

# Attaining Sustainability in California's Watersheds

From Headwater Forests to Groundwater Basins

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**PPIC**

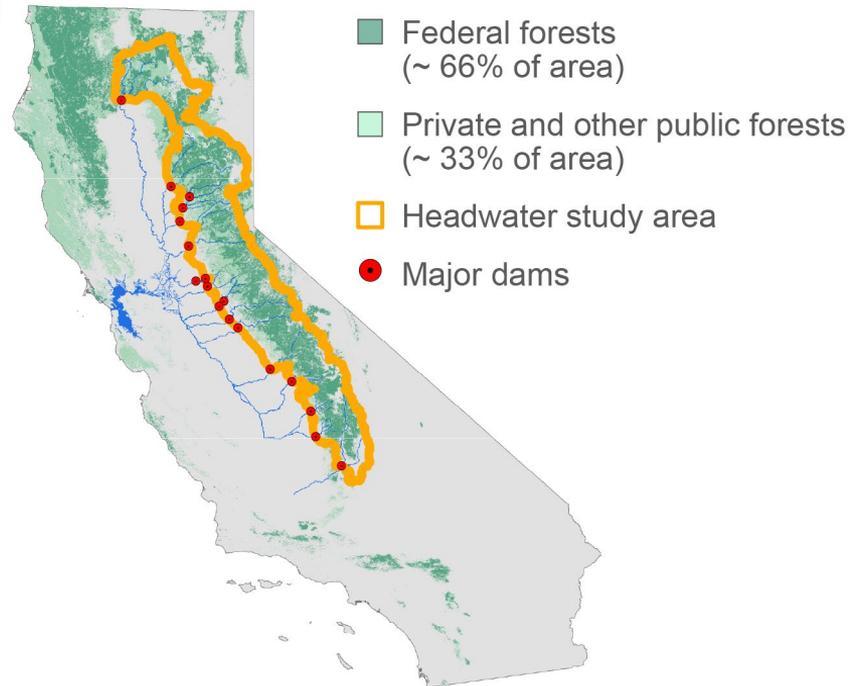
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# California's headwater forests and groundwater basins are both receiving major policy attention

- Forested headwaters: Restoring resilience after decades of declining health, growing wildfire risk (federal-state-local responsibilities)
- Groundwater basins: Bringing basins into balance, mitigating harm from overdraft (local lead, state backstop)
- Changing climate (esp. warmer, more intense droughts) increases urgency of addressing these challenges

# Improving the health of California's headwater forests



10 million acres of mixed conifer forest on the western slope of Sierra Nevada (~2,000-6,000' elevation)

Source of >50% of CA's surface water

Mix of ownership, with heavy federal role

Very high and rising wildfire risk

# California's headwater forests have changed

Feather River 1890



*Resilient mosaic forest*

Feather River 1993



*Overly dense forest*

# We need to manage for resilient mosaic forests

**The goal:** A patchwork of varied tree densities, openings, tree sizes



A mosaic of trees in the Stanislaus-Tuolumne Experimental Forest

# Removing forest fuels will improve forest health



Prescribed and managed wildfire



Mechanical thinning

# Improving forest health brings many benefits



**Support the well-being of rural communities**



**Reduce smoke impacts on public health**



**Store carbon and reduce emissions**



**Protect water quality**



**Increase water supply**



# Protect water quality from post-fire erosion

- Sediment & debris disrupt water infrastructure, ecosystems

## Considerations:

- Large foothill reservoirs somewhat buffered
- Each tributary has different risks, vulnerable assets



Post-fire sedimentation, American River



# Increase water supply



Feather River

- Thinning trees can increase runoff in wetter tributaries
- Potential link with snowpack enhancement

## Considerations:

- Benefit shrinks as vegetation grows back
- Uncertainty at large scales



# Support the well-being of rural communities

- Create economic opportunities
- Decrease wildfire threats

## Considerations:

- Investing in infrastructure, workforce training is essential
- Home hardening, defensible space, safety planning also key



