

# Impacts of 2017 Fires on Timber Supply in the Cariboo Region

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Office of the Chief Forester  
British Columbia Ministry of Forests, Lands,  
Natural Resource Operations and Rural Development

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Ministry of  
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Resource Operations  
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### Cover photographs

- Left photo: area killed by the Mountain Pine Beetle before the 2017 fires.
- Right photo: area in same management area burnt by 2017 fires.

## Executive Summary

The 2017 wildfires in British Columbia (BC) affected over 1.2 million hectares, the largest impact on record (about 100 year of records) for a single fire season – and eight times larger than the average annual area burned (142 000 hectares). About 1.0 million hectares of the burnt area was in the Cariboo Region with the Quesnel, Williams Lake, and 100 Mile House Timber Supply Areas (TSAs) being the most heavily impacted. About 609 000 hectares of the fire impacts in the Cariboo are in the timber harvesting land base<sup>a</sup> (THLB) – with 22.5%, 17.7%, and 12% of the THLB impacted, respectively, in the Quesnel, Williams Lake, and 100 Mile House TSAs. Given this, a special review of the impacts of the 2017 fires on timber supply in the Cariboo Region was undertaken by the ministry’s forest analysis and inventory staff. The review was completed to assist the Chief Forester in assessing if current allowable annual cuts<sup>b</sup> (AAC) should be re-determined and to provide an initial assessment of the impacts of fires on mid-term timber supply levels (post-salvage timber supply levels).

In response to the wildfires, salvage of fire damaged timber is underway. In January 2018, the ministry released *Post-Natural Disturbance Forest Retention Guidance: 2017 Wildfires*. The document provides guidance on what forested areas should be reserved from harvest to protect non-timber values (referred to as retention planning). When planning retention during salvage harvesting, there are six points of overarching guidance that should be contemplated in order of priority:

- Ensure human safety and minimize damage to existing infrastructure.
- Sustain, restore or enhance the capacity of ecosystems to provide ecosystem values, such as those related to water quality and wildlife habitat.
- Consider the collective disturbances on the landscape to mitigate cumulative impacts on environmental and societal values.
- Facilitate the adaptation of forests to improve resilience to climate change.
- Minimize impacts to timber supply by shifting logging from undamaged stands to damaged stands wherever possible.
- Recover value from the burnt timber before the wood quality deteriorates.

To support the special review of the timber supply impacts from the 2017 wildfires in the Cariboo Region:

- Fire severity mapping was completed to support salvage operations and update the forest inventory;
- Re-measurement of existing ground plots within fire perimeters was completed to quantify timber volume losses due to 2017 fires within the fire severity mapping classes; and,
- Forest inventories were updated to account for timber volume losses due to the 2017 fires using both the severity mapping and ground sampling information.

Findings from the updated post-2017 fire timber supply projections for the three TSAs in the Cariboo Region show:

- Quesnel TSA where the current AAC is 2 607 000 cubic metres, of which 1 250 000 cubic metres is attributed to live coniferous trees, drops to 1 450 000 cubic metres in the mid term;

### <sup>a</sup>Timber harvesting land base (THLB)

*The THLB is an estimate of the land where timber harvesting is considered both acceptable and economically feasible, given the objectives for all relevant forest values, existing timber quality, market values and applicable technology. The THLB is derived from the data, forest management practices and assumptions described in the data package. It is a theoretical, strategic-level estimate used for timber supply analysis and could include areas that may never be harvested or may exclude areas that will be harvested.*

### <sup>b</sup>Allowable annual cut (AAC)

*Allowable annual cut is the maximum volume of timber available for harvesting each year from a specified area of land, usually expressed as cubic metres of wood.*

- Williams Lake TSA where the current AAC of 3 000 000 cubic metres, with half of that volume attributed to live stands, drops to 1 430 000 cubic metres in the mid term; and,
- 100 Mile House TSA where the current AAC of 1 948 002 cubic metres, of which no more than 477 707 cubic metres is attributed to live trees, drops to 840 000 cubic metres in the mid term.

These updated projections suggest that the current AACs do not need to change; however, current partitions may need to be reconsidered to protect mid-term timber supply. Licensees need to focus on harvesting dead trees to protect mid-term harvest levels. Mid-term harvest levels in the Cariboo will be reduced because of the 2017 wildfires.

**Introduction**

The B.C. Ministry of Forests, Lands, Natural Resource Operations and Rural Development (FLNR) regularly reviews the timber supply<sup>d</sup> for all timber supply areas<sup>e</sup> (TSAs) and tree farm licences<sup>f</sup> (TFLs) in the province. This special review addresses the timber supply impacts stemming from the 2017 wildfires in the Cariboo Region.

