

LESSON #3:

FIRE BEHAVIOR – BASICS

GRADES:
3-5

TIME REQUIREMENT:
40-60 minutes or longer

STANDARDS:
[Science Standards for Alaska and NGSS:](#)
[3-ESS3-1, 4-ESS3-1, 5-ESS2-1](#)

[Alaska Content and Performance Standards:](#)
[Geography: A-2, A-4, A-5, A-6, B-8, C-1, C-2, E-5, F-2](#)
[Alaska Cultural Standards:](#)
[B-1, E-2](#)

OVERVIEW:

Small groups work through a fire scenario and film it to show the rest of the class.

CONSIDERATIONS:

This lesson can be broken up into sections, as it requires time for students to solve scenarios, film their stories, and showcase their work to the rest of the class.

MATERIALS NEEDED

- *Forest Fire Scenario kit* for each group of students
- Scenarios to film (included on separate page)
- Cameras or tablets for stop motion animation with Stop Motion Studio, iMovie, or other stop-motion app loaded on to them
- Index cards (for title/hypothesis cards)
- A way to share examples and student videos

LEARNING OBJECTIVES

The student will:

1. Create a model of a forest fire

2. Learn about fire behavior
3. Understand that different conditions affect a fire's behavior
4. Explore the effects of clear spaces, wind, slope angle, and terrain on fire behavior
5. Experiment different ways to affect a fire's behavior

ASSESSMENT

The students' films should reflect what they have learned, with the following features.

1. Model of a forest fire burning
2. Description of the fire behavior in their scenario
3. One or more conditions that affect a fire's behavior
4. Theories about fire spread or behavior

ACTIVITY STEPS

1. Students will be designing a stop motion animation to demonstrate different fire behavior scenarios. First they will follow a designed scenario, then they will film an assigned scenario to show the rest of the class (scenarios below).
2. Complete *Introducing the Forest Model and Fire Simulation* in the "Introduction to Lessons 3-5"

3. Divide students into groups of 2-3 and provide each student with a *Forest Fire Scenario kit*. There are six scenarios, but you can have different students do the same scenario and start the fires at different positions on the board and compare results. Small groups allow students to share ideas and collaborate. Have each group practice laying out chips as trees and then documenting the progress of the fire through successive stages.
4. Each group runs through these three beginning exercises as practice:
 - A. Fill the board with tree chips (1 per square). If a fire in one of the corner squares (i.e. A1, A10, J1, or J10) is the first step, how many steps will it take for the entire board to be on fire?
 - B. Again, with a full board: If a fire in one of the center squares (i.e. E5, E6, F5, or F6) is Stage 1, at what stage will the entire board be on fire?
 - C. What happens when there is a tree on every other square and a fire starts in a corner? In the center?
5. The scenarios are listed on another sheet of paper. Distribute the scenarios cards and ask students to spend a few minutes making predictions about how the fire might behave (these can be written down). Once they have made their predictions, they can create an animation showing their scenario. Explain that each scenario will be used to teach the rest of the class,

so the film should include explanations about the phenomena they are demonstrating.

6. Scenario Filming

- A. Have the students lay out the initial scenario description, create title cards for both their scenario and their hypothesis.
- B. To animate the scene, students change the tokens across the forest fire grid, taking a picture each time.
- C. Use tablets or cameras and apps to capture each image and create the animation.

The six scenarios:

- Safe margin
- Fire break—road
- Wind
- Hillside
- Water/Fire break—river
- Water—wetland

General instructions for each scenario (also printed on each card):

Show the class what happens when there is a fire with the special conditions in your scenario. Your film should include:

- A description of the setting. (What makes it different from the way the

board was set up in the practice exercises?)

- Your team's theory about how the fire will burn. (Will it go faster or slower? Will it spread in every direction equally?)
- What you learned about the fire spread in your scenario (Did it match your prediction? Do you have any new questions or predictions now?)

