DROUGHT & AGRICULTURE IN CALIFORNIA

RICHARD A. WALKER, UC BERKELEY GEOGRAPHY

FOR SPUR, JANUARY 27, 2015

DROUGHT & CALIFORNIA AGRICULTURE

I. Climate & Drought
II. Plumbing for Drought
III. Demand & Drought
IV. Adapting to Drought

I. DROUGHT & WATER SUPPLY

① Climate & Normal Drought

② Surface Runoff

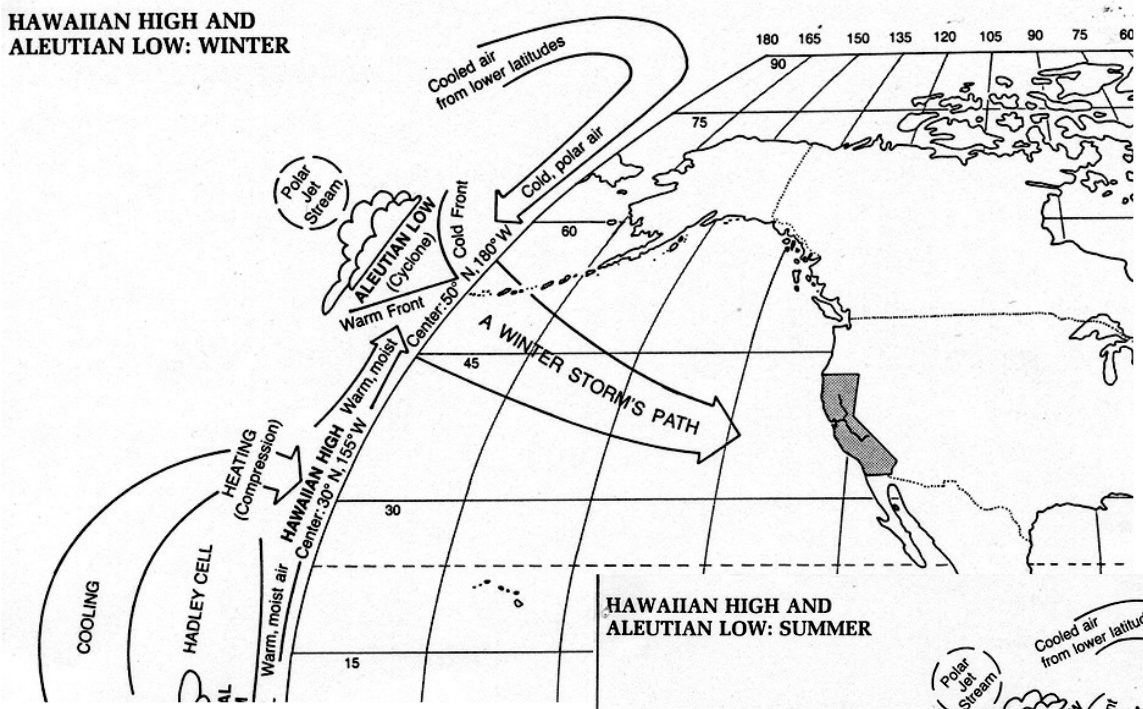
③ Groundwater

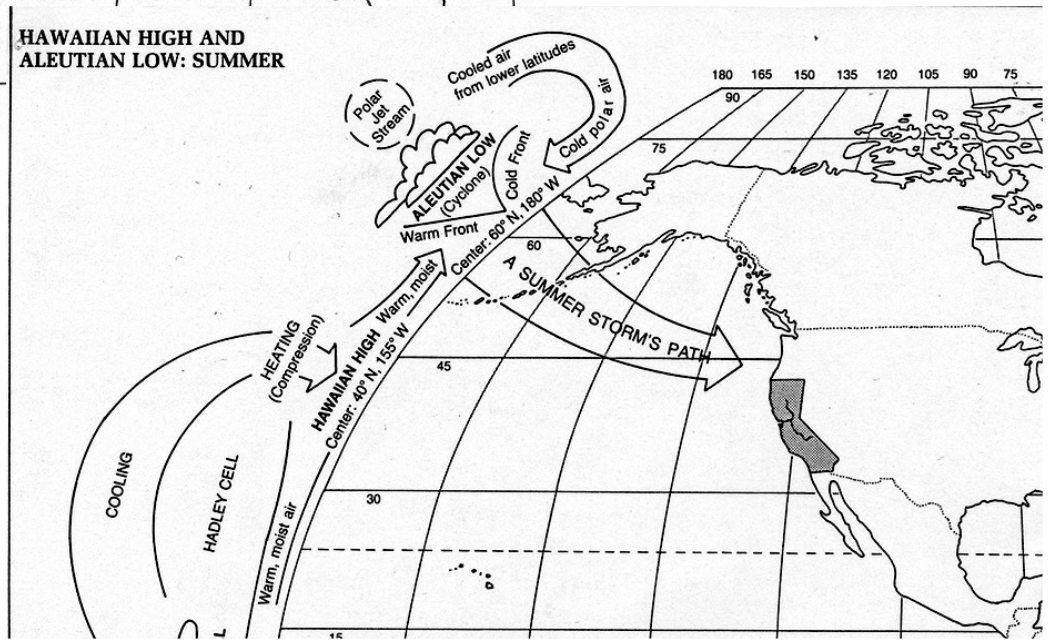
④ Snowpack

1. CLIMATE & NORMAL DROUGHT

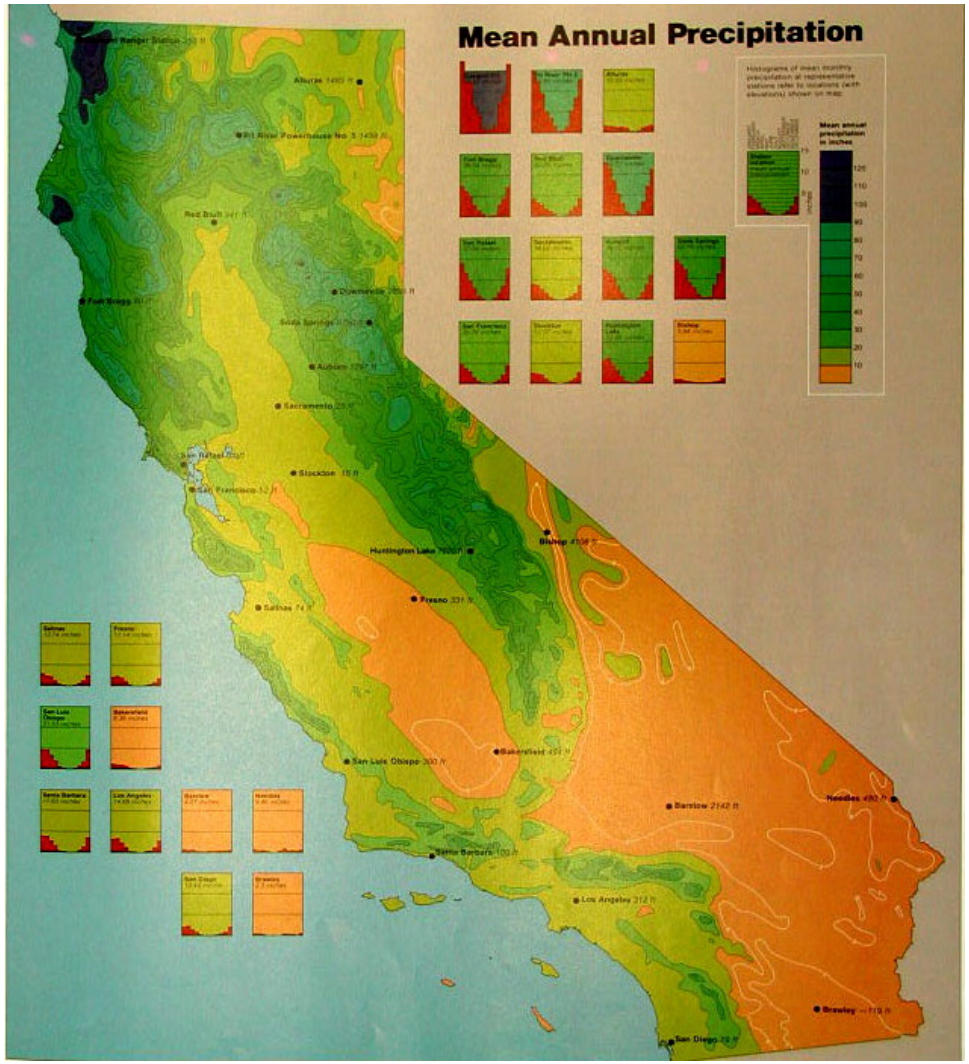
Mediterranean Margins

ANNUAL SUMMER ‘DROUGHT’



