



Natural
Resources
Conservation
Service

Arizona

Basin Outlook Report

March 15, 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.



For more water supply and resource management information, contact:

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ARIZONA Basin Outlook Report as of March 15, 2017

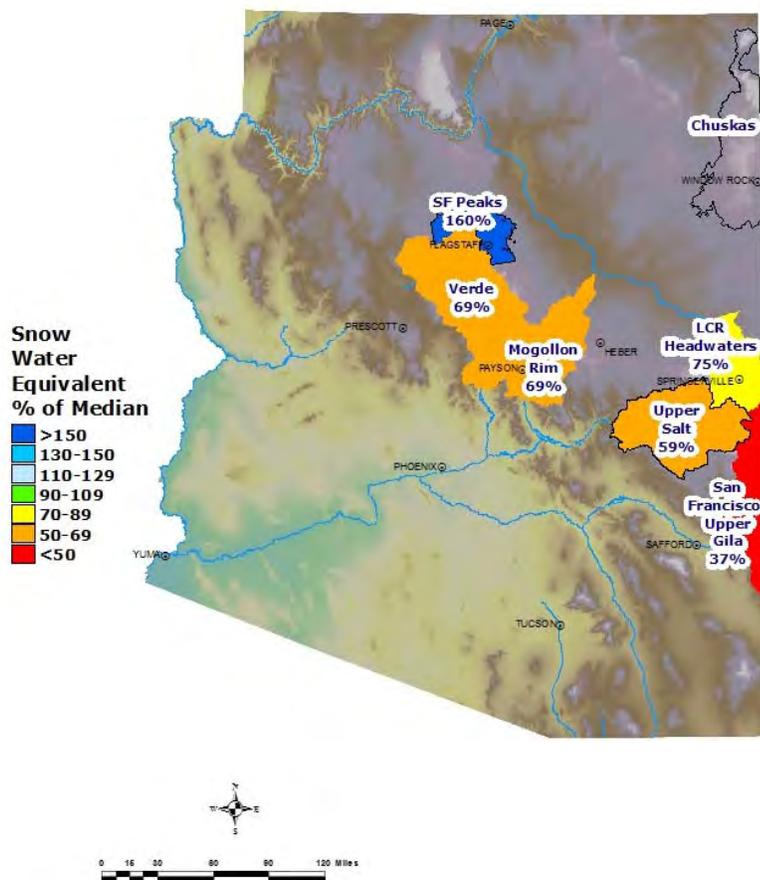
SUMMARY

As of March 15, snowpack levels are below normal to well below normal throughout the major basins of the state. Precipitation for the first half of March was well below normal in the major basins. The Salt and Verde River reservoir system stands at 74 percent of capacity, while San Carlos Reservoir is at 27 percent of capacity. The mid-month forecast calls for normal to above normal runoff in all basins for the spring runoff period.

SNOWPACK

Snow water equivalent levels in the state's major river basins are well below normal to below normal, ranging from 37 percent of median in the San Francisco – Upper Gila River Basin to 75 percent of median in the Little Colorado River Basin. The statewide snowpack, which includes the San Francisco Peaks, is slightly below normal at 91 percent of median.

**Arizona
Snow Water Equivalent
as of March 15, 2017**

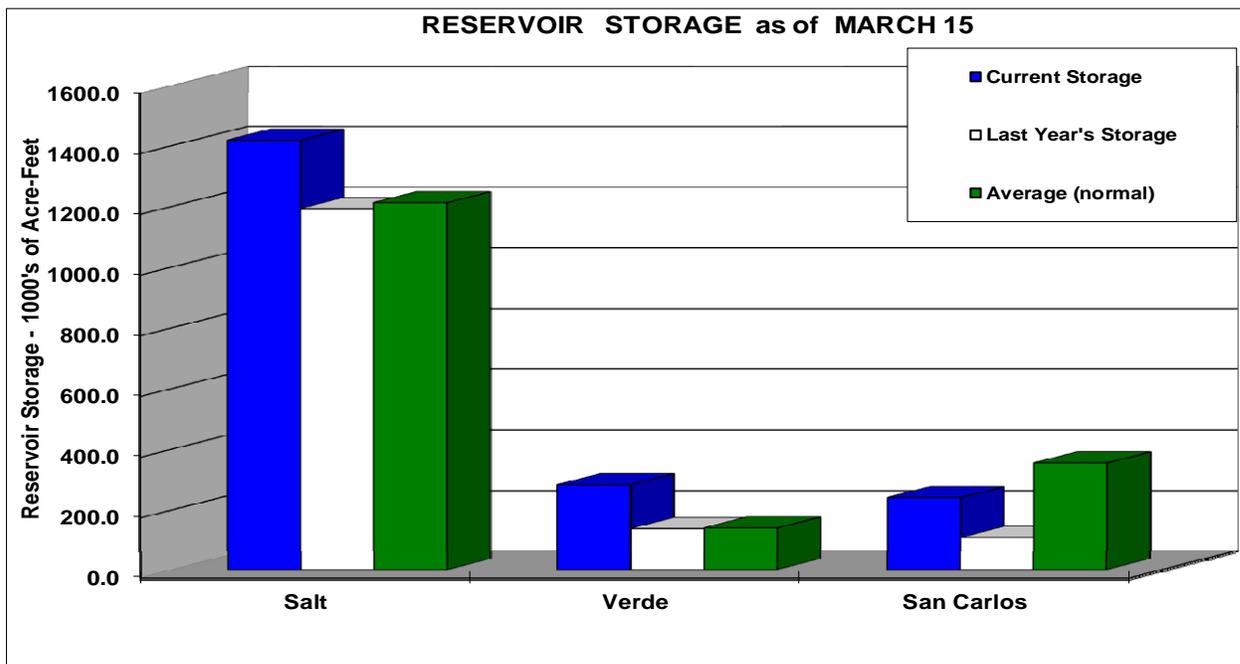


PRECIPITATION

Mountain data from NRCS SNOTEL sites and NWS Cooperator gages show that precipitation for the first half of March was well below average in the major basins. Cumulative precipitation since October 1 remains 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 March 15, the Salt and Verde River reservoir system stands at 74 percent of capacity. San Carlos Reservoir remains well below normal at 27 percent of capacity.



