Drought and Desperation:

New State Mandates and What They Mean for the Monterey Peninsula…

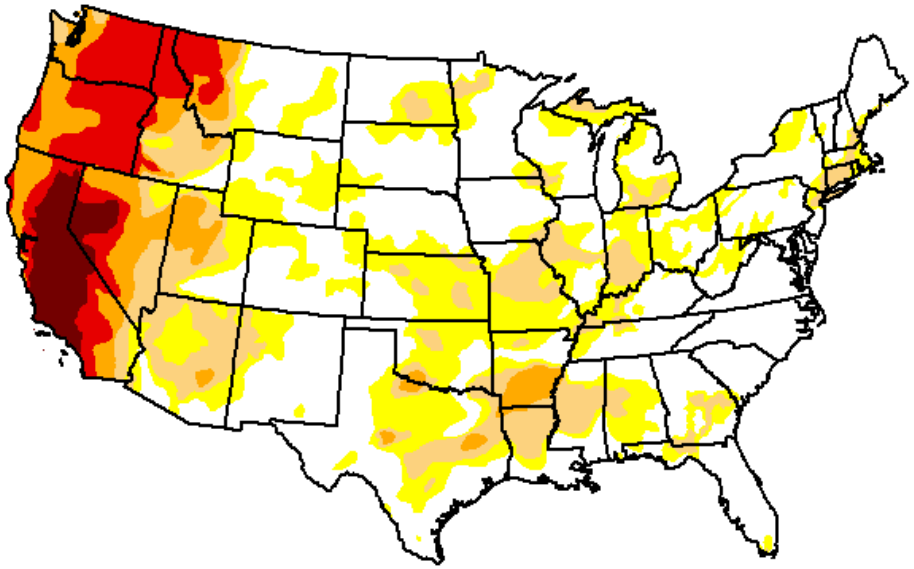
Dave Stoldt
Monterey Peninsula Water Management District
November 2015

Monterey Peninsula Water Management District

DROUGHT

Drought Monitor – October 27, 2015

U.S. Drought Monitor
CONUS



October 27, 2015
(Released Thursday, Oct. 29, 2015)
Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	46.24	53.76	30.27	17.21	10.34	3.00
Last Week 10/20/2015	41.04	58.96	34.78	23.23	14.42	3.76
3 Months Ago 7/28/2015	61.11	38.89	25.71	17.17	8.79	2.83
Start of Calendar Year 12/30/2014	53.20	46.80	28.68	16.93	8.96	2.54
Start of Water Year 9/29/2015	44.91	55.09	31.36	20.09	11.45	3.00
One Year Ago 10/28/2014	56.52	43.48	29.61	18.02	9.17	3.99

Intensity:

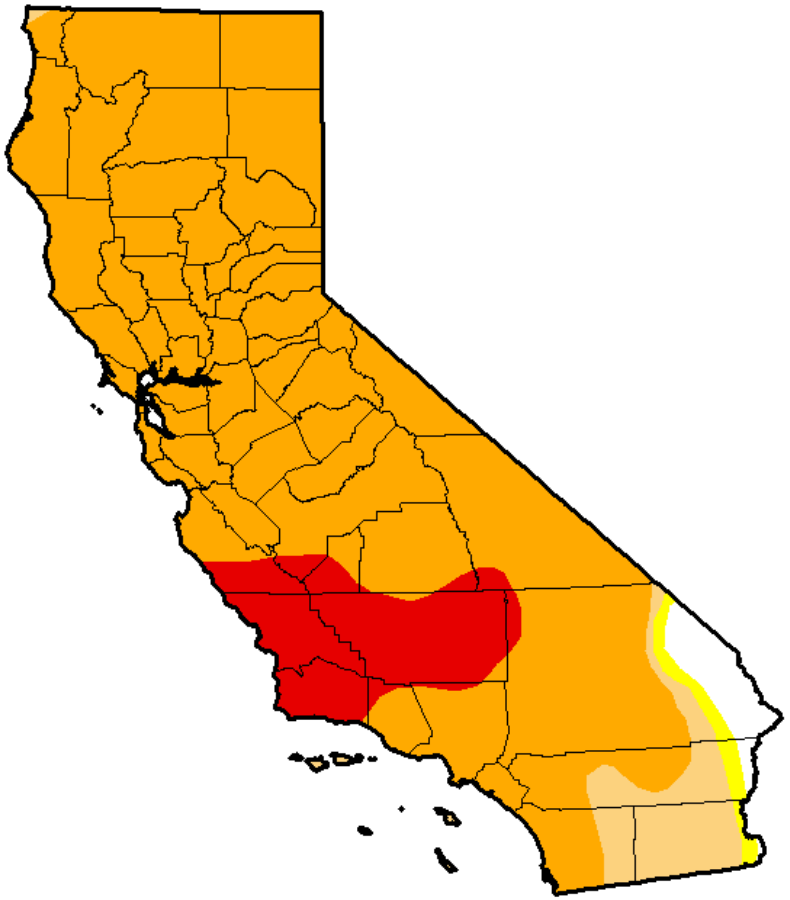
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

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

Author(s):
Brad Rippey
U.S. Department of Agriculture

Drought Monitor – California
Two Years Ago

U.S. Drought Monitor
California



September 17, 2013

(Released Thursday, Sep. 19, 2013)

Valid 7 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	2.63	97.37	96.04	89.84	11.36	0.00
Last Week 9/10/2013	0.00	100.00	97.08	92.94	11.36	0.00
3 Months Ago 6/18/2013	0.00	100.00	98.21	67.07	0.00	0.00
Start of Calendar Year 1/1/2013	31.75	68.25	55.32	22.50	0.00	0.00
Start of Water Year 9/25/2012	11.95	88.05	69.41	22.27	1.14	0.00
One Year Ago 9/18/2012	11.95	88.05	69.09	22.27	1.14	0.00

Intensity:

- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
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Author:
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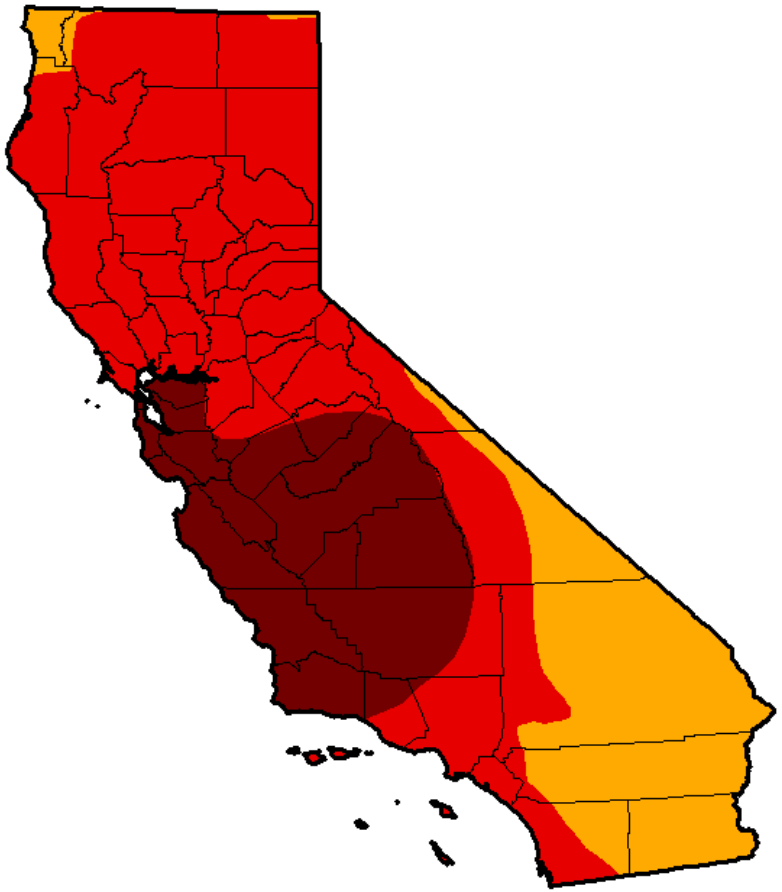
http://droughtmonitor.unl.edu/

Drought Monitor – California
18 Months Ago

U.S. Drought Monitor
California



May 13, 2014

(Released Thursday, May. 15, 2014)

Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	0.00	100.00	100.00	100.00	76.68	24.77
Last Week 5/6/2014	0.00	100.00	100.00	95.93	76.68	24.77
3 Months Ago 2/11/2014	1.43	98.57	94.54	91.59	60.94	9.81
Start of Calendar Year 12/31/2013	2.61	97.39	94.25	87.53	27.59	0.00
Start of Water Year 10/1/2013	2.63	97.37	95.95	84.12	11.36	0.00
One Year Ago 5/14/2013	0.00	100.00	98.16	46.25	0.00	0.00

Intensity:

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

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Author:

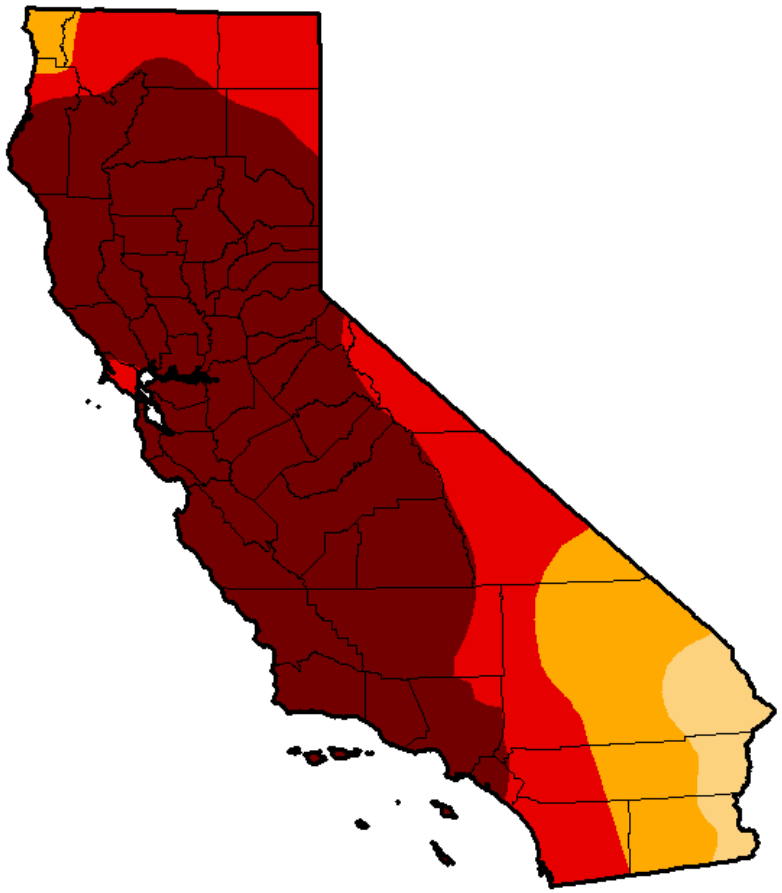
Mark Svoboda

National Drought Mitigation Center

http://droughtmonitor.unl.edu/

Drought Monitor – California
One Year Ago

U.S. Drought Monitor
California



September 16, 2014

(Released Thursday, Sep. 18, 2014)

Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	0.00	100.00	100.00	95.42	81.92	58.41
Last Week 9/9/2014	0.00	100.00	100.00	95.42	81.92	58.41
3 Months Ago 6/17/2014	0.00	100.00	100.00	100.00	76.69	32.98
Start of Calendar Year 12/31/2013	2.61	97.39	94.25	87.53	27.59	0.00
Start of Water Year 10/1/2013	2.63	97.37	95.95	84.12	11.36	0.00
One Year Ago 9/17/2013	2.63	97.37	96.04	89.84	11.36	0.00

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Author:

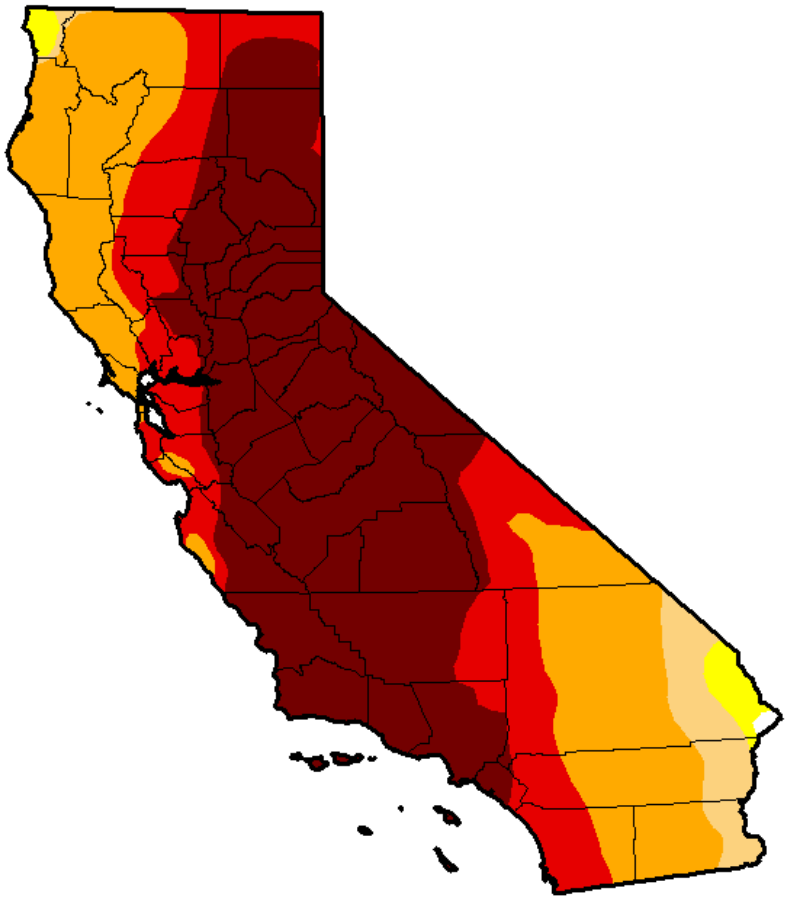
Michael Brewer

NCDC/NOAA

http://droughtmonitor.unl.edu/

Drought Monitor – California
6 Months Ago

U.S. Drought Monitor
California



May 12, 2015

(Released Thursday, May. 14, 2015)

Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	0.14	99.86	98.28	93.91	66.60	46.77
Last Week 5/5/2015	0.14	99.86	98.28	93.91	66.60	46.77
3 Months Ago 2/10/2015	0.16	99.84	98.10	93.44	67.46	39.99
Start of Calendar Year 12/30/2014	0.00	100.00	98.12	94.34	77.94	32.21
Start of Water Year 9/30/2014	0.00	100.00	100.00	95.04	81.92	58.41
One Year Ago 5/13/2014	0.00	100.00	100.00	100.00	76.68	24.77

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Mark Svoboda

National Drought Mitigation Center

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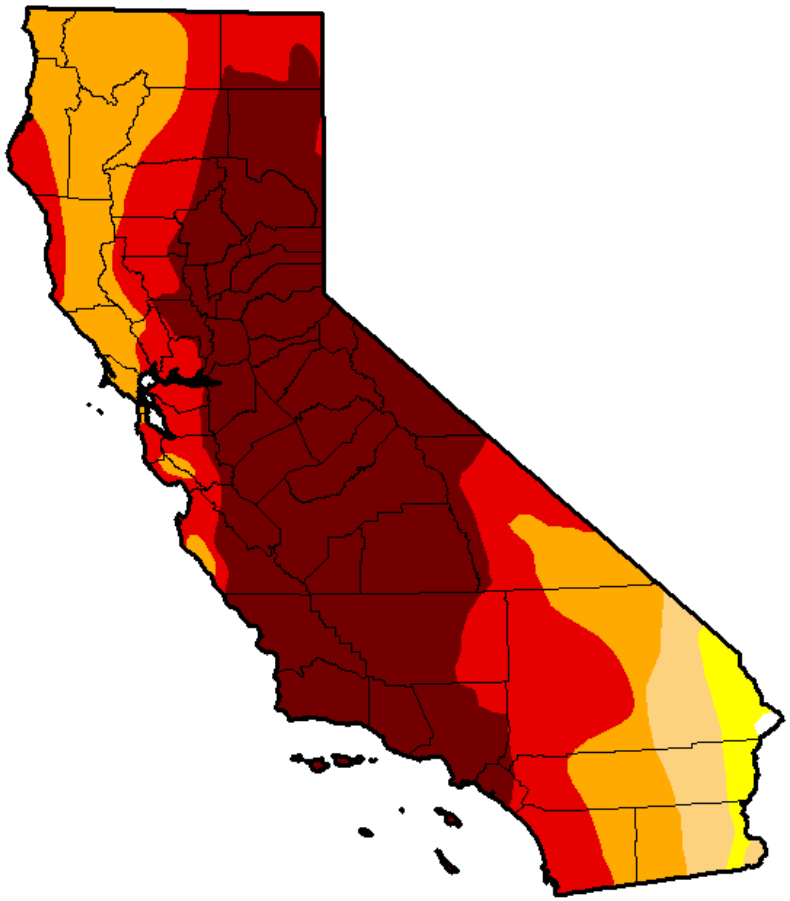
Drought Monitor – California Today

U.S. Drought Monitor
California



October 27, 2015

(Released Thursday, Oct. 29, 2015)

Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	0.14	99.86	97.33	92.27	71.08	46.00
Last Week 10/20/2015	0.14	99.86	97.33	92.27	71.08	46.00
3 Months Ago 7/28/2015	0.14	99.86	97.35	94.59	71.08	46.00
Start of Calendar Year 12/30/2014	0.00	100.00	98.12	94.34	77.94	32.21
Start of Water Year 9/29/2015	0.14	99.86	97.33	92.36	71.08	46.00
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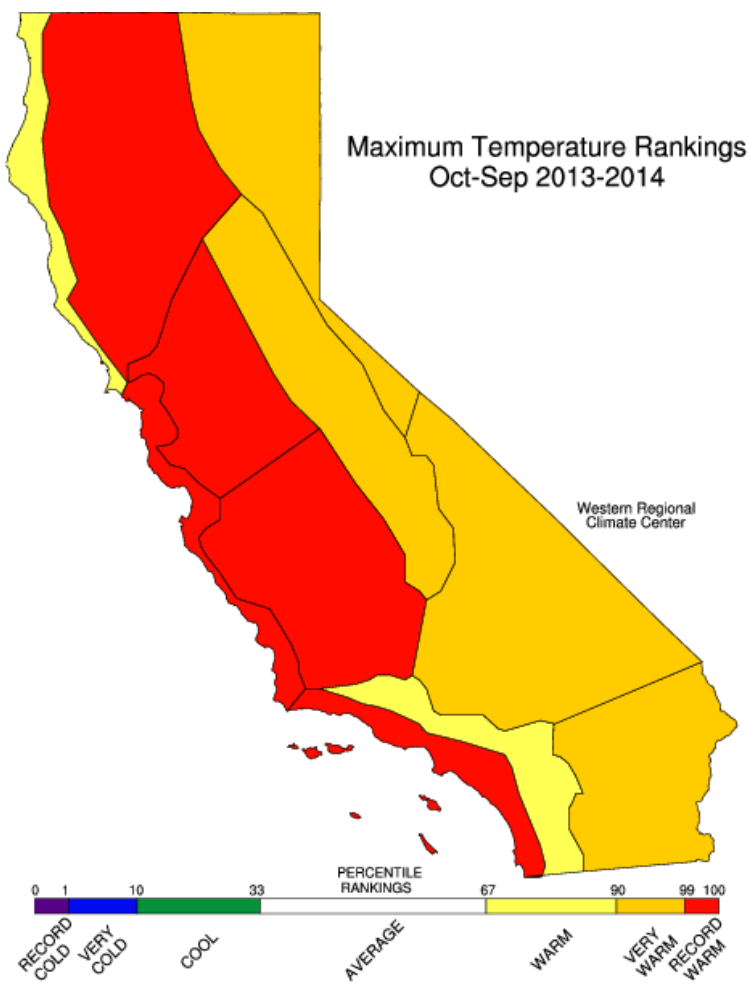
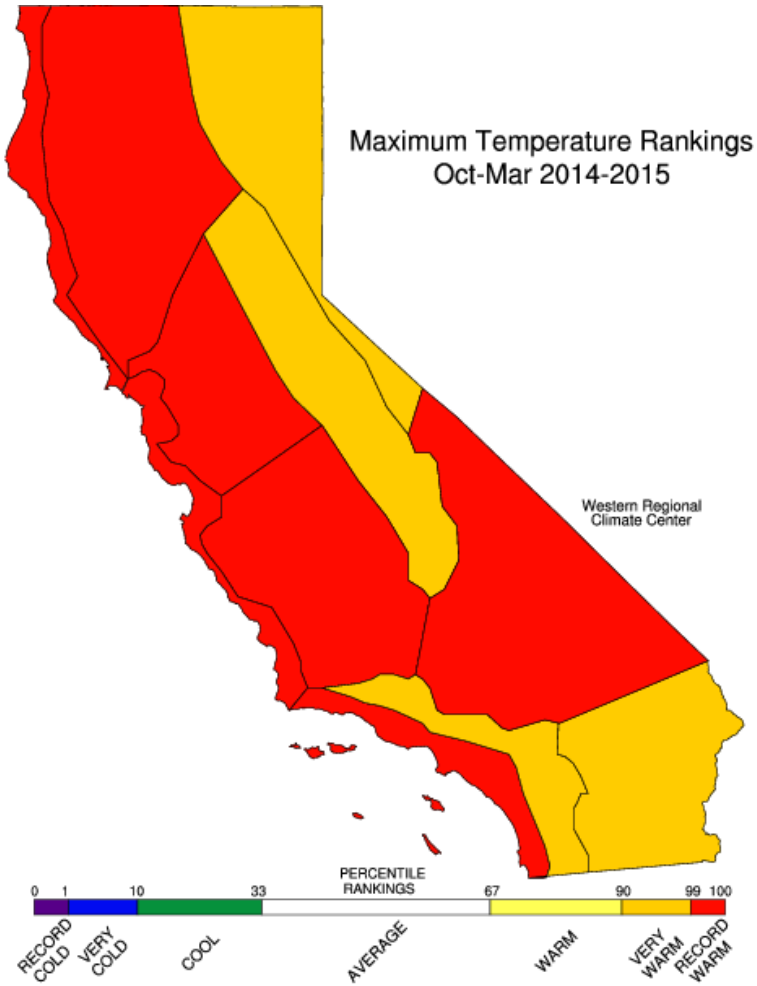
Maximum Temperature Rankings
2014 Water Year v. First Half 2015 Water Year

Red Indicates Record Warmth





Minimum Temperature Rankings
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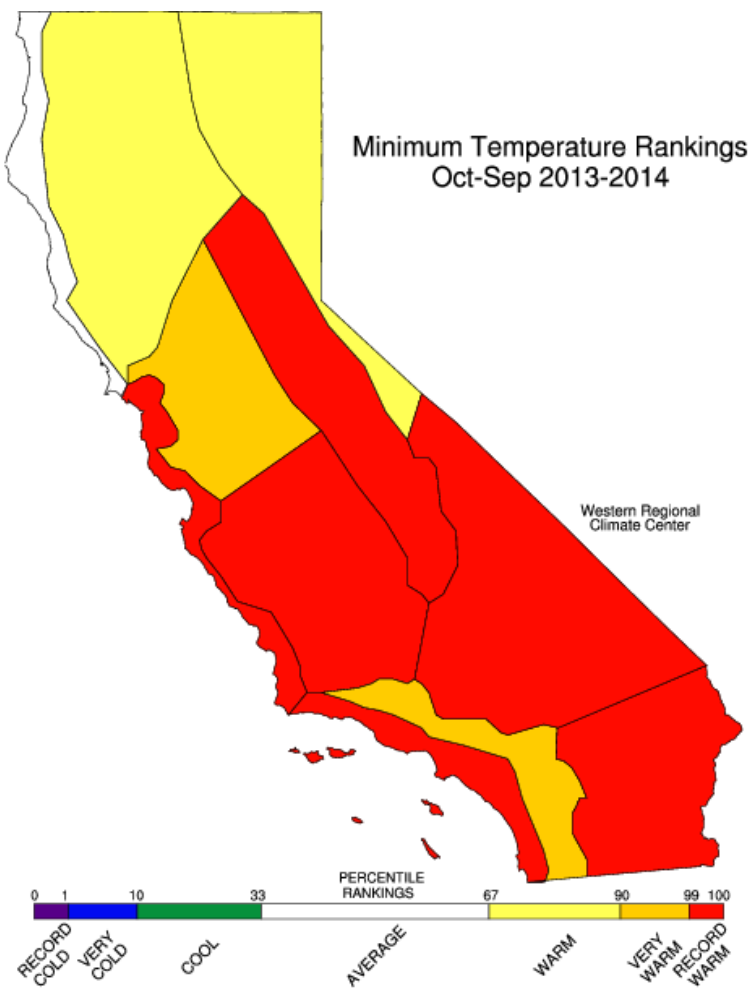
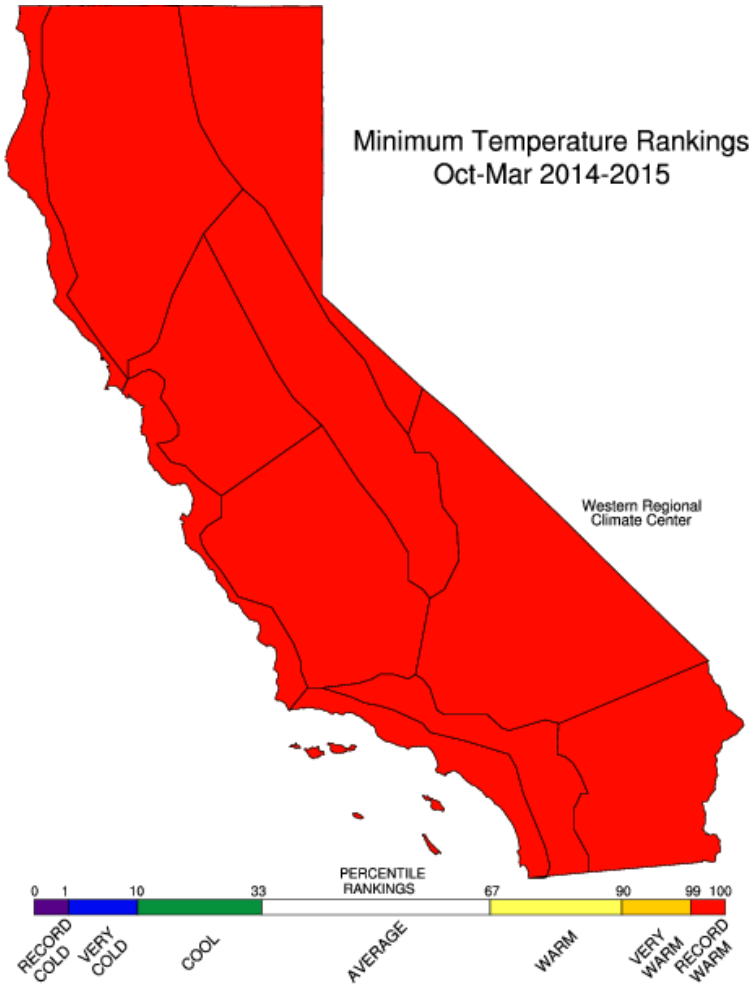
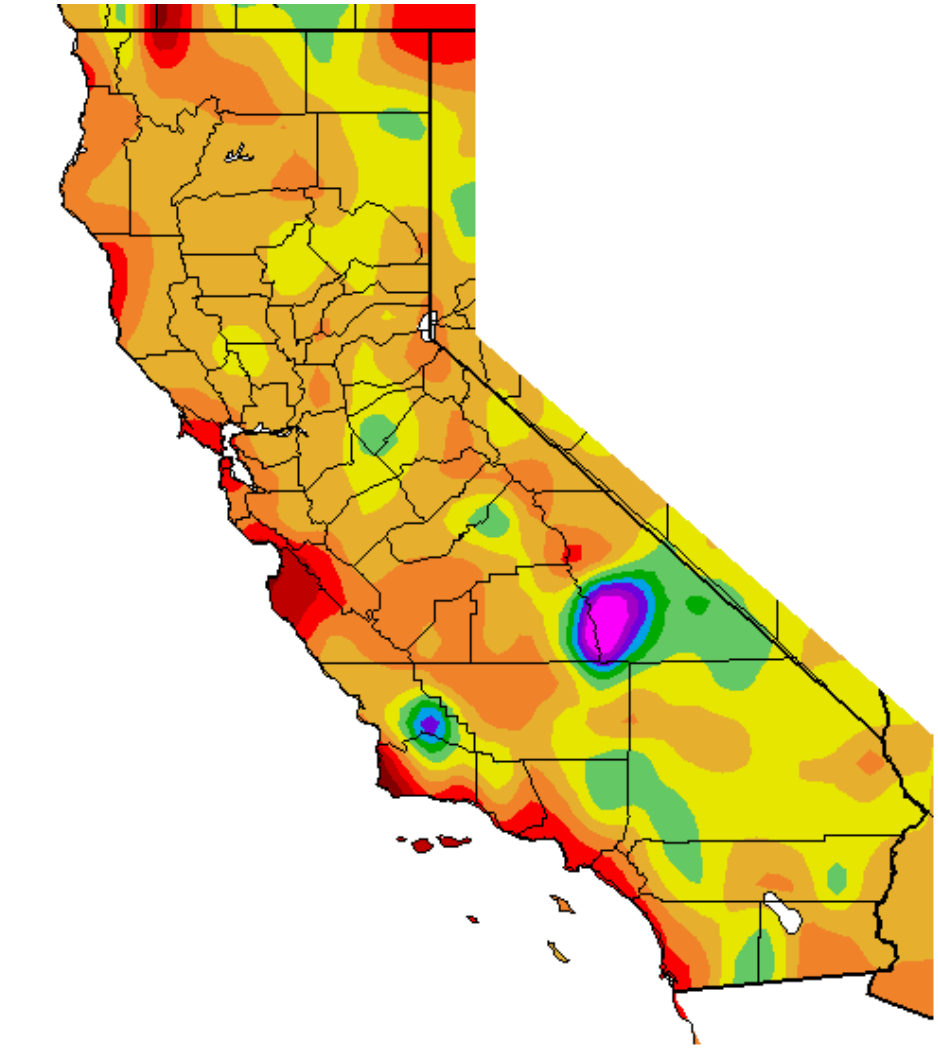
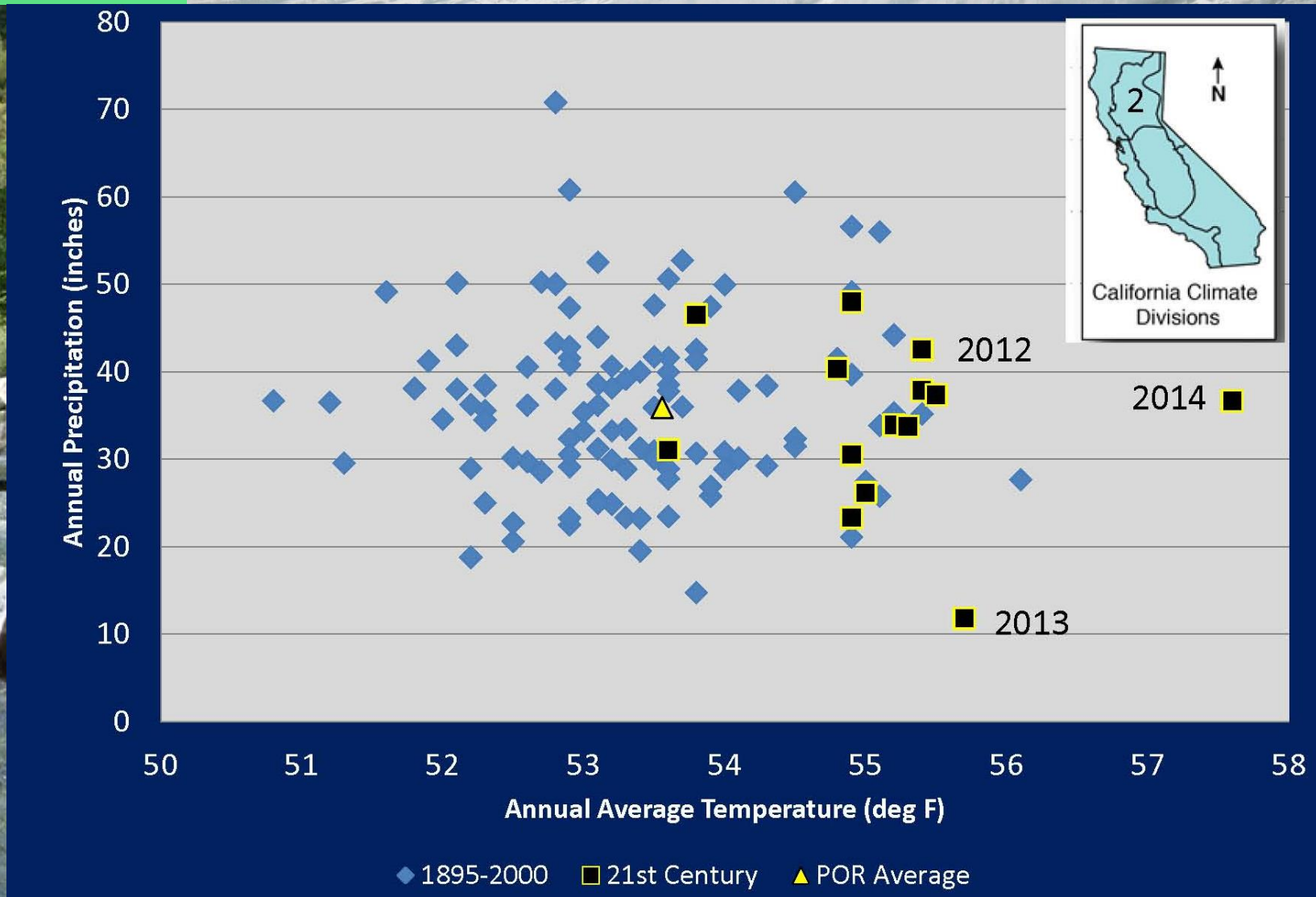




