Wildfires

"Fire has been part of grassland, brush and forest ecosystems in Canada for as long as they have existed. Like storms, avalanches, and floods, fire is a powerful force of change in nature. It renews and recycles ecosystems."

-Parks Canada

What do you think of when it comes to summer break? Sleeping in, a new job or summer camp, and... smoky skies?

With an increase in the number and severity of wildfires in Canada, Canadians are experiencing the effects of fire season nation-wide. In this backgrounder, learners will find out more about the positive and negative effects of wildfires, and what is being done to help reduce destruction and encourage ecosystem health.

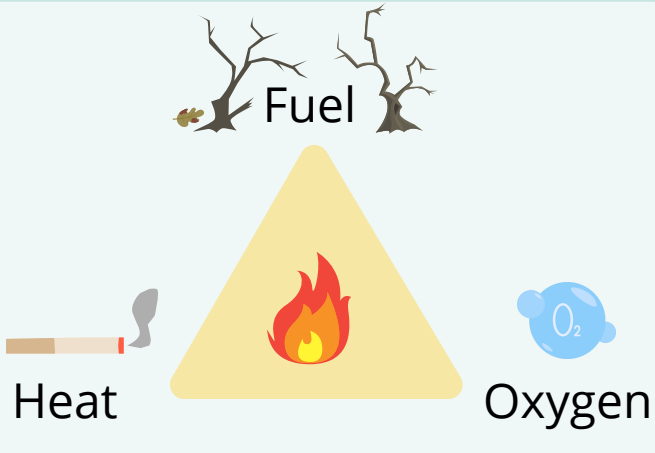
What is a wildfire?

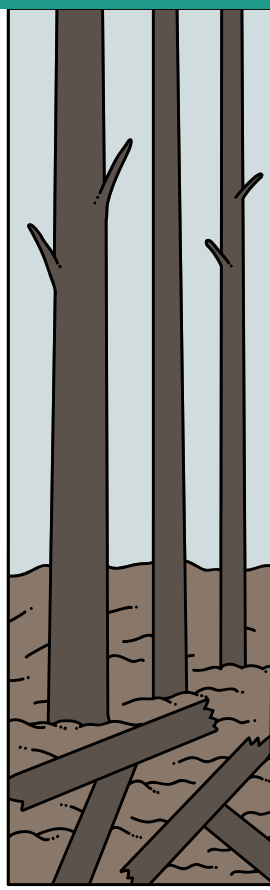
A wildfire is an unplanned, uncontrolled fire that burns in natural areas. Wildfires are also called forest fires or bushfires. Wildfires can start naturally, most often by lightning. They can also be started by humans - from things like cigarette butts, campfires, or even sparks from equipment failure or malfunction.

The Fire Triangle

There are three things that are needed for a fire to start, and continue burning: fuel, heat, and oxygen.

Together, they are often referred to as the "fire triangle". Without all three components, a fire will be unable to keep burning.





The Beneficial Role of Wildfire

Wildfires are a crucial ecological force that shape our natural landscapes and preserve biodiversity.

Imagine a forest where a wildfire has just occurred. The intense heat clears out the old, dense vegetation, paving the way for new plant communities to flourish. This isn't a random occurrence, but a cycle of renewal that some species have adapted to.

For example, the lodgepole pine releases its seeds only when exposed to extreme heat, ensuring its lineage continues in the freshly cleared, fertile ground. But the benefits of a wildfire extend beyond this. The ashes left behind from the burned vegetation act like a natural fertilizer, returning essential nutrients like nitrogen, phosphorus, and potassium back to the soil. This nutrient boost supports the growth of a diverse range of plant species, contributing to a balanced ecosystem.

Wildfires play a crucial role in controlling invasive species because the cleared forest floor allows native plants to regenerate and compete with invasive species. Understanding this interplay is key for effective land management and conservation efforts. [1]

Negative Consequences of Wildfire

Despite many advantages, wildfires have also caused immense destruction and loss. Wildfires can grow quickly and spread far. If a wildfire burns near where people live or work, there is a great danger to their health and safety, as well as their homes, belongings, and important infrastructure.

