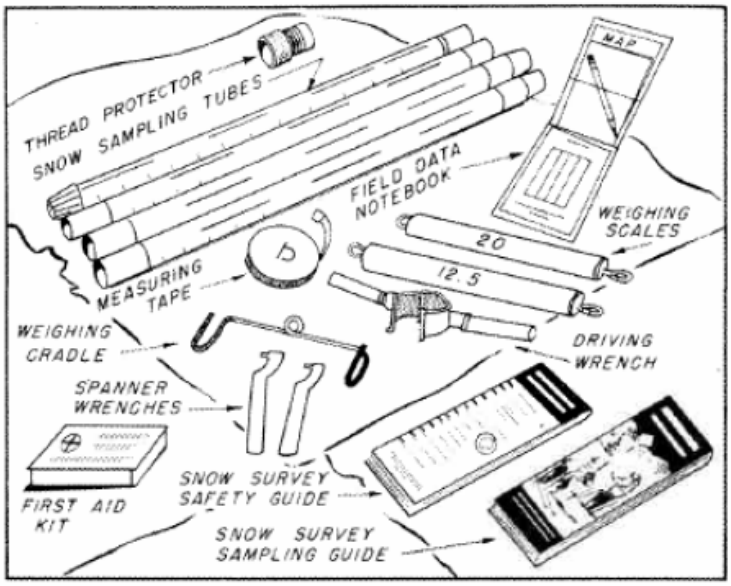
UNITED STATES DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

