

# Fish in Hot Water:

## Subject

Earth Systems and Human Activity

## Objectives

The students will:

- Understand how climate change impacts salmon
- Demonstrate how vanishing glaciers cause poor water quality for salmon.

## Materials

You will need outdoor space and a sunny day for the following activity:

- Open white board space
- 2 clear jars
- 2 yogurt cups that fit in top of jar (equal #/size of holes (small) drilled through bottom)
- Carbon filter or cheese cloth cut to the size of the bottom of the yogurt cups
- Soil, dirt, or sand
- 2 pitchers
- Ice and water
- Measuring cup
- 2 thermometers

## Size/Setting/Duration

Entire class/classroom/~1 hour

## Background

**Climate change** is a term used to define global or regional climate patterns, in particular a change largely attributed to the increase in atmospheric **carbon dioxide** produced by the use of fossil fuels (oil, natural gas, coal, etc.). **Fossil fuels** are **nonrenewable resources**, or resources that cannot be replaced once they are used, and is the most common energy resources used by people to power phones, cars, buildings, etc.

A **glacier** is a slowly moving mass of ice known as 'rivers of ice' that is formed by the accumulation and compaction of snow on mountains. The North Cascades are home to over 300 glaciers and countless snow fields. Glaciers in the North Cascades melt to form rivers that will empty into the sea, including the Nooksack River! However, due to climate change glaciers are melting faster and some

are vanishing due to wetter winters with less snowpack and drier summers with high heat. Less snow pack means high flows in the winter and spring and low flows that dry up in the summer and fall.

These changes in water flow and temperature effect salmon. High flows mean more sediment in the water (high **turbidity**) and dry/warm summers mean high temperatures and less water, which causes low dissolved oxygen, an essential component of healthy streams for fish.

## Procedure

1. Begin the lesson by reminding students of the Earth in a Jar activity – climate change increases earth's temperature over time and caused our ice cubes to melt much more quickly. This is easily related to glaciers. Ask if anyone can tell the class what a glacier is.
2. Once you have fully established the term, "glacier," show the students this 2.5 minute video on [glaciers](#) and how they shape the landscape.
3. Tell your students that the Nooksack River is also formed by glaciers that are melting and the Nooksack River has all 5 Pacific salmon species in it. Ask your students to brainstorm ways melting glaciers impact fish – write ideas on the white board.
4. Once the class has established some ideas, tell your students that they will be carrying out an experiment to see how glacier melt due to climate change impacts the three C's: cold, clean, and clear water.
  - a. Explain that students will be observing two classroom glaciers – one impacted by climate change and one not. Students should first answer the first two questions on their Fish in How Water worksheet.
  - b. Have students set up two glaciers in their classroom (can also be done in small groups, each group has two glaciers). Fill each clear jar with 1 inch of water, place thermometer in each jar, place yogurt cup with filter at bottom at the top of the jar and fill yogurt cup with 2 inches of soil.
  - c. Label large pitchers (No Climate Change Glacier and Climate Change Glacier).
  - d. Students will begin by simulating winter for each pitcher - No Climate Change should be filled with 1 cup of ice; Climate change should be filled with ½ cup of ice (smaller glacier) and ½ cup of water (rain instead of snow pack during winter).
    - i. After each "season"/minute segment, students will slowly pour the pitcher for 2 seconds, watch the water move through their "watershed", or yogurt cup, then record temperature, water level, and make observations about the turbidity (clarity) of the water.
    - ii. After ten minutes, repeat the above steps to simulate the other season of the year using the following chart:

Time	Season	No Climate Change	Climate Change
0 minutes	Winter	1 cup of ice	½ cup ice, ½ cup water
10 minutes	Spring	½ cup ice, ½ cup water	1 cup water
20 minutes	Summer	½ cups water	0 cups
30 minutes	Fall	½ cup ice, ½ cup water	1 cup water
40 minutes	Winter	1 cup of ice	½ cup ice, ½ cup water

NOTE: During minute 20, pour out jar before pouring pitcher over dirt. This simulated the evaporation and drying up of rivers, luckily the no climate change system will still have enough snow pack to melt (1/2 cup of water).

- e. Students should begin noticing more sediment (high turbidity), high water levels, and higher temperatures in the climate change system than the no climate change system.
- f. When the class has completed 40 minutes, ask learners to compare the results of each system and write a conclusion sentence on their work sheet. Think about the following questions as a group:
  - i. What did you find?
  - ii. Why do you think this happened?
  - iii. Were your predictions correct?
  - iv. Does climate change effect the clean, cold, and clear water that salmon need to survive?

Next Generation Science Standards

Performance Expectation		
<p><b>4-ESS2-1:</b> Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.</p>		
Scientific and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<ul style="list-style-type: none"> <li>▪ Planning and carrying out investigations</li> <li>Analyzing and interpreting data</li> </ul>	<ul style="list-style-type: none"> <li>▪ ESS2.A: Earth Materials and Systems</li> </ul>	<ul style="list-style-type: none"> <li>▪ Patterns</li> <li>▪ Cause and Effect</li> </ul>



## Fish in How Water Worksheet

1. We know that climate change is warming the Earth and that glaciers sit on the tops of mountains in the North Cascades. How do you think the weather has changed seasonally in the winter, spring, summer, and fall? Fill in the chart below with your best guess:

In the Mountains	Winter	Spring	Summer	Fall
Without Climate Change	Heavy snow, increases glacier size	Snow/rain mix, erosion, some glacier pack, melting ice feeds Nooksack	Warm, slowly melts glacier to feed Nooksack River, some erosion	Rain/snow mix, some erosion, some glacier pack, melting ice feeds Nooksack
With Climate Change				

2. Write your hypothesis. How do you think melting glaciers impact erosion and temperature of the Nooskack River? Does this impact salmon, why or why not?

---



---



---

3. Use the table and graph below to record your results.

Time	No Climate Change			Climate Change		
	Temperature	Water Level	Erosion Observation	Temperature	Water Level	Erosion Observation
0 min						
10 min						
20 min						
30 min						
40 min						

4. Write complete sentences about your conclusion of the experiment. Was your hypothesis correct?

---



---



---