Name _____ Date _____

Analyzing Watershed Health: Nitrates

What is nutrient pollution?

Nutrients are chemicals that plants and animals need to grow and survive. Nutrient pollution is the process during which too many nutrients, mainly nitrogen and phosphorus, are added to bodies of water and act like fertilizer, causing excessive growth of algae.

Virtually all people and industries in the Chesapeake Bay watershed—and even some beyond the watershed—contribute nutrients to the bay and its tributaries. In general, excess nutrients reach the bay from three major sources:

- Wastewater treatment plants contribute the majority of nutrients that enter the bay by releasing treated water—often still containing large amounts of nutrients—into local streams and rivers, which eventually flow to the bay.
- Nutrients that run off the land—including farmland and urban and suburban areas—come from fertilizers, septic systems, boat discharges, and farm animal manure.
- Air pollution from vehicles, industries, gas-powered lawn tools, and other emitting sources contribute nearly one-third of the total nitrogen load to the Chesapeake's waterways.

Excessive amounts of nutrients can lead to more serious problems such as low levels of dissolved oxygen in the water. Severe algal growth blocks the sunlight that is needed for plants, such as bay grasses, to grow. When the algae and bay grass die, they decay. In the process of decay, the oxygen in the water is used up, leading to low levels of dissolved oxygen in the water. This, in turn, can kill fish, crabs, oysters, and other aquatic animals.

Scientists are most interested in the nutrients that are related to people living in the coastal zone because human-related inputs are much greater than natural inputs. Because there are increasingly more people living in coastal areas, there are more nutrients entering our coastal waters from wastewater treatment facilities, runoff from land in urban areas during rains, and from farming.

All of these factors can lead to increased nutrient pollution.

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Analyzing Watershed Health: Nitrates, continued

Part 1. Explore nitrate levels in the Chesapeake Bay.

Nitrates are a group of chemicals that contain nitrogen. An overabundance of nitrates in the Chesapeake Bay watershed can be harmful to humans. You can use FieldScope to explore nitrate levels throughout the Chesapeake Bay watershed. CBIBS does not collect data on nitrates so it is important to note that the data you will be looking at has been collected by citizen scientists—these include scientists, students from local schools, residents from the area, and anyone else who is interested in collecting and sharing data about nitrates through FieldScope. This data may not be as reliable as the CBIBS data but it can still be useful to explore.

❶ Open the FieldScope map, **Nitrates in the Watershed**: http://chesapeake.fieldscope.org/v3/maps/333

❷ Examine the legend:

1. What do the numbers in the green circles represent? _____

_____

2. What does the size of the circles represent? _____

_____

3. In what parts of the Chesapeake Bay watershed do you observe higher nitrate levels? Why might this happen? _____

_____

_____

_____

_____

4. What is the range of nitrate levels in the Chesapeake Bay? In other words, what is the highest observed nitrate level and what is the lowest? _____

_____

_____

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Analyzing Watershed Health: Nitrates, continued

5. When nitrate levels are high, how do you think aquatic life is affected? _____

_____

_____

_____

Part 2. Examine data for nitrates at the selected sites.

❶ Continue your examination of the FieldScope map, **Nitrates in the Watershed:** http://chesapeake.fieldscope.org/v3/maps/333

❷ Zoom in to the selected sites to identify nitrate levels. (Tip: Enter the six sites, one at a time, in the search box.)

1. What are the nitrate levels at each site? Note that some sites may not have data exactly from the site. Select data that is close to each site. If there are two or more numbers close to the site, calculate an average. Hint: make sure you zoom into the site as much as you can.

Site	Nitrate Levels (mg/L)
Annapolis, Anne Arundel County, Maryland	
Havre de Grace, Harford County, Maryland	
Scotland, St. Mary's County, Maryland*	
Alexandria, Alexandria County, Virginia	
Norfolk, Virginia	
Jamestown, Virginia	

*Enter "Scotland, Maryland" in the search box and select St. Mary's County.

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Analyzing Watershed Health: Nitrates, continued

When water has nitrate levels less than 1 mg/L, it is considered unpolluted. When nitrate levels are greater than 10mg/L, water is unsafe for drinking.

2. In the chart above, draw a circle around the sites that have the highest nitrate levels. What sites have nitrate levels greater than 1 mg/L? _____

_____

_____

3. What site has the highest nitrate levels? What might be contributing to the nitrate levels at this site? _____

_____

_____

Part 3. Water Flow to the Chesapeake.

While nitrate levels are taken at different places, the nitrates themselves can follow a flow path to the larger Chesapeake Bay. For the action plan, it is important to know the distance and location of the flow paths from each site. FieldScope allows you to identify this flow path using a simple tool.

❶ Continue using the FieldScope map, **Nitrates in the Watershed**: http://chesapeake.fieldscope.org/v3/maps/333

❷ Enter “Annapolis, Maryland”, in the search box.

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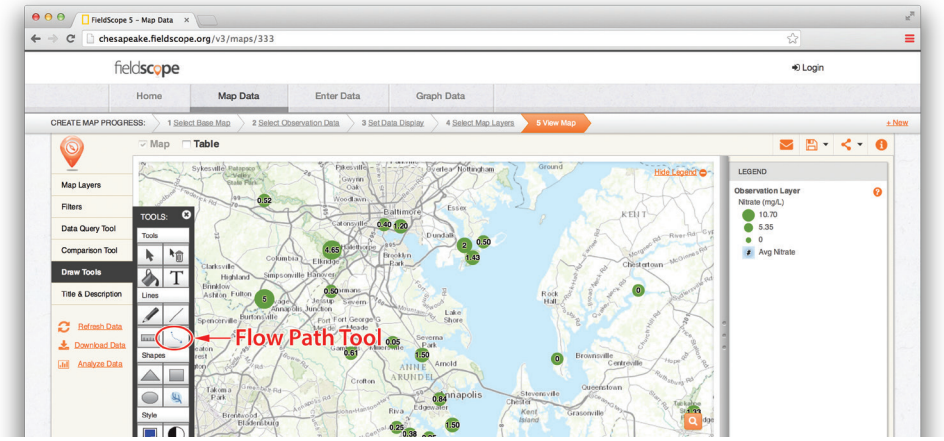
Analyzing Watershed Health: Nitrates, continued

❸ On the left tool bar, click on *Draw Tools*. Select the *Flow Path Tool*.



❹ Click the map near Annapolis, Maryland, and the water flow path will appear as a blue line with the distance of that path to the Chesapeake Bay watershed.

1. Record this distance in the table below. Repeat the procedure for the other sites.

Site	Water Flow (miles)
Annapolis, Anne Arundel County, Maryland	
Havre de Grace, Harford County, Maryland	
Scotland, St. Mary's County, Maryland*	
Alexandria, Alexandria County, Virginia	
Norfolk, Virginia	
Jamestown, Virginia	

*Enter "Scotland, Maryland" in the search box and select St. Mary's County.

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Analyzing Watershed Health: Nitrates, continued

2. What site has the longest flow path? _____

3. What site has the shortest flow path? _____

Part 4. Chesapeake Bay Action Plan Connection.

1. On your Project Data Table, record the average nitrate levels and water flow path distance for each site.
   a. Go back to Part 2, Question 1 of this worksheet, and copy the nitrate levels from this table to your larger Project Data Table.
   b. Go back to Part 3, Question 1 of this worksheet, and copy the water flow path distance from this table to your larger Project Data Table.

2. Complete the second box on your Decision Statement Planner worksheet to identify the best site for an action plan based on nitrate levels and water flow path distance. Refer to your Stakeholder Table as well to help you make this decision.

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