

TO QUENCH A
THIRST
THE CALIFORNIA WATER CRISIS

VIEWER'S GUIDE



“Right now, everyone is losing. The environment is in worse shape than it was five years ago, agriculture is in worse shape and the cities are in worse shape.”

Lester Snow,
San Diego County Water Authority

“The State Water Project provided water for the development of this great big state. I hate to think of what it would be if we didn't have it.”

Gov. Edmund G. "Pat" Brown
Ca. Gov. 1959 - 1967



“The issue at hand is the shut down of the irrigation water pumping out of the Sacramento River. The entire future of counties in the north state depends on a reliable source of water for agriculture-based economies.”

Sue Sutton, Family Water Alliance



“I think the idea that we're going to throw out environmental regulations would be very unpopular among the voters and I think they would come down on the side of the environment rather than saving a few rice farmers.”

Gerald Meral, Planning and Conservation League



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To Quench a Thirst: The California Water Crisis presents a comprehensive look at critical water resource issues in California. The new, one-hour documentary examines agricultural, urban and environmental interests that compete for this precious resource in a time of limited supply and increasing demand. The documentary explores the history and the creative solutions that are being pursued to carry the state into the next century. *To Quench a Thirst* is produced by KVIE, Sacramento, narrated by veteran journalist Roger Mudd and funded through a grant from the Hans and Margaret Doe Charitable Trust of San Diego. The program is written and produced by Sue Pearson Atkinson with assistance from the Water Education Foundation of Sacramento.



Public TV crew with Roger Mudd (center).

HOW TO USE THIS GUIDE

This viewer's guide is designed to encourage thought and discussion about issues raised in the program. The following pages contain pertinent facts about California water use, a brief chronology of state water development, remarks by water leaders interviewed in the documentary, a list of agencies and organizations to contact for more information and questions to guide further discussion. The guide may be photocopied and distributed to classrooms or groups.

Videocassettes:

Home videocassettes of *To Quench a Thirst* are available from the:

Water Education Foundation
717 K Street, #517
Sacramento, CA 95814
(916) 444-6240



"The state's water problems no longer come and go with the weather. They are here to stay."

PRODUCTION CREDITS

Made possible by:
**The Hans and Margaret Doe
Charitable Trust**

Production: KVIE Channel 6, Sacramento
Host: Roger Mudd
Producer: Sue Pearson Atkinson
Executive Producer: Chris Cochran
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Rita Schmidt Sudman
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PROGRAM HIGHLIGHTS

In California, water was the force from which all good things flowed. The 49ers found gold in it and the dreamers who followed built cities and farms with it. Engineers harnessed the water and channeled it great distances, transforming barren desert into orange groves and palm-lined avenues. Water was as good as gold, in fact, better, because there was so much more to find and use. The rest of the country would hear about the California dream and come to understand that it meant rising above physical limitations. In this state, all things seemed possible.

But California has come to an important crossroads in the dream. Despite the fact that California remains a leader in farm production, manufacturing, foreign trade, entertainment and tourism, some people claim that the dream is lost. Water problems no longer come and go with the weather. Three primary factors have collided to place unanticipated demands on the existing system of federal, state and local facilities that collect water where it naturally occurs and transport it to where it is needed. They are: 1) booming population growth, 2) increasing demands for more water to benefit fish and wildlife, and 3) no significant water development in the past 20 years. Increasingly, competing interests are placing greater demands on a limited water supply.

California's water history is rife with conflicts between the haves and the have-nots. Until recently, the battle has primarily been between northern California, where 75 percent of the precipitation occurs, and southern California, where 75 percent of the population lives. But as the state entered the 1990s, the water wars had evolved into a complex triad of opposing interests — urban, agricultural and environmental — each with the ability to stymie one another's agenda. Consequently, the

statewide water planning process has become a virtual stalemate.

