

Natural Resources Conservation Service

Nevada Water Supply Outlook Report

February 1, 2023



Photo Credit: Jeff Anderson

Record breaking snowpack in Walker and Carson Basins

Matt Cole, NRCS Soil Scientist and Snow Surveyor, measures [Willow Flat Snow Course](#) in the Little Walker Basin on January 27, 2023. The measurement found 58 inches of snow depth and 20.0 inches of water content which is 282% of median. This is by far the best February 1 snowpack ever measured at this course beating the 2005 measurement by 3.9 inches of snow water! Data for this course dates back 50 years. Willow Flat is not alone, nearly all [SNOTEL and snow courses](#) in the Carson and Walker basins are measuring record February 1 snow water amounts across elevations from 6,000 to 9,400 feet. Record to near-record snowpacks stretch from the [Sierra Nevada across Nevada, Utah and into Colorado](#).

Background information about this report:

This report provides an analysis of water supply conditions across Nevada and a part of the eastern Sierra in California. It is published monthly from January to May. First of month data are summarized and used to forecast summer streamflow. The report is best read in digital format which allows readers to click on the blue internet links.

Streamflow Forecasts: Most of the annual streamflow in the western United States originates as snowfall that accumulates in the mountains during the winter. As the snowpack accumulates, hydrologists can estimate the runoff that will occur when the snow melts. Measurements of [snow water equivalent \(SWE\)](#) at snow courses and SNOTEL sites, along with precipitation, antecedent streamflow, and El Niño / Southern Oscillation indices are used in computerized statistical models to produce streamflow runoff forecasts. **Forecasts in this report give the total volume of water expected to flow past a location during a specified period, such as April 1 to July 31.**

Most **streamflow forecast volumes** in this report are expressed in KAF (thousand-acre-feet). Some smaller streams are forecast in acre-feet and noted as such in parentheses after the forecast name, such as “Marlette Lake Inflow (acre-feet)”. Forecasts for Lake Tahoe, Pyramid Lake and Walker Lake are expressed in feet of water surface elevation change during the forecast period. A rise in lake level is indicated by a positive value, while a drop caused by evaporation is indicated by a negative number. The East Fork Carson River has two recession forecasts that provide the dates when spring river flows are expected to recede to 500 cfs and 200 cfs levels as the snowmelt decreases in late spring.

Interpreting Streamflow Forecasts: Forecasts of any kind are not perfect. Streamflow forecast uncertainty arises from three primary sources: (1) uncertain knowledge of future weather conditions, (2) uncertainty in the forecasting procedure, and (3) errors in the data. The forecast, therefore, must be interpreted not as a single value but rather as a range of values with specific probabilities of occurrence. The middle of the range is expressed by the 50% exceedance probability forecast. There is a 50% chance that the actual flow will be above, and a 50% chance that the actual flow will be below, this value. **Unless otherwise stated the 50% exceedance forecast is the one referred to in the text of this report.** To quantify the range around this 50% value, four other forecasts are provided in the forecast tables, two smaller values (90% and 70% exceedances) and two larger values (30% and 10% exceedances). There is a 90% chance that the actual flow will be more than the minimum forecast (90% exceedance forecast). Likewise there is a 10% chance the actual flow will be more than the maximum forecast (10% exceedance forecast). Other forecasts can be interpreted similarly. The wider the spread between these values, the more forecast uncertainty.

As the season progresses, forecasts become more accurate, primarily because a greater portion of the future weather conditions become known; this is reflected by a narrowing of the

range around the 50% exceedance probability forecast. Water users should take this uncertainty into consideration when making operational decisions by selecting forecasts corresponding to the level of risk they are willing to assume about the amount of water to be expected. If users anticipate receiving a lesser supply of water perhaps due to a dry climate outlook for the coming months, or if they wish to increase their chances of having an adequate supply of water for their operations, they may want to base their decisions on the 90% or 70% exceedance probability forecasts, or something in between. On the other hand, if users are concerned about receiving too much water, for example if there is a threat of flooding, they may want to base their decisions on the 30% or 10% exceedance probability forecasts, or something in between. Regardless of the forecast value users choose, they should be prepared to deal with either more or less water.

Streamflow Adjustments: Forecasts are for unimpaired flows. Actual flow will be dependent on management of upstream lakes, reservoirs and diversions. Certain forecasts are adjusted for these structures; these are footnoted with a (2) in the report. A summary list of all streamflow adjustments is provided on the back cover of this report.

“Normal” = Median: Starting in water year 2022 the NRCS selected the statistical median for the 1991-2020 period as the default central tendency for all parameters including snowpack, precipitation, soil moisture, streamflow and reservoir storage. Unless otherwise stated all percentages in this report are based on median. For more information about the 1991-2020 normals and how they impact our region visit the [Nevada Normals Dashboard](#).

Soil moisture has been measured at SNOTEL sites since ~2006. Due to the short record the soil moisture normal is based on water years 2006-2020. Soil moisture data are depth averaged from sensors located at soil depths of 2, 8, and 20 inches.

Maximums and Minimums: Graphs in this report display “Max” and “Min” lines for snowpack, precipitation and soil moisture. For snow and precipitation these are basin-wide, daily maximums and minimums for water years 1981-2021; for soil moisture the period is 2006-2021.

Watershed Snowpack Analysis: These tables summarize the snowpack percent of median for each basin and its sub-basins. Percentages are based on SNOTEL and snow course measurements. Basin snowpack files are [available here](#). Select “Nevada” and report type “Snow” a full report with station-by-station data. Basin order is alphabetical by main basin, followed by its sub-basins, then the next main basin.

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Nevada Water Supply Outlook

February 1, 2023

SUMMARY

NINE atmospheric rivers made landfall along the California coast between Christmas and mid-January! These storms brought heavy snowfall from the Sierra Nevada Mountains right across Nevada, Utah and Colorado. February 1 snow water amounts are at or near record setting amounts at SNOTELs and snow courses from California to Colorado.

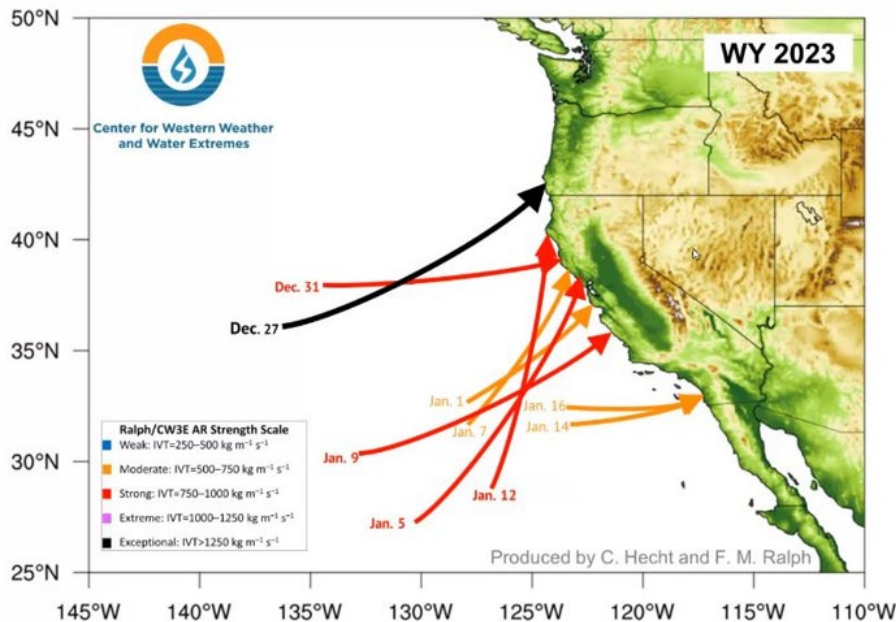


Figure 1: Atmospheric rivers making landfall along the California coast from December 27th to January 16th
Source: <https://cw3e.ucsd.edu/>

February 1 snowpacks are 173-240% of median in the eastern Sierra, 130-247% across northern Nevada, 247% in the Spring Mountains, and 144% in the Upper Colorado Basin. Most SNOTELs in the eastern Sierra and across Nevada are already exceeding April 1 peak amounts. February 1 streamflow forecasts point to well above normal runoff this spring. If winter and springtime precipitation continues to be strong, the 10% exceedance streamflow forecasts indicate the potential for near record setting streamflow volumes. The lingering effects of drought add a level of uncertainty to just how good the runoff will be. This is especially true in the Humboldt Basin where water year 2022 observed streamflow volumes were at or near record low for a number of gages. In order to go from record dry to record wet in one year, there are some key puzzle pieces that need to fit together. Mainly, the hydrologic system needs to become primed by the rapid melt-off of low elevation snow likely assisted by rain. An event similar to the flooding that occurred in February 2017 would improve baseflows and boost runoff off efficiency later in the spring allowing much of snowmelt from higher elevations to reach the lower end of the Humboldt River.

SNOWPACK

This year ranks as one of the best February 1 snowpacks on record for our region. SNOTELs and snow courses across four states from California to Colorado are [measuring record and near record February 1 snow water amounts](#). Snowpacks are 173-240% of median in the eastern Sierra, 130-247% across northern Nevada, 247% in the Spring Mountains, and 144% in the Upper Colorado Basin. Many SNOTELs have already [exceeded their normal spring-time peak amounts](#) that typically occur close to April 1. Nearly all [SNOTEL and snow courses](#) in the Carson and Walker basins are measuring record February 1 snow water amounts across elevations from 6,000 to 9,400 feet. Conditions in [Eastern Nevada and the Upper Humboldt Basin](#) are also spectacular with snow

at most sites exceeding the 95th percentile when compared to historic data. Like the Carson and Walker basins, the Humboldt Basin also possesses near record low elevation snow. Located north of Elko, Tremewan Ranch snow course (5700ft) with 5.6 inches of snow water, has its second highest February 1 measurement since 1955. If this low elevation snow melts off quickly, it could prime the river system for high elevation snowmelt later in the season. Based on SNOTEL data back to 1981, the Upper Humboldt Basin has only seen more snow in 1997 and 1984. SNOTELs in Eastern Nevada along the Route 50 corridor are currently also record high. The February 1 snowpack in the Upper Colorado Basin ranks above the [90th percentile](#) and was only better in 1997, 2017 and 2005. Snowpacks have already exceeded normal spring-time peak amounts in the [Lake Tahoe](#), [Truckee](#), [Carson](#), [Walker](#), and [Humboldt](#) basins, as well as, in the [Eastern Nevada](#) and the [Spring Mountains](#). The [Northern Great Basin](#), [Owyhee](#), [Snake](#) and [Upper Colorado](#) are all making excellent progress towards this mark as well.

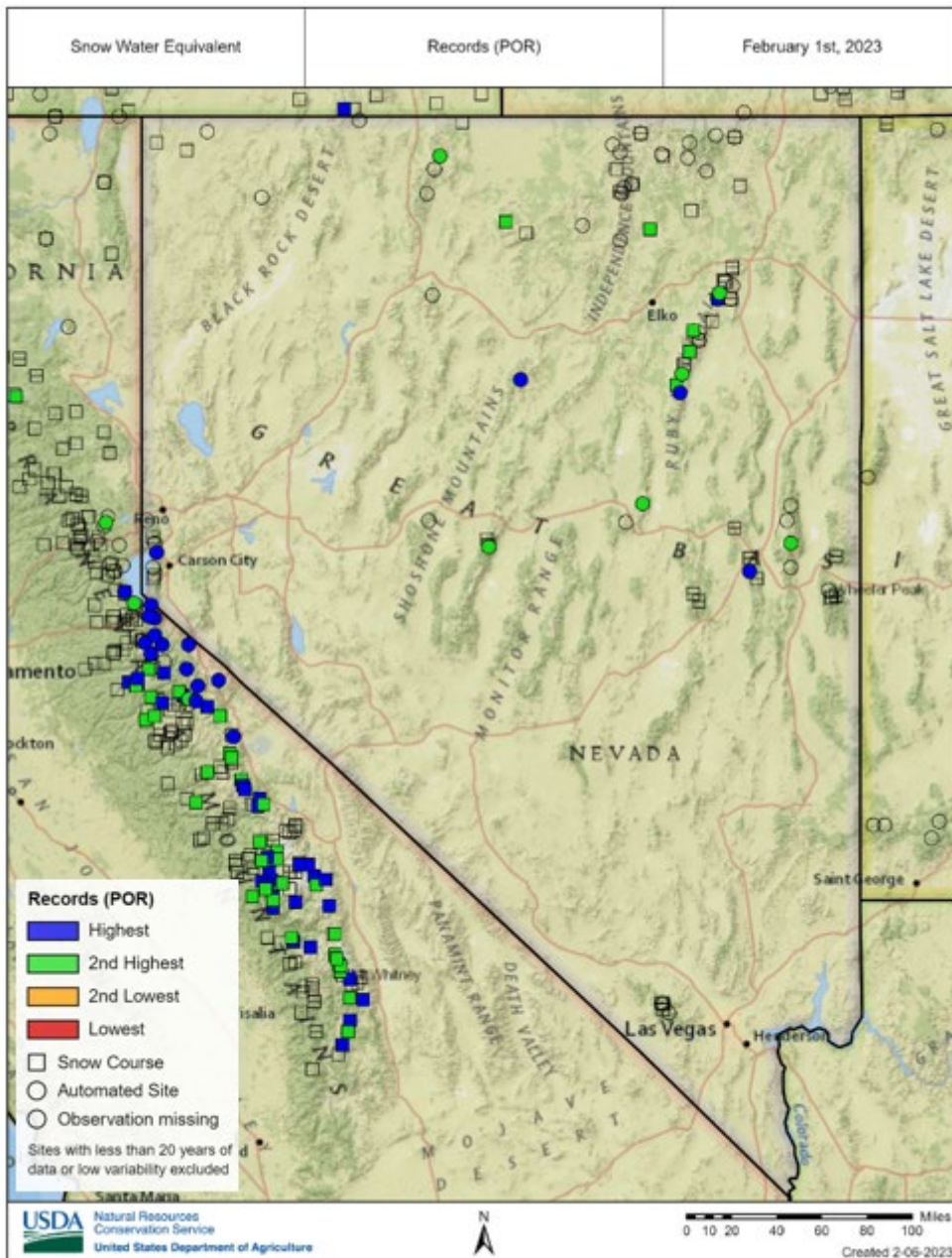


Figure 2: February 1, 2023 snow water equivalent compared to period of record (POR) data.

Blue symbols: Feb 1, 2023 is the highest ever measured.
Green symbols: Feb 1, 2023 is the 2nd highest measured

Notable Measurements:

Heavenly Valley (Lake Tahoe)
highest in 55 years*

Mt Rose Ski Area (Truckee)
3rd highest in 53 years*

Upper Carson Pass (Carson)
3rd highest in 91 years

Lobdell Lake (Walker)
highest in 60 years*

Willow Flat (Walker)
Highest in 50 years

Lamoille #1 (Humboldt)
2nd highest in 77 years

Corral Canyon (Humboldt)
highest in 45 years

Tremewan Ranch (Humboldt)
2nd highest in 68 years

Ward Mountain (Eastern Nevada)
highest in 56 years*

*SNOTEL record extended backwards using a nearby, well correlated, snow course

PRECIPITATION

Water year precipitation is 155-223% of median in the eastern Sierra basins, Humboldt, Clover Valley, Spring Mountains and Eastern Nevada. Amounts are a bit less at 114-118% in the Northern Great Basin, Owyhee and Snake basins along Nevada's northern border. Monthly precipitation in January ranged from near normal along Nevada's northern border up, to two to three-and-a-half times normal in the eastern Sierra, Eastern Nevada and to nearly five times median in the Spring Mountains. The rapid succession of atmospheric river storms between December 27 and January 16 overwhelmed many SNOTEL precipitation gages with heavy snowfall. NRCS staff were busy in the field in January doing maintenance on precipitation gages to register all this snow. Some gages continue to be filled with snow. Precipitation data from plugged gages appears as "missing" in public reports until daily data are estimated by a hydrologist using snow pillow accumulation. This estimation technique has proven reliable over many other big winters should not be a cause for concern. Eventually the precipitation will register either after a site visit or once conditions warm up. SNOTEL issues, such as precipitation gage plugging, can be tracked on the [SNOSTAT map](#).

SOIL MOISTURE

Soil saturation improved across the state after the relatively warm atmospheric river brought rain to the valleys and up into mountains on December 31. Soil moisture under the snow is currently above median in the Sierra basins, Eastern Nevada and Upper Colorado Basin. Soils moisture is near median for February 1 in the Humboldt, Clover Valley, Owyhee and Spring Mountains. The only area with below normal soil moisture is the Snake Basin. Soil moisture will play a critical role in the Humboldt Basin this spring. The Comus and Imlay gages recorded the [lowest observed flows](#) on record in water year 2022 as the lower reaches of the Humboldt River dried up and stopped flowing. Streamflow returned at the Comus gage last month, but the river continues to be dry at Imlay. Soil moisture is near normal for this time of year in the [Humboldt Basin](#) based SNOTEL data. If the near record snowpack at low elevations melts off quickly, soil conditions could improve dramatically leading to improved base flows when high elevation snow starts melting this spring. This would positively impact runoff efficiency. For comparison this year's February 1 soil moisture ranks better than 2019, but not nearly as high as 2017. The observed runoff volumes were strong in [2019](#) and [2017](#), but 2017 was significantly higher in part due to excellent soil moisture. Soil moisture graphs found later in this report average data from sensors located at soil depths of 2, 8 and 20 inches for all the SNOTEL sites in a basin. SNOTEL soil moisture data has a short period of record. Soil moisture graphs in this report are based on data since October 2005.

RESERVOIRS

January storms added 138.5 kaf to Lake Tahoe storage and 73.9 kaf to Lahontan Reservoir storage. Gains in other northern Nevada reservoirs were smaller, but the deep snowpack holds water that will improve reservoir storage dramatically once spring melt occurs. Streamflow forecast skill improves each month, by March 1 reservoir operators should have a better idea about the chances for filling reservoirs this spring. For current storage levels see individual basin pages found later in this report.

STREAMFLOW FORECASTS

Given the record to near record February 1 snowpacks, its little surprise April through July streamflow forecasts are well above normal across Nevada. In most basins the 50% exceedance forecasts rank between the [75th and 99th percentile](#) compared to period of record data. For comparison this [month's forecasts percentiles](#) are similar to [observed data in 2019](#) in some areas. Forecasts are lowest along Nevada's northern border in the Snake and Owyhee basins, where percentages are 121-125% of median, ranking in 50th-67th percentile. Forecasts improve

to 160-220% of median for most points in the Truckee Basin, ranking between the 74th and 88th percentile. Forecasts are higher still from Lake Tahoe south to the Walker basin with most forecasts ranging from 222% for the WF Carson near Woodfords (92nd percentile) up to 350% for the East Walker near Bridgeport (94th percentile). Percentages for many points in the Humboldt Basin and Eastern Nevada are above 250% of median and some over 400%. These extremely large percentages indicate this year runoff could be in the upper end of the historical distribution. Streamflow in the Great Basin is most often modest, however the spread in volumes is very wide when comparing a “big” year to what is observed more typically. These skewed datasets cause large differences between the median streamflow which represents the middle value, compared to the average. The average is often skewed higher than the median by the few large runoff years. Medians can be less than half of the average. Dividing forecast volumes by the smaller median leads to large percentages. Nevada depends on the boom years to fill reservoirs and make it through multiple years of drought caused by low snow and precipitation. To have such a bountiful snowpack this early in the season presents a challenge for forecasting due to how much future weather is still not known. With two months of winter ahead record-breaking streamflow is possible. The 30% and 10% exceedance forecasts give runoff volume estimates assuming the weather continues to be wetter or much wetter than normal. The [10% exceedance forecasts](#) indicate April-July volumes could be near record amounts (>95th percentile). Such volumes could be similar to or even exceed [2017](#). With two months of winter ahead there is still a lot of uncertainty about how big runoff volumes could be. Forecast skill in January and February is lower than in March and April of a year, and the range of outcomes between the 90% and 10% exceedance are still wide.

