

**Activity 3.5.3 The Spread of Pollutants****Purpose**

Pollution is the presence of substances in water, air, or soil that cause unpleasant smells, tastes, or sights. Some pollutants are harmful to living organisms and the environment. In relation to water, pollution occurs in both groundwater and surface water and is carried throughout the water cycle.

Pollution commonly occurs in two ways, point source and non-point source. Point source pollution occurs when there is a single source of contamination, such as a factory or leaking storage tank. Non-point source pollution occurs when there are many sources contaminating the water, air, and soil. Examples of non-point source pollution include automotive exhaust or fertilizer runoff.

Is point source worse than non-point source pollution for the environment and water supply? What other factors influence pollution? You will determine the answers to these questions and more in this activity.

**Materials****Per group of four students:**

- Groundwater contaminant

**Per student:**

- Pencil
- *Agriscience Notebook*

**Per pair of students:**

- Water
- 30 ml syringe
- Contaminant plume tray
- 2 pieces of filter paper

**Procedure**

You will be working with a partner to determine the spread of point source and non-point source pollution. The spread of pollution is influenced by many factors, but in this simulation, you will be testing the effects of point source versus non-point source pollution and how the slope of the topography influences pollution.

**Part One – Determining the Comparisons**

Discuss the following components of the experiment with your partner. Determine what natural features each experimental component simulates in a pollution scenario. After you and your partner have determined your predictions, discuss your thoughts with the other pair in your group.

Experimental Component	Natural Feature
Layers of filter paper	Ground
Bottom of tray under filter paper	Bottom rock
Catch basin	Body of water

**Part Two – Pollution on Level Ground**

1. Moisten the two pieces of filter paper with water so that they are damp but not dripping. Do **not** squeeze or wring out the paper if too wet. Simply pat between two pieces of dry paper towel to remove excess water.

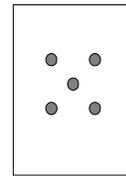
2. Place the moistened filter papers in the contaminant plume tray.

### **Trial 1**

1. Squeeze 5 drops of groundwater contaminant, one on top of the other, onto the center of the paper.
3. Fill the syringe with 5 ml of water.
4. Using the syringe, gently sprinkle the 5 ml of water in the syringe evenly over the entire area of the filter paper.
5. Wait 30 seconds. While waiting, observe any color changes in the contaminant.
6. Carefully peel the layers of filter paper off the tray and separate them.
7. Sketch and describe the appearance of the top and bottom layers of the filter paper in the area for Trial 1 on *Activity 3.5.3 Student Worksheet*.
8. Describe if the pollution is point source or non-point source on your student worksheet.
9. Predict if and how this pollution will affect groundwater and surface water. Write your prediction on your worksheet in the area provided.
10. Dispose of the water in the tray as directed by your teacher.
11. Carefully and thoroughly rinse the filter paper so that no color remains.
12. Blot the excess water from the papers by pressing them between two dry paper towels. Do not squeeze or wring the papers.
13. Return the papers to the tray.

### **Trial 2**

1. Squeeze 5 drops of groundwater contaminant adjacent to, not on top of each other, onto the filter paper. See Figure 1.
14. Repeat Steps 4-7 from above.
15. Sketch and describe the appearance of the top and bottom layers of the filter paper in the area for Trial 2 on *Activity 3.5.3 Student Worksheet*.



**Figure 1. Contaminant Pattern, Trial 2 & 4**

16. Describe if the pollution is point source or non-point source on your student worksheet.
17. Predict if and how this pollution will affect groundwater and surface water. Write your prediction on your worksheet in the area provided.
18. Dispose of the water in the tray as directed by your teacher.
19. Carefully and thoroughly rinse the filter paper so that no color remains.
20. Blot the excess water from the papers by pressing them between two dry paper towels. Do not squeeze or wring the papers.
21. Return the papers to the tray.

### **Part Three – Pollution on a Slope**

1. For Trial 3 and Trial 4, place a notebook or other item that is approximately ½” high under the end of the contaminant plume tray. The end of the tray without the catch basin should be elevated.
2. Repeat Steps 3–22 above, where Trial 3 uses the same drop pattern as Trial 1 and Trial 4 uses the drop pattern of Trial 2.
3. Place the filter papers on dry paper towels on a flat surface as directed by your teacher.

4. Clean up your workspace as directed.

## Conclusion

1. Based on your observations in this experiment, discuss the effects of point source and non-point source pollution on groundwater.

Point source, because it flowed into the basin and it was clear because it was filtered.

5. Based on your observations in this experiment, discuss the effects of point source and non-point source pollution on surface water.

Non point source, because the sheets on top are always darker and the water is blue.

6. Would you expect point source pollution or non-point source pollution to be easier to clean up? Why?

Point source, because it's not as spread out.

7. How does slope of the topography affect contaminant spread?

It flowed down to the body of water.

Source: Lab-Aids. (2004). *Groundwater contamination: Trouble in Fruitvale*. Ronkonkoma, NY: Author.

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## Activity 3.5.3 Student Worksheet

Trial 1	Trial 2
<b>Type of contamination:</b> Point source	<b>Type of contamination:</b> Non point source
<b>Predicted impacts on groundwater:</b> It will spread out.	<b>Predicted impacts on groundwater:</b> Its going to not be as dark as the surface water.
<b>Predicted impacts on surface water:</b> It will spread out the same	<b>Predicted impacts on surface water:</b> Its going to be dark.
Trial 3	Trial 4
<b>Type of contamination:</b> point source	<b>Type of contamination:</b> non point source
<b>Predicted impacts on groundwater:</b> it will spread alot	<b>Predicted impacts on groundwater:</b> it will spread.
<b>Predicted impacts on surface water:</b> it will stay together.	<b>Predicted impacts on surface water:</b> It will spread.

