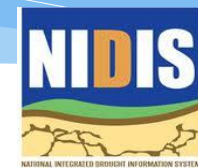


# California-Nevada Drought & Climate Status Update

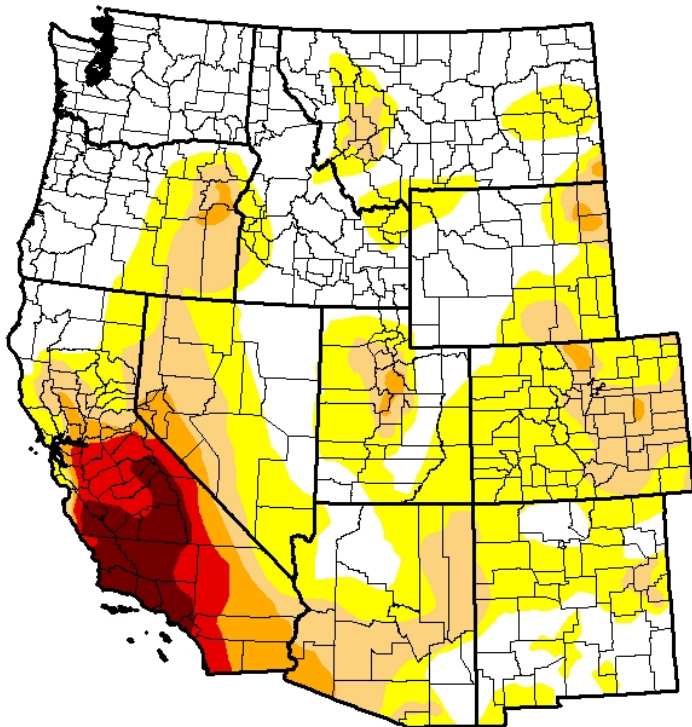
California-Nevada Drought Early Warning System  
Drought & Climate Update Webinar  
December 2, 2016

David B. Simeral  
Associate Research Scientist – Climatology  
U.S. Drought Monitor Author  
Desert Research Institute – Division of Atmospheric Sciences  
Western Regional Climate Center



# Current California-Nevada Drought Status

## U.S. Drought Monitor West



**November 29, 2016**  
(Released Thursday, Dec. 1, 2016)  
Valid 7 a.m. EST

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
<b>Current</b>	43.28	56.72	25.58	9.90	5.73	2.81
<b>Last Week</b> 11/22/2016	43.92	56.08	25.58	9.90	5.73	2.81
<b>3 Months Ago</b> 8/30/2016	24.36	75.64	34.75	12.84	5.99	2.81
<b>Start of Calendar Year</b> 12/29/2015	33.17	66.83	45.07	29.30	15.92	6.85
<b>Start of Water Year</b> 9/27/2016	27.78	72.22	30.95	13.45	5.77	2.81
<b>One Year Ago</b> 12/1/2015	28.98	71.02	48.88	37.23	21.16	6.85

### Intensity



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

**Author:**  
Richard Heim  
NCEI/NOAA



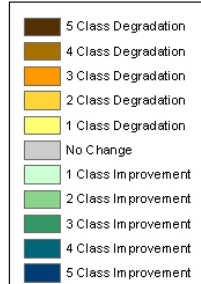
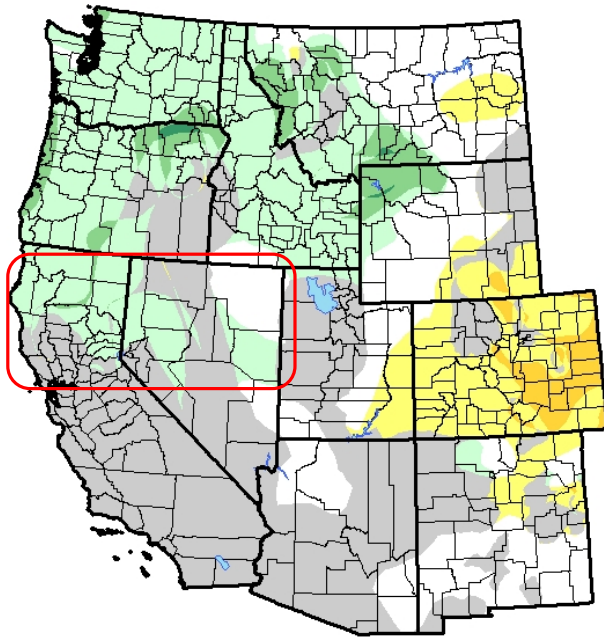
- \* Since Jan 1<sup>st</sup>, significant improvements across much of Nevada and northern California.
- \* The southern half of California has not seen improvement in drought conditions.
- \* Portions of northern California have gone from D4/D3 range to D1/D0/D-nada.
- \* Since Oct 1<sup>st</sup>, above normal precipitation led to one-category improvements in areas of D1/D0 in northern California while areas of D2/D1 in northwestern Nevada saw one-category improvements.
- \* Longer-term hydrologic impacts (below-normal groundwater and reservoir storage levels) have persisted across much of California.

# Drought Status – Change Maps

2 months

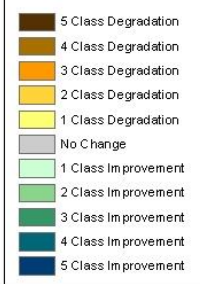
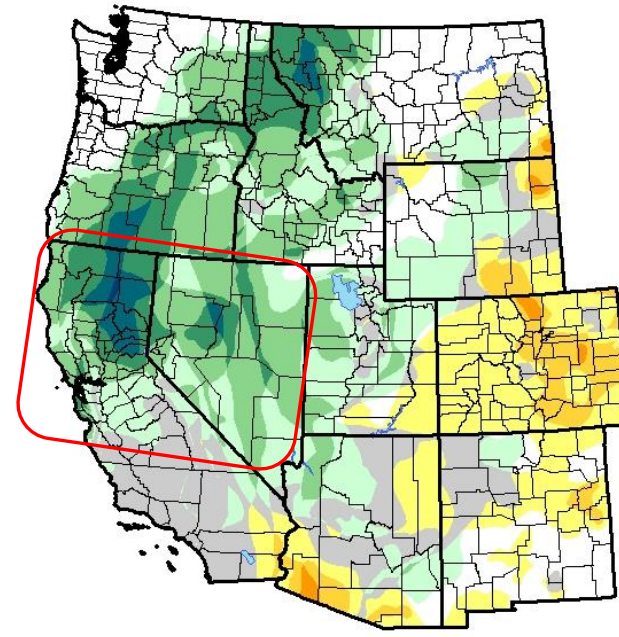
Since Jan 1

U.S. Drought Monitor Class Change - West  
2 Months



November 29, 2016  
compared to  
October 4, 2016

U.S. Drought Monitor Class Change - West  
Start of Calendar Year



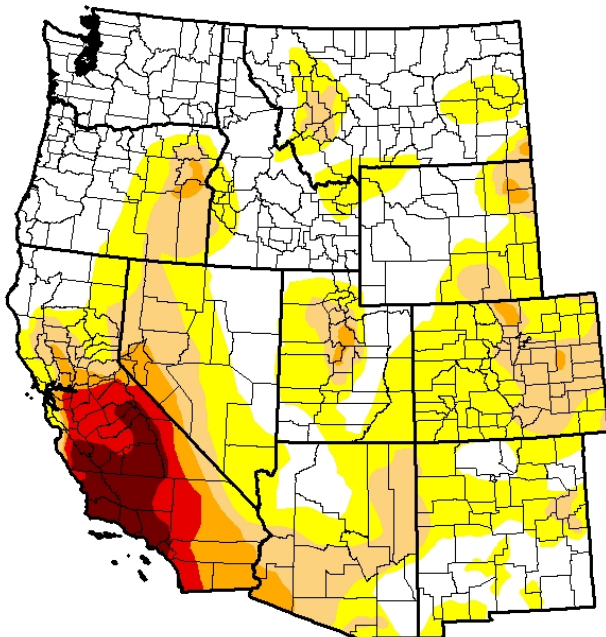
November 29, 2016  
compared to  
December 29, 2015

# Drought Status – Compared to a Year Ago

**Current**

**Dec 1, 2015**

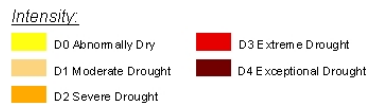
**U.S. Drought Monitor  
West**



**November 29, 2016**  
(Released Thursday, Dec. 1, 2016)  
Valid 7 a.m. EST

*Drought Conditions (Percent Area)*

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
<b>Current</b>	43.28	56.72	25.58	9.90	5.73	2.81
<b>Last Week</b> <i>11/22/2016</i>	43.92	56.08	25.58	9.90	5.73	2.81
<b>3 Months Ago</b> <i>09/02/2016</i>	24.36	75.64	34.75	12.84	5.99	2.81
<b>Start of Calendar Year</b> <i>12/29/2015</i>	33.17	66.83	45.07	29.30	15.92	6.85
<b>Start of Water Year</b> <i>02/27/2016</i>	27.78	72.22	30.95	13.45	5.77	2.81
<b>One Year Ago</b> <i>12/1/2015</i>	28.98	71.02	48.88	37.23	21.16	6.85



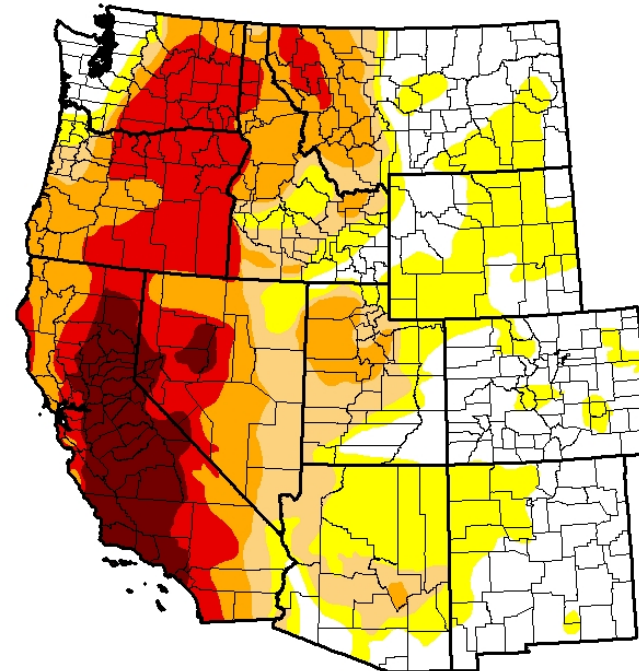
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

**Author:**  
Richard Heim  
NCEI/NOAA

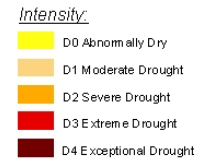


<http://droughtmonitor.unl.edu/>

**U.S. Drought Monitor  
West**



**December 1, 2015**  
(Released Thursday, Dec. 3, 2015)  
Valid 7 a.m. EST



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

**Author:**  
David Simeral  
Western Regional Climate Center



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

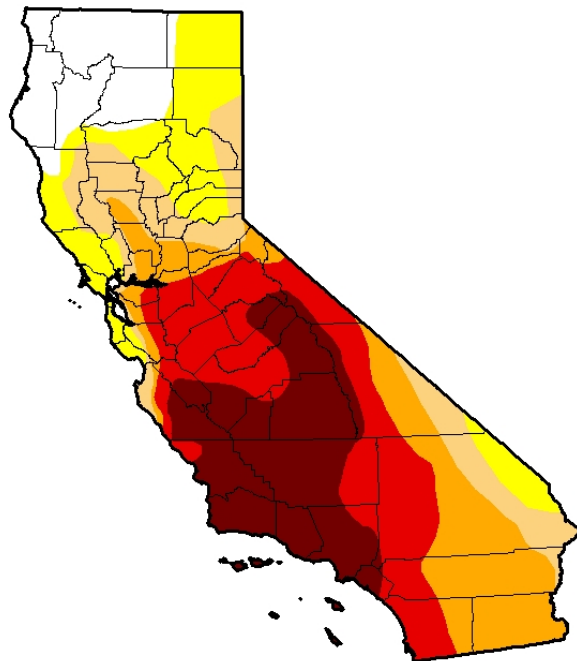
# Compared to a Year Ago California

Nov 22, 2016 – 73% in D1-D4

Dec 1, 2015 – 97% in D1-D4

## U.S. Drought Monitor California

November 29, 2016  
(Released Thursday, Dec. 1, 2016)  
Valid 7 a.m. EST



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.*

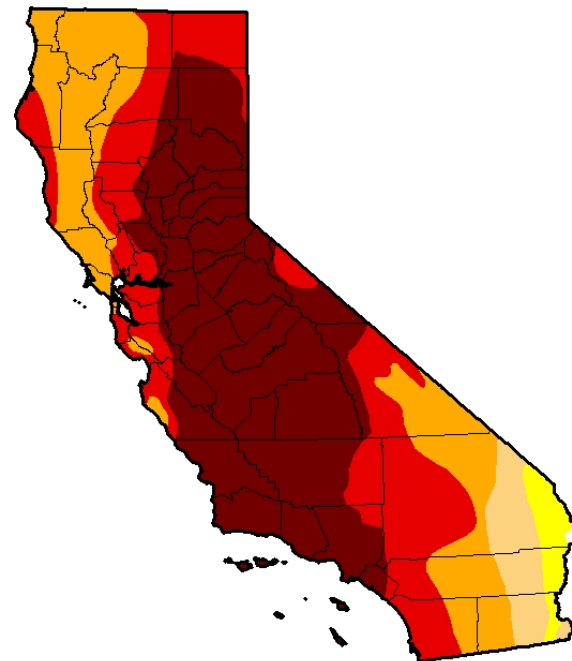
Author:  
Richard Heim  
NCEP/NOAA



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

## U.S. Drought Monitor California

December 1, 2015  
(Released Thursday, Dec. 3, 2015)  
Valid 7 a.m. EST



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:  
David Simeral  
Western Regional Climate Center



