



United States
Department of
Agriculture

Natural Resources
Conservation
Service

Arizona

Basin Outlook Report

April 1, 2017



Issued by

Leonard Jordan
Acting Chief
Natural Resources Conservation Service
U.S. Department of Agriculture

Released by

Keisha L. Tatem
State Conservationist
Natural Resources Conservation Service
Phoenix, Arizona

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:

Dino DeSimone
Water Supply Specialist
230 N. First Ave., Suite 509
Phoenix, AZ 85003-1706
Phone: (602) 280-8786
Email: dino.desimone@az.usda.gov

The United States Department of Agriculture (USDA) prohibits discrimination in its programs on the basis of race, color, national origin, sex, religion, age, disability, political beliefs and marital or familial status. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at 202-720-2600 (voice and TDD).

To file a complaint, write the Secretary of Agriculture, U.S. Department of Agriculture, Washington, D.C., 20250, or call 1-800-245-6340 (voice) or (202) 720-1127 (TDD). USDA is an equal employment opportunity employer.

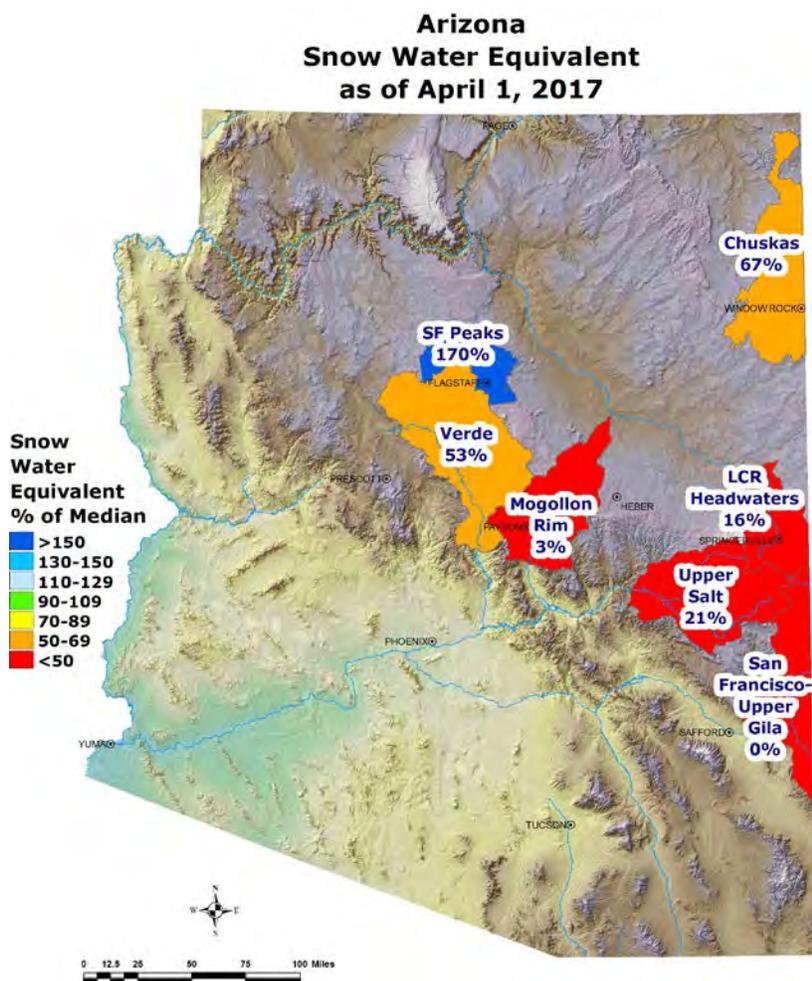
ARIZONA Basin Outlook Report as of April 1, 2017

SUMMARY

As of April 1, snowpack levels are well below normal in all of the major basins. Precipitation for March was well below normal throughout the mountains. The Salt and Verde River reservoir system stands at 76 percent of capacity, while San Carlos Reservoir is at 28 percent of capacity. The final forecast of the season calls for normal to below normal runoff for the remainder of the spring runoff period.

SNOWPACK

Snow water equivalent levels are well below normal in the basins, ranging from zero percent of median in the San Francisco-Upper Gila River Basin to 53 percent of median in the Verde River Basin. All but a handful of snow measurement sites are now melted out. The exception is the San Francisco Peaks which remains well above normal at 170 percent of median. The statewide snowpack, which includes the Chuskas and the SF Peaks, is below normal at 78 percent of median.

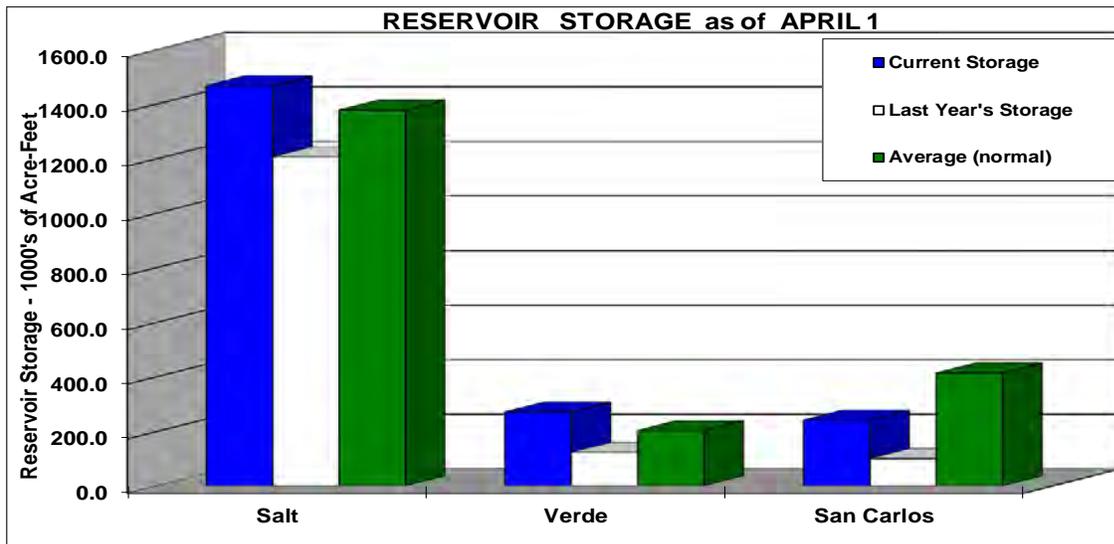


PRECIPITATION

Mountain data from NRCS SNOTEL sites and NWS Cooperator gages show that precipitation for the month of March was well below normal, ranging from 41 percent of average in the San Francisco – Upper Gila River Basin to 48 percent of average in the Verde River Basin. However, cumulative precipitation since October 1 remains above normal in all 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 April 1, the Salt and Verde River reservoir system stands at 76 percent of capacity. San Carlos Reservoir remains well below normal at 28 percent of capacity.



