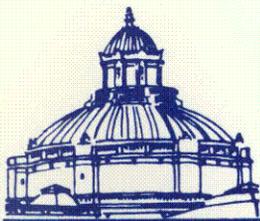


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CALIFORNIA WATER

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ABSTRACT

California water resources development represents a struggle between residents in water-rich regions primarily in the north of California trying to retain their water for local use, and agricultural and urban development interests primarily in semi-arid southern California trying to acquire this water. Factors reviewed are the continuing water demands of southern California, the Central Valley Project, the State Water Project, State law protecting local water, dependence on Colorado River supplies, Federal involvement through the Central Valley Project and the Wild and Scenic Rivers Act, and the environmental water requirements of the Delta, the Peripheral Canal, and Mono Lake.

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CALIFORNIA WATER

INTRODUCTION

The history of California water resources development represents a struggle between water-rich regions trying to retain their water and arid regions trying to acquire this water. The water-rich areas are in the northern and east-central parts of the State, and are often associated with extraordinary natural beauty. The arid regions are largely in the southern part of the State, and it is there that water must be imported if the municipal and industrial needs of urban development and the irrigation needs of agricultural development are to be satisfied.

The traditional way to satisfy the water-scarce southern part of the State was to build water storage and distribution systems to trap water during the high flow season for later distribution during the dry season to water-scarce regions. Before the environmental decade of the 1960s, such storage and distribution systems were more politically and economically acceptable, as long as the water transported out of the region of origin to arid regions was surplus water. During the 1930s, however, northern California legislators passed State laws to protect local water supplies for existing and future water needs.

The largest project designed to redistribute the State's water resources is the Federal Central Valley Project (CVP). Other projects to accommodate the explosive growth of the Los Angeles region and irrigated agriculture include the Owens Aqueduct, now extended to Mono Lake; the second Los Angeles Aqueduct from

Owens Lake; and the Colorado River Aqueduct to divert Colorado River supplies from outside the State. The State Water Project (SWP) is the most recent large-scale water transfer project.

During the last decade, however, concern about the environmental damage these structural projects might do, coupled with the rising costs of such projects and the fact that many of the most cost-effective projects have already been constructed at the best sites, have led many to re-evaluate these structural approaches. Non-structural approaches--such as conservation and demand reduction--are receiving increased attention. Environmentalists are concerned about areas of extraordinary natural beauty and biological significance, which are highly dependent on sufficient water resources. The Sacramento/San Joaquin Delta, the rivers of northern California, Mono Lake, and the Owens Valley are critical areas.

The use of more and more water by northern California, the continuing demand for more water in southern California, and new flushing water requirements for the Sacramento/San Joaquin Delta, have resulted in increasing conflict over dwindling California water supplies. A U.S. Supreme Court decision which will cut back on southern California's use of Colorado River water supplies has intensified this conflict, as has Federal involvement in the State allocation problem through the 1902 Reclamation Act and the 1963 Wild and Scenic Rivers Act.

CONTINUING WATER DEMANDS OF SOUTHERN CALIFORNIA

Development in Southern California has produced a continuing demand in this arid region for water supplies from wherever they can be obtained--the Owens Valley and the Mono Basin in the east-central part of the State, Colorado River

