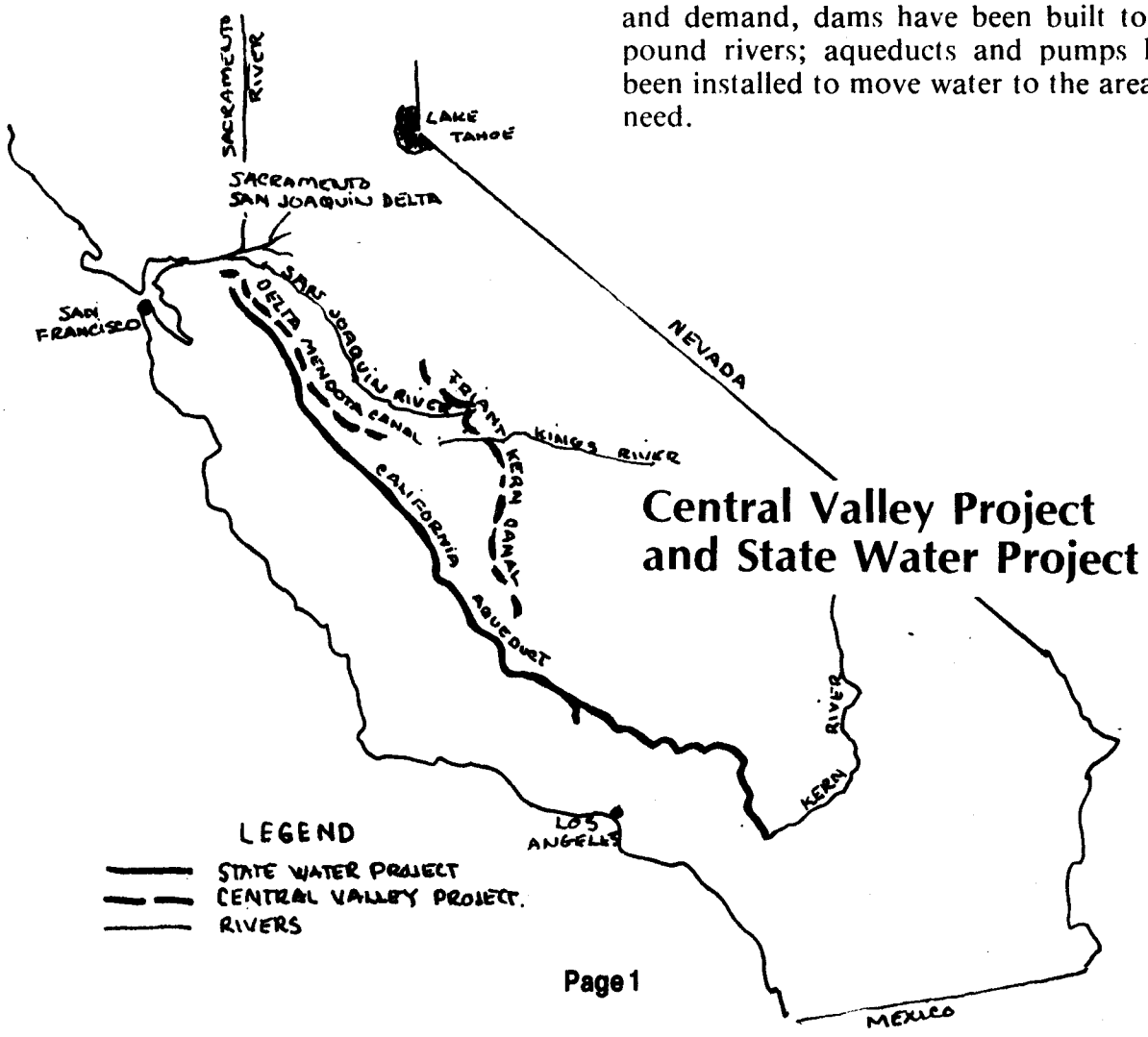
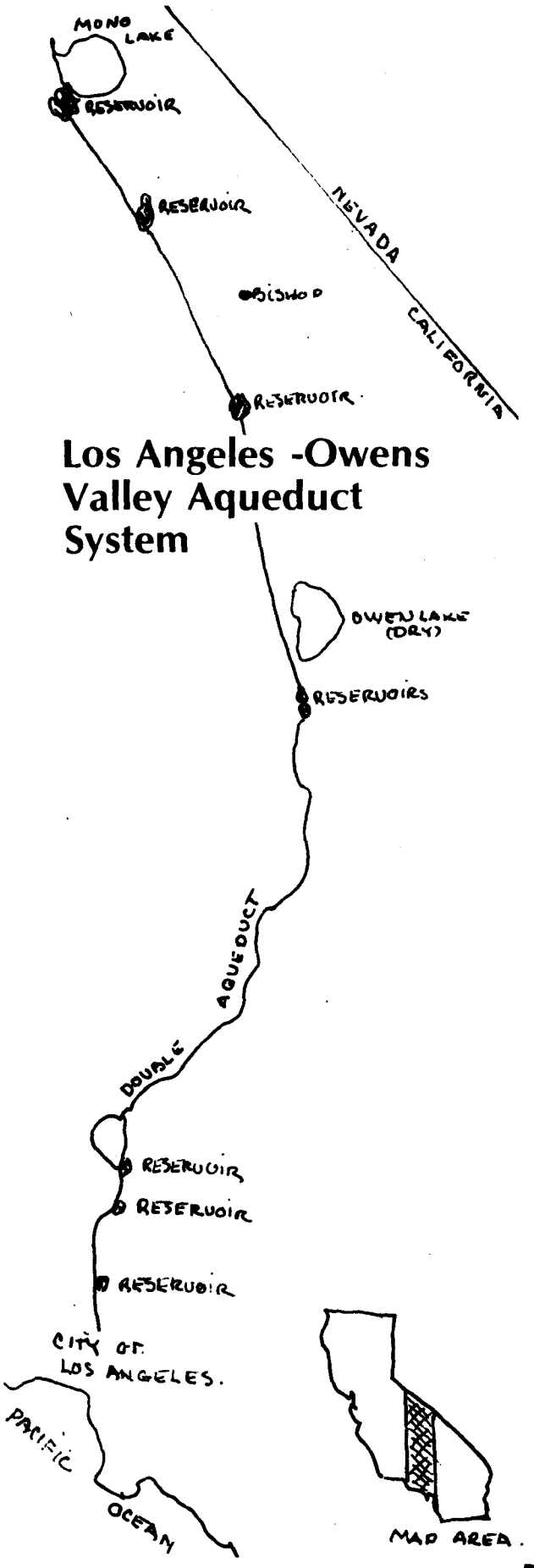
WATER: CALIFORNIA'S LIQUID ASSET

