Climate Impacts and Promising Adaptations for California Farms

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The State of Agricultural Production in California

Joint Informational Hearing of the Senate and Assembly Committees on Agriculture

Sacramento, California, August 4th, 2026

UCMERCED | VISTA Valley Institute for Sustainability, Technology & Agriculture | UCDAVIS | cdfa California Department of Food & Agriculture | PPIC Public Policy Institute of California | UC MERCED Water Systems Management Lab

Climate Extremes and Regulation Constrain Water Supplies and Growing Conditions for California

SGMA responds to decades of overdraft and gives growers certainty — the state is investing to close a gap that widens through 2100.



Warming, less snowpack

–10% by 2040 / –50%+ snowpack by 2100
Statewide supply and snowpack decline, mid- to end-century



+9 MAF by 2040

New Supply target set in law SB 72, 2025



27% of Water, 5% Revenue

Feed crops may carry outsized water risks and are often overlooked

2030 targets: 800 TAF recycled water, 500 TAF recharge, 4 MAF storage — partly funded by Prop 4 (2024).

Sources: CA Water Supply Strategy 2022; SGMA; SB 72; PPIC

Turning Storms into Supply, at a Basin Scale

- **Forecast Informed Reservoir Operations (FIRO)**
  - Better storm forecasting to safely capture more water without compromising flood protection
  - Piloted at Lake Mendocino
- **Managed Aquifer Recharge**
  - Banking storm water underground
  - DWR-funded basin recharge studies
- **Sizeable Economic benefits**
  - FIRO increased capacity and economic benefits. (Corringham, UCSD, forthcoming)
  - Other ongoing research of combined FIRO and MAR (SDSU-UC Davis-UC Merced)





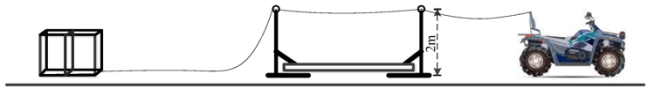


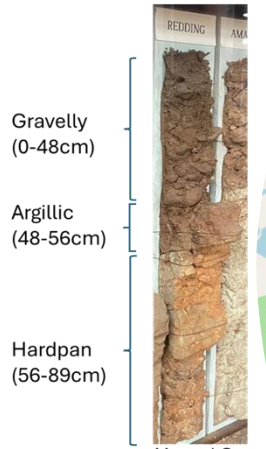
Image Credits: DWR

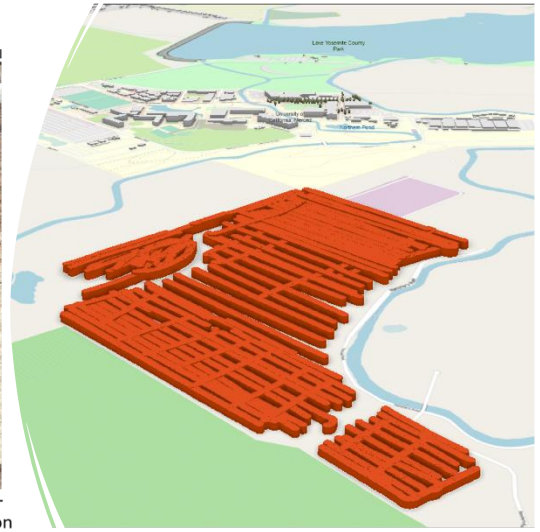
… and also at field scale: Micro-MAR

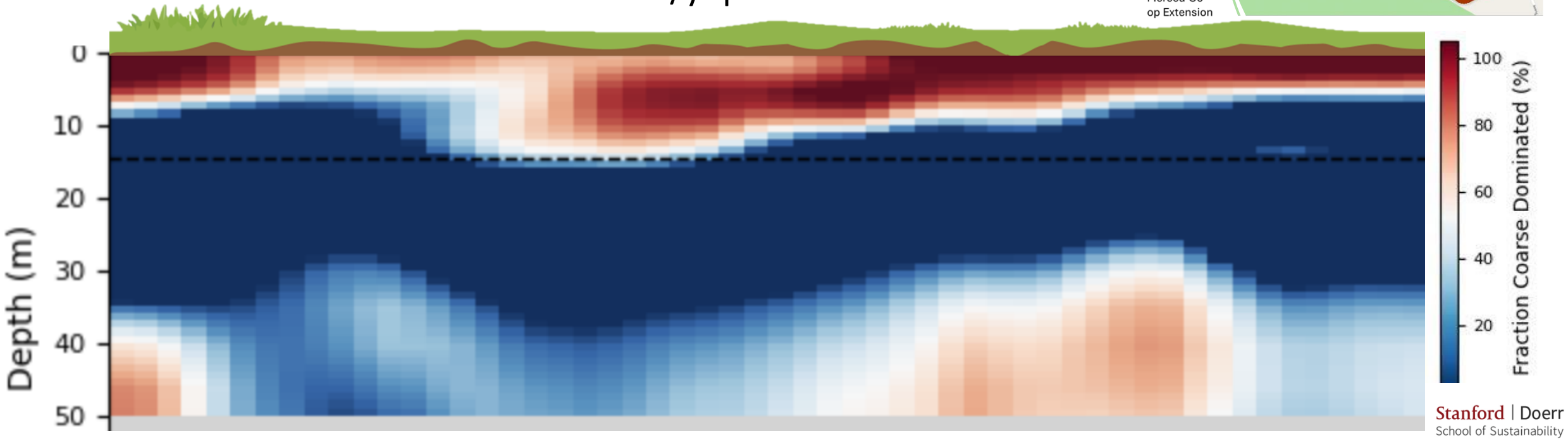
Humberto Flores-Landeros, a Ph.D. Candidate with Professor Harmon and me at UC Merced employs geophysics to find shallow storage beneath individual farms

