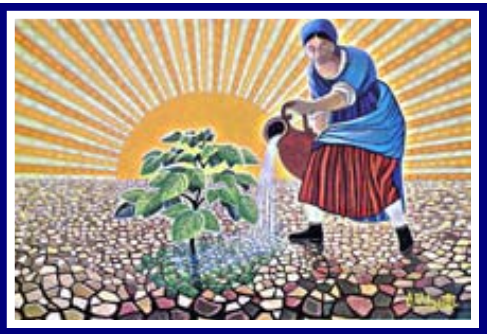
University of California
Agriculture and Natural Resources



UPDATE ON DROUGHT & ESTIMATED IMPACTS ON CALIFORNIA AGRICULTURE

South Sacramento Valley Processing Tomato Production Meeting

Woodland, CA – January 8, 2014

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California Agriculture & Water Facts (DWR Water Plan 2010)

>80,000 Farms => $45 Billion Industry **(< 5% GIR)**

26 Million Acres of Agricultural Lands

13 Million Acres of Pasture and Rangeland

9.5 Million Acres of Irrigated Cropland

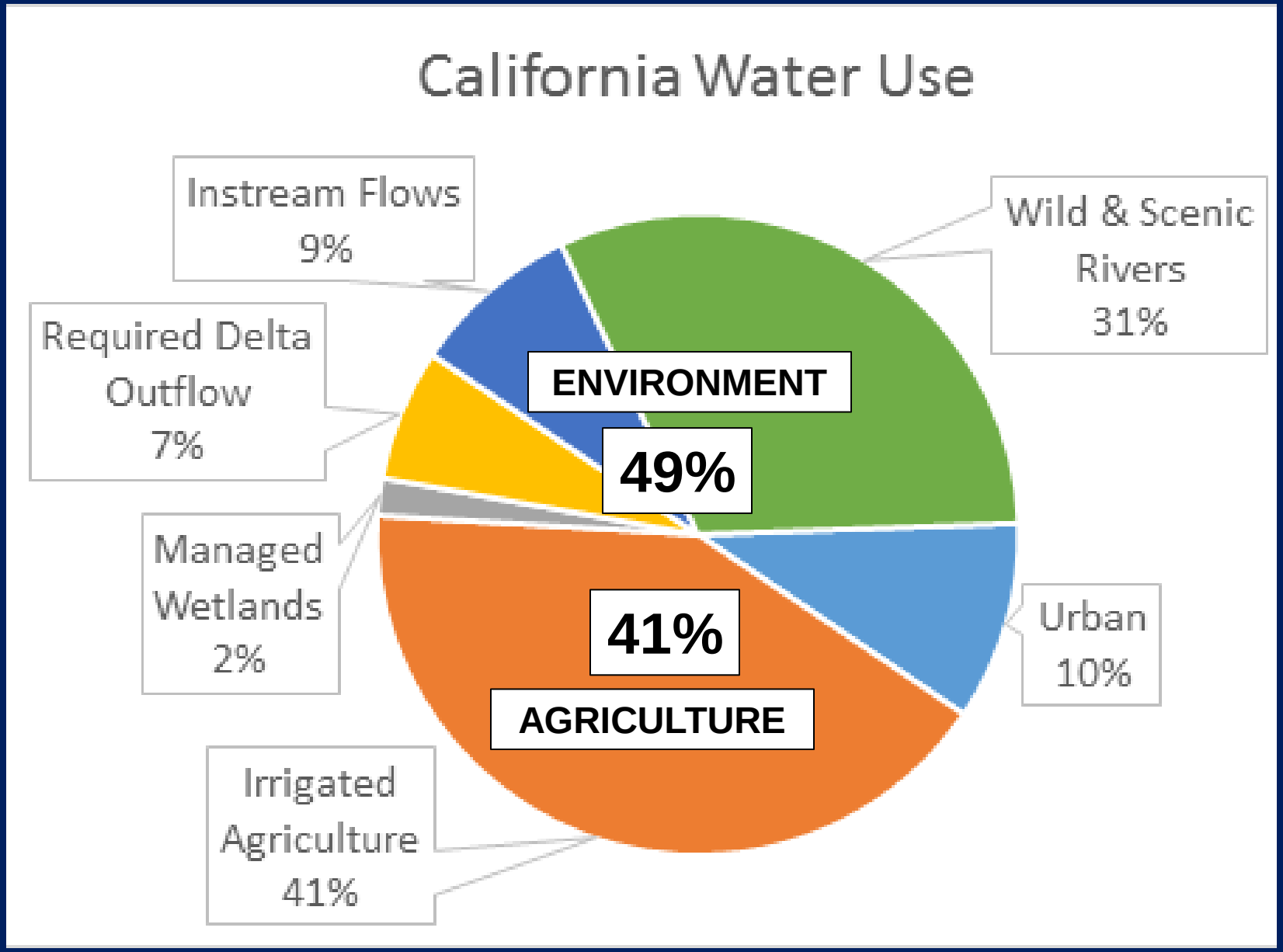
6.2 Million Acres Annuals

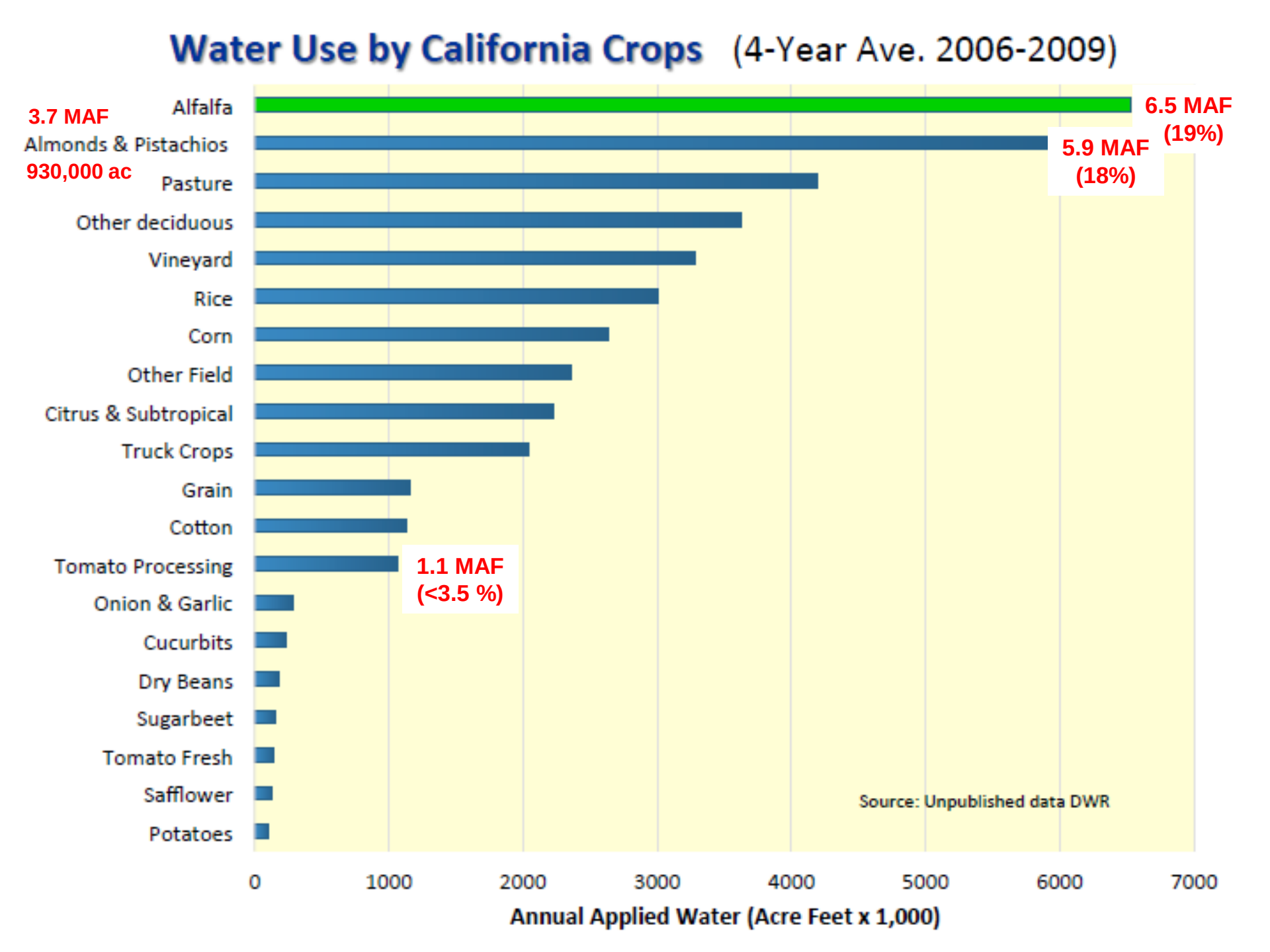
3.3 Million Acres Orchards/Vineyards

> 350 crops

WATER FACTS	MAF/Yr
Water Supply in Average Year (2010)	**200 (*precipit. + import*)**
