

Impacts of 2018 Fires on Forests and Timber Supply in British Columbia



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

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Ministry of
Forests, Lands, Natural
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Executive Summary

The 2018 wildfires in British Columbia (B.C.) affected about 1.3 million hectares, the largest impact on record (~100-years' of records) for a single fire season – and 8.5 times larger than the average annual area burned (154,000 hectares). The 2017 wildfires had the previous largest impact, affecting 1.2 million hectares.

The 2017 wildfires were concentrated in management units that had experienced high-to-very-high levels of pine killed by the mountain pine beetle since 1999. In contrast, the 2018 wildfires were more dispersed but still affected some management units highly impacted by the mountain pine beetle.

About 980,000 hectares (~73%) of the 2018 wildfire-impacted areas occurred in six timber supply areas (TSAs): the Cassiar, Lakes, Great Bear Rainforest North, Prince George, Fort Nelson, and Morice TSAs. In contrast, about 1 million hectares (80%) of the 2017 wildfires occurred in the Cariboo Region with the most severely affected management units being the Quesnel, Williams Lake, and 100 Mile House TSAs.

The 2018 fires affected about one million hectares of area that was not considered harvestable either because of economic reasons or the area was reserved from harvest to provide for non-timber values. The 2018 fires impacted over 400,000 hectares of parks and protected areas, over 300,000 hectares designated as wildlife areas (such as ungulate winter ranges and wildlife habitat areas), about 130,000 hectares in old growth management areas, and over 200,000 hectares in scenic areas (areas managed for visual resource values). These areas can overlap (one hectare can provide for one or more values).

About 300,000 hectares (23%) of the area impacted by the 2018 fires occurred in the timber harvesting land base (THLB)^a, the area that is legally available and economic to harvest. The units most affected in terms of having the most forest areas within the perimeters of the 2018 fires and within the THLB were the Prince George, Morice, Lakes, Quesnel, and Cassiar TSAs. In comparison, about 700,000 hectares (~58%) of the area impacted by the 2017 fires (within fire perimeters) was within the THLB.

In 2018, the B.C. Ministry of Forests, Lands, Natural Resource Operations and Rural Development (the “Ministry”) prepared *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) that is also applicable to the 2018 wildfires. 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.

^aTimber 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.

- 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 burned timber before the wood quality deteriorates.

To support this special review of the timber supply impacts from the 2018 wildfires:

- Fire severity mapping was completed to support salvage operations and update the forest inventory.
- Air call estimates of timber volume losses in severity mapping classes were completed.
- Forest inventories were updated to account for timber volume losses due to the 2018 fires using both the severity mapping and information from the air call estimates.

The average volume loss within the area affected by fire (within the fire perimeters) and within the THLB was 54% for the Morice TSA, 46% for the Prince George and Cassiar TSAs, 45% for the Lakes TSA, and 42% for the Quesnel TSA – averaging 45% for all the management units experiencing wildfires in 2018. Timber volume losses within the THLB were greatest in the Prince George, Morice, Lakes, Cassiar, and Quesnel TSAs.

The three TSAs whose live (green) timber volume losses in the THLB, as a per cent of the total live volume in the THLB, were greatest due to the 2018 fires are the Cassiar (5.6%), Lakes (5%), and Morice (2.9%) TSAs. Although 2018 fire losses were less in the Quesnel TSA (~1.5%), these losses are in addition to previous losses from the 2017 fires and the mountain pine beetle.

Assessments of the timber supply impacts from the 2018 fires have been completed for the Quesnel, Cassiar, Lakes, Morice, and Prince George TSAs – units most impacted by the 2018 fires. Based on the assessments, none of the allowable annual cuts (AACs)^b need to be re-determined immediately although some will likely be revisited prior to the previously planned AAC determination date.

^b **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.

Introduction

The B.C. Ministry of Forests, Lands, Natural Resource Operations and Rural Development regularly reviews the timber supply^c for all timber supply areas^d and tree farm licences (TFLs)^e in the province. This special review addresses the timber supply and forest impacts stemming from the 2018 wildfires in B.C.

As shown in Figure 1, the 2018 wildfires affected about 1.3 million hectares in B.C., the largest impact on record – even larger than the approximately 1.2 million hectares affected by the 2017 wildfires. The area burned in 2018 is 8.5 times larger than the average area burned annually (154,000 hectares) over the last 99 years; 43% of the total area affected by wildfires in the last 99 years was the result of the 10-largest wildfire years.