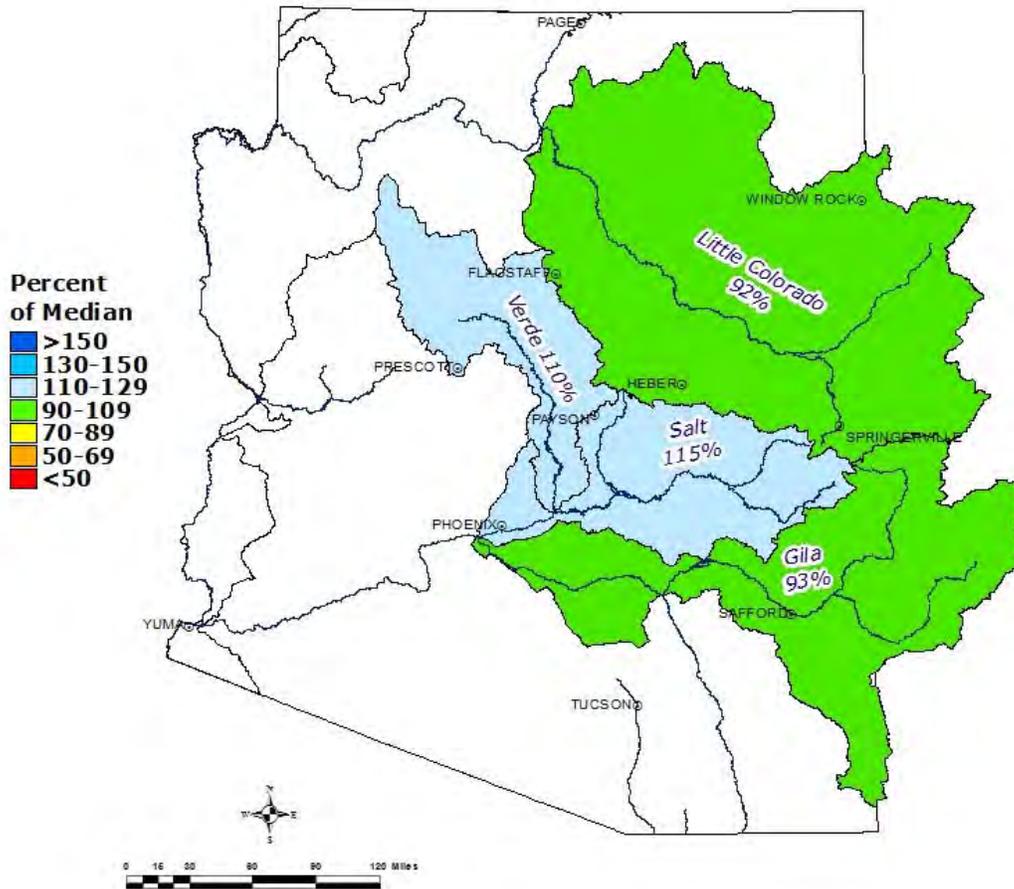
Key storage volumes displayed in thousands of acre-feet (x1000):

<u>Reservoir</u>	<u>Current Storage</u>	<u>Last Year Storage</u>	<u>30-Year Average</u>	<u>Storage Capacity</u>
Salt River System	1417.8	1192.4	1212.0	2025.8
Verde River System	282.7	137.9	140.2	287.4
San Carlos Reservoir	240.4	108.6	355.0	875.0
Lyman Lake	13.1	11.8	12.0	30.0
Lake Havasu	577.7	583.2	561.2	619.0
Lake Mohave	1729.0	1677.0	1659.0	1810.0
Lake Mead	10756.0	10243.0	20361.0	26159.0
Lake Powell	11173.0	11156.0	17553.0	24322.0

