

Lessons from droughts: what worked and what did not work in California?

Richard Howitt

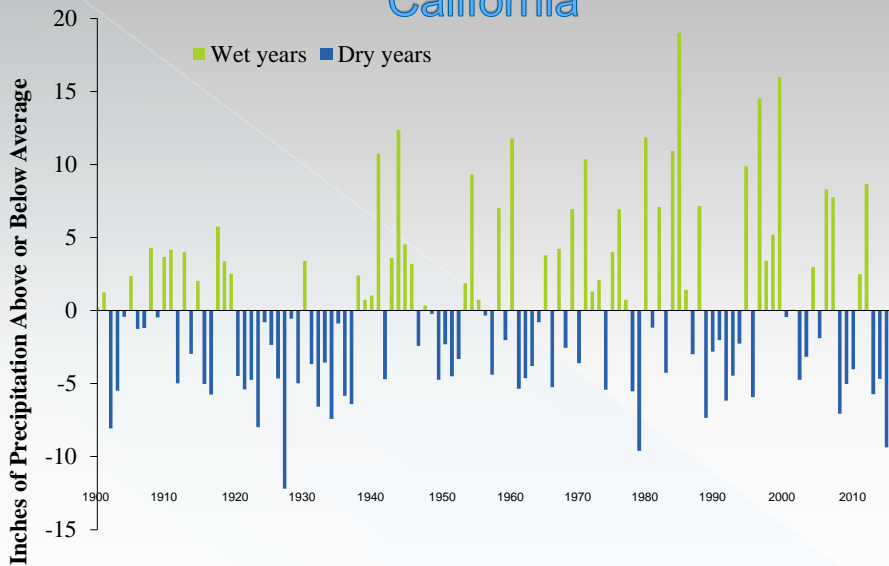
University of California - Davis
Center for Watershed Sciences
ERA Economics

4th International Climate Change Adaptation Conference
Rotterdam, Netherlands

May 10, 2016



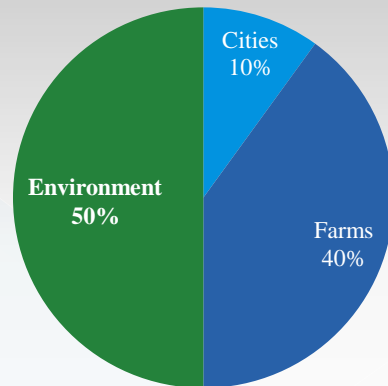
Droughts & Floods are Normal in California



California Water Use

- Cities: 10% of water use, 98% of economy
- Farms: 40% of water use, 2-4% of economy
- Ecosystems: 50% of available water, and performing poorly
- All have experienced drought shortages

Average Water Use



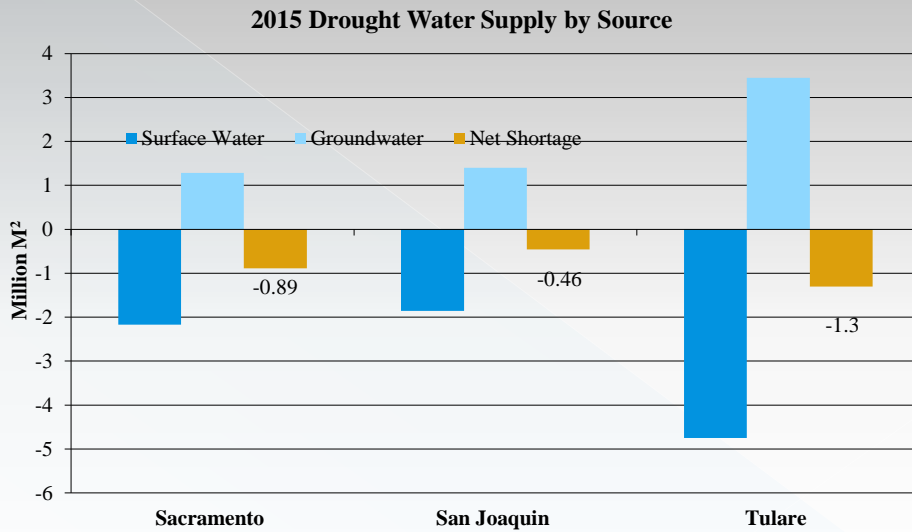
Sources: Dept. of Water Resources (1998-2010 average)

