

# Drought in the West



Doug Parker

Director, California Institute for Water Resources  
Strategic Initiative Leader, UC ANR Water Initiative

[doug.parker@ucop.edu](mailto:doug.parker@ucop.edu)

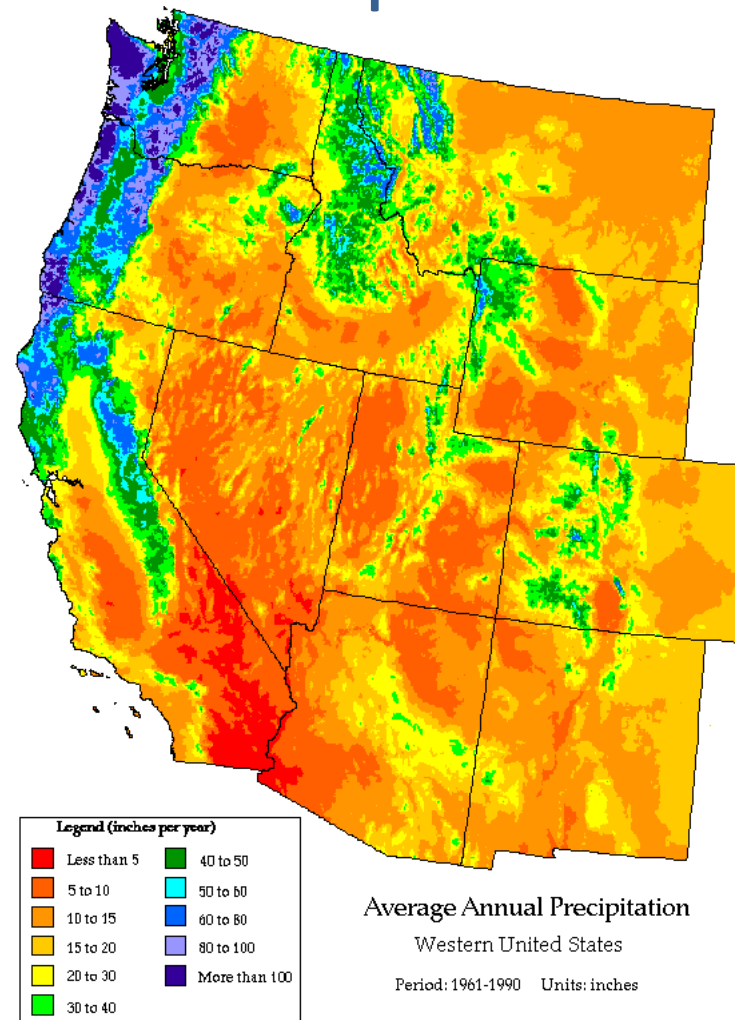
[ciwr.ucanr.edu](http://ciwr.ucanr.edu) | [@ucanrwater](https://twitter.com/ucanrwater)



**University of California**

Agriculture and Natural Resources | California Institute for Water Resources

# Precipitation



University of California

Agriculture and Natural Resources

California Institute for Water Resources



Colorado River Basin- MAP- CRBC- Chris Harris.jpg



**University of California**

Agriculture and Natural Resources | California Institute for Water Resources

# Colorado River Use

- Supplies to 40 M people
  - 12.7 M people In Basin
- 4 M Acres Cropland
- 12 Billion kwh of hydropower per year



**University of California**

Agriculture and Natural Resources ■ California Institute for Water Resources

# Colorado River Allocations

- 1922 Colorado River Compact
  - 7.5 MAF Upper Basin States (CO, NM, UT, WY)
  - 7.5 MAF Lower Basin States (AZ, CA, NV)
- 1944 US – Mexico Treaty
  - 1.5 MAF Mexico



**University of California**

Agriculture and Natural Resources ■ California Institute for Water Resources

# Colorado River Development

## Major River Developments

- Over 29 Major Dams
- Hundreds of Miles of Canals
- 1935 Hoover Dam/Lake Mead 28.5 MAF
- 1966 Glen Canyon Dam/Lake Powell 26.2 MAF



**University of California**

Agriculture and Natural Resources ■ California Institute for Water Resources

# Colorado River Development Colorado

## Colorado-Big Thompson Project (US BOR)

- 18 Dams and Dikes
- 10 Reservoirs
- Tunnel Under Continental Divide
- 220,000 AF/Year



**University of California**

Agriculture and Natural Resources ■ California Institute for Water Resources

# Colorado River Development California

## California Development Company

- Imperial Valley Agriculture
- 1905 Flood Breaches Canal
- River Diverted to Salton Sink
- 2 years to plug
- Salton Sea 45 miles long



**University of California**

Agriculture and Natural Resources ■ California Institute for Water Resources



# Colorado River Development California

## 1938 Imperial Dam

- All American Canal
- 26,000 cfs
- Largest Irrigation Canal in World

## 1941 Parker Dam/Colorado River Aqueduct

- Supplies to Los Angeles Area

## 1947 San Diego Aqueduct



**University of California**

Agriculture and Natural Resources ■ California Institute for Water Resources

# Colorado River Development Arizona

1957 Gila Gravity Canal

1973-1994 Central Arizona Project (CAP)

