

# **Impacts of 2021 Fires on Forests and Timber Supply in British Columbia**

Forest Analysis and Inventory Branch  
Office of the Chief Forester  
Ministry of Forests

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## Executive Summary

The areas affected by wildfires in 2017 (1.2 million hectares), 2018 (1.3 million hectares) and in 2021 (0.9 million hectares) were the three largest in 102 years of recorded wildfire history in British Columbia.

The 2017 fires were mostly in the central interior of the province with three timber supply areas (TSA) (Quesnel, Williams Lake and 100 Mile House) accounting for about 80% of the area affected. The 2018 fires were spread across the northern interior of the province with six TSAs (Cassiar, Lakes, Great Bear Rainforest North, Prince George, Fort Nelson, and Morice) accounting for about 73% of the area burned. The 2021 fires were scattered across the southern interior of the province with five TSAs (Kamloops, 100 Mile House, Okanagan, Lillooet and Merritt) accounting for about 54% of the area burned. Three tree farm licences (TFL) (TFL 23, TFL 49 and TFL 59) account for a further 10% of the area burned in 2021. Almost all of these management units had previously experienced significant levels of lodgepole pine mortality during the mountain pine beetle epidemic which started in British Columbia (BC) since about 1999.

Wildfires occurred on the timber harvesting land base (THLB)<sup>a</sup> as well as the non-THLB. The THLB area within the fire perimeters was 700 000 hectares in 2017 (58% of total area), 300 000 hectares in 2018 (23% of total area) and 419 500 hectares in 2021 (54% of total area).

Within a fire perimeter some of the trees are completely burned, some can be salvaged for lumber production and some areas remain unburned. To guide salvage operations after the 2017 fires, the Ministry published *Post-Natural Disturbance Forest Retention Guidance: 2017 Wildfires* ([https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/forestry/2017\\_fire\\_report\\_revised.pdf](https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/forestry/2017_fire_report_revised.pdf)). Since the areas affected by wildfires were also significantly affected by the mountain pine beetle, the document focussed on what forested areas should be reserved from harvest to protect non-timber values rather than on salvaging whatever remained in the fire perimeters.

In any management unit, the allowable annual cut (AAC)<sup>b</sup> for the unit is directly related to the amount of timber on the THLB. After the 2017, 2018 and 2021 wildfires, staff from the Forest Analysis and Inventory Branch (FAIB) updated the forest inventories and assessed the timber supply projections for the most severely affected management units. These assessments were done to determine whether the AAC for those management units needed to be revisited by the chief forester sooner than expected due to timber volume losses attributable to fires.

To update the forest inventories, the following actions were taken:

- Fire severity mapping was completed.
- Ground sampling to estimate timber volume losses by severity class were completed.
- Forest inventories were updated to account for timber volume losses using both the fire severity mapping and information from the ground samples.

FAIB has determined that wildfires during the past five years do not pose a risk to timber supply for the Great Bear Rainforest North, Prince George, Fort Nelson, Morice TSAs. The most recent timber supply reviews for the Lakes and Okanagan TSAs have accounted for wildfires which have occurred during the past five years. Timber supply reviews which will account for all past wildfires are underway for the 100 Mile House, Lillooet, Quesnel and Williams Lake TSAs.

FAIB will assess the impacts of the fires to timber supply for the Cassiar, Merritt, and Kamloops TSAs. FAIB will also ask the licence holders of TFL 59, TFL 49 and TFL 23 to provide assessments of the impact of fires to timber supply for their TFLs.

### <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.*

### <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.*

**Introduction**

The BC Ministry of Forests regularly reviews the timber supply for all timber supply areas and tree farm licences (TFLs) in the province. This special review assesses the effect of the 2021 wildfires on timber supply and non-timber forest values in BC. Since the area burned in 2017, 2018 and 2021 are the three largest on record, this review will also assess the cumulative impacts of wildfires on timber supply for the period 2017 to 2021.

As shown in Figure 1, the 2021 wildfires affected about 863 000 hectares in BC, the third largest annual area of burn on record. In 2017, fires affected approximately 1.2 million hectares, and in 2018 fires affected approximately 1.3 million hectares of forested areas in BC. The area burned in 2021 is more than five times larger than the average area burned annually (158 381 hectares) over the past 102 years. The area burned during the 10 worst wildfire years account for 46% of the total area affected by wildfires during the last 102 years.

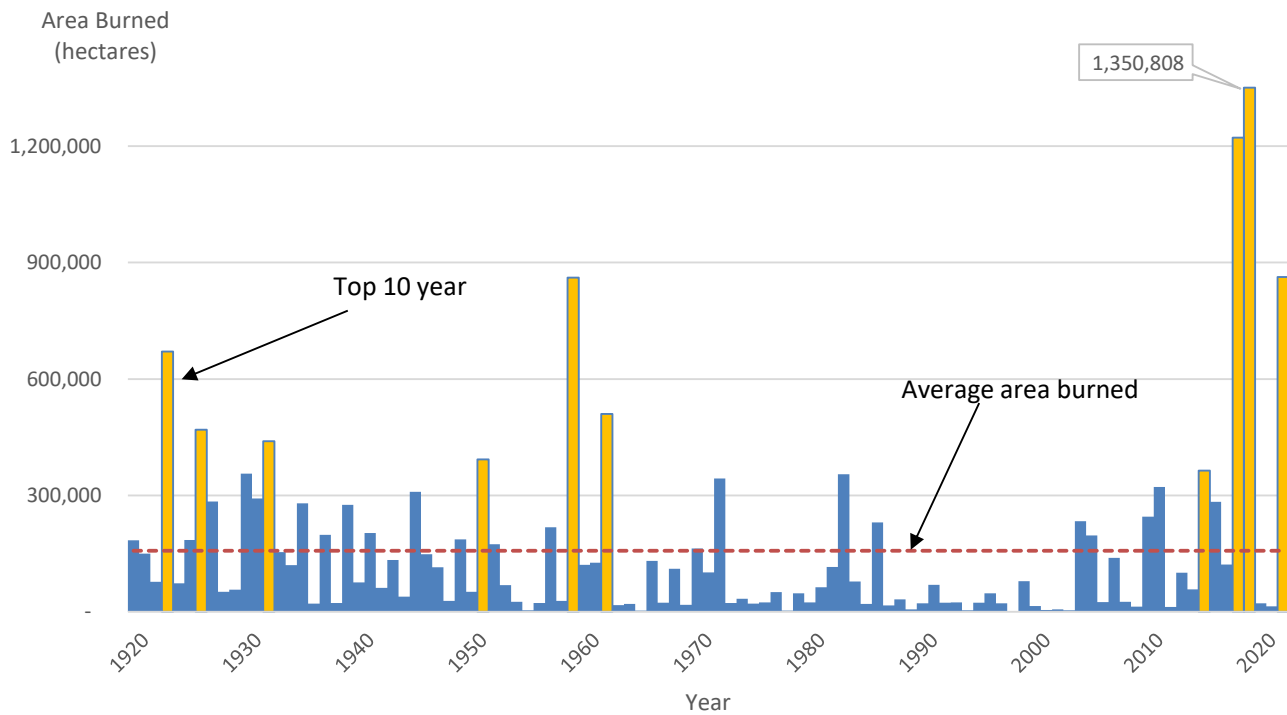


Figure 1. Annual area affected by wildfire in British Columbia.



