Interpreting the Economic Impacts of Drought

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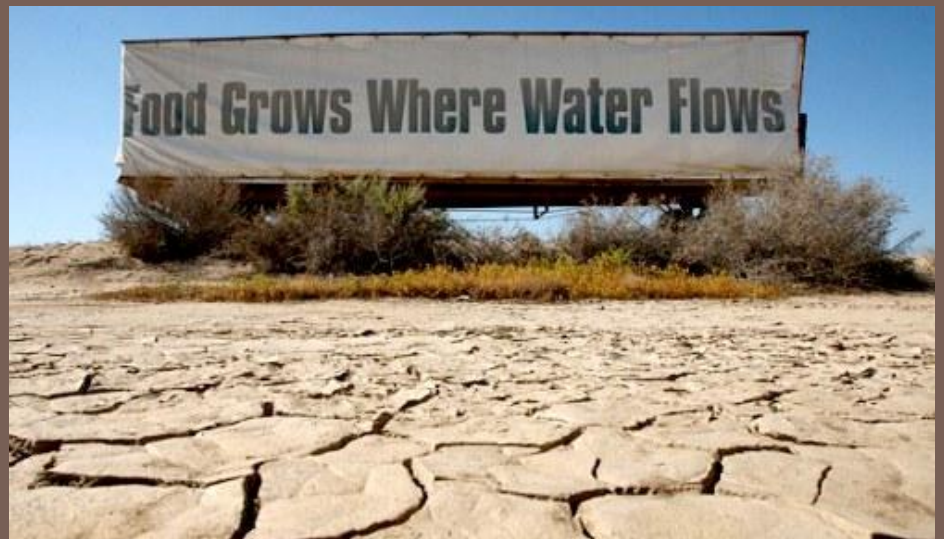
Outline

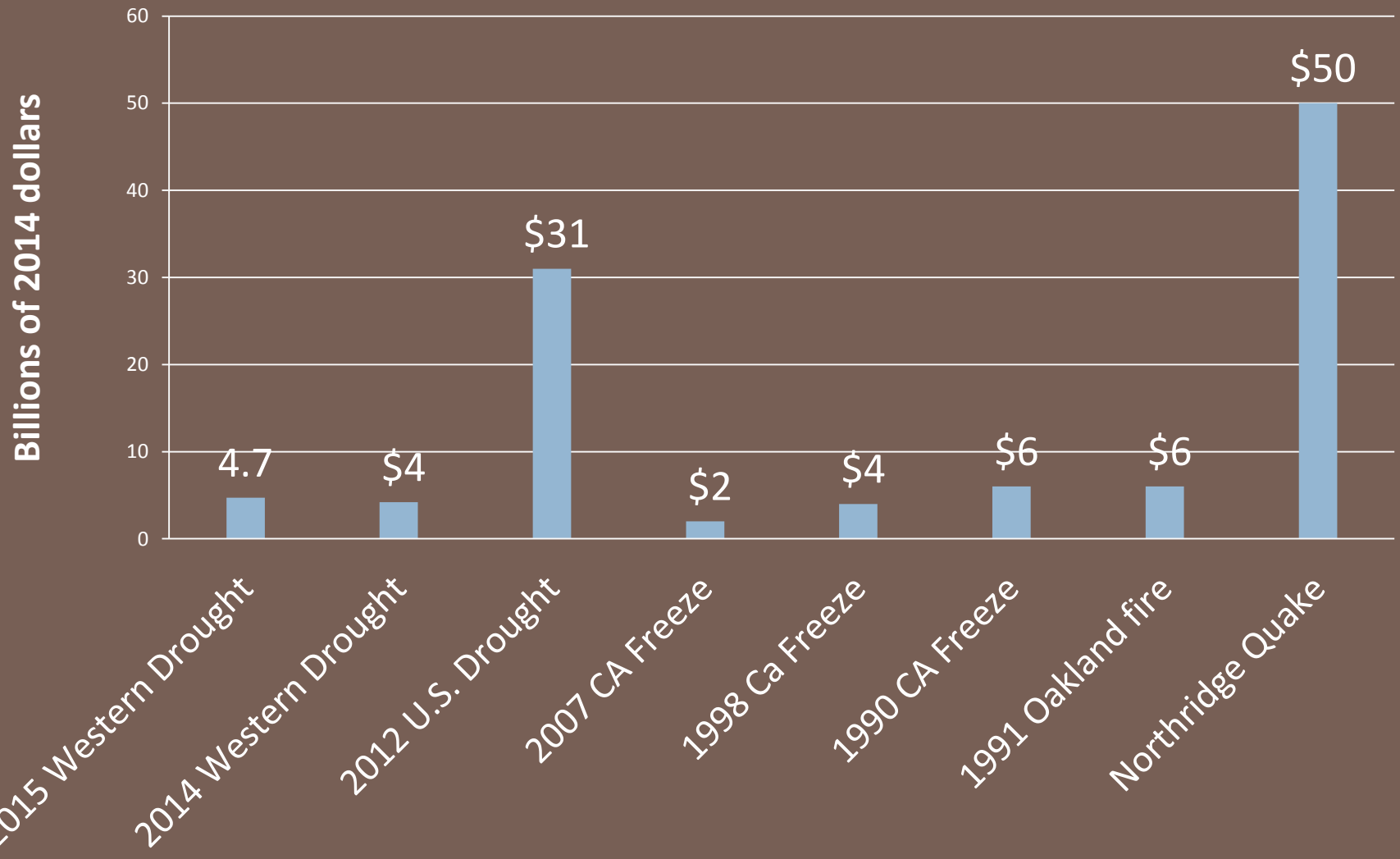
- The Cost of the Drought in Context
  - Compared to other weather events and disasters.
  - Regional Economic Indicators
- A Closer Look at Agricultural Impacts
- Some Lessons from the Drought With Policy Implications.
  - Are the economic “shock absorbers” sustainable?
  - Should we waive environmental protections in drought?
  - Does it show mega-infrastructure is more or less needed?

