

Arizona Project WET 5E Lesson Three

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LESSON THREE: WATERSHEDS

PROJECT WET WATER LITERACY PRINCIPLE:

Water Connects All Earth Systems

- Water is found in the atmosphere, on the surface, and underground.
- The water cycle connects Earth systems, purifying and renewing water on Earth.
- The Sun drives the water cycle through state changes and energy transfer.
- Climate and water are inseparable—changes in water impact climate, and climate change impacts water resources.

LESSON SUMMARY

Students use maps and modeling to characterize what a watershed is; to identify the key parts and functions of watersheds; to determine watershed boundaries; to describe how water flows in a watershed.

MATERIALS

Slides

- Spray bottles for water
- 2 pieces of 8-1/2 by 11 white paper per student (scrap paper can be used if blank on one side)
- Water soluble markers (green, blue, brown, red, purple)
- Scotch Tape

TIME

1-4 Hours

OBJECTIVES

Students will be able to use a system's model to learn how water moves through a watershed and **demonstrate** the human impact of changes to that natural system; city surfaces affect the movement of water, and those changes can be **observed/measured**. **Identify** the cause-and-effect interactions between matter and energy in the hydrosphere, biosphere, atmosphere, and geosphere.

GUIDING QUESTIONS

How do we manage a watershed to make sure our water is clean and sustainable? How do the parts of a watershed interact with the water cycle?

ARIZONA STATE STANDARDS ADDRESSED IN LESSON

SCIENCE	ARIZONA SCIENCE STANDARD: 4.E1U1.6/7 Plan and carry out an investigation to explore and explain the interactions between Earth's major systems and the impact on Earth's surface materials and processes. Students will investigate the movement of water and its interactions with the geosphere and biosphere using a model. Optional: Blue River Activity Summary Students participate in a whole-body simulation exploring the movement of water through a river and its watershed during different seasons by passing objects at different rates. Objectives Students will: - describe the major components of a watershed. - demonstrate the movement of water through a river and its watershed. - compare and contrast the amount of water flowing through a river and its watershed based on climate (seasonal variations) and weather (precipitation). - create a hydrograph based on simulation data. Materials Copy Pages (downloadable on APW Website) Part I - Containers with 75-100 pony beads, pea gravel, beans, marbles or similar objects—one for each headwaters stream (quantity depends on the number of students) - Large containers to collect beads (or similar objects) at the end of the river - Signs on sticks with words or pictures representing each of the seasons (spring, summer, fall, winter) Part II 200-500 pony beads, pea gravel, beans, marbles or similar objects (depending on the number of students) - Large bucket or other large container to collect beads or other objects - One-gallon pails or similar containers (one for each headwaters stream) - Signs on sticks with pictures representing snow, rain, sun and each of the seasons (optional) - Four chairs - Length of rope or string Part III - Copies of Graph It! (one per two students)
MATH (Elaborate)	4.MD.B.4: Make a line plot to display a data set of measurements in fractions of a unit ($\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$). Solve problems involving addition and subtraction of fractions by using information presented in line plots. And/or use the Blue River Graph It! Extension to express measurements

	of rainfall in different seasons.
ELA (Elaborate)	*4.RI.4 Determine the meaning of general academic and domain-specific words or phrases in a text relevant to a grade 4 topic or subject area. Read the Blue River Background Reading and summarize the key ideas and write definitions for the bolded words.
Social Studies (Elaborate)	4.E2.1 Examine concepts of scarcity, choice, opportunity cost, and risk. Challenge students to create a list of wants vs needs related to water, and to generate the rules they would use to govern the management of water resources.
CTE	5.6 Explore jobs, occupations and careers to understand the value of all careers to society. Investigate one or more of the careers in the careers section of the Blue River Background reading.
ENGAGE	
Students construct a model of the land surface to explore the parts of a watershed and observe the relationships between surface water and the land/environment in that watershed.	
EXPLAIN	
Students do a gallery walk of each unique model and make claims based on evidence about what each demonstrated in relation to watersheds.	
VOCABULARY	Watershed, floodplains, streamflow, gaging station, hydrograph
EXPLORE	
Students do a gallery walk of each unique model and make claims based on evidence about what each demonstrated in relation to watersheds.	
ELABORATE	
See extension activities for ELA, Math, Social Studies and CTE	
EVALUATE	
Notes and Quiz	
REFLECT	
What went well? What resources could be improved, added, or removed to increase the	

usability or effectiveness of this lesson? [General Feedback](#) [Google Form](#)

CONTENT KNOWLEDGE AND SUGGESTED READING FOR TEACHERS

[Watersheds and Drainage Basins](#)

LESSON 3.2 UNDERSTANDING URBAN WATERSHEDS

PROJECT WET WATER LITERACY PRINCIPLE:

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- The Sun drives the water cycle through state changes and energy transfer.
- Climate and water are inseparable—changes in water impact climate, and climate change impacts water resources.