Of the 863 000 hectares affected by the 2021 wildfires, about 419 500 hectares (~49%) were within the timber harvesting land base (THLB), the area that is legally available and economic to harvest. Figure 3 shows the THLB and the non-THLB areas within the 2021 wildfire perimeters for the more significantly affected TSAs and TFLs.

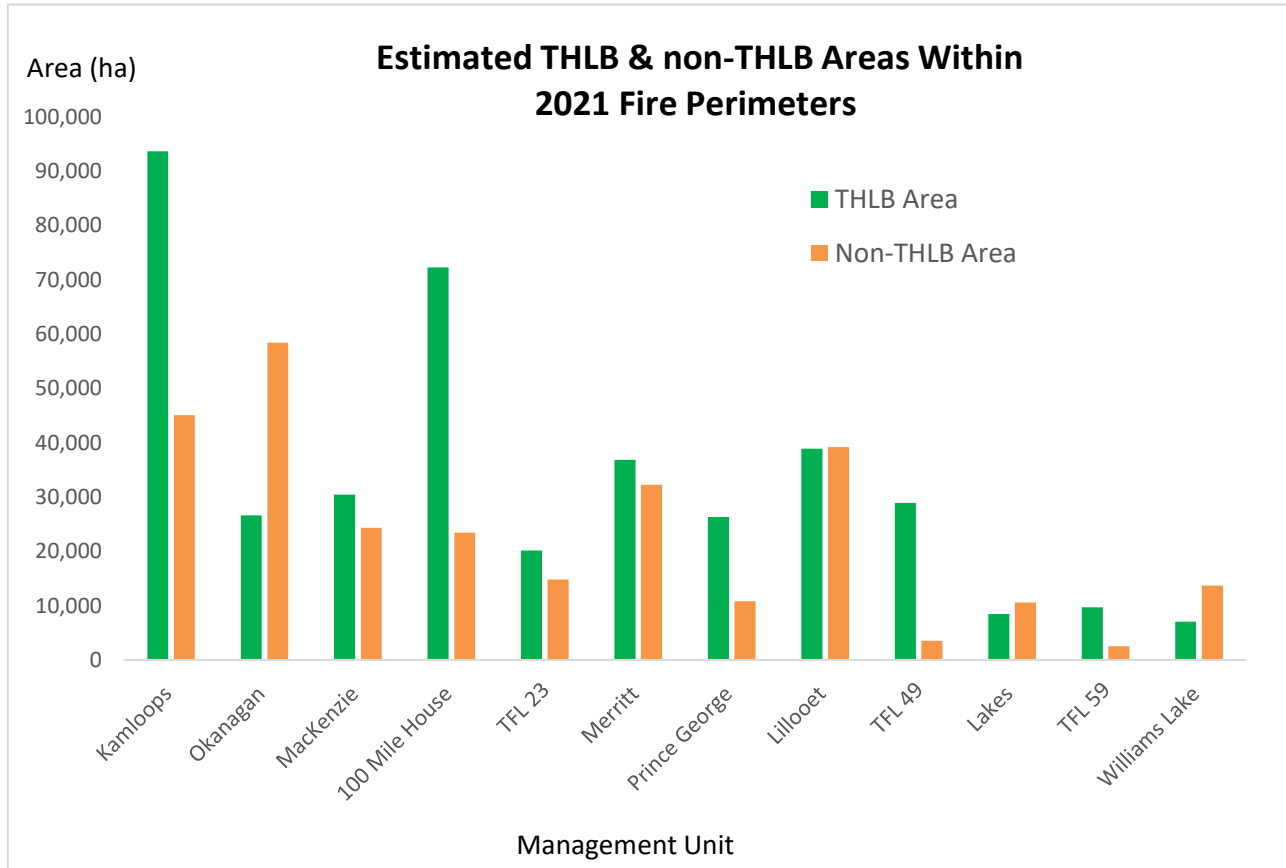


Figure 3. THLB and non-THLB areas within the 2021 wildfire perimeters.

To estimate the effects of the 2021 wildfires on timber volumes, the following actions were taken:

- Fire severity mapping was completed.
- Ground sampling to estimate timber volume losses by severity class were completed.
- Forest inventories were updated to account for timber volume losses due to 2021 fires using both the fire severity mapping and information from the ground samples.

FAIB is currently working on a document which will provide a more detailed description of the process used to quantify timber volume losses within the fire perimeters. Readers interested in learning more about this process may contact Tim Salkeld at [Tim.Salkeld@gov.bc.ca](mailto:Tim.Salkeld@gov.bc.ca) for a draft copy of the document.

Not all of the timber within a fire perimeter is consumed by the fire. Depending on the severity of the fire, some of the burned timber may be salvageable, some unsalvageable and some stands that the fire skipped would remain green.

Figure 4 shows the estimated live volume and burned volume (salvageable and unsalvageable) on the THLB within the fire perimeters for management units most affected by the 2021 wildfires. Of the 48 million cubic metres of timber on the THLB within the fire perimeters, approximately 50 percent remained unburned.

