

TRENDS IN CANADIAN FOREST FIRES

1959–2019

Robert Murphy



2020
Fraser Institute

Trends in Canadian Forest Fires, 1959–2019

by Robert P. Murphy

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Executive Summary

In recent years, media coverage and academic discussions of extreme fire activity have fostered the belief among some Canadians that the country is suffering from a rising trend of destruction from forest fires. During the period of reliable data from 1959 to 2019, it is true that there has been a rising trend in fire activity calculated over the entire six decades. However, a closer inspection of the data show that there was a sharp increase in destruction caused by forest fires in the first half of this period, and a general decline in the second half. The all-time peak of fire activity in 1989 involved some 7.6 million hectares burned, while the most recent national data show only 1.8 million hectares burned in 2019.

This ostensible trend of growing devastation from forest fires is often linked to the broader issue of climate change. For a typical example, a 2019 article in *Maclean's* reported: “The forestry experts will also tell you that forest fires—in Australia, California, British Columbia, and Alberta—are bigger, hotter, and more dangerous than fires in the past because of climate change, and we had better get used to them. This is the new reality, and there is reason to worry it will get worse and worse”.

Here is another way to analyze claims about a rising trend of unprecedented forest fires. If we rank the years during this period according to area burned, the six worst years all occur prior to the year 2000. This underscores the point that over the past three decades, there has been a declining trend in numbers of fires and the total area burned at the national level in Canada, a pattern consistent with that observed globally.

If we look only at British Columbia and the Northwest Territories, then recent fire activity really has been unprecedented (during our data period, 1959–2019) and the narrative of increasingly worse fires is correct. Moreover, Alberta's forest fire loss in 2019 was the second highest on record (with the worst year still being 1981), so this too is arguably consistent with the alarmist narrative. However, these are exceptions to the general pattern. In contrast to the experience in British Columbia, Alberta, and the Northwest Territories, we see the opposite in Manitoba, New Brunswick, and Newfoundland & Labrador: in each of these provinces, peak fire activity occurred several decades ago, while recent activity has been much less. Meanwhile, in Ontario, Quebec, and Saskatchewan, there have been relatively steady levels of forest fire activity over our data period. This combination of outcomes explains why the press can feature stories that accurately portray the situation in some Canadian jurisdictions, even though the narrative does not fit the historical facts at the national level.

This study does not aim to explain trends in Canadian fire activity, but merely to document them. In reality, there are many possible explanations for changing trends in fire activity, including not just temperature and rainfall, but also local fire suppression policies, human-forest interactions, and agricultural practices. However, even though this study does not offer a definitive explanation of the trends in forest fires, the information we present does help frame the discussion about which policy reforms, if any, should be taken. Specifically,

the fact that the problematic patterns in fire activity so far only seem to be present in two provinces and the Northwest Territories can rule out simplistic explanations that postulate a single cause (such as climate change). In other words, we know that the factors driving the recent surge in forest fires in some areas must be complex, because any simple cause would not have such disparate impacts across provinces and territories.

Canadian policy makers should be rightly concerned about any surge in forest fires. However, would-be solutions should line up with the facts, and be based on a diagnosis that accounts for the fact that an increase in forest fires has so far only hit a few jurisdictions, while nationally, destruction from forest fires in recent years has not been nearly as bad as it was during the late 1980s and the mid-1990s.

1 Introduction

In recent years, the popular press as well as some academics have pushed a narrative that Canada is suffering from a rising and unprecedented wave of forest fires. The following examples give a flavour of this narrative (emphasis added):

Bigger, hotter wildfires are turning Canada’s vast boreal forest into a significant new source of climate-changing greenhouse gases, scientists say. ...

But with climate change, *fires are becoming more frequent, larger and more intense*. ...

Researchers from five U.S. and four Canadian universities wanted to see if that was affecting stored carbon. *They looked at the impact of the 2014 fire season in the Northwest Territories, which burned the largest area on record.*

(Weber, 2019)

The forestry experts will also tell you that forest fires—in Australia, California, British Columbia and Alberta—are bigger, hotter and more dangerous than fires in the past because of climate change, and we had better get used to them. This is the new reality, and there is reason to worry it will get worse and worse.

So far this summer, fires in northern Alberta have burned more than 800,000 hectares, an area bigger than Prince Edward Island. *Unless Alberta gets a lot of rain soon, before the snow flies, the province will beat the record set in 1981*, when 1.3 million hectares burned. (Maher, 2019).

The next crisis on the horizon is climate change.

Again, the warnings from science are clear. If we do not dramatically reduce emissions, we risk increasingly severe to catastrophic warming of the globe that will ultimately threaten our survival.

In B.C., we are already experiencing the early impacts, such as more severe flooding and forest fires, and the threats will only intensify over the next several decades.