Water development in California began in the 18th century when Father Junipero Serra and the Franciscans established the missions along the streams which flowed into the sea. For over two hundred years our progress and prosperity have been directly related to the availability of this precious liquid. It may appear to flow in abundance at the turn of the tap, but the problems surrounding the supply and distribution of water are so complex that it has become a continuing source of controversy within our democratic system.

In an average year 200 million acre feet (MAF) of water reaches California's soil as rain or snow, nearly enough to put the entire state under two feet of water. An acre foot is the amount of water required to cover one acre one foot deep, approximately the amount of water used by a family of five in one year. Yet nature has distributed this resource unevenly. Seventy percent of the state's annual runoff occurs north of Sacramento in the spring and winter, while eighty percent of the state's needs are south of Sacramento in the summer and fall. Most agricultural operations and major population centers are south of Sacramento. To help correct the dislocation of water supply and demand, dams have been built to impound rivers; aqueducts and pumps have been installed to move water to the areas of need.



Central Valley Project and State Water Project



HOW IS IT COLLECTED & DISTRIBUTED?

Of all water being used in California, about forty percent is pumped from groundwater basins, that is, water that has been collected in the earth's substrata as a bank account for plants, animals, humans and the earth itself. The remaining sixty percent is delivered to users by hundreds of local water and irrigation districts, which either develop their own sources or purchase water from the **United States Bureau of Reclamation (USBR)** or the **State Department of Water Resources (DWR).**

The US Bureau of Reclamation operates the Central Valley Project (CVP). The CVP consists of dams and reservoirs (the largest of which is Shasta Dam on the Sacramento River), canals, pumping stations and power plants. In average years the CVP can deliver up to eight million acre feet of water, and hydroelectric power for sale.

The Department of Water Resources operates the State Water Project (SWP). It too consists of dams and reservoirs, the largest of which is Oroville Dam on the Feather River, pumping stations, power plants and the 450 mile-long California Aqueduct. The San Luis Dam and reservoir is a joint federal/state facility, as is a portion of the aqueduct used by the Central Valley Project to deliver water to the Westlands Water District. The hydro electric power it produces is used to operate the system.