UPCOMING EVENTS

Western Snow Conference, April 17-20, 2023, Flagstaff, AZ - *Submit abstracts by February 1, 2023* - [link](#)

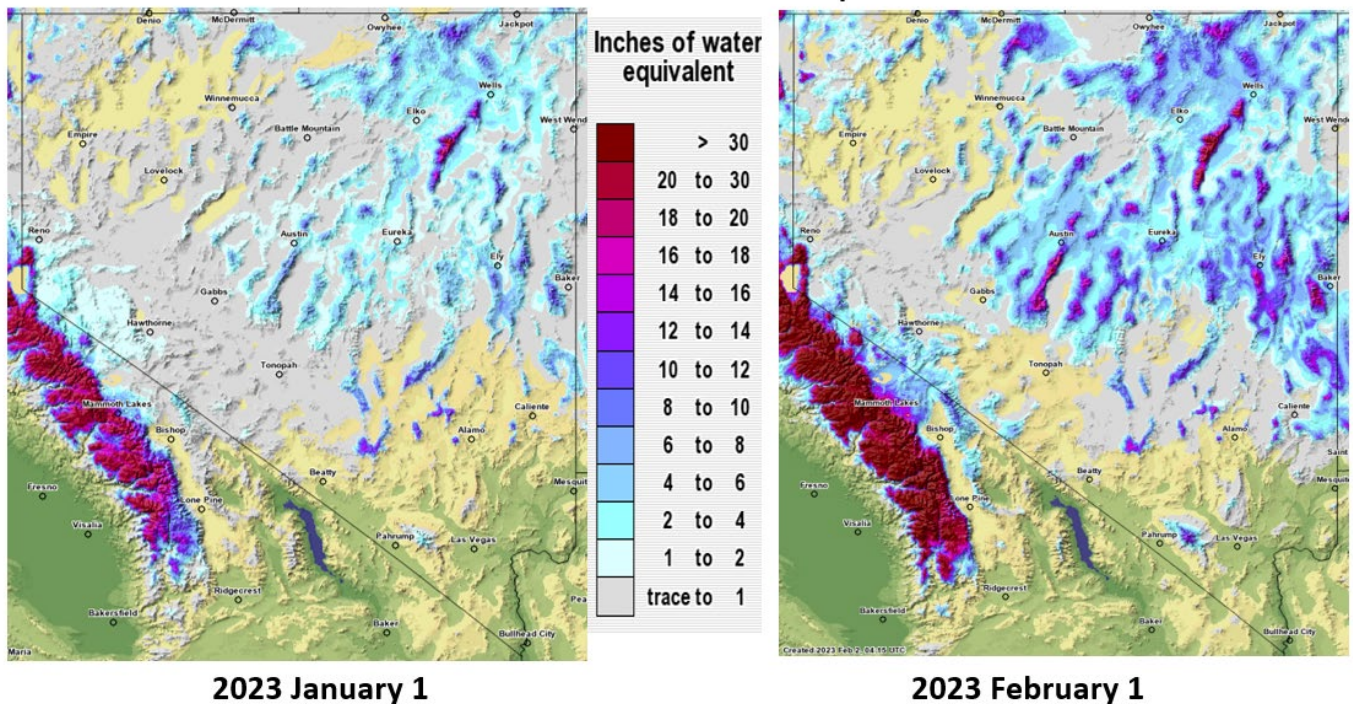
RANGELAND CONDITIONS

The NRCS mission is to provide resources to farmers and ranchers to aid them with the management of their land. Most NRCS SNOTEL stations are located in the mountains above 6,500 feet. There are many millions of rangeland acres below the SNOTEL network. This section takes a closer look at data from lower elevation rangeland and valley locations that may be especially useful to rangeland users.

Seasonal snow cover replenishes soil moisture and provides water for plant growth. A useful tool to track the lower elevation snowpack is [NOAA's Modeled Snow Water Equivalent Map](#).

The January 1, 2023 map (left) shows modeled snow water equivalent across Nevada one month ago. Comparing January 31, 2023 (right), snow accumulation increased substantially in January across all elevations.

NOAA Modeled Snow Water Equivalent



2023 January 1

2023 February 1

Figure 2: Modeled snow water content across Nevada for this month versus last month, source: [NOAA](#)

Plant Growth: Temperatures in January have been below normal across the state. Plant growth has slowly initiated at low to mid-elevations (~5500 ft.). Germination is behind on several annual non-native plants, including cheatgrass (*Bromus tectorum*), Arabian schismus (*Schismus arabicus*), bur buttercup (*Ceratocephala testiculata*), red-stem filaree (*Erodium cicutarium*) and annual mustards due to dry and cold conditions. Long-term forecasts developed by the USA Phenology Network predicted that spring leaf out would arrive later than normal (<https://www.usanpn.org/home>). Spring leaf out is behind in southern Nevada and 9 days late in parts of southern California near Los Angeles according to the National Phenology Network. U.S. Drought Monitor map (below) shows the entire state being in drought status. Moisture events in December lowered drought severity ratings across Nevada.

Temperature and Precipitation: Table 1 provides a summary of temperature and precipitation data from selected valley climate stations across the state for the month of January. January had below normal temperatures across all weather stations. On January 31, the maximum temperature for the month at Reno was 56°F with a minimum temperature of 4°F. Elko had a January high of 45°F which is 5°F cooler than last year. The highest temperature in January was 61°F at the Las Vegas airport climate station with a low of 32°F. Precipitation

was above average across the state except for Winnemucca. In January 2022, Reno received no precipitation ranking as the driest January since 1893. January 2023 was the third wettest January since 1893 with Reno 1.19 inches above normal for the month. The additional moisture will have a positive effect on spring vegetation across Nevada including increases in biomass production of invasive annuals. The Drought Monitor map in Figure 3 shows continued improvement in drought status since last month. Increased

Table 1. January summary of valley climate stations, source: <http://www.rcc-acis.org/>

Climate Station	January Average Temperature °F	January Departure from Average °F	January Precipitation (Inches)	January Precipitation Departure From Average (inches)
Reno airport	31.2	-5.7	2.44	+1.19
Orovada	27.9	-2.8	1.64	+0.38
Winnemucca	31.1	-1.1	0.83	-0.13
Elko airport	24	-3	1.83	+0.64
Ely	19.7	-7	3.55	+2.8
Eureka	21.4	-4.5	1.49	+0.69
Tonopah Airport	31.9	-2	0.8	+0.35
Overton	46.7	-1	1.36	+0.67
Las Vegas airport	48.1	-0.6	0.82	+0.15
Mina	34.9	-3.3	1.79	+1.31
Cathedral Gorge SP	32.4	-0.7	3.1	+1.82
Hiko	37.8	-1.1	3.32	+2.6
Minden	25.4	-7.4	8.33	+6.63
Hawthorn	33.9	-3.1	1.8	+1.37
Mercury 3	41.7	-2.5	1.54	+0.84
Yerington	29.3	-4.9	3.97	+3.43
Austin	26.5	-7.7	3.92	+2.7

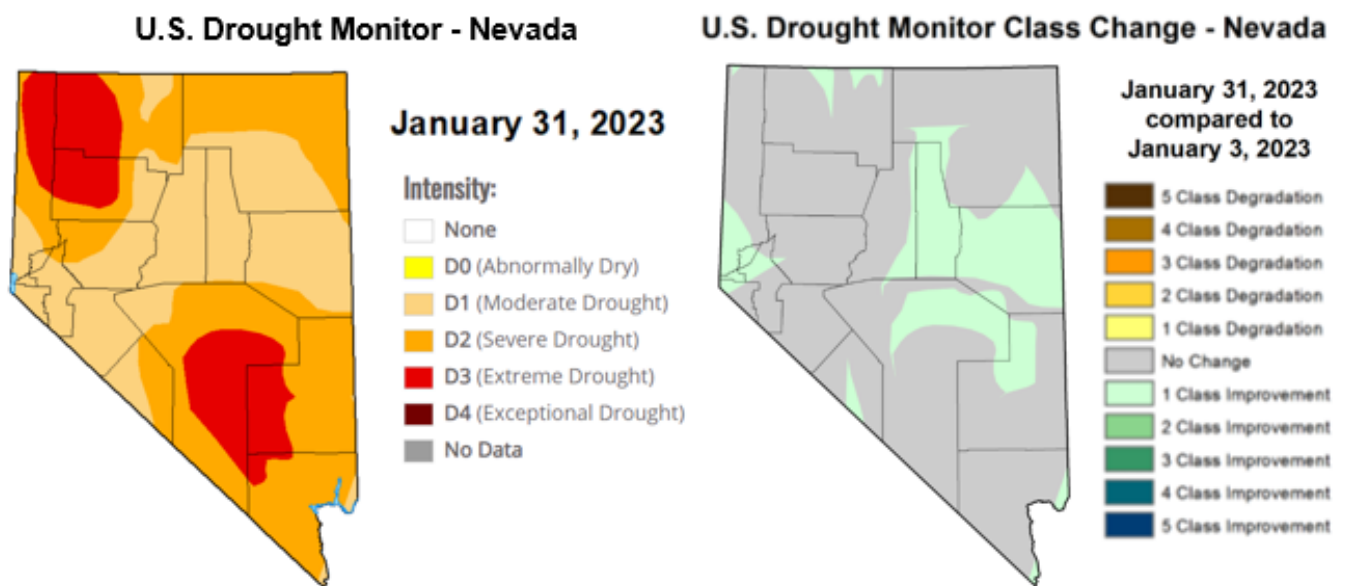
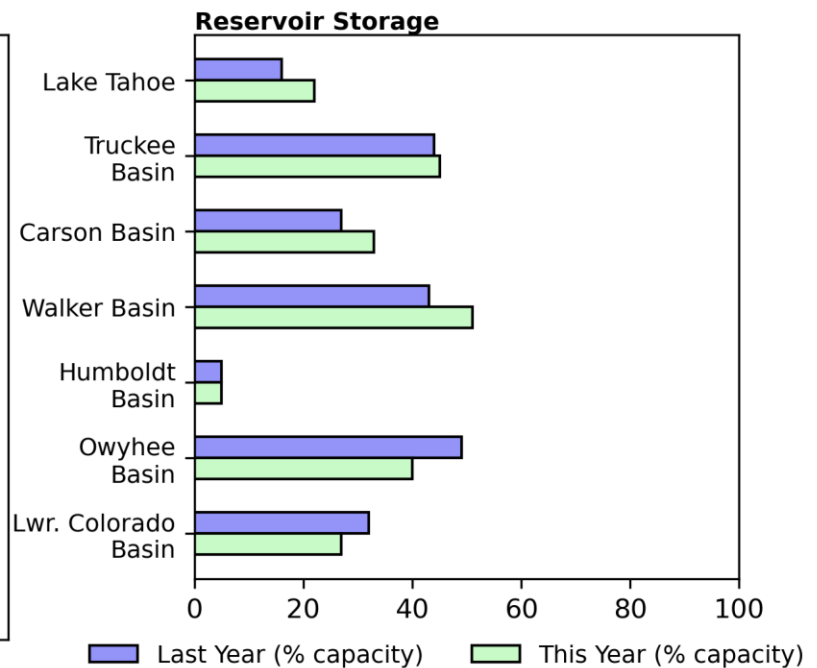
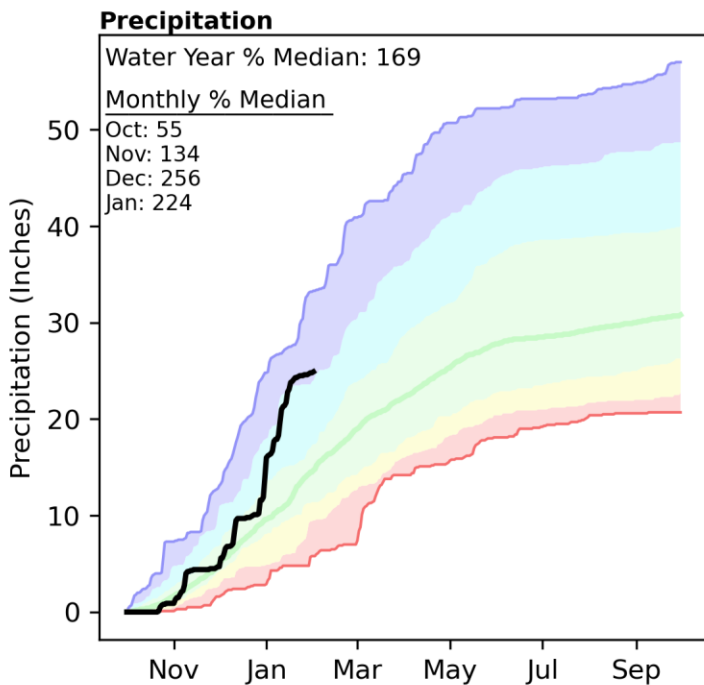
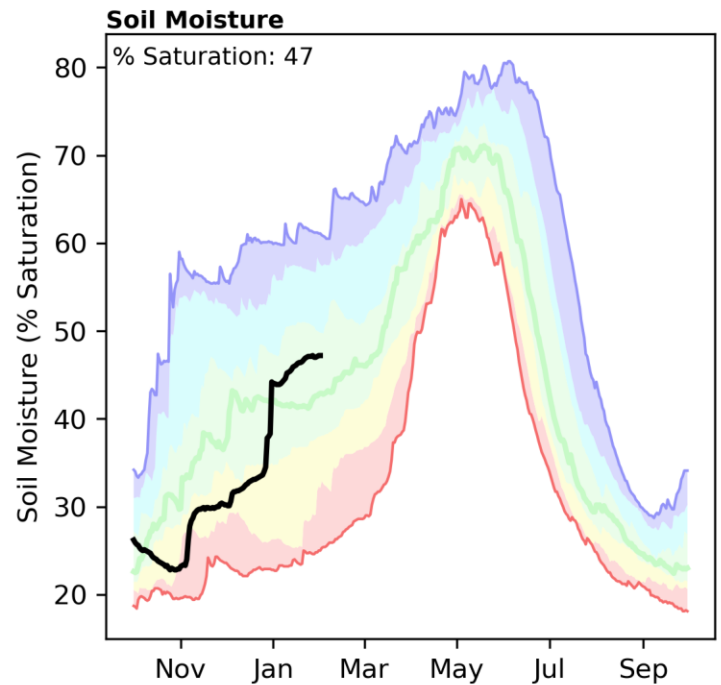
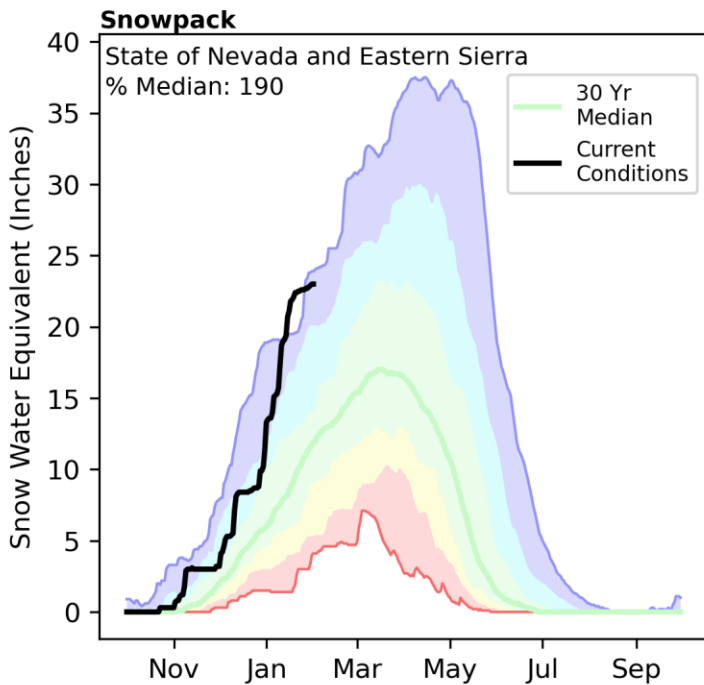


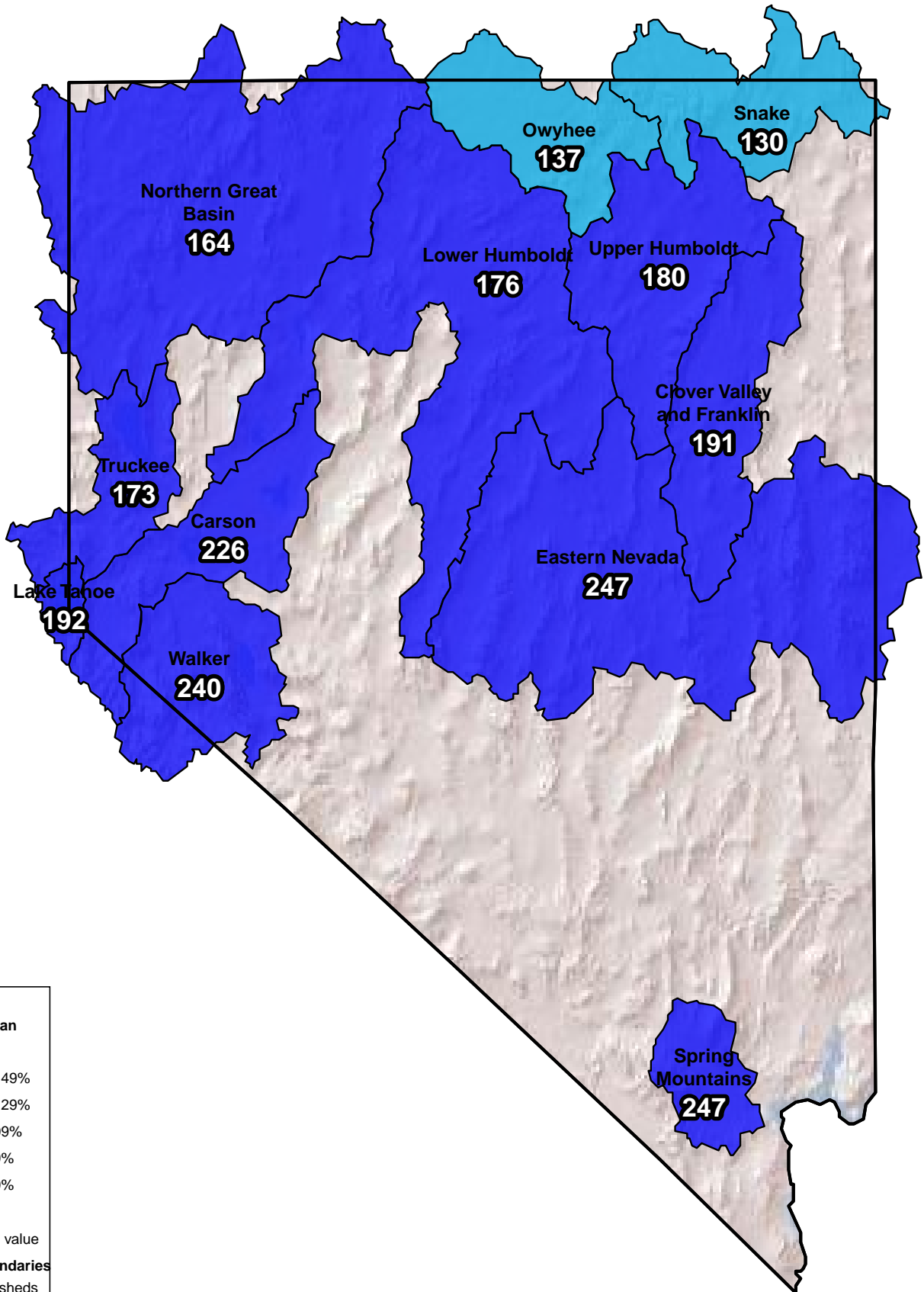
Figure 3: US Drought Monitor from January 31, 2023, source <https://droughtmonitor.unl.edu>

State of Nevada and Eastern Sierra | February 1, 2023

Snowpack in the State of Nevada and Eastern Sierra is well above normal at 190% of median, compared to 101% at this time last year. Precipitation in January was well above normal at 224%, which brings the seasonal accumulation (October-January) to 169% of median. Soil moisture is at 47% saturation compared to 50% saturation last year.



