

2016 Snowpack Status and Streamflow Outlook for the Truckee, Carson, Walker, and Humboldt River Drainages

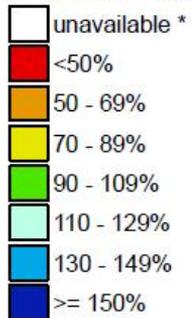
January 19, 2016

Jeff Anderson
USDA-NRCS
Snow Survey / Water Supply Forecasting Program
Reno, NV

Nevada/California SNOTEL Current Snow Water Equivalent (SWE) % of Normal

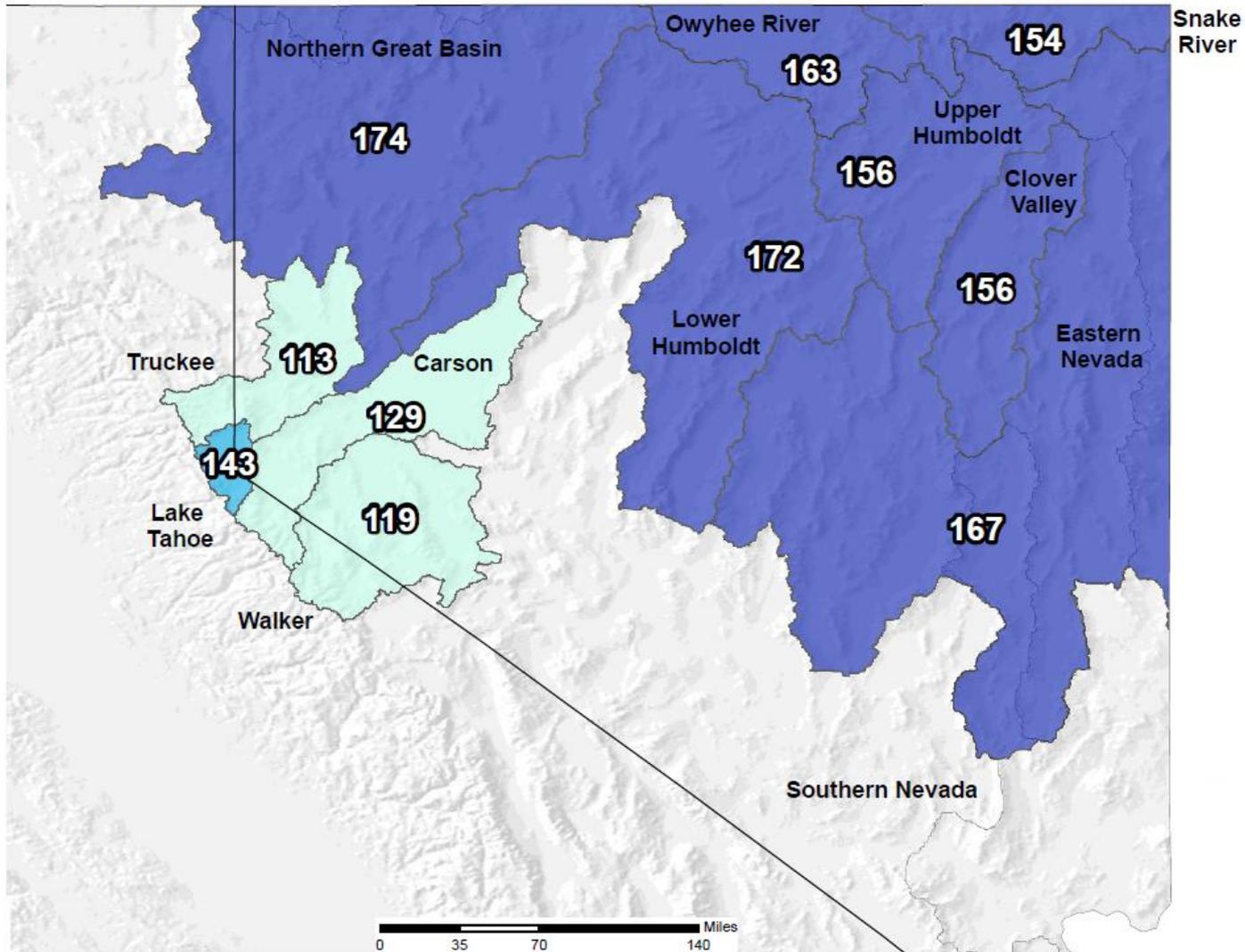
Jan 19, 2016

Current Snow Water Equivalent Basin-wide Percent of 1981-2010 Median



* Data unavailable at time of posting or measurement is not representative at this time of year

Provisional data subject to revision



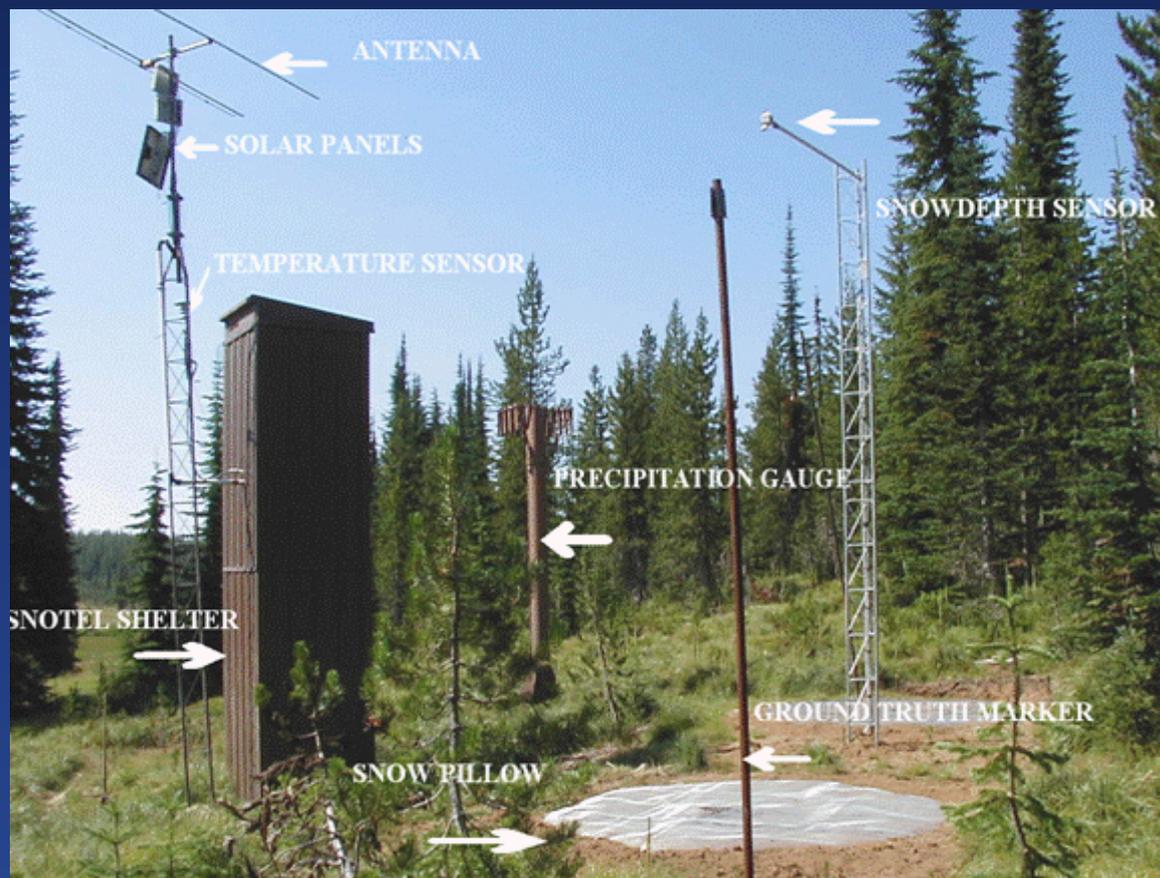
The current snow water equivalent percent of normal represents the snow water equivalent found at selected SNOTEL sites in or near the basin compared to the average value for those sites on this day. Data based on the first reading of the day (typically 00:00).

Prepared by:
USDA/NRCS National Water and Climate Center
Portland, Oregon
<http://www.wcc.nrcs.usda.gov>

What is a SNOTEL Site?

Automated Weather Station
that measures...

- SWE
- Cumulative precipitation
- Temperature
- Snow Depth
- Soil moisture / temperature (2",8",20") +10yrs data
- In NV & East Sierra there are 81 stations & 43 sites have data back to 1981



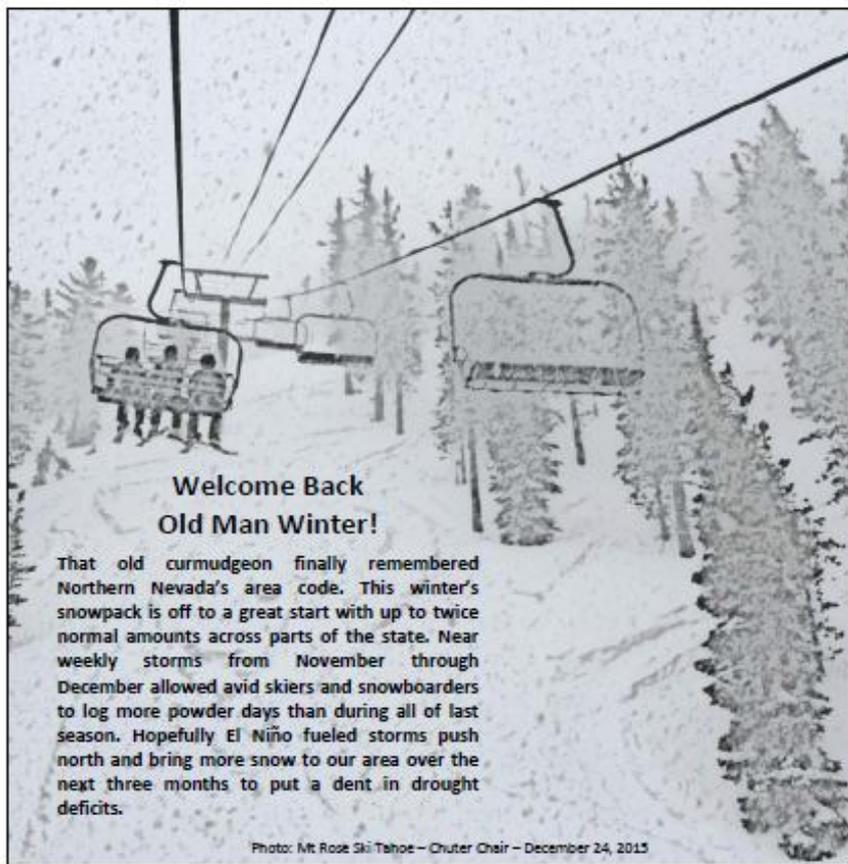
Snow Water Equivalent (SWE) is a common snowpack measurement. It is the amount of **water** contained within the snowpack. It can be thought of as the depth of **water** that would theoretically result if you melted the entire snowpack instantaneously.

$$\text{Snow Depth (in)} * \text{Density} = \text{SWE (in)}$$



Natural Resources Conservation Service

Nevada Water Supply Outlook Report January 1, 2016



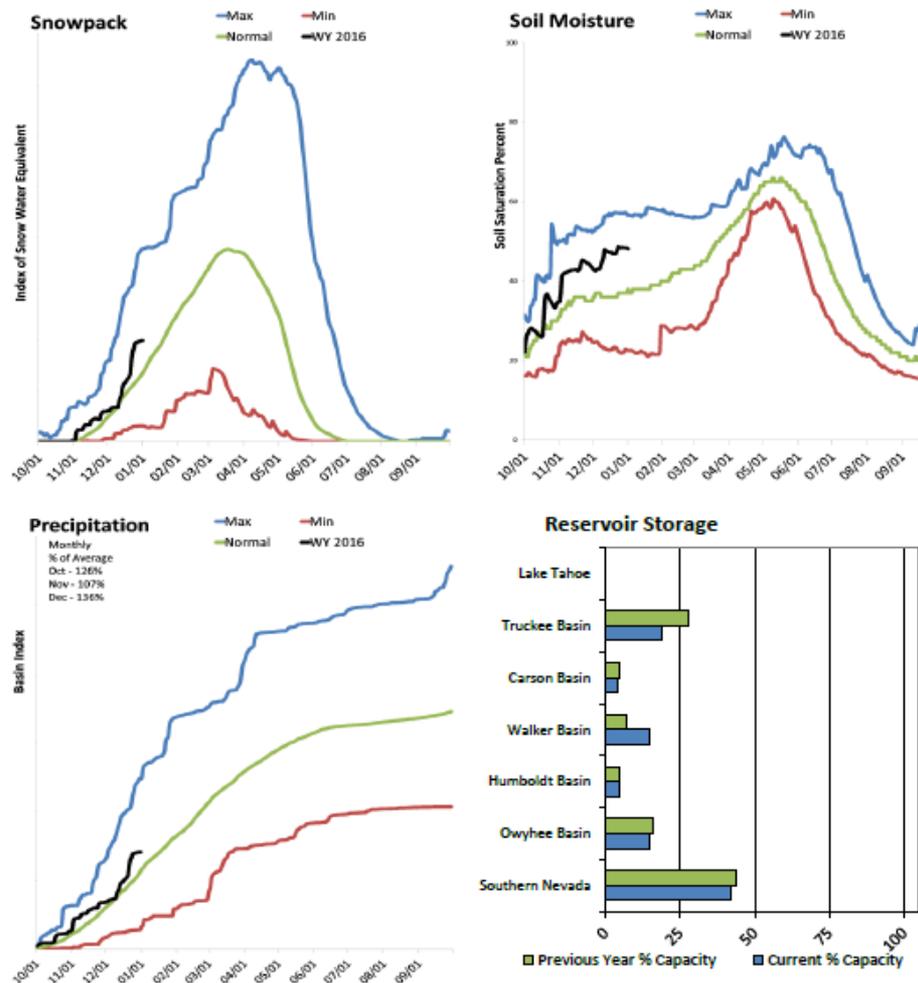
Welcome Back Old Man Winter!

That old curmudgeon finally remembered Northern Nevada's area code. This winter's snowpack is off to a great start with up to twice normal amounts across parts of the state. Near weekly storms from November through December allowed avid skiers and snowboarders to log more powder days than during all of last season. Hopefully El Niño fueled storms push north and bring more snow to our area over the next three months to put a dent in drought deficits.

