

A Primary Look at Regional Water Use and Residential Water Consumption in the California San Joaquin Valley

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Water scarcity from recent severe drought



(2009)



(2014)



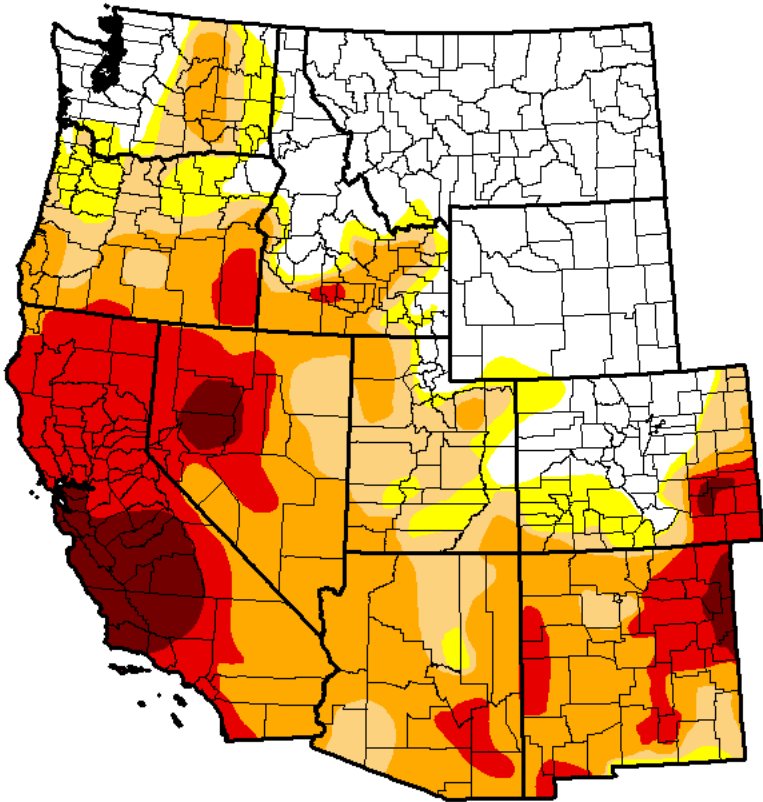
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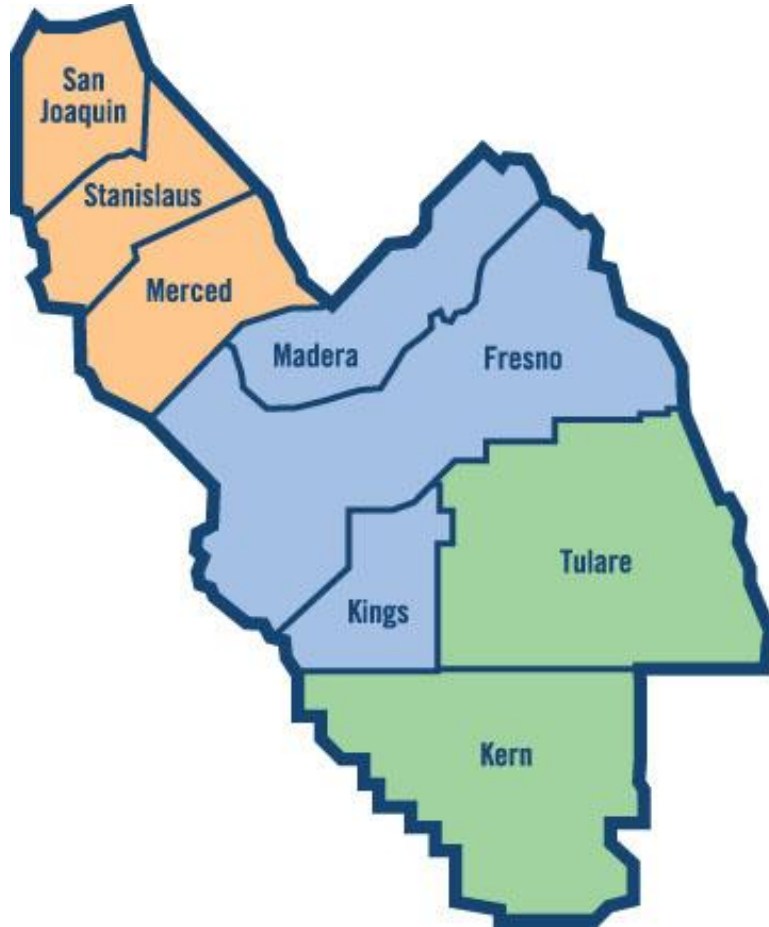
Drought and population growth

U.S. Drought Monitor West



- Water uses drop by 26% (-14% in the SJV; -32% in the non-SJV region) from 2000 to 2010.
- Population increases by 10% (20% in the SJV; 9% in the non-SJV region).
- Population growth and continued drought would both exacerbate the water scarcity.

