

# Colorado

## Water Supply Outlook Report

### April 1, 2015



Snow surveyors Zack Wilson and Lexi Landers perform measurements along the Deer Ridge snow course in Rocky Mountain National Park. Temperatures were warm and snow was patchy along the snow course late in March, but Zack and Lexi measured an average depth of 17 inches and an average snow water equivalent (SWE) of 6.4 inches. These measurements were above the normal median depth of 15 inches and SWE of 4 inches typically observed on April 1<sup>st</sup>.

Date: 3/30/2015

Photo By: Pamela Johnson (Loveland Reporter-Herald)

**REMINDER:** We are soliciting field work photos from our snow surveyors again this year. Each month we will pick one to grace the cover of this report! The photographer will be given proper credit of course. Please include information on where, when and of who/what the photo was taken.

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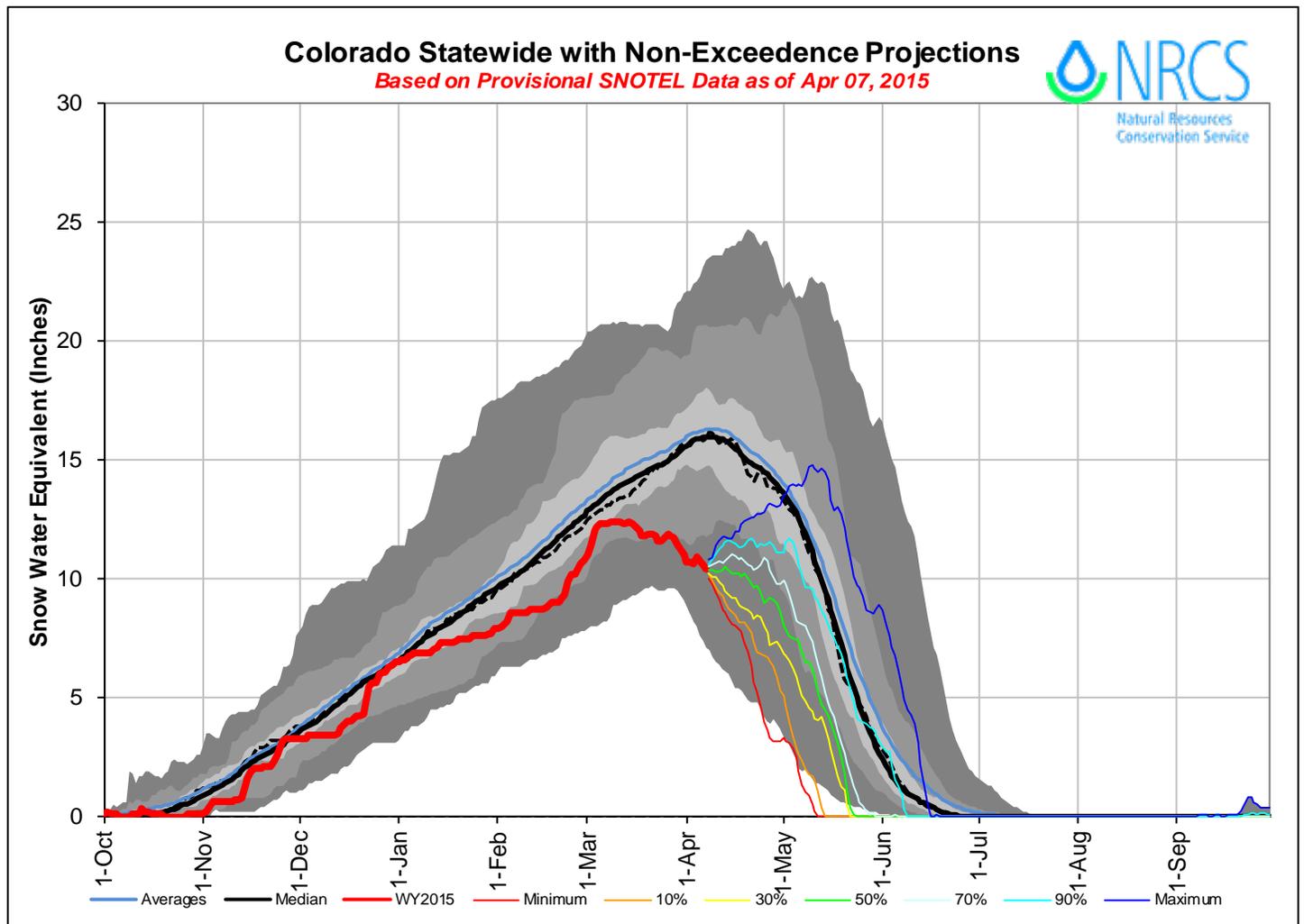
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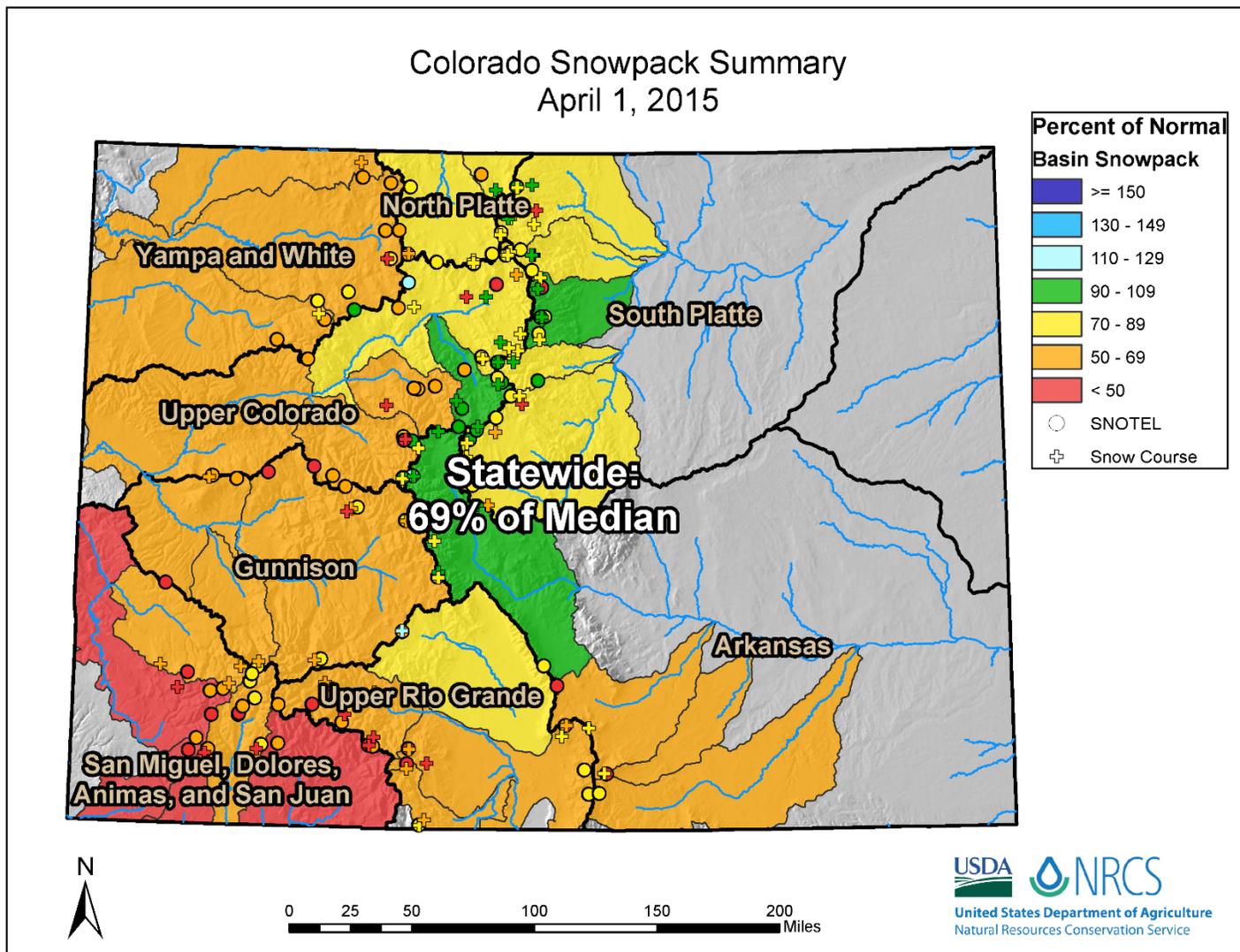
# Statewide Water Supply Conditions

## Summary

At this point, even the most optimistic snowfall forecasts would not provide the amount of snowpack accumulation needed to reach the median peak snowpack levels. Currently Colorado snowpack is in the bottom tenth percentile for the period of record. As the low and mid elevation snowpacks succumb to warmer temperatures and start melting, it will not take much additional energy to start the melt of the higher elevation snowpacks. Reports have been coming in for more than a month from some locations in southwest Colorado that high-elevation snow has transitioned to a spring-time snowpack ready to melt and generate runoff. With the warm and dry weather of the past few weeks, significant melt across the rest of the state's high country snowpack can't be far behind. If high elevation snow begins to melt by the middle of April, it would be nearly three weeks early. This, in addition to the below normal snowpack, could have further negative ramifications on summer runoff. To make up snow-water shortages Colorado will need to rely predominately on rain for the remainder of the water year. With the month of April typically providing the greatest contribution to the annual precipitation total, Colorado and other downstream states have high hopes that April will provide above normal precipitation in any form. Storage in reservoirs will be increasing as runoff ramps up and while statewide reservoir storage is above normal, the difference is vast between north and south. Despite better reservoir storage levels in the northern half of the state, streamflow forecasts are going to be the best indicator of expected water availability through the summer.



