Wetland vs. Stream Macroinvertebrates - Stream Side Sci

Summary

In this exercise, students will use their data from the activity Who Lives in the Water? or Missing Macroinvertebrates and compare it to a macroinvertebrate sample collected from a wetland site.

Time Frame

3 class periods of 45 minutes each

Materials

- Kick nets*
- plastic pan*
- Transfer pipettes*
- Plastic petri dishes*
- Magnifying glasses*
- Copies of macroinvertebrate keys (pdf)
- Copies of student worksheet (pdf)
- Copies of macroinvertebrate sampling instructions (pdf)
- Data from activity Who Lives in the Water? or Missing Macroinvertebrates.
- Bucket
- Waders
- Clipboard
- Pencils

* For information on equipment for loan or for purchase, contact USU Water Quality Extension at (435) 797-2580 or www.extension.usu.edu/waterquality

Background for Teachers

Purpose

To investigate various biomes through observation and comparison of the diversity of life, in particular, the specific number of species, biomass and type of organisms.

Background

For background information, see:

- The Macroinvertebrate section (pdf) of the Utah Stream Team Manual which defines a macroinvertebrate and discusses how macroinvertebrate populations change due to natural and human influences, why macroinvertebrates are important in aquatic ecosystems, how to collect a sample and how to interpret the results.
- The activity Who Lives in the Water? or Missing Macroinvertebrates.

Intended Learning Outcomes

- Use Science Process and Thinking Skills
  - Observe objects, events and patterns and record both qualitative and quantitative information.
  - Use comparisons to help understand observations and phenomena.
  - Evaluate, sort, and sequence data according to given criteria.
  - Select and use appropriate technological instruments to collect and analyze data.
  - Plan and conduct experiments in which students may:
    - Identify a problem.
    - Formulate research questions and hypotheses.

Predict results of investigations based upon prior data.
Identify variables and describe the relationships between them.
Plan procedures to control independent variables.
Collect data on the dependent variable(s).
Select the appropriate format (e.g., graph, chart, diagram) and use it to summarize the data obtained.
Analyze data, check it for accuracy and construct reasonable conclusions.
Prepare written and oral reports of investigations.

Develop and use classification systems.

Manifest Scientific Attitudes and Interests

Raise questions about objects, events and processes that can be answered through scientific investigation.

Demonstrate Understanding of Science Concepts, Principles and Systems

Know and explain science information specified for the subject being studied.
Apply principles and concepts of science to explain various phenomena.
Solve problems by applying science principles and procedures.

Communicate Effectively Using Science Language and Reasoning

Provide relevant data to support their inferences and conclusions.
Use precise scientific language in oral and written communication.
Use proper English in oral and written reports.
Use reference sources to obtain information and cite the sources.
Use mathematical language and reasoning to communicate information.

Demonstrate Understanding of the Nature of Science

Understand that science investigations use a variety of methods and do not always use the same set of procedures; understand that there is not just one "scientific method."
Science findings are based upon evidence.

Instructional Procedures

Classroom Activity:

Ask the students to list differences between a stream biome and a wetland biome (e.g., water velocity, temperature, depth, width, vegetation, sediment, inhabitants). Tell them that for this activity they will compare the diversity of macroinvertebrates found in a stream to those found in a wetland.

Explain to the students that they will be using their data from the activity Who Lives in the Water? to compare with the new data they collect from a wetland biome.

Ask the students about the differences they expect to see in the macroinvertebrates from the two types of biomes. Why would there be differences?

Be sure the students are familiar with the macroinvertebrate keys they will be using in the field and also the sampling procedures. If you would like a larger, laminated version of the key provided, please contact USU Water Quality Extension at (435) 797-2580.

Field Activity:

Set up stations for sampling macroinvertebrates. These areas should be easily accessible and safe to enter. Each station should include:

Safety First!

Always consider safety factors when working near water.

Wetland sampling instruction sheets (it helps to laminate these!)
Waders
Kick net
Plastic pan

Transfer pipettes
Magnifying glasses
Petri dishes
Macroinvertebrate keys

Divide the students into groups. The groups should be made up of no more than six students to be sure everyone gets to participate. Provide each group with clipboards, pencils, and worksheets. Each group will sample at a different station.

Have the students follow the instructions for sampling macroinvertebrates on the macroinvertebrate sampling sheet, and record the information on the macroinvertebrate sorting worksheet.

Applying the Data:

Use the following suggestions to have the students compare their data.

Have the students graph the number of each species or types found at each site. Are there entire groups present at one site, but missing at another?

Have the students graph the number of individuals found at each site. See example below.

Have the students estimate the biomass (organisms per unit area) at each site.

Further Discussion:

1. Were there some types of organisms found in both biomes and other types of organisms not found in one or the other?

   The most obvious difference in large macroinvertebrates in a wetland is the presence of dragonfly and damselfly larvae. These are rarely found in moving streams because they require emergent vegetation such as cattails for resting, and for laying their eggs. You may also find considerably more swimming beetles (Order Coleoptera) or boatmen and backswimmers (Order Hemiptera) in a wetland than in a stream, because they do better in still water.

   Zooplankton are also typically found in wetland ponds. Look for Daphnia and other microscopic animals swimming in the water.

   Animals found in moving water may be more stream lined or have adaptations for clinging to rocks compared to animals who live in still water. They may be less streamlined and have adaptations for swimming.

2. What features of those habitats might have caused these differences?

   The most obvious difference between the two habitats is flow. Water slowly moves through a wetland, but there is not any measurable velocity. Materials settle in these conditions, typically resulting in a soft, mucky bottom rather than the rocky bottom of many fast streams. Standing water may warm up faster than running water, resulting in changes in oxygen. Both systems have standing plants and mats of plants that cover some of the surfaces, but a pond/wetland is much more likely to have an abundance of suspended single celled plants (algae).

Extensions

Research factors that would contribute to a decline in the diversity of macroinvertebrates (refer to the activity What's in the Water and/or see the activity Missing Macroinvertebrates).

Bibliography

Lesson plan authors: Andree Walker and Nancy Mesner (Utah State University Water Quality Extension)

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Additional resources can be found on the USU Stream Side Science 9th Grade Curriculum web page.

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