

California Water Supply Outlook Report

March 2022

UNITED STATES DEPARTMENT OF AGRICULTURE
 SOIL CONSERVATION SERVICE
 FEDERAL-STATE-PRIVATE
 COOPERATIVE SNOW SURVEYS

NRCS-ENG-701
 9-05

Snow Course Rubicon #1
 Drainage Basin Tahoe State Ca
 Sampler Jeff Anderson Note Taker Evyn Smith
 Date 2-25-2021 Began 11:56 a.m. Ended 12:58 a.m.
 p.m.

Sample Number	Depth of Snow Inches	Length of Core Inches	Weight of Tube and Core	Weight of Empty Tube	Water Content Inches	Density Percent	Remarks (See reverse)
15	81	80	97.5	71.0	26.5	33	GNF Dry
24	83	80.5	98.0		27.0	32	GNF SE 1500's
3	87.5	74	96		25	28	GNF Dry soil
3B	86	74	97		26	30	1
40	79						
92	82.5	79	97		26	32	91% Ho wood No plus GNF
1	81.0	77.5					
1	80.0	76.5	98.5		27.5	34	11% plus GNF
Total	412.5				1330	32	
Ave 82.5					26.6		
Ave 82					26.5		

No. of tube sections used. 4
 Was driving wrench used? Yes
 No. of sheets Comp. by Checked by

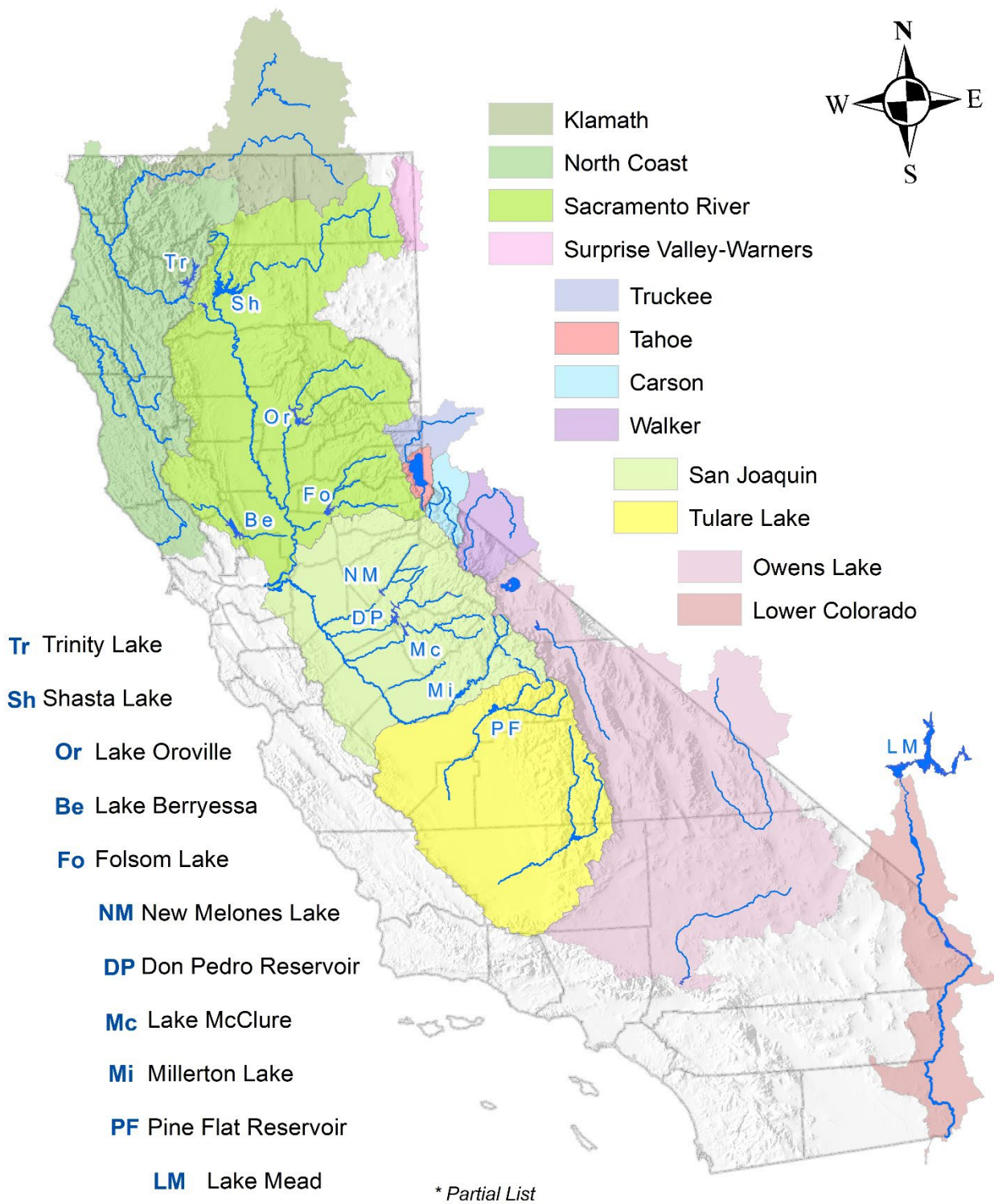
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Cover: Snow surveyors record measurements on a standard form. This data will be entered into the database once they return back to the office..

