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Stream Flow Monitoring Guide

What is stream flow?

Stream flow is the movement of an amount of water over a designated point per a determined period of time. It is usually measured in cubic feet per second (ft^3/sec).

Why is it important?

Flow rates have a significant effect on wildlife presence and diversity, and the habitat and water quality of a stream.

With normal levels of flow:

- As the volume of water increases, so does the velocity
- Turbulence causes aeration => higher Dissolved Oxygen content
- Moving water is more resilient to pollution events
- Certain types of organisms are dependent on these fast moving streams, while others need isolated pool habitats.

Some of the effects of low flow:

- Streams with lower water volume are prone to increased water temperatures
- Water at higher temperatures contains more kinetic energy, which inhibits its ability to hold on to gasses such as oxygen. The Dissolved Oxygen content decreases.
- With slow moving water, particles fall through water column depositing sediment. Gravel beds covered with sediment create challenges for salmon, covering food and filling in hiding and resting spots for fry.

Rainstorms can cause an increase in stream flow, while summer and fall months often have lower and sometimes even no flow. Shortage of rainfall, high evaporation rates, along with increased use of water by riparian vegetation are all natural causes of low stream flow during the summer and fall, with the lowest during the months of August and September.

Monitoring stream flow reveals how much water is moving off the watershed into the waterway, which is influenced by the weather conditions of the region as well as how pervious the surrounding land is. Stream flow levels are also affected by human activity; water withdrawals for irrigation or industry can deplete flow levels, and dams block the flow of a stream and create altered flow patterns.

Choosing a Flow Monitoring Site:

Like with water quality monitoring, a flow monitoring site should be a location that can be regularly returned to so flow and depth changes over time can be understood. This means legal and physical access to the site must be available. Specifically with flow monitoring the stream characteristics that should be observed and considered when choosing a site are channel morphology, stream reach type, and stream bottom topography.

A *run,* or a *riffle,* are the best stream reach types for measuring flow. A stream *pool*, although important for wildlife habitat, isn't preferred because of the limited amount of movement in the water. When choosing a flow study site try to find a run or riffle where at least most of the flow passes through the transect. Areas where the stream is diverted and multi channeled by objects such as rocks, and wood debris, are difficult to measure and calculate an accurate flow reading.

Stream bottom topography is another important characteristic that should influence monitoring location. Boulders, wood debris, tree roots, benthic vegetation and any objects that make the depth across a transect inconsistent makes the process of monitoring flow difficult.

Monitor safety when studying flow is important when choosing a site. Monitors will often have wade in the stream as they measure at each interval throughout the transect so having an idea of the depth, velocity, bank stability, and objects on the bottom should be most important when deciding on a site. Flow monitoring during storm flows can be dangerous and difficult to perform.

Procedures:

Stream flow is measured by breaking the width of the stream into intervals, and measuring the depth and velocity at each point. Then, each interval's observed velocity is multiplied by the cross-sectional area, and finally the flow calculations for each interval are combined to obtain the overall flow, measured in cubic feet per second. Starting from the Left Edge of the water (LEW) when looking downstream mark up horizontal intervals where depth and velocity measurements will be taken across the entire stream.

We measure our depth and transects in tenths of feet so a measuring tool with this option is needed. The channel width will determine the monitor's strategy for dividing up a transect into cross sectional areas. A narrow channel will sometimes allow the measuring tool to be laid across the transect for easy reference. A string staked to both banks is needed to divide up wider channels and even having a second monitor to help with depth, interval, or velocity measurements is best.

It is most desirable to have the distance between each interval to be consistent but be prepared for the last cross section (from the last interval to the Right Edge Water) to be a bit different from the rest. Once the transect mapped out turn the Flow Probe to *AVG Speed* and put the bottom end (with tube and fan) at 60 percent depth (means 40 percent of water column should be between the tube and the stream bed). If the stream is more than 2.5 feet deep perform readings at 80 and 20 percent depth as well.

Community Clean Water Institute has been using Global Water's Flow Probe FP101 to collect flow measurements. (Please see reference guide on instructions for use.)

For questions about flow monitoring or to schedule training contact CCWI at (707) 824-4370 or email at info@ccwi.org