Environmental use	39
Agricultural water use	**33 (~30% from GW)**
Urban water use (residential + industrial)	**8.5**
Total beneficial water use	**80.5**
Recycled water use	**0.65 (7% = 0.65/8.5 MAF)**

TOTAL BENEFICIAL WATER USE: 80.5 MAF

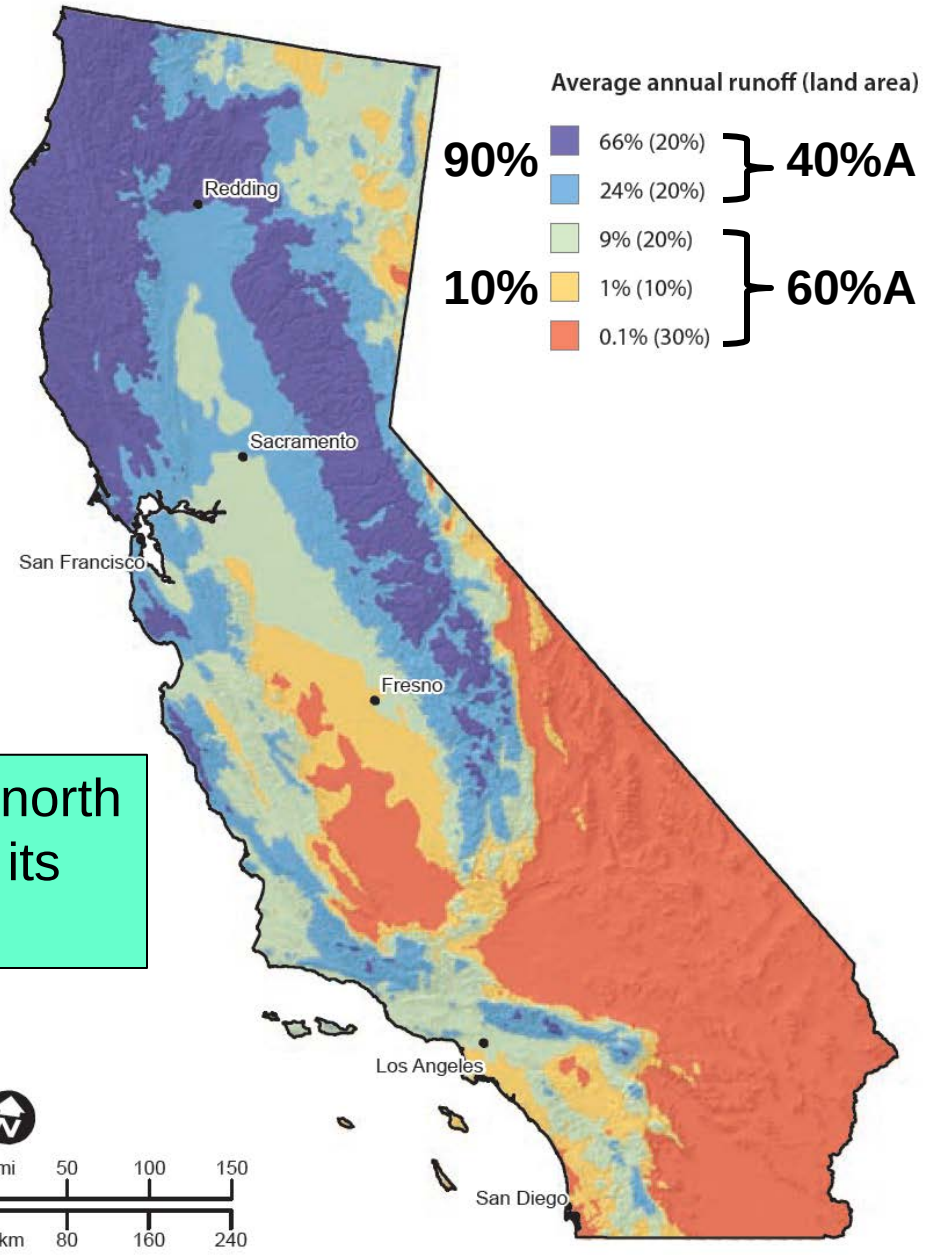



Water Use by California Crops (4-Year Ave. 2006-2009)
3.7 MAF
Almonds & Pistachios
930,000 ac
Alfalfa
Pasture
Other deciduous
Vineyard
Rice
Corn
Other Field
Citrus & Subtropical
Truck Crops
Grain
Cotton
Tomato Processing
Onion & Garlic
Cucurbits
Dry Beans
Sugarbeet
Tomato Fresh
Safflower
Potatoes
6.5 MAF
(19%)
5.9 MAF
(18%)
1.1 MAF
(<3.5 %)
Source: Unpublished data DWR
0
1000
2000
3000
4000
5000
6000
7000
Annual Applied Water (Acre Feet x 1,000)

