EDUCATIONAL OUTREACH
FLORIDA POLYTECHNIC UNIVERSITY

FLORIDA POLYTECHNIC
WATER QUALITY
Environmental Engineering

Overview:

Nutrients are vital to the health of an ecosystem. Phosphorus is one of the key elements necessary for growth of plants and animals. This is especially true in lake ecosystems. Like nitrate, high levels of phosphorus can lead to overgrowth of plants, increased bacteria, and decreased oxygen levels. Phosphorus tends to be the growth-limiting nutrient due to its importance to the Krebs Cycle and the formation of deoxyribonucleic acid, or DNA. Low levels of phosphorus limit the production of freshwater systems. The availability of phosphorus in an ecosystem plays a key factor in photosynthesis as well. Phosphate also stimulates food chains and food webs. Phosphate stimulates growth of aquatic plants and plankton which will provide food for larger organisms.

However, too many nutrients can be determinantal to an ecosystem. An excessive amount of nutrients such as phosphate can lead to eutrophication. Eutrophication, excessive richness of nutrients in a lake or other body of water, frequently due to runoff from the land, which causes a dense growth of plant life and death of animal life from lack of oxygen; reduces the stability of an ecosystem, causing the natural cycles to become imbalanced, which in turn causes overproduction of plants and algae. Excessive nutrients come from several sources. Most nutrients involved in eutrophication are derived from point-source human activity pollution such as fertilizer runoff from agriculture, land development, stormwater runoff, construction, and wastewater treatment. There are non-point-sources, or natural methods of pollution, including erosion, sedimentation, atmospheric deposition, and direct input from wildlife. Detergents containing nutrients are another “non-biodegradable” substance that can lead to overburden of the ecosystem. Depending on the pollution, the nutrient levels can cause an imbalance in the ecosystem.

Learning Outcomes

- Explain the process of eutrophication
- Relate abiotic and biotic parameters
- Identify the difference between point and non-point pollution
- Understand why the Earth’s fresh water supply is considered a limited resource
- Interpret data and results of testing

Materials

- 6 water samples from various sources (run-off, tap water, wetlands, lakes, stream, retention pond)
- Commercial Water quality test tabs or test kit* (LaMotte 5918 Urban Water Quality Test Kit used in this activity)
- 6 Test tubes

- 1 gallon Distilled water
- Gloves
- Liquid waste container

The Activity

Preparation

- Apply for permission, if necessary, to gain access to certain test sites.
- This activity can be done on site or samples can be brought back to a classroom or laboratory.
- Obtain water samples from testing sites (approximately one liter from each location). Be sure to label them and indicate origin.
- Keep samples in a cooler until testing.
- If this is being done on-site, have students collect samples from different areas (shaded/limited sunlight exposure, no vegetation, heavy vegetation, flowing water, still water, turbidity, etc.)

Part 1

1. Before testing, discuss the testing sites of each group. Find out what the students already know and want to learn. Where are these sites found? How much human impact does this site experience? What types of pollution does this site experience?
2. Discuss the importance of balance in an ecosystem. What will happen if there is a disruption that causes an imbalance?
3. Students should work with their lab partners at the testing stations following the water quality test instructions.
4. Predict results before testing.

Part 2

1. Conduct tests and record observations and data.
2. **(follow the testing procedure with the test kit)**
3. When finished testing, students should place all test liquids into the liquid waste container.

Data/Observations

Station Number	**Sample Site**	**Description** (clarity, turbidity, color, etc)	**Predicted Phosphate Level**	**Actual Phosphate Level**	**Ranking** (excellent, good, poor)	**Type of Pollution Causing Imbalance**

Station Number	**Sample Site**	**Description** (clarity, turbidity, color, etc)	**Predicted Nitrogen Level**	**Actual Nitrogen Level**	**Ranking** (excellent, good, poor)	**Type of Pollution Causing Imbalance**

Add additional testing parameters based on testing kit

Assessment

1. At the end of the laboratory exercise, why were the test liquids placed in a waste container?
2. What might be the source of the type of pollution found in your samples?
3. How do water samples from various areas of the same site vary?
4. What are natural methods of phosphate entering the water?
5. What organisms might be affected by poor water quality?
6. How will the effects on organisms influence ecosystem balance and function?
7. What might remedy some of the pollution problems?
8. What could you do to make a difference?
9. What sources of error might have affected your results? How could you reduce the error?

Extensions

1. Research water quality problems in history and find out what has been done or is being done to resolve them.
2. Have students test common household items for nutrient that cause eutrophication.

Additional Resources: Suggested Test Kit

Suggestion: Contact your local water management district about donating test kits
Suggestion: One kit can be broken down and used by multiple lab groups

LaMotte 5918 Urban Water Quality Test Kit

Carolina® 9-Factor Classroom Water Quality Test Kit

4-Pack Water Testing Kits Perfect for Students, Classrooms

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