



United States Department of Agriculture

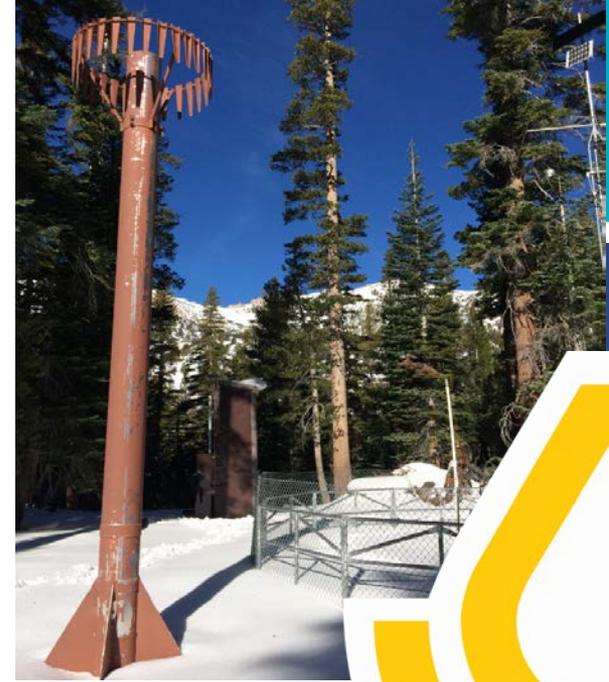


**WATER
OVER
ROADWAY**

Spring 2017 Snowpack Status and Streamflow Outlook for the Central Nevada

March 31, 2017

Central Nevada Regional
Water Authority Meeting




Natural
Resources
Conservation
Service

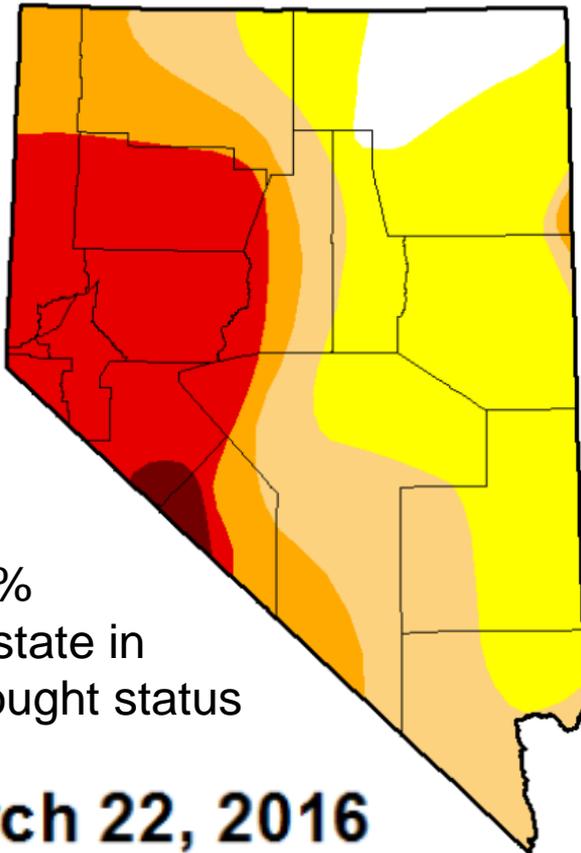
www.nv.nrcs.usda.gov/snow

Rhinehart Street (NV 795), Winnemucca, March 2017

Jeff Anderson
Nevada NRCSSnow Survey

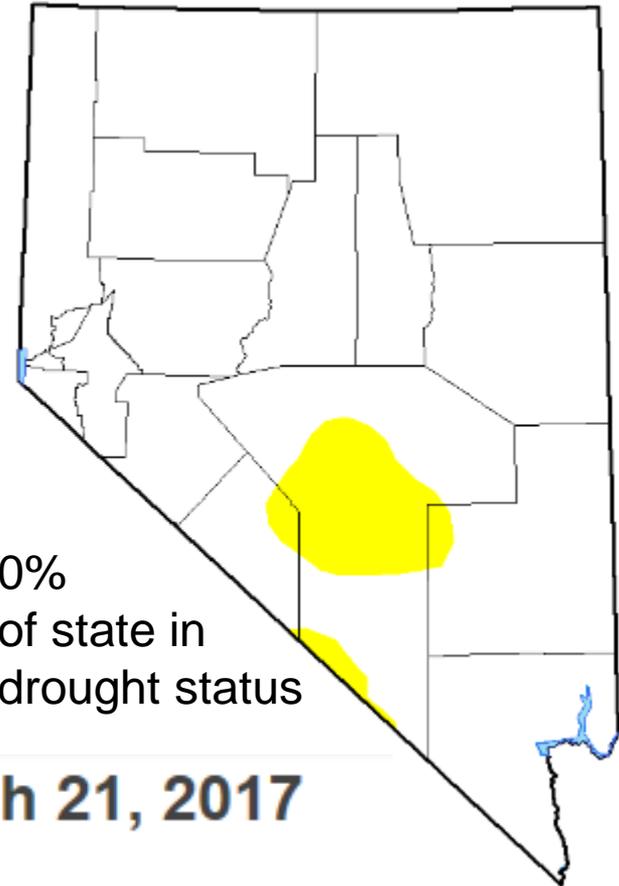
(775) 857-8500 x152
jeff.anderson@nv.usda.gov

U.S. Drought Monitor



60%
of state in
drought status

March 22, 2016



0%
of state in
drought status

March 21, 2017

Intensity:

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



Outline

- **Overview of NRCS Monitoring Network**
- **Precipitation and Snowpack Update**
- **Soil Moisture Status**
- **Current Streamflow Status**
- **April-July Summer Streamflow Forecasts**