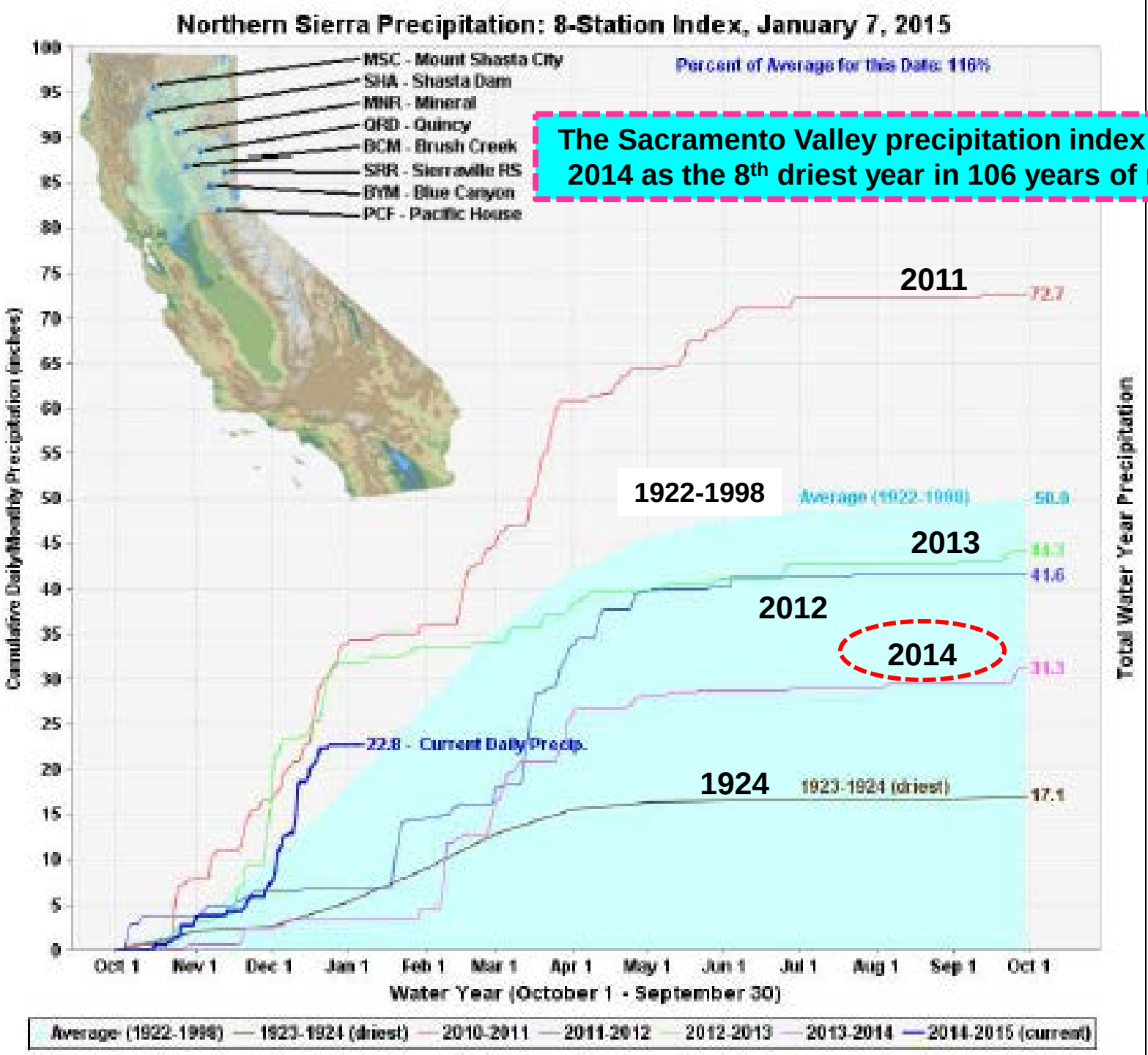
WATER SUPPLY & WATER DEMAND

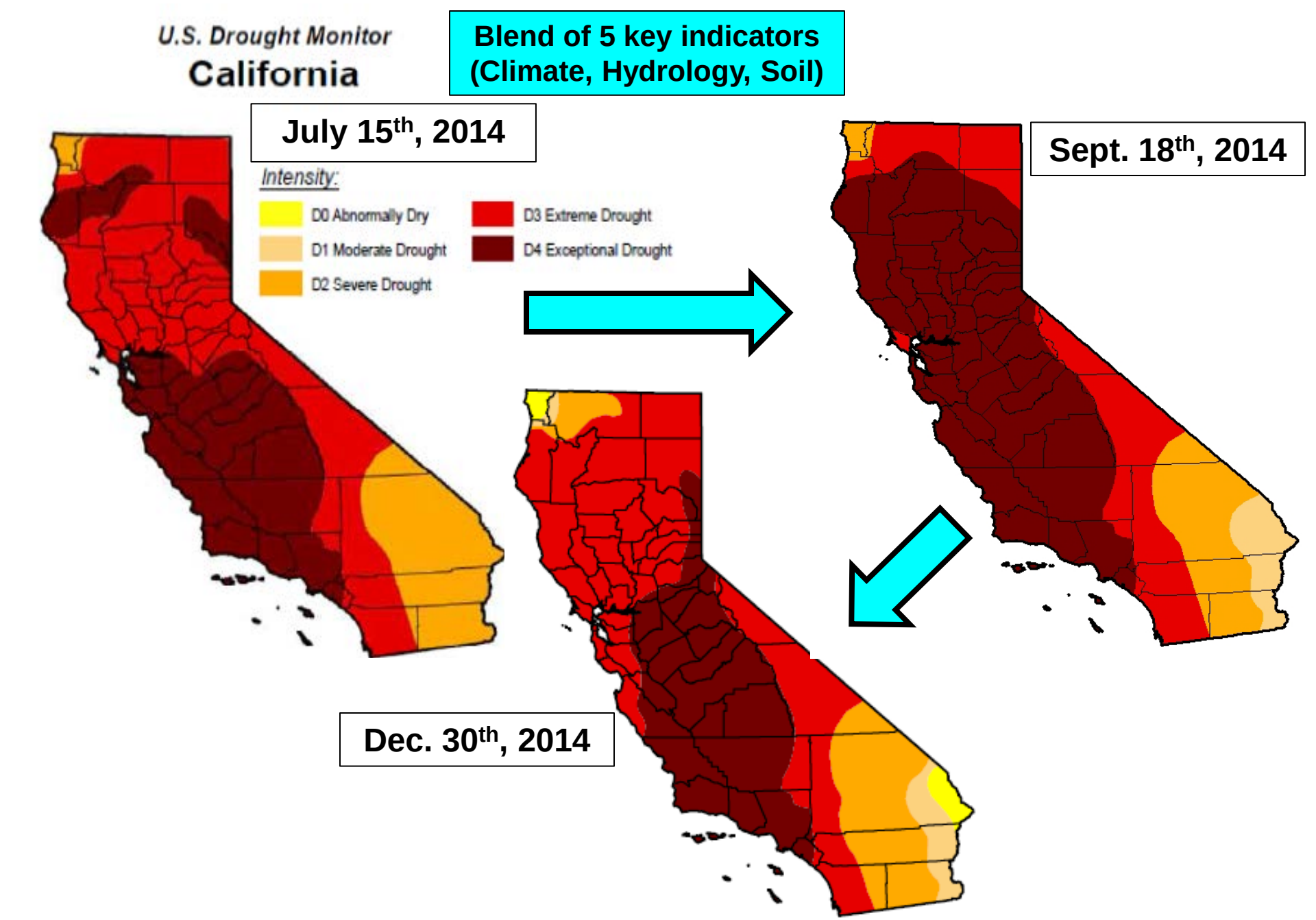
- **Water Supplies**
  - Mostly in North
  - Mostly in Wet Season
- **Water Demands**
  - Mostly central and South
  - Mostly in Dry Season
- **Aqueducts, reservoirs, groundwater use**

