

# A Public Policy Lens on Storage, Conveyance and Operations

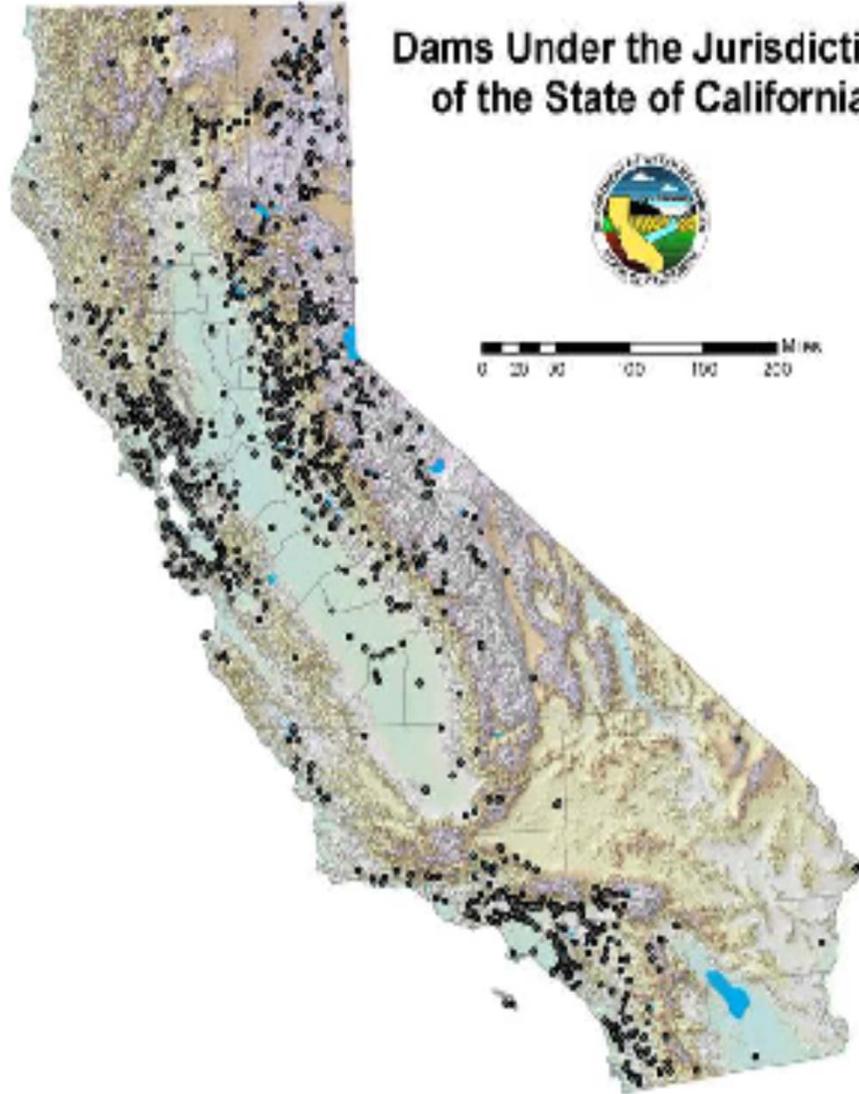
Presentation to the Delta Stewardship Council Meeting  
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## Delta Reform Act (selected provisions)

- Coequal goals defined (section 85054)
- Elements of a “more reliable water supply for the state involves water use efficiency and conservation..., wastewater reclamation..., desalinization, and new and improved infrastructure, including water storage and Delta conveyance facilities.” (section 85004(b))
- Specified elements of the Delta Plan (section 85302, including ecosystem (c), (e) and a more reliable water supply (d))
- Section 85304. “The Delta Plan shall promote options for new and improved infrastructure relating to the water conveyance in the Delta, storage systems, and for the operation of both to achieve the coequal goals.”

## Dams Under the Jurisdiction of the State of California



Lots of  
Dams

DWR graphic

# Largest reservoirs in California

The water bond on California's November ballot contains \$2.7 billion that could be used to build new reservoirs. Here are the state's 10 largest reservoirs, which were built between 1927 and 1979.