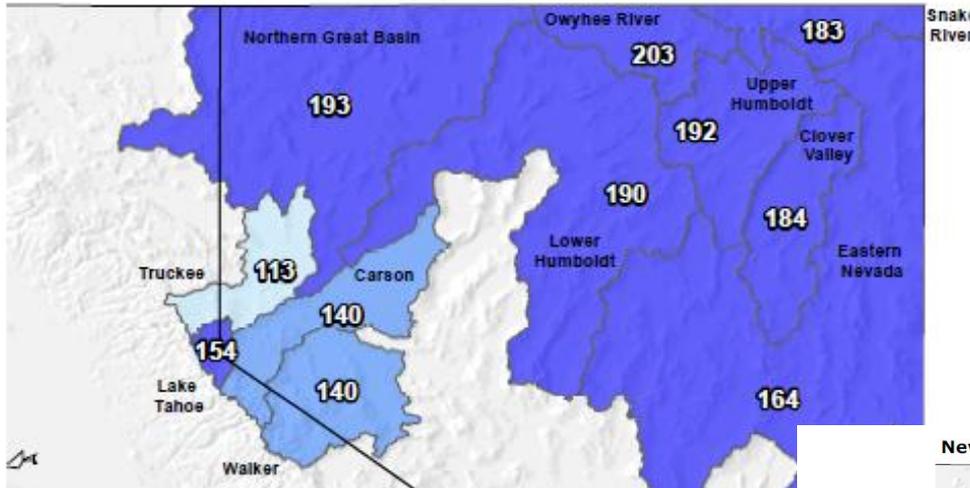
Photo: Mt. Rose Ski Tahoe – Chuter Chair – December 24, 2015

State of Nevada & Eastern Sierra 1/1/2016

The snowpack across Northern Nevada and the Eastern Sierra (Truckee, Tahoe, Carson and Walker basins) is much above normal at 154% of median, compared to 80% last year. Precipitation in December was much above average at 142%, which brings the seasonal accumulation (Oct-Dec) to 127% of average. Soil moisture is 48% compared to 54% last year. Reservoir storage ranges from 0% of useable capacity in Lake Tahoe to 42% of capacity in Southern Nevada.



Nevada & Eastern Sierra
Percent of Median Snowpack
January 1, 2016



1st of Month Snow Water Equivalent Basin-wide Percent of 1981-2010 Median

- <50%
- 50-69%
- 70-89%
- 90-109%
- 110-129%
- 130-150%
- >150%

Provisional data subject to revision

Prepared by:
USDA/NRCS Nevada Snow Survey



Map data based on the first of month snow water equivalent found at selected SNOTEL and snow course sites basin compared to the median value for those sites. SNOTEL data based on the first reading of the day (typical course data based on measurements taken within the last 5 days of preceding month). A table based on the underlying data can be found by selecting "Nevada" and report type "Snowpack" for the date listed above webpage: <http://www.wcc.nrcs.usda.gov/basin.html>.

WSOR Monthly Map

Includes QC'd SNOTEL,
as well as,
Snow Course data

Nevada/California SNOTEL Current Snow Water Equivalent (SWE) % of Normal

Jan 01, 2016

Current Snow Water Equivalent Basin-wide Percent of 1981-2010 Median

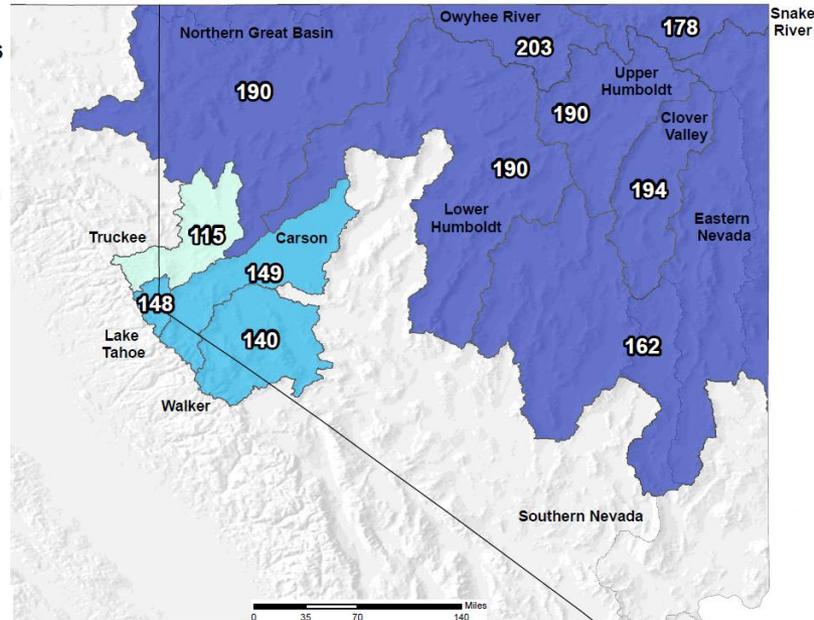
- unavailable *
- <50%
- 50 - 69%
- 70 - 89%
- 90 - 109%
- 110 - 129%
- 130 - 149%
- >= 150%

* Data unavailable at time of posting or measurement is not representative at this time of year

Provisional data subject to revision

USDA

NRCS



USDA

NRCS

The current snow water equivalent percent of normal represents the snow water equivalent found at selected SNOTEL sites in or near the basin compared to the average value for those sites on this day. Data based on the first reading of the day (typically 00:00).

Prepared by:
USDA/NRCS National Water and Climate Center
Portland, Oregon
<http://www.wcc.nrcs.usda.gov>

Daily Update Map

Includes SNOTEL only
Some stations may be missing

USDA Natural Resources Conservation Service
Nevada
United States Department of Agriculture

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Nevada NRCS Snow Survey Program

The NRCS Snow Survey Program provides mountain snowpack data and streamflow forecasts for the western United States. Applications of snow survey products include water supply management, flood control, climate modeling, recreation, and conservation planning.

Latest Snow & Water Supply Information:

- [January 1, 2016 Water Supply Outlook Report - NEW!](#)
- [2015 Streamflow Forecast vs Actual Runoff Review - NEW!](#)
- [Weekly El Niño Status Update](#) (from NOAA)
- [NWS Reno - El Niño & Winter Outlook Briefing](#)

Today's Snow & Precipitation Update Reports:

- > [Snow and Precipitation - Percent of Normal](#)
- > [Precipitation - Month to Date](#) | [% of Monthly Ave](#)
- > [Snowpack - Percent of Normal Peak](#)
- > [Maps: Snow](#) | [Water Year Prec](#) | [Monthly Prec](#)

Snow Survey Data

- > **Site Pages:**
- > **Interactive Map:** (zoom, click site for data)
[SNOTEL](#) | [Snow Course](#) | [SCAN](#)
- > **Interactive Map Conditions Links - NEW!**
- > **Current and Historic Data Reports**
- > **30 Year Normals**
- > **Metadata:** [Location](#) | [Site Photos](#)

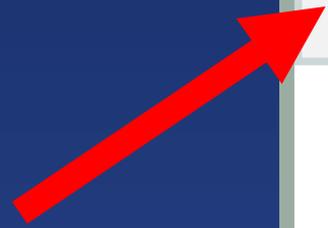
Water Supply Information

- > **Outlook Reports:**
- > **Streamflow Forecasts:**
- > **Streamflow Forecast Maps:** [NV](#) | [West US](#)
- > **Daily Streamflow Forecasts - NEW!**
- > **Monthly Reservoir Report** (select reservoir)
- > **USGS Conditions:** [Stream](#) | [Reservoir](#)
- > **Past Water Supply Presentations**

www.nv.nrcs.usda.gov/snow/

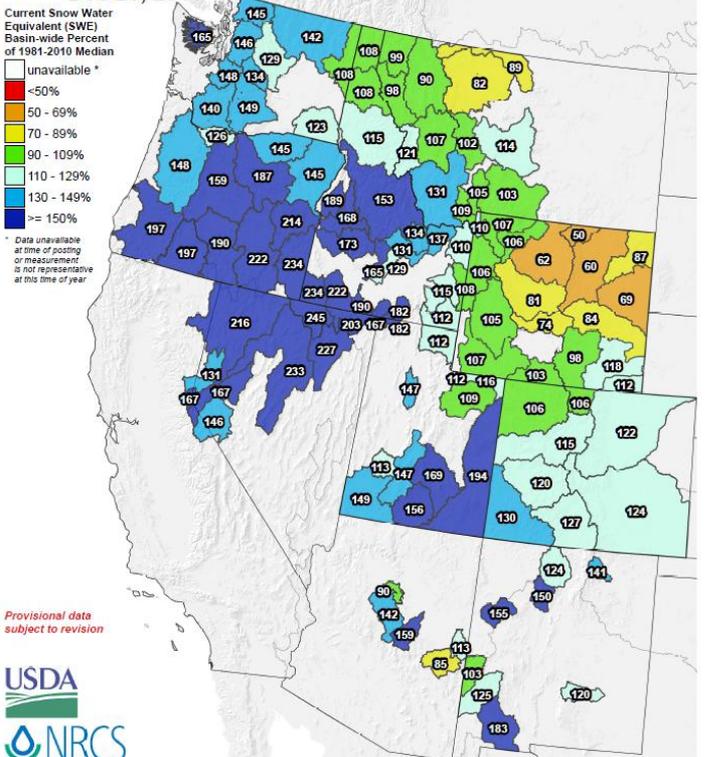
Or just Google...

"Nevada NRCS Snow Survey"

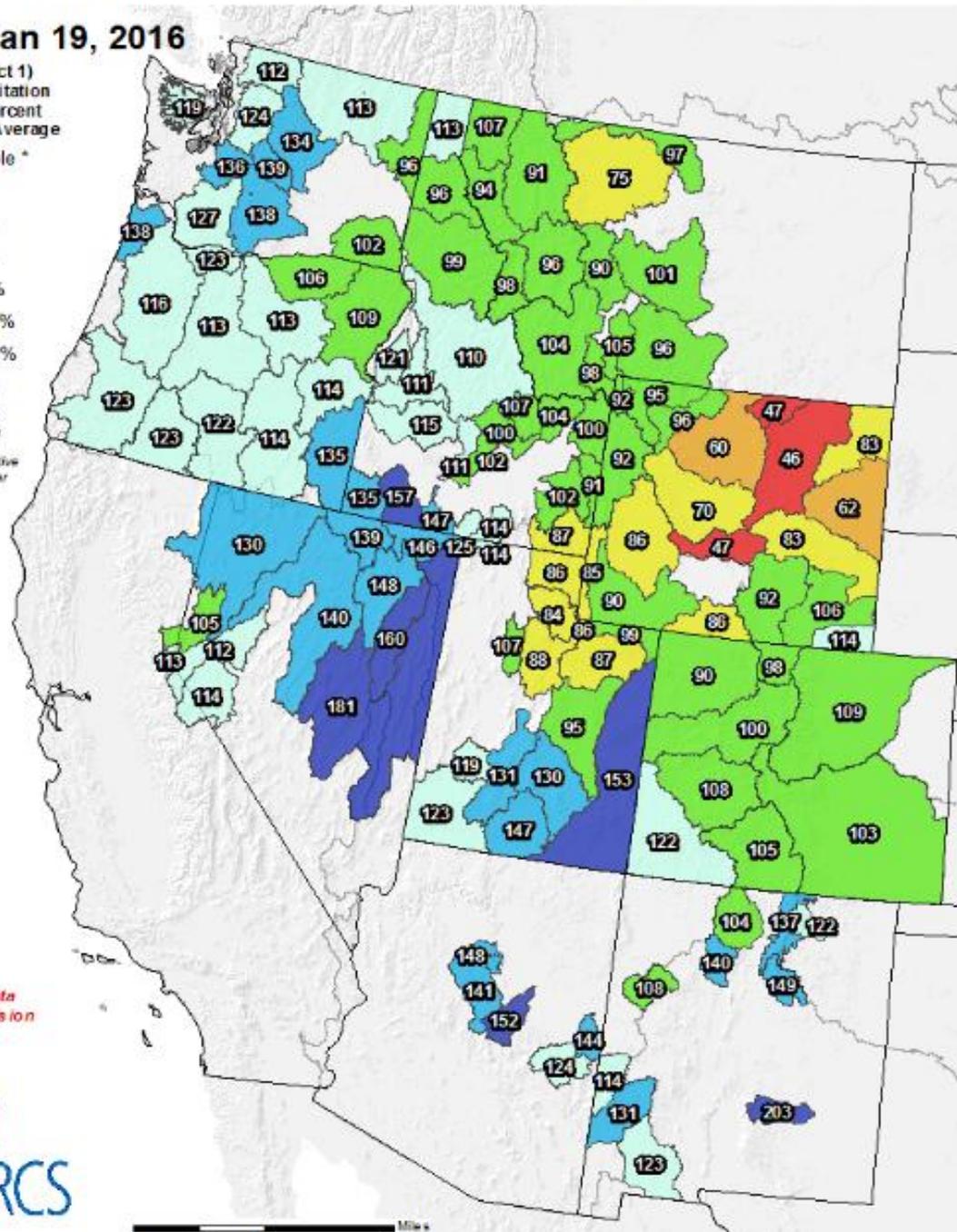
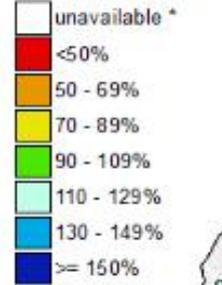


Dec 25, 2015

Jan 19, 2016



Water Year (Oct 1) to Date Precipitation Basin-wide Percent of 1981-2010 Average

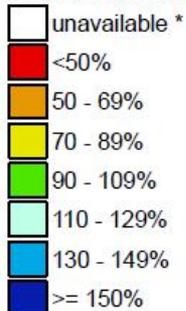


Typical
El Niño
Pattern
Developing

Nevada/California SNOTEL Water Year (Oct 1) to Date Precipitation % of Normal

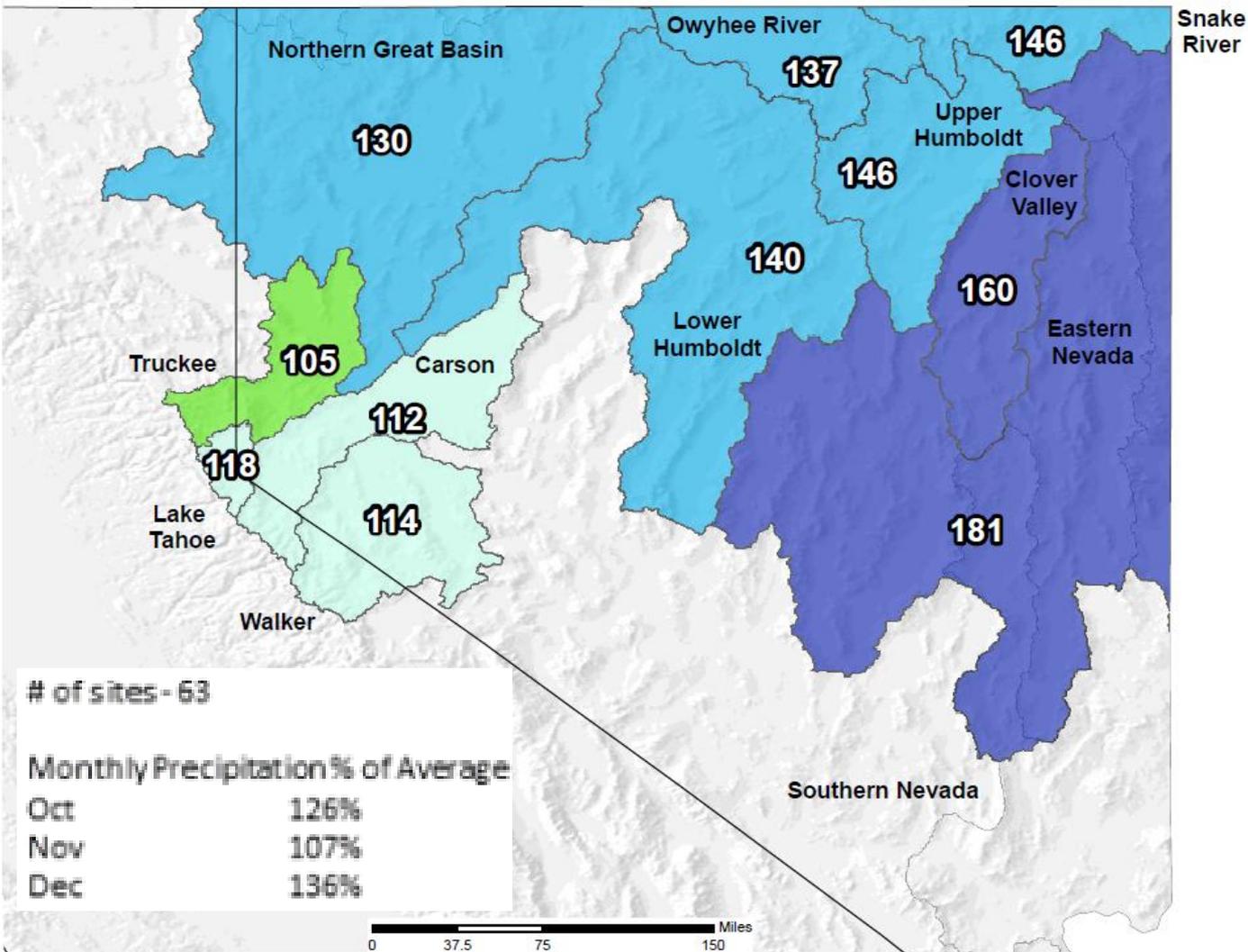
Jan 19, 2016

Water Year (Oct 1)
to Date Precipitation
Basin-wide Percent
of 1981-2010 Average



* Data unavailable
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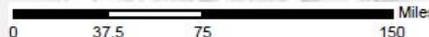
Provisional data
subject to revision