7. Film festival

Allow 5 minutes per group, if possible. Have students present their animations and tell the class about their scenarios, hypotheses, discoveries, and further questions/wonderings. One way to do this is to upload all animations onto the teacher's computer and have groups present their films to class on a projector. If a projector is not available, another option is to divide the class in half and have one half of the class circulate to view presentations displayed on iPads. The class switches roles after the first group is finished.

EXTENSION

Have the students write a story centered around a forest fire, creating their own scenarios with varying conditions, or combining multiple conditions, and comparing the effects. They then film the scenario as a story, providing a voice-over narration

Art variation - Students draw their own forest grids and make the trees/fire/house/markers. Grids could have various landscape features and roads.



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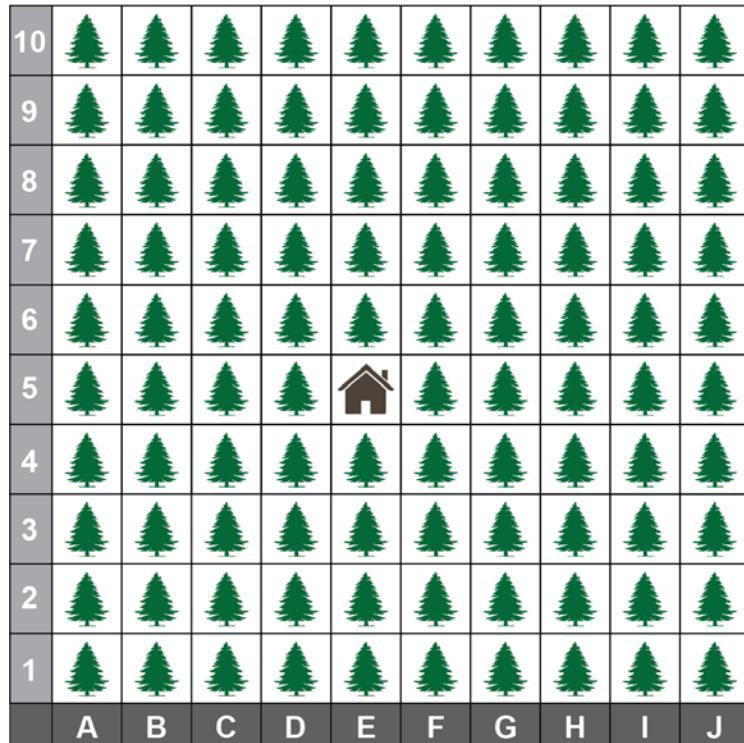
SCENARIO 1

SAFE MARGIN

Show what happens when there is a fire with the special conditions in your scenario. Each scenario film should include:

1. A description of the setting. (What makes it different from the way the board was set up in the practice exercises)
2. Your team's theory about how the fire will burn. (Will it go faster or slower? Will it spread in every direction equally?)
3. What you learned about the fire spread in your scenario (Did it match your prediction? Do you have any new questions or predictions now?)

Fill the board with trees. Remove one tree from the middle of the board and place a marker representing a house in its place. How many trees do you need to remove to keep the house safe from fire? Remove those trees. Start a fire at one edge of the board and film the progress.



