California's Groundwater:
A Political Economy

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Table of Contents

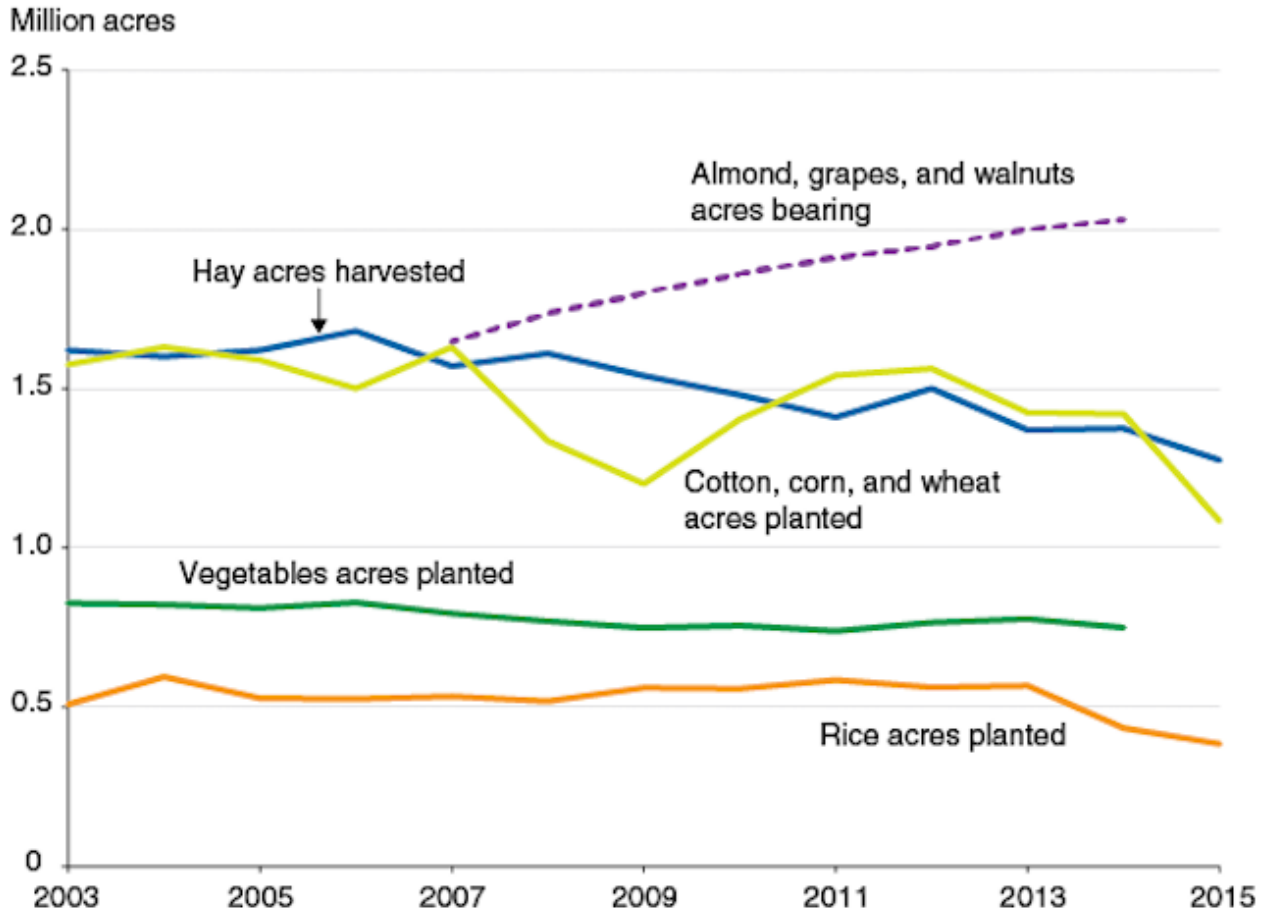
> "...Annie Cooper was looking outside her kitchen window at another orchard of nuts going into the ground. This one was being planted right across the street. Before the trees even arrived, the big grower – no one from around here seems to know his name – turned on the pump to test his new deep well, and it was at that precise moment, Annie says, when the water in his plowed field gushed like flood time, that the Coopers' house went dry."[1]

Introduction

Many suppose that Annie Cooper's story is emblematic of California's water problem. Often the culprit is named – almonds, pistachios, walnuts – each of which is very profitable to farm in California and is water hungry. It is true that California Almond growers supply 80% of the worldwide supply despite severe drought conditions in recent years. In 2015 a story in the Sacramento Bee reported that "the amount of California farmland devoted to almonds has nearly doubled over the past 20 years, to more than 900,000 acres." Similar increases have been experienced by other nut crops (pistachios, walnuts, etc). There is no question therefore that there has been an immense change Central Valley agriculture. The relative growth of orchard crops (compared with field crops) can be seen below. And, as we shall see, there is little question that this shift has caused wells to be drilled deeper and water tables to decline with the host of other bad consequences.

[1] https://stories.californiasunday.com/2015-01-04/disappearing-water-at-fairmead/

Orchard acreage is trending upward in California while other crops are declining



Source: USDA, Economic Research Service using data from USDA, National Agricultural Statistics Service, *QuickStats*.

The example is both dramatic and plausible but are nuts really the problem? Tree nuts are not really new in the valley and are no more thirsty than other orchard crops (peaches, apricots, nectarines, cherries) which flourish the Central Valley. And plunging groundwater tables are not new either: the rapid expansion of irrigated acreage in the 1920s and 30s produced the same effect. Indeed, looking back at the chart, what leaps out is a shift from lower to higher value crops. In principle, as water scarcity increases such a shift is a good thing and probably an efficiency gain. One could argue that it would be even better if agriculture were to use less

irrigation water overall, allowing that water to be used for even higher value purposes: domestic consumption, manufacture, or habitat preservation or whatever.

I do think there is a problem with groundwater but that it is not so much with its causes as with its effects. And the concern is not so much with efficiency as with distribution. Indeed, I suspect that large farms, because they are able to internalize costs and benefits, are likely to promote efficient water use in two ways: the first is aforementioned shift to higher value crops; the second is to shift to water farming (better known as water banking). Water banks permit the storage of water across drought cycles and appear to be a key aspect of more efficient water allocation. One could complain that the big farms get their water too cheaply and will earn unjustified rents for serving as water intermediaries. But that is a distributional complaint as long as the water finds its best use. And it is always true that the public could step in to correct distributional concerns. In any case California's populist heritage provides ample warning of the need for agribusinesses to keep public opinion onside. Sometimes, for this reason political convenience has led big farms to operate in ways that permitted smaller farmers to flourish as well. The family farm projected a fuzzy mythic glow that provided political cover for bigger and less popular growers. You can read it on billboards up at down highways 5 and 99. And farmers have votes too which were often needed in populist California politics. But as water competition has become more intense the interests of big and small farmers may no longer align and so we may be entering a new era of consolidation.

Anyway, what I want to ask in this paper is how it is that California water got to where it is today. As the reader will see, this question led me to focus on agriculture in the southern Central Valley and specifically on groundwater. This is where the critical action has been from the beginning economically, legally, and politically. Southern CV farms have always shaped water law and policy – on the ground, in the courts, in the state and federal legislatures and in direct elections too. Well that is not quite right: the farms and farmers have been somewhat transient players in creating the demand and supply of water. As Karl Marx said, "Men make their own history, but they do not make it as they please…" The more likely causal source is found in the peculiar climactic and hydrological characteristics of the region. The combination of abundant water in an arid and erratic climate has exercised persistent force in favor of

especially large integrated firms. While this claim seems simple enough, the path by which the material forces work is more complicated and is, in the end, political. In other words I want to claim that there are political economies of scale in California agriculture.

Historians have usually taken a dim view of the rise and persistence of large farms, seeing this as the result of dirty tricks and political shenanigans which undermined the favored family farm. But for those political tricks, the natural course in the region would have been small farms surrounding well populated and thriving villages and towns. This is apparently what Congress intended when enacting *Homestead Act* and various other statutes giving special preference to small farmers. Instead, we have nearly empty towns throughout the southern CV, mechanized agriculture dependent on transient and undocumented workers and overexploited and polluted groundwater. Historians and journalists can point to some parts of the Valley where their dream seemed to be realized.[2] But those were places where, despite the apparent aridity, there was adequate water to use for agricultural purposes and it was already well organized by private adventurers. Donald Pisani notes that the Fresno colonies were established between the San Joaquin and the Kings River which both had relatively large flows throughout the summer. [3] Nothing like this situation existed further South: the Kern often dried up in the southern months. The efforts of private water companies to build canals to water the area – however well financed – always collapsed when their investors finally surrendered. And the large ranches and farms picked up the pieces. The implicit belief is that things could have been otherwise and if they had they would have been better. I don't see it. The armies of transient labor needed to operate the

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[2] There were various efforts to organize colonies in various parts of California and some were successful. In the CV the Fresno colonies provide an example. The colonies were promoted by businessmen who subdivided and sold both land and water rights and were populated initially by Europeans. "… the era of expansion swept over the plains of Fresno County and transformed thousands of unproductive acres, that were once "too dry to support a horned toad," into a countryside rich with vineyards, orchards, and gardens, with a population so varied in respect to nationalities that no country on the globe appeared to lack a representative. Germans, Italians, British, Scandinavians (the Danes were the largest group of the Nordic races represented), Armenians, Portuguese, Russians, Mexicans, Chinese …turned their particular talents into any number of channels. And just as from the original colonies on the eastern seaboard had emanated the incentive to spread, so the pioneer agricultural colonies in Fresno County had been the centers of attraction from which settlers went into the outlying districts, until they had built up one of the most cosmopolitan communities in the state."): Virginia E. Thickens, "Pioneer Agricultural Colonies of Fresno County," *California Historical Society Quarterly*, Vol. 25, No. 2 (Jun., 1946), pp. 175-6.

[333] Donald Pisani, *Water: Land and Law in the West*, Lawrence: University of Kansas Press, 1996. P. 97. For the more hopeful view see Arthur Maass and Raymond Anderson, *And the Desert Shall Rejoice*, Cambridge: MIT Press, 1978.

large farms might have been needed in smaller ones as well. And where labor was replaced by machines the smaller farmer would have had to make the same substitution (if she could) or suffer lost profits. And, as to water, is it really plausible that large numbers of small farmers would be better motivated or able to internalize externalities than larger ones? The brutal fact is that, for all the tumult of its history and turnover of crops and ownership the large farm has persisted.

So. I want to tell a historical story. It has many parts but as far as possible I have tried to stage them as chronologically as possible. I will start, however, from the end – with what I take to be Annie Cooper's complaint.

1. Nuts

The distinguishing feature of any orchard crop is that an investment in a tree pays out over several years. Getting that payout requires that trees be watered during drought years or else the investment is lost. Thus, while nut trees are not the most water intensive crops in the CV (alfalfa and especially rice require more water) they must be watered every year. Unless they have ways to buy water tree farmers in the Southern CV therefore must rely on groundwater during dry periods. This requires them to drill deeper and deeper wells and purchase more and more costly pumps and this evidently drives up the price of irrigation.

Not surprisingly increased planting of nut trees has required new capital to invest in drilling and pumping deeper water. Increasingly financial entities such as mutual funds and private equity firms been supplying much of that capital. TIAA-Cref, for example, which "... owns 37,000 acres of California farmland, claims to be one of the globe's top five almond producers." Other large firms involved in the business are the Hancock Agricultural Investment Group which owns 24,000 acres of almonds, pistachios, and walnuts, and Paramount Farms, the largest producer, which has more than 70,000 acres in nut trees.[4] The entry of big firms with deep pockets seems to fit with Annie Cooper's story. Well financed companies drill deep wells in order to supply steady water for profitable tree crops with strong and stable international

[4] http://www.motherjones.com/environment/2015/01/california-drought-almonds-water-use

markets, drying up the wells of small family farmers and, no doubt, consolidating their worthless acreage into their own growing empires.

I have no idea who the "big grower" is in Cooper's lament but we may as well take it to be the biggest nut farmer in the Valley (and probably the world). We can take a look at what the new world looks like from its viewpoint. Paramount Farms is owned by the recently renamed "Wonderful" company which is itself owned by Beverly Hills based billionaires Stewart and Lynda Resnick. It is located "... a little to the west of Lost Hills ... Come at the right time of year and you'll see the almond trees blossoming, covering the valley in a blanket of light pink petals.... Those crops and the land are worth more than ever before, about $3 billion....Their oasis has plenty of water, the result of relentless opportunism that has given their orchards access to more water than nearly any other farm during the worst drought on record in California's history. The Resnicks use at least 120 billion gallons a year, two-thirds on nuts, enough to supply San Francisco's 852,000 residents for a decade. They own a majority stake in the Kern Water Bank, one of California's largest underground water storage facilities, which they got fairly but sagely from the government 20 years ago. It is capable of storing 500 billion gallons of water. They have also spent at least $35 million in recent years buying up more water from nearby districts to replenish their supplies."[5] Like the cattle and cotton empires that preceded it, the genius of the Resnick operation is vertical integration; they market the almonds both domestically (Blue Diamond) and internationally, they process them, they grow their own trees , most importantly, they own the water: not only the rights to the water (they have those too) but the actual water which is in their 'vaults' underground.[6]

By necessity, almond farmers have been very active in securing water rights. But water rights are not water: they are entitlements to a place in line and, in drought years, they do not result in actual water deliveries for those far down the queue. In the Southern CV nearly all water rights are "junior" and of little actual value during droughts. For that reason the farmers have to buy water from contractors who deliver waters from the big government run water projects. But

[5] http://www.forbes.com/sites/chloesorvino/2015/11/04/americas-nuttiest-billionaire-couple-amid-drought-stewart-and-lynda-resnick-are-richer-than-ever/#11bb6c1643d6

[6] The Resnicks have not stuck to Almonds. They also own Fiji Water, Telaflora, and POM Wonderful and a number of other lines of business.

again, in drought years, contracted supplies can be reduced. This is the reason for the increasing reliance on groundwater extraction. But big industrial farms have gone further. For example, Paramount Farms secured control over the Kern Water Bank in a swap that was part of the Monterey Agreement.[7] This allows them to control actual water which it stores from its allocation in wet years and withdraws in drought years. And as the bank holds nearly four years of supply they are often able to sell the excess to Southern California buyers or the state at very good prices.[8]

Because nut trees need a steady supply of water Big Almond spends a lot of money on legal and political efforts to assure that that water keeps flowing.[9] The swap for Kern Water Bank was essentially a settlement of a lawsuit brought to assure that environmental restrictions would not choke off the supply of state water project water. And the deal itself seemed a bit sweet: the Resnick's swapped low value junior rights for what has turned out to be an extremely valuable asset that permits them, effectively, to farm water as well as nuts. They are more subtle than the cattle and cotton kings were but they find ways to get to the table when things are being negotiated. The Resnicks are big contributors to cultural and educational institutions and it is

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[7] The story of how this happened is complicated. The state had bought land to prepare for a water bank capable of storing 1 million acre feet, to be fed by recharge ponds on the Kern River alluvium. But it was unable to get the project started and, so the story goes, exchanged control of the bank with the Kern River Water agency in return for its relinquishing rights to 45,000 acre feet of water per year. In effect, ownership was transferred to subsidiaries of Paramount Farms, which completed the construction and has successfully operated the bank since the late 1990s. See Mark Arax, "Massive Farm Owned by LA Man uses Water Bank Conceived for State Needs, "Los Angeles Times, December 19, 2003. Here is the story as told on the Kern Water Bank Website: http://www.kwb.org/index.cfm/fuseaction/Pages.Page/id/360

Water banking has become more and more widespread in California. Los Angeles has banked Owens Valley water from the beginning. Indeed, part of the motivation for annexing the San Fernando Valley was to acquire the underling aquifer which had room to store the imported water. There are many other such programs throughout the state.

[8] "According to an investigation by the *Contra Costa Times*, between 2000 and 2007 the Resnicks bought water for potentially as little as $28 per acre-foot (the amount needed to cover one acre in one foot of water) and then sold it for as much as $196 per acre-foot to the state, which used it to supply other farmers whose Delta supply had been previously curtailed. The couple pocketed more than $30 million in the process." http://www.motherjones.com/environment/2016/04/lynda-stewart-resnick-california-water.

Some environmentalists get upset by the fact that the Bank sometimes sells its water but, aside from distributional concerns, I am not sure it is objectionable. One can complain that the state should not have made the swap at all but the fact was that the state was unable to complete or operate the bank at the time. Maybe the state should have got more in return. In any case by building and operating the bank, not only does Paramount Farms get water in dry years, it also serves as a backup for the state when it needs the water. Whether or not the swap was a "bad" deal depends on what it would have cost the state to build and run a bank itself.

[9] http://elanormal.com/posts/17669-a-simple-explanation-for-the-paradox-of-how-california-s-almonds-boomed-in-the-drought

clear that philanthropy is part of their business model.[10] But sometimes old style politics works too.[11] Big farms like Paramount have often taken control of local water and irrigation districts, and have or are setting up water banks. The Resnick's Kern Country Water bank itself was one example but it is not the only one.[12]

2. Groundwater

The southern CV has long been a desert, averaging 8 inches of rain a year (perhaps only 5 inches in the western parts), with widely fluctuating flows both within and between years. The water normally arrives from the mountains rather than the sky. Until around 1900, however, that water was sufficient to form Tulare Lake, which was the largest lake in the United States west of the Great Lakes. Fed by southern sierra rivers the lake fluctuated in size between wet and dry periods and was often more than 600 square miles in surface area. It was surrounded by extensive wetlands and connected by swamps and sloughs to Buena Vista and Kern Lakes to the south. Until the late 19th Century, the lakes and wetlands persisted, providing an abundant habitat for elk, bear, trout, and birds. It was also a homeland to Native American tribes and, for fear of Malaria and the native inhabitants, had never been extensively settled by the Spanish or Mexican governments. There were a few large haciendas whose cattle wandered in the tules and fed on "natural" grasses, Hispanic rule did not alter the landscape of water or land. Nor did it much disturb the native populations who continued to hunt and fish the lakes and wetlands.

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[10] Here are some examples: "…$15 million to found UCLA's Stewart and Lynda Resnick Neuropsychiatric Hospital; $35 million to the Los Angeles County Museum of Art for an exhibition space designed by Renzo Piano and dubbed the Resnick Pavilion; $20 million for the Resnick Sustainability Institute at Caltech, which focuses on making "the breakthroughs that will change the balance of the world's sustainability." (Wonderful claims to have developed an almond tree that has 30 percent higher yields than a conventional tree, using the same amount of water.)" http://www.motherjones.com/environment/2016/04/lynda-stewart-resnick-california-water

[11] The capture of local water and irrigation districts by large farms has relied on controversial political concessions made long ago. Nowadays for example, votes in irrigation districts are allocated by land ownership rather than by population, as had been the case in the early days of water districts. Large farms have also been permitted to receive federal water despite acreage restrictions in the federal laws which authorize the provision of irrigation water. These concessions have allowed private entities to secure control of public entities and often this happened for good reasons. Whether or not these deals are desirable, these concessions may be less stable than they appear. We can see in the last years of the recent drought, repeated legislative efforts to disrupt or destabilize political arrangements at both the federal and state levels.

[12] In 2014 the Bureau of Reclamation published regulatory guidelines for water banks using Central Valley Project water. The document lists 9 such banks, all but one operated by water districts (including the Resnick's Kern Water Bank). https://www.usbr.gov/mp/waterbanking/docs/water-banking-guidelines.pdf

This peculiar topography was made possible by prehistorical developments. Between 600,000 and 700,000 years ago – not very long ago in geologic time -- the entire Central Valley was covered by a huge lake, which geologists call either Lake Clyde or Lake Corcoran. While the lake persisted fine sediments were regularly deposited on the bottom, forming a thick impermeable layer of "Corcoran" clay which prevented water from penetrating very deeply into the earth. The result was a shallow contained freshwater basin sitting atop a larger saline and very ancient aquifer that extends thousands of feet below the surface. Corcoran Lake lasted until a massive flood event permitted its water to break through what became the Carquinez Straits and empty its northern portions through bays and wetlands linked to the Pacific. The result was very different in the northern and southern parts of the Valley. In the north, "Over the long term, natural replenishment of the shallow aquifer was dynamically balanced by natural depletion through ground-water discharge, which occurred primarily through evapotranspiration and contributions to streams flowing into the Delta."[13] But the southern sierra rivers did not reach the sea and emptied instead into extensive lake basins in the southern Central Valley. That part of the Valley received most of its water from the Kings, Kaweah, and Kern Rivers, which issue from steeply plunging Sierra canyons onto broad alluvial fans. Over many thousands of years, the natural flow of these rivers fed networks of streams and washes which spread alluvial fans terminating in topographically closed sinks, such as Tulare Lake, Kern Lake, and Buena Vista Lake, and the extensive wetlands surrounding them.

The abundance of water could not hide the fact that the southern CV remained a desert in that it received less than 10 inches a year in rainfall. Until the early 20th Century the rivers remained wild and the water table was usually refreshed by spring runoffs. But early settlers soon suffered from droughts and floods and began trying to control the rivers and starting fighting about how to do it. The fights began violently with rivers diverted, cattle dying, people being driven off their land but proceeded to courts, legislatures, and agencies. In a democracy however, battles tend to end up in the court of public opinion.

[13] http://pubs.usgs.gov/circ/circ1182/pdf/06SanJoaquinValley.pdf.

There have been three critical periods in the modern story: the first, 1850-1930, saw the assembly and consolidation of the first big farms and ranches. The farms that flourished had to have the financial capacity to drain swamps and irrigate deserts and absorb the risk of periodic droughts and floods. Perhaps it is not surprising, therefore, that big farms also owned banks as well as many other lucrative nonfarm operations. Eventually the ranchers began to plant crops to feed the animals and, as transport costs fell, they began to export grains as well as meat. These supplied not only San Francisco and Sacramento but also east coast and international markets. The period was marked by intense conflicts over land and especially water. Many of the fights were fought out in courts as well as in the legislature and, indeed, on the ground as well, giving birth to California's distinctive form of water law.

The second period was dominated by the development of immense government sponsored water projects.[14] Not coincidentally it was also marked by the decline of cattle and grain businesses and rise of cotton farming, principally planted on lake bottom land that was especially vulnerable to floods.[15] The Federally funded Central Valley Project (1930 to 1950+) tamed

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[14] The earliest projects were run by municipalities in a kind of north-south swap. One involved the transfer of Owens River water to Southern California farms and municipalities. It was run by the City of Los Angeles and Southern California water agencies. The city of San Francisco did much the same thing in getting control of the Tuolumne River and flooding the Hetch Hetchy Valley. The Colorado River was more complicated as the waters flowed across state lines. It was made possible by the *Colorado River Compact* of 1922 – an interstate agreement to divvy up the River's water, made under the shadow of Supreme Court rulings favorable to lower basin state. The big Federal component began with the construction of Boulder (now Hoover) Dam in around 1930; other projects followed for decades, reaching far into the upper basin.

[15] The Miller-Lux cattle empire lost out to lower cost Chicago based cattle operations around the turn of the 20th century. Chicago meat packers were able to use new refrigerated railroad cars to reach west coast markets. The Chicago packers then managed to snatch the large feed lots south of the city from Charles Lux's heirs (he had died in 1887), and build modern meatpacking facilities that outcompeted Miller's meatpackers. Modern refrigerated facilities, end-to-end, made it easy for the Chicago Meat Trust to survive Progressive era food regulation. In fact they used the regulations as an advantage, driving out competitors who could not afford the machinery. By 1916, when Henry Miller died, his heirs were selling off large chunks of Valley land to pay off debt and continued to do so for years. There was also some bad genetic luck as the (first generation of) heirs were high-living spendthrifts who treated the farms as a piggy bank.

The cotton empire was built partly from discounted Miller-Lux land and partly from reclaimed lake bottoms farmed with water from the government funded water projects. Eventually, the cotton kingdom collapsed as well, under the pressure of falling world cotton prices. As the cotton markets became more competitive, J.G. Boswell, the son of the Boswell founder, turned increasingly to real estate development. He was a major investor in the development of Sun City, the first really large and profitable retirement community.

In its place rose a new empire based on trees and especially nuts. The acreage devoted to almonds and other nut trees in the Southern and Western Valley has been increasing rapidly in the last decades due partly to the relatively high and stable prices that tree nuts command on world markets and partly to comparatively low production costs made possible by subsidized water.

Northern California rivers and harnessed their waters for Southern CV irrigation projects. As it developed the CVP impounded waters on central and southern Sierra streams as well, regulating flows into the Southern CV. The California State Water project (1960 to 1980+) was built largely to transport water to Southern California but to get water over the Tehachipis required a big political coalition and, as it happened, Southern CV farmer were willing partners as long as the water was cheap.[16] These As a result the projects were pushed and shaped substantially by large CV farm interests. The big projects were both creatures and creators of politics and law. Water law had to make room for the emerging fact that to run a water project government had to get control of pre-existing water rights if that water was to stored and put to use.

The third period, which is still going on, is characterized by escalating municipal demand for water combined with intensifying environmental demand to leave water in its natural courses in order to protect species habitat. These new demands have increased competition for water putting pressure on irrigation, driven up water prices, and intensified pressures to rely on well water. But drilling and pumping are increasingly costly and damage the overlying land as well as collapsing underground hydrologic structure. Some of this damage is irreversible. But whether that is so or not, the increasing cost of irrigation water has encouraged farms to shift production toward higher value commodities (orchard crops) and away from grain, feed, and cotton.

This may seem like a local story, confined not merely to California or the Central Valley, but to an even smaller and more desolate section – the southern Central Valley or Tulare Basin. But the issues here are broader and typical of a kind of political geography. Groundwater issues are global: "The world is in an historic crisis from a shortage of fresh clean water. Seventy percent of the world's fresh water is used by agriculture, and of this, a substantial fraction is underground. Groundwater withdrawals are greater than inflows on every continent. In some cases, water tables are falling by one to three meters per year ... the bulk of the problem is with

[16] There are many estimates but the overall magnitudes of subsidy are not in much dispute. "CVP farmers get about one-fifth of all the water used in California, at rates that by any measure are far below market value. In 2002, the average price for irrigation water from the CVP was less than 2 percent what Los Angeles residents pay for drinking water, one-tenth the estimated cost of replacement water supplies, and about one-eighth what the public pays to buy its own water back to restore the San Francisco Bay and Delta." http://www.ewg.org/research/california-water-subsidies.

agriculture, and the bulk of the problem in agriculture is with groundwater."[17] One worry is that as greater *quantities* of groundwater are mined and water tables drop other problems will follow: underground water-holding structures will collapse (compactify) and the land above will sink (subsidence), and there will be less of it to use. Another concern is that the *quality* of groundwater will fall, either because recycled irrigation water may be polluted by fertilizer and pesticide residues (making it unsafe to drink), or because deep water may be excessively saline or contaminated by heavy metals. And many worry that these effects may be irreversible.[18]

The groundwater "problem" is evidently mostly attributable to irrigated agriculture. This can be seen from two basic facts: first, groundwater use and depletion is heavily concentrated geographically in arid areas. A recent article argues that most of the measured depletion (worldwide) is actually "...driven by a few heavily overexploited aquifers."[19] In California, these problems are mostly confined to arid areas such as Southern California and in the southern and western parts of the Central Valley, and areas east of the Sierras.[20] These are places where groundwater has been used to irrigate crops in years when rainfall is sparse and where, for various reasons, aquifers are not adequately recharged naturally. In wetter areas, even if groundwater is drawn down during droughts, natural percolation usually refills aquifers when the

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[17] John F. Raffensperger, Mark W. Milke and E. Grant, "A Deterministic Smart Market Model for Groundwater," Operations Research , Vol. 57, No. 6 (Nov.- Dec., 2009), pp. 1333-1346. These engineers were interested in setting up a general market solution to correct chronic misallocation of groundwater (or any other scarce resource). Their model had to recognize and come to grips with special features of groundwater that make its allocation more difficult than surface water.

[18] The quantity and quality issues are often linked in complex ways. Extracting too much groundwater near coastal areas can lead to salinization from seawater incursion. And, the need to maintain high quality water supplies to municipalities may lead to more extraction of groundwater for irrigation. And there are quality-quality interactions too; ensuring high quality water transfers to Southern California users can lead to increased salinization in the Delta region.