## Snowpack

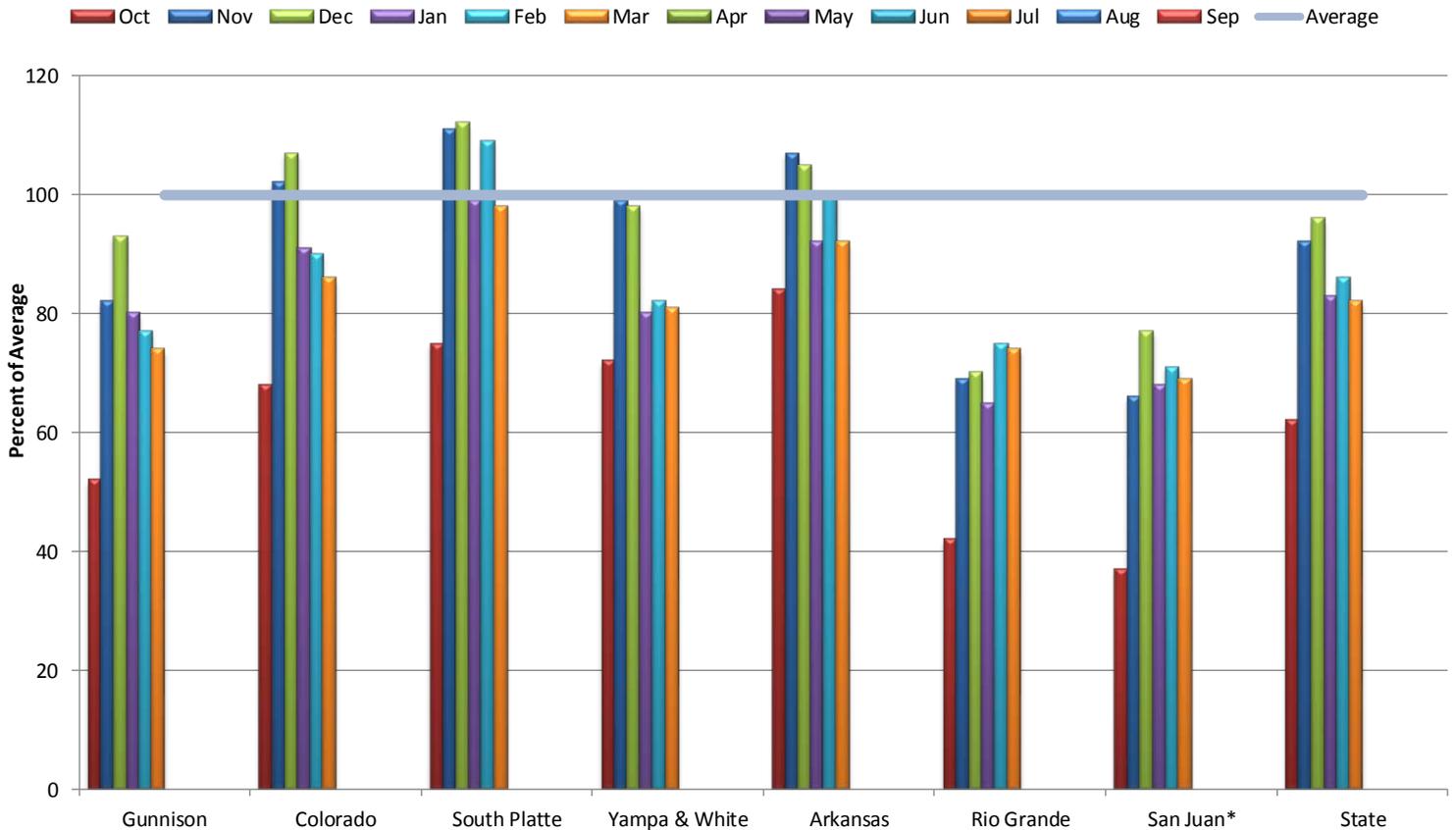


After the large storm system that spanned the end of February and into the first week of March, the rest of the month passed with minimal net snow accumulation across the state, which was reflected through notable declines in the percent of normal snowpack. Between March 1 and April 1 statewide percent of median snowpack dropped by 18 percent, to 69 percent of the normal amount typically observed at the beginning of April. The South Platte basin had the largest drop in snowpack (relative to normal) in the state and now sits 23 percent of normal less than a month ago and is currently tied with the Arkansas for the most plentiful snowpack in Colorado, at 87 percent. The combined Animas, Dolores, San Miguel, and San Juan basins of southwest Colorado experienced the second largest drop in the percent of normal snowpack during March. These basins, comprising the southern San Juan Mountains, have experienced warm and dry conditions for much of the winter and now have only 49 percent of their normal April 1 snowpack. The Upper Rio Grande, Gunnison, and combined Yampa and White basins have slightly more plentiful snowpacks, at 59, 63, and 65 percent of normal, respectively. The Upper Colorado is reporting a snowpack that is 76 percent of normal, similar to the headwaters of the North Platte, which is at 73 percent.

# Precipitation

## Colorado Year-to-Date Precipitation Summary for WY2015

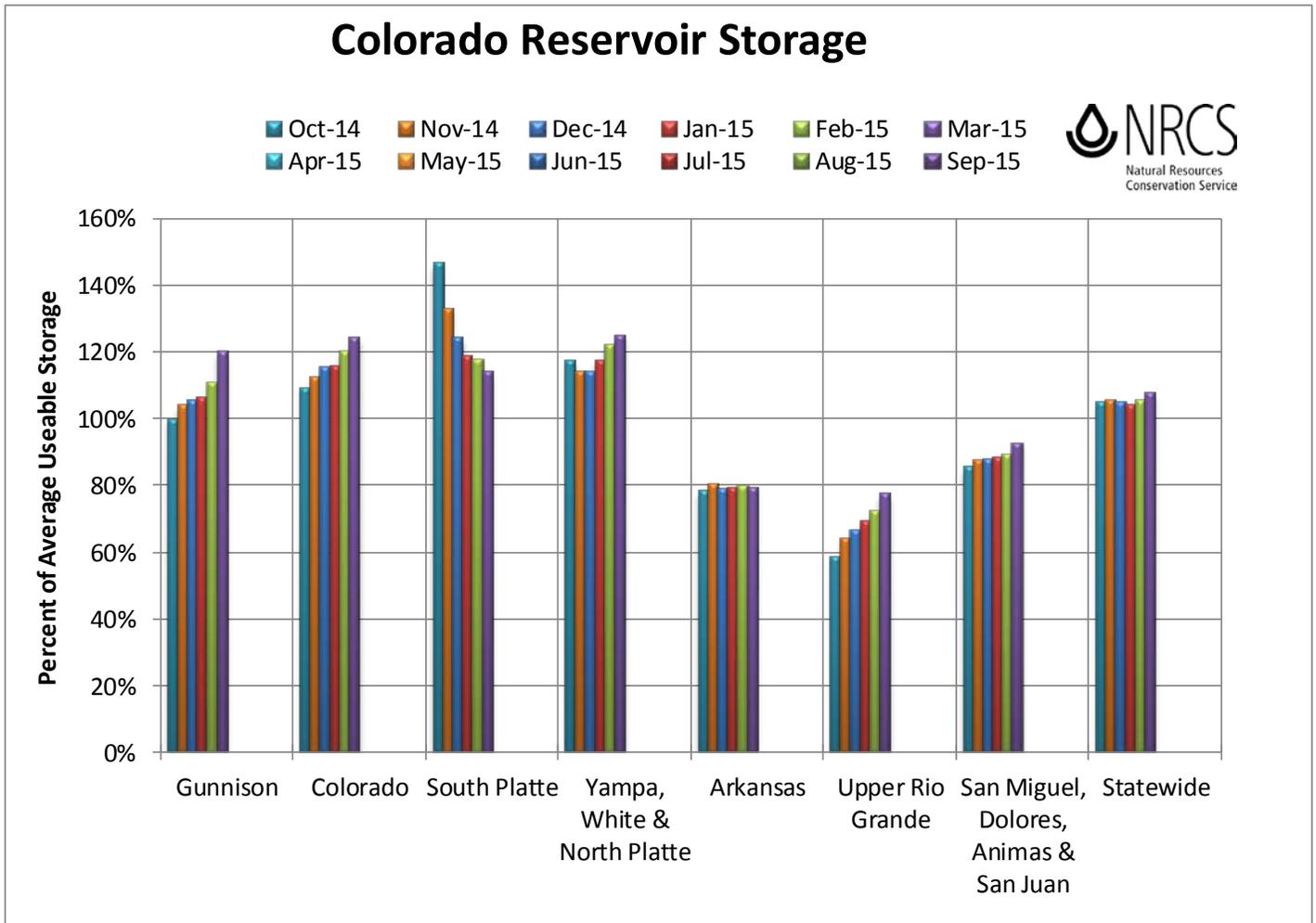
USDA Natural Resources Conservation Service



\*Includes Animas, Dolores, San Miguel Basins

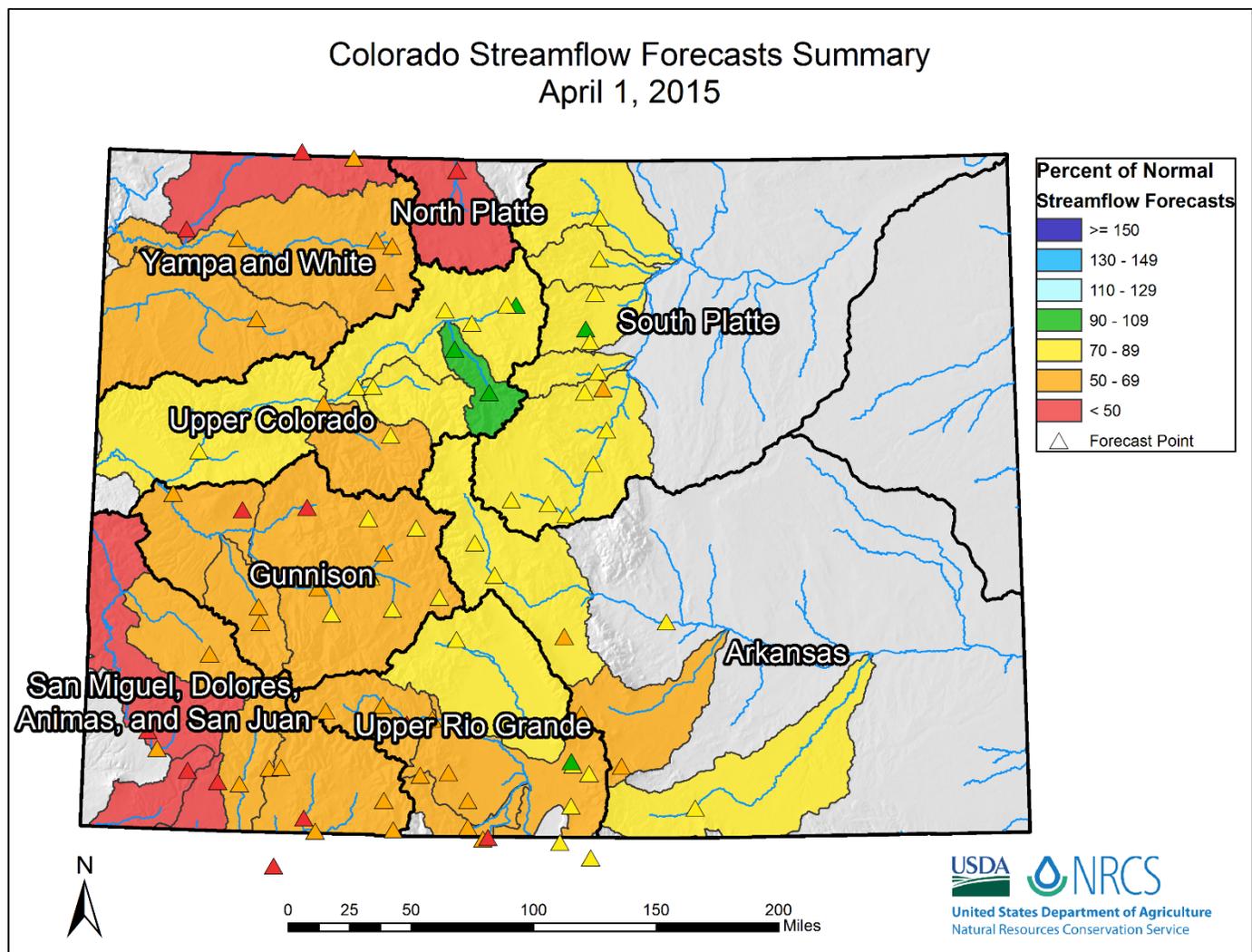
Although March started off with several days of substantial precipitation, the rest of the month remained much drier than normal across Colorado. Statewide, precipitation at Colorado SNOTEL sites was only 63 percent of average in March, leaving the water-year-to-date (WYTD) precipitation slightly lower than last month at 82 percent of average. The San Miguel, Dolores, Animas, and San Juan basins collectively received the least amount of precipitation in the state (compared to normal) at 57 percent, followed closely by the South Platte basin at 58 percent. Due to several of the previous months having well above average precipitation, the South Platte basin currently resides at near normal WYTD precipitation but the same cannot be said about the basins in southwest Colorado, which have only received 69 percent of their average precipitation so far this water year. The Upper Rio Grande and the combined Yampa, White, and North Platte basins received the largest percent of normal March precipitation in the state, at 71 and 73 percent of normal, respectively. While these monthly amounts were well below normal, these basins experienced the smallest drop in WYTD precipitation of anywhere in the state and are only one percent less than a month ago. The lack of March precipitation in the South Platte basin caused the largest drop in percent of normal WYTD precipitation, from 109 to 98 percent, over the past month.

