

Attaining Sustainability in California's Watersheds

From Headwater Forests to Groundwater Basins

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Ellen Hanak and Henry McCann



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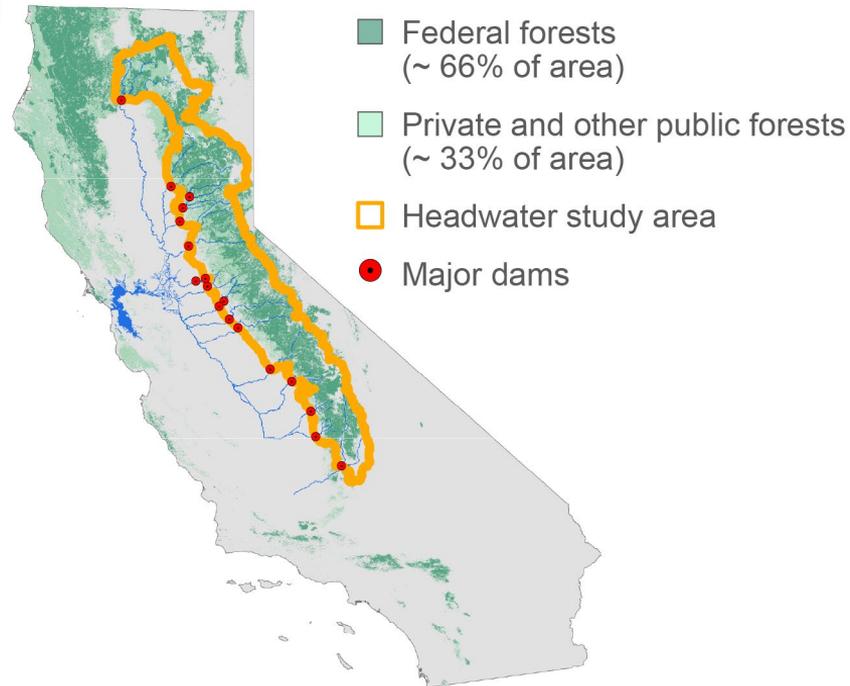
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California's headwater forests and groundwater basins are both receiving major policy attention