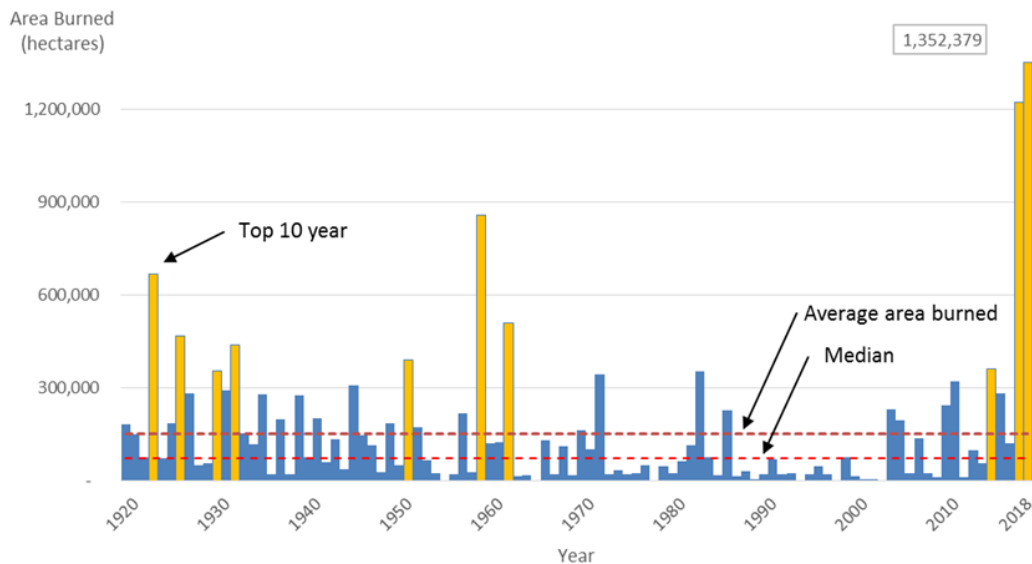


Figure 1. Annual area affected by wildfire provincially.

Overview of the Area and Volume within Fire Perimeters by Management Unit

Figure 2 shows the 2017 and 2018 fire perimeters overlaid on the cumulative percentage of merchantable forest volume killed since 1999 by the mountain pine beetle by management unit. The 2017 wildfires were concentrated in the Quesnel, Williams Lake and 100 Mile House TSAs – units with high-to-very-high merchantable forest volume killed by the mountain pine beetle. In contrast, the 2018 wildfires were more dispersed but still affected the Lakes and Quesnel TSAs, and the Vanderhoof portion of the Prince George TSA – units very highly impacted by the mountain pine beetle.

^c**Timber supply**

Timber supply is the amount of timber available for harvesting over a specified period of time.

^d**Timber supply areas (TSAs)**

Timber supply areas are integrated resource management units established in accordance with Section 7 of the Forest Act.

^e**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.