## Reservoir Storage



Reservoir storage across Colorado has increased slightly over the past month and is currently 107 percent of average. In general, the basins in the southern half of the state continue to have below average reservoir storage while storage in the northern portions of the state have continued to hold above average volumes of water. While still well below normal, the Upper Rio Grande basin has had an increase of nearly 20 percent of average reservoir storage since the beginning of the water year in October and currently resides at 77 percent of average. Reservoirs in the Gunnison River basin have also observed a similar increase in storage over the water year, including a 13 percent increase during March alone; basin-wide storage is 120 percent of average as of the beginning of April. The Upper Colorado and the combined Yampa, White, and North Platte River basins currently have the highest percent of average reservoir storage in the state, near 125 percent. Storage in the South Platte basin has dropped substantially (33 percent) over the course of the water year but is still above normal, at 114 percent of the average amount. Reservoir storage in the Arkansas basin continues to remain at similar levels to what has been observed throughout the water-year-to-date, near 80 percent of average.

## Streamflow



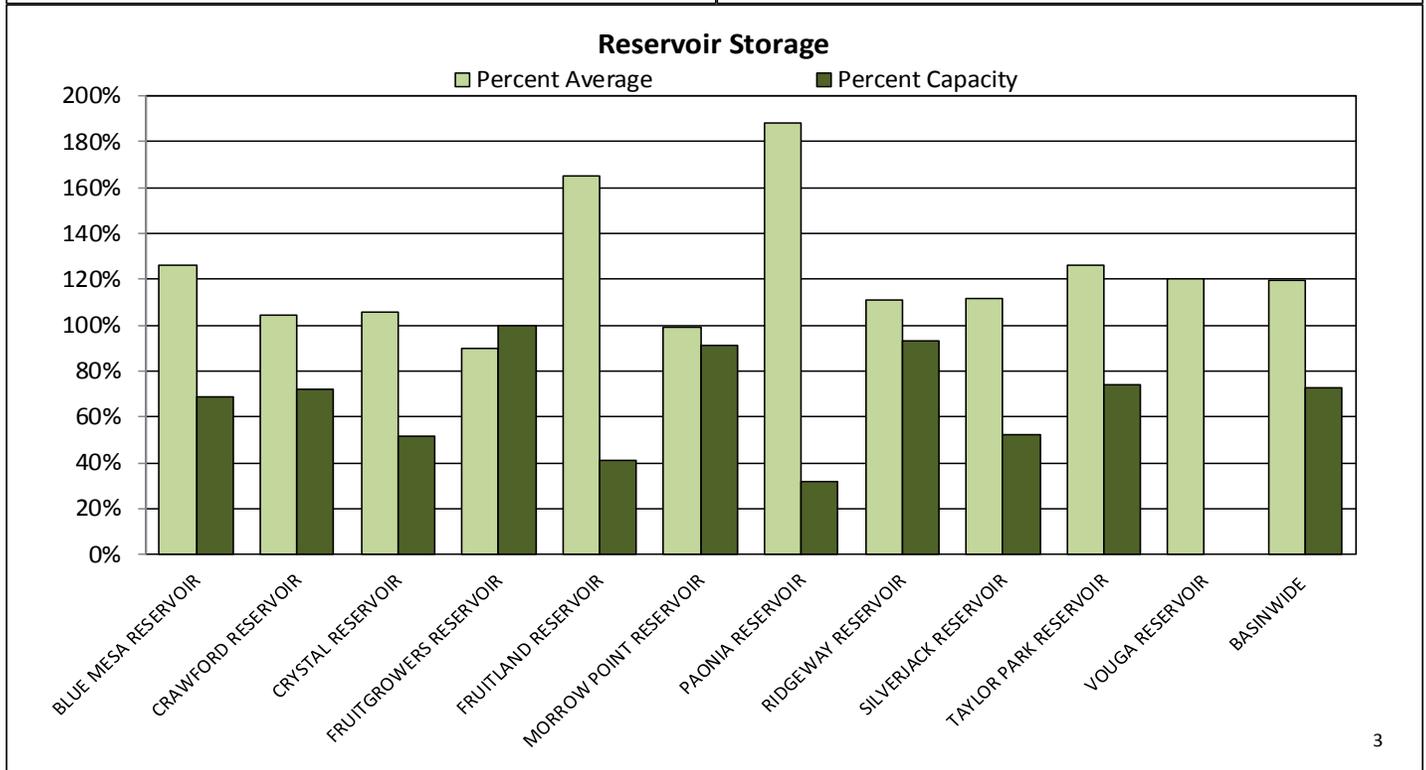
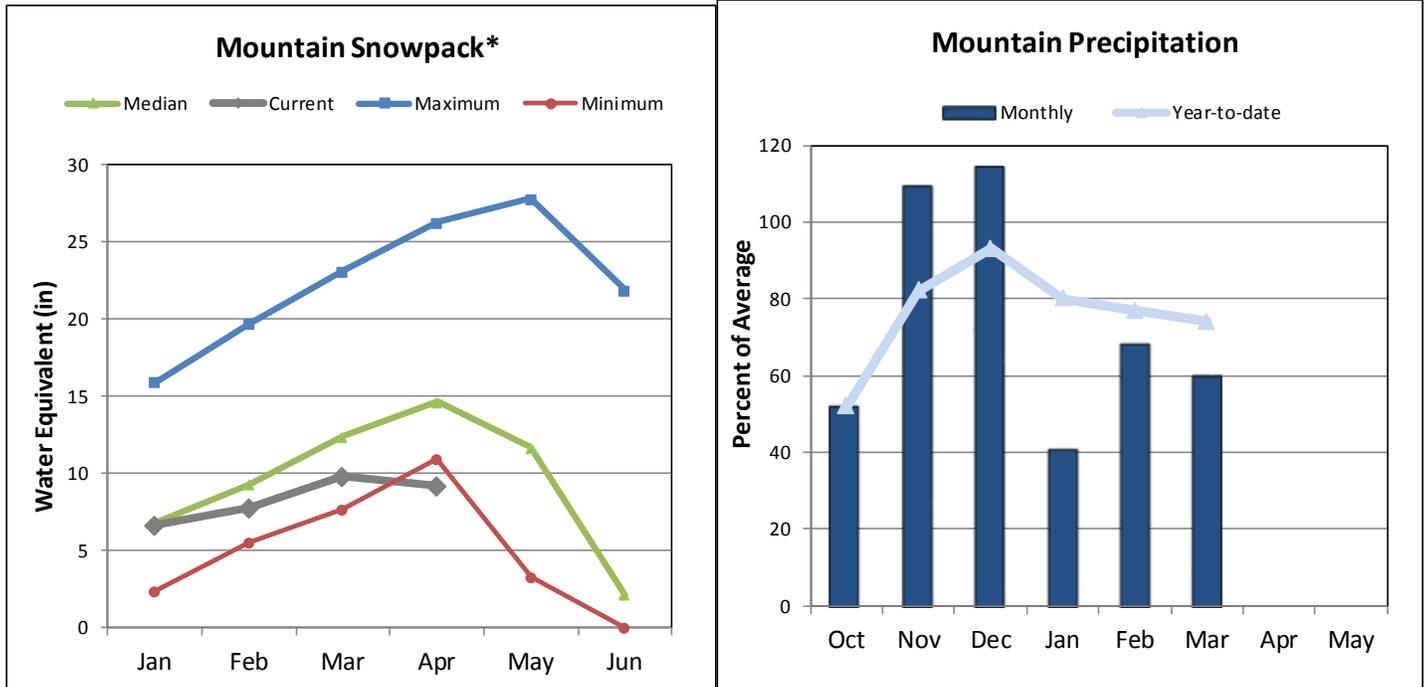
Statewide streamflow forecasts range from 31 percent of average at the Paonia Reservoir Inflow to as high as 102 percent of average at Dillon Reservoir inflow. With such great variation it is worth mentioning that southwest Colorado is currently projected to have the lowest runoff from the San Juan Mountains due to the snowpack, which is currently well below normal amounts. Northwestern Colorado basins such as the Yampa, White, Little Snake and North Platte River basins can also anticipate lower volumes of water from snowmelt as January and March were particularly dry precipitation months. The lower section of the Gunnison River basin as well as the western half of the Rio Grande River basin will also likely yield well below normal streamflows. Moving eastward, the Continental Divide in Colorado provides the best snowpack and resulting streamflow forecasts. Generally, the best projections exist the further north one goes along Colorado's Continental Divide in the South Platte and Upper Colorado River basins.

