

# The Three Grand Challenges Facing Water Supply Reliability in California

Presentation to Water Advisory Committee of Orange County

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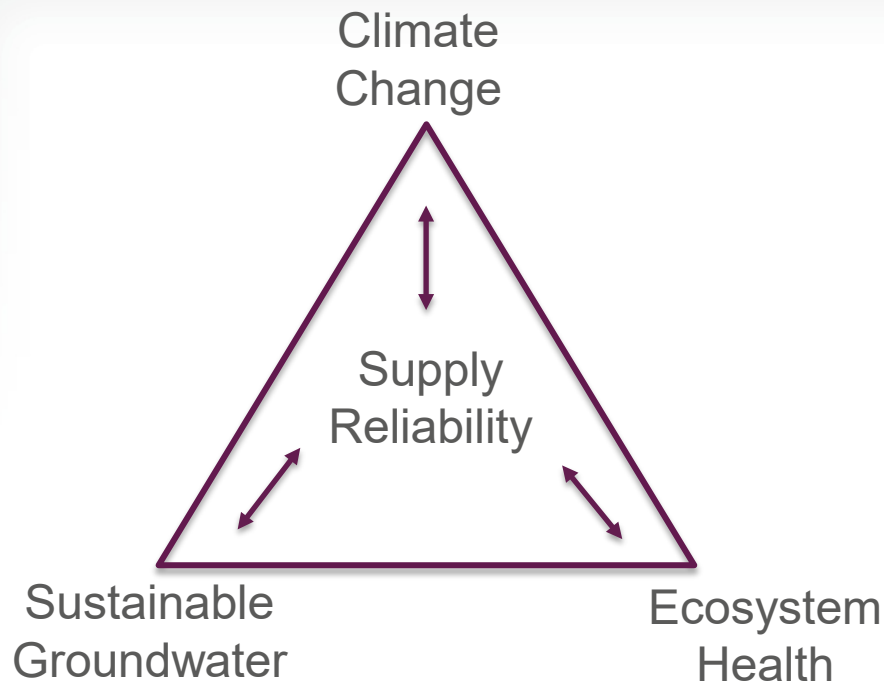


**PPIC**

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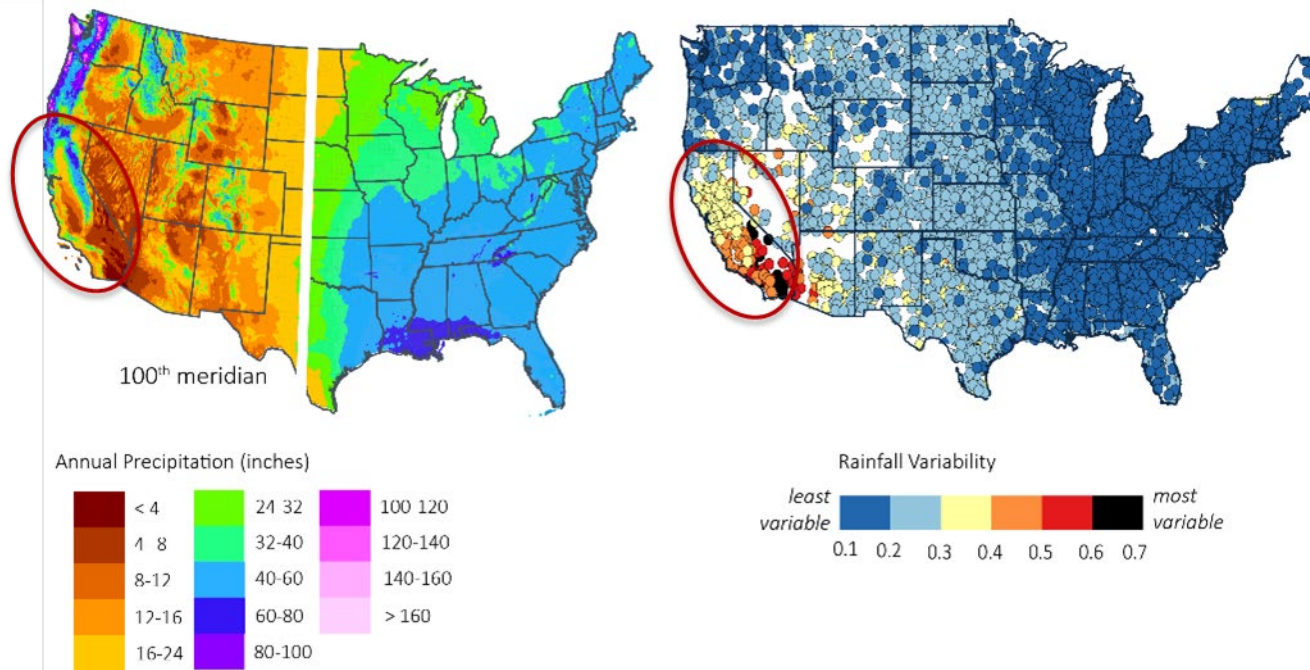
PPIC WATER POLICY CENTER 1

# The Big Issues in tension



- The three issues in tension driving a seeming decline in supply reliability
- Understanding California's water management grid and how we got there
- Some thoughts about managing groundwater and ecosystems to adapt to changing climate
- Lots of time for discussion of these and other water issues

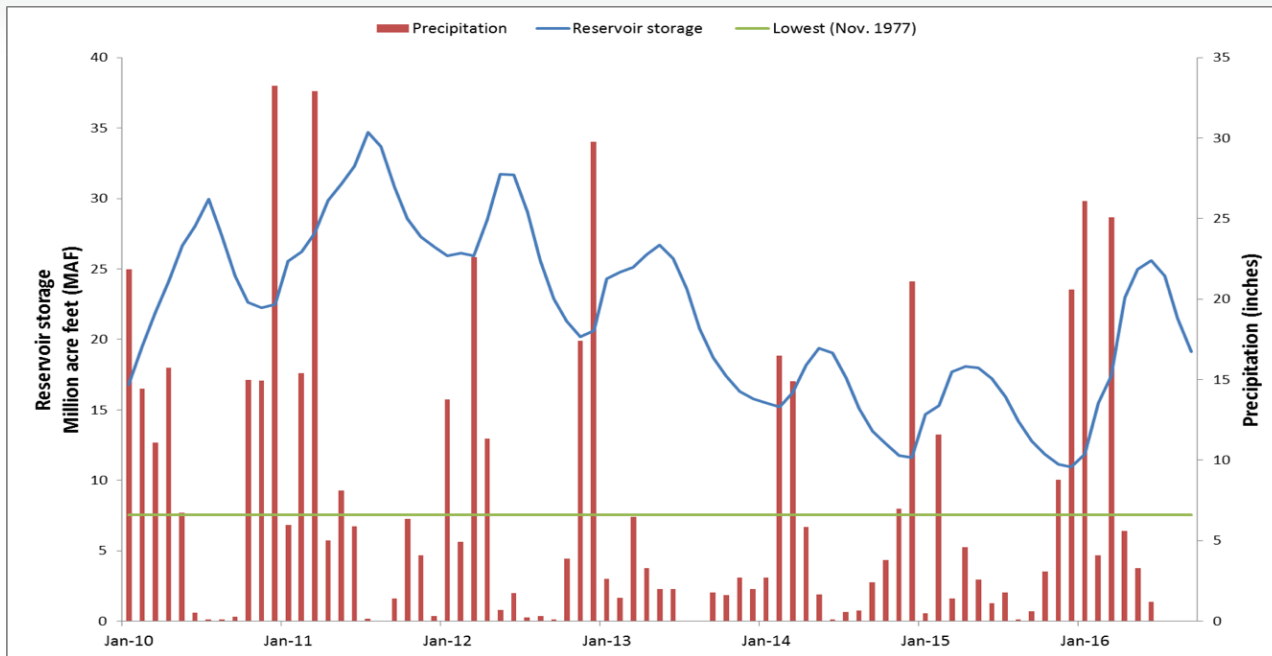
# Reminder: Western US is drier, with more variable precipitation—California is THE most variable