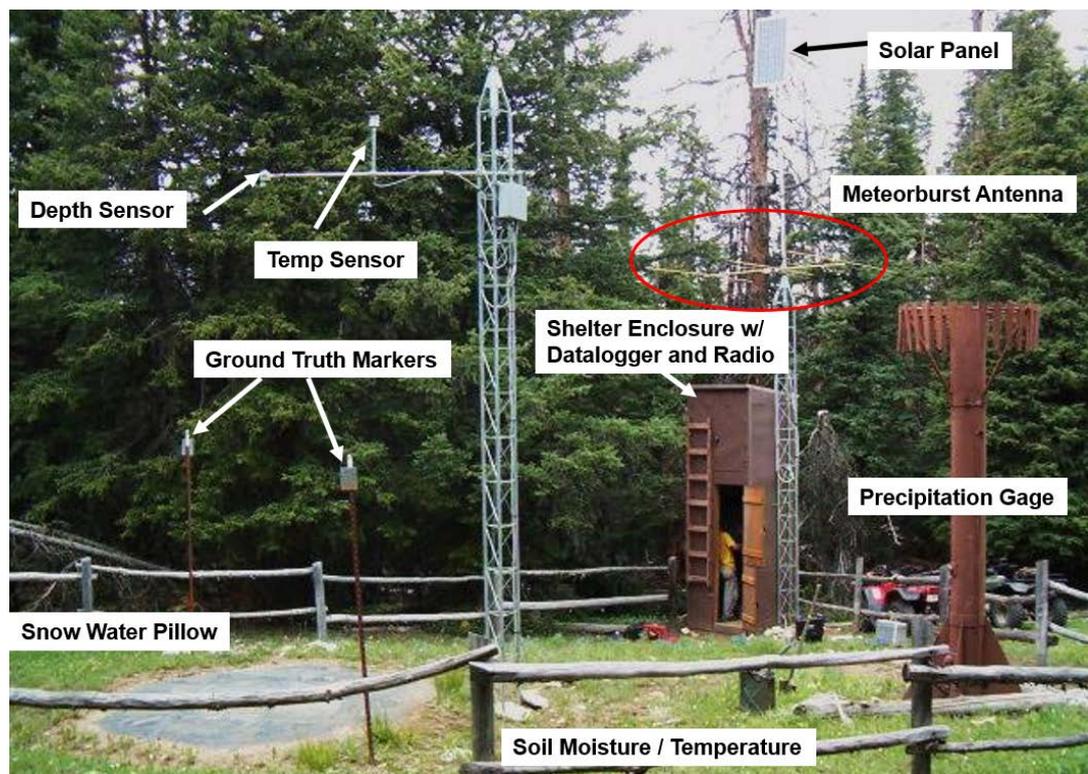


NRCS Monitoring Network

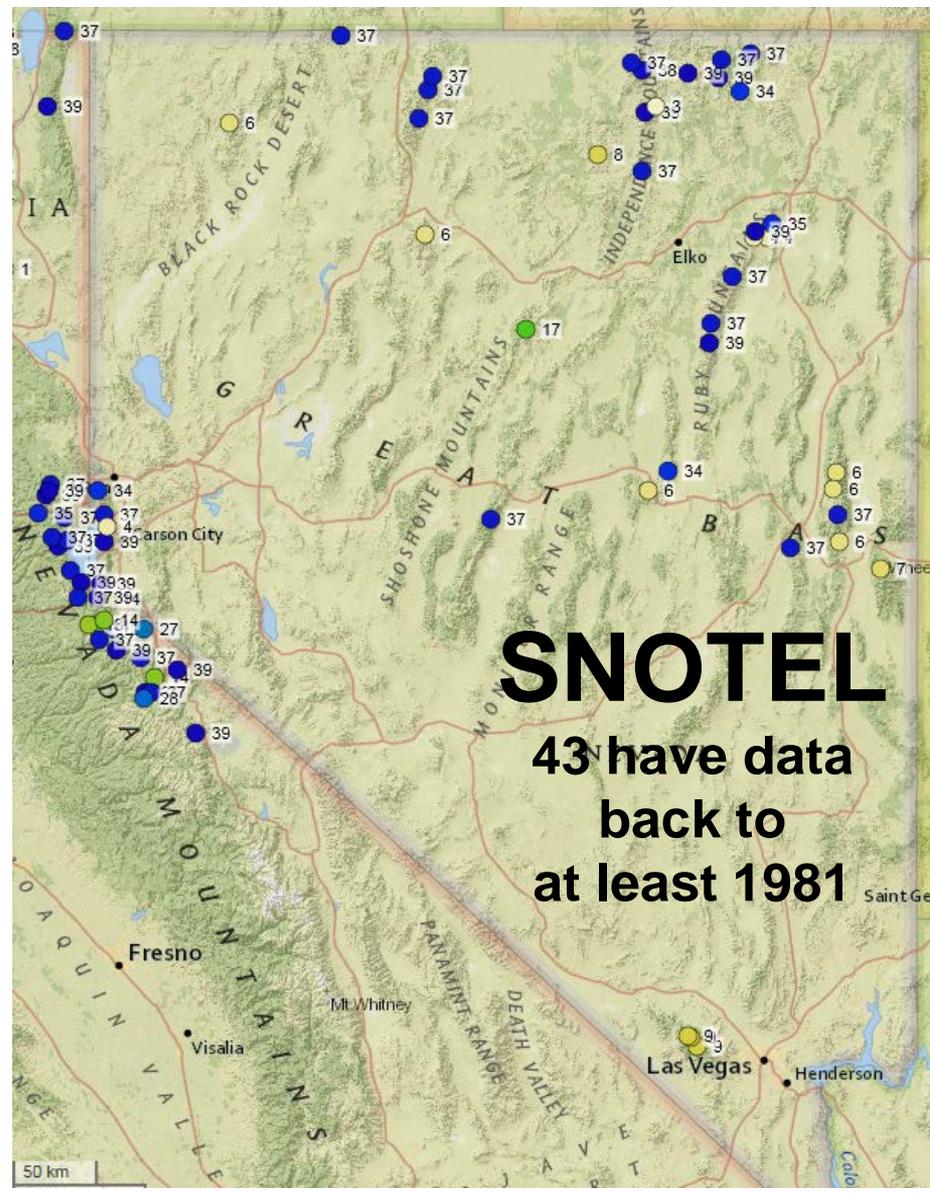
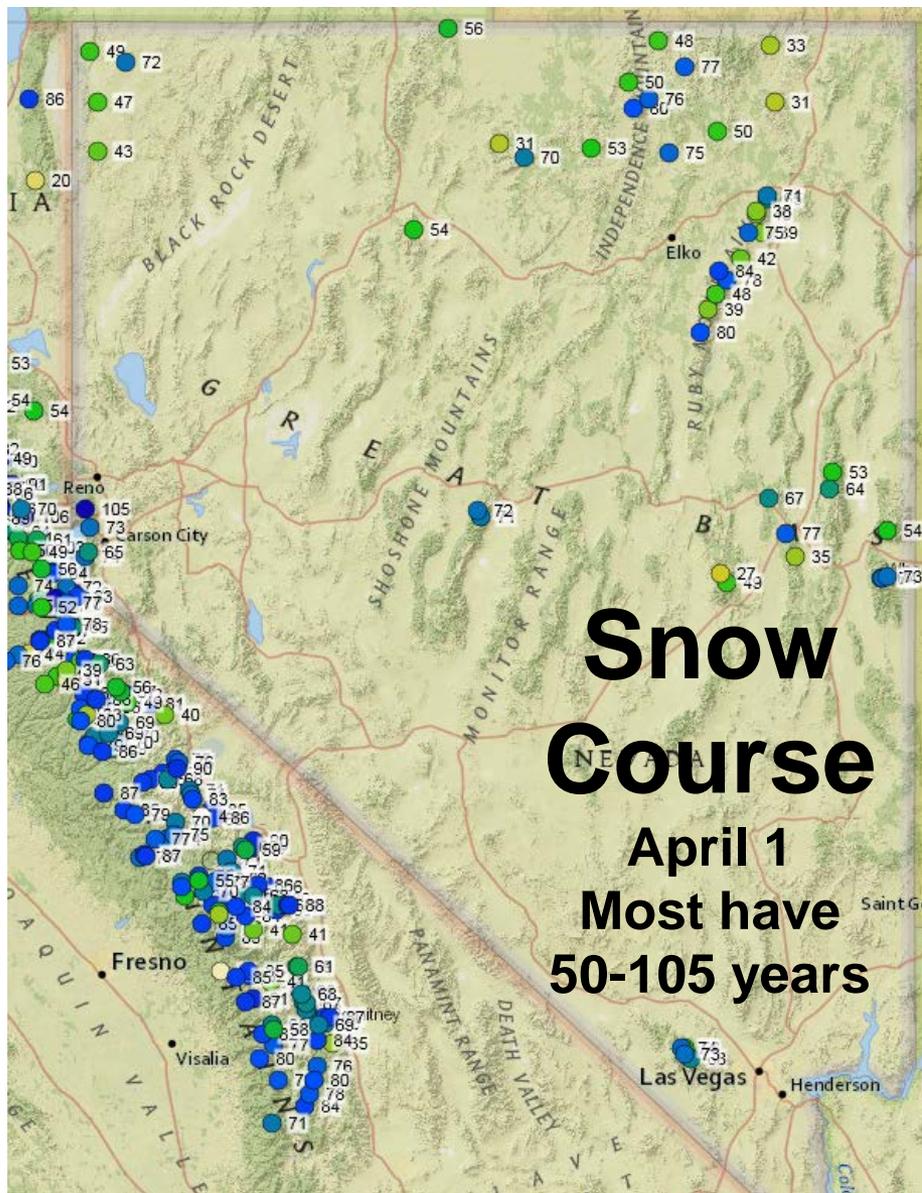
Snow Courses *snow tube transect*



SNOTEL Stations *automated weather station with snow pillow*



Network Distribution and Years of Data



SWE definition

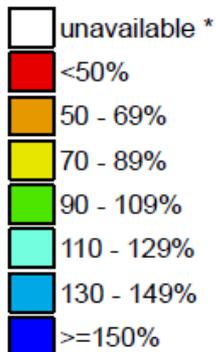
Snow Water Equivalent (**SWE**) is the amount of water contained within the snowpack. It can be thought of as the depth of water that would result if you melted the entire snowpack.



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

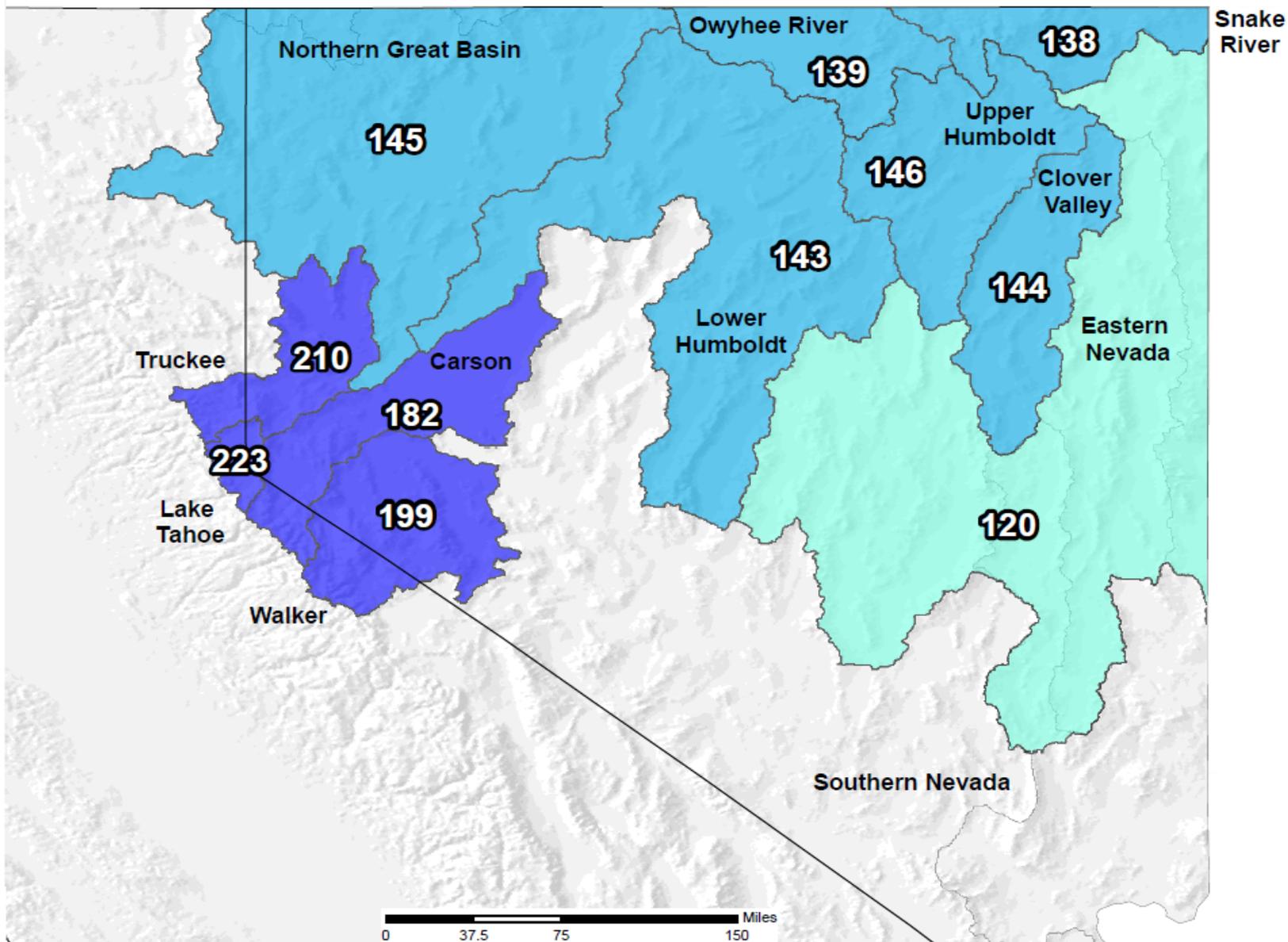
Mar 27, 2017

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



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

Provisional data subject to revision



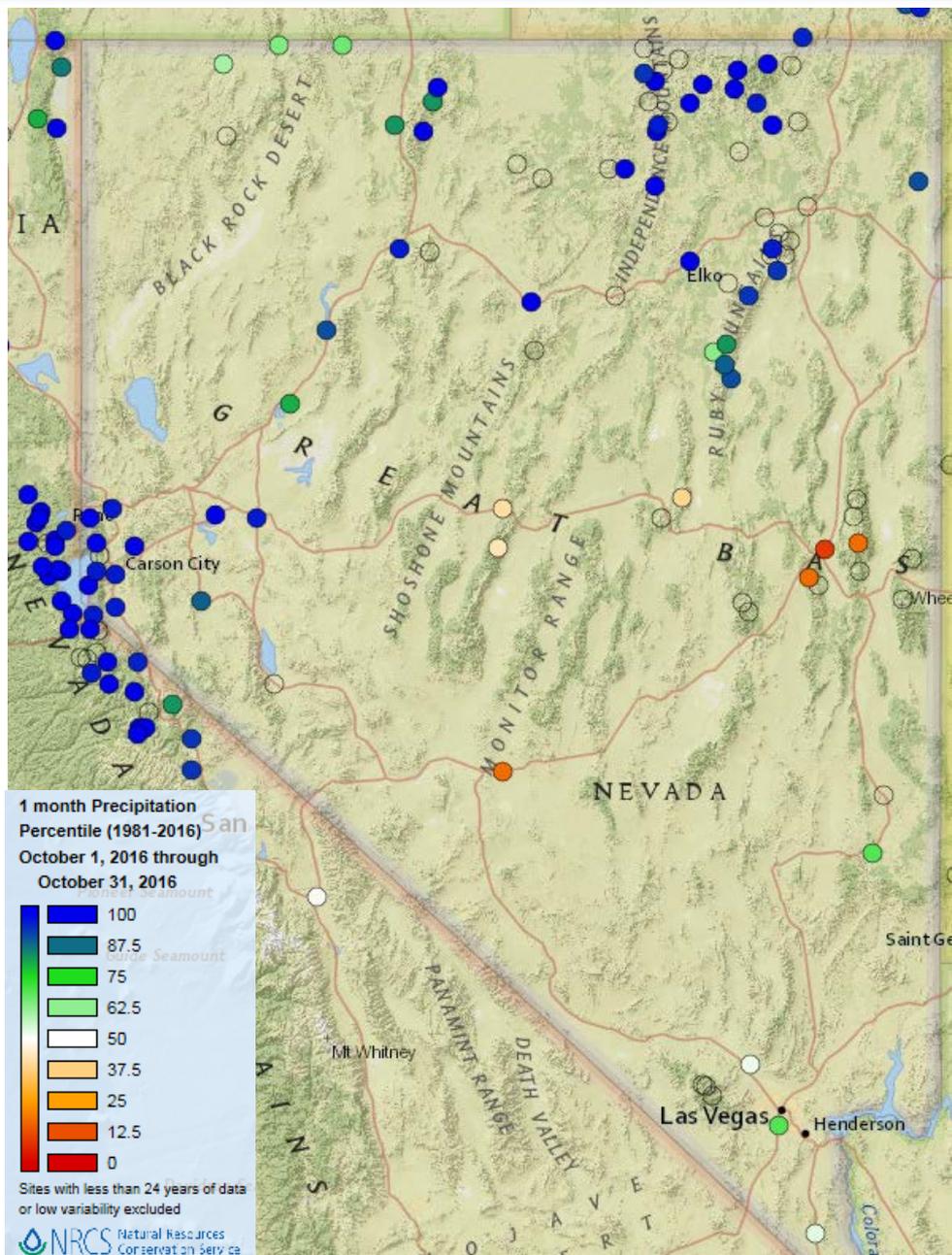
Record October

5 times average precipitation
at SNOTEL sites in Sierra

1.5 to 3 times average at many
sites in across northern NV

Exception...

