

Canadian Wildfire Analysis: An Evidence-Based Perspective

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Wildfires are dangerous phenomena that can be natural or human. In recent years, they have been occurring in Canada with alarming frequency. According to the Government of Canada, 2023 saw over 6,000 wildfires that burned more than 15 million hectares of land. Similarly, Global News reported that 2024 is on track to be the second-worst wildfire season in Canadian history (Omstead, 2024). These fires pose a significant threat to Canada's environment and the people.

The causes of wildfires have sparked a debate among journalists, with some aligning with climate activists and others opposing that view. Our report will focus on the latter perspective by analyzing two articles: Randall Denley's "No, this year's wildfires aren't a sign of the end times" and Chris Sankey's "Stop blaming forest fires on climate change." In the following section, we will critique their arguments, highlight some of the weaknesses in their reasoning, and advocate for a balanced view that takes into account all factors contributing to wildfires.

Denley argues that the wildfire season in 1989 was more severe than what Canada experienced in 2023. He claims that climate activists are exaggerating the connection between global warming and wildfires. He suggests that the public is being misled about the role of the climate crisis in causing these fires. According to Denley, the evidence does not show that global warming is the primary driver of wildfires, although he does not provide evidence to support an alternative view.

Denley references the Canadian National Fire Database but focuses solely on the years 1989 and 1995. By selectively choosing these years, his argument offers a narrow perspective, making it difficult to assess whether those years reflect a broader trend or are simply outliers. A

more thorough analysis spanning a longer timeframe would provide a clearer picture of the role that climate change plays in the occurrence and severity of wildfires.

In addition, Denley only looks at the frequency of wildfires. But the real issue today is not just how often wildfires happen, it is how much longer and more intense they have become. Climate change has created conditions that make wildfires much more destructive—with higher temperatures and drier climates contributing to larger, more severe fires. Denley's argument lacks the solid evidence needed to support his claims, making it feel incomplete and unconvincing. By selectively presenting information, he presents a skewed view of the situation. Furthermore, the conclusions of his article, published in June 2023, feels premature, considering Canada's peak wildfire season runs from May to August.

Denley's report lacks substantial data and visuals to support his claims. Instead, he relies on personal anecdotes and selective numbers. While he does link to a graph showing the number of fires, he overlooks the point that in wildfire analysis, the area burned is often more significant than the frequency of fires. His dismissive language toward climate activists, labeling them as "climate change alarmists" or referring to their concerns as "hyperventilation," further undermines his argument, making it seem biased and lacking serious, objective analysis.

On the other hand, Chris Sankey attributes most wildfires to human activities like camping and arson rather than climate change and criticizes poor forest management practices. However, Sankey's argument is also weak because he fails to provide specific data or evidence to support his claim that human activities are the primary cause of wildfires. He does not offer a clear breakdown of fires caused by natural factors versus human-caused incidents, which makes it difficult to assess the true impact of each accurately. Sankey's references are limited, relying

on a video of someone committing arson and an article about a woman starting fires—examples that appear cherry-picked to support his narrative.

Sankey also dismisses the role of climate change without offering any credible sources or analysis to support his claim that camping and arson are the main causes of wildfires. His argument seems biased and lacks the necessary evidence to make it convincing. Even though he calls for a fair and balanced perspective, his article seems to fall short of achieving that. A comprehensive analysis, backed by sufficient data, would provide a clear framework for understanding the wildfire issue.

In conclusion, both Denley and Sankey's articles could benefit significantly from more data, facts, and evidence. A balanced, evidence-based approach that connects or disconnects climate change and wildfires would provide readers with a better understanding of this complex and pressing issue. Without this, the arguments presented are incomplete and may mislead those trying to grasp the real drivers behind wildfires in Canada.

We will conduct our own analysis to gain a deeper understanding of wildfires in Canada and address the issues raised in the aforementioned articles.