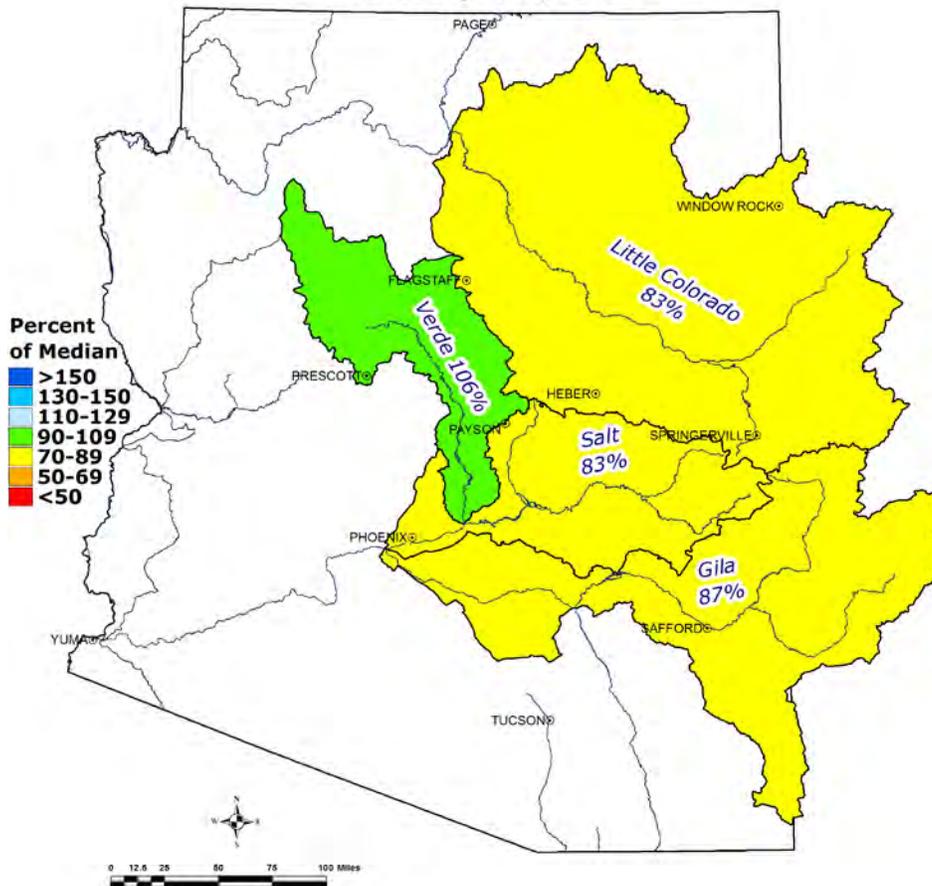
Key storage volumes displayed in thousands of acre-feet (x1000):

<u>Reservoir</u>	<u>Current Storage</u>	<u>Last Year Storage</u>	<u>30-Year Average</u>	<u>Storage Capacity</u>
Salt River System	1467.2	1207.4	1378.0	2025.8
Verde River System	271.3	123.0	203.6	287.4
San Carlos Reservoir	241.6	99.9	413.8	875.0
Lyman Lake	17.1	12.5	14.7	30.0
Lake Havasu	573.7	570.9	562.8	619.0
Lake Mohave	1713.4	1707.0	1687.0	1810.0
Lake Mead	10756.0	10034.0	20450.0	26159.0
Lake Powell	11383.0	11007.0	16942.0	24322.0

STREAMFLOW

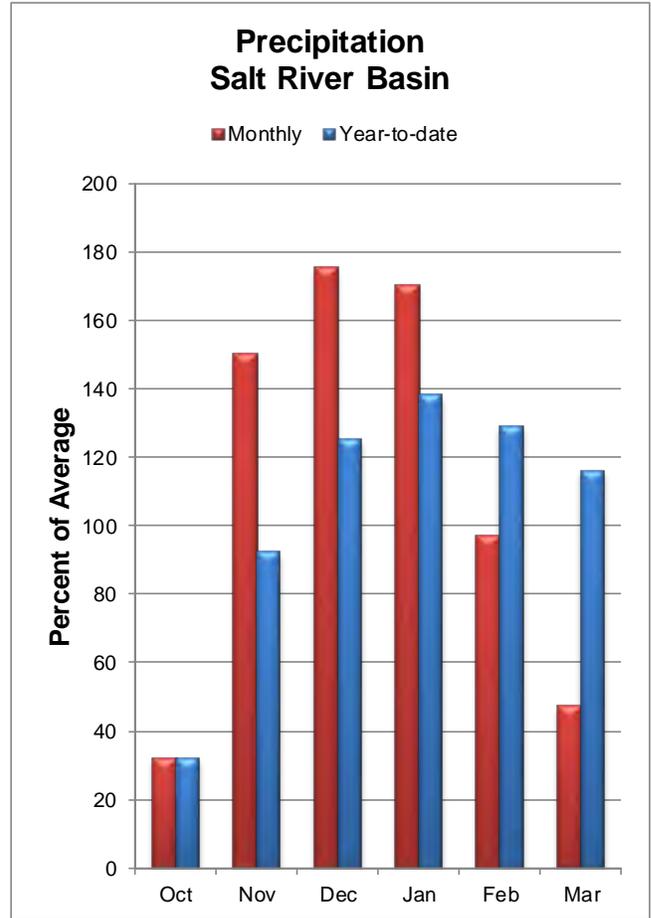
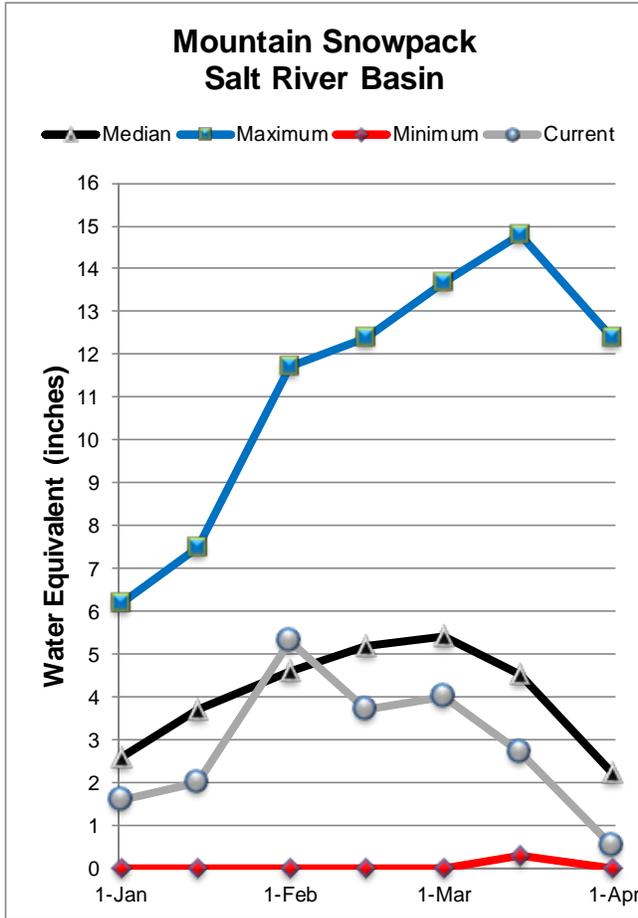
As of April 1, the forecast calls for normal to below normal streamflow for the remainder of the spring runoff period, ranging from 106 percent of median in the Verde River above Horseshoe Dam to 83 percent of median in the Salt River near Roosevelt and the Little Colorado River above Lyman Lake. Despite the minimal snowpack and lack of moisture during March, the final forecasts for the season remain close to normal due to the above average cumulative precipitation for the water year, saturated soil conditions, and other related factors. Please refer to the basin forecast tables found in this report for more information regarding water supply forecasts.