60% in Eastern NV



State of Nevada & Eastern Sierra Precipitation

As of: March 28, 2017

Current % of Avg - 180 %

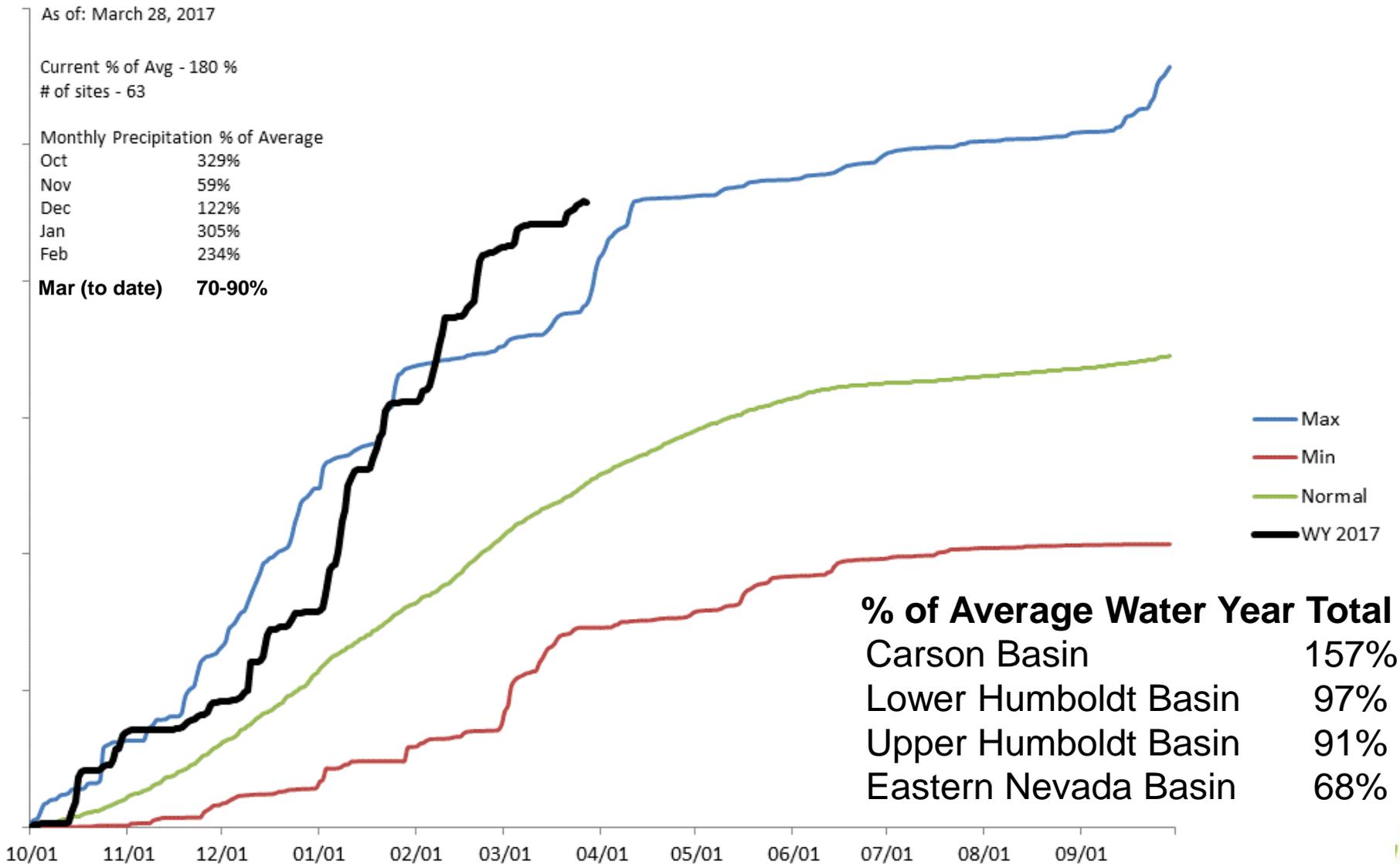
of sites - 63

Monthly Precipitation % of Average

Oct	329%
Nov	59%
Dec	122%
Jan	305%
Feb	234%

Mar (to date) 70-90%

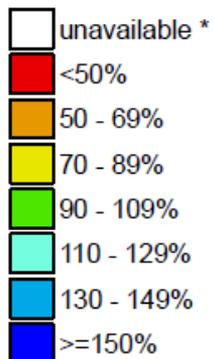
Basin Index



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

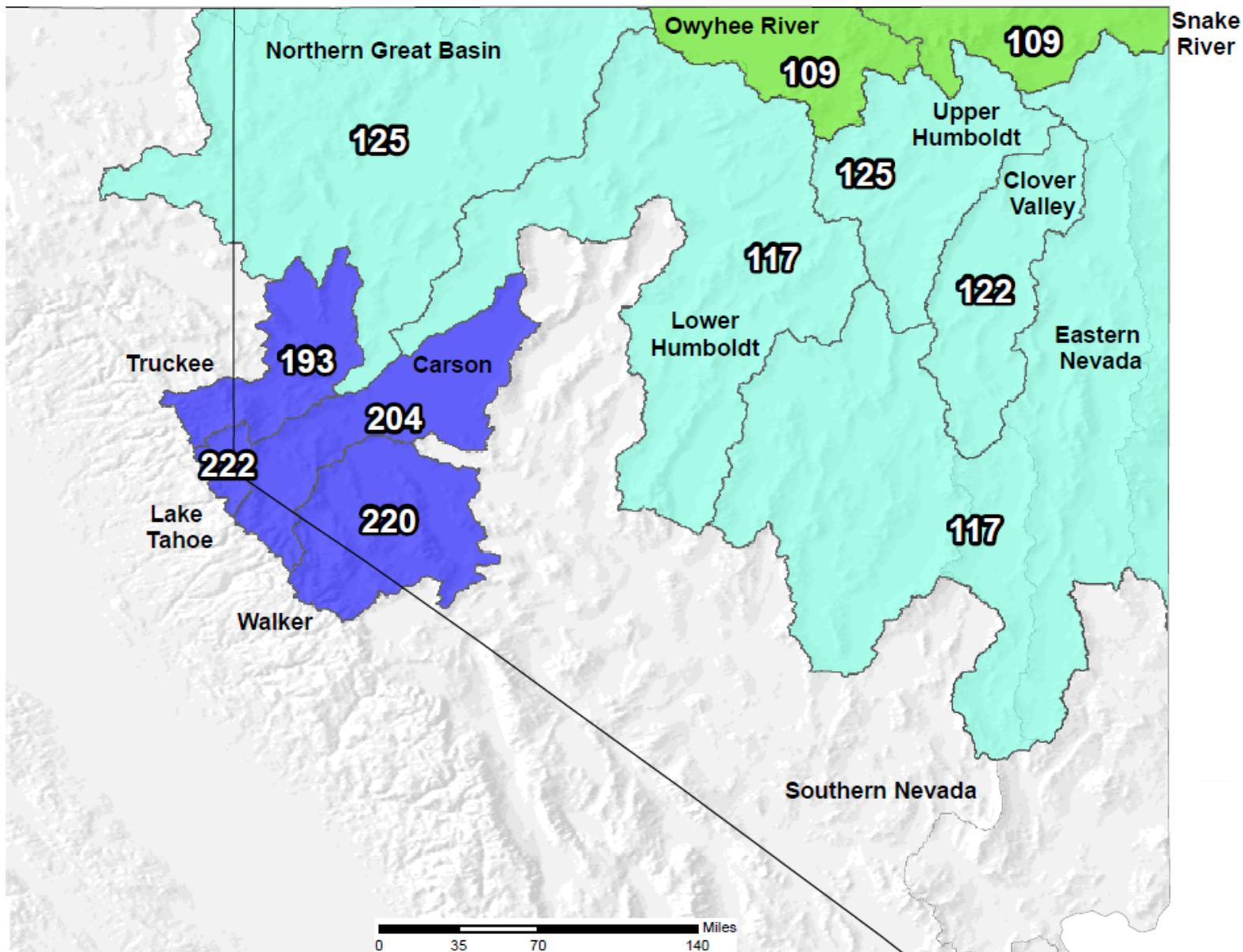
Mar 27, 2017

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

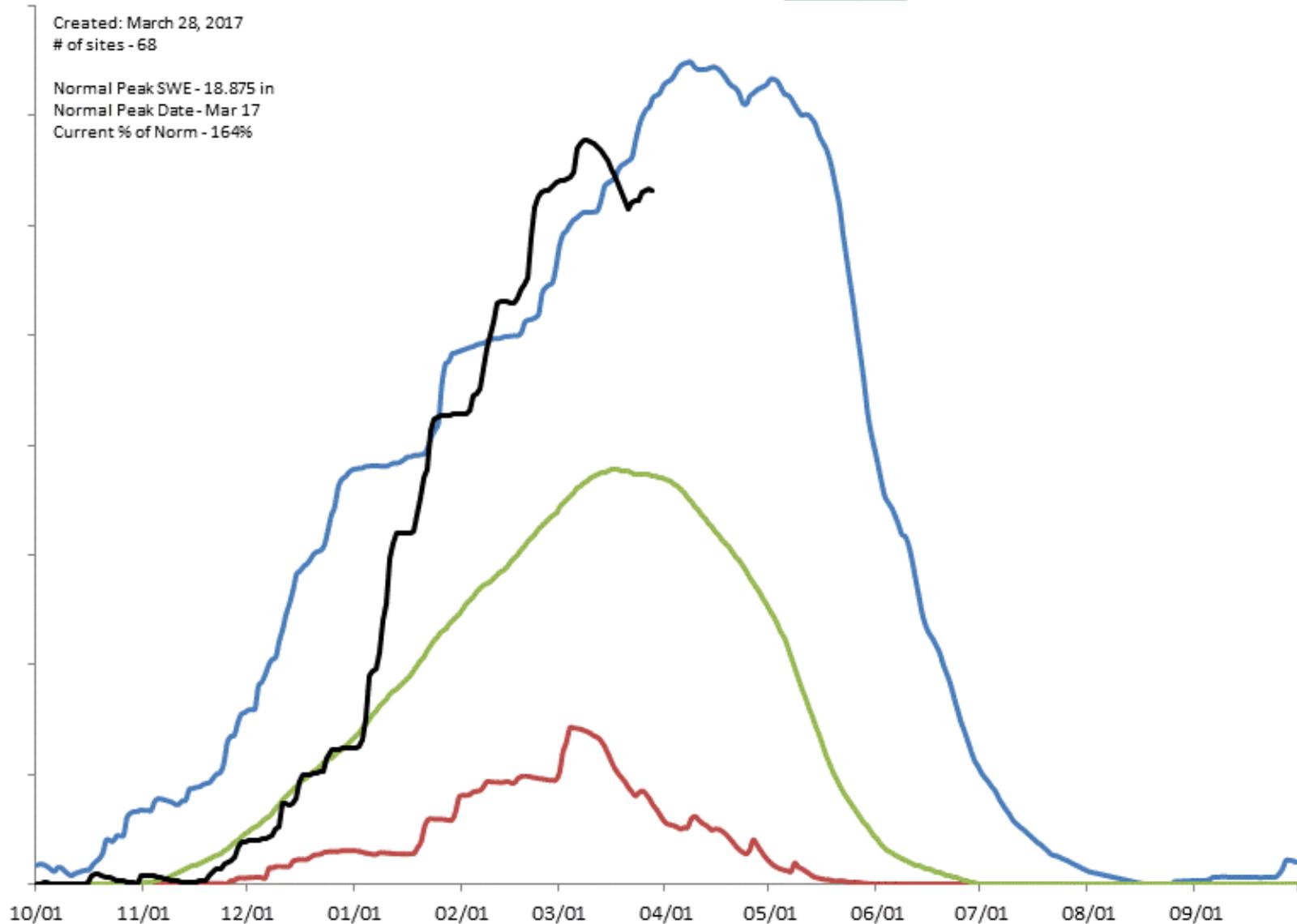


State of Nevada & Eastern Sierra - SWE Index



Created: March 28, 2017
 # of sites - 68
 Normal Peak SWE - 18.875 in
 Normal Peak Date - Mar 17
 Current % of Norm - 164%

