

What's Growin' On?

Let's Look at Water



A message for everyone...

What role does water play in your life? Do you have plenty of clean, fresh water when you turn on the tap at your house? Is your grocery store filled with plenty of food at an affordable price? Have you ever wondered where your water comes from?

The drought in California has caused all of us to think about water. During a drought, farmers and ranchers are often the first to feel the effects of a water shortage. They have to cut back on the crops they plant because there isn't enough water. How will this affect everyone else? More than 400 different crops are grown in California and our state leads the nation in agriculture production. Nearly half of the fruits, nuts, and vegetables consumed in the United States are produced by California farmers.

This year's edition of *What's Growin' On? Let's Look at Water* is inspired by this precious resource. Use these pages to learn about the water cycle, how we get our water, how we use it, and its importance to the environment and every aspect of our lives. Activities inspire critical thinking and show how we can all take small steps to conserve water and make the most efficient use of what we have.

Table of Contents

Introduction	page 2
Water: A Fact of Life.	page 3
What's in Your Watershed?	page 4
Where Do We Get Our Water?	page 5
Drought!	page 6
Preserving our Liquid Gold	page 7
Our Food Grows	
Where Water Flows	pages 8 and 9
More Crop Per Drop	page 10
Farms for Food and Habitat	page 11
Good, Clean Water.	page 12
Water is Energy	page 13
How Would You Vote?	page 14
Water Words Glossary	page 15
Acknowledgments	page 16

A message for teachers...

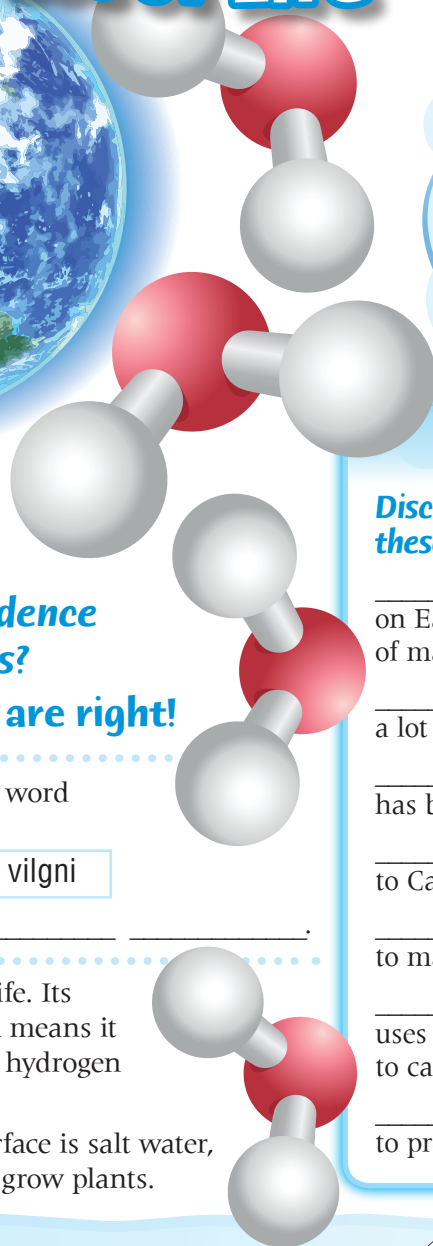
For the past 13 years, California Foundation for Agriculture in the Classroom has produced *What's Growin' On?* to help students discover the many ways agriculture impacts their daily lives.

Use the activities on the following pages to connect your students to the world of agriculture and its important role in California. Content engages students in current events and activities require critical thinking to align with Common Core Standards. Encourage students to share *What's Growin' On?* at home to help family members

appreciate the process and people involved in producing food, clothing, and other necessities in our daily lives that are often taken for granted.

Each annual edition of *What's Growin' On?* is developed by educators and reviewed by leading agriculture industry experts to provide current and accurate information. The activities on the following pages are aligned to third through eighth grade Content Standards for California Public Schools including Common Core and Next Generation Science Standards.

Water: A Fact of Life



Water Wise

California produces approximately 50% of our nation's fruits, nuts, and vegetables.

Why does water matter to you?

On average, the human body is made up of 65% water. Show this by shading the graphic below.

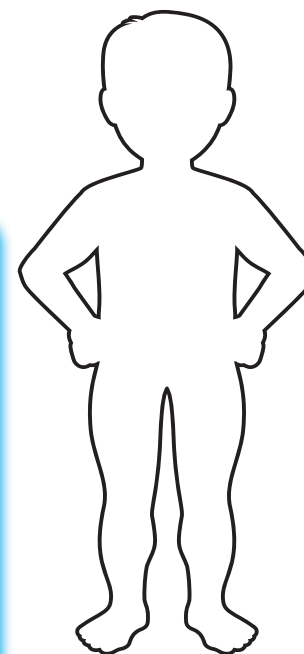
Water we drink is used by our body to deliver oxygen to cells, regulate temperature, digest food, flush waste, and to grow and repair cells.

It is recommended that we drink eight, eight ounce glasses of water a day. How many total ounces of water is this per day? _____

Per year? _____

There are 128 ounces in a gallon, how many gallons of water do you drink in a year? _____

How many gallons of water would your whole class drink in a year? _____



Activity

Discuss with a partner whether these are true or false and why.

_____ Water is the only substance on Earth that exists in three states of matter - solid, liquid, and gas.

_____ California usually gets a lot of rain during the summer.

_____ All of the food we eat has been grown using water.

_____ Water is very important to California's economy.

_____ It takes a lot of water to make a slice of pizza.

_____ The average Californian uses 196 gallons of water per day to carry out normal activities.

_____ It doesn't take any water to produce a chicken egg.

Tech Check

Learn how some of your favorite foods are grown by visiting "Farm Water Minute" at www.farmwater.org/California-Farm-Water-blog/farm-water-minute.

Click on a **crop** of your choice and write down two important facts from the text and two important facts from the one-minute radio broadcast.

Two facts about _____ from the text:

1.) _____

2.) _____

Two facts about _____ from the one-minute radio broadcast:

1.) _____

2.) _____

What do all crops need to grow?

_____, _____, _____.

Standards: English-Grades 3-8; RI 1, 2, 7, 10, W 8, SL 1 NGSS-Grade 5; ESS3.C Grades 6-8; MS-ESS2.C, MS-ESS3.A Math-Grade 3; Operations 1, 2, 3, 7 Grades 3-8; MP 1, 2, 6

What is one of the first things scientists look for when they look for evidence of life on other planets?

If you said water, you are right!

Unscramble the letters to each word to decode the message below.

ssue

rewat

vilgni

Every _____ thing _____.

