Understanding Your EnviroDIY Mayfly Sensor Station Data

Water Depth

Water depth is measured in millimeters using a pressure transducer, which measures water pressure. The deeper the water, the more pressure it exerts. Water depth measurements can be translated to discharge through development of a rating curve, which requires a series of discharge measurements at varying flows allowing for the development of a relationship between depth and discharge.

Discharge, or stream flow, is the volume of water that moves over a designated point over a fixed period of time. It is often expressed as cubic feet per second (ft^3/sec). Access to streamflow data allows for more accurate interpretation of water-quality data. An observed trend in water quality—for example, increasing concentrations of a contaminant in a stream over a six-month period—may indicate an actual water-quality change or may be the indirect result of differences in the distribution of flow volumes when the water samples were collected.

Temperature

In general, trout prefer water temperature to not exceed 20-22 degrees C. To breath, trout utilize oxygen that is dissolved in water (dissolved oxygen). Colder water can hold more dissolved oxygen than warmer water.

Temperature is expressed in degrees Celsius. To convert a Celsius measurement to Fahrenheit use the formula below.

F = (C x 1.8) + 32 …. So for a measurement of 16 degrees Celsius… F = (16 x 1.8) + 32 >>> F = 60.8

Chapter 93 (https://www.pacode.com/secure/data/025/chapter93/s93.7.html) in the Pennsylvania DEP Water Quality Standards document states that "Maximum temperatures in the receiving water body resulting from heated waste sources regulated under Chapters 92a, 96 and other sources where temperature limits are necessary to protect designated and existing uses" and temperature criteria are dependent on time of year:

Designated or Existing Use	Jan 1-31	Feb 1-29	Mar 1-31	Apr 1-15	Apr 16-30	May 1-15	May 16-31	Jun 1-15	Jun 16-30	Jul 1-31	Aug 1-15	Aug 16-30	Sep 1-15	Sep 16-30	Oct 1-15	Oct 16-31	Nov 1-15	Nov 16-30	Dec 1-31
Cold Water Fishery	38	38	42	48	52	54	58	60	64	66	66	66	64	60	54	50	46	42	40
Warm Water Fishery	40	40	46	52	58	64	72	80	84	87	87	87	84	78	72	66	58	50	42
Trout Stocked Fishery	40	40	46	52	58	64	68	70	72	74	80	87	84	78	72	66	58	50	42

Electrical Conductivity

Electrical conductivity is a measurement of the ability of water to pass an electrical current and is expressed in microsiemens per centimeter (μS/cm). The conductivity of water is affected by the presence of dissolved inorganic ions, such as calcium, chloride and magnesium, which enter the water through erosion of rocks and soils, as well as various human impacts such as urban runoff and agriculture. Every stream has a baseline conductivity, which can vary widely from stream to stream ranging from 50 to 1500 μS/cm. Think of conductivity as a tool for a rough assessment of stream health, like a doctor taking your temperature. A rapid increase in conductivity indicates that there is something

in the stream that was not there previously, which may signify a water quality problem. Generally, as flow increases conductivity will decrease since rainwater has a low conductivity and dilutes higher conductivity groundwater. An increase in conductivity corresponding to an increase in streamflow indicates that rainwater is picking up some type of ion before entering the stream. A common cause of high conductivity readings is road salt washing into a stream during snowmelt or a rain event. Conductivity will also vary with temperature, so readings displayed on monitormywatershed.org are standardized to 25 degrees C. There are no numeric standards for conductivity in Pennsylvania. High conductivity has the potential to negatively affect aquatic life, especially benthic macroinvertebrates. Starting at approximately 500 µS/cm, some macroinvertebrate species are negatively impacted. Trout growth may be impacted when conductivity exceeds ~2,150 µS/cm.

Turbidity

Turbidity measures the ability of light to pass through water. The higher the turbidity the cloudier the water. Measured in Nephelometric Turbidity Units (NTU) turbidity is primarily affected by sediments and other material suspended in the water column. There are no numeric standards for turbidity in Pennsylvania. PA general water quality criteria (Ch. 93.6) state that: "(a) Water may not contain substances attributable to point or nonpoint source discharges in concentration or amounts sufficient to be inimical or harmful to the water uses to be protected or to human, animal, plant or aquatic life; (b) In addition to other substances listed within or addressed by this chapter, specific substances to be controlled include, but are not limited to, floating materials, oil, grease, scum and substances that produce color, tastes, odors, turbidity or settle to form deposits".

See the table below for turbidity effects on salmonids.

Table 3. Overview of turbidity levels (NTU) and responses that may lead to adverse effects to aquatic life in flowing waters (adapted from Rosetta 2005).

Turbidity (NTU)	Selected organism response
<3 – 25	Primary productivity: dependent on water depth/color/nutrients. (for 0.5 m water depth; shallower water: less effect; deeper water: more effect)
<4	Invertebrate densities, dependent on primary production /allochthonous inputs
≤10	Fish reactive distance (visible range is decreased by approximately one-half, with potential change to active feeding strategy)
10 – 20	Fish foraging/feeding strategy (brook trout)
<22	Coho salmon growth rate (significant decrease at 22 NTU, the lowest level tested above the control (0 NTU)
<38	Steelhead trout growth rate (significant decrease at 38 NTU, the lowest level tested above the control (0 NTU)
70-100	Coho salmon avoidance (significant avoidance at 70 and 100 NTU compared to controls –0 NTU, and for similar test fish acclimated to <0.3 and 2-15 NTU, respectively)

Birtwell, Farrell, and Jonsson 2008: The validity of including turbidity criteria for aquatic resource protection in land development guideline