

TITLE: River Stream Flow

Overview: The U.S. Geological Survey (USGS) has thousands of stream flow monitoring stations throughout all 50 states; In this lesson, students will understand what stream flow is, analyze stream flow data related to a specific site, and collect stream flow data during an outdoor school experience. Finally, students will create an infographic using stream flow data and relate it to salmon migration.

National Geography Standards:

Standard 1: How to use maps and other geographic representations, geospatial technologies, and spatial thinking to understand and communicate information

Standard 14: How human actions modify the physical environment.

Oregon Geography Content Standards:

HS.14. Create and use maps, technology, imagery and other geographical representations to extrapolate and interpret geographic data.

HS.20. Analyze the impact on physical and human systems of resource development, use, and management and evaluate the issues of sustainability. (this standard is primarily covered in the lesson extensions and/or adaptations).

Oregon Science Content Standard:

HS-ESS2-2 Earth's Systems - Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems.

HS-ESS3-5 Earth and Human Activity - Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems.

Connections to Common Core:

CCSS.ELA-LITERACY.RST.9-10.7

Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

Objectives:

In completing this activity, students should be able to understand the concept of stream flow, analyze and translate stream flow data into an infographic, and relate stream flow data to Salmon migration patterns and the human impacts of climate change.

Grade Levels: 8-10**Time:** 4-6 50 minute periods**Materials:**

The USGS website, specifically USGS Current Water Data for the Nation (accessible at <http://waterdata.usgs.gov/nwis/rt>)

Salmon migration data (fish counts) from the Oregon Department of Fish and Wildlife

For extensions:

Glacier data related to the river where stream flow is being monitored

Background:

Flow Rate: Flow rate is the volume of water passing a point in a fixed period of time. Flow rate is usually measured in cubic feet per second (cfs or ft^3/sec) but could also be measured in gallons or liters per minute or second. For example, if a running faucet took one minute to fill a gallon container, its flow rate would be 1 gallon per minute. Water flow in a stream, river or pipe also has a flow rate. The flow rate in a river, stream or pipe can be determined by multiplying water velocity by the cross-sectional area. For example, if water was flowing through a 1 foot diameter pipe (area = 0.8 ft^2) at 5 feet per second, the flow rate would be $0.8 \text{ ft}^2 \times 5 \text{ ft}/\text{sec} = 4 \text{ ft}^3/\text{sec}$.

Procedures:

(Using the USGS website and creating an infographic about stream flow can be performed as a stand alone lesson or it can be a supplement to an outdoor school stream flow monitoring activity. If you are collecting stream flow data at an outdoor school site, please first follow the attached procedures for the outdoor data collection activity).

1. Arrange for a full 3 periods of computer time allowing two students per computer.
2. Direct students to the USGS website (specifically USGS Current Water Data for the Nation (accessible at <http://waterdata.usgs.gov/nwis/rt>) You may want to familiarize yourself with the USGS site in advance to learn about possible pitfalls that students might encounter while using the website.
3. Students will download / print stream flow data for the chosen site, please see attached example for Sandy River data. (If you are going to relate the stream flow data to salmon migration, it is best to use monthly data throughout the course of a year; If you are going to relate stream flow data to glacier changes as it pertains to the source of the river, you may want to direct students to use yearly data).
4. Students should also research fish counts data from the Oregon Department of fish and Wildlife for a site near the stream flow monitoring site to be able to relate stream flow and salmon migration.
5. Provide students with examples of infographics (see sites below) and discuss with students ways to create an infographic related to stream flow data. Infographics are a visual representation of data. When students create infographics, they are using information, visual, and technology literacies.
6. Here are some infographic resources and tools for educators:

Kathy Schrock's seven-step guide for creating infographics is a simple, but thorough summary of the process that is ideal as an assignment handout. <http://www.schrockguide.net/infographics-as-an-assessment.html>

Piktochart is a Web-based infographic software that has a vast selection of themes, graphics, and easy-to-use editing tools. The service is free to get started, then offers special pricing for educators.

<https://piktochart.com/>

Hubspot offers five free, fully customizable PowerPoint templates with which to create infographics.

<http://offers.hubspot.com/how-to-create-infographics-in-powerpoint>

Easel.ly is another Web-based infographic tool that gives users 12 complimentary templates to start. The templates are customizable and allow users to add their own graphics with one click.

<http://www.easel.ly/>

7. Allow students to work on developing their infographic and provide students with a copy of the assessment rubric.

Assessment: Students' infographics can be assessed with the INFOGRAPHIC RUBRIC found here:

http://www.schrockguide.net/uploads/3/9/2/2/392267/schrock_infographic_rubric.pdf

Extensions and/or Adaptations:

Provide students with additional data sets related to stream flow monitoring sites such as water temperature, glacier data for the stream's source, or human made impacts on the stream or river such as commercial development. The goal here is to analyze data overtime and reflect on possible relationships that may occur. With that being said, remind students that correlation does not imply causation. Just because two things occur together does not mean that one caused the other, even if it seems to make sense. For additional information regarding causation vs correlation, please read the following article: <http://www.stats.org/causation-vs-correlation/>

Sources:

The USGS website, specifically USGS Current Water Data for the Nation (accessible at <http://waterdata.usgs.gov/nwis/rt>)