(Gunton, 2020)

The examples above provide a good sampling of the narrative on forest fires that the Canadian public has received in recent years. Specifically, the public has been led to believe that there is an upward trend in forest fires as a result of climate change.

The main purpose of this study is to review data on the frequency and extent of forest fires in Canada. We will show that, although there has been an upward trend in forest fires over the six decades of reliable data from 1959 to 2019, there was a sharp increase in the first

half combined with a decline in fire activity during the second half of the period. Indeed, forest fires across the nation as a whole were significantly worse from the late 1980s to the mid-1990s. Some places—British Columbia, Alberta, and the Northwest Territories—have had record or near-record fires in recent years, but other regions have not.

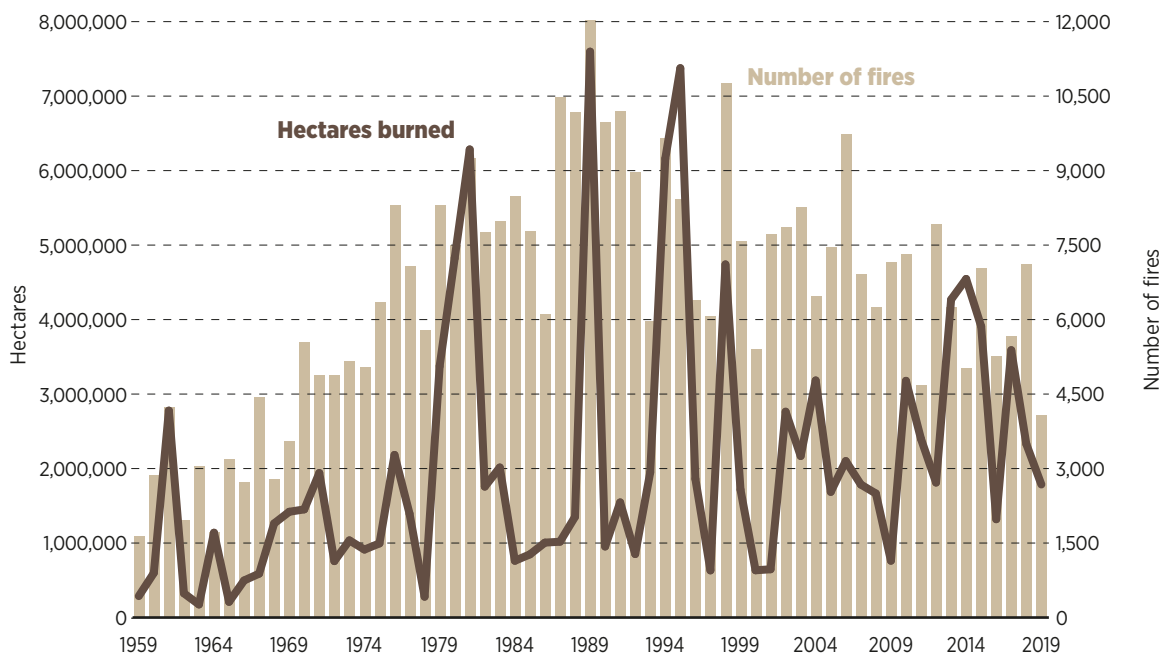
We do not attempt to attribute variations in fire activity to specific causes, but the lack of a uniform upward trend does indicate that there is no simple attribution to climate change, since the pattern is not common across the country. Indeed there is no *global* pattern of increased wildfires either; instead wildfire activity on a global scale has been trending downwards in recent decades, contrary to common perceptions (Doerr and Santin, 2016). Wildfire frequency and extent depends on many factors, including local fire suppression policies, [1] human-forest interactions, and agricultural practices. If climate change were causing a surge in recent fire activity, we would expect numbers to be rising across the country; but as we will see, that is not the case.

[1] For example, the older approach of “zero tolerance” of forest fires may have unwittingly set the stage for uncontrolled infernos because of a build-up of fuel. Some experts argue that a better strategy could be to allow smaller fires to run their natural course (North *et al.*, 2015).

2 Forest Fire Trends in Canada

Figure 1 shows annual fire data for all of Canada, showing both the number of fires and total area burned (in hectares) over the period from 1959 to 2019. [2] As shown, the annual number of fires peaked in 1989, which is also the year that the area burned reached a maximum. The area burned almost reached the same maximum in 1995. Thereafter, both measures have generally gone down. The area burned went up again in 2013/14, though not to levels reached in the 1980s and 1990s. Although there is an upward trend of fire activity during the entire six-decade period, that can be decomposed into a period of sharp increase from 1959 to 1989 and a period of decline from 1989 to 2019.