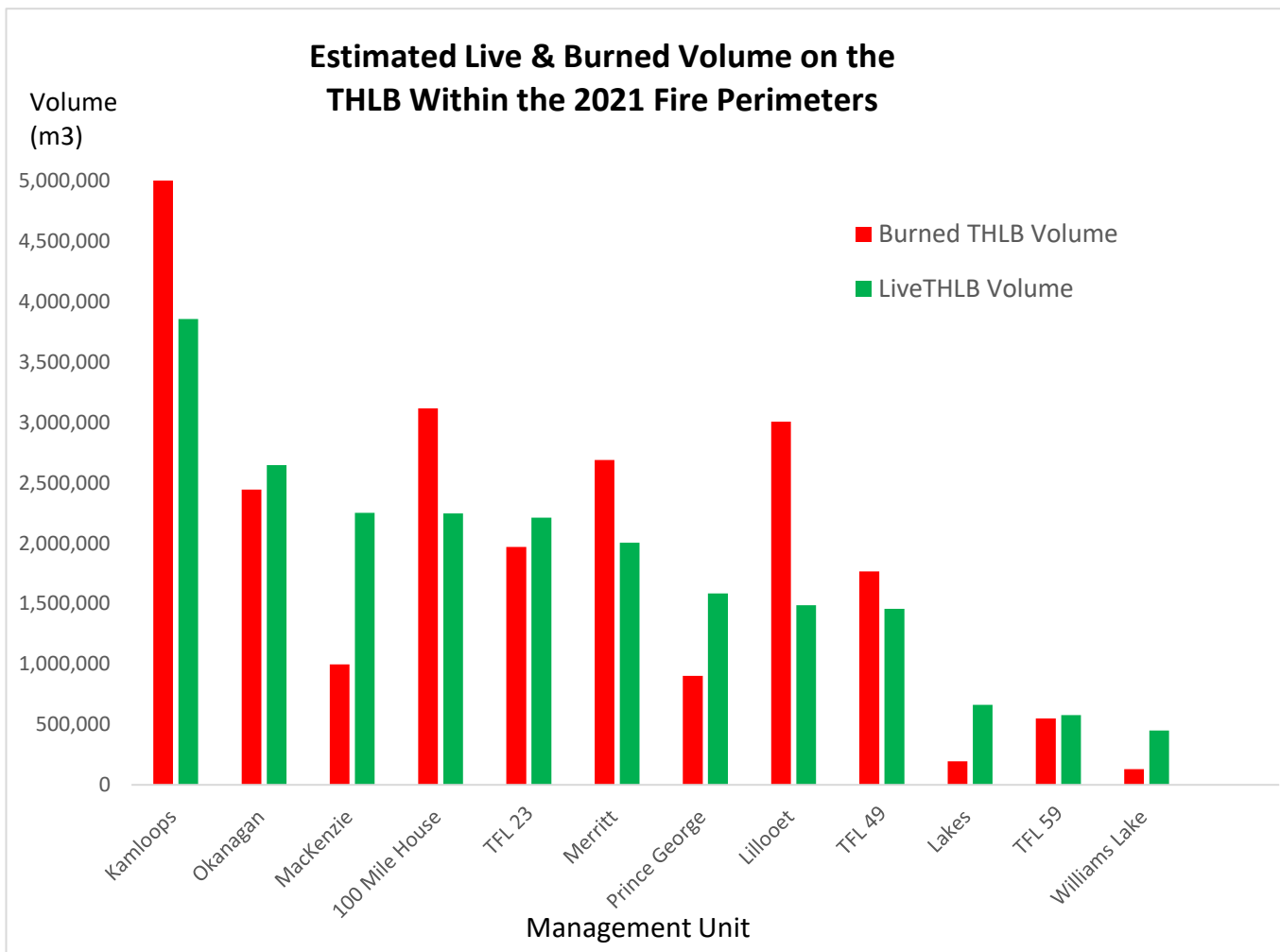


Figure 4. Live volume and burned volume on the THLB within the 2021 wildfire perimeters.

The timber supply for any management unit depends on the volume of timber on the THLB. Timber supply impacts would be greater for management units that had a greater proportion of THLB volume damaged. Figure 5 shows the burned volume of timber within the 2021 wildfire perimeters on the THLB expressed as a proportion of the total THLB volume for the management unit.