As shown in Figure 1, the 2017 wildfires affected over 1.2 million hectares in B.C., the largest impact on record, and over eight times larger than the average annual area burned (142 000 hectares). The area affected is 17 times larger than the long-term median. The 10 largest wildfire years in the last century account for 40% of the total area affected by wildfire.

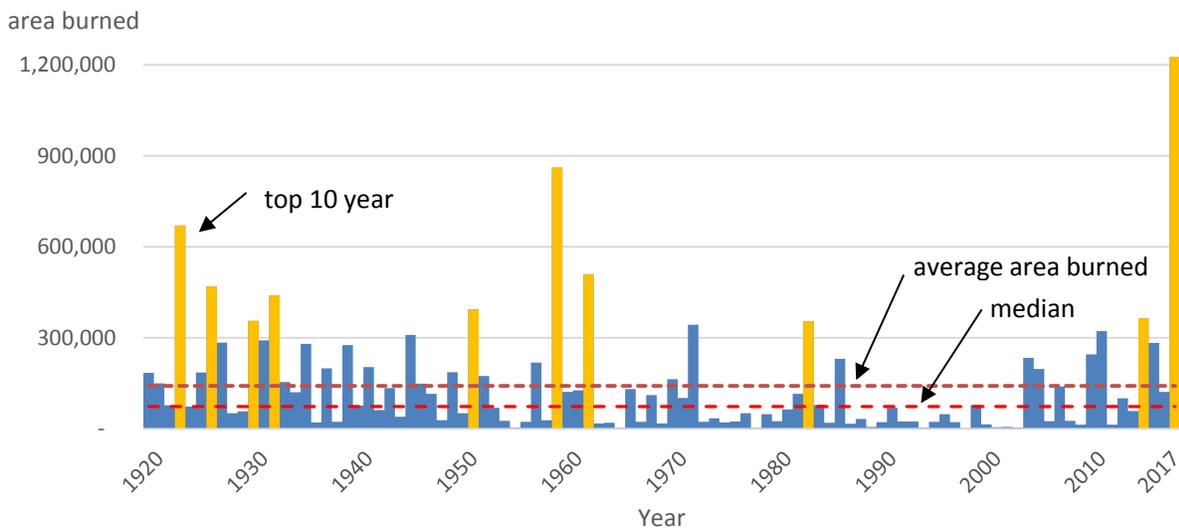


Figure 1. Annual area affected by wildfire provincially.

**<sup>e</sup>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.

**<sup>d</sup>Timber supply**  
 Timber supply is the amount of timber available for harvesting over a specified period of time.

**<sup>e</sup>Timber supply areas (TSAs)**  
 Timber supply areas are integrated resource management units established in accordance with Section 7 of the Forest Act.

**<sup>f</sup>Tree farm licences (TFLs)**  
 Tree farm licences are tenures that grant exclusive rights to harvest timber and manage forests in a specific area; may include private land.

About 1.0 million hectares (80%) of the area burnt by the 2017 wildfires was in the Cariboo Region with the Quesnel, Williams Lake and 100 Mile House TSAs being the most severely impacted. These TSAs were experiencing substantial decreases in timber supply as a result of the Mountain Pine Beetle (MPB) outbreak and the subsequent salvage of dead pine. The 2017 wildfires killed additional live timber that was previously projected to contribute to timber supply after the beetle salvage ends. Given this, a special review of the impacts of the 2017 fires on timber supply in the Cariboo Region was undertaken. The review can assist the chief forester in assessing if current AACs should be re-determined and provide an initial assessment of the impacts of fires on mid-timber timber supply levels (post-salvage levels).

**Overview of the area and volume within fire perimeters by management unit**

Figure 2 shows the 2017 fire perimeters relative to the cumulative percentage of merchantable forest volume killed since 1999 by the MPB by management unit. Most of the provincial forest area impacted by fire (about 80%) occurred in forests significantly impacted by MPB within the Quesnel, Williams Lake and 100 Mile House TSAs. Of the 1.0 million hectares impacted by 2017 fires in those three TSAs, about 609 000 hectares are in the timber harvesting land base (THLB) - with 22.5%, 17.7%, and 12% of the THLB impacted, respectively, in the Quesnel, Williams Lake, and 100 Mile House TSAs.