Figure 1: Total area burned (hectares) and number of forest fires, Canada, 1959–2019



Source: Natural Resources Canada, 2020: Canadian National Fire Database (CNFDB).

[2] This is the period of data published in the Canadian National Fire Database (CNFDB) (Natural Resources Canada, 2020), “compiled and maintained by the Canadian Forest Service” as described at <https://cwfis.cfs.nrcan.gc.ca/ha/nfdb>. To retrieve data earlier than 1980, choose to download the “fire point” data from the options at <https://cwfis.cfs.nrcan.gc.ca/datamart>. There is a “grey literature” of fire statistics going back further in time, but researchers caution that these older data are not directly comparable to the post-1959 statistics. For papers displaying these earlier data, see, for example, Stocks, 1991, 2013; and Van Wagner, 1988.

Another way to illustrate that Canada is not suffering from a recent burst of record forest-fire activity, is to rank the years—drawing on the data available from 1959 to 2019—according to total hectares burned. We present the top ten worst years in **table 1**. The six worst years (measured in terms of total area burned) of forest fires in Canada all occurred before the year 2000, that is, more than two decades ago. The 7th through 10th worst slots occurred in more recent years, but fires in those years were significantly less intense than those during prior peak years.

The national data clearly do not support the idea that there is an upward trend in overall forest fire activity in recent decades. We now turn to provincial records to consider the variations across regions.

Table 1: Years ranked according to total hectares burned in forest fires from 1959 to 2019

Rank	Year	Hectares burned
1	1989	7,597,266
2	1995	7,375,319
3	1981	6,284,405
4	1994	6,161,327
5	1980	4,824,670
6	1998	4,740,953
7	2014	4,545,655
8	2013	4,268,421
9	2015	3,908,377
10	2017	3,589,423

Source: Natural Resources Canada, 2020: Canadian National Fire Database (CNFDB).

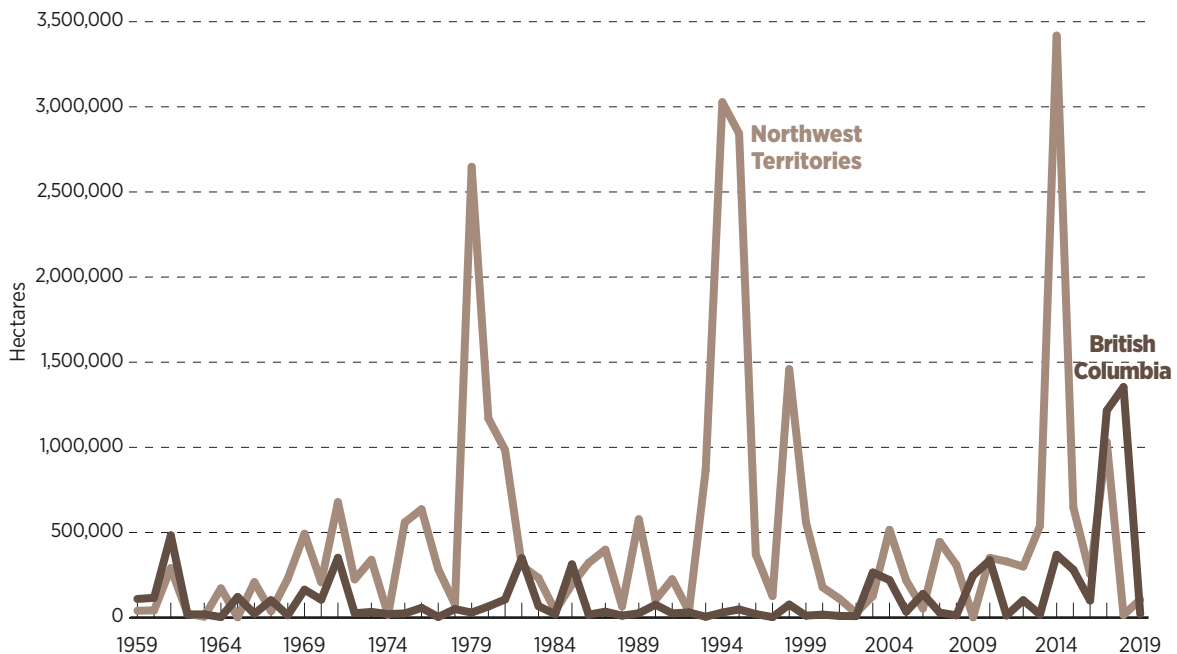
3 Trends in Forest Fires at the Provincial and Territorial Level

In this section, we disaggregate the forest-fire data for Canada into nine provinces and two territories. (Nunavut has relatively modest activity, and its data are reported as part of the Northwest Territories. We also exclude Prince Edward Island, because it has only reported results for 2018 and 2019, and its area burned is relatively insignificant.) As we shall see, once we move to smaller jurisdictions, we get much different results from those suggested by the apparent trends. In the following subsections, we have organized the 11 jurisdictions (9 provinces and 2 territories) into four groups, based on the pattern of forest-fire activity, specifically, the total area burned over the period from 1959 to 2019.

