The Ecology of Running Waters
Cold Brook: Macroinvertebrate Study

This week we will examine the diversity of animal life found living within a stream, focusing on invertebrates – which can be used as indicators of stream habitat degradation.

Physical features such as water velocity, depth, stream discharge (volume of water across a section of stream channel per unit time) and temperature are very important to the organisms living in a stream. Likewise, chemical factors such as pH and amounts of dissolved oxygen and nitrates will limit the kinds of organisms found in streams.

Fast-flowing streams close to the source, like Cold Brook, are considered heterotrophic ecosystems because much of the available energy to organisms living there comes from sources outside the stream, rather than from plant photosynthesis within the stream. These sources include all material, such as fallen leaves and other plant debris that enter the stream and are swept along. Entire food chains begin with this material which is referred to as coarse particulate organic matter (CPOM) and this CPOM is perhaps the major energetic resource in streams. Other sources of energy in a stream that will be further discussed in class are dissolved organic matter, suspended fine particulate organic matter (FPOM) and the energy trapped by benthic algae. The term **benthic** refers simply to the bottom (streambed). Feel a stream rock and note how slippery it is. The slipperiness is due too a film of benthic algae and other microscopic organisms collectively called **periphyton**.

CPOM and these other sources are food for most of the organisms we will collect today, which in turn are food for still larger organisms such as brook trout. The organisms we will collect today, mostly insects and other invertebrates, can be divided into functional feeding groups that are defined by the way they gather their food. These groups are (with examples):

1) **Shredders** which feed primarily on CPOM (nymphs of some stoneflies, larvae of some caddisflies, and most craneflies)

2) **Collectors** – which feed on FPOM. Those that filter FPOM from the water are called Filtering Collectors – examples include blackfly larvae and many caddisfly larvae and a few mayfly larvae as well as clams. Those that find FPOM in the sediment are called Gathering Collectors and include some caddisfly larvae, many mayfly nymphs and some beetle larvae.

3) **Scrapers** – which feed on periphyton. These include snails, some beetle larvae (water penny beetles, many mayfly nymphs and caddisfly larvae.

4) **Predators** – which feed on other groups; invertebrate predators in streams include some true fly larvae, many stonefly nymphs and all dragonfly and damselfly larvae.

Macroinvertebrate Sampling

Working in teams, we will sample a section of Cold Brook for macroinvertebrates. Using the **Kick Seining Technique** (see handout) each team will collect aquatic invertebrate organisms from the stream and identify them. A **Key to the Stream Dwelling Macroinvertebrates** is provided to help sort to major taxonomic groups.

As discussed in the article by Barbara Peckarsky, macroinvertebrates can be used as indicators of stream habitat degradation. There are many indeces that can be used to study water quality and various chemical or physical alterations to streams. We will use the data collected in this lab to calculate two indeces:

> **Cumulative Index** – based on the diversity of taxanomic groups. For this index you will keep track of the number of different types of taxa found.
>
> **EPT Index** – based on the percentage of sensitive species in the sample. For this index you will need to keep track of the total number of individuals collected and the number of individuals in three of the taxa.

Data for the lab is to be recorded on the **Stream Quality Assessment Form**. Additional notes and observations are to be recorded in your **Field Journal.**

When done, the organisms will be returned to the stream.

Report

Using the information and data collected from the Cold Brook study, you will produce a report summarizing the results of your study. The report should be written in the style of a scientific paper. Discuss the aquatic organisms, the results of your species diversity study and lastly, present your opinion as to the relative health of the stream.

Cover Page and Abstract – Include a title, your name, course, and a one-paragraph summary of the study including the purpose, methods, results, and conclusion.

Introduction – Describe the background of the study. End this section with a statement of objectives or hypotheses. Why did we do this study?

Methods – Briefly describe the study site, and give a concise account of the field methods. Do not repeat in detail the instructions in the handout. Just enough information so that the reader could repeat the study.

Results – Concise text describing the results, with reference to any tables or figures. (Note: save data interpretation for the discussion).

Discussion – Interpret the results (and support your interpretation with outside information). You may also speculate in this section about why you think the results occurred. End with a statement of conclusion that refers back to the statement of objective or hypotheses.

Literature Cited