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Law of the River

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Editor: William Burke

Law of the River

When young Carl Hayden went to Washington in 1912 to represent the even younger State of Arizona, the scattered residents of the Pacific Southwest were concerned mainly with the task of finding adequate water supplies for their 20th-century needs. When the 91-year-old Senator Hayden stood in the White House in September 1968 to witness the signing of the Colorado River Basin Project Act, the millions of residents of this fastest-growing section of the country were faced with the even more awesome task of meeting the water deficits of the 21st century. But the new law, whose passage climaxes a half-century of feuding over the scarce water resources of the Southwest, represents a big step forward in meeting the major needs of forthcoming decades.

The "law of the river"—the 1968 legislation along with the body of statutes, compacts, treaties, and court rulings which have accumulated over the years—highlights the overriding influence which the Western desert exerts throughout this crucial section of the nation. In the words of one of the West's leading historians, Walter Prescott Webb, the desert is the West's "one unifying force—it permeates the plains, climbs to all but the highest mountain peaks, dwells continuously in the valleys, and plunges down the Pacific slope to argue with the sea." (*Harper's*, May 1957)

Yet, beginning in the 1880's, Westerners attacked the desert with the help of the tools of modern science, and again in Webb's words: "The Government enlisted on the side of The People vs. The Desert" by building dams and blocking the rivers to create tiny islands in the sea of aridity. In the meantime, well-diggers continuously probed the

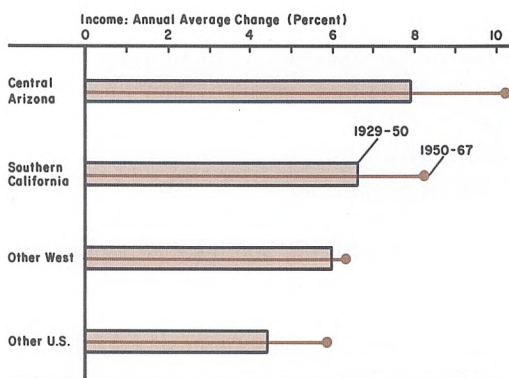
earth to discover every possible deposit of underground water, and when they were successful, installed pumps to bring up water for homes and irrigated plots. "And every source of water—whether from river, lake, or well—was declared to be 'everlasting'."

Regardless of the source of water, its major effect was to create a series of fertile oases. In and around each oasis, people came to build towns and cities, establish industries, and open irrigated farms. Thus the Southwest today is virtually an oasis civilization—and Los Angeles is the world's greatest oasis of all time.

Prosperous oases

Precipitation data form a pattern which matches nearly all the yardsticks which we use to measure the assets of civilization. Obviously the pattern of precipitation is relatively low in the center of the desert region and relatively high along its rim. And the same is true, according to Webb, "of people,

Incomes—and everything else—grow much faster in the Pacific Southwest



bank deposits, factories, cities, horses, mules, cattle, and all farm crops."

The precipitation figures are instructive. Annual rainfall averages about 7 inches in Phoenix and 14 inches in Los Angeles, in contrast to 42 inches in New York and 60 inches in Miami. Still, precipitation isn't everything; after all, it was New York, not Los Angeles, which had to prohibit the washing of cars and the watering of lawns several dry summers ago.

But the Pacific Southwest has practically turned Webb's thesis upside down, for this is a major part — indeed, the fastest-growing part — of the nation. In 1967 personal income totaled \$40 billion in Southern California (six metropolitan counties) and about \$3½ billion in Central Arizona (Phoenix-Tucson). These areas alone thus accounted for 7 percent of the total national economy.

More important, these areas have far outpaced the rest of the nation for many decades. Between 1929 and 1950, personal income grew at a 7.9-percent annual average rate in Central Arizona and at a 6.6-percent rate in Southern California, in contrast to growth rates of 6.0 percent in the rest of the West and 4.4 percent in the rest of the nation. Then, in the 1950-67 period, these fast-growing areas increased their margin even more. Average annual growth rates during this most recent period were 10.3 percent for Central Arizona, 8.3 percent for Southern California, 6.4 percent for the rest of the West, and 6.0 percent for the eastern two-thirds of the nation. Southern Nevada, although of course smaller than the other Southwest areas, has grown even more phenomenally.

Precious resource

If this pattern of rapid economic growth continues, the Pacific Southwest's population can easily increase from 13 to 30 million between now and the year 2000, and this burgeoning population will of course exert heavy demands on water and other resources. Even

today, it takes 70,000 gallons of water to produce a single ton of steel, and 500,000 gallons to irrigate a single acre of Southwest farmland.

The water resources that are located completely within the region are already inadequate to sustain present development, so that purely regional supplies cannot, under any circumstances, be expected to sustain future growth. For example, ground-water supplies in the Southwest have been overdrafted at an alarming rate over the years. Thus, unless additional water supplies from outside the region become available, the economy of the Pacific Southwest could face severe strains.