3.1 Group one: recent peaks in forest fires

The first group comprises regions where there have been recent peaks in fire activity (**figure 2**). Here the situation can be described as unprecedented (at least for the time period of modern record-keeping). However, only two of our twelve jurisdictions fit into this category, namely British Columbia and the Northwest Territories.

Figure 2: Total area burned (hectares), British Columbia and Northwest Territories, 1959–2019



Source: Natural Resources Canada, 2020: Canadian National Fire Database (CNFDB).

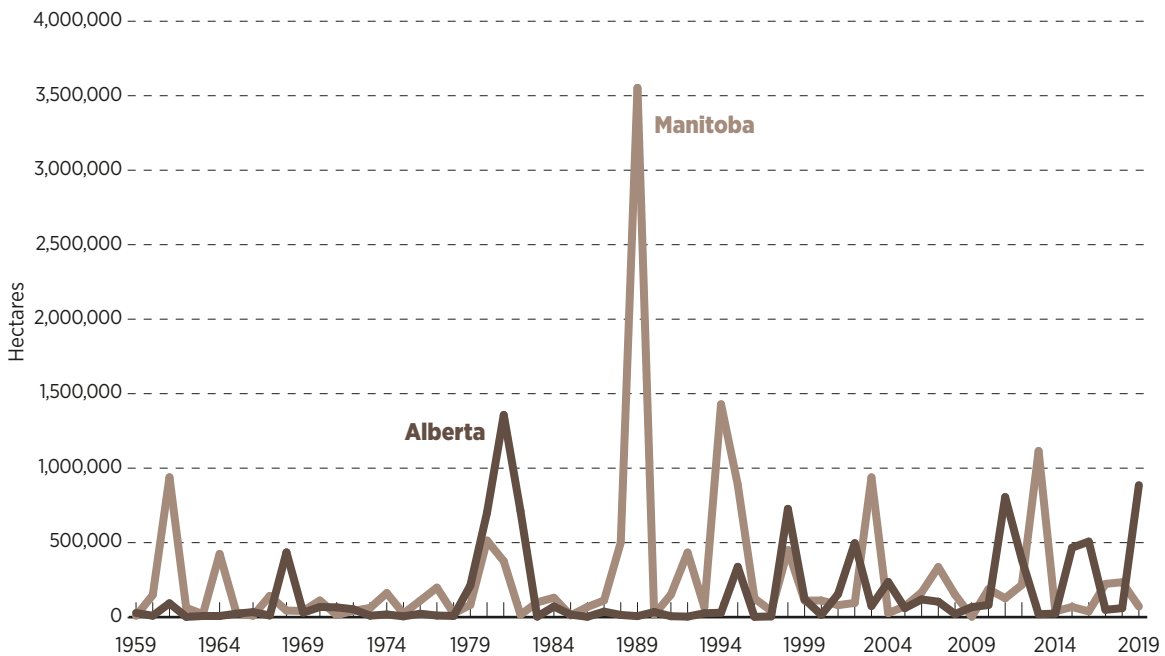
As figure 2 indicates, it is relatively recently that fire activity in British Columbia and the Northwest Territories has reached an all-time peak—at least for the period for which we have accurate data. Specifically, British Columbia saw almost 1.4 million hectares burned in 2018 and 1.2 million hectares in 2017. These levels of fire activity were each more than *double* any prior year’s activity, going back to 1959.

In the Northwest Territories, the record year in this data set was 2014, in which 3.4 million hectares were burned. Although there were three other comparable years—namely 1979, 1994, and 1995—the curve for the Northwest Territories shown in figure 2 is consistent with the popular narrative claiming that forest fires are getting worse over time. However, as we will show in the next three subsections, British Columbia and the Northwest Territories are unusual in this regard, as they are the only two jurisdictions showing such a pattern.

