6-8 Topography Activity

South Carolina Aquarium

Overview

Focus Question
The mountains are high, the coast is low, so which way do you think the water will flow?

Activity Synopsis
Using newspaper and aluminum foil, students will create a model of a topographic landscape. Water will be sprayed on the model to observe the effect of topography on the shapes and sizes of drainage basins and watersheds. Also using newspaper and aluminum foil, students will create a model of the South Carolina landscape that simulates the topography, regions, flow of water and major watersheds found in the state.

Time Frame
2 hours

Objectives
The learner will be able to:

- Explain how topography affects the direction of water flow
- Explain how elevation creates the drainage divides of drainage basins
- Create a model of the topography of South Carolina that demonstrates the way that water flows through the state

Student and Teacher Key Terms

- drainage basin
- drainage divide
- region
- topography
- watershed

Standards

South Carolina College- and Career-Ready Science Standards 2021

6th Grade: 6-ESS2-4
7th Grade: 7-LS2-1, 7-LS2-2, 7-LS2-4
8th Grade:

***Bold standards are the main standards addressed in this activity**

6th Grade Performance Expectations
6-ESS2-4. Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity.

7th Grade Performance Expectations
7-LS2-1. Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.
7-LS2-2. Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.
7-LS2-4. Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.

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Cross Curricular Standards

South Carolina Social Studies Standards
6.5.CX, 7.5.1.PR, 7.5.2.ER

South Carolina College and Career Standards for ELA
Communication (C) – 6-1.1, 6-1.2, 6-1.3, 6-1.4, 6-1.5, 6-2.4, 6-3.2, 7-1.1, 7-1.2, 7-1.3, 7-1.4, 7-1.5, 7-2.4, 7-3.2, 8-1.1, 8-1.2, 8-1.3, 8-1.4, 8-1.5, 8-2.4, 8-3.2

Common Core ELA Standards
Speaking/Listening – 6.2, 6.3, 7.1, 7.2, 8.1, 8.2, 8.5
Language – 6.1, 6.6, 7.3, 7.6, 8.1, 8.3, 8.6
Reading for Literacy – 6-8.7, 6-8.8, 6-8.9

Background

Key Points
Key Points will give you the main information you should know to teach the activity.

- **Topography**, the shape and form of the land, plays a major role in defining the size and shape of **watersheds**. As water flows from high to low elevation, areas of high elevation, such as hills, mountains and even small rises in flat areas, can become **drainage divides**, the boundaries of watersheds.
- The **regions** in South Carolina, the areas of distinct topography, drop in elevation from the northwest to the southeast. For this reason, all watersheds in South Carolina flow southeast to the ocean.
- The regions in South Carolina from the northeast to the southeast are the Mountains, the Piedmont, the Sandhills, the Coastal Plain, the Coast and the Ocean.

Detailed Information
Detailed Information gives more in-depth background to increase your own knowledge, in case you want to expand upon the activity or you are asked detailed questions by students.

The force that moves the water in streams and rivers is not atomic energy, solar power or hamsters running in exercise wheels. It is gravity. The attraction of gravity pulls water from areas of high elevation to areas of low elevation. For this reason **topography**, the shape and form of the land, plays a major role in defining the size and shape of watersheds.

Watersheds or **drainage basins**, the area of land where all the water drains to one stream, river or lake, are surrounded by drainage divides. **Drainage divides** are areas of relatively high topography that separate two watersheds. Water that falls on one side of a divide will drain to a different basin than the water that falls on the other side. Drainage divides can be as high as the Rocky Mountains or as low as a small rise in the Lowcountry of South Carolina.

Continental land tends to rise in elevation as one travels inland from the coastline. For this reason almost all river and streams in watersheds across the world flow towards the coast and eventually will discharge into the ocean. There are exceptions, though, such as the Great Basin in the Southwestern United States. This is an area in Utah and Nevada of approximately 210,000 square miles. It contains the Great Salt Lake, a lake with no outlets that is three to five times saltier than the ocean. Its high salt content is caused by the salt and mineral deposits of the rivers flowing into the lake. With no outlets, the Great Salt Lake has been accumulating salt for centuries.

