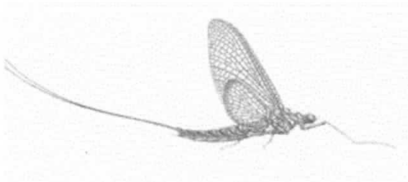

Biological Stream Monitoring using benthic macroinvertebrates

What is biological stream monitoring?

Biological stream monitoring is the collection, identification, and analysis of macroinvertebrates found in wadeable streams in order to answer questions about the health of the river or to determine the impacts of human activities within the watershed. Most benthic macroinvertebrate samples are taken from riffle areas of wadeable rivers.

Biological stream monitoring allows volunteers to become involved in the conservation and protection of Northwest waters. We all need clean water to survive and live. The invertebrates within streams have developed some fascinating adaptations for living in their constantly flowing freshwater environment. With some simple biological analyses such as taxa richness, feeding strategies, dominance of certain organisms, tolerance levels to pollution, and presence of certain groups of tolerant or intolerant macroinvertebrates, volunteers can provide valuable information about stream health.

What are benthic macroinvertebrates?

Benthic means "bottom-dwelling", macro means "able to see with the unaided human eye" and invertebrate describes those animals without backbones. Therefore, stream monitoring involves taking a sample of bottom-dwelling, easy-to-see animals without backbones, for analysis.

The majority of benthic macroinvertebrates are immature aquatic insects such as mayflies, caddisflies, stoneflies, midges, dragonflies, dobsonflies, and beetles. Some other groups include adult beetles, crayfish, worms, snails, leeches, or clams. Size varies from less than a millimeter to 8 centimeters (approximately 3 inches).

What can biomonitoring tell us?

A monitoring project is designed to answer specific questions regarding a stream:

- Is the stream clean enough for recreational purposes such as swimming or fishing?
- Can a stream support salmon or steelhead or other fish species?
- Do human influences, such as urban runoff, agricultural practices, or logging affect the health of the stream?
- What kinds of restoration projects might be designed to address the specific problems of a stream?

Why use macroinvertebrates in stream sampling?

Macroinvertebrates are relatively easy to see and identify, are abundant and diverse, possess limited mobility (unlike fish), and have relatively long life histories. These characteristics make them good biological indicators for water quality. They also are a critical part of the aquatic food web--a link between aquatic plants, algae, leaf litter, and fish. Fish are difficult to sample and require expensive equipment; algae are good short-term indicators, but identification keys are not readily available and identification requires high-powered microscopes. Thus, macroinvertebrates provide the best choice for rapid and reliable information about stream communities. The diverse roles and adaptations of macroinvertebrates allow them to exploit a variety of stream habitats and resources, thus providing for integrated assessment of stream health.

Why should we do biological stream monitoring?

In a world where human impacts on the natural environment are great, the need for evaluating and assessing our impact is of vital importance. The biological communities within our rivers and streams are good indicators of the health of our earth. To understand why this is true, we need to look at the entire river ecosystem. Rivers integrate all the components of their landscape; thus the living organisms within streams tell us much about the health of a watershed. If the watershed is impacted, so is the life within the streams and rivers that run through that watershed.

No other aspect of a river more clearly gives an integrative picture of the condition of a river than its biota (Karr 1996). Sampling the life within a stream is a practical and cost-effective way to determine if human activities are degrading the biological integrity of the stream. Biological integrity refers to a river's capacity to support and maintain a balanced, integrated, and adaptive biological system having the full range of elements and processes expected in a region's natural habitat (Karr 1996). Reserchers have learned that chemical analysis alone is not a sufficient measure of stream health. However, chemical and physical habitat analyses help pinpoint the source of disturbance to a river.

The Pacific Northwest has seen its share of human impacts and change to the landscape. Examples include logging, hydrologic dams, mining, farming, grazing, urbanization, recreation, channelization, introduction of exotic species, and industrialization. All these activities have taken their toll on Northwest rivers and the life they support. Serious declines in migratory salmon populations and other native fishes attest to these human impacts. Since benthic macroinvertebrates respond to human activities, they can help us determine the effectiveness of our watershed management plans.

In summary, here are some facts identifying the need for biological monitoring of streams (River Watch Network, Dates and Byrne 1997):

- Water resources, especially their biological components, are in steep decline. Since 1910, naturally spawning salmon runs in the Columbia River have declined by more than 95 percent and numerous species of salmon are currently on EPA's endangered species list.
- Degradation of streams stems from more than chemical contamination, yet historically that was the primary focus of assessing water quality. The biota of rivers offers a multidimensional perspective and a more effective tool for analysis of stream health.
- Long term success in protecting water quality means continued monitoring of the organisms that inhabitat those waters. Stream life is affected by numerous human activities, not just chemical contamination. Physical and biological disturbances also affect stream life.
- The objective of the Clean Water Act of 1972 is to restore and maintain the chemical, physical, and biological integrity of the Nation's waters. Until recently, regulatory enforcement of this act focused primarily on water chemistry.

Name:__________________

Date:_________ Period:___

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Article questions

1. What is biological stream monitoring?
2. What are benthic macroinvertebrates?
3. What can biomonitoring tell us?
4. Why use macroinvertebrates in stream sampling?
5. Why should we do biological stream monitoring?