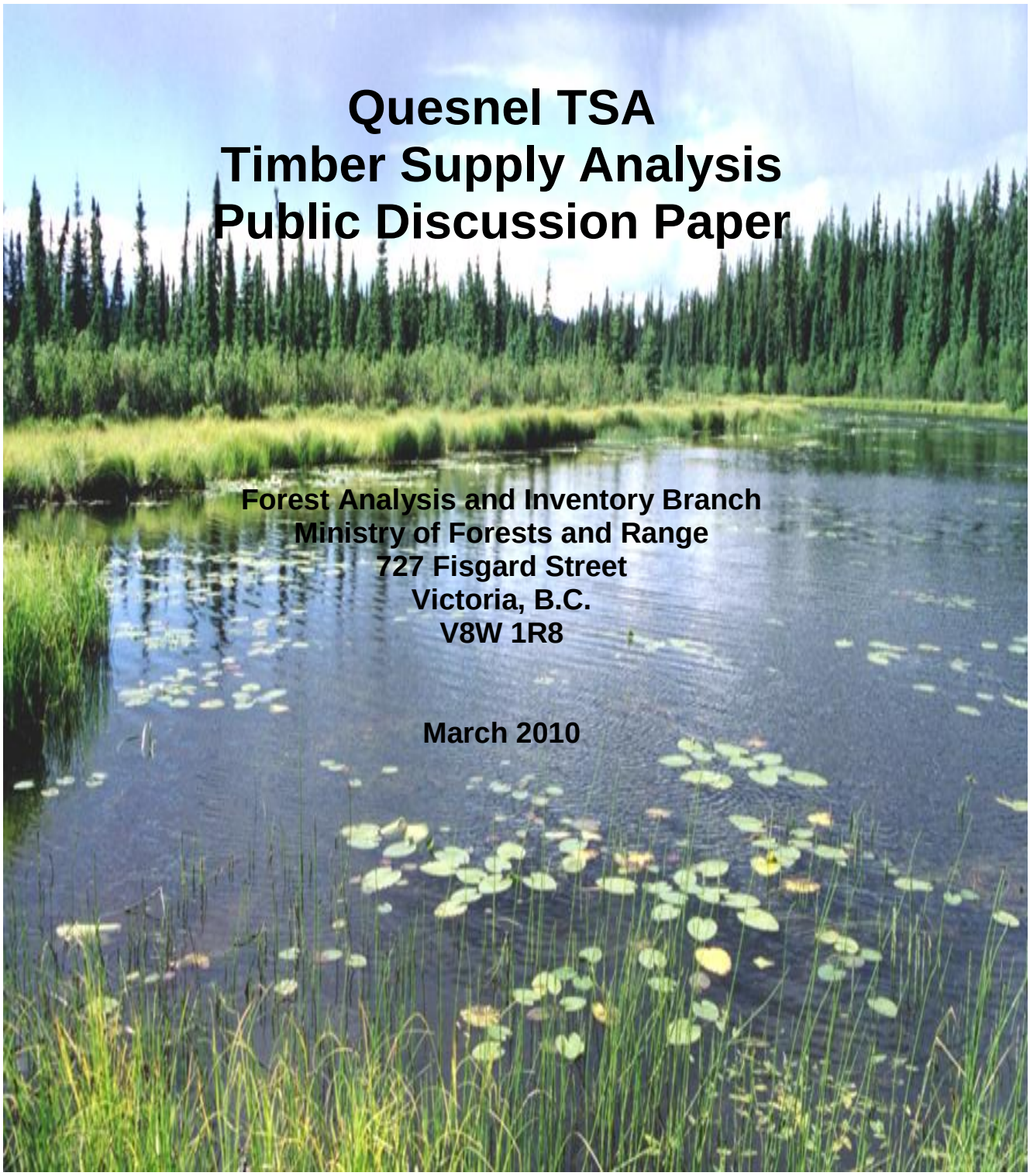

Quesnel TSA
Timber Supply Analysis
Public Discussion Paper

Forest Analysis and Inventory Branch
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Kluskoil Lake

Quesnel TSA Public Discussion Paper

Introduction

The British Columbia Ministry of Forests and Range 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 Quesnel TSA, examines the impacts 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)[d] for the Quesnel TSA.

According to Section 8 of the *Forest Act* the chief forester must regularly review and set new AACs for all 37 TSAs and 33 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 Quesnel TSA. Details about the information used in the analysis are provided in an April 2009 data package and the technical details of the analysis will be available April 2010 on request from the Ministry of Forests and Range. 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 Quesnel TSA

The current AAC for the Quesnel TSA, effective October 1, 2004, is 5 280 000 cubic metres. Since the previous timber supply review, improved information has become available regarding the mountain pine beetle (MPB) level of infestation and the extent of beetle-killed pine volume available for salvage harvesting.

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

Quesnel TSA Public Discussion Paper

This discussion paper is being released in order 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 Quesnel 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 staff, the public and First Nations. Following this review, the chief forester's determination will be outlined in a rationale statement that will be publicly available.

Once the chief forester has determined the new AAC, the Minister of Forests and Range 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 Quesnel Timber Supply Area

The Quesnel TSA is located in the northern part of the Southern Interior Forest Region, lying in the Fraser Basin and the Interior Plateau between the Coast Mountains on the west and the Cariboo Mountains on the east. To the west of Quesnel and of the Fraser plateau, the TSA includes the Itcha-Ilgachuz mountain ranges and the intervening gently rolling terrain encompassing the Blackwater and Nazko river systems. To the east lie the Quesnel highlands, Barkerville, and the Cariboo River. The climate, terrain and forests of the TSA are varied. West of the Fraser River, a relatively dry climate supports forests predominated by lodgepole pine. East of the Fraser River, the forests receive more rainfall and contain more spruce and subalpine fir. Overall, the TSA is covered by stands of lodgepole pine (85 percent by area), spruce (10 percent), and Douglas-fir (3 percent) with hemlock and subalpine fir, and deciduous species forming minor components. The Biogeoclimatic Ecosystem Classification (BEC) zones present in the TSA (in descending order by total area in the TSA) are sub-boreal pine-spruce; sub-boreal spruce; montane spruce; Engelmann spruce-subalpine fir; interior Douglas-fir; interior cedar-hemlock; and two alpine tundra zones.

