

Watershed Models

Driving Question: How can I, along with my family and community, positively affect our watershed?

Investigative Question for this activity: How does water movement affect a watershed as a whole?

End-of-activity reflection question (SOL big idea reflection): What did I learn about the characteristics of Virginia watersheds?

Goal: Students build a model to explore watershed characteristics and use the model to learn how landscape characteristics (such as elevation, slope) determine the flow of the water in a watershed.

Learning Objectives:

Knowledge- Students learn the characteristics of watersheds in each of Virginia's five geographic regions. They learn that water flows from high elevations to low elevations, that the highest elevations (such as ridge lines) define the upper boundaries of a watershed, and the lowest elevations (such as rivers, ponds, or lakes) define the lower watershed boundaries.

Students also learn that slope influences erosion.

Skills- Students practice inquiry investigations and questioning skills, making predictions and observations.

Values - Landscape dictates human use and humans change landscapes to suit building needs.

Virginia SOL: VS.2 b&c (2015); Science 4.1, 4.8 (2018)

From VA Studies SOL VS.2 b&c Curriculum Framework:

The 5 geographic regions have distinctive characteristics. Water features were important to the early European colonization of Virginia.

From VA Science SOL 4.8 Curriculum Framework:

4.8 Big Idea (central idea): Virginia has many natural resources including watersheds, minerals, rocks, ores, soil, land & forests.

Building watershed models based on the characteristics of Virginia physiographic regions helps students understand that Virginia has many types of watersheds and that all these watersheds are important resources that determine water flow on the land and into bodies of water.



 = Science and Engineering Practice (SEP)

This activity helps develop skills in SEP 4.1e developing and using models: develop and/or use models to explain natural phenomena & identify limitations of models

4.8 The student will investigate and understand that Virginia has important natural resources. Key resources include:

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a) watersheds and water

Enduring Understandings	Essential Knowledge and Practices
<p>Natural resources are necessary or useful to humans. Many natural resources are distributed unevenly around the planet.</p> <ul style="list-style-type: none"> · Virginia has many natural resources. Some examples of Virginia’s natural resources include minerals, plants, animals, water, soil, and land (4.8 a, b, c, d). · A watershed is an area of land over which surface water flows to a single collection place. The materials from the watershed, including pollutants, add to the water flow and impact organisms that may serve as a natural resource for humans. The Chesapeake Bay watershed covers approximately half of Virginia’s land area. The other two major watershed systems in Virginia are the Gulf of Mexico and the North Carolina sounds (4.8 a). <i>Students do not need to identify all the major watersheds in Virginia; however, they should be able to identify the watershed in which they live.</i> · Virginia’s water resources include lakes, rivers, bays, and the Atlantic Ocean (4.8 a). 	<p>In order to meet this standard, it is expected that students will</p> <ul style="list-style-type: none"> · describe characteristics of Virginia’s waterways (including rivers, bays, lakes, and the Atlantic Ocean), name an example of each, and discuss the importance of the waterways to Virginia (4.8 a) ·  create and interpret a model of a watershed (4.8 a) ·  use evidence to explain the statement, “We all live downstream.” (4.8 a)

Materials (per group)

- Aluminum pan (turkey roasting pan)
- Plastic table cloths, cut to a good size for the pans

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- Squirt bottles with water; Food coloring
- Newspaper/recycled paper
- Sticky Post-It notes--arrows
- Pepper shakers filled with pepper
- Towels for clean up
- Virginia Relief Map or Map of Virginia Regions
- Virginia's Geographic Regions Cards (one region per group)

Set Up For each team/group of 4 students, place a set of the materials listed above at each work table/location.

Special Safety

Floor can become wet from the water spray.

