

Fire Ecology Learning Lab

Agency and Informal Educator Lesson Plan: Fire Adaptations

Grade Level: 3-5

Estimated Time per Class: 80 minutes

Lesson Overview:

- Introduction - 5 minutes
- What is Fire?
 - Fire Safety - 5 minutes
 - Candle Burning Activity - 5 minutes
 - Discussion - 10 minutes
- Adaptations and Fire
 - Introduce concept of adaptations - 5 minutes
 - Fire Adaptation Experiment Rotations - 40 minutes
- Discussion and conclusion - 10 minutes

Materials - all materials are included in the trunk or binder, unless otherwise noted.

What is Fire materials:

- Candle
- Heat-safe jar and lid
- Matches
- Fuel Cards (1 set)

Adaptation Rotation materials:

- Imagine a Fire-Adapted Plant or Animal
 - “My Fire Adapted Discovery” student worksheets (original included in binder and available online)
 - Art materials (ask teachers to provide these if they are not in the kits)
- Animal Adaptation Memory Game
 - Animal adaptation game (4 sets)
 - “Animals and Fire Matching Game” student worksheets (original included in binder and available online)
- Tree Bark Experiment
 - Infrared thermometer
 - Tree cross-sections: Ponderosa and aspen
 - Hair Dryer
 - Newspaper, printer paper, or phonebook to model bark (some paper included, but may need to be replenished)
 - Heat resistant gloves
 - “Bark as Insulator” student worksheet (original included in binder and available online)



Conclusion:

- Serotinous cones: Arizona cyprus (optional)
- Magnifying boxes (4 optional)
- Habitat Recovery Cards or PowerPoint

Guiding Question and Assessment**Guiding Questions:**

- What are the factors that allow a wildland fire to burn?
- What adaptations allow plants and animals to survive fire?

Objectives:

- Students will know two factors that allow wildfire to burn.
- Students will be able to identify three adaptations that help organisms survive fire.

Vocabulary

- Fuel - A material (like wood, leaves, coal, or gas) that releases energy (such as light, heat or power) by being burned.
- Habitat - A place where a living organism gets the things it needs to survive, including food, water, shelter, and space.
- Adaptation - Inherited structures or behaviors that serve a specific function and helps organisms survive in their habitat.

Preparation, Agenda, and Timing**Prepare:**

- *At least 2 weeks before:* send optional letter for teacher to provide to families about trauma informed care, provided in the binder
- *1 week before:* Contact teacher lesson to confirm details
- Collect and prepare materials
- Arrive at least 30 minutes before the lesson is supposed to begin
- Lay out all handouts somewhere they are easy to reach for each part of the lesson

Notes**Before visit:**

- Ask if the teacher has checked in with families to identify any students who might have been impacted by fire



Pre-Lesson Activities for the Teacher	Notes
<ul style="list-style-type: none"> ● Pre: Fire safety inventory (for classroom or home) 	<p>These activities are optional for the teacher to complete with the class outside of your visit. Less than 25% percent of classes complete pre-work.</p>

Timing and Instructions Introduction (5 minutes)	Notes
<ul style="list-style-type: none"> ● Introduce yourself and your agency. What do you do? What makes it interesting? 	<ul style="list-style-type: none"> ● Write your name on the board. ● 3-5 audiences may be interested in your uniform. After introducing your name, consider explaining the uniform that you wear and connecting it to the agency that you work for. If your uniform has a patch, point out the symbols and how it relates to your agency (e.g. the tree on the patch of the Forest Service uniform, the bison or sequoia on the National Park Service uniform)

Timing and Instructions Fire Safety (5 minutes)	Notes
<ul style="list-style-type: none"> ● Discuss fire safety – Have a group discussion. Write ideas on the board. Explore the following topics: <ul style="list-style-type: none"> ○ When are fires okay? ○ How to have a safe fire? ○ How to put out a fire? ○ “How and when can fire be used safely?” ● Discuss safety for the fire lesson. Explain your expectations for the upcoming lesson. <ul style="list-style-type: none"> ○ Identify the location of Safety equipment (extinguisher, sprinklers, alarm, etc.) ○ Students will stay seated. ○ Raise hands to participate. 	<ul style="list-style-type: none"> ● You can invite students to come up with additional expectations for safely handling fire in the classroom.



Timing and Instructions What is fire (5 minutes)	Notes
<ul style="list-style-type: none"> ● <u>Introduce activity</u>, e.g. “We are going to observe a fire. As we conduct this experiment, think about what fire needs to burn.” ● <u>Burn Candle</u>. Place a candle in a heatproof jar and light it with a match. You can secure the candle in the bottom of the jar with a piece of clay. ● <u>Observe the candle</u>. ● <u>Brainstorm</u>. Discuss the elements needed for the fire to burn. ● Place a cup over the candle to remove oxygen from the system. ● <u>Introduce the Fire Triangle</u>. Show the blank triangle and add the velcro words to “complete it.” 	<p>If the classroom is bright, it can be challenging to see when the candle goes out. Consider dimming the lights of the classroom or holding up a dark background to make the candle stand out.</p>

Timing and Instructions Discussion (10 minutes)	Notes
<ul style="list-style-type: none"> ● <u>Discuss how this relates to wildland fire</u>. Hold a discussion, include the following: <ul style="list-style-type: none"> ○ What are the fuel sources? Hold up fuel cards as students identify various fuel sources. ○ What is the ignition? Have students brainstorm this. 	<ul style="list-style-type: none"> ● Consider starting with fuel sources that are observable from the window or in the schoolyard and then extended to different fuels that exist in other parts of the region. ● Reinforce personal responsibility when using fire outdoors. Include statistics about human causes of fire.

