United States Department of Agriculture

Natural Resources Conservation Service

Arizona Basin Outlook Report January 1, 2020

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Basin Outlook Reports
And Federal – State – Private Cooperative Snow Surveys

How forecasts are made

Most of the annual streamflow in Arizona 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 snow courses and automated Snow Telemetry (SNOTEL) sites, along with precipitation and streamflow values, are used in statistical and simulation models to prepare runoff forecasts. These forecasts are coordinated between hydrologists in the Natural Resources Conservation Service (NRCS) the National Weather Service, and the Salt River Project.

Forecasts of any kind are not perfect. Streamflow forecast uncertainty arises from three primary sources: (1) uncertainty 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 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 are concerned about having an adequate water supply, they may want to base their decisions on the 90% or 70% exceedance probability forecasts. On the other hand, if users anticipate receiving too much water, or are concerned about the threat of flooding, they may want to base their decisions on the 30% or 10% exceedance probability forecasts. Regardless of the forecast value users choose, they should be prepared to deal with either more or less water.

For more water supply and resource management information, contact:

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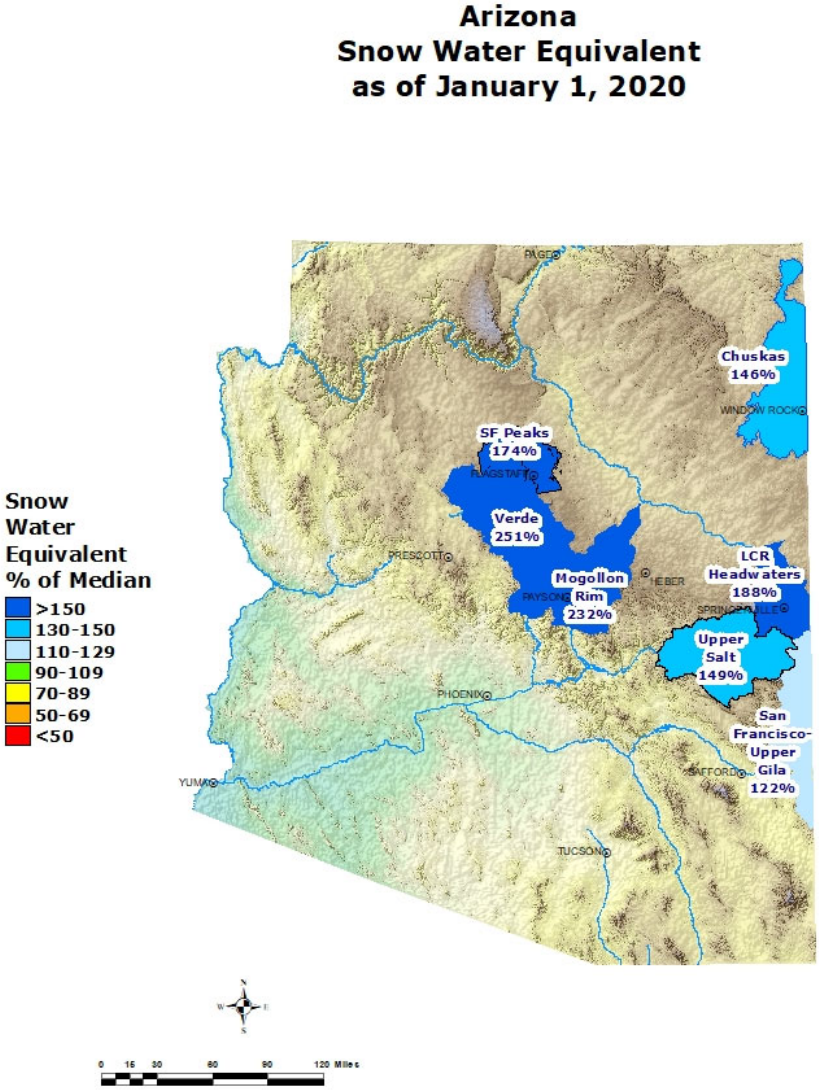
ARIZONA Basin Outlook Report
as of January 1, 2020

SUMMARY

As of January 1, snowpack levels are above normal to well above normal throughout the major basins of the state. Precipitation for the month of December was above normal to well above normal in the major river basins. The Salt and Verde River reservoir system stands at 73 percent of capacity, while San Carlos Reservoir is at 5 percent of capacity. The forecast calls for above normal to well above normal runoff in all basins for the spring runoff period.

SNOWPACK

Snow water equivalent levels in the state's major river basins are above normal to well above normal, ranging from 251 percent of median in the Verde River Basin to 122 percent of median in the Upper Gila River Basin. The statewide snowpack is well above normal at 184 percent of median.