# Adaptation: Surface Storage



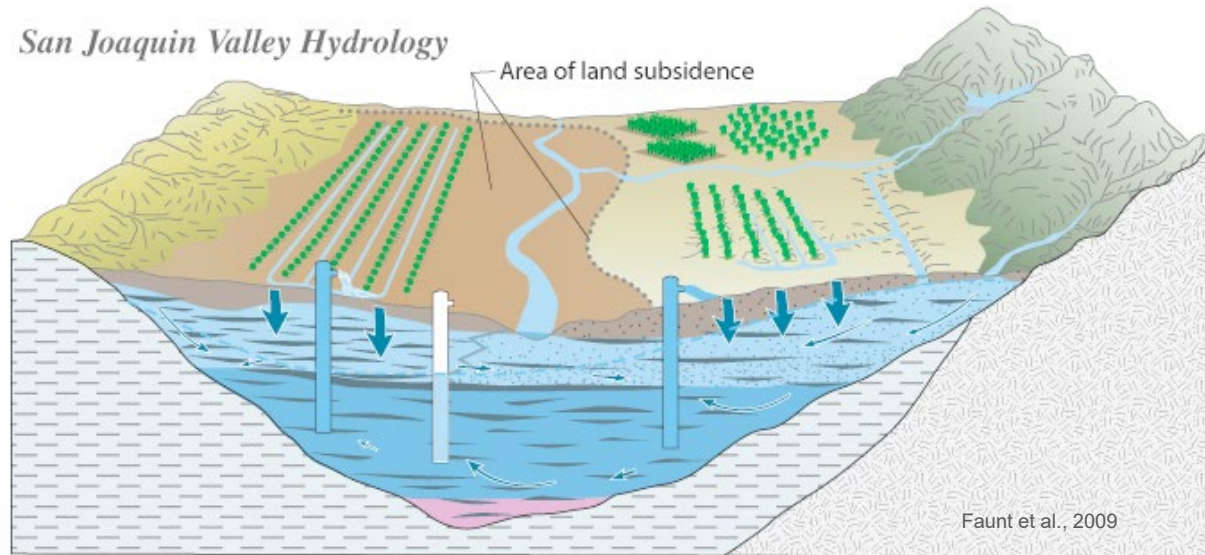
# Prolonged drought depletes surface storage



SOURCE: California Department of Water Resources.

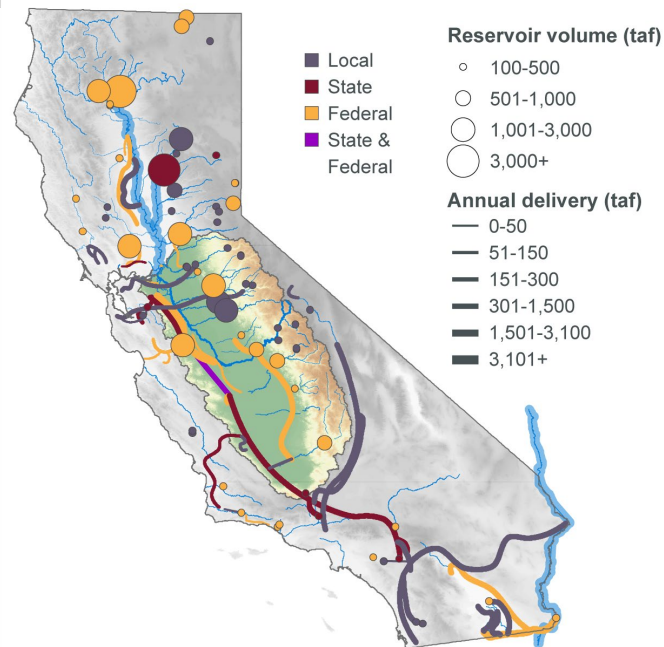
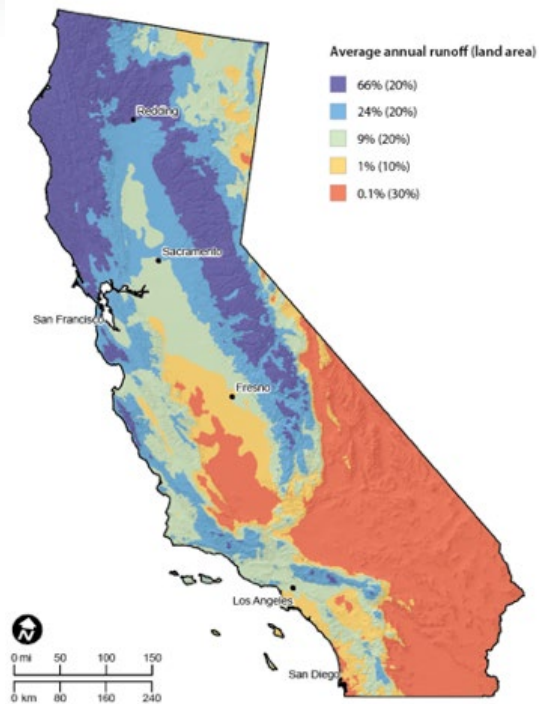
NOTE: Precipitation is measured by summing the Northern Sierra 8-station and San Joaquin 5-station precipitation indices to account for most rainfall available for reservoir storage. Reservoir storage is the sum of monthly storage in 154 major reservoirs within the state (excluding storage in the Colorado River Basin).

# Adaptation: Groundwater Storage





# Adaptation: Conveyance Systems



# Adaptation: allocation, trading, regulation

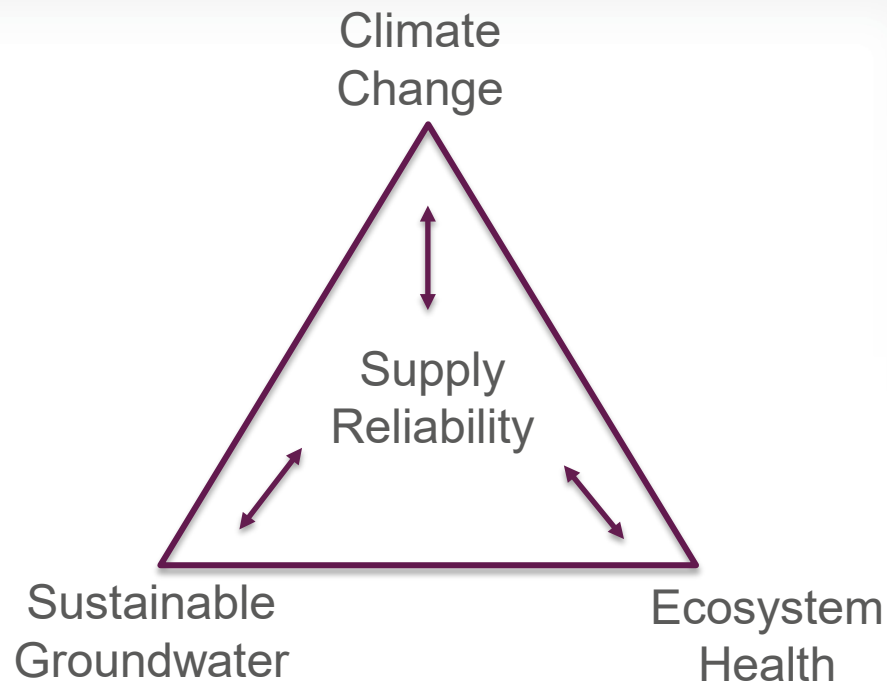
- Century-old water rights system specifically designed for scarcity
- Water markets and trading
- California's water as a public trust resource
- All regulated by landmark Federal and State laws
- Sustainable Groundwater Management Act (SGMA) the most recent