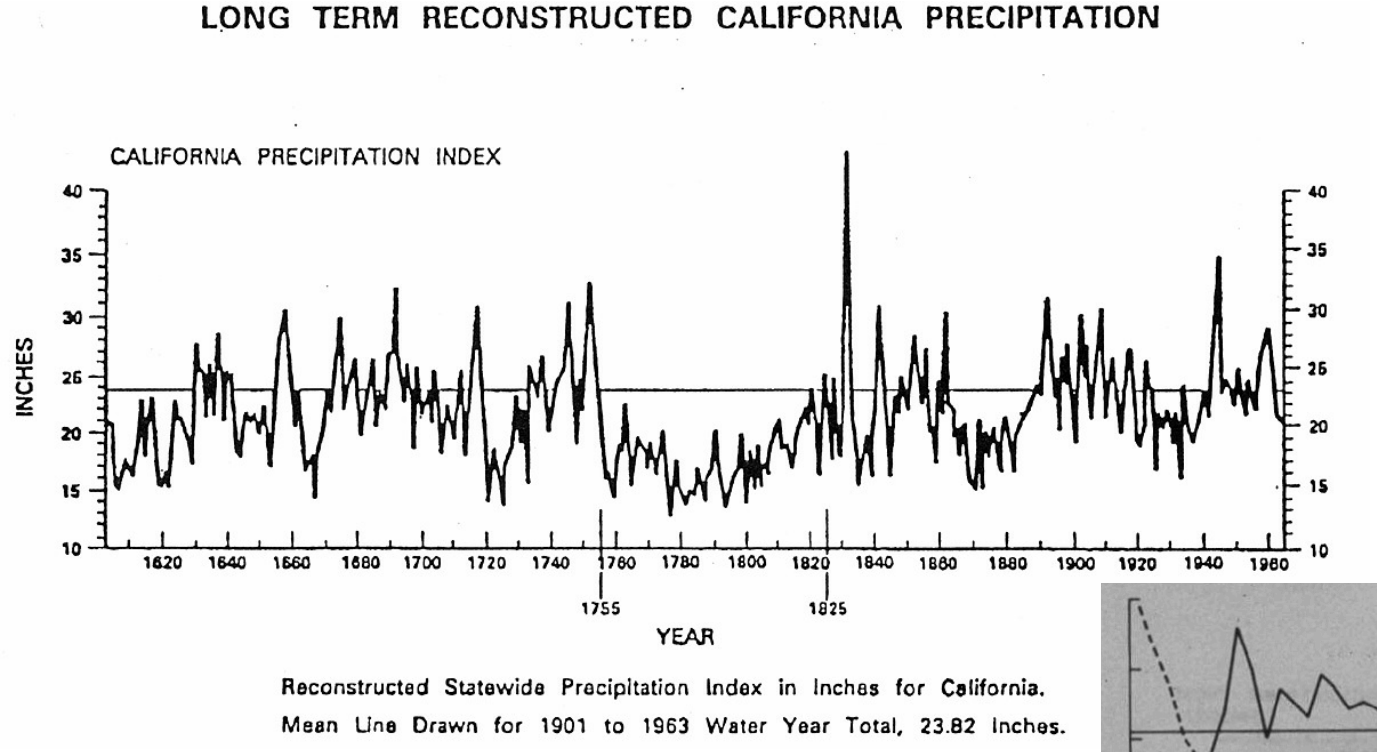


NORMAL SOUTHERN ‘DROUGHT’

