Lab Report: Water Systems and Photovoice

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# Background

This lab report is connected to the “A STEAM Approach to Understanding Water Systems” lesson plan. Students will identify elements and interconnections of natural and anthropogenic water systems, including water sources (e.g., groundwater, snow melt) and anthropogenic influences (e.g., wastewater, irrigation water, sewage) in their regional watershed. Then students will investigate water quality from point and nonpoint sources of pollution. Finally, students will communicate the impact of regional water systems using mapping, photography, and storytelling.

# Photovoice: What does water mean to you?

[PhotoVoice](https://photovoice.org/) is a qualitative research method that empowers positive social change through the ethical use of photography. A photograph is the easiest way to share your experiences and raise awareness about global issues to a general audience (Blackman & Fairey, 2007).

Water is such an important topic that transcends scientific analysis alone. To understand water and its role in our world, consider what water means to you in your life. You will use photography to investigate intersectional issues related to water systems (e.g., water governance, security, pollution, etc.). This activity aims to challenge your perspective about our planet, our relationship with its living and nonliving entities, and our connection with water.

1. What does water mean to you? Consider how you use water, where does your water come from, and what is your relationship with water. You can answer with a few sentences, bullet points, or sketches.
2. Visualize the relationship that water has to your life. What are some images that you think of when you think of water?
3. Take a picture that answers the question, “What does water mean to you?” The photograph should be **original, creative, and contemporary.** For your reflection, answer the following questions:

* **What do you see?** – Provide a literal and detailed description of the image.
* **What issue related to water systems are you highlighting?** – Provide evidence about the issue's scientific, cultural, and/or historical significance.
* **How does the issue connect to your experiences?** – Share anecdotal evidence and/or personal insights about the issue's significance.

# Elements of human and natural water systems

Recall that a *system* is a network of relationships among parts, elements, or components that interact with and influence on another through the exchange of energy, matter, or information. Natural water systems contain elements of geology, hydrology, biology, and chemistry. Anthropogenic systems include elements that are created or impacted by humans. Observe the map below of Picture Canyon Natural and Cultural Preserve. Search for elements of natural and anthropogenic water systems on the map and around you at the field site. Mark elements that you see with the following symbols:

→ - water route and flow direction

(S) - natural water source or reservoir

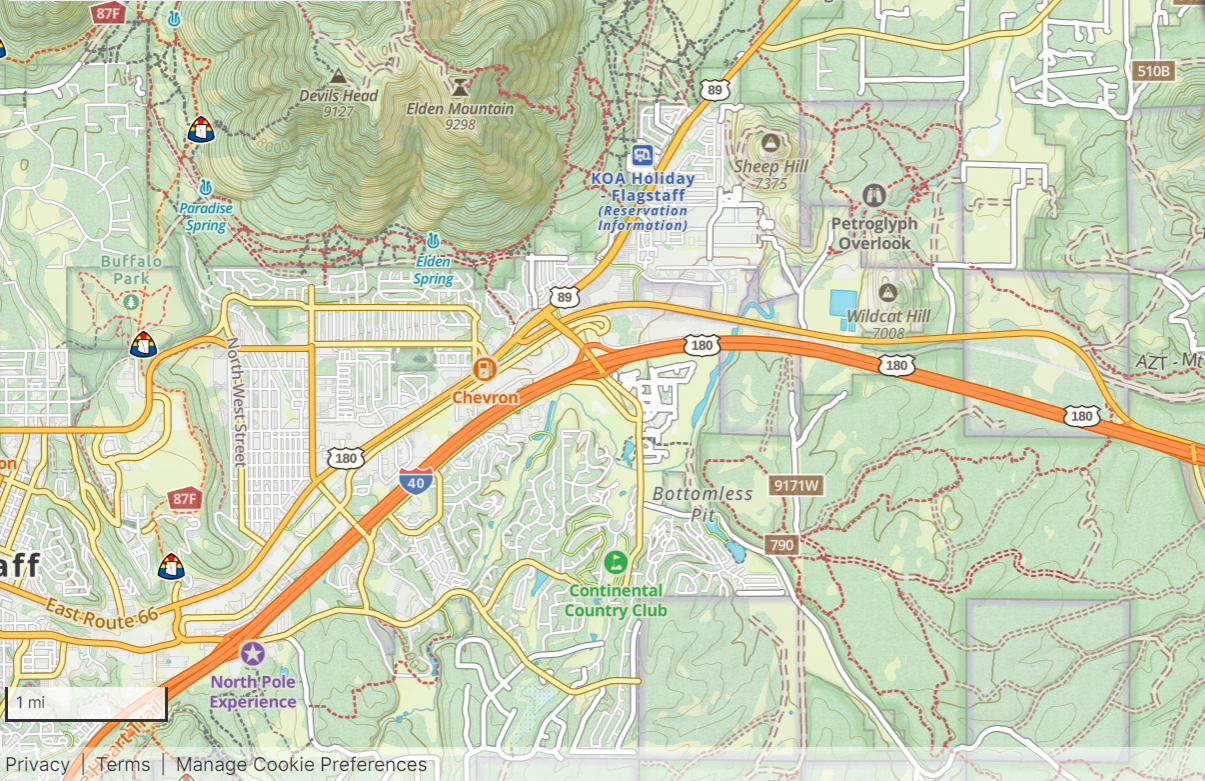
(G) - greenspace (natural or man-made)

(B) - bare soil or dirt area

(I) - water infrastructure (wastewater plant, irrigation canals, etc.)