Fall 2011 to Fall 2015 California Drought

- Driest 4 year period in California history
- 2014 and 2015 were also the hottest ever
- Some CVP farmers received 0% water allocation.
- Statewide decrease of 11 maf in surface water supply, normal year water use is 40maf from all sources.



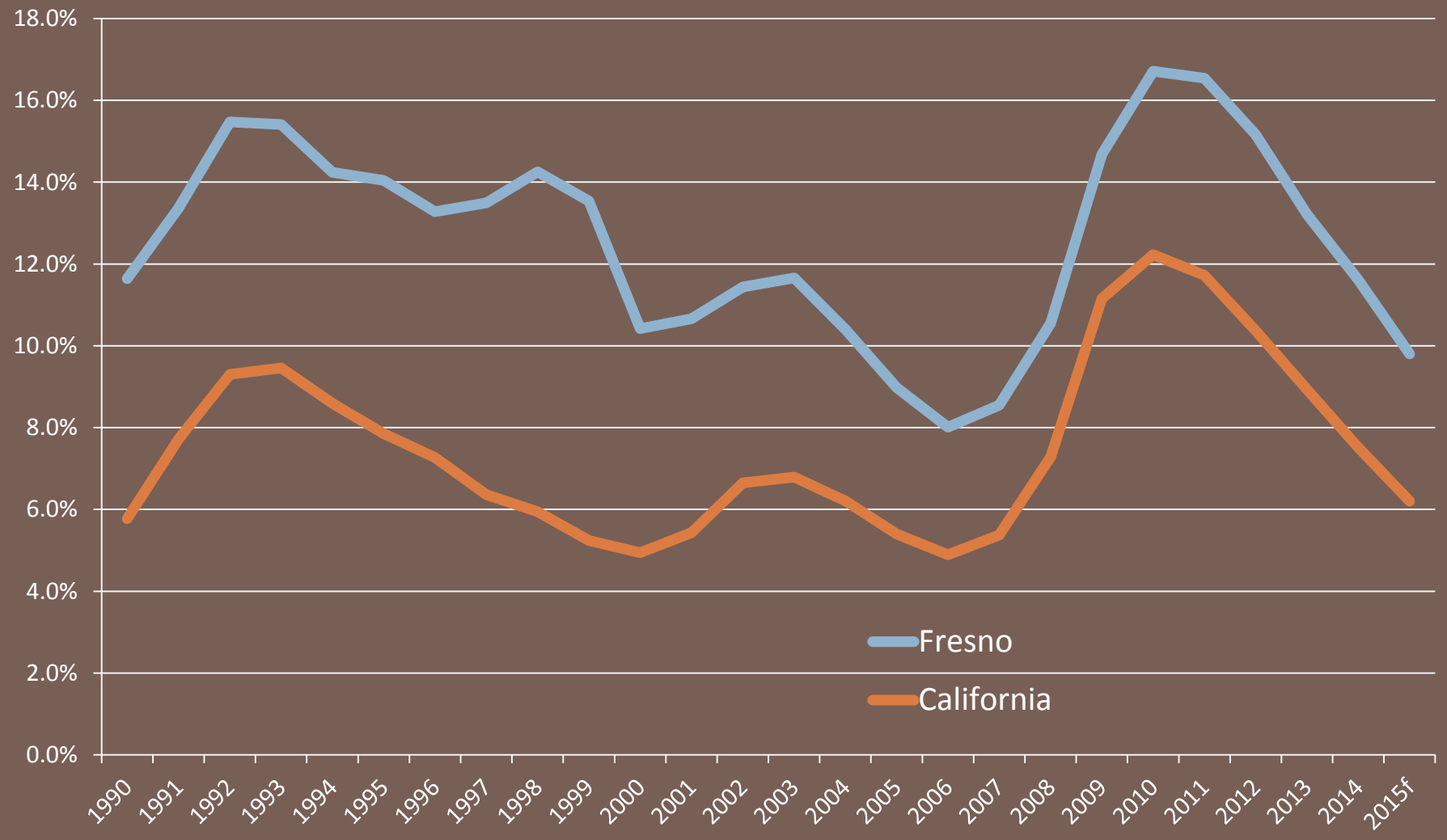
Comparable billion dollar weather and climate disasters. (Source: NOAA)



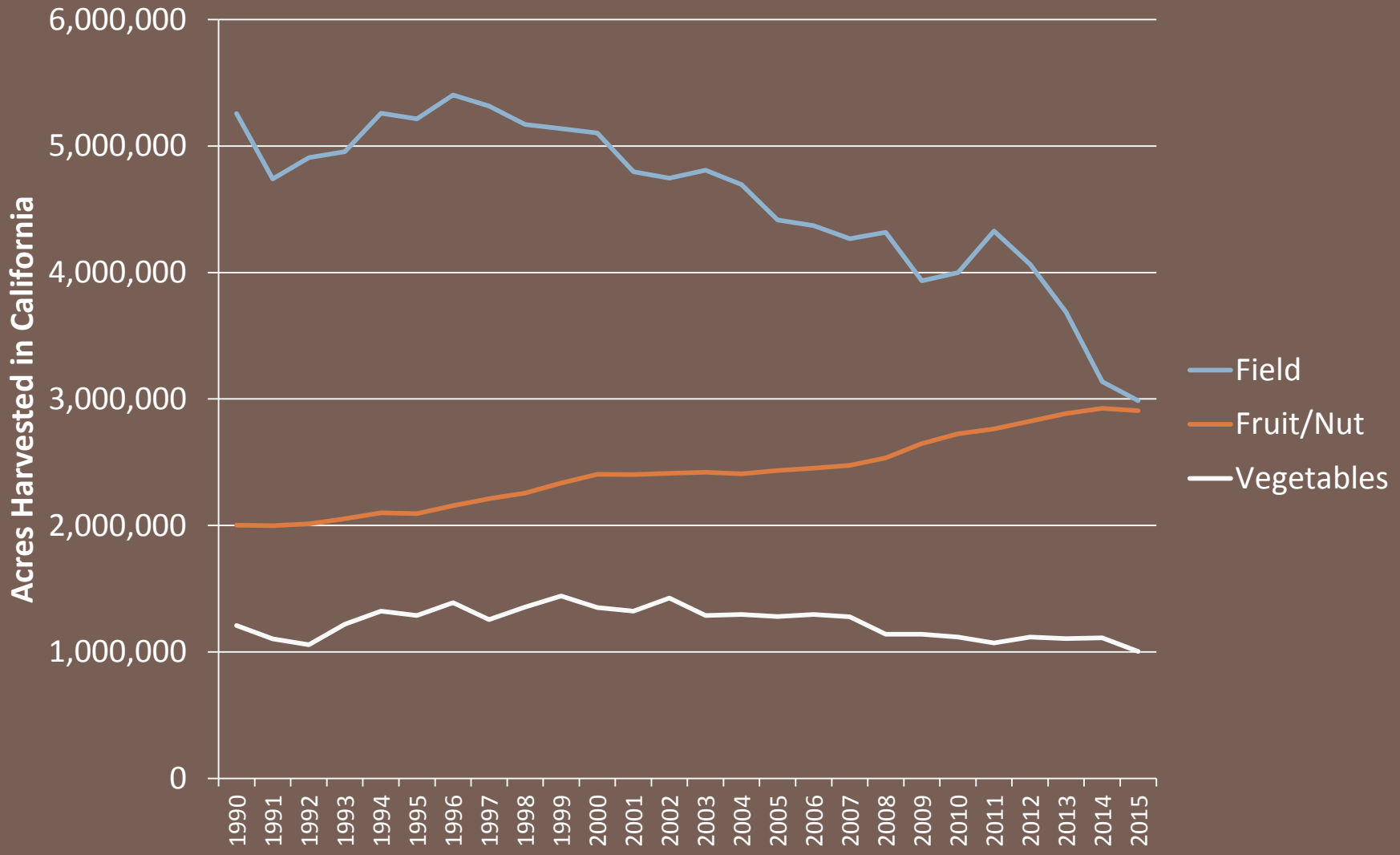
Annual Costs of the California Drought in 2014 and 2015

