

Agricultural Water

Information compiled by the California Farm Water Coalition

Sources – California’s annual water supply averages about 200 million acre-feet from rain, snowfall and the Colorado and Klamath rivers. The majority is consumed by natural vegetation, leaving approximately 77.2 million acre-feet for dedicated use. An acre-foot is 325,851 gallons and covers an area about the size of a football field one-foot deep. Half of California’s water supply is used to protect the environment. Farms account for about 40%, and 10% goes to domestic and industrial water needs in cities and towns.

The major projects that have been the primary sources of stored water include the Central Valley Project (CVP), State Water Project (SWP), Coachella Canal, All-American Canal, and the Klamath Basin. Construction of the CVP began in 1937 and for the SWP in 1957, with full SWP funding approved in 1960. The delivery of water originating in northern California from the CVP and SWP has been reduced in recent years due to environmental regulations that govern the delivery of water through the Sacramento-San Joaquin Delta.

Distribution – Water is available through natural precipitation such as rain and snow. It is then transported throughout the state’s numerous waterways, including creeks, streams, lakes, and rivers. Other water is stored underground in porous rock and soil (also called aquifers) and brought to the surface by wells and pumps. Approximately 30 to 50 percent of the water supply for farms, homes, and businesses comes from groundwater depending on the water-year type. More groundwater is used during dry years or in times of drought because less surface water is available.

Two-thirds of the demand for water comes from the Southern one-third of the state, while two-thirds of the precipitation and water storage are in the Northern one-third, creating significant challenges for water distribution.

History – The history of California agriculture and water development are intertwined. The first California agricultural water delivery system was built at Mission San Diego Acala. With the Gold Rush, the state’s demand for food grew with its population. As early as 1865, private companies began constructing canals in the Central Valley to irrigate crops. In 1877, the State Legislature passed the Wright Act, authorizing the formation of public irrigation

districts. These agencies, formed by local citizens, are responsible for providing a steady, reliable supply of water for irrigation, flood control, recreation, human consumption, and other uses. In the twentieth century, the California

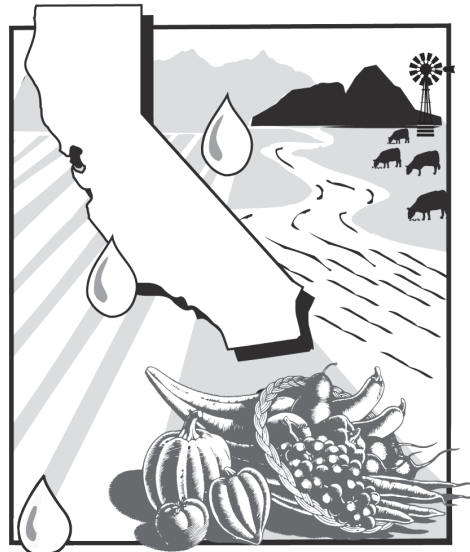
Department of Water Resources and the United States Bureau of Reclamation also began storing water and delivering it to farms and cities. This large-scale development of water has allowed California to become a national and world leader in agriculture.

Irrigation Techniques – Simply stated, the term “irrigation” is the process of putting water into the soil to make plants grow. There are three basic ways to irrigate: surface, micro-irrigation, and sprinkler. Surface irrigation includes methods such as border-strip and furrow, where water flows on top of the soil. Micro-irrigation techniques, such as drip, bubbler, spray, and subsurface drip,

deliver a measured amount of water through an emitter located near each plant. Micro-irrigation techniques can be located above or below ground. Sprinkler irrigation includes the use of a mechanical device which sprinkles water over the crops and simulates rain.

The method of irrigation used depends on many factors including geographical location, crop type, soil type, climate, and economics. Farmers often use laser-leveling of fields, computers, remote sensors, and GPS to improve the efficient use of their water supplies.

Economic Value – Water is an essential component to life and the economy of California. It is vital to the success of California’s \$50 billion agricultural industry. California farms grow two-thirds of the fruit, one-third of the vegetables, and almost one out of every five gallons of milk produced in the United States. Each of the more than 400 commodities grown in California depends upon the availability of water—from the fruits, vegetables and meats people eat, to the cotton and wool clothing people wear, and the forest and floral products people use and enjoy.



