The Future of Irrigated Agriculture: Where's the Water?

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Sustaining California Agriculture in an Uncertain Future

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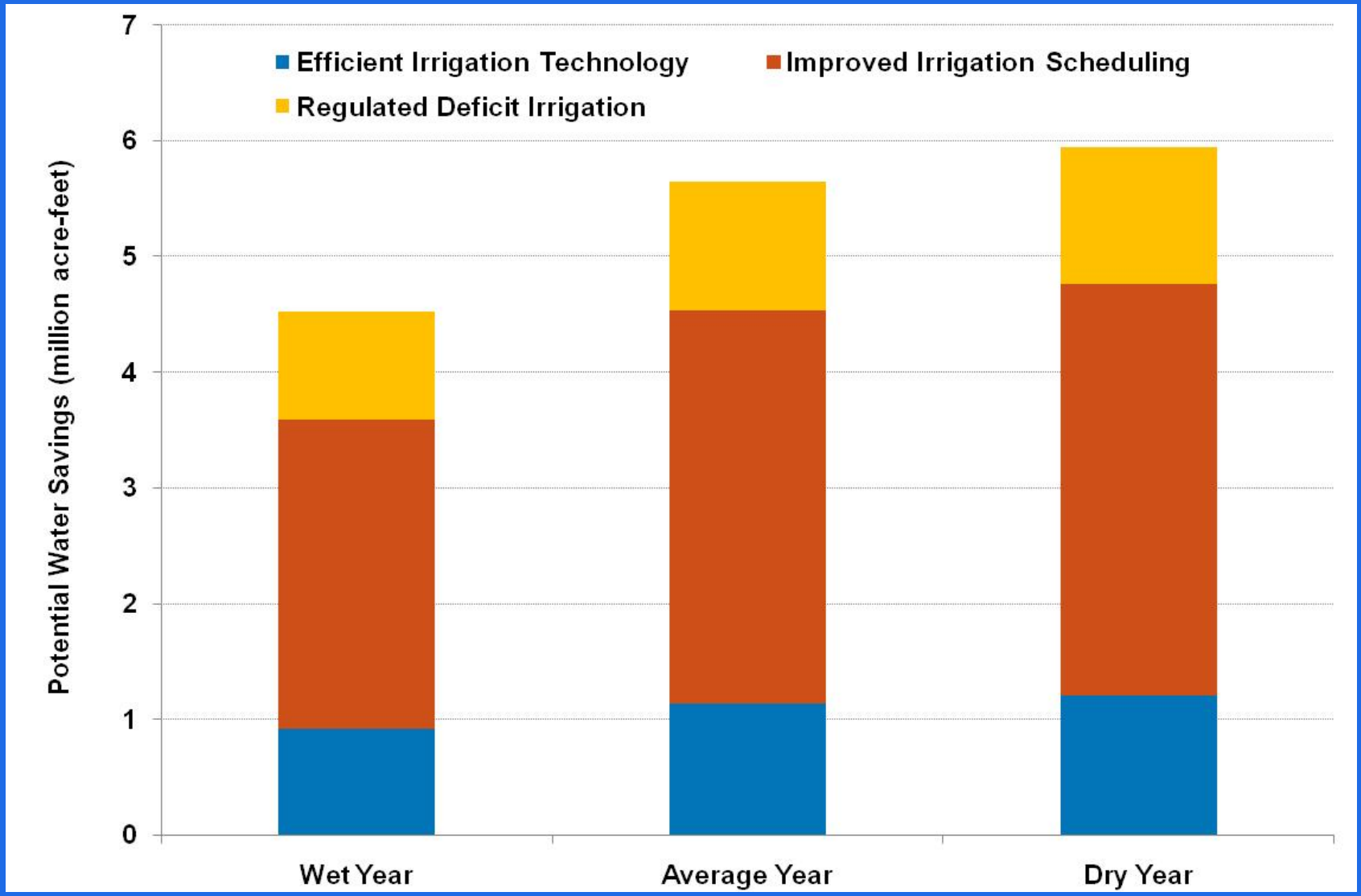
Sustaining California Agriculture
Conclusions

- There is great potential for improving the efficiency of water use in California agriculture.
- Many farmers are already doing these things, but much more can be done.
- There are obstacles to improving efficiency, but the largest is old thinking.
- These can be overcome. But will they?

