

# How water management agreements are likely to impact agriculture in California and beyond

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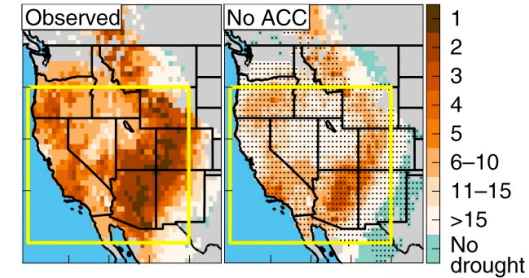


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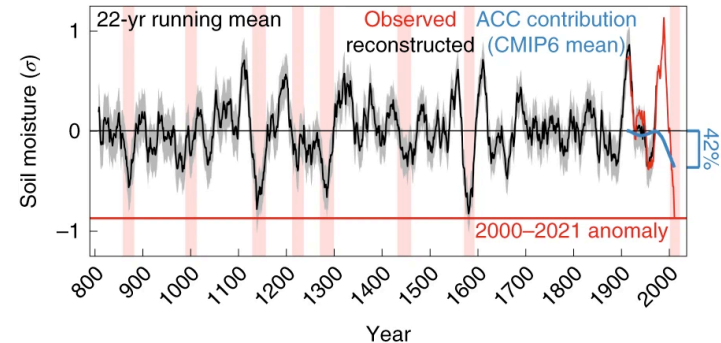
# The Western US is facing an unprecedented water crisis

- Competing demands are increasing water conflicts
  - Population growth increases water needs for cities and food production
  - Degraded ecosystems also need more water
- Climate change intensifies droughts and floods