Arizona Spring Streamflow Forecasts as of April 1, 2017



SALT RIVER BASIN as of April 1, 2017

Below normal streamflow levels are forecast for the basin. In the Salt River, near Roosevelt, the forecast calls for 83% of median streamflow through May, while at Tonto Creek, the forecast calls for 102% of median streamflow through May. Snow survey measurements show the Salt snowpack to be at 21% of median.



**Salt River Basin
Streamflow Forecasts - April 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)	10% (KAF)	
Salt R nr Roosevelt ³	APR			78	98%			80
	APR-MAY	62	86	105	83%	127	164	127
Tonto Ck ab Gun Ck nr Roosevelt ³	APR			4.6	105%			4.4
	APR-MAY	1.99	4	6	102%	8.5	13.4	5.9

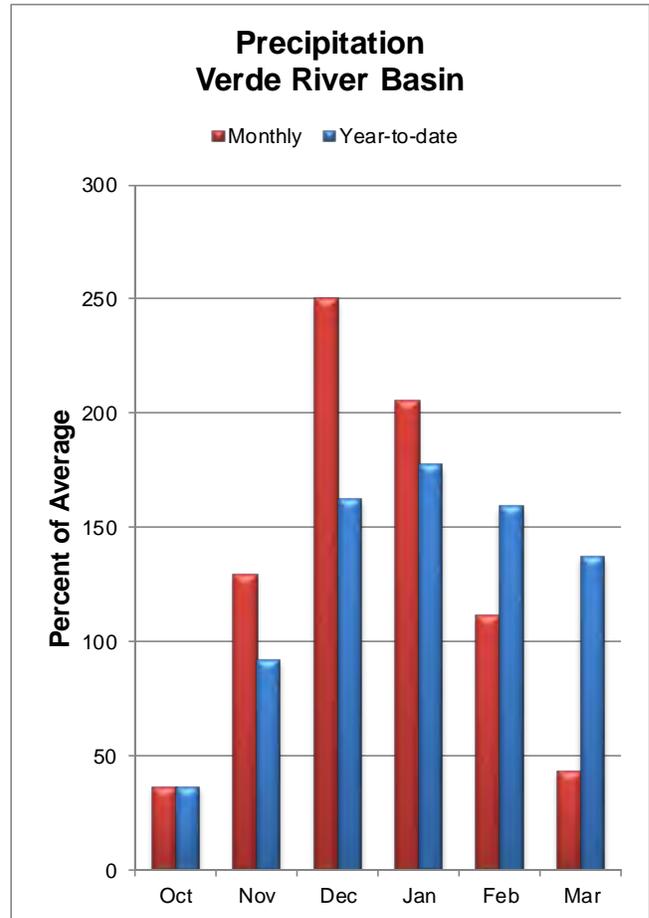
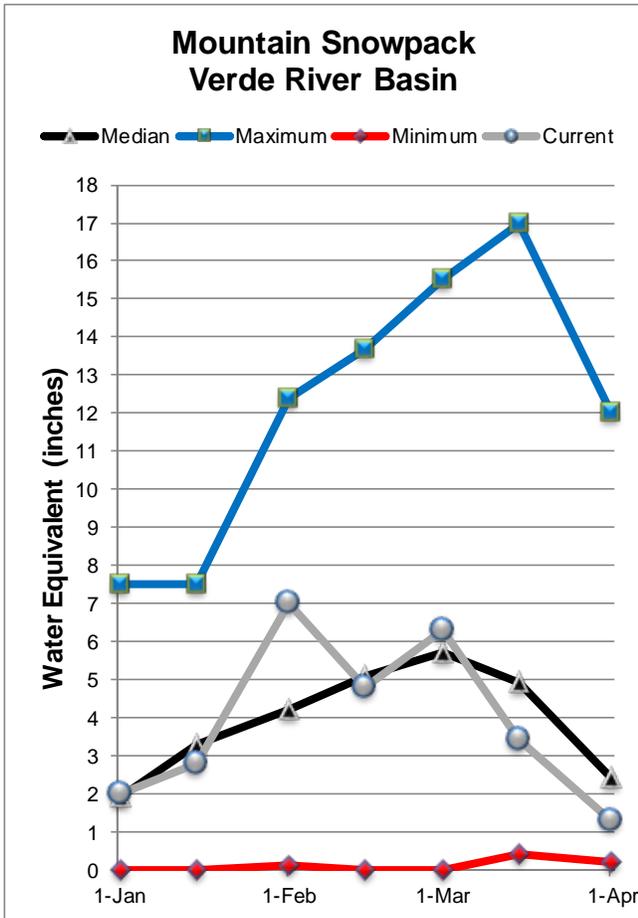
- 1) 90% and 10% exceedance probabilities are actually 95% and 5%
- 2) Forecasts are for unimpaired flows. Actual flow will be dependent on management of upstream reservoirs and diversions
- 3) Median value used in place of average

Reservoir Storage End of March, 2017	Current (KAF)	Last Year (KAF)	Average (KAF)	Capacity (KAF)
Salt River Reservoir System	1467.2	1207.4	1378.0	2025.8
Basin-wide Total	1467.2	1207.4	1378.0	2025.8
# of reservoirs	1	1	1	1

Watershed Snowpack Analysis April 1, 2017	# of Sites	% Median	Last Year % Median
SALT RIVER BASIN	11	21%	8%

VERDE RIVER BASIN as of April 1, 2017

About normal streamflow levels are forecast for the basin. In the Verde River, at Horseshoe Dam, the forecast calls for 106% of median streamflow through May. Snow survey measurements show the Verde snowpack to be at 53% of median.