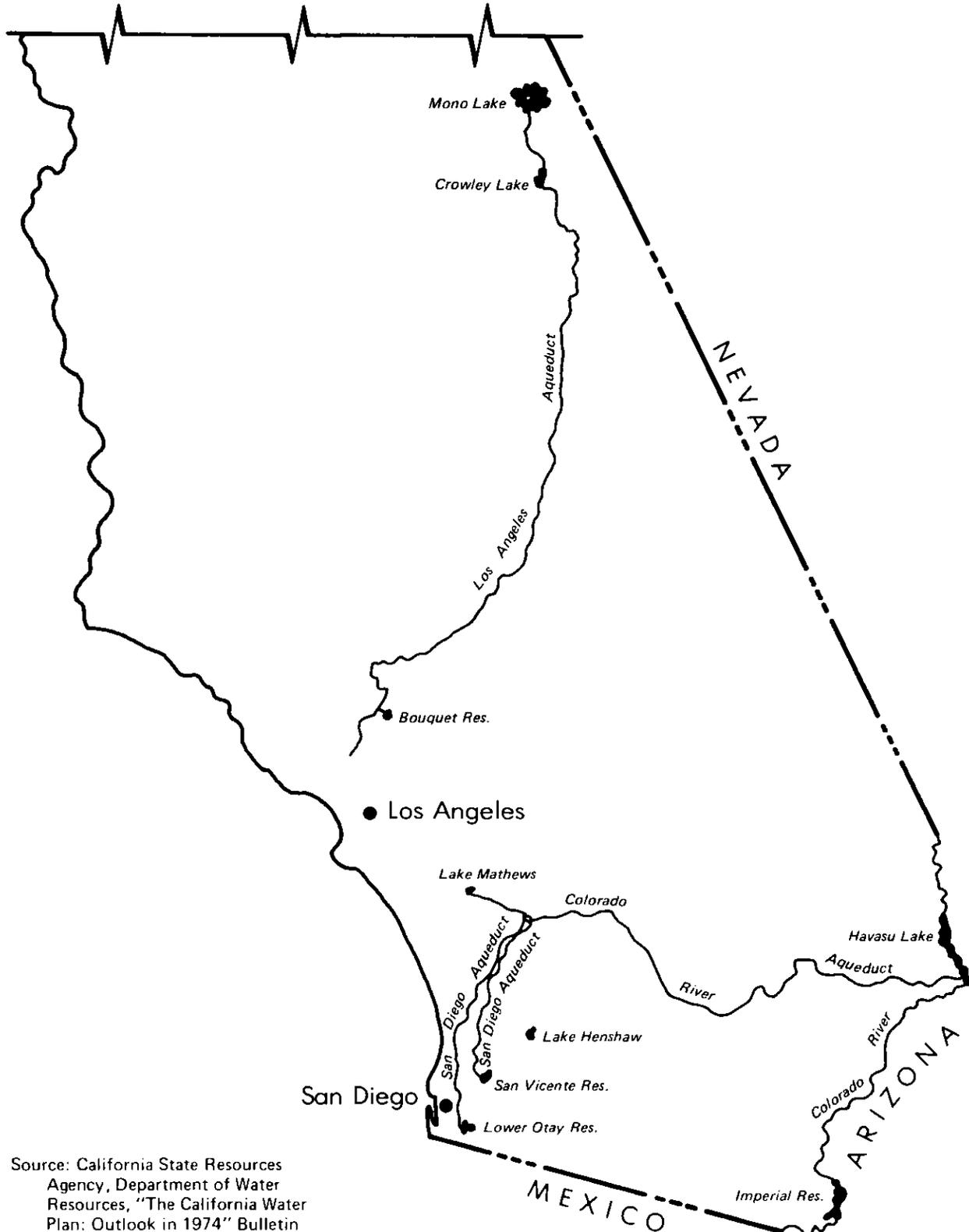
water originating from outside the State, and water from northern California. The phenomenal growth of the urban complex from Los Angeles to San Diego, and the development of large-scale irrigated agriculture have resulted in tremendous pressures for development of water supplies. These pressures continue today, but, because of diminishing supplies and environmental concerns, are more difficult to meet through the traditional structural solutions of water storage and distribution systems.

The development of water for Los Angeles is a tale of high adventure. William Mulholland, one of the early water developers for the Los Angeles region, predicted that acquisition of water supplies for the region would bring people and development. As later became the case, the drawing of people and development to the region through the importation of water in turn generated demand for more water. In the early years of water importation, bloodshed sometimes resulted, as in the Owens Valley, when residents attempted to prevent the diversion of their water supplies to Los Angeles. The conflict continues today, as residents of the Owens Valley attempt to prevent the withdrawal of ground water and residents of the Mono Lake region attempt to prevent the decline in water levels.

Los Angeles began diverting water from the Owens Valley in 1916 through the 250-mile-long Owens Aqueduct. (See Figure 1.) The water supplies conveyed through the aqueduct soon proved inadequate, and in 1940 the city completed the 240-mile-long aqueduct to divert Colorado River water for Los Angeles. Still requiring more water, Los Angeles extended the Owens aqueduct 100 miles north to Mono Lake. Later the district completed a second pipeline, paralleling the original Owens Aqueduct, thus increasing the flow capacity for Los Angeles by 50 percent. Branch aqueducts of the Colorado River Aqueduct were completed in 1947, 1954, and 1960, to deliver water to San Diego.

Figure 1.

