Sustainably Managing California's Groundwater in the Midst of Prolonged Drought

RNRF Virtual Roundtable—June 9, 2021

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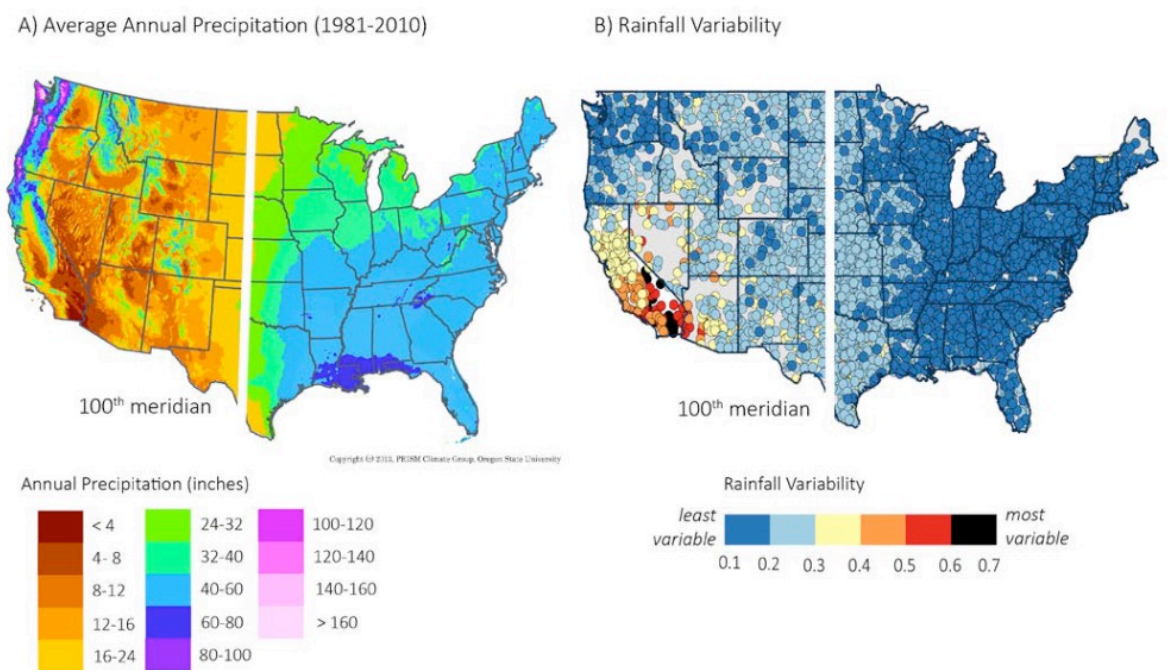
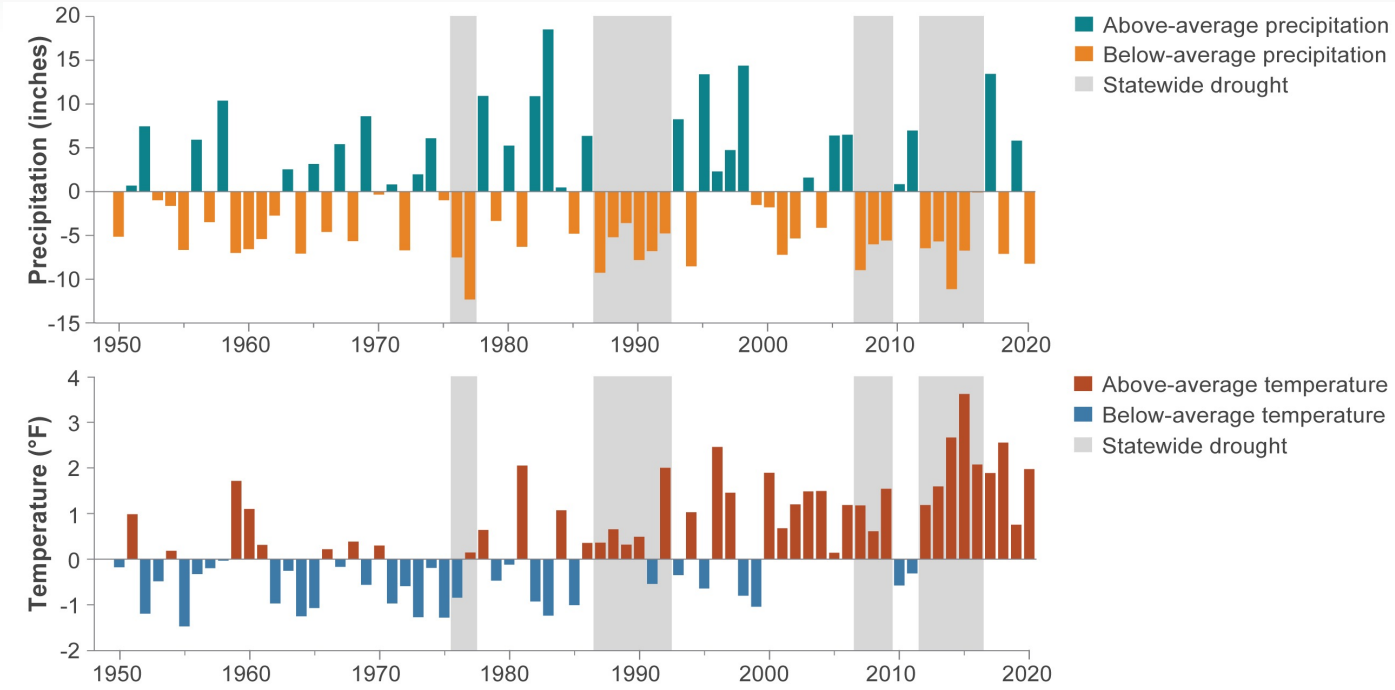
Precipitation in the West is lower and more variable—California's variability is off the charts