[19] Recent research suggests the limits to the issue: places like the Ganges Basin, the Arabian Aquifer, and the Canning basin in northwest Australian – all of which contain extensive deserts and very uneven water flows. In the US, the study also notes that the southern part of the High Plains aquifer (Kansas to Texas) is severely depleted as is the southern CV aquifer in California. Alexandra Richey, Brian Thomas, Min-hui Lo, John Reager, James Famiglietti, Katherine Voss, Sean Swenson, Matthew Rodell, "Quantifying Renewable Groundwater Stress with GRACE," Water Resources Research, 51. Pp. 5217-5238

[20] This is not to say that groundwater is not sometimes overexploited in other areas of California. But, again, in wetter areas, such as the Sacramento Valley, aquifers normally refill during the Winter and, in any case, are not dependent on groundwater except in periods of severe drought. It is not very surprising that that there is a global correlation between aridity (measured in annual rainfall) and fights over water. These fights often involve groundwater which is hard to measure and where extractive rights are uncertain or contested. The consequences are sometimes violent but, just as often, results in highly repressive governmental regimes. See Eyal Weizman and Fazal Sheikh, The Conflict Shoreline, Steidl, 2015.

rains come. Second, groundwater problems have varied systematically over time in ways that largely track the development of large scale irrigation. In the Southern Central Valley for example water was plentiful until the early years of the 20th Century but, as irrigation schemes spread, "Eventually, the yields of flowing wells diminished as water levels were reduced, and it became necessary to install pumps in wells to sustain flow rates." By "...1930, the development of an improved deep-well turbine pump and rural electrification enabled additional ground-water development for irrigation."[21] As a result of these developments groundwater extraction in the area steadily increased and, by 1955, a quarter of all US groundwater extraction was being pumped in the Central Valley -- mostly in its Southern and western expanses. "Until 1968, irrigation water in these areas was supplied almost entirely by ground water...." and water tables were sinking: "As of 1960, water levels in the deep aquifer system were declining at a rate of about 10 feet per year. Western and southern portions of the valley generally experienced more than 100 feet of water-level decline in the deep aquifer system." What had happened over this period was the emergence of "factory farms" operating in a desert environment which must rely heavily on groundwater.[22]

It would be wrong to conclude that groundwater depletion has been impossible to manage in those places where it has been a problem. In Southern California, for example, cities and farmers have long struggled to manage conflicts over groundwater for years, but eventually they were able to use the courts to stabilize water tables. But agricultural demand for water in Southern California has been declining and, by itself, this takes some of the pressure off. In the Central Valley farmers have usually tried to manage groundwater on their own, though not without frequent appeals to federal and state governments for assistance. The big farms, however, were in no hurry to invite regulators onto their land. In any case the farms are big

[21] http://pubs.usgs.gov/circ/circ1182/pdf/06SanJoaquinValley.pdf , page 27.

[22] Ibid, page 29. A few years later the State Water Project began to run water through the canal system making cheap surface water available to the southern CV. Groundwater mining became uneconomic except as a backup in dry spells when surface supplies failed. "...since 1974, land subsidence has been greatly slowed or largely arrested ...." The pause proved temporary, however: "... during the severe droughts in California in 1976–77 and 1987–91, diminished deliveries of imported water prompted some water agencies and farmers, especially in the western valley, to refurbish old pumping plants, drill new wells, and begin pumping ground water to make up for cutbacks in the imported water supply." P. 31.

enough that they can often take direct action on their own, and to use the courts where necessary without involving federal or state regulators.

Legal evolution has been an important part of the story. Historically groundwater was considered to attach to the land: if you owned property you had unrestricted access to the water beneath it. In effect, then, the *overlying interest* had first call on the groundwater and could use or sell it as wished, without taking account of the effects of withdrawals on others. For a long time, moreover, there were physical limitations on how much groundwater would be taken – imposed by the costs of digging and pumping it (relative to the cost of importing surface water) – so the extent of externalities was limited.[23] But pumps and drills got better and cheaper and more people moved in amplifying external effects and, as a result, groundwater management got more difficult. The old system remained in place, however, into the Twentieth Century, at which time courts began to impose restrictions on groundwater use which required users to take some account of the external effects of mining water (such as drying up neighboring wells or impairing the flow of nearby streams).

By the late 20th Century, however, increased demand for water for environmental and municipal uses combined with demand by irrigators, who were rapidly switching to high value orchard crops and away from traditional field crops, put new pressures on groundwater.[24] The prolonged droughts early in the 21st Century threatened a resumption of chronic groundwater overdrafts of the mid 20th Century. But, as we shall see, while groundwater tables are continuing to recede, USGS data suggest that southern CV farmers have increasingly found ways to replenish groundwater supplies during wet years by banking surplus water. We will explore how and why this has occurred below.

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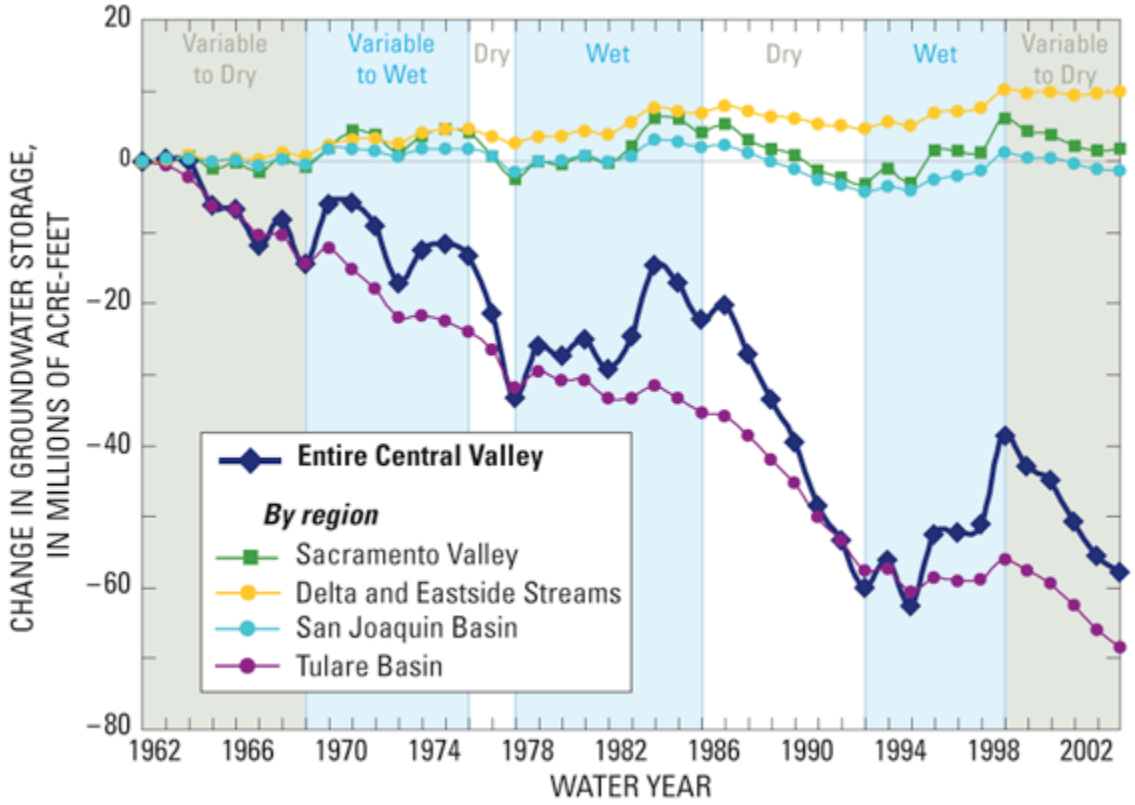
[23] Indeed, some recent research suggests that underground supplies in California are much larger than previously thought, though the newly found waters are very deep and not always of high quality. See Mary Kang and Robert B. Jackson, "Salinity of deep groundwater in California: Water quantity, quality, and protection," PNAS, ☐ 1600400113

[24] See Thomas Gleeson, Yoshihide Wada, Marc Bierkens, Ludovicus van Beek, "Water Balance of Global Aquifers Revealed by Groundwater Footprint," Nature 488 (August 2012), 11295-. The Ganges,for example, rises out of rain shadow of the Himalayas and is fed mostly by glacial runoff.

As can be seen in this figure, since the 1960s, nearly all of the recent decline in groundwater storage in the Central Valley is attributable to withdrawals in Tulare basin. I have found no comparable illustration for earlier periods, but there is evidence (adduced below) that there was a rapid decline in water tables in this area from 1920 to 1960 as well. And, from that evidence the Central Valley lands to the north suffered no such decline. Indeed, the problem in the north was often that the water tables were too high.



Evidently, some groundwater recharge happens during wet years from the flows of the Kern, Kings and other southern rivers. Beginning in the late 1960s imported water from the big water projects permitted some recovery in groundwater levels in the southwestern part of the valley.[25]

[25] "In the early 1960s, groundwater pumping caused water levels to decline to historic lows on the west side of the San Joaquin Valley, which resulted in large amounts of surface subsidence. In the late 1960s, the surface-water delivery system began to route water from the wetter Sacramento Valley and Delta regions to the drier, more heavily pumped San Joaquin Valley. The surface-water delivery system was fully functional by the early 1970s, resulting in groundwater-level recovery in the northern and western parts of the San Joaquin Valley. Overall, the Tulare Basin portion of the San Joaquin Valley, the hottest and driest part of the Central Valley, is still showing declines in groundwater levels and accompanying depletion of groundwater storage." http://pubs.usgs.gov/fs/2009/3057/

But little of this recharge took place in the Tulare basin until the 1990s, when waterbanks in the area began more systematic efforts to recharge the basin. But, as can be seen in the chart, in dry years Southern valley farms still draw more from aquifer than has been banked and water storage continues to decline, if less quickly.[26] Moreover, wet years seem to be less frequent than they have been historically so there is more and more reliance on groundwater. [27]

3. From Political Economy to Industrial Organization

The key to the building and keeping big farms is partly economic but also legal and especially political. The cattle and cotton kings needed state and federal officials to look the other way as they got control of land to assemble their farms. They needed courts to help them settle the disputes that arose as they bumped up against one another and to keep populist forces at bay. And they came to need more active government help to impound water to prevent floods and provide impounded water cheaply for irrigation.[28] Almond farmers are no different in this respect. There were always opponents: well financed rival firms fought them for land and water on the ground as well as in financial and export markets in Europe and the east coast. And fights often ended up in political capitals or before the voters. And smaller farmers fought to gain

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[26] In 2003 there were active recharge programs in about 30 of California's 400+ basins. Peter Kiel and Gregory Thomas, "Banking Groundwater in California: Who Owns the Aquifer Storage Space?" Natural Resources & Environment, Vol. 18, No. 2 (Fall 2003), pp. 25-30.

[27] I will not discuss water quality issues here except in passing. The use of irrigation runoff to recharge groundwater can lead to increases in salinity, heavy metals which impair drinking water. For years farmers have sought governmental assistance to channel waste water away from their farms to prevent the destruction of their farmland. Farmers have an interest in in preventing the destruction of their farmland caused by the buildup of salts and heavy metals. The prospect of losing farmlands may induce landowners to find ways to maintain sufficient groundwater quality to prevent the destruction of farmland. But it is not clear that they have an incentive to fully internalize the health effects of recycled irrigated water especially as much of their workforce is transient. As long as water is used for irrigation and combined with the use of pesticides and fertilizers, water deteriorates in quality, because nitrates and other pollutants percolate into shallow aquifers. This is so regardless if the water is from wells or is imported from northern rivers.(Gary Bobker, "Agricultural Point Source Pollution in California's San Joaquin Valley," Natural Resources & Environment, Vol. 9, No. 3 (Winter 1995), pp. 13-16). The problem is especially vexing for people, farm workers and their families, who rely on wells for drinking water and other household uses. Many studies have documented serious health effects from drinking low quality well water and shown the (expensive) measures taken by impoverished local communities to try to defend against these effects. Carolina Balazs, Rachel Morello-Frosch, Alan Hubbard and Isha Ray, "Social Disparities in Nitrate-Contaminated Drinking Water in California's San Joaquin Valley," Environmental Health Perspectives, Vol. 119, No. 9 (SEPTEMBER 2011), pp. 1272-1278. Camille Pannu "Drinking Water and Exclusion: A Case Study from California's Central Valley," California Law Review, Vol. 100, No. 1 (February 2012), pp. 223-268.

[28] Mark Arax, The King of California: J.G. Boswell and the Making of a Secret American Empire, New York: Perseus Books, 2003.

political leverage against the land "monopolists" by devising state sanctioned schemes to break up or limit the reach of the big firms. The key to survival was to maintain political alliances.

Karl Wittfogel argued years ago that this kind of agriculture –he called it *hydraulic agriculture* – could only flourish under a "despotic" government.[29] Only despotic rulers, he thought, would be able to conscript needed labor and capital to build the big water projects needed to do the job, exerting whatever force is needed without the burdens of due or legal process. As a corollary, he argued that a successful despotism must build an army to defend its newly watered land. But this military capacity would also permit the regime to expand. Thus, he thought that in these conditions, only a unified central government could internalize the costs and benefits of hydraulic agriculture. In effect, then, Wittfogel's argument is that there are strong *political* scale economies to farming in desert regions. Wittfogel might have been right about political scale economies but wrong about the need for government control. Eleanor Ostrom's work has largely aimed at showing that under some conditions, it is possible for smaller farmers to coordinate their behavior sufficiently to manage fairly large hydraulic tasks. Wittfogel might have responded that even if self help alternatives existed, the most convenient coordination device would nevertheless have been a government with unchecked coercive power. And such an entity, once created, would have had ample capacity to snuff out competitors.

It might seem farfetched to expect Wittfogel's brand of governmental despotism to arise in the Central Valley which is, after all, embedded inside an established democratic governmental system with well developed courts and legal traditions.[30] Whether that is so depends on how "despotic" rule is understood. The traditional definition, given by Montesquieu and Kant, is simply this: despotism is arbitrary rule, unconstrained by law. But on this definition, a people can be ruled despotically in various ways, only some of which involve the government as the principal actor. While government might rule by lawless decree as Wittfogel imagined, it is possible that powerful private actors could ignore a weak government and rule

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[29] Karl August Wittfogel, Oriental Despotism.

[30] Wittfogel applied his theory to places (early Northern China, ancient Peru, Central Mexico, etc) which were both arid and had warrior cultures whose leaders would have been highly motivated, for reasons of security and defense, to find ways to make their desert productive enough to support a powerful army. Hydraulic agriculture was their only option.

without regard to law. Alternatively, private actors might be able to capture government and get law to conform to their wishes. These last two forms of rule count as despotic (by the classical definitions) insofar as law is not acting as a constraint on either account. In any of these three models the the people are subjected to arbitrary choices by powerful entities uncontrolled by law. One or both of the latter alternatives describe fairly well the way that large farms have been able to run things in the Southern Central Valley. [31]

As we will see, the farms in the area rapidly became powerful enough that they shaped much of the law that ostensibly controlled them and were, for that reason, able to act without regarding the law as constraining their actions.[32] When the Central Valley was first settled (by Europeans), very large enterprises were established, partly to manage the scarce and erratic waters in the area, and partly to protect their unfenced domains. Both state and federal laws ostensibly limited the formation of large farms by imposing acreage limitations on land acquisition. These were effectively ignored and big San Francisco based companies managed to take control of Spanish and Mexican land grants and employed networks of agents and dummy purchasers to buy huge parcels no matter what the statutes said.[33] Cattle were put into the swampy land first but soon enough, swamps were drained and feed planted, and the area shifted

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[31] The classic political science study of despotic rule by private organizations is Grant McConnell, Private power & American democracy, New York: Knopf, 1966. For careful descriptions of way the vast Miller-Lux Ranch was run internally and relations with neighbors and competitors see David Igler, Industrial Cowboys:Miller&Lux and the Transformation of the Far West,

[32] Lon Fuller argues that despotic rule is not very efficient and that other forms of organization would have been more effective, even in the ancient empires he considers. Maybe. But it is hard to argue empirical regularities away and Fuller does not even try. It may be much more difficult to find and coordinate on other governmental forms even if they are more efficient. Lon Fuller, "Irrigation and Tyranny," Stanford Law Review, Vol. 17, No. 6 (Jul., 1965), pp. 1021-1042. Fuller spent his childhood in California's Imperial Valley, another "hydraulic society," and saw little trace of despotism as a young boy, remembering instead a bucolic community. While I agree that Wittfogel's thesis needs modification if applied inside a democratic polity, I am not persuaded that Fuller was looking in the right places for despotic rule in his neighborhood. The cotton farms of the Imperial Valley at that time were, in fact, largely controlled by one immense company – The Colorado River Land Company-- and were operated by legions of imported laborers, initially Chinese and Japanese, soon to be replaced by Mexicans fleeing revolutionary disturbances in their own country. And the CRLC successfully pioneered the capture of federal land schemes and state agencies to run their irrigation and cropping schemes, often in direct violation of state and federal laws. For a history of irrigated agriculture along the Mexican border, see Casey Walsh, Building the Borderlands, College Station: Texas A and M Press, 2008.

[33] The treaty ending the Mexican War had required that Spanish and Mexican land grants would be honored but frequently the Hispanic owners found that they could not afford to litigate their rights and it necessary to sell to the big farms. The initial holdings of the Miller-Lux empire were built from the haciendas.

to irrigated farming. The shift to irrigation required lots of unskilled labor and these San Francisco based farms were increasingly worked by transient labor, as skilled Mexican-American vaqueros were gradually replaced (by unskilled Asian immigrants followed by Mexicans and Italians). The surrounding small farmers depended on these huge farms for water and off season employment. Farm managers became judge, jury and policeman to the local population. Though the large farms were "private" enterprises, they invariably developed extensive political operations: conscripting local governments to do what they themselves could not easily do as private actors and using their agents to shap both state and national water policy to their advantage. The political footprint of these behemoths forced both opponents and allies to play by their rules.

There has always been political resistance to these private despotisms. The area has long been marked by labor strife and episodes of violence. And small farmers have occasionally been able to mount legislative assaults on privileges claimed by the big farms. Their advocates have sometimes tried to impose "progressive" restraints on the capacity of big farms to exploit the public domain. More recently the tide of complaints about the environmental effects of the big irrigation schemes has resulted in state and federal legislation which has increasingly constrained the big operations. At times these oppositions have succeeded and governments tried to place some legal and constitutional limits on the organization of private and public power in the area. But for the most part these efforts ultimately failed as the representatives of agribusiness have been able to outspend, outlast and outwit the opponents.

We expect, therefore, a version of Wittfogel's theory to apply to the southern CV: the need to acquire reliable water supplies advantages big vertically and horizontally integrated organizations capable of making and executing strategic plans and financing them. Such entities must be agile enough to react to the extreme and fluctuation weather conditions in the Valley. They must be capable also of adapting to market conditions on both ends of their enterprise: economizing on labor and other input costs while responding to evolving (and increasingly international) markets for their products. As well, they would need to react effectively to the shifting political environments in which they were embedded (national, state and local). This required that they dominate local governments and exert sufficient influence on state and federal

governments to extract subsidies while minimizing regulatory restraints on their operations. As we shall see, the big farm has always been the characteristic organizational form in the area, from the time of the Haciendas. Indeed, when a large farm has failed, as has happened a few times, it was replaced not by small farms but by another behemoth able to exploit political scale economies effectively.

This pattern of industrial organization has shaped the political economy of groundwater. Groundwater shortages are a problem for society: the falling water tables threaten to destroy farmland and dislocate people. But they are both a problem and an opportunity for large farms. The problem is familiar: increasing costs of drilling and pumping, declining water quality, compaction of soils, and land subsidence threaten to drive down profits. The opportunity is that empty aquifers can be used as for water storage, permitting their owners to arbitrage water between wet and dry periods. Large farms incentives to internalize (some of) the costs of extraction and recharge which are required to manage successful water banks. They have the political capacity to get governments at all levels to let them do it. There are of course distributional complaints about encouraging agribusiness to enter water intermediation business. And there could be antitrust worries as well.

The combination of abundant water and fertile soil attracted settlers to the southern CV from the time of statehood. The area was settled soon after the gold rush as settlers saw profit in feeding the miners and growing towns and cities and stakes were put down in the fertile wetlands. The southern valley was immediately hospitable to ranching, as cattle could feed on abundant native grasses in the wetlands. Initially, there was too much water and it was in the wrong places. Moreover, California water flows are both seasonal and erratic. Water floods into the Valley during the Spring runoff and then little rain falls until the following winter. And there is great year to year variability in quantities. The early ranchers soon found the need to control and move water around: to drain swamps and plant feed to supply increasing numbers of cattle. The problem for early settlers was to build operations capable of draining and channeling water, often over long distances, in order to make the land productive. This required access to capital

and credit.[34] In this sense weather related risks reinforced the "political" scale economies in the region as only large farms could afford to impound water to smooth out flows. Soon ambitious San Francisco businessmen and lawyers invaded the territory, seeing opportunity in the vast new lands and legal chaos.[35] The area came to be dominated by a few very large farms whose owners and agents were able to take advantage of the lawless situation to accumulate immense domains (despite federal and state acreage and residence limitations on lands acquired from the public domain).

4. **Early History**

Historians have long noted that, from the beginning, southern CV settlement has been dominated by very large farms. Some have speculated that this is due to the nature of farming suited to the extensive wetlands. The early CV settlers usually started with cattle and then, as lands were made suitable for farming, started planting alfafa and grain which could be farmed on a large scale. The eminent historian Donald Pisani noted "An 1872 California legislative report showed that each of 122 individuals and companies owned more than 20,000 acres in California. These landowners were cattlemen, wheat farmers, and a wide variety of speculators, including former state officials. Bixby & Flint held 334,000 acres; Miller & Lux 328,000; William S. Chapman and associates, 277,600; Edward F. Beale, 173,000; Isaac Friedlander, 107,000; and Dibble & Hollister, 101,000….. He argued for the importance of water scarcity as an explanation for the stability of large farms. "in most parts of the state, irrigation and water law ultimately reinforced early patterns of land tenure…."[36]

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[34] While there were some large Spanish land grants in the Valley much of the land was owned by the federal government as public domain. Congress granted some of the lands to the state in the *Swamp Land Act* (1850), and others were made available to individuals under various federal statutes including the *Homestead Act*, the *Morrill Act* (1862), and vast tracts were also given to the Railroads. Additionally various statutes permitted (Union) veterans to buy property cheaply.

[35] At the time California became a state, the federal government owned the public domain lands but the waters were governed by state law. The treaty ending the Mexican war required recognition of Spanish and Mexican land grants (subject to a ruling by the federal land commission). But it was often so costly to validate a grant that the original "Californio" owners often had to sell the land anyway. Various federal statutes granted lands to the state as in the *Swamp Land Act*. Both the federal and state governments established programs to permit qualified individuals -- Veterans and homesteaders, and others who promised to develop or reclaim swamp or desert land -- to purchase public domain land cheaply. Individuals could obtain scrip or warrants entitling them to purchase small lots. These rights were, however, traded and quickly fell into the hands of a few big ranchers.

[36] Pisani op cit. p. 26

The big farms soon drained the marshes and lakes, often channeling the water west and northwest into arid lands west of the San Joaquin.[37] Once that land was drained, however, farmers still needed to get water to irrigate their fields. Upstream miners and earlier settlers had already diverted local rivers and held most of the legal rights to the water. Farmers, big and small, were forced either to bargain for water or to drill wells but the technology for drilling and pumping was primitive. Well financed operations bought up miles of river frontage which carried rights to water. Water and land law at that time were both unclear and contradictory, and the problem of getting water rapidly became political: a matter of accumulating sufficient power to influence outcomes in courts or legislatures or, failing that, on the ground. One needed armies of workers, lawyers, and public officials to be successful. If the risks were great, the rewards were greater, especially for the large ranches and farms that came to dominate the southern landscape; there was plenty of reason to keep fighting even if you lost in one venue or another.

This development is quite puzzling from the standpoint of the economics of farming. [38] The literature on scale economies in farming generally does not find decreasing production costs beyond moderate sized farms. "...farm average cost curves are generally L-shaped. Costs fall rapidly as size expands for a limited range, but after a minimum size, costs decline very gradually, if at all, and farms are distributed across a range of sizes based on some criteria other than economies and diseconomies of scale…" [39] The author goes on to however that "...changes in technology have meant that the minimum-cost farm size has been shifting out over time." If

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[37] The process was more complicated of course. Various private water companies attempted to set up schemes to build canals and ditches. Some of these were mutual companies or cooperatives but the big operations floated bonds (often in Europe) with the purpose of building large scale works which they hoped would be paid off by sales of irrigation water. Most of these schemes failed but some failed better than others in that they or their ditches were acquired by big landowners or municipalities. Later on public irrigation districts were formed for the purpose of constructing ditches and levies.

[38] For a comparison of developments in the Tulare basin compared to the Fresno area which had more abundant surface water see Donald Pisani, "Land Monopoly in Nineteenth-Century California," Agricultural History, Vol. 65, No. 4 (Autumn, 1991), pp. 15-37.

[39] Daniel A. Sumner, "American Farms Keep Growing: Size, Productivity, and Policy," The Journal of Economic Perspectives, Vol. 28, No. 1 (Winter 2014), pp. 155. According to the following study they are largely exhausted -- ie. The cost curves flatten out -- by the point at which farms achieve modest size measured either in acreage or sales. There appear to be some (small) scale advantage for grains and cotton compared with vegetables and fruits. Bruce F. Hall and E. Phillip LeVeen, "Farm Size and Economic Efficiency: The Case of California," American Journal of Agricultural Economics, Vol. 60, No. 4 (Nov., 1978), pp. 589- 600. In any case, that there are only modest scale economies in farming does not imply that there are no scale economies in marketing or at other points along the chain to consumers. Nor does it imply that there are no political scale economies.

we are to understand why southern CV farms have been so large we must look outside the farms themselves for an explanation. Perhaps the vertical integration of production and marketing can supply an explanation. Certainly the cattle, cotton and almond empires were all integrated in this way. I think that vertical integration with supply is a more likely place to look. And there are two prominent ingredients to farming – land and water – that exhibit special characteristics sufficient (I argue) to generate big scale economies.

The largest early operations were run by Henry Miller and Charles Lux -- Rhineland born San Francisco butchers who followed separate paths to booming San Francisco and who combined to extend their business to include slaughterhouses, feed lots, and cattle ranches in the CV – and James Ben Ali Haggin, a powerful Sacramento lawyer who, with his partner and brother-in-law, Lloyd Tevis, controlled one of the largest mining companies in the world (including, among other things, Anaconda Copper Mine, Homestake Mine and Ontario Silver) as well as banks and other businesses.[40] Charles Lux functioned as the public face of Miller-Lux in San Francisco, running its legal and financial operations, and he did double duty as its Sacramento lobbyist when necessary. Henry Miller ran the ranch.[41] They were well connected to the city's financial elite and grew the business from their own butcher shops to meatpacking, feedlot operations, cattle ranching, and then irrigated farming. "The corporation expanded its landownership by using a broad network of agents who helped the firm navigate California's institutional landscape."[42] "Miller and Lux did not refrain from exploiting the desperate situation of many indebted Mexican landowners who had to sell their ranches as a result of the California Land Law of 1851, and they also cleverly used laxly administered land laws, such as the Swamp and Overflow Lands Act of 1850, the Homestead Act of 1862, and the Desert Land Act of 1877, to their advantage.... Miller and Lux sometimes also utilized unfair and illegal means to obtain land titles, such as using so-called dummy buyers, engaging in exploitative

[40] Haggin and Tevis soon relocated to San Francisco and, effectively, abandoned their law practice for the pursuit of business interests of their own. Jame Haggin remained a Kentuckian at heart, and his real passion was raising horses: he eventually returned to his home state to raise thoroughbreds (building the largest such operation in the world).

[41] David Igler, Industrial Cowboys: Miller and Lux and the Transformation of the Far West, 1850-1920, Berkeley: University of California Press, 2005.

[42] Igler, p. 90.

credit-giving practices, and bribing state officials."[43] It was not pretty as it depended fundamentally on corrupting both public and private agents.

Land acquisition was only the first problem; control of water was even more important and this required more ruthless methods. The threats came from two sides: upstream farmers who claimed water rights, but also from adventurers seeking to enlist prospective settlers with the hope of reclaiming desert land. There were two important schemes – private and public – to build canals and irrigation ditches, seeking passage through Miller-Lux lands and threatening their water supplies. In 1876 the state authorized the formation the West Side Irrigation district which was to take over a private scheme to build a navigable canal extending from Tulare Lake to the San Francisco Bay, a distance of more than 150 miles. The district was given eminent domain powers and was to hold elections to elect officers to exercise its function. Henry Miller saw the danger and soon got himself on the board. Soon "Miller & Lux ... used its land and property rights to gain control of California's first major irrigation project, the San Joaquin and King's River Canal & Irrigation Company. In the process, the two partners scuttled plans for the West Side Irrigation District, at least temporarily delaying the movement toward locally controlled irrigation."[44] Eventually a large part of the canal was built by Miller-Lux (without the navigation feature) allowing it to retain control of its water and postponing the threat that democratically controlled irrigation districts posed to their interests.

