



United States  
Department of  
Agriculture

Natural  
Resources  
Conservation  
Service

# Arizona

## Basin Outlook Report

### March 15, 2013



**Issued by**

Jason Weller  
Chief  
Natural Resources Conservation Service  
U.S. Department of Agriculture

**Released by**

Curtis Elke  
State Conservationist  
Natural Resources Conservation Service  
Phoenix, Arizona

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

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### ***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](mailto:dino.desimone@az.usda.gov)

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# ARIZONA Basin Outlook Report as of March 15, 2013

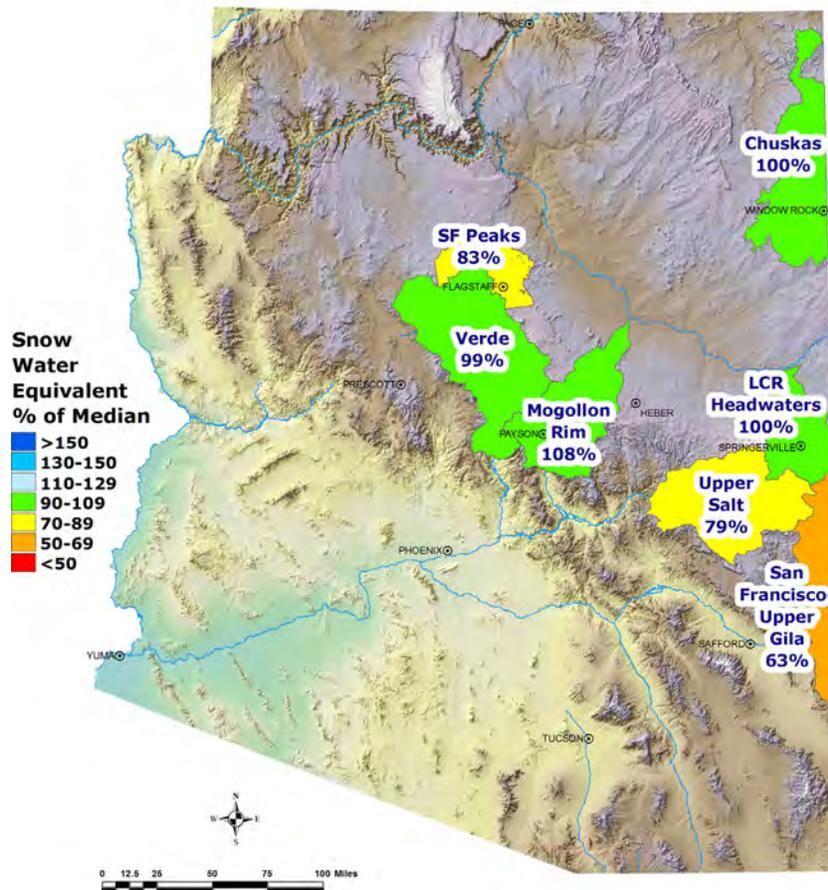
## SUMMARY

As of March 15, snowpack levels are well below normal to about normal in the major basins. Precipitation for the first half of March was above normal throughout the basins. The Salt and Verde River reservoir system stands at 60 percent of capacity, while San Carlos Reservoir is at one percent of capacity. The mid-month forecast continues to call for well below normal to below normal runoff in all of the basins for the remainder of the spring runoff period.

## SNOWPACK

Snow water equivalent levels are well below normal to about normal in the major river basins, ranging from a low of 63 percent of median in the San Francisco-Upper Gila River Basin to a high of 100 percent of median in the Little Colorado River Basin. The statewide snowpack is slightly below normal at 93 percent of the long-term median.

**Arizona  
Snow Water Equivalent  
as of March 15, 2013**

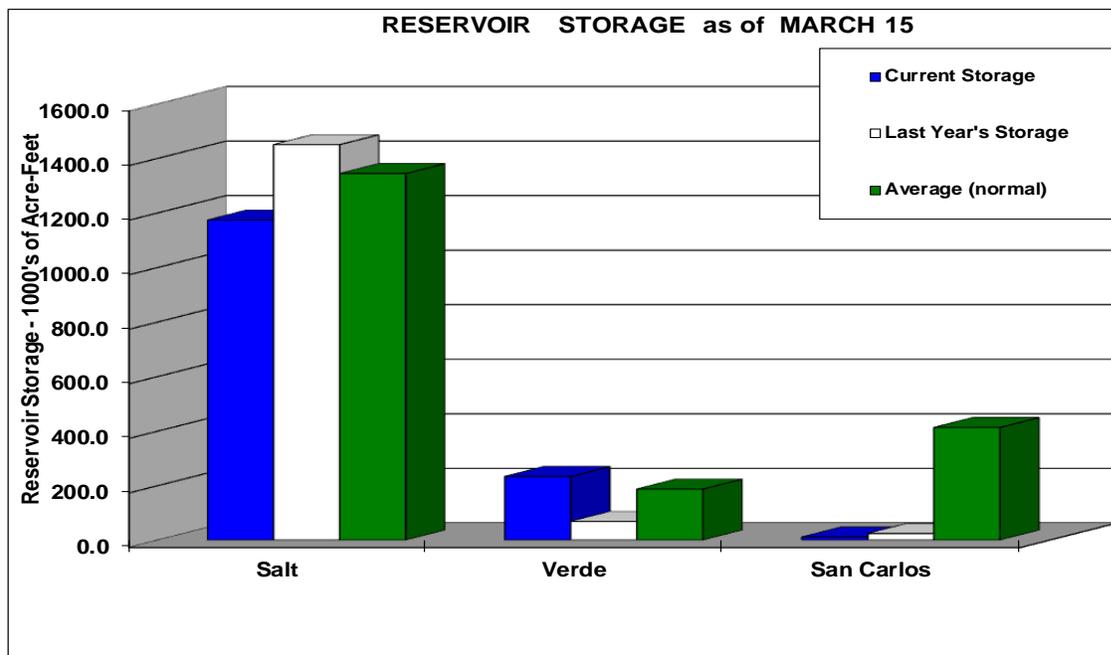


## PRECIPITATION

Mountain data from NRCS SNOTEL sites and Cooperator gages show that precipitation for the first half of March was above normal, ranging from 115 percent of average in the Verde River Basin to 154 percent of average in the Little Colorado River Basin. A strong winter storm moved through the state on March 8-9 producing significant rain and snow in the mountains. Cumulative precipitation since October 1 is now about normal in the Verde and Little Colorado River Basins, but remains below normal in the Salt and San Francisco-Upper Gila River 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 60 percent of capacity. San Carlos Reservoir remains well below normal at only one percent of capacity.