Average Temperature
Departure from Average July – October 2015

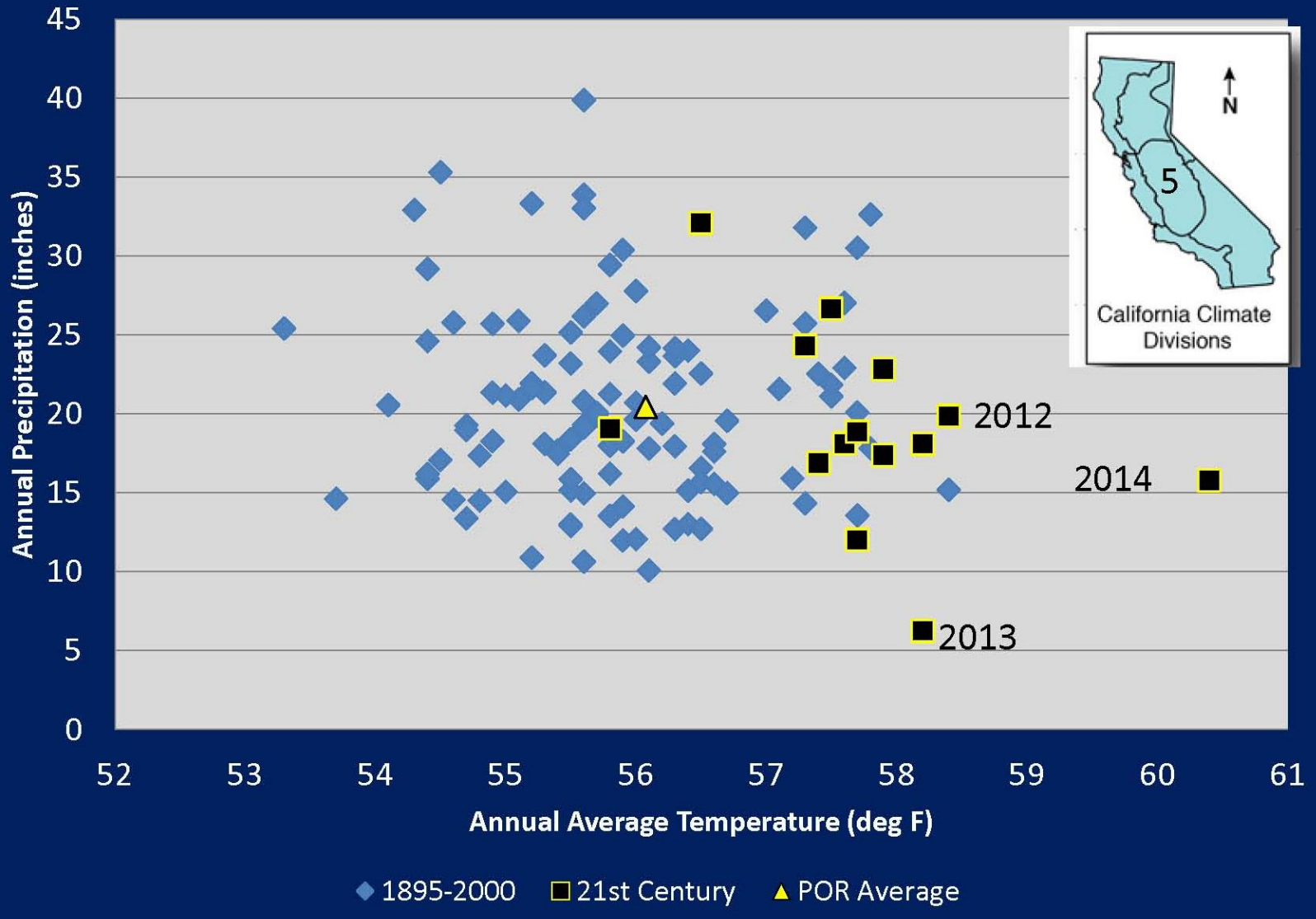


Its Getting Warmer – Sacramento Valley



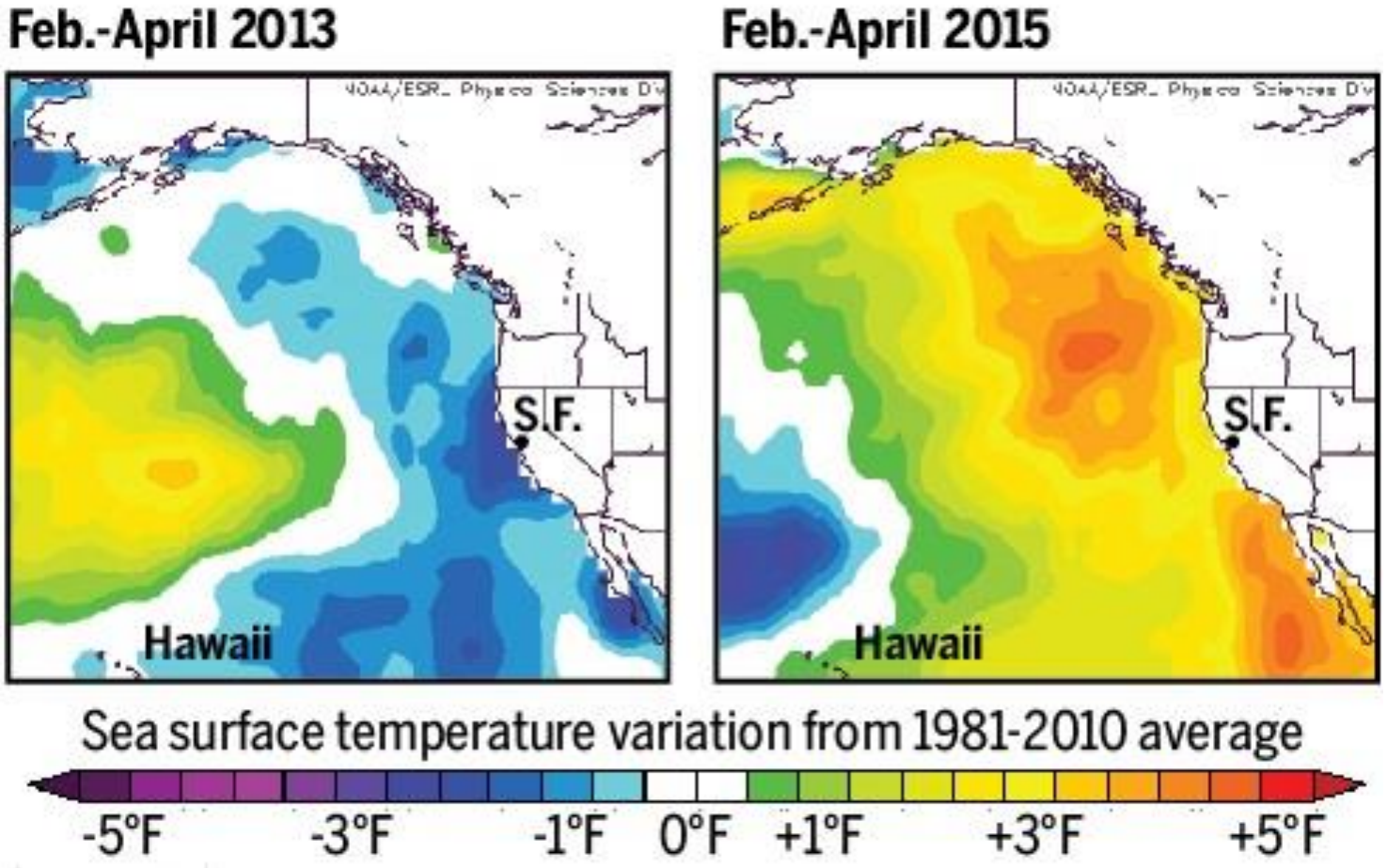
Source: NOAA Climate Division 2 Calendar Year Data

Its Getting Warmer – San Joaquin Valley



Source: NOAA Climate Division 5 Calendar Year Data

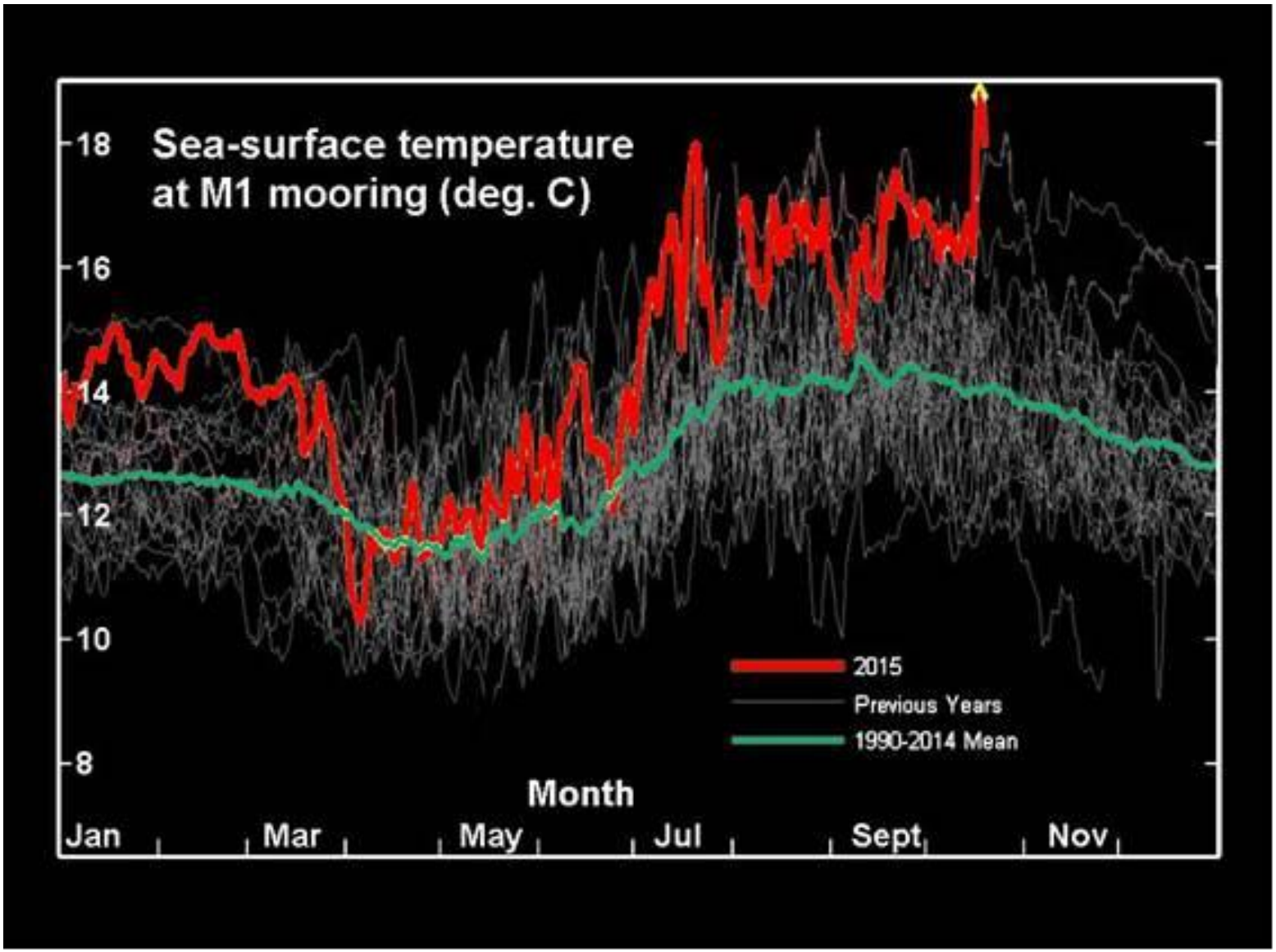
Ocean Surface Temperature Change
Feb - April



Ocean Surface Temperature Change

- West Coast over the past year has grown to the biggest and longest-lasting ocean temperature anomaly on record
- Unusually slack winds are to blame for the warming ocean off the West Coast
- In 2015, a temperature sensor in Monterey Bay picked up its highest temperature reading ever recorded (69^{o})
- More stranded California sea lions and northern elephant seals than average

Monterey Bay Temperatures
Thru October 17th

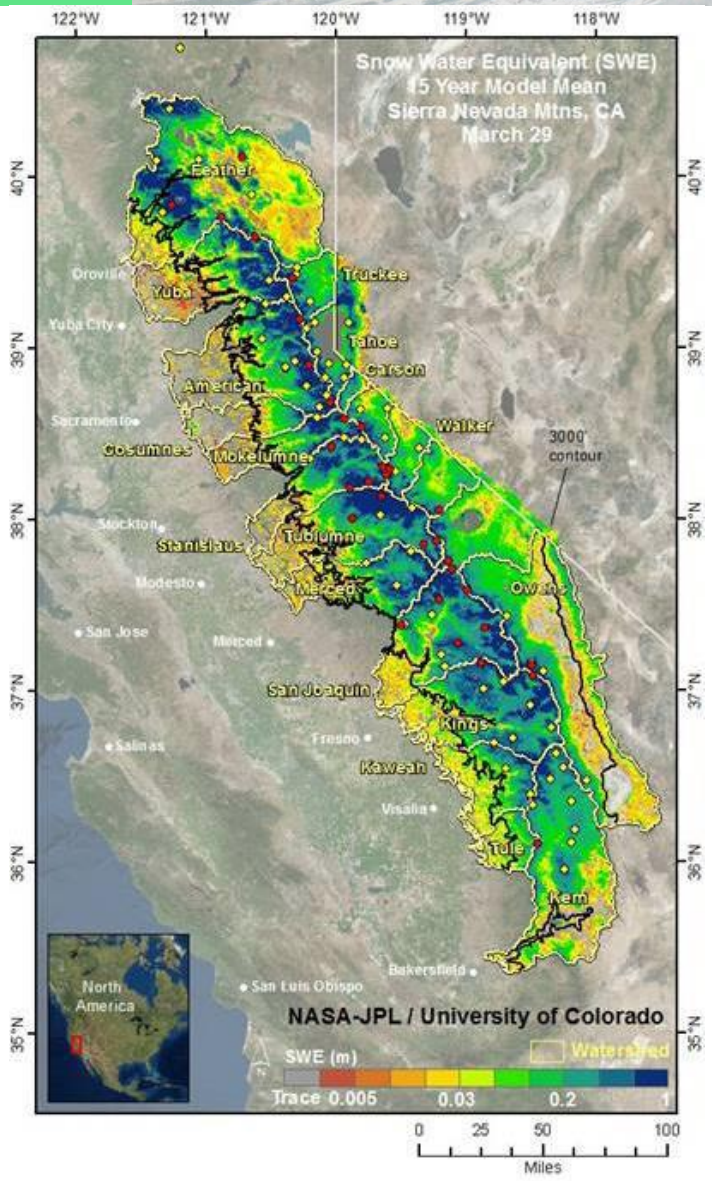


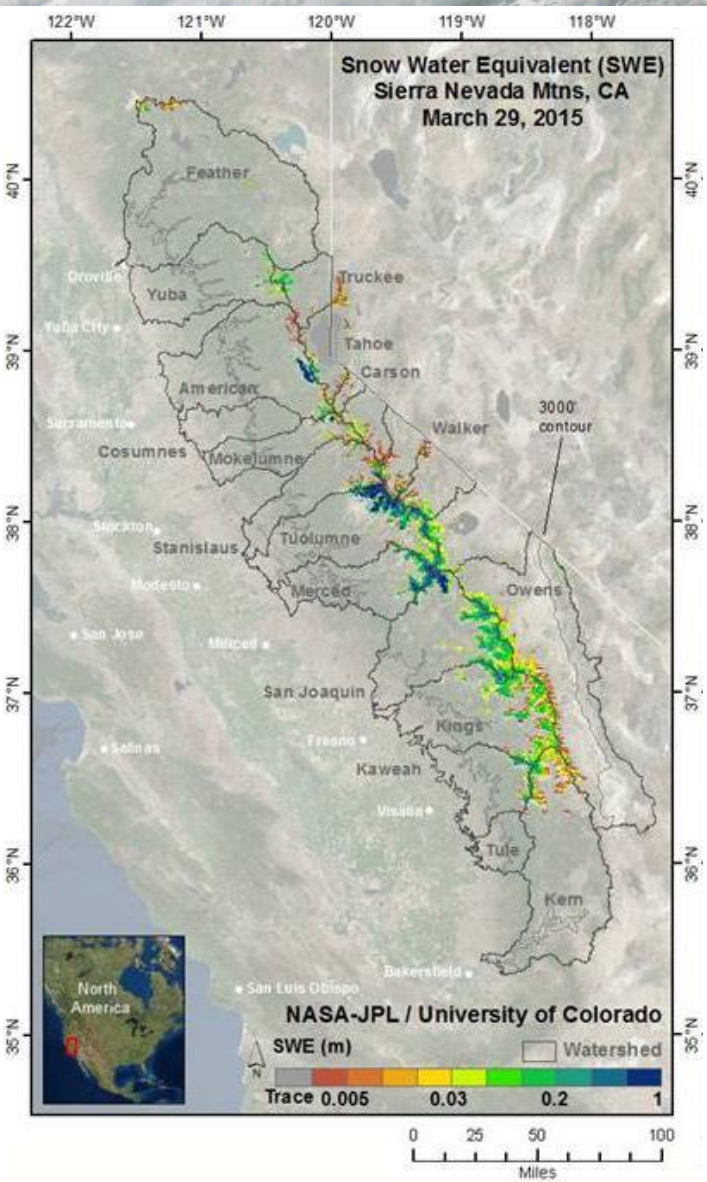
Snowpack

- In a normal year, ***melting Sierra Nevada snow provides the state with one-third of its water.*** Another third is pumped from underground aquifers, and the rest comes from rivers and reservoirs.

- Because of its importance as a water source, officials began monitoring the snowpack in the 1930s and have established ***108 measuring stations throughout the Sierra Nevada***.

April 1 Snowpack
45-Year Mean vs. 2015





The Not Top 10
Worst April 1 Snowpack

2015	5%
2014	25%
1977	25%
1988	29%
1976	37%
2007	39%
2013	42%
1963	45%
1990	45%
2012	52%

Tree Rings and Snowpack

- In a paper published September 14th in the journal Nature Climate Change, scientists estimate that the amount of ***snow in the Sierra Nevada was the lowest in more than 500 years***.

- To reconstruct long ago snow conditions, researchers used measurements from 1,500 living and dead blue oak trees to estimate rainfall back to the year 1400 and tree-ring data from a different group of trees to model temperatures for the same period.

Could it be "Worst in 500 Years"?