As it happened upstream interests were actually the larger threat. The single minded and ruthless James Haggin moved in next door. Haggin was at least as well connected as Charles Lux to the San Francisco business elite and he saw a great opportunity in cheap Valley land and began a political campaign to get his hands on as much as he could. He knew well enough that the state legislature had effectively tolerated (if not encouraged) the growth of the Miller-Lux corporation. Moreover, "Haggin... matched Miller & Lux's skill for manipulating state land laws and officials. [He] secured close to sixty thousand acres of Kern County railroad lands during the

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[43] Britta Waldschmidt-Nelson, Henry Miller: Cattle King of California, German historical institute, 2013. http://www.immigrantentrepreneurship.org/entry.php?rec=153. Waldschmidt-Nelson defends Miller-Lux's methods as being not "unusually" ruthless for the time. It was a land rush after all and victory goes to the swift and strong and the lawyers (and hagiographers) need to clean up the mess later.

[44] Igler, p. 90.

1870s through an alliance with William B. Carr – sometimes called Billy or Boss Carr – a powerful Republican Party leader, also known as the 'political Napoleon of the Southern Pacific Railroad Company.' Previously withheld from settlers, these lands comprised some of Kern County's most valuable real estate. Haggin next followed Miller & Lux's lead by seeking out public lands. With the assistance of California's Senator A. A. Sargent, Haggin and his cohorts orchestrated the passage of the *1877 Desert Land Act*, an act perfectly designed for acquiring Kern County's dry acreage. During the first month of the act's operation, Haggin paid hundreds of San Francisco residents to file 'dummy' claims on Kern County's desert lands."[45] "To water his desert lands, Haggin began purchasing the surrounding land and water rights claimed by early settlers, as well as the controlling interest in many small irrigation canals." And by 1877... Haggin had gained control of almost every irrigation ditch diverting the Kern River's flow."[46]

By the time Haggin began his land-acquisition campaign Californians had become skeptical of land monopolists. Historian Donald Pisani argued that "By the 1870s, the state's easily arable land was gone, and the legislature which had done much to encourage monopoly in the 1850s and 1860s debated ways to break up these giant holdings …."[47] Haggin, as a late arriver, had to manage public opinion as well as the land office. When "...the San Francisco Chronicle and other newspapers lambasted this premeditated grab of Kern County real estate, Haggin defended his actions with the promise to reclaim and offer the land at public auction. He would turn 'wasteland' into farmland, Haggin wrote, and divide his acreage into small tracts and sell them out to farmers, with the water-rights rights necessary for irrigation." [48] It is hard to know who believed such self interested cant. In any case, he was not above using blunter methods for managing public opinion: "Haggin ... stymied local criticism through his control of the ditches upon which farmers relied for irrigation. This 'Grand Khan of the Kern' could easily decide not to provide a particular farmer with water. Finally, his Kern County Land Company, organized in 1875, was the largest employer in the county, and few small farmers could bypass

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[45] "He particularly sought the even-numbered sections to match his odd-numbered railroad lands. In this manner, Haggin claimed over a hundred thousand acres north and south of Bakersfield....."Igler, p. 102

[46] Igler, P. 102

[47] Donald Pisani, "Land Monopoly in Nineteenth-Century California," Agricultural History, Vol. 65, No. 4 (Autumn, 1991), p. 16.

[48] P. 102

the opportunity for off-season employment. Most Tulare Basin residents had some connection to 'the Company,' as the Kern County Land Company came to be known in the 1880s. Years later, one paper convincingly argued that the 'development of Kern County is so closely allied with the growth of the Kern County Land Company that the story of one is the story of the other.'"[49]

Both Miller-Lux and Haggin controlled banks and other businesses, and both had integrated their farm businesses into larger and often disparate enterprises. They had each allied with railroad companies to expand the range of markets for their products and to get special deals on federally granted land. Both had stables of high priced lawyers and acquired the lobbyists and public officials needed to expand and protect their businesses. The important point is that, even as political opposition mounted against "monopolies," the hard conditions of the Southern CV favored the development of big diversified farms with deep pockets and substantial political footprints in Sacramento, San Francisco, and Washington DC as well.

It was inevitable that Haggin and Miller-Lux would square off at some point and a severe drought in 1877 provided the occasion: Haggin took the entire flow of the Kern to water his farms and, as a consequence, thousands of Miller-Lux cattle starved. Miller-Lux sued and organized other farmers downstream from Haggin's holdings to do the same. In what became the famous case, *Lux v Haggin*, Miller-Lux lawyers argued that Miller-Lux's riparian rights were being illegally violated by Haggin's appropriation of Kern water. We will look into the litigation in the next section but it is important to see that the struggle between the two 'land monopolies' was only partly about water rights. As Miller-Lux and Hggin both held riparian and appropriative rights on their vast holdings, neither had a clear stake in the doctrinal dispute. Indeed after the final ruling, they had little difficulty finding an agreement to divide up the Kern between them. Both remained, however, vulnerable to voters in city and country, and especially to aspiring settlers who wanted in on California's bounty. The Grange and other organizations eagerly drove anti-monopoly sentiment against both of the big farms. If Miller-Lux and Haggin (and their powerful railroad and mining allies) had the money, these other groups had the votes,

[49] Igler 102-3.

and sometimes votes beat money. The fate of the big firms rested on their being able to keep the public from getting too exercised about monopoly.

By the turn of the 20th Century private investment by these large firms was sufficient to drain the swamps and channel rivers, in order to irrigate much of the Valley. But there were limits to private schemes. Repeated irrigation depleted and polluted the soils, reducing productivity and profit. Moreover, periodic floods could wipe out years of expensive irrigation works and prolonged droughts would render them useless. And lots of the land was being ruined by excessive irrigation from the Tulare and Buena Vista lakes. Successful irrigation needed a better and fresher water supply, from higher in the mountains or further north. It also required upstream dams to control period floods that would wipe out expensive irrigation works. Eventually political pressure would be put on the state and federal governments to find ways to smooth and stabilize flows: to make the rural economy a more efficient machine. The big farms already had built large political operations and were not reluctant to plant agents in Sacramento and San Francisco and use them to build the political backbone for government water projects. As we shall see however, this could not happen until Washington and Sacramento had become less receptive to popular anti-monopoly sentiment. But that story will wait.

5. Water Law: Courts v Legislature 1850-1930

Private rights to surface water in California are allocated in two ways: first *riparian* rights give landholders adjacent to waters right to use those waters. California is unusual among western (semi-arid) states in recognizing common law riparian rights. Most of the other states have used appropriation as the sole basis for their water law. Riparian rights attach to the land and cannot be forfeited by nonuse. And it is well settled law that riparian water rights are not transferrable to nonriparian land but many ambiguities about such rights have had to be litigated.[50] Moreover, a riparian can contract not to use her right. (the Department of Water

[50] *People v. Shirokow* (1980) 26 Cal 3rd. For example, if a riparian buys adjacent land away from the river, is she entitled to water that land from the river? What purposes are considered beneficial and reasonable. These and other questions have been answer in various ways. Another, possibly deeper question is whether under riparian doctrine water is property.

Resources has entered into many such agreement with Delta farmers). And riparian rights may be condemned in eminent domain proceedings.

Second, rights can be acquired by *appropriation*. Prior to 1914, someone could claim an appropriative right (to presumptively unappropriated or surplus) to public domain waters by notoriously taking the water (diverting a stream or impounding its flow) and putting the water to reasonable and beneficial use. The creation of such a right normally required posting a notice so that any other potential claimant "knew" of the trespass and could object before it ripened into a right. After 1914 rights were appropriated by administrative permitting processes (now lodged in the State Water Resources Control Board, SWCB, under various provisions of the California Water Code.). Appropriated rights can be lost if they are abandoned or not used for a period of time. And they can be transferred as long as the transfer does "no injury" to other entitled users. Moreover, the first appropriator has rights "senior" to those of later appropriators ("*first in time, first in right"*). Riparian and pre-1914 appropriated rights are called *senior* rights; others (either acquired later or in some other way) are *junior* to those rights (and seniority among those junior rights is further regulated by the first in time principle).

The Riparian doctrine is traceable to Roman law and became part of the Common law only in the early 19th Century.[51] It was incorporated into California law in around 1850 in a statute that established the common law as the "rule of decision" for the state. It is not clear that the legislators at the time were aware that the common law included the riparian doctrine,[52] and

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[51] The creation of Riparian rights doctrine in the Unites States is generally attributed to a federal, judge Joseph Story, who, in *Tyler v Wilkinson* (24 Fed. Cas. 472 (No. 14,312) (C.C.D.R.I. 1827), established the principle that a riparian had a right to a reasonable use of the water. This notion was soon promulgated by Chancellor James Kent in his treatise, Commentaries on American Law published in 1828. "Both Story and Kent [actually] drew heavily upon civil law in promulgating the reasonable use doctrine. Kent cites in his Commentaries the Code Napoleon, which had become the law of France in 1804; and although Story's opinion cites no civil law source directly, it is strongly flavored with the approach suggested by the Code Napoleon." T. E. Lauer, "Common Law Background of the Riparian Doctrine," 28 Mo. L. Rev. (1963), 62. The new doctrine was rapidly adopted by American judges and soon spread to England. "It must ...be kept in mind that these American jurists did not simply adopt an English common law doctrine. The reasonable use test was decidedly not English in its origin. Indeed, it was 1851 before the Court of Exchequer 8 adopted the riparian doctrine, and in so doing it cited both Kent and Story as authority." Lauer, 62.

[52] It goes without saying that rights are initial conditions for bargaining. It is sometimes said that appropriations doctrine is more pro-development than riparian doctrine. On the Coasian view this is not so. The difference between them is merely distributional. No matter who holds the rights, the parties ought to bargain to an efficient outcome.

few could anticipate what a time bomb it could be for landholders in the state. After all, under riparian doctrine, if someone bought riverfront property they acquired the rights to enjoin any upstream claims to desist from impairing their riparian rights. So while old upstream diversions were protected (as long as they were used), new uses, however valuable, were required to satisfy downstream users under the no injury standard.

Those who hold "senior" water rights can normally expect to receive their nominal allocations while junior rights holders may sometimes have to purchase water from more senior rights holders (from a water contractor), or drill wells on their property instead. Under California's system, junior rights holders risk losing their rights unless they actually use them regularly. Historically, courts had to sort out conflicts over water rights.[53] Before the big farms were established, gold miners had already made intensive use of water to work their claims, diverting rivers to faraway mines, and dumping immense quantities of waste downstream. As settlers moved into CV lands downstream, conflicts ensued between mining and agricultural land uses and most of these disputes had to do with water. Moreover, large and well-funded farms came into frequent conflict with one another – again usually over access to water. All sides appealed to the courts to settle their disputes. Lacking coherent doctrine – or rather, having two incompatible doctrines -- the courts were forced to craft new law capable of resolving these conflicts. As we will see, the critical cases – the ones that came to form California water doctrine -- arose from disputes in the Southern CV.

Another type of right is important where water is scarce. A *prescriptive* right is similar to an appropriative right which is a right to unappropriated or surplus water. Unlike an appropriative right, however, it can be claimed only when there is no surplus water "Prescriptive groundwater rights are not acquired by taking surplus or excess water. An appropriative taking of groundwater that is not surplus is wrongful, and may ripen into a prescriptive right [only] when the use is actual, open and notorious, hostile and adverse to the original owner, continuous and uninterrupted for the statutory period of five years, and under a claim of right. (See, generally, *City of Barstow v. Mojave Water Agency* (2000) 23 Cal.4th 1224.) Prescriptive groundwater

[53] Mark T. Kanazawa, "Efficiency in Western Water Law: The Development of the California Doctrine, 1850–1911," The Journal of Legal Studies, Vol. 27, No. 1 (January 1998), pp. 159-184.

rights are most often obtained when someone pumps groundwater during an obvious overdraft condition." [54] As will be shown below, while prescription is especially important in allocating groundwater, in some circumstances prescription is also available for surface waters.[55]

Initially, private rights to water were determined in struggles among settlers – miners, farmers and ranchers – in a kind of legal state of nature. The problem, however, was not that there was no law. Rather, there was too much law:[56] California had adopted contradictory legal principles for determining water rights. Courts initially played the central role in resolving disputes among claimants, but as there was no overarching principle to reconcile contradictions, court decisions amounted to judicial legislation. Eventually state agencies came to play the more important role in regulating private rights. Some municipalities (Los Angeles for example) also held "pueblo" rights conferred by the Spanish which could assert claims prior to private rights over water (though the reach of these claims had to be litigated). Evidently then, the California public claimed authority over water that could be expanded and elaborated as water became more scarce and valuable. We will see later that the evolving "*public trust*" doctrine – which has served as a legal basis for environmental claims – finds its foundation in this legal/political fact.

Both riparian and appropriation doctrines date from the state's earliest days. Appropriative rights originated in the goldfields as miners diverted streams to mines (which were often miles away from the stream). Under the appropriations doctrine, the use of water for mining was rights-conferring as long as the use continued. But appropriative rights could lapse if not used "continuously." Moreover, an appropriative right trumped any downstream rights as long as it preceded those claims in time so that someone could not buy up river frontage in order

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[54] There are other kinds of rights as well that I do not discuss. *Pueblo* rights are held by some towns that were established under Mexican rule. And *A SUMMARY OF THE CALIFORNIA LAW OF SURFACE WATER AND GROUNDWATER RIGHTS*, (memo posted by the BARTKIEWICZ, KRONICK & SHANAHAN in Sacramento at http://www.norcalwater.org/wp-content/uploads/bks_water_rights.pdf).

[5555] *Brewer v. Murphy* C.A. 5th; April 3, 2008; F051700.

[56] Readers of Hobbes will see the parallel. In his state of nature, there is not silence with respect to rights; rather there is cacophony: each person is able to say what rights he and others hold. The establishment of a sovereign resolves this babble by conferring a monopoly on the sovereign to say what each is required to do. Leviathan, 1651.

to invalidate upstream appropriators' rights.[57] A miner, if he got there first and used the stream for a long enough period could thereafter divert all the water for his use leaving none for downstream use. But if riparian rights were claimed, an upstream appropriator was limited in the use he could make of the water. Later doctrine required new upstream appropriations claims to satisfy a 'no injury' test, which effectively gave riparians a kind of veto over late arriving appropriators (as long as they could actually show injury).

The potential for fighting was evident and suits were soon filed against appropriators who, it was said, were trespassing on riparian rights that could not legally be lost through nonuse.[58] The case law went back and forth for a few years, generally favoring the appropriations doctrine in the lower courts. That doctrine had already recognized well established practice in the mining areas, which had increasingly relied on expensive water intensive hydraulic techniques as most of the cheaply exploited "placer" deposits had been exhausted (by around 1852).[59] But in 1886 the California Supreme Court suddenly decided for riparian rights, reversing a lower court ruling in *Lux v Haggin* (1886). The suit arose from a conflict between the two dominant farm empires in the southern CV: Henry Miller and Charles Lux had acquired huge swaths of land in the Valley from the 1850s, especially on the western side and in the Tulare basin. These areas benefitted from the overflow from the Kern River that found its way ultimately to Tulare lake. Haggin had acquired large tracts of arid upper Kern acreage (upstream from Miller-Lux property) which carried appropriated rights to the river from prior diversions and he proceeded to build a huge new canal to take Kern water further into his desert holdings. When drought struck in 1877, Haggin's diversions took the whole flow of the river for irrigation and there was not enough water to reach the downstream Miller-Lux ranch. Thousands of their cattle died, provoking both real and legal violence. The resulting suits

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[57] While a watercourse could support riparian rights even if its flow was seasonal (and was dry some of the time), courts still required that water appeared regularly, so that if a stream dried up permanently it would not support riparian rights. Then there is the issue of meanders.

[58] Riparian rights, unlike appropriative rights are "correlative": the rights holder is not entitled to a fixed quantity of water but his use must be correlated with the rights of other users. Moreover, riparian rights are subject to *prescription*, which permits a trespasser to establish a right by an "adverse" diversion as long as he maintains that diversion for at least five years. These features of riparian rights had the effect of exposing Miller-Lux to endless claims and litigation, requiring essentially political deals among claimants or else run the risk of the vagaries and whims of judges.

[59] Rodman Paul, California Gold, Lincoln: University of Nebraska Press, 1947.

involves some of the highest priced legal talent in the State and is justly famous for establishing the preeminence of riparian over appropriative rights, but in the end the dispute was actually heavily based on factual matters.[60]

There were two questions: were riparian rights superior to appropriative rights? And, did Miller-Lux actually have riparian rights to Kern River water? Haggin's lawyers sought to avoid the issue of the priority of riparian and appropriative rights by arguing that Miller-Lux actually had no riparian right at all. Haggin's lawyers argued that the Miller-Lux claim was based on the false assertion that the Buena Vista Slough (which ran between Buena Vista and Tulare lakes) was a watercourse or river rather than mere swampland. Miller-Lux countered that there was, in fact, a recognizable stream in place despite the fact that the area was often swampland. While the trial court initially ruled for Haggin, on appeal the Supreme Court decided in favor Miller and Lux. It accepted Miller-Lux's claim that the Slough was a waterway and argued that common law had not been abrogated and that the downstream riparian was entitled to his rights and could not lose them by a prior diversion no matter how well established. Once the legal matter was settled both sides came to see that there was no further point in fighting over abstract principles and rapidly agreed to divide the Kern between themselves (Bremer, pp. 197-220).[61] The effect pf *Lux v Haggin* was to shift initial entitlements but, once those were fixed the parties still had interests in reaching a "Coasian" agreement that would allow them to control the water rather than letting it leak out to third parties, such as those who aspired to settle the land and get their water where they could.[62]

But Haggin had another card to play first. Small farmers throughout the Valley had long been convinced that their interests lay with the appropriators as that doctrine permitted the settler

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[60] Haggin and his partner, Lloyd Tevis eventually controlled the Homestake Mine in South Dakota as well as the Anaconda Mine in Montana. They bought out Wells Fargo and also grew the largest thoroughbred breeding business in the world, eventually shifting this operation to Haggin's native Kentucky.

[6161] Miller-Lux built an upstream dam to impound Kern water so that there the river would still flow even during dry periods and 2/3 of that flow was allocated to Haggin.

[62] By the 1870s, the state's easily arable land was gone, and the legislature which had done much to encourage monopoly in the 1850s and 1860s debated ways to break up these giant holdings …." Donald Pisani, "Land Monopoly in Nineteenth-Century California," Agricultural History, Vol. 65, No. 4 (Autumn, 1991), p. 16. But Pisani also pointed out that in other agricultural western states, these large farms tended to break up presumably because scale economies were not sufficient to support them.

on dry land to find a nearby stream and stake a claim to its water. Indeed Haggin brought in lots of small farmers on his side in the litigation. However unlikely success may have been in such efforts, farmers experienced *Lux v Haggin* as a blow to their rights. It was easy enough to portray Henry Miller as a deep pocketed monopolist using riparian claims to snuff out the small family farm. Predictably, therefore, in the tempestuous atmosphere of California politics in the 1880s this sense of grievance soon ripened into fierce political and legislative attempts to restore the legal status quo ante. William Carr (who we met before as "Boss Carr"), James Haggin's land agent and an accomplished spoilsman, organized the initial political reaction.[63] "Carr, aided by screaming, protesting farmers, helped to organize an anti-riparian convention in San Francisco in May 1886, and again pressured the state government to act against the court's ruling. Carr then toured the state and convinced a bare majority of state senators - and a vast majority of state assemblymen - to sign a petition that urged Governor George Stoneman to call a special session of the legislature to rewrite the state's water laws. Reinforced by a massive number of mint julips and other drinks, the governor, in an advanced state of intoxication, signed the executive order to convene the legislature on July 20. The special session was a squalid affair. Votes were reportedly bought and sold for outrageous prices.... Carr's men reportedly paid $300 to each assemblyman who voted for the constitutional amendment abolishing riparian rights and another $600 if the amendment passed the Senate" (Bremer 217) In the end however "...wagon loads of Miller's money, helped to destroy the chances to overturn the court's riparian ruling in the legislature." (Bremer, 218)

This was not, however, the end of the matter. Carr's appeal to the "people" or the legislature was soon to prove dangerous for the large farms. As time went on it was hard to see how Haggin was really any different than Miller: both held rich empires and indeed both controlled large portfolios of riparian as well as appropriated rights. Popular sentiment in the state ran heavily against "monopoly" land and water interests and their reliance on immigrant

[63] "Historian Donald Pisani described Carr as "the most powerful man in California politics during the late 1870s and 1880s." Carr had migrated to California during the gold rush and had made huge profits in the construction of mining ditches and levees. He eventually made important political and business connections in San Francisco and Sacramento where he met his future employers." Jeff, Bremer, "The Trial of the Century: "Lux v. Haggin" and the Conflict Over Water Rights in Late Nineteenth-Century California," Southern California Quarterly, Vol. 81, No. 2 (Summer 1999), p. 204.

farm labor. And Haggin fit the description as well as Miller. Popular pressure rapidly appeared for legislation to protect smaller farmers against wealthy ranchers. What was wanted was something that would allow the small farmers to form irrigation districts with the capacity to condemn interfering riparian rights unless those rights holders cooperated. And to be useful to the small farmer, those districts should be governed by majorities of people rather than acreage. "The unpopularity of *Lux v. Haggin* … helped to provide support for the passage of the *Wright Irrigation Act of 1887*, which authorized the formation of irrigation districts to distribute water to non-riparian lands." (Bremer 219) These districts were exactly what the populists wanted: "...the act authorized the formation of irrigation districts as special units of local government. Fifty or a majority of landowners in an area could secure organization of a district upon approval of the county board of supervisors and two-thirds of the electorate in the affected area. Once organized, the district had the power of eminent domain to obtain water through condemnation of the necessary riparian rights."[64]

The idea for these new creatures had long been urged by reformers as a way that smaller farmers could organize themselves cooperatively and compete with the larger firms.[65] Large landowners, like Henry Miller, worried that the new powers given to the *Wright Act* commissions would allow local majorities to impose unwanted projects and assessments on them. California courts however, accepted, the "public" character of irrigation districts in upholding the Wright Act. In *In re the Bonds of the Madera Irrigation District*, 92 Cal. 296 (1891) and permitted the districts to choose their own voting rules. This made the big landowners very nervous. Suits were soon brought to state and federal courts arguing that Wright districts were 'taking' property without compensation. The US Supreme Court rejected that challenge in 1896, deeming reclamation a form of public use and arguing that the

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[64] Gordon Miller, "Shaping California Water Law, 1781 to 1928," Southern California Quarterly, Vol. 55, No. 1 (SPRING 1973), p. 24. The Wright Act was controversial. "One Reclamation official considered the Wright Act a model for irrigation legislation in the west. Others claimed it was a good idea, but badly implemented. Future Reclamation Commissioner, then Wyoming State Engineer, Elwood Mead declared the Wright Act, "a disgrace to any self-governing people.

[65] Though there had been some earlier (unsuccessful) efforts to authorize irrigation districts the model for the Wright Act, was the 1876 West Side Irrigation District, discussed above, which had been strangled in its crib by Henry Miller. "The original act is of great interest historically, however, because it set forth the framework and much of the verbiage of the general irrigation district legislation to follow in 1887." Frank Adams, Irrigation districts in California, Sacramento, State Print Office, volume 21, 1929, p. 15.

Commission procedures constituted adequate process. It looked, by end of the 19th Century that the era of the big industrial operations was finished and that voters – either in local districts or in state and federal legislatures were about to place limits on the "industrial" farmers in favor of the little guy.

Immediately however "The districts' encountered problems in selling their bonds, filling their reservoirs, and fairly allocating water."[66] Most of the Wright districts failed: "49 districts were organized of which 26 went beyond the point of organization and seriously attempted to function... only 8 of these have survived.... 6 of the 8 having...financial reorganizations."[67] The long term significance of the *Act* was clear, however, to the big famers: if area residents were given the power of the initiative to organize and run local reclamation schemes and could use eminent domain powers to condemn other water claims, what was to stop them from expropriating investors? If the courts were unwilling to stop these unconstitutional creatures or limit their powers, other steps had to be taken to limit the damage they could do. Ten years later, when populist forces had cooled or became distracted, an opening appeared. "Under pressure from large landowners, California amended the Wright Act in 1897, stopping the establishment of irrigation districts until the formation of the Irrigation Districts Bond Certification Commission."[68]

The Commission was given certification authority over bond issues, requiring that project benefits and assessments be allocated in proportion to acreage and that project benefits exceed costs. While the districts were not required to get initial Commission approval for a bond issue and the state did not guarantee the bonds, certification made it easier to sell bonds that passed muster. Moreover, once certified bonds were issued, it was thereafter illegal for the district to issue any further bonds without approval of the Commission. With this amendment, irrigation and other water districts soon became a central fixture of California's water government. "In contrast [with the failed Wright Act districts], the second wave of district formation (1909-1927) was to meet with long-term success. During this second wave, 112 irrigation districts were

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[66] Eric A. Stene The Central Valley Project – Introduction, http://www.usbr.gov/history/cvpintro.html.
[67] Wells Hutchins, Irrigation Districts, Their Organization and Financing: Technical Bulletin 254(June 1931), US Department of Agriculture, p. 72.
[68] http://www.usbr.gov/history/cvpintro.html.

formed, several of which remain active up to the present... This period witnessed the decline of the private irrigation company as the irrigation works of many of the largest and most important private companies were acquired by irrigation districts."[69] Donald Pisani dates the actual surge in district formation to the post World War One period when immense new acreage came under irrigation, driving up property values and cementing California's domination of agriculture. At the same time, this period saw water tables begin to fall, especially in the Southern and Western parts of the Valley.[70] Not surprisingly, these new districts increasingly fell under the control of the larger landowners.[71]

Indeed, their capture may well have been the key to their success in managing water in a peaceful way. California courts soon permitted the property based franchise to elect representatives in reclamation districts: "Six years after the *Madera* judgment, reclamation districts were found not be municipal corporations like irrigation districts, but quasi-corporations, 'part of a scheme for conducting a public work, and not for self-government.' (*People ex rel. Sells v. Reclamation District No. 551*, 117 Cal. 114 at 123 (1897))..... no one is a voter therein in the sense of section 24 of Article I, and section 1 of Article II of the constitution; nor is their organization rendered invalid because votes for the trustees of the district are allowed to be cast in proportion to the ownership of property therein. . . ."[72] The California Supreme Court eventually (unanimously) approved property qualification for reclamation districts in

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[69] Edward McDevitt, "The Evolution of Irrigation Institutions in California: The Rise of the Irrigation District, 1910-1930,"· The Journal of Economic History, January 1966.

[70] Donald Pisani, From Family Farm to Agribusiness, Berkeley: UC Press, 1984. Chapter eleven.

[71] Until the early 1960s California statutes tended to feature property qualifications in all kinds of water district elections. The situation at that point (when 'one person one vote' jurisprudence commenced) was striking:

> "In the Westlands Water District, for example, a district which comprises 597,778 acres and has more than 3,000 landowners, ten landowners account for 43 percent of all the land in the district. This situation, coupled with assessed valuation voting, means that a handful or so of corporations and individuals effectively controls district elections. Nominating petitions for the 1971 board elections in Westlands indicate how trusts and corporations relate to political influence. In that year a current board of directors member signed a nominating petition in the following manner: in his own name; as vice-president of one corporation; as president of another; and as trustee of a children's trust. In the *Tulare Lake Basin Water Storage District*, four corporations farm nearly 85 percent of the district's land, and the J. G. Boswell Corporation alone, with its vast landholdings, commands 37,845 votes, enough to determine who is elected to the district board of directors." Merrill R. Goodall and James B. Jamieson, "Property Qualification Voting in Rural California's Water Districts," Land Economics, Vol. 50, No. 3 (Aug., 1974), p. 293.

[72] David Martin, "'One Person, One Vote' and California's Water Districts," Natural Resources Lawyer, Vol. 8, No. 1 (1975), p. 10.

Barber v. Galloway, U95 Cal. 1 (1924). The legal basis for the capture of water agencies by large farms was complete – at least until the Warren Court began to turn things upside down.

