

Stream Ecosystem Lab

Implemented at Bay Mills Community College

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Overview

The stream ecosystem lab is study in which students collect stream water for pollutant and nutrient analysis (Figure 1). Here students chose local stream sites of interest to each lab group and learned collection and measurement techniques. Many students had never actually entered a stream prior to this activity, making wearing waders and collecting samples a great new experience for many (Figure 2). During the stream lab students were required to create a question and hypothesis, organize data, and later analyze that data using statistical methods. Student groups combined values into a singular database, to be used for comparison in future semesters. Also during each project, students recorded GPS coordinates to be mapped on GIS in the classroom. These hands-on approaches to learning, along with the use of GIS in the classroom were both ideas taken from the Institute's workshop.

Students can collect data even in winter; they can auger into streams to collect nutrient and pollution data during the snowy season.

In all, students enjoyed the field work described here (Figure 3). It gave them an opportunity to link concepts discussed in the classroom with real-life situations. In addition, many students expressed that they enjoyed learning to use GPS/GIS systems and that creating a database in Microsoft Excel was a new skill. Students were excited to learn which streams had the best water quality parameters and enjoyed identifying that nutrient levels were higher downstream of a golf course than upstream.

Lesson Overview

Name:	Water Ecology
Class:	NS 101, Environmental Science (sections 11/12)
Date/Duration:	Oct 7-21, 2013

Objectives- Following this project, students will be able to:

- Plan, implement, and analyze a scientific investigation
- Develop field and laboratory skills
- Strengthen observational, analytical, and problem-solving skills
- Compile and compare water quality data
- Use and integrate several disciplines (biology, chemistry, geography, mathematics)
- Become familiar with limnology
- Learn to recognize water quality problems and their sources
- Understand relationships between land use and water quality
- Conduct sampling procedures using proper safety protocols
- Identify watersheds and their uses
- Use GPS/GIS software to locate and map local sampling locations
- Perform statistical analyses using Microsoft Excel and SPSS software

Methods

- Day 1 and 2: An introduction to watersheds and land use impacts on water quality will be discussed on day 1, along with review of scientific method. Students assigned roles in mock township meeting. Discussion of water quality issues.
- Day 3: Mock township meeting. Students will represent the many local stakeholders that either impact or are affected by the water quality of local water sources. These stakeholders will include commercial fishermen, dairy and crop farmers, the golf course manager, the manager of Tribal works (plows snow into nearby stream), and any that others students would like to represent.
- Day 4: Identify sampling locations and create question of interest for each lab group. Introduce sampling methods.
- Day 5: Travel to sites. Evaluate land use, river bank, water appearance, and water/soil odor. Collect GPS coordinates.
- Day 6: Travel to sites. At each site, test the following water quality parameters: *E. coli*, dissolved oxygen/nitrate, pH, phosphate, temperature, turbidity
- Day 7: Discussion and combination of data into master spreadsheet.
- Day 8: Use ArcGIS to map site locations (one mapping for the class). Student groups were then able to use master spreadsheet, integrate into GIS, and create bar/pie charts on map to indicate levels of chosen water quality parameter.

Figure 1. Water ecology lesson plan



Figure 2. Environmental science students collecting water samples at nearby lakes and ponds. Pollutants and nutrients were measured on site.