of sites - 63

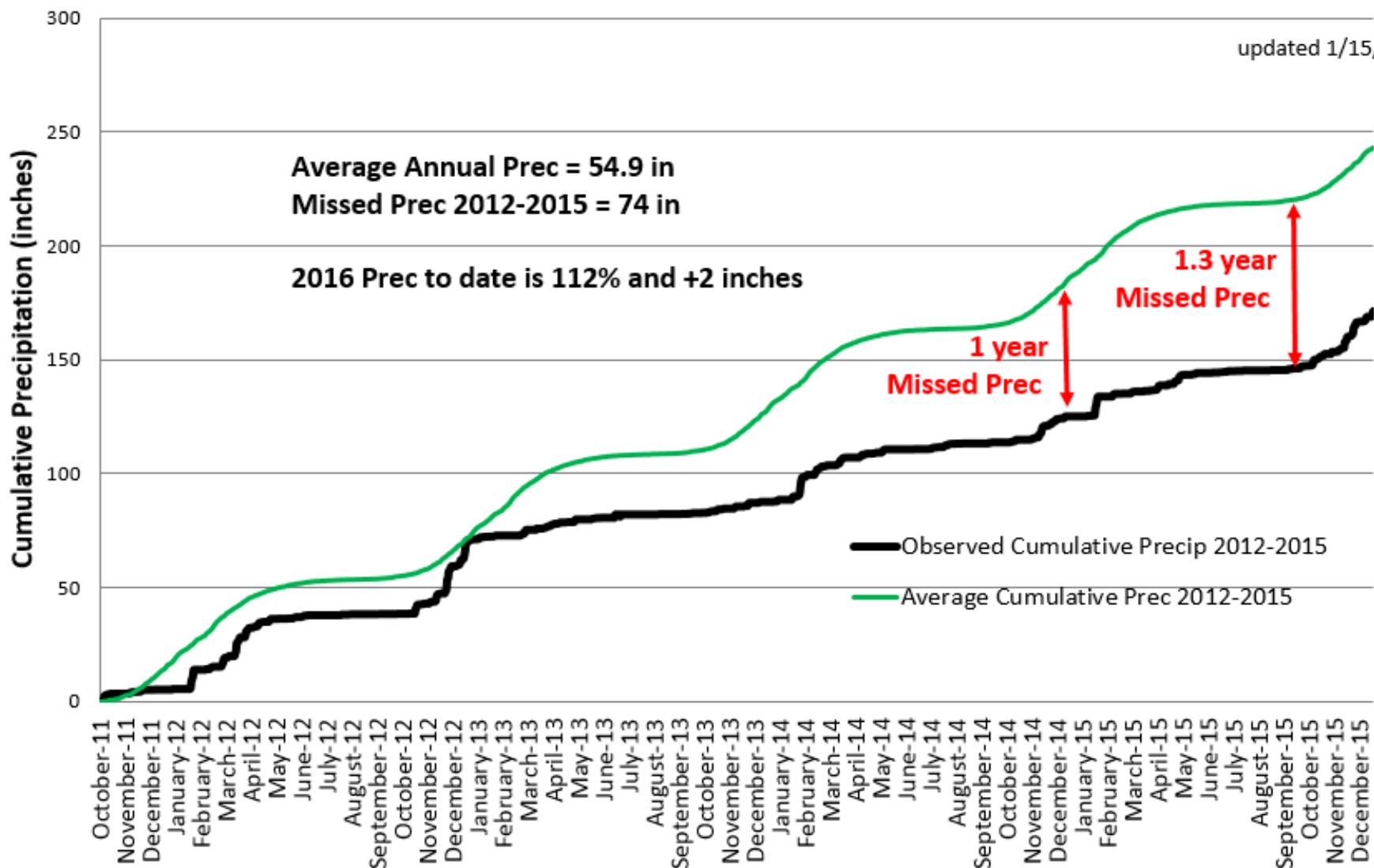
Monthly Precipitation % of Average

Oct	126%
Nov	107%
Dec	136%



Mt Rose SNOTEL Precipitation Accumulation WY 2012-2015

updated 1/15/16

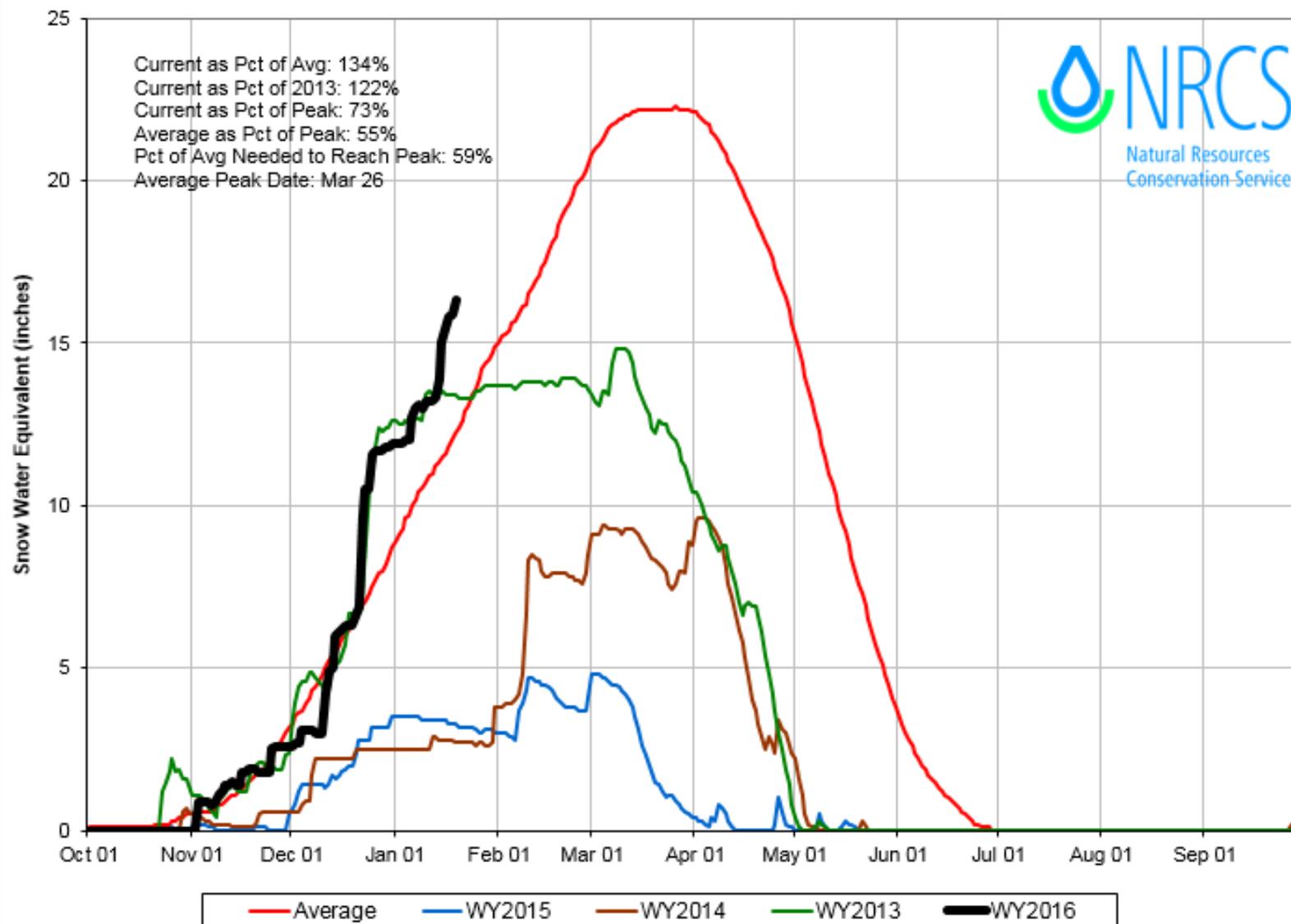


Missed Precipitation Water Years 2012-2015

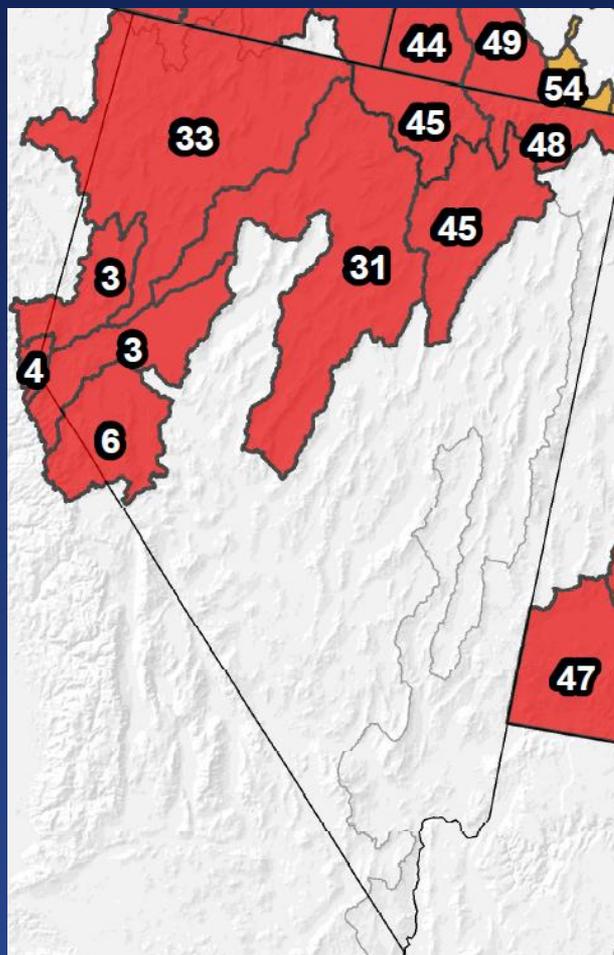
Basin	# Sites	Average # Years Missed Prec
Truckee	8	1.3
Carson	9	1.3
Walker	6	1.2
Tahoe	7	1.1
Humboldt	10	0.7
Eastern Nevada	3	0.5
Snake - Owyhee, Burneau, Salmon Falls	9	0.4

Station Name	Basin	2012-2015 Prec Missed	Years Prec Missed
Sonora Pass	Walker	56.3	1.5
Blue Lakes	Carson	67.3	1.5
Carson Pass	Carson	70.5	1.5
Independence Camp	Truckee	50.0	1.5
Independence Creek	Truckee	47.1	1.4
Poison Flat	Carson	45.9	1.4
Virginia Lakes Ridge	Walker	38.3	1.4
Rubicon #2	Tahoe	58.2	1.4
Squaw Valley G.C.	Truckee	89.2	1.4
Mt Rose Ski Area	Truckee	73.6	1.3
Leavitt Lake	Walker	73.4	1.3
Forestdale Creek	Carson	66.4	1.3
Css Lab	Truckee	86.2	1.3
Burnside Lake	Carson	54.7	1.3
Monitor Pass	Carson	29.0	1.3
Big Meadow	Truckee	39.7	1.2
Truckee #2	Truckee	41.9	1.2
Spratt Creek	Carson	38.2	1.2
Ward Creek #3	Tahoe	81.3	1.2
Leavitt Meadows	Walker	37.7	1.2
Ebbetts Pass	Carson	61.9	1.2
Echo Peak	Tahoe	66.1	1.1
Disaster Peak	Black Rock Desert	24.3	1.1
Tahoe City Cross	Tahoe	40.6	1.1
Independence Lake	Truckee	52.2	1.1
Lewis Peak	Humboldt	28.0	1.1
Horse Meadow	Carson	28.1	1.1
Big Creek Sum	Humboldt	27.4	1.0
Marlette Lake	Tahoe	35.0	1.0
Lobdell Lake	Walker	25.6	1.0
Heavenly Valley	Tahoe	32.5	1.0

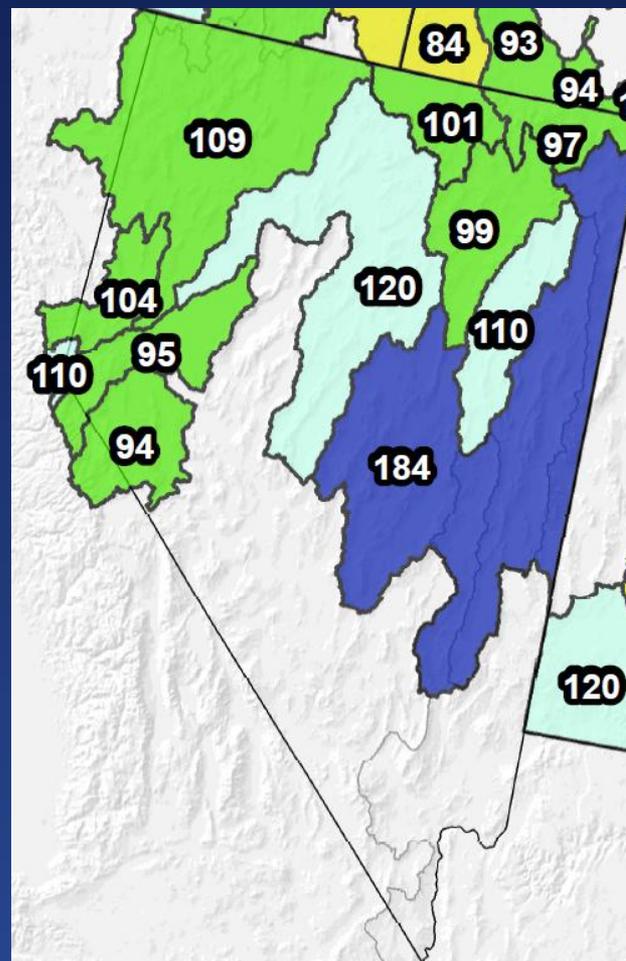
Lake Tahoe Basin Time Series Snowpack Summary
Based on Provisional SNOTEL data as of Jan 19, 2016