California courts were not yet persuaded, moreover, to set aside common law (riparian) doctrine. In its aftermath, courts generally ignored or interpreted the *Wright Act* and other legislative enactments very narrowly. Over the forty years following *Lux v Haggin* California courts repeatedly held that appropriators were mere trespassers with respect to riparian rights holders and were unable legally to diminish their rights. In 1909 the state Supreme Court stated quite brutally: "As against an appropriator who seeks to divert water to non-riparian lands, the riparian owner is entitled to restrain any diversion which will deprive him of the customary flow of water which is or may be beneficial to his land. He is not limited by any measure of reasonableness."[73] This last phrase is key: it meant that the court understood the riparian right to be essentially absolute. The rights holder could use her water for any purpose or whim and could even waste or poison them if she so chose. As one can imagine, what had been a license to extort upstream appropriators, became even more valuable because now it applied downstream as well as upstream.

It is important to see what was at stake in these legal struggles. If a right is qualified by reasonable use then it is necessary to consider the effects of using it and the value for which it is used. This invites litigation and empowers courts to resolve the issue and the considerations that can be considered by a court are open ended. As social values change, as new people move in, or as the composition of the courts or the legislature changes, reasonability is up for reinterpretation. As momentous as these new considerations may have been for those holding rights to surface waters, the consequences have turned out to be more profound for groundwater for reasons that we will see below.

[73] *Miller and Lux v. Madera Canal and Irr. Co*., 155 Calif. 59, 64 (1909). Limitations were sometimes placed on riparian rights however. Congress passed a statute in 1870 requiring appropriations on federal lands. And there were restrictions on exporting water outside the watershed even if rights to it were founded on riparian claims. Moreover, courts accepted the doctrine of "adverse diversion, permitting an appropriative right where a diversion has existed publically for five years.

The conflicting claims and rulings came to head with the rise of Progressives in California. In 1913 Governor Hiram Johnson signed into law the *Water Commission Act* which was meant to establish the primacy of the appropriations principle. The act declared all unappropriated waters, and riparian waters not "reasonably needed for useful and beneficial purposes," to be "public waters of the State of California." These waters, including riparian waters not "beneficially" applied within ten consecutive years following passage of the act, were declared subject to appropriation." The political response was immediate: signatures were gathered for an initiative overturning the Act but it failed and the statute went into effect the following year, marking 1914 as a critical moment in water history. The Act made appropriations doctrine paramount over riparian rights and effectively converted pre-1914 riparian rights to early (first in time) appropriations rights which were limited by the notion of "reasonable" and beneficial use (just as other rights were).[74] Just as important, the act established procedural requirements for establishing an appropriative right: such rights were no longer to be established by staking a public claim and using the water.

The legislative fight was over but appropriators still had to run the judicial gauntlet to see which parts, if any, of the new statutory doctrine would stand. The state Supreme Court gave its answer in *Herminghaus v Southern California Edison Company* (1926), in which the riparian rights holder challenged SoCal Edison's proposal to impound overflow in the San Joaquin for purposes of power generation. There the court asserted that the riparian could enjoin any impoundment that threatened his usage and it set aside the portion of the *Water Commission Act* that permitted appropriation of riparian rights. The court then reasserted its 1909 claim that riparian rights were not subject to a reasonableness limitation. Once again the legislative reaction was quick. It came only two years later (1928), this time, it succeeded. It took the form of a constitutional amendment that established that the doctrine of "reasonable use" applied to all waters in the state (riparian and appropriative; surface and groundwater). The amendment settled legal matters as both the California and US Supreme Courts eventually accepted this doctrine in repeated rulings (though, in the case of the state courts, there was further hesitation). While the amendment did not technically abolish riparian rights, the reasonableness standard had the effect

[74] Catherine Miller, "Riparian Rights and the Control of Water in California, 1879-1928: The Relationship between an Agricultural Enterprise and Legal Change," Agricultural History, Vol. 59, No. 1 (Jan., 1985), pp. 1-24.

of putting all rights under a similar regulatory standard and establishing 1914 as a critical division between senior and junior rights, giving the Water Commission plenary authority thereafter.

Gradually (if grudgingly), therefore, courts accepted important limiting principles on water use. Water use must be reasonable and beneficial, and therefore subject to regulation, and establishing that water rights are essentially *correlative*.[75] What uses qualify counts as beneficial and reasonable use has fluctuated over time: it has always included domestic use and (in California) use for mining operations; it has come to include irrigation, recreation, and eventually habitat preservation, etc. Importantly, reasonable and beneficial categories have increasingly been shaped by state and federal statutes as well as by evolving legal doctrines (especially the public trust doctrine as we shall see).[76]

An important feature of water rights is that there are more water rights than water: a lot more. A recent survey conducted to estimate the relationship between water rights and water supplies concluded "...that water right allocations total 400 billion cubic meters, approximately five times the state's mean annual runoff. In the state's major river basins, water rights account for up to 1000% of natural surface water supplies, with the greatest degree of appropriation observed in tributaries to the Sacramento and San Joaquin Rivers and in coastal streams in southern California."[77] The over-allocation of water rights is partly a consequence of the fact that water flows in California are highly variable both within and between years. But it is also political creation. The agency that issues these rights has adopted the practice of granting

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[75] The requirement is now embedded in the state constitution which requires that "...the water resources of the State be put to beneficial use to the fullest ex- tent of which they are capable . . . and that the conservation of such waters is to be exercised with a view to the reasonable and beneficial use thereof in the interest of the people and for the public welfare. *Cal. Const, art. X*, § 2.

[76] As an example, the court, in *Joslin v. Marin Mun. Water Dist*., 429 R2d 889, 895-96 (Cal. 1967), held that it was not reasonable to use water to carry and deposit sand and gravel for commercial purposes. Surely, such a use would have been reasonable a century earlier.

[77] Theodore E Grantham and Joshua H Viers, "100 years of California's water rights system: patterns, trends and uncertainty." Environ. Res. Lett. 9 (2014). These data are tricky to interpret as water is normally used more than once. The authors are careful to take out water rights for hydropower (all of that is available for re-use except for what evaporates). But irrigation water often runs off to a river. Moreover, the authors are only considering post 1914 water rights – those under the jurisdiction of the water board. These two effects seem to offset each other qualitatively. The authors, who wrote while at UC Davis, are now with USGS and are widely respected. They are convinced that there is massive overpermitting despite these data problems.

permits relatively easily as a way to minimize short run conflicts. Moreover, authors show that water use is routinely overestimated by users – presumably to retain their hold on their right by showing that they are using lots of water. But, as these routine practices cumulated over time, the "...over-allocation of available supplies, coupled with uncertain water use by individual water right holders, has become a significant handicap for water policy and management reform. As regional drought and growth reduce available supplies, inaccurate water use accounting has also intensified conflicts over water." (ibid, p.2.) The can has been kicked far down the road.

This also highlights an important fact: water rights in California are not "ownership" rights but are merely rights to use the water (usufructuary rights), subject to certain limitations. When you own a water right what you own is a place in line to receive water for reasonable use. When water needs to be rationed (as it does during droughts), junior rights holders cannot expect to receive water at all; indeed, if the drought is sufficiently severe even senior rights holders may not get what they are "entitled to." Rights of this kind are valuable but they are not the same as water. Rights holders are ranked according to various principles (riparian rights are prior to appropriated rights, and senior rights rank over junior). But this ranking does not resolve all conflicts and it remains necessary to invoke further regulatory principles.

6. Groundwater Regulation

If access to water was a simple matter of exercising or trading well defined legal rights – as Coase imagined – its allocation might not be problematic. However they were initially distributed, rights would be traded to those with high value uses and cashed in for actual water at the spigot. But things are not so simple. Rights and water, however, don't neatly correspond: there are too many rights (or too little water). Legal rights have often been acquired by force, fraud, or political influence: by taking water and then successfully protecting the claim by force or law. Courts and other political institutions have regularly been asked to intervene and sometimes they have. For this reason water rights are unstable. Moreover, water rights are not always clearly defined. Rights to groundwater are especially difficult to establish and retain. Underground water is hard to keep track of: the structure of an aquifer is complex and often imperfectly understood, so it is hard to estimate quantities, qualities and flows of underground

water, or to detect extractions.[78] There is plenty of opportunity for people to take such matters in their own hands, without government or neighbors knowing much about it.

Thus, while surface water regulation is regulated at the state level, California's groundwater has generally been managed locally (if managed at all). New regulations have retained this localistic approach. California is a big state and groundwater problems vary greatly across the state. While Southern California municipalities worry about salt water incursion and accept government assistance to maintain water tables, farmers who need to irrigate have been very reluctant to invite governmental officials into their terrain. Normally they prefer to settle things with their neighbors with assistance, perhaps, of local water agencies or, if necessary, the courts. They resist state efforts to regulate drilling or extraction and sometimes resist even limited state directed efforts to measure extractions, and keep track of wells.

Groundwater rights have traditionally been much less regulated than surface water rights. Such regulation as there is has been mostly driven by courts rather than by legislatures.[79] Initially, courts treated groundwater in the same way as real property, similar to their treatment of minerals or oil or coal. Water was part of what you purchased when you bought land and it could be used at your discretion. This posture resembled the riparian idea that if a person had property next to a stream, she was entitled to use the water. For groundwater this notion took the form of a doctrine of *absolute ownership,* the overlying interest (the landowner) could take groundwater for any purpose. There was no requirement that the owner take any account of the effect of his use of groundwater on his neighbors, and certainly not that his use need be reasonable or beneficial or harmless to her neighbors. And, there were no restrictions on

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[78] "California does not have a comprehensive monitoring network for evaluating the health of its groundwater resource, including quantity and quality of groundwater. The reasons for this are many with the greatest one being that information on groundwater levels and groundwater quality is primarily obtained by drilling underground, which is relatively expensive. Given that delineated groundwater basins cover about 40 percent of the State's vast area, the cost of a dedicated monitoring network would be prohibitive. The other important reason for the lack of a comprehensive network is that, as will be discussed later in this report, groundwater is a locally controlled resource." http://www.water.ca.gov/pubs/groundwater/bulletin_118/california's_groundwater__bulletin_118_-_update_2003_/bulletin118-chapter1.pdf page 28.

[79] Following the Wright Act, some southern California communities set up districts to manage ground and surface water. All those attempts failed for reasons mentioned above.

exporting pumped water.[80] "The seminal English case involving groundwater was *Acton v. Blundell* (12 Mees and W. 324 [1843]; 152 Eng. Rep. 1223 [Ex. Ch. 1843]), handed down in 1843. In *Acton,* the defendant dug a coal mine that cut off water from the plaintiff's well, which was being used to operate a mill. The court found for the defendant, arguing that groundwater "falls within that principle, which gives to the owner of the soil all that lies beneath its surface...." Kanazawa points out that the *Acton* holding implied what the court thought to be an essential difference between ground and surface waters: "...*Acton,* was based on the fact that surface-water flows were obvious and observable to claimants, while groundwater movements were not. Consequently, surface-water rights could be based on the "implied assent and agreement" of various claimants to the same surface source... In effect this... physical difference permitted the courts to assume that surface-water claimants had entered into a valid implicit contract regarding use of the water source, while the same did not hold for groundwater claimants." (Kanazawa, 160)."

The feeble and costly drills and pumps at the time may have made it reasonable for courts to assume that one person's actions would have limited effects on others' rights, and that any attempt to control external effects would unduly discourage productive investment. Kanazawa argues that early American cases from Connecticut and Pennsylvania, explicitly immunized overlying users from taking account of external effects: "*Roath* and *Wheatley* went on to make the argument, reminiscent of *Acton*, that groundwater differed from surface water in that its movements were unobserved and, therefore, that pumpers should not be legally accountable for their effects on others."(162) Ignorance of underground connections and flows led courts to presume, for legal purposes, that the water did not in fact move (unless a plaintiff could actually prove that it did; a very high burden of proof given the hydrological knowledge at the time). This presumption was always known to be a fiction but it made work much easier for courts and simpler for people to forsee what would happen if a dispute went to court. It worked also to

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[80] Mark Kanazawa, "Origins of Common-Law Restrictions on Water Transfers: Groundwater Law in Nineteenth-Century California," The Journal of Legal Studies, Vol. 32, No. 1 (January 2003), p. 159. "[i]n the case . . . of [groundwater], there can be no ground for implying any mutual consent or agreement . . . between the owners of the several lands beneath which the underground springs may exist, which is one of the foundations on which the law as to running streams is supposed to be built; nor, for the same reason, can any trace of a positive law be inferred from long-continued acquiesence [*sic*] and submission, whilst the very existence of the underground springs or of the well may be unknown to the proprietors of the soil" (*Acton,* p. 350).

support the absolute ownership doctrine and weakened the capacity of groundwater law to deal with externalities.[81] There were exceptions to this presumption in cases where the underground water was flowing along a defined course: courts were willing to accept that water flowed beneath rivers, for example, or that some rivers disappeared below ground to re-emerge "downstream" and that such waters should be treated the same as river water.

The absolute ownership doctrine was abandoned in 1903 in a landmark Southern California case, *Katz v. Walkinshaw.*[82] "*Katz* addressed a dispute over priority to a limited groundwater supply between an overlying landowner and an appropriative groundwater user. While *Katz* abolished the rule of absolute ownership as against public policy, [it] ... did not abolish overlying rights in favor of a pure prior appropriation rule (as other western states have done). Instead, *Katz* analogizes the rights of the overlying groundwater user to the common law of riparian rights and established the "*correlative rights*" doctrine. The court ... required that groundwater be used reasonably and shared equitably by the overlying landowners in time of shortage. Once the reasonable needs of overlying landowners are met, non-overlying users may appropriate the surplus according to priority in time..."[83] Evolving knowledge about hydrology and new measurement techniques formed part of the basis for *Katz*. In any case the court adopted the reasonable use doctrine – a doctrine that was flexible enough to permit taking account of external effects of groundwater use, at least in principle. By 1936 an authoritative survey of water law could say "... there are few American jurisdictions today that have not taken over the 'American rule' limiting the taker of groundwater to 'reasonable use, of one's own land.'"[84]

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[81] This situation is further complicated when attention is paid to imported waters. In a series of cases, Los Angeles successfully asserted its rights to return flows from waters fit imported from the Owens Valley. The imported water had been used for irrigation and the excess percolated into the basin. The decisions established that the return flow was owned by the City and not the overlying landowner.

[82] , 141 Cal. 116(1 90 3).

[83] Peter J. Kiel and Gregory A. Thomas , "Banking Groundwater in California: Who Owns the Aquifer Storage Space?" Natural Resources & Environment, Vol. 18, No. 2 (Fall 2003), pp. 26-7.

[84] Samuel C. Wiel, "Fifty Years of Water Law," Harvard Law Review, Vol. 50, No. 2 (Dec., 1936), pp. 252-304

The "reasonable use" standard for groundwater appropriation may appear weaker in some respects than the "no injury" standard for surface water appropriation.[85] The no injury standard gives veto power over new appropriations to incumbent water users. But this standard seemed unworkable for groundwater as no one could really say with confidence which existing users would be harmed by a new water user. This seems to be a difference based mostly in practicality. In principle, while groundwater and surface water rights have been subject to similar standards since the *Katz* holding (or, perhaps, a bit later when the courts finally accepted the reasonable use doctrine with respect to surface waters), as a practical matter, differences remain. Because of difficulties of observation and legal proof of causation in many cases, overlying users are still able, in fact, to draw on groundwater fairly freely despite the existence of legal doctrine to the contrary. It remains difficult for those possibly affected by someone's use of groundwater to know whether she is affected or, if she does, to prove damage in court.

In principle anyway, groundwater is subject to prescription as well as appropriation in ways similar to surface waters. In *Peabody v City of Vallejo* the California Supreme Court stated that "...the appropriator may use the stream surface or underground or percolating water, so long as the land having the paramount right is not materially damaged."[86] In other words, an

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[85] "The "no injury" rule originates in the common law, and also is reflected in Water Code provisions intended to protect legal users of water from injury from a water transfer. (See, e.g.,Water Code sections 1702, 1706 and 1725.) Under the no injury rule, a water transfer would not be authorized to the extent that it reduced the availability of water for downstream users, regardless of the water priority of those users. Under the no injury rule, only "new water" is transferable, i.e., water that is added to the downstream water supply as a result of the transfer." *A SUMMARY OF THE CALIFORNIA LAW OF SURFACE WATER AND GROUNDWATER RIGHTS*, (memo posted by the BARTKIEWICZ, KRONICK & SHANAHAN in Sacramento at http://www.norcalwater.org/wp-content/uploads/bks_water_rights.pdf). The memo continues that the effect of the no injury rule is to protect junior rights holders: ". . . California water law protects senior water users (those with the oldest water rights) from junior diverters while protecting junior water right holders from the expansion of senior water rights. Junior water right holders would be harmed if seniors could increase the amount of water they divert under their senior priority. Likewise, juniors could be hurt if seniors could change their point of diversion, place of use or purpose of use in a manner that reduces the quantity or quality of water relied upon by juniors for their diversion. The 'no injury' rule protects junior right holders against this kind of harm from senior right holders." (See *A Guide to Water Transfers*, July 1999, pages 3-7 and 3-8, published by the State Board.)

[86] The court goes to note that "Any use by an appropriator which causes substantial damage thereto, taking into consideration all of the present and reasonably prospective recognized uses, is an impairment of the right for which compensation must be made either in money or in kind..." *Peabody v. City of Vallejo*, 2 Cal.(2d). While this standard appears, in *Peabody*, to limit the rights of appropriators, it was interpreting the 1928 Constitutional amendment that subjected riparians to the reasonableness standard. In effect, it put both appropriators and riparians in the same correlative rights regime. The California Supreme Court's majority opinion concludes "... the rule of reasonable use as enjoined by section 3 of article XIV of the Constitution applies to all water rights

appropriator can only take water when the aquifer is not in an overdraft situation. But prescriptive rights – those established by notorious and adverse trespass are more important for groundwater. This was the finding of a court in the *Raymond Basin Reference*, which permitted the City of Pasadena to divert water from the underlying basin in ways that did affect the rights of other users.[87] In this case, the trespass was asserted by the City and accepted by the court. "An important element in *Raymond* was the earlier established principle that rights to the use of percolating ground water may be acquired by adverse use - prescription- as against the rights of overlying land owners." In this respect, prescription can be successfully asserted only when the aquifer is overdrafted, as it was in Pasadena (and as is common in arid areas). But in such cases water is scarce and rights conflict and the parties need to resort to an arbitrator of some kind.

When water rights come into conflict they can be resolved according to two different procedures. The older procedure was devised by courts. "The *Court Reference Procedure* ... evolved from a water law setting characterized and determined by court decisions more than by statutory provisions.... Until 1914 court action alone provided for the adjudication of water rights. The courts in arriving at their decision relied heavily upon the then currently accepted doctrines relating to the use of water."[88] The court reference procedure was used to resolve both ground and surface water disputes. In 1913 California's *Water Commission Act* established an alternative *statutory adjudication procedure* – it might better be called an administrative procedure authorized by statute -- which could be invoked on the initiative of any disputing party, by petitioning the Commission, or by the Commission itself on its own initiative. Until

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enjoyed or asserted in this state, whether the same be grounded on the riparian right or the right, analogous to the riparian right, of the overlying landowner, or the percolating water right, or the appropriative right."

[87] "The *Raymond Basin Court Reference* was the first instance of the adjudication of conflicting water rights of many owners of ground water in California. On September 23, 1937 the city of Pasadena initiated litigation in the Superior Court of Los Angeles to quiet title to groundwater rights within the Raymond Basin. Specifically involved were the rights to divert water from the groundwater basin." (295) ...prescriptive rights were established by the later appropriators against both overlying owners and prior appropriators and that the latter also obtained or preserved rights by reason of the water they pumped. (296) J. Herbert Snyder, "The California Court Reference Procedure: Economics and Law in the Allocation of Ground Water," Land Economics, Vol. 33, No. 4 (Nov., 1957), pp. 286-303

[88] "The statutory adjudication procedure is instigated by the action of one or more claimants to the use of water who petition the State Water Rights Board to determine the rights of the various claimants to the water. It is in these two respects that the adjudication procedure differs markedly from the court reference procedure." J. Herbert Snyder, "The California Court Reference Procedure: Economics and Law in the Allocation of Ground Water," Land Economics, Vol. 33, No. 4 (Nov., 1957), pp. 291..

1933, this new procedure explicitly excluded groundwater conflicts.[89] In 1957 Herbert Snyder noted that "The statutory adjudication procedure has, so far, been restricted by statute to the adjudication of water rights concerning other than percolating ground water." (Snyder, 291) In 1935 moreover, two years after the statutory procedure became applicable to groundwater disputes, the legislature removed the authority of the Commission to initiate adjudications on its own. "This portion of the 1935 legislation was designed to accomplish two objectives, the first being to eliminate [Commission] authority to initiate adjudications. It was conceived that such power was so broad that it was resented by the public affected..."[90] The main avenue for adjudication has reverted to the venerable court reference procedure in which the State Board plays only a support role in providing expert advice and sometimes administering the court's order in the role of watermaster.

Thus, by the 1920s as the doctrines of reasonable use and correlative rights became important in resolving groundwater, courts began to play a regular role. Soon after *Raymond*, courts began to "adjudicate" more and more groundwater basins – I think there are more than 20 by now. As in Pasadena, there were often hundreds of conflicting claims; each had facially plausible arguments for rights based in an overlying interest or a prior appropriation. More importantly many asserted prescriptive rights to the water by pumping it in ways that notoriously affected incumbent users and which (they argued) had not been challenged in a timely fashion.[91] These asserted rights could not all be satisfied.

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[89] "The Statutory Adjudication Procedure. The Terms of the Water Commission Act of 1913 permitted statutory adjudication of water rights, excluding percolating ground water" either upon the initiative of the water commission or upon petition of one or more claimants to the use of water from a particular source. The procedure outlined for the adjudication of water rights in the 1913 act was not sufficiently precise and proved to be unsatisfactory. The procedure was revised and clarified by amendment to the Water Commission Act in 1917." (289)

[90] "...the elimination of the provision that the State Water Commission (now State Water Rights board) might undertake water rights adjudication procedures on its own initiative. This was done by legislative amendment in 1935...." (289-90)

[91] "An important element in the decisions of the *Raymond Basin court reference* was the earlier established principle that rights to the use of percolating ground water may be acquired by adverse use- *prescription*-as against the rights of overlying land owners. In all instances, however, it has been consistently recognized that the court may regulate and apportion use of percolating ground water in accord with relative rights. Thus, the courts have the power to adopt and enforce a physical solution even if the parties cannot agree upon one." Snyder, 289.

Having abandoned absolute right for overlying interests, courts were also reluctant to mechanically satisfy appropriators merely in the temporal order of their appropriations. Nor did they wish to give free reign to aggressive trespassers. Instead courts began to allocate rights on a different basis altogether.[92] After hearing claimants and experts in civil engineering in large and complex adjudications, courts typically produced rulings that reflected a (new and judicially created) principle of *proportionality*. They refused to give priority either to the landowner (overlying interest) or to the prior appropriator but instead they divvied things up in a way that seemed just or, in legalese, equitable. Then the court would appoint a "watermaster" to administer its ruling.[93]

A watermaster would usually be a public agency of kind such as the state water board. Alternatively a court might "...appoint a committee to serve as watermaster for an adjudicated area and can give that watermaster greater powers than those given the state department when acting as watermaster.... watermasters have the power to require pumpers to file periodic reports, levy a pump tax, replenish water in an aquifer, import water for spreading and replenishment of aquifers and control storage within the basin."[94] While it has been widely used, there are serious limits to the watermaster as a regulatory institution. While watermasters have significant powers, their methods of proceeding are slow and costly to use and, lacking budgetary authority, they are likely to take the amount of water available as fixed rather than to contemplate ways to improve supplies. And a watermaster's scope is (mostly) limited to set of plaintiffs before the court and this may not correspond to the hydrological groundwater basin. But the legislature has always been reluctant to move to the more administrative "statutory" procedure, fearing the state level agencies would run roughshod over local interests.

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[92] "California has broadly interpreted legal powers implicit within the correlative rights doctrine. This has been done whether the actions were instituted by local initiative under a state enabling act for groundwater districts or by judicial action in a private or state initiated adjudication. As a result, the power to manage groundwater, whether in an aquifer or in a basin of hydrologically interconnected aquifers and surface waters, has been broadened to a plenary degree." Earl Finbar Murphy, "THE POTENTIAL FOR LEGISLATIVE CHOICE CONCERNING GROUNDWATER AND AQUIFERS," *Journal of Land Use & Environmental* Law, Vol. 4, No. 1 (Summer 1988), p. 34. This seems a bit optimistic to me.

[93] The watermaster (zanjero) was a fixture of Hispanic rule in Alta California possibly borrowed from native American practices. Abraham Hoffman and Teena Stern, "The Zanjas and the Pioneer Water Systems for Los Angeles," *Southern California Quarterly*, Vol. 89, No. 1 (Spring 2007), pp. 1-22

[94] Op. cit p. 34.

Southern California has made the most extensive use of court appointed watermasters for managing groundwater. The method has, however, recently been promoted by the state legislature for managing streams in the northern part of the state and: "In November 2009, the California Legislature passed several bills regarding water legislation. Senate Bill X7 1...included a provision requiring the appointment of a "special master" for the Delta, who would be 'granted specified authority'. The Delta Watermaster's authority extends to diversions of water in the Delta, and for the monitoring and enforcement of State Water Resources Control Board orders and license and permit terms and conditions that apply to conditions in the Delta." The problems in the Delta mostly concern surface water though, as in the Southern California basins, there are many claimants, large fluctuation in flows over times, and difficult problems of observation and measurement. But apparently, the state needed to step in to provide a third party – a court or state agency – to find and administer a compromise.

The idea of state intervention would be anathema in the Southern CV. As we have seen very few large farms dominate the area and might have much to lose if courts or agencies were to intervene, especially if the procedure gave the chance for small cultivators and residents to press their claims. While there have been various attempts to mobilize state or federal attention there has been little political receptivity for such action. The big farms are major donors to both parties and neither is eager to oppose them. The absence of toothy state legislation in the area has had important consequences for Central Valley groundwater issues. In effect, therefore, the big players there have mostly been left on their own so far to devise solutions. Fortunately for them, they are few in number and they find it simple to coopt local authorities to address groundwater issues. The best example is the development of Kern Water Bank, which is largely controlled by Paramount Farms and its various tentacles. Though people may deplore its distributional effects, in many ways this bank has been successful not only in serving the interests of its owners but also in ameliorating the groundwater crisis in some respects and, in developing water markets too.

In fact there has always been strong resistance to state level regulation of groundwater. This is partly because it is hard to measure quantities, locations, and flows in underground aquifers. But the deeper reason is a political refusal to subject groundwater to regulation. The

California Water Code states for example, that "This article shall not be construed to authorize the board to regulate groundwater in any manner."[95] Still, something resembling the "use it or lose it" rule attached to appropriative water rights may apply. The traditional regulatory principle is that the overlying interest has first claim on water underneath.[96] But if someone isn't using her rights, someone else can (publically) assert a claim to it which may ripen into a right. If the right to surface water is often said to be allocated by a first come first served principle (first in time, first in right), groundwater is governed more by physical action: "she who drills deepest" is entitled to the water. Or at least gets to keep using it.

The two systems of rights allocation therefore remain distinct even if ground and surface water are very closely related in both in supply and use. Surface waters rise from springs and percolate into the ground and there are underground flows beneath river bottoms. These are not closed physical systems but interact in various ways. More importantly the use of these waters is connected in that one is a substitute for the other. Those who lack access to sufficient surface waters to water their crops can use groundwater to make up for shortfalls in water deliveries, especially in droughts. This substitution is regulated mostly by the (rising) cost of extracting groundwater and (over time) by any new regulatory requirements on groundwater use.