Index of Snow Water Equivalent



- Max
- Min
- Normal
- WY 2017

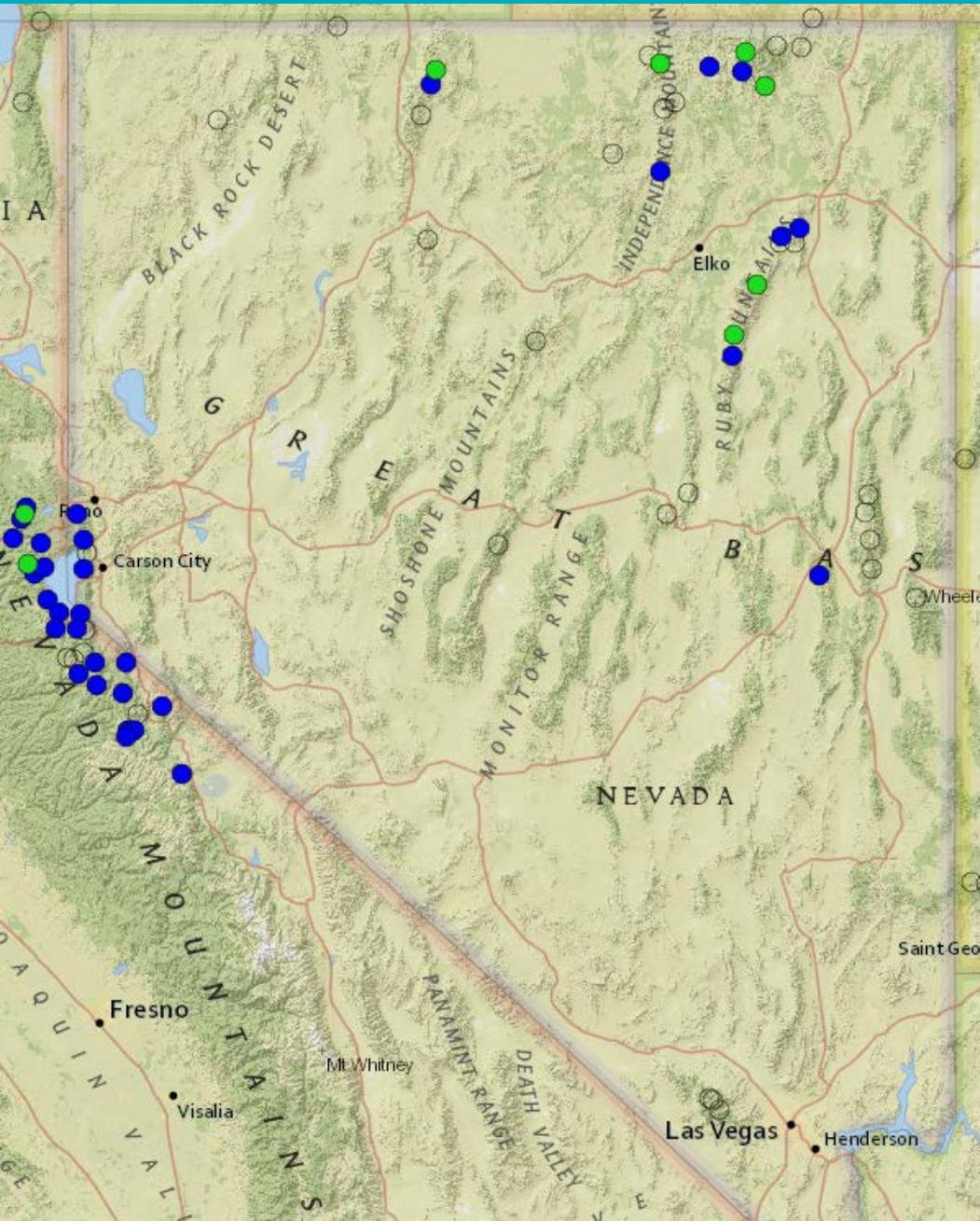
Wide Range of Conditions

**Mt Rose
Sierra Nevada
7 sections
of snow tubes
210 inches**



**Baker Creek
Eastern NV
2 sections
of snow tubes
60 inches**





Biggest January in SNOTEL Era (1981-2017)

Snow Water Equivalent
Delta
Records (1981-2010)
Beginning of February, 2017
minus
Beginning of January, 2017

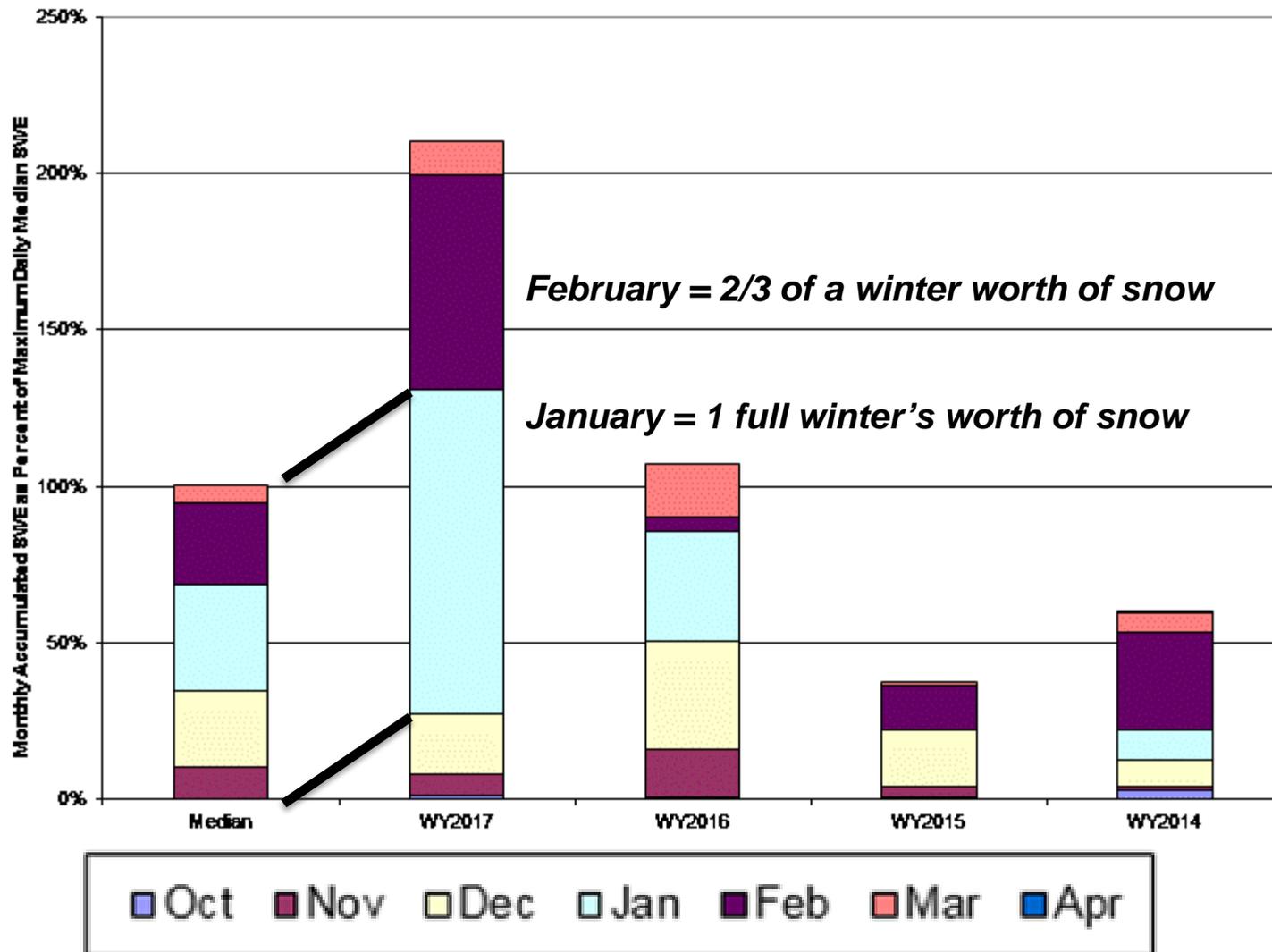
- Highest
- 2nd Highest
- 2nd Lowest
- Lowest

