Managing California's Water in a Time of Drought and Climate Change

37th Annual Salmonid Restoration Conference, Santa Rosa, CA

April 25, 2019

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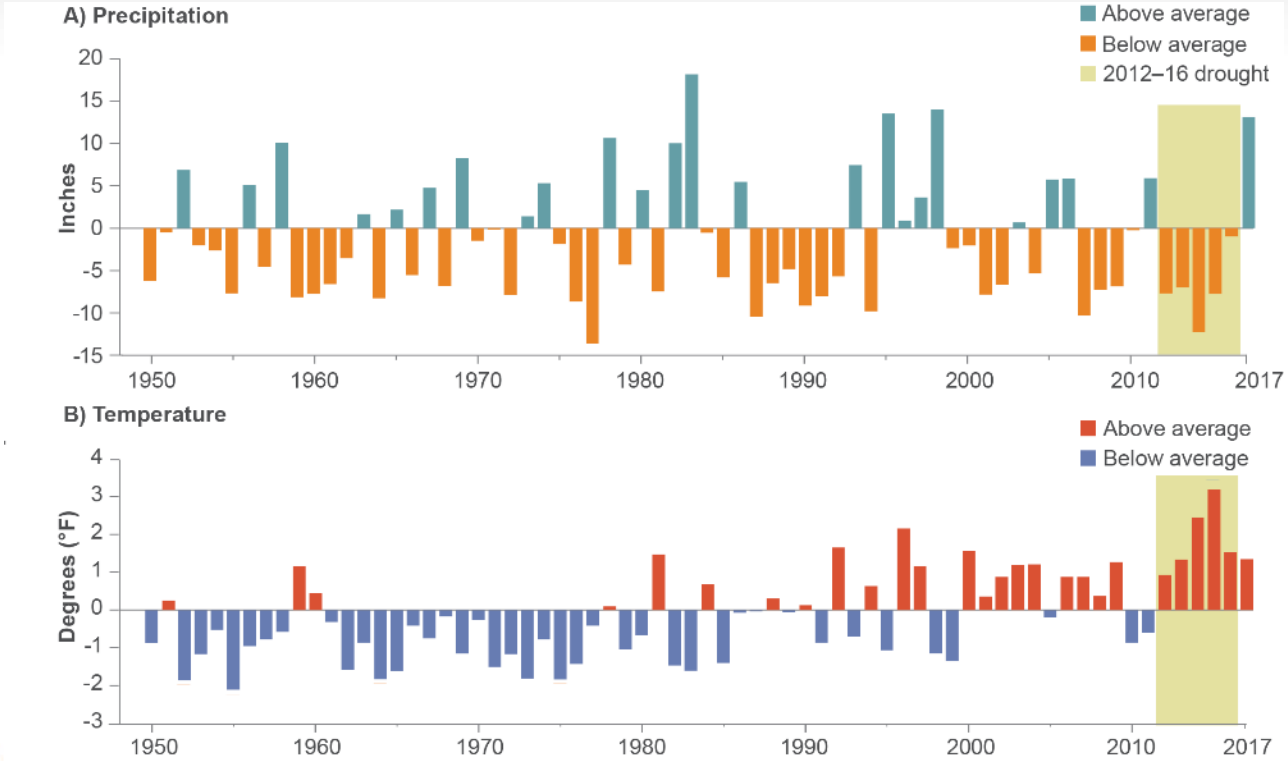
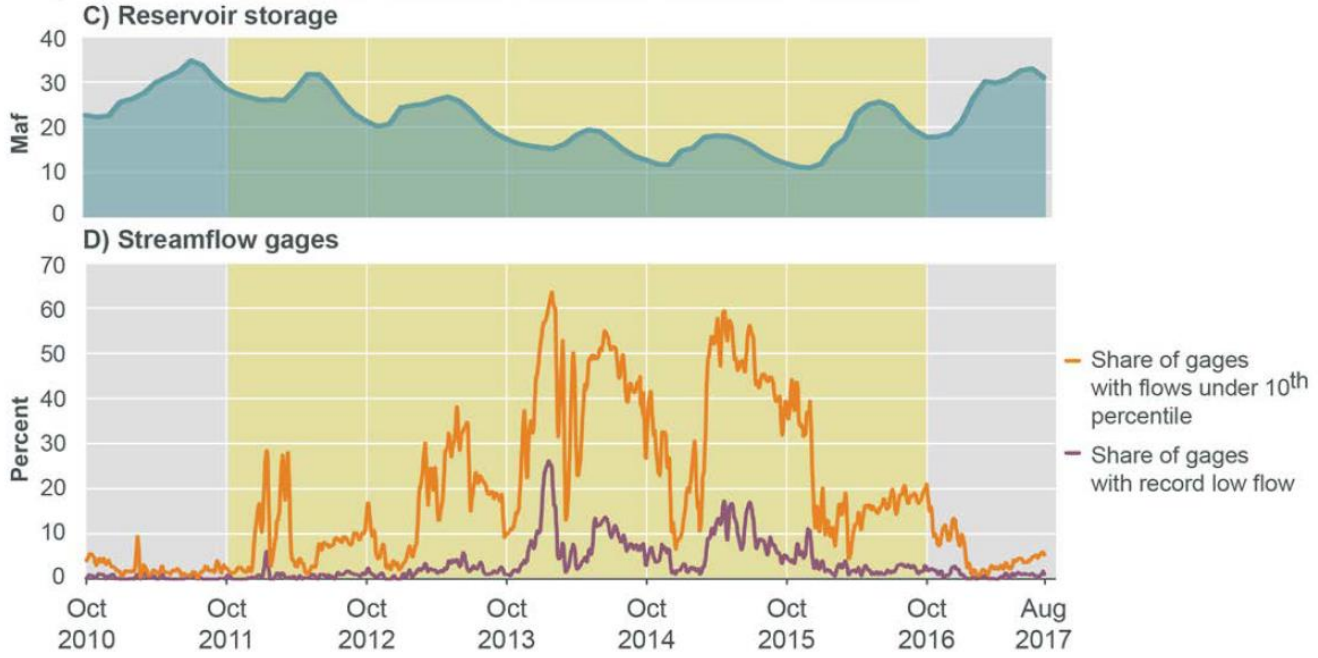
Research supported by the S. D. Bechtel, Jr. Foundation and the US Environmental Protection Agency