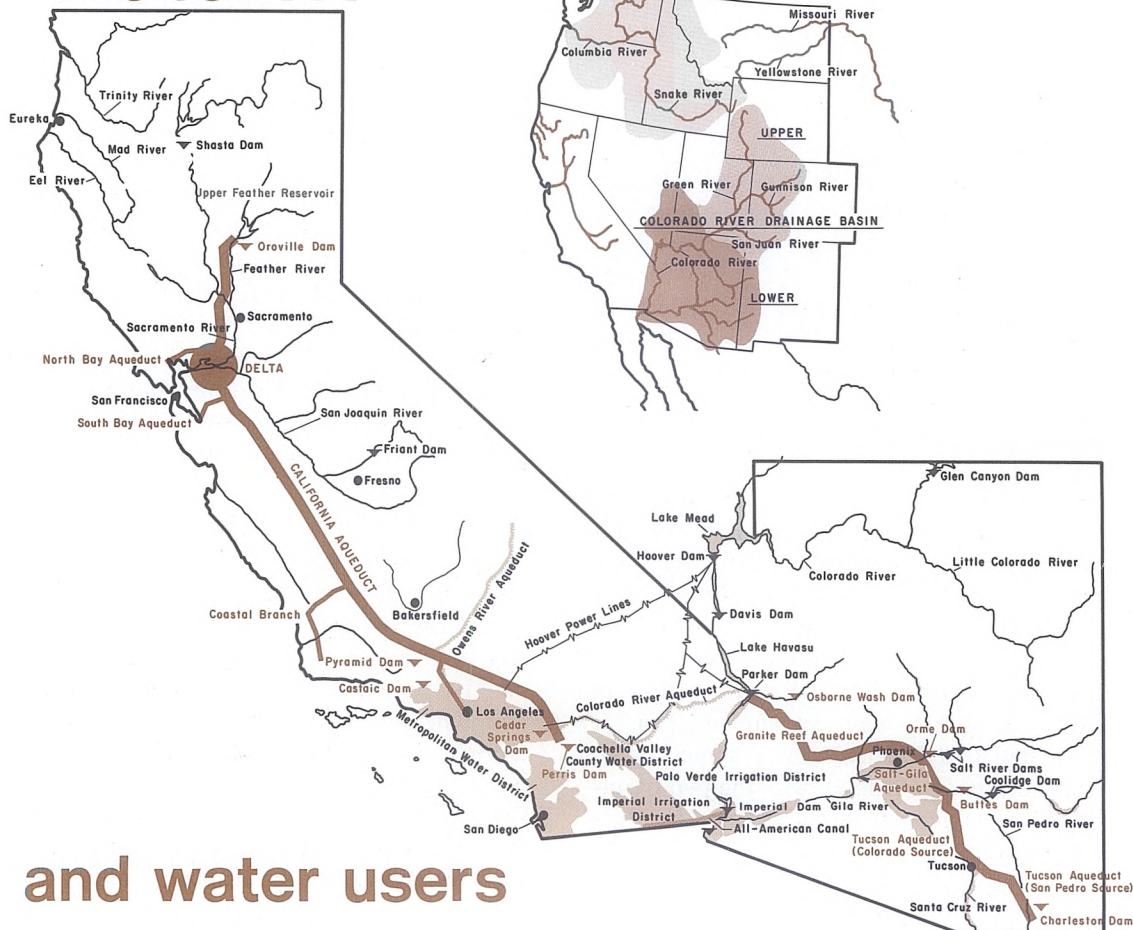
Most planners project regional water needs at about 23 million acre-feet annually by the year 2000—roughly 7 million more than are now utilized every year. (It takes 325,850 gallons to cover one acre of land to a depth of one foot.) By the year 2000, perhaps 3 million extra acre-feet can be supplied by the rivers of Northern California and other regional sources. Still, that would leave the Pacific Southwest with an annual water deficit of over 3½ million acre-feet.

The Colorado . . .

The Colorado River Basin Project Act is designed to advance the Colorado's already significant contribution to the solution of regional water deficits. The new law concerns the harnessing of a river which flows 1,400 miles from the Rocky Mountains of Colorado to the Gulf of California in Mexico, draining seven states along the way. The river with its tributaries drains 242,000 square miles, or roughly one-twelfth of the entire U.S. land area outside Alaska. Since the Colorado Basin is at the heart of the Western desert, the controlled use of the entire river system is essential to provide a basis of growth for the Pacific Southwest.

Water management, specifically irrigation, is not at all new to this area. The Hohokam Indians operated irrigation canals in the

Water...



and water users

Phoenix area 2,000 years ago, and the pale-faces followed their example by developing irrigation works in Utah in the 19th century and in California and Arizona in the early 20th century. But water management is necessary not only to bring water to the crops and cities but also to control the frequently erratic and destructive flow of the Colorado; in the winter of 1905-06, the river broke through its channel four miles below the Mexican border and for sixteen months poured its full flow into California's Imperial Valley, destroying much property and inundating 30,000 acres of arable land.

By 1920, the need for a regional (or even national) solution to the problems of the Colorado was painfully evident. At that point, private irrigation works were so extensive as to utilize the entire unregulated (low-water) flow of the river. Further development would have required vast expenditures beyond the reach of private firms at that time, especially in view of the difficulties created by the limited and erratic nature of river flows and the region's vast distances and mountainous topography. Consequently, the Federal Government initiated studies looking towards the construction of Hoover Dam (which some

recalcitrant Democrats still call Boulder Dam) and the states of the region hammered out the Colorado River Compact of 1922.