STREAMFLOW

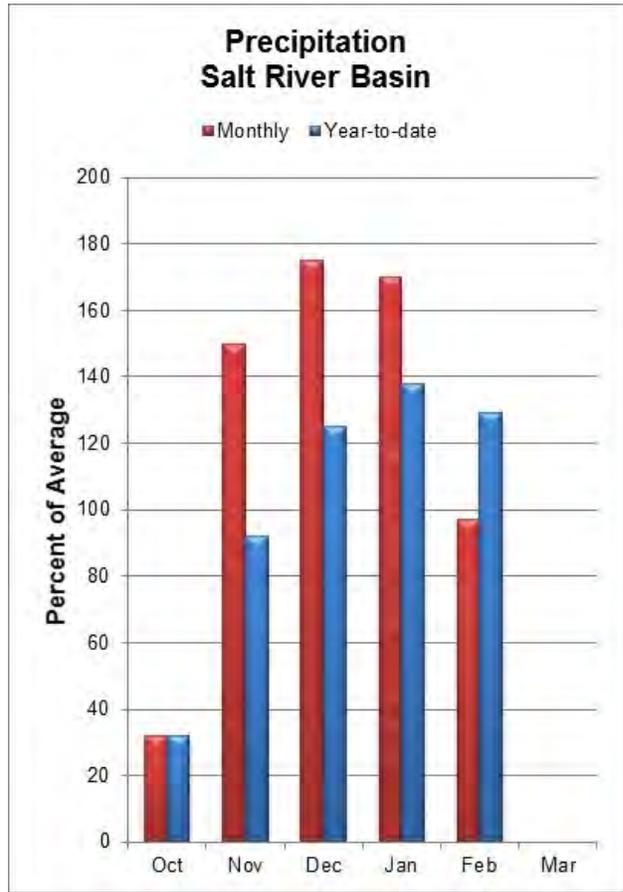
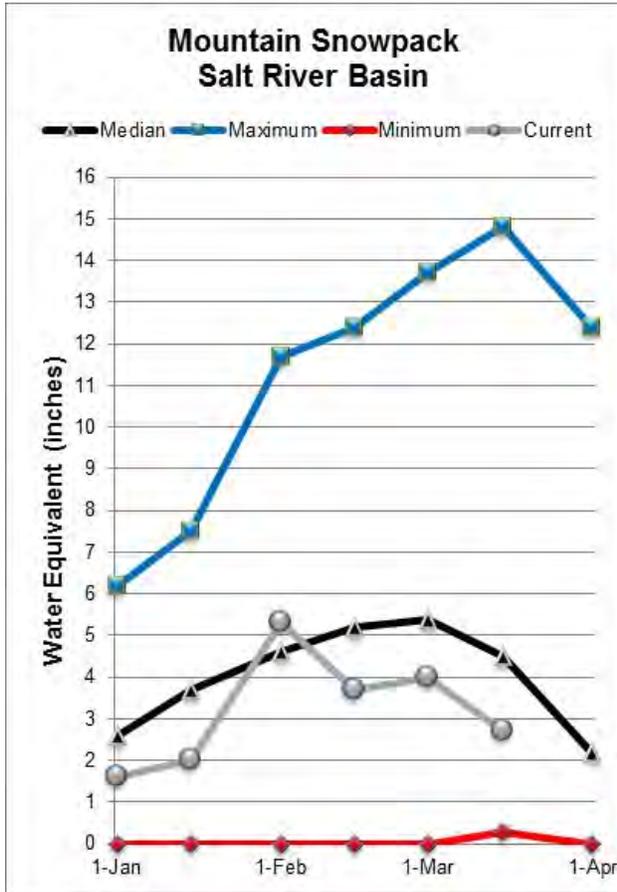
As of March 15, the forecast calls for normal to above normal streamflow for the spring runoff period, ranging from 92 percent of median in the Little Colorado River above Lyman Lake to 115 percent of median in the Salt River near Roosevelt. Most of the runoff is anticipated during the remainder of the month of March as above average temperatures are expected to continue. 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 15, 2017



SALT RIVER BASIN as of March 15, 2017

Above normal streamflow levels are forecast for the basin. In the Salt River, near Roosevelt, the forecast calls for 115% of median streamflow through May, while at Tonto Creek, the forecast calls for 148% of median streamflow through May. Snow survey measurements show the Salt snowpack to be at 59% of median.



**Salt River Basin
Streamflow Forecasts - March 16, 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			157	138%		114
	M15-MAY	147	196	235	115%	280	205
Tonto Ck ab Gun Ck nr Roosevelt ³	MAR			25	162%		15.4
	M15-MAY	6	12.1	18	148%	26	12.2

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

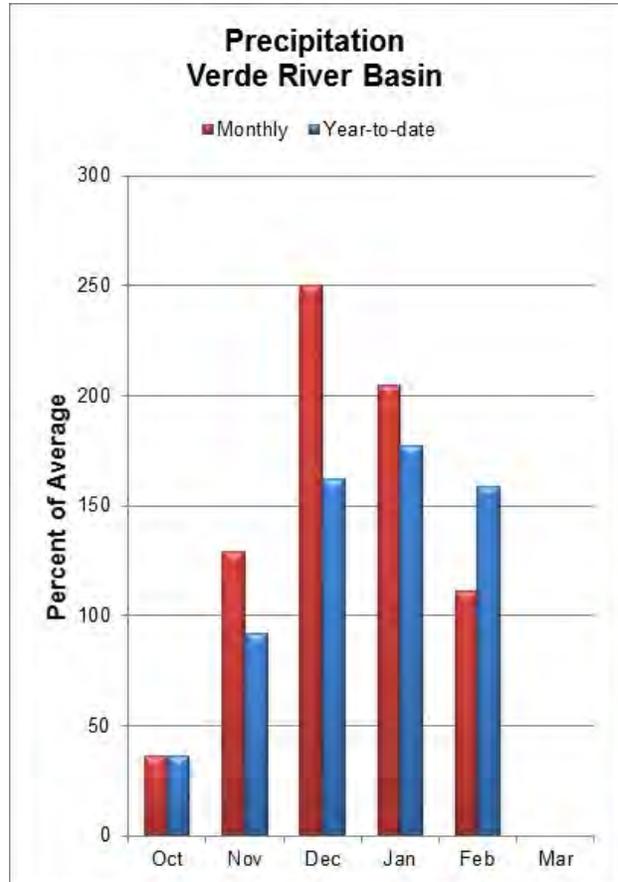
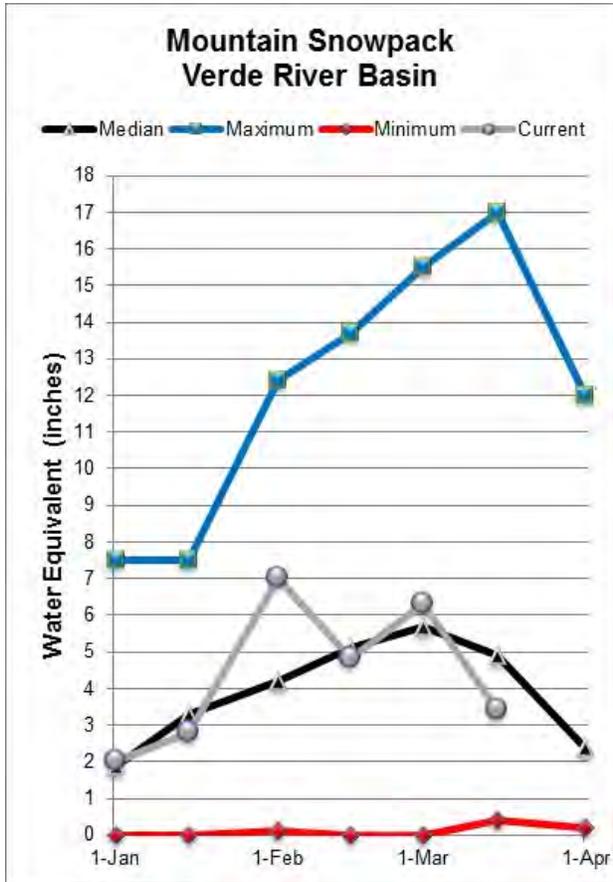
3) Median value used in place of average

