



2.1.9 Lab: Investigate Watershed Analysis

Wet Lab

AP Environmental Science Sem 1

Points Possible: 40

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Date: _____

Investigate Watershed Analysis

Many factors affect the quality of the water in areas of a watershed and are often linked to the human use of the area. In protected natural areas, the water tends to be cleaner and freer of chemical pollutants and other contaminants. In agricultural and urban areas, water can be contaminated with substances that affect the water's clarity, dissolved oxygen level, nitrate/nitrite levels, pH, and more.

In this lab, you will be investigating your local watershed. First you will use government data to research features of the local area of the watershed near you, and then you will identify a source of water in your watershed and test it at three different points.

Be sure to:

- Follow safe practices during this investigation.
- Check your location visit plan with your parent or guardian, and be sure they know when and where you are going.
- Collect your water sample with an adult present. *Do not go alone.*
- Be careful around the water source you will be visiting. Avoid areas with fast-rushing water and steep areas where you might fall in.
- Include time and a plan to travel to three different water sources.
- Read the instructions carefully on the water testing kit and follow them exactly.
- Use the testing chemicals carefully and avoid contact with your fingers.

Materials

- Computer with Internet
- Water test kit – the more detailed, the better (found at local store or aquarium store)
- 3 local natural water sources (including an upstream source and a downstream source)
- 3 sealable containers (for collecting water samples)
- 3 clear glass or plastic cups (for water testing)

Procedure

Part 1: Research a Watershed Area

1. First, you will do some research to learn about your watershed. Identify a source of flowing water near you (the more natural, the better). This could be a local stream, creek, or river. Ideally, you will use a natural source, but if you need to, a local park or man-made river is an option. An irrigation canal would be your last resort. Talk to an adult in the area, a local municipality, or your instructor if you need help identifying a good source.

a. Use the first link on your landing page, "The National Map," to learn more about the topography (elevations) of your source. You can enter the name of a location, such as a town or a creek or river, and click the search icon. Or you can click on the area you want to view on the national map. A topographic map of the area you selected will appear, along with a menu of links to more information. Use the map that appears and the links as references. In the data collection section for Part 1a, record the name of your source of flowing water and describe the topography of the areas immediately around it (within 1 mile). Include a description of the elevations, which are found using the curvy brown lines that show the natural hills and valleys of the area and include a number (the elevation) at some point along their length.

b. Use a search engine to search "zoning map + [your location]." Your local municipality should include maps of the zoning of your area. Zones can be commercial areas, single-family housing areas, industrial areas, multi-family housing areas, etc. Click on your area on the map, identify your source, and describe the zoning of the areas around your source (within 1 mile) in data collection Part 1b.

c. Now zoom out a little bit from your source to the watershed that it lies in. Identify the location of your watershed and some of its general characteristics. To do this, click the second link, "Surf Your Watershed," on the landing page. Enter your zip code and hit "Submit." Use this site to answer questions in your data collection section for Part 1c.

d. Research some of the characteristics of your watershed. Click the third link, titled "USGS Water Data," on the landing page. Scroll down to the section under the heading "Water Data for the Nation," and then enter your state in the "Use a Map" menu. Use the map to zoom in, or enter an address or location to get to your area. Then click on one of the map points nearest to your source. In the box that opens, click "Access Data." Use this site to answer questions in your data collection section for Part 1d.

Data for Part 1: Research Watershed Area (11 points)

Record your data from Part 1a here:

Describe the topography near your water source, including the elevations and land features. You may describe the topography in detail or make a sketch of the topographic map. (2 points)

Record your data from Part 1b here:

Describe the zoning near your water source. You may describe the zoning in detail or sketch the zones, being sure to label. (2 points)

Record your data from Part 1c here:

What is the name of your watershed? List the watersheds that are upstream and downstream of yours. (1 point)

Draw a map of your state, and include a sketch of the watershed that appears on the map at the "Surf Your Watershed" site. Place a dot approximately labeling your water source on the map. (1 point)

Summarize some of the information that you found on the health of your watershed by clicking the links under "Assessments of Watershed Health" and "Information provided by the USGS" on the "Surf Your Watershed" site. Include at least three pieces of information and their sources. (2 points)

Record your data from Part 1d here:

What is the drainage area? (1 point)

Summarize some of the information that you found on your area by clicking on the blue links found in the table under "Available Data" on the "USGS Water Data" site. Include at least four pieces of information and their sources. (2 points)

Part 2: Test a Water Sample

You are now going to test a sample of water in your source and then collect upstream and downstream samples of water to test as well. Be sure to follow the safety guidelines listed at the beginning of this lab.