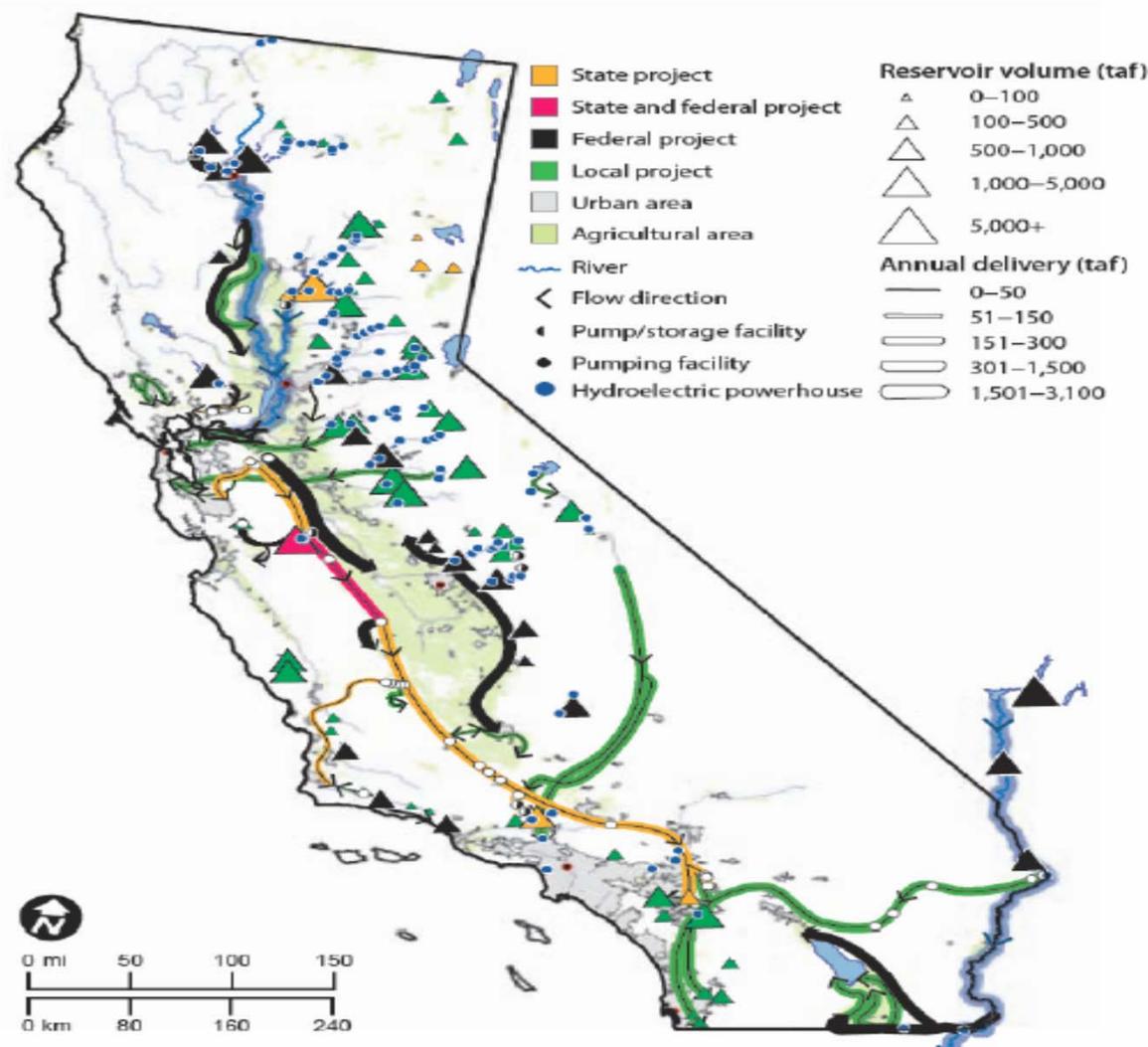


Reservoir	Year opened	Acre feet of water in millions	Dam height	Location
1 Shasta	1945	4.5	521 feet	Shasta County
2 Oroville	1968	3.5	742	Butte County
3 New Melones	1979	2.4	578	Calaveras County
4 Trinity	1962	2.4	458	Trinity County
5 Don Pedro	1971	2	568	Tuolumne County
6 San Luis	1967	2	305	Merced County
7 Berryessa	1957	1.6	255	Napa County
8 Almanor	1927	1.3	130	Plumas County
9 Folsom	1956	1	275	Sacramento County
10 McClure	1967	1	479	Mariposa County

**Simple  
system-**  
Single dam,  
simple  
conveyance  
(perhaps  
gravity only),  
single  
operator;  
little  
regulatory  
oversight



