



# STATE OF ONTARIO'S PROTECTED AREAS

Natural Disturbance

2021

# State of Ontario's Protected Areas Indicator Report

## Natural Disturbance

This indicator tracks natural forest disturbance within Ontario's system of provincial parks and conservation reserves caused by insects, disease, weather events and wildland fire.

### Status



**Status:** Good



**Trend:** Mixed

### Why it's important

A natural forest disturbance occurs when trees are killed or damaged from wildland fire, native insects, disease, or weather events that influence change to the natural environment. These natural processes contribute to the maintenance of ecological integrity as mandated in the legislation under which Ontario's provincial parks and conservation reserves are planned and managed. The composition, structure, and function of forest ecosystems across Ontario are shaped by natural disturbances.

Natural processes are important because:

- Natural disturbance regimes create healthy, natural ecosystems and provide diverse landscapes
- Species and ecosystems are adapted to natural disturbance regimes; many depend on natural disturbances for their persistence
- The number and quality of species and habitats is enhanced by natural disturbances
- Natural disturbances release nutrients that help new plant growth to thrive and regulate other ecological processes that maintain ecosystems

Natural disturbance regimes such as native insect or disease disturbance fluctuate over time as populations rise and naturally fall when encountering, amongst other things, a change in forest type or experience a population collapse due to naturally occurring controls (e.g. parasites/parasitoids/viruses). These controls have evolved within ecosystems and play an important role in maintaining natural systems. In contrast, non-native insects and diseases have minimal naturally occurring controls, and outbreaks are detrimental to ecological integrity. As a result, their impacts are not measured or included here as a positive disturbance element.

Another major contributor to natural disturbances within the protected areas system is the north American beaver. Beavers construct dams blocking waterways which may

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contribute to mass flooding or cause fluctuation of water levels causing natural changes to forest ages, types, and structure. This activity is widespread but not provincially tracked or mapped.

Most natural disturbance regimes are a part of healthy ecosystems. However, the effects of accelerated climate change could result in un-natural rates of disturbance due to more frequent outbreaks or population collapses of native insects, more frequent and intense storms and increased drought that may result in mortality and increased forest fires.

## How we monitor

Annual surveys are conducted by the forest health monitoring program and wildland fire management program with the Ministry of Northern Development, Mines, Natural Resources and Forestry (NDMNR) to determine the general area of insect, disease, fire, and weather-related disturbances.

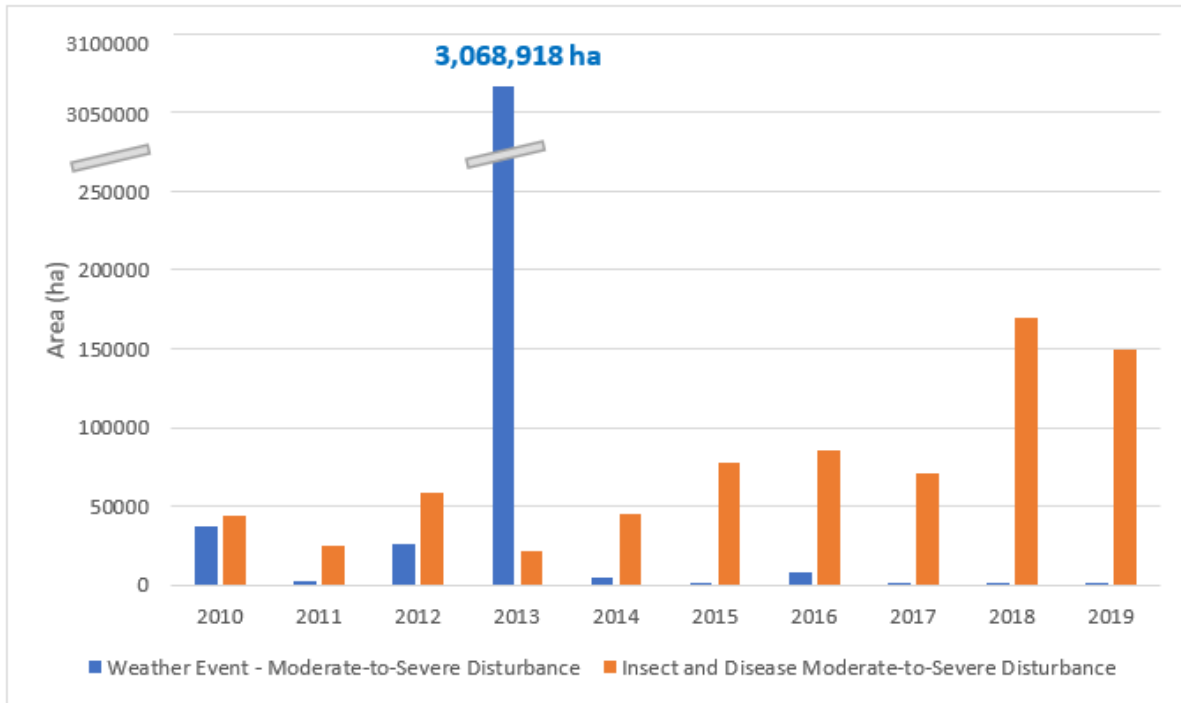
Areas disturbed by weather (e.g. high wind events) and wildland fire most often cause mass mortality and are measured as the gross area within which the disturbance occurred.