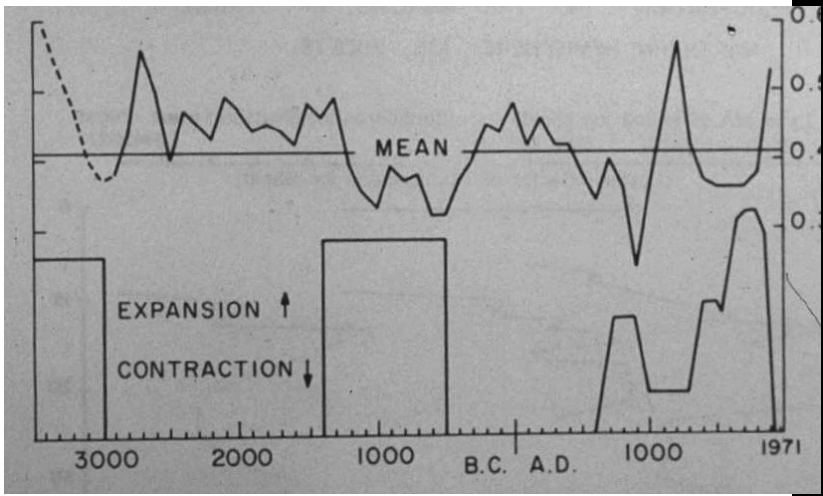


NORMAL VARIABILITY & DRY YEARS

150 year record of modern occupation is nothing to rely on

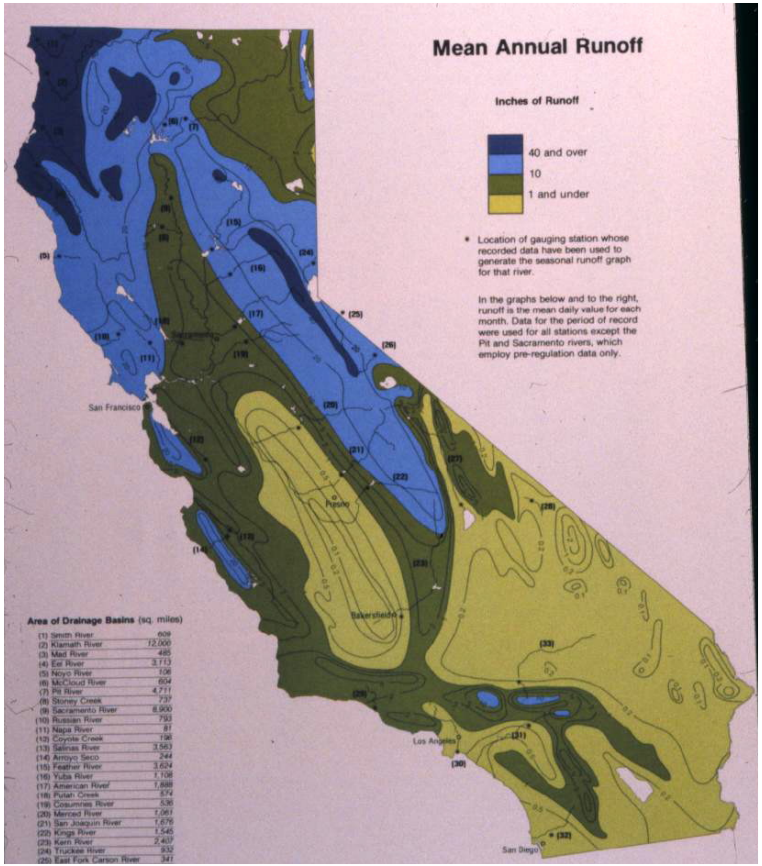


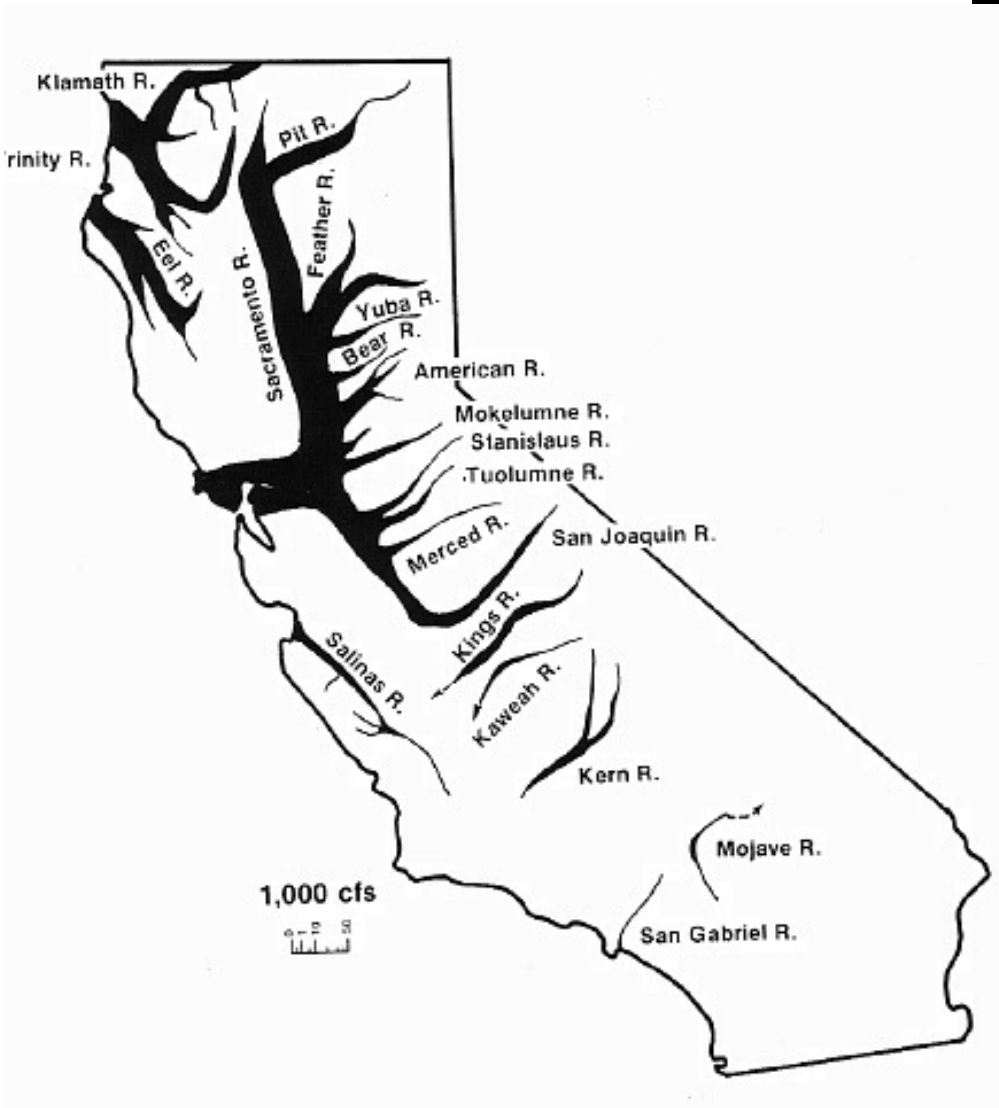
Reconstructed Statewide Precipitation Index in Inches for California.
Mean Line Drawn for 1901 to 1963 Water Year Total, 23.82 Inches.



2. SURFACE RUNOFF

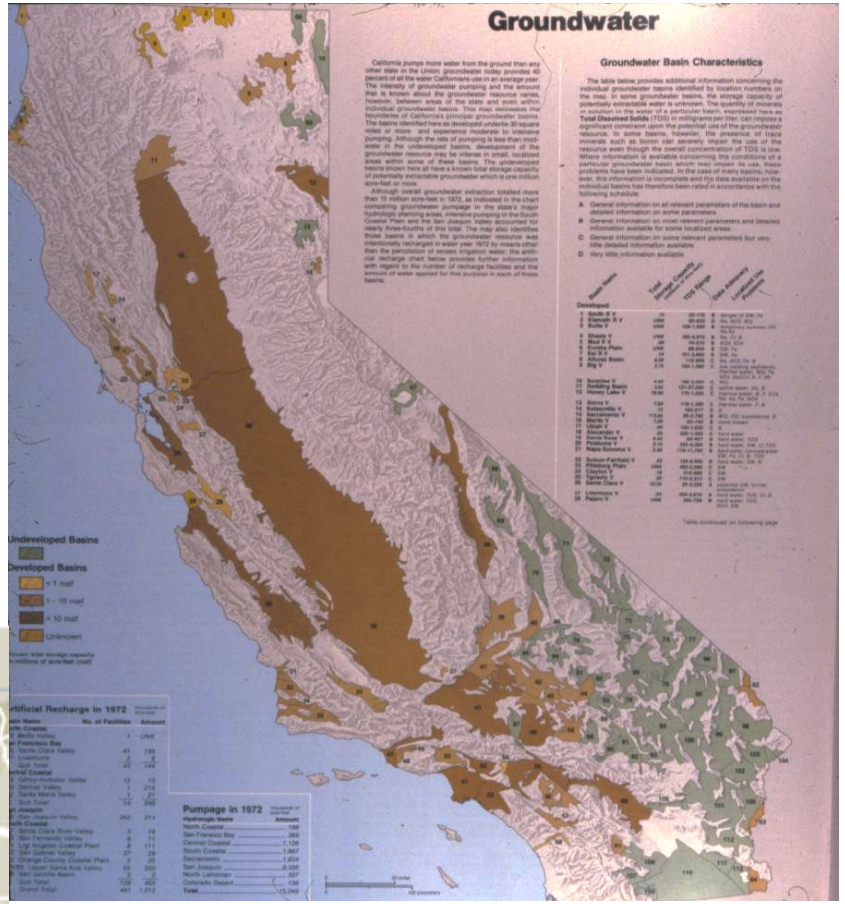
- **Runoff & Rivers**
  - What's left over
  - North-South split