- 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

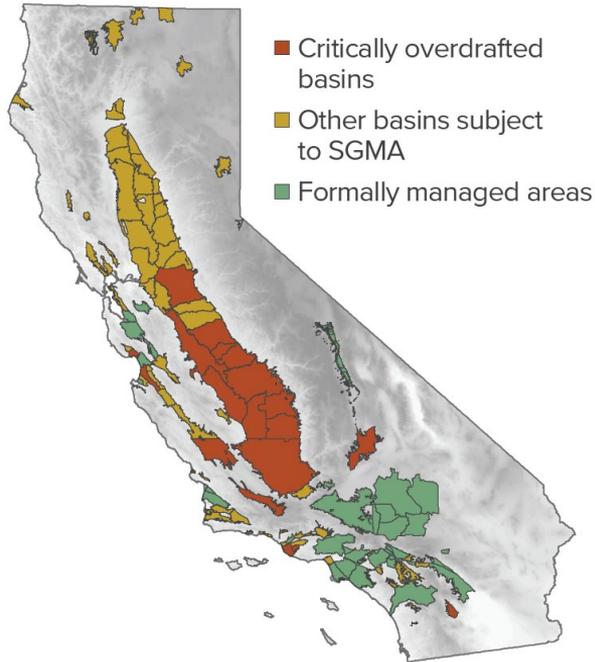


Collaboration on North Yuba River project

- 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

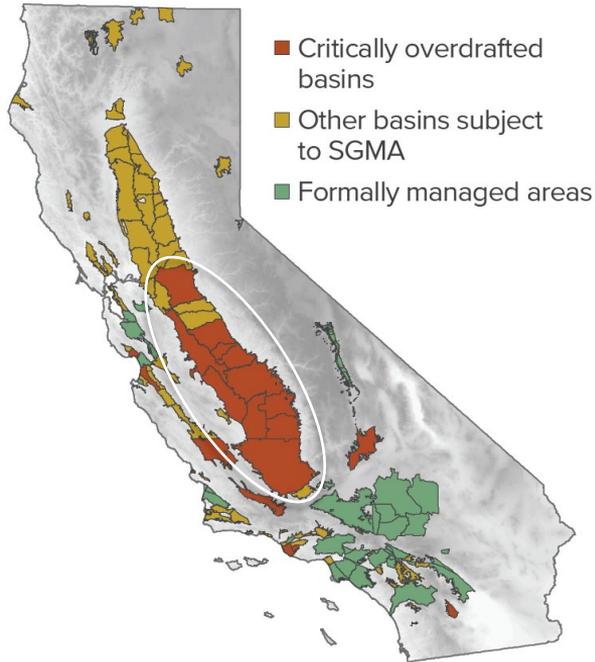
Main groundwater basins



- ~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

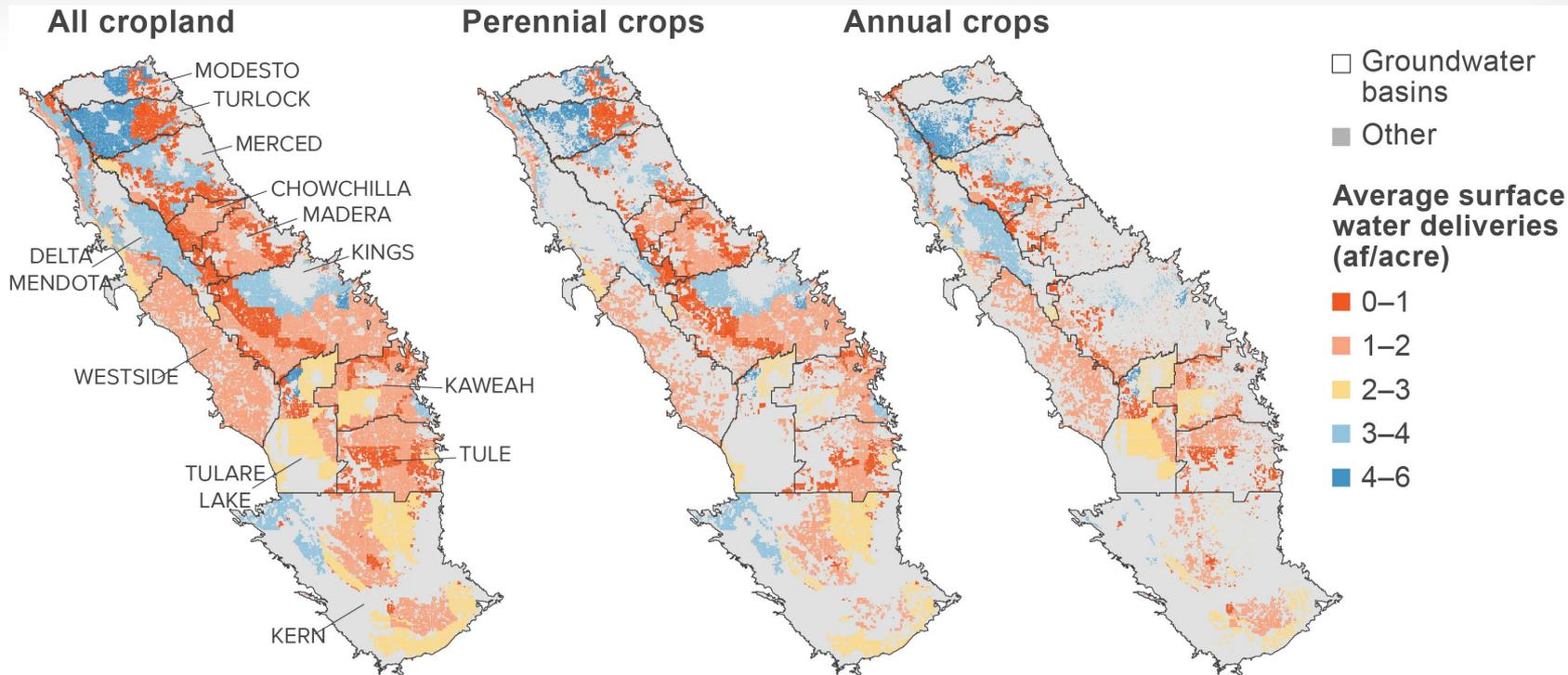
San Joaquin Valley is at ground zero for SGMA

