

Impacts of 2023 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

In 2023, wildfires affected a record 2.8 million hectares, more than 15 times the average annual area affected during the past 105 years (approximately 183 000 hectares). The areas affected by wildfires in 2017 (1.2 million hectares), 2018 (1.3 million hectares) and in 2021 (0.9 million hectares) are the next three largest areas affected in 105 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. The 2023 wildfires were mostly in the northeastern part the province with four TSAs (Fort Nelson, Fort St. John, Mackenzie, and Prince George) accounting for about 78% of the area burned.

The 2017 and 2018 fires occurred mainly in management units that had previously experienced significant levels of lodgepole pine mortality whereas the 2021 and 2023 fires occurred mainly in areas with live timber.

Wildfires occur on the timber harvesting land base (THLB)^a 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 420 000 hectares in 2021 (54% of total area). In 2023, the THLB within the fire perimeters was 687 000 hectares (24% of the 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). Since the areas affected by wildfires in 2017 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 within the fire perimeters.

In any management unit, the allowable annual cut (AAC)^b for the unit is directly related to the amount of timber on the THLB. Each year after the wildfires, staff from the Forest Analysis and Inventory Branch (FAIB) update the forest inventories and assess the timber supply projections for the most severely affected management units. These assessments are 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 assessed the impacts of the fires to timber supply for TFL 48 and the Great Bear Rainforest North, Prince George, Fort Nelson, Morice, Cassiar, Merritt, and Kamloops TSAs and concluded that the AAC for those management units do not need to be redetermined ahead of schedule. The most recent timber supply reviews for the Okanagan and Lillooet TSAs accounted for wildfires which occurred in those units. Timber supply reviews which will account for all past wildfires are underway for the 100 Mile House, Quesnel, and Williams Lake TSAs. FAIB will assess the impact of the fires to timber supply for the Lakes and Fort St. John TSAs.

FAIB asked 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. The assessments indicated that it was not necessary to redetermine the AACs for these units.

^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.

^bAllowable 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 2023 wildfires on timber supply and non-timber forest values in BC. Since the area burned in 2017, 2018, 2021 and 2023 are the four largest on record, this review will also assess the cumulative impacts of wildfires on timber supply for the period 2017 to 2023.

As shown in Figure 1, the 2023 wildfires affected about 2 842 000 hectares in BC. In 2017, fires affected approximately 1.2 million hectares, in 2018 fires affected approximately 1.3 million hectares, and in 2021 fires affected approximately 863 000 hectares of forested areas in BC. The area burned in 2023 is more than 15 times the average area burned annually (approximately 183 000hectares) over the past 105 years. The area burned during the 10 worst wildfire years account for 50% of the total area affected by wildfires during the last 105 years.

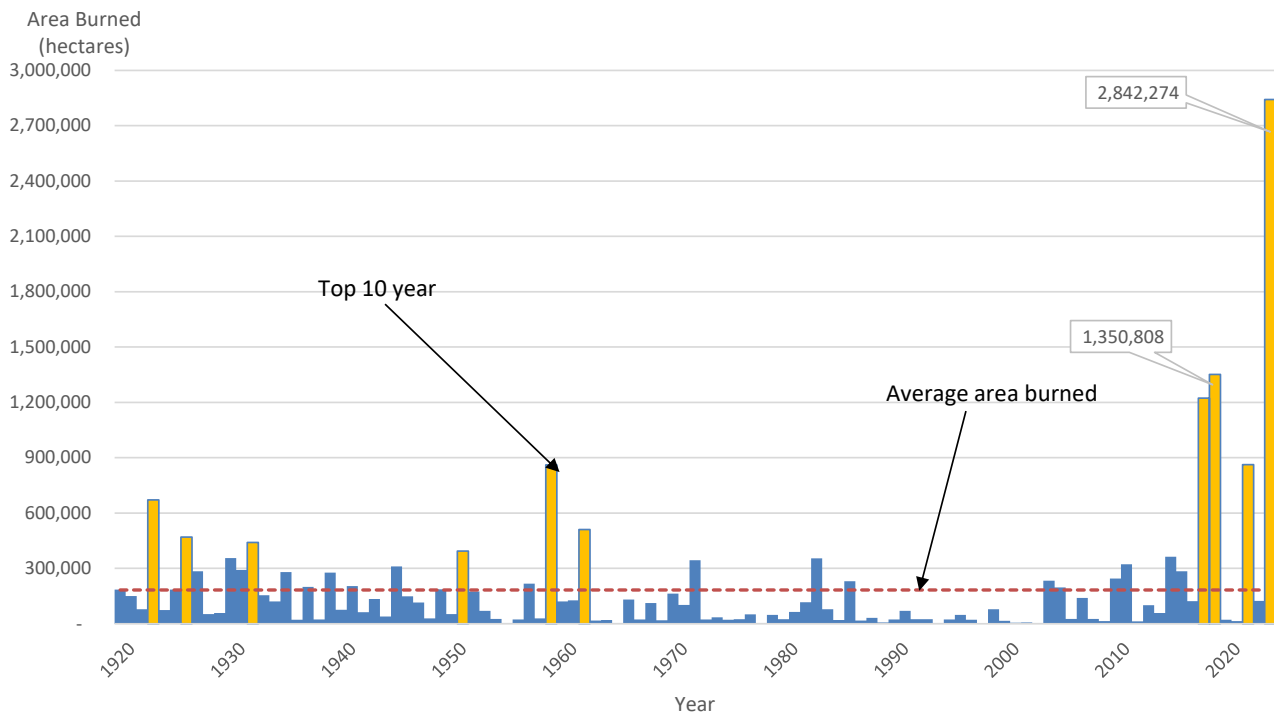


Figure 1. Annual area affected by wildfires in British Columbia, 1919 - 2023.

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

Figure 2 shows the extent and location of the 2023 forest wildfires in BC. The fires covered a total of 2 842 000 hectares of forest and were mostly in the northeastern area of the province.

