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Wrong policies are to blame for damage from Flood of '97

by Richard Freeman

Starting on Dec. 23, 1996, heavy rainfall merged with snow melt that started high up in the mountains, to form flood waters that ravaged portions of California, Oregon, Washington, Idaho, and Nevada. Enormous damage has resulted: In the five-state area, there are officially 26 persons dead, although the death toll could rise to three times that number; highways and roads were ripped up; an estimated 25-50,000 livestock were killed; prime agricultural land was flooded; and 2-3,000 homes and dozens of business establishments were badly damaged or destroyed. The total damage is estimated at $3 to 3.5 billion, and could go higher. While flooding has subsided along the rivers in most areas, it continues on portions of the San Joaquin River in California, and could continue on stretches of the river until July, according to state water experts, killing vineyards and orchards in the process.

In February and early March, floods were also raging through other parts of the United States, including the Ohio River states of Ohio, Kentucky, Indiana, and Illinois, as well as Tennessee, Arkansas, and Iowa. The London-controlled news barons have covered the California-Pacific Coast flood by babbling that "this was a rare and unexpected 100-year flood," which is used to justify the conclusion: "There is little that powerless little man can or should even attempt to do in the face of the powerful and irrepressible force of Mother Nature." This is a lie. Indeed, it is painfully clear that almost all of the Flood of '97 damage in California, and elsewhere, was preventable. It is man, succumbing to the fascist ideologies of fiscal conservative budget-cutting and environmentalism, who has taken down the infrastructure for flood control and water management, and who is responsible for the massive damage. Don't blame Mother Nature.

This was evidenced by the breakdown in strategic locations of California's levee system—altogether, 46 levees broke, including 24 on the San Joaquin River (see **Figure 1**)—and the lack of dams and reservoirs which should have been built, but were not, to hold back the floodwaters.

Had California's government and the appropriate U.S. government agencies funded and adequately maintained existing flood control infrastructure, and built new infrastructure flood control projects that have been on the drawing board (in most cases since the state's masterful 1957 Water Plan), *between one-half and four-fifths of the flood's damage would have been averted.*

What should be investigated

That such infrastructure was not built, and is under continuing attack—in the face of a $7-9 trillion deficit in U.S. infrastructure obsolescence—is the aspect of the Flood of '97 that should be investigated. That ideologues are allowed to destroy infrastructure, as part of the post-industrial society policy that Britain imposed in America in the mid-1960s, is the real scandal. That policy deliberately fostered speculation, while crushing production. It built a speculative bubble that has caused the contraction of the physical economy at the rate of 2% per year since 1970. Infrastructure is slashed by budget-cutters, to funnel revenues instead into a foredoomed attempt to keep this financial bubble inflated.

Readers must free themselves of a misconception, that man is helpless when confronted by a so-called "natural disaster." Most extreme occurrences in nature may have caused unavoidable disasters centuries ago; today, they become disasters only when man does nothing to prevent their foreseeable results. In California, "abnormal" weather patterns, such as flooding or drought, are the norm. Influenced by a number of weather and climatological systems, including the El Niño currents in the Pacific Ocean, California, since 1955, has ex-

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perienced three floods that were at or near the threshold of "100-year floods"—in 1955, 1986, and 1997. The "100-year flood" is defined as a flood that occurs once in every 100 years, but it really means that the water discharges are far above, roughly double, the norm for winter months, which is the peak precipitation period for California. Thus, the "100-year flood" has occurred three times in the last 42 years. Its appearance should be expected and planned for. The 1955 "100-year flood" killed 23 people. The 1986 "100-year flood," which was as severe as the current one, caused $1 billion in damage. A serious flood in 1995 was responsible for $1.8 billion in damage. It is unacceptable to be "caught by surprise" by flooding.

More safeguards can easily be built into California's flood control system to enable it to cope with a 100-year flood. This is not pie in the sky. In fact, when America was committed to economic growth, it used to be part of the standard planning activity of the U.S. Army Corps of Engineers and the California Department of Water Resources, which devises and implements, along with other agencies, the state's water plan. That plan is updated, on average, every five years. In the past, there were plans to build water projects in California to protect against even "150-year" and "200-year floods," but the projects were not built. Since 1991, when George Bush ally and fiscal conservative Pete Wilson became governor, even planning has been abandoned. In the 1993 "California Water Plan Update," Wilson made everything pass the test of not whether it is needed, but whether it is "cost effective," according to narrowly defined criteria. This is part of the post-industrial, anti-infrastructure, budget-cutting ideology.

Under competent planning, redundancy would be built into the system, and if a portion of the system were faulty or under stress, it would be either upgraded, or the system as a whole would be strengthened. Naser Bateni, a longtime veteran of the California Department of Water Resources, who was program manager for state planning for five years, and is now district chief of the Northern Water District, told *EIR* on Feb. 25 about a structural defect in California's flood control system which became apparent in a major way during the 1986 flood. Nothing was done about it. Bateni reported:

"During the height of the 1986 flood, the Folsom Reservoir, which is on the American River above the city of Sacramento, was filled to overflowing. The channel capacity below the reservoir could handle 115,000 cubic feet per second, and the Folsom Reservoir was releasing into it about 135,000 cubic feet per second, more than the channel could handle. If it had rained another half-day, the unregulated release from the reservoir would have potentially flooded the city of Sacramento. Several tens of thousands of homes would have been affected; we would have had a disaster."

A dam needed at Auburn

The Folsom Reservoir lies on the American River (see **Figure 2**), which is a tributary of the Sacramento River, California's most powerful river system. Toward the headwaters of the American River lies Auburn, a site where for more than 30 years, various Army Corps of Engineers specialists and hydrologists have proposed building a dam. All the design and feasibility studies have been completed. The Auburn project was planned to have a storage capacity of 2.3 million acre-

EIR fuels infrastructure vulnerability debate

On July 15, 1996, President Clinton signed Executive Order 13010, establishing a Presidential Commission on Strategic Infrastructure Vulnerability. The commission, as we reported in the March 7 *EIR,* has a one-year mandate to conduct a nationwide survey of the transportation, energy, telecommunications, banking, and financial infrastructure of the United States, to determine where there may be points of vulnerability, and recommend a course of action to repair the damage before a national disaster strikes.

Although the impetus for the commission arose over concern about the threat of sophisticated terrorist attack in the wake of the World Trade Center and Oklahoma City bombings, the mandate of the panel is far broader, according to commission officials interviewed by *EIR.* The commission is concerned about all possible sources of vulnerability, including lack of investment and replacement-maintenance, natural disasters, and irregular warfare assaults, whether in the form of physical or "cyber attack" through disruption of computer support systems.

For decades, *EIR* has been detailing the crippling effects of deregulation, privatization, and the post-industrial ideology that has fueled an across-the-board policy of disinvestment in our physical economy, especially our hard and soft infrastructure. As the result of this work, *EIR* is uniquely situated to foster a public debate on the commission's mandate. The commission will be holding hearings, beginning in April 1997, in five cities across the United States to solicit public input into its deliberations.

