Seeing Watersheds

This lesson is correlated to Grades 4-8 and recommended for upper elementary and middle school aged children. The lesson is correlated as written in the Project WET Curriculum and Activity Guide 2.0 is are meant to show how activities support a standard, performance expectation and/or three-dimensional learning. NGSS correlations are provided in detail in a separate document to demonstrate how the content of the activity provides a three-dimensional learning experience. Common Core State Standards correlations for grade spans assume that teachers will be familiar with the standards for their respective grade level(s) and be able to apply them judiciously.

Summary: Students use maps to characterize what a watershed is; to identify the key parts and functions of watersheds; to determine watershed boundaries; to discover how watersheds are named; and to describe how water flows in a watershed based on elevation.

Common Core: ELA: RH.6-8.7; RST.6-12.2; RST.6-8.7

NGSS: 4-ESS2-1, 4-ESS2-2, 5-ESS2-1, 5-ESS2-2

Instructions for Educators

1. Distribute the pdf lesson of Seeing Watersheds to students.
2. Have them complete the lesson as instructed.
3. Ask students to turn in the completed lesson and student pages to you.
4. Research your local watershed so that you know what watershed you live in and what bigger wastershed you are a part of.
5. To download the full Seeing Watersheds activity for free including background information, objectives and full instructions for classroom use, go to store.projectwet.org/covid-19-free-resource-downloads.html.
6. See answer key on following pages for this lesson.
Pre-Activity Questions:

1. Do you know what a watershed is? Pick the best answer:
   a. A shed with water
   b. A giant body of water
   c. An area of land that drains to a common river
   d. A river that drains into the ocean

2. What watershed do you live in? (You will need to research this yourself. Ask your city or local water utility)

Procedure

Warm Up

1. Fold your wax paper or aluminum foil in half and set it up to look like the photo by placing it on a cookie sheet or large plate.

2. Spray or SLOWLY pour some water on one side of the fold in the wax paper or aluminum foil.

3. What happens to the water? The water:
   a. Stayed in place
   b. Moved up the paper slope
   c. Moved down the paper slope

4. What force moves water?

   Try This!

   Take your pen or pencil and hold it in front of you then let go. What happened? What is the force responsible for this?

   Gravity

5. Spray or SLOWLY pour water on the fold of the wax paper or aluminum foil. How did the water move? Did it move down one side or both sides?
Both sides

Next, crumple your paper or foil as in the picture. Spray or SLOWLY pour some water over the wax paper or aluminum foil.

6. What happened to the water on the wax paper or foil? Describe how water moved over the folds. Water moves down the paper through different folds or valleys on the paper. It pools in some areas and may run onto the cookie sheet for some.

7. The wax paper represents an area of land to show how water moves and pools. Pools represent lakes, and water movement represents rivers.

Activity

See Teacher Answer Keys Pages

Assessment

1. Water flows from high to low elevations. Are the headwaters and tributaries of a river at a high or low elevation compared to the main stem?
   a. High
   b. Low

2. Is the main stem of a river at a high or low elevation?
   a. High
   b. Low

3. Given that the headwaters of the river and tributaries are at high elevations, what do the lines connecting the dots represent?
   a. Ridgelines of hills/mountains
   b. Valleys
   c. Highways
d. State boundaries

**Your Local Watershed**

1. Research the watershed you live in. You can call your local water utility or city to learn about your watershed. It is very likely the major river near where you live. What is the major water source that water flows to?

   **You will need to research this yourself**

2. What is the larger watershed you are in (for example Mid-Atlantic or Missouri)? Where does it start and where does it empty? Look at the map below to help you identify it.

   **You will need to research this yourself**

![Water Resource Regions](image-url)
1. What information does a topographic map provide?
   See below. Elevation or terrain are also acceptable answers

   A topographic map indicates “relief.” Relief is the difference in elevation between two points. If the relief is low, the area is flat, such as a river valley. If it is high, the slope is steep, indicating hills or mountains.

2. Study the simple map below. What do the lines indicate?
   Contour lines

   The lines are contour lines that connect points at the same elevation along a line.

   2a. All points on line B are 1040 feet in elevation.

   All points on line A are 1020 feet in elevation.

   The contour interval is the difference in elevation between adjacent contour lines. (On the map, line B is adjacent [next to] line A.) Among topographic maps, contour intervals vary. Contour intervals are large for very steep areas (80-100 feet) but are smaller for lower areas (10-20 feet). Although contour intervals may vary, on a single map they are consistent (the same).
2b. What is the contour interval for the map above?