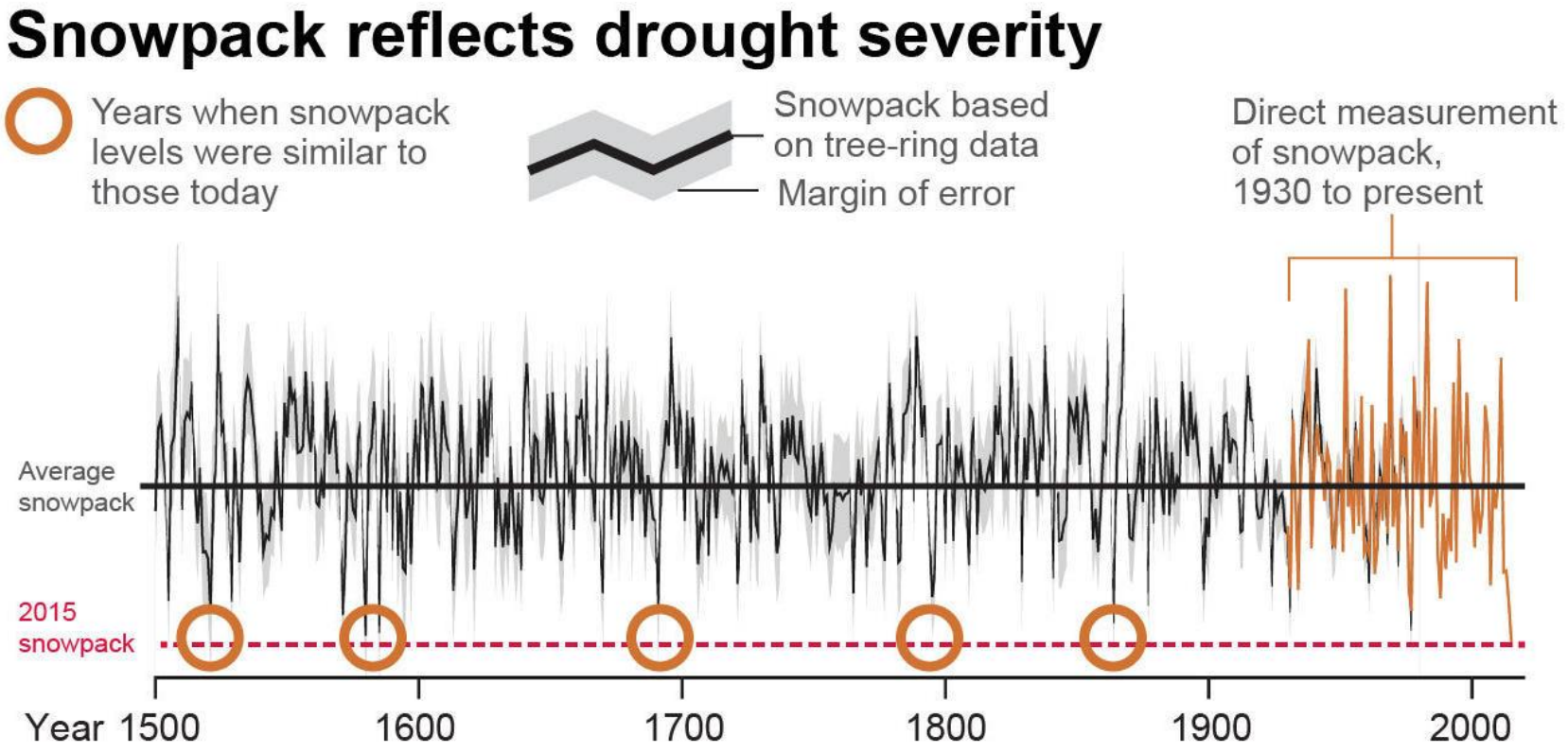
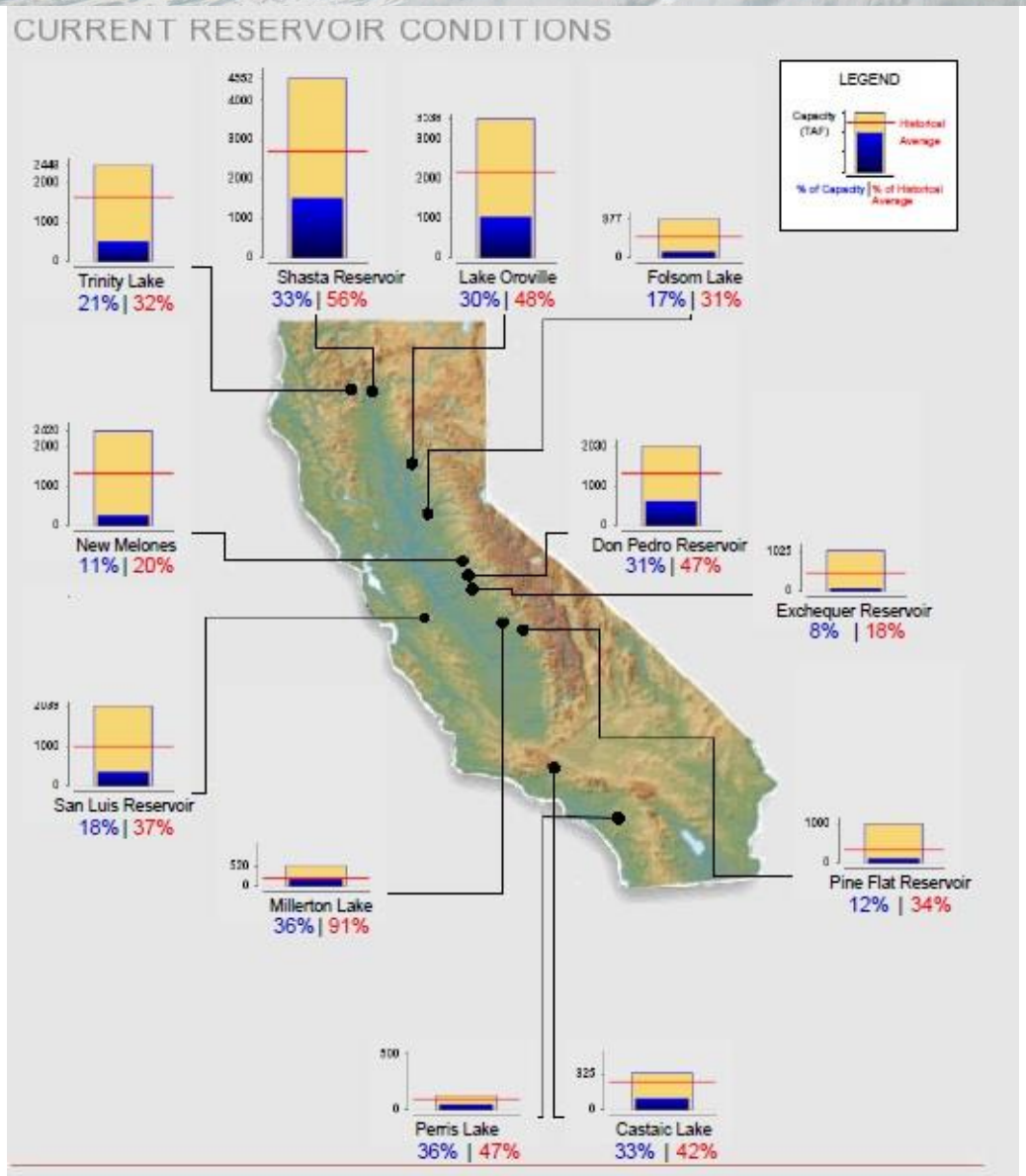


Chart image provided by University of Arizona.

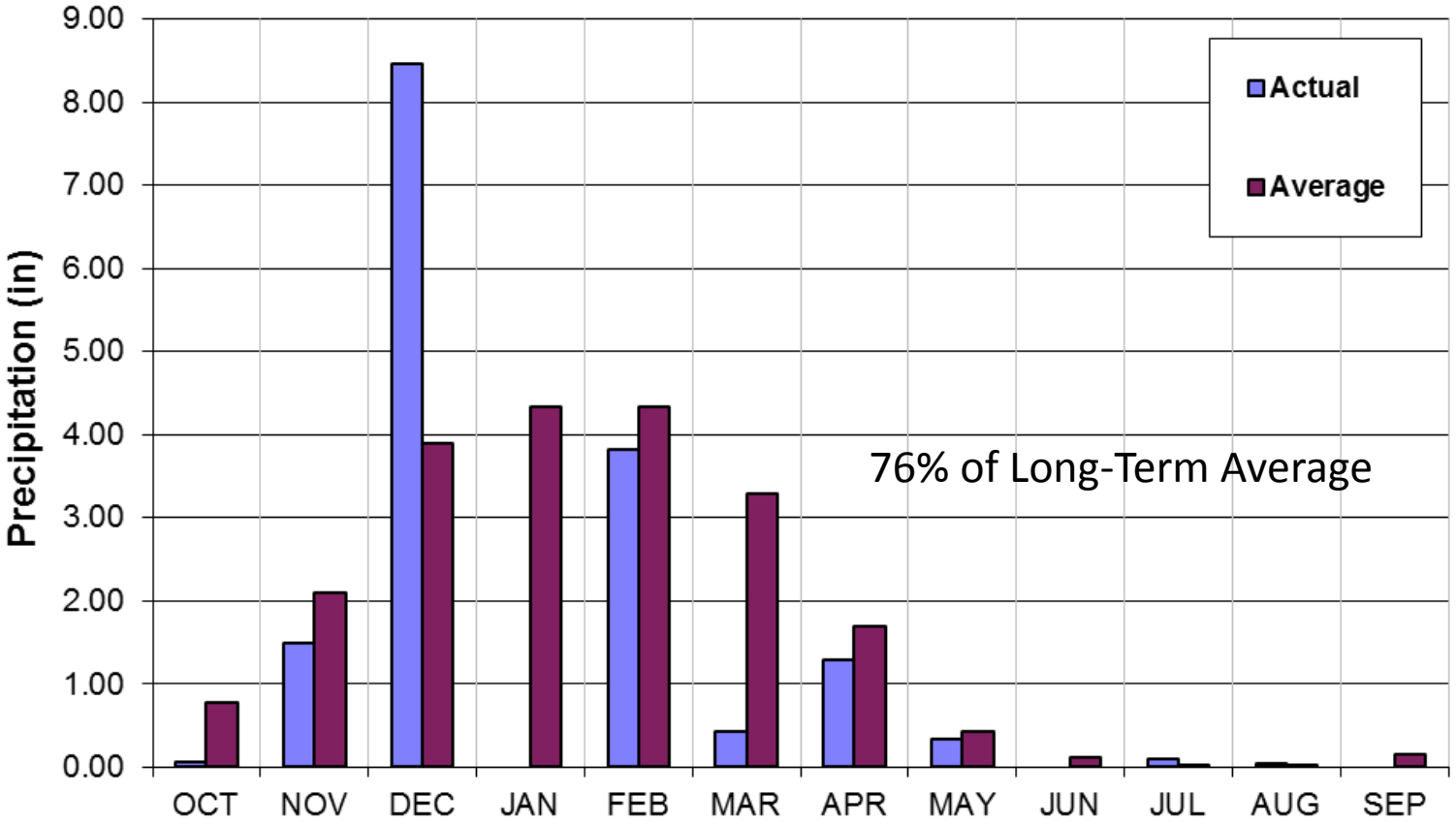
Source: Laboratory of Tree-Ring Research, University of Arizona

@latimesgraphics

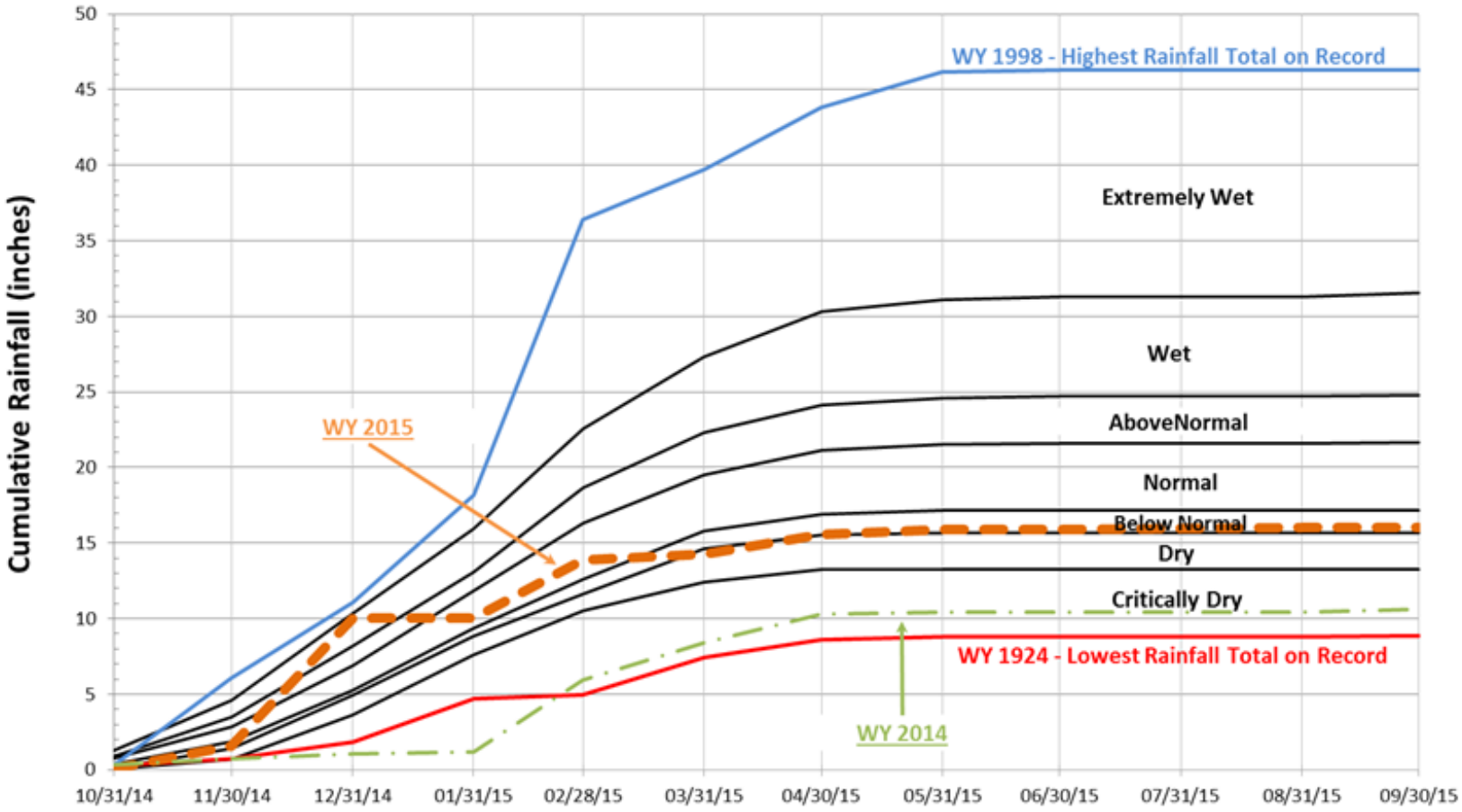
October 13, 2015 Reservoir Conditions



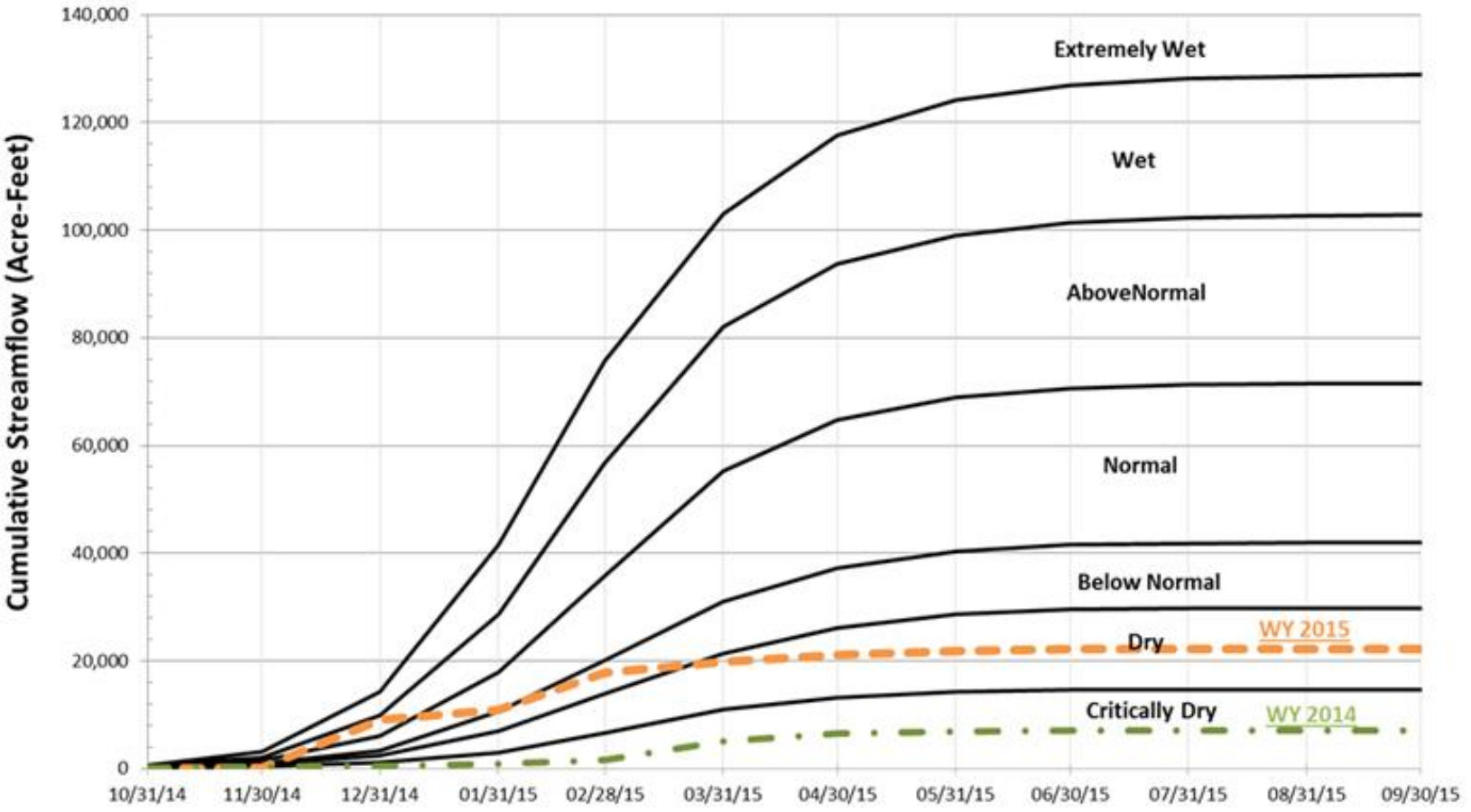
Recorded Rainfall at San Clemente Dam: Water Year 2015