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# GUNNISON RIVER BASIN

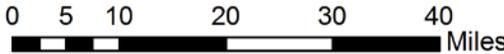
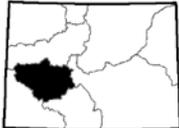
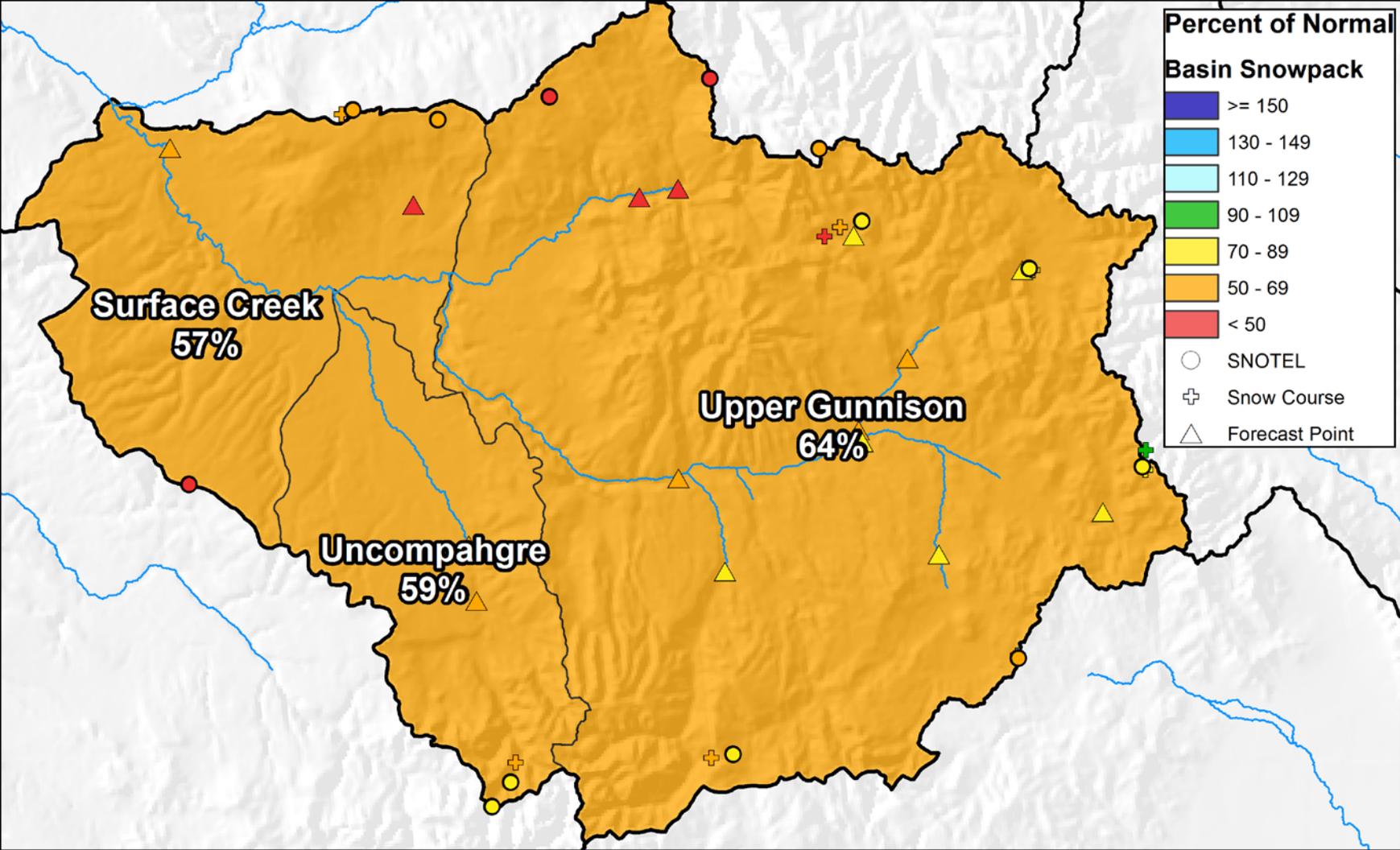
April 1, 2015

Snowpack in the Gunnison River basin is below normal at 63% of the median. Precipitation for March was 59% of average which brings water year-to-date precipitation down to 74% of average. Reservoir storage at the end of March was 120% of average compared to 94% last year. Current streamflow forecasts range from 77% of average for the Lake Fork at Gateview to 31% of average for the Paonia Reservoir Inflow.



# Gunnison River Basin Snowpack and Streamflow Forecasts

April 1, 2015



## Gunnison River Basin Streamflow Forecasts - April 1, 2015

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

| GUNNISON RIVER BASIN                      | Forecast Period | 90% (KAF) | 70% (KAF) | 50% (KAF) | % Avg | 30% (KAF) | 10% (KAF) | 30yr Avg (KAF) |
|---|-----------------|-----------|-----------|-----------|-------|-----------|-----------|----------------|
| Taylor Park Reservoir Inflow              | APR-JUL         | 54        | 65        | 73        | 74%   | 82        | 96        | 99             |
| Slate R nr Crested Butte                  | APR-JUL         | 49        | 56        | 61        | 73%   | 66        | 73        | 83             |
| East R at Almont                          | APR-JUL         | 93        | 109       | 120       | 66%   | 132       | 151       | 182            |
| Gunnison R near Gunnison <sup>2</sup>     | APR-JUL         | 166       | 205       | 230       | 62%   | 260       | 310       | 370            |
| Tomichi Ck at Sargents                    | APR-JUL         | 11.8      | 17.1      | 21        | 70%   | 26        | 34        | 30             |
| Cochetopa Ck bl Rock Ck nr Parlin         | APR-JUL         | 4.6       | 8.1       | 11        | 73%   | 14.4      | 20        | 15             |
| Tomichi Ck at Gunnison                    | APR-JUL         | 24        | 41        | 55        | 74%   | 71        | 98        | 74             |
| Lake Fk at Gateview                       | APR-JUL         | 68        | 84        | 95        | 77%   | 107       | 127       | 123            |
| Blue Mesa Reservoir Inflow <sup>2</sup>   | APR-JUL         | 335       | 405       | 460       | 68%   | 515       | 605       | 675            |
| Paonia Reservoir Inflow                   | MAR-JUN         | 20        | 28        | 35        | 36%   | 42        | 54        | 96             |
|   | APR-JUN         | 15.4      | 23        | 30        | 33%   | 37        | 49        | 91             |
|   | APR-JUL         | 14        | 23        | 30        | 31%   | 38        | 52        | 97             |
| NF Gunnison R nr Somerset <sup>2</sup>    | APR-JUL         | 100       | 123       | 140       | 48%   | 158       | 187       | 290            |
| Surface Ck at Cedaredge                   | APR-JUL         | 4.1       | 5.2       | 6         | 36%   | 6.9       | 8.3       | 16.8           |
| Ridgway Reservoir Inflow                  | APR-JUL         | 48        | 61        | 70        | 69%   | 80        | 96        | 101            |
| Uncompahgre R at Colona <sup>2</sup>      | APR-JUL         | 54        | 74        | 90        | 66%   | 107       | 135       | 137            |
| Gunnison R nr Grand Junction <sup>2</sup> | APR-JUL         | 535       | 680       | 790       | 53%   | 905       | 1090      | 1480           |

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

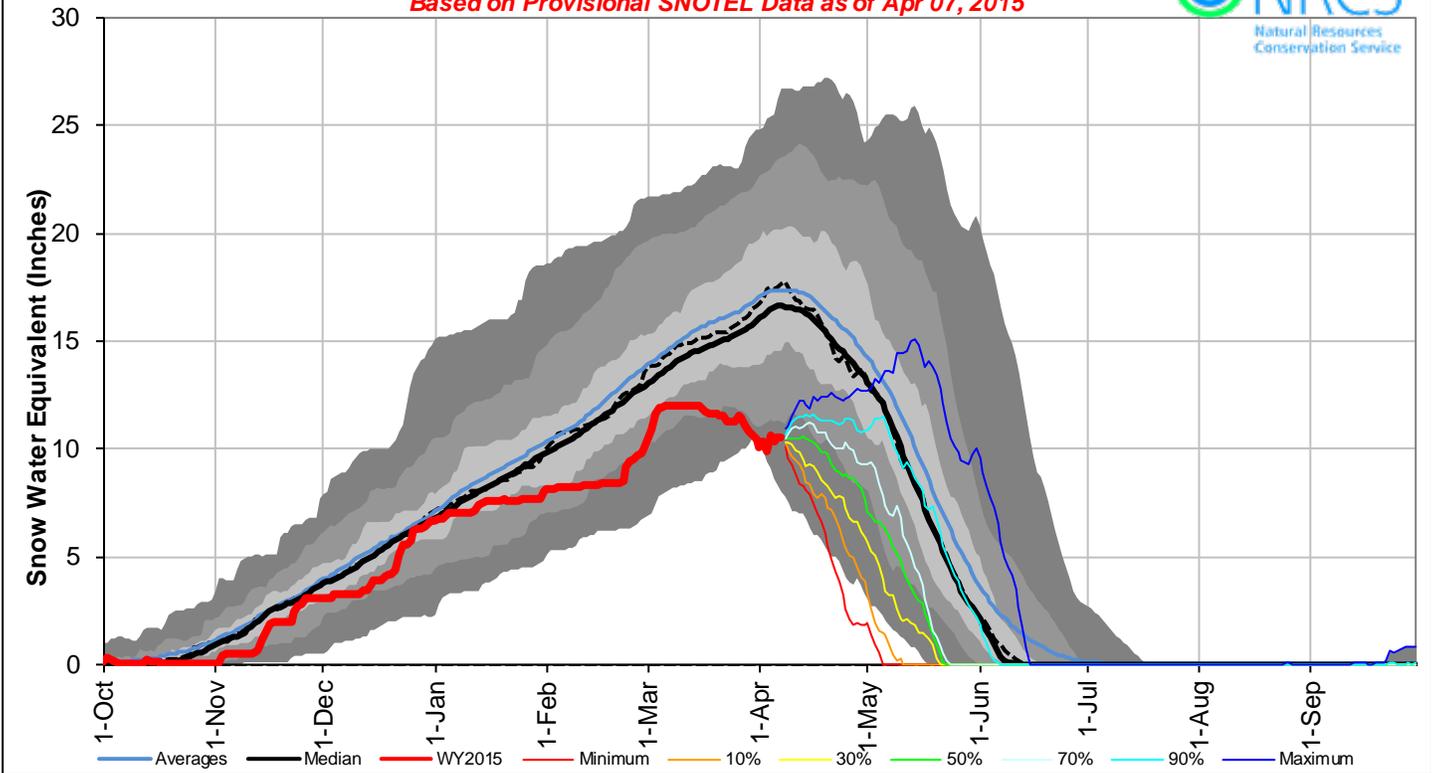
3) Median value used in place of average