... and the Compact

The Compact contained a formula for the distribution of Colorado River waters between the three Lower Basin states—California, Arizona and Nevada—and the four Upper Basin states — Utah, Colorado, New Mexico and Wyoming. (The boundary between the two basins was set at Lee Ferry in north-central Arizona—the point of division between the “upper” and “lower” tributaries of the river.) This inter-state agreement apportioned in perpetuity 7.5 million acre-feet a year to each basin for its “beneficial consumptive use,” in an attempt to insure the fast-growing Lower Basin states the supplies that they needed immediately and at the same time guarantee the slower-growing Upper Basin states the supplies that they could expect to need in later decades. The Compact also authorized the Lower Basin to utilize an extra 1.0 million acre-feet annually, and it stipulated that Mexico’s share should come from surplus water flows, with the two basins together making up any deficiency in Mexican supplies.

The Compact, however, could not settle the disputes among the Lower Basin states regarding their respective allocations of Colorado River water; Arizona, in fact, refused for two decades to ratify the Compact because of its lack of iron-tight guarantees of access to water. But the Boulder Canyon Project Act of 1928 permitted the Compact to go into effect without Arizona’s signature, provided that all six of the other Basin states signed the agreement. At the same time, that statute required California to accept a 4.4 million acre-feet quota out of the Lower Basin’s total allocation of 7.5 million acre-feet, with 2.8 million going to Arizona and 0.3 million to Nevada—and stipulated that California and Arizona would divide equally

any surplus unapportioned by the Compact. Yet Arizona still remained recalcitrant.

Meanwhile, Mexico provided another problem. Throughout the 1930’s and 1940’s, more than 8 million acre-feet of water spilled unused across the international boundary every year, and Mexico wanted to establish rights to some of this water by treaty before it should become unavailable. When agreement was reached in 1944, Mexico was guaranteed 1.5 million acre-feet delivered at the boundary every year. The treaty promised delivery of up to 1.7 million acre-feet annually during times of surplus, but provided for a reduction in Mexico’s allocation in proportion to the U.S. reduction during times of severe drought.

Dambuilders' achievement

Development of the river could not proceed without the construction of the facilities called for by the Boulder Canyon Project Act, and while California’s lawyers talked of “III-B Water,” “Self-Limitation Acts,” and other esoteric matters, Arizona’s Governor called out the National Guard at one point to block dam construction along the river. But eventually the dam builders went to work, and constructed some of the most spectacular engineering achievements of the century.

Above all, there was the massive Hoover Dam (1936), built in Black Canyon, 330 miles above the Mexican border, with a reservoir storage capacity of 27.2 million acre-feet. Then there was Parker Dam (1938), which from its location 155 miles below Hoover Dam provides a diversion point for the Colorado River aqueduct serving Southern California. There was also Davis Dam (1950), which from its location halfway between Hoover and Parker Dams regulates Hoover Dam water to conform to the downstream requirements of California and Mexico. Within California, major installations included the 242-mile Colorado River aque-

duct, which serves the household and industrial needs of metropolitan Southern California, and the All-American Canal, an 80-mile man-made river which brings life-giving waters to the Imperial and Coachella Valleys.

Arizona and the Court

But in contrast to these impressive engineering achievements, the legal scene remained entangled as the decades passed. Indeed, the political negotiations throughout all of this period were just about as tumultuous as a trip down the Colorado on a raft.

Legislation was introduced early in the postwar period to obtain guaranteed water supplies for the fast-growing Central Arizona area, but this proposed Central Arizona Project ran afoul of the perennial debate over California's Colorado River allocation. (Although California's basic allotment under the 1928 agreement was 4.4 million acre-feet, it was actually geared up to use 5.4 million acre-feet annually, as a consequence of contracts negotiated with the then-Secretary of the Interior, incidentally a Californian.) Arizona in 1952 thereupon instituted action in the Supreme Court to obtain a final adjudication of Lower Basin water allocations. A court-appointed special master ruled on this matter in 1960, and the Court itself handed down its final ruling in 1963.

In that decision the Supreme Court im-

plicitly rejected California's "first come, first served" doctrine—the doctrine that a person using water resources has established a prior right to its use. The Court ruled that the annual allocation of Colorado River water (in acre-feet) should be 4.4 million to California, 2.8 million to Arizona, and 0.3 million to Nevada, under normal-flow conditions. The Court also ruled that California could draw water only from the main stream, which meant that Arizona obtained sole use of the water from the Gila River, an important Colorado tributary.

Even so, the Court left unanswered a vital question: How to apportion Colorado River water when a normal flow is not available. It left this decision to the discretion of the Secretary of the Interior, and Arizona thus was still left without a guaranteed supply for its proposed Central Arizona Project.

The new plan . . .

Several months after the Court handed down this ruling, Interior Secretary Udall announced a new water plan which was designed to bring together all the elements necessary for a long-term solution of the problem. According to this Pacific Southwest Water Plan, the region's total developed water supply amounted to 16.4 million acre-feet annually, as against future requirements (year 2000) of 23.4 million acre-feet. The

Ultimate Sovereign

In an arid environment, men will fight for water with a truly implacable bitterness, a bitterness beyond reason and entreaty. For if there is not enough water to meet all needs, there is really no basis for compromise: there is nothing to negotiate. Water controversies, therefore, present the ultimate in the way of irreconcilable points of view. On the other hand, nothing will weld disparate elements into a more cohesive force than a common concern over water. If men will fight over water, they will also cooperate to conserve it and the history of water controversies is that, in the long run, the rule of cooperation prevails. In an arid environment, water is the ultimate sovereign.

