



Utility Exploration Center Unit Plan



Water, Water, Everywhere?

Grade

2nd

NGSS standards

[2-ESS2-2](#)

[2-ESS2-3](#)

Time

4 hours, over 4-5 days

Water is a precious resource, and we are all responsible for conserving it and keeping it clean.

Description

Students will explore how water moves over a landscape, in what forms (such as fresh, frozen and saltwater) and where water exists on Earth (such as lakes, oceans, rivers, glaciers and underground).

After making these discoveries, students will be able to pinpoint the source of their own drinking water. Students will finish this lesson with an appreciation for the scarcity of fresh water on Earth and a toolkit of simple actions they can take to conserve and protect their water source.

Specific Learning Outcomes

- After exploring where, and in what forms, water is found on Earth, students will be able to identify where water exists and why it is so important to conserve and protect watersheds.
- Students will make connections to how the work of stormwater and drinking water utilities support their daily lives and be able to take actions that will positively affect their water supply.

Materials List

- Tarp or large plastic sheet
- Spray bottles or watering can
- Rocks
- Zip style sandwich bags
- Ice (cubes and/or large block)
- Course salt
- Food coloring
- Plastic box/tub
- Glass cup or other container
- Plastic wrap
- Lamp with a bulb that gets hot (optional)
- Small, medium and large sponge
- Large transparent basin/bucket (½ full of water)
- 97 blue beads
- 2 white beads
- 1 red bead
- Bag (large enough for 100 beads and not transparent)
- Poster boards (optional)



Performance Expectation(s)

- Develop a model to represent the shapes and kinds of land and bodies of water in an area.
- Obtain information to identify where water is found on Earth and that it can be solid or liquid.

Phenomena / Essential Question(s)

Phenomena: Water moving over a landscape and the changes that may occur.

Essential Question(s): How does water move, and how (in what forms) is it found in on Earth? Where is water on Earth? How does water affect us? How do we affect our water?

NARRATIVE / BACKGROUND INFORMATION

Prior Student Knowledge

- **K-LS1-1.** Use observations of patterns to describe what plants and animals (including humans) need to survive. (Humans need water to live.)
- **K-ESS2-1.** Use and share observations of local weather conditions to describe patterns over time. (Indicates that students are aware of rain and snow.)
- **K-ESS3-3.** Communicate solutions that will reduce the impact of humans on the land, water, air and/or other living things in the local environment. (Provides foundational knowledge that their actions have an impact on water.)

Life Experience

- Students will have seen different quantities of water and in different forms (liquid, solid).
- Students use water daily in activities such as brushing their teeth, flushing the toilet and taking a bath/shower.

Teacher Background Information

This document provides information about how our local watersheds provide a high percentage of our drinking water in Placer County. Understanding the importance of water quality and water conservation and how water flows across the landscape can provide a nice foundation to support your students' learning.

Possible Preconceptions/Misconceptions

Misconception: Water is always there when I turn on my tap and always will be.

Truth: Our demand for water is getting bigger while the supply of water remains the same.

Misconception: If we have too little water, we can just clean the salt water in the oceans and drink it.

Truth: Although we can remove the salt from ocean water in a process called desalinization, it takes a lot of energy and is very expensive. It makes more sense to save water and make sure we keep our fresh water clean.



Science & Engineering Practices (SEPs)

Developing and Using Models

- Develop a model to represent patterns in the natural world. (2-ESS2-2)

Constructing Explanations and Designing Solutions

- Compare multiple solutions to a problem. (2-ESS2-1)

Obtaining, Evaluating and Communicating Information

- Obtain information using various texts, text features (e.g., headings, tables of contents, glossaries, electronic menus, icons) and other media that will be useful in answering a scientific question. (2-ESS2-3)

Disciplinary Core Ideas (DCIs)

ESS2.A: Earth Materials and Systems

- Wind and water can change the shape of the land. (2-ESS2-1)