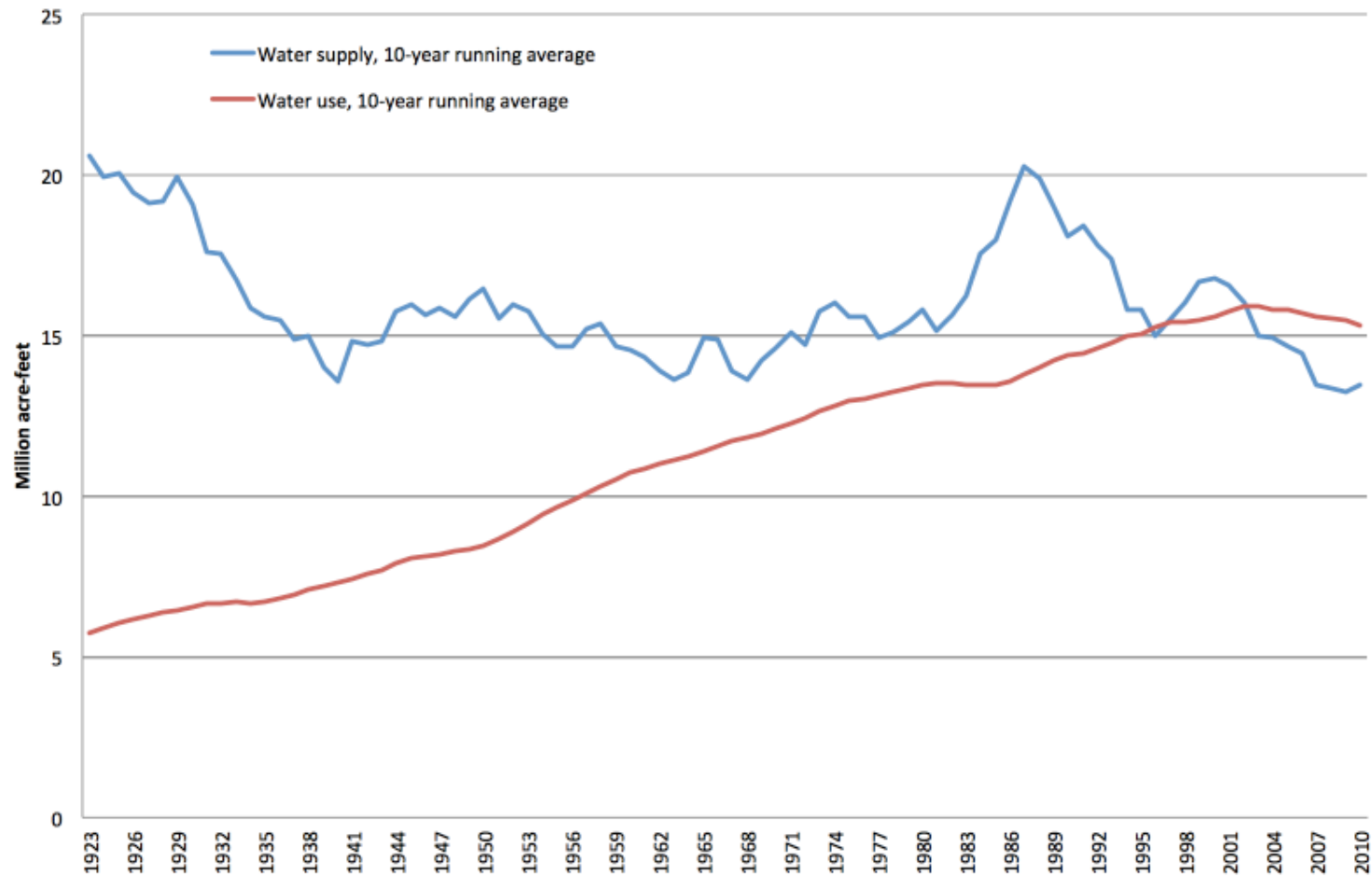
- 336 Mile Canal
- Terminus near Tucson
- 830,000 Acres Cropland