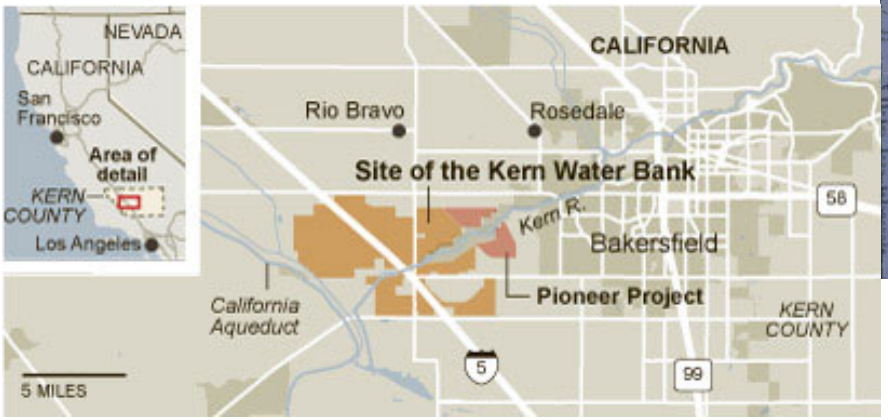




3. GROUNDWATER

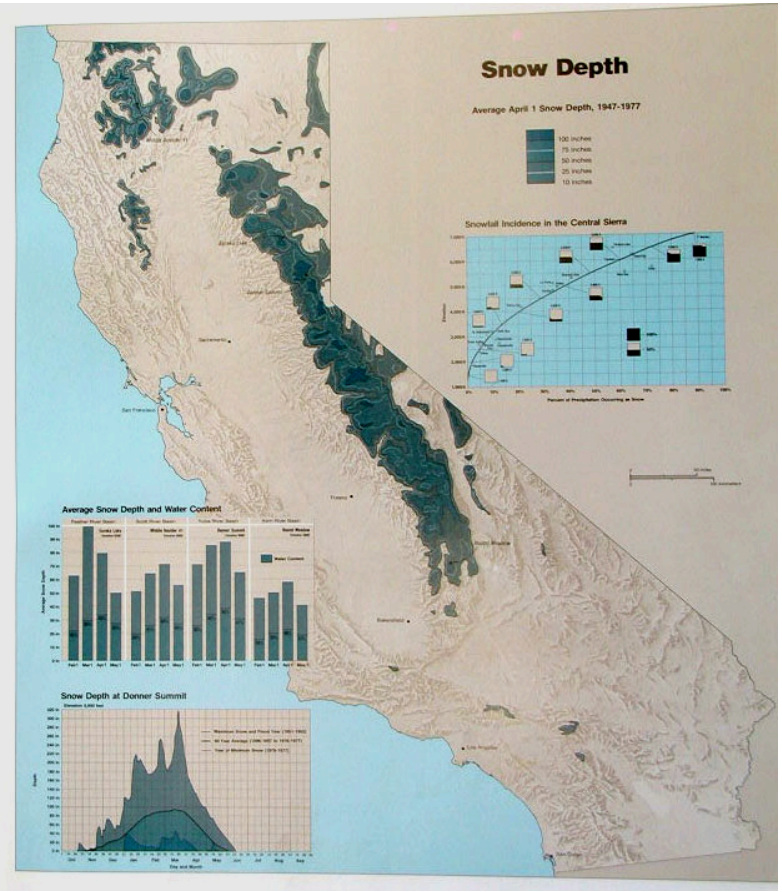
- **Hidden resource**
  - 40% of state supply
- **GW storage capacity**
  - LA, SCCo
  - Kern water bank