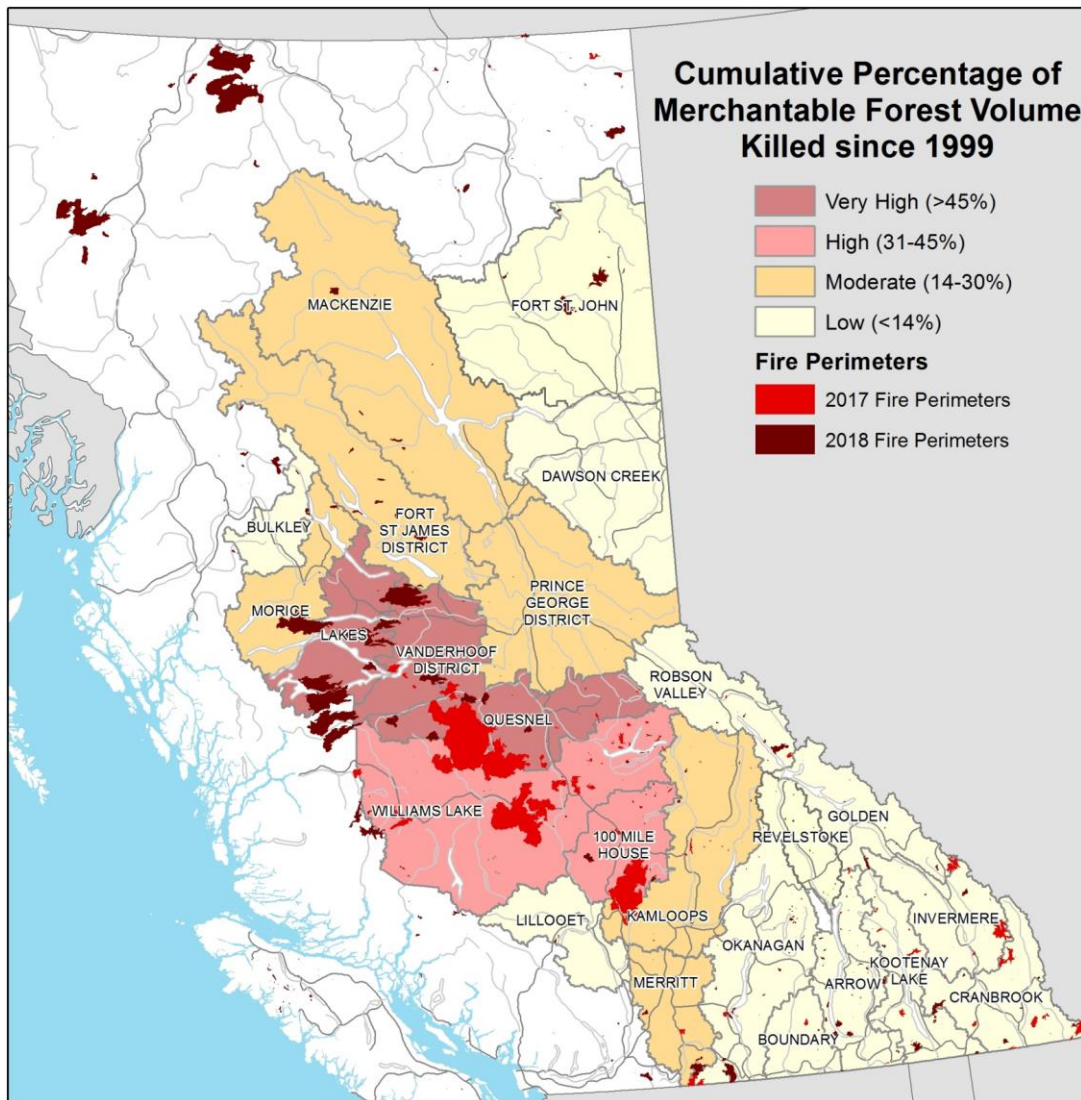


Figure 2. 2018 fire perimeters relative to the cumulative forest volume killed by mountain pine beetle since 1999.

As shown in Figure 3, the 2018 wildfires affected about 315,000 hectares in the Cassiar TSA, about 175,000 hectares in the Lakes TSA, about 165,000 hectares in the Great Bear Rainforest North TSA, about 123,000 hectares in the Prince George TSA, about 125,000 hectares in the Fort Nelson TSA, and about 73,000 hectares in the Morice TSA. These six TSAs accounted for about 980,000 hectares (~75%) of the 2018 wildfires. Numerous other management units (TSAs and TFLs) were also impacted to a lesser degree by the 2018 wildfires. In contrast, about 1 million hectares (80%) of 2017 wildfires occurred in the Cariboo Region with the most severely affected management units being the Quesnel, Williams Lake and 100 Mile House TSAs.

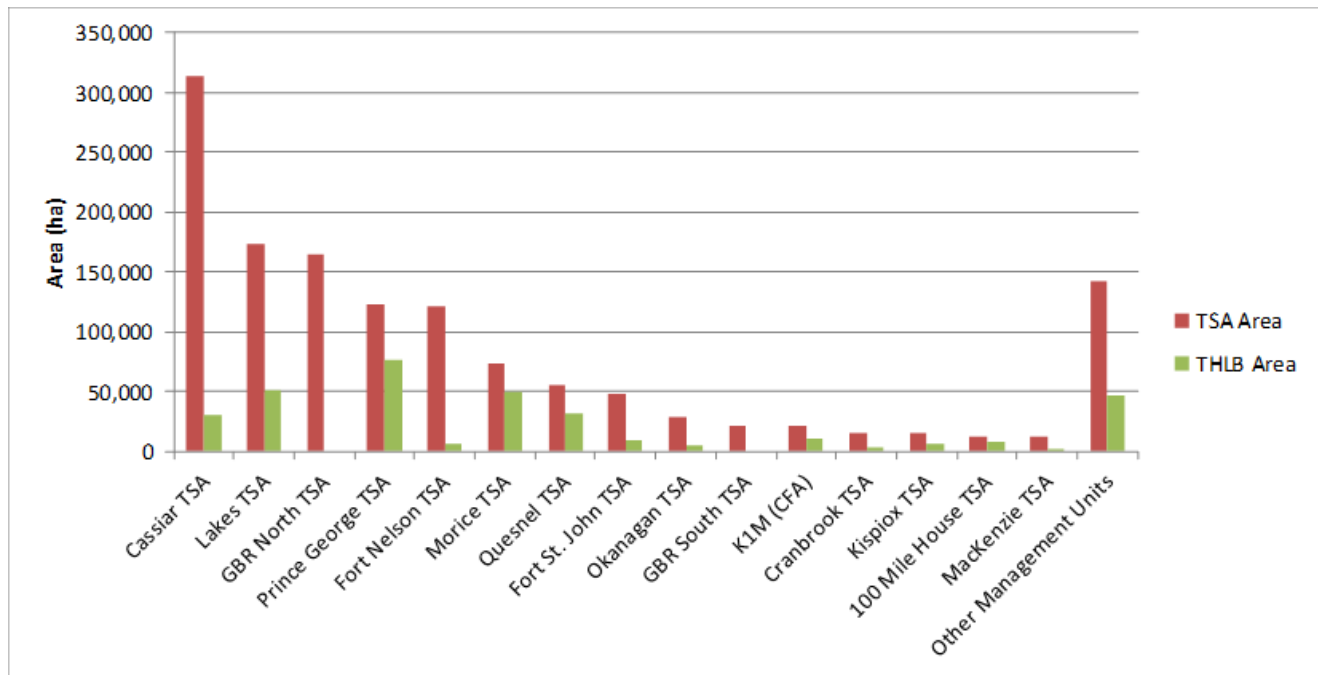


Figure 3. 2018 fire perimeters relative to timber harvesting land base.

Of the 1.3 million hectares impacted by the 2018 wildfires, about 300,000 hectares (~23%) were within the THLB, the area that is legally available and economic to harvest. As shown in Figure 3, the units where the THLB area was most affected by the 2018 wildfires were the Prince George, Morice, Lakes, Quesnel, and Cassiar TSAs. In comparison, of the 1.2 million hectares impacted by the 2017 wildfires, about 700,000 hectares (~58%) were within the THLB. *Note that only a portion of the timber within fire perimeters is actually burned; so, not all 300,000 hectares of THLB impacted by the 2018 fires would actually be burned – some timber would be salvageable, some unsalvageable and some stands that the fire skipped would remain green.

