



The 2012-2014 Drought in Perspective

Jeanine Jones

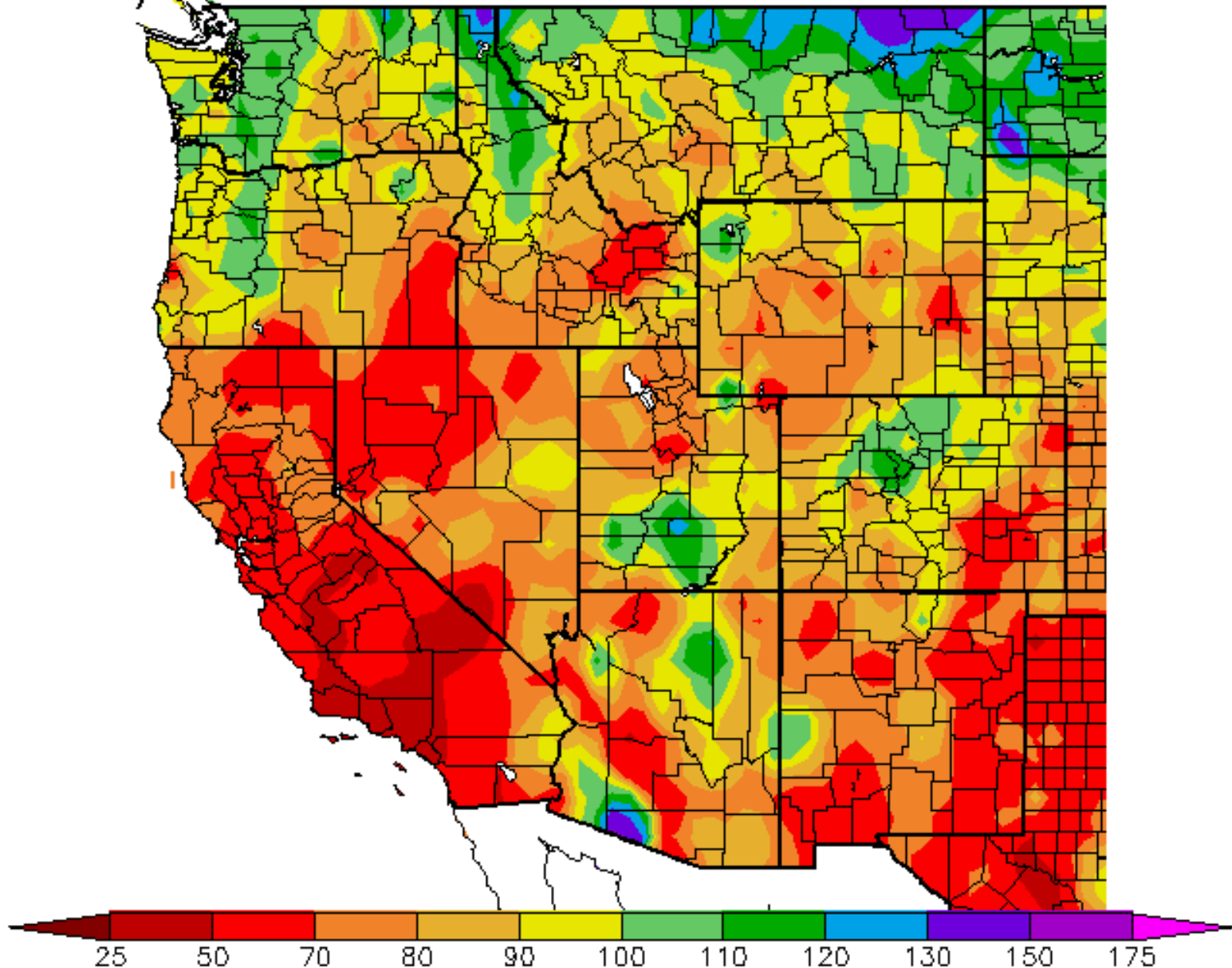


Department of Water Resources

June 2014

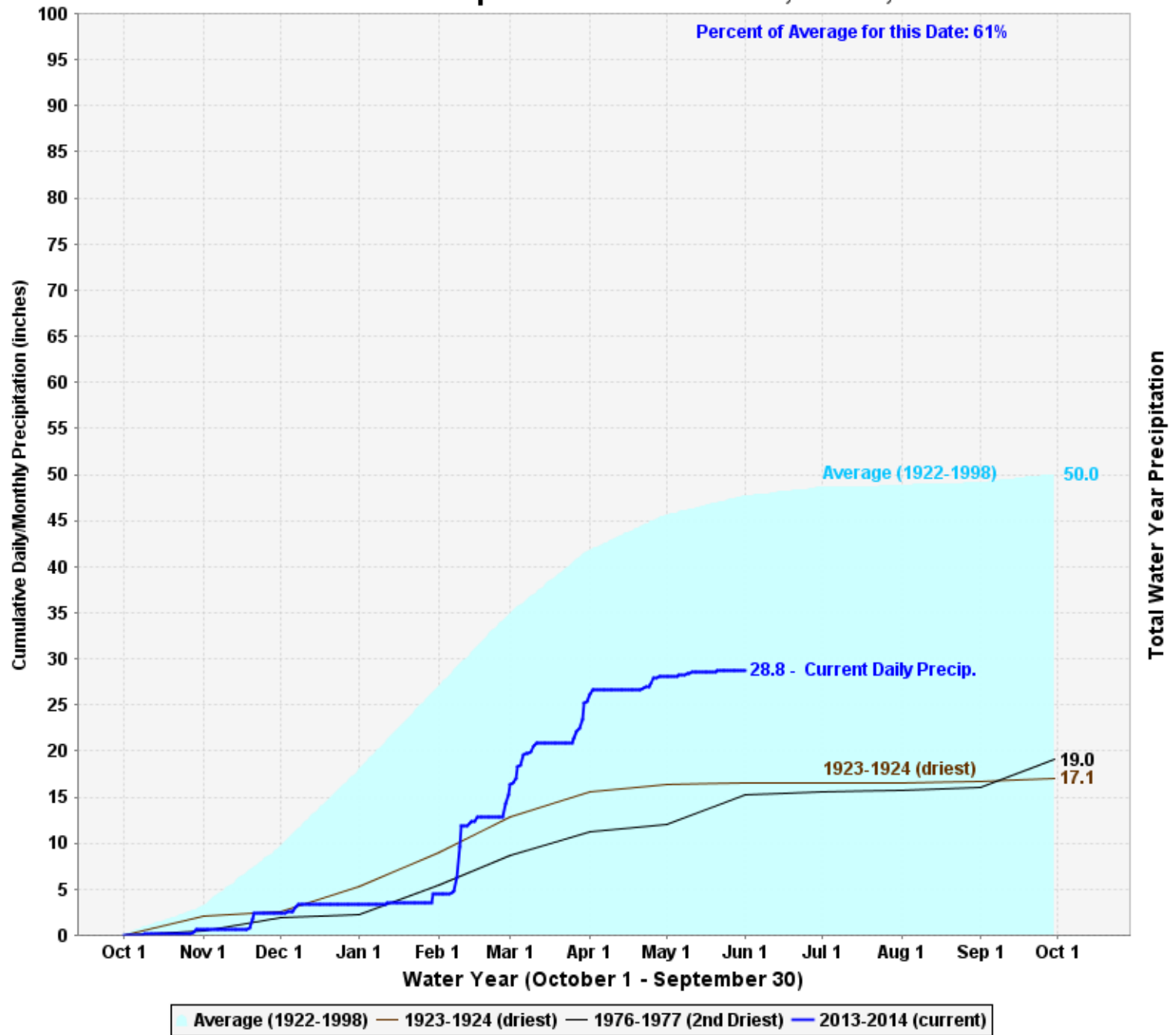
Percent of Average Precipitation (%)