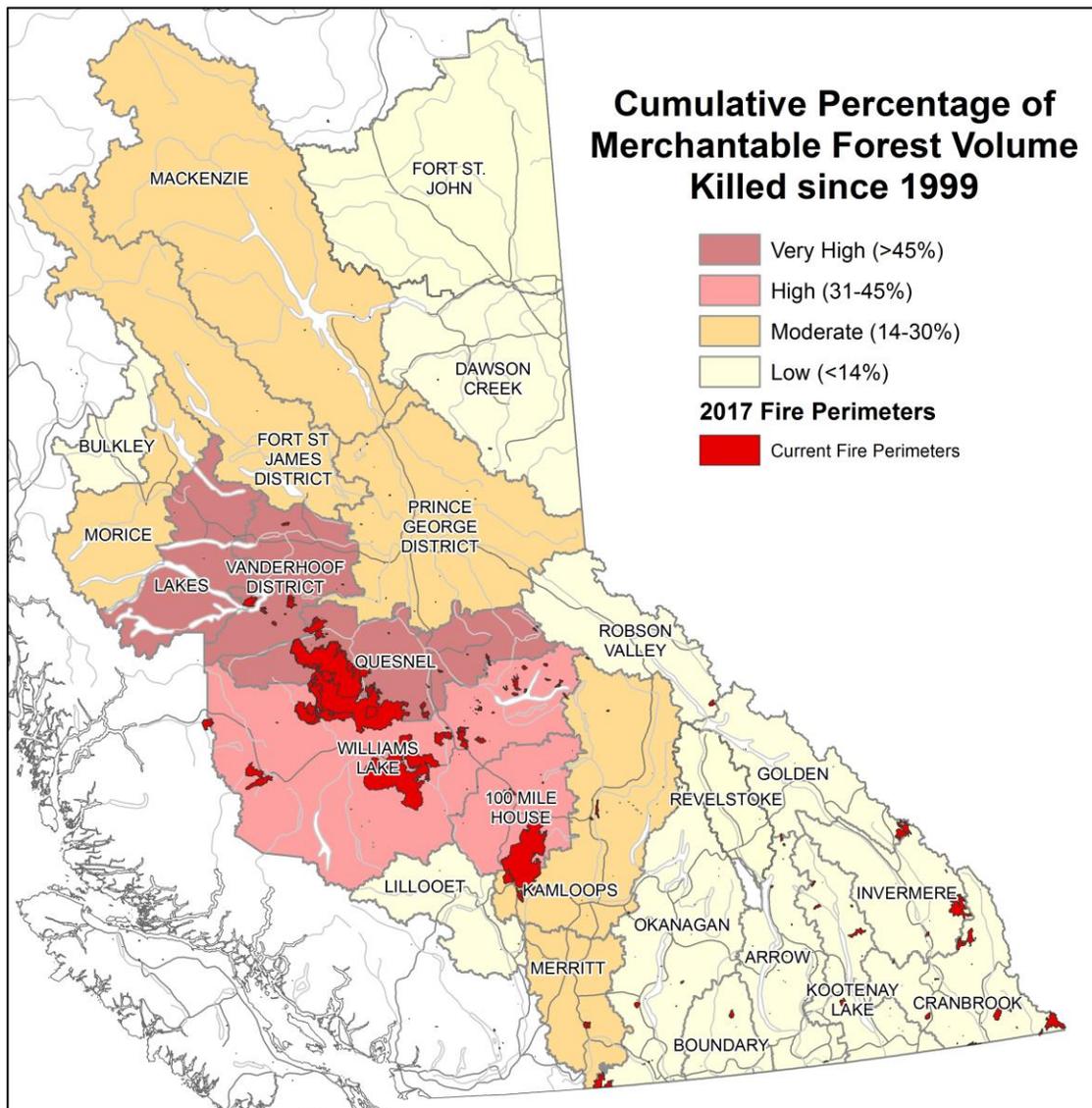


Figure 2. 2017 fire perimeters relative to the cumulative forest volume killed by MPB since 1999.

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## Post-natural disturbance forest retention guidance: 2017 wildfires

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There is an expectation that some of the stands that burned within the fire perimeters will be logged. To guide salvage operations, strategic principles for 2017 fire salvage were developed by the Cariboo Region, and post-wildfire guidance has been provided in areas designated under the *Forest and Range Practices Act* Government Actions Regulation (e.g., as ungulate winter range or wildlife habitat areas).

In January 2018, the FLNR released *Post-Natural Disturbance Forest Retention Guidance: 2017 Wildfires*<sup>i</sup> prepared jointly by the Chief Forester, and Assistant Deputy Minister, Resource Stewardship Division. The document provides guidance for forest professionals who plan and implement retention strategies in areas that have experienced extensive natural disturbance. Retention planning refers to the required planning for landscape connectivity, interior forest and intact ecosystem attributes (e.g., overstorey trees, vegetation communities, soils and other live and decaying forest structure) that will be retained for habitat, hydrologic function, mid-term timber supply and to support recovery at stand and landscape scales. The guidance was provided due to the need for retention planning to guide salvage harvesting in areas affected by the 2017 wildfires; some of the highlights are summarized below.