The National Forestry Database website provided seven datasets that included statistics ranging from the number of fires to the area burned and the financial damage caused by wildfires. Some of the data consists of actual statistics, while some is estimated. For the purpose of our analysis, we treated them the same. Each dataset had both English and French columns, but we only used the English columns for our analysis. Most datasets had less than 2% missing values, except for the property loss dataset, which had around 56% missing data. We opted to remove the missing values for this specific dataset, while for the others, we left them as they

were. The initial datasets did not include information for the years 2022 to 2024, so we obtained this additional data from Natural Resources Canada and the NBAC database.

Each dataset includes information on the year, province, cause of fire, and other relevant factors. Human activity was the leading cause of fires, with 371 instances, followed by lightning with 355 cases, and unspecified causes accounted for 232 incidents. The most significant number of fires in a single year was recorded in British Columbia, with 2,888 fires in 1994, followed by 2,344 in 1992 and 2,196 in 2009. The top 22 yearly fire counts were observed in British Columbia and Ontario.

The largest area burned was in the Northwest Territories, covering 2,491,437.7 hectares in 1995. Regarding monthly data, May had the highest number of fires (368), closely followed by August (364), June (364), and July (362). The most extensive area burned within a single month also occurred in the Northwest Territories, reaching 2,491,437.7 hectares. The average monetary loss for property damage was \$505,121, with the highest recorded loss being \$12,115,901.

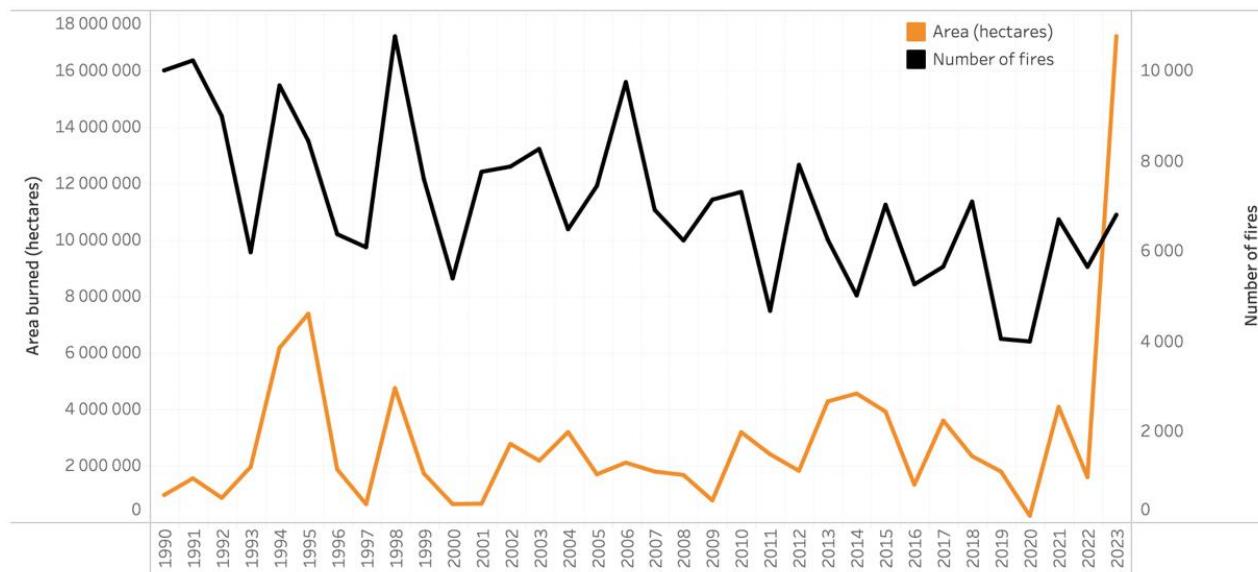


Figure 1: Total area burned and the number of fires by year

Figure 1 illustrates the total area burned and the number of fires recorded each year. It shows that while 1998 had the highest number of fires, the wildfires in 2023 caused the most damage in terms of the area burned. The graph reveals a slight decline in the number of fires over the years, but the extent of the burned land has stayed relatively consistent, with occasional fluctuations. This suggests that, although there are fewer fires, they are becoming more intense, with smaller numbers causing as much, if not more, damage than in previous years. Figure 1 also highlights that 2023 was an anomaly, with over 16 million hectares burned—far exceeding any other year on record.