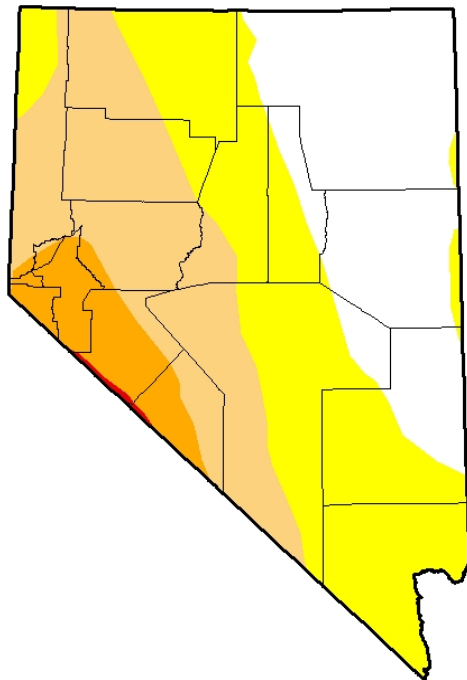
<http://droughtmonitor.unl.edu/>

# Compared to a Year Ago Nevada

Nov 22, 2016 – 34% in D1-D4

Dec 1, 2015 – 93% in D1-D4

## U.S. Drought Monitor Nevada



**November 29, 2016**  
(Released Thursday, Dec. 1, 2016)  
Valid 7 a.m. EST

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
<b>Current</b>	29.23	70.77	34.13	7.47	0.26	0.00
<b>Last Week</b> <i>11/22/2016</i>	29.23	70.77	34.13	7.47	0.26	0.00
<b>3 Months Ago</b> <i>8/30/2016</i>	32.76	67.24	34.25	21.68	0.26	0.00
<b>Start of Calendar Year</b> <i>12/29/2015</i>	1.34	98.66	93.08	65.49	31.74	9.35
<b>Start of Water Year</b> <i>9/27/2016</i>	19.64	80.36	36.60	21.68	0.26	0.00
<b>One Year Ago</b> <i>12/1/2015</i>	0.01	99.99	93.78	66.21	31.94	9.35

Intensity:



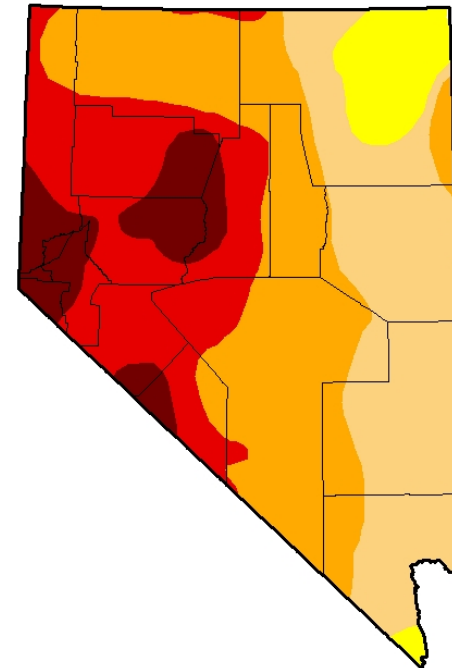
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

Author:  
Richard Heim  
NCEI/NOAA



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

## U.S. Drought Monitor Nevada



**December 1, 2015**  
(Released Thursday, Dec. 3, 2015)  
Valid 7 a.m. EST

Intensity:



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

Author:  
David Simeral  
Western Regional Climate Center



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

# NOAA NCEI Climatological Rankings Statewide - California

## 48-month – 1<sup>st</sup> Warmest, 8<sup>th</sup> Driest

### California Average Temperature Rankings, October 2016

« September 2016

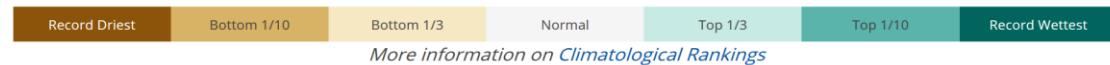


Download: [XML](#)  

PERIOD	AVG TEMP	20 <sup>TH</sup> CENTURY AVERAGE	DEPARTURE	RANK	WARMEST/COOLEST SINCE	RECORD
Nov 2012 - Oct 2016 48-month period	60.4°F (15.8°C)	57.4°F (14.1°C)	3.0°F (1.7°C)	118 <sup>th</sup> Coolest	Coolest since: 2013	1913, 1912
				1 <sup>st</sup> Warmest	Warmest to Date	2016

### California Precipitation Rankings, October 2016

« September 2016



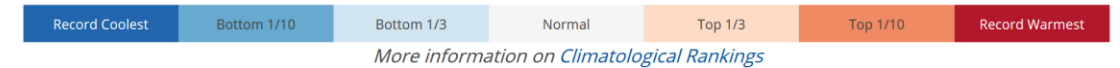
Download: [XML](#)  

PERIOD	PRECIP	20 <sup>TH</sup> CENTURY AVERAGE	DEPARTURE	RANK	WETTEST/DRIEST SINCE	RECORD
Nov 2012 - Oct 2016 48-month period	71.53" (1,816.86 mm)	89.47" (2,272.54 mm)	-17.94" (-455.68 mm)	8 <sup>th</sup> Driest	Driest since: 2015	2015
				111 <sup>th</sup> Wettest	Wettest since: 2014	1998

## 12-month – 7<sup>th</sup> Warmest, 35<sup>th</sup> Wettest

### California Average Temperature Rankings, October 2016

« September 2016

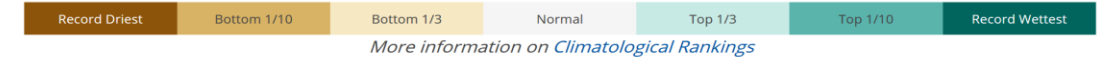


Download: [XML](#)  

PERIOD	AVG TEMP	20 <sup>TH</sup> CENTURY AVERAGE	DEPARTURE	RANK	WARMEST/COOLEST SINCE	RECORD
Nov 2015 - Oct 2016 12-month period	59.6°F (15.3°C)	57.4°F (14.1°C)	2.2°F (1.2°C)	115 <sup>th</sup> Coolest	Coolest since: 2013	1912
				7 <sup>th</sup> Warmest	Warmest since: 2015	2015

### California Precipitation Rankings, October 2016

« September 2016



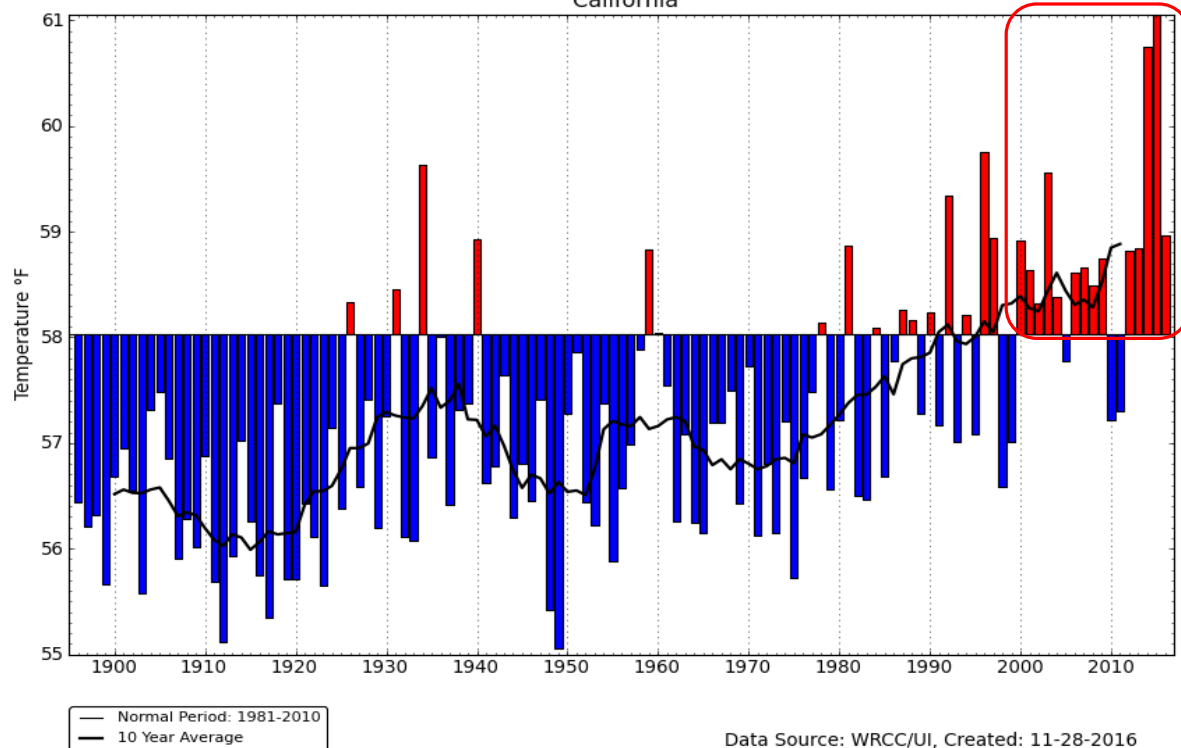
Download: [XML](#)  

PERIOD	PRECIP	20 <sup>TH</sup> CENTURY AVERAGE	DEPARTURE	RANK	WETTEST/DRIEST SINCE	RECORD
Nov 2015 - Oct 2016 12-month period	25.49" (647.45 mm)	22.44" (569.98 mm)	3.05" (77.47 mm)	87 <sup>th</sup> Driest	Driest since: 2015	1977
				35 <sup>th</sup> Wettest	Wettest since: 2011	1983
<i>Ties: 1973</i>						

# Time Series Plots 1895-2016 California - Statewide

## Temperature

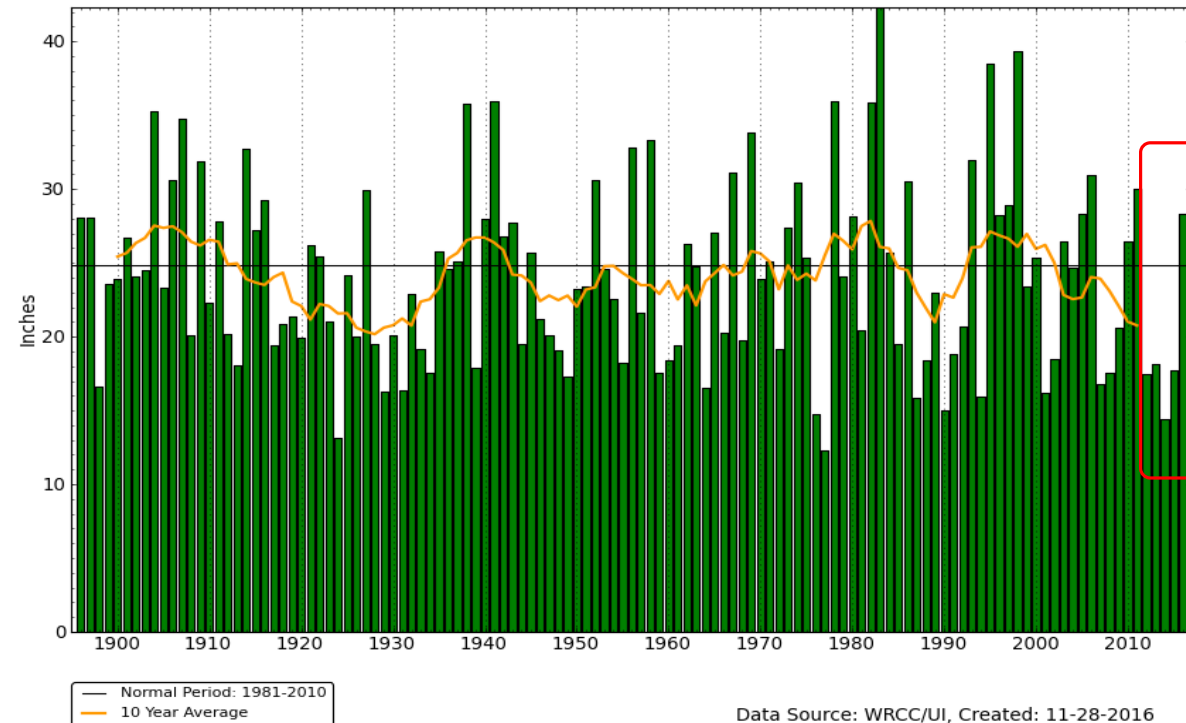
Mean Temperature, 12-Months Ending in October  
California



Data Source: WRCC/UI, Created: 11-28-2016

## Precipitation

Precipitation, 12-Months Ending in October  
California



Data Source: WRCC/UI, Created: 11-28-2016



# NOAA NCEI Climatological Rankings Statewide - Nevada

**48-month - 2<sup>nd</sup> Warmest, 53<sup>rd</sup> Driest**

**12-month - 11<sup>th</sup> Warmest, 30<sup>th</sup> Wettest**

## Nevada Average Temperature Rankings, October 2016

« September 2016



Download: [XML](#)

PERIOD	AVG TEMP	20 <sup>TH</sup> CENTURY AVERAGE	DEPARTURE	RANK	WARMEST/COOLEST SINCE	RECORD
Nov 2012 - Oct 2016 48-month period	52.1°F (11.2°C)	49.5°F (9.7°C)	2.6°F (1.5°C)	117 <sup>th</sup> Coolest	Coolest since: 2014	1913
				2 <sup>nd</sup> Warmest	Warmest since: 2015	2015