Timing and Instructions Adaptation Introduction (5 minutes)	Notes
<ul style="list-style-type: none"> ● <u>Introduce concept of adaptations</u> - <ul style="list-style-type: none"> ○ Pass out/hold up Fuels in Ecosystems cards or use the PowerPoint. Define habitat. ○ Explore the complexity of different habitats having different relationships with fire, 	<ul style="list-style-type: none"> ● Depending on the grade, consider using the term ecosystem or biotic community. ● The habitat cards have terms that may be unfamiliar for students, they don't need to know the terms to be able to make observations and



pointing out the fuels growing in different ecosystems.	predictions. Emphasize curiosity and exploration, rather than knowing the answer.
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Timing and Instructions Fire Adaptation Rotations (40 minutes)	Notes
<p>These are designed to use as a rotation, However, they can also be used as individual activities if there is limited time. The Bark activity works best with a small group.</p> <ul style="list-style-type: none"> ● <u>Bark as an Insulator.</u> <ul style="list-style-type: none"> ○ Pass out the Insulator worksheet ○ Students compare the bark of aspen (picture) and ponderosa (sample). ○ Students create a model of each type of bark to recreate the thickness of each by using layers of paper. One student will hold the model aspen bark, a second student will use the hair dryer on one side of the bark. A third student will take a temperature reading. ○ The student holding the paper should wear the provided heat resistant gloves to avoid burned fingers. ○ Repeat with the ponderosa “bark” model. ○ Note: Keep the distance of the hairdryer to the paper the same each time. ● <u>Animals and Fire Adaptations Game</u> <ul style="list-style-type: none"> ○ Pass out the Animal worksheet ○ Using the animal adaptation cards, students work in pairs to match the animals with their adaptations. ○ They will then choose their favorite pair and record this on their worksheet. ○ Then, students use the cards to play a game of memory. ● <u>Imagine a Plant or Animal that is Fire Adapted.</u> <ul style="list-style-type: none"> ○ Pass out Imagine worksheet. ○ Students choose a habitat. ○ Students create a new plant, by drawing and labeling a fire adapted plant for their habitat. 	<ul style="list-style-type: none"> ● Additional details on the worksheet. ● Notes for Bark as an Insulator: <ul style="list-style-type: none"> ○ Be clear about the different roles for each student. ○ Reinforce that students should <u>never</u> point the thermometer at humans or animals. ○ Students may need help using a ruler to measure the bark. ● Notes for Animals and Fire Adaptations: <ul style="list-style-type: none"> ○ Not all of the animals are found in the Southwest. ● Notes for Imagine a Plant: <ul style="list-style-type: none"> ○ Students may need additional help thinking through unique features of their selected habitat. ○ Students may want an entire page of paper to draw their plant. ○ Students should be able to describe the adaptation.



Closing (10 minutes)	Notes
<ul style="list-style-type: none"> ● <i>Optional: Do a demonstration using the seeds of Arizona cypress seeds. Use a heat source to open the cypress cone. Use the magnifying boxes to look at the cones and seeds.</i> ● <u>Discussion</u>. Students discuss and reflect on what they learned. <ul style="list-style-type: none"> ○ What does this look like in different habitats? Show pictures of recovery over time in different ecosystems and identify similarities and differences across the different habitats. 	<ul style="list-style-type: none"> ● <i>Note on Arizona Cypress cones:</i> <ul style="list-style-type: none"> ○ <i>We have included Arizona cypress cones, a serotinous cone, which opens after exposure to fire. Cones may continue to open after they are exposed to a flame, consider leaving with the class. The cones also open over time (ambient heat, drying out, etc.).</i>

Post-lesson activities and homework	Notes
<ul style="list-style-type: none"> ● Have students look for the adaptations in their school yard. There is an Adaptation Hunt handout you can leave for teachers that is on the website. 	<p>These activities are optional for the teacher to complete with the class outside of your visit. Less than 25% percent of classes complete post-visit extensions or homework.</p>

Common Questions
<p>What happens to animals in a fire? Are fires bad? If you are a firefighter:</p> <ul style="list-style-type: none"> ● Are you scared? ● Is it dangerous?

Working with Grades 3-5
<p>Tips and Tricks:</p> <ul style="list-style-type: none"> ● The lead teacher might want you to visit multiple classes in a day. <u>You might need to shorten parts of this lesson to fit into their schedule.</u> ● Remember you are a subject expert. <u>Use words that are easy to understand.</u> Avoid using acronyms, jargon, and big words. ● <u>Communicate your expectations for the teacher</u> (e.g. dividing students into groups, addressing any behavior issues, etc.)



- Set clear expectations and know you will need to repeat these. You can ask students about the norms in their classroom.
- Set clear consequences for not listening or not following directions, especially when doing the fire. Follow these consequences immediately.
- 3-5 students are able to work well in groups, but can be competitive. Set clear roles and expectations for group work.
- 3-5 students are beginning to explore the broader world. They enjoy problem solving and engaging with more complex ideas.

The state standards below are provided to share with teachers. These are topics they are responsible for covering in a year. By sharing these with teachers they will be more likely to justify having you visit their classroom. NGSS stands for Next Generation Science Standards. These are used in New Mexico, sometimes called STEM Ready! Science Standards. Arizona standards are similar, but have a slightly different numbering convention. Common Core standards are the language arts and math standards.

NGSS and AZ Science Standards

NGSS Content:

3-LS3-2 Heredity: Inheritance and Variation of Traits: Use evidence to support the explanation that traits can be influenced by the environment.

3-LS4-2 Biological Evolution: Unity and Diversity: Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing.

3-LS4-3 Biological Evolution: Unity and Diversity: Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.

3-LS4-4 Biological Evolution: Unity and Diversity: Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.*

4-PS3-2 Energy: Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.

