

FireSmart™ BC Education Program



Lesson One

In this lesson, students identify the factors that affect wildfire frequency and intensity and then use criteria to decide how much climate change may impact each of these factors.



Lesson Question:

What are the most significant impacts of climate change on wildfires?

Lesson Challenge:

Decide which factors that contribute to wildfires will be most impacted by climate change.

Big Ideas

- Human activities cause [changes in the global climate system](#). (Grade 12 Environmental Science)
- The transfer of energy through the [atmosphere](#) creates weather, and this transfer is affected by climate change. (Grade 11 Earth Sciences)
- Human practices affect the [sustainability of ecosystems](#). (Grade 11 Environmental Science)

Suggested Materials

- **Activity Sheet A:** Identifying Conditions That Affect the Frequency and Intensity of Wildfires (one copy for each small group)
- **Activity Sheet B:** Evaluating the Impacts of Climate Change on Wildfires (one copy for each student)
- **Briefing Sheet A:** Climate Change and Wildfires (one copy for each small group)



Start the Thinking



1. Begin the lesson by organizing students into small groups and provide each group with a copy of Activity Sheet A: Identifying Conditions That Affect the Frequency and Intensity of Wildfires. Invite each group to work together to suggest and note conditions that might influence the frequency (how often they occur) and intensity (strength, size, force) of wildfires in British Columbia. For example, students might suggest conditions such as hot summers, lack of rain, lightning storms, pine beetle infestations resulting in dead timber, wind, human carelessness, and a lack of wildfire mitigation efforts.
2. If students need further prompting, consider discussing or researching conditions that affected the frequency and intensity of fires such as the 2003 Okanagan Park Wildfire or other wildfires.
3. Invite groups to share conditions that affect wildfire frequency and intensity with the class and encourage students to record any additional ideas.
4. Encourage students to sort their suggested conditions into common categories. The categories could include factors such as fuel, ignition, weather, and other.
5. Lead the class in discussing how climate change (changes in temperature and weather patterns) may affect the frequency and intensity of wildfires in Canada by posing the following questions:
 - How might climate change have already impacted the frequency and intensity of wildfires?
 - If the effects of climate change continue and increase, what may happen to the intensity and frequency of wildfires?
6. Ask each group to make an initial decision about which of the categories are most and least impacted by climate change. Prompt groups to note their rankings and reasoning on Activity Sheet A. Encourage each group to share their rankings and thinking with the class.

Grow the Thinking



1. As groups share their rankings, use their thinking to co-create or share the following criteria for assessing the significance of wildfire impacts:
 - **Magnitude:** How deeply felt are the impacts of wildfires? (for example, severity, size, extent of impact)
 - **Scope:** How widespread are the impacts of wildfires? (for example, geographic scope of impact, number of species affected by the impact)
 - **Duration:** How long-lasting are the impacts of wildfires? (for example, short-term or long-term impacts)



2. Instruct each group to revisit their ranking of the four categories, this time using the criteria to guide their thinking.
3. Provide each student with a copy of Briefing Sheet A: Climate Change and Wildfires and each group with a copy of Activity Sheet B: Evaluating the Impacts of Climate Change on Wildfires. Ask groups to look for information in the briefing sheet that can be used to evaluate the impact of climate change on each of the categories of factors that affect wildfire frequency and intensity. Remind students to use the criteria for significance to guide their decision-making and to support their ratings with evidence from the briefing sheet or other sources. Alternatively, groups could select or be assigned one of the factors and then share ratings with the class.
4. Ask groups to use their ratings to decide which category will be most impacted by climate change. Invite groups to share their decisions and thinking with the class.
5. Encourage students to reflect on the information shared by other groups by posing the following questions:
 - Which category of factors might be the most directly impacted by climate change?
 - Which category of factors might be indirectly impacted by climate change?

