Make Your Own Monitoring Equipment

Stadia Rod

A stadia rod is used to take depth measurements in a stream channel. With this rod you can measure in both metric and English systems. You can also take length measurements in feet and tenths of feet at the same time. To measure, rest the rod on the bottom of the stream (do not dig in). Then read the depth on the downstream side of the rod (water piles up on the upstream side and will render a false measurement).

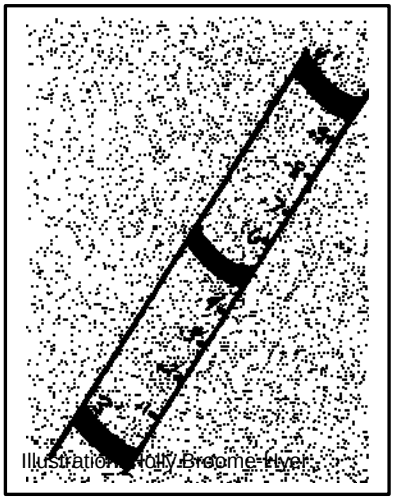


Illustration: Holly Broome-Hyer

Materials

- a 5 ft length of wooden dowel, rebar or PVC (¾ or ¼ in diameter)
- paint (red and white) / paint brush
- measuring tape

Directions

1. Paint the rod in either metric or English units (or both).
2. If you use English paint the rod with alternating 6 in long sections of bright red and white. Let dry. Then, paint black lines over the red and white, marking 0.1 foot intervals.

Occular Tube

An occular tube is used to sample canopy cover – see "The Riparian Zone – Canopy Cover Directions," section IV-4c. It is easy and cheap to make and easy to use.

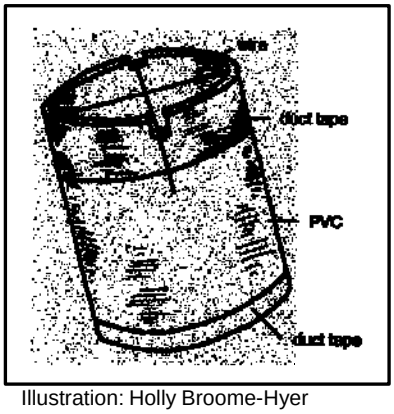


Illustration: Holly Broome-Hyer

Materials

- 6 in of 1 in wide PVC or other tubing material
- 2 paper clips
- Duct tape

Directions

1. Cut a 6 in length of PVC.
2. Make 4 notches every 90 degrees on one end.
3. Straighten paper clips and lay into notches. Bend excess length over the outside of the tube.
4. Duct tape around the ends of the paper clips to hold them in place.
5. Duct tape over the edges of the viewing end of the tube to make a smooth surface.

Staff/Crest Gauge

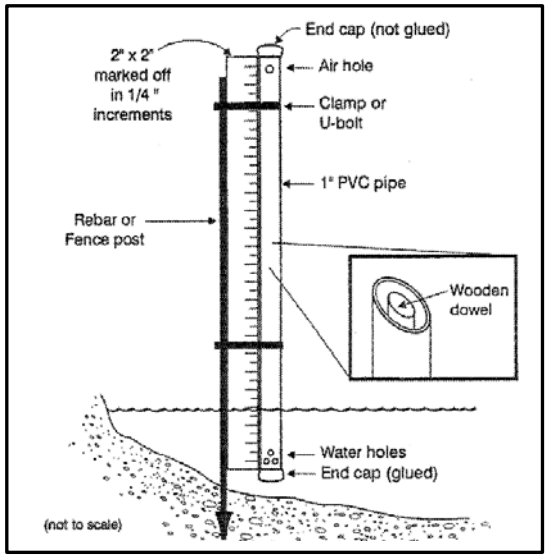
[source: Ken Pritchard, Vol Monitor, 7 (2), Fall 1995]
This combination gauge serves as both a staff gauge to measure the water level of a stream at the time of inspection, and a crest gauge to measure the highest level reached by that stream between the last inspection and the current inspection.

By taking successive staff and crest gauge readings and plotting them on a time graph, you can obtain a general picture of how a stream behaves in response to rain. For instance, a rapid rise and fall in stream level would denote the watershed's inability to slowly release water (probably due to a lack of vegetation). Long-term trends can also show a correspondence between stream levels and land use changes. For example, the data might show that runoff from a new shopping center has caused the stream to crest several inches higher after receiving the same amount of precipitation.