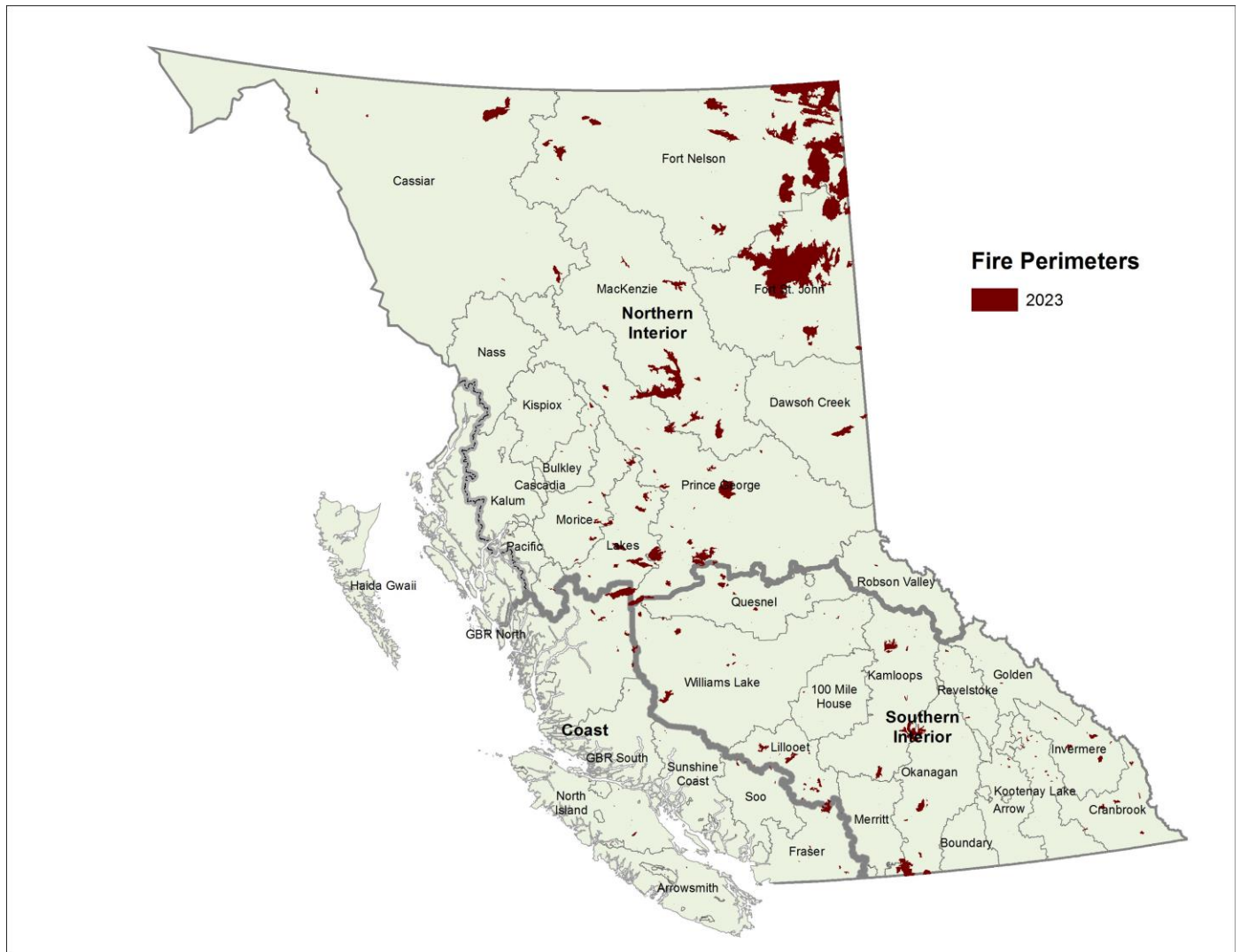


Figure 2. Location and extent of the 2023 fire perimeters.

The 2023 wildfires affected about 1 008 000 hectares in the Fort Nelson TSA, about 775 000 hectares in the Fort St. John TSA, about 228 000 hectares in the Mackenzie TSA, and about 196 000 hectares in the Prince George TSA. These four management units account for about 2 208 000 hectares (~78%) of the total area affected by the 2023 wildfires. Cassiar TSA (79 000 hectares), Okanagan TSA (67 000 hectares), Lakes TSA (66 000 hectares), and Kamloops TSA (64 000 hectares) account for a further 10 percent of the area affected in 2023. Several other management units (TSAs, TFLs, Woodlots and Community Forests) were also affected.

Of the 2 842 000 hectares affected by the 2023 wildfires, about 669 000 hectares (~24%) 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 2023 wildfire perimeters for the more significantly affected management units.

