Learning Landscapes

Outdoor Water Efficiency and Conservation Lessons

Alliance for Water Efficiency

Aligned with Next Generation Science Standards for Grades 3-8

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Acknowledgements

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Learning Landscapes Lessons Overview - Teacher

Conserving and sustainably using water, our most precious natural resource, is one of the most urgent issues facing our planet. While water crises manifest in different forms in different climates and regions, every part of our planet will be affected as the 21st century unfolds and climate change wreaks havoc on historic weather patterns and predictable precipitation. As water sources get stretched by increased demand and sporadic supply, society must approach this challenge from a variety of perspectives.

An important but often overlooked perspective is the outdoor water use required to sustain landscapes that we create. If we choose to grow plants that are adapted for the climates in which they live, we will use less water. These lessons are designed to teach students about how climate-appropriate plants in our landscapes can help conserve water, whether at home, in school, or elsewhere.

These lessons may be used as stand-alone lessons, though they also function effectively as a cohesive unit. Each lesson emphasizes a different component of climate, water conservation, and our outdoor spaces. We have provided a variety of resources and activities that teachers may choose to use to suit the needs of their students. The activities are designed to be facilitated in whole-group, small-group, or individual formats.

The first lesson focuses on water itself, why it is important, and how it is used in our community. Students will use provided readings and maps to explore these topics while they will use the Internet to determine more detailed information about the origin of the water supply in their community.

The second lesson digs deeper into climate, weather, and the impact these factors have on the types of plants that grow in certain areas. Students will use provided readings, graphs, and a multimedia presentation to explore key concepts such as climate, weather, datapoint, and trends. They will then analyze student-centered scenarios to determine and correct planting mistakes. Finally, they will use the Internet to conduct further research of their local climate.

The third lesson is an outdoor exploration of your school's learning landscape. Using readings and graphics, students will review expectations of outdoor activities as well as the characteristics of plants that align with their climate zone. Students will then transition outside as they observe and take notes on the plants that they find as well as any features that may affect water use (shade, incline, etc.). An optional extension to this lesson involves applying what students have learned to create their own outdoor landscape that is designed to include climate-appropriate plants.

The fourth lesson focuses on the importance of soil in water conservation by investigating how the unique properties of soil types and how they affect water retention. Students will participate in a guided meditation and mini lessons on percolation and water retention, where they will learn the importance of soil in supporting plant life. The lesson also includes an optional extension where students can use the Alliance for Water Efficiency's Indoor Water Use Calculator to learn about water use in their own homes and discover ways they can conserve water.

Learning Landscapes Lessons Overview - Student

Since you live in the United States or Canada, you are one of the fortunate people in the world: in all likelihood, when you turn the faucet, water comes out … and miraculously, that water is usually clean enough to drink and keep us healthy. About one-quarter – 25% – of the world's population does not have access to clean water or sanitation.

Because our water is so precious, we need to be thoughtful in how we use it. Unfortunately, much of our water is wasted. The average American family wastes 180 gallons per week because of leaks in their home. That's 9,400 gallons of water, the equivalent of 120 bathtubs full of water, down the drain every year!

It's not just indoors; we also waste a lot of water in our outdoor landscapes. Outdoor use makes up about 30 percent of water use in the average American home. However, in dry, arid climates, outdoor water use can be as high as 60 percent! Up to half of that outdoor water goes to waste because our landscapes are not designed well. It may look nice to grow the greenest grass in the desert, but is it worth the water? If we grow plants that are adapted to our climate, then we can conserve more of our precious water.

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Lesson 1: It's Our Water

Teacher Lesson Plan

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Overview

In this lesson, students will learn facts about water as a natural resource. They will connect their scientific knowledge of water to their personal experience with water in order to recognize its importance for our society and our planet. Students will take the lead by researching their local water provider, creating a list of all the ways that we use water, and outlining the process by which water moves from nature to the places we live, work, and play.

Student Learning Objectives

Student will be able to… (*I can…)*

- Examine the basic scientific facts of water and its relationship to our bodies and our planet (*tell my friends and family all about how and why water is so important!*)
- Describe the water cycle and related natural systems (*explain how water moves from the clouds to the ground and back again)*
- Investigate the process in which local water providers deliver water to our community (*discover how we get our water)*
- Identify the specific amount of water used for different purposes, such as agriculture, indoors, and outdoors (*measure how much water we use and how we use our water)*

Aligned Standards

Next Generation Science Standard	Grade Level
MS-ESS2-4 Earth's Systems Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity.	Middle School (6th through 8th)
5-ESS2-2 Earth's Systems Describe and graph the amounts and percentages of water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth.	Upper Elementary (3rd through 5th)

3-ESS2-2 Earth's Systems Obtain and combine information to describe climates in different regions of the world.	Upper Elementary (3rd through 5th)
3-ESS2-1 Earth's Systems Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season.	Upper Elementary (3rd through 5th)

Lesson Outline

1. Introduction - Water Use Brainstorm and Predictions [10 - 15 minutes]
2. We Do (Whole Group) - "How Important Is Water?" Reading and "How Do We Use Water?" Research [20 - 30 minutes]
3. You Do (Small Group / Independent) - "Where Does Our Water Come From?" Water Provider Research [10 - 20 minutes]
4. Closing - Review Responses or 3-2-1 Closing [5 - 15 minutes]
5. Extension: Water Cycle Matching Cards Puzzle

1. Introduction - Water Use Brainstorm and Predictions

[10 - 15 minutes]
Resources: Student Handout, pages 10 - 11

Explain to students that they will be learning about water and how we use it. To kick off the lesson, **ask** students, the experts, to create a list of all the different ways in which we use water. Students may work independently, using their Student Handout to record their thoughts, or in small groups, with one member acting as a scribe.

Once students have finished their lists, **ask** them to share their notes so you can create a class list. **Record** student responses on a poster board. You may ask a student volunteer to do so or write it yourself. **Tell** students to record notes on our class list, especially if they haven't already recorded their own thoughts.

After students have taken notes, **ask** students which activity they think uses the most water. **Explain** that students will uncover the answer to this question and more as they investigate our water.

2. We Do (Whole Group) - "How Important Is Water?" Reading and "How Do We Use Our Water?" Research

[20 - 30 minutes]
Resources: Student Handout, pages 10 - 11, Readings, pages 12, Maps and Data pages 13 - 14

Tell students that they will be answering questions on their Student Handout as we learn more about water together. **Read** the "How Important Is Water?" passage as a whole class or in small groups. You may structure this as an independent activity if students are able.

Instruct students to complete the response questions. You may do so as a whole-group activity as students volunteer answers or as an individual assessment.

Ask students if they have any questions regarding the passage before moving on.

Direct students to the "How Do We Use Our Water?" section of the Student Handout. **Instruct** them to use Data and Maps handout to answer these questions. Circulate and assist students as they attempt to analyze the materials in small groups. Those that finish early may benefit from the Matching Cards Extension.

3. You Do (Small Groups / Independent) "Where Does Our Water Come From?" Water Provider Research

[10 - 20 minutes]
Resources: Student Handout, pages 10 - 11, Reading page 12,

Direct students to the "Where Does Our Water Come From? Section of their Student Handout.

Explain to students that they will be using the Internet to explore where our water comes from. *If there are not enough available Internet-connected devices*, **prepare** answers specific to your location for the Where Does Our Water Come From questions on their Student Handout:

- Where does your water come from?
- Besides humans, what animals and plants depend on this water source? (use Google!)
- Are there any challenges, like drought or overuse, that may impact our water source in the future?

Print the answers to these questions, **post** them around the room, and **tell** students to find the answers they seek by physically exploring the room.

4. Closing - Review Responses or 3-2-1 Closing

[5 - 15 minutes]

There are two options for this lesson's closing:

1. Review the responses that students recorded on their handout and discuss.

2. Instruct students to write or otherwise share Three Facts That They Learned, Two Questions That They Still Have, and One Thought (not necessarily related to the lesson). This may be an independent, partner or whole-group activity.

5. Extension - Water Cycle Puzzle

Resources: Extension, page 15

To extend learning and offer students an opportunity for hands-on experiences, consider using the Water Cycle Puzzle in your instruction. First, students will piece together the printable, cutable pieces of the puzzle. Next, they will have to use the definitions of the water cycle to identify which part of the completed water cycle puzzle corresponds with the correct definition.

Water Cycle Content

1. Precipitation: when liquid water falls from the atmosphere to the ground as rain, snow, or ice
2. Percolation: when water filters through the ground
3. Evaporation: when liquid water heated by the sun becomes water vapor and rises into the atmosphere
4. Condensation: when water vapor in the atmosphere becomes liquid water
5. Transpiration: when liquid water filters through plants, then evaporates into the atmosphere as water vapor

Printable Resources

Name:
Date:

It's Our Water - Student Handout

List as many ways that we use water as you can. Take notes when we review our answers together.