In the March 7 *EIR,* we published a report on the devastating impact of deregulation and disinvestment in our nation's electical power grid, as the first in a series of studies on the national infrastructure crisis. We continue this series with this report, by Richard Freeman, on the collapse of the water-management system in California.

FIGURE 1

Flood of '97 ruptured 46 inadequate levees on the Sacramento and San Joaquin River system

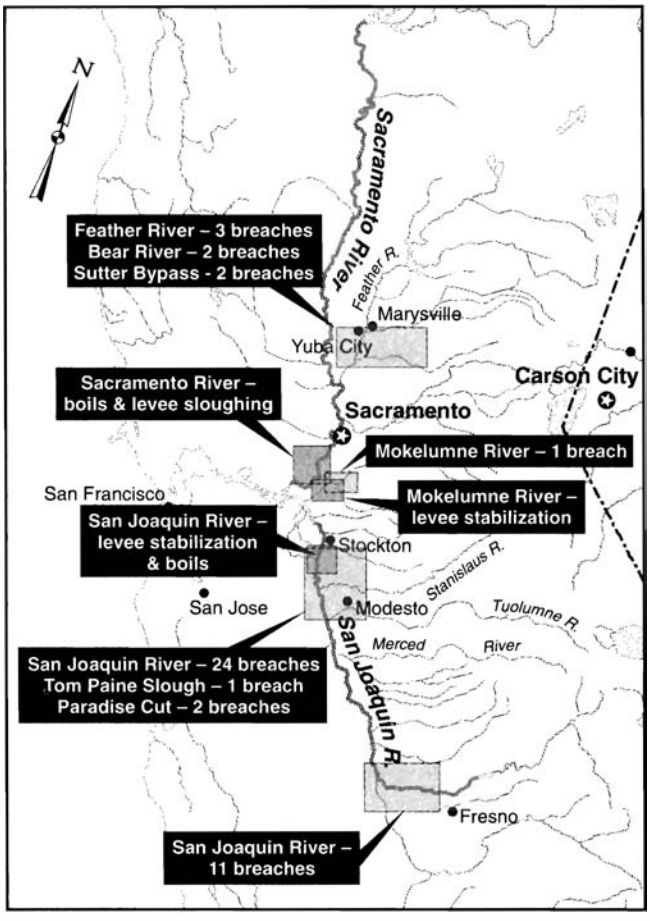
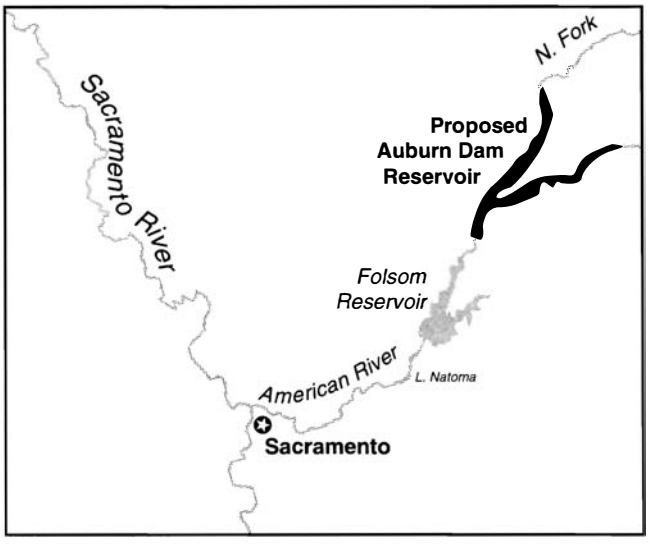


FIGURE 2

Auburn Dam would provide flood control protection on American River against even 200-year flood



feet (maf; an acre-foot is the volume of water covering 1 acre to the depth of 1 foot; it is equal to 325,851 gallons), which would make it one of the largest dam/reservoirs in California. During rainstorms and/or heavy rainfalls, it would store water farther upstream, reducing the flow of the American River and taking the pressure off the Folsom Reservoir downstream, so that the possibility that the Folsom Reservoir would overflow and inundate Sacramento *could never occur.*

But despite the clear need for the Auburn Dam for flood control and water supply, and the danger thatt he city of Sacramento could be inundated with waters from the American River by future "100-year floods," the dam was not built. The reason was that a coalition of "Contract on America" budget-cutters and environmentalist zealots teamed up to kill it.

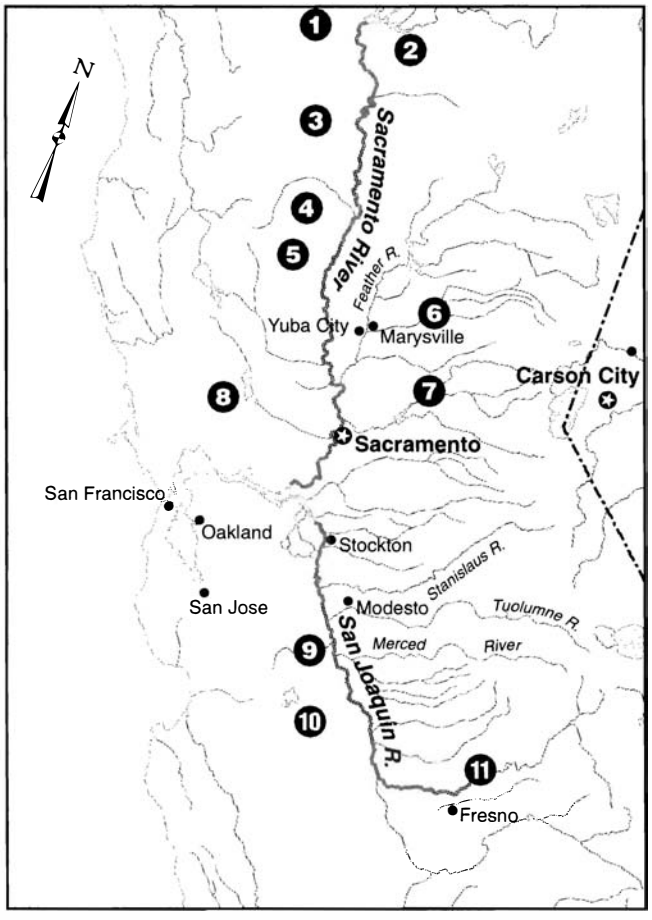
In 1992, legislation was introduced into the U.S. Congress for the U.S. government to help fund construction of the Auburn Dam. (The federal government usually funds 50-75% of the construction cost of public water works and flood-control projects.) The bill lost by a vote of 273-140 in the House of Representatives. In 1996, an attempt was again made to bring up the construction of Auburn Dam. Opposition to the proposal was led by Rep. Thomas Petri (R-Wisc.), a Gingrichite fiscal conservative, and by the Taxpayers for Common Sense. The eco-fascist environmentalist movement, led by the Friends of the River, the Sierra Club, the Environmental Defense Fund, Friends of the Earth, and the National Wildlife Federation, fanned out in Washington, D.C. to lobby and threaten against it. By a vote of 35-28, the proposal never made it out of the Republican-controlled House Transportation and Infrastructure Committee (formerly the Public Works Committee).