6/2/2011 – 6/1/2014

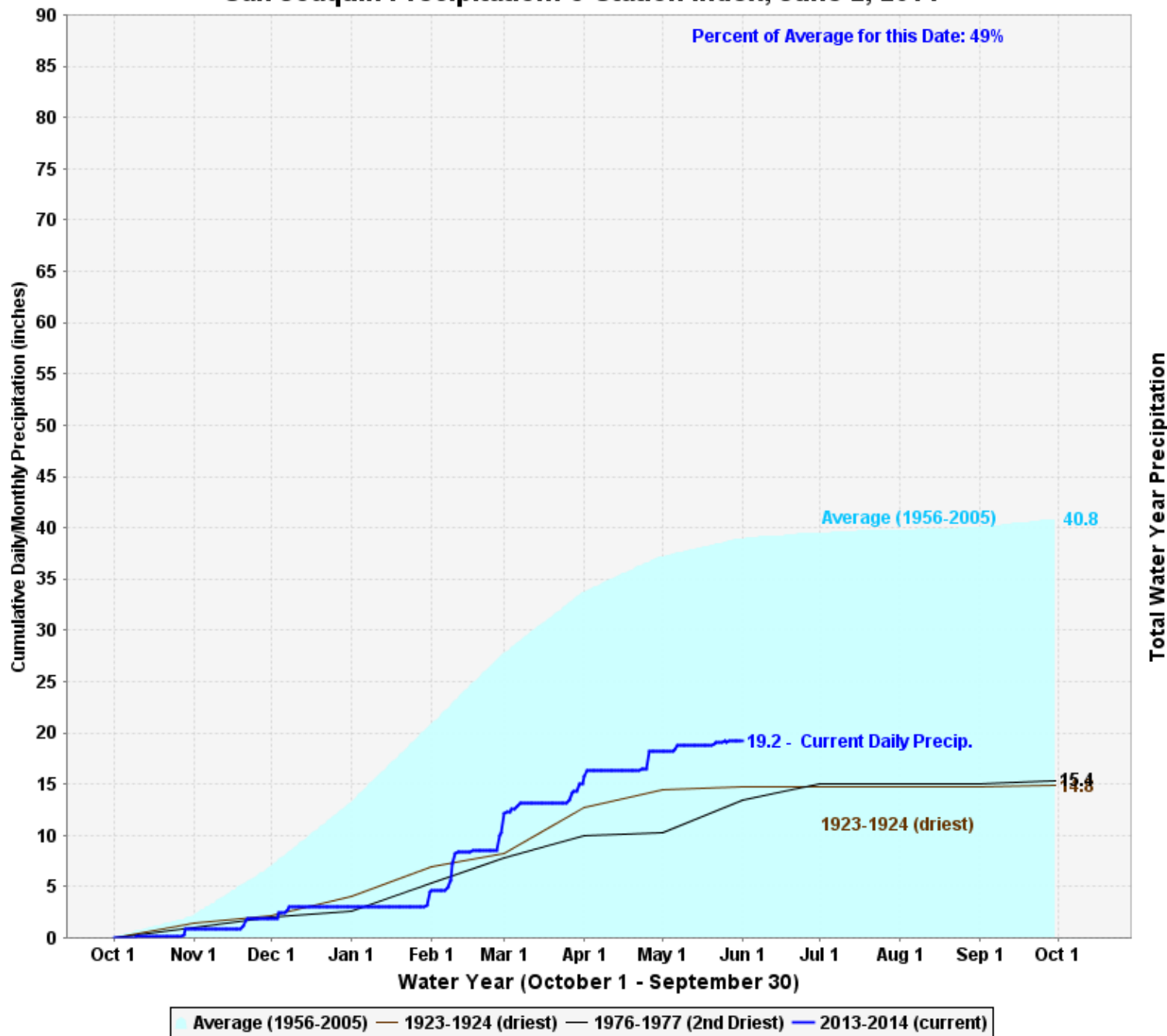


Generated 6/02/2014 at WRCC using provisional data.

Northern Sierra Precipitation: 8-Station Index, June 2, 2014



San Joaquin Precipitation: 5-Station Index, June 2, 2014



USGS Computed CA WY Runoff Dozen Driest years -- (rank out of 113)

1. 1977	113 th	7. 2001	107 th
2. 1931	112 th	8. 1934	106 th
3. 1924	111 th	9. 1992	105 th
4. 1991	110 th	10. 1976	104 th
5. 1994	109 th	11. 1929	103 rd
6. 1990	108 th	12. 1998	102 nd

California's 20th & 21st Century Statewide Droughts

- 1918-20
- 1922-24
- 1929-34
- 1947-50

- 1959-61
- 1976-77
- 1987-92
- 2007-09

1929-34

- The “dustbowl drought”
- Its hydrology used in design of most of California’s largest water projects (to estimate project yield)



1976-77

- State population about 22 million
- 1977 – driest year of record for statewide runoff (21% of average)
- 47 of 58 counties declared local emergencies
- Marin County emergency pipeline across San Rafael Bridge
- Striped bass index in Delta