7. Federal and State Water Projects: 1930-70

Court rulings and injunctions were not going to resolve California's water scarcity issues. The legal battles had been inconclusive from the standpoint of winners and losers: large farmers tended to win in court; but smaller farmers and towns and cities often prevailed in the legislature, or in popular referenda. Nevertheless the notions of reasonable and beneficial use were eventually accepted which put water users on notice that they had to pay some attention to the external effects their actions and that courts stood ready to sanction the failure to do so. While new legislation permitted the formation of many new irrigation districts with powers to tax and override traditional water rights, the districts were small and generally dominated by large landowner. Moreover, they had only limited capacities to resolve problems of flooding and

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[95] CWC, Section 1221 (West Supp. 2003)

[96] But see Joseph Sax, "We Don't Do Groundwater: A Morsel of California Legal History," U. Denn Water L. Rev, vol 6 (2002), who argues that despite what the Water Code says, groundwater is subject to state regulation.

drought which required constructing impoundments upstream from the district. As a state Engineer wrote in 1929 "...irrigation districts recently organized in California have been confronted with far larger financial problems than faced districts organized ten to fifteen years ago and earlier. This is not alone the result of increased cost of construction, due to higher prices of labor, material, and equipment, but it is also due to the fact that most all recent projects have involved storage for a substantial portion of their water supplies. Some of the districts formed in California during the past ten years, particularly some of those in the Kings River and San Joaquin River areas, have, in fact, had as their principal objectives the construction of storage."[97] Moreover, in these southern Valley areas, districts were in no position to import water from other basins should local supplies prove insufficient.

Neither law nor new legislative inventions were able to control the economic and social dynamism that were reconfiguring the Valley economy. Long before the turn of the century, Henry Miller had shifted most of his cattle operations out of the state and concentrated on irrigated farming for feed and wheat. With his death, the Miller-Lux company went into decline but others continued farming wheat, especially opening up new croplands in the lake bottoms and producing a late century boom in wheat production. "...by 1888, wheat was harvested on 3 million acres, mainly located in the Central Valley. With a production of 42 million bushels, California ranked second in the nation. Most wheat was produced on large, extensive ranches, some of which approached 1 million acres in size. After reaching a peak in the late 1880s, wheat production decreased as quickly as it had increased. Soil exhaustion leading to declining yields and low farm prices were the main reasons for the end of the wheat boom."[98] To some extent, declining wheat production was replaced by barley, which is much more drought tolerant, but its market was limited. The bottom lands could be farmed if the flooding could be managed and that required a crop that was profitable enough to do the work.

In fact, part of the job of reducing flood risks had already been started. A local newspaper wrote in January 1915: "They're digging long, wide canals and building huge dikes to

[97] Adams, op cit. p. 34
[98] Daniel Geisseler and William R. Horwath , "Wheat Production in California," https://apps1.cdfa.ca.gov/FertilizerResearch/docs/Wheat_Production_CA.pdf

hold back the surplus waters of the Kings River and at the same time permanently reclaim the lake bottom ...Within three years, possibly a shorter space of time, much of Tulare Lake will be no more, and the land will be added to the fertile soil of Kings County."[99] That was wishful thinking then and the work actually never stopped as long as neighbors built higher dikes than yours. Still, "One valley resident, remembering what the area looked like when it had been submerged in 1909, couldn't believe the progress twenty years later. 'Had anyone been foolhardy enough to have suggested this,' he said, 'he would have been sat on by the insanity board.'"[100]

For several years the cotton economy in the South had been under an assault by the Boll Weevil and production had begun shifting to the more arid western states where the weevil did not flourish. As there was no place for him on his family's Georgia plantation, young James G. (Colonel) Boswell moved west after leaving the army to try his hand at buying and selling cotton in Arizona and the Imperial Valley. His Los Angeles based business rapidly became fairly successful, as he had a good feel for quality and was tireless in pursuit of growers. But he was soon seduced by the prospect of growing his own cotton in the newly opening bottom lands in Tulare Lake. And, as it happened the USDA had been experimenting with cotton plantings in the area and had already picked out a productive strain (Alcala) and had persuaded the California legislature to "outlaw" other variants.[101] "Trooping back and forth to Yuma may have been fine for a tyro. But by anchoring himself here in Kings County-in what he instantly concluded was 'the richest land next to the Nile Valley in the world'-he had the chance to become a titan....The Colonel's timing was impeccable. The price of cotton in the Imperial and Yuma areas was about to fall into a tailspin; an invasion of insects sects would soon send the industry along the

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[99] Corcoran Journal, January 1915.
[100] Arak and Wartzman, pp 87-
[101] "...scientists from the U.S. Department of Agriculture, tugged west by the completion of the Colorado River irrigation canal, began to experiment with sowing long-staple Egyptian cotton in the Imperial and Yuma valleys. In 1917-six years after Imperial Valley cotton had claimed a silver cup at an exposition in New York-the horticultural commissioner in El Centro counted thirty gins in the area. And in 1920, the year Lieutenant Colonel J. G. Boswell was honorably discharged from the army, more than 100,000 valley acres were planted to cotton." (Arak and Wartzman, 87). "Based on work by W.B. Camp, a USDA agronomist, state legislature passed laws in 1925 that limited the cotton production in the San Joaquin Valley to one Acala strain [6] . These laws, in effect until 1978, prevented high-quality cotton from cross-pollination with inferior strains. The one-variety community also facilitated marketing, and increased yields." Daniel Geisseler and William R. Horwath, "Cotton Production in California," http://apps.cdfa.ca.gov/frep/docs/Cotton_Production_CA.pdf

Mexican border practically into oblivion. ....Though some skeptics viewed cotton cultivation in the lake bottom as a fool's mission ... by late 1920 a gin was up and running."[102]

Boswell picked the right time to start cotton farming: the cotton market had expanded greatly during the war, the domestic competition was devastated by pests, the bottom lands were fertile and cheap, and water problems were increasingly manageable. Like Miller-Lux, Boswell built backwards up the supply chain –from the market to the gins to the fields – and his firm was highly vertically integrated. He had local competition – especially from his neighbor/enemy Clarence Salyer – who constantly sought fair or unfair advantages in the field and markets. But Boswell often kept the upper hand by controlling the farm loan and ginning operation. And, like Miller-Lux, Boswell mastered the art of exploiting cheap migratory labor, often playing up ethnic divisions among workers, and successfully keeping unions out. The business took off.[103] But the cost in water use – especially groundwater use was very high.

This was the state of play at the dawn of the era of massive water projects. Valley farmers were rapidly reaching the limits of private irrigation schemes. They had straightened rivers and built dikes but crops remained vulnerable to large floods that happened occasionally. And prolonged droughts could force farmers to fallow their crops for extended periods. Farmers had increasingly to rely on groundwater during such periods and there was a resulting buildup of alkali salts. At the same time, engineers were figuring out how to control and move water over large distances. The Owens Valley and Colorado River Projects were already shipping water to Southern California farms and cities,[104] San Francisco had built Hetch Hetchy, and various other municipalities had developed projects to import water on their own. And state engineers had been busily developing plans to move "excess" Northern California water to the arid reaches of the Southern CV. They could envision the elements of a grand bargain coming into focus: one that could be struck if only the political will could be found to do it.

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[102] Arak and Wartzman, King of California, p. 90.

[103] The big expansion in land and sales took place after World War Two under his Stanford educated heir and nephew J.G. Boswell II, who successfully mechanized most of the operations, reducing reliance on migratory labor; California cotton came to dominate world markets by the late 1950s.

[104] Southern Californian communities had exhausted their natural water supplies by the early 20th Century and had to rely on water imported from the Owens Valley and the Colorado River project. Along the way, the SWP diverts water to Bay area communities, the Central Coast and, especially, to farmers in the southern Central Valley.

The chief political challenge was centered in the Sacramento-San Joaquin Delta, through which most of the state's largest rivers flowed, and which would be heavily affected by any new scheme. The Delta had been a vast wetland when the gold rush began, but as cities sprouted and commerce picked up, its swamps were rapidly diked and drained, creating an archipelago of fertile "islands" which were highly profitable to farm to supply the nearby cities.[105] The problem was that the newly drained farmland began sinking and compactifying and soon the island surfaces sank below the level of the rivers.[106] This put enormous and growing stress on the levees to keep the water out. In dry periods (April to November and during droughts) saltwater moved into the Delta. In very wet years floods could rip the dykes apart. Thus, there the levees had to be continually reinforced and raised and this steadily raised the cost of farming. There was a need for a better solution.

One option was to build a physical barrier that would regulate flows and keep saltwater from moving up the rivers. This would not really help protect from floods however and would be very costly to build in any case The State Engineers settled on a cheaper option. Their plan would build upstream impoundments to in order to regulate flows on the big rivers in order to maintain sufficient freshwater pressure to keep saltwater out of the Delta during the dry season (April through November). The reservoirs were to be large enough to maintain flows even during prolonged droughts.[107] In 1930 the California state water plan adopted the freshwater

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[105] Following the gold rush, settlers in the peat-rich Delta built dikes and levees to establish about 60 islands among the various channels of the Sacramento and San Joaquin rivers. But the huge water projects have vastly diminished flows through the Delta. "Most of the delta has subsided five meters or more below sea level because of the conversion to farming: as peat soil dries, microbial oxidation turns the carbon in it into gas. For 100 years, farmers kept building ever-bigger levees to hold out channel water. "It evolved into a network of 1100 miles [1700 km] of levees that protect holes in the ground,"" Carolyn Strange, "Troubling Waters," BioScience, Vol. 58, No. 11 (December 2008), pp. 1008-1013.

[106] Sinking ground and compactifying soils are also problems in the western parts of the Valley but the causes are different. In the Valley the cause is the decline in the water table. In the Delta, where the water table is very near the surface, the cause is that the soil is heavily peat-based and compacts easily under pressure.

[107] "The Delta frequently experienced salinity intrusion, which caused problems for Antioch and Pittsburg. Unless water flowed past Antioch at a minimum of 3,300 second-feet, salt water from San Francisco Bay moved into Suisun Bay and the Delta during high tide, making the water unusable for crops and industry. Between 1919 and 1924, the salt water in Suisun Bay allowed sufficient growth of teredo, a woodboring, salt water worm, to destroy $25 million of the bay's wharves and pilings. In 1924, the water reached its lowest recorded stream flow. The maximum salt water content at Pittsburg reached 65 percent. In 1926, Pittsburg and Antioch stopped using water from Suisun Bay for crops and industry. Both communities had used the bay water since the middle of the nineteenth century." http://www.usbr.gov/history/cvpintro.html.

barrier solution: and, "... the state water plan called for construction of a 420 foot dam at Kennett [Shasta] to maintain a regular flow to Antioch, keeping salt water out of Suisun Bay. The California Legislature authorized the future Central Valley Project as a state project in 1933. The act authorized the sale of "revenue" bonds not to exceed $170 million." It was a win-win situation: Southern CV farmers would get their irrigation water and the Delta would be saved.

The Central Valley Project

The timing was awful. With the economy in a deep Depression the state could not sell the bonds and it was forced to turn to Congress for help. Here things got complicated. FDR was eager to push the project forward as a shovel ready emergency stimulus measure under the NRA. But, as was to become common in the next few years, the Supreme Court blocked this move, insisting that the Project required explicit congressional authorization. It took a few efforts but in 1937 Congress finally authorized the project in the Rivers and Harbors act. Though the project was to be managed by the Bureau of Reclamation, the Army Corps of Engineers was to play a big construction role too.[108] The 1937 legislation presented the project as having the primary purposes of flood control and navigation (the traditional meat and potatoes of the Rivers and Harbors and Flood Control Committees and their agency, the Corps of Engineers), with reclamation and power generation as secondary purposes.[109] One could see already the seeds of interagency conflict in the authorization legislation. But however it was justified the Project would build sufficiently large dams needed to protect the Delta and supply water to the southern CV.

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[108] *The Rivers and Harbors Act of 1935* initially authorized the project, subject to a finding of feasibility by the Secretary of the Interior and approval by the President. The initial features were to be constructed by the Corps of Engineers. Funds were provided by the *Emergency Relief Appropriation Act of 1935* (49 Stat. 115). When the *Rivers and Harbors Act* was reauthorized in 1937 (50 Stat. 844, 850), Reclamation took over CVP construction and operation, and the project became subject to the provisions of the *1902 Reclamation Act*.

[109] The *1937 Rivers and Harbors Act* provided that "....the entire Central Valley project, California... is hereby reauthorized and declared to be for the purposes of improving navigation, regulating the flow of the San Joaquin River and the Sacramento River, controlling floods, providing for storage and for the delivery of the stored waters thereof, for the reclamation of arid and semi-arid lands and lands of Indian reservations, and other beneficial uses, and for the generation and sale of electric energy as a means of financially aiding and assisting such undertakings and in order to permit the full utilization of the works constructed to accomplish the aforesaid purposes..." Leland O. Graham, "The Central Valley Project: Resource Development of a Natural Basin," California Law Review, volume 38 (October 1950), p. 592.

The Bureau had been established early in the Progressive era for the purpose of reclaiming and settling western lands and the Central Valley Project seemed a perfect fit for its core mission.[110] The agency had, however, entered the 1930s in terrible shape. When it was established in 1902 the idea was that Bureau reclamation projects would be financed by end users paying off the project of a ten year payment period, by making payments into a revolving fund. This proved unrealistic and by the 1920s the Fund was out of money. Because of growing opposition from southern and Midwestern farmers, who were not really eager to have the government support their competitors, Congress was not disposed to authorize the use of general revenues to finance new farmlands in the western deserts. But the hard times of the Depression changed everything. The Midwestern districts were mostly Republican, and politically irrelevant, and the new administration was eager to find ways to deal with the massive numbers of unemployed and struggling small farmers. New Deal Interior Secretary (Harold Ickes) however was not much interested in reclamation and, indeed, early in his tenure, he sought to have the Bureau itself transferred to Agriculture.

It was not until he realized the potential of power generation (at Hoover Dam, and he Grand Coulee in Washington, etc) that Ickes became a convert to large water schemes.[111] Marketing power would provide a robust source of financing and make it possible to stretch out the repayment period for irrigation benefits. Moreover, new and cheap power would allow the agency to push rural electrification. Once Ickes got on board, the California CV looked to be tailor made for the Bureau.[112] The state had already passed an initiative in 1933 authorizing a central valley project but had been unable to raise the money for it. The combination of massive unemployment and a fortuitous statewide drought powerfully altered the national as well as state

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[110] The reclamation mission – which amounted mostly to building dams and other works to drain swamps and provide irrigation, and eventually to generate power – had long been controversial. The Reclamation act envisioned that its projects were to be reimbursed by beneficiaries.

[111] The Bureau had learned to allocate many of the project benefits to flood control, navigation and wild life preservation, all of which are non-compensable. This permitted the Bureau to set low prices for its irrigation benefits. Still, until the CVP was engineered to include power generation it was hard to justify the project.

[112] The CVP "... was mainly designed to extend the area of agricultural land under irrigation. Two-thirds of the water involved is used for irrigation although, as the scheme has become more elaborate over years of development, supplementary benefits in the form of urban water supplies, drainage, power production and navigational improvements on the Sacramento River have assumed some importance." D. N. WILCOCK, B. P. BIRCH and L. M. CANTOR, "Changing Attitudes to Water Resource Development in California," Geography, Vol. 61, No. 3 (July 1976), pp. 127-136

political landscape. California congressmen, allied with the state engineer successfully urged a newly receptive federal government to take over.

The Bureau needed to acquire rights to the necessary waters – which brought it into contact with the complex system of water law described above – and it needed to find a way to finance the Project.[113] There were two issues: acquiring existing rights from private rights holders and acquiring previously unappropriated rights. As to privately held rights the Bureau made bargains – often offering to swap rights in one watershed for others elsewhere.[114] With respect to new water rights, various state and federal precedents implied that state doctrine would generally prevail, and specifically, that the Bureau would have to go through California procedures when claiming new water rights. However, the Federal government has never regarded this as a binding legal requirement but instead considers it a matter of comity. This raised some interesting federalism issues insofar as a federal agency was purported to be regulated by state law. It still does. But the Bureau and its congressional sponsors were willing to go along as long as the courts did not upset the deal. Financing was made easier by building the Shasta, Trinity and Friant Dams as power generating facilities.[115] Moreover, the Bureau was permitted to stretch out the period over which end users had to pay for construction (to a slightly more realistic 40 years) and get access to general revenues. Moreover, crucially, it was able to continue use other benefits that did not need to be paid for by end users (navigation, flood

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[113] A riparian owner on the San Joaquin, whose pastureland had benefitted from periodic flooding, demanded compensation for the construction of Friant dam upstream which effectively prevented flooding. While the Court denied his constitutional (takings) claim, it held that the Bureau was required, as a matter of policy (under its authorizing acts), to act in according to state legal doctrine and to compensate rights holders for deprivations of rights. Moreover, it denied the government's effort to characterize the Friant dam as having the purpose of improving navigation (which is noncompensable) and insisted that Congress understood the Project's primary purpose as reclamation. *U.S. v Gerlach Livestock Co*. 339 U.S. 725 (1950).

[114] The initial efforts were on the San Joaquin, where Miller-Lux rights dominated the River. But the Bureau had to negotiate with many rights holders in the area in order to proceed. "In 1939, after extended negotiations, a transaction was concluded between the United States and Miller & Lux and its affiliated companies through the execution of the purchase and exchange contracts and deed... They in effect expressed the consent of Miller & Lux and its affiliated companies to the operation of Friant Reservoir in accordance with prescribed standards and conveyed certain defined rights. In return, the United States paid a cash consideration of $2,450,000" and contracted to furnish, for certain croplands, water of a stipulated quantity and quality in substitution for a portion of the San Joaquin water which would be available but for the operation of Friant Reservoir." (Graham, 597-8).

[115] Though power generation generated opposition from private power companies such as PG and E and SoCal Edison.

control, power generation, recreation, and eventually conservation) to lower the costs that irrigation users had to pay.

But the Bureau also had to find the authority to distribute the waters it was able to control. Here was the problem: when it came to distributing actual water, the 1902 Reclamation Act (Section 5) seemed (on its face) to prohibit distribution to nonresidents or to land parcels exceeding 160 acres. The Reclamation Act had been aimed at opening farming lands to settlers who would not only farm the land but would also populate the area and build towns and communities. Frances Newlands, the acknowledged father of the Act, said that its purpose was "not only to prevent the creation of monopoly in the lands now belonging to the Government, but to break up existing land monopoly in the West." Like everyone else, Newlands knew that large farms dominated the Valley. The immense Miller-Lux company was only one example.[116] Haggins' mining/agribusiness empire was another, as were the domains of other land barons throughout the American West. Smaller farms persisted on in the Eastern and northern parts of the Valley, where water was more available. Of course Newlands also knew that if water were to become available for irrigation, there would be a speculative boom in the arid parts of the Valley. That accounts for the acreage and residency restrictions he put into the Act. These features of reclamation law were not only accepted but they were also popular with Roosevelt and his progressive administrators. The idea that the arid west could be made safe for the family farm resonated widely.

In fact, however, the existence of Section 5, the part of the Reclamation Act that placed acreage restrictions on Project waters had long discouraged the big farmers from supporting federal efforts to develop the Central Valley. But the political climate changed after the depression set in. The Bureau, in congressional testimony began to suggest that the limit would be removed before the project was completed (Taylor, 242), or was in any case "was not to be taken seriously."[117] Director Page wrote Secretary Harold Ickes in 1940: "My present idea is

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[116] See Paul Taylor, "Central Valley Project: Water and Land," The Western Political Quarterly, Vol. 2, No. 2 (June, 1949), pp. 228-253.

[117] Statement by Russell Giffen, a high ranking Engineer in the Bureau, in Hearings on Central Valley Project before Subcommittee of U.S. Senate Military Affairs Committee, San Francisco, April 7, 1944 (mimeo.). The limitation had long been ignored on Bureau projects in the Imperial Valley and on the Salt River in Arizona.

that the Secretary should be given authority to establish farm units without the 160-acre limitation [where only] a supplemental water supply [is furnished]. We are convinced that in some areas the reduction of holdings to 160 acres would be impractical and would adversely affect the economy of the areas." So while the Bureau hinted that it willing to drop the limitation it was not clear that this could be accomplished legally. And of course, such efforts ran afoul of the progressives inside the Bureau and elsewhere in the administration.

The battle lines were clear: on one side, favoring large farmers, the California Chamber of Commerce, Farm Bureau, and Irrigation Districts lined up against acreage limits. On the other, the California Grange, AFL-CIO, VFW, the American Legion, The National Famer's Union, and various religious groups. While this lineup cut across party lines to some extent, it mostly aligned small farmers against big agribusiness. It soon became evident that Republicans were more hostile to acreage limits than Democrats.[118] This conflict played out in various settings – congressional, bureaucratic, and judicial – for nearly two decades, with each side winning battles occasionally but, over time, it became increasingly apparent that the Bureau itself was becoming more and more reluctant to enforce acreage restrictions. The evolution of the Bureau's position was not, however, fast enough for the big landowners.

An option, explored by big landowners, was simply to switch agencies – to seek to have the Corps of Engineers (which did not see itself as bound by the Reclamation Act,[119] and which was included in the original authorizing legislation) build the Project instead of the Bureau.[120] The big farms seized the opportunity to try play one agency off against the other and they found the Corps to be a more than willing partner. The Corps was already building dams on the Kern

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Landowners argued that failure to enforce over a period of years had effectively repealed the limitation altogether. Paul Taylor, "The 160-Acre Water Limitation and the Water Resources Commission," The Western Political Quarterly, Vol. 3, No. 3 (Sep., 1950), pp. 435-450.

[118] The Bureau of Agricultural Economics, in the Agriculture Department, Authorized a sociological study of the effects of farm size on various features of the economy of local areas. The resulting report – which argued that areas with smaller holders performed "better" in various respects -- supported retaining the 160 acre limit. This caused immense controversy for its authors and the BAE. Eventually the Department itself suppressed official publication. Richard S. Kirkendall, "Social Science in the Central Valley of California: An Episode," California Historical Society Quarterly, Vol. 43, No. 3 (Sep., 1964), pp. 195-218.

[119] This, despite the fact that in 1944 the Flood Control Act required the acreage restriction on Corps projects.

[120] Alten Davis, "The Application of the Excess Land Provisions of the Reclamation Law to the Central Valley Project," The Western Political Quarterly, Vol. 19, No. 3, Supplement (Sep., 1966), pp. 22-23.

and Kings rivers to the South, and was eager to extend its portfolio further into the western bailiwick of the Bureau. The Corps made several attempts to take the construction of the Pine Flat Dam on the Kings River away from the Bureau, even ignoring repeated presidential directives to the contrary.

By the early 1940s large southern CV farmers succeeded in getting the state Engineer on their side in getting the Corps into the irrigation business. The Corps promised to be much more responsive to local interests—especially big farmers and the water districts they controlled -- than the Bureau (which, under Interior Secretary Ickes, retained its Progressive tilt). The Bureau's traditional mission had been to reclaim land for agriculture in order to settle the empty western lands. This led the Bureau to favor projects that would permit the establishment of large populations of small farms (as it was directed to do in the 1902 Reclamation Act). Ickes and Roosevelt believed in this mission and supported it as did the agency's civil servants for the most part. By contrast the Corps' traditional mission was navigation, to which flood control was added following the 1927 Mississippi flood. These were considered to be public goods which were not considered to require much in the way of local contributions. Corps projects could therefore mostly be funded out of general revenues without the need to charge end users. The Corps did not need to add hydroelectric power generation in order to finance its projects and considered itself free to provide irrigation benefits as incidental. For these reasons, the Corps could avoid controversies that the Bureau could not escape. And it was much freer to seek support even from small famers whose enthusiasm for the Project was inversely proportional to the repayment requirements.

In 1944 an amendment was offered to the Rivers and Harbors Bill in the House exempting the Project from the acreage limit altogether. The bill however failed in the Senate, but the idea did not die. Another attempt to exclude the Project from acreage limits came in the "do nothing" 80th Congress; it did not get out of Senate committee. These maneuvers reflected the political conflicts inside Congress: Corps projects were considered by the public works committees (Rivers and Harbors and Flood Control) while Bureau business was in the jurisdictions of the Interior committees. The Corps argued that Pine Flat was justified solely by its flood control benefits and that any irrigation benefits from the use of impounded water were

incidental (and did not need to be reimbursed).[121] At the end of the day a compromise was reached: the Corps built Pine Flats dam but the Bureau took over its management. This left the acreage limitation in limbo: it was not clear that the Bureau could legally refuse to enforce it. The big landowners got very nervous and indeed they offered to buy out the government altogether and build the dam privately.[122]

A turning point was reached when (Bureau) "Commissioner Michael Straus, 1945-1953, eased tensions over enforcement of the excess land law by announcing a *technical compliance formula*. The public at large was to understand that the family farm law was still intact while the large growers were assured that it would not be strictly enforced."[123] At this point the political coalitions shifted.[124] The Grange, for example, which had historically supported the (Progressive) Bureau, now saw the agency as having been coopted or corrupted. Other deals were cut too. PG and E was bought off by a wheeling agreement with the Bureau (permitting it to buy public power to resell to its clients). Soon the "...Bureau and the Army Corps of Engineers became reconciled under the terms of the *Folsom Formula* in building and management of the New Melones and other Corps-constructed dams in the 1960s."[125] The Corps would build the projects but the Bureau would manage them (without enforcing the acreage limits). At this point bureaucratic peace seemed secured on grounds favorable to the large landowners. Southern CV farmers, who which had previously relied on damaging groundwater extraction, could now look forward to the prospect of two federal agencies competing to supply them with cheap surface water in most years, without any annoying acreage restrictions. And they could use the surplus, when there was one, to recharge groundwaters as a bank against intermittent droughts.

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[121] This story is told in detail by Mark Arax and Rick Wartzman, The King of California: J.G. Boswell and the Making of a Secret American Empire, New York, 2003.

[122] Arax and Wartzman, op cit.

[123] Lawrence Lee, "California Water Politics: Opposition to the CVP, 1944-1980," Agricultural History, Vol. 54, No. 3 (Jul., 1980), p. 404.

[124] "...Straus could not abandon the excess land law openly...the 160 acre law was indispensable to reclamation appropriations, particularly among liberals who were most receptive to federal spending." Clayton Koppes, "Public Water, Private Land: Origins of the Acreage Limitation Controversy, 1933-1953," Pacific Historical Review, Vol. 47, No. 4 (Nov., 1978), pp. 624. Koppes describes the way in which the technical compliance formula was implemented by the Bureau and the various issues that arose.

[125] Lee. P. 405.

There remained some flies in the ointment however. In 1958, the Supreme Court ruled that the acreage limitation was not quite dead.[126] The Bureau reacted by requiring those holding "excess lands" (in excess of statutory requirements) to enter contracts to sell the excess within 10 years, and also to be resident on land that received federal water. Other new rules permitted some relaxation of the acreage limit (essentially permitting farms up to 960 acres, which was more or less the point at which, the econometric studies at the time indicated that scale economies in farming were mostly exhausted). But these rules were easily evaded. The sales of excess lands were frequently made to absentees who then hired the previous owner (usually a large corporation) to manage the farm, employing migrant and other farm workers. The result has been that landholdings in the southern CV to this day have remained very large and waters are still supplied at very low prices by the CPV.[127]

The last gasp of the 160 limitation occurred much later and was squarely centered on Kings River water and specifically on the Pine Flat Dam, which had been constructed by the Corps of Engineers. The question was raised when an appellate court ruled that the acreage limitation applied to Pine Flat water. "No one saw it coming. A federal appeals court in San Francisco was now saying that the giant farms of Tulare Lake had to abide by the old reclamation law. They could be no bigger than 16o acres...." (Arak, chapter 15) Until then the big growers had been on a winning streak: "In 1963, after much dithering, the government had

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[126] *Ivanhoe Irrig. Dist. v. McCracken*, 357 U. S. 275 (1958). *Ivanhoe*, which concerned limitations on water delivery contracts for the Friant canal in the Southern CV, overturned a California Supreme Court construction of the 1902 Reclamation Act. Section 8 of that Act "requires" the federal government to respect state laws in acquiring water rights. The California Court read section as overriding Section 5 which is the 160 acre limitation, thus permitting the state to deliver water to farms in excess of the 160 acre limit. Justice Clark wrote for the Court that Section 8 only requires the Federal government to respect laws when acquiring rights, not with respect to deliveries. "We read nothing in § 8 that compels the United States to deliver water on conditions imposed by the State. To read § 8 to the contrary would require the Secretary to violate § 5, the provisions of which, as we shall see, have been national policy for over half a century. Without passing generally on the coverage of § 8 in the delicate area of federal-state relations in the irrigation field, we do not believe that the Congress intended § 8 to override the repeatedly reaffirmed national policy of § 5."