Carey McWilliams—*California: The Great Exception*

deficit possibly could be overcome from such sources as Northern California rivers, return flows from treated urban sources, and evaporation-and-seepage control. But the plan was even more specific on immediate requirements.

The Pacific Southwest Water Plan provided a springboard for the debates which finally culminated in the 1968 legislation. The major elements of the Udall plan included the construction of the Bridge Canyon and Marble Canyon Dams along the main stream of the Colorado River, the development of the Central Arizona Project for serving Phoenix and Tucson, the construction of an enlarged aqueduct delivering Northern California water southward, and the eventual construction of a large desalinization plant along the California seacoast. The plan also envisioned the provision of 90,000 acre-feet of irrigation water to southern Nevada and 60,000 acre-feet of irrigation water to southern Utah (the Dixie project), construction of the Hooker Dam in New Mexico, and various Indian irrigation projects. Financing of the plan would come from a special development fund, with income deriving from water and power sales of these new projects and from revenues of the Hoover and Parker Dams at termination of their 50-year pay-out periods.

... and the issues

The debates generated by the Udall plan helped to set forth, with striking clarity, the conflicting viewpoints over the region's long-range water needs. Arizona wanted a guaranteed supply of water for its farms and cities. Southern California wanted continued access to more water than it was guaranteed under the agreements of the 1920's. The Upper Basin states wanted guaranteed access to the water which they would need for future development but were not yet using. Meanwhile, the Pacific Northwest states with their ample water supplies wanted to keep the thirsty Southwest from turning to the Colum-

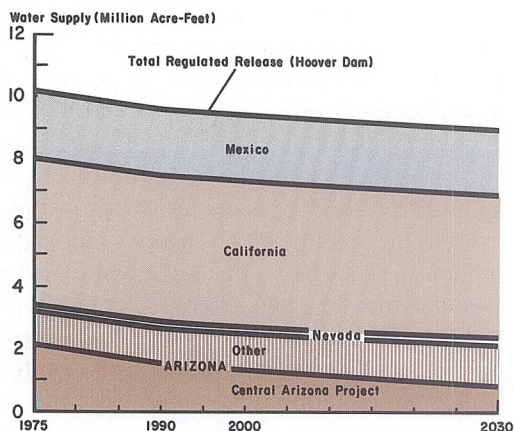
bia and Snake Rivers when the Colorado supply became fully utilized. Then, too, conservationists wanted to maintain intact the original glories of the Colorado River and thus were adamantly opposed to the construction of the proposed dams. (In its nationwide advertising, the Sierra Club asked, "Should we flood the Sistine Chapel, so tourists can get nearer the ceiling?")

When these conflicting viewpoints were finally resolved, the \$1.3-billion Colorado River Basin Project Act became a reality. This act authorized the long-sought Central Arizona Project — an \$831-million project designed to bring water to the Phoenix-Tucson areas — along with several projects intended to serve the other regional interests involved.

California, under the act, obtained a reduction in Central Arizona diversions when necessary in order to provide California with a guaranteed 4.4-million acre-feet of Colorado River water. The Upper Basin states obtained five reclamation projects in Colorado and increased appropriations for Utah's Dixie project. The Pacific Northwest obtained a ban against the study of trans-basin diversion plans for a ten-year period, although the National Water Commission set up under the act will study all other means of meeting regional needs. Conservationists meanwhile obtained assurance from the Federal Government that Central Arizona power installations would be developed through privately financed thermal-generation plants rather than through dams that would flood portions of the Grand Canyon.

President Johnson drew the curtain on a half-century of controversy in his comments at the September 30 bill-signing ceremony: "I have a feeling of freedom this morning when I see California and Arizona sitting there arm-in-arm smiling with each other. (*Laughter*) Isaiah must be proud to finally recognize that they have come to reason together."

Arizona's share of Colorado water will decline in the 21st century



Central Arizona

The centerpiece of the new legislation is the project designed to bring fast-growing Central Arizona the water which it needs to maintain its spectacular rate of growth. This area contains 1.0 million acres of farmland, along with 25 cities and towns, and their water requirements total 4.5 million acre-feet annually, or twice what is locally available on a sustained basis.

Central Arizona is a major producer of specialty agricultural products — winter lettuce, vegetables, citrus, dates, melons — all of which are heavily dependent on irrigation. This irrigation-dependent agricultural economy should move over time in the direction of a strongly diversified industrial economy, and this transition may well ease the problem of growth, since 25 people in an industrial environment require no more water than does one acre of irrigated farmland. Central Arizona Project water is not designed to bring new lands under irrigation, but rather to supplement existing water sources. Yet, the construction of this project should permit a gradual transition towards municipal and industrial uses which will support a larger, more diversified population.

Arizona's past growth has been based upon the mining of the ground-water accumulated in underground basins over millions of years. Water has been pumped out much faster than it has been recharged naturally; the average depth of the water table dropped from 70 feet in 1940 to 200 feet in 1964, and may drop further to 300 feet by 1975. Moreover, not all the underground volume is available, since the poor-quality water found at lower depths requires dilution at heavy pumping costs if it is to be used at all. Altogether, depletion of this largely non-replenishable resource amounts to about 2.5 million acre-feet a year.

Central Arizona Project facilities will coordinate Colorado River and Gila Basin water resources for both the Phoenix-Tucson centers and the agricultural areas now dependent on severely overdrafted ground-water basins. Secondary purposes include flood control, soil and wildlife conservation, sediment reduction, salinity control, and power generation.