- Experimental Farm
  - Combining Transient Electromagnetic Method and soil analysis Collaboration with Stanford Doerr
  - 1/3 acre can provide 20 AF/yr of storage
- DWR AEM flights regional coverage
- Micro-MAR Merced sub-basin 5 to 18 TAF/yr potential









Courtesy: HFL

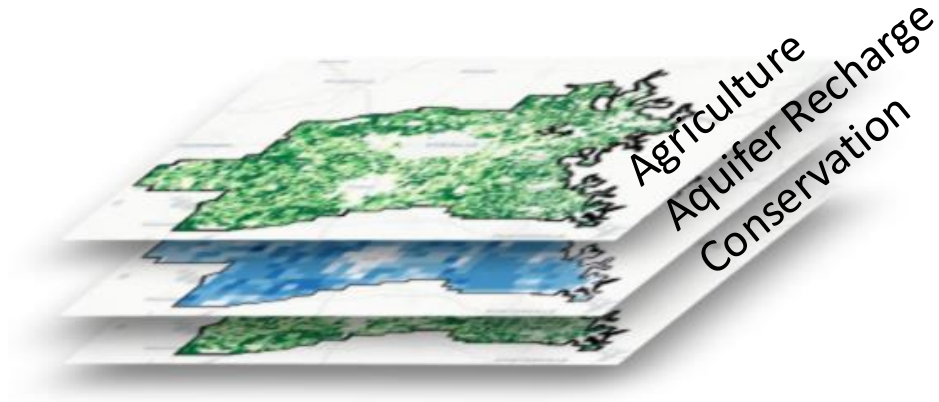
Land Repurposing — Tule & Kaweah Subbasins

A geospatial toolkit identifying which retiring land is best suited for which use.

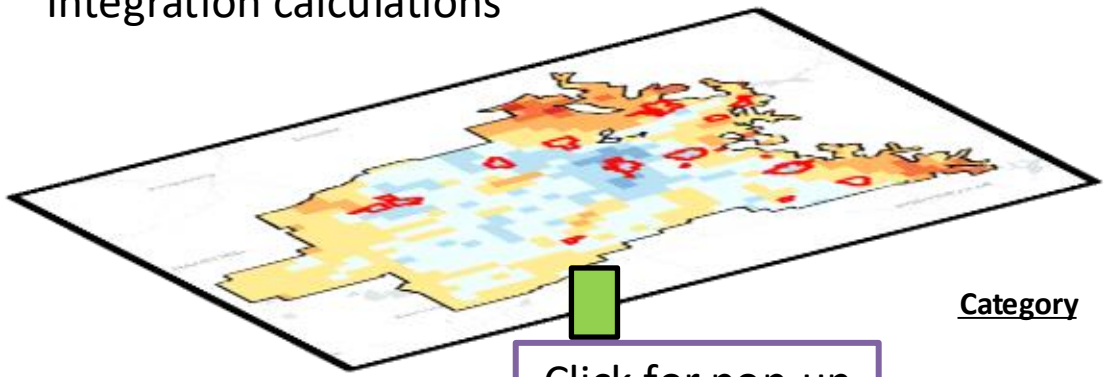
Where retiring acreage can most effectively bank water underground.

Restoring habitat while reducing local flood exposure.

Solar paired with grazing or drought-tolerant crops — not idling the land outright.



Integration calculations



Click for pop-up scorecard for each land unit

Category	MLRP Suitability
Agriculture	0.63
Recharge	0.38
Conservation	0.72

UC Merced Harmon Group

Other Water Supply Augmentation

Project Nexus (Turlock ID): "A DWR, Turlock Irrigation District, and SolarAquaGrid pilot — with UC Merced as a research partner



Agrivoltaics: Sarah **Kurtz** leads agrivoltaics field research at UC Merced's Experimental Smart Farm, testing how solar shading affects crop growth and harvest timing — part of the national InSPIRE network.



