The Ongoing California Drought

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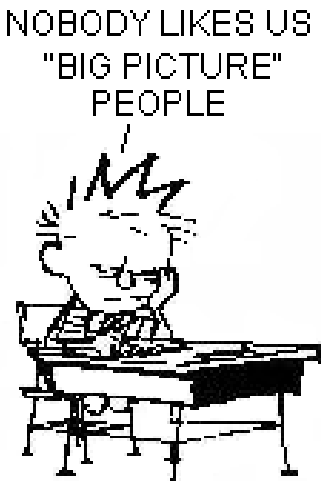

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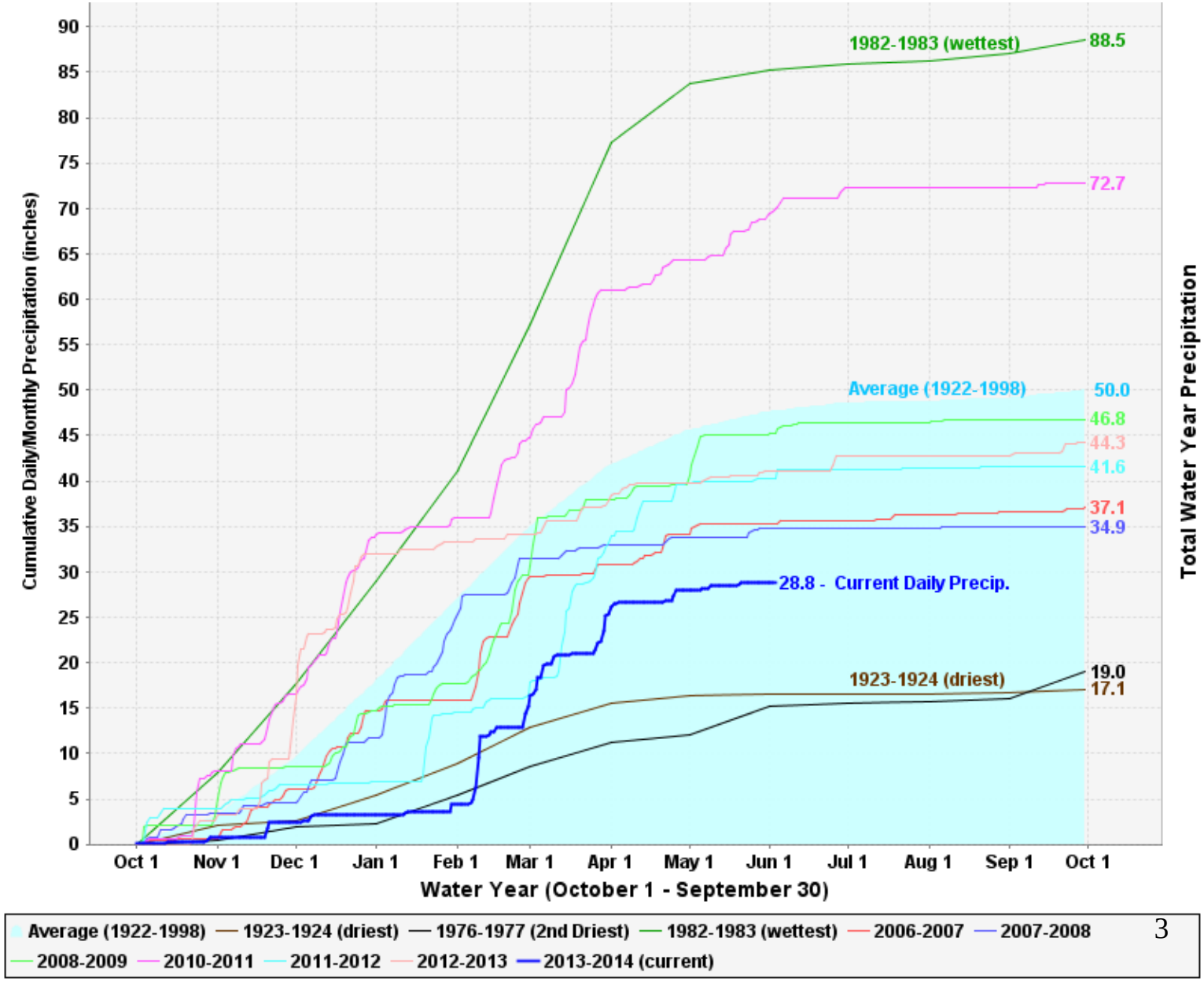
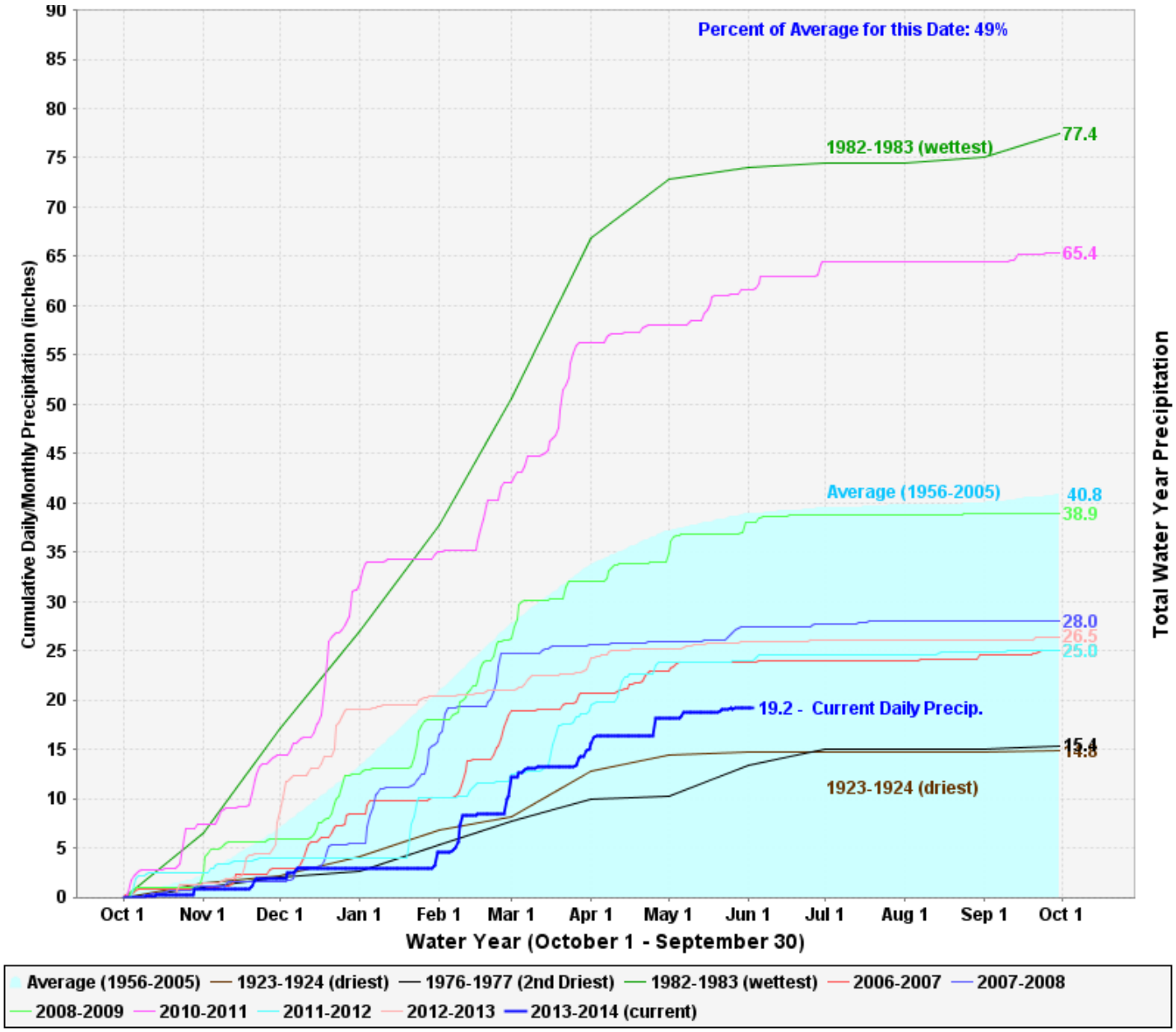
Outline