California Forecast Basins, Major Rivers, and Large Reservoirs*



STATE OF CALIFORNIA GENERAL OUTLOOK

March, 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 have seen a steady decrease in snow pack percent of normal. As of March 16, 2022, the snow water equivalent percent of normal for the three Sierra regions were 52-, 59-, and 59 percent, respectively. Since last month's report, the statewide average snowpack has continued to drop, from 72 percent on February 16th to 57 percent on March 16th.

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

PRECIPITATION

After an up and down season to date, the Northern Sierra-, San Joaquin-, and Tulare Basin Index stations are currently at 86-, 78-, and 76 percent of their monthly averages as of March 8, 2022, with a downward trend for the rest of the month.

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

RESERVOIRS

Most reservoirs as of March 10th had storages at normal amounts, or within plus or minus 30% of normal. Several major reservoirs such as Shasta, Trinity, San Luis, and McClure, continue to lag in storage volumes. In the Colorado River Basin, the reservoir storage in Lake Powell and Lake Mead is 43 percent and 54 percent, respectively of their historical averages.

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

STREAMFLOW

NWS forecasts are both above and below the 1991-2020 average between April and July. However, at this point, there is no specific basin that is extremely low or high on the runoff forecast. Summaries for each basin are provided below.

**Sacramento River
Streamflow Forecasts - March 1, 2022**

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

Sacramento River	Forecast Period	90% (KAF)	70% (KAF)	50% (KAF)	% Median	30% (KAF)	10% (KAF)	30yr Median (KAF)
Inflow to Shasta Lk (NWS)	APR-JUL	715	770	905	52%	1450	1720	1738.5
MF American R nr Auburn (DWR)								
MF American R nr Auburn (NWS)	APR-JUL	210	255	305	66%	475	610	461.7
Inflow to Shasta Lk (DWR)	OCT-SEP	2860		3400	60%		5140	5643
	APR-JUL	740		1050	59%		2070	1767
Silver Ck bl Camino Div. Dam (DWR)	APR-JUL			100	64%			157
McCloud R ab Shasta (DWR)	APR-JUL			230	59%			393
Sacramento R nr Red Bluff (NWS)	APR-JUL	1010	1100	1320	44%	1990	2440	3026
MF Feather R nr Clio (DWR)								
NF Feather R at Pulga (DWR)	APR-JUL			450	53%			842
Inflow Jackson Mdws & Bowman Res (DWR)	APR-JUL			65	63%			103
Feather R at Lk Almanor (DWR)	APR-JUL			125	52%			241
Inflow to Folsom Res (DWR)	OCT-SEP	1400		1940	72%		2910	2689
	APR-JUL	340		770	62%		1500	1247
Pit R at Shasta Lk (NWS)	APR-JUL	415	425	460	43%	580	715	1080.2
Silver Ck bl Camino Div. Dam (NWS)	APR-JUL	79	91	118	69%	138	182	171.6
Pit R at Shasta Lk (DWR)	APR-JUL			630	64%			992
Inflow to Oroville Res (NWS)	APR-JUL	470	570	765	50%	1290	1800	1533.3
Inflow to Folsom Res (NWS)	APR-JUL	485	590	775	65%	1180	1520	1195.3
Yuba R at Smartville (DWR)	OCT-SEP	1240		1650	73%		2570	2273
	APR-JUL	350		650	65%		1320	993
N Yuba R bl Goodyears Bar (DWR)	APR-JUL			180	66%			271
Yuba R at Smartville (NWS)	APR-JUL	355	460	610	64%	950	1240	949.9
Inflow to Union Valley Res (NWS)	APR-JUL	42	53	69	71%	92	110	97.5
N Yuba R bl Goodyears Bar (NWS)	APR-JUL	101	132	174	64%	260	340	272.3
Sacramento R at Shasta (NWS)	APR-JUL	73	83	131	44%	270	325	296.6
Sacramento R nr Red Bluff (DWR)	OCT-SEP	4100		4920	59%		7700	8351
	APR-JUL	1010		1500	61%		3160	2474
S Yuba R nr Langs Crossing (DWR)	APR-JUL			150	63%			237
Cosumnes R at Michigan Bar (NWS)	APR-JUL	38	44	62	51%	118	164	121.5
McCloud R ab Shasta (NWS)	APR-JUL	152	161	195	52%	285	330	374.5
NF American R at N FK Dam (DWR)	APR-JUL			150	63%			240
Sacramento R at Shasta (DWR)	APR-JUL			145	47%			309
SF Feather R at Ponderosa Dam (DWR)								
NF Feather R nr Prattville (NWS)	APR-JUL	111	121	143	50%	190	235	283.6
Inflow to Oroville Res (DWR)	OCT-SEP	2390		3000	69%		4950	4341
	APR-JUL	480		890	52%		2110	1710