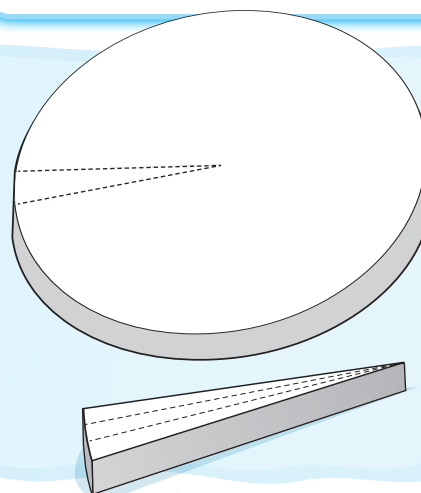
Water is the building block of life. Its chemical formula is H_2O which means it is made up of two molecules of hydrogen and one molecule of oxygen.

97% of the water on Earth's surface is salt water, which we can't drink or use to grow plants.

Activity

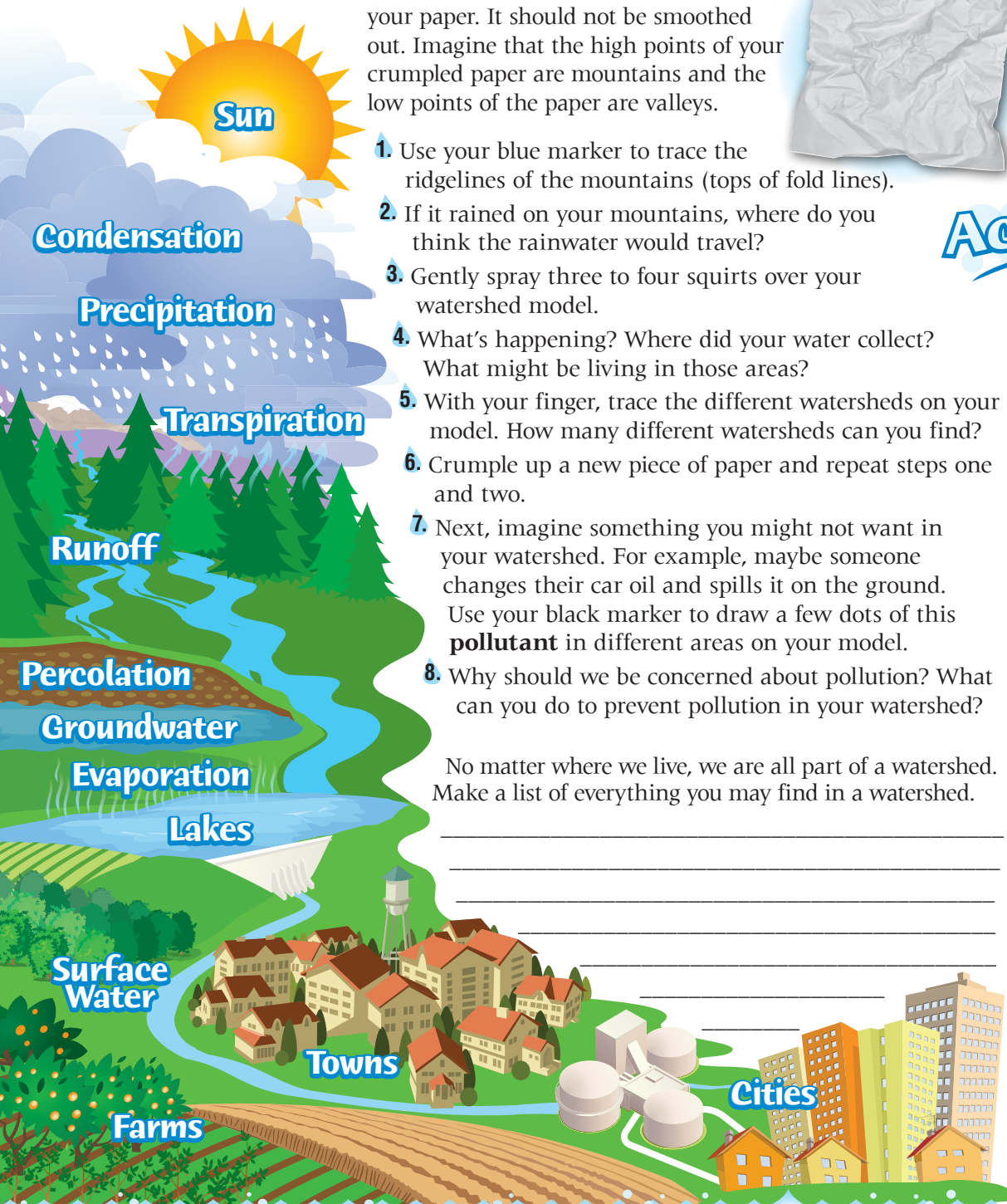
Estimate and color 97% of the pie chart in green.

- Color the remaining 3% blue. This 3% represents fresh water.
- Of the 3% of freshwater on the planet, two-thirds of it is frozen in polar ice caps and glaciers. Shade two-thirds of the pie slice with your pencil or pen.
- The remaining one-third is freshwater that is available for us to use.



What's in your WATERSHED?

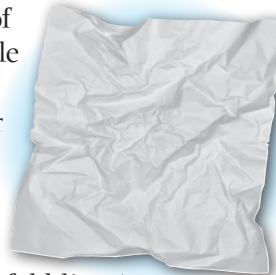
A **watershed** is the land area that drains rain and melted snow into a creek, river, lake, or ocean.



Activity Make a Watershed Model

Materials: white paper, spray bottle with water, water-soluble blue and black markers

Directions: Crumple up your piece of paper into a loose ball. Slightly uncrumple your paper. It should not be smoothed out. Imagine that the high points of your crumpled paper are mountains and the low points of the paper are valleys.



1. Use your blue marker to trace the ridgelines of the mountains (tops of fold lines).
2. If it rained on your mountains, where do you think the rainwater would travel?
3. Gently spray three to four squirts over your watershed model.
4. What's happening? Where did your water collect? What might be living in those areas?
5. With your finger, trace the different watersheds on your model. How many different watersheds can you find?
6. Crumple up a new piece of paper and repeat steps one and two.
7. Next, imagine something you might not want in your watershed. For example, maybe someone changes their car oil and spills it on the ground. Use your black marker to draw a few dots of this **pollutant** in different areas on your model.
8. Why should we be concerned about pollution? What can you do to prevent pollution in your watershed?

No matter where we live, we are all part of a watershed. Make a list of everything you may find in a watershed.



TechCheck

What watershed(s) do you live in?

Find out by going to Surf Your Watershed, <http://cfpub.epa.gov/surf/locate/index.cfm>.

Once you have found it, write a description of your watershed and explain how water travels through it.

Activity

Earth's water is always cycling through different phases of the water cycle. Use the bold words from the illustration to complete the description of the **water cycle**. Use the glossary for assistance.

Heat from the _____ warms the water in oceans and _____. Some water turns into water vapor, which is a gas. This process is called _____. When water evaporates from the leaves of plants, it is called _____.