Retention planning is the responsibility of licensees who conduct salvage harvesting. However, government expects that the planning will be done in full partnership with impacted communities and Indigenous people. When planning retention during salvage harvesting, there are six points of overarching guidance that should be contemplated in order of priority:

- Ensure human safety and minimize damage to existing infrastructure.
- Sustain, restore or enhance the capacity of ecosystems to provide ecosystem values, such as those related to water quality and wildlife habitat.
- Consider the collective disturbances on the landscape to mitigate cumulative impacts on environmental and societal values.
- Facilitate the adaptation of forests to improve resilience to climate change.
- Minimize impacts to timber supply by shifting logging from undamaged stands to damaged stands wherever possible.
- Recover value from the burnt timber before the wood quality deteriorates.

In general, those planning retention during salvage harvesting should consider human safety and the long-term provision of ecosystem values as well as the short-term economic gain obtained from salvaging the burnt timber. Planning should focus on what to retain, rather than on what to harvest.

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## Quantifying fire impacts within fire perimeters

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To support the special review of the timber supply impacts from the 2017 wildfires on the Quesnel, Williams Lake and 100 Mile House TSAs, the following was undertaken:

- Fire severity mapping was completed to support salvage operations and update the forest inventory;
- Re-measurement of existing ministry ground plots within fire perimeters was completed to quantify timber volume losses due to 2017 fires within the fires severity mapping classes; and,
- Forest inventories were updated to account for timber volume losses due to 2017 fires using both the severity mapping and ground sampling information.

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<sup>i</sup> See <https://www2.gov.bc.ca/gov/content/industry/forestry/managing-our-forest-resources/sustainable-forest-management-practices>

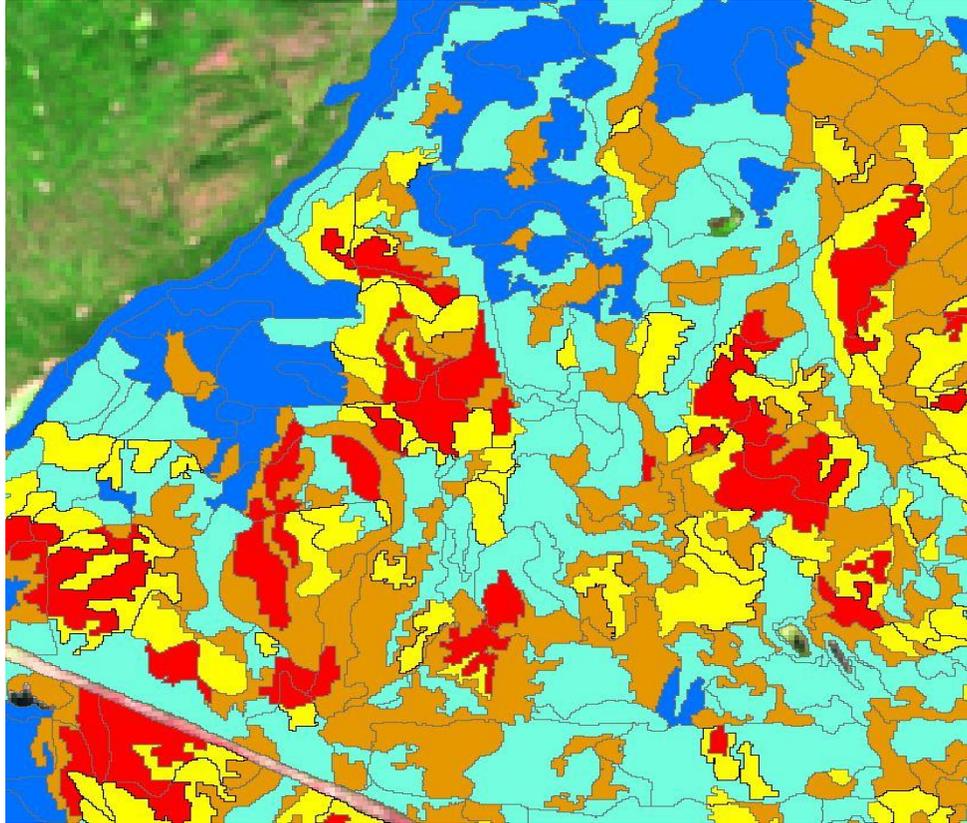


Figure 3. Forest cover polygons themed by fire severity mapping classes.

