



# Watershed Education Network

*Growing the next generation of watershed stewards*

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## Fall '09 Biological Station Script for Field School-Based Water Monitoring Program

The school-based water monitoring program was designed to collect baseline data from stream reaches in Western Montana. The field trips aim to foster stewardship among students through science, and create awareness of our local watersheds. The school-based water monitoring field trip is typically divided into three stations: chemical, biological and physical. Key concepts, objectives and instructions are provided for the three previously mentioned stations below.

### Biological Station

**Focus:** The focus of the Biological station is to understand the importance of macro-invertebrates in our streams and rivers. Students should be able to identify the three most important macro-invertebrates; stoneflies, mayflies and caddis. Students should also know the anatomy of an insect, the lifecycle of macro-invertebrates, and how they fit into the food web. The understanding of pollution tolerance as it relates to specific species is also a key component to this station. The data collected gives us a quantitative biological health assessment of the specific stream reach.

**Opening:** Introduce yourself and get to know the students by asking them to tell their name and their favorite water animal, or favorite water activity. Empower students by telling them that they are doing a great service by helping WEN collect data that will eventually go into a database to be viewed by other students in Montana. Remind them that safety comes first. Begin the biological station by learning first and then observing. Students should have the gist of the key concepts before they can collect the bugs. **You are responsible for filling out a completed data sheet for your station and giving it to the field coordinator or field assistant at the end of the day.**

#### Big Questions

- How does this measurement relate to a healthy river?
- What impacts, both naturally occurring and human caused, influence the measurements of this parameter?
- What changes in the river during the year may alter this measurement?
- Why is it important to measure these parameters on a regular basis?
- Who and what depends on healthy rivers for survival?

## Objectives and Key Concepts for the Biological Station

**Aquatic Macro-invertebrates:** Macro, meaning big enough to see with the naked eye. Invertebrate, meaning lacking a backbone.

**Anatomy:** Students should know that insects have a head, thorax and abdomen. Ask them how aquatic macro-invertebrates breathe. If they don't get it right off ask them how fish breathe. More than likely they will put it together and answer gills.

**Identification:** Provided in the biological tubs are keys, pictures and books to help students with identification. Students will focus on three ways to identify stoneflies, mayflies and caddis; the number of tails present, the location of their gills and how they move. Remind students that there are many macro-invertebrates but these are the three to remember for the day.

**Lifecycle:** Most macro-invertebrates spent more than 99% of their life underneath the water living as nymphs (stonefly, mayfly) or lava and pupa (caddis, midge). When specific water conditions allow they emerge to the surface split their nymphal shuck, dry their wings and search for a mate. Show students the lifecycle diagram provided in the tub.

**Stoneflies:** Stoneflies are the most pollution sensitive species in Montana. Stoneflies require what WEN calls the **4 C's: CLEAN, COLD, CLEAR and CONNECTED** water. Stoneflies always have two tails and their gills are located underneath their legs or on their thorax. The larger stoneflies like the salmonfly and golden stone are known to trout as the double cheeseburger, and can live up to four years in the water before incomplete metamorphosis leads them to adulthood. Don't forget about the stonefly strut!

**Mayflies:** There are nearly two thousand mayfly species in North America. Mayflies come in all shapes, sizes and colors and can best be identified by their abdominal gills. Not all mayflies have three tails, but as a general rule if you see three it is definitely a mayfly. Most mayflies live one year as nymphs, and some will only live for hours as adults. Don't forget about the mayfly mambo!

**Caddis:** Caddis are some of the most fascinating of the macroinvertebrates. Many of them are case builders, and some are web spinners. Unlike mayflies and stoneflies, caddis lack a hard armored exoskeleton. Caddis build cases to protect themselves from predation and stay stuck to the substrate. Free-living caddis do not build themselves cases. The gills on the caddis are located on both the thorax and the abdomen.

**Activity:** Once students have learned about the "big three" it is time to collect the macroinvertebrates and identify them. Make sure that students understand that the bugs **must be in water at all times**. If students are hurting or killing them purposely ask them to sit out. Make sure there is water in the tubs and ice tray before collecting.

### Instructions and Pointers

- Make sure everybody has a chance to do something at your station.
- Encourage students to get involved and ask questions.
- Directions for performing chemical tests are located in the chemistry binder.
- Remind students that the data they collect is important.
- If there is a discipline problem don't take action. Locate the teacher.
- Ask students to raise their hands when answering questions.

**Closing:** Make sure that your station is cleaned up and ready before the next group arrives. Show students that the proper way to release the macro-invertebrates is to submerge the buckets rather than dump them. Ask students to go around the group and share one fact that they learned or thought was interesting at your station. Invite students to ask questions (its okay if you don't know the answer).

**Safety Concerns:** Keep an eye on students that are going to the river and always send them with a partner. Wading can get tricky when you're kicking up bugs. The first aid kit is located in the chemistry tub and the throw rope is located in the physical tub.