Drought and Desperation:

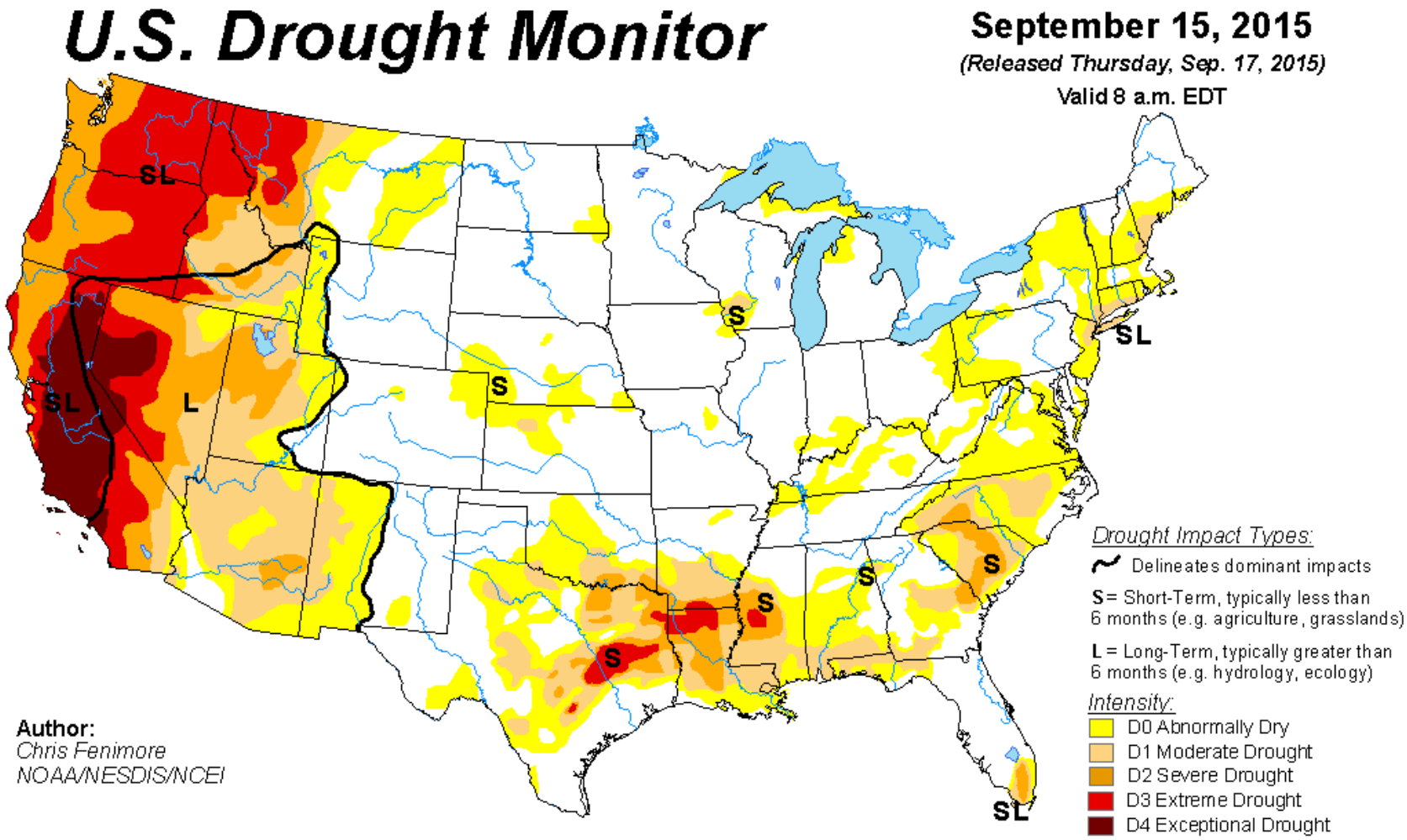
New State Mandates and What They Mean for the Monterey Peninsula…

Dave Stoldt
Monterey Peninsula Water Management District
October 2015

Monterey Peninsula Water Management District

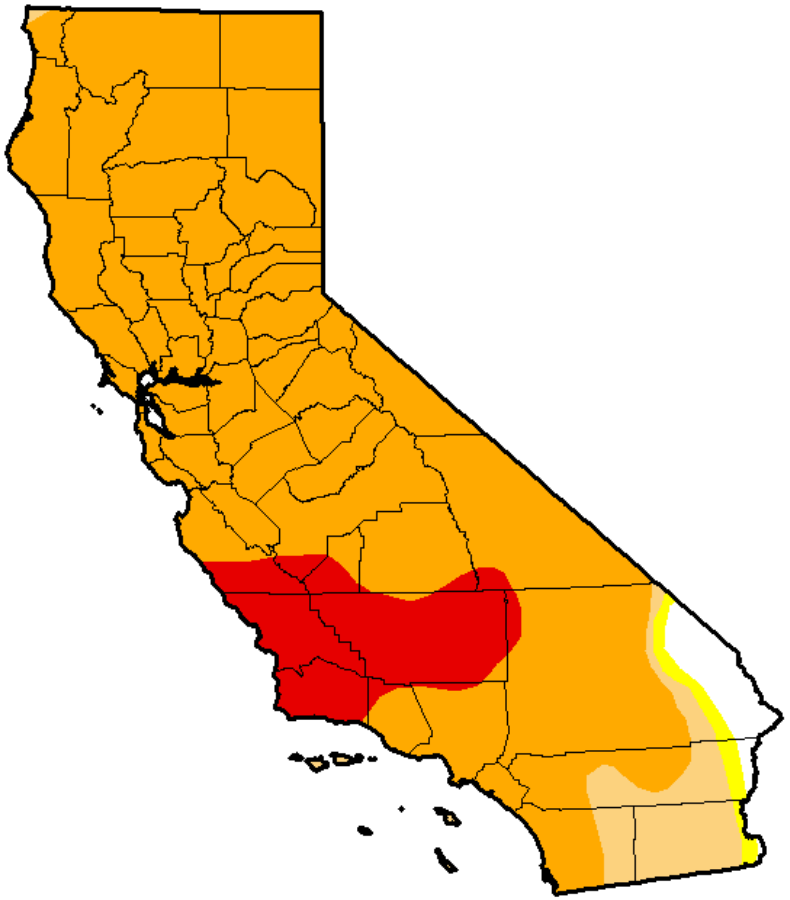
DROUGHT

Drought Monitor – Western States
September 15, 2015



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
- D4 Exceptional Drought

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

Author:
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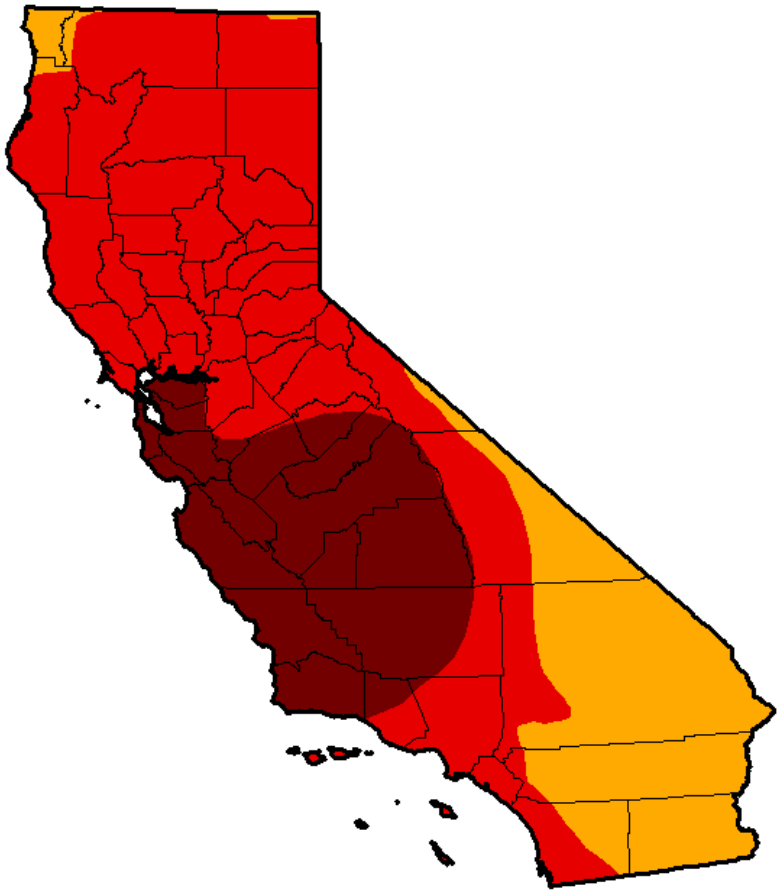
http://droughtmonitor.unl.edu/