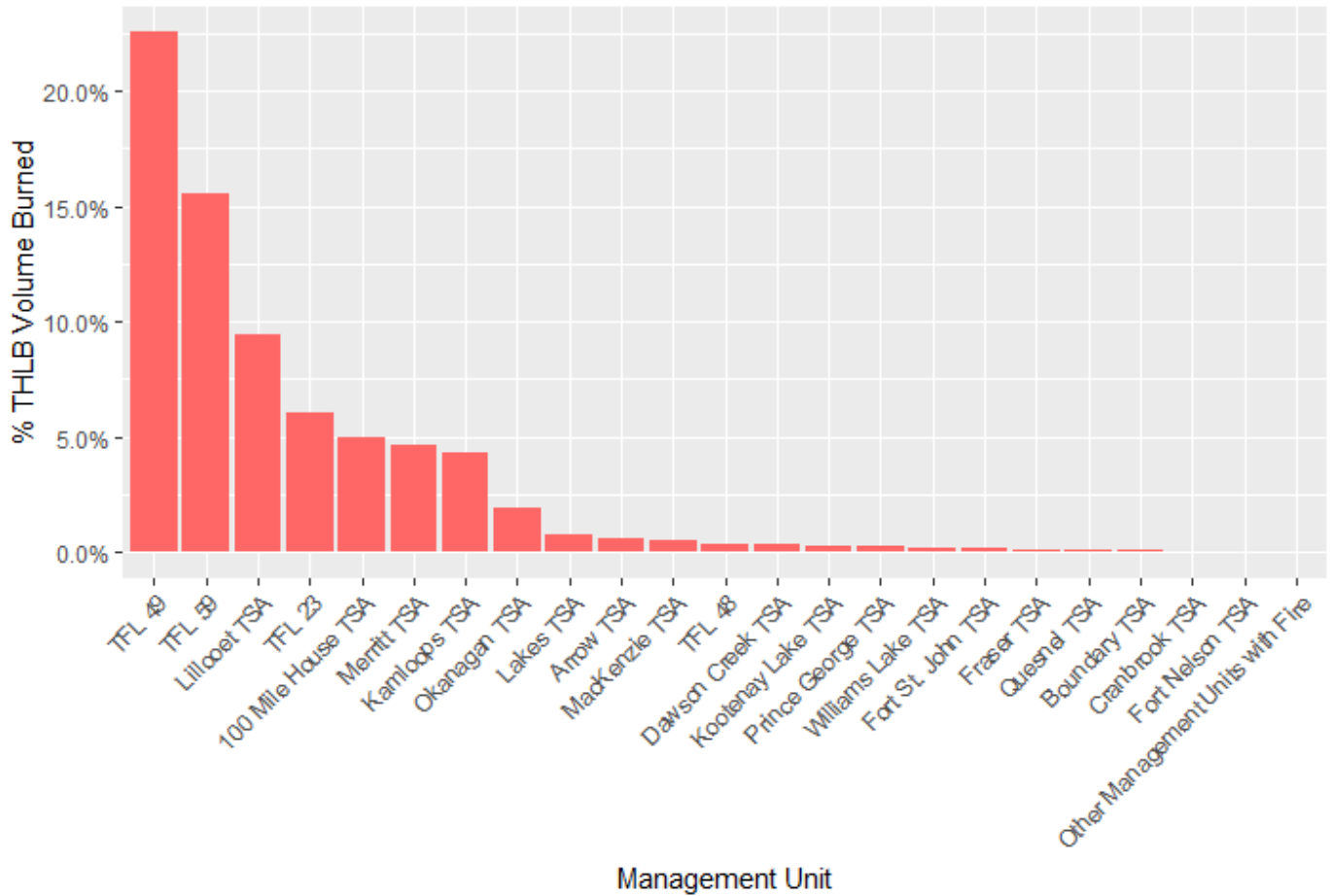


Figure 5. Burned timber volume within the 2021 wildfire perimeters on the THLB expressed as a proportion of total THLB volume.

The management units most affected by wildfires in 2021 were TFL 49 (23%), TFL 59 (16%), Lillooet TSA (9%) and TFL 23 (6%).

Non-timber forest values (e.g., wildlife habitat, scenic areas etc.) are provided by forests on the non-THLB as well as the THLB. Figure 6 shows the areas which are set aside to provide non-timber values that were within the 2021 wildfire perimeters. Approximately 108 000 hectares were in scenic areas (areas managed for visual resource values), 123 000 hectares were in parks and protected areas, about 56 000 hectares were in old-growth management areas and about 149 000 hectares were in wildlife areas (such as ungulate winter ranges and wildlife habitat areas). Some portions of scenic areas and wildlife habitat areas are usually in the THLB, whereas parks, protected areas and old-growth management areas are in the non-THLB.

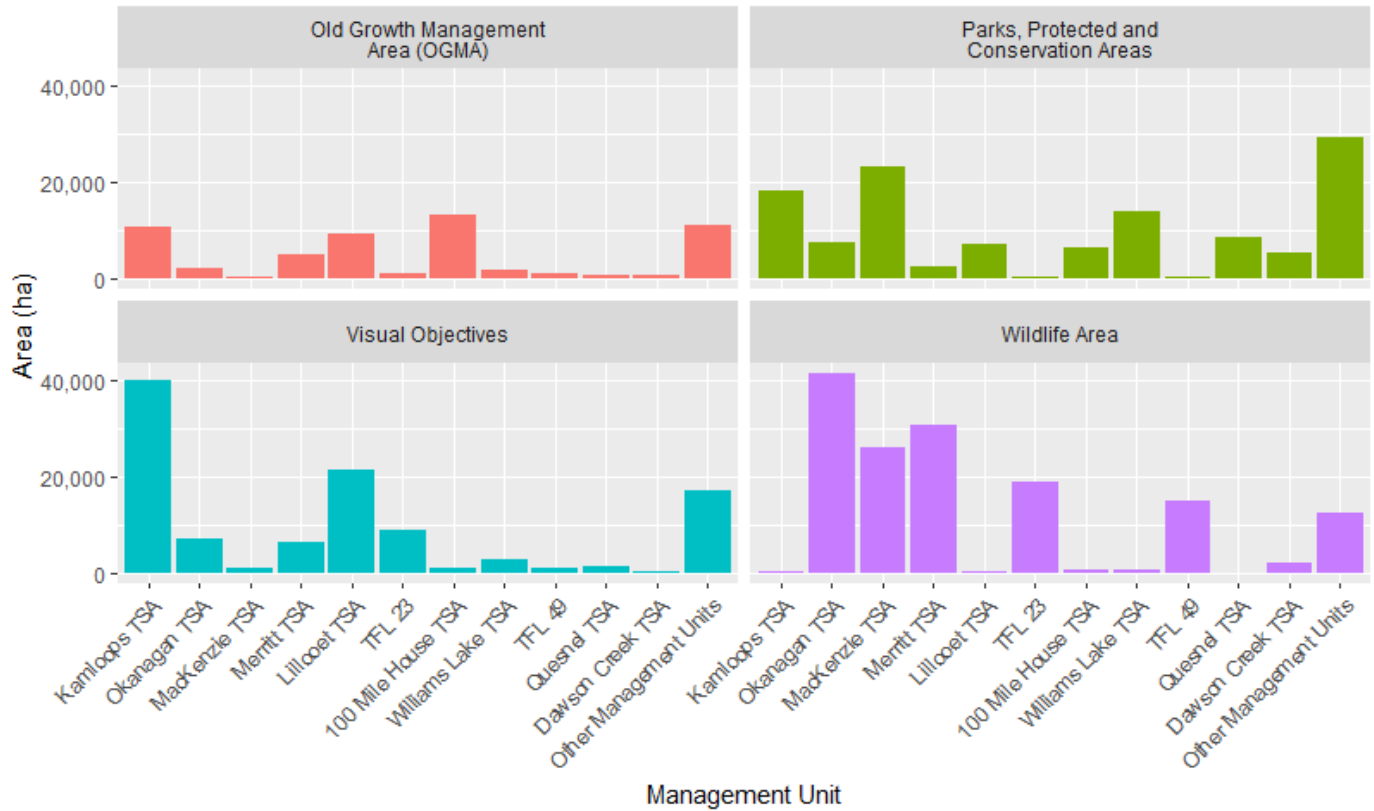


Figure 6. Areas designated for non-timber values within the 2021 wildfire perimeters.

Note: Some of the non-timber designations are overlapping, meaning some areas shown in Figure 6 can contribute to more than one forest value.



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## Post-Natural Disturbance Forest Retention Guidance

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It is expected that some of the stands that burned within the fire perimeters will be logged. To guide salvage operations following the 2017 fires, the Ministry prepared *Post-Natural Disturbance Forest Retention Guidance: 2017 Wildfires*<sup>1</sup>. The document, published in 2018, provides guidance for forest professionals who plan and implement timber salvage operations in areas that have experienced extensive natural disturbance. The guidance emphasized planning retention strategies before any harvest operations begin so as to support recovery at stand and landscape scales. Retention planning requires planning for landscape connectivity, interior forest condition, wildlife habitat, hydrologic function, mid-term timber supply, and intact ecosystem attributes (e.g., overstorey trees, vegetation communities, soils and other live and decaying forest structure).