75% of California's precipitation occurs north and east of Sacramento, and 75% of its water demand lies to the south

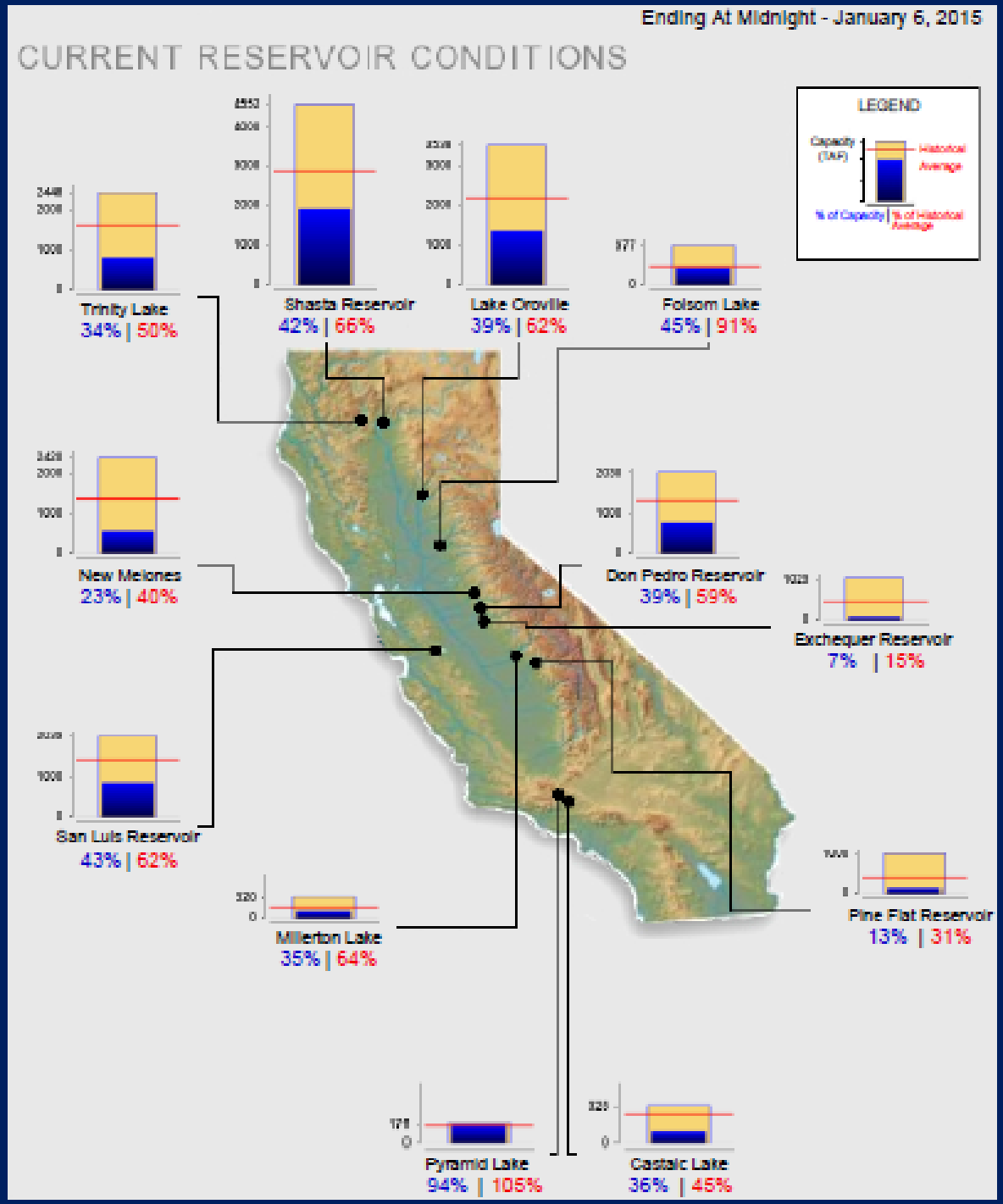


*** Hanak et al. (2011). "Managing California's Water."**
<http://watershed.ucdavis.edu/research/waterpolicy.htm


Northern Sierra Precipitation: 8-Station Index, January 7, 2015
MSC - Mount Shasta City
SHA - Shasta Dam
MNR - Mineral
ORD - Quincy
BCM - Brush Creek
SRR - Sierraville RS
BYM - Blue Canyon
PCF - Pacific House
Percent of Average for this Date: 116%
The Sacramento Valley precipitation index showed 2014 as the 8th driest year in 106 years of records
2011
72.7
1922-1998
Average (1922-1998)
50.8
2013
44.3
41.6
2012
2014
31.3
22.8 - Current Daily Precip.
1924
1923-1924 (driest)
17.1
Cumulative Daily/Monthly Precipitation (inches)
Total Water Year Precipitation
Oct 1
Nov 1
Dec 1
Jan 1
Feb 1
Mar 1
Apr 1
May 1
Jun 1
Jul 1
Aug 1
Sep 1
Oct 1
Water Year (October 1 - September 30)
Average (1922-1998)
1923-1924 (driest)
2010-2011
2011-2012
2012-2013
2013-2014
2014-2015 (current)



http://droughtmonitor.unl.edu/Home/StateDroughtMonitor.aspx?CA

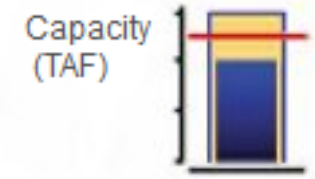


LEGEND

Blue Bar: Storage level for date

Gold Bar: Total reservoir capacity.

Red Line: Historic level for date.