This decision showed an irrational disregard for the future. During the Flood of '97, the American River once again became swollen with water, and there were levee breaks on the river, but the Folsom Dam/Reservoir did not overflow this time, for two reasons. First, the managers of the dam kept the year-round water level at a lower level in order to afford greater space to capture storm waters if and when heavy rains were to occur. But this was a dangerous trade-off, because the amount of water that the dam/reservoir could store for drinking and freshwater use was accordingly reduced, posing other problems should drought conditions return. But even the extra space created might not have proved sufficient if it were not for the fact that the current heavy rains fortuitously deposited less water into the American River and Folsom Reservoir, in particular, than in 1986. During the next flood, California may not be so lucky.

As Bateni put it, "Reservoirs are the first line of defense

FIGURE 3

Eleven needed surface water dam/reservoirs



Key

Shown here are 11 out of 60 surface storage projects that could be built for flood control to protect against "100-year" and, in many locations, "200-year" floods. The dam/reservoirs would also add to the fresh water supply. Many of these projects were drawn up as far back as California's 1957 Water Plan. Engineering and other studies required for their construction have already been completed.

Listed are their storage capacity, and cost, where known. Their combined storage capacity would be 39.1 million acre-feet (maf), almost equal to the current storage capacity of California's system. An acre-foot is equal to 325,851 gallons (the amount of water that could cover one acre to the depth of one foot).

1. **Clair Engle Lake:** enlargement to 5 maf
2. **Shasta Reservoir:** enlarge from 4.55 maf to 14 maf
   cost: $4-6 billion
3. **Cottonwood Creek:** 1.6 maf
   1987 cost in 1995 dollars: $760 million
4. **Glenn Reservoir:** 8 maf
   1980 cost indexed to 1996 dollars: $3.4 billion
5. **Sites Colusa Reservoir:** 3 maf
   cost: 1.5 billion
6. **Marysville Reservoir:** 900,000 acre-feet
   cost: $1 billion
7. **Auburn Dam:** 2.3 maf
   1987 cost, expressed in 1996 dollars: $1.5 billion
8. **Lake Berryessa:** enlargement from 1 maf to 13 maf
   cost: $2.9 billion
9. **Orestimba Reservoir:** 1.1 maf
   cost: $1.8 billion
10. **Los Banos Grandes:** 2 maf
    cost: $1.1 billion
11. **Millerton-Friant Dam:** enlargement from 0.6 maf to 1.4 maf

in flood control. They take the peak out of storms." **Figure 3** identifies 11 dams/reservoirs that should be built in California (most have been on the drawing board since the 1950s), with their planned storage capacity and estimated cost, where known. They would add a cumulative storage capacity of 39.1 maf, almost equal to California's current storage capacity. Construction of even a portion of them would add to California's ability to withstand a "100-year," or in many locations, a "200-year" flood. (Construction time for a dam/reservoir is two to ten years, depending on the size, physical location and features, engineering requirements, etc.)

The levee system collapse

There is a second element of California's flood control system that failed during the current flood: its system of levees and embankments.

A levee is a shaped mound of material placed on one or both banks of a river, to hold back waters from overflowing the river stream, and can be composed of earth, clay, concrete, or a combination of the three. It can range from a few feet, up to several tens of feet in height. The Army Corps of Engineers, which is charged by the U.S. Congress with overseeing flood control throughout the United States, has established a minimum design standard for levees.

The majority of levees in California are built along the Sacramento-San Joaquin river system. The Sacramento River (375 miles long), the San Joaquin River (350 miles long), and their tributaries, which together are called the Sacramento and San Joaquin river system, are lined with 6,000 miles of project and local levees. Most of the levees are continuous, i.e., with no gaps in between. However, the quality of the levees varies. Many local levees were built by farmers or others 100 years ago, and were added to and built up over time. *Hundreds of miles of local levees are substandard relative to Army Corps of Engineers "project levee" standards.* Some are made of peat, which deteriorates, and earth; some have no concrete; some have very weak foundations; some are victim to sand boils, because of the inadequate way they were built.

The Sacramento and San Joaquin river system is to California what the Mississippi River system, including its tributaries (the Missouri River, the Illinois River, and so on), is to the area from northern Minnesota down to New Orleans. The Sacramento and San Joaquin system is the state's central source of water.

The Sacramento River is the state's mightiest river, with the largest volume of water flow (see **Figure 4**). It begins at the northern end of California's Central Valley, where Mt. Shasta rises to 14,000 feet. Yearly precipitation at the higher elevations averages about 70 inches, most of it as snow. From Mt. Shasta, the Sacramento River flows in a southerly direction between the Sierra Nevada and the Coastal Range mountains, on its east and west, respectively. It flows to a delta bed in the central part of the state, where it has left alluvial deposits. This is called the Delta, which it shares with the San Joaquin River, which flows in from the south.

The Sacramento Valley has always been subject to floods, because the natural river channels have capacity sufficient for only a small part of the maximum flow. During 1848 through the 1860s, gold prospectors unloaded some of their debris into the river channel, raising its level. But the fundamental problem was always the limited capacity of the Sacramento River channel itself. In 1874, the Army Corps of Engineers presented a plan for controlling the waters of the Sacramento River, but not much came of it. In 1904, 1907, and 1909, there were disastrous floods on the river. Part of the 1910 Sacramento River Flood Control Plan was adopted by the U.S. Congress in the Rivers and Harbor Act that it passed that year. Over the next several years, this resulted, in part, in the dredging of 25 million cubic yards from the river.

But the flooding problems persisted. In 1933, the voters of California approved a bond issue that authorized money for a project that would control the waters of the Central Valley, principally the Sacramento River. But the Depression halted the plan. Then, in 1935, President Franklin Roosevelt, following the initiative of certain flood-control experts in the Congress, broke the logjam and began the process of implementing a multi-purpose flood-control and water development plan. Using appropriations under the Emergency Relief Appropriations Act of 1935, Roosevelt authorized the Bureau of Reclamation of the Department of Interior to proceed with construction of the Shasta Dam, in the Shasta mountains near the headwaters of the Sacramento River. Completed in 1944, the dam is a 602-foot-high gravity, concrete dam, which is a mile long and has a 115,000 kilowatt power plant that by the 1970s was producing 1.5 billion kilowatt hours of electric energy per year. The dam/reservoir has a storage capacity of 4.55 maf of water. Since the Shasta Dam was built, about 20 other multi-purpose dams have been constructed along the Sacramento River and its tributaries, along with a system of levees.

The San Joaquin River, which has only about one-fourth the water flow volume of the Sacramento River, starts in the south central part of the state, near Lake Buena Vista lakebed, and runs northerly. The Sacramento and San Joaquin river systems pour into the Delta, which runs on its northern border from south of the city of Sacramento, and on its southern border from north of the city of Stockton. The waters then flow westward, emptying into San Francisco Bay, flowing past the City of San Francisco and out into the Pacific Ocean.