Figure 8. California's Vast Intertied Water System



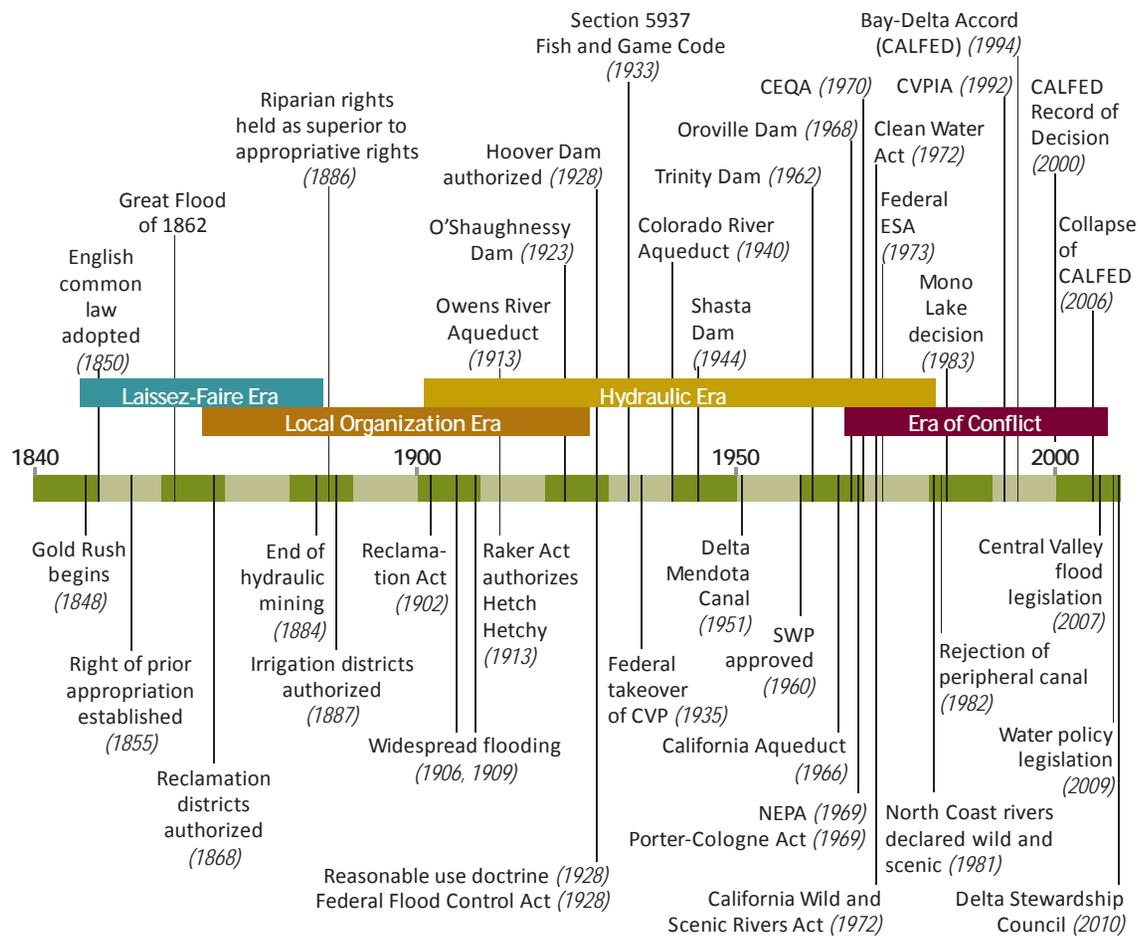
Source: Hanak et al. 2011

### Complex system-

Multiple dams, interconnected conveyance, multiple operators; overlay of regulators

**Figure I.1**

Water management in California has undergone several eras of change



Courtesy of the Public Policy Institute of California

# Physical Attributes of Storage and Conveyance

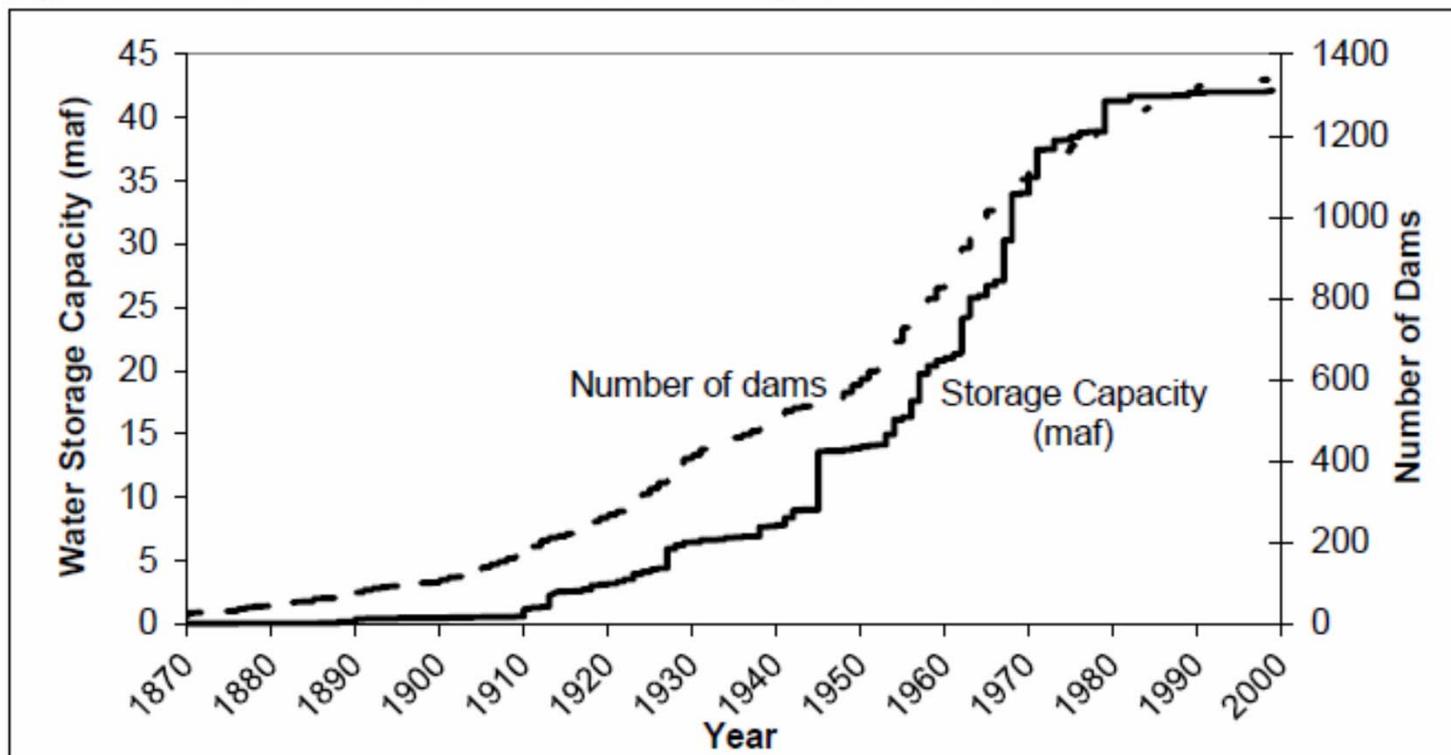
- **Overview of Hydrology and Storage** (four following slides from Lund, et. al., 2014)
  - Surface and ground water both important
  - Surface and ground water commonly used for different purposes and managed differently
- **Three systems of conveyance** (distinguished in State Water Plan Update, 2013):
  - Regional (includes emergency interconnects among local systems)
  - Interregional (e.g., CVP and SWP; EBMUD, SFPUC/Hetch Hetchy, LADWP)
  - Sacramento-San Joaquin Delta (in Delta uses, plus roles in interregional conveyance)