# California Water Supply Outlook Report

## January 1, 2022

**Snow Sampling Kit**



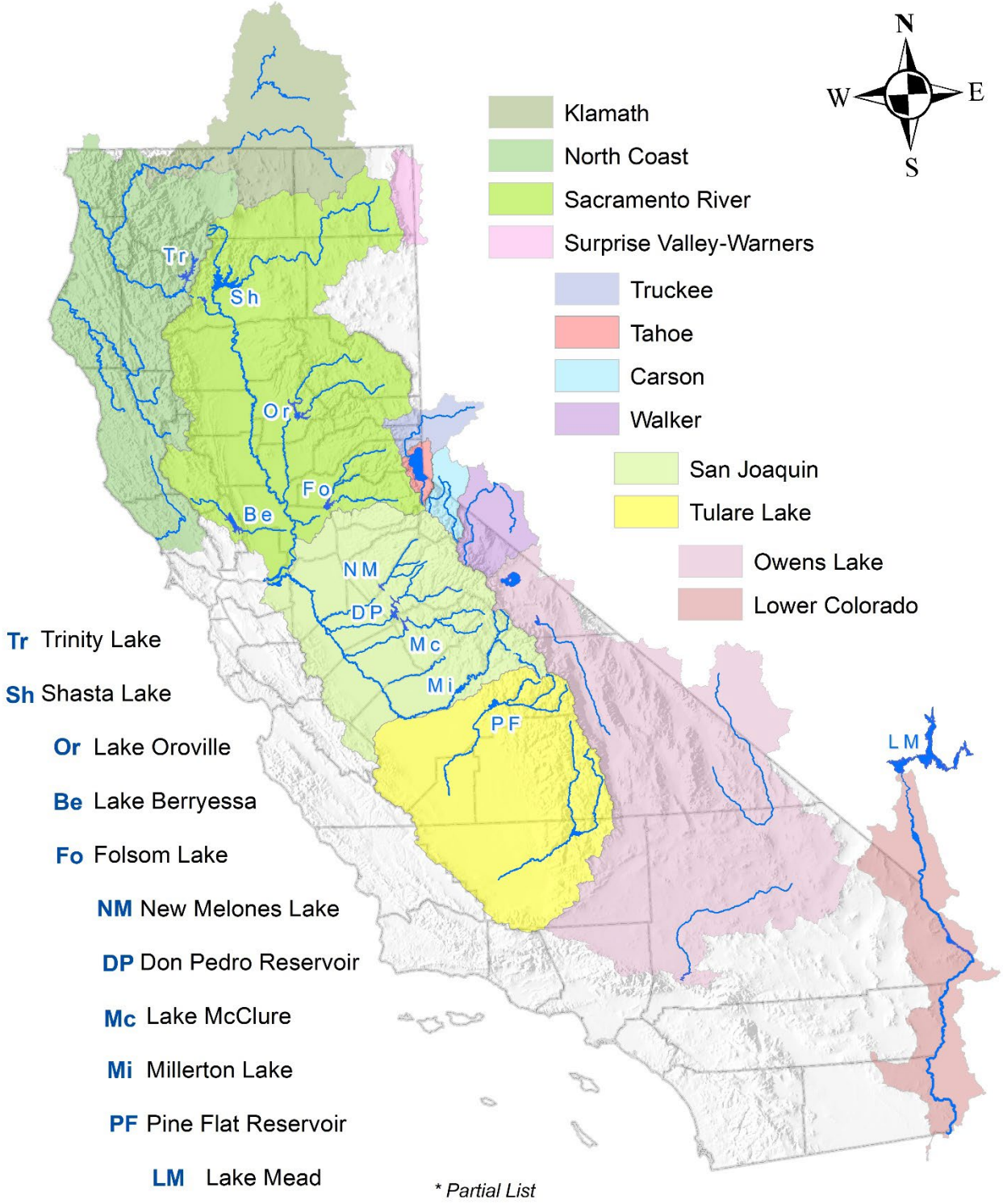



# Contents



*Cover: From the Snow Survey Sampling Guide (USDA- Agricultural Handbook 169). Visit NRCS' Water and Climate Center's Publications site for more information.*

# California Forecast Basins, Major Rivers, and Large Reservoirs*



# STATE OF CALIFORNIA GENERAL OUTLOOK
## January 1, 2022

### NEW 1991-2020 MEDIANS

On October 1, 2021 the NRCS updated its 30-year normals period, shifting it from 1981-2010 to 1991-2020. The normals available from the National Water and Climate Center (NWCC) include the median and average for Snow Water Equivalent (SWE), snow depth (snow courses only), precipitation, volumetric streamflow, and reservoir storage. Values are calculated from data collected by NRCS-managed stations and external agencies such as the U.S. Geological Survey (USGS), National Weather Service (NWS), state agencies, and private organizations. Normals are calculated for various durations including daily, month-to-date, semi-monthly, monthly, seasonal, and annual based on the data type.

The 1991-2020 normals update may have shifted the reported median values compared to those in previous reports for one or both of the following reasons: 1) the underlying data used to compute the statistics are not the same between the two 30-year periods; and 2) Calculation methods for 1991-2020 have also been updated. Therefore, caution is recommended when making inferences from comparisons between the 1991-2020, 1981-2010, and 1971-2000 normals. More information is available online at https://www.nrcs.usda.gov/wps/portal/wcc/home/snowClimateMonitoring/30YearNormals/.

## SNOWPACK

Snow gages in the northern-, central-, and southern mountains recorded snow water equivalents on December 31st that averaged 144-, 158-, and 172 percent of normal for the date, respectively. Since the beginning of the calendar year, the statewide average snowpack has dropped slightly, from 157 percent on December 31st, to 128 percent on January 14th.

More information is available online at http://cdec.water.ca.gov/snow/current/snow/index2.html.

## PRECIPITATION

The Water Year started strong, with the Northern Sierra-, San Joaquin-, and Tulare Basin Index stations receiving 453-, 314-, and 216 percent of their monthly averages in October. November totals were below average in all three regions, but a wet December helped keep seasonal totals to between 120-140 percent of their January 14th average.

More information is available online at http://cdec.water.ca.gov/snow_rain.html

## RESERVOIRS

Total reservoir storage (excluding Lake Powell and Lake Mead) on December 31st was 86 percent of average, compared to 75 percent of average at the end of 2020. Storage at Shasta Reservoir was 73 percent of average at the end of 2020, down from 119 percent last year. Don Pedro Reservoir was 102 percent of average at the end of 2020, down from 122 percent of average last year. In the Colorado River Basin, the combined reservoir storage in Lake Powell and Lake Mead is 67 percent of its historical average.

More information is available online at http://cdec.water.ca.gov/snow/reservoir_ss.html.

## STREAMFLOW

NWS forecasts in the Sacramento, San Joaquin, and Tulare basins range between 62- and 133 percent of the 1991-2020 average between April and July. NRCS forecasts in the Tahoe, Truckee, Carson, and Walker River basins are all well above the 1999-2020 median. NRCS forecasts for stations in the Klamath Basin are above the median, while the NWS forecasts for the North Coast remain below the median. Summaries are provided below.