2000-2021 Drought Rank

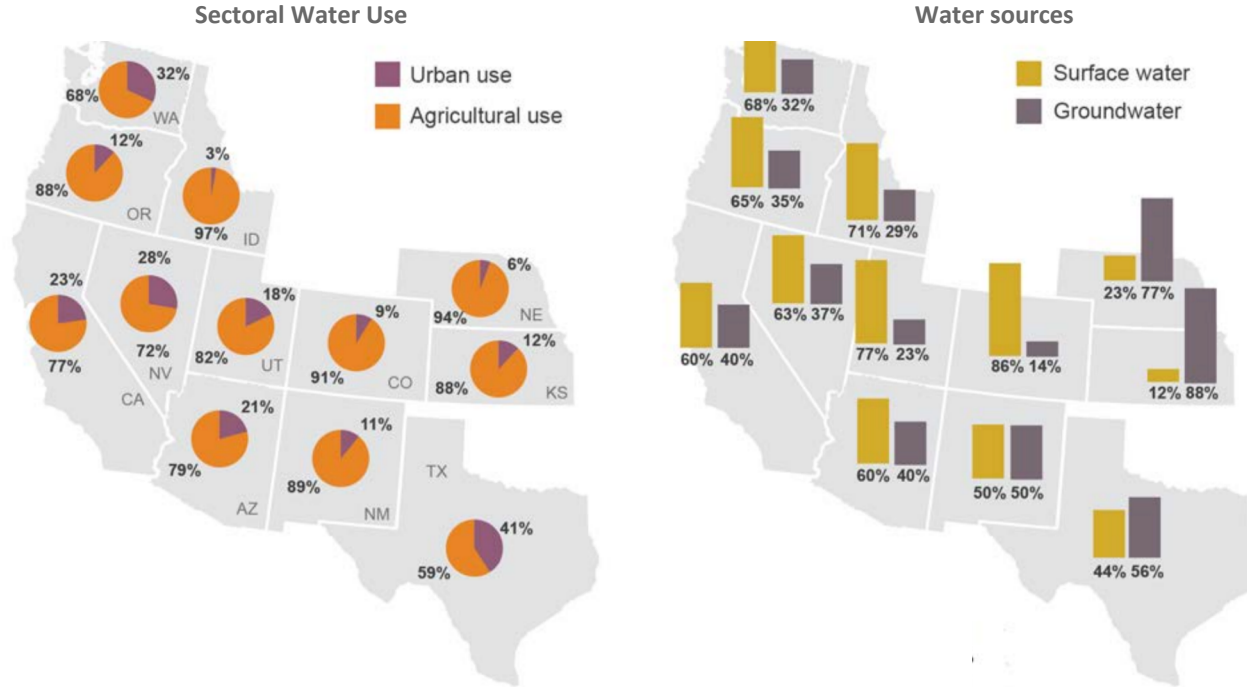


Reconstructed Soil Moisture and Anthropogenic Effect



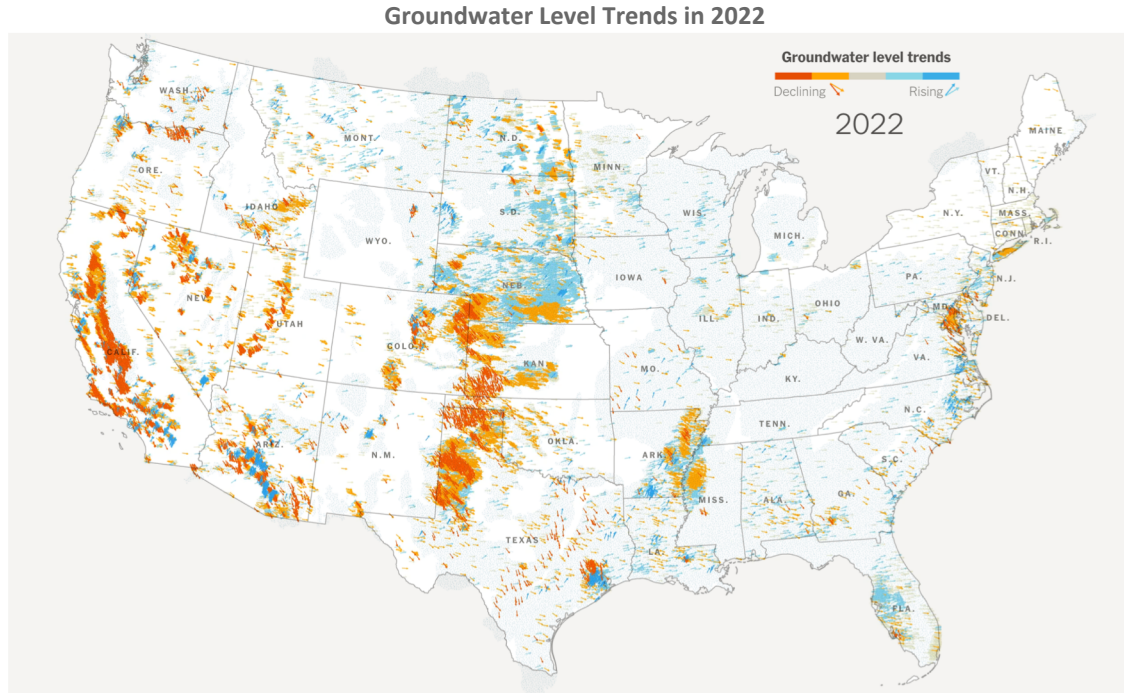
**Source:** Williams et al. (2022). Rapid intensification of the emerging southwestern North American megadrought in 2020–2021

# As a major water user, agriculture is highly vulnerable



Source: Escriva-Bou et al. (2016). Accounting for California's Water

# Groundwater is being depleted like never before



Source: New York Times (2023). America Is Using Up Its Groundwater Like There's No Tomorrow.  
Data from GebreEgziabher, Jasechko and Perrone, Nature Communications (2022)



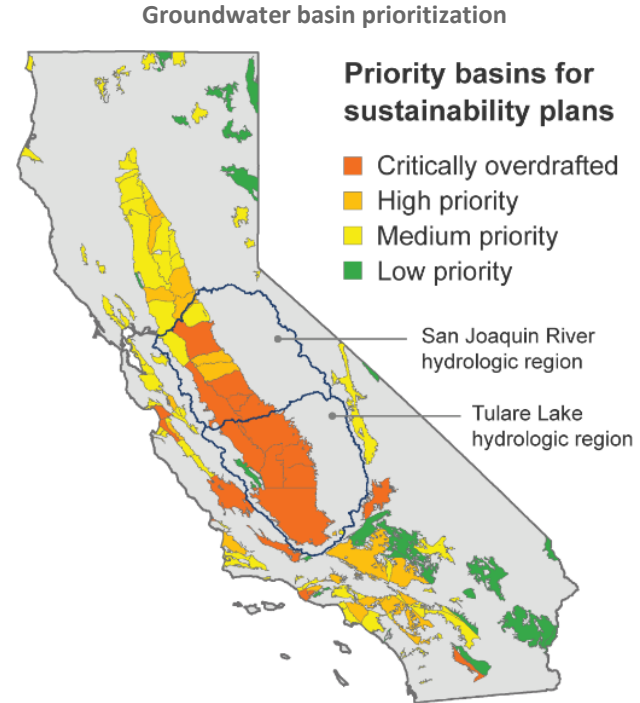
# Although there are important challenges, agriculture will still thrive in the Western US

- Embrace the challenges
  - A reduction in water availability will translate in a reduction in farmland
- Define successful transition pathways
  - Water trading
  - Water partnerships
  - Land repurposing