**Table 1. Surface and Groundwater Storage Serves Many Purposes in California**

Purpose	Roles of Storage	Performance Indicators
Water supply delivery	Seasonal and short-term storage in surface reservoirs and groundwater; Annual and long-term storage mostly in groundwater	Local and regional water deliveries, South of Delta and Bay Area deliveries (for major Central Valley reservoirs), Economic production from deliveries (or economic losses from un-met deliveries)
Flood Management	Storage of flood peaks in surface reservoirs	Average annual flood damage (or avoided damage), Flood stage reduction
Energy production	Seasonal and peaking energy storage; Energy production from streamflow	Hydropower revenues; Kilowatt-hours generated
Water Quality	Reservoir flow regulation of temperature, contaminants, and Delta salinity; aquifer disposal of contaminants	Temperature, salinity, and other water quality metrics
Ecosystem support	Dams interrupt habitat and alter flow patterns; Reservoirs provide cold water downstream and regulate environmental flows; Groundwater supports overlying wetlands and riparian corridors	Temperature targets; Area of habitat type provided; Meeting prescribed salinity, temperature, depth, flooding pattern requirements; Delta flow patterns; San Joaquin river flow patterns; Fish production/populations
Recreation	Lakes and regulated streamflow for boating, fishing, and aesthetics	Recreation days, Recreation revenues, Quality of life indicators