While the guidance was originally provided for retention planning to guide salvage harvesting in areas affected by the 2017 wildfires, it also applies to salvage operations in areas affected by the 2018 and 2021 wildfires. Some of the highlights from that document 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 affected communities and Indigenous People.

When planning retention during salvage harvesting, there are six overarching points 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 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 is to be retained, rather than on what will be harvested.

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<sup>1</sup>See <https://www2.gov.bc.ca/gov/content/industry/forestry/managing-our-forest-resources/sustainable-forest-management-practices>.

**Cumulative Impact of Wildfires during the period 2017 to 2021**

Figure 7 shows the approximate location of the wildfires in BC during the period 2017 to 2021.

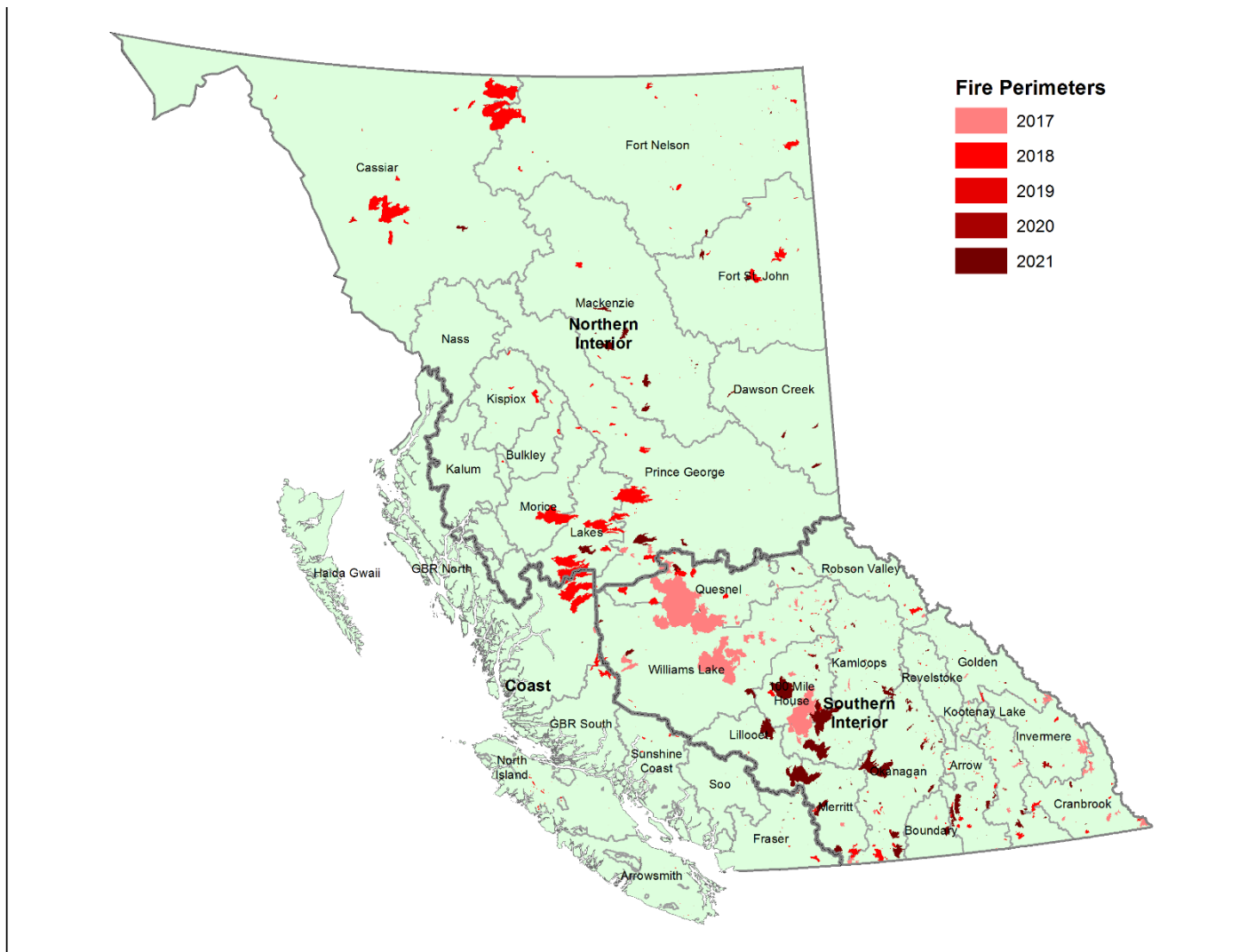


Figure 7. Location and extent of fire perimeters during the period 2017 to 2021.

The 2017 wildfires affected over 1.2 million hectares of which about one million hectares (83 percent) were in the Quesnel, Williams Lake and 100 Mile House TSAs. Since 1999, the mountain pine beetle (MPB) epidemic had killed a significant amount of the timber volume in these TSAs. It is estimated that about 30 percent of the timber volume affected by the wildfires in 2017 were previously killed by the MPB.

In 2018, wildfires affected about 1.3 million hectares in BC. Six TSAs (Cassiar, Lakes, Great Bear Rainforest North, Prince George, Fort Nelson and Morice) account for about 75 percent of the area within the 2018 wildfire perimeters. These fires were also in areas previously affected by the MPB.

The province experienced minimal fire activity in 2019 (22 000 hectares) and in 2020 (14 000 hectares). However, the area burned in 2021 (863 000 hectares) was the was the third largest annual area burned on record for BC. Five TSAs in the Southern Interior (Kamloops, 100 Mile House, Okanagan, Lillooet and Merritt) account for about 54 percent of the area within the 2021 wildfire perimeters.

Figure 8 shows the live THLB volume and the total live timber volume (THLB and non-THLB) within the fire perimeters for each of the past five years. Even though the area burned in 2017 was slightly smaller than the area burned in 2018 (1.2 *versus* 1.3 million hectares), the total live timber volume affected in 2017 was about 50 percent of the volume affected in 2018. This is because the TSAs affected in 2017 were also the ones most affected by the MPB which had killed greater than 30 percent of the timber volume in those TSAs. In 2018 the areas within the wildfire perimeters were not as severely damaged by the MPB as were the areas within the 2017 wildfire perimeters.

The THLB area within the fire perimeters was 700 000 hectares in 2017 (58% of total area), 300 000 hectares in 2018 (23% of total area) and 419 500 hectares in 2021 (49% of total area). Even though the area of THLB within the fire perimeter in 2018 was only about 43% of the area of the THLB within the fire perimeter in 2017, the live volume in the THLB affected in 2018 was about 83% of the volume affected in 2017.

