

Pollution, Pollution, Everywhere!



The average American produces 5 pounds of solid waste and refuse each day.

Equipment/Materials

five 1-liter plastic soft drink bottles*

measuring cup

labels

masking tape

kitchen waste (1/4 cup)**

* clear with tops cut off

** avoid meat or fat

pond or stream (2 1/2 gallons)

distilled water (5 cups)

liquid detergent (2 teaspoons)***

vinegar (1/4 cup)

liquid bleach (1/4 cup)****

*** phosphate-based for best results

**** chlorine or hypochlorite bleach is best

Time Required: Approximately 2 hours over the course of a week

Procedures:

1. Pour approximately 1/2 gallon of pond water into each of the five plastic soft drink bottles. Try to have an equal amount of water in each of the containers.
2. Prepare five labels and attach them to each container. A suggested labeling scheme is:
#1 = control, #2 = nutrient, #3 = toxic, #4 = bacteria, #5 = acidic.
3. Add 1 cup of distilled water to the control container (#1).
4. Add 1 cup of distilled water and 2 teaspoons of phosphate-based liquid detergent to the nutrient container (#2).
5. Add 1 cup of distilled water and 1/4 cup of liquid bleach to the toxic container (#3). Be careful not to splash the bleach on the skin or clothing.
6. Add 1 cup of distilled water and 1/4 cup of kitchen waste to the bacteria container (#4). Fruit or vegetable trimmings work great. The more finely they are chopped or ground, the more rapidly they will decompose.
7. Add 1 cup of distilled water and 1/4 cup of household vinegar to the acidic container (#5).
8. Have participants set the containers on a table near a window. Encourage them to record their observations each day. In the beginning, it may be helpful to share observations to encourage all participants to record their observations (including color, turbidity, odors, color changes, presence of gas bubbles, or observations of living things) more completely. The record sheet provided may encourage careful observation.
9. Challenge participants to speculate or hypothesize what will happen in each container and to record their personal hypotheses.
10. Common observations are as follows:
Control—no change to a slight algal bloom
Nutrient—Extensive growth of algae
Toxic—no visual change to clarification of the water and loss of living things visible in the water, chemical smell that may dissipate during observation
Bacteria—increased turbidity, gas bubbles common, may form mats of decaying material, foul odors (methane or sulfur smell)
Acid—no change to slight clearing of the water, loss of some aquatic life
11. Encourage participants to explain why they got the results they did. Ask them why the containers were treated in a similar fashion and placed in the same general location during this experiment. Encourage them to explain the differences that they observed between the containers. Ask them to draw implications for similar types of pollutants in larger bodies of water.

Algae, plankton, bacteria and protozoans were present in the pond water collected for the experiment. Growth and multiplication of some small organisms should have occurred in the control container. The phosphates in the liquid detergent should have provided fertilizer for the algae, initiating an algal bloom (it will occur rapidly once it gets started). The organic waste in the “bacteria” container should have produced a bacterial bloom (decomposers) that would have consumed the oxygen in the water, killing other organisms while releasing decay gases like methane and sulfur dioxide. The bleach should have killed all or nearly all the organisms in the water, allowing it to clear slightly. If the acid treatment is great enough, similar outcomes would have taken place in the acidified container as well.

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1. Briefly state what you think will happen in each of the containers.

Control _____

Nutrient _____

Toxic _____

Bacteria _____

Acid _____

2. Observe each container at least once daily for 7 days and record any changes you observe.

Control:

Initial _____

Day 1 _____

Day 2 _____

Day 3 _____

Day 4 _____

Day 5 _____

Day 6 _____

Day 7 _____

Conclusions _____

Nutrient:

Initial _____

Day 1 _____

Day 2 _____

Day 3 _____

Day 4 _____

Day 5 _____

Day 6 _____

Day 7 _____

Conclusions _____

Toxic:

Initial _____

Day 1 _____

Day 2 _____

Day 3 _____

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Day 4 _____

Day 5 _____

Day 6 _____

Day 7 _____

Conclusions _____

Bacteria:

Initial _____

Day 1 _____

Day 2 _____

Day 3 _____

Day 4 _____

Day 5 _____

Day 6 _____

Day 7 _____

Conclusions _____

Acid:

Initial _____

Day 1 _____

Day 2 _____

Day 3 _____

Day 4 _____

Day 5 _____

Day 6 _____

Day 7 _____

Conclusions _____

3. Did the results observed differ from your original hypothesized outcomes? If so, why?

Control:

Nutrient:

Bacteria:

Toxic:

Acid:

4. List some examples of pollutants that could occur in water sources.

Nutrient

Bacteria

Toxic

Acid