Lund et al, 2014.  
*Integrating Storage in California's Changing Water System.*

Figure 1. Historical Development of Surface Storage in California

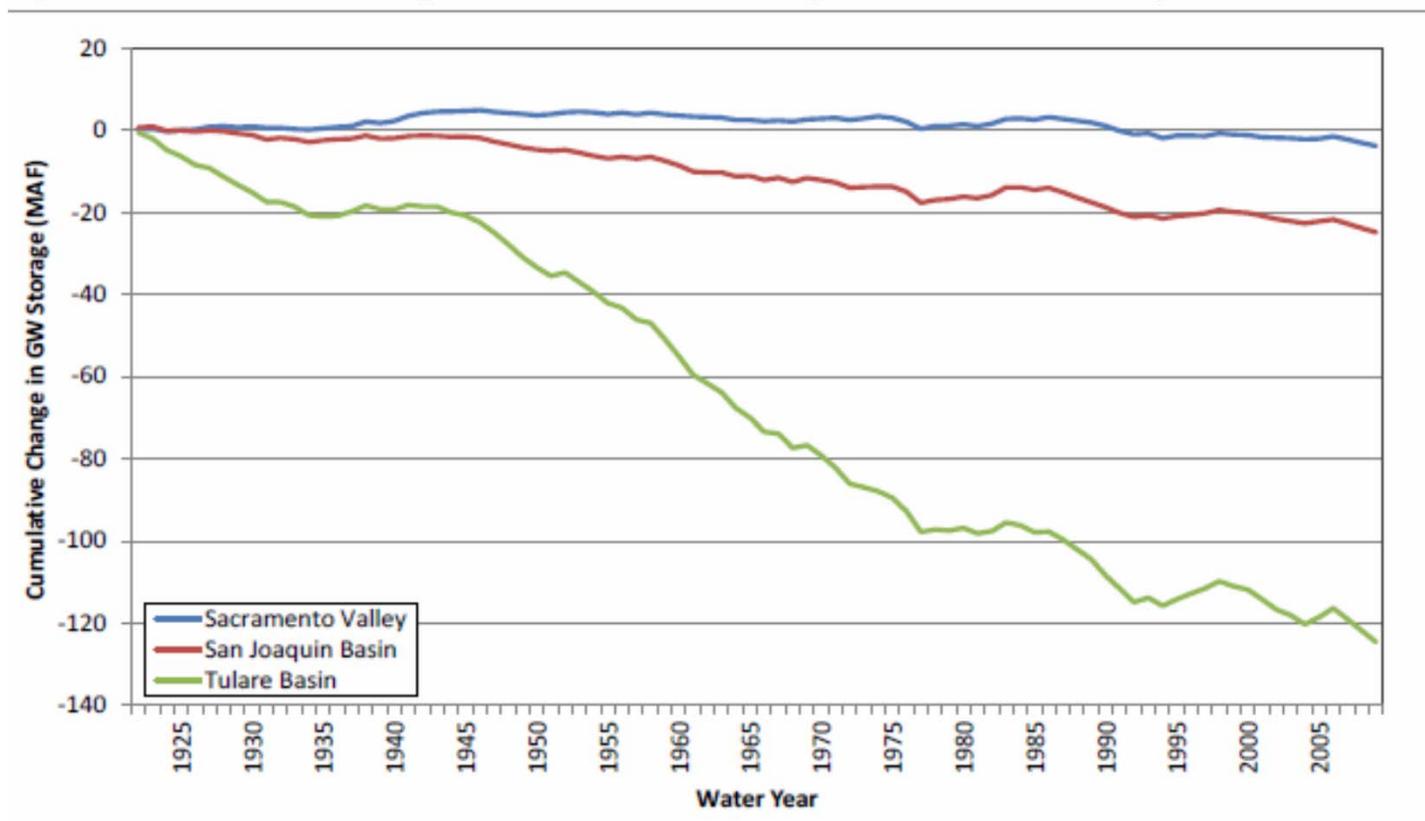


Source: California Division of Safety of Dams data

Lund et al,  
2014.  
*Integrating  
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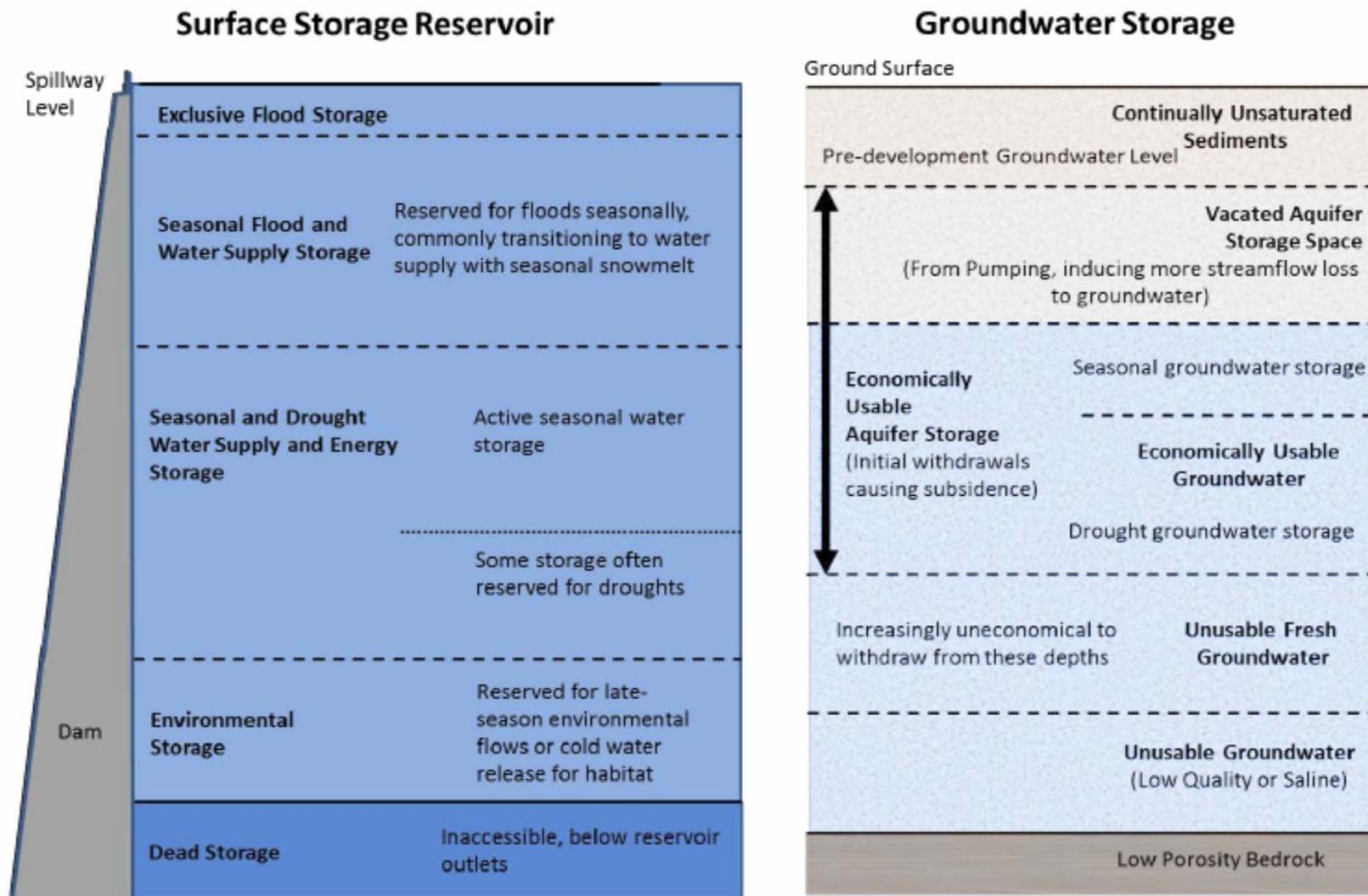
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**Figure 3. Cumulative Change in Groundwater Storage in the Central Valley**



Source: C2VSIM simulations (TNC, 2014)

