

This guide accompanies
[*Science Sustainability Sleuths Day 3*](#)

PRIOR TO TEACHING



Subject

Sources of Water



Program Length

45 minutes – 1 hour



Program Objective

California has really tall mountains with lush, agriculturally rich valleys down below. Learn about the Big Bumpy Land we call home and show off these features in your very own 3D relief map as you learn where our water comes from in Southern California.



Next Generation Science Standards

3-PS2-2: Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion.

4-ESS2-2: Analyze and interpret data from maps to describe patterns of Earth's features.

5-LS2-1: Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.

5-ESS2-1: Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.

5-ESS3-1: Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.

5-PS1-4: Conduct an investigation to determine whether the mixing of two or more substances results in new substances.

5-PS2-1: Support an argument that the gravitational force exerted by Earth on objects is directed down.



What I Need Today

¼ cup salt

½ cup flour

3 tablespoons warm water

measuring cups

measuring spoons

medium or large mixing bowl

mixing spoon

microwave

markers or paint

parchment paper, wax paper, or cling film
paper or template ** (here on last page)

pen or pencil (optional)

masking tape (optional)

hot mitts (optional)



Vocabulary

Raised Relief Map – a physical model of the Earth that uses bumps and colors to show off the Earth's elevation and land features. Often, green represents low-lying areas; brown, red, or white represent tall mountains, and blue represents water.

Contiguous United States – The 48 states (and Washington, D.C.) that touch one another. This does not include Alaska, Hawaii, or any territories, such as Puerto Rico, or the US Virgin Islands.

Engineer – A person who uses physics, math, and chemistry to figure out the best way to solve problems by creating new things or improving a product.

Aqueduct – A system that carries water from one place to another. Aqueducts can help water travel underground (through a tunnel or pipe), at ground level (through a canal), or above the ground (over a bridge).



Instructor Prep

In advance, send students a list of the materials needed for today's lesson.

Note: This activity calls for using a microwave, which drastically speeds up a salt dough's drying process. If your students do not have access to a microwave, they can let their model air dry.

*If your students do not have access to a printer, they can draw their own outline of California on a blank piece of paper.



PROCEDURE



What We'll Learn

California has a rich landscape diversity: from a long coast line, a lush central valley, deserts, and lots of tall mountains. Much of Southern California doesn't have a wealth of drinking water, so a lot of our water comes from snow melting in the tall California mountains.



What Will Happen?

Scientists ask questions and make predictions before they start investigating. Have your students hypothesize: how many mountain ranges are in California?

- ☐ 3
- ☐ 12
- ☐ 352
- ☐ 4,421

What to Do



REVIEW - DAY 2: SALT WATER

Have your students show off the results of their desalination experiments. What did they learn from watching their experiment over the course of the week?



VIDEO - BIG BUMPY LAND

To start learning about the geography of our land, first watch [Big Bumpy Land](https://vimeo.com/482433180/e006a1ce87): <https://vimeo.com/482433180/e006a1ce87>

Reflect on the video: what did your students learn?





EXPERIMENT - THE UPS AND DOWNS OF TOPOGRAPHY: MAKE A 3D MAP MODEL

1) Print the template showing the shape and features of California – or try drawing your own.



Tips & Tricks: If your students do not have access to a printer, have them draw their own shape of California on a blank piece of paper.

2) To make your raised relief map showing off the mountains and valleys of California, start by mixing $\frac{1}{4}$ cup salt with 3 tablespoons warm water.



Fun Facts: A raised-relief map is a three-dimensional (3D) map that usually exaggerates the height of mountains so it's easier to see the difference in geographic features.

3) Once the salt is mostly dissolved, mix in $\frac{1}{2}$ cup flour.



Tips & Tricks: Once it gets hard to mix with the spoon, try using your hands to “knead” the dough. You want the dough to be stiff: if it is too crumbly, try adding a few drops of water; if it is too wet, try adding a dusting of flour.

4) Place parchment paper, wax paper, or cling film over your paper drawing of California.



Tips & Tricks: Try taping this to the table top to keep it from moving.

5) With about $\frac{1}{3}$ rd of your dough, create a flat shape of California using the template or drawing as your guide. Make sure you build this on top of the parchment paper, wax paper, or cling film so it does not stick to the copy paper.