1) 2014 drought conditions
   - Precipitation, snowpack, reservoirs
2) 2014 drought effects in Central Valley
   - Water deliveries, groundwater, agriculture
3) Will next year be dry too?
   - Historical statistics
   - Insights from El Nino
4) Some Policy Issues
   - Environmental flows and habitats (esp. wetlands)
   - Water rights security – surface and groundwater
   - Water quality and public health and safety

Sac. Valley Precipitation index

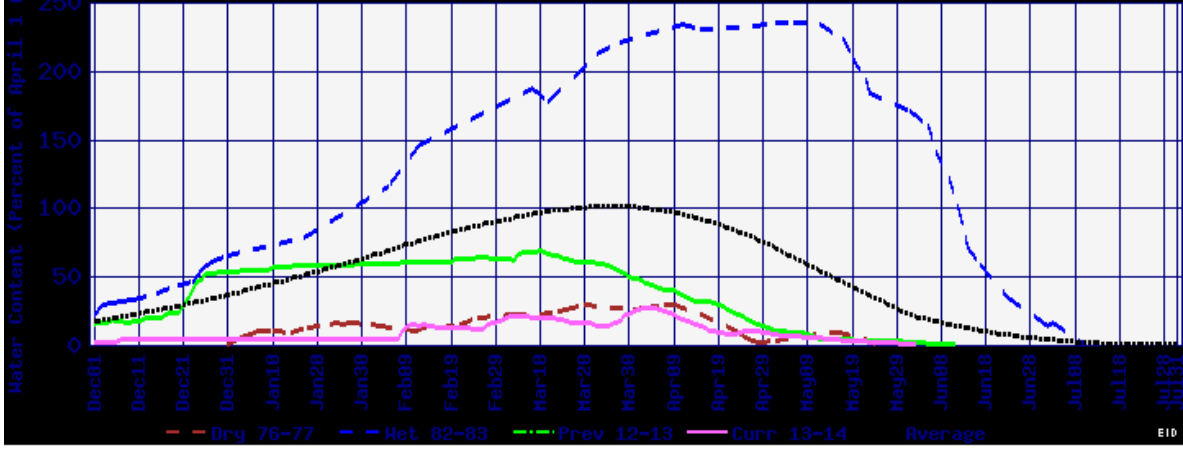


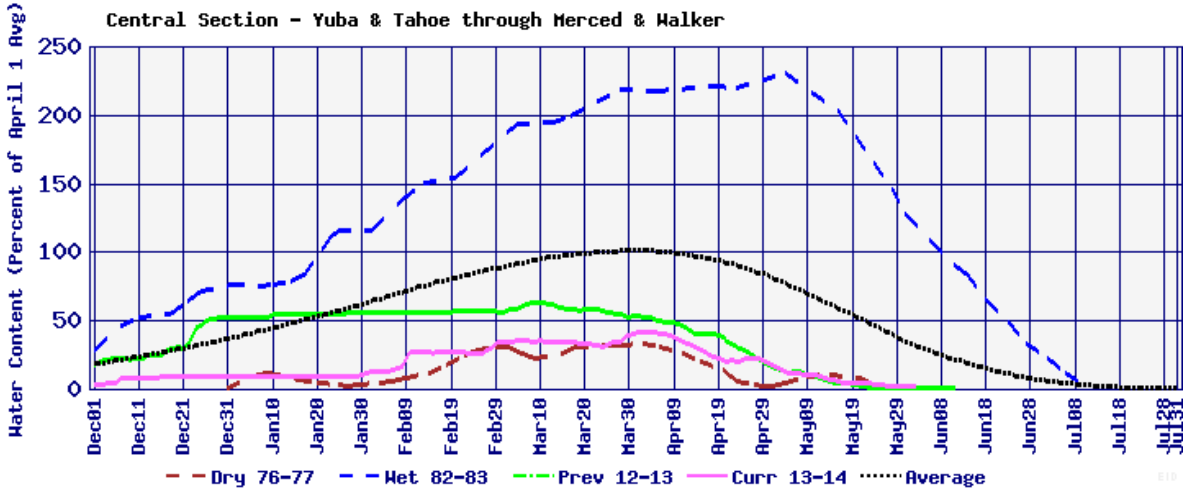
SJ Valley Precipitation index

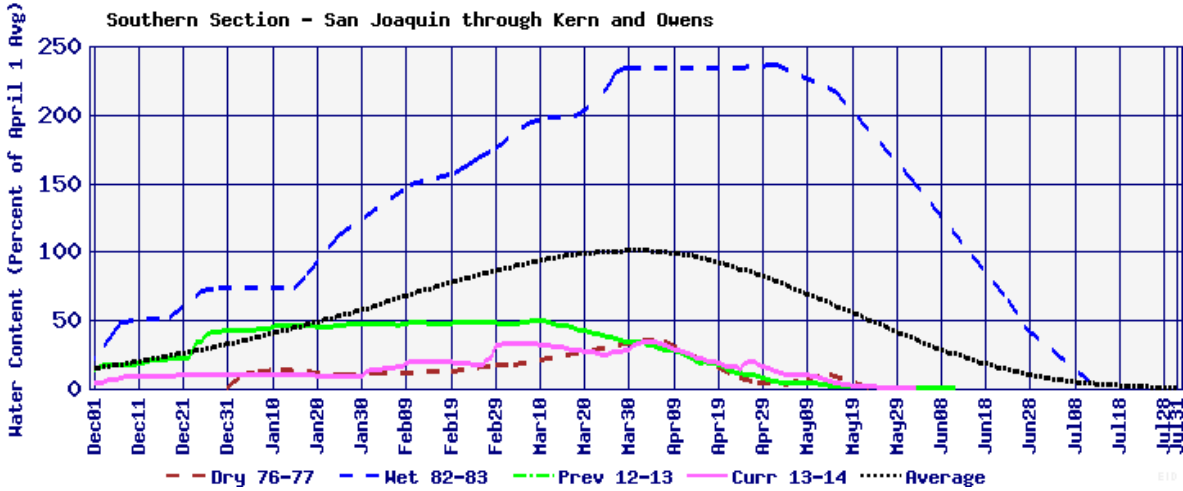


Snowpack:

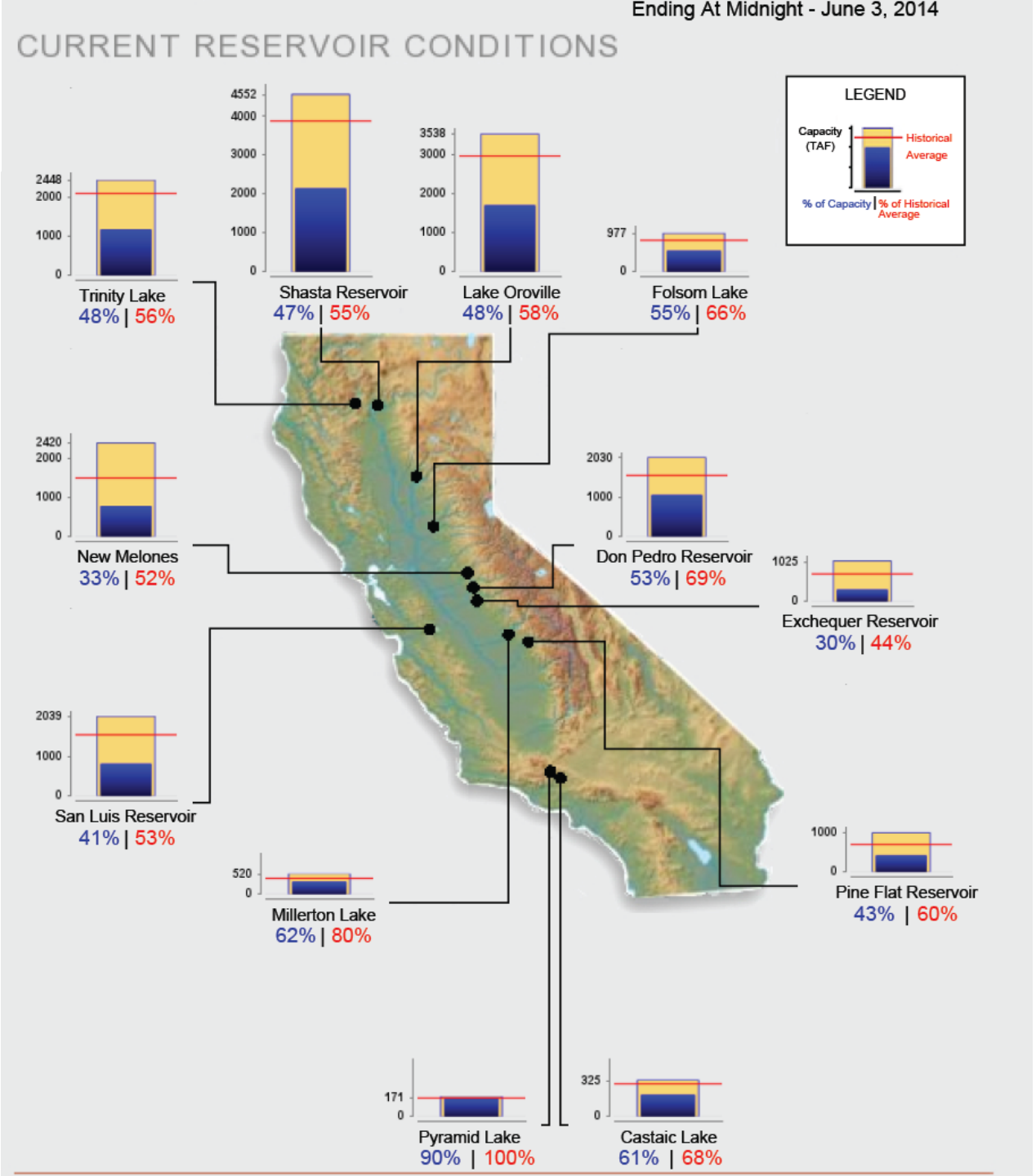
Trinity/ Feather/ Truckee. Yuba-Tahoe-Merced-Walker. San Joaquin-Kern-Owens.







Reservoirs


Ending At Midnight - June 3, 2014
CURRENT RESERVOIR CONDITIONS
LEGEND
Capacity (TAF)
Historical Average
% of Capacity | % of Historical Average
Trinity Lake
48% | 56%
Shasta Reservoir
47% | 55%
Lake Oroville
48% | 58%
Folsom Lake
55% | 66%
New Melones
33% | 52%
Don Pedro Reservoir
53% | 69%
Exchequer Reservoir
30% | 44%
San Luis Reservoir
41% | 53%
Millerton Lake
62% | 80%
Pine Flat Reservoir
43% | 60%
Pyramid Lake
90% | 100%
Castaic Lake
61% | 68%

2014 Drought and Central Valley Agriculture

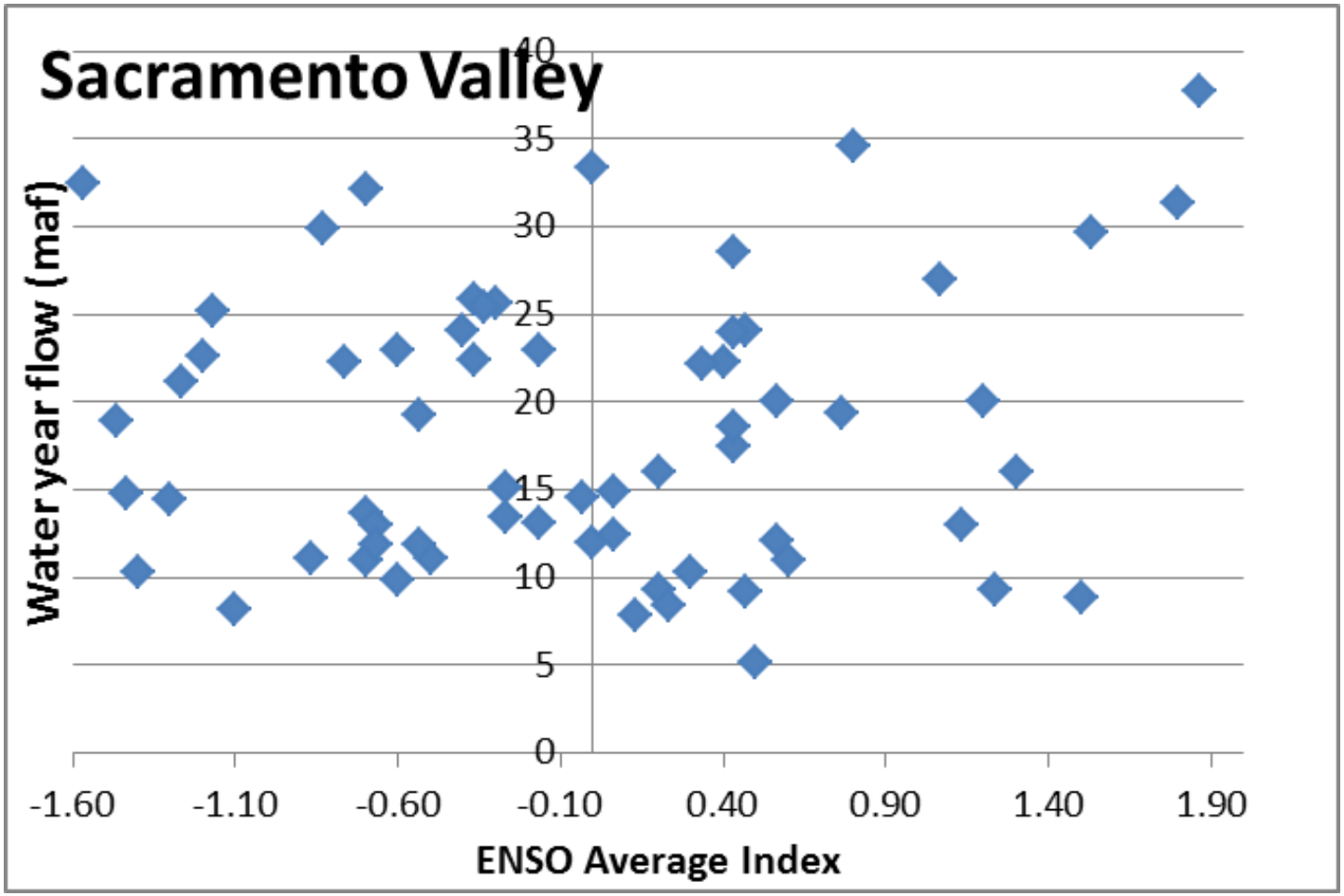
Drought impact	Loss Quantity	Normal Quantity	Percent Loss
Water delivery reduction	6.5 maf	20 maf	32.5%
Shortage after increased groundwater pumping	1.5 maf	20 maf	7.5%
Fallowed irrigated land	410,000 acres	7,000,000 acres	6%
Crop revenue loss	$740 million	$25 billion	3%
Revenue lost plus additional pumping cost ($450 million)	$1.2 billion	$25 billion	4.8%
Central Valley economic loss	$1.7 billion	N.A.	
Direct crop production job losses (seasonal and full time)	6,400	152,000	4.2%
Direct, indirect and induced job losses	14,500	N.A.	N.A.

maf = million acre feet.