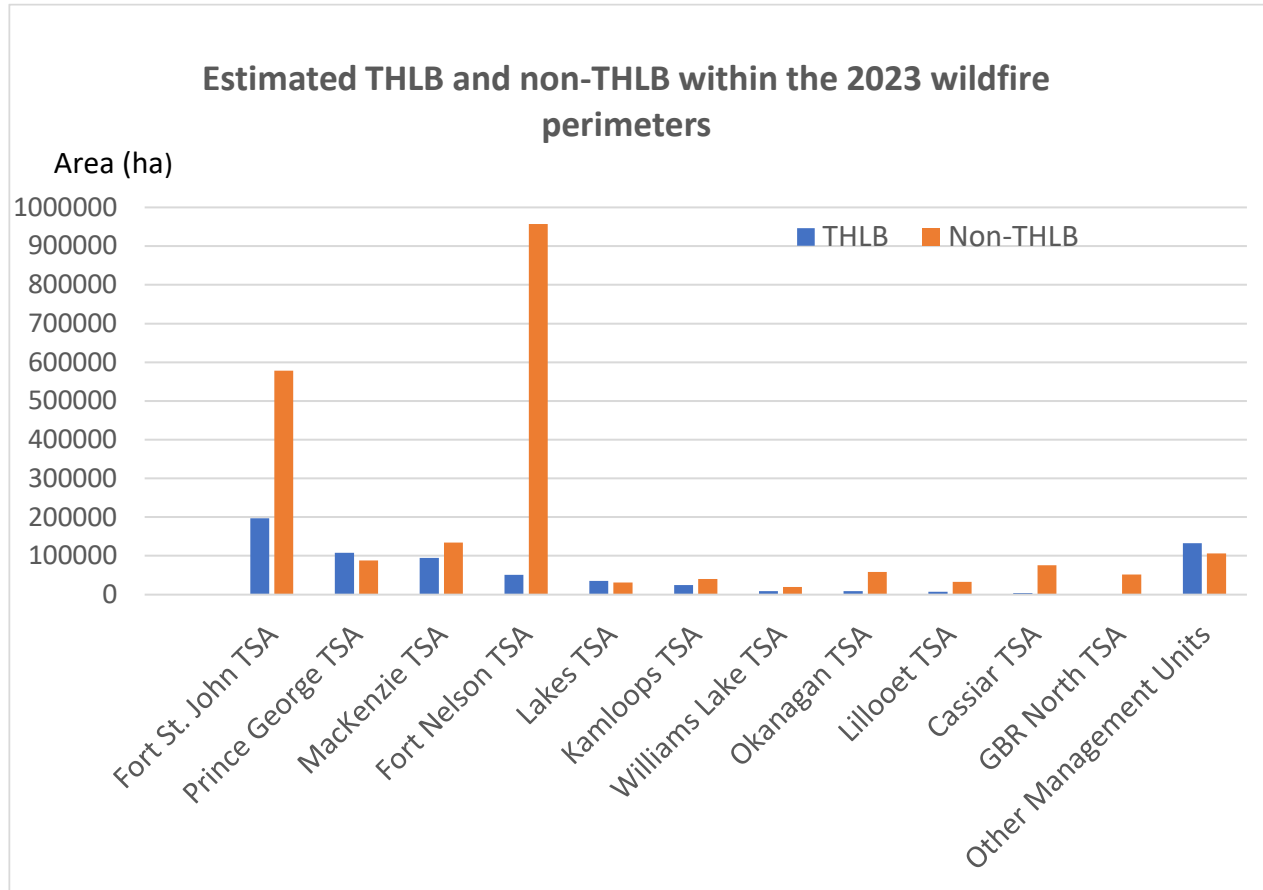


Figure 3. THLB and non-THLB areas within the 2023 wildfire perimeters.

The most severely affected management unit was the Fort St. John TSA where approximately 197 000 hectares of the THLB were within the fire perimeters. Other management units with significant amounts of their THLB within the 2023 fire perimeters include, the Prince George TSA (108 000 hectares), Mackenzie TSA (94 000 hectares, and Fort Nelson TSA (50 000 hectares).

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 there may be some stands that remain green because the fire skipped them.

To estimate the effects of the 2023 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 2023 fires using both the fire severity mapping and information from the ground samples.

After the 2023 wildfires, FAIB prepared a document, *Estimates of mortality in areas affected by the 2023 wildfires*, which provides a detailed description of the process used to quantify timber volume losses within the fire perimeters. Readers interested in learning more about this process may find a copy of the report at <https://www2.gov.bc.ca/gov/content/industry/forestry/managing-our-forest-resources/forest-inventory/data-management-and-access>.

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 2023 wildfires. Of the 92 million cubic metres of timber on the THLB within the fire perimeters, approximately 39 million cubic metres (43%) remained unburned.