Current collaboration with Kurtz: estimating the economic case for pairing solar generation with cropland

Crop Flexibility — From Alfalfa to Agave

Maintaining current agricultural footprint by increasing irrigation flexibility and introducing drought-tolerant crops

Alfalfa — Deficit Irrigation

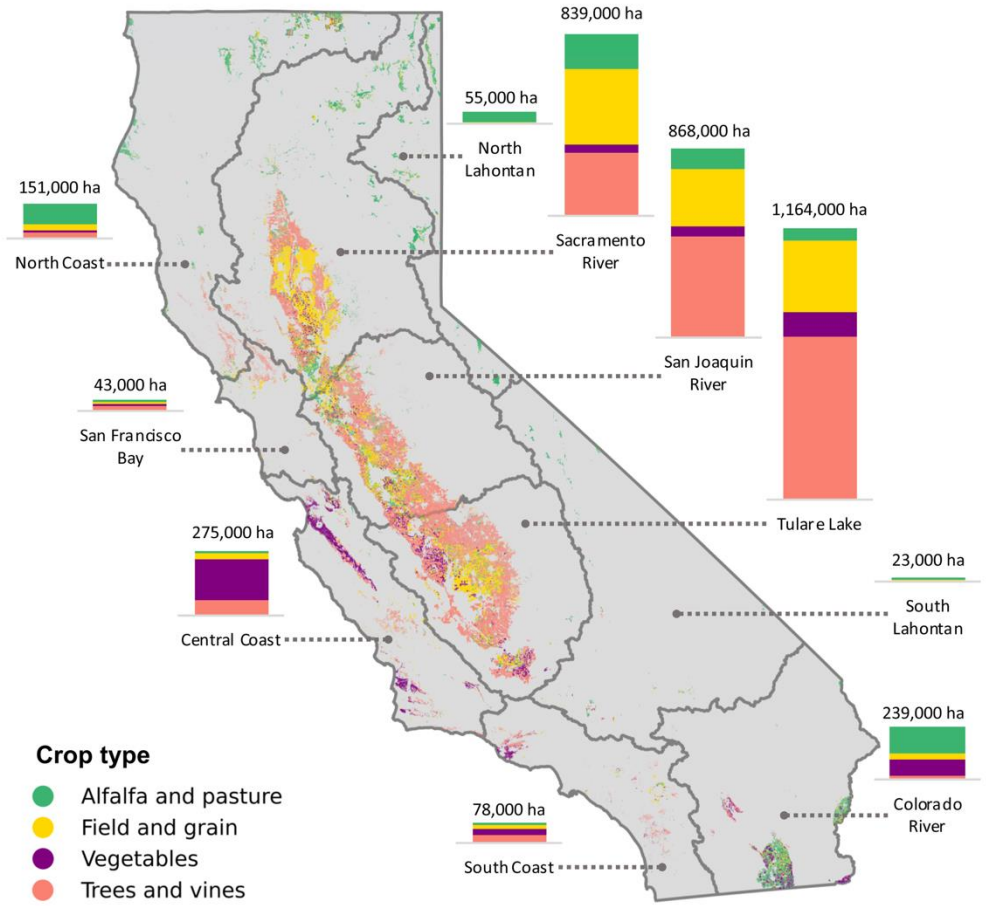
California's largest feed crop. Summer deficit irrigation (suspended after July 1) saves 16–50% of water use with minimal impact on farm revenue (Waring et al. 2025). Preliminary estimated water savings ~645 TAF/yr (Sarwar et al. in review)

Agave — Emerging Drought-Tolerant Crop

In partnership with Tecnológico de Monterrey, UC Merced's Experimental Smart Farm is piloting agave on marginal San Joaquin Valley land —with potential uses spanning sweeteners, fiber, biofuel, and nutritional products.

SGMA ready crops PPIC (Peterson et al. 2026): Crops and practices cut demand while generating revenue, improving soil health and air quality and improving rainfall capture. Winter grains and forages and desert-adapted varieties are suitable.

Better Data, Tools and Programs



Medellin-Azuara et al. 2024, PNAS

- **Data and Tools Landscape**
  - Climate Toolbox (Abatzoglou)
  - Land Use Surveys and Water Portfolios (DWR)
  - Water Rights data (eWRIMS CA Waterboards)
  - OpenET consortium
  - COEQWAL, Collaboratory for Equity in Water Allocations (Grantham, UCB)
- **Other Programs**
  - SWEEP, Statewide Water Efficiency and Enhancement Program (CDFA)
  - Healthy Soils (CDFA)
  - Drought Assessment Tools (OpenAg supported by CDFA)

POLICY IMPLICATIONS

Sustain Investment in the Full Portfolio — Every Scale, Every Front

Open data and forecasting — Climate Toolbox, OpenET, COEQWAL, and OpenAg

Recharge at every scale — basin-wide FIRO and MAR, and microscale µMAR

Land, water, and energy flexibility — repurposing, agrivoltaics, and solar-covered canals

Crop and livestock adaptation — deficit-irrigated alfalfa, agave, and other SGMA-ready crops

CDFA programs that fund the transition — SWEEP, Healthy Soils, OpenAg



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