Reflect on the Thinking



1. Conclude the lesson by guiding students' attention back to Activity Sheet A. Invite groups to make a final decision about which of the factors are most significantly impacted by climate change.
2. Ask them to reflect on their thinking: How has their thinking about climate change and wildfires changed during the lesson? Grown? Stayed the same?
3. As an extension of this lesson, students might identify actions that could help mitigate the impacts of climate change on the factors that affect wildfire frequency and intensity. To guide this inquiry, consider posing questions such as the following:
 - Which factors have the greatest impact on wildfires near your community or region?
 - Which factors near your community are most affected by climate change?
 - What actions could be most effective in mitigating or addressing the impacts of climate change on wildfires near your community?
 - How might Indigenous knowledge and practices help mitigate the impacts of climate change on wildfires near your community?

Activity Sheet A: Identifying Conditions That Affect the Frequency and Intensity of Wildfires

What conditions affect the frequency (how often they occur) and intensity (strength, size, force) of wildfires? Use words and/or pictures in the space below to record your thoughts.

Sort your suggested conditions that influence wildfire frequency and intensity into the categories of factors shown below.

 Fuel

 Ignition


 Weather

 Other

Which of these categories of factors might be the most impacted by climate change? Which might be affected the least?

Use the ranking ladder to rank the factors according to how much they may be affected by climate change.

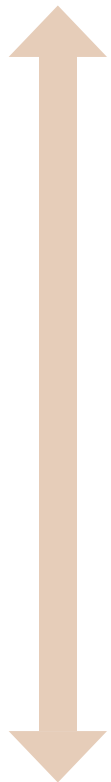
Our Initial Thoughts

Most impacted by climate change	Reasons that support your rankings
	
Least impacted by climate change	

Our Final Thoughts

Most impacted by climate change

Reasons that support your rankings




Least impacted by climate change



Activity Sheet B: Evaluating the Impacts of Climate Change on Wildfires

Criteria for Assessing the Significance of an Impact

- Magnitude:** How deeply felt are the impacts of climate change on this factor?
 (for example, severity, size, extent of impact)
- Scope:** How widespread are the impacts of climate change on this factor?
 (for example, geographic scope of impact, number of species affected by the impact)
- Duration:** How long-lasting are the impacts of climate change on this factor?
 (for example, short-term or long-term impacts)

Factor Affecting Wildfire Frequency and Intensity	How much will climate change impact this factor?	Evidence
Fuel 	<p>Magnitude of impact</p> <p>1 2 3 4</p> <p>small magnitude large magnitude</p> <p>Scope of impact</p> <p>1 2 3 4</p> <p>small scope large scope</p> <p>Duration of impact</p> <p>1 2 3 4</p> <p>short duration long duration</p>	

**Factor Affecting
Wildfire Frequency
and Intensity**

**How much will climate
change impact this factor?**

Evidence

Ignition 

Magnitude of impact



Scope of impact



Duration of impact



Weather 

Magnitude of impact



Scope of impact



Duration of impact



Factor Affecting
Wildfire Frequency
and Intensity

How much will climate
change impact this factor?

Evidence



Other ?