Monthly SNOTEL Precipitation as % Average



January 2015



January 1-18, 2016

Since 2000 there have been 10 years with

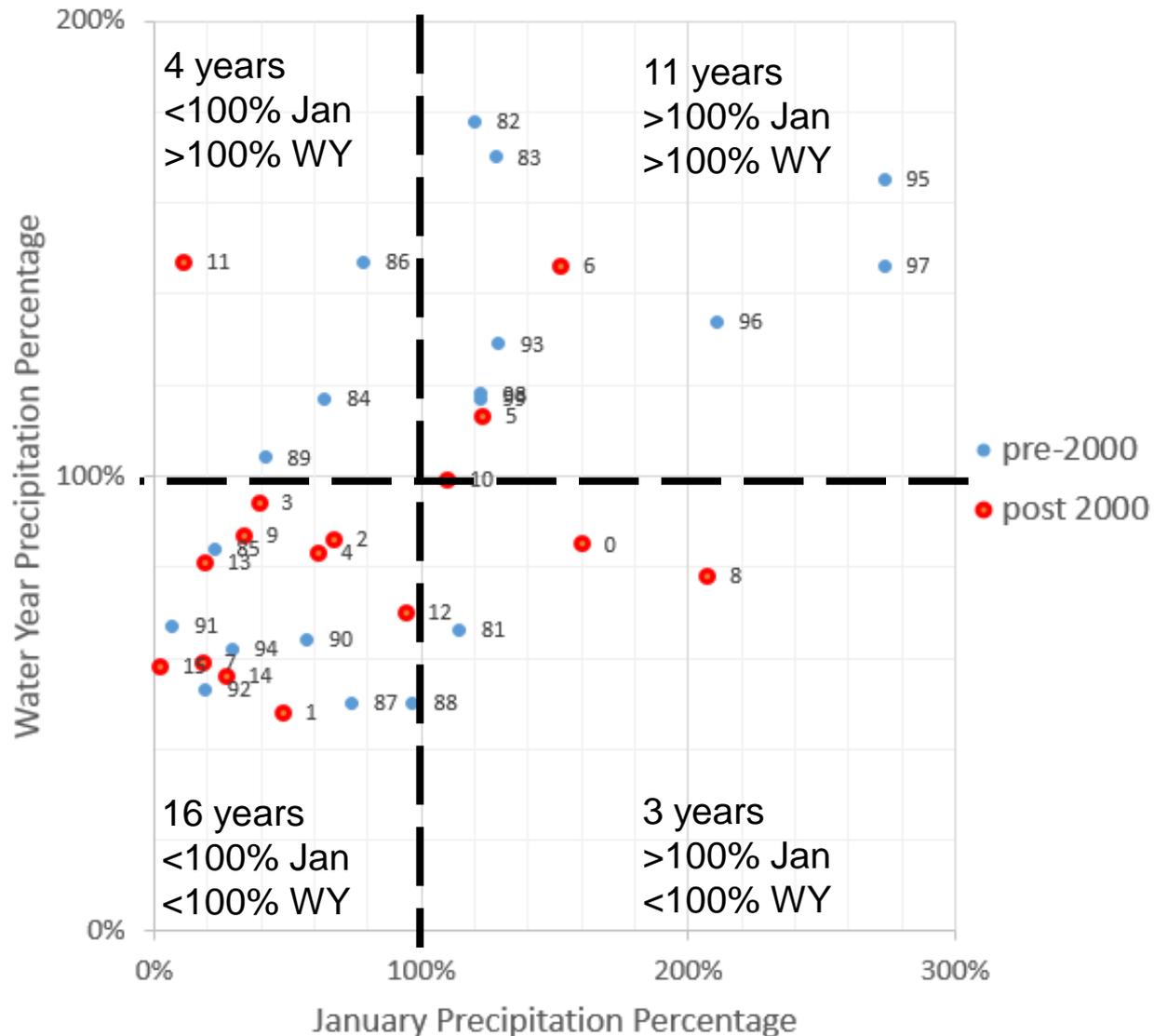
<100% January precipitation

which led to

<100% Water year precipitation

January 2016 is 115% for 1-18th
 69% of monthly Average

Mt Rose SNOTEL January Prec % vs Water Year Prec %
 for Water Years 1981-2015



El Niño Strength

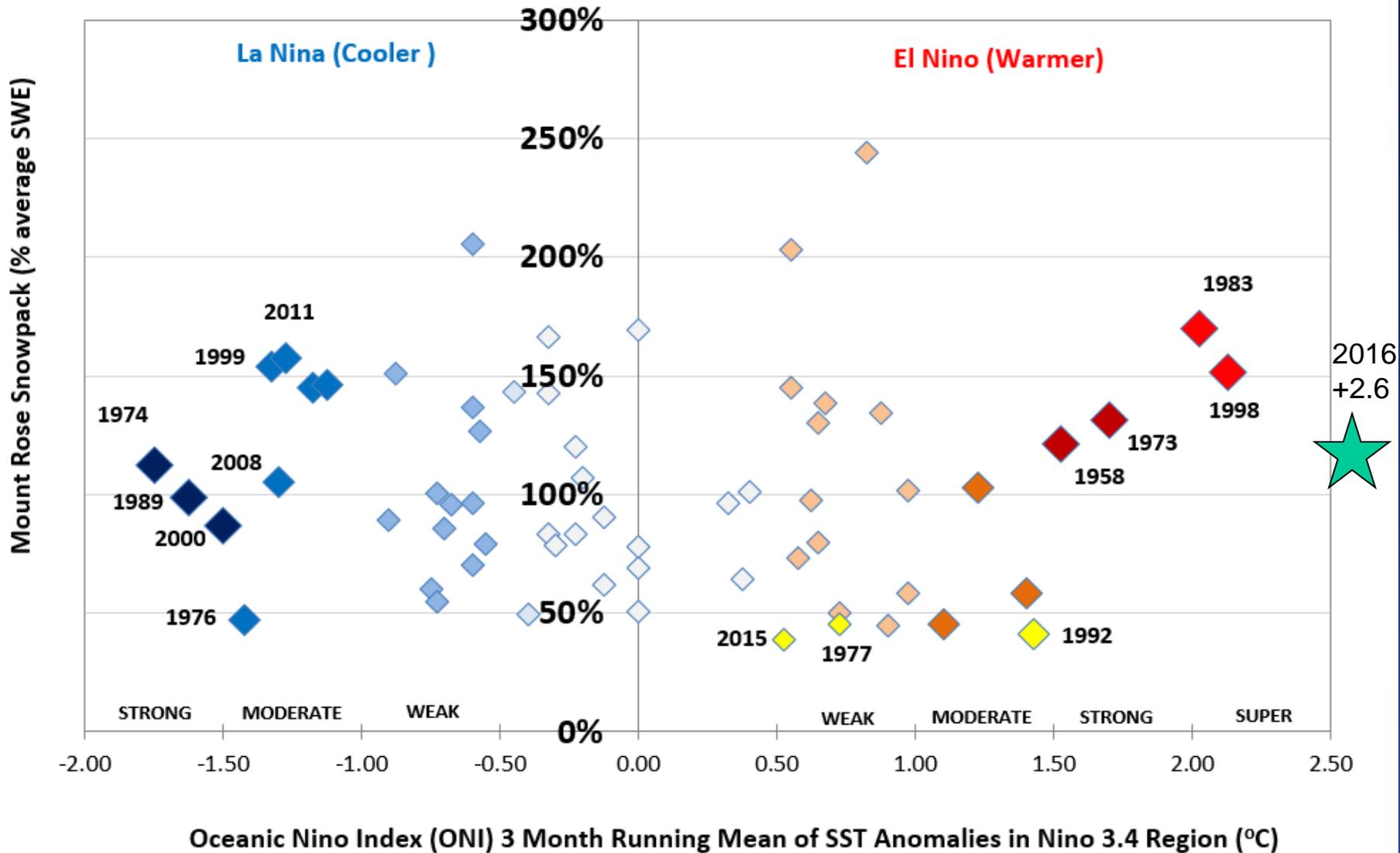


1997-98

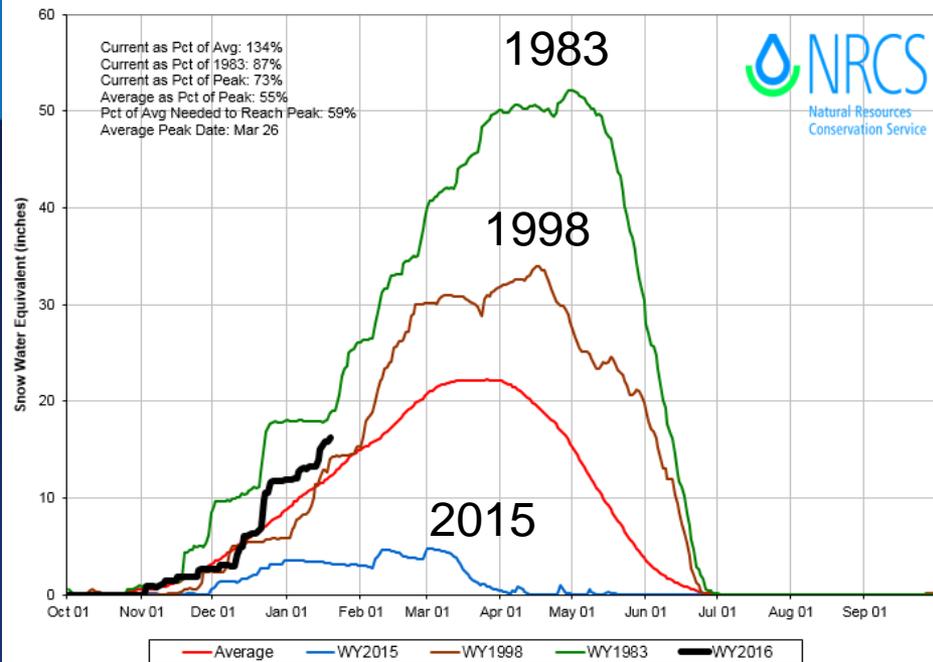
vs

2015-2016

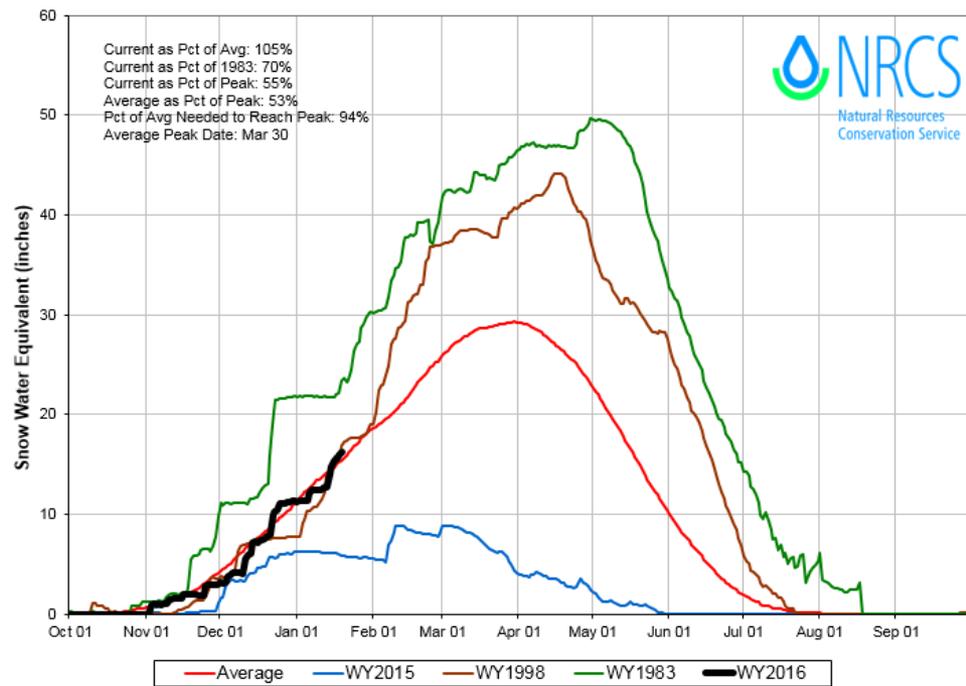
Sea Surface Temperature (SST) Anomalies vs. Mount Rose Snowpack (WY 1951-2015)