Icons courtesy dom-studio and freepik.com

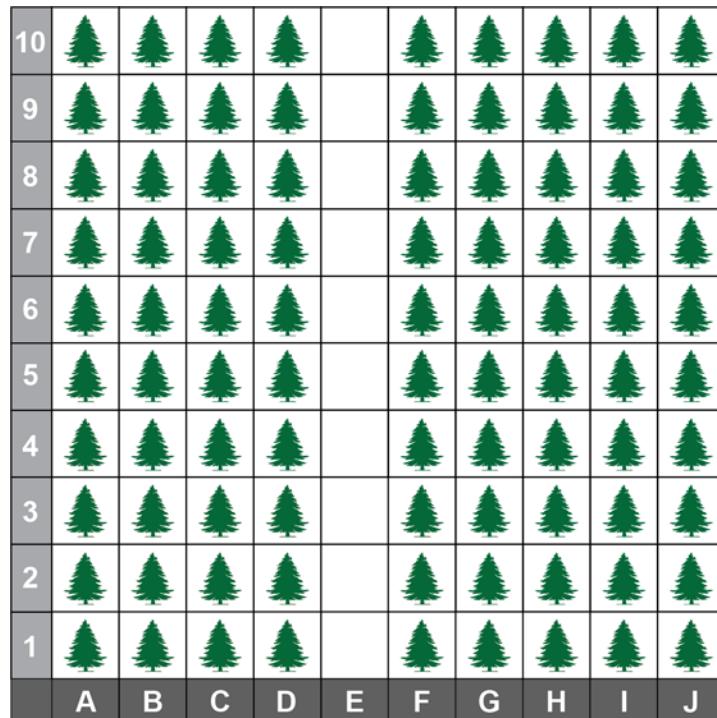
SCENARIO 2

FIRE BREAK—ROAD

Show what happens when there is a fire with the special conditions in your scenario. Each scenario film should include:

1. A description of the setting. (What makes it different from the way the board was set up in the practice exercises)
2. Your team's theory about how the fire will burn. (Will it go faster or slower? Will it spread in every direction equally?)
3. What you learned about the fire spread in your scenario (Did it match your prediction? Do you have any new questions or predictions now?)

Fill the board with trees. Remove a strip of trees (row E) from the middle of the board. What happens now when a fire starts in one corner of the board? Start a fire at one edge of the board and film the progress.



Icon courtesy of dmitri-studio, freepik.com

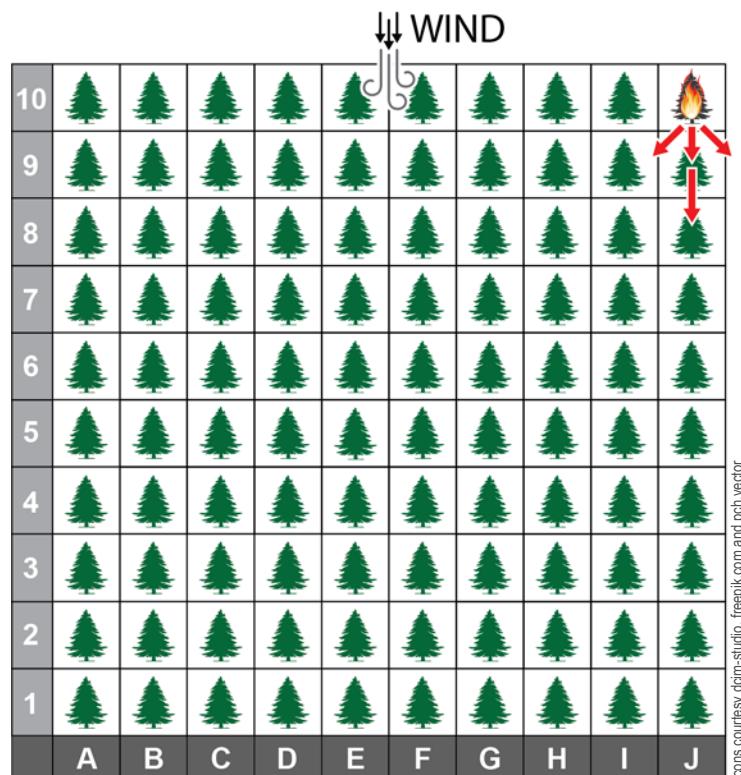
SCENARIO 3

WIND

Show what happens when there is a fire with the special conditions in your scenario. Each scenario film should include:

1. A description of the setting. (What makes it different from the way the board was set up in the practice exercises)
2. Your team's theory about how the fire will burn. (Will it go faster or slower? Will it spread in every direction equally?)
3. What you learned about the fire spread in your scenario (Did it match your prediction? Do you have any new questions or predictions now?)