Major Local Water Supply and Conveyance Facilities of Southern California



Source: California State Resources Agency, Department of Water Resources, "The California Water Plan: Outlook in 1974" Bulletin No. 160-74, pp. 28-29. (November 1974)

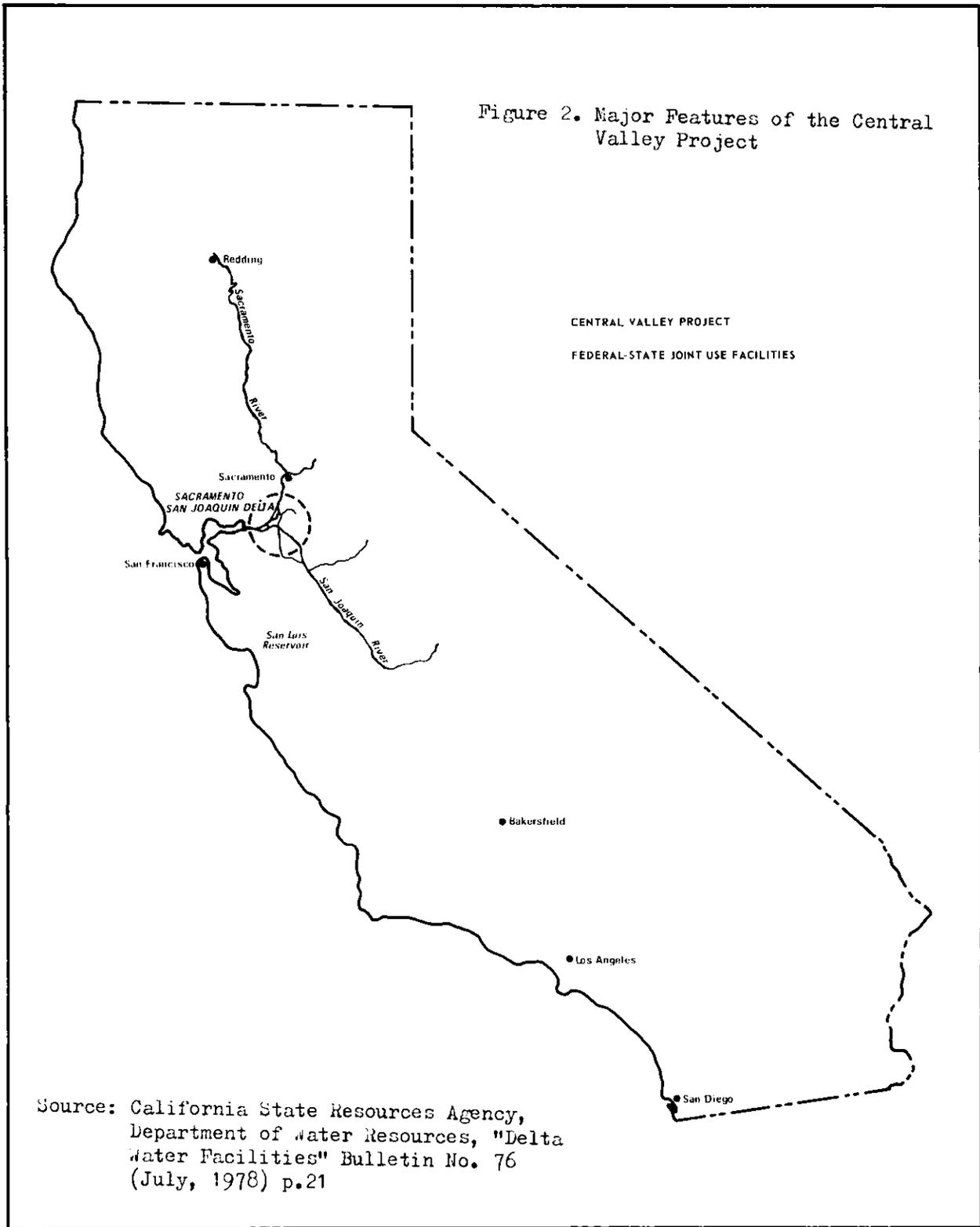
The largest of all the water transportation projects were the Federal Central Valley Project (CVP) and the California State Water Project (SWP). Both these projects transported water 450 miles from northern California to southern California as well as areas of northern and central California requiring increased water supplies.

CENTRAL VALLEY PROJECT

The Central Valley Project (CVP) was designed to redistribute the water resources of the 450-mile-long Central Valley in a more equitable manner. (See Figure 2.) The project was constructed by the Interior Department's Bureau of Reclamation (now the Water and Power Resources Service), and the primary purpose of the CVP was provision of irrigation water for water-deficient parts of the Valley. The Sacramento Valley, in the northern part of the Central Valley, accounted for one-third of the agricultural land but two-thirds of the water, while the San Joaquin Valley in the southern part of the Central Valley accounted for two-thirds of the agricultural land but only one-third of the water.