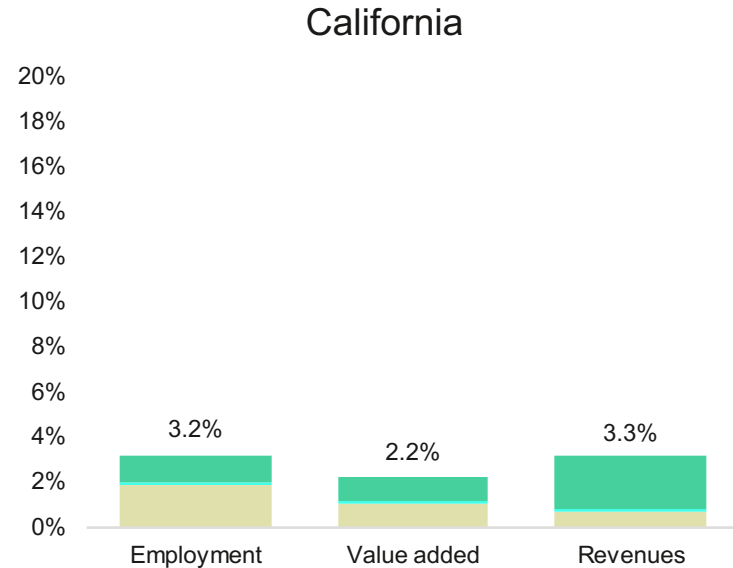
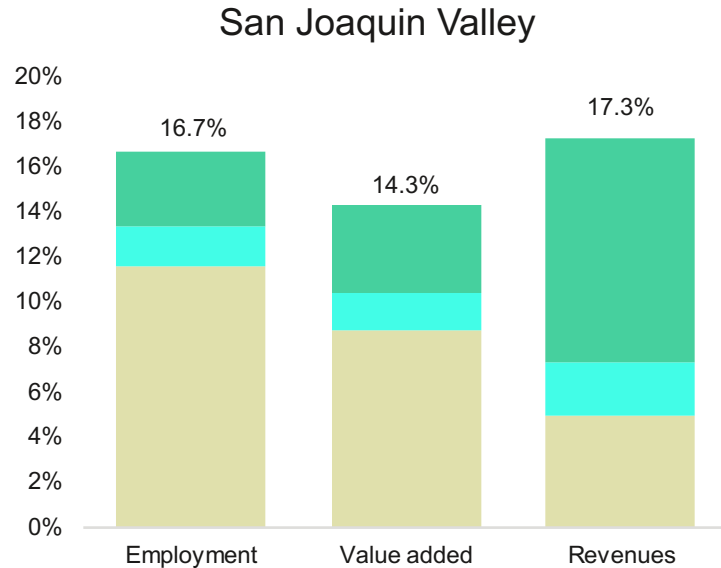
# The San Joaquin Valley is at a pivotal moment

- > 50% of California's agricultural output
  - Fresno, Kern and Tulare Counties are the nation's top three agricultural counties
- The valley is ground zero for implementing the Sustainable Groundwater Management Act (SGMA)
  - All basins must achieve sustainability by 2040



Source: Hanak et al. (2017). Water stress and a changing San Joaquin Valley

# Agriculture is a key driver of the San Joaquin Valley's economy

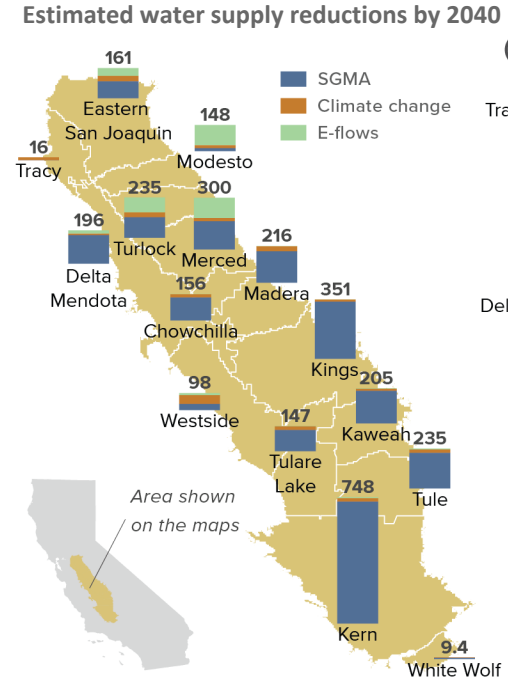


■ Crop production ■ Dairy and beef products ■ Processing industries

Source: Escriva-Bou et al. (2023). The Future of Agriculture in the San Joaquin Valley