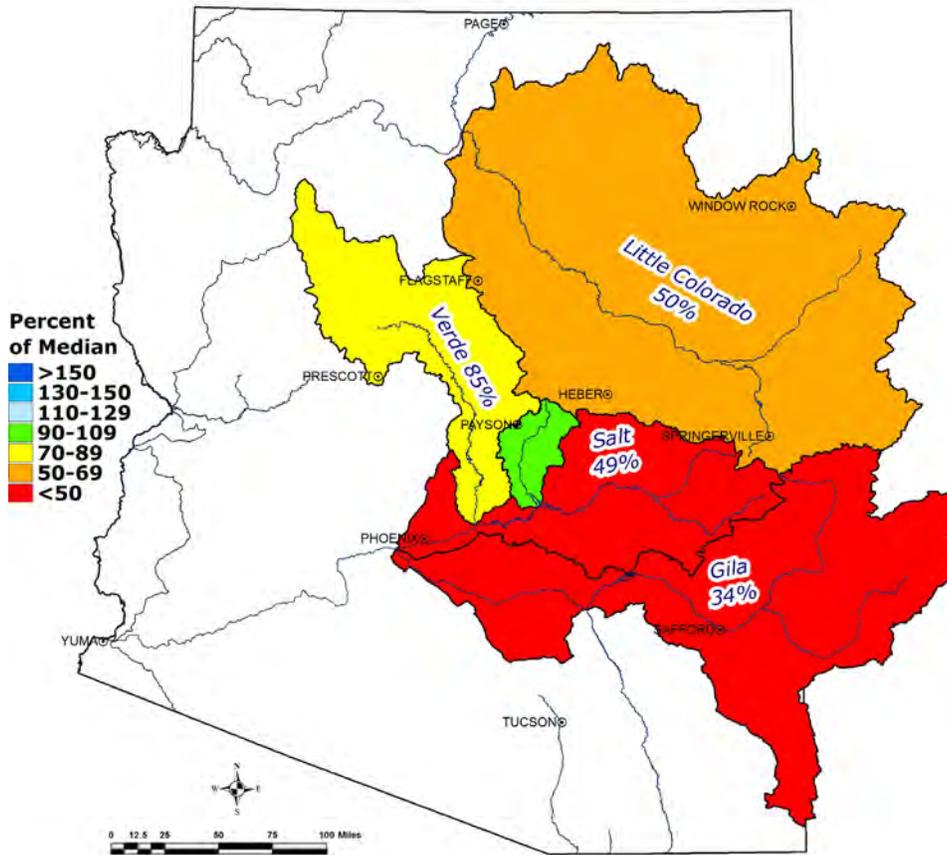
Key storage volumes displayed in thousands of acre-feet (x1000):

<u>Reservoir</u>	<u>Current Storage</u>	<u>Last Year Storage</u>	<u>30-Year Average</u>	<u>Storage Capacity</u>
Salt River System	1173.5	1450.0	1344.0	2025.8
Verde River System	223.3	68.4	187.1	287.4
San Carlos Reservoir	11.3	24.3	413.2	875.0
Lyman Lake	4.6	9.6	13.6	30.0
Lake Havasu	577.5	553.9	559.5	619.0
Lake Mohave	1661.7	1672.2	1692.0	1810.0
Lake Mead	13676.0	14763.0	20543.0	26159.0
Lake Powell	11769.0	15410.0	16977.0	24322.0

# STREAMFLOW

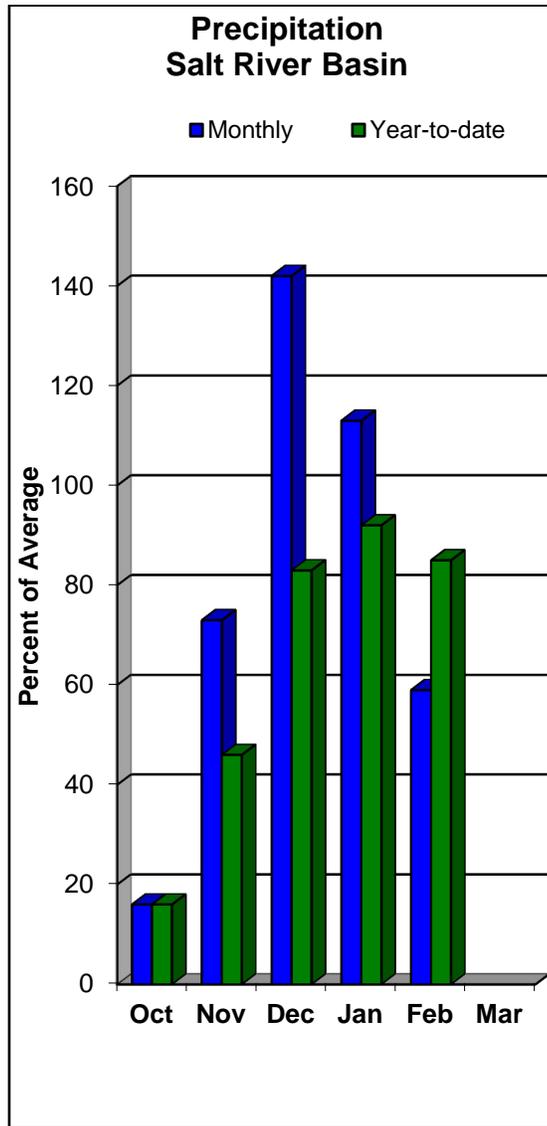
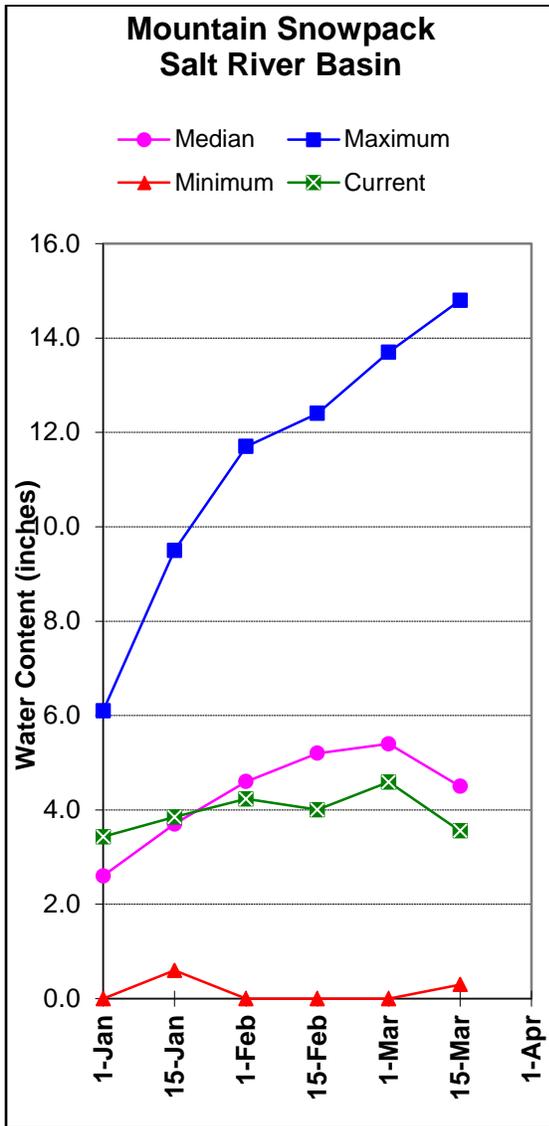
As of March 15, the forecast continues to call for well below normal to below normal streamflow for the remainder of the spring runoff period, ranging from 34 percent of median in the Gila River near Solomon to 85 percent of median in the Verde River above Horseshoe Dam. The mid-month forecasts reflect an expectation that there will be no significant additions to the snowpack for the remainder of the winter. 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, 2013**



## SALT RIVER BASIN as of March 15, 2013

Well below normal to about normal streamflow levels are forecast for the basin. In the Salt River, near Roosevelt, , the forecast calls for 49% of median, while on Tonto Creek, the forecast calls for 98% of median streamflow through May. Snow survey measurements show the Salt snowpack to be at 79% of median.