Ways We Use Water

How Important Is Water? - Use the Readings to answer these questions.

How much of Earth is covered by water? _____
How much of your body is made up of water? _____
True or False: Dinosaurs drank and peed the same water molecules you drink. _____
How much of the total amount of water on Earth is accessible fresh water?
_____
How does evaporation purify or clean water? _____
What is "the pump" that drives the water cycle? _____
How many days can a human survive without water? _____

How Do We Use Water? - Use your Data and Maps to answer the following questions.

How much water does your state use every day? _____
In comparison to other states, is this high? Low? In the middle? _____
Does your state experience precipitation that is higher or lower than the national average?_____
Will your state experience water shortage over the next decade? What kind (statewide, regional, local)? _____

Where Does Our Water Come From? - Use the Internet to find out where your water comes from.

You may live in a city, in the country, or in a remote hollow deep in the woods. Your water may come from a spring, a reservoir, a river, or a well. You may buy water from a water agency or you may get water from a well in your yard. ***Do you know where your water comes from?***

Use the tools (computer, tablet, printed sheet) to find out ***where your water comes from***.
GOOGLE *"Drinking Water Source TOWN/CITY NAME" to get started.*

Where does your water come from? _____
Besides humans, what animals and plants depend on this water source? (use Google!) _____
Are there any challenges, like drought or overuse, that may impact our water source in the future?
_____

Reading

How Important Is Water?

Did you know that:
• Two-thirds of the planet earth is water, and two-thirds of your body is water … and the water in your body has about the same level of saltiness as ocean water. We are truly part of the planet!

• For all practical purposes, all of the water that existed when the earth formed is the same water that is on earth today. It has been cycled from the oceans to the atmosphere to rain to the rivers and streams and underground, to the animals, and back again millions of times. Dinosaurs drank – and peed – some of the same molecules of water that you drank this morning!

• At any moment in time, only 0.3% – one-third of one percent – of the water on earth is accessible fresh water, suitable for drinking, bathing, and growing crops. All the rest is under the ground, in the atmosphere, or in the oceans. While we always have plenty of "water" on earth, only a tiny fraction of that water is available to humans and other land animals and plants.

• With the help of the sun and the "water cycle," the earth itself purifies water. How does it do this: through evaporation. When water evaporates, water goes into the atmosphere while other elements in the water stay behind. In the atmosphere, water again starts to dissolve gasses and minerals even before it falls to earth as precipitation. The sun is the pump that drives this cycle by evaporating the liquid water and lifting it high into the atmosphere to rain down upon us again.

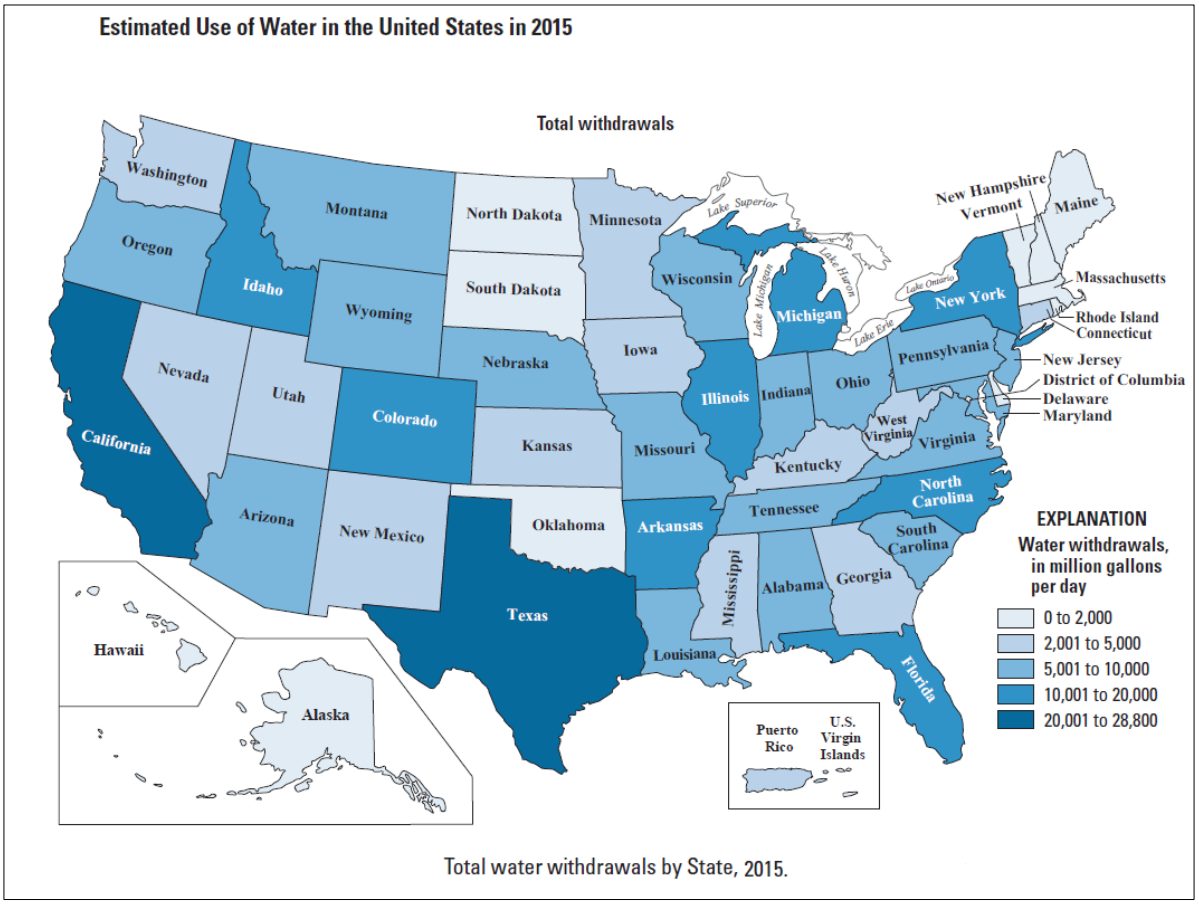
• Human beings can survive for several weeks without food, but only 3 or 4 days without water!

Since we all share the same water and since the amount we have is the amount we will always have, we must all use water very, very carefully!

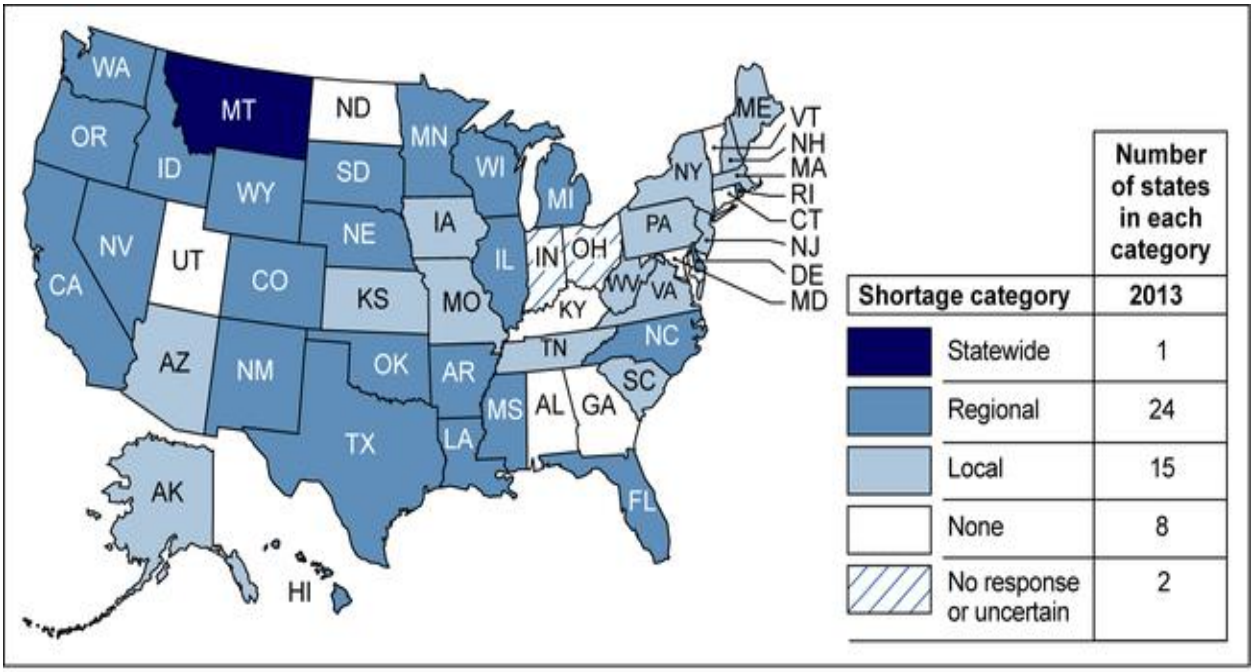
How do we USE water?