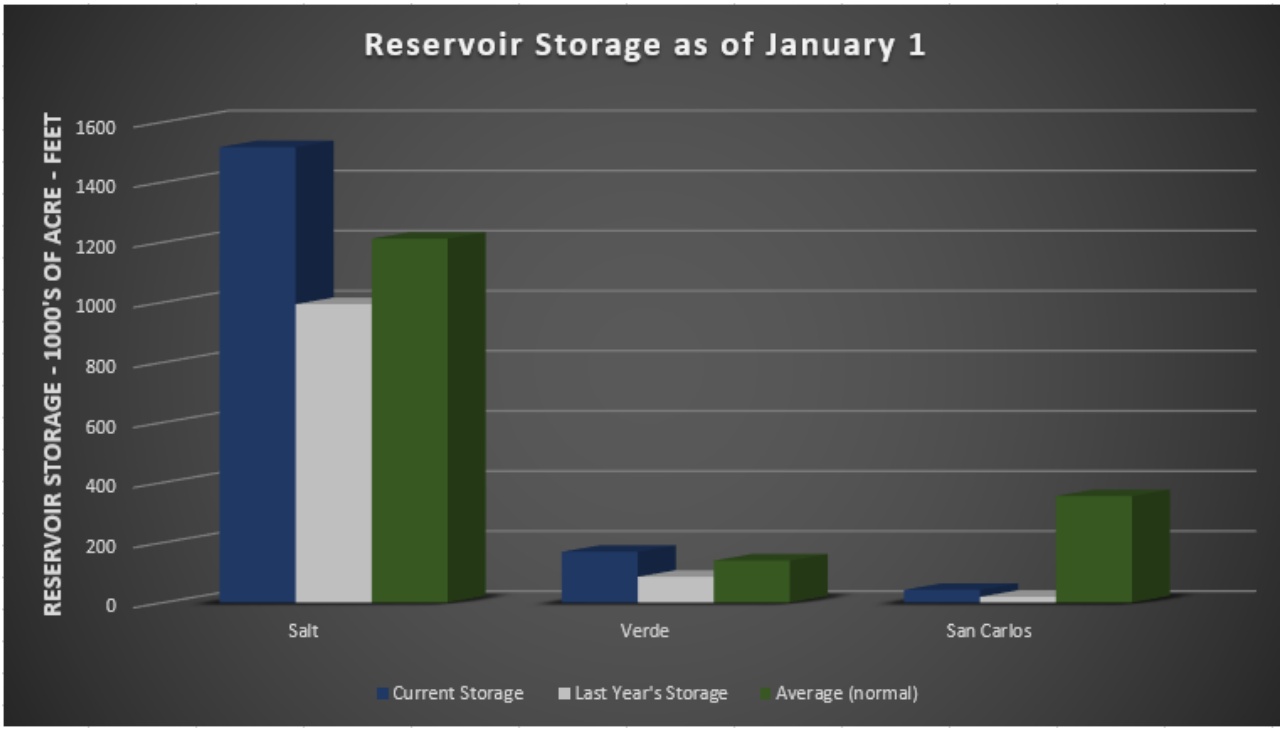


PRECIPITATION

Mountain data from NRCS SNOTEL sites and NWS Cooperator gages show that precipitation for December was above average to well above average in the major river basins. Cumulative precipitation since October 1 is above normal to well above normal throughout the basins. Please refer to the precipitation bar graphs found in this report for more information on precipitation levels in the basins.

RESERVOIR STORAGE

As of January 1, the Salt and Verde River reservoir system stands at 73 percent of capacity. San Carlos Reservoir is currently at 5 percent of capacity.

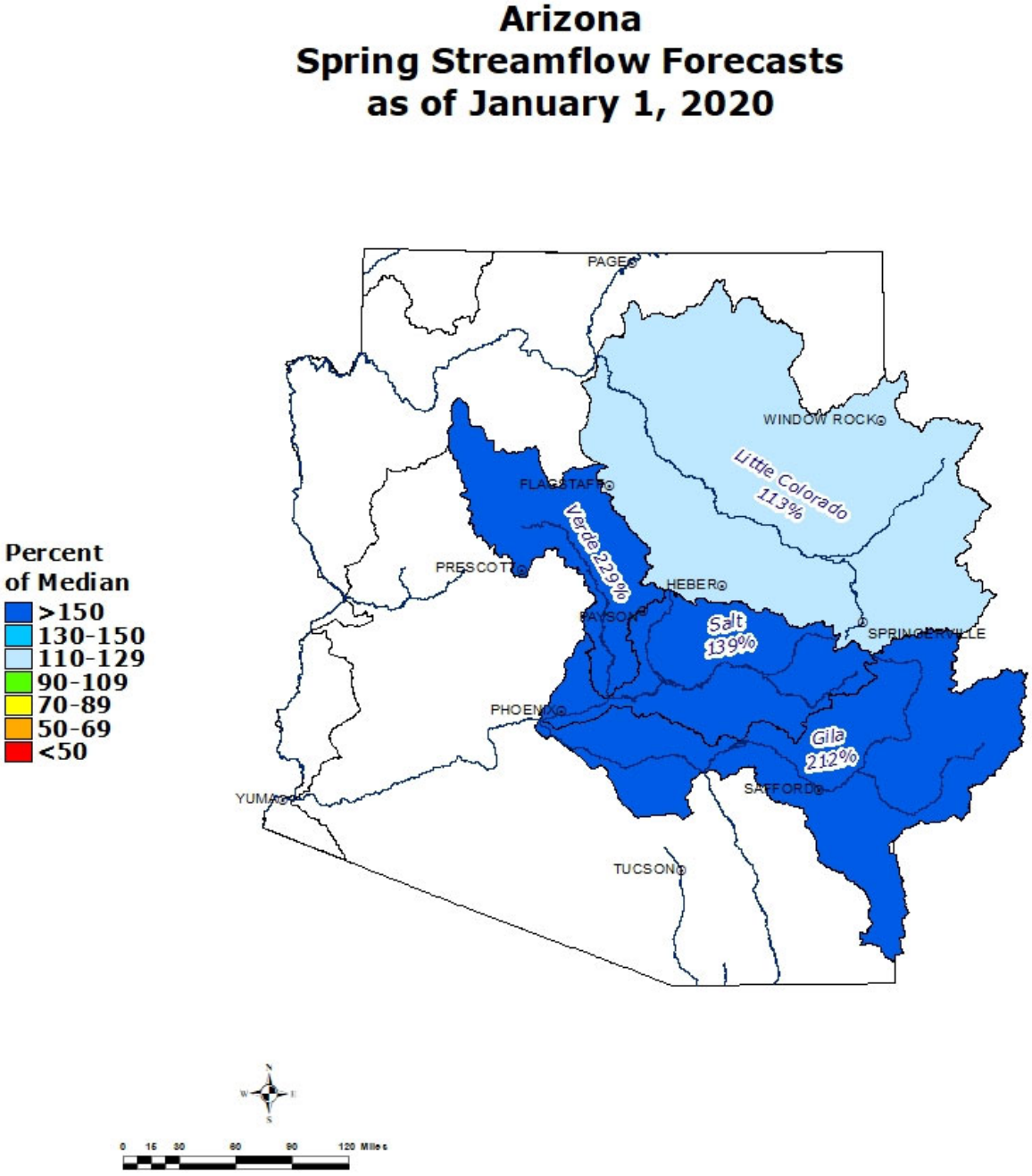


Key storage volumes displayed in thousands of acre-feet (x1000):

Reservoir	Current Storage	Last Year Storage	30-Year Average	Storage Capacity
Salt River System	1516.7	994.0	1181.0	2025.8
Verde River System	169.3	86.2	135.7	287.4
San Carlos Reservoir	42.7	19.5	324.9	875.0
Lyman Lake	8.7	3.7	11.8	30.0
Lake Havasu	583.1	552.4	562.7	619.0
Lake Mohave	1638.1	1638.7	1602.0	1810.0
Lake Mead	10899.0	10132.0	20297.0	26159.0
Lake Powell	12604.0	10099.0	17745.0	24322.0