The 2018 wildfires impacted a much higher percentage of areas set aside to protect non-timber values or areas not economic to harvest (see Figure 4) than the 2017 fires. Within the 2018 wildfire perimeters, over 400,000 hectares were in parks and protected areas, over 300,000 hectares were in wildlife areas (such as ungulate winter ranges and wildlife habitat areas), about 130,000 hectares were in old growth management areas, and over 200,000 hectares were in scenic areas (areas managed for visual resource values). In Figure 4, K1M (CFA) refers to the Cheslatta Carrier Nation Community Forest Agreement impacted by the 2018 fires.

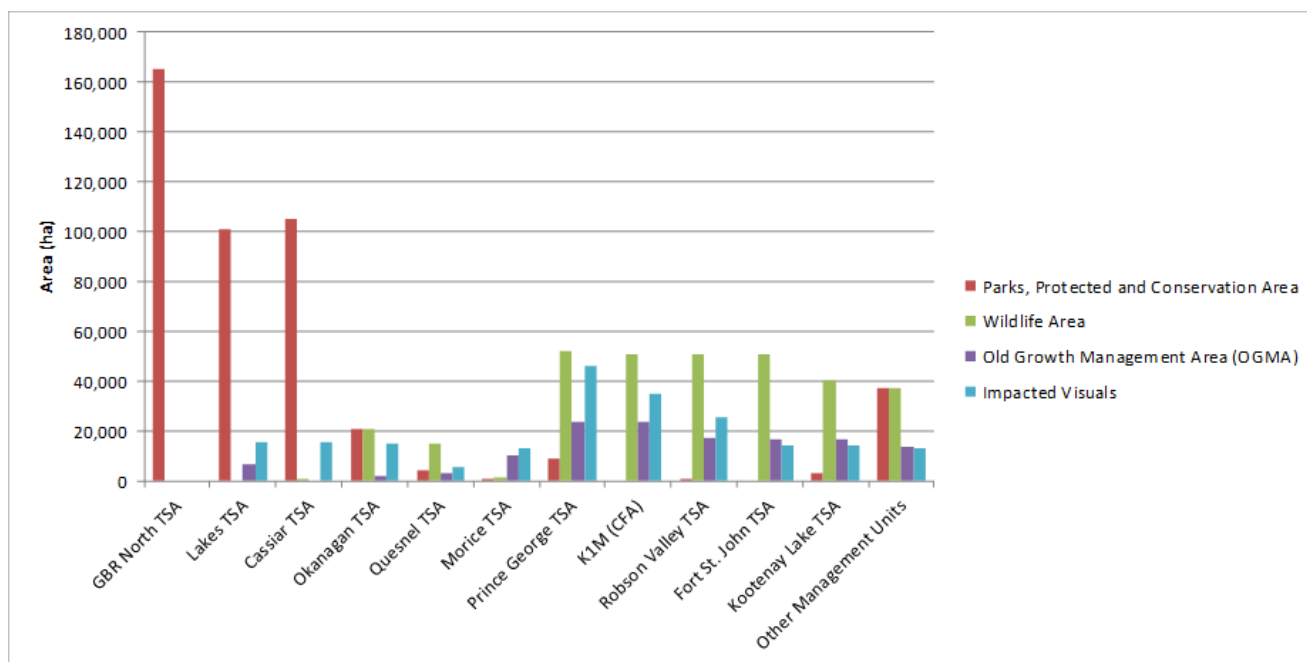


Figure 4. 2018 fire perimeters relative to areas designated for non-timber values.

Note: Some of the non-timber designations are overlapping meaning the same area can contribute to more than one objective in Figure 4.

Post-Natural Disturbance Forest Retention Guidance

There is an expectation that some of the stands that burned within the fire perimeters will be logged. To guide salvage operations, in 2018, the Ministry released *Post-Natural Disturbance Forest Retention Guidance: 2017 Wildfiresⁱ* 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. While the guidance was originally provided for retention planning to guide salvage harvesting in areas affected by the 2017 wildfires, it now also applies to salvage operations in areas affected by the 2018 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.

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

- Minimize impacts to timber supply by shifting logging from undamaged stands to damaged stands wherever possible.
- Recover value from the burned 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 over the short-term economic gain obtained from salvaging the burned timber. Retention planning should focus on what to retain, rather than on what to harvest.

Quantifying Fire Impacts within Fire Perimeters

To support the special review of the timber supply impacts from the 2018 wildfires on management units, the following was undertaken:

- Fire severity mapping was completed to support salvage operations and update the forest inventory.
- Air call estimates of timber volume losses in severity mapping classes were completed.
- Forest inventories were updated to account for timber volume losses due to 2018 fires using both the severity mapping and information from the air call estimates.

