



Watershed

Materials

- 2 fiberglass watershed models
- 2 spray bottles
- 1 bucket for extra water
- 2 sponges
- 1 box containing props
 - 1 bag of clay
 - 1 bag of toy figures
 - 1 small container of coffee grounds
 - 1 small container of sand
- 1 laminated heat island effect pictograph (in binder)
- 1 rolled watershed map of Arizona

Supporting Information:

- Watershed Dynamics:
 - Water flows from high points (mountains) to low points (rivers).
 - Permeable surfaces allow water to soak into the ground, filling the aquifer and reducing temperatures.
 - Impermeable surfaces like concrete increase runoff and contribute to erosion and higher temperatures.
- Human Impact:
 - Construction of roads, buildings, and farms alters natural water flow. Humans manage watersheds to prevent erosion, store water in reservoirs, and avert flooding.
 - Stormwater management is vital for preventing pollution from entering water sources. We are all responsible for ensuring we do not pollute the watershed.
- Urban Heat Island Effect:
 - Cities are warmer than rural areas due to the absorption of heat by buildings and roads, as well as more impermeable surfaces.
 - This heat can increase water evaporation and reduce groundwater infiltration, in turn preventing rain over the city and exacerbating drought conditions.
 - Solutions include using heat-reflective materials, increasing green spaces, and implementing permeable surfaces in urban planning.

Set the Stage for Success:

- Model excitement with your expressions and encourage engagement by asking open ended questions to get the students sharing their own ideas and thoughts
- Go over the rules and expectations as a group. Introduce the concept of “hands off the watershed model!”
- Let students take an active role in the demonstrations to solidify their understanding of the concepts being taught.
- Be ready to adapt the lesson based on the students’ responses and level of understanding. Use real-life examples that relate to the students' own experiences.



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Narrative

Min.	Directions:	What You Say:	Big Ideas:
4	<p>Gather students on blue tarp and introduce yourself.</p> <p>Lead discussion on watersheds using the map.</p>	<ul style="list-style-type: none"> • What is a watershed? If students struggle, ask: What is a shed? (Place to store things.) What is another meaning for shed? (To fall off.) • Do you live in a watershed? [Show map to students to highlight we all live in a watershed] 	<ul style="list-style-type: none"> • A watershed is a land area that drains to the low points. [Demonstrate “Land area that drains to a low point” action] • Most of the watershed is the land. • We all live in a watershed. • Have students show where they are on the map
4	<p>Gather students around models.</p> <p>Have a student add “snow” to the top of the mountains.</p> <p>Students add sand to the mountain, and spray water on sand.</p>	<ul style="list-style-type: none"> • Look at the model, what do you see? • Where are the high points and the low points? • Have you seen snow on the mountains? What is that snow called? [Students add snow to mountains] • When the snow melts, where does the water go? • Does water have the power to move rocks? [Have students add sand to the model and spray water on sand] 	<ul style="list-style-type: none"> • It is called snowpack and is an important source of water in Arizona. • Water flows from high points (mountains) to low points (rivers/valleys) because of gravity. • Yes, water can move and wear away rocks (erosion). Humans can help manage erosion.

4	<p>Have a student pour water on the felt/sponge to explain the concept of permeable vs impermeable.</p>	<ul style="list-style-type: none"> • What happens when we spray water over the sponge? [Student spray water on sponge] • What happens when we spray water over the road? [Student spray water on road] • Where can we find permeable and impermeable surfaces? 	<ul style="list-style-type: none"> • Sponge is permeable (water absorbs), road is impermeable (water runs off) • <u>Permeable examples:</u> Natural environments such as grassy parks, green corridors, desert landscaping, dirt lots • <u>Impermeable examples:</u> roads, parking lots, and sidewalks
5	<p>Have each student add human elements to the model.</p> <p>Elect two students as engineers and the rest as consultants.</p> <p>Have students do the dam engineer challenge.</p>	<ul style="list-style-type: none"> • Where on the model should we build a dam to store water for our city? <p>--[Provide students with clay, and let them build]</p> <p>--[Students test the dam by adding water to the model]</p> <p>--[Have students make changes to their dam and test again]</p> <p>--[Remove dam and make observations]</p>	<ul style="list-style-type: none"> • Humans manage watersheds to ensure water availability • Dams are made to make reservoirs and provide water for cities and agriculture • Networks of pipes and canals transport water from our rivers and reservoirs to our cities and farms
3	<p>Discuss how impermeable surfaces increase heat in urban areas.</p>	<ul style="list-style-type: none"> • How might impermeable surfaces affect how water flows in a watershed? • How might impermeable surfaces affect heat? • What does it feel like to walk barefoot at the pool or on the sidewalk in the middle of the summer? 	<ul style="list-style-type: none"> • Impermeable surfaces prevent water from going into the ground, and water will run off these surfaces. • Impermeable surfaces like roads and parking lots absorb and radiate heat, creating hotter temperatures in cities.