## Nevada Precipitation Rankings, October 2016

« September 2016

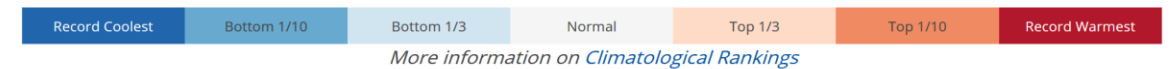


Download: [XML](#)

PERIOD	PRECIP	20 <sup>TH</sup> CENTURY AVERAGE	DEPARTURE	RANK	WETTEST/DRIEST SINCE	RECORD
Nov 2012 - Oct 2016 48-month period	39.86" (1,012.44 mm)	41.17" (1,045.72 mm)	-1.31" (-33.28 mm)	53 <sup>rd</sup> Driest	Driest since: 2015	1931
				66 <sup>th</sup> Wettest	Wettest since: 2007	1998

## Nevada Average Temperature Rankings, October 2016

« September 2016



Download: [XML](#)

PERIOD	AVG TEMP	20 <sup>TH</sup> CENTURY AVERAGE	DEPARTURE	RANK	WARMEST/COOLEST SINCE	RECORD
Nov 2015 - Oct 2016 12-month period	51.5°F (10.8°C)	49.5°F (9.7°C)	2.0°F (1.1°C)	111 <sup>th</sup> Coolest	Coolest since: 2013	1917, 1949
				11 <sup>th</sup> Warmest	Warmest since: 2015	2015
<i>Ties: 1926, 2007</i>						

## Nevada Precipitation Rankings, October 2016

« September 2016



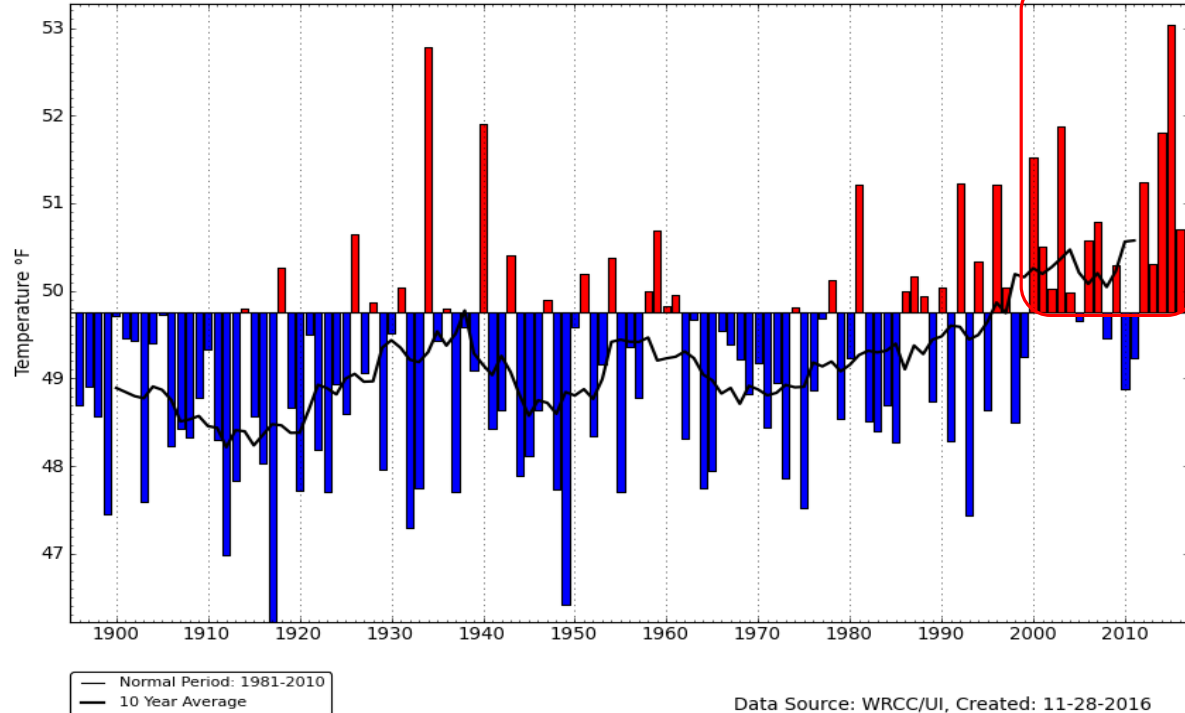
Download: [XML](#)

PERIOD	PRECIP	20 <sup>TH</sup> CENTURY AVERAGE	DEPARTURE	RANK	WETTEST/DRIEST SINCE	RECORD
Nov 2015 - Oct 2016 12-month period	11.48" (291.59 mm)	10.31" (261.87 mm)	1.17" (29.72 mm)	92 <sup>nd</sup> Driest	Driest since: 2015	1924
				30 <sup>th</sup> Wettest	Wettest since: 2011	1998

# Time Series Plots 1895-2016 Nevada - Statewide

## Temperature

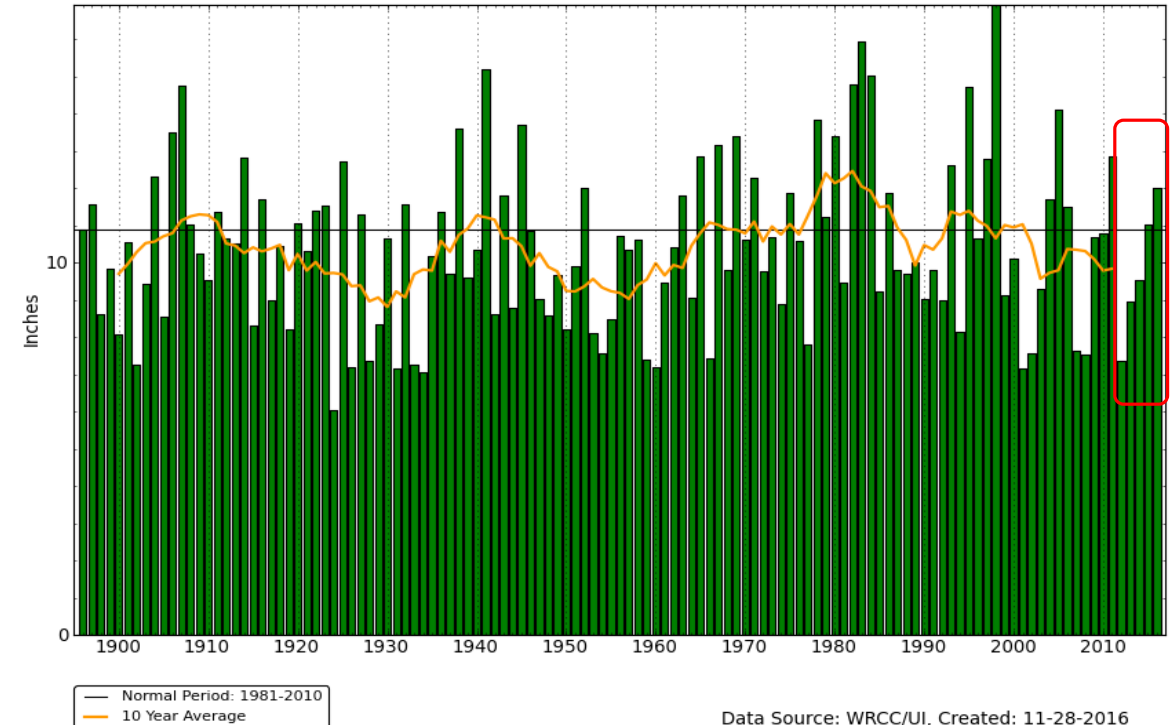
Mean Temperature, 12-Months Ending in October  
Nevada



Data Source: WRCC/UI, Created: 11-28-2016

## Precipitation

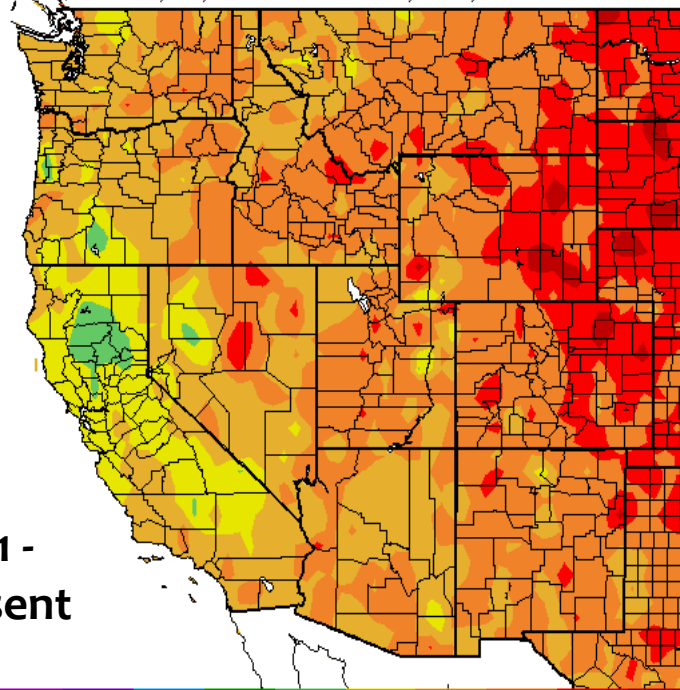
Precipitation, 12-Months Ending in October  
Nevada



Data Source: WRCC/UI, Created: 11-28-2016

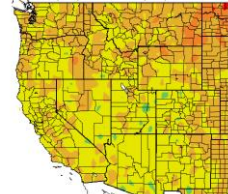
# Average Temperature Departures Oct 1<sup>st</sup> - Present

Ave. Temperature dep from Ave (deg F)  
10/1/2016 - 11/30/2016



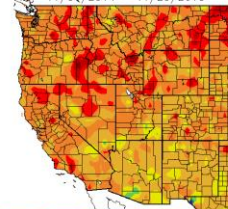
Oct 1 -  
present

Ave. Temperature dep from Ave (deg F)  
11/30/2015 - 11/29/2016



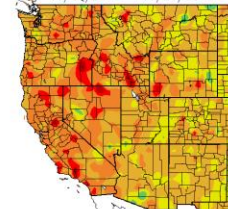
12-  
month

Ave. Temperature dep from Ave (deg F)  
11/30/2014 - 11/29/2016



24-  
month

Ave. Temperature dep from Ave (deg F)  
11/30/2013 - 11/29/2016

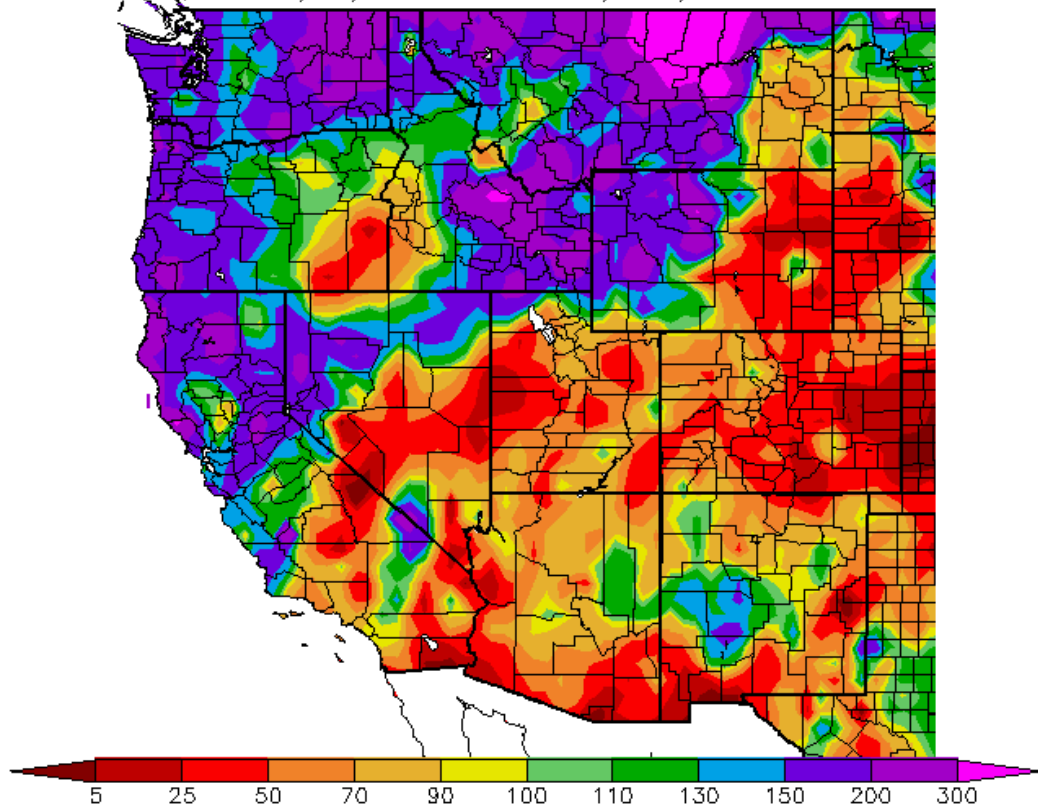


36-  
month

- \* Overall, a warm West.
- \* Above normal temps across most of California and Nevada with exception of northern portions of the Central Valley & Trinity Mts.