Figure 3 shows forest cover polygons themed by fire severity mapping classes based on the intensity of the burn. The colours in Figure 3 range from dark blue (essentially no impact), light blue (low intensity burn), brown (medium intensity), yellow (high intensity), and red (severe intensity burn). To determine timber volume impacts by fire severity mapping class, pre-existing sampling and monitoring plots were re-measured. Based on the plot data, volume losses were on average 16% for low intensity burns, 30% for medium intensity burns, 84% for high intensity burns, and 98% for severe intensity burns. Example of plot photos for low, medium and severe burns, respectively, are shown in Figure 4 below from left to right.



Figure 4. Example of plot photos for low, medium and severe burns, respectively.

Overall, the average timber volume loss within fire perimeters and the THLB were 60.5%, 54.5%, and 51.2%, respectively, for the Quesnel, Williams Lake, and 100 Mile House TSAs – averaging 54% for the three units. The timber volume losses could increase over the next few years as the trees injured by the 2017 fires die; to account for this FLNR will re-assess losses yearly. Another concern is the potential for additional timber volume losses due to the Douglas-fir beetle, which could flourish in fire-damaged stands and could add to mortality levels within and beyond the fire perimeters.

### **Updated timber supply projections**

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To support the review of the timber supply impacts of the 2017 fires on the Quesnel, Williams Lake and 100 Mile House TSAs, the following information was used:

- New forest inventories (both photo-delineation and ground sampling) completed after the last timber supply review was initiated but before the 2017 fires occurred.
- Latest inventory information updated with the use of fire severity mapping and ground sampling to reflect 2017 fire losses.
- An updated assessment of the timber harvesting land base.
- For Quesnel and 100 Mile House TSAs, the definition of what constitutes managed stands was revised to include only those harvested stands that have silvicultural records as opposed to using a fixed age (e.g., < 50 years) as was done in previous timber supply reviews.
- Updated timber supply projections for pre- and post-fire conditions.

The updated timber supply projections were used to determine if changes may warrant a re-determination of current AACs and to provide an initial assessment of the impacts of the fires on mid-term timber supply levels. In the projections, short-term salvage of fire-impacted timber volumes did not contribute to meeting timber supply. The forecasts maintained a focus on the continued salvage of pine in the short-term as there is much uncertainty as to how much of the fire killed stands can be salvaged. Any harvest of fire killed timber will therefore just provide additional assurances that projected timber supply and current AACs can be met.

#### **Quesnel TSA**

The current AAC for Quesnel TSA was set in June 2017 at 2 607 000 cubic metres per year, of which a maximum of 1 250 000 cubic metres per year could be harvested from live coniferous trees. Figure 5 shows three timber supply forecasts that include the base case forecast (most likely scenario) developed during the last timber supply review (TSR) to support the current AAC determined pre-fire (red line), an updated base case forecast reflecting new inventory collected pre-fire (green line), and finally an updated base case forecast that reflects new inventory and the 2017 fire losses (black dashed line). The updated post-2017 fire timber supply projection for Quesnel TSA shows that the current AAC of 2 607 000 cubic metres per year can be maintained in the short term before it drops to 1 450 000 cubic metres in the mid term.

The timber supply projections also show that new inventory information, not counting volume losses due to the 2017 fires, increases the mid-term timber supply by 53 000 cubic metres per year relative to the TSR base case forecast however, accounting for the 2017 fire-related volume losses decreases the mid-term timber supply by 167 000 cubic metres per year (about a 10% decrease) relative to the last base case. This suggests that the current AAC does not need to change at this time but mid-term timber supply will be reduced.