Main groundwater basins

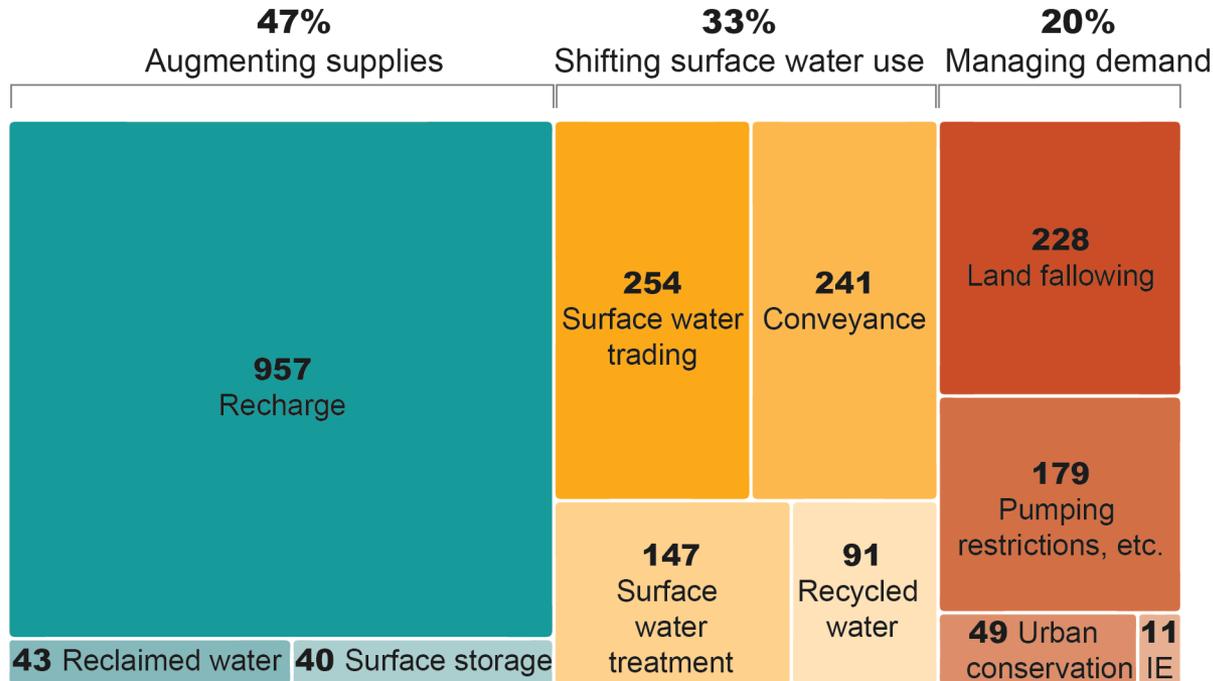


- Largest ag region: >50% of CA output
- Biggest imbalance: ~2 M acre-feet/yr overdraft; 11% of net water use
- Consequences: dry wells, sinking lands, reduced supplies for droughts
- The groundwater math problem: attaining balance means more supply, less water use, or both
- The economics problem: some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