3.2 Group two: long-past peaks in forest fires

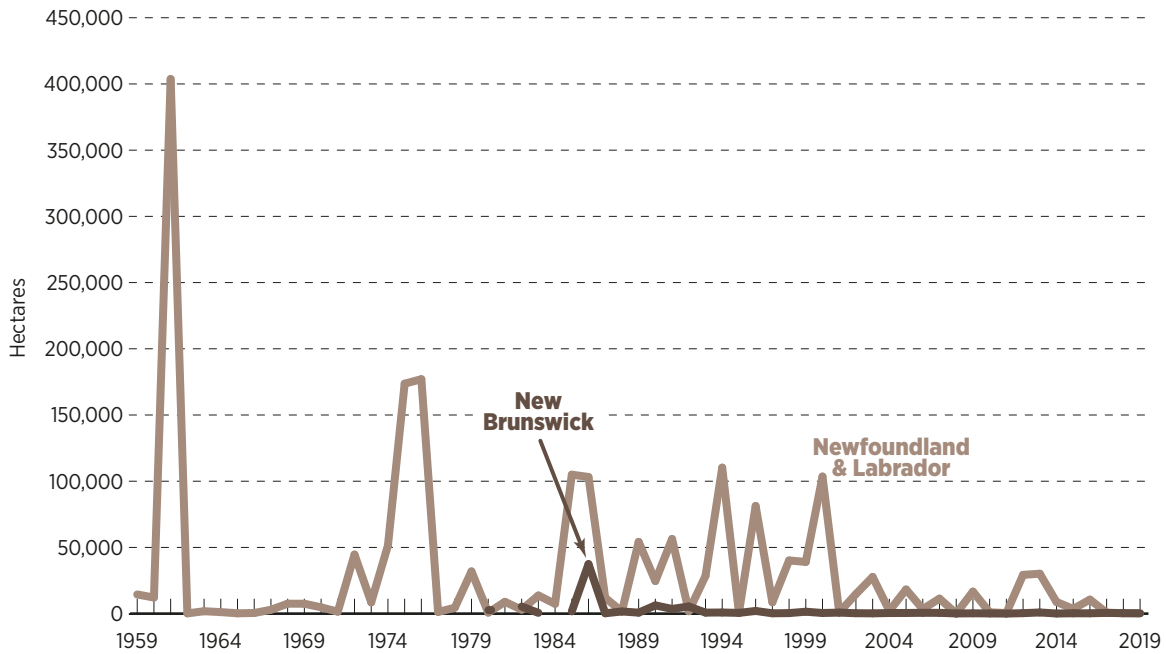
In this subsection, we document those jurisdictions in which the popular narrative is exactly backwards. That is, we here identify those jurisdictions where peak fire activity happened long ago, casting doubt on the claims that recent activity is unusually severe. (Note that the 2019 figure for Alberta presents a special case, which we discuss after presenting the figures below.) Specifically, this group contains the jurisdictions of Alberta, Manitoba, New Brunswick, and Newfoundland & Labrador. Because Alberta and Manitoba have years where the areas burned far exceed the peaks of New Brunswick and Newfoundland & Labrador, we have split the results in this group into two charts (**figures 3 and 4**).

Figure 3: Total area burned (hectares), Alberta and Manitoba, 1959–2019



Source: Natural Resources Canada, 2020: Canadian National Fire Database (CNFDB).

Figure 4: Total area burned (hectares), New Brunswick and Newfoundland & Labrador, 1959–2019



Source: Natural Resources Canada, 2020: Canadian National Fire Database (CNFDB).

As figures 3 and 4 indicate, these four provinces recorded peak fire activity in the distant past. Specifically, Alberta's record fire activity occurred in 1981, Manitoba's in 1989, [3] New Brunswick's in 1986, and Newfoundland & Labrador's in 1961. Note, however, that Alberta's 2019 value is 885,943 hectares burned, which is the second worst in the province's history, behind the 1,357,304 hectares in 1981. Even so, figure 3 makes it clear that Alberta's 2019 result is congruent with its earlier history; besides the record-breaking 1981, Alberta suffered comparable areas burned in the years 1998 and 2011. In any event, there is no evidence of a nation-wide surge in forest-fire activity. The total Canadian forest area burned in 2019 is well below the 2018 and 2017 values, and Alberta is the only jurisdiction with 2019 numbers that are unusually high.