## SACRAMENTO RIVER BASIN

National Weather Service (NWS) streamflow forecasts at 14 sites in the Sacramento River Basin range between 62- and 133 percent of the 1991-2020 median between April and July (APR-JUL).

**Streamflow Forecast Summary: January 1, 2022**
**(Medians based on 1991-2020 reference period)**

| Sacramento River | Forecast Period | Forecast Exceedance Probabilities For Risk Assessment<br>Chance that actual volume will exceed forecast<br>90% (KAF) | 70% (KAF) | 50% (KAF) | % Median | 30% (KAF) | 10% (KAF) | 30yr Median (KAF) |
|---|---|---|---|---|---|---|---|---|
| Inflow to Shasta Lk (NWS) | APR-JUL | 935 | 1100 | 1400 | 81% | 2080 | 2450 | 1738.5 |
| MF American R nr Auburn (NWS) | APR-JUL | 405 | 535 | 615 | 126% | 840 | 980 | 489.8 |
| Sacramento R nr Red Bluff (NWS) | APR-JUL | 1340 | 1640 | 2090 | 69% | 2990 | 3600 | 3026 |
| Pit R at Shasta Lk (NWS) | APR-JUL | 480 | 535 | 670 | 62% | 875 | 1120 | 1080.2 |
| Silver Ck bl Camino Div. Dam (NWS) | APR-JUL | 133 | 169 | 210 | 133% | 265 | 330 | 157.6 |
| Inflow to Oroville Res (NWS) | APR-JUL | 755 | 1100 | 1520 | 99% | 2250 | 3030 | 1533.3 |
| Inflow to Folsom Res (NWS) | APR-JUL | 875 | 1170 | 1410 | 118% | 2020 | 2400 | 1195.3 |
| Yuba R at Smartville (NWS) | APR-JUL | 575 | 825 | 1070 | 113% | 1480 | 1860 | 949.9 |
| Inflow to Union Valley Res (NWS) | APR-JUL | 76 | 98 | 122 | 125% | 153 | 187 | 97.5 |
| N Yuba R bl Goodyears Bar (NWS) | APR-JUL | 174 | 250 | 330 | 121% | 425 | 525 | 272.3 |
| Sacramento R at Shasta (NWS) | APR-JUL | 132 | 170 | 260 | 88% | 435 | 555 | 296.6 |
| Cosumnes R at Michigan Bar (NWS) | APR-JUL | 56 | 89 | 128 | 105% | 215 | 295 | 121.5 |
| McCloud R ab Shasta (NWS) | APR-JUL | 220 | 255 | 315 | 84% | 455 | 520 | 374.5 |
| NF Feather R nr Prattville (NWS) | APR-JUL | 140 | 200 | 245 | 86% | 310 | 370 | 283.6 |

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

## SAN JOAQUIN RIVER BASIN

National Weather Service (NWS) streamflow forecasts at seven sites in the San Joaquin River Basin are all above the 1991-2020 median between April and July (APR-JUL).

**Streamflow Forecast Summary: January 1, 2022**
**(Medians based on 1991-2020 reference period)**

| San Joaquin R | Forecast Period | Forecast Exceedance Probabilities For Risk Assessment Chance that actual volume will exceed forecast 90% (KAF) | 70% (KAF) | 50% (KAF) | % Median | 30% (KAF) | 10% (KAF) | 30yr Median (KAF) |
|---|---|---|---|---|---|---|---|---|
| Tuolumne R nr Hetch Hetchy (NWS) | APR-JUL | 490 | 610 | 750 | 124% | 930 | 1020 | 605.2 |
| Inflow to New Melones Res (NWS) | APR-JUL | 425 | 585 | 770 | 115% | 1060 | 1280 | 672.1 |
| Inflow to Millerton Lk (NWS) | APR-JUL | 880 | 1170 | 1540 | 124% | 1950 | 2300 | 1238.4 |
| Inflow to New Don Pedro Res (NWS) | APR-JUL | 825 | 1120 | 1460 | 121% | 1880 | 2220 | 1208.3 |
| Merced R at Pohono Bridge Yosemite (NWS) | APR-JUL | 295 | 360 | 465 | 122% | 585 | 690 | 382.3 |
| Inflow to Lake McClure (NWS) | APR-JUL | 385 | 500 | 705 | 115% | 865 | 1120 | 610.6 |
| Inflow to Pardee Res (NWS) | APR-JUL | 275 | 380 | 485 | 109% | 675 | 825 | 443.5 |

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

## TULARE LAKE BASIN

National Weather Service (NWS) streamflow forecasts at four sites in the Tulare Lake Basin range between 85- and 118 percent of the 1991-2020 median between April and July (APR-JUL).