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:
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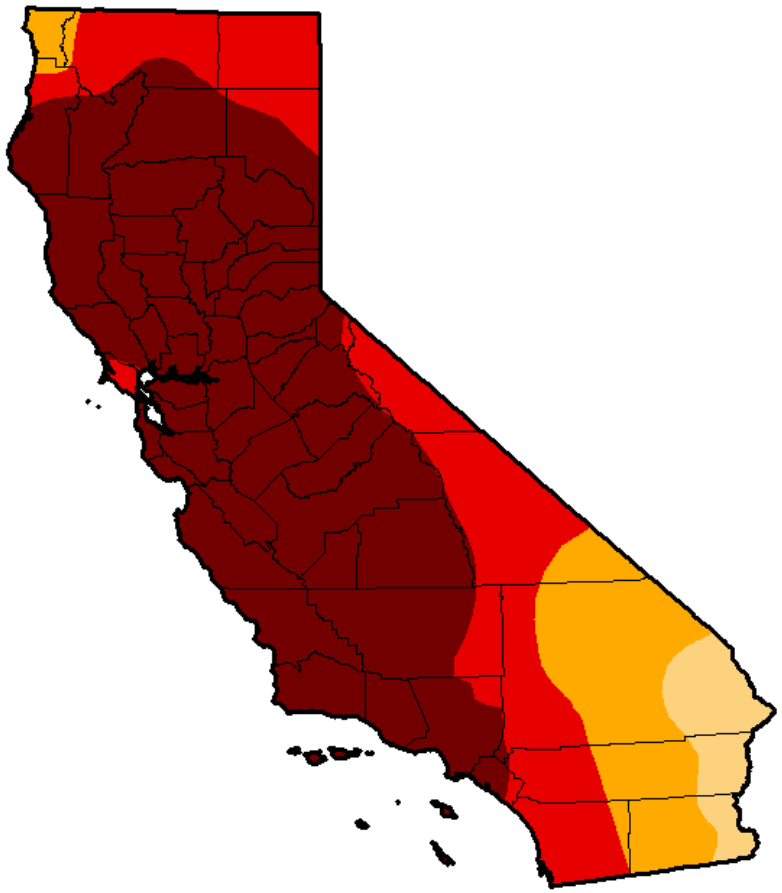
http://droughtmonitor.unl.edu/

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

Intensity:

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Author:
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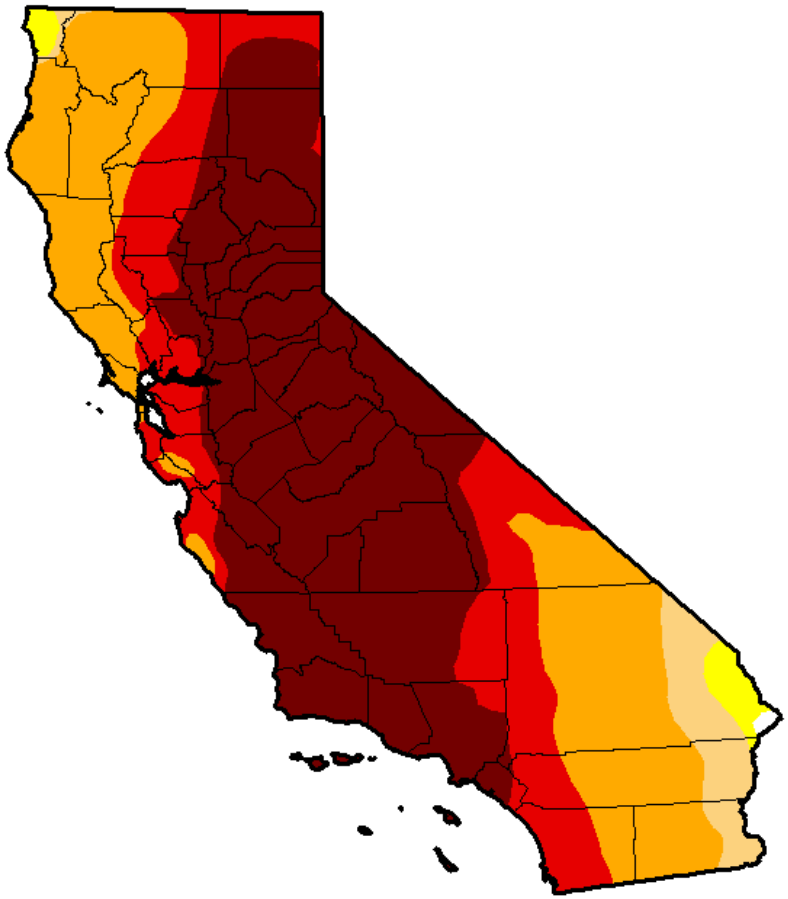
http://droughtmonitor.unl.edu/

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

Intensity:

- D0 Abnormally Dry
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Author:

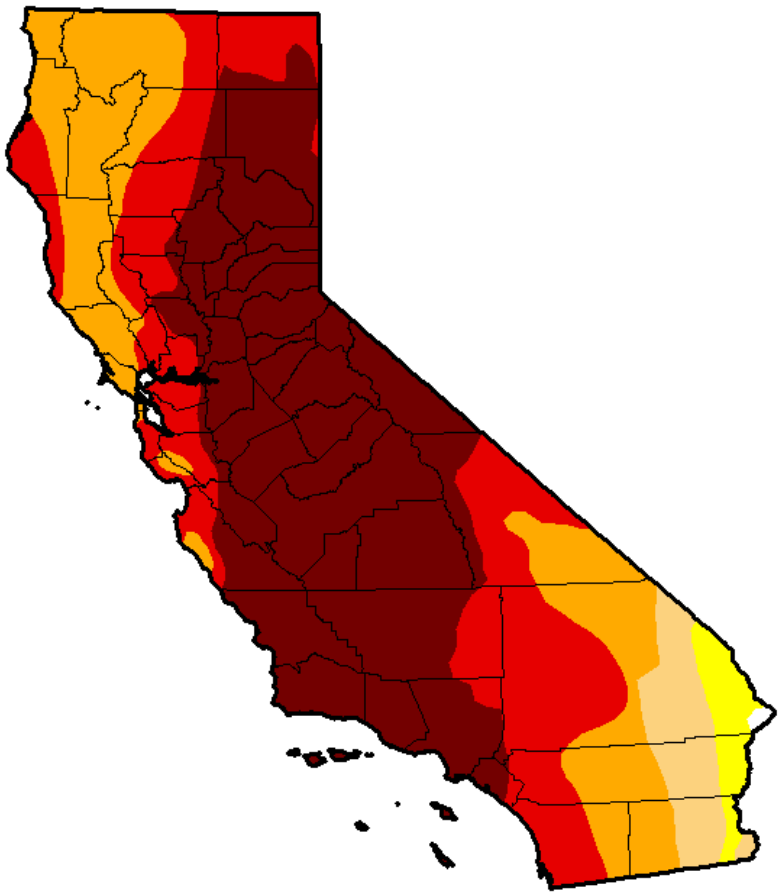
Mark Svoboda

National Drought Mitigation Center

http://droughtmonitor.unl.edu/

Drought Monitor – California Today

U.S. Drought Monitor
California



September 15, 2015

(Released Thursday, Sep. 17, 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	92.36	71.08	46.00
Last Week 9/8/2015	0.14	99.86	97.35	92.36	71.08	46.00
3 Months Ago 6/16/2015	0.14	99.86	98.71	94.59	71.08	46.73
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 9/16/2014	0.00	100.00	100.00	95.42	81.92	58.41

Intensity:

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Author:

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http://droughtmonitor.unl.edu/

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"?