**Figure 6. Common Operating Ranges for Surface and Groundwater Reservoirs**



Lund et al, 2014.  
*Integrating Storage in California's Changing Water System.*

# Public Policy Context

- Multiple actors and actions to capture, convey, store and use water over many decades
- Attention to ecosystem effects and efforts to protect species and to restore ecosystems follows passage of CESA (1970) and ESA (1973); addressed through regulations vs. physical structures
- What is “normal?” Possible long-term drought—or destructive floods – likely reduction in snow pack – understanding of atmospheric rivers
- Regional variation in context and initiatives

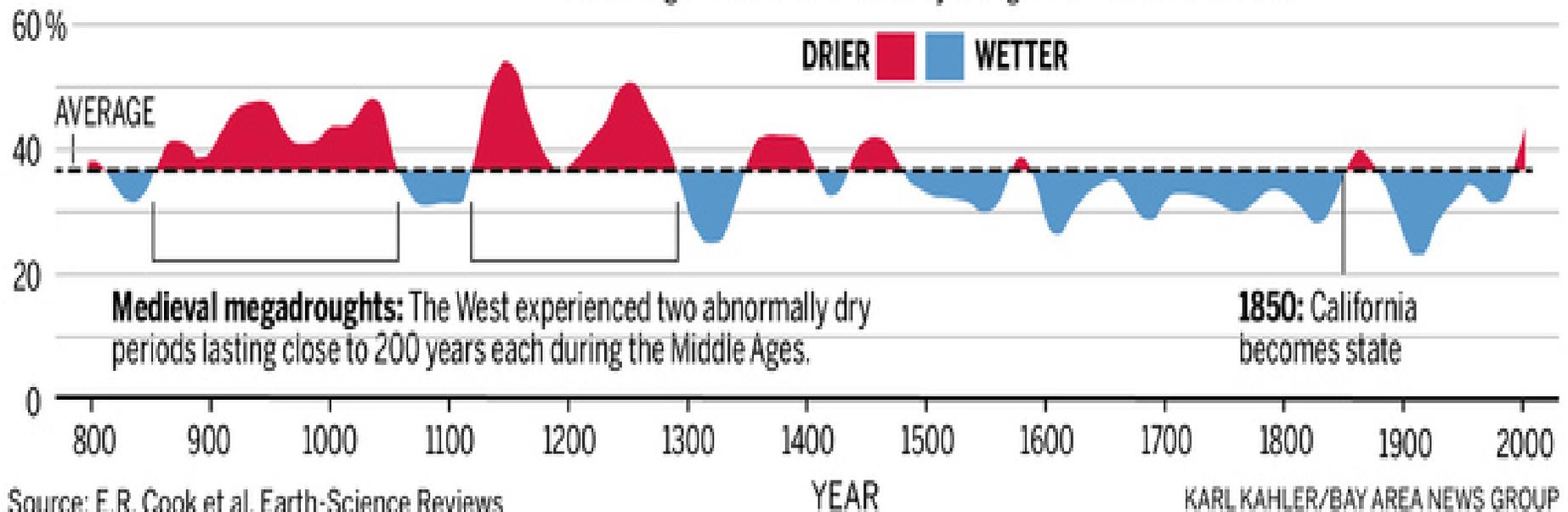
# Increased Complexity, Conflict and Uncertainty

- More complex physical systems moving water longer distances
- Climate/weather variability
- Demand hardened (permanent agriculture, some conservation gains already taken)
- Allocation discretion reduced (e.g., Monterey Agreement)
- More species listed or at greater risk
- Conflict fault lines visible



# A 200-year drought?

Evidence from tree rings shows that drought was historically much more widespread in the American West than now, while the 20th century was wetter than normal. Percentage of the West affected by drought from 800 A.D. to 2000:

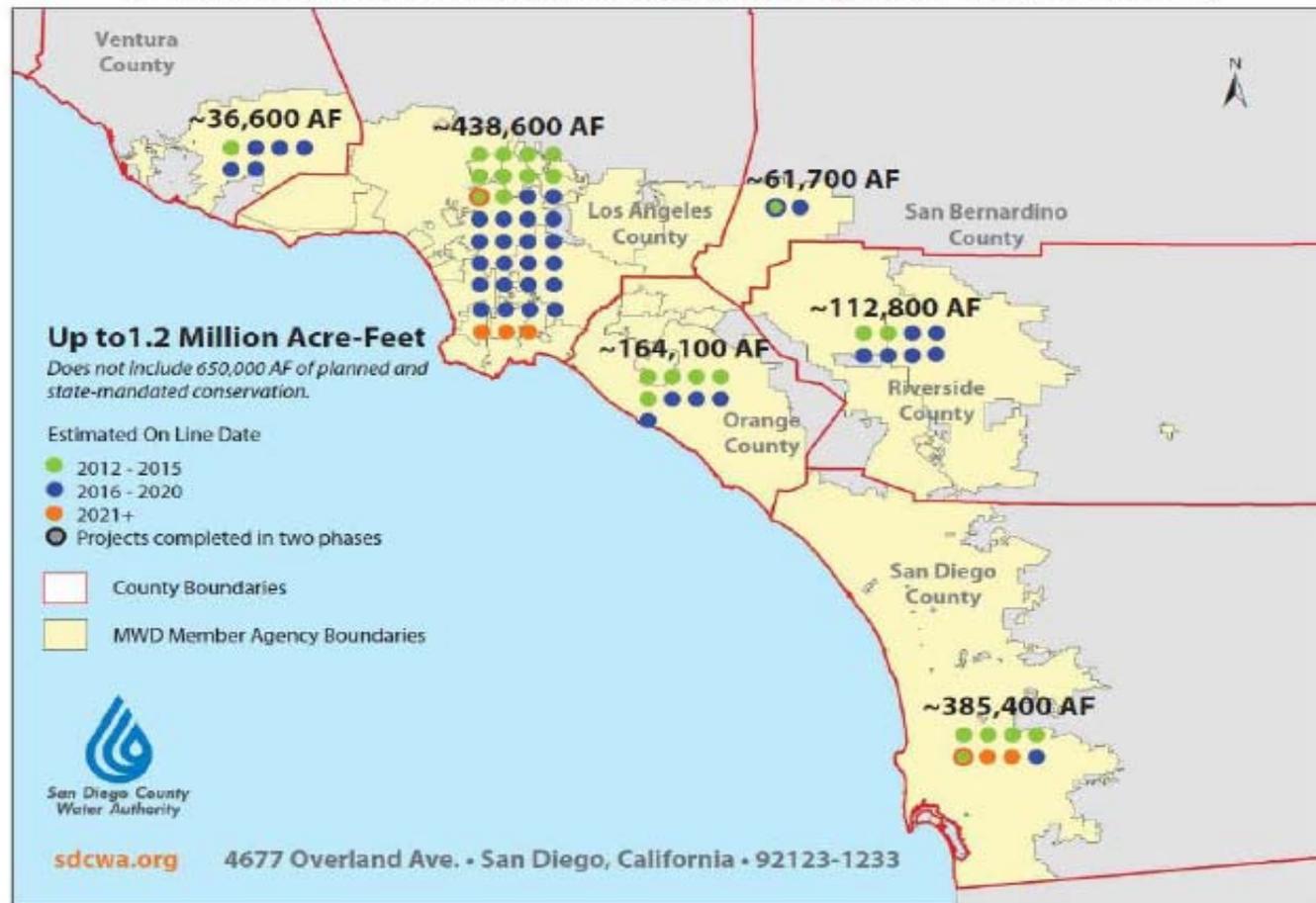


## Identify, Assess and Pursue Promising Actions, Statewide (selected examples)

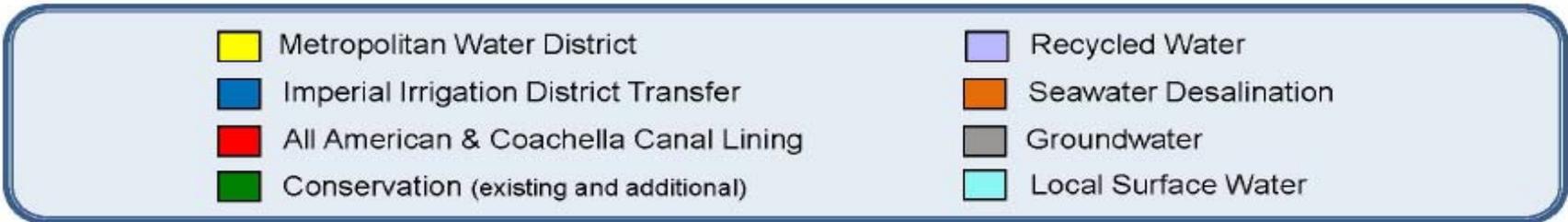
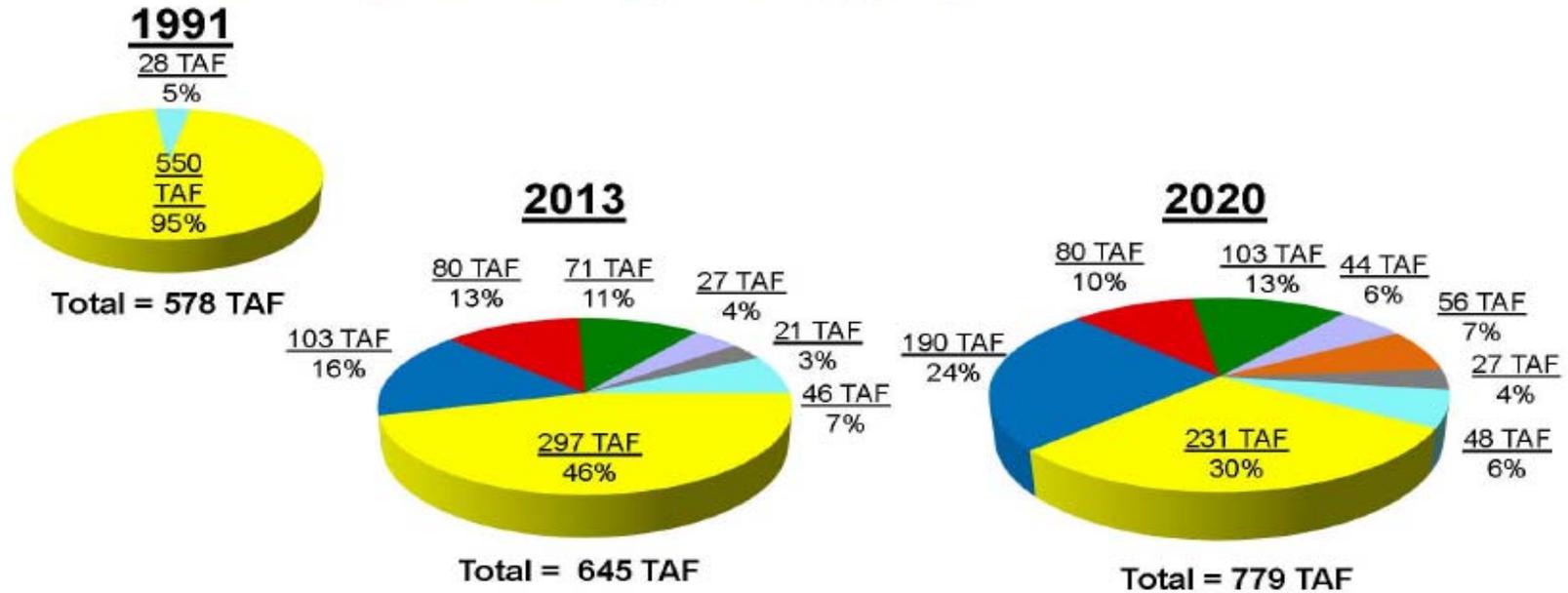
- “Reoperation” – DWR. *System Reoperation Study*. Focused on Central Valley. Phase 2 report, 2014
- Increased storage in regions, e.g.: MWD, Diamond Valley (2000); CCWD, Los Vaqueros expansion, 2012.
- Addressing old conflicts also promising: e.g., Freeport Regional Water Project (2010) (EBMUD and SCWA)
- Habitat/ecosystem restoration: very little progress over decades. Increased detail re Yolo Bypass actions in recent plan.
- Administration proposal re Delta conveyance using tunnels at front of queue with other ideas behind, including dual conveyance (DVSP), western intake concept or through Delta with strengthened levees (DPC).