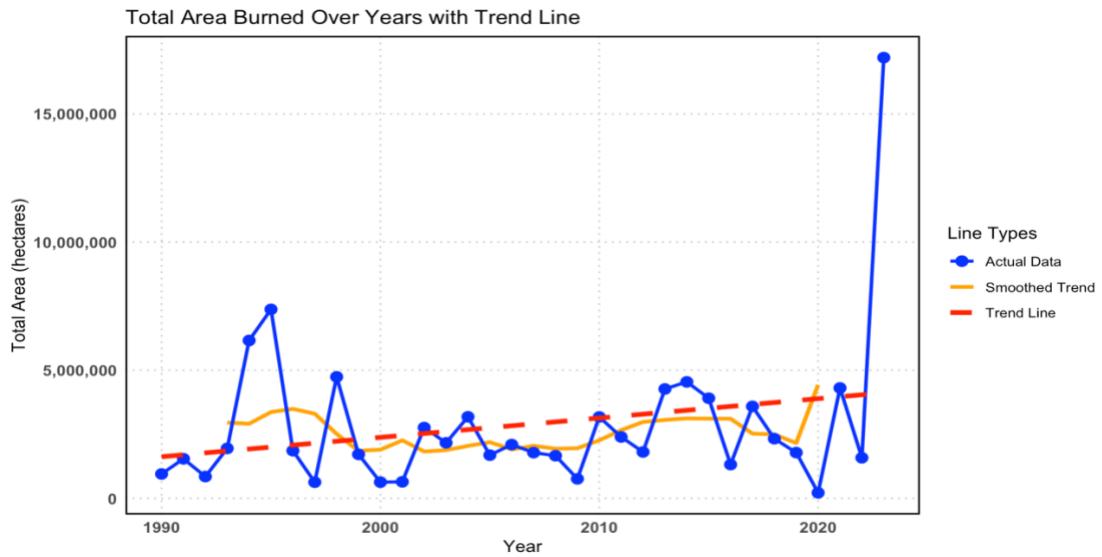


Figure 2: Total Area Burned Over Years with Trend Line and a smoothed trend using a 7-point moving average

Figure 2 provides additional details based on Figure 1. The orange line represents a smoothed trend, helping to reduce the yearly fluctuations and highlight the underlying pattern over time. This smoothed trend shows a gradual increase in the total area burned. The red line is a linear trend line, which also slopes slightly upward, indicating that, over time, there has been a rise in the total area burned each year. While fire activity varies annually, Figure 2 suggests a slow, long-term increase in burned areas, possibly influenced by broader environmental factors.