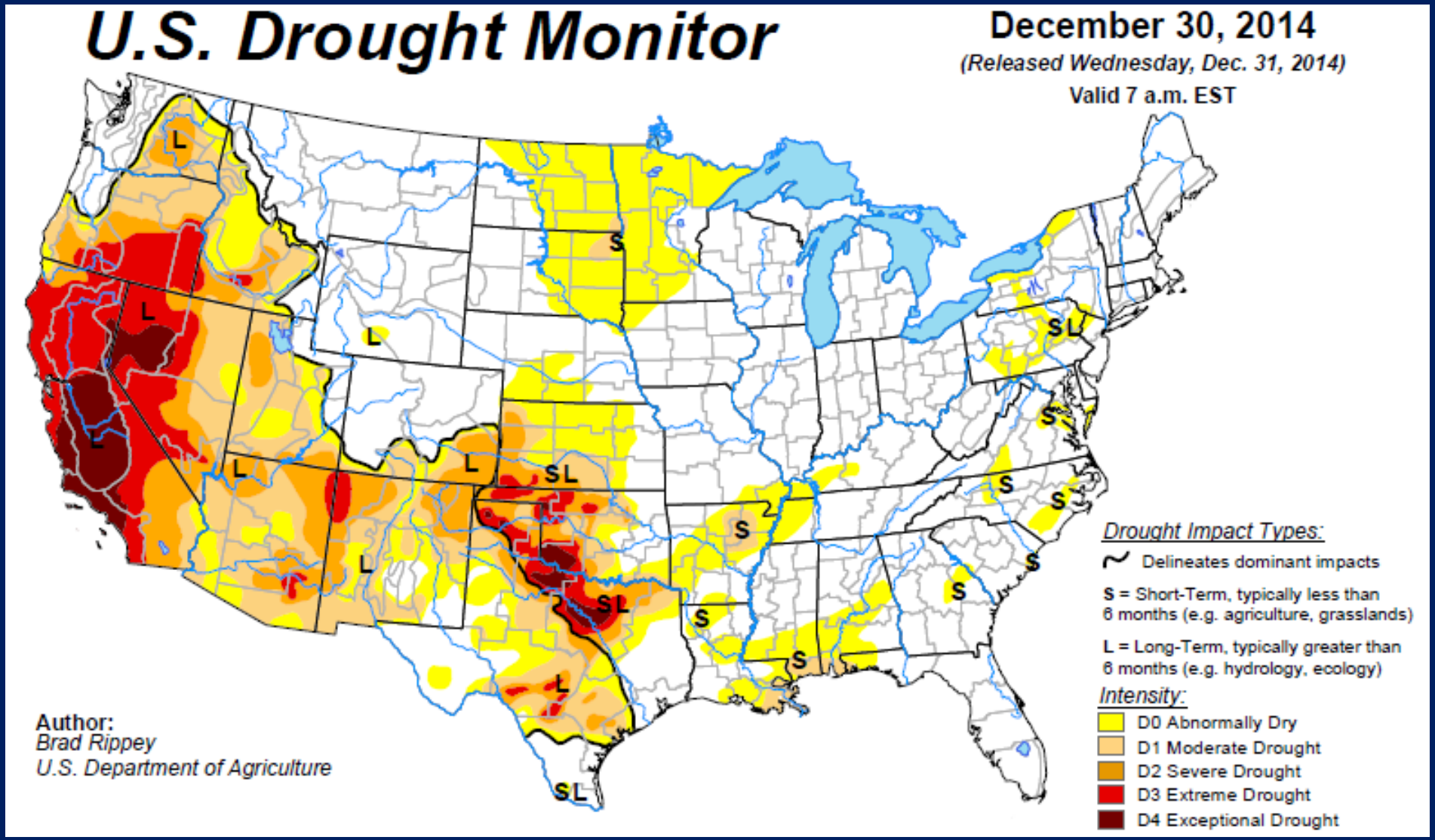


% of Capacity | % Historical Avg

(Click reservoir name for details)

- ✓ **6 out of 12 major reservoirs are around or below 35% capacity**
- ✓ **All are way below historic averages (incl. Shasta and Lake Oroville)**
- ✓ **San Luis Reservoir (critical for the Central Valley and Southern California) is currently at 43% capacity**

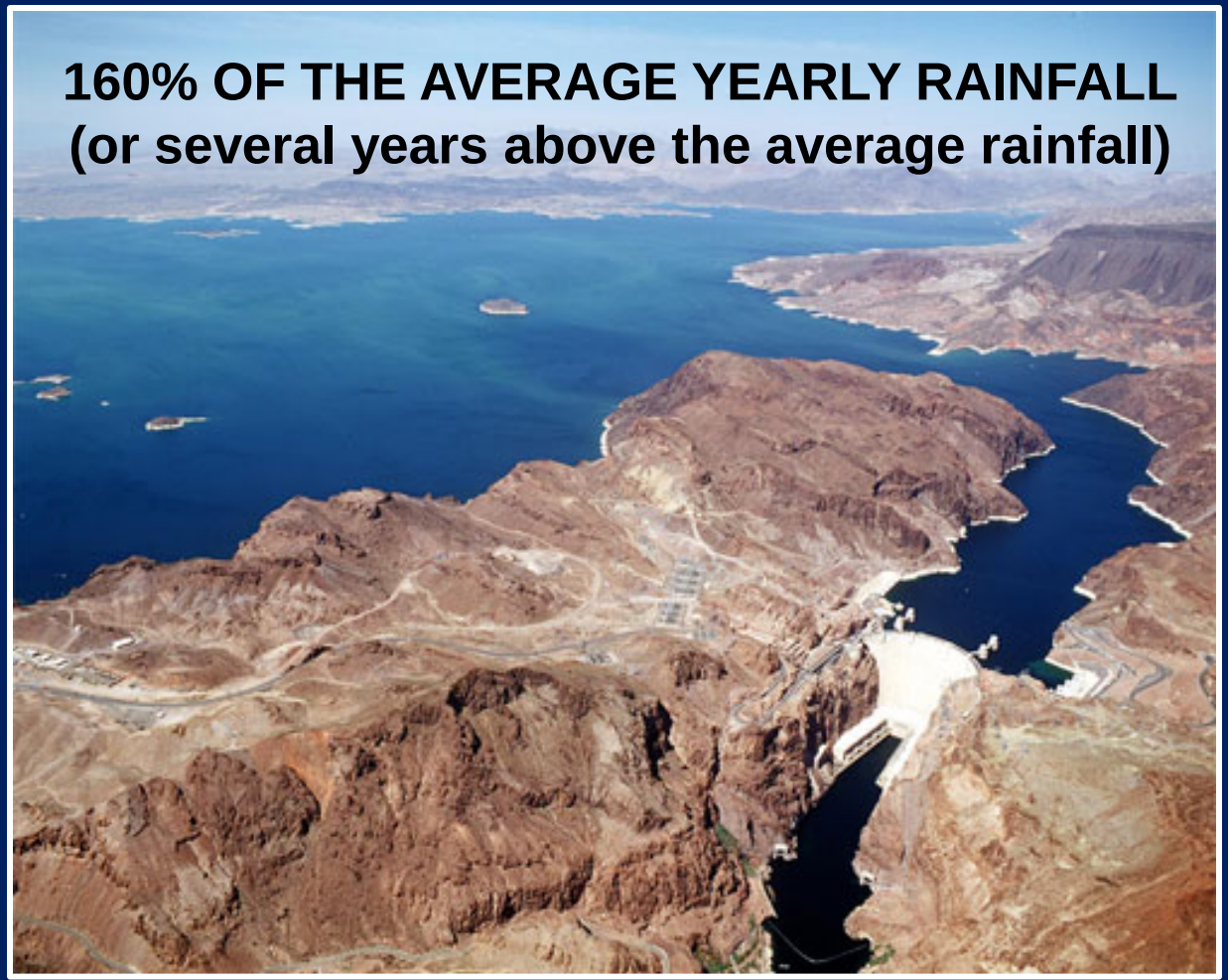
WESTERN AND SOUTHERN U.S.



