LESSON #3:
INTRODUCTION TO FIRE BEHAVIOR

GRADES:
3-5

STANDARDS:
Science Standards for Alaska and NGSS:
3-LS4-3, 3-LS4-4, 3-ESS3-1, 3-5-ETS1-2, 5-ESS2-1, 5-ESS3-1

Alaska Content and Performance Standards:
Geography: A-2, A-4, A-5, A-6, B-8, C-1, C-2, C-3, E-5, E-6, F-2, F-3

Alaska Cultural Standards:
A-4, E-2

OVERVIEW:

This and the following lessons use models to show the effects of different conditions on wildfires. Ecological systems are central to these lessons, and students learn how one part of the system can have effects on other parts of the system. Each lesson has its own variations, but they are designed to build one upon the other in numbered order.

BACKGROUND INFORMATION

Fire behavior is the term used to describe a forest fire. It includes the many different characteristics a fire can have. Many factors influence fire behavior. Weather, climate, tree density, landscape, and human structures (like roads and houses) all affect the way a fire spreads through an area. Rivers and roads can make firebreaks, and people create margins of safety around houses and other buildings. Wind fans flames, and fires burn faster uphill. In a forest, the density of trees and fuel can determine the rate at which a fire burns-- things that are closer together burn quicker.

Fire scientists have to take all of these factors into account when making decisions about managing healthy forests and handling forest fires. These lessons will help students think about the system of a forest fire with its many moving parts and changing conditions.

CONSIDERATIONS:

This work is best done in small groups of 2-4 students.

MATERIALS NEEDED

Forest Fire Scenario kit

- Forest Fire grid: fabric gameboards labeled along the edges with letter and number coordinates
- Tree / fire tokens: 100
- Blank grid sheets (templates at end of lesson)
- Pencils

ACTIVITY STEPS

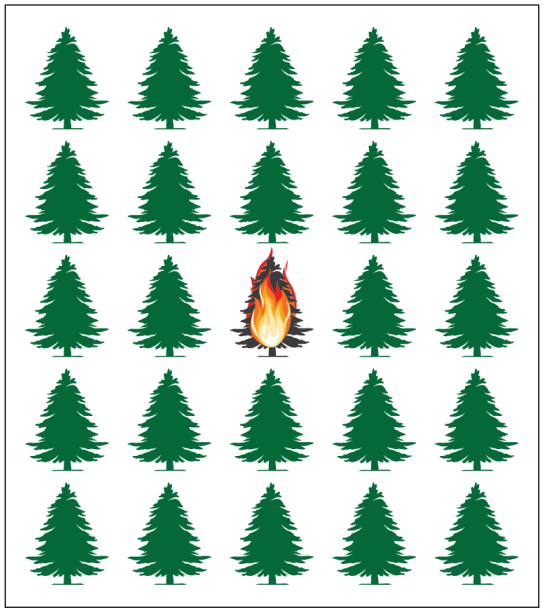
Introducing the Forest Model and Fire Simulation

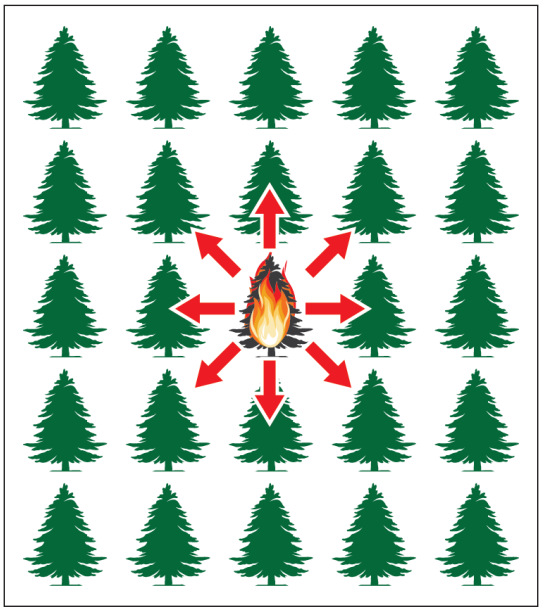
1. Have students open their gameboard grids and inspect the pieces.