The TSA covers about 1.6 million hectares in total, of which approximately 84 percent—1 400 103 hectares—is forest management land base (FMLB). About 434 416 hectares of the FMLB area in the TSA are in reserves for old growth, wildlife tree patches or riparian areas, in areas of environmental sensitivity or low productivity, support non-merchantable forest types, or for other reasons are unavailable for timber harvesting. About 69 percent of the FMLB, or 58 percent of the total TSA area, is included in the current timber harvesting land base of 965 687 hectares.

The TSA is administered by the Ministry of Forests' Quesnel Forest District office in Quesnel. The Quesnel Forest District includes, in addition to the Quesnel TSA, 65 woodlot licence areas and TFL 52. The information provided in this discussion paper pertains to the TSA only, unless otherwise specified.

The major population centre in the TSA is the city of Quesnel with a population of 10,023 in 2009. The adjacent communities of Red Bluff, Barlow Creek, Dragon Lake and Bouchie Lake, contribute to the TSA's total population of 23,584 (BC Stats). Other communities within the TSA include Wells and Barkerville in the east, and Nazko and Kluskus villages in the west. The economies of the communities in the TSA are largely resource-based, and the majority are dependent on the local forest industry. Ranching, mining and tourism are also integral to communities in the TSA.

The Quesnel Forest District has a large processing sector with five lumber mills, two pulp mills, a veneer/plywood plant, panel board plant, log home manufacturer and pellet mill. From 2005 to 2007, sawmills and other solid wood mills processed 4.2 million cubic metres of logs per year. In addition to lumber and veneer products these mills also supplied approximately 570 to 630 thousand bone dry units per year of chips used for a variety of purposes such as the production of pulp and pellets.

Timber processing facilities in Quesnel have operated with limited curtailments in recent years, with the exception of West Fraser's Northstar sawmill which suspended operations in December, 2008. At the time of writing Canfor's Quesnel sawmill is experiencing a market-related curtailment which started in January 2010.

Land-use planning

The Quesnel TSA lies within the area covered by the Cariboo Chilcotin Land-Use Plan (CCLUP). Forest development in the TSA is required to be consistent with legally established goals and objectives of this Higher Level Plan (HLP). The timber supply analysis assumes that harvesting will be consistent with the CCLUP.

First Nations

The Kluskus Band, the Lhtako-Dene First Nation (Red Bluff Band), the ?Esdilagh (Alexandria) Band, and the Nazko Band located within the TSA, as well as eight other First Nations communities located outside the TSA, have all asserted traditional territories or interests within the TSA. First Nations are actively involved in the forest industry; First Nations companies hold 12 non-replaceable forest licences of varying terms and annual harvest levels.

Natural resources

Numerous natural resources are associated with the forest land base. Forest products, recreation and tourism, ranching, and wildlife highlight the wide range of resources and values found in the Quesnel timber supply area. West of the Fraser River, the dry climate yields predominately lodgepole pine forests. East of the Fraser River, where rain and snow occur in higher amounts, the forests include spruce and subalpine fir.

Crown range provides forage for both livestock and wildlife. In the Quesnel area grazing occurs under the forest canopy as well as in early seral stage openings where forage is temporarily available a few years following harvesting or fire.

Parks, recreation sites and trails, and roaded and non-roaded areas provide opportunities for numerous outdoor activities. There are two large provincial parks (Bowron Lake Park and Itcha Ilgachuz Park), several smaller parks, as well as 32 recreation sites and 21 recreation trails in the area. There is a range of recreational activities such as hiking, canoeing, camping, guided horse tours, fishing, hunting, snowmobiling, dog-sledding, and downhill and cross-country skiing.

There are eight forested biogeoclimatic zones in the Quesnel timber supply area. The distinct ecological features contribute to high biodiversity values. The western portion of the timber supply area is characterized by higher elevation lodgepole pine and Interior spruce stands. Areas exposed to frequent wildfires usually regenerate to even-aged densely stocked stands of lodgepole pine. Where dominant old forests exist, white spruce, Englemann spruce and subalpine fir are the main species. Minor components of Douglas-fir, black spruce, trembling aspen and black cottonwood can also be found.

The eastern portion of the timber supply area is characterized by forests ranging from lodgepole pine and white spruce near the Fraser River, to Englemann spruce and subalpine fir in the Cariboo Mountains. The high elevation areas of the Cariboo Mountains are blanketed with alpine shrubs, herbs and lichens.

The diverse forests host a range of wildlife species, of which some are considered to be endangered or threatened. Examples in the Quesnel timber supply area include woodland caribou, the American white pelican and northern goshawk. Species considered to be potentially threatened by human activities or natural events include bull trout, sandhill crane, grizzly bear, and fisher. The Blackwater River has a unique subspecies of rainbow trout.

