

Puzzle of Pennsylvania Watersheds

Adapted from: Pennsylvania Dept. of Conservation and Natural Resources (DCNR) Watershed Education program. Harrisburg, PA.

Grade Level: Basic

Duration: Minimally 20 minutes

Setting: Classroom

Summary: Students will put together a mystery puzzle and discover that the pieces are the 6 major watersheds of PA. Information about each of those watersheds is then shared.

Objectives: Students will learn to identify Pennsylvania's six major watersheds.

Vocabulary:

Watershed, drainage basin

Related Module Resources:

- What is a Watershed PowerPoint presentation
- PA Watersheds Fact sheets

Materials (Included in Module):

- Puzzles (envelope)
- Blank worksheet of PA borders and watershed boundaries
- Blank worksheet of just PA borders
- 3-D model of PA watersheds
- Higbee Stream Map of PA

Additional Materials (NOT Included in Module):

- None

ACADEMIC STANDARDS (ENVIRONMENT AND ECOLOGY)

7th Grade

- 4.1.7.B Understand the role of the watershed.
- Identify and explain what determines the boundaries of a watershed.
 - Explain how water enters a watershed
 - Explain factors that affect water quality and flow through a watershed.

10th Grade

- 4.1.10.A Describe changes that occur from a stream's origin to its final outflow.
- Identify Pennsylvania's major watersheds and their related river systems.
 - Describe changes by tracing a specific river's origin back to its headwaters including its major tributaries.

12th Grade

- 4.1.12.B Explain the relationships that exist within watersheds in the United States.
- Identify and describe the major watersheds of the United States.

BACKGROUND:

Pennsylvania, and any state or territory for that matter, can be subdivided in a number of different ways. Manmade divisions such as county and other municipal boundaries reflect the political or governmental characteristics of the landscape. Using natural features of the land, we might think of Pennsylvania in terms of its physiographic provinces, such as the once glaciated areas in the northeast and northwest corners of the state and the Appalachian Mountain region of central Pennsylvania. Perhaps we think geologically, and section the state based on when the landscape was most significantly shaped. One could argue, however, that the most natural boundaries of the landscape are **watershed** boundaries. Simply put, all water in any form within the boundaries of a particular watershed drains to a common waterway.

There is an infinite number of watersheds in any given region of the Earth, as even the tiniest rivulets that form after a heavy rain could potentially be considered to be "waterways" and thus having watersheds; however, it is more useful to consider the *major* watersheds of an area that contribute water and runoff to the *major* waterways of the area. Pennsylvania can be subdivided into six major watersheds or **drainage basins**: the Susquehanna River Watershed, the Ohio River Watershed, the Delaware River Watershed, the Potomac River watershed, the Lake Erie Watershed, and the Genesee River Watershed.

OVERVIEW:

Students will put together a mystery puzzle and discover that the pieces are the 6 major watersheds of PA. Information about each of those watersheds is then shared.

PROCEDURE:

1. Pass out the “Puzzle” envelopes but do not tell the students that it is a “Watersheds of Pennsylvania Puzzle”. Just tell them that it is a puzzle that they will need to put together as fast as they can. You can make it into a contest if you want. Tell students to make sure that they get all pieces out of the envelope because there are some small pieces.
2. If students have trouble putting the puzzle together, you can offer them some suggestions/hints. There are slight black edges on one side of each piece and that is the side they want to use. You should tell students that their puzzle is incorrect if they have put it together upside down or transposed.
3. When the puzzles are finished, ask students what the puzzle formed? What were each of the puzzle pieces? *A major watershed of PA.* How many pieces/major watersheds are there in Pennsylvania? *Six.*
4. At this point, use the 3-D Watersheds of Pennsylvania model to show the approximate locations of each of the 6 watersheds (the model is not to scale).
5. Pass out a blank worksheet with only the PA boundaries and the 6 major watersheds boundaries on it. Encourage students to take notes about the various watersheds on this sheet. To begin, have students write the name of each major watershed.
6. Review where each of the major waterways for which the watershed is named eventually flows. See the table below for review. This information was also in the PowerPoint presentation. Demonstrate the 6 directions of flow by using the spray bottles and rain cups. Make sure you have a towel down under the model to catch the water.

Major Watershed Name	Eventual Destination
Susquehanna River Watershed	Chesapeake Bay then Atlantic Ocean
Ohio River Watershed	Mississippi River then Gulf of Mexico/Atlantic Ocean
Delaware River Watershed	Delaware Bay then Atlantic Ocean
Potomac River Watershed	Chesapeake Bay then Atlantic Ocean
Lake Erie Watershed	Lake Erie, Niagara River, Lake Ontario, St. Lawrence Seaway, then Atlantic Ocean.
Genesee River Watershed	Lake Ontario, St. Lawrence Seaway, then Atlantic Ocean.

7. Go over each watershed/puzzle piece. Which is the largest watershed in PA? *Susquehanna - 20,926 sq. miles.* Which is the smallest? *Genesee - 94 sq. miles.* The order in size is below:

Major Watershed Name	Size (sq. miles)	Size (sq. kilometers)
Susquehanna River Watershed	20,926	54,199
Ohio River Watershed	15,422	39,943
Delaware River Watershed	6,470	16,757
Potomac River Watershed	1,582	4,097
Lake Erie Watershed	509	1,318
Genesee River Watershed	94	243.5

8. In which major watershed do the students live? *Either Ohio River Watershed or Lake Erie Watershed if in W. PA.*
9. Ask students if they were to have a puzzle piece of smaller watersheds in Pennsylvania, how many puzzle pieces would they have? Depends on how small they subdivide the watersheds. If they included every small stream, they would have many thousands of watersheds. If they include only moderate sized waterways, there still would be hundreds.
10. Use the Higbee Stream Map of Pennsylvania to show them how many waterways there are in Pennsylvania. This map has some watershed boundaries for major watersheds and submajor watersheds on it.

DISCUSSION:

Why might it be difficult to have a Watersheds of PA Puzzle if we included ALL the watersheds of Pennsylvania? *Because every waterway, whether a little stream or a big creek or river has a watershed. We actually do not know technically how many watersheds there are in PA, but according to the state Dept. of Environmental Protection, there are 83,161 miles (133,835 kilometers) of waterways in PA and approximately 4,000 lakes, reservoirs, and ponds.*

Does the boundary for each of Pennsylvania's major watersheds also follow the state's boundary like shown in the puzzle? *No, each watershed crosses state lines. We share watersheds and potential impacts made in those watersheds to the waterway with our neighboring states.*

EVALUATION:

- Provide a blank map of Pennsylvania's major watersheds and have students label them or provide just the outline of the state and have students draw in the approximate boundaries for the 6 major watersheds and label them.

EXTENSIONS AND MODIFICATIONS:

- Make a Major Watersheds of USA Puzzle if desired.
- Have students use their own PA Watersheds page and have them fill in more information/facts on each one about the watershed. Or they could draw in or list some of the major waterways in the watershed. They could also write in where the water eventually flows in that watershed. You can have students use the PA Watershed Fact Sheets or provide this information in lecture content.
- Have students create a poster like the enclosed “Clean Watersheds! Clean Water” that shows the 6 major PA watersheds with nice illustrations of representative activities and natural resources going on in each of the areas.

NOTES (PLEASE WRITE ANY SUGGESTIONS YOU HAVE FOR TEACHERS USING THIS ACTIVITY IN THE FUTURE):

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