As the water vapor rises into the atmosphere, it cools and forms clouds. This is called _____.

Rain, snow, hail, and sleet are forms of _____ that fall from clouds when water droplets in the cloud become too heavy to be suspended. In California, about 70% of our _____ falls north of Sacramento. Much of this land is forestland. Some of the rain and melted snow seeps into the ground by _____ and becomes _____.

The roots of trees and other plants soak up some of the water from precipitation, while other water runs off the surface of the ground into creeks, rivers, and oceans. This is called _____. Water is used by animals and is also used on farms to water crops grown for people in _____ and _____.

Standards: English-Grades 3-8; RI 1, 4, 7 NGSS-Grades 3-5 ETS1-1 Grade 5 LS2.B, ESS2-1, ESS2.A, ESS2.C, ESS3.C Grades 6-8; MS-ESS2-4, MS-ESS2.C, MS-ESS3.A

Where Do We Get our H₂O?

California's fresh water is used for washing, drinking, and for growing food and fiber. It exists as **surface water** and **groundwater**, which sometimes is connected through the water cycle. In normal years, California may get 200 million acre-feet of precipitation from snow and rain. This amount of water would cover California in approximately 23 inches of water. However, this doesn't happen because the rain and snow doesn't fall at one time and about two-thirds of it soaks into the ground and is used by plants in the environment or evaporates into the atmosphere. The remainder of California's precipitation runs off the surface of the land into lakes and rivers, and the ocean.

Fresh water on the surface of the earth is called surface water. Examples are rivers, ponds, and lakes. This water comes from rain or snowmelt that runs off the land into waterways.

Groundwater is fresh water that is stored under the surface of the earth in aquifers. An **aquifer** [aw-kwe-fer] is an underground layer of rock particles that collects water like a sponge.



How Do we Get our H₂O?

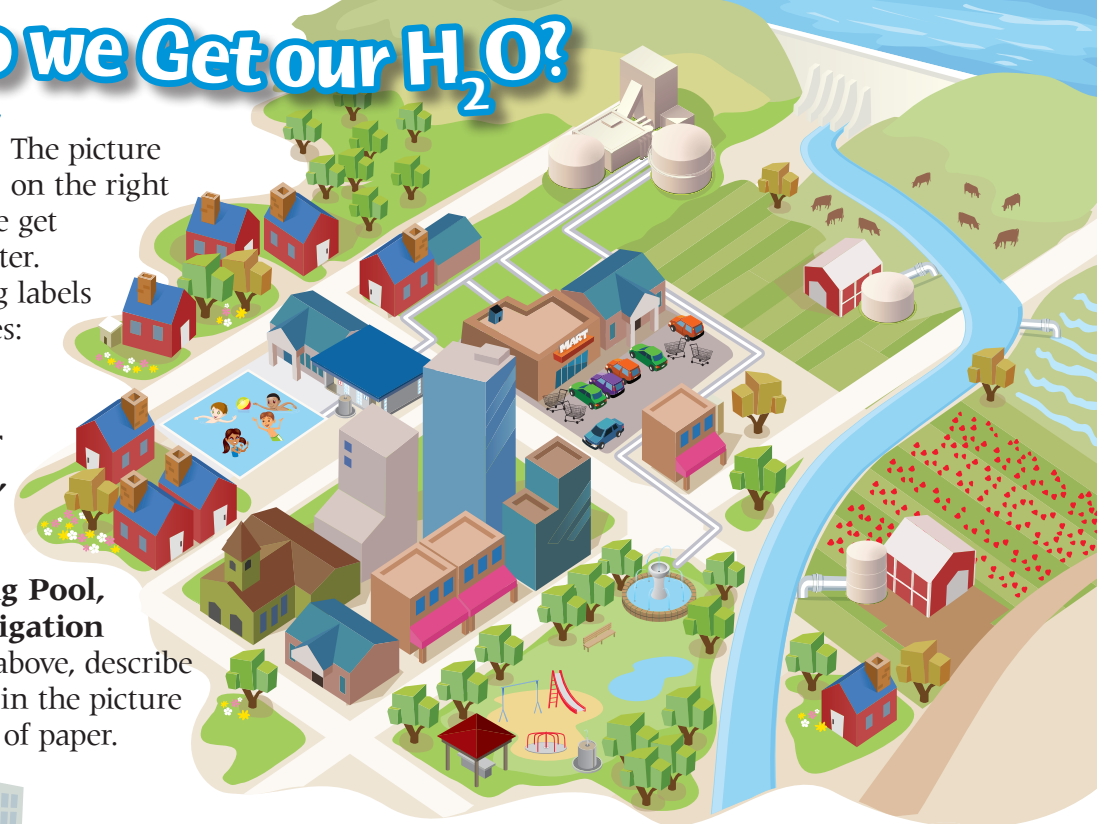
Activity

The picture on the right shows ways that we get and use surface water.

Insert the following labels in the correct spaces:

Reservoir, Dam, Growing Food, Aqueduct, Water Treatment Plant, Grocery Store, Drinking Water, Public Swimming Pool, Landscaping, Irrigation

Using the words above, describe what is happening in the picture on a separate piece of paper.



Activity

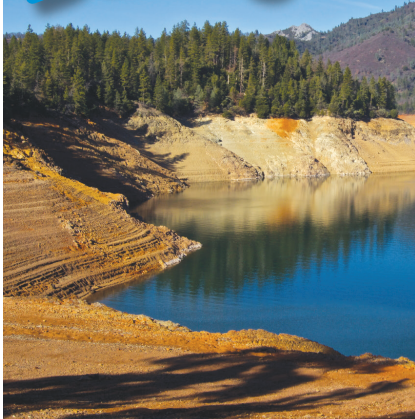
More than 40% of people in California get their drinking water from groundwater. The picture on the left shows how we obtain and use groundwater. Insert the following labels in the correct spaces: **Well, Pump, Aquifer, Water Treatment Plant, Water Tower, Drinking Water**



You can save up to eight gallons of water a day if you turn off the water while brushing your teeth or shaving.

How many gallons of water could be saved in a week if each person in your house did this?

Drought!



A **drought** is a long period of time when it does not rain and snow as much as we need. Weather data and tree rings show that droughts are a normal part of California's climate pattern. There have been 13 droughts in the last 100 years in California and 2014 is the most severe drought in recorded California history. A drought ends when rain and snow levels return to normal, and lakes, reservoirs, and streams fill up.



Sandy Denn of Snow Goose Farms in Willows reduced her rice farm by 140 acres due to the drought. Water costs have increased and farming a smaller acreage with the same overhead costs means less profit for the farm.

Photo: California Farm Bureau Federation



Dan Errotebere and his daughter, Marisa, standing in an **idled** field that once grew row crops like tomatoes, onions, and garlic all on buried drip irrigation. The Errotebere family has been farming here since the late 1920's but drought restrictions have cut back their water supply and they have not been able to plant 1,500 acres. This cuts back on the available California grown food in our grocery stores.