Reservoir Storage Middle of February, 2017	Current (KAF)	Last Year (KAF)	Average (KAF)	Capacity (KAF)
Salt River Reservoir System	1417.8	1192.4	1344.0	2025.8
Basin-wide Total	1417.8	1192.4	1344.0	2025.8
# of reservoirs	1	1	1	1

Watershed Snowpack Analysis March 16, 2017	# of Sites	% Median	Last Year % Median
SALT RIVER BASIN	11	59%	10%

VERDE RIVER BASIN as of March 15, 2017

Above normal streamflow levels are forecast for the basin. In the Verde River above Horseshoe Dam, the forecast calls for 110% of median streamflow through May. Snow survey measurements show the Verde snowpack to be at 69% of median.



Verde River Basin Streamflow Forecasts - March 16, 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			80	136%			59
	M15-MAY	22	44	65	110%	92	144	59

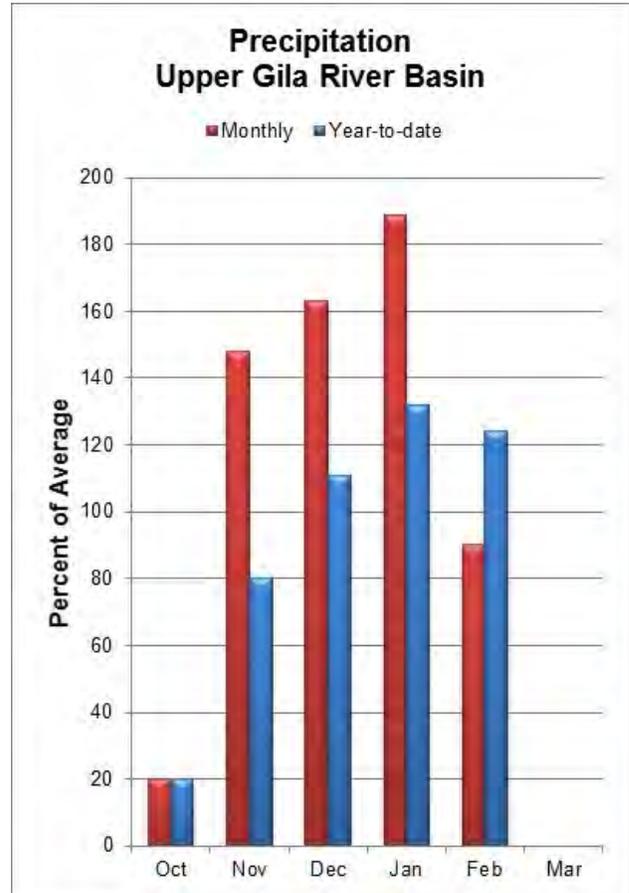
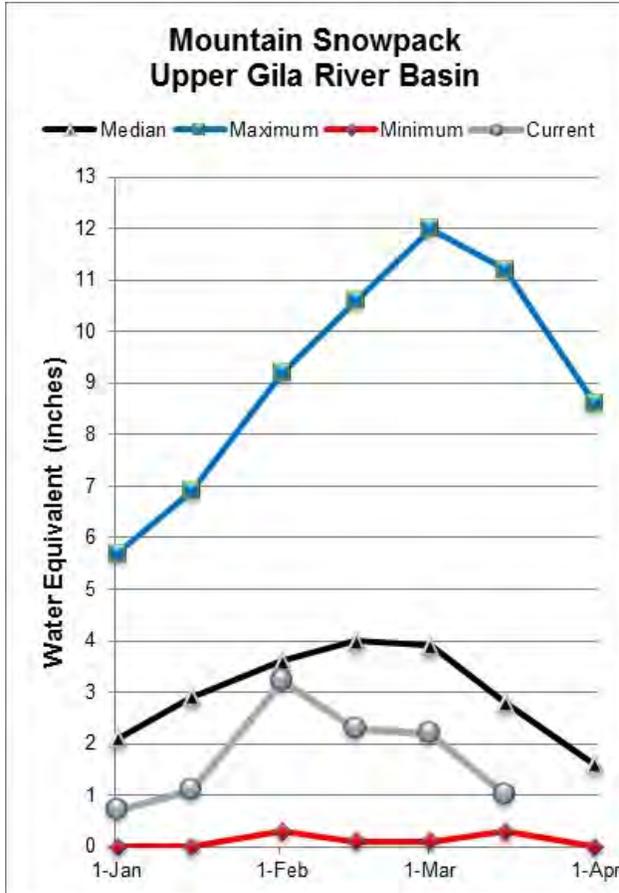
- 1) 90% and 10% exceedance probabilities are actually 95% and 5%
- 2) Forecasts are for unimpaired flows. Actual flow will be dependent on management of upstream reservoirs and diversions
- 3) Median value used in place of average

Reservoir Storage Middle of February, 2017	Current (KAF)	Last Year (KAF)	Average (KAF)	Capacity (KAF)
Verde River Reservoir System	282.7	137.9	187.1	287.4
Basin-wide Total	282.7	137.9	187.1	287.4
# of reservoirs	1	1	1	1

Watershed Snowpack Analysis March 16, 2017	# of Sites	% Median	Last Year % Median
VERDE RIVER BASIN	11	69%	20%

SAN FRANCISCO-UPPER GILA RIVER BASIN as of March 15, 2017

Near normal streamflow levels are forecast for the basin. In the San Francisco River, at Clifton, the forecast calls for 86% of median streamflow levels through May. In the Gila River, near Solomon, the forecast calls for 93% of median streamflow levels through May. At San Carlos Reservoir, inflow to the lake is forecast at 86% of median through May. Snow survey measurements show the snowpack for this basin to be at 37% of median.