SALT RIVER BASIN as of March 15, 2013

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=====
                        SALT RIVER BASIN
                    Streamflow Forecasts - March 15, 2013
=====
Forecast Pt | <=== Drier === Future Conditions === Wetter ===> |
Forecast | ===== Chance of Exceeding * ===== |
Period | (1000AF) (1000AF) | (1000AF) (% MED.) | (1000AF) (1000AF) | (1000AF)
=====
Salt R nr Roosevelt (3)
M15-MAY      52      78      100      49      126      171      205
MARCH                62      54                114

Tonto Ck ab Gun Ck nr Roosevelt (3)
M15-MAY      3.3      7.6      12.0      98      17.9      30      12.2
MARCH                34      221                15.4
=====

```

\* 90%, 70%, 50%, 30%, and 10% chances of exceeding are the probabilities that the actual volume will exceed the volumes in the table.

The average and median are computed for the 1981-2010 base period.

- (1) - The values listed under the 10% and 90% Chance of Exceeding are actually 5% and 95% exceedance levels.
- (2) - The value is natural volume - actual volume may be affected by upstream water management.
- (3) - Median value used in place of average.

```

=====
                        SALT RIVER BASIN
                    Reservoir Storage (1000AF) Mid-March
=====
Reservoir | Usable Capacity | ***** Usable Storage ***** |
           |                 | This Year   Last Year   Average |
=====
SALT RIVER RES SYSTEM | 2025.8 | 1173.5 | 1450.0 | 1344.0 |
=====

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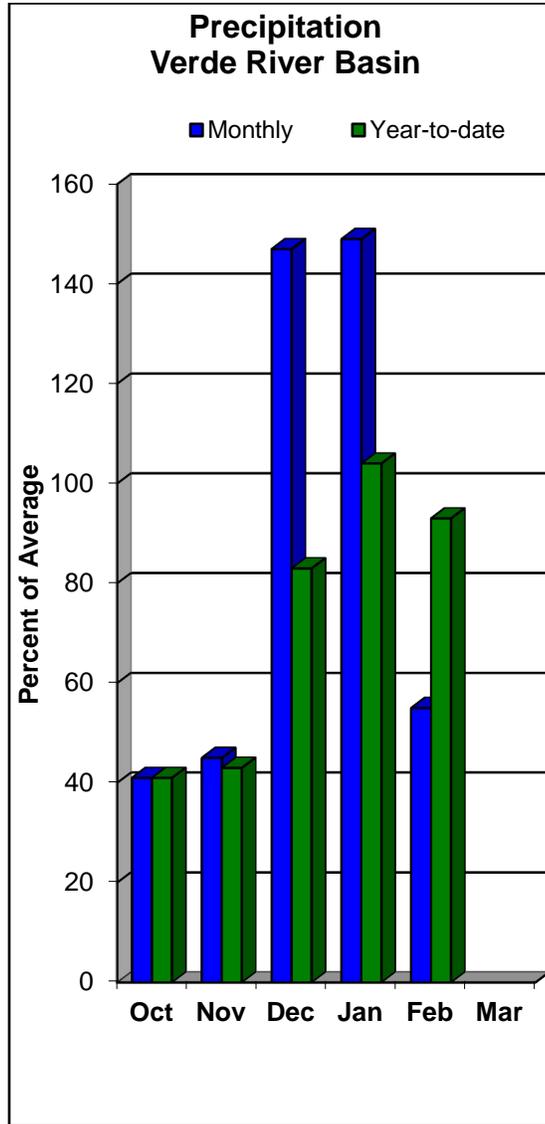
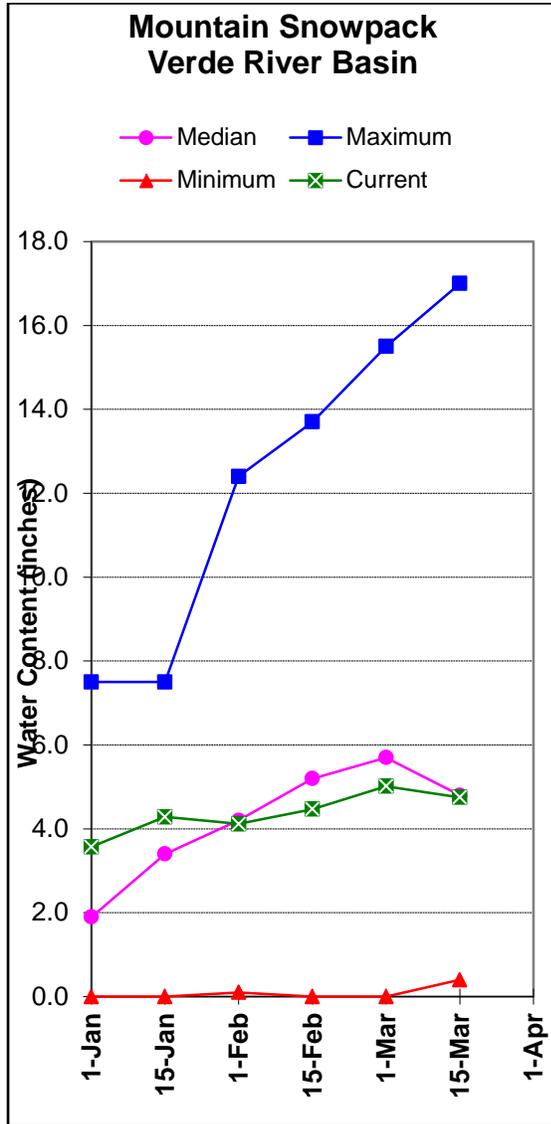
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=====
                        SALT RIVER BASIN
                    Watershed Snowpack Analysis - March 15, 2013
=====
Watershed | Number of Data Sites | This Year as Percent of Last Year | Median |
=====
SALT RIVER BASIN | 10 | 142 | 79 |
=====

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## VERDE RIVER BASIN as of March 15, 2013

Below normal streamflow levels are forecast for the basin. In the Verde River, at Horseshoe Dam, the forecast calls for 85% of median streamflow through May. Snow survey measurements show the Verde snowpack to be at 99% of median.