| Reservoir Storage<br>End of March, 2015 | Current (KAF) | Last Year (KAF) | Average (KAF) | Capacity (KAF) |
|---|---------------|-----------------|---------------|----------------|
| Blue Mesa Reservoir                     | 573.0         | 406.3           | 454.9         | 830.0          |
| Crawford Reservoir                      | 10.1          | 7.3             | 9.7           | 14.0           |
| Crystal Reservoir                       | 9.0           | 6.9             | 8.5           | 17.5           |
| Fruitgrowers Reservoir                  | 3.6           | 3.6             | 4.0           | 3.6            |
| Fruitland Reservoir                     | 3.8           | 2.4             | 2.3           | 9.2            |
| Morrow Point Reservoir                  | 110.4         | 106.6           | 111.7         | 121.0          |
| Paonia Reservoir                        | 4.9           | 0.4             | 2.6           | 15.4           |
| Ridgway Reservoir                       | 77.6          | 74.3            | 70.0          | 83.0           |
| Silverjack Reservoir                    | 6.7           | 9.2             | 6.0           | 12.8           |
| Taylor Park Reservoir                   | 78.7          | 71.1            | 62.4          | 106.0          |
| Vouga Reservoir                         | 0.9           | 0.4             | 0.8           | 0.9            |
| Basin-wide Total                        | 878.7         | 688.5           | 732.9         | 1213.4         |
| # of reservoirs                         | 11            | 11              | 11            | 11             |

| Watershed Snowpack Analysis<br>April 1, 2015 | # of Sites | % Median | Last Year % Median |
|--|------------|----------|--------------------|
| UPPER GUNNISON BASIN                         | 18         | 64%      | 116%               |
| SURFACE CREEK BASIN                          | 3          | 57%      | 95%                |
| UNCOMPAHGRE BASIN                            | 4          | 59%      | 93%                |
| GUNNISON RIVER BASIN                         | 22         | 63%      | 111%               |

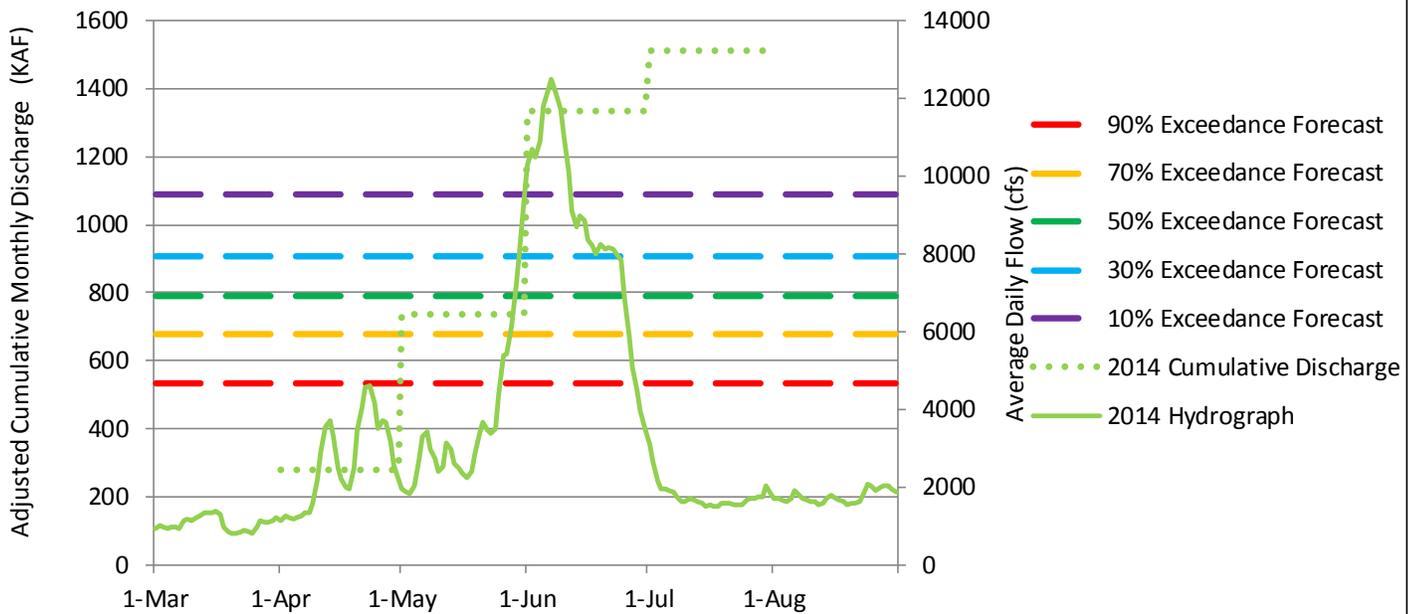
## Gunnison River Basin with Non-Exceedence Projections

Based on Provisional SNOTEL Data as of Apr 07, 2015



## Gunnison River near Grand Junction, CO

### Daily and Cumulative Discharge Compared to Current Streamflow Forecasts (Apr - Jul)

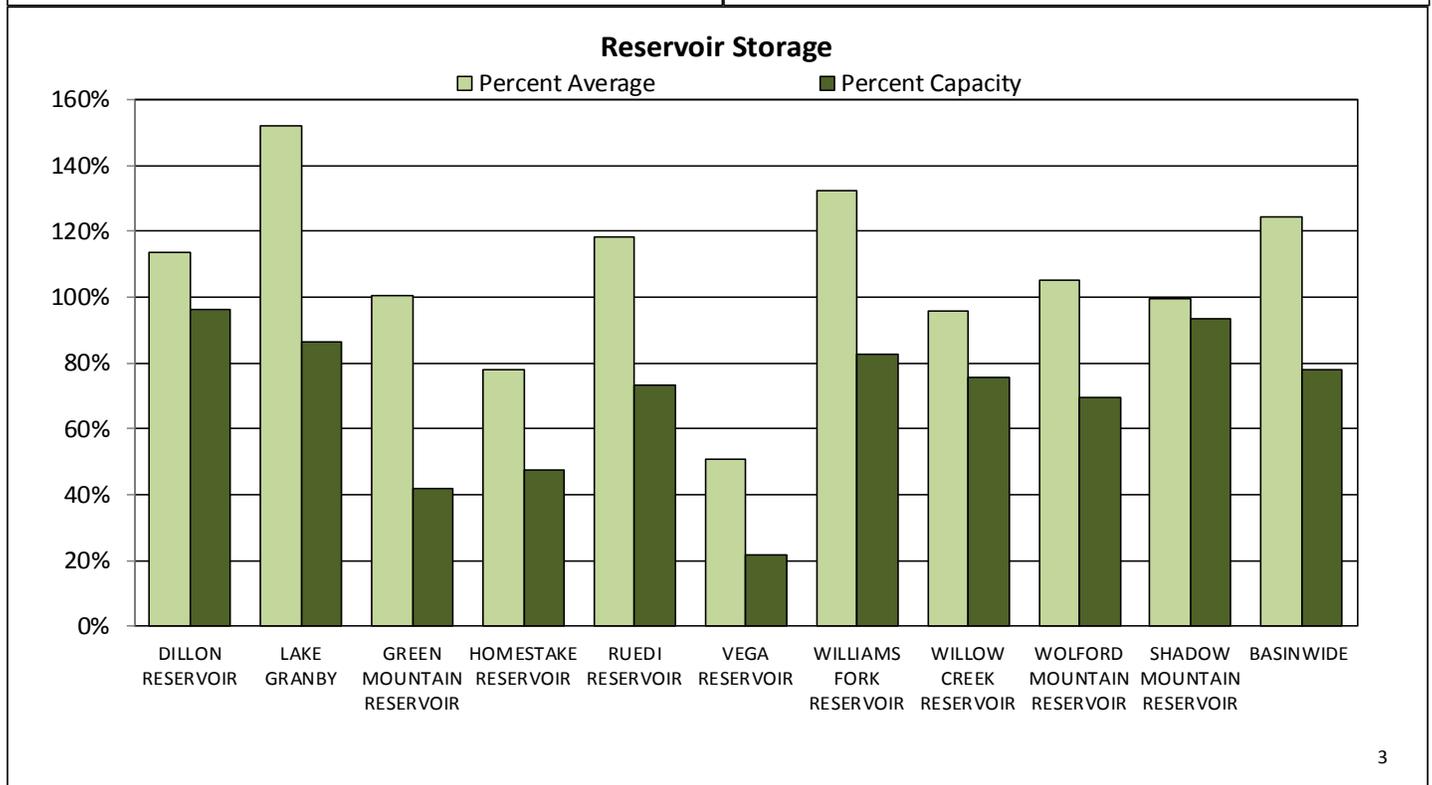
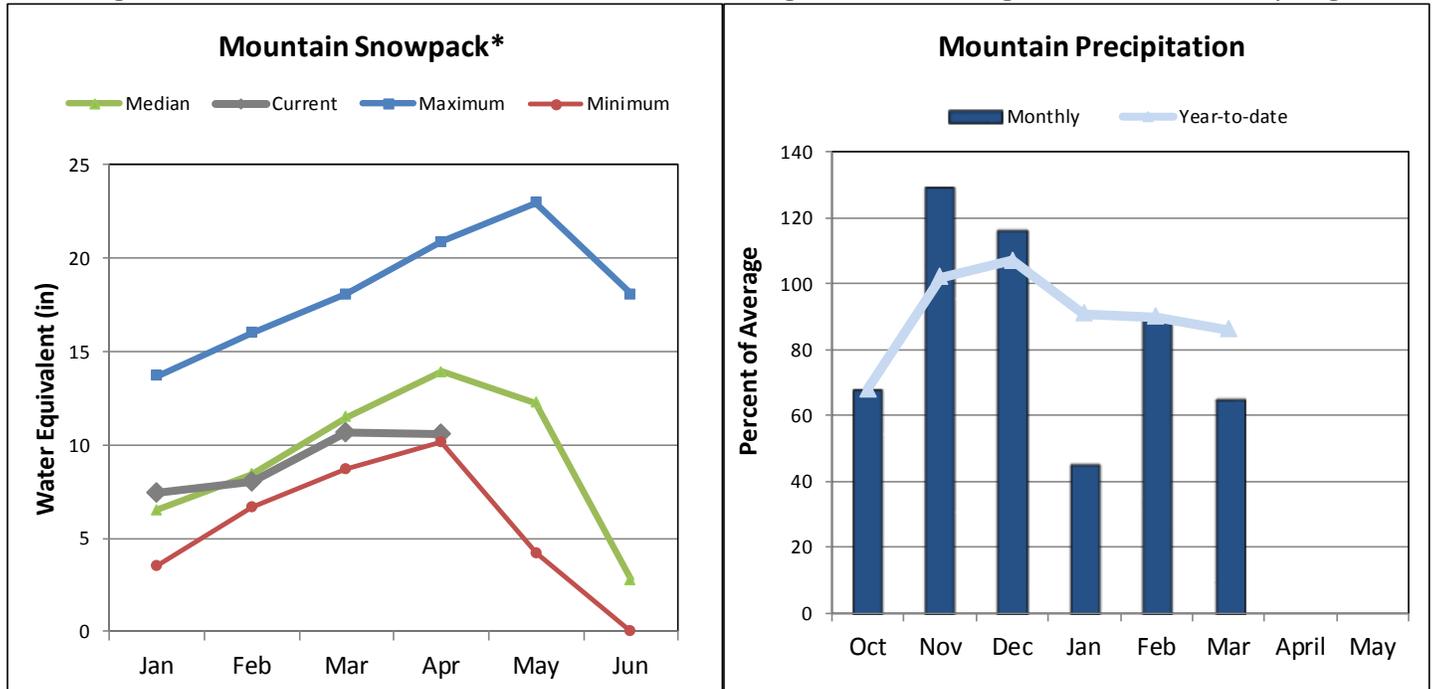


