



Name: _____ Date: _____

Our Growing Need for Water

Student Journal





Agricultural Water Use

Introduction: Farming is responsible for about 70% of the freshwater we use around the world! It takes a lot of water to grow food and raise animals. But did you know that not everything that is grown or raised on a farm or ranch uses the same amount of water?

Here are some examples¹:

It takes about...	To grow...
5.4 gallons of water	1 head of broccoli
1.1 gallons of water	1 almond (yes, just 1 nut!)
0.4 gallons of water	1 strawberry

Imagine that you are a farmer, and you want to know which crop is best to grow in a drought (when there isn't a lot of water!). Assume that on an **area of land the size of a football field**, you can grow:

15,000 heads of broccoli OR 1,000,000 almonds OR 500,000 strawberries

1. Which crop should you grow to use the least amount of water? To figure this out, do some calculations below, and then write down your choice:

¹ [Mekonnen, M.M. and A.Y. Hoekstra \(2010\) The Green, Blue and Grey Water Footprints of Crops and Derived Crop Products, Volume 1: Main Report, UNESCO-IHE Institute for Water Education.](#)





2. Let's consider how much water it takes to raise farm animals for human consumption²:

It takes about...	To produce...
1000 gallons of water	1 lb of beef
500 gallons of water	1 lb of chicken
700 gallons of water	1 lb of pork

If you are a farmer who is **only** concerned with trying to save water, would you be better off growing produce (fruits, vegetables, and nuts) OR raising farm animals for humans to eat? Explain:

3. Now think about this: Choosing your crop rotation and farm animals for the year depends on much more than simply saving water. What other factors might come into play in making your decision? List as many as you can.

Example: How much I can make at the market by selling each product.

² [Mekonnen, M.M. and A.Y. Hoekstra \(2010\) The Green, Blue and Grey Water Footprints of Farm Animals and Animal Products, Volume 1: Main Report, UNESCO-IHE Institute for Water Education.](#)