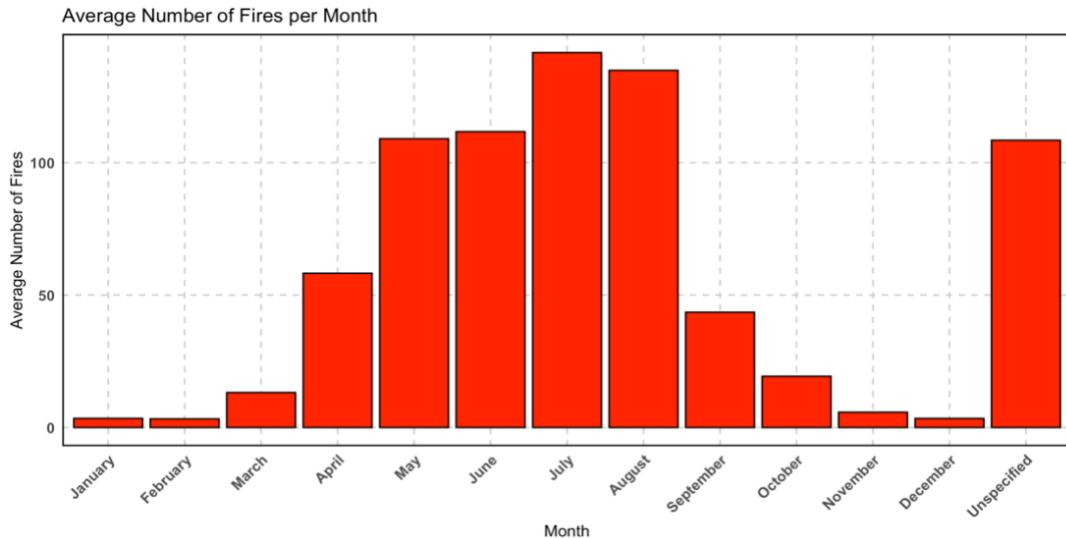


Figure 3: Average number of fires per month

Figure 3 displays the average number of fires that occur each month. July records the highest average, closely followed by August. The data indicates that the majority of fires happen during the summer months rather than in winter, suggesting a stronger likelihood that these fires are driven by hot, dry weather conditions rather than accidental causes like campfires. Additionally, a significant number of fires are categorized under "unspecified," reflecting instances where the exact cause of the fire remains unknown.

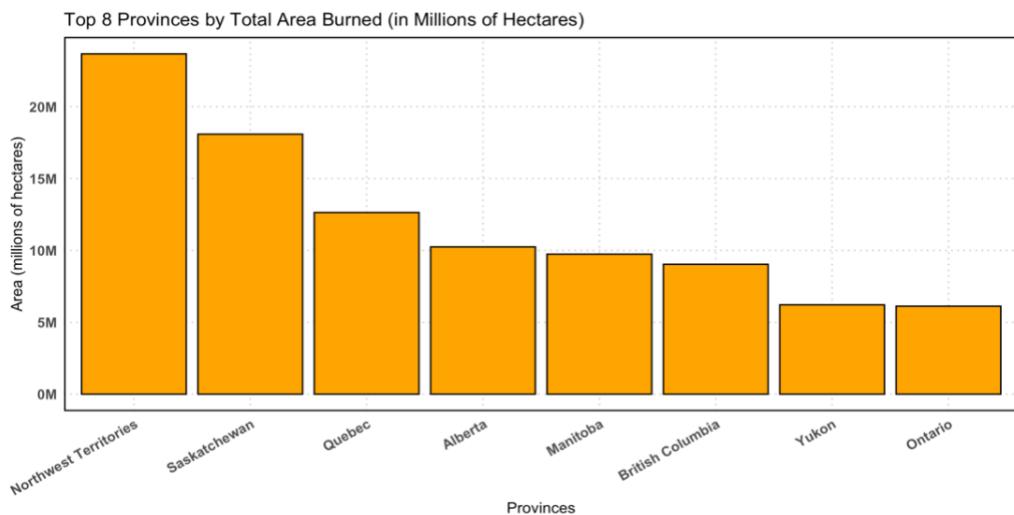


Figure 4: Top 8 provinces by total area burned

Figure 4 shows a similar comparison—the total area burned by wildfires across different provinces. The Northwest Territories suffered the most significant damage, with over 20 million hectares burned, followed by Saskatchewan and Quebec. Interestingly, despite having some of the highest wildfire occurrences, British Columbia and Ontario rank lower at sixth and eighth positions, respectively.

