

## WATER RESOURCE DEVELOPMENT AND USE

John R. Teerink  
Department of Water Resources  
The Resources Agency  
Sacramento, California

California is making bold plans to provide the water supplies which will meet her needs in the decades beyond 1990. We are doing the long-range planning which will ensure that future generations of Californians will be free of drought worries.

Planning to meet California's water needs for agriculture, municipal, industrial and domestic use is interrelated with planning for recreation and fish and wildlife uses. Since other panel members will discuss fish and wildlife resource development, I will not discuss in detail our many activities in these areas, but instead will emphasize water development for the other purposes.

Some may ask: Why is it necessary to plan now for something that is 25 years away?

The answer is found in the time that it takes to get from the initial conception of a large and complex water project to the time when water flows from the kitchen faucet or rushes through a farmer's headgate.

For instance, Oroville Dam and Reservoir, keystone of the State Water Project, was authorized by the Legislature in 1951. Initial deliveries of water from the Feather River to Southern California, will be in 1971, twenty years later.

The factors which must be considered in California's future water projects will be no less complex than those factors affecting water development today. It is apparent that decisions will have to be made in the early 1970s in order that water deliveries after 1990 can keep pace with growing needs. Alternatives which must be considered are the conventional devel-

opment of surface water, desalination of brackish or ocean water, reclamation of waste water, and the possibilities of regional transfers of water. It is therefore essential that we do the planning now upon which these decisions will be based.

Given the need for long-range water planning, what specifically is California doing about it? The Department of Water Resources is the state agency which has been charged with the authority and responsibility to plan for the State's future water needs. It is the only water agency, state or federal, whose responsibility is statewide in scope.

The Department is meeting this unique charge through its Coordinated Statewide Planning Program. The magnitude of this planning effort is indicated by the program's present annual budget of approximately \$1,000,000.

Those working full time on this program include civil engineers, economists, hydrologists, land and water use analysts, recreation planners, fish and wildlife biologists and a population statistician.

In March of 1966, the Department published the first of a series of reports which will be produced by this program. It is entitled "Bulletin No. 160-66, 'Implementation of the California Water Plan'."

This report gives Californians, for the first time, a look into the water development picture including the period after 1990. It presents projections of the State's future economic growth and associated water development needs and outlines the way in which these needs could be met.

Late this year we plan to publish Bulletin No. 160-68, the second of the series of reports presenting progress we have made under our Coordinated Statewide Planning Program. The report will present information on the alternative courses of action available to meet California's future water needs.

The basis of increasing water requirements is the State's unrelenting population growth. More people require more water to drink and cook with, to bathe and swim in, to produce manufactured goods and to irrigate large acreages of crops. Of growing importance with a growing population will be the needs for recreation, fish and wildlife enhancement and water quality control. There will continue to be a need for flood control. Through proper multiple-purpose planning, these needs will be fully satisfied.

The State's present population is approximately 20 million. The Department estimates that it will grow to 35 million in 1990 and 54 million in 2020.

Accompanying this growth will be the development of about 3.9 million more

acres of urban land and over 2.7 million acres net, new irrigated land.

Our statisticians have determined that for every resident in California, almost 200 gallons of water are required for domestic and industrial use every day, and some 1,300 gallons per day for agricultural uses. Roughly speaking, this means that under present conditions, almost 27 billion gallons of water are used every day. Over the next 20 years, if California is to continue its present rate of development and retain its leading role in food production, its developed water supply must be increased by about one-quarter million acre-feet per year.

Between 1960 and 2020, the State's annual water requirements for agricultural purposes are expected to increase about 25 percent to almost 36 million acre-feet; annual water requirements for urban purposes are expected to more than quadruple to over 14 million acre-feet; and total annual water requirements are expected to rise nearly 60 percent to about 50 million acre-feet. Urban water use, now about 10 percent of the total usage, is expected to reach 28 percent in 2020.

This constantly increasing need for water, and more water has created increasingly difficult and costly problems of distribution. Stated another way, we actually have an abundance of water in California, but almost all of it is in one corner of the State. Specifically, the North Coastal area, together with the Sacramento Valley, produces more than 70 percent of our normal annual runoff, whereas almost 77 percent of the demand for water occurs in the central and southern parts of the State.

Agriculture will have to contend increasingly with urban development which will force shifts in productive areas. In general, it is expected that there will be a continued decline in citrus production in south coastal urban areas but increase in Riverside County and especially in Kern and Tulare Counties. Fruit, nut, grape and berry acreages will diminish in Southern California but greatly expand in the Central Valley. Field crop acreages will increase in all the major hydrographic units of the State except the South Coastal and San Francisco Bay areas. Acreages in truck crops reveal greater variations than any other categories. The North Coastal, Central Coastal, South Coastal and Sacramento River Basin areas show steady increases after 1965 and the San Francisco Bay area shows increases after 1975. In other sectors of the State both increases and decreases occur.

Now I would like to briefly mention the major water development projects which are being planned or constructed by the Department of Water Resources, Bureau of Reclamation and Corps of Engineers.

The Department of Water Resources is delivering water from the South Bay Aqueduct. Construction of Del Valle Reservoir is proceeding.

The Department of Water Resources has recently completed the construction of Oroville Dam on the Feather River. The gates were closed in late 1967. The pool of water in the reservoir is now slowly rising.