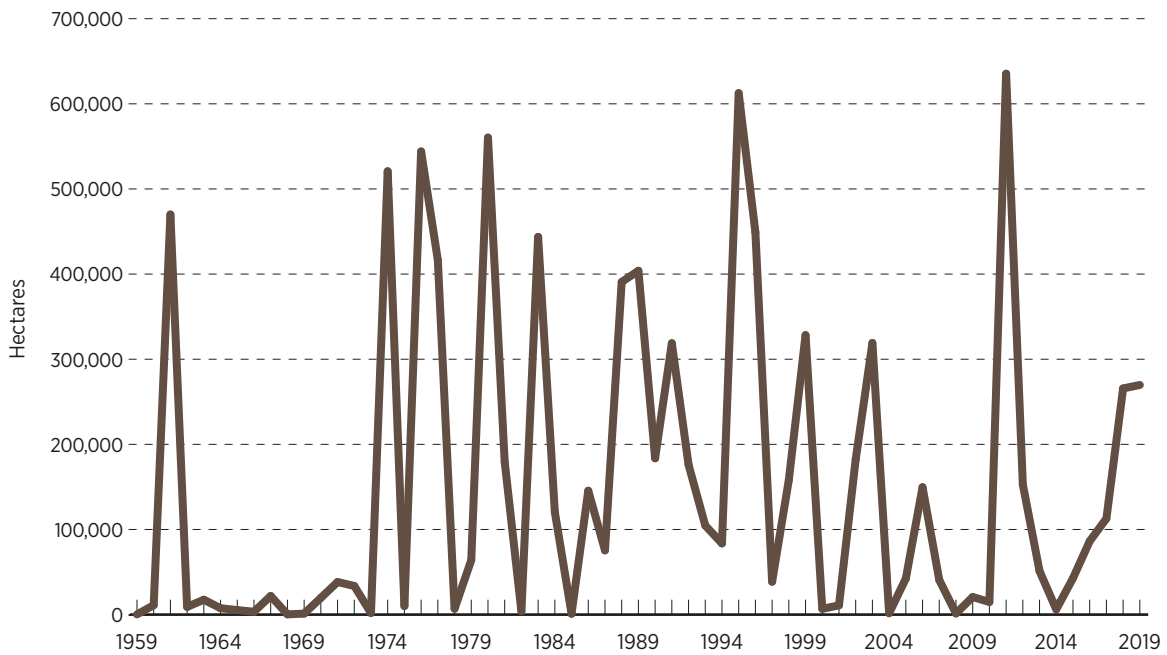
3.3 Group three: steady levels in forest fires

Our third group includes those jurisdictions that have had relatively steady levels in forest fire activity over the past several decades. This group comprises Ontario, Quebec, and Saskatchewan. For ease in viewing, we have broken this group into two charts (figures 5 and 6).

As Figures 5 and 6 illustrate, these three provinces have had relatively consistent levels of fire activity over the years, in the sense that there is no obvious change in the pattern over time. For example, for all three provinces in this category, when we look at recent peak years of fire activity, we see that the number of hectares burned is comparable to the peak years from decades in the past.

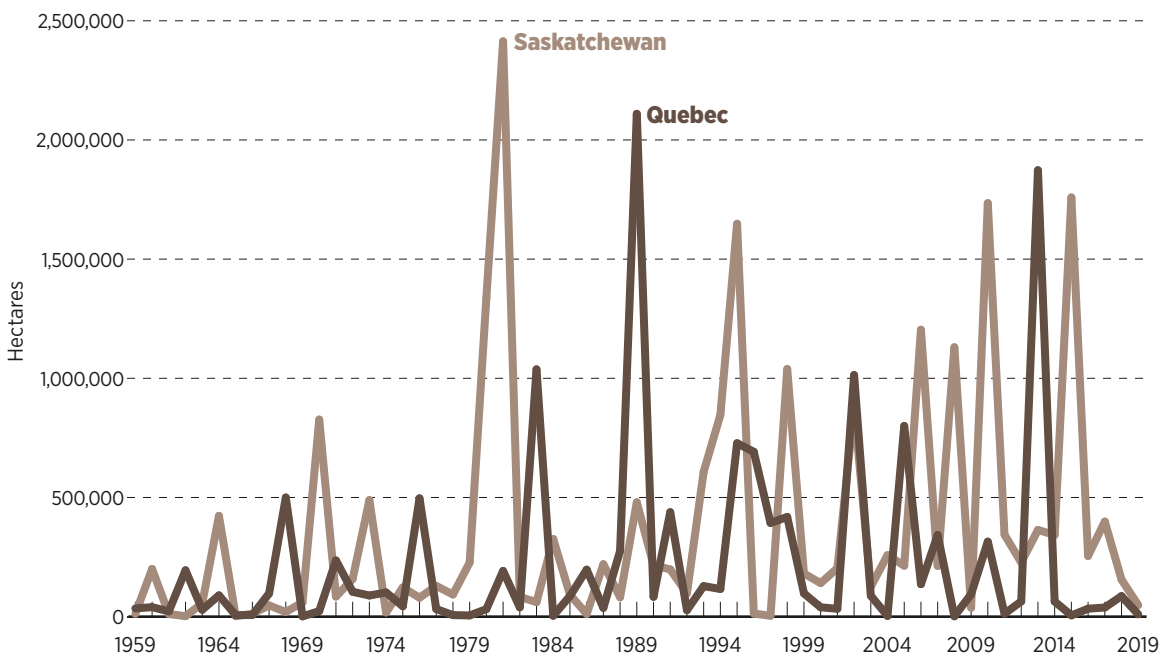
[3] Indeed, in 1989 Manitoba received global news coverage because of its record fire outbreaks (Hirsch, 1991).