Many people across Canada have been directly affected by wildfire. In 2023, we witnessed a record-breaking year of fire. 15.2 million hectares burned, which is more than double the previous record set in 1995. This is like burning an area two times larger than the whole province of New Brunswick![5]

The 2016 Fort McMurray wildfire in Alberta resulted in the evacuation of nearly 88,000 people and destroyed approximately 2,400 homes and buildings.[3] Based on the data from Natural Resources Canada, in the past decade, Canada has spent between $800 million to $1.4 billion annually to protect people, homes, businesses, and forests from wildfires. These costs include preparing for fires, reducing their impact, responding to them, and recovering afterwards. In fact, six of the last ten years saw the annual cost of wildfire protection exceed $1 billion. As climate change continues to create conditions that favour wildfires, these costs are expected to rise, especially in western Canada (based on projections by the Canadian Forest Service).[4]

Wildfires produce smoke and toxic chemicals from burning materials, posing serious health risks. When these fires occur, smoke can cause discomfort like eye irritation and headaches, and even serious health problems like bronchitis and other respiratory conditions. Even if you're not near a wildfire, you can still be affected; smoke can travel long distances and impact the air we breathe.[6]

When man-made materials burn, the resulting ash can contain toxic chemicals that can find their way into our water supplies, posing serious health risks. For instance, after the fires in Santa Rosa, California in 2017 and Paradise, California in 2018, a cancer-causing chemical called benzene was found in the water systems, making the water unsafe to drink even years later.[7]

To learn more about historical wildfires in your area, Natural Resources Canada has a database available. Visit **https://cwfis.cfs.nrcan.gc.ca/ha/nfdb** for more information.

The Relationship Between Wildfires and Climate Change

The impacts of wildfires on global climate change

Forests store large amounts of carbon. When fires burn, they release greenhouse gases like carbon dioxide (CO^2), methane (CH^4), and nitrous oxide (N^2O). Even after burning, forests continue to release CO^2 gradually through decomposition. These gases contribute to global warming by trapping heat in the Earth's atmosphere.

However, although wildfires release substantial amount of CO^2 into the atmosphere in a short period of time, regrowing vegetation in burned areas can absorb an equivalent amount of CO^2 during ecosystem recovery. This means that wildfires don't necessarily result in a net increase in CO^2. Only fires that don't balance out with regrowth—such as deforestation fires or those on drained peatlands—contribute significantly to CO^2 emissions.

Besides greenhouse gases, wildfires also produce soot, also known as black carbon, which is a dark-colored aerosol. Soot consists of tiny particles of carbon resulting from the burning of fossil fuels, wood, or other organic matter. These dark particles have a significant impact on the climate. When soot is released into the atmosphere, it absorbs sunlight, contributing to warming. Additionally, when soot settles on snow and ice, it darkens the surface, leading to faster melting.[9]

The impacts of climate change on wildfires

Hot weather and drought conditions caused by climate change have significantly impacted Canada, particularly in the Prairie Provinces and Northwestern regions. For instance, during the summer of 2023, regions near Whitehorse, Faro, Dawson, and Old Crow experienced their hottest July since records began, with temperatures exceeding 35°C at lower elevations. Precipitation levels were affected as well, with areas like Yellowknife receiving only 15-30% of normal precipitation between July 24 and August 17, contributing to record high temperatures.

These conditions have led to many challenges, including wildfires, with 3.7 million hectares burned across the Northwest Territories by the end of August 2023. This is the greatest area burned in the last 44 years. These extreme weather conditions pose significant challenges to agriculture, water resources, and wildfire management in Canada.[11]

Warmer temperatures caused by climate change also impact the landscape in various ways. One significant effect is that they allow non-native creatures to move into and survive in areas they couldn't previously inhabit. For instance, the invasive bark beetle has thrived due to the absence of seasonal cold spells that would normally kill them off. These beetles have caused extensive damage, killing approximately 100,000 square miles of trees across western North America in the last two decades. The dead trees left behind are highly vulnerable to wildfires, making it more likely for fires to spread rapidly and cover larger areas.[12]