San Luis Dam and San Luis Canal, both joint federal-state facilities, are nearing completion. The Department and the Bureau of Reclamation began deliveries to agricultural users in the San Joaquin Valley early this year.

We plan to complete the construction of the California Aqueduct through the San Joaquin Valley to Southern California to meet our contract delivery commitments to our water contractors. The scheduled delivery dates are 1971 on the West Branch and 1972 on the East Branch, both in Southern California.

We are working closely with the Bureau of Reclamation on the planning of the proposed Peripheral Canal in the Sacramento-San Joaquin Delta, to convey water from the Sacramento River to our Delta Pumping Plant where it will be lifted into the California Aqueduct. It is proposed that the Peripheral Canal be constructed as a joint federal-state facility. We hope to receive federal authorization within the next few years in order that the Peripheral Canal can be completed by 1976.

The construction activities of the Bureau of Reclamation are concentrated on the Tehama-Colusa Canal and the San Luis Project including the San Luis Drain. The Tehama-Colusa Canal will bring water from Red Bluff along the west side of the Sacramento Valley to Yolo County. The San Luis Drain will convey drainage water from the vicinity of Kettleman City along the west side of the San Joaquin Valley to the Delta.

The Bureau of Reclamation is engaged in active design and preconstruction activities for Auburn Reservoir on the American River and the Folsom South Canal. The Folsom South Canal will serve portions of Sacramento and San Joaquin counties.

The San Felipe Division of the Central Valley Project recently has been authorized. It will tap the San Luis Reservoir through a tunnel under Pacheco Pass, and convey water to Santa Clara, Santa Cruz, San Benito, and Monterey counties. It is now awaiting its first appropriation.

The Bureau of Reclamation is actively planning the Nashville Reservoir on the Cosumnes River, the East Side Canal, the West Sacramento Valley

Canal, Kellogg Reservoir, and the Paskenta-Newville Reservoir. The Nashville Reservoir will serve areas in Sacramento, El Dorado and San Joaquin counties. The initial phase East Side Canal will deliver an additional million and one-half acre-feet of water to the east side of the San Joaquin Valley. Kellogg Reservoir will make available high quality water in Contra Costa County. Paskenta-Newville Reservoir is a large multi-purpose development on Thomas and the North Fork Stony Creeks, in the upper Sacramento Valley. The West Sacramento Valley Canal is an extension of the Tehama-Colusa Canal which will provide service to the North Bay Area.

The Corps of Engineers is now constructing or proceeding with advanced planning on the Warm Springs Reservoir in the Russian River Basin, the New Melones Reservoir on the Stanislaus River, and the Mojave Reservoir in San Bernardino County. The Corps of Engineers is participating as a partner in the New Don Pedro Reservoir on the Tuolumne River and the New Bullards Bar Reservoir on the Yuba River.

Marysville Reservoir on the Yuba River and Knights Valley Reservoir on the Russian River have been authorized. Additionally, the Corps of Engineers is actively planning two large flood control reservoirs on Cottonwood Creek in the upper Sacramento Valley.

All of these reservoirs are located in the Sacramento or San Joaquin River basins except Warm Springs and Knights Valley Reservoirs which are located in the Russian River Basin in the North Bay area.

There are a few remaining storage sites in the Sacramento and San Joaquin River basins, which will be used to develop new water yield for the State Water Project and the Central Valley Project. The amounts of water which will be developed are relatively small in relation to future water needs. Most of California's undeveloped water resources are in the North Coastal streams.

Planning for the development of the water resources of California's North Coast must of necessity be a cooperative local, state and federal effort. The problem is large and the solutions will be varied; all will be expensive. The development of this water is needed to meet growing water demands in other parts of the State, as well as to control the devastating floods of the North Coastal area and to provide local water supplies and recreation development.

Water developed in the North Coast will be conveyed to water deficient areas of the State, primarily through physical integration with the Central Valley Project and the State Water Project.

The Department's recent North Coastal area investigation laid the ground work for orderly staged development of the North Coastal streams.

Other projects moving toward development are Butler Valley, English Ridge, and Dos Rios.

The Corps of Engineers is planning the Butler Valley Project on the Mad River in Humboldt County. It will serve critical needs for flood control, water supply, and recreation.

The Bureau of Reclamation is pushing ahead with its proposed English Ridge Project on the Upper Eel River. It will provide water for Clear Lake, Upper Putah Creek, Cache Creek, and the Sacramento-San Joaquin Delta.

The Department and the Corps of Engineers have signed a memorandum of understanding on the Dos Rios Project on the Middle Fork Eel River. It is proposed that the Corps of Engineers will construct Dos Rios Dam. The Department will construct the tunnel to convey the water to the Sacramento Valley. This development has been selected as the first additional facility of the State Water Project. It will supply about one million acre-feet of yield when coordinated with the State Water Project.

Planning is continuing on additional projects in the Trinity, Mad, and Van Duzen River basins.

The focal point for California's water development will always be in the Sacramento-San Joaquin Delta. Surplus water developed in the North Coastal area will be tunneled through the Coast Range Mountains into the Sacramento River Basin, where it will flow by gravity to the Delta. The water will then be pumped from the Delta for conveyance to areas of use.

Studies are being made today to determine the best means of conveying the future water supplies from the Delta to the service areas.

Today's Californians are continuing and keeping alive a century-old tradition of water development planning.

More than any other state, we have taken steps to provide wise management of our water resources.

By planning today we can be assured that our children and grandchildren will enjoy abundant water supplies as we have.