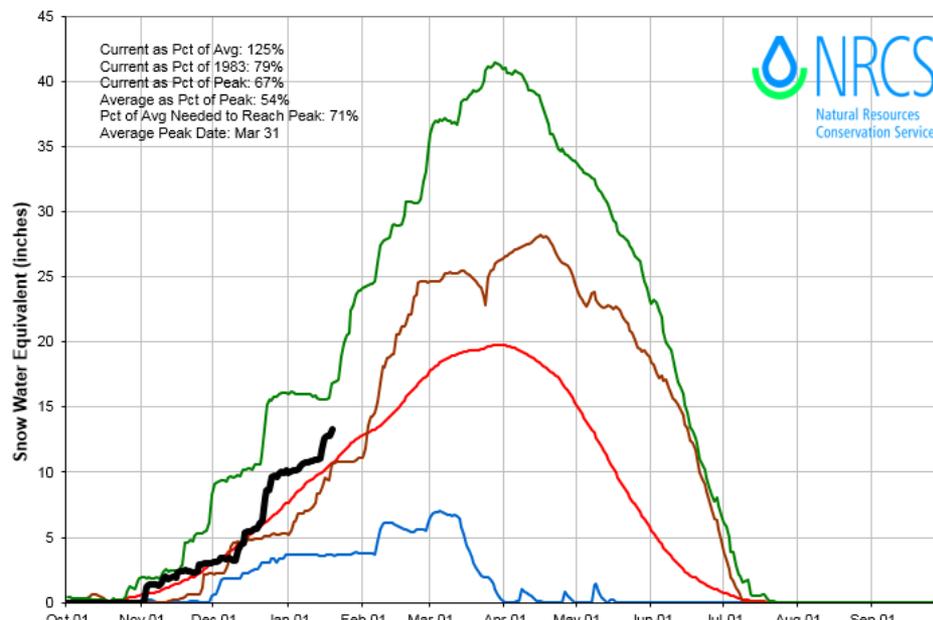
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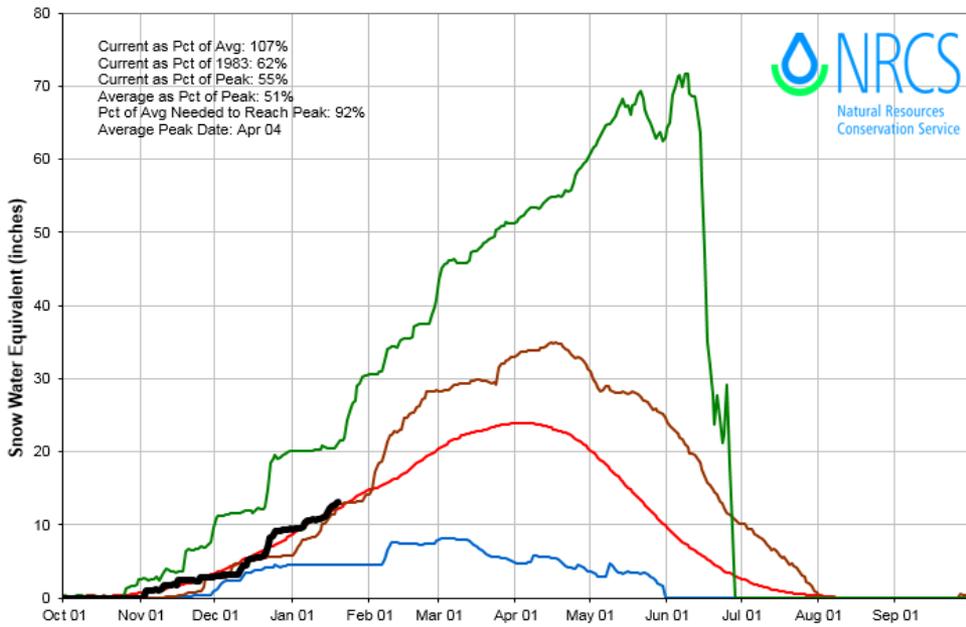
Truckee Basin Time Series Snowpack Summary
Based on Provisional SNOTEL data as of Jan 19, 2016



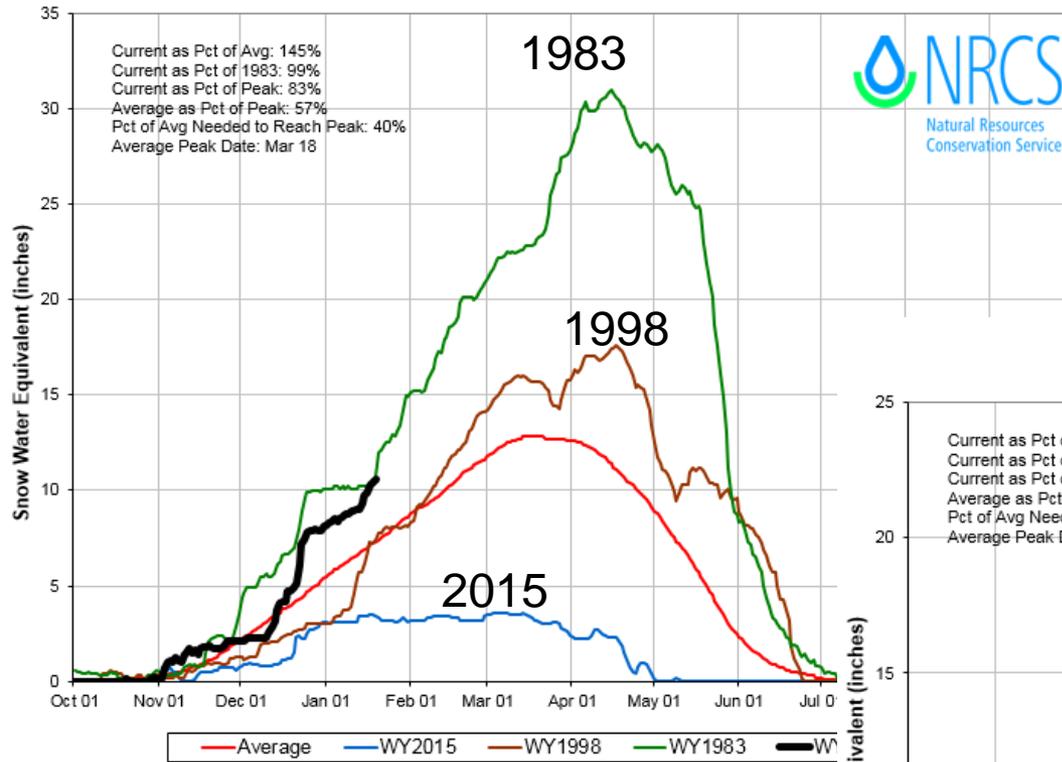
Carson Basin Time Series Snowpack Summary
Based on Provisional SNOTEL data as of Jan 19, 2016



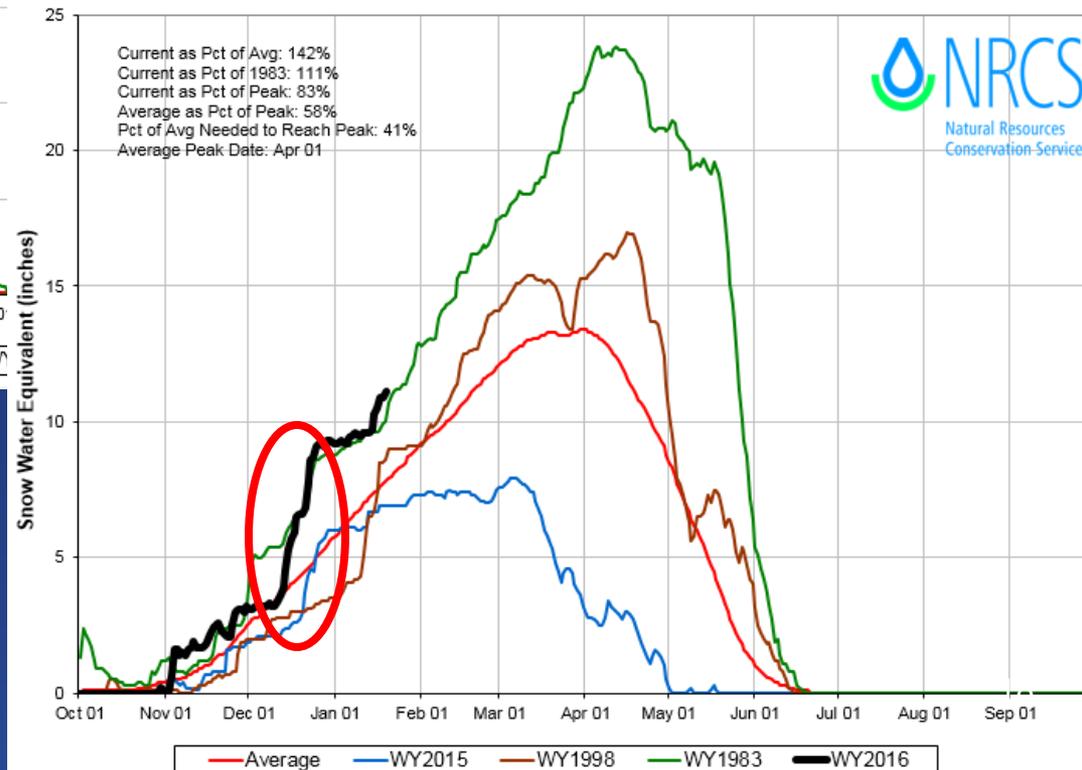
Walker Basin Time Series Snowpack Summary
Based on Provisional SNOTEL data as of Jan 19, 2016



Lower Humboldt Basin below Palisade (5 long term SNOTELs)
Based on Provisional SNOTEL data as of Jan 19, 2016



Upper Humboldt Basin above Palisade Time Series Snow
Based on Provisional SNOTEL data as of Jan 19, 2016

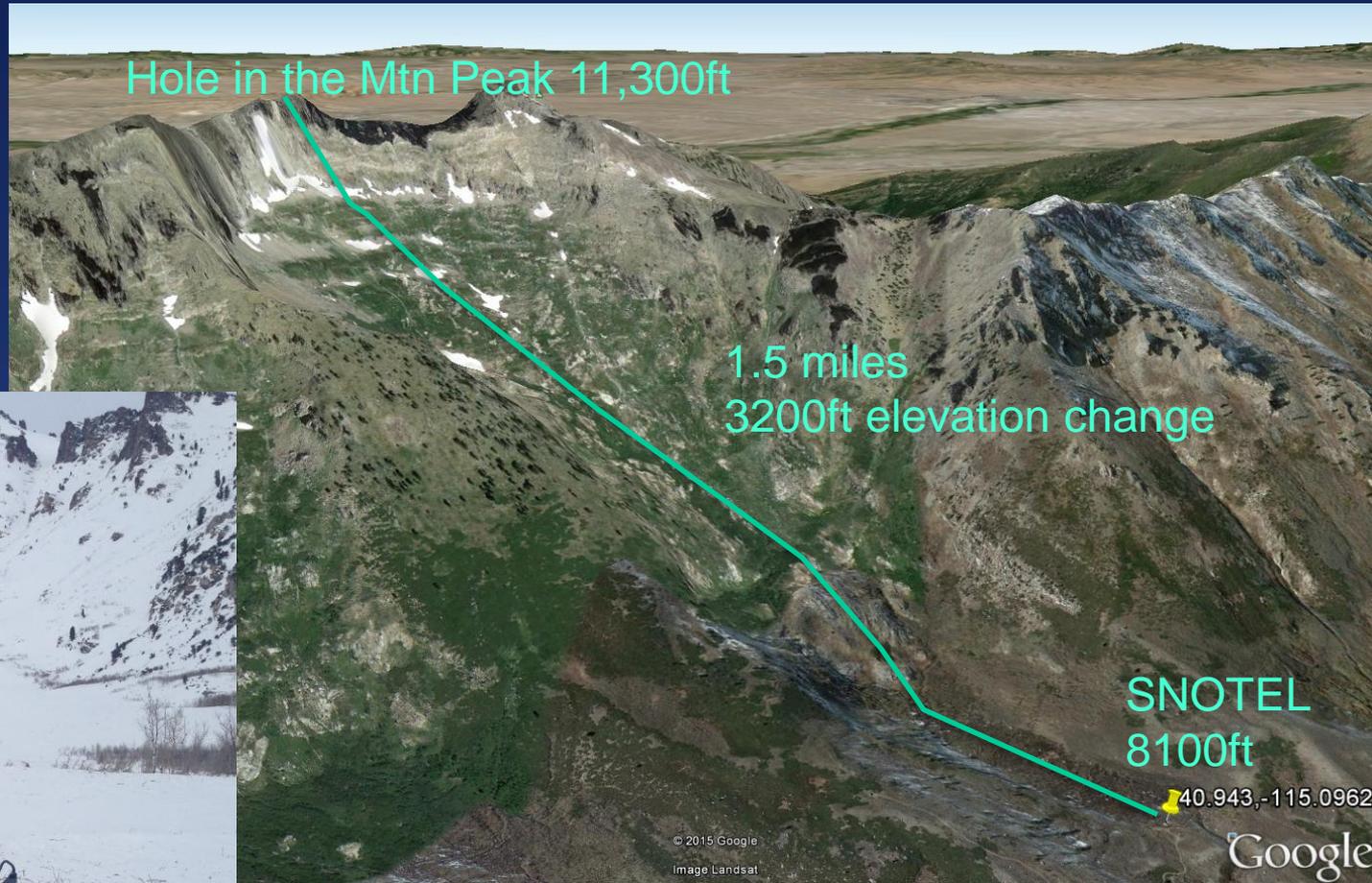


Hole-in-Mountain SNOTEL, Nevada hit by Avalanche!

Site stopped reporting
12/23 at 7:00

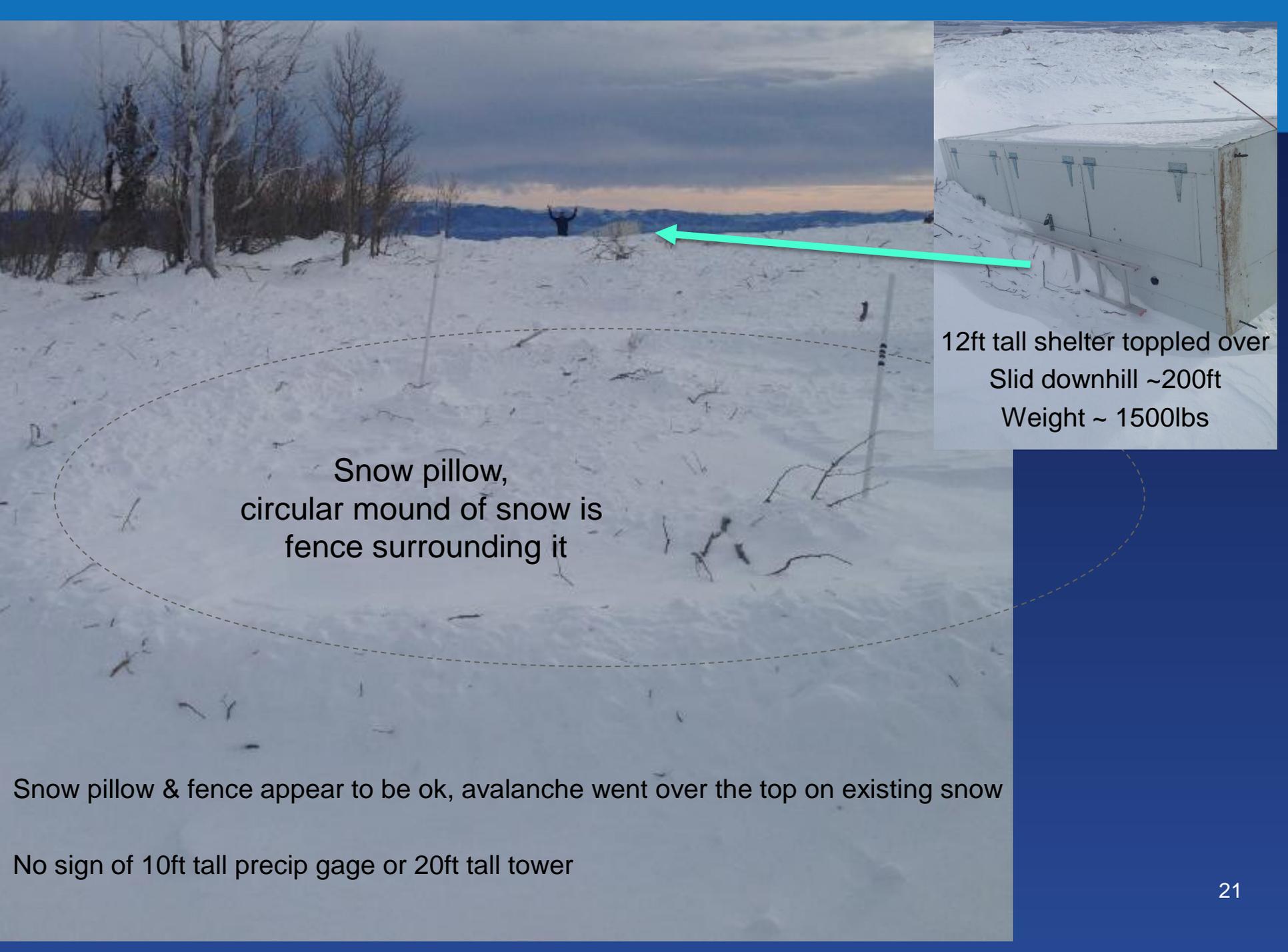
Site had received 28" in
previous 72 hours

