



United States
Department of
Agriculture

Natural Resources
Conservation
Service

Arizona

Basin Outlook Report

March 1, 2017



Issued by

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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.



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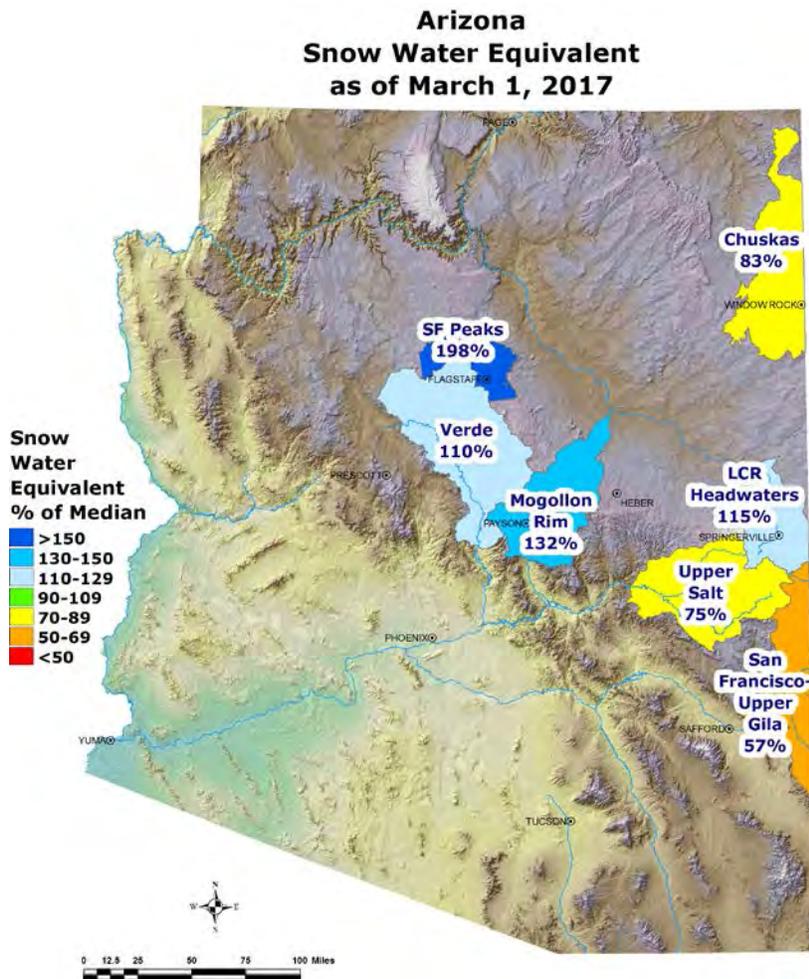
ARIZONA Basin Outlook Report as of March 1, 2017

SUMMARY

As of March 1, snowpack levels range from well below normal to above normal in the major basins. Precipitation for February was about normal throughout the basins. The Salt and Verde River reservoir system stands at 70 percent of capacity, while San Carlos Reservoir is at 26 percent of capacity. The forecast calls for normal to well above normal runoff for the spring runoff period.

SNOWPACK

Snow water equivalent levels are well below normal to above normal in the major basins, ranging from a low of 57 percent of median in the San Francisco – Upper Gila River Basin to a high of 115 percent of median in the Little Colorado River Basin. The statewide snowpack, which includes the Chuska Mountains and San Francisco Peaks, is above normal at 116 percent of median.

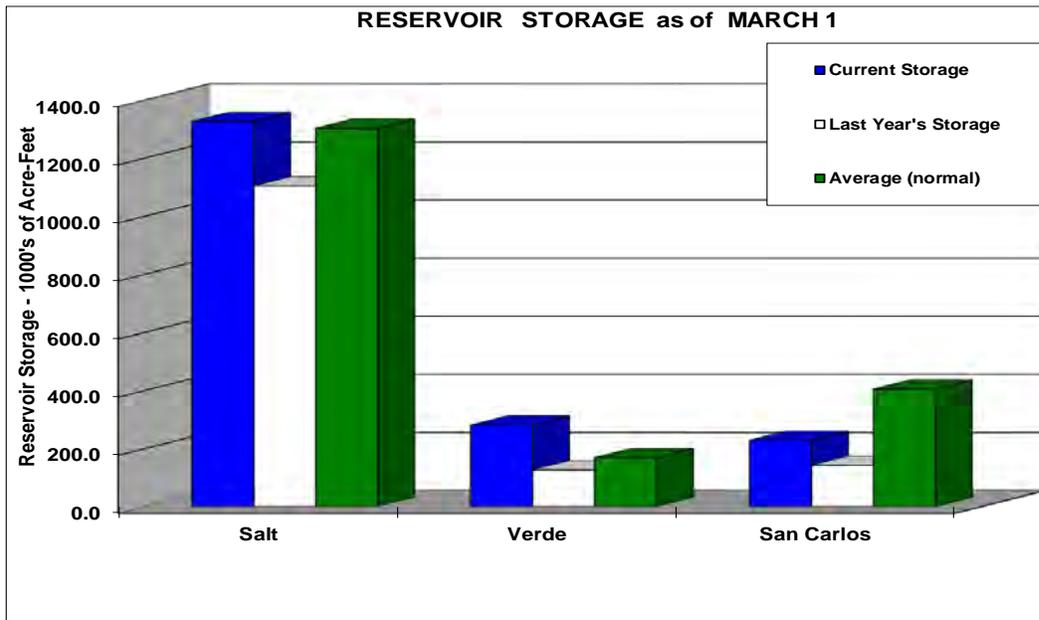


PRECIPITATION

Mountain data from NRCS SNOTEL sites and NWS Cooperator gages show that precipitation for the month of February was about normal, ranging from a low of 90 percent of average in the San Francisco – Upper Gila River Basin to a high of 111 percent of average in the Verde River Basin. Cumulative precipitation since October 1 is above normal in all of the basins for the water year. Please refer to the precipitation bar graphs found in this report for more information on precipitation levels in the basins.

RESERVOIR STORAGE

As of March 1, the Salt and Verde River reservoir system stands at 70 percent of capacity. San Carlos Reservoir remains well below normal at 26 percent of capacity.