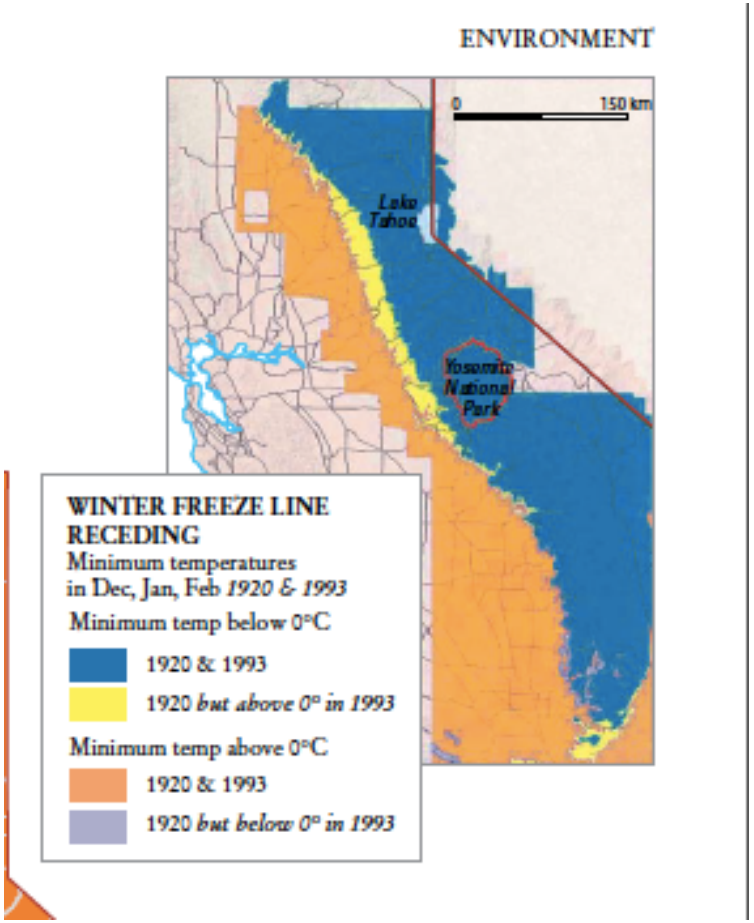




4. SNOWPACK

Key summer storage – will decline with global warming





II. PLUMBING FOR DROUGHT

① Local Sources

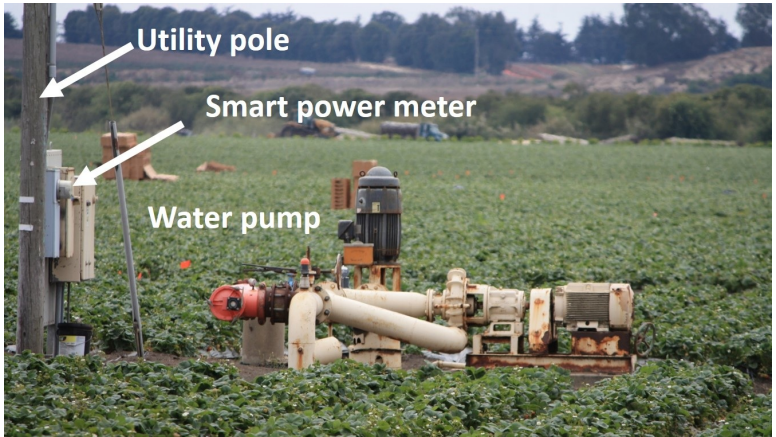
② City Systems

③ The Big Units

④ The Delta

1. LOCAL SOURCES

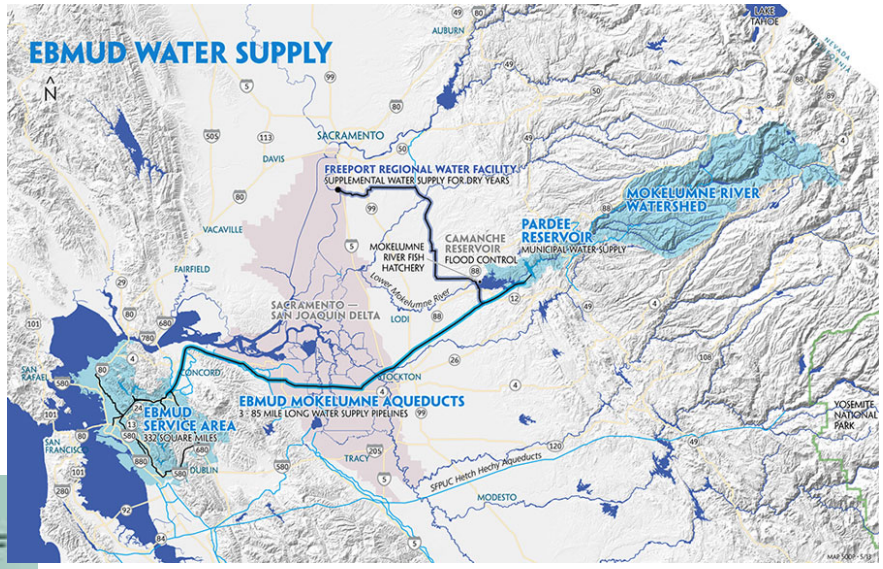
Dams & Pumps



2. CITY SYSTEMS

First long-distance aqueducts

Replaced/supplemented local sources



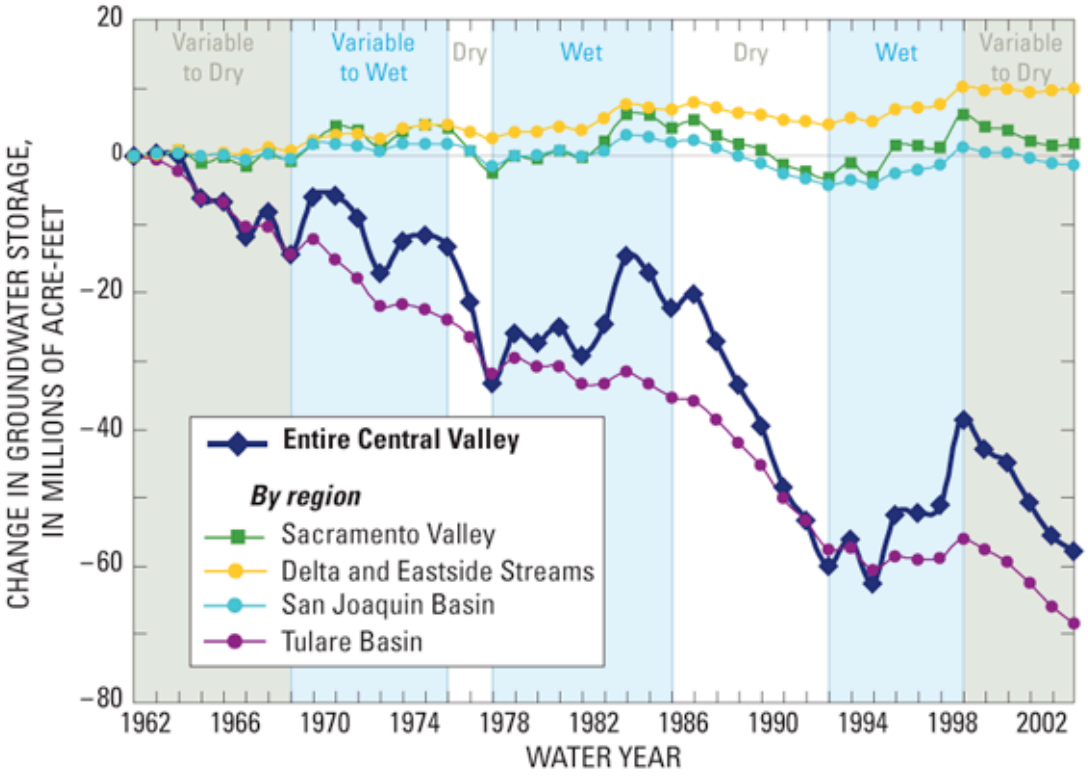
3. THE BIG UNITS

- Colorado, CVP, SWP
- Last & least NOT first & foremost
- All were salvage jobs
- Served most ‘marginal’ lands

GROUNDWATER DECLINE

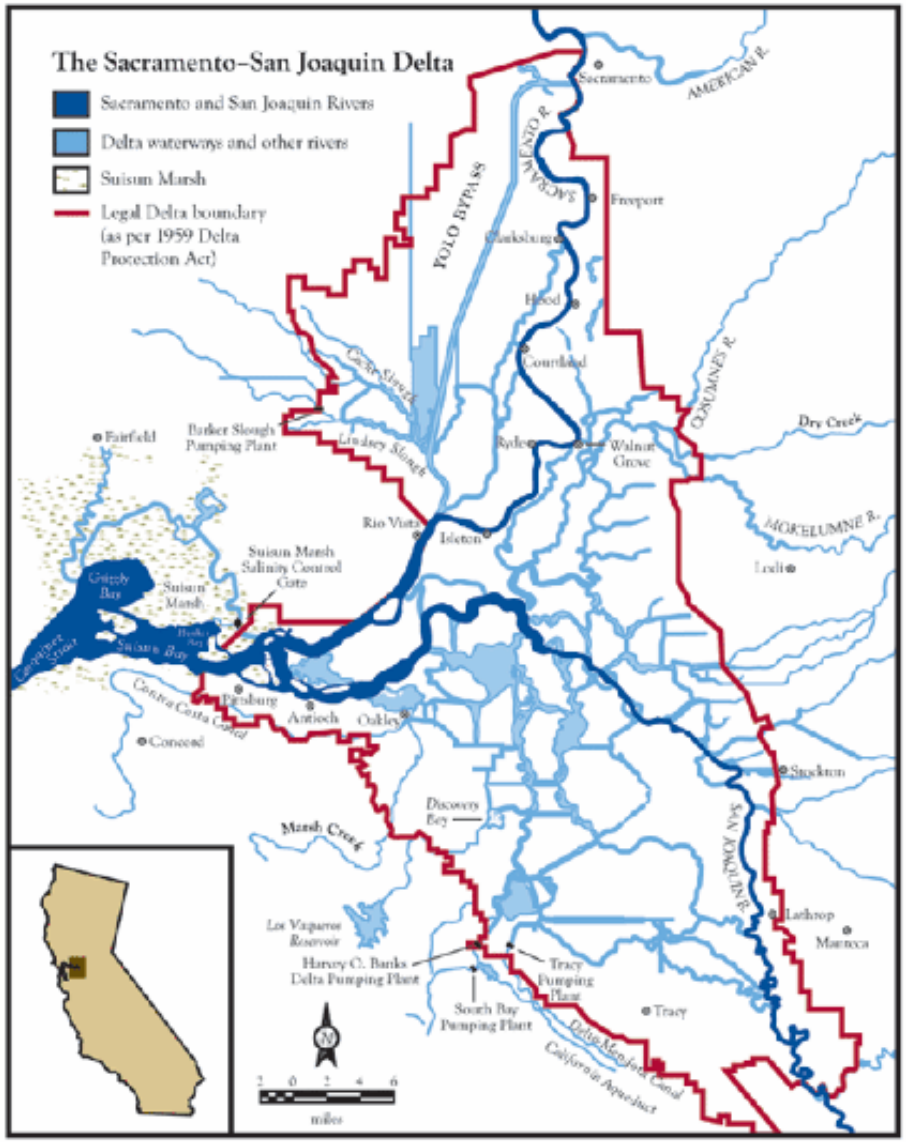
Long-term overpumping in low-recharge areas

West side and south end of San Joaquin Valley



4. THE DELTA

- **Key link in chain of Big Units**
  - but not for everyone
  - 5.5 maf/yr average
  - ~ 25% of all surface water used