The major project facilities—Granite Reef, Salt Gila, and Tucson aqueducts—are designed to convey pumped Colorado River water 450 miles to the Phoenix-Tucson areas. (Central Arizona, unlike the Imperial Valley, lies uphill from the Colorado River, so that development of this area involves substantial pumping costs.) Other major facilities include Orme Dam (Phoenix) and three other dams, as well as power generation and transmission lines. By function, the project will cost \$358 million for irrigation purposes, \$216 million for municipal and industrial uses, \$95 million for power generation and transmission, and \$42 million for water salvage and recovery.

Southern California

The new law's provision for a guaranteed water supply is an essential element, but yet only one of several crucial elements, in meeting Southern California's rapidly growing water needs. The requirements are greatest

in Los Angeles—the nation's second-largest metropolitan area—and in the very productive but very thirsty oases of the Imperial and Coachella Valleys.

Los Angeles, which requires close to 500 million gallons of water every single day, gets about two-thirds of its supply from the Owens River Valley on the east slope of the Sierra, 250 miles to the north. (To the surprise of Owens Valley residents, Los Angeles agents a generation ago bought up water rights throughout the valley and let the land revert to desert; to nobody's surprise, the local residents thereupon dynamited the Angelenos' waterworks.) Another one-fifth of Los Angeles' supply comes from local wells, and roughly one-sixth from the Colorado River 250 miles to the east. The Colorado supply is transmitted through the major aqueduct which taps the Colorado River at Parker Dam and is then distributed by the six-county Metropolitan Water District.

Nonetheless, the municipal needs of Los Angeles and other cities, as well as the irrigation needs of the Imperial and Coachella Valleys, led Southern California a decade ago to spearhead the drive for a California Water Plan. The region's requirements became even more obvious when California, which was already using more than its Colorado River allotment, was faced with the possibility of a substantial cutback in that allotment under terms of the 1963 Supreme Court decision. Thus a note of urgency was injected into the development of the state-wide project.

North to South

The \$2.5-billion California Water Plan is designed to transport water 740 miles from far Northern California, which accounts for 70 percent of the state's precipitation, to Central and Southern California, which account for 77 percent of the state's total water usage of roughly 25 million acre-feet a year. When completed in the 1970's, the project will harness the state's largest untamed

stream, the Feather River, a tributary of the Sacramento. It will impound 3.5 million acre-feet of water behind 770-foot-tall Oroville Dam, the largest earth-filled dam in the world. It will transmit water into the Sacramento and Delta areas and therefrom by aqueduct to Southern California and the San Joaquin Valley.

Acceptance of this mammoth project was spurred by 1955's disastrous floods—which caused the deaths of 65 people and \$200 million in damages in the Sacramento Valley—and by the expected loss of Colorado River water under the Supreme Court decision. But other factors were involved as well. Central Valley agricultural communities were threatening to outgrow even the massive facilities developed under the Central Valley Project of the 1930's, centering around the Shasta and Friant Dams and a 350-mile network of canals. But in particular, the rapid growth of the Southern California economy seemed destined to require ever-larger supplies of water beyond those already available within that region.

Upon completion, the California Water Plan will include 20 dams, 24 pumping plants, 8 power plants, and 691 miles of aqueduct and canals. (The largest pumping system ever designed will pump Northern California water across the Tehachapi Mountains to Southern California.) The water developed under this plan—4.2 million acre-feet annually—should reach the San Joaquin area in 1968, Los Angeles in 1971, and San Bernardino-Riverside in 1972. Financing costs originally were scheduled to be covered by the \$1.75-billion bond issue authorized by California's voters in 1960, but project costs are now estimated at \$2.5 billion and are still rising.

Sources: the Colorado

Since the Pacific Southwest's ongoing projects ensure its water supplies only until about 1990, regional planners must look ahead to

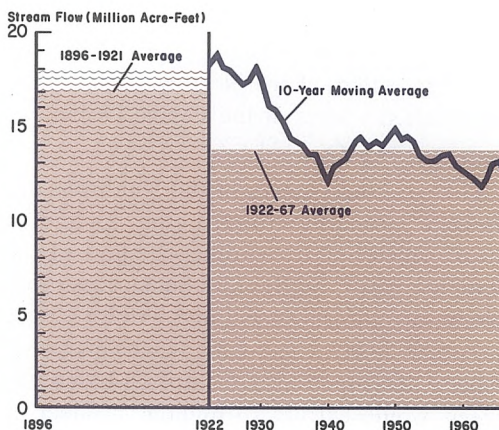
the water sources of the next century—which include not only the river of the Southwest but also the many rivers of other areas and perhaps even the Pacific Ocean. Attention initially should center on the much-disputed Colorado, a river which has generated more acre-feet of legal documents than of water over the years.

A half-century's wrangling over the law of the river results from the fact that the supply of Colorado River water is severely limited in relation to other resources of the region, and especially in relation to the continuous expansion of demand on the part of the rapidly growing Southwest. The imbalance is traceable to a national population which is ever growing—and ever shifting southwestward—and to the increasing water needs of families with higher living standards and farms and factories with more complex production processes.

On the supply side, water planners are concerned because the river's recent flow has fallen considerably short of the amount apportioned by the negotiators of the Colorado River Compact back in 1922. At least several Congressional studies have pointed to a consistent downtrend in the river's flow and to the absence of the heavy flows which characterized the period of a half-century ago.