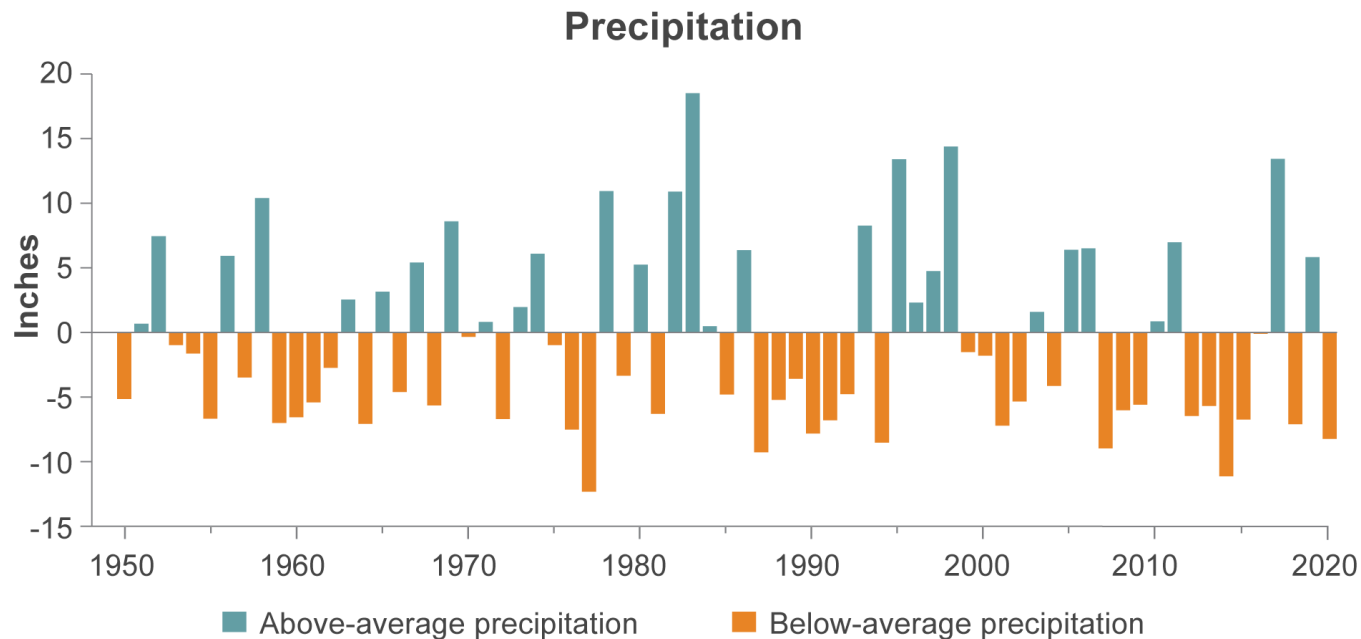


# The grid is being challenged

- **Key Takeaway:** We have adapted to variable climate through a storage-conveyance grid managed by water rights and some trading, and regulated by numerous environmental laws.
- But.....

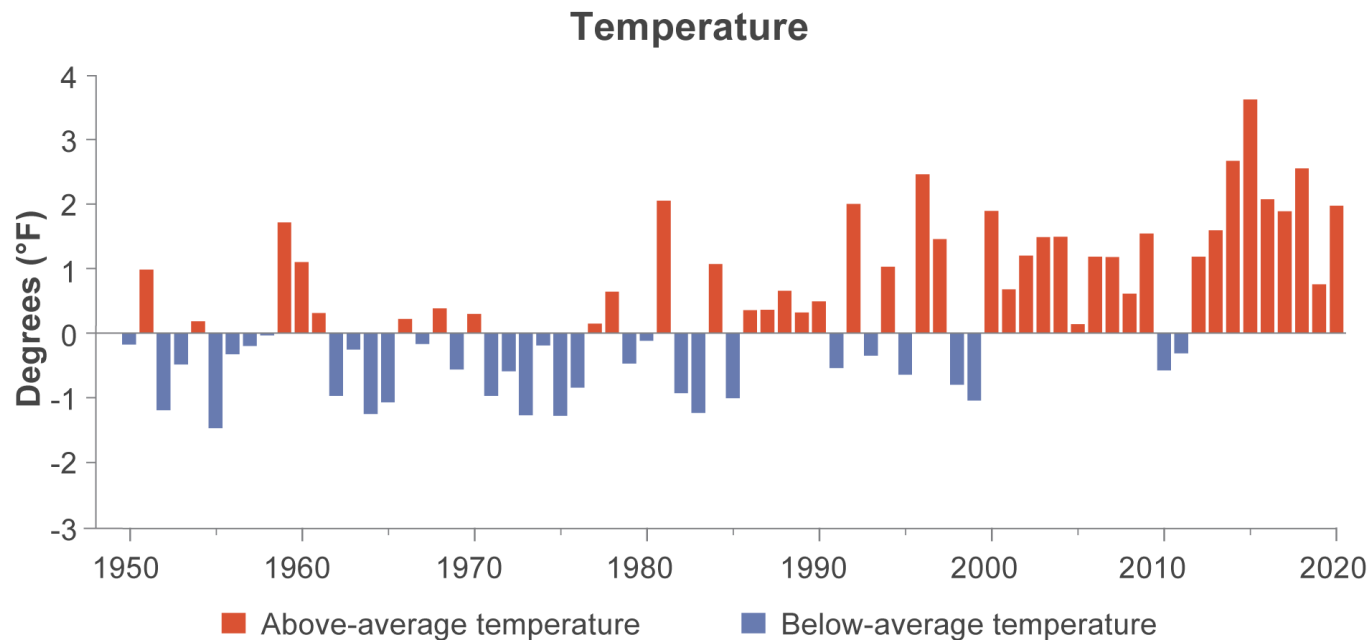


# Climate Change: Are we in a megadrought?



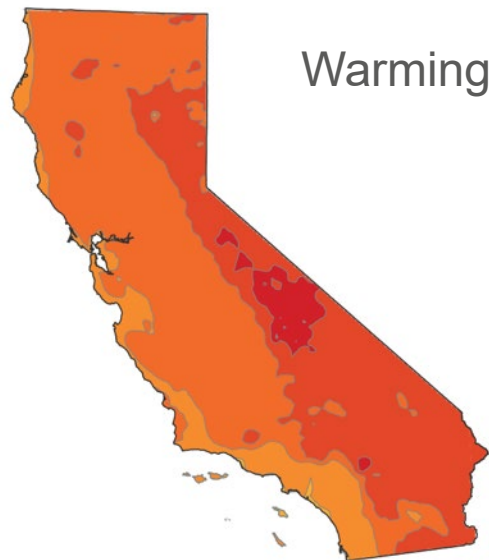
Source: Climate Tracker, Western Regional Climate Center

# Climate Change: Are we in a megadrought?

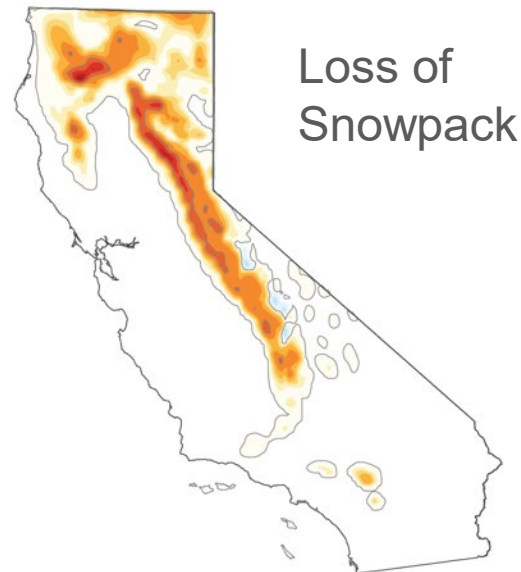


Source: Climate Tracker, Western Regional Climate Center

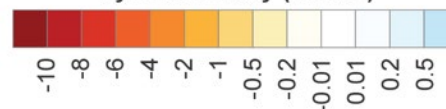
# California is warming and snowpack is changing