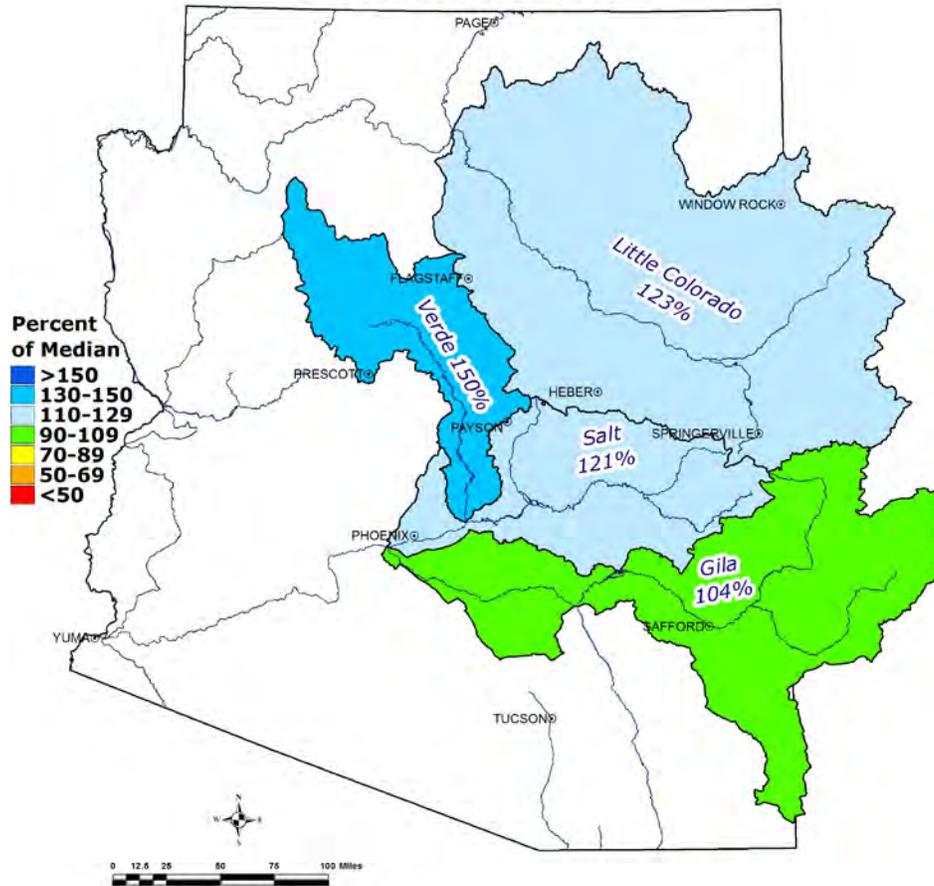
Key storage volumes displayed in thousands of acre-feet (x1000):

<u>Reservoir</u>	<u>Current Storage</u>	<u>Last Year Storage</u>	<u>30-Year Average</u>	<u>Storage Capacity</u>
Salt River System	1325.3	1103.3	1302.0	2025.8
Verde River System	280.1	126.1	168.0	287.4
San Carlos Reservoir	227.9	141.7	404.1	875.0
Lyman Lake	10.5	4.2	12.9	30.0
Lake Havasu	587.8	578.0	560.2	619.0
Lake Mohave	1688.0	1658.1	1673.0	1810.0
Lake Mead	10826.0	10768.0	20575.0	26159.0
Lake Powell	11212.4	11024.0	17055.0	24322.0

STREAMFLOW

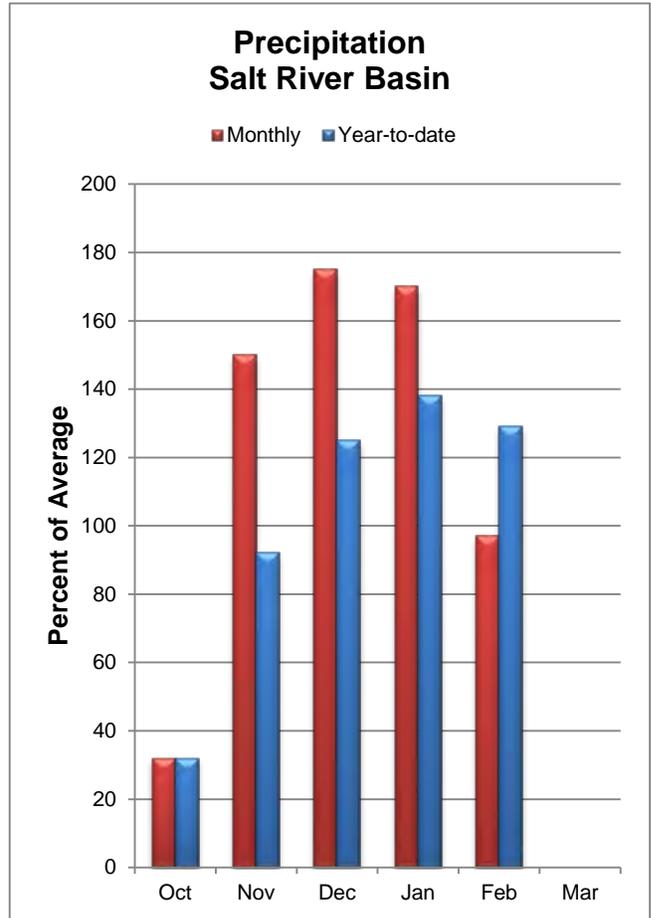
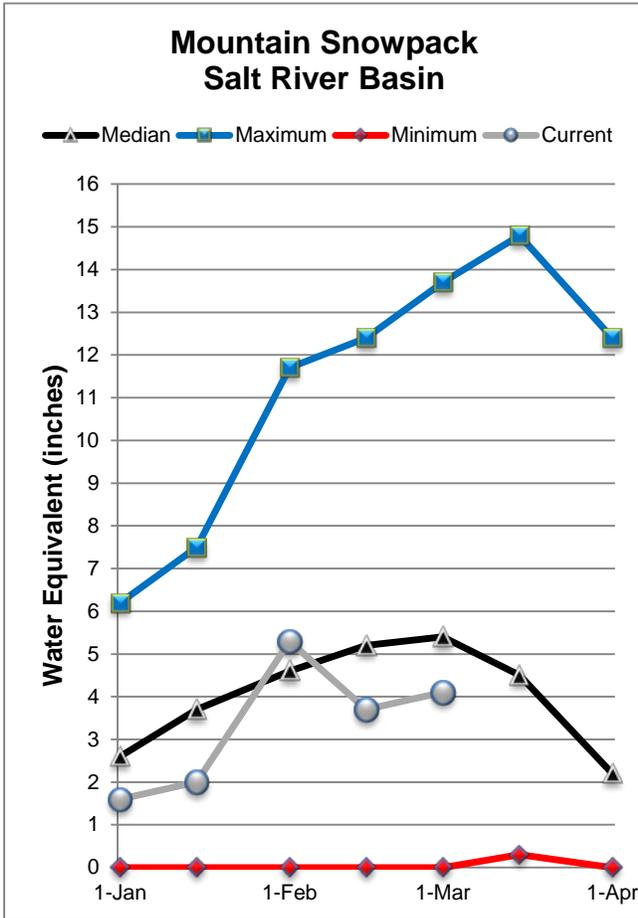
As of March 1, the forecast calls for normal to well above normal streamflow for the spring runoff period (March – May for most forecast points). The updated streamflow forecasts range from 104 percent of median in the Gila River near Solomon to 150 percent of median in the Verde River above Horseshoe Dam. Most of the anticipated runoff is expected to occur during the month of March as temperatures warm up and the snowpack rapidly melts. Please refer to the basin forecast tables found in this report for more information regarding water supply forecasts.