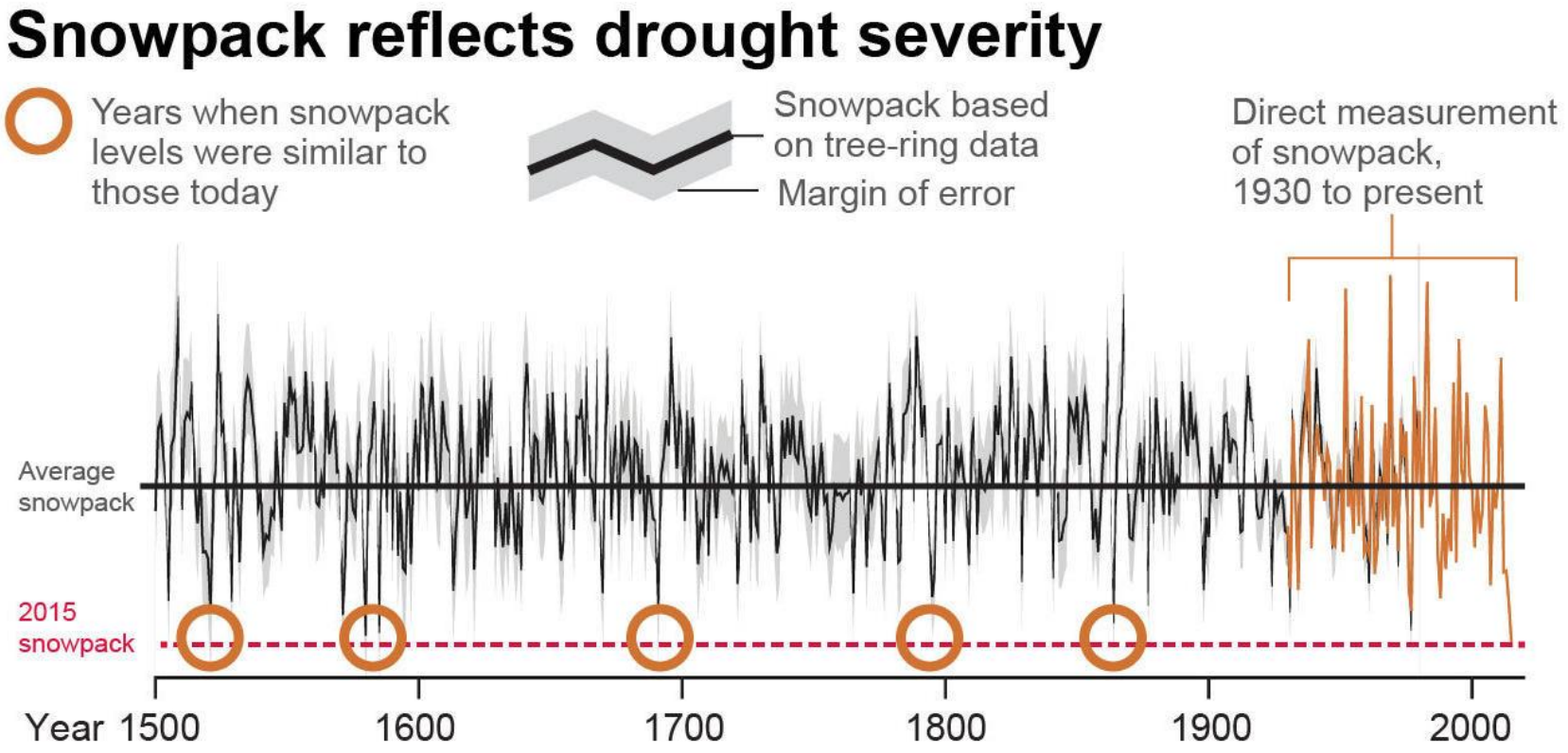
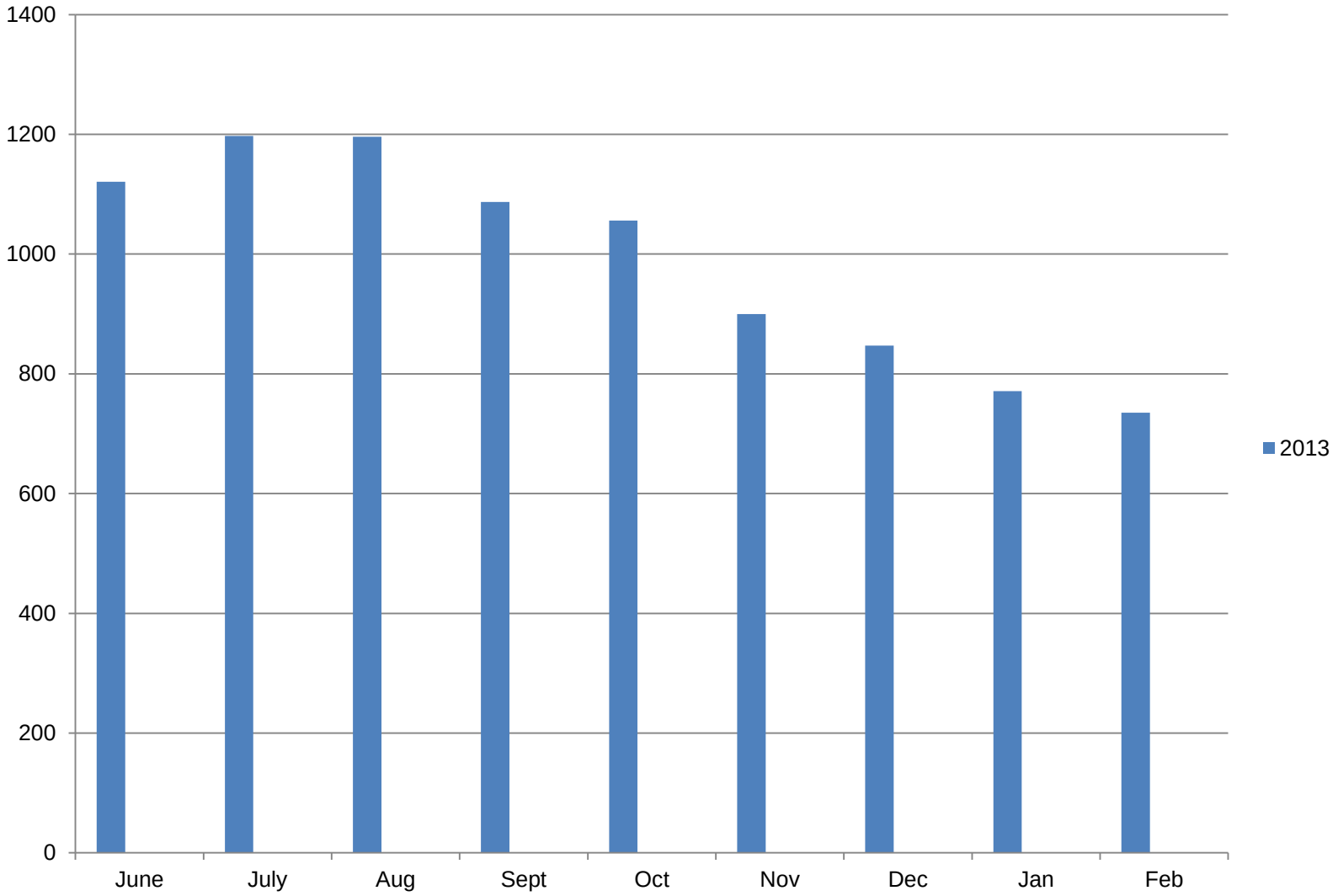


Chart image provided by University of Arizona.