# Percentage of Average Precipitation Oct 1 – Present

Percent of Average Precipitation (%)  
10/1/2016 – 11/30/2016

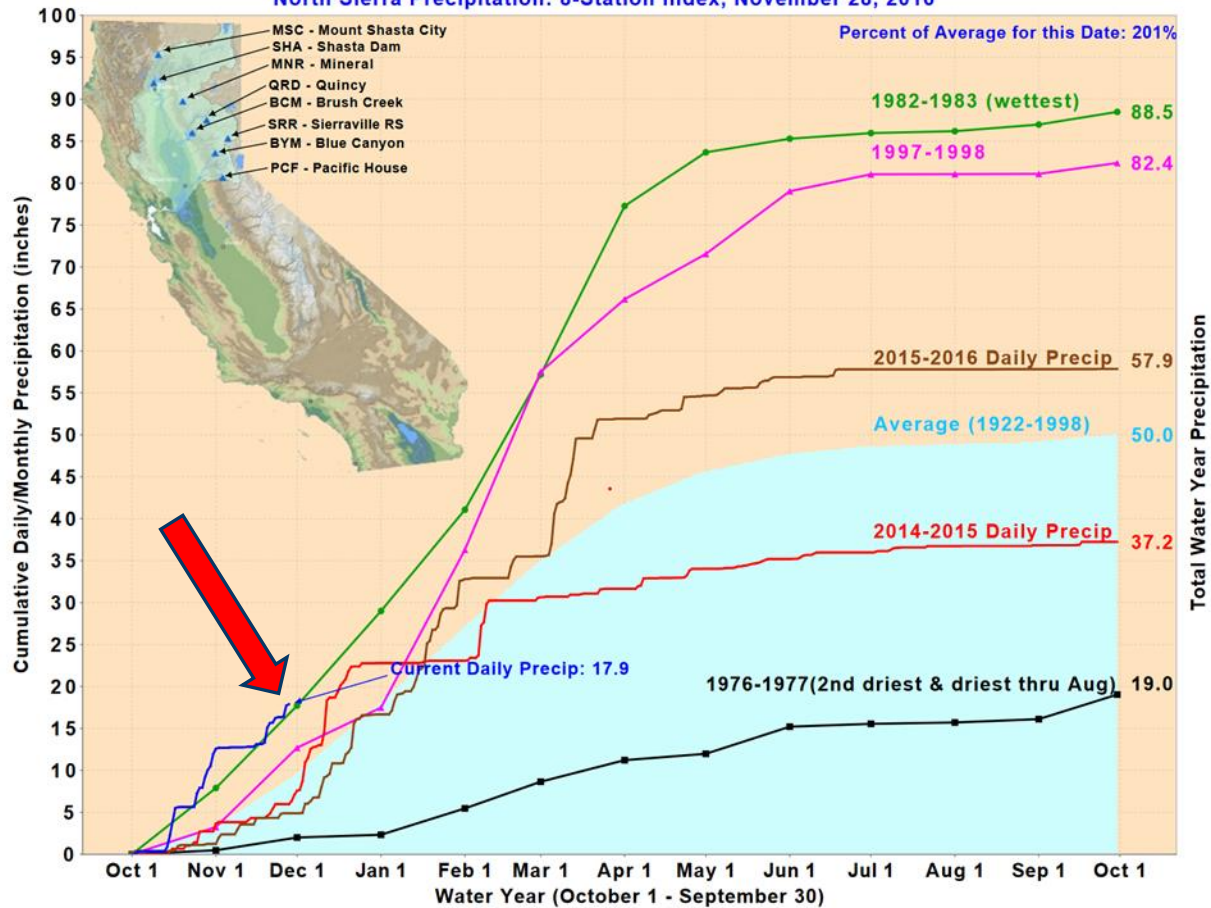


- \* **Normal to above- normal precipitation:**  
**California** – northern CA, central Coast, southwestern Inyo Co., and San Bernardino Co.  
**Nevada** – much of northern and western NV as well as southern Nye Co.
- \* **Below normal precipitation:**  
**California** – most of the southern half of the state.  
**Nevada** – central and southern NV.

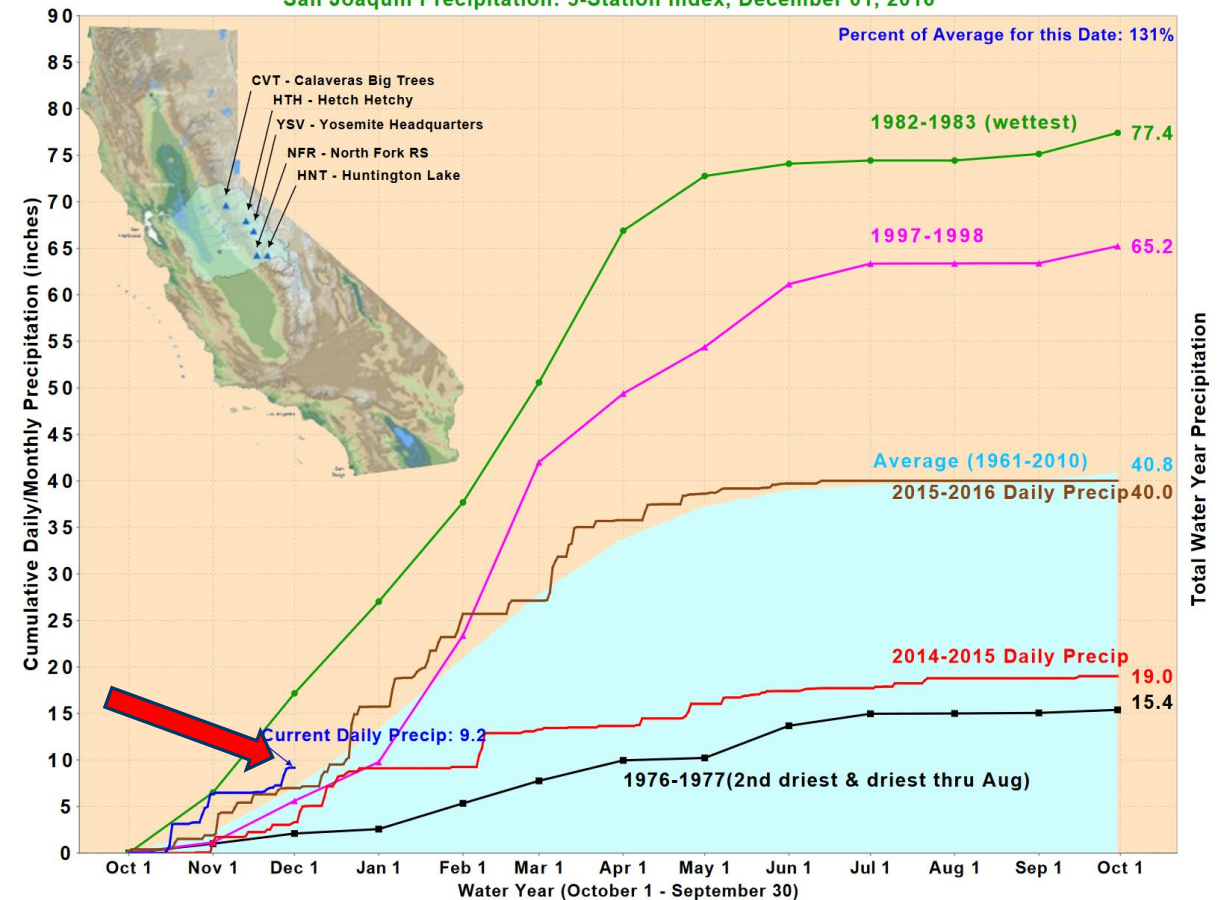
# Precipitation - WYTD

## Northern & Central Sierra

North Sierra Precipitation: 8-Station Index, November 28, 2016



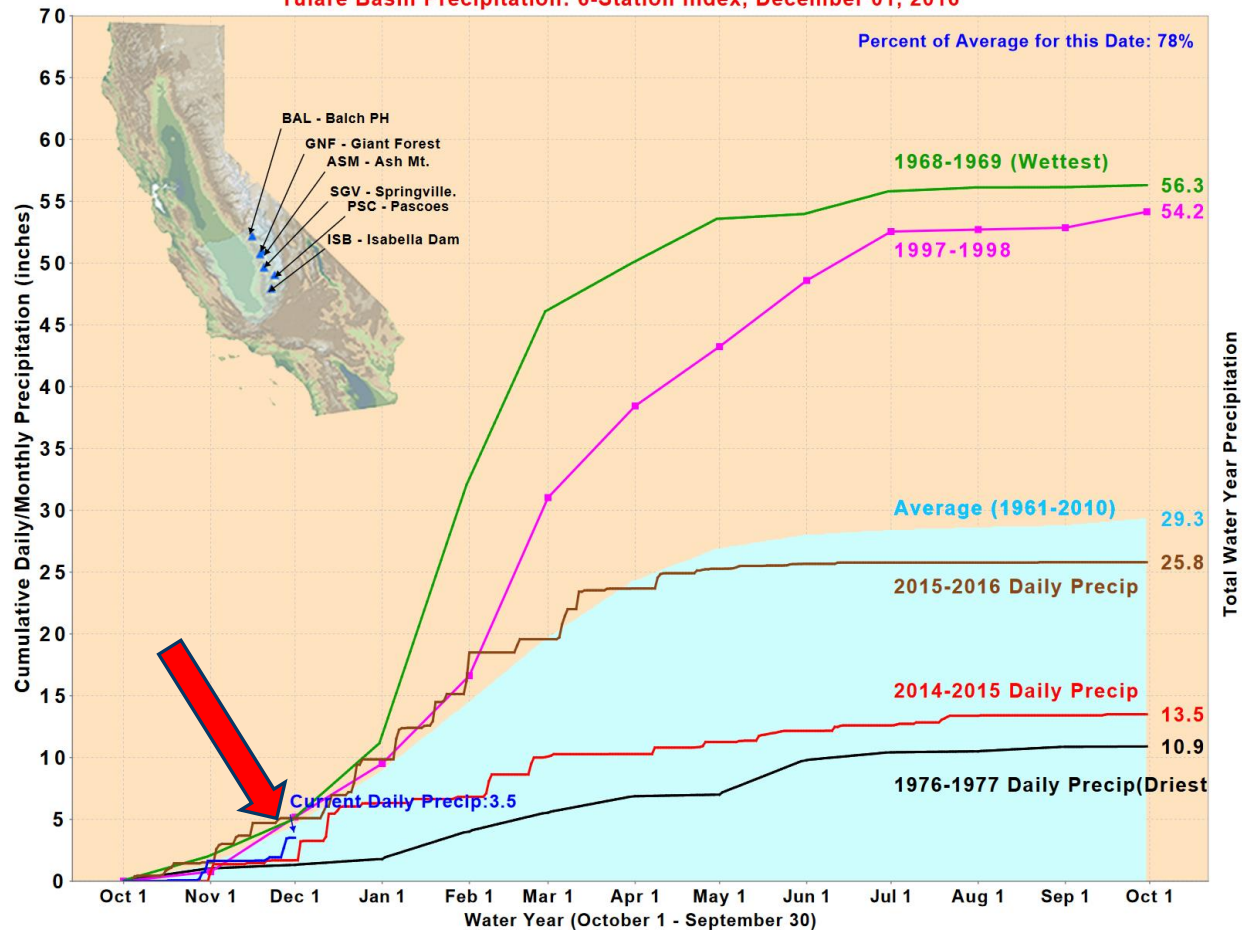
San Joaquin Precipitation: 5-Station Index, December 01, 2016



# Precipitation - WYTD

## Southern Sierra

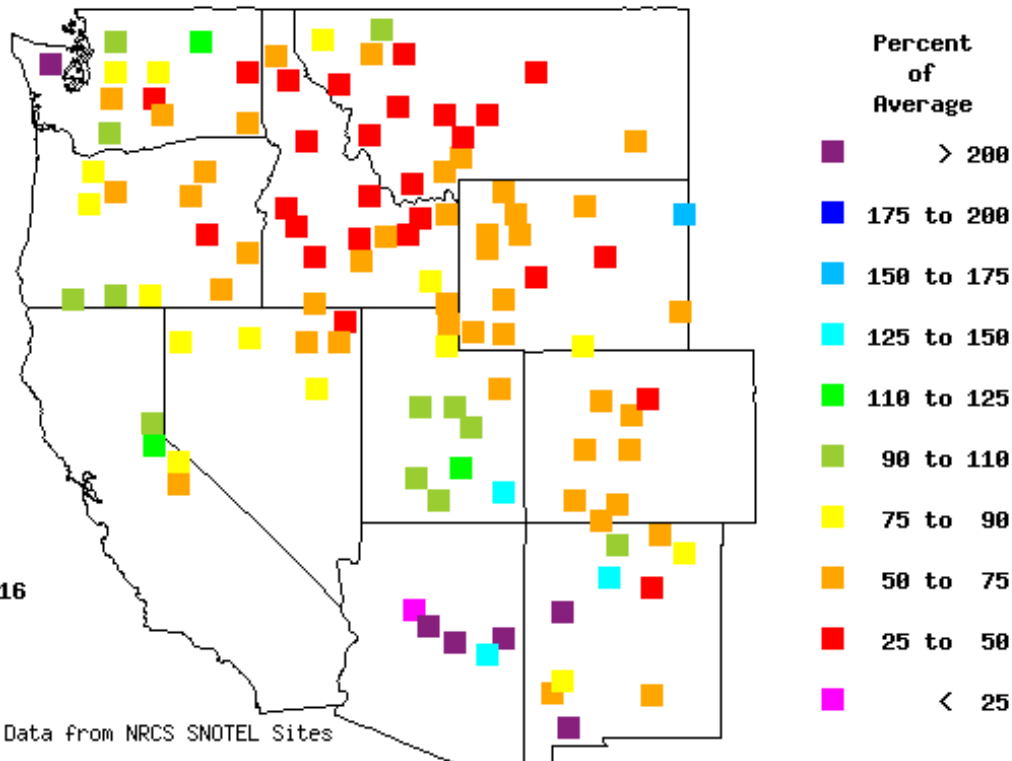
Tulare Basin Precipitation: 6-Station Index, December 01, 2016



- \* Northern – well above normal
- \* Central – above normal
- \* Southern – below normal

# Current Snowpack Snow Water Content (% of Avg)

Basin Average Snow Water Content. ( % of Average.)