The Colorado basin's yield is measured by the "virgin" or "estimated undepleted" flow at Lee Ferry (Arizona), which marks the boundary between the Upper and Lower Basins. The negotiators of the 1922 Compact assumed, on the basis of average flows since 1896, that 16.8 million acre-feet would be available for apportionment between the Upper and Lower Basin states and exportation to Mexico. Yet the average virgin flow during the 1922-67 period has measured out to only 13.7 million acre-feet, and the flow over the last decade has averaged only 12.1 million acre-feet. Moreover, annual flows have varied widely since 1896 between 5.6 million and 24.0 million acre-feet.

Colorado's average flow drops over the past half-century



According to the House Interior and Insular Affairs Committee, the Lower Basin faces a serious water deficiency, and even the Upper Basin faces the prospect of eventual depletion of its now-abundant supplies. Increased demands on the part of the Lower Colorado states can now be met in part from the still-unused supplies which the Compact apportioned to the Upper Basin states. Yet, as those states develop, they will use more and more of their apportionment and ultimately none of their surplus water will be available for the use of the Lower Basin.

The 1.2 million acre-feet scheduled for allocation to the Central Arizona Project should continue to be available until about 1995. (But even that amount makes up for only about half of the area's present overdraft on its water supplies.) Thereafter, Arizona's supply will diminish as the guaranteed claims of California and the Upper Basin states take precedence.

Consequently, in the House Committee's view, all possible means of increasing the Pacific Southwest's supplies must be investigated as the 21st century approaches, since the Colorado River by itself cannot meet the future requirements of all the areas depend-

ent on it, either by the standards of the Compact apportionment or by the terms of the Mexican treaty. The Committee in 1968, like Secretary Udall five years ago, concluded that future demands could be met from the sparkling waters of the Northwest as well as the desalted waters of the Pacific Ocean.

Sources: the Columbia

The covetous glances of the Southwest are directed primarily toward the Columbia River, which boasts ten times the flow of the Colorado River, but Idaho's Snake River and Northern California's Eel and Trinity Rivers are other likely candidates. One suggested project, developed by a California-based engineer, would extract 13 million acre-feet of Columbia River water at The Dalles Dam, lift it 5,000 feet over the mountains and thence transport it 1,200 miles by aqueduct to Hoover Dam. The \$11-billion plan would double the water supplies of the Pacific Southwest—and would undoubtedly cause apoplexy among Northwestern legislators.

The thirsty Southwest's search for water helped to push through Congress this year's compromise legislation, whereby California agreed to support the Central Arizona Project and Arizona agreed to support California's demand for a guaranteed supply of

Colorado River water. The search has also contributed to an increasingly forthright stand on the part of many Southwest legislators. Writing in the *San Diego Law Review* (1967), California's Senator Kuchel argued:

"As an increasingly thirsty Pacific Southwest becomes a vast megalopolitan complex, this area is compelled to look, perhaps afar, for a new water supply to slake its thirst. That water supply could be as far away as the Yukon River, or as near as the Eel. And, indeed, the supply could be the mighty Columbia River. If an area has surplus water—surplus to both its present and future requirements—and if another area is parched and unable to grow because of a water shortage, this nation has a solemn duty to study, scientifically and with the utmost care, the problem of efficiently utilizing its water resources."

The Northwest has heard speeches of this type for the last several decades, but still remains unimpressed. Residents of that area claim that vast quantities of water—perhaps as much as 12 million acre-feet annually—may yet be needed to irrigate the arid areas of East-Central Washington and Oregon, and they fear that any depletion of the Columbia could, among other hazards, cripple the cru-

Water for London Bridge?

When the City of London sold its fallen-down London Bridge to an Arizona developer for \$2.4 million, it failed to send along any Thames River water for the rebuilt bridge to span. This oversight was discovered recently when Federal and state authorities refused to supply any water for the channel which the developer planned to build for the bridge at its site near Lake Havasu, the man-made lake formed behind Parker Dam on the Arizona-California border.

London Bridge—not to be confused with the more postcardy-looking Tower Bridge—now lies in rocky ruin in downtown Lake Havasu City (population 4,000), but it is scheduled to be re-assembled soon at a \$3.6-million cost as a centerpiece to a Tudor-style tourist village. But the bridge has already proved to be a tourist attraction, even without water to span, and it has managed to triple the real-estate sales pace in this desert community.

cial salmon industry. Moreover, they ask, as the Portland *Oregonian* asked back in 1948, "Why should not the people come to the water, instead of the water being transported to the people?" At any rate, the Northwest supported the 1968 legislation only with the understanding that a 10-year moratorium be imposed on studies of trans-basin diversion. After a decade's time, that region may have a better idea of its own long-term requirements as well as the possibilities inherent in other forms of water supply.

Sources: the Pacific

Atomic-power water desalinization plants may provide one answer—perhaps the major answer—to the 21st century's water needs. Needless to say, plenty of salt water is available, covering as it does three-quarters of the surface of the globe.

The problem of desalinization is not scientific but economic; over the past fifteen years, production costs have dropped from \$4 to \$1 per thousand gallons, but this is still almost ten times the average cost of fresh water. Even so, desalted-water capacity doubles every 2 to 3 years, so that it may reach 20 billion gallons daily within the next two decades. In relation to the nation's daily requirements of perhaps 600 billion gallons two decades hence, that may be only a drop in the bucket, but in terms of the Southwest's sharply rising needs and restricted supplies, that may well be a godsend.

