



NATURE WORKS EVERYWHERE

As part of Recycle for Nature, PepsiCo Recycling has partnered with The Nature Conservancy and its Nature Works Everywhere program to provide some fun activities to encourage families and children to get outdoors. Nature Works Everywhere gives teachers, students and families everything they need to start exploring and understanding nature around the globe alongside The Nature Conservancy scientists—interactive games, and interactive lesson plans that align to standards and can be customized for each classroom.

*All website links work in Internet Explorer 9 or later, Google Chrome or Firefox browsers

FIGHTING FIRE WITH FIRE: CAN FIRE POSITIVELY IMPACT AN ECOSYSTEM?

For more information about PepsiCo Recycling, visit: www.PepsiCoRecycling.com.
For more resources that support this lesson, [download the full lesson plan here](#).

Grades: 5th – 9th

Essential Questions:

- What role does fire play in maintaining healthy ecosystems?
- How does fire impact the surrounding community?
- Is there a need to prescribe fire?
- How have plants and animals adapted to fire?
- What factors must fire managers consider prior to planning and conducting controlled burns?

Lesson Overview:

Students distinguish between a wildfire and a controlled burn, also known as a prescribed fire. They explore multiple controlled burn scenarios. They explain the positive impacts of fire on ecosystems (e.g., reduce hazardous fuels, dispose of logging debris, prepare sites for seeding/planting, improve wildlife habitat, manage competing vegetation, control insects and disease, improve forage for grazing, enhance appearance, improve access, perpetuate fire-dependent species) and compare and contrast how organisms in different ecosystems have adapted to fire.

Middle School Next Generation Science Standards

LS1-5: Construct a scientific explanation based on evidence for environmental and genetic factors influence the growth of organisms.

LS2-1: Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms and populations of organisms in ecosystems.

LS2-5: Evaluate competing design solutions for maintaining biodiversity and ecosystem services.

ES3-2: Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.

High School Next Generation Science Standards

HS-LS2-7: Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.

HS-LS4-5: Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, (3) the extinction of other species.

HS-ESS3-1: Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.

Vocabulary:

- *Adaptation*: A characteristic that increases an organism's ability to survive and reproduce in its environment.
- *Controlled Burn*: A fire purposely lit in order to safely apply a natural process to ensure ecosystem health.
- *Keystone species*: A species that has a critical role in maintaining the structure of an ecological community.
- *Behavioral Adaptation*: This is something an animal does, usually in response to some type of external stimulus.
- *Structural Adaptation*: A physical feature or a part of an organism's body that has helped it to survive in its environment.

Background for the Teacher:

Wildfires often occur naturally when lightning strikes a forest and starts a fire in a forest or grassland. Humans also often accidentally set them. In contrast, controlled burns, also known as prescribed fires, are set by land managers and conservationists to mimic some of the effects of these natural fires.

Today controlled burns are often conducted to counteract years of fire prevention policy, which called for all fires to be suppressed as quickly as possible. The policy of blanket fire suppression resulted in a tremendous buildup of forest underbrush and natural litter, such as pine needles. As a result, when these forests do catch on fire, the fire can be very destructive and intense. Controlled burns reduce the buildup of forest underbrush and litter, effectively lowering the intensity of future wildfires. Since 1972 National Park officials have adopted a policy of letting selected lightning-caused fires burn themselves out, within reason. Fires that threaten human lives, buildings, private property, or wildlife are extinguished.

In certain ecosystems, fires are necessary for the health of plant and animal species. The quick recovery of vegetation is evidence of how fire enhances habitat for most plants and animals in Florida. Herbivores, such as the white-tailed deer, are attracted to the highly nutritious plants after a fire. Fruit production is stimulated by fire, resulting in increased availability of seeds and berries that provide food for many species of wildlife. Predator populations increase in these areas, as they are attracted to increase in prey. Both plants and animals have developed adaptations to survive in this unique ecosystem even relying on each other for protection. Controlled burns help preserve plant succession patterns in the forest and habitat that supports diverse plant and animal species that have evolved over a long period of time exposed to both the natural influences of lightning-caused fire, as well as effects caused by indigenous human populations that have utilized fire for a wide variety of reasons.