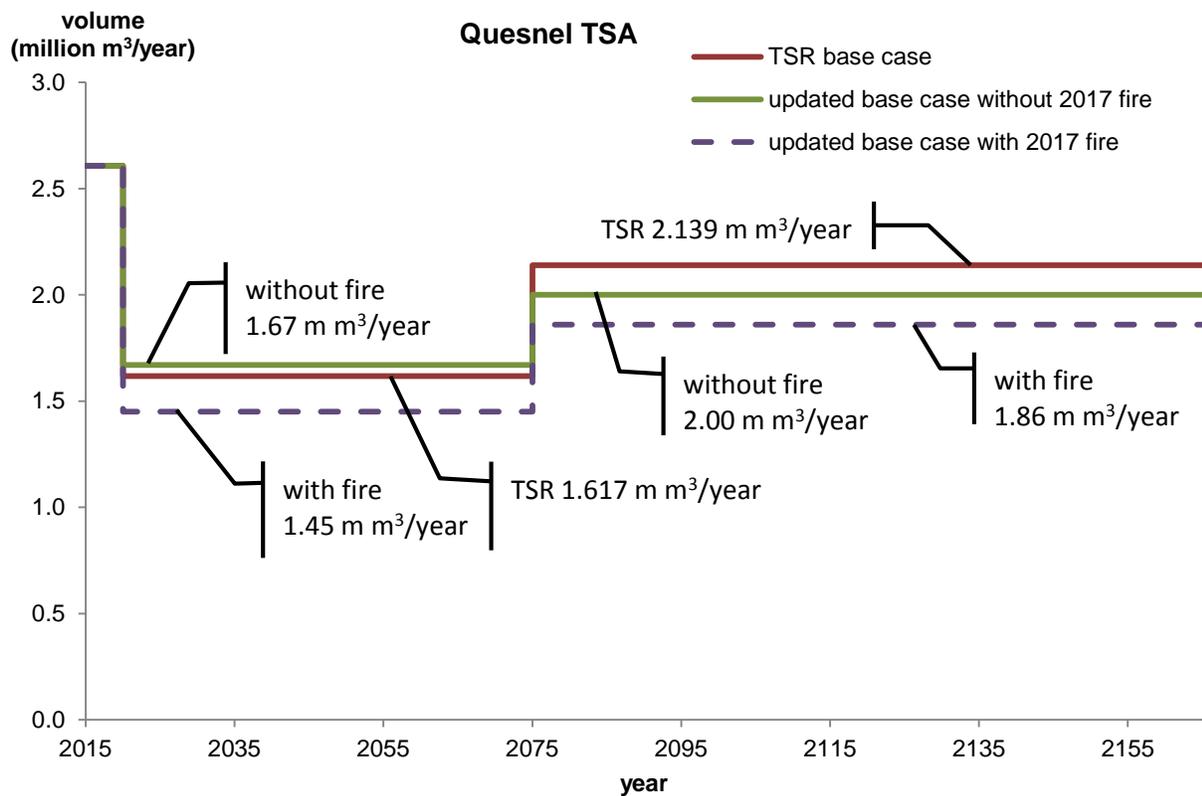


Figure 5. Updated timber supply projection for Quesnel TSA.

**Williams Lake TSA**

The current AAC for Williams Lake TSA was set in February 2015 at 3 000 000 cubic metres per year, of which a maximum of 1 500 000 cubic metres is from live coniferous trees. Figure 6 shows three timber supply forecasts that include the base case forecast (most likely scenario) developed during the last timber supply review (TSR) to support the current AAC determined pre-fire (red line), the base case forecast updated to reflect new inventory collected pre-fire (green line) and finally the base case updated to reflect new inventory and the 2017 fire losses (black-dashed line). The updated post-2017 fire timber supply projection for the Williams Lake TSA shows that the current AAC of 3 000 000 cubic metres per year can be maintained in the short term before it drops to 1 430 000 cubic metres in the mid term.

The timber supply projections also show that new inventory information, not counting volume losses due to the 2017 fires, increases the mid-term timber supply by 150 000 cubic metres per year relative to the TSR base case forecast however, accounting for the 2017 fire-related volume losses decreases the mid-term timber supply by 140 000 cubic metres per year bringing it almost in line with the mid-term timber supply level reflected in the TSR base case. The reduction in mid-term timber supply is again about 10% relative to updated base case pre-fire. The revised forecasts suggest that the current AAC does not need to change and mid-term timber supply is not significantly reduced relative to the TSR base case.