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 March 1, 2022	# of Sites	% Median	Last Year % Median
Sacramento River	78	75%	79%

Sanjoaquin Streamflow Forecasts - March 1, 2022

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

SanJoaquin	Forecast Period	90% (KAF)	70% (KAF)	50% (KAF)	% Median	30% (KAF)	10% (KAF)	30yr Median (KAF)
MF Stanislaus R bl Beardsley (DWR)	APR-JUL			195	66%			297
Tuolumne R nr Hetch Hetchy (NWS)	APR-JUL	300	370	425	70%	550	645	605.2
Big Ck bl Huntington Lk (DWR)	APR-JUL			70	72%			97
Inflow to New Melones Res (NWS)	APR-JUL	280	330	415	62%	590	765	672.1
Inflow to Millerton Lk (NWS)	APR-JUL	535	720	845	68%	1090	1420	1238.4
NF Mokelumne R nr West Point (DWR)								
Inflow to New Don Pedro Res (NWS)	APR-JUL	490	615	725	60%	1000	1320	1208.3
Inflow to Millerton Lk (DWR)	OCT-SEP	915		1360	77%		1980	1775
	APR-JUL	470		850	69%		1370	1229
Cherry & Eleanor CKs, Hetch Hetchy (DWR)	APR-JUL			195	62%			317
Inflow to New Don Pedro Res (DWR)	OCT-SEP	905		1260	64%		1960	1954
	APR-JUL	430		730	60%		1310	1222
Merced R at Pohono Bridge Yosemite (DWR)	APR-JUL			210	57%			369
Cosumnes R at Michigan Bar (DWR)	OCT-SEP	170		235	60%		450	390
	APR-JUL	15		52	39%		180	133
SF San Joaquin R nr Florence Lk (DWR)	APR-JUL			135	72%			188
Inflow to New Melones Res (DWR)	OCT-SEP	535		810	69%		1280	1181
	APR-JUL	220		440	63%		820	699
Inflow to Pardee Res (DWR)	OCT-SEP	340		545	71%		830	764
	APR-JUL	125		290	62%		520	469
Merced R at Pohono Bridge Yosemite (NWS)	APR-JUL	189	225	260	68%	350	435	382.3
Inflow to Lake McClure (NWS)	APR-JUL	245	300	345	57%	490	665	610.6
Inflow to Lake McClure (DWR)								
Inflow to Pardee Res (NWS)	APR-JUL	182	220	275	62%	380	480	443.5
Tuolumne R nr Hetch Hetchy (DWR)	APR-JUL			360	61%			587

- 1) 90% And 10% exceedance probabilities are actually 95% And 5%
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Watershed Snowpack Analysis March 1, 2022	# of Sites	% Median	Last Year % Median
SanJoaquin	78	68%	69%