Report Date:

DECEMBER 1 , 2016

Provisional Data  
Based on Mountain Data from NRCS SNOTEL Sites

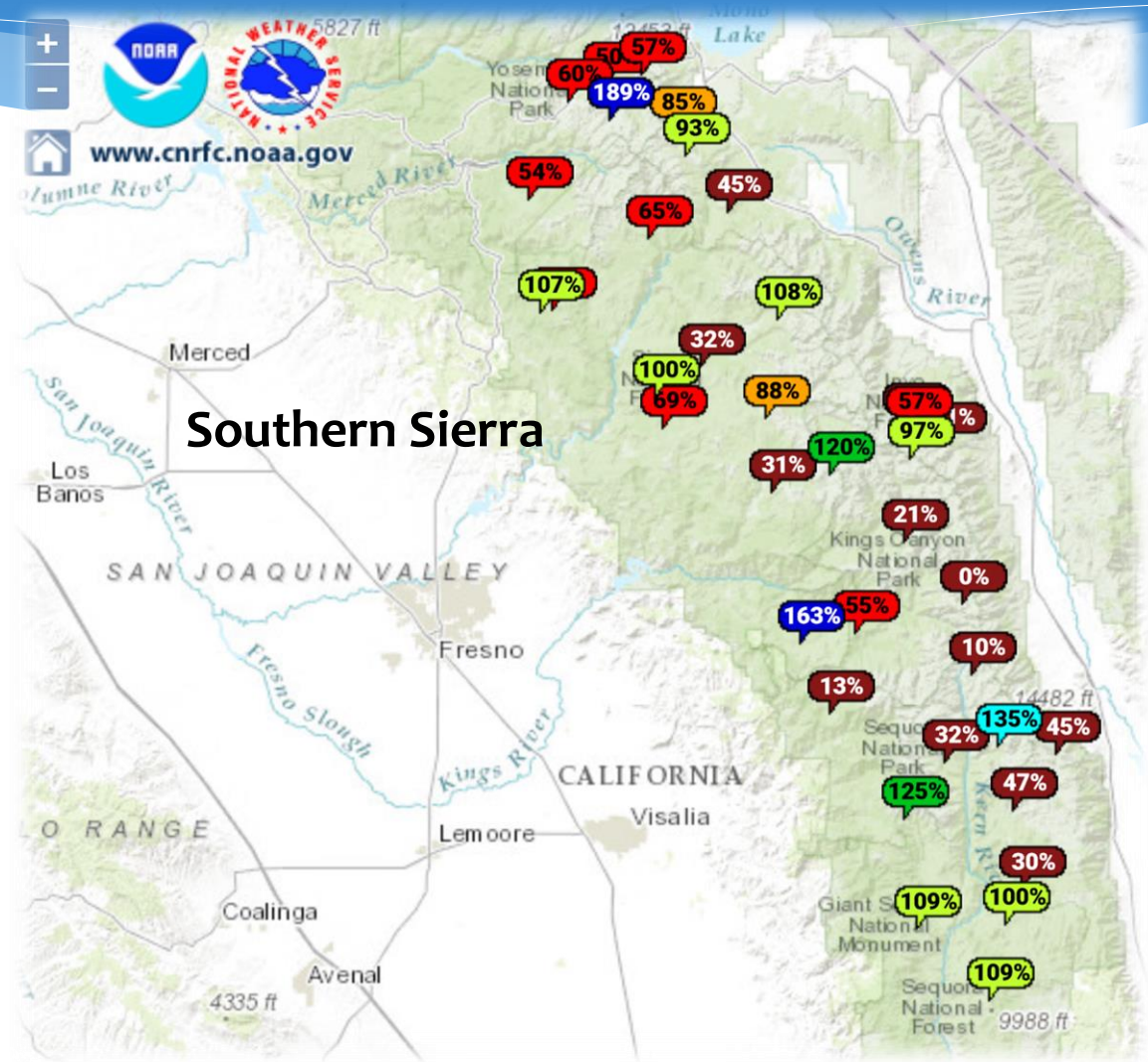
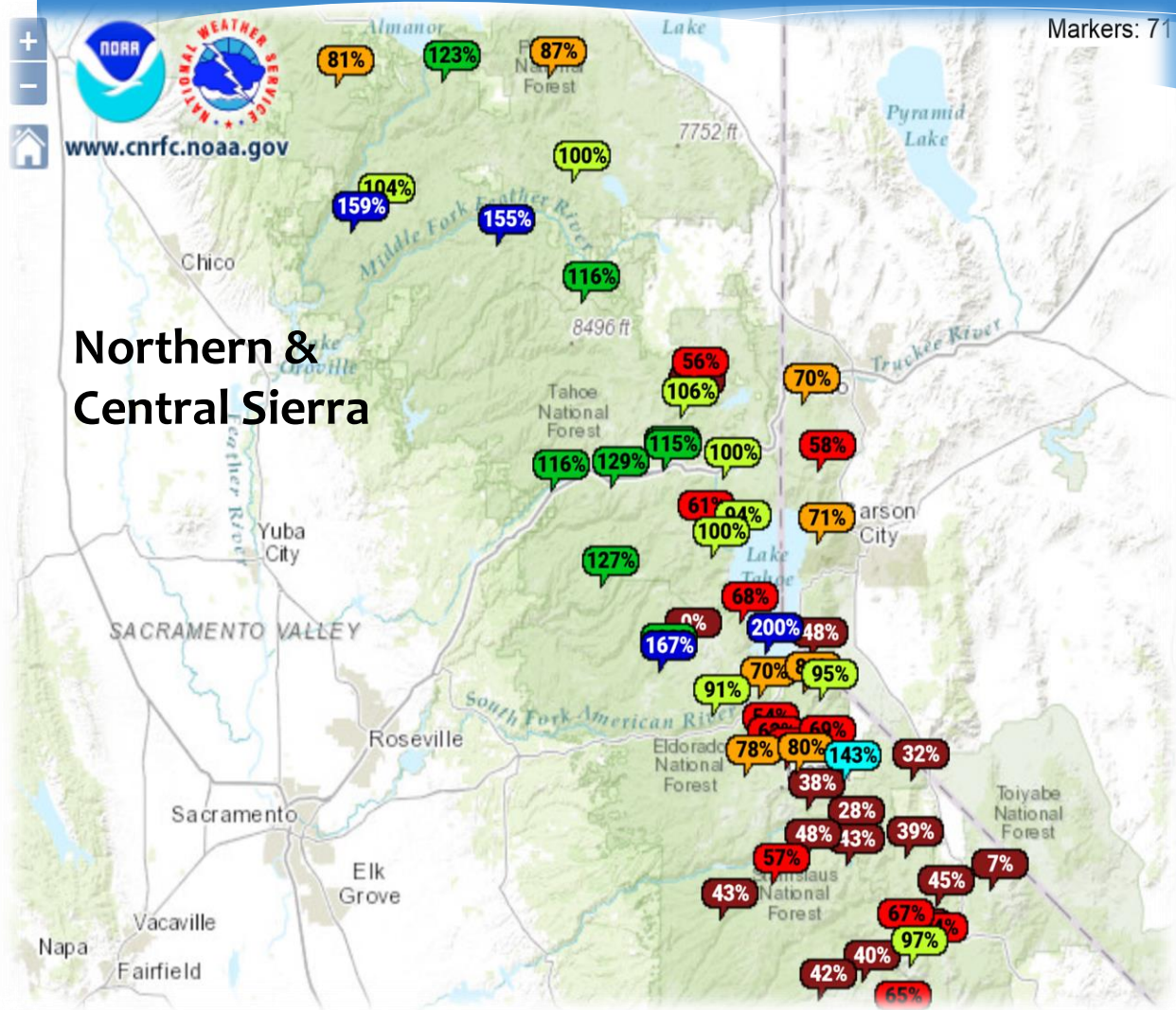
Data provided by  
Water and Climate Center  
Natural Resources Conservation Service  
Portland, Oregon

Western Regional Climate Center  
Desert Research Institute  
Reno, Nevada

- \* Normal to above-normal snow water equivalent (SWE) across much of the northern Sierra and Trinity Mts.
- \* Below-normal SWE across most of the southern half of the Sierras as well as Ruby Mts, Schell Range, and Jarbridge Mts of northern and eastern Nevada.

# Current Snowpack –Sierras

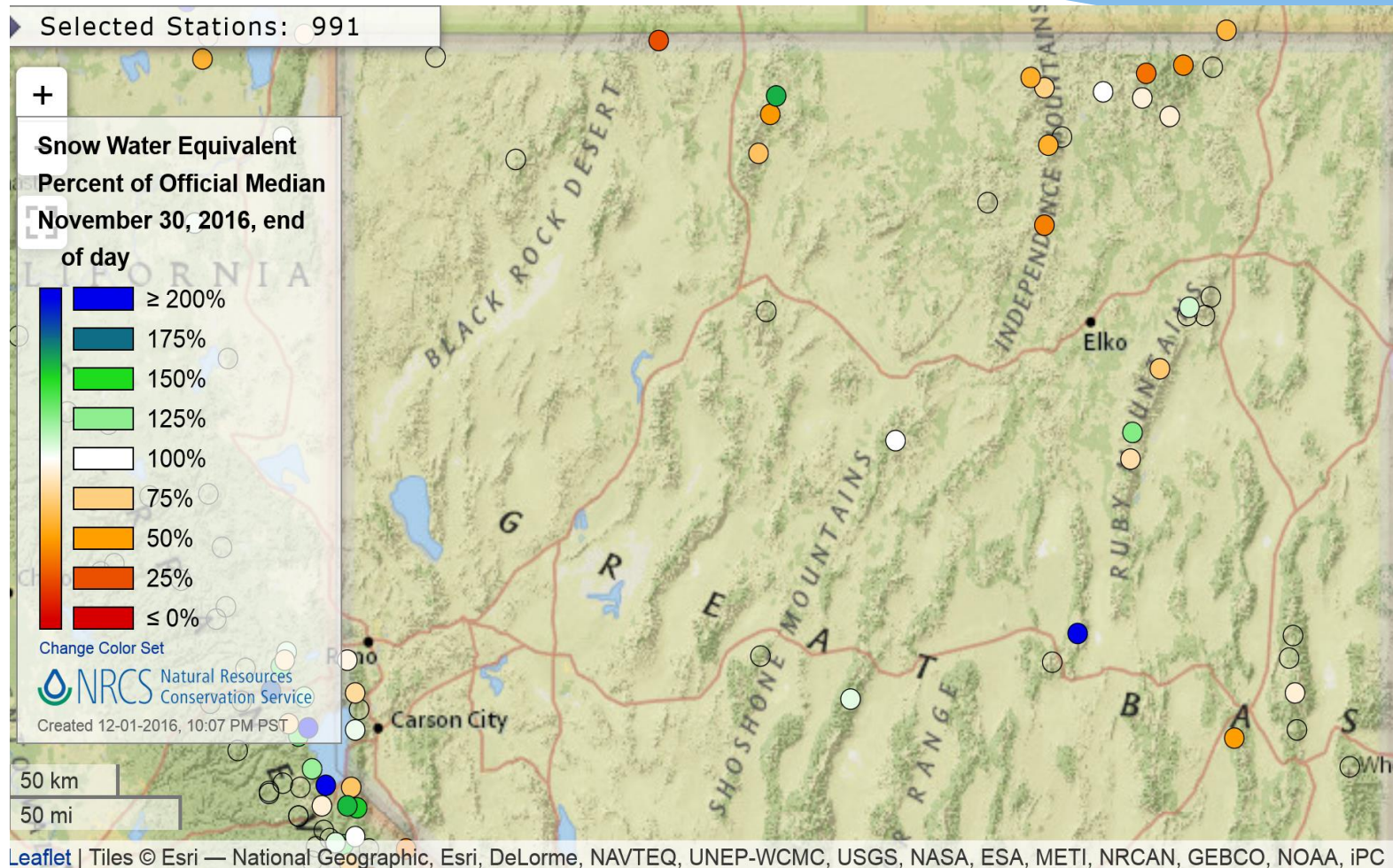
## Current Day SWE (% of Normal)





# Current Snowpack – Nevada

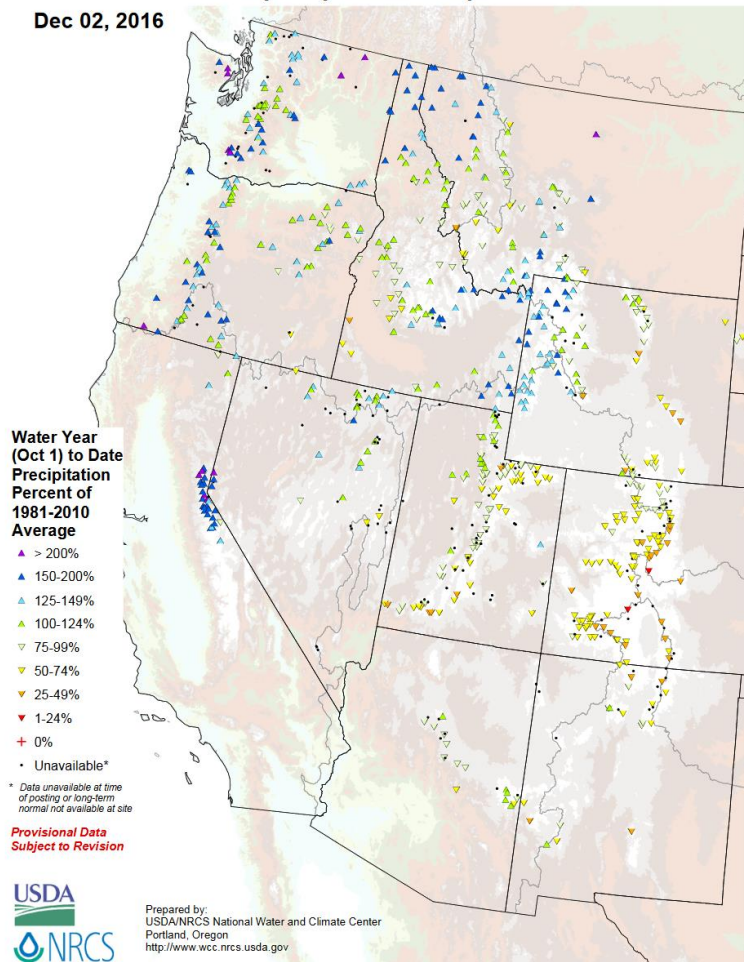
## Current Day SWE (% of Normal)



