

Moving California's Water Supply

Watch the segment online at <http://education.savingthebay.org/moving-californias-water-supply>

Watch the segment on DVD: Episode 3, 11:37–15:23

Video length: 4 minutes 6 seconds

SUBJECT/S

Science

History

GRADE LEVELS

4–5

9–12

CA CONTENT STANDARDS

Grade 4

History – Social Science

4.4.1. Trace the evolution of California's water system into a network of dams, aqueducts, and reservoirs.

Grades 9–12

Earth Sciences – California Geology

9.c. Students know the importance of water to society, the origins of California's fresh water, and the relationship between supply and need.

History – Social Science

11.6.4. Analyze the effects of and the controversies arising from New Deal economic policies and the expanded role of the federal government in society and the economy since the 1930s (e.g., Works Progress Administration, Social Security, National Labor Relations Board, farm programs, regional development policies, and energy development projects such as the Tennessee Valley Authority, California Central Valley Project, and Bonneville Dam).

VIDEO OVERVIEW

Together, California's Central Valley Project and State Water Project stand as an engineering marvel that endowed the state with the ability to move water from the north to the arid south, permanently transforming California.



Friant Dam—one of two dams that made up the original Central Valley Project—opened in 1942. (California State Library)

In this segment you'll learn that:

- Robert Bradford Marshall designed the network of dams and canals that move Northern California water to the Central Valley.
- California's agricultural industry grew rapidly following the construction of the Central Valley Project.
- California's two water projects bring fresh water for drinking from the San Francisco–San Joaquin Delta to 23 million people throughout the state.

TOPIC BACKGROUND

In 1919, Robert Bradford Marshall, an employee of the U.S. Geological Survey, first proposed a plan to solve Californian's water problems by shipping water from the Sacramento River in the north to the San Joaquin Valley and then over the Tehachapi Mountains into Southern California. There was a great deal of interest in Marshall's plan. In 1933, the state legislature and the voters approved a \$170 million plan calling for a dam on the Sacramento River and pumps to send water from the Sacramento–San Joaquin Delta into the Valley. Because of the Depression, however, the state could not fund the project and turned to President Franklin D. Roosevelt for federal help. In 1935, the plan was approved as a public works project to provide jobs—\$20 million was allotted, and the Bureau of Reclamation began construction on the Central Valley Project. The Friant Dam was completed in 1944, and the Shasta Dam, along with the canals and pumping plant in Tracy, was completed in 1945. The project became operational in 1951, and water began to flow to the Central Valley.

After World War II ended in 1945, California experienced rapid population growth. People were attracted to the state by its good climate and growth in industries. New business and housing developments placed increasing demands on the state's water resources. Especially in larger metropolitan areas, it became clear to water officials that local supplies were not going to be sufficient to meet future community needs.

California's legislature began to investigate statewide water resources, producing reports on precipitation, flood flows, water quality, and water use. They also developed the California Water Plan, which proposed local projects and a huge state project to meet projected "ultimate" water needs for the Golden State.

Debates about the proposed project were contentious. Costs and engineering feasibility were questioned. Northern Californians claimed the water was rightfully theirs and opposed shipping it south. Southerners argued for guarantees that northern water managers could not rescind supply agreements and questioned whether project costs

VOCABULARY

dam

a barrier built across a watercourse to impound (hold) water

engineering

the application of science and mathematics to design and implement materials, structures, machines, systems, and processes that safely achieve a desired objective

infrastructure

the system of public works of a country, state, or region; the resources (such as equipment, buildings, and people) needed for an activity

irrigation

supplying land with water to help plants grow

pumping station

a facility that uses pumps and other equipment to pump water from one place to another

were realistic. People in the Bay-Delta region wanted protection for their waterways, but San Joaquin Valley farmers fervently supported the project to provide much-needed surface water for irrigation.

Compromise was sought for several years until the Burns-Porter Act (formally known as the California Water Resources Development Bond Act) was placed on the November 1960 ballot and approved by a margin of fewer than 200,000 votes out of 5.8 million ballots cast. Construction soon began on facilities from north to south; the project that is now the nation's largest state-built water and power development and distribution system was under way.

The Department of Water Resources, created in 1956, now manages a network of 34 storage facilities, reservoirs, and lakes; 20 pumping plants; four pumping-generating plants; five hydroelectric power plants; and about 701 miles of open canals and pipelines. The project provides supplemental water to approximately 20 million Californians and 660,000 acres of irrigated farmland.

Although California's most noted water projects and the most vociferous battles tend to run "north-south," smaller-scale water projects exist throughout the state, and most are also associated with some controversy. The East Bay Municipal Utility District, for example, draws Sierra Nevada runoff and transports it through the Mokelumne Aqueducts to Alameda and Contra Costa counties in the eastern portion of the San Francisco Bay Area. San Francisco brings much of its drinking water from the Tuolumne River in the central Sierra, and Metropolitan Water transports water from the Colorado River (and other sources) to quench the thirst of its 18 million customers in Los Angeles, Orange, San Diego, Riverside, San Bernardino, and Ventura counties.

PRE-VIEWING ACTIVITIES

Grades 4–5

- Review the function and purpose of dams. (Explain what a dam is and how dams enable water to be stored and moved to where it is needed.)

Grades 9–12

- Discuss the four reasons for building the Central Valley Project: water supply, hydroelectric power, recreation, and flood control.