Sustaining California Agriculture
The Potential for Improving Efficiency

- **Efficient Irrigation Technology** – shifting from flood irrigation to sprinkler and drip systems;
- **Improved Irrigation Scheduling –** using local climate and soil information to schedule irrigation; and
- **Regulated Deficit Irrigation –** applying RDI to almonds, pistachios, wine grapes, raisins.

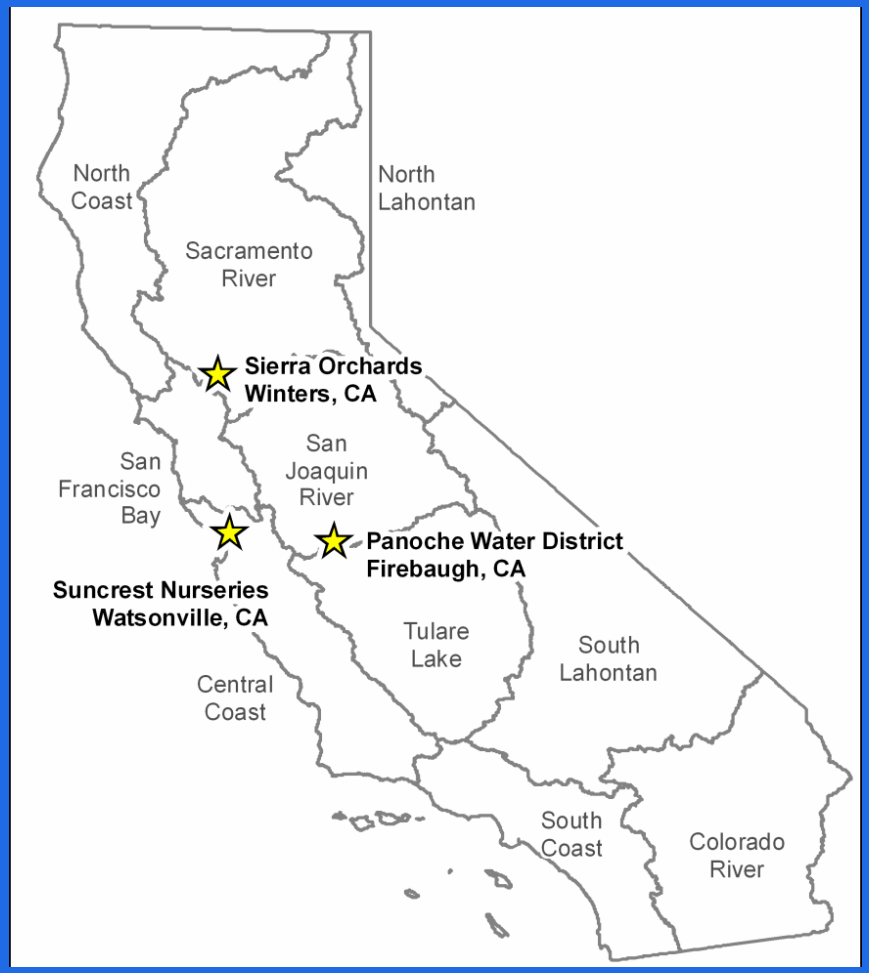
Sustaining California Agriculture
Applied Water Savings



Other Savings Estimates

- Pacific Institute: 4.5 to 6 million acre-feet.
- CalFed/Bay Delta Estimate (2006): 6.3 million acre-feet statewide (technical potential)
  [available online at:
  http://calwater.ca.gov/content/Documents/library/WUE/2006_WUE_Public_Final.pdf]
- Quantification Settlement Agreement: 150,000 – 270,000 acre-feet of conservation annually in the Colorado River area only (2010-2021)

Sustaining California Agriculture
Examples of Innovators



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Challenges to Capturing Savings

- **Inadequate Data** – lack of actual water use measurement and monitoring, water balances