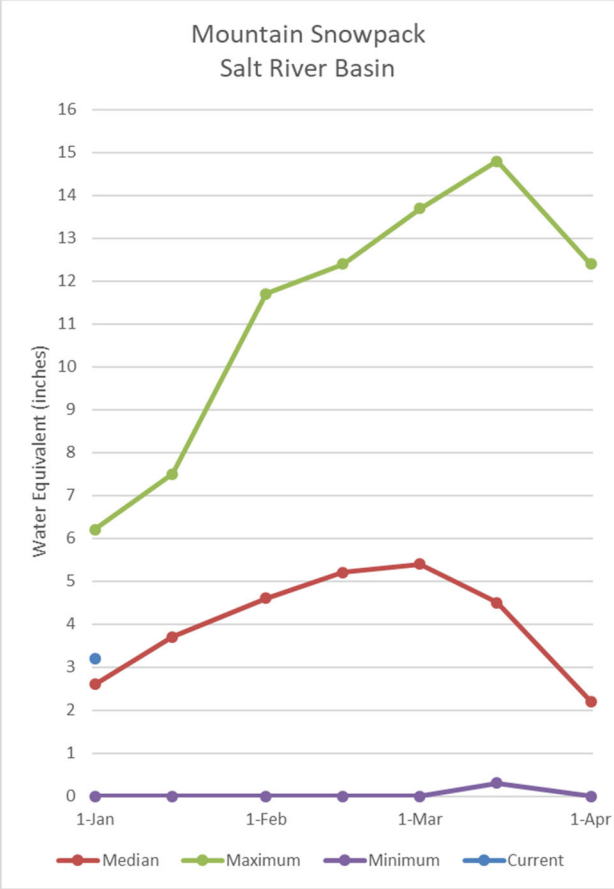
STREAMFLOW

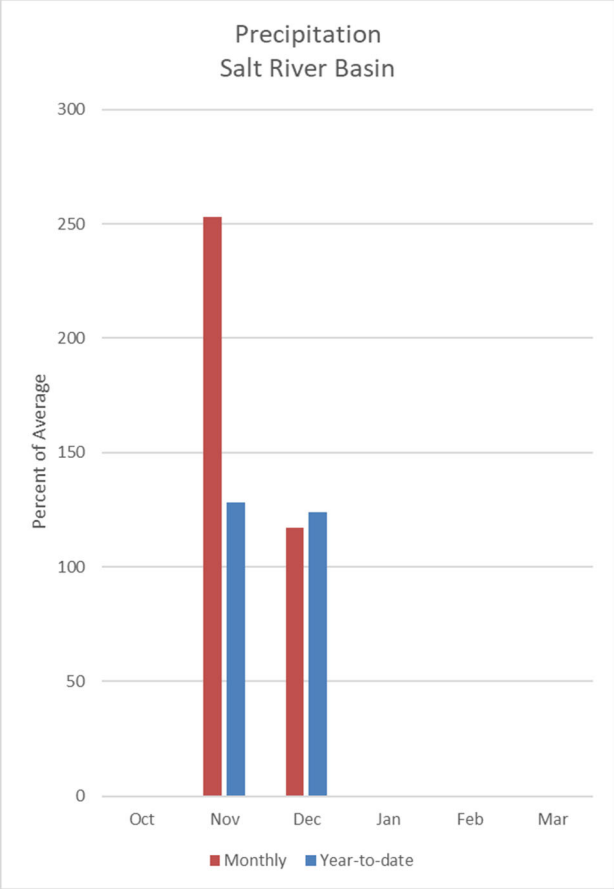
As of January 1, the forecast calls for above normal to well above normal streamflow for the spring runoff period, ranging from 113 percent of median in the Little Colorado River above Lyman Lake to 229 percent of median in the Verde River near above Horseshoe Dam. Total precipitation since the beginning of the water year has been well above average for the state, producing favorable conditions for runoff. Please refer to the basin forecast tables found in this report for more information regarding water supply forecasts.



SALT RIVER BASIN as of January 1, 2020

Well above normal streamflow levels are forecast for the basin. In the Salt River, near Roosevelt, the forecast calls for 139% of median streamflow through May, while at Tonto Creek, the forecast calls for 214% of median streamflow through May. Snow survey measurements show the Salt snowpack to be at 149% of median.





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Salt River Basin
Streamflow Forecasts - January 1, 2020

SALT RIVER BASIN	Forecast Period	Forecast Exceedance Probabilities for Risk Assessment Chance that actual volume will exceed forecast 90% (KAF)	70% (KAF)	50% (KAF)	% Avg	30% (KAF)	10% (KAF)	30yr Avg (KAF)
Salt R nr Roosevelt[3]								
	JAN	14.1	36	59	246%	91	156	24
	JAN-MAY	187	315	430	139%	570	825	310
	MAR-MAY	120	197	265	110%	345	495	240
Tonto Ck ab Gun Ck nr Roosevelt[3]								
	JAN	4.3	11.9	24	632%	48	135	3.8
	JAN-MAY	22	55	90	214%	137	235	42

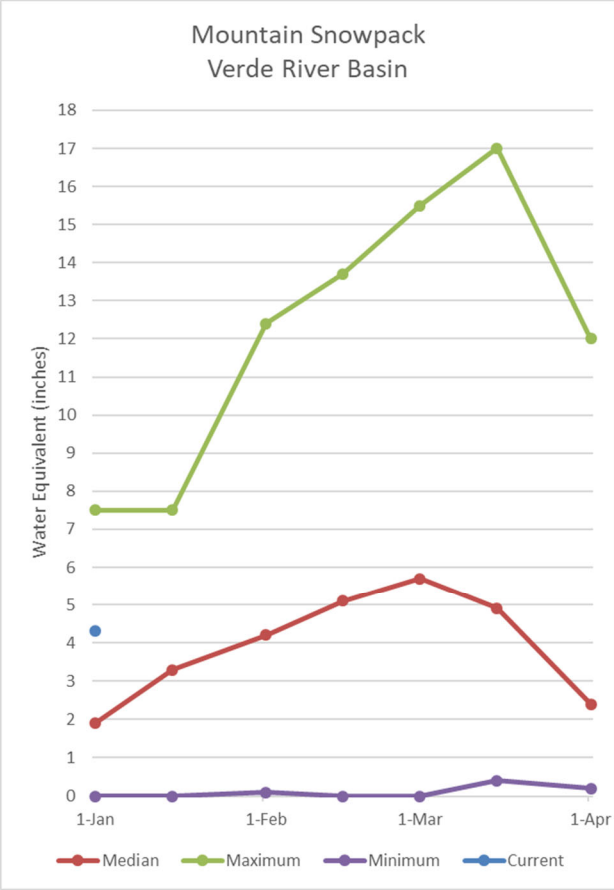
1) 90% and 10% exceedance probabilities are actually 95% and 5%
2) Forecasts are for unimpaired flows. Actual flow will be dependent on management of upstream reservoirs and diversions
3) Median value used in place of average