Water supply failure in agriculture



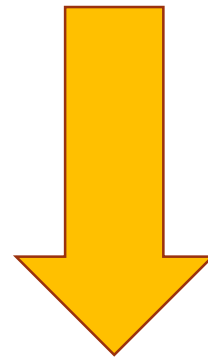
Source: SJV District

Drought



Surface water

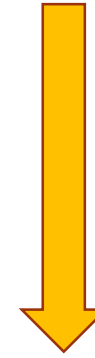
Groundwater



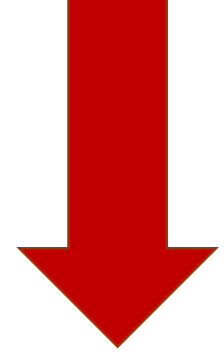
2010



2015



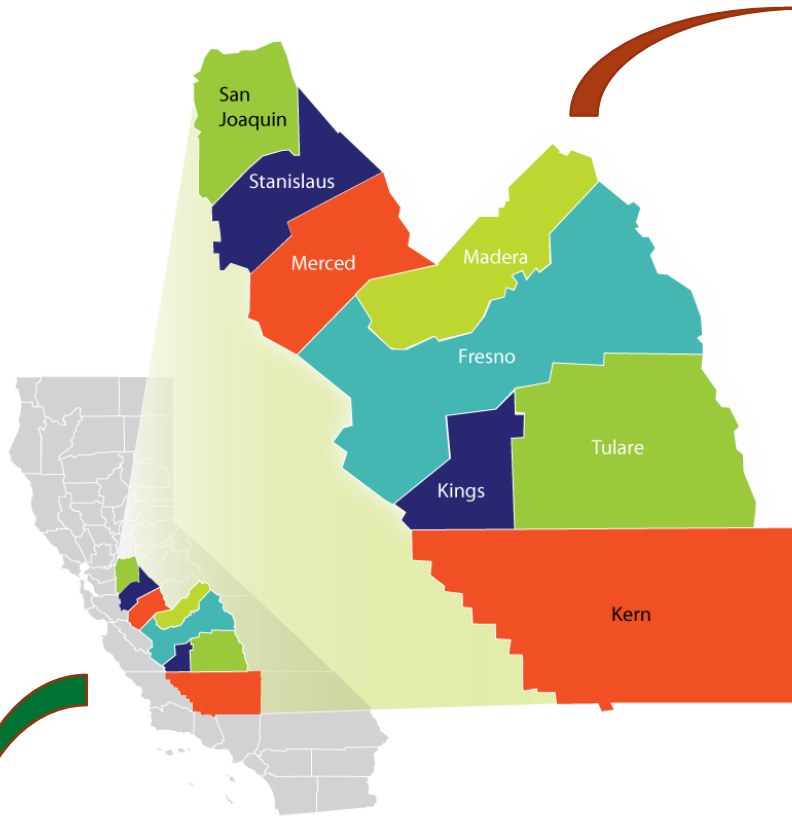
2010



2015

Agricultural activities

Irrigation water uses



Source: The SJV

The non-SJV region:

- 197 mgal/day

The SJV:

- 1,648 mgal/day (91% of total water uses)
- ### **In the short term:**
- A more efficient surface-water delivery system
 - Regulations on groundwater uses
- ### **In the long term:**
- Crop changes to substitute high water consuming crops for low ones