PPIC WATER POLICY CENTER
3

California Agricultural Drought Response

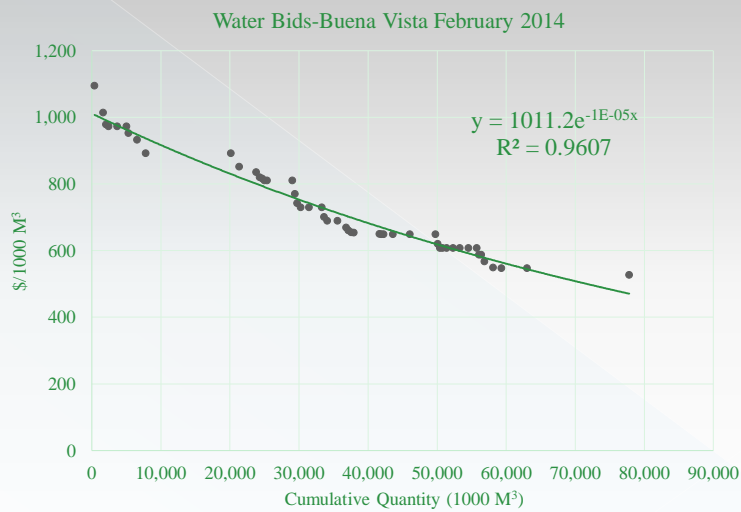
- Water Markets
 - > Agency Authorized Markets
 - > Private Local Markets
- Fallowing crop areas
- Groundwater Overdraft

2015 Drought Water Supply



5

Private water markets



6

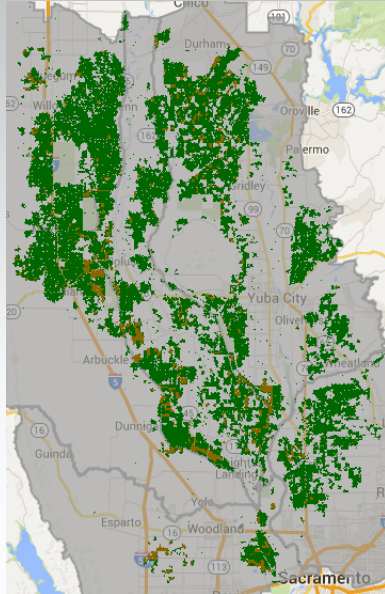
2014 Agency Water Transfers

- 574 Million M³ Total
- 377 Million M³ DWR
- 12 Short-term and 3 Long-term
- 6 - Crop Idling
- 7 - Groundwater Substitution
- 5 - Reservoir Release
- Multi- benefit Transfers

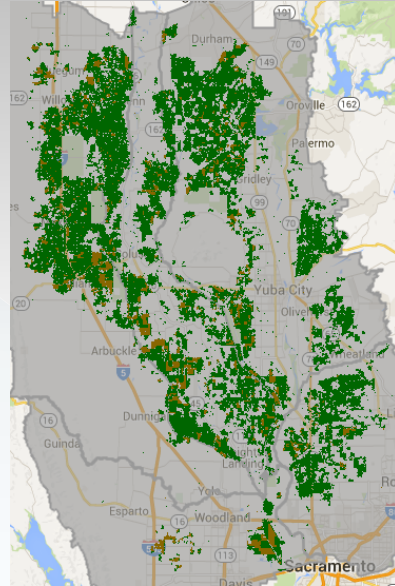
Validating Agricultural Impact Forecast

- ◉ Drought impact analysis controls for confounding factors
 - > Recent trends in crop prices
 - > Plantings of new orchards (over 81,000 Ha statewide)
 - Low water use, high jobs
- ◉ Satellite measures of fallowed acres
 - > USDA, NASA
- ◉ Socio-economic impact indicators
 - > Jobs and food banks
- ◉ Price changes for California specialty crops
 - > USDA, County Agricultural Statistics