Verde River Basin Streamflow Forecasts - April 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								
	APR			26	108%			24
	APR-MAY	14.8	27	38	106%	52	78	36

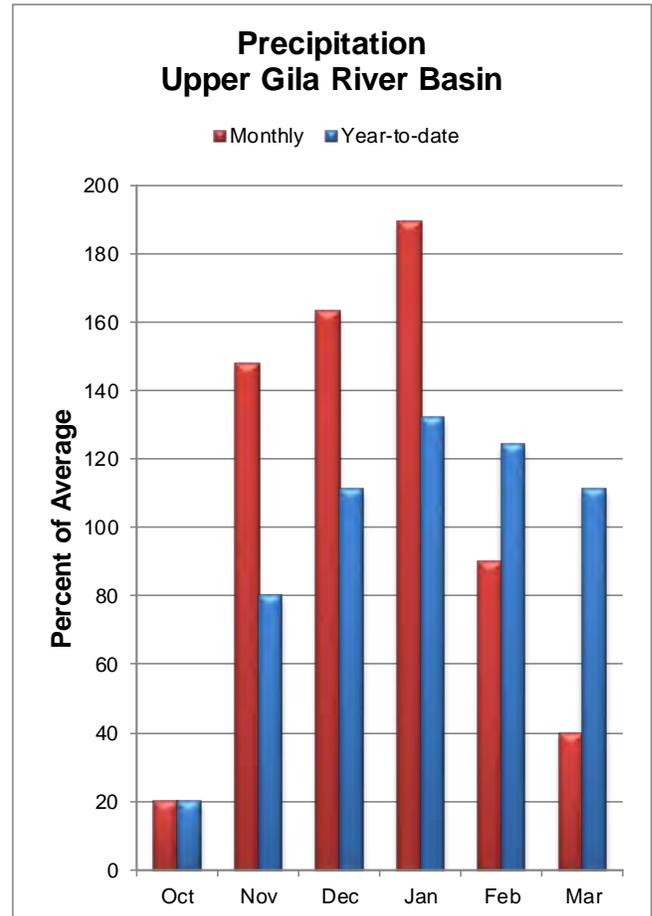
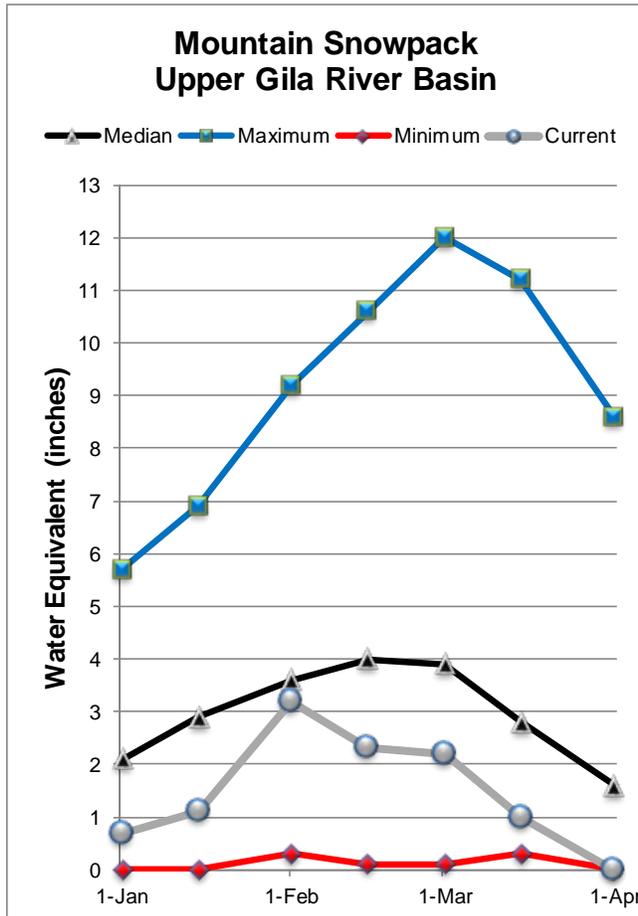
- 1) 90% and 10% exceedance probabilities are actually 95% and 5%
- 2) Forecasts are for unimpaired flows. Actual flow will be dependent on management of upstream reservoirs and diversions
- 3) Median value used in place of average

Reservoir Storage End of March, 2017	Current (KAF)	Last Year (KAF)	Average (KAF)	Capacity (KAF)
Verde River Reservoir System	271.3	123.0	203.6	287.4
Basin-wide Total	271.3	123.0	203.6	287.4
# of reservoirs	1	1	1	1

Watershed Snowpack Analysis April 1, 2017	# of Sites	% Median	Last Year % Median
VERDE RIVER BASIN	12	53%	23%

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

Below normal streamflow levels are forecast for the basin. In the San Francisco River, at Clifton, the forecast calls for 90% of median streamflow levels through May. In the Gila River, near Solomon, the forecast calls for 87% of median streamflow levels through May. At San Carlos Reservoir, inflow to the lake is forecast at 92% of median through May. Snow survey measurements show the snowpack for this basin to be at 0% of median.