Source: Escriva-Bou et al. (2016) using data from Oregon State (A) & Mike Dettinger (2011) (B)

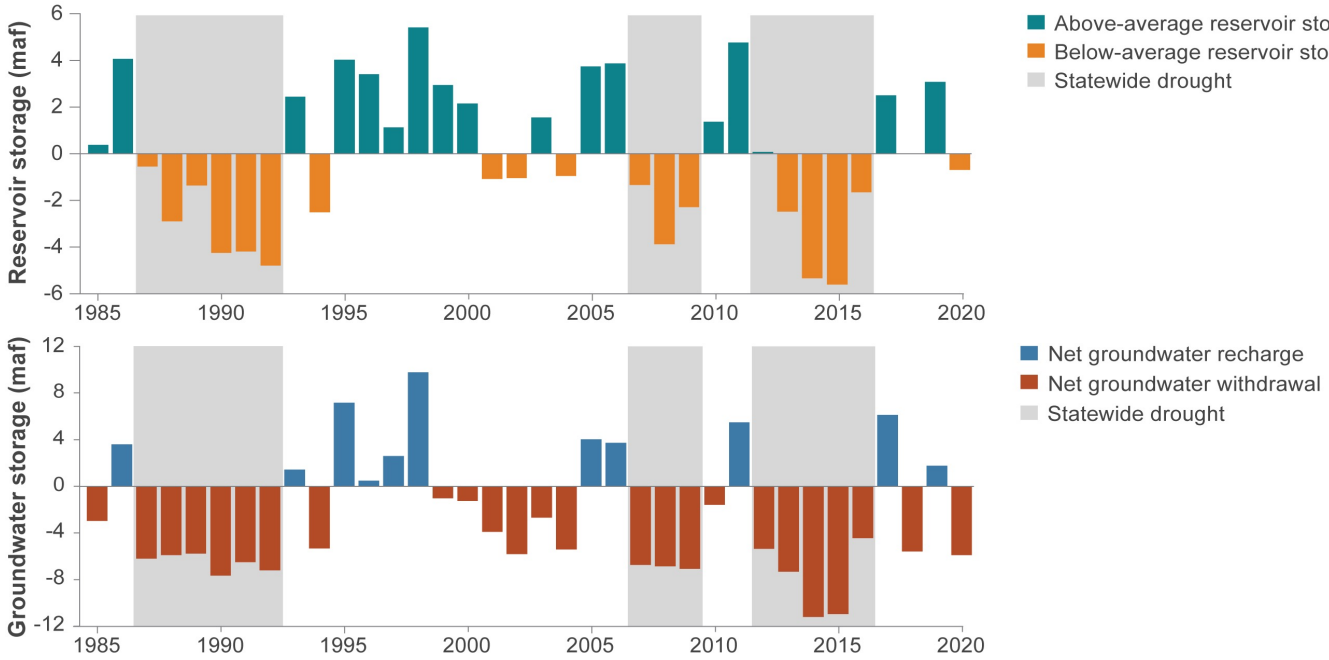
Droughts are a recurring feature of California's climate, but warming is making them worse



