Too Much of A Good Thing

Activity 6: Algae Soup!

Goal

- To demonstrate how too many nutrients affect the water.

Voluntary State Curriculum

1.0 Skills and Processes

A Scientific Inquiry: 1, 2, 4,6, 9

B Critical Thinking: 1, 5

Time Several Weeks – document observations frequently.

Materials

- ✓ 5 clear quart jars
- ✓ Labels for jars
- ✓ Houseplant food
- ✓ 1 gallon of water from a stream, pond or aquarium
- ✓ Aluminum foil
- ✓ Magnifying glass (optional)
- ✓ Algae Soup! Data Form

Vocabulary

Algae – microscopic plants

Nutrient - substance (such as fertilizer or decayed leaves and grass) that supplies food for plant growth, but which in large concentrations can cause pollution

Motivation

- Review "Nutrients and the Chesapeake Bay"
- Read "Too Much of a Good Thing"

Procedure

This activity may take several weeks to complete. To speed up the experiment, add an equal amount of algae culture or small bits of algae collected from a stream to each water sample.

1) Wash jars, making sure to rinse well.

2) Prepare water samples.
   a. Fill one jar with tap water and set it aside as your control. Label this jar "Tap Water." No algae should grow in this jar.
   b. Fill the remaining four jars with stream water.
   c. Label one jar "No Nutrients Added" and set it aside.

d. Label the next jar “1 Serving Nutrients” and add enough plant food to make a regular solution, according to package directions.
e. Label the next jar “3 Servings Nutrients” and add three times the required plant food.
f. Label the last jar “6 Servings Nutrients” and add six times the required plant food.

3) Cover the jars lightly with foil and place them in a cool, sunny spot but not in direct sunlight that can heat up the water.

4) Present the question, “What will happen to the water with more nutrients?” On the Data Form, have students write their hypothesis and record the date the algae soup was started.

5) Every few days, stir the water and check the samples for any algae growth on the glass. It might be a thin gray or green film or small green splotches. Place a white piece of paper behind the jar to help highlight the color.

6) Record the date of the first appearance of algae growth. Using the magnifying glass describe the appearance of each sample on that date. Continue checking, recording, describing until there is a visible difference in your samples.

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Wrap Up

- Review the dates and descriptions recorded.
- What does the plant food represent? (Nutrients and fertilizers added to the stream.)
- Which jar had more algae? Why?

Modifications

- Home assignment

Assessment

- Completed data form.

Optional Challenges/Extensions

- Journal.
- Project Wet Activities: Imagine, The Incredible Journey, Just Passing Through, Poetic Precipitation, The Rainstick, Stream Sense, The Thunderstorm, Water Match, Water Models, Where are the Frogs?
- Healthy Water, Healthy People Activities: Pollution-Take it or Leave it, A Snapshot in Time, From H to OH!

Nutrients and The Chesapeake Bay

The Chesapeake Bay is like a soup. Both are composed of many ingredients. But just as too much of any ingredient can spoil the flavor of the soup, too much of a particular substance can harm the Bay. One current problem with the Bay is too many nutrients such as nitrogen and phosphorus.

Nutrients are substances that help plants grow. Once the nutrients are in the Bay, they become food for plants. But excess nutrients cause too much plant growth, especially algae (microscopic floating plants). When there is too much algae, the water becomes cloudy and blocks the light needed by underwater plants called bay grasses. Algae can also coat the leaves of the bay grasses blocking the light received by the plants. These grasses are very important to fish and blue crabs because they provide food, shelter and nursery areas. Research has shown that the density of young crabs is ten times greater in grass beds than in unvegetated Bay areas.

Too much algae can cause other problems. When algae die, they settle to the bottom where they are naturally decomposed by bacteria. During this process, the bacteria use oxygen from the Bay's bottom waters. When bacteria decompose large amounts of algae, too much oxygen is removed from the water. Blue crabs and other aquatic life that live on and near the bottom need the oxygen to live. The low oxygen levels drive blue crabs and fish away in search of more oxygen. Sometimes the crabs will even come up on land (“Crab Jubilee”) to escape. Many of the small bottom aquatic life that blue crabs and fish eat die off. In the summer, the lack of oxygen is worse when several natural factors act to lower the amount of oxygen in the Bay's water. The low oxygen conditions caused by excess nutrients are the primary reason large bottom sections of the Bay are unsuitable for bottom dwelling organisms (oysters, crabs, etc.). This is sometimes called the “Dead Zone”.