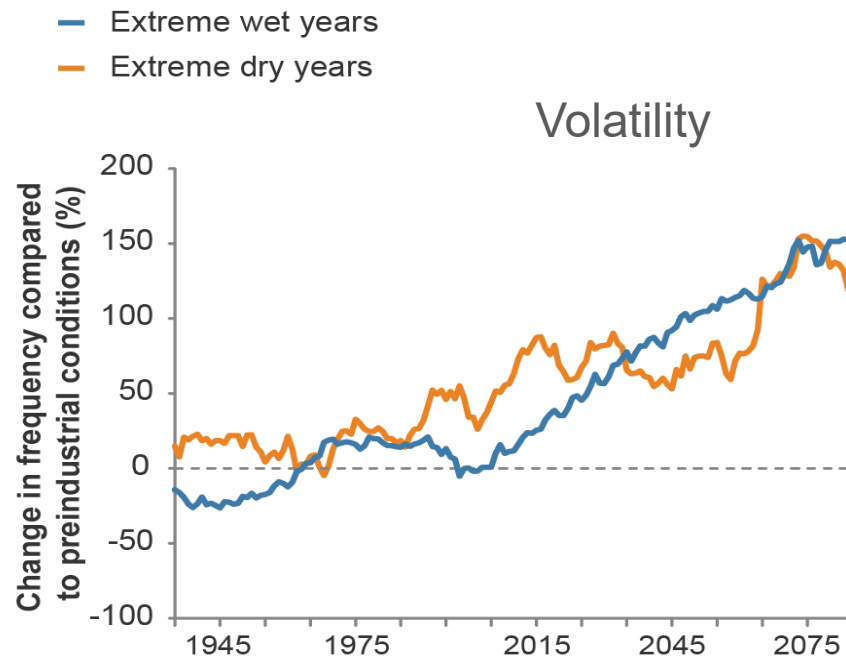
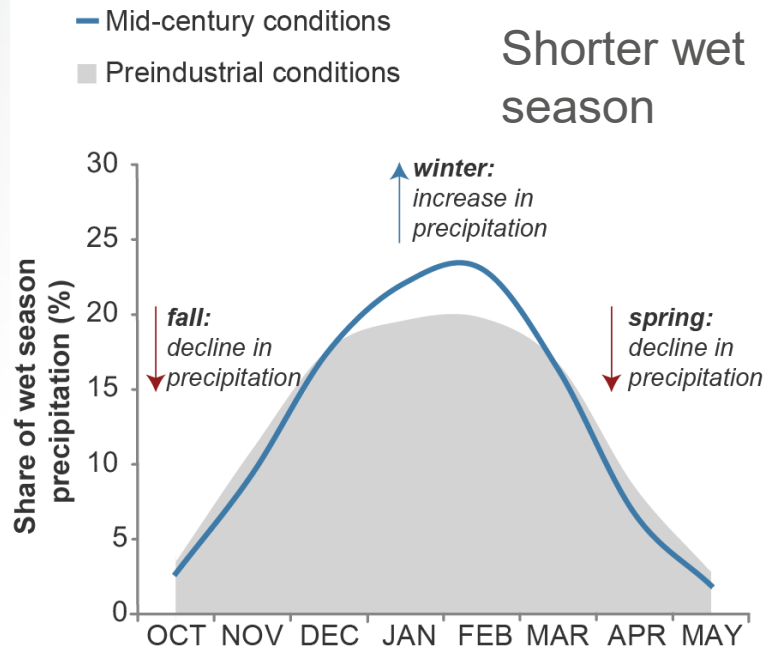
Temperature change  
by mid-century (degrees °F)



Change in snow water equivalent  
by mid-century (inches)