Repeat of 1983 incident



Summer





Snow pillow,
circular mound of snow is
fence surrounding it

12ft tall shelter toppled over
Slid downhill ~200ft
Weight ~ 1500lbs

Snow pillow & fence appear to be ok, avalanche went over the top on existing snow

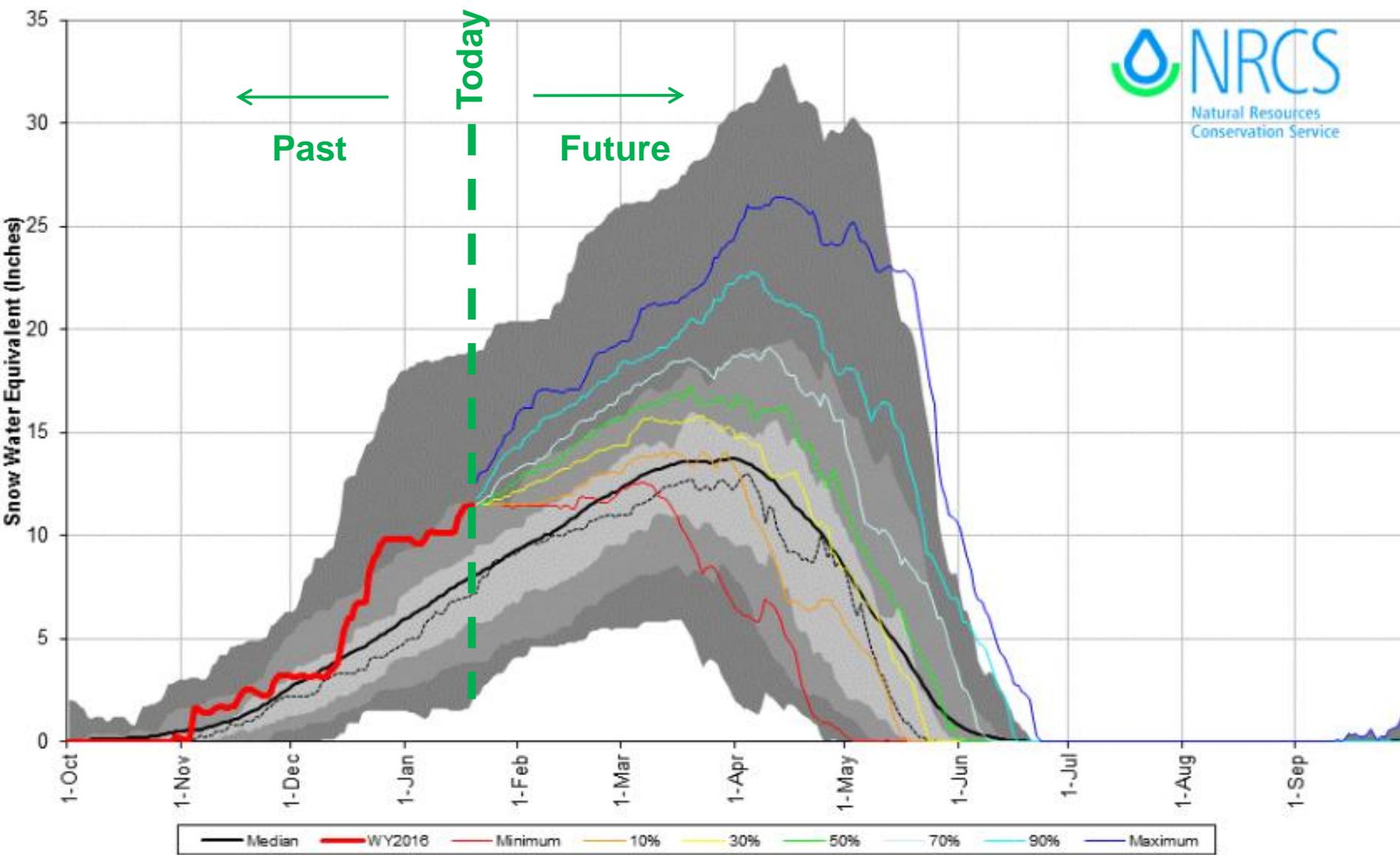
No sign of 10ft tall precip gage or 20ft tall tower



Red Flag Warning of recent avy activity?
Antenna wrapped around aspen

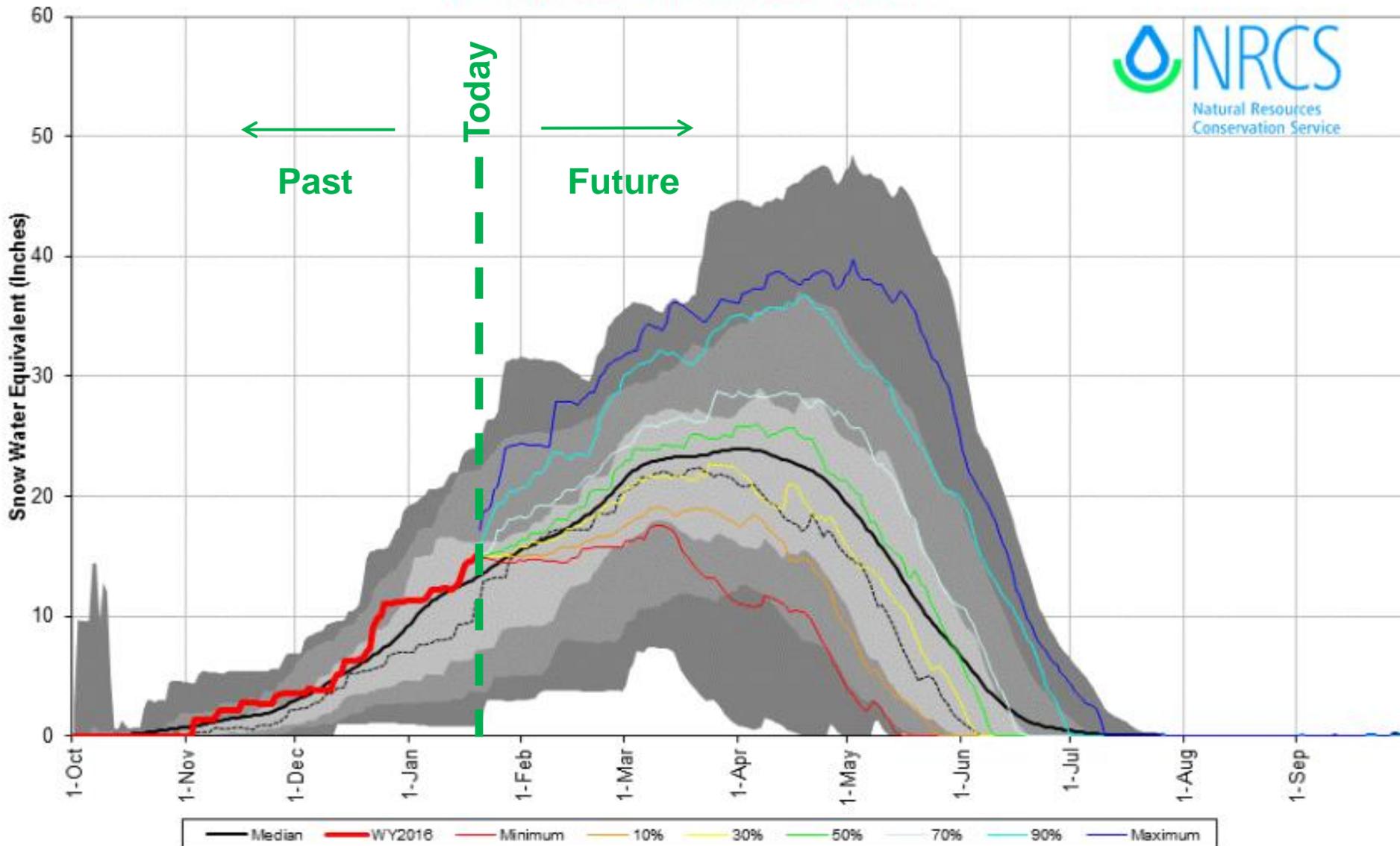
Upper Humboldt with Non-Exceedence Projections

Based on Provisional SNOTEL Data as of Jan 19, 2016

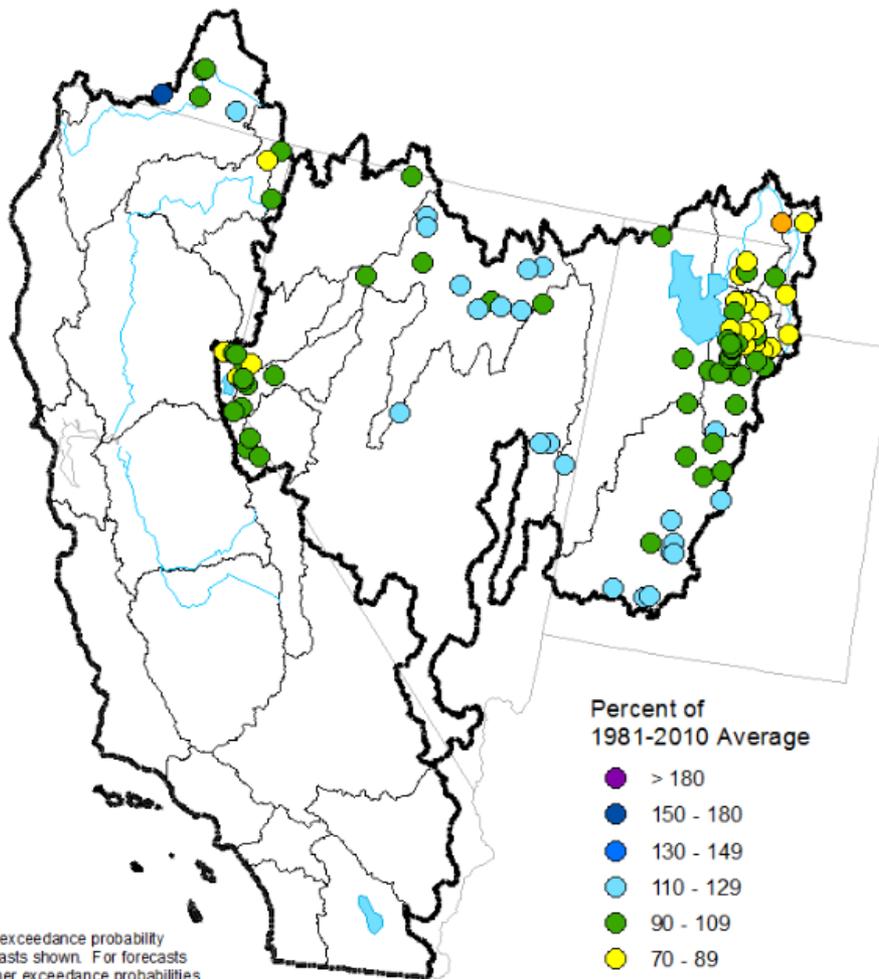


Carson with Non-Exceedence Projections

Based on Provisional SNOTEL Data as of Jan 19, 2016



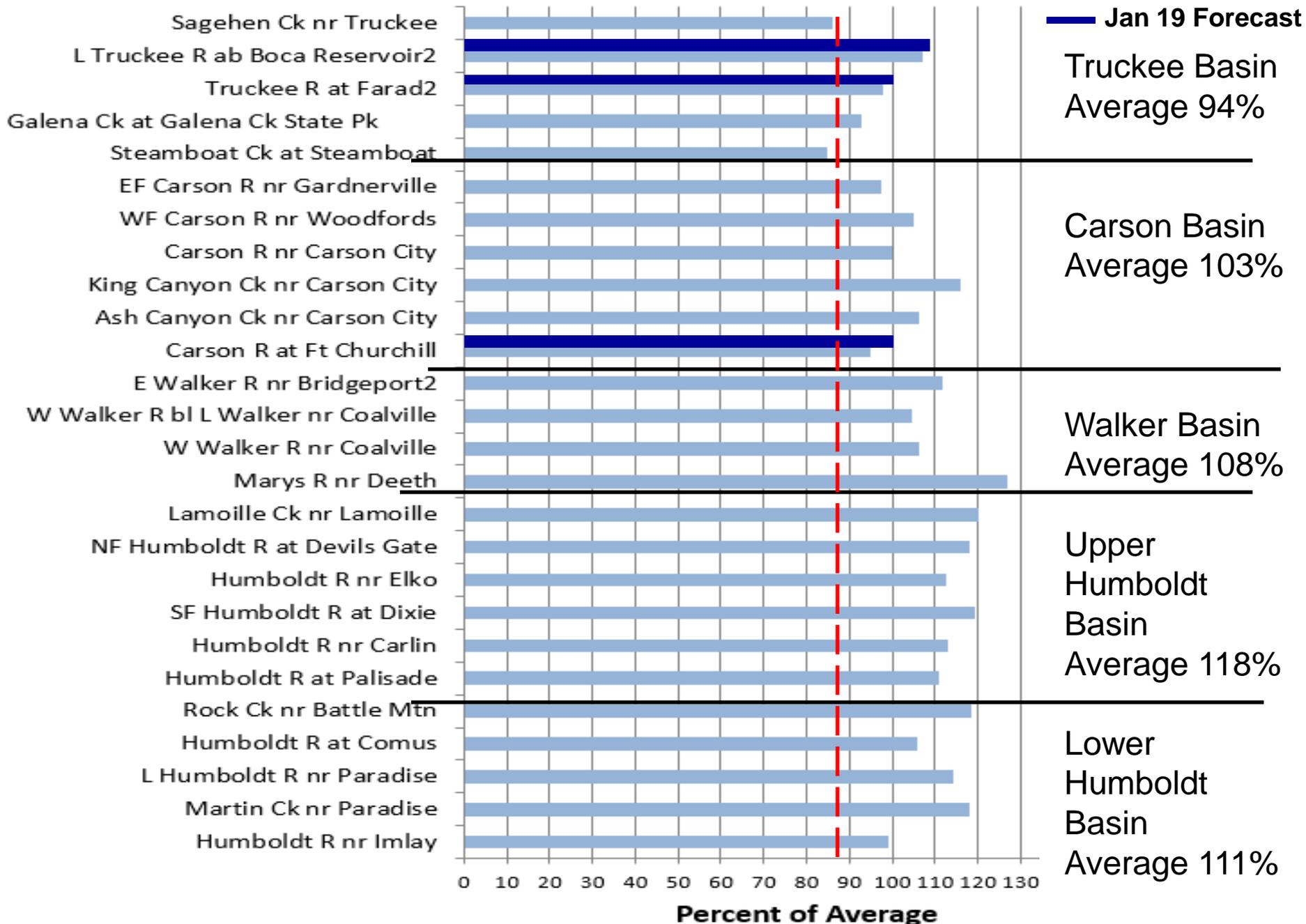
Great Basin and California Spring and Summer Streamflow Forecasts as of January 1, 2016



50% exceedance probability forecasts shown. For forecasts at other exceedance probabilities, see individual state reports.