Insect and disease disturbance may cause mortality (e.g., wood boring insects, root rots, etc.), but can also cause defoliation and decline to forest cover that may lead to mortality when disturbances persist over consecutive years. These types of disturbances are measured by identifying the primary cause of disturbance and the level of severity. The level of severity is broken down into three main categories, light (1-25%), moderate-to-severe (40%-100%), and mortality (death of forest trees). The "area within which" is also calculated as a gross area within which the host species of a specific insect or disease was affected. The total areas will also include the non-forested land or forest lands of non-host species.

## What's happening

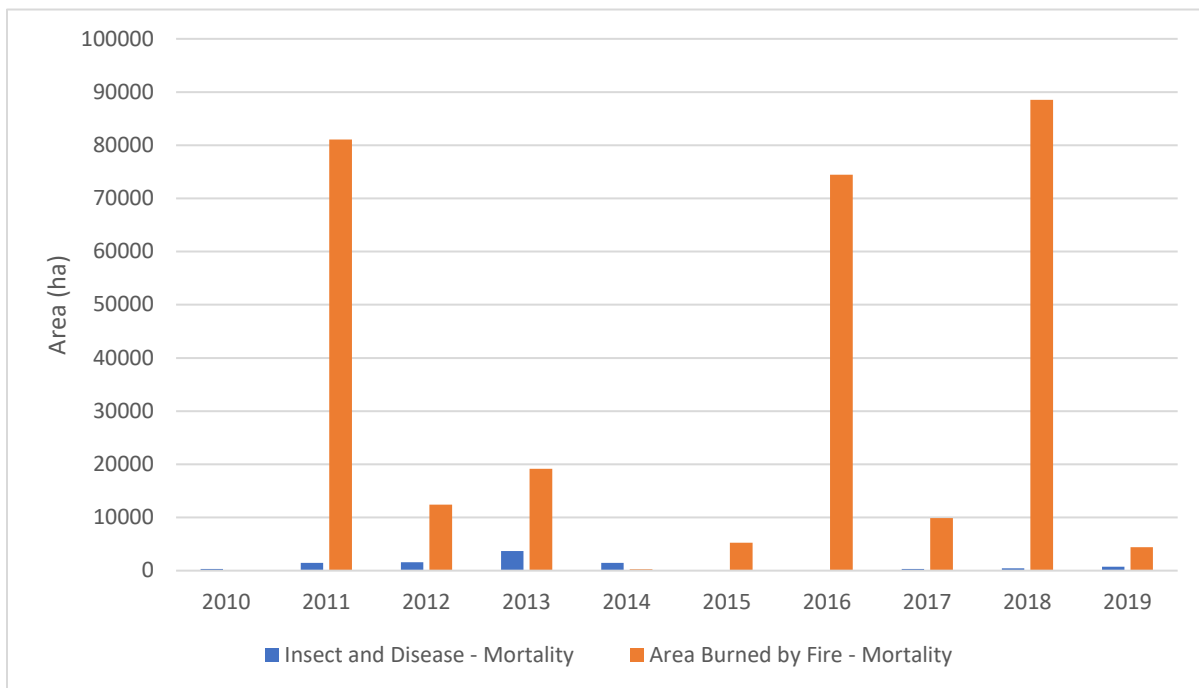
From 2010 to 2019, the area within provincial parks and conservation reserves affected by natural disturbances totalled just over 3.98 million hectares. Of that total, approximately 3.0 million hectares occurred in the year 2013 due to a severe snowfall event.