**Streamflow Forecast Summary: January 1, 2022**
**(Medians based on 1991-2020 reference period)**

| Tulare Lake | Forecast Period | Forecast Exceedance Probabilities For Risk Assessment<br>Chance that actual volume will exceed forecast<br>90% (KAF) | 70% (KAF) | 50% (KAF) | % Median | 30% (KAF) | 10% (KAF) | 30yr Median (KAF) |
|---|---|---|---|---|---|---|---|---|
| Kaweah R at Terminus Res (NWS) | | | | | | | | |
| | APR-JUL | 182 | 235 | 320 | 113% | 440 | 550 | 282.1 |
| Inflow to Pine Flat Res (NWS) | | | | | | | | |
| | APR-JUL | 865 | 1120 | 1440 | 118% | 1770 | 2130 | 1222.8 |
| Tule R at Success Res (NWS) | | | | | | | | |
| | APR-JUL | 24 | 37 | 58 | 96% | 90 | 129 | 60.3 |
| Inflow to Isabella Res (NWS) | | | | | | | | |
| | APR-JUL | 205 | 280 | 385 | 85% | 580 | 800 | 455.3 |

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

## NORTH COASTAL AREA BASIN

Streamflow forecasts for the two NWS sites in the North Coastal Area Basin between April and July (APR-JUL) are below the 1991-2020 median.

**Streamflow Forecast Summary: January 1, 2022**
**(Medians based on 1991-2020 reference period)**

| North Coast | Forecast Period | Forecast Exceedance Probabilities For Risk Assessment Chance that actual volume will exceed forecast: 90% (KAF) | 70% (KAF) | 50% (KAF) | % Median | 30% (KAF) | 10% (KAF) | 30yr Median (KAF) |
|---|---|---|---|---|---|---|---|---|
| Inflow to Clair Engle Lk (NWS) | | | | | | | | |
| | APR-JUL | 230 | 330 | 470 | 71% | 735 | 935 | 666.1 |
| Scott R nr Fort Jones (NWS) | | | | | | | | |
| | APR-JUL | 40 | 60 | 93 | 56% | 178 | 210 | 167 |

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

## KLAMATH BASIN

Including information from the Water Supply Outlook Report for Oregon
(https://www.nrcs.usda.gov/wps/portal/nrcs/main/or/snow/ ):

As of January 1, the basin snowpack is 118 percent of median.

December precipitation was 104 percent of median. Precipitation since the beginning of the water year (October 1 - January 1) has been 99 percent of median.

The March through September (MAR-SEP) streamflow forecasts at selected gages in the basin range from 115- to 123 percent of the 1999-2020 median.

**Streamflow Forecast Summary: January 1, 2022**
**(Medians based on 1991-2020 reference period)**

| Klamath River | Forecast Period | Forecast Exceedance Probabilities For Risk Assessment<br>Chance that actual volume will exceed forecast<br>90% (KAF) | 70% (KAF) | 50% (KAF) | % Median | 30% (KAF) | 10% (KAF) | 30yr Median (KAF) |
|---|---|---|---|---|---|---|---|---|
| Sprague R nr Chiloquin | | | | | | | | |
| | JAN-SEP | 185 | 275 | 345 | 133% | 425 | 560 | 260 |
| | MAR-SEP | 129 | 205 | 265 | 123% | 330 | 445 | 215 |
| Upper Klamath Lake Inflow[1,1,2] | | | | | | | | |
| | JAN-SEP | 405 | 710 | 850 | 114% | 990 | 1290 | 745 |
| | MAR-SEP | 280 | 485 | 580 | 115% | 670 | 880 | 505 |
| Gerber Reservoir Inflow[2] | | | | | | | | |
| | JAN-JUN | 29 | 44 | 54 | 164% | 64 | 79 | 33 |
| Williamson R bl Sprague R nr Chiloquin | | | | | | | | |
| | JAN-SEP | 330 | 460 | 545 | 116% | 630 | 760 | 470 |
| | MAR-SEP | 265 | 360 | 420 | 117% | 485 | 580 | 360 |