Mountain Pine Beetle epidemic

Mountain pine beetle is native to B.C. and usually occurs at endemic levels. Epidemic outbreaks have occurred periodically throughout the Interior of B.C. and have played a vital role in the natural disturbance of pine forests, contributing to biodiversity and variation 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, whereas the area infested in the current epidemic is about 14.5 million hectares. In the early 1980's a severe MPB epidemic swept across the Chilcotin Plateau to the south of the TSA and was subdued by extremely cold early winter weather in 1984 and 1985. Between 1998 and the summer of 2008 it is estimated that mountain pine beetle killed approximately 620 million cubic metres of pine or about 46 percent of the commercially available pine volume in B.C.

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. The second factor is climate change. Historically, beetle populations have been limited by cold winters; however, the 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 70 percent of the commercial pine across the B.C. interior will be killed by 2015. It appears that the infestation peaked in the Quesnel TSA in the summer of 2004.

By 2009, approximately 68 percent of the forest inventory available for harvesting in the Quesnel TSA had been killed by the mountain pine beetle epidemic. Very little new attack is projected over the next ten years and by 2029 the volume of dead pine available for salvage is projected to decrease to one percent as killed stands decay to the point of falling down. These current and future projected impacts of the mountain pine beetle epidemic were modelled in all the 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 mountain pine beetle. 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). It is acknowledged that sawlog shelf-life will not likely exceed 15 years but all scenarios presented in this analysis assume that beetle-killed trees will remain standing for 20 years to demonstrate the volume available for other potential biomass products.

Ministry and licensees response to the beetle infestation

There has been a sustained effort by government and forest licensees within the Quesnel TSA to salvage mountain pine beetle infested stands. Between 2004 and 2008, 82 percent of the harvest volume was lodgepole pine.

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;
- increasing the AAC to allow for increased harvesting capacity to support beetle population management and salvage damaged timber; and
- issuing new non-replaceable forest licences restricted to the harvesting of lodgepole pine-leading stands with significant levels of beetle damaged timber.

Environmental values

All forested lands, whether they contribute to timber supply or not, help to maintain critical habitats for many species. Therefore, the timber supply analysis includes constraints or forest cover requirements for biodiversity, visual quality, riparian management and protection of environmentally sensitive areas.

Current forest management must be consistent with the requirements of the FRPA and associated regulations, which are designed to maintain a range of biodiversity and wildlife values. In the Quesnel TSA approximately 31 percent of the productive forest land is excluded from harvesting because it occurs in a park, reserve, or on unstable terrain. Other forested areas are excluded from harvesting because the volume of wood per hectare is too low or they are located on environmentally sensitive areas. Although this land is not suitable for timber harvesting, it does provide for other values.

Recent history of the allowable annual cut

The AAC for the Quesnel TSA was first established in 1981, at 2.3 million cubic metres. In response to the early 1980's severe MPB epidemic that swept across the Chilcotin Plateau to the south, the AAC for the Quesnel TSA was increased by 50 percent to 3 450 000 cubic metres. The beetle infestation was subdued in 1984 and 1985 by extremely cold early winter weather, and, although the infestation in the Quesnel TSA never reached the high levels experienced in the Chilcotin area, the AAC increase (through a licence that expired in 1990) allowed a consortium of local licensees to harvest trees under attack and to salvage forest stands killed by beetles.

In 1989, the AAC for the TSA was further increased by 50 000 cubic metres to accommodate a 'partition' for harvesting attributable to deciduous species. In 1990, when the area of TFL 52 was removed from the TSA, the AAC for the remaining area of the TSA was determined at 2 450 000 cubic metres. This included 400 000 cubic metres attributable to harvesting in 'problem forest types' (PFTs); in 1992 this partition was reduced to 300 000 cubic metres for a total AAC of 2 350 000 cubic metres. In 1996, the AAC was determined at 2 340 000 cubic metres, of which 1 965 000 cubic metres were attributable to conventional sawlogs, 300 000 cubic metres were attributable to PFTs, and 40 000 cubic metres were attributable to deciduous species.

In 2001 during the initial outbreak of the current mountain pine beetle epidemic, the AAC for the Quesnel TSA was set at 3 248 000 cubic metres to facilitate the salvage of timber and attempt to diminish the extent of future damage. Of this total AAC, 300 000 cubic metres were attributable to problem forest types as defined by the Quesnel Forest District Manager, and 20 000 cubic metres were attributable to deciduous species.

Effective October 1, 2004, the AAC for the Quesnel TSA was further raised to 5 280 000 cubic metres, an increase of about 63 percent from the previous AAC. The purpose of this increase was to provide the district with sufficient AAC to salvage timber killed by the current and projected MPB epidemic. This AAC is in effect today. Of the AAC, 20 000 cubic metres are attributable to deciduous-leading species and 450 000 cubic metres are attributable to PFTs as defined by the Quesnel Forest District Manager.

Table 1 shows the harvest performance since the 2004 determination from Ministry of Forests and Range records of timber volume harvested. Harvest levels have increased to a maximum of 4.3 million cubic metres in 2008.

Table 1. Current harvest performance

Year	Harvest volume (m^3/year)
2004	2 682 914
2005	3 854 866
2006	3 660 271
2007	3 676 757
2008	4 307 957

Timber supply forecast scenarios

The purpose of the current timber supply review is to provide the chief forester with information to consider in determining a new AAC for the Quesnel TSA. One of the key issues in this determination, and potentially subsequent ones, is to identify the best way to manage the flow of timber from the remaining mature, non-pine forests that were unaffected by the MPB infestation until currently immature stands are suitable for harvesting.