Some 5.1 maf of the water that would otherwise flow out into the Pacific Ocean is diverted and pumped south, to supply dry southern California. As a result, three out of four Californians get all or a portion of their water from that which originates in the Sacramento and San Joaquin river system.

The 6,000-mile levee system built up along the Sacramento and San Joaquin river system was complementary to the dam/reservoir system. In fact, a good flood-control system employs the following elements, usually in combination: 1) levees and embankments; 2) dams and reservoirs; 3) diversion channels, conveyances, floodways, and other outlets; 4) bank and channel stabilization; 5) cut-offs; and 6) contour plowing and reforestation. But, while the levee system was built and maintained through the 1970s, as the pro-speculation, anti-industry thrust of the London financier oligarchy's post-industrial society policy gained momentum, the level of vigilance and repair began slipping in the 1980s.

The deficiencies were known

The 1986 "100-year flood" exposed the fact that the protection afforded by the state's levee system was eroding. It was found that 110 miles of levees were vulnerable and improperly maintained, along different stretches of the Sacramento River system. But delays in funding authorization by the U.S. government, and attempts (many successful) to block some of the levee construction by environmentalists (who claimed that it ruined the habitats of endangered species), slowed the pace of work. When the Flood of '97 struck, some of the levees, known for years to be inadequate, burst, causing heavy damage (and wiping out the endangered species' habitats, as well).

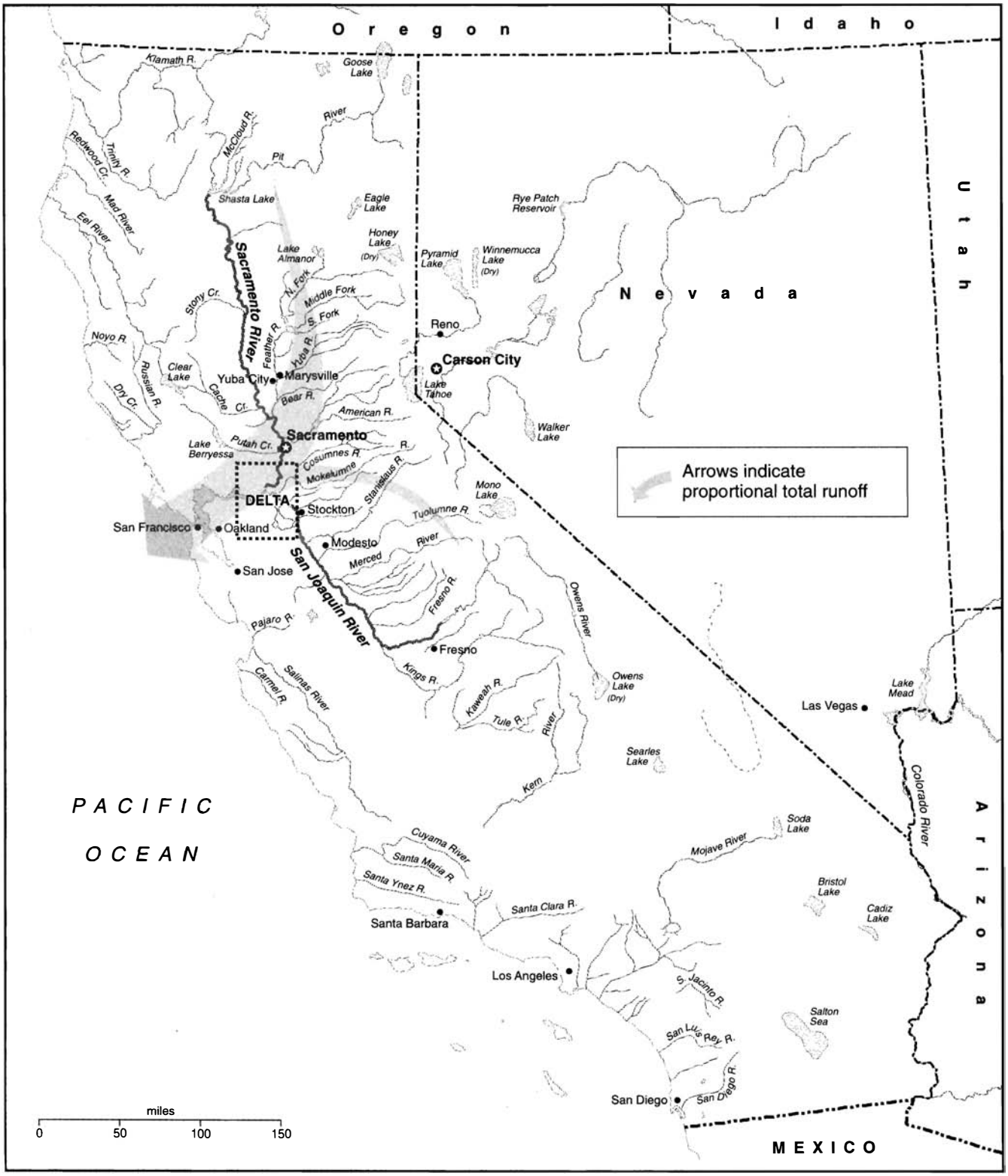
Further, there are many inadequately built and maintained levees in the Delta region, much of which is below sea-level, and some of which is islands, which are used for agriculture. The 1993 California Water Update Plan put out by the California Governor's Office, the state's Resource Agency, and the state's Department of Resources, and which is the last plan published by the California government, contains the following startling revelation about the endangered state of levees in the Delta region:

"Nonproject or local levees (three-fourths of the Delta levees) are those constructed and maintained to varying degrees by island landowners or local reclamation districts. *Most of these levees have not been brought up to federal standards, and are less stable, thereby increasing the chances of flooding*" (emphasis added).

During the recent flood, these levees were insufficient,

FIGURE 4

California's river network; and proportional discharge of the Sacramento and San Joaquin rivers through the Delta into the Pacific Ocean



and there was extensive flooding in the Delta, as there had been in years past. This flooding allows brackish seawater to flow into the water supply, which is pumped to other parts of the state, adding another layer to the damage.

Aside from the immediate Delta area, it is estimated, according to the March 3 *Oakland Tribune,* that *only one-fifth of the state's system of levees is maintained up to federal "project level" standards,* and that it would require $40 billion to replace the most run-down or vulnerable levees with new dirt levees. Dirt levees still have a degree of vulnerability to flooding; the levees should be made better, in many places, by adding in concrete to their construction, but that would add to the costs. The fanatical budget-cutters don't even countenance spending a fraction of that $40 billion to replace current levees with a new dirt levee system.