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

## LAKE TAHOE BASIN

From the Water Supply Outlook Report for Nevada
(https://www.nrcs.usda.gov/wps/portal/nrcs/main/nv/snow/):

Snowpack in the Lake Tahoe Basin is well above normal at 213 percent of median, compared to 85% at this time last year. Precipitation in December was well above normal at 245 percent, which brings the seasonal accumulation (October-December) to 223% of median. Soil moisture is at 61 percent saturation compared to 32 percent saturation last year. Reservoir storage is 20 percent of capacity, compared to 44 percent last year.

**Streamflow Forecast Summary: January 1, 2022**
**(Medians based on 1991-2020 reference period)**

| Tahoe | Forecast Period | Forecast Exceedance Probabilities For Risk Assessment<br>Chance that actual volume will exceed forecast<br>90% (KAF) | 70% (KAF) | 50% (KAF) | % Median | 30% (KAF) | 10% (KAF) | 30yr Median (KAF) |
|---|---|---|---|---|---|---|---|---|
| Lake Tahoe Net Inflow | | | | | | | | |
| | MAR-JUL | 270 | 375 | 450 | 324% | 525 | 630 | 139 |
| | APR-JUL | 205 | 290 | 350 | 347% | 410 | 495 | 101 |
| Lake Tahoe Rise[1] (ft) | | | | | | | | |
| | OCT-HIGH | 1.68 | 3.4 | 4.2 | 215% | 5.0 | 6.7 | 1.95 |
| | MAR-HIGH | 0.91 | 2.0 | 2.5 | 168% | 3.0 | 4.1 | 1.49 |
| | APR-HIGH | 0.80 | 1.50 | 1.90 | 160% | 2.1 | 3.1 | 1.19 |
| Marlette Lake Inflow | | | | | | | | |
| | MAR-JUL | 1.03 | 1.69 | 2.1 | 375% | 2.6 | 3.2 | 0.56 |
| | APR-JUL | 0.86 | 1.41 | 1.78 | 445% | 2.2 | 2.7 | 0.4 |

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

## TRUCKEE RIVER BASIN

Including information from the Water Supply Outlook Report for Nevada
(https://www.nrcs.usda.gov/wps/portal/nrcs/main/nv/snow/):

Snowpack in the Truckee River Basin is well above normal at 236 percent of median, compared to 88% at this time last year. Precipitation in December was well above normal at 223 percent, which brings the seasonal accumulation (October-December) to 218 percent of median. Soil moisture is at 58 percent saturation compared to 22 percent saturation last year. Reservoir storage is 40 percent of capacity, compared to 38 percent last year.