In previous timber supply analyses, one harvest forecast is presented as an outcome of the best available data and current management practices. This forecast is referred to as the 'base case'. However, the extent of the damage caused by the mountain pine beetle epidemic has increased the uncertainty regarding the effect of forest management practices on timber supply. Therefore, no single timber supply forecast is being presented as the base case. Instead, using a common data set, three timber supply scenarios, which are based on different management assumptions, were prepared to explore the implications of a range of forest management choices. An assessment of the harvest forecasts from these scenarios should serve to stimulate discussion and guide future management practices. These scenarios are as follows:

1. Continue the salvage harvest of dead pine stands at the level of the current AAC until all of the salvageable pine has been harvested while maintaining the harvest of non-pine leading – predominantly spruce – stands at a sustainable level (shown in the blue line in Figure 1);
2. Minimize the harvest of non-pine volume while salvaging dead pine and then utilize the reserved non-pine volume to alleviate the harvest level decline. Additionally, alter the minimum harvest criteria to increase mid-term timber supply; and
3. Stop salvaging dead pine stands immediately and start harvesting non-pine leading stands at about the 2008 actual harvest level (the green line in Figure 1).

These scenarios were prepared using a computer model that projects the future availability of timber for harvesting based on the growth of the forest and level of harvesting, while staying within the legal objectives established by the provincial government under higher level plans (see *land use planning*). The major forest management assumptions common to all the scenarios are discussed in Appendix 1.

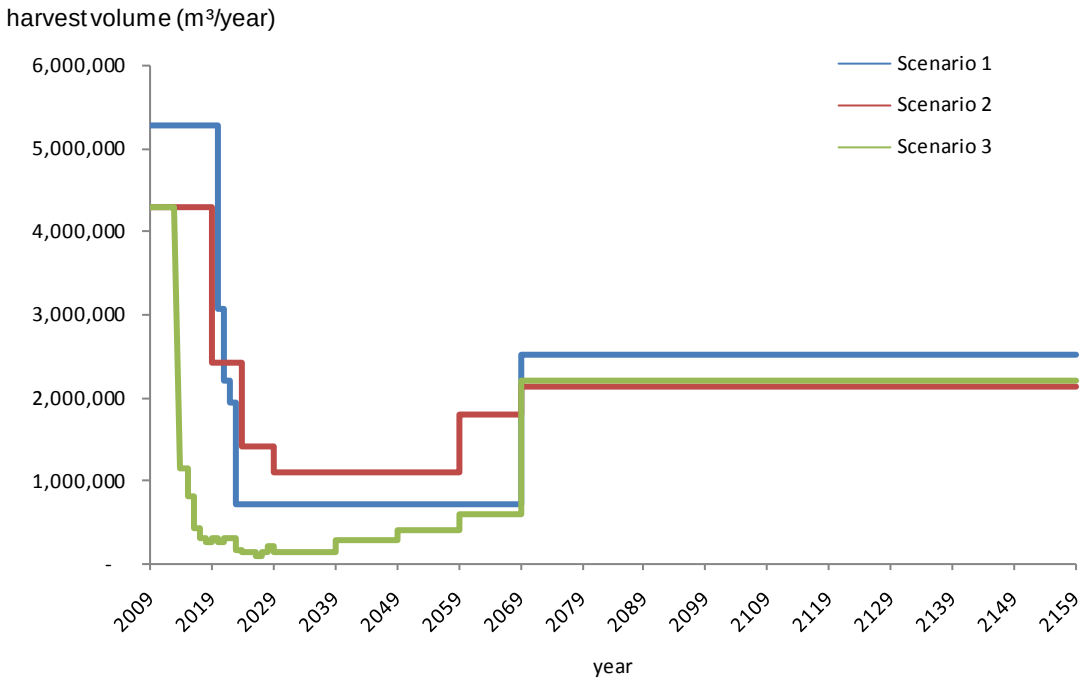
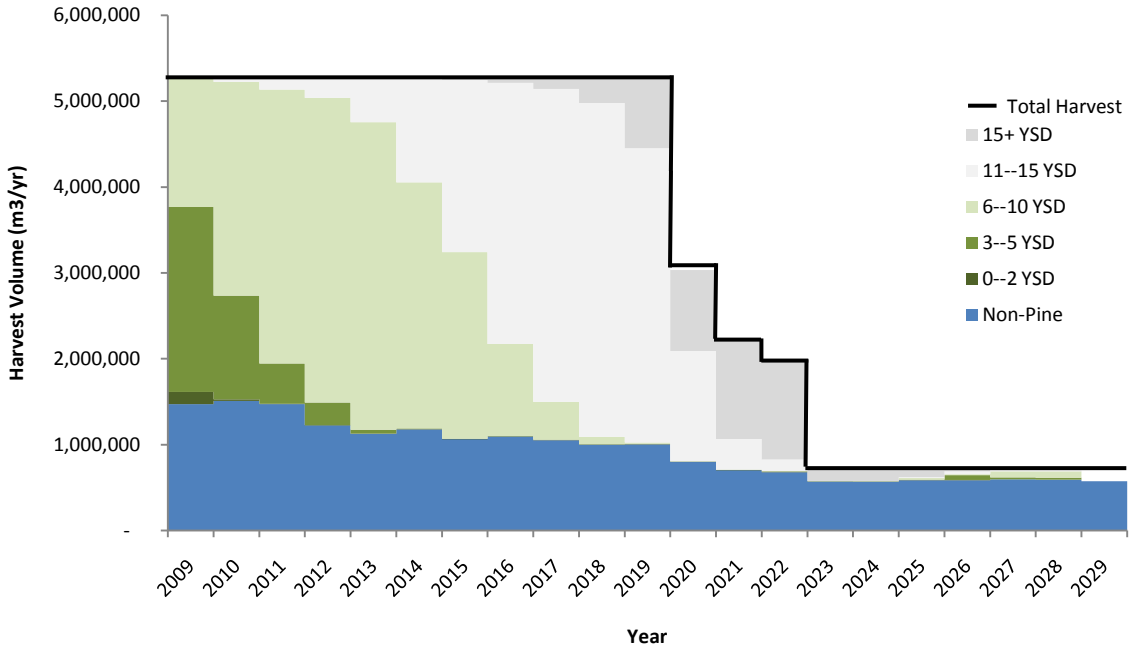


Figure 1. Harvest forecasts from scenarios 1, 2 and 3 – Quesnel TSA 2009.

