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► WATER

# A Tale of Delta Levees and Quakes

By Marc Reisner

SALSALITO, CALIF.

What bliss it must be to dwell in Southern California these days, bothered only by truck-topping desert winds as the rest of the state becomes an inland sea.

Southern Californians, of course, are entitled to feel relief that, for once, a major calamity happened somewhere else. But not too much relief. The sort of serial levee failure that inundated thousands of Central Valley homes during the New Year's floods could happen again, even in the dry season, when a powerful earthquake strikes on one of the faults that run near the Sacramento-San Joaquin River Delta. The consequences for the Southland would be like nothing it has experienced: in the worst case, it could lose half its water supply for two or three years.

Many Southern Californians may have only a vague idea where the delta is, what it is and what it once was. Encompassing 600,000 acres between Stockton and Sacramento and the East Bay hills, the delta is formed by the confluence of California's largest and third-largest rivers before they empty into San Francisco Bay. The



as they meander seaward, branch into a number of channels, or sloughs, that flow between levees protecting some 30 delta "islands," on which bumper crops of fruits and vegetables have been produced for almost a century and a half.

The delta levees and channels were never designed to serve as a critical link in the world's most far-flung water-delivery system, but, by default, that is what they are. Water released from the huge reservoirs,

formed by Shasta, Oroville and other Northern California dams is pumped southward through the delta, in these semi-natural waterways, to the wholly artificial rivers that sustain San Joaquin Valley agriculture and the Southland's \$350-billion economy.

Before the Gold Rush, the unimproved delta was the largest marshland west of Louisiana, a sightless expanse of tules and labyrinth of sloughs so confusing to Gen. John C. Fremont ("The Pathfinder") that he managed to lose a whole regiment for several days. But once farmers saw what the gold miners were willing to pay for fresh food—an 1850 dollar for an egg, four or five dollars for a watermelon—the delta's early conversion to cropland was foreordained. Millennia of tule growth and death had left behind a thick frosting of peat-like potting soil, and irrigation water, flowing everywhere, was close at hand. Late in the 19th century, successful delta farmers were building some of the most stunning mansions in the state.

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Marc Reisner, the author of "Cadillac Desert: The American West & Its Disappearing Water" (Viking Penguin), is a work on a new book about fin de siecle California.

COMMENTARY / ANALYSIS / TIMES INTERVIEW

# OPINION

# Water

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After decades of intensive cultivation, however, the delta's fatal vulnerability was increasingly obvious. Peat oxidizes when exposed to air; like rusted metal, the upper soil stratum simply disappears. (The tule cover and frequent flooding had generally prevented this, and the undammed rivers replenished any land loss by depositing fresh silt.) Light and fluffy, delta soils also blow away when strafed by the region's brisk summer winds, and heavy farm machinery compacts them. After subsiding for decades at a rate of several inches a year, half the delta islands have become immense, deep bowls, miles across and 10 to 20 feet below sea level. An area the size of the city of Los Angeles would instantly become an inland sea if levee protection were suddenly lost.

With water at sea level (or higher) on the one side and land two or three stories lower on the other, the delta levees are constantly stressed by hydrostatic pressure: mega-tonnages of water, in obedience to gravity, bear down on them 24 hours a day. You can stand in a delta island and watch pleasure boats pass overhead. Given that they function almost like dams, most delta levees are seriously underengineered; they have failed more than 100 times, mainly during floods. To make them strongly resistant to collapse (there is no such thing as a failure-proof levee) would demand an immense reconstruction program or, alternatively, an island-fill operation of equally grand scale to reverse ongoing land subsidence.

No matter how daunting and expensive, one course of action or the other seems inescapable. (Proposition 204, approved by California's voters last November, appropriates some serious money to begin.) A single levee break and one flooded island is a manageable affair; a mass levee failure is, from Southern California's point of view, an unthinkable event. Nature abhors a vacuum, and, since hundreds of thousands of below-sea-level acres are, in essence, just that, the vacuum will be filled—largely by salt water sucked inland from San Francisco Bay. Once there, filling several or perhaps a couple of dozen delta islands, the brackish water will be fearfully hard to get rid of; you would have to pump it out of the islands and then flush it back out to sea, something that would demand an imponderable quantity of water released from upstream reservoirs.

