



1. Wildland Fire in the Sagebrush Ecosystem

Overview

Students view a narrated photo presentation that shows wildland fire and some of the plants and animals in the sagebrush ecosystem. During the presentation, students record observations about fire behavior. Afterwards, they compare and contrast the kinds of fire they observed, and describe their feelings about wildland fire.

Lesson Goals Increase students' understanding that wildland fire is a complicated process and it can sometimes benefit ecosystems

Objectives

- Students will sketch different kinds of fire behavior in various wildlands based on a photo presentation.
- Students will compare and contrast the different kinds of fire behavior in writing.
- Students will describe their feelings about wildland fire.

Subjects: Science, Writing, Speaking & Listening, Art

Duration: 30 – 50 minutes

Setting: Classroom

Vocabulary

- ecosystem
- ecological community
- fire behavior
- wildland
- wildland fire
- species
- succession

Standards		Middle School (Grades 6-8)
NGSS	Crosscutting Concepts	<ul style="list-style-type: none">Stability and ChangeSystems and System Models
	Science & Engineering Practices	Obtaining, Evaluating, and Communicating Information
	Disciplinary Core Ideas	LS2.C: Ecosystem Dynamics, Functioning, and Resilience
Common Core ELA	Writing	4, 10
	Speaking & Listening	1, 2, 4, 6
	Language Standards	1, 2, 3, 6
	Writing Standards Science & Technical Subjects	4, 7, 10
EEGEL	Strand 1	A, E, F, G

Teacher Background

As an introduction to the study of wildland fire, the photo presentation which accompanies this lesson highlights variation in **fire behavior** and its relationship to specific **ecosystems**. If you walk through a recently burned **wildland** area, you might encounter some places where all the vegetation looks dead and other places that still have a lot of green vegetation. You might see deep holes in the ground where roots have burned away, or even patches of leaf litter that are just lightly scorched.

Fire behavior and fire effects vary with topography, weather, and vegetation. As a result, some patterns are typical of certain kinds of landscapes and vegetation. For example, steep hillsides are more likely to support fast-moving fires than flatlands or moist ravines, and forested areas with trees

close together are more likely to support crown fires (spreading through the tree canopy) than forests where the trees are far apart.

This version of the *FireWorks* program focuses on the sagebrush ecosystem, the largest ecosystem in North America, which contains 350+ species. A large area of the ecosystem is the sagebrush steppe (also known as the high desert), which is found in the higher elevation plains of the Western United States. It contains dense patches of shrubs and grasses, as well as patches of timber, such as juniper. Historically, the steppe was a vast area with bunch grasses and shrubs with open spaces between. Due to this open spacing between vegetation, intense fires were rare, and a stand replacement fire occurred only about every 50-100 years. Low intensity fires were common between stand replacement fires. These fires typically remained on the ground, cleaning up litter and duff, not harming the larger shrubs.

Materials + Preparation

1. *Wildland Fire and the Sagebrush Ecosystem* PowerPoint presentation available here: www.frames.gov/partner-sites/fireworks/curriculum/sagebrush-ecosystem
2. Computer with Microsoft PowerPoint software and Internet access; projector and display screen
3. Copies of the “Wildfire in the Sagebrush Ecosystem” handout for each student (at end of lesson)
4. Write on the board: “**ecosystem**” and “**ecological community**”
5. **Note:** If you plan to teach the units on fire ecology (Units V and VI), consider giving the assignment from Activity 11 at the end of the lesson, so students have time to prepare for that activity, and so you can spread out student presentations over several days instead of having them all at once. See Activity 11 for more information.
6. **Optional:** Read additional sources such as the following for background, or make copies for students to read / discuss:
 - “Born of Fire—Restoring Sagebrush Steppe.” USGS Forest and Rangeland Ecosystem Science Center: fresc.usgs.gov/products/fs/fs-126-02.pdf
 - “Big Wildfires in the West: Why, How, What to Do?” Lily Whiteman, National Science Foundation. livescience. July 31, 2013: www.livescience.com/38572-western-wildfires-causes-nsf-bts.html
 - Joyce, Christopher. “In Arid West, Cheatgrass Turns Fires into Infernos.” NPR. Dec. 5, 2012. www.npr.org/2012/12/05/166574589/in-arid-west-cheatgrass-turns-fires-into-infernos
 - Schimel, Kate. “The art – and science – of forecasting wildfires.” Mar. 13, 2015. *High Country News*. www.hcn.org/articles/the-art-and-science-of-forecasting-wildfires
 - “Science Connections: Western Wildfires & Climate Change.” Infographic. Union of Concerned Scientists: www.ucsusa.org/global_warming/science_and_impacts/impacts/infographic-wildfires-climate-change.html



Procedure

1. **Optional:** Ask students an essential question to engage them and prime them for learning, such as “In what ways is our classroom (or school or town) a community?” Direct them to discuss the question with a neighbor while you circulate to answer any questions. After a couple minutes, ask for a volunteer to share their thoughts. Then ask students: “Do plants and animals live in communities like people? If so, what types of natural communities might be best able to adapt to change?” Explain that you will explore that question in class today and in the weeks ahead.