VERDE RIVER BASIN as of March 15, 2013

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=====
                        VERDE RIVER BASIN
                        Streamflow Forecasts - March 15, 2013
=====
Forecast Pt | <=== Drier === Future Conditions === Wetter ===> |
Forecast     | ===== Chance of Exceeding * ===== |
Period       | 90%    70%    | 50%    | 30%    10%    | 30 Yr Med
              |(1000AF) (1000AF)|(1000AF) (% MED.)|(1000AF) (1000AF)| (1000AF)
=====
Verde R bl Tangle Ck ab Horseshoe Dam (3
M15-MAY      25      32      50      85      73      118      59

Verde R bl Tangle Ck ab Horseshoe Dam
MAR          60      102      59
=====

```

\* 90%, 70%, 50%, 30%, and 10% chances of exceeding are the probabilities that the actual volume will exceed the volumes in the table.

The average and median are computed for the 1981-2010 base period.

- (1) - The values listed under the 10% and 90% Chance of Exceeding are actually 5% and 95% exceedance levels.
- (2) - The value is natural volume - actual volume may be affected by upstream water management.
- (3) - Median value used in place of average.

```

=====
                        VERDE RIVER BASIN
                        Reservoir Storage (1000AF) Mid-March
=====
Reservoir      Usable Capacity      ***** Usable Storage *****
                This Year      Last Year      Average
=====
VERDE RIVER RES SYSTEM      287.4      223.3      68.4      187.1
=====

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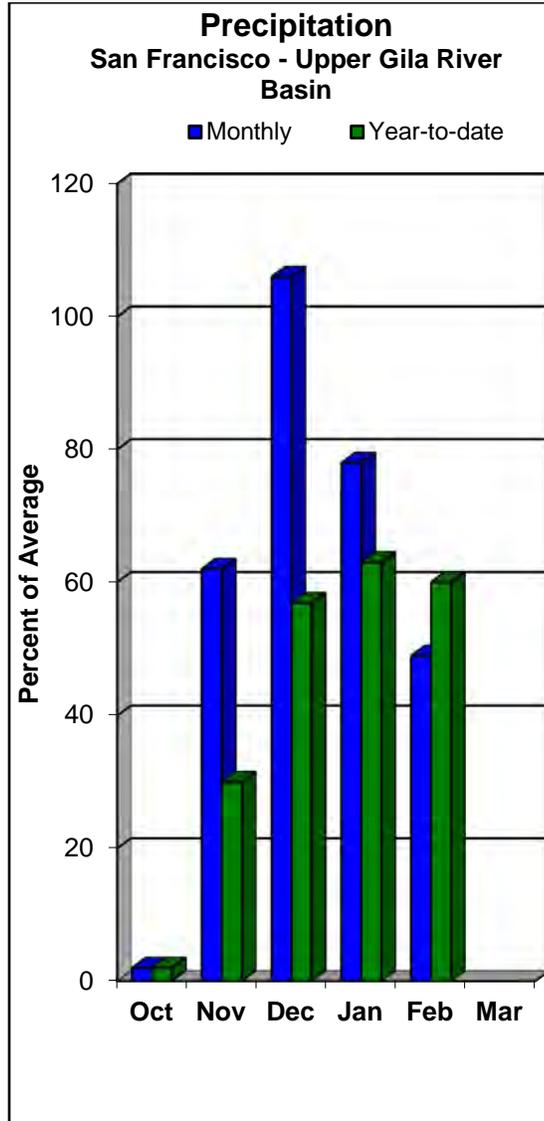
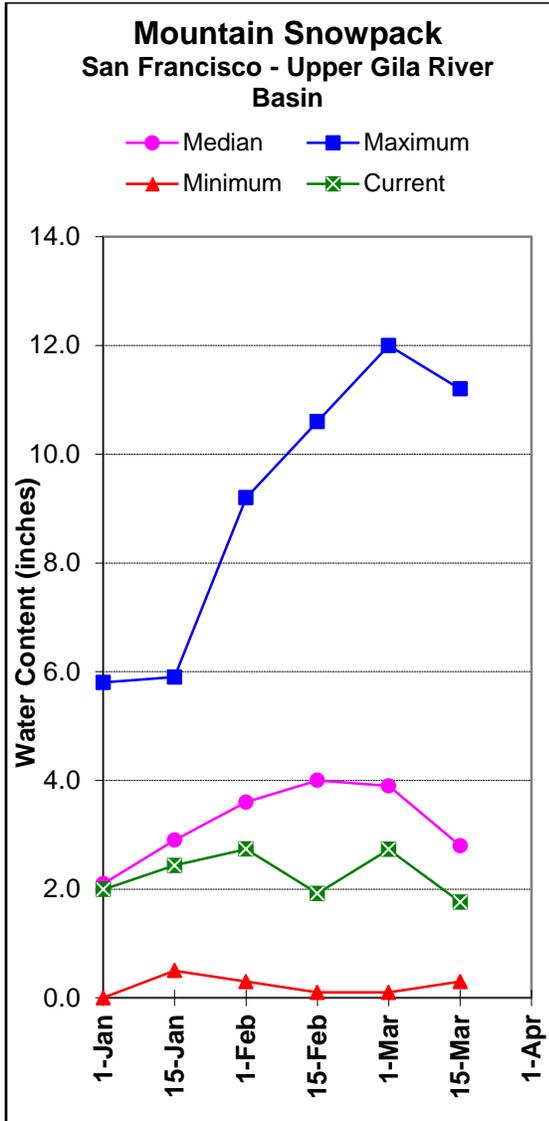
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=====
                        VERDE RIVER BASIN
                        Watershed Snowpack Analysis - March 15, 2013
=====
Watershed      Number of Data Sites      This Year as Percent of Last Year      Median
=====
VERDE RIVER BASIN      11      200      99
SAN FRANCISCO PEAKS      2      154      83
=====

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## SAN FRANCISCO-UPPER GILA RIVER BASIN as of March 15, 2013

Well below normal streamflow levels are forecast for the basin. In the San Francisco River, at Clifton, the forecast calls for 41% of median streamflow through May. In the Gila River, near Solomon, the forecast calls for 34% of median, while at San Carlos Reservoir, inflow to the lake is forecast at only 14% of median through May. Snow survey measurements show the snowpack for this basin to be at 63% of median.



SAN FRANCISCO - UPPER GILA RIVER BASIN as of March 15, 2013

SAN FRANCISCO - UPPER GILA RIVER BASIN Streamflow Forecasts - March 15, 2013							
Forecast Pt Forecast Period	<=== Drier === Future Conditions === Wetter ===>						30 Yr Med (1000AF)
	Chance of Exceeding * 90% 70% 50% 30% 10% (1000AF) (1000AF) (1000AF) (% MED.) (1000AF) (1000AF)						
Gila R at Gila (3)							
M15-MAY	7.3	10.3	12.7	49	15.5	20	26
Gila R bl Blue Ck nr Virden (3)							
M15-MAY	4.8	9.9	14.4	47	19.7	29	31
San Francisco R at Glenwood (3)							
M15-MAY	1.3	2.9	4.5	37	6.7	11.0	12.1
San Francisco R at Clifton (3)							
M15-MAY	2.4	7.2	12.0	41	18.0	29	29
Gila R nr Solomon (3)							
M15-MAY	5.3	14.8	24	34	35	56	70
MARCH	6.2	10.5	14.0	37	18.0	25	38
San Carlos Reservoir Inflow (2,3)							
M15-MAY	0.0	1.0	6.0	14	15.2	36	42

\* 90%, 70%, 50%, 30%, and 10% chances of exceeding are the probabilities that the actual volume will exceed the volumes in the table.