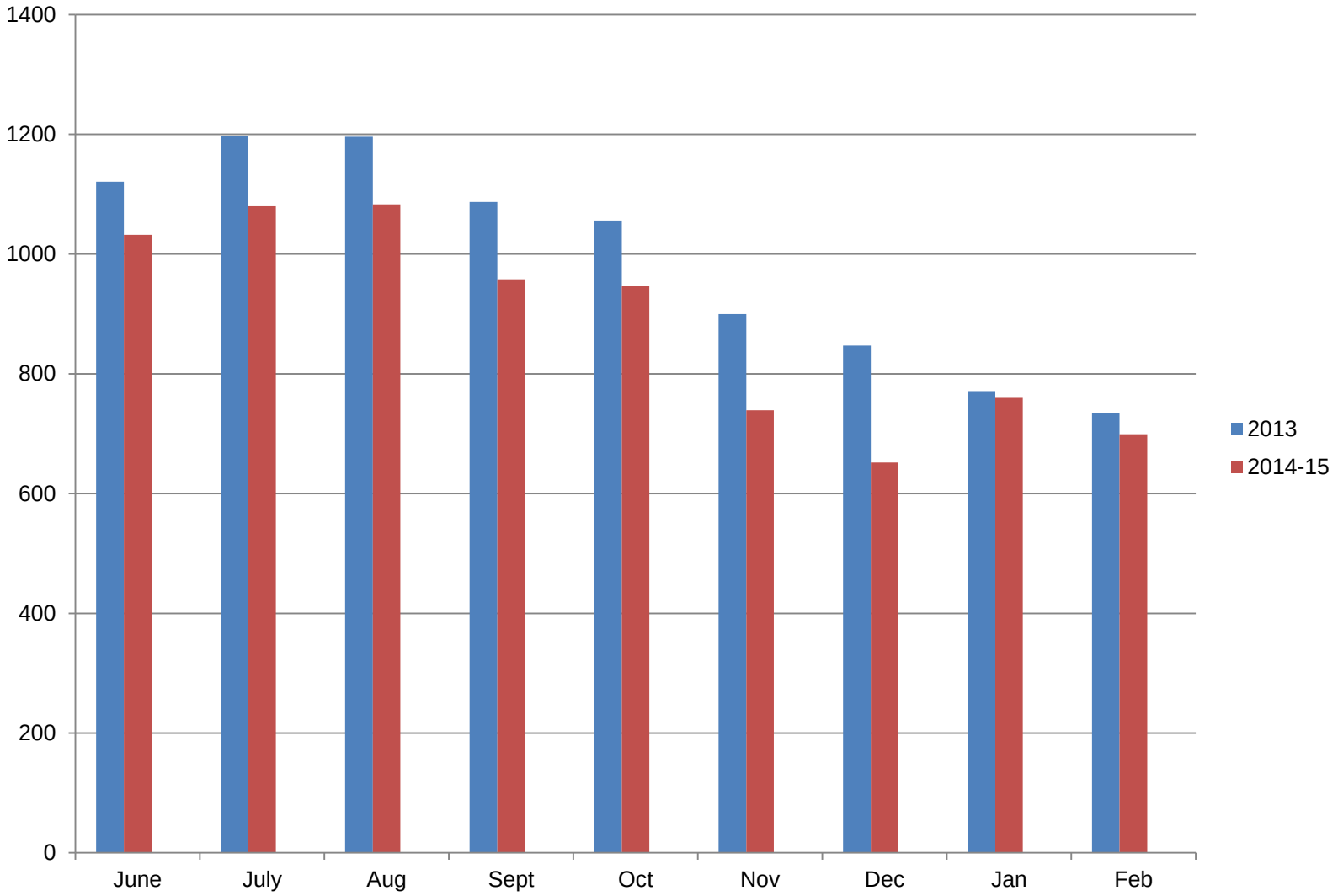
Source: Laboratory of Tree-Ring Research, University of Arizona

@latimesgraphics

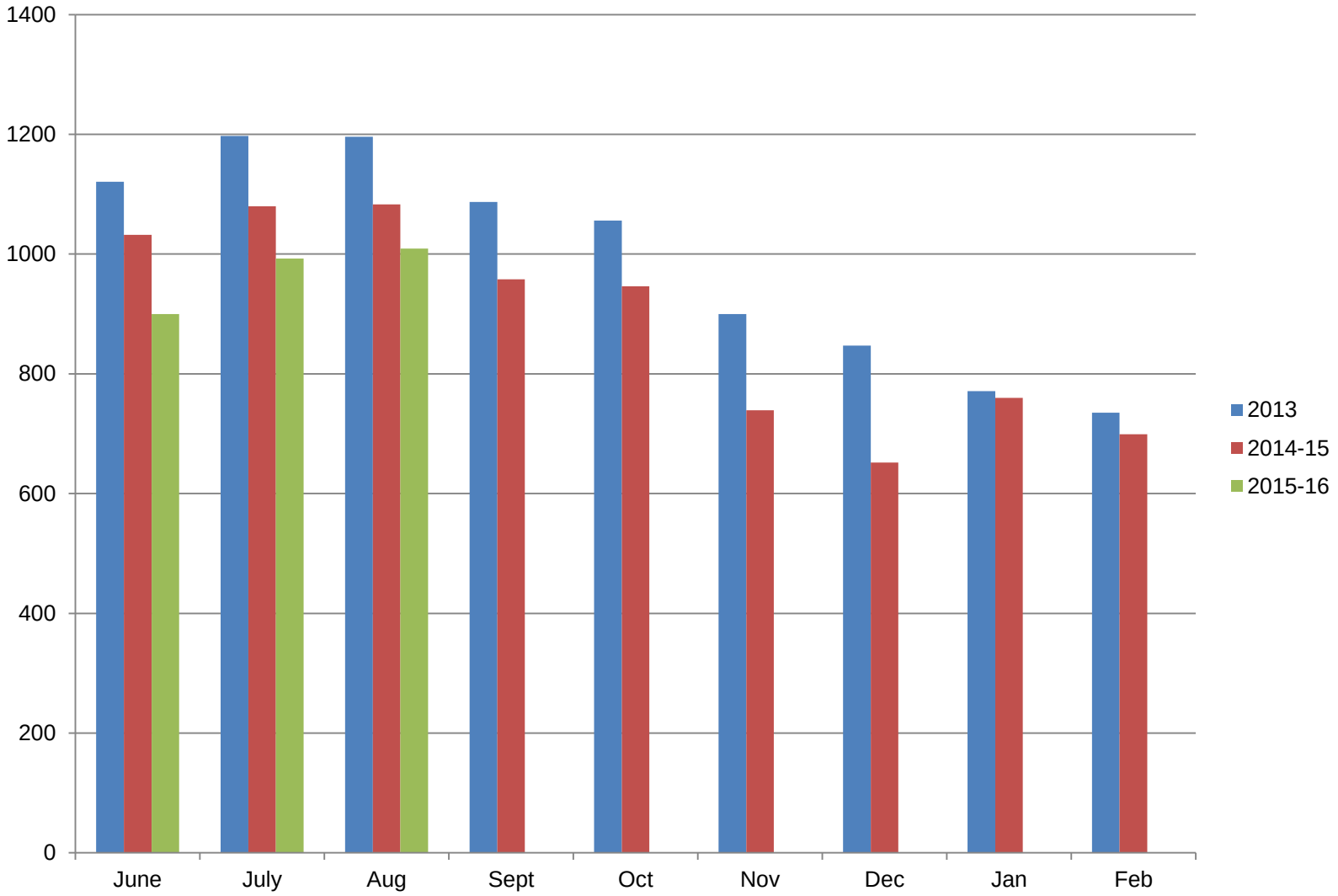
New Mandatory Conservation Standards
Monterey Peninsula 2013 Target Year