1. Obtain a water testing kit, which can be found online or at a local supermarket, pool store, or aquarium store. Choose one that at least tests pH, nitrates/nitrites, and dissolved O₂.
2. Go to your determined water source with an adult. Use caution and follow safety tips when collecting at least a cup of water in a sealable container. Label the container "Source."
3. Select an upstream, flowing water source that is as far as possible from your original source. This could be as far as you can walk or up to a 30-minute drive, depending on your situation. Use caution and follow safety tips when collecting at least a cup of water in a second sealable container. Label the container "Upstream." Note the features of this area, including the topography and zoning.
4. Select a downstream, flowing water source that is as far as possible from your original source. This could be as far as you can walk or up to a 30-minute drive, depending on your situation. Use caution and follow safety tips when collecting at least a cup of water in a third sealable container. Label the container "Downstream." Note the features of this area, including the topography and zoning.
5. Set out three identical clear glass or plastic cups, and pour your water samples into them. Label the cups.
6. Rate the turbidity of the samples on a scale of 1 to 10, with 1 being the clearest and 10 being the most turbid (dirty or hard to see through). Record your results in the Data for Part 2 section.
7. Follow the instructions on your water testing kit to perform as many tests as possible on each sample. Record your results in the Data for Part 2 section.

Data for Part 2: Test a Water Sample (10 points)

1. Describe your three water sources, including the distance between them. (1 point)

Use this data table to record your findings as you test the water: (9 points)

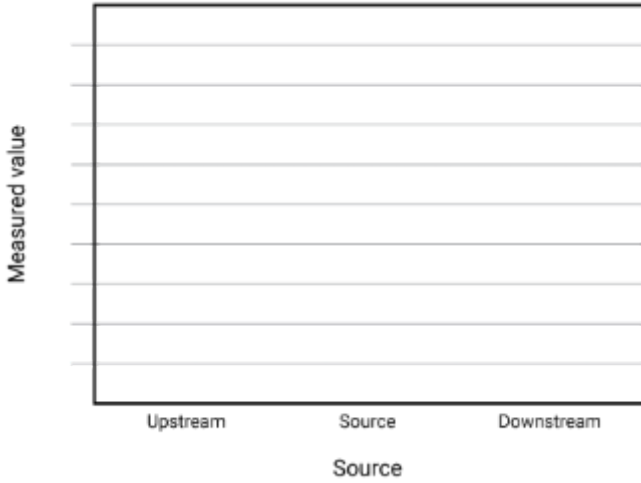
Water source	Turbidity (1 – 10 scale)	Test 1: pH	Test 2: Nitrates (mg/L or ppm)	Test 3: Nitrites (mg/L or ppm)	Test 4: Dissolved O₂ (mg/L or ppm)	Test 5: (optional) _____	Test 6: (optional) _____
Upstream							
Source							
Downstream							

Analyze Data and Draw Conclusions (19 points)

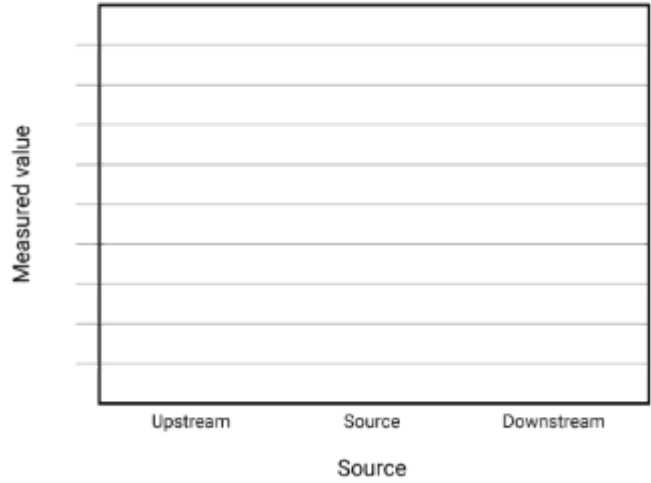
1. Analyze the Data (9 points)

a. Graph each of the columns listed in your data table. Create a bar graph with the water sources (Upstream, Source, and Downstream) on the x-axis and measured values on the y-axis. (5 points)