The average and median are computed for the 1981-2010 base period.

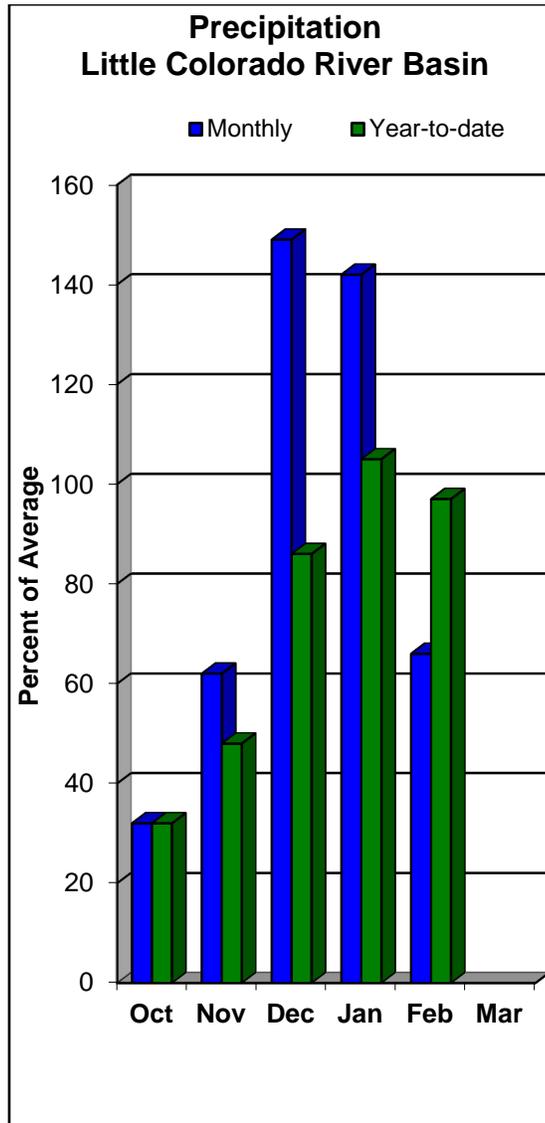
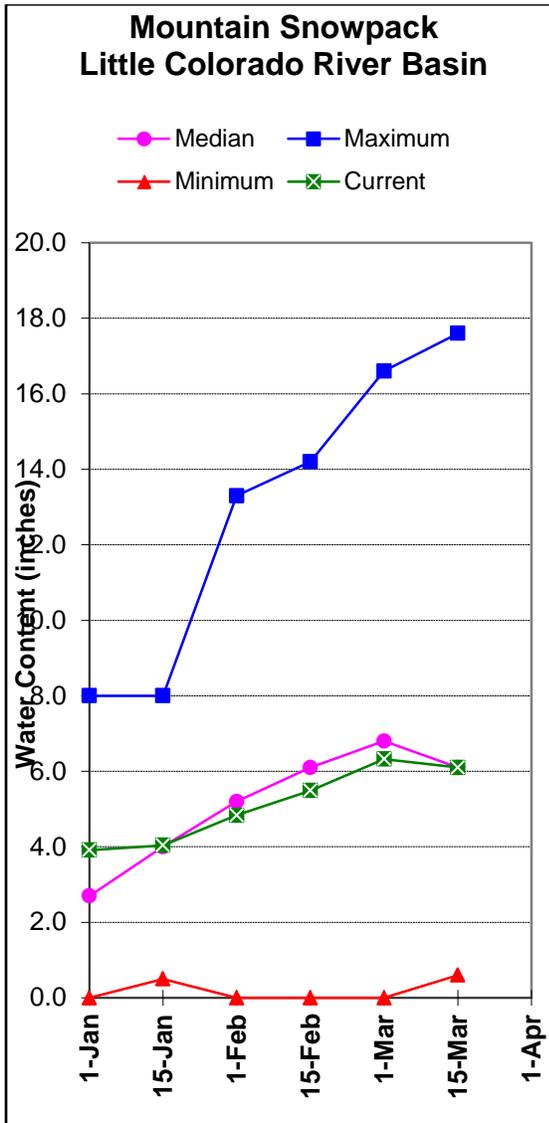
- (1) - The values listed under the 10% and 90% Chance of Exceeding are actually 5% and 95% exceedance levels.
- (2) - The value is natural volume - actual volume may be affected by upstream water management.
- (3) - Median value used in place of average.

SAN FRANCISCO - UPPER GILA RIVER BASIN Reservoir Storage (1000AF) Mid-March				
Reservoir	Usable Capacity	***** This Year	Usable Storage Last Year	***** Average
SAN CARLOS	875.0	11.3	24.3	413.2

SAN FRANCISCO - UPPER GILA RIVER BASIN Watershed Snowpack Analysis - March 15, 2013			
Watershed	Number of Data Sites	This Year as Percent of Last Year	Median
SAN FRANCISCO - UPPER GILA R	9	93	63

## LITTLE COLORADO RIVER BASIN as of March 15, 2013

Well below normal streamflow levels are forecast for the basin. In the Little Colorado River, at Lyman Lake, the forecast calls for 50% of median streamflow through June. At Blue Ridge (C.C. Cragin) Reservoir, inflow to the lake is forecast at 59% of median through May. Snowpacks along the southern headwaters of the Little Colorado River, and along the central Mogollon Rim, were measured at 100% and 108% of median, respectively.