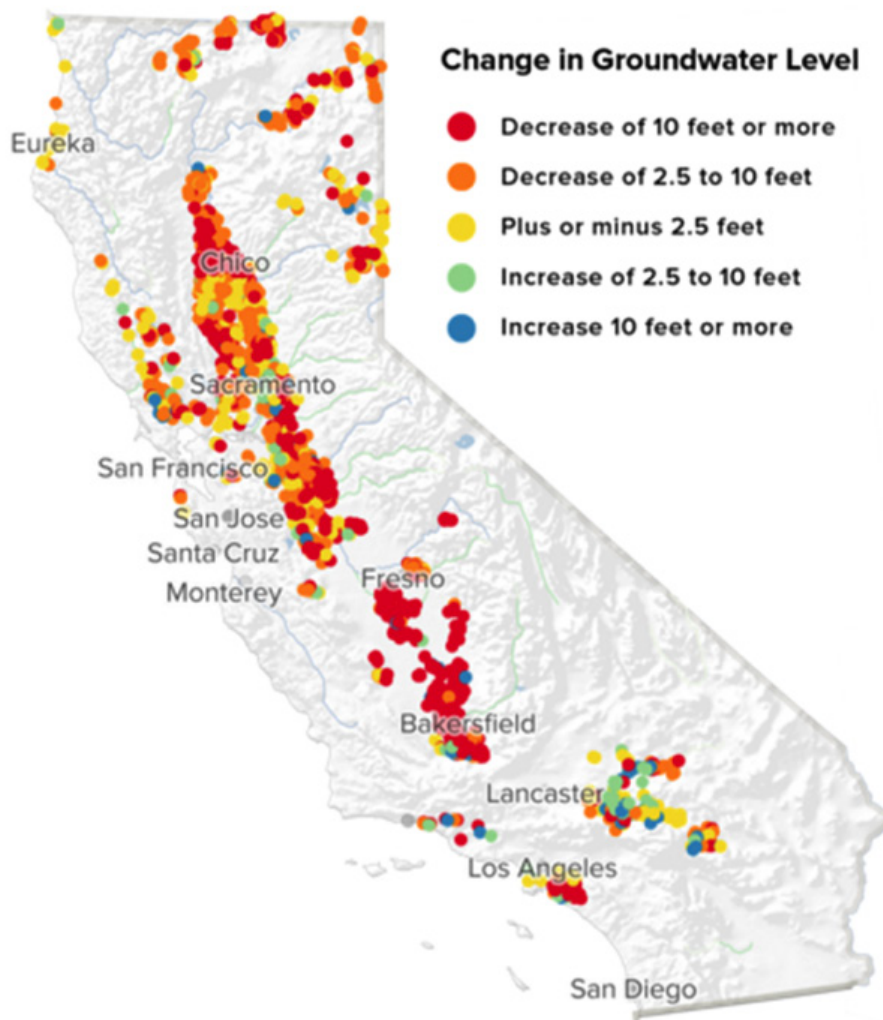


Groundwater Supply

Introduction: Did you know that a pair of satellites called GRACE that are currently orbiting the earth can measure changes in groundwater below the earth's surface? In this activity, you will explore some of those changes in California and their impacts.

What is groundwater? Take a look at the glass jar at your station. Groundwater is stored in the pore spaces between sand or soil grains, or in the cracks in rocks.

Take a look at the map of California below, which shows **changes in** groundwater levels in different parts of the state from Spring 2013 to Spring 2014:



Groundwater level changes between Spring 2013 and Spring 2014

Source: [Groundwater Information Center, California Department of Water Resources](#)

Modified from [Water in the West at Stanford University](#)





1. The colored dots on the map represent changes in groundwater levels that have occurred over time. You can think of them as the amount of water that has been pumped out of the ground to use for things like watering crops.

Describe what you see on the map. Is groundwater pumped out equally from all over the state, or just from certain regions? Why do you think this is? **Hint:** *In 2014, California produced almost half of the U.S.'s fruits, nuts, and vegetables³.*

2. Why do you think the dots concentrated in certain regions and not spread out all over the map?

3. After reviewing the data on the map, what questions come to mind?

4. Water gets into the ground by slowly seeping down from the surface. What do you think might cause groundwater levels to go up (more groundwater) instead of down?

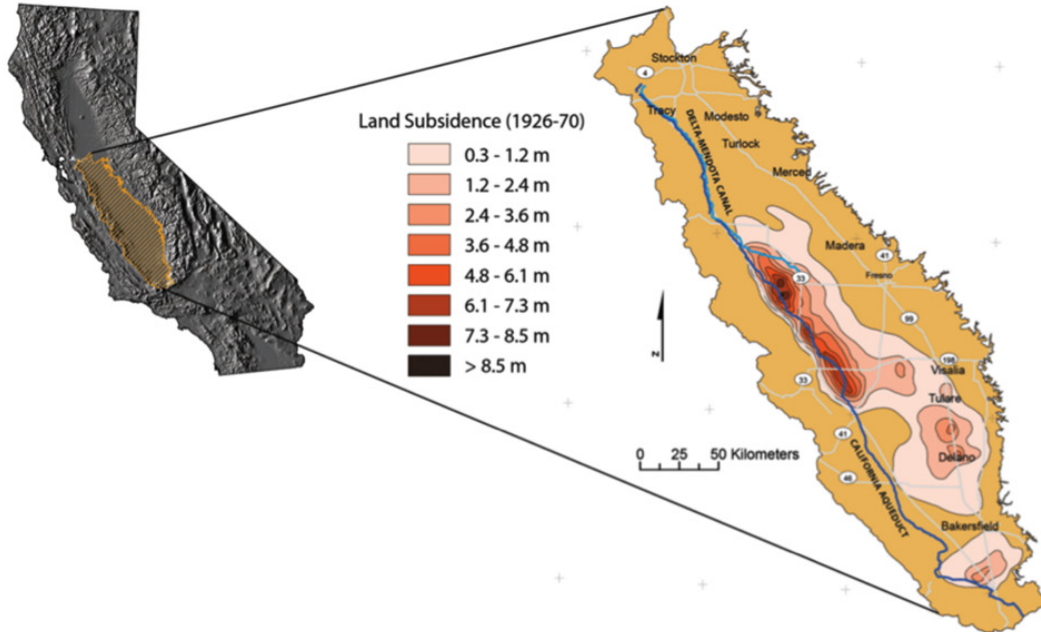
³ [CA Dept. of Food and Agriculture CA Agricultural Production Statistics](#)





When too much water is pumped out of the ground, the spaces where that water was stored tend to close up, which means that land can actually *sink*! When we talk about land sinking, we often use the term '*subsidence*' to mean the same thing.