California's unusually warm drought of 2012–16 was a window into the future

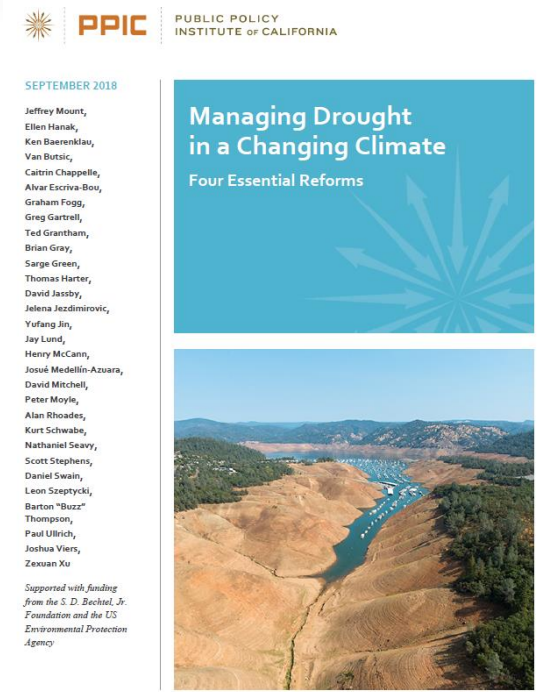


This translated to especially tough conditions for fish in California's rivers and streams



Managing water is at the forefront of climate change adaptation in California

- Drought reveals strengths and weaknesses in water systems
- What are lessons in 4 sectors?
  - Cities
  - Agriculture
  - Rural communities
  - Ecosystems
- How will a changing climate add to the challenges?



Five climate pressures are impacting California's water system

Warming temperatures


Shrinking snowpack


Shorter wet seasons


More volatile precipitation


Rising seas

Reducing vulnerability to climate pressures requires concerted action

Four essential reforms:

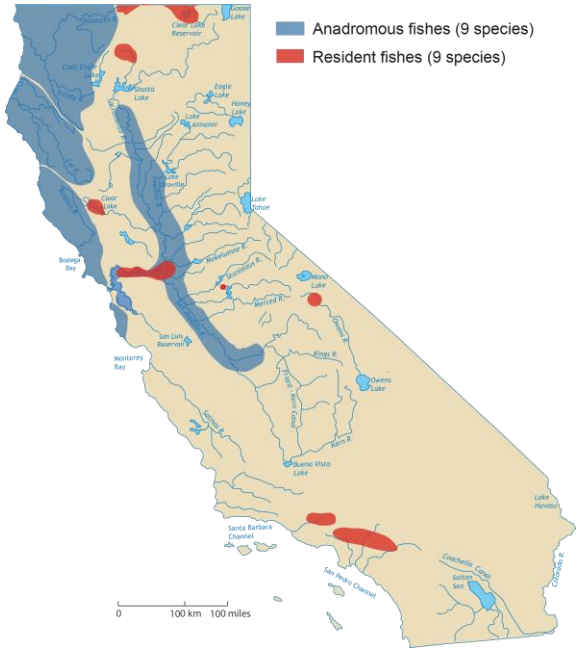
1. Plan ahead
2. Upgrade the water grid
3. Update water allocation rules
4. Find the money