NASA ESTIMATED THAT CALIFORNIA NEEDS 11 TRILLION GALLONS (33.7 MAF) TO RECOVER FROM THE LAST 3-YEAR DROUGHT

(NASA conducted such estimate by using satellite data)

1.5 TIMES THE VOLUME OF WATER OF THE LAKE MEAD



Reliability of water supply (DWR)

In the last 25 years (1990-2014) contractors received from the Central Valley Project and delivered to farmers

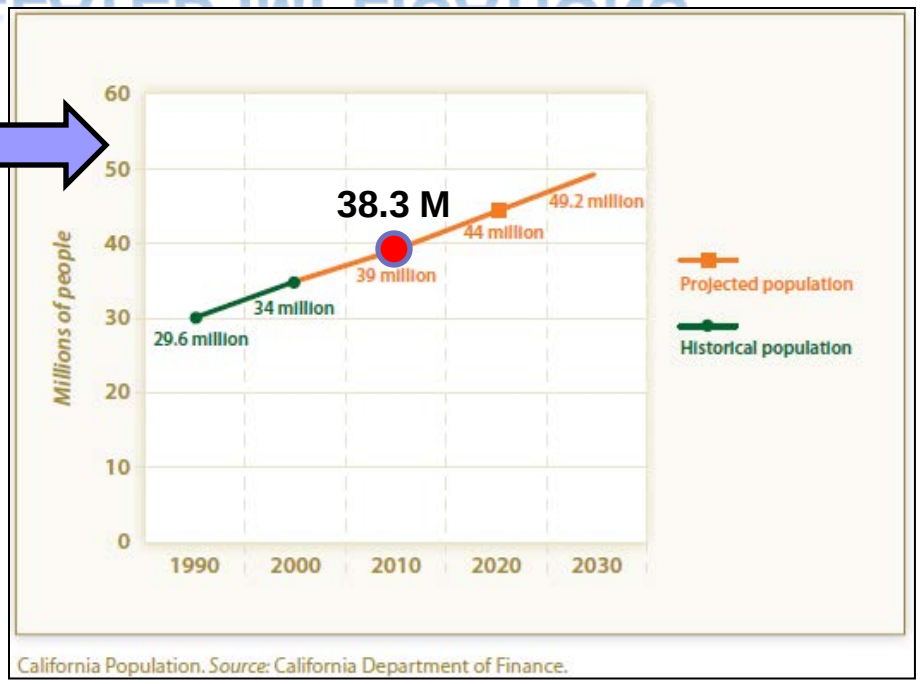
✓100% of water rights only on 3 years/25 years (12%)

✓ 75% of water rights only on 8 years/25 years (30%)

due to combined impacts of dry conditions and environmental regulations

TRENDS & WATER-RELATED IMPLICATIONS

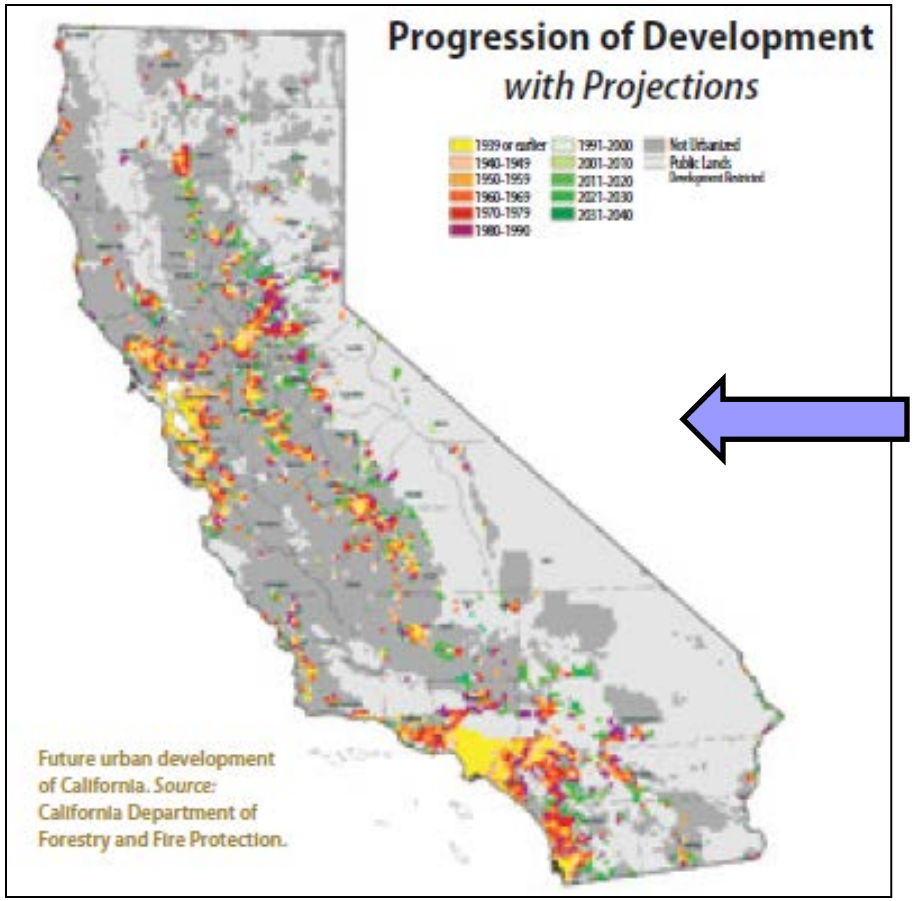
Population is growing at fast rate



California Population. *Source:* California Department of Finance.

IMPLICATION 1:

there is an increasing internal need for food to meet the demand of population



Future urban development of California. *Source:* California Department of Forestry and Fire Protection.

IMPLICATION 2:

1990-2004 => ~ 75,000 ac. of prime agricultural land **lost** to urban development in the S.J.V.