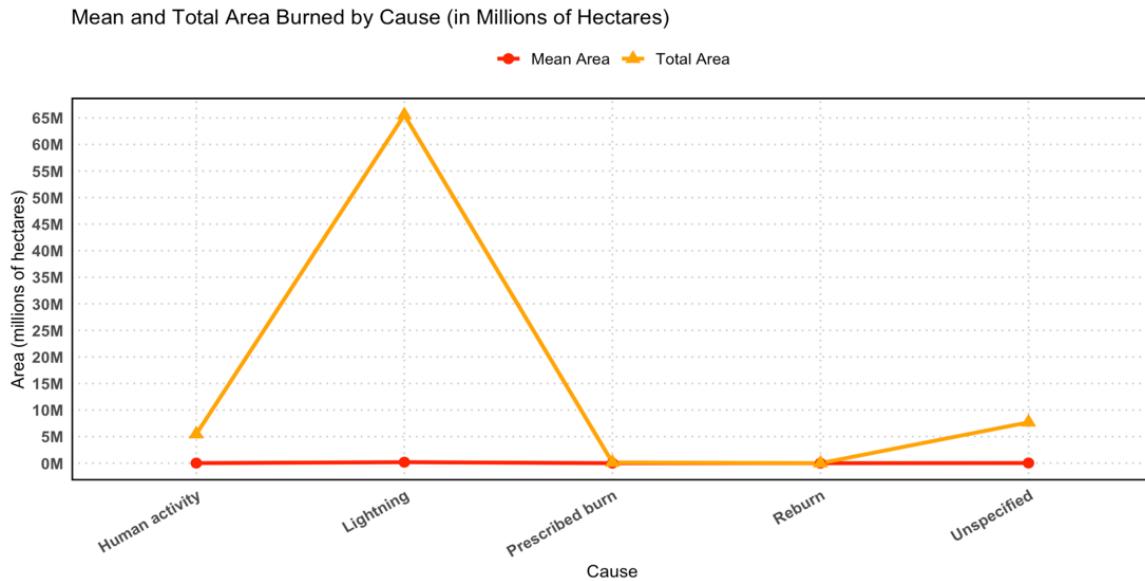


Figure 5: Total and mean area burned by cause (of wildfire)

Figure 5 highlights the total and average area burned based on the cause of wildfires. Lightning is the top cause of damage, responsible for over 65 million hectares burned. This is followed by unspecified causes, at just under 10 million hectares, and human activity, at around

6 million hectares. The data suggests that the majority of damage to Canadian land and environment is driven by lightning, a natural phenomenon, rather than human activities.