Figure 5: Total area burned (hectares), Ontario, 1959–2019



Source: Natural Resources Canada, 2020: Canadian National Fire Database (CNFDB).

Figure 6: Total area burned (hectares), Quebec and Saskatchewan, 1959–2019



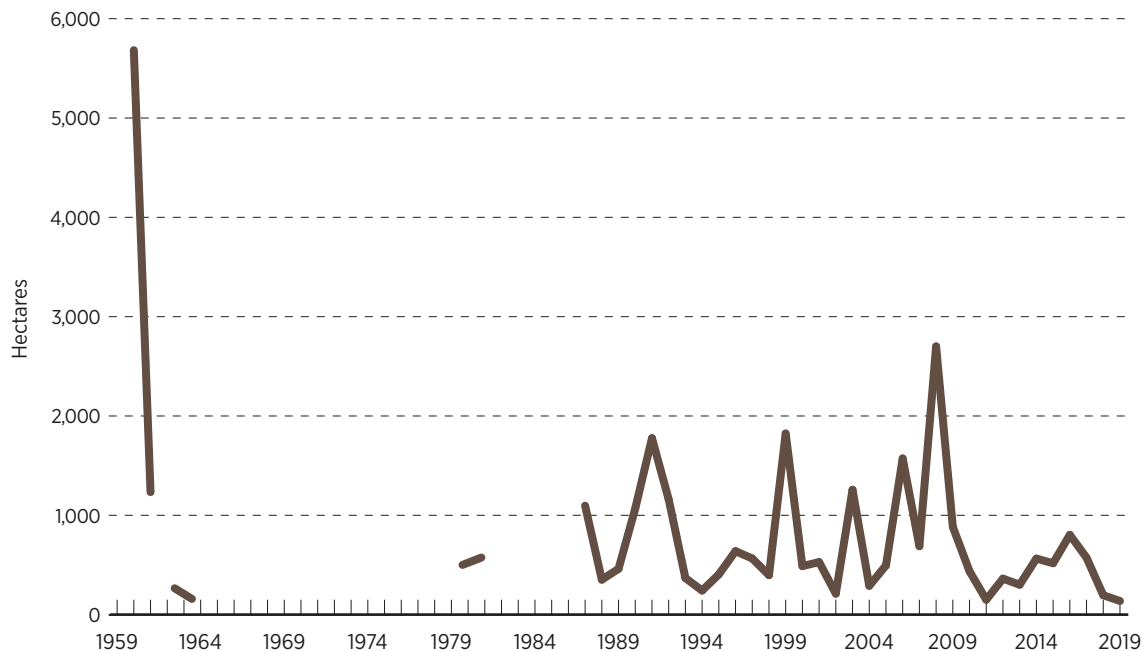
Source: Natural Resources Canada, 2020: Canadian National Fire Database (CNFDB).

3.4 Group four: hard-to-classify cases

Finally, our remaining jurisdictions of Nova Scotia and Yukon fall into a catch-all category that is hard to assess for our purposes in this study. We will simply chart their fire activity in figures 7 and 8. As **figure 7** illustrates, the official data for Nova Scotia is incomplete. Looking just at the full record beginning in 1987, we would put Nova Scotia into our Group Three, as its fire activity has been relatively consistent from 1987 to 2019. However, the official data contain a very high value of 5,683 hectares burned in 1960, which is more than double the next-highest value of 2,700 hectares recorded in 2008. From this consideration, we might place Nova Scotia in our Group Two, containing jurisdictions that had long-distant peaks in fire activity. Yet because we only have the data for two of the years in the range from 1962 to 1986, and because the data are generally less reliable the further back we go, it is unclear how to assess the fire record in Nova Scotia. In any event, what we *can* say with confidence is that Nova Scotia does *not* belong in our Group One. That is, there is nothing in the record to indicate that fire activity is becoming a worsening problem in Nova Scotia.