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**Figure 1.** Total area within which moderate-to-severe disturbance from insect, disease and weather events occurred from 2010 to 2019 in provincial parks and conservation reserves (NDMNR 2021)

From 2010 to 2019, wildland fire was the greatest contributor to areas within which mortality to forest cover caused by natural disturbances occurred in provincial parks and conservation reserves.



**Figure 2.** Total area within which mortality occurred from insect and disease and wildland fire from 2010 to 2019 in provincial parks and conservation reserves (NDMNR 2021)

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## Weather Disturbance

From 2010 to 2019, major weather events caused the highest level of moderate-to-severe disturbance to forest cover within provincial parks and conservation reserves. These disturbances caused nearly 3,070,000 hectares of moderate-to-severe disturbance, of which large scale snowfall amounts caused approximately 3.0 million hectares in the year 2013 in northwestern Ontario. Damage caused by large amounts of snow occurs when heavy snowfall accumulates on tree branches causing trees to bend, snap and uproot.

This 2013 disturbance occurred from areas of Woodland Caribou Provincial Park to Quetico Provincial Park and extended as far east as Wakami Lake Provincial Park northeast of Sault Saint Marie, Ontario.

Other major weather events causing damage to forest cover from 2010 to 2019 in provincial parks and conservation reserves included:

- High wind events in every year of the reporting period, totalling approximately 10,000 hectares of disturbance to forest cover
- Severe drought events occurring in 2010-2013 and 2016 in southern Ontario, causing nearly 67,000 hectares of a moderate-to-severe disturbance
- Hail and ice damage within provincial parks and conservation reserves totalling approximately 1,200 hectares of disturbance to forest cover

## Insects and Disease Disturbance

Insect and disease outbreaks also contribute to ecological processes that maintain biodiversity and are generally left uninterrupted to benefit the ecological integrity of provincial parks and conservation reserves and a natural succession of forest type, age and structure.

From 2010 to 2019, insect infestations caused approximately 820,000 hectares of moderate-to-severe defoliation and approximately 23,000 hectares of mortality to forest cover within provincial parks and conservation reserves. This included approximately:

- 383,000 hectares of jack pine budworm defoliation and 15,000 hectares of mortality to jack pine tree species
- 106,000 hectares of spruce budworm defoliation and 4,500 hectares of mortality to spruce and fir tree species
- 231,000 hectares of forest tent caterpillar defoliation
- 29,000 hectares of aspen two-leaf tier defoliation

Other major native insect disturbances that occurred within provincial parks and conservation reserves from 2010-2019 included cedar leafminer, larch casebearer and

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large aspen tortrix, among other native insects totalling approximately 43,000 hectares of moderate-to-severe defoliation to forest cover.

From 2010 to 2019, tree diseases caused approximately 650 hectares of disturbance to forest cover which included approximately 400 hectares of septoria leaf spot and septoria canker, brown spot needle blight, and armillaria root rot.