First of all, let's talk about weather and climate. What's the difference?

Weather is what the forecasters on the news predict for temperature, cloudiness, wind, and precipitation for *each day*.

Climate is the average weather in a certain place over many years.

Scientists have tracked the amount of precipitation in our climate zones for a long time. This information gives us a good idea of how much rain or snow we can expect after each year. It is different for California's many different climate zones. For example, the Mojave Desert in Southern California averages less than five inches of rain a year, while the coastal mountains of Northern California average 65 inches a year. Do you think you would find the same types of plants and animals living in these two different climate zones? _____

Why or why not? _____

Activity Cause and Effect

In the following sentences, underline the cause with one line and underline the effect with two lines.

- Due to the lack of rain during a drought, grasses and other plants in the environment turn brown and die. This means less food for animals like deer and cattle.
- In 2014, California farmers did not get enough water to grow as much food as they normally do and had to leave more than 410,000 acres unplanted, which meant that 17,000 people lost their jobs.
- There is a lack of snow during the winter and very little melted snow running off the mountains in the spring and summer. Lake levels drop very low and rivers and creeks begin drying up. People and animals have less water to live on.

Every drop counts. How can you help?

We all need to do our part each day to save water so we can make sure there's enough to go around.

Put a check mark by the things you can do to help and compute your water savings.

Task	Number of times per day	Water saved	Total Saved Per Day
Take a five minute shower instead of a ten minute shower		25 gallons	
Fill the bath $\frac{1}{2}$ way full instead of full		12 gallons	
Turn water off when brushing teeth		6 gallons	
Don't use toilet as a wastebasket		5 gallons per flush	
		Total Saved	=

Put a check mark by the things you can do to save water each week and compute your water savings.

Task	Number of times per week	Water saved	Total Saved Per Week
Only wash full loads of laundry		16 gallons per load	
Only run the dishwasher when full		8 gallons per load	
Water outdoor landscaping only during cool hours of morning and evening		25 gallons each time you water	
Place mulch around plants to reduce evaporation		25 gallons each time you water	
		Total Saved =	

How much water would be saved if everyone in your house practiced these water saving measures each day? _____ Each week? _____

Activity How Does Drought Affect You?

Write down three ways the drought impacts you when you shop at the grocery store.

- 1) _____
- 2) _____
- 3) _____

Tech Check

Go to www.home-water-works.org to explore your water use with the water use calculator.

How does your water use compare to a friend's? _____

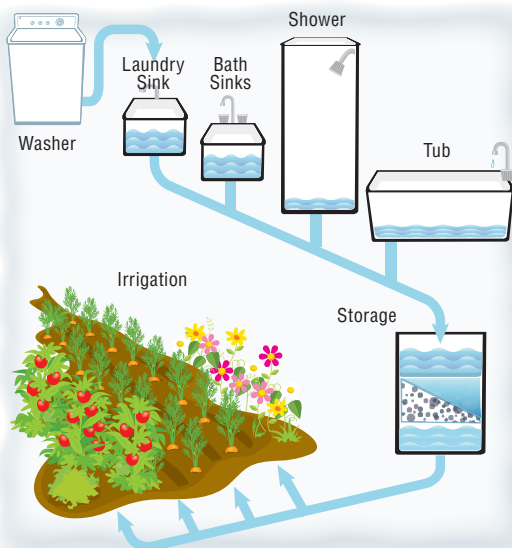
Water Wise

The average person uses about 196 gallons of water per day in and around their home.

Standards: English-Grades 3-8; RI 1, 7, 10, W1, SL 1
NGSS-Grade 3; ESS3.B, ESS2-1, ESS2.D, LS2.C Grade 4; Grade 5; ESS2.A, ESS2.C, ESS3.C Grades 6-8; MS-ESS2.C, ESS2.D, LS2.A, ESS3.A, ESS3-2 Math- Grades 3-8; MP 1, 2, 6 History- Grade 3; 3.1.1, 3.1.2 Grade 4; 4.1.5

Preserving our Liquid Gold

Have you ever heard the term liquid gold? This term has been used to describe one of California's most precious resources... fresh water. How important is water to you? As our population grows, there will be less water to go around for everyone. This page shows some ideas that people have come up with to help solve this problem.



Rainwater Harvesting

Rainwater can be collected by connecting roof gutter spouts to tanks for storing rainwater. This water can be used to water plants, flush toilets, and wash clothes.

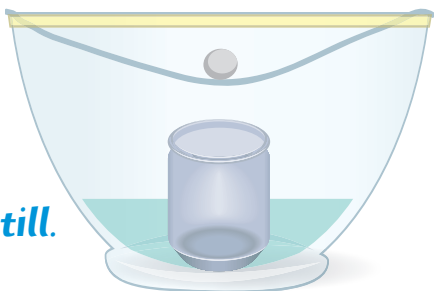


Greywater

Greywater is water that has been used for washing clothes and dishes, showers, and hand washing. This water can be stored in a tank, filtered, and used to water lawns, flowers, and vegetable gardens.

Desalinization

When you are thirsty, do you ever think that a nice big glass of seawater sounds good? Probably not! People, animals, and plants can't consume saltwater without becoming sick. **Desalinization** is the process of converting salt water into fresh water by removing the salt. You can do this by constructing a simple solar still in the classroom.



Procedure

1. Imagine that your bowl is the ocean. Fill the bowl with 1 to 2 inches of water. Add one heaping spoonful of salt and stir until dissolved. Dip your finger in the water and taste - is it salty?
2. Place your empty jar in the middle of the bowl. Imagine that this is the land.
3. Cover your bowl with plastic wrap and seal all the way around with tape.
4. Place a pebble on top of the plastic wrap directly above the jar. Carefully set your solar still in a sunny location. What do you think will happen as it sits in the sun?

5. After several hours, examine your solar still and discuss the following questions.
 - a. Did water collect in the jar? Taste it. Is it fresh or salt water?
 - b. What happened to the salty "ocean" water as it heated up?
 - c. What did the plastic wrap do?
 - d. Where did the salt go?
 - e. How much fresh water did you get? How long did it take?
 - f. How could the process be sped up?

Letter to a Farmer

Dear farmer,

I have heard that it takes a lot of water to grow the food we eat. How are you making the most of water on your farm?

Sincerely,

Maddie, 5th Grade, Bloomfield School

Dear Maddie,

Water can be the most expensive part of growing my crops, so it is very important that I use it wisely. Farmers have to decide which irrigation systems work best for their crops. Most crops on my farm are watered with micro-irrigation which is a combination of pumps, filters, and pipes that allow me to give my plants the precise amount of water they need each day. Farmers are pretty high tech, and like many farmers, I use a tool that is a combination of a weather station and a soil probe that communicates with an internet program to tell me how much water the plants use during the day and how deep the water is soaking into the soil. This allows me to calculate how many hours I need to run my irrigation systems to provide the right amount of water to my plants without wasting any water.