Still, the drought, which began in 1987, has brought about a stark realization that if the stalemate is not broken soon, future generations will face declining agricultural productivity, urban water rationing, the disappearance of native fish and wildlife species and an overall deterioration in Californians' quality of life. The situation has forced some compromises and innovative solutions that might not have otherwise occurred. *To Quench a Thirst* identifies several key issues and/or problems that will form the basis of California water planning and policy into the 21st century. They are:

The Sacramento-San Joaquin Delta

California's two greatest rivers, the Sacramento River flowing from the north and the San Joaquin River flowing from the south, converge in this maze of channels and islands before discharging into San Francisco Bay. Delta channels carry 42 percent of the state's average annual runoff. Local, state and federal facilities pump Delta water into aqueducts for delivery west to the Bay Area and south to the Central Valley and southern California. As the central spigot of California's complex plumbing system, the Delta suffers from poor water quality, declining fish populations, levee instability and seismic threats. A plan to build a peripheral canal, skirting the eastern edge of the Delta to more efficiently carry water to southern pumps and avoid drawing fish into the pumps, was defeated in a 1982 statewide vote. The process of establishing Delta water quality and quantity standards, environmental protection programs and facilities operations plans remains quite controversial.

Environmental Protection

With the passage of tough state and federal environmental legislation in the 1970s and 1980s, traditional water project development (building dams or diversion facilities) came to a virtual halt. A changing social ethic — from conquering nature to protecting it — demanded that any new projects be environmentally sensitive and that the damage done by old projects be mitigated. Dams prevent anadromous fish, such as salmon or steelhead trout, from migrating downstream to the ocean and back to their native fresh water spawning grounds. Unscreened or poorly screened pumps kill hundreds of thousands of young fish each year and environmentalists are demanding that more water be left in rivers and streams to benefit fish. While programs have been carried out to improve fishery conditions, including restoring gravel spawning beds, installing state-of-the-art fish screens and releasing hundreds of thousands of juvenile, hatchery fish in the Delta, the drought has hampered many of these efforts.

Water Costs

Water is free in California, but customers must pay for the cost incurred in treating, pumping and transporting water or for building the dams, reservoirs and aqueducts needed to store and deliver the water. Residential water costs vary widely throughout the state, from about \$9.70 per month in water-rich Shasta County to about \$40 per month in dry Marin County. Some argue that water is too cheap, especially for farmers with long-term, fixed-rate contracts for federal project water and say that higher costs will encourage conservation efforts.

Agricultural Water Use and Water Marketing

California farmers produce about half of the nation's fruits, vegetables and nuts. To do so, they use about 80 percent of the state's developed surface water and billions of gallons of ground water per day. Because of this, and because agricultural water is generally much cheaper than urban water, urban water managers and environmentalists are trying to reallocate some agricultural water (about 10 percent) for other uses. Legislation has been introduced in Congress and in the state Legislature that would provide incentives for farmers to sell some of their water, a practice called "water marketing." California farmers are concerned about water marketing plans, fearing that when land is taken out of production, agricultural communities and related industries will suffer.

Alternative Water Sources

One positive outcome of the California water crisis is that water-short communities have been forced to seek new solutions to water supply problems. Significant progress has been made in the area of water conservation, especially in urban areas, and water-saving plumbing fixtures are being installed in all new construction. Southern California has led the state in treating wastewater and reusing it to water golf courses or replenish depleted ground water aquifers. Some coastal communities have made sizable investments in sea water desalination plants. Efforts are being made to store surplus spring runoff underground in natural aquifers and save it for use in dry years. But most importantly, the crisis has encouraged traditionally warring factions to sit down together and attempt to reach consensus on new approaches for the future.



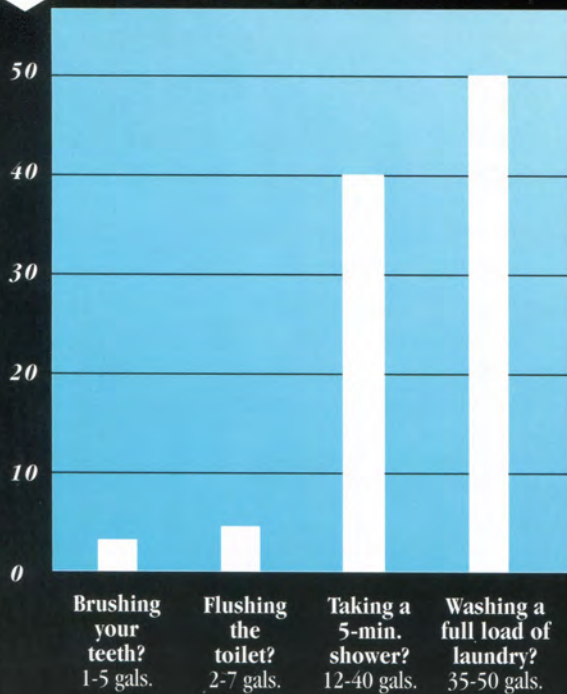
“When we turn on a faucet, we expect something to happen automatically. We expect water to come out. But water is not an automatic or limitless resource and water is not an impervious resource. It can be polluted and fouled and mismanaged. But it can be renewed and reused for our benefit if we treat it with respect.”