In South Carolina, all of the watersheds flow into the Atlantic Ocean. This is because of the elevation changes in the different **regions** of the state from the northwest to the southeast. Each region of the state is characterized by its topography. In the northwest corner of the state is the Mountains region. This is part of the Blue Ridge Mountain Range and contains the highest elevations in the state, up to 3500 ft. The next region in the state is the Piedmont, which is characterized by rolling hills and valleys and presents a drop in

elevation. The next region is the Sandhills, which, as you may have guessed, are sandy hills, the remains of ancient sand dunes and barrier islands. The next region is the Coastal Plain, very flat land that gradually drops in elevation to sea level. The final land region is the Coast, the lowest elevation in the state at sea level.

The watersheds flow from northwest to southeast, from the mountains to the sea. The three major watersheds, the Santee, Pee Dee and Savannah River watersheds, all start in the Blue Ridge Mountains of South and North Carolina and flow downwards toward the Atlantic Ocean. The smaller coastal watersheds, such as the Ashley, Edisto and Ashepoo Rivers, all begin in the Coastal Plain and flow to the ocean.

The topography of South Carolina was formed by three major forces: the continental collision that created the Appalachian Mountains, the periodic rising and falling of sea level through the ages and the erosion and deposition of streams and rivers. During the Paleozoic Era, the collision of the North American and African continental plates pushed the rocks upward that formed the Appalachian Mountains. This mountain growth occurred only at a few inches a century, but on the geologic time scale, this is rapid. At their tallest these mountains were as high as the Himalayas are today. This may be hard to believe by looking at the mild mountains we are familiar with in our time, but hundreds of millions of years of erosion have smoothed them down.

Sea level changes occur because the Earth's climate undergoes periodic changes in which the average temperature of the atmosphere will rise and fall. When it rises, the water frozen in the ice caps of the Arctic and Antarctic begins to melt and sea level will rise. As sea level rises, water begins to cover the land. In South Carolina, millions of years ago, the sea covered the Coastal Plain to the Sandhills in the mid-state near Columbia. The Sandhills are remnants of ancient sand dunes. When temperatures lowered, water was again captured in the icecaps and the coastline receded again. The ocean waters flattened most of the Coastal Plain, though ancient sand dunes and barrier islands have formed a few small hills.

In recent times, the topography of South Carolina has been shaped by the erosion and deposits of streams and rivers. The soils of the Piedmont are composed of sediment eroded from the Blue Ridge Mountains that have been deposited in the area by streams and rivers. The rivers and streams also have eroded the Piedmont region to form the low hills and valleys characteristic of the Piedmont region, and brought the sediment that composes the beaches and barrier islands. The erosion of streams and rivers do more to shape the topography of the land than any other geologic force.

All of these features combine to give the watersheds in South Carolina their size and shape. Mountains, hills and even a small rise in elevation in the Coastal Plain can form the drainage divides that are the boundaries of the watersheds. The drop in elevation from the mountains to the sea causes all of the watersheds in South Carolina to eventually empty into the sea. Knowing about the topography of South Carolina leads to a better understanding of the watersheds of South Carolina.

Procedure

Materials

- Physical map of South Carolina
- Map of South Carolina Regions
- Map of South Carolina Watersheds
- Seedling tray tops (one for each group)
- Newspaper
- Aluminum foil or plastic wrap
- Markers (one for each group)
- Spray bottles
- Blue food coloring
- Drinking straws or pencils
- Transparent tape
- Bottle of spices or sprinkles

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Procedure

Preparation: The teacher should have the spray bottles full of blue colored water ready prior to class.

1. Review the concepts of watersheds, drainage divides and drainage basins. Ask students to think about what creates the drainage divides in watersheds.

2. Divide the class into small groups. Each group will receive a tray, marker, newspaper, aluminum foil or plastic wrap and tape. Have students crumple newspaper into small balls and randomly tape them down in the tray. Next have them place aluminum foil or plastic wrap over the newspaper so it follows the contours to simulate the topography of mountains and valleys.

3. Using the marker, have students draw on the aluminum foil where they predict the drainage divides will occur in their models and where water might collect in pools. Bring the spray bottle(s) filled with blue colored water to each group, and have students spray several pumps of water on the model (for management purposes, you may want to do the spraying yourself). Students will observe how the water flows, what direction it moves and where it collects and compare this with their original predictions.