# Water challenges loom over California's San Joaquin Valley

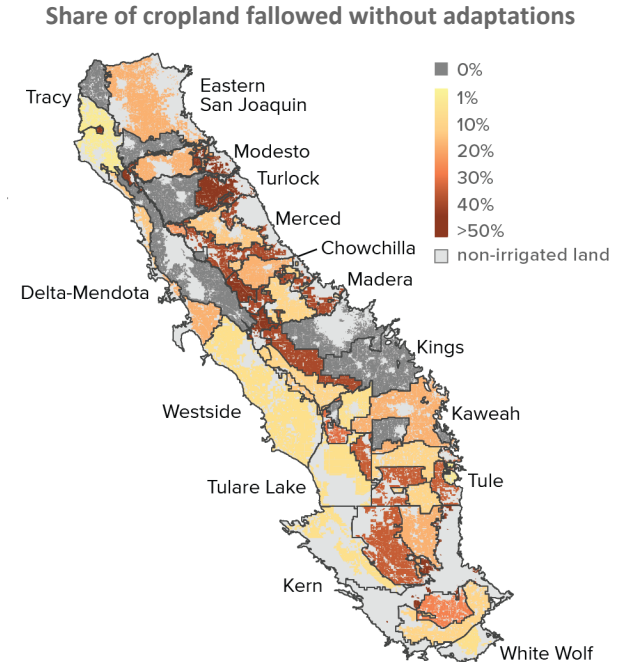
- By 2040, average annual water supplies could decline by 20% (3.2 maf)



Source: Escriva-Bou et al. (2023). The Future of Agriculture in the San Joaquin Valley

# Water challenges loom over California's San Joaquin Valley

- By 2040, average annual water supplies could decline by 20% (3.2 maf)
- Without adaptations:
  - ~900,000 acres of lands fallowed, ~50,000 jobs lost, and a 2.3% decline in GDP

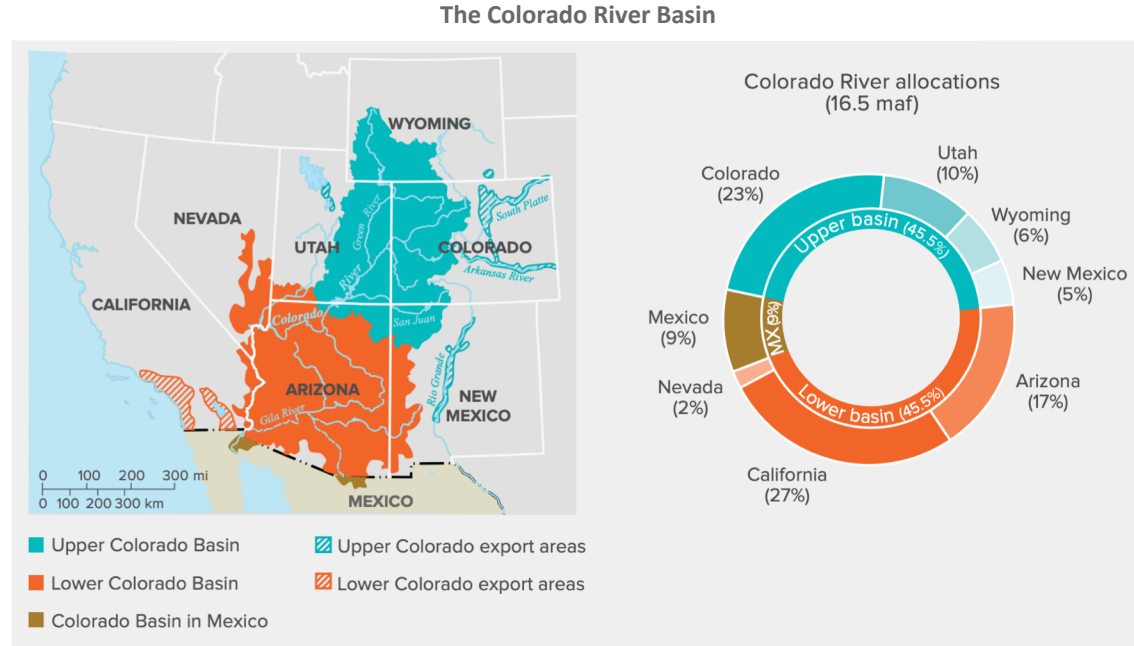


Source: Escriva-Bou et al. (2023). The Future of Agriculture in the San Joaquin Valley