The drought of 1918 to 1920 led to the abandonment of many newly irrigated lands in the San Joaquin Valley, because of depletion of ground water supplies. Together with the recession of the 1920s, this water supply failure led to the development of the State CVP, the origins of which were contained in the 1931 State Water Plan.

After exploring a number of ways for State financing of the CVP, the State applied for Federal financing through the Public Works Administration and through special congressional legislation. Neither of these approaches proved successful when initiated in the years 1933-35. In 1935, however, Public Works Administration



funds were allotted to the Department of the Interior for construction of certain features of the project, through direct Presidential action.

Over the years, Congress appropriated more funds for the Federal CVP to construct more features for the transportation of water from the Sacramento, Trinity, American, and San Joaquin River Basins to the water-deficient areas of the Sacramento and San Joaquin Valleys. The key water storage features of the CVP today are the Shasta, Trinity, Friant, Folsom, and San Luis Dams.

The Shasta Dam stores water for release into the natural channel of the Sacramento River which carries the water to the Sacramento/San Joaquin Delta. Diversions from the Trinity Dam flow via the Trinity and Sacramento Rivers into the Delta. The Keswick, Lewiston, and Whiskeytown Dams provide additional storage for release to the Trinity and Sacramento Rivers. At Red Bluff a diversion dam diverts water from the Sacramento River to the Sacramento Valley through the Corning and Tehama-Colusa Canals. American River water stored behind the Folsom Dam is released for use in the Folsom-South service area and into the Sacramento River upstream of the Delta.

Water conserved by the Friant Dam on the San Joaquin River is transported to the Tulare Basin via the Friant-Kern Canal, and to the San Joaquin Basin via the Madera Canal. Thirty miles south of Sacramento, the Delta Cross Channel diverts water from the Mokelumne and Sacramento Rivers to the Contra Costa Canal and to export pumps near Tracy for diversion into the Delta-Mendota Canal which delivers water 117 miles into the San Joaquin Valley to the San Joaquin River, where it replaces a portion of the natural flows of the San Joaquin River that are stored by the Friant Dam.

Sixty miles south of the Delta is the Federal/State joint-use San Luis Dam, an off-stream storage facility of the CVP and the State Water Project. Water

diverted from the CVP's Delta-Mendota Canal and the SWP's California Aqueduct is pumped to the San Luis Reservoir during the winter and early spring for release to service areas during the summer and fall.

State Law Protecting Local Water

Enactment of the State Central Valley Project depended on the provision of assurances to certain areas that their water rights would be protected. The more slowly developing areas at higher elevations were fearful that future development would be limited by downstream appropriations. Beginning in 1931, enactment of protective laws gave assurances to the residents of these areas that their future water supplies would be protected, and thereby minimized sectional resistance to the project. In 1933, the State legislature adopted the State Central Valley Project Act, which authorized the CVP and specifically included protections for the areas of origin.

These protections attempted to assure a county in which water originated that rights to use that water would not be released by the State Water Resources Board for use elsewhere if, in the judgment of the Board, the water was necessary for the development of the county. Similarly, there are limits on the powers of the Department of Water Resources to use or exchange the water of a watershed. These provisions which protect the water for the counties and watersheds of origin are still in effect today.

The Attorney General of the State of California in 1955 rendered two opinions relating to the county or watershed of origin doctrine. 1/ These opinions interpreted the State laws as requiring that if water previously put to use in operation

1/ 25 Cal. Ops. Attorney General. 8.

of projects outside the country of origin becomes necessary for beneficial uses in the county or area of origin, this water must be withdrawn from outside areas and made available to the county or area of origin.