You use water both indoors and outdoors. Most indoor uses require high quality treated water. Most outdoor uses do not require any treatment at all. One of our most important uses of water is not indoors or out. It is for fighting fires. Water systems must provide enough water for all of our indoor and outdoor uses and for being sure the firefighters have enough to douse the flames if a fire breaks out.

Maps and Data

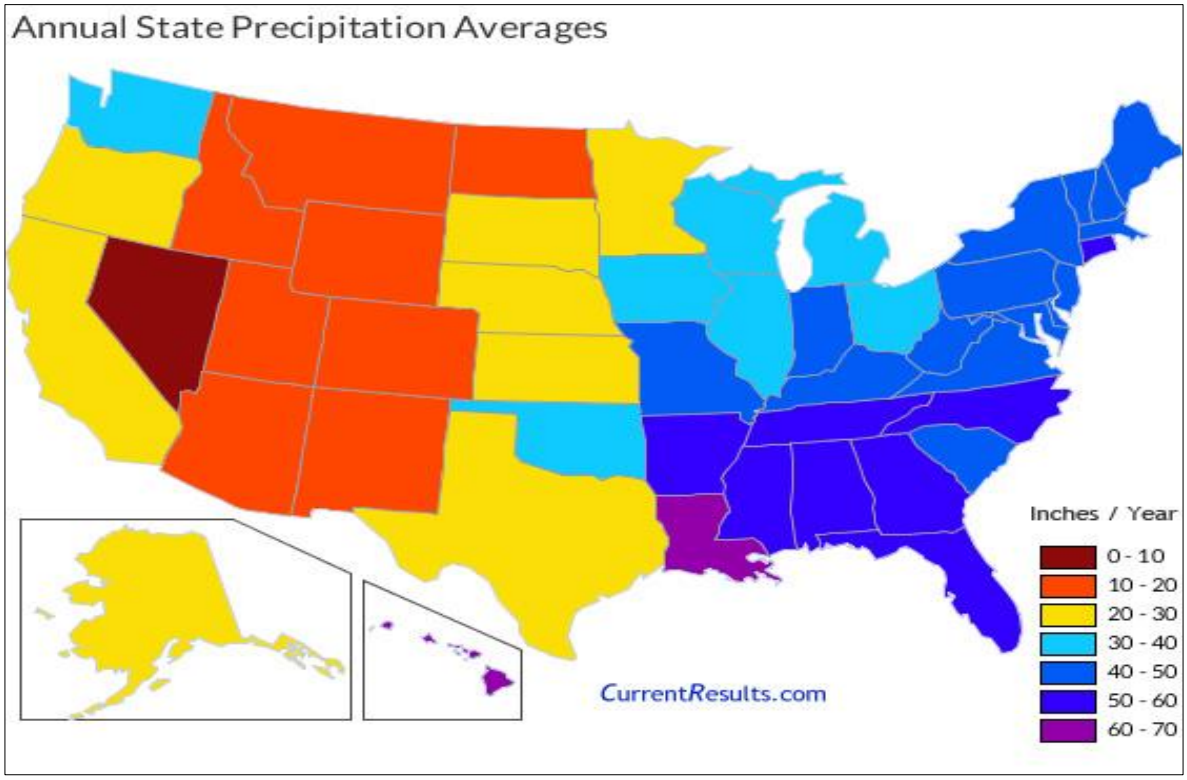


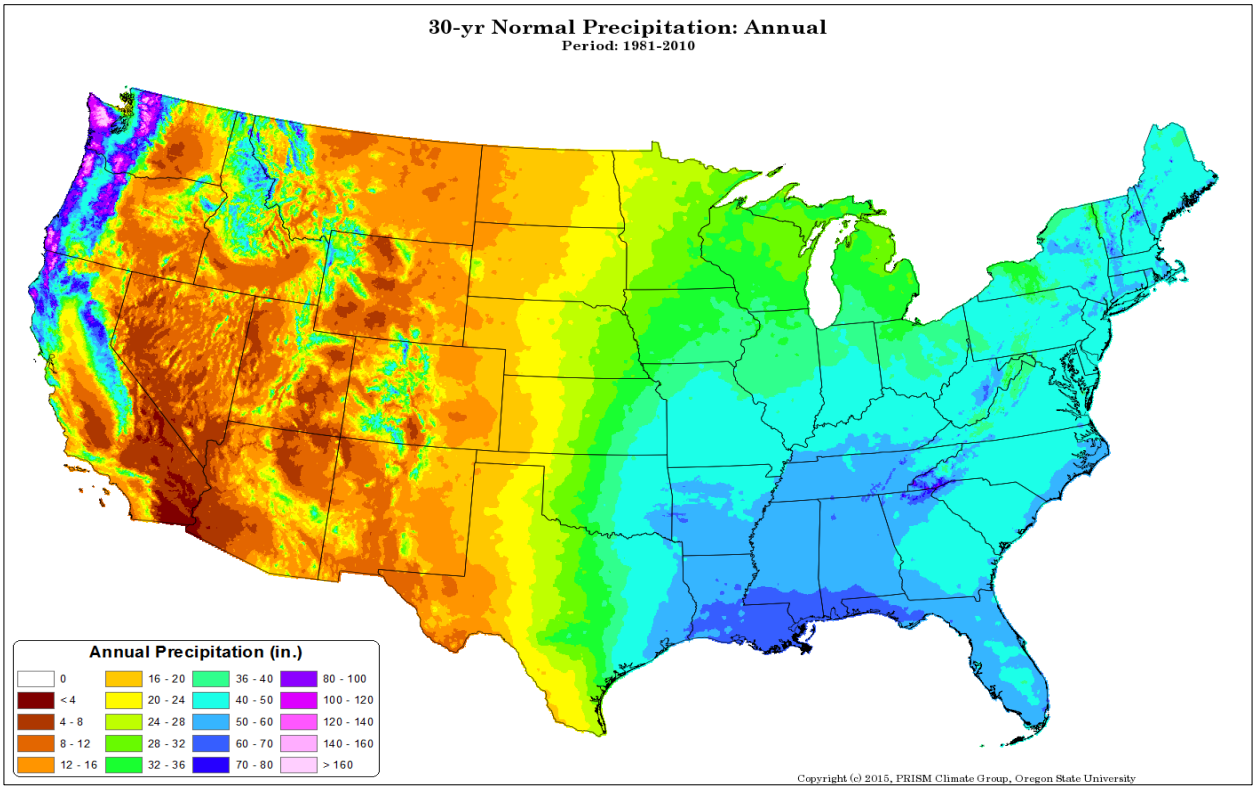
Total water withdrawals by State, 2015.



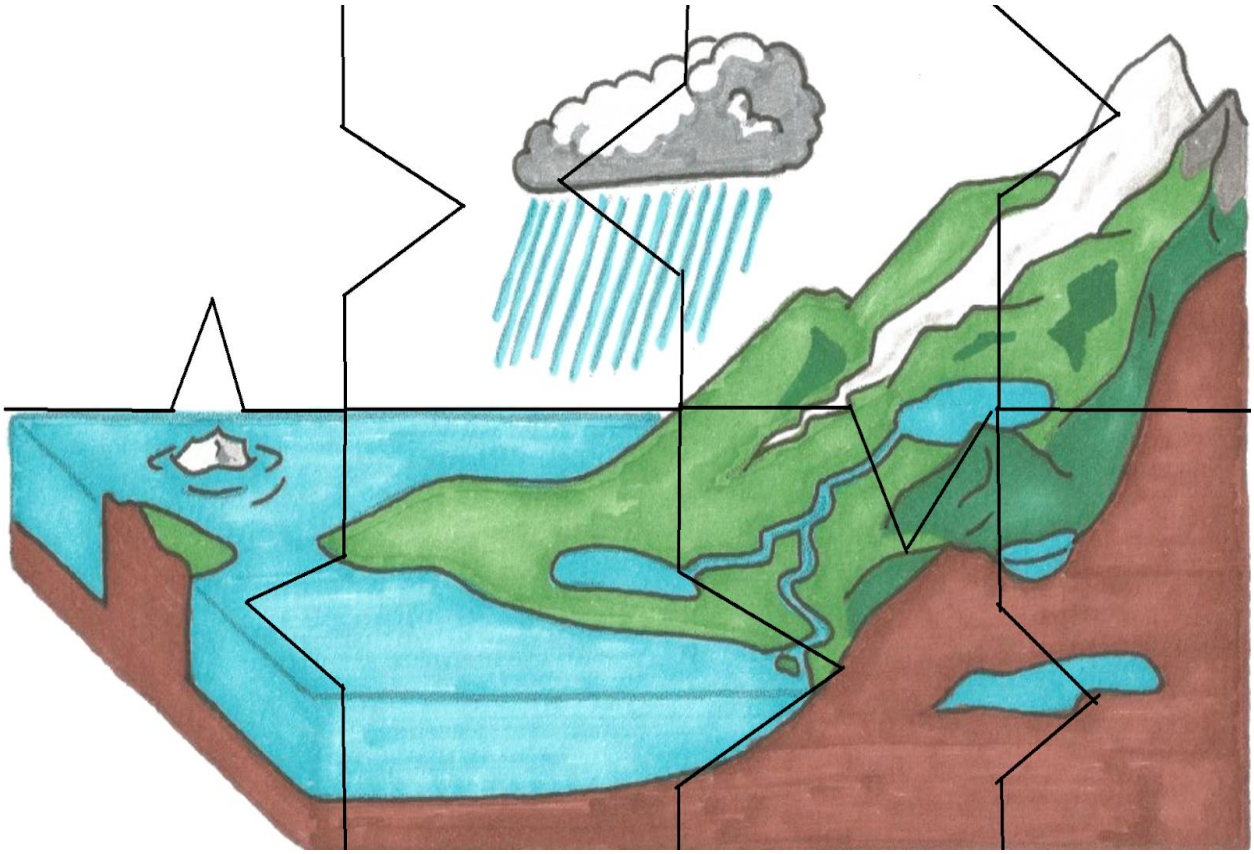
Sources: GAO analysis of state water managers' responses to GAO survey; Map Resources (map).