**University of California**

Agriculture and Natural Resources ■ California Institute for Water Resources

## Water supply and water use in the Colorado River Basin



<http://palm.mydesert.com/2014Projects/2014ClimateChange/WaterSupplyUse800.png>

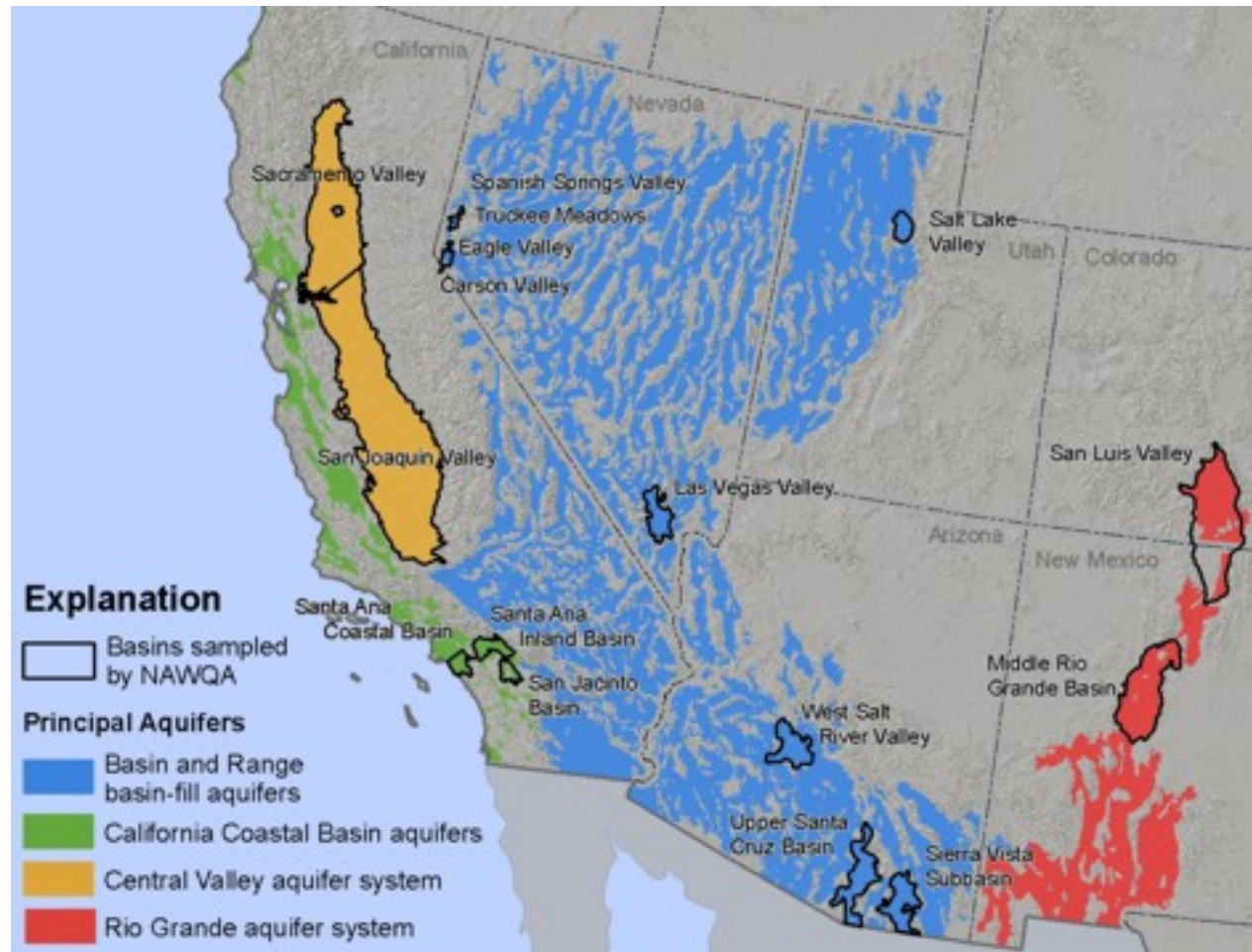


**University of California**

Agriculture and Natural Resources

California Institute for Water Resources

# Groundwater Basins



University of California

Agriculture and Natural Resources | California Institute for Water Resources

# CA Water Supply Facts

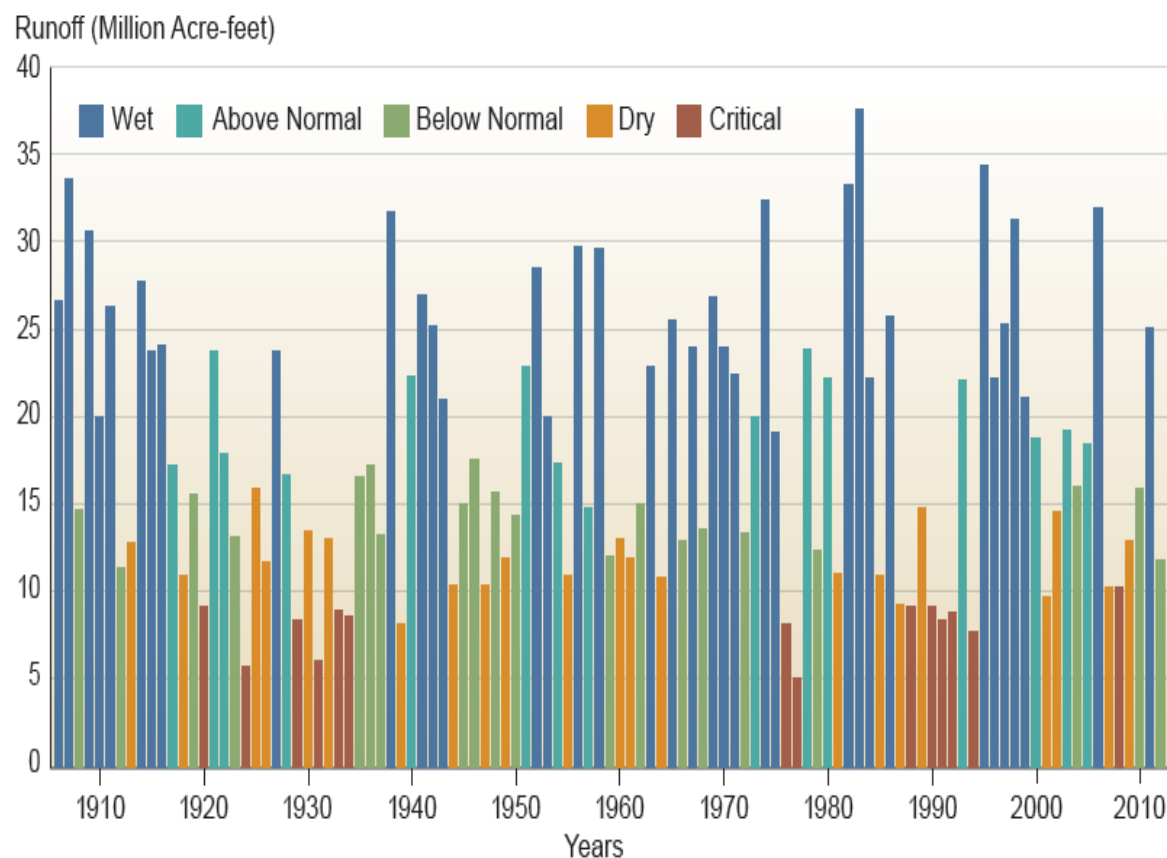
- 43 MAF Surface Storage
- 150+ MAF Groundwater Storage
- 15 MAF Snowpack
  - Decreasing to 10-11 MAF with Climate Change



**University of California**

Agriculture and Natural Resources | California Institute for Water Resources

**Figure 3-7 Sacramento Four Rivers Unimpaired Runoff, 1906-2012**



Note: The Sacramento Four Rivers are Sacramento River above Bend Bridge, near Red Bluff; Feather River inflow to Lake Oroville; Yuba River at Smartville; American River inflow to Folsom Lake.