The Metropolitan Water District (MWD) in southern California and the **Imperial Irrigation District (IID)** in the southeast corner of the state receive a total of 4.4 million acre feet of water per year from the Colorado River through a contractual agreement with the federal government. This combined system consists of the Parker and Hoover Dams on the river, pumping plants, reservoirs and a delivery system of aqueducts and canals. Most of the Colorado River water allotment is used by agriculture. The MWD expects to have its presently available supply of surplus water reduced during the dry years. While the MWD will continue to receive a firmly-agreed-upon 550,000 acre feet of water, it must seek a supplemental supply for periods of drought when surplus will not be available. This

issue has given rise to conflicting perceptions between Northern and Southern voters as to the need for additional development.

The large municipal districts are also important in understanding the water picture in California. The first is the **Hetch Hetchy system,** dating from 1934, which supplies drinking water to the city of San Francisco. The second, the **Los Angeles Department of Water and Power,** dates from the early 1900s when the city of Los Angeles purchased much of the Owens Valley, and established a system to take water from the east side of the Sierra Nevada and transport it by gravity to the city of Los Angeles. Conflict has developed between Owens Valley residents, who fear the depletion of Mono Lake and their groundwater basins, and the city of Los Angeles, which is determined to retain the rights to its water supply.

WHO PAYS; WHO BENEFITS BY THESE PROJECTS?

The Central Valley Project is operated by the US Bureau of Reclamation which derives its authority from the Reclamation Act of 1902. The bureau is responsible for developing water resources in the Western United States, to encourage growth and develop arid lands. The act stipulated that no one could receive water to irrigate more than 160 acres of lands, the intent being to encourage development of small farms.

The law has not worked as originally intended. Through the years large landowners lobbied to eliminate acreage and residency requirements on the basis that larger acreages are needed to operate economically viable farms. They also exerted political pressure to generate new sources of water. Agricultural demand, together with population increases, has forced the cost of water higher and the demand for new sources threatens to become overwhelming. While the new impoundments are being promoted by development-oriented constituencies, they are opposed by those who doubt that benefits outweigh environmental and social costs.

Water and power users are expected to pay their share; however agriculture, which uses the largest percentage of Central Valley Project water, does not pay interest on its share. Having committed nearly all of its available water, the US Bureau of Reclamation is now uncertain about its ability to meet state water quality standards in the Sacramento/San Joaquin Delta. To do so during dry periods, it would be necessary to reduce the amount of water transported to the south and flush more out through the Delta and Bay, thereby diluting pollutants.

The State Water Project is operated by the State Department of Water Resources. The state has contracted to deliver half again as much water as it is presently capable of providing. Existing contracts can be fulfilled only by building additional facilities, which, in turn, exert pressure for more development. Theoretically, the project is designed so that its costs are paid by those who benefit. However, an option exists for the State Water Project contractors to request annual allocations of "surplus" water, in addition to their entitlement. "Surplus" water refers to water contracted for but not needed to meet other claims, which is sold at very low rates. The low cost of surplus water has encouraged a buildup in demand and minimized the incentive for conservation.

The State Water Project faces the prospect of future problems because the project does not produce enough power to move the water south. Inevitable increases in the cost of power needed to pump water will result in higher rates for users, although it is possible that at some point higher costs could deter buildup of demand and could increase conservation. Most public concern exists over the prospect of future shortages of water and default in ultimate contractual commitments, unless the State Department of Water Resources renegotiates long-term contracts to reduce delivery schedules, finds ways to conserve or stretch this available water, or develops new sources of water.

The Colorado River allocation is operated and distributed by several large water wholesalers. One of these, the **Metropolitan Water District,** has, in recent years, taken its full entitlement of Colorado water and a part of the surplus available to it. Like the federally developed water for the Central

Valley, this water is also available at a very reasonable cost to the water wholesaler. At the same time the Metropolitan Water District has had to increase water charges to its customers because, although a part of the District's entitlement is routinely returned for use as "surplus" water for agriculture, maintenance and delivery costs have escalated.