Statistical shading breaks at 10th, 30th, 50th, 70th, and 90th percentiles.
For more information visit: [30 year normal calculation description](#)



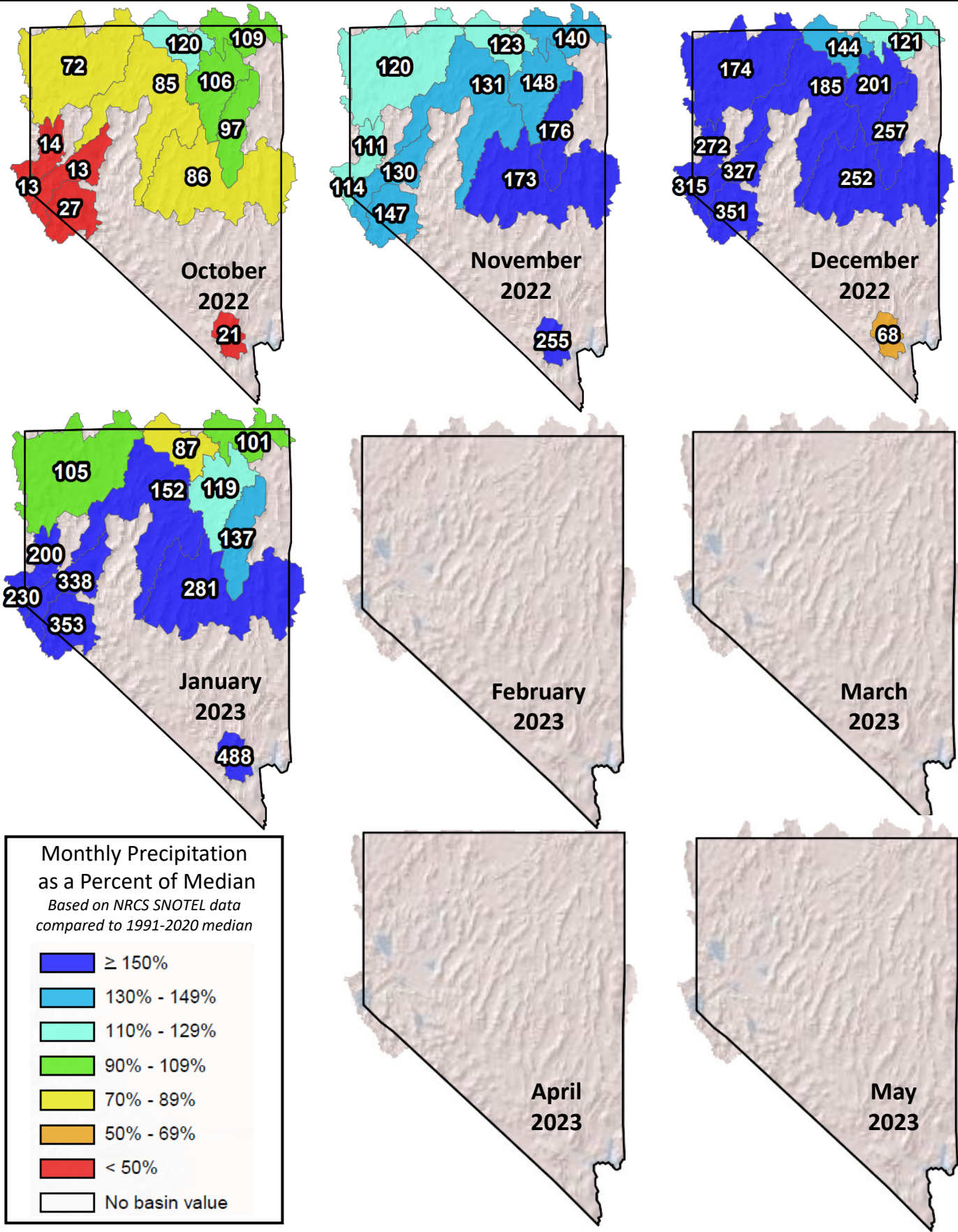
Percent NRCS 1991-2020 Median

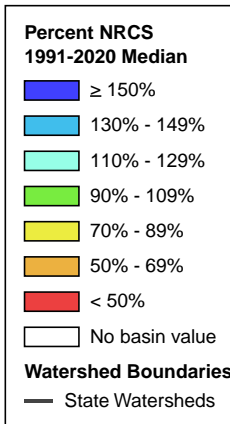
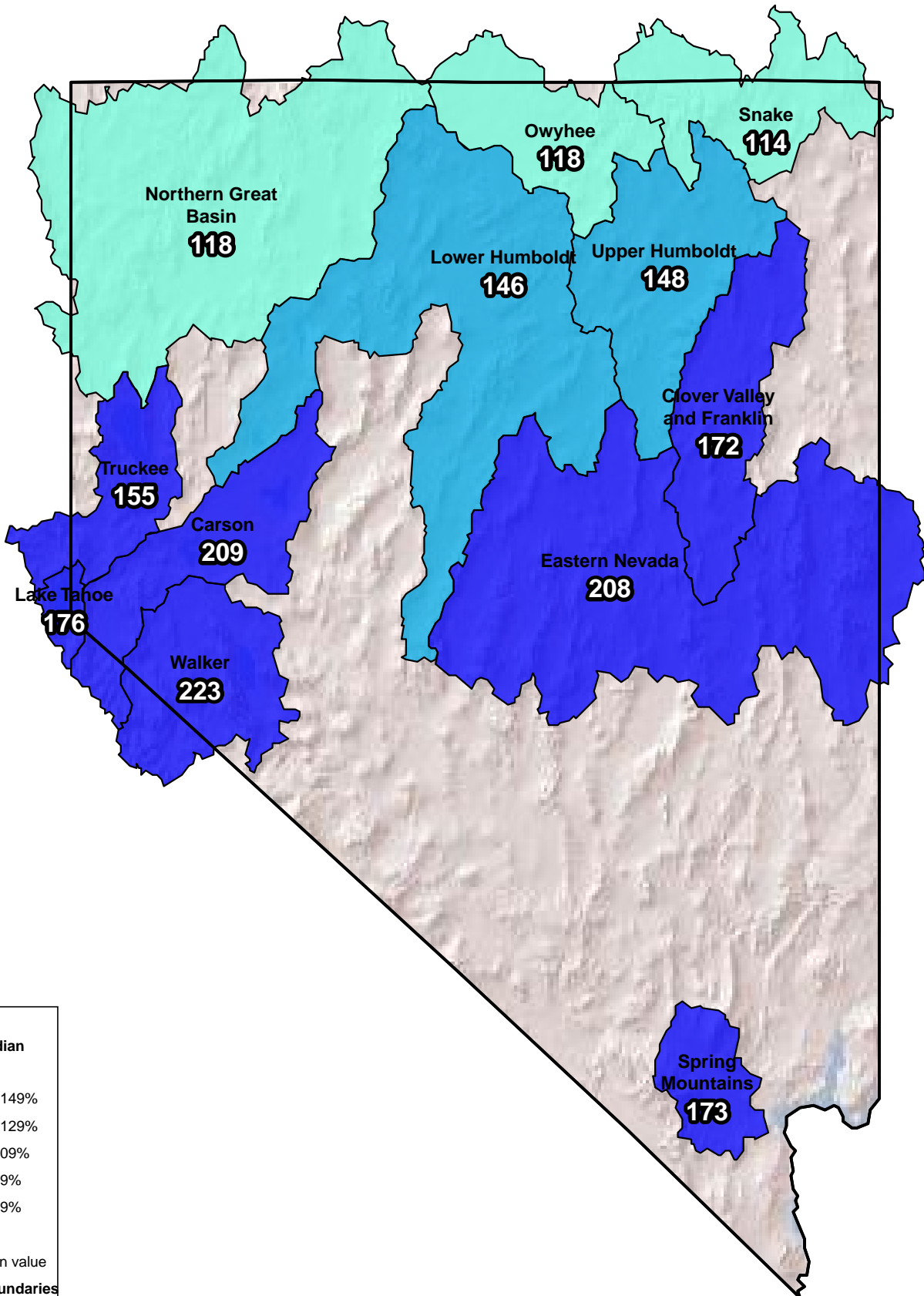
- ≥ 150%
- 130% - 149%
- 110% - 129%
- 90% - 109%
- 70% - 89%
- 50% - 69%
- < 50%
- No basin value

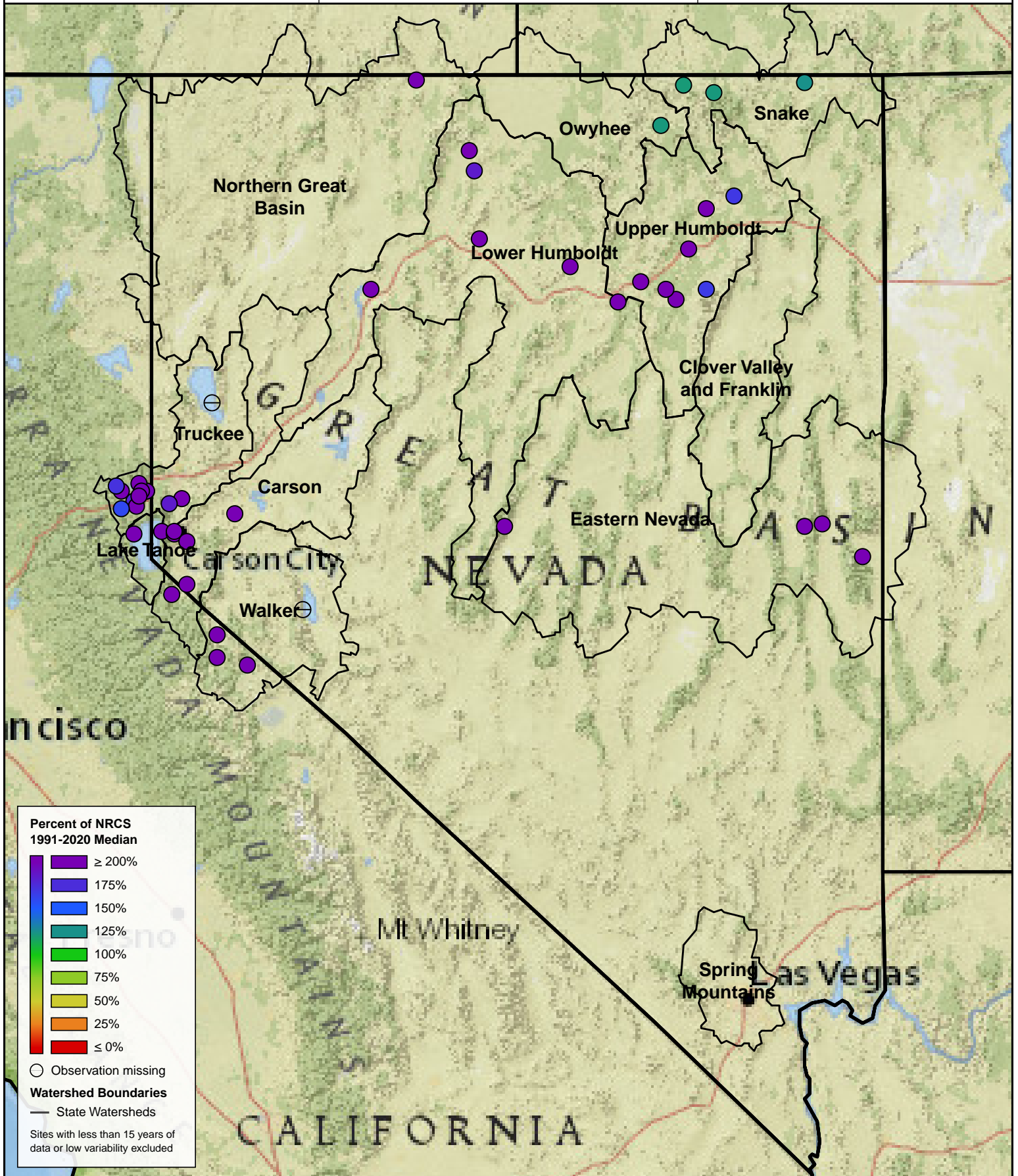
Watershed Boundaries

- State Watersheds

Monthly Precipitation as Percent of Median – Water Year 2023



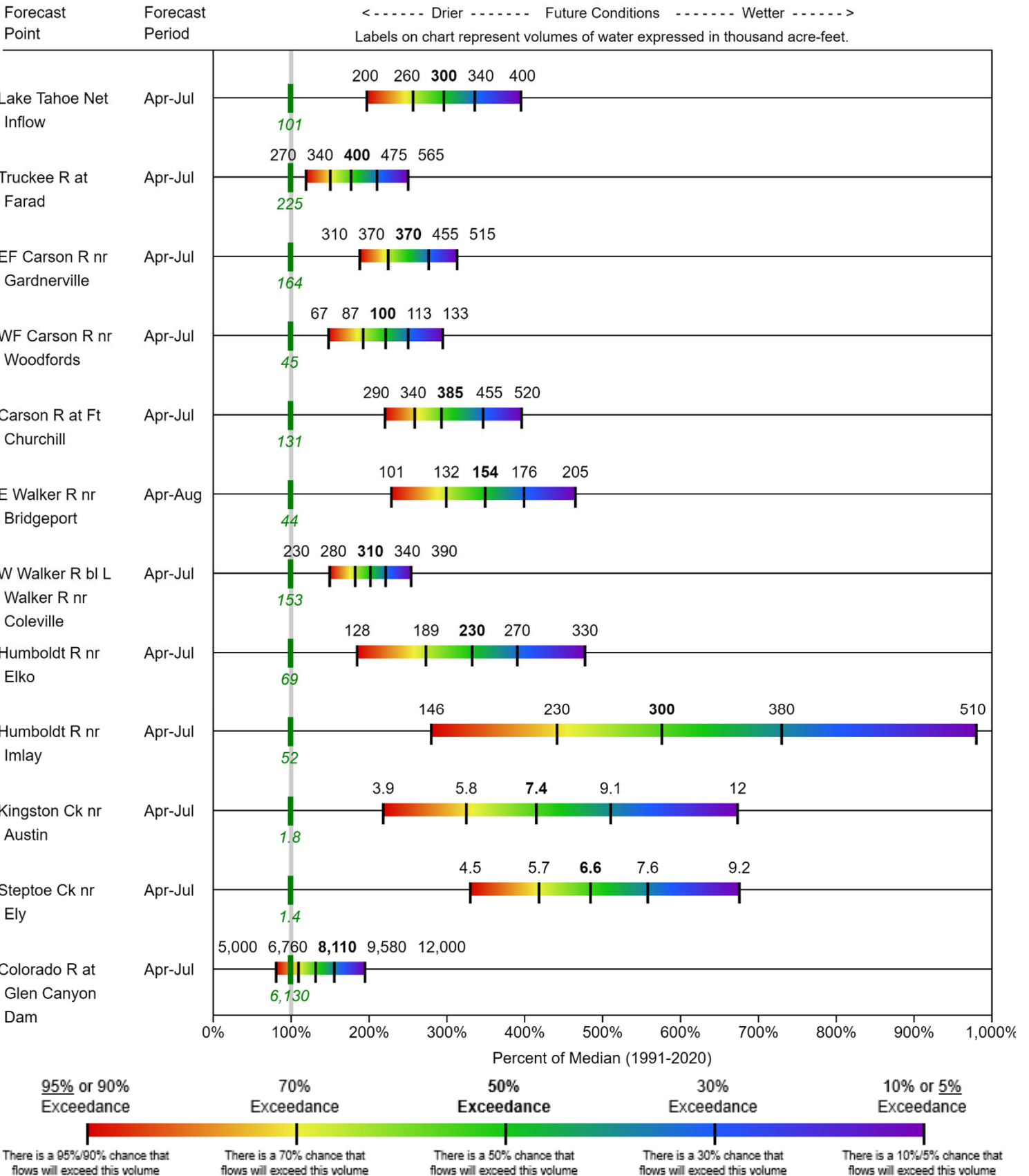




Streamflow Forecasts - State of Nevada Overview

February 1, 2023

Forecast Exceedance Probabilities

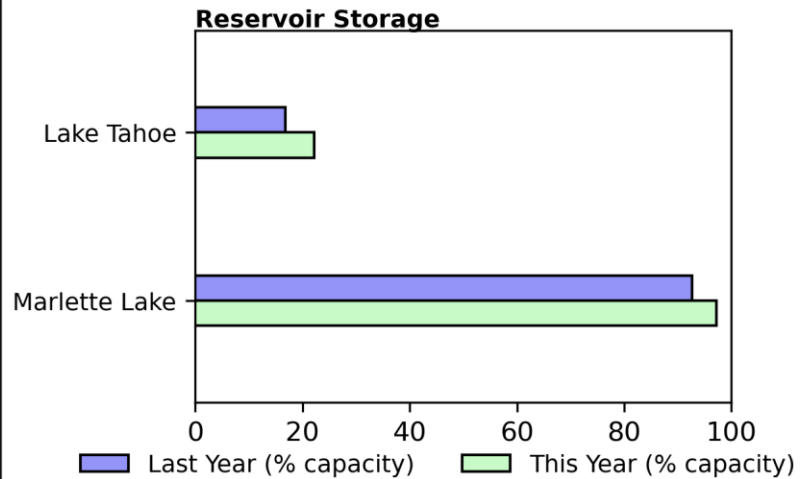
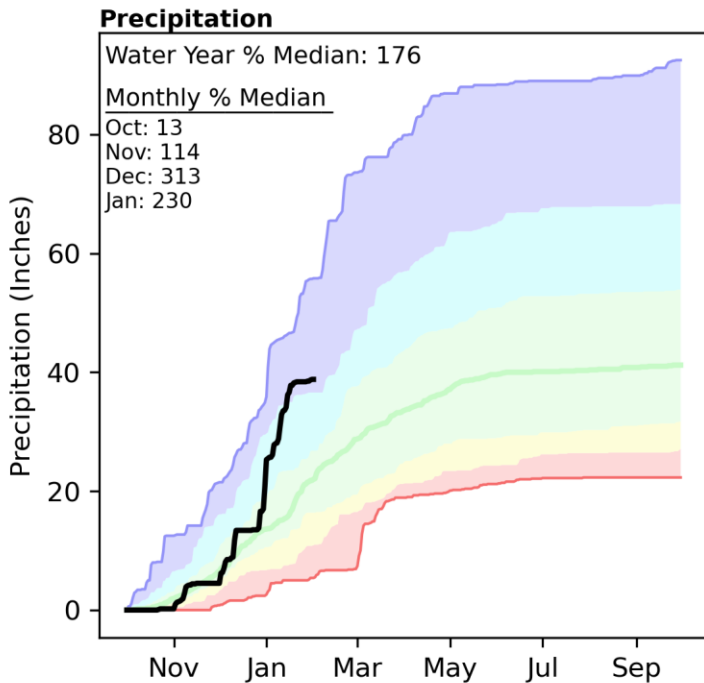
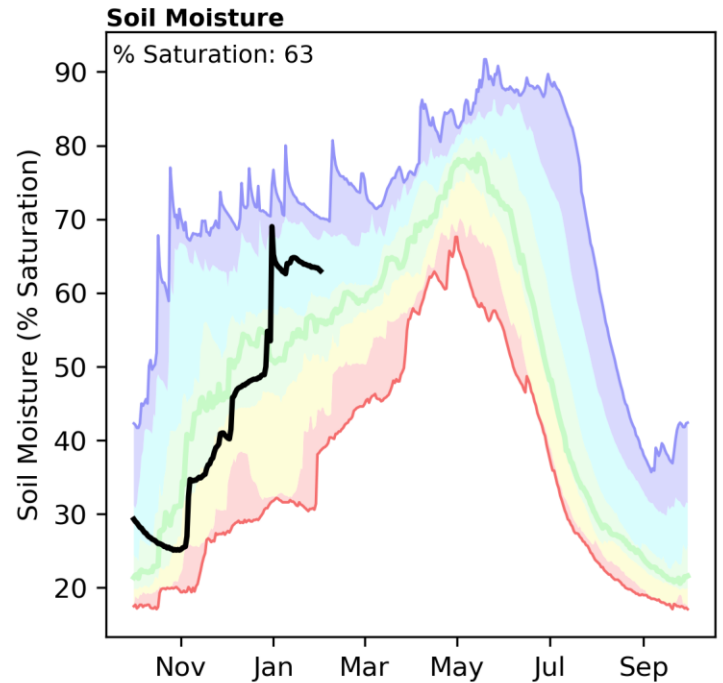
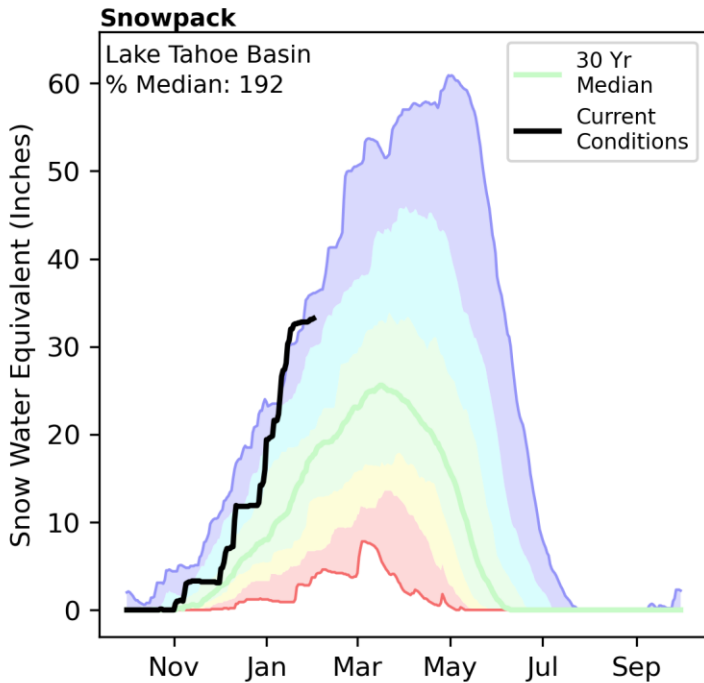


1981-2010 Normal Streamflow KAF

See appendix for more information

Lake Tahoe Basin | February 1, 2023

Snowpack in the Lake Tahoe Basin is well above normal at 192% of median, compared to 106% at this time last year. Precipitation in January was well above normal at 230%, which brings the seasonal accumulation (October-January) to 176% of median. Soil moisture is at 63% saturation compared to 60% saturation last year. Reservoir storage is 23% of capacity, compared to 18% last year.