Source: Mount et al. *Droughts in California* (PPIC 2021)

Water storage is key to managing droughts, but unsustainable use has depleted groundwater

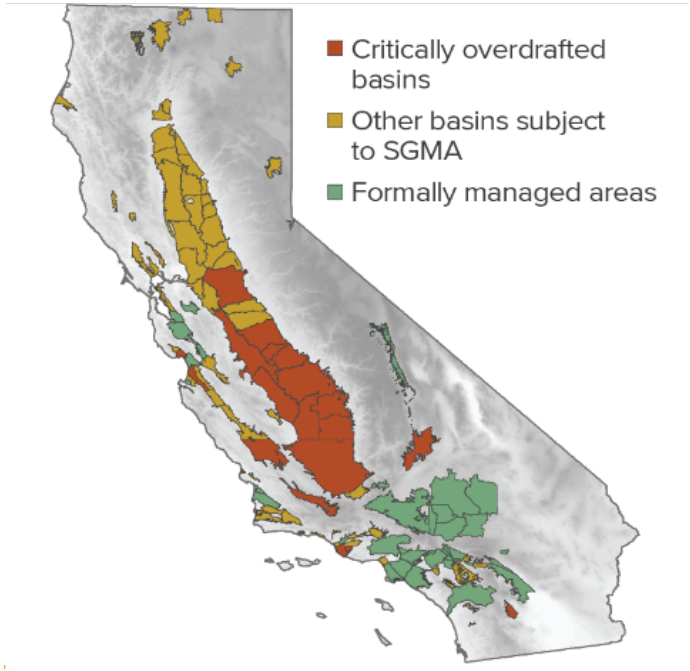
California's Central Valley—changes in water storage



Source: Mount et al. *Droughts in California* (PPIC 2021)

California's 2014 Sustainable Groundwater Management Act (SGMA)

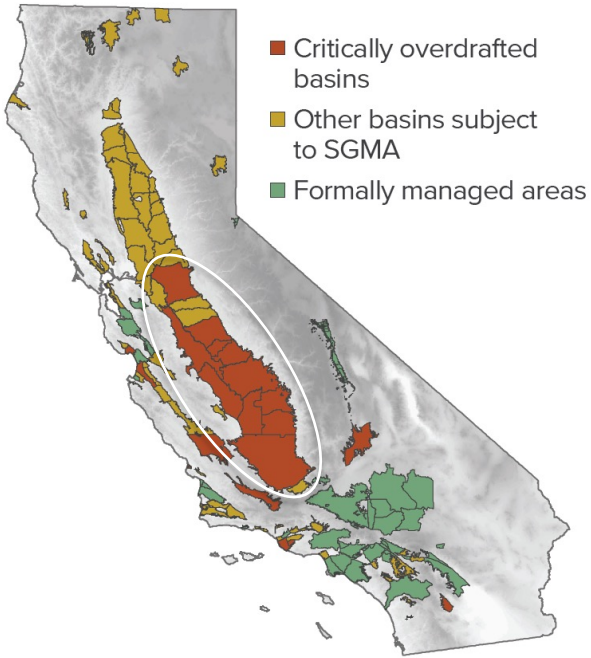
Main groundwater basins



- Local responsibility, state backstop
  - ~85 priority basins
  - > 250 sustainability agencies
- Sustainability plan deadlines: 2020/2022
  - Annual data reporting
  - Plan updates every 5 years
- Flexible timeline, with guardrails
  - 20 years to attain sustainability…
  - …as long as no significantly unreasonable, undesirable effects