Arizona Spring Streamflow Forecasts as of March 1, 2017



SALT RIVER BASIN as of March 1, 2017

Above normal streamflow levels are forecast for the basin. In the Salt River, near Roosevelt, the forecast calls for 121% of median streamflow through May, while at Tonto Creek, the forecast calls for 145% of median streamflow through May. Snow survey measurements show the Salt snowpack to be at 75% of median.



**Salt River Basin
Streamflow Forecasts - March 1, 2017**

SALT RIVER BASIN	Forecast Period	Forecast Exceedance Probabilities for Risk Assessment Chance that actual volume will exceed forecast					30yr Avg (KAF)
		90% (KAF)	70% (KAF)	50% (KAF)	% Avg	30% (KAF)	
Salt R nr Roosevelt ³	MAR			200	175%		114
	MAR-MAY	162	230	290	121%	355	240
Tonto Ck ab Gun Ck nr Roosevelt ³	MAR			28	182%		15.4
	MAR-MAY	10.6	21	32	145%	45	22

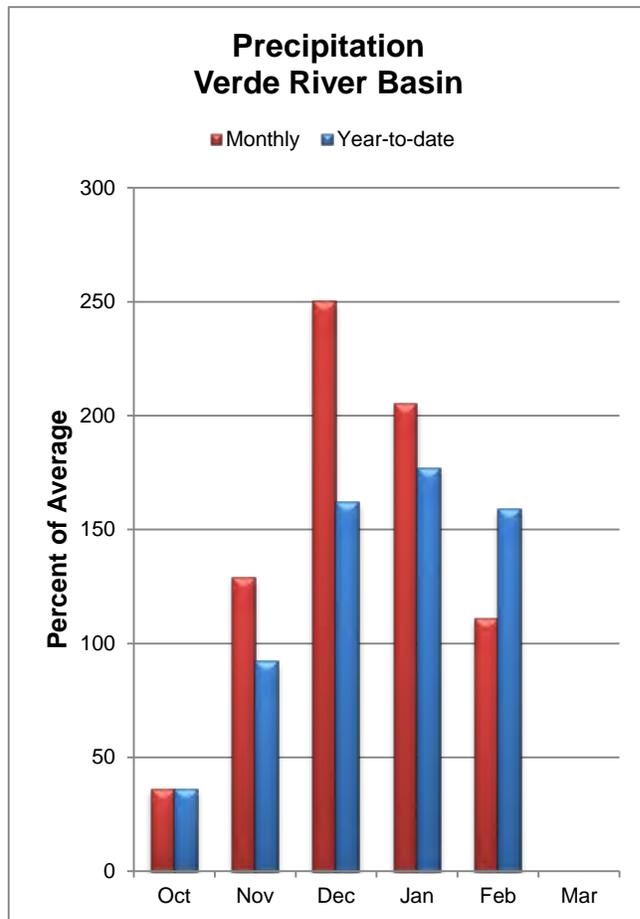
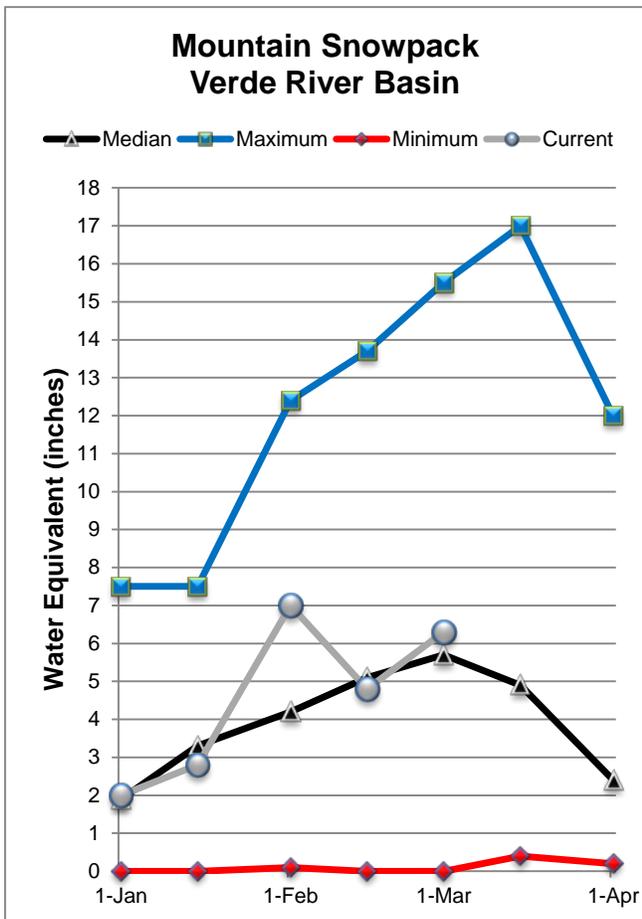
- 1) 90% and 10% exceedance probabilities are actually 95% and 5%
- 2) Forecasts are for unimpaired flows. Actual flow will be dependent on management of upstream reservoirs and diversions
- 3) Median value used in place of average

Reservoir Storage End of February, 2017	Current (KAF)	Last Year (KAF)	Average (KAF)	Capacity (KAF)
Salt River Reservoir System	1325.3	1164.5	1302.0	2025.8
Basin-wide Total	1325.3	1164.5	1302.0	2025.8
# of reservoirs	1	1	1	1

Watershed Snowpack Analysis March 1, 2017	# of Sites	% Median	Last Year % Median
SALT RIVER BASIN	10	75%	20%

VERDE RIVER BASIN as of March 1, 2017

Well above normal streamflow levels are forecast for the basin. In the Verde River, above Horseshoe Dam, the forecast calls for 150% of median streamflow through May. Snow survey measurements show the Verde snowpack to be at 110% of median.