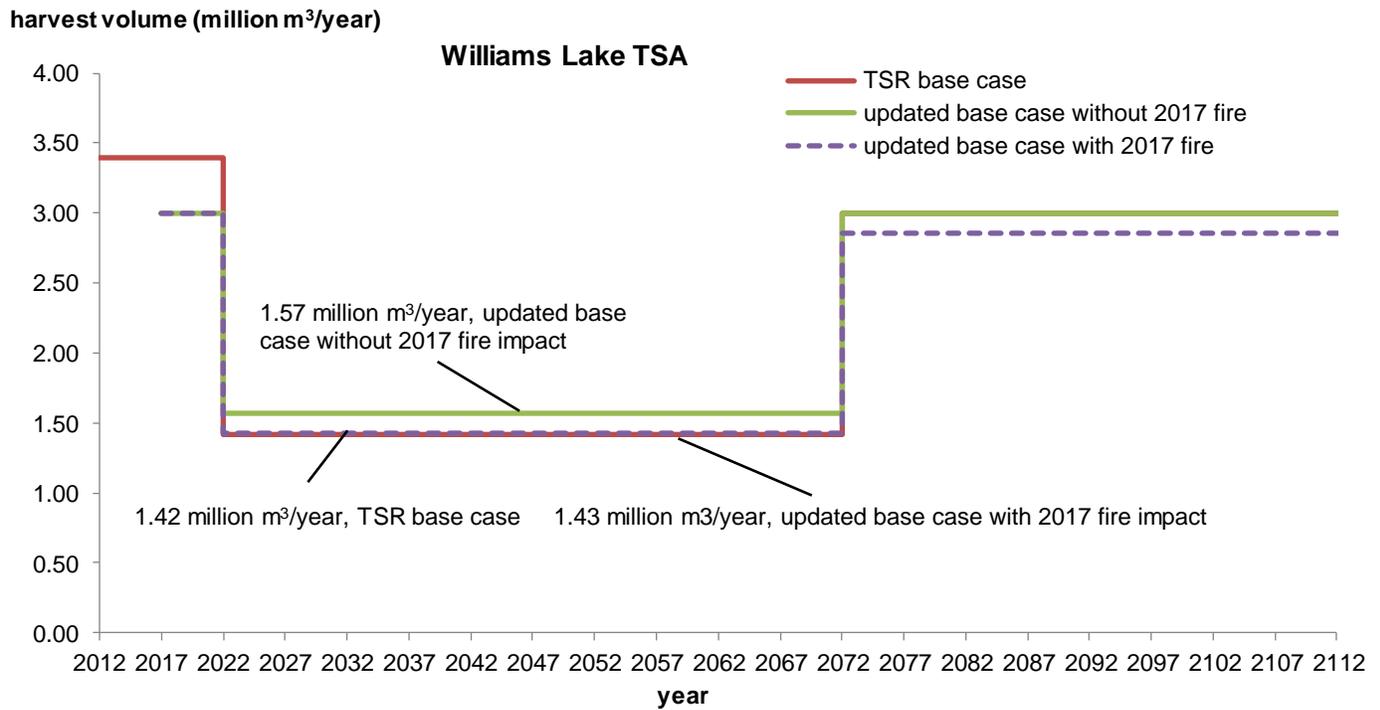


Figure 6. Updated timber supply projection for Williams Lake TSA.

**100 Mile House TSA**

The current AAC for 100 Mile House TSA is 1 948 002 cubic metres per year, of which a maximum of 477 707 cubic metres is from live coniferous trees. The AAC was set in November of 2013 and adjusted in 2014 to reflect the creation of the Clinton Community Forest. Figure 7 shows three timber supply forecasts that include the base case forecast (most likely scenario) developed during the last timber supply review (TSR) to support the current AAC determined pre-fire (red line) and well as that base case forecast updated to reflect new inventory collected pre-fire (green line) and finally an updated base case forecast based on the new inventory updated to reflect the 2017 fire losses (black-dashed line). The updated post-2017 fire timber supply projection for the 100 Mile House TSA shows that the current AAC of 1 948 002 cubic metres per year can be maintained in the short term before it drops to 840 000 cubic metres in the mid term.

The timber supply projections also show that new inventory information, not counting volume losses due to the 2017 fires, increases the mid-term timber supply by 10 000 cubic metres per year relative to the TSR base case forecast however, accounting for the 2017 fire-related volume losses decreases the mid-term timber supply by 50 000 cubic metres per year (about a 6% decrease) relative to the TSR base case. The revised forecasts suggest that the current AAC does not need to change but mid-term timber supply is reduced relative to the TSR base case.

