



Department of Ecosystem Science and Management

Youth

Living in a Watershed

- **Keywords:** ecosystem, watershed, basin, headwaters, source, tributary, mouth
- **Lesson Plan Grade Level:** Grade 4
- **Total Time Required:** Two classes of at least 40 minutes each
- **Setting:** Indoor classroom

Goals for the lesson:

- Students will be able to describe what a watershed is and how many there are in Pennsylvania.
- Students will be able to identify and locate the watershed they live in on a map of Pennsylvania.
- Students will be able to label the 6 Pennsylvania Watersheds on a map of Pennsylvania.
- Students will be able to label and explain the parts of a watershed.

Materials needed:

(Note- all handouts/sheets are at the end of the lesson procedure)

- Handout “Choose Your Watershed” [<http://ecosystems.psu.edu/youth/sftrc/lesson-plans/pdfs/ChooseYourWatershed.pdf>]
- [Assessment sheet/handout \[http://ecosystems.psu.edu/youth/sftrc/lesson-plans/pdfs/watershed-words\]](http://ecosystems.psu.edu/youth/sftrc/lesson-plans/pdfs/watershed-words) to label watersheds
- Handout “The Watershed” [<http://ecosystems.psu.edu/youth/sftrc/lesson-plans/pdfs/watershed>]
- Overhead transparencies of both sheets listed
- overhead projector and markers

State Standards Addressed: 3.1.4.A Know that natural and human-made objects are made up of parts - Identify and describe what parts make up a system; 3.5.4.A Know basic landforms and earth history - Identify various earth structures (eg. mountains, faults, drainage basins) through the use of models; 4.1.4.E Recognize the impact of watersheds and wetlands on animals and plants - Explain the role of watersheds in everyday life and identify the role of watersheds and wetlands for plants and animals.

Subjects covered:

- what a watershed is
- parts of a watershed
- Pennsylvania's six watersheds
- watershed they live in

Topic covered: Pennsylvania's watersheds

Teaching Models/Methods:

Verbal and visual to include lecture, demonstration with illustration, group discussion, map skills, and identification/labeling.

Procedure:

1. Write the word "Watershed" on the board.
 - ask students what they think this is/means and discuss
 - write out definition of a watershed and have students copy it in their notebooks
 - write out definition of a basin and have students copy it in their notebooks
 - discuss how a watershed is only one type of a water environment and review some of the other water environments found on earth
2. Review what is meant by the term ecosystem.
 - discuss how a watershed is an ecosystem
 - list other systems a watershed is connected to or affects
 - list resources available from a watershed
3. List the parts of a watershed on the board: source, headwaters, tributary, mouth.

- using transparency of handout “The Watershed,” go over the four parts
- write out definitions for each term and discuss
- have students copy definitions in their notebooks

4. Pass out handout “The Watershed.”

- look over handout and parts that are to be labeled by students
- have students label parts
- go over handout with students reviewing each part and its definition

5. Assessment: Vocabulary multiple choice and/or labeling parts of a watershed.

*** Some of the following steps may vary or need to be adapted to your location.*** (Steps are set to be used with the Delaware Basin.)

6. On overhead, show map of Pennsylvania Watersheds and point out the Delaware Basin as the watershed we live in.

7. Discuss rivers near us that are part of the watershed we live in.

8. Discuss the course of our watershed to where it empties. (eg. Lehigh River – Delaware River – Atlantic Ocean)

9. Point out and discuss other watersheds of Pennsylvania including the major river systems that are a part of them and where they empty.

10. Give students “Pennsylvania’s Watersheds” handout and have them label our state’s six watersheds. Also have students outline the watershed we live in.

Assessment:

“Pennsylvania’s Watersheds” handout can also be used as a quiz, etc.

Evaluation:

- Pennsylvania’s six watersheds identified and labeled correctly on map.
- Identify the watershed they live in.
- Label the main parts of a watershed system.
- Vocabulary quiz: matching (on parts of a watershed)

Literature/Source cited:

“The Watershed Tour” (LaMotte/STROUD Water Resource Center)

Websites that can be used with this lesson:

- <http://www.dep.state.pa.us> [<http://www.dep.state.pa.us/>]
- <http://delawariverkeeper.org> [<http://delawariverkeeper.org/>] (for the Delaware Basin)

Video-stream that can be used with this lesson: Natural Focus with Laurie Sanders, A: What is a Watershed?

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Youth

Mapping Watersheds in a Small Community

- **keywords:** Compass, Geology, GIS, GPS, Lagoon, MAPS, Plainimetric, Query, Scale, Spatial, Topographic, Watershed, Wetlands
- **Grade Level:** Middle School, Grades 5 – 8
- **Total Time Required:** Five Meetings
- **Setting:** The lesson will require one meeting in the classroom, two days working on site at the small community and two meetings using the computer laboratory.

Subjects covered: The lesson will include environmental science, computer science, and geography.

Topics covered: The lesson will show students how to use a Global Position System (GPS) to calculate the watershed sites and a computerized Geographic Information System (GIS) to create the topographic map.

Goals for the lesson

In this project students will work as a team, practice problem solving, and sharpen their skills in critical thinking, decision-making and communication. Additionally, the group will use the GIS concepts presented to create a large scale, custom, unique, plainimetric, topographic map of the watershed areas of a small community.

