



# Carbon losses from the 2023 wildfires in Canada

## Comparing data from Canada's wildfires with emissions from the world's largest countries

### The 2023 wildfires

Canada's forests cover a vast area (almost 362 million hectares), accounting for about 8.5% of the global forested area. They are a huge store of carbon. Wildfires are a normal feature of this environment, but they are becoming more frequent, burning for longer and across larger areas. The summer of 2023 was the warmest and driest for decades and saw record-breaking wildfires in Canada's boreal forests. Fires burned across the provinces of British Columbia, Alberta, Ontario, Nova Scotia, the Northwest territories and Quebec. Air pollution from the burning was blown into the USA affecting air quality in several major cities, including New York and Chicago.

### Carbon emissions

A study of the 2023 Canadian wildfires published in the journal *Nature* estimated the magnitude of carbon emissions from May to September to be 647 teragrams of carbon (TgC), with an estimated range of 570–727 TgC. A

teragram is equivalent to 1 megatonne or one million metric tons. The estimate of carbon loss includes carbon dioxide (CO<sub>2</sub>) and carbon monoxide (CO). The amount of carbon (CO<sub>2</sub> plus CO) emitted from the forest fires was estimated using a range of data sources, including satellite data to map the burnt area.

The carbon loss was compared to the annual fossil fuel emissions of the world's largest countries. Only India, China and the USA released more carbon in 2023 than the Canadian wildfires. India emitted 740 teragrams of carbon in 2023. The carbon loss from this exceptional wildfire season was five times more than Canada's emissions in a normal year. The carbon released from wildfires is not accounted for in Canada's annual greenhouse gas emissions inventory.

As the forests regenerate they will take up carbon from the atmosphere. But as global climate continues to warm — with accelerated warming in the high latitudes — the 2023 wildfire

season may become the norm by 2050. The vulnerability of the vast boreal forests to wildfires poses significant challenges for the management of forest ecosystems as well as our attempts to reduce global carbon emissions. In some areas, boreal forests are burning faster than they can regrow, which compromises their long-term ability to store carbon. These forests are becoming a net source of carbon rather than a carbon sink.

### Mapping the wildfires

Natural Resources Canada maintains an interactive map of wildfires and classifies them by extent and in terms of whether or not they are under control. These data are shown over a map of fire danger. This is a good example of a geographical information system used for near-real-time hazard mapping. The map shown here is the situation for 5 September 2023 at the peak of wildfire activity. You can view the interactive map at: [www.tinyurl.com/5ffn45pa](http://www.tinyurl.com/5ffn45pa)

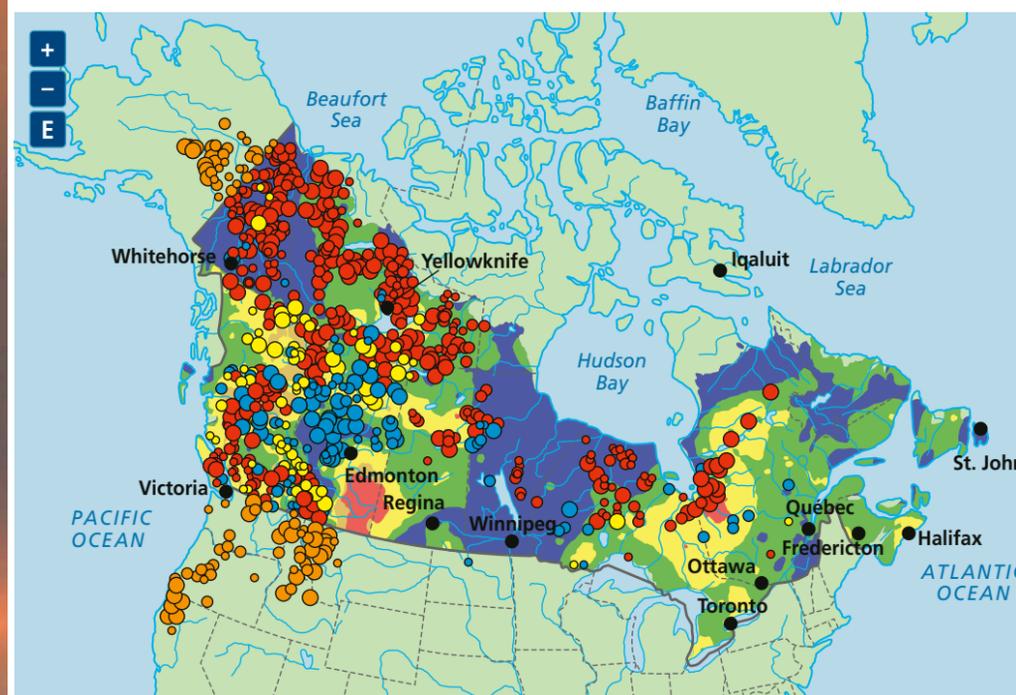
### Interactive map

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September 5 2023 Retrieve Map

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#### Overlays

Base map  
GeoGratis

Fire Weather Index

Fire Danger

Provincial/territorial classifications

- Low
- Moderate
- High
- Very High
- Extreme

Fire Perimeter Estimate

Fire M3 Hotspots

Season-to-date Hotspots

Active Fires

Out of control

● 0 to 100 Ha

● 101 to 1000 Ha

● >1000 Ha

Being held

● 0 to 100 Ha

● 101 to 1000 Ha

● >1000 Ha

Under control

● 0 to 100 Ha

● 101 to 1000 Ha

● >1000 Ha

Other

● 0 to 100 Ha

● 101 to 1000 Ha

● >1000 Ha

Reporting weather stations

Fire History

Source: Adapted from Natural Resources Canada information

Figure 1 Interactive map of wildfire hazard and occurrence maintained by the Canadian Wildland Fire Information System. These maps are updated each day. Follow the links in the key for more information about the Fire Weather Index and other parameters

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### RESOURCES

The *Nature* paper is open access: [www.tinyurl.com/yckfyaxw](http://www.tinyurl.com/yckfyaxw)

This research received widespread media coverage. Read a

BBC article here: [www.tinyurl.com/2s398uf3](http://www.tinyurl.com/2s398uf3)

Jamie Woodward is professor of physical geography at The University of Manchester and an editor of GEOGRAPHY REVIEW.