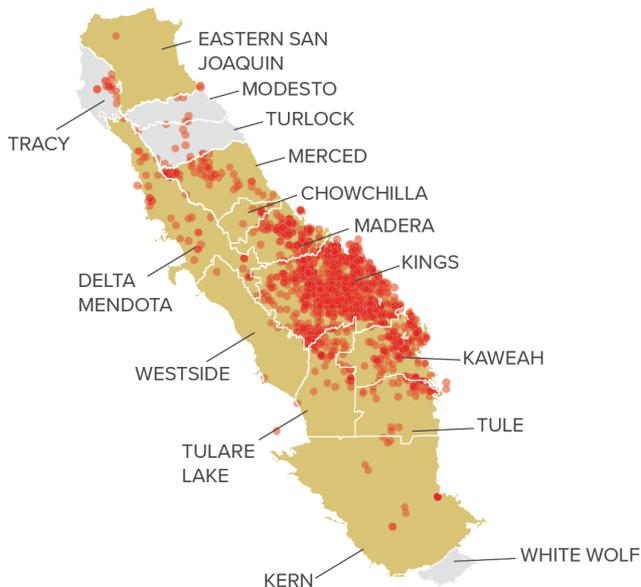
Degraded
quality

We reviewed how plans address two of the six undesirable results

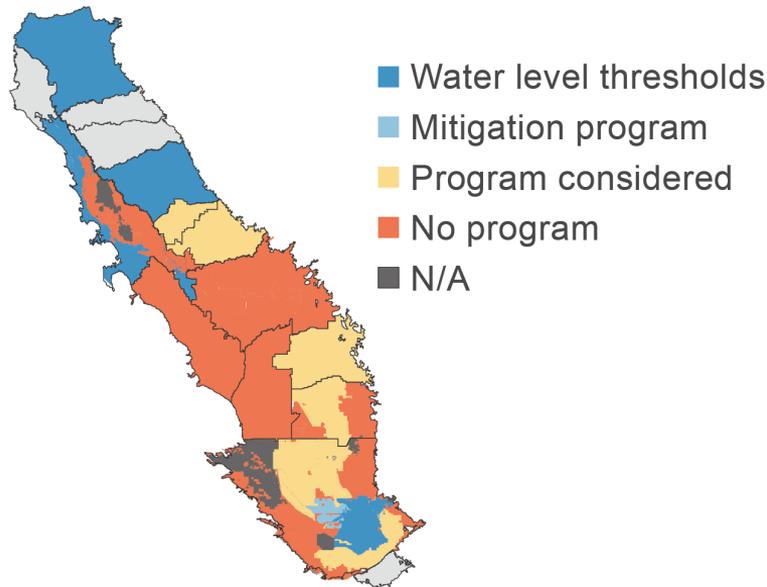


Many plans do not have protections for domestic wells

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)

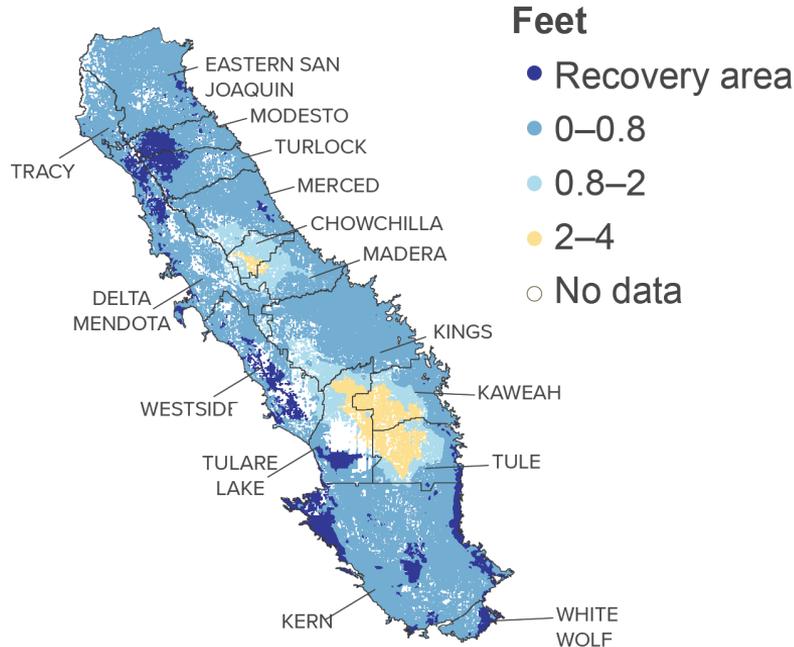


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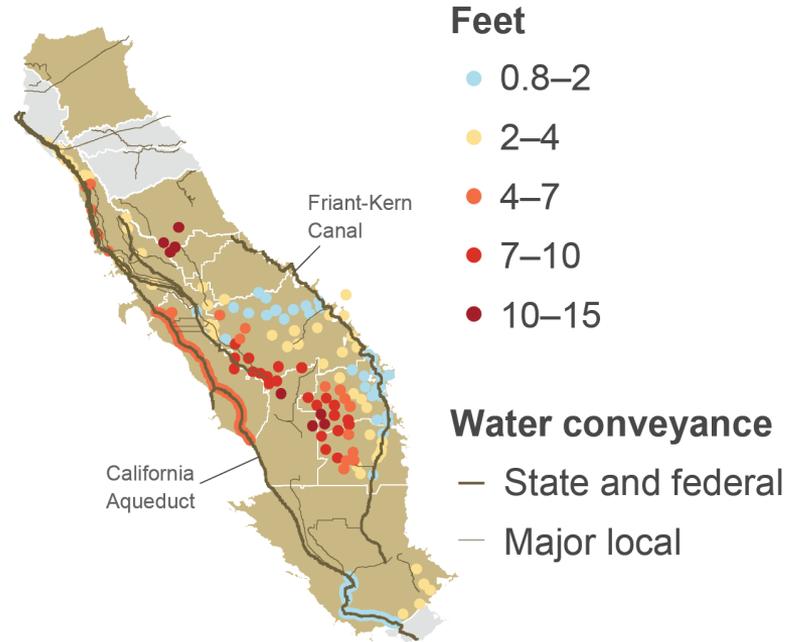
[Bostic et al. \(2020\)](#), [Water Foundation \(2020\)](#) estimate that thousands of wells could go dry.

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:

Groundwater: Ellen Hanak (hanak@ppic.org; 415-291-4433)

Forests: Henry McCann (mccann@ppic.org; 415-4409)

Thank you for your interest in this work.