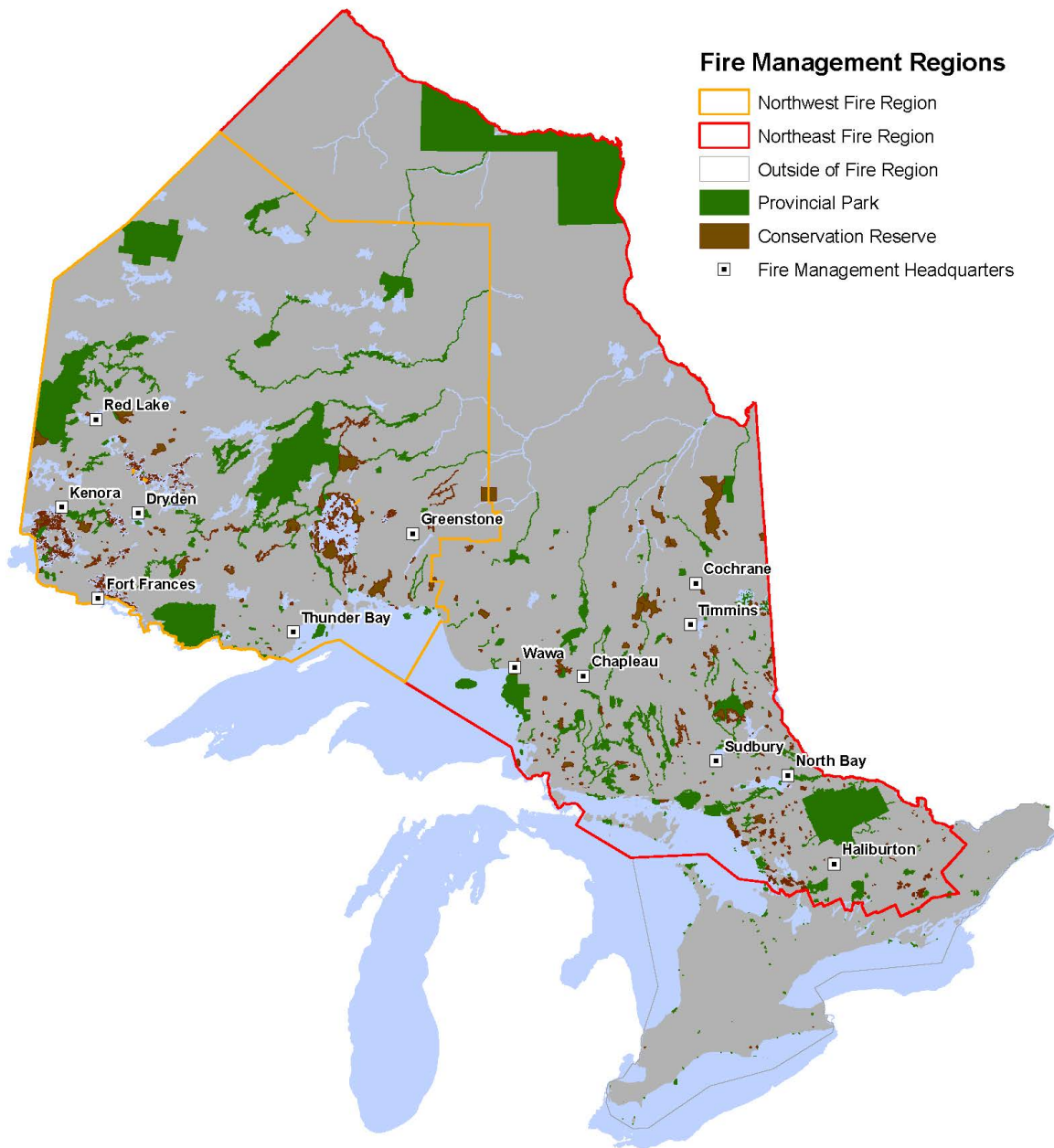
## **Wildland Fire Disturbance**

NDMNRF is responsible for managing wildland fires across all public lands, including provincial parks and conservation reserves inside the provincial fire region (Figure 3). Wildland fire response is guided by the Wildland Fire Management Strategy. This strategy seeks to achieve the best overall result, with the aim of realizing ecological benefits (e.g. allowing fire to burn for ecological purposes), reducing adverse impacts and managing costs.

Historically, all wildland fire was considered undesirable, and fire management goals were to minimize the area burned. This approach prevented natural forest regeneration processes from occurring. Introduced control measures such as fire suppression are used within provincial parks and conservation reserves in efforts to reach an acceptable balance between maintaining healthy forests and protecting public safety and values.

Prescribed burning may also be used to achieve more specific outcomes (e.g., reduce competition from woody species in a grassland ecosystem, reduce fuels to assist in managing wildland fires, etc.) within a defined timeframe, or where opportunities to allow wildland fire are limited.