Sites with less than 20 years of data
or low variability excluded



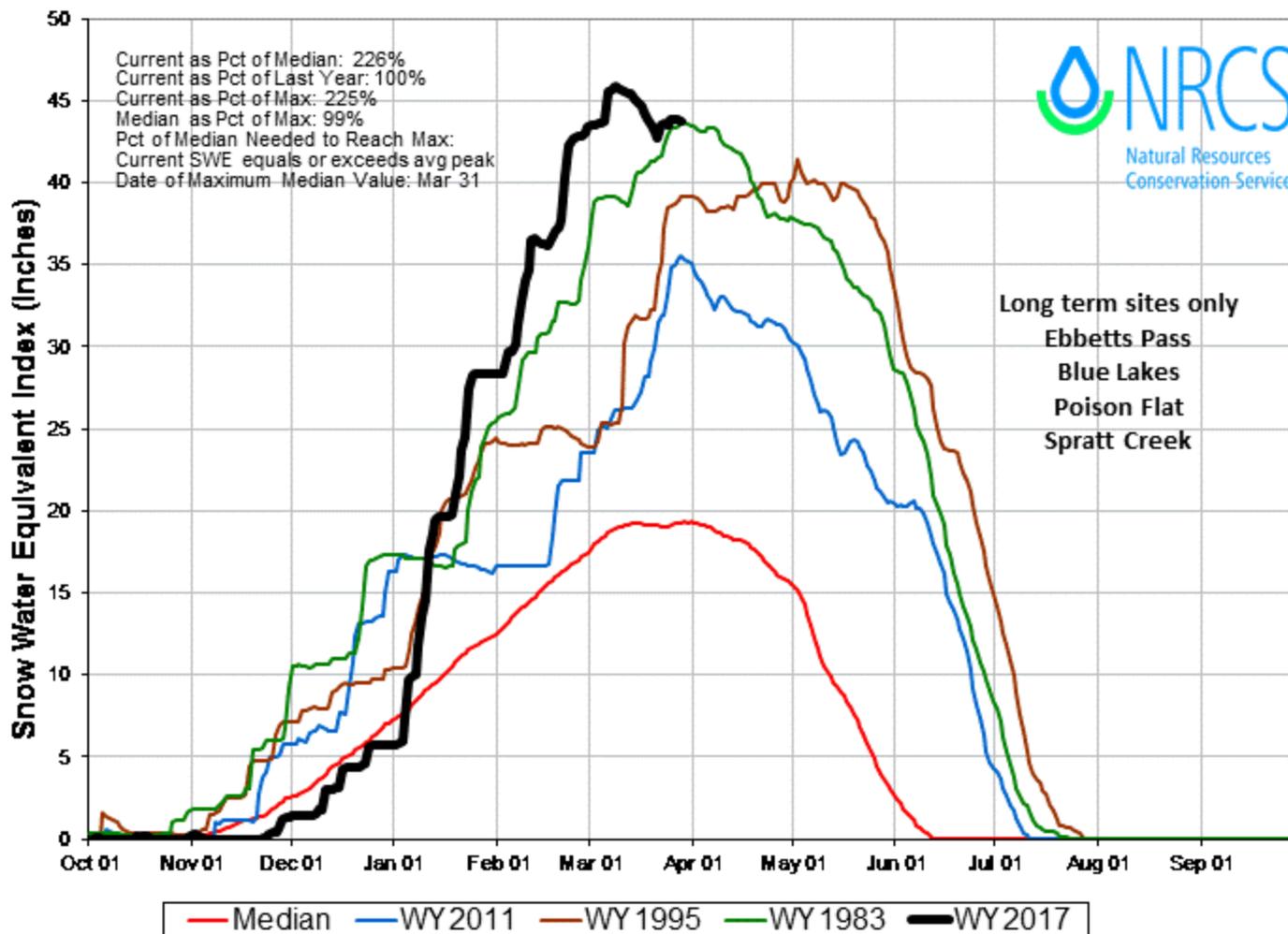
Carson River Monthly Snowpack Summary

Updated March 28, 2017

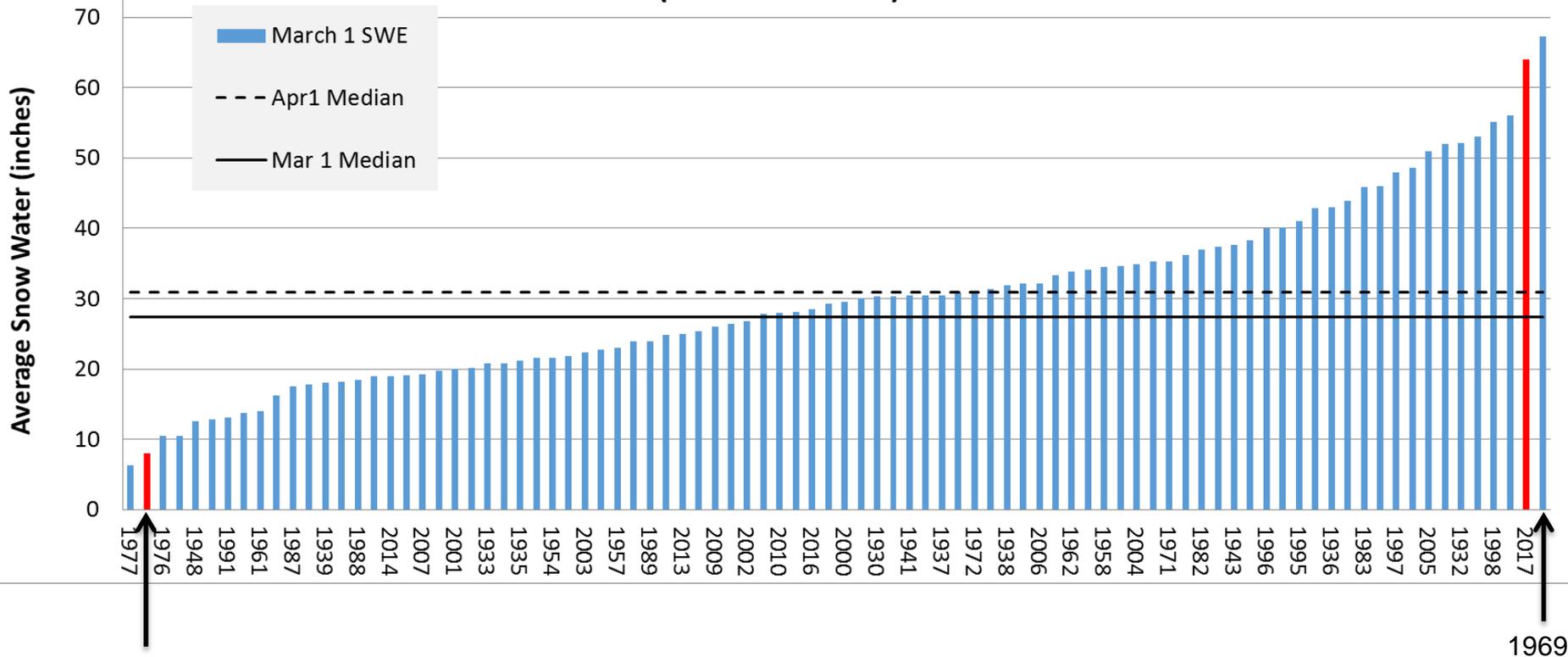


CARSON RIVER BASIN Time Series Snowpack Summary

Based on Provisional SNOTEL data as of Mar 28, 2017



Carson Pass Upper Snowcourse - Sorted by March 1 SWE (POR 1930-2017)

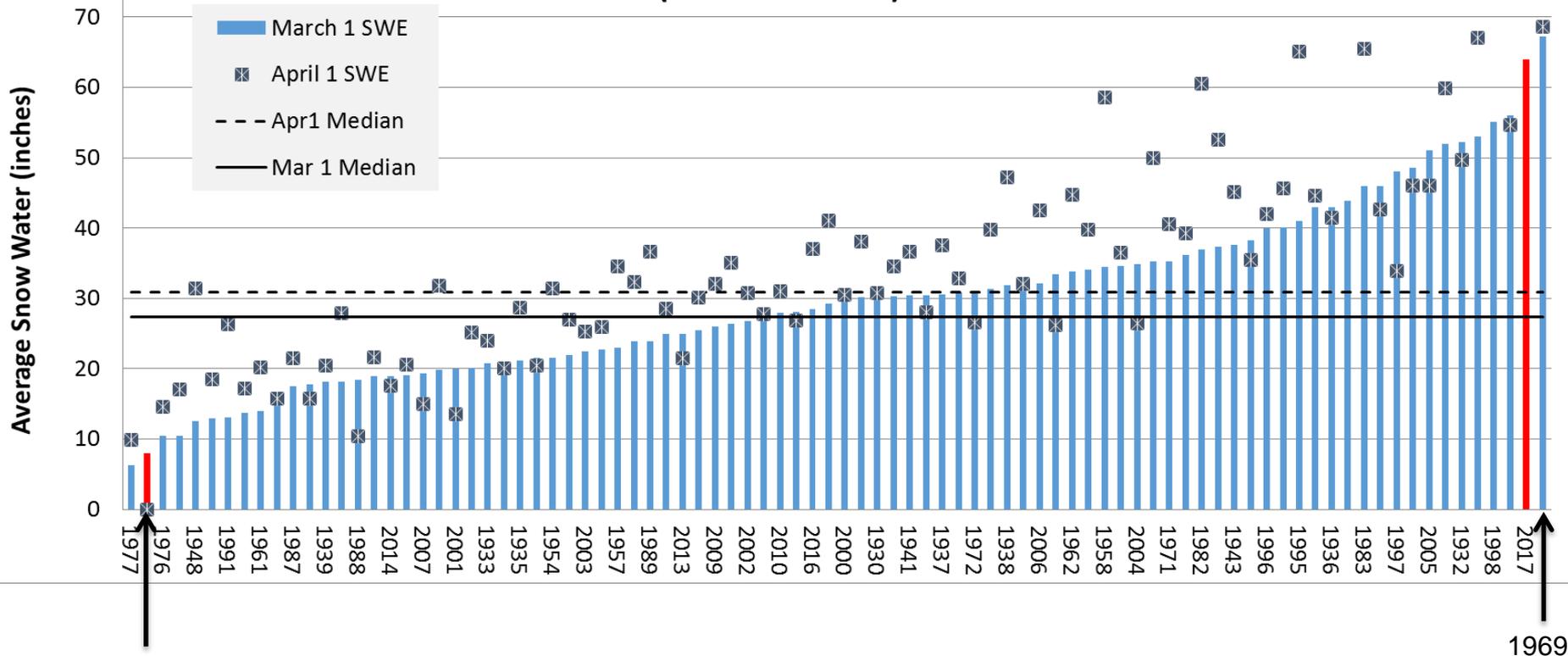


2th highest since 1930

Year	SWE
1969	67.3
2017	64.0



Carson Pass Upper Snowcourse - Sorted by March 1 SWE (POR 1930-2017)

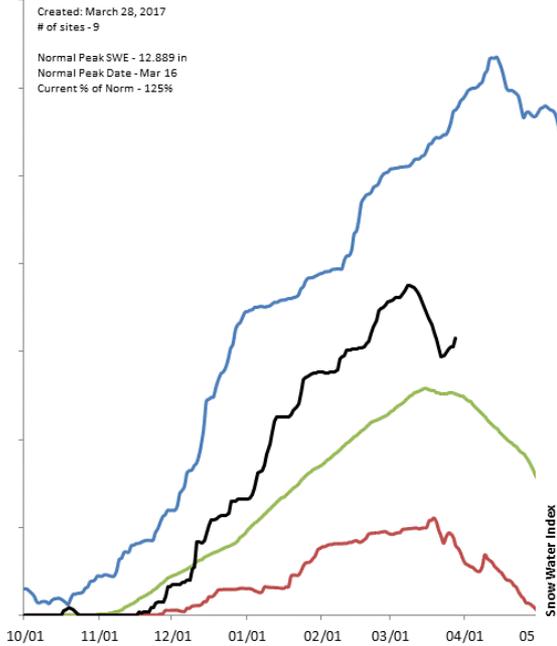


**Already 3rd highest
compared to April 1**

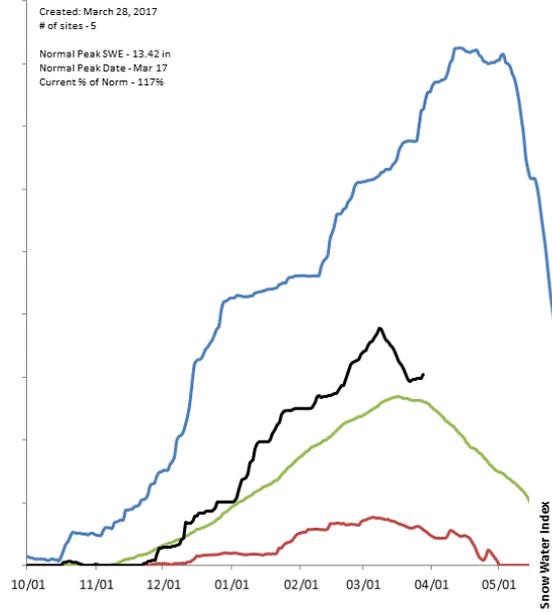
Year	SWE
Apr 1 1969	68.6
Apr 1 1952	67.0
Mar 1 2017	64.0