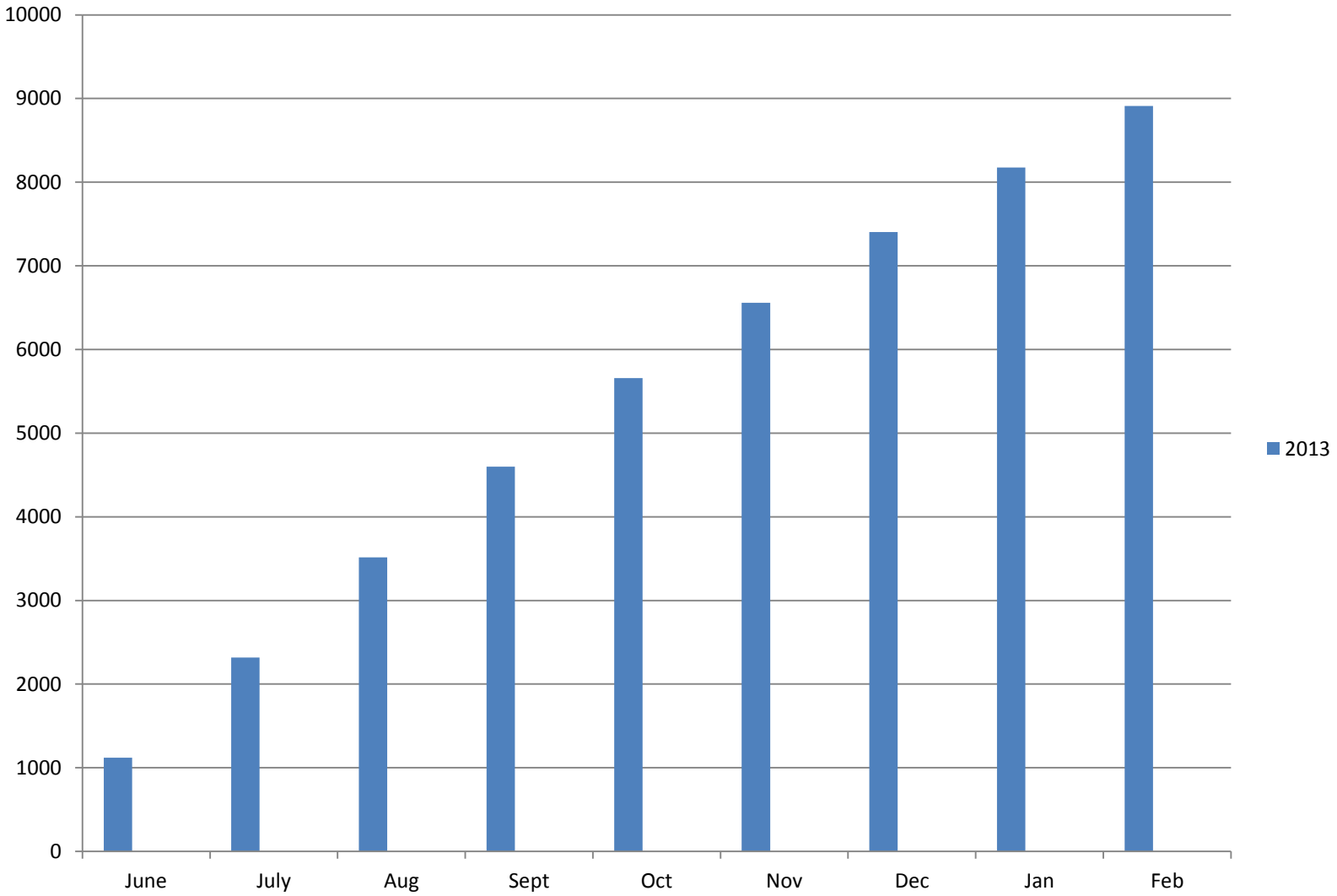
Last Year's Performance



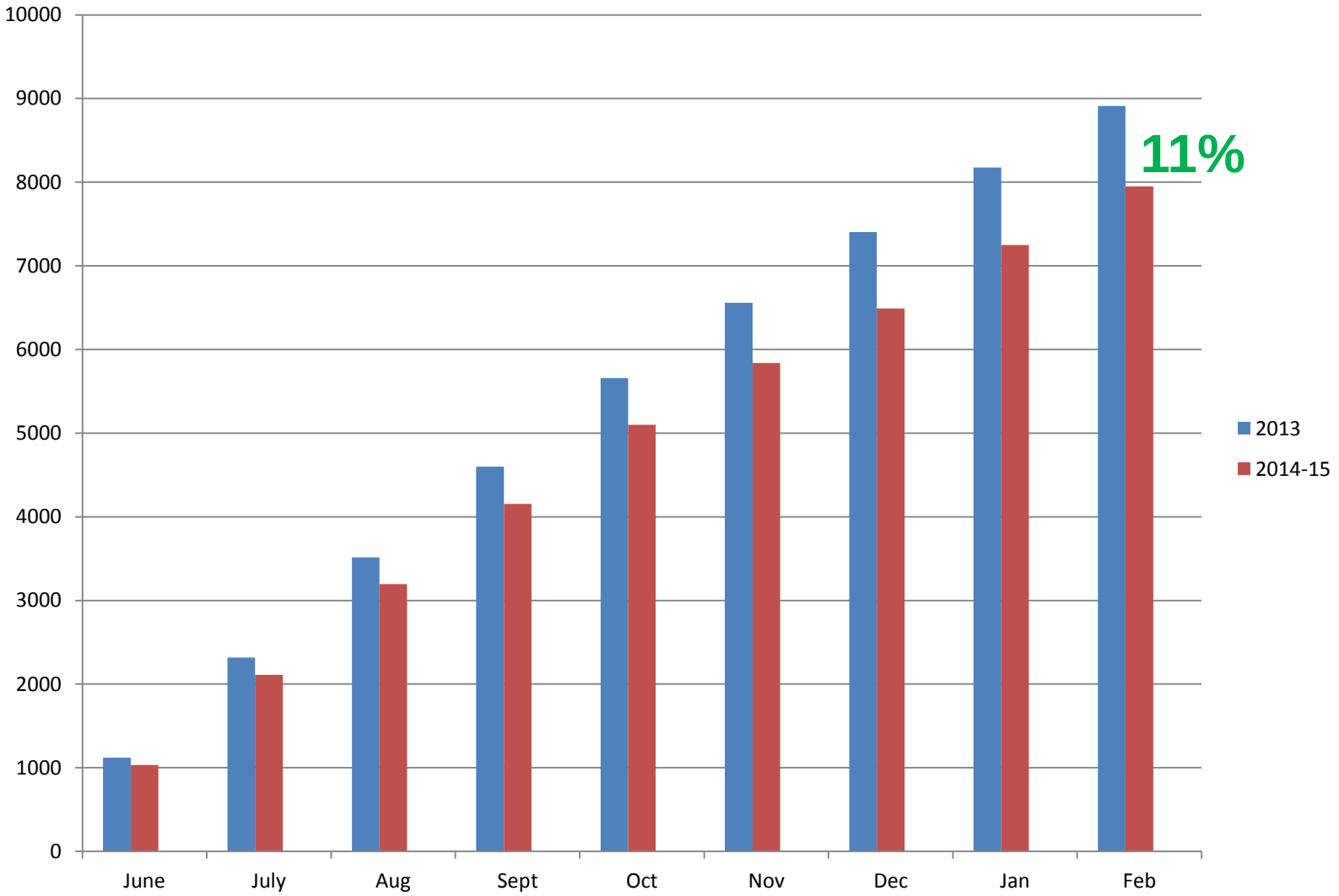
The 2015 Sweepstakes: How Are We Doing So Far?