# The water problem in the Colorado basin is similar

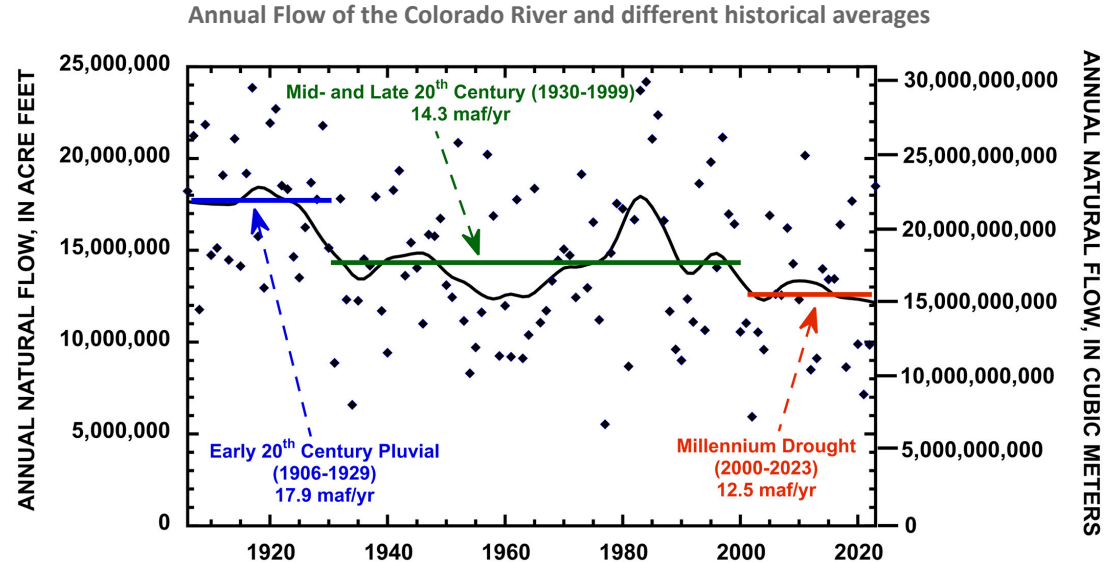
- It provides water to 7 states and Mexico



Source: PPIC (2018). The Colorado River.

# The water problem in the Colorado basin is similar

- It provides water to 7 states and Mexico
- Allocations are based on outdated hydrological assumptions
- Current allocations exceed supplies in 2-3 maf/year
  - ~13-20% of total supplies

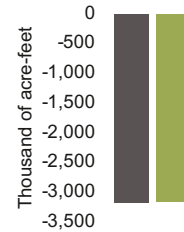


Source: Schmidt et al. (2023). The Colorado River water crisis: Its origin and the future

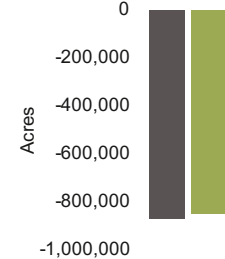
# Water trading and supply strategies can soften the impacts of water stress

- Water trading would significantly reduce economic losses

**Reductions in applied water**  
(Thousands of acre-feet)



**Land fallowing**  
(Thousands of acres)

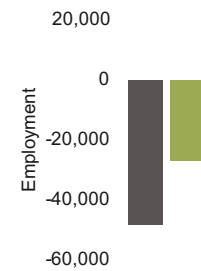


**Scenario**  
■ SGMA + CC+ E-flows  
■ Valley trading

**Agricultural GDP losses**  
(Billions of \$)



**Agricultural job losses**  
(Thousands)

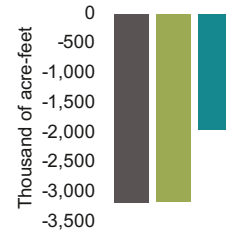


Source: Escrivá-Bou et al. (2023). The Future of Agriculture in the San Joaquin Valley

# Water trading and supply strategies can soften the impacts of water stress

- Water trading would significantly reduce economic losses
- New supplies would reduce fallowing and mitigate losses

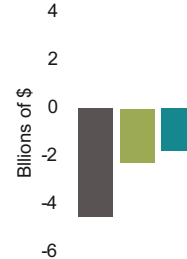
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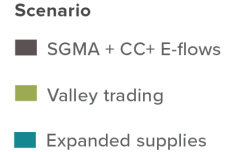
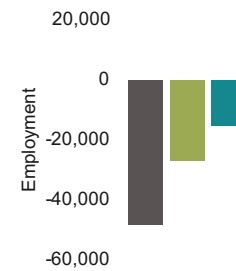
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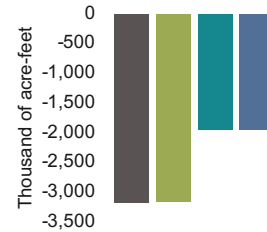


Source: Escrivá-Bou et al. (2023). The Future of Agriculture in the San Joaquin Valley

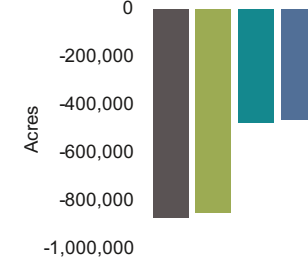
# Water trading and supply strategies can soften the impacts of water stress