San Francisco-Upper Gila River Basin Streamflow Forecasts - April 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	APR-MAY	10	13.9	17	103%	21	27	16.5
Gila R bl Blue Ck nr Virden ³	APR-MAY	8.8	15.6	21	100%	28	39	21
San Francisco R at Glenwood ³	APR-MAY	3.1	5.2	7	96%	9.3	13.4	7.3
San Francisco R at Clifton ³	APR-MAY	6.4	11.6	15.5	90%	21	30	17.3
Gila R nr Solomon ³	APR			24	96%			25
San Carlos Reservoir Inflow ³	APR-MAY	14	25	34	87%	45	64	39
	APR-MAY	-9.6	0.55	17	92%	34	59	18.4

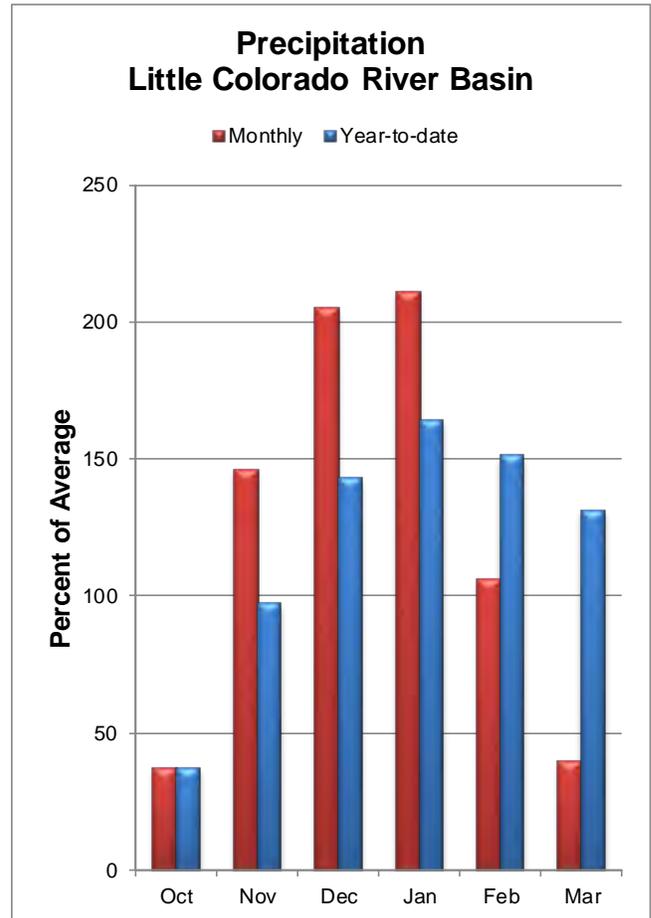
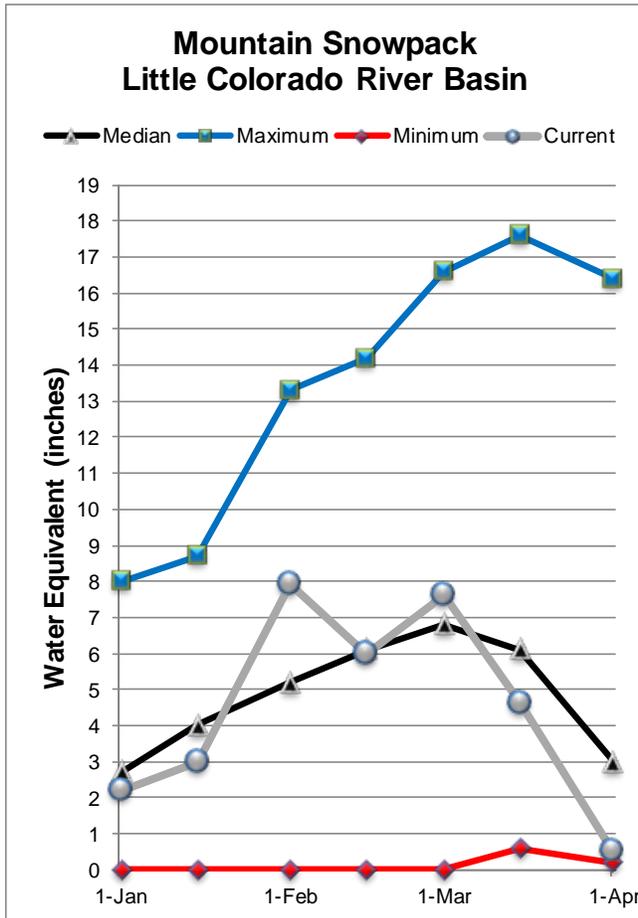
- 1) 90% and 10% exceedance probabilities are actually 95% and 5%
- 2) Forecasts are for unimpaired flows. Actual flow will be dependent on management of upstream reservoirs and diversions
- 3) Median value used in place of average

Reservoir Storage End of March, 2017	Current (KAF)	Last Year (KAF)	Average (KAF)	Capacity (KAF)
San Carlos Reservoir	241.8	99.9	413.8	875.0
Basin-wide Total	241.8	99.9	413.8	875.0
# of reservoirs	1	1	1	1

Watershed Snowpack Analysis April 1, 2017	# of Sites	% Median	Last Year % Median
SAN FRANCISCO-UPPER GILA RIVER BASIN	10	0%	0%

LITTLE COLORADO RIVER BASIN as of April 1, 2017

Below normal streamflow levels are forecast for the basin. In the Little Colorado River, above Lyman Lake, the forecast calls for 83% 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 16% and 3% of median, respectively.



Little Colorado River Basin Streamflow Forecasts - April 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	APR-JUN	1.14	2.1	2.9	83%	4	6	3.5
Rio Nutria nr Ramah ³	APR-MAY	0.01	0.09	0.24	126%	0.49	1.12	0.19
Zuni R ab Black Rock Reservoir ³	APR-MAY	0	0.02	0.13	130%	0.54	1.67	0.1
Blue Ridge Reservoir Inflow ³	APR-MAY	1.5	3.2	4.9	120%	7.2	11.6	4.1
Lake Mary Reservoir Inflow ³	APR-MAY	0.53	0.91	1.25	125%	1.67	2.4	1