Figure 5 shows forest cover polygons themed by fire severity mapping classes based on the intensity of the burn. The colours in Figure 5 range from dark blue (essentially no impact), light blue (low intensity burn), brown (medium intensity), and yellow (high intensity). There were no severe intensity burn fire mapping classes in 2018. To determine timber volume impacts by fire severity mapping class, air call estimates of losses were completed. Example of ground photos for low, medium, and severe intensity burns, are shown in Figure 6 from left to right.

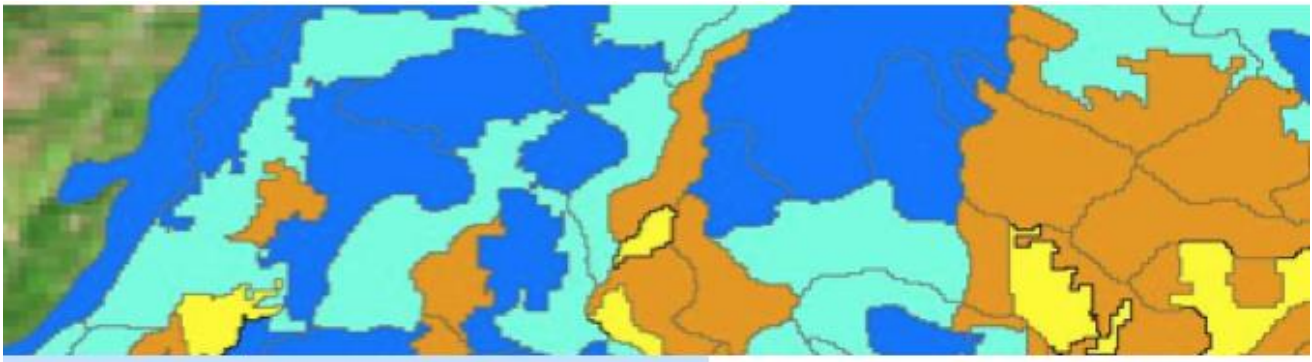


Figure 5. Forest cover polygons themed by fire severity mapping classes.



Figure 6. Example of ground photos for low, medium and high intensity burns, respectively.

Overall, the average THLB timber volume loss within fire perimeters was 54% for the Morice TSA, 46% for the Prince George and Cassiar TSAs, 45% for the Lakes TSA, and 42% for the Quesnel TSA – averaging 45% for all the management units experiencing wildfires in 2018. In comparison, average THLB volume losses within the 2017 fire perimeters was 54%. The timber volume losses could increase over the next few years as the trees injured by the 2018 fires die; there will be a need to reassess these losses on an on-going basis.

Figure 7 shows both the overall total forest volume losses, and the overall timber volume losses within the THLB, from the 2017 and 2018 fires. More forested volume burned in 2018 than in 2017, but less timber volume burned in the THLB in 2018 than in 2017. The live and dead volumes affected by fires reflect tree conditions prior to the 2018 fires with the dead volumes being a function of the previous mountain pine beetle mortality.

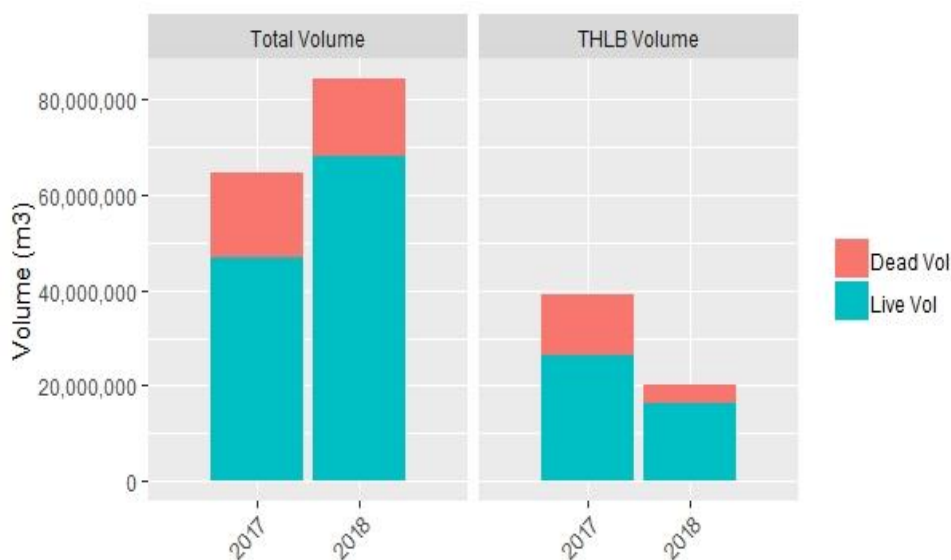


Figure 7. Overall forest volume losses, and timber volume losses within the THLB from 2017 and 2018 fires.

Figure 8 shows live (green) timber volume losses due to both the 2017 and 2018 fires expressed as a percentage of the total live volume within the THLB from the most impacted TSAs. The three most impacted TSAs include the Quesnel (12.7%), Williams Lake (6.7%), and 100 Mile House TSAs (5.9%) with losses

largely a result of the 2017 fires. The Quesnel TSA also experienced notable losses due to the 2018 fires. The Cassiar (5.6%), Lakes (5%) and Morice (2.9%) TSAs were the most fire-impacted units in 2018 in terms of live-volume losses expressed as a percentage of the total live volume within the THLB.