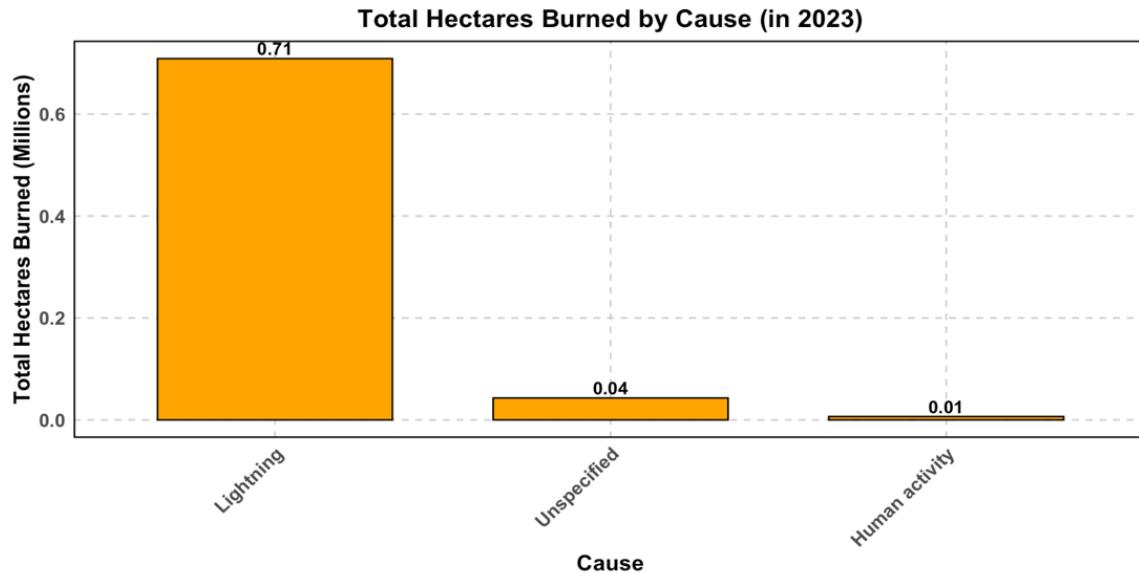


Figure 6: Total area burned by cause (of wildfire) in 2023

Figure 6 provides a closer look at the data from Figure 4, focusing specifically on the year 2023. In this snapshot, lightning was responsible for burning 0.71 million hectares, making it the most significant cause of wildfire damage. Unspecified causes accounted for 0.04 million hectares, while human activity contributed the least, with just 0.01 million hectares burned. Proportionally, lightning was responsible for the overwhelming majority of the damage, accounting for approximately 93% of the total burned area; unspecified causes comprised around 5%, and human activity was responsible for just 1%. This highlights that in 2023, natural causes like lightning played a far greater role in wildfire destruction compared to human-related factors.

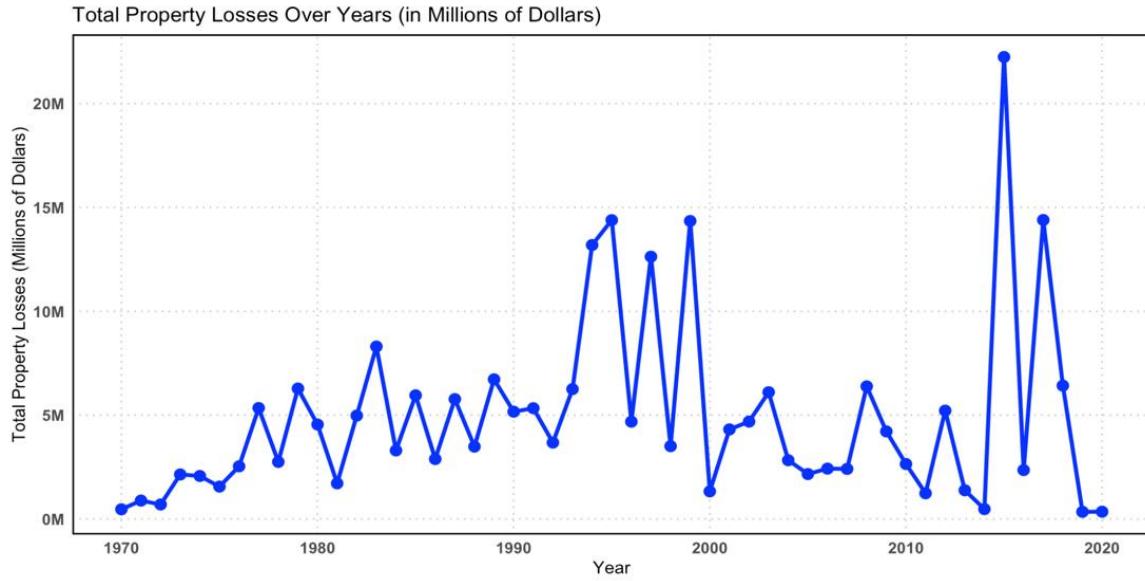


Figure 7: Total property losses over the year

Figure 7 illustrates the property loss and financial damage caused by wildfires in Canada. The decade between 1990 and 2000 stands out as particularly devastating, likely due to less developed fire management and control methods at the time. The wildfires in 2015 inflicted the most financial damage, costing over \$20 million. Interestingly, the more recent fires in 2019 and 2020 resulted in minimal financial damage, suggesting improvements in fire prevention and management strategies have been effective. In terms of proportions, the fires in 2015 and 2017 accounted for a significant share of the overall monetary losses in the last few decades, emphasizing the outlier nature of those years compared to others with far less damage. This pattern suggests that while wildfires continue to occur, advancements in firefighting and containment efforts may be reducing their financial impact in recent years.