Prepared by:
USDA Natural Resources Conservation Service
National Water and Climate Center
Redland, Oregon

Jan 1 Streamflow Forecasts - 50% Exceedance - March to July Period



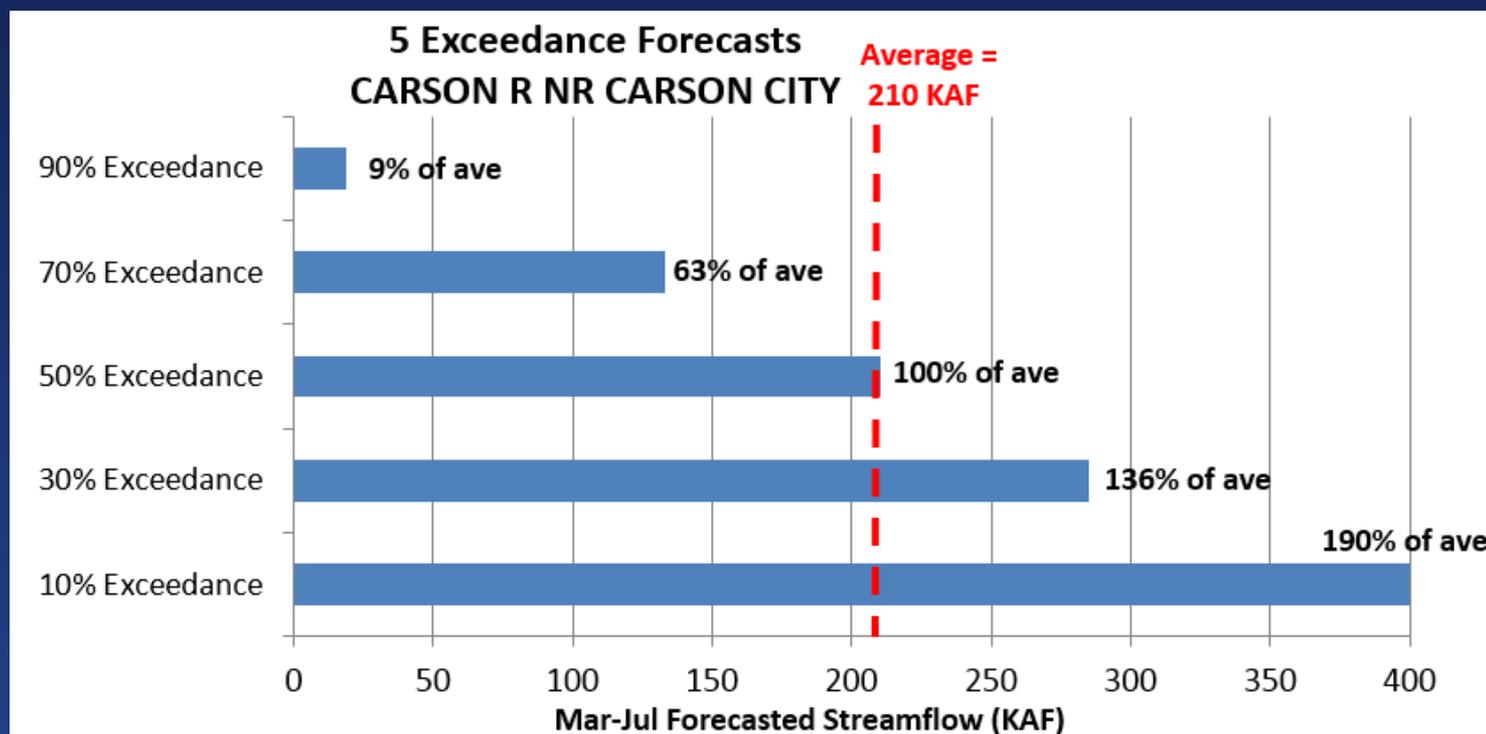
Drier than
Normal
Future

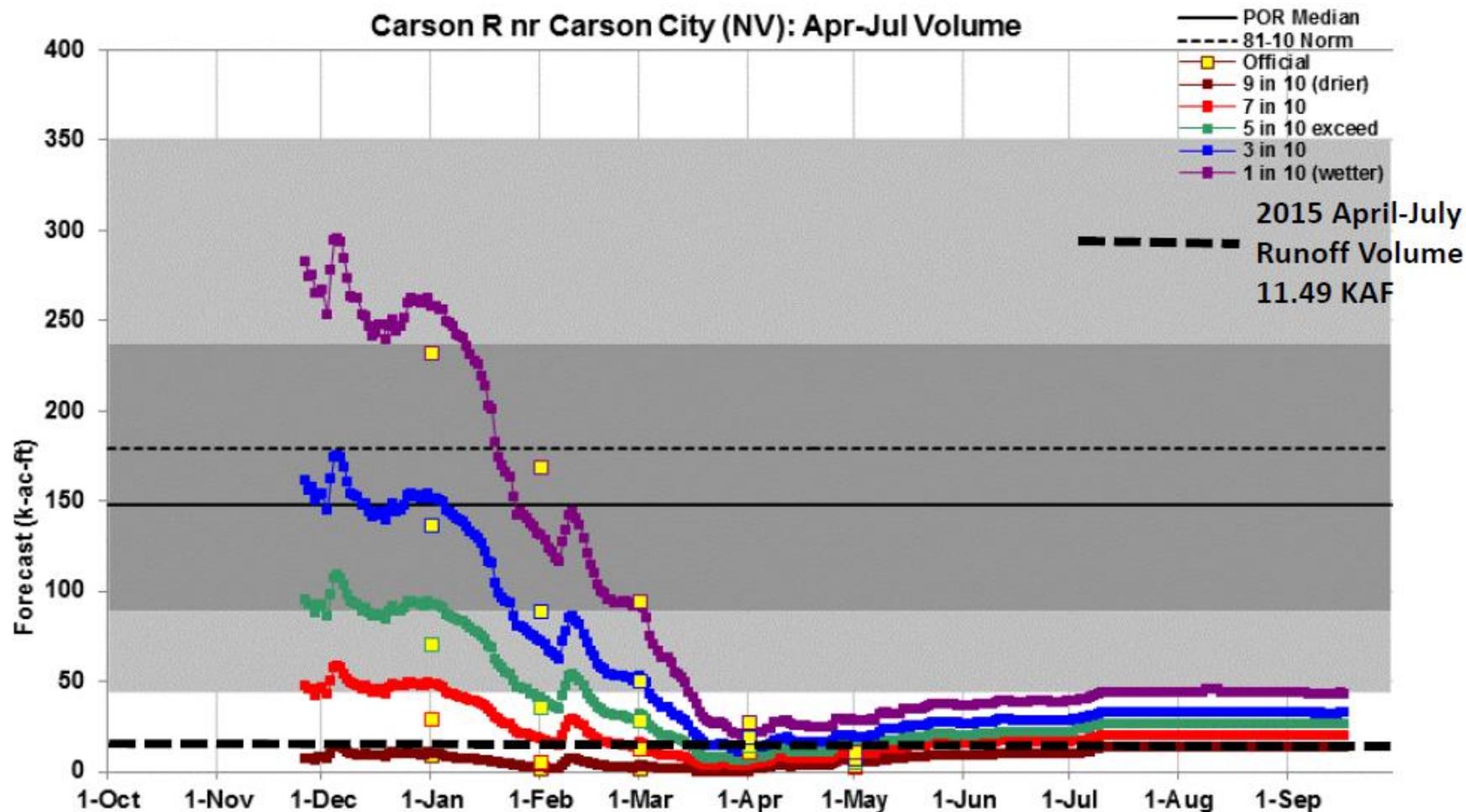


Normal Future
Precip



Wetter than
Normal
Future

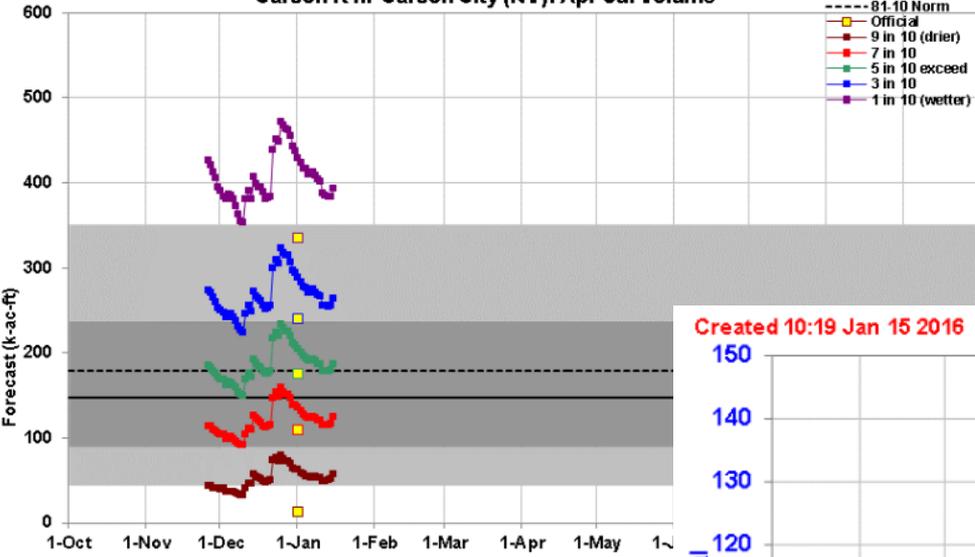




Created 6:57 Sep 17 2015

This is an automated product based solely on SNOTEL data, provisional data are subject to change. This product is a statistically based guidance forecast combining indices of snowpack and precipitation. **Yellow squares** are the official outlooks. **Gray background** is the historical period of record variability. This product does not consider climate information such as El Niño or short range weather forecasts, or a variety of other factors considered in the official forecasts. This product is not meant to replace or supersede the official forecasts produced in coordination with the National Weather Service. Science Contact: Cara.s.McCarthy@por.usda.gov www.wcc.nrcs.usda.gov/wsfdaily_forecasts.html

Carson R nr Carson City (NV): Apr~Jul Volume

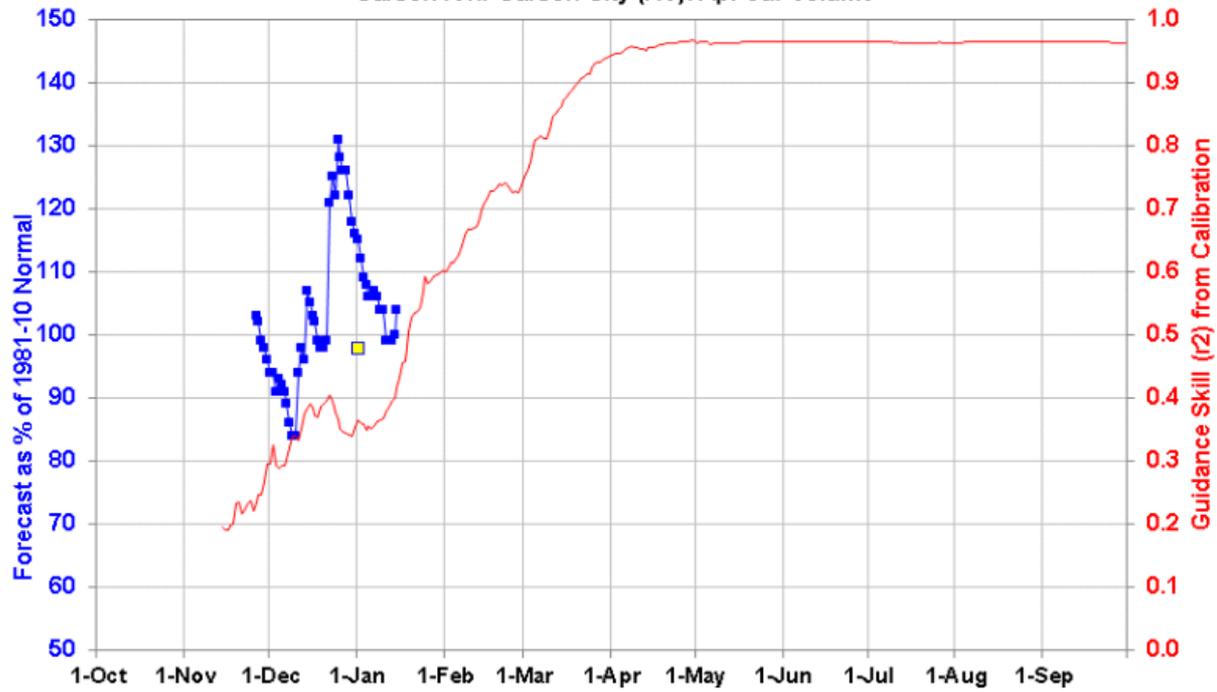


Created 10:19 Jan 15 2016
NRCS

This is an automated product based solely on SNOTEL data. This product is a statistically based guidance forecast combining Official forecasts and the 81-10 Norm. Yellow squares are the official outlooks. Gray background is the 81-10 Norm. This product does not consider climate information such as El Niño or a variety of other factors considered in the official forecast or supercede the official forecasts produced in coordination with the National Weather Service. Science Contact: Cara.s.McCarthy@por.usda.gov www.nrcs.usda.gov

Created 10:19 Jan 15 2016

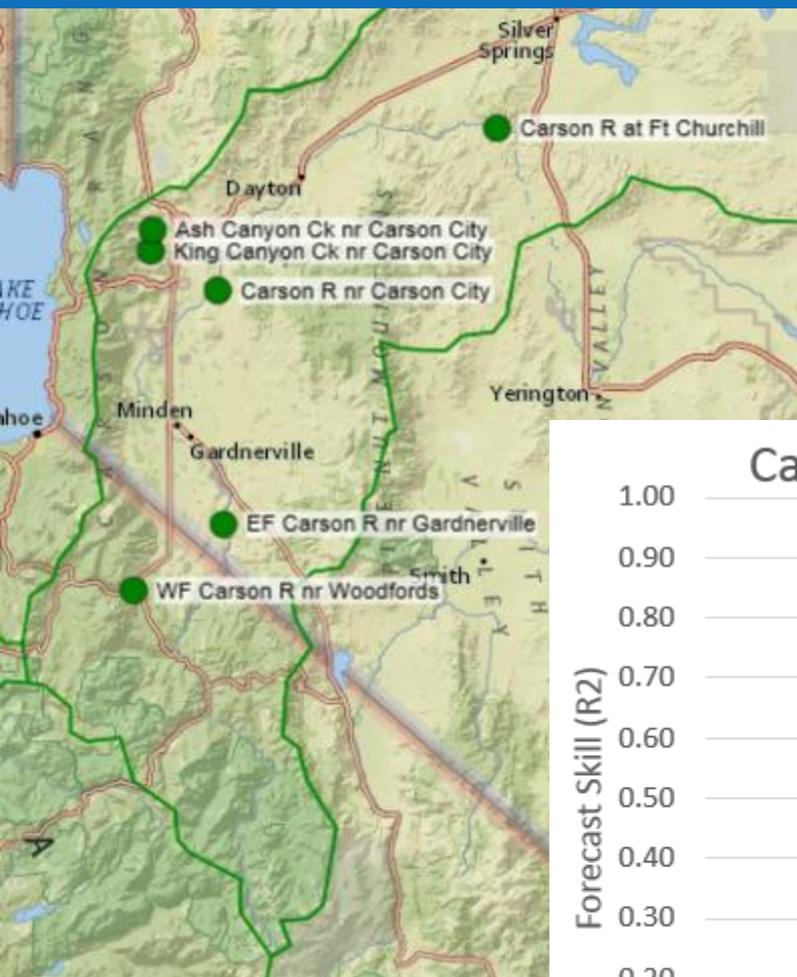
Carson R nr Carson City (NV): Apr~Jul Volume