Residential water consumption survey

Water consumption

- Winter
- Summer

Outdoor physical conditions

- House size
- Pool
- Watering
- House aspect

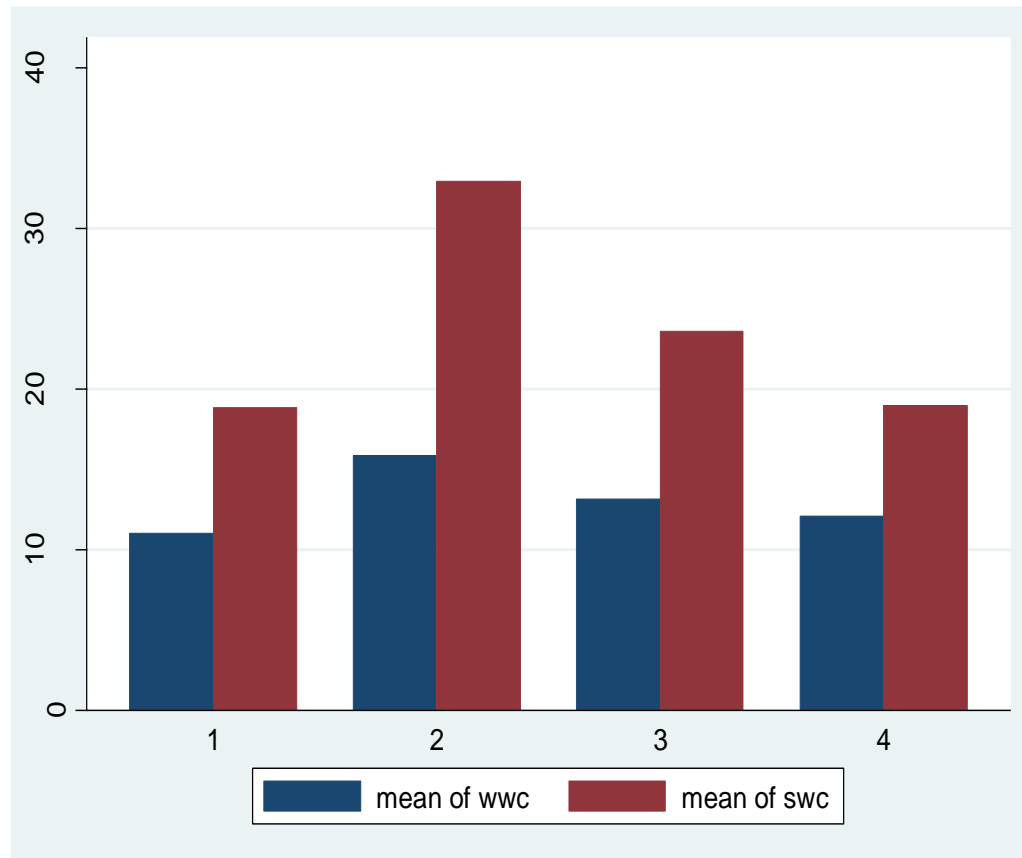
Indoor physical conditions

- Bathrooms

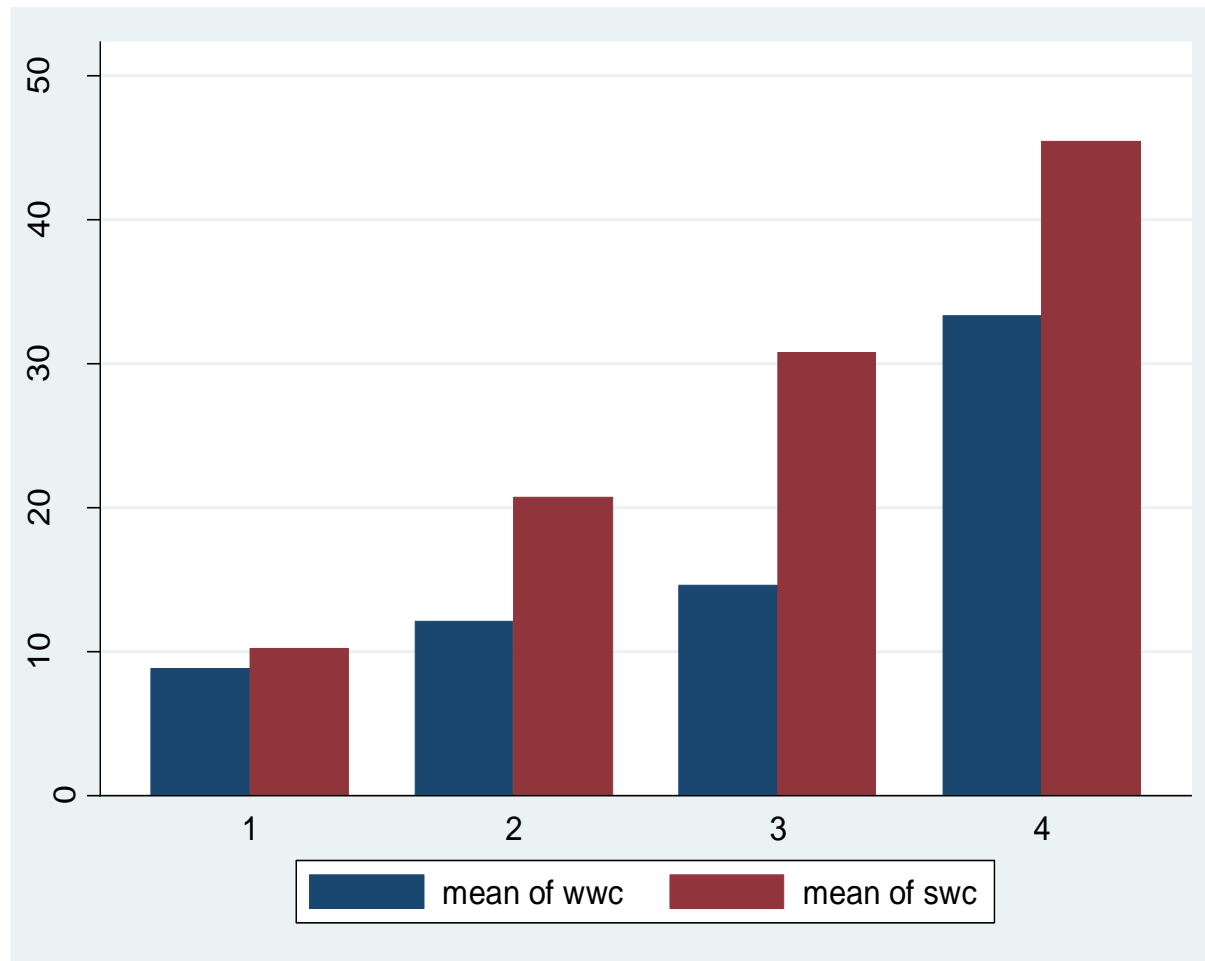
Socioeconomic factors

- Income
- Household size
- Water use perception

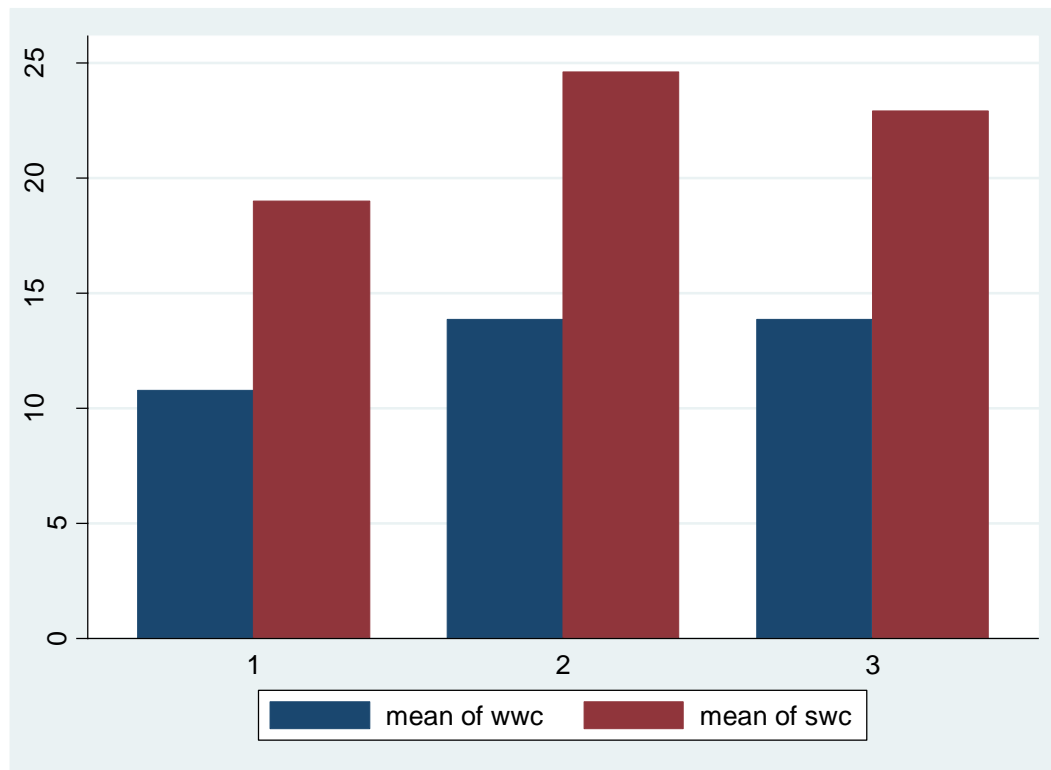
Winter and summer water consumptions by house aspect (1: East; 2: South; 3: West; 4: North)



Winter and summer water consumptions by bathroom number



Winter and summer water consumptions by water-use perception (1: light water user; 2: moderate water user; 3: heavy water user)



Neighborhood social effects

- Water consumption of a given household is likely affected by its neighbors, resulting similar water use patterns among neighborhoods.
- **Winter water use (WWC) = $0.057 \cdot W \cdot WWC + 3.06 \cdot \text{Bathroom Number}$**
- Spatial emulation in summer water use was found for such effects in British Columbia (BC) because the BC residents were willing to keep their front yards as green and lush as their neighbors (Janmaat, 2013).

Water saving design



Source: inhabitat

- Survey results can help locate water saving targets
- Promote outdoor and indoor water saving innovations
- Design incentives for neighborhood social effects on water uses
- Provide education on water scarcity awareness

THANK YOU!