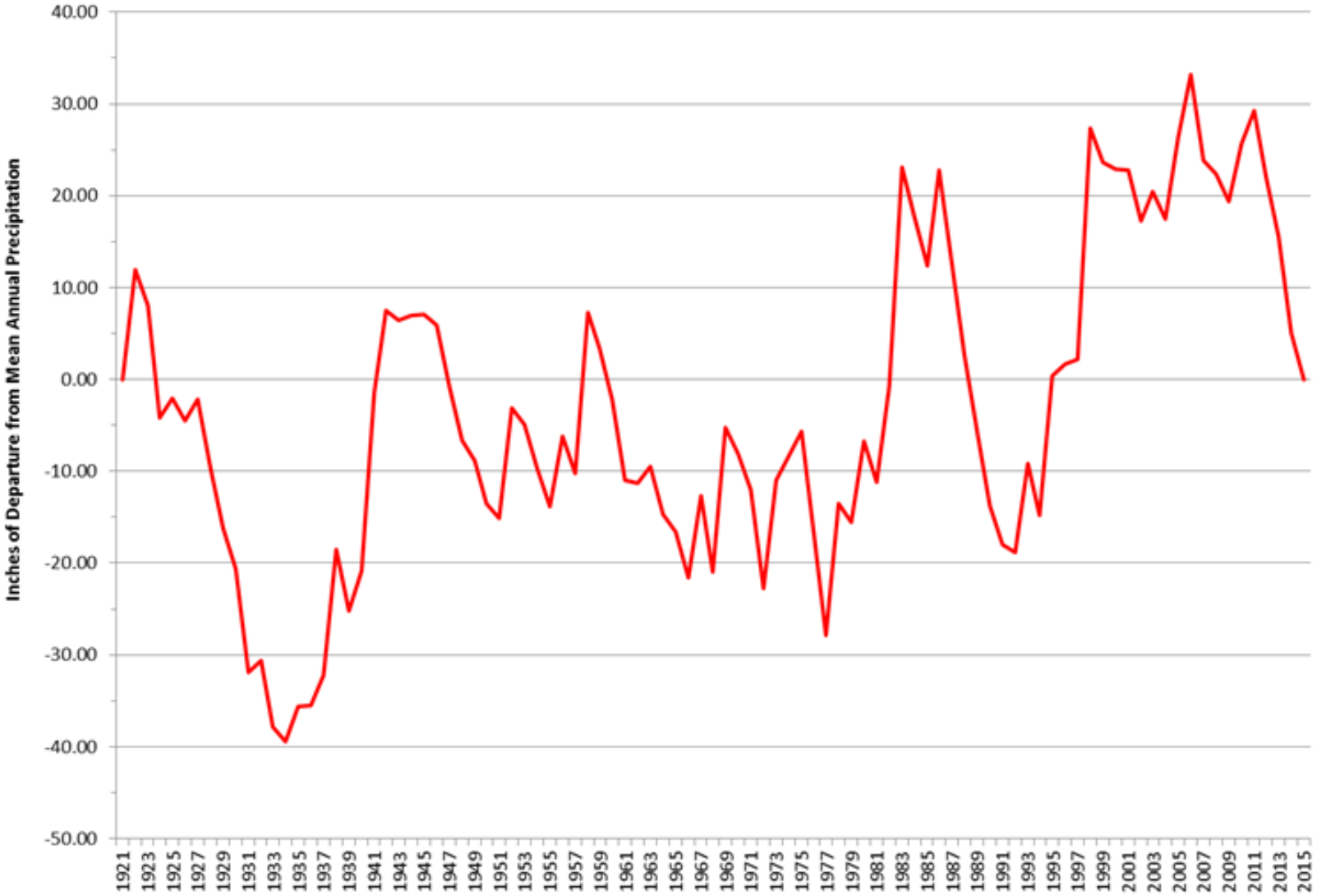
Water Year Classification By Recorded Rainfall



Water Year Classification By Unimpaired Streamflow



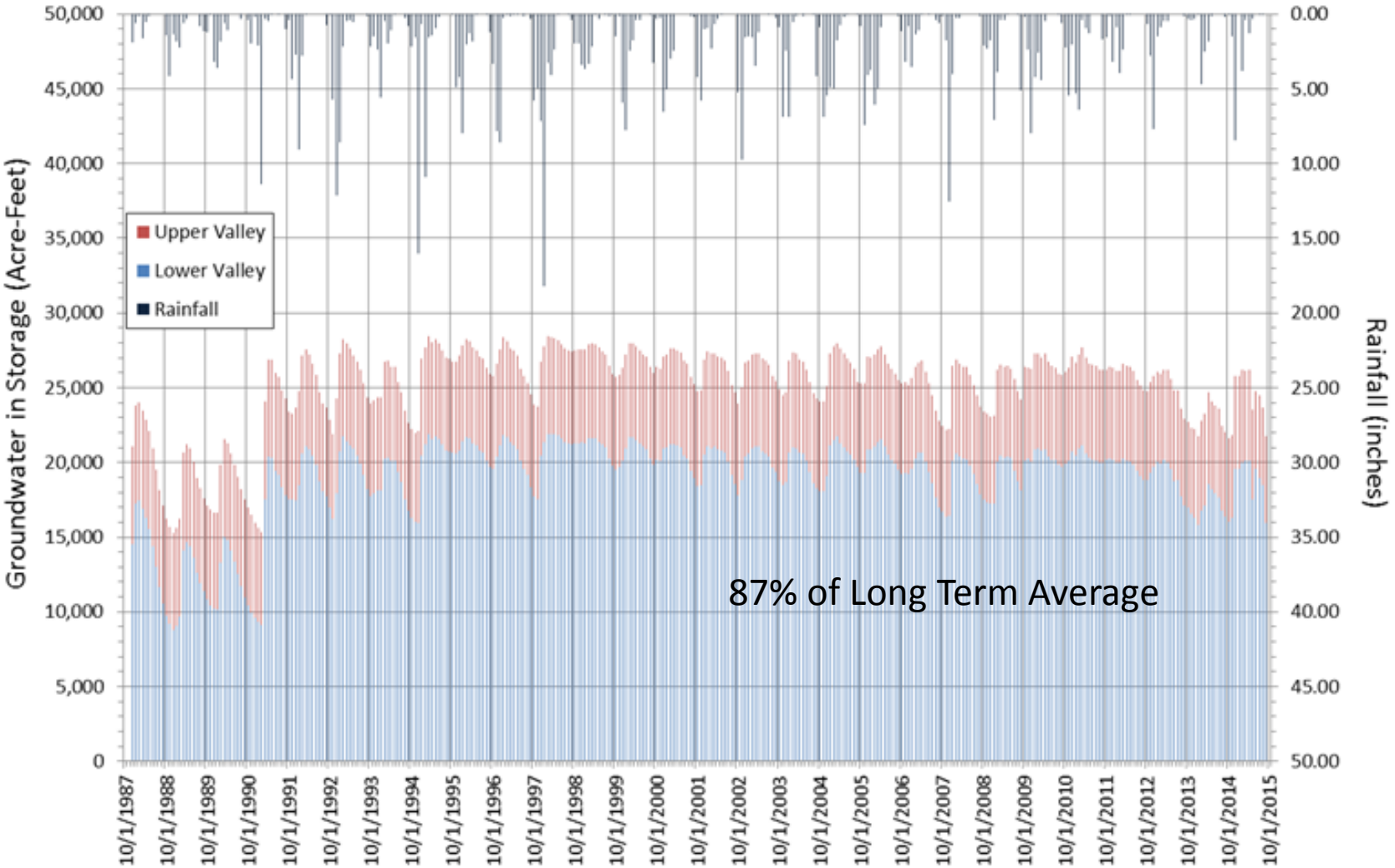
Rainfall Cumulative Departure from Mean



Droughts
(Based on Cumulative Departure From Mean Precipitation Record)

- 1924 – 1936 52.01 inches
- 1988 – 1994 41.96 inches
- 1960 – 1968 29.62 inches
- *2013 – 2015 24.38 inches*
- 1947 – 1953 22.53 inches
- 1977 – 1979 22.34 inches
- 1971 – 1974 17.94 inches

Recorded Rainfall v. Carmel Valley Aquifer Storage



THE STATE'S RESPONSE

State Water Board Emergency Regulations

- Focus on (a) Water Waste, (b) Mandatory conservation, and (c) Reporting
- State Water Board amended and re-adopted August 2014 drought-related emergency water conservation regulations in March 2015, ***including fines***

  1st Offense: Courtesy Notice

  2nd Offense: $100 fine

  3rd Offense: $250 fine

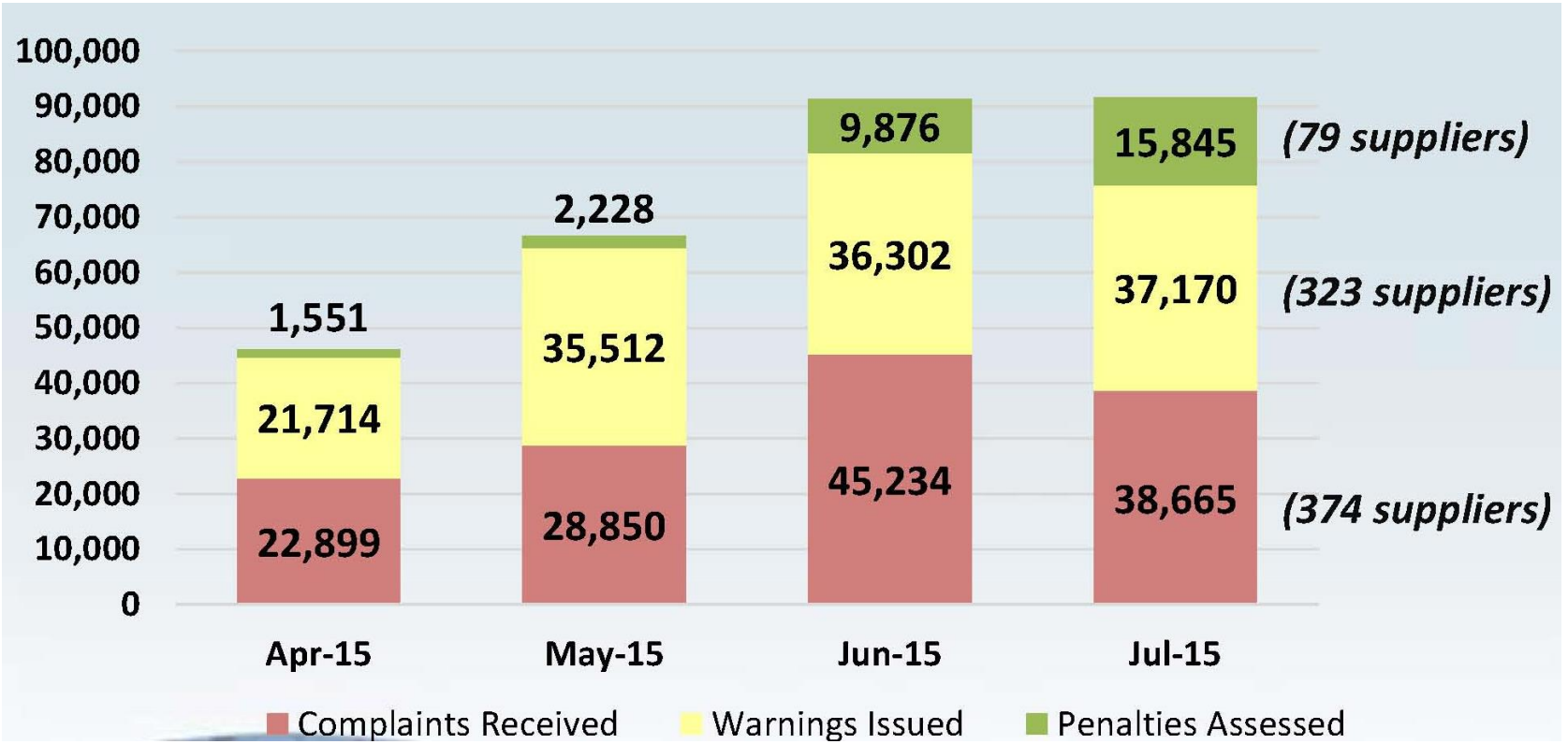
  4th Offense: $500 fine

Potable Water Waste Defined

New State Law – "Water Waste"
Landscape Irrigation Overflow
Landscape Irrigation w/in 48 Hours of Rain
2 Day per Week Landscape Irrigation
New Irrigation Not Consistent with CA Code
Irrigation of Turf in Street Medians
Serving Water Other Than Upon Request
Hotel Linen Programs
Washing a Car without Shut-Off Nozzle
Cleaning Sidewalks or Driveways
Water Features w/o Recirculation

The District's rules are more extensive

2015 Supplier Enforcements



New Mandatory Conservation Standards

- Rank 400+ water suppliers by Residential Gallons per Capita per Day (GPCD) for Jul-Aug-Sep 2014
- Create 9 categories of reduction targets 4% to 36%
- Judge total system water production relative to target %
- Will be judged based on June to February usage
- Target is relative to 2013 for same period
- Compliance measured monthly on a cumulative basis

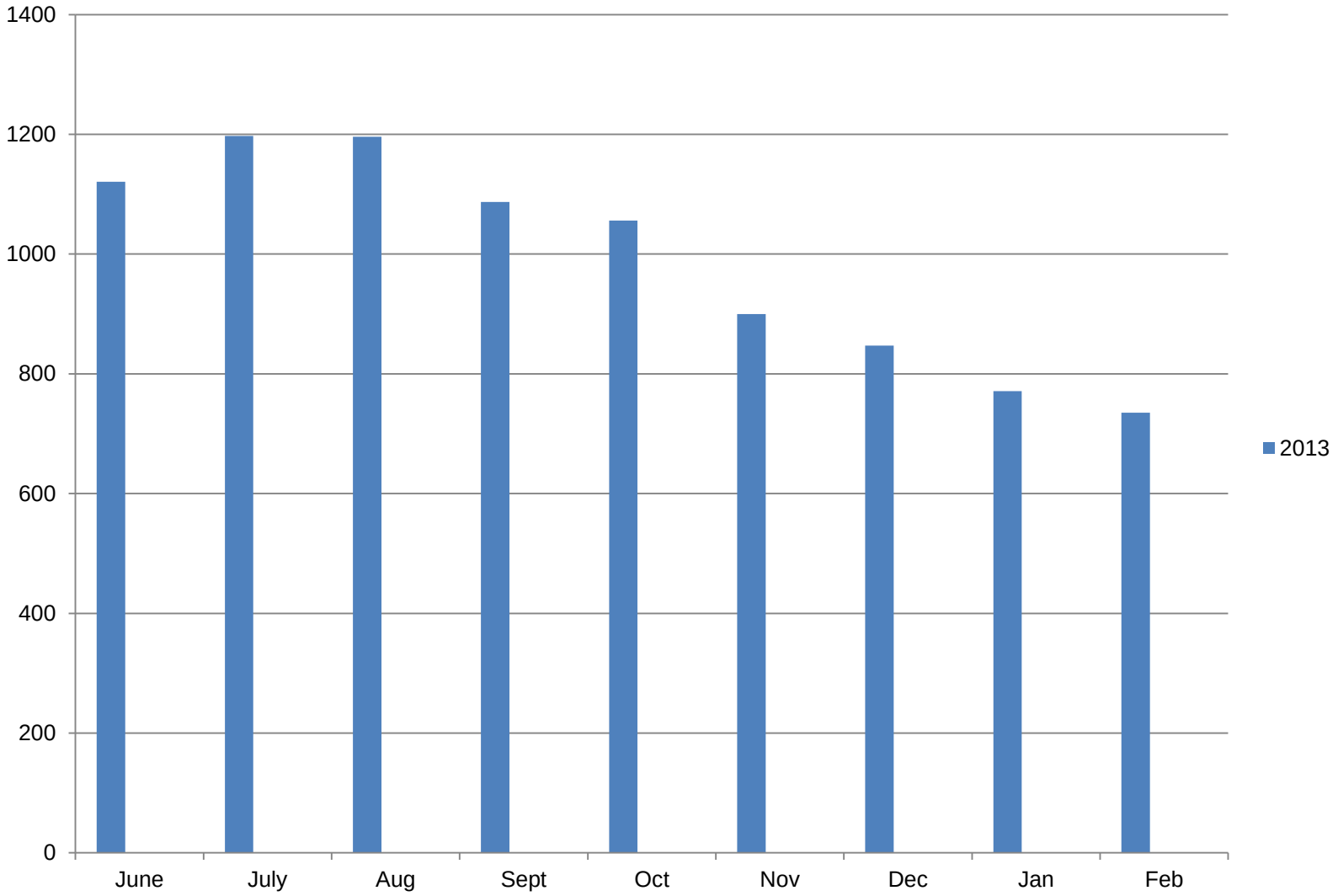
New Mandatory Conservation Standards

Category	Range GPCD	Reduction Required	#	Example Community And GPCD
1	Reserved	4%	0	
2	< 65	8%	23	Monterey Peninsula (51.3)
3	65 – 79	12%	24	Santa Ana (78.3)
4	80 – 94	16%	44	Sunnyvale (85.2)
5	95—109	20%	51	Watsonville (100.3)
6	110 – 129	24%	48	Chino (126.7)
7	130 – 169	28%	82	Morgan Hill (161.3)
8	170 – 214	32%	54	Suburban Sacramento (222.5)
9	> 215	36%	85	Palm Springs (416.0)