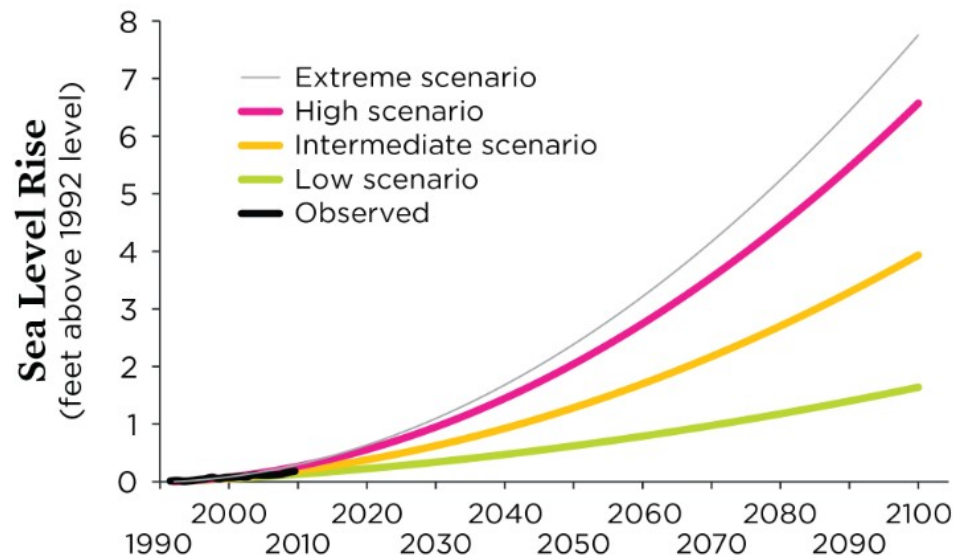


# Shorter wet season and increasing volatility





# Five Climate Pressures

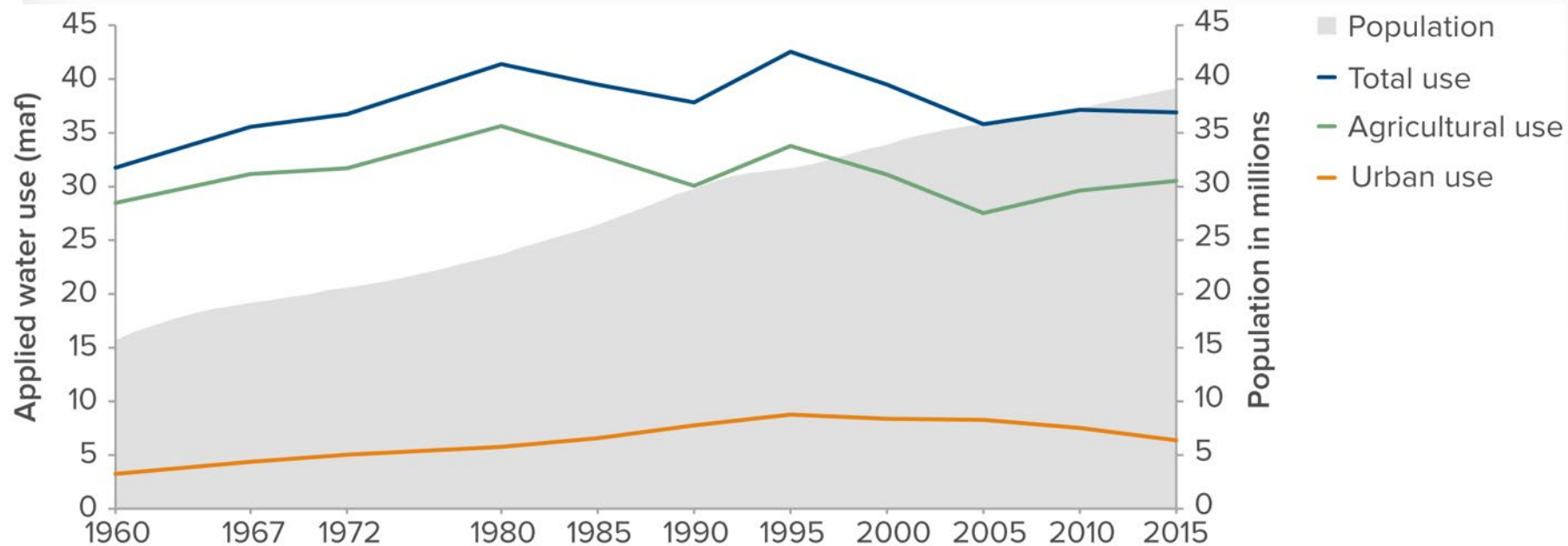


UNION OF CONCERNED SCIENTISTS

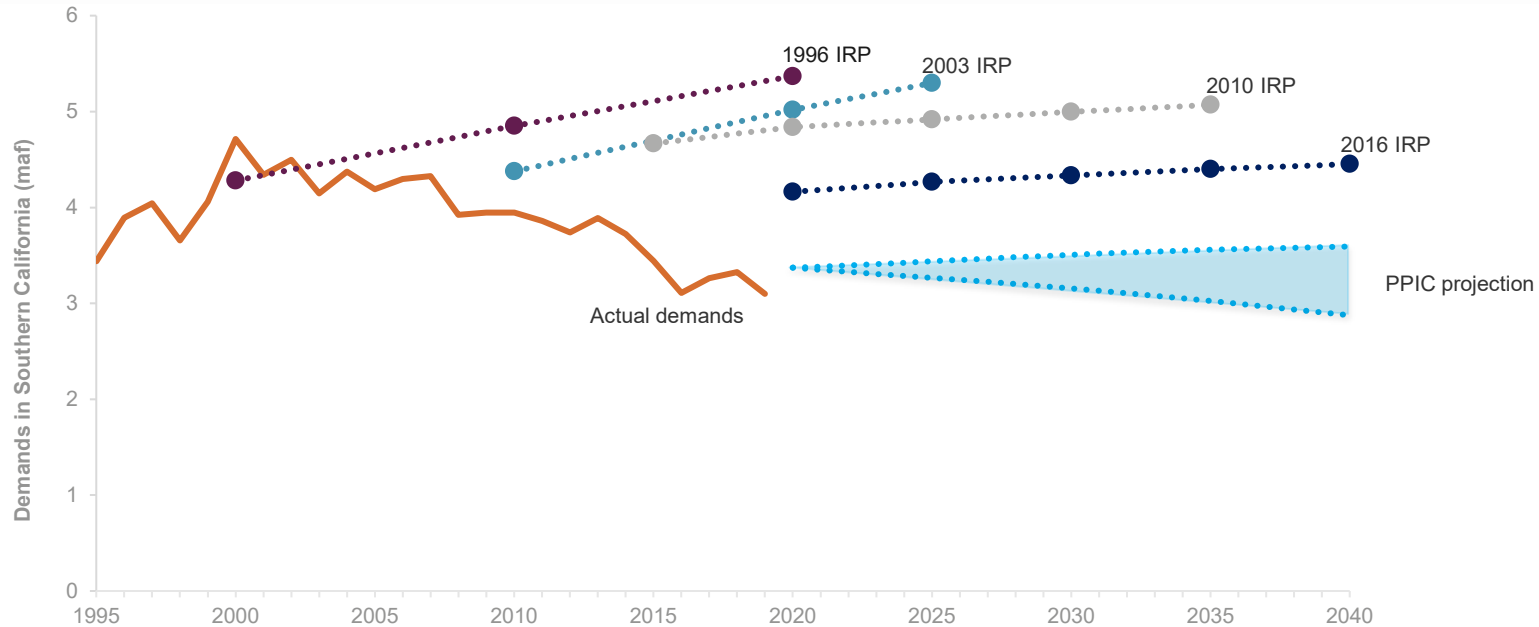
- All five pressures are interacting to decrease reliability of supply
- Primary adaptation tool is changing operations and upgrading the water grid
- But even in the best case scenario, this points to increasing water scarcity for farms, cities and the environment.

Sea level rise impacts coastal aquifers and Delta

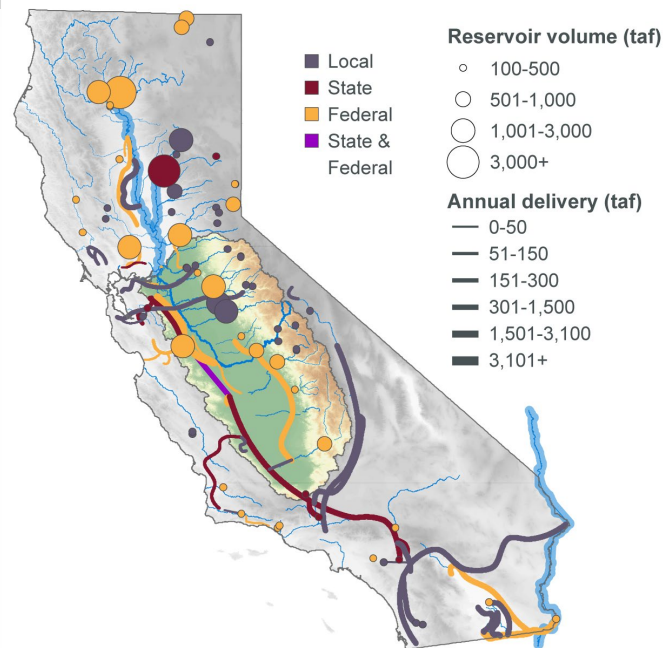
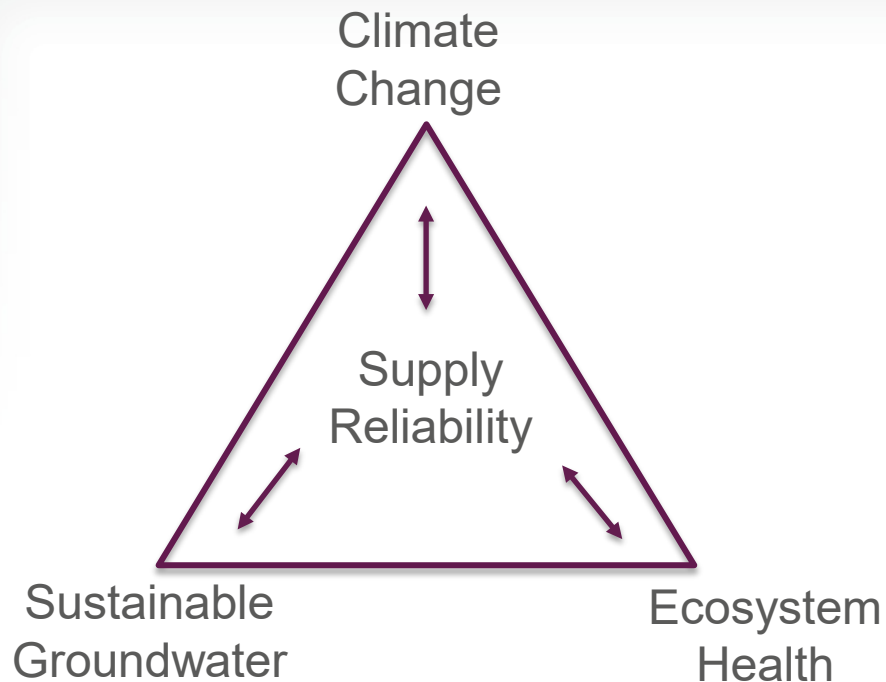
## Side note: population growth not one of the tensions