- Water trading would significantly reduce economic losses
- New supplies would reduce fallowing and mitigate losses
- Productivity growth could raise farm output above today's levels

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(Thousands of acre-feet)



**Land fallowing**  
(Thousands of acres)



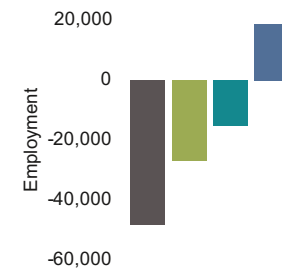
**Scenario**

- SGMA + CC+ E-flows
- Valley trading
- Expanded supplies
- Increased productivity

**Agricultural GDP losses**  
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**Agricultural job losses**  
(Thousands)



Source: Escrivá-Bou et al. (2023). The Future of Agriculture in the San Joaquin Valley



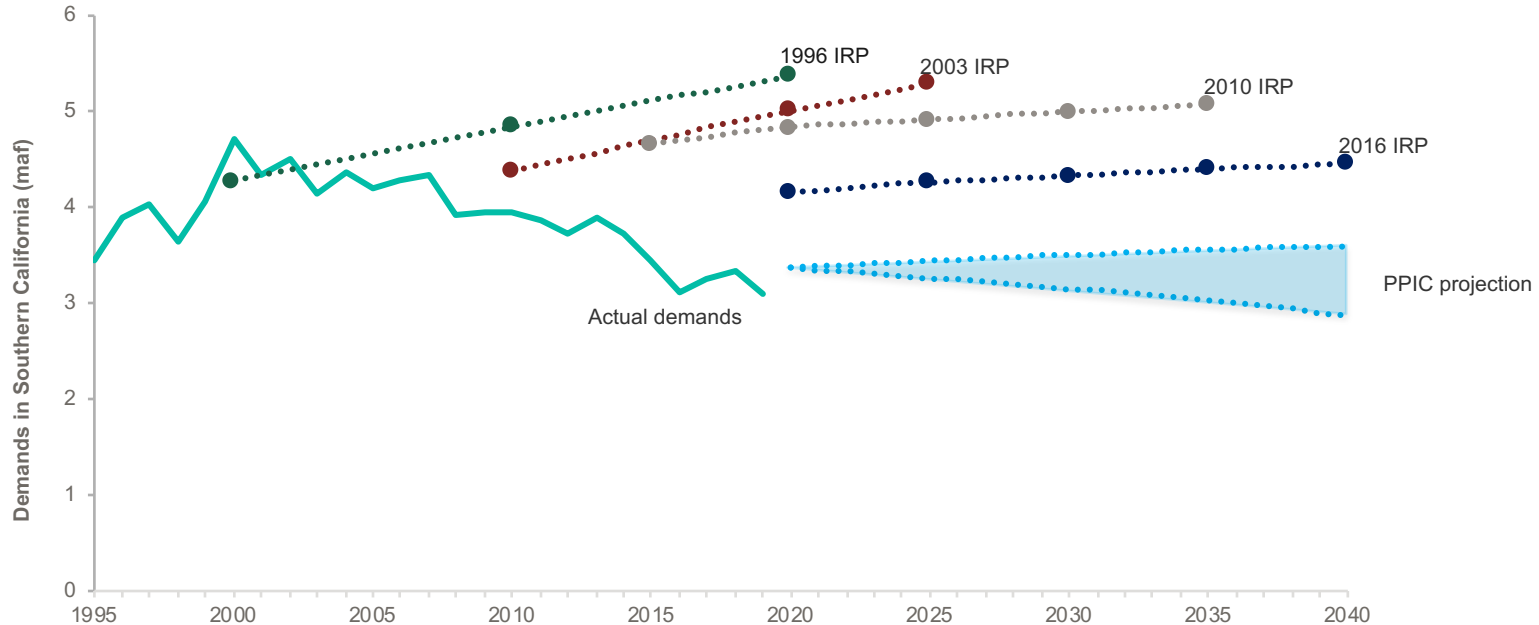
# Water partnerships and expansion of supply infrastructure options

- Partnerships can increase resilience for farms and cities:
  - Increase overall supplies for farms to address supply constraints
  - Build urban resilience during droughts
- Connecting infrastructure and water sharing agreements are key to promote these options



The State Water Project connects the San Joaquin Valley and Southern California. Photo: DWR

# Regional water demands and demand projections have been falling in Southern California



Source: Escrivá-Bou et al. (2020). Water Partnerships between Cities and Farms in Southern California and the San Joaquin Valley