Verde River Basin Streamflow Forecasts - March 1, 2017

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	MAR			123	208%			59
	MAR-MAY	60	112	160	150%	220	335	107

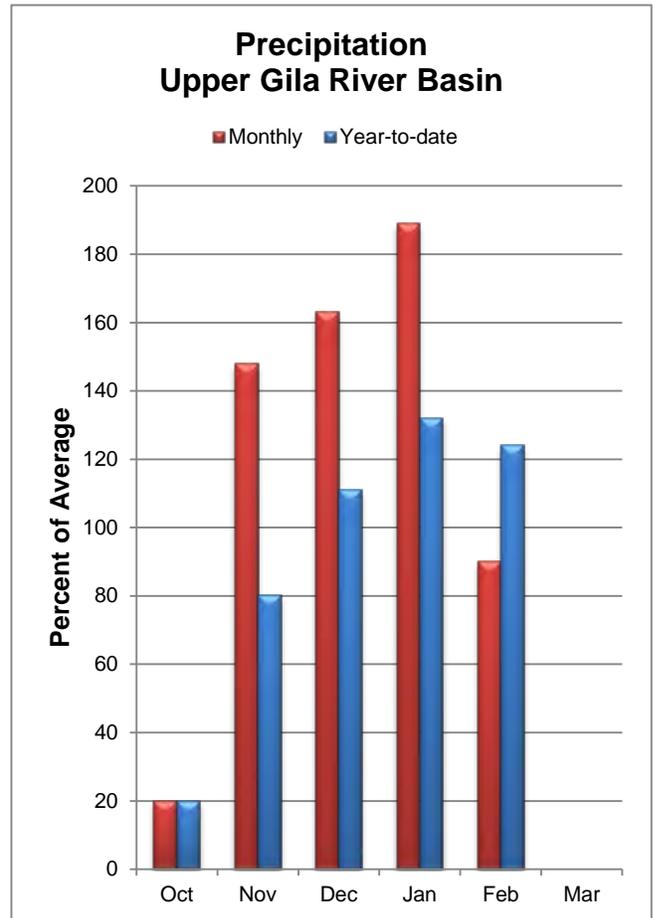
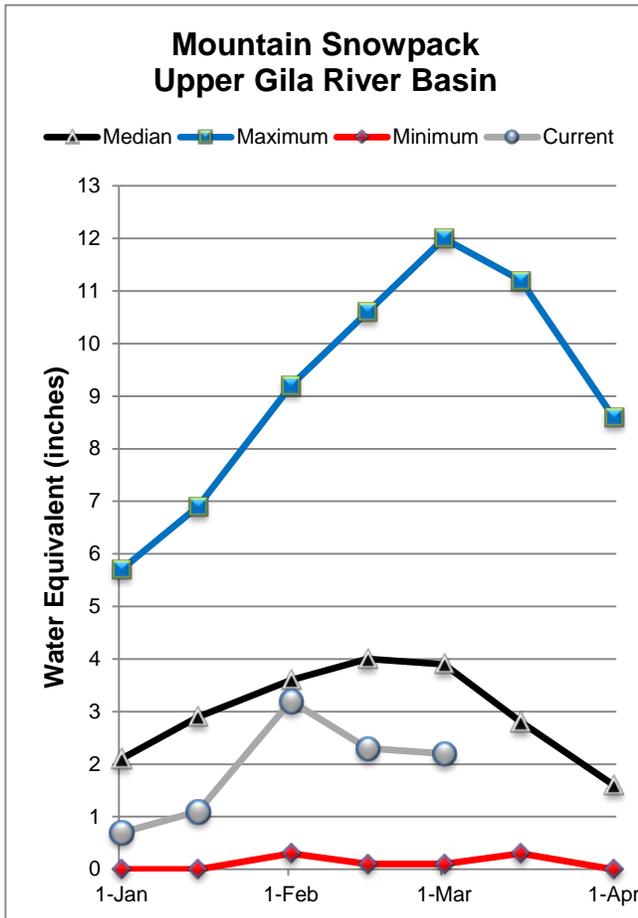
- 1) 90% and 10% exceedance probabilities are actually 95% and 5%
- 2) Forecasts are for unimpaired flows. Actual flow will be dependent on management of upstream reservoirs and diversions
- 3) Median value used in place of average

Reservoir Storage End of February, 2017	Current (KAF)	Last Year (KAF)	Average (KAF)	Capacity (KAF)
Verde River Reservoir System	280.1	148.1	168.0	287.4
Basin-wide Total	280.1	148.1	168.0	287.4
# of reservoirs	1	1	1	1

Watershed Snowpack Analysis March 1, 2017	# of Sites	% Median	Last Year % Median
VERDE RIVER BASIN	10	110%	33%

SAN FRANCISCO-UPPER GILA RIVER BASIN as of March 1, 2017

Normal to above normal streamflow levels are forecast for the basin. In the San Francisco River, at Clifton, the forecast calls for 111% of median streamflow levels through May. In the Gila River, near Solomon, the forecast calls for 104% of median streamflow levels through May. At San Carlos Reservoir, inflow to the lake is forecast at 119% of median through May. Snow survey measurements show the snowpack for this basin to be at 57% of median.



San Francisco-Upper Gila River Basin Streamflow Forecasts - March 1, 2017

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	MAR-MAY	20	29	36	106%	45	59	34
Gila R bl Blue Ck nr Virden ³	MAR-MAY	21	36	48	112%	63	87	43
San Francisco R at Glenwood ³	MAR-MAY	8.2	14.2	19.7	130%	26	39	15.2
San Francisco R at Clifton ³	MAR-MAY	16.4	30	42	111%	56	81	38
Gila R nr Solomon ³	MAR			53	139%			38
	MAR-MAY	37	67	93	104%	122	174	89
San Carlos Reservoir Inflow ³	MAR-MAY	10	36	63	119%	97	162	53