California Water Plan Update 2013

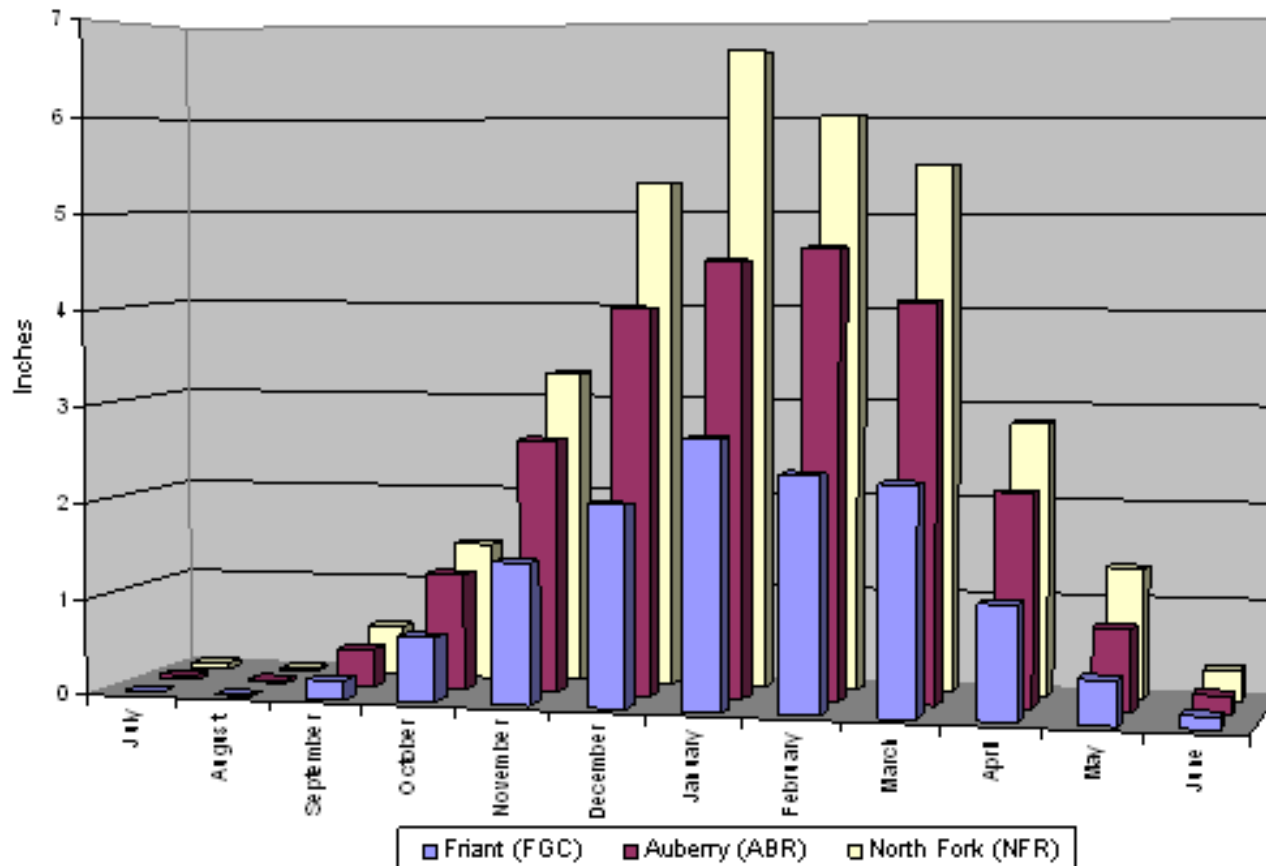


**University of California**

Agriculture and Natural Resources

California Institute for Water Resources

## Average Monthly Precipitation



[www.sierrafoothill.org](http://www.sierrafoothill.org)



**University of California**

Agriculture and Natural Resources | California Institute for Water Resources





# Central Valley Project (US BOR)

- Designed in 1933
- 2,000 + MW Hydropower
- 13 MAF Storage
- 20 Reservoirs
- 3 M Acres Farmland
- Small Municipalities
- Wetlands



**University of California**

Agriculture and Natural Resources ■ California Institute for Water Resources



# California State Water Project

- Begun 1960
- 3,000 MW Hydropower
  - Net User of Power
- 5.7 MAF
- 10 Reservoirs
- 700,000 Acres Farmland
- 24 M People