[127] A good example concerns the Westlands district which began receiving federal water in 1963. Its "…parcels technically meet acreage limitations; existing landowners selected friends, relatives, or absentee investors to be the recipients of excess lands. Control is assured to the selling parties because original sellers lease back lands sold, allowing the farm to continue virtually unchanged. … The three largest landowners—Southern Pacific Railroad (106,000 acres, 42,898 hectares), J. G. Boswell (26,485 acres, 10,718 hectares), and Standard Oil (10,474 acres, 4,239 hectares)—hardly qualified as small farmers. Martin Mitchell, "Westlands Water District, Fresno County, California: Problems with the National Reclamation Act," Yearbook of the Association of Pacific Coast Geographers, Vol. 46 (1984), pp. 117-128.

agreed to store water at Pine Flat and, meanwhile, leave it to the courts to decide the knotty question of whether all the farms served by the project should be capped at a quarter square mile. Then, nine long years after that case was first filed, a ruling finally came down. From his chambers at the federal courthouse in Fresno, Judge Myron Crocker had decreed that " 'reclamation law has no application to lands within the Kings River' area. The Colonel couldn't have said it any better himself. The Bureau of Reclamation's thirty-year attempt to break up Boswell and Salyer and the other agri-giants of Tulare Lake had been soundly rebuffed."

But four years later, the appeals court upset everything requiring that if irrigators wanted water from Pine Flat Dam, they would have to sell massive amounts of their lands .[128] Until the appellate court ruling it seemed that these and other assurances from the Bureau were sufficient to keep the 160 acre limitation in its grave. The growers had long argued that they "... had already reimbursed the U.S. Treasury for that minor portion of the dam allocated to storage and irrigation benefits. And that payment, in and of itself, should have removed the manacles of reclamation law.... That the farmers could buy their way out of acreage limits-in the case of Pine Flat, for an interest-free total of $14.25 million-had long been a contentious proposition.... Through the Truman, Eisenhower and Kennedy administrations, officials at the highest levels had debated whether or not the policy was sound, flitting back and forth between blessing and denunciation." Their lawyers that argued that Commissioner Straus (he of the technical compliance formula) had said in a 1952 that the payout principle was "established departmental policy." Furthermore, "...in July 1957, Interior Secretary Fred Seaton assured those on the Kings that 'the Department continues to recognize and support the basic concept of reclamation law that full and final payment ... ends the applicability of the acreage limitation.'" (Arax, ch. 15)

According to Mark Arax, Salyer and Boswell disagreed tactically on their next move. While Salyer urged a political campaign, Boswell's lawyers were sure that the Supreme Court would reverse, and were shocked when "In February 1977....The Supreme Court declined

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128 535 F. 2d 1093 - United States v. Tulare Lake Canal Company

to hear the Tulare Lake case, letting stand the appeals court ruling that the 160-acre limit should be placed on the lands fed by Pine Flat Dam." At this point the only possible tactic was political; to get Congress to revise reclamation law to remove the limitation at least as applied to the Pine Flat Dam. Boswell and Salyer immediately set up and funded new interest groups, established a PAC, and fielded a team of lobbyists. They were well aware that careerists in the Bureau remained favorable to the acreage limitation and with Jimmy Carter's prominent opposition to big water projects and Cecil Andrus as the new Interior Secretary, the lifers had powerful support from the top. Boswel-Sayler lawyers had actually tried, early in Carter's term, to sneak a bland seeming rider exempting Pine Flat from the limit, onto another bill. This not only failed but bought them new opponents, including home state Senator, Alan Cranston, and local congressman (Krebs), both of whom resented the underhanded methods. They tried belatedly to convert Secretary Andrus to their cause: an effort that seemed likely to fail as Andrus was already publically committed to the acreage restriction. After the midterm, the course settled on was to ally with other water interests across the nation and attempt to enact an omnibus act reforming Reclamation law. The proposed act had many moving parts and the strategy was risky. By tying their "little" exemption to an ambitious reform package the fate of Pine Flat water was then tied to allies they could not control. Moreover there was always the risk that their "little" exemption would be cut out of the package in last minute bargaining.

But there was really no other option. Boswell-Salyer lobbyists did eventually manage to neutralize Senator Cranston who ultimately did not oppose the exemption in the Senate. But the omnibus bill finally died in the House in 1980. But the outgoing Carter Administration left a big gift: Cecil Andrus, who had been strongly opposed to the exemption turned around after a visit to the Tulare Lake farm. "'I have concluded '... that in the Tulare Lake Basin, small-scale scale farming is not economically feasible.... Only large farming operations can financially sustain the high costs of diverting the flood waters into selected large tracts of land.... Without large farms in Tulare Lake, large amounts of acreage would not be in agricultural production, and that would in no way further the purposes and goals of the reclamation program.' He ended by saying that if the big farmers in the lake bottom were to let the Kings River run wild, it would no doubt 'impair the productivity of the small farm operations that are upstream of the Tulare Lake basin.' To do anything other than grant an exemption on the Kings 'would be irresponsible and would most

likely jeopardize the many small operators to get at a few large operators.' Andrus's traditional allies were dumbfounded." (Arax). The ground was cut out under congressional liberals as well as Bureau supporters of the 160 limit.

Andrus's backflip had not helped to save the legislation in 1980 but two years later, with President Reagan in office, and pro-agribusiness appointees in Interior, it was to prove a godsend. "For Boswell and Salyer, it was difficult to overstate the importance of Andrus's turnabout. Most Republicans, including the incoming Reagan administration interior secretary, James Watt, already were on board or soon would be. And now, how many liberal Democrats were going to attack a provision that Cecil Andrus had seen the wisdom of?" The Boswell/Salyer lobbyists reported that "Andrus's acquiescence 'changed the whole course' of the debate. It was "major, major, major..." In 1982, the Reclamation Reform Act became law with President Reagan's signature and the Pine Flat exemption was built in. It had taken nearly forty years but finally, it seemed, the limitation was killed. The historic attachment of reclamation with the small family farm was severed.

With so much uncertainty about federal policy, the big farms sought to get the state, which was much more responsive to farm interests, to take over the lead role in irrigation policy. The CVP itself had originated a state program and only became a federal one because of the lack of state resources. From the earliest days there had been repeated proposals by large landholders for the state to buy out the CVP. A state program would be managed by local water agencies in which voting weights were determined by acreage so that big farmers would be in control.[129] But even after the depression had passed, the state would have to come up with a lot of money to purchase the project and this meant that a very big (and probably very controversial) bond referendum would have to be placed on the ballot. Questions were bound to arise about who

[129] Water districts have various authorizing statutes which permit the use of various forms of property weighted voting. These include the County Water, Municipal Water, Water Conservation (1931 Act), Water Replenishment, Irrigation, Community Services, Municipal Utility, and Public Utility Districts have resident voting provisions. California Water, California Water Storage, Water Conservation (1927 Act), and Reclamation Districts have a landowner franchise.

stood to benefit from the takeover. There was moreover a new constitutional question about the status of property based voting rules in water districts. No one was eager to take this on.[130]

The Warren Court, however, decided to reopen the Pandora's Box in the series of reapportionment rulings that began in the early 60s. A number of challenges were soon made to voting rules in special districts.[131] he first case was *Thompson et al. v. Board of Directors of the Turlock Irrigation District*, which was decided in 1967. The appellate court held that as water and irrigation districts did not exercise general "police" powers, they were not required to satisfy the one person one vote principle. At the same time it held that the Turlock district had failed to make boundary alterations to respond to large shifts in population that had occurred over the previous half century: "The appellate court therefore affirmed, but modified, the [district court] judgment, ordering the Turlock Board to redraw the division boundaries so that they were as nearly equal in area and in population as practicable under pain of having the court do it."[132] This was a small but important victory for the idea that at least some special districts were bound to vote equality. For a decade state and federal courts struggled with the question of how far the new one person one vote doctrine would apply. In California the question centered on special districts and especially on various kinds of water districts. The question was whether to regard such districts as special service providers (which could use whatever decision rule they found convenient) or as general purpose governments, in which residents would presumably have voting rights. The cases went both ways in lower courts and the question was finally decided by

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[130] See David Martin, "One Person, One Vote" and California's Water Districts," Natural Resources Lawyer, Vol. 8, No. 1 (1975), 9-28

[131] "As of January 1972 there were 886 districts in California per- forming water utility functions. These districts are legally constituted governmental entities, created under either general or special acts of the state legislature and governed by a board established by the statute under which the district is formed. Such districts are ordinarily authorized to levy taxes, issue both general obligation and revenue bonds, and set rates for services. In recent decades these districts, although charged most prominently with water resource activities, tend to assume many of the features of general municipal governments and provide the basic services normally assumed by cities. Among the activities presently engaged in by such districts are sewage disposal, police and fire protection, the construction and maintenance of streets and roads, street and highway lighting, the provision of park, recreation, and parkway facilities, and library and ambulance services." Merrill R. Goodall and James B. Jamieson, op cit. p. 292.

[132] (Martin, p. 15). Martin argued that "The California court had been remarkably adroit in formulating a definition for special districts being exempt from the 'one person, one vote' doctrine, yet achieving reform in the case before it." (15) I am not sure that this was really adroit or simply confused. In any case, a series of state and federal court decisions between 1967 and1972 appeared to be moving in the general direction of the *Thompson* ruling in imposing constitutional restriction on voting rules in water districts.

the new Burger court, which put an end to the string of restrictive lower court decisions challenging the voting systems of storage districts.

Salyer Land Co. et al. v. Tulare Lake Basin Water Storage District,[133] centered, as many earlier cases had, on the actions of a large CV farmer – J.G. Boswell once again – and decided matters in his favor.[134] Boswell had used his (property weignted) control over a local water district to block the effort of his neighbor and nemesis (Clarence Salyer) to redirect Kern River water into Buena Vista (away from Tulare Lake), in order to protect his lands from flooding. "On March 20, 1973, the United States Supreme Court, by a vote of six to three, declined to intervene in the voting arrangements of a water storage district in California in delineating the applicability of the Equal Protection Clause." (p 9). "The six to three majority opinion delivered by Mr. Justice Rehnquist agreed the district provides none of the general public services ordinarily attributed to a governing body, and that its special limited purposes fall so disproportionately upon landowners as a group that restriction of the franchise was the sort of exception to the rule laid down in *Reynolds* .... Nor does the exclusion of lessees from the franchise violate the Equal Protection Clause since the land-owner can assign proxy voting rights to the lessees as part of the contract. Weighing the votes according to assessed valuation of the land is not unconstitutional, the Court concluded, since expenses for massive projects are also levied in proportion to the land's assessed value..."[135] Salyer's loss in the water storage district would stand; he simply did not have enough property/votes to prevent his lands from flooding before Boswell's.

The State Water Project

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[133] 342 F. Supp. 144 (1972).

[134] The situation in the Tulare Basin (where Boswell's business was located) "...was considered by large agro business to be an ideal test case because water storage districts have more restricted powers than other types of [water districts], and few people live in the basin since the land is subject to flooding." Martin 26.

[135] Martin, p 26-7. Justice Douglas wrote a dissent that was joined by Justices Brennan and Marshall: "These four [agro businesses] farm almost 85% of all land in the district. Of these J. G. Boswell Co. commands the greatest number of votes, 37,825, which are enough to give it a majority of the board of directors. As a result it is permanently in the saddle. Almost all the 77 residents of the district are disenfranchised. The hold of J. G. Boswell Co. is so strong that there has been no election since 1947, making little point of the provision in ... the California Water Code for an election every other year." (Martin, 27) The dissent went on to point out that the district had chosen to divert waters from the Boswell holdings during a major flood in 1969, instead permitting inundation of lands Boswell did not farm.

As it became clear that it was not feasible for the state to raise the needed funds to buy out the Federal Government, attention turned to the prospect of building a whole new project. Such a project would have new beneficiaries who had been left out the CPV: the rapidly growing Southern Californian cities and suburbs. The "...Feather River Project differs from earlier plans. It follows the principle of the Central Valley Project as originally conceived by earlier state engineers, but it was designed to deliver water outside of the Sacramento and San Joaquin valleys, which was never envisioned in the Central Valley Project."[136] Of course the big irrigators in the southern CV would also stand to gain massive supplies of new water (ostensibly these new supplies were supposed to be temporary).

State Engineer A. D. (Bob) Edmonston, 1950-1955 had personally led a persistent campaign against federal water resource dominance in the Valley. He developed the feasibility report which eventually persuaded the state legislature to authorize the Feather River or State Water Project (SWP) in 1951. His efforts, however, took the better part of decade to begin to pay off and by the time they did he was largely out of the picture. Ironically, perhaps, Pat Brown, who Edmonston had converted to a water enthusiast, essentially shoved him aside in the final push to get the project approved (the critical pumps that lifted the water over the Tehachapi's were, nevertheless, named for Edmonston). Predictably, the chief obstacle to the plan was the geographically apportioned State Senate. Until the reapportionment decisions in the early sixties, it was apportioned in a way that advantaged the northern and rural parts of the state. It was not going to be easy to find a compromise that the Senate could accept.

Some of the (State Water) project's most ardent supporters were Southern California developers, eager to get a share of water to continue rapid postwar growth.[137] But the supporters also included representatives from the Southern part of the central valley [138] Prior to the project,

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[136] C. A. Griffith, "Development of the California Water Plan," American Water Works Association, Vol. 47, No. 4 (April 1955),p. 370. Griffith was then the chair of the State Water Resources Board.

[137] There were divisions in the Southland however, the Metropolitan Water District (MWD) opposed the project out of fear that it would undercut its claim on Colorado River water.see Mark Reisner, Cadillac Desert: the American West and its Disappearing Water, New York: Penguin Books. The MWD's opposition is therefore best understood as tactical rather than strategic.

[138] Martin Nie, "Build It And They Will Come: A Reexamination of the California State Water Project," Southern California Quarterly, Vol. 80, No. 1 (Spring 1998), pp. 71-88

much of the western parts of the valley lay fallow. The federally funded Central Valley Project watered land to the north and east, but not much reached the southwestern portion of the San Joaquín. As a result, groundwater was being overdrafted and poor quality recycled irrigation was poisoning large stretches of the southwest CV. Any expansion of farming and land development would require importing water for irrigation (Nie, 78). Anyone owning a large tract of land without a steady water source stood to receive a windfall if a reliable source of water was provided.

Six major corporations including Standard Oil and Kern County Land Company owned approximately 30 percent of the agricultural land in the southern and western parts of the San Joaquín Valley-all within project boundaries. And, as expected, one reason the State Water Project was supported by the state's large landowners was it allowed them to circumvent the Bureau of Reclamation's 160-acre limitation created by the Reclamation Act of 1902 for those who use federal waters. (Nie, 78) SWP water would mean increased growth and development in southern California, resulting in increased profits for related business and industry. But it also would provide a great windfall in the value and production of whoever owned the land in the Southern and western parts of the valley, even if the relief for the groundwater table was to be temporary.

The political events were complicated but revealing. When Governor (Pat) Brown had been elected in the nationwide Democratic landslide in 1958, there had already been several attempts by previous governors (Earl Warren and Goodwin Knight), to get the project started. While that had been a number of favorable reports by State Engineers, there remained a great deal of resistance from northern Californians. State senators from the “counties of origin,” which stood to lose water, allied with senators from the Bay area and the Delta who opposed the plan as it complicated the management of the fragile Delta -- the transit point for shipping waters North to South – to the detriment of water quality and wildlife. The power companies (PG and E and SoCal Edison) were also opposed to the public power aspects of the plans, which threatened to undercut their business models if the state marketed cheap power. The support for the plan was very strong in Southern California however and its large and growing population made it an attractive constituency to Governor Brown. The north-south split was clear enough. What wasn’t

so evident is where the line would be drawn: which side would central valley farmers (historical beneficiaries of CVP water) take?

The first test was in the state Senate, where the Northern parts of the state enjoyed significant malapportionment advantages. Brown enlisted Fresno Senator Burns to sponsor the legislation. Burns's job was to help broker details important to CV farmers (especially by refusing to include an acreage limitation in the legislation) in order to keep the Valley farmers inside the coalition. "Brown could count as certain the eight southern California votes. In addition, he had [senator] Burns and several senators from northern and Valley counties which stood to gain directly from the FRP, especially the Oroville Dam Project and the San Luis Reservoir Project."[139] He also reassured the power companies that they could buy publically produced power directly, and tried to give other reassurances to county of origin interests. For example, He refused to give southern Californians the constitutional guarantee of water rights that they demanded. Subversion of traditional water rights had become a symbolic sticking point to northerners. Instead he pointed out to southern Californians that the population weight of the state had already shifted decisively southwards, and (with more water to permit real estate development) would continue to do so. Southern Californians, he argued, simply did not need the constitution to protect their rights to water. The important thing, he argued, was to get the project off the ground and especially get it through the malapportioned State Senate. After that, southern California could protect itself.

The governor's assurances did not appease northernors. "Definitely against the measure Brown probably could count the fourteen senators from northern mountain counties of origin and the Delta. Everyone else was 'fair game' and Brown has indicated that, with some of these remaining senators, he 'begged, pleaded, urged, and cajoled' to get votes and divided the opposition sufficiently to start the big projects." (Grody) In the end, Brown's campaign succeeded in dividing the opposition, not by breaking the North-South cleavage that had threatened the Project from its earliest days, but by moving the critical line northwards into the

[139] Harvey Grody, "From North to South: The Feather River Project and Other Legislative Water Struggles in the 1950s," Southern California Quarterly, Vol. 60, No. 3 (FALL 1978), pp. 287-326 Published

CV. The crucial next step remained: to convince the public to agree to a massive bond issue to finance the Project.

The (State Water) project was placed on the November 8, 1960, ballot as a proposition in the general election... (Nie, 76) "... the governor made public statements which were heavily laced with detailed explanations of how much money was going to be spent in different parts of the state as a result of the water development program. The implication, of course, was that the economy of various parts of the state would be materially benefited by passage of the bond measure. In his appeal for public support, the governor was not relying alone on the public's acceptance of some general abstract concept of "public benefit" in the long-term, but rather he was attempting to gain public support for his program by detailing specific practical economic benefits." (Grody, 309) It is not clear that this "distributional" campaign persuaded anyone. In the end, "Northern California counties almost unanimously rejected the bond act, while support in the south was very strong. In fact, the farther south one went, the stronger was the bond's support. The only northern county that supported the act was Butte, the proposed future site of the Oroville Dam." (Nie, 76) Butte county looked forward, no doubt, to generations of construction jobs.

Perhaps as telling in regards to the project's enactment were the significant campaign contributions given for the passage of the *Burns-Porter* Act in 1960. Receipts obtained show that those that did make large contributions (over $1,000 in 1960 dollars) had much to gain from the bill's passage, either in the form of direct land development or southern California growth as a whole. Thus, it was not only large landowners that gave generous sums, but so too did construction interests that were tied into the further growth and development of southern California. (Nie, 84)

8. The Environmental Revolution

As the big water projects came online and water usage for irrigation surged, environmental problems began to surface. To some extent, of course, the environmental issue arose nationally and internationally in the late 1960s, quite independently from California's water problems. Important national laws were put in place including the *National Environmental*

Policy Act (1969), the *Clean Air* (1970) and *Clean Water* (1972) *Acts*, and the *Endangered Species Act* (1973) along with other laws concerning toxic substances, fertilizers and pesticides. All these concerns threatened to have big effects in California. The Central Valley long been managed as an enormous industrial farm system which used lots of resources and generated a lot of pollution in order to produce massive agricultural outputs. Water transfers within the state, moreover, triggered additional concerns with the impacts on species habitats – especially collapsing runs of salmon through the Delta, as well as the decline of the less glamorous smelt, as well as other fish. Such issues often allied environmental and commercial fishing interests and with other interests as well. Environmental problems are greatly heightened during drought years but there has been a growing pressure to use water for environmental protection even in normal rainfall years.

It may simply state the obvious but it is important to see that "The emergence of environmental interest groups as a major competitor for California's water has radically changed the "iron triangle" of agencies, urban users, and irrigated agriculture which had synergistic goals and was responsible for development of the existing water structure in the West....." [140] A powerful new set of players has joined the game, bringing new money and votes and in some areas, California has become a national leader in environmental legislation. It has imposed higher standards for air pollution from both automobiles as well as on gasoline; it has limited development in coastal and other environmentally sensitive areas And, while it has imposed additional regulatory restrictions in the state water code as well, progress in this area has not been as impressive. Much of the significant legislation has come from the federal government. For example, in 1992 Congress passed major amendments to the *1937 Rivers and Harbors Act*: "... the *Central Valley Project Improvement Act*, mandates changes in management of the Central Valley Project, particularly for the protection, restoration, and enhancement of fish and wildlife." The *Act* elevated habitat restoration and protection to the same level as irrigation, and just behind navigation and flood control. You could almost see the blood on the floor, as the 102nd Congress

[140] Richard E. Howitt and Jay R. Lund, "Measuring the Economic Impacts of Environmental Reallocations of Water in California," American Journal of Agricultural Economics: Proceedings Issue Vol. 81, No. 5, (Dec., 1999), pp. 1268.

(just before closing up shop) effectively said to the farmers that they were on their own in fights with environmental interests.

But at the state level, important moves have come in the courts. California courts began to play an increasingly important role in responding to environmental concerns. The "reasonable and beneficial use" doctrines, which applied to ground as well as surface water, had long permitted courts to redefine which water uses were permissible and could easily be (and were) retrofitted to apply to environmental claims. More important, perhaps, was the judicial rediscovery of an old Roman and Common Law concept, *the public trust,* as a useful doctrinal vehicle for articulating the public's interest in the conservation and allocation of resources. Indeed, while the *public trust* is sometimes considered an attribute of sovereignty, in traditional common law jurisprudence *public trust doctrine* was mostly used to impair the exercise of sovereign authority – as in the crucial early case, *Illinois Central*.[141] There the Court held that the state as sovereign had special duties to protect navigation and was therefore required to forgo policies that would interfere with that duty. The modern form of this doctrine originated in a seminal article by Joseph Sax, which greatly expanded the reach of the concept to attribute to the state the responsibility to protect the environment including fish and other wildlife and their habitats and public access to it. His suggestions were soon picked up in California courts,[142]and to some extent in the federal courts as well. Important in this development is the idea that the content of the *public trust* could be shaped legislatively as well as by common law. For example, with the enactment of the *Clean Air Act* in 1970, the *public trust* has been understood to include air quality. Indeed, as that *Act* was further amended over the past 45 years, the content of the *public trust* has continued to evolve doctrinally. This is not to say that the expansive notion of *public trust* is uncontroversial, either in law or politics.

The *public trust* duty is limited in several ways. First, as it has developed into doctrine, it is limited to states and does not appear to bind the federal government. Its content can be

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[141] In *llinois Central Railway. v. Illinois,* the Court held that the State of Illinois could not convey title to lands underlying Lake Michigan in derogation of its public trust responsibilities. 146 U.S. 387, 452 (1892)

[142] "The Public Trust Doctrine in Natural Resources Law: Effective Judicial Intervention," Mich. L. Rev. vol. 68, 471 (1970). See also the decision of the California Supreme Court in *National Audubon Society v. Superior Court*, 33 CaL3d 419 (1983).

regulated by common law, statute (state or federal) as well as by the state constitution. There is also an important distinction between the *public trust* – a fiduciary duty to protect land and water or other things held in common – and the public interest, which may include other duties. For example, the California Constitution directs the state's policy makers to develop its water resources to the maximal extent. This may require making use of things that are held in trust, even destroying or alienating them. Thus, there may be a need for the state to balance or harmonize its constitutional requirements with its duty to protect the public trust. A second limitation has to do with its scope; what things are considered to be part of the *public trust*? This question has been answered in many different ways in different states. Many state courts have accepted state ownership of rivers up to the high water mark and required landowners to permit access to the river in that domain. More controversially, some courts have attributed to the state ownership of wildlife.[143] Other limitations are more technical having to do with justiciability and evidence, which can be especially difficult questions when raising a complaint about a violation of the public trust. Thus, a court needs to decide who can bring suit (standing), when (mootness and ripeness), and what it takes to succeed in making a claim (rules of evidence, and especially of causation which is often hard to establish in environmental cases).

The Delta has been the center of struggles over California water policy for many years. The State Water project like the CVP runs its water down the Sacramento and through the Delta, and then, backwards, up the San Joaquin, to the massive pumps at Tracy, where it is shipped south. Normally, water impounded by the projects is released from April to November to keep back saltwater from Delta farmlands but a large quantity is kept in reserve in system reservoirs. In drought years enough project stored water remained to maintain flows at a level sufficient to keep the Bay at bay, so to speak. That was the genius of the Projects. The rising demand for water in the southland, however, has put this assumption at risk.[144] As long as water was

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[143] Richard M. Frank, "The Public Trust Doctrine: Assessing Its Recent Past & Charting Its Future," University of California, Davis Law Review, vol 45 (2012), 665-

[144] In 1957 the California Department of Water Resources requested the Bureau of Reclamation to clarify its policy concerning the quality of waters to be shipped south. the response by the regional director of the Bureau was as follows:

> It appears that, under present conditions of upstream development and diversions from the Delta, a computed outflow of approximately 1500 second-feet will protect the intakes to the Tracy and Contra Costa pumping plants. I consider that the obligations of the Central Valley Project are satisfied when a satisfactory quality of water is provided at the intakes to the Contra Costa and Tracy pumping plants.

restricted to irrigating Central Valley farms, as it had been under the CVP, it was possible to assure a sufficient flow through the Delta to maintain adequate water quality. This was so partly because in drought years Valley farmers would receive reduced allocations (they hold mostly junior rights) and they could then fallow their field crops.

All that changed with the addition of the State Water Project which began shipping water to Southern California down the Sacramento and through the Delta "hub." Municipal demand persists in dry as well as wet years and, while you can ask them to use less water for landscaping, you cannot "fallow" people who need drinking water. The result is that in dry years "The combined yield of the two projects is not adequate to meet the contractual obligations of the projects and provide the necessary releases to maintain adequate delta outflows ...."[145] Adding in new (court backed) environmental demand for water to protect species' habitats, and the problem is amplified. The situation has been further compounded by the recent shift by CV farmers away from field to orchard crops which cannot economically be fallowed in dry years. By the later 1970s the situation looked to be a slow motion catastrophe.

The Peripheral Canal

The solution, favored by state engineers was to build a peripheral canal that would take water fresh water from the Sacramento River, upstream from the Delta, and route it directly to the pumps at Tracy.[146] By drawing clean upstream flows this would solve the salinity issue for the pumped water ensuring high quality water for Southern California. But, as the Canal would reduce water volumes through the Delta, it did not address the issues facing Delta farmers. Unless sufficient flow through the Delta is maintained, saltwater incursion threatens the viability of Delta agriculture and could impair water quality for municipal users drawing on Delta water. Supporters of a peripheral canal, if they hoped to get statewide support, had to include promises

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Donald F. Anthrop, "The Peripheral Canal and the Future for Water in California, Yearbook of the Association of Pacific Coast Geographers, Vol. 44 (1982), pp. 109-128

[145] Anthrop, 116.

[146] The peripheral canal, as originally proposed "...would divert water from the Sacramento River around the east side of the delta from Hood (located about 15 miles south of the delta) to the pumping plants near Tracy (Fig. 3). A number of release gates in the canal would maintain positive downstream flow in delta channels. Since the reverse flow in the lower San Joaquin would be eliminated, less water would have to be released for salinity repulsion." Anthrop, 116.

that adequate flows would be maintained both during the April-November period and during (sometimes extended) droughts. Events were soon to prove that many people had trouble believing that such promises could be kept, especially as the demand for water escalated. To make matters more difficult, agricultural supporters of the canal demanded assurances that they would get enough irrigation water to satisfy their needs. The political "solution" amounted to this: promise that the agency would somehow be able to assure adequate flows to satisfy affected interests and hope that people believed it. As they say, good luck with that.

Whatever doubts may have remained, Governor (Jerry) Brown signed SB200 in July of 1980 authorizing the construction of the peripheral canal. Even before the bill passed, however, sufficient signatures had been gathered to put a proposition on the November ballot codifying the state's promises as constitutional guarantees. Proposition 9 required that the SWP not violate state water quality standards (which are set by the State Water Quality Control Board), that the SWP would make up for shortfalls in water deliveries by the CVP. Additionally, it required that the Department of Water Resources make an agreement with the DFG to "restore and maintain Delta fish and wildlife resources to their historic levels (1922-1967 average)." (Anthrop, 119). Moreover, Proposition 9 "... prohibits the construction of dams or the export of water from any components of California's Wild and Scenic River System ... [which] consists of portions of the Eel, Van Duzen, Trinity, Klamath, Salmon, Scott, Smith, and American rivers, which together total approximately 4,006 miles of river..." without a majority vote of the electorate or a two thirds vote of the legislature. (Anthrop, 120). It was all things to all people. In the end, Proposition 9's guarantees did not convince skeptics. Indeed, they were not intended to. Environmentalists thought its promises insufficient to protect the environment; CV farmers believed its environmental protections so extravagant as to threaten future water deliveries; and ordinary taxpayers thought it was too expensive. The Proposition was, as its authors intended, simply an effort to overturn SB200.

