

THE WEST WITHOUT WATER

Imagine the entire Central Valley as a lake, in places overtopping telephone poles, thousands of people dead, one third of California's property destroyed, seven of every eight houses severely damaged, and the city of Sacramento under 10-20 feet of water for six months. Such actually was the scene, only 150 years ago.

Then imagine a drought 1,000 years long, that destroyed a Pueblo culture perhaps more savvy in drought survival than any humans then alive – another real event that ended about 1400 A.D.

As B. Lynn Ingram and Frances Malamud-Roam say in *The West Without Water: What Past Floods, Droughts and Other Climate Clues Tell Us About Tomorrow* (2013), the deadly climate patterns of the past are likely to recur in the future. And vastly larger floods and prolonged droughts than any we've experienced, are as certain as earthquakes.

Today, as a result of overtapping groundwater, the Central Valley has sunk, in some places as much as 28 feet, yet Sacramento has the lowest level of flood protection of any U.S. city. As the U.S. Geological Survey says, "this is the next disaster waiting to happen."

What would it take? A heavy early snowpack and an extended series of warm atmospheric river storms (pineapple expresses) from the Pacific, sending rain and snowmelt cascading down frozen earth. Today, in a storm equaling or surpassing the 1861-2 flood, ¼ of all California homes would be lost and 1.5 million residents forced to evacuate, with a cost of \$725 billion and the loss of many lives.

Over the last 800 years, 1861-2 sized floods have occurred on the Sacramento River every 100-200 years, and four mega floods every 200 years. The last was in 1605, and hence well overdue -- the evidence for recurrence is growing.

As for droughts, almost all of California's water arrives on 5 or 6 Pacific winter storms. Miss even a couple, and we have drought. Lake Powell and Lake Mead, on the Colorado, which store water for 30 million folks, including many Californians, could be useless for power or water storage by 2021. A decade of drought has already dropped Powell by 60%.

The authors say that 50-80% of California's water comes from snowpack. With global warming, as snow falls at higher elevations, northern California could lose half its annual snowpack.

How confident can we be that these professors' calculations are correct?

They draw on a wide range of long term studies among several disciplines, accumulating corroborative climate data from lake, swamp and ocean sediments, tree rings, glaciers, marine fossils, pollen, charcoal, etc. So they're beginning to have a clear, solid picture of past climate cycles, and hence can predict future ones with some confidence.

But surely our dams and dikes will protect us? Not necessarily so. Dams and canals have masked droughts and controlled floods during the benign 150 year fragment of climate we've experienced. But our long-term normal climate consists of extended droughts and violent floods beyond anything we've known. And even dams have short lives – they silt in and risk failure in massive storms.

What, then, should we do? Of course, conserve water in every way we can. Somehow legislate emptying the floodplains of houses and businesses, before they're destroyed. Consider the environmental cost of supplying water to huge populations during prolonged droughts. Stop growing water intensive crops in our "Cadillac desert" to supply the wetter half of the country. Try to embrace nature's cycles, including drought and floods, since we cannot control them.

Try to avoid the endgame violence of cultures collapsing under climatic pressure. Try, that is, to keep from shooting each other over a bucket of water.