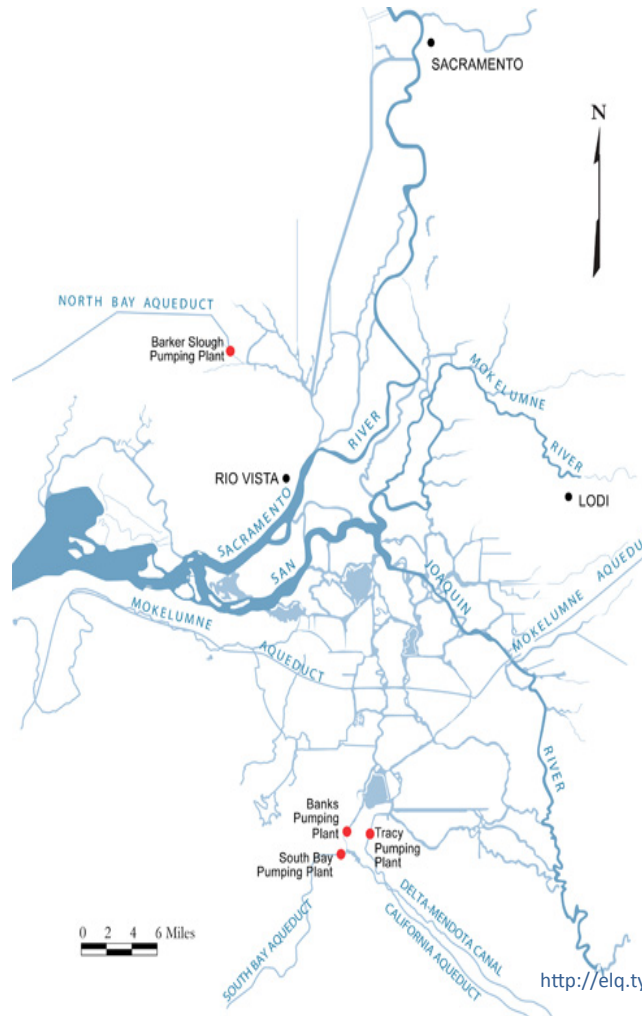
**University of California**

Agriculture and Natural Resources

California Institute for Water Resources



# Sacramento-San Joaquin Delta



<http://elq.typepad.com/currents/2010/03/currents37-03-frank-2010-0319.html>

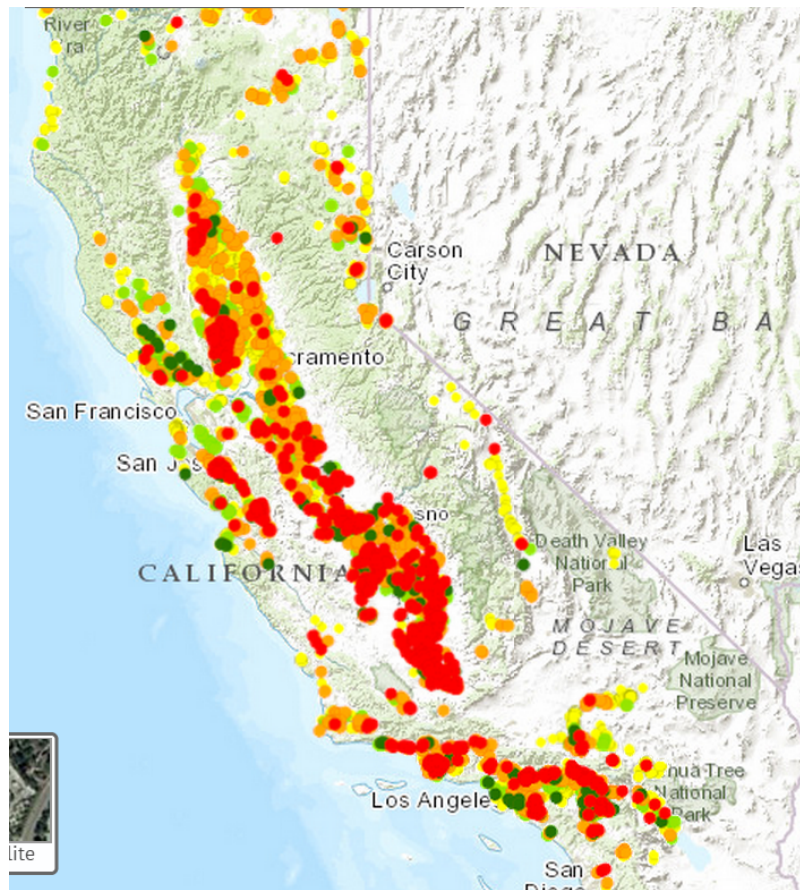


**University of California**

Agriculture and Natural Resources

California Institute for Water Resources

# 2014-2015 Change in Groundwater Levels



**University of California**

Agriculture and Natural Resources

California Institute for Water Resources



# U.S. Drought Monitor West

**September 22, 2015**


(Released Thursday, Sep. 24, 2015)

Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
<b>Current</b>	22.79	77.21	58.18	42.49	26.73	7.62
<b>Last Week</b> 9/15/2015	24.68	75.32	59.66	42.69	26.73	7.62
<b>3 Months Ago</b> 6/23/2015	23.93	76.07	57.86	35.88	17.13	7.26
<b>Start of Calendar Year</b> 12/02/04	34.76	65.24	54.48	33.50	18.68	5.40
<b>Start of Water Year</b> 9/30/2014	31.48	68.52	55.57	35.65	19.95	8.90
<b>One Year Ago</b> 9/23/2014	31.18	68.82	56.42	35.96	20.00	8.90

## Intensity:

 D0 Abnormally Dry	 D3 Extreme Drought
 D1 Moderate Drought	 D4 Exceptional Drought
 D2 Severe Drought	

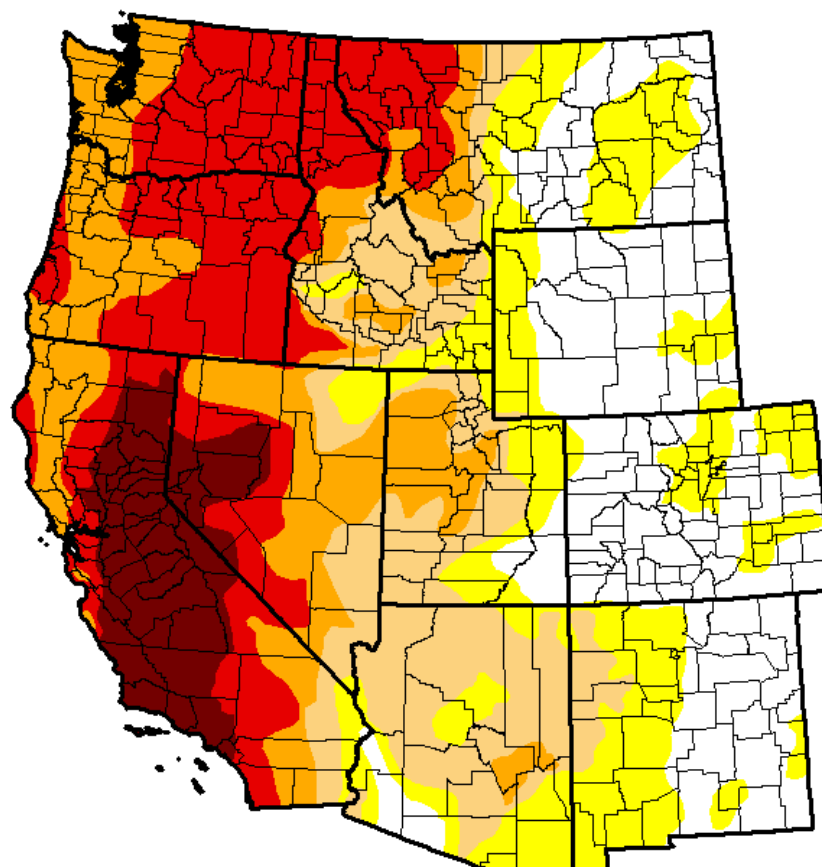
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