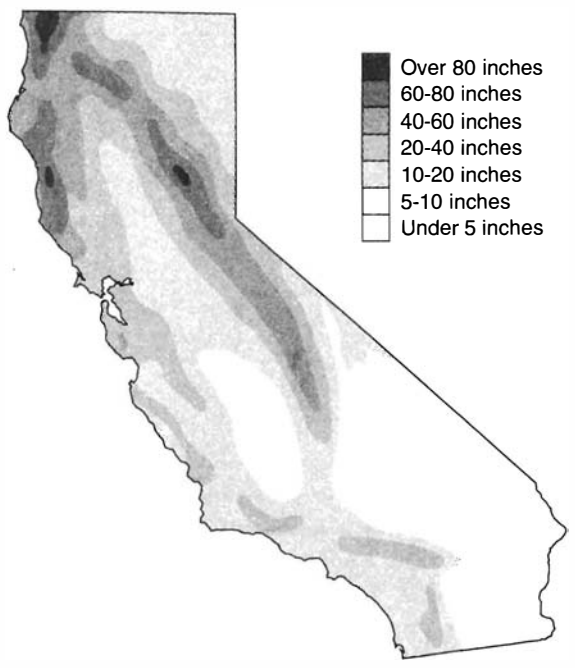
One of the most glaring problems in levee maintenance is sabotage by the fascist environmentalist movement. Frank Hartzell, publisher of *Business to Business Journal,* and an avid environmentalist, told *EIR* on Feb. 27, that near a major levee on the Feather River, in the area of Marysville and Yuba City, environmentalists demanded that a 75-acre "mitigation area" be built to protect endangered species, including the elderberry beetle, which, Hartzell stated, "no one has ever really seen in this area." Within the mitigation area, a pond was built 600 feet from this important levee. "When the flooding came, the pond structurally undermined the levee, and the levee gave way," Hartzell reported. A 600-foot gap in the levee allowed millions of gallons of water to pour through. Approximately 20,000 people in the towns of Marysville and Yuba City had to be evacuated from their homes for days; 3 people died, 500 homes were destroyed, and the damage in this area alone is estimated in the range of $50-100 million.

'Least-cost analysis'

Equally criminal is the approach being enforced by Governor Wilson, the protégé and crony of former U.S. President and crack cocaine super-kingpin George Bush. Wilson has instituted an anti-infrastructure, anti-growth "cost-benefit analysis" strategy, dubbed in California-ese "least-cost analysis." This strategy demands that all infrastructure be justified on a unit-cost basis: If $1 million is to be spent on infrastructure, will it yield a return of $1 million measured in terms of that project alone? If not, an anti-growth strategy must be adhered to instead, on the rationale that it "saves money." This Wall Street accountant's approach is in stark opposition to that of Alexander Hamilton, America's first treasury secretary, who made clear, in his 1791 *Report on Manufactures,* that the benefit of infrastructure is not what it yields in the small, but the profit it produces by increasing the profitability of the entire economy: By increasing the productivity of all industry and agriculture, output is greater and of a greater technological quality, which swells tax revenues, repaying many times over the initial cost of the infrastructure project.

The "California Water Plan Update" sets all the parameters and plans for flood-control/water-management for the state of California. Governor Wilson's office produces this report in conjunction with two other state offices, whose heads and staff Wilson appoints. The 1993 "California Water Plan Update" presents the destructive goals, including the specific rejection of building new capacity, inherent in "least cost analysis":

FIGURE 5
Average annual precipitation



"The least-cost process gives all available options an equal chance in the selection process. . . .

"With LCP the water manager's objective becomes one of meeting all water-related needs of customers, *not one restricted to looking for ways of providing additional supply.* For example, if a growing service area's need for additional water can be reduced with an ultra-low-flush toilet retrofit program *rather than additional water supplies,* then the retrofit program should be considered on its merits and compared with all other options when putting together a water management plan.

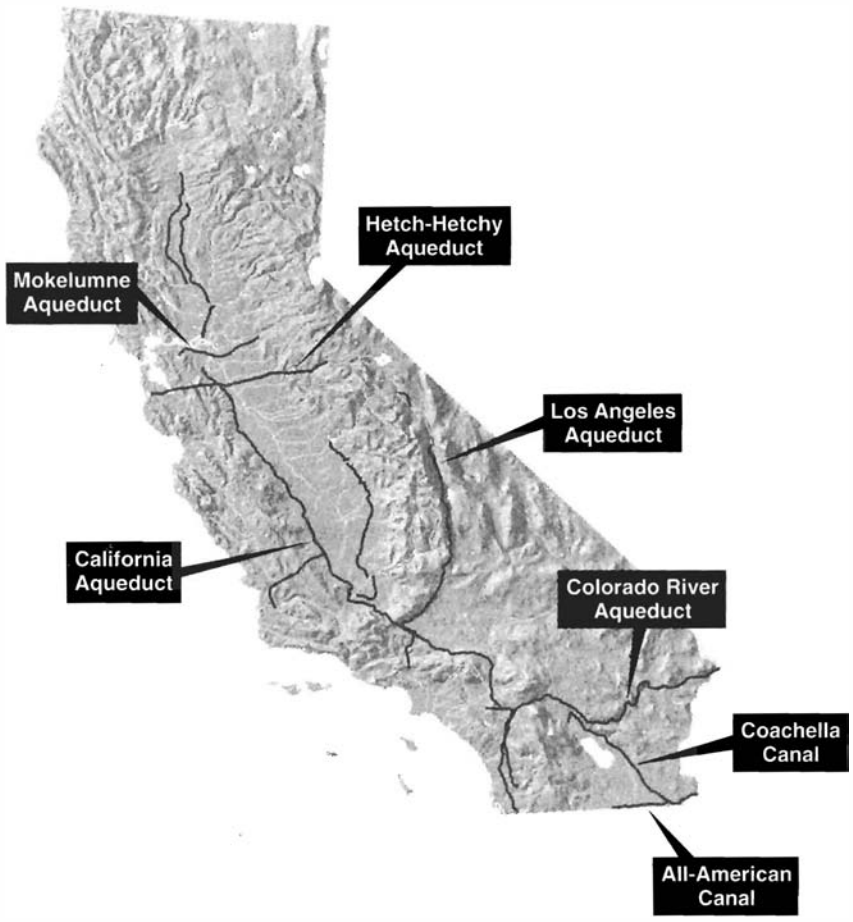
"The option of planned periodic shortages must be as carefully evaluated as any other (plans which would result in extreme shortages jeopardizing life or health would, of course, be unreasonable)" (p. 275, emphasis added).

The fact that a disingenuous disclaimer is added—that extreme shortages should not be pursued if that could threaten life—means that Wilson and his budget-balancers know that the austerity they are pushing could threaten life, and that they

plan to come as close to the line as possible in cutting water program functions without inducing death, knowing that they just might cross that line.

From this standpoint, it is clear that the damage of the Flood of '97 was caused by the deliberate destruction of flood-control and water infrastructure—the refusal to build dam/reservoirs that would make flooding a much more remote possibility; the delay in repairing levees, which the 1993 plan stated were inadequate, "thereby increasing the chances of flooding"; and the institution in the 1990s of "least-cost planning," which vitiates all infrastructure building. Combined, these made inevitable the loss of life and billions of dollars of damage, as much as 80% of which could have been prevented.