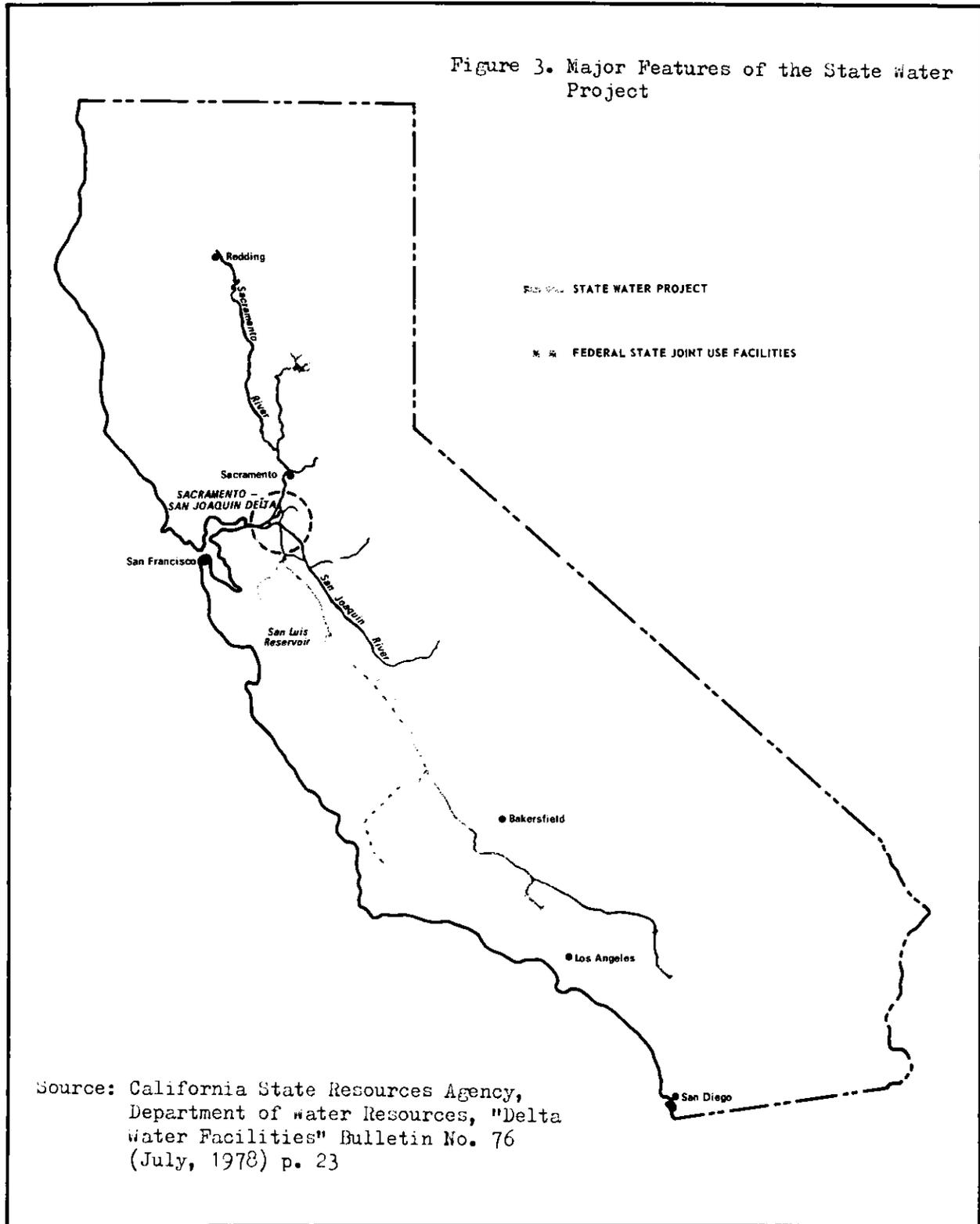
STATE WATER PROJECT

The California State Water Project (SWP) is a water delivery system which supplies central and southern California with water from northern California. (See Figure 3.) The 444-mile-long California Aqueduct is the principal water transportation facility of the SWP, which also includes 20 dams and reservoirs, 5 power plants, 17 pumping plants, and an additional 100 miles of branch aqueducts. Water released from Lake Oroville and associated upstream reservoirs flows into the Feather River and then into the Sacramento River. From this point, some of the water goes directly to the Sacramento/San Joaquin Delta, and some goes to the Delta Cross Channel. The Delta Cross Channel diversion provides water for the Contra Costa Canal for distribution to the Delta agricultural lands, and for the Delta-Mendota Canal for further transmission south to the San Luis Reservoir and beyond.

The Delta Pumping Plant of the SWP withdraws water from the southern part of the Delta into the California Aqueduct, which parallels the route of the Delta-Mendota Canal to the San Luis Reservoir. At this point, the California Aqueduct continues south, through the San Luis Canal past Los Angeles, while the Delta-Mendota Canal continues southeastward into the San Joaquin Valley for a short distance. In the conveyance of water from the Delta region south, the SWP shares the use of several Federal Central Valley Project (CVP) facilities such as the Delta Cross Channel, the San Luis Reservoir, and the San Luis Canal.