CHALLENGES AND CONCERNS

Ground water is a reserve that man has sometimes rearranged with troublesome results. In California ground water basins underlie nearly forty percent of the state and their storage capacity is enormous, estimated at about 1.3 billion acre feet. Ground water basins serve the same purpose as surface water storage in reservoirs: storage of surplus water in wet years. Existing ground water can be withdrawn and replaced later, or surplus water can be stored for future use.

Ground water is said to be "overdrafted" when more is being pumped out than man or nature is replenishing. In California our average annual overdraft is 2.2 million acre feet. As the ground water level recedes and the cost of pumping from deeper and deeper wells soars, the cost of water also soars. In the San Joaquin Valley, certain groundwater reservoirs have collapsed as the water was withdrawn.These basins cannot be replenished by available technology. The objective evidence of this phenomenon is called "subsidence."

In coastal areas overdrafting is responsible for sea water intrusion. As ground water is mined, sea water is sucked in to fill its place. The result is a loss of productive agricultural land. Recently the public has become aware of ground water contamination from hazardous pollutants such as solvents, pesticides, nitrates, viruses and other elements such as selenium.

Dramatic examples throughout the state have caused a public outcry and protective legislation, but many contaminated sites are yet to be identified. Those that have been identified are proving intractable to easy solution. To deal with these concerns in the future will require well-planned programs, including an extensive effort to monitor ground water.

One ground water management technique receiving general support **is ' 'conjunctive use,"** a coordinated operation of a ground water basin and the surface water supply. The surface and ground water supply operate as an intercommunicating system, replenishing the basins with winter runoff. This technique requires enough supplemental supply to offset the overdraft. Given that availability in wet years, the cost of surface water must be kept competitive with pumped water, and more conveyance capacity built to transfer larger amounts of water for use and storage. Over the long term such a solution would be much cheaper than constructing more reservoirs with their high percentage of water loss through evaporation.

All of California's major rivers, with the exception of the Eel, Smith and Klamath, have been dammed at least one time. Those remaining are presently protected through several legal mechanisms. The **State Wild and Scenic Rivers** are protected by legislation passed in 1972. Its purpose is to preserve certain rivers "which possess extraordinary scenic, recreational, fishery or wildlife values in their free-flowing state for the benefit and enjoyment of the people of the state."

In the future, dams, reservoirs, or other water impoundment facilities which would adversely affect the free flowing condition of a river are prohibited on portions of the Klamath, Trinity, Smith, Eel and American rivers.