You can correlate your crest gauge readings (ft) to flow readings (CFS). Then, in the future, you will be able to determine stream flow based soley on your crest gauge readings.

Materials

- 6 ft fence post or rebar
- PVC pipe, 1in diameter (or wider), 4 or 5 ft long (length depends on anticipated change in stream level)
- 2 end caps for the PVC pipe
- 2 or 3 metal clamps or U-bolts
- Section of 2 in x 2 in wood, (about the same length as PVC pipe)
- Wooden dowel, ¼ in to ½ in diameter, to fit inside PVC pipe
- Granulated cork
- Permanent, waterproof marker
- Tape measure
- Drill
- Saws for cutting pipe and wooden dowel



Directions

1. Permanently mark 2 in x 2 in in 1/4 in increments. (Alternative: affix length of measuring tape to 2 in x 2 in.)
2. Glue end cap to bottom of PVC pipe. Drill three or four vent holes in section of pipe that will always be immersed in water. This will allow water to flow into pipe. Drill one vent hole near top of pipe, to allow air to escape.
3. Drive fence post or rebar into streambed in a location where water flows permanently and where you will be able to reach the gauge without getting wet.
4. Attach 2 in x 2 in to fence post or rebar using clamps or U-bolts.
5. Attach PVC pipe to 2 in x 2 in, aligning bottom of pipe with zero point marked on 2 in x 2 in.
6. Cut dowel to same length as PVC pipe (dowel should fit snugly so it won't float). Place dowel and granulated cork inside PVC pipe. Place end cap (DO NOT GLUE) on top end of pipe.

Calibrating the crest gauge

Calibrate the gauge by measuring the difference between the lowest point on the stream bed and the zero point on the scale marked on the 2 in x 2 in. (Note that the lowest point on the stream bed

won't necessarily be the point where the gauge is located, but it must be along the same cross section.) This "depth-of-stream factor" must always be added to the gauge readings. Recalibrate the gauge yearly, and also after severe episodes of erosion or deposition.

Reading the crest gauge

To read the crest gauge, remove the top end cap and take out the dowel. Use the scale on the 2 in x 2 in to measure the level of the cork powder "ring." Don't forget to add the depth-of-stream factor (see "Calibration," above). After taking the reading, wipe off the cork powder and replace the dowel. Occasionally you may need to add more cork powder.

[For more information, contact Ken Pritchard, Special Projects Coordinator, Adopt a Beach, P.O. Box 21486, Seattle, WA 98111; 206-624-6013.]

Kick Net

Kick nets, which consist of screening material stretched between two poles, are used for sampling macroinvertebrates. Sampling is done by pushing the two poles into the substrate until the edge of the screen rests on the bottom. Organisms are dislodged by disrupting the substrate on the upstream side of the stream, allowing them to be carried by the current into the screen. For more information on sampling with a kick net, refer to "Macroinvertebrate Sampling Directions," section IV-4b.

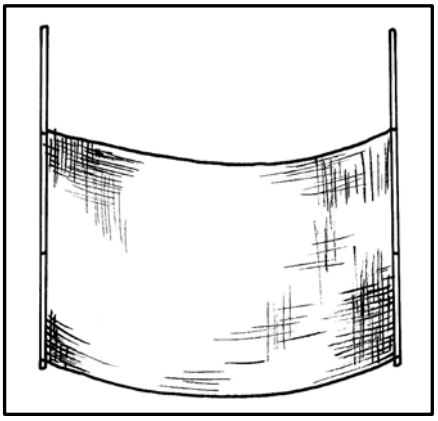


Illustration: Holly Broome-Hyer

Materials

- two 3 ft x 1.5 in sections of wooden dowel
- one 3 ft x 2 ft section of metal window screen
- duct tape
- staple gun

Directions

1. stretch window screen length-wise between dowels
2. attach window screen to dowels with staples and duct tape (wrap as much screen around dowel as possible to properly secure it)

Hester-Dendy sampler

A Hester-Dendy sampler is a fancy word for "bug hotel." Aquatic macroinvertebrates will colonize the spaces between the rough-textured plates of the sampler. Anchor the sampler to the bottom of the stream or suspend in the water column (different placements will attract different populations). Allow at least 4 weeks to attract a sizable population. Wrap a fine mesh bag around the sampler when you remove it to investigate. This will catch any macros that float off of the squares. Also, remember to flag your sampler so you can find it later.