Roger Mudd

WATER FACTS

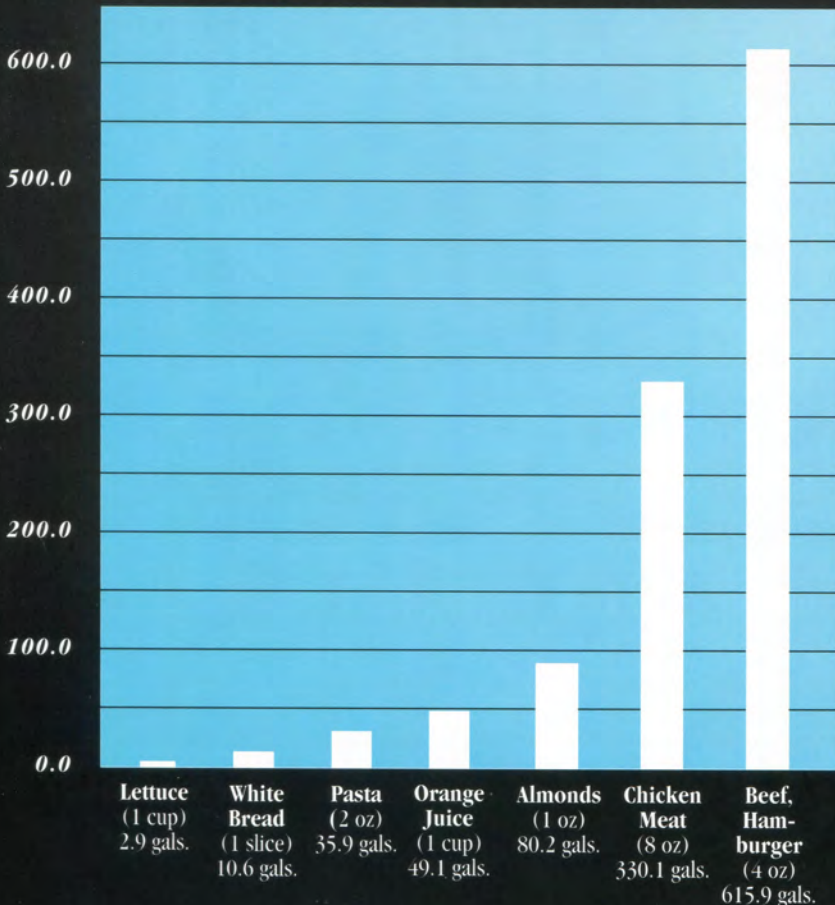
GALLONS

HOW MUCH WATER DO WE USE WHEN...



GALLONS

HOW MUCH WATER DOES IT TAKE TO PRODUCE A SERVING OF...



Precipitation

California receives, on average, about 193 million acre-feet of water each year as precipitation. (An acre-foot equals about 326,000 gallons, or enough water to cover an acre of land — about the size of a football field — one foot deep.) Of this, about 122 million acre-feet are lost to evaporation or underground seepage, leaving about 71 million acre-feet in average annual runoff, or “surface water.”

Water Use

Half of this runoff is “developed” water — water that is stored in reservoirs or pumped for planned use. Of the state’s developed water, about 80 percent is used by agriculture and 20 percent goes for residential, industrial and commercial use. About 16.6 million acre-feet of ground water is also used in an average year (about 40 percent of total statewide water use). In drought years, however, ground water use escalates to about 60 percent of total use.

Water Projects

There are 1,313 local, state and federally owned and operated reservoirs in California. Two major water projects bisect the state, carrying northern California water to central and southern California users. In an average year, the State Water Project, operated by the California Dept. of Water Resources, delivers 2.4 million acre-feet of water annually, mostly to urban users. The federal Central Valley Project, operated by the U.S. Bureau of Reclamation, delivers about 7 million acre-feet annually, mostly to agricultural users.