Plant and animal matter (including human waste), fertilizer, and even air pollution from car exhaust and power plants all contain nutrients. If left untreated, these nutrients will find their way into creeks, rivers and eventually the Bay. Reducing nutrient pollution has been a priority of the Chesapeake Bay cleanup for over a decade. Progress is being made due to the combined efforts of citizens, industry and the government. Since 1985, Maryland has greatly reduced phosphorus and nitrogen pollution. By monitoring water quality, scientists are already seeing results in the Bay and its tributaries such as cleaner water and more bay grasses. These improvements show that the cleanup is on the right track, but we also know we still have a long way to go.

Presently, many people are trying to restore the Chesapeake Bay by reducing the nutrients that ultimately harm the habitats for blue crabs and many other aquatic organisms. Here are a few things that you can do to prevent too many nutrients from entering the Bay:

- ❖ Don't use too many fertilizers on your lawn.
- ❖ Compost your lawn wastes.
- ❖ Try not to get fertilizers on the sidewalks and driveways.
- ❖ Pump out your septic system once every three years.
- ❖ Use your garbage disposal sparingly to reduce grease and solids in your septic system, and reduce stress on municipal wastewater treatment plants.
- ❖ Plant trees, shrubs and ground cover to protect bare soil and reduce runoff.
- ❖ Create a "rain garden" to keep rain water in your yard and to replenish plants.
- ❖ Encourage your parents to become involved with the Maryland Tributary Strategy Team in your watershed. The Maryland Tributary Strategies are a program designed to involve the public and local governments in activities to reduce nutrient pollution and help the State reduce the nutrient goal for a healthier Chesapeake Bay. For more information on the Tributary Strategy Teams visit http://www.dnr.state.md.us/bay/tribstrat/index.html

When citizens, industry and government work together, we can make a difference in the health of the Chesapeake Bay for future generations to enjoy.

Student Page

Too Much of A Good Thing

Have you ever put too much salt on your food? The right amount of salt tastes good. Too much salt can ruin the food. It's too much of a good thing.

A stream can have too much of a good thing. Nutrients are substances that cause plants and animals to grow. Plant and animal matter (including human waste), fertilizer, and even air pollution from car exhaust and power plants all contain nutrients. If left untreated, these nutrients will find their way into creeks, rivers and eventually the Bay.

Algae Soup!

What You Will Need

- 5 1-quart glass jars
- Houseplant food
- Aluminum foil
- Labels for the jars
- Water from a stream, pond or aquarium

Know the Meaning…

Algae – microscopic plants

Nutrient - substance (such as fertilizer or decayed leaves and grass) that supplies food for plant growth, but which in large concentrations can cause pollution

What To Do

Wash all the jars and rinse them well. Fill jar #1 with tap water and label it "Tap Water". Fill the other four jars with water from a stream, pond or aquarium. Label jar #2 "No nutrients added." Follow the directions on the plant food container and mix enough fertilizer with the water in jar #3 to make a regular solution; label the jar "1 serving nutrients." In jar #4, use three times more fertilizer to make the solution; label "3 servings nutrients." In jar #5, make a solution six times stronger than normal; label "6 servings nutrients."

Cover the tops of the jars lightly with aluminum foil to keep the water from evaporating. Place all the jars in a cool, sunny place (avoid direct sun – it makes the water too hot). Every few days, stir the water and check to see if any algae is growing on the glass. The algae will look like a thin grey or green film. Be patient! It could take weeks for the algae to start growing. When you first see algae, mark the date on your data form and describe how each jar looks. Keep checking, recording and describing until you see clear differences between the jars.

Talk with your group about your algae soup. What did you learn about nutrients? What happens in a stream when too many nutrients are washed into the water? Can you think of ways to decrease the nutrients that enter a stream.

Algae Soup!

What will happen to the jars with more servings of nutrients? Write your prediction here:

_____

_____

_____

Date Algae Soup was started:_____

Record below the dates that you look at the jars. Write a description of what each jar looks like.

Date	Tap Water	No Servings	1 Serving	3 Servings	6 Servings

Was your prediction correct?_____

What happened?_____

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