DELTA PUMPING PROBLEMS

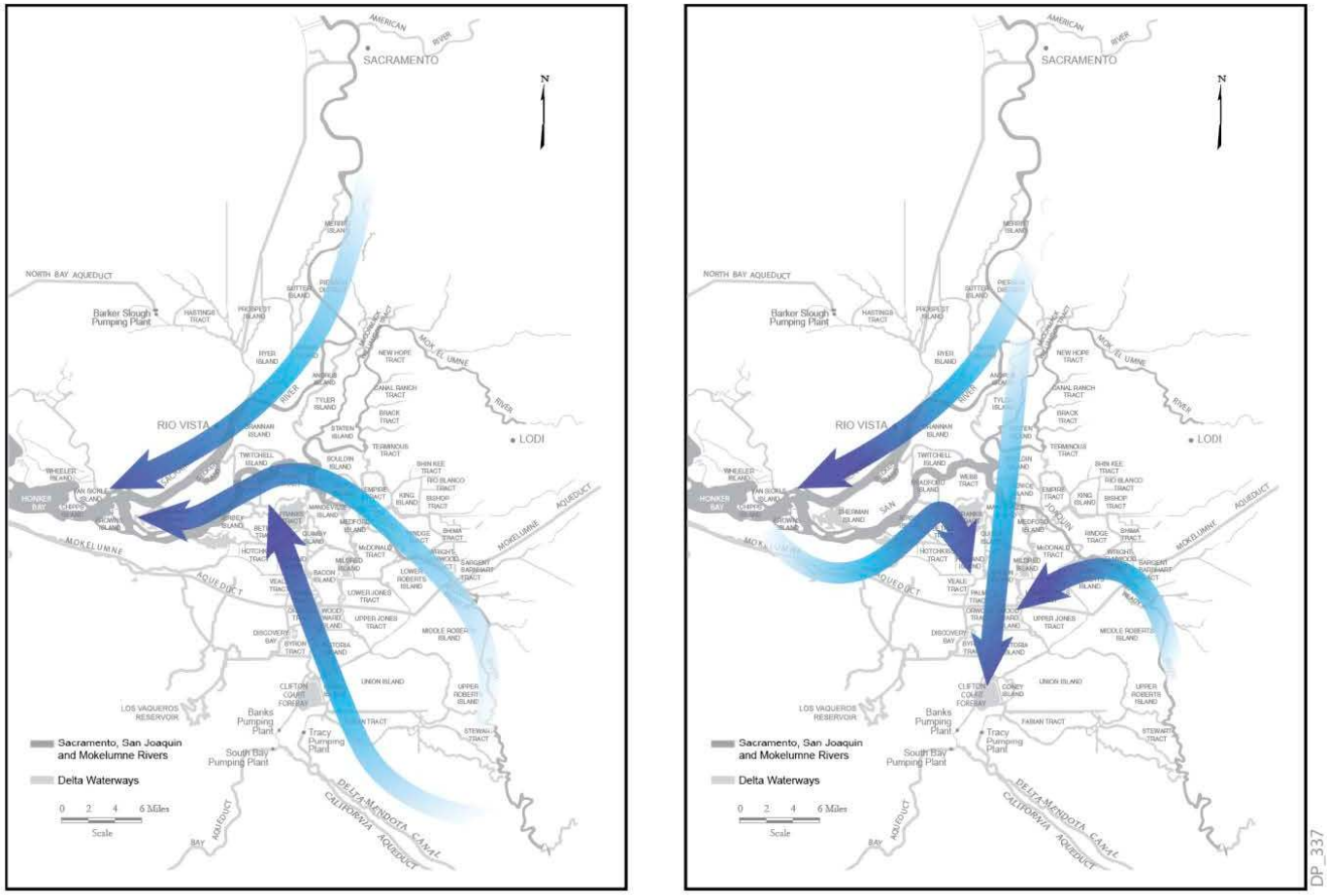


Figure 4-3

Flow Direction in South Delta

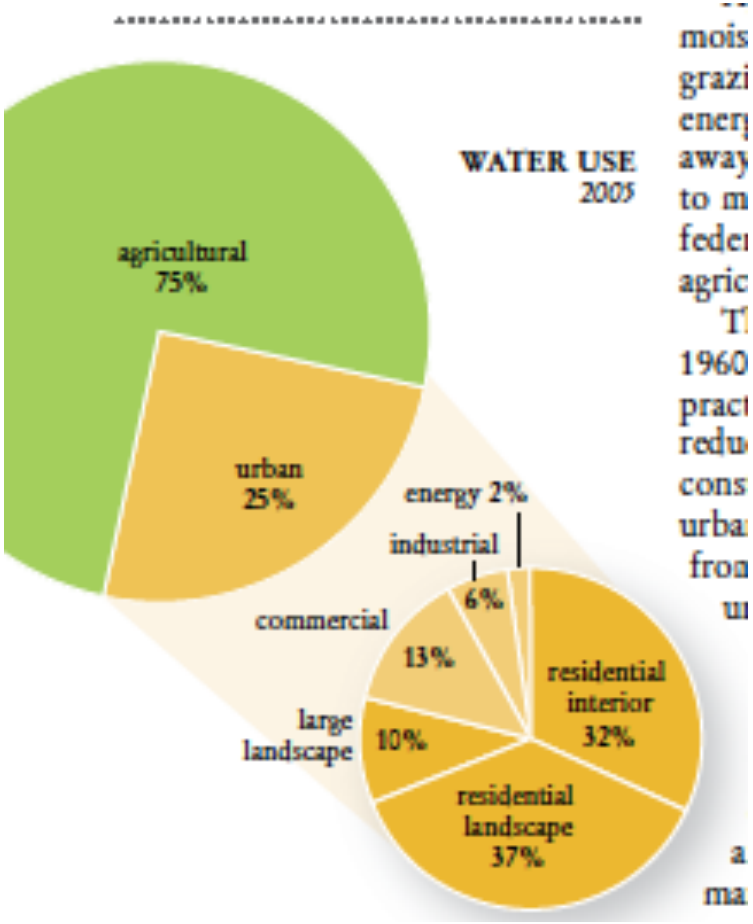
The left panel depicts the tidally averaged flow direction in the absence of export pumping. The right panel depicts reversal of tidally averaged flows that occurs during times of high exports (pumping) and low inflows to the Delta.

III. DROUGHT & WATER DEMAND

① Agriculture's Big Thirst
② Tree Crops at Risk
③ Crop Dynamics
④ Subsidies & Price Signals
⑤ Uncounted Costs

1. AGRICULTURE'S BIG THIRST

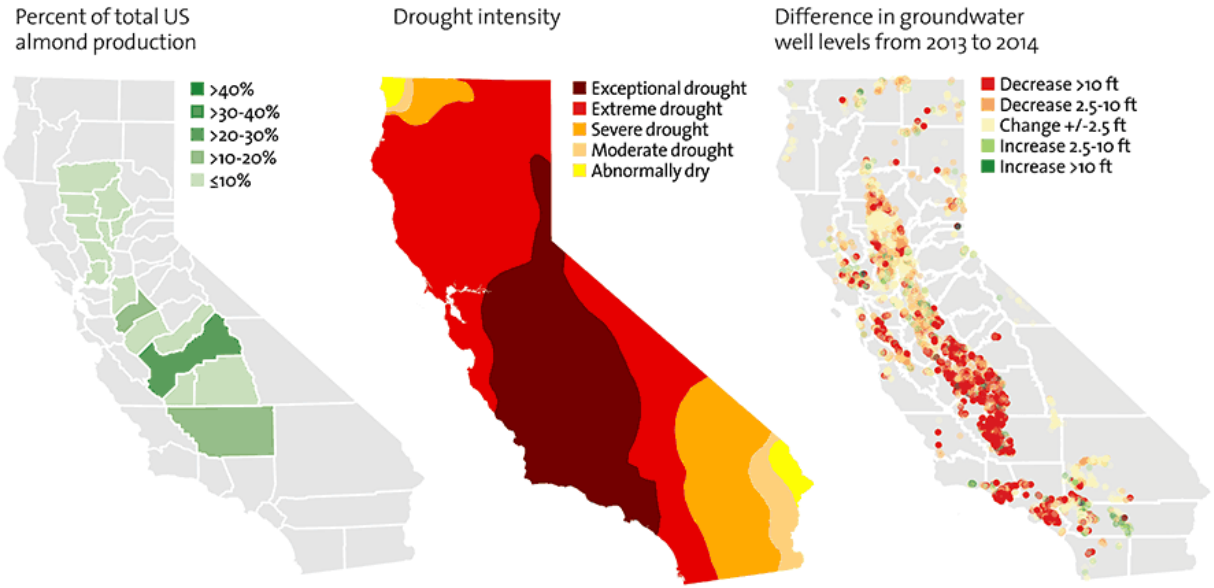
- **It's not about you & showers**
  - It's the gardens
- **It's not about Evil L.A.**
  - LA < 1maf/yr of Sacramento
  - Westlands > 1 maf/yr ave.



2. TREE CROPS AT RISK

- **The almond boom (up 3x) – 1 gallon per almond**
- **Trees & drought – cannot fallow**
- **Misjudging risk – here we go again with rescue operations**

California's Almond Counties Are Its Driest—and Most Overpumped



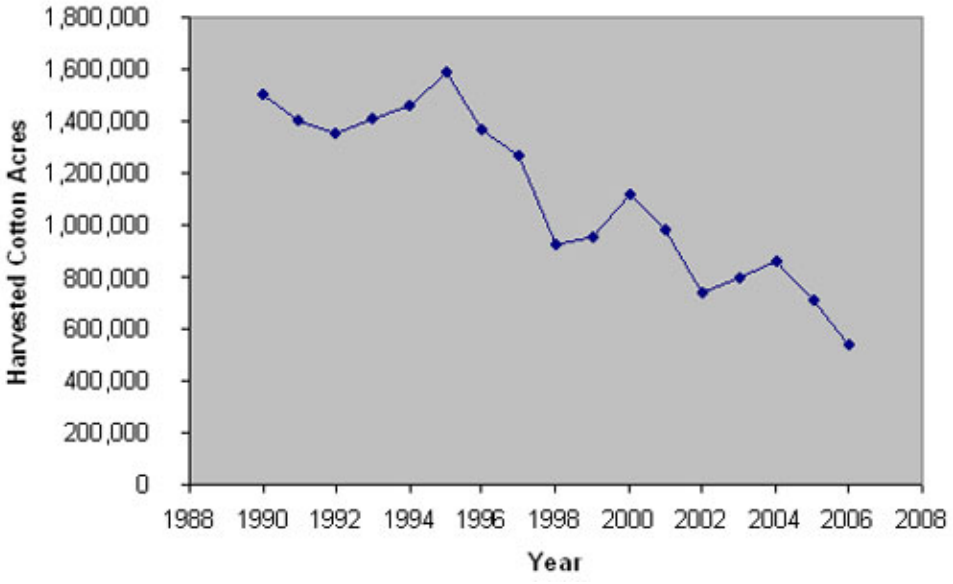
Note: The drought map represents the intensity of the drought as of January 6, 2015. The groundwater map shows data currently available from the California Department of Water Resources. Not all wells in California are part of the database.