Will next year be dry? (from historical data, 1906-2013)

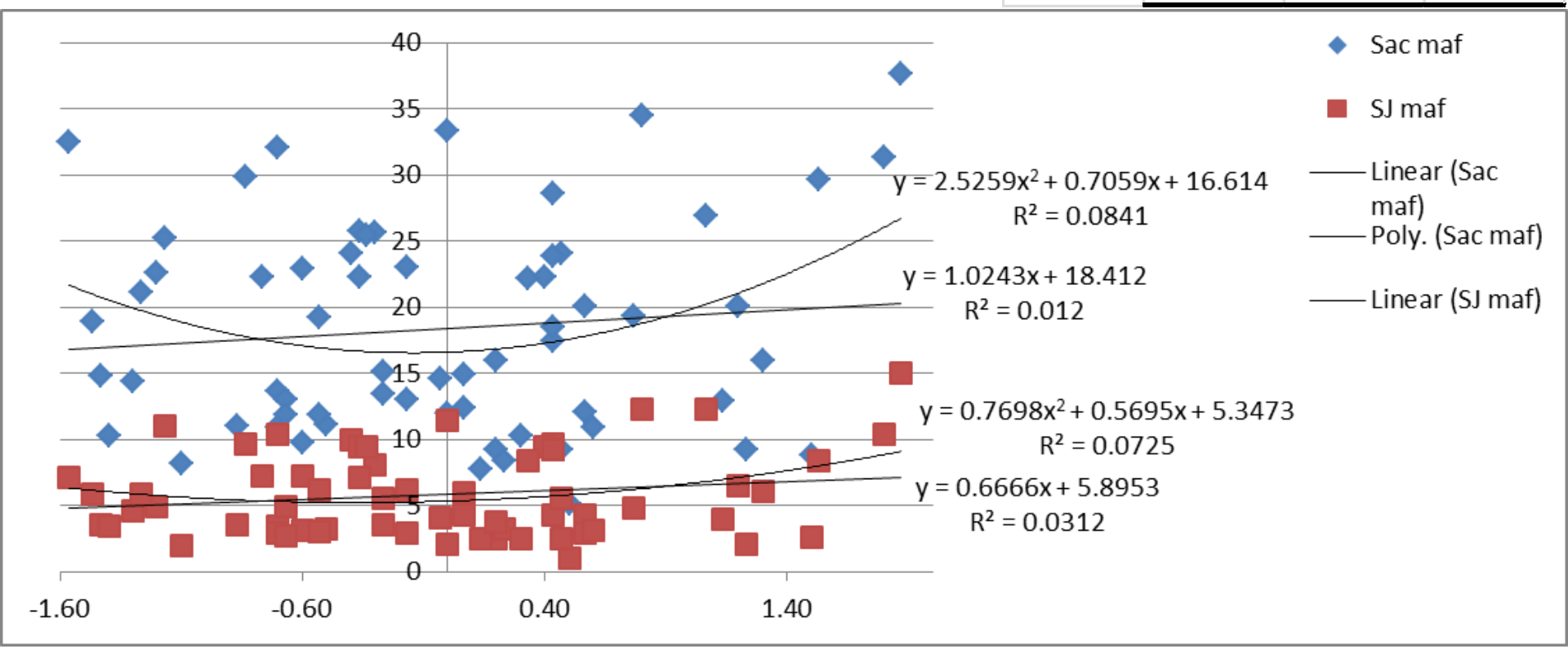
	Probability next year			
	Sacramento Valley		San Joaquin Valley	
Next Year	Historical	Critical now	Historical	Critical now
Critical	0.13	0.29	0.18	0.55
Dry	0.21	0.35	0.14	0
Below Normal	0.18	0.07	0.16	0.15
C,D	0.34	0.64	0.32	0.55
C,D, BN	0.52	0.71	0.48	0.7
AN, W	0.48	0.29	0.52	0.3

Streamflow and El Nino



Streamflow and El Nino (maf)

Correlations			
	ENSO Ave	Sac maf	SJ maf
ENSO Ave	1		
Sac maf	0.109464	1	
SJ maf	0.176724	0.911798	1



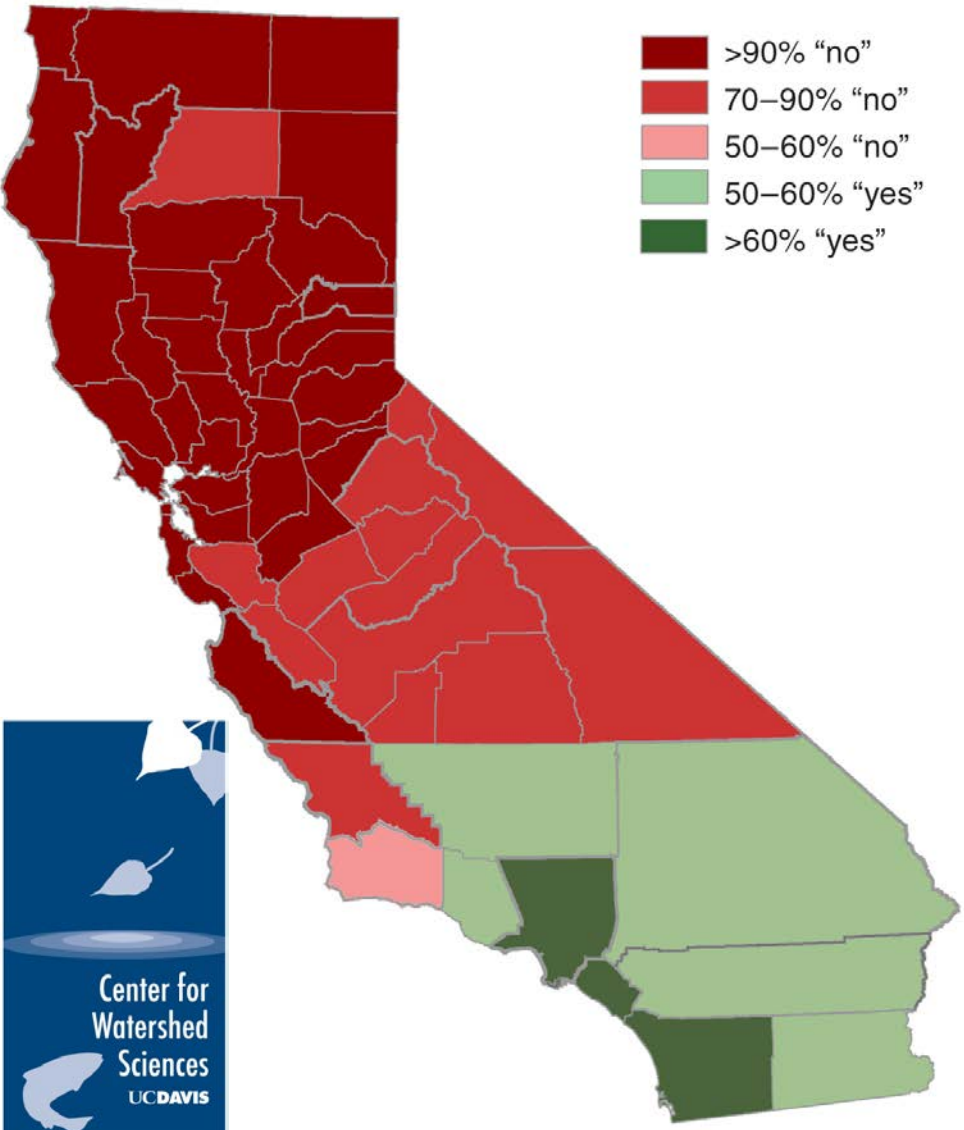
Some Immediate Policy Issues

1. Environmental flows and wetland habitats
2. Water rights security – surface, groundwater
3. Making water markets work
4. Water quality – dilution and drought?
5. Public health and safety – can markets and rare commandeering work?