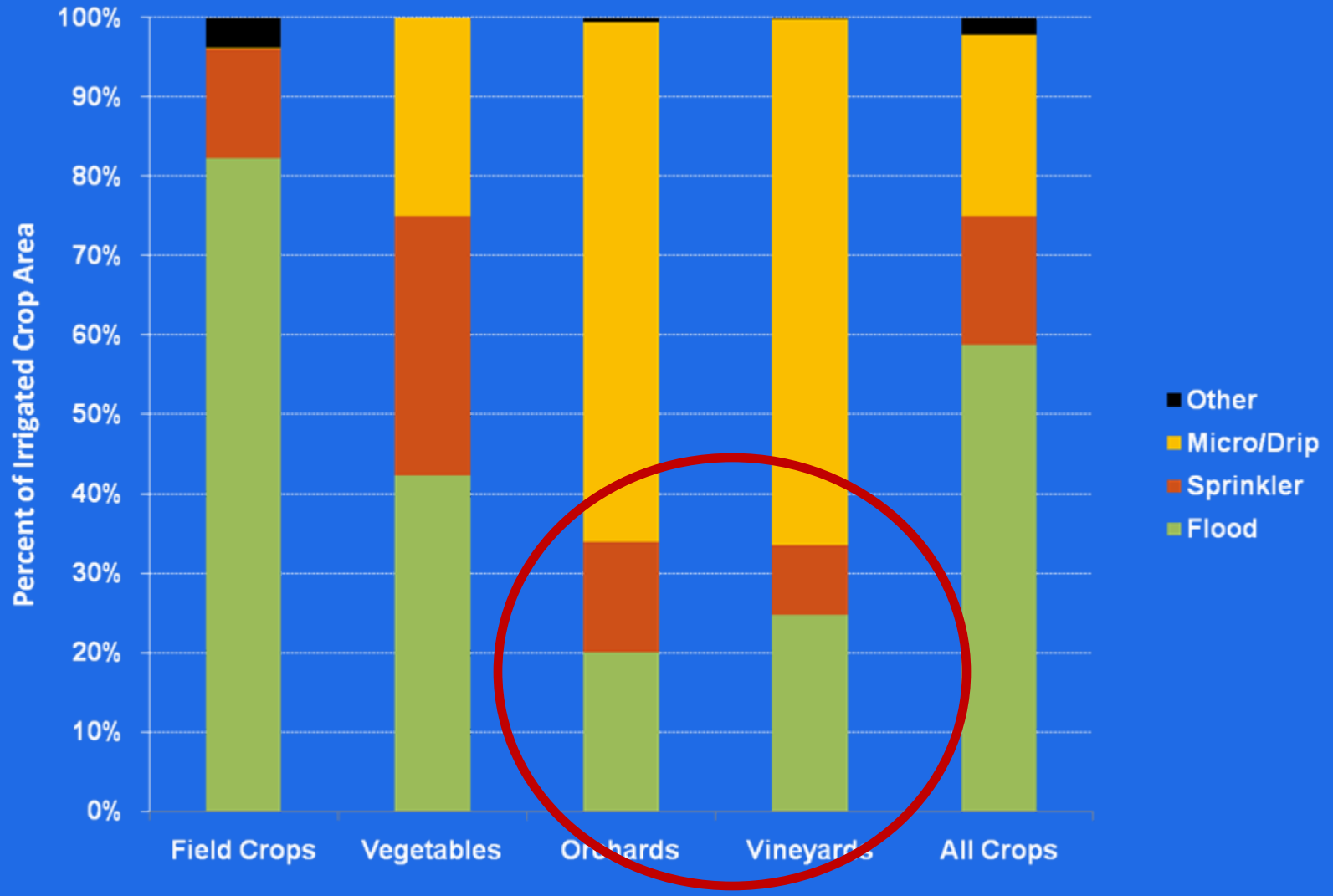
- **Economic/Financial Barriers** – significant initial investment sometimes required; confusing subsidies.

- **Inflexible Infrastructure** – inflexible delivery systems (right place, right quality, right time); few on-demand water systems.