Fill the board with trees. There is a strong wind coming in from the North (the top of the board). When a tree catches fire, two squares to the South, one square each to the Southeast and Southwest burn, and no squares to the North burn. Start a fire at one top corner of the board and film the progress.



Icons courtesy of dimi-studio, freepik.com and pch.vector

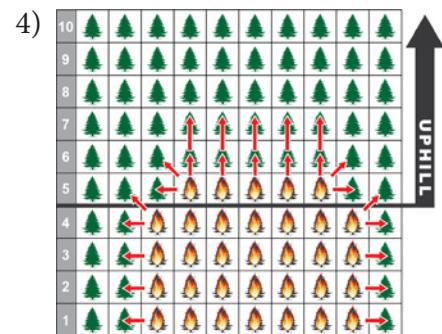
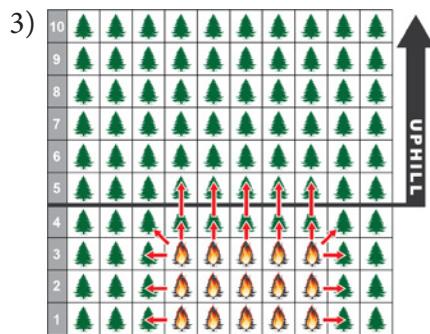
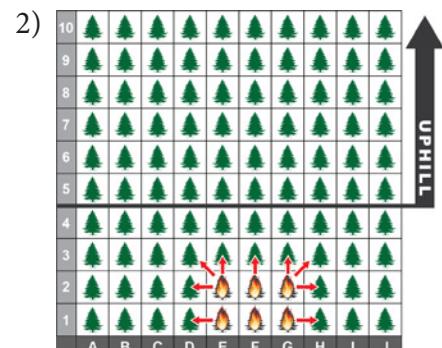
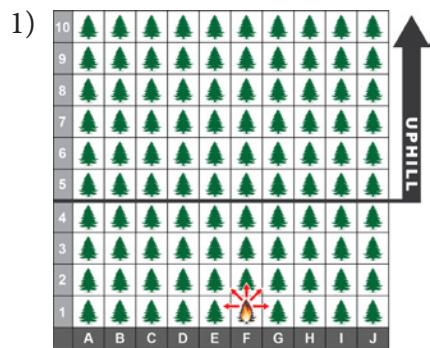
SCENARIO 4

LAND—HILLSIDE

Show what happens when there is a fire with the special conditions in your scenario. Each scenario film should include:

1. A description of the setting. (What makes it different from the way the board was set up in the practice exercises)
2. Your team's theory about how the fire will burn. (Will it go faster or slower? Will it spread in every direction equally?)
3. What you learned about the fire spread in your scenario (Did it match your prediction? Do you have any new questions or predictions now?)

Fill the board with trees. Designate rows 5-9 as uphill. When fires burn they tend to travel uphill rapidly. On level ground a fire might move equally in all directions, but it will move rapidly uphill. When a square on a hillside catches fire, it burns uphill more rapidly as shown in the pattern below. Have the fire start at a square on the bottom row and film the progress. What happens when the fire hits the hill?