**Streamflow Forecast Summary: January 1, 2022**
**(Medians based on 1991-2020 reference period)**

| | | Forecast Exceedance Probabilities For Risk Assessment<br>Chance that actual volume will exceed forecast | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Truckee** | Forecast Period | 90% (KAF) | 70% (KAF) | 50% (KAF) | % Median | 30% (KAF) | 10% (KAF) | 30yr Median (KAF) |
| L Truckee R ab Boca Reservoir[2] | | | | | | | | |
| | MAR-JUL | 116 | 163 | 196 | 228% | 230 | 275 | 86 |
| | APR-JUL | 35 | 102 | 130 | 181% | 158 | 199 | 72 |
| Independence Lk Inflow[2] | | | | | | | | |
| | MAR-JUL | 12.9 | 17.2 | 20 | 175% | 23 | 27 | 11.4 |
| | APR-JUL | 11.5 | 15.6 | 18.3 | 174% | 21 | 25 | 10.5 |
| Donner Lake Inflow[2] | | | | | | | | |
| | MAR-JUL | 25 | 30 | 34 | 177% | 38 | 43 | 19.2 |
| | APR-JUL | 18.3 | 23 | 26 | 173% | 29 | 34 | 15 |
| Truckee R ab Farad Sidewater[2] | | | | | | | | |
| | MAR-JUL | 106 | 155 | 187 | 176% | 220 | 270 | 106 |
| | APR-JUL | 89 | 133 | 162 | 180% | 192 | 235 | 90 |
| Boca Res Local Inflow[2] | | | | | | | | |
| | MAR-JUL | 10.1 | 15.3 | 18.8 | 427% | 22 | 28 | 4.4 |
| | APR-JUL | 3.1 | 6.6 | 9 | 592% | 11.4 | 14.9 | 1.52 |
| Stampede Res Local Inflow[2] | | | | | | | | |
| | MAR-JUL | 87 | 120 | 143 | 207% | 165 | 199 | 69 |
| | APR-JUL | 70 | 102 | 123 | 208% | 144 | 176 | 59 |
| Galena Ck at Galena Ck State Pk | | | | | | | | |
| | MAR-JUL | 5 | 6.6 | 7.6 | 173% | 8.6 | 10.2 | 4.4 |
| | APR-JUL | 4.5 | 6 | 7 | 175% | 8 | 9.5 | 4 |
| Steamboat Ck at Steamboat | | | | | | | | |
| | MAR-JUL | 3.1 | 8.1 | 12.7 | 470% | 18.5 | 29 | 2.7 |
| | APR-JUL | 2.5 | 6.5 | 10.3 | 490% | 15 | 24 | 2.1 |
| Martis Ck Res Inflow[2] | | | | | | | | |
| | MAR-JUL | 12.1 | 17.6 | 21 | 236% | 25 | 30 | 8.9 |
| | APR-JUL | 8.6 | 13.1 | 16.1 | 282% | 19.2 | 24 | 5.7 |
| Sagehen Ck nr Truckee | | | | | | | | |
| | MAR-JUL | 5.5 | 8.7 | 10.9 | 227% | 13.1 | 16.3 | 4.8 |
| | APR-JUL | 4.8 | 7.8 | 9.8 | 239% | 11.8 | 14.8 | 4.1 |
| Prosser Ck Res Inflow[2] | | | | | | | | |
| | MAR-JUL | 46 | 63 | 75 | 179% | 86 | 103 | 42 |
| | APR-JUL | 38 | 53 | 64 | 183% | 74 | 90 | 35 |
| Truckee R at Farad[2] | | | | | | | | |
| | MAR-JUL | 330 | 425 | 490 | 185% | 555 | 650 | 265 |
| | APR-JUL | 140 | 230 | 370 | 164% | 430 | 515 | 225 |

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

## CARSON RIVER BASIN

Including information from the Water Supply Outlook Report for Nevada
(https://www.nrcs.usda.gov/wps/portal/nrcs/main/nv/snow/):

Snowpack in the Carson River Basin is well above normal at 199 percent of median, compared to 85 percent at this time last year. Precipitation in December was well above normal at 271 percent, which brings the seasonal accumulation (October-December) to 217 percent of median. Soil moisture is at 56 percent saturation compared to 24 percent saturation last year. Reservoir storage is 20 percent of capacity, compared to 23 percent last year..

**Streamflow Forecast Summary: January 1, 2022**
**(Medians based on 1991-2020 reference period)**

| | | Forecast Exceedance Probabilities For Risk Assessment<br>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 | 225 | 305 | 360 | 196% | 415 | 495 | 184 |
| | APR-JUL | 198 | 270 | 320 | 195% | 370 | 440 | 164 |
| WF Carson R nr Woodfords | | | | | | | | |
| | MAR-JUL | 61 | 84 | 100 | 200% | 116 | 139 | 50 |
| | APR-JUL | 52 | 74 | 89 | 198% | 104 | 126 | 45 |

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

## WALKER RIVER BASIN

Including information from the Water Supply Outlook Report for Nevada
(https://www.nrcs.usda.gov/wps/portal/nrcs/main/nv/snow/):

Snowpack in the Walker River Basin is well above normal at 228 percent of median, compared to 65 percent at this time last year. Precipitation in December was well above normal at 323 percent, which brings the seasonal accumulation (October-December) to 238 percent of median. Soil moisture is at 48 percent saturation compared to 16 percent saturation last year. Reservoir storage is 36 percent of capacity, compared to 21 percent last year.