Scenario 1: Continue the salvage harvest of dead pine stands while maintaining the harvest of non-pine leading stands at a sustainable level

In scenario 1, the initial harvest level is set at 5.28 million cubic metres per year, which is the same as the current AAC. The contribution from non-pine leading stands is 600 000 cubic metres per year and remains constant over the entire forecast. After the first 14 years of this harvest scenario, almost all of the pine-leading stands were assumed to have either been salvaged or have fallen over and no longer be merchantable. For the next 46 years, a harvest level of 720 000 cubic metres per year can be maintained, comprised of 600 000 cubic metres per year from the non-pine leading stands and 120 000 cubic metres per year from pine-leading stands that were assumed to still be salvageable or have survived the mountain pine beetle attack.

The regenerating pine-leading stands are forecast to become harvestable 60 years from now and are projected to contribute 1.92 million cubic metres per year to the total harvest level of 2.52 million cubic metres per year for the remainder of the forecasted time period (see Figure 1).



Note: "YSD" is "years since death".

Figure 2. The first 20 years of the harvest forecast for scenario 1 showing the contribution of non-pine and dead pine to the harvest forecast.

Figure 2 provides an expanded view of the first 20 years of the harvest volume by species from all stand types in scenario 1. In Figure 2, the black line represents the projected total harvest for scenario 1. The various bands of colour represent the volume of non-pine and dead pine that makes up the total harvest. This figure provides a picture of the change in composition of the total harvest over time.

For example, at year zero (i.e., 2009) the total harvest level is 5.28 million cubic metres, the level of the current AAC. Of this total volume, non-pine volume (blue on Figure 2) contributes 1.47 million cubic metres, volume from pine that has been dead for two years or less (dark green) contributes 140 000 cubic metres, pine dead for three to five years (green) contributes 2.16 million cubic metres, and pine that has been dead for six to ten years (light green) contributes 1.51 million cubic metres. In 2009 no pine that has been dead for 11 to 15 years (light grey) or dead for more than 15 years (dark grey) was forecast to be harvested.

At year nine (i.e., 2018), although the total annual harvest remains unchanged, the non-pine contribution has decreased to 1.0 million cubic metres and almost all of the pine harvest (3.89 million cubic metres) comes from stands that have been dead for more than 11 years. By 2023 (14 years from 2009), the forecast harvest has decreased to 720 000 cubic metres and is comprised almost entirely of live non-pine volume with a minor contribution from dead pine volume still remaining after the rest of the dead pine was either salvaged or has decayed.

As mentioned above, starting in 2009 the non-pine harvest is approximately 1.47 million cubic metres per year or 28 percent of the total harvest. This proportion of non-pine volume contribution is much higher than the actual non-pine volume contribution harvested between 2004 and 2008, which has averaged 550 000 cubic metres per year. For the first three years of the forecast, approximately 900 000 cubic metres of non-pine volume is incidental harvest from within salvaged pine-leading stands. This incidental harvest volume then decreases over time because in the modelling, a harvest rule was applied that selects highest volume stands first. Since mature stands with mixed species generally have higher yields than mature pure pine stands, the model prioritizes the harvest of the pine-leading stands that contain a subcomponent of non-pine species, then directs harvest to the mature pure pine stands. The volume of non-pine harvest decreases until all the pine stands have been salvaged and then stabilizes as harvesting is almost exclusively in non-pine leading stands.

Scenario 2: Minimize the harvest of non-pine volume while salvaging dead pine and then utilize the reserved non-pine volume to alleviate the harvest level decline. Additionally, alter the minimum harvest criteria to increase mid-term timber supply.

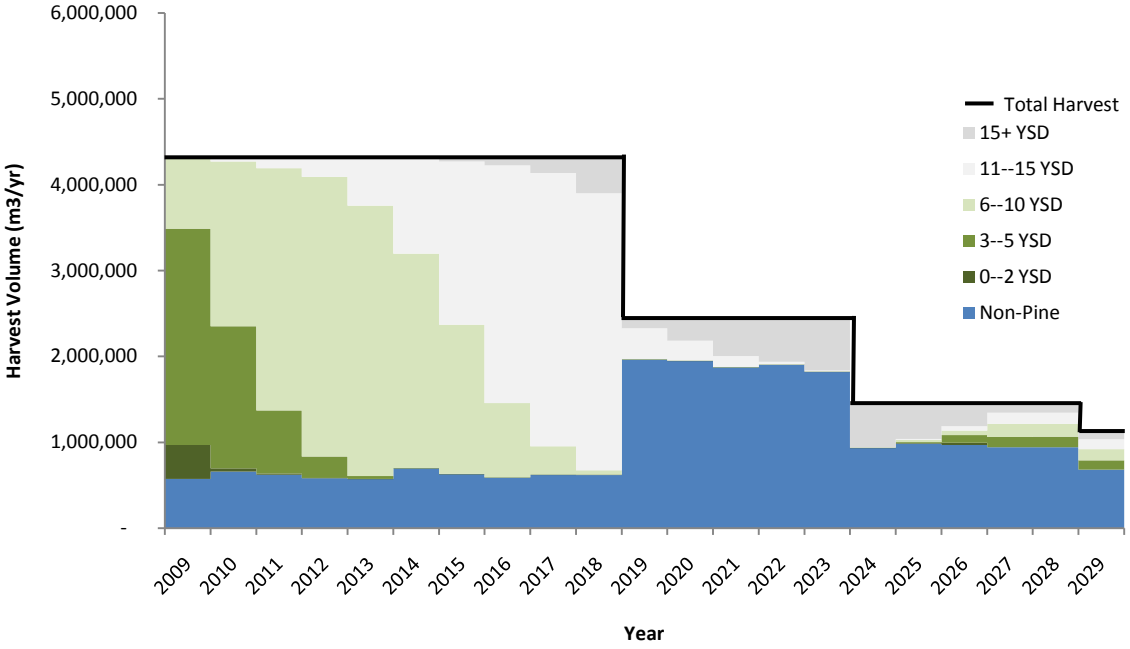
In this scenario, two changes were made to the harvest assumptions modelled in order to minimize the harvest of non-pine volume until all of the pine-leading stands are either salvaged or have fallen over and are no longer merchantable. First, a restriction was placed on the harvest of all non-pine leading stands. In reality, the actual volume harvested from non-pine leading stands has been minor, recently averaging 145 000 cubic metres per year. Second, the harvest priority rule was changed in order to minimize the incidental harvest of non-pine volume from within the salvaged pine-leading stands. Changing the harvest rule reduced the harvest of non-pine volume for the first 20 years to an average of 615 000 cubic metres per year. This contribution closely represents the recent harvest average of 550 000 cubic metres of non-pine per year.