Magnitude of impact



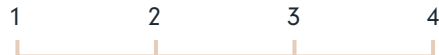
small magnitude large magnitude

Scope of impact



small scope large scope

Duration of impact

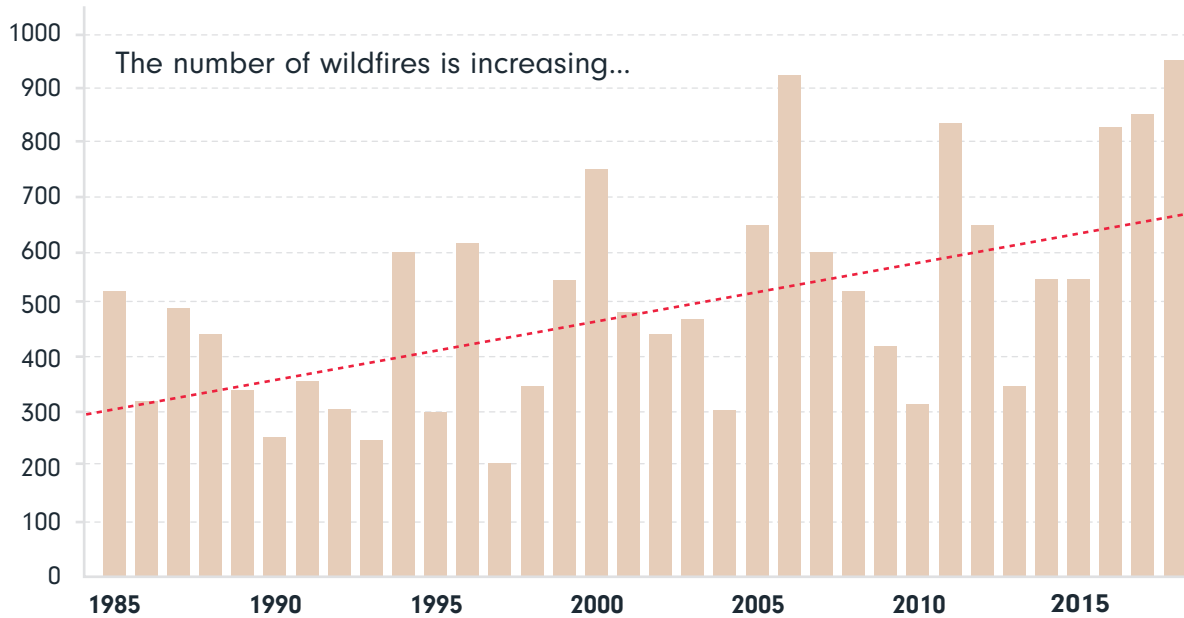


short duration long duration