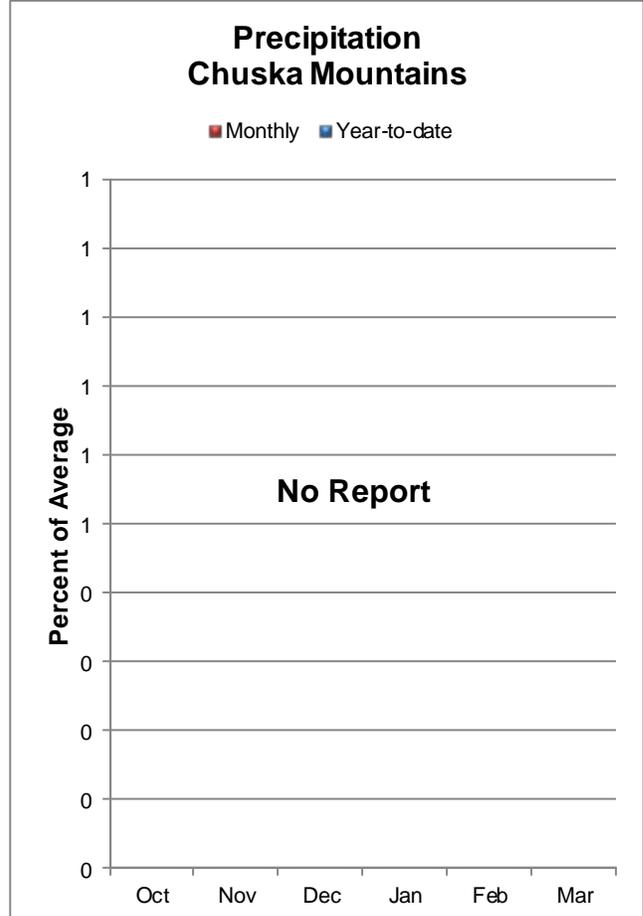
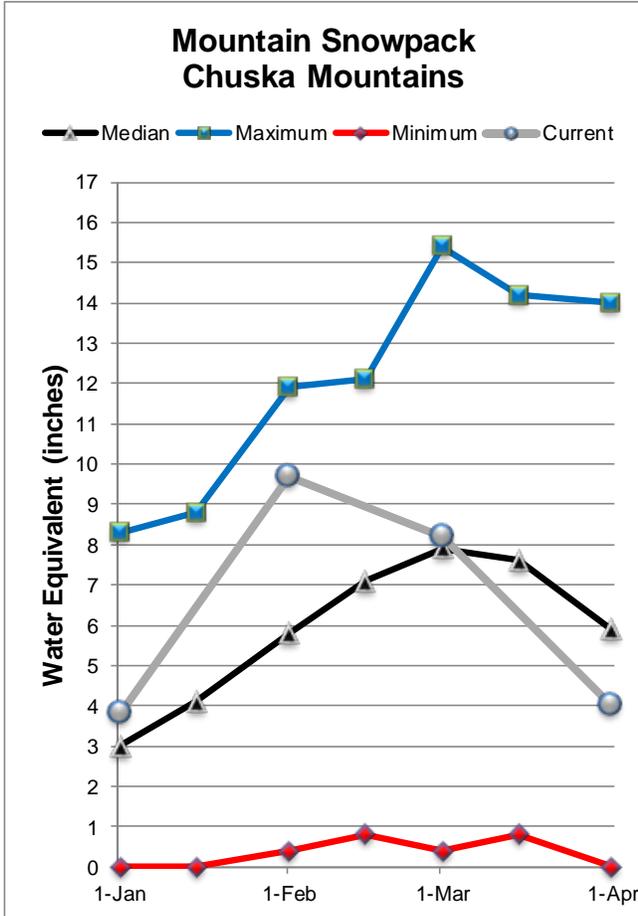
- 1) 90% and 10% exceedance probabilities are actually 95% and 5%
- 2) Forecasts are for unimpaired flows. Actual flow will be dependent on management of upstream reservoirs and diversions
- 3) Median value used in place of average

Reservoir Storage End of March, 2017	Current (KAF)	Last Year (KAF)	Average (KAF)	Capacity (KAF)
Lyman Reservoir	16.9	12.5	14.7	30.0
Basin-wide Total	16.9	12.5	14.7	30.0
# of reservoirs	1	1	1	1

Watershed Snowpack Analysis April 1, 2017	# of Sites	% Median	Last Year % Median
LITTLE COLORADO RIVER BASIN	10	16%	6%
CENTRAL MOGOLLON RIM	4	3%	1%

CHUSKA MOUNTAINS as of April 1, 2017

Snow survey measurements conducted by staff of the Navajo Nation Water Management Branch show the Chuska snowpack to be at 67% of median. Well below normal runoff is forecast for Captain Tom Wash, Wheatfields Creek, and Bowl Canyon Creek.



Chuska Mountains Streamflow Forecasts - April 1, 2017

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

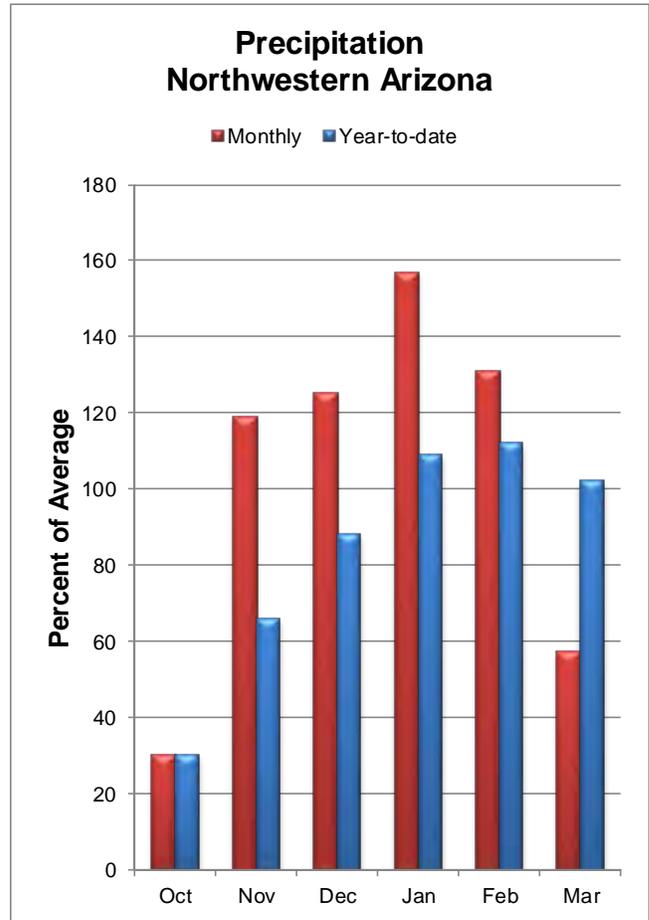
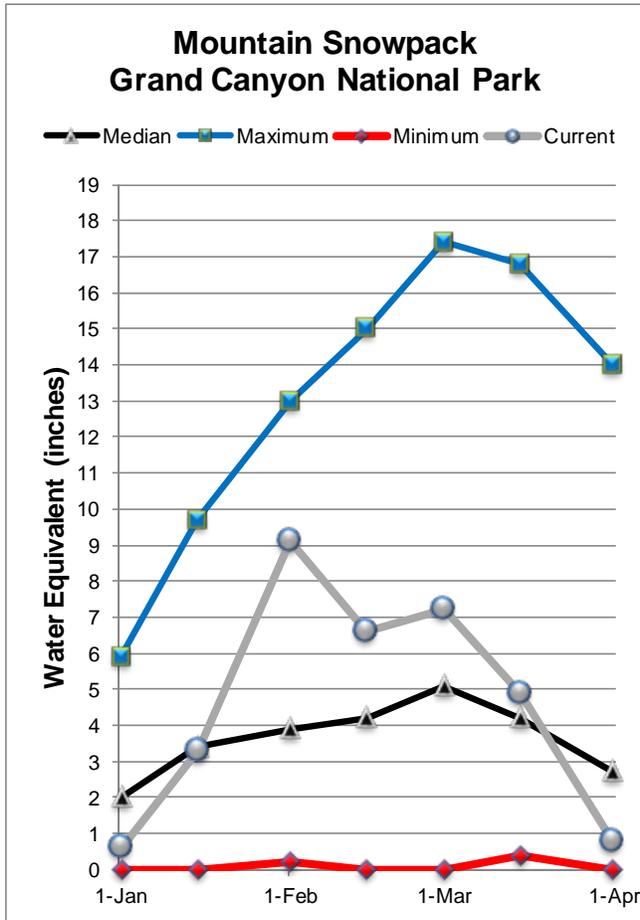
CHUSKA MOUNTAINS	Forecast Period	90% (KAF)	70% (KAF)	50% (KAF)	% Avg	30% (KAF)	10% (KAF)	30yr Avg (KAF)
Captain Tom Wash nr Two Gray Hills	MAR-MAY	0.13	0.59	1.2	46%	2.1	4.2	2.6
Wheatfields Ck nr Wheatfields	MAR-MAY	0.8	1.19	1.5	71%	1.85	2.4	2.1
Bowl Canyon Ck ab Asaayi Lake	MAR-MAY	0.4	0.67	0.9	69%	1.16	1.6	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 April 1, 2017	# of Sites	% Median	Last Year % Median
CHUSKA MOUNTAINS	6	67%	21%
DEFIANCE PLATEAU	1		