Statistical shading breaks at 10th, 30th, 50th, 70th, and 90th percentiles.
For more information visit: [30 year normal calculation description](#)

**Lake Tahoe
Streamflow Forecasts - February 1, 2023**

Forecast Exceedance Probabilities For Risk Assessment
Chance that actual volume will exceed forecast

Lake Tahoe	Forecast Period	90% (KAF)	70% (KAF)	50% (KAF)	% Median	30% (KAF)	10% (KAF)	30yr Median (KAF)
Marlette Lake Inflow	MAR-JUL	1.13	1.71	2.1	375%	2.5	3.1	0.56
	APR-JUL	0.82	1.34	1.69	423%	2	2.6	0.4
Lake Tahoe Rise Gates Closed	OCT-HIGH	2.8	4	4.5	283%	5.1	6.3	1.59
	MAR-HIGH	0.95	2	2.5	179%	3	4.1	1.4
	APR-HIGH	1	1.7	2.1	181%	2.5	3.2	1.16
Lake Tahoe Net Inflow	MAR-JUL	290	370	425	306%	475	555	139
	APR-JUL	200	260	300	297%	340	400	101

- 1) 90% And 10% exceedance probabilities are actually 95% And 5%
- 2) Forecasts are For unimpaired flows. Actual flow will be dependent On management of upstream reservoirs And diversions

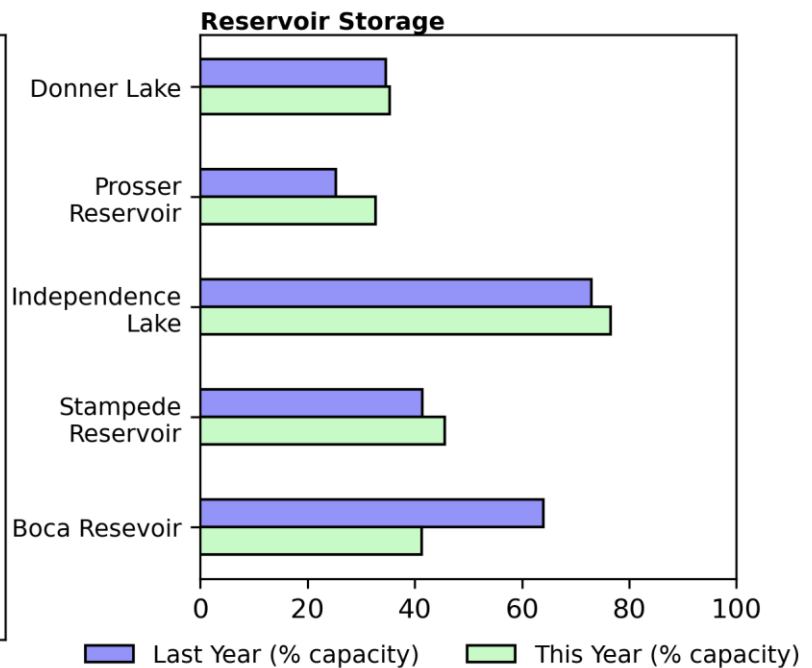
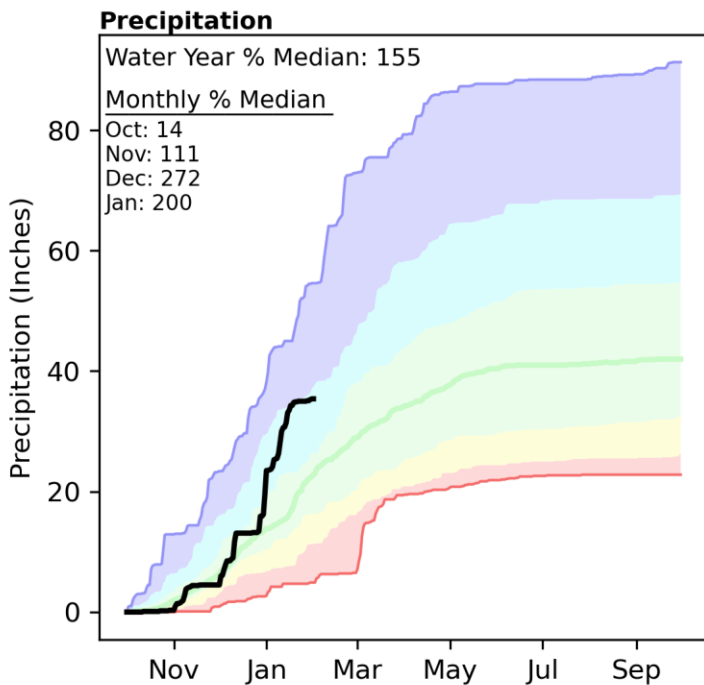
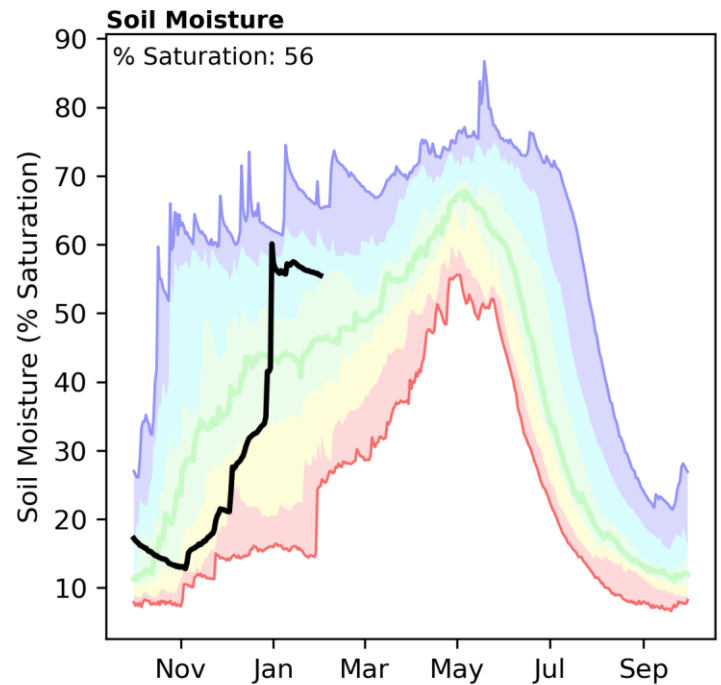
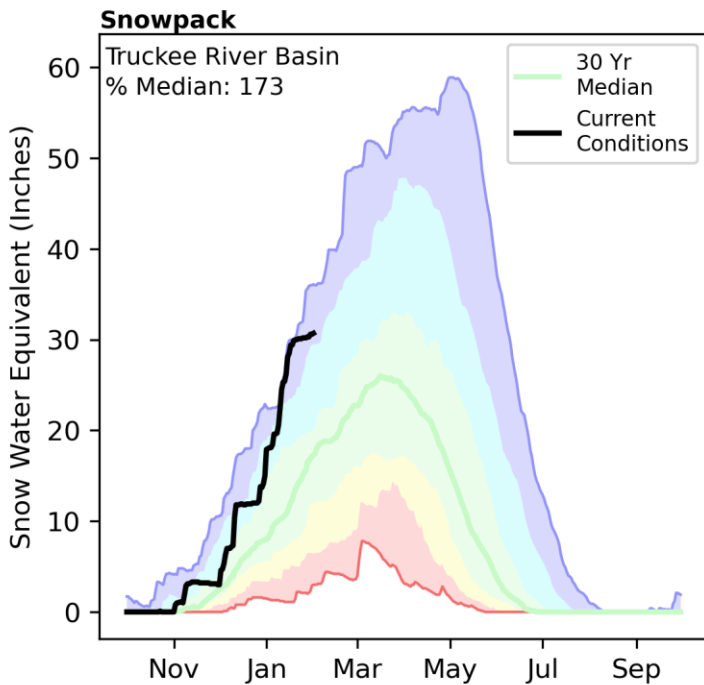
Reservoir Storage End of January, 2023	Current (KAF)	Last Year (KAF)	Median (KAF)	Capacity (KAF)
Lake Tahoe	165.2	125.1	221.8	744.5
Marlette Lk nr Carson City	11.5	10.9	11.8	11.8

Watershed Snowpack Analysis February 1, 2023	# of Sites	% Median	Last Year % Median
Lake Tahoe	23	192%	106%

Note: Hydrologists with the NRCS and National Weather Service California Nevada River Forecast Center (CNRFC) coordinate Lake Tahoe Rise, Truckee River at Farad, Little Truckee River above Boca, and the Carson River near Ft. Churchill using output of their respective hydrology models at the request of the Bureau of Reclamation. The NRCS model is a statistical model based on the current data as of the first of each month. The CNRFC ensemble forecasting system incorporates near-term weather prediction and climatology into their model. These models can provide different answers because of the nature of the model systems, and from the inclusion of future weather in the CNRFC model. The hydrologists agree on forecast values using guidance from both models to best provide an accurate water supply forecast for these points.

Truckee River Basin | February 1, 2023

Snowpack in the Truckee River Basin is well above normal at 173% of median, compared to 112% at this time last year. Precipitation in January was well above normal at 200%, which brings the seasonal accumulation (October-January) to 155% of median. Soil moisture is at 56% saturation, same as last year at this time. Reservoir storage is 45% of capacity, compared to 44% last year.



Statistical shading breaks at 10th, 30th, 50th, 70th, and 90th percentiles. For more information visit: [30 year normal calculation description](#)

Truckee Streamflow Forecasts - February 1, 2023

Forecast Exceedance Probabilities For Risk Assessment
Chance that actual volume will exceed forecast

Truckee	Forecast Period	90% (KAF)	70% (KAF)	50% (KAF)	% Median	30% (KAF)	10% (KAF)	30yr Median (KAF)
Donner Lake Inflow ²	MAR-JUL	20	27	31	161%	35	42	19.2
	APR-JUL	15.2	20	24	160%	28	33	15
Martis Ck Res Inflow ²	MAR-JUL	14.7	20	24	270%	28	33	8.9
	APR-JUL	7.2	11.8	15	263%	18.2	23	5.7
Prosser Ck Res Inflow ²	MAR-JUL	56	70	79	188%	88	102	42
	APR-JUL	41	54	62	177%	70	83	35
Independence Lk Inflow ²	MAR-JUL	16.1	19.2	21	184%	24	27	11.4
	APR-JUL	13.1	16	18	171%	20	23	10.5
Sagehen Ck nr Truckee	MAR-JUL	6.7	9.2	11	229%	12.7	15.2	4.8
	APR-JUL	5	7.4	9	220%	10.6	13	4.1
Stampede Res Local Inflow ²	MAR-JUL	109	140	161	233%	182	215	69
	APR-JUL	77	106	125	212%	144	173	59
L Truckee R ab Boca Reservoir ²	MAR-JUL	117	154	180	209%	205	245	86
	APR-JUL	86	120	145	201%	170	210	72
Boca Res Local Inflow ²	MAR-JUL	13	17.6	21	477%	24	28	4.4
	APR-JUL	5.2	8.6	11	724%	13.4	16.8	1.52
Truckee R at Farad ²	MAR-JUL	310	410	480	181%	550	650	265
	APR-JUL	270	340	400	178%	475	565	225
Truckee R ab Farad Sidewater ²	MAR-JUL	142	181	205	193%	235	270	106
	APR-JUL	119	155	179	199%	205	240	90
Galena Ck at Galena Ck State Pk	MAR-JUL	5.6	7.1	8.1	184%	9	10.5	4.4
	APR-JUL	5.1	6.5	7.4	185%	8.4	9.8	4
Steamboat Ck at Steamboat	MAR-JUL	6.4	13.1	18.9	700%	26	38	2.7
	APR-JUL	5.3	10.7	15.4	733%	21	31	2.1
Pyramid Lake Elevation Change	LOW-HIGH	1.97	3.3	4.2		5.1	6.4	

1) 90% And 10% exceedance probabilities are actually 95% And 5%

2) Forecasts are For unimpaired flows. Actual flow will be dependent On management of upstream reservoirs And diversions

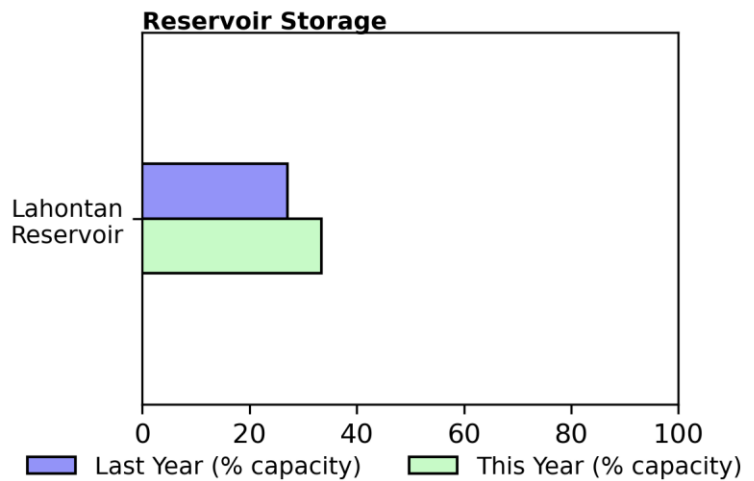
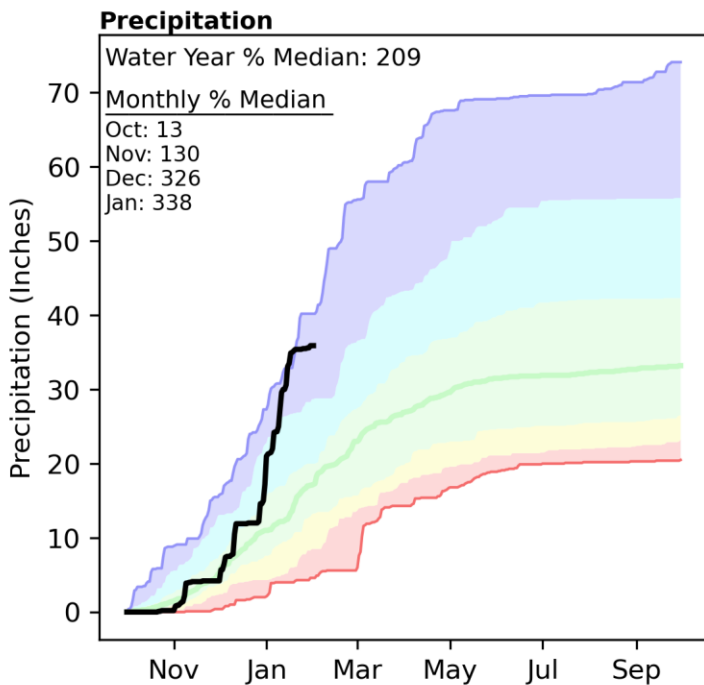
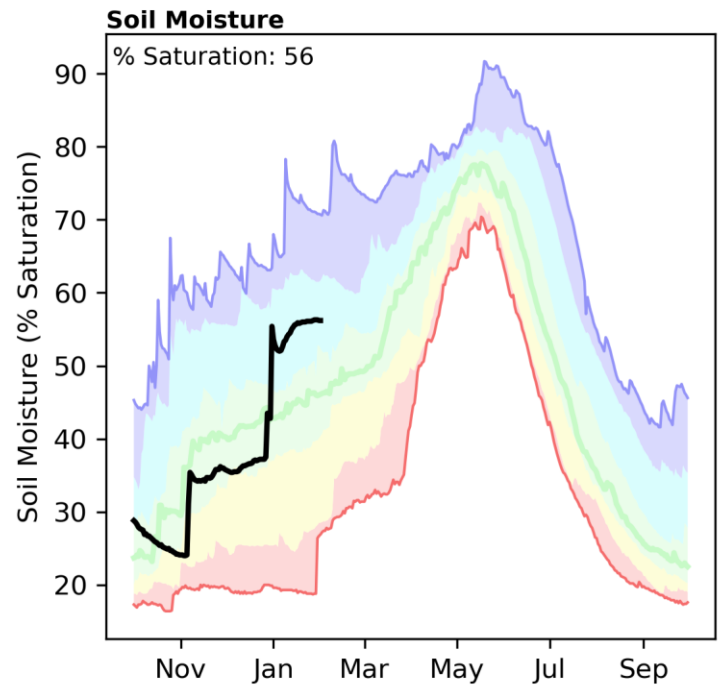
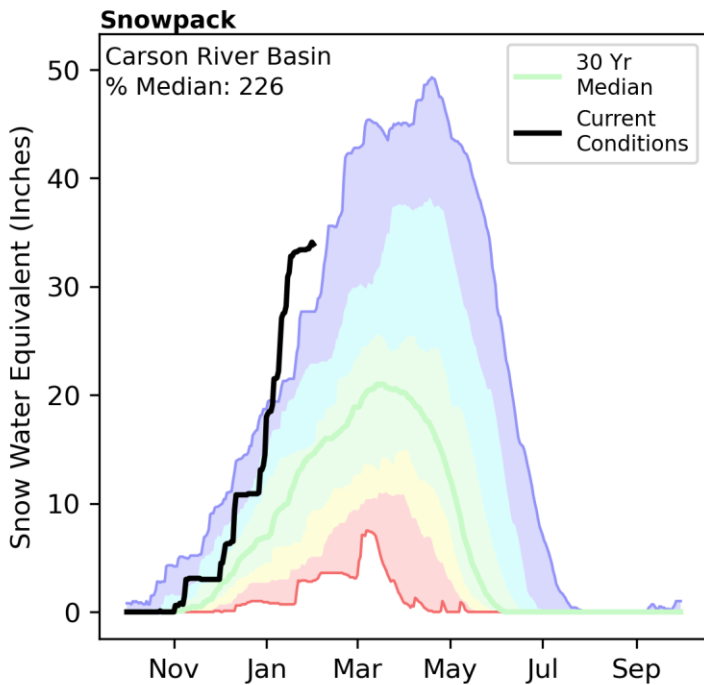
Reservoir Storage End of January, 2023	Current (KAF)	Last Year (KAF)	Median (KAF)	Capacity (KAF)
Boca Reservoir	16.9	26.1	10.7	40.9
Donner Lake	3.4	3.3	3.7	9.5
Independence Lake	13.3	12.6	14.1	17.3
Prosser Reservoir	9.8	7.5	9.7	29.8
Stampede Reservoir	103.4	93.8	151.4	226.5

Watershed Snowpack Analysis February 1, 2023	# of Sites	% Median	Last Year % Median
Truckee	17	173%	112%
Little Truckee ab Stampede	5	181%	125%
Sagehen-Independence	3	193%	142%
Galena	1	192%	113%
Steamboat	1	192%	113%
Truckee above Pyramid Lake	33	186%	111%

Note: Hydrologists with the NRCS and National Weather Service California Nevada River Forecast Center (CNRFC) coordinate Lake Tahoe Rise, Truckee River at Farad, Little Truckee River above Boca, and the Carson River near Ft. Churchill using output of their respective hydrology models at the request of the Bureau of Reclamation. The NRCS model is a statistical model based on the current data as of the first of each month. The CNRFC ensemble forecasting system incorporates near-term weather prediction and climatology into their model. These models can provide different answers because of the nature of the model systems, and from the inclusion of future weather in the CNRFC model. The hydrologists agree on forecast values using guidance from both models to best provide an accurate water supply forecast for these points.

Carson River Basin | February 1, 2023

Snowpack in the Carson River Basin is well above normal at 226% of median, compared to 102% at this time last year. Precipitation in January was well above normal at 338%, which brings the seasonal accumulation (October-January) to 209% of median. Soil moisture is at 56% saturation compared to 57% saturation last year. Reservoir storage is 33% of capacity, compared to 27% last year.