4. Review South Carolina Regions and South Carolina Watersheds using the maps (links). Observe that some drainage divides occur where there do not seem to be any major elevation differences, such as in the Coastal Plain. In their trays, have students tape drinking straws or pencils to the bottom and cover them with a sheet of aluminum foil or plastic wrap. Students will again predict where they think the water will flow. Again assist students in spraying water and have students observe where the water flows. Students will infer from this that even slight elevation changes can form drainage divides.

5. Now, have the students create a model of the state of South Carolina in their trays. Using newspaper, drinking straws and aluminum foil again, students should create a topography that simulates each region of South Carolina. The tray should have a definitely recognizable Mountain region, a Piedmont region, a Coastal Plain region leading into the Coast and finally the Ocean. The model will also represent the four major watersheds of South Carolina (Savannah, PeeDee, Santee and Coastal Rivers) and drainage divides will occur in similar positions to those found in South Carolina. Have students use the markers to predict the flow of water. Spray water on their model and the water should flow from the mountains to the sea and major drainage basins will be the same. Students do not need to worry about reproducing the position of rivers, streams, mountains and reservoirs, just watersheds and regions. The model does not need to be the shape of South Carolina, but can fit the shape of the tray.

6. Lastly, give the students spices or sprinkles and have them sprinkle them in two different spots on their topographic model. Again, spray the model with water. Have the student's watch what happens to the spices/sprinkles. Let them know that the spices/sprinkles represent pollution such as litter, oil or gas. Ask them what happens to pollution as it rains.

At-home Learning and Virtual Modifications

At-home: Send the following nearpod lesson to your students. This independent activity will cover the topic of topography. Students will learn about how the shape of the land determines how water flows. They will build a mountain to watch how water flows from high elevation to low elevation, then build a topographic map of South Carolina focusing on the 4 major SC watersheds. You will need to let them know how to turn in their videos to you.

Topography Nearpod Lesson

Virtual Learning: Use the same above nearpod link, but have the students complete the activity with you and their classmates virtually. Materials needed ahead of time for each student includes: a pan (9x13 works best), paper (or newspaper), tape, aluminum foil (or saran wrap), a marker and a cup of water. If students don't have the supplies to do this at home, you could demonstrate it for them virtually, asking for their advice along the way.

Follow-up Questions

- How accurate are these models? When it rains on soil, does all of the water stay on top of the soil and run off like it does on aluminum foil? Would some of the water become groundwater in the natural world? Does any of the water in the model become groundwater?
- How do the Appalachian and Rocky Mountains affect the shapes of watersheds and the direction of water flow in the United States?
- Is there anywhere in the United States where a watershed does not flow into one of the oceans or the Gulf of Mexico? Where and why?

Assessment

In their models of watersheds and topography of South Carolina students will:

- Show that the elevation of the topography in the northwest of the state is higher than the topography in the southeast of the state.
- Show that water flows from the northwest mountains to the southeast sea.
- Correctly delineate the major watersheds of South Carolina and place elevation to create drainage divides in the approximate location of where they occur in the state.

Scoring rubric out of 100 points

The elevation decreases from the Mountain region to the Coast region:	20 points
Water flows from the Mountain region to the sea:	20 points
When water is sprayed, four separate watersheds can be observed on the model:	20 points
1-2 watersheds are correct in position and roughly shaped as they appear in SC:	20 points
OR	
3-4 watersheds are correct in position and roughly shaped as they appear in SC:	40 points

Cross Curricular Extensions

STEM Extension
Water flows from high elevation to low elevation and with it can carry pollution downstream. Have students brainstorm ways to keep pollution from either getting into the water or flowing downstream. Make sure their idea allows for animals to survive as well.

Art Extension
Pass out one piece of art paper and a straw to each student. Have students lightly crumple the paper and then flatten it out again. Put a few drops of ink or paint at the edge of the paper. Have the students come down level with the paper and blow through the straw at the drop of ink. The ink will branch out as it moves over the paper to create a shape that is similar to that of a watershed. After the ink has dried have students compare the pattern of their blown ink with the patterns of watersheds in South Carolina. Are any of them similar? Have them think about how differences in elevation on the paper might have the same effect on flowing water as differences in elevation on land.