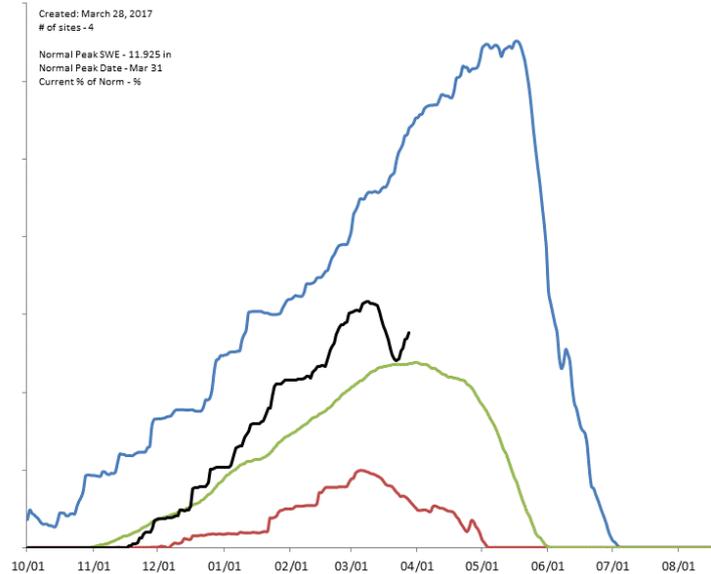
Upper Humboldt River Basin - SWE Index



Lower Humboldt River Basin - SWE Index



Eastern Nevada - SWE Index

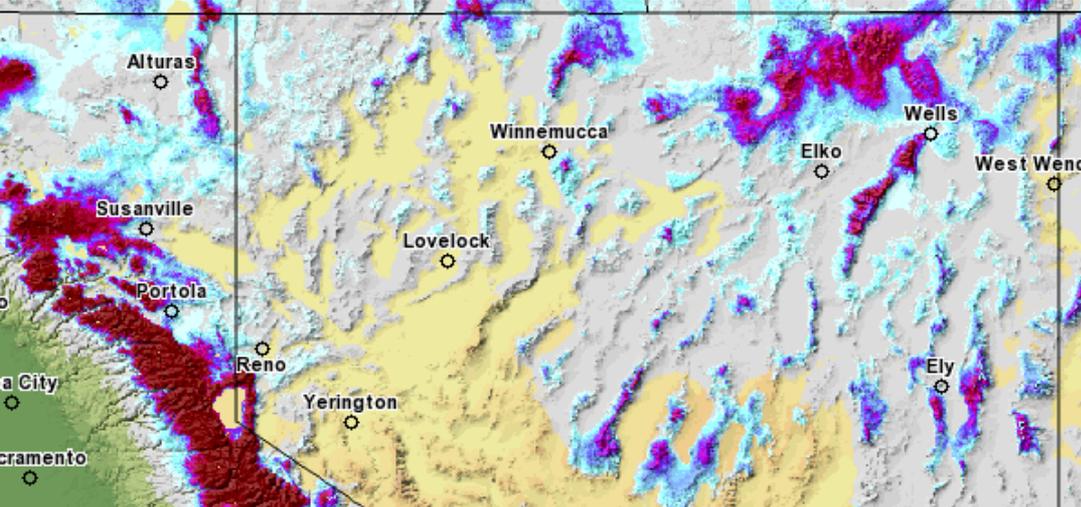


- Max
- Min
- Normal
- WY 2017

Peak as Percent of Normal Peak
 Lower Humboldt 140%
 Upper Humboldt 145%
 Eastern Nevada 135%