For additional information:
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Agricultural Water Activity Sheet

History of Agricultural Water Development in California

Late 1700s - California missions began to irrigate crops for their own consumption. Cattle production dominates commercial agriculture.



1848 - James Marshall discovers gold in the American River.



1879 - The California State Supreme Court case *Lux vs. Haggin* establishes "The California Doctrine" of water rights.



1901 - Colorado River water is first used to irrigate crops in the Imperial Valley.



1946-Present - California leads the nation in agricultural production.



2015 - Exports of California farm products to other countries exceed \$21 billion in value.

1839 - John Sutter founds New Helvetia (later to become Sacramento) as the first large-scale agricultural operation in the Sacramento Valley.



1856 - First commercially developed irrigation project is constructed in Yolo County.

1887 - With the Wright Act, the State Legislature allows the establishment of public irrigation districts. Shortly thereafter, the Turlock, Modesto, and Merced Irrigation Districts are formed.



1940s - First deliveries of irrigation water made by the federally funded Central Valley Project.



1960s - First deliveries made by the California State Water Project.



Lesson Ideas

- Examine the affect of watering duration and frequency on plant growth by manipulating one variable. Beginning with the same amount of water, irrigate one plant with more water less often and one plant with less water more often.
- Fill three plastic cups; one with soil, one with gravel, and one with sand. Predict which cup will hold the most water. Pour water into the cups to test your predictions.
- Discuss the water cycle and how evaporation, condensation, transpiration, and precipitation affect agriculture.
- Place a rain gauge outside your classroom and record the precipitation in your area.
- Research the seasonal rainfall averages in your area.
- Locate newspaper articles that cover local, state, and federal water issues. Discuss how they affect the students.

Fantastic Facts

1. Most precipitation in California occurs in Northern California.
2. California's agriculture industry is dependent on the availability of water.
3. The average annual rainfall and snowfall in California is 194.7 million acre-feet.
4. Irrigation is the process of putting water in the soil to make plants grow.
5. Rivers, creeks, dams, canals, and pumps are used to store and transport water.
6. The first water delivery system established for California agriculture was the Mission San Diego Acala.
7. Lasers are used to level irrigated fields with precision.

Lesson Plan: Waterways

Introduction: Surface, sprinkler, and micro-irrigation are the three main types of irrigation techniques used in California. In this lesson, students will deliver water from a source (a bucket) to a field (an aluminum pie plate) and apply the water using an irrigation technique.

Objective: Students will learn about sources of water in their community and construct a model of a chosen irrigation technique.

California Standards: CC ELA: SL.3-12.4, SL.4-8.5; NGSS: 3-5-ETS1-1, 3-5-ETS1-2, 5-ESS3-1, MS-ETS1-3, HS-ETS1-1, HS-ESS3-1

Materials: Buckets, aluminum pie plates, straws, duct tape, sponges, old rags, PVC pipe tubing and fittings, writing paper, butcher paper, markers, and other supplies.

Procedure:

1. Divide students into groups. Have them discuss and write down where they think the water for their community comes from. Discuss their thoughts and clarify the information with facts you have gathered from your local water agencies.
2. Explain that once water is available, it must be delivered to

cities and farmlands. Show the students the supplies they have to work with—the bucket of water is the source and the straws, sponges, pipe fittings, etc. are the equipment used to deliver the water to the farm or city (the aluminum pie plate placed a reasonable distance from the source).

3. Once the students have created a way to transport the water, add soil, which represents the farm or garden that needs irrigating, to the pie plate. Have the students devise a way to efficiently irrigate their crop.
4. After completing the experiment, have each group draw a picture of their model on butcher paper and share their successes and challenges with the class. Compare and contrast the various delivery and irrigation techniques.
5. Invite a local water district representative or a farmer to visit your class to discuss how local water is delivered to homes and farms and how the farms are irrigated.