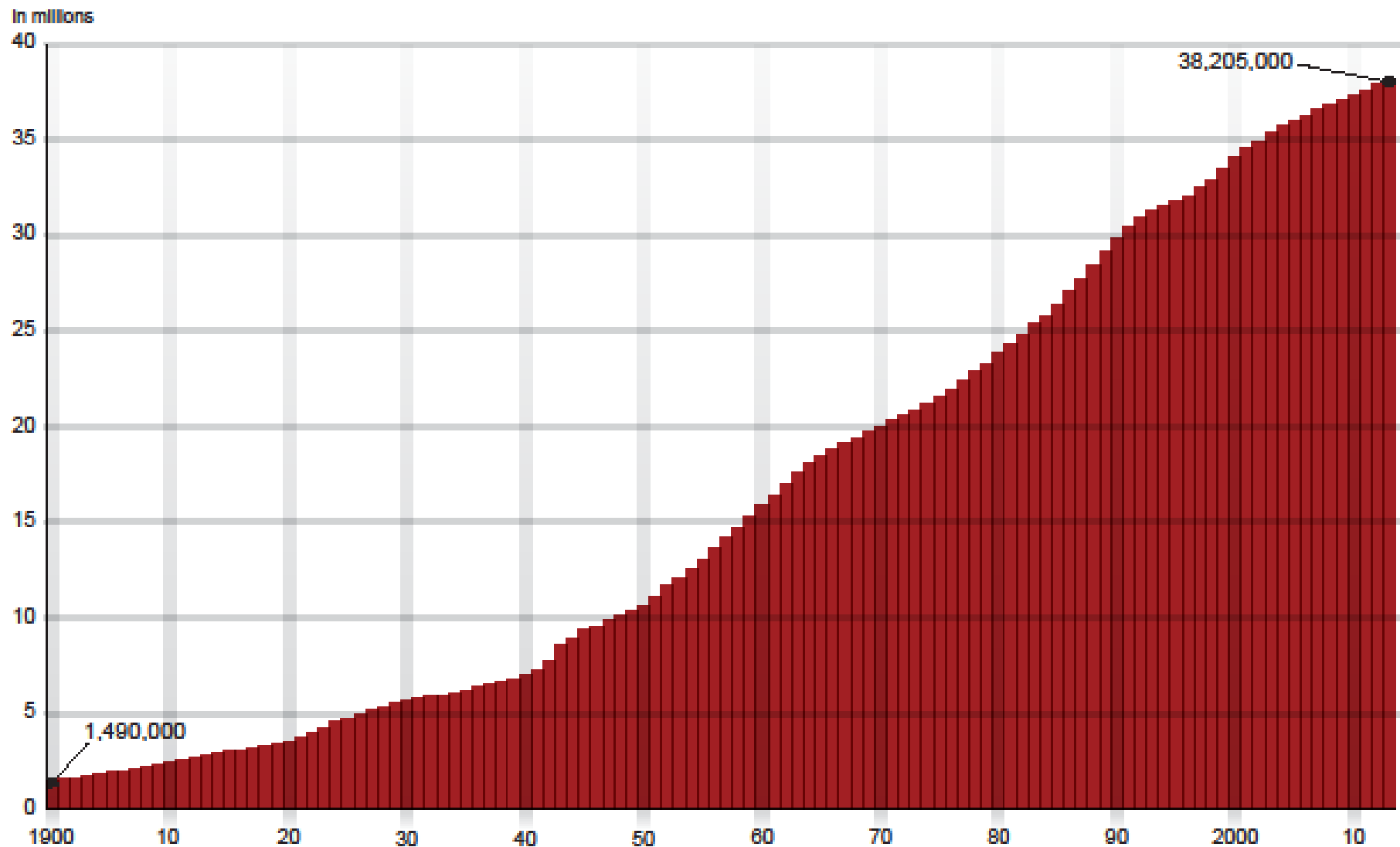
1987-92

- Population about 30 million in 1990
- 23 counties declared local emergencies
- SWP & CVP made full deliveries during first four years of drought, then reduced deliveries in years 5-6
- Surplus water available from Colorado River
- Winter-run salmon listed

1987-92 Drought Impacts

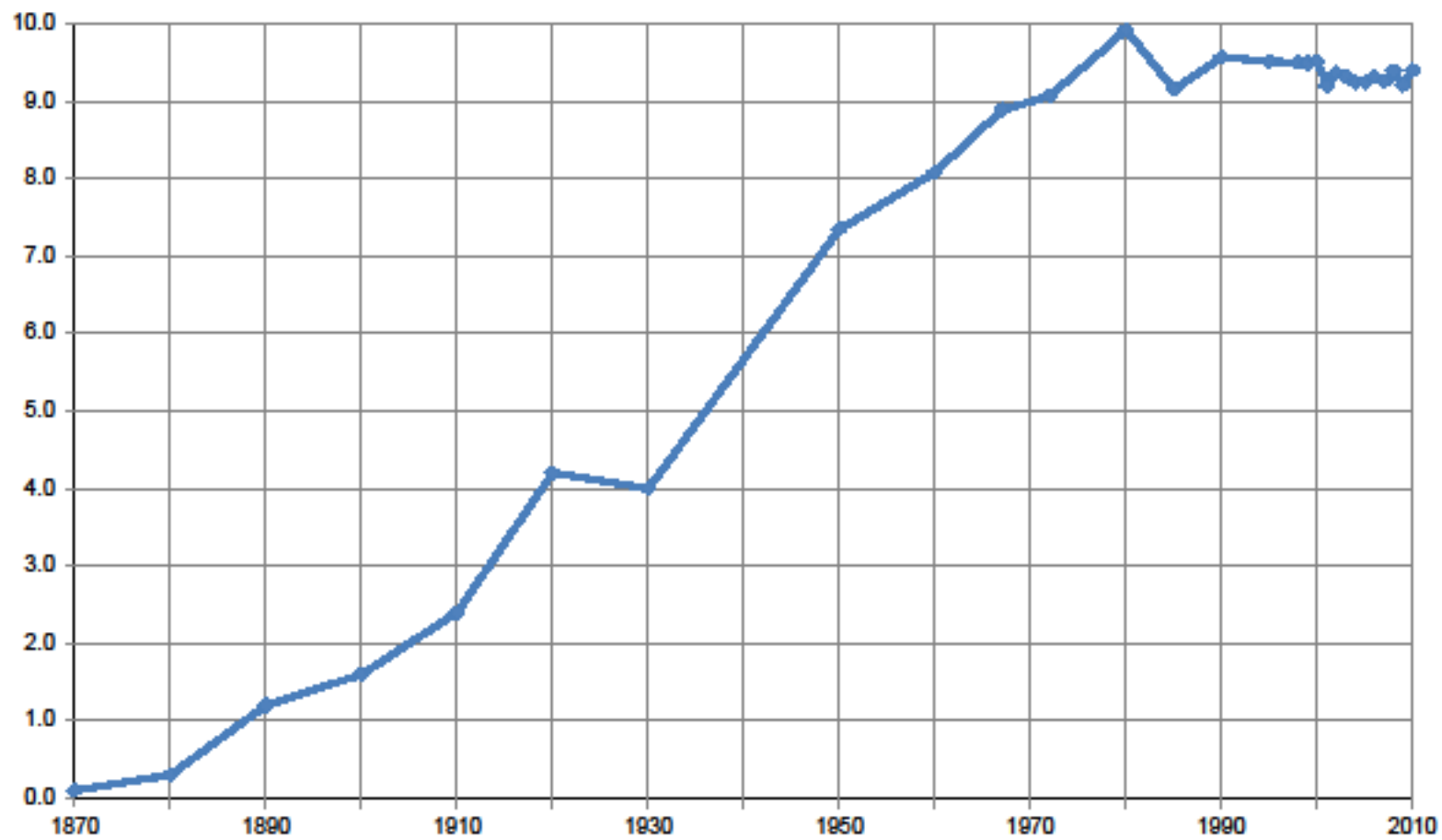
- San Francisco's system dropped to 25% of storage capacity in 1991
- Extreme cutbacks in Santa Barbara area, construction of emergency pipeline
- Severe rationing/water haulage in some small communities in North Coast, Central Coast, and Sierra Nevada foothill areas
- 1991 Oakland Hills wildfire