Sacramento Valley Rice Following

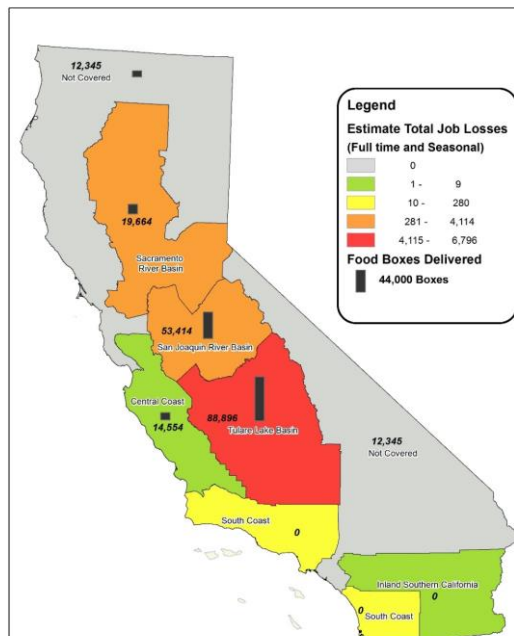


2014



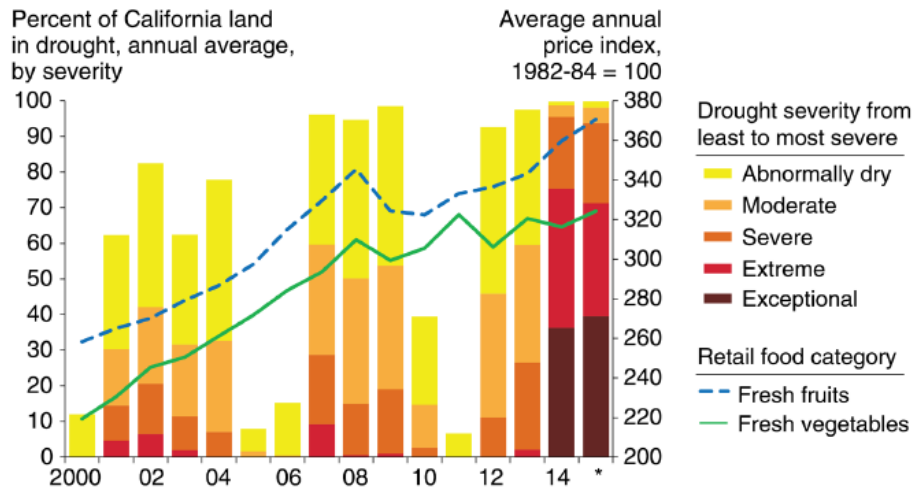
2015

Job Losses and Food Assistance



No Crop Price Effects for Fruit & Vegetables

California drought severity and change in Consumer Price Index (CPI) for fresh fruits and vegetables



Urban Drought Response

- ◉ Mandated statewide urban water conservation of 25% over 2013 levels
- ◉ Bad Public economics
 - > Ignores differences in regional supplies
 - > Ignores differences in elasticities of substitution
 - > Set by residential use, but applied to total urban use
- ◉ Good Public Relations
 - > Created strong drought awareness
 - > Designed to be seen as strictly equitable

What Worked

- ◉ Crop portfolio changes to minimize the impact on high value crops
- ◉ Interagency water trades at both State and Federal level
- ◉ Following lower value crops to optimize water use
- ◉ Mandated Urban cuts in terms of water use
- ◉ Diversification of urban water supplies

13

What Didn't Work

- ◉ Uncompensated groundwater over draft
 - > Currently no groundwater replacement mechanism
- ◉ Mandated urban cuts penalized utility drought investments
- ◉ Missing information on prices and quantities in the "Private" water market
 - > Missed trade potential and Under bidding prices
- ◉ No advance Environmental Impact Analysis for Water trades
 - > Some trades prohibited after lengthy paper work
 - > Need for prior approval for more market certainty
- ◉ Household water security–
 - > Wells going dry
 - > Quality degradation

14

Drought Policy Lessons

- The California water economy is relatively drought resilient
- Agriculture relies on groundwater, urban uses a portfolio approach
- Could use detailed information on water use from remote sensing
- Need to clarify water right priorities and define groundwater recharge rights
- 2015 Drought Impacts vary greatly by sector
 - Environmental values and fish species
 - Rural communities
 - Agricultural production
 - Urban water use

15