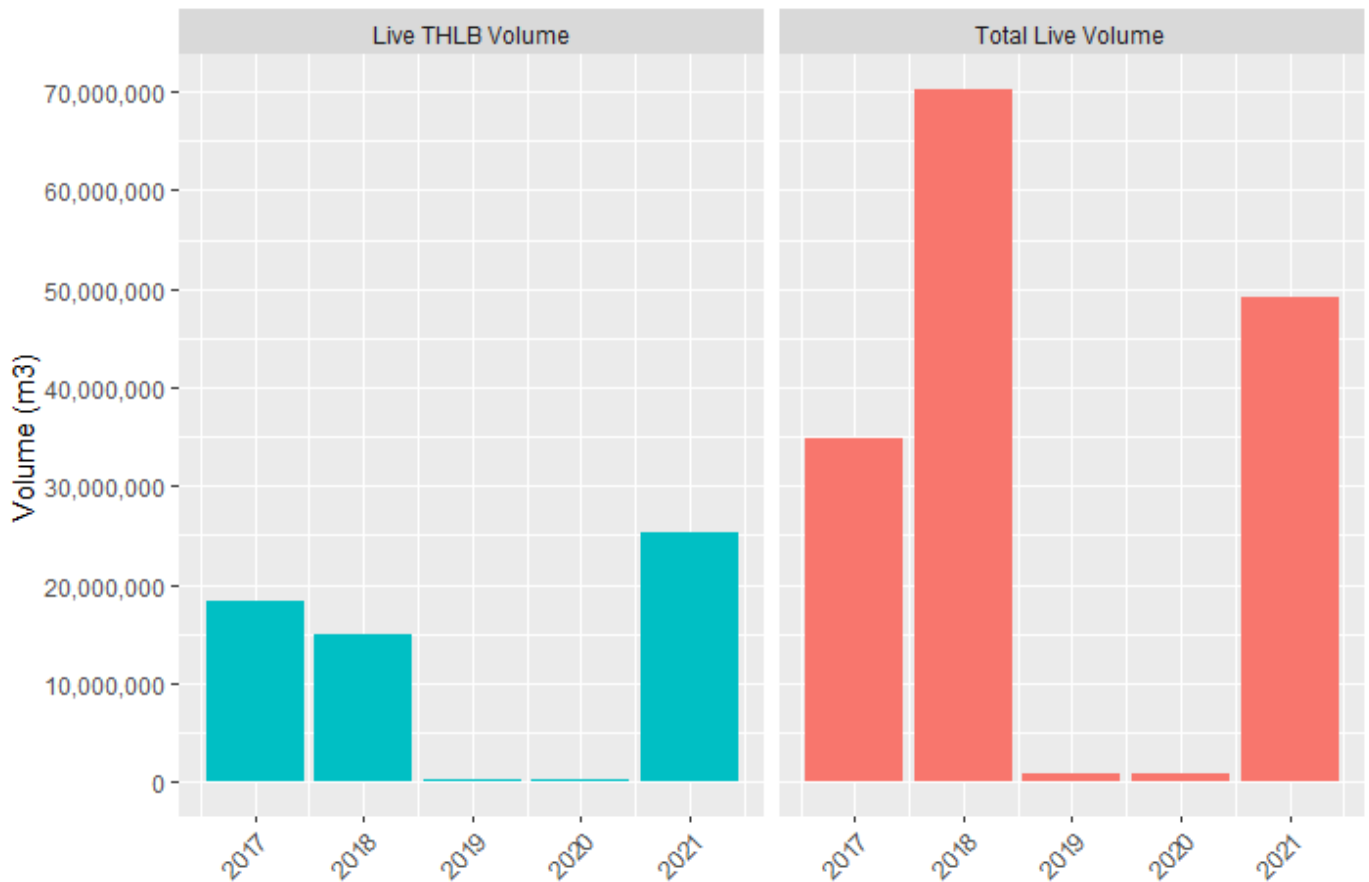


Figure 8. THLB live timber volume and total live timber volume within the fire perimeters, 2017 to 2021.

Non-timber forest values (wildlife habitat, scenic areas etc.) are provided by forests on the non-THLB as well as the THLB. Figure 9 shows the areas which are set aside to provide non-timber values that were within the wildfire perimeters for the period 2017 to 2021. Approximately 263 00 hectares were in scenic areas (areas managed for visual resource values), 691 000 hectares were in parks and protected areas), about 177 000 hectares were in old-growth management areas and about 546 000 hectares were in wildlife areas (such as ungulate winter ranges and wildlife habitat areas). Some portions of scenic areas and wildlife habitat areas may be in the THLB, whereas parks, protected areas and old-growth management areas are always in the non-THLB.