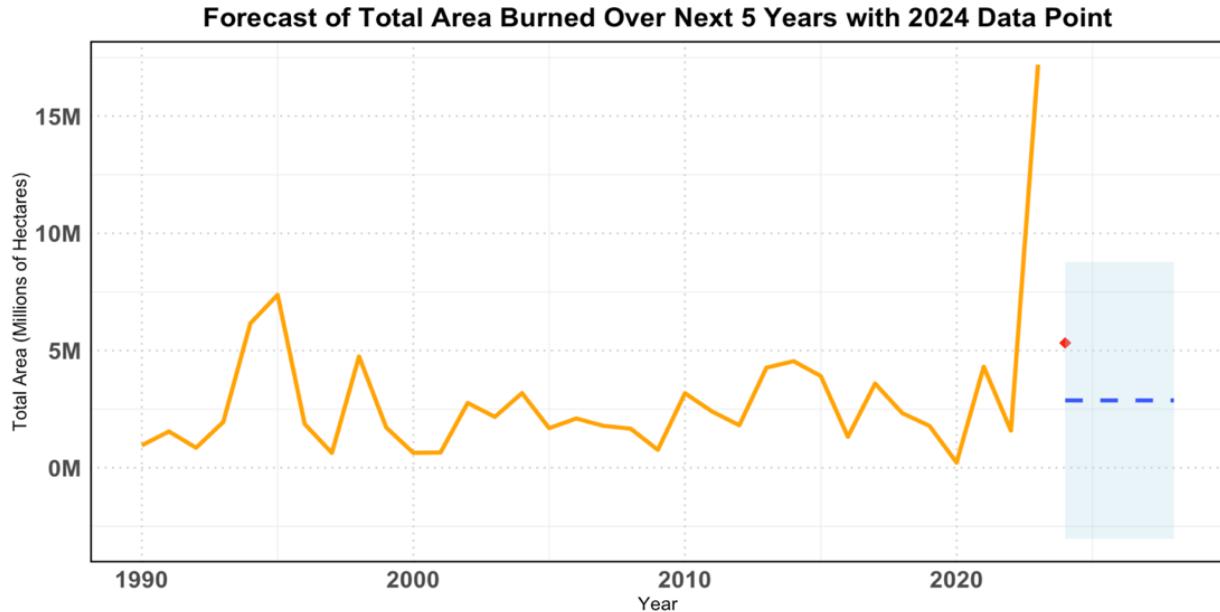


Figure 8: Forecast of Total Area Burned over the next 5 years

Figure 8 presents a forecast predicting the potential wildfire damage over the next five years. The dotted line and shaded area represent the predicted damage, with the dashed blue line showing the average burned area based on historical trends. The light blue shaded region indicates the prediction interval, meaning there is a 95% confidence that future wildfire damage will fall within this range. The forecast suggests that while the area burned will likely remain significant, it will not reach the extreme level seen in 2023. Instead, predictions show that wildfire damage in the coming years could range between 5 to 10 million hectares. For context, we can look at the red point, representing the year 2024. It shows that while the burned area is higher than the historical mean trend, it still falls within the forecasted range. However, it is important to note that 2024 is still ongoing, and the data for this year is incomplete and subject to change.

In conclusion, the impact of wildfires on Canada has been substantial, with large numbers of fires and millions of hectares burned. The data indicates that 2023 was an anomaly, with

unprecedented damage compared to previous years. However, even though 2024 is still ongoing, the damage so far is already above the historical average. It remains unclear whether 2024 will also be an anomaly or if we are witnessing a shift towards more intense and destructive wildfires.

We also observed that most fires occur during the summer months (May to August), further disproving Denley's and Sankey's claims, which were incorrect and premature. Contrary to his conclusion, 2023 stands out as the worst year in terms of area burned. Additionally, the data clearly shows that almost 93% of the damage in 2023 was caused by lightning, not human activity, directly challenging the argument that wildfires are primarily human-caused.

Our forecast predicts the potential damage for the coming years, suggesting that the trend may continue to rise above the historical mean. This forecast could serve as a call for increased government vigilance and preparedness in the future.

In the end, the concerns raised by climate activists are indeed justified. With 2023 being the worst year on record, it felt like a breaking point. Let us hope that we can take meaningful steps to improve conditions in the years ahead.

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