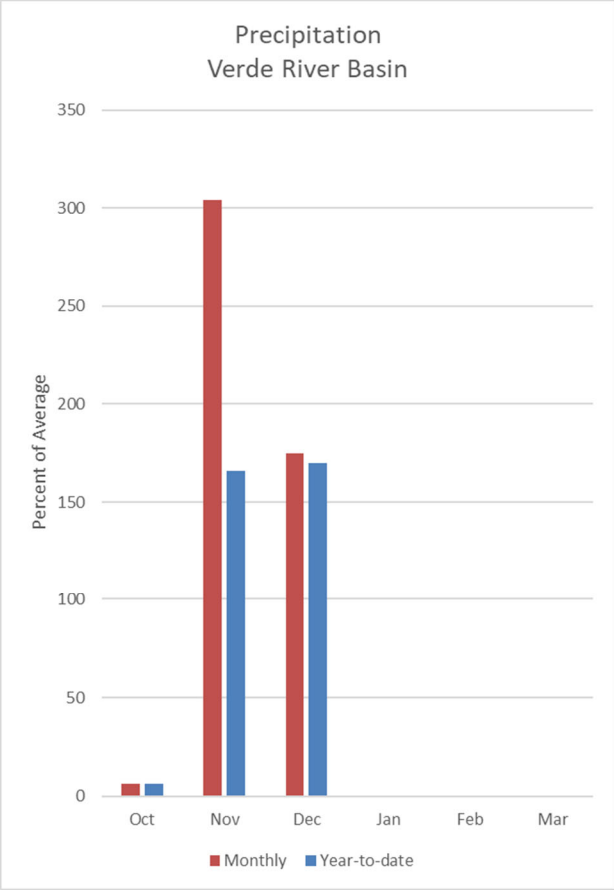
Reservoir Storage End of December, 2019	Current (KAF)	Last Year (KAF)	Average (KAF)	Capacity (KAF)
Salt River Reservoir System	1516.7	994.0	1181.0	2025.8
Basin-wide Total	1516.7	994.0	1181.0	2025.8
# of reservoirs	1	1	1	1

Watershed Snowpack Analysis January 1, 2020	# of Sites	% Median	Last Year % Median
SALT RIVER BASIN	8	149%	80%

VERDE RIVER BASIN as of January 1, 2020

Well above normal streamflow levels are forecast for the basin. In the Verde River above Horseshoe Dam, the forecast calls for 229% of median streamflow through May. Snow survey measurements show the Verde snowpack to be at 251% of median.





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Verde River Basin
Streamflow Forecasts - January 1, 2020

		Forecast Exceedance Probabilities for Risk Assessment Chance that actual volume will exceed forecast						
VERDE RIVER BASIN	Forecast Period	90% (KAF)	70% (KAF)	50% (KAF)	% Avg	30% (KAF)	10% (KAF)	30yr Avg (KAF)
Verde R bl Tangle Ck ab Horseshoe Dam[3]								
	JAN	26	45	67	291%	98	172	23
	JAN-MAY	147	250	360	229%	515	880	157

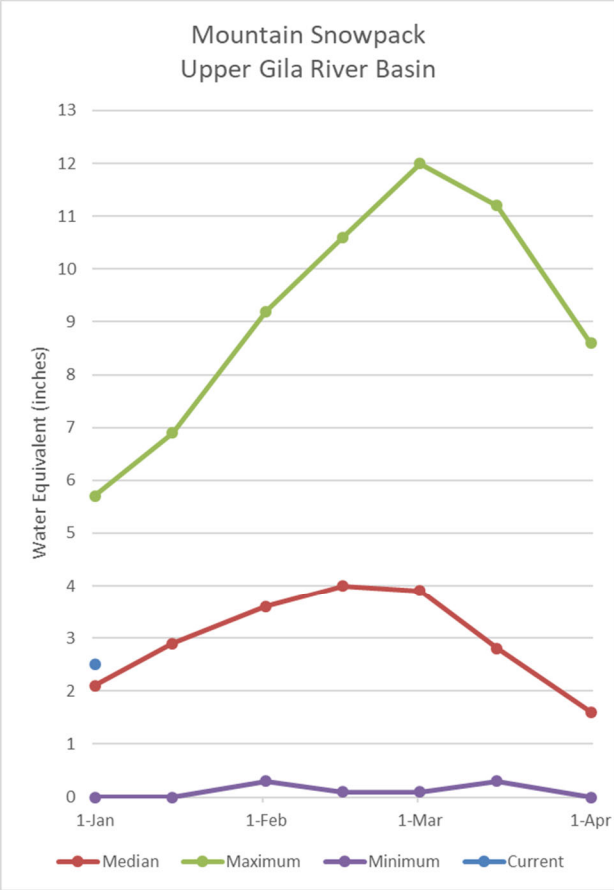
1) 90% and 10% exceedance probabilities are actually 95% and 5%
2) Forecasts are for unimpaired flows. Actual flow will be dependent on management of upstream reservoirs and diversions
3) Median value used in place of average

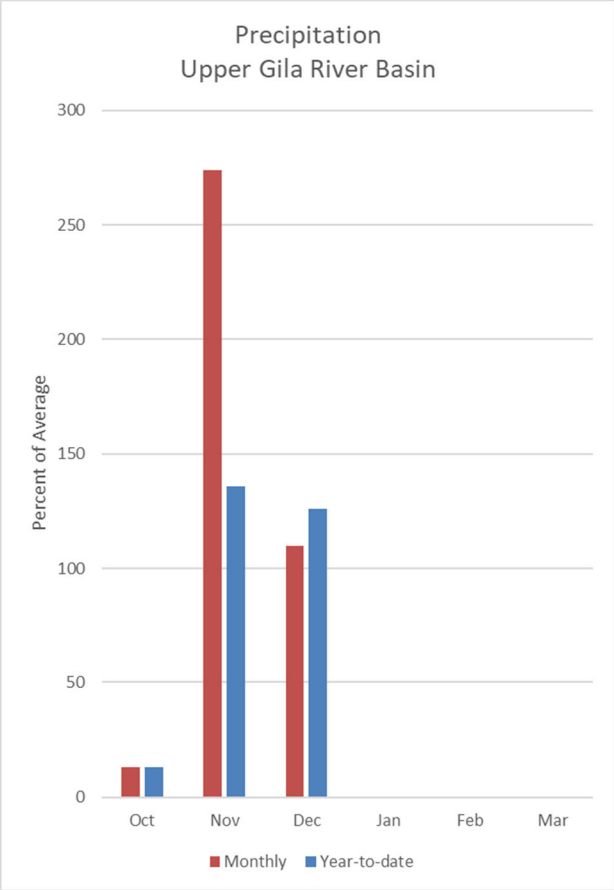
Reservoir Storage End of December, 2019	Current (KAF)	Last Year (KAF)	Average (KAF)	Capacity (KAF)
Verde River Reservoir System	169.3	86.2	135.7	287.4
Basin-wide Total	169.3	86.2	135.7	287.4
# of reservoirs	1	1	1	1