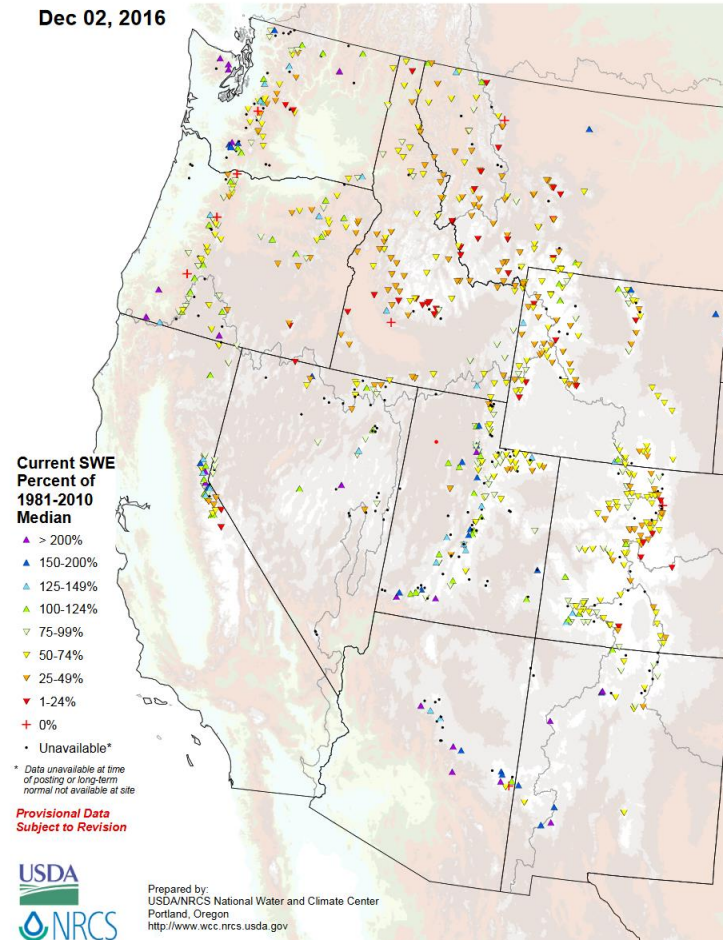
- \* **Below normal** across the ranges of northern and eastern NV.
- \* A few sites reporting near normal or above (Ruby Mts, Diamond Mts)

# Rain vs. Snow

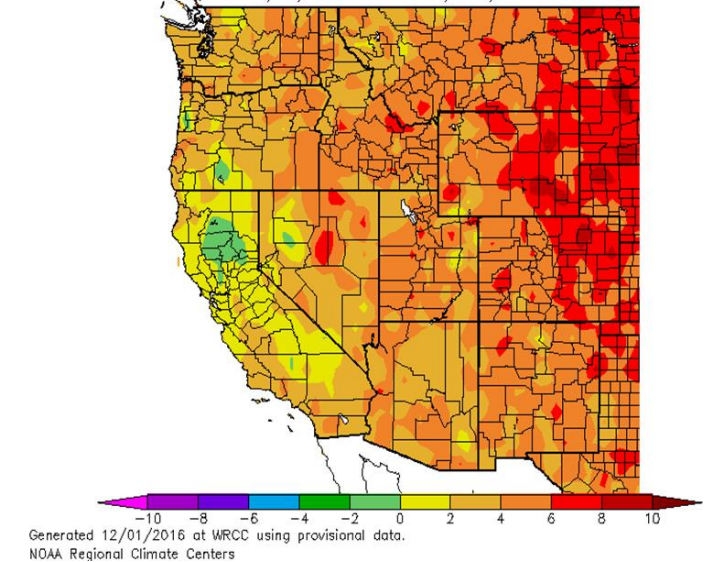
**SNOTEL Water Year (Oct 1) to Date Precipitation Percent of Normal**  
Dec 02, 2016



**SNOTEL Current Snow Water Equivalent (SWE) Percent of Normal**  
Dec 02, 2016

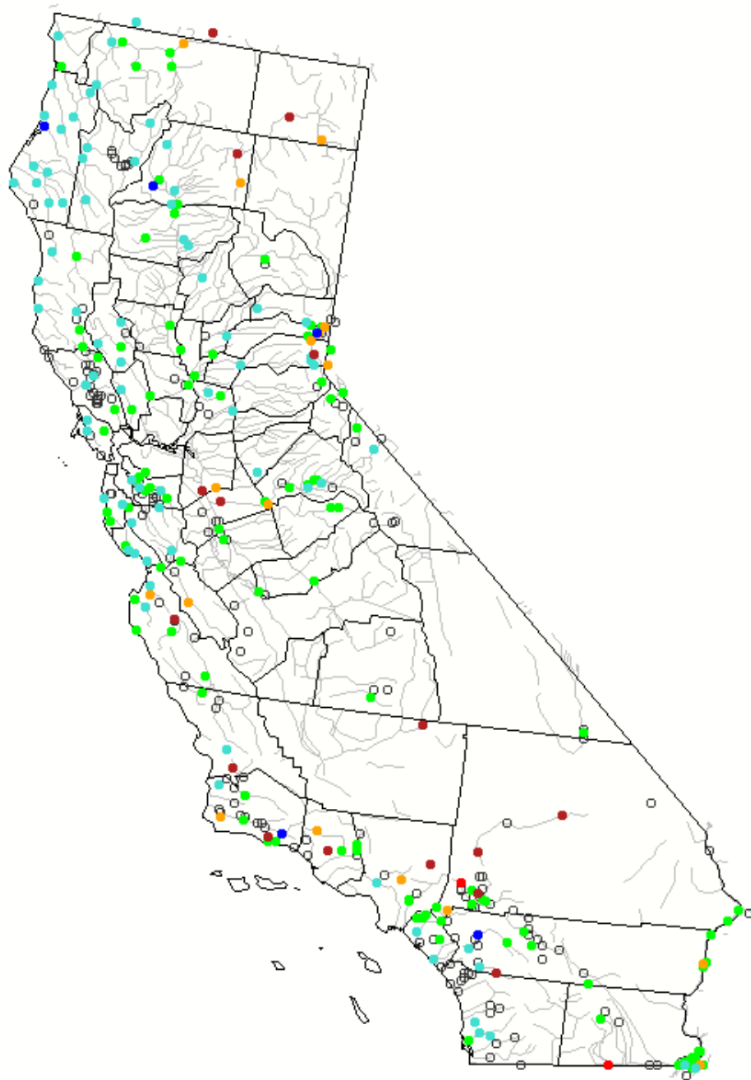


Ave. Temperature dep from Ave (deg F)  
10/1/2016 – 11/30/2016



# Current Streamflows - California (7-Day Average)

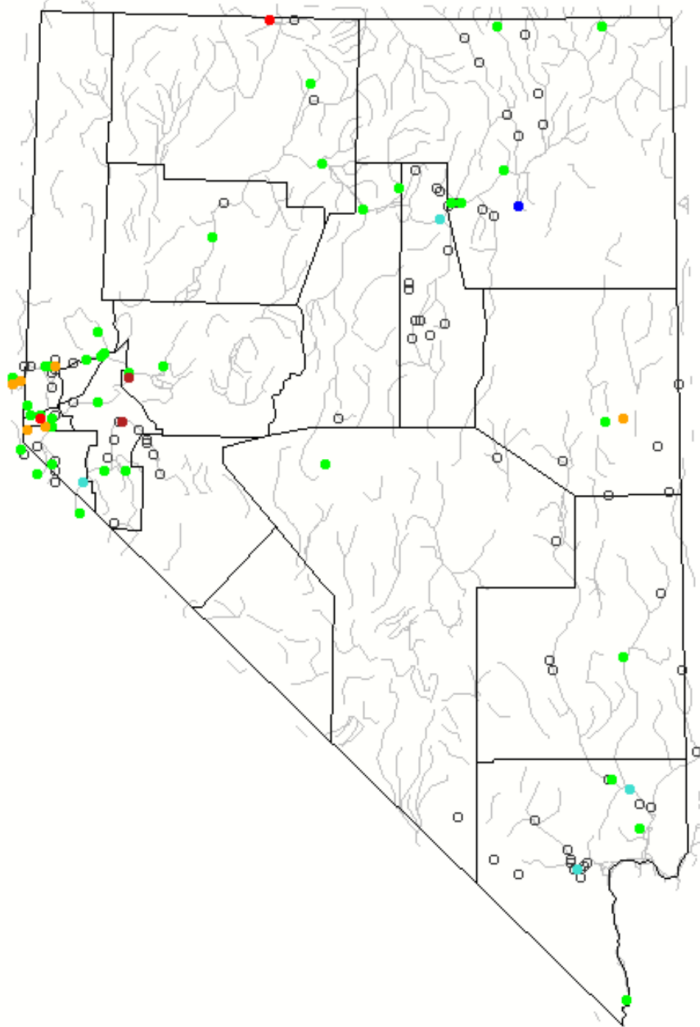
Thursday, December 01, 2016



- \* Overall, streamflows running normal to above normal across most of the state.
- \* Low streamflows – creeks in northeastern CA, Salinas River, and S. Fork Kern River.

Explanation - Percentile classes							
●	●	●	●	●	●	●	○
Low	<10	10-24	25-75	76-90	>90	High	Not-ranked
	Much below normal	Below normal	Normal	Above normal	Much above normal		

# Current Streamflow - Nevada (7-Day Average)



- \* Near normal to normal streamflows across most of the state including flows on the Humboldt River, East and West Walker River.

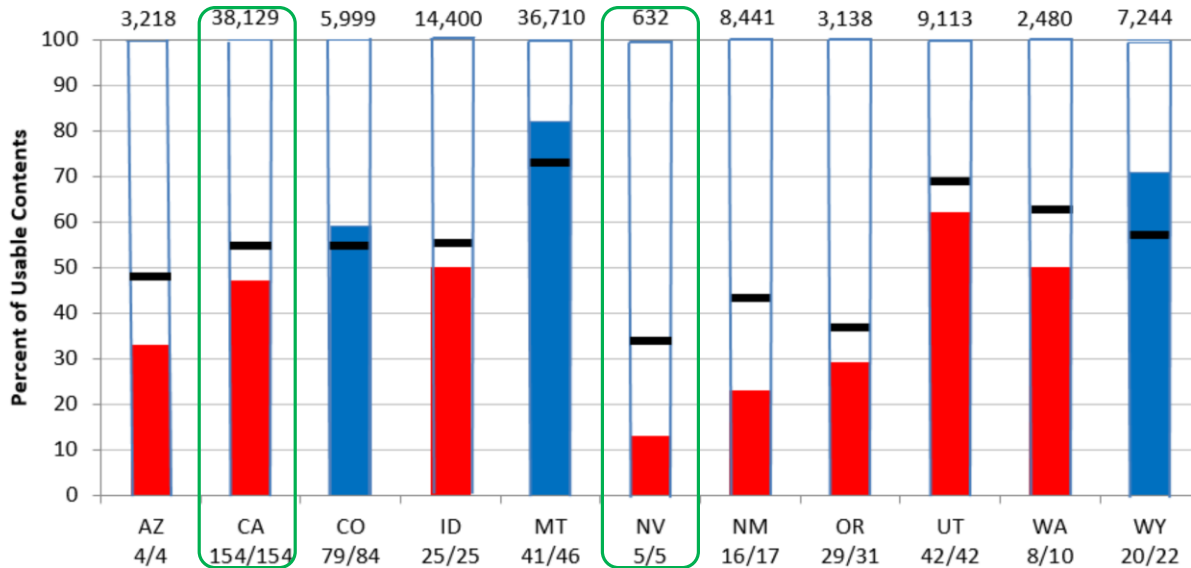
Explanation - Percentile classes							
Low	<10	10-24	25-75	76-90	>90	High	Not-ranked
	Much below normal	Below normal	Normal	Above normal	Much above normal		

# Current Reservoir Storage

## Reservoir Storage as of November 1, 2016

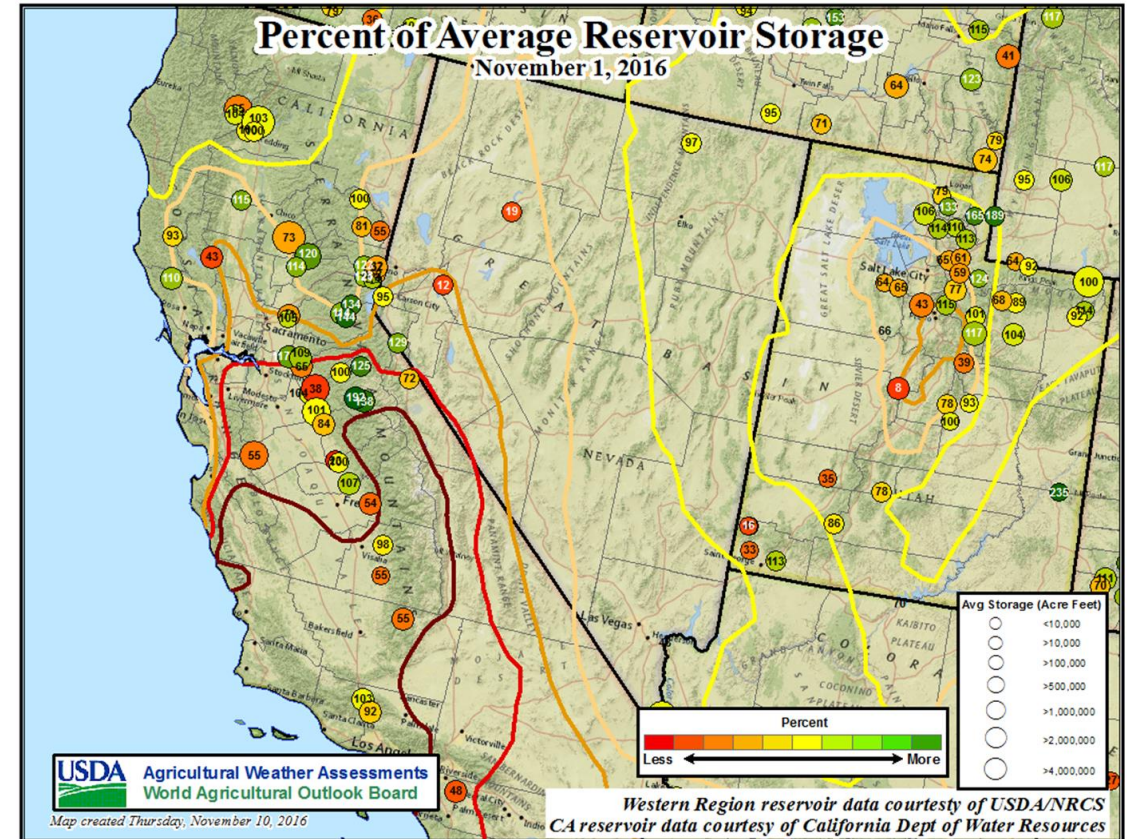
■ Below Average ■ Above Average ■ Average

