

# Agricultural Water

Information compiled by the California Farm Water Coalition

**Sources** – California's water supply averages 194.7 million acre-feet per year, statewide. This water comes from rain and snowfall and the Colorado and Klamath rivers. From this supply, the majority is consumed by natural vegetation, leaving 82 million acre-feet available for dedicated use. During an average water-supply year, California farmers and ranchers consume 34.2 million acre-feet of water to grow their crops. Other consumptive uses include the environment at 39.4 million acre-feet and 8.9 million acre-feet for municipal and industrial uses.

The major projects that have been the primary sources of stored water include the Central Valley Project (CVP), State Water Project, Colorado River Aqueduct, All-American Canal and the Klamath Basin. Construction of the CVP began in 1937 and was designed to provide 5.6 million acre-feet of water to California farms, homes and businesses, supporting approximately 6.9 million people at that time. Today, the project is attempting to support the 38 million individuals that call California their home. This water storage challenge will continue to grow as California's population is expected to reach 59.5 million by 2050.

**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 percent of the water supply for farms, homes and businesses comes from groundwater.

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 to simulate 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 to make their fields level or sloped for efficient irrigation.

**Economic Value** – Water is an essential component to life and the economy of California. It is vital to the success of California's \$36.6 billion agricultural industry. California has led the nation in farm production every year since 1946. Each of the more than 400 crops 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.



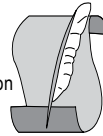
**2003** - Exports of California farm products to other countries exceed \$7.2 billion in value.

**1939** - John Sutter founds New Helvetia (later to become Sacramento) as the first large-scale agricultural operation in the Sacramento Valley.

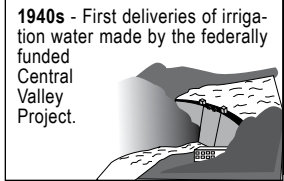


**1856** - First commercially developed irrigation project is constructed in Yolo County.

**1887** - With the Wright Act, the State Legislature allows the establishment of public irrigation districts. Shortly thereafter, the Modesto, Turlock 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

- Evaluate examples of surface, micro and sprinkler irrigation. Discuss how new technology has affected water use and conservation.
- 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. What crops could be supported by this rainfall average?
- Locate newspaper articles that cover local, state and federal water issues. Discuss how they affect the students.

### Fantastic Facts

1. List the three main types of irrigation techniques.
2. Where does most precipitation occur in California?
3. True or false? California's agricultural industry is dependent on the availability of water.
4. In acre-feet, what is the average annual rainfall and snowfall in California?
5. What term means "putting water in the soil to make plants grow?"
6. True or false? Rivers, creeks, dams, canals and pumps are used to store and transport water.
7. Where was the first water delivery system established for California agriculture?
8. How are fields leveled precisely for appropriate irrigation?

- 1) Surface, micro-irrigation, sprinkler
- 2) Northern California
- 3) True
- 4) 200 million acre-feet
- 5) Irrigation
- 6) True
- 7) Mission San Diego Acala
- 8) With lasers

### Lesson Plan: Waterways

**Introduction:** In this activity students will learn about the sources of water in their community as well as perform an activity that teaches about water delivery systems and irrigation techniques. Students will use innovative processes to deliver water from a source (a bucket) to a field (a aluminum pie plate) and then distribute it throughout their field (pie plate full of dirt) using an irrigation technique.

**Materials:** Buckets, plastic rain gutters, aluminum pie plates, straws, duct tape, sponges, old rags, PVC pipe tubing and fittings, writing paper, butcher paper, markers and other supplies of your choosing.

#### Procedure:

1. Divide students into groups. Have them discuss and write down where they think the water for their community comes from. Do they think the water used for agricultural production in the community comes from the same sources? Discuss their thoughts and clarify the information with facts you have gathered from your local water agencies.
2. Explain that once the 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). Have the students design and build a way to deliver the water from the source to their city or farm, which is a significant distance from the source.

3. Once the students have created a way to transport the water from the source to the city or farm, add soil, which represents the farm or garden that needs irrigating, to the pie plate. Have the students devise a way to efficiently irrigate this crop or garden.
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.