Watershed Snowpack Analysis January 1, 2020	# of Sites	% Median	Last Year % Median
VERDE RIVER BASIN	6	251%	55%

SAN FRANCISCO-UPPER GILA RIVER BASIN as of January 1, 2020

Well above normal streamflow levels are forecast for the basin. In the San Francisco River, at Clifton, the forecast calls for 170% of median streamflow levels through May. In the Gila River, near Solomon, the forecast calls for 212% of median streamflow levels through May. At San Carlos Reservoir, inflow to the lake is forecast at 263% of median through May. Snow survey measurements show the snowpack for this basin to be at 122% of median.





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San Francisco-Upper Gila River Basin
Streamflow Forecasts - January 1, 2020

		Forecast Exceedance Probabilities for Risk Assessment Chance that actual volume will exceed forecast						
SAN FRANCISCO-UPPER GILA RIVER BASIN	Forecast Period	90% (KAF)	70% (KAF)	50% (KAF)	% Avg	30% (KAF)	10% (KAF)	30yr Avg (KAF)
Gila R at Gila[3]								
	JAN-MAY	30	49	65	116%	85	120	56
Gila R bl Blue Ck nr Virden[3]								
	JAN-MAY	42	76	105	138%	139	197	76
San Francisco R at Glenwood[3]								
	JAN-MAY	16.5	29	41	195%	55	82	21
San Francisco R at Clifton[3]								
	JAN-MAY	42	75	104	170%	137	194	61
Gila R nr Solomon[3]								
	JAN	16.3	27	37	188%	47	65	19.7
	JAN-MAY	124	215	290	212%	380	530	137
San Carlos Reservoir Inflow[3]								
	JAN-MAY	91	176	250	263%	335	490	95

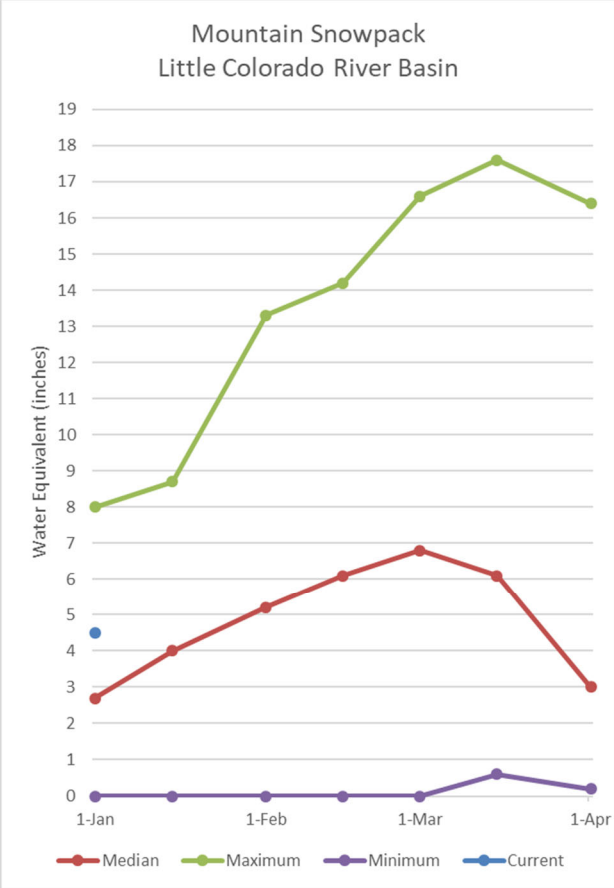
1) 90% and 10% exceedance probabilities are actually 95% and 5%
2) Forecasts are for unimpaired flows. Actual flow will be dependent on management of upstream reservoirs and diversions
3) Median value used in place of average

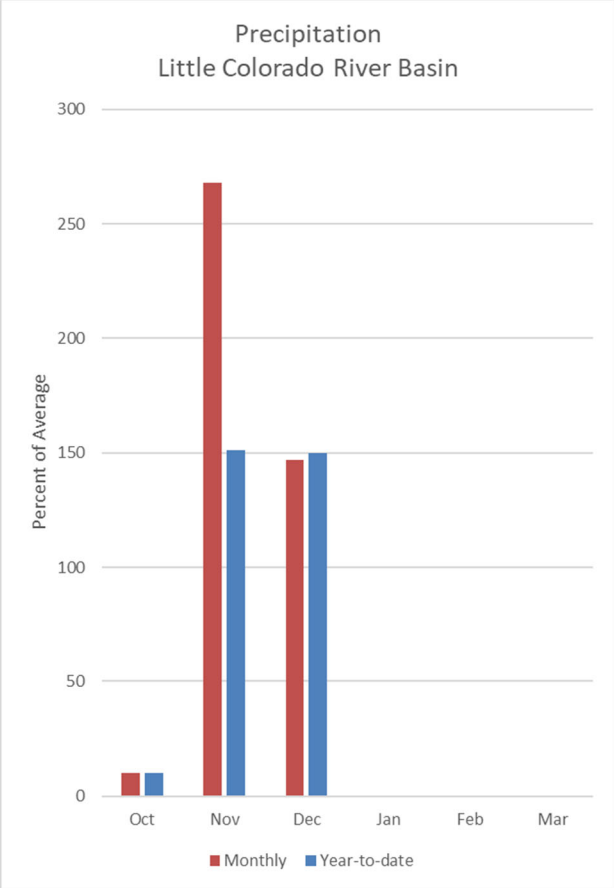
Reservoir Storage End of December, 2019	Current (KAF)	Last Year (KAF)	Average (KAF)	Capacity (KAF)
San Carlos Reservoir	42.7	19.6	324.9	875.0
Basin-wide Total	42.7	19.6	324.9	875.0
# of reservoirs	1	1	1	1

Watershed Snowpack Analysis January 1, 2020	# of Sites	% Median	Last Year % Median
SAN FRANCISCO-UPPER GILA RIVER BASIN	7	122%	80%

LITTLE COLORADO RIVER BASIN as of January 1, 2020

Above normal streamflow levels are forecast for the basin. In the Little Colorado River, above Lyman Lake, the forecast calls for 113% of median streamflow through June. At Blue Ridge (C.C. Cragin) Reservoir, inflow to the lake is forecast at 120% of median through May. Snowpacks along the southern headwaters of the Little Colorado River, and along the central Mogollon Rim, were measured at 188% and 232% of median, respectively.