Capacity of Reservoirs Reported (1000 Acre-Feet)

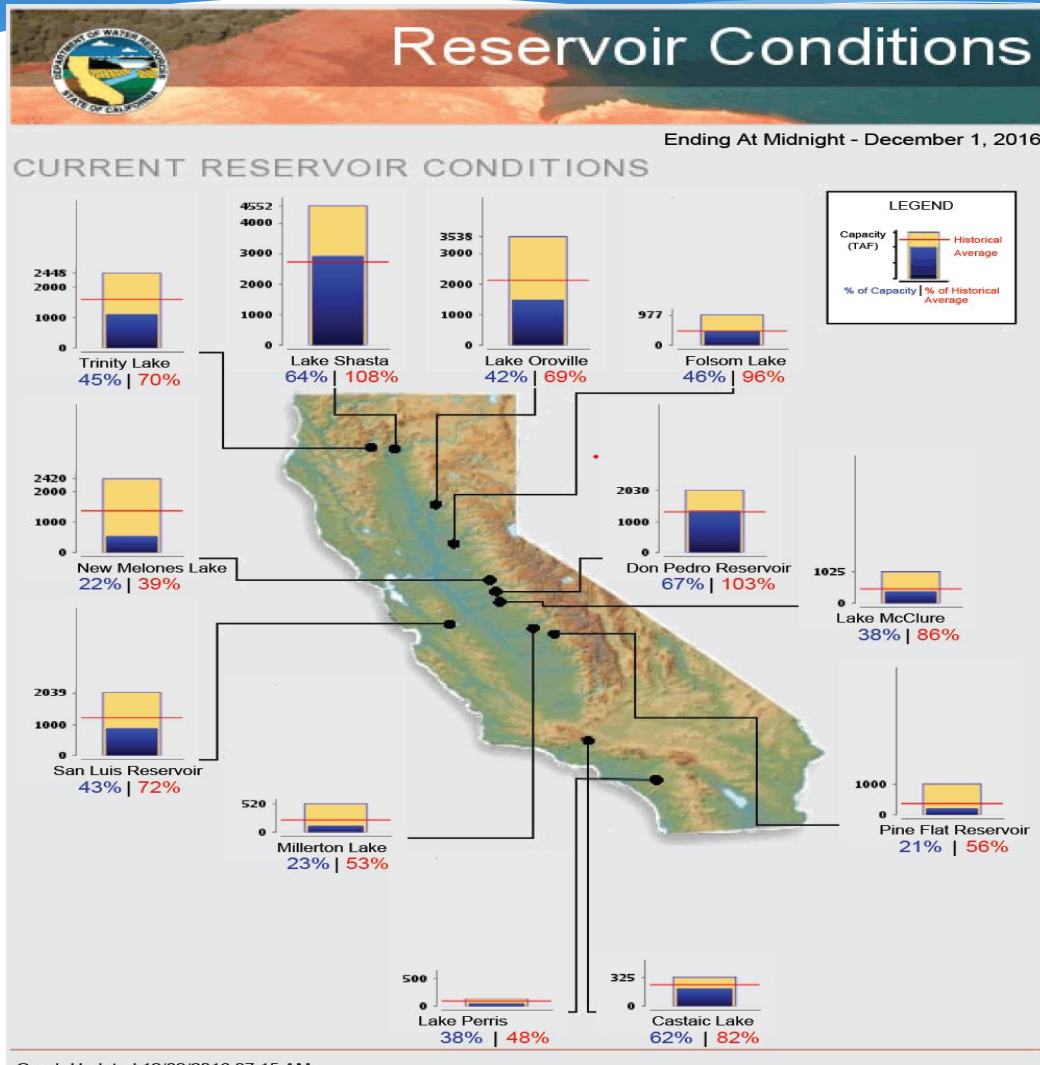


State and Number of Reservoirs Reported

Prepared by: USDA Natural Resources Conservation Service  
National Water and Climate Center, Portland, OR  
www.nrcs.usda.gov



# Current Reservoir Storage Levels California



- \* Many reservoir across the state remain below normal. Statewide variability partially related to reservoir operations.
- \* Compared to last year at this time, overall storage levels in northern California have improved.
- \* **Above normal to near normal** – Lake Shasta (108%), Don Pedro (103%), Folsom Lake (96%)
- \* **Below normal** – Trinity Lake (70%), Pine Flat (56%), New Melones Lake (39%), Lake Cachuma (10%).

# Current Reservoir Storage Levels Nevada

**Basinwide Summary: December 1, 2016**  
(averages based on 1981-2010 reference period)

Reservoir Storage Summary for the end of November 2016

Lake Tahoe Basin	Current (KAF)	Last Year (KAF)	Average (KAF)	Capacity (KAF)	Current % Capacity	Last Year % Capacity	Average % Capacity	Current % Average	Last Year % Average
Lake Tahoe	0.0	0.0	255.2	744.6	0%	0%	34%	0%	0%
Marlette Lk nr Carson City, NV	11.0	10.6	11.6	11.8	94%	90%	98%	95%	91%
Basin-wide Total	11.0	10.6	266.8	756.4	1%	1%	35%	4%	4%
# of reservoirs	2	2	2	2	2	2	2	2	2

Truckee River Basin	Current (KAF)	Last Year (KAF)	Average (KAF)	Capacity (KAF)	Current % Capacity	Last Year % Capacity	Average % Capacity	Current % Average	Last Year % Average
Boca Reservoir	12.4	5.7	15.2	40.9	30%	14%	37%	82%	37%
Donner Lake	4.0	3.5	3.2	9.5	42%	37%	34%	124%	109%
Independence Lake	16.6	13.4	13.2	17.3	96%	77%	76%	126%	102%
Prosser Reservoir	7.0	7.7	9.6	28.6	24%	27%	34%	73%	80%
Stampede Reservoir	91.6	27.1	143.7	226.5	40%	12%	63%	64%	19%
Basin-wide Total	131.5	57.3	184.9	322.8	41%	18%	57%	71%	31%
# of reservoirs	5	5	5	5	5	5	5	5	5

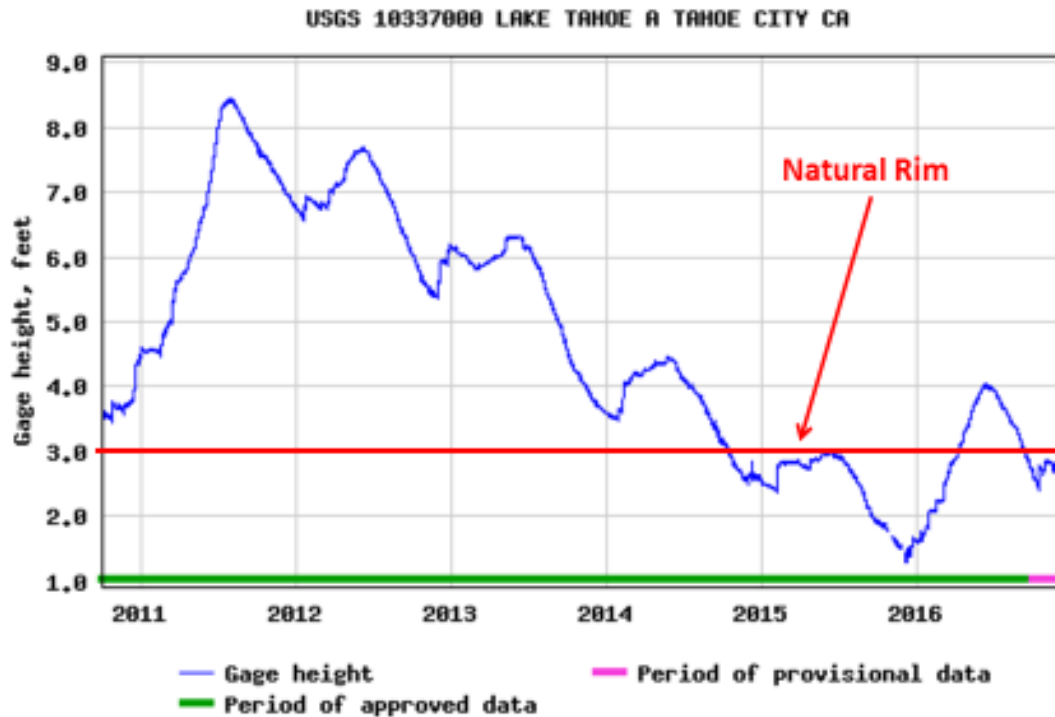
Carson River Basin	Current (KAF)	Last Year (KAF)	Average (KAF)	Capacity (KAF)	Current % Capacity	Last Year % Capacity	Average % Capacity	Current % Average	Last Year % Average
Lahontan Reservoir, NV	34.5	7.6	103.3	295.1	12%	3%	35%	33%	7%
Basin-wide Total	34.5	7.6	103.3	295.1	12%	3%	35%	33%	7%
# of reservoirs	1	1	1	1	1	1	1	1	1

Walker River Basin	Current (KAF)	Last Year (KAF)	Average (KAF)	Capacity (KAF)	Current % Capacity	Last Year % Capacity	Average % Capacity	Current % Average	Last Year % Average
Bridgeport Reservoir	13.7	6.0	15.0	42.5	32%	14%	35%	91%	40%
Topaz Lk nr Topaz, CA	21.7	5.3	15.4	59.4	37%	9%	26%	141%	34%
Basin-wide Total	35.4	11.2	30.4	101.9	35%	11%	30%	116%	37%
# of reservoirs	2	2	2	2	2	2	2	2	2

- \* Overall, improvement compared to the same time last year.
- \* Above normal – Walker River Basin (116% of Average)
- \* Below normal – Truckee River Basin (71%), Carson River (33%).
- \* Lake Mead (37% full)