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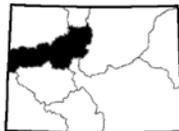
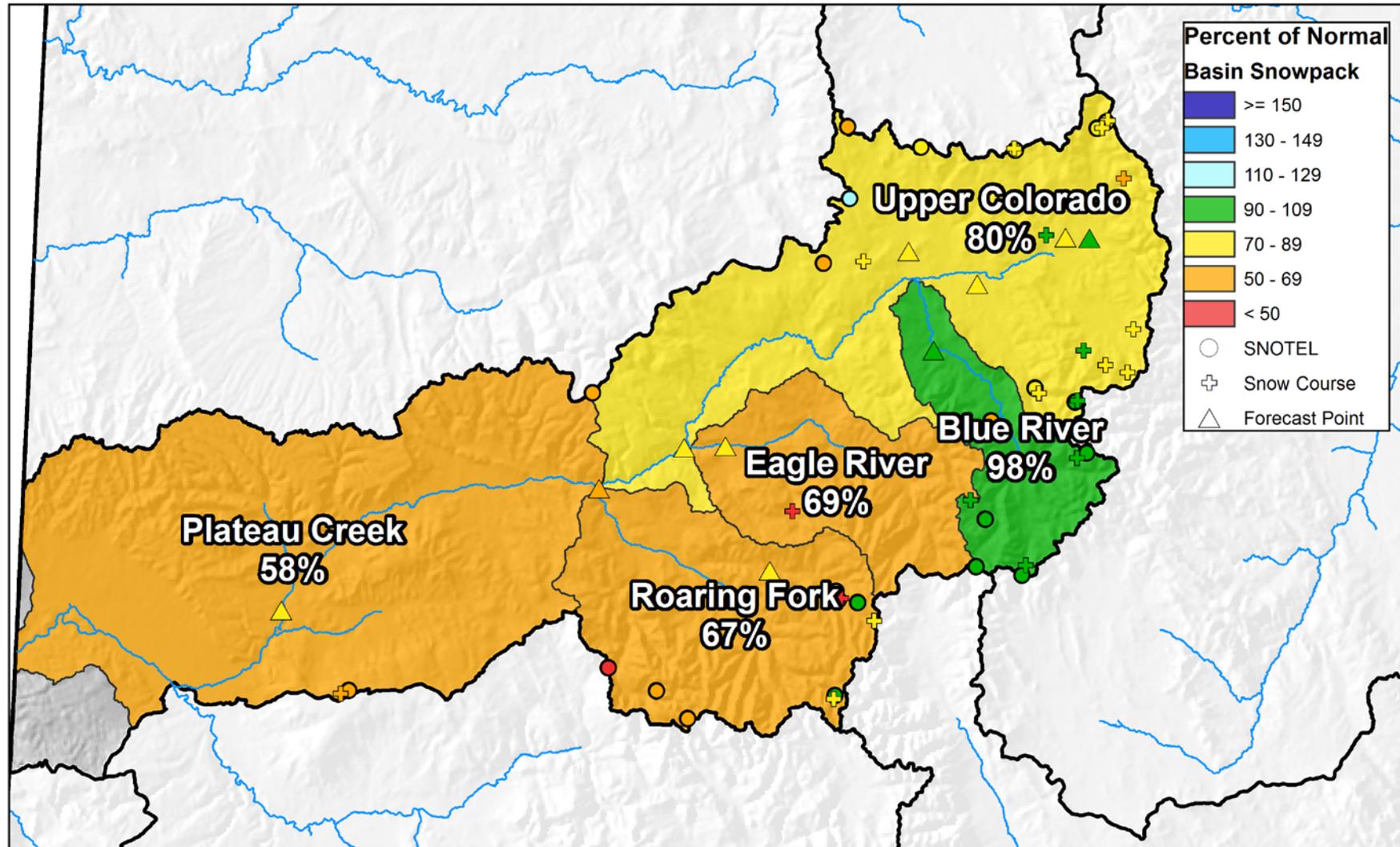
# UPPER COLORADO RIVER BASIN

April 1, 2015

Snowpack in the Colorado River basin is below normal at 77% of the median. Precipitation for March was 65% of average which brings water year-to-date precipitation down to 86% of average. Reservoir storage at the end of March was 124% of average compared to 94% last year. Current streamflow forecasts range from 102% of average for the Inflow to Dillon Reservoir to 69% of average for the Roaring Fork at Glenwood Springs.



# Upper Colorado River Basin Snowpack and Streamflow Forecasts April 1, 2015



0 5 10 20 30 40 Miles

## Upper Colorado River Basin Streamflow Forecasts - April 1, 2015

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

| UPPER COLORADO RIVER BASIN                        | Forecast Period | 90% (KAF) | 70% (KAF) | 50% (KAF) | % Avg | 30% (KAF) | 10% (KAF) | 30yr Avg (KAF) |
|---|-----------------|-----------|-----------|-----------|-------|-----------|-----------|----------------|
| Lake Granby Inflow <sup>2</sup>                   | APR-JUL         | 144       | 176       | 200       | 91%   | 225       | 265       | 220            |
| Willow Ck Reservoir Inflow                        | APR-JUL         | 21        | 30        | 37        | 79%   | 44        | 57        | 47             |
| Williams Fk bl Williams Fk Reservoir <sup>2</sup> | APR-JUL         | 58        | 71        | 80        | 82%   | 90        | 106       | 97             |
| Wolford Mtn Reservoir Inflow                      | APR-JUL         | 24        | 32        | 38        | 70%   | 45        | 56        | 54             |
| Dillon Reservoir Inflow <sup>2</sup>              | APR-JUL         | 124       | 148       | 166       | 102%  | 184       | 215       | 163            |
| Green Mountain Reservoir Inflow <sup>2</sup>      | APR-JUL         | 200       | 240       | 270       | 98%   | 300       | 350       | 275            |
| Eagle R bl Gypsum <sup>2</sup>                    | APR-JUL         | 192       | 240       | 270       | 81%   | 310       | 365       | 335            |
| Colorado R nr Dotsero <sup>2</sup>                | APR-JUL         | 845       | 1060      | 1220      | 87%   | 1390      | 1650      | 1400           |
| Ruedi Reservoir Inflow <sup>2</sup>               | APR-JUL         | 83        | 98        | 109       | 78%   | 121       | 139       | 139            |
| Roaring Fk at Glenwood Springs <sup>2</sup>       | APR-JUL         | 360       | 425       | 475       | 69%   | 525       | 605       | 690            |
| Colorado R nr Cameo <sup>2</sup>                  | APR-JUL         | 1330      | 1600      | 1800      | 77%   | 2010      | 2340      | 2350           |

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

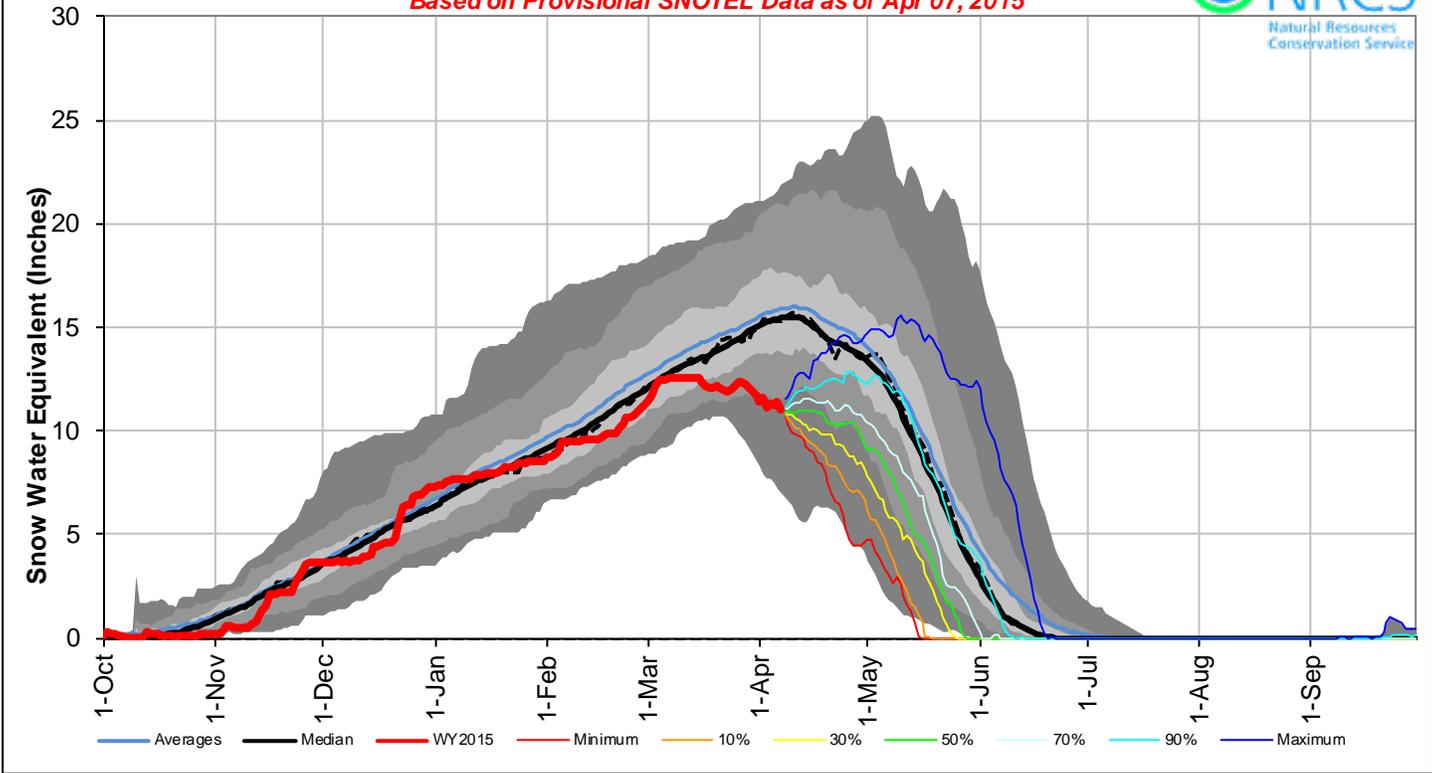
3) Median value used in place of average