To more closely represent current practice, the initial harvest level was set at the recent maximum harvest level of 4.3 million cubic metres per year achieved in 2008. At this harvest rate, the salvage of mountain pine beetle killed stands can be maintained for 10 years as opposed to 14 years in scenario 1. Directing almost all of the initial harvest to salvaging dead pine reduces the average number of years between the time of stand mortality and time of harvest. However, lowering the initial harvest level allows more dead stands to decay and fall over before they can be salvaged.

To help ease the transition from the harvest rate of 4.3 million cubic metres per year to the much lower mid-term level, the reserved non-pine volume was used to step down the harvest level over 10 years. Figure 3 shows that when salvage of the pine-leading stands was completed in 2019 the harvest level was decreased to 2.42 million cubic metres per year. After five years, the harvest was lowered to 1.42 million cubic metres per year then decreased once more after another five years to a mid-term level reached in 2029 of 1.11 million cubic metres per year. Throughout this transition, 420 000 cubic metres per year of the harvest volume comes from pine-leading stands that have been dead for at least 11 years and are likely to be of limited economic value.

To increase the maximum timber supply available during the mid-term, the minimum volume at which the regenerating pine-leading stands were assumed to be harvestable was decreased from 120 cubic metres per hectare to 100 cubic metres per hectare. Harvest records between 2002 and 2009 for the Quesnel TSA show that the average volume of harvested stands was 236 cubic metres per hectare. However, the records also show rare instances where stands were harvested with volumes down to 104 cubic metres per hectare.

Adjusting the minimum volume at which a stand could be harvested allowed for the regenerating pine stands to be available for harvest sooner in the timber supply forecast. This helped sustain the harvest rate of 1.11 million cubic metres per year throughout the mid-term and resulted in an earlier transition to the long-term harvest level. However, if licensees do not continue salvaging dead pine stands for the next nine years and begin the transition to the mid-term harvest level sooner than 2019 the benefits of the reduced minimum harvest volume will be negated. There is also concern that the model used to forecast the MPB infestation assumes that stands less than 60 years old will not be attacked. Recent surveys in the Quesnel TSA show heavy levels of attack in stands as young as 20 years old. Therefore, the regenerating pine stands assumed to support the mid-term timber supply may have lower yields than forecast in this scenario.



Note: "YSD" is "years since death".

Figure 3. The first 20 years of the harvest forecast for scenario 2 showing the contribution of non-pine, live pine and dead pine to the harvest forecast.

Changing the minimum harvest criteria assumes that pine-leading stands will be managed on shorter rotations which results in reduced growth potential and a lower long-term timber supply. In this scenario, the forecast timber supply 60 years from now is 2.15 million cubic metres per year compared to 2.52 million cubic metres per year in scenario 1 (shown in Figure 1). However, operationally it would be possible to resume the original rotation length in 60 years time to achieve a harvest level of 2.52 million cubic metres per year in the very long-term.

Scenario 3: Stop salvaging dead pine immediately and start harvesting non-pine leading stands at about the 2008 harvest level

In the 2004 AAC determination rationale for the current AAC, no upper limit was placed on the harvest of non-pine species. Instead, the chief forester indicated an expectation that the increased AAC be primarily used to harvest mortality in the moderately and severely impacted pine stands. Although the licensees in the Quesnel TSA have met this expectation, the Ministry of Forests and Range is aware of requests elsewhere in the province for increased access to non-pine leading stands.

Since the 2004 determination, licensees operating within the Quesnel TSA have never harvested the full AAC. The annual harvest increased from 2004 to 2008 and reached a maximum of 4.3 million cubic metres in 2008. However, the economic recession has reduced the ability of licensees to continue salvaging dead pine. This has resulted in various temporary and long-term mill closures.

Scenario 3 explores the implications on mid-term timber supply of discontinuing the salvage of dead pine stands without reducing the initial harvest level below the 2008 harvest level. This scenario is not a likely future outcome, but is included to demonstrate the importance of regulating the harvest of non-pine species.