Here's a math challenge for your class.

Water for growing crops is measured in inches, just as rainfall is measured in inches.

Imagine that your technology tool tells you that your tomatoes need 0.24 inches of water per day based on the weather, soil moisture, and growth rate. If your irrigation system applies water at 0.046 inches per hour, how many hours per day should you run your irrigation system?

Sincerely,
Farmer Bill

P.S. You may have eaten or even worn some of the crops I grow, which include almonds, processing tomatoes, walnuts, grapes, pomegranates, oats, wheat, and cotton.



Activity

Work with a partner to build your own solar still.

Materials

- | | | |
|--|---------------------------------------|---------------------------------|
| ☐ Large bowl | ☐ Tape | ☐ Salt |
| ☐ Jar that is shorter than the bowl | ☐ Plastic wrap | ☐ Water |
| | ☐ Spoon | ☐ Pebble |

Standards: English-Grades 3-8; RI 1, 7, 10, W8, SL 1NGSS-Grades 3-5; ETS1-1 Grade 3; ESS3.B Grade 4; ESS3-2, Grade 5; ESS3.C, ESS2.C Grades 6-8; MS-ETS1-1, MS-ESS3.A, MS-ESS3-3 MSESS3-2 Math- Grade 3; Operations 1, 2, 3, 7 Grades 3-8; MP 1, 2, 6

Our Food Grows Where Water Flows

California's water is needed for many different things including drinking, growing our food, watering our plants, habitat for animals, taking showers and more. Our state has a sophisticated system of rivers, lakes/reservoirs, and aqueducts to move water to the places where we need it.

Legend

Rivers

Lakes

Aqueducts and Canals

Activity

Directions:

- Find the rivers on the map and color them blue.
- Find the lakes on the map and color them purple.
- Which part of the state has the most lakes and rivers? _____
- Look at this map showing the average annual precipitation in California: www.ponce.sdsu.edu/california_average_annual_precipitation.html. Which area of the state gets the most precipitation? _____ Which area of the state gets the least? _____
- Aqueducts are structures built to move water from lakes and rivers to places that need water. Find the aqueducts on the map and color them green.
- Which aqueduct carries water from the Sacramento area to southern California? _____
- Which area of the state has the most aqueducts? _____ Why do you think most aqueducts are found in this part of the state? _____

- Find the area on the map where you live and make an X. Write in the name of your city or town.
- Circle the river, lake, or aqueduct that is closest to where you live.
- Find and label the San Francisco Bay on your map. Name four rivers that drain into this area that we call the Delta. _____
- Find the area of our state capitol and label its name on the map.
- Circle the areas on the map that are the Sacramento, San Joaquin, Salinas, and Imperial Valleys. These areas are very good for growing crops due to fertile soil and plenty of sunshine. Why is getting water to these areas important to you? _____

- California farmers and ranchers grow over 400 different crops to feed not only Californians but people throughout the United States and the world. List five foods that California farmers and ranchers supply to your grocery store. _____

Did you know?

There are three main systems for getting water to Californians

1. **California State Water Project (SWP):** Includes 34 reservoirs, 20 water pumping plants, and approximately 700 miles of pipelines and canals including the California Aqueduct. About 70% of water from the SWP goes to towns and cities and 30% goes to grow our food on farms.

2. **Central Valley Water Project (CVP):** Includes 20 reservoirs and about 500 miles of canals and pipelines. Provides enough water for the needs of about 1/3 of California's farmland.

3. **Local Water and Irrigation Districts:** There are over 600 different districts and associations that provide water to homes and agricultural land throughout California. This water may come from local reservoirs, wells, or the SWP or CVP.

Activity

View the weather and climate section of your local newspaper. Track the precipitation for five days and create a bar or line graph to represent the information.

Source: California Farm Water Coalition

More Crop per Drop

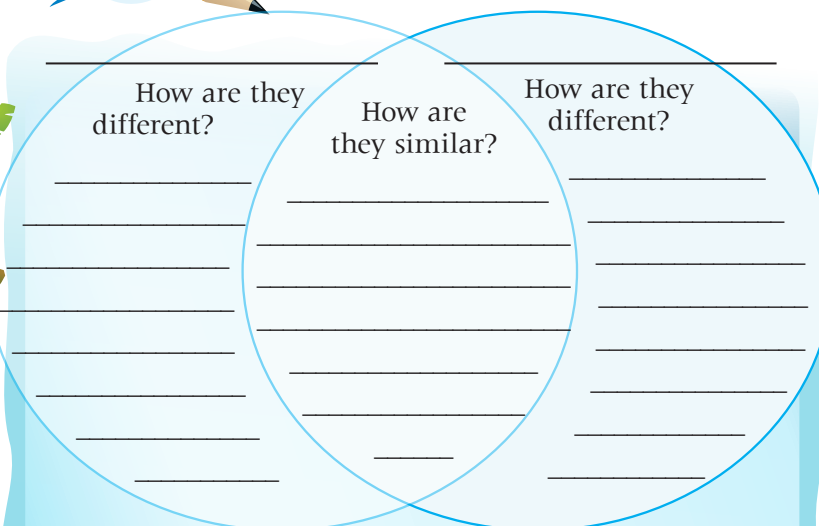
Farmers are always looking for more efficient ways to use resources like water to grow our food. **Irrigation** is the word that farmers use to describe how they water their crops. A crop is a type of plant grown for food, fiber, or landscaping. Examples are apples, corn, lettuce, trees, cotton, and flowers.

Farmers choose the type of irrigation they use depending upon the needs of their plants and the area where they are grown.



Activity

Use the Venn diagram to compare and contrast two of the different types of irrigation.



Why do you think farmers need to use different types of irrigation? _____

Activity

There are three main types of irrigation.

Match the photo with the correct description.

Micro irrigation – Water is applied above or below ground by drip or small sprinklers directly to the plant.

Sprinkler irrigation – Water is applied by a sprinkler head over the top of the plants, similar to rainfall.

Surface irrigation – Water is released from a ditch at one end of the field and uses gravity to flow to the other end of the field to provide water to plants.



Irrigation



Irrigation



Irrigation

Activity

Imagine that your school has a flower garden, and the patch of flowers near the corner is dying.

Identify the possible problem: _____

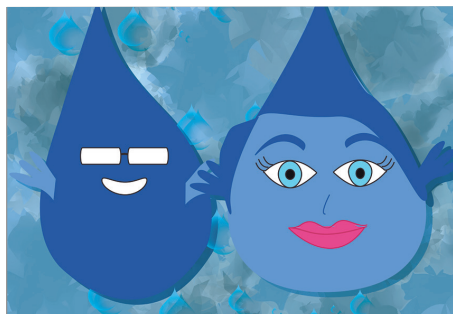
Which one of the three irrigation methods would you recommend that your school use to solve the problem? _____

Explain why you chose this method. _____

Tech Check

Check out the *Imagine this... Story Writing Contest* and read *Rainee and Dropulete*, a fun story about irrigation, written by an 8th grade author.

www.learnaboutag.org/imaginethis/2013



Water Wise

In the past 40 years, farmers have doubled the amount of food they grow while using 14% less water.