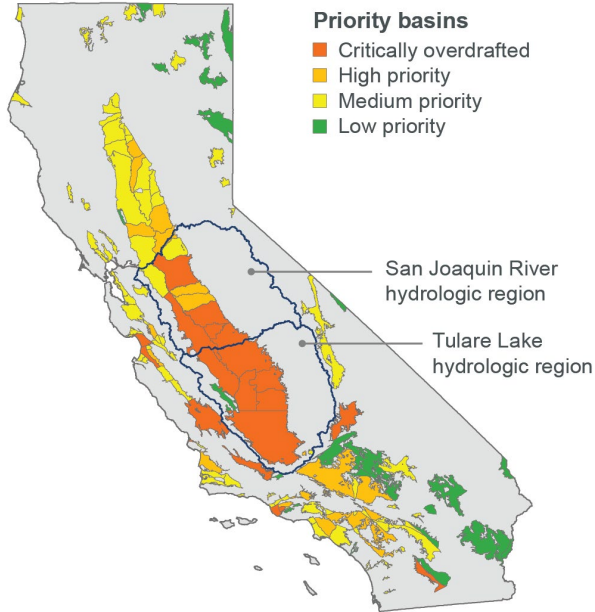
# Regional water demands and demand projections have been falling



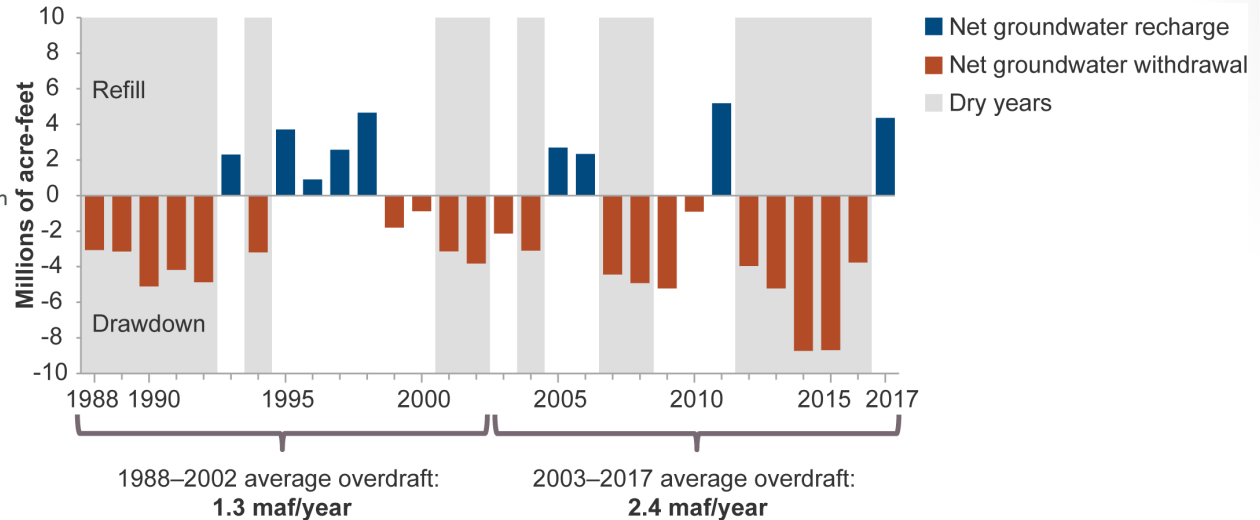
# The Big Challenges in Tension



# Why should Southern California care about sustainable groundwater in the San Joaquin Valley?



■ 30-year valley-wide deficit (1988-2017): 1.8 maf/year



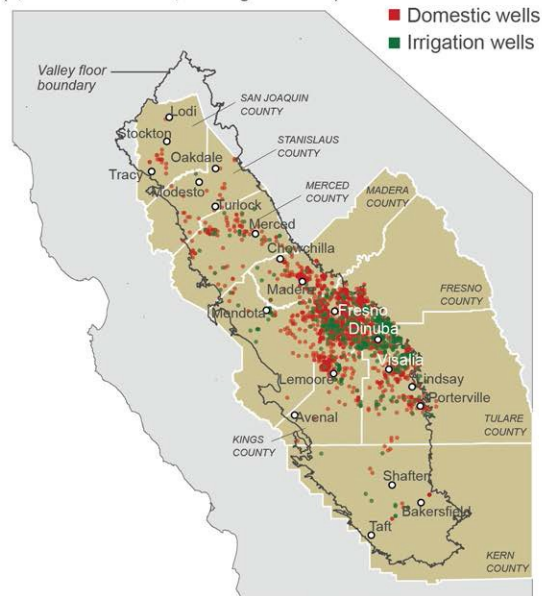


# Numerous undesirable local effects of overdraft

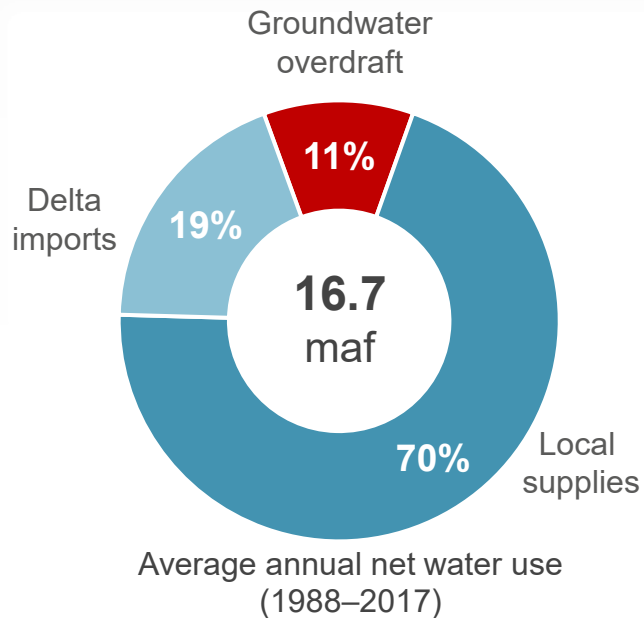
- Key impacts

- Chronic lowering of groundwater level (major EJ issue)
- Reduction of groundwater storage
- Seawater intrusion
- Degraded water quality
- Land subsidence
- Surface water depletions
- Increased costs of pumping

**Wells that went dry during 2012-16 drought**  
(2,285 domestic wells, 576 irrigation wells)



# Addressing groundwater overdraft will stress the grid



The State Water Project connects the San Joaquin Valley and Southern California

# Sustainable Groundwater Management Act implementation will be painful

- Fallowing of approximately 750,000 acres in San Joaquin and Tulare
- Job losses in farm economy with greatest impact on disadvantaged communities
- Range of potential undesirable effects to be managed
- **More pressure on the Delta and environmental flows, making less available for SWP exports**