FIGURE 6
Major man-made canals and diversion channels



Over the course of the Twentieth Century, drawing on federal, state, and local government funding, California constructed a remarkable system of canals and diversion channels to provide flood control, and, especially, to move fresh water supply throughout the state. Of special importance, is that water is transported from the water-rich north to the water-poor south.

Water management and fighting droughts

There is another element here which broadens the picture, that of water use and supply. Water management policy has two functions: flood control, and to supply clean water. These are complementary; in notable instances, the same piece of infrastructure can be used for both purposes, such as dam/reservoirs, conveyances, channel lining, and so on. The same dam/reservoir which allocates a large portion of its space to store water during a storm, so that it doesn't overflow a river channel, can, during non-storm periods, ship the water so accumulated during a wet period, to a place that is in need of water. And, California, since it became a state, like many other states, has been simultaneously pre-occupied with flood control and freshwater supply.

Figure 5 shows the precipitation patterns of the state, which closely mirror the location, or absence, of large rivers. Notice, that in the northern part of the state, there are three zones, where more than 80 inches of precipitation accumulate annually, and four zones of 60 to 80 inches annual precipitation, while in the southern part of the state, precipitation accumulation is 10 to 20 inches, and for large stretches, less than 10 inches per year. In the southeast quadrant of the state is the Mojave Desert, with virtually no precipitation.

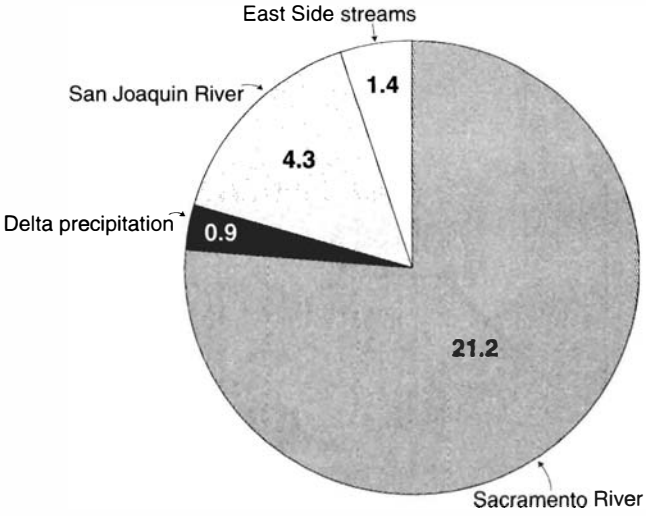
Thus, a key function of the state's dam/reservoir and canal system is storing and moving water from the northern to the southern part of the state (see **Figure 6**). One nexus region for this is the Delta. **Figures 7** and **8** show the transmission process through the Delta. For 1980-89, on average, 27.8 maf came into the Delta annually, of which 21.8 maf came from the Sacramento River, 4.3 maf from the San Joaquin River, and the rest from other sources. In turn, 27.8 million maf flows out of the Delta: Three-quarters of it flows into the Bay, but 5.1 maf is pumped through the Tracy, Banks, and to a lesser extent, Contra Costa pumping stations, to the south of the state. While two-thirds of the water in California originates in the north, more than two-thirds of the population lives in the south. This exchange of water is crucial.

A complicating factor is the wide swings from year to

FIGURE 7

Inflows to the Delta, by inflow source

(million acre-feet)



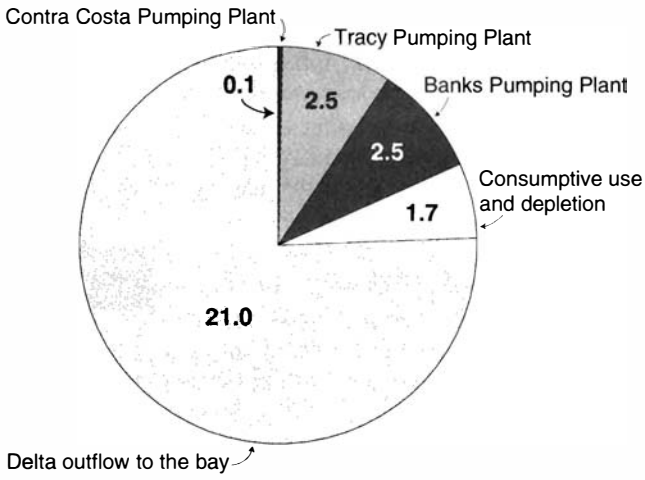
Total annual average flow = 27.8 million acre-feet

Source: "California Water Plan Update, 1993," Vol. 1, p. 250.

FIGURE 8

Outflows and diversions from the Delta, by outflow destination

(million acre-feet)



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Source: "California Water Plan Update, 1993," Vol. 1, p. 250.

year, from very dry conditions to very heavy precipitation. **Figure 9** is the annual Sacramento River index, which shows the estimated annual natural runoff that occurs cumulatively at four station sites on the Sacramento River and its Feather, Yuba, and American rivers tributaries, for 1906-93. The annual average for the 50-year period of 1941 through 1990 is 18.4 maf in runoff. Notice that in some years, runoff is 30 maf or more; in other years, it is 10 maf or less. Moreover, the annual runoff in 1974 was 33 maf, while just two years later, in 1976, it was 8.1 maf, a very serious drought year when water was badly needed in most parts of the state. The extremes are the norm. This means that in California, one has to have a flood-control/freshwater-management system that can handle both drought and flood on a regular basis. Preparing for the average-norm is ludicrous, because the norm occurs less than one-third of the time.

For example, while we have reported extraordinary floods (which may be very intense, but only for a short period of time), California suffered an agonizing drought during 1987-92, when precipitation levels, for some years in some regions of the state, were only 6% of the norm.

Thus, there are two separate, though at times intersecting processes: 1) the annual movement of water, through the Delta nexus, from the north to the south of the state; and 2) the cycle of floods and droughts, during the latter of which as much as 80 to 90% of the state can be badly in need of water.

Preparing for such eventualities typifies the history of California, a state that, through the building of water (and other) infrastructure, has increasingly mastered nature and the limitations and seeming prohibitions nature would impose. It survives only because of its extraordinary ability to control and move water.

Take the case of California agriculture, which is a successful scientific experiment. The state's settlers did not simply start farming arable land; rather, they had to transform the soil through infrastructure—water management, new sources of power generation, and scientific farming.