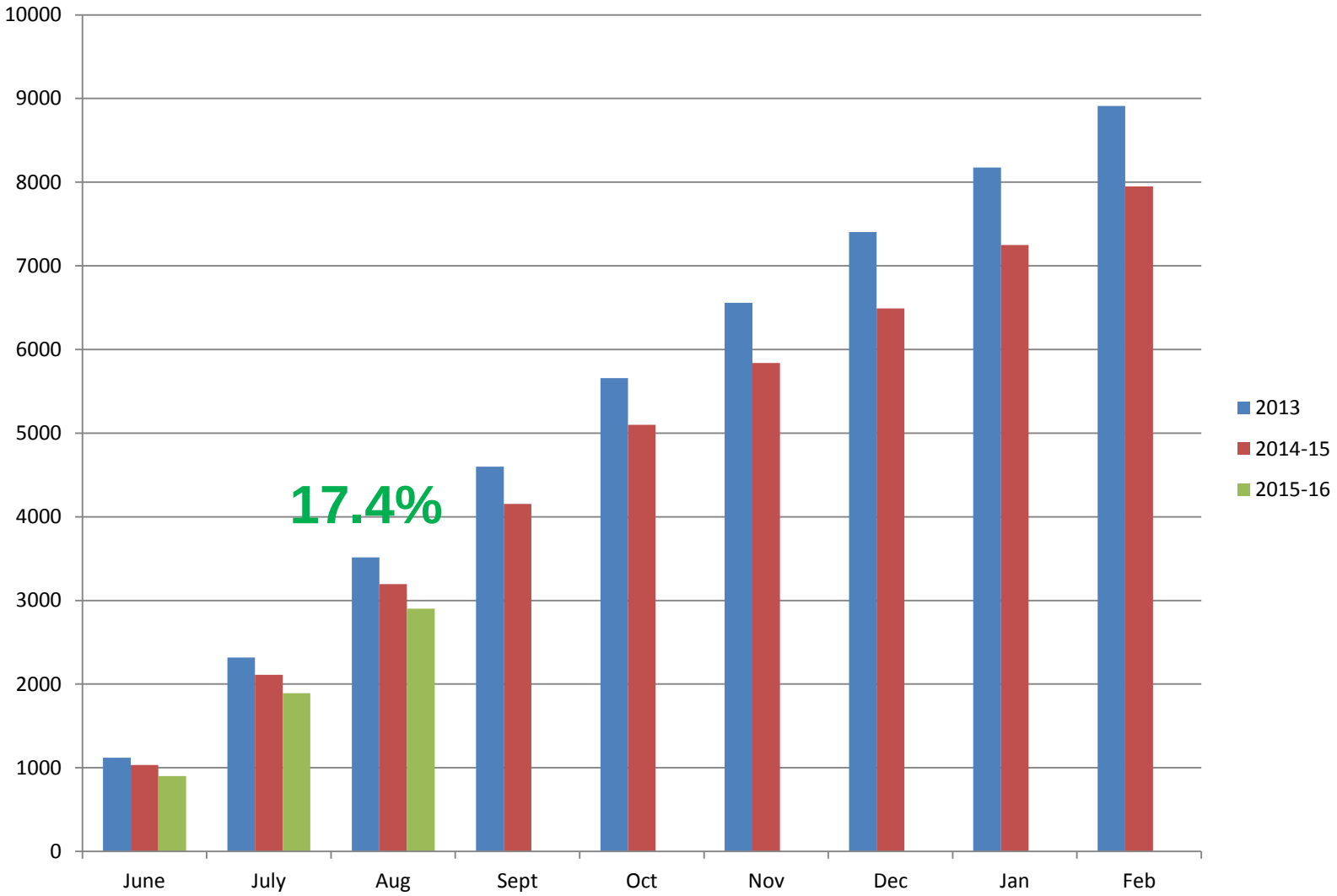
New Mandatory Conservation Standards
Monterey Peninsula 2013 Target Year



Last Year's Performance



The 2015 Sweepstakes: How Are We Doing So Far?



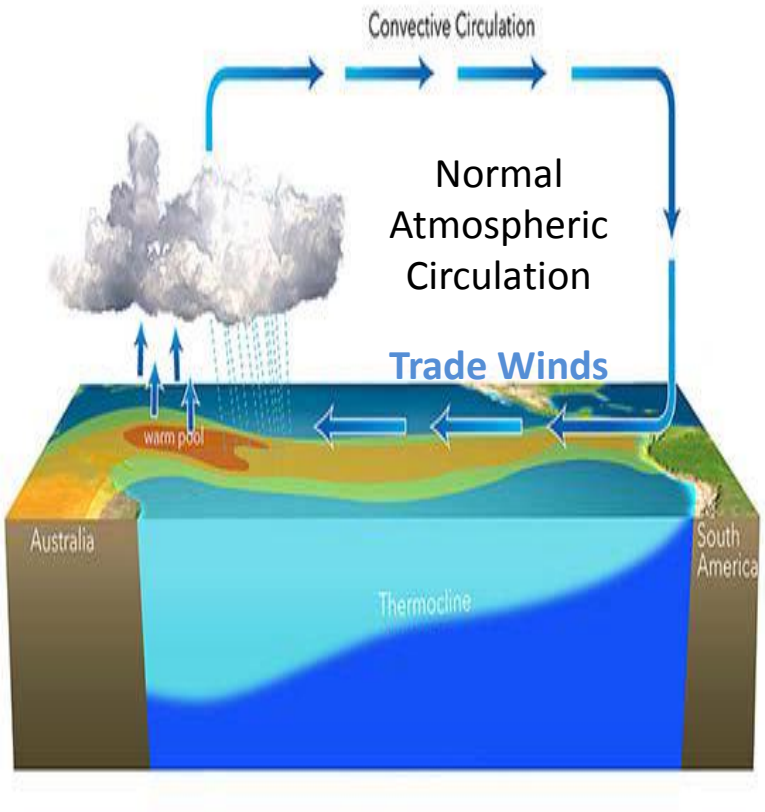
Monterey Peninsula Water Management District

Will El Nino Save Us?

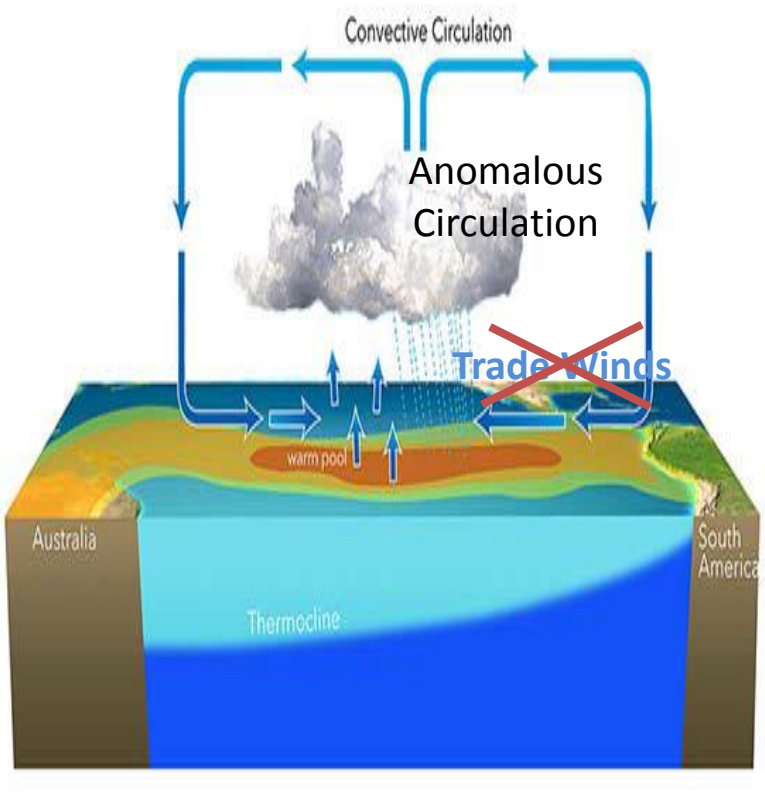
Waiting for El Nino

- 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?