CONTACTS

The following list of organizations and agencies are among those involved in using or allocating water in California or establishing state water policy. Many have public information offices with spokespeople on hand to answer questions or provide materials for further learning.

State and Federal Agencies

California Dept. of Water Resources - agency that plans for statewide water use and manages the State Water Project
1416 9th Street, Sacramento, CA 95814
(916) 653-6192

California Dept. of Fish and Game - agency that protects and enhances the state's native fish, plants and wildlife
1416 9th Street, Sacramento, CA 95814
(916) 653-6420

California State Water Resources Control Board - five-member board which allocates water rights and regulates water quality
901 P Street, Sacramento, CA 95814
(916) 657-2390

U.S. Army Corps of Engineers - agency charged with flood control, levee and dam construction and the regulation of navigable waters and wetlands
1325 J Street, Sacramento, CA 95814
(916) 557-5100

U.S. Bureau of Reclamation - agency that operates water projects in 17 western states including California's Central Valley Project
2800 Cottage Way, Sacramento, CA 95825
(916) 978-4919

U.S. Environmental Protection Agency - agency that enforces federal laws protecting the quality of air, water and land
75 Hawthorne Street, San Francisco, CA 94105
(415) 744-1585

Other Water Organizations

Association of California Water Agencies - represents 400 urban water agencies and irrigation districts throughout the state
910 K Street, Sacramento, CA 95814
(916) 441-4545

California Farm Water Coalition - represents agricultural interests in the water use debate
423 W. Fallbrook Avenue, Fresno, CA 93711
(209) 439-9663

California Urban Water Agencies - represents 11 of the state's largest urban water agencies, serving 2/3 of urban customers
660 J Street, #485, Sacramento, CA 95814
(916) 552-2929

Environmental Defense Fund - promotes increased water supplies to support fish and wildlife habitat in the California water use debate
5655 College Avenue, #304, Oakland, CA 94618 (510) 658-8008

Pacific Coast Federation of Fishermen's Associations - coalition of fishery organizations that advocates protection of West Coast fishing habitats
P.O. Box 989, Sausalito, CA 94966
(415) 332-5080

Save San Francisco Bay Association - advocates wetlands preservation and reduced diversions of fresh water from San Francisco Bay and the Delta
1736 Franklin Street, Oakland, CA 94612
(510) 452-9261

Three-Way Water Agreement Process - ad hoc group representing urban, agricultural and environmental water interests working to reach consensus on California water policy (contact the Ca. Farm Water Coalition, Ca. Urban Water Agencies or the Environmental Defense Fund)

Water Education Foundation - nonprofit, nonpartisan organization that produces unbiased educational materials on western water issues
717 K Street, #517, Sacramento, CA 95814
(916) 444-6240



"All major water user groups must recognize that no one sector can be allowed to get ahead of the others in meeting its needs. We must move step by step and each step must be linked to progress for every sector."

Governor Pete Wilson

CHRONOLOGY

California Indians adapted to the high and low flows of the rivers.



Gold miners built more than 4,000 miles of ditches and flumes in an effort to sluice out the elusive metal.



California's history is one of floods and drought. Dams were built to protect human life and property in times of floods and to store water for times of drought.



1813 Padre Dam, California's first water project, built near San Diego

1848 Gold discovered on the American River, thousands migrate to California, California republic established

1850 California granted statehood

1880 First flood control plan for the Sacramento Valley developed by state engineer William Hammond Hall

1913 Los Angeles Aqueduct begins delivery of water from the Owens Valley to Los Angeles

1923 Hetch Hetchy Valley flooded to provide water supply for San Francisco

1928 Worst drought of the 20th century begins in California and ends in 1934

1937 Rivers and Harbors Act approved, authorizing construction of the initial features of the Central Valley Project by the Army Corps of Engineers

1941 Opening of the Colorado River Aqueduct from Hoover Dam, delivering Colorado River water to southwestern California, and the All-American Canal, carrying Colorado River water to the Imperial Valley



1951 Central Valley Project begins first deliveries to the San Joaquin Valley

1960 Burns-Porter Act passed, providing \$1.75 billion in bonds to build the State Water Project

1970 Passage of the National Environmental Quality Act, the California Environmental Quality Act and the California Endangered Species Act