**Streamflow Forecast Summary: January 1, 2022**
**(Medians based on 1991-2020 reference period)**

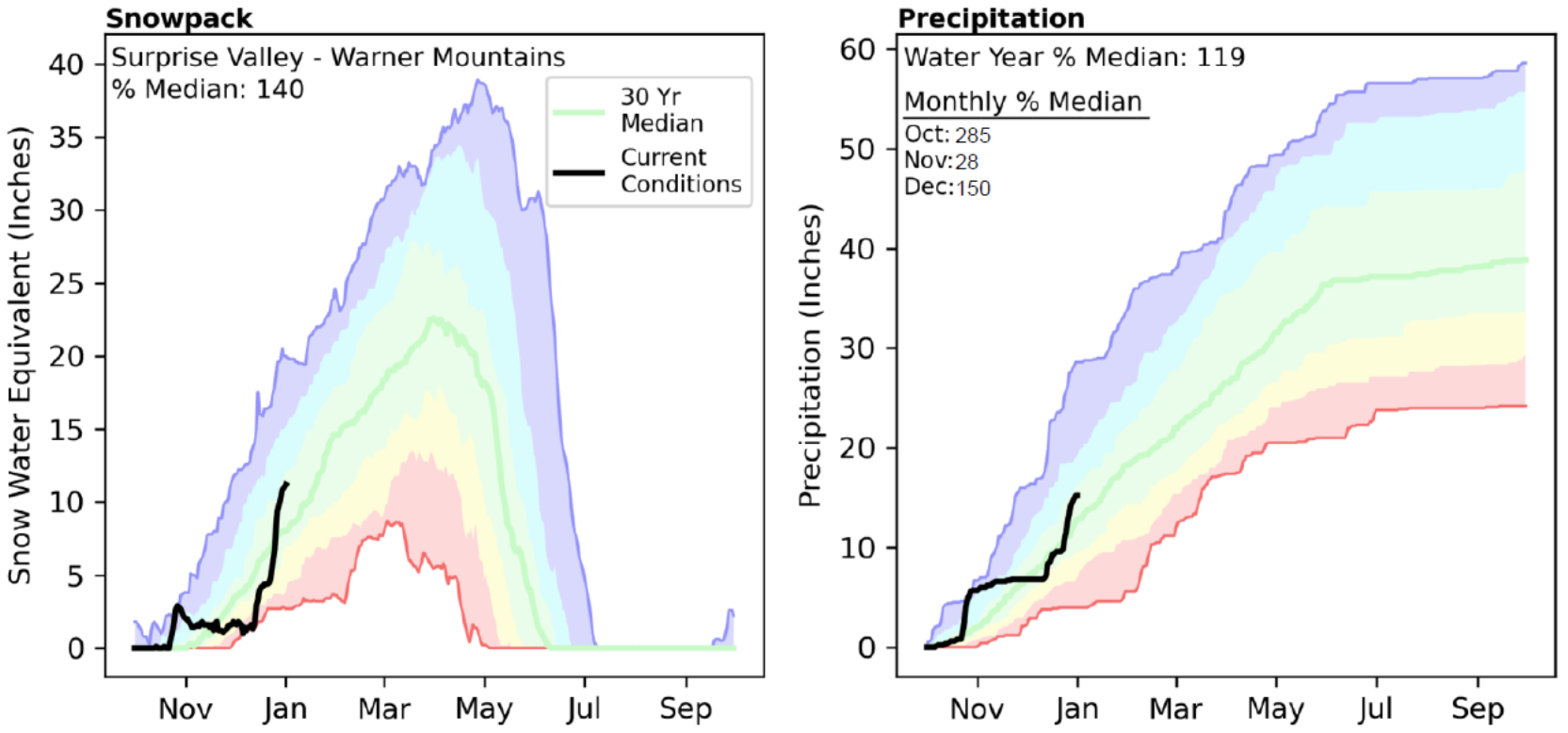
| | | Forecast Exceedance Probabilities For Risk Assessment<br>Chance that actual volume will exceed forecast | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Walker** | Forecast Period | 90% (KAF) | 70% (KAF) | 50% (KAF) | % Median | 30% (KAF) | 10% (KAF) | 30yr Median (KAF) |
| E Walker R nr Bridgeport[2] | | | | | | | | |
| | MAR-AUG | 47 | 89 | 117 | 229% | 145 | 187 | 51 |
| | APR-AUG | 45 | 84 | 110 | 250% | 136 | 175 | 44 |
| W Walker R nr Coleville | | | | | | | | |
| | MAR-JUL | 183 | 245 | 285 | 185% | 325 | 385 | 154 |
| | APR-JUL | 172 | 230 | 270 | 184% | 310 | 365 | 147 |
| W Walker R bl L Walker R nr Coleville | | | | | | | | |
| | MAR-JUL | 184 | 245 | 285 | 179% | 330 | 390 | 159 |
| | APR-JUL | 174 | 235 | 275 | 180% | 315 | 375 | 153 |

