

LESSON #6:

FIRE BEHAVIOR – WEATHER AND CHANCE

GRADES:
3-5

TIME REQUIREMENT:
40-60 minutes or longer

STANDARDS:

**Science Standards for Alaska
and NGSS:**

3-5-ETS1-3 4-ESS3-2, 5-ESS2-1

Alaska Content and

Performance Standards:

Geography: A-2, A-4, B-8, C-1,
E-5, E-6

Alaska Cultural Standards: E-1,
E-2

OVERVIEW:

Small groups make a forest model and experiment with different conditions, observing what happens when things such as climate and weather change.

MATERIALS NEEDED

- Forest fire game kit for each student group
- "Game Guide and Rules" for each student group (copy at end of lesson)
- "Fire Behavior Record" for each student group (copy at end of lesson)

LEARNING OBJECTIVES

The student will:

- Model forest fires and make observations about fire behavior
- Experiment with variations in wind, terrain, and rain on fire volatility
- Understand that lightning strikes start fire
- Record data on a sheet in order to compare different conditions

ASSESSMENT

Students are able to:

- Describe the movement of a fire through a forest
- Name factors that affect wildfires and explain their effects
- Interpret and record weather data
- Make predictions about fire behavior under different conditions

ACTIVITY STEPS

1. This lesson should only be done after the students have had an opportunity to experiment with the forest fire game and all of the different pieces. Review the previous lessons or have the students refresh their memories using the templates at the end of Lesson 4.
2. Students will create a board and then experiment with different conditions, observing what happens when things such as climate, wind, and topography vary. Students should write down the conditions they roll and record their observations on the "Fire Behavior Record" sheet each time they play through a scenario.
3. Once the students are ready, give them the "Fire Behavior Record" sheets and the "Game Guide and Rules" (*separate pages*).



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GAME GUIDE AND RULES (1 OF 2)



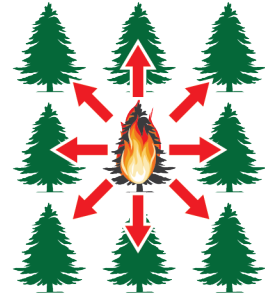
TREE

One part of a forest.



FIRE

Burns trees and other fuel. Normally burns in all eight directions around it.



DIRECTIONS

Fire normally burns in all eight directions around it.



HOUSE

Burns like a tree. You might want to protect it.



WATER

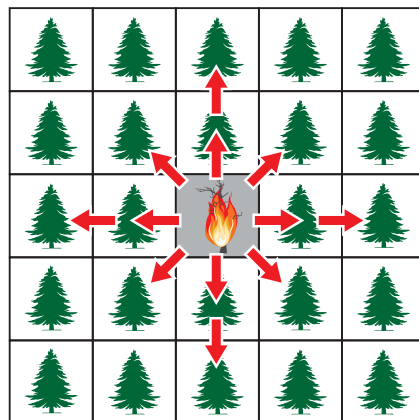
Squares with water will not burn.



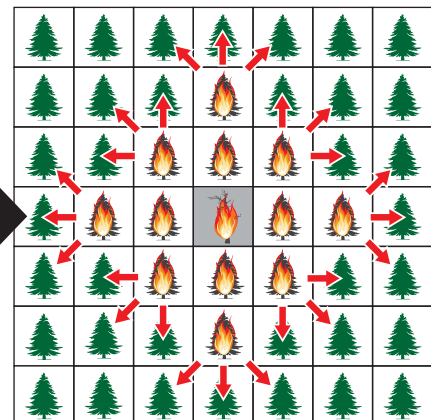
DEAD WOOD

These squares are very volatile. They burn two squares on each flat side and one diagonally.

DEAD WOOD EXAMPLE



The dead wood is extra fuel and burns more trees around it.



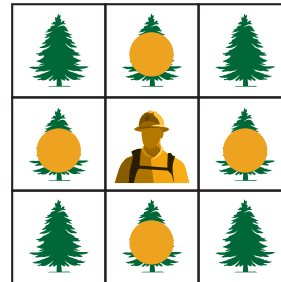
The trees on fire now burn like regular trees.