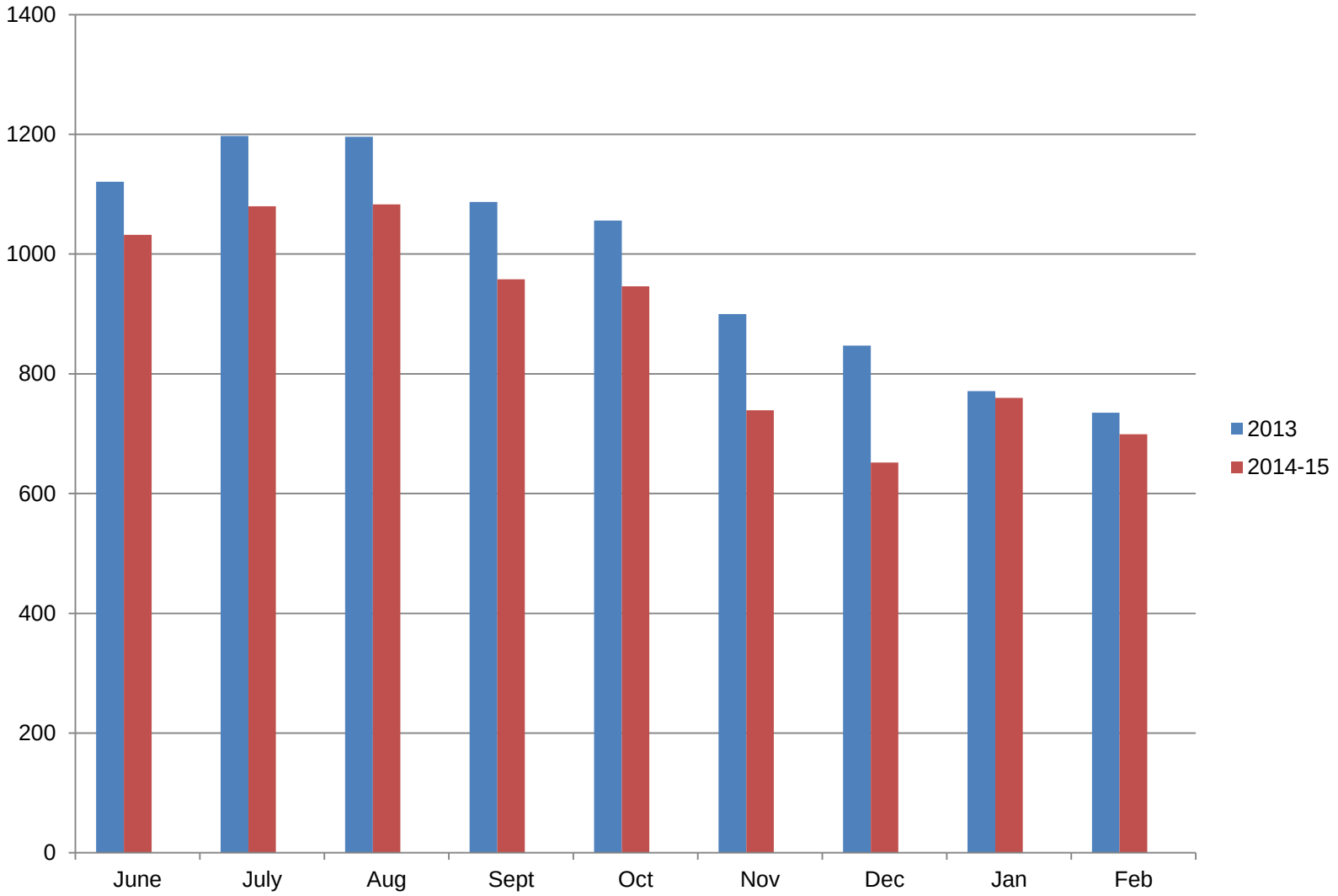
Other Local Communities

Community	GPCD	Reduction Required
Santa Cruz	47	8%
King City	68	12%
Marina	76	12%
Greenfield	84	16%
Salinas (Cal Water Service)	85	16%
Scott's Valley	92	16%
Gilroy	118	24%
Salinas (ALCO)	124	24%

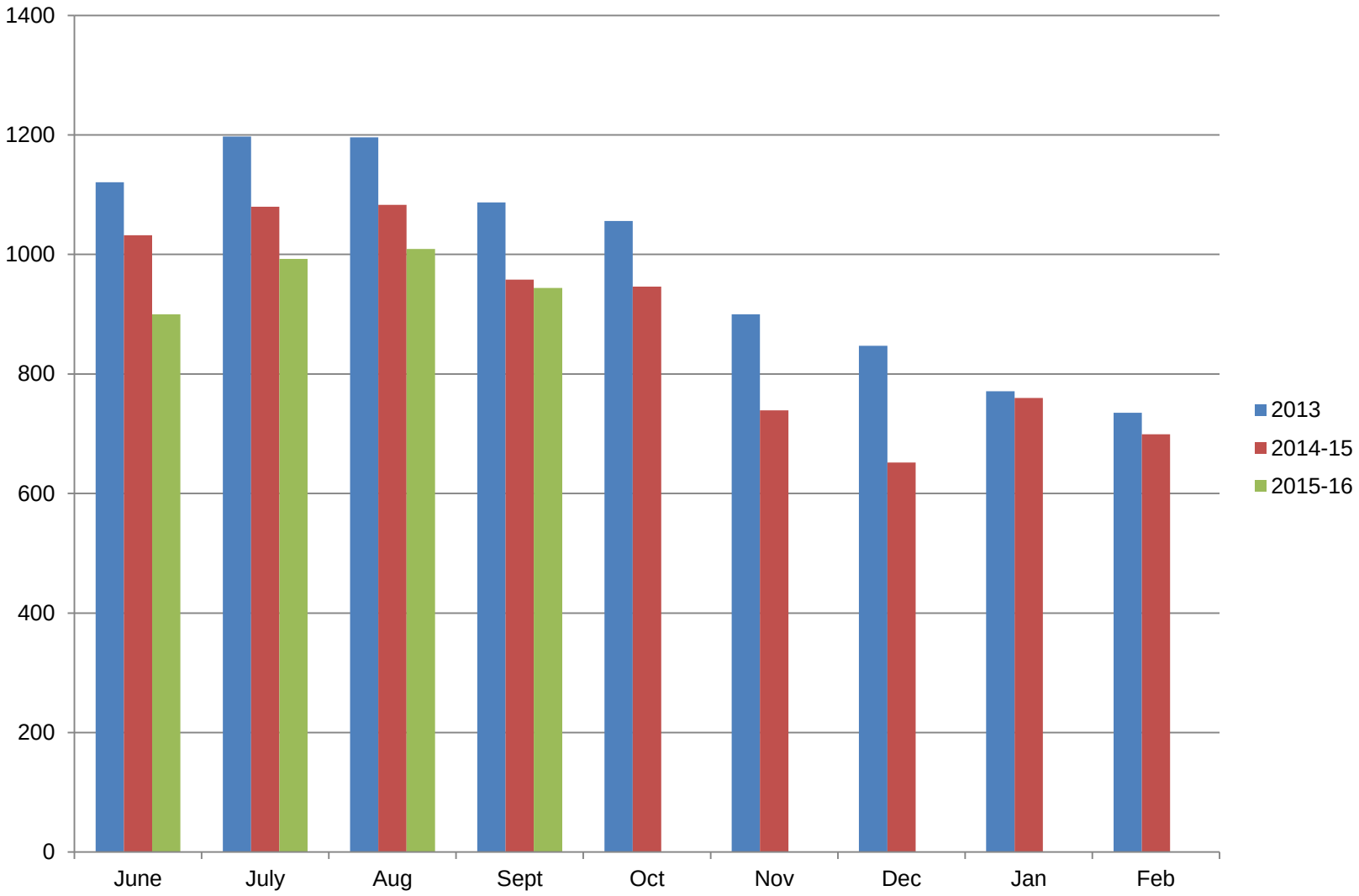
New Mandatory Conservation Standards
Monterey Peninsula 2013 Target Year



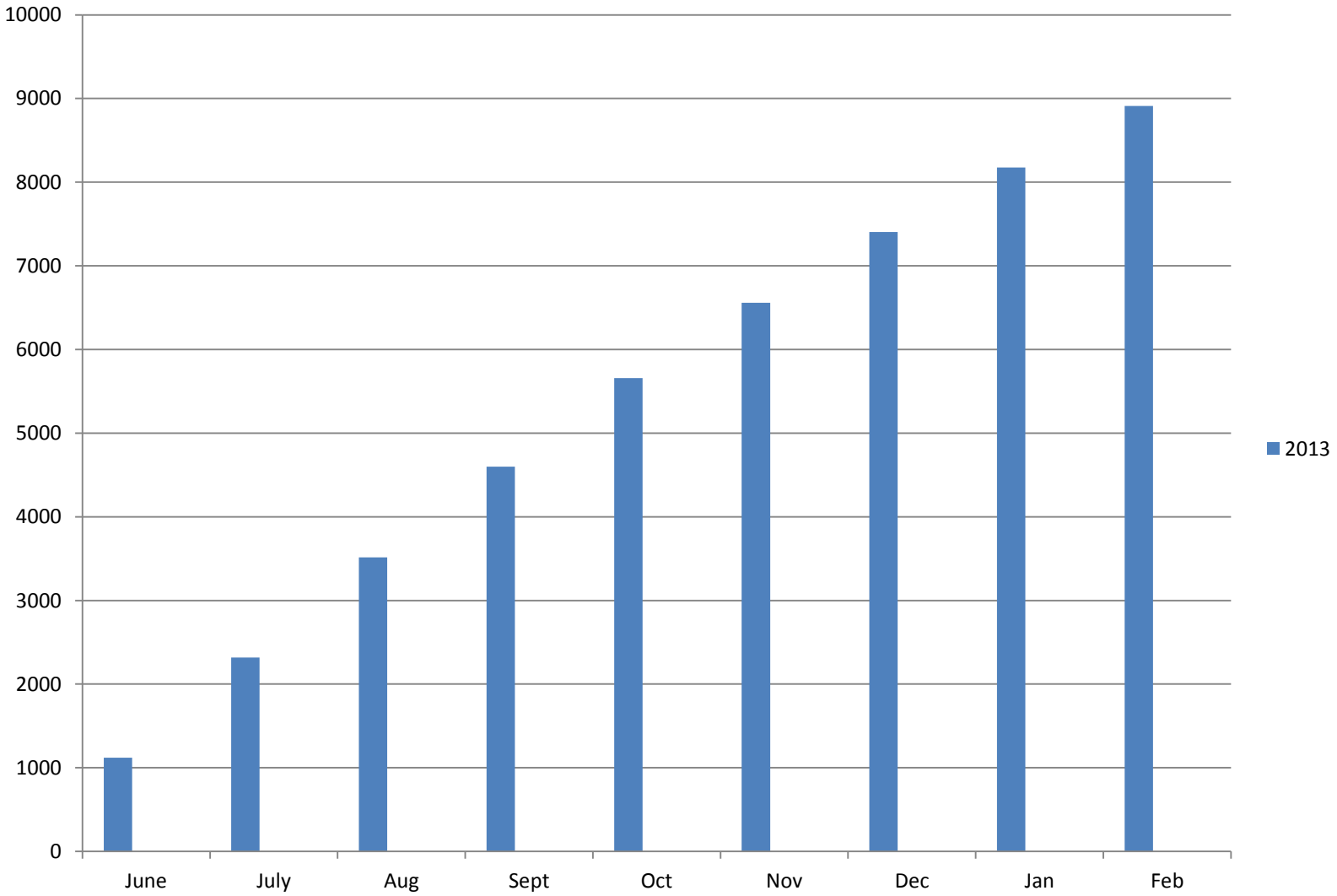
Last Year's Performance



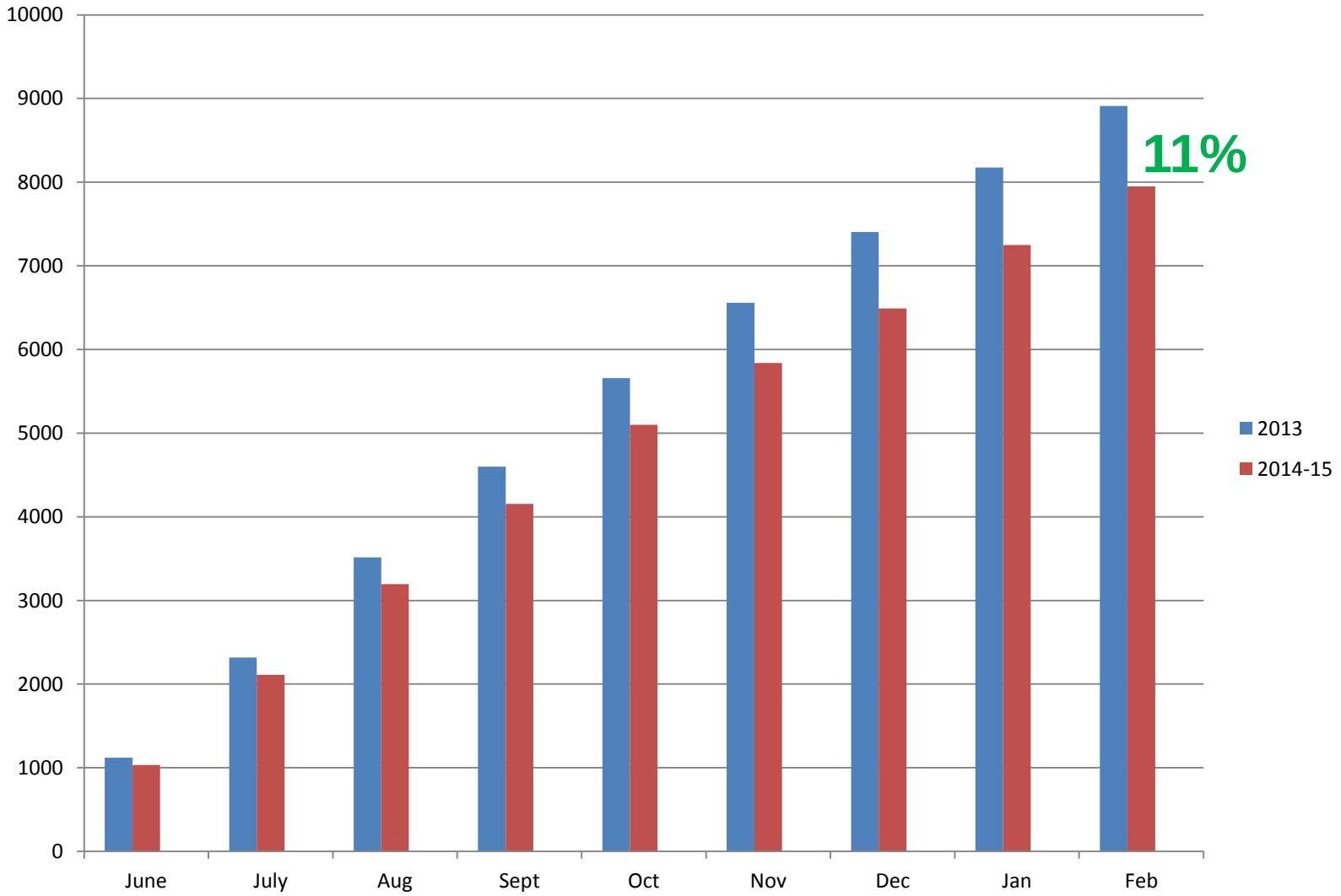
The 2015 Sweepstakes: How Are We Doing So Far?