The difference in elevation between line A and line B is 20 feet. Therefore, the contour interval is 20 feet.

Is the contour interval consistent (always 20 feet) for this map? 

YES [YES or NO] The difference in elevation between each contour line is 20 feet.

What landform do you think this map represents? 

A mountain or hill

Imagine that you are a bird flying over and looking down on this landform. The elevation at the top is the greatest, 1,060 feet, and continues to decrease as you move “down” the landform. Another way to think of this representation of a hill is a collapsible cup.

Imagine you had a collapsible cup. Turn it over so that the wide part (from which you would drink) is flat on the table. Now imagine pushing down on the cup, collapsing it. A topographic map is like that—the landforms are “collapsed” on paper.
3a. Now look at this more complicated topographic map. Study the contour lines and the contour interval. Imagine you are a bird flying over this area. The greatest elevation is at the top and tapers down to the bottom.

What are the landforms? Remember the shape of the hill in the first map.

This is a topographic map of two ________________________________ connected by a saddle [a ridge connecting two higher points].

3b. What do the arrows indicate? See the key.

____________________________________________________________

The arrows show the flow of ____________________ across the surface of the land. A general rule is that water runs perpendicular to contour lines.

4. Do watersheds only occur in hilly or mountainous areas where there are definite changes in elevation?

No. Everyone lives in a watershed!
Seeing Watersheds

Summary

You will use maps to define a watershed and identify the key parts and functions of watersheds, including determining watershed boundaries, discovering how watersheds are named and describing how water flows in a watershed based on elevation.

Digital Option

This activity is available as a digital lesson on your computer, tablet or smartphone. You may choose to do the activity digitally if you prefer, but check with your teacher first. Scan the QR code below with your smartphone camera to access the digital version or go to lessons.projectwet.org/seeing-watersheds.

Pre-Activity Questions:

1. Do you know what a watershed is? Pick the best answer:
   a. A shed with water
   b. A giant body of water
   c. An area of land that drains to a common river
   d. A river that drains into the ocean

2. What watershed do you live in? ________________________________
Materials
Please gather these materials before starting.

**Warm Up**
- Wax paper or aluminum foil *(regular paper can also work if you don’t have either)*
- Spray bottle with water or 1/2 cup of water and a tablespoon
- Cookie sheet or large plate
- 3-in tall prop such as a food storage container or an apple or orange

**Activity**
- Student Pages Blue River and Four Rivers
- Four different-colored pens or markers *(or just one color and you will use different types of lines)*

Procedure

**Warm Up**
1. Fold your wax paper or aluminum foil in half and set it up to look like the photo by placing it on a cookie sheet or large plate.
2. Spray or SLOWLY pour some water on one side of the fold in the wax paper or aluminum foil.
3. What happens to the water? The water:
   - a. Stayed in place
   - b. Moved up the paper slope
   - c. Moved down the paper slope
4. What force moves water?

*Try This!*
Take your pen or pencil and hold it in front of you then let go. What happened? What is the force responsible for this?
5. Spray or SLOWLY pour water on the fold of the wax paper or aluminum foil. How did the water move? Did it move down one side or both sides?

6. Next, crumple your paper or foil as in the picture. Spray or SLOWLY pour some water over the wax paper or aluminum foil.

7. What happened to the water on the wax paper or foil? Describe how water moved over the folds.

8. The wax paper represents an area of land to show how water moves and pools. Pools represent lakes, and water movement represents rivers.

**Activity**

**Activity Materials**

- *Student Pages Blue River and Four Rivers*
- *Four different-colored pens or markers (or just one color and you will use different types of lines)*

1. Take out the *Blue River* Student Page.
2. Color the **main stem** of the river blue or a color of your choosing.
3. Locate the **headwaters** of the main stem river and place a dot there. The headwaters are where the river originates, possibly coming out of the land as a spring.
4. Next, locate the four **tributaries** and color them blue as well. In this case there are both primary and secondary tributaries. Tributaries are parts of the river that contribute to the main stem. Primary tributaries connect to the main stem and secondary tributaries connect to the primary tributaries.
5. Place dots at the beginning of each of these tributaries.
6. Draw a line to connect the dots starting at “Start Here” and moving around the tributaries, including the headwaters.
7. You should now have a defined boundary around your Blue River watershed. Congratulations! You just defined a watershed!