San Francisco-Upper Gila River Basin Streamflow Forecasts - March 16, 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	M15-MAY	16.2	21	25	96%	29	36	26
Gila R bl Blue Ck nr Virden ³	M15-MAY	16.8	26	32	103%	40	53	31
San Francisco R at Glenwood ³	M15-MAY	4.7	8.2	11.4	94%	15.3	22	12.1
San Francisco R at Clifton ³	M15-MAY	9.5	17.9	25	86%	33	48	29
Gila R nr Solomon ³	MAR			47	124%			38
San Carlos Reservoir Inflow ³	M15-MAY	30	49	65	93%	83	114	70
	M15-MAY	5.8	21	36	86%	56	92	42

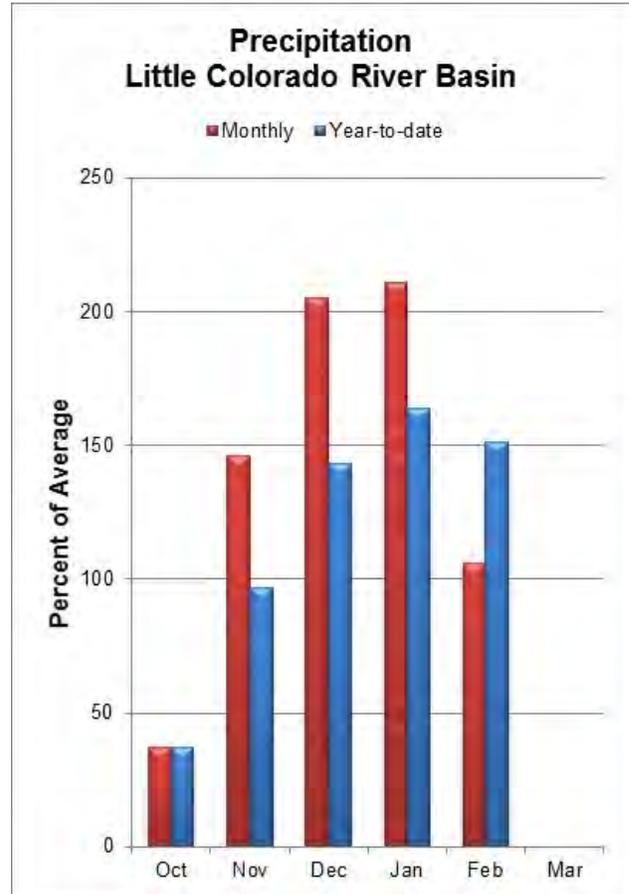
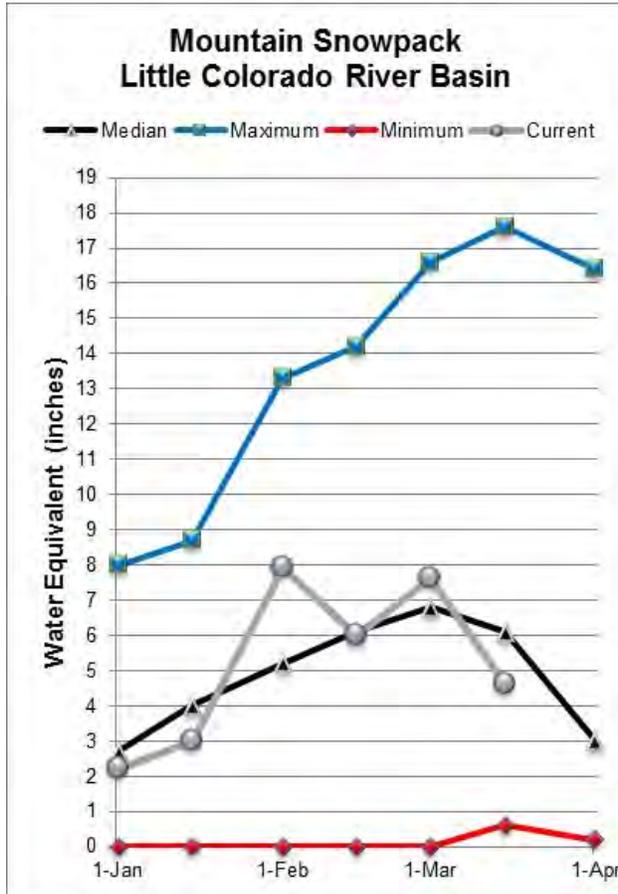
- 1) 90% and 10% exceedance probabilities are actually 95% and 5%
- 2) Forecasts are for unimpaired flows. Actual flow will be dependent on management of upstream reservoirs and diversions
- 3) Median value used in place of average

Reservoir Storage Middle of February, 2017	Current (KAF)	Last Year (KAF)	Average (KAF)	Capacity (KAF)
San Carlos Reservoir	240.4	108.5	413.2	875.0
Basin-wide Total	240.4	108.5	413.2	875.0
# of reservoirs	1	1	1	1

Watershed Snowpack Analysis March 16, 2017	# of Sites	% Median	Last Year % Median
SAN FRANCISCO-UPPER GILA RIVER BASIN	9	37%	4%

LITTLE COLORADO RIVER BASIN as of March 15, 2017

Normal streamflow levels are forecast for the basin. In the Little Colorado River, above Lyman Lake, the forecast calls for 92% of median streamflow through June. At Blue Ridge (C.C. Cragin) Reservoir, inflow to the lake is forecast at 109% of median through May. Snowpacks along the southern headwaters of the Little Colorado River, and along the central Mogollon Rim, were measured at 75% and 69% of median, respectively.