ESS2.B: Plate Tectonics and Large-Scale System Interactions

- Maps show where things are located. One can map the shapes and kinds of land and water in any area. (2-ESS2-2)

ESS2.C: The Roles of Water in Earth's Surface Processes

- Water is found in the ocean, rivers, lakes and ponds. Water exists as solid ice and in liquid form. (2-ESS2-3)

ETS1.C: Optimizing the Design Solution

- Because there is always more than one possible solution to a problem, it is useful to compare and test designs. (Secondary to 2-ESS2-1)

Crosscutting Concepts (CCCs)

Patterns

- Patterns in the natural world can be observed. (2-ESS2-2), (2-ESS2-3)

Stability and Change

- Things may change slowly or rapidly. (2-ESS2-1)

Connections to Engineering, Technology and Applications of Science; Influence of Engineering, Technology and Science on Society and the Natural World

- Developing and using technology has impacts on the natural world. (2-ESS2-1)

Distance Learning Variations

- Students can make a small version of the class watershed model in the Engage section at home using crumpled paper and a spray bottle or cup of water. Remind them to work on a surface that can get wet. Add watercolor along the ridges or mountain tops to be able to see the water flow after they add water. Ask students to do the same steps in the activity and share a picture and their questions/answers from the independent experiment.
- In the Explore section, students can complete these activities at home or the teacher can demonstrate during a live meet session.
- In the Evaluate section, students present posters to the class via your virtual class meeting. Students could also present their poster in a video using [FlipGrid](#).



LESSON PLAN – 5E MODEL



ENGAGE

Estimated time: 45 minutes

Create a Class Watershed Model

- Students bring an object from home (between the size of a golf ball and a cereal box). Although these items will be covered during the exercise, students must choose objects that will be okay if they accidentally get wet or dirty. The items will return home with the students after the activity. Students arrange the objects together on a table top or outside on the ground (preferable). Then, spread a tarp or plastic sheet over the objects, making sure there are multiple high points and low points in the “terrain.” No objects should be visible. You will be pouring water on the sheet and observing where it goes.
- Students write two questions they’d like to answer about water movement based on observations.
- **Guiding questions:** What do you notice about the watershed? Where does the water pool?
- Explore the watershed model.
 - Pour some water from the top of one of the high points in the model. Watch where the water goes. Pour some more water.
 - **Guiding questions:** Does the water go the same places it did when you poured it the first time? Are your results consistent? Why or why not?
 - Place an ice cube on one of the highest points of the model and let it melt.
 - **Guiding question:** What happens to the ice?
 - Try placing rocks or sticks in various locations throughout the watershed model. Then, pour more water.
 - **Guiding question:** How do these obstacles change the water’s flow?
- Students draw a picture of the watershed model and include where the water flowed and pooled.
 - Students mark high points and low points on the model and write about their observations and questions.



EXPLORE

Estimated time: 45 minutes

Watch [Watersheds! video](#) (5 minutes) to introduce new vocabulary.

- While watching the video, students make a list of new words they hear.
- Create a [Word Wall](#) with all the vocabulary students found.
- Using vocabulary, students label parts of their watershed map drawing from activity above.



Vocabulary (Slides with Images)

Groundwater - water held underground in the soil or in pores and crevices in rock.

Headwaters - a tributary stream of a river close to or forming part of its source.

Evaporate - turn from liquid into vapor.

Topography - the arrangement of the natural and artificial physical features of an area.

Drainage Divide - The line following the ridges or summits that form the exterior boundary of a watershed, river basin, or catchment.

Precipitation - rain, snow, sleet or hail that falls to the ground.

Runoff - the draining away of water (or substances carried in it) from the surface of an area of land, a building or structure, etc.

Explore what happens to solid/frozen water over time.

- Two options: pick one or do both, either together or in two groups. If students observe both experiments, ask afterwards, "Why do you think that sun and salt melt the water more quickly?"