Procedure/Instructional Practice

1. Inquiry Engagement, Part 1: Ask students some of the following questions: How does water get to your house? Where does the water go after you use it? Where does water go after it falls on land?
2. Inquiry Engagement Part 2: Once students are thinking about water and how it gets to different places, inquire: What is a watershed? Describe a watershed. Do you know your watershed address (i.e., Do you know what watershed you live in)? A watershed is an area of land over which water flows to a single collection place. Ask students for examples of watersheds.
3. Explore (investigation instruction): Each student group will pick a geographic region card from a bag. Instruct students that they are to build a landscape, based on the geographic region card they picked, using the materials found on their tables (see the materials list). Model the following process :
 - a. Quickly describe a landscape for the students, such as the Rockies or the Himalayas or a desert valley. Ask students to describe how that landscape will look.
 - b. Place crumpled paper in a turkey pan to lay the foundation for mountains and valleys.
 - c. Form the landscape by placing the plastic table cloth over the paper form (tuck in the sides so the water stays inside the tray).
 - d. Tell students to use the post-it arrows to predict the ways water will move over the landscape; i.e., what direction will the water flow when it rains?
 - e. Once the landscapes are built, students use the spray bottles to simulate rain on their landscapes. They observe how the water moves over their landscapes to determine if their predictions about water flow were accurate. After students have made their initial observations and have evaluated their predictions about water flow, they can sprinkle pepper on their landscapes to model erosion of soils and/or rocks. When the students use the spray bottles again to create "rain", they can explore the process of erosion and how the angle of slope (steepness) affects erosion.

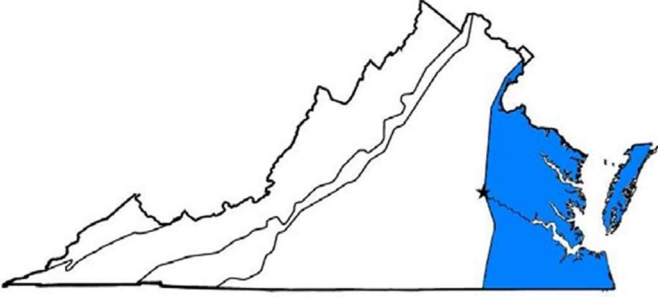
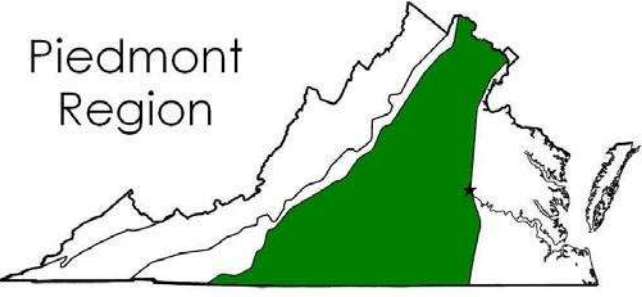
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- f. As students work in their teams, go to each group and ask:
 - i. Where are the high and low elevation points?
 - ii. Where are the steepest slopes? The more gentle slopes?
 - iii. What determines where the water will go?
 - iv. How would you describe some of the water resources? (are there lakes, rivers, a bay? An ocean?)
 - v. Did the water move as you predicted?
4. Tell student teams that at the end of the activity, they will share their model with the rest of the class and answer the above questions during a gallery walk.
5. Gallery Walk/ Explain: Instruct students to put down spray bottles. Remind students that they will share the above details with the rest of the class during the gallery walk. Ask the class to hover over the table while each of the student teams describe and SHOW how water moves (using the spray bottle; nice visual).
6. Clean up: While students are working on their paragraph (if you choose to do the extension activity), ask your instructional helpers to bring the entire model to a designated place to empty the water and either discard or save for future models the recycled papers. The plastic table cloths should be taken outside and shaken to remove as much water as possible. At the end of the instructional day, hang the tablecloths outside to dry, if possible. If no instructional helpers, you can designate roles in the student teams.