LITTLE COLORADO RIVER BASIN as of March 15, 2013

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=====
                                LITTLE COLORADO RIVER BASIN
                                Streamflow Forecasts - March 15, 2013
=====
Forecast Pt | <=== Drier === Future Conditions === Wetter ===> |
Forecast     | ===== Chance of Exceeding * ===== |
Period       | 90%    70%    | 50%    | 30%    10%    | 30 Yr Med
              |(1000AF) (1000AF)|(1000AF) (% MED.)|(1000AF) (1000AF)| (1000AF)
=====
Little Colorado R ab Lyman Lake
MAR-JUN      1.04    2.00    3.00    50    4.20    6.60    6.00

Blue Ridge Reservoir Inflow (3)
MAR-MAY      3.2     5.7     8.0     59    10.9    16.2    13.5

Lake Mary Reservoir Inflow (3)
MAR-MAY      0.53    1.14    1.75    60    2.50    4.10    2.90
=====

```

\* 90%, 70%, 50%, 30%, and 10% chances of exceeding are the probabilities that the actual volume will exceed the volumes in the table.

The average and median are computed for the 1981-2010 base period.

- (1) - The values listed under the 10% and 90% Chance of Exceeding are actually 5% and 95% exceedance levels.
- (2) - The value is natural volume - actual volume may be affected by upstream water management.
- (3) - Median value used in place of average.

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=====
                                LITTLE COLORADO RIVER BASIN
                                Reservoir Storage (1000AF) Mid-March
=====
Reservoir      Usable Capacity      ***** Usable Storage *****
                |                    | This Year  Last Year  Average
=====
LYMAN RESERVOIR      30.0                4.6      9.6      13.6
=====

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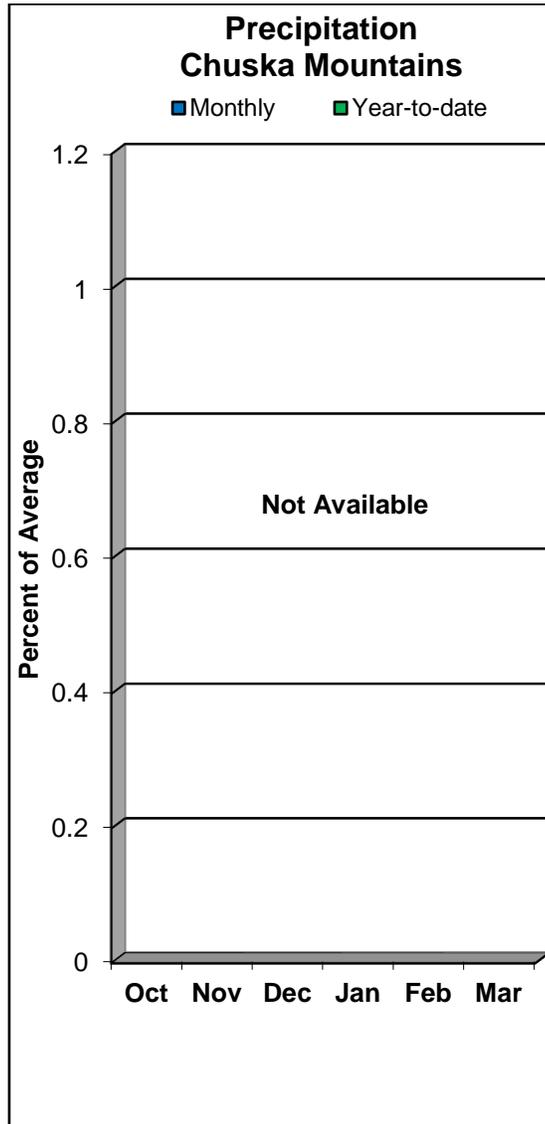
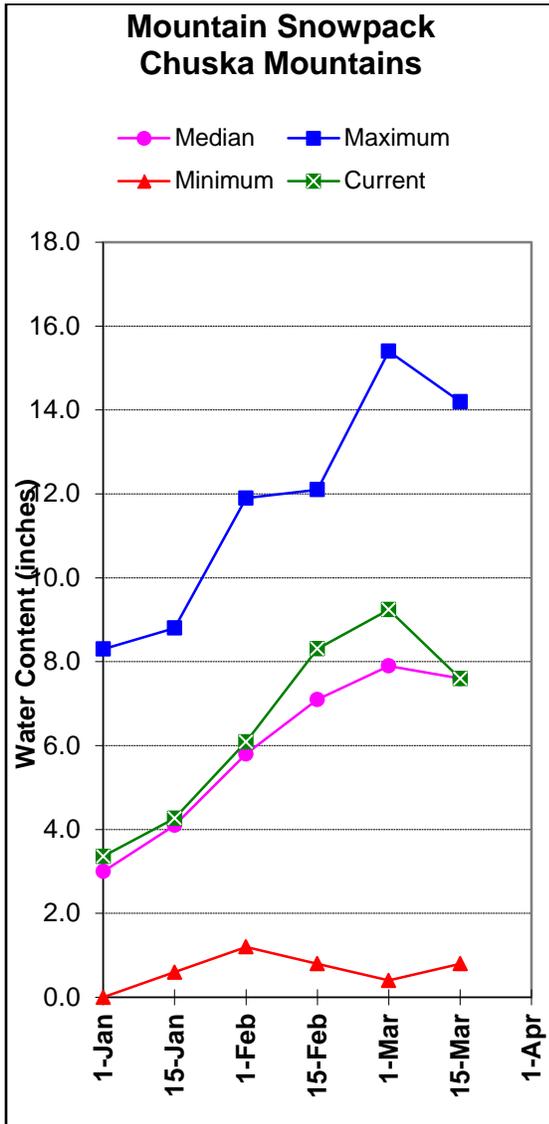
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=====
                                LITTLE COLORADO RIVER BASIN
                                Watershed Snowpack Analysis - March 15, 2013
=====
Watershed      Number of Data Sites      This Year as Percent of
                |                    | Last Year  Median
=====
LITTLE COLORADO - SOUTHERN H      10                183      100
CENTRAL MOGOLLON RIM              4                 226      108
=====

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## CHUSKA MOUNTAINS as of March 15, 2013

Snow survey measurements conducted by staff of the Navajo Water Management Branch show the Chuska snowpack to be at 100% of median. Below normal runoff is forecast for Captain Tom Wash and Kinlichee Creek, while about normal runoff is forecast for Wheatfields Creek and Bowl Canyon Creek.



CHUSKA MOUNTAINS as of March 15, 2013

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=====