Statistical shading breaks at 10th, 30th, 50th, 70th, and 90th percentiles.
For more information visit: [30 year normal calculation description](#)

Carson Streamflow Forecasts - February 1, 2023

Forecast Exceedance Probabilities For Risk Assessment
Chance that actual volume will exceed forecast

Carson	Forecast Period	90% (KAF)	70% (KAF)	50% (KAF)	% Median	30% (KAF)	10% (KAF)	30yr Median (KAF)
EF Carson R nr Gardnerville	MAR-JUL	300	365	410	223%	455	520	184
	APR-JUL	310	370	370	226%	455	515	164
	200 cfs	13 Aug	30 Aug	10 Sep		21 Sep	08 Oct	14 Jul
	500 cfs	20 Jul	06 Aug	17 Aug		28 Aug	14 Sep	20 Jun
WF Carson R nr Woodfords	MAR-JUL	77	96	110	220%	124	143	50
	APR-JUL	67	87	100	222%	113	133	45
Carson R nr Carson City	MAR-JUL	300	390	450	287%	510	600	157
	APR-JUL	315	395	400	301%	505	580	133
Kings Canyon Ck nr Carson City	MAR-JUL	0.26	0.42	0.54	284%	0.68	0.92	0.19
	APR-JUL	0.19	0.32	0.42	323%	0.54	0.75	0.13
Ash Canyon Ck nr Carson City	MAR-JUL	1.28	1.69	2	194%	2.3	2.9	1.03
	APR-JUL	1.06	1.43	1.7	207%	2	2.5	0.82
Carson R at Ft Churchill	MAR-JUL	305	390	450	292%	510	595	154
	APR-JUL	290	340	385	294%	455	520	131

- 1) 90% And 10% exceedance probabilities are actually 95% And 5%
- 2) Forecasts are For unimpaired flows. Actual flow will be dependent On management of upstream reservoirs And diversions

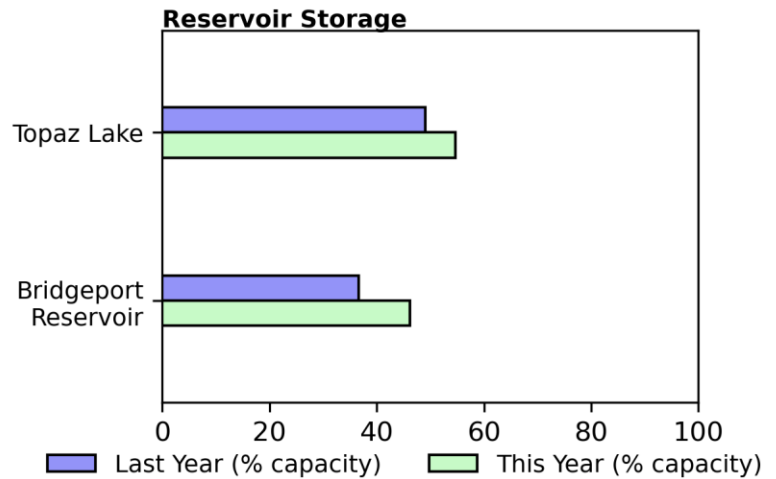
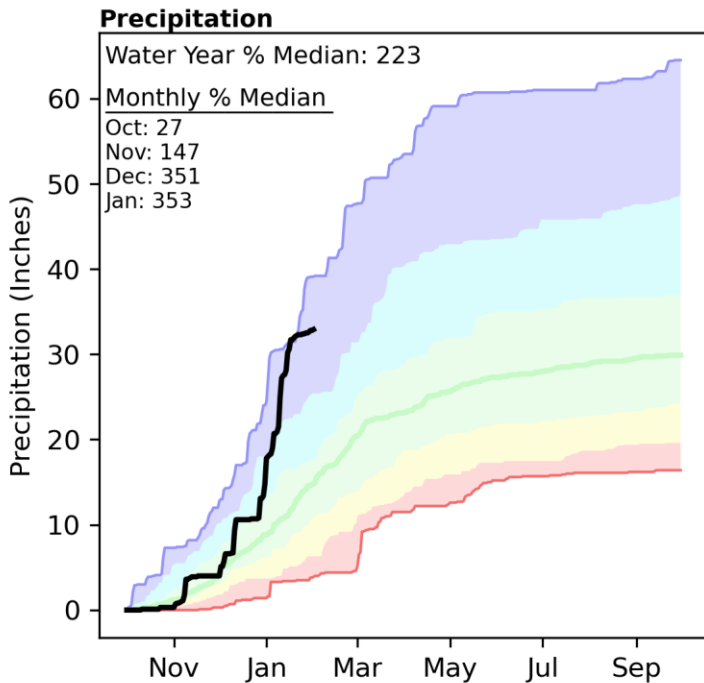
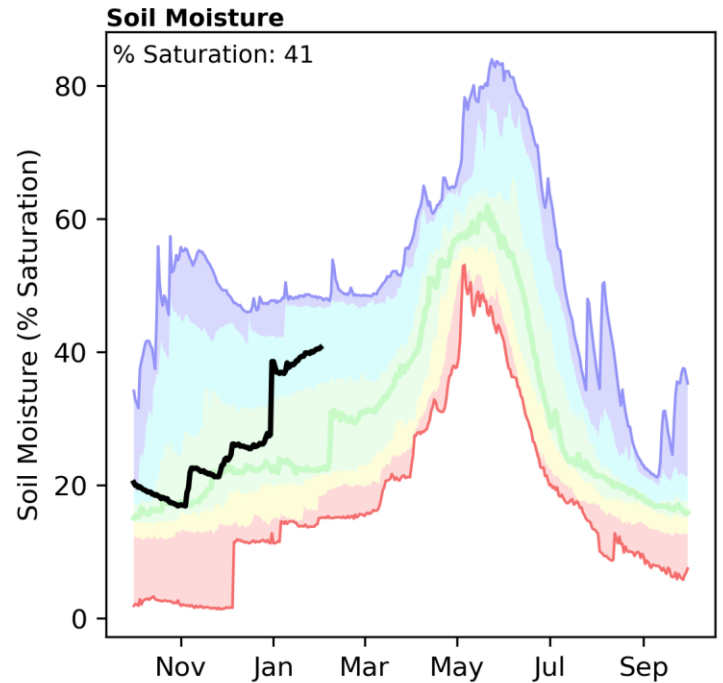
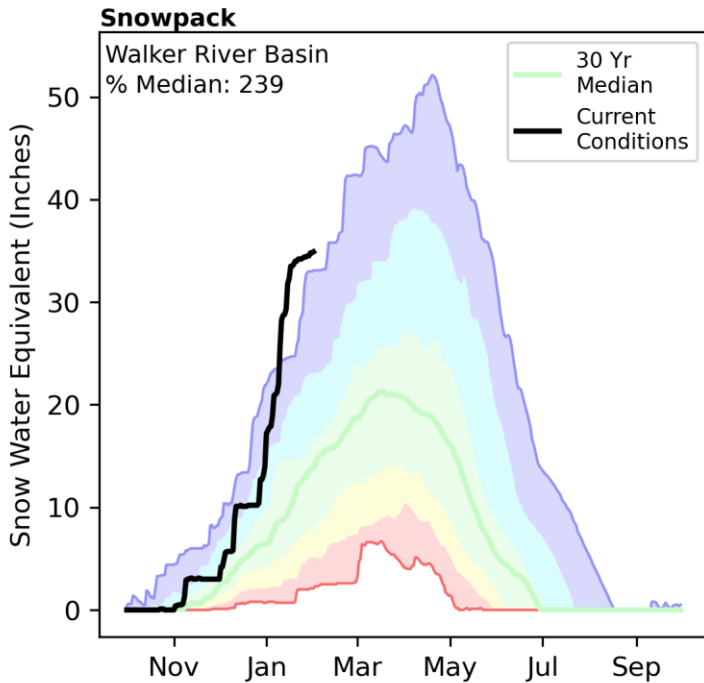
Reservoir Storage End of January, 2023	Current (KAF)	Last Year (KAF)	Median (KAF)	Capacity (KAF)
Lahontan Reservoir	104.6	84.6	131.5	313.0

Watershed Snowpack Analysis February 1, 2023	# of Sites	% Median	Last Year % Median
Carson	16	226%	102%
East Fork Carson	7	237%	98%
West Fork Carson	9	211%	97%

Note: Hydrologists with the NRCS and National Weather Service California Nevada River Forecast Center (CNRFC) coordinate Lake Tahoe Rise, Truckee River at Farad, Little Truckee River above Boca, and the Carson River near Ft. Churchill using output of their respective hydrology models at the request of the Bureau of Reclamation. The NRCS model is a statistical model based on the current data as of the first of each month. The CNRFC ensemble forecasting system incorporates near-term weather prediction and climatology into their model. These models can provide different answers because of the nature of the model systems, and from the inclusion of future weather in the CNRFC model. The hydrologists agree on forecast values using guidance from both models to best provide an accurate water supply forecast for these points.

Walker River Basin | February 1, 2023

Snowpack in the Walker River Basin is well above normal at 239% of median, compared to 101% at this time last year. Precipitation in January was well above normal at 353%, which brings the seasonal accumulation (October-January) to 223% of median. Soil moisture is at 41% saturation compared to 48% saturation last year. Reservoir storage is 51% of capacity, compared to 44% last year.



Statistical shading breaks at 10th, 30th, 50th, 70th, and 90th percentiles.
For more information visit: [30 year normal calculation description](#)

Walker Streamflow Forecasts - February 1, 2023

Forecast Exceedance Probabilities For Risk Assessment
Chance that actual volume will exceed forecast

Walker	Forecast Period	90% (KAF)	70% (KAF)	50% (KAF)	% Median	30% (KAF)	10% (KAF)	30yr Median (KAF)
E Walker R nr Bridgeport ²	MAR-AUG	123	157	180	353%	205	235	51
	APR-AUG	101	132	154	350%	176	205	44
W Walker R bl L Walker R nr Coleville	MAR-JUL	250	295	330	208%	365	410	159
	APR-JUL	230	280	310	203%	340	390	153
W Walker R nr Coleville	MAR-JUL	265	315	345	224%	380	425	154
	APR-JUL	250	295	330	224%	360	405	147
Walker Lake Elevation Change ¹	LOW-HIGH	4	5.8	7		8.2	10	

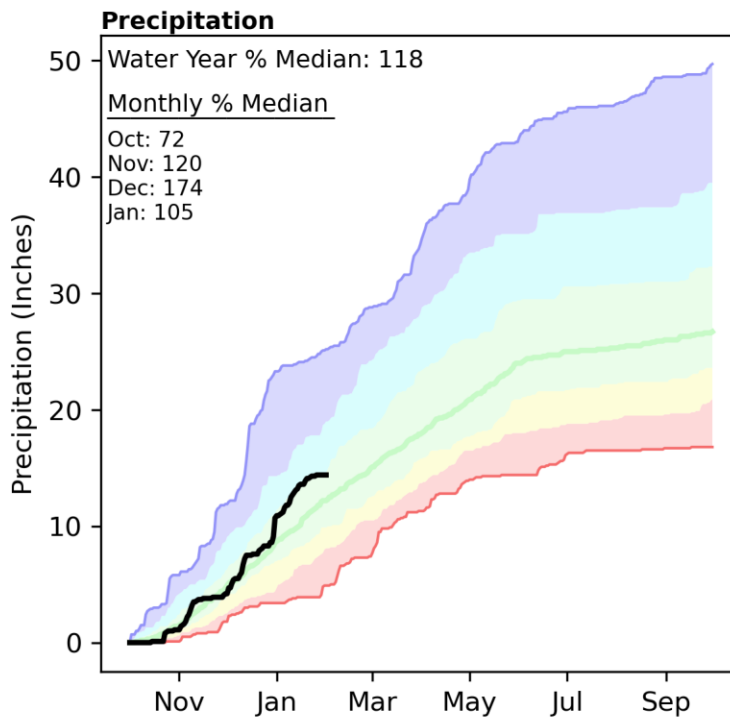
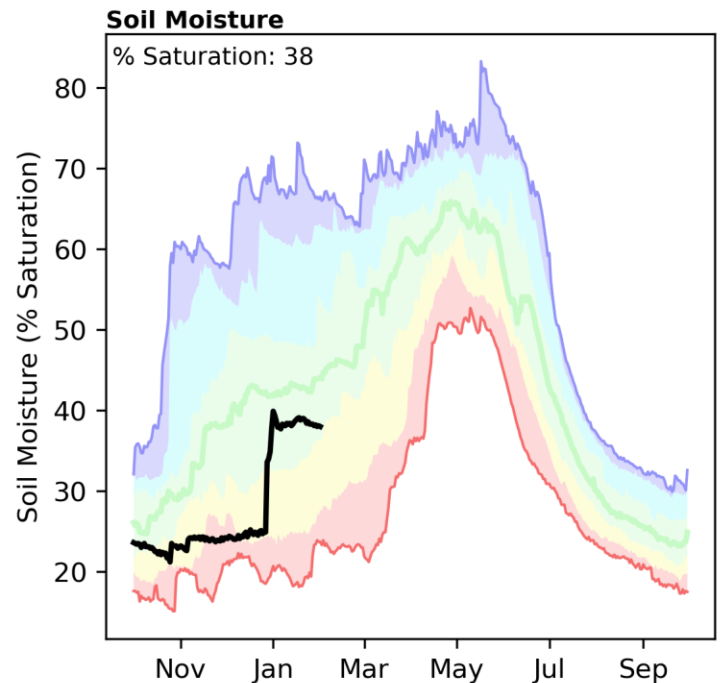
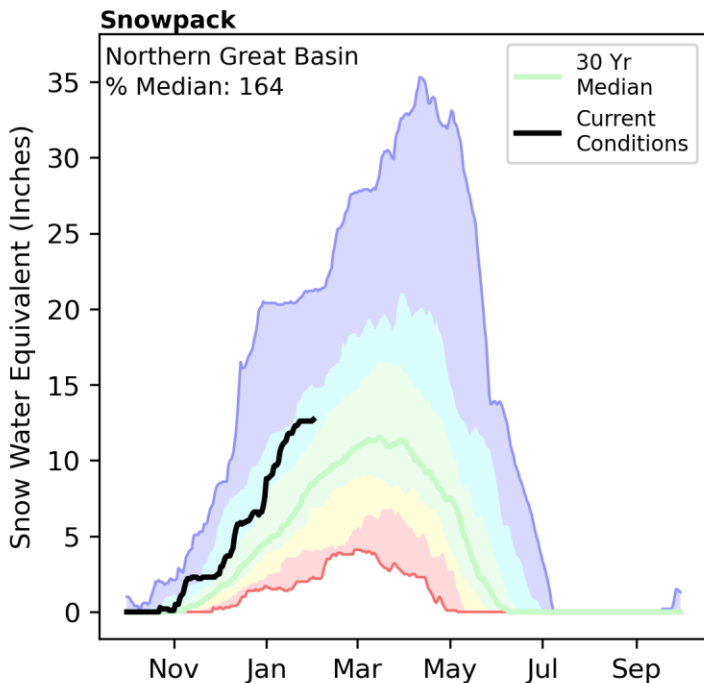
1) 90% And 10% exceedance probabilities are actually 95% And 5%

2) Forecasts are For unimpaired flows. Actual flow will be dependent On management of upstream reservoirs And diversions

Reservoir Storage End of January, 2023	Current (KAF)	Last Year (KAF)	Median (KAF)	Capacity (KAF)
Bridgeport Reservoir	19.6	15.6	15.6	42.5
Topaz Lk nr Topaz	32.5	29.1	16.5	59.4

Watershed Snowpack Analysis February 1, 2023	# of Sites	% Median	Last Year % Median
Walker	9	239%	101%
East Walker ab Bridgeport	3	307%	105%
West Walker ab Coleville	8	234%	100%

Snowpack in the Northern Great Basin is well above normal at 164% of median, compared to 92% at this time last year. Precipitation in January was about normal at 105%, which brings the seasonal accumulation (October-January) to 118% of median. Soil moisture is at 38% saturation compared to 55% saturation last year.



Statistical shading breaks at 10th, 30th, 50th, 70th, and 90th percentiles.
For more information visit: [30 year normal calculation description](#)

Northern Great Basin Streamflow Forecasts - February 1, 2023

Forecast Exceedance Probabilities For Risk Assessment
Chance that actual volume will exceed forecast

Northern Great Basin	Forecast Period	90% (KAF)	70% (KAF)	50% (KAF)	% Median	30% (KAF)	10% (KAF)	30yr Median (KAF)
McDermitt Ck nr McDermitt	MAR-JUN	16.4	23	28	255%	34	44	11
	APR-JUL	10.3	15.9	20	274%	25	34	7.3

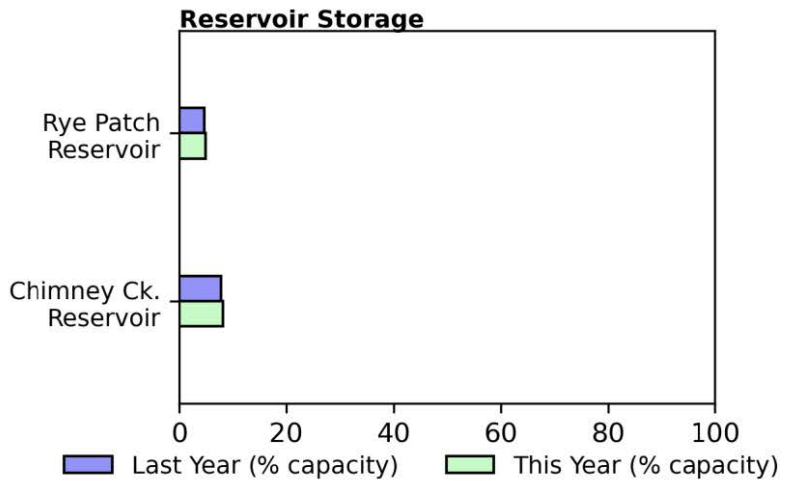
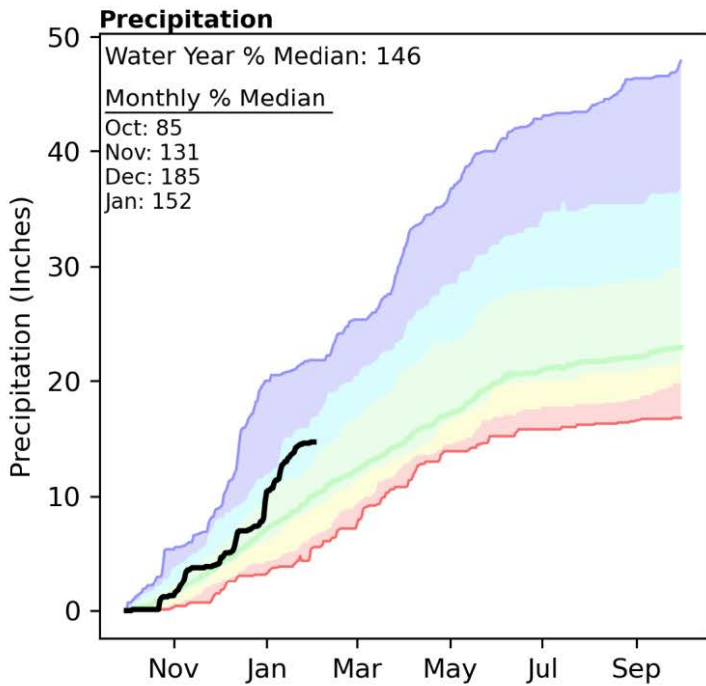
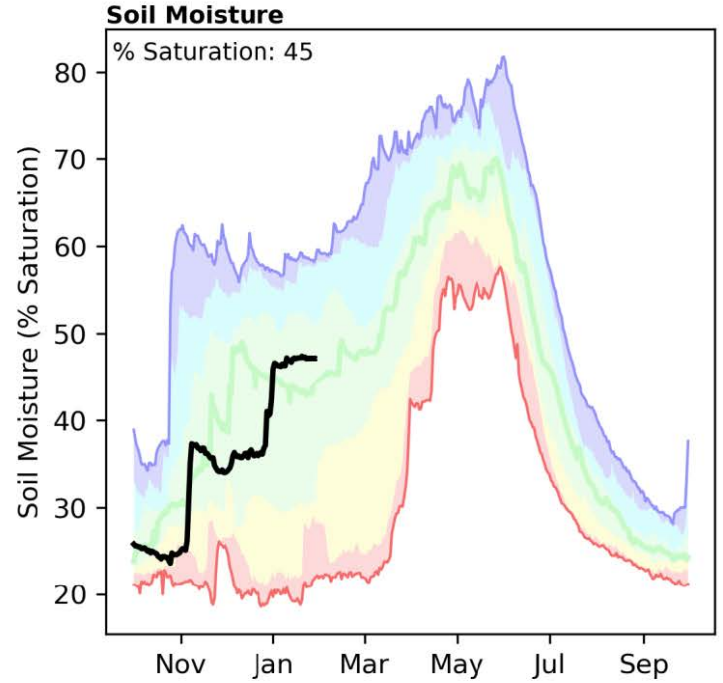
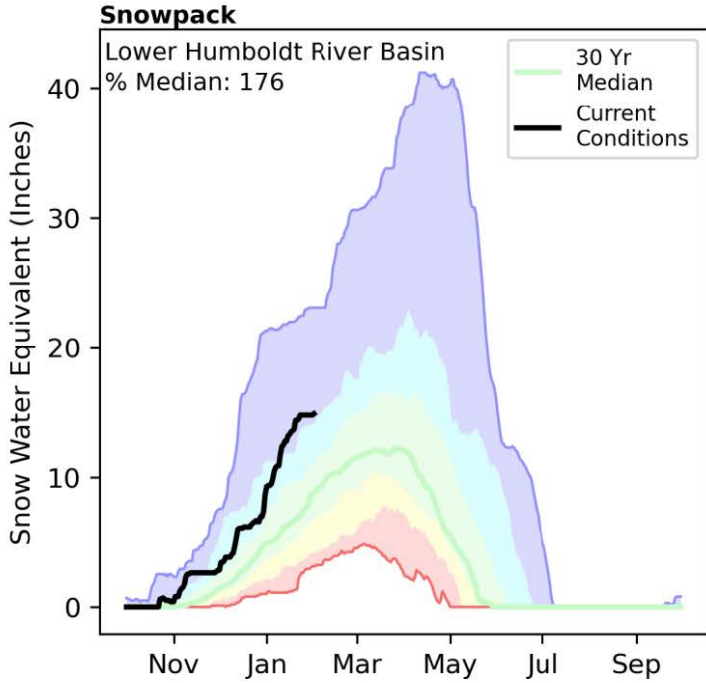
1) 90% And 10% exceedance probabilities are actually 95% And 5%

2) Forecasts are For unimpaired flows. Actual flow will be dependent On management of upstream reservoirs And diversions

Watershed Snowpack Analysis February 1, 2023	# of Sites	% Median	Last Year % Median
Northern Great Basin	18	164%	92%
Surprise Valley-Warner Mtns	6	143%	87%
McDermitt	4	179%	82%
Quinn	9	178%	102%

Lower Humboldt River Basin | February 1, 2023

Snowpack in the Lower Humboldt River Basin is well above normal at 176% of median, compared to 89% at this time last year. Precipitation in January was well above normal at 152%, which brings the seasonal accumulation (October-January) to 146% of median. Soil moisture is at 47% saturation compared to 49% saturation last year. Reservoir storage is 5% of capacity, same as last year at this time.