| Reservoir Storage<br>End of March, 2015 | Current (KAF) | Last Year (KAF) | Average (KAF) | Capacity (KAF) |
|---|---------------|-----------------|---------------|----------------|
| Dillon Reservoir                        | 244.7         | 222.6           | 215.6         | 254.0          |
| Green Mountain Reservoir                | 61.5          | 54.0            | 61.2          | 146.8          |
| Homestake Reservoir                     | 20.4          | 0.3             | 26.1          | 43.0           |
| Lake Granby                             | 402.9         | 220.6           | 265.0         | 465.6          |
| Ruedi Reservoir                         | 74.7          | 66.5            | 63.2          | 102.0          |
| Shadow Mountain Reservoir               | 17.2          | 17.4            | 17.3          | 18.4           |
| Vega Reservoir                          | 7.1           | 17.3            | 14.0          | 32.9           |
| Williams Fork Reservoir                 | 80.4          | 77.4            | 60.8          | 97.0           |
| Willow Creek Reservoir                  | 6.9           | 8.3             | 7.2           | 9.1            |
| Wolford Mountain Reservoir              | 45.9          | 43.0            | 43.7          | 65.9           |
| Basin-wide Total                        | 961.7         | 727.4           | 774.1         | 1234.7         |
| # of reservoirs                         | 10            | 10              | 10            | 10             |

| Watershed Snowpack Analysis<br>April 1, 2015 | # of Sites | % Median | Last Year % Median |
|--|------------|----------|--------------------|
| BLUE RIVER BASIN                             | 8          | 98%      | 143%               |
| HEADWATERS COLORADO RIVER                    | 35         | 82%      | 138%               |
| MUDDY CREEK BASIN                            | 4          | 86%      | 160%               |
| EAGLE RIVER BASIN                            | 5          | 69%      | 118%               |
| PLATEAU CREEK BASIN                          | 3          | 57%      | 95%                |
| ROARING FORK BASIN                           | 10         | 67%      | 121%               |
| WILLIAMS FORK BASIN                          | 5          | 86%      | 131%               |
| WILLOW CREEK BASIN                           | 4          | 71%      | 146%               |
| UPPER COLORADO RIVER BASIN                   | 48         | 77%      | 130%               |

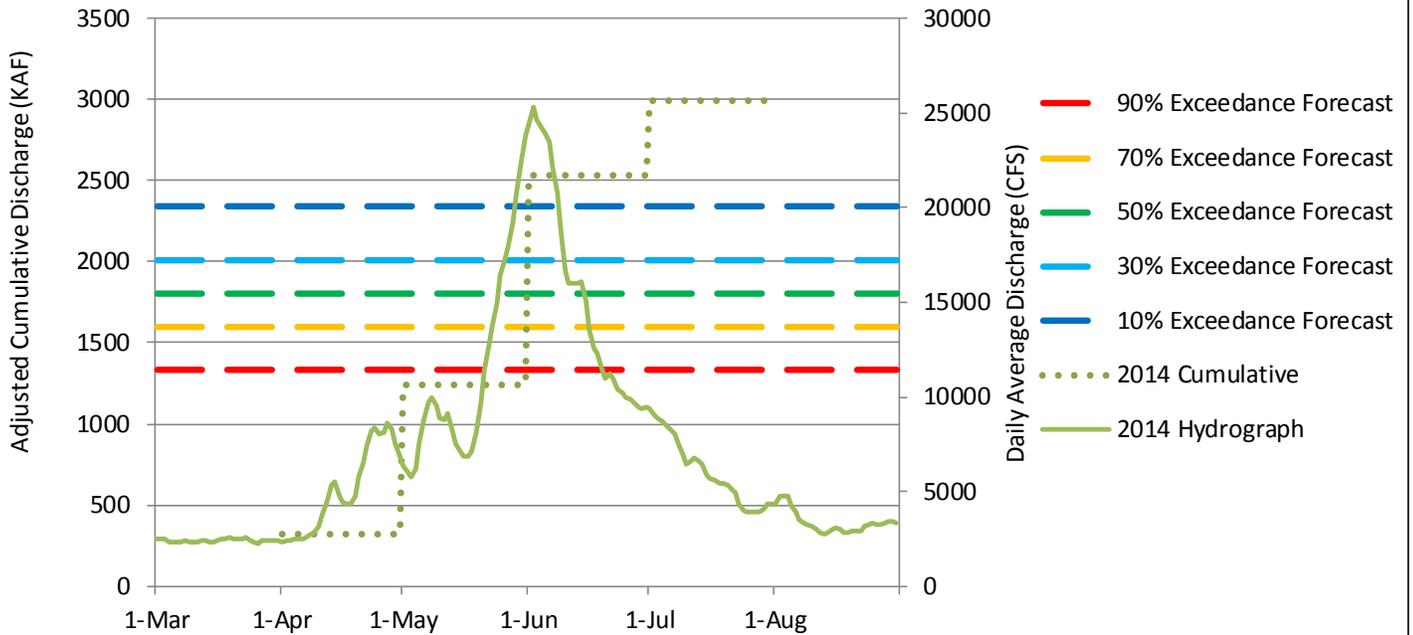
# Upper Colorado River Basin with Non-Exceedance Projections

Based on Provisional SNOTEL Data as of Apr 07, 2015



## Colorado River near Cameo, CO

Daily and Cumulative Discharge Compared to Current Streamflow Forecasts (Apr - Jul)

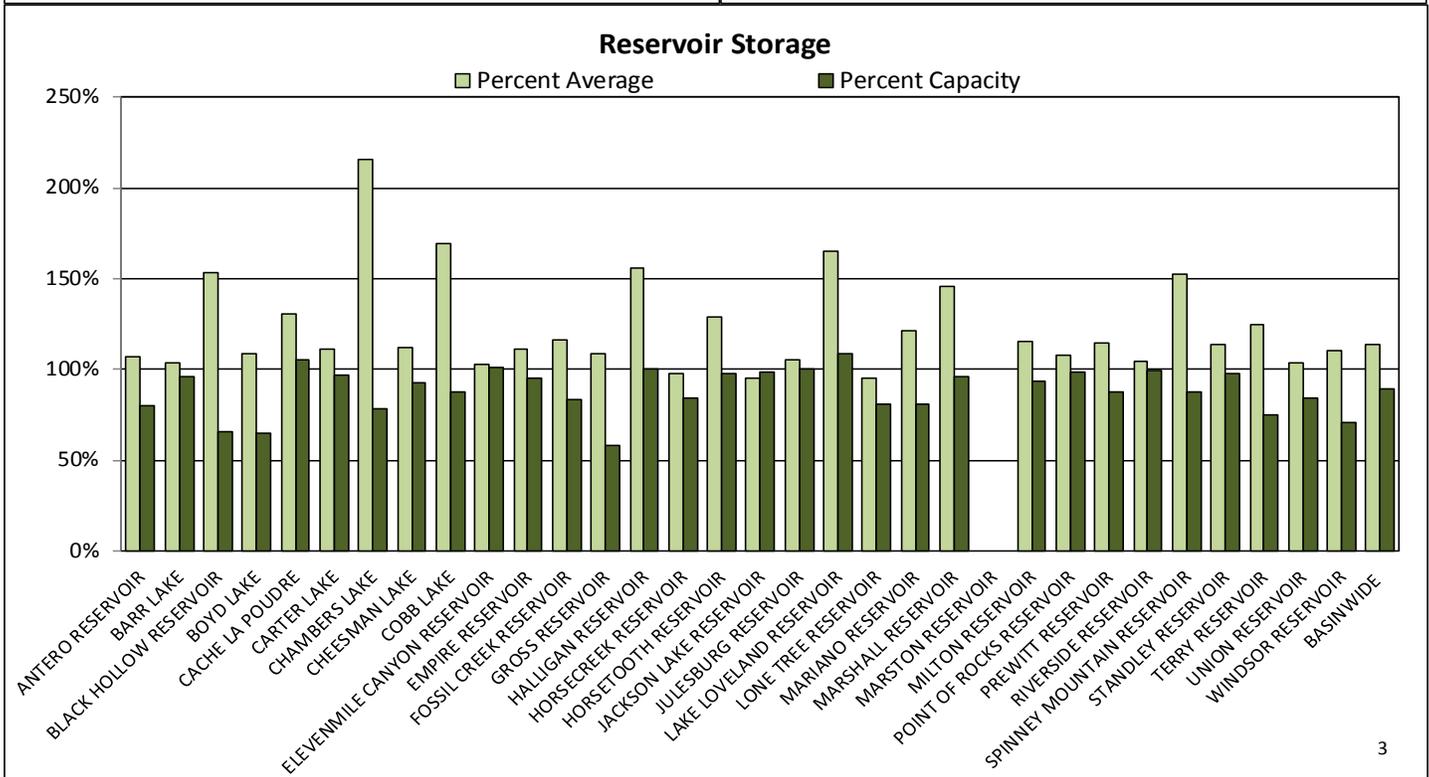
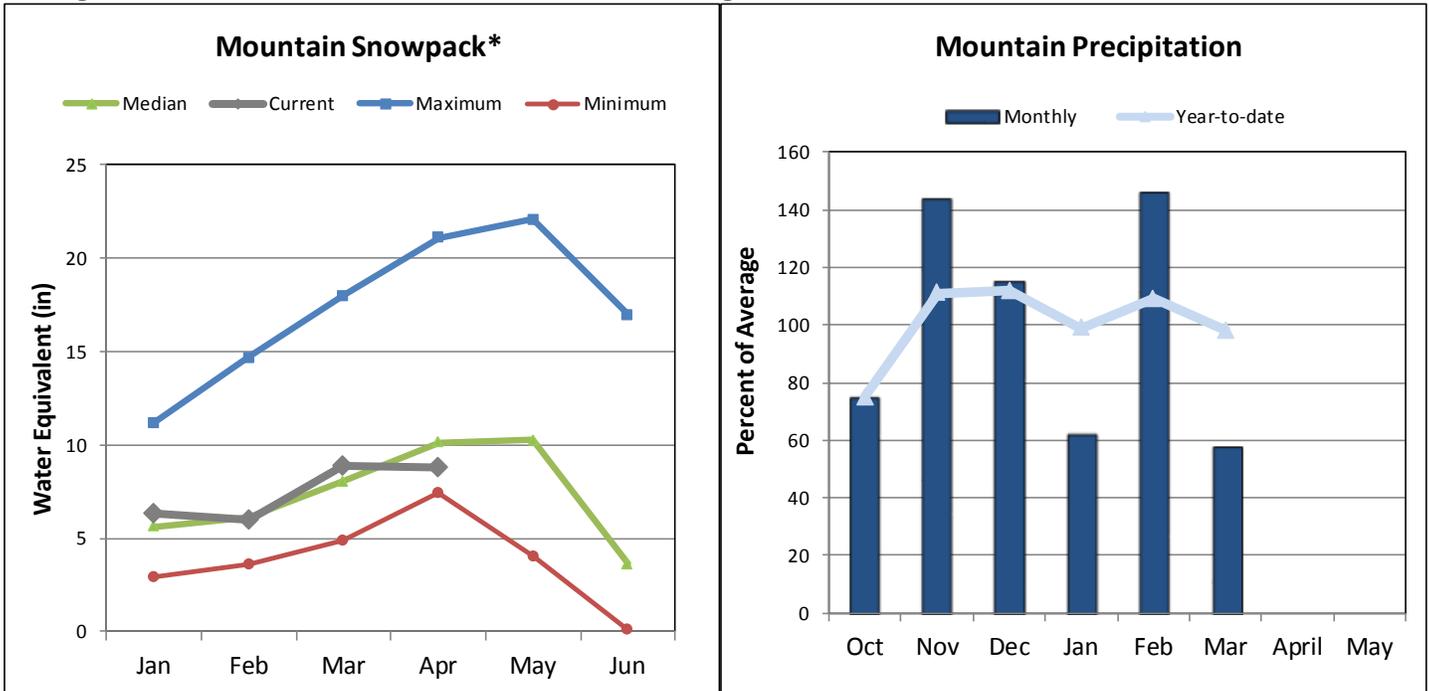


