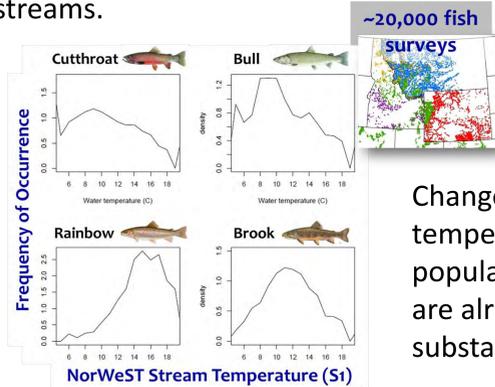




Overview

Changing climate conditions can have direct and immediate effects on streams. The amount and timing of flows, water temperature, and associated water quality variables can be particularly vulnerable to change in mountain snowmelt streams.



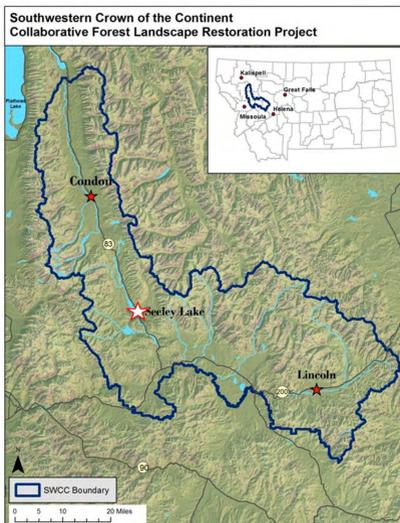
Changes in stream flows and temperatures affect fish populations, many of which are already subject to other substantial stressors.

Changes in amounts and timing of flows can have significant impacts on water available for fish and other wildlife as well as human uses such as household, agricultural, and recreational uses.



Communities in the Southwestern Crown of the Continent depend on streams and the lakes they feed for natural, recreational, economic, and aesthetic values key to community vitality, sense of place, and way of life.

There is limited information available to communities in the Southwestern Crown on the amount and quality of the water in their streams and of any trends in water supply.



We have developed a network of citizen science stream monitoring sites in and around three of the largest communities in the Southwestern Crown.

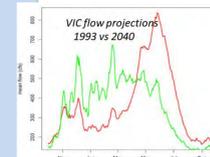
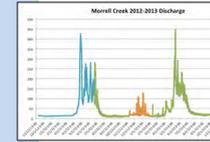


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Project Goals

- Engage people in assessing natural resources in their communities
- Collect long term data that can be useful in making decisions about water use, fisheries management, and land use and restoration
- Promote awareness of potential impacts of climate change in the region.



Partners

- Seeley Swan High School
- Seeley Elementary School
- Lincoln School
- Swan Valley Elementary School
- Swan Ecosystem Center
- Northwest Connections
- The Wilderness Society
- Montana Fish, Wildlife, and Parks
- US Forest Service
- Helena National Forest Youth Forest Monitoring Program

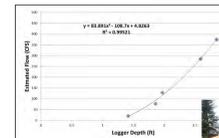
The project is truly a collaborative effort with partners in each community.

Core Data Collection

Students and teachers from local schools work with community members to collect intensive, high quality data on streamflow, temperature, and turbidity in important streams in their area.

Primary Steps

1. Install permanent gage and stilling well with pressure and temperature data loggers.
2. Measure flow using top-setting rod with flow meter, 8-10 times/year.
3. Create rating curve to estimate flow based on depth.
4. Collect samples and measure turbidity at various levels of flow.



Other Topics of Interest

We support educators and students in collecting additional information that enhances their understanding of stream ecology, especially about organisms and conditions that will respond directly to flow, temperature and a changing climate.



Supportive Curriculum

We've developed a series of lessons to help students understand why and how to collect data, how to analyze them, and how to make sense of the information.

Calculating Area

If streams were perfect rectangles, it would be easy:

$$\text{Area} = \text{h} \times \text{w}$$

But streams are irregular and tend to be flat (but not smooth) at the bottom, rise steeply, and then have flatter banks as they near the top.

When a stream's gage height doubles from 10 feet to 20 feet, the flow can more than just double.

STUDENT PAGES

Build a Morrill Creek Hydrograph

1. Open the Microsoft Excel file Morrill Creek Data. You will see a table with rows running across the page and columns running up and down the page. Each box is known as a cell. The first row has labels for each column.
2. Your first step in building your graph will be to select the data you want to use. For this graph, your variables are date-time and discharge or flow. Which of these is the independent variable and which is the dependent variable? Why? Which should be on the x-axis and which should be on the y-axis?
3. To select the data cells you'll use in your graph, it's easiest to just select the A and B columns. To do this, put your cursor over the blue box labeled A above the first column. The blue box should turn yellow. Left click on this and, holding down, drag your cursor over to the next box labeled B. This should highlight both columns in blue, as in this screenshot:
4. Now click on the Insert tab at the top of the page, then on the box labeled Scatter below and to the right. From the drop-down menu that appears, put your cursor over the box in the second row down and the second column over. A pop-up box should say Scatter with Straight Lines and Markers (see below). Left click and your graph should appear in your spreadsheet.

What do we use water for?

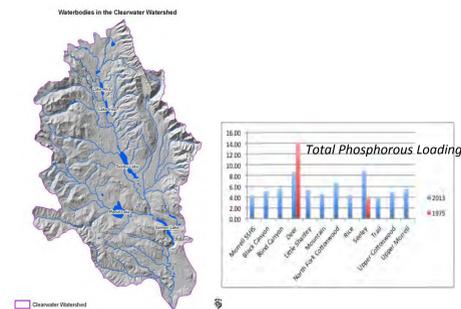
- Drinking
- Washing
- Cooking
- Playing
- Irrigation
- Livestock
- Mining
- Industry
- Fishing
- Others?

How to predict flow from depth

1. Each time we take a flow measurement, we take a gage reading.
2. We keep a record of each flow measurement and the corresponding gage reading.
3. Once we have enough data, we simply plot these two variables on a graph and draw or compute the resulting curve.

Gage (depth) vs. Flow

Volunteer Water Quality Monitoring



Community volunteers also collected nutrient and turbidity data on 11 additional streams.

Community Discussions

We are integrating this information into a series of ongoing community discussions on climate change:

- Pure Montana Tales: Seeley Lake Elementary Students
- Blackfoot Challenge Community Listening Sessions
- Swan Ecosystem Center Educational Programs
- Student Presentations



This project supported with funding by:

- The Kresge Foundation
- Roundtable on the Crown of the Continent, Adaptive Management Initiative
- Southwestern Crown of the Continent Collaborative
- Bonneville Environmental Foundation
- Seeley Lake Community Foundation