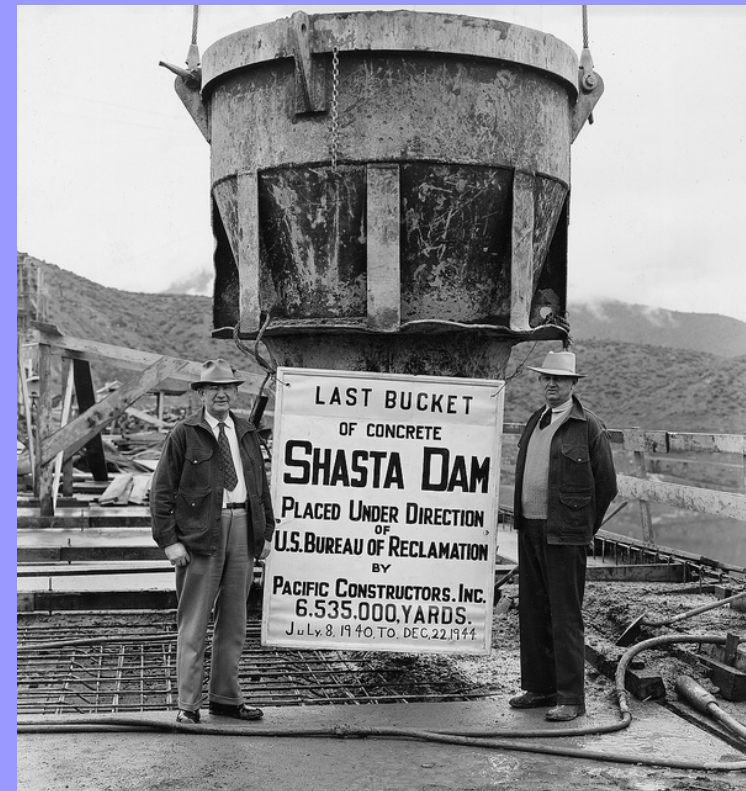
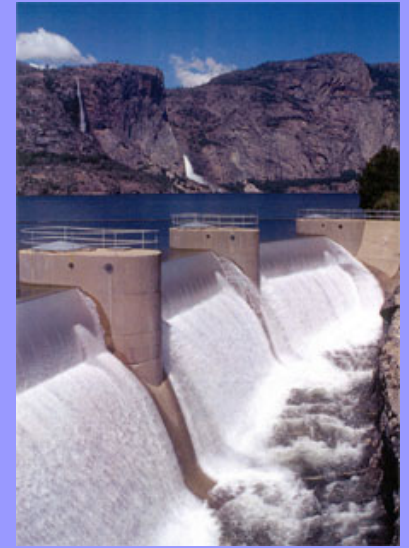
California Population Estimates, with Components of Change and Crude Rates, July 1, 1900-2013