Standards: English-Grades 3-8; RI 1, 7, 10, W1, 8, NGSS-Grades 3-5; ETS1-1 Grade 3; ESS3.B Grade 4; ESS3-2, Grade 5; ESS2.A Grades 6-8; MS-ETS1-1, MS-ESS2.C, ESS3.A

Farms for Food and Habitat

Farms, ranches, and forests aren't just places to grow our food, fiber, and lumber, they also provide an important habitat for wildlife. **Habitat** is another name for where an animal lives.

Farmer Feature:

Bryce Lundberg,
Lundberg Family Farms

Bryce's family has been growing rice in the Sacramento Valley for more than 75 years.

They practice farming techniques that care for the soil, wildlife, air, and water. Their rice fields provide wetland habitat for numerous species of birds.

To learn more about their environmental commitment visit www.lundberg.com



Class Discussion

Conservation is a word used to describe the wise management of natural resources such as water, plants, soil, air, and minerals. California is made up of 100 million acres of land. Much of this land is open space that is farmed, ranched, and managed for agriculture products. These places also provide a home for many animals.

Imagine that this land could no longer be used for growing our food, clothing material, wood, and paper, but was used for another purpose such as apartments, malls, and highways. What would happen to the animals that lived there? How would people be affected?

Consider the viewpoints of different groups such as:

- people who want to live in the new homes and open new businesses
- farmers, ranchers, and forest managers
- people who want to buy locally grown food

Activity

Schoolyard and Backyard Wildlife Watch

Find a quiet place near your house or school to watch for animals and insects such as squirrels, birds, butterflies, frogs, mice, and deer. Sit here for 15 minutes each day and record any sights, sounds, or smells related to the animals that might live there. Share observations and pictures with your class. What do you think the animals are feeding on? What makes a good habitat for these

Tips:

- Watch at different times of day. You may see different animals in the early morning and early evening than you do during the middle of the day.
- Animal tracks are good clues that animals are in the area. Sketch tracks in your notebook or take pictures and see if you can identify which animal they belong to.

Activity

Hundreds of species of animals use California farm fields, pastures, and forests for habitat. A few of these animals include:

Pacific slender salamander, southern alligator lizard, red bat, great blue heron, snowy egret, muskrat, black tail deer, gray fox, bobcat, great grey owl, cinnamon teal, mallard, striped skunk, giant garter snake, western spadefoot toad, king snake, pacific fisher, ringtail cat, American kestrel, short-eared owl, song sparrow, California quail, Botta's pocket gopher, Canada geese, giant water beetle, western pond turtle, American avocet, killdeer, goshawk, black-crowned night heron, coyote, cottontail rabbit, barn owl, and red tail hawk.



Water Wise

Kangaroo rats that live in drier areas of California are so efficient at using water that they get most of the water they need from seeds they eat and rarely have to drink water.

Choose one of these animals and make a poster that includes

- picture of your animal
- what it eats and where it finds its food
- what it uses for shelter
- where it may be found in California
- three other interesting facts.

Standards: English-Grades 3-8; RI 1, 7, 10, W 1, 8, SL 1 NGSS-Grades 3-5; ETS1-1 Grade 3; LS2.C Grade 4; LS2.A Grade 5; ESS3.C Grades 6-8; MS-ETS1-1, LS2.A, ESS3.A

Good, Clean Water!

Let's go on a wastewater journey...o

Water quality is the term we use to describe the cleanliness of water. Thankfully, drinking water supplies in the United States are among the safest in the world. Before water comes out of your tap, it goes through a series of tests and treatments to remove any germs or pollutants that could make you sick.

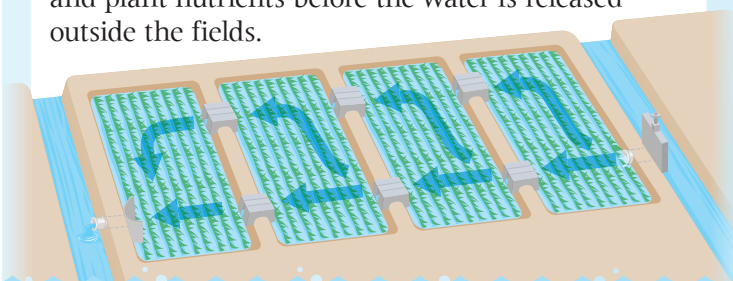
Imagine your town or city. The homes and businesses all have plumbing systems so when you wash your hands, take a shower, or flush the toilet, wastewater is carried away. Have you ever wondered where it goes?



A long time ago, untreated **wastewater** was thrown out into the streets or piped out of town and emptied into rivers or oceans. This was not healthy for people or the environment. Luckily, modern engineering and health codes have provided us with wastewater treatment plants to clean up dirty water before it is returned to the environment.

Water Quality on Farms

Farmers do many things to help keep our water clean. One example is the tailwater recovery system that is sometimes used in rice fields. The diagram shows how drainage water from one field is collected and pumped to another field. Drainage water also goes through a filtration system to remove sediment and plant nutrients before the water is released outside the fields.



Wastewater from your home or school gets piped into the sewer system where it flows to the wastewater treatment plant.

Step 1: Screening: large debris like garbage, wood, and rocks are removed from wastewater and sent to a landfill.

Step 2: Sedimentation: wastewater flows into a tank where the heavy particles sink to the bottom to form sediment. Sediment is collected and pumped to a digester where it will be decomposed and can be mixed with green clippings from yards to make compost. The water moves to step 3.

Step 3: Filtration: Water moves through layers of sand, gravel, and charcoal. This process removes small particles, reduces odor and bacteria. Some treatment plants also use wastewater lagoons where algae and microorganisms help clean the water.

Step 4: Disinfection: Addition of chlorine, UV light, or microfiltration kills any remaining bacteria and viruses before the clean water is released into a local river or ocean.

Activity

In the spaces below, draw a diagram or cartoon that shows each step of the wastewater treatment process. Write a paragraph describing why this process is important.

Screening

Sedimentation

Filtration

Disinfection

To find out how sedimentation works, do the Shake, Rattle, & Roll Activity www.learnaboutag.org/wegarden/pdf/ShakeRattleRoll.pdf

Activity

Use the Venn diagram to compare and contrast how wastewater is treated on farms and in city treatment plants to prevent pollutants from being released into the environment.

Farm Wastewater Treatment

City Wastewater Treatment

Water is Energy

How Does Hydroelectric Power Work?