## Author:

Eric Luebbehusen  
U.S. Department of Agriculture



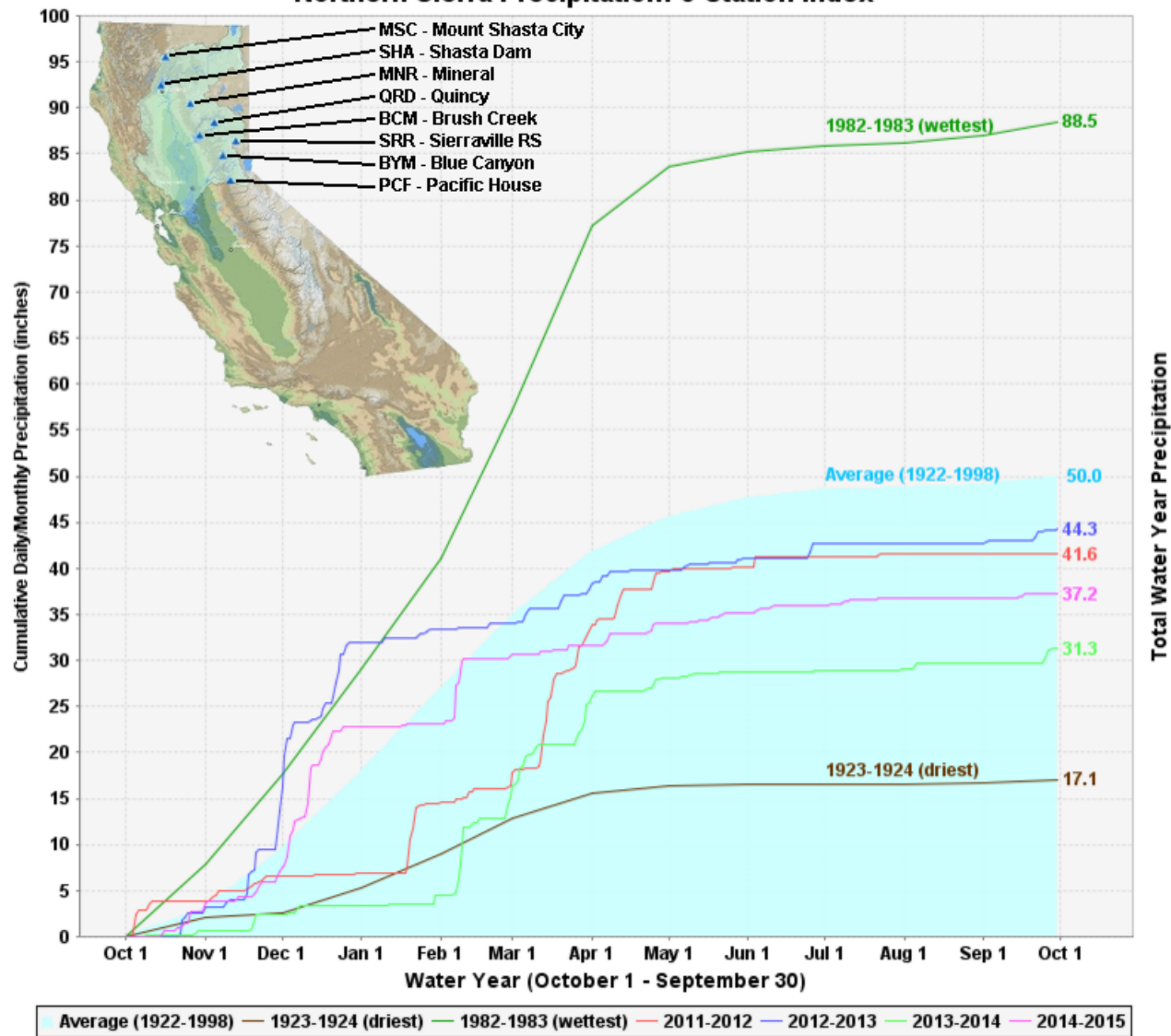
<http://droughtmonitor.unl.edu/>



**University of California**

Agriculture and Natural Resources | California Institute for Water Resources

## Northern Sierra Precipitation: 8-Station Index



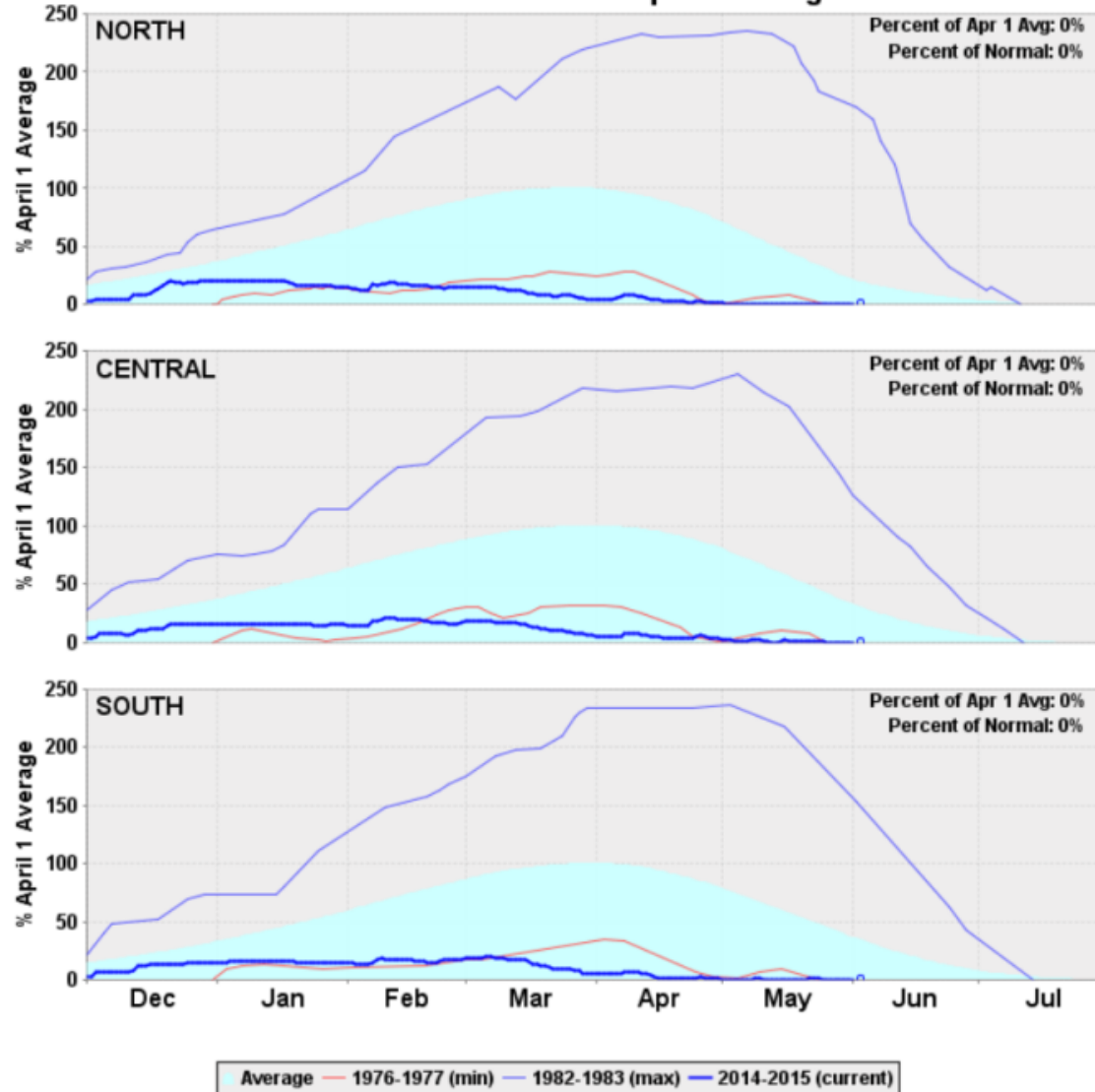
University of California

Agriculture and Natural Resources

California Institute for Water Resources



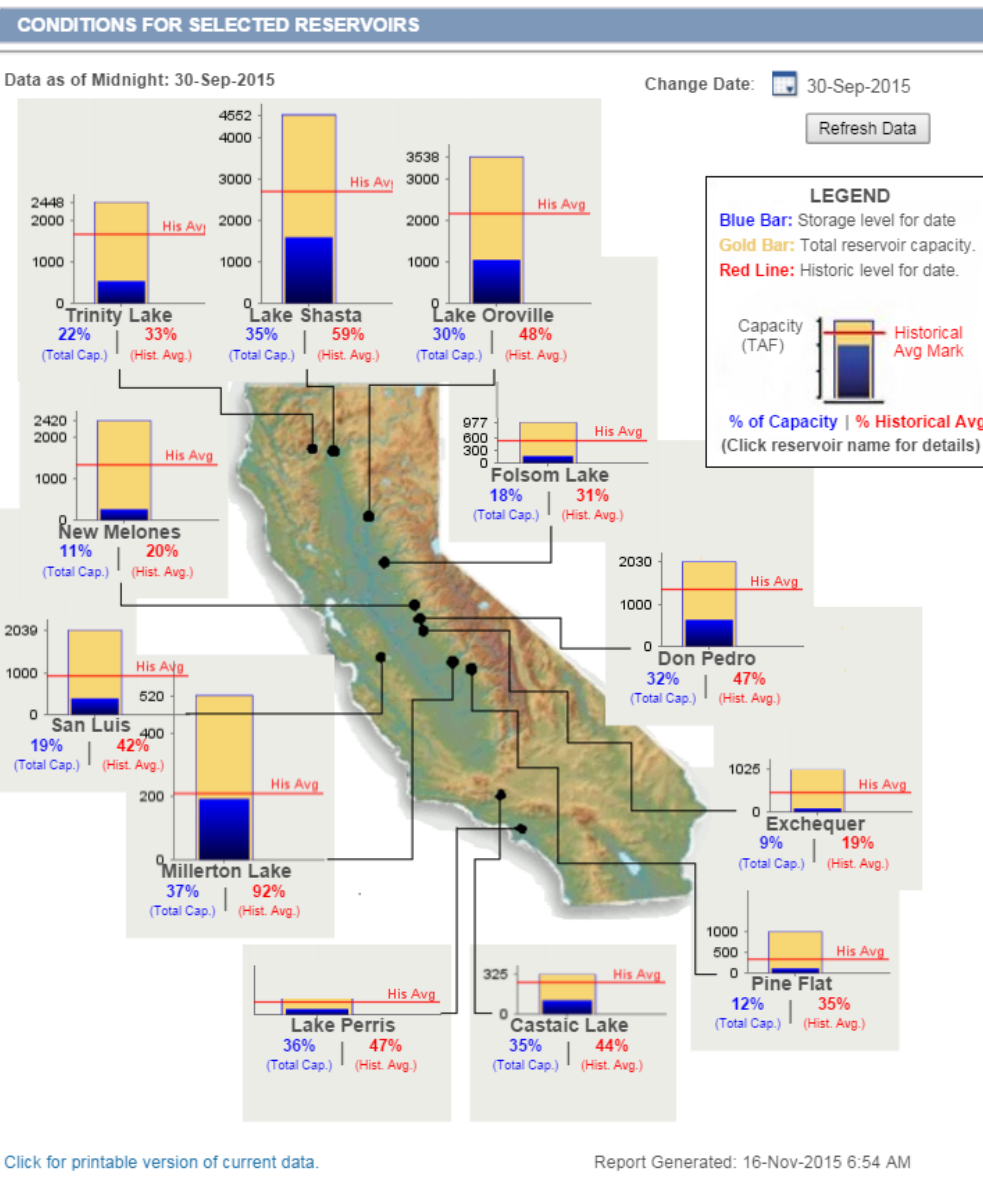
# California Snow Water Content - Percent of April 1 Average For: 01-Jun-2015



**University of California**

Agriculture and Natural Resources

California Institute for Water Resources



**University of California**

Agriculture and Natural Resources ■ California Institute for Water Resources