Materials/resources needed

- a. Several hand held GPS devices
- b. Access to a computer lab to download the GIS database
- c. Use of a countywide topographical map of its watershed
- d. A local mobile home park with a lagoon that the class have approval to visit

State Standards Addressed:

Environment and Ecology

4.1.4 Recognize the impact of watersheds and wetlands on animals and plants

4.2.4 Identify needs of people, identify products derived from natural resources, know that some natural resources have limited life spans and identify by-products and their use of natural resources

4.2.5.A: Explain the water cycle

4.2.6.A: Identify the watersheds of Pennsylvania

4.2.6.C: Identify natural and human made factors that affect water quality

4.2.7. A: Explain how water enters, moves through and leaves a watershed

- Explain the concept of stream order
- Describe factors that affect the flow and water quality within a watershed

4.2.8A: Describe factors that affect the quality of ground and surface waters

Science and Technology

3.3.6.A4: Describe how water on earth cycles in different forms and in different locations including underground and in the atmosphere

3.3.7.A2: Explain land use in relation to soil type and topography

3.3.8.A6: Explain how models, and maps are used to identify Earth's resource of water

Methods

- a. Teachers may first need to develop their own proficiency with GIS technology.
- b. On the first day of classroom instruction, the students will learn basic GIS by using Getting to Know ArcView GIS, an ESRI publication that uses case studies to familiarize the students with GIS functions. In these case studies, students made maps of their neighborhoods using ArcView GIS databases.
- c. The teacher will project new terms on a screen and the class will explain each term and come up with a collective definition under the guidance of the classroom teacher, learning the importance of measurement, scale and compass use.
- d. While reviewing the ERIS publication, the teacher will emphasize geography and spatial exploration as the skill.
- e. The teacher will introduce the project by asking the class, how a GIS may be useful to map the path of water through a watershed.
- f. The teacher will use a projector to let the class see what a small scale topographic map of a watershed looks like for their county and Pennsylvania.
- g. The teacher will ask the youth to list examples of various watershed entry points in a small

community. Examples would be springs, water wells, local treatment lagoon/pond system, streams and creeks.

h. The lesson will continue with a discussion on how to use hand held GPS devices to chart out watershed entry points of a small mobile home park community, one with a treatment lagoon/pond system.

i. During the next two days, the class will report to the park to work in pairs using their GPS devices to get the coordinates and mark the location of each mobile home in the park.

j. By a qualified waste water operator, the class will be briefly instructed on how a lagoon waste water system is used to treat the water before it is reintroduced into the watershed.

k. On the next day, the class will reconvene in the computer lab where the teacher will first lead discussion of their findings from the last two days at the mobile home park.

l. The teacher will complete a brief review of the GIS with the youth, showing them how to add themes, zoom in and out and label features to help them explain their data.

m. All sets of students will map, document, and illustrate their assigned lots on the GIS database showing the watershed.

n. On the final day, to complete the lesson the class will save and duplicate a large scale, custom, unique, planimetric, topographic map of the watershed areas of a small community.

Evaluation

The youth will be evaluated through the 4-H Youth Development Pennsylvania Study, developed by Perkins, D.F. & Mincemoyer, C. entitled “Skills for Everyday Living.” The surveys are given as a pre-test and as a post-test and must be completed by each student individually, where they circle the statement that best fits how often they did what is described in the last 30 days. The surveys are entered into a web based data collection system and used for program evaluation and improvement.

- Critical Thinking in Everyday Life questions the youth on how students might think about certain things in their daily life.
- Skills for Everyday Living questions the youth on how the students might communicate, solve problems, make decisions and achieve goals in everyday life.

Literature/Sources Cited

To learn mapping fundamentals, the students used the 4-H Publication “GIS Basics – Working with Arcexplorer 9, Members Guide and the “GIS in Schools” CD software and book set, which was developed by Environmental Systems Research Institute, Inc. (ESRI). The students studied “From the Woods – Watersheds” publication prepared by Bryan Swistock, Water Resources Specialist, and Sanford S. Smith, Natural Resources and Youth Specialist. Additionally, they

used “Forest Stewardship – Watershed Management” originally prepared by Joseph R. Makuch, Coordinator, Water Quality Information Center, USDA.

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Definitions

Compass – a device for finding directions, usually with a magnetized needle that automatically swings to magnetic north

Geology – the study of the structure of the Earth, especially its rocks, soil, and minerals, and its history and origins

GIS – Geographic Information Systems. GIS allows you to combine and organize many layers of spatial information in a digital format, such as roads, streams and buildings

GPS – Global Positioning System

Lagoon – Man made wetland used as a waste water treatment system

MAPS – Drawing or a graphic representation of layers of spatial information are used to create maps.

Plainimetric – each element on the drawing is drawn in proportion to that same element in the landscape

Query – A quest for information

Scale – relationship between measuring distance on a map and the actual distance, in real life, on the ground.

Spatial – Relating to, occupying or happening to space

Topographic - the study and mapping of the features on the surface of land, including natural features such as mountains and rivers

Watershed - an area of land from which surface and subsurface water moves to drain into a stream. A watershed includes all the land from which a particular stream or river is supplied

Wetlands - a marsh, swamp, or other area of land where the soil near the surface is saturated or covered with water