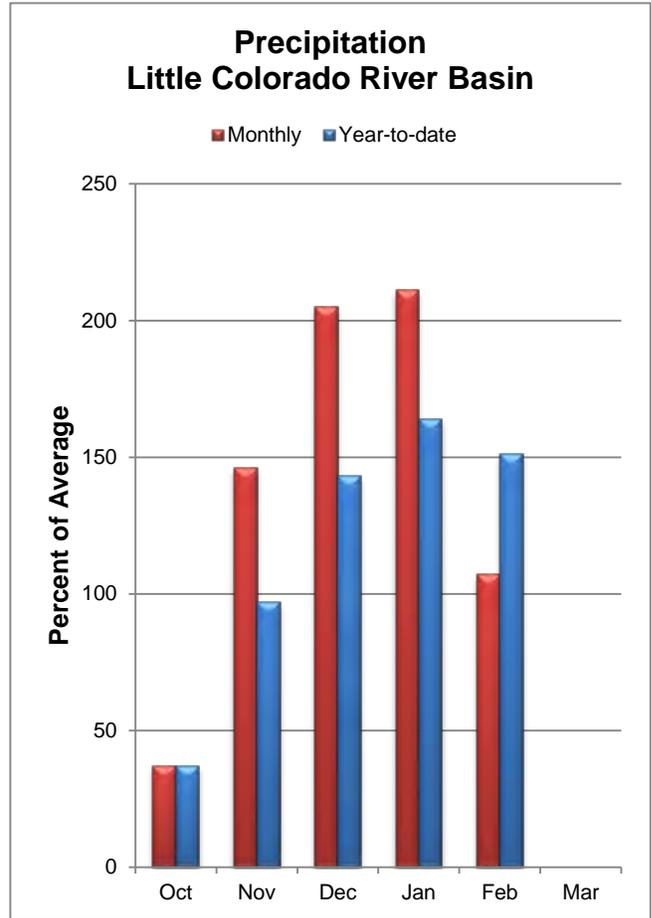
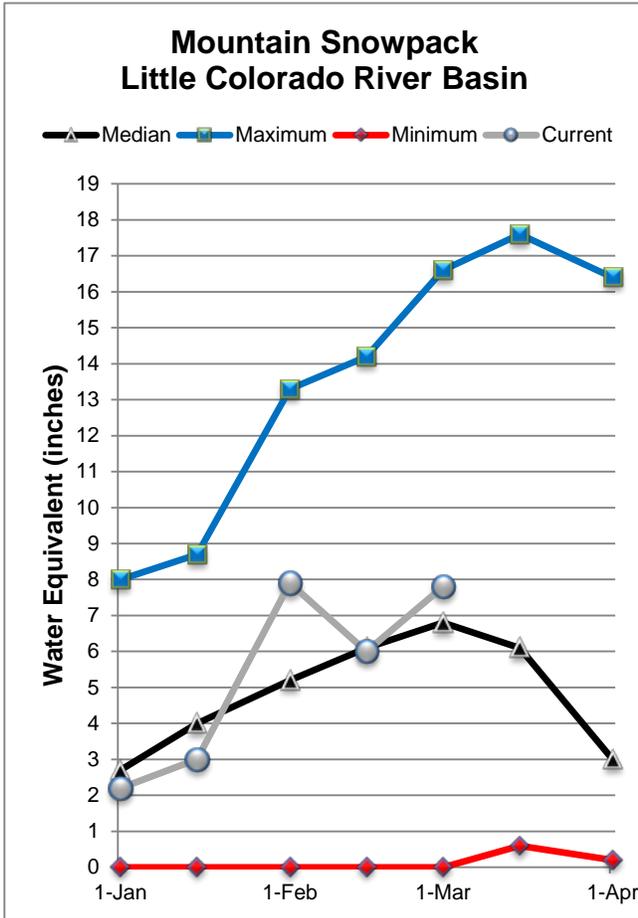
- 1) 90% and 10% exceedance probabilities are actually 95% and 5%
- 2) Forecasts are for unimpaired flows. Actual flow will be dependent on management of upstream reservoirs and diversions
- 3) Median value used in place of average

Reservoir Storage End of February, 2017	Current (KAF)	Last Year (KAF)	Average (KAF)	Capacity (KAF)
San Carlos Reservoir	227.9	108.6	404.1	875.0
Basin-wide Total	227.9	108.6	404.1	875.0
# of reservoirs	1	1	1	1

Watershed Snowpack Analysis March 1, 2017	# of Sites	% Median	Last Year % Median
SAN FRANCISCO-UPPER GILA RIVER BASIN	10	57%	19%

LITTLE COLORADO RIVER BASIN as of March 1, 2017

Above normal streamflow levels are forecast for the basin. In the Little Colorado River, above Lyman Lake, the forecast calls for 123% of median streamflow through June. At Blue Ridge (C.C. Cragin) Reservoir, inflow to the lake is forecast at 146% of median through May. Snowpacks along the southern headwaters of the Little Colorado River, and along the central Mogollon Rim, were measured at 115% and 132% of median, respectively.



Little Colorado River Basin Streamflow Forecasts - March 1, 2017

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

LITTLE COLORADO RIVER BASIN	Forecast Period	90% (KAF)	70% (KAF)	50% (KAF)	% Avg	30% (KAF)	10% (KAF)	30yr Avg (KAF)
Little Colorado R ab Lyman Lake ³	MAR-JUN	3.4	5.5	7.4	123%	9.6	13.7	6
Rio Nutria nr Ramah ³	MAR-MAY	0.48	1.38	2.4	214%	3.8	6.8	1.12
Zuni R ab Black Rock Reservoir ³	MAR-MAY	0	0.08	0.47	204%	1.43	4.4	0.23
Blue Ridge Reservoir Inflow ³	MAR-MAY	7.6	13.9	19.7	146%	27	41	13.5
Lake Mary Reservoir Inflow ³	MAR-MAY	2	3.6	5	172%	6.7	9.9	2.9