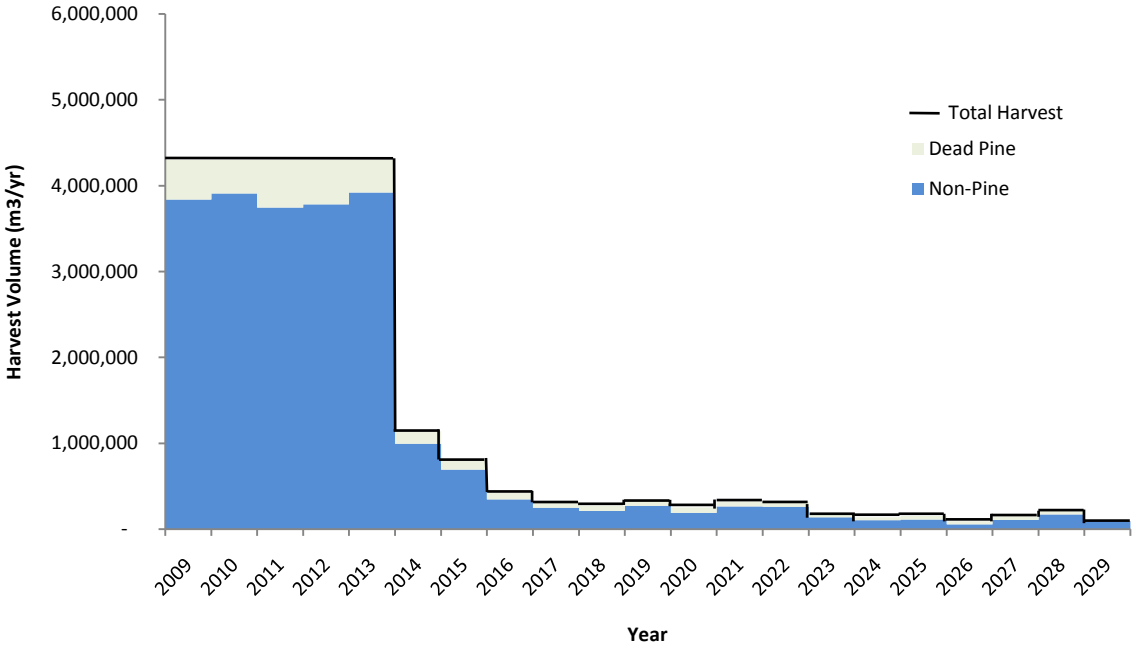


Figure 4. The first 20 years of the harvest forecast for scenario 3 showing the contribution of non-pine and dead pine to the harvest forecast.

Figure 4 shows that the current harvest level can only be supported for five years when harvesting is limited to the non-pine leading stands. The unregulated harvest of non-pine leading stands results in a fluctuating mid-term timber supply that rarely exceeds 200 000 cubic metres per year until the pine-leading stands have regenerated and are available for harvest 60 years from now. There is another consequence of discontinuing the salvage of dead pine stands, which is a lower long-term harvest level resulting from the increased proportion of naturally regenerated pine-leading stands. When dead stands are salvaged they regenerate as higher yielding managed stands. In scenario 3, the long-term harvest level is 2.3 million cubic metres per year which is 220 000 cubic metres per year less than the long-term harvest level in scenario 1.

The chief forester may exercise the option to partition the harvest level attributed to non-pine species within the AAC decision, to ensure a sustainable mid-term and long-term timber supply.

Conclusions

Scenario 1 suggests that when all mountain pine beetle-killed stands have either been salvaged or have fallen over, the mid-term harvest level that is sustainable is 720 000 cubic metres per year. Consequently, the harvest level will likely decline by 4.56 million cubic metres per year from the current AAC of 5.28 million cubic metres at some point over the next 14 years. Scenario 2 demonstrates that by avoiding the harvest of non-pine and directing the initial harvest almost entirely to pine-leading stands it may be possible to transition the decrease in the harvest level in two steps over a 10-year period. Additionally, scenario 2 suggests that the mid-term timber supply may be increased through changes in minimum harvest criteria. Scenario 3 demonstrates that immediately abandoning the salvage of pine-leading stands and redirecting the current harvest rate of 4.3 million cubic metres per year to non-pine leading stands could not be maintained beyond 2013 and would result in an unsustainable timber supply over the mid-term.

Being able to maintain an elevated initial harvest level in the range of the current AAC for the next five years depends on the ability of the forest sector to utilize significant quantities of timber that has been dead for longer than six years (see Figure 2—scenario 1). If timber product markets for stands dead for this many years cannot be found, it will be necessary to transition the harvest sooner to mid-term levels.

A similar outcome to scenario 3 occurs if harvesting is limited to the stands within a short haul distance to the mills in Quesnel. As time passes since the year of death in beetle-killed stands the value of the timber decreases and cannot support the costs of longer hauling distances. The mid-term timber supply in scenario 1 and scenario 2 assume harvesting will occur across the entire TSA. If hauling cost economics effectively limit the size of the timber harvesting land base to an area within a short haul distance to Quesnel (i.e., landscape units within an approximate six hour cycle-time), the mid-term timber supply will be further reduced to the range of 300 000 cubic metres per year.

It is also important to note that the assumptions for the length of time until the beetle-killed pine stands regenerate and become harvestable, approximately 60 years from now in all scenarios, is the most optimistic forecast. The timber supply model assumes full future genetic gains and utilizes improved managed stand productivity estimates.

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

Environmental implications

The current mountain pine beetle infestation in the Quesnel 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.

The Quesnel Forest District prepared a *Quesnel Forest District Enhanced Conservation Strategy (2006)*. This document provided guidance on increasing the amount of stand-level retention during large-scale salvage operations for the recovery of MPB damaged timber. The landscape-level objective is to retain an average of 20 percent of the cutblock area in reserves, resulting in an expected 13 percent increase over the legislated WTP requirement. These additional reserved areas are classified as Conservation Legacy Areas (CLAs). The CLAs recommended by the strategy were modelled in the analysis to persist for 30 years to allow salvage harvested areas to recover to a point where the CLAs could be harvested without compromising wildlife or hydrological values.