California Irrigated Crop Acreage, 1870-2010

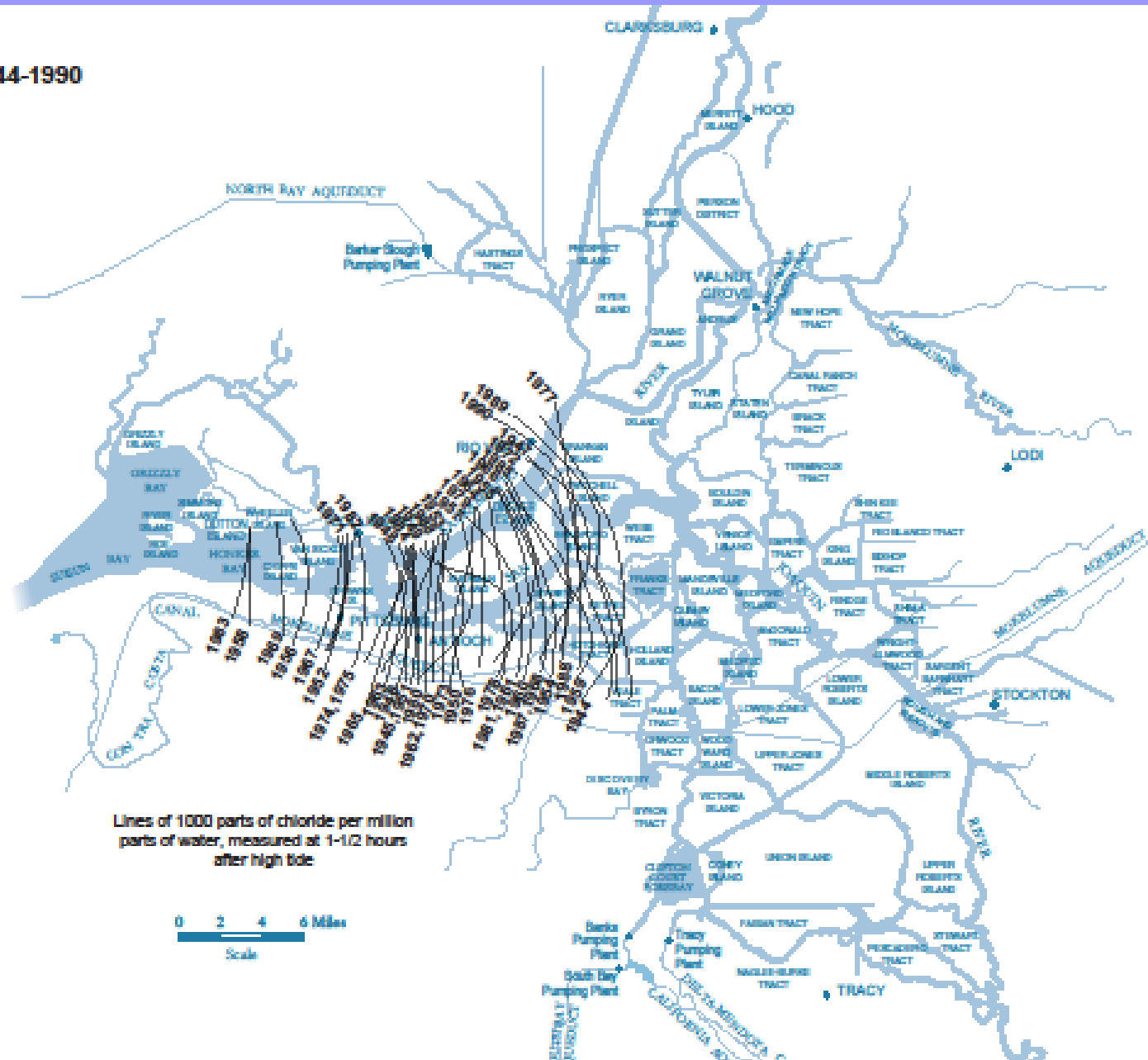
Acres, millions



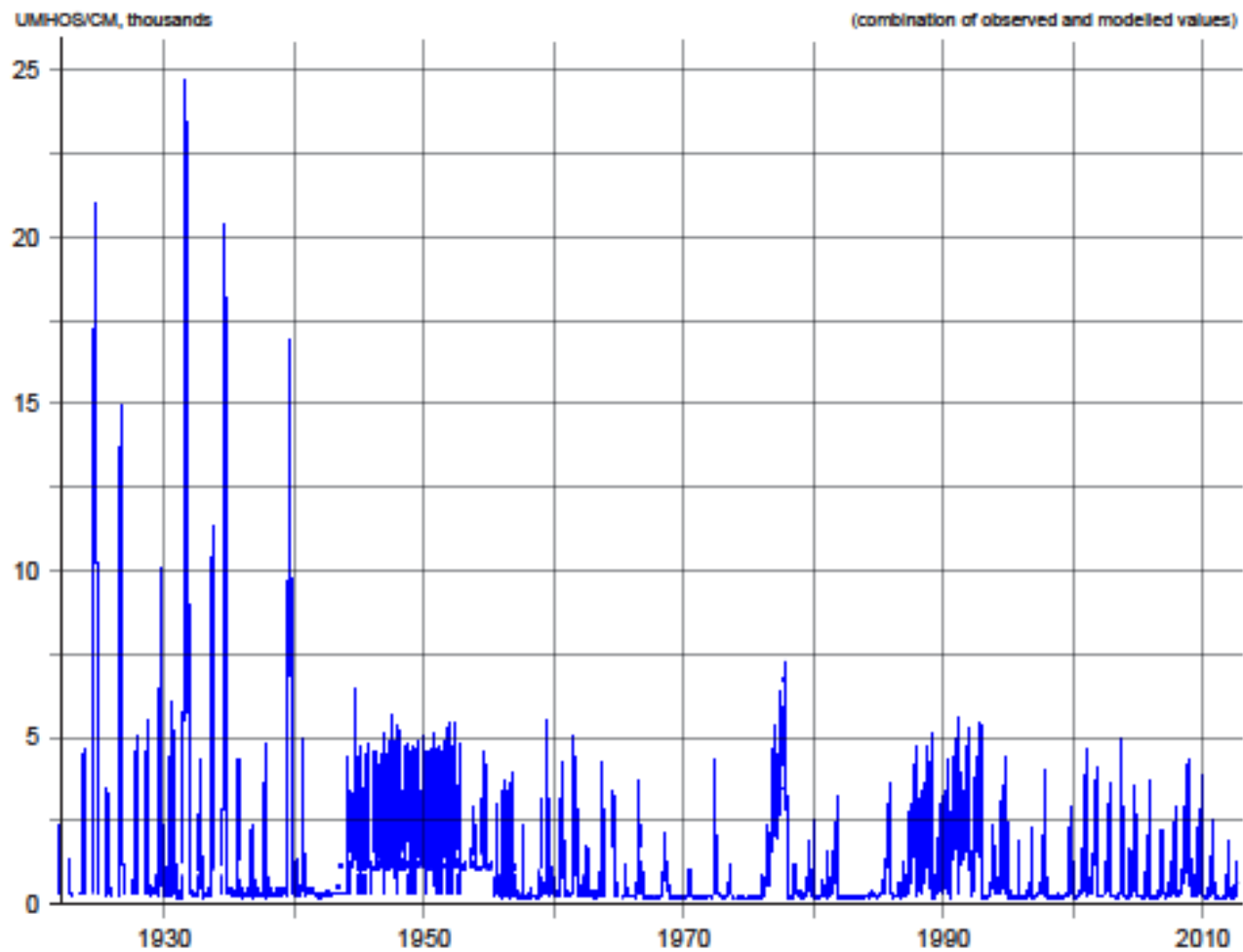




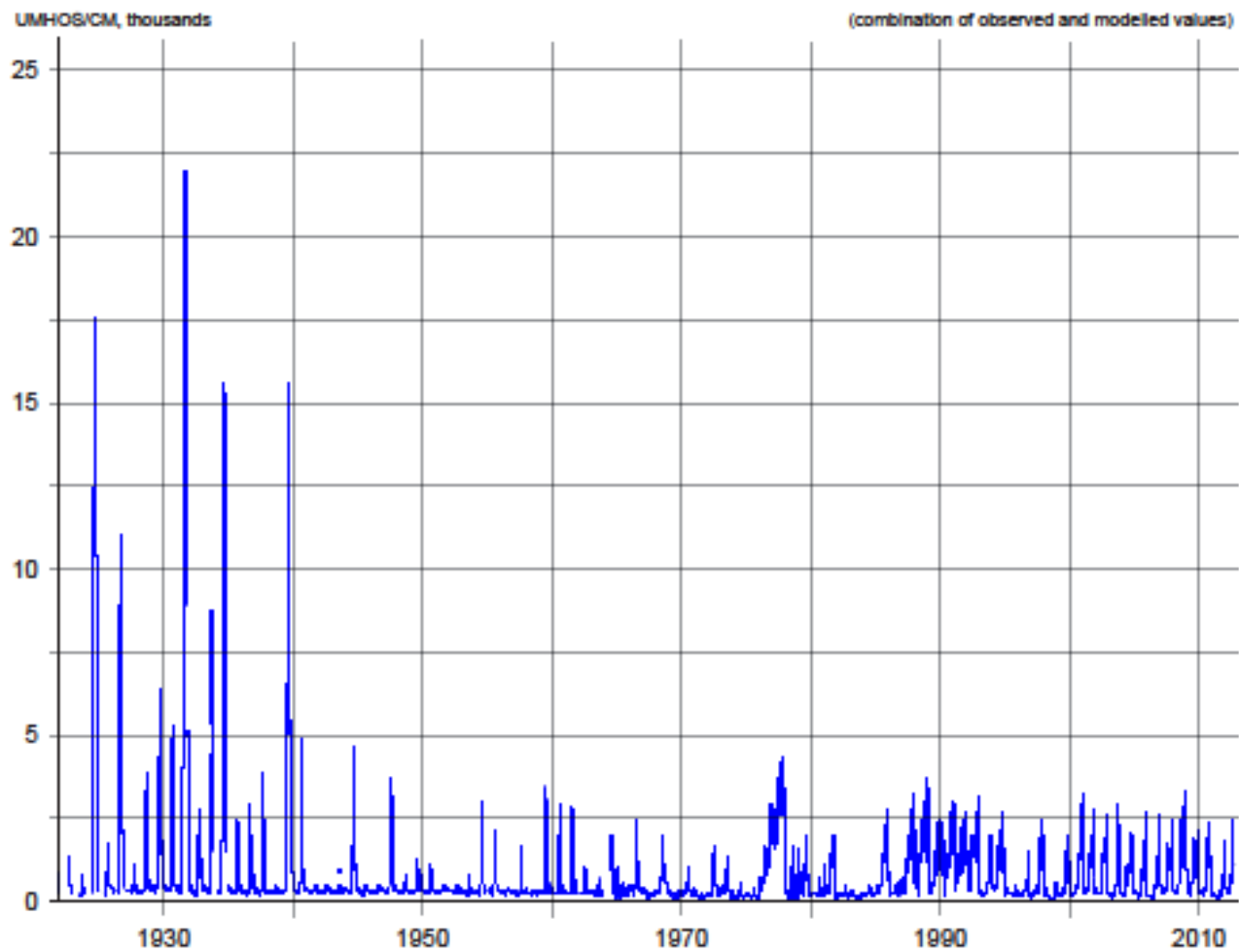
Maximum Salinity Intrusion, 1944-1990