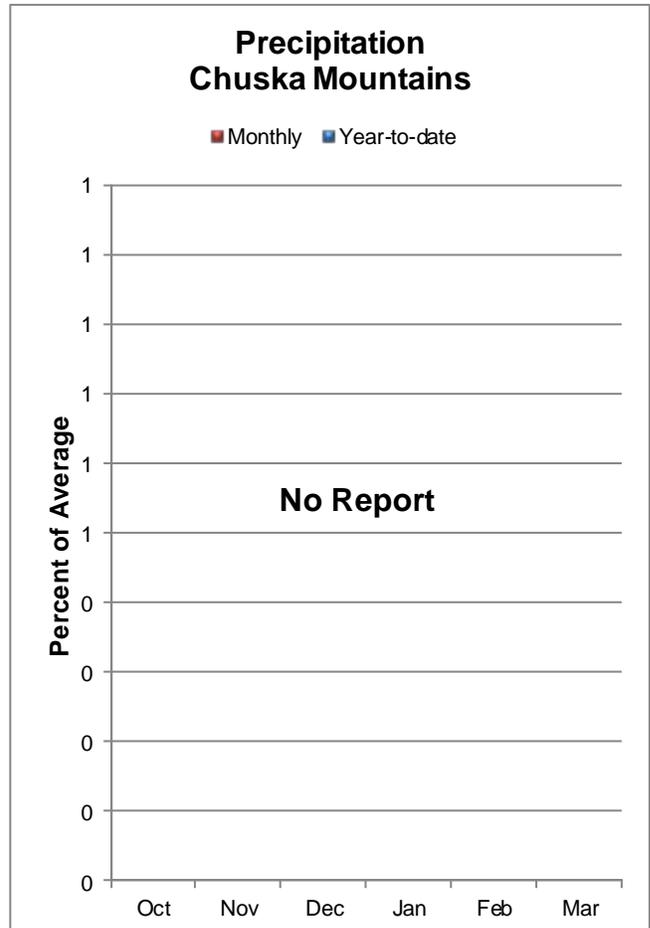
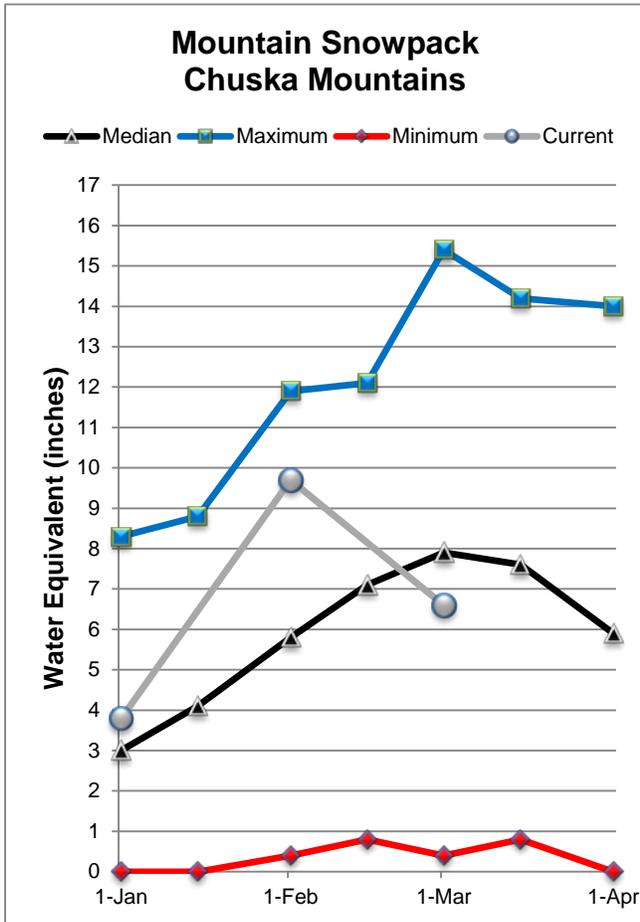
- 1) 90% and 10% exceedance probabilities are actually 95% and 5%
- 2) Forecasts are for unimpaired flows. Actual flow will be dependent on management of upstream reservoirs and diversions
- 3) Median value used in place of average

Reservoir Storage End of February, 2017	Current (KAF)	Last Year (KAF)	Average (KAF)	Capacity (KAF)
Lyman Reservoir	10.5	10.3	12.9	30.0
Basin-wide Total	10.5	10.3	12.9	30.0
# of reservoirs	1	1	1	1

Watershed Snowpack Analysis March 1, 2017	# of Sites	% Median	Last Year % Median
LITTLE COLORADO RIVER BASIN	8	115%	39%
CENTRAL MOGOLLON RIM	3	132%	31%

CHUSKA MOUNTAINS as of March 1, 2017

Snow survey measurements conducted by staff of the Navajo Nation Water Management Branch show the Chuska snowpack to be at 83% of median. Well above normal runoff is forecast for Captain Tom Wash, Wheatfields Creek, and Bowl Canyon Creek.



**Chuska Mountains
Streamflow Forecasts - March 1, 2017**

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

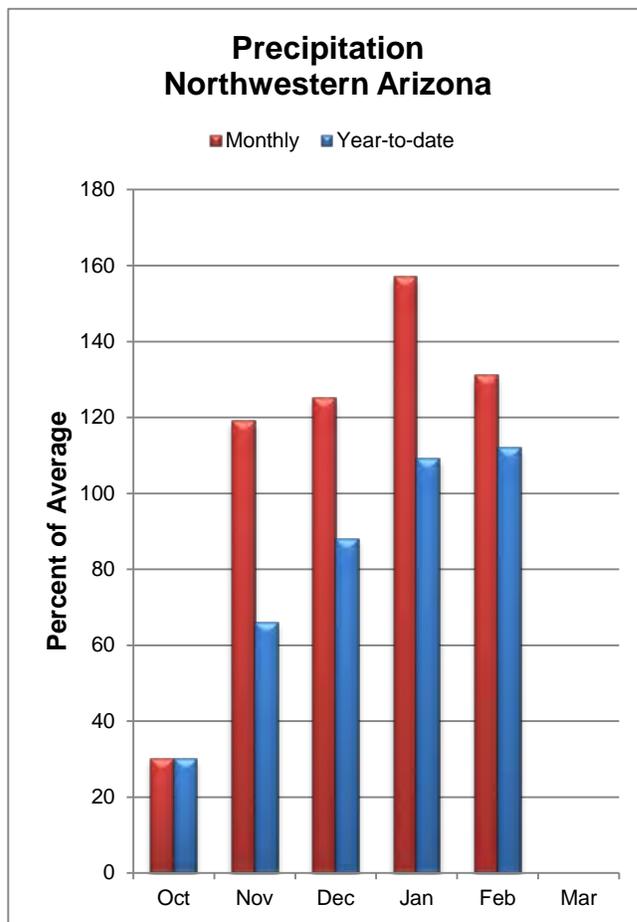
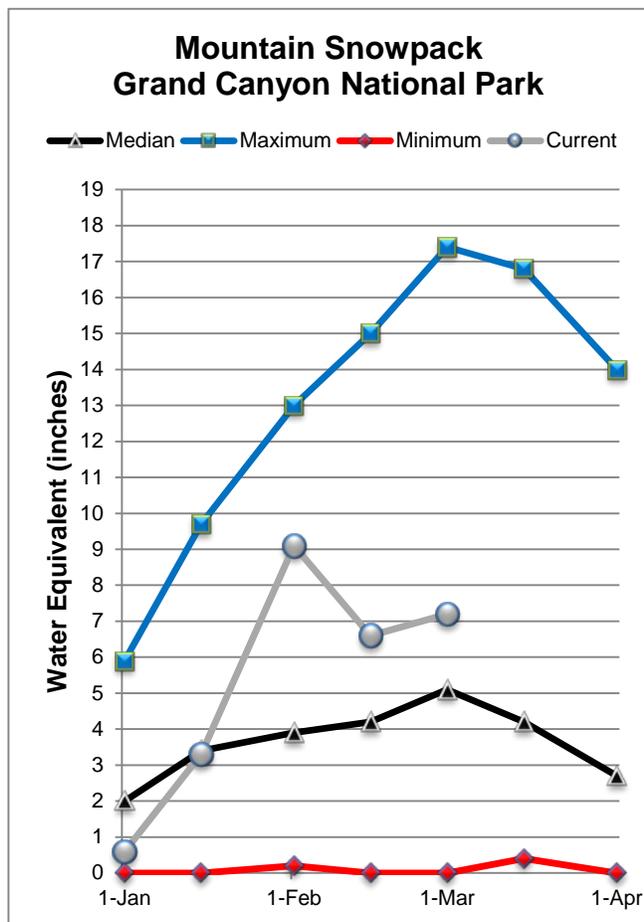
CHUSKA MOUNTAINS	Forecast Period	90% (KAF)	70% (KAF)	50% (KAF)	% Avg	30% (KAF)	10% (KAF)	30yr Avg (KAF)
Captain Tom Wash nr Two Gray Hills	MAR-MAY	1.98	3.2	4.3	165%	5.7	8.1	2.6
Wheatfields Ck nr Wheatfields	MAR-MAY	1.74	2.8	3.6	171%	4.5	6	2.1
Bowl Canyon Ck ab Asaayi Lake	MAR-MAY	1.22	1.69	2	154%	2.4	3.1	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 March 1, 2017	# of Sites	% Median	Last Year % Median
CHUSKA MOUNTAINS	3	83%	73%
DEFIANCE PLATEAU	1	42%	72%