Proposition 9, an up or down vote on the canal, was placed on the June 1982 ballot. A study of the campaign (which relied on campaign finance reports) noted that the opposition

coalition included environmentalists, Delta farmers, [147] and, surprisingly perhaps, Southern CV agribusinesses who thought that the Legislature had conceded too much to environmentalists in SB200.[148] The "J.G. Boswell Company and Salyer Land Company [together] contributed over $1.5 million or slightly under a half (45 percent) of the reported $3.3 million in funds opposing the proposition. Although these two companies were the largest contributors in this campaign, they were aligned with the majority of contributors who gave less than $500 each." (Gwynn, 24) The opposition included some public agencies as well.[149] "...the U.S Fish and Wildlife Service, the federal counterpart of the California Department of Fish and Game, officially opposed the Peripheral Canal. Its reasons paralleled those of the Sierra Club, which was wary of the potential for siphoning off too much water and improper operation of the canal." (Gwynn, 23) Environmentalists "... charged that the primary beneficiaries would be large oil companies with large agricultural holdings in areas that would obtain most of the water sent through the canal..." Big oil was an easy target as its holdings were mostly in the arid parts of the Valley. "Indeed, as it turned out, the "Reports to the State Division of Political Reform show that, together, Getty Oil Company, Shell Oil Company, and Newhall Land and Farming Company contributed over $750,000, or about a third of the reported $2.5 million supporting the canal." But many smaller farmers supported the canal as well. In any case, the big push for the Canal came from the South which wanted an assured flow of high quality water. "The Metropolitan Water District was central in organizing support for the Peripheral Canal."[150] Its hope was that the populous Southern California vote would turn out in sufficient numbers to push the canal through.

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[147] "Delta farmers feared that this would increase salinity problems, should a disproportionate amount of water be shipped south instead of being used to flush the Delta. Proponents of the canal, such as the California Department of Water Resources, claimed that the canal would allow for a more efficient flushing action through controlled outlets."

[148] "... Major farm organizations, such as the Farm Bureau Federation, the Grange, and the Cattlemen's Association, also declared publicly that they opposed the canal early in the campaign.... some large agricultural interests, such as the J. G. Boswell Company and the Salyer Land Company, felt that [the environmental] provisions were too restrictive. They donated large amounts of money to the anti-canal campaign, not because they were anti-canal but because they were against these environmental controls." (ibid. 22)

[149] Michael De Leo and Elinor Smith, Two Californias: the Truth about the Split State Movement, Covelo: Island Press, 1983.

[150] "It was particularly active in using political strategists and lobbyists in this campaign and also was instrumental in starting the major procanal organization, "Californians for Water." This group includes such members as the Irvine Company, Bixby Land Company (whose president is a director of MWD), Mission Viejo Company (whose president is a former MWD director), Newhall Land and Farming Company, Pacific Mutual Insurance, Union Oil Company, Pacific Lighting Company, and Fluor, Inc..... These companies make up a large proportion of the major donors who supported the Peripheral Canal campaign. The California Department of Water

The struggle was another North-South fight – similar to the one Pat Brown fought to get the SWP built. But, this time the North South line was drawn further North with agribusiness in the south Valley joining the northern coalition. "Much of the disagreement became a tug-of-war between Kern County and northern California farming interests for future water supplies. [On one side] Kern County farmers wanted water both to supplement their decreasing groundwater supply and to develop new farmlands. [On the other side] Northern agricultural interests not only did not want this water taken away from them, but also did not like the provision that prohibited development of North Coast rivers as suppliers of water. The division in agriculture exemplified the north/south division in the state. This can be illustrated by the split within farming organizations, such as the Farm Bureau Federation and the Grange." (Gwynn, et al. 22-23.)

In the end Proposition 9 lost in a landslide. The opposition may have resembled a "dog's breakfast" but, nevertheless, it prevailed by mobilizing nearly unanimous support in northern California and by exploiting the cost issue to reduce support from Southern California. More than 90% of the voters in Alameda, Contra Costa and Marin Counties voted "no" and many other county votes came close to those lopsided fractions. These are numbers last seen in Soviet elections.[151] And, despite its best efforts, the MWD was not able to get sufficiently strong support for the Canal in Southern California as many voters thought project was simply too expensive. While Prop 9 prevailed two to one in the Southland, the margin needed to be much bigger to overcome unified northern opposition. According to Field polls, with proponents and opponents somewhat evenly matched statewide, the cost of the project was the most likely cause of its rejection. But one could have attributed blame as easily to the split among farmers or between big farms and railroads. The defeat was not an orphan.

The canal had been defeated but the idea itself was not yet dead. "On the day after the June 8 election, hints of a new and more powerful coalition of interest groups to bring more Sacramento River water to southern California began to appear. The attorney for the Salyer Land

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Resources and the California Department of Fish and Game were other government agencies active in supporting the canal." (Gwynn, 23)

[151] De Leo and Smith, p. 147.

Company (one of the two principal donors opposed to the canal) stated that theirs was not a vote against water development, and the assistant general manager of the Metropolitan Water District (one of the principal proponents of the canal) agreed." (Gwynn, 24) It was pretty clear that the big Southern CV farmers would find ways to move back into their old alliance with Southern California developers in the future. They would not make the same mistake again.

The failure of Proposition 9 did nothing to resolve issues in the Delta. Indeed, things got worse in the ensuing decades. Major fish populations in the delta crashed (including runs of King Salmon, non-native striped bass, as well as the less glamorous delta smelt),[152] Delta levies became increasingly vulnerable to flooding and earthquakes, saltwater incursion issues continued to grow, agricultural pollution and invasive species impacted water quality. The state and national legislatures attempted to respond to these new pressures. Congress enacted the *Central Valley Project Improvement Act (CVPIA)* in 1992 which, among other things, directed that "substantial quantities of water be transferred from irrigation to environmental uses..." (Howitt and Lund).

CALFED and the Monterey Agreement

By the early 1990s it was widely recognized that environmental interests were capable of playing in big league water politics. Their sway was not limited to the courts but extended into Congress and the state legislature, as well as in the politics of initiative and referendum. The addition of a new set of interests made water politics even more challenging for California political actors than it had been. And, rather than trying to impose new laws from "above" the state sought to find ways to get all the conflicting parties to the table and negotiate consensual agreements that might then be ratified in legislation. In 1994 two such efforts were launched.

The Bay-Delta Accord was finally agreed to in December of that year by state and various federal agencies.[153] In principle it authorized the creation of a state agency (CALFED)

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[152] The causes were complex. Delta smelt are weak swimmers and were often swallowed up by the pumps. Their food supply was also disrupted by invasive species like the Asian Clam, and pesticides and other pollutants from agriculture. King Salmon declines seemed mostly caused by big dams that prevented migrations to spawning grounds.

[153] "In June 1994, two years after the historic California drought ended, [the federal government] and California signed an agreement to coordinate activities in the Delta, particularly for water quality standards. This was the

whose mission was to coordinate the actions of various state and federal agencies in the effort to treat chronic water quality issues arising in the Delta. These issues largely arose from the Delta being not only a delicate constructed ecology of reclaimed wetlands, but also the critical crossroads for water delivery for both the state and federal water programs. The Accord "... reallocates further water supplies from both urban and agricultural users to environmental restoration projects." (Howitt and Lund, 1268). The Accord included a collaborative research and decision-making process known as CALFED which was supposed to create a common vision for improving the Delta.[154] The effort was widely heralded for bringing more than 100 local, state, and federal government agencies that have jurisdiction over some aspect of the delta and its wildlife together with stake holder groups such as farmers, industry representatives, and environmentalists."[155]

By the end of the 1980s it was clear that the SWP would not be able to fulfil the water demands of its traditional clientele: the water contractors. This was partly because of the demand to leave water in rivers and streams and partly because environmental and other interests had prevented the build-out of the SWP itself. There was a recognition that sooner or later there would have to be a multiparty negotiation over what to do about the chronic water scarcity the state faced. "In the early 1990's, a drought compounded the disparity between SWP supply and demand and disputes arose among the agricultural and urban SWP contractors about how the limited amount of water available should be allocated during shortages, particularly in drought years..." And as a result the ".....DWR and SWP contractor representatives engaged in mediated

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beginning of CALFED. State and federal agencies, along with stakeholders, worked for six months to develop a science-based proposal for water quality standards, which then led to the signing of a document titled "Principles for Agreement on Bay-Delta Standards between the State of California and the Federal Government." This agreement is known as the Bay-Delta Accord, and it initiated a long-term planning process to improve the Delta and increase the reliability of its water supply." http://calwater.ca.gov/calfed/about/History/Detailed.html

[154] 'The signing of the Accord began a 10-year period in which the CALFED Framework, Record of Decision, final Programmatic EIS/EIR and California Bay-Delta Act were adopted; the Bay-Delta Public Advisory Committee was formed and Congress authorized federal CALFED participation. The Framework document formalized cooperation among state and federal agencies with management and regulatory responsibility in the Bay-Delta. Signatories to the Framework agreed to work together to formulate water quality standards, coordinate operations of the State Water Project and the federal Central Valley Project and work toward long-term solutions to problems in the estuary." http://calwater.ca.gov/calfed/about/History/Detailed.html

[155] Robert F. Service, "Delta Blues, California Style," Science, New Series, Vol. 317, No. 5837 (Jul. 27, 2007), p. 444.

negotiations in an attempt to settle allocation disputes arising under the long-term water supply contracts. The negotiations grew into an omnibus revision to the long-term water supply contracts. In December of 1994, a comprehensive agreement was reached in Monterey, California, which came to be known as the "Monterey Agreement."[156] These two multiparty agreements structured complex and controversial negotiations over the new water situation in the state: there was not enough water to satisfy both the agricultural contractors, Delta interests, environmentalists concerned with species habitats, and the municipal users in Southern California. Unlike CALFED, the Monterrey Agreement had binding effects on water allocation.[157] For that reason the negotiations over its details were especially intense. Moreover, the Agreement authorized the controversial sale or swap of a state water bank program on the Kings' river to a private party.[158]

While CALFED did manage to create a science program to study Delta problems, it lacked the power to guide political solutions. And, as it essentially required unanimity even to make recommendations, CALFED was usually unable to take positions, especially on important

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[156]The Monterey Amendment had six principal objectives: (1) resolve conflicts and disputes among SWP contractors regarding water allocations and financial responsibilities for SWP operations; (2) restructure and clarify SWP water allocation procedures and delivery during times of shortage and surplus; (3} reduce financial pressures on agricultural contractors in times of drought and supply reductions; (4) adjust the SWP's financial rate structure to more closely match revenue needs; (5) facilitate water management practices and water transfers that improve reliability and flexibility of SWP water supplies in conjunction with local supplies..." *CENTRAL DELTA WATER AGENCY, et al. v. CALIFORNIA DEPARTMENT OF WATER RESOURCES*

CENTRAL DELTA WATER AGENCY, et al. v. CALIFORNIA DEPARTMENT OF WATER RESOURCES, et al, SUPERIOR COURT OF CALIFORNIA COUNTY OF SACRAMENTO, Case Number: 34-2010-80000561.

[157] The original agreement was amended over the following few months. Some of the changes were significant. For example, "Prior to the Monterey Amendment, Article 18(a) of the water supply contracts provided that in the event of a temporary shortage in water supply, agricultural SWP contractors would have their deliveries cut back first, before any reduction in water deliveries to urban contractors. The contracts refer to this as the 'ag-first deficiency'...Article 18(b) provided that, with certain exceptions, the entitlements of all SWP contractors would be reduced proportionately so that the sum of entitlements would be equal to the SWP's reduced water supply (or "yield")." But the Amendment modified these requirements: "Among other things, the Monterey Amendment: (1) amended Article 18 by eliminating the "urban preference," mandating that deliveries to both agricultural and urban contractors would (with some exceptions) be reduced proportionately in times of shortage, regardless of whether the shortage was deemed temporary or permanent; (2) eliminated Article 18(b)'s permanent shortage provision, which became irrelevant after the amendments to treat all contractors equally in times of shortage..... " In addition the Amendment "....required certain agricultural contractors to permanently transfer 130,000 AF of their pre-Monterey Amendment [rights] to urban contractors...." *CENTRAL DELTA WATER AGENCY, et al. v. CALIFORNIA DEPARTMENT OF WATER RESOURCES*

[158] "...required DWR to transfer the "Kern Water Bank" property to Kern County Water Agency in exchange for agricultural contractors' permanent retirement of 45,000 AF [in annual water rights]." *CENTRAL DELTA WATER AGENCY, et al. v. CALIFORNIA DEPARTMENT OF WATER RESOURCES*

issues. As a result, fights about water have tended increasingly to turn (or return actually) to the courts. "Litigation has ousted collaboration as the dominant means of solving water issues," says David Nawi, an attorney with Environmental Mediation in Sacramento, California." (Service, 445). The issues of most of the litigation concerned not CALFED (which was largely toothless) but the Monterey Agreement and its Amendment.

In 1995, a suit was filed arguing that the Agreement had not been properly subjected to an environmental impact analysis.[159] The proceedings went back and forth and the "... conflicts reached crisis levels in 2007 when Judge Oliver Wanger of the U.S. District Court began issuing a series of rulings that operations of the CVP and SWP were jeopardizing Delta smelt and salmonids in violation of the ESA. Judge Wanger ordered the federal resource agencies to develop a new operations schedule for the pumps to reduce or halt water exports during key periods of time when the species are at greatest risk. *Natural Res. Def. Council v. Kempthorne*, No. l:O5-cv-O12O7 (E.D. Ca. Dec. 14, 2007) (interim remedial order). These restrictions, coming in the midst of a three-year drought and a deep economic recession, raised the prospect - perhaps for the first time in California's history - that the state faced a true water shortage, with not enough to go around for the state's people, farms, and fish. In the months that followed, a multitude of additional lawsuits were filed on all sides and the courts became increasingly involved in day-to-day operations of the state and federal projects. California was losing control over its water."[160]

Ironically perhaps, one effect of the new environmental worries about the Delta has been to revive the idea of a peripheral canal. In 2007 "state officials announced... that they intend[ed] to ask voters for a new $5.9 billion bond measure to build two new dams and begin detailed

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[159] One of the main complaints was that the transfer of the state water bank to the Kern agency was not properly subjected to environmental review: "...at a minimum, the new EIR would evaluate as components of the project the Monterey Amendment (including the provisions relating to the transfer of the Kern Water Bank lands) plus certain additional amendments agreed to in the Settlement Agreement. This project came to be known as the "Monterey Plus" project because it is comprised of the original Monterey Amendment plus the additional terms and conditions of the Settlement Agreement." *CENTRAL DELTA WATER AGENCY, et al. v. CALIFORNIA DEPARTMENT OF WATER RESOURCES*

[160] Christian L. Marsh and Peter S. Prows, "California's New Water Legislation: A Bucket of Reform or But a Drop?" Natural Resources & Environment, Vol. 25, No. 2 (Fall 2010), p. 39.

studies of a canal that would remove irrigation and municipal water from higher up the delta and channel it directly to the south delta pumps to avoid sucking fish. [despite the fact that] California voters overwhelmingly rejected a similar proposal in 1982." (Service, 445) The governor agreed. The peripheral canal was renamed as a "conveyance" facility in the hopes of avoiding older cleavages that had doomed the earlier proposal. Soon, blessed by a new drought that escalated the sense of crisis, the state moved to start the project. But this turned out to be difficult because, as before, there was really not enough water to go around to satisfy all the affected interests.

"The contractors balked, and the Kern County Water Agency Board of Directors demanded that the state and federal agencies deliver a description of the project (the legal green light to build) by June or it might walk. Two weeks later, federal officials took over the show. The Interior Department convened meetings near San Francisco with state water and fish officials to discuss what a canal or tunnel ... might look like. The fish agencies said: one that would export between 4.5 million acre feet and 5.5 million acre feet a year. (The state exports 4.9 million acre feet now, and the delta ecosystem is suffering.).... The contractors did give on what they really wanted: a project to export 5.9 million acre feet because the fish agencies said it was not possible. Now they must determine: Does it make economic sense for them to spend $12 billion or more on a canal that might deliver less water? Will their customers be able to pay more for water and still grow almonds or other crops profitably?"[161]

In any case, the state has pushed ahead with a scaled down version of the original plan. "Documents for the Bay Delta Conservation Plan were originally released in December of 2013; the documents underwent a 6 month public review period which garnered over 12,000 public comments. In response to those comments, the project underwent several changes and on July 9 [2014], the Bureau of Reclamation and the Department of Water Resources released revisions to the plan in the form of a Partially Recirculated Draft Environmental Impact Report/Supplemental Draft Environmental Impact Statement (RDEIR/SDEIS)... Just a fraction of the size of the original plan and environmental documents released in December of 2013, the revised

[161] http://www.sfgate.com/opinion/editorials/article/California-Peripheral-canal-coming-soon-3602636.php

documents present three new sub-alternatives, as well as other substantive changes. Only those sections where changes or modifications have been made that necessitate additional public review according to the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA) are included in the recirculated documents.[162]

This is not to say that environmentalists necessarily support the idea. The canal would address worries about fish-sucking pumps that continue to threaten smelt, salmon and steelhead. These concerns certainly added to the kit of arguments that canal proponents could advance. Following their strategic miscalculation on Proposition 9, Kern area agribusiness interests have switched to supporting a diversion of some kind even though they recognize that historical allocations will be reduced. Consider this statement from the Water Association of Kern County in support of the effort to build a new (underground) peripheral canal (now it is called the "California Water Fix"), while acknowledging that the County will only get a fraction of its contracted water: "The 30 percent allocation represents about 300,000 af of SWP water for Kern County. While the snowpack measurements indicate the drought has receded slightly this year, federal rules intended to protect Delta smelt and salmon continue to limit the capacity for both the SWP and the Central Valley Project. These current pumping restrictions and inadequate infrastructure underscore the need for a comprehensive solution to the state's longstanding water crisis." [163] Central Valley farmers, who control the local water districts, plainly recognize the need to come to some kind of realistic understanding with urban and environmental interests.

It is hard to see however that the Water Fix addresses Delta concerns. The Water Fix, as proposed, takes the same quantity of Sacramento water as before, and during a drought, that means that less will go through the Delta to hold out saltwater incursion. Not surprisingly Bay Area congressional representatives remained deeply skeptical about the plans; they worried that reduced flows through the Delta would damage farmland, impact water quality in the Bay, undermine efforts to restore fisheries, and threaten supplies of municipal water too. A cynic would say that, in effect, the Water Fix has not really addressed the scarcity problems at all. It

[162] http://mavensnotebook.com/2015/07/15/california-water-fix-a-road-map-for-the-revised-delta-tunnels-documents/

[163] http://wakc.com/index.php/bpandol/245-state-water-project-allocation-increases-to-30-percent

has simply constructed a new (or rather an old) political alliance that aligns Southern Valley agribusiness with the MWD and other Southland water companies, with a sop to environmentalist concerns about salmon and smelt. Still, even if one accepts the cynic's version, it is not clear that the Water Fix addresses in any way the thing that probably killed the Peripheral Canal – its huge price tag. Mama Brown didn't spawn any dummies however and the Brown administration has no plans to submit the idea to a popular referendum and so the hope is that the delicate compromise will go through without a replay of the peripheral canal issue. Of course, opponents still have the option to gather signatures and go to the people. It is not clear that the governor has a counter to that.

However the Water Fix issue comes out, the writing is on the wall for Southern Valley agribusinesses. They will need to find ways to use groundwater more efficiently if they are to survive. That means finding ways to recharge aquifers in those (wet) years when they receive their full allocations. While the Monterey Agreement (as modified in negotiations and court proceedings), reduces their minimum allocation during droughts, it provides for a share of surplus water during wet years. That water can be used to recharge aquifers and the existing claimants would seem to have a strong incentive to do so. That provision gives hope to southern agribusinesses that water banking might offer a solution.

9. Drought: Groundwater Management Models

While environmental issues have played an important role in reshaping the state's peripheral canal plan as a solution to environmental stresses, the drought that began in 2010 resulted in congressional pressure to force agency personnel to commit to minimum water deliveries for irrigation. Southern Central Valley congressmen took the lead: "Rep. Devin Nunes (R-Visalia) …joined by Rep. Jeff Denham, R-Turlock, and House Majority Whip Kevin McCarthy, R-Bakersfield, introduced the Sacramento-San Joaquin Valley *Water Reliability Act*… in response to repeated severe cutbacks in irrigation water deliveries south of the Delta. The legislation returns federal irrigation contracts to 40 years, rather than the 25-year limit imposed in 1992. It eases water transfers and preempts strict state laws that might impose stricter environmental standards….." The legislation that was pushed through the House in 2012 (on a

virtually party line vote, 246 to 175) aimed at suspending the enforcement of environmental laws that interfered with water deliveries (the *Endangered Species Act* was the principal target but the legislation reached wide and deep)."[164]

The response of Northern California Democrats was immediate and apoplectic: "This is a power grab," shouted Rep. John Garamendi, D-Walnut Grove. "It's a water grab, and it's an imposition of the federal government over the state." Senator Feinstein's website went on to say that: "Democratic Sens. Dianne Feinstein and Barbara Boxer both oppose the legislation, as does the Brown administration in Sacramento, and the Obama administration has threatened a presidential veto. 'Senator Boxer and I will do everything we can to make sure it won't pass,' Feinstein said, 'and I don't believe it will pass.'"[165] Though that bill died in the Senate it was clear that it would reappear soon (it did, in 2014). Feinstein promised to work on an alternative – one that would try to incorporate features of the House legislation that she thought might be acceptable to the Senate and to northern Californians (including Senator Boxer who hails from Marin). She tried to reconcile with House legislation in 2014 but she was unable to keep Senator Boxer in line and the effort collapsed.

Feinstein plugged on doggedly and early this year (2016) succeeded in "Unveiling her third proposal in the past two years for ways to divide California's water supply among many competing interests, Feinstein packaged her latest 184-page measure as a reasonable compromise that draws the best from past Capitol Hill efforts. The bill largely tracks draft language Feinstein made public in January. It eases limits on water transfers south of the Delta, but does not mandate specific pumping levels. It authorizes $1.3 billion for desalination, water recycling, storage and grants. It compels completion of feasibility studies for storage projects like Temperance Flat on the San Joaquin River. 'Drafting this bill has been difficult, probably the hardest bill I've worked on in my 23 years in the Senate," Feinstein said. "But it's important, and that's why we've been working so hard, holding dozens and dozens of meetings and revising the bill over and over again." Feinstein disclosed words of encouragement from parties who usually

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[164] http://www.feinstein.senate.gov/public/index.cfm/feinstein-in-the-news?ID=32c3737d-f7a5-4629-8a6f-e0df598f3388

[165] Ibid.

are on opposite sides of the water battle, including Rep. John Garamendi, D-Walnut Grove, and the South Valley Water Association.

Feinstein's bill faced some familiar obstacles. California's House Republicans continued to demand more certain deliveries of water for agriculture, and Delta area Democrats sought more water to prevent saltwater incursion. "'How do you thread that needle?' Rep. Jared Huffman, D-San Rafael, said in an interview, when asked whether Congress will reach a viable compromise. 'I think it's highly unlikely.'"[166] Maybe he's right. But Feinstein certainly drew on all the venerable tricks of her trade to try: adding in special projects, expanding storage, and soft pedaling the mandatory flows language. The key in her bill, however, is what is not there at all: there is no guarantee that the agencies will in fact deliver promised waters. As Southern CV districts were getting less than 15% of their contracted allocations during the drought, it is easy enough to see why their representatives find the Feinstein compromise unappetizing. The drought seems to have abated for now, however, and this may make Republicans more willing to accept the compromise, especially if state proposals for a new canal, which would increase deliveries, make progress. Governor Brown and some other Democrats are on board with some version of that proposal. But, again, everything turns on whether promises made to Delta farmers and environmentalists can actually be believed. Meanwhile, the nature of the southern CV economy has changed in ways that appear to make the prospects for compromise more difficult.

… Groundwater remains the elephant in the room; or is it the ace in the hole? As long as southern farm interests have had access to "their own" groundwater, they could play the long game with respect to surface water supply, using surface water when it is available. But that game is getting tougher as other powerful political interests get involved and surface supplies shrink. Thus, water tables in the Southern CV have been plummeting during the drought and the fear is that, over the long run, groundwater depletion will continue. As a result here have been increasing pressures on the state and federal government to intervene in some way.

There are only a few possible solutions: increase water supplies; manage existing supplies more efficiently; eliminate certain water using practices. Increasing supplies is likely to

[166] http://www.fresnobee.com/news/state/california/water-and-drought/article59569706.html

be costly. There have been proposals to desalinate sea water (or pumped deep groundwater) but the costs have been prohibitive. The third option is possible for extreme water users: in California's history, the use of huge water volumes for mining and sludge transport has been discouraged both administratively and by pricing. Most potential solutions involve the second option: increasing the efficiency of water use. And the principal proposals usually involve water banking – storing water in underground aquifers during times when it plentiful and withdrawing it during dry periods. And usually, water banking proposals are combined with schemes for developing water markets which would use prices to allocate water to higher uses.

The state has tried to play a role in encouraging underground water storage but private parties have incentives to run water banks and markets as well. Water banking is, after all, banking: where an entity (public or private) 'borrows short and lends long" and may earn a profit by offering such services. Water banks need the capacity permit accurate accounting and measurement of deposits and withdrawals, to maintain water quality, and to effectively store and transfer water to those who demand it – even those located very far away from the bank. Concretely, there needs to be ways to keep track of wells (and other extraction and injection devices) and metering what is coming in and out of them and to require that existing conduits act as networks facilitating efficient water transfers, permitting substitution of water traded in different parts of the state. If there are many such banks, there may need to be clearinghouses where interbank surpluses and deficits can be reconciled. Such infrastructure is needed to limit predatory taking and to permit the regulation of water quality to assure that it is suitable for public uses.

Public water banking has faced political resistance especially from areas that fear losing control "their own" groundwater sources. Private water banks have been opposed too. The worry has been that water banks, once set up will do what financial intermediaries do. They will take contracted (surplus) water from the big water projects in wet years, store it underground, and sell it to the highest bidder during dry periods. Of course that is correct. One may well object to the distributional implications of such activity or worry about local antitrust issues. Indeed, some counties have imposed ordinances against water exports, seeking to limit the capacity of private water banks to participate in water markets. One could regard the growing

number of county ordinances banning water exports as mere rent seeking. Or one could see the ordinances as bargaining chips in the struggle over the division of scarce water. In any case, these county level efforts have not yet been pre-empted by state or federal law, it seems possible that this situation is temporary and that big fights over groundwater rights lie ahead.

Whether or not water banks are involved, effective groundwater management requires better monitoring whether it is done at the state or local level. In fact, the big impediment to statewide groundwater regulation has always been political. Localities with access to groundwater worry that their rights would be reduced if outsiders were able to observe their actions. Some localities have also passed laws forbidding the export of water from their jurisdiction; indeed this seems to be a trend. When the state has tried to intervene in water conflicts local interests have often pushed back often enacting legislation to prevent state intervention.[167] As a result the state has been reluctant even to require that drilling and pumping information be recorded and made publically accessible or to interfere with local decisions or court judgments. So far it has preferred to let local governments try to manage things. The presumption is that the relevant local interests will be competently represented -- either in local governments and water districts, or before courts – and that they can bargain to a reasonable agreement. Such approaches have a long history in water-scarce Southern California and some think that they might form a model for solving groundwater problems. Possibly this view has begun to change recently, partly as a result of the prolonged drought, and partly from an increasing recognition that groundwater is fungible with surface water and that there may be significant inter-basin spillovers.

Local Models

In Southern California, where there have long been many small cities, local governments brought intercity groundwater disputes into court, and generally obtained court-managed solutions. Where there was one dominant city – such as Los Angeles -- it may be able to manage

[167] The "California Water Code Section 1200 (West, 1971), states that "Whenever the terms stream, lake or other body of water, or water occurs in relation to applications to appropriate water or permits or licenses issued pursuant to such applications, such term refers only to surface water, and to subterranean streams flowing through known and definite channels." Later in the Code Section 1221 (West Supp. 2003) the Legislature declared: "This article shall not be construed to authorize the board to regulate groundwater in any manner." What affect does SIGMA have on these declarations?"

both surface and groundwater issues on its own. Where there was no one dominant municipality the courts have provided fora for negotiation and enforcement authority. In either case, as long as the relevant spillovers remain local in extent, state intervention would simply have the effect of introducing irrelevant interests into the dispute. The local entities include not only municipal governments, of course, but also the great variety of overlapping water related districts, and of course private parties as well.