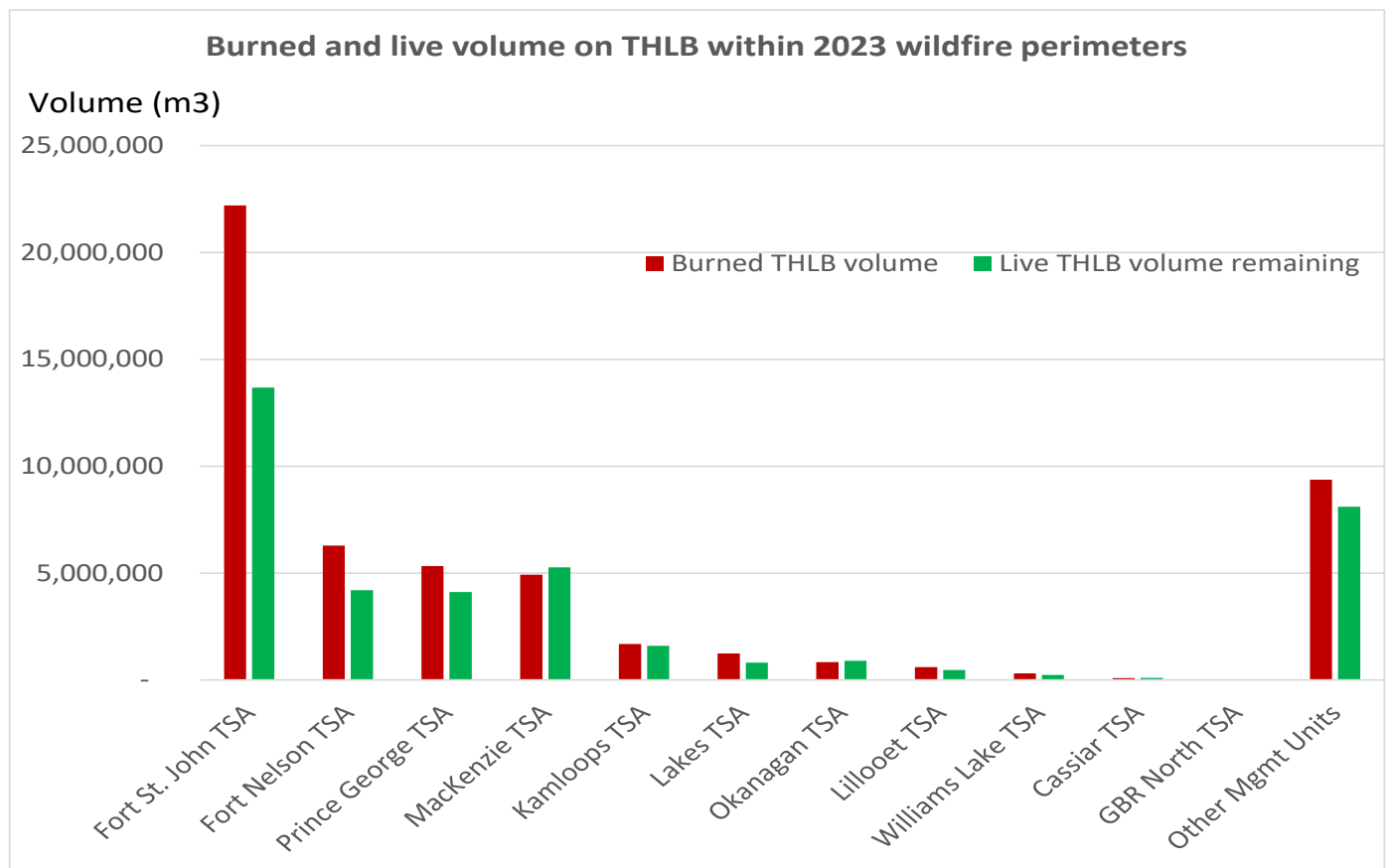


Figure 4. Live volume and burned volume on the THLB within the 2023 wildfire perimeters.

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 its THLB volume damaged. Figure 5 shows the burned volume (salvageable and unsalvageable) of timber within the 2023 wildfire perimeters on the THLB expressed as a proportion of the total THLB volume for the management unit.

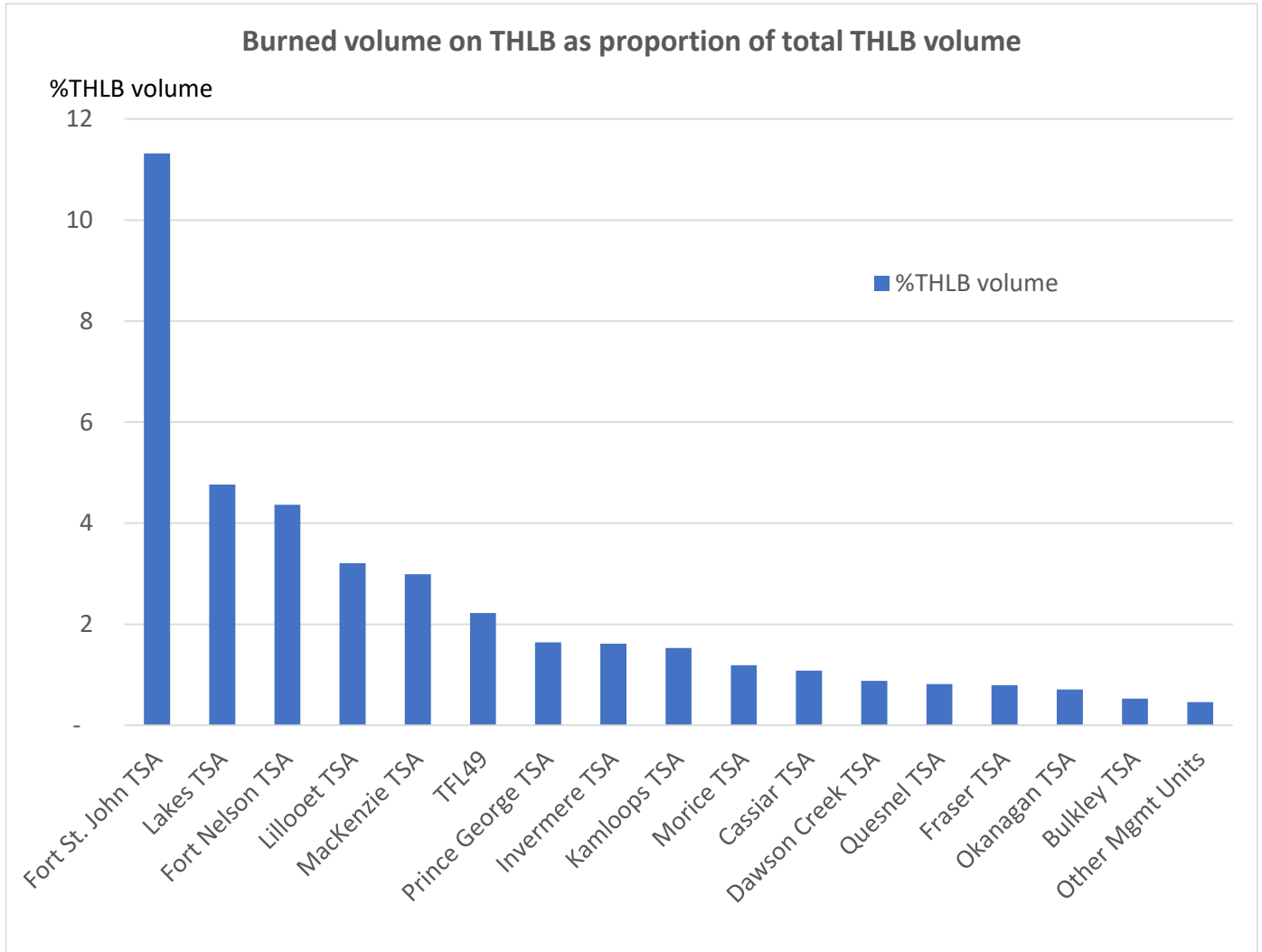


Figure 5. Burned timber volume within the 2023 wildfire perimeters on the THLB expressed as a proportion of total THLB volume.

The management unit with the greatest proportion of THLB volume affected by wildfires in 2023 was the Fort St. John TSA (11%). The Lakes (5%), Fort Nelson (4%), Mackenzie (3%), and Lillooet (3%) TSAs were also significantly affected.

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 2023 wildfire perimeters. Approximately 36 000 hectares were in old-growth management areas, 281 000 hectares were in parks and protected areas, 97 000 hectares were in scenic areas (areas managed for visual resource values), and about 235 000 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.