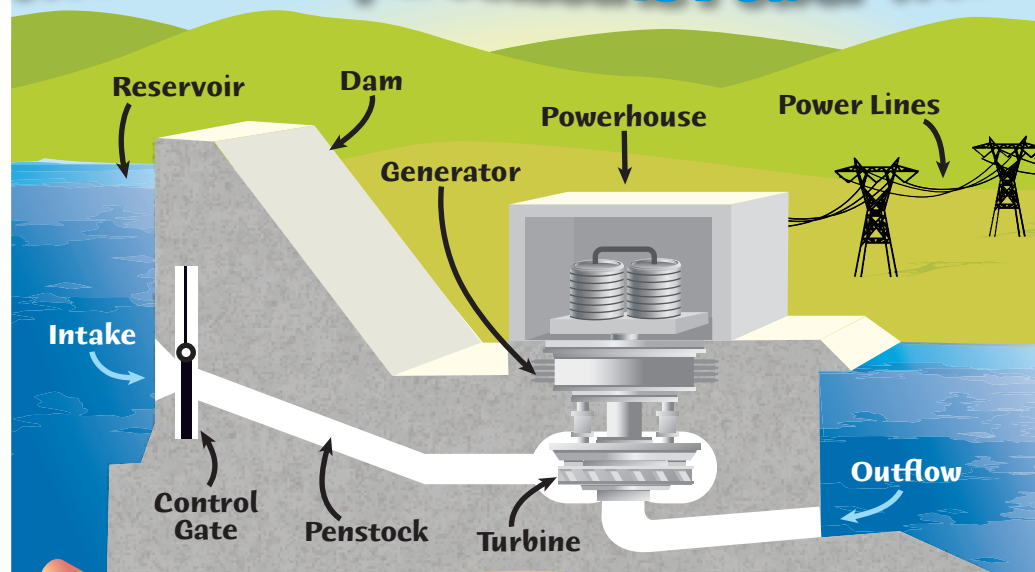
What is a dam?

Dams are barriers that are built across a river or stream to create a reservoir and control the flow of water. **Reservoir** is another name for a man-made lake.



Dams have three main purposes:

1. **Store water in reservoirs.** This allows us to store water from winter precipitation so we can use it for homes, businesses, and farming throughout California's long, dry summers. Reservoirs also provide wildlife habitat and a place for people to swim, fish, boat, and camp.
2. **Flood control.** Dams help catch water runoff during storms so cities and towns are not flooded.
3. **Generate electricity.** Many dams use the power of flowing water to turn electrical generators and provide a clean source of renewable energy. When water is used to make electricity it is called **hydropower**.



Activity

Place the appropriate name on each component of the hydroelectric dam: **Reservoir, Outflow, Penstock, Power Lines, Dam, Turbine, Generator**

- | | |
|--|---|
| _____ - stores water. | _____ - shaft connected to a magnet inside the generator. A coil of copper wire surrounds the magnet and creates electricity as the magnet spins. |
| _____ - carries water from the dam to the turbines. | _____ - conduct electricity from the power plant to homes, farms, and businesses. |
| _____ - blades are turned by the force of the water coming down the penstock. | _____ - water that flows through the dam and power plant is returned to the river. |
| _____ - generates electricity when rotated by the spinning turbines. Turbines turn a | |

Activity

Design a Dam!

1. Brainstorm a possible materials list of easy to obtain items such as: plastic containers, garbage bag lined shoeboxes, plastic spoons, popsicle sticks, toothpicks, cardboard, rocks, and sand.
2. Sketch your design and have it approved by your teacher.

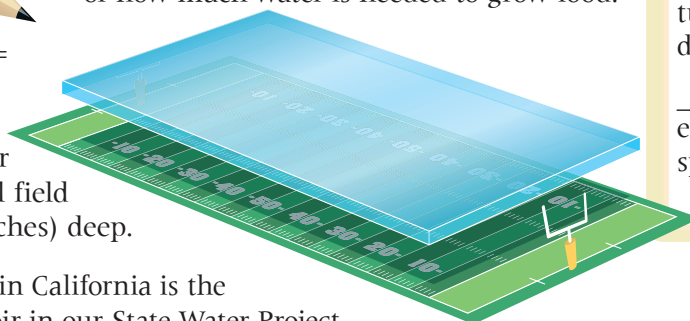
Questions to Consider:

- What is the purpose of your dam?
- What happens if the dam breaks? How can you strengthen your dam?
- How will fish get around your dam?
- How could you build a water wheel to generate power from the water flowing through your dam?
- What was the biggest challenge in building your dam and how did you overcome it?

Standards: English-Grades 3-8; RI 1, 7, 10 NGSS- Grades 3-5; ETS1-1 Grade 3; ESS3.B Grade 4; ESS3-2, PS3-4 Grade 5; ESS3.C Grades 6-8; MS-PS3.B, MS-ETS1-1, MS-ESS3.A, MS-ESS3-3 **Math-** Grade 3; Operations 1, 2, 3, 7 Grade 4; Measurements 1 Grades 3-8; MP 1, 2, 6 **History-** Grade 3; 3.1.2

Activity

One acre foot = 325,851 gallons of water. This is enough water to fill a football field one foot (12 inches) deep.



1. Lake Oroville in California is the largest reservoir in our State Water Project. At full capacity, it can hold 3,500,000 acre-feet of water. How many gallons is that? _____
2. The average food crop in California requires 42 inches of water per acre, per year. How many acre feet is this? _____ how many gallons of water would it take to grow two acres of your favorite fruit? _____
3. The average California family of four uses one acre-foot of water per year showering, washing dishes, watering plants and doing other activities around the house. How many acre-feet of water does a family of six use in a year? _____ How many gallons is this? _____

How Would You Vote?

In the 1870s the state of California began to investigate its water resources by studying rivers, flood plains, climate, geology, and irrigation in different parts of the state. Maps were drawn and permanent gauges were installed in more than 200 rivers in order to measure the height of water throughout the year.

As more people moved to California, it became necessary to build a water system that could deliver fresh water to towns and cities and to farms for growing food.

A major step forward took place in the mid 1900s as the federal Central Valley Project and the State Water Project were constructed to deliver water from Northern California to other areas throughout the state. This water system allowed California to become the leading food producer in the nation and provided new homes to millions of families.

Many years have passed since the construction of California's water supply system and it is now outdated. Years of drought and a population approaching 38 million people have added to the strain on the water supply.

Who makes decisions about water?

On November 4, 2014 Californians voted on Proposition 1: Water Bond for \$7.12 billion to make improvements to our water systems, protect drinking water, build new water storage reservoirs, restore ecosystems, and much more.

Activity

Find out if voters approved Proposition 1 by visiting California Election Results vote.sos.ca.gov and click on "Prior Election Results."

Circle the answer:

Proposition 1 was PASSED Proposition 1 was NOT PASSED

As a class, discuss how the election outcome impacts each listed item and write down main ideas.