The construction of the SWP began after a majority of Californians voted their approval of the project in 1960. This project will benefit southern Californians

Figure 3. Major Features of the State Water Project



Source: California State Resources Agency,
Department of Water Resources, "Delta
Water Facilities" Bulletin No. 76
(July, 1978) p. 23

who depend heavily on water supplies from the Colorado River but will have to limit this supply source in the future.

DEPENDENCE ON COLORADO RIVER SUPPLIES

As a result of the 1964 United States Supreme Court ruling in the case of Arizona v. California, California is having to reduce its dependence on the Colorado River as a source of water supply. Before the ruling, the Colorado River provided southern California 5.3 billion acre-feet (MAF) of water annually, or 80 percent of its water requirements. As a result of the ruling, California's share of Colorado River water will be reduced to 4.4 MAF as authorized projects in the States of the Lower Basin of the Colorado River watershed come on line. The principal project reducing southern California's water from the Colorado River is the Central Arizona Project (CAP).

Much of the present California water controversy is focused on the expectation that the deficit from reduced entitlements to Colorado River water will be replaced by water from the SWP or CVP. But recent environmental problems associated with the Sacramento/San Joaquin Delta may require that some of the supplies from the CVP and SWP be diverted for increased flushing water for the Delta. Federal laws such as the 1902 Reclamation Act and 1968 Wild and Scenic Rivers Act may also affect the distribution of California's water supplies.

FEDERAL INVOLVEMENT

The potential for Federal involvement in California's water allocation occurs because of Federal involvement in the construction of the Central Valley Project and the Federal mandate under the Wild and Scenic Rivers Act.

Central Valley Project

Before the CVP project authorization legislation, the 1902 Reclamation Act provided the basic authority for the Bureau of Reclamation (now the Water and Power Resources Service) to construct federally subsidized irrigation projects to aid family farmers in settling arid western lands. Section 8 of the 1902 Act provided that the construction activities of the Interior Secretary, through the Bureau of Reclamation, would not interfere with State law relating to the control, appropriation, use, or distribution of water used in irrigation. Yet this deference to State law may conflict with section 7 of the 1902 Act, 2/ which authorized the Secretary to condemn rights and property to carry out the purposes of the Act. Legislation enacted in 1937 that made the CVP a multipurpose project under the management of the Secretary of the Interior also contained similar authority expressly applicable to water rights. All of these provisions taken together probably mean that State law, such as county and watershed of origin doctrine, defines water rights for which compensation must be paid if those rights are "taken" for Federal purposes.

Wild and Scenic Rivers

The Wild and Scenic Rivers Act (P.L. 90-542) established procedures giving Federal protection to wild, scenic, and recreational river areas. Congress may designate a river section for protection, or, under certain conditions, the Secretary of the Interior can add a select State- or locally-administered river area to the National Wild and Scenic Rivers System, upon application of the Governor

2/ Ch. 1093, June 17, 1902, 32 Stat. 390.

of the State. In order for the rivers to be designated by the Secretary, the State must already have designated the rivers as part of the State wild and scenic rivers system. Federal involvement in the allocation of California's waters could occur if wild and scenic rivers--mostly in the northern part of the State--are designated under the national system, thereby limiting or preventing the construction of dams on these rivers or making them difficult to tap for irrigation projects or municipal and industrial use.

ENVIRONMENTAL WATER REQUIREMENTS

In the years before the environmental decade of the 1970s, water developers could generally meet increasing demand for additional water supplies by construction of more water storage and distribution projects. The environmental awareness of the 1970s changed many people's attitudes toward the continued construction of large-scale projects as the solution to increasing demand. Many groups concerned with the preservation of the pristine quality of watersheds and natural ecological systems, conservation and reuse of water as an alternative to more water projects, and improvement of the quality of life, viewed this continued construction of water projects as not only environmentally harmful, but also excessively costly. These groups--sometimes collectively labeled "environmentalists"--advocated such "non-structural" solutions as water conservation and demand reduction through pricing policy changes. Furthermore, they pointed out that California's water storage and distribution system was highly developed, and that the best sites already had dams. Projects such as the CVP, SWP, and the two Los Angeles Aqueducts, and the Colorado River Aqueduct, were sufficient infrastructure for the distribution of California's free-flowing rivers.