LESSON SUMMARY

Students will consider the impacts of human choices on water flow and quality in urban watersheds.

MATERIALS

Slides

Each water festival group will need:

- Heat and Runoff Scavenger Hunt Worksheet for each student
- Temperature Gun (Can be purchased on Amazon for about \$20).
- Clipboards (one for each group if possible)
- Chalk (for outside) or 10-15 chairs (for inside option)
- Sticky notes or other materials to represent pollutants found in urban runoff
- Can or bottle labeled “chemicals” or “oil” (optional)

Storm Drain Stencils

TIME

1-4 Hours

OBJECTIVES

Students will be able to use a system's model to learn how water moves through a watershed and **demonstrate** the human impact of changes to that natural system; city surfaces affect the movement of water, and those changes can be **observed/measured**. **Identify** the cause-and-effect interactions between matter and energy in the hydrosphere, biosphere, atmosphere, and geosphere.

GUIDING QUESTIONS	How does human impact on the land affect water and heat within a watershed? How do the parts of an urban watershed interact with the water cycle? How do we manage a watershed to make sure our water is clean and sustainable? How do the parts of a watershed interact with the water cycle?
ARIZONA STATE STANDARDS ADDRESSED IN LESSON	
SCIENCE	ARIZONA SCIENCE STANDARD: 4.E1U1.6/7 Plan and carry out an investigation to explore and explain the interactions between Earth's major systems and the impact on Earth's surface materials and processes. Students will investigate the movement of water and its interactions with the geosphere and biosphere while considering types of surfaces and heat as an important factor in desert landscapes.
MATH (Elaborate)	4.MD.B.4: Make a line plot to display a data set of measurements in fractions of a unit ($\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$). Solve problems involving addition and subtraction of fractions by using information presented in line plots. Students may take measurements of different surfaces (using an infrared thermometer - we have some to lend) and create a chart that relates color to temperature, and surface temperature as a fraction of temperature as provided by a weather report on the same day.
ELA (Elaborate)	*4.W.1 Write opinion pieces on topics or texts, supporting a point of view with reasons and information. a. Introduce a topic or text clearly, state an opinion, and create an organizational structure in which related ideas are grouped to support the writer's purpose. b. Provide reasons that are supported by facts and details. c. Link opinion and reasons using words and phrases (e.g., for instance, in order to, in addition). d. Provide a concluding statement or section related to the opinion presented. Use the prompt and resources in the Social Studies section to complete the task above.
Social Studies (Elaborate)	4.E2.1 Examine concepts of scarcity, choice, opportunity cost, and risk.

	Challenge students to investigate and choose viable solutions for decreasing urban heat and/or water pollution. https://www.arizonawaterfacts.com/tips-resources/only-rain-storm-drain https://www.wri.org/insights/urban-heat-effect-solutions
CTE	5.6 Explore jobs, occupations and careers to understand the value of all careers to society. Investigate one or more of the careers in the careers section of the Blue River Background reading.
ENGAGE	
Students construct a model of the land surface to explore the parts of a watershed and observe the relationships between surface water and the land/environment in that watershed.	
EXPLAIN	
Revisit watershed models and ask students to consider, share, and list where they think water will be absorbed (permeable surfaces) and where they think it will remain on the surface (Impermeable surfaces). Ask them to make a prediction about where the surface will be warmer or colder using place locations – buildings, parking lots, farms, parks etc.	
VOCABULARY	Vocabulary Doc Permeable, impermeable, urban heat island effect, storm drains
EXPLORE	
Students explore the topics of permeable and impermeable surfaces, the urban heat island effect and pollutants from runoff to better understand how humans can impact the flow of water and the temperature within an urban watershed. Students investigate their school grounds during a scavenger hunt identifying different surfaces, possible pollutants and recording temperature of surfaces with a heat gun (or by touch). Students participate in a whole-body simulation of urban runoff in a storm drain system and discuss what happens to the quality of water in an urban environment.	
ELABORATE	
Optional: See extension activities for ELA, Math, Social Studies and CTE	
Optional: Storm Drain Stencil Project	
Arizona Project WET will have storm drain stencil kits and sidewalk chalk available for schools to check out on a first-come, first-served basis. These kits are designed to encourage your class to create a summative, place-based art project during the Water Festival Unit—helping	

students share what they have learned about where rainwater goes and what happens to water that enters our storm drain systems.

We encourage you to take photos of your students' artwork and share them with us! We would love to showcase your class's creativity on our social media platforms and share your projects with local water municipalities and city representatives.

[Click here to request a Storm Drain Stencil Kit.]

EVALUATE

[Notes and Quiz](#)

REFLECT

What went well? What resources could be improved, added, or removed to increase the usability or effectiveness of this lesson? [General Feedback Google Form](#)

CONTENT KNOWLEDGE AND SUGGESTED READING FOR TEACHERS

<https://www.arizonawaterfacts.com/tips-resources/only-rain-storm-drain>

<https://www.wri.org/insights/urban-heat-effect-solutions>