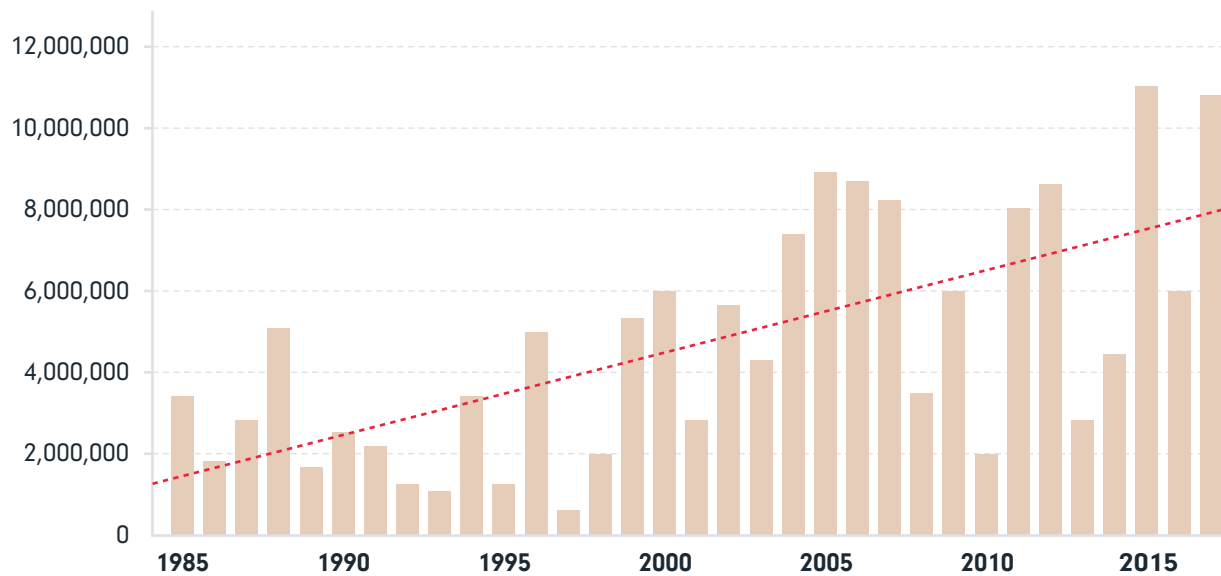


Briefing Sheet A: Climate Change and Wildfires

Number of Wildfires per Year

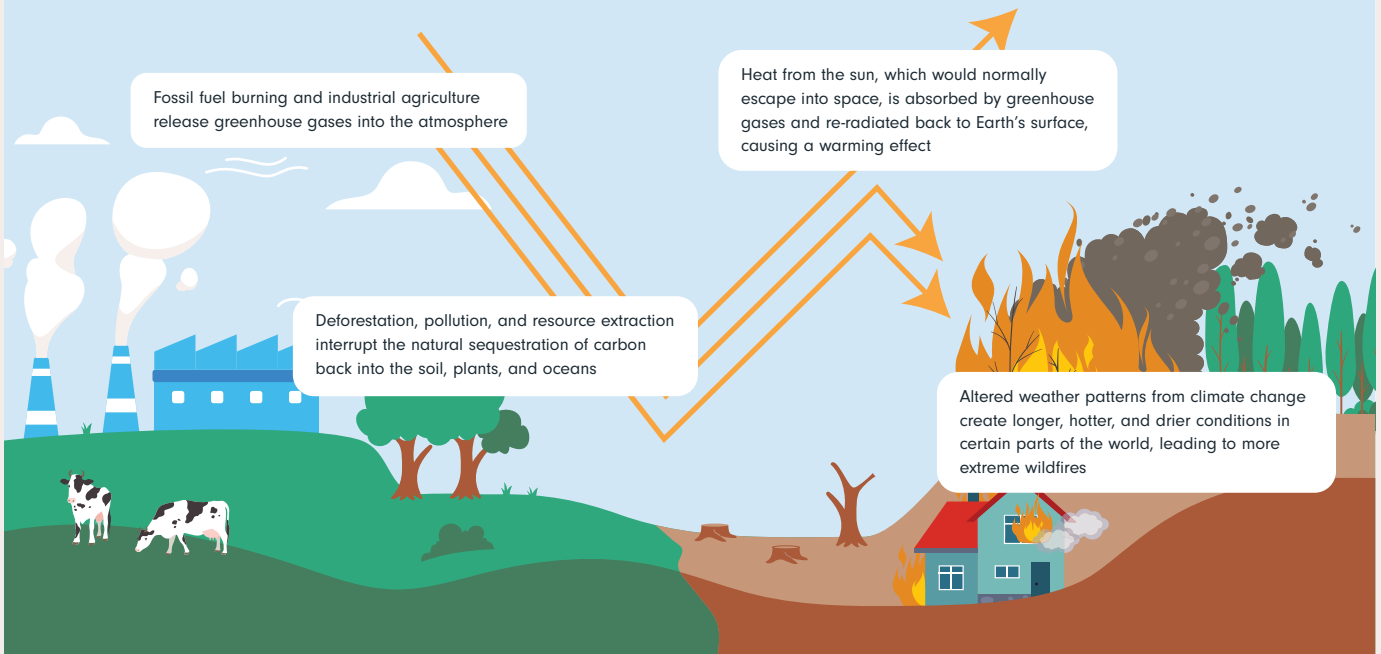


Number of Acres Burned per Year

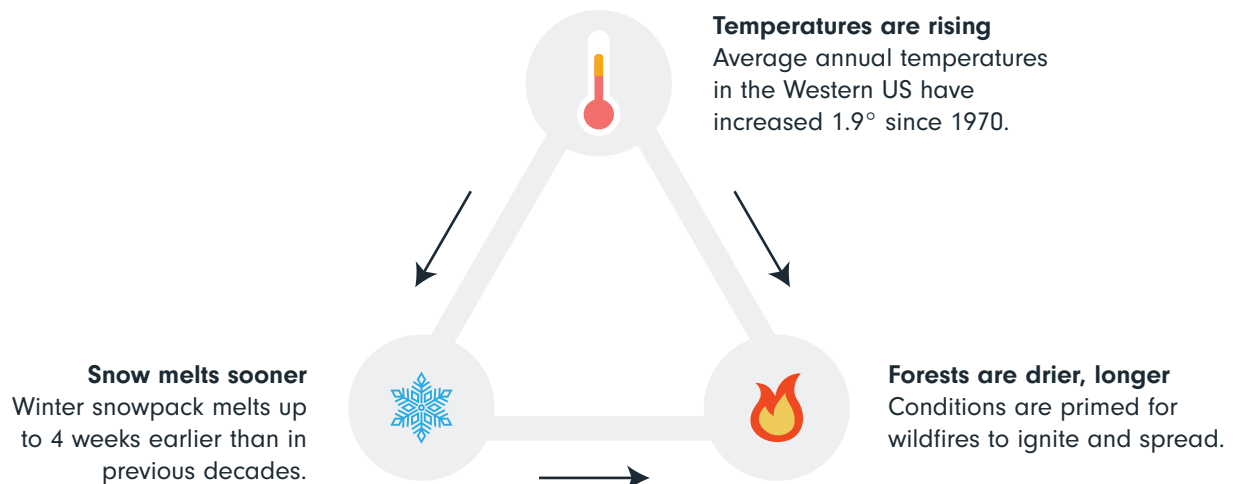