State Drought Policy

1) Inevitable droughts and scarcity
   - Reconciling for permanent scarcity
2) State regulation
   - Native species and habitats (esp. wetlands)
   - Water rights security – surface and groundwater
   - Water quality and public health and safety
3) Modernize state regulation and infrastructure
   - Support local/regional portfolios and funding
   - Provide authoritative information
   - Rebuilding or abandoning the Delta
   - Referee conflicts and mutual needs

Suggested Readings



Hanak et al. (2011) *Managing California's Water*, PPIC.org

Hanak et al. (2010) *Myths of California Water*, PPIC.org

Hundley (1992), *The Great Thirst*, UC Press.

Lund et al. (2010) *Comparing Futures for the Sacramento San Joaquin Delta*, UC Press

Pisani (1983), *From Family Farms to Agribusiness*, UC Press

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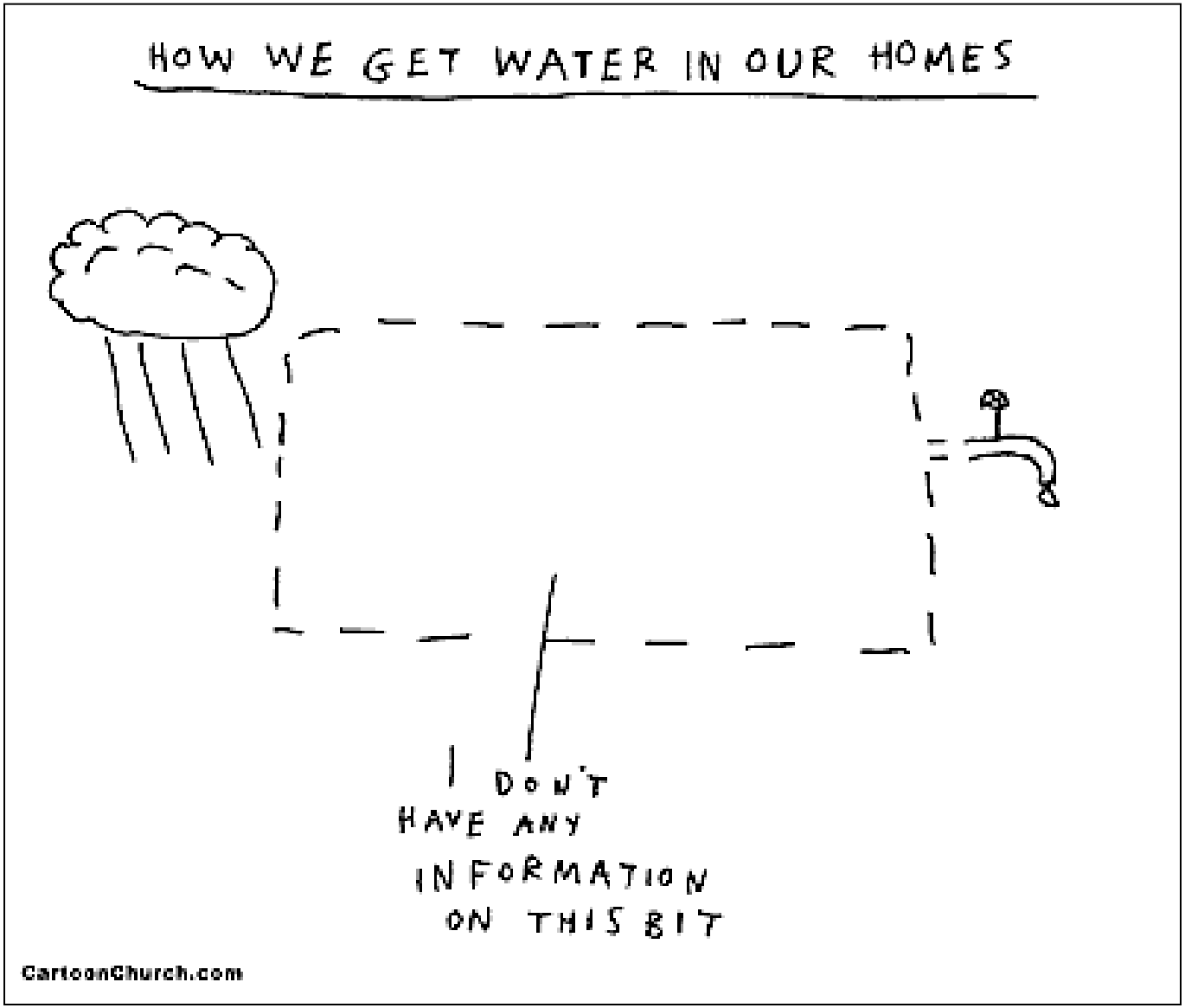
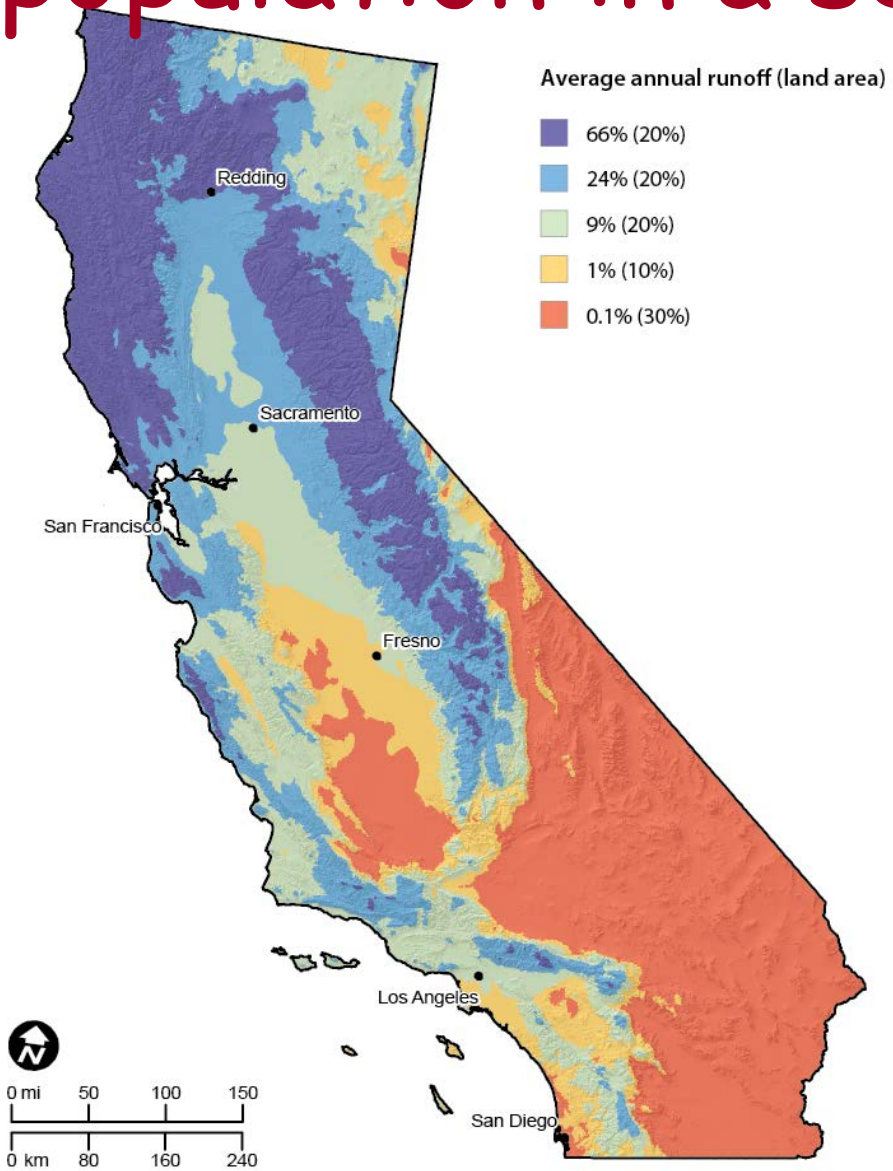
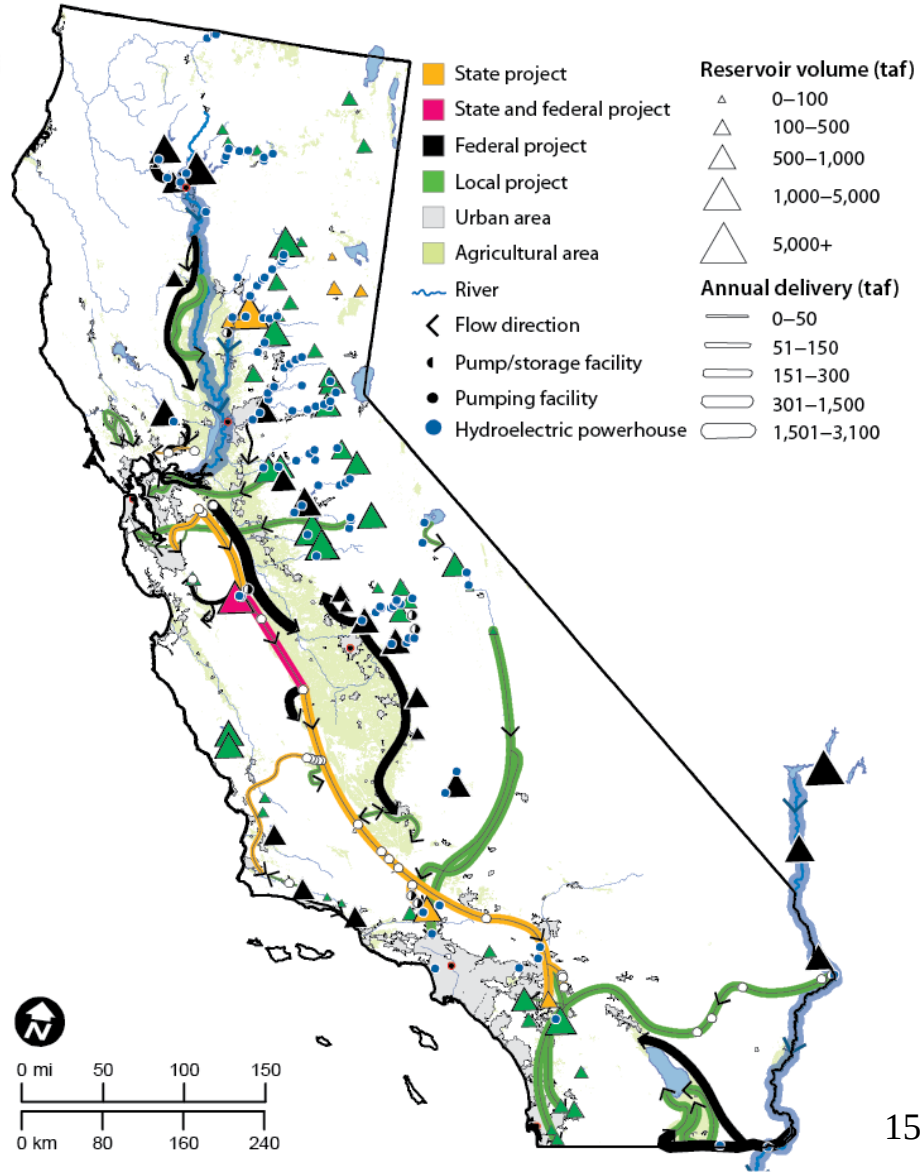
How does California's water work?