Businesses in a Sierra community

# Recent efforts are heading in the right direction

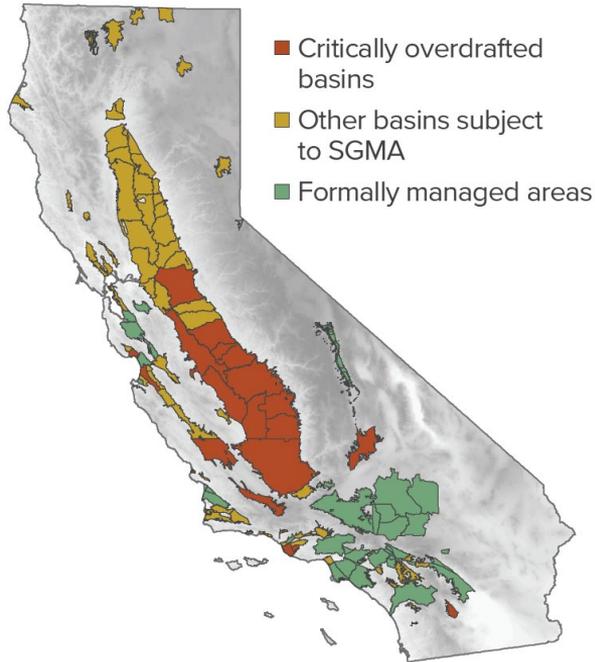


Collaboration on North Yuba River project

- State funding for large-scale management projects
- Increased use of “shared stewardship” tools with US Forest Service
- Some downstream beneficiaries investing to reduce risk
- Sustained funding, partnerships will be essential to increase pace and scale of this work

# California's 2014 Sustainable Groundwater Management Act requires bringing basins into balance

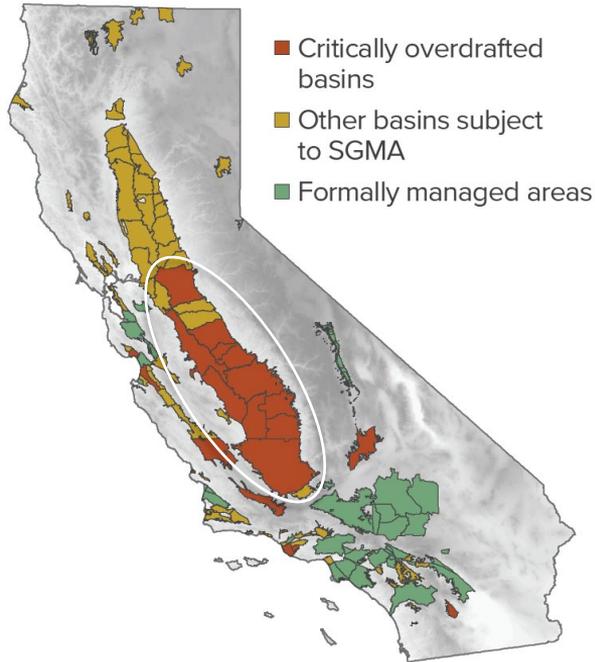
## Main groundwater basins



- ~130 priority basins, > 250 sustainability agencies
- Local sustainability plan launch deadlines: 2020 (for critical basins), 2022 (for others)
- 20 years to attain sustainability, must show progress along the way