Little Colorado River Basin Streamflow Forecasts - March 16, 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	2.4	4	5.5	92%	7.3	10.6	6
Blue Ridge Reservoir Inflow ³	MAR-MAY	7.1	11.2	14.7	109%	18.9	26	13.5
Lake Mary Reservoir Inflow ³	MAR-MAY	1.6	2.8	3.8	131%	5.1	7.5	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

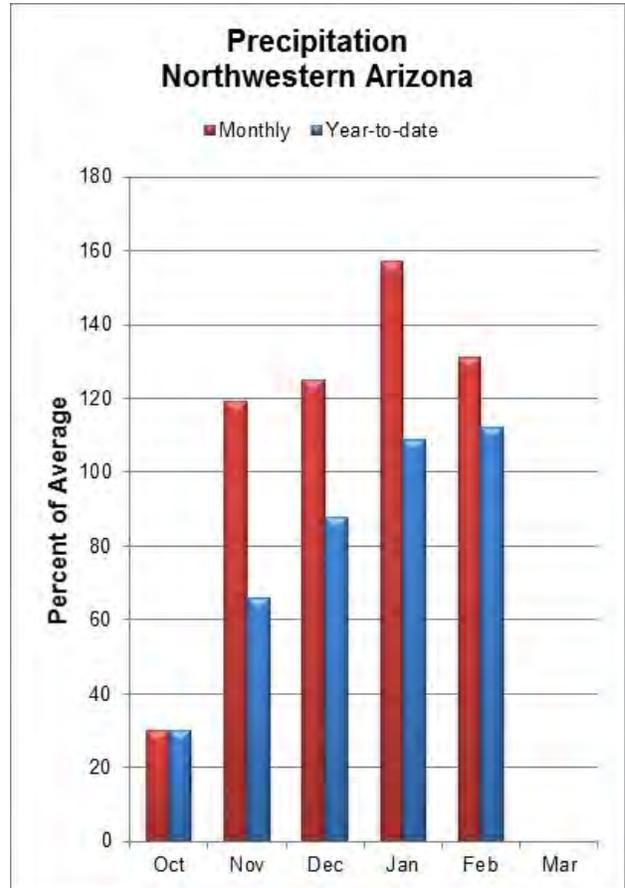
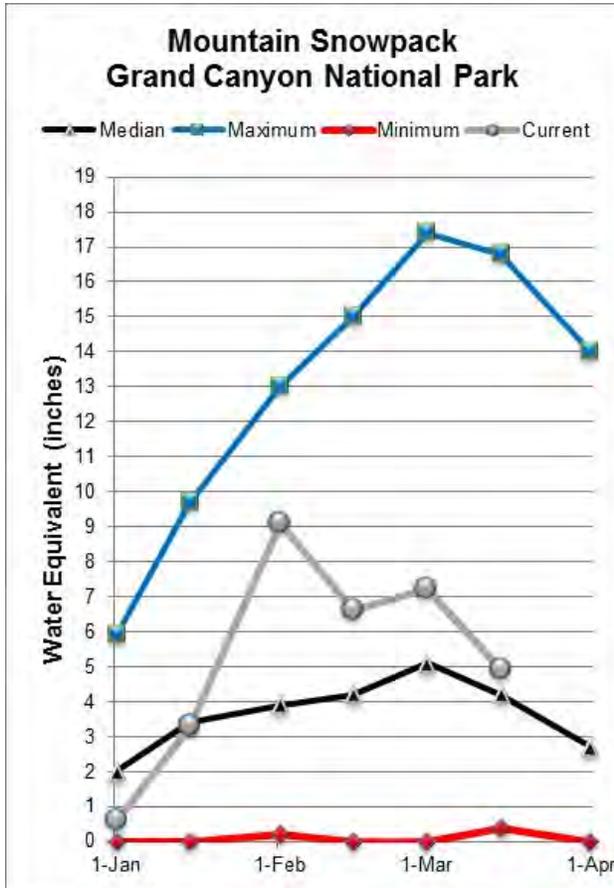
3) Median value used in place of average

Reservoir Storage Middle of February, 2017	Current (KAF)	Last Year (KAF)	Average (KAF)	Capacity (KAF)
Lyman Reservoir	13.1	11.8	13.6	30.0
Basin-wide Total	13.1	11.8	13.6	30.0
# of reservoirs	1	1	1	1

Watershed Snowpack Analysis March 16, 2017	# of Sites	% Median	Last Year % Median
LITTLE COLORADO RIVER BASIN	10	75%	17%
CENTRAL MOGOLLON RIM	4	69%	7%

NORTHWESTERN ARIZONA as of March 15, 2017

On the Colorado River, well above normal inflow to Lake Powell is forecast at 147% 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 116% of median.