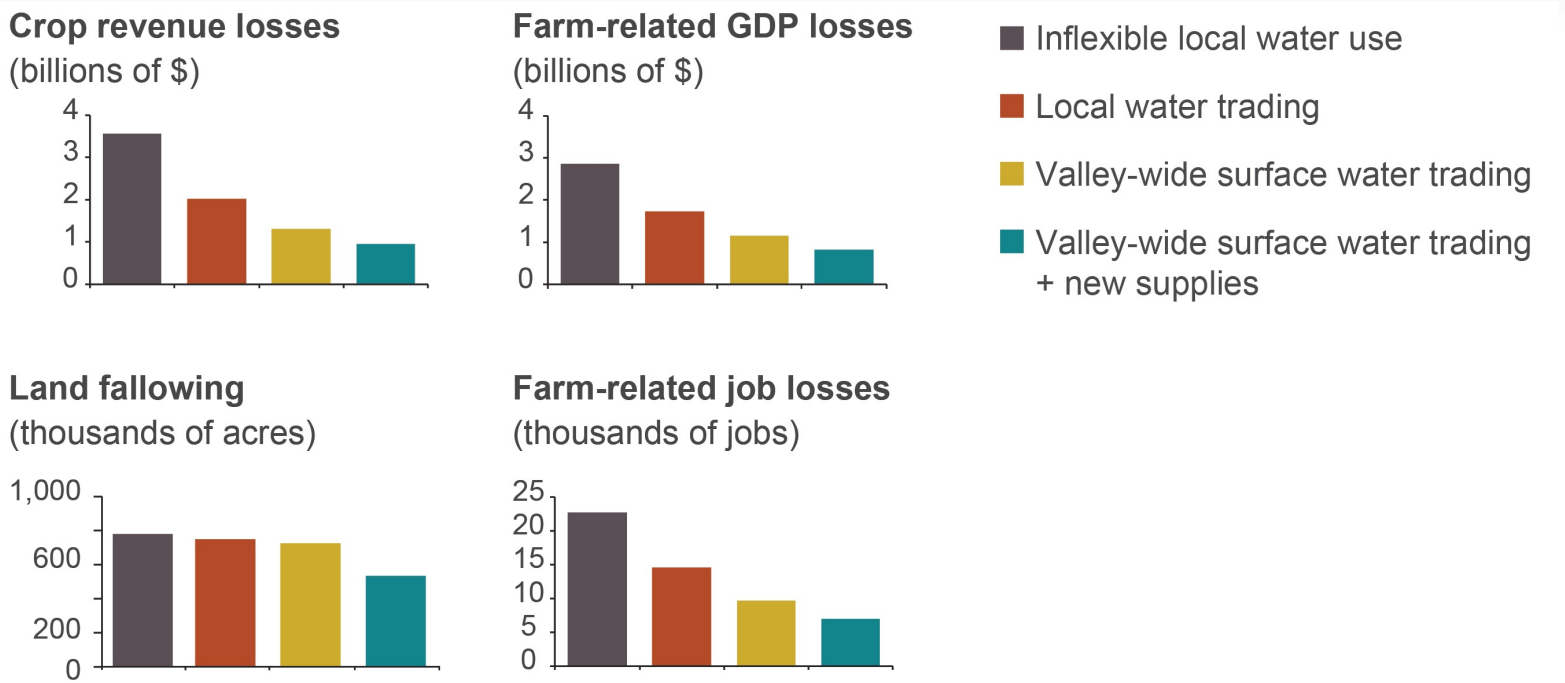
San Joaquin Valley is at ground zero for implementing SGMA