Challenges to Capturing Savings (more)

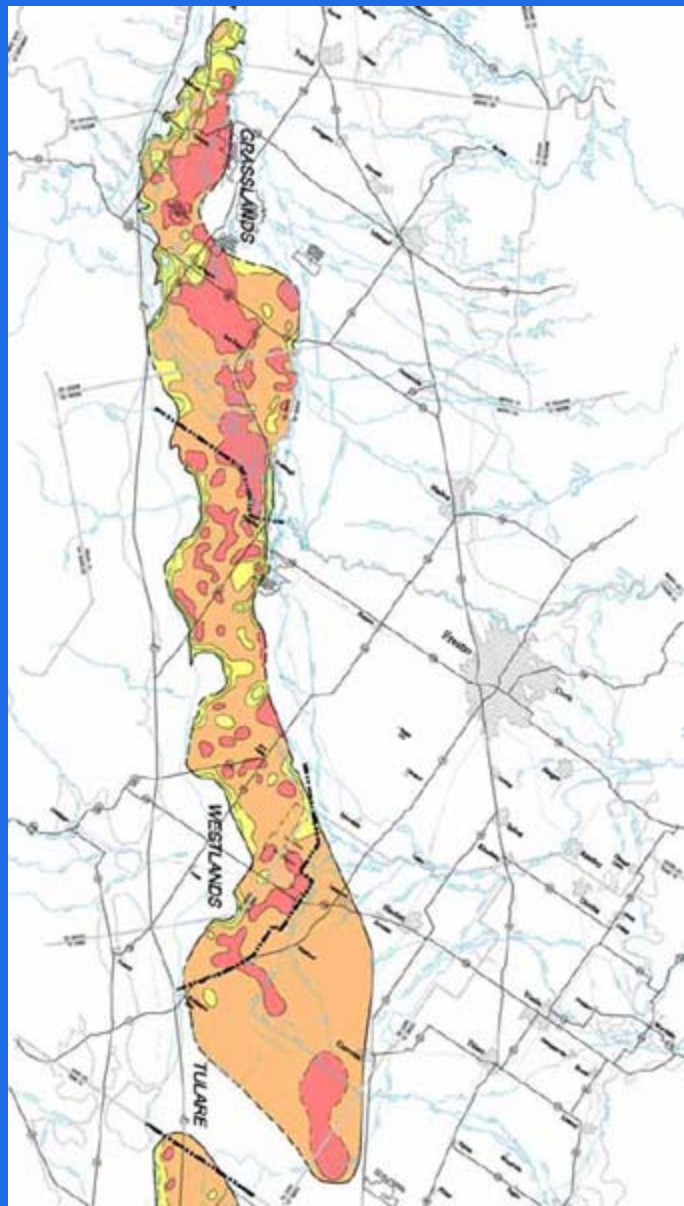
- **Old Thinking** – 3 prevalent myths:
  - 1) We've done all we can do.
  - 2) Only "consumptive" water savings are important because all excess water is captured and used.
  - 3) We accurately understand water use and flows in California.

1) More Can Be Done



2) “Non-Consumptive” Savings are Critical

- Drainage
- Water quality
- Avoided infrastructure costs
- Potential for energy savings
- Ecosystem/streamflow restoration



It's Not Just the Delta Smelt

- Ecosystem impacts: NOAA and NMFS conclude that CVP/SWP Operations are threatening:
  - Endangered winter-run Chinook salmon
  - Threatened spring-run Chinook salmon
  - Threatened steelhead
  - Threatened green sturgeon
  - Southern Resident killer whales