Northwestern Arizona Streamflow Forecasts - March 16, 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)
Lake Powell Inflow ²	APR-JUL	8140	9550	10500	147%	11400	12800	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 Middle of February, 2017	Current (KAF)	Last Year (KAF)	Average (KAF)	Capacity (KAF)
Lake Havasu	577.7	583.2	559.5	619.0
Lake Mohave	1729.0	1677.0	1692.0	1810.0
Lake Mead	10756.0	10243.0	20543.0	26159.0
Lake Powell	11173.0	11156.0	16977.0	24322.0
Basin-wide Total	24235.7	23659.2	39771.5	52910.0
# of reservoirs	4	4	4	4

Watershed Snowpack Analysis March 16, 2017	# of Sites	% Median	Last Year % Median
NORTHWESTERN ARIZONA	2	116%	10%

Basinwide Summary: March 16, 2017
(Averages/Medians based on 1981-2010 reference period)

Snowpack Summary for March 16, 2017

SALT RIVER BASIN	Network	Elevation (ft)	Depth (in)	SWE (in)	Median (in)	% Median	Last Year SWE (in)	Last Year % Median
Baldy	SNOTEL	9125	7	3.3	7.9	42%	0.0	0%
Beaver Head	SNOTEL	7990	0	0.0	3.8	0%	0.0	0%
Buck Spring	SC	7400	0	0.0	0.9	0%	0.0	0%
Coronado Trail	SNOTEL	8400	0	0.0	0.0		0.0	
Hawley Lake	SNOTEL	8300	25	11.1			9.4	
Coronado Trail	SC	8350	0	0.0	0.7	0%	0.0	0%
Fort Apache	SC	9160	28	9.4	8.0	118%	4.7	59%
Hannagan Meadows	SNOTEL	9020	12	5.9	11.1	53%	0.0	0%
Maverick Fork	SNOTEL	9200	17	8.1	9.1	89%	0.0	0%
Nutrioso	SC	8500	0	0.0	0.4	0%	0.0	0%
Nutrioso	SNOTEL	8500	0	0.0			0.0	
Wildcat	SNOTEL	7850	0	0.0	1.9	0%	0.0	0%
Workman Creek	SNOTEL	6900	0	0.0	1.5	0%	0.0	0%
Basin Index						59%		10%
# of sites						11		11
VERDE RIVER BASIN	Network	Elevation (ft)	Depth (in)	SWE (in)	Median (in)	% Median	Last Year SWE (in)	Last Year % Median
Baker Butte	SNOTEL	7300	0	0.0	3.6	0%	0.0	0%
Baker Butte No. 2	SC	7700	26	9.8	12.1	81%	2.0	17%
Baker Butte Smt	SNOTEL	7700	38	14.1			7.3	
Bar M	SNOTEL	6393	0	0.0			0.0	
Chalender	SC	7100	0	0.0	1.1	0%	0.0	0%
Chalender	SNOTEL	7100	0	0.0			0.0	
Fort Valley	SC	7350	0	0.0	1.0	0%	0.0	0%
Fort Valley	SNOTEL	7350	0	0.0			0.0	
Fry	SNOTEL	7200	7	3.1	3.7	84%	0.0	0%
Happy Jack	SNOTEL	7630	16	6.7	4.9	137%	0.0	0%
Happy Jack	SC	7630	0	0.1	3.0	3%	0.0	0%
Mormon Mountain	SNOTEL	7500	6	2.4	4.6	52%	0.0	0%
Mormon Mountain Summit #2	SC	8470			11.6			
Mormon Mtn Summit	SNOTEL	8500	26	12.6			5.4	
Newman Park	SC	6750	0	0.0	0.4	0%	0.0	0%
White Horse Lake	SNOTEL	7180	0	0.0	2.1	0%	0.0	0%
Williams Ski Run	SC	7720	28	9.1	8.4	108%	6.8	81%
Basin Index						69%		20%
# of sites						11		11
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	88	24.2	17.8	136%	11.4	64%
Snowslide Canyon	SNOTEL	9730	71	31.8	17.1	186%	7.7	45%
Basin Index						160%		55%
# 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	3.8	0%	0.0	0%
Coronado Trail	SNOTEL	8400	0	0.0	0.0		0.0	
Coronado Trail	SC	8350	0	0.0	0.7	0%	0.0	0%
Frisco Divide	SNOTEL	8000	0	0.0	0.1	0%	0.0	0%
Hannagan Meadows	SNOTEL	9020	12	5.9	11.1	53%	0.0	0%
Hummingbird - Aerial And Snow Course	SC	10550						
Lookout Mountain	SNOTEL	8500	0	0.0	0.0		0.0	

Nutriosio	SC	8500	0	0.0	0.4	0%	0.0	0%
Nutriosio	SNOTEL	8500	0	0.0			0.0	
Signal Peak	SNOTEL	8360	0	0.0	1.0	0%	0.0	0%
Silver Creek Divide	SNOTEL	9000	7	3.6	8.5	42%	1.0	12%
State Line	SC	8000			0.7			
Whitewater - Aerial And Snow Course	SC	10750						

Basin Index **37%**
of sites 9 **4%**

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	0	0.0	3.6	0%	0.0	0%
Baker Butte No. 2	SC	7700	26	9.8	12.1	81%	2.0	17%
Baker Butte Smt	SNOTEL	7700	38	14.1			7.3	
Baldy	SNOTEL	9125	7	3.3	7.9	42%	0.0	0%
Buck Spring	SC	7400	0	0.0	0.9	0%	0.0	0%
Cheese Springs	SC	8700	14	4.9	5.7	86%	3.7	65%
Fort Apache	SC	9160	28	9.4	8.0	118%	4.7	59%
Heber	SNOTEL	7640	0	0.0	1.2	0%	0.0	0%
Lake Mary	SC	6930	0	0.0	0.6	0%	0.0	0%
Maverick Fork	SNOTEL	9200	17	8.1	9.1	89%	0.0	0%
Promontory	SNOTEL	7930	22	9.6	11.4	84%	0.0	0%

Basin Index **75%**
of sites 10 **17%**

CENTRAL MOGOLLON RIM	Network	Elevation (ft)	Depth (in)	SWE (in)	Median (in)	% Median	Last Year SWE (in)	Last Year % Median
Baker Butte	SNOTEL	7300	0	0.0	3.6	0%	0.0	0%
Baker Butte No. 2	SC	7700	26	9.8	12.1	81%	2.0	17%
Baker Butte Smt	SNOTEL	7700	38	14.1			7.3	
Heber	SNOTEL	7640	0	0.0	1.2	0%	0.0	0%
Promontory	SNOTEL	7930	22	9.6	11.4	84%	0.0	0%