These two maps show precipitation averages throughout the United States. The National Average is 30 inches per year (per NOAA). What is the average where you live?





Extension



Precipitation	when liquid water falls from the atmosphere to the ground as rain, snow, or ice
Percolation	when water filters through the ground
Evaporation	when liquid water heated by the sun becomes water vapor and rises into the atmosphere
Condensation	when water vapor in the atmosphere becomes liquid water
Transpiration	when liquid water filters through plants, then evaporates into the atmosphere as water vapor

Lesson 2: Planting for our Climate

Teacher Lesson Plan

Pages 16 - 20
Printable Resources - pages 21 - 26

Overview

In this lesson, students will learn how climate zones impact our water resources and affect the environment around us. Specifically, students will explore the relationship between the kinds of plants we choose to grow in our outdoor spaces and outdoor water use. Students will distinguish between weather and climate and identify the particular characteristics of the climate zone in which they live. They will then apply this knowledge to a series of challenges, matching plants with climates and analyzing landscape plans to determine their fitness for specific climate zones.

Student Learning Objectives

Student will be able to… (*I can…)*

- Describe the relationship between weather and climate (*tell the difference between weather and climate*)
- Identify the characteristics of several climate zones, including their own (*use my observation skills to describe the climate where I live*)
- Analyze landscape design plans based on whether they are well-suited for the water resources of a particular climate zone (*think and decide whether outdoor design plans are right for our climate)*
- Match plantings with the appropriate climate zone (*figure out which plants match with which climate zone)*

Aligned Standards

Next Generation Science Standard	Grade Level
3-LS4-3 Biological Evolution: Unity and Diversity Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.	Upper Elementary (3rd through 5th)
3-ESS2-2 Earth's Systems Obtain and combine information to describe climates in different regions of the world.	Upper Elementary (3rd through 5th)
3-ESS3-1 Earth and Human Activity Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard.	Upper Elementary (3rd through 5th)
3-5-ETS1 Engineering Design Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.	Upper Elementary (3rd through 5th)
MS-LS1-4 From Molecules to Organisms: Structures and Processes Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.	Middle School (6th through 8th)
MS-LS2-1 Ecosystems: Interactions, Energy, and Dynamics Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.	Middle School (6th through 8th)

Lesson Outline

1. Introduction - Climate and Weather Brainstorm [10 minutes]
2. We Do (Whole Group) - “Data and Trends, Climate and Weather” Presentation and Note-Taking [15 - 20 minutes]
3. You Do (Small Groups / Independent) - Stations: Climate Research + Redesign the Landscape [30 - 45 minutes]
4. Conclusion - Teachbacks (students teaching students) and Shout-Outs (students praising students) [5 - 10 minutes]

1. Introduction - Climate and Weather Brainstorm

[10 minutes]
Resources: Chart Paper, Markers (or SmartBoard)

To kick off the lesson, **ask** students the following questions to start a discussion based on their prior knowledge and experience.

- How would you describe the weather today?
- How would you describe the climate where we live?
- What is weather?
- What is climate?
- What is spring like here? Summer? Fall? Winter?
- What do the seasons have to do with climate?

Record student responses on a poster board divided into two columns: climate and weather. You may ask a student volunteer to do so or write it yourself. **Ask** students whether they observe any differences or similarities between the two columns.

2. We Do (Whole Group) - “Data and Trends, Climate and Weather” Presentation and Note-Taking

[15 - 20 minutes]
Resources: Student Handout, pages 21 - 24
PowerPoint Slides

Tell students that they will be learning more about how climate and weather affects the outdoor spaces we enjoy and the plants that live there.

Read the “Green Green Grass of Home” passage found on the Student Handout. Students may read aloud as a whole class, in small groups, or independently.

Ask students if they have any questions regarding the passage before moving on.

Display the PPT. Alternatively, you may print the slides and incorporate them in a gallery walk (posting different slides around the room) or as materials with which small-groups work.

Instruct students to record the projected definitions of weather [Slide 1] and climate [Slide 2]

To further solidify student understanding of climate and weather, **explain** to students that "weather" is how we decide what to wear that day while "climate" is how we decide what to keep in our wardrobe [Slide 3]. However, even dry climates get rain once in a while. **Explain** to students that the weather today is only one data point in our climate trend.

To reinforce this idea for students, you may use the Weather vs. Climate video resource from NASA.

[Slide 4] **Display** the academic language chart, which defines "data," "dataset," "trend," and "datapoint" in written and visual form. **Instruct** students to record these definitions on their Student Handout as well as to label "datapoint" and "trend" on a graph. You may model how to do so with your students.

[Slide 5] **Display** the tables and graphs that document trends of annual temperature, year-over-year temperature, average monthly rainfall, and average sunlight hours by month in Phoenix, Arizona and Atlanta, Georgia. **Ask** students what they can observe about each city's climate based on the datasets. Next, **ask** how these climate trends might impact living things in that region. **Explain** that living things are adapted to the climate in which they live. **Ask** what would happen if a living thing were to be moved to a different climate, like from a swamp to a desert.

3. You Do (Small Groups / Independent) - Stations: Climate Research + Redesign the Landscape

[30 - 45 minutes]

Resources: Station 1 Instructions pages 25, Station 2 Instruction/Readings pages 26, Stations Handout pages 21 - 24

Explain to students that they will be completing several activities related to climate in stations. **Separate** students into two groups, each of which will rotate through the stations as instructed. Alternatively, these activities can be assigned to the whole class at the same time.

As students work, **rotate** between groups to check in on their progress and address any misunderstandings.

Station 1: Climate Research and Graphing
At this station, students will use the Internet and available resources to create temperature and precipitation graphs that represent the climate in their location. **Print** Station 1 instructions and post it by a computer, tablet or other Internet-connected device on which students can research the climate data for their home and compare and contrast to that of another city. NOAA has an excellent tool to research this data: https://outflux.net/weather/noaa/index.php Students will use this data to answer the Station 1 Questions on their Student Handout.

If you do not have access to Internet-connected devices, **print** the pre-prepared Data Sheets with several American cities to choose from.

Station 2: Different Designs
At this station, students will read scenarios in which gardeners, farmers, landscape designers, etc. choose certain plants to meet certain needs. **Print** Station 2 Instructions and Design passages. Based on these passages, students will determine whether this was an appropriate planting based on the plant's needs and the climate in which it is planted. The three potential scenarios include an invasive species (kudzu, Japanese knotweed), a water-intensive planting (turfgrass in the desert), and a climate-appropriate planting (succulents in the desert).

4. Closing - Teachbacks and Shout-Outs

[5 - 10 minutes]

To conclude the lessons, **ask** students to offer a Teachback, in which they share something they have learned and understood from today's lessons. **Ask** students to offer a Shout-Out, a positive message directed towards someone else that describes something that did well in class.

Printable Resources

Name: Date:

The Green Green "Grass" of Home

Whether you live in the city or the country, someplace wet or someplace dry, someplace warm or someplace cold, it is nice to have the beauty of flowers and lawns in your life. In some climates, grass grows easily on the natural amounts of rainfall; in drier climates, native plants like cactus, succulents, and wildflowers grow naturally, while grass may not be able to survive without irrigation.

In this lesson, you will learn about your climate and its natural resources. Water and soil for growing plants are examples of natural resources. In some regions, these resources are plentiful. In others they are scarce and must be used carefully. Did you know that no matter where you live, you live in a specific "climate zone"? By knowing your climate zone, you know what plants thrive. Some are ***native plants, which are from where you live***, while others are from climates similar to yours. If we grow the right plants for the right climate zone, we can use our precious water resources more efficiently and have beautiful landscapes.