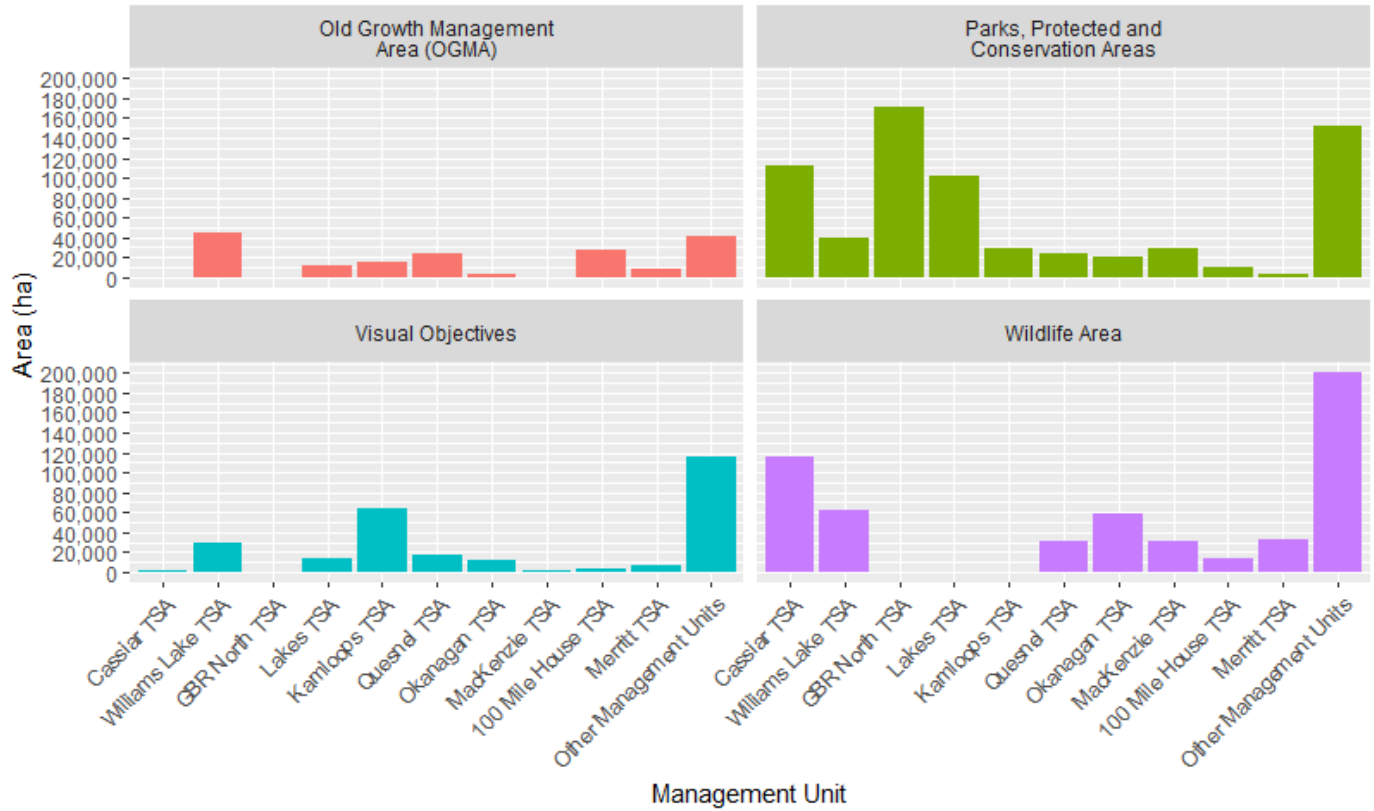


Figure 9. Areas designated for non-timber values within the wildfire perimeters 2017–2021.

Note: Some of the non-timber designations are overlapping, meaning some areas shown in Figure 9 can contribute to more than one forest value.

Figure 10 shows, by management unit, burned timber volume within the fire perimeters on the THLB expressed as a proportion of the total volume within the THLB for the period 2017 to 2021. TFL 49 (23%), Cassiar TSA (22%), TFL 59 (18%), 100 Mile House TSA (12%) and Lillooet TSA (10%) were the most significantly affected management units. Other management units with greater than five percent of the volume burned within the fire perimeters on the THLB are TFL 23 and Quesnel, Lakes, Williams Lake, Merritt and Kamloops TSAs.

In any management unit, the allowable annual cut (AAC) is directly related to amount of timber on the THLB for the unit. The following section discusses the impacts of the recent wildfires on timber supply and AACs for affected management units.

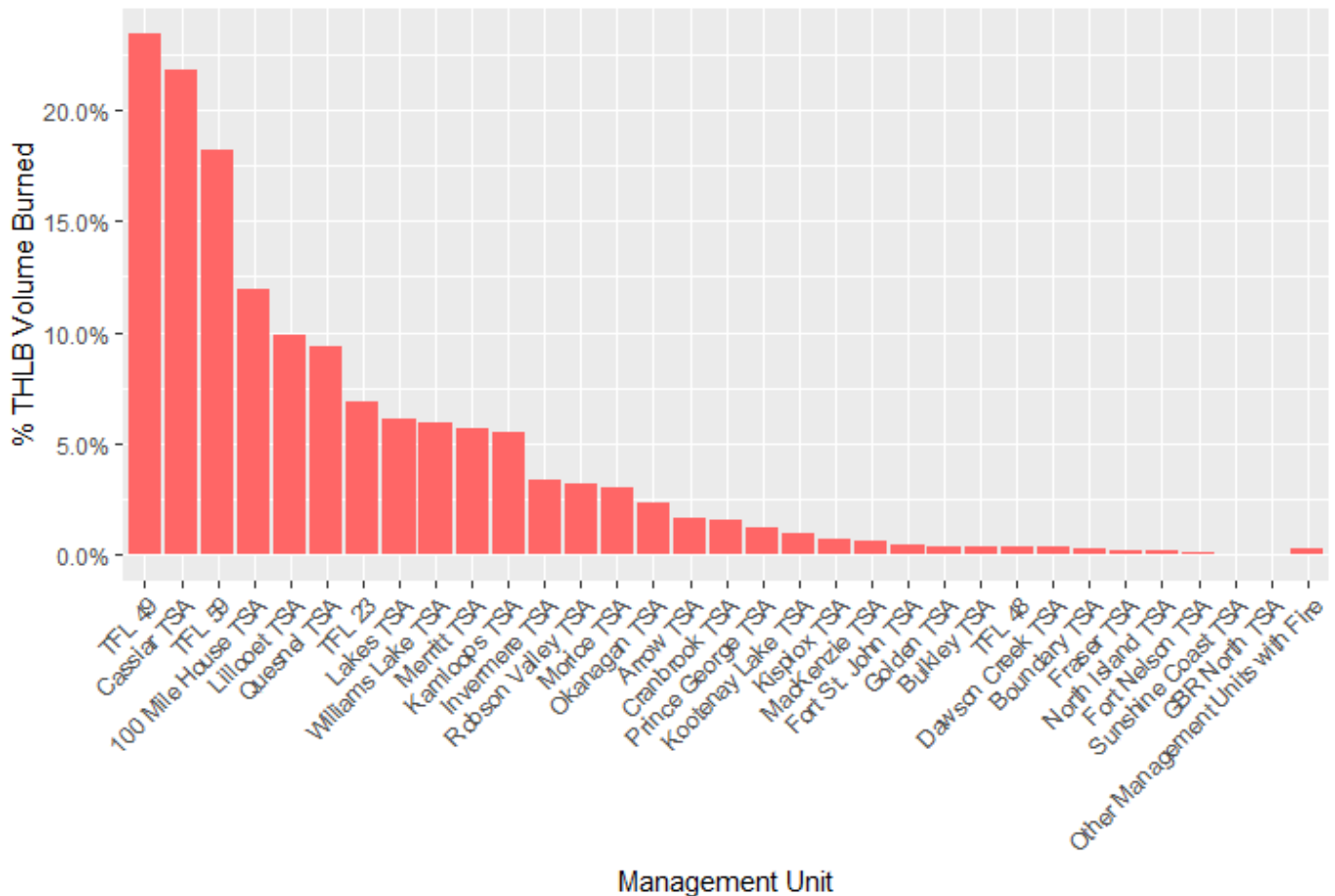


Figure 10. Burned timber volume within the fire perimeters on the THLB expressed as a proportion of total THLB volume by management unit for the period 2017 to 2021.