Nevertheless, growth in demand continues to outstrip available supply. Semi-arid southern California places increasing demands on Northern California water resources. Meanwhile, development in northern California continues, and surplus water supplies formerly sent to southern California are being used locally. Northern California increasingly invokes the authority of the county and watershed of origin protection measures.

Within this context, several key environmental issues have emerged. The most controversial are the Sacramento/San Joaquin Delta and the proposed peripheral Canal. Other environmental issues are the declining water levels of Mono Lake and the rivers of northern California.

The Delta

The Sacramento/San Joaquin Delta--once a marsh rich in wildlife resources and dependent upon tidal flows from San Francisco Bay--is now one of California's richest agricultural and recreational areas. The Delta is threatened, however, by withdrawals of water necessary for this development and for development upstream on the Sacramento River, especially when combined with pressure for more water from northern California for southern California. From their varying perspectives, developers and environmentalists alike agree that the Delta is in bad shape: developers, because they see increasing salt water intrusion threatening to deteriorate the quality of water necessary for certain desired uses such as agriculture; and environmentalists, because they see actual and potential damage to fish and wildlife populations.

The Delta is an important source of water for agricultural irrigation except when there is insufficient fresh water flowing into it to repulse salt water.

Insufficient fresh water flows, resulting from general upstream development on the Sacramento River, have caused a salt water wedge to intrude further and further into the Delta. Agricultural development in particular, which requires tremendous amounts of irrigation water, has compounded the salinity problems because of the increased salinity of the irrigation return flows. The result is that more and more water, further and further up-Delta, cannot be used for irrigation and other purposes because of increasing salinity.

Equally as important as salinity intrusion are the deleterious effects to the Delta ecosystem and San Francisco Bay into which the Delta feeds. Both of these areas are important breeding grounds and habitat for fish and wildlife. Upstream development has denied the Delta and San Francisco Bay some of the water originally flowing into them, thus changing salt and fresh water balances and affecting the estuary ecosystems. Environmentalists view further reductions in these flushing waters as extremely dangerous to these ecosystems.

Anadromous (spawning) fish are especially threatened by the heavy pumping of water from the fresh water portions of the Delta and Sacramento River. These fish, which rely on fresh water flow for their direction, are confused by the altered fresh water flow from pumping. As a result, they swim towards--and often through--the pumps. Those not killed in the pumps are swept down the aqueducts. These fish often end up in dense concentrations in such unlikely places as the San Luis Reservoir.

Peripheral Canal

The 43-mile-long Peripheral Canal would transport high quality water from the Sacramento River around the Delta to Federal and State pumping stations south of

the estuary for delivery to San Francisco Bay, the San Joaquin Valley, and southern California. The Canal could also release high quality water into the main channels of the Delta, thus providing flushing flows which could correct some of the existing salinity intrusion problems. While the Canal is potentially a mechanism for the provision of more water for the south as well as flushing water for the Delta, it cannot provide unlimited supplies for both purposes. A political compromise as to how much to allocate to each purpose is now developing.

Many environmentalists cautiously support the construction of the Peripheral Canal because it could provide more flushing water for the Delta and San Francisco Bay. They are concerned, however, that political pressure may build to send water to southern California at the expense of Delta protection, and this same political pressure may force the tapping of additional water supplies from northern California rivers. Southern California development interests are in favor of the Canal but hope that minimal amounts of water would be used for Delta water quality improvement. Delta development interests are in favor of the Canal but hope that larger amounts of water would be used for improving the water quality of the area.

Governor Brown authorized the construction of the Canal when he signed SB 200 on July 18, 1980. At that time, he requested then Interior Secretary Cecil Andrus to grant national designation to State-protected wild and scenic rivers in northern California. On January 19, 1981, Interior Secretary Andrus added portions of five California rivers to the National Wild and Scenic Rivers System. Included are portions of the American, Eel, Klamath, Smith, and Trinity Rivers, totaling 1235 river miles, or 31 percent of the 4006 river miles recommended by the Governor. Of the 1235 river miles included in the five California river designations, 195 are classified as wild, 88 as scenic, and 952 as recreational.

From the developmental standpoint, SB 200 is a good law because it potentially provides more water for developmental interests. From the environmental standpoint also, SB 200 is a good law because Delta water quality protection measures are now part of the constitution. Environmentalists are also largely content with the inclusion of sections of five northern California rivers in the National Wild and Scenic Rivers System, which will protect these river sections from the export of their water to other regions. Environmentalists, however, were still concerned that the California constitution could be amended to negate the Delta protection provisions. This position, put to a referendum vote, led to the passage of Proposition 8 in November 1980. Proposition 8 provided that the California legislature may not change the Delta protection provisions of SB 200 without approval by a majority vote of the electorate or by a two-thirds vote of the legislature. Any proposed changes on which the electorate or legislature may vote cannot reduce the protection of Delta fish and wildlife.