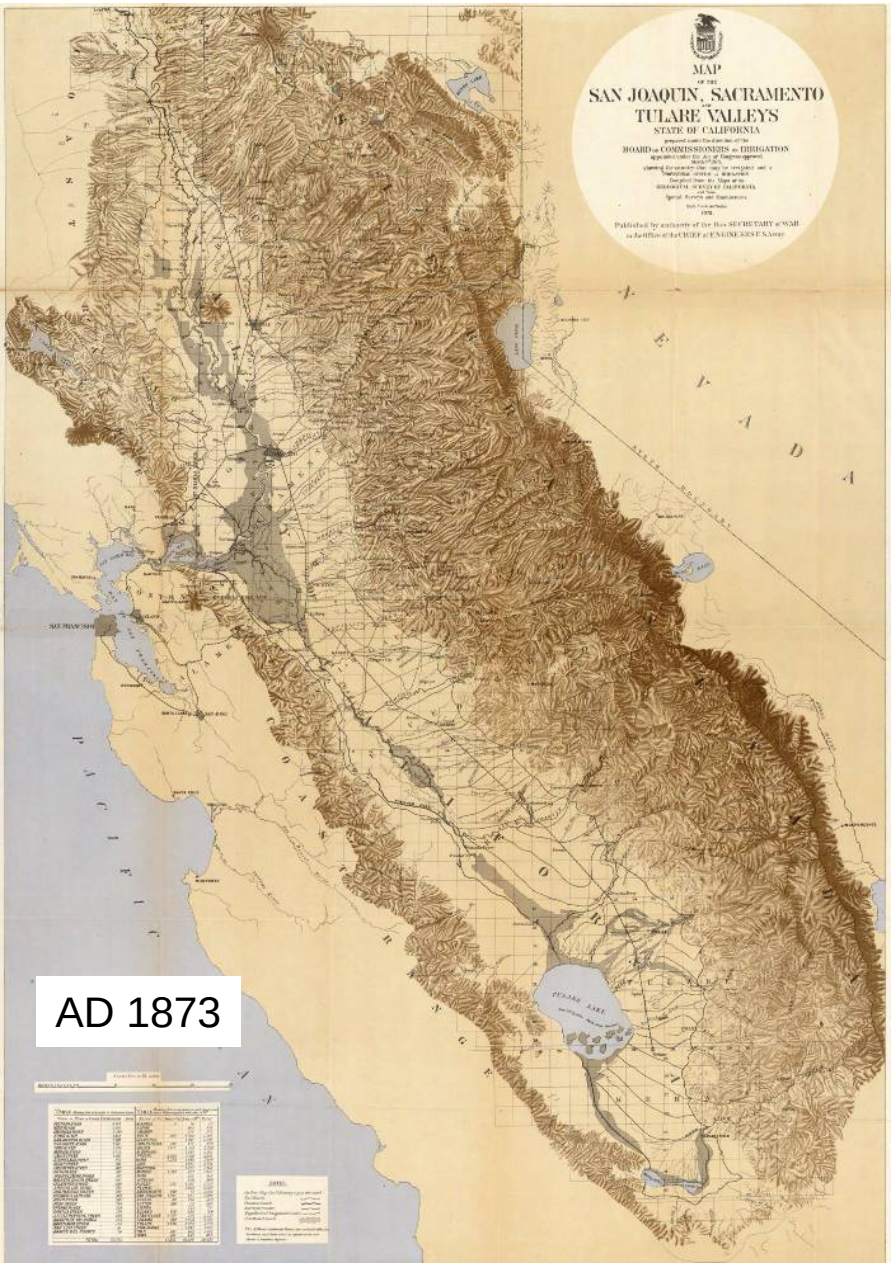


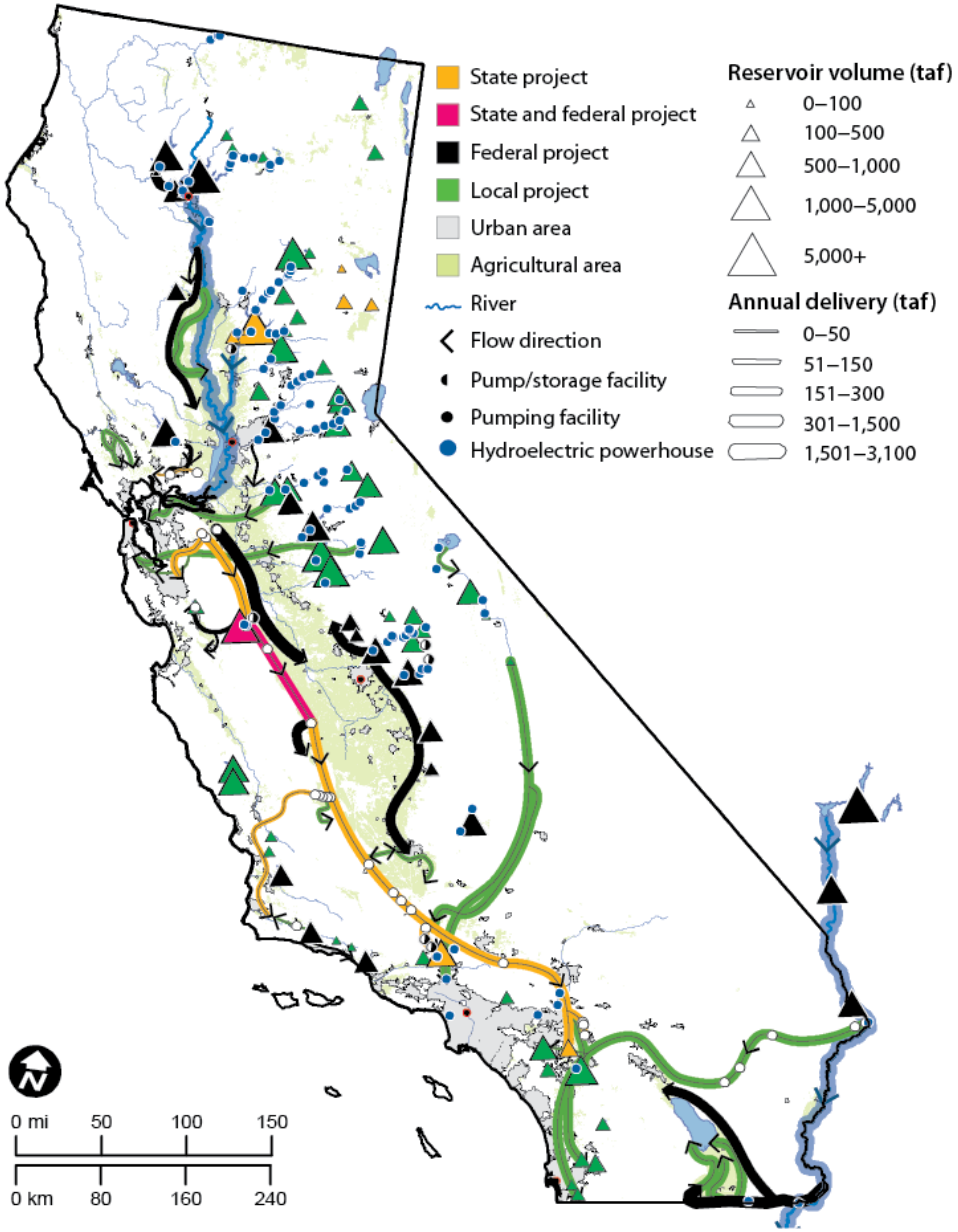
California – massive economy and population in a semi-arid climate