CHALLENGE:

increasing safe food production on less fertile lands (more water & nutrients)

TREND 2

Irrigated Agriculture is concentrating:

San Joaquin Valley, Sacramento-San Joaquin Delta, Imperial Valley

> 35% of the US table food on only ~1.2% of the US farmland

Cropping patterns are intensifying:

✓Shift from annual to perennial crops (fruit, nuts and vines)

✓Higher planting densities

✓Shift from surface irrigation to localized methods (drip & micro-sprinkler)

more frequent and flexible delivery schedules needed by farmers

ARE WATER DISTRICTS CAPABLE TO SUPPLY WATER WITH SUCH A FREQUENCY??

Water demand & use steadily growing to higher and less adjustable levels

Shift to permanent crop makes irrigated agriculture less drought-resilient

Lesson Learned from 2014 Drought:

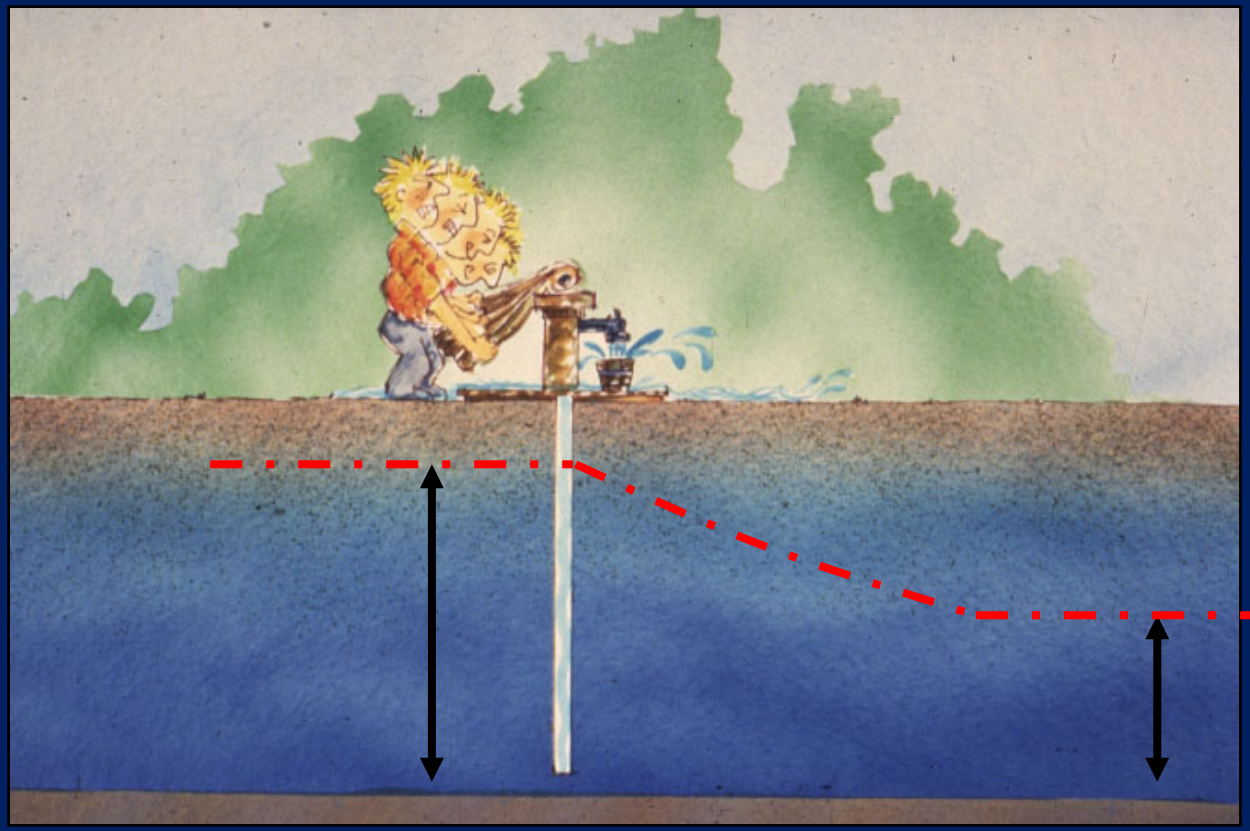
It will happen again:
it's part of California climate!

35%+ chances that 2015 will be a dry year

ECONOMIC IMPACTS OF DROUGHT IN CALIFORNIA

< 5% price increase

California's farmers reacted quickly, by pumping enough ground water to remain competitive



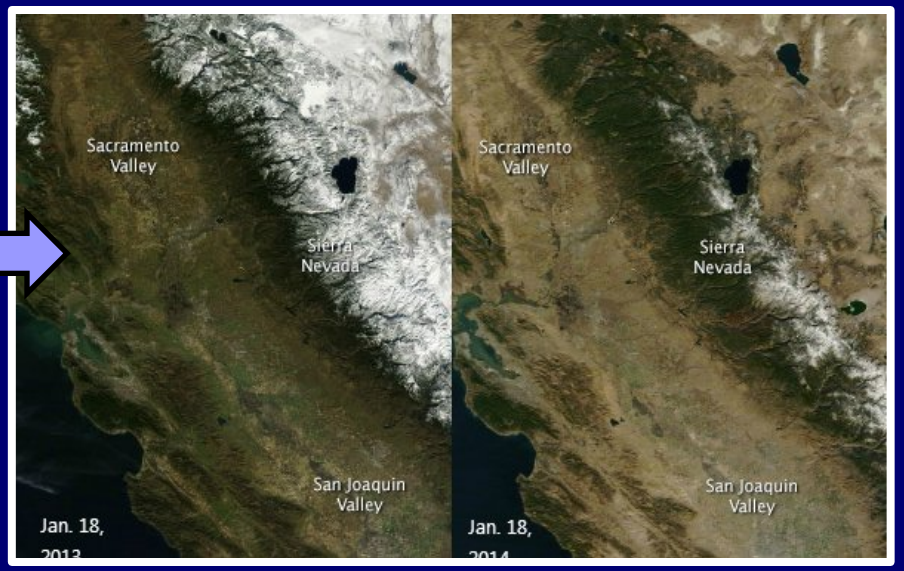
State-Wide Agricultural Production Model, SWAP

Howitt et al. 2014

DROUGHT IMPACT	LOSS QUANTITY
Water Supply	
Surface water reduction	6.6 million ac-ft (~30%)
Groundwater pumping increase	5 million ac-ft
Net water shortage	1.6 million ac-ft
Cropped lands	
Irrigated cropland fallowed (mostly S.J.V.)	430,000 ac (5% of total)
Jobs	
Total job losses (seasonal & part-time)	17,100
State-wide costs	
Crop revenue loss	$810 million
Livestock and dairy revenue loss	$203 million
Additional pumping costs	$454 million
Total direct losses	**$1.5 billion**
TOTAL ECONOMIC COST	**$2.2 billion**

UC OUTREACHING INFORMATION

California is not a water-abundant State (recurrent DROUGHTS)