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Little Colorado River Basin
Streamflow Forecasts - January 1, 2020

LITTLE COLORADO RIVER BASIN	Forecast Period	90% (KAF)	70% (KAF)	50% (KAF)	% Avg	30% (KAF)	10% (KAF)	30yr Avg (KAF)
		Forecast Exceedance Probabilities for Risk Assessment Chance that actual volume will exceed forecast						
Little Colorado R ab Lyman Lake[3]	JAN-JUN	3.2	5.7	8	113%	10.8	16	7.1
Rio Nutria nr Ramah[3]	JAN-MAY	0.16	0.84	1.8	127%	3.3	6.8	1.42
Zuni R ab Black Rock Reservoir[3]	JAN-MAY	0.03	0.11	0.6	128%	1.74	5.2	0.47
Blue Ridge Reservoir Inflow[3]	JAN-MAY	5	12.3	20	120%	30	51	16.6
Lake Mary Reservoir Inflow[3]	JAN-MAY	2.2	4.3	6.3	131%	8.8	13.7	4.8

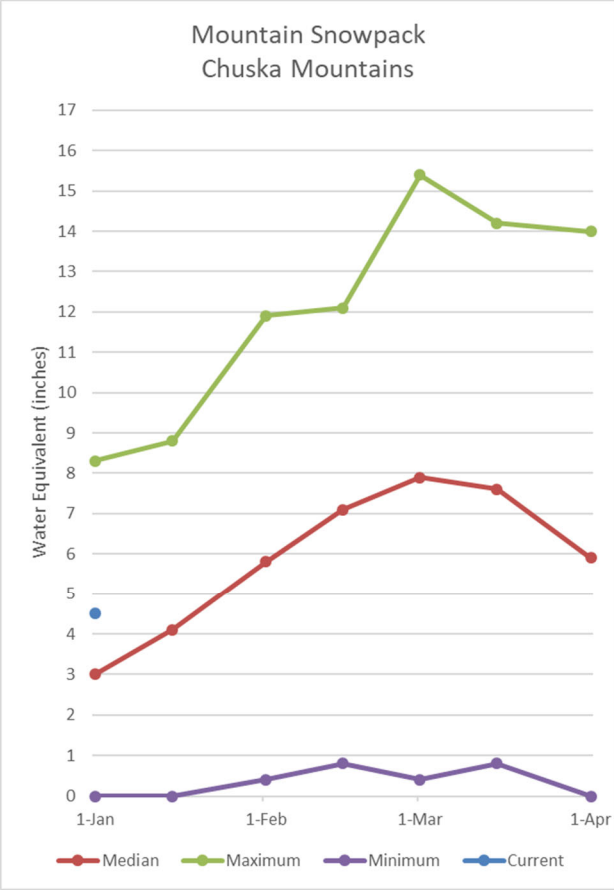
1) 90% and 10% exceedance probabilities are actually 95% and 5%
2) Forecasts are for unimpaired flows. Actual flow will be dependent on management of upstream reservoirs and diversions
3) Median value used in place of average

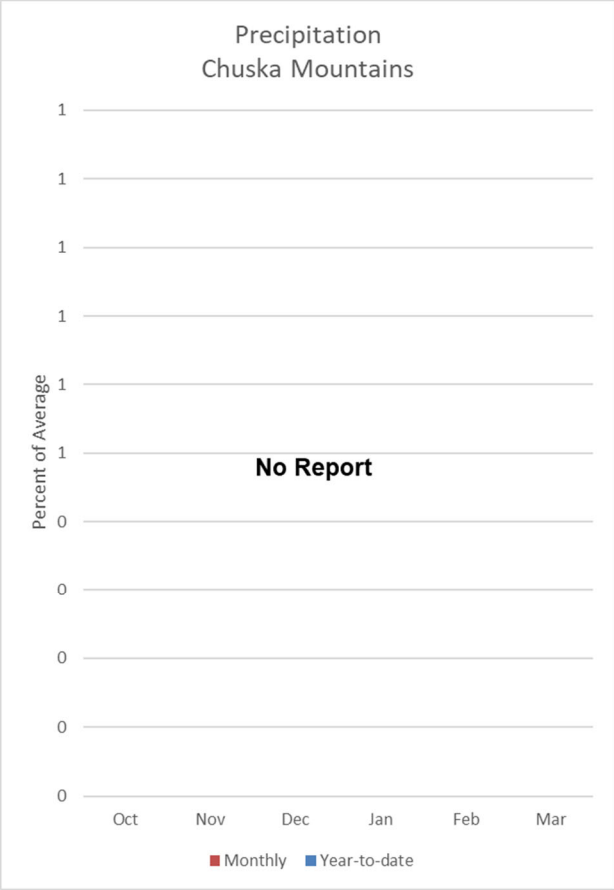
Reservoir Storage End of December, 2019	Current (KAF)	Last Year (KAF)	Average (KAF)	Capacity (KAF)
Lyman Reservoir	8.7	3.7	11.8	30.0
Basin-wide Total	8.7	3.7	11.8	30.0
# of reservoirs	1	1	1	1

Watershed Snowpack Analysis January 1, 2020	# of Sites	% Median	Last Year % Median
LITTLE COLORADO RIVER BASIN	8	188%	74%
CENTRAL MOGOLLON RIM	4	232%	69%

CHUSKA MOUNTAINS as of January 1, 2020

Snow survey measurements conducted by staff of the Navajo Nation Water Management Branch show the Chuska snowpack to be at 146% of median. The forecast calls for well above normal runoff for Wheatfields Creek, Captain Tom Wash, and Bowl Canyon Creek.





