LESSON 2

Area Watershed Survey

Applicable TEKS

Science Grade 4	Science Grade 5	Science Grade 6
4.2 B	5.2 C	6.2 C
4.3 C	5.3 C	6.3 B
4.4 A	5.4 A	6.4 A
Math Grade 4	**Math Grade 5**	**Math Grade 6**
4.1 A	5.1 A, C	6.1 A, C
4.1 C	5.4 H	6.4 H
4.8 B, C	5.7 A	6.8 B, C

Duration

Two 40-minute lessons

Objectives

Students will outline a watershed and understand that stormwater in the watershed goes to its outlet.

Prerequisites

Students should understand the basics of topographic maps. Your students should also understand the water cycle and surface runoff.

Instructors should select a survey area and obtain topographic maps for that area before starting this lesson.

Materials

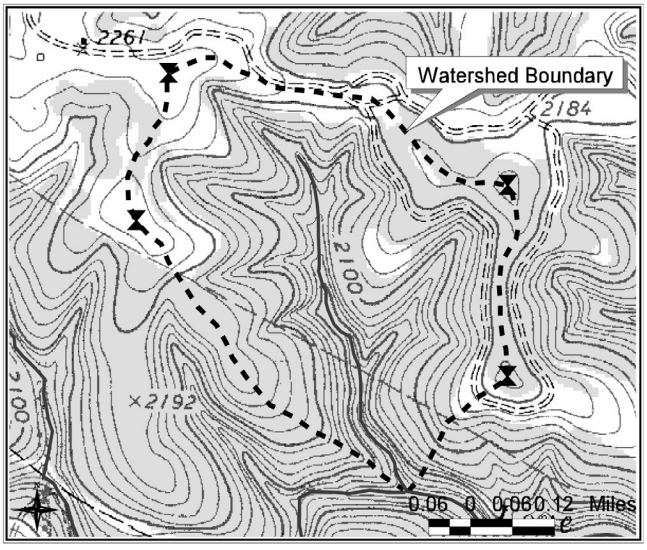
- *Handout 2—Area Watershed Survey*
- Topographic maps
  - Free topographic maps are available online at <nationalmap.gov/ustopo>. "Additional Resources" contains links to other sources.
- Rulers
- Optional: a computer and a projector

Procedure

1. Review with your students the information in the guide under "Watershed"—specifically, about surface runoff.
2. Have your students open their binders to Handout 2, which allows them to practice drawing a watershed. They should look at the map and visualize the topography of the stream and the watershed. Ask them to imagine which way the water would flow over the land. You might want your students to discuss together as a team.
3. Once they are familiar with the map, they should work together and:
   a. Find the stream and its low point.
   b. Mark the high points along the ridge of the stream.
   c. Start connecting the high points, following ridges, and crossing slopes at right angles to contour lines.
   d. Shade in or draw dots to fill in the estimated watershed area.
   e. Locate the scale on the map and estimate the dimensions of the watershed.
4. Discuss with your students that water at the low point could have come from anywhere within this watershed.
5. Next, show your students the survey area on their topographic maps.
6. Have your students outline the watershed for this area. Have them use the survey area as the low point. Explain that watersheds are very complex so everyone's watershed boundaries might look different.
7. Once completed, explain to them that stormwater within that watershed will go through their survey area.

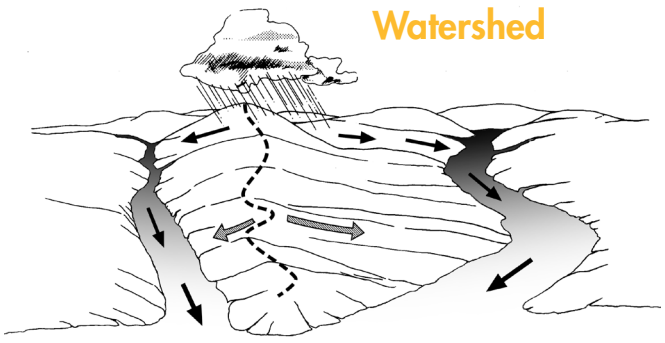
Handout Answers

Watershed Boundaries



Watershed

When precipitation hits the ground, it either enters the ground (called *infiltration*, or *percolation*) or drains across the land as surface runoff (called *stormwater*). The stormwater follows the drainage patterns of a *watershed*—a geographic area in which water, sediments, and dissolved materials drain into a common outlet. This outlet could be a stream, lake, reservoir, playa, estuary, aquifer, or ocean. The precipitation that enters the ground (*groundwater*) may eventually drain into a watershed or its outlet.



Watersheds are also commonly called *drainage basins* or *drainage areas*. The total area of land that contributes stormwater to the outlet is determined by topographic boundaries. A ridge or other area of elevated land (called a *divide*) separates one watershed from another. A stream on one side of the divide will flow to a different outlet than one that is on the other side of the divide.

In each watershed a variety of factors interact with the water in the system, including the climate, the amount of rainfall, the geology and geography of an area (soil, hills, lowlands, forests, etc.), and human activities (urban or industrial development, agriculture, etc.). Everything that happens in the watershed can contribute to what ends up in its outlet. Impurities such as oil and grease (from roads) or bacteria (from untreated wastewater, leaking septic systems, pet waste, or other sources) can be picked up in the stormwater and deposited into the watershed's outlet.

In natural areas (such as forests), vegetation slows the flow of water over the land, filters some impurities, and decreases erosion. As much as half of all rainfall that falls in these areas is absorbed into the ground. In urban areas, many vegetated surfaces are replaced with impervious cover (like concrete) which does not allow water to enter the ground. Instead, the amount of stormwater increases and it flows more swiftly downhill. This increased flow can lead to flooding, erosion, and additional impurities reaching a watershed's outlet. In many urban areas, less than one-third of all rainfall is absorbed into the ground.