United Nations University
Institute for Water, Environment and Health

INCIDENTBRIEF
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The July 2026 Wildfires in Canada and Their Transboundary Smoke Problem

Key Findings

Late but Explosive Start
Canada has experienced several extreme wildfire activity years in the last decade. Canada's 2026 fire season had a slow start, trailing behind the 10-year (2016-2025) average until the late June North American Heat Dome, when the burned area started to sharply increase. As of July 23, the cumulative burned area in 2026 in Canada ranked third highest, surpassed only by 2023 and 2025 (January 1 to July 21 period)[1].

Significant Above-normal Regional Wildfire Activity
As of this writing, the Northwest Territories, Quebec, and Ontario have shown marked above-average wildfire activity, with Ontario experiencing a 3.5-fold larger burned area than the 10-year average. Ontario wildfires, in particular, caused widespread evacuations, affecting multiple First Nation communities. Some had to flee wildfire blazes on boats.

Severe and Widespread Transboundary Disruption
Smoke from these wildfires reached major metropolitan areas in North America, including Toronto and New York, causing them to record the worst air quality conditions globally. Between July 15 and 17, exposure to unhealthy, very unhealthy, or hazardous air quality reached nearly 106 million person-days (number of people exposed x number of exposure days), requiring major metropolitan areas to take mitigative actions. There were concerns that heavy smoke would impact the final World Cup match on July 19 in New Jersey, which drew widespread global attention, but it did not pan out due to favorable weather conditions.

Climate Change as a Key Driver and Amplifier
These wildfires are a stark manifestation of a warming climate. Below-normal June-July precipitation in Ontario was worsened by a >2°C above-average temperature, drying the vegetation to support wildfire ignition and growth. A stationary high-pressure system, also known as a heat dome, at the end of June across much of North America contributed to curing the fuels for large wildfire activity.

Urgent Need for Enhanced Resilience and Mitigation
The current wildfire crisis emphasizes the critical need for improved societal resilience, better evacuation systems, robust support for displaced populations, and proactive wildfire prevention. Additionally, strengthening resilience to wildfire smoke is paramount, as studies suggest smoke can cause a cumulative 1.9 million excess deaths between 2026 and 2055 across the United States alone[2].

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Context

Canada's initially slower-than-average 2026 wildfire season intensified sharply in late June-early July. This occurred after the 2026 North American Heat Dome brought record-breaking temperatures to parts of Canada, particularly Ontario, where several communities set new daily temperature records coinciding with extreme fire weather. As of July 21, 3,915 wildfires had burned nearly 3.04 million hectares across Canada, with Ontario experiencing uncharacteristic wildfires, with impacts ranging from local evacuations and community destruction to heavy smoke affecting large metropolitan areas across the Canada-US border. In this timeline, Ontario alone experienced 565 wildfires burning more than 728,000 hectares, forcing around 1,800 residents from remote northwestern communities to evacuate. A large fraction of the burned area occurred over a 3-day interval, resulting in large, concentrated smoke emissions that were transported downwind to populated areas. Indigenous communities have borne a particularly heavy burden: more than 3,500 First Nations residents were displaced nationally by mid-July, some evacuated with the help of the Canadian Armed Forces.

Dense smoke from Canadian and northern Minnesota fires gave Toronto and U.S. Great Lakes states some of the world's worst air quality before spreading into New York. Despite the long record of cooperation between the two nations in emergency management, particularly firefighting, transboundary smoke became an unexpected source of political friction. U.S. President Donald Trump accused Canada of failing to control the Ontario fires and threatened tariffs on Canadian goods, while Ontario Premier Doug Ford condemned the criticism as unacceptable, urged the United States to provide assistance instead, and emphasized Canada's history of supporting American hurricane and wildfire responses. The dispute is yet another example of how worsening climate-driven wildfire and smoke hazards can strain even close international relationships, reinforcing the need for coordinated firefighting, public-health planning, and cross-border emergency cooperation in the short term, while addressing the root causes of climate change in the long term.