2. Explain to students that they will view a short presentation that shows fires in **wildlands**, natural areas without people living in them. In particular, they'll see fires in three different **ecological communities**. Explain that an ecological community includes all of the living things in an area—plants, animals, fungi, and microorganisms. An **ecosystem** includes the living AND nonliving things—soil, water, air, sunlight, etc. Ask for examples of **community** members (living things). Ask which is more inclusive or “larger”: a community or an ecosystem? (An ecosystem is more inclusive, because it includes the community and also nonliving things.)
3. Explain that you will stop several times during the presentation and ask students to record something. After the presentation, you will ask them to compare and contrast different kinds of **fire behavior** and also to describe their feelings about the presentation.
4. Pass out copies of the “Wildfire in the Sagebrush Ecosystem” handout. Explain that you’ll let students know when you’d like them to use it to record observations.
5. Show the presentation. You can use the narrative in Table 1 (below) or give your own narrative, but keep it brief. If questions arise, record them on a flipchart or other medium, but don’t necessarily try to answer them during the presentation. Instead, explain that the class will seek the answers during this unit on **wildland fire**.
6. When you come to the four photos that show fire behavior, pause. Ask the students to look carefully at the flames in the photo—how long they are and what parts of the plants they are burning—and then sketch the flames on their handout. They can also write a few words in the margin to describe the fire behavior. Give them a couple of minutes for each sketch.
7. After the presentation, have a brief discussion with the class about variety in fire behavior and how different ecological communities can respond to it differently. Also discuss their experiences with and feelings about wildland fire. This discussion need not be long; it is a warm-up for the writing assignment (see Assessment, below).

Table 1

Suggested narrative for *Wildland Fire and the Sagebrush Ecosystem* photo presentation:

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| <p>Slide 1: Here is a bird’s-eye view of some of the wildlands of the sagebrush ecosystem. We’re going to spend the next few days/weeks/months learning about fires in this land.</p> <p>Slide 2: Here is a fire burning the sagebrush ecosystem. Observe and sketch the fire under “A” on the handout.</p> <p>Slide 3: This is what the land can look like after that kind of fire.</p> <p>Slide 4: Here are some plants and animals that live in the sagebrush ecosystem after fire:
Idaho fescue</p> <p>Slide 5: Wildflowers (forbs), such as arrowleaf balsamroot; Slide 6: Western yarrow; Slide 7: Rabbitbrush; Slide 8: Sagebrush</p> <p>Slide 9: Greater sage-grouse are one of many species which depend on sagebrush for survival. A male is shown doing his impressive mating display on the left, a female on the right.</p> <p>Slide 10: Pygmy rabbits also depend on sagebrush for survival.</p> <p>Slide 11: The sagebrush lizard is one species of reptile which can survive in the sagebrush ecosystem.</p> <p>Slide 12: Here is another kind of fire in the sagebrush ecosystem, where there are some native plants from the sagebrush ecosystem with invasive cheatgrass. Observe and sketch the fire under “B.”</p> <p>Slide 13: This is what the land looks like after that kind of fire, which burns hotter.</p> <p>Slide 14: Here are some plants and animals that live in that ecosystem after fire: Cheatgrass with some native species returning; bunchgrasses and brush</p> |
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Slide 15: Here is a third kind of fire in the sagebrush ecosystem. Observe and sketch it under “C.”

Slide 16: This is what the land can look like after that kind of fire, after it has been completely taken over by cheatgrass.

Slide 17: Here are some plants and animals that live in the area after fire: cheatgrass with little to no native species. Explain how systems respond to fire depending on what plants were found on the site and its disturbance legacy; e.g. a relatively intact site will respond more favorably (release of native plants, especially grasses and forbs) versus a site that is all cheatgrass prior to a fire.

Slide 18: **Succession** is the normal process of plants growing after a disturbance like wildfire. Native plants like bunchgrasses and wildflowers recover fastest, with shrubs eventually dominating the sagebrush ecosystem.

Slide 19: Invasive plants like cheatgrass regrow and spread very quickly after fire. Then fires spread faster and burn hotter. This fire cycle is difficult to break.

Assessment

1. Ask students to write on the back of the handout—or on a clean sheet of paper—responses to the prompts at the bottom of the handout:
 - a. A paragraph in which they compare the kinds of fire they observed, giving at least two examples of how the kinds of fire are the same
 - b. A paragraph in which they contrast the kinds of fire, giving at least two examples of how the kinds of fire are different
 - c. A list of three words or phrases that describe their feelings about wildland fire, especially based on what they observed in the presentation. Explain that people’s feelings often differ without being “right” or “wrong,” so all of the feelings are valid. Also, a person’s feelings can change over time, and they will have a chance to record their feelings again after they’ve learned more about fire.
2. *Optional:* Keep the handouts so they can be used again at the end of the wildland fire unit.

Evaluation

Task	Good	Fair	Poor
1. Fire comparison paragraph	<ul style="list-style-type: none">• Complete paragraph• Contained two examples of similar fire behavior	<ul style="list-style-type: none">• Incomplete paragraph• Contained one example of similar fire behavior	<ul style="list-style-type: none">• Incomplete paragraph• Did not contain examples of similar fire behavior
2. Fire contrast paragraph	<ul style="list-style-type: none">• Complete paragraph;• Contained two examples of different fire behavior	<ul style="list-style-type: none">• Incomplete paragraph• Contained one example of different fire behavior	<ul style="list-style-type: none">• Incomplete paragraph• Did not contain examples of different fire behavior.
3. Fire feelings list	<ul style="list-style-type: none">• Three words or phrases about personal feelings about wildfire	<ul style="list-style-type: none">• Two words or phrases about personal feelings about wildfire	<ul style="list-style-type: none">• One word or no words or phrase about personal feelings about wildfire

Wildfire in the Sagebrush Ecosystem

I. Color each sketch to show a typical fire in each ecological community.

A: Healthy sagebrush ecosystem



B: Some native plants from the sagebrush ecosystem with invasive cheatgrass



C: Cheatgrass with very few native plants



II. Please write:

1. One paragraph comparing the kinds of fire behavior and how they are similar. Give at least two examples.
2. One paragraph contrasting the kinds of fire behavior and how they are different. Again, give at least two examples.
3. Three words or phrases that describe your feelings about wildland fire.