TAKE CARE OF TEXAS: EDUCATOR MATERIALS

LESSON PLAN

Area Watershed Survey

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.

Duration

One 40-minute lesson

Materials

- Watershed Divide poster
- Watershed Divide handout
- Area Watershed Survey – Student Worksheet
- Rulers
- Perry-Castañeda Library Map Collection
- A computer

Introduction

Show the Watershed Divide poster to students and explain watersheds using the teacher information.

TEACHER INFORMATION

*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.

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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.

Pass out Watershed Handout to students either in pairs or individually. Students will use the information within the handout to complete the crossword and close test. Review vocabulary with students using the poster and having students explain each part of a watershed.

Procedure

Pass out the Area Watershed Survey worksheet to students. Students can be in pairs or small groups. Have students follow the steps to determining the watershed of the given topographic map. Once all groups have completed the worksheet have students come together and review the discussion questions as a class.

DISCUSSION QUESTIONS

1. How does using a topographic map help environmental investigators do their job?
2. Why do environmental investigators need to identify watersheds in areas with water pollution?
3. Give an example of how an average Texan might accidentally pollute a watershed.
4. What are some ways we can help reduce watershed pollution?

EXTENSION

If time allows, have students continue working as pairs or small group and visit the **Perry-Castañeda Library Map Collection** and locate the city or county topography map. Have students screenshot the map and using the same instructions as the Area Watershed Survey worksheet, find the watershed divide of their area. Students can the open the saved file in Paint or another drawing application and mark the highest points and draw boundary lines for the watershed. Once the watershed is properly marked students can share the image with an explanation on is within their watershed and whether they believe it will have issues such as flooding or erosion. Students can create a plan to resolve the issues for a further extension.

Glossary

- **Groundwater** – water that remains below the surface of the earth.
- **Infiltration (Percolation)** – the movement of water from the surface into the ground.
- **Stormwater** – surface water resulting from heavy rain or snow fall.
- **Topography** – physical features and elevations of a specific area.
- **Water Pollution** – contamination of water sources by substances that interfere with beneficial usage.
- **Surface water** – The water that you can see, like a lake or a river.
- **Precipitation** – The water that falls to the ground from the sky.
- **Reservoir** – Man made lakes that store water for drinking or to generate electricity
- **Tributaries** – The waters that flow down from the hills and mountains into the rivers
- **Aquifer** – Tiny spaces in the soil, rocks, and underground layers of sand and gravel

Applicable TEKS

Science TEKS

- **4th Grade** – §112.6.b.1A,G; 2A-B; 3A-C; 10B
- **7th Grade** – §112.6.b.1A,G; 2A-B; 3A-C; 11A

Mathematics TEKS

- **4th Grade** – §111.6.b.1A-G; 8A-C.
- **5th Grade** – §111.7.b.1A-G; 4H; 7A.
- **6th Grade** – §111.26.b.1A-G; 4H; 11A.

References

- Watershed Divide poster. https://takecareoftexas.org/resources/watershed-divide-poster
- Watershed Divide handout. https://takecareoftexas.org/resources/watershed-handout
- Area Watershed Survey- Student worksheet. https://takecareoftexas.org/resources/area-watershed-survey
- Perry-Castañeda Library Map Collection. https://maps.lib.utexas.edu/maps/topo/texas/