# There is a window of opportunity for partnerships between Southern California and San Joaquin Valley

The SWP is the key link between coastal cities and San Joaquin Valley farms

- Two major shifts:
  - Agriculture: SGMA heightens interest in expanding supplies, underground storage
  - Urban areas: Demand reductions reduce supply pressures during normal/wet years. Droughts now major concern
- State Water Project infrastructure facilitates partnerships

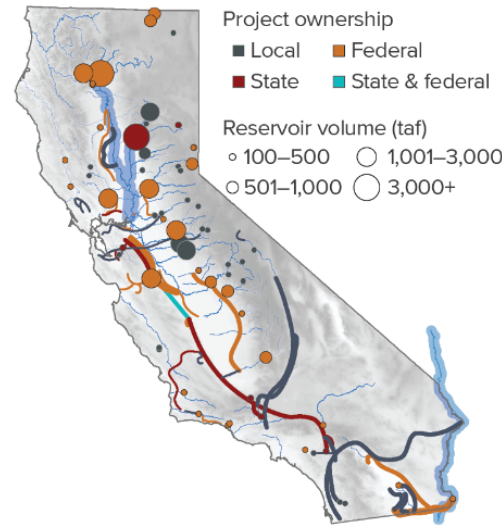


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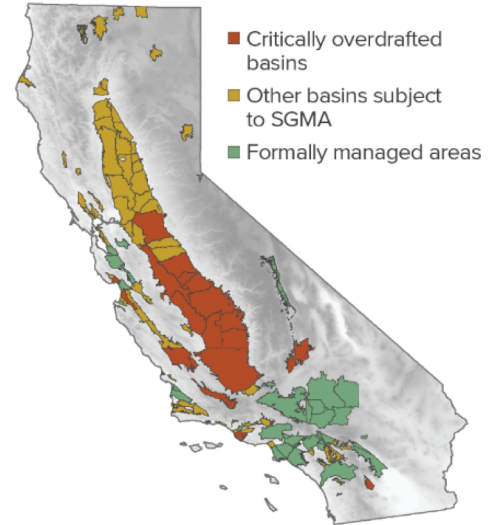
# Existing partnerships use the water grid to manage droughts, scarcity, infrastructure costs

- Underground storage in southern SJ Valley
- Long-term transfers of dry-year water from Yuba River
- Various Colorado River trading and storage partnerships
- Interstate partnerships

Main above-ground storage and conveyance



Main groundwater basins



# What types of partnerships are possible?

- **Co-investments**
  - Farmers invest in alternative water supplies, conservation in cities
  - Urban agencies expand investments in water storage, conveyance in ag regions
- **Unbalanced exchanges**
  - Farmers get a more water in normal/wet years in return for supplying some water during droughts
- **Mixed strategies**
  - Co-investments + unbalanced exchanges
- **Opportunities related to future urban growth**
  - Cities invests in long-term supplies, with near-term transfers to ag



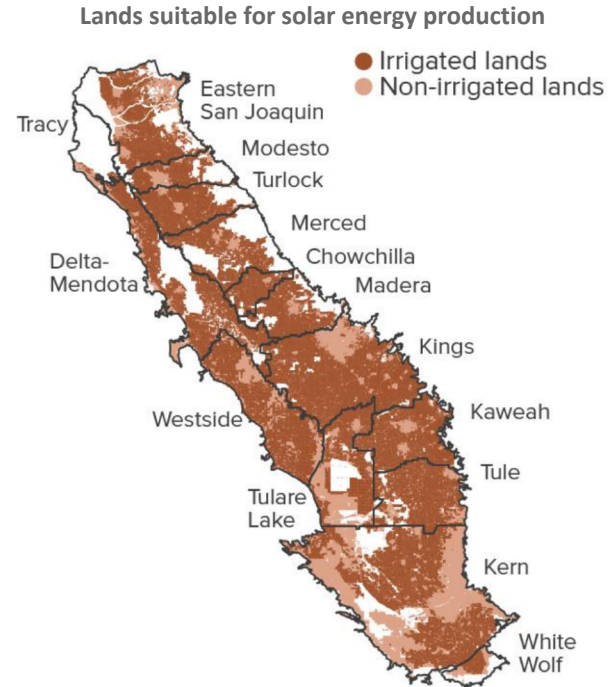
# Managing water and land transitions

- There are some options for keeping lands productive with less water
- Providing economic alternative to farmers can align water and land policies
- Reduce negative impacts of fallow lands