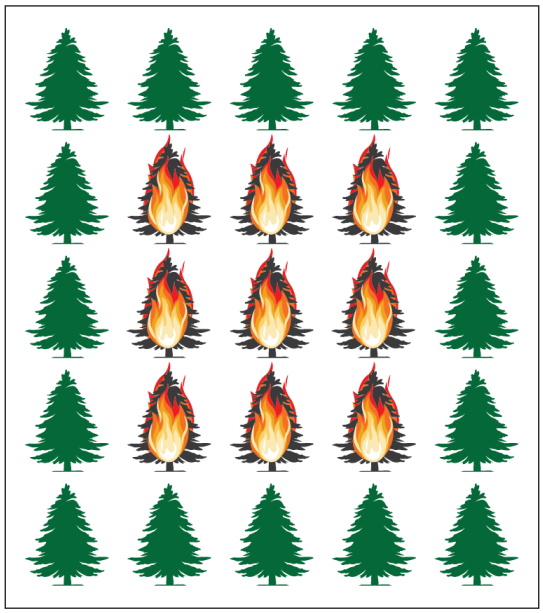
2. Describe each board as a forest. The board lines up with the cardinal directions on a compass, so that Row 1 is the southern edge and Row 10 is the northern edge. Each square is a space for a tree.

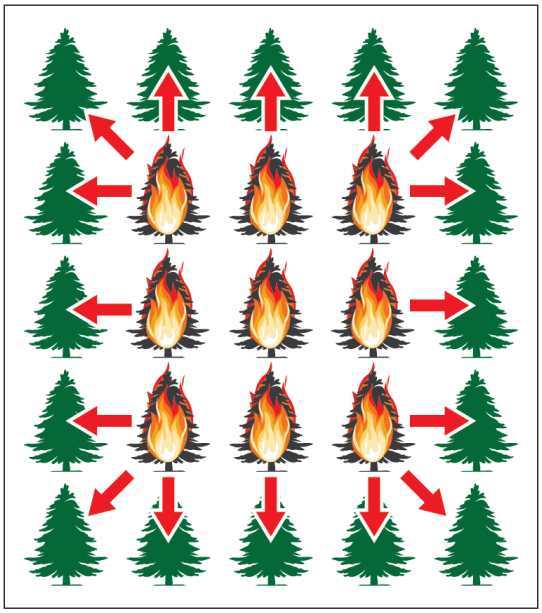
3. Trees are represented by the “tree” side of the tree/ fire tokens. Trees represent the fuel in a forest fire. When a tree catches on fire, every tree in a space next to it catches on fire, horizontally, vertically, and diagonally. Fire is indicated by flipping over a tree/ fire token to fire side, representing burning/burnt trees. The process repeats in stages.

4. Demonstrate the movement of a fire from one corner of the board to another on a 5x5 section of a board, like the illustrations below. Between stages, ask students to predict what they think will happen next. Emphasize that the trees will burn in a sequence, or "steps." This will be important later on in the curriculum.









icons courtesy dsim-studio, freepik.com and pch.vector

5. The student groups will run through the next three exercises on their own:

   A. Fill the board with chips (1 per square). If a fire in one of the corner squares (i.e. A1, A8, H1, or H8) is Stage 1, at what stage will the entire board be on fire?

   B. Again, with a full board: If a fire in one of the center squares (i.e. D4, D5, E4, or E5) 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?

At this point many students may be confused about the sequencing of the fire or keeping track of which trees burn (i.e. being able to distinguish or calculate which trees burned in the first step, which trees burned in the second step, etc.) To help them, introduce the blank grid sheets (templates at end of lesson).

6. Distribute the paper blank grid sheets. Have each group select a random square on the grid, and mark it "0". Ask them "If this where the fire starts, which squares will catch fire next?" Have them label every touching square with a "1".

   Alternatively, have the students roll a 10-sided die twice to determine the coordinates where the fire starts.

7. Help the students check their work, then have them mark every blank square touching a "1" square with a 2. Continue in this sequence until the students fill their entire grids.

8. The different grids should vary, depending upon where the burn started. Have the students compare their grids. How many seps did it take to cover each grid? Which grids took the most number of steps to cover?

9. As an alternative to numbering, student may color their squares. Each step is a different color. If the entire class uses the same color sequence (i.e. 0=red, 1=orange, 2=yellow, 3=green, etc.), students can compare their patterns and make inferences about similarities and differences in the patterns.

ASSESSMENT

Students should be able to:

1. Model a forest fire as it burns

2. Track the sequence of a fire spread

3. Compare the effects of fire starting at different places on the board

4. Share theories about fire spread or behavior

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BLANK GRID SHEET

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