

Water Basins

Civil Engineering

Objective

- Connect the study of water, water cycle, and ecosystems with engineering
- Discuss how human impacts can effect our water basins, and how engineers lessen these impacts

Standards and Objectives

- Earth Systems Standard 4, Objective 1

Learning Outcomes

Students will learn:

- The basic concepts of water basins are why they are important
- To use a topographic map
- To delineate a water basin

Essential Questions

- What is a water basin?
- Why do engineers & scientists study water basins?

Time Required (Itemized)

- Topic introduction & discussion – 20 minutes
- Delineating water basin overview – 10-15 minutes
- Delineating Water Basin activity – 15 - 20 mintues

Assessments

- Each student will turn in a topographic map with delineated water basins.

Materials

- Topographic map (one copy is included in the water unit).

Lesson Description

Water basins are simply a geological bowl in which all the precipitation that falls in the bowl flows down to the bottom. Typically, a river or wash is located at the bottom of the bowl to provide basin drainage. Peaks and ridgelines separate water basins. These geological features are the highest elevation point between two water basins. If a drop of water fell exactly on the peak or ridge, then part of the water drop would flow into the first water basin and part of the water drop would flow into the other water basin. The direction water flows into basins is the way engineers and scientists delineate water basins.

Questions to ask students:

- What are water basins?

- How are water basins defined?

Why is it important to delineate water basins and study individual basins? Many water engineers and hydrologists study individual water basins because each small basin can provide water to a community, be impacted by human development, and be a source for flooding. Large water basins consist of thousands of small water basins. For example, the Colorado River System is one giant water basin, but it is comprised of millions of smaller water basins. Each major mountain range that contributes to the Colorado River is constructed of many individual water basins, as well. Sometimes engineers are concerned about the entire water system (like the Colorado River System); however, many times engineers and scientists are concerned about one or two individual water basins that form local watersheds and ecosystems.

One common situation occurs when new developments are constructed in a water basin. New developments usually mean asphalt and concrete will cover large amounts of once dirt-covered land. Asphalt and concrete are impervious materials (materials that do not allow water to seep into the soil). Impervious land coverage equates to additional runoff in a water basin. The amount of additional runoff is dependent upon the size and design of the new development. A commercial development, for example, will have significantly more impervious surface area than a residential development because there are more parking lots, sidewalks, and buildings covering the land. Engineers must study how new developments will affect the water basin's runoff because a significant increase in runoff will lead to flooding and possible damage to the ecosystem or personal property downstream of the new development. After the initial assessment, engineers may determine a water-regulating structure like a retention basin or small reservoir (both structures fill with water to detain water and allow a consistent level of flow downstream during peak runoff) will be necessary.

Questions to ask students:

- What is one reason engineers evaluate an individual water basin?
- What does impervious mean? What are examples of impervious land coverage?
- How can a new development effect a water basin's runoff?
- How can a dam or retention basin prevent flooding?

Procedure:

- Introduce the topic to the students. Define what a water basin is and why it is important to study water basins.
- Introduce students to topographic maps. Describe how to use a topographic map:
 - The lines on a topo map represent elevation.
 - The closer the elevation lines are, then steeper the mountainside.
 - Peaks are denoted with tiny circles.
 - Ridgelines are in between peaks. Many times, the elevation lines come together and form points. The "points" usually indicate the direction of the ridgeline.

- This included topo map shows shadowing. Shadowing can help visualize the ridgelines. The north slopes on this map are highlighted and the south slopes are shadowed.
- Help the students delineate one water basin. The basic procedure is:
 - Step one: locate the peaks (small dots running along the ridgeline).
 - Step two: start to locate the ridgeline surrounding the basin. Look for the elevation lines that join together to form points.
 - Step three: start to trace a line connecting peaks and ridgelines around a basin.
 - Remember: a water basin is a bowl with a river or drainage path down the middle. Identifying bowl-like images on the map and river pathways will help identify individual water basins.
- Have the student delineate the rest of the water basins on the map.
- The map included in the unit is of Mill D North between Millcreek Canyon and Big Cottonwood Canyon. There are three prominent water basins.