Findings

This Incident Brief by the United Nations University Institute for Water, Environment and Health (UNU-INWEH) provides a rough estimate of the wildfire activity in Canada as of July 21, 2026 and human exposure to wildfire smoke in Canada and the United States during the peak smoke impact (July

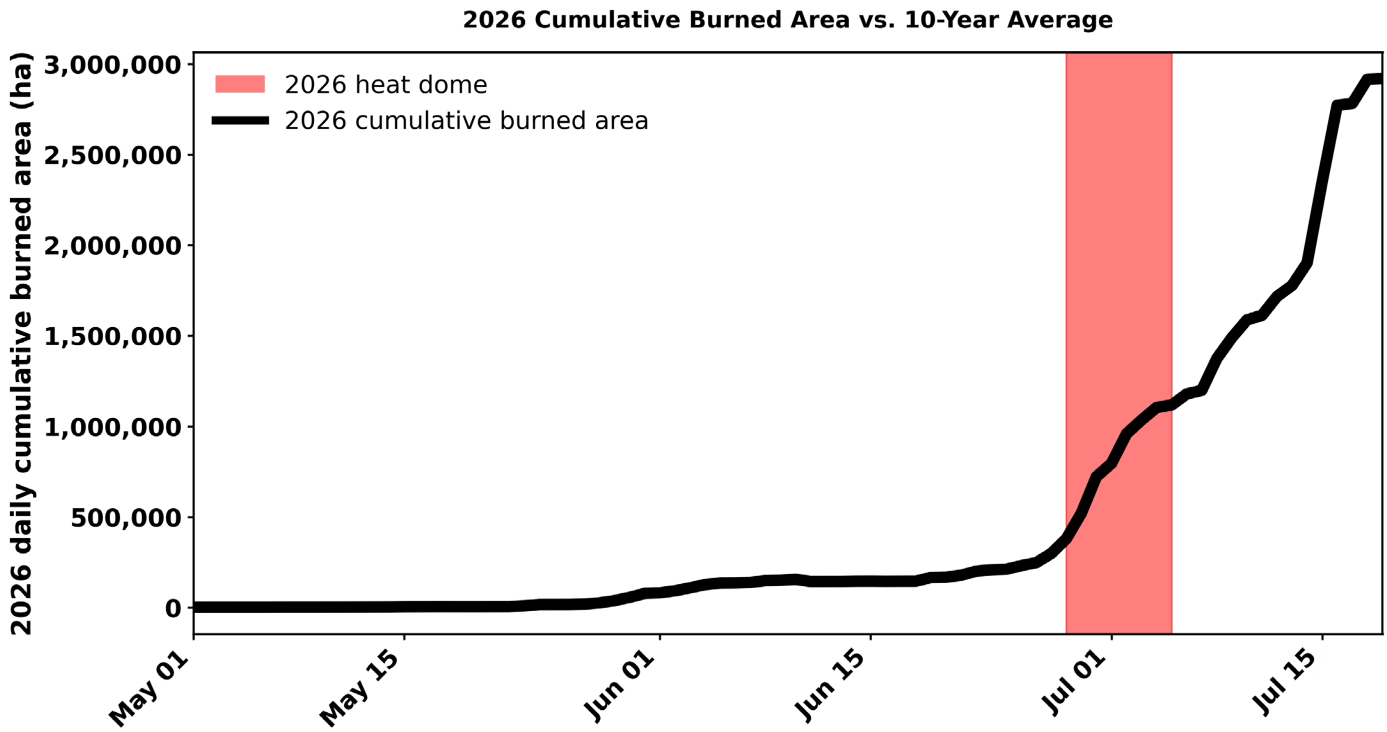

Figure 1. Daily cumulative burned area across Canada in 2026.

13-18, 2026) using wildfire perimeter data from the Canadian Wildland Fire Information System (derived from AVHRR, MODIS and VIIRS satellite imagery, and NASA Firms platform), air quality data from AirNow, drought information from the Climate Engine Platform (ERA5 Land), land cover from the North American Land Change Monitoring System, and gridded population data from WorldPop. The analysis indicates that Canada started 2026 with a below-10-year-average burned area; cumulative burned area deficit exceeded 1.2 million hectares by June 28, when the 2026 North American Heat Dome formed over much of North America, particularly impacting the Eastern US and Canada. This is when wildfire activity sharply expanded across Canada, with burned area exceeding the 10-year average by 367,000 hectares by July 21 (Figure 1). Trends were most pronounced in Ontario. While annual precipitation in Ontario was around normal, the last two months' precipitation in Southwest Ontario was more than 2 standard deviations below normal for the time of year (standard precipitation index < -2), and average temperature was >2°C above average, drying out forests. The two-month Standardized Precipitation-Evapotranspiration Index (SPEI) that incorporates both the supply of and the atmospheric demand for moisture (i.e., precipitation and evapotranspiration) dropped to extremely dry conditions (Figure 2a) before the wildfires peaked.