FOCUS QUESTIONS FOR VIEWING

Grades 4–5

- What was the first dam to be completed in the Central Valley Project? *Shasta Dam*
- How did farmers benefit from the Central Valley Project? *They used the water to irrigate the Sacramento and San Joaquin valleys. It also helped to control frost and heat.*
- How many people rely on fresh water taken from the Sacramento–San Joaquin Delta for drinking water? *23 million*

Grades 9–12

- What is meant by the term "wasted water"? *any water that is used for a purpose other than household, agricultural, or industrial*
- How did building the Central Valley Project spur California's economy? *By bringing water to the Central Valley and allowing farmers to irrigate their fields, California's agricultural industry grew rapidly.*

ABOUT THE AUTHOR

Lori Mann is an environmental education consultant with 30 years' experience at the local, state, and national levels. She has worked extensively with curriculum development and review, has taught numerous environmental education courses and workshops, and served for 15 years as education director at Coyote Point Museum for Environmental Education in San Mateo, California.

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POST-VIEWING ACTIVITIES

Grades 4–5

- Identify and label the primary components of California's water management system on a map. Research the source of your community's water and locate any components.

Grades 9–12

- Investigate the effects of the Great Depression on California's water system plans and why the federal government agreed to build the Central Valley Project.
- Explain (in writing or discussion) the historical and present-day economic importance of California's water management system.
- Research another major dam system and compare its influence with that of the Central Valley Project.

ADDITIONAL RESOURCES

Building Big Dams, WGBH Educational Foundation

<http://www.pbs.org/wgbh/buildingbig/dam/index.html>

Find information about building dams and why some last while others fail. The site also includes simulations in which site users can explore different types of dams and, presented with issues, can decide whether to repair the dam, remove it, or leave it alone.

California State Water Project and the Central Valley Project, California Department of Water Resources

<http://www.water.ca.gov/swp/cvp.cfm>

This section of the California Department of Water Resources' website provides facts about the Sacramento–San Joaquin Delta and a wealth of information on California's water issues and what the state has done and plans to do to address these issues.

California Water Plan Update 2005: California's Major Water Projects, California Department of Water Resources

<http://www.waterplan.water.ca.gov/docs/cwpu2005/vol4/vol4-infrastructure-camajorwaterprojects.pdf>

Explore a map of California's major federal, state, and local water projects.

Liquid Gold, California's Water, Water Resources Center Archives

<http://wrca.library.ucr.edu/exhibit.html>

Read the text of a 1997 exhibit on California's water development. Access to historical and contemporary photographs, documents, maps, and books is provided.

Where Does My Water Come From? Water Education Foundation

<http://www.water-ed.org/watersources/default.asp>

Identify the drinking water sources for incorporated cities of 10,000 or more people throughout California.

CREDITS

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JOSH COLLINS: About 1918, there is a man who retired from the USGS as a geographer, chief geographer of the USGS, Bradford Marshall, who, on his own, produces a plan to harbor the waters of the state in a series of dams from the Cascades all the way down to the Tehachapis, with canals moving the water from one basin to another.

NARRATOR: By 1933, the state of California committed to creating a huge new water management infrastructure to manage and distribute flows. But with the Great Depression under way, only the federal government could build so grand a scheme. In 1937, the Bureau of Reclamation—builder of Boulder Dam on the Colorado River and Grand Coulee Dam on the Columbia—began construction of the Central Valley Project.

JEFF MOUNT: This was going to spur the economic engine of California. And, in principle, it made sense because wherever water came, you fueled economies.

COLLINS: To improve drainage—in the minds of those engineers, farmers, and everybody else—basically ... was to move the water more efficiently from one place to another, store where you could move it downstream when you wanted to, and not waste any of it by allowing it to go to some other purpose besides household, agriculture, or industry. So water going out the Golden Gate was wasted water.

NEWSREEL ANNOUNCER: Four years after the beginning of construction, California's mighty Shasta Dam is ready to generate its first power ...

NARRATOR: Initially, the Central Valley Project would rely on two great dams: 600-foot high Shasta Dam on the Sacramento River and, hundreds of miles south, Friant Dam on the San Joaquin. In between, on the Delta, would be a huge pumping station moving fresh water from the wet northern end of the valley to its arid south. By 1945, the system was up and running.

FILM ANNOUNCER: This is the self-sustaining Central Valley Project built for the people of the valley by the Bureau of Reclamation of the United States Department of the Interior ...

NARRATOR: The Central Valley Project stood as one of the world's greatest engineering achievements. The Sacramento and San Joaquin valleys bloomed in an abundance of new water.

FARMER: In our orchards, here, we have both overhead and trickle irrigation. The overhead has multiple uses. We use it primarily for irrigation. Secondary things are frost control and summer heat suppression ...

NARRATOR: By the '50s, the state of California, flush in postwar prosperity and hungry for more, would build its own companion project—the State Water Project. Today, some 23 million people rely on fresh water taken from the Sacramento–San Joaquin Delta for drinking water—the same

water that serves as the underpinning of the state's immense agricultural output. The Bay, its Delta, its watershed are now irrevocably changed.

COLLINS: That large plumbing system greatly alters the flow of water upstream from the Delta, into the Delta, through the Delta, and into San Francisco Bay. So in that sense, you can say that the Bay is downstream of a very large plumbing system that was not designed to move water into the Bay.