Art Extension
Have the students design a T-shirt to promote awareness of one of South Carolina's watersheds. Have them depict aquatic habitats found in the watershed and show some of threats that may be affecting the health of that watershed.

Social Studies Extension
Have the students plot the location of schools that share their watershed, preferably one for each geologic region (Mountains, Piedmont, Sandhills, Coastal Plain, and Coast). Through e-mails or letters students from each school will communicate with each other to describe their local topography and aquatic habitats and how they are used (do students hike to see waterfalls, go white-water rafting, go surfing, etc.). Students may exchange artifacts from their region such as shells or pressed mountain flowers.

Resources

Teacher Reference Books

Cvancara, Alan M. A Field Manual For The Amateur Geologist: Tools and Activities for Exploring Our Planet, John Wiley & Sons, Inc., New York, 1995.
This field guide contains information on the physical environment.

Kovacik, Charles F. and John J. Winberry. South Carolina: the Making of a Landscape, University of South Carolina Press, Columbia, 1989.
This wonderful reference book provides information on the abiotic factors that determine the habitats of South Carolina.

Murphy, Carolyn Hanna. Carolina Rocks!: The Geology of South Carolina, Sandlapper Publishing Co., Inc., Orangeburg, 1995.
Information on the geology, topography and formation of all of the regions in South Carolina.

Plummer, Charles C. and David McGeary. Physical Geology, Wm. C. Brown Publishers, Iowa, 1991.
Though admittedly college textbooks are often a little too dry and in-depth, with their text, photographs and illustrations they are often the best resources for finding information on a particular subject. This college textbook is an excellent resource for anyone wanting to know more about geology.

Teacher Reference Websites

Chesapeake Bay Foundation Environmental Education
www.cbf.org/
The Chesapeake Bay Foundation has put together an exemplary watershed protection program that encompasses many states. This site includes information on what they have done in this program as well as curricula and other education related items.

EPA'S Environmental Education Center
www.epa.gov/teachers/
Provides information on water and watersheds and links to other sites.

EPA Office of Water: Office of Wetlands, Oceans and Watersheds
www.epa.gov/owow/
Provides information on watersheds, wetlands, water quality plus much more.

South Carolina Department of Health and Environmental Control (DHEC): Bureau of Water
www.scdhec.net/water
This site offers information on drinking water, water pollution control, watersheds plus much more.

Southern Appalachian Watershed Conservation Clearinghouse
http://sunsite.utk.edu/samab/proj/watershed.html
This site offers links to a number of websites related to watershed conservation in the Southeastern United States.

Surf Your Watershed: A Service to Help You Locate, Use, and Share Environmental Information about your Place
www.epa.gov/surf
This site allows you to learn specific information related to the watershed your town is located in.

U.S. Geological Survey
www.usgs.gov/
This site offers valuable earth science information on a variety of topics.

Water Science for Schools
http://ga.water.usgs.gov/edu/
Background information on water and watersheds is provided on this site.

Student Reference Books

Eyewitness Books: Earth, Susanna Van Rose. Dorling Kindersley, London, 1994.
These very attractive books use photographs, illustrations and text to teach the reader about the earth.

Haslam, Andrew. Make It Work! Rivers, World Book Inc./ Two-Can, Hong Kong, 1996.
Readers will explore the rivers of the world and determine how they affect Earth.

Levete, Sarah. Closer Look At: Rivers and Lakes, Copper Beech Books, Connecticut, 1999.
This book uses photographs, illustrations and text to teach the reader about rivers and lakes.

Taylor, Barbara. Earth Explained: A Beginner's Guide to Our Planet, Henry Holt and Company, New York, 1997.
This book uses photographs, illustrations and text to teach the reader about the earth.

Curricula

JASON Science: Education through Exploration
The JASON Science is an interdisciplinary curriculum for K-12 teachers focusing on the geology, climate, biology and biodiversity of specific regions in the world. The activities cover a broad range of topics.
For more information click on: http://www.jason.org/public/whatis/start.aspx

SC MAPS
SC MAPS is a standards-based interdisciplinary curriculum for middle school teachers that focus on the geology of the regions of South Carolina using aerial photographs, images and topographic maps. Great source for good maps!
For more information visit the website at http://www.cas.sc.edu/cege/resources/scmaps/scmaps.html