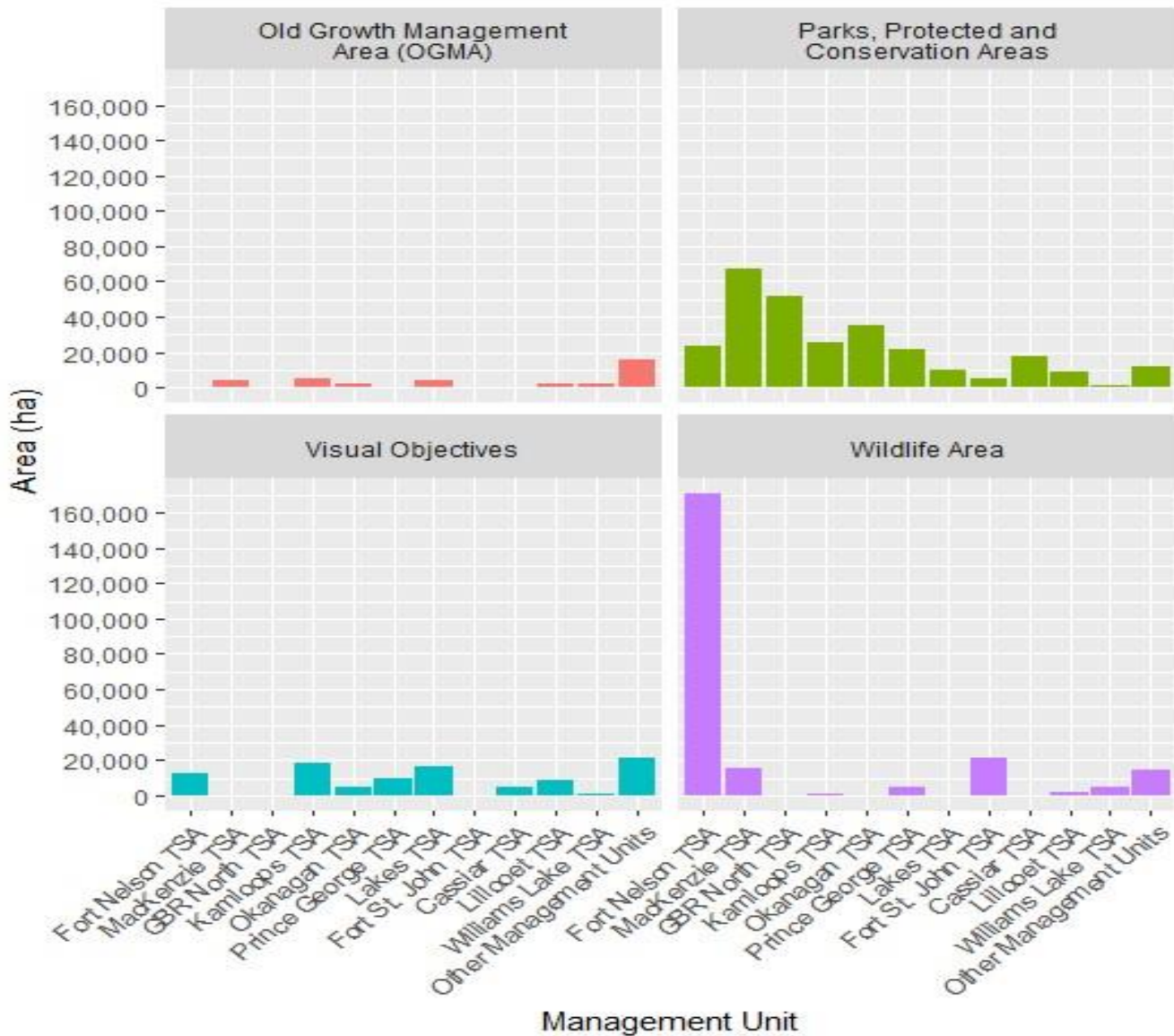


Figure 6. Areas designated for non-timber values within the 2023 wildfire perimeters.

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

In June 2021, government convened an independent Old Growth Technical Advisory Panel (TAP) to identify at-risk old growth ecosystems and prioritize areas for temporary deferral from harvesting. The TAP identified 2.6 million hectares of BC's most at-risk old growth forests for deferral. Approximately 108 000 hectares of at-risk old growth forests identified by the TAP were within the 2023 wildfire perimeters.

Post-Natural Disturbance Forest Retention Guidance

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*¹. 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 to facilitate recovery at the 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 all wildfires in BC. 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 Peoples.

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.

¹See <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 2023

Figure 7 shows the approximate location of the wildfires in BC during the period 2017 to 2023.

