

FireSmart™ BC Education Program



Lesson Three

In this lesson, students explore and investigate the impacts of wildfires on the health of ecosystems. Students collaborate to develop compelling ideas about the degree to which wildfires are helpful or harmful in creating and maintaining healthy ecosystems and to challenge their thinking through a U-shaped discussion.



Lesson Question:

To what degree are wildfires helpful or harmful to the health of ecosystems?

Lesson Challenge:

Suggest at least two compelling ideas during a U-shaped discussion about the impacts of wildfires on ecosystem health.

Big Ideas

- Complex roles and relationships contribute to the [diversity of ecosystems](#). (Grade 11 Environmental Science)
- [Changing ecosystems](#) are maintained by natural processes. (Grade 11 Environmental Science)
- Human practices affect the [sustainability of ecosystems](#). (Grade 11 Environmental Science)
- Scientific understanding enables humans to [respond and adapt to changes](#) locally and globally. (Grade 11 Science for Citizens)

Suggested Materials

- **Briefing Sheet A:** Characteristics of a Healthy Ecosystem
- **Activity Sheet A:** Wildfire Impacts on Ecosystem Health: Harmful or Helpful? (one copy for each student)
- **Activity Sheet B:** Exploring Impacts of Wildfires on Ecosystem Health



Start the Thinking



1. Begin the lesson by organizing students into small groups and prompt their thinking by inviting them to think about recent wildfires; have these wildfires been more helpful or harmful to the health of ecosystems? Ask each group to discuss and decide whether wildfires are more helpful or harmful to the health of ecosystems. Ask each group to share their decision and thinking.
2. Provide each student with a copy of Activity Sheet A: Wildfire Impacts on Ecosystem Health: Harmful or Helpful? Encourage each student to place an X on the U-shaped diagram that best represents their own thinking about the degree to which wildfires impact ecosystem health. Ask students to include at least one reason or piece of evidence that supports this decision.
3. Introduce the lesson question and explain that their challenge is to suggest at least two important ideas to a U-shaped discussion about the impacts of wildfires on ecosystem health.

Grow the Thinking



1. Invite students to suggest what indicators or features might be used to determine the health of an ecosystem. Record their suggestions on chart paper or other display for use later in this lesson.
2. Provide each student with a copy of Briefing Sheet A: Characteristics of a Healthy Ecosystem. Lead a discussion with students about the characteristics of a healthy ecosystem by posing questions such as the following:
 - Why might it be important for an ecosystem to be able to recover and adapt to changes in its environment?
 - What are the most important ways that variety and diversity in plant and animal species help improve the health of an ecosystem?
 - What roles do healthy ecosystems play in nutrient cycling? Why do nutrients like carbon, nitrogen, and phosphorous need to be recycled?
 - What essential benefits do healthy ecosystems provide to human well-being and/or our society?
3. Guide students' attention back to their suggestions about the indicators or features of a healthy ecosystem. Ask them to sort or match their suggestions with the four characteristics described in the briefing sheet.
4. Ask students to suggest how a wildfire may impact each of the four characteristics of a healthy ecosystem by posing questions such as the following:



- How might wildfires impact
 - the stability and resilience of an ecosystem?
 - plant and animal biodiversity?
 - nutrient cycling of carbon, phosphorous, and nitrogen?
 - the food web and energy flow?
 - air and water quality and soil fertility?
 - climate change?
 - human activities?
5. Provide each group with a copy of Activity Sheet B: Exploring Impacts of Wildfires on Ecosystem Health. Assign or ask each group to choose one of the four characteristics of ecosystem health. Explain that their task is to use information from the briefing sheet to decide whether wildfires are helpful or harmful to their selected characteristic of ecosystem health. Remind groups to use their criteria for a significant impact to guide their decision-making.
 - Groups can also consult other sources to collect further evidence about the impacts of wildfire on the selected characteristic. As an extension or enrichment to groups' inquiry into the impacts of wildfires on ecosystem health, consider inviting a FireSmart representative to the class. Additionally, local Knowledge Keepers or Elders could be important sources of scientific information and wisdom about the impacts of wildfires on ecosystem health.
 6. Instruct each group to identify the two most compelling ideas about the degree to which wildfires are harmful or helpful to their selected characteristic of ecosystem health. A compelling idea is one that
 - is based on significant scientific evidence
 - helps us better understand how wildfires impact ecosystem health
 7. Lead students in a U-shaped discussion about the impacts of wildfires on ecosystem health. Arrange students in the form of a large U shape and identify one end of the U as representing harmful impacts and the other end helpful impacts. Then, instruct each student to individually position themselves at their initial location within the U shape. Remind students that unlike a conventional debate, the purpose of a U-shaped discussion is not to "win" but rather to share and discuss important ideas.
 8. Ask each group to share their two compelling arguments. After each group has shared, invite students to adjust their position to better reflect their thinking when they hear ideas that prompt them to question their current position. Instruct each student to record on Activity Sheet A
 - the position on the U shape of the student who shared the idea
 - the idea that shifted their thinking



9. After every group has had an opportunity to share their compelling arguments, encourage students to share and discuss their reasoning behind their position on the U shape. Encourage students again to adjust their position whenever they hear an idea that shifts their thinking.

Reflect on the Thinking



1. Encourage each student to return to Activity Sheet A and to use the prompts to reflect on their thinking about the impacts of wildfires on ecosystem health.
2. Conclude the lesson by inviting students to compare what they have discovered about the impacts of wildfires on ecosystem health to the messages often communicated by media and other sources. How accurately do media and other sources describe the impacts of wildfires on ecosystem health? Which powerful ideas from the U-shaped discussion might more accurately describe the impacts of wildfires on ecosystem health?

