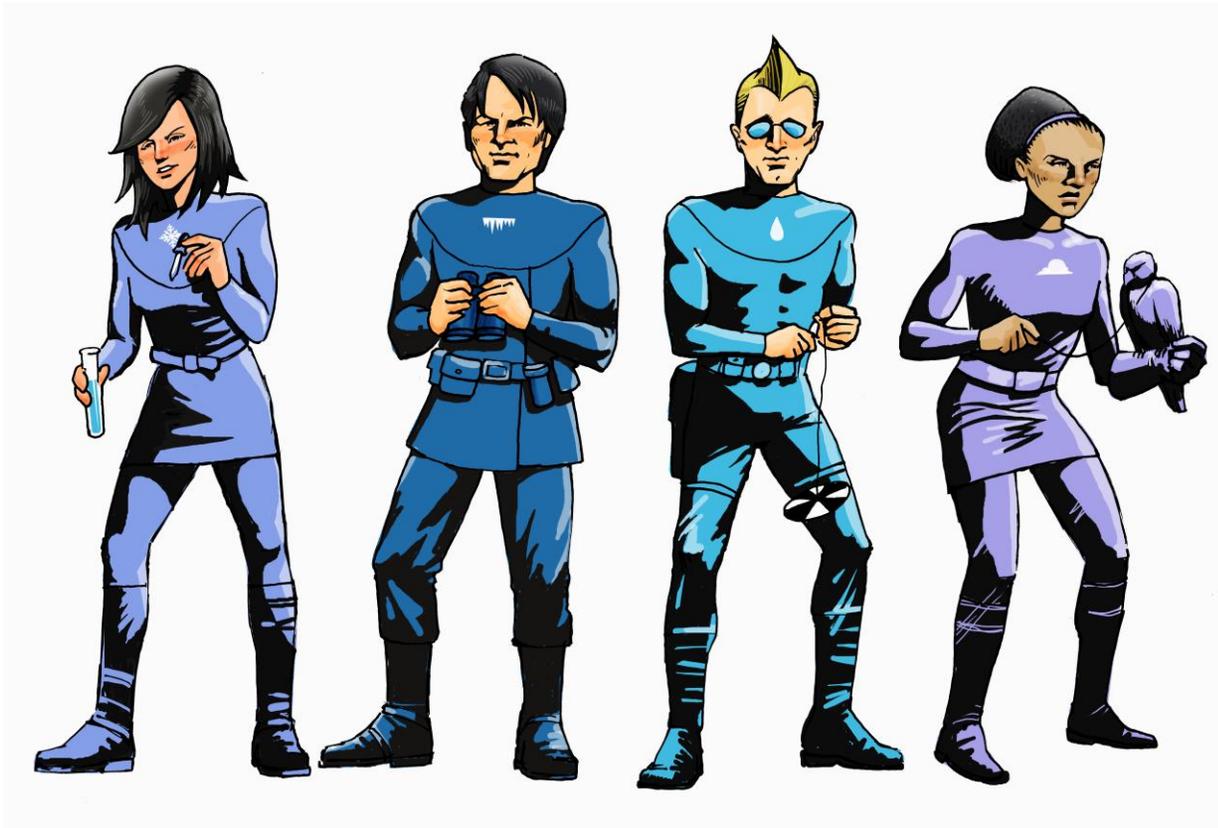


The Ways of Water

Teacher's Guide: Grade 8



AQUA TEAM

the Next Generation



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Lesson 2: Topographic Mapping – The Ups & Downs of Mapmaking

Purpose

The Beaver Lake Watershed includes all the rivers, streams, and runoff from sloping land which flows into Beaver Lake. It is impacted by activities that occur within the surrounding waterways and sloping areas. Activities such as recreation, farming, construction, and industry all affect the quality of the water in Beaver Lake. Geologic Beaver Lake Watershed maps may be found at the Beaver Water District website, www.bwdh2o.org, and the United States Geological Survey website, <http://www.usgs.gov/pubprod/>.

Objective

Students will construct a 3-dimensional watershed model and generate 2-dimensional (planar) map of their watershed.

Arkansas Framework Correlation

Language Arts

8th Grade

IR.12.8.9 Use research to create one or more oral, written, or visual presentations/products.

Science

8th Grade

ESS.8.8.3 Conduct investigations to compare and contrast different landforms found on Earth: mountains, plateaus, plains

ESS.8.8.7 Use topographic maps to identify surface features of Earth

Mathematics

8th Grade

G.8.8.2 Make, with and without appropriate *technology*, and test *conjectures* about characteristics and properties between *two-dimensional* figures and *three-dimensional* objects.