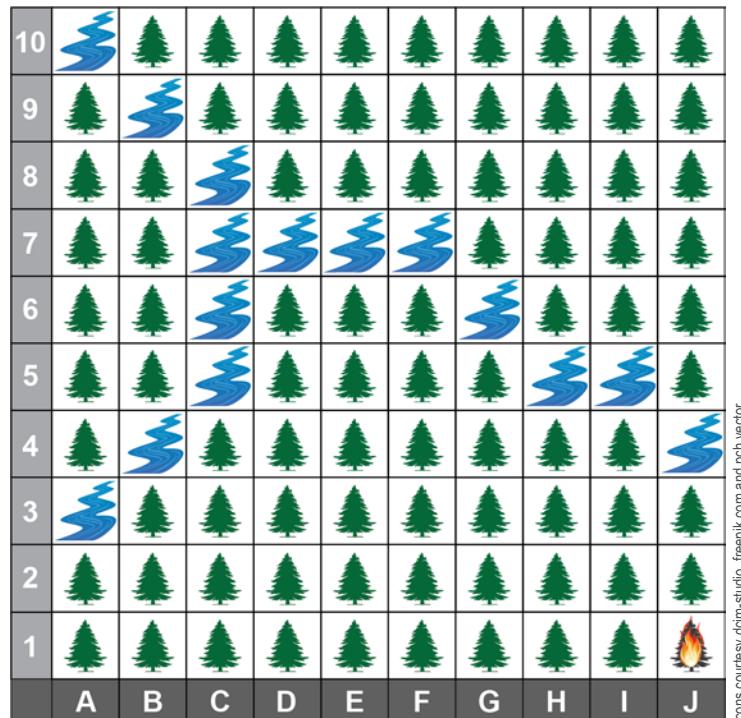
SCENARIO 5

WATER/ FIRE BREAK—RIVER

Show what happens when there is a fire with the special conditions in your scenario. Each scenario film should include:

1. A description of the setting. (What makes it different from the way the board was set up in the practice exercises)
2. Your team's theory about how the fire will burn. (Will it go faster or slower? Will it spread in every direction equally?)
3. What you learned about the fire spread in your scenario (Did it match your prediction? Do you have any new questions or predictions now?)

Mark out squares on the board to indicate the presence of a river with a fork. Put trees on all the other spaces. Have the fire start in a corner on the bottom row and film the progress, note that only squares with trees can burn.



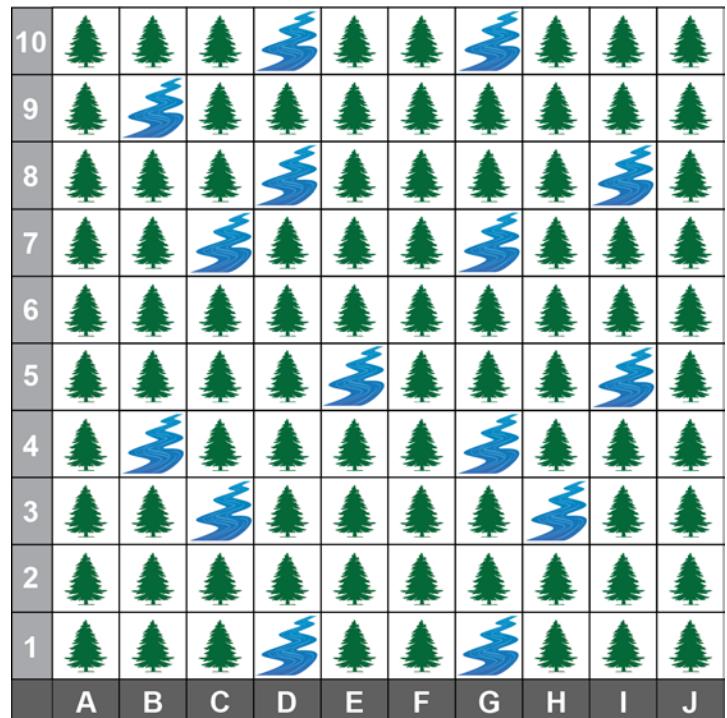
SCENARIO 6

WATER—WETLAND

Show what happens when there is a fire with the special conditions in your scenario. Each scenario film should include:

1. A description of the setting. (What makes it different from the way the board was set up in the practice exercises)
2. Your team's theory about how the fire will burn. (Will it go faster or slower? Will it spread in every direction equally?)
3. What you learned about the fire spread in your scenario (Did it match your prediction? Do you have any new questions or predictions now?)

Mark 35 squares as water squares. Distribute them so that no more than 4 squares are connected. Put trees on all the other spaces. Pick a spot on the board to start the fire and film the progress, note that only squares with trees can burn.



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