GAME GUIDE AND RULES (2 OF 2)



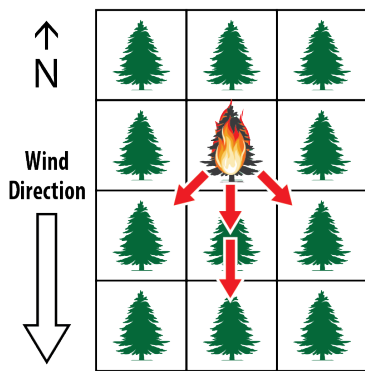
FIREFIGHTER

Keeps the square that they are on from burning. They can also protect up to four other squares that are touching the square that they are on.



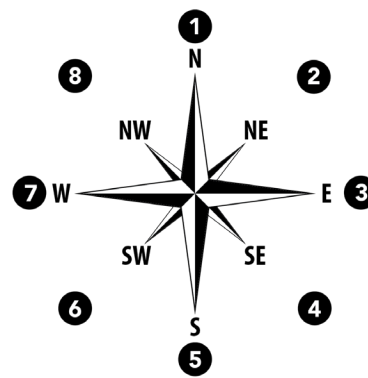
PROTECTION

In this case, the firefighter is protecting the four squares directly to each side of the square that they are standing on.



WIND

Burns two squares in the direction the wind is blowing from, one square in the two directions next to it on either side. The side and back squares do not burn. In this case, the wind is blowing from the North.



DIRECTION

We roll the 8-sided die to determine the direction the wind is blowing from.

EXAMPLE:

Maria rolled a 7. She used the compass to figure out that the wind is blowing to the West. She put the arrow next to her board like this:



10										
9										
8										
7										
6										
5										
4										
3										
2										
1										
	A	B	C	D	E	F	G	H	I	J

FIRE BEHAVIOR RECORD (1 OF 5)

Board Conditions — these stay the same for all three rounds

Set up the board so it has:

- 1 house with a fire break
- At least 65 trees
- 10-15 water squares
- 7-10 squares with dead wood

Write down the number of trees, river squares, and houses that you choose to put on your board below:

Trees: _____ **Water:** _____ **Dead wood:** _____

FIRST ROUND

1. Roll an 8-sided die for climate

Roll	Climate	Conditions
1 or 2	Very wet	Trees only burn in four directions, North, South, East, West
3 or 4	Wet	Trees burn in all 8 directions
5 or 6	Dry	Trees burn in all 8 directions, plus for two spaces in the direction of wind, but the fire cannot jump breaks
7 or 8	Very Dry	Trees burn for 2 spaces and the fire can jump a fire break (1 space)

Write down the number you rolled and the climate conditions.

Number: _____ **Condition:** _____

* If you get a Very Wet Climate, look for a special rule later on.

2. Roll a die for wind/no wind

Even numbers are wind, odd number are no wind.

Write down the number you rolled and whether there is wind.

Number: _____ **Is there wind?** _____

* If you have wind, roll the 8-sided die for wind direction. Look at the compass to figure out which direction the wind is rolling from. If there is no wind, skip to lightning.

Write down the number you rolled and the wind direction.

Number: _____ **Wind direction:** _____

FIRE BEHAVIOR RECORD (2 OF 5)

3. Roll for a lightning strike

Roll a 10-sided die twice to see where lightning hits and start the fire. The first roll is the row across, same as the number you rolled. The second roll is the vertical column: 1=A, 2=B, 3=C, 4=D, 5=E, 6=F, 7=G 8=H, 9=I, 10=J.

Write down the numbers you rolled and the location of the lightning strike.

First number: _____ **Second number:** _____ **Strike location:** _____

SPECIAL RULE FOR VERY WET CLIMATE:

After rolling to determine the lightning location, roll again. The trees around the lightning strike only catch fire if the roll is an even number.

VERY WET CLIMATE ONLY: Write down the number you rolled and if the trees burn.

Number: _____ **Will the trees catch fire?** _____

Look at your board conditions, climate, wind, and lightning strike location. What do you think is going to happen? **Explain why.**

4. Continue the fire until everything is burned or the fire cannot burn any longer.

What happened? Did the fire burn the way you thought it would?