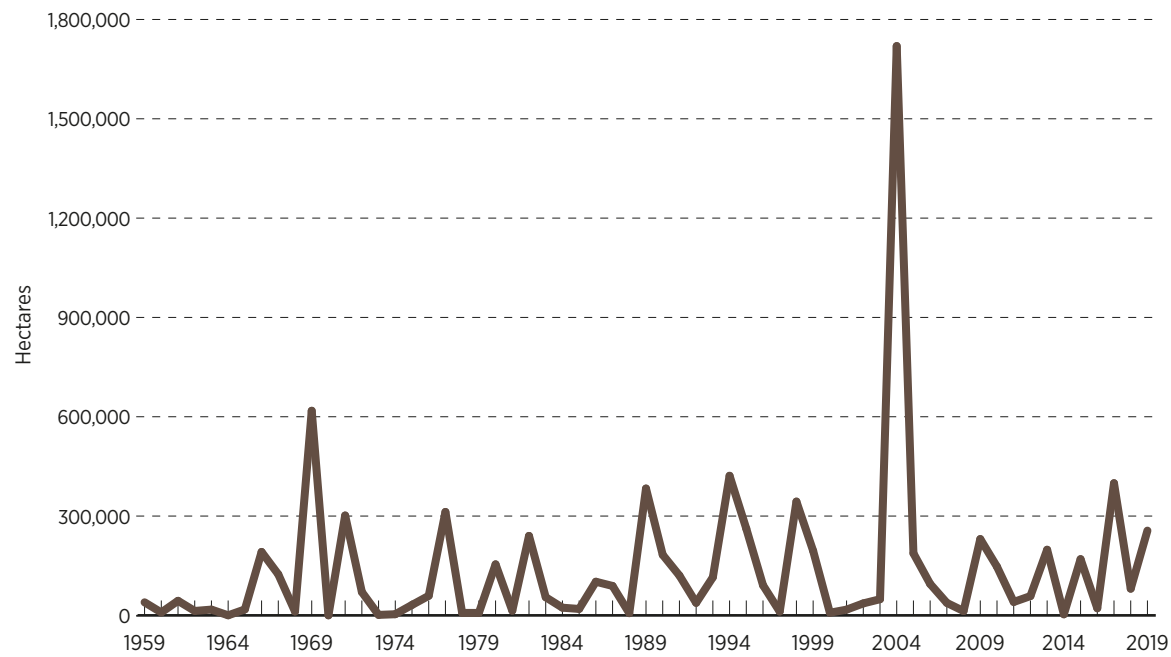
As **figure 8** indicates, Yukon is likewise difficult to classify according to our framework. Generally speaking, fire activity in the territory has been remarkably consistent over the entire 1959–2019 time frame. However, the one striking exception was in 2004, when Yukon lost 1.7 million hectares to forest fires, an amount almost triple the next-highest loss of some 618,000 hectares, which occurred back in 1969. Because of the outsized 2004 experience, it would be wrong to put Yukon in our Group Three. On the other hand, it also seems inappropriate to classify Yukon in Groups One or Two, because the outsized 2004 peak was neither in the distant past, nor is it part of a more recent trend. For these reasons, we have elected to place Yukon into this final Group Four.

Figure 7: Total area burned (hectares), Nova Scotia, 1959–2019



Source: : Natural Resources Canada, 2020: Canadian National Fire Database (CNFDB).

Figure 8: Total area burned (hectares), Yukon, 1959–2019



Source: : Natural Resources Canada, 2020: Canadian National Fire Database (CNFDB).

4 Conclusion

In recent years, media coverage and some academic discussions of extreme fire activity—particularly in British Columbia, Alberta, and the Northwest Territories—have fostered the belief among some Canadians that the country is suffering from a rising trend of destruction from forest fires. This ostensible trend is often linked to the broader issue of climate change. However, a simple inspection of Canadian fire activity shows that there has not been a rising trend in the last 30 years. During the six decades of reliable data from 1959 to 2019, the all-time peak in total hectares burned occurred back in 1989; the first half of the period was characterized by an upward trend in fire activity while the second half saw a decreasing trend. Furthermore, if we rank the years during this period according to area burned, the six worst years all occur prior to the year 2000. Over the past three decades, there has been an overall declining trend in numbers of fires and the total area burned in Canada, a pattern consistent with that observed globally.

If we look only at British Columbia and the Northwest Territories, then recent fire activity really has been unprecedented (during our data period, 1959–2019) and the narrative of increasingly worse fires is correct. Moreover, Alberta’s forest fire loss in 2019 was the second highest on record (with the worst year still being 1981), so this too is arguably consistent with the alarmist narrative.

However, these are exceptions to the general pattern. This combination of outcomes explains why the press can feature stories that accurately portray the situation in *some* Canadian jurisdictions, even though the narrative doesn’t fit the historical facts at the national level.

This study does not aim to explain trends in Canadian fire activity, but merely to document them. However, the information we present in the study does help frame the discussion about which policy reforms, if any, should be taken. Specifically, the fact that the problematic patterns in fire activity so far only seem to be present in two provinces and the Northwest Territories can rule out simplistic explanations that postulate a single cause (such as climate change). In other words, we know that the factors driving the recent surge in forest fires in some areas must be complex, because any simple explanation would not have such disparate impacts across provinces and territories.

Canadian policy makers should be rightly concerned about any surge in forest fires. However, would-be solutions should line up with the facts, and be based on a diagnosis of the problem that accounts for the fact that an increase in forest fires has so far only hit a few jurisdictions, while nationally destruction from forest fires in recent years has not been nearly as bad as it was during the late 1980s and the mid-1990s.

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