# Keeping land productive will require innovation and investment

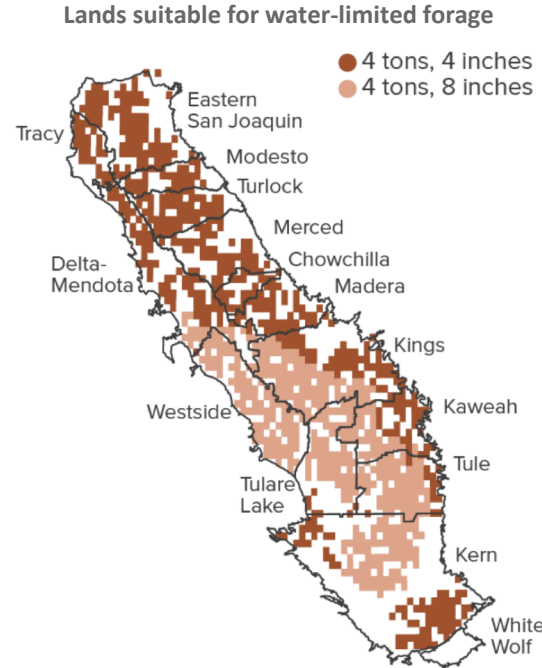
- Solar is promising (135–215K acres in the valley), but transmission is a bottleneck



Source: Ayres et al. (2023). Managing Water and Farmland Transitions in the San Joaquin Valley

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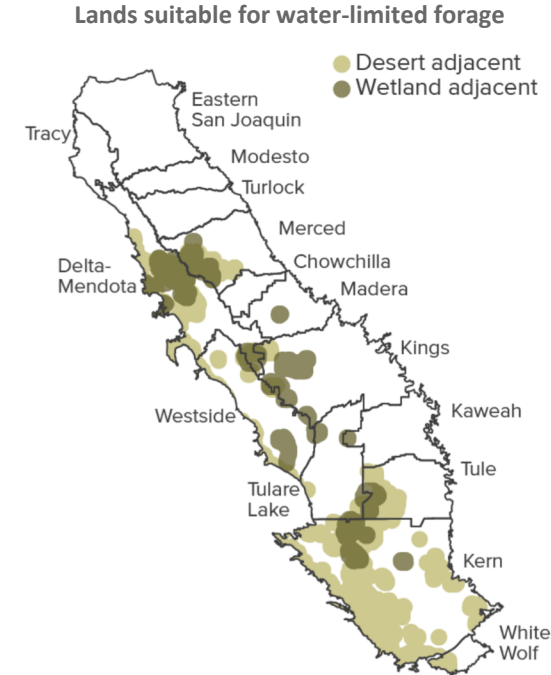
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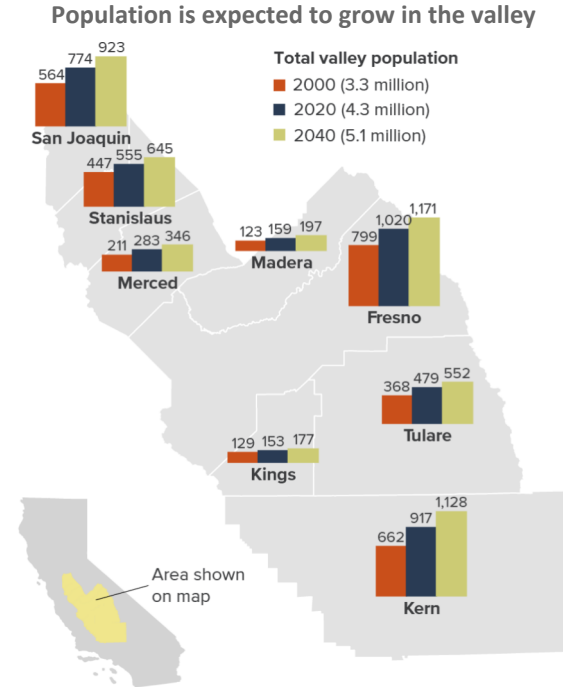
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- Recharge basins can be managed for multiple benefits





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- Much of the valley floor is suitable for forage with supplemental irrigation
- Public investments in habitat could mitigate historical habitat loss
- Recharge basins can be managed for multiple benefits
- New developments could bring revenues and save water



Source: Ayres et al. (2023). Managing Water and Farmland Transitions in the San Joaquin Valley

# Embracing the challenges and planning for successful transitions pathways is key for the future of ag

- Assess the water constraints and define realistic plans
- Innovate with new approaches:
  - Water trading
  - Water partnerships
  - Land repurposing



# Effective and equitable solutions will require cooperative approaches

- Planning
  - Strengthen coordination across basins and sectors
- Flexible regulatory approaches
  - Promote effective and responsible water trading
- Make strategic water, land and energy infrastructure investments
- Provide local, state, federal financial incentives
  - Align regulatory and fiscal incentives



# Thank you!

Don't hesitate to send me an email if you have any questions, comments or suggestions

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