Desalinization efforts recently have centered around the development of a Southern California plant scheduled to produce as much as 150 million gallons a day of fresh water. (That amount would equal 168,000 acre-feet a year.) This joint public-private venture carried a price tag of \$444 million when first announced last year (albeit on the basis of 1965 cost estimates), but when more recent estimates suggested an ultimate cost of \$765 million, the project was sent back to the drawing board.

The original project plan called for three Southern California utilities to supply nuclear-generating units to the Metropolitan Water District, receiving in return entitlement to 1.5 million kilowatts of power, and for the MWD to construct "flash evaporator" desalting facilities on a 40-acre man-made island off the coast of Orange County. The plant's initial desalting capacity would be 50 million gallons a day, and this would be increased over a period of five years to 150 million gallons a day—enough to meet the water needs of a city of one million population.

The project's ballooning cost estimates were based upon steep increases in the costs of labor, materials, nuclear reactor units and nuclear steam-supply units, along with the extra costs involved in providing earthquake protection to the plant site on man-made Bolsa Island. (Present cost-cutting efforts center around an attempt to resite the plant on the mainland.) As a consequence, the costs of desalinization are now estimated at 35 cents a thousand gallons instead of the 22-cent figure originally expected. In contrast, future supplies of Northern California water should cost Southern California users 22 cents a thousand gallons at the completion of the California Water Plan, while Colorado River water costs them only 11 cents today.

To obtain their 21st-century water supplies, the teeming millions of the Pacific Southwest may have to seed the clouds, reclaim waste water, pump water out of the Pacific, or transport it across far-distant mountain ranges. But supplies now seem assured for the rest of the 20th century, thanks to the successful resolution of such major projects as the California Water Plan and the Colorado River Basin Project. The law of the river now holds sway even as the desert sun beats down on the fertile oases and on the mighty Colorado, trickling to the sea.

William Burke

Municipals and Tight Money

Any state or local government that needs long-term financing is liable to encounter difficulties during a tight-money period such as 1966. In such periods, commercial banks—the primary investors in municipal securities—can be expected to liquidate their holdings in order to meet burgeoning loan demand, thus depressing the prices and raising the market yields on these investments.

As interest rates climb, debt-servicing costs on new bond issues rise concurrently. If interest rates soar high enough, they may exceed statutory, constitutional or referendum-imposed ceilings, thereby precluding or at least postponing the flotation of a proposed bond issue.

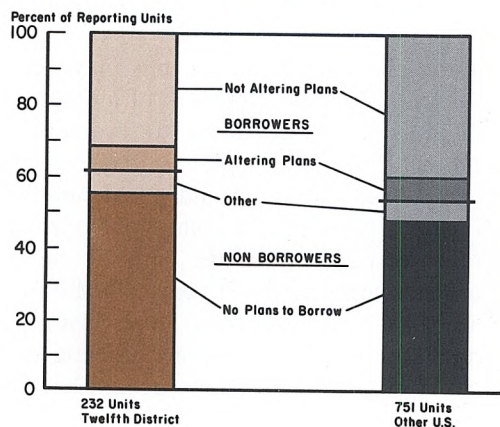
Consequently, governments may find themselves hard pressed to sell their offerings at the required volume whenever credit conditions tighten. And to the extent that an intended bond offering is either reduced in size, temporarily postponed, or abandoned entirely, state and local governments may be forced to cancel contract awards and to curtail planned capital spending. Deferral or reduction in new borrowings need not cause immediate cutbacks in capital expenditures, but some ultimate decline in spending levels is likely to ensue.

To determine the impact of tight money on the borrowing and spending of state and local governments, the Federal Reserve System recently conducted a survey which focused on the 1966 borrowing experience of large state-local governmental units throughout the nation. (The survey included all states, counties with over 250,000 in population, municipalities with over 50,000 in popu-

lation, school districts with over 25,000 in enrollment, and other special districts with over \$5 million of debt outstanding.) This article highlights the experience of Twelfth District units and compares their performance with that of governmental units elsewhere.

In general, monetary restraint did serve as a check on the borrowing plans of large governmental units during 1966, as roughly one out of every eight units (in the West as elsewhere) encountered some form of difficulty in borrowing. Although high interest rates were to some extent instrumental in forcing Twelfth District units to cut back, postpone and/or cancel their bond issues, other factors were also involved—such as voter defeats of proposed bond offerings. But despite financing problems, credit restrictions apparently did not endure long enough or with enough sustained severity to cause any serious curtailment of capital outlays or contract awards.

One-eighth of all state-local units had trouble borrowing in 1966



Difficulty for one of eight

In this District, only 103 of 232 units responding (44 percent) reported that they had had long-term borrowing plans for 1966; the remaining 129 reported no borrowing intentions. Thirty of the would-be borrowers (13 percent of the overall total) encountered borrowing difficulties during the year, while 73 units (31 percent) carried out their financing plans as originally intended. Of those encountering difficulties, 7 either reduced the amount of the prospective issue or postponed it until later in the year, 9 at first postponed the issue but then postponed it again to 1967 or else cancelled it completely, and the other 14 from the very outset decided to postpone the issue to 1967 or to abandon their borrowing plans completely.