Groundwater users have sometimes found other ways to manage the resource on their own without extensive resort either to litigation or legislation. Lynn Ostrom, the most prominent advocate of such approaches, has suggested features of effective coordination solutions.[168] She argued that, in case studies of irrigation systems, successful solutions to commons problems usually regulate who can draw on the resource and in what quantities (often such rules favor farmers in proportion to acreage). They often use different rules when there is unusual scarcity, as is common in California. Successful systems also usually incorporate some kind of a penalty regime for rule breakers, which requires some degree of mutual monitoring.[169] And, when water is scarce, successful systems also tend to appoint an authority or 'water guard,' with the authority to punish violations.[170] In effect, Ostrom's autonomous coordination devices more or less mimic what state provided courts have done in Southern California. In effect, she argues that even where courts are unavailable, too expensive, or simply ineffective, it may still be possible to manage groundwater conflicts..

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[168] "Field studies in all parts of the world have found that local groups of resource users, sometimes by themselves and sometimes with the assistance of external authorities, have created a wide diversity of institutional arrangements for coping with common-pool resources" Elinor Ostrom, "Coping with tragedies of the commons," Annual Review of Political Science, 2 (1999), 498-535.

[169] However, as one scholar notes, "More so than with surface water, it is difficult for the right holders to self-regulate groundwater use. Withdrawals from the basin occur out-of-view, and underground water levels are typically unseen and unknown. This mix of easy public access; limited oversight; and gradual, unseen consequences sets up a classic tragedy of the commons." M. Rhead Enion, "Allocating under Water; Reforming California's Groundwater Adjudications," Policy Brief no. 4, Pritzker Briefs, UCLA Law Center. 2013.

[170] "Of the 28 farmer-organized systems, 17 (61%) utilized the position of water distributor or guard. Of the 11 farmer-organized systems that did not employ a guard, farmers on 5 systems (45%) were vigilant enough in monitoring each other's activities that rule conformance is high." Tang SY. 1992. Institutions and Collective Action: Self-Governance in Irrigation. San Francisco: ICS.151 pp. For an empirical application to the development of integrated management of ground and surface water in California see Heikkila, op cit. pp. 97-117.

More commonly, however, government, either a court or an agency, seeks to facilitate coordination among small players, or tries to help arrange private deals. Adjudicated basins in Southern California (discussed above) provide the most prominent example. A newer illustration may be found in the growing popularity of water banks. Writing in 2003 two authors observed that "Groundwater banking is not new in California, yet only about thirty of the state's (estimated) 428 basins are actively recharged.... Most of these programs were developed by court decree or special legislation following years of severe water shortages, groundwater overdraft, and protracted litigation; few have developed as a consensus-based elective water management program."[171] So far this looks to be an "Ostrom-like" story where interests coordinate on a common solution with a bit of a boost from courts. The authors go on to point out, however, that despite their great promise, water banks are not yet as widely utilized as they might be.[172] They trace the problem to "...uncertainty of rights in the unsaturated space of aquifers. There is no statutory right to store surface water in underground basins, nor is there clear law granting a landowner the right to exclude use of the unsaturated space. Compounding these uncertainties, groundwater pumping is essentially unregulated by the state. Unless there is an applicable groundwater management statute or management authority for the basin, parties must resort to the courts or engage in self-help.... neither the California legislature nor the courts have specifically addressed the uncertainties regarding storage rights, groundwater banking projects are legally too risky and sometimes face opposition from local interests" (p. 26) in effect the authors point to the need for legislative interventions of various kinds if water banks are to be developed more extensively.

Where the farms are very large, however, one would expect coordinated solutions to be found and accepted without much help from government. Indeed, insofar as governmental

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[171] Peter J. Kiel and Gregory A. Thomas, "Banking Groundwater in California: Who Owns the Aquifer Storage Space?" Natural Resources & Environment, Vol. 18, No. 2 (Fall 2003), p. 25

[172] They address two legal problems associated with the ownership issue. The first concerns the question of who owns the space and can they exclude others from using it (and therefore either rent the space to others or regulate the quality of introduced water)? The second problem is who owns the rights to water that they put into that space. The issues are complicated by the fact that "... California does not have a regulatory agency with statewide authority over groundwater use. The California State Water Resources Control Board arguably could grant an appropriative permit to divert surface water for storage underground and could condition that permit to protect third parties, but it essentially has no authority to prevent groundwater users from taking that water. (p. 28) This is another manifestation of the localism of California groundwater law.

institutions are involved they are likely to act as agents or vehicles for the big farms. So, for example, in the Kern and Kings basins large farms have tended to, in effect, coopt the water districts. In some cases a single farm dominates the area and takes action by itself. In other cases Southern CV farmers have found ways to coordinate their actions through private associations or by getting control of water districts to do the job. Such associations have enabled farmers in the area to establish (or capture control of) water banks which can be replenished when water is plentiful and cheap and upon which all the local farmers can draw. These banks have allowed farmers in this area to mitigate groundwater depletion to some extent. Still, the problems of over-extraction of groundwater and the associated issues of subsidence and compaction have continued to worsen even if at a lower rate.[173]

State Models

The state Department of Water Resources has made a number of attempts over the years to assess the groundwater situation with goal of encouraging solutions to the chronic overdraft of groundwater. Many of these efforts are found in the DWR Bulletin 118 program which maps and categorizes groundwater basins throughout the state for the purpose of developing new legislation. For example, Bulletin 118-75 (published in 1975) "...contains a summary of technical information for 248 of the 461 identified groundwater basins, subbasins, and what were referred to as "areas of potential ground water storage" in California as well as maps showing their location and extent. The *Bulletin 118-75* basin boundaries were based on geologic and hydrogeologic conditions except where basins were defined by a court decision." 118-80 "...updated boundaries on 36 groundwater basins. The changed boundaries combined several basins based on geologic or political considerations and divided the San Joaquin Valley groundwater basin into many smaller subbasins based primarily on political boundaries. These changes resulted in the identification of 447 groundwater basins, subbasins, and areas of potential groundwater storage. *Bulletin 118-80* identified 11 basins as subject to critical conditions of overdraft." The last major revision was in 2003 which brought the number of basins up to 515, and "... includes a description of current groundwater management efforts by local water agencies, required and recommended components of effective groundwater

[173] http://pubs.usgs.gov/fs/2009/3057/

management plans, and a model ordinance that can be used by local governments. In addition, the bulletin describes the roles of state and federal agencies in protecting groundwater quantity and quality."[174]

There has been increasing recognition in practice, and in law and legislation, that surface and groundwater sources are so interconnected that there remains a need for a genuinely integrated regulatory regime, which goes by the name of *conjunctive* management, which usually involves water banking.[175] There have been a number of recent institutional developments that facilitate conjunctive management. "The first type … is a special groundwater management district. The California legislature has authorized a number of special districts to engage specifically in groundwater management…. Most of these districts have taxing authority for basin replenishment and recharge. The second type of … institution is the adjudicated groundwater basin. In 16 of California's groundwater basins, state courts have adjudicated the quantity of rights available to appropriators and have designated basin "watermasters," who ensure that appropriators comply with assigned rights….The third form of … institution … is a legislatively authorized institutional arrangement called an AB3030 Plan. The state legislature changed the California Water Code in 1992 to provide local agencies with a clearly defined procedure for developing a groundwater management plan and the authority to raise money for groundwater management (California Water Code, Sections 10750-10756)…. AB3030 Plans offer institutional design and structure specifically for groundwater management that was not available under California legislation prior to 1992."[176]

Beyond these institutional developments, the state provides subsidies for groundwater storage schemes.[177] Each of these schemes is decentralized in operation and relies on the formation of local majorities. The newest one –AB 3030 – exemplifies this feature. "The plan

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[174] http://www.water.ca.gov/groundwater/bulletin118/b118history.cfm

[175] JEANINE JONES, "Groundwater storage-THE WESTERN EXPERIENCE," Journal (American Water Works Association), Vol. 95, No. 2 (February 2003), pp. 71-8.

[176] Tanya Heikkila, "Institutional Boundaries and Common-Pool Resource Management: A Comparative Analysis of Water Management Programs in California," Journal of Policy Analysis and Management , Vol. 23, No. 1 (Winter, 2004), p. 104. "With AB 3030 in 1992, sections 10750-10756 of the California Water Code (AB 3030) provided a systematic procedure for an existing local agency to develop a groundwater management plan....." http://www.water.ca.gov/groundwater/docs/1992_AB3030_Summary_02202014.pdf.

[177] See Jones, op cit.

can be developed only after a public hearing and adoption of a resolution of intention to adopt a groundwater management plan. If there is no majority opposition of assessed land value (no improvements), the plan can be adopted within 35 days. If the majority is opposed the plan cannot be adopted and no new plan may be attempted for 1 year. Once the plan is adopted, rules and regulations must be adopted to implement the program called for in the plan." The 1992 Bill goes on suggest various things that a locally adopted plan may include. The usual suspects are all there: facilitate groundwater monitoring, facilitate conjunctive use, mitigation of overdrafts, etc. These efforts have not really worked any better than the voluntary local efforts recent administrations have looked to take more effective action at the state level.

Governor Schwarzenegger convened a Task force in 2007 to examine water problems with an eye to finding a comprehensive solution, which would have to include groundwater. The task force focused most of its efforts on the Delta (including the never ending saga of a peripheral canal or some equivalent). But it did suggest groundwater reforms that resulted in the 2009 Water Conservation Act. The groundwater provisions are found in SB 6 which "...requires, for the first time in California's history, ...that local agencies monitor the elevation of their groundwater basins.... requires the Department of Water Resources (DWR) to establish a priority schedule for the monitoring of groundwater basins and the review of groundwater elevation reports..... Requires DWR to assist local monitoring entities with compliance with this statute....Allows local entities to determine regionally how best to set up their groundwater monitoring program...Provides landowners with protections from trespass by state or local entities...Provides that if the local agencies fail to implement a monitoring program and/or fail to provide the required reports, DWR may implement the groundwater monitoring program for that region....Provides that failure to implement a monitoring program will result in the loss of eligibility for state grant funds by the county and the agencies responsible for performing the monitoring duties."[178] It seemed an impressive effort to depart from localism to give the state a credible entry into groundwater management.

[178] http://www.water.ca.gov/news/newsreleases/2009/01272010waterpackage.pdf

One commentator summarized the situation acutely: "The groundwater monitoring program is groundbreaking in that it represents the first effort to study and monitor the impact of groundwater use on a statewide scale. Historically, there has been considerable resistance to state efforts to quantify groundwater use because of concerns that quantification represented the first step in statewide regulation. Groundwater in California has a different legal status than surface water. Unlike appropriations of surface water (post 1914), which are regulated by the State Water Resources Control Board, the use of percolating groundwater is not regulated by the control board or any other state agency. Local regulations may apply, as in the case of adjudicated groundwater basins, under groundwater management plans, local districts, cities, and counties. The new law *does not change this existing policy of leaving groundwater management to local agencies. It, however, does create a publicly available database* of the effects of local use on groundwater basins. Presumably this information may motivate local regulatory action if it reveals that a groundwater basin is in overdraft, but no such mandate is included in the bill"[179] [my emphases]

The provisions of SB 6 appear to significantly strengthen the procedures in AB 3030. In particular, the statute warns that there will be consequences for foot dragging. But is important to pay attention to what is excluded. The DWR is given only a supporting role of assisting local authorities and is forbidden (along with others) to trespass on private lands (ie. Where much drilling and pumping is happening). It may taste great but it is not very filling.

It is too soon to tell if localist resistance has been broken, but in 2014, after four years of drought, the legislature took the next step and enacted *the Sustainable Groundwater Management Act* (SGMA) which may mark a significant shift in the politics of groundwater. The key features of the Act are that it identifies critical (severely or moderately ovedrafted) groundwater basins and requires that a groundwater sustainability agency (GSA) take responsibility by 2020 to put together a management plan (GSP). "There are 127 such basins. Exempted are 338 basins categorized as low or very-low priority and all adjudicated basins and

[179] Aaron Baker, "California Passes Water Management Legislation for the Future" Journal (American Water Works Association), Vol. 102, No. 1 (January 2010), pp. 16-18

three pending adjudications."[180] If no such agency appears and complies, the state will (it says) step in and make a plan for the basin itself.

There are many uncertainties about how the *Act* will work. First is the definition itself which has an open textured qualities with lots of weasel words. "Sustainable groundwater management is: the 'management and use of groundwater in a manner that can be maintained during the planning and implementation horizon without causing undesirable results' which include chronic lowering of groundwater levels; significant and unreasonable reduction of groundwater storage; significant and unreasonable seawater intrusion, degraded water quality, and land subsidence; and depletions of interconnected surface water that have significant and unreasonable adverse impacts on beneficial uses of the surface water."[181] The second question is which local agency will take the responsibility for formulating a plan? A third issue is whether the state has authority either to delegate to the local GSA or to step in to make and enforce a plan on its own. The first two questions really turn on how the state agency – the Department of Water Resources -- will perform. Will it write effective guidelines and standards to get the statute to work as envisioned or will opponents manage to scuttle its provisions. The last question is legal – does the legislature actually have sufficient authority to impair or modify groundwater rights or to pre-empt local practices?

Some things can be learned from the legislative fight over the *Act*. "In general, Republican lawmakers and Central Valley Democrats, some farmers and growers and their industry associations opposed the law for a variety of reasons. The latter category reads like a cornucopia: associations of almonds, beans, blueberries, peaches, grain and feed, pears, raisins, tomatoes. Environmentalists, urban water suppliers, non partisan policy institutions, scientific organizations, some Indian tribes, and some water agency associations promoted the bill."[182]The lineup suggests that the major players anticipate that the legislation may not be toothless. "In

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[180] Joseph F. DiMento,"The Shape of [Ground] water (law): California's New Act, and Prospects for Sustainability," Legal Studies Research Paper Series No. 2016-38, UC Irvine.

[181] Joseph F. DiMento,"The Shape of [Ground] water (law): California's New Act, and Prospects for Sustainability," Legal Studies Research Paper Series No. 2016-38, UC Irvine.

[182] DiMento, op cit.

opposition to the new law, the California Farm Bureau Federation, the Sacramento Suburban Water District, counties in the Central Valley and agricultural related businesses in various hearings focused on what they characterized as the broad scope of the law and the fiscal impact – noted as potentially up to many millions of dollars. The adverse impact on groundwater rights and the agricultural economy was emphasized. In their letter calling for a veto of SB 1168 the California Aquaculture Association and the California Farm Bureau Federation said that the bills would significantly hinder growth of aquaculture and agriculture industries in California; that the bills were too hastily written and were overbroad; will be costly; and create greater uncertainty for famers and rangers.... We believe groundwater must be managed locally/regionally and that overlying property rights are protected to avoid a taking." (DiMento)

Evidently the forces that opposed the legislation based their opposition the violation of localism. And there is every reason to think that these same groups will reappear at the implementation phase. DiMento argues that "...arguments similar to those reflected in the legislative history are likely to re-appear. They will include political attacks on the elected officials in the planning entity, of various kinds: they are non responsive, non representative, insensitive, incompetent [make decisions on groundwater based on insufficient data and information], unjust, unlawful in imposition of fees."

It remains unclear whether California can reverse the localist bias embedded (by local interests) in the state Water Code. "Might it be argued by local governments that they maintain authority to address groundwater management in their own way, not responsive to state requirements? At one point this was a reasonable argument ..... In short, this argument goes, in the absence of pre-emption, local districts can chose to do what they please in managing groundwater. SGMA however has now seemingly pre-empted the groundwater regulatory field and it is local government in the high and medium priority basins that lacks authority to treat groundwater management other than under SGMA. The local control position will likely fail." (DiMento)

Despite the endemic 'localism' and political resistance, however, recent efforts to develop water banks have succeeded to some extent in slowing the decline of water tables. The

most important of these efforts has been the effort of a private company which has found a profitable opportunity in entering the water banking business. Moreover, the state legislature and water agencies have recently taken steps to encourage locally based groundwater regulation. But there has been a lot of resistance to this project and it remains incomplete.

10. Political Opportunities

Everyone agrees that groundwater has not been well managed. But there is much disagreement as to how to do better. Engineers and farmers, and more recently, environmentalists and economists each have their preferred solutions which amount to, in one way or another, either rationing water use in some way or other (by imposing either regulatory or market-based controls), or increasing the available supply (by building new facilities or reducing "wasted" water – though there is little agreement as to what counts as waste). But the devil is in the institutional details. My focus in this paper has not been on solutions – what should be done -- but on what has been done in the past and why. Any solution, if it is to have any chance of being implemented, must take account of the interests of the powerful who have shaped the current system (or find ways to reduce or tame the powers they have). We might as well try to learn from what has happened in the past. I will argue that the best explanation of past practices is political, in the sense that it focuses on explaining the creation and actions of powerful interests and how those actions resulted in actual outcomes. That is we need to recognize that economic and political power is endogenous but that its effects are nonetheless real.

In this case, that means we need to focus on the formation and activities of the big industrial farms that have long dominated the southern central valley, as well as on governments and, indeed, electorates. Specifically, we need to explain how the big farms were assembled and reassembled and held together, the rise of big city water agencies, powerful new (and old) federal and state agencies and eventually, the emergence of powerful environmental interests as well. The relative powers of these newer entities may have increased over time but central valley agribusiness has remained a major player whose interests end up playing a big role in shaping water use as well as the political context itself.

While the groundwater problem is rooted in geography, it has been shaped politically. California's unique populist heritage means that, in the end, whatever deals are struck and however robust they appear, there are still the People. They may not guide things in detail but they can say "no" and they can motivate political leaders. As one farmer recently noted, "If we don't find a way for people in the south to get water when they desperately need it, we're afraid they'll change our water rights. So if we don't sell it to them, they'll find a way to take it…" That seems right. Indeed, since the 1970s CV farmers have been losing access to water even if they had the rights to it. Contracted allocations have been repeatedly shrunk during the drought and sometimes zeroed out. Farmers were forced to surrender water rights under the Monterey agreement and probably that is not the last time that will happen. In effect the cost of water is going up as supplies are limited and there is more demand for it. One may well ask instead how is it that a small minority (farmers and those who profit from them) were able for so long to retain access to water, blocking the redistribution of water to a vastly larger populations in the south?

Evidently both the state and federal government have made efforts to address scarcity issues. Starting with CALFED and the Monterey agreement federal and state water agencies have begun trying to get the main players to negotiate. The revived peripheral canal and the sustainable groundwater act each indicate a willingness of the legislature to get some control of the issue too. At the federal level, the complicated push and pull of the Monterey compromise is being replayed along with new projects to increase storage and desalinization. Farmers have every reason to worry. The government is coming. Of course they will play defense by getting CV Republicans to oppose threatening initiatives where they can. But importantly, the big farms still have the capacity to change the facts on the ground (or, under it).

Much of this essay has illustrated the critical role played by Southern Valley agribusinesses – from Lux-Miller, Boswell and Sayler, to the Resnicks – in getting control of water and keeping it. Their argument was that farms needed to be big to take advantage of political scale economies necessary to get and keep control of water While Boswell and the Resnicks struggled to get Project water when it came online, they fought especially to keep control of their precious groundwater resource and to shield it from the state. As it turns out,

recent research suggests that there is much more water under those Southern Valley farms than had been thought – good water too if it can be protected from oil and gas production – as long as someone is willing to pay the cost to pump it up and possibly desalinate it.[183] And, farmers have reasons to seek to manage its quality too. Moreover, their partially depleted aquifers open up valuable storage space for water banking.

The North-South distributional question did not really arise until the SWP constructed canals reaching Los Angeles. Before that there was no way to get northern California water to the Southland. Ironically, Fresno Senator Burns played a pivotal role in changing the politics of water distribution. It probably would have happened eventually anyway, but Burns brought agribusiness into the coalition which opened the floodgates to Southern California developers eager extend housing tracts into the eastern deserts. As the SWP came online and environmental pressures ramped up the story has mostly been of farmers seeking to hold on to as much as their traditional allocations as they can. This is a far different picture than the aggressive empire building of Miller-Lux and the Boswells. Still, it appears that playing defense requires political acumen and scale as much as offence. And the Resnick's operations indicate that even when the writing on the wall is bleak, there are payoffs to the politically agile. So the Resnicks managed to build their own empire too partly by assembling a formidable political operation that is aimed mostly at retaining control of water.[184] The political environment remains tricky however and there is no guarantee that the dominant businesses will persist. To some extent, chronic instability is part of the deal when dealing with elected politicians. As a famous Senator once said: "my vote cannot be bought; it can, however be rented." Making friends and keeping them is not so easy in politics. Besides, political leaders are driven by electoral considerations and elections are, in their nature, unpredictable. It is always possible that someone with new ideas will get into office, or that a previously reliable partner needs to change her allegiances to keep her office.

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[183] Mary Kang and Robert B. Jackson "Salinity of deep groundwater in California: Water quantity, quality, and protection," PNAS, July 12, 2016, vol. 113, pp. 7768–7773.

[184] Since 1993 the owners of Paramount Farms, for example, have donated more than $5 million to state and federal campaigns. See http://www.motherjones.com/environment/2014/08/california-water-politics-drought-players. No doubt they spend even more in lobbying and politically oriented PR.

Moreover, economic circumstances themselves change. The recent drought has made it necessary for farmers to rely, once more, on groundwater, rapidly driving down water tables. That has led to the drilling of deeper wells which is economically rational only for higher value crops.[185] This has encouraged more specialization in high value crops – especially orchard crops for which there is strong foreign demand -- for which it is rational to drill deep wells.[186] But deeper wells bring new problems – poor water quality from deep wells can degrade the land – and lead to more demand for (higher quality) surface water and, over time, deepen conflicts with other users. Incumbent firms may make the right choices in these tough circumstances. Or they can screw it up, leaving space for new entrants.

A larger and more persistent issue is the growth of environmental awareness which increased in the 1960s, partly driven by the adverse consequences of the big water projects. It has increased concern with pollution, habitat protection, and worries about sustainability. Rising environmental awareness soon spawned new advocacy groups and political organizations capable of playing sophisticated interest group politics. If anything, these new groups and emerging public opinion made it even more important for the farms to maintain a steady and well-resourced political presence in every place where environmental concerns could be raised. Soon, new laws were passed and agencies created at both the Federal and state levels to regulate the use of water and disrupt the complex distribution system. These new laws and regulations, in turn have produced an organized legal and political backlash, partly fueled ideologically, and

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[185] According to satellite data, Central Valley farmers have for years been drawing down groundwater at an alarming rate. Between 2003 and 2010, the valley's aquifers lost a total of 20 cubic kilometers of groundwater—enough to meet the household water needs of New York City for 11 years. And then came the current drought, which started in 2011, when suddenly the region's groundwater was being pumped up at an estimated rate of nearly seven cubic kilometers per year. That's the same amount of water that everyone in Texas uses at home annually. Jay Famiglietti, a senior water scientist at NASA's Jet Propulsion Laboratory who tracks groundwater depletion, points out that no one knows exactly how much water is left in the region's aquifers—mainly because the state's lax regulation means no one keeps track—but the current depletion rate has pushed the state "to the edge of a cliff," he recently wrote. http://voices.nationalgeographic.com/2014/02/04/epic-california-drought-and-groundwater-where-do-we-go-from-here/

[186] 2013 California Almond Acreage Report California Department of Food and Agriculture, released April 24, 2014. http://www.slate.com/articles/technology/future_tense/2014/05/_10_percent_of_california_s_water_goes_to_almond_farming.html

partly by self interest. The result has been churning legislative and litigation activity, contradictory laws and unstable legal doctrine. "The emergence of environmental interest groups as a major competitor for California's water has radically changed the "iron triangle" of agencies, urban users, and irrigated agriculture which had synergistic goals and was responsible for development of the existing water structure in the West."[187] Oh, one longs the innocence of youth!

On the other hand, environmental interests are not monolithic. There are concerns about groundwater, and for species habitats in the Sierras, and for the fate of the Delta ecology. All these concerns push against big new water projects such as the peripheral canal in any of its manifestations. But there is also concern about the Salmon and smelt runs that are threatened by the Tracy Pumps and these interests seem to support a Delta bypass. Thus, environmentalism opens complex new possibilities for coalition formation with cross cutting interests. No surprise really. California's water politics has never been a domain for the timid. There have always been political fights over water: sometimes staged in courts, legislatures, boardrooms, and in obscure local water districts, and sometimes in the fields and streets. It has always been a domain where, to some extent, political and material might makes right. Political power can arise from economic facts. Farming is a commercial activity and, in a desert like the Southern CV, profitability depends on water. When new water is made available previously worthless land becomes valuable and worth developing; when the water stops, farms fail. This is why it is worth fighting over water and why, if the law does not prove advantageous, it can be worthwhile to seek (or try to keep) water by other means. But the first fights were about the law; let's start there.

As the cost of water goes up there are only a few options for Southern Valley farms: they could shut down their agricultural operations, or move them out of state or offshore, and begin planting housing tracts or outlet malls. Both the Miller-Lux heirs and the younger Boswells have done that to some extent. They could plant sufficiently high value crops that it is worth either

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[187] Richard E. Howitt and Jay R. Lund, "Measuring the Economic Impacts of Environmental Reallocations of Water in California," American Journal of Agricultural Economics, Vol. 81, No. 5, Proceedings Issue (Dec., 1999), pp. 1268.

paying competitive prices for water or pumping and cleaning deep groundwater. Evidently there has already been a shift in crops from field to orchard crops and this has transformed the political economy of the valley in important ways. Or, as last alternative, they could farm water rather than crops: shift to a business model in which water rather than crops are the principal source of revenue. The key to water farming, however, is maintaining legal and political control over the aquifers.

Whether they are selling almonds or water, industrial farmers would benefit from access to well-functioning water markets. They have access to groundwater as a buffer but can operate as either suppliers or demanders depending on local conditions. But to work efficiently, water markets need ways to verify and meter flows (as is done in Australia currently). In fact there has been a limited "market" for water for years: farmers in the west side of the valley buying from those in the east. But the market is thin because it requires complex systems of verification and a high incidence of weather related risk to both parties. Moreover, poorly defined rights make some farmers worry that if they sell their rights they may lose them altogether: "Philip Bowles, a farmer from Los Banos ... worried that selling water could put water rights in jeopardy." "... state water law has always lacked clarity and invited attorneys to use their imagination."[188]

I believe that if these problems are worked out, big farmers might be willing to support the needed infrastructure to develop such markets (metering, systematic recharge programs, etc). They seem also likely to support the development of more completely specified groundwater rights that would permit them to buy and sell rights without worrying about risking the loss of unexercised rights. It seems to me that industrial farmers would recognize that they are in a common pool situation with the extra twist that losses are somewhat irreversible (due to compaction and subsidence), driving down the value of their land. And they should see that they could, rationally, benefit from the imposition of a regulatory regime that would 1. Stabilize water

[188] http://grist.org/food/california-has-a-real-water-market-but-its-not-exactly-liquid/ This article describes the development of an internet based water trading regime in Australia and conjectures that the same could happen in California. But, again, it seems to restrict attention to surface water and to ignore substitution of ground for surface water and the possible impact on groundwater rights.

tables rather than require continual costly drilling (and more subsidence); and 2. Justify state action to infuse groundwater in wet years.[189]

These evolving economic circumstances may have produced a new political situation. The Central Valley family farmer is disappearing and the "food" that is produced on industrial farms is mostly for export. That is a good thing for the economy but there is less justification for subsidizing these operations with artificially cheap water. Actually, I think solutions to the two problems might actually be linked. Part of the efficiency problem is that the marginal value of water in agricultural use has traditionally much lower than in municipal uses. But insofar as low value crops are being driven out by water scarcity, this gap is probably shrinking. The cost of water to the farmer is not the price he pays for allocated surface water (which he may not be able to get unless there is a functioning water market) but the costs of drilling deep enough to get the last gallon. In this sense, the inefficiency of the current system may be alleviated by the competition for groundwater. Still, I doubt that there is a political equilibrium that will support the widespread planting of water hungry nut trees producing crops for export even if that is the most efficient use of the resource.

[189] I admit that I am making the assumption that markets are not adjusting quickly and that it is hard for these interests to coordinate on a private solution.