Statistical shading breaks at 10th, 30th, 50th, 70th, and 90th percentiles.
For more information visit: [30 year normal calculation description](#)

Lower Humboldt Streamflow Forecasts - February 1, 2023

Forecast Exceedance Probabilities For Risk Assessment
Chance that actual volume will exceed forecast

Lower Humboldt	Forecast Period	90% (KAF)	70% (KAF)	50% (KAF)	% Median	30% (KAF)	10% (KAF)	30yr Median (KAF)
Rock Ck nr Battle Mountain	MAR-JUL	15.6	30	42	368%	57	82	11.4
	APR-JUL	7.2	17.3	27	443%	38	58	6.1
Humboldt R at Comus	MAR-JUL	295	410	500	510%	600	765	98
	APR-JUL	210	305	380	481%	465	605	79
L Humboldt R nr Paradise Valley ²	MAR-JUL	7	13	17.1	145%	21	27	11.8
	APR-JUL	3	7.6	10.7	184%	13.9	18.5	5.8
Martin Ck nr Paradise Valley	MAR-JUL	17.8	27	33	226%	39	48	14.6
	APR-JUL	12.3	20	26	241%	31	40	10.8
Humboldt R nr Imlay	MAR-JUL	193	295	375	577%	465	620	65
	APR-JUL	146	230	300	577%	380	510	52

1) 90% And 10% exceedance probabilities are actually 95% And 5%

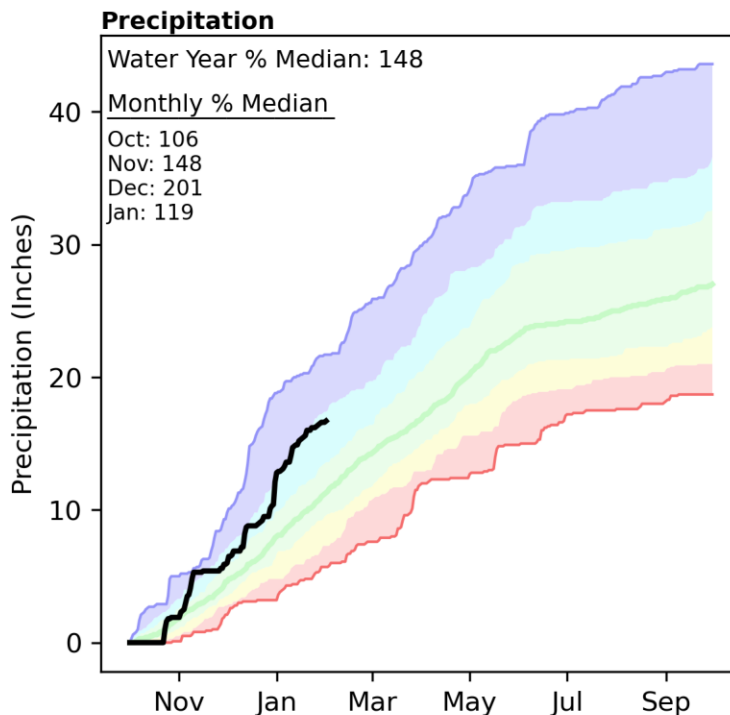
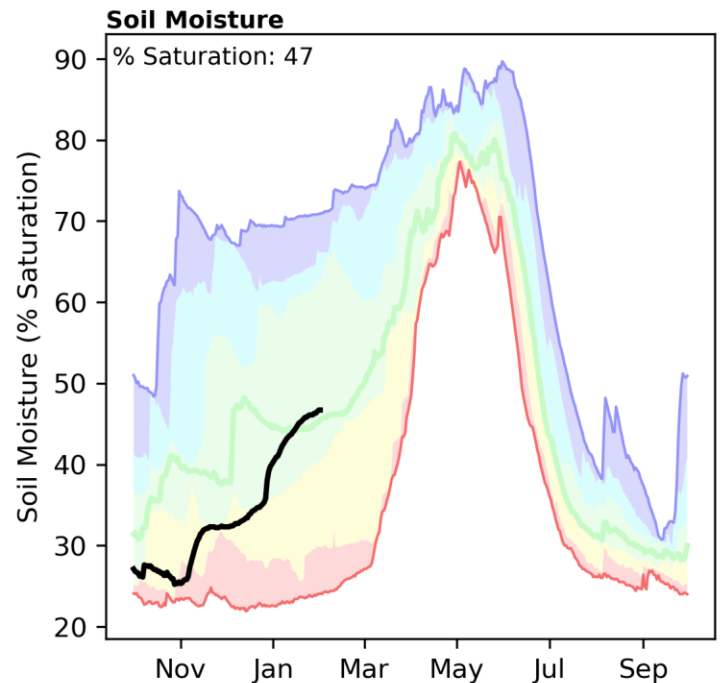
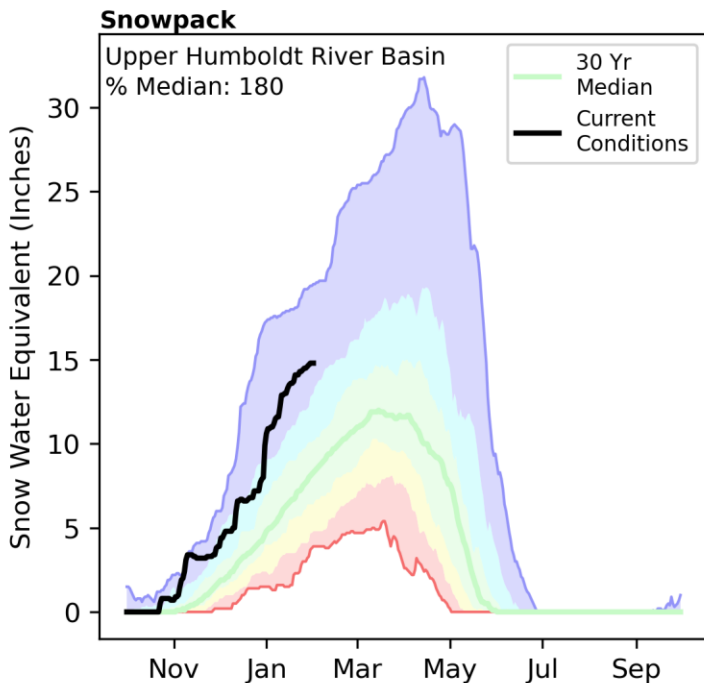
2) Forecasts are For unimpaired flows. Actual flow will be dependent On management of upstream reservoirs And diversions

Reservoir Storage End of January, 2023	Current (KAF)	Last Year (KAF)	Median (KAF)	Capacity (KAF)
Chimney Creek Reservoir	2.8	2.7	11.6	35.0
Rye Patch Re nr Rye Patch, NV	9.4	8.9	20.7	194.3

Watershed Snowpack Analysis February 1, 2023	# of Sites	% Median	Last Year % Median
Lower Humboldt	8	176%	89%
Rock	2	149%	98%
Reese	2	208%	64%
Martin	2	168%	107%
Little Humboldt	5	179%	102%
Humboldt above Imlay	31	179%	81%

Upper Humboldt River Basin | February 1, 2023

Snowpack in the Upper Humboldt River Basin is well above normal at 180% of median, compared to 78% at this time last year. Precipitation in January was above normal at 119%, which brings the seasonal accumulation (October-January) to 148% of median. Soil moisture is at 47% saturation compared to 54% saturation last year.



Statistical shading breaks at 10th, 30th, 50th, 70th, and 90th percentiles.
For more information visit: [30 year normal calculation description](#)

Upper Humboldt Streamflow Forecasts - February 1, 2023

Forecast Exceedance Probabilities For Risk Assessment
Chance that actual volume will exceed forecast

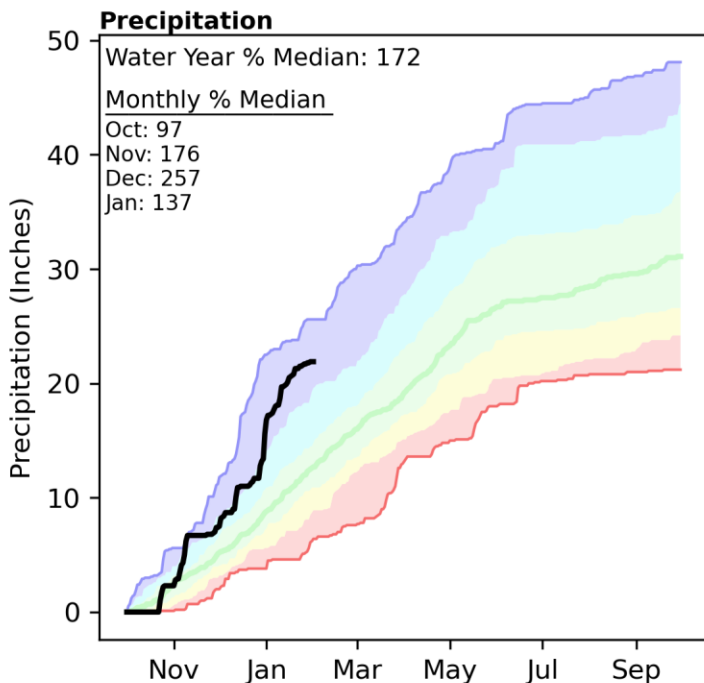
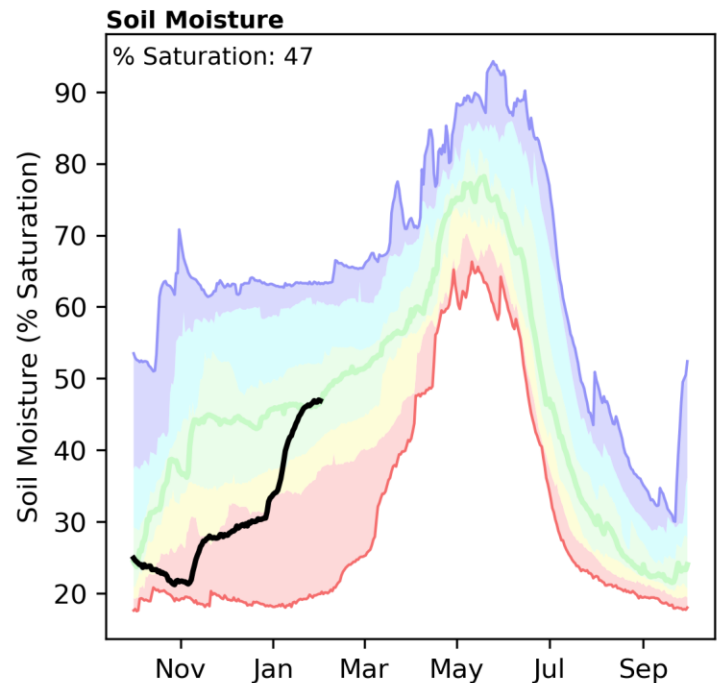
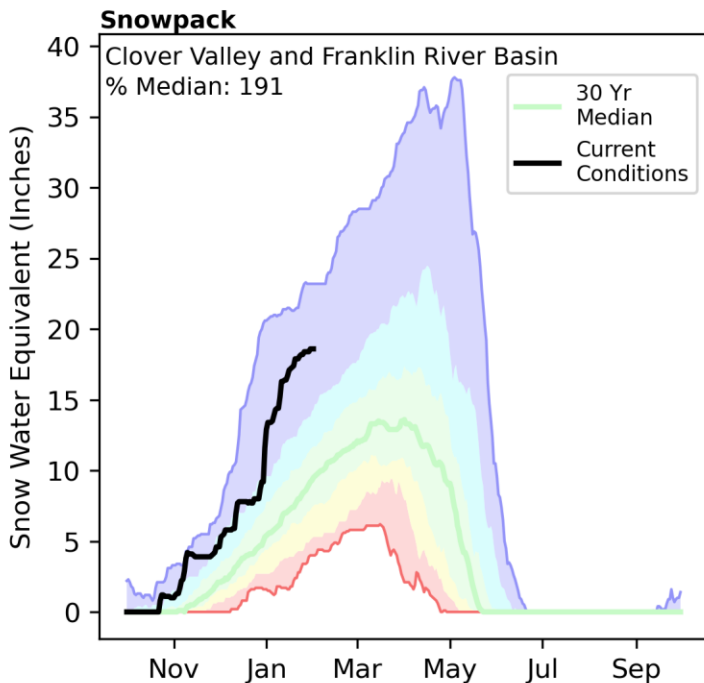
Upper Humboldt	Forecast Period	90% (KAF)	70% (KAF)	50% (KAF)	% Median	30% (KAF)	10% (KAF)	30yr Median (KAF)
Marys R nr Deeth	MAR-JUL	26	40	50	172%	60	74	29
	APR-JUL	21	35	44	169%	53	67	26
Lamoille Ck nr Lamoille	MAR-JUL	35	42	46	170%	50	57	27
	APR-JUL	33	40	44	169%	48	55	26
NF Humboldt R at Devils Gate	MAR-JUL	37	52	62	270%	72	87	23
	APR-JUL	22	36	45	250%	54	68	18
Humboldt R nr Elko	MAR-JUL	162	225	270	346%	315	380	78
	APR-JUL	128	189	230	333%	270	330	69
SF Humboldt R abv Tenmile Ck	MAR-JUL	105	135	155	282%	175	205	55
	APR-JUL	96	125	145	279%	165	194	52
SF Humboldt R ab Dixie Ck	MAR-JUL	107	135	155	292%	175	205	53
	APR-JUL	97	126	145	284%	164	193	51
Humboldt R nr Carlin	MAR-JUL	290	400	480	429%	570	715	112
	APR-JUL	235	335	410	410%	495	630	100
Humboldt R at Palisade	MAR-JUL	335	455	550	433%	655	820	127
	APR-JUL	260	365	450	413%	545	695	109

1) 90% And 10% exceedance probabilities are actually 95% And 5%

2) Forecasts are For unimpaired flows. Actual flow will be dependent On management of upstream reservoirs And diversions

Watershed Snowpack Analysis February 1, 2023	# of Sites	% Median	Last Year % Median
Upper Humboldt	23	180%	78%
Mary's	5	146%	78%
Lamoille	3	175%	87%
North Fork Humboldt	5	157%	75%
South Fork Humboldt	7	195%	78%

Snowpack in the Clover Valley and Franklin River Basin is well above normal at 191% of median, compared to 75% at this time last year. Precipitation in January was well above normal at 137%, which brings the seasonal accumulation (October-January) to 172% of median. Soil moisture is at 47% saturation compared to 52% saturation last year.



Hole-in-Mountain SNOTEL - Status

Starting in water year 2020, automated snow water and snow depth measurements have been moved back to the original Hole-in-Mountain SNOTEL location used from 1981-2015. This move allows daily snow water percent of median to be calculated using historic data. The SNOTEL was re-located outside an avalanche zone in 2016 following an avalanche that damaged the site. Unfortunately, the new location while protected from future slides, was subject to drifting and snow data proved unrepresentative. Snow data from 2016-2020 have been removed from the public database and will appear as missing in NRCS products. Other SNOTEL parameters collected at the newer location are representative and were not moved. These include air temperature, precipitation and soil moisture.

Contact Jeff Anderson for more information:
jeff.anderson@usda.gov or 775-834-0913

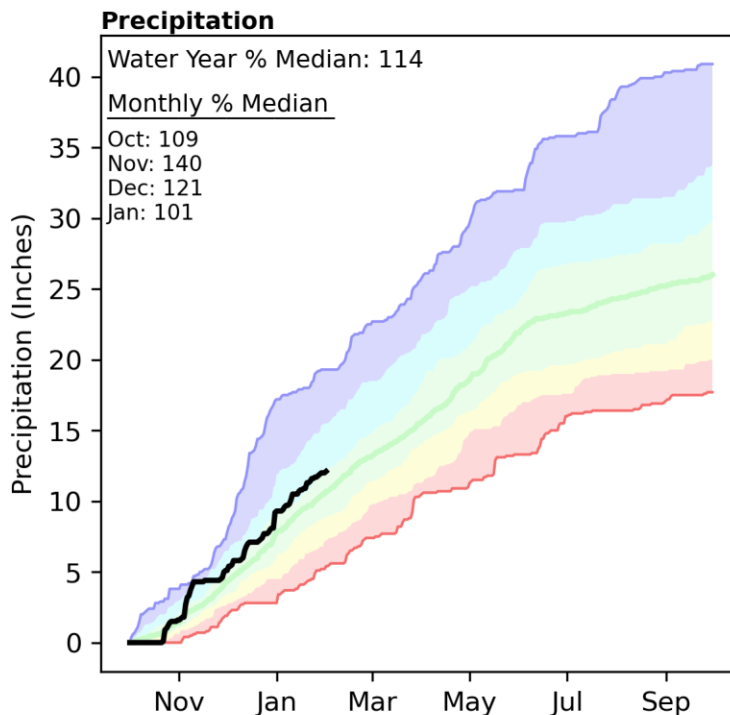
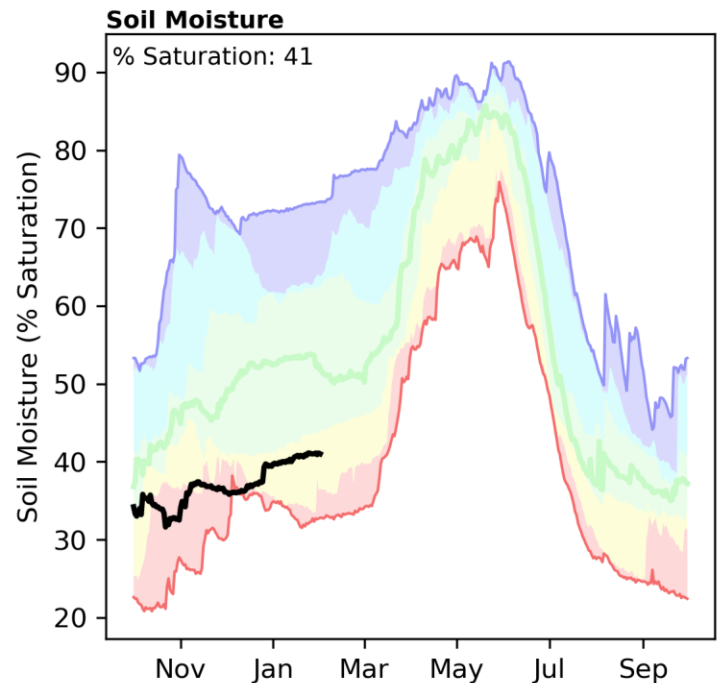
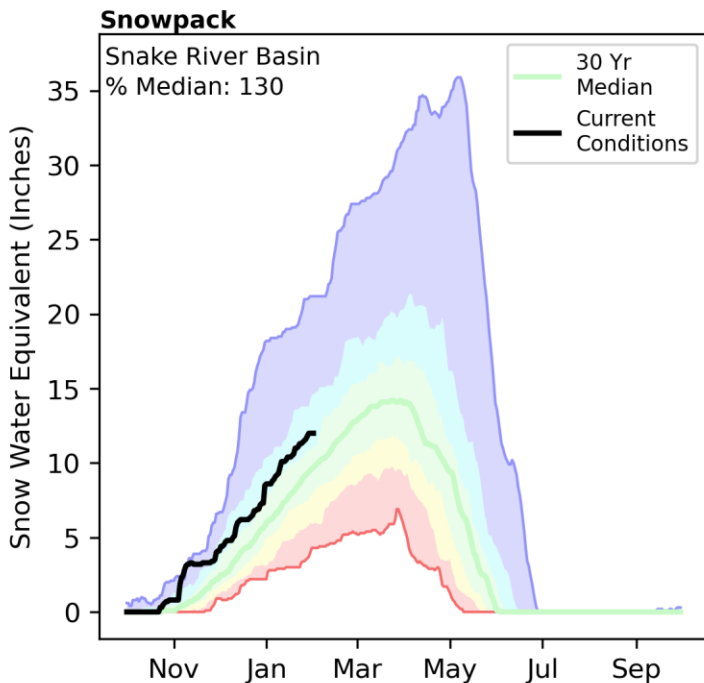
Statistical shading breaks at 10th, 30th, 50th, 70th, and 90th percentiles.
For more information visit: [30 year normal calculation description](#)

Clover Valley And Franklin - February 1, 2023

Watershed Snowpack Analysis February 1, 2023	# of Sites	% Median	Last Year % Median
Clover Valley and Franklin	9	191%	75%
Clover Valley	4	181%	61%
Franklin	7	192%	79%

Snake River Basin | February 1, 2023

Snowpack in the Snake River Basin is well above normal at 130% of median, compared to 91% at this time last year. Precipitation in January was about normal at 101%, which brings the seasonal accumulation (October-January) to 114% of median. Soil moisture is at 41% saturation compared to 52% saturation last year.