Record the definitions to these key vocabulary words.

Climate - _____

Weather - _____

Data - _____

Datapoint - _____

Trend - _____

If we grew a wet climate plant in a dry climate, what might happen to the plant? What would be required to keep it alive?

_____

_____

_____

Station 1: Climate Research and Graphing

Use the NOAA Internet tools <https://outflux.net/weather/noaa/index.php> to gather the following information for your two cities.

Location	Average High Temperature (°F)	Average Low Temperature (°F)	Average Precipitation (inches)	Average Sunny Days
City 1_____				
City 2_____				
United States	52.7°F	42.8°F	30.2	205

Based on your research, which city has a colder climate? Which city has a warmer climate? Which city has a wetter climate? Which city has a drier climate?

_____
_____

Which city would you like to visit? Write about that city's climate in your answer.

_____
_____

Do you think that the plants in City 1 need a lot of water to thrive or just a little? Do they need warm weather or can they survive the cold? Use your research in your answer.

_____
_____

Data Sheet

Location	Average High Temperature (°F)	Average Low Temperature (°F)	Average Precipitation (inches)	Annual Sunlight Hours
Atlanta, Georgia	72	53	47	2,821
Phoenix, Arizona	87	63	8	3,832
Boston, Massachusetts	59	44	44	2,633
Los Angeles, California	72	56	15	3,254
Houston, Texas	78	60	48	2,578

Station 2: Redesign the Landscape

Use the printed scenarios at **Station 2** to figure out what's wrong with the landscape and describe how you would fix it.

Question	Scenario 1	Scenario 2	Scenario 3
What's wrong with this landscape?	Maria grew a cactus, a plant that is adapted to a warm, arid climate, in a cold, wet climate.		
How would you fix the problem?	Maria can grow a plant that is adapted to the cold, wet climate OR bring her cactus inside for protection when the weather is not warm and sunny.		

Station Resources

Station 1 Instructions:

Welcome, scientists! At this station, your mission is to gather important data to tell the climate tale of two cities.

1. Pick two cities that you would like to visit and learn more about. If you can't decide, choose two from these examples: Boston MA, Burlington VT, Atlanta GA, Phoenix AZ, Honolulu HI, Miami FL, Seattle WA.

2. Write these two cities down on the Station 1 section of your Student Handout.

3. Use the tools (tablet, computer, table) to gather the data you need to understand the climate in these cities. You must uncover each city's average high temperature, average low temperature, and average precipitation.

4. Use your research to complete the table and answer the questions on your Student Handout.

Station 2 Instructions:

Plants provide food for us, they shade us from the sun, and clean our air. Sometimes we design landscapes with plants that we like, even if those plants are not adapted to the climate where we live. It is your mission to read about three landscapes and figure out what's wrong with each one. How would you fix the problem?

Design 1

Maria and her family recently moved from Phoenix, Arizona to Portland, Oregon. Although she disliked the hot weather in Arizona, she loved the native cacti that grew in Arizona's dry, sunny climate. To remember her old home, she bought a small potted cactus and placed it on the porch of her family's new apartment in cool, wet, Portland. For the next week, it rained and rained and rained some more. The sun was missing for days. Maria noticed that her cactus did not look well.

Design 2

Demetrius and his mother were asked to clear his grandmother's backyard in Atlanta, Georgia, so that she would have room to start a garden. As they were pulling plants, Demetrius noticed a purple flower growing from a vine that covered the ground. "That's kudzu," said his mother. "It's an invasive plant that grows like crazy." Demetrius learned in school that "invasive" meant that it was a plant from another place, another climate, and could hurt native plants. Still, he let it grow because he liked the way it looked. A few months later, Demetrius returned to his grandmother's house to see how her garden was growing. He was shocked to see that the kudzu had nearly overtaken her vegetables!

Design 3

Bryan's parents were raised in a time and place when a green grass lawn was a really cool thing to have. When they bought their own home in Los Angeles, California, they wanted the greenest grass possible. To keep that grass green, they constantly watered it. Bryan learned in school that California was in a drought and wanted to conserve water. He wondered if there were better plants than grass to grow in the arid California climate.

Lesson 3: Our Great Outdoors and Water Use

Teacher Lesson Plan

Pages 27 - 30
Printable Resources pages 31 - 33

Overview

In this lesson, students will apply what they have learned about water, their climate, and the connection between plants and outdoor water use by exploring the great outdoors of their local school. Students will review what they have learned about climate, plants, and water. We can reduce outdoor water use by growing climate-appropriate plants in our outdoor spaces. The class will then explore the outdoors, observing plants and environmental features that may affect water use.

Student Learning Objectives

Student will be able to… (*I can…)*

- Describe the connection between climate, plants, and outdoor water use (*explain how growing the right plants in the right climate saves water!*)
- Identify characteristics of plants related to their water needs (*observe the plants and water at our school)*
- Participate in an outdoor learning experience (*explore the outdoors)*
- Summarize and reflect on their learning (*show what I know!)*

Aligned Standards

Next Generation Science Standard	Grade Level
MS-LS2-5. Evaluate competing design solutions for maintaining biodiversity and ecosystem services.	Middle School (6^{th} through 8^{th})
MS-LS1-4. Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.	Middle School (6^{th} through 8^{th})

MS-ESS2-4. Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity.	Middle School (6th through 8th)
3-ESS2-1 Earth's Systems. Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season.	Upper Elementary (3rd through 5th)
3-ESS3-1 Earth and Human Activity Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard.	Upper Elementary (3rd through 5th)
4-ESS3-2 Earth and Human Activity Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.	Upper Elementary (3rd through 5th)

Lesson Outline

1. Introduction - Local Climate and Plant Brainstorm [10 minutes]
2. We Do (Whole Group) - "Water and Plants" Passage + Outdoor Exploration Expectations [15 minutes]
3. You Do (Small Groups / Independent) - Note-Taking and Observation of Local Plants [30 - 45 minutes]
4. Closing - Discussion and Reflection [10 - 15 minutes]
5. Extension: Design Your Own Landscape

1. Introduction- Local Climate and Plant Brainstorm

[10 minutes]
Resources: Chart Paper, Markers OR Smartboard

Tell students that they will be exploring the great outdoors of our school today. **Explain** that their mission will be to observe plants in order to understand how much water they require to thrive; first, we must know what we're looking for.

Ask students to describe the weather and climate of where they live. **Ask** them to identify ***native*** plants, those that grow where they live; they do not have to know the name, though that is encouraged. **Record** their responses on a visual (poster, digital representation).

Ask students how they think the weather and climate might affect the plants that live here (plants in rainy climates need a lot of water, plants in dry climates don't need a lot of water,

plants in cold climates can survive frosts, plants in hot climates struggle in frosts, etc.). **Explain** that plants are adapted to their environments. If we grow plants that aren't adapted for our climate in our landscapes, we will hurt the plant or use a great amount of resources to keep it healthy.

2. We Do (Whole Group) - "Water and Plants" Passage + Outdoor Exploration Expectations

[15 minutes]
Resources: Student Handout, pages 31 - 33

Tell students that they will be answering questions on their Student Handout as we learn more about water together. **Read** the "Water and Plants" passage found on the Student Handout. Students may read aloud as a whole class, in small groups, or independently. **Instruct** students to complete the questions

Ask students if they have any questions regarding the passage before reminding them of the Expectations during their outdoor learning segment.

Tell students that we are going outside to learn, not to play. When leaving the building, we must be very quiet because other classes are working. Make sure that they record the Expectations information on their Student Handout.

Say "We are going outside to learn, not to play. We will work and have fun learning about plants and our climate. When we walk in the hallway on our way to outside, we need to be very quiet. Students are learning. When we are outside, we will make a map, take notes and draw sketches of the plants we observe."

Escort your students to the outdoor area at your school. Prior to the visit, **plan** where you want students to observe and take note of some of the characteristics of plants (stem thickness, leaf quality, root size).

3. You Do (Small Groups / Independent) - Note-Taking and Observation of Local Plants

[30 - 45 minutes]
Resources: Student Handout pages 31 - 33

Supervise students as they begin to create their maps and document the plants that are growing in their outdoor space. **Assist** students as they orient their map and begin to take notes/sketches of plants.

4. Closing - Discussion and Reflection

[10 - 15 minutes]

Gather students together outside or **return** to the classroom.

Ask students to share their notes, sketches, and their maps with the rest of the class.

5. Extension: Design Your Own Landscape

In this activity, students will use their notes and map as a basis to redesign the landscape at their school with climate-appropriate plants and water saving techniques. This extension will require an Internet connection for students to conduct research.