NORTHWESTERN ARIZONA as of April 1, 2017

On the Colorado River, well above normal inflow to Lake Powell is forecast at 132% 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 30% of median.



Northwestern Arizona Streamflow Forecasts - April 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	53	74	88	135%	102	123	65
Lake Powell Inflow ²	APR-JUL			9460	132%	11810		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 March, 2017	Current (KAF)	Last Year (KAF)	Average (KAF)	Capacity (KAF)
Lake Havasu	579.0	570.9	562.8	619.0
Lake Mohave	1718.0	1707.0	1687.0	1810.0
Lake Mead	10707.0	10034.0	20450.0	26159.0
Lake Powell	11350.0	11007.0	16942.0	24322.0
Basin-wide Total	24354.0	23318.9	39641.8	52910.0
# of reservoirs	4	4	4	4

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

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

Snowpack Summary for April 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	0	0.0	2.5	0%	0.0	0%
Beaver Head	SNOTEL	7990	0	0.0	0.0		0.0	
Buck Spring	SC	7400	0	0.0	0.0		0.0	
Coronado Trail	SNOTEL	8400	0	0.0	0.0		0.0	
Hawley Lake	SNOTEL	8300	13	5.3			3.2	
Coronado Trail	SC	8350	0	0.0	0.0		0.0	
Fort Apache	SC	9160	14	4.5	6.2	73%	1.7	27%
Hannagan Meadows	SNOTEL	9020	0	0.0	7.7	0%	0.0	0%
Maverick Fork	SNOTEL	9200	0	0.0	5.3	0%	0.0	0%
Nutriosio	SC	8500	0	0.0	0.0		0.0	
Nutriosio	SNOTEL	8500	0	0.0			0.0	
Wildcat	SNOTEL	7850	0	0.0	0.0		0.0	
Workman Creek	SNOTEL	6900	0	0.0	0.0		0.0	
Basin Index						21%		8%
# 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	0.0		0.0	
Baker Butte No. 2	SC	7700	0	0.0	8.9	0%	0.1	1%
Baker Butte Smt	SNOTEL	7700	26	10.8			5.7	
Bar M	SNOTEL	6393	0	0.0			0.0	
Chalender	SC	7100	1	0.3	0.0		0.0	
Chalender	SNOTEL	7100	0	0.0			0.0	
Fort Valley	SC	7350	0	0.0	0.0		0.0	
Fort Valley	SNOTEL	7350	0	0.0			0.0	
Fry	SNOTEL	7200	0	0.0	0.0		0.0	
Happy Jack	SNOTEL	7630	0	0.0	0.3	0%	0.0	0%
Happy Jack	SC	7630	0	0.0	0.0		0.0	
Mormon Mountain	SNOTEL	7500	0	0.0	0.7	0%	0.0	0%
Mormon Mountain Summit #2	SC	8470	20	7.6	10.2	0%		
Mormon Mtn Summit	SNOTEL	8500	18	9.1			1.6	
Newman Park	SC	6750	0	0.0	0.0		0.0	
White Horse Lake	SNOTEL	7180	0	0.0	0.0		0.0	
Williams Ski Run	SC	7720	18	6.2	6.5	95%	3.6	55%
Basin Index						53%		23%
# of sites						12		12

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	91	30.2	19.2	157%	10.6	55%
Snowslide Canyon	SNOTEL	9730	67	31.5	17.0	185%	8.6	51%
Basin Index						170%		53%
# 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	0.0		0.0	
Coronado Trail	SNOTEL	8400	0	0.0	0.0		0.0	
Coronado Trail	SC	8350	0	0.0	0.0		0.0	
Frisco Divide	SNOTEL	8000	0	0.0	0.0		0.0	
Hannagan Meadows	SNOTEL	9020	0	0.0	7.7	0%	0.0	0%
Lookout Mountain	SNOTEL	8500	0	0.0	0.0		0.0	
Nutriosio	SC	8500	0	0.0	0.0		0.0	
Nutriosio	SNOTEL	8500	0	0.0			0.0	
Signal Peak	SNOTEL	8360	0	0.0	0.0		0.0	

Silver Creek Divide	SNOTEL	9000	0	0.0	7.0	0%	0.0	0%
State Line	SC	8000	0	0.0	0.0		0.0	