Shasta Reservoir during drought

Reform 1: Plan ahead

- Successful adaptation requires advance planning at local and regional scales.
- Top priorities:
  - Strengthen urban water management plans
  - Ensure effective groundwater sustainability plans (SGMA)
  - Develop drinking water plans for rural communities
  - Prepare ecosystem drought plans

Fishes at risk of extinction in the next major drought

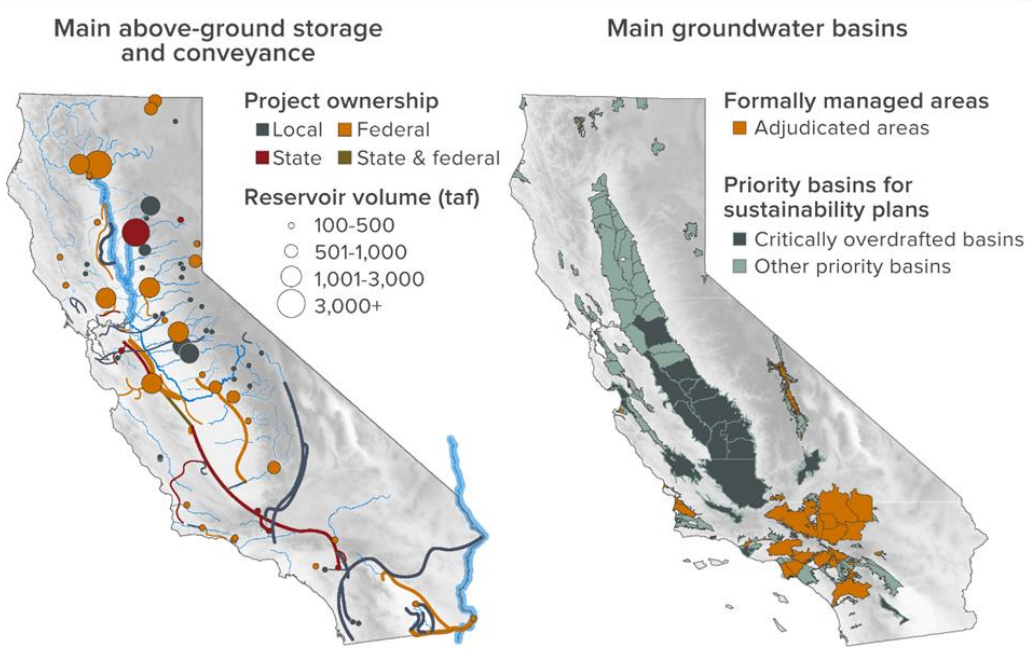


Planning tools to prescribe actions—including use of ecosystem water—before, during, after drought

SOURCE: Victorian Environmental Water Holder, 2015. Seasonal Watering Plan 2015-16: Introduction.

Reform 2: Upgrade the water grid

- Modernizing our “water grid” can help reduce costs of future droughts
- Top priorities:
  - Improve capacity of conveyance and storage (reservoirs + aquifers)
  - Modernize and integrate operations