Statistical shading breaks at 10th, 30th, 50th, 70th, and 90th percentiles.
For more information visit: [30 year normal calculation description](#)

Snake Streamflow Forecasts - February 1, 2023

Forecast Exceedance Probabilities For Risk Assessment
Chance that actual volume will exceed forecast

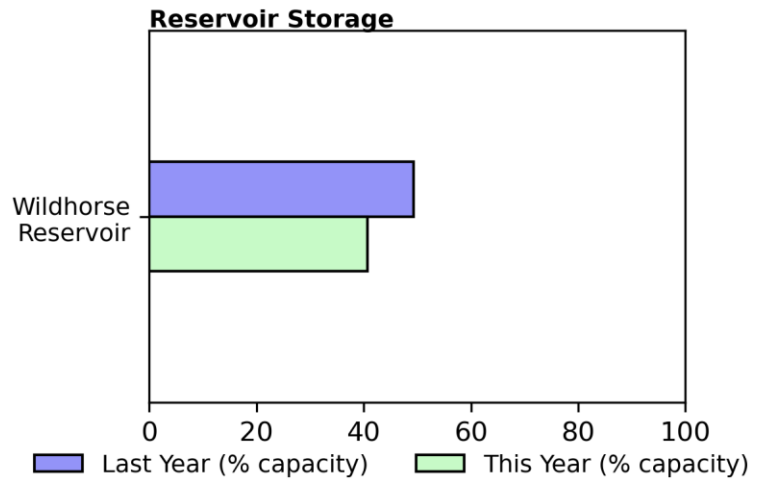
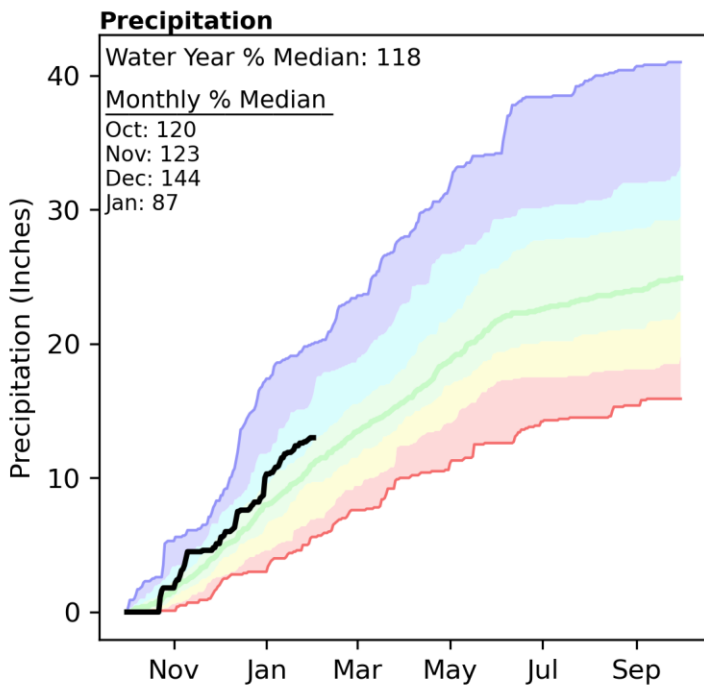
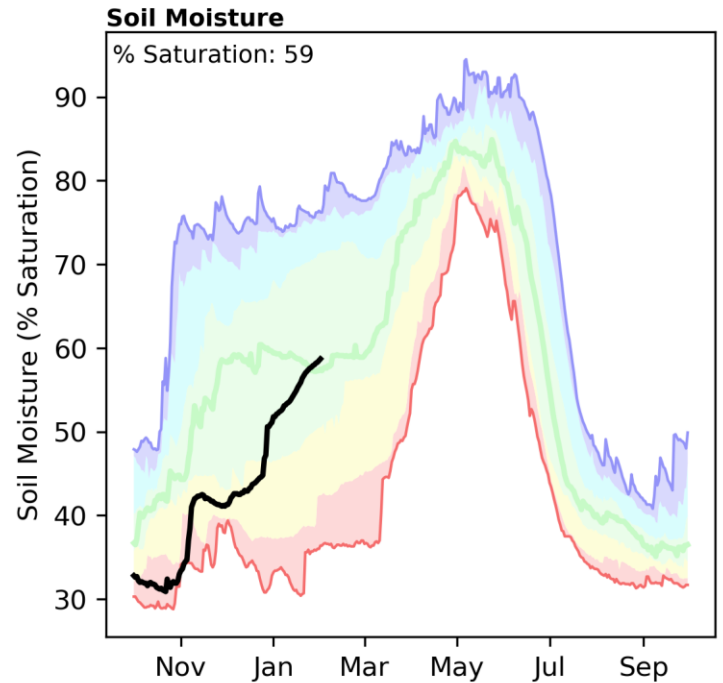
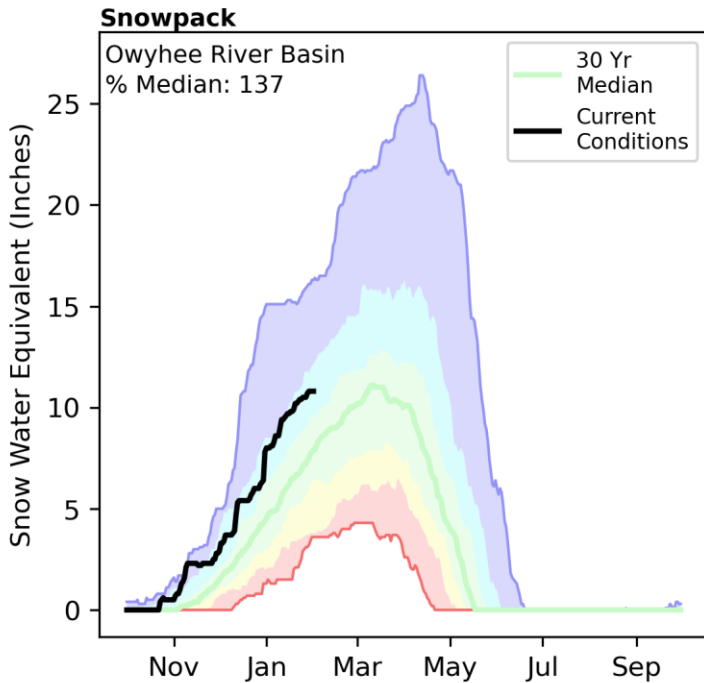
Snake	Forecast Period	90% (KAF)	70% (KAF)	50% (KAF)	% Median	30% (KAF)	10% (KAF)	30yr Median (KAF)
Bruneau R at Rowland	APR-JUL	26	45	58	121%	71	90	48
	APR-SEP	27	46	59	120%	72	91	49
Jarbidge River Below Jarbidge	APR-JUL	16.5	21	24	122%	27	32	19.6
	APR-SEP	17.1	22	25	125%	28	33	20
Salmon Falls Ck nr San Jacinto	MAR-JUL	44	64	80	125%	97	126	64
	MAR-SEP	47	67	83	126%	100	129	66

- 1) 90% And 10% exceedance probabilities are actually 95% And 5%
- 2) Forecasts are For unimpaired flows. Actual flow will be dependent On management of upstream reservoirs And diversions

Watershed Snowpack Analysis February 1, 2023	# of Sites	% Median	Last Year % Median
Snake	12	130%	91%
Bruneau Headwaters	6	136%	83%
Jarbidge	3	124%	82%
Salmon Falls	6	125%	96%

Owyhee River Basin | February 1, 2023

Snowpack in the Owyhee River Basin is well above normal at 137% of median, compared to 96% at this time last year. Precipitation in January was below normal at 87%, which brings the seasonal accumulation (October-January) to 118% of median. Soil moisture is at 59% saturation compared to 66% saturation last year. Reservoir storage is 41% of capacity, compared to 49% last year.



Statistical shading breaks at 10th, 30th, 50th, 70th, and 90th percentiles.
For more information visit: [30 year normal calculation description](#)

Owyhee Streamflow Forecasts - February 1, 2023

Forecast Exceedance Probabilities For Risk Assessment
Chance that actual volume will exceed forecast

Owyhee	Forecast Period	90% (KAF)	70% (KAF)	50% (KAF)	% Median	30% (KAF)	10% (KAF)	30yr Median (KAF)
Owyhee R nr Gold Ck ²	MAR-JUL	11.8	21	28	127%	37	51	22
	APR-JUL	5.9	13.8	21	122%	30	45	17.2

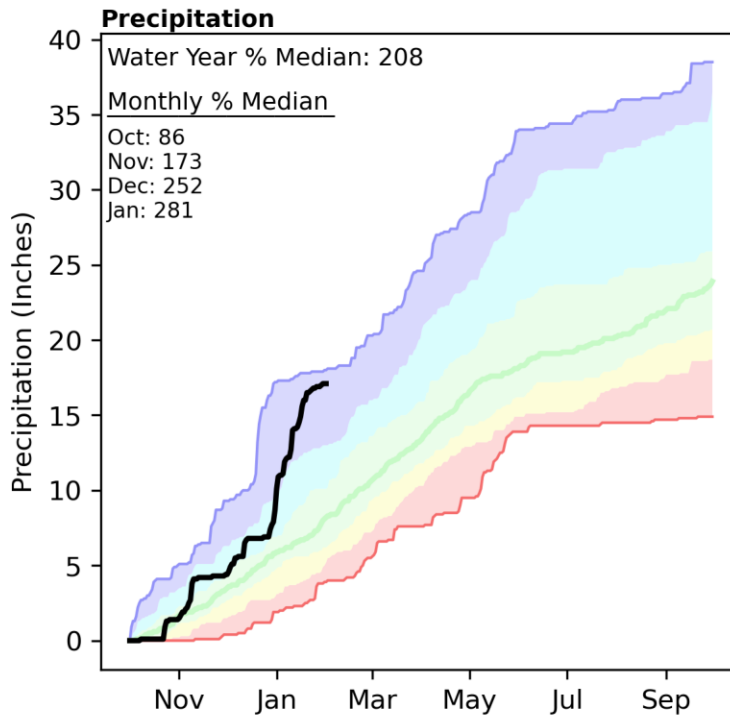
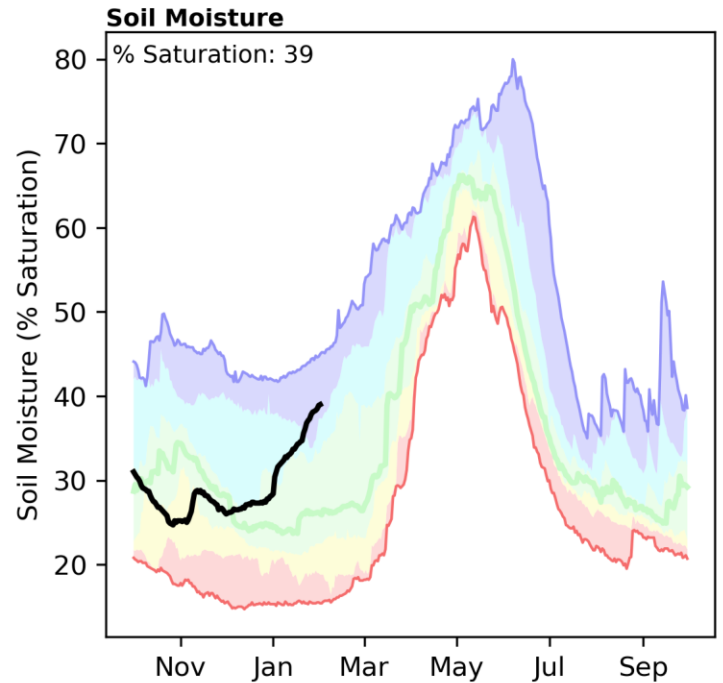
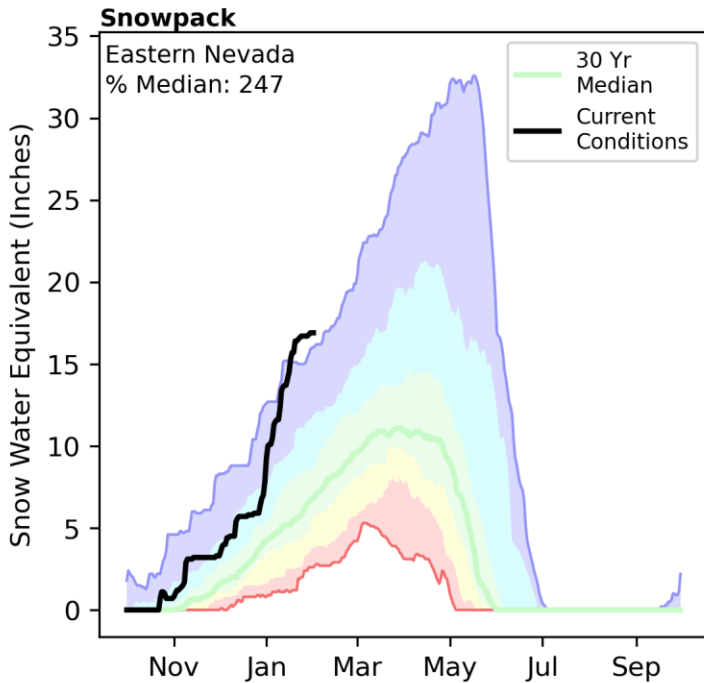
1) 90% And 10% exceedance probabilities are actually 95% And 5%

2) Forecasts are For unimpaired flows. Actual flow will be dependent On management of upstream reservoirs And diversions

Reservoir Storage End of January, 2023	Current (KAF)	Last Year (KAF)	Median (KAF)	Capacity (KAF)
Wild Horse Reservoir	29.1	35.3	30.5	71.5

Watershed Snowpack Analysis February 1, 2023	# of Sites	% Median	Last Year % Median
Owyhee	12	137%	96%
Owyhee ab Owhyee	8	133%	86%
Owhyee ab Gold Creek	4	123%	81%
South Fork Owyhee	6	139%	82%

Snowpack in Eastern Nevada is well above normal at 247% of median, compared to 106% at this time last year. Precipitation in January was well above normal at 281%, which brings the seasonal accumulation (October-January) to 208% of median. Soil moisture is at 39% saturation compared to 27% saturation last year.



Statistical shading breaks at 10th, 30th, 50th, 70th, and 90th percentiles.
For more information visit: [30 year normal calculation description](#)

Eastern Nevada Streamflow Forecasts - February 1, 2023

Forecast Exceedance Probabilities For Risk Assessment
Chance that actual volume will exceed forecast

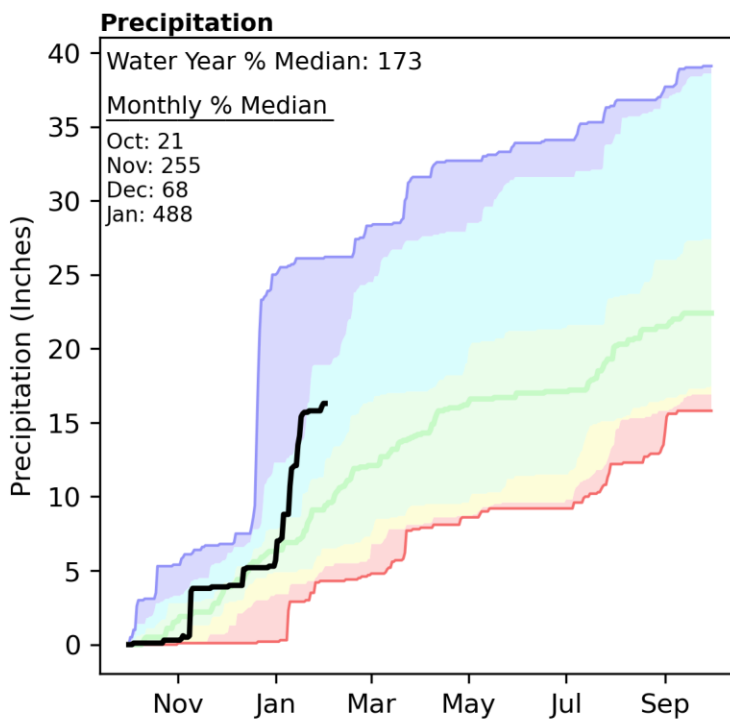
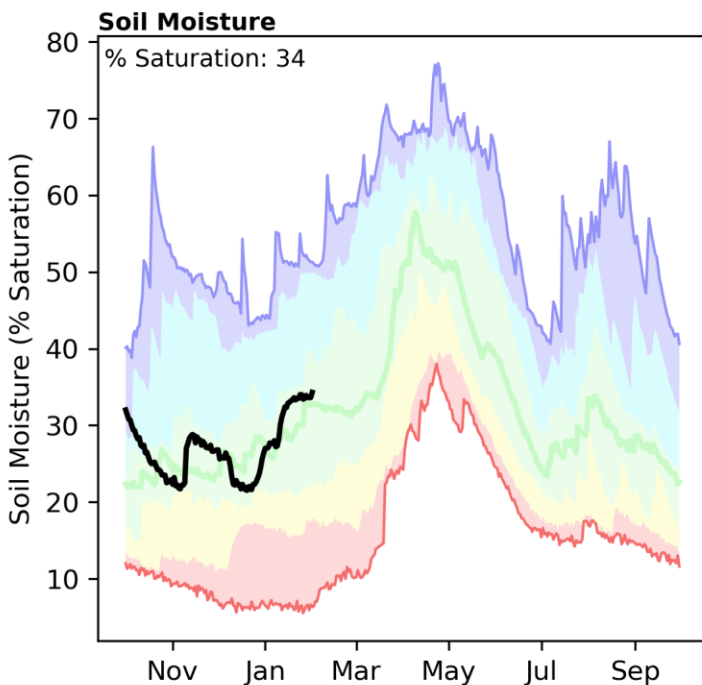
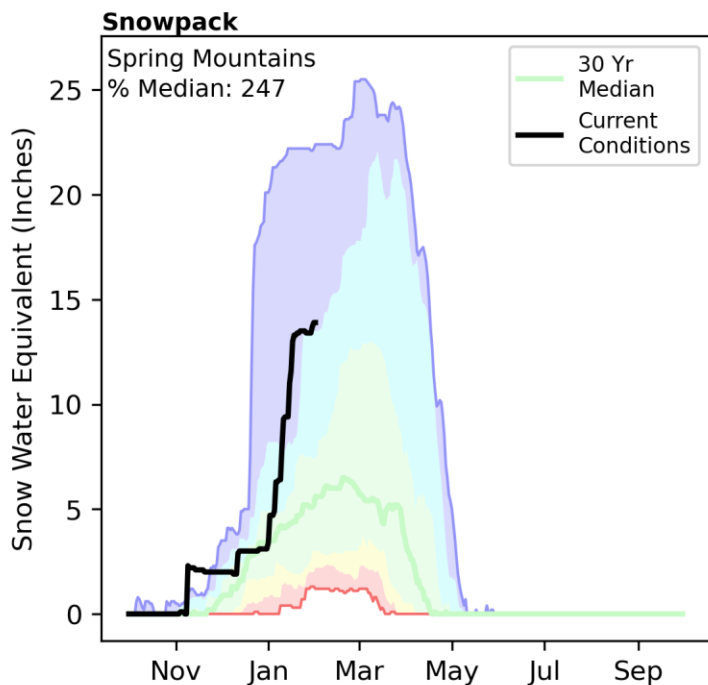
Eastern Nevada	Forecast Period	90% (KAF)	70% (KAF)	50% (KAF)	% Median	30% (KAF)	10% (KAF)	30yr Median (KAF)
Kingston Ck nr Austin	APR-JUL	3.9	5.8	7.4	416%	9.1	12	1.78
Steptoe Ck nr Ely	APR-JUL	4.5	5.7	6.6	485%	7.6	9.2	1.36
Cleve Ck nr Ely	APR-JUL	6.9	8.9	10.5	389%	12.2	14.9	2.7
Lehman Ck nr Baker	APR-JUL	3.5	4.6	5.3	266%	5.9	7	1.99

- 1) 90% And 10% exceedance probabilities are actually 95% And 5%
- 2) Forecasts are For unimpaired flows. Actual flow will be dependent On management of upstream reservoirs And diversions

Watershed Snowpack Analysis February 1, 2023	# of Sites	% Median	Last Year % Median
Eastern Nevada	5	247%	106%
Kingston	1	242%	61%
Steptoe Valley	2	246%	114%

Spring Mountains | February 1, 2023

Snowpack in the Spring Mountains is well above normal at 247% of median, compared to 149% at this time last year. Precipitation in January was well above normal at 488%, which brings the seasonal accumulation (October-January) to 173% of median. Soil moisture is at 34% saturation compared to 32% saturation last year.