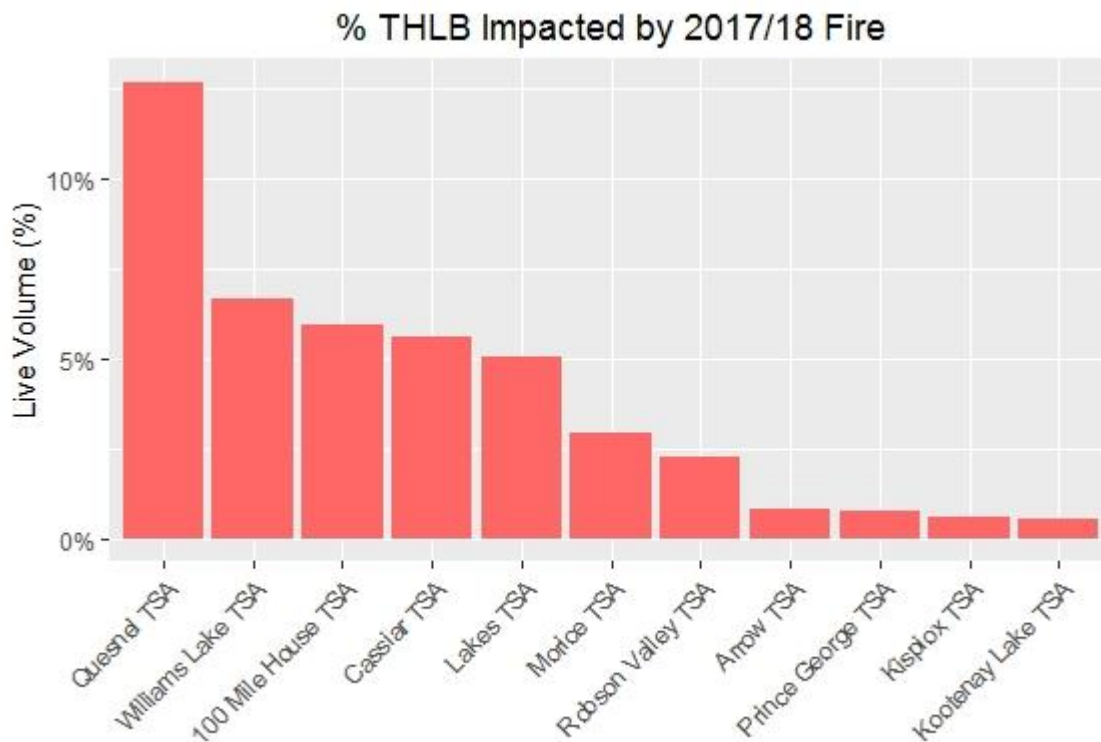


Figure 8. THLB live timber volume losses as percent of total THLB live volumes by management unit.

Timber Supply Impact

Staff from the Forest Analysis and Inventory Branch have reassessed the timber supply for the Quesnel, Cassiar, Lakes, Morice and Prince George TSAs as a result of the 2018 fires. This assessment was done to determine if the allowable annual cut in these management units needed to be revisited by the chief forester sooner than expected due to timber volume losses attributable to fire. A description of the impact of the 2018 fires on timber supply by management unit follows.

Quesnel TSA

The timber supply for the Quesnel TSA was assessed for the second time in two years as significant fire losses occurred in this unit in both 2017 and 2018. In 2017 about nine million cubic metres of live (green) timber volume and 7.8 million cubic metres of mountain pine beetle-killed timber volume burned within the THLB. In 2018, an additional one million cubic metres of live (green) timber volume and 500,000 cubic metres of mountain pine beetle-killed timber volume burned within the THLB.

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 based on an AAC partition. Figure 9 shows three timber supply forecasts: (1) the updated base-case forecast that is

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.

pre-2017 and 2018 fires that supported the last determination but was updated to reflect new forest inventory information (red line); (2) a timber supply forecast that reflects the new inventory and the 2017 fire losses (green line); and (3) a forecast that reflects the new inventory and both the 2017 and 2018 fire losses (black dashed line). Impacts of the 2017 fires are significantly larger than those experienced in 2018. In 2017, fires resulted in a mid-term impact (from 2020 to 2075) that is 13.2% lower than the updated base case; this reflects the live-volume losses of 11.4% due to the 2017 fires. In 2018, fire impacted the mid-term timber supply by 1.2% (relative to impacts from 2017 fires); this reflects the live-volume loss of 1.3% due to the 2018 fires. The forecast that reflects the impact of both the 2017 and 2018 fires suggests that the current AAC of 2,607,000 cubic metres per year can be maintained in the short term (until 2020) before it drops to 1,430,000 cubic metres in the mid-term. Long-term timber supply, starting in 2075, is reduced by 7% due to the 2017 and 2018 fires relative to the updated base case forecast.