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**Figure 3.** Fire Region Map of Ontario (NDMNRF 2021)

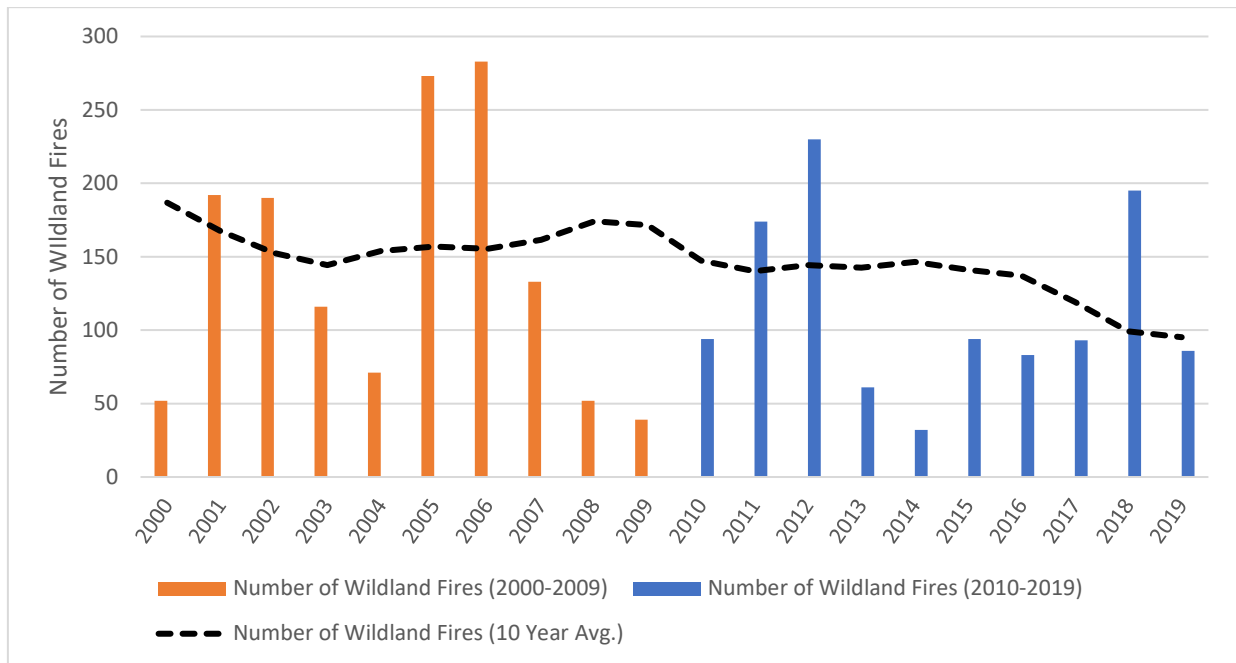
From 2010 to 2019, a total of 47 prescribed burns were implemented across 14 provincial parks and conservation reserves to meet a wide array of management objectives, including but not limited to, oak savannah restoration, tallgrass prairie restoration, and control of invasive species. Of the 47 prescribed burns that took place in provincial parks and conservation reserves, 33 occurred outside of the NDMNRF fire regions.

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There are currently 9 fire response or fire management plans in place for 23 provincial parks and conservation reserves. These plans include more detailed direction for responding to wildland fire that includes flexibility to allow fire to occur in some circumstances to achieve ecological benefits while protecting public safety and values. Additional provincial parks and conservation reserves would benefit from having plans in place.

From 2010 to 2019, NDMNRF reported 8,715 wildland fires in total. Of these, 13% occurred in or extended into provincial parks and conservation reserves.

Due to a highly variable rate of wildland fires from year to year, a 10-year average is used to show a trend in the number of wildland fires and area burned (Figure 4).