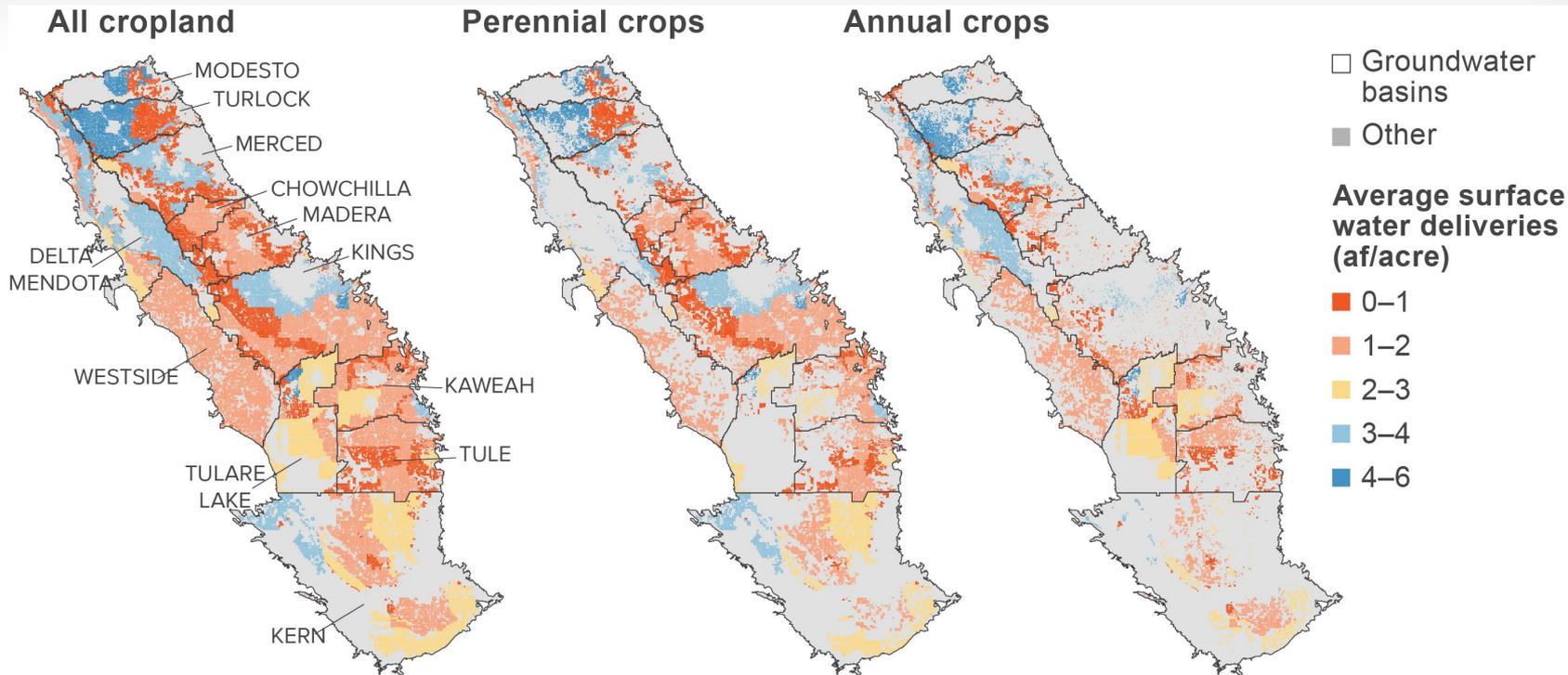
# San Joaquin Valley is at ground zero for SGMA