The live, mid-term timber supply of 1,430,000 cubic metres per year is still above the partition maximum of 1,250,000 cubic metres per year that can be harvested from live coniferous timber, which means the current AAC does not appear to pose an immediate sustainability risk. A reassessment timber supply review is warranted for the Quesnel TSA, given the magnitude of disturbance on timber supply from the 2017 and 2018 fires. The timber supply review is expected to start this spring and culminate in an AAC decision in 2020.

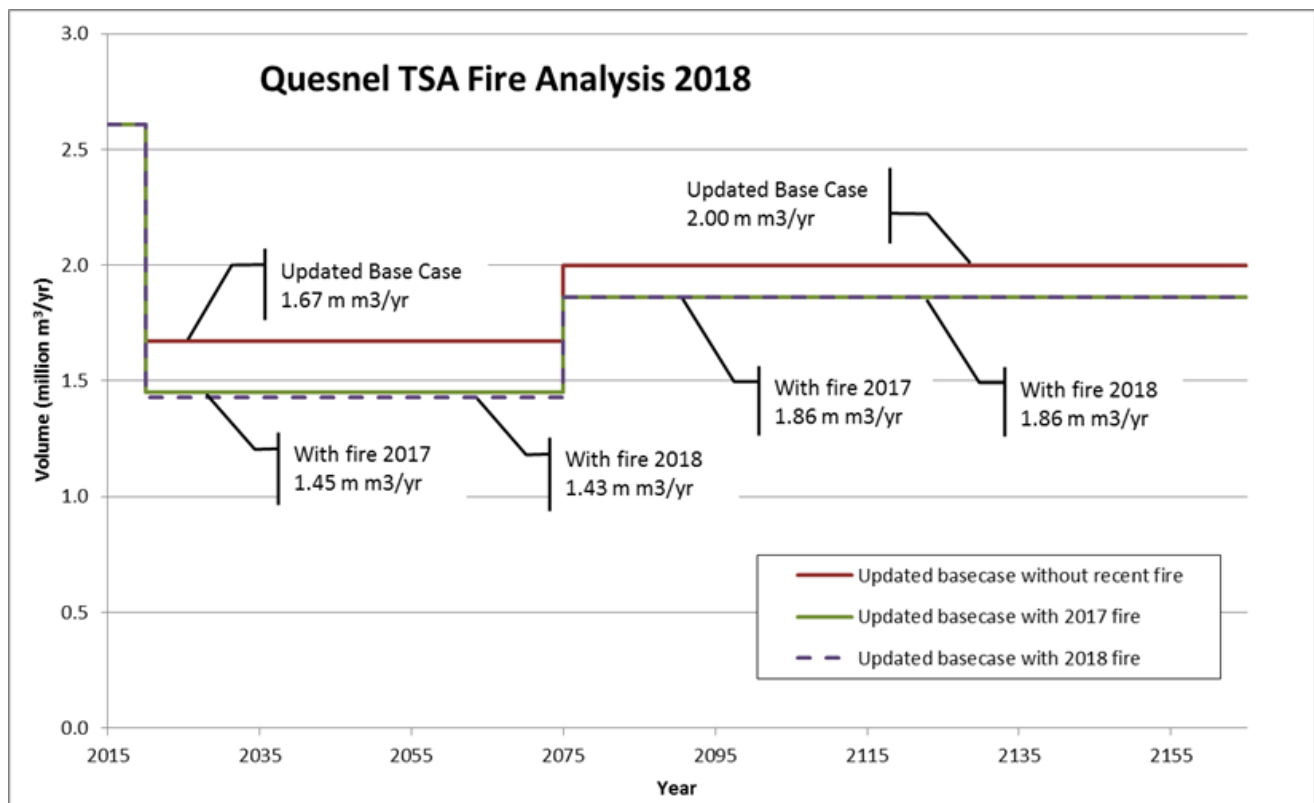


Figure 9. Updated timber supply projection for Quesnel TSA.

Cassiar TSA

The current AAC for Cassiar TSA was set in March 2015 at 196,000 cubic metres per year, of which, 80,000 cubic metres per year is attributable to the Iskut “A” operable block. In 2018, about 2.3 million cubic metres of live timber burned in the THLB, representing about 5.6% of its live timber. The burn area is mainly located in the Dease-Liard operable block, Iskut B operable block (centre-west block) and Park (east of centre-west Iskut B block). Only a small area in the Iskut A operable block burned.

The timber supply projections indicate that there is no short-term impact to the 2014 base-case projections. Impacts to the base case start more than 50 years into the projection. Harvesting has been well below the AAC from 2014 to 2018, averaging about 137,000 cubic metres per year, so there is no immediate need to revisit the AAC.

Lakes TSA

The AAC for Lakes TSA that was set in July 2011 at 2,000,000 cubic metres per year to facilitate dead pine salvage included a partition specifying that no more than 350,000 cubic metres per year be attributable to non-pine species. The current AAC for the Lakes TSA was adjusted to 1,648,660 cubic metres in September 2016 to reflect new area-based tenures (e.g., community forest agreements) that were deleted from the TSA. While the volumes from these new area-based tenures no longer contribute to the Lakes TSA AAC, the harvest from these tenures is still available locally.