<p>3</p>	<p>Engage in discussion of urban heat island effect.</p> <p>Show students infographic.</p>	<ul style="list-style-type: none"> • When everything is so hot in the summer, what happens to the water? • Why does it rain so rarely in Phoenix? [Student place bowl over the city and students spray water over the city] • What is this called when cities are so hot they push the rain clouds away? • How can we reduce heat in cities to protect water resources? 	<ul style="list-style-type: none"> • More heat creates hotter temperatures that increase water evaporation and higher air pressure, which pushes away rainstorms. • This is referred to as the urban heat island effect. • The urban heat island effect causes it to rain less and by creating warmer temperatures. • We can add more green spaces, natural landscaping, like planting trees.
<p>5</p>	<p>Students add coffee grounds to the road to represent pollution.</p> <p>Spray water over the coffee, allowing the brown water to flow into the river.</p>	<p>[Add coffee grounds and spray water]</p> <ul style="list-style-type: none"> • What do you think the coffee represents? • What are some possible sources of pollution that we might introduce into the watershed? • What are some things you can do to make sure our water stays clean and our environment healthy? 	<ul style="list-style-type: none"> • Pollution. Oil from cars, dog poop, trash/litter, fertilizers, pesticides, cleaning products • We are all responsible for maintaining the health of the watershed where we live • We can prevent our pollutants from entering the water by picking up pet waste, litter, and being careful with chemicals • Simple actions, like reducing pollution and conserving water, can make a big difference
<p>2</p>	<p>Move students to blue tarp and review big ideas.</p> <p>Begin to reset the station.</p>	<ul style="list-style-type: none"> • What is a watershed? • Do you live in a watershed? • What are the connections between people, heat, water, and the environment? • Can you help manage the watershed? 	<ul style="list-style-type: none"> • A watershed is a land area that drains to a low point. • Yes, we all live in a watershed • They are all connected, and humans impact the environment through construction of impermeable surfaces • Yes, we can all take actions to help take care of the watershed

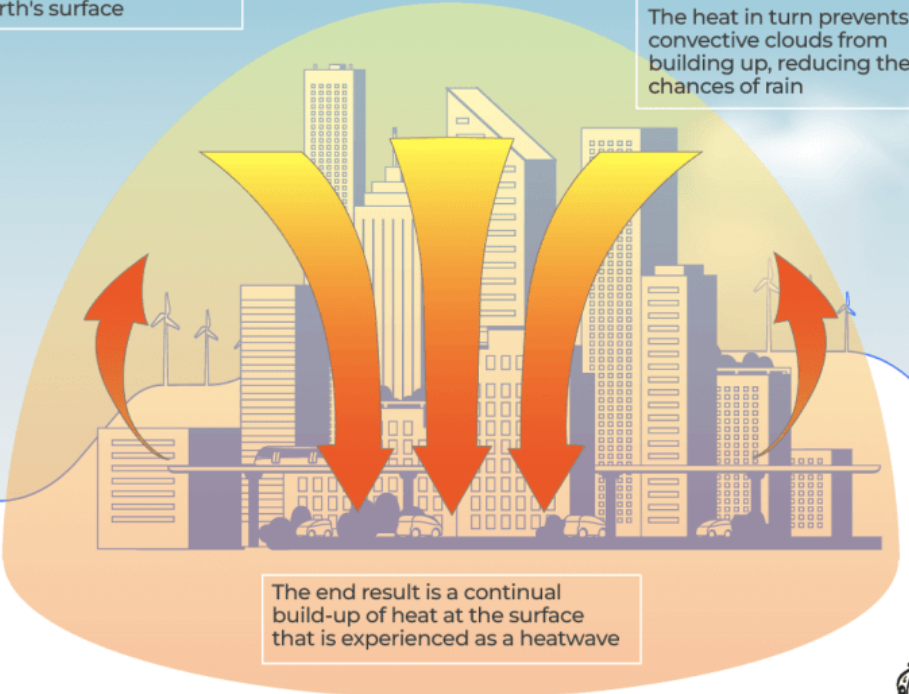
CLIMATE

What is a heat dome?

A high-pressure system in the atmosphere that traps heat over a certain area.

High pressure acts as a cap, trapping heat at the Earth's surface

The heat in turn prevents convective clouds from building up, reducing the chances of rain



The end result is a continual build-up of heat at the surface that is experienced as a heatwave