Mono Lake

Mono Lake is 45,000 acres of high-salinity water, which serves as one of the sources of water for southern California. In recent years, the water levels have declined drastically, increasing the salinity of the naturally high-salinity water. This naturally high salinity of the water excludes fish life but not algae, brine shrimp, and brine flies--all critical food supplies for large bird populations of gulls and grebes. The increasing salinity threatens to change the ecology of the area by eliminating the food source of the bird population. Declining water levels have created a land bridge to an important rookery, so that predators can easily decimate the bird populations. Residents of the Mono Basin are requesting the City of Los Angeles to limit its water withdrawals through the Owens-Mono Aqueduct.

Water development in California has reached a point where the construction of more water storage and distribution systems to tap water-rich areas for use in water-deficient areas may no longer be politically or economically feasible. The problem is enhanced by the required future cutback of southern California's use of Colorado River water, and attempts on the part of regions such as the Owens Valley and the Mono Basin to limit water supplies sent to southern California. These conditions may require State water development officials to evaluate the feasibility of water conservation, reclamation, and reuse as an alternative "non-structural" approach to solving California's water problems.

CONSERVATION

Conservation, reclamation, and reuse are alternative methods to developing more water supplies and extending available water supplies. The California Department of Water Resources has stated that potential exists to conserve about 3 million acre-feet of water by the year 2000. Over a third of this would come from residential water savings, through the installation of such equipment as water-saving commodes and showers. Increased agricultural water conservation would account for 1.2 million acre-feet and would result from improving conveyance and distribution systems, selecting crops with low requirements for water, and improving the efficiency of on-farm irrigation systems and practices. About 700,000 acre-feet could come from urban water savings, leak detection and repair programs, and increased commercial and governmental savings. 3/

Reclamation and reuse of waste water has great potential to extend California's water resources. The Tulare Basin now reclaims the largest percentage of

3/ California State Department of Water Resources, "Water Conservation in California." Bulletin No. 198, published May 1976, reprinted March 1977.

its waste water--over 70 percent--resulting in a saving of 65,000 acre-feet/per year. 4/ But water planners could develop far more waste water reclamation and reuse in the San Francisco Bay area, the metropolitan region between Los Angeles and San Diego, the San Joaquin Basin in the Central Valley, and the Central Coastal Basin from Monterey to Ventura.

There is some element of public health concern in the reclamation and reuse of waste waters, and this health concern is directly proportional to the degree of human contact with the water and the adequacy and reliability of the treatment processes. Generally speaking, reuse of treated waste water for non-contact purposes--such as irrigation of crops, parks, freeway landscaping, and golf courses; and industrial cooling and processing--is more acceptable from both the health and public acceptability standpoints than for human contact purposes such as recreational lakes and potable water. Public health officials are most concerned about biological agents in setting standards for reuse, since control of biological agents will control infectious disease, should human contact occur with the reclaimed waste water.

An important benefit resulting from water conservation, reclamation, and reuse is energy savings. Large amounts of energy are used to operate pumps to move water from place to place, to extract ground water, and to pressurize distribution systems.

4/ Laurence Hall, Reclamation for Local Water Agencies, in Community Water Management for the Drought and Beyond: a Handbook for Local Government, published May 1977, 2d printing July 1977, by the State of California, the Governor's Office of Emergency Services.

CONCLUSION

California's water demand is pressing the limits of available supply, and available supply may be exceeded when southern California is forced to cut back its use of Colorado River water. A strong environmental movement seeking to preserve many of northern California's remaining free-flowing rivers has successfully lobbied for their inclusion in the National Wild and Scenic Rivers System, thus preventing the use of these waters for transfer to water-deficient parts of the State such as southern California. Environmentalists also have attached important safeguards to the construction authorization for the Peripheral Canal which would insure adequate flushing water for the Delta.

Because of the strength of the environmental movement, the fact that water storage and distribution projects have already been constructed at many of the best sites, and the rapidly inflating costs of constructing similar projects, construction of "structural" projects may be more difficult politically and economically than in the past. With these conditions in mind, California water developers may take a harder look at "non-structural" approaches such as water conservation, reclamation, and reuse, as means of extending California's water supplies to meet increasing demands.