Modeled Snow Water Equivalent for 2017 March 1, 6:00 UTC

540.2 mi

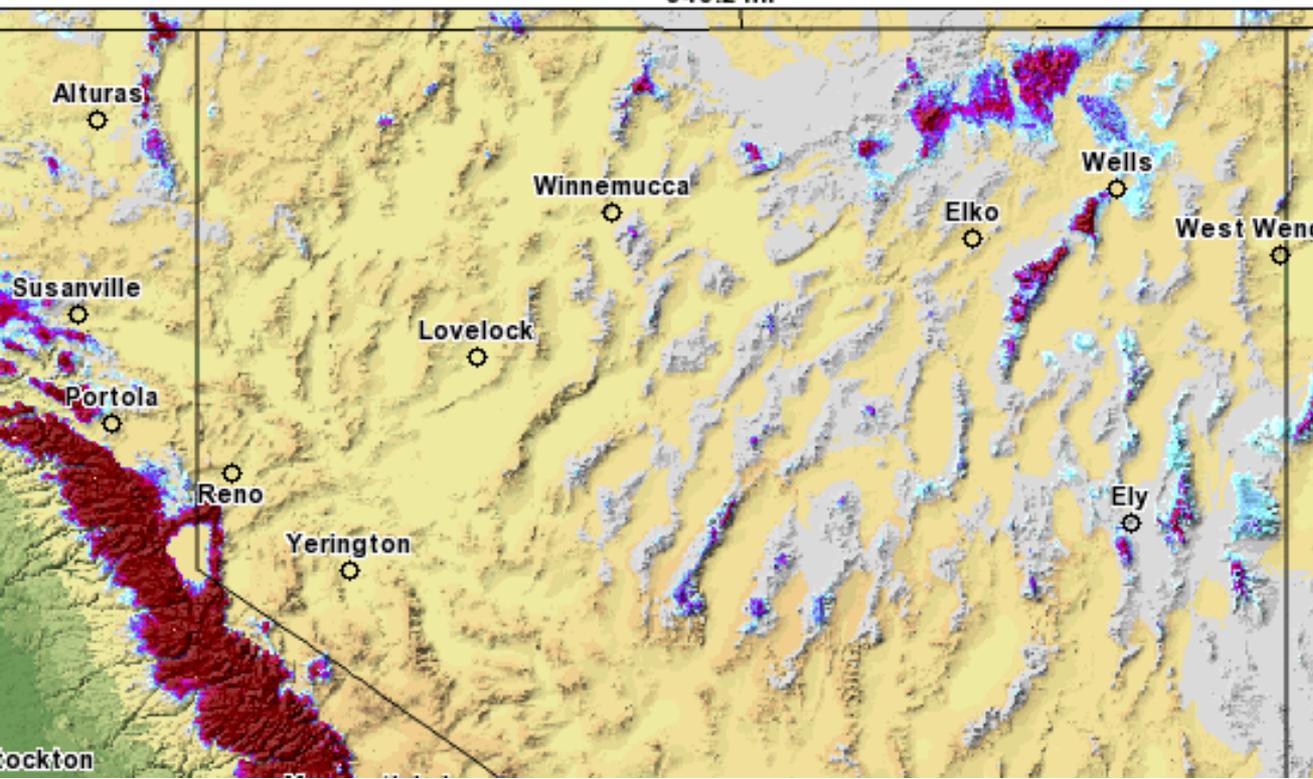


National Operational Hydrologic Remote Sensing Center

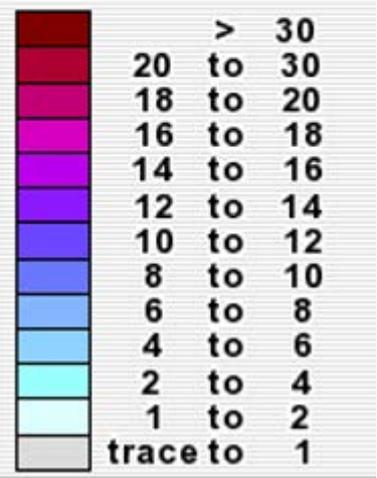
Interactive Snow Information

Modeled Snow Water Equivalent for 2017 March 28, 6:00 UTC

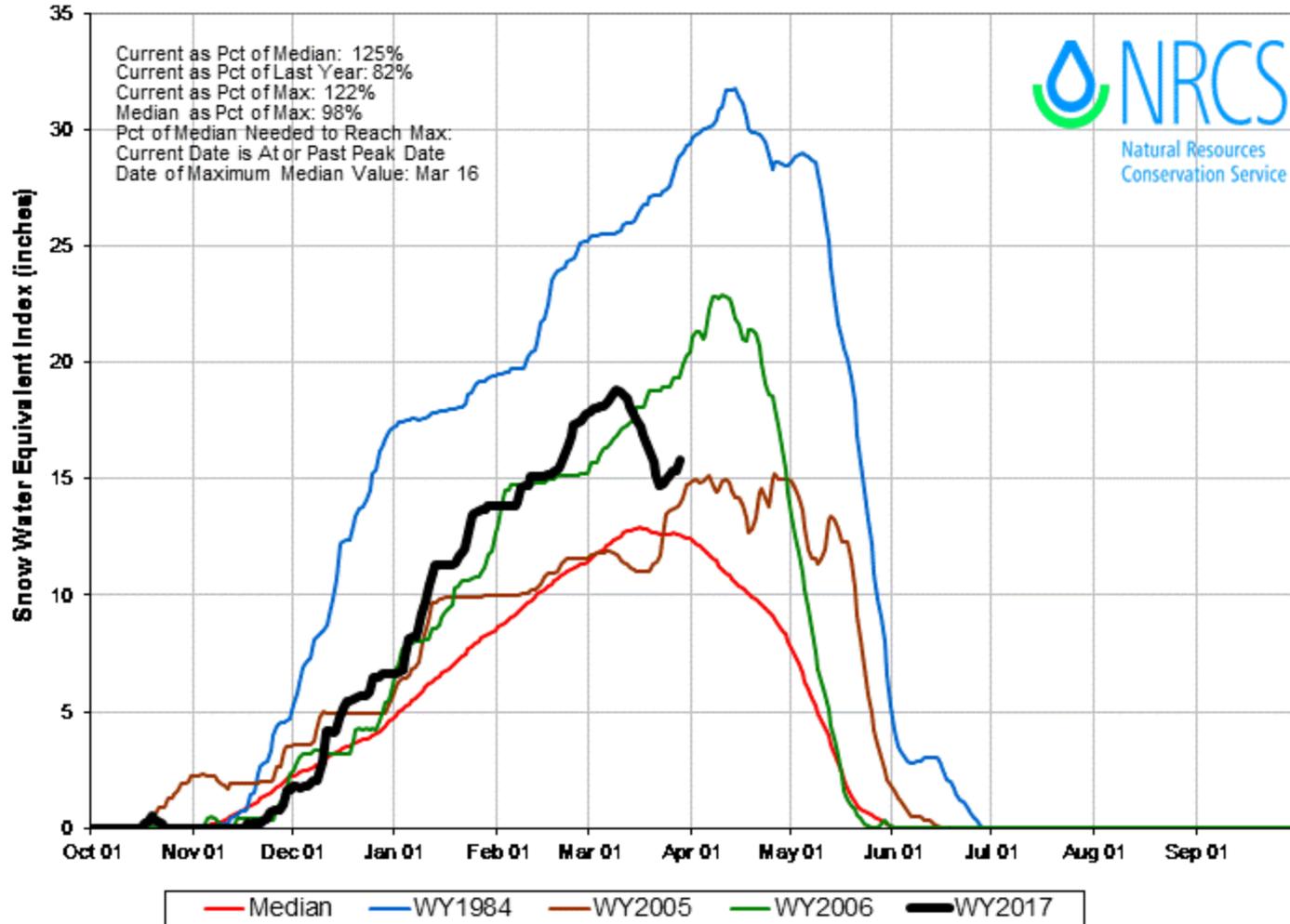
540.2 mi



Inches of water equivalent

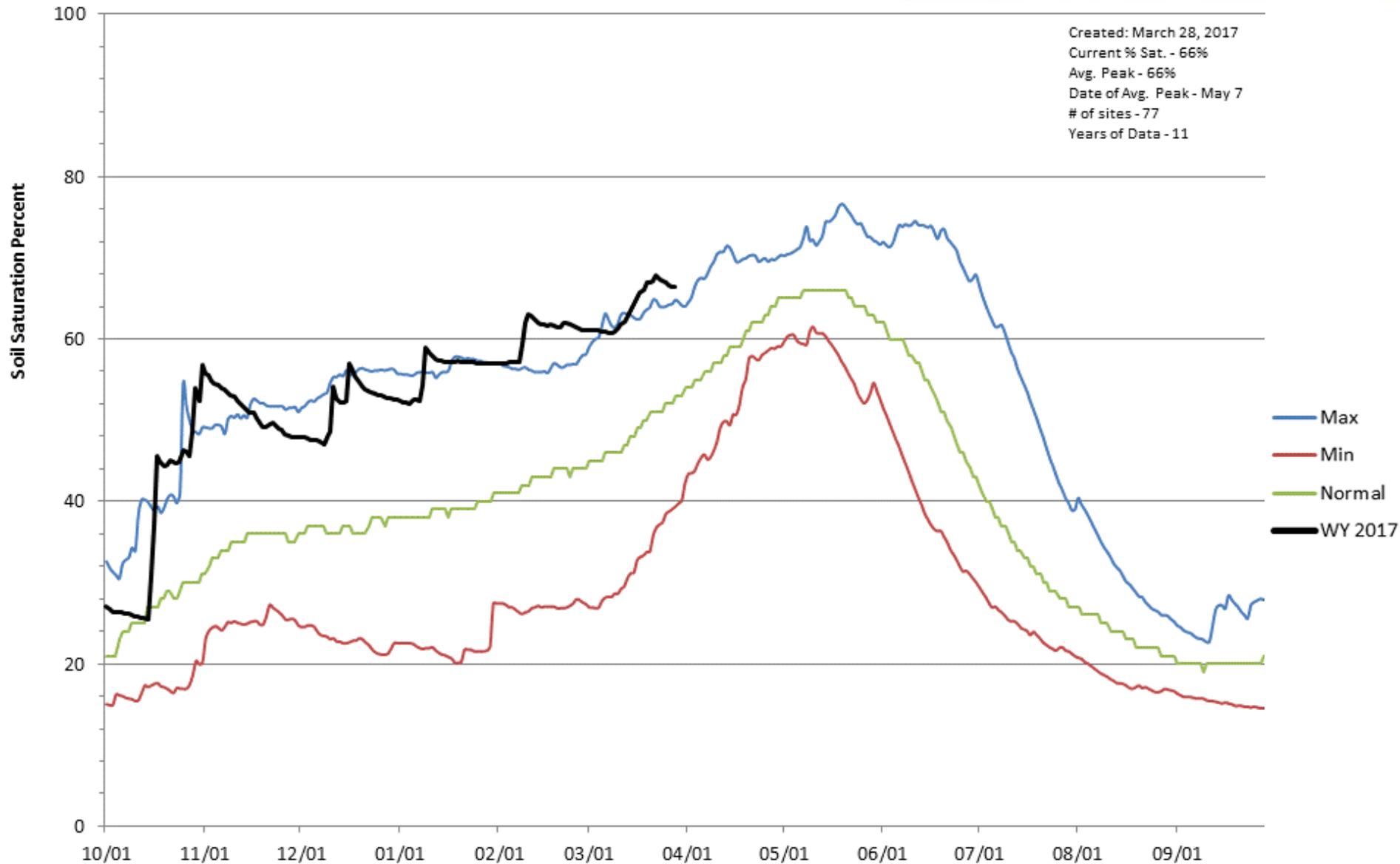


UPPER HUMBOLDT RIVER BASIN Time Series Snowpack Summary Based on Provisional SNOTEL data as of Mar 28, 2017



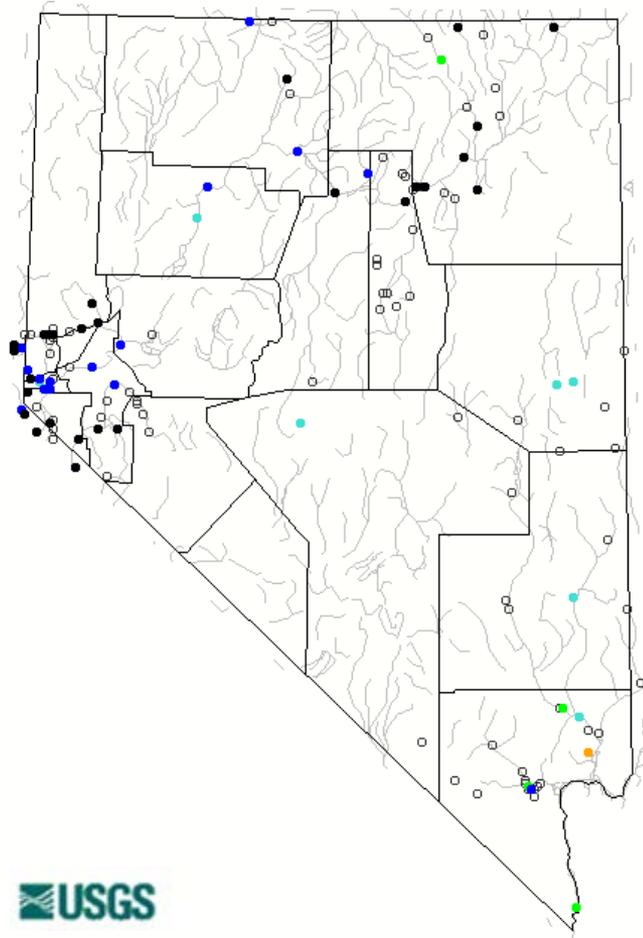
State of Nevada & Eastern Sierra - Soil Saturation

Created: March 28, 2017
 Current % Sat. - 66%
 Avg. Peak - 66%
 Date of Avg. Peak - May 7
 # of sites - 77
 Years of Data - 11



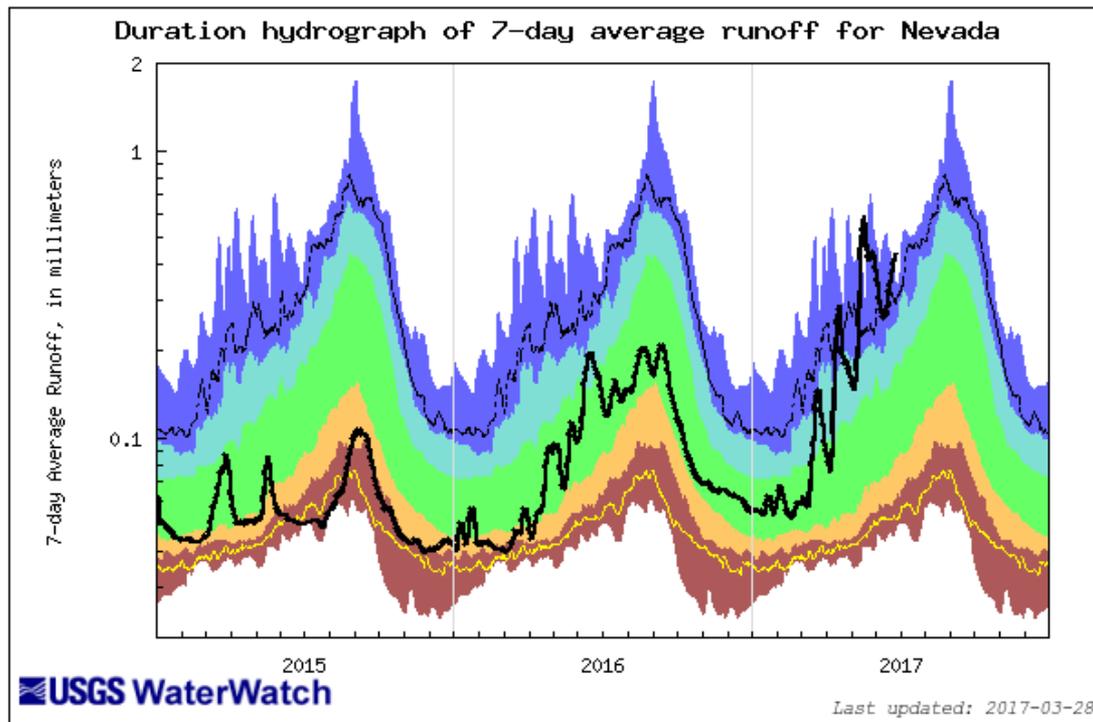
Map of 7-day average streamflow compared to historical streamflow for the day of the year (Nevada)

Monday, March 27, 2017



Explanation - Percentile classes

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



Explanation - Percentile classes

	-----				-----		-----
lowest-10th percentile	5	10-24	25-75	76-90	95	90th percentile -highest	Runoff
	Much below Normal	Below normal	Normal	Above normal	Much above normal		



	Water Year to Date	Average for Entire WY	Percent
Truckee @ Farad	476 kaf	411	116%
Carson @ Carson	325	293	111%
West Walker @ Coleville	64	204	31%
East Walker @ Bridgeport	71	114	62%
Humboldt @ Imlay	114	256	44%

Reno National Weather Service



 **USGS Nevada** @USGS_Nevada · Feb 14
No evidence of flow at 10326825 MILL CK NR BATTLE MOUNTAIN
waterdata.usgs.gov/nv/nwis/invent...



 **USGS Nevada** @USGS_Nevada · 11h
#HumboldtRiver Battle Mountain sustained flood damage today. Will repair tomorrow morning.
waterdata.usgs.gov/nv/nwis/uv/?si...



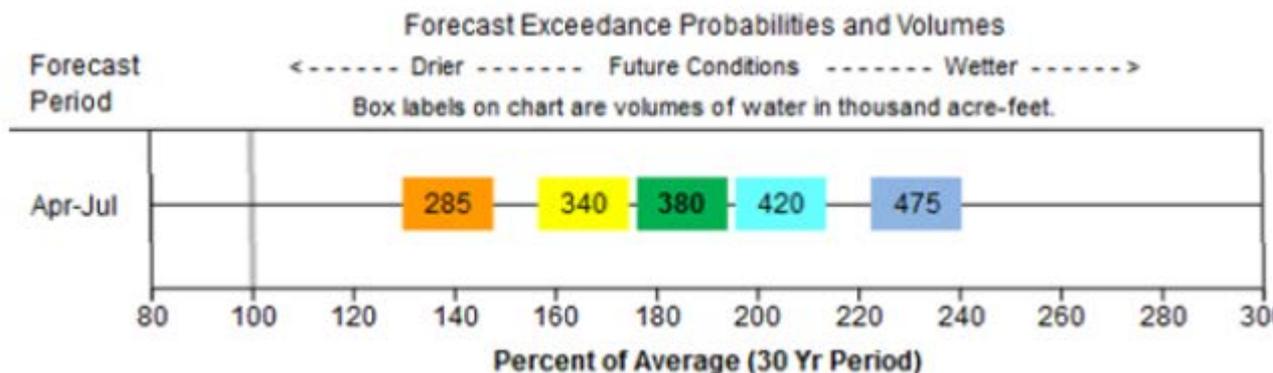
 **USGS Nevada** @USGS_Nevada · Feb 15
Very high wading measurement yesterday at 10321950 MAGGIE CK AT MAGGIE CR CYN NR CARLIN
waterdata.usgs.gov/nv/nwis/uv/?si...



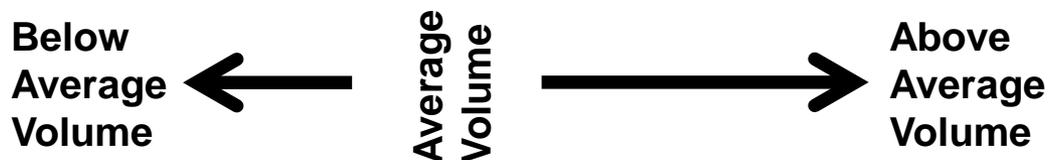
 **USGS Nevada** @USGS_Nevada · Feb 15
View from a hydrographer's perspective at 10326825 MILL CK NR BATTLE MOUNTAIN
waterdata.usgs.gov/nv/nwis/inven...



