Watershed Walk
An exploration of urban watersheds

Objectives:
Students will be able to:

- describe what happens to water when it hits the ground.
- recognize that bodies of water are the end product of drainage from watersheds.
- differentiate between water flow in a natural versus an urban system.

Author:
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Time:
50-60 minutes

Grade Level:
4-8

Standards:
AZ Science Standards:

Inquiry Process, Personal and Social Perspectives, Life Sciences, Physical Science, Earth Science

NGSS-Core

ESS1.C Earth Materials and Systems
ESS2.C. The Roles of Water in Earth's Surface Processes
ESS3C: Human Impacts on Earth Systems

Specific standards listed on page 2-3.

Background:
Everyone lives in a watershed. The name of it might not be as familiar as the city or town, but a healthy watershed is vital to a healthy community. Urbanization impacts watersheds and affects how they function. This lesson identifies what a watershed is, the nested watersheds Phoenix Valley students live in, and how the built environment alters natural flows of water and materials through the watershed.

Vocabulary:
watershed - the region or area drained by a river, stream, etc.; drainage area

aquifer - any geological formation containing or conducting ground water, especially one that supplies the water for wells, springs, etc.

urban - of, relating to, or designating a city or town

canal - an artificial waterway for navigation, irrigation, etc

permeable/impermeable surfaces - the ability of water to pass through a surface, typically dependent on the porosity and connectivity of open space within the surface material

Advanced Preparation:
Prepare spray bottles (< 1 c required)

Observe schoolyard watershed to locate relevant features and possible hazards.

Materials:
Watershed model:

- plastic trays
- white paper
- water-soluble markers
- spray bottle w/water
- water
- slide presentation of natural and urban watersheds images (https://ecologyexplorers.asu.edu/docs/explorers/watersheds_slides.pdf)
- student journals and handout

Recommended Procedure:
1) Review the basics of the water cycle – condensation, precipitation, evaporation. What happens to liquid water when it is on the Earth? Where does it travel? How does it affect the living and nonliving parts of the Earth?

2) Ask each group of students to color in a 2-inch diameter circle in the middle of the white paper with the water-soluble marker). Make a mountain out of the paper with the colored dot at the apex (crumple the paper over the top of a marker or their own fist). Stand the mountain on their tray. Have students predict where the "rain" will

flow down the mountain. Ask the students to spray the mountain with rain and see where the "runoff" goes. Did it match their predictions?

3) Introduce the concept of a watershed. Show the students an image of a natural wash with obvious topography and drainage. Ask the students where the water in streams and rivers come from. High points or ridge lines separate watersheds from each other. Ask the students where the water goes? Does it flow from high places to low places or low places to high places?

4) Explain that water soaks into the ground and is stored under ground in aquifers. When the ground is saturated the excess runs off and flows downhill. This water collects in washes and connects with rivers.

5) Show students an image of a desert watershed and ask the students to note the differences. Water is not often evident in a desert habitat. It follows the same drainage patterns, but does not always flow year-round.

6) Have the students evaluate the maps and answer the questions for Activity 1 on the Student Worksheet.

7) Show students an image of an urban watershed and ask them to observe differences. Ask students how does water reach the soil in an urban watershed? Introduce the concepts of permeable and impermeable surfaces.

8) Explain that your school is part of a watershed. If possible show an aerial image of the neighborhood from Google maps. Where does the water in your neighborhood drain? Does it run over streets, into storm sewers, through underground pipes? Is there a wash or retention basin nearby? Often these are in parks that are familiar to students.

9) Students should prepare to go outside for a "watershed tour." They will need pencils and they may use the Student Worksheet or write in their journals (journals also can be used as a writing surface).

   While outside, ask the students:

   Look for places where water drains off the roof, and follow the paths water would take, noticing where it leaves the school grounds. Where are the high and low areas (does the water pool anywhere)?

   Can it soak into the soil? How does the water get to the soil? Are there design features in the parking lots where water can flow into low, vegetated areas or is it curbed? Is most of the ground surface permeable or impermeable to water?

   Is the rainwater used to water landscape plants, or does it get directed off the school grounds?

   As the water runs-off of the impermeable surfaces (parking lots, roads, sidewalks), what does it carry with it (litter, oil, dog waste)?

10) Return to the classroom. Now that the students have seen where and how water flows on their school's grounds, ask them to reflect on what happens to the water after it rains on their houses and yards? What pollutants does the rain water pick-up (fertilizers from the grass, detergent from washing the car)? How does the urban area with houses, roads and parking lots, impact the watershed?

11)Ask the students: during what time of year does it rain most? When can you expect precipitation in your neighborhood? Guide students to write in their journal about how the local weather (heavy rain, drought) affects the watershed and the plants and animals around it. You may wish to provide an annual precipitation graph for Phoenix.