Rapidly expanding wildfires in Ontario created emergency conditions across remote and predominantly Indigenous communities. Roughly 1,800 residents were evacuated, and as many as 11 Ontario First Nations were under evacuation because of wildfire impacts. Ontario requested federal assistance, including support from the Canadian Armed Forces, for evacuations from isolated areas accessible only by air or water. The consequences were especially severe in Namaygoosisagagun First Nation, where residents escaped by boat as approaching flames destroyed the community. Whitewater Lake First Nation was also impacted. Wildfires additionally disrupted transportation and economic activity, including the temporary suspension of Canadian National Railway operations.

Smoke from the Ontario fires traveled hundreds of kilometers, affecting densely populated areas. In Canada, smoke pushed air quality in Toronto to unhealthy levels and, for a period, gave the city the poorest air quality status among major cities worldwide; plumes also spread across southern Ontario and parts of Quebec. Southward-moving smoke then blanketed large portions of the U.S. Midwest, Northeast, and Mid-Atlantic, degrading air quality in metropolitan areas including Detroit, Minneapolis, Milwaukee, Chicago, New York City, and Washington, D.C. (Figure 2). Our results indicate that smoke caused more than 769 million person-days of exposure to air quality that was moderate or worse across the region, as indicated in Figure 2. Person-days indicate the number of people exposed to smoke times the number of smoke days. Exposure to unhealthy, very unhealthy, or hazardous air quality reached nearly 106 million person-days between July 15 and 17 (Table 1). Here, a ground-level, gauge-measured air quality index (AQI) based on PM2.5 (particulate matter with aerodynamic diameter less than 2.5 microns, 30 times smaller than human hair) from AirNow was used. Daily AQI readings were interpolated using Kriging to create a gridded AQI product, which was subsequently overlaid on WorldPop population maps to estimate exposure to poor air quality.

Unhealthy air quality readings prompted officials across numerous states to recommend that residents remain indoors, limit outdoor exercise, and protect children, older adults, and people with respiratory or cardiovascular conditions. Outdoor programs, swimming facilities, concerts, and other public events were canceled or moved indoors in some cities. The widespread public-health and social disruptions across North America gained global attention when, for a brief period, smoke-related air-quality concerns raised questions about the feasibility of holding the World Cup final in New Jersey on July 19.

Drivers

Wildfires fundamentally depend on the availability, continuity, and density of dry fuels, as well as a source of ignition to initiate combustion[3]. In forested and grassland ecosystems, the build-up of fine fuels such as dried grasses, shrubs, leaf litter, and fallen branches provides the material necessary for fires to ignite and spread. The continuity of