1. **Water Cycle Explore It** - Each student observes water melting using only the sun/heat.

- Provide each student with a sealable sandwich-sized bag. After decorating their bag, each student places 1-2 ice cubes in their bag and seals it (slightly inflated for better visibility). Tape bags to a window. Students draw observations at timed intervals, every 15 minutes if possible.
- Use the next two activities - Solar Still and Changing States of Matter video - to create wait time between observations.
- **Guiding questions:** What do you see that's different or the same as the last time you drew the ice? Do you notice anything new that wasn't there before? What questions do you have about the changes you're observing?

2. **Melting Ice Experiment with Salt video** (5:28 minutes) - Students observe water melt more rapidly using heat (sun) and salt (oceans).

- **Guiding questions before video:** What happened to the block of ice? Why are we seeing water, where before we saw a solid block of ice?
- Additionally, using fresh frozen and salty frozen water provides opportunity for discussion about types of water on Earth.
- Ask students to draw or photograph what happened in each interval of observation time.
- **Guiding question after video:** What does salt do to a block of ice?

Complete **Build a Solar Still activity**.

- **Guiding questions before building:** Is rain salty? Why not?
- **Guiding questions after Solar Still experiment is complete:** How does it taste? Is it salty? Did you expect salt? Do you think this experiment would work without the sun/heat? Does this happen all over the Earth?

Watch **Changing States of Matter video** (5 minutes) to review/explore what happens to water in its different states of matter.

Assign **Solid or Liquid worksheet** (or **Drag-n-Drop Google Slide**) as an in-class worksheet or home-work assignment.



EXPLAIN

Estimated time: 45 minutes

Explore maps to identify where we can find different types water (solid/frozen, fresh and salty) on Earth.

- Using [Google Maps](#) or [Google Earth](#), point out glaciers on Earth.
- Explore the map with students and identify salt water and some fresh water locations.
- Zoom in and out to remind students this information about water is true for the whole planet. Take your time, let them guide your exploration of the maps.
- **Guiding Questions:** Where do we find salt water? Is there more fresh water or salt water on Earth? Where could we find fresh water near where we live? How much fresh water is there really?

Complete Water on Earth activity.

- Create a bag prepared with 97 blue beads, 2 white beads and 1 red bead. Ask the students what they think each colored bead in this bag represents. Have each student pick a bead from the bag and, when all students have drawn, see if they can guess what kind of water their color might represent (salty, frozen or fresh). Write their hypothesis on the board. BLUE represents salty water that we can't drink. WHITE represents frozen water that we can't drink. And RED represents fresh water we can drink. Did anyone get a white or red bead?

Watch [Show Me the Water video](#) (2:50 minutes).

Assign the [How Do You Use Water? worksheet](#) (or [Drag-n-Drop Google Slide](#)) as an in-class worksheet or homework assignment.



ELABORATE

Estimated time: 45 minutes

Tell a [Lake Story](#)

- **Guiding questions before story:** Who uses water and for what? How did you use water when you used the checklist at home?
- Read the Lake Story aloud with the necessary materials to demonstrate the changing lake levels. Pause at appropriate moments to engage in discussions using these guiding questions.
- **Guiding questions mid-story after farms and more factories are built:** What is happening to the water level in the lake? What ways can we make sure everyone has enough water?



- **Guiding questions after intro of [storm drain image](#) at end of story:** Were you able to find a storm drain during your walk in your neighborhood? Did you find a sign near the drain? What did it say? Roseville signs read: No Dumping, Drains to Creek.

Introduce the local watershed where Roseville gets most of its drinking water in [Watershed PDF](#).

*Be sure to click the yellow dialogue box in the upper right corner to find background information within each slide.

- **Guiding question:** How can we protect our water from getting dirty in the first place? Stormwater that falls in our yards eventually ends up in the Sacramento watershed and is used by other communities.

Using a [Storm Drain template](#), ask students to draw an image on the sidewalk.