Printable Resources

Name:
Date:

Water and Plants

Look out of your window. Unless you happen to be in the heart of a very big city (or in an unfortunate corner of a very large building), you probably see something growing, such as weeds, trees, plants, flowers, lawns, or forests. Just like you, that greenery needs water to survive. We not only need to share our available water with all of the humans and other animals on earth, we also need to share it with all of the plant life.

Some plants store water and use it very efficiently, while others need water every day to survive. Most plants take water in from their roots, suck it up to their leaves, and then release it to the atmosphere through a process known as "transpiration." Transpiration is an insanely cool concept: translated from Latin, it means "breathing across." It is how plants move water from their leaves back into the atmosphere.

Even in the most severe deserts, earth supports plant life, regardless of how wet or dry or rocky or fertile or high or low a spot might be. An amazing number of factors determine what might grow in a given spot, and nature is so brilliant that it puts just the right plants into just the right spot in just the right climate to thrive.

By looking at the parts of a plant, you can learn more about what it needs to survive. When you go outside, take a look at nearby plants and ask yourself: Are the leaves thick? Waxy? Veiny? Are the stems sturdy or flimsy? Are the roots deep or shallow?

Outdoor Agreement

We are going outside to **learn**, not to **play**.
We will **work** and have **fun** learning about **plants** and **our climate**.
When we walk in the **hallway**, we need to be very **quiet**. Students are **learning**.
When we are outside, we will **make a map**, take **notes** and draw **sketches** of the **plants** we observe.

Our Climate

Climate Zone:	Plant Hardiness Zone:
Average High Temperature:	US Average High: 52.7°F
Average Low Temperature:	US Average Low: 42.8°F
Average Precipitation:	US Average Precipitation: 30.2 in

First, create a map of your outdoor space. Be sure to orient the map with the Compass!

Second, explore your outdoor space and record notes and sketches of the plants you find. Use the Numbers to label where you found these plants on your map.

Number	Plant Notes	Sketch

Learning Landscapes SOILS

The Dirt on Dirt

Teacher Overview

Water is earth's most precious natural resource. Conserving it and using it sustainably is one of the most urgent issues facing our planet. Not a single human on earth is immune from water crises, especially as climate change wreaks havoc on historic weather and precipitation patterns. Most of us will face flooding, drought, or a water shortage during our lifetimes. For the lucky, the impacts will be fleeting. For others, the impacts might be fatal or life altering. As water sources get stretched by increased demand and sporadic supply, we must all work together to protect our precious water.

One of water's most important uses is in agriculture, where it works hand-in-hand with soil and plants. If we grow plants that are adapted for the climates in which they live, we will use less water. If we recognize the unique properties of soil types and their interaction with water, we can make better decisions about what to plant, how to plant, and how to keep crops watered.

This lesson teaches students about

- how soil functions in an ecosystem.
- how soil interacts with and stores water in a landscape.

It also reinforces basic concepts of the scientific method and experimentation.

Like the three previous lessons in the Learning Landscapes series, this lesson may stand alone or be used as part of a larger unit. Each of the Learning Landscape lessons emphasizes a different component of climate, water conservation, and outdoor space. They contain a variety of resources and activities for teachers to choose from to best suit the needs of their students. The activities are designed to be facilitated in whole-group, small-group, or individual formats. Be creative and have fun!

While these lessons have been designed for students in grades 4-7, the activities may be adapted to learners at every level.

Learning Landscape SOIL

The Dirt on Dirt
STUDENT OVERVIEW

DIRT! YUCCH! It's SOOO dirty, right? You can walk all over it. Maybe you know somebody who has a "dirty mouth." Maybe you know someone who "airs dirty laundry" by talking about private or embarrassing things in public. If you try to find out embarrassing or incriminating information about someone or something, you are "digging up dirt." If you are disrespectful to someone, you are "treating them like dirt." A boring person is a "stick in the mud." When someone gets labeled with something bad, their "name is mud."

Aw c'mon! These characterizations are just not fair to dirt. Dirt is not a bad thing. It is a WONDERFUL thing that deserves our utmost respect! Dirt, mud, soil… this amazing gift to all living things on our planet is worth so much more than our language would suggest. Dirt provides the foundation for our ecosystems, our buildings, our food, our landscapes, and so much more. Without dirt, we would not be able to live as we do.

As you may have guessed by now, this lesson is about dirt. You will have a chance to be soil scientists, conducting experiments to learn about different types of dirt and how dirt interacts with water and the environment. You will also test how plants and soil work together to prevent erosion and protect our environment.

Most importantly, you will get to combine going to school and playing in the dirt. Have fun!

Lesson: Soil

Teacher Overview

In this lesson, students will learn about soil and its role in water retention. They will connect scientific knowledge of soil to their personal and sensory experiences to recognize soil's importance for our landscapes and the plants we choose to grow. Students will take the lead by

- gathering qualitative and quantitative data,
- conducting experiments on erosion and water retention in different types of soils,
- researching how plants adapt to different soil types.

The lesson contains an introductory guided meditation, two mini-lessons, one on percolation and water retention, and the other on plants and erosion control, and an extender that students can complete on their own. The extender entails the use of the Alliance for Water Efficiency's online Indoor Water Use Calculator so students can learn about their own water use and discover ways they can conserve water.

Learning Objectives

Students will:

- Use imagination and mindfulness to learn about plants and soil through a teacher-led guided meditation that entails a movement-based and sensory exploration of photosynthesis and soil.
- Explain the role that soil plays in retaining (holding) water and supporting plant life.
- Compare the water retention characteristics of different soil types.
- Construct an experiment to gather qualitative and quantitative data on the effects of erosion on a soil mound.
- Sort plants by the soil types they prefer and identify common or dissimilar traits.

Aligned Standards

Next Generation Science Standard	Grade Level
3-ESS3-1 Earth and Human Activity Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard.*	3-5
3-LS4-4 Biological Evolution: Unity and Diversity Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.	3-5
4-ESS2-1 Earth's Systems Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.	3-5
3-LS4-3 Biological Evolution: Unity and Diversity Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.	3-5
5-PS2-1 Motion and Stability: Forces and Interactions Support an argument that the gravitational force exerted by Earth on objects is directed down.	3-5
5-ESS3-1 Earth and Human Activity Obtain and combine information about ways individual communities use science ideas to protect the Earth’s resources and environment.	3-5
MS-LS2-4 Ecosystems: Interactions, Energy, and Dynamics Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.	6-8
MS-ESS2-4 Earth's Systems Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity.	6-8

Lesson Outline

1. Introduction - Soil Meditation [5-10 minutes]
2. We Do (Whole Group) - Brainstorm: KWL Chart [5-10 minutes]
3. We Do (Whole Group) - Soil and Water Retention Mini-Lesson [10-15 minutes]
4. We Do (Whole Group) / You Do (Small Groups) - Experiment: Soil and Erosion Part 1 [20+ minutes]
5. We Do (Whole Group) / You Do (Small Groups) - Experiment: - Soil and Water Retention Part 2 [15 - 20 minutes, and separated from Part 1 for 3 – 5 weeks]
6. Extender: Using the Home Water Use Calculator

Meditation on Soils and Photosynthesis

[10 - 15 minutes]

Materials

A bagful of soil from around your school (enough so each student can have a handful)
Spray bottle of water
Calming music

Objective

To focus students' attention and interest through a meditation in which students take the time to breathe, be present, and experience the sensory journey of a plant.

Instructions

Explain to your students that will be thinking about the complex relationship among dirt, plants, and the earth.

Ask students to stand, close their eyes, and receive a small handful of soil … dug from the ground near your school.

Ask them to feel the soil and note what it feels like. Is it thick? Sandy? Moist? Rocky? Smooth?

As they feel the soil, ask them to be aware of the air surrounding them … air that is made up of oxygen, carbon dioxide, nitrogen, and other atmospheric chemicals. Ask them also to be aware of their breathing as they inhale and exhale, taking in oxygen and releasing carbon dioxide. Remind them that plants grow in the soil they are holding and through photosynthesis, those plants produce the oxygen they are breathing while the plants breathe the carbon dioxide they are exhaling. Their body's waste is the plant's nourishment, and the plant's waste is their nourishment. We could not survive without each other.

With a spray bottle, moisten the soil in the student's hand and have them note how the texture and feel of the soil changes with the addition of water.

Explain that soil, air, and water are the key ingredients needed for plant growth, nourishment, and their ability to survive on planet earth.

Know-Want-Learn Class Discussion / Brainstorm Session

Materials
Chart paper and markers or a Smart Board

Instructions
Ask your students to finish this sentence: “Plants grow in…” and record their responses.

While answers may vary (like pots or gardens), guide your students to the common denominator: dirt or soil. Build a KWL Chart by recording what students already KNOW about dirt and soil and what they WANT to know. At the end of the lesson, revisit the chart to complete what they LEARNED.