(D) - urban development (houses, roads, stores)

(P) - potential source of pollution



INSERT MAP (1 mile = 1-inch scale) OF LOCAL WATERSHED AREA, courtesy of Gaia GPS. ↑ North is toward the top of the paper.

# Field observations and measurements

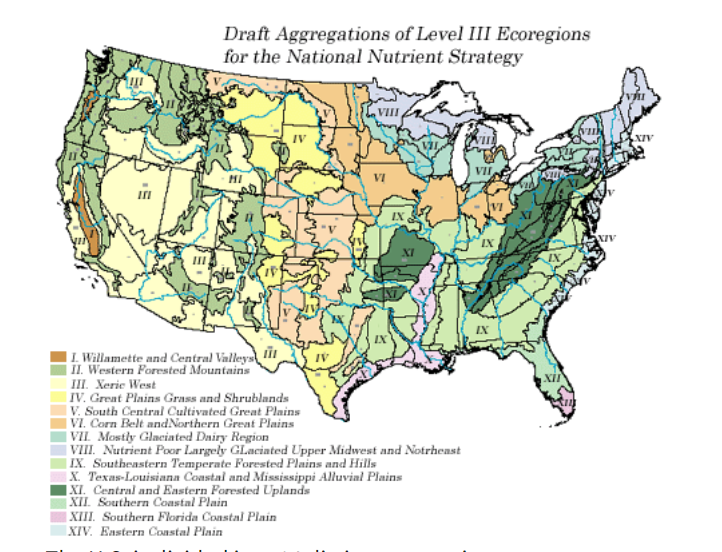
Record your data from three different water samples in the table below: 1) your group’s data from the field site, 2) another group’s data from the field site, and 3) the data from another sampling site that was provided by your instructor and measured as a group. Be sure to include a site name that you have assigned to the specific site that you measured, a brief description of exactly where you sampled, the date and time that the sample was collected. This is an important habit to get into to ensure the accuracy of your data and to observe trends over time.

|  |  |  |  |
| --- | --- | --- | --- |
| **Sample** | 1. **Your Group** | 1. **Other Group** |  |
| **Site name** |  |  |  |
| **Brief site description** |  |  |  |
| **Sample Date** |  |  |  |
| **Sample time** |  |  |  |
| **Total phosphorous (µg/L)** |  |  |  |
| **Total nitrogen (mg/L)** |  |  |  |
| **Turbidity (NTU)** |  |  |  |
| **pH** |  |  |  |
| **Dissolved Oxygen (mg/L)** |  |  |  |
| **Notes** |  |  |  |

# Reflection

Water quality parameters can vary a lot from site to site. These variations can be based on inputs and conditions of the system from natural and anthropogenic sources. As a result, it can be very difficult to determine the “good” or “right” values for a particular parameter.

The US EPA has developed criteria for specific ecoregions that aim to represent the conditions of surface water that are minimally impacted by human activities and that are protective of life and recreational uses. These criteria differ by region due to things like geology and hydrology. The map showing different ecoregions is below, along with the criteria, or typical clean water quality in those areas.



*Note for instructor: Replace below table with table representing your ecoregion.*

|  |  |  |
| --- | --- | --- |
| Parameter | Ecoregion II  Western Forested Mountains | Ecoregion III  Xeric West |
| Total phosphorous (µg/L) | 3.0-32.5 | 10-55 |
| Total nitrogen (mg/L) | 0.0-0.53 | 0.22-0.90 |
| Turbidity (NTU) | 0.25-5.5 | 1.93-5.13 |
| pH | 6.5-9.0 (consistency is more important than actual value) | |
| Dissolved Oxygen (mg/L) | < 3 = water of concern; < 1 = hypoxic, devoid of life  otherwise, depends on specific organism tolerance | |

Examine your watershed map of the water systems and the water quality data that you collected at each site to answer the following questions.

1. Did the values from the three sets of data that you have differ on any parameter? Why do you think this was the case?
2. Where in the watershed do you expect levels of phosphorous to be *higher* than where you measured? Where do you expect levels of phosphorous to be *lower? Why?*
3. Where in the watershed do you expect levels of nitrogen to be *higher* than where you measured? Where do you expect levels of nitrogen to be *lower?*
4. Where in the watershed do you expect levels of turbidity to be *higher* than where you measured? Where do you expect levels of turbidity to be *lower?*
5. How do the water quality parameters that you measured relate to the way you use water, where your water comes from, or your relationship with water?
6. Based on the activities that you did in the field, visualize the relationship that water has to your life again. What are some images that you think of when you think of water now?
7. Take another picture that answers the question, “what does water mean to you?” Compare your two pictures. Has anything changed with how you depicted water?