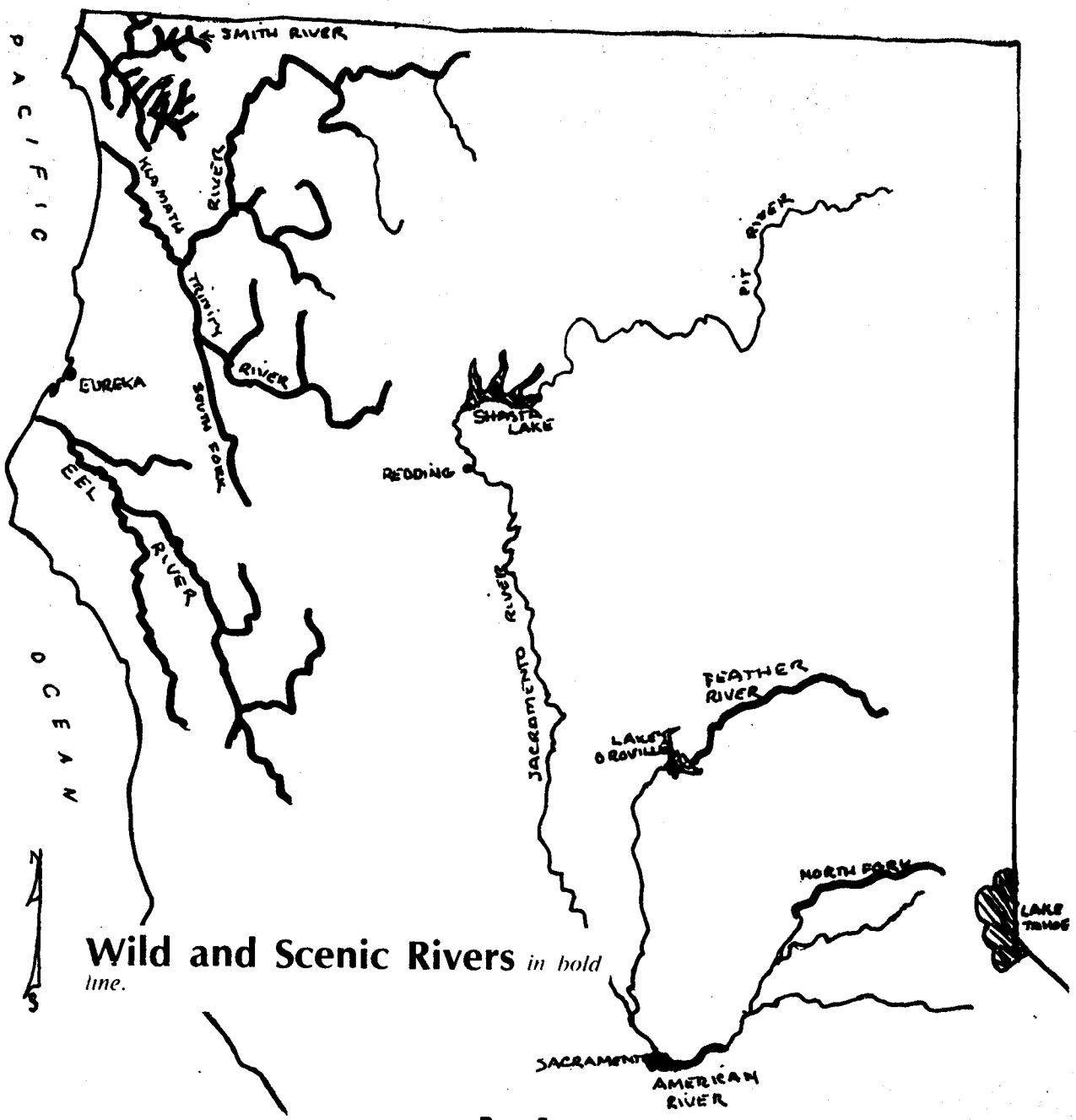
The Eel River is currently the most vulnerable river in the system. To appease advocates of Dos Rios Dam and other dam sites on the river, the legislature included a provision in the 1972 Act which directs the Department of Water Resources to report back to the legislature on the need for water supply and flood control projects on the Eel River and its tributaries. This report is now due. The legislature will hold public hearings to reevaluate the need to delete all or any segment of the Eel River from the system. Some groups, such as the Farm

Bureau, California Chamber of Commerce, and the Central Valley Water District, favor development of the Eel as the most eonomical source of new water to supplement the needs of agriculture and urban development.

The Supreme Court has recently added federal protection to the rivers by including them in the National Wild and Scenic rivers system, thus preventing construction of either state or federal water resource projects.

Situated amidst meandering waterways of the merging Sacramento and San Joaquin rivers are some sixty islands protected from flooding by aging levees. (A levee is an embankment against river floods.) This unique estuary provides or supports agricultural land, water recreation, wildlife habitat, industries, major fisheries, and water for export. The **Sacramento/San Joaquin Delta** is the only such resource on the West Coast of either North or South America.

The **Suisun Marsh,** also an integral part of the Delta, has problems caused by diverting upstream water to the CVP and SWP. Uncertainties of nature often result in reduction of the flow through the Delta which is needed to sustain the health of the marsh.



Wild and Scenic Rivers *in bold line.*

Water quality in the San Francisco and the Delta is a complex and incompletely understood interaction of natural and human influences including agricultural and municipal and industrial pollutant discharge. The salinity of the Delta at or below sea level is determined by the interaction of tides and fresh water.

Both the State Water Project and the federal Central Valley Project pump water through the Delta from separate pumping plants located at its south edge, to send to the Central Valley and to Southern California. The amount of water available to the Central Valley Project and the State Water Project is insufficient to cover existing water supply contracts in the South while still meeting Delta quality and quantity needs. The release of stored water during dry summer months improves water quality and the general environment in the Delta. During the winter and spring, natural high flow water is captured and stored. The resulting depletion of water in the Delta is damaging to the environment.

Fish and wildlife are affected because of reduced flows available to flush the Delta and Bay and resist the ebb and flow of ocean tides. Questions of efficiency, economic profit and loss, equity, and environmental quality cloud the issue. Problems grow more acute each year as exports increase and urban and agricultural developments expand.

