# Pre-Lab Information

**Purpose** To 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** In this lab, you will study a virtual model of a watershed to see how point and nonpoint source pollution affect the watershed. Next, you will create food chains. Finally, you will model scenarios of environmental changes and observe the effect of these environmental changes on a food chain you created. 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.

# Lab Procedure

1. **Prepare for the project.**
	1. Read through this guide before you begin, so you know the expectations for this lab.
	2. If anything is not clear to you, be sure to ask your teacher.
2. **Open the virtual lab.**
3. **Observe how nonpoint source pollution enters and flows through the watershed.**
	1. Read the introduction to this part of the lab. Press the **“Start the lab.”** button to start the virtual lab.
	2. Drag the acid rain clouds from the tools panel onto the watershed model. (Note: Acids in rain form when chemicals from cars, factories, and power plants that produce electricity are released into the air and combine with other chemicals in the air. Acids, in this case, are considered pollutants.)
	3. Press the **“Play”** button to start the animation.
	4. Observe how acid rain enters and flows through the watershed.
	5. Press the **“Pause”** button to stop the animation.
	6. Press the **“Reset”** button to restart this part of the lab if you need to.
	7. Record your observations in **Table A** in the **Data** section of this guide.
	8. Proceed to the next activity.
4. **Observe how point source pollution enters and flows through the watershed.**
	1. Drag the factory from the tools panel onto the watershed model.
	2. Press the **“Play”** button to run the animation.
	3. Observe how pollution from the factory enters and flows through the watershed.
	4. Press the **“Pause”** button to stop the animation.
	5. Press the **“Reset”** button to restart this part of the lab if you need to.
	6. Record your observations in **Table A** in the **Data** section of this guide.
	7. When you are ready, move on to the next part of this activity.
	8. Press the **“+”** button next to the **“Freshwater source”** label on the panel to add freshwater sources to the watershed.
	9. Press the **“Play”** button to run the animation.
	10. Observe how the pollution from the factory flows through the watershed.
	11. Press the **“Pause”** button to stop the animation.
	12. Press the **“Reset”** button to restart this part of the lab if you need to.
	13. Record your observations in **Table A** in the **Data** section of this guide.
	14. Proceed to the next activity.
5. **Build food chains.**
	1. Read the introduction to this part of the lab. Press the **“Build food chains.”** button to continue the virtual lab.
	2. Drag the biotic factors from the panel and put them in their proper place in the food chain. Use the following table to help you determine where to place each biotic factor.
	3. Press the **“Check”** button to check whether you placed the biotic factors in the right order.
	4. If your answer is not correct, try again. Pressthe **“Reset”** button to restart this task.
	5. Press the **“Regenerate”** button to build new food chains.
	6. Proceed to the final activity in this lab.

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

1. **Change the environmental conditions of the watershed.**
2. Read the introduction to this part of the lab. Press the **“Model scenarios.”** button to continue the virtual lab.
3. Read scenario 1 in the following table. Model this scenario by checking the correct box in the panel.
4. Observe what happens to the biotic factors in the food chain. Circles that become bigger represent increasing populations. Circles that become smaller represent decreasing populations. Think about why the populations changed.
5. Record your observations and explanations in **Table B** in the **Data** section of this guide.
6. Click the **“Reset”** button to model the next scenario.
7. Repeat **steps** **b** to **e** to model **scenarios 2–4**.
8. When you have completed the lab, move to the next activity in the Virtual Classroom.

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| **Environmental Change** | **Description** |
| **Scenario 1** | Rainfall has been low and a drought occurs. Now less water is in the stream. This causes the trout to move to other streams or rivers. |
| **Scenario 2** | A plant that is originally from a different region is introduced to the watershed. It produces a compound that prevents algae growth.  |
| **Scenario 3** | A local factory releases chemicals that enter the stream. The chemicals cause fish eggs to develop irregularly and die. |
| **Scenario 4** | Additional runoff flows into the river. Runoff contains nutrients that algae use to grow and reproduce. |

# Data

Record your observations in the table.

**Table A: Modeling a Watershed**

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|  | **Observations** |
| **Nonpoint Source Pollution (Acid rain)** |  |
| **Point Source Pollution (Factory)** |  |
| **Point Source Pollution (Factory) with New Freshwater Sources Added** |  |

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

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| --- | --- | --- |
| **Scenario** | **Effect on Abiotic Factors (Environment)** | **Effect on Biotic Factors** **(Living things or things that once lived)** |
| **Scenario 1** |  |  |
| **Scenario 2** |  |  |
| **Scenario 3** |  |  |
| **Scenario 4** |  |  |