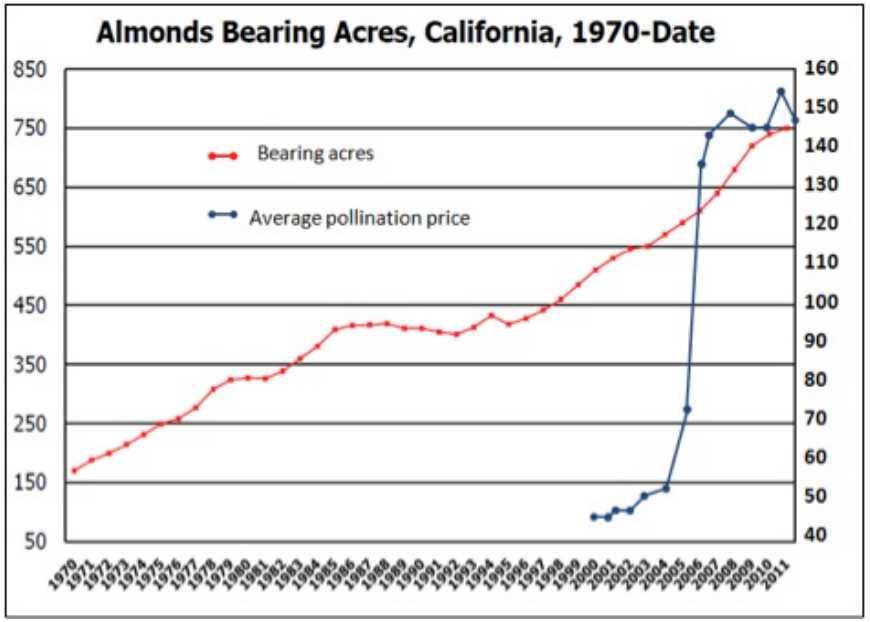
Sources: US Drought Monitor (drought map); California Department of Water Resources (groundwater levels); California County Agricultural Commissioners (crop maps).

Mother Jones

3. CROP & USE DYNAMICS

- **Repeated long-term shifts**
  - Response to prices
- **Going, going, gone…**
  - Wheat, sheep, barley, beans, apples, sugar beets, cotton…
- **Prices & conservation measures**
  - San Joaquin farmers vs. Sacramento Valley rice growers





4. SUBSIDIES & PRICE SIGNALS

- **CVP never repaid**
  - Hydropower & taxation
  - Low-cost contracts

- **SWP cover-up**
  - SoCal's 'surplus water' & Kern County
  - 2/3 of SWP to Kern, 1/3 to MWD

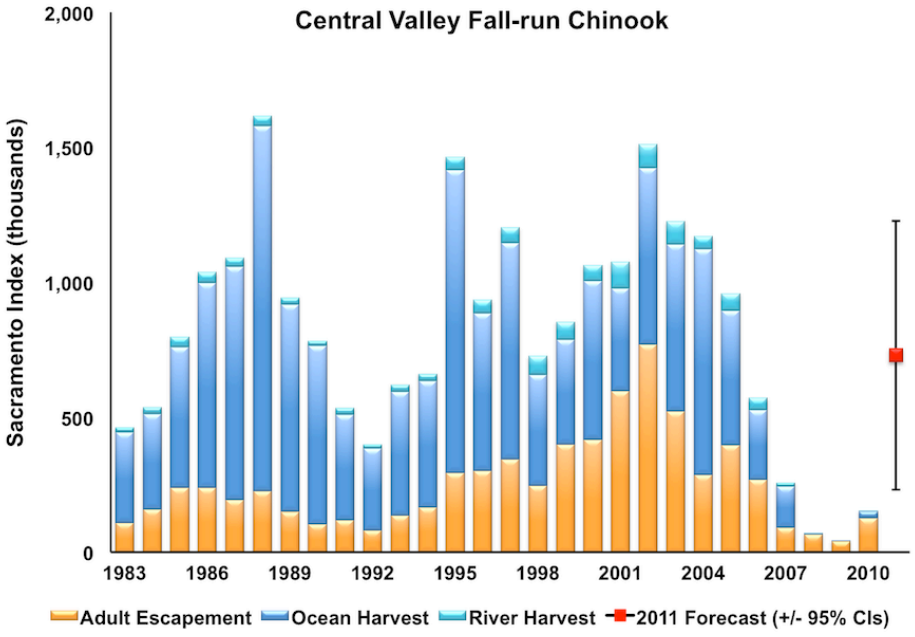
- **CVP vs. SWP at the pumps**
  - 2/3 to CVP, 1/3 to SWP
  - CVP serves Merced & Fresno County – esp. west side of valley

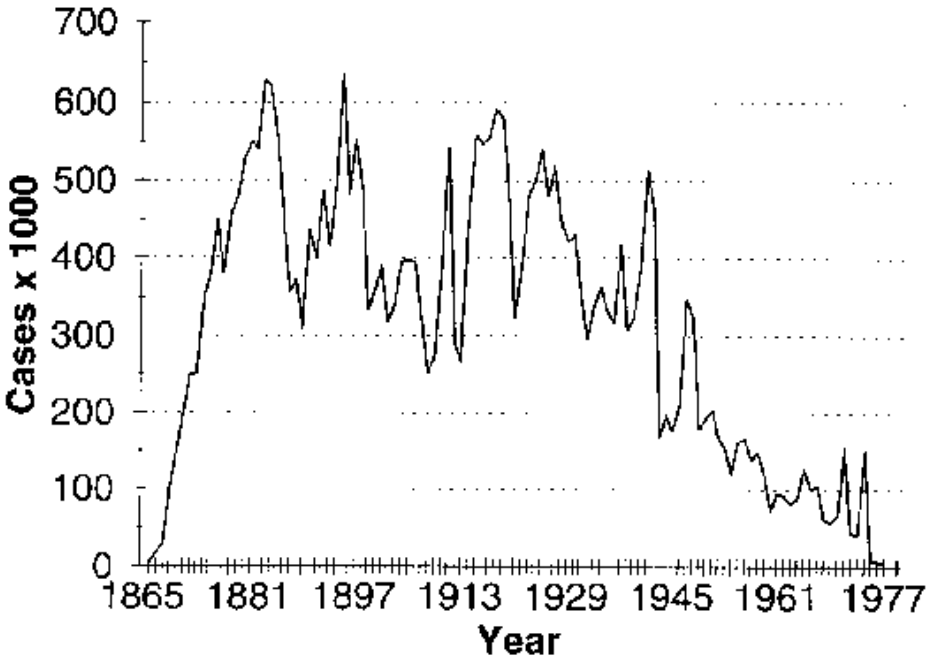
In short, the Big Water Systems serve mostly Westlands & Kern County Water District