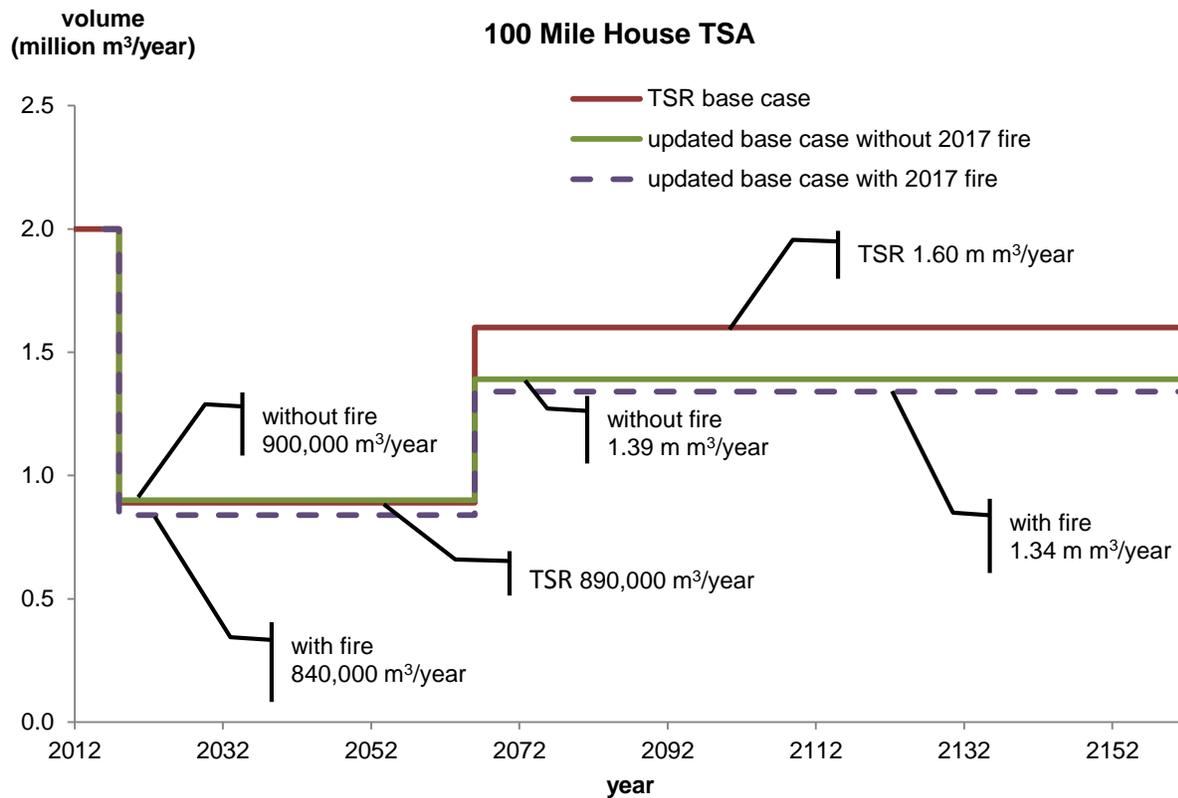


Figure 7. Updated timber supply projection for 100 Mile House TSA.

In all three cases, mid-term timber supply impact is less than the land base impact. This is due to three reasons. The first reason is that a significant portion of the stands burned within the fire perimeters were pine-leading stands much of which was killed prior to the fire and did not contribute to mid-term timber supply. The second reason is that as noted above, not all stands within the fire perimeter burned leaving some remaining green stands to contribute to mid-term timber supply. Thirdly, the new inventory information collected in all three TSAs since the last determination indicated more green volume than the older inventories indicated.

Long-term timber supply is generally lower in the updated base case forecasts for two reasons. The first reason is that much of the burned area was previously forecast to be harvested and planted to managed stands. In the updated base case with fire, this area is now modelled as burnt stands that regenerate naturally and grow on a lower yield curve as a result. Secondly, for the Quesnel and 100 Mile House TSAs, a revised definition of what constitutes managed stands was used in both the updated base cases, with and without fire. An age (e.g., stands < 50 years) has traditionally been used in the timber supply review process to define harvested stands which are considered managed. Recently, much work has been done by ministry staff using corporate silvicultural records to define which harvested stands are considered managed. This change in definition of managed stands reduced the number of stands considered managed and again led to more stands being placed on a lower natural stand yield curve. This in turn reduced long-term timber supply.

**Conclusions**

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- The 2017 fires have had an influence over large areas – about 1.0 million hectares – in the Cariboo Region including the Quesnel, Williams Lake and 100 Mile House TSAs.
- Retention planning is key to successful salvage harvesting. The recent January 2018, *Post-Natural Disturbance Forest Retention Guidance: 2017 Wildfires* provides guidance on retention planning with the focus on planning what to retain in fire-impacted areas prior to determining what to salvage.
- Updated timber supply projections for the three TSAs in the Cariboo Region suggest that current AACs do not need to change as long as they remain focused on salvage of dead trees.
- Changes in mid-term timber supply (post salvage) are 10% or less depending on management unit but this level of impact is predicated on short-term harvest remaining focused on salvage.
- There may be a need for the chief forester to re-consider current partitions; the portion of the AAC is attributable to certain types of timber such as live trees, to help ensure that salvage harvesting does not unduly impact mid-term timber supply in these three TSAs.
- These three TSAs were already heavily impacted by the mountain pine beetle thus, the impact of the 2017 fires will add additional downward pressure on timber supply in the mid term once short-term salvage harvesting ends.