### Timber Supply Impact

After the 2017 wildfires, staff from the Forest Analysis and Inventory Branch updated the forest inventories and assessed the timber supply projections for the three most severely affected TSAs (Quesnel, Williams Lake and 100 Mile House). This assessment was done to determine if the AAC for these management units needed to be revisited by the chief forester sooner than expected due to timber volume losses attributable to fires. In addition to the wildfires, forests in these TSAs were also significantly damaged by the MPB. The results of the assessment were published in February 2018 in a report titled *Impacts of 2017 Fires on Timber Supply in the Cariboo Region* ([https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/forestry/stewardship/forest-analysis-inventory/impacts\\_2017\\_fires.pdf](https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/forestry/stewardship/forest-analysis-inventory/impacts_2017_fires.pdf)).

The report concluded that the current AAC for these TSAs do not need to be changed as long as licensees remain focussed on salvaging trees killed by the MPB.

Following the 2018 wildfires, staff updated the forest inventories and assessed the timber supply projections for the Cassiar, Lakes, Morice and Prince George TSAs. Timber supply for the Quesnel TSA was again assessed after the 2018 fires. This assessment was done because, in addition to the timber killed in 2017, the 2018 fires had damaged a further one million cubic metres of live trees on the THLB for the Quesnel TSA. The results of the assessment were published in April 2019 in a report titled *Impacts of 2018 Fires on Forests and Timber Supply in British Columbia* ([https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/forestry/stewardship/forest-analysis-inventory/impacts\\_of\\_2018\\_fires.pdf](https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/forestry/stewardship/forest-analysis-inventory/impacts_of_2018_fires.pdf)). For the Quesnel TSA, the report concluded that while the current AAC did not pose a sustainability risk, a timber supply review leading to a new AAC is warranted. The report noted that the Lakes TSA was already undergoing a timber supply review and that the timber supply analysis for that review will include the effects of the 2018 fires. Assessments for the Cassiar, Morice and Prince George TSAs indicated that there was no need to adjust the current AAC for those TSAs.

The province experienced minimal fire activity in 2019 (22 000 hectares) and in 2020 (14 000 hectares). However, Figure 5 shows that for 2021, the burned timber volume within the fire perimeters on the THLB as a proportion of the total THLB timber volume were greatest for TFL 49 (23%), TFL 59 (16%) and the Lillooet TSA (9%). Figure 10 shows the cumulative impacts of wildfires on THLB volume during the period 2017 to 2021. TFL 49 (23%), Cassiar TSA (22%), TFL 59 (18%), 100 Mile House TSA (12%) and Lillooet TSA (10%) were the most significantly affected management units. Other management units with greater than five percent of the volume burned within the fire perimeters on the THLB are TFL 23 and Quesnel, Lakes, Williams Lake, Merritt and Kamloops TSAs.

In every AAC rationale the chief forester states that the AAC decision could be revisited earlier than the 10-year duration of the AAC if there are major changes to the land base or management practices that could affect the decision. For TFLs, the licensee is responsible for providing timber supply analyses to the chief forester to determine the AAC. Given the fire impacts to timber volume on the THLB for TFL 49, TFL 59 and TFL 23, FAIB will request the TFL holders to provide timber supply assessments to determine whether the current AACs for these TFLs are sustainable.

FAIB has determined that wildfires during the past five years do not pose a risk to timber supply for the Great Bear Rainforest North, Prince George, Fort Nelson, Morice TSAs. The most recent timber supply reviews for the Lakes and Okanagan TSAs have accounted for wildfires which have occurred during the past five years. Timber supply reviews which will account for all past wildfires are underway for the 100 Mile House, Lillooet, Quesnel and Williams Lake TSAs. FAIB has decided that it will assess whether the cumulative impacts of fires during the past five years affects the sustainability of the AACs for the Cassiar, Merritt, and Kamloops TSAs.

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## Conclusions

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- The areas affected by wildfires in 2017 (1.2 million hectares), 2018 (1.3 million hectares) and in 2021 (0.9 million hectares) were the three largest in 102 years of recorded wildfire history in British Columbia.
- The 2017 fires were mostly in the central interior of the province. The 2018 fires were spread across the northern interior of the province, and the 2021 fires were scattered across the southern interior of the province. Almost all of areas within the fire perimeters had previously experienced lodgepole pine mortality during the mountain pine beetle epidemic.
- The 2021 wildfires affected about 863 000 hectares – the third largest annual area burned on record in BC. Six TSAs, Kamloops (139 000 hectares), 100 Mile House (96 000 hectares), Okanagan (85 000 hectares), Lillooet (78 000 hectares), Merritt (69 000 hectares), and Mackenzie (55 000 hectares) account for about 522 000 hectares (~60%) of the 2021 wildfires. Significant areas were also burned in TFL 49, TFL 59 and TFL 23. Some smaller woodlots were completely within the fire perimeters.

- During the past five years the volume of burned timber within the fire perimeters on the THLB expressed as a proportion of the total THLB volume for the management unit were TFL 49 (23%), Cassiar TSA (22%), TFL 59 (18%), 100 Mile House TSA (12%) and Lillooet TSA (10%). Other management units with greater than five percent of the volume burned within the fire perimeters on the THLB are TFL 23 and Quesnel, Lakes, Williams Lake, Merritt and Kamloops TSAs.
- After the 2017, 2018 and 2021 wildfires staff from FAIB updated the forest inventories and assessed the timber supply projections for the most severely affected management units. This assessment was done to determine whether the AAC for those management units needed to be revisited by the chief forester sooner than expected due to timber volume losses attributable to fires.
- FAIB has determined that wildfires during the past five years do not pose a risk to timber supply for the Great Bear Rainforest North, Prince George, Fort Nelson, Morice TSAs. The most recent timber supply reviews for the Lakes and Okanagan TSAs have accounted for wildfires which have occurred during the past five years. Timber supply reviews which will account for all past wildfires are underway for the 100 Mile House, Lillooet, Quesnel and Williams Lake TSAs.
- FAIB will assess whether the cumulative impacts of fires during the past five years affects the sustainability of the AACs for the Cassiar, Merritt, and Kamloops TSAs. For TFL 49, TFL 59 and TFL 23, FAIB will ask the licensees to provide timber supply assessments to determine whether the current AACs are sustainable.