A watershed is more than just the waterways that flow within it—a watershed is a system that includes all the land, water and animals within the defined boundary.

8. Now we will look at a larger watershed made up of several smaller watersheds. Take out your Four Rivers Student Page. Color each main stem of a river based on its name: blue for Blue River, red for Red River, etc. If you do not have different colors, then use shapes or dots and lines to code each river.

9. Color the primary and secondary tributaries of each river the same color as the main stem.

10. The headwaters of each stem are labeled with HW. Place a dot in the corresponding color at the headwaters of each river on your Four Rivers copy page.

11. Next place a dot at the beginning of all tributaries in each river. Connect the dots for each river, being careful not to cross over rivers. The red river has been done for you as an example. If you do not have different colors, then use different dotted lines.

12. How many watersheds do you see? (You should see four distinct watersheds: red, green, blue and orange.)

Assessment

1. Water flows from high to low elevations. Are the headwaters and tributaries of a river at a high or low elevation compared to the main stem?
   a. High
   b. Low

2. Is the main stem of a river at a high or low elevation?
   a. High
   b. Low

3. Given that the headwaters of the river and tributaries are at high elevations, what do the lines connecting the dots represent?
   a. Ridgelines of hills/mountains
   b. Valleys
   c. Highways
   d. State boundaries
Topography

This is a topographic map of a drainage in Yellowstone National Park. On this map it is clear that the river and its tributaries are in valleys. The ridge lines divide each creek.

The dots are at the end of the tributaries for Cache Creek. The line connecting them is along a ridge line. All water within the black line boundary flows downhill into Cache Creek.

Complete the *What’s in a Drop?* Student Page to learn more about topography.
Your Local Watershed

1. Research the watershed you live in. You can call your local water utility or city to learn about your watershed. It is very likely the major river near where you live. What is the major water source that water flows to?

2. What is the larger watershed you are in (for example Mid-Atlantic or Missouri)? Where does it start and where does it empty? Look at the map below to help you identify it.

Source: USGS
Glossary

**Basin**: A large or small depression in the surface of the land or on the ocean floor. A geographical feature describing a depression or lower lying area than the surrounding terrain.

**Catch basin**: Also called a catchment. A reservoir, well or low area that surface water may drain into.

**Continental divide**: The line that separates the major watersheds in a continent, such that the waters from each flow into different oceans or seas.

**Contour interval**: The distance between two adjacent topographic rings on a map that indicate where an elevation change has occurred. The intervals of elevation change can vary depending upon the detail of the map.

**Contour lines**: The topographic lines on a map that connect areas of identical elevation.

**Gravity**: The natural force of attraction exerted by Earth on objects or materials on its surface that tends to draw them down toward its center.

**Headwaters**: The source of a stream or river.

**Main stem**: The main course of a river or stream.

**Mouth of the river**: The place where a stream or river enters a larger body of water, such as a stream or lake.

**Ridge line**: Points of higher ground that separate two adjacent streams or watersheds; also known as divides.

**Slope**: Land that is not level—a hillside. Slopes can be gentle, moderate or steep.

**Source water**: The site where water is collected for use. It can be a lake, reservoir, river, aquifer or some other body of water.

**Topographic map**: A map that shows the relief (topography) of an area, including natural and man-made features.

**Topography**: The configuration of geographical (natural or man-made) features of an area such as the location, size and altitude of mountains, valleys, cities, etc.

**Tributary**: A stream that contributes its water to another larger stream or body of water. Note: a tributary contributes to a river.

**Watershed**: The land area from which surface runoff drains into a stream channel, lake, reservoir or other body of water; also called a drainage basin.
1. What information does a topographic map provide?

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2. Study the simple map below. What do the lines indicate?

The lines are contour lines that connect points at the same elevation along a line.

2a. All points on line B are _________ feet in elevation.

All points on line A are _________ feet in elevation.

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2b. What is the contour interval for the map above?

____________________________________________________________________________

The difference in elevation between line A and line B

is ______________ feet.

Therefore, the contour interval is 20 feet.

Is the contour interval consistent (always 20 feet) for this map?

_____________ [YES or NO] The difference in elevation between each contour line is 20 feet.

What landform do you think this map represents?

____________________________________________________________________________

Imagine that you are a bird flying over and looking down on this landform. The elevation at the top is the greatest, 1,060 feet, and continues to decrease as you move “down” the landform. Another way to think of this representation of a hill is a collapsible cup.

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____________________________________________________________