Cost (value) of irrigation water is increasing on farming budgets

REGULATIONS

- Groundwater Pumping => Monitoring & Control
- ILRP (SCWCB) =>> Third party certification??
- WATER DISTRICTS => Tiered Water Pricing

UC C.E. is engaged in applied research programs to further investigate:

✓water use efficiency, water productivity, deficit irrigation

✓re-use of treated wastewater (and drainage water) for agricultural production

✓crop breeding & drought resistant varieties adapting to water-limited conditions

WATER & DROUGHT ONLINE SEMINAR SERIES

- Drought Impacts on Natural Resources, Man-made Environment & Water Supply
- Drought Preparedness Practices and Policies
- Water Management in Urban Landscapes under Drought
- Crop Management Practices under Limited Water Supply
  - Annual Crops
  - Perennial Crops

http://ucanr.edu/insights

Agricultural water management practices under limited water supply: Lessons from recent droughts

Jim Ayars, Agricultural Engineer, USDA ARS

Land subsidence along the Delta-Mendota Canal and neighboring areas

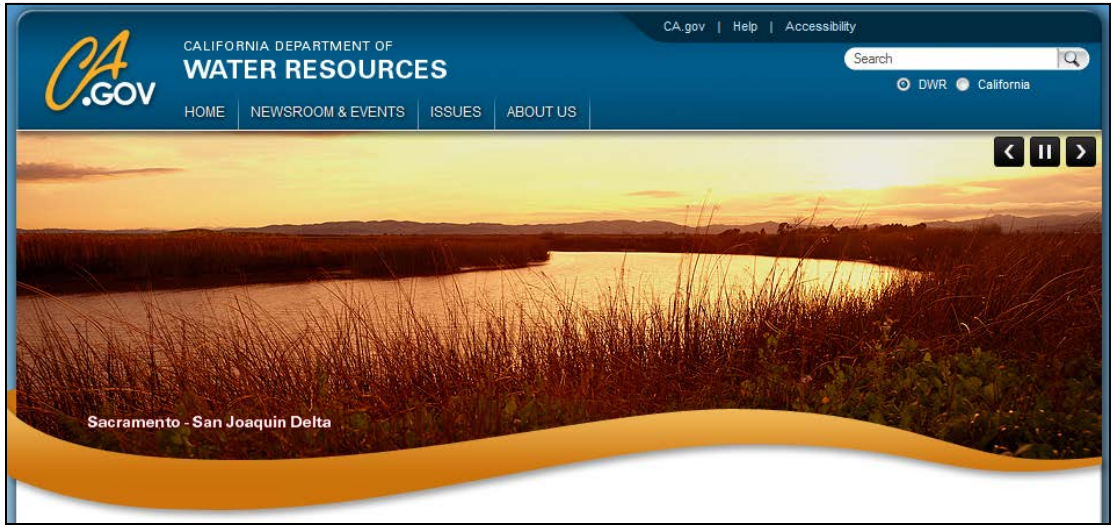
Michelle Sneed, California Water Science Center, US Geological Survey

Groundwater and surface water interactions under water shortage

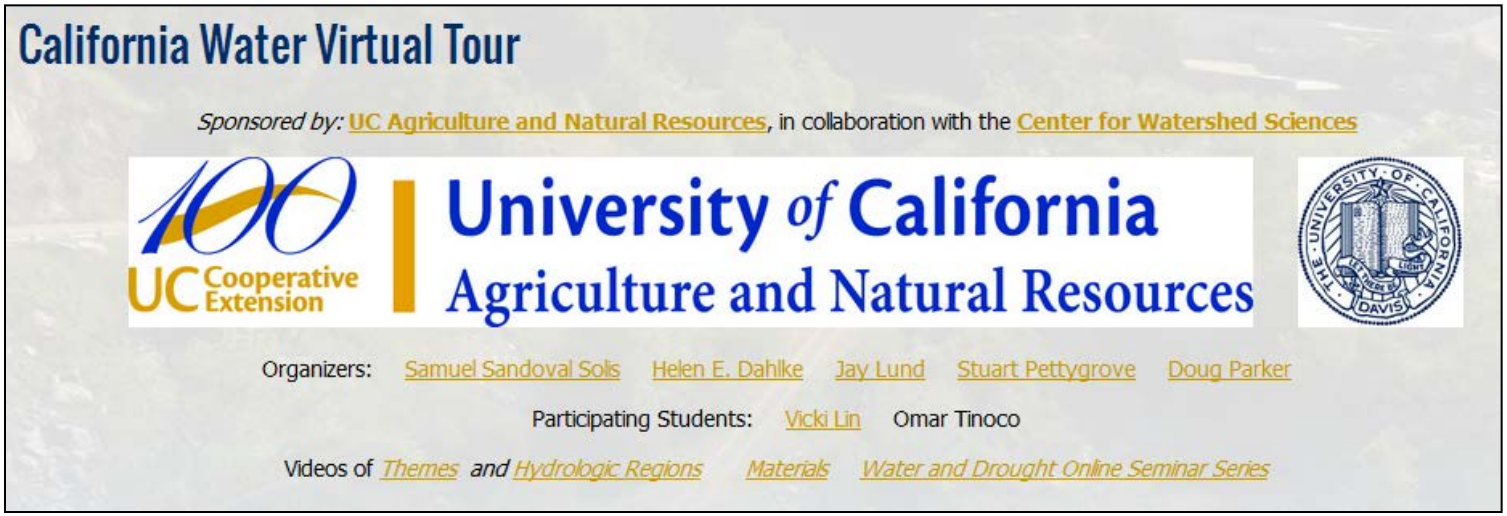
Thomas Harter, UC Cooperative Extension Specialist, UC Davis

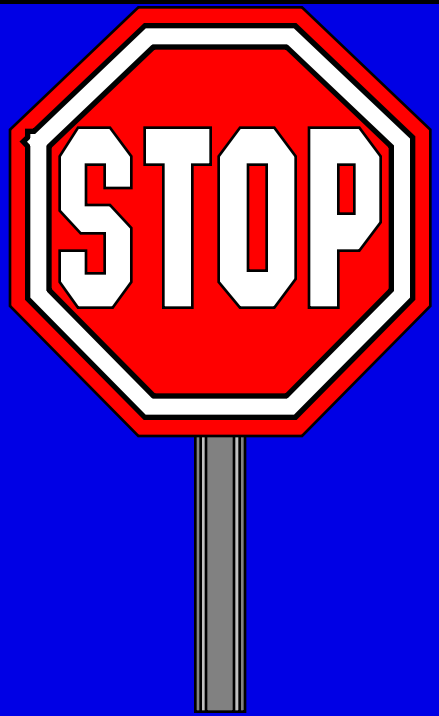
USEFUL LINKS TO CALIFORNIA WATER

http://www.water.ca.gov



http://watermanagement.ucdavis.edu/cooperative-extension/cwvt





THANK YOU !