Reform 3: Update water allocation rules

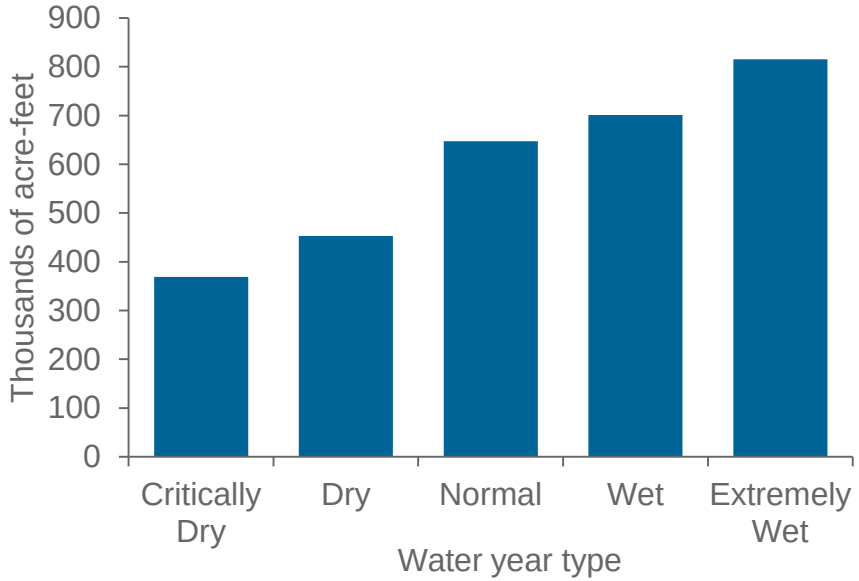
- Facilitate equitable and efficient allocation during dry times, promote capture and storage during wet times
- Top priorities:
  - Promote groundwater recharge
  - Streamline trading and banking
  - Give the environment a water budget
  - Improve water rights administration

Sacramento National Wildlife Refuge

Ecosystem water should be flexibly managed, traded, and stored

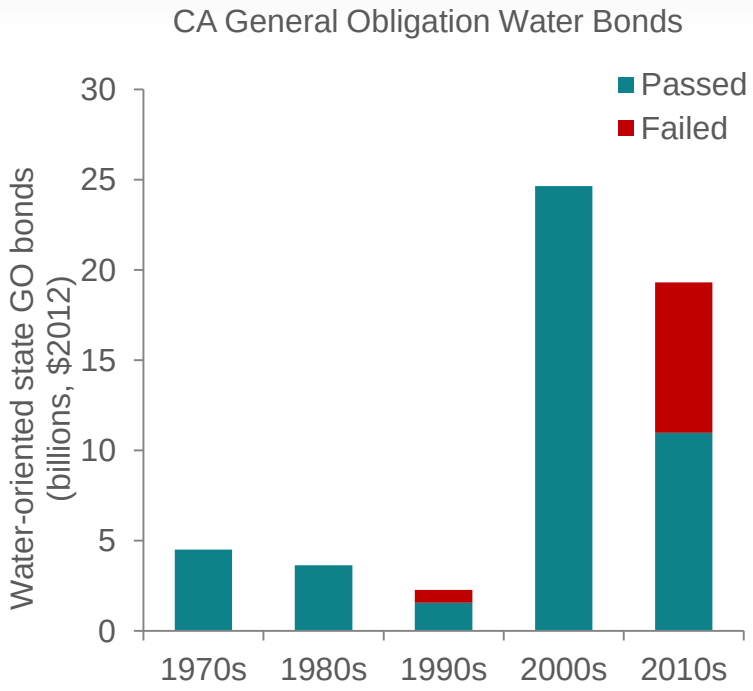
- Integrate into the water rights system within a watershed
- Create a management structure with ecosystem trustees
- Grant management flexibility, including trading and storage
- Improve certainty over allocation by fixing budget and term

Restoration flows on the Trinity River vary by year type



Reform 4: Find the money

- Local water users pay for most water supply infrastructure
- "Fiscal orphans" are increasingly vulnerable:
  - Poor rural communities
  - Flood protection
  - Ecosystems
- State bonds can help, but they can't do it all



Reasons for optimism

- Urban sector has been adapting and investing
- Agriculture has been innovating and working toward groundwater sustainability
- Progress is under way on safe drinking water supplies in rural communities

The environment needs a fundamental change in course

- Efforts haven't stopped decline of aquatic species
- Climate pressures increasing the risk
- More flexible, ecosystem-based management is needed

Lower Yuba River

Preparing for droughts of the future will require strong leadership across all sectors and levels of governance

Some ecosystem-focused resources from the PPIC drought study (ppic.org/water)

- Hanak et al. *What if California's Drought Continues?* (2015)
- Gray et al. *Allocating California's Water: Three Directions for Reform* (2015)
- Mount et al. *Managing Water for the Environment During Drought: Lessons from Victoria, Australia* (2016)
- Mount et al. *Managing California's Freshwater Ecosystems: Lessons from the 2012-16 Drought* (2017) (includes appendix with 8 case studies)
- Gartrell et al. *A New Approach to Accounting for Environmental Water: Insights from the Sacramento-San Joaquin Delta* (2017)
- Mount et al. *Managing Drought in a Changing Climate: Four Essential Reforms* (2018)

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.