Evaluation:

Can the students define a watershed? Can the students predict where water and pollutants will flow from their own houses?

Extension:

- Evaporation rates may affect how much water moves into the wash. Ask how evaporation rates may be different throughout the seasons. Does water evaporate at different rates at different times of year? Discuss the evidence behind their answers. Based on the consensus, have students write a formal hypothesis and prediction. Can they design an investigation to test it?
- Perform a watershed assessment at home. Draw a picture or aerial map of the home site showing how water and pollutants flow.

Standards

Arizona Science Standards

S1C1-GR4-5-PO2
S1C2-GR4-8-PO1
S1C2-GR6-8-PO5
S1-C3-GR4-8-PO1
S1-C3-GR4-PO2
S3-C1-GR4-5-PO1

S3-C1-GR7-8-PO1
S3-C1-GR6-PO2
S3-C1-GR5-PO3
S4-C3-GR4-PO1
S4-C3-GR6-PO2
S5-C1-GR5-PO3
S5-C1-GR8-PO1
S6-C1-GR6-PO1-2, 4
S6-C2-GR4-PO3
S6-C2-GR6-PO1
S6-C3-GR4-PO1-2,4

AZ Social Studies

SS1-C1-GR4-PO1-2,5-7
SS1-C1-GR5-PO3-4
SS1-C1-GR6-8-PO3-5
SS1-C2-GR4-PO3
SS4-C5-GR6-4-PO1
SS4-C5-GR6-7-PO2-4
SS4-C5-GR8-PO1,4

NGSS- Core Ideas

ESS2A: Earth Materials and Systems
ESS2.C. The Roles of Water in Earth's Surface Processes
ESS3C: Human Impacts on Earth Systems

NGSS-Practices

Developing and Using Models
NGSS- Crosscutting Concepts
Cause & Effect
Systems and System Models
Stability and Change

Student Worksheet
Watershed Walk Activity 1

1) Locate Arizona on Map 1 and draw a red line around it.

2) Locate Phoenix on Map 1 and draw a green circle around it.

3) How many rivers contribute water to the Phoenix area?

_____

4) Can you tell which direction the rivers flow? Draw some mountains where you think they are on the map.

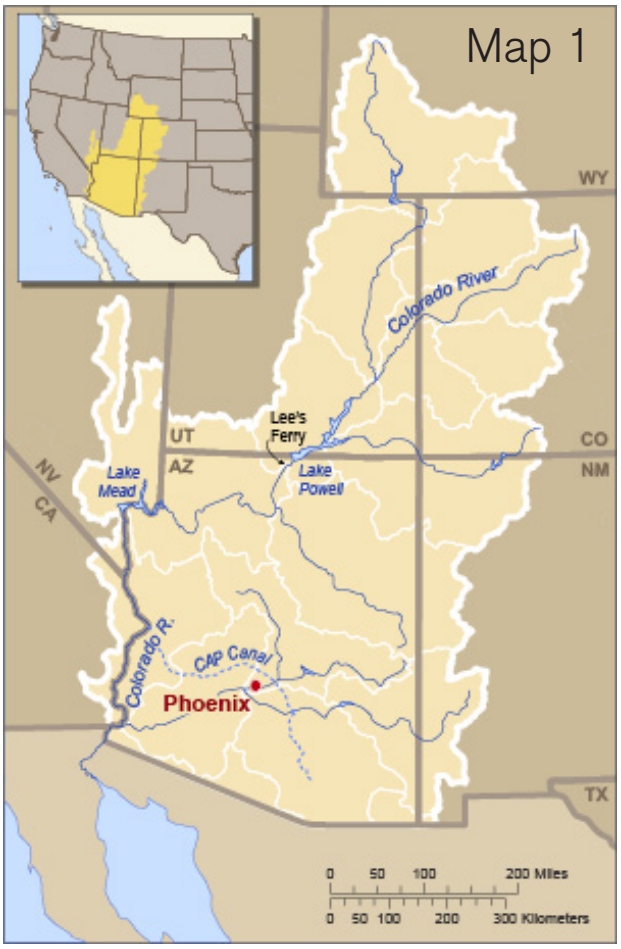
5) Find the CAP canal and trace a blue line along it. What river supplies water to the CAP canal?

6) Compare Map 1, and Map 2, which shows a smaller area?

7) On Map 2, can you locate approximately where your city is?

8) Which rivers flow near your city (or Phoenix)

9) at what time of year do Arizona rivers contain the most water?



Student Worksheet
Watershed Walk, Activity 2

1) Where does water go after it hits the roof of the school?

2) Where does water go after it hits the sidewalk?

3) Where does water go after it hits the playground?

4) Where does water go after it hits the parking lot?

5) Where does the water go after it hits the lawn?