Lab: Deadly Waters

(modified from Project Wet)

Purpose

Using water from the Green Hope wetland, you will test levels of Nitrate, Phosphate, Dissolved Oxygen and pH. Then you will analyze the results and learn about various pollutants using the background information below.

Background Information

SEDIMENTS

Particles of soils, sand, silt, clay and minerals wash from land and paved areas into creeks and tributaries. In large unnatural quantities, these natural materials can be considered a pollutant. Construction projects often contribute large amounts of sediment. Certain lumbering practices affect sediments in runoff. Sediments may fill stream channels and harbors that later require dredging. Sediments suffocate fish and shellfish populations by covering fish nests and clogging the gills of bottom fish and shellfish.

PETROLEUM PRODUCTS

Oil and other petroleum products like gasoline and kerosene can find their way into water from ships, oil drilling rigs, oil refineries, automobile service stations and streets. Oil spills kill aquatic life (fish, birds, shellfish and vegetation). Birds are unable to fly when oil loads the feathers. Shellfish and small fish are poisoned. If it is washed on the beach, the oil requires much labor to clean up. Fuel oil, gasoline and kerosene may leak into ground water through damaged underground storage tanks.

ANIMAL WASTE

Human wastes that are not properly treated at a waste treatment plant and then released to water may contain harmful bacteria and viruses. Typhoid fever, polio, cholera, dysentery (diarrhea), hepatitis, flu and common cold germs are examples of diseases caused by bacteria and viruses in contaminated water. The main source of this problem is sewage getting into the water. People can come into contact with these microorganisms by drinking the polluted water or through swimming, fishing, or eating shellfish in polluted waters. Often unexpected flooding of barnyards or stock pens can suddenly increase the toxic effects of animal waste in water. Animal waste can also act as a fertilizer and create damage by increasing nutrients. (see Fertilizers)

ORGANIC WASTES

Domestic sewage treatment plants, food processing plants, paper mill plants and leather tanning factories release organic wastes that bacteria consume. If too much waste is released, the bacterial populations increase and use up the oxygen in the water. Fish die if too much oxygen is consumed by decomposing organic matter.

INORGANIC CHEMICALS

Inorganic chemicals and mineral substances, solid matter and metal salts commonly dissolve into water. They often come from mining and manufacturing industries, oil field operations, agriculture, and natural sources. These chemicals interfere with natural stream purification; they destroy fish and other aquatic life. They also corrode expensive water treatment equipment; and increase the cost of boat maintenance.

DETERGENTS, AND FERTILIZERS

Many of these substances are toxic to fish and harmful to humans. They cause taste and odor problems and often cannot be treated effectively. Some are very poisonous at low concentrations. The major source of pollution from agriculture comes from surplus fertilizers in the runoff. Fertilizers contain nitrogen and phosphorous that can cause large amounts of algae to grow. The large algae blooms cover the water's surface. The algae die after they have used all of the nutrients. Once dead, they sink to the bottom where bacteria feed on them. The bacterial populations increase and use up most of the oxygen in the water. Once the free oxygen is gone, many aquatic animals die. This process is called eutrophication.

HEATED OR COOLED WATER

Heat reduces the ability of water to dissolve oxygen. Electric power plants use large quantities of water in their steam turbines. The heated water is often returned to streams, lagoons, or reservoirs. With less oxygen in the water, fish and other aquatic life can be harmed. Water temperatures that are much lower than normal can also cause habitat damage. Deep dams often let extra water flow downstream. When the water comes from the bottom of the dam, it is much colder than normal.

ACID PRECIPITATION

Aquatic animals and plants are adjusted to a rather narrow range of pH levels. pH is a measure of the acidity of a solution. When water becomes too acid, due to inorganic chemical pollution or from acid rain, fish and other organisms die.

PESTICIDES, HERBICIDES, FUNGICIDES

Agricultural chemicals designed to kill or limit the growth of life forms are a common form of pollution. This pollution results from attempts to limit the negative effects of undesirable species on agricultural crop production. Irrigation, groundwater flow and natural runoff brings these toxic substances to rivers, streams, lakes and oceans.

Procedure

Nitrate Test

1. Fill a tall plastic vial to the 5 mL line with water from the GH wetland (if unavailable, use water from one of the classroom fish tanks).
2. Drop a Nitrate #1 tablet into the vial. Cap the tube and slowly mix until the tablet has dissolved.
3. Add one Nitrate #2 tablet. Cap the tube and slowly mix until the tablet has dissolved.
4. Wait for 5 minutes. Compare the color of the sample to the Nitrate Color Chart.

Phosphate Test

5. Fill a tall plastic vial to the 5 mL line with water from the GH wetland (if unavailable, use water from one of the classroom fish tanks).

6. Add one Phosphorus tablet. Cap the tube and slowly mix until the tablet has dissolved.
7. Wait for 5 minutes. Compare the color of the sample to the Phosphate Color Chart.

Dissolved Oxygen Test

8. Fill the small glass vial to overflowing with water from the wetland (if unavailable, use water from one of the classroom fish tanks).
9. Add TWO Dissolved Oxygen tablets into the vial. Cap the tube. Be sure that no air bubbles are in the sample.
10. Mix by slowly inverting the vial until the tablets have dissolved.
11. Wait for 5 minutes. Compare the color of the sample to the Dissolved Oxygen Color Chart.

pH Test

12. Fill a tall plastic vial to the 5 mL line with water from the wetland (if unavailable, use water from one of the classroom fish tanks).
13. Drop one pH tablet into the vial. Cap the tube and slowly mix until the tablet has dissolved.
14. Wait for 5 minutes. Compare the color of the sample to the pH Color Chart.
15. Record results in a data chart, as shown.

Test	Results
Nitrate	ppm
Phosphate	ppm
Dissolved Oxygen	ppm
pH	

Analysis Questions

1. How does sediment get into a waterway?

2. What are the effects of sedimentation?

3. What is the source of sediment pollution in the GH wetland?

4. Identify two examples of petroleum products.

5. What is the source of petroleum pollution in the GH wetland?

6. Identify two examples of diseases caused by bacteria and viruses in sewage.

7. What happens when too much organic waste enters a waterway?

8. Where do inorganic chemicals come from?

9. What is the effect of inorganic chemicals on the waterway?

10. What is the major source of detergents and fertilizers?

11. Define the term *eutrophication*.

12. Describe the results of your Nitrate, Phosphate & D.O tests. Is eutrophication an immediate concern? Why or why not?

13. What is the effect of heated water?

14. What causes changes in the pH of water?

15. Based on your test results, is the pH of your sample a concern to the organisms living in that water?

16. What is the effect of pesticides, herbicides, and fungicides in the waterway?