You	
Food prices	
Wildlife	
Farmers	



Activity Act it Out

You and your classmates will play the role of different people involved in the legislative process to model how the Water Bond came to be voted upon by Californians. You will need five different groups to:

- ★ Act as the people taking ideas for the proposition to the Legislature
- ★ Act as the Senate
- ★ Act as the Governor
- ★ Act as the voters
- ★ Act as the Assembly

Step 1 – all groups must research what Proposition 1 is about: [www.ballotpedia.org/California_Proposition_1_Water_Bond_\(2014\)](http://www.ballotpedia.org/California_Proposition_1_Water_Bond_(2014))

Step 2 – learn more about the role of your group in the process of how a bill becomes a law: leginfo.ca.gov/bil2lawx.html. Each group member should write down notes to outline what they will say and do during the skit.

Step 3 – Perform the skit as a class. Act out each step that had to take place for the Water Bond to be placed on the ballot and the voters' decision on the Water Bond.

Would you have voted yes or no on Proposition 1: Water Bond?

Explain your reasoning for voting yes or no. _____

Activity Voter Survey

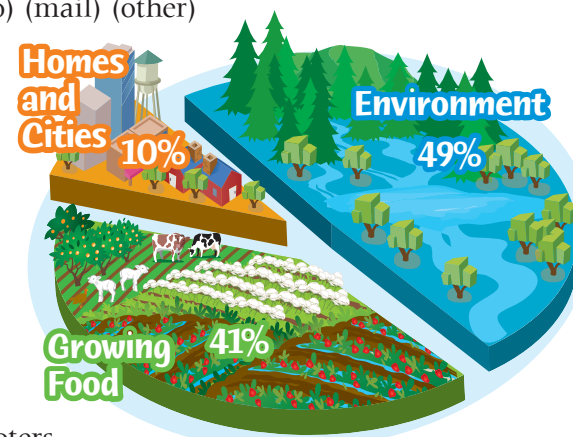
Work in a group to design a survey for voters. The survey can be carried out by interviewing people in person or through an online survey like Zoomerang or social media.

Begin your survey with the following question: *Where did you get most of your information about Proposition 1: Water Bond?* (newspaper) (online) (television) (radio) (mail) (other)

Part 1: Brainstorm and make a list of three other survey questions:

1. _____
2. _____
3. _____

Part 2: Survey at least 5 voters, summarize survey results, and report to your classmates.



Water Words Glossary



Resources:

California Department
of Food and Agriculture
www.cdffa.ca.gov

California Department
of Water Resources (Education)
www.water.ca.gov/education

California Farm Bureau
Federation
www.cfbf.com

California Farm Water Coalition
www.farmwater.org

California State Water
Resources Control Board
www.waterboards.ca.gov

Natural Resources
Conservation Service
www.nrcs.usda.gov

Project Wet
www.projectwet.org

Save Our Water
www.saveourh2o.org

U.S. Geological Survey
www.usgs.gov/water

U.S. Environmental
Protection Agency
water.epa.gov

To request a free copy of
What's Growin' On? Extra!
Extra! Extensions to enhance
the use of this newspaper,
or for an answer key, visit
www.LearnAboutAg.org/wgo
or call (800) 700-AITC (2482).

Filtration: Process of removing particles or chemicals from a substance by using a filter to trap them.

Flood: Overflow of water on the land from large amounts of precipitation.

Greywater: Water that has been used for dish washing, clothes washing, and bathing that can be reused to water plants.

Groundwater: Water that is stored under the surface of the earth in aquifers.

Habitat: The environment where an organism lives.

Hydropower: Using the power of moving water to create electricity or do work.

Idled: Farm land that has been left unplanted for a season.

Irrigation: The application of water to crops (not including natural precipitation).

Percolation: The process of water seeping down into the ground.

Pollutant: Certain waste products including minerals and chemicals that make the air, soil, or water unsuitable for a certain use.

Precipitation: Moisture such as rain, snow, hail, sleet, falling from the atmosphere.

Reservoir: Human-made lake used for recreation, habitat, and storing water that will be used for drinking, washing, and growing food.

Runoff: When precipitation flows over the surface of the ground.

Sedimentation: When material such as sand settles to the bottom of a body of water and forms a solid layer.

Surface Water: Fresh water on the surface of the earth including lakes, ponds, rivers, and creeks.

Transpiration: The evaporation of water from plant leaves.

Wastewater: Untreated water that has been used in household washing, flushing toilets, and other business purposes.

Water Cycle: The circulation of Earth's water through the ocean, atmosphere, and land by the processes of evaporation, transpiration, condensation, percolation, and runoff.

Watershed: Land area that drains rain and melted snow into a creek, river, lake, or ocean.

Weather: Daily temperature, cloud cover, precipitation, wind, etc.



Activity

Choose two glossary words and use both in a complete sentence in the space provided.

Meet the four C's of
Common Core with
CFAITC Resources
Critical thinking,
creativity,
collaboration, and
communication
while connecting students
to the world around them!

california science critical thinking food
gardens communication reading writing contest
Lessons research books STEM non-fiction
hands-on fiction nutrition creativity
grants agriculture collaboration imagination flowers
common core grades k-12
fiber

California Foundation for Agriculture in the Classroom (CFAITC) is a 501(c)(3) not-for-profit organization that provides educators with free and low cost standards-based materials, training opportunities, and information to promote student understanding of California agriculture. The Foundation's vision is an appreciation of agriculture by all. Contact CFAITC to request additional classroom resources, such as the *Extra! Extra! Classroom Extensions* that complement this newspaper.



©2014 California Foundation for Agriculture in the Classroom

2300 River Plaza Drive
Sacramento, CA 95833
(800) 700-AITC (2482)
(916) 561-5625
www.LearnAboutAg.org

Executive Director: **Judy Culbertson**
Illustrator: **Erik Davison**
Contributing Educators: **Kristina Beltz, Shaney Emerson, Haley Hanse, Nancy Keating, Carla Peterson, Carrie Traina**
Contributing Staff: **Mindy DeRohan, Stephanie Etcheverria, Lyn Hyatt**

Acknowledgements



CALIFORNIA



FARM BUREAU
FEDERATION



jim hicks & company
Products for Growing Concerns



CALIFORNIA DEPARTMENT OF
FOOD & AGRICULTURE

Jim and Neta Hicks
The James G. Boswell
Foundation



United States Department of Agriculture
National Institute of Food and Agriculture



FARM CREDIT

American AgCredit | Farm Credit West
CoBank | Fresno Madera Farm Credit
Yosemite Farm Credit

Estate of
Josephine Marks



Bayer CropScience

Bob Johnson



Look for the Seals
California Milk Advisory Board



Pacific Gas and
Electric Company



CALAMCO
A PARTNERSHIP WITH GROWERS



Fujishige Farms
California Cotton Alliance

The Bertha and
John Garabedian
Charitable Foundation