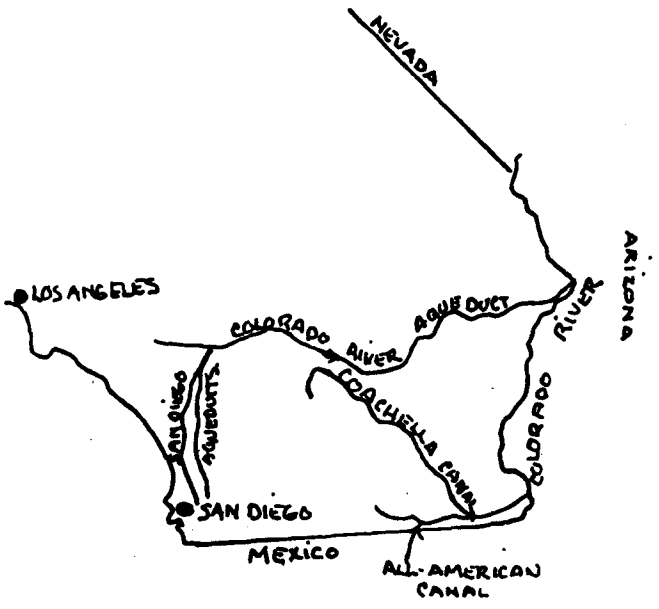
Recent proliferation of **levee failures,** with restoration costs in the millions of dollars, have raised new questions about the Delta. Who pays for the repairs? Which, if any, islands should remain inundated? Who is responsible for maintenance? What constitutes an "emergency," the status required in order to acquire low-interest loans to pay for restoration of damaged levees?

The interdependent problems of the Delta are often compounded by overlapping jurisdictions and a multiplicity of interests. Cooperation between federal, state and local interests is paramount to better Delta management, including operating agreements between the Central Valley Project and the State Water Project to meet both project and Delta needs. The challenge is to merge physical and technical realities with economic and political ones.

Southern California and the San Joaquin Valley are faced with **problems of insufficient supply.** Regional pressures for building new projects to import additional water are exacerbated by population growth and agricultural expansion. Meanwhile, overall **costs** of new construction have increased nearly three times in the past ten years. While it is still possible to import new supplies of water from areas of abundance, any new proposal must contain not only feasible engineering, but must also be economically justified, environmentally sound and institutionally operable.

The **quality of California's water** is regulated by the State Water Resources Control Board and the nine Regional Water Quality Control Boards. These appointed boards get their authority from the 1969 California Porter Cologne Act and the federal Clean Water Act. The basis of the water regulation is to ensure water quality for municipal, industrial and agricultural purposes and for fish and wildlife protection. Permits are issued which limit the

Colorado System in California



amount of various pollutants such as lead, arsenic, pesticides and herbicides that can enter ground or surface waters.

While water quality for municipal, industrial and agricultural uses is protected by law; these same users are the principal generators of water pollutants.

Municipal pollution is caused mainly by improperly treated sewage, which either percolates into the groundwater from discharge onto land or discharges directly into rivers, lakes and streams. Once the major source of water pollution, sewage discharge is being brought under control in most areas of California thanks to an intensive program of building and upgrading sewage treatment plants, paid for largely with federal tax dollars.

The great increase in the discharge of industrial and agricultural toxic chemicals since World War II poses the major threat to water quality and causes deep concern among California citizens for the safety of their drinking water. While industrial pollutant regulation is effective in many areas, the recent disclosures of serious pollution in the Silicon Valley groundwater near San Jose shows that even so-called "smokeless industries" can and do cause serious problems.

Agricultural discharges have not yet been regulated in California to the degree necessary to protect fish and wildlife, drinking water supplies and human health. The devastation to waterfowl in the San Joaquin Valley and the pollution of ground and surface water there from pesticides and heavy metals show that much remains to be done.

Toxic chemicals leaching and leaking from waste dumps threaten water quality. How to dispose of these wastes, hazardous and non-hazardous alike, without poisoning the groundwater remains a serious and unsolved problem for all Californians.

Cost is a theme running through the water picture from the standpoint of present and future generations - cost to taxpayers for more building, more education, more subsidies, cost to all Californians if degradation of the environment and the health hazards of polluted drinking water are not prevented.

POSSIBLE SOLUTIONS

Traditionally California has used numerous options to solve water problems. Most experts believe that agriculture through **conservation,** could save from two to ten percent of the water it now uses in the state. Since agriculture uses over 85 percent of California's water, the potential savings is significant. Problems arise, however, over who should pay for conservation measures. The benefits of California's extensive agriculture are not limited to farmers. The industry brings the state an estimated 22 billion dollars in annual income. For every one farmer, six other Californians hold a job directly related to agriculture. Farmers also point out that we presently enjoy some of the lowest food prices in the nation.