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Chuska Mountains
Streamflow Forecasts - January 1, 2020

CHUSKA MOUNTAINS	Forecast Period	90% (KAF)	70% (KAF)	50% (KAF)	% Avg	30% (KAF)	10% (KAF)	30yr Avg (KAF)
		Forecast Exceedance Probabilities for Risk Assessment Chance that actual volume will exceed forecast						
Captain Tom Wash nr Two Gray Hills	MAR-MAY	0.23	2.1	5.2	200%	10.5	23	2.6
Wheatfields Ck nr Wheatfields	MAR-MAY	1	2.5	3.9	186%	5.6	8.7	2.1
Bowl Canyon Ck ab Asaayi Lake	MAR-MAY	0.83	1.72	2.5	192%	3.4	5.1	1.3

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
3) Median value used in place of average

Watershed Snowpack Analysis January 1, 2020	# of Sites	% Median	Last Year % Median
CHUSKA MOUNTAINS	3	146%	97%
DEFIANCE PLATEAU	1	60%	170%

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Basinwide Summary: January 1, 2020
(Averages/Medians based on 1981-2010 reference period)

Snowpack Summary for January 1, 2020

SALT RIVER BASIN	Network	Elevation (ft)	Depth (in)	SWE (in)	Median (in)	% Median	Last Year SWE (in)	Last Year % Median
Baldy	SNOTEL	9125	24	5.9	3.7	159%	3.6	97%
Beaver Head	SNOTEL	7990	10	2.1	2.7	78%	1.8	67%
Buck Spring	SC	7400	8	1.4	1.5	93%		
Coronado Trail	SNOTEL	8400	8	2.7	1.8	150%	1.3	72%
Hawley Lake	SNOTEL	8300	31	7.1			5.6	
Coronado Trail	SC	8350			0.7			
Fort Apache	SC	9160	32	6.9	3.7	186%	2.6	70%
Hannagan Meadows	SNOTEL	9020	23	6.4	5.0	128%	4.3	86%
Maverick Fork	SNOTEL	9200	25	6.0	4.0	150%	2.7	68%
Nutrioso	SC	8500			0.4			
Nutrioso	SNOTEL	8500	4	1.3			0.8	
Wildcat	SNOTEL	7850	10	1.8	1.3	138%	1.3	100%
Workman Creek	SNOTEL	6900	18	4.0	1.9	211%	1.7	89%
Basin Index						**149%**		**80%**
# of sites						8		8

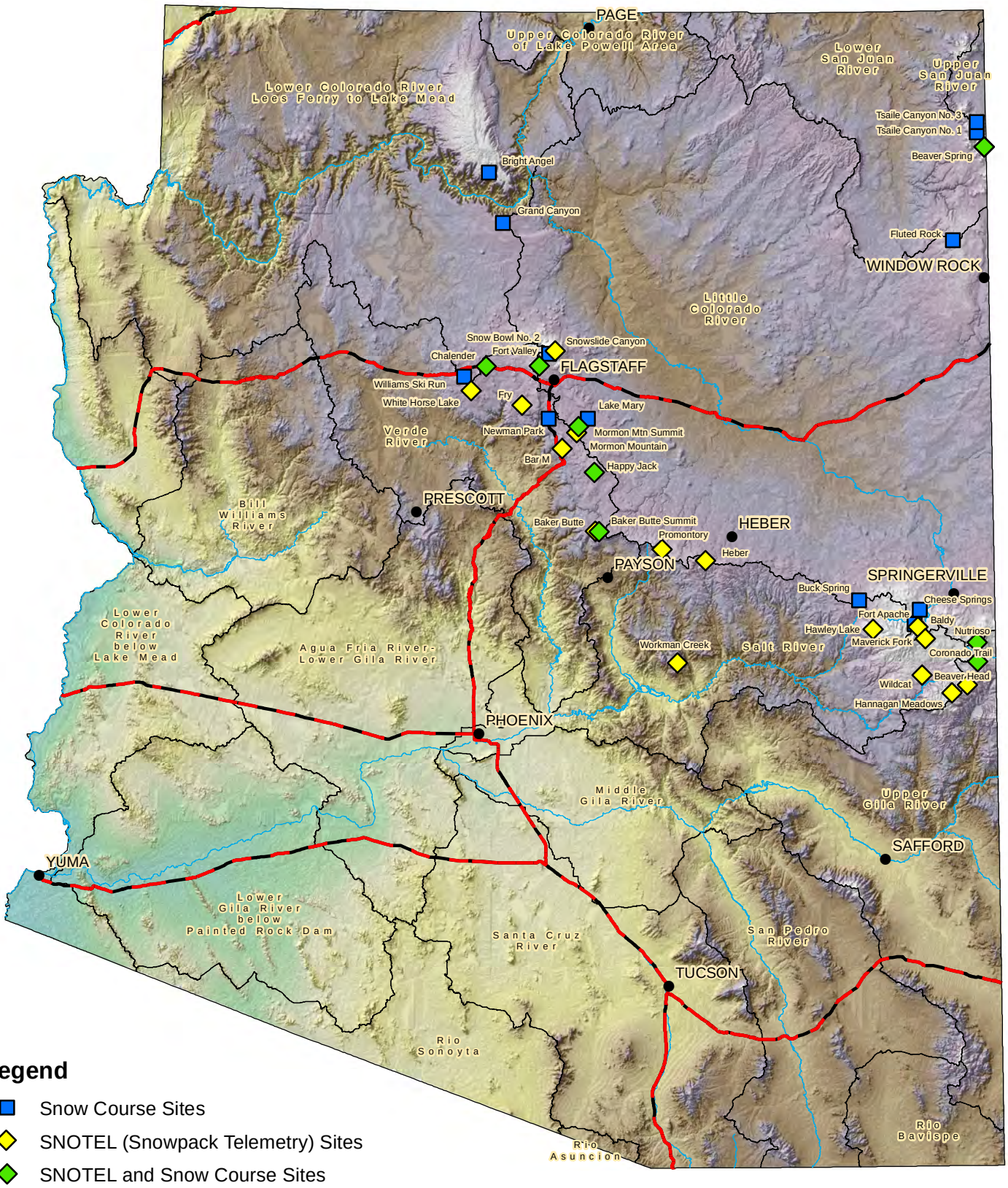
VERDE RIVER BASIN	Network	Elevation (ft)	Depth (in)	SWE (in)	Median (in)	% Median	Last Year SWE (in)	Last Year % Median
Baker Butte	SNOTEL	7300	24	5.4	1.6	338%	1.0	63%
Baker Butte No. 2	SC	7700	33	6.9	3.4	203%	1.1	32%
Baker Butte Smt	SNOTEL	7700	38	9.9			2.5	
Bar M	SNOTEL	6393	11	3.5			0.8	
Chalender	SC	7100	14	1.4	0.6	233%		
Chalender	SNOTEL	7100	17	3.9			1.2	
Fort Valley	SC	7350	8	1.6	0.8	200%		
Fort Valley	SNOTEL	7350	7	1.5			0.3	
Fry	SNOTEL	7200	27	6.7	2.8	239%	2.3	82%
Happy Jack	SNOTEL	7630	17	4.0	1.7	235%	1.8	106%
Happy Jack	SC	7630	15	2.9	1.0	290%		
Mormon Mountain	SNOTEL	7500	16	5.3	1.8	294%	0.8	44%
Mormon Mountain Summit #2	SC	8470	32	7.6	3.6	211%		
Mormon Mtn Summit	SNOTEL	8500	25	6.3			2.4	
Newman Park	SC	6750	14	2.9	0.6	483%		
White Horse Lake	SNOTEL	7180	17	3.6	1.4	257%	0.0	0%
Williams Ski Run	SC	7720			2.6			
Basin Index						**251%**		**55%**
# of sites						6		6