The 103 units with financing plans intended to issue \$1,531 million of bond offerings during 1966. (Here as elsewhere, one-third of the total volume was scheduled for educational facilities; Twelfth District units also planned to float a comparable amount for water-sewerage-utility purposes, while elsewhere the calendar of offerings was heavy with highway issues.) The actual volume offered totaled \$1,202 million—22 percent short of the planned amount. The shortfall amounted to \$303 million in abandoned or long-postponed offerings—that is, postponed

beyond 1966—plus \$27 million in reductions from intended volume. Additionally, \$42 million of offerings was postponed during 1966, but this amount was offered at a later date during the year and was thus included in the \$1,202 million actually borrowed. In aggregate, \$372 million of planned offerings—almost one-fourth of the total—became involved in borrowing difficulties during the year.

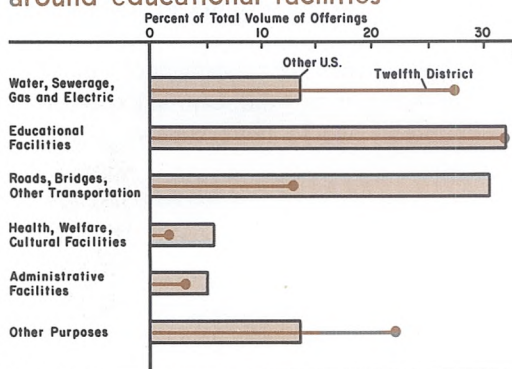
Elsewhere in the nation, the tight-money impact was not quite so strong as it was in the West. During 1966, 389 of 751 units responding in other districts planned to engage in long-term borrowing, amounting to \$6,034 million. Altogether, 12 percent of all units (as against 13 percent in the West) encountered financing problems, and 40 percent (as against 31 percent in the West) carried out their financing plans as originally intended. In these districts, the actual volume of offerings was 17 percent less than the volume planned, as against the 22-percent shortfall in the Twelfth District.

Impact of high rates

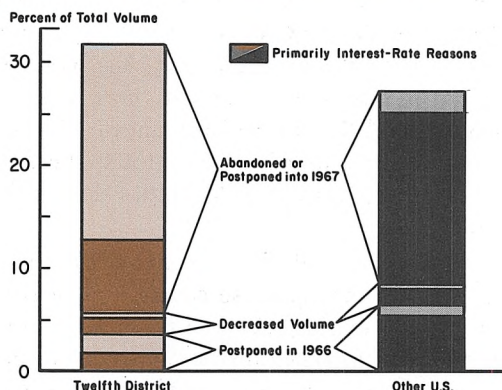
At the same time, high interest rates exerted a considerably smaller influence on financing decisions of Western units than on those of other would-be borrowers. Only 35 percent of the Twelfth District volume which underwent financing troubles was attributable to excessive interest rates, while 90 percent of the comparable volume in all other districts was explained by this factor. Thus, at least by the interest-rate yardstick, monetary restraint affected the borrowing plans of other districts somewhat more than it affected Twelfth District plans.

Long-term postponements or abandonments constituted the vast bulk of borrowing setbacks—82 percent of District volume and 70 percent of total volume elsewhere. Eleven of the 23 District units in that category named interest rate reasons as the primary cause of long-term postponement or aban-

Original financing plans centered around educational facilities



Interest-rate difficulties cited, but less in West than elsewhere



donment, and 45 of the 63 other units in that predicament named that factor. In other areas, most decisions to abandon or postpone indefinitely were taken because market interest rates were expected to decline later on. In the Twelfth District, some decisions were made on that basis, but other interest-rate factors were considered even more important—for instance, interest rates exceeding statutory limits or contributing to extremely high debt-servicing costs.

In addition, other factors besides adverse credit-market conditions hampered the borrowing plans of Twelfth District governments. Bond-referendum difficulties, primarily voter revolts, accounted for almost one-fourth of the total volume of postponements, reductions and abandonments. Another one-third of volume was attributed to the catch-all category of “other reasons”—reasons of a highly individualized nature which were unrelated to credit-market phenomena. The volume of offerings in the rest of the nation, however, was affected almost exclusively by credit conditions, and hardly at all by other

factors. Moreover, very little impact was felt, either here or elsewhere, by such factors as underwriting delays, construction cost increases, unanticipated increases in revenues and/or unanticipated reductions in current expenditures, and court proceedings (such as injunctions against bond offerings).

Impact on capital spending

Borrowing setbacks understandably had some impact on planned capital spending, but the impact was greater when measured by the number of units affected than by the dollar volume of reductions. During 1966, 30 percent of the District units with altered plans (as against 19 percent of such units elsewhere) actually postponed or cancelled contract awards or reduced their capital outlays. Yet these curtailments amounted to only 6 percent of the total dollar volume of borrowing involved in financing difficulties in the District.

A number of expedients were utilized by those District governments which, despite financing problems, were able to carry out their capital spending as scheduled. Six of the 21 units involved simply drew down their liquid assets. Three other units had a sufficient backlog of funds on hand from previous bond sales, another three had not yet put out their contracts for bid, another three felt that their spending plans could be left unaltered because of the small dollar volume or brief timespan involved in their altered borrowing plans, and so on. Of course, all the adjustments made by these units to finance their capital-spending plans were only temporary stopgaps; had credit stringency persisted longer than it in fact did, capital expenditures undoubtedly would have suffered a greater impact.

Karen Kidder

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