- NOAA: 2014 Western Drought: $4 billion across six states.
- California Impacts from Various Sources
  - Farm Output: $600mil to $1.2 bil (various)
  - Groundwater pumping: about $500 million (UC-Davis)
  - Non-Ag Econ Welfare, 2015: about $600 mil (M cubed)
  - Hydropower Loss: about $500 mil (PPIC)
  - Tourism/Ski Industry: about $250 mil (author est.)
- Total CA Loss: about $3 billion per year
  - About 0.1% of California Gross State Product

Did drought impact unemployment?



Virtually all drought acreage decline is field crops: cotton, corn, rice, alfalfa, wheat.



Estimating the economic impacts of drought on Agriculture

- Model Estimates: Typically apply input-output model to a projection of acreage changes.
  - Advantages: Timely forecast, Isolates Water Supply Effect
  - Disadvantages: Deterministic model, highly sensitive to assumptions. Does not reflect overall economic welfare.
- Data: Tracking economic indicators.
  - Advantages: Actual data. Reflects overall economic welfare of economic sector or region.
  - Disadvantages: Have to wait. Does not isolate drought impacts from other market factors that change year to year.

Estimates of Acreage Decline In Drought (thousands of acres)

2014 drought (USDA is author calculation from various USDA reports)

	UC-Davis model estimates	USDA acreage estimates 2014 to 2013 change
Vegetables	-10	+5
Fruit/Nut	-41	+41
Field Crops	-377	-547
Total	-428	-501

2015 drought (USDA is author calculation from various prelim. estimates)