Mini-Lesson: Soil and Water Retention [10-20 minutes]

Materials
PowerPoint slide deck (included)
Student worksheets (included)
Soil from your local area (You may use the same soil you used in their introductory meditation.)

Background
Explain to your students that all soils are a combination of organic material and three mineral building blocks: sand, clay, and silt. Sand is like they would find in a sandbox or on the beach. Clay is the same sticky, malleable material they might use in art class. Silt is fine material deposited by running water, such as rivers and streams. Technically, its particle size is between that of sand and clay. Organic material is the decomposed leaves and branches of now-dead plants. In a broad range of proportions, they make the soil that everything grows in. Some of those soils are much better at holding and using water than others. In this lesson, they are going to try to determine the characteristics of the local soil by conducting a "squeeze test."

Show the PowerPoint deck or create a gallery walk in your classroom. Discuss the three soil types.

Procedure
1. As in the guided meditation, give each student a handful of soil
2. Moisten that soil and have students work the moist soil into a ball.
3. Observe and note if:
    A. The soil holds shape but crumbles when it is poked.
    B. The soil holds its shape even when it is poked.
    C. The soil crumbles even before it is poked.

If A, the soil has a high silt content.
If B, the soil has a high clay content.
If C, the soil has a high sand content.

4. As a class, agree on the type of soil found in your locale.

Experiment: Soil and Water Retention (20 – 30 minutes)

You may conduct this experiment as a class demonstration or with experimental teams, depending on time and space.

Materials
3 1- or 2-liter plastic soda bottles with the bottom cut off (per team)
Small piece of cotton rag to prevent soil from falling through the neck of the bottle
Small bag of clay (from the art room)
Small bag of top soil or potting soil
Dirt from around your school
Water
A measuring cup
A timing device (such as the timer on a cell phone)
Worksheets (included)

Teacher Instructions
Explain that each type of soil has its own unique qualities. Some soils hold water very well, while some drain quickly. Ask how this characteristic might affect the ecosystem in which it is found.

Explain also that different plants need different amounts of water to survive and thrive. Some plants need a lot of moisture, while others, such as desert plants need very little.

Procedure
1. Place a small piece of rag at the neck of each soda bottle to hold the soil in place.
2. Fill each bottle 1/3 full with each of the three soil types, 1 with clay, 1 with sand, and one with the soil from your locale.
3. Slowly pour one cup of water into the open end of each of the three soda bottles.
4. Allow the water to percolate through the bottle for 1 minute and drain into a bowl or measuring cup.
5. Measure the amount of water that passed through the bottle in one minute.

Conclusions (Class discussion and comparison of notes)
Of the three types of soil tested, which do you think would be best for growing plants and crops? Why.

How might you design an experiment to determine the water needs of certain plants and then create an ideal soil mixture for growing that plant

Mini-Lesson: Soils and Erosion

Whole Class or Small Groups, 20+ minutes, over two sessions

Overview

In this lesson, students will observe the effects of flowing water on erosion with and without plant/root structures in place.

Materials

Quick-growing seeds (such as radishes)
Soil
Potting containers (paper cups work fine)
Qualitative and Quantitative data worksheet

Teacher Instructions

Explain to students that they will be conducting an experiment to measure the impact that plants can have on the erosion of soil.

Review the Scientific Method and key terms (such as dependent variable), and discuss the experimental design.

Students will create two small soil mounds of roughly the same size and consistency. One mound will be planted with radish seeds and periodically watered with a spray bottle to ensure germination. The other will remain unplanted and bare soil. Students may or may not choose to water the unplanted mound. Discuss the challenge of controlling variables in an experiment. (Does water alone affect the soil, or is the dependent variable the radish plants and root structures?)

Carefully observe the two mounds for several weeks as the radish seeds sprout and establish strong roots.

Once the plants and roots have fully established themselves, pour a cup of water at roughly the same angle and force, with exactly the same amount of water, onto each mound. Measure the before and after size of the mound, and observe what the poured water did to the dirt in the mounds. Discuss the observational (qualitative) data that students gathered, then collect the quantitative data by carefully measuring the mounds.

Conclusions

What conclusions can your students draw about the importance of plants and crops on erosion and soil retention?

Extender: Measuring Water Use: Using the Home Water Works Calculator

Teacher Overview

In this lesson, students will learn about the use of indoor and outdoor water in their home and in different climates. In simple terms, hot, dry climates require more water than cool, wet climates. In this lesson, students will compare the water use of three identical fictitious families, one in Tucson, Arizona (hot and arid), one in Atlanta, Georgia (hot and humid), and one in Portland, Maine (cool and wet). After completing a data analysis exercise on those households, they will extend the lesson by using the "Home Water Works Calculator" to analyze their own water use and strategize about how to use less water.

Student Learning Objectives

Student will:

- Develop an understanding of the relationship between climate and water use.
- Analyze and compare data from the Alliance for Water Efficiency's Home Water Works Calculator to determine the impact of changes in behavior, practices, and equipment.
- Practice map reading and data analysis skills.
- Incorporate their understanding of climate and their map skills into their analysis.
- Describe their findings and compare/contrast their results to the results of their classmates.
- Use the Home Water Works Calculator to estimate their own household's water use.

Aligned Standards

Next Generation Science Standard	Grade Level
5-ESS3-1 Earth and Human Activity Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment. MS-LS2-4 Ecosystems: Interactions, Energy, and Dynamics Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.	3-5 6-8
MS-ETS1-3 Engineering Design Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.	6-8

Lesson Outline

1. Introduction – Review Climate and Weather [10 minutes]
2. We Do / You Do – Water Use and Climate [15-20 minutes]
3. We Do / You Do - Calculating Outdoor Water Use [15-20 minutes]
4. Extension – Using the Home Water Use Calculator [15-20 minutes]

Teacher Instructions

1. Introduction – Review Climate and Weather [10 minutes]

Resources: Student Handout, SmartBoard, Climate Maps

Explain to students that they will be learning about climate and water use in homes. Ask the difference in "climate" and "weather."

Climate: The long-term pattern of weather in a particular place.

Weather: What is happening outside at a single moment or on a single day.

Here's a way to help students understand: "Climate" determines your wardrobe, or the type of clothing you own. "Weather" determines what you wear on a specific day. If you live in a cold climate, you own heavy clothes, jackets, and sweaters … but you still dress lightly on the occasional day when the weather is warm.

Ask students for examples of climate characteristics: precipitation, temperature, relative humidity, and types of flora or plant life, such as cactus in the desert.

Explain that plants and animals are adapted to live in certain climates while humans are so adaptable that we live in nearly every climate on Earth! Climates can have a huge impact on resource use. We have to heat more in cold climates and air condition more in hot climates. We have to water outdoor plants more in dry climates and take care to have plants that thrive in your specific climate.

Project the Climate Map onto a SmartBoard to show students how different parts of the United States have vividly different climates. Ask students to identify where they live, then describe their climate based on information from the map.

2. We Do / You Do – Water Use and Climate [15 minutes]

Resources: Student Handout

Direct students to their Handout and review the instructions. In this lesson, students will compare the water use of three identical families living in three very different climates, then identify the reasons for these differences in water use. You may choose to do this activity together as a class, or in small groups / independently.

3. We Do / You Do - Calculating Outdoor Water Use [15-20 minutes]

Resources: Student Handout

Direct students to the Calculating Outdoor Water use section of their handout and review the instructions. In this lesson, students will use the calculator to see how outdoor water use differs in these three different climates just because of the climate, not because of any action that these families take.

4. Extender: Using the Home Water Works Calculator [15-20 minutes]

Resources: Computer

This web-based calculator deepens the students' knowledge of water conserving techniques in a friendly, easy-to-use interface. The lesson has been designed to be appropriate for a broad range of settings, from urban to rural, single unit housing to multi-family housing, and single family to extended households. It should provide an opportunity for students to work independently, with their families, or with friends or other adults.

Student Handout

Extender: Measuring Water Use: Using the Home Water Works Calculator

Have you ever thought about how the climate you live in influences the way you use the earth's resources?

What is Climate?
"Climate" is the long-term pattern of weather in a particular place. "Weather" is **w**hat is happening outside at a single moment or a single day.

Here's a way to help you understand: "Climate" determines your wardrobe, or the type of clothing you own. "Weather" determines what you wear on a specific day. If you live in a cold climate, you own heavy clothes, jackets, and sweaters … but you still dress lightly on the occasional day when the weather is warm.

If you live in a cold climate, you use more heat than you would in warmer climates, and you probably own coats and sweaters and heavy blankets. If you live in a hot climate, you might have an air-conditioned home, which requires electricity. If you live in a dry climate, you might water your outdoor plants to keep them healthy. If you live in a warm, damp climate, you might spend a lot of time outdoors pulling the weeds that just seem to keep growing, or you might eat out of your very own vegetable garden.

