Lake States Fire Science Consortium

JOINT FIRE SCIENCE PROGRAM

Increase in fire activity across Canada and the Great Lakes region between 1959 – 2015

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Understanding how fire regime characteristics have varied across space and throughout time is vital to establishing a reference point from which future fire regime changes may be assessed. Historical efforts at establishing a reference point in Canada have been a mixed success due to errors in data sets (e.g., unclear distinctions between human-caused and lightning-caused fires), data collection practices (e.g., unstandardized data collection across fire management agencies), or data sets too short in time to assess fire regime characteristics. Stocks et al (2002) carried out the first nation-wide study of fire regime characteristics in Canada from 1959 – 1997. Their significant findings included: 1.82 million hectares (Mha) were burned on average every year, 3% of large fires accounted for 97% of area burned, and 72% of lightning-caused fires accounted for 85% area burned.

Since the Stocks et al. (2002) study, there have been significant corrections and updates to historical data sets, 15 to 20 years of additional data, standardized data collection across fire management agencies, and more accurate fire mapping. In addition, rapid climate change in recent years has resulted in increasingly severe weather, longer fire seasons, and droughts. Therefore, Hanes et al. (2019) investigated whether fire regimes have been changing over the last half century across Canada. They specifically studied area burned, number of fires, fire size, and fire seasonality.

The study area was divided into 16 homogeneous fire-regime zones (HFRZ). HFRZs were characterized by homogenous weather and fuels and relatively limited variability in fire regimes. Two national databases were used: the National Fire Database (NFDB) and national forestry database combined with historic Canadian Forest Service data (CFSD). Summary statistics were updated from Stocks et al. (2002) and trend analyses were performed for area burned, number of fires, fire cause, fire size, and fire seasonality for 1959 – 2015.

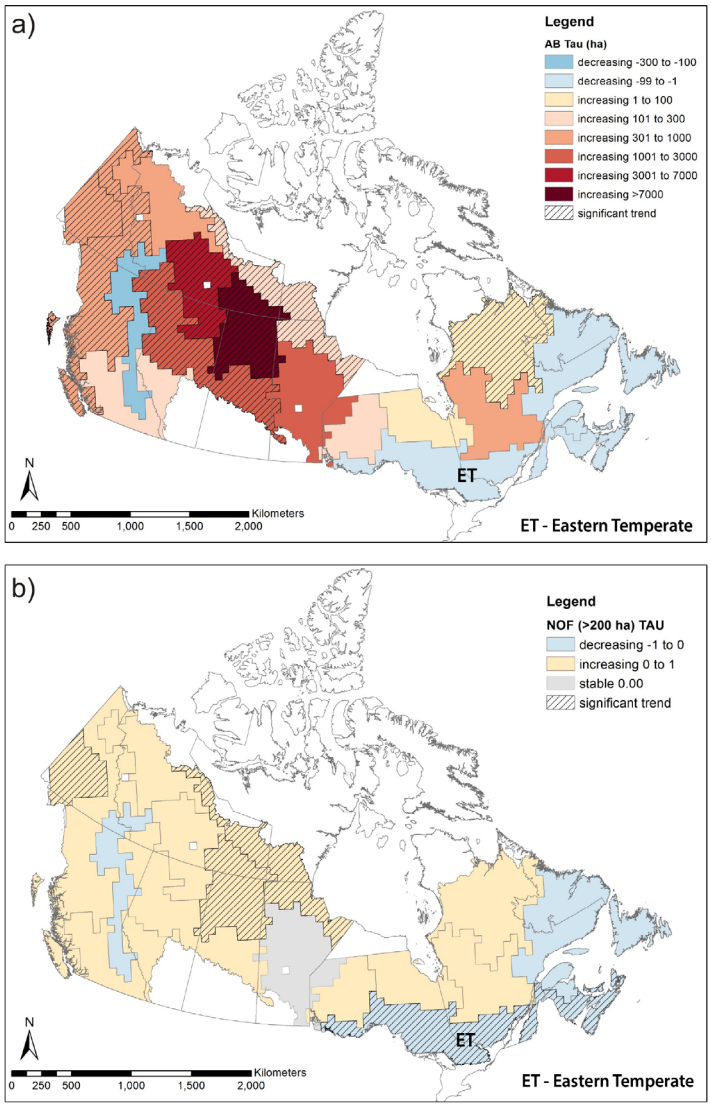

Figure 1. Trends in (a) area burned and (b) number of fires for large fires between 1959 – 2015. Panels modified from Hanes et al. (2019).

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There was increase in overall fire activity broadly across Canada between 1959 – 2015. Specifically, Hanes et al. (2019) determined that in:

Canada

- The annual average area burned was 1.96 Mha·year-1. This was a significant increase, resulting in an additional 33, 593 ha·year-1 burned since 1959, in 13 of 16 HFRZs (compared to the earlier study by Stocks et al.).
- Only 3.2% of fires account for 96.8% of area burned. This statistic remained stable between the initial and updated studies.
- The number of large fires increased significantly, at a rate of 3 fires per year since 1959. Half of the number of fires were lightning-caused and accounted for over 90% of the area burned from 1980 – 2015.
- Of the lightning-caused fires, 85% accounted for 91% the area burned, an increase from the 72% accounting for 85% of area burned, reported by Stocks et al. (2002).
- Fire size at the 50th percentile doubled in size, increasing significantly by 15 ha·year-1 over 57 years. At the 95th percentile, fire size increased significantly by 271 ha·year-1 and 57% larger by 2015.
- Fire season started earlier by 9 days and ended later by 7 days and resulted in significant increase in fire season for all fire sizes (1959 – 2015).

Lakes States Region

- There were no significant increases in the Lakes States region (part of the Eastern Temperate region) for annual area burned and a significant decrease in number of fires[1], with four fewer large fires over 57 years.
- The number and area burned of human-caused fires decreased significantly nationally, with significant decreasing trends in the Lake State region. The Lakes States region also experience a significant decrease in large fires caused by humans.

An increase in fire activity between 1959-2015 may be due to several factors including increased fuel on the landscapes, hotter and drier weather exacerbated by rapid climate change, longer fire seasons. These changes are projected to be even more extreme in the upcoming century.

For Further Reading

Chelene C. Hanes, Xianli Wang, Piyush Jain, Marc-André Parisien, John M. Little, and Mike D. Flannigan. Fire-regime changes in Canada over the last half century. Canadian Journal of Forest Research. 49(3): 256-269. https://doi.org/10.1139/cjfr-2018-0293

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[1]This decrease in number of fires should be viewed with some caution due to a change in reporting of fires after the start of municipal agreements in Ontario in the late 1990's. After these agreements were in place small fires within municipal boundaries were no longer counted or actioned by the province. This may be part of the reason for the decreased number of small fires.