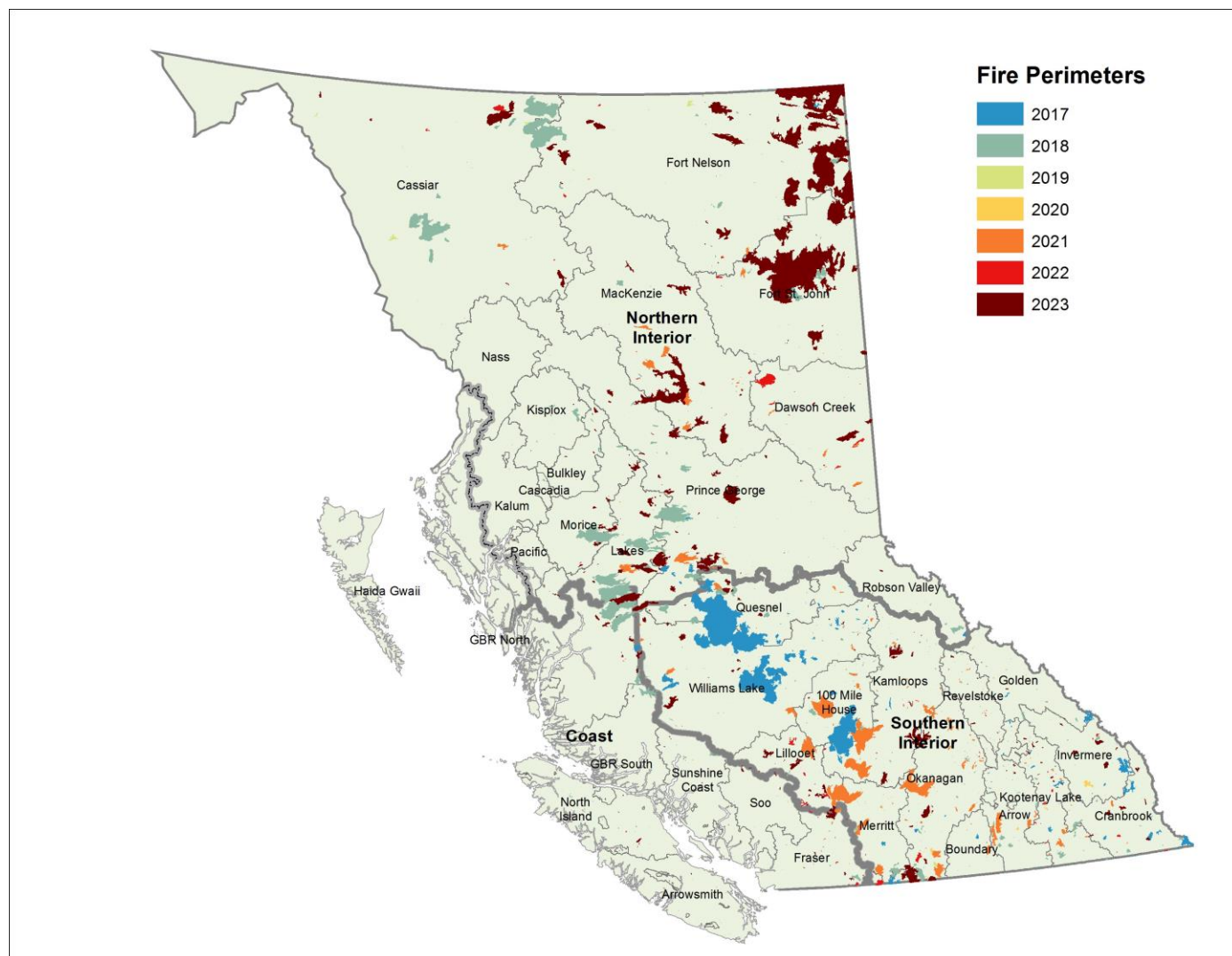


Figure 7. Location and extent of fire perimeters during the period 2017 to 2023.

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. Except for the Lakes and Prince George TSAs these fires were not in areas significantly 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 fourth 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. In 2022 wildfires affected 123 000 hectares, of which 34 400 hectares were in TFL 48.

The area affected by wildfires in 2023 (2.8 million hectares) was more than double the previous record amount which

occurred in 2018. Four management units (Fort Nelson TSA, Fort St. John TSA, Mackenzie TSA, and the Prince George TSA) account for about 2 208 000 hectares (~78%) of the total area affected by the 2023 wildfires. The fires occurred mostly in the northeastern portion of the province where severe drought conditions were reported.

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 seven years. 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. By 2023 it was assumed that MPB-killed timber did not contribute to the stand volume and therefore all the timber volume affected were from live trees.

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), 419 500 hectares in 2021 (49% of total area) and 669 000 hectares in 2023 (24% of the total area). Even though the THLB area within the fire perimeters in 2023 is similar to the area affected in 2017, the live THLB volume affected in 2023 was more than twice the volume affected in 2017.