                        CHUSKA MOUNTAINS
                    Streamflow Forecasts - March 15, 2013
=====
Forecast Pt | <=== Drier === Future Conditions === Wetter ===> |
Forecast     | ===== Chance of Exceeding * ===== |
Period      | (1000AF) (1000AF) | (1000AF) (% AVG.) | (1000AF) (1000AF) | (1000AF)
=====
Captain Tom Wash nr Two Gray Hills
MAR-MAY      0.71    1.37    2.00    77    2.80    4.30    2.60

Wheatfields Ck nr Wheatfields
MAR-MAY      0.89    1.50    2.00    95    2.60    3.60    2.10

Bowl Canyon Ck ab Asaayi Lake
MAR-MAY      0.71    0.98    1.20    92    1.44    1.82    1.30

Kinlichee Ck
MAR-MAY      0.38    0.84    1.30    86    1.90    3.10    1.52
=====

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\* 90%, 70%, 50%, 30%, and 10% chances of exceeding are the probabilities that the actual volume will exceed the volumes in the table.

The average is computed for the 1981-2010 base period.

- (1) - The values listed under the 10% and 90% Chance of Exceeding are actually 5% and 95% exceedance levels.
- (2) - The value is natural volume - actual volume may be affected by upstream water management.
- (3) - Median value used in place of average.

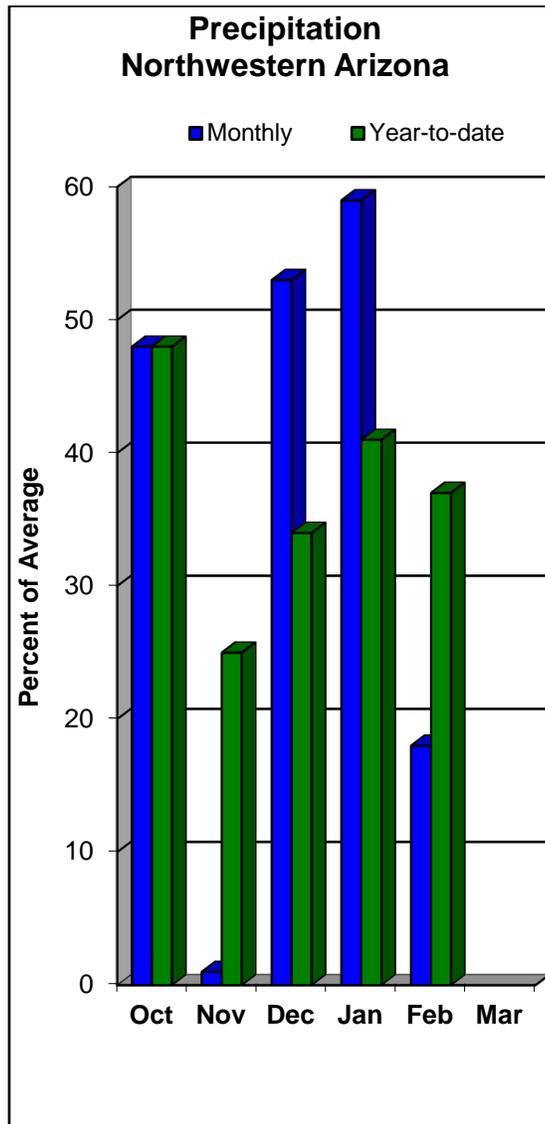
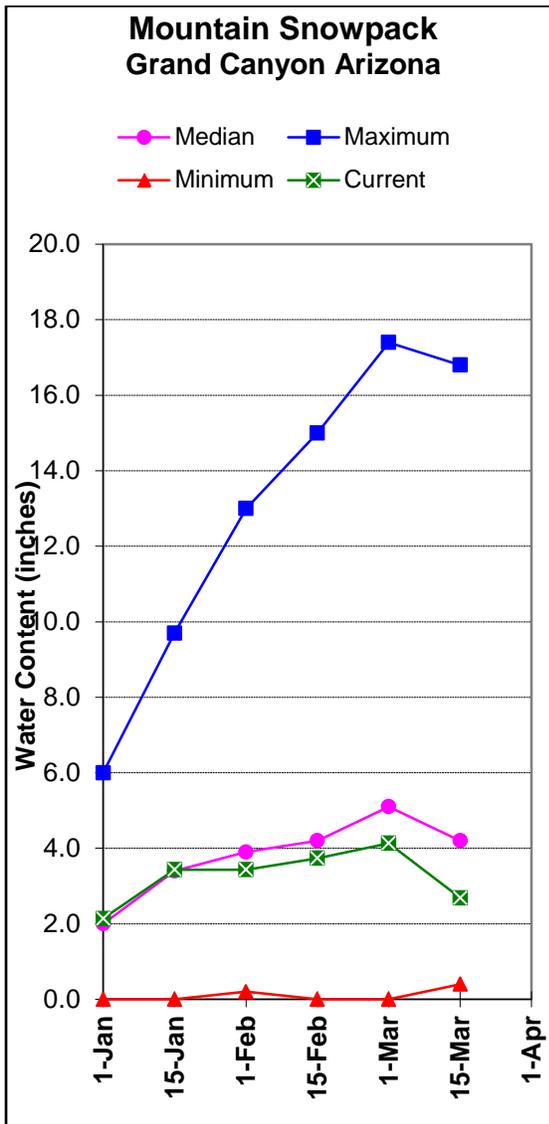
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                        CHUSKA MOUNTAINS
                    Watershed Snowpack Analysis - March 15, 2013
=====
Watershed           Number of           This Year as Percent of
                    Data Sites         Last Year           Median
=====
CHUSKA MOUNTAINS           6                145                100
DEFIANCE PLATEAU           2                4200               145
=====

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## NORTHWESTERN ARIZONA as of March 15, 2013

On the Colorado River, well below normal inflow to Lake Powell is forecast at 42% 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 64% of median.



NORTHWESTERN ARIZONA as of March 15, 2013

NORTHWESTERN ARIZONA  
Streamflow Forecasts - March 15, 2013

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Forecast Pt Forecast Period	<=== Drier === Future Conditions === Wetter ===>					30 Yr Avg (1000AF)	
	Chance of Exceeding * 90%      70%      50%      30%      10% (1000AF) (1000AF) (1000AF) (% AVG.) (1000AF) (1000AF)						
Lake Powell Inflow (2)							
APR-JUL	1330	2240	3000	42	3870	5350	7160

\* 90%, 70%, 50%, 30%, and 10% chances of exceeding are the probabilities that the actual volume will exceed the volumes in the table.

The average is computed for the 1981-2010 base period.

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- (2) - The value is natural volume - actual volume may be affected by upstream water management.