A worst-case computer scenario, modeled for the Department of Water Resources, has ocean water poisoning the delta—and half of the Southland's water supply—for three years when a mass levee failure occurs during a severe drought that has left the state's reservoirs half empty. In fact, some engineers and hydrologists wonder how a destroyed and inundated delta could ever be rebuilt and restored. Sodden, cavitated, battered by waves hurling themselves against their weaker interior sides, levee sections would be apt to fail as quickly as other

sections are repaired.

Meanwhile, where would Southern California go for more water? Its Colorado River aqueduct is operating at full capacity, and California already uses more Colorado River water than it is entitled to. Forget about Mono Lake. Even with more local reservoir storage for such an emergency, unprecedented rationing will soon be a fact of life.

In the recent floods, the delta levees performed much better than many had expected. One reason was they were inspected around the clock and, when a threatening leak or slump was found, feverishly repaired. (Without inmate crews, who performed much of the work, the delta likely wouldn't have held.) A major earthquake, on the other hand, is a much more powerful force than a flood, and one that takes you utterly by surprise. Subsoil conditions under the delta are similar to those that caused severe liquefaction and damage in San Francisco's Marina District during the Loma Prieta earthquake in 1989, even though it is more than 60 miles from the epicenter.

According to the U.S. Geologic Survey, the Hayward fault, which is 40 miles from the delta, has a 1-in-3 chance of producing at least a magnitude 7.0 earthquake during the next 30 years. The same odds were assigned to the Loma Prieta section of the San Andreas fault 11 months before it broke.

Even if the delta may not turn into a huge brackish-water sea during a levee-toppling earthquake that may not occur for 50 years, who is willing to bet how much that it won't? More important, what can Californians agree to do, if anything, to protect Southern California's and the San Joaquin Valley's main water supply?

The simplest solution would be to build a colossal concrete aqueduct around the entire region and call it anything but a peripheral canal. The problem is that such a canal is unlikely ever to be built; the last time it came to a vote, in 1982, it was trounced. To Northern Californians, a full-scale canal as envisioned in the past is simply an invitation to their southern neighbors to come up and build more dams and steal more of their rivers away.

On the other hand, a small peripheral canal, if we dare call it that—a canal just big enough for the Southland's reasonable needs—has a respectable chance of approval. Most Northern Californians are finally cognizant of the Southland's contributions to their material well-being, and besides, if Southern Californians don't have enough water, they will have to move up here. That leaves the San Joaquin Valley the odd man out, but a serious delta restoration and maintenance program would make its supply a lot more reliable than it is now, earthquake or come what may. Politically speaking, this "two-track" delta fix is the most likely to satisfy everyone (though it will, of course, satisfy no one), and it adds some redundancy to a water-supply system whose vulnerability is—after one has contemplated its weakness for a while—almost mind-boggling.

Buying some strategic delta islands at fair market value, and filling them in, is such a politically troublesome proposition

that the Department of Water Resources has resisted it so far. (For some reason, back in the '60s, the department was nonplused at the idea of constructing a 444-mile aqueduct from the delta to Los Angeles.) It should be thinking more heroically. A large section of the delta raised back to sea level—perhaps by reseeding tule cover atop a combination of mud dredged from Bay shipping channels and rice straw that Sacramento Valley farmers are no longer allowed to burn off—could then be restored as primordial marsh habitat; it would likely be the most significant wetlands restoration project in the entire world. Thus, there is a powerful economic incentive (sustaining shipping) and at least a couple of important environmental reasons (wetlands and air quality) to begin.

Ultimately, Southern California will drive the delta solution, whatever it is, when it finally awakens to what it stands to lose. Preoccupied by crime, economic recovery, Michael Ovitz, subway snafus and whatever else is on its collective mind, the Southland may have briefly forgotten that nothing is more important than water—than *imported* water, without which the region as we know it would simply not exist. Suppose that, someday, the water doesn't arrive. □