Briefing Sheet A: Characteristics of a Healthy Ecosystem

Ecosystem health is the overall condition and functioning of an ecosystem. It includes the physical, chemical, and biological components of an ecosystem, as well as the interactions and relationships among the organisms within it. A healthy ecosystem is one that maintains its ecological balance, sustains biodiversity, and provides essential ecosystem services.

An ecosystem is considered healthy when it exhibits several interconnected key characteristics:

- 1. Stability and resilience:** A healthy ecosystem is stable and has the ability to withstand disturbances or changes in its environment without undergoing significant disruptions. It shows resilience, meaning it can recover from and adapt to disturbances, maintaining its structure and functionality. Just as our bodies have immune systems to fight off illnesses and recover from injuries to return to our stable state of homeostasis, ecosystems need resilience to bounce back from natural disasters, human activities, and other disruptions. Ecosystems face various challenges such as extreme weather events, habitat loss, pollution, and climate change. These disturbances can have significant impacts on plants, animals, and microorganisms that rely on each other for survival. However, resilient ecosystems can absorb these shocks, adapt to new conditions, and restore themselves to stable states. Resilient ecosystems often have
 - diverse species compositions and genetic variability
 - robust ecological processes and interactions that maintain balance and functionality
 - intact habitats and interconnected landscapes, allowing for the movement of species and exchange of resources
- 2. Biodiversity:** Ecosystem health is closely linked to biodiversity. A healthy ecosystem supports a diverse array of plant and animal species, ranging from large

mammals to microscopic organisms. High diversity indicates a well-functioning and resilient system, as each species contributes to the overall ecological balance and performs its unique role in nutrient cycling, pollination, predator-prey dynamics, and other ecological processes.

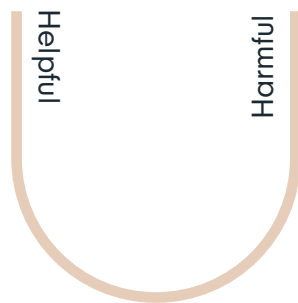
3. **Nutrient cycling and energy flow:** Healthy ecosystems efficiently cycle and recycle nutrients, ensuring a continuous supply of essential elements such as carbon, nitrogen, and phosphorous. Nutrient cycling involves the uptake, use, and release of nutrients by organisms, allowing for sustained growth and productivity. Effective nutrient cycling ensures the sustainable functioning of the ecosystem and the availability of essential resources for plants and animals. Additionally, a healthy ecosystem exhibits a smooth flow of energy through the food web, supporting the survival and reproduction of organisms throughout the ecosystem.
4. **Ecosystem goods and services:** Ecosystem health is closely tied to the benefits that ecosystems provide to humans, sometimes called ecosystem goods and services. These goods and services include clean air and water, soil fertility, climate regulation, flood control, pollination, and recreational opportunities. A healthy ecosystem can deliver these goods and services in a sustainable manner, supporting human well-being and the functioning of society.

Monitoring and assessing ecosystem health helps scientists, conservationists, and policy makers understand the condition of ecosystems and guide management strategies to maintain and restore their health. By recognizing the importance of ecosystem health and taking action to protect and preserve it, we can ensure the long-term sustainability of Earth's ecosystems and the well-being of both present and future generations.



Activity Sheet A: Wildfire Impacts on Ecosystem Health: Harmful or Helpful?

Initial position: To what degree are wildfires helpful or harmful to the health of ecosystems? Mark your decision on the U-shaped continuum below.



Both helpful and harmful

Explain the reasons for your initial choice.

Compelling ideas: Describe the ideas given by two other groups whose position on the U-shaped continuum caused you to wonder about or rethink your initial position.

Position on the U-shaped continuum:

Position on the U-shaped continuum:

Idea:

Idea:

Thinking about your final position: If you moved along the U-shaped continuum from your original position during the group work or discussion, in which direction did you move? What caused you to make this shift? If you did not move, what ideas or evidence reinforced your thinking and caused you to stay in your original position?

I changed my position to:

Reasons for remaining in the same or for changing my position.

I did not change my position



Describe up to four of the most compelling ideas that support your final position on the issue.

Compelling idea 1

Compelling idea 2


Compelling idea 3



Compelling idea 4

Activity Sheet B: Exploring Impacts of Wildfires on Ecosystem Health

Use these steps to identify significant impacts of wildfire on the selected characteristic of a healthy ecosystem.

- Use the information from Briefing Sheet A: Characteristics of a Healthy Ecosystem to find at least two significant impacts of wildfires on the selected characteristic of ecosystem health.
- Use the criteria to describe the significance of the impacts of wildfires on the areas of ecosystem health. For example:
 - **Depth:** How deeply felt is the impact of wildfires on this characteristic of a healthy ecosystem?
 - **Breadth:** How widely felt is the impact of wildfires on this characteristic of a healthy ecosystem?
 - **Duration:** How long does the impact of wildfires on this characteristic last?
- Place an X on the corresponding line to show the degree to which each impact is harmful or helpful in creating and maintaining healthy ecosystems.

Characteristics of a Healthy Ecosystem	How might wildfires impact this characteristic of ecosystem health?	Make a decision:
Stability and resilience	Describe the most significant impacts that wildfires would have on this characteristic of ecosystem health.	Place an X on the line below to show whether the impact is more helpful or more harmful to this characteristic of ecosystem health. <div style="text-align: center;">  </div>

Characteristics of a Healthy Ecosystem	How might wildfires impact this characteristic of ecosystem health? Describe the most significant impacts that wildfires would have on this characteristic of ecosystem health.	Make a decision: Place an X on the line below to show whether the impact is more helpful or more harmful to this characteristic of ecosystem health.
Biodiversity		
Nutrient cycling and energy flow		
Ecosystem goods and services		