## Main groundwater basins

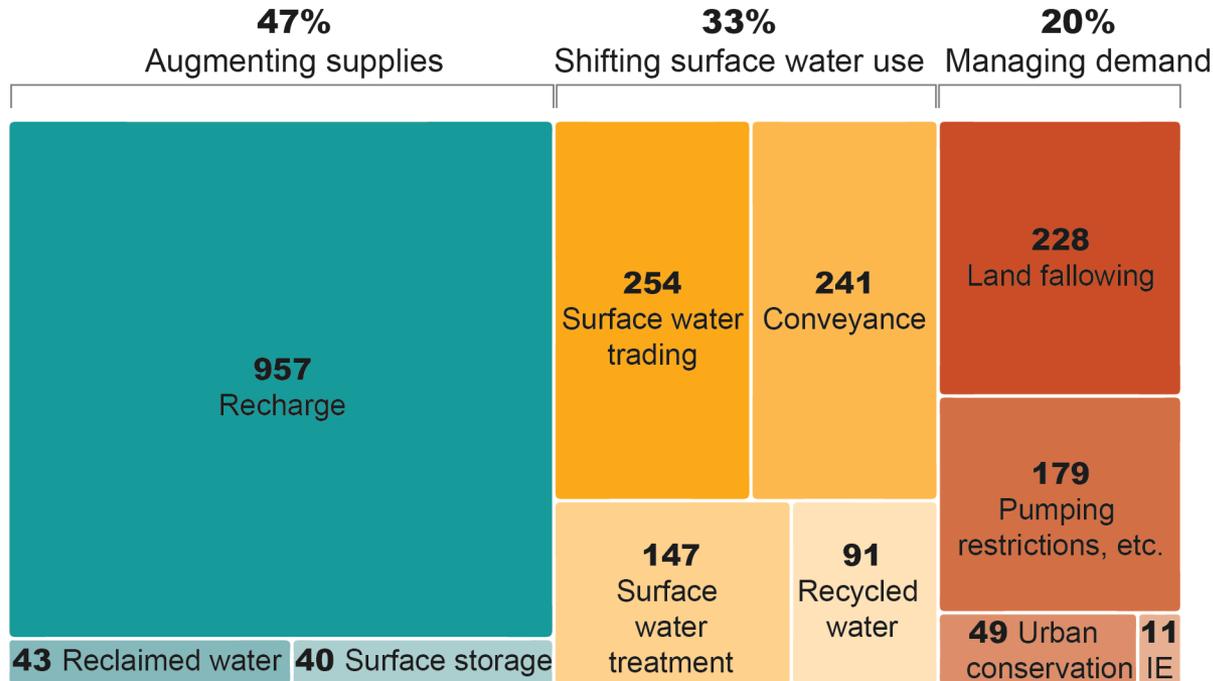


- Largest ag region: >50% of CA output
- Biggest imbalance: ~2 M acre-feet/yr overdraft; 11% of net water use
- Consequences: dry wells, sinking lands, reduced supplies for droughts
- The groundwater math problem: attaining balance means more supply, less water use, or both
- The economics problem: some solutions are more costly than others