Extensions

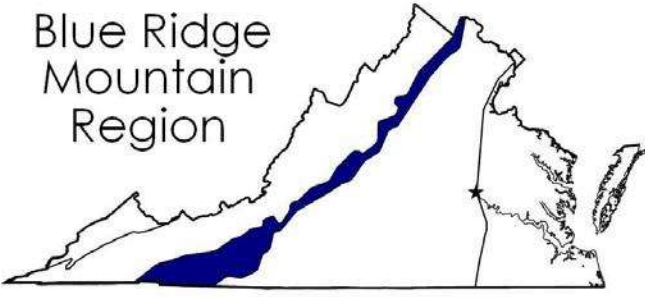
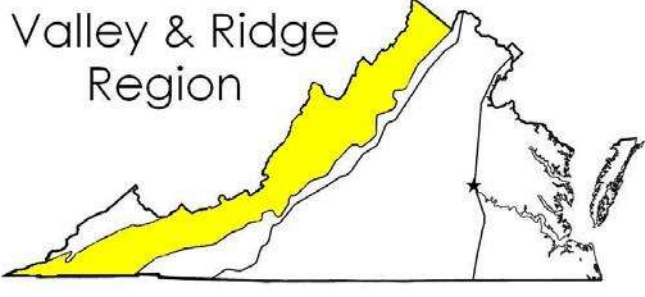
After the gallery walk, ask students to provide details on what they learned about watersheds from this modeling activity. Ask them to raise hands and give responses to "What is a watershed?" Students can use the key words and concepts they generate to write an explanatory paragraph to help develop skills in writing.

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<p>Coastal Plain</p> 	<p>Characteristics</p> <ul style="list-style-type: none">• Land is low in elevation flat & close to the ocean• Location near Atlantic Ocean and Chesapeake Bay• Includes Eastern Shore• East of the Fall Line <p>Products</p> <ul style="list-style-type: none">• Seafood• Peanuts <p>Industry</p> <ul style="list-style-type: none">• Shipbuilding• Tourism• Military
<p>Piedmont Region</p> 	<p>Characteristics</p> <ul style="list-style-type: none">• Land at the Foot of Mountains• Gentle, rolling hills• West of the Fall Line <p>Products</p> <ul style="list-style-type: none">• Tobacco• Corn• Information Technology <p>Industry</p> <ul style="list-style-type: none">• Farming• Horses• Federal & state government

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Watershed Models

<p>Blue Ridge Mountain Region</p> 	<p>Characteristics</p> <ul style="list-style-type: none">• Old, rounded mountains• Part of Appalachian mountain system• Located between the Piedmont & Valley and Ridge• Source of many rivers <p>Products</p> <ul style="list-style-type: none">• Apples• Small Family Farms <p>Industry</p> <ul style="list-style-type: none">• Recreation• Farming
<p>Valley & Ridge Region</p> 	<p>Characteristics</p> <ul style="list-style-type: none">• Includes the Great Valley of Virginia and other valleys separated by ridges• Part of Appalachian mountain system• Located west of Blue Ridge Mountains <p>Products</p> <ul style="list-style-type: none">• Apples• Poultry• Dairy <p>Industry</p> <ul style="list-style-type: none">• Farming



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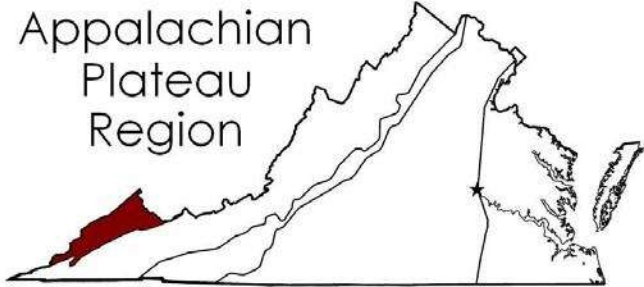


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Region maps accessed 2/10/16 at

Appalachian
Plateau
Region



Characteristics

- Located in Southwest Virginia
- Plateau makes this region higher in elevation than other VA regions
- Only a small part of the plateau is located in Virginia

Products

- Coal

Industry

- Coal Mining

<http://www.lcps.org/cms/lib4/va01000195/centricity/domain/5598/varegionsstudyguidekey.pdf>