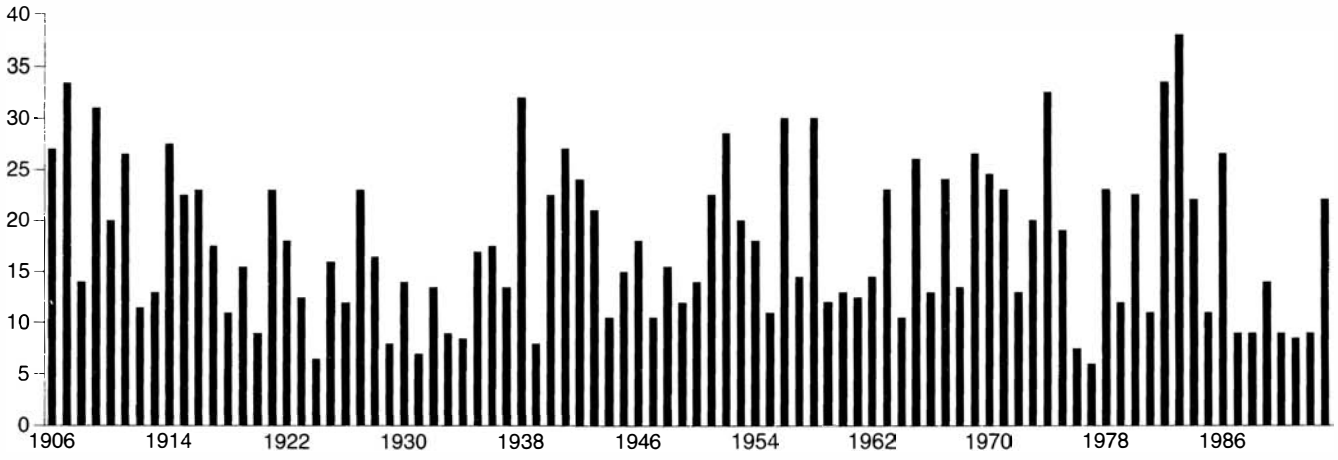
Californians artificially transformed the soil in the same sense of the word artificial as Alexander Hamilton employed the term "artificial labor" in his 1791 *Report on Manufactures.* Hamilton's idea derives from the 1439-40 Council of Florence concept of *imago viva Dei* (man in the living image of God), which is that through man's creativity, revolutionary new scientific discoveries of principle, the basis for economic wealth and growth, are made. Man employs scientific discoveries to improve the power of machinery employed in increasingly capital- and energy-intensive modes of production. The increase in labor power enables one man today do the work of 50 to 100 workers 100 years ago. This scientific principle is generalized throughout the economy through the machine-tool-building sector and through infrastructure, such as flood control and water management.

The republican nationalist forces in California altered the state's rivers, irrigated its land, and so on. The story of engi-

FIGURE 9

Estimated natural run-off of the Sacramento River, 1906-93

(million acre-feet)

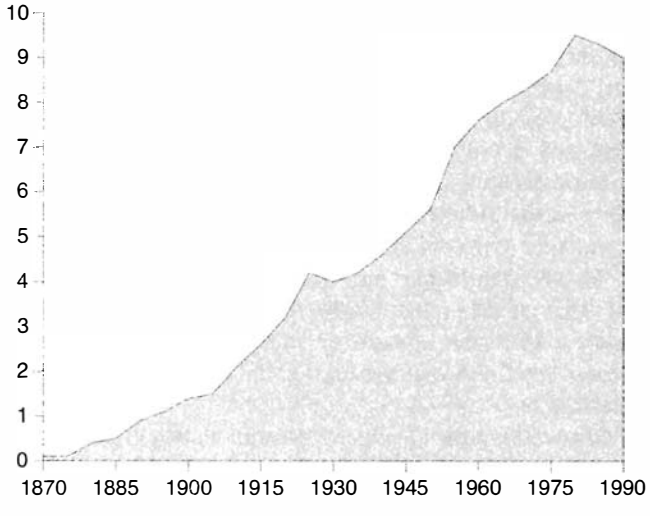


Source: "California Water Plan Update, 1993," Vol. 1, p. 52.

FIGURE 10

Irrigated agricultural acreage in California, 1870-1990

(million acres)



Source: "California Water Plan Update, 1993," Vol. 1, p. 171.

neer George Chaffey and the development of the Imperial Valley, is exemplary (see p. 21). **Figure 10** depicts the amount of acreage irrigated for agriculture, which rose from a few tens of thousands of acres in 1870, to 4 million acres in 1925, to 9.7 million acres in 1981 (which, in 1981, represented one-fifth of all irrigated cropland in the United States). California produces over 250 crops and livestock commodities and is the nation's largest agricultural producer. In 1989-91, it produced the following percentage of the nation's output of the following crops: almonds, 100%; prunes, 100%; pistachios, 100%; olives, 100%; walnuts, 99%; nectarines, 97%; grapes, 91%; broccoli, 90%; processed tomatoes, 90%; plums, 85%; avocados, 83%; lemons, 81%; strawberries, 78%; safflower, 77%; lettuce, 75%; celery, 73%; peaches, 66%; carrots, 58%; asparagus, 43%; alfalfa seed, 38%; oranges, 34%, and so forth. It is also a large producer of milk, rice, and cotton.

California is also the nation's largest manufacturing state. One out of ten of America's 18.3 million manufacturing workers is employed in California. In November 1996, California's manufacturing workforce, at 1.83 million, was 700% larger than the state with the next largest manufacturing workforce, Ohio.

California's population of 32.2 million is one-eighth of America's total. Thus, California needs water for agriculture, manufacturing, drinking, transportation, bathing, sewerage, and so on. As of the latest figures of 1990, California withdraws 31.9 billion gallons of freshwater supply per day, one-tenth of America's daily freshwater withdrawal of 327 billion gallons. **Table 1** shows the average daily residential use of water.

Thus, the proposals to slash California's water infrastructure and, thus, consumption, by Governor Wilson, by the U.S. Congressmen who voted down the construction of the Auburn Dam, etc., is suicidal. In addition, there are two other attacks on water infrastructure. First, contained in California's 1993 Water Plan Update was the announcement that by 2020, water

TABLE 1
California residential interior water use
(gallons per person per day, in 1990)

Toilet	28.2
Bath / shower	22.4
Faucets	10.4
Laundry	16.0
Dishwashing	2.4
Total	**80.0**

Source: "California Water Plan Update, 1993," Vol. 1, pp. 152-53.

consumption levels would be permanently cut by 10% from current levels, and that during drought, an additional 10% cut would be imposed. Second, according to the plan, an additional nearly 1 maf of California water will be diverted and segregated from urban and agricultural use, to be used solely for the environmentalist protection of so-called endangered species.

As the banking forces behind these proposals know, if water infrastructure for flood control and water supply are dismantled, then industrial, agricultural, and population growth will contract, and the society and human existence wither.

The infrastructure solution

The means to reverse the takedown of California's water-management system are at hand. Some of the measures have been studied, reexamined, and updated many times. In 1994, the relevant flood-control and water-management agencies of the federal and the California state governments formed a commission, called Cal-Fed, to formulate answers to the water problems in the Sacramento-San Joaquin Delta. At least on paper, Cal-Fed is attempting, correctly, to locate the solution within the context of solving California's statewide water shortage and to strengthen flood control. Cal-Fed has identified 60 dam/reservoir surface water projects, 20 groundwater projects, and 20 conveyance and channel projects that could be built, many of them dating from California's 1957 Water Plan (all subsequent state water plans have been updates of that 1957 plan).