# Severity of California Drought

- Worst 4 consecutive years in 1,200 years
- Worst snowpack in 500 years
- Over 2,000 wells gone dry
- Severe areas of subsidence

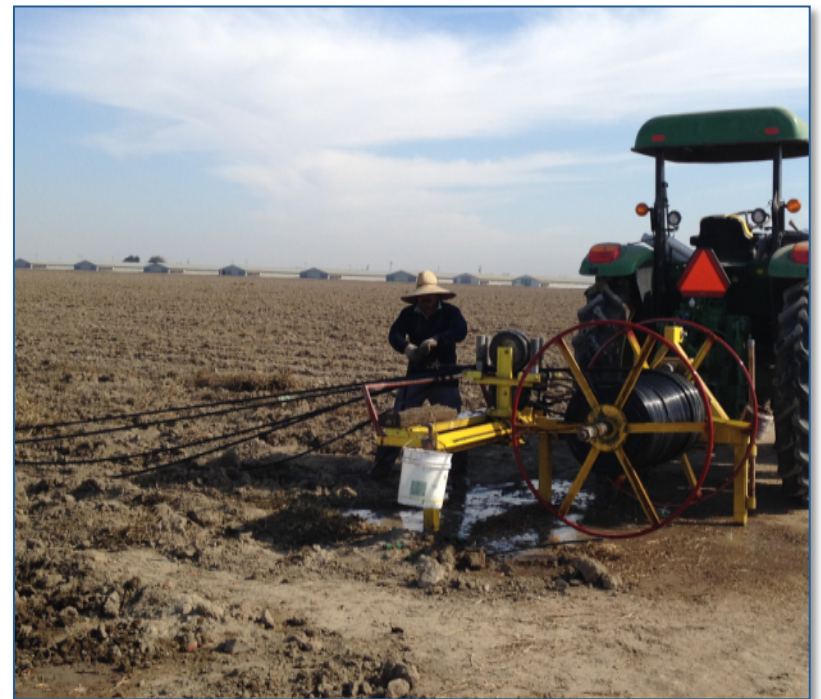


**University of California**

Agriculture and Natural Resources ■ California Institute for Water Resources

# Searching For Solutions

- Desalination
- Waste Water Reuse
- Surface Storage
- Groundwater Storage
- Reallocation
- Water Use Efficiency/Conservation



**University of California**

Agriculture and Natural Resources ■ California Institute for Water Resources

# The Fallacy of the Solutions Mindset

Problem: Supply  $\neq$  Demand

Solution: Supply = Demand

## solution

*noun* so·lu·tion \sə-'lü-shən\

- something that is used or done to deal with and **end a problem**
- something that solves a problem
- the act of solving something