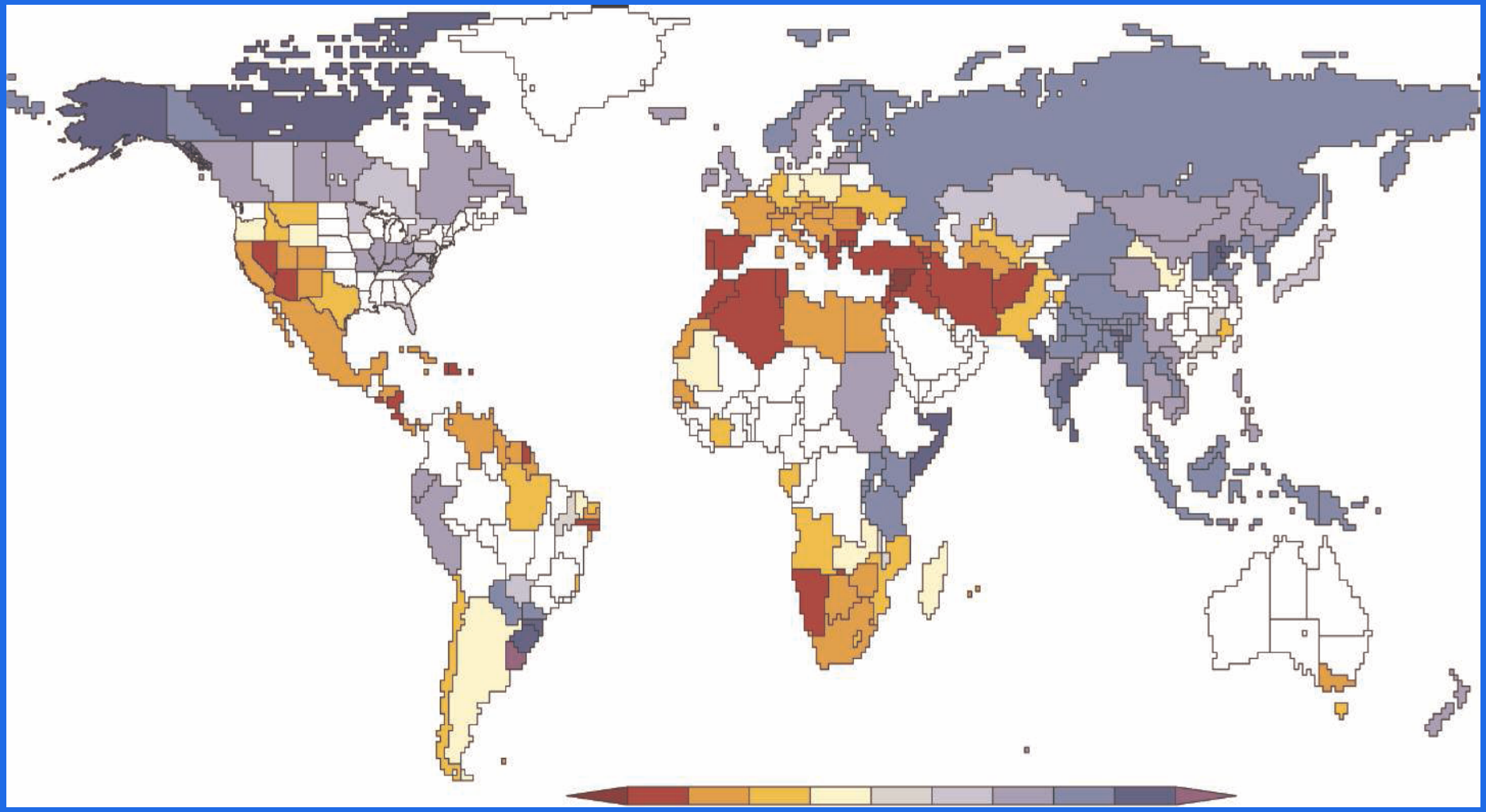
- Socio-economic impacts: closure of commercial fisheries

3) Lack of Water Measurement

- No direct measurement of agricultural water use.
- No direct measurement of groundwater use.
- No direct measurement of evaporative losses.
- No direct measurement of groundwater recharge or return flows.