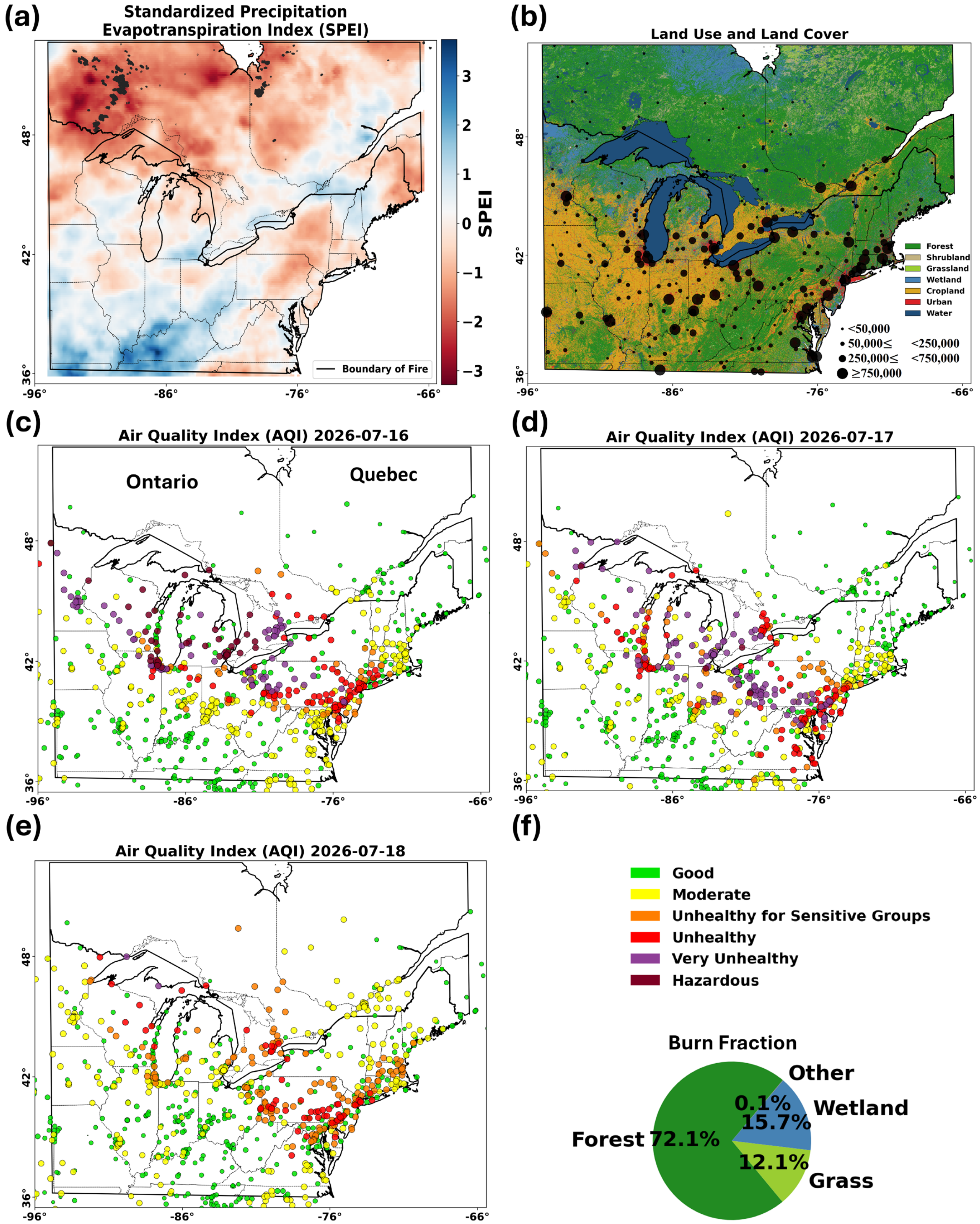

Figure 2. Ontario Wildfires as of July 19, 2026: (a) Drought map based on the Standardized Precipitation Evapotranspiration Index (SPEI: 2-month aggregation ending in July 19, 2026, with respect to the 1991-2020 data). Satellite-derived fire boundaries in Ontario are indicated by black polygons; (b) Land cover and land use map of the Northeast US and Southeast Canada impacted by wildfires and smoke. Major cities are shown on the map, with circle sizes proportional to population; (c)-(e) Ground-level wildfire smoke covering large swaths of Canada and the USA on July 16 to 18, 2026, respectively; (f) Fraction of burned area by the general land cover class.

these fuels determines how easily a fire can move through the environment, while their density affects the intensity and heat release of the flames. The ignition sources can be natural, such as lightning, or human-caused, including campfires, discarded cigarettes, or powerline sparks.

Lengthening dry spells and rising temperatures associated with climate change further exacerbate wildfire risk by creating an abundance of dry, flammable fuels. Prolonged drought conditions desiccate vegetation, while heat waves lower humidity levels, increasing fuel flammability. This creates a feedback loop in which fires become more likely and harder to control. Additionally, warming temperatures can expand the fire season, increasing the window of vulnerability for ignition and fire spread.