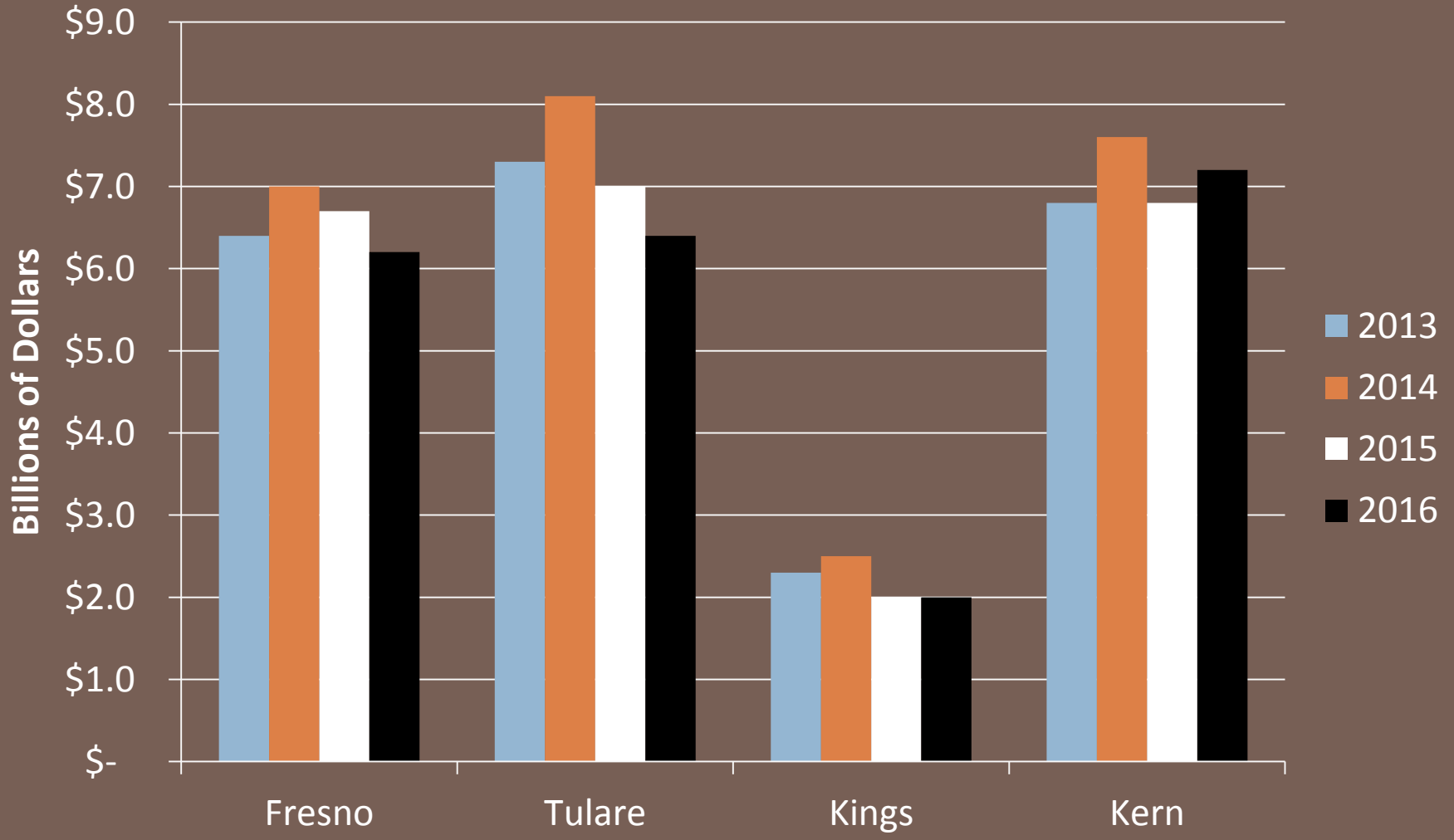
	UC-Davis model estimates	USDA acreage estimates 2015 to 2013 change
Vegetables	-24	+10
Fruit/Nut	-36	+60
Field Crops	-482	-770
Total	-542	-700

California Farm Receipts Increased by $2.7 billion (about 5%) during 2014 drought.