In 2018, about 1.7 million cubic metres of live timber volume and 750,000 cubic metres of mountain pine beetle-killed timber volume was burned within the THLB. The burned live timber represents about 5% of the live timber within the THLB. This loss of live timber resulted in a proportional reduction in timber supply by about 5% in post-salvage, mid-term timber supply when timber supply is primarily predicated on live timber. The AAC for the Lakes TSA is currently under review and the loss in live volume resulting from the 2018 fires has been incorporated into the analysis that will support the upcoming AAC determination.

Morice TSA

The AAC for Morice TSA was set in March 2015 at 1,900,000 cubic metres per year, of which, no more than 1,600,000 cubic metres per year is attributable to live trees. The 2015 determination also set the AAC beginning in March 2020 to be 1,600,000 cubic metres per year.

In 2018, about 2.5 million cubic metres of live timber volume and 820,000 cubic metres of mountain pine beetle-killed timber volume burned within the THLB. The live timber that burned represents about 2.9% of the live timber within the THLB. This loss of live timber resulted in a proportional reduction in timber supply by about 3% in mid-term supply. The timing of the next timber supply review for the Morice TSA may be moved forward from 2025 because of the fires but no firm decision has been made.

Prince George TSA

The AAC for Prince George TSA was set in October 2017 at 8,350,000 cubic metres per year, and includes several geographic partitions to ensure harvest is distributed throughout the unit.

In 2018, about 2.9 million cubic metres of live timber volume and 1.1 million cubic metres of mountain pine beetle-killed timber volume burned within the THLB. The live timber that burned represents about 0.8% of the live timber within the THLB. The fires were primarily centred in the former Vanderhoof District portion of the Prince George TSA. Although 2.9 million cubic metres of live volume burned, it represents less than 1% of the live volume in the THLB and resulted in no impact to the timber supply forecast for this TSA. The timber supply model had enough flexibility to accommodate this level of loss; so, the AAC does not need to be immediately re-determined as a result of this assessment.

Conclusions

- The 2018 fires impacted about 1.3 million hectares of B.C. – even larger than the 1.2 million hectares impacted by the 2017 fires.
- About 980,000 hectares (73%) of the 2018 fires impacted the Cassiar, Lakes, Great Bear Rainforest North, Prince George, Forest Nelson, and Morice TSAs.
- About 300,000 hectares (23%) of the 2018 fires occurred within the THLB – much less than the 700,000 hectares of THLB impacted by the 2017 fires.
- The THLB in the Prince George, Morice, Lakes, Quesnel, and Cassiar TSAs were most impacted by the 2018 fires in terms of total fire perimeter area.

- Retention planning is key to successful salvage harvesting. The *Post-Natural Disturbance Forest Retention Guidance: 2017 Wildfires*, which is applicable also to the 2018 fires, provides guidance on planning what to retain in fire-impacted areas prior to determining what to salvage.
- Overall, the average timber volume loss within the 2018 fire perimeters and the THLB were 54% for the Morice TSA, 46% for the Prince George and Cassiar TSAs, 45% for the Lakes TSA, and 42% for the Quesnel TSA – averaging 45% for all the management units experiencing wildfires in 2018. In comparison, average THLB volume losses within the 2017 fire perimeters was 54%.
- The three TSAs whose live (green)-volume losses in the THLB, relative to total live volume in the THLB, were greatest due to the 2018 fires were the Cassiar (5.6%), Lakes (5%), and Morice (2.9%) TSAs. Although losses were less in the Quesnel TSA (~1.5%), these losses come on top of previous losses from the 2017 fires and the mountain pine beetle.
- The Forest Analysis and Inventory Branch assessed the timber supply impacts from the 2018 fires for the Quesnel, Cassiar, Lakes, Morice, and Prince George TSAs. Based on the assessments, none of the AACs need to be re-determined immediately although some will likely be revisited prior to the previously planned AAC determination dates.
 - The Quesnel TSA: The forecast that reflects the impact of both the 2017 and 2018 fires indicates that the current AAC of 2,607,000 cubic metres per year can be maintained until 2020 before it drops to 1,430,000 cubic metres. A new timber supply review is expected to start this spring and culminate in an AAC determination in 2020.
 - The Cassiar TSA: In 2018, about 2.3 million cubic metres of live timber burned within the THLB, representing about 5.6% of its live timber. The burn area is mainly located in the Dease-Liard operable block. The timber supply projections indicate that there is no short-term impact to the 2014 base case projections.
 - The Lakes TSA: The burned live timber from the 2018 fires represents about 5% of the live timber within the THLB, with a proportional 5% reduction in forecasted mid-term timber supply. The AAC is currently under review, and the loss of live volume from the 2018 fires has been incorporated into the analysis that will support the upcoming AAC determination.
 - The Morice TSA: The burned live timber from the 2018 fires represents about 2.9% of the live timber within the THLB with a proportional 3% reduction in forecasted mid-term timber supply. The timber supply review may be moved forward from 2025 because of the 2018 fires but no firm decision has been made.
 - Although the Prince George TSA had about 2.9 million cubic metres of live timber volume burned in 2018, this represents less than 1% of the total live timber in the THLB and resulted in no impact to the timber supply forecast for this TSA. The timber supply had enough flexibility to accommodate this level of loss; so, the AAC does not need to be immediately re-determined as a result of this assessment.