6) Microwave the flat layer of dough (shaped like California) for 15 seconds. Then turn it over and microwave for another 15 seconds.



Tips & Tricks: You can keep the parchment paper, wax paper, or cling film under the dough when you microwave – just be sure to remove the tape before you cook the dough. Be careful when cooking the dough, as it can get hot! If needed, use hot mitts to help you handle the cooked dough.

THE UPS AND DOWNS OF TOPOGRAPHY: MAKE A 3D MAP MODEL



1. PRINT THE TEMPLATE SHOWING THE SHAPE AND FEATURES OF CALIFORNIA – OR TRY DRAWING YOUR OWN.
2. IF YOU DO NOT HAVE ACCESS TO A PRINTER, DRAW YOUR OWN SHAPE OF CALIFORNIA ON A BLANK PIECE OF PAPER.

THE UPS AND DOWNS OF TOPOGRAPHY: MAKE A 3D MAP MODEL



2. TO MAKE YOUR RAISED RELIEF MAP, DRAWING OUT THE MOUNTAINS AND VALLEYS OF CALIFORNIA, START BY MIXING $\frac{1}{4}$ CUP SALT WITH 3 TABLESPOONS WARM WATER.
3. A RAISED RELIEF MAP IS A THREE-DIMENSIONAL (3D) MAP THAT EXAGGERATES THE HEIGHT OF MOUNTAINS SO IT'S EASIER TO SEE THE DIFFERENCE IN GEOGRAPHIC FEATURES.

THE UPS AND DOWNS OF TOPOGRAPHY: MAKE A 3D MAP MODEL



3. ONCE THE SALT IS MOSTLY DISSOLVED, MIX IN $\frac{1}{2}$ CUP FLOUR.
4. ONCE IT GETS HARD TO MIX WITH THE SPOON, TRY USING YOUR HANDS TO “KNEAD” THE DOUGH. YOU WANT THE DOUGH TO BE STIFF: IF IT IS TOO CRUMBLY, TRY ADDING A FEW DROPS OF WATER; IF IT IS TOO WET, TRY ADDING A DUSTING OF FLOUR.

THE UPS AND DOWNS OF TOPOGRAPHY: MAKE A 3D MAP MODEL



4. PLACE PARCHMENT PAPER, WAX PAPER, OR CLING FILM OVER YOUR PAPER DRAWING OF CALIFORNIA.
5. TRY TAPING THIS TO THE TABLE TOP TO KEEP IT FROM MOVING.

THE UPS AND DOWNS OF TOPOGRAPHY: MAKE A 3D MAP MODEL



5. WITH ABOUT $\frac{1}{3}$ of YOUR DOUGH, CREATE A FLAT SHAPE OF CALIFORNIA USING THE TEMPLATE OR DRAWING AS YOUR GUIDE. MAKE SURE YOU BUILD THIS ON TOP OF THE PARCHMENT PAPER, WAX PAPER, OR CLING FILM SO IT DOES NOT STICK TO THE COPY PAPER.

THE UPS AND DOWNS OF TOPOGRAPHY: MAKE A 3D MAP MODEL



6. MICROWAVE THE FLAT LAYER OF DOUGH (SHAPED LIKE CALIFORNIA) FOR 15 SECONDS. THEN TURN IT OVER AND MICROWAVE FOR ANOTHER 15 SECONDS.
7. YOU CAN KEEP THE PARCHMENT PAPER, WAX PAPER, OR CLING FILM UNDER THE DOUGH WHEN YOU MICROWAVE – JUST BE SURE TO REMOVE THE TAPE BEFORE YOU COOK THE DOUGH. BE CAREFUL WHEN COOKING THE DOUGH, AS IT CAN GET HOT! IF NEEDED, USE HOT MITTS TO HELP YOU HANDLE THE COOKED DOUGH.



7) Turn the dough back over, so it once again looks like the shape of California. Use about $\frac{1}{2}$ of the dough you have left to start making some of California's 352 mountain ranges (see map for more details):

Along the top, flat edge of the state

Along the coast, north of the Bay Area to the top of the state

Along the coast, south of the Bay Area to north of Los Angeles

On the north-eastern part of the state, following the border with Nevada.

In a semi-circle starting just north of Los Angeles and ending near the coast on the border with Mexico (surrounding Orange County and San Diego).