Water Use and Climate
In this lesson, you are going to compare the water use of three identical families living in three very different climates. The Allen family lives in Portland, Maine, which has a cool, damp climate. The Williams family lives in Atlanta, Georgia, which has a warm, damp (tropical) climate. The Martinez family lives in Tucson, Arizona, which has a hot, dry (desert) climate.

Here is some climate-related information for each of the cities:

	Avg. Yearly Temperature (˚F)	Avg Annual Rainfall (inches)	Avg Annual Humidity
Portland, Maine	46.4	47.3	60.8
Atlanta, Georgia	62.2	49.7	54.9
Tucson, Arizona	70.9	10.9	29.2

Which city gets the most rainfall every year? _____

Which city is the coldest? _____

Which city is the driest (or has the lowest relative humidity)? _____

Calculating Outdoor Water Use

The Alliance for Water Efficiency's "Home Water Use Calculator" allows you to calculate the amount of water you use in different parts of your home and helps you figure out strategies for using less water.

In this lesson, you will use the calculator to see how outdoor water use differs in these three different climates just because of the climate, not because of anything these three families do.

Family Water Use

All three families live in single-family homes built in 2002. Their lots are 10,000 square feet. With driveway and the house, they each have 5,000 square feet of yard (50' X 100'). They all take pride in their yards, and maintain a combination of native shrubs and flowers, as well as a small amount of lawn which they water as needed.

As the "Home Water Use Calculator" shows us, their indoor water use is identical regardless of their location. Their outdoor water use, however, varies by location. Here is the data from the calculator:

Indoor Water Use		
Allen Family, Portland, Maine	166.5 gallons per day (GPD)	60,772 gallons per year (GPY)
Williams Family, Atlanta, Georgia	166.5 gallons per day (GPD)	60,772 gallons per year (GPY)
Martinez Family, Tucson, Arizona	166.5 gallons per day (GPD)	60,772 gallons per year (GPY)
Outdoor Water Use		
Allen Family, Portland, Maine	98.2 gallons per day (GPD)	35,843 gallons per year (GPY)
Williams Family, Atlanta, Georgia	162.3 gallons per day (GPD)	59,240 gallons per year (GPY)
Martinez Family, Tucson, Arizona	384.4 gallons per day (GPD)	140,306 gallons per year (GPY)

With that information in hand, try to explain the differences.

1. Where are the differences in the water use of the three families, indoors or out?
   _____

2. Explain in your own words why these differences exist.

3. What ideas might you suggest to each of the three families to use less water?

4. If each family replaced all of their lawn and plants with landscapes that require no additional water, how much water would they save each year? If that water cost $1.50 per thousand gallons, how much money would they save each year?

Using the "Home Water Works Calculator" to calculate your own household's water use

You can complete this activity on your own, with your family or others in your household, or with your friends. It is fun to use, and it will teach you a lot about how you use water and how to use less. Using less water is good for the environment, and it saves money!

Getting started with the calculator

Using a web browser, go to https://www.home-water-works.org. Click on "Find my water usage" then again on "Click here to start."

You will need to know the following information. If you do not know it, speak with people at home. If you are still not sure, make your best guesses or approximations.

- Postal Zip Code
- The approximate year your home was built (before 1980, 1980-2010, or after 2010).
- Whether or not any of your plumbing fixtures (toilets, showerheads, dishwasher, clothes washer) have been upgraded to high-efficiency models. If you do not know, adults in your home might. Otherwise, do the best you can.
- The number of people living in your home.

- Whether or not you use water outside on the lawn or garden or to maintain a swimming pool.

- The approximate size of the yard that you water, either with a hose or an irrigation system (“very small” or less than 1,000 square feet, “small” or 1,000 to 3,000 square feet, “average” or 3,000 to 7,000 square feet, “large” or 7,000 to 15,000 square feet, “very large” or greater than 15,000 square feet, or “other”).

Once you have entered this information, the calculator will tell you how much water your household uses each day, both inside and outside.

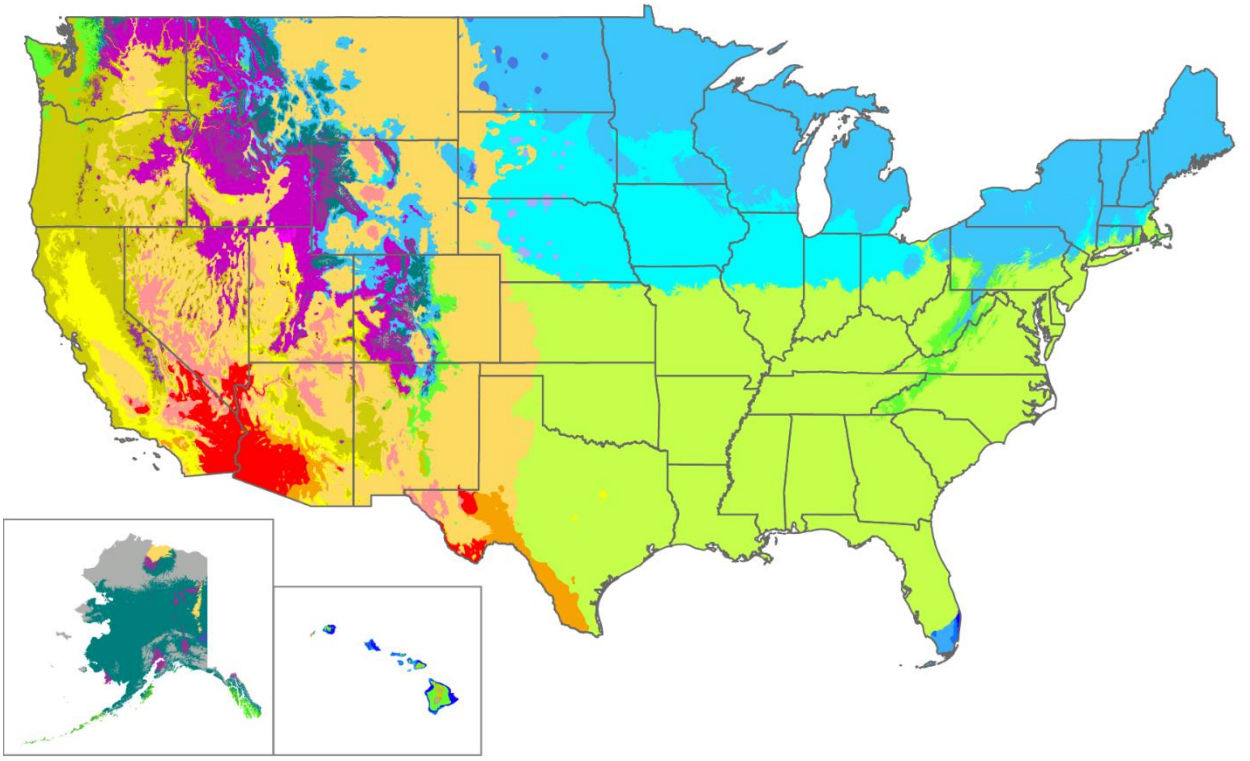
From, you can start to look more closely at your water use in four areas:
- Kitchen
- Bathroom
- Laundry
- Outside

Clicking on one of the four the magnifying glasses will take you into that room. The question marks provide the calculator with more detailed information about your equipment and behavior. The exclamation points provide tips and information that will teach you even more about how to save water.

Conclusion
Depending on your climate, outdoor water use can be among the biggest water users in your home. Landscaping with native plants that thrive in your climate instead of grass or lawns can be one of the smartest water-use decisions your household can make.

What can I do to save water?
List things you and your household can do over the next few months to save water. Compare your lists with the lists of your classmates.

Climate Maps



(Adam Peterson, Creative Commons)

(Public Domain)

About the Authors

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The Writing Company
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After ten years of teaching, Kenneth Mirvis, Ed.D., founded The Writing Company in 1980. In addition to providing communications workshops to corporations, universities, and governments, he has developed award-winning teaching materials related to drinking water, water conservation, water quality, watershed protection, solar energy, and clean energy for clients across the U.S. He currently serves as a commissioner on his local water board and works as a communications coach in the Sustainable Innovations MBA program at the University of Vermont. In the early 2000s, co-writer Greg Beach interned at The Writing Company, working on an AWWA project focused on internships.

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Greg Beach is an educator and writer who currently teaches high school social studies at BEST Academy in Atlanta Public Schools. Originally from Massachusetts, Greg published his first book, The World and Watertown, in 2017 and served as a contributing writer for green design website Inhabitat from 2015 to 2018. Prior to moving to Atlanta, Greg worked as a public school garden educator with CitySprouts in Boston and Cambridge and served two terms with AmeriCorps, including one year as a FoodCorps Service Member. Greg completed his graduate studies at Lesley University and his undergraduate studies at Tufts University.

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