# Pre-Lab Information

**Purpose** To model a watershed and examine how environmental changes affect the health of a watershed, and to predict the effect of human activity on the watershed.

Time Approximately 60 minutes

Question How do environmental changes affect both living and nonliving things in a watershed?

**Summary** You will build a model watershed to see how pollution affects the ecosystem. You will then create a food web using provided biotic factors. You will predict how environmental changes, including those caused by humans, affect biotic and abiotic factors in a watershed. This will help you understand how the overall health of a watershed is affected by changes in environmental factors, such as populations of organisms, water quality and flow, and human activity.

# Safety

* Behave in a purposeful manner in the lab at all times.
* Report all accidents—no matter how big or small—to the teacher.
* Be careful when working with aluminum cans. Make sure you wear protective gloves to prevent injury from the sharp edges.
* Only spray water directly into your model watershed. Do not spray other students.
* Immediately clean up any spilled water to avoid slips and falls.

# Lab Procedure

1. **Gather materials.**

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| --- | --- | --- |
| * aluminum baking pan * six aluminum cans * safety gloves * aluminum foil * masking tape * sponge * yellow and green food coloring | * eyedropper * clear spray bottles (two) * soil * scissors * colored pencils * blank paper |  |

1. **Build a model watershed.**
   1. Put on safety gloves and crumple all six of your aluminum cans by pinching and twisting them in the middle. Be careful when doing this, as the top of the can has sharp edges.
   2. Tape the cans together in the shape of a rough pyramid. This will allow for your model to have hills.
   3. Place your cans in the aluminum baking pan in a location of your choosing.
   4. Mold aluminum foil over the top of the crushed cans. Make sure all of the cans and the bottom of the pan are covered. Also make sure your model has several hills. Be careful not to tear or puncture the aluminum foil.
2. **Model point source and nonpoint source pollution.**
   1. Fill one spray bottle with water. Add drops of yellow food coloring until the water becomes visibly yellow. You may need to put the lid on and shake the bottle to mix it.
   2. Gently use a spray bottle with yellow water to model rainfall. Spray the water on the top of your model.
   3. Take note of how the water flowed in Table A in the **Data** section below.
   4. Cut your sponge into five small pieces.
   5. Place four of the sponge pieces on your watershed model. Place these in random locations of your choosing. These represent freshwater sources.
   6. Repeat Step a to model rainfall. Take note of the flow in Table A in the **Data** section of this guide. Be sure to note how the sponge pieces changed flow.
   7. Fill the second spray bottle with water. Add drops of green food coloring until the water becomes visibly green. You may need to put the lid on and shake the bottle to mix it.
   8. Use the eyedropper to place several drops of green water on the fifth piece of sponge. Place this sponge on the highest point of your watershed. This sponge represents a factory dumping point source pollution.
   9. Repeat Step a to model rainfall. Make sure the rainfall is falling on the sponge that represents a factory. Take notes in Table A in the **Data** section of this guide, making special notes of where the point source pollution flows.
   10. Sprinkle several tablespoons of soil on and around your watershed. This represents nonpoint source pollution.
   11. Repeat Step a to model rainfall. Take notes in Table A in the **Data** section of this guide. Make special note of where the nonpoint source pollution flows.
3. **Create a food web.**
   1. Read the list of biotic factors and their descriptions below.
   2. Based on the provided descriptions, draw on a blank piece of paper a food web using each species listed. Use the colored pencils to draw and label the different species. Turn in your completed food web to your teacher after completing this lab.

|  |  |
| --- | --- |
| **Species** | **Description** |
| **Algae** | are nonflowering plants that grow on the surface of the water. Because they are plants, they need sunlight to grow. |
| **Plants** | produce leaves that die and fall to the bottom of the water. |
| **Mosquito larvae** | live in the water, where they eat algae. They eventually grow into adult mosquitoes. |
| **Worms** | feed on decaying organic matter such as plant leaves. |
| **Minnows** | are small fish that eat decaying plant matter, mosquito larvae, crayfish larvae, and algae. |
| **Crayfish** | are bottom feeders that eat worms, dead plants, and insects and their larvae. |
| **Trout** | are large fish that prefer to eat smaller fish, crayfish, worms, and aquatic insects. They prefer to live in cool, deep water. |
| **Herons** | are large birds that eat fish and crayfish, among other things. |

1. **Change the environmental conditions of the watershed.**
   1. Read the environmental change scenarios below.
   2. For each scenario, predict the effects on abiotic factor(s) and record them in Table B in the **Data** section of this guide.
   3. Then, predict what effects the change to the abiotic factor will have on the biotic factors in the food web. Record your predictions in Table B in the **Data** section of this guide. Remember to consider all the paths in the food web in both directions.

|  |  |
| --- | --- |
| **Environmental Change** | **Description** |
| **Scenario 1** | A plant that is originally from a different region is introduced to the watershed. It produces a compound that prevents growth of other plant life in the area. Its broad leaves prevent light from filtering through to plants beneath it. |
| **Scenario 2** | Rainfall has been low and a drought follows. There is now less water in the stream. |
| **Scenario 3** | A local factory releases chemicals that enter the stream. The chemical causes fish eggs to develop irregularly and die. |
| **Scenario 4** | A new housing development is built by a nearby pond. Due to this new development, runoff has increased and is flowing into the pond. |
| **Scenario 5** | Insecticides from a nearby housing development enter the watershed through the groundwater. |

1. **Clean up your area.** 
   1. Return unused materials and dispose of any trash according to your teacher’s instructions.

# Data

Record your observations either in your lab notebook or in the space below.

**Table A: Modeling a Watershed**

|  |  |
| --- | --- |
|  | **Description of Water Flow and Pollution Movement** |
| **Spray #1—Rainfall** |  |
| **Spray #2—Freshwater Sources** |  |
| **Spray #3—Point Source Pollution** |  |
| **Spray #4—Nonpoint Source Pollution** |  |

**Table B: Likely Effects of Environmental Changes**

|  |  |  |
| --- | --- | --- |
| **Scenario** | **Effect(s) on Abiotic Factors** | **Effect(s) on Biotic Factors** |
| **Scenario 1** |  |  |
| **Scenario 2** |  |  |
| **Scenario 3** |  |  |
| **Scenario 4** |  |  |
| **Scenario 5** |  |  |

# Follow-Up Questions

Answer the following questions:

1. Why is it important to understand how different species relate to one another?
2. How might changes in a watershed’s biotic and abiotic factors affect human activities?
3. Recall your model watershed and the scenarios about which you wrote. What are several ways humans can prevent or control environmental changes? Is it important for humans to prevent these changes? Why, or why not?