Indigenous Fire Practices

Indigenous Peoples around the world have been and continue to be stewards and guardians of the land. Many groups knew that smaller fires, burned safely and carefully, help support healthy forests and wildland. As colonial governments established new rules and laws, Indigenous people were not consulted or allowed to continue land practices like cultural burning that helped support the health of local ecosystems. Historically, colonial governments viewed wildfires as a negative event, to be suppressed and prevented. It is only relatively recently that Indigenous fire practices are being permitted again in Canada, although barriers to the re-establishment of these practices remain. To learn more about how cultural burning is being restored in Canadian parks through, check out **https://parks.canada.ca/nature/science/conservation/feu-fire/autochtones-indigenous** .

> *"Historical fire suppression combined with climate change has resulted in more frequent, severe wildfires than in the past. These severe wildfires can be especially damaging for wildlife."*
>
> *- Parks Canada*

To learn more about Indigenous fire practices, we encourage you to check out and learn from the following resources:

Indigenous Relationship to Fire is All Year Long
Q&A with Dr. Amy Cardinal Christianson
https://www.ilinationhood.ca/blog/indigenousrelationshiptofireisallyearlong

Owl Creek Cultural Burn Case Study
Video documenting a cultural burning on the traditional territory of the Lil'wat First Nation outside Pemberton, BC
https://vimeo.com/748198873
For additional information and case studies, visit
https://prescribedfire.ca/cultural-burning/

We Are Fire
A Toolkit for Applying Indigenous-Led Fire Practices and Western Fire Management in the Saskatchewan River Delta
https://wearefire.ca/

References

1. Canada. (n.d.). The role of fire. Government of Canada. Retrieved from https://parks.canada.ca/nature/science/conservation/feu-fire/role
2. Canadian Interagency Forest Fire Centre. (n.d.). Wildfire graphs. Retrieved from https://ciffc.net/statistics
3. Journalist's Resource. (n.d.). Do wildfires have long-term health effects? Study shows current evidence. Journalist's Resource. Retrieved from https://journalistsresource.org/health/wildfires-longterm-impact-on-health/
4. Canada. (n.d.). Cost of wildland fire protection. Government of Canada. Retrieved from https://natural-resources.canada.ca/climate-change/climate-change-impacts-forests/impacts-climate-change-forests/cost-fire-protection/17783
5. Canadian Geographic. (n.d.). Mapping 100 years of forest fires in Canada. Canadian Geographic. Retrieved from https://canadiangeographic.ca/articles/mapping-100-years-of-forest-fires-in-canada/
6. Canada. (2023). Risk profile: Wildfires 2023. Government of Canada. Retrieved from https://www.canada.ca/en/public-health/services/emergency-preparedness-response/rapid-risk-assessments-public-health-professionals/risk-profile-wildfires-2023.html
7. Climate Atlas of Canada. (n.d.). Wildfires, water, and our health. Retrieved from https://climateatlas.ca/wildfires-water-and-our-health
8. Earth System Science Data. (2017). Global fire emissions estimates during 1997–2016. Copernicus Publications. Retrieved from https://essd.copernicus.org/articles/9/697/2017/
9. NASA. (n.d.). Aerosols: Small particles with big climate effects. NASA Science. Retrieved from https://science.nasa.gov/science-research/earth-science/climate-science/aerosols-small-particles-with-big-climate-effects/
10. Agriculture and Agri-Food Canada. (n.d.). National agroclimate risk report. Retrieved from https://agriculture.canada.ca/en/agricultural-production/weather/national-agroclimate-risk-report
11. National Integrated Drought Information System. (n.d.). PowerPoint presentation. Retrieved from https://www.drought.gov, link to presentation: https://www.drought.gov/sites/default/files/2023-10/AK-CAN%20Summer%202023_0.pdf
12. U.S. Geological Survey. (n.d.). Wildfire and climate change. Retrieved from https://www.usgs.gov/science-explorer/climate/wildfire