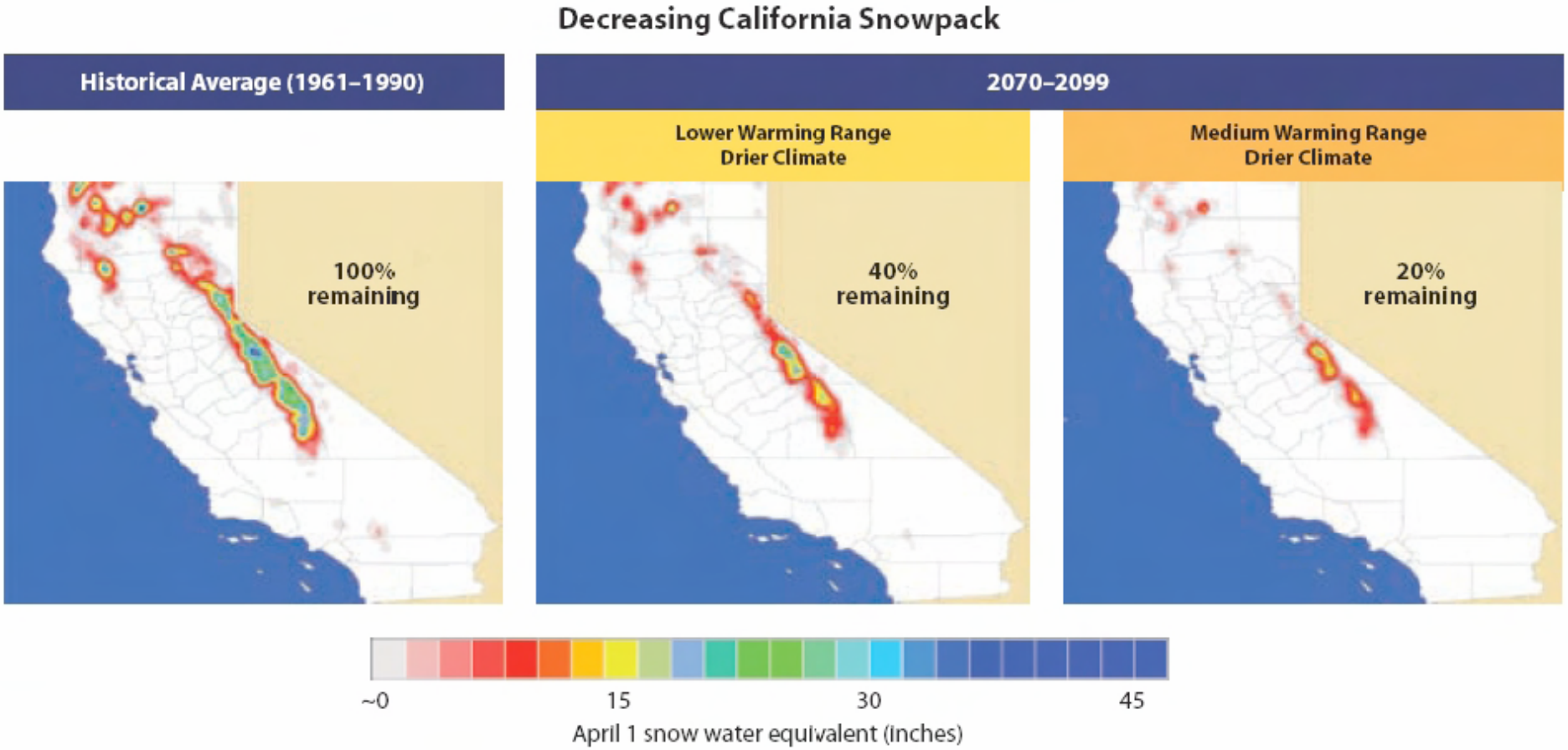
- So? No way to do an accurate water budget.

Future Threats



Milly et al. 2008 (Science, Vol 319); color added when 8/12 models agree on direction of change, for IPCC A1B

Changes in Hydrology



Source: Cayan et al. 2006

Paradigm Shift Needed

- Old Thinking: inefficient/over-irrigation doesn't matter
  - Consequences: poor water quality, drainage problems, ecosystem destruction, need for large infrastructure, ongoing competition for water.
- New Thinking: smart and efficient irrigation can help maintain a healthy agricultural sector and environment
  - Consequences: reduced drainage problems, higher productivity per unit water, enhanced in-stream flows, more flexible infrastructure.

Moving Forward

- Comprehensive monitoring of water use.
- Financial incentives for improving efficiency.
- Enforcement of reasonable and beneficial use laws.
- Ecosystem restoration.
- Strategic “conjunctive use.”
- Include agriculture in statewide water conservation targets.
- Increased education and technical assistance: UC Extension, NRCS, RCDs