To address these growing risks, fire mitigation strategies increasingly focus on fuel management and proactive forest treatments[4]. Techniques such as mechanical thinning and prescribed burning are employed to reduce fuel loads, decrease fuel continuity, and create fire breaks. These practices limit the intensity and rate of fire spread, providing critical windows of opportunity for suppression efforts. However, fuel treatments must be carefully planned to account for ecosystem characteristics; in mesic systems, for example, where moisture retention is high, such interventions may be less effective. Alongside fuel management, fire prevention remains essential[5]. Measures such as fire bans during high-risk periods, public education campaigns on fire safety, and investments in early detection and rapid response systems can reduce ignition risk and limit the potential for fires to escalate. By integrating these approaches, society can enhance its preparedness and resilience against the increasingly frequent and severe wildfires driven by climate change.

Recommendations

Wildfire suppression in carbon-rich, northern latitude ecosystems is particularly challenging due to the unique characteristics of these mesic systems. Once ignited, these densely vegetated systems burn with high intensity, rendering suppression efforts both arduous and resource-intensive. In addition to proactive fire prevention strategies, investing in technology and human resources for early fire detection and rapid response, particularly at the initial stages of ignition before fires gain momentum, can enhance suppression effectiveness, acknowledging this is challenging in remote areas. Air response plays a crucial role in controlling raging wildfires, allowing for rapid delivery of water and retardants to areas inaccessible by ground crews. However, high winds and dense smoke can ground aircraft, and unauthorized drone flights can pose significant safety risks, disrupt operations, and delay critical firefighting efforts. Community cooperation, including adherence to no-fly zones and public awareness campaigns, is essential to ensure air response teams can operate safely and effectively. International sharing of wildfire suppression and response resources is essential during wildfire disaster periods, allowing for the strategic deployment of personnel, equipment, and aircraft to where they are needed most. This cooperative approach enhances collective resilience, reduces response delays, and maximizes the effectiveness of suppression efforts in managing increasingly frequent and severe wildfires.

Equally important is enhancing societal preparedness to respond effectively to increasingly frequent and severe wildfires. Home hardening is a critical strategy to mitigate wildfire risks, particularly in the wildland-urban interface where human developments meet flammable landscapes. Home hardening refers to the process of making homes and structures more resistant to ignition by using non-combustible building materials, installing ember-resistant vents, and creating defensible space around properties[6,7]. This reduces the chances of structures igniting from embers or direct flames during a wildfire. In addition to individual home hardening, communities play a vital role in reducing wildfire risk through vegetation management. This includes maintaining defensible zones by clearing flammable vegetation around homes. Community-wide planning, such as establishing fire-safe councils, enforcing building codes, creating evacuation routes, and conducting regular fire drills, can collectively strengthen resilience and preparedness for wildfires.

Table 1. Daily human exposure to ground-level smoke in Canada and the USA. Daily air quality readings were obtained from AirNow-reported gauge stations. AQI readings were spatially interpolated using Kriging and were overlaid on WorldPop maps to estimate exposures.

Date	Number of People (x1,000) Exposed to:							
	Moderate		Unhealthy for Sensitive Groups		Unhealthy		Very Unhealthy or Hazardous	
	Canada	USA	Canada	USA	Canada	USA	Canada	USA
July 13, 2026	22,271	56,774	0	0	0	0	0	0
July 14, 2026	22,793	109,941	0	0	0	0	0	0
July 15, 2026	10,599	103,609	3,397	17,230	8,625	1,867	1	359
July 16, 2026	2,766	53,265	1,900	33,048	3,383	28,302	7,180	12,056
July 17, 2026	1,079	41,586	3,283	41,146	5,260	32,588	2,291	3,894
July 18, 2026	11,371	86,983	10,637	29,839	0	0	0	0

It is also imperative to invest in the development of resilient infrastructure[8]. This includes designing fire-resistant power and communication systems, establishing reliable aerial evacuation frameworks with support from national resources such as the army and emergency services, and pre-positioning equipment and personnel in high-risk areas. Equally important is the creation of wildfire shelters within remote communities to serve as refuges when evacuation routes are compromised by encroaching fires and dense smoke, particularly during periods of synchronous wildfire activity when resources are stretched thin. This integrated approach can bolster the safety, preparedness, and resilience of northern and Indigenous communities increasingly vulnerable to wildfire threats.