- (3) - Median value used in place of average.

NORTHWESTERN ARIZONA  
Reservoir Storage (1000AF) Mid-March

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Reservoir	Usable	***** Usable Storage *****		
	Capacity	This Year	Last Year	Average
LAKE HAVASU	619.0	577.5	557.9	559.5
LAKE MOHAVE	1810.0	1661.7	1668.0	1692.0
LAKE MEAD	26159.0	13676.0	14763.0	20543.0
LAKE POWELL	24322.0	11769.0	15411.0	16977.0

NORTHWESTERN ARIZONA  
Watershed Snowpack Analysis - March 15, 2013

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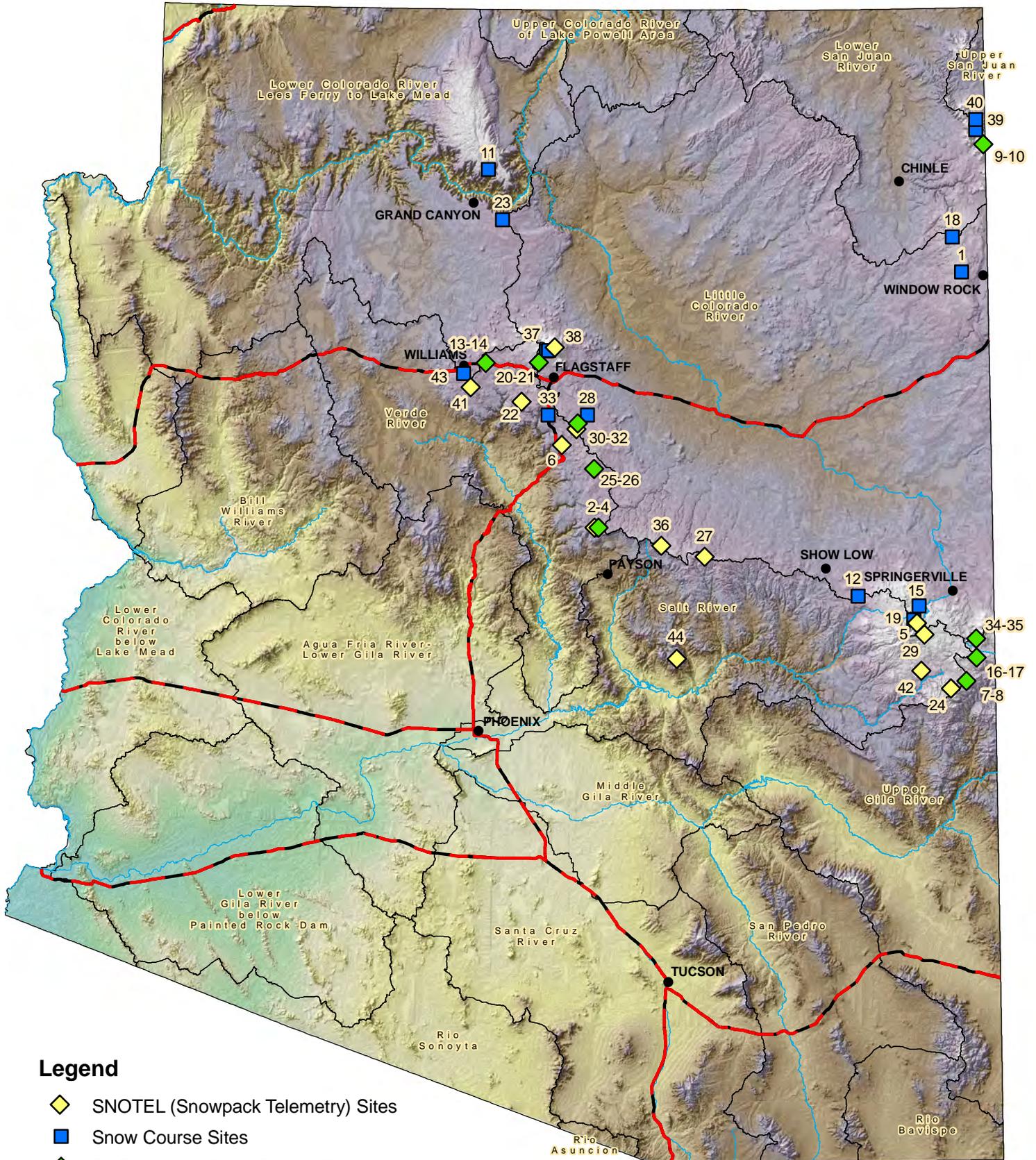
Watershed	Number of	This Year as Percent of	
	Data Sites	Last Year	Median
GRAND CANYON	2	143	64

S N O W   S U R V E Y   D A T A

MARCH 15, 2013

MAP NUM.	SNOW COURSE	ELEV.	DATE	SNOW DEPTH	WATER CONTENT	LAST YEAR	MEDIAN 81-10
1.	ARBABS FOREST (AK)	7680	3/11	4	1.4	.0	.9
2.	BAKER BUTTE SNOTEL	7330	3/15	11	3.3	.0	3.6
3.	BAKER BUTTE #2	7700	3/15	34	11.9	6.6	12.1
4.	BAKER BUTTE SMT SNTL	7700	3/15	40	13.3	9.3	-
5.	BALDY SNOTEL	9220	3/15	22	6.8	3.9	7.9
6.	BAR M SNOTEL	6393	3/15	0	.0	-	-
7.	BEAVER HEAD	8000	3/13	1	.4	.0	1.4
8.	BEAVER HEAD SNOTEL	7990	3/15	0	.6	.0	3.8
9.	BEAVER SPRING	9220	3/13	26	8.4	6.6	9.2
10.	BEAVER SPRING SNOTEL	9200	3/15	24	9.7	6.1	-
11.	BRIGHT ANGEL	8400	3/15	17	5.3	3.7	8.0
12.	BUCK SPRING	7400	3/15	0	.0	.0	.9
13.	CHALENDER	7100	3/14	1	.6	.0	1.1
14.	CHALENDER SNOTEL	7100	3/15	1	.9	.0	-
15.	CHEESE SPRINGS	8600	3/14	19	6.1	5.5	5.7
16.	CORONADO TRL SNOTEL	8400	3/14	0	.0	.0	.0
17.	CORONADO TRAIL	8400	3/13	0	.0	.0	.7
18.	FLUTED ROCK	7800	3/11	9	2.8	.1	2.0
19.	FORT APACHE	9160	3/14	31	9.6	7.6	8.0
20.	FORT VALLEY	7350	3/14	0	.1	.0	1.0
21.	FORT VALLEY SNOTEL	7350	3/15	-	.2	.0	-
22.	FRY SNOTEL	7220	3/15	6	3.8	1.6	3.7
23.	GRAND CANYON	7500	3/15	0	.0	.0	.3
24.	HANNAGAN MDWS SNOTEL	9020	3/15	22	7.5	8.9	11.1
25.	HAPPY JACK	7630	3/14	8	3.3	.0	3.0
26.	HAPPY JACK SNOTEL	7630	3/15	25	8.4	3.7	4.9
27.	HEBER SNOTEL	7640	3/15	9	3.6	.4	1.2
28.	LAKE MARY	6970	3/14	2	.7	.0	.6
29.	MAVERICK FORK SNOTEL	9200	3/15	21	6.9	3.9	9.1
30.	MORMON MTN SNOTEL	7500	3/15	11	3.9	.1	4.6
31.	MORMON MT. SUMMIT #2	8470	3/15	27	10.1	6.2	11.2
32.	MORMON MTN SUMMIT SN	8500	3/15	24	8.3	5.9	-
33.	NEWMAN PARK	6750	3/14	1	.2	.0	.4
34.	NUTRIOSO	8500	3/13	0	.0	.0	.4
35.	NUTRIOSO SNOTEL	8500	3/15	1	.2	.2	-
36.	PROMONTORY SNOTEL	7900	3/15	32	11.7	3.1	11.4
37.	SNOW BOWL #2	11000	3/14	54	12.8	8.0	17.8
38.	SNOWSLIDE CYN SNTL	9750	3/15	51	16.3	10.9	17.1
39.	TSAILE CANYON #1	8160	3/11	26	8.6	3.4	6.4
40.	TSAILE CANYON #3	8920	3/11	35	11.0	7.5	9.3
41.	WHITE HORSE SNOTEL	7180	3/15	1	.6	.0	2.1
42.	WILDCAT SNOTEL	7850	3/15	0	.2	.0	1.9
43.	WILLIAMS SKI RUN	7720	3/14	25	9.5	4.2	8.4
44.	WORKMAN CREEK SNOTEL	6900	3/15	6	3.5	.4	1.5

# Arizona Snow Survey Data Sites



## Legend

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