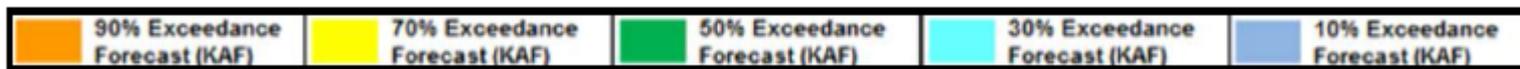
New Forecast Graphic



Numbers inside boxes are KAF for 5 exceedances



Each colored box represents different exceedance forecasts



← ----- Drier ----- Future Conditions ----- Wetter ----- →

State of Nevada Summary

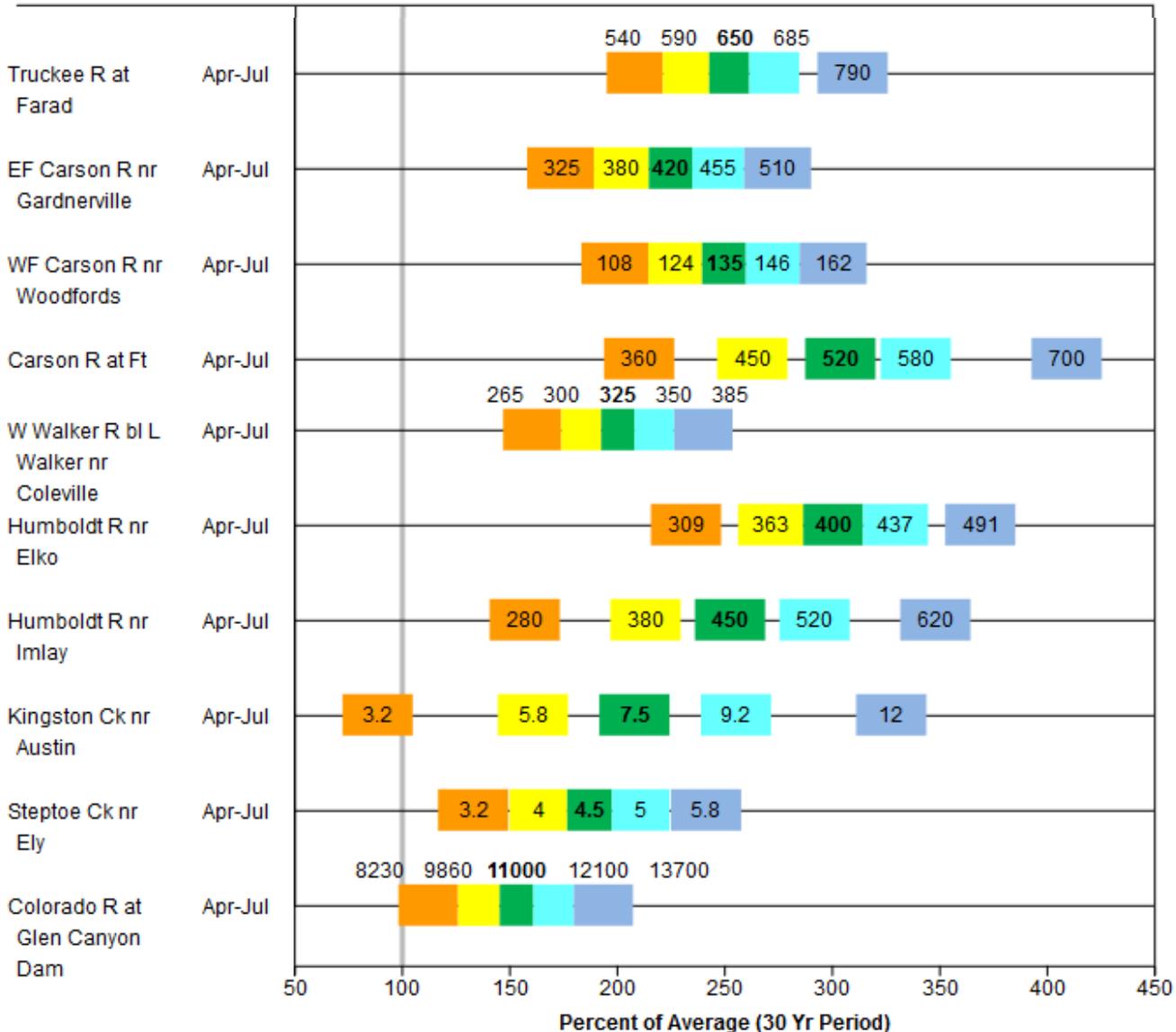
Water Supply Forecasts

March 1, 2017

Forecast Exceedance Probabilities and Volumes

<----- Drier ----- Future Conditions ----- Wetter ----->

Box labels on chart are volumes of water in thousand acre-feet.



March 1, 2017 NRCS Forecasts vs. 2011, 1983 & Record Volumes

Forecast Point	Forecast Period	March 1, 2017 Forecast Exceedances - KAF					2011 KAF	1983 KAF	Record	Record Year
		←---drier future-----wetter future--→								
		90%	70%	50%	30%	10%				
Truckee R at Farad (Adj)	Mar-Jul	619	697	750	803	881	568	760	760	1983
EF Carson R nr Gardnerville	Mar-Jul	356	412	450	488	544	368	478	515	1890
WF Carson R at Woodfords	Mar-Jul	118	134	145	156	172	95	136	166	1907
Carson R nr Carson City	Mar-Jul	410	519	600	687	826	452	589	589	1983
Carson R nr Fort Churchill	Mar-Jul	393	509	600	701	869	441	576	576	1983
E Walker R nr Bridgeport	Mar-Aug	107	133	150	167	193	135	237	229	1969
W Walker R nr Coleville	Mar-Jul	285	320	345	380	405	290	302	395	1907
Humboldt R nr Elko	Mar-Jul	410	465	500	535	590	294	406	687	1984
Humboldt R nr Comus (Winnemucca)	Mar-Jul	523	604	660	716	797	340	939	1234	1984
Humboldt R nr Imlay	Mar-Jul	418	526	600	674	782	236	756	1212	1984

This table shows this month's 90%, 70%, 50%, 30%, and 10% exceedance forecasts vs 1983, 2011 and record year volumes. Volumes highlighted in yellow are greater than 2011, volumes highlighted in light red are greater than 1983, and volumes highlighted in dark red set a new record.

>2011

>1983

New
Record



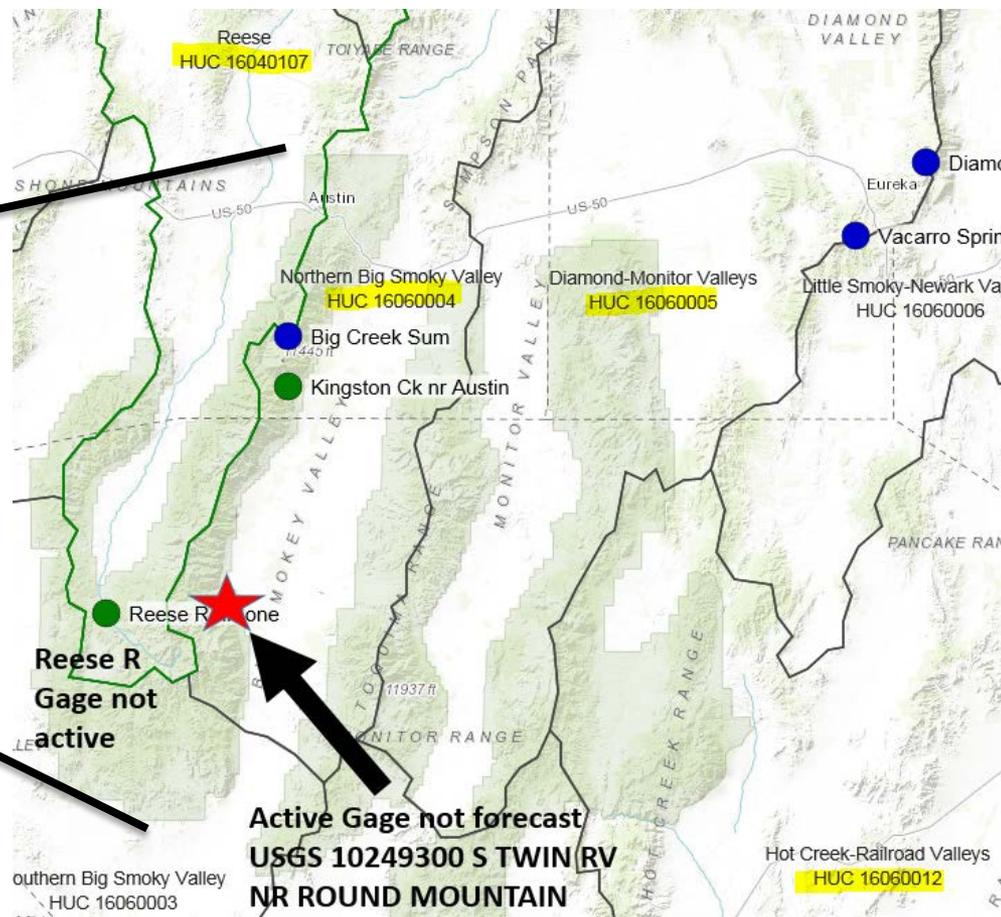
Chris & Tim's Rough Sketch on Timing the Highest Risks of Snowmelt Flooding

	March	April	May	June	July	August
Walker River Basin	Yellow	Yellow	Red	Red	Red	Yellow
Carson River Basin	Yellow	Yellow	Red	Red	Orange	Green
Truckee River Basin	Green	Yellow	Orange	Orange	Yellow	Green
Tahoe Basin Creeks/Streams	Green	Yellow	Red	Orange	Orange	Green
NE California Basins	Yellow	Orange	Orange	Yellow	Green	Green
E Sierra Creeks/Streams	Green	Yellow	Red	Red	Orange	Green
Humboldt River Basin	Orange	Orange	Red	Orange	Yellow	Green
What Does This Mean?	No worries	Low level of freakoutness	Moderate freakoutness	High freakoutness	High freakoutness	End of this

Reno National Weather Service
 Forecasting for the Sierra and western Nevada since 1905



May 2017 – NRCS will discuss possible new SNOTELs with USFS H-T with Central Nevada as main area of interest



Key Points:

- Drought status is over.
- Precipitation already near to above average water year totals in Sierra and Humboldt basins.
- March 1 snowpack was historic in Sierra, statewide snowpack peaked above normal amounts.
- Soil moisture is high, runoff will continue to be efficient.
- March through July streamflow volumes in Carson basin could break records.
- Statewide streamflow forecasts are above average.
- Problem is not a lack of water, but dealing with too much water.
- All reservoirs should fill, carryover storage for 2018 should also be very good due to high base flows late into summer.
- For spring flooding info contact National Weather Service



Snow Survey

- [-] Snow Survey Products
- [-] Water Supply Products

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Snow Survey

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.

USDA United States Department of Agriculture
Natural Resources Conservation Service
Nevada Water Supply Outlook Report
March 1, 2017



Winter Extremes - Two Years Apart

On February 24, 2017 the NRCS measured 20 inches (21 feet) of snow depth and 47.5 inches of water content (19 inches) of snow on the ground. This measurement sets a new March 1 record based on data files for 1953. The measurement crushed the old record from 2007 which had 5.6 inches less water content. This month's measurement was the sixth highest ever compared to all March 1 measurements from 1953 to 2016. March 1 snowpack in the Sierra Nevada is expected to be 10-15% below average this year and will be below last month's. There is a high potential for snowmelt runoff in 2017 when the snow on the high end of the Sierra Nevada is expected to melt only a half of the snow depth and 2.5 inches of water content. Snowpack across the entire Sierra Nevada from Lake Tahoe westward to the High Sierra is being tracked by NRCS.

Latest Snow & Water Supply Information:

NWS Spring Flood Briefing - PDF [] | Recording [] - NEW

March 1, 2017 Water Supply Outlook Report

Snowpack Graphs - 2017 vs Big Years - updated 3/28

Interactive Map 3.0 (beta) options include delta function, snow density, water year peak, streamflow forecasts, basin reporting.

News Release: Hole-in-Mtn SNOTEL Rebuilt - updated

Today's Snow & Precipitation Update Reports

- > Why are there missing precip data in 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



Boom or Bust