Full report available online at www.pacinst.org

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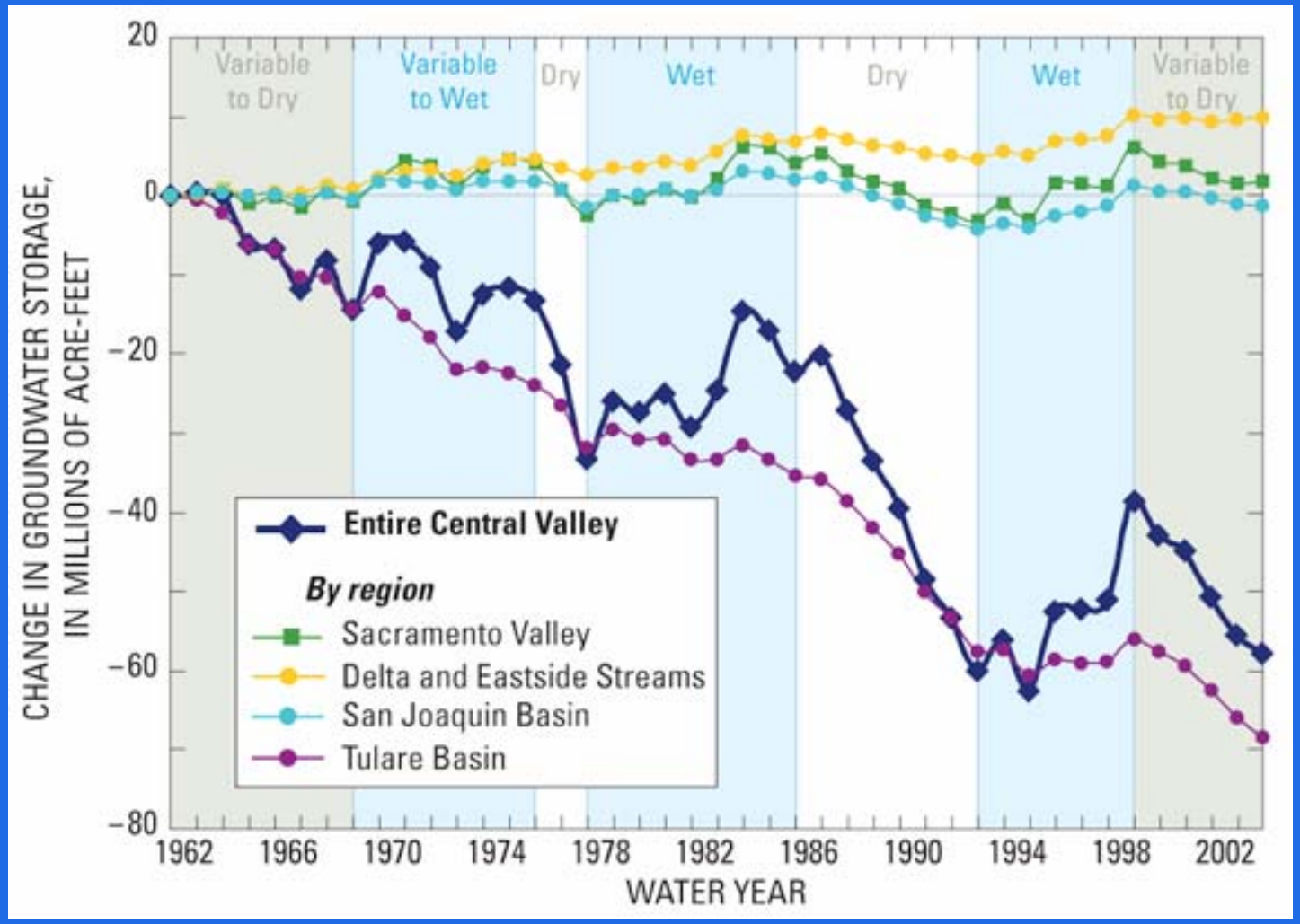
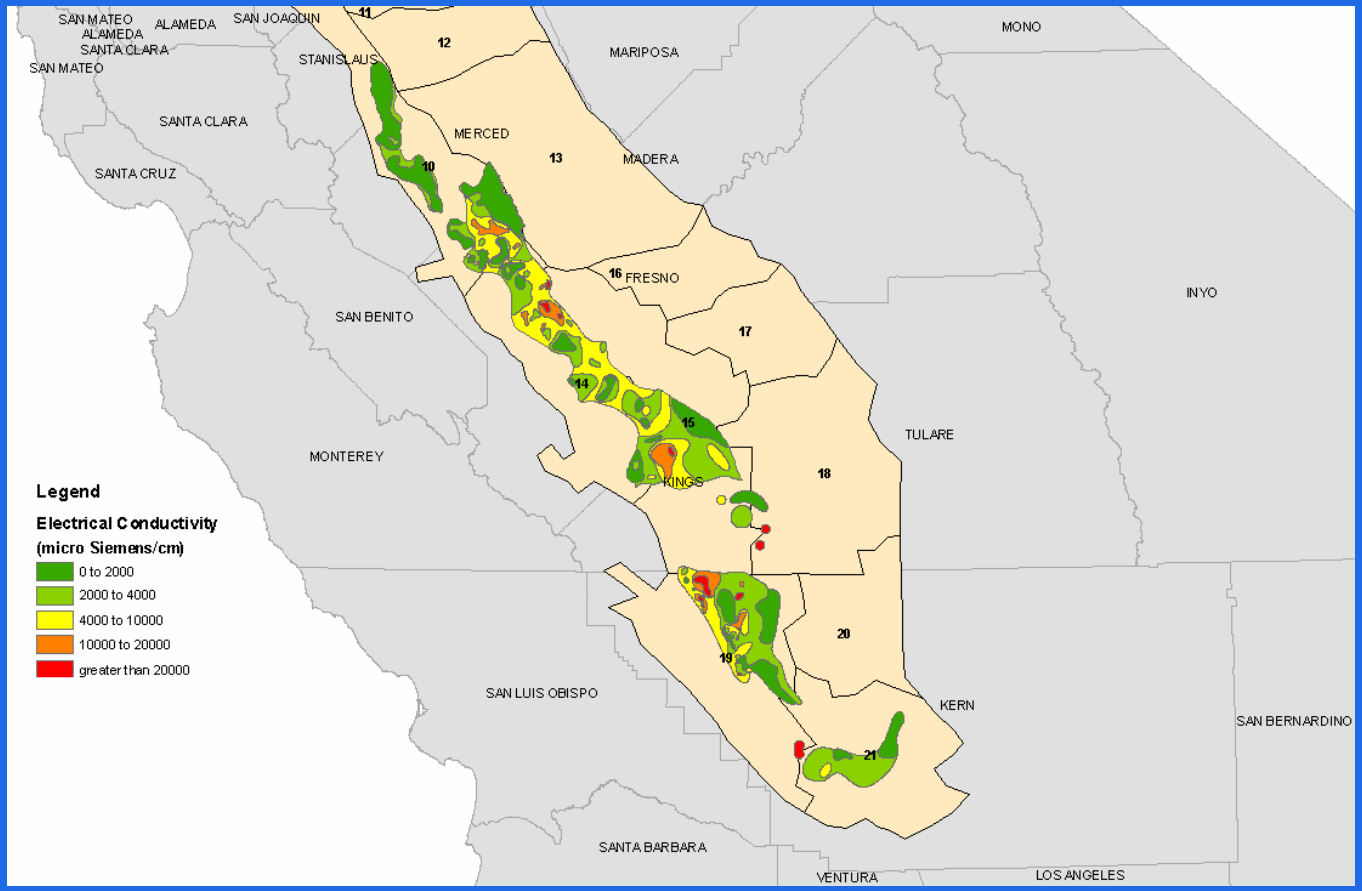
Groundwater Mining



Source: Faunt, C.C., ed., 2009, Groundwater Availability of the Central Valley Aquifer, California: U.S. Geological Survey Professional Paper 1766, 225 p.

Rising Salinity

- A 2009 study from UC Davis, “The Economic Impacts of Central Valley Salinity,” reported that if salinity increases at the current rate until 2030, the direct annual costs will range from $1 billion to $1.5 billion, with income impacts to the Central Valley between $1.2 billion and $2.2 billion (Howitt et al. 2009)



All excess water is captured and used?

- According to the California Department of Water Resources, an estimated 250,000 acres of land had a water table within 5 feet of the ground surface and were classified as a "present problem area" in 2002. An additional 1.0 million acres of land had a water table 5 and 20 feet below the ground surface and were classified as "potential problem areas" (DWR 2007).