- Students demonstrate the story of where the water goes and include the tagline “Only Rain in the Drain.”



EVALUATE

Estimated time: 45-90 minutes, possibly two class sessions

Formative Monitoring (Guiding Questions / Discussion):

Use homework and worksheet discussions throughout. Add vocabulary words to label their watershed maps showing where they can find the drainage divide, runoff, headwaters, rivers, lakes, etc.

Summative Assessment (Quiz / Project / Report):

Students create a large image (poster/Google Slide/flier) to educate others about what they learned about their water and present their image to the class.

- Posters feature information about both saving water and keeping water clean.
- Students could include details like: different types of water on Earth, the source of their water in written form or a drawing and encourage others to save water and keep water clean using taglines like “Only Rain in the Drain.”
- Share your students’ work with us! We’d love to see what they create. Email rucc@roseville.ca.us.

COMMON CORE STATE STANDARDS CONNECTIONS ELA

- SL.2.5 - Add drawings or other visual displays to stories or recounts of experiences when appropriate to clarify ideas, thoughts and feelings (2-ESS2-2).
- W.2.6 - With guidance and support from adults, use a variety of digital tools to produce and publish writing, including in collaboration with peers (2-ESS2-3).
- W.2.8 - Recall information from experiences or gather information from provided sources to answer a question (2-ESS2-3).

COMMON CORE STATE STANDARDS CONNECTIONS MATHEMATICS

- MP.2 - Reason abstractly and quantitatively (2-ESS2-2).
- MP.4 - Model with mathematics (2-ESS2-2).
- 2.NBT.A.3 - Read and write numbers to 1000 using base-ten numerals, number names and expanded form (2-ESS2-2).



Resource Links:

In case hyperlinks above get broken, here is a detailed list of links.

- **2-ESS2-2:** <https://www.nextgenscience.org/pe/2-ess2-2-earths-systems>
- **2-ESS2-3:** <https://www.nextgenscience.org/pe/2-ess2-3-earths-systems>
- **K-LS1-1:** <https://www.nextgenscience.org/pe/k-ls1-1-molecules-organisms-structures-and-processes>
- **K-ESS2-1:** <https://www.nextgenscience.org/pe/k-ess2-1-earths-systems>
- **K-ESS3-3:** <https://www.nextgenscience.org/pe/k-ess3-3-earth-and-human-activity>
- **Teacher Background Information:** www.roseville.ca.us/grade2
- **FlipGrid:** info.flipgrid.com/
- **Watersheds Video:** www.youtube.com/watch?v=2pwW2rIGla8&feature=emb_title
- **Word Wall:** www.readingrockets.org/strategies/word_walls
- **Vocabulary/Slides with Images:** www.roseville.ca.us/grade2
- **Water Cycle Explore It:** www.roseville.ca.us/grade2
- **Melting Ice Video:** www.youtube.com/watch?v=SV-vBSi_Hng&feature=emb_title
- **Solar Still Explore It:** www.roseville.ca.us/grade2
- **Changing States of Matter Video:** www.youtube.com/watch?v=tuE1LePDZ4Y&feature=emb_title
- **Solid or Liquid Worksheet:** www.roseville.ca.us/grade2
- **Google Maps:** www.google.com/maps/@38.7720779,-121.3427256,15z
- **Google Earth:** earth.google.com/web/@8.95688583,-87.29575709,-9583.26135331a,11086188.59161019d,35y,-0h,0t,0r
- **Show Me the Water Video:** www.youtube.com/watch?v=4HSFKwho7MQ&feature=emb_title
- **How Do You Use Water? Worksheet:** www.roseville.ca.us/grade2
- **Tell me a Lake Story:** www.roseville.ca.us/grade2
- **Storm Drain Image:** www.roseville.ca.us/grade2
- **Watershed PDF:** www.roseville.ca.us/grade2
- **Storm Drain Template:** www.roseville.ca.us/grade2