Basin Index **69%**
of sites 4 **7%**

CHUSKA MOUNTAINS	Network	Elevation (ft)	Depth (in)	SWE (in)	Median (in)	% Median	Last Year SWE (in)	Last Year % Median
Beaver Spring	SC	9220			9.2		6.2	67%
Beaver Spring	SNOTEL	9200	22	8.9			1.0	
Bowl Canyon	SC	8980			9.1		6.2	68%
Hidden Valley	SC	8480					3.9	
Missionary Spring	SC	7940			2.4		0.0	0%
Tsaile Canyon #1	SC	8160			6.4		3.2	50%
Tsaile Canyon #3	SC	8920			9.3		5.9	63%
Whiskey Creek	SC	9050			9.2		7.0	76%
Navajo Whiskey Ck	SNOTEL	9050	19	7.7			0.0	

Basin Index 0
of sites 0

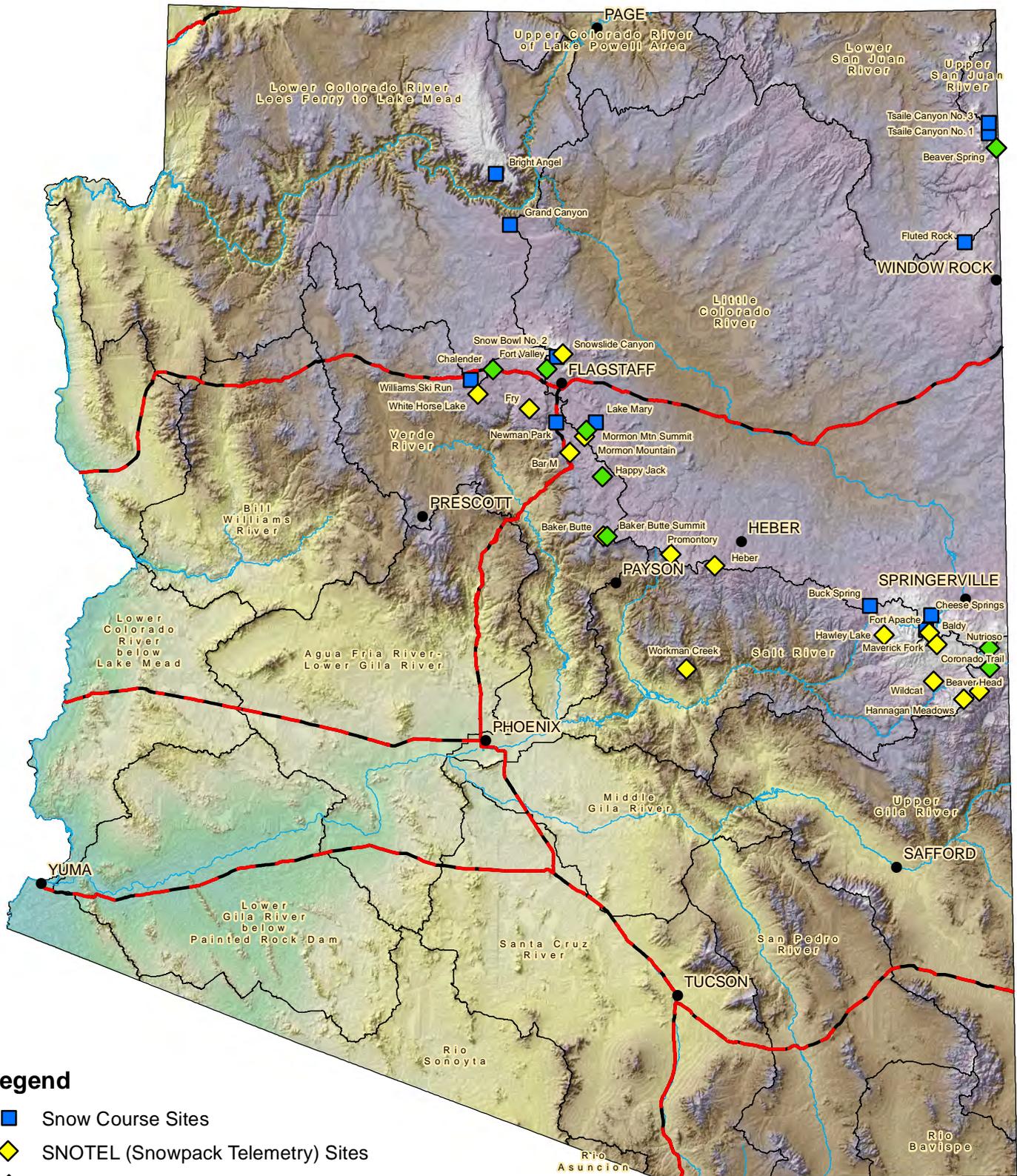
DEFIANCE PLATEAU	Network	Elevation (ft)	Depth (in)	SWE (in)	Median (in)	% Median	Last Year SWE (in)	Last Year % Median
Fluted Rock	SC	7800			2.0		0.0	0%

Basin Index 0
of sites 0

NORTHWESTERN ARIZONA	Network	Elevation (ft)	Depth (in)	SWE (in)	Median (in)	% Median	Last Year SWE (in)	Last Year % Median
Bright Angel	SC	8400	24	9.6	8.0	120%	0.8	10%
Grand Canyon	SC	7500	0	0.0	0.3	0%	0.0	0%

Basin Index **116%**
of sites 2 **10%**

Arizona Snow Survey Data Sites



Legend

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