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

First Nations implications

The ?Esdilagh, Lhoosk'uz Dene, Nazko t'in, Lhtako, Xa''sull, Ulkatchot'en and T'exelc First Nations currently have non-replaceable forest licences providing tenure and revenue sharing opportunities. Local First Nations have expressed an interest in ensuring there is sufficient timber available to meet their economic needs.

The Ministry of Forests and Range has already begun consultation efforts with respect to this timber supply review and intends to continue to fulfill its legal obligations to consult with First Nations in conjunction with the release of this public discussion paper.

Community implications

The implication of changes in the allowable annual cut for local communities is an important consideration in the timber supply review. In terms of economic activity, the Quesnel forest district is the third most forestry dependent district in British Columbia with forestry supporting 48 percent of employment.

The mountain pine beetle led to increases in forestry activity through 2008. Harvesting activity increased by as much as 90 percent from 2004 to 2008. Since then, however, the economic recession has reduced the level of forestry activity in the area. Throughout 2008 and 2009, processing activity in Quesnel has been subject to various temporary and long-term mill closures.

The first two scenarios presented in this discussion paper forecast that supplies of timber will begin to decline 10 to 15 years from now, depending on when the pine becomes no longer merchantable. Both of these scenarios project an initial harvest level at the level of the current AAC. Table 2 below shows the potential employment implications if the current AAC is fully utilized to salvage mountain pine beetle-killed stands. These employment numbers are shown with the employment numbers associated with the past five-year average harvest level as well as with the pre-2004 AAC.

Table 2. Quesnel TSA potential employment associated with the timber supply forecasts

Forestry sub-sector	Pre-2004 AAC	5-year average harvest 05-09	Current AAC	Scenario 1 Year 2023	Scenario 2 Year 2019
Timber supply volume (cubic metres)	3,248,000	3,767,289	5,280,000	720,177	2,430,347
Employment (person-years)					
Harvesting and silviculture	537	622	872	119	401
Processing	1,328	1,541	2,160	295	994
Direct employment in the Quesnel TSA	1,865	2,163	3,032	414	1,396
Direct impacts outside Quesnel TSA	127	147	206	28	95
Total direct impacts in BC (TSA plus non-TSA)	1,992	2,310	3,238	442	1,490
Indirect and induced impacts	1,170	1,357	1,902	259	876
Total direct, indirect and induced impacts	3,162	3,667	5,140	701	2,366

Based on the existing forest sector structure of solid wood and pulp production, unless other economic sources of timber are available once the pine is no longer available, the Quesnel economy will be significantly challenged. Other forest related opportunities may provide alternative economic activity, such as the bio-resource sector through the use of salvage and decayed timber. At this time it is difficult to predict whether or not this will occur. The City of Quesnel also relies on local forestry-related mills for about 66 percent of its municipal tax base. The potential for further mill closures increases the risk that the sector will no longer maintain this historical role in supporting the tax base.

Your input is needed

Public input is an important part of establishing the allowable annual cut. Feedback is welcomed on any aspect of this discussion paper or any other issues related to the timber supply review for the Quesnel timber supply area. 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 May 28, 2010.

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 contact and/or mail your comments to:

Mailing Address:

District Manager
B.C. Ministry of Forests and Range
Quesnel Forest District
322 Johnston Avenue
Quesnel, B.C.
V2J 3M5
Electronic mail: Forests.QuesnelDistrictOffice@gov.bc.ca

Available April 2010, further information regarding the technical details of the timber supply analysis are available on request by contacting Forests.ForestAnalysisBranchOffice@gov.bc.ca

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

Appendix 1: Major assumptions

Assumptions common to most of the scenarios presented in this public discussion paper are outlined in the sections that follow. For more detail and for information regarding other modelling assumptions please refer to the Quesnel TSA technical report available April 2010 on request from the Ministry of Forests and Range. The assumptions used represent the best available information regarding observed forest management.

Projection of the beetle epidemic

For this analysis, the progression of the epidemic in the Quesnel TSA was projected using the computer model (BCMPB.v5) developed by scientists in the Ministry of Forests and Range, the Canadian Forest Service and consultants. The computer model was calibrated using provincial infestation maps from 1999 to 2007.

Best estimates indicate that as of 2008, approximately 62 percent of the timber harvesting land base across the entire Quesnel TSA had been impacted by mountain pine beetle.

Shelf-life

A major assumption impacting the effectiveness of any salvage program is the 'shelf-life' of the dead lodgepole pine, or the length of time it will remain commercially viable. After that period the dead pine is considered a non-recovered loss (NRL).

There is great uncertainty regarding shelf-life. 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 standing for 20 years after attack. These assumptions are different than previous assumptions about shelf-life. The graphs presented in this discussion paper show the contribution to the harvest forecast of volume from trees dead for grouped periods of time: two years or less, three to five years, six to ten years, 11 to 15 years and 15-plus years. Presenting the information in this way makes it possible to solicit people's opinions and knowledge regarding shelf-life for various commercial products at any time in the future and accordingly interpret the timber supply projections without the requirement to rerun the timber supply model.

Proximity to an existing road

For this analysis, it was assumed a stand had to be within 2.0 kilometres of a road to be a candidate for harvest. Once harvested, that stand was considered roaded and any stands within 2.0 kilometres of that harvested stand were considered candidates for harvest.

Management for non-timber objectives

All forest cover constraints to manage for visual quality, wildlife habitat, old growth as well as any area-specific management objectives were modelled in this analysis. These constraints are listed in the Quesnel TSA data package from April 2009.