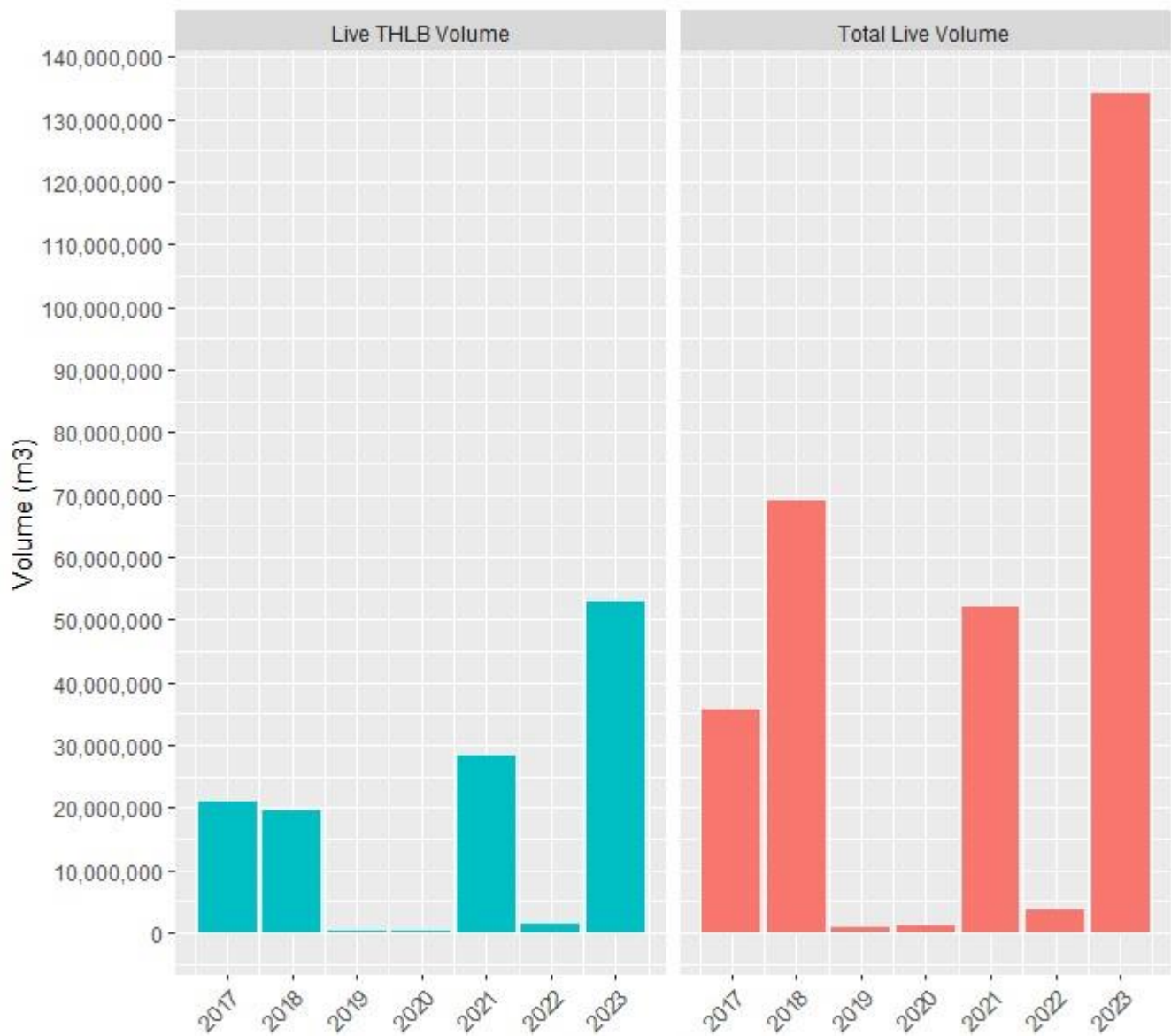


Figure 8. THLB live timber volume and total live timber volume within the fire perimeters, 2017 to 2023.

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 2023. Approximately 264 000 hectares were in old-growth management areas, 901 000 hectares were in parks and protected areas, 388 000 hectares were in scenic areas (areas managed for visual resource values), and about 295 000 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. Most of the parks and protected areas affected were in the Great Bear North TSA, the scenic areas affected were in the Kamloops TSA, and the wildlife areas affected were in the Fort Nelson TSA.

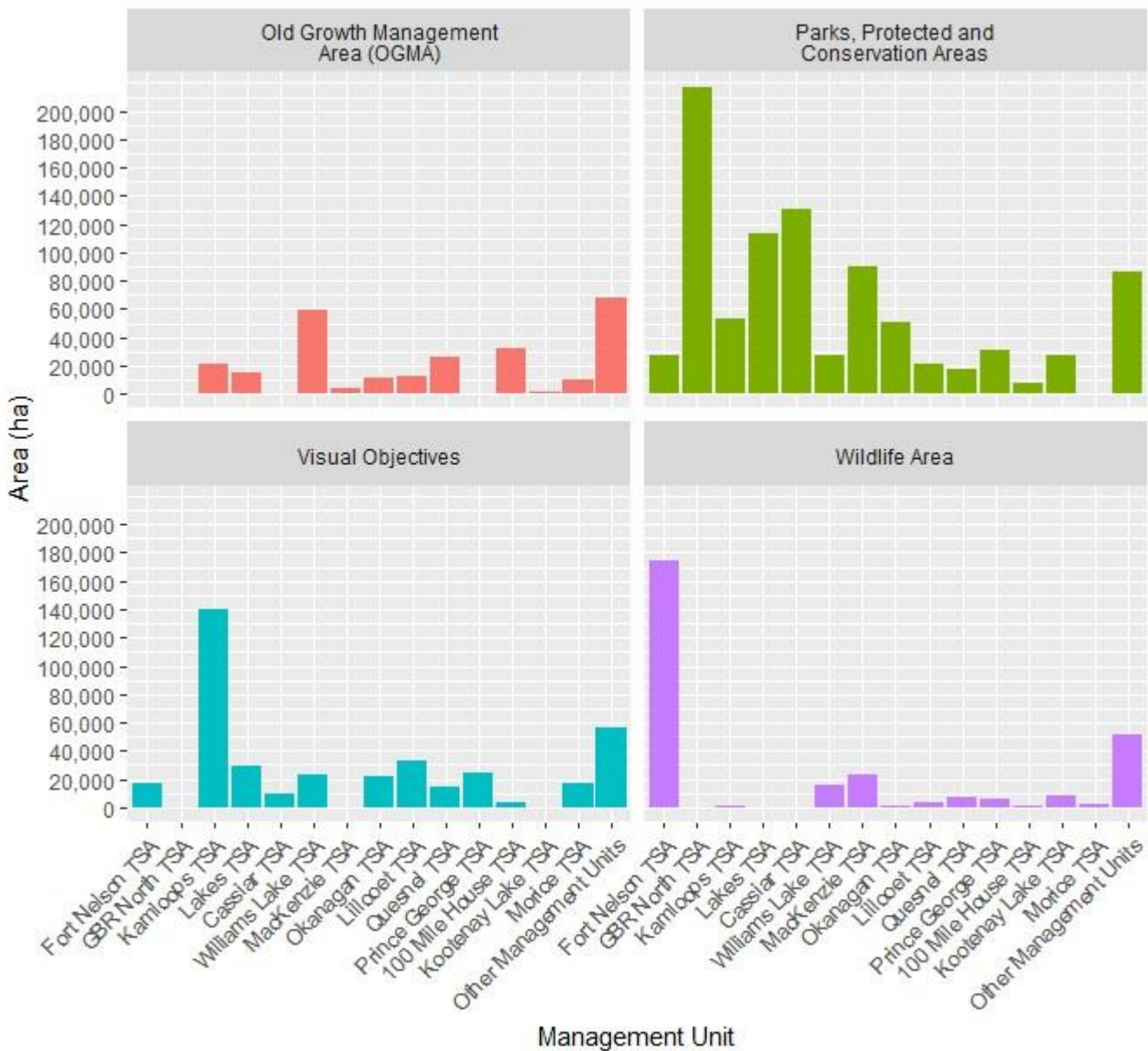


Figure 9. Areas designated for non-timber values within the wildfire perimeters 2017–2023.

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

Timber Supply Impact

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

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 2023. TFL 49 (21%), TFL 59 (15%), Fort St. John TSA (12%), Lillooet TSA (11%), 100 Mile House TSA (11%), Lakes TSA (11%), TFL 23 (9%), and Cassiar TSA (9%) 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 the Quesnel, Kamloops, Merritt, and Williams Lake TSAs.