Typical Year

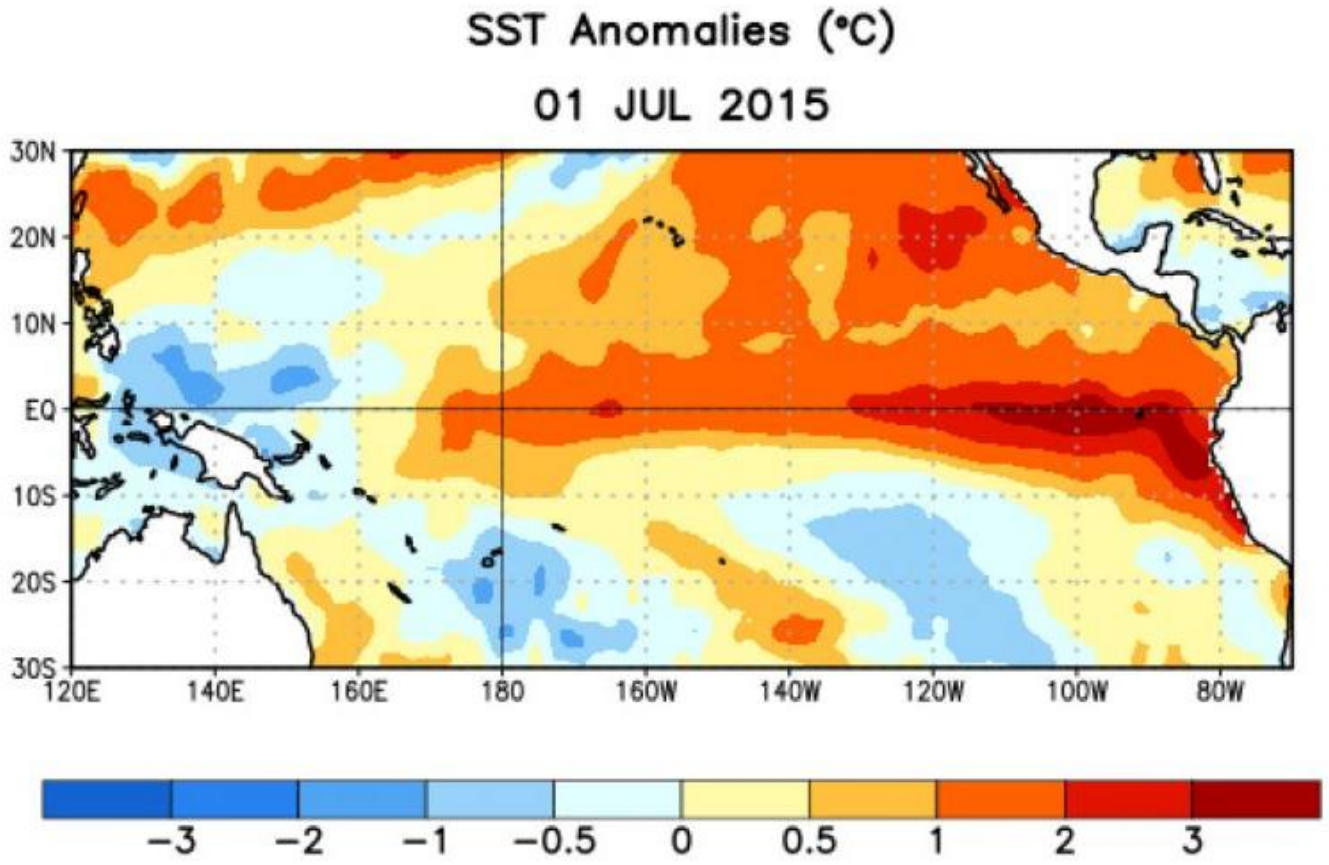


El Nino Year

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

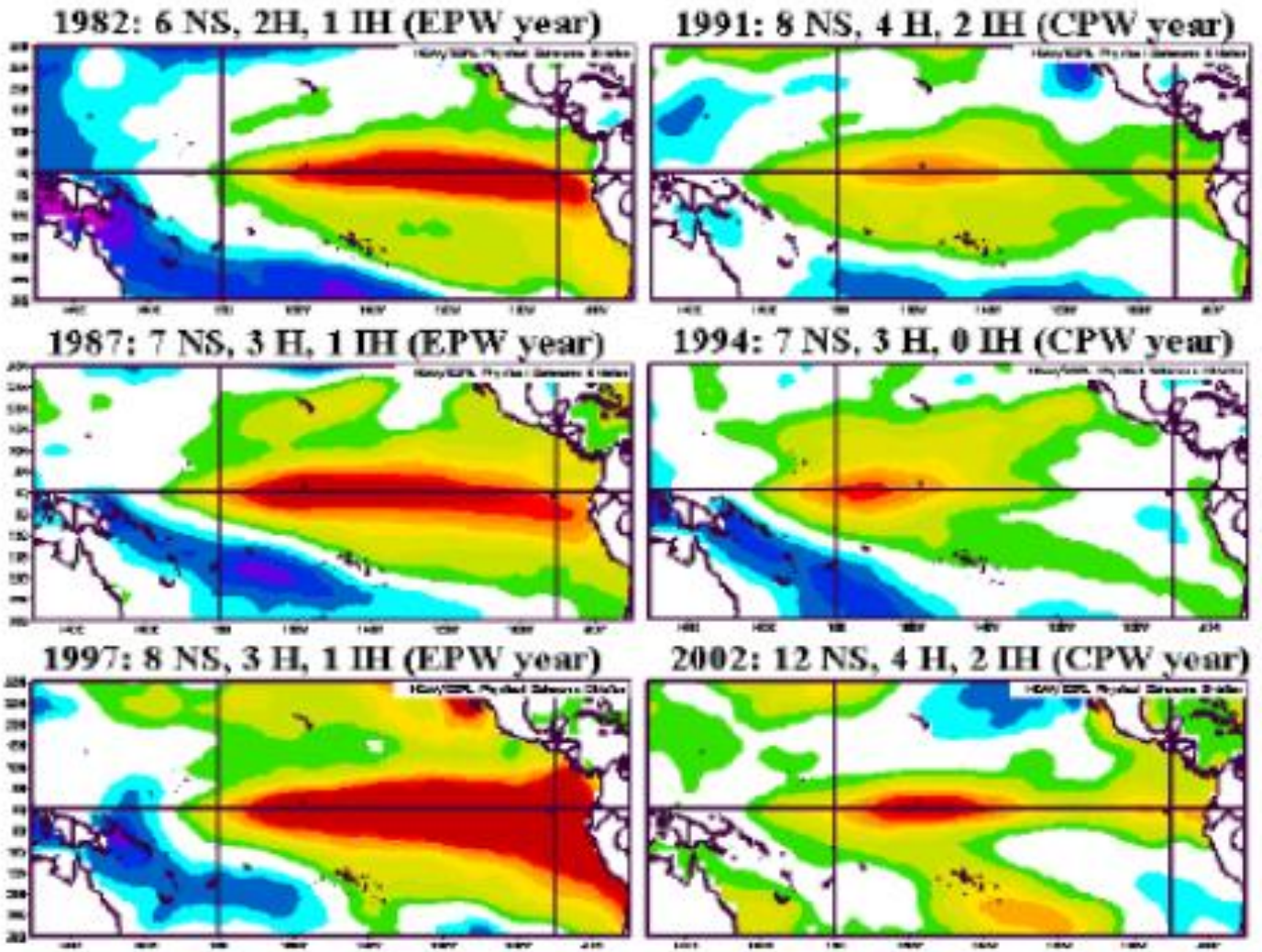


re 1. Average sea surface temperature (SST) anomalies (°C) for the week centered on 1 July 201
Anomalies are computed with respect to the 1981-2010 base period weekly means.

How Strong Might El Nino Be?

