

Ponds, lakes, and rivers are valuable aquatic ecosystems. Unfortunately, these ecosystems can be harmed by human activities. Salt on roads, fertilizer on lawns, or soap detergents used to wash vehicles and clothes can flow into nearby waterways. Acid rain, or rain that contains harmful pollutants, can also enter aquatic ecosystems, affecting plants and animals that rely on these ecosystems. In this investigation, you will examine the effects of altering an abiotic factor in a model pond ecosystem. The community of organisms in the normal pond water (the control) will be compared with those in which the acid, salt, or nutrient content of the pond water has been altered (the treatments).

Background Information

The amount of life in a pond, lake or stream depends upon the amount of dissolved nutrients in the water. The amount of nutrients in lakes depends upon many conditions. Water that is low in nutrients is called oligotrophic. These lakes typically have little plant life, clear water and sandy, gravelly or rocky bottoms. They have a small surface area and often are very deep. Wind does not mix the water enough to stir the nutrients throughout the water. However, if the water is rich in nutrients and murky with abundant plant life, the lake is called eutrophic. Wind action is capable of mixing the nutrients evenly throughout the shallower depth of the water. If the quantity of nutrients increases too much in a lake, the growth of algae becomes too great and can have devastating effects such as a collapse of the ecosystem. The process of increasing the nutrients in the water is called eutrophication. Eutrophication is a natural process that is increasingly accelerated by human activity in an unnatural way. This acceleration results in nutrient loading which has complex effects on people, wildlife and the environment.

Question

How might the addition of road salt, detergent, fertilizer, farm run-off, or acid rain affect the community of organisms in an aquatic ecosystem and thus its sustainability?

Hypothesis

Write a prediction (If ... then ... because ... statement) of the expected outcome of the experiment for each treatment. Base your hypotheses on what you know about the factors affecting aquatic ecosystems.

Materials

You will need to write these out. See "Method" below.

Method

The teacher will explain/demonstrate the procedure verbally (and the equipment necessary). As such, you will need to listen/watch carefully and take notes. Don't forget to include a control sample.

Observations

You will need to make a chart to record your observations of the pond samples (including the control sample) that will take place over the next week or so. Be sure to include a description of your samples before any treatments are added.

Conclusion

According to your results, how did each of the treatments (road salt, detergent, fertilizer, farm run-off, and acid rain) affect the organisms in an ecosystem and thus its sustainability? Be sure to discuss each treatment. How did your results compare with your prediction?

Analysis (Make sure you use full sentences!)

- {3} (a) What determines the amount of life in a pond, lake or stream? How do these nutrients enter aquatic ecosystems?
- {5} (b) Define the terms "oligotrophic" and "eutrophic". Be sure to include a description of each. Identify the source of your pond water as one of these.
- {3} (c) What effect does wind have on "oligotrophic" and "eutrophic lakes"?
- {3} (d) What does "eutrophication" and "nutrient loading" mean? What are their effects?
- {3} (e) According to your results, which treatment(s) could be classified as promoting "eutrophication"? Explain how you made this decision.
- {4} (f) What are some natural (2) and human-related (2) sources of nutrients in aquatic ecosystems?
- {4} (g) What efforts (2) are being done to prevent nutrient loading in local aquatic ecosystems (i.e. streams, small lakes, the Bay of Quinte, Lake Ontario, ...)? Be sure to provide some detail!