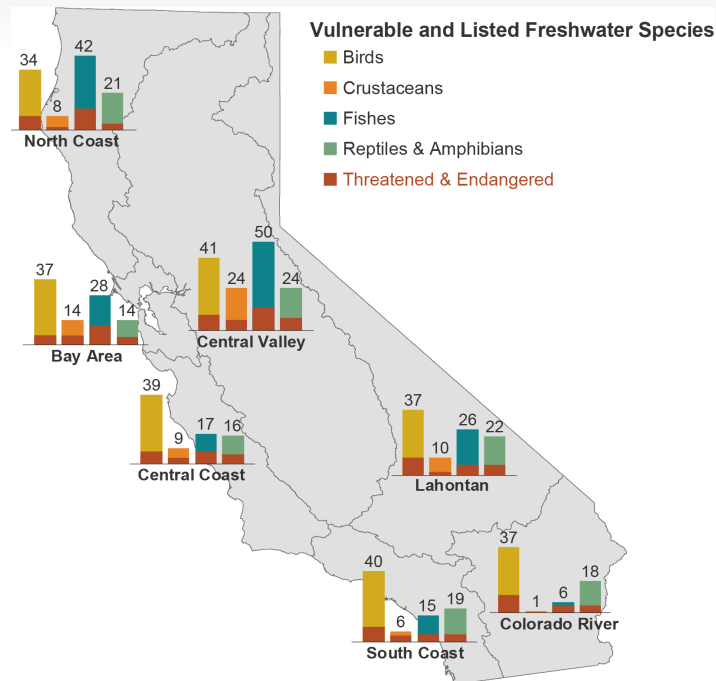
# And the Environment Matters

- Freshwater management in conflict: supply, hydropower, recreation, flood control, ecosystems
- Historic approach uses 50 year-old state and federal ESAs and CWAs with focus on listed species
- Our old approaches using old regulatory tools will not work in a rapidly changing climate and pressures to achieve groundwater sustainability



# Freshwater ecosystem management is not working

- Multiple social, economic, environmental benefits of healthy ecosystems often overlooked
- Long-term decline of native biodiversity likely getting worse
- Vulnerable species vastly outnumber ESA-listed ones
- Overreliance on state and federal ESAs to manage water

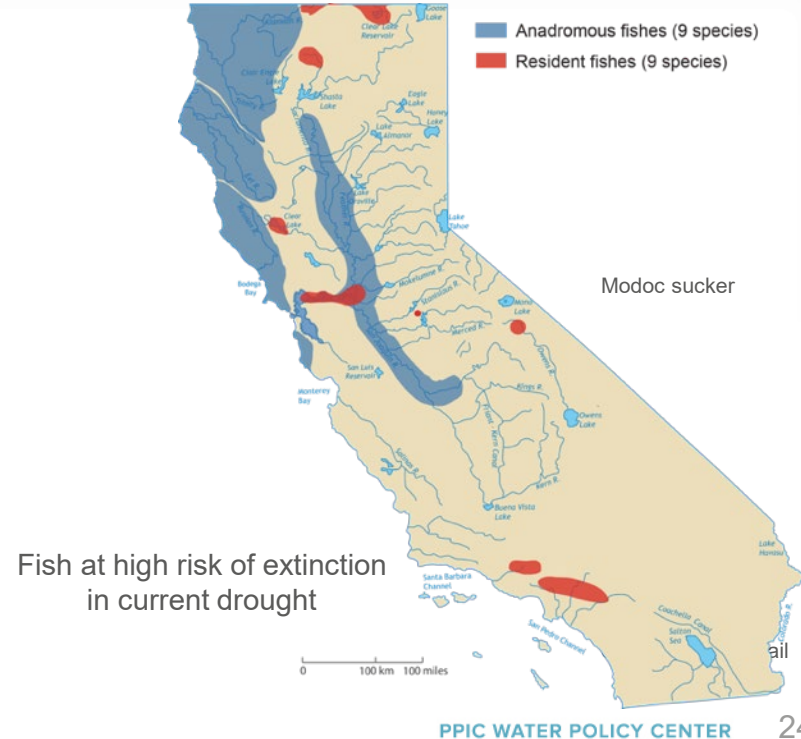


Source: Howard et al. (2015)