- The three-month, June-August average of sea surface temperatures is 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 is 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

Historic Sea Surface Temperature Anomalies

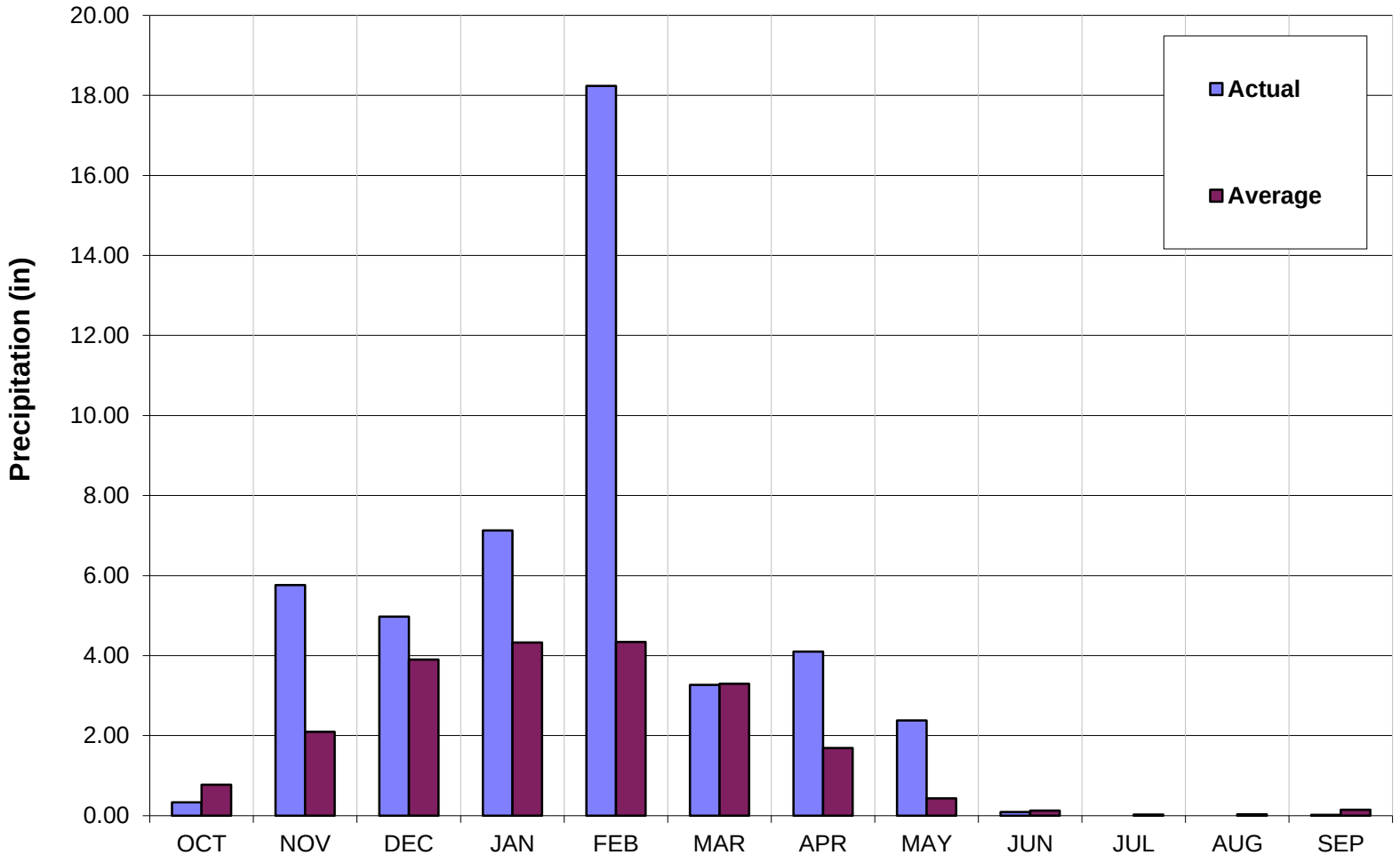


EPW– East Pacific Warm pattern (El Niño), CPW– Central Pacific Warm pattern (weak El Niño)

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?
Monterey Peninsula Rain 1997-98

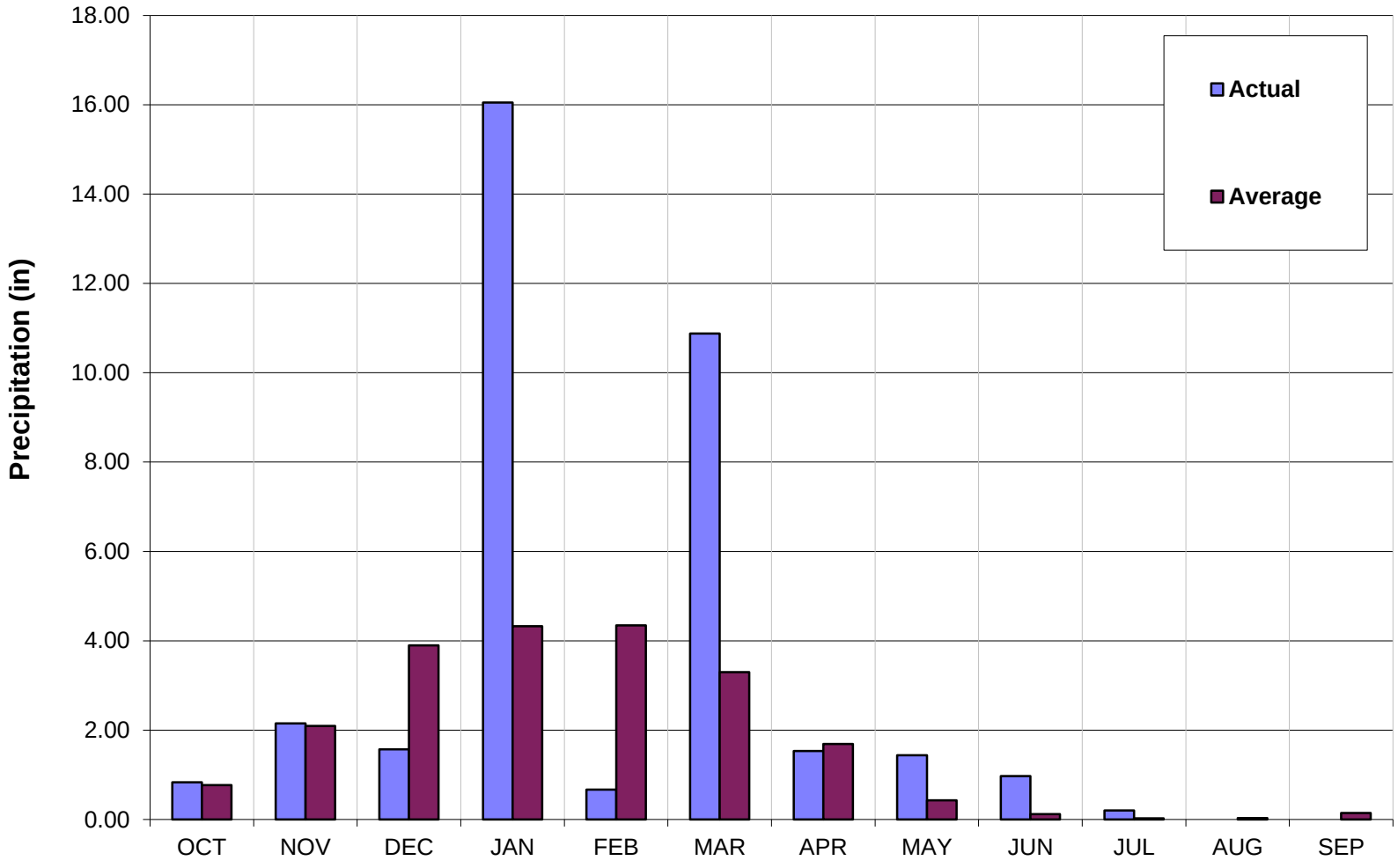


Carmel River on El Nino
February 3, 1998

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

Monterey Peninsula Water Management District

QUESTIONS?