8) Microwave for 15 seconds. If the dough is still moist, microwave for another 15 seconds. If it still isn't dry, microwave in 15 second increments a few more times.



Tips & Tricks: It might seem easier to microwave the dough for longer periods of time, but it can burn quickly, so short bursts of microwave energy are a much better way to quickly "bake" your salt dough.

9) Use the remainder of the dough to finish the tall mountain ranges:

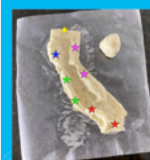
Mount Whitney is near the middle of the Sierra Nevada mountains about half-way up the state, close to the border with Nevada. At 12,505 feet (4,421 meters), this is the largest mountain in the contiguous United States.

All around Mount Whitney are other tall mountains of the Sierra Nevada mountain range, including Mammoth Mountain (a famous ski resort) and Half Dome in Yosemite National Park, both of which are north of Mount Whitney.

While the Sierra Nevada mountains should be your tallest range, use some of your remaining dough to build higher mountains along the northern-most section of the state. This is where Mount Shasta is located, near the Oregon border.

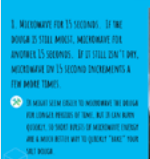
10) Microwave for 15 seconds. If the dough is still moist, microwave for another 15 seconds. Repeat a couple more times, if needed, being careful to make sure the dough doesn't burn.

THE UPS AND DOWNS OF TOPOGRAPHY: MAKE A 3D MAP MODEL



1. Turn the original map over, so it shows back. Using your map of California, the shape of the dough you have left to start making some of California's 352 mountain ranges. Use map for more details.
2. Along the top, flat edge of the state.
3. Along the coast, north of the Bay Area to the top of the state.
4. Along the coast, south of the Bay Area to north of Los Angeles.
5. On the north-eastern part of the state, following the border with Nevada.
6. In a semi-circle starting just north of Los Angeles and ending near the coast on the border with Mexico (surrounding Orange County and San Diego).

THE UPS AND DOWNS OF TOPOGRAPHY: MAKE A 3D MAP MODEL



1. Microwave for 15 seconds. If the dough is still moist, microwave for another 15 seconds. If it still isn't dry, microwave in 15 second increments a few more times.
2. Use the remainder of the dough to finish the tall mountain ranges.

THE UPS AND DOWNS OF TOPOGRAPHY: MAKE A 3D MAP MODEL



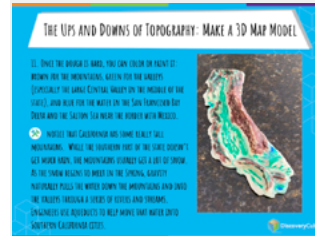
1. Roll the remainder of the dough to finish the tall mountain ranges.
2. Mount Whitney is near the middle of the Sierra Nevada mountain range, about half-way up the state, close to the border with Nevada. At 12,505 feet (4,421 meters), this is the largest mountain in the contiguous United States.
3. All around Mount Whitney are other tall mountains of the Sierra Nevada mountain range, including Mammoth Mountain (a famous ski resort) and Half Dome in Yosemite National Park, both of which are north of Mount Whitney.
4. While the Sierra Nevada mountains should be your tallest range, use some of your remaining dough to build higher mountains along the northern-most section of the state. This is where Mount Shasta is located, near the Oregon border.



11) Once the dough is hard, you can color or paint it: brown for the mountains, green for the valleys (especially the large Central Valley in the middle of the state), and blue for the water in the San Francisco Bay Delta and the Salton Sea near the border with Mexico.



Fun Fact: You may notice that California has some really tall mountains. While the southern part of the state doesn't get much rain, the mountains usually get a lot of snow. As the snow begins to melt in the Spring, gravity naturally pulls the water down the mountains and into the valleys through a series of rivers and streams. Engineers use aqueducts to help move that water into Southern California cities.



CONCLUSION



What I Discovered

To earn a portion of the Go With The Flow badge, have your students reflect on what they discovered. We would love to see pictures of their 3D maps. Please email pictures to educationemail@discoverycube.org.



For Next Week

Have your students gather these supplies:

scissors

cardboard

construction paper

tape

toy train tracks (optional)

marble or other small spherical object

*empty toilet paper tubes, paper towel tubes, and/or wrapping paper tubes (as many as possible). Note: these will be needed next week.