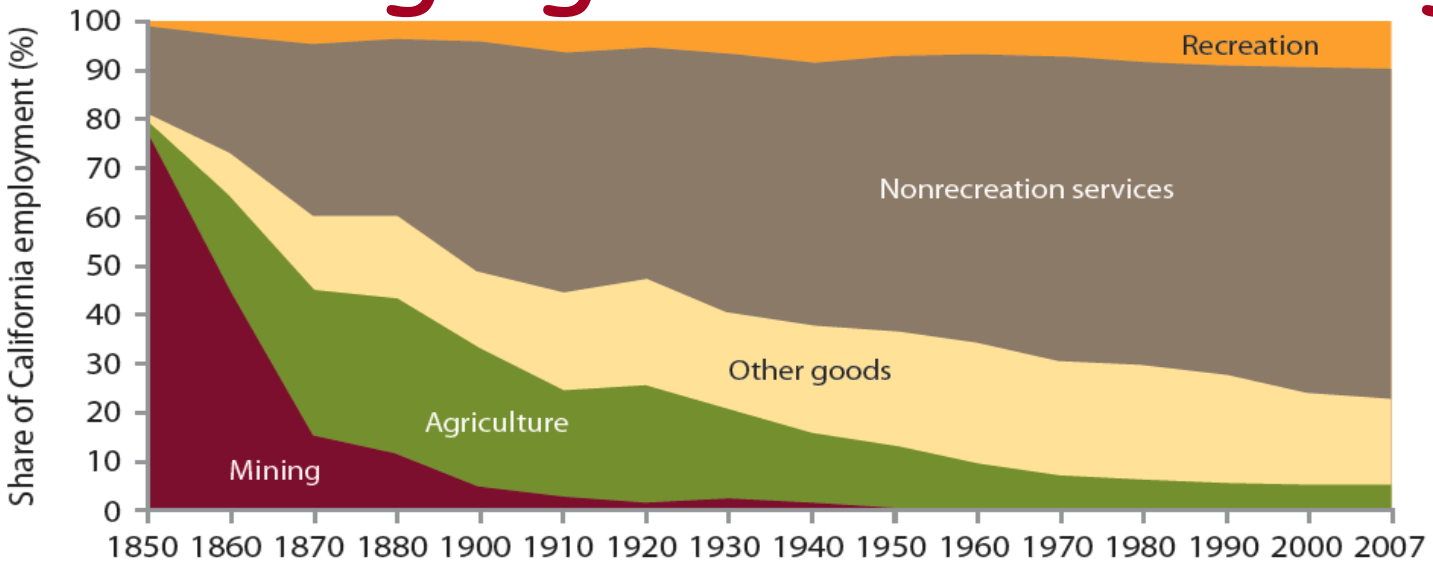


Quest to drought-proof



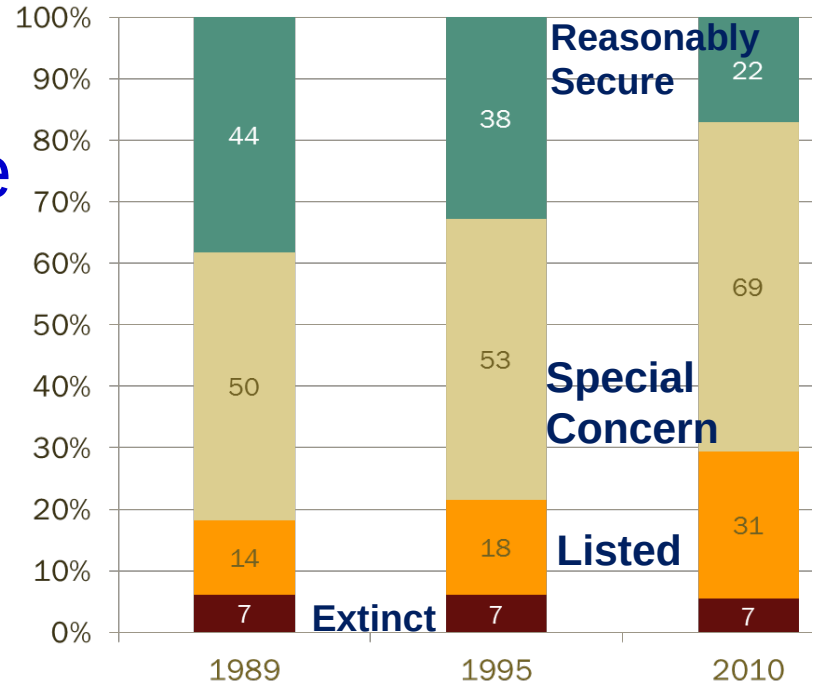


Changing Water Challenges



Source: Hanak et al. 2011

Freshwater fishes

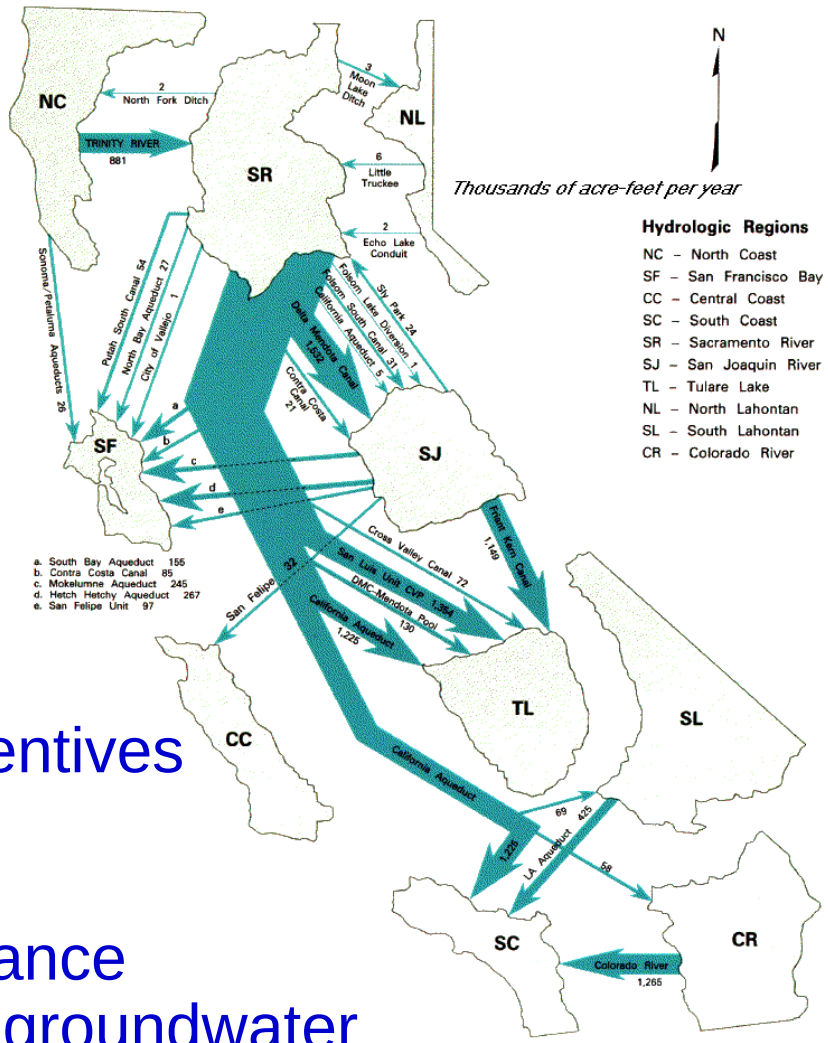


- Changed economic structure
- Less dependent on water
- Declining fish and wetlands
- Local initiative and funding

Local and Statewide Portfolios

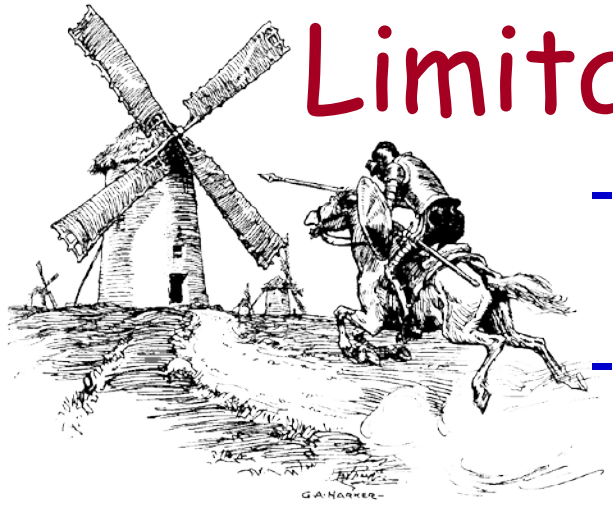
Local Activities:
- Conservation and use efficiency
- Desalination (brackish & ocean)
- Groundwater use, recharge, and banking
- Surface reservoir operations
- Wastewater reuse
- Water markets and exchanges

Statewide Activities:
- Inter-regional water conveyance
- Plumbing codes, conservation incentives
- Surface reservoir operations
- Wastewater reuse standards
- Water market support and conveyance
- Water right security – surface and groundwater



Integrated mix of actions – No silver bullet!

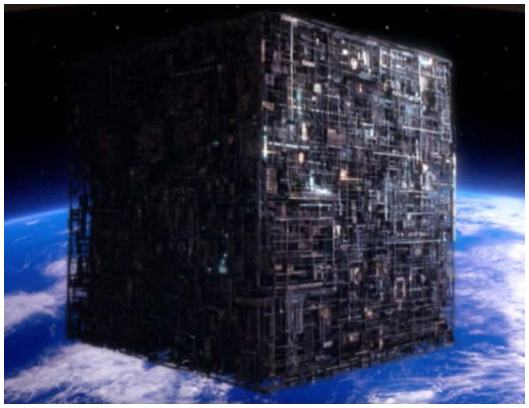
Limitations of Single Actions



- Ending urban irrigation would supply 15% of Cal. agriculture
- Agricultural conservation usually saves little real water and reduces aquifer recharge – Fallowing makes real reductions
- Ocean desalination still costs much more than alternatives
- New reservoirs cost much and usually deliver little
- Groundwater use, recharge, and banking need water to store
- Urban water reuse can never supply more than 10% of all use
- Water markets help much, but amount to at most 5-10%
- Local agencies – assemble and fund portfolios
- State – regulate rights and environment, information, standards

Droughts are part of California – we manage for them

Resistance is Futile



1) Flooding in parts of the Delta
2) Reduced Delta diversions*
3) Less irrigated land in the southern Central Valley*
4) Less urban water use, more reuse & storm capture*
5) Some native species unsustainable in the wild*
6) Funding solutions mostly local and regional
7) State's leverage is mostly regulatory, not funding
8) Nitrate groundwater contamination is inevitable
9) Groundwater will become more tightly managed*
10) The Salton Sink will be largely restored*

We cannot drought-proof, but we can manage better.