Wildfire evacuations present significant challenges for both evacuees and host communities. Vulnerable populations, including the elderly, those with chronic illnesses, and individuals requiring specialized medical equipment or assistance, face heightened risks during evacuation due to limited access to essential services and physical barriers to mobility. Simultaneously, receiving communities often struggle with resource shortages, strained healthcare systems, and disruptions to local infrastructure, creating tensions and potentially leaving the most at-risk populations without necessary support. To address these challenges, national-level policies must focus on enhancing evacuation preparedness and shelter capacity, particularly for vulnerable groups. This includes equipping shelters with essential medical supplies and mobility resources, training staff to manage specialized care needs, and ensuring dynamic allocation of emergency funding, while fostering national cooperation to effectively accommodate evacuees during disaster events.

Wildfire risk extends far beyond those directly exposed to flames, with smoke impacting a much larger population, both in the short and long term. Exposure to wildfire smoke has been linked to increased mortality, especially among vulnerable populations such as the elderly and those with pre-existing respiratory or cardiovascular conditions[9]. In the short term, wildfire smoke leads to a surge in emergency room visits, hospital admissions, and increased use of both over-the-counter and prescribed medications for asthma, bronchitis, and heart conditions, among others. Long-term exposure can exacerbate chronic diseases and impair lung function. To mitigate these impacts, public health measures must prioritize raising awareness about the dangers of wildfire smoke, encouraging reduced outdoor activities during smoky periods, and promoting the use of air filtration systems and high-quality masks like N95 respirators. Community planning should also emphasize creating “clean air shelters” and providing accessible resources for those most at risk. These proactive strategies are essential for protecting public health as wildfire activity and associated smoke events become more frequent and severe.

Final Remarks

Wildfires present profound challenges for remote communities, where limited evacuation infrastructure and sparse road networks make safe and timely escape difficult, particularly during rapidly spreading fires. Indigenous communities are especially vulnerable, given their often isolated locations. Many remote settlements lack multiple evacuation routes, and air evacuation may be the only viable option during emergencies. However, logistical constraints, unpredictable weather, and the scale of wildfires can hamper aerial evacuation efforts. Furthermore, critical infrastructure such as power lines, communication networks, fuel depots, and water systems is increasingly exposed to wildfires in these regions. When such infrastructure fails, it can lead to cascading impacts, leaving entire communities cut off from essential services and hampering firefighting efforts.

Wildfires' secondary effects, particularly smoke, can affect vast populations far beyond the fire zones. Wildfire smoke contains harmful pollutants such as fine particulate matter (PM2.5) and volatile organic compounds, which can travel hundreds or even thousands of kilometers, impacting air quality and human health across national and international borders. This problem has been amplified by the increasing frequency and severity of wildfires, especially in northern latitude carbon-rich ecosystems. Rising temperatures and prolonged dry spells driven by climate change have made these ecosystems more susceptible to large-scale fires, turning them from carbon sinks into net sources of carbon in the short term. The burning of peatlands and dense organic soils releases massive amounts of carbon dioxide and methane, contributing to a dangerous feedback loop of global warming and increased fire activity. These escalating fires not only threaten local communities but also degrade air quality on a continental scale, underscoring the urgent need for international cooperation and climate action. Curbing global temperature increases is critical to mitigating wildfire risks, particularly in the boreal regions, where the resilience of carbon-rich ecosystems is vital for global carbon balance and long-term climate stability.

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Open Research

We obtained fire perimeters as of July 21, 2026 from the Canadian Wildland Fire Information System available at https://cwfis.cfs.nrcan.gc.ca/datamart/metadata/fm3buffered, which is based on the NASA FIRMS platform: https://firms.modaps.eosdis.nasa.gov/usfs/map/. We obtained ground-level AQI data from AirNow: https://fire.airnow.gov/. We used https://climateengine.org/datasets/climatehydrology/era5land_daily_11100/ for drought information. For land cover and land use information, we used https://www.cec.org/north-american-environmental-atlas/land-cover-30m-2020/. For analyzing fire history, we used https://cwfis.cfs.nrcan.gc.ca/en/fire-history. For evaluating population exposure to wildfire smoke, we employed gridded population estimates from WorldPop (https://www.worldpop.org/).

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