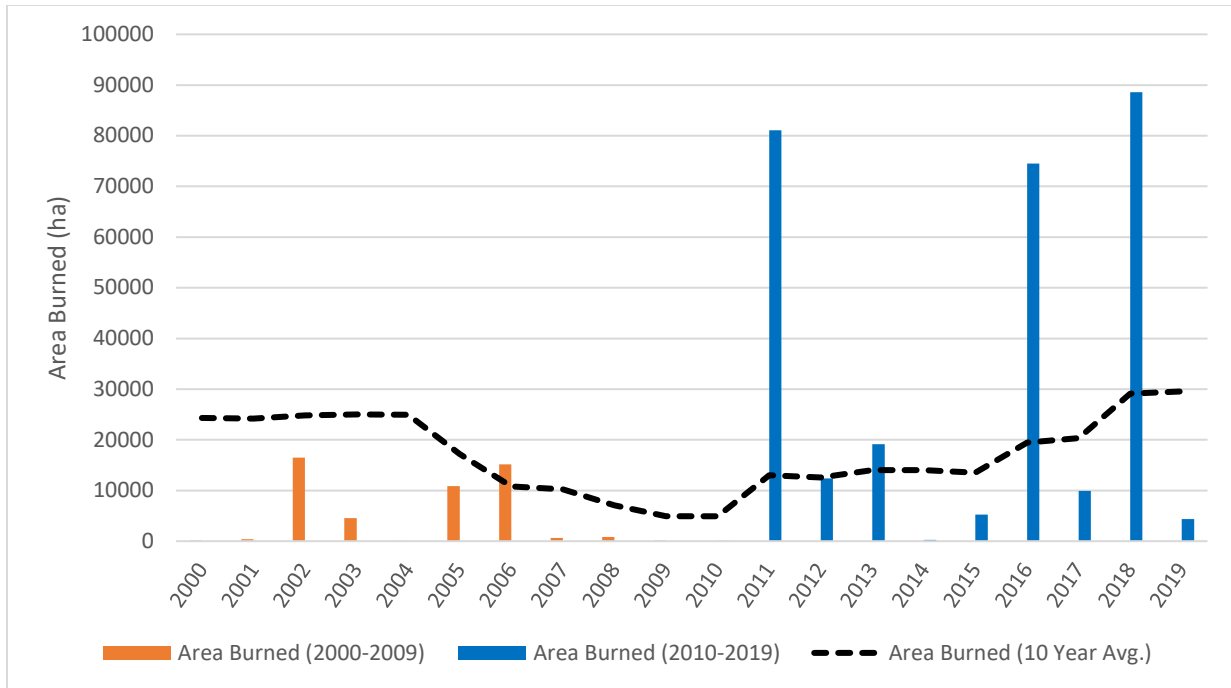
**Figure 4.** Total number of wildland fires that occurred within provincial parks and conservation reserves from 2000 to 2019 compared to the 10-year average.

From 2000 to 2019, the data shows a variable annual rate of wildland fire occurrence within provincial parks and conservation reserve. A decrease is noted within this reporting period of 259 wildland fires, as a total of 1,401 wildland fires occurred within the protected area system from 2000 to 2009, compared to 1,142 wildland fires occurring from 2010 to 2019.

From 2010 to 2019, the data shows a significant increase in area burned when compared to the last reporting period with approximately 295,000 hectares of protected forested land burned; this compares to 49,000 hectares from 2000-2009 (Figure 5).



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**Figure 5.** Total area within which disturbance from wildland fire occurred within provincial parks and conservation reserves from 2000-2019 compared to the 10-year average.

Significant wildland fires occurring in 2011, 2016 and in 2018 accounted for approximately 244,000 hectares of forested area burned, of which 215,000 hectares occurred in northwestern Ontario provincial parks and conservation reserves.

The status of natural disturbance within provincial parks and conservation reserves is assessed as “good” as the number and area disturbed encourages healthy, natural ecosystems and provides for diverse landscapes within provincial parks and conservation reserves. Different types of disturbances affect large amounts of forest in some years and little in others. This variability creates a “mixed” trend.

## Indicator last updated

November 2021

## Data sources

Spatial data from the NDMNRF forest health program and Ontario’s wildland fire management program

PAM 7.02; AFFES:FM:2:12 Fire Management Policy for Provincial Parks and Conservation Reserves. Available at: [Link]

Ontario Ministry of Northern Development, Mines, Natural Resources and Forestry, 2021. Forest Health Conditions in Ontario 2010 – 2019, Available at: [Forest health conditions | ontario.ca](https://www.ontario.ca/forest-health-conditions)

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Ontario Ministry of Northern Development, Mines, Natural Resources and Forestry, 2021. State of Ontario's Natural Resources – Forests 2021. Queen's Printer for Ontario. Sault Ste. Marie, ON. Available at: <https://www.ontario.ca/page/state-ontarios-natural-resources-forest-2021>

## Related links

N/A