# Variable surface water access highlights need for local and regional cooperation



# Local plans emphasize recharge, have limited focus on demand management



Total amount: 2,241 taf/y

# SGMA was enacted to address the negative consequences of groundwater overdraft



Lowering of  
GW levels



Reduction of  
storage



Land  
subsidence



Seawater  
intrusion



Surface water  
depletion



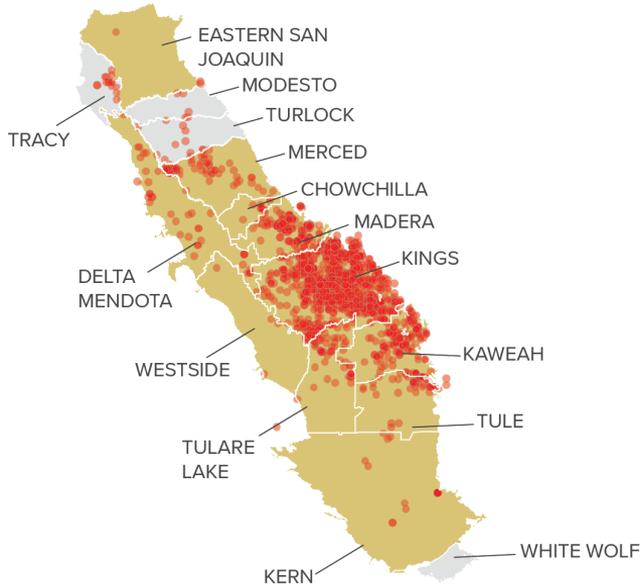
Degraded  
quality

# We reviewed how plans address two of the six undesirable results

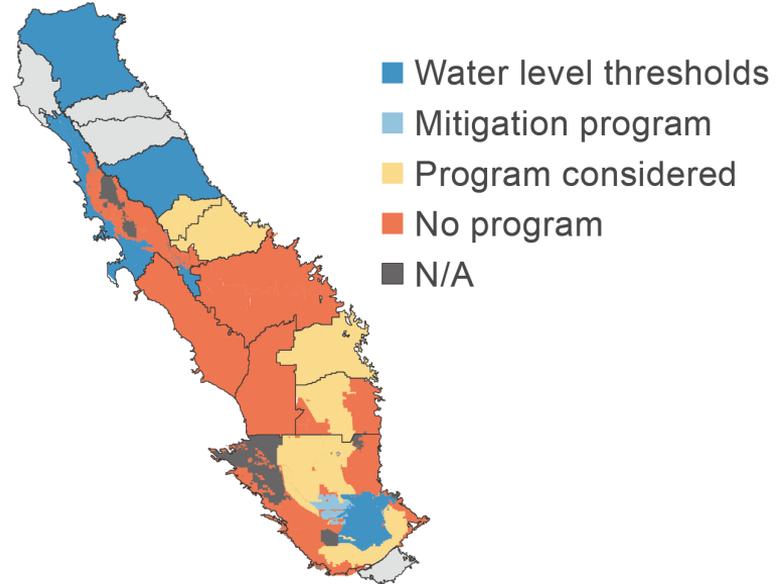


# Many plans do not have protections for domestic wells

A) Wells that went dry during 2012–16 drought



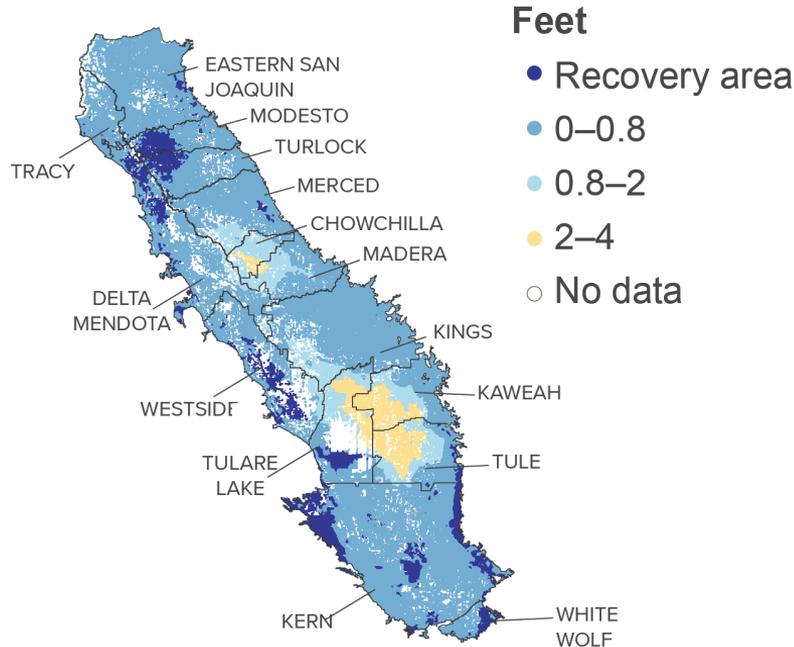
B) Well protections in groundwater sustainability plans



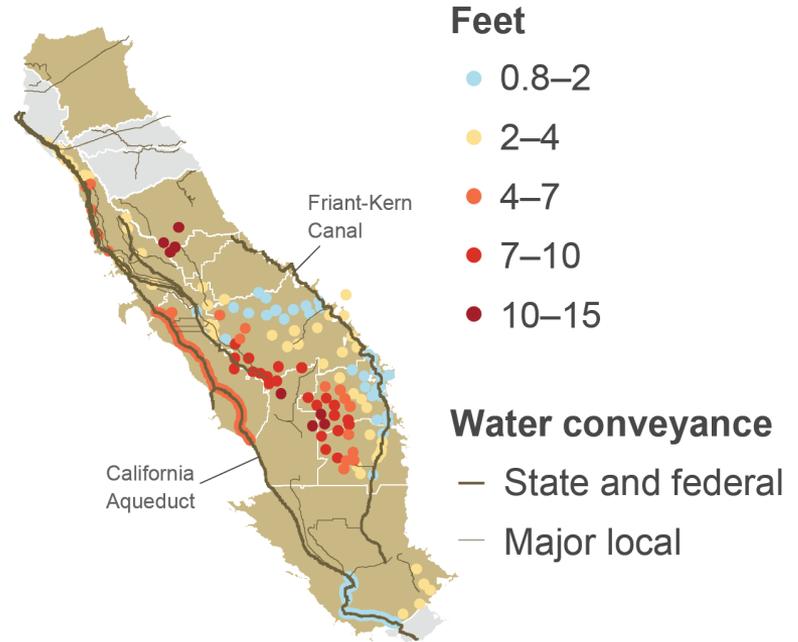
Maps from: Jezdimirovic et al. (PPIC Blog, May 14, 2020)

# Many plans allow for significant subsidence to continue

## A) Total subsidence (2015–19)



## B) Maximum allowed subsidence by 2040



# What are the near-term priorities for transitioning to groundwater sustainability?

- Address undesirable results of overdraft
  - Develop strong water accounting frameworks
  - Assess smart infrastructure investments
  - Launch broad-based planning for both water and land
  - Pilot efforts for innovative approaches to trading, recharge, and land stewardship
- ➔ Efficient and equitable solutions require more cooperation, both within and across basins

# Additional PPIC resources

- Headwater forest management
  - [Improving the Health of CA's Headwater Forests](#) (Butsic et al. 2017)
  - [Benefits of Headwater Forest Management](#) (McCann et al. 2020)
  
- Groundwater management
  - [“Replenishing Groundwater in the SJ Valley”](#) (Hanak et al. 2018)
  - [“Water and the Future of the SJ Valley”](#) (Hanak et al. 2019)
  - [“A Review of Groundwater Sustainability Plans in the San Joaquin Valley”](#) ([blog series](#), [datasets](#), and public comments submitted to DWR May 2020)

# Thank you!

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.