Tulare Lake Streamflow Forecasts - March 1, 2022

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

Tulare Lake	Forecast Period	90% (KAF)	70% (KAF)	50% (KAF)	% Median	30% (KAF)	10% (KAF)	30yr Median (KAF)
Kaweah R at Terminus Res (DWR)	OCT-SEP	120		210	49%		425	426
	APR-JUL	65		140	51%		320	276
Kaweah R at Terminus Res (NWS)	APR-JUL	69	109	135	48%	225	330	282.1
	APR-JUL	505	685	790	65%	1080	1330	1222.8
Inflow to Pine Flat Res (NWS)	OCT-SEP	210		290	43%		625	672
	APR-JUL	110		170	40%		430	427
Inflow to Isabella Res (DWR)	OCT-SEP	660		1060	63%		1700	1671
	APR-JUL	410		750	62%		1310	1204
Tule R at Success Res (DWR)	OCT-SEP	30		46	35%		120	132
	APR-JUL	8		17	30%		65	56
Tule R at Success Res (NWS)	APR-JUL	10	15	21	35%	39	73	60.3
	APR-JUL	109	153	181	40%	265	360	455.3
NF Kings R nr Cliff Camp (DWR)	APR-JUL	109	153	181	40%	265	360	455.3
	APR-JUL			265	70%			379

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Watershed Snowpack Analysis March 1, 2022	# of Sites	% Median	Last Year % Median
Tulare Lake	39	73%	52%

**North Coast
Streamflow Forecasts - March 1, 2022**

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

North Coast	Forecast Period	90% (KAF)	70% (KAF)	50% (KAF)	% Median	30% (KAF)	10% (KAF)	30yr Median (KAF)
Trinity R at Lewiston (DWR)	OCT-SEP	390		630	48%		1140	1322
	APR-JUL	95		270	42%		650	648
Inflow to Clair Engle Lk (NWS)	APR-JUL	114	142	230	39%	395	560	584
Scott R nr Fort Jones (NWS)	APR-JUL	16	21	42	25%	69	109	167

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Watershed Snowpack Analysis March 1, 2022	# of Sites	% Median	Last Year % Median
North Coast	10	37%	69%

Klamath Streamflow Forecasts - March 1, 2022

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

Klamath	Forecast Period	90% (KAF)	70% (KAF)	50% (KAF)	% Median	30% (KAF)	10% (KAF)	30yr Median (KAF)
Sprague R nr Chiloquin	MAR-SEP	89	123	150	70%	179	225	215
	APR-SEP	64	94	117	74%	142	184	159
Upper Klamath Lake Inflow ¹²	MAR-SEP	260	355	405	78%	455	580	520
	APR-SEP	168	250	290	79%	335	445	365
Gerber Reservoir Inflow ²	MAR-JUN	-0.53	9.5	16.4	92%	23	33	17.8
Clear Lake Inflow ²	MAR-JUN	-31	-9.4	5.5	43%	20	42	12.8
	MAR-SEP	198	255	295	82%	335	395	360
Williamson R bl Sprague R nr Chiloquin	APR-SEP	147	200	235	82%	270	325	285

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

Reservoir Storage End of February, 2022	Current (KAF)	Last Year (KAF)	Median (KAF)	Capacity (KAF)
Upper Klamath Lake	322.6	316.9	385.4	523.7

Basin Index
of reservoirs

Watershed Snowpack Analysis March 1, 2022	# of Sites	% Median	Last Year % Median
Klamath	31	65%	95%

Tahoe Streamflow Forecasts - March 1, 2022

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

Tahoe	Forecast Period	90% (KAF)	70% (KAF)	50% (KAF)	% Median	30% (KAF)	10% (KAF)	30yr Median (KAF)
Lake Tahoe Net Inflow	MAR-JUL	2.8	62	120	86%	178	265	139
	APR-JUL	-26	37	80	79%	123	186	101
Lake Tahoe Rise Gates Closed ¹	MAR-HIGH	0.179	0.81	1.2	81%	1.59	2.4	1.49
	APR-HIGH	0.2	0.612	0.9	76%	1.2	1.8	1.19

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Reservoir Storage End of February, 2022	Current (KAF)	Last Year (KAF)	Median (KAF)	Capacity (KAF)
Lake Tahoe	112.9	318.5	244.2	744.5

Basin Index
of reservoirs

Watershed Snowpack Analysis March 1, 2022	# of Sites	% Median	Last Year % Median
Tahoe	23	81%	73%