# Most of MWD's Customers Plan to Reduce Their Reliance on MWD

Southern California's Local Water Supply Development Plans (2012 - 2035)



# Increasing San Diego County's Water Supply Reliability through Supply Diversification



TAF=Thousand Acre-Feet

## DSC in Only One of Relevant Policy Arenas (selected)

- Potential major changes: US Congress and President, federal or state courts, potentially California voters
- For Storage: California Water Commission allocation of Proposition 1 (2014) bond funds, local and regional combinations of districts
- For Delta Conveyance: Water agencies and water contractors, fish agencies, SWRCB, USACE, DSC
- For Delta Conveyance Operations:
  - Parameters: Fish agencies, SWRCB, permit terms (e.g., in Delta Water Fix)
  - Operations: Real Time Operators

# Focus on action capacity and effectively matching actions to types of problem

- Action capacity is a long-standing problem in water/ecosystem/Delta policy making and implementation
  - Little Hoover Commission analysis of CalFed
  - Delays in making or implementing major decisions (e.g., BDCP, Fish Restoration Project, CalFed storage proposals)
- Understand impacts of conflict and uncertainty on addressing problems
  - Low conflict, low uncertainty => can use science or collaboration
  - All other combinations => need “politics”/authority to resolve
  - Delta Vision, an “extraordinary process” => legislative package of 2009, an extraordinary set of actions by legislature and Governor Schwarzenegger
- If paralysis, consider an extraordinary decision process again:
  - State led and financed
  - Transparent, consistent assessment of alternatives
  - Constitute a body to recommend decision for up or down action (e.g., like Base Realignment and Closure Commission)

	<u>Agreement on goals/values</u>	<u>Disagreement on goals/values</u>
<b><u>Certainty</u> regarding cause/effect relations</b>	<p>Cell 1: Computational strategies (efficiency tests)</p> <p>WATER example: Southern California Coastal Water Research Project (SCCWRP) (a JPA of POTWs to comply w/CA &amp; fed water quality regs, + \$60 B of fed funds nationally )</p>	<p>Cell 2: Comparison strategies (instrumental tests)</p> <p>WATER example: Conflicts over water storage proposals of CalFed (vs. water from conservation or...); get resolved through formal policy decisions or access to financing</p>
<b><u>Uncertainty</u> regarding cause/effect relations</b>	<p>Cell 3: Judgmental strategies (improvement in performance tests)</p> <p>WATER example: Real time water operations (“rules”= ‘agreement’)</p>	<p>Cell 4: Authority strategies (legitimate decision maker and participation tests, especially of important constituencies)</p> <p>WATER example: Rule making of SWRCB</p>

James D. Thompson. *Organizations in Action* (1967) (adapted by J. Kirlin, 2015)

## Perspective of Delta Vision Blue Ribbon Task Force Worth Considering

“...Task Force’s conclusion that there are two co-equal goals that must drive water policy in California: restoration of the Delta ecosystem and creation of a more reliable state water supply. Co-equal means just that: not secondary, not an afterthought, not something to be ignored until a lawsuit or catastrophe forces water users to change, or government to act. No, the Task Force means co-equal in the most important sense of the word; requiring a coherent effort to join a desired Delta ecosystem together with the effort to provide water to Californians.”

(*DVSP*. 2008: page 6)