Main groundwater basins



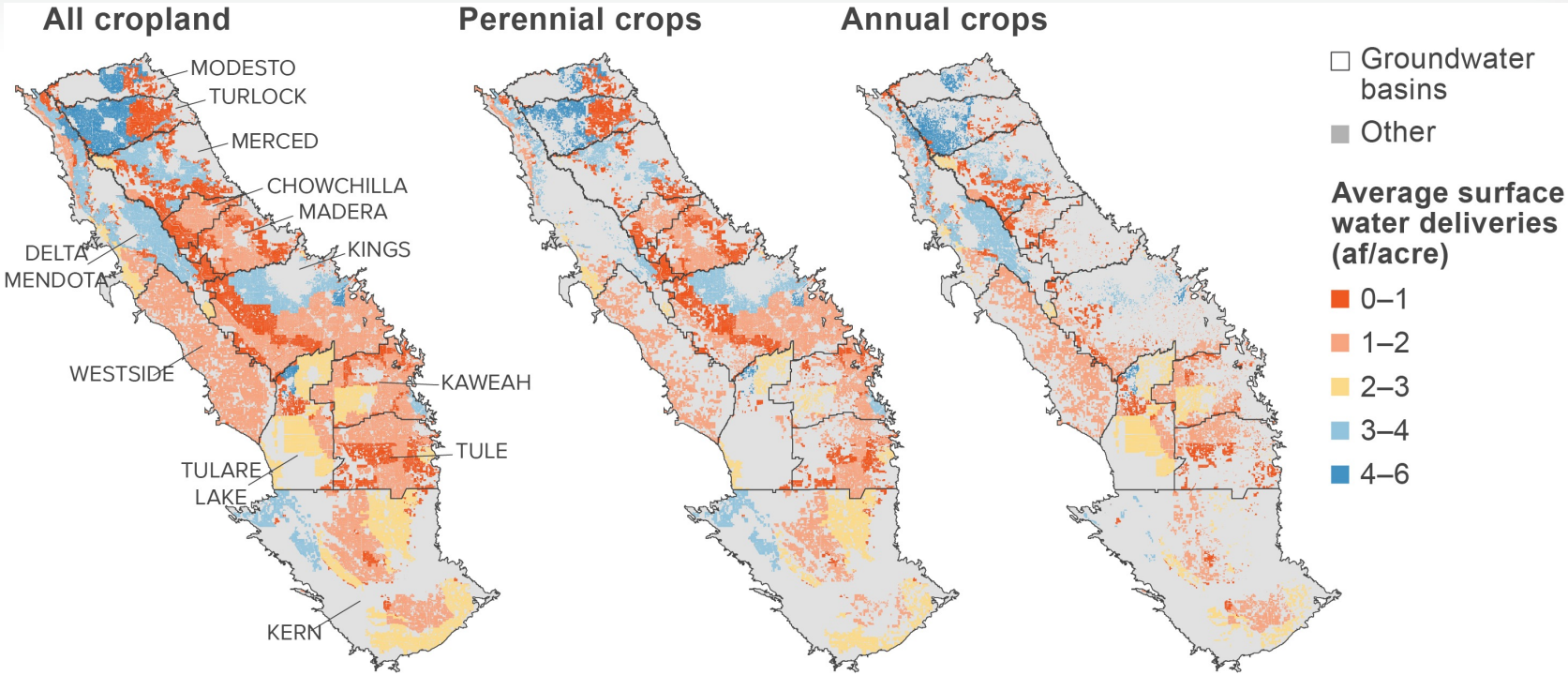
- Largest ag region: >50% of CA output
- Biggest imbalance: ~2 M acre-feet/yr overdraft; 11% of net water use
- Consequences: dry wells, sinking lands, reduced supplies for droughts
- Tightest timelines: plans in January 2020
- The groundwater math problem: attaining balance means more supply, less water use, or both
- The economics problem: some solutions are more costly than others

Flexibility is key for managing farm water demand, and new supplies can reduce land fallowing