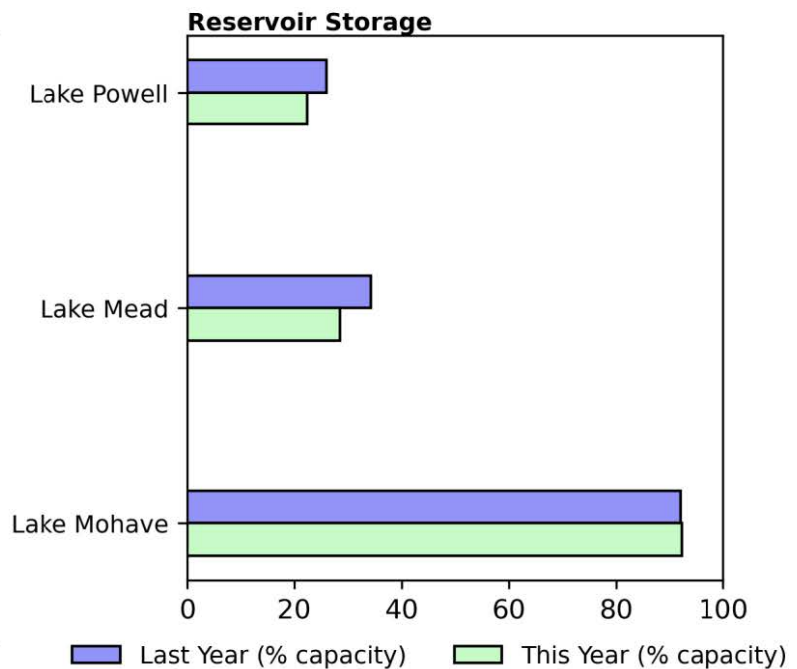
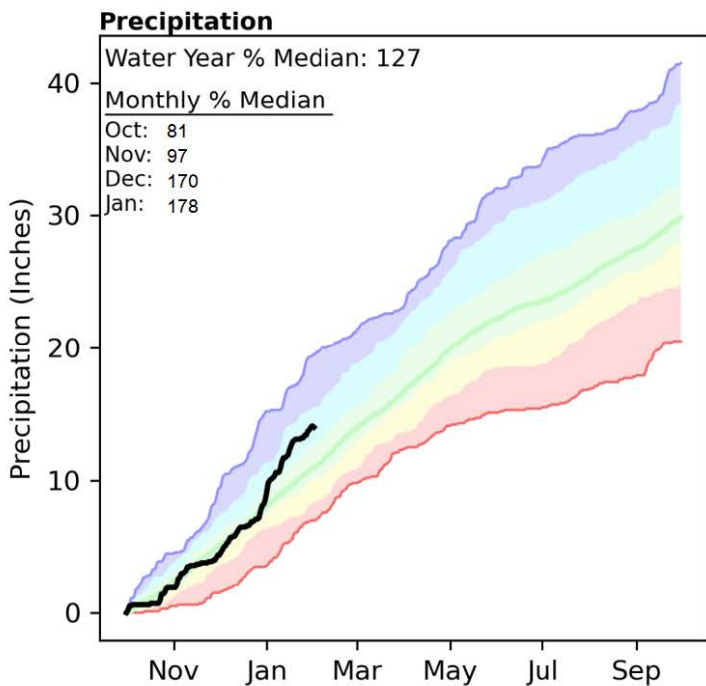
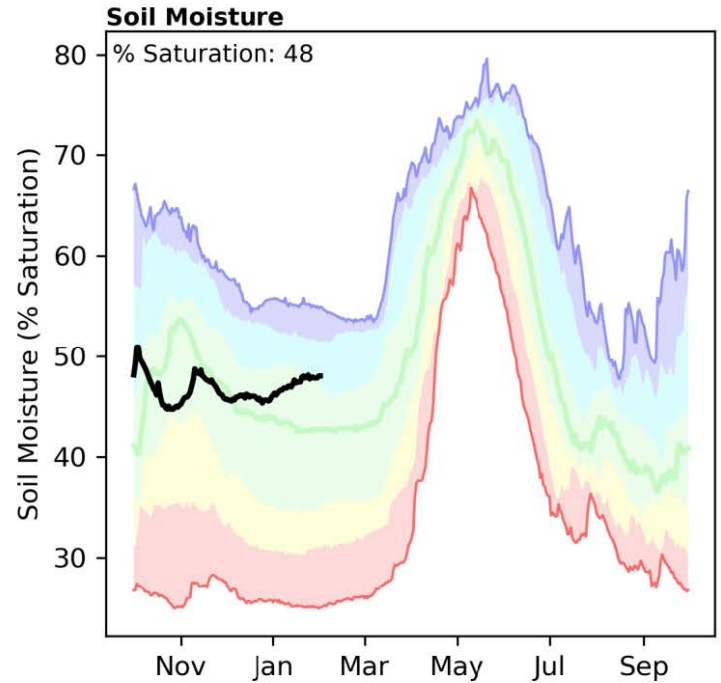
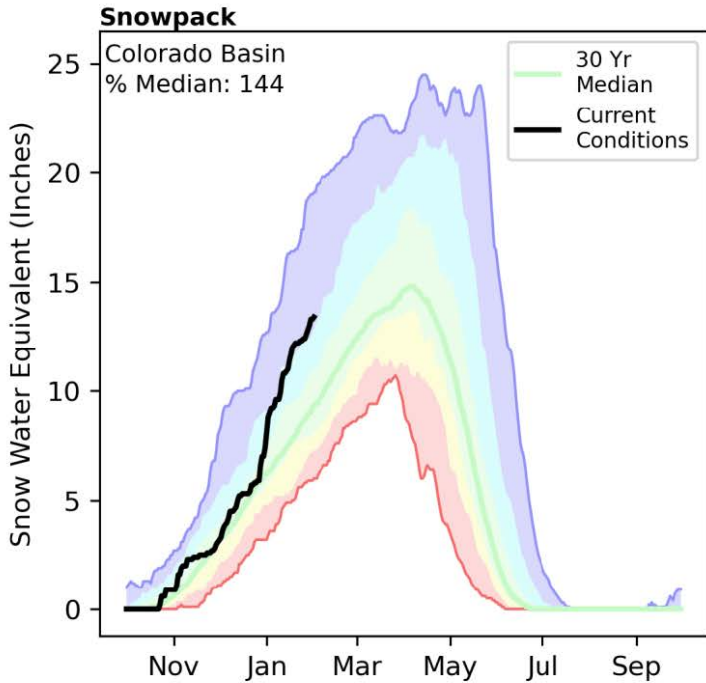


Statistical shading breaks at 10th, 30th, 50th, 70th, and 90th percentiles.
For more information visit: [30 year normal calculation description](#)

SNOTEL sites in the Spring Mountains were installed in 2008. Reported percentages are based on SNOTEL medians calculated using data from water years 2009-2020, not the full 30-year period. Snowpack percentages in the March and April reports include snow course measurements from long term data collection transects.

Colorado Basin | February 1, 2023

Snowpack in the Colorado Basin above Lake Powell is well above normal at 144% of median, compared to 105% at this time last year. Precipitation in January was well above normal at 178%, which brings the seasonal accumulation (October-January) to 127% of median. Soil moisture is at 48% saturation, same as last year at this time. Reservoir storage in the Lower Colorado Basin is 27% of capacity, compared to 32% last year.



Statistical shading breaks at 10th, 30th, 50th, 70th, and 90th percentiles. For more information visit: [30 year normal calculation description](#)

Colorado Streamflow Forecasts - February 1, 2023

Forecast Exceedance Probabilities For Risk Assessment
Chance that actual volume will exceed forecast

Colorado	Forecast Period	90% (KAF)	70% (KAF)	50% (KAF)	% Median	30% (KAF)	10% (KAF)	30yr Median (KAF)
Lake Powell Inflow ²	APR-JUL	5000	6760	8110	132%	9580	12000	6130
Virgin R at Littlefield	APR-JUL	58	88	111	336%	138	182	33
Virgin R nr Hurricane	APR-JUL	50	78	101	326%	126	169	31

1) 90% And 10% exceedance probabilities are actually 95% And 5%

2) Forecasts are For unimpaired flows. Actual flow will be dependent On management of upstream reservoirs And diversions

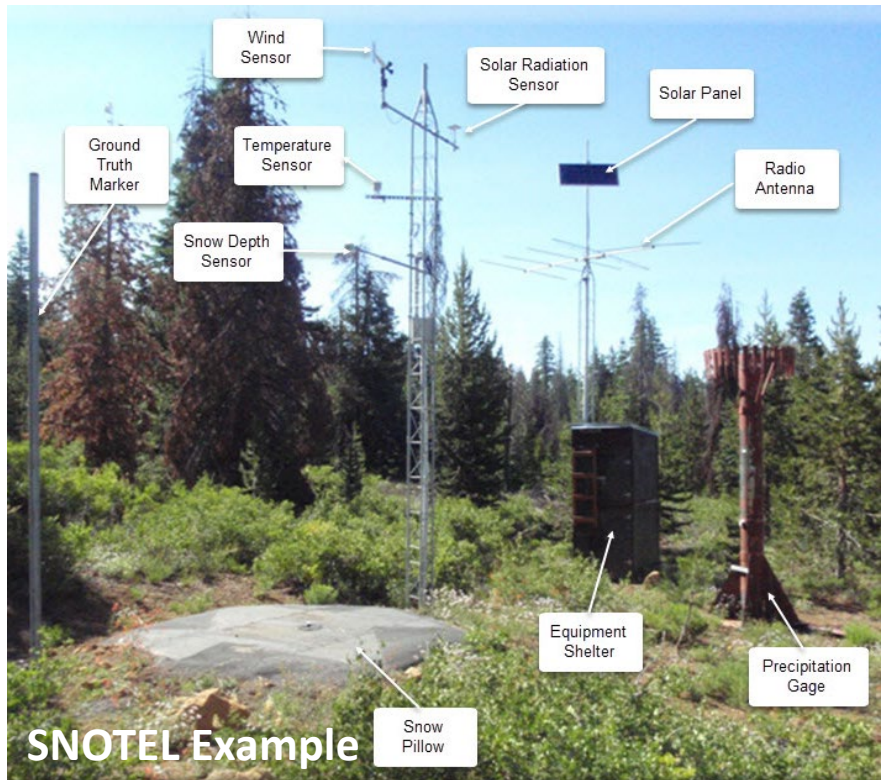
Reservoir Storage End of January, 2023	Current (KAF)	Last Year (KAF)	Median (KAF)	Capacity (KAF)
Lake Powell	5456.1	6335.2	13471.0	24322.0
Lake Mead	7459.0	8969.8	15227.0	26159.0
Lake Mohave	1668.0	1664.0	1658.0	1810.0

Watershed Snowpack Analysis February 1, 2023	# of Sites	% Median	Last Year % Median
Virgin	9	224%	132%
Upper Colorado	130	144%	105%

Appendix - SNOTEL and Snow Course Overview

SNOTEL

The NRCS operates an extensive, automated data collection network called SNOTEL (short for Snow Telemetry). SNOTEL sites are designed to operate unattended in remote mountain locations. Data are collected and transmitted hourly and available on the internet. Daily data (midnight values) are quality checked by NRCS hydrologists on at least a weekly basis. SNOTEL sites provide snowpack water content data via a pressure-sensing snow pillow. Other data include snow depth, water year precipitation accumulation, air temperature with daily maximums, minimums, and averages, soil moisture and soil temperature at depths of 2, 8 and 20 inches. The earliest NRCS SNOTEL sites have data back to 1981 or a bit earlier.



SNOTEL Example

Snow Course

Snow courses are measurement transects where snow tubes are used by snow surveyors during the winter season to determine the depth and water content of the snowpack. Hollow snow tubes are used to vertically core the snowpack. The tubes are then weighed to determine the water content of the snow. Generally, snow courses are situated in meadows or forest openings protected from the wind. A snow course measurement is the average of a number of sample points, typically 5 to 10. Snow courses are measured on a monthly basis typically between February 1 and April 1. Snow courses provide a longer record than SNOTEL. The earliest snow courses in the Lake Tahoe and Truckee basins have data back to 1910.



Snow Course Example

Sample points

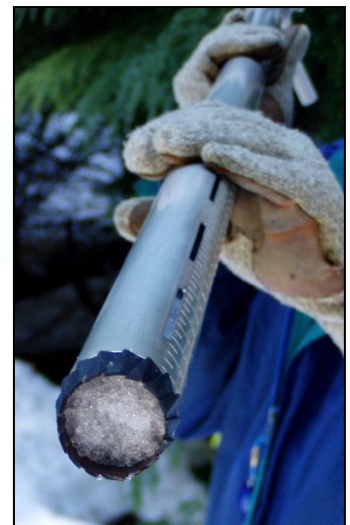
Snow Water Equivalent (SWE):

Sometimes also called snow water content, this is the amount of water contained within the snowpack. It can be thought of as the depth of water (in inches) that would result if you melted the snowpack. For example, if the snowpack was contained 12 inches of SWE, then when melted there would a puddle of water 12 inches deep on the ground.

SWE measurements made by snow pillows or snow tubes rely on the fact that water weighs the same whether it is liquid or frozen.



Weight of frozen water = Weight of liquid water



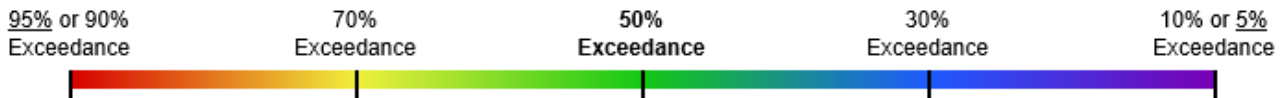
Snow core inside snow tubes

Appendix: Interpreting the Streamflow Forecast Chart

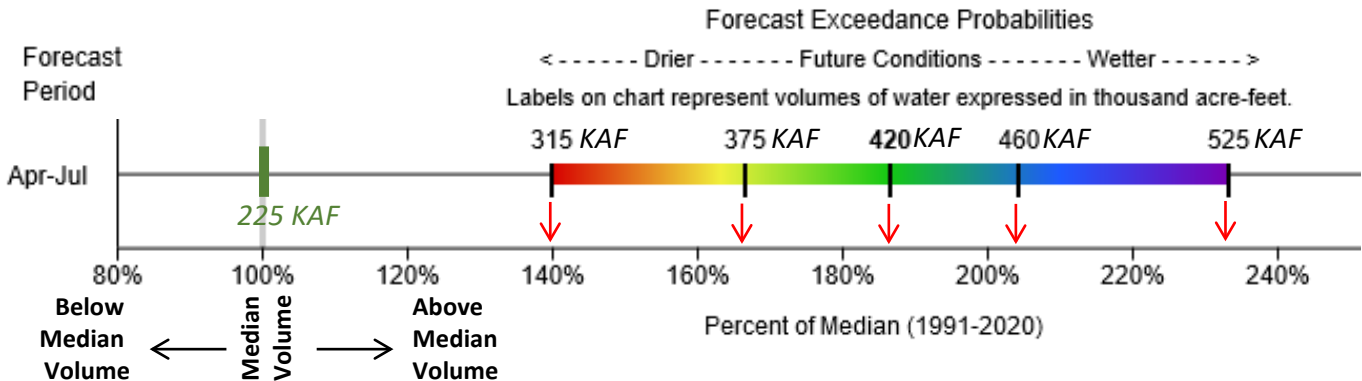
Forecast Exceedance Probabilities for Risk Assessment
Chance that actual volume will exceed forecast

Forecast Period	90% (KAF)	70% (KAF)	50% (KAF)	% Median	30% (KAF)	10% (KAF)	30yr Median (KAF)
APR-JUL	315	375	420	187%	460	525	225

The Forecast Chart (below) provides an alternative to the tables (above) used in the basin summaries. The chart displays the forecast exceedance range as a colored bar. The vertical lines on the bar signify the five forecast exceedances.

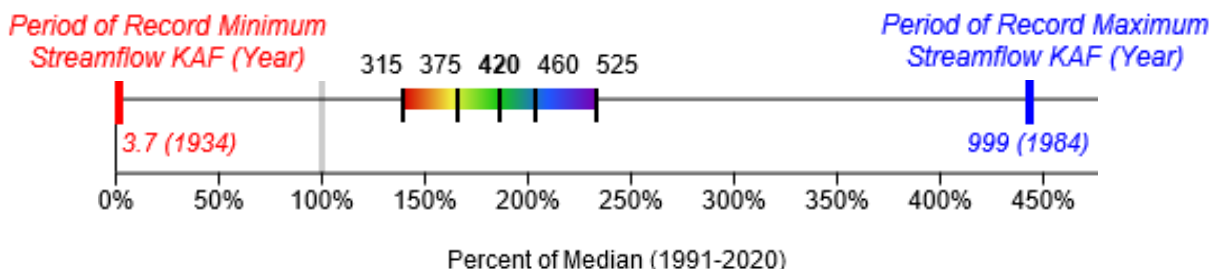


The numbers above the forecast bar are the five exceedance probability volumes in thousand acre-feet (KAF). Each exceedance forecast's percent of median can be estimated by looking at the horizontal axis. The green line and number centered above 100% on the horizontal axis represents the 1981-2010 historical median streamflow for the forecast period in KAF.



In the example above, the entire forecast bar is shifted right of the green bar indicating a forecast for above the median Apr-Jul streamflow of 225KAF. The 50% exceedance is represented by the black line in the green portion of the colored bar. This represents a forecast volume of 420KAF which is ~185% of median. If drier than normal future conditions occur the 70% exceedance forecast may be more likely (375KAF or ~165% of median). If future conditions turn wetter than normal, the 30% exceedance forecast may be more likely (460KAF or ~205% of median). Water users are encouraged to consider the range of forecast exceedances instead of relying solely only on the 50% forecast.

In very wet or dry years forecasts may approach historical records. In these cases the period of record minimum or maximum may be displayed. The minimum is represented by a heavy red line, while the maximum is represented by a heavy blue line. The numbers below the red and blue lines represent the volume in KAF and the year it occurred in parentheses.



[Click here](#) for an online version which allows users to see averages instead of medians, as well as historic forecasts.



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A number of [NRCS field offices and outside agencies](#)
provide assistance with snow course measurements.

This cooperation is greatly appreciated.

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List of Streamflow Adjustments:

Lake Tahoe Net Inflow (2) (externally adjusted by US Water Master*) = Lake Tahoe storage change + Lake Tahoe Release. Net inflow used due to complexities with estimating Lake Tahoe evaporation and precipitation.

Marlette Lake Inflow (2) = Marlette Lake Inflow, observed + Marlette Lake storage change

Donner Lake inflow (2) (externally adjusted by US Water Master*) = Donner Lake storage change + Donner Lake Release + Lake Evaporation – Lake Precipitation

Martis Creek Reservoir inflow (2) (externally adjusted by US Water Master*) = Martis Creek Reservoir storage change + Martis Creek Reservoir Release + Lake Evaporation – Lake Precipitation

Prosser Creek Reservoir Inflow (2) (externally adjusted by US Water Master*) = Prosser Creek Reservoir storage change + Prosser Creek Reservoir Release + Lake Evaporation – Lake Precipitation

Independence Lake Inflow (2) (externally adjusted by US Water Master*) = Independence Lake storage change + Independence Lake Release + Lake Evaporation – Lake Precipitation

Stampede Reservoir Local Inflow (2) (externally adjusted by US Water Master*) = Stampede Reservoir storage change + Stampede Reservoir Release + Lake Evaporation – Lake Precipitation – Independence Lake Release + Sierra Valley Diversion

Boca Reservoir Local Inflow (2) (externally adjusted by US Water Master*) = Boca Reservoir storage change + Boca Reservoir Release + Lake Evaporation – Lake Precipitation – Stampede Reservoir Release

Little Truckee River above Boca Reservoir (2) (externally adjusted by US Water Master*) = Independence Lake Inflow (2) + Stampede Reservoir Local Inflow (2) + Boca Reservoir Local Inflow (2)

Truckee R above Farad Sidewater (2) (externally adjusted by US Water Master*) = Truckee River at Farad, observed – Boca Creek Reservoir Release – Prosser Creek Reservoir Release – Donner Lake Release – Martis Creek Reservoir Release – Lake Tahoe Release

Truckee River at Farad (2) (externally adjusted by US Water Master*) = Donner Lake inflow (2) + Martis Creek Reservoir inflow (2) + Prosser Creek Reservoir Inflow (2) + Independence Lake Inflow (2) + Stampede Reservoir Local Inflow (2) + Boca Reservoir Local Inflow (2) + Truckee R above Farad Sidewater (2)

East Walker River near Bridgeport (2) = East Walker River near Bridgeport, observed + Bridgeport Reservoir storage change

L Humboldt R nr Paradise Valley (2) = L Humboldt R nr Paradise Valley + Chimney Creek Reservoir storage change

Owyhee River near Gold Creek (2) = Owyhee River near Gold Creek + Wildhorse Reservoir storage change

Lake Powell Inflow (2) (externally adjusted by Bureau of Reclamation for major upstream reservoirs, but not trans-basin diversions to Missouri or Rio Grande)

*Externally adjusted US Water Master data comes from Hydrologic Flow Report which accounts for precipitation and evaporation from each reservoir:
http://www.troa.net/reports/wm_hydrologicflow/