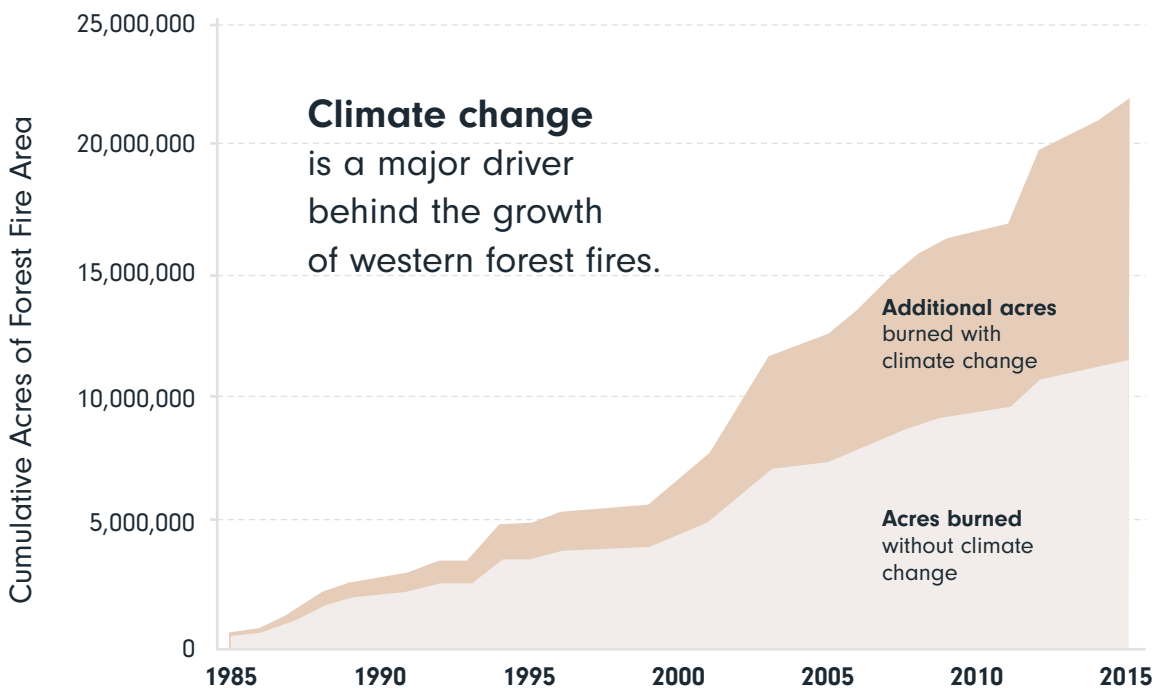
Data from the Monitoring Trends in Burn Severity program. MTBS only includes large fires in the United States (>500 acres for the eastern US, >1000 acres for the west). Prescribed fires removed.