Truckee Streamflow Forecasts - March 1, 2022

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)
L Truckee R ab Boca Reservoir ²	MAR-JUL	20	50	71	83%	92	122	86
	APR-JUL	11	39	58	81%	72	90	72
Independence Lk Inflow ²	MAR-JUL	6.5	9.2	11	96%	12.8	15.5	11.4
	APR-JUL	5.7	8.3	10	95%	11.7	14.3	10.5
Donner Lake Inflow ²	MAR-JUL	6.8	12	15.5	81%	19	24	19.2
	APR-JUL	4.6	9	12	80%	15	19.4	15
Truckee R ab Farad Sidewater ²	MAR-JUL	50	82	104	98%	126	158	106
	APR-JUL	39	69	90	100%	111	141	90
Boca Res Local Inflow ²	MAR-JUL	0.53	2.3	4.6	105%	6.9	9.5	4.4
	APR-JUL	0.18	0.67	1.6	105%	2.4	4.7	1.52
Stampede Res Local Inflow ²	MAR-JUL	17.4	43	60	87%	77	103	69
	APR-JUL	9.9	34	50	85%	66	90	59
Martis Ck Res Inflow ²	MAR-JUL	0.73	5.1	8	90%	10.9	15.3	8.9
	APR-JUL	0.68	2.3	5	88%	7.7	11.6	5.7
Sagehen Ck nr Truckee	MAR-JUL	0.69	2.7	4	83%	5.3	7.3	4.8
	APR-JUL	0.22	2.1	3.4	83%	4.7	6.6	4.1
Prosser Ck Res Inflow ²	MAR-JUL	19.9	31	39	93%	47	58	42
	APR-JUL	14.1	25	32	91%	39	50	35
Truckee R at Farad ²	MAR-JUL	82	161	215	81%	270	350	265
	APR-JUL	56	130	180	80%	210	300	225

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Reservoir Storage End of February, 2022	Current (KAF)	Last Year (KAF)	Median (KAF)	Capacity (KAF)
Independence Lake	11.6	11.2	14.6	17.3
Martis Reservoir		0.9	0.8	35.8
Stampede Reservoir	97.4	98.0	161.1	226.5
Donner Lake	3.3	3.0	3.7	9.5
Boca Reservoir	26.7	6.3	15.0	40.9
Prosser Reservoir	6.9	6.4	9.7	29.8

Basin Index
of reservoirs

Watershed Snowpack Analysis March 1, 2022	# of Sites	% Median	Last Year % Median
Truckee	17	85%	75%

Carson Streamflow Forecasts - March 1, 2022

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	58	108	142	77%	176	225	184
	APR-JUL	46	93	125	76%	157	205	164
	200 cfs	16 Jun	03 Jul	15 Jul		27 Jul	13 Aug	14 Jul
	500 cfs	28 May	13 Jun	23 Jun		03 Jul	19 Jul	20 Jun
WF Carson R nr Woodfords								
	MAR-JUL	15.8	30	40	80%	50	64	50
	APR-JUL	10.9	25	35	78%	45	59	45

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Watershed Snowpack Analysis March 1, 2022	# of Sites	% Median	Last Year % Median
Carson	16	77%	77%

Walker Streamflow Forecasts - March 1, 2022

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	2.6	23	40	78%	57	81	51
	APR-AUG	1.32	18.1	34	77%	50	73	44
W Walker R nr Coleville	MAR-JUL	55	95	122	79%	149	189	154
	APR-JUL	49	88	115	78%	142	181	147
W Walker R bl L Walker R nr Coleville	MAR-JUL	58	98	125	79%	152	192	159
	APR-JUL	54	93	120	78%	147	186	153

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Reservoir Storage End of February, 2022	Current (KAF)	Last Year (KAF)	Median (KAF)	Capacity (KAF)
Bridgeport Reservoir	18.9	14.8	19.4	42.5

Basin Index
of reservoirs

Watershed Snowpack Analysis March 1, 2022	# of Sites	% Median	Last Year % Median
Walker	8	76%	68%

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Surprise Valley-Warners - March 1, 2022

Watershed Snowpack Analysis March 1, 2022	# of Sites	% Median	Last Year % Median
Surprise Valley-Warners	3	86%	105%

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**Colorado
Streamflow Forecasts - March 1, 2022**

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	2490	3670	4600	75%	5640	7360	6130

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Reservoir Storage End of February, 2022	Current (KAF)	Last Year (KAF)	Median (KAF)	Capacity (KAF)
Lake Powell	6048.3	9225.6	13114.0	24322.0

Basin Index
of reservoirs

Watershed Snowpack Analysis March 1, 2022	# of Sites	% Median	Last Year % Median
Colorado	232	92%	80%

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**Owens Lake
Streamflow Forecasts - March 1, 2022**

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

Owens Lake	Forecast Period	90% (KAF)	70% (KAF)	50% (KAF)	% Median	30% (KAF)	10% (KAF)	30yr Median (KAF)
Owens R (DWR)	APR-JUL			178	77%			231

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Watershed Snowpack Analysis March 1, 2022	# of Sites	% Median	Last Year % Median
Owens Lake	11	84%	61%

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.

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California Water Supply Outlook

