Stream Flow Procedure

**Why are we concerned?**

**DEFINITION OF TERMS**

*Discharge:* Another term for stream flow, or the volume of water moving past a designated point over a set period of time.

*Flow Regime:* The pattern of stream flow over time, including increases with stormwater runoff inputs and decreases to a base-flow level during dry periods.

*Impervious Surface:* A surface that does not allow water (e.g., rain) to pass through (infiltrate).

*Rating Curve:* A graphical representation of the relationship between the stage height and the discharge (flow).

*Run:* An area of a stream that has swift water flow and is slightly deeper than a riffle (a run will be about knee/thigh deep).

*Stage Height:* Height of the water in a stream above a baseline.

*Watershed:* An area of land that drains to a main water body.

Stream flow, or discharge, is the volume of water moving past a cross-section of a stream over a set period of time. It is usually measured in cubic feet per second (cfs). Stream flow is affected by the amount of water within a watershed, increasing with rainstorms or snowmelt, and decreasing during dry periods. Flow is also important because it defines the shape, size and course of the stream. It is integral not only to water quality, but also to habitat. Food sources, spawning areas and migration paths of fish and other wildlife are all affected and defined by stream flow and velocity. Velocity and flow together determine the kinds of organisms that can live in the stream (some need fast-flowing areas; others need quiet, low-velocity pools). Different kinds of vegetation require different flows and velocities, too.

Stream flow is affected by both forces of nature and by humans. In undeveloped watersheds, soil type, vegetation, and slope all play a role in how fast and how much water reaches a stream. In watersheds with high human impacts, water flow might be depleted by withdrawals for irrigation, domestic or industrial purposes. Dams used for electric power generation may affect flow, particularly during periods of peak need when stream flow is held back and later released in a surge. Drastically altering landscapes in a watershed, such as with development, can also change *flow regimes,* causing faster runoff with storm events and higher peak flows due to increased areas of *impervious surface.* These altered flows can negatively affect an entire ecosystem by upsetting habitats and organisms dependent on natural flow rates.

Tracking stream flow measurements over a period of time can give us baseline information about the stream’s natural flow rate.

**Safety considerations**

You will need to enter the stream channel to make width and depth measurements and to calculate velocity. Be aware of stream velocity, water depth, and bottom conditions at your stream-monitoring site.

Do not attempt to measure stream flow if water velocity appears to be fast enough to knock you down when you are working in the stream. If you are unsure of water depth across the width of the stream, be sure to proceed with caution as you move across the stream, or choose an alternate point from which to measure stream flow.

**Determining Stream Flow (Area x Velocity = Flow)**

The method you are going to use in determining stream flow is known as a velocity-area approach. The task is to find out the volume of water in a 20-ft. (at least) section of stream by determining both the stream’s velocity and the area of the stream section. You will first measure the width of the stream, and then measure water depth at a number of locations across the width to find the average depth at your monitoring site. Then by multiplying the average depth by the width, you can determine the average cross-sectional area (ft2) of the stream. Water velocity (ft/sec) is determined simply by measuring the number of seconds it takes a float to travel along the length of stream you are studying. Since water velocity varies at different depths, (surface water moves more quickly than subsurface water because water moving against rough bottom surfaces is slowed down by friction) you will need to multiply velocity by a correction factor to adjust your measurement to account for the effect of friction. The actual equation you will use to determine flow is this: Flow=Area x Corrected Velocity. This method was developed and adapted from several sources (see bibliography). Alternative methods that may be better for your monitoring site are featured in the sidebar below.

**Stream Flow Monitoring Methods: Professional and Home-Made**

The type of monitoring station used by professionals depends on the conditions at the site including size, slope, accessibility, and sedimentation of the stream. Flow can also be measured at spillways, dams, and culverts or by using a weir or flume, which are man-made structures within a stream that provide a fixed stage-flow relation. Another method, using a home-made combination staff/crest gage, allows volunteer monitors to measure the water level (stage) both at the time of inspection and at the highest level reached since last inspected. This tool is made of PVC pipe, granulated cork and other materials.

For more information, including how to make your own, visit: [**www.epa.gov/owow/monitoring/volunteer/newsletter/volmon07no2.pdf**](http://www.epa.gov/owow/monitoring/volunteer/newsletter/volmon07no2.pdf)

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