Estimated Salinity at Emmanton, 1920-2013



Estimated Salinity at Jersey Point, 1920-2013



Most Recently, 2007-09 Drought

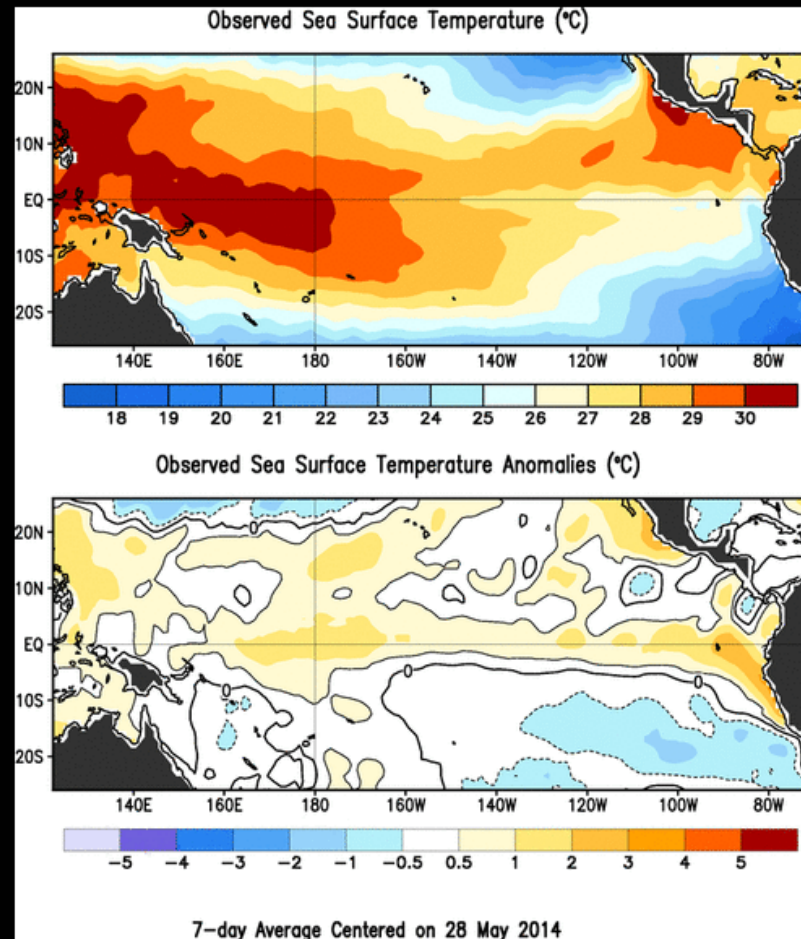
- Southern California cities set dry year records.
- 2007 Southern California wildfires
- California now limited to 4.4 MAF on Colorado River
- CVP Westside SJV ag deliveries: 50%, 40%, 10%
- SWP deliveries: 60%, 35%, 40%
- Affected areas – Westside SJV, Russian River service area