Take a look at the map of California below, which shows land subsidence that occurred between 1926-1970:



Land subsidence in the San Joaquin Valley, California, 1926-70 (modified from Ireland and others, 1984).

From: [The U.S. Geological Survey California Water Science Center's Delta-Mendota Canal Study](#)

5. Describe what you see. Where did land sink between 1926-1977? How much did it sink? Where did the most subsidence occur?





6. Compare this map of California to the one you looked at in #1. Do you see any connections between where groundwater in California is changing and where land is sinking?

7. Pumping too much water out of the ground has some serious consequences for both people and natural ecosystems:

Sinking land can damage structures built on top of the land like buildings, as well as structures built *underneath* or within the ground, like pipelines. Describe how you think these structures might be damaged by land subsidence:

Many rivers and streams and the ecosystems they support are connected to and rely on groundwater sources. When groundwater resources are depleted, fish and other organisms in these ecosystems can be affected. Describe how you think organisms in ecosystems connected to groundwater could be affected when too much water is pumped out of the ground:





Who Gets Clean Freshwater?

Introduction: Around the world, our population is growing, and so is our need for freshwater. In this activity, you will read stories about different people around the world who, for various reasons, did not have easy access to clean water. You will also learn some ways in which they have addressed these issues in their community.

Open a web browser and go to the **Blue Planet Network's Stories of Water**: <http://storiesofwater.org/photogalleries/>

On this website you will see a gallery of photos, each of which has a story associated with it that you can read by clicking on the photo. For example, here is a story about the quality of drinking water in Ethiopia: <http://storiesofwater.org/sidamo-ethiopia/>

- » Choose **two** stories to read by clicking on their photos. Make sure you and your partner choose **different** stories.
- » Read your water stories quietly by yourself, then answer the questions below.

1. Who are the people in your story? Where do they live, and what are they like? What was the biggest challenge the people in your stories faced with getting clean water?

2. How were the people in your stories affected by not having easy access to clean water? For example, did they get sick?





3. What are some ways that the people in your stories addresses or solved their water issue?

4. Share your stories with your partner. Then, discuss the following question together, and write down your answer to the question below. Be sure to justify your answer!

- *In your opinion, which of the most stories highlighted the most difficult situation to live in? Explain your reasoning for your choice.*





Wasted Water

Introduction: Around the world, our population is growing, and so is our need for freshwater. This means that we should be thinking about ways to reduce our water use and conserve the water that we have. In this activity, you will explore how much water you use for many of your daily activities.

Open a web browser and go to the **Alliance for Water Efficiency's Home Water Works** calculator: <http://www.home-water-works.org/calculator>

1. How much water do you use?

- Click on the orange button that says 'Click **HERE** to start NOW!'. Answer a few questions about your home.
- Next, navigate through the virtual house and modify different parts of it to better fit your water use habits. Clicking on a magnifying glass will take you to a particular room, and clicking on a question mark will allow you to modify something in that room.
- Finally, roll your mouse over the pie chart labeled 'My Daily Usage,' and fill in your water use percentages below:

Shower: _____%

Dishwasher: _____%

Bath: _____%

Outdoor water use: _____%

Toilet: _____%

Possible leaks: _____%

Faucets: _____%

Other: _____%

Clothes washer: _____%

- How might someone 'waste' water while they are brushing their teeth? What is one way you could reduce the amount of water you use to take a shower?





3. Go back into the virtual house and click on the green check marks to enter a room. Click around on the blue 'i' icons. What are some things that you can do to reduce the amount of water you use in your house?

4. **How much water does a leaking faucet waste?** Go to the U.S. Geological Survey's Water Science School page: <http://water.usgs.gov/edu/activity-drip.html>. Read the information on the page, and calculate how much water would be wasted if **1 home, 10 homes, and 1,000 homes** each had **three** dripping faucets:

1 home:

10 homes:

1,000 homes:

5. How certain or uncertain do you think the numbers calculated in this exercise (your water usage and water leak waste) are? What are they based on? Why might they be different for different people?