The Impacts of **Climate Change** on Wildfires



Climate change is driving hotter temperatures and drier conditions in many parts of the world, increasing **wildfire risk**.





Data shown is from John T. Abatzoglou and A. Park Williams, Impact of anthropogenic climate change on wildfire across western US forests, which models forest fire area as a function of fuel dryness both with and without climate change.

Climate Change and Wildfire Fuel

- Climate change is leading to warmer weather. When temperatures rise, the land dries out quickly, making grass, trees, and brush more likely to catch fire and keep burning. This happens because of global warming, which makes the vegetation dry out faster. The dry fuel from these plants makes wildfires more likely to start and spread over larger areas.
- Just a few hot days can create conditions for wildfires, even after heavy rain or flooding. For example, in British Columbia, the 2017 and 2018 wildfire seasons broke records for the largest areas burned. These fires happened right after spring rain and floods.

- Climate change predictions show that we can expect many more very hot days across the country. This means our forests from coast to coast could become much more prone to wildfires.
- In places like British Columbia and Alberta, warmer temperatures help pests like the mountain pine beetle spread faster. These beetles kill trees, leaving lots of dry wood behind. This dry wood becomes a huge fuel source for wildfires. The pine beetle is only one of many damaging forest pests that are likely to spread because of warmer winters caused by climate change.

Climate Change and Wildfire Fuel

- Rising temperatures caused by climate change are leading to more storms capable of producing lightning, which is the primary cause of wildfires in remote areas and more than half of all wildfires.
- Scientists predict that by the end of the century, there could be an 80 percent increase in the number of lightning strikes in Canada. Currently, Canada experiences an average of over 7,000 forest fires per year since 1990, with more than half of them being caused by lightning. With the expected increase in lightning strikes, the number of wildfires per year could nearly double by the end of the century. This highlights the significant impact of climate change on wildfire ignition and reinforces the need to address the underlying environmental factors to reduce the risk of wildfires.

Climate Change and Weather

- The severity of wildfires is greatly influenced by dry and windy weather, also known as fire weather. When the weather is hot and dry, it creates more fuel for wildfires, and the wind spreads wildfires faster, making them harder to control.
- Climate change is making hot, dry, and windy weather more frequent than before. One surprising reason for this is the rising temperature of the Arctic, even though it's far away from us. The northern parts of Canada are warming much faster than the southern areas. The warming of the Arctic affects the jet stream, causing it to slow down and meander. This means that weather patterns stay in place for longer

periods, leading to prolonged rainstorms (lasting for days or weeks) or droughts (persistent hot and dry weather).

- Global warming raises temperatures, making more dry fuel available for wildfires to burn. It also creates persistent hot and dry conditions, allowing fires to intensify and spread more easily.
- Warmer weather also causes snow to melt earlier in the year and fall frosts to come later. As a result, the wildfire season—the time when the weather is warm and dry enough for fires to occur—is expanding. Across the country, the wildfire season is starting earlier and lasting longer. For instance, the season in Alberta now begins a whole month earlier, in March instead of April.

Sources

Forest fires and climate change. (n.d.) In Climate Atlas of Canada.

Prairie Climate Centre, University of Winnipeg.

<https://climateatlas.ca/forest-fires-and-climate-change#:~:text=Global%20warming%20has%20a%20direct,then%20burn%20farther%20and%20wider>

Natural Resources Canada. (2022). Climate change and fire.

<https://natural-resources.canada.ca/our-natural-resources/forests/wildland-fires-insects-disturbances/climate-change-fire/13155>