NORTHWESTERN ARIZONA as of March 1, 2017

On the Colorado River, well above normal inflow to Lake Powell is forecast at 159% of the 30-year average for the forecast period April-July. At the Grand Canyon, measurements conducted by park rangers show the snowpack to be at 141% of median.



Northwestern Arizona Streamflow Forecasts - March 1, 2017

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

NORTHWESTERN ARIZONA	Forecast Period	90% (KAF)	70% (KAF)	50% (KAF)	% Avg	30% (KAF)	10% (KAF)	30yr Avg (KAF)
Virgin R at Littlefield	APR-JUL	71	101	122	188%	142	172	65
Lake Powell Inflow ²	APR-JUL			11400	159%			7160

- 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 February, 2017	Current (KAF)	Last Year (KAF)	Average (KAF)	Capacity (KAF)
Lake Havasu	587.8	554.1	560.2	619.0
Lake Mohave	1688.0	1647.0	1673.0	1810.0
Lake Mead	10826.0	10360.0	20575.0	26159.0
Lake Powell	11212.4	11229.1	17055.0	24322.0
Basin-wide Total	24314.2	23790.2	39863.2	52910.0
# of reservoirs	4	4	4	4

Watershed Snowpack Analysis March 1, 2017	# of Sites	% Median	Last Year % Median
NORTHWESTERN ARIZONA	2	141%	30%

Basinwide Summary: March 1, 2017
(Averages/Medians based on 1981-2010 reference period)

Snowpack Summary for March 1, 2017

SALT RIVER BASIN	Network	Elevation (ft)	Depth (in)	SWE (in)	Median (in)	% Median	Last Year SWE (in)	Last Year % Median
Baldy	SNOTEL	9125	26	6.6	8.1	81%	0.0	0%
Beaver Head	SNOTEL	7990	0	0.0	5.2	0%	0.0	0%
Buck Spring	SC	7400			2.2		0.0	0%
Coronado Trail	SNOTEL	8400	0	0.0	2.4	0%	0.0	0%
Hawley Lake	SNOTEL	8300	38	13.6			11.4	
Coronado Trail	SC	8350	2	0.5	1.8	28%	0.0	0%
Fort Apache	SC	9160	30	9.7	8.2	118%	6.4	78%
Hannagan Meadows	SNOTEL	9020	24	9.5	10.3	92%	1.3	13%
Maverick Fork	SNOTEL	9200	33	11.2	8.9	126%	3.3	37%
Nutriosio	SC	8500	3	0.4	0.6	67%	0.0	0%
Nutriosio	SNOTEL	8500	1	0.3			0.0	
Wildcat	SNOTEL	7850	4	0.7	3.2	22%	0.0	0%
Workman Creek	SNOTEL	6900	6	1.9	5.1	37%	0.0	0%
Basin Index						75%		20%
# of sites						10		10

VERDE RIVER BASIN	Network	Elevation (ft)	Depth (in)	SWE (in)	Median (in)	% Median	Last Year SWE (in)	Last Year % Median
Baker Butte	SNOTEL	7300	29	6.0	5.2	115%	0.0	0%
Baker Butte No. 2	SC	7700			10.5		6.3	60%
Baker Butte Smt	SNOTEL	7700	56	15.5			9.0	
Bar M	SNOTEL	6393	22	3.7			0.0	
Chalender	SC	7100	13	1.4	2.0	70%	0.0	0%
Chalender	SNOTEL	7100	13	1.7			0.0	
Fort Valley	SC	7350	13	2.4	1.9	126%	0.0	0%
Fort Valley	SNOTEL	7350	13	1.2			0.0	
Fry	SNOTEL	7200	29	10.3	7.0	147%	3.2	46%
Happy Jack	SNOTEL	7630	37	8.5	5.9	144%	4.1	69%
Happy Jack	SC	7630	1	0.3	4.0	8%	0.0	0%
Mormon Mountain	SNOTEL	7500	33	7.2	4.7	153%	0.0	0%
Mormon Mountain Summit #2	SC	8470			11.2		7.0	63%
Mormon Mtn Summit	SNOTEL	8500	44	14.6			7.3	
Newman Park	SC	6750	16	2.9	2.0	145%	0.0	0%
White Horse Lake	SNOTEL	7180	16	3.2	3.9	82%	0.0	0%
Williams Ski Run	SC	7720	35	7.2	8.2	88%	7.7	94%
Basin Index						110%		33%
# of sites						10		10

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	98	31.0	16.1	193%	13.8	86%
Snowslide Canyon	SNOTEL	9730	94	31.3	15.3	205%	6.9	45%
Basin Index						198%		66%
# of sites						2		2

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	0	0.0	5.2	0%	0.0	0%
Coronado Trail	SNOTEL	8400	0	0.0	2.4	0%	0.0	0%
Coronado Trail	SC	8350	2	0.5	1.8	28%	0.0	0%
Frisco Divide	SNOTEL	8000	3	1.2	2.4	50%	0.0	0%
Hannagan Meadows	SNOTEL	9020	24	9.5	10.3	92%	1.3	13%
Lookout Mountain	SNOTEL	8500	0	0.0	0.6	0%	0.0	0%
Nutriosio	SC	8500	3	0.4	0.6	67%	0.0	0%
Nutriosio	SNOTEL	8500	1	0.3			0.0	
Signal Peak	SNOTEL	8360	0	0.0	4.3	0%	0.0	0%

Silver Creek Divide	SNOTEL	9000	25	8.7	8.3	105%	5.7	69%
State Line	SC	8000	2	0.8	1.4	57%	0.0	0%