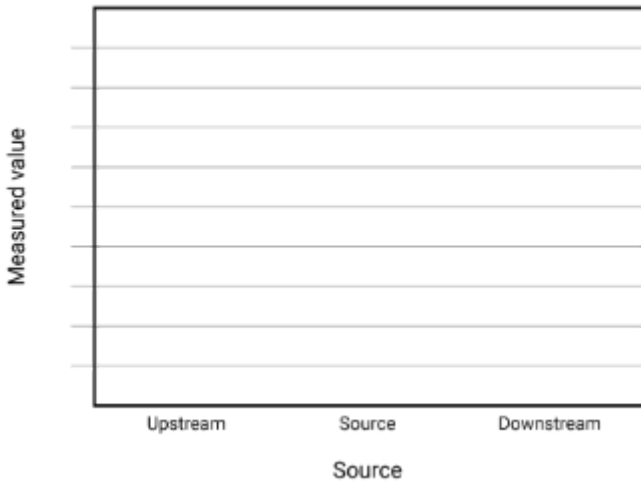
Water turbidity



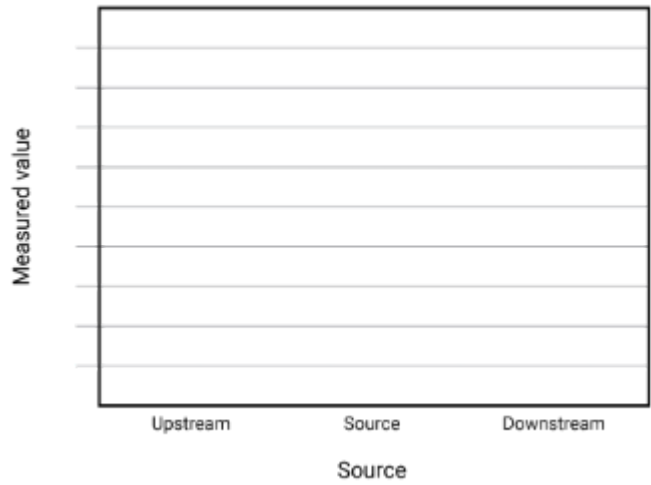
Water pH



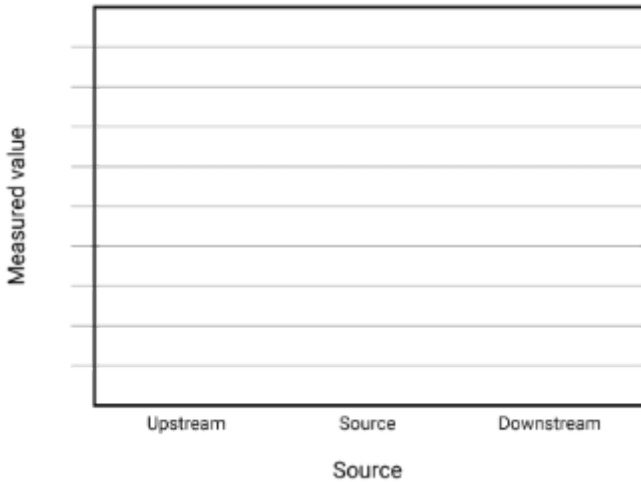
Nitrate concentration



Nitrite concentration



Dissolved O₂ concentration



b. Compare your graphs. Did any of the values differ significantly? If so, which ones, and in what way? Were there any generalizations that could be made from your data – for example, were the upstream or downstream sources more or less contaminated? What other patterns did you notice? (2 points)

c. Compare your collected data with the test kit's recommended values for water. (Research these data for each area tested if the kit does not provide it.) Were there any results that were considered non-ideal? If so, which ones, and in what way? Were there any generalizations that could be made from your data? What other patterns did you notice? (2 points)

2. Draw Conclusions (10 points)

a. Why do you think the data showed what they did? Were there any sources of water pollution that you observed near your water source? Were there any major differences in the topography or zoning around the different sources that could have contributed to the differences in data? Research the zoning and topographic maps for those areas if they were outside your initial search zone. (2 points)

b. Did any of the data you collected corroborate or refute the research that you did on your watershed in Part 1? For example, if your water was high in bacteria, did any of the health research show that as a problem? Explain. (2 points)

c. A watershed is an area that drains into a land basin. How healthy do you think the soil is around your water source as a result of the watershed? Why? (2 points)

d. Select a value that was not in line with the recommended water values (or the one that was the closest to being out of line). Do some research to determine possible problems that can arise from using water with this abnormality. Summarize what you find out, and include your sources for the information. (2 points)

e. Are there any recommendations that you would make that could improve the health and sustainability of your watershed? Are there any changes to the zoning or regulations that you think would help? (2 points)

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