# *The River Continuum*

*(minimum 30 minute activity)*

## *Objectives*

Students will be able to:

1) Describe where macroinvertebrates are located in a stream, based on their functional feeding groups
2) Illustrate a stream, from headwaters to the mouth, and identify the vegetation, macroinvertebrates and fish that are likely to be present in various sections

## *Background*

The *geomorphology* of a stream is generally based on precipitation, land forms or geology, and elevation. Land processes, such as floods, *erosion*, earthquakes, etc., cause channels and patterns of channels to develop. Channels (see Riparian Rx section) form into different types or reaches, thus forming different aquatic habitats.

The headwaters of a river or stream contain different features than the lower, wider reaches. Usually, upper reaches are more complex with *riparian* vegetation, substrate, woody debris, and lower temperatures. Aquatic life may differ depending on where they are found in the stream. For example, the headwaters attract more shredders because of the abundance of organic litter. Bull trout, steelhead, spring Chinook salmon, and other cool water fish species often dwell in this habitat. These upper areas are sometimes classified as first or second order streams. Mid reaches generally contain the greatest diversity of species and act as a transition zone, having features from both the upper and lower reaches. Like the headwaters, all four functional feeding groups are typically found here. However, there will be fewer shredders and more of the others. Fish like summer Chinook salmon might also be in this third order section. The lower reach or mainstem river, where the vegetation canopy lessens and sun has a more pronounced effect, grows algae harvested by collectors. Thus, they dominate the area along with northern pikeminnow, white fish, and other slower water fish.

## *Procedure*

1. Make a transparency of *The River Continuum* (Figure 8) and show it to students. Review the functional feeding groups with them. Ask them where the feeding groups are found in the river and why they are there. What fish might be feeding on them? Investigate the macroinvertebrates of a local river and see if their predictions of where the insects are found is correct.

## *Extensions*

- ❏ Mayflies can be found in more than one location in the stream, working as collectors or scrapers. Other aquatic insects are multi-tasked as well. Form research groups by assigning students to one of four feeding groups. What insects fit into their groups? Study the physical characteristics they have to survive. Give a copy of *The River Continuum* illustration to each group. Ask students how their insect of study relates to other macroinvertebrates, to fish, vegetation, and to the rest of the environment? Why are some found in slower water and others in faster, more oxygenated water? Report findings to the class.

- ❏ Data Analysis: Gather data from other schools who participated in the *Kids in the Creek* program on a day when your school was not there. Ask students to compare the information. How many macroinvertebrates did they find? Were they from the same functional feeding groups? If there were differences, why? Was there an event like rain, snow, drought, or debris slides that occurred?

- ❏ Invite a guest from an organization like Trout Unlimited or a fly fishing club to discuss aquatic macroinvertebrates from the perspective of an angler. Ask them to demonstrate the art of tying flies and explain the thinking behind the designs. Some angling organizations have videotapes to share on various topics relating to the aquatic environment.

## *Extensions* *continued*

- ❏ Have students analyze the *The Case of the Skink River* scenario found in the student section and answer the questions. Clues for you are:
  - Carp, black flies, and aquatic beetles are very tolerant species.
  - Water should be tested at several different reaches of Catkin Creek (the tributary) and the Skink River.
  - Tests must include dissolved oxygen and pH and should include water chemistry analysis.
  - Fish must be sampled for lab analysis.
  - Loss of aquatic life is due to depleted levels of dissolved oxygen and hydrogen sulfide poisoning (rotten eggs).
  - Remind students that looking back on what they learned during Kids in the Creek will be helpful during their investigation.

## *Assessment*

- ❏ Ask students to analyze data collected from the *Kids in the Creek* field study by adding up how many macroinvertebrates from each functional feeding group were found. What do these insects eat? What anatomical adaptations are required to survive in each category? What are the anatomical differences between scrapers, collectors, shredders and predators? Distribute *The River Continuum* sheet provided, and have students label where the macroinvertebrates were found. Species investigated during *Kids the Creek* must be included in the assignment. Is the study creek healthy or unhealthy and why?

- ❏ Using the *Key to Immature Aquatic Insects* (Figure 2), ask students to identify the stage of development for selected insects and their names (block out names on the sheet). Students then may describe the level of tolerance to environmental changes for each insect.

- ❏ Draw a cross section of the river, showing where specific insects may be found. Explain what aquatic insects contribute to the ecosystem.

- ❏ Assess answers written by students relating to this section in the *Kids in the Creek Scavenger Hunt.*