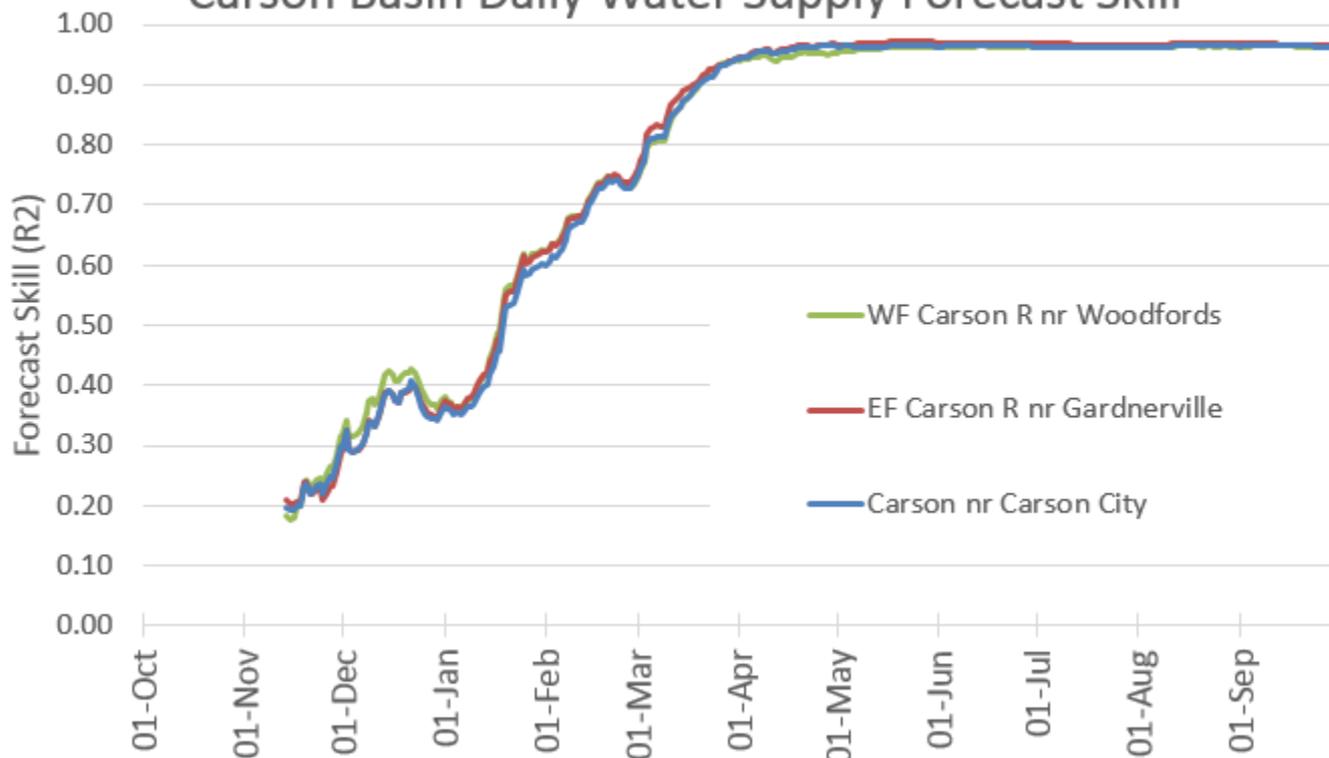
■ Guidance fcst % norm
■ Official fcst % norm
— Guidance Skill (r2)

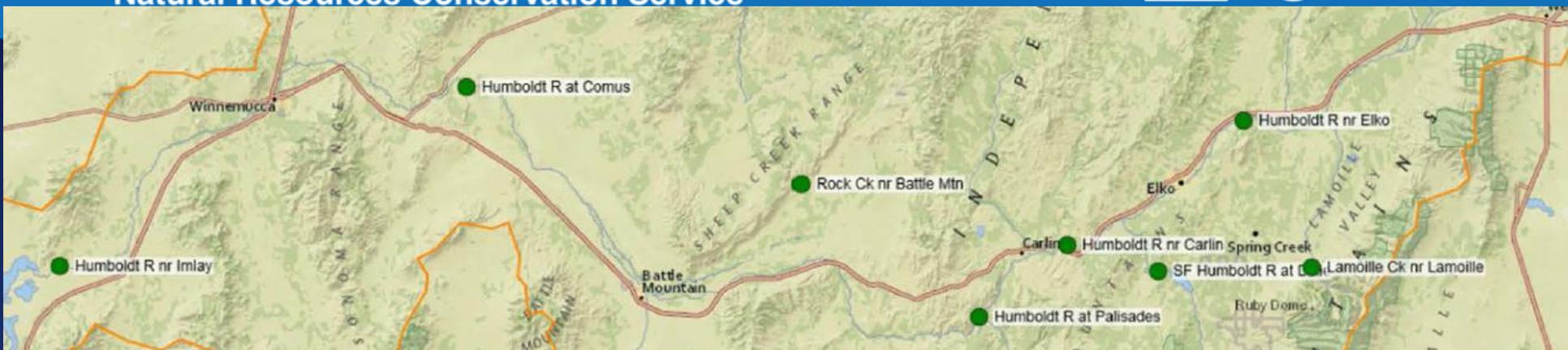
NRCS

This is an automated product based solely on SNOTEL data, provisional data are subject to change. This product is a statistically based guidance forecast combining indices of snowpack and precipitation. Skill is defined as the correlation (squared) between the guidance and observed during calibration. This product does not consider climate information such as El Niño or short range weather forecasts, or a variety of other factors considered in the official forecasts. This product is not meant to replace or supercede the official forecasts produced in coordination with the National Weather Service. Science Contact: Cara.s.McCarthy@por.usda.gov www.nrcs.usda.gov/wst/daily_forecasts.html

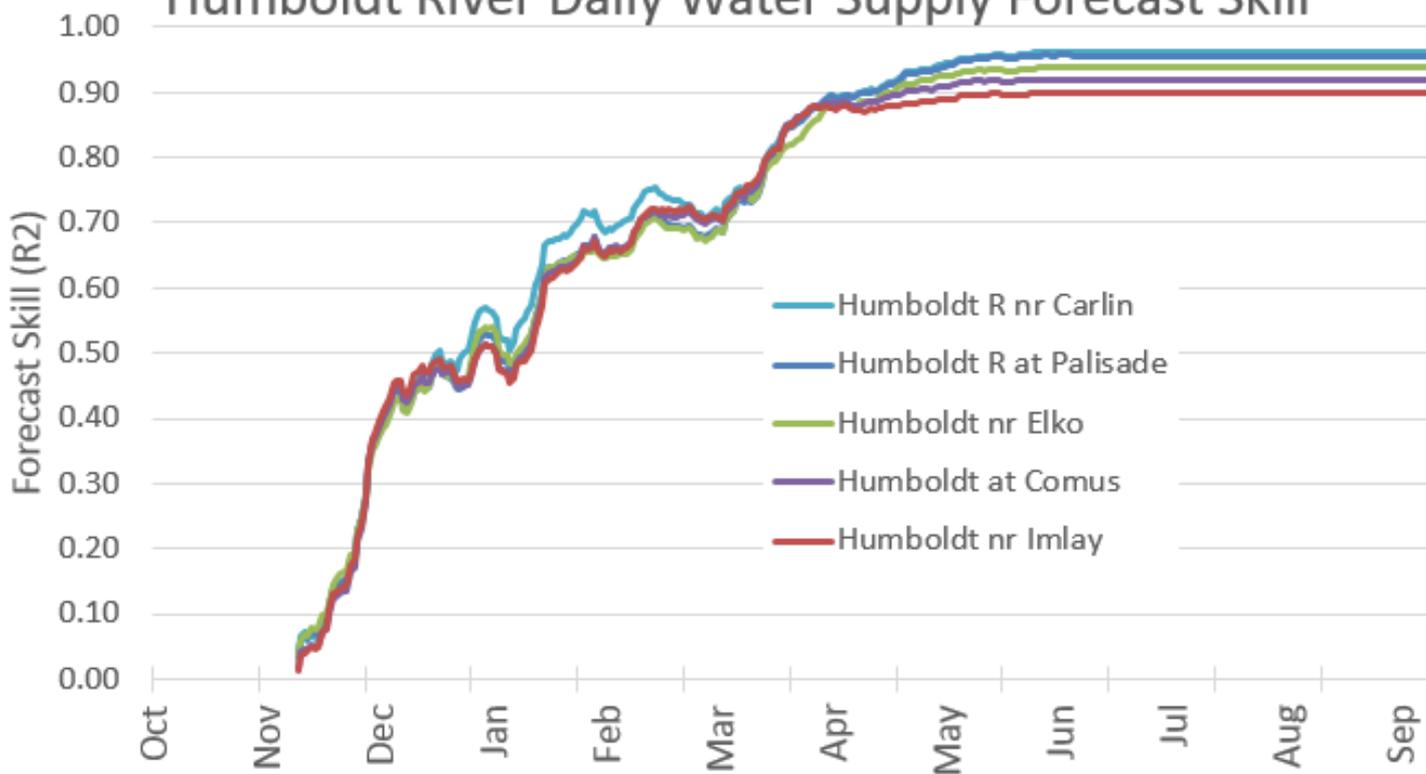


Carson Basin Daily Water Supply Forecast Skill

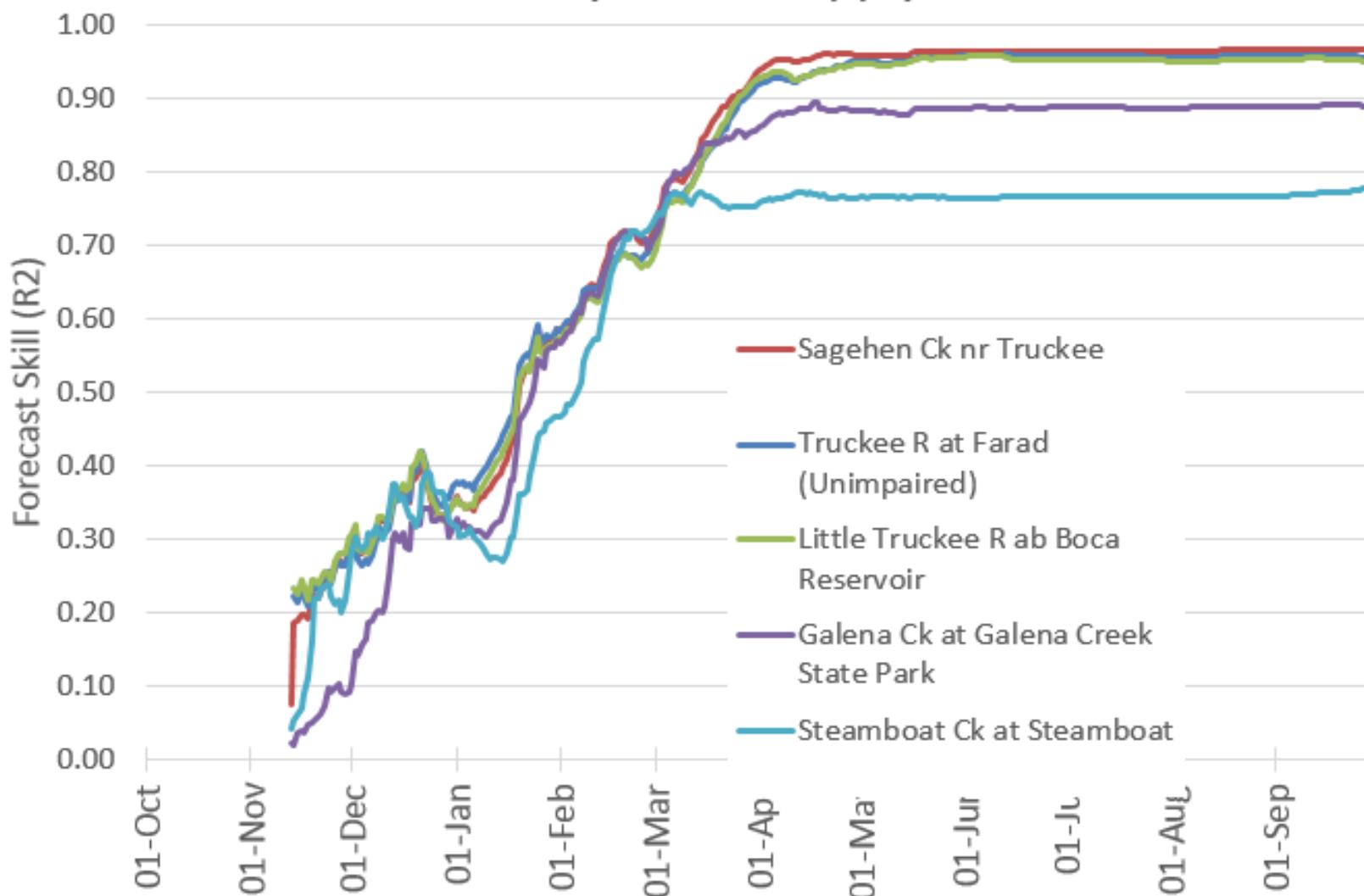




Humboldt River Daily Water Supply Forecast Skill



Truckee Basin Daily Water Supply Forecast Skill



Summary

- 2016 Snowpack is off to a great start
- El Niño pattern still not setting up across Western US.
- Similar El Niño years of 1983 and 1998 both ended up above normal, this year's snow is similar or better than 1998 in all basins but only the Upper Humboldt is on track to beat both years.
- January is key precip month to change the trajectory of the last 4 years
- It is unlikely one water year can replace drought deficits, it would take a year with 170%-230% of average precip based on the amount of precip missed in last four years.
- Streamflow forecasts (50% exceedence) are 85-125% of average.
- Forecast skill is still low at this time of year, so bounds on forecast (10% and 90% forecasts) cover wide range, comparable to historic range in flows.
- Due to basin hydrology and/or lack of adequate data some forecasts have greater skill than others, but all get better with time. Stay tuned...

Jeff.Anderson@nv.usda.gov

775-857-8500 x 152

