Name _____ Date _____ Class _____

Watershed Mapping

Materials

master water testing kit

phosphate water testing kit

coliform water testing kit

aquarium salinity hydrometer

local water sample

water sample from another location within the watershed

computer with Internet access

topographical map of your state with water sources marked

topographical map of the United States with water sources marked

colored pencils

ruler

Water pollution can occur in a variety of ways. But how does pollution from a farm in the Midwest reach the ocean hundreds of kilometers away? The answer is the watershed. When water enters the ground, by rain or by a garden hose, it begins its journey to the estuary: the highly productive habitat where freshwater and saltwater meet and mix. One of the major reasons estuaries are areas of degradation and decline is due to the agricultural and industrial pollution that is carried there via freshwater. In this lab activity, you will conduct chemical and biological tests on local water samples, and map the path that water takes from your town to the nearest estuary. By doing so, you will better understand your impact on the global marine ecology.

Question

How does the chemistry and biology of your local water affect the estuary in your watershed?

Objectives

- **Analyze** the chemical aspects of various water samples
- **Use** online maps to locate your local watershed and to trace the pathway to the estuarine endpoint
- **Identify** how local pollution affects areas along the watershed
- **Hypothesize** the potential sources of pollution in various water samples based on their chemical composition

Procedure

Part A. Water analysis

1. Read and complete the lab safety form.
2. Use the analysis kits to conduct the chemical and biological tests on the water samples your teacher has collected. Record the test results in **Table 1**.

Watershed Mapping *Continued*

Part B. Watershed mapping

1. Use a computer to find watershed maps on the Internet. You will need to find the following:
   - United States watershed map
   - Watershed map of your state
   - Watershed map of your local county

For the United States map, make sure it includes major rivers, lakes, and seas. The state map should include major and minor rivers, as well as lakes and other large bodies of water.

2. Use your colored pencils to trace and color in the area of your local county watershed on your state topographical map. Use your online watershed map as a reference.
3. Using the locations provided by your teacher, mark the locations of the two water samples you analyzed in Part A on your state topographical map.
4. Mark the path of your local county watershed to the nearest large body of water (a river or lake, for example) on your state map. Connect your local county watershed to the state watershed system. Use the topography on the map to make sure that your water sources are running downhill.
5. Trace the country's major river systems on the United States topographical map. Use your online United States watershed map as a reference.
6. Now use your information to trace the watershed path from your local body of water to the ocean on your United States topographical map. Note that the area where the freshwater meets the ocean is your nearest estuary.
7. On your United States topographical map, use a colored pencil to circle any place where the watershed moves through or near a large city. Also mark any areas that you know have large farming communities.
8. Use your United States map to fill out **Table 2**.

Data and Observations

Table 1 Water Sample Data

Sample Location	pH	Salinity	Ammonia	Nitrate	Nitrite	Phosphate	Coliform

Table 2 Local Watershed Information

Number of Rivers	
Number of Large Bodies of Water	
Number of Nearby Cities	
Number of States the Watershed Encompasses	

Watershed Mapping *Continued*

Analyze and Conclude

1. How did the test results between the two water samples compare? What are the reasons behind the differences?

2. Did any of the tests indicate that high levels of pollution were in the water samples you tested? Based on your state topographical map, what are possible sources of the pollutants found in your water samples?

3. What impact might large cities or large agricultural areas have both on the water source and on the surrounding area?

4. How do typical weather patterns in different parts of the country affect local watersheds? Think of areas that are traditionally dry and those that receive a lot of rainfall. How might those watersheds be altered if the weather pattern changed? How might different precipitation levels affect the amount and type of pollution in each watershed?

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Watershed Mapping *Continued*

5. In what ways do you and your household personally contribute to local watershed pollution? What are ways that your community pollutes? What can be done to reduce your own personal impact on your local watershed?

Name _____ Date _____ Class _____

Wetland in a Pan

Materials

long shallow pan, such as a paint pan or an aluminum baking pan

modeling clay

sponges, cut lengthwise

food coloring

watering can filled with water

cup of soil

Wetlands form a buffer between land and sea, and are the most productive ecosystems per m^2 in the world. For an area to be considered a wetland it must be flooded with water for at least part of the year, but the vegetation among wetlands can range from moss to salt grass to trees and shrubs. These habitats are important to not only the animals that live there, but to the people who rely on the wetland's ability to filter and clean water, absorb storm impacts, such as waves and flooding, prevent erosion, and provide recreational areas for activities such as hiking, kayaking, and fishing. During this activity, you will see the benefits of wetlands by modeling a wetland ecosystem in the lab.

Question

How does a wetland improve water quality and prevent flooding and erosion?

Objectives

- **Understand** the relationship between terrestrial runoff and wetlands.
- **Understand** the benefits that wetlands provide animals and humans.
- **Conduct** a wetland experiment and record observations.

Procedure

Part A. Build a Wetland Model

1. Fill one half of the pan with clay. If you are using a slanted pan, put the clay on the shallow side. Have the clay gradually slope down toward the middle of the pan. Smooth the clay around the edges of the pan to form a seal. This clay represents the land. The empty half of the tray represents the ocean.
2. Place sponge pieces along the edge of the clay (at the land-water interface in the middle of the tray). This represents the wetland. Be sure that the wetland fits snugly along the land, and that there are no big gaps between the land and the ocean.
3. Place 5–10 drops of food coloring around the clay. The food coloring represents pollutants, such as heavy metals, salts, and fertilizer.
4. Slowly sprinkle the watering can on the clay (which simulates rain), and observe the path the water takes from the land to the wetlands.
5. Watch how much water and pollutants the sponges absorb as the water flows from land towards the ocean. Record your observations in **Table 1**. Once the water has reached equilibrium, take the sponges out of the tray and wring them out over the sink to observe the amount of water they absorbed.
6. Pour the water from the tray down the drain, and repeat steps 3 and 4 without the sponges in place. Observe how differently the water flows from land to sea this time. Record your observations in **Table 1**.

Wetland in a Pan *Continued*

Part B. Model Wetland Filtration

1. Pour the water from the tray down the drain and place the sponges in the same location as Part A, step 2.
2. Pour the cup of soil in an even layer over your clay. This represents topsoil.
3. Slowly sprinkle the watering can over the land again, and observe the differences in water clarity between the mud on land and the water that ends up in the ocean. Record your observations in **Table 1**.
4. Remove the sponges and the dispose of the muddy water in the trash. Place a fresh layer of soil over the clay, but do not return the sponges to the tray.
5. Repeat step 3 and note the difference in the water quality in the ocean now compared to when the wetland was in place. Record your observations in **Table 1**.

Name _____ Date _____ Class _____

Wetland in a Pan *Continued*

Data and Observations

Table 1 Wetland Observations

	With the Wetland	Without the Wetland
What happened when it rained (Part A)? Discuss the water flow, pollutants, and resulting water quality in the ocean.		
What happened when it rained (Part B)? Discuss the water flow, effects on topsoil, and resulting water quality in the ocean.		

Name _____ Date _____ Class _____

Wetland in a Pan *Continued*

Analyze and Conclude

1. How do you think wetlands absorb water and filter pollutants?

2. What are the negative effects of topsoil and pollutants entering our oceans?

3. Based on the lab you performed today, do you think wetlands are more likely or less likely to be polluted than surrounding habitat? Why?

4. How does a decline in wetlands negatively affect humans?

5. Why do you think wetlands are called the kidneys of the planet?