1972 Passage of the Federal Clean Water Act (amended in 1977) and the California Wild and Scenic Rivers Act

1973 Federal Endangered Species Act enacted, first State Water Project deliveries to southern California

1982 Voters overwhelmingly defeat Proposition 9, which would have authorized construction of a Delta Peripheral Canal

1983 Landmark decision by the California Supreme Court extends public trust protections to scenic and wildlife preservation

1987 - 1992 Latest drought



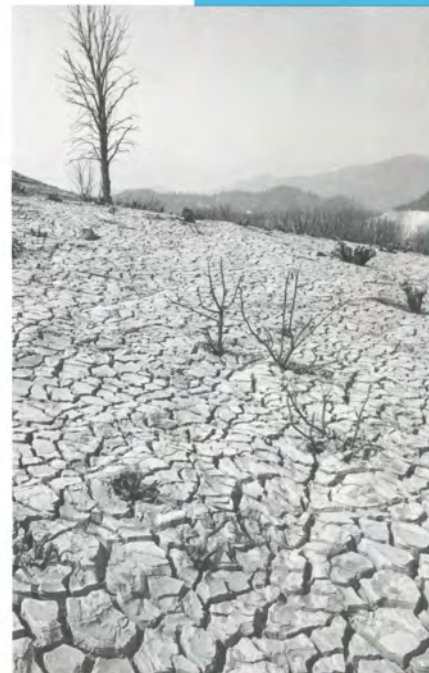
Shasta Dam on the Sacramento River can store 4.5 million acre-feet of water and is the main reservoir for the Central Valley Project.



The Colorado River is a major source of urban and agricultural water for southern California.



The Los Angeles Aqueduct, carrying water from the Owens Valley, helped the city grow from a population of 214,000 in 1905 to 3.5 million today.



Severe droughts have occurred throughout California's history including 1928 to 1934, 1976 to 1977 and 1987 to 1992.

QUESTIONS FOR FURTHER DISCUSSION:

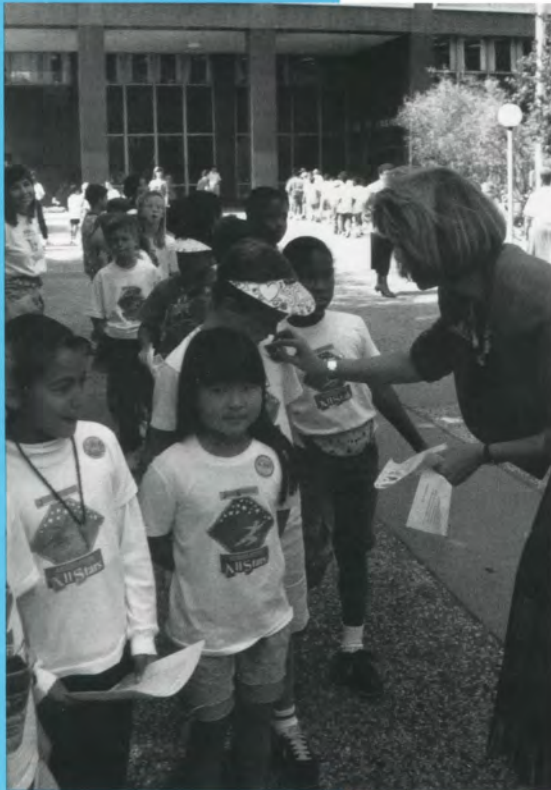
1. What factors are contributing to the water supply crisis in California?
2. Would you be willing to reduce your personal water use — for example, take shorter showers, discontinue watering your lawn or washing your car — so that more water can be left in rivers for fish and wildlife? How much would you be willing or able to cut back?
3. Should building and development continue to occur in arid regions of California where water is already scarce? Can a community control growth?
4. Given that water is so essential to everyday life, how much should water cost? How much would you be willing to pay per month for the water you use?
5. California farmers use about 80 percent of the state's developed water to grow about half of the country's fruits and vegetables. At the same time, California cities are growing. Should farmers give up some of their water to support urban growth?
6. In 1991, about 200 endangered winter-run salmon returned to spawn in the Sacramento River, below Shasta Dam. The winter-run is one of four chinook salmon runs that spawn in the river; all are declining in number due to the drought and other factors. While the wild winter-run has not made up a significant portion of the commercial ocean catch, biologists consider it to be of biological significance. Some federal water deliveries this year will go to save the winter-run, water that would otherwise go to drought-stressed Central Valley farmers. Should this water go for salmon or to keep orchards alive and save agricultural jobs?
7. John Muir, founder of the Sierra Club, fought desperately to prevent the Hetch Hetchy Valley in Yosemite National Park from being dammed. He lost his battle and in 1923 the valley was flooded to provide clean water for the people who lived at that time in California's most prosperous city, San Francisco. Discuss the changing societal values that allowed a dam to be constructed in a national park 70 years ago but would not allow it today.