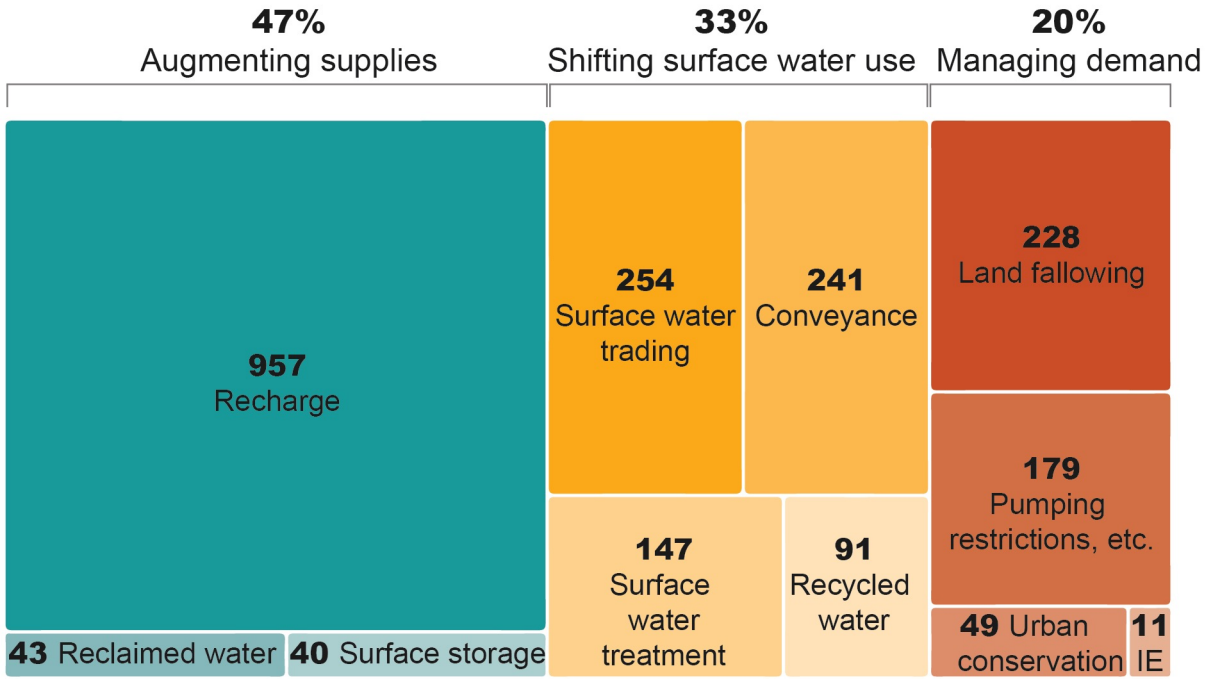
Source: Hanak et al. *A Review of Groundwater Sustainability Plans in the SJ Valley: Public Comments to DWR* (PPIC, 2020)

Variable surface water access highlights need for local and regional cooperation



Jezdimirovic et al. (PPIC Blog, April 21, 2020)

Plans emphasize recharge, have limited focus on demand management



Total amount: **2,241 taf/y**

Source: Hanak et al. *A Review of Groundwater Sustainability Plans in the SJ Valley: Public Comments to DWR* (PPIC, 2020)