# Lake Tahoe Level - Current

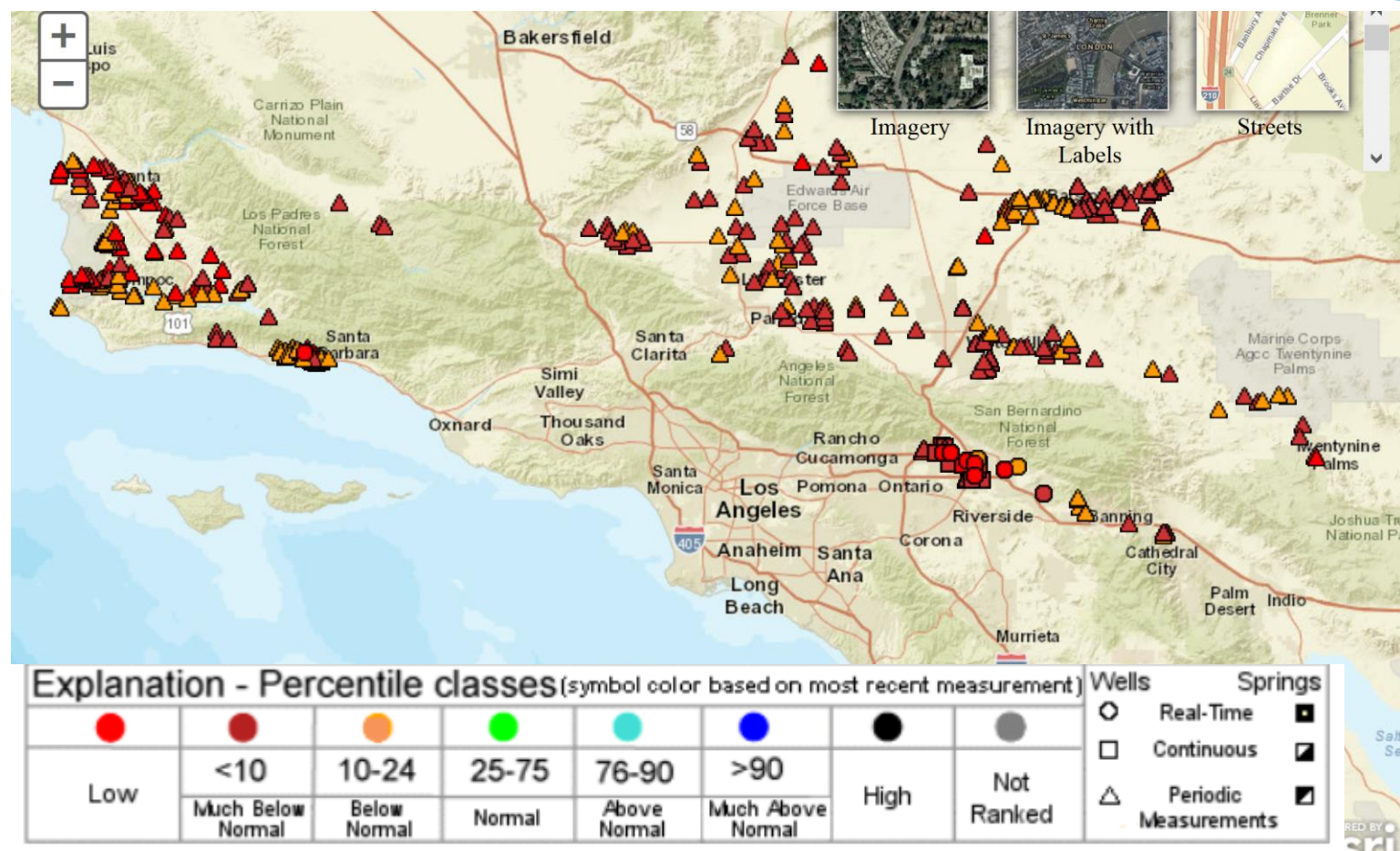
## Current Conditions: Reservoirs



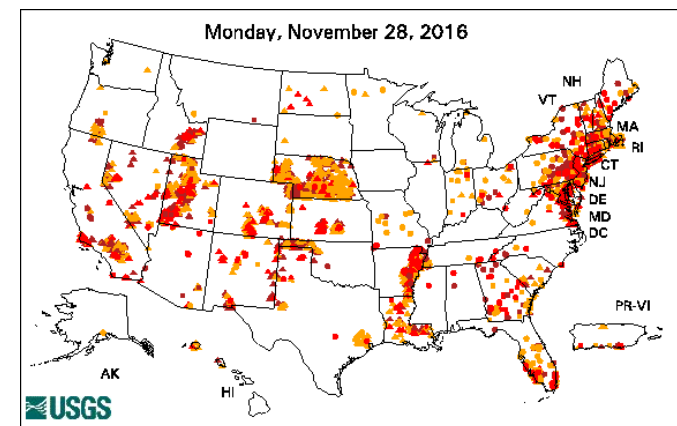
\* Currently below its natural rim.



# Current Groundwater California



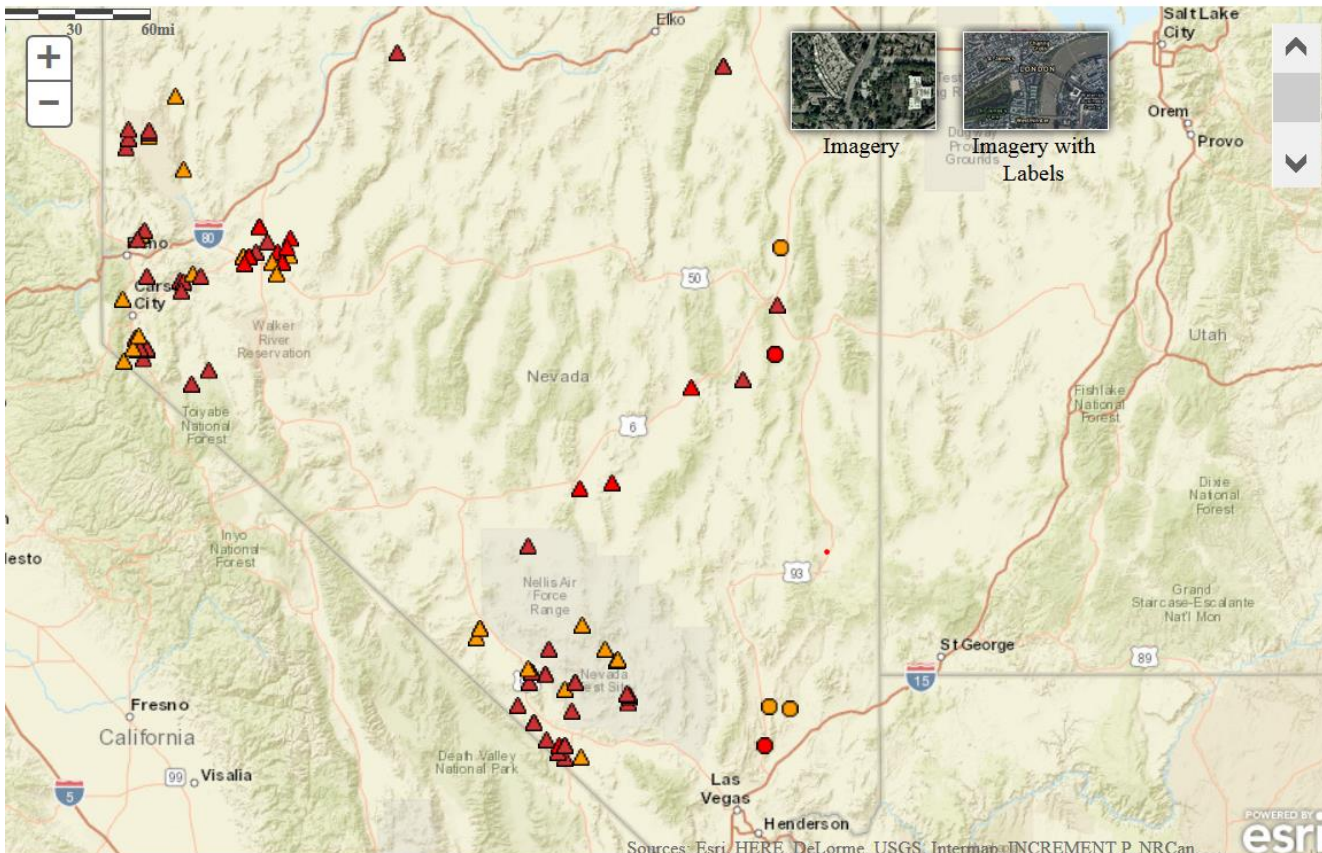
- \* **Below normal** groundwater levels - Inland Empire, San Joaquin Valley, and vicinity of Santa Barbara.



# Current Groundwater Nevada

## Nevada Below Normal Groundwater Levels

Click site symbol to open information pop-up. Click Station ID in pop-up for information and data.

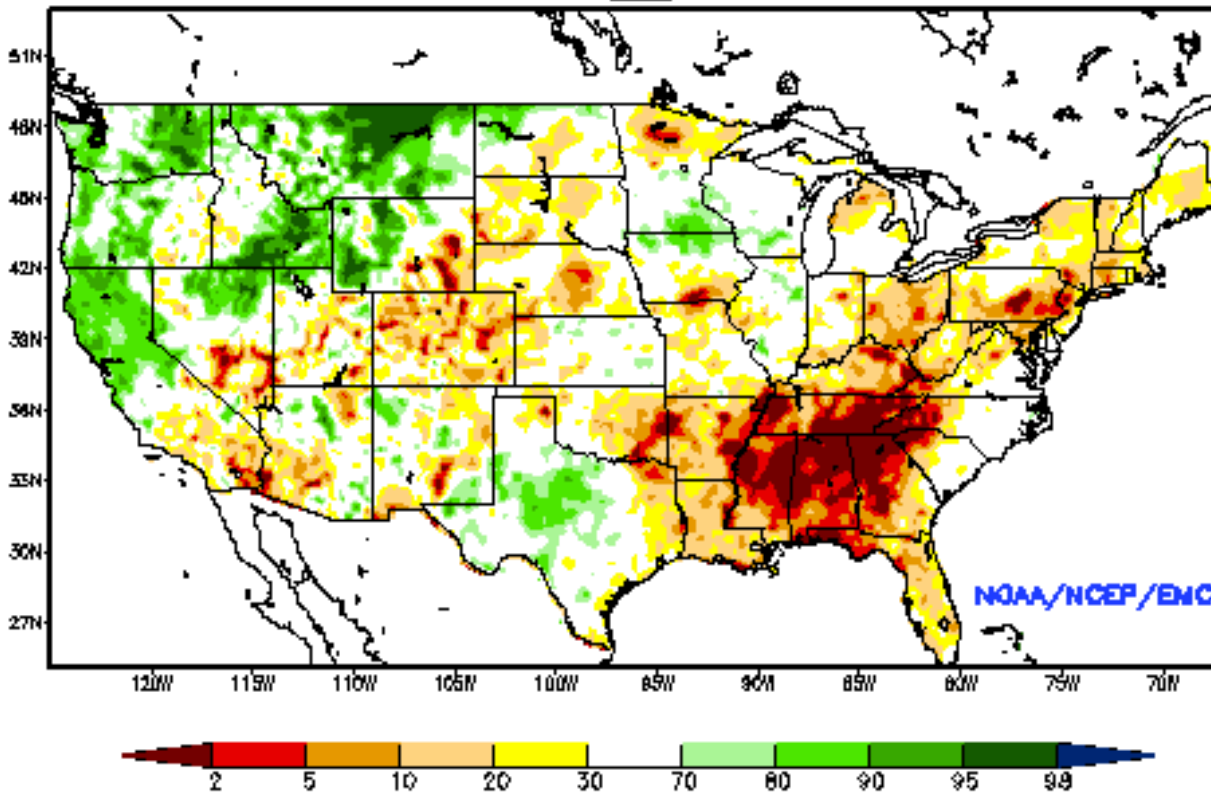


\* Largest concentration of below normal levels around Fallon, Carson Valley, and Amargosa Valley.

Explanation - Percentile classes (symbol color based on most recent measurement)							Wells	Springs
<span style="color: red;">●</span>	<span style="color: red;">●</span>	<span style="color: orange;">●</span>	<span style="color: green;">●</span>	<span style="color: cyan;">●</span>	<span style="color: blue;">●</span>	<span style="color: black;">●</span>	○ Real-Time	■
Low	<10	10-24	25-75	76-90	>90	High	□ Continuous	▣
	Much Below Normal	Below Normal	Normal	Above Normal	Much Above Normal	Not Ranked	△ Periodic Measurements	▣

# Current Soil Moisture

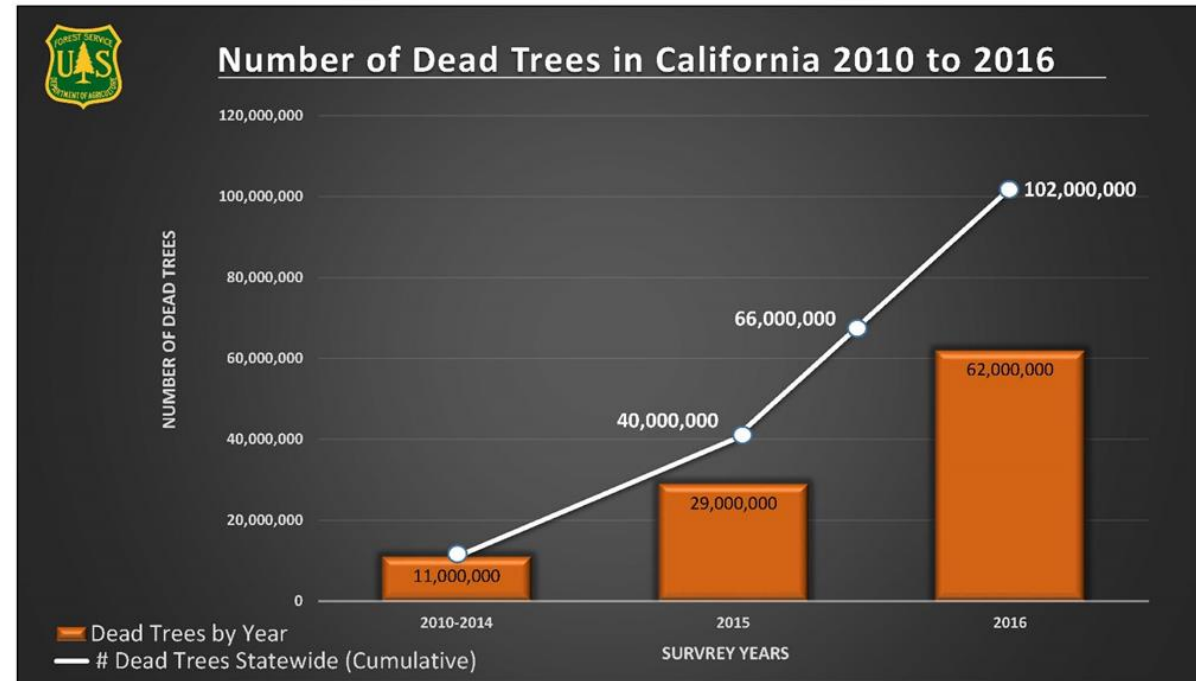
Ensemble-Mean - Past Month Top 1M Soil Moisture Percentile  
NCEP NLDAS Products Valid: NOV 27, 2016



- \* Recent storm events in October and November improved soil moisture in northern California and Nevada.
- \* Well below normal percentiles in southeastern CA, portions of south-central and southeastern NV.

# Drought Impacts

- \* State of California remains under a state-declared drought emergency.
- \* Cachuma Reservoir (Santa Barbara County) is currently 10% of normal. The reservoir supplies drinking water for Santa Barbara and communities in the Santa Ynez Valley.
- \* Five years of drought have led to a very significant rise in bark beetle infestation and historic levels of tree die-off.
- \* Based on aerial detection surveys conducted throughout 2016, the Forest Service estimates the number of dead trees on California's forested lands grew to a cumulative total of **102 million** on 7.7 million acres since 2010.
- \* The majority of the 102 million dead trees are located in ten counties in the southern and central Sierra Nevada region. The Forest Service also identified increasing mortality in the northern part of the state, including Siskiyou, Modoc, Plumas and Lassen counties.





Thank you!

Questions or comments?

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Photo: Eagle Lake, Desolation  
Wilderness, CA.