Some suggest that the state should pay for installation of conservation equipment on farms. So far, few legislators see any benefit to such an extensive government-funded project, and would see any such act as a government giveaway.

Large scale urban conservation could reduce water use by 15 percent but little has been done to provide financial incentives for households to retrofit their homes for water conservation. Rising costs of water in the South have led to some modifications of water use, but it is uncertain whether such changes will last. Laws requiring water-conserving appliances to be installed in new housing are now common, but the reserve of unmodified existing housing is much larger than the number of new homes.

Making existing sources more productive is another way to increase water supplies. More frugal management of existing resources could be required. It is estimated, for example, that careful coordination of the State Water Project and the Central Valley Authority aqueducts and delivery systems could conserve almost 200,000 acre feet a year. The State Water Resources Control Board has recently required the Imperial Irrigation District to develop a plan to use its annual water allocation more carefully. Lining its canal would conserve as much as 400,000 acre feet per year.

Reclamation of Waste Water is a process whereby water is reused for such purposes as landscape irrigation and some forms of agriculture. The energy costs for such procedures are not excessive, but testing for safety standards set by the state, pumping to where the water is to be used, and general lack of public education has so far limited this concept's widespread application. Estimates vary of how much

fresh water could be saved by re-use. We do know about 50 percent of urban water use is for purposes outside the home. Substituting reclaimed water for fresh water in such cases would be a significant benefit. California health officials are serious concerned about both viral contamination and the unknown long term health effects if reclaimed water were to be used for human consumption. Many years of research and testing are needed before wastewater can be offered directly for potable (drinkable) use.

It has been suggested that the **free enterprise system** be applied to water. Those who have the commodity should be allowed to sell it to those who wish to buy it, at a fair market price. Current law forbids those who benefit from federal water projects to make a profit by selling the water to others. Water, like air, has always been a free public commodity in the US. There is some indication that this may be changing.

And finally, the water industry believes the best way to obtain more water is to **expand the State Water Project** to its original planned capacity. In 1982 the voters defeated the Peripheral Canal measure because of economic and environmental concerns. As an alternative there have been recent attempts to enlarge the Delta transfer facility of the State Water Project, but the legislature overruled this solution. Environmentalists and others are trying to develop a plan to effectively protect the Delta and still permit more water transfers. These developments bear close watching by the public.

ALTERNATIVE SOURCES OF WATER

Some have looked with interest at the idea of somehow diverting **water from the Columbia River** to California. The immense costs of such a project and its impact on the area of origin are not often discussed. Another unconventional idea for bringing more fresh water to California is to tow icebergs from the Antarctic here. Seriously proposed recently by an Arab leader, this suggestion bogged down under the laws of physics and the difficulties of herding an inert mass thousands of miles through an uncooperative medium--the sea.

A closer-to-home source for additional water is to look to the last remaining **free and scenic rivers** of California. Such rivers are currently protected by both federal and state laws forbidding their diversion. Constant vigilance and agitation by those concerned with protecting the environment will be required if they seek to keep wild and scenic rivers untouched by dams.

Another idea being given serious attention now is **seeding rain clouds.** The federal government is now engaged in such studies in the upper Colorado River area. They believe that more moisture can be coaxed from the skies with appropriate chemicals. If tests produce consistent results, a ten percent enhancement of rain is possible.This would mean thousands of acre feet more for the Colorado River, and increased security to those who use its water. There is no reason why a successful program could not also be used in the Sierra Nevadas to enhance rainfall there and increase captured runoff for existing dams and aqueducts.

Desalination of seawater is considered by many to be the obvious answer to more potable water. The technology exists and in some parts of the world entire countries exist on desalinated seawater. However, to date, the costs of building and operating a desalination plant are high. Costs per acre foot can range from $600 to $1500 depending on the technique used. So far it is still cheaper in California to use imported water than to use desalinated seawater.

At some point the state and its citizens will have to make informed and reasonable decisions about whether to expand existing systems or try new technologies, whether to secure more water or use our current supply in a better way, whether to spend our money on water itself. How much money can we spend on water? Such questions will only be answered over time. For now, interested citizenscan only educate themselves and listen carefully to the many different ideas about California's water future.

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