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

**SURPRISE VALLEY-WARNER MOUNTAINS**
**January 1, 2021**

Provided by Jeff Anderson, Hydrologist, NRCS Nevada Snow Survey:

Snowpack in the Surprise Valley - Warner Mountains is well above normal at 140 percent of median, compared to 91 percent at this time last year. Precipitation in December was well above normal at 150 percent, which brings the seasonal accumulation (October-December) to 119 percent of median.




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

## LOWER COLORADO RIVER BASIN

Including information from the Water Supply Outlook Report for Nevada
(https://www.nrcs.usda.gov/wps/portal/nrcs/main/nv/snow/):

Reservoir storage in Lake Mead at the end of 2021 was at 34 percent of capacity, down 1410 thousand acre-feet (KAF) from this time last year when it was at 39 percent capacity. Snowpack in the Colorado River Basin above Glen Canyon Dam is 131 percent of the January 1 median, compared to 77 percent last year. The forecast streamflow volume for Lake Powell Inflow is 118 percent of the 1991-2020 median for April through July.

| Reservoir Storage End of December, 2021 | Current (KAF) | Last Year (KAF) | Median (KAF) | Capacity (KAF) |
|---|---|---|---|---|
| Lake Powell | 6713.1 | 10130.0 | 13921.0 | 24322.0 |
| Lake Mead | 8918.2 | 10328.0 | 15014.0 | 26159.0 |
| Lake Mohave | 1573.0 | 1581.0 | 1608.0 | 1810.0 |

| Basin Index # of reservoirs | | | |
|---|---|---|---|
| **Watershed Snowpack Analysis January 1, 2022** | **# of Sites** | **% Median** | **Last Year % Median** |
| White Headwaters | 1 | 143% | 32% |
| Virgin | 9 | 218% | 47% |
| Upper Colorado | 129 | 131% | 77% |

### Streamflow Forecast Summary: January 1, 2022 (Medians based on 1991-2020 reference period)

| | | Forecast Exceedance Probabilities For Risk Assessment Chance that actual volume will exceed forecast | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Lower Colorado** | Forecast Period | 90% (KAF) | 70% (KAF) | 50% (KAF) | % Median | 30% (KAF) | 10% (KAF) | 30yr Median (KAF) |
| Lake Powell Inflow [2] | APR-JUL | 3890 | 5750 | 7230 | 118% | 8880 | 11600 | 6130 |

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

## HOW FORECASTS ARE MADE

Most of the annual streamflow in the western United States originates as snowfall that has accumulated in the mountains during the winter and early spring. As the snowpack accumulates, hydrologists estimate the runoff that will occur when it melts. Measurements of snow water equivalent at selected manual snowcourses and automated SNOTEL sites, along with precipitation, antecedent streamflow, and indices of the El Niño / Southern Oscillation are used in computerized statistical and simulation models to prepare runoff forecasts. These forecasts are coordinated between hydrologists in the Natural Resources Conservation Service and the National Weather Service. Unless otherwise specified, all forecasts are for flows that would occur naturally without any upstream influences.

Forecasts of any kind, of course, 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, for which 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. To describe the expected range around this 50% value, four other forecasts are provided, two smaller values (90% and 70% exceedance probability) and two larger values (30%, and 10% exceedance probability). For example, there is a 90% chance that the actual flow will be more than the 90% exceedance probability forecast. The others can be interpreted similarly.

The wider the spread among these values, the more uncertain the forecast. 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. 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, 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, 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 for operations, they should be prepared to deal with either more or less water. (Users should remember that even if the 90% exceedance probability forecast is used, there is still a 10% chance of receiving less than this amount.) By using the exceedance probability information, users can easily determine the chances of receiving more or less water.

**This publication is posted with other Water Supply Outlook Reports for California at**:
https://www.nrcs.usda.gov/wps/portal/nrcs/detail/ca/snow/.

**For questions, contact Greg Norris, California NRCS, at** Greg.Norris@usda.gov

*Issued by*

**Terry Cosby, Chief**
**Natural Resources Conservation Service**
**Conservation Service**
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# California Water Supply Outlook