# Pre-Lab Information

**Purpose** To model and understand how human activity affects Earth’s freshwater resources, including the pollution of both surface water and groundwater resources

**Time** Approximately two 45-minute periods

**Question** How does human activity affect Earth’s freshwater resources?

**Summary** In this virtual lab you will explore the impact of human activity on Earth’s freshwater resources. As part of this investigation, you will identify sources of water pollution and the effects of pollution on the quality of surface water and groundwater resources.

# Background Information

Fresh water is a vital resource for all life on Earth. Although 71 percent of the Earth’s surface is covered in water, only a small percentage of this is usable. Fresh water that is used for drinking and irrigation comes from groundwater and surface water, such as rivers and lakes. Unfortunately, human activity has a lasting impact on groundwater and surface water. Human activity such as mining, sewage treatment, farming, and urban development can lead to the pollution and contamination of freshwater resources.

# Lab Procedure

Here is an outline of the steps you should follow to perform this virtual lab. You will record your observations in the **Data** section.

1. **Prepare for the project.**
2. Read through this guide before you begin, so you know the expectations for this lab.
3. If anything is not clear to you, be sure to ask your teacher for assistance.
4. **Open the virtual lab.**
5. Read the text. Press the “**Start the lab**” button.
6. Drag the empty jar to the lake to get a water sample.
7. Proceed to the next part of the lab.
8. Drag the jar to the beaker on the left to fill it with water from the lake. Repeat this step for the beaker on the right.
9. Proceed to the next part of the lab.
10. Drag and place the “1” label on the beaker on left. Place the other label on the beaker on the right.
11. Proceed to the next part of the lab.
12. Read the information about pH. Press the “**Close**” button to return to the lab. If you want to reread this information, select the “**?**” pop-up button any time you are measuring the pH of a liquid.
13. Drag the pH meter to Beaker 1. Record the pH of the water from the lake in **Table A**. Be sure to describe the water in the second column of the table. For example, you may describe the color of the water and where it came from.
14. Proceed to the next part of this experiment.
15. **Observe the effects of pollutants on the pH of water.**
16. Drag the pH meter to Beaker 2. Record the pH of the water from the lake in **Table B**.
17. Add bases to the water by adding one soap, one alkaline battery, and one spoonful of baking soda to the beaker. Record the pH of the polluted water in **Table B** in the row “Water from lake after adding bases.”
18. Press the “**Clear**” button.
19. Add acids to the water by adding one lead-acid battery, one spoonful of pesticide, and one lemon (citric acid) to the beaker. Record the pH of the polluted water in **Table B** in the row “Water from lake after adding acids.”
20. Press the “**Clear**” button.
21. Add three of each kind of pollutant to the water.
22. Record the pH of the polluted water in **Table A**. Be sure to describe the water in the second column of the table.
23. Press the “**Continue**” button to proceed to the next step.
24. **Filter polluted water.**
25. Drag the filter to the beaker to prepare the filtration setup.
26. Press the “**Continue**” button to proceed to the next step.
27. Drag the “**3**” label to the beaker.
28. Drag Beaker 2 to the filtration setup.
29. Press the “**Continue**” button to proceed to the next step.
30. Drag the pH meter to Beaker 1.
31. Drag the pH meter to Beaker 3. Record the pH of the filtered water in **Table A**. Be sure to describe the water in the column under description in **Table A**.
32. Continue to the next part of the lab.
33. **Observe where groundwater comes from.**
34. Read the text. Press the “**Explore**” button.
35. Drag the rain clouds from the tools panel to the model. Observe what happens to the rainwater.
36. Record your observations by answering questions 1 and 2 in **Table C**.
37. Proceed to the next step.
38. Drag the lake to the model.
39. Observe what happens to the groundwater. Record your observations by answering questions 3 and 4 in **Table C**.
40. Proceed to the next part of the lab.
41. **Observe the effects of pollutants on freshwater resources.**
42. Add 10 of each pollutant to the lake.
43. Observe the changes in the lake water and the groundwater. Record your observations by answering questions 5 and 6 in **Table C**.
44. Press the “**Continue**” button to proceed to the next step.
45. **Observe how fresh water is replaced.**
46. Drag the clouds from the tool panel to the model.
47. Press the “**Play**” button to start the animation. Press the “**Accelerate**” button (the orange button) to speed up the animation, and the “**Pause**” button to stop the animation. Use the “**Reset**” button (the blue button) to view the animation again.
48. Observe the changes in the water in the lake water and the groundwater. Record your observations and ideas by answering questions 7–10 in **Table C**.
49. Continue to the next activity in the Virtual Classroom.

# Data

Record the pH values and descriptions of water in this table.

**Table A: Effects of Pollution and Filtration on the Quality of Water**

|  |  |  |
| --- | --- | --- |
| **Beaker** | **pH** | **Description** |
| 1 (water from lake) |  |  |
| 2 (polluted water) |  |  |
| 3 (filtered polluted water) |  |  |

**Table B: Effects of Acids and Bases on the pH of Water**

|  |  |
| --- | --- |
| **Description** | **pH** |
| Water from lake |  |
| Water from lake after adding bases |  |
| Water from lake after adding acids |  |

**Table C:** **Freshwater Sources and Pollution**

|  |  |
| --- | --- |
| **Questions** | **Answers** |
| 1. What happened to the rainwater?  2. Where did the rainwater go? |  |
| 3. What happened to the groundwater after a lake was added to the model?  4. What caused this change in the groundwater? |  |
| 5. What happened the lake after the pollutants were added to it? |  |
| 6. What happened to the groundwater when pollutants were added to the lake? |  |
| 7. What happened to the lake when it rained?  8. Why do you think this happened? |  |
| 9. What happened to the groundwater when it rained?  10. Why do you think this happened? |  |