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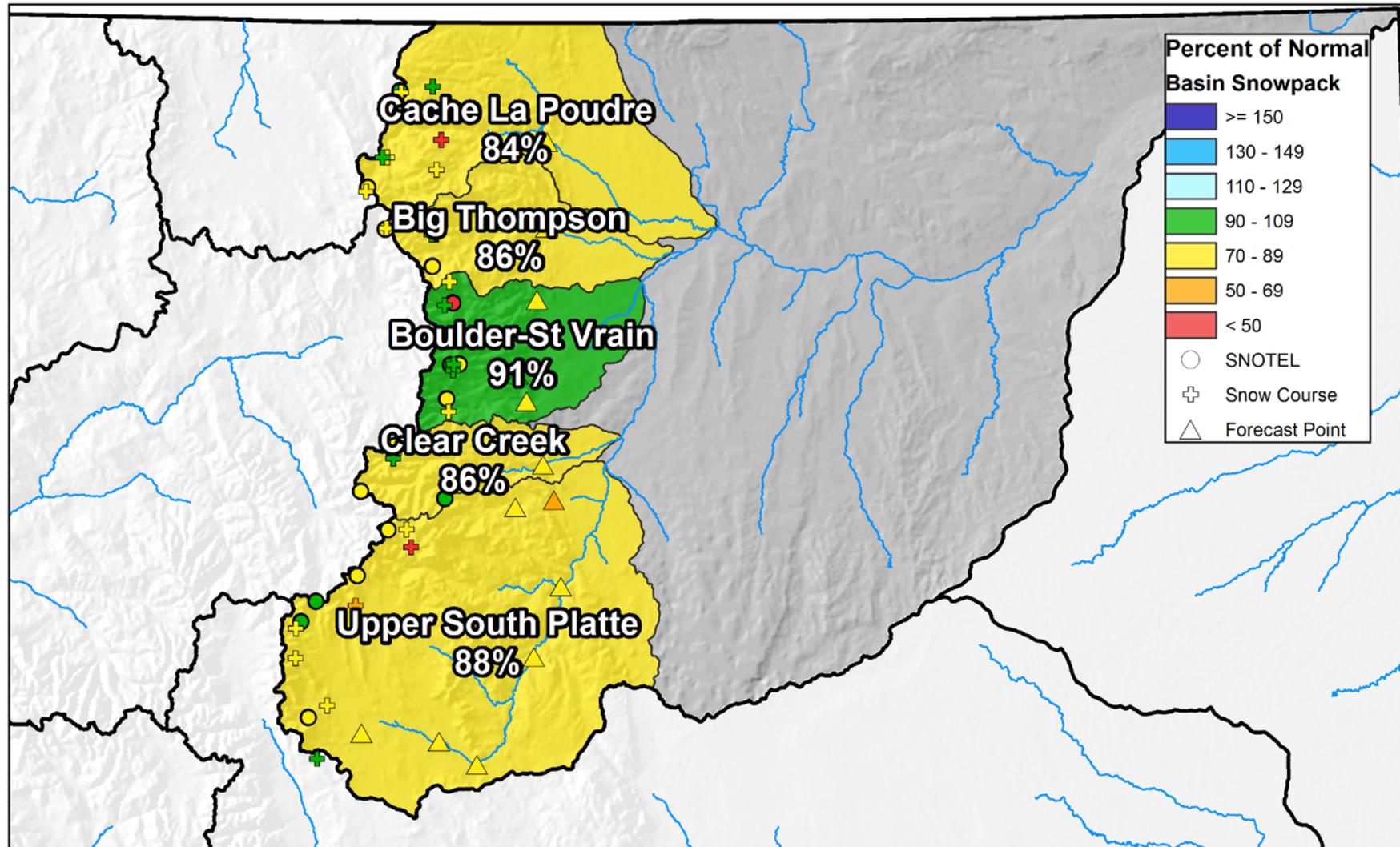
# SOUTH PLATTE RIVER BASIN

April 1, 2015

Snowpack in the South Platte River basin is below normal at 87% of the median. Precipitation for March was 58% of average which brings water year-to-date precipitation to 98%. Reservoir storage at the end of March was 114% of average compared to 109% last year. Streamflow forecasts for April to July range from 93% of average for Boulder Creek near Orodell to 73% of average for the South Platte River at South Platte.



# South Platte River Basin Snowpack and Streamflow Forecasts April 1, 2015



0 10 20 40 60 80 Miles

### South Platte River Basin Streamflow Forecasts - April 1, 2015

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

| SOUTH PLATTE RIVER BASIN                          | Forecast Period | 90% (KAF) | 70% (KAF) | 50% (KAF) | % Avg | 30% (KAF) | 10% (KAF) | 30yr Avg (KAF) |
|---|-----------------|-----------|-----------|-----------|-------|-----------|-----------|----------------|
| Antero Reservoir Inflow <sup>2</sup>              | APR-JUL         | 6         | 9.1       | 11.2      | 77%   | 13.3      | 16.4      | 14.5           |
|   | APR-SEP         | 7.6       | 11.3      | 13.8      | 78%   | 16.3      | 20        | 17.8           |
| Spinney Mountain Reservoir Inflow <sup>2</sup>    | APR-JUL         | 22        | 32        | 41        | 85%   | 53        | 76        | 48             |
|   | APR-SEP         | 26        | 38        | 50        | 82%   | 65        | 97        | 61             |
| Elevenmile Canyon Reservoir Inflow <sup>2</sup>   | APR-JUL         | 23        | 33        | 43        | 86%   | 56        | 82        | 50             |
|   | APR-SEP         | 26        | 40        | 54        | 84%   | 72        | 110       | 64             |
| Cheesman Lake Inflow <sup>2</sup>                 | APR-JUL         | 41        | 61        | 80        | 80%   | 105       | 158       | 100            |
|   | APR-SEP         | 50        | 76        | 101       | 80%   | 134       | 205       | 126            |
| South Platte R at South Platte <sup>2</sup>       | APR-JUL         | 61        | 96        | 131       | 73%   | 179       | 285       | 180            |
|   | APR-SEP         | 75        | 119       | 164       | 73%   | 225       | 360       | 225            |
| Bear Ck ab Evergreen                              | APR-JUL         | 5.7       | 9         | 12.3      | 75%   | 16.8      | 27        | 16.4           |
|   | APR-SEP         | 7         | 10.9      | 14.8      | 70%   | 20        | 31        | 21             |
| Clear Ck at Golden                                | APR-JUL         | 56        | 74        | 87        | 83%   | 100       | 118       | 105            |
|   | APR-SEP         | 68        | 93        | 110       | 86%   | 127       | 152       | 128            |
| St. Vrain Ck at Lyons <sup>2</sup>                | APR-JUL         | 59        | 69        | 76        | 86%   | 83        | 93        | 88             |
|   | APR-SEP         | 68        | 80        | 88        | 85%   | 96        | 108       | 103            |
| Boulder Ck nr Orodell <sup>2</sup>                | APR-JUL         | 39        | 45        | 50        | 93%   | 55        | 61        | 54             |
|   | APR-SEP         | 44        | 53        | 59        | 94%   | 65        | 74        | 63             |
| South Boulder Ck nr Eldorado Springs <sup>2</sup> | APR-JUL         | 24        | 30        | 33        | 85%   | 36        | 42        | 39             |
|   | APR-SEP         | 26        | 32        | 37        | 86%   | 42        | 48        | 43             |
| Big Thompson R at Canyon Mouth <sup>2</sup>       | APR-JUL         | 53        | 66        | 75        | 83%   | 84        | 97        | 90             |
|   | APR-SEP         | 65        | 81        | 92        | 86%   | 103       | 119       | 107            |
| Cache La Poudre at Canyon Mouth <sup>2</sup>      | APR-JUL         | 121       | 154       | 182       | 81%   | 215       | 275       | 225            |
|   | APR-SEP         | 136       | 173       | 205       | 82%   | 240       | 305       | 250            |