Comparison of Water Project Allocations in Dry Years

	1991	2009	2014
SWP	30% / 0%	40%	5%
SWP water rts	50%	100%	100%
CVP N of Delta Ag	25%	40%	0
CVP S of Delta Ag	25%	10%	0
Friant	100%	100%	0
CVP Sac water rts	75%	100%	75%
CVP SJ water rts	75%	100%	65%

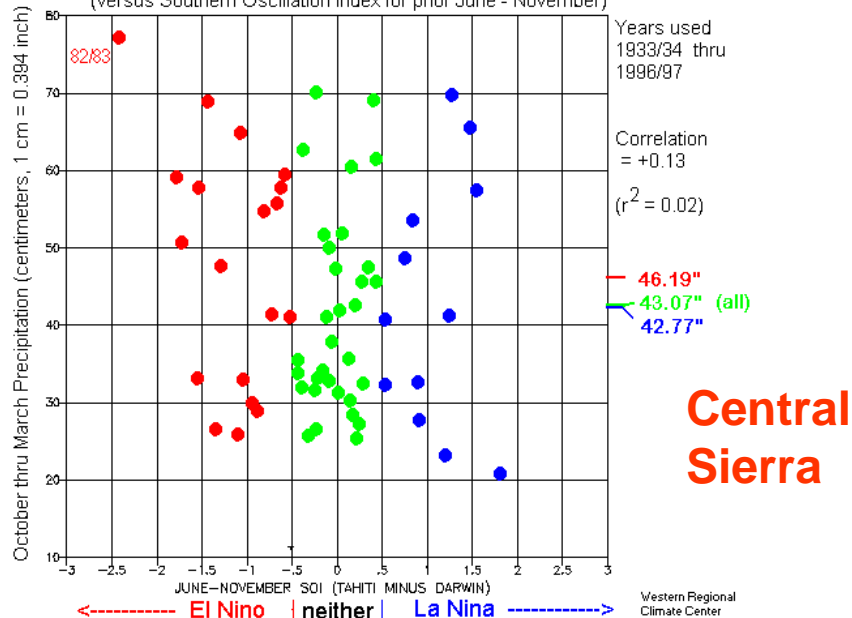
Do past big droughts share common climate characteristics?

(And can we infer anything about WY 2015 prospects?)

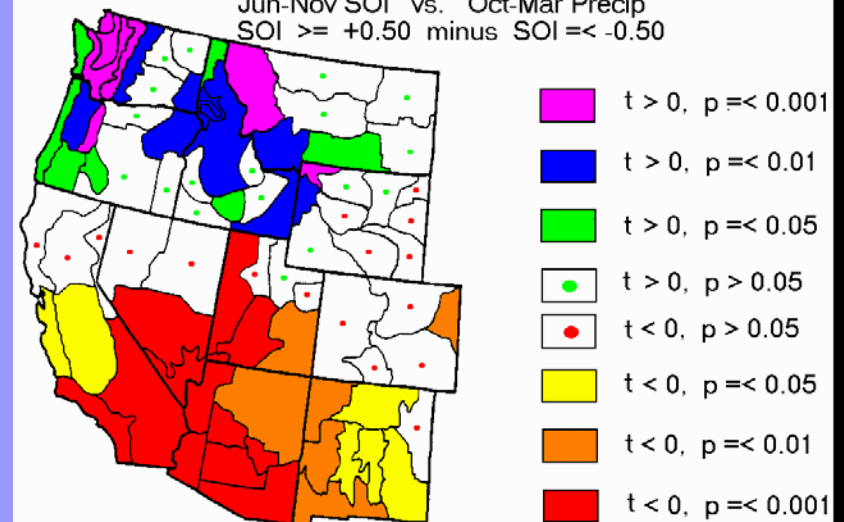


ENSO & Precipitation Correlation (courtesy of Kelly Redmond, DRI)

California 8-Station Index October thru March Precipitation
(versus Southern Oscillation Index for prior June - November)



Split Samples:
Jun-Nov SOI vs. Oct-Mar Precip
SOI $\geq +0.50$ minus SOI ≤ -0.50



Updated from Redmond and Koch (1991). Winters of 1933/34 - 1994/95.
Reddish: Composite El Niño winters are wet, La Niña winters are dry.
Bluish/greenish: Composite El Niño winters are dry, La Niña winters are wet.

**Redmond & Koch,
1991, updated.**

Redmond, K.T., and R.W. Koch, 1991. Surface climate and streamflow variability in the western United States and their relationship to large-scale circulation indices. *Water Resources Research*, 27(9), 2381-2399.

What Does it Take to End a Drought?