New Mandatory Conservation Standards
Monterey Peninsula 2013 Target Year



Last Year's Performance



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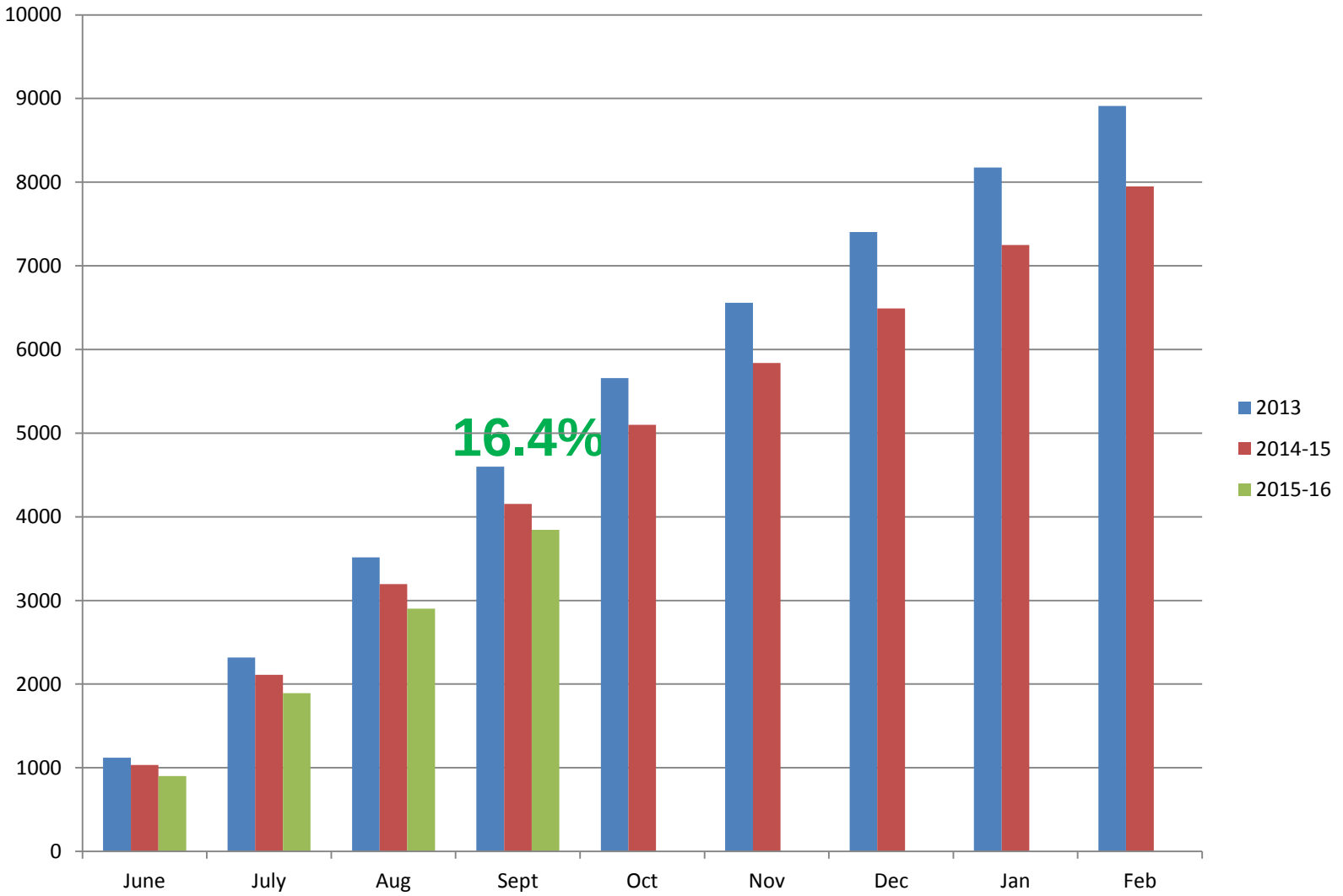


State Water Board Actions

- 8 Conservation Orders Issued
- 74 Information Orders Issued
- 59 Warning Letters Issued
- Cease and Desist Orders in cases of willful violation of an Information or Conservation Order

Where is the State Water Board Heading?

Improvements to the emergency regulations should they be extended and potentially a longer-term conservation regulatory strategy. Areas of discussion include:

- Performance Standards
  - Residential
  - CII
  - Water Loss
- Rates, Pricing, & Fiscal Management
- Conservation Programs

Additionally, asked stakeholders to identify equity and implementation considerations for future measures around the following topics:

- Credit for investments in resilience
- Affordability for low-income customers
- Climate adjustments
- Groundwater reserves
- Data collection and reporting

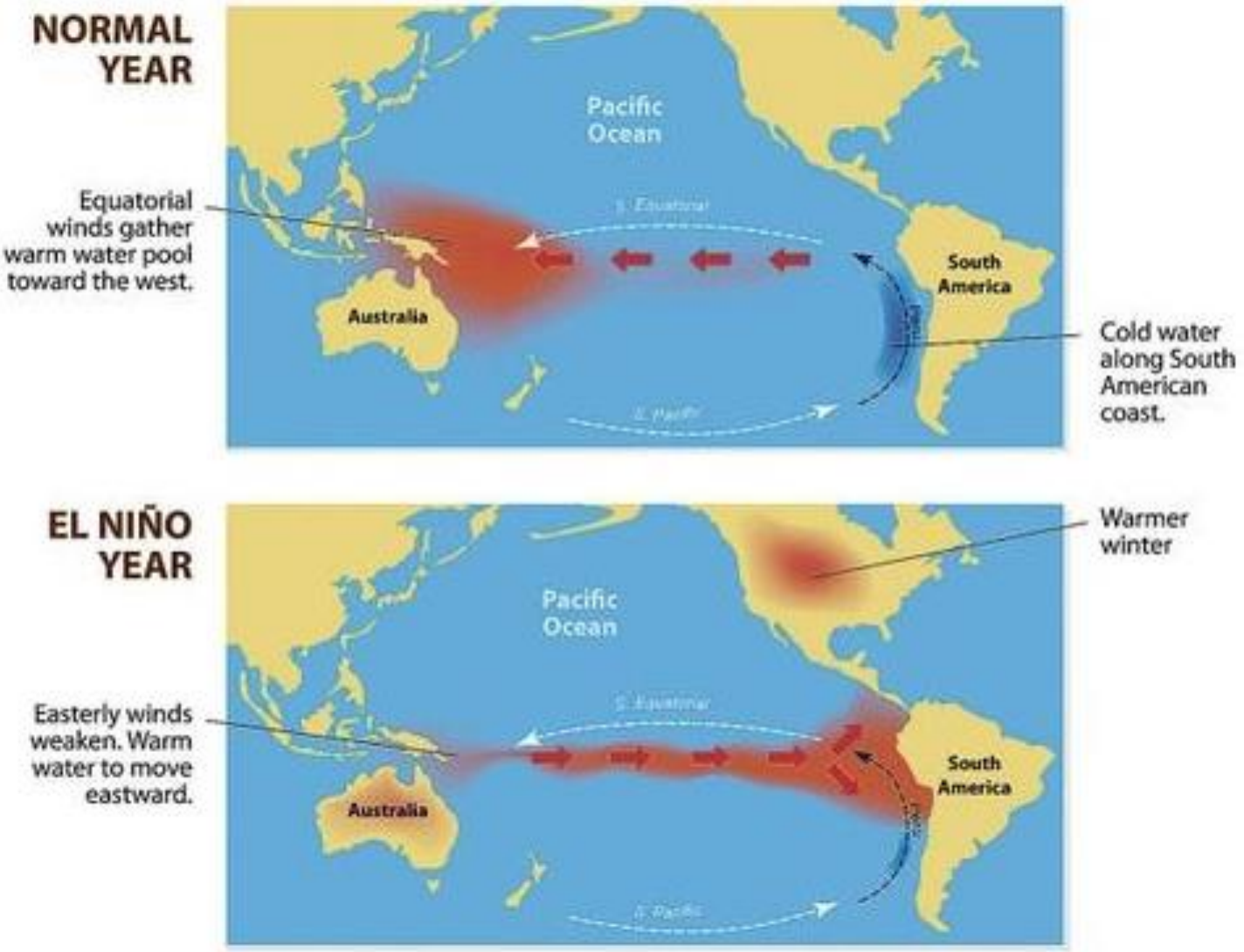
Monterey Peninsula Water Management District

Will El Nino Save Us?

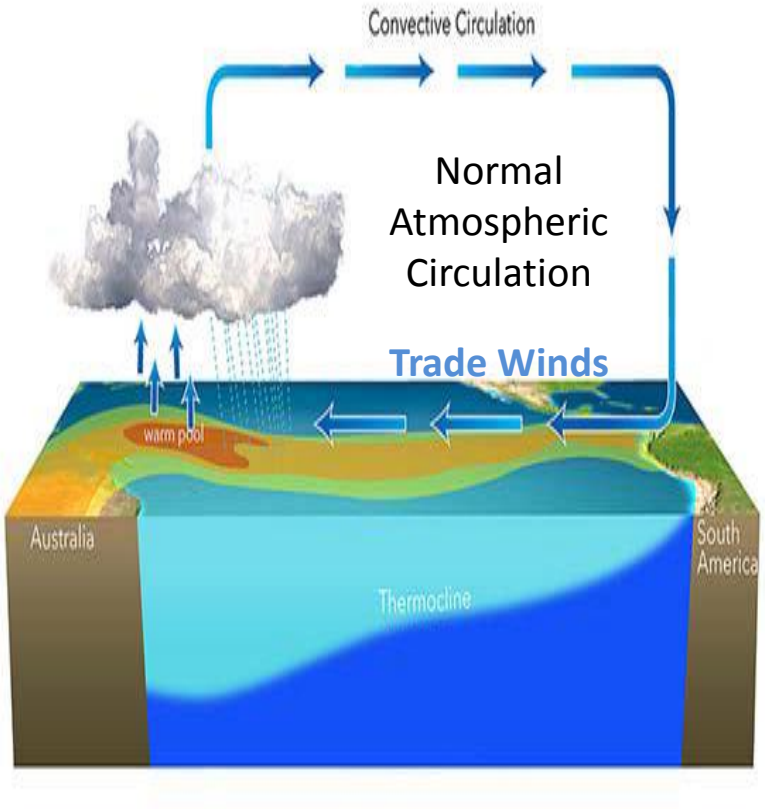
Waiting for El Nino

- In early July, the U.S. Climate Prediction Center reported that telltale signs of El Niño, which include warming sea surface temperatures and emerging equatorial winds, bore close resemblance to conditions preceding some of the strongest El Niños in recent history.

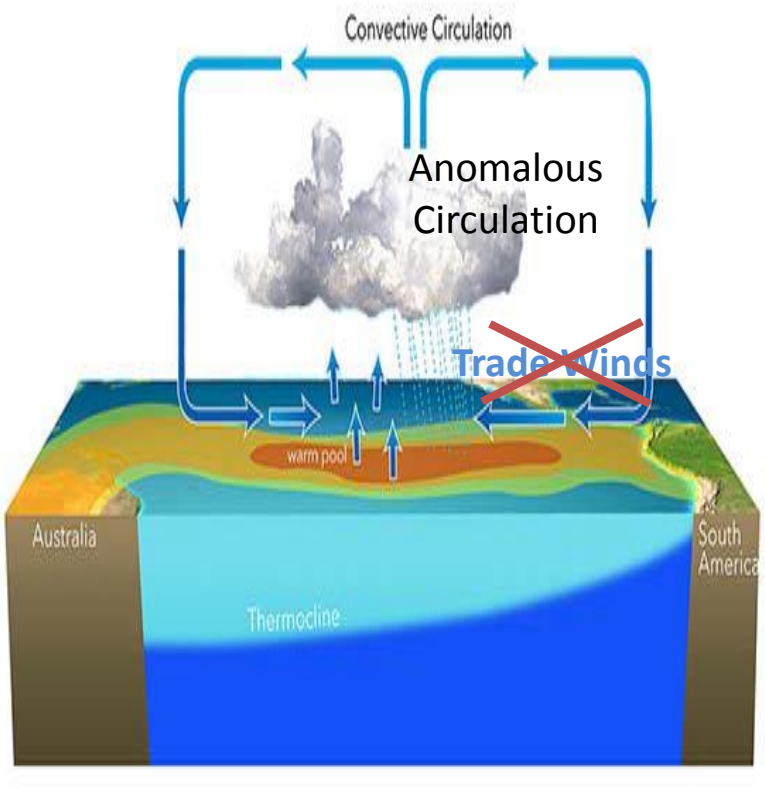
What is El Nino?



What is El Nino?



Typical Year

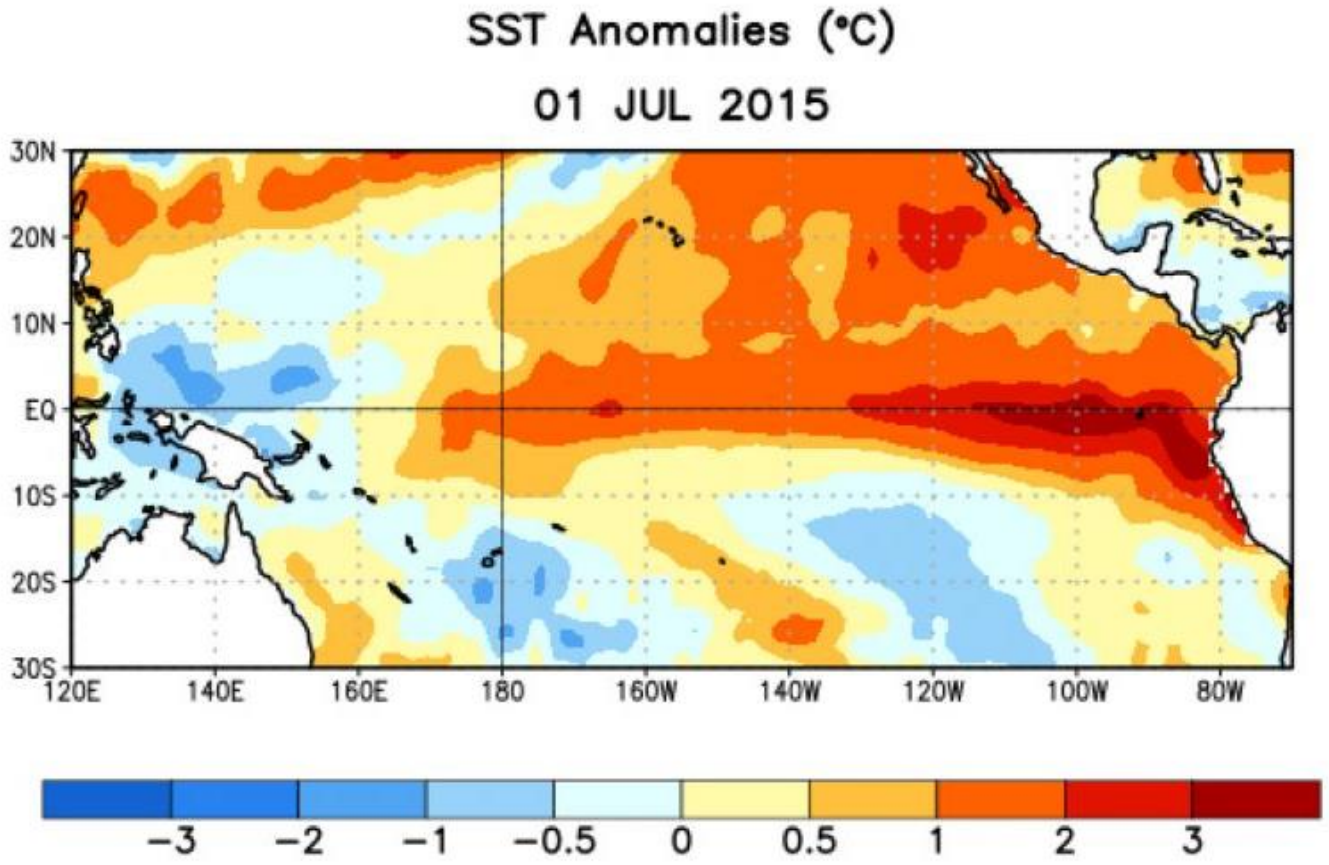


El Nino Year

What is El Nino?

- Coupled ocean-atmosphere phenomenon
- Changes in air pressure throughout the global tropics
- Abnormally warm equatorial sea surface temperatures (SSTs) from the date line to the South American coast
- Large-scale atmospheric circulation changes
- Changes in rainfall distribution from the eastern Indian Ocean east throughout the western hemisphere

Waiting for El Nino
Sea Surface Temperature Anomalies

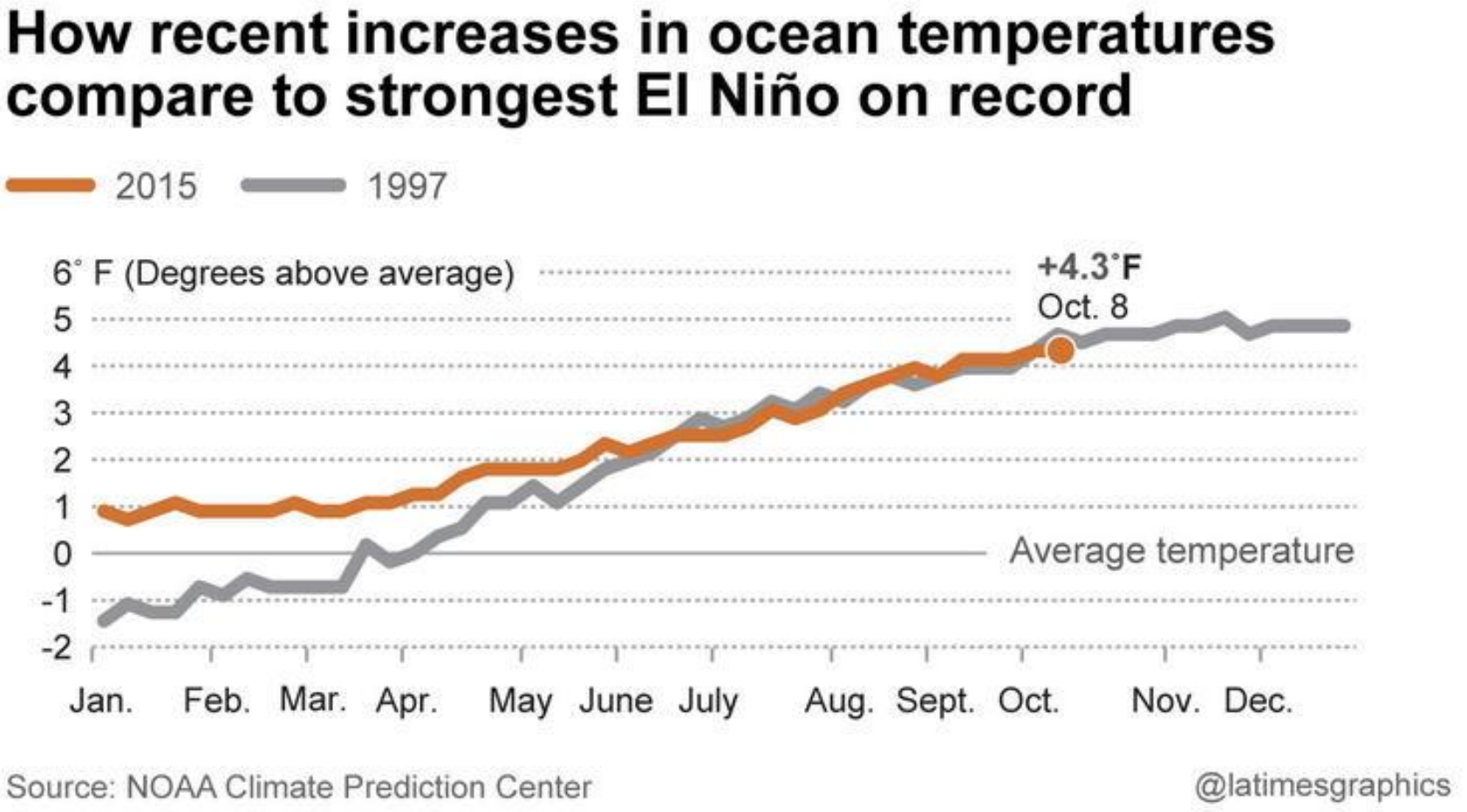


re 1. Average sea surface temperature (SST) anomalies (°C) for the week centered on 1 July 201
Anomalies are computed with respect to the 1981-2010 base period weekly means.