SAN FRANCISCO PEAKS	Network	Elevation (ft)	Depth (in)	SWE (in)	Median (in)	% Median	Last Year SWE (in)	Last Year % Median
Snow Bowl #2	SC	11200	52	15.2	8.0	190%		
Snowslide Canyon	SNOTEL	9730	45	14.1	8.1	174%	6.5	80%
Basin Index						**174%**		**80%**
# of sites						1		1

SAN FRANCISCO-UPPER GILA RIVER BASIN	Network	Elevation (ft)	Depth (in)	SWE (in)	Median (in)	% Median	Last Year SWE (in)	Last Year % Median
Beaver Head	SNOTEL	7990	10	2.1	2.7	78%	1.8	67%
Coronado Trail	SNOTEL	8400	8	2.7	1.8	150%	1.3	72%
Coronado Trail	SC	8350			0.7			
Frisco Divide	SNOTEL	8000	8	1.5	1.5	100%	0.9	60%
Hannagan Meadows	SNOTEL	9020	23	6.4	5.0	128%	4.3	86%
Hummingbird - Aerial And Snow Course	SC	10550			4.4			

Lookout Mountain	SNOTEL	8500	5	1.0	1.4	71%	0.8	57%
Nutrioso	SC	8500			0.4			
Nutrioso	SNOTEL	8500	4	1.3			0.8	
Signal Peak	SNOTEL	8360	9	1.3	1.9	68%	1.0	53%
Silver Creek Divide	SNOTEL	9000	19	6.7	3.5	191%	4.1	117%
State Line	SC	8000			0.6			
Whitewater - Aerial And Snow Course	SC	10750			9.5			
Basin Index						**122%**		**80%**
# of sites						7		7
LITTLE COLORADO RIVER BASIN	Network	Elevation (ft)	Depth (in)	SWE (in)	Median (in)	% Median	Last Year SWE (in)	Last Year % Median
Baker Butte	SNOTEL	7300	24	5.4	1.6	338%	1.0	63%
Baker Butte No. 2	SC	7700	33	6.9	3.4	203%	1.1	32%
Baker Butte Smt	SNOTEL	7700	38	9.9			2.5	
Baldy	SNOTEL	9125	24	5.9	3.7	159%	3.6	97%
Buck Spring	SC	7400	8	1.4	1.5	93%		
Cheese Springs	SC	8700	17	3.5	2.8	125%	2.2	79%
Fort Apache	SC	9160	32	6.9	3.7	186%	2.6	70%
Heber	SNOTEL	7640	19	3.9	1.6	244%	1.7	106%
Lake Mary	SC	6930	8	1.8	1.0	180%		
Maverick Fork	SNOTEL	9200	25	6.0	4.0	150%	2.7	68%
Promontory	SNOTEL	7930	29	6.8	3.3	206%	3.0	91%
Basin Index						**188%**		**74%**
# of sites						8		8
CENTRAL MOGOLLON RIM	Network	Elevation (ft)	Depth (in)	SWE (in)	Median (in)	% Median	Last Year SWE (in)	Last Year % Median
Baker Butte	SNOTEL	7300	24	5.4	1.6	338%	1.0	63%
Baker Butte No. 2	SC	7700	33	6.9	3.4	203%	1.1	32%
Baker Butte Smt	SNOTEL	7700	38	9.9			2.5	
Heber	SNOTEL	7640	19	3.9	1.6	244%	1.7	106%
Promontory	SNOTEL	7930	29	6.8	3.3	206%	3.0	91%
Basin Index						**232%**		**69%**
# of sites						4		4
CHUSKA MOUNTAINS	Network	Elevation (ft)	Depth (in)	SWE (in)	Median (in)	% Median	Last Year SWE (in)	Last Year % Median
Beaver Spring	SC	9220			3.9		2.5	64%
Beaver Spring	SNOTEL	9200	25	6.5			3.5	
Bowl Canyon	SC	8980	15	4.9	3.5	140%	2.8	80%
Hidden Valley	SC	8480	15	4.4				
Missionary Spring	SC	7940	4	0.7	1.1	64%	1.4	127%
Tsaile Canyon #1	SC	8160	19	4.5	2.3	196%	2.5	109%
Tsaile Canyon #3	SC	8920			3.8		2.5	66%
Whiskey Creek	SC	9050			3.5		2.6	74%
Navajo Whiskey Ck	SNOTEL	9050	25	7.0			3.9	
Basin Index						**146%**		**97%**
# of sites						3		3
DEFIANCE PLATEAU	Network	Elevation (ft)	Depth (in)	SWE (in)	Median (in)	% Median	Last Year SWE (in)	Last Year % Median
Fluted Rock	SC	7800	2	0.6	1.0	60%	1.7	170%
Basin Index						**60%**		**170%**
# of sites						1		1
NORTHWESTERN ARIZONA	Network	Elevation (ft)	Depth (in)	SWE (in)	Median (in)	% Median	Last Year SWE (in)	Last Year % Median
Bright Angel	SC	8400			3.0			
Grand Canyon	SC	7500			0.9			
Basin Index								

Arizona Snow Survey Data Sites



Legend

- Snow Course Sites
- SNOTEL (Snowpack Telemetry) Sites
- SNOTEL and Snow Course Sites
- Basin Boundaries

January 2017
Data Sources: NRCS / ALRIS
Projection: UTM Zone 12 Datum: NAD83

0 12.5 25 50 75 100 Miles

N

NRCS
Natural Resources Conservation Service