“California is facing a water crisis. It is a three-way tug-of-war between cities, farms and the environment over a finite supply of water.”



TO QUENCH A **THIRST** THE CALIFORNIA WATER CRISIS

Teacher's Guide



Water has become one of the hottest political and scientific issues in California. If our students, who are our future citizens and voters, are to make intelligent decisions about the fate of this precious resource, they must be taught not only the scientific facts about water, but the skills necessary for gathering and evaluating information. They must also have the opportunity to practice problem-solving strategies on real-life natural resources issues.

Curriculum Links:

Environmental Science:

- ◆ Hydrologic Cycle
- ◆ Anadromous fish life cycles
- ◆ Endangered species
- ◆ Limiting factors
- ◆ Wetlands and fresh water ecology
- ◆ Salinity levels

Earth Science:

- ◆ Meteorology
- ◆ Resource distribution
- ◆ River deltas, peat soils
- ◆ Ground water and surface water distribution

Economics:

- ◆ Resource management
- ◆ Agricultural water needs vs. production costs
- ◆ Urban growth limiting factors
- ◆ Water and crop subsidies

Government:

- ◆ Endangered species protection
- ◆ Surface and ground water rights
- ◆ Formation and compromise in regulation writing
- ◆ Legislative control of natural resources

TOPICS FOR EXTENDED DISCUSSION



1 Rainfall patterns in California

◆ Compare annual rainfall amounts of 10 northern California cities with 10 southern California cities. What are the sources of water for southern California? What is the source of water in your area? (Consult the Water Education Foundation's "California Water Map.")

◆ Look in an almanac to find the years of droughts and floods in California since 1900. Is there a detectable pattern?

2 Agriculture in California

◆ What are the major crops produced in California? Approximately how much water does agriculture use in one year in California? What is the approximate annual income from agriculture in California? How many jobs are tied to California agriculture?

◆ What are the differences in the supply of water to the Sacramento Valley farmlands (north of Sacramento), as compared to the San Joaquin Valley farmlands (south of Stockton)? How do farmers pay for their water? Why are there different rates, depending on the source?

◆ What are the problems associated with agricultural drainage in some parts of the state? Discuss the difference between natural soil problems and man-made problems (use of fertilizers, pesticides, water).

3 Wildlife and wetlands

◆ Why is the Delta such a fragile ecological area? Why are levees failing? What are the differences between the riparian and the rip-rapped levees? Who maintains the levees? Why is Delta soil so rich for agriculture? Why are some islands sinking?

◆ What is the difference in the endangered status of: striped bass, winter-run salmon and the Delta smelt? What is meant by "reverse flow" as it refers to the large pumps at the head of both federal and state water delivery systems? Why is this a

problem for fish? Do fish hatcheries take care of replenishing diminished fish populations? Is there a problem with stocking rivers with hatchery-grown fish?

◆ How is the Doctrine of Public Trust applied to deciding water issues?

4 Possible solutions...thinking about the future

◆ How could water marketing be used to solve some of California's supply and demand problems?

◆ What is the cost of desalination? What is the energy source? What happens to the salt that is taken out of sea water when it is desalinated? Are there any environmental hazards?

◆ What are some ways that industry could be encouraged to become more efficient in its water usage?

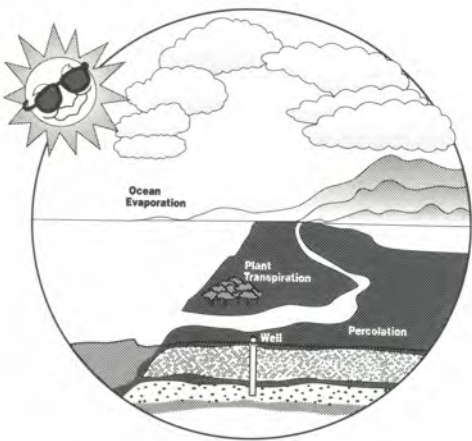
◆ How can household water users conserve water? If a 20 percent cutback could be achieved, how many gallons (or acre-feet) could be saved?