Basin Index						57%		19%
# of sites						10		10

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	29	6.0	5.2	115%	0.0	0%
Baker Butte No. 2	SC	7700			10.5		6.3	60%
Baker Butte Smt	SNOTEL	7700	56	15.5			9.0	
Baldy	SNOTEL	9125	26	6.6	8.1	81%	0.0	0%
Buck Spring	SC	7400			2.2		0.0	0%
Cheese Springs	SC	8700	18	6.1	5.8	105%	5.2	90%
Fort Apache	SC	9160	30	9.7	8.2	118%	6.4	78%
Heber	SNOTEL	7640	25	6.1	4.5	136%	0.0	0%
Lake Mary	SC	6930	11	2.2	3.4	65%	0.0	0%
Maverick Fork	SNOTEL	9200	33	11.2	8.9	126%	3.3	37%
Promontory	SNOTEL	7930	50	15.7	11.3	139%	6.6	58%

Basin Index						115%		39%
# 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	29	6.0	5.2	115%	0.0	0%
Baker Butte No. 2	SC	7700			10.5		6.3	60%
Baker Butte Smt	SNOTEL	7700	56	15.5			9.0	
Heber	SNOTEL	7640	25	6.1	4.5	136%	0.0	0%
Promontory	SNOTEL	7930	50	15.7	11.3	139%	6.6	58%

Basin Index						132%		31%
# of sites						3		3

CHUSKA MOUNTAINS	Network	Elevation (ft)	Depth (in)	SWE (in)	Median (in)	% Median	Last Year SWE (in)	Last Year % Median
Beaver Spring	SC	9220			10.0			
Beaver Spring	SNOTEL	9200	44	12.6			6.4	
Bowl Canyon	SC	8980			8.7		8.4	97%
Hidden Valley	SC	8480	21	8.2			5.6	
Missionary Spring	SC	7940	0	0.0	4.1	0%	0.4	10%
Tsaile Canyon #1	SC	8160	14	5.4	6.4	84%	5.9	92%
Tsaile Canyon #3	SC	8920			8.8		8.5	97%
Whiskey Creek	SC	9050	32	11.0	9.3	118%	8.2	88%
Navajo Whiskey Ck	SNOTEL	9050	41	13.2			4.2	

Basin Index						83%		73%
# of sites						3		3

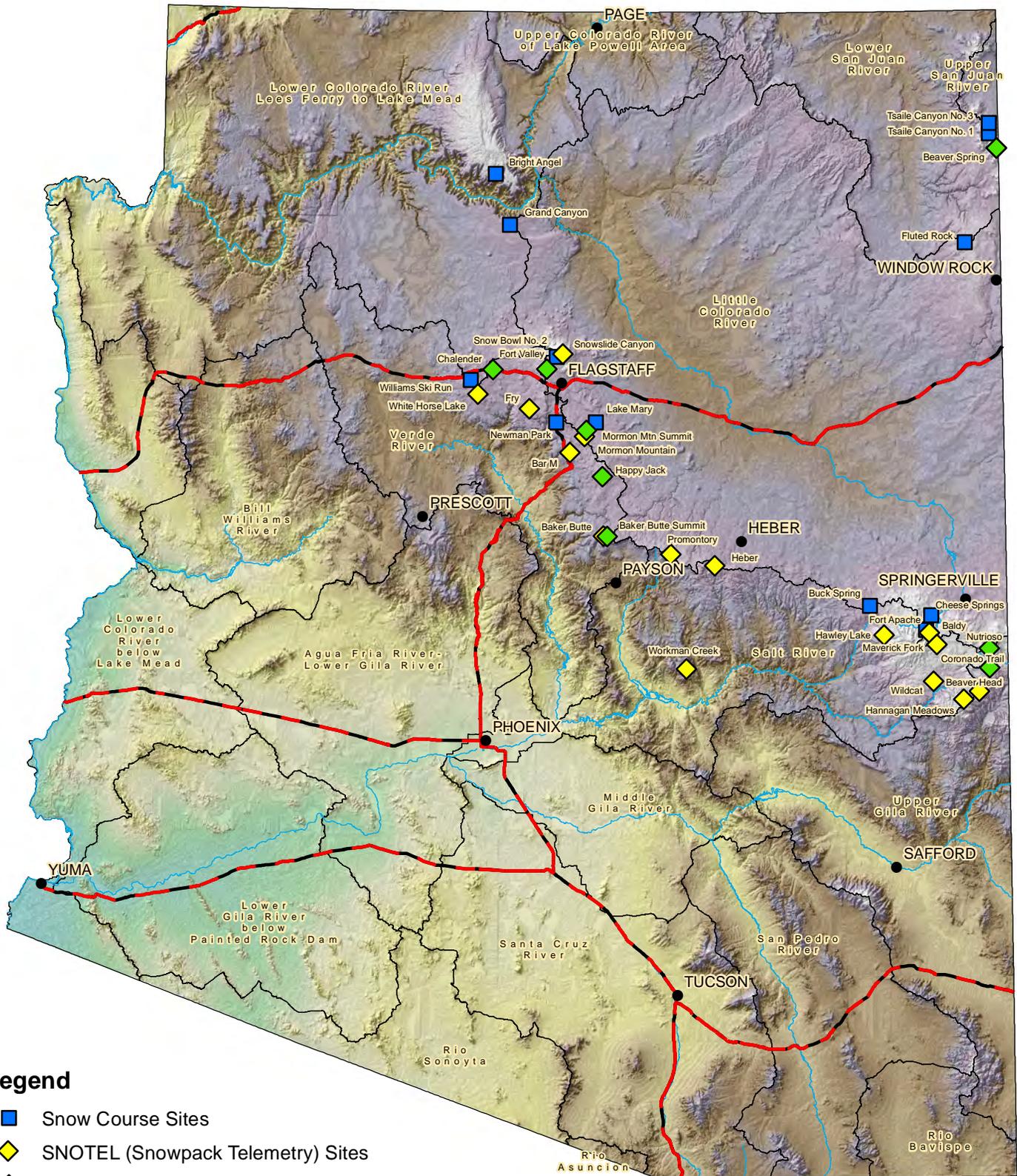
DEFIANCE PLATEAU	Network	Elevation (ft)	Depth (in)	SWE (in)	Median (in)	% Median	Last Year SWE (in)	Last Year % Median
Fluted Rock	SC	7800	4	1.5	3.6	42%	2.6	72%

Basin Index						42%		72%
# 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	40	14.2	8.7	163%	3.0	34%
Grand Canyon	SC	7500	0	0.0	1.4	0%	0.0	0%

Basin Index						141%		30%
# of sites						2		2

Arizona Snow Survey Data Sites



Legend

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