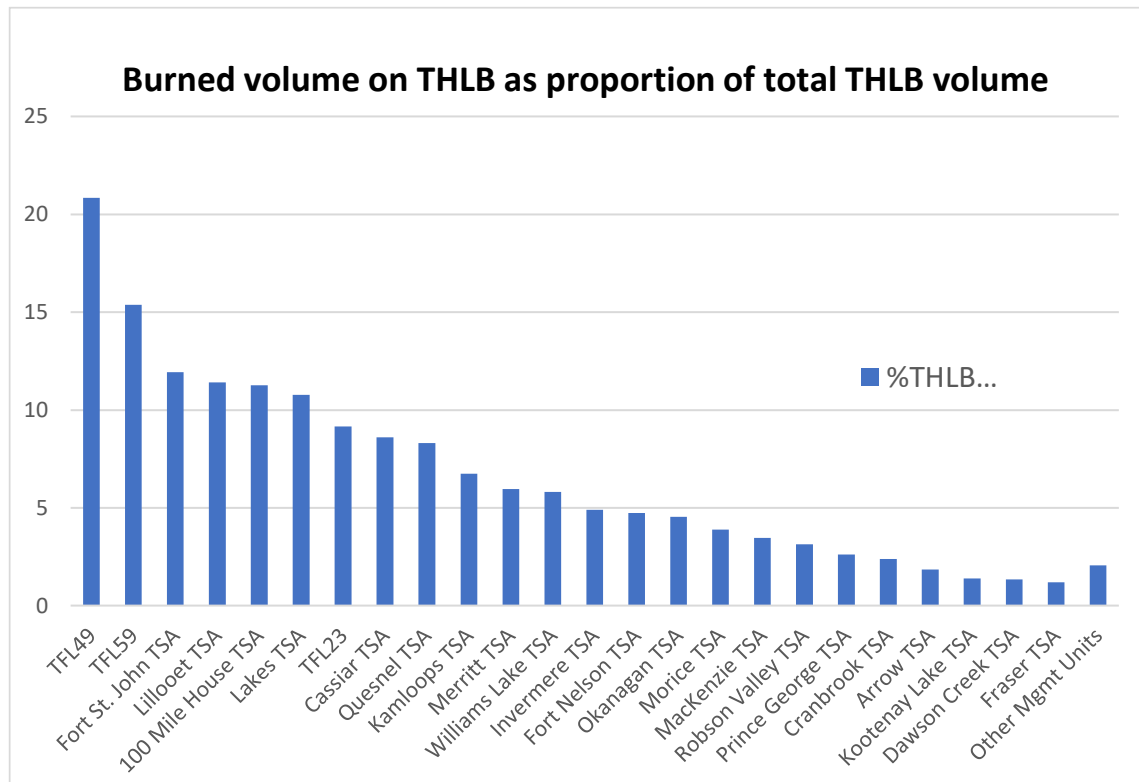


Figure 10. Burned timber volume within the fire perimeters on the THLB expressed as a proportion of total THLB volume by management unit for the period 2017 to 2023.

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).

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). 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, in 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 (21%), TFL 59 (15%) and the Lillooet TSA (9%).

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 requested the TFL holders to provide timber supply assessments to determine whether the current AACs for these TFLs are sustainable. The assessments indicated that the current AACs for these management units are sustainable. Was this done?

FAIB has determined that wildfires during the past seven years do not pose a risk to timber supply for the Great Bear Rainforest North, Prince George, Fort Nelson, and Morice TSAs. The most recent timber supply reviews for the Okanagan and Lillooet TSAs accounted for wildfires which occurred in those units. Timber supply reviews which will account for all past wildfires are underway for the 100 Mile House, Quesnel, and Williams Lake TSAs. FAIB assessed whether the cumulative impacts of fires during the past seven years affected the sustainability of the AACs for the Cassiar, Merritt, and Kamloops TSAs. This assessment showed that it was not necessary for the AACs for these TSAs to be re-determined ahead of schedule.

As a result of the 2023 fires on the Fort St. John TSA and the additional impacts to the Lakes TSA, FAIB will assess the impact of the fires to timber supply for these management units.

Conclusions

- In 2023, the area within the fire perimeters was 2 842 000 hectares, more than double the previous record set in 2018 and more than 15 times the average area burned during the past 105 years (183 000 hectares). Four management units (Fort Nelson TSA, Fort St. John TSA, Mackenzie TSA, and the Prince George TSA) account for about 2 208 000 hectares (~78%) of the total area affected by the 2023 wildfires.
- The areas affected by wildfires in 2017 (1.2 million hectares), 2018 (1.3 million hectares), 2021 (0.9 million hectares) and in 2023 (2.8 million hectares) were the four largest in 105 years of recorded wildfire history in British Columbia.
- In 2023 the wildfires were mostly in the dry northeastern portion of BC. 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 2017 fire perimeters had previously experienced lodgepole pine mortality during the mountain pine beetle epidemic. Since then, the fires were mostly in live timber.
- 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), 420 000 hectares in 2021 (49% of total area) and 669 000 hectares in 2023 (24% of the total area).

- During the past seven 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 (21%), TFL 59 (15%), Fort St. John TSA (12%), Lillooet TSA (11%), 100 Mile House TSA (11%), Lakes TSA (11%), TFL 23 (9%), and Cassiar TSA (9%). Other management units with greater than five percent of the volume burned within the fire perimeters on the THLB are the Quesnel, Kamloops, Merritt, and Williams Lake TSAs.
- After the 2023 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 seven years do not pose a risk to timber supply for TFL 48 and the Great Bear Rainforest North, Prince George, Fort Nelson, Morice, Cassiar, Merritt, and Kamloops TSAs. The most recent timber supply reviews for the Okanagan and Lillooet TSAs accounted for wildfires which occurred in those units. Timber supply reviews which will account for all past wildfires are underway for the 100 Mile House, Quesnel, and Williams Lake TSAs. FAIB will assess the impact of the fires to timber supply for the Lakes and Fort St. John TSAs.
- For TFL 49, TFL 59 and TFL 23, FAIB asked the licensees to provide timber supply assessments to determine whether the current AACs are sustainable.