Social Studies

8th Grade

G.1.8.3 Construct specialized maps using data (e.g., *climate*, population, *political* units, resources).

G.1.8.5 Analyze the influence of Earth's physical features on the development of *regions* of the world.

Problem Question

What man-made constructions and/or natural features have the greatest effect on stream dynamics and water quality in the Beaver Lake Watershed?

BACKGROUND INFORMATION

- A topographic map is a map that depicts changing elevation in landforms. (the ups and downs of the terrain)
- Beaver Lake is surrounded by sloping landforms and numerous streams flow into it.
- In 1879 the U.S. Geological Survey (USGS) was established and produced the first topographic map.
- In the 1940's, scientists began to measure and interpret aerial photographs to produce topographic maps.

- On a topographic map, different colors are used to model natural structures and elevations.
- On a topographic map, brown contour lines show landform elevations.

Timeline

One to two (1-2) class periods.

Materials

- Modeling medium (choose from clay, sand, soil, dough, etc.)
- If a volleyball sand court is available, use it!
- Water in pouring container (optional) *How much mess are you willing to deal with?*
- String or yarn
- Tray, board, or AL foil covered cardboard for model base
- Scissors
- Paper and pencil (mapping)
- Paperclip

Teacher Preparation

Make materials and art supplies available.

Additional Resources

Resources for materials not included:
UA Center for Math & Science Education
<http://www.uark.edu/~k12info/>
479.575.3875
Northwest Arkansas Education Co-Op
<http://starfish.k12.ar.us/web/>
479.267.7450
Beaver Water District
www.bwdh2o.org
479.717.3807
Know of other resources? Please let us know!
education@bwdh2o.org or 479.756.3651

7E's Topographic Mapping

Elicit

In pairs or small teams, students answer questions (at the end of this lesson) about topographic maps. Use whatever resources you have available to collect data on what the students already understand.

- Have students write letters of correct answers on a sheet of paper or individual sized marker boards and hold up their team's answer after each question.
- Use an electronic clicker system.
- Use a program in the computer lab to enter the questions and gather data

Engage

Interactive building of a topographic map to be done in pairs or in a whole group, on computer in the classroom with a projector. <http://www.forgefx.com/casestudies/prenticehall/ph/topo/topo.htm>.

Explore

Procedure:

1. Using the modeling materials supplied by the teacher, construct a watershed with hills of varying elevations.
2. Optional: Be sure that it is water-tight. Then, partially fill the "lake" of your model.
3. Using a pencil point or paperclip end, make rows of holes (at same height) all around the "lake" and at other levels on the model. **The holes in each row should be the same height.** Use a ruler to keep the holes level.
4. Carefully, lay lengths of string (yarn) around each hill to join the holes in each row.
5. Looking down on your model, the lines of string will be the contour lines on the map.
6. Draw the topographic map of your model. Be sure to draw a line at the height of the lake edges.
7. Place your model and maps where the teacher instructs to prepare for walk-around.

Explain

Walk Around; Student teams will now rotate around the room comparing student topographic maps to the watershed model that was constructed. Leave notes at each model about what is good and how to improve. (Teacher may want to time the rotation and have students rotate to the next model approximately every 2 minutes.

Elaborate

Student teams use the notes from other teams and the teacher to improve their model and topographic maps.

Evaluate

Student will be evaluated by

- the walk around by students during “*Explain*” part of lesson.
- informal monitoring of the teams as they build the model and draw the maps.
- formal assessment of the model and corresponding maps.

Extensions

Using aerial photographs of the Beaver Lake Watershed, have student partners draw topographic maps of the area.

Questions for Elicit

1. On a topographic map, a contour line shows points of __ elevation(s)?
 - a. equal
 - b. higher
 - c. lower

2. Topographic maps show
 - a. political boundaries for congressional districts
 - b. manmade features such as historical markers
 - c. contour lines showing shape and elevation of land

3. What color is a contour line on a topographic map?
 - a. black
 - b. white
 - c. yellow
 - d. brown

4. What color is water on a topographic map?
 - a. white
 - b. green
 - c. blue

5. Woodlands are what color on a topographic map?
 - a. white
 - b. green
 - c. blue
 - d. black

6. V shaped contour lines point
 - a. downstream
 - b. upstream

7. The first U.S. Geological Survey (USGS) topographic map was produced in
 - a. 1752
 - b. 1879
 - c. 1925

8. In 1940 a great stride was made in mapmaking. What brought this about?
 - a. satellite imagery
 - b. aerial photography
 - c. infrared imagery

Answers to Questions for Elicit

1. A
2. C
3. D
4. C
5. B
6. B
7. B
8. B