Basin Index							0%	0%
# 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	0	0.0	0.0		0.0	
Baker Butte No. 2	SC	7700	0	0.0	8.9	0%	0.1	1%
Baker Butte Smt	SNOTEL	7700	26	10.8			5.7	
Baldy	SNOTEL	9125	0	0.0	2.5	0%	0.0	0%
Buck Spring	SC	7400	0	0.0	0.0		0.0	
Cheese Springs	SC	8700	0	0.0	1.6	0%	0.0	0%
Fort Apache	SC	9160	14	4.5	6.2	73%	1.7	27%
Heber	SNOTEL	7640	0	0.0	0.0		0.0	
Lake Mary	SC	6930	0	0.0	0.0		0.0	
Maverick Fork	SNOTEL	9200	0	0.0	5.3	0%	0.0	0%
Promontory	SNOTEL	7930	2	0.4	5.5	7%	0.0	0%

Basin Index							16%	6%
# of sites							10	10

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	0.0		0.0	
Baker Butte No. 2	SC	7700	0	0.0	8.9	0%	0.1	1%
Baker Butte Smt	SNOTEL	7700	26	10.8			5.7	
Heber	SNOTEL	7640	0	0.0	0.0		0.0	
Promontory	SNOTEL	7930	2	0.4	5.5	7%	0.0	0%

Basin Index							3%	1%
# 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	11	3.4	8.0	43%	1.1	14%
Beaver Spring	SNOTEL	9200	12	3.1			0.0	
Bowl Canyon	SC	8980	18	7.2	7.8	92%	2.8	36%
Hidden Valley	SC	8480	6	2.5			0.0	
Missionary Spring	SC	7940	0	0.0	0.0		0.0	
Tsaile Canyon #1	SC	8160	2	0.3	3.4	9%	0.0	0%
Tsaile Canyon #3	SC	8920	11	4.6	7.2	64%	1.4	19%
Whiskey Creek	SC	9050	20	8.1	8.7	93%	2.2	25%
Navajo Whiskey Ck	SNOTEL	9050	2	0.3			0.0	

Basin Index							67%	21%
# of sites							6	6

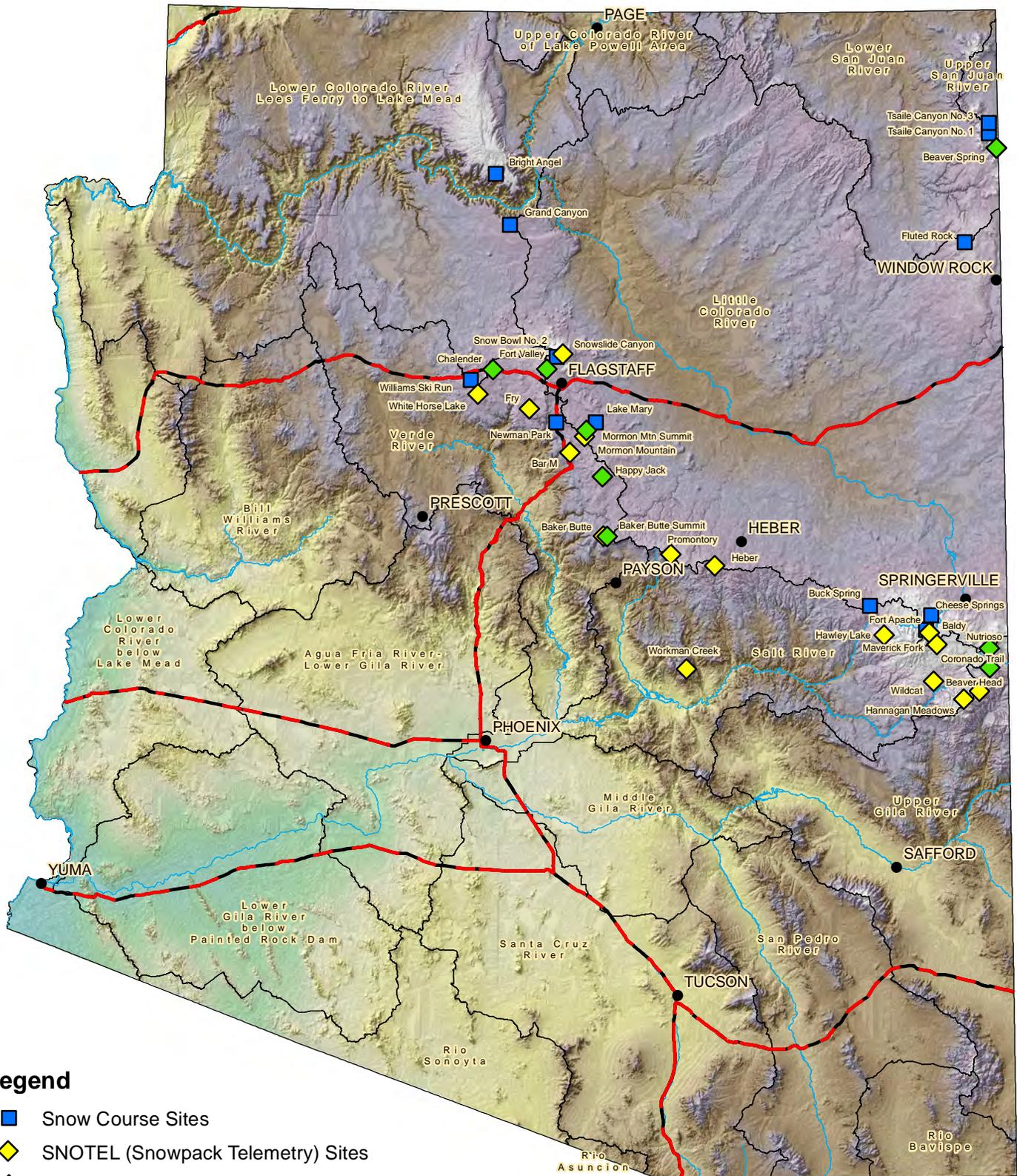
DEFIANCE PLATEAU	Network	Elevation (ft)	Depth (in)	SWE (in)	Median (in)	% Median	Last Year SWE (in)	Last Year % Median
Fluted Rock	SC	7800	0	0.0	0.0		0.0	

Basin Index							1	1
# of sites								

NORTHWESTERN ARIZONA	Network	Elevation (ft)	Depth (in)	SWE (in)	Median (in)	% Median	Last Year SWE (in)	Last Year % Median
Bright Angel	SC	8400	6	1.6	5.3	30%		
Grand Canyon	SC	7500	0	0.0	0.0		0.0	

Basin Index							1	1
# of sites								

Arizona Snow Survey Data Sites



Legend

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