University of California

Agriculture and Natural Resources ■ California Institute for Water Resources

# The Fallacy of the Solutions Mindset

## Challenge #1: The West is land rich but water poor

### California Agriculture Facts

- 80,000 + farms
- \$46+ billion industry
- 26 million acres of agricultural lands
  - 13 million acres pasture and rangeland
  - 9.5 million acres of irrigated cropland
    - 6 million acres annuals
    - 3 million acres orchards/vineyards



University of California

Agriculture and Natural Resources

California Institute for Water Resources



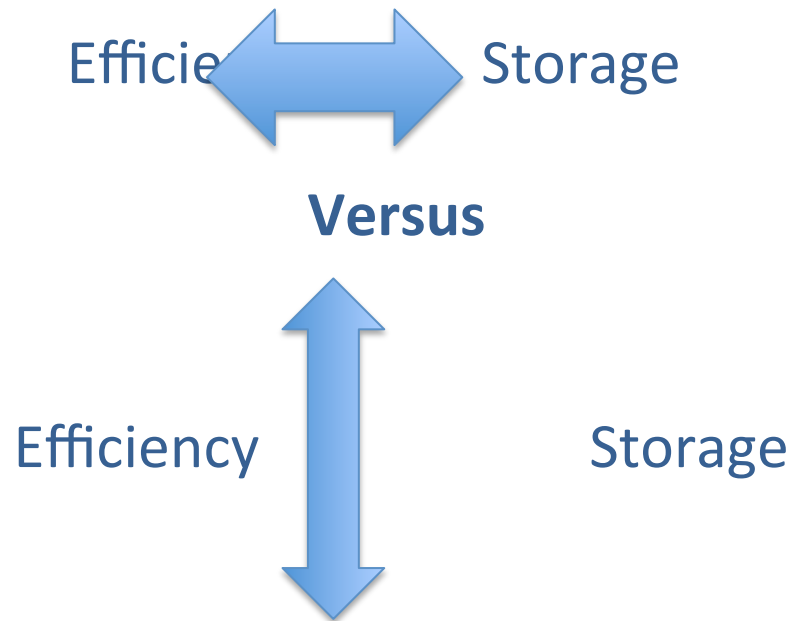
University of California

Agriculture and Natural Resources

California Institute for Water Resources

# The Fallacy of the Solutions Mindset

## Challenge #2: Efficiency vs. Storage



**University of California**

Agriculture and Natural Resources

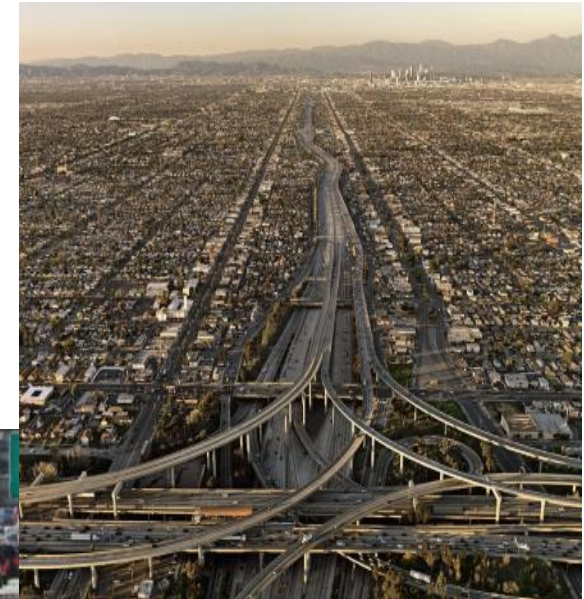
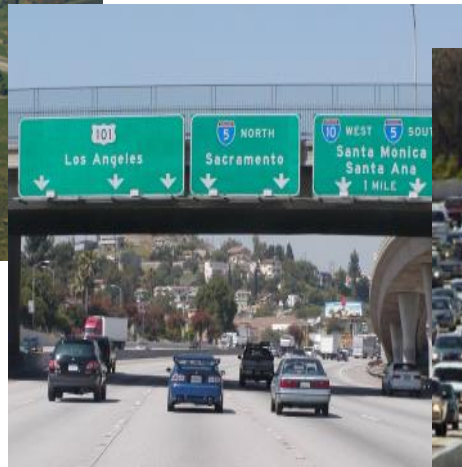
California Institute for Water Resources



# Changing the Conversation

Fundamental Paradox

Enough will never be enough



University of California

Agriculture and Natural Resources

California Institute for Water Resources

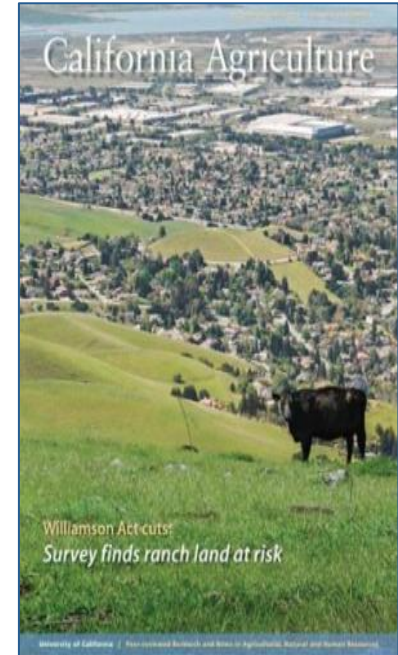
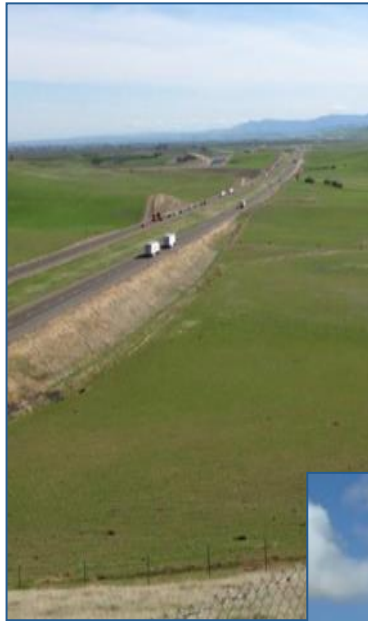


# Changing the Conversation

Fundamental Paradox

$$\cancel{S_w = D_w \forall t}$$

Enough will never be enough



University of California

Agriculture and Natural Resources

California Institute for Water Resources

# Thank You



Web: [ucanr.edu/drought](http://ucanr.edu/drought) Twitter: @ucanrwater



**University of California**

Agriculture and Natural Resources ■ California Institute for Water Resources