FIRE BEHAVIOR RECORD (3 OF 5)

Return the board to its original conditions with the house, rivers and dead wood in the same places as before. For the second round, you will roll again for climate, wind and lightning.

SECOND ROUND

1. Roll an 8-sided die for climate

Write down the number you rolled and the climate conditions.

Number: _____ **Condition:** _____

2. Roll a die for wind/no wind.

Write down the number you rolled and whether there is wind.

Number: _____ **Is there wind?** _____

If there is wind, roll for direction. Write down the number you rolled and the wind direction.

Number: _____ **Wind direction:** _____

3. Roll for a lightning strike.

Remember there is a special rule for a very wet climate.

Write down the numbers you rolled and the location of the lightning strike.

First number: _____ **Second number:** _____ **Strike location:** _____

VERY WET CLIMATE ONLY: Write down the number you rolled and if the trees burn.

Number: _____ **Will the trees catch fire?** _____

Look at your board conditions, climate, wind, and lightning strike location. What do you think is going to happen? Explain why.

FIRE BEHAVIOR RECORD (4 OF 5)

4. Continue the fire until everything is burned or the fire cannot burn any longer.

What happened? Did the fire burn the way you thought it would?

THIRD ROUND

1. Roll an 8-sided die for climate

Write down the number you rolled and the climate conditions.

Number: _____ **Condition:** _____

2. Roll a die for wind/no wind.

Write down the number you rolled and whether there is wind.

Number: _____ **Is there wind?** _____

If there is wind, roll for direction. Write down the number you rolled and the wind direction.

Number: _____ **Wind direction:** _____

3. Roll for a lightning strike.

Remember there is a special rule for a very wet climate.

Write down the numbers you rolled and the location of the lightning strike.

First number: _____ **Second number:** _____ **Strike location:** _____

VERY WET CLIMATE ONLY: Write down the number you rolled and if the trees burn.

Number: _____ **Will the trees catch fire?** _____

Look at your board conditions, climate, wind, and lightning strike location. What do you think is going to happen? Explain why.

FIRE BEHAVIOR RECORD (5 OF 5)

4. Continue the fire until everything is burned or the fire cannot burn any longer.

What happened this time? Did all the fires burn the same way?

Now that the fires have burned three times with the same basic conditions, compare the different ways the fires burned. What had the biggest effect in how the fires burned?

Were there things that surprised you? Why or why not?

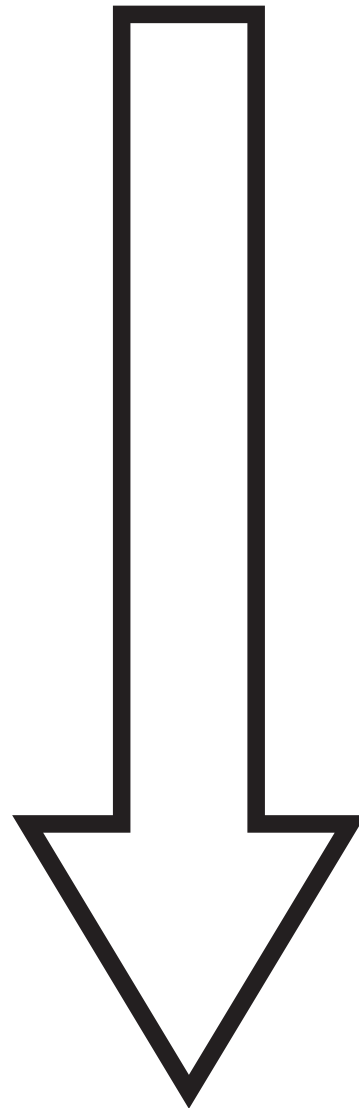
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GAME PIECE INVENTORY

Bag Contents	#
board (10x10)	1
tree/burn tokens	100
water/brush tokens	35
firefighters	15
protected squares	60
houses	20
8-sided die	1
10-sided die	1
6-sided die	1
big mesh bag	1
tree/burn tokens	100
houses	20
water/brush tokens	35
protected squares	60
firefighters	15
8-sided die	1
10-sided die	1
6-sided die	1

WIND DIRECTION

*Use this arrow to show wind direction
after you roll the dice (Lesson #5)*



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