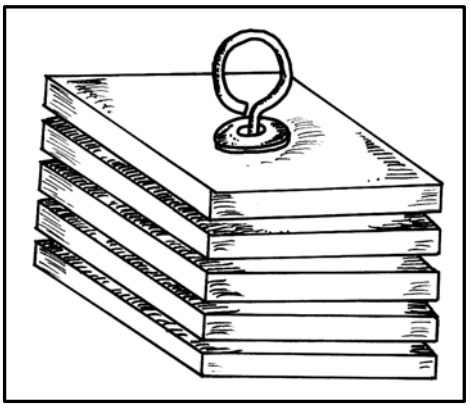


Illustration: Holly Broome-Hyer

Materials
- 8 large plates (made of wood, cement, unglazed porcelain or anything rough and durable) about 3 in square and 1/8 in thick.
- 7 smaller plates should be about 1in square and ¼ in thick.
- 1 eye bolt 6 in long
- 20 washers
- 2 nuts
- bailing wire (or similar wire)
- drill

Directions
1. Drill a hole through the middle of each plate the size of your eye bolt and washers.
2. Stack plates on the eyebolt and separate with washers. Place larger plates on bottom. Using the washers, vary the space between plates to provide for different habitats.
3. Secure the plates in place with a nut.
4. Using the bailing wire, anchor the sampler to the bottom substrate or suspend from above. Remember to flag the sampler to help you relocate it.

Secchi Disc

The Secchi disc is used to measure light penetration which tells us the level of turbidity in the water. Secchi discs work well for still bodies of water like lakes, wetlands and pools in streams. Slowly lower the disc into the water until it disappears; record this depth. Then, pull it back up until it is barely visible; record this depth. Average two measurements. This should be done in a shady area if possible.

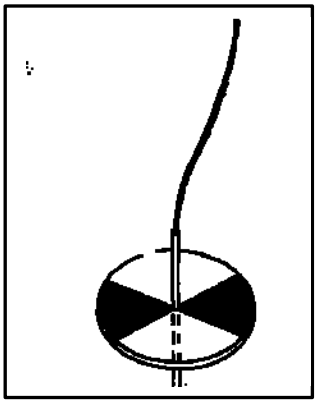


Illustration: Holly Broome-Hyer

Materials
- a lid from a ½ gallon paint can (or similar-size, stiff lid)
- black and white paint
- 6 ft of ½ in line
- drill

Directions
1. paint the lid, in alternating quarters, black and white
2. drill a hole through the middle of the lid
3. attach the line through the hole with knots

Underwater Viewer

An underwater viewer allows you to see what's happening under the surface with surprising clarity. In shallow riffle areas the viewer works well for investigating substrate and macroinvertebrate habitat.

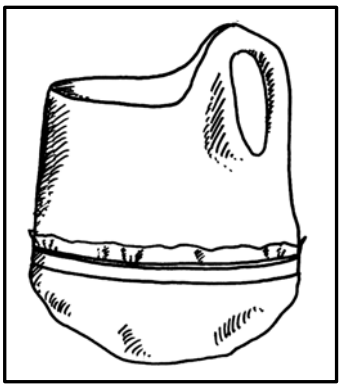


Illustration: Holly Broome-Hyer

Materials
- plastic ½ gallon milk jug
- thick plastic wrap

- heavy rubber bands

Directions

1. Cut off the top of the jug leaving the handle
2. Cut off the bottom of the jug
3. Wrap a piece of plastic wrap over the bottom of the jug, making sure there are no wrinkles. Secure the wrap to the jug with the rubber bands.

Using the underwater viewer

Press the viewer down into the water making sure not allow the water to rise over the rubber bands. Hold the handle and look through the top opening. The water slightly magnifies the objects you will see.

Resources for Further Investigation

Water Quality Sampling Equipment and Homemade Sampling Equipment by theTennessee Valley Authority, 1988. Two 16-page booklets, designed to be used as a set. The first describes professional sampling equipment and tells how to obtain it; the second contains instructions for making low-cost facsimiles of the same equipment (Secchi disks, plankton samplers, artificial substrates, nets for macroinvertebrate sampling, and more). Contact: Carol A. Davis, 311 Broad St., Chattanooga, TN 37402-2801; 615-751-7338. Free (one set only).