



Algal Bloom Experiment

Suggested Curriculum links (Grade 8)

Water systems on Earth's Surface

- identify the effects of abiotic factors on plant and animal distributions in marine and freshwater ecosystems. (208-2, 306-3) Include:
 - (i) dissolved oxygen
 - (ii) phosphates

Materials

- Pen
- Glass jam jars
- Tin foil
- Masking tape
- Marker
- Graph paper
- Ruler
- Paper
- Paint samples

Overview

Algal blooms can negatively impact the plants and animals in our watersheds. In this activity students will investigate the abiotic and biotic factors that lead to harmful algal blooms.

Objectives

- To investigate the abiotic and biotic factors that lead to harmful algal blooms in freshwater systems.

Background

Algal blooms are rapid increases in the number of algal cells that end up dominating the planktonic community. Like most plants, algae are dependant on water, carbon dioxide, sunlight and nutrients to grow. Most of these factors are quite common in freshwater environments except for nutrients. Nutrients are abundant in areas where run-off occurs, flushing nutrients from the land and farms into the water. One of the main sources of nutrients besides farm fertilizers are laundry and dishwasher detergents. These chemicals have lots of phosphates in them which is a major factor in plant growth. When algal cells are not lacking nutrients and has favourable conditions they rapidly divide to create other algal cells. This may potentially create a bloom. Algal blooms may block out sunlight in a pond or lake, killing other plants in the water. Oxygen is also used up as they die, creating hypoxic conditions and killing fish and other aquatic creatures.

Procedure

1. *Discuss how water conditions and nutrients can affect plants and animals.*

Discuss with the students how factors such as phosphates, dissolved oxygen, turbidity, temperature, and acidity can affect water systems. Tell the students that they will be testing some of these nutrients in an experiment, specifically phosphate.

2. *Set up the experiment of building an algal bloom.*



At the Fluvarium

Join us for *Who Killed Fred the Fish?* In this CSI scenario program, abiotic factors that influence the health of life within our freshwater world will be analyzed by our Grade 8 environmental detectives. Hands-on, station-based investigations of non-living factors such as Dissolved Oxygen, Phosphates and Turbidity, as well as an up-close encounter with biological indicators provide clues in solving the mystery around the demise of 'Fred the fish.' Students will be introduced to the diversity of animal life within our freshwater environment, review the concept of the water cycle and the role of our freshwater systems within this.

Ask the students to take two jam jars per group and fill them with dechlorinated water (You can leave an open bucket of water out overnight). In both jars at a few drops algal culture. Algal cultures may be available from a school scientific supplier or from a fish tank. Have them add garden fertilizer to one of the jars. Ask them to cover it with tinfoil and label it as "Test (+nutrients)". Ask the students to cover the other jar with tinfoil and label it "Control". Place the jars in a sunny area exposed to the same temperature. Ensure that the jars are exposed to the same conditions. If one jar is near an open drafty window or a heater it will affect the experiment.

3. *Form a hypothesis and make a testing plan.*

Based on their previous knowledge of water systems and conditions, ask the students to form a hypothesis of what will happen. As the students to form a plan for collecting data. How often will they collect data? Besides colour of the water, what things will they test? (Students may test, pH, phosphate level, temperature, dissolved oxygen). They may want to test these things sporadically as removing water from the jar will impact algae growth.

4. *Collect data.*

Collect data on the jars over two weeks. Ask the students to compare the colour of the water to the paint samples.

5. *Analyze and report data.*

Ask the students to analyze and report their data. They should graph the algal concentration (y-axis) against time in days (x-axis) by assigning numbers to each colour on the paint sample. They should also graph any conditions they may have tracked. Discuss with the students the class results. Ask them to write up their observations and analysis of what happened.

Extensions

- Students may try this experiment testing how other factors impact algal growth. They may do a run-off experiment where they compare nutrient run-off from planted and bare areas. They should add fertilizer to two pans of soil. One pan has grass growing in it and the other does not have any plants. Water should be added and the run-off collected and used to culture algae.



- Students may want to test dishwasher detergent with phosphates, various kinds of fertilizer, specific nutrients or compare types of algae.

Resources

Websites

Lopez, C.B., Jewett, E.B., Dortch, Q., Walton, B.T., Hudnell, H.K. 2008. Scientific Assessment of Freshwater Harmful Algal Blooms. Interagency Working Group on Harmful Algal Blooms, Hypoxia, and Human Health of the Joint Subcommittee on Ocean Science and Technology. Washington, DC.



Paint Sample



These are some sample paint colours that you may use to track the concentration of your algae. Different kinds of algae will need different colour samples. Choose a colour set that matches your algae sample closest and pick it up at your local hardware store.