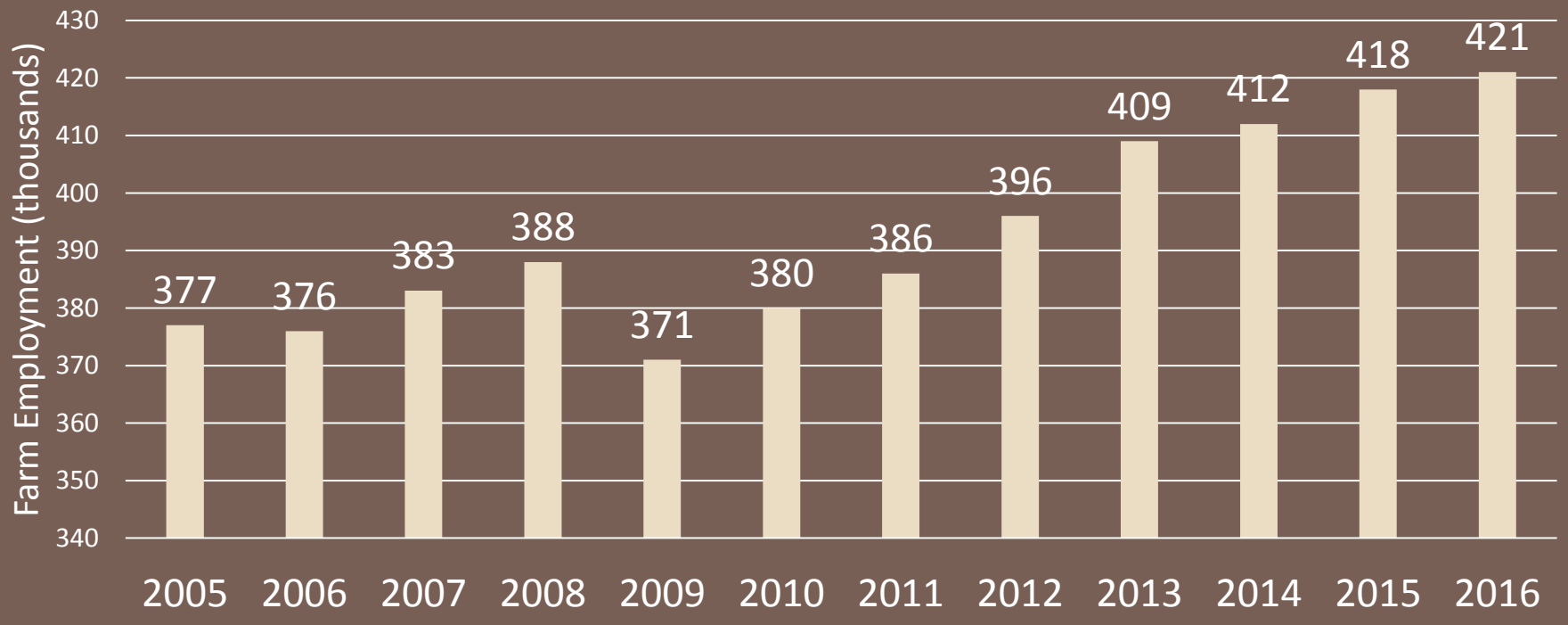
California Agricultural Revenue ($ billions, not inflation adjusted)

Models predict up to $1 billion more revenue with no drought.

Agricultural Revenue In the Tulare Basin During Drought Impacted 2014 and 2015, compared to minimally impacted 2013 and 2016..



CA Farm Employment Increased By Almost 4,000 during the 2014 drought. Wages have also been rising.



(Source: BLS Quarterly Census of Employment and Wages, NAICS 111, 112, 115, includes farm employees and labor contractor jobs)

UC-Davis deterministic model suggests at least 425-430,000 jobs in 2014 and 2015 without drought, which would have been the biggest gain in decades.

Conditions that have reduced economic impact of the 2014-15 drought on farms.

1. Favorable Markets.
2. Heavy Groundwater Withdrawals.
3. Millions of acres of “low-value” crops are still available to be fallowed.
4. State Water Board has repeatedly relaxed environmental standards to boost water supply.
5. Labor market “disequilibrium”

Are these sustainable strategies for the next drought?

Policy Lessons From Drought

- Ability of economy and water-system to adapt to shortage has increased significantly.
  - Demonstrated value of diversifying portfolio.
  - Lower water-intensity of the economy.
- Demonstrates limited value/need for new mega-infrastructure like dams and delta tunnels.
- Sustainable Groundwater Management Act.
- State Board may be too quick to relax environmental protections in drought.
  - Pushed several fish species at brink of extinction.