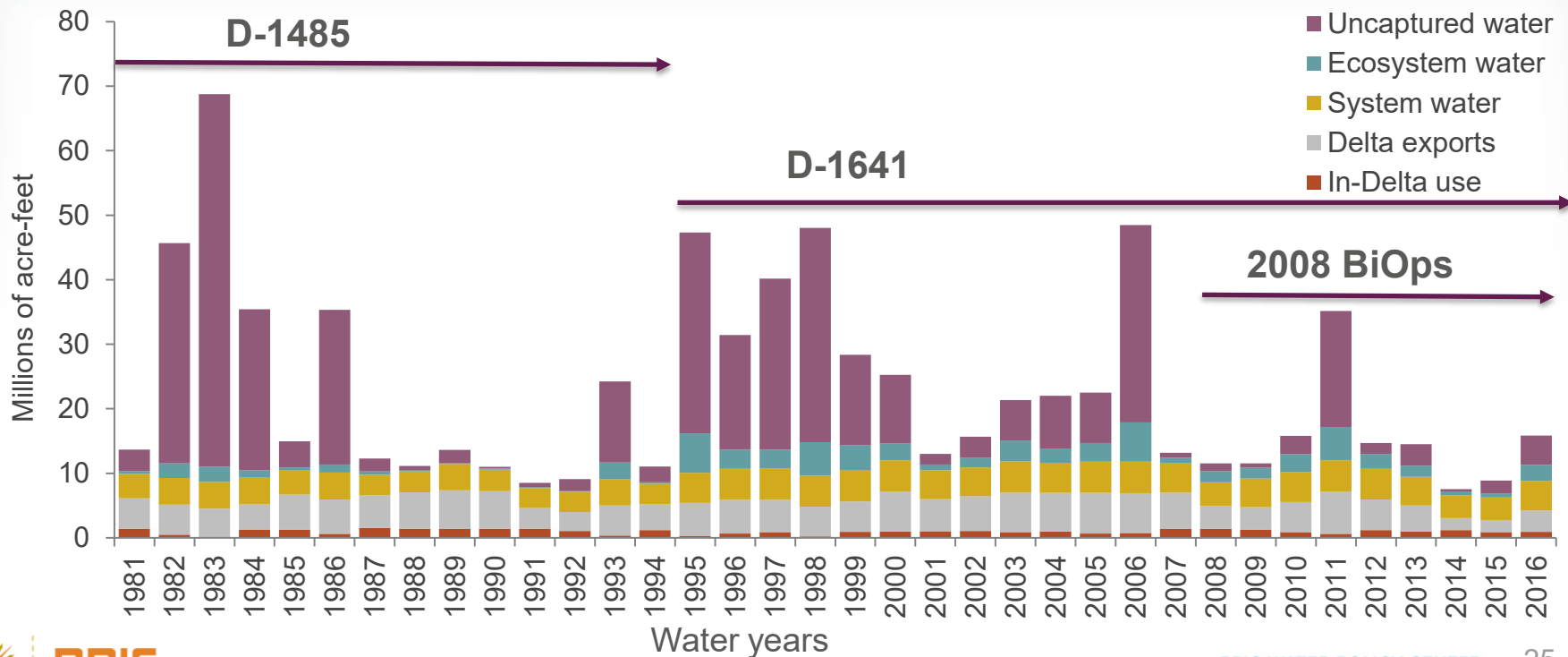


# Reasons to change course

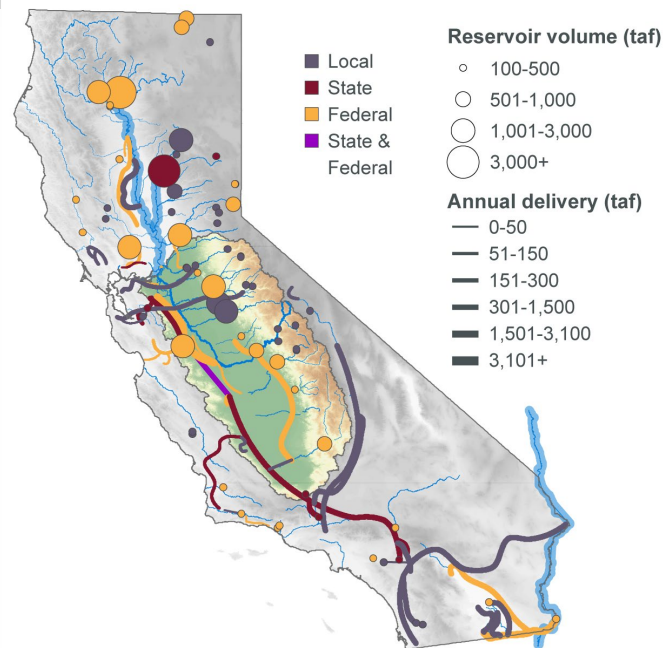
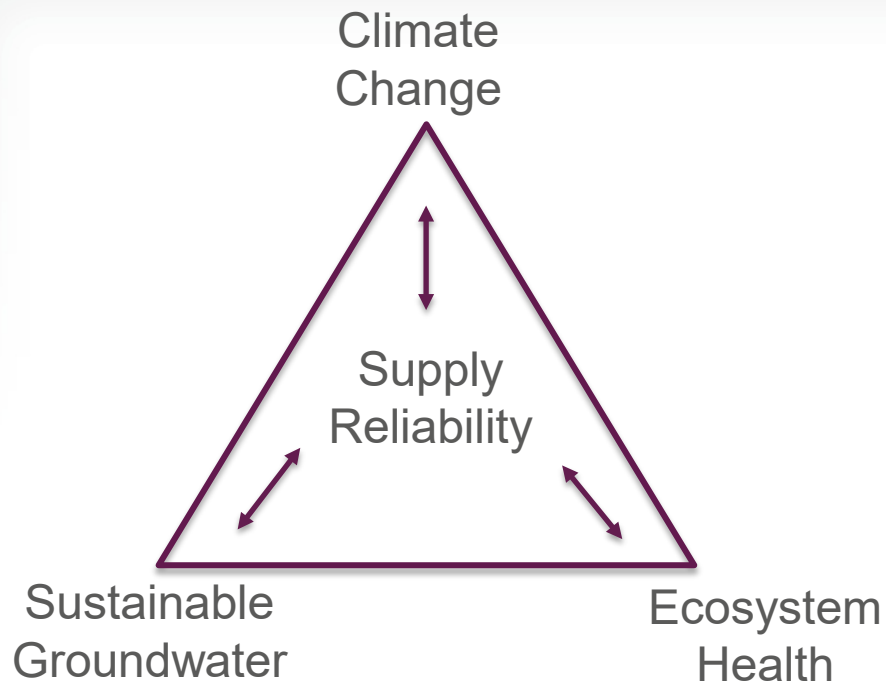
- *ESAs and CWAs are designed to prevent bad things from happening but are not good for fixing things and adapting to change*
- *More listings both inevitable and warranted; threatens the social support for ESAs and increases conflict*
- *Profound disruptions to water supply operations and reliability*



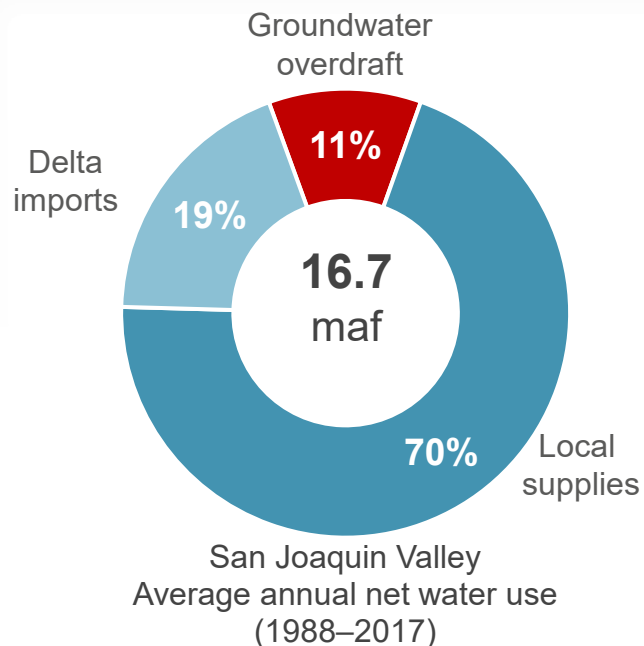
# 35 years of changing Delta water assignment



# How do we alleviate some of the tension?



# Accelerate getting to groundwater sustainability



## Supply management options

- Capture and store more local runoff
- Increase local runoff
- Increase Delta imports
- Reduce exports to other regions
- Reuse and repurpose local supplies

## Demand management options

- Reduce net farm water use
- Reduce net urban water use
- Reduce net water use for open space, wetlands
- Reduce losses from water infrastructure
- Increase flexibility

# Change course on ecosystem management



## Switch to ecosystem-based management

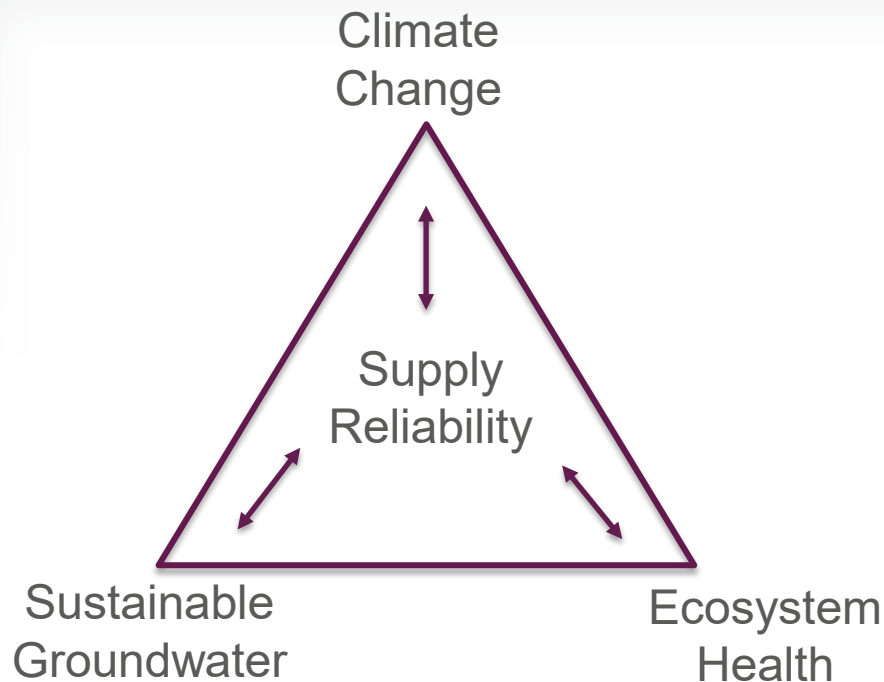
- Ecosystem water budgets
- Connect functional flows to physical habitat
- Co-manage water quality and quantity
- Active management of native and non-native species
- Manage at the watershed scale

## Update Planning, Accounting and Regulation

- Develop annual environmental watering plans
- Modernize accounting for environmental water
- Develop sustainable watershed management plans
- Promote comprehensive agreements over regulation



# Discussion: The Big Challenges in Tension



- And lots of others
  - Aging infrastructure
  - Flood management
  - Environmental Justice
  - Disadvantaged Communities
  - Fed/State Tensions
  - Permitting
  - Funding, Funding, Funding

# Reminder: Floods, Droughts and Lawsuits Primary Catalysts for Policy Reforms



## About these slides

These slides were created to accompany a presentation. They do not include full documentation of sources, data samples, methods, and interpretations. To avoid misinterpretations, please contact:

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Thank you for your interest in this work.