CLASSROOM ACTIVITIES

Materials

For each group of students/individual student:

- Notebook paper/journal

Engage

1. Ask students to fold a piece of paper into two columns and label one as Harmful and the other as Helpful. Guide students to brainstorm ways that fire can be harmful and ways it is helpful.
 - a. Examples of harmful may include: damaging buildings, ecosystems and harming people.
 - b. Examples of helpful may include: cooking, heating, and powering machines, its symbolic use in religious practices and during ceremonies such as the Olympics.
2. Facilitate a discussion asking students to share from their list.
3. Pose the following questions as students view the following photograph:
 - a. What do you think is happening in the photograph? How long did it take you to decide? What information in the photograph helped you decide?
 - b. Were you curious about why this fire occurred?
 - c. Did you wonder about where this was taking place?
 - d. Do you think this fire is harmful or helpful? Why?

Be sure to take this opportunity to explain that fire is necessary to the health of some ecosystems.

4. Explain that some fires are caused naturally by lightning or set accidentally by humans. Fire managers, as controlled burns, set other fires.
5. Share with the students the [Fire overview video](http://vimeo.com/77792710) (<http://vimeo.com/77792710>).
6. Explain to students that they will work to answer these questions during the lesson. Focus their attention on the guiding questions:
 - a. What role does fire play in maintaining healthy ecosystems?
 - b. How does fire impact the surrounding community?
 - c. Is there a need to prescribe fire?
 - d. How have plants and animals adapted to fire?
 - e. What factors must fire managers consider prior to planning and conducting controlled burns?

Explore

1. Explain that Florida is an example of an area that has many naturally occurring wildfires, because its geographical location lends itself to frequent lightning.
2. Have students view the [Meet the Scientist: Zachary Prusak](#) video and then the scientist video [“How has a place like Florida been shaped by fire?”](#)
3. After students view the video, have them identify the following statements as true or false.:
 - Lightning first became a major source of wildfires in Florida in the 1970s.

- Many organisms depend on fire.
 - Fire is not a natural part of an ecosystem.
4. Provide students with the definition of Controlled Burn – A fire purposefully lit in order to safely apply a natural process to ensure ecosystem health. Re-emphasize the concept of wildfires as a valuable and necessary part of forest or grassland ecosystems.
 5. Share the scientist video [“How do prescribed fires benefit plants, animals and people?”](#)
 6. Explain that fire manager Zachary Prusak mentioned some of the benefits of fire. Explain to students that fires work for us and are a critical role in many ecosystems, like those found in Florida. Next, students will explore a variety of ways that fire can benefit ecosystems. Guide small groups of students to conduct a gallery walk: students will rotate around the room to the different examples of the benefits of fires. Have students use a capture sheet with the different examples listed (bulleted below) to record their investigation. At each station, ask students to identify if the benefits impact plants and animals, humans or both.
 - Reduce hazardous fuels
 - Dispose of logging debris
 - Prepare sites for seeding/planting
 - Improve wildlife habitat
 - Manage competing vegetation
 - Control insects and disease
 - Improve forage for grazing
 - Enhance appearance
 - Improve access
 - Perpetuate fire-dependent species
 7. Now that students have explored how fires can benefit ecosystems, they are going to investigate how certain plants and animals have adapted to wildfires. Provide the definition of Adaptation – a characteristic that increases an organism’s ability to survive and reproduce in its environment.
 8. Provide the definition of Behavioral Adaptation – this is something an animal does, usually in response to some type of external stimulus. Explain to students behavioral adaptations are things animals do to survive. Over generations, animals have adapted to know what to do when there is a change in their environment.
 9. Provide students with the definition of Keystone Species – a species that has a critical role in maintaining the structure of an ecological community.
 10. Share the Scientist video [“Why is the gopher tortoise one of this area's keystone species?”](#) This video further explains how species have adapted to this unique ecosystem.
 11. Share the Scientist video [“How does a Gopher Tortoise burrow work and what animals rely on it?”](#) This video provides examples of how other animals rely on the Gopher Tortoise burrows during a wildfire.
 12. Reinforce that the animals students previously observed were able to adjust their behavior to avoid fire. However, the plants they will view next have developed a different type of adaptation. Explain to students that three plant adaptations will be discussed in the following

video. As they view the video, they should think about whether each species' adaptation is to protect the species, promote or advance its population, or both.

13. Have students view the scientist video "[How do plants and grasses adapt to fire?](#)" After the video, review students' responses.
14. Provide students with the definition of a Structural Adaptation – a physical feature or part of an organism's body that has helped it survive in its environment. Explain that structural adaptations are physical features that help protect the plants against fires.
15. Option: Check out The Nature Conservancy's slideshow on [Florida's Fire Dependent Plants and Animals](#) for students to investigate additional adaptations to fire.