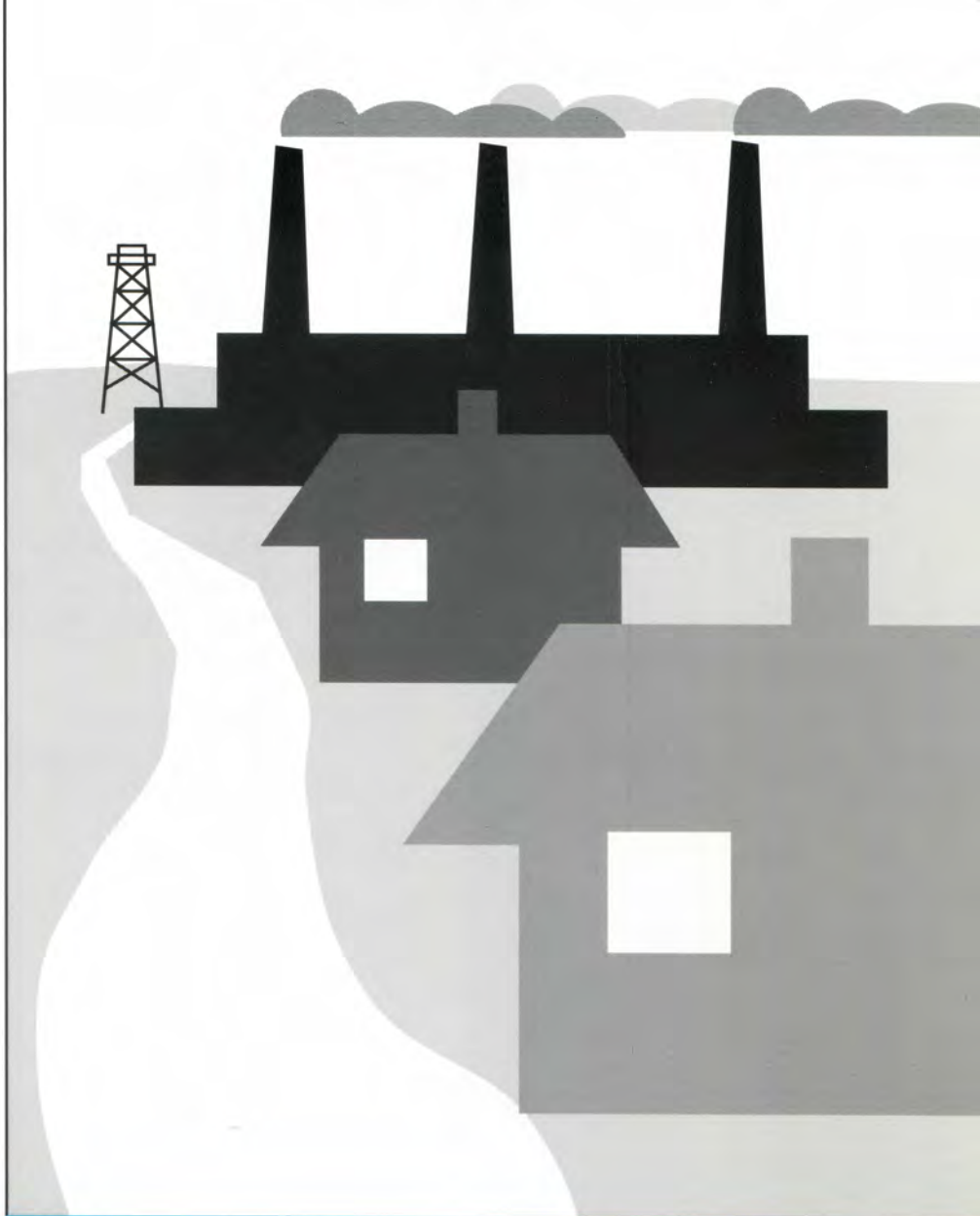
◆ Can California continue to supply a growing population with water? What do you see as limits?

Possible lesson: Water rights law - a simulation activity

Objective: Students will demonstrate an understanding of the conflicts between the different doctrines of water rights law by defending a decision concerning a ground water rights dispute.