Unfortunately, two spokesmen for Cal-Fed, as well as representatives from the California-based Friends of the River, have told *EIR* that Cal-Fed will not recommend for construction any ambitious hard infrastructure water project. This reflects the least-cost analysis straitjacket, as well as the environmentalist views, both of which are reflected in Cal-Fed. Nonetheless, whether these projects are built will really depend on the will of citizens who realize their necessity. Their initiation could take place as part of an economic recovery program, part of the bankruptcy reorganization of the U.S. and world financial systems, through the development-vectored New Bretton Woods monetary-financial system that Lyndon LaRouche is talking about.

There are three types of water projects that would stop the sabotage of California's economic development, and provide for real growth for decades into the future:

1. *The North American Water and Power Alliance (Nawapa).* This project would divert the water flow of the Yukon and Mackenzie rivers in Alaska and Canada, which otherwise flow unutilized into the Arctic Ocean, down through Canada and the 500-mile-long Rocky Mountain Trench (which is the world's second largest natural reservoir), as far south as northern Mexico. Nawapa would create an interconnected network of rivers, canals, and reservoirs, carving out dozens of new major waterways in Canada, the United States, and Mexico, and would add at least 135 billion gallons per day to the freshwater supply of the lower 48 states of United States, as well as additional supplies to Canada and Mexico (see "Fresh Water Is Never Too Expensive," *EIR,* Dec. 18, 1992).

2. *Eleven dam/reservoir projects* (Figure 3). The 11 are from a list of 60 that could be constructed. They have all been exhaustively studied, and are all feasible. Among these 11 projects is the Auburn Dam. The real focus of opponents of the dam seems to be the admission contained in the 1993 California Water Update Plan, which stated, "In 1991, the Army Corps of Engineers completed a Feasibility Report and environmental documentation for a 545,000 af [acre-foot] flood detention dam at the Auburn Dam Site which would provide 1-in-200-year flood protection for Sacramento and vicinity." That is, in conjunction with other flood-control measures, it would provide against a flood twice as severe as the 100-year flood. This, opponents don't want.

Another proposal is to expand the storage capacity of the Shasta Dam/Reservoir, from 4.55 maf, to almost 14 maf. This would protect the Sacramento River directly, and greatly add to the amount of stored water that could be released for California's drinking, bathing, agriculture, and industrial use.

These proposed 11 projects combined, which are among the largest of the 60 on the Cal-Fed list, would add approximately 39.1 maf of new storage capacity. Most of them, the ones that are on-stream, would provide added flood protection, and all of them would add a huge amount of new freshwater, as well as hydropower. The total cost in 1996 dollars would be approximately $23 billion. Not all the 11 projects are needed at once, and the building of some projects would permit construction of some of the other projects in the future. But it is necessary to know that the solution to California's water shortages and flooding is at hand.

3. *Water desalination.* Taking the salt out of seawater is a technology that has been practiced on a limited scale for at least two decades. There are a number of desalination processes (electrodialysis membrane desalting, reverse osmosis, and so on), but one of the biggest stumbling blocks is making the process commercially feasible. While work goes on in that area, one of the most crucial features is to develop nuclear power, because desalination uses a large amount of energy. Cheap nuclear power, delivered by high temperature gas-cooled reactors (HTGRs), would help spur the process.

But these solutions are not being pursued in the nation or in California. In Figure 10, notice that the amount of irrigated agricultural land in California has declined 10% since it reached its peak of 9.7 million acres in 1981. If the Newt Gingriches and Pete Wilsons, and the London oligarchical financiers have their way, this will be slashed further.

The Flood of '97 demonstrates that it is not natural occurrences, but incorrect economic policies, that caused the vast majority of preventable damage. Rather than waiting for the catastrophe of the next flood, and the news media's retailing of ridiculous tales about why it occurred, there is a simple solution: Reverse the trend and put the emphasis back on one of the best examples of man's creative development—infrastructure.

George Chaffey enabled the Imperial Valley to bloom

California was developed by a republican movement's commitment to science. Work to reshape California is exemplified by the Imperial Valley, which was a stretch of sand until developed by George Chaffey, Jr., during the first decade of the 20th century, into a fertile producer of fruits and vegetables.

Chaffey was born in January 1848 in Brockville, Ontario, Canada, the son of George Chaffey, Sr., a shipper and shipbuilder who supplied iron ore to Cleveland, Ohio. Though the members of the Chaffey family were Canadian, their patrons were leaders of the Ohio and Pennsylvanian Republican parties, who strove in Abraham Lincoln's tradition, to populate the American West with farms and industry. Chaffey assimilated this method and this mission as his own. Chaffey went to work for his father as a marine engineer. At 17 years of age, he invented a new type of marine propeller that was faster than existing types and fuel efficient. It was fitted to many oceangoing and Great Lakes steamers.

From 1881 to 1886, Chaffey and his brother William, a horticulturalist, worked with spectacular success on two irrigation settlements in San Bernardino County, California, east of Los Angeles. In both cases, the land for the projects had been considered worthless, except as pasture-land. In 1884, Chaffey organized the Los Angeles Electric Company, of which he was president and an engineer, and made Los Angeles the first city in the United States to be lit exclusively by electric light.

During 1886-96, Chaffey worked developing irrigated settlements in Australia.

In 1900, Chaffey became president and chief engineer of the California Development Company. His job was to develop a desert area in the extreme southeast tip of California, which borders Mexico to its south and Arizona to its east. In its existing form, the desert land was valueless and had defied attempts to develop it. The area, which is now the Imperial Valley (a name Chaffey gave to it), had once been under the northern end of the body of water called the Gulf of California, where the Colorado River ends its run. The lowest part of this desert was called the Salton Sink.

Chaffey's job was to construct irrigation canals capable of diverting 400,000 acre-feet of water per year from the Colorado River to this desert area. He built a canal that crossed sand dunes in California, passed over into Mexico at the Alamo River, then crossed back into the United States. At this second crossing point, Chaffey founded the twin cities of Calexico, California and Mexicali, Mexico. Today, Mexicali has a population of more than 1 million people.

All told, Chaffey built a 70-mile-long irrigation canal, as well as 400 miles of irrigation ditches. He irrigated 250,000 acres, making the desert bloom. Between 1901 and 1904, some 10,000 settlers came to the area to farm.

The project enraged British-controlled President Teddy Roosevelt, who considered the miracle of the Imperial Valley offensive to his conservationist and anti-development sensibilities. Roosevelt used agencies of the U.S. government to break the California Development Company, and drive Chaffey out of it. In 1904, the Imperial Development Company went bankrupt. In 1911, it was taken over by the Imperial Valley Irrigation District, which manages the area to this day.

Chaffey's achievement endures. (See also, "Imperial Valley: The Desert Blooms, Despite Teddy Roosevelt," by Peter Chaitkin, *New Federalist,* Oct. 21, 1988.)

—R. Freeman