'The last shall be first' - water for the most marginal lands

5. UNCOUNTED COSTS

The Delta & the fish





IV. THE SOLUTIONS

① What Not to Do

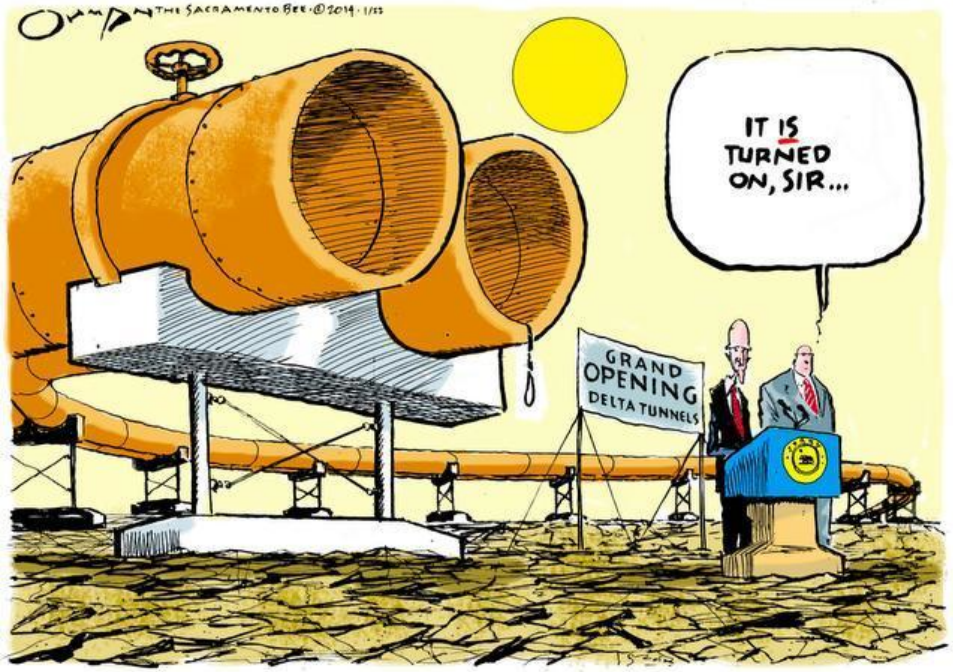
② Investing in Conservation

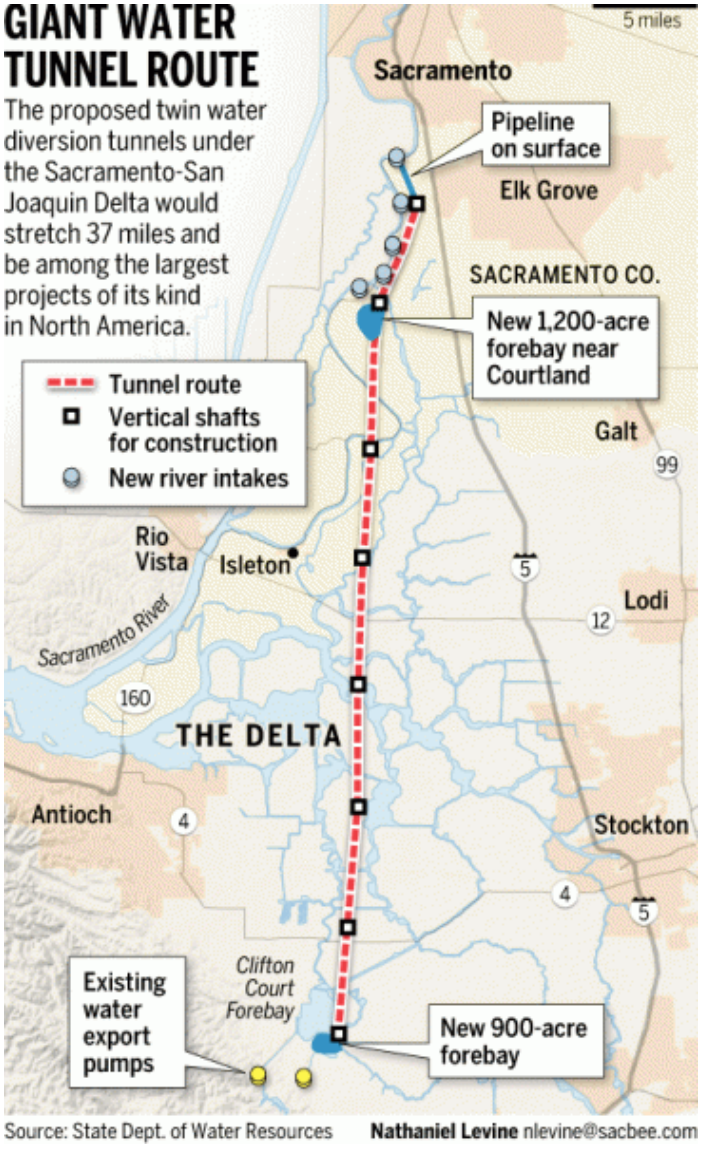
③ Reallocation of Rights

④ Retiring Acreage

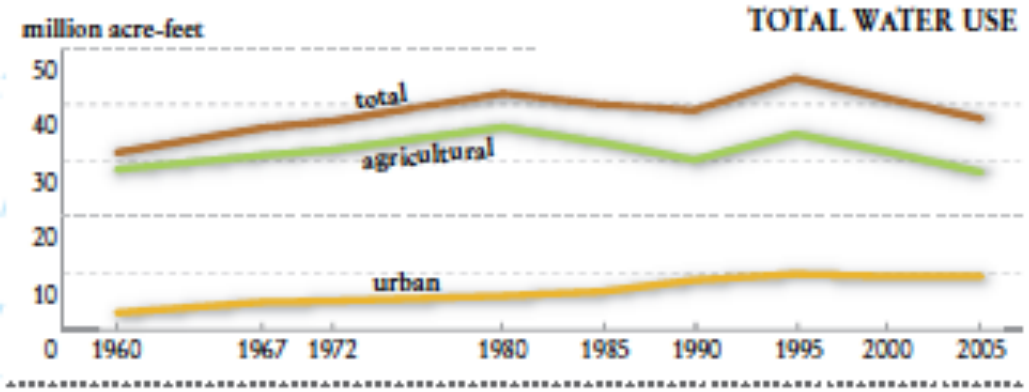
1. WHAT NOT TO DO

- More of the same
- Delta Drains

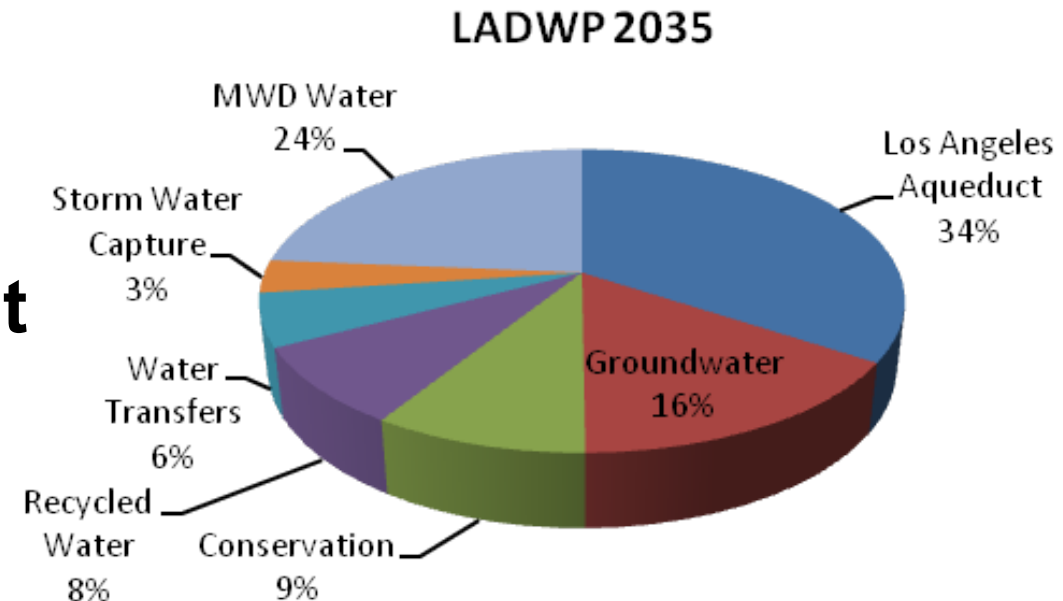




2. INVESTING IN CONSERVATION



- Use reduction
- Supply management
- Recycling



3. REALLOCATION

- **Away from marginal uses**
  - Western & Southern San Joaquin Valley
  - Rice & Sacramento Valley
- **Whose rights, anyway?**
  - Groundwater unchecked
  - Surface muddle
  - Contracts as leaseholds

4. ACREAGE RETIREMENT

- **Irrigation to grazing or wetlands**
- **Decline in irrigated acreage**
  - From 11 to 9 million acres
  - Westlands: -200,000 ac.
- **Buy out Westlands**
  - $10 billion vs. $25 billion