Procedure: Discuss the water rights doctrines to clarify definitions. Ask for volunteers to play the parts of the factory owner and the three landowners. Everyone else in the class plays the collective role of "the judge." "The judge" can ask questions of the factory owners and the landowners. (Ex. How much water do you use per day? What do you use water for? How long have you been using water at this rate? etc.) Each student should render a decision in writing about what





“the judge” should decide is fair in regard to the usage of the ground water by the chemical factory owner and the landowners.

Information source: *Layperson’s Guide to Water Rights Law* from the Water Education Foundation, 717 K St., Suite 517, Sacramento, CA 95814.

Laws concerning surface water:

- ◆ Appropriative rights - rights based on physical control of water and since 1914, used by right of permit or license for its beneficial use.
- ◆ Prescriptive rights - rights assumed by asserting a title to water on the basis that the prior right has become invalid or unenforceable by lapse of time and specified conditions.
- ◆ Pueblo rights - water rights possessed by a municipality which, as a successor of a Spanish-law pueblo, is entitled to the beneficial use of all needed, naturally-occurring surface and ground water of the original pueblo watershed.
- ◆ Riparian rights - rights to water in a river, stream, pond, lake or well-defined underground channel which physically touches the land owned by a property holder.
- ◆ Reasonable and beneficial use doctrine - a state constitutional requirement that all water resources must be put to the best possible use, preventing waste or unreasonable use or unreasonable method of use.
- ◆ Public Trust Doctrine - holds that the state has to consider those values, primarily environmental, that are held in trust for the people. Now long-standing water rights can be challenged.

(KEEP IN MIND THAT LAW GOVERNING GROUND WATER IS OPEN TO DEBATE IN CALIFORNIA.)

SIMULATION:

(Taken from *Groundwater: a Vital Resource*, compiled by Cedar Creek Learning Center in cooperation with the Tennessee Valley Authority.)

A chemical factory has been located in an area for 50 years. When it first moved into the area, it bought all the land within a wide area. As years passed, some of the area was sold to real estate developers who sold houses to individual landowners. The factory has always pumped the

thousands of gallons it uses daily from underground wells. There is no municipal or surface water available. As the number of homes in the area increased, the number of family-owned wells also increased. Landowners are now being forced to dig deeper and deeper to find water, and many wells are being abandoned as they “dry out.” The landowners feel it is the fault of the chemical factory, which pumps such an enormous amount of water out of

the ground each day. The matter has now been taken to court and you as a judge must decide the correct action to take.

Using the laws of water rights, make a decision about the discussion you are about to hear. Decide which rule would best apply here and defend your position to the factory owners and the individual homeowners in a paragraph.



Increased competition for clean water, a finite resource, has forced Westerners to face difficult decisions. By providing coverage of western water issues in a fair and balanced way, the Water Education Foundation's materials can help people make their own informed decisions on water use.

Established in 1977, the Foundation is a nonprofit, nonpartisan, tax-exempt organization. Its mission is to develop and implement educational programs leading to a broader understanding of water issues and to resolution of water problems. The Foundation is governed by a 25-member board of directors representing a broad cross-section of the state's water, education, environmental and public interest communities.

The Foundation's programs are largely supported by the development and sale of its materials. Additional contributions are tax-deductible as allowed by law. We want to be a personal reference for you on water issues, so please contact us.

Rita Schmidt Sudman
Executive Director
Water Education Foundation
717 K Street, Suite 517
Sacramento, CA 95814
(916) 444-6240

LEARN MORE ABOUT IT

The following publications, posters, videos and special events are available through the Water Education Foundation. See opposite page for order form.

Western Water Magazine

Published bi-monthly, each issue examines a different aspect of California and western water issues.

Layperson's Guide Series

All 13 in-depth, easy-to-understand guides provide information about regions and topics of importance to California water resources management.

Classroom Materials

These program sets, suitable for grades 4-12, include lesson plans, posters, Layperson's Guides and worksheets.

Posters

California Water Map
Colorado River Water Map
California's Water System Poster
Hydrologic Cycle Poster

Slide Shows and Videos

Waterquest Video
Water Conservation Video
To Quench a Thirst Video
Making California's Water Work Slide Show

Special Events

Bay-Delta Tour
Northern California Tour
Central California Tour
Executive Briefing
Reporters' Briefing