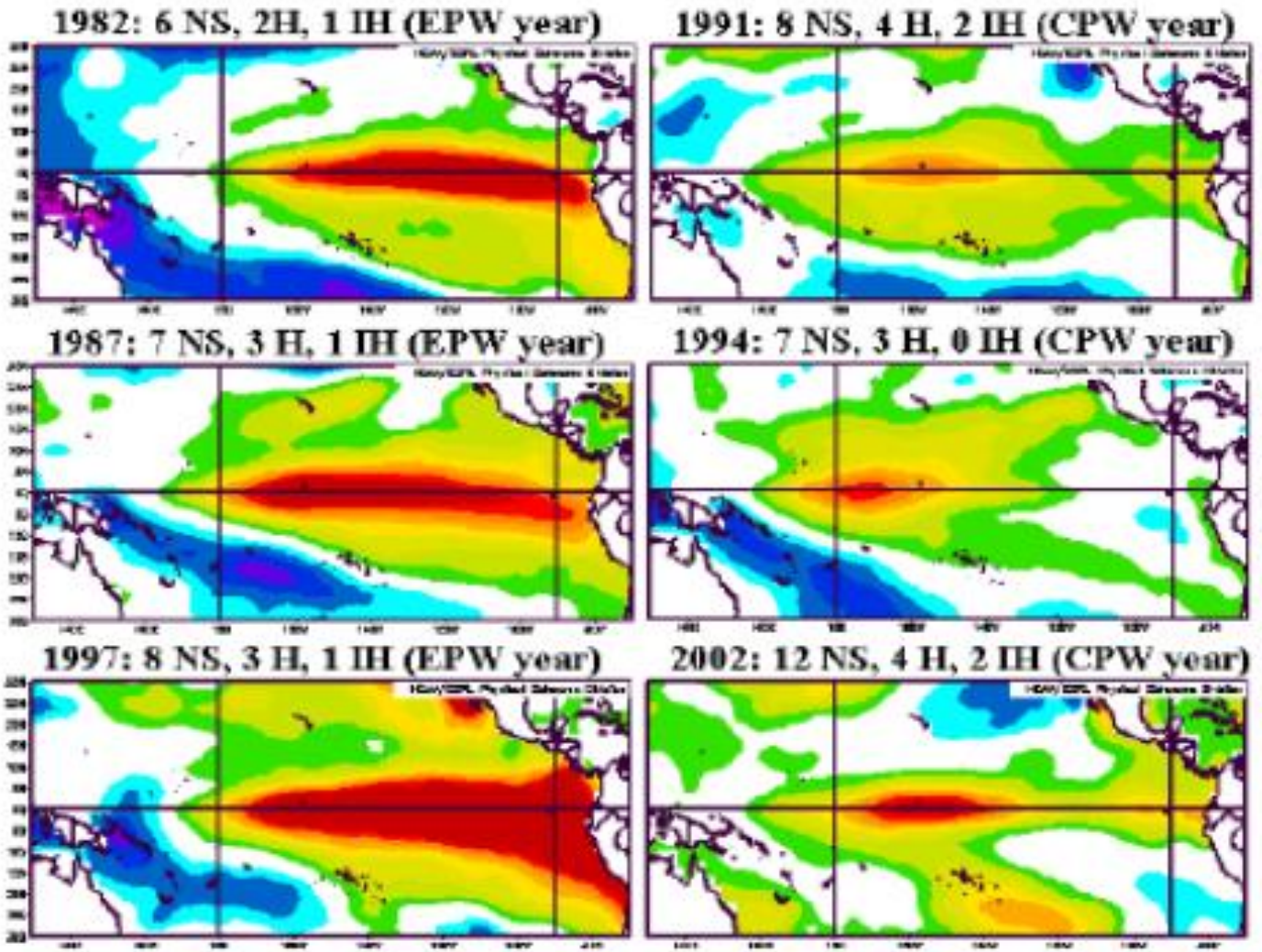
How Strong Might El Nino Be?

- The three-month, June-August average of sea surface temperatures was 1.22°C above normal, the ***third-highest June-August value since records start*** in 1950, behind 1987 (1.36°C) and 1997 (1.42°C)
- The August average was 1.49°C, ***second behind August 1997*** (1.74°C)
- The August Equatorial Southern Oscillation Index (which measures the strength of the atmospheric part of ENSO) was -2.2, ***second to 1997's*** -2.3

How Strong Might El Nino Be?



Historic Sea Surface Temperature Anomalies

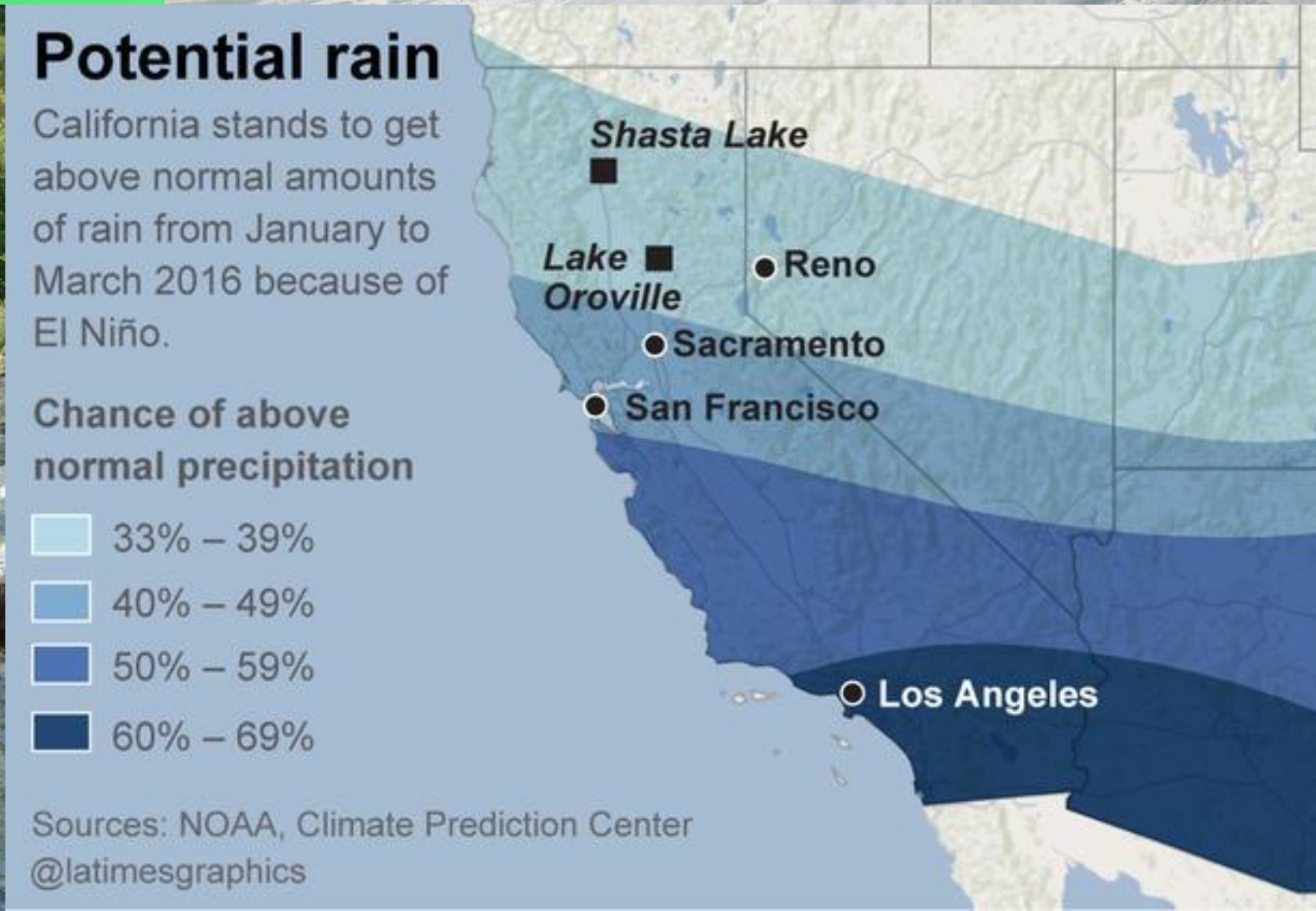


EPW– East Pacific Warm pattern (El Niño), CPW– Central Pacific Warm pattern (weak El Niño)

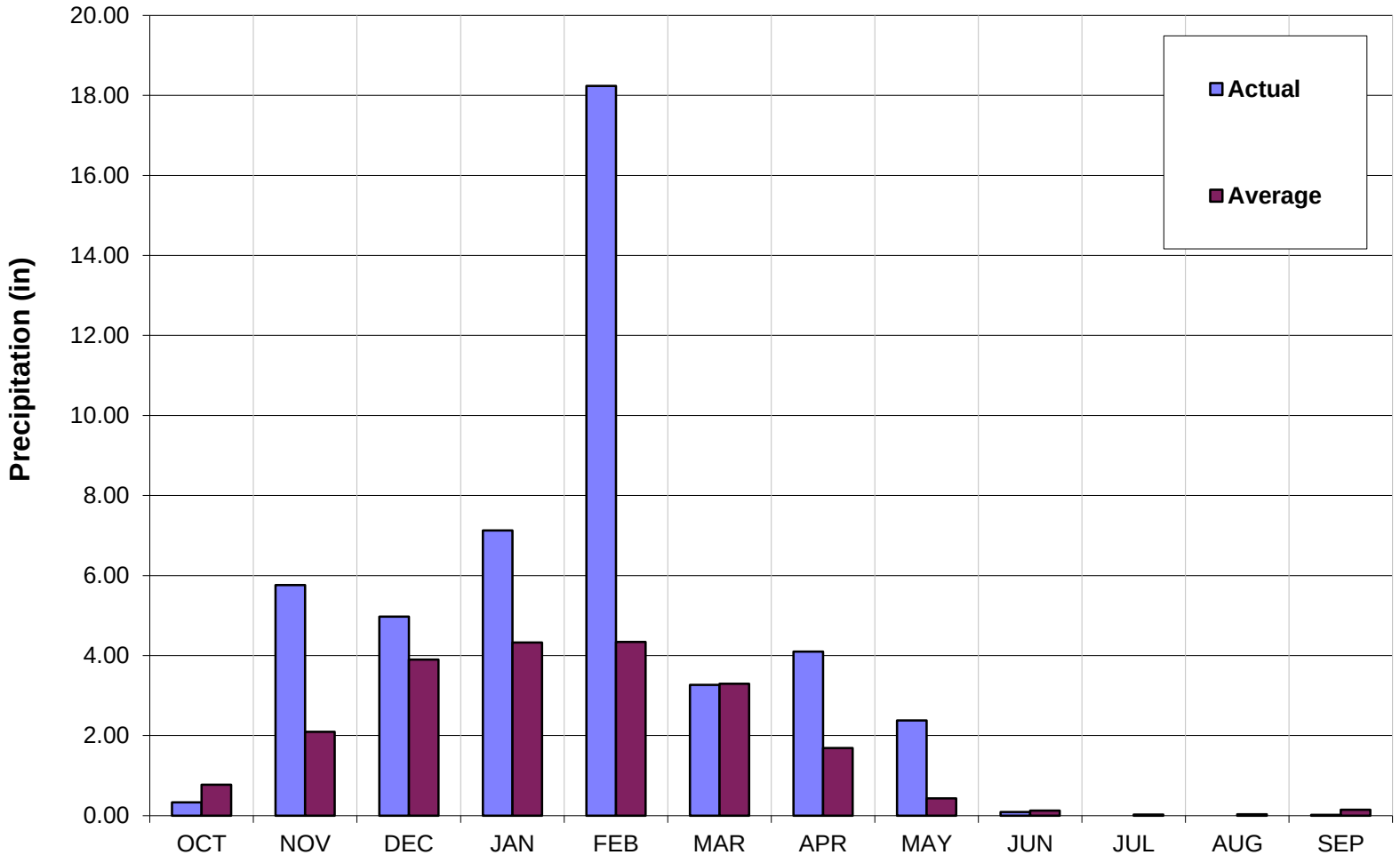
How Strong Might El Nino Be?

- Would need 150 percent of normal precipitation in the Sierra Nevada and statewide for “drought buster” and needs a snowpack
- Past El Nino seasons have resulted in variable precipitation - Moderate to Strong correlate to wet in Southern California, but only Very Strong correlates to a wet Northern California

How Strong Might El Nino Be?



How Strong Might El Nino Be?
Monterey Peninsula Rain 1997-98

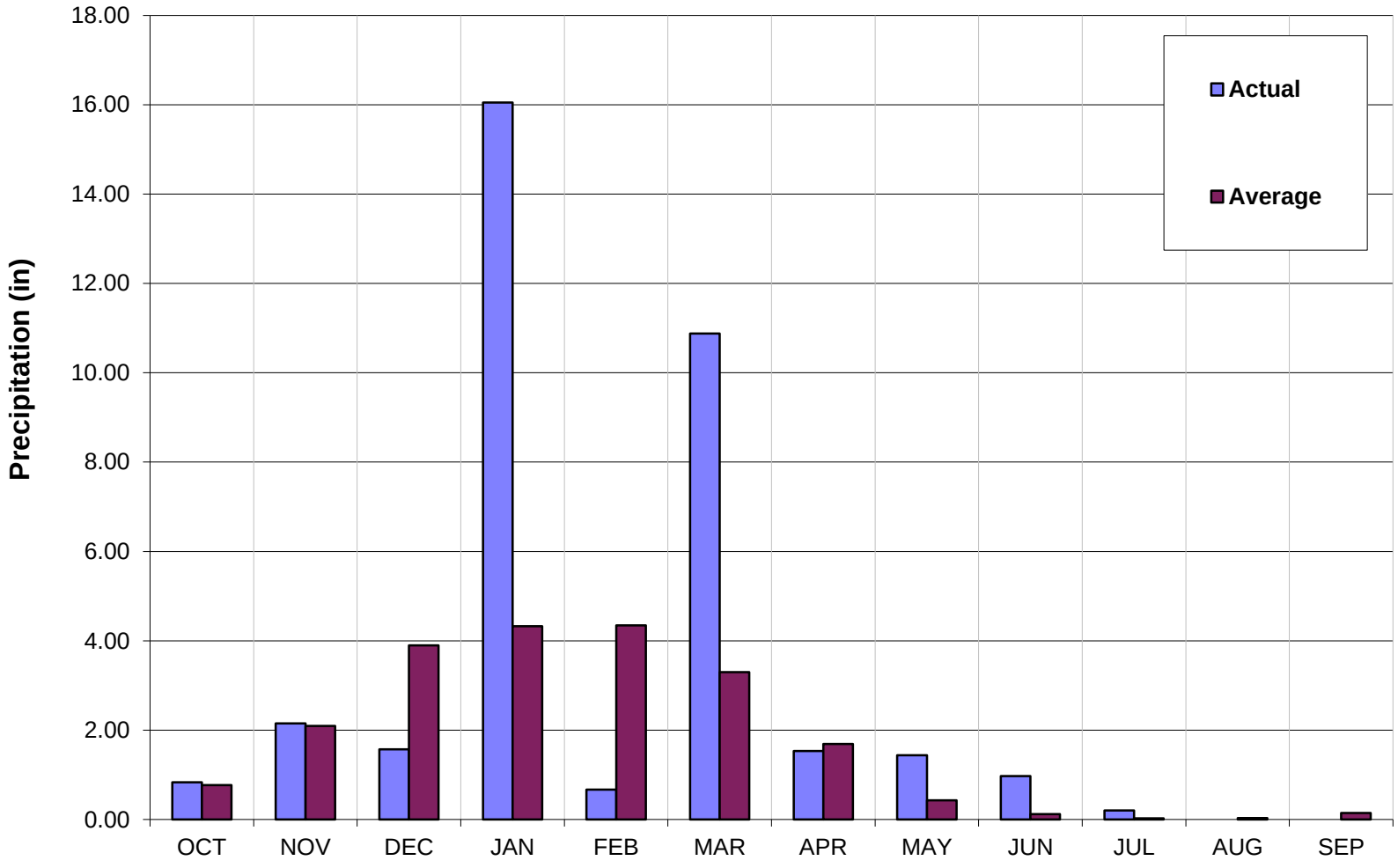


Carmel River on El Nino
February 3, 1998

Looking downstream from Via Mallorca Bridge to Rancho Canada, February 3, 1998 at 9 a.m. Peak flow for the day was estimated by the USGS to be 14,600 cfs at mid-day.

Rancho Canada Loses 2 Fairways
February 7, 1998

How Strong Might El Nino Be?
Monterey Peninsula Rain 1994-95



How Strong Might El Nino Be?

Highway 1 Bridge over the Carmel River
Above - March 10, 1995
Below - March 12, 1995

Rancho Canada Bridge No. 5
March 1995

California is warmer

The State wants permanent reductions

El Nino likely, but may not solve problem

Prepare for a wet winter

Sea Surface Temperature Anomalies
November 2nd