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

Reduction of
storage

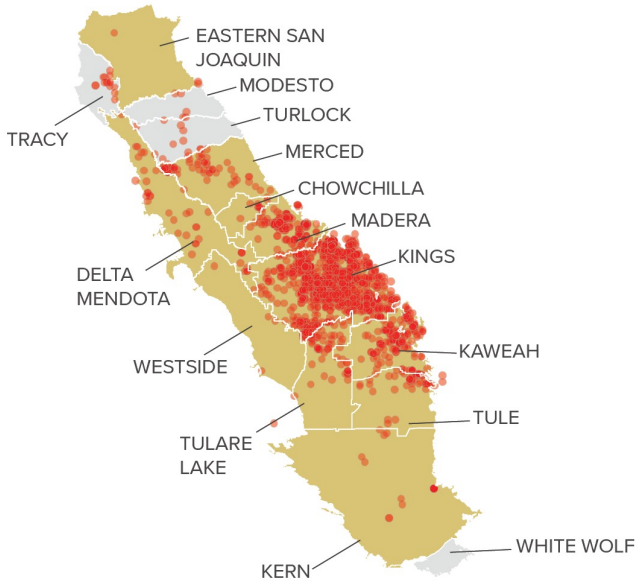
Seawater
intrusion

Surface water
depletion

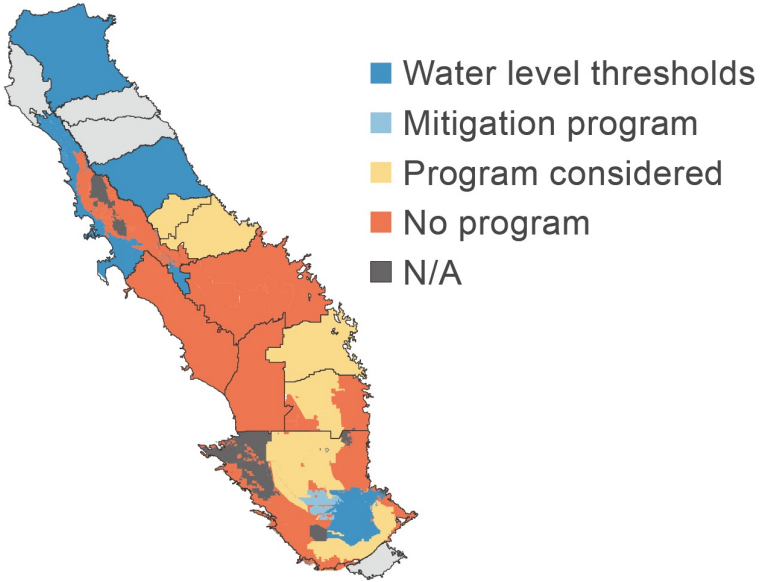
Degraded
quality

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

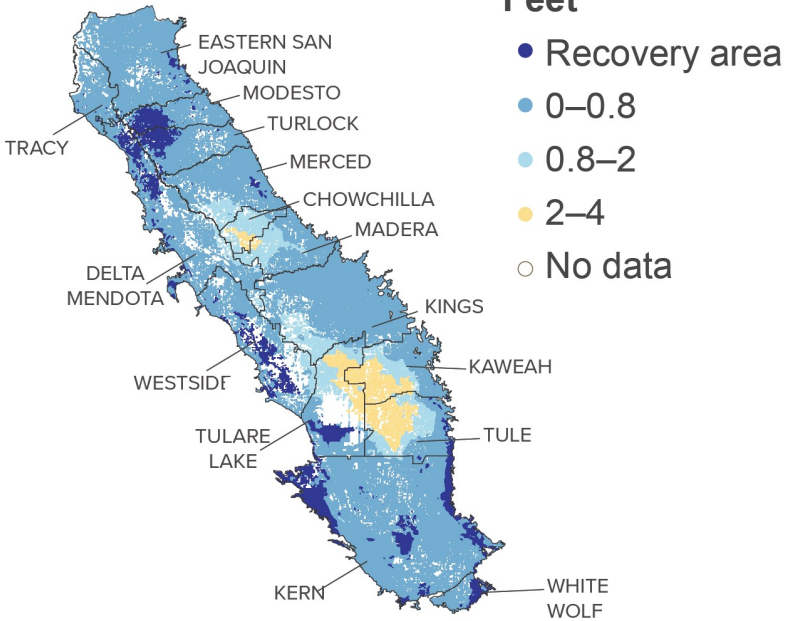


Source: Jezdimirovic et al. (PPIC Blog, May 14, 2020)

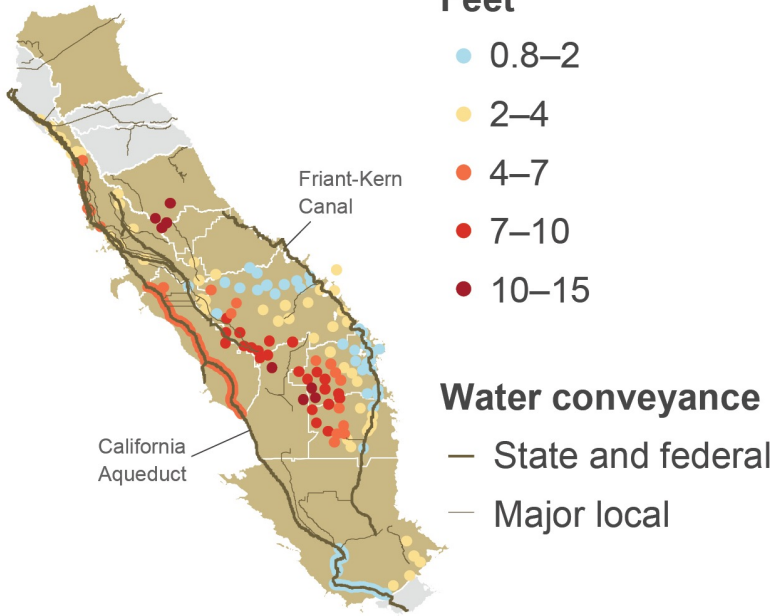
[Bostic et al. (2020)], [Water Foundation (2020)] estimate that thousands of wells could go dry.

Many plans allow for significant subsidence to continue

A) Total subsidence (2015–19)



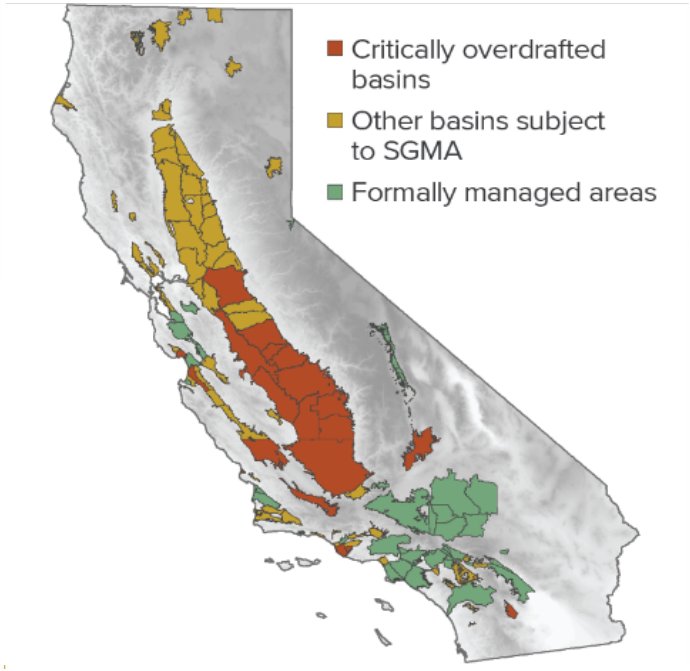
B) Maximum allowed subsidence by 2040



Source: Escriva-Bou et al. (PPIC Blog, May 14, 2020)

Many other basins will face major challenges in avoiding impacts to surface water, ecosystems

Main groundwater basins



- SGMA innovation: formally connects groundwater and surface water law
- In *less* overdrafted basins, rivers and groundwater basins still have tight connections
- This can mean *less* pumping flexibility during droughts than in overdrafted basins

We’re back in a severe drought—which will make the balancing act even harder

April 1, 2015 Sierra snowpack measurement

April 21, 2021 Lake Mendocino basin

Drinking water impacts for rural communities will escalate as more farmers turn to groundwater

Wells impacted in the Central Valley by fall 2021

Wells impacted in the Central Valley by fall 2022 if drought persists

Source: Escriva-Bou & Pauloo (CalMatters, June 9, 2021)

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

- Address undesirable results of groundwater overdraft
- Develop strong water accounting frameworks
- Assess smart infrastructure investments
- Launch broad-based planning for both water and land
- Pilot innovative approaches to trading, recharge, land stewardship

➔Efficient, equitable solutions require more cooperation, both within and across basins

➔State, feds can help with financial & regulatory incentives

Additional PPIC resources (ppic.org/water/)

- "Droughts in California" (fact sheet, April 2021)
- "California's Latest Drought in 4 Charts" (PPIC blog, May 2021)
- "A Review of Groundwater Sustainability Plans in the San Joaquin Valley" (blog series and public comments submitted to DWR May 2020)
- "Water and the Future of the SJ Valley" (report, Feb 2019)
- "Managing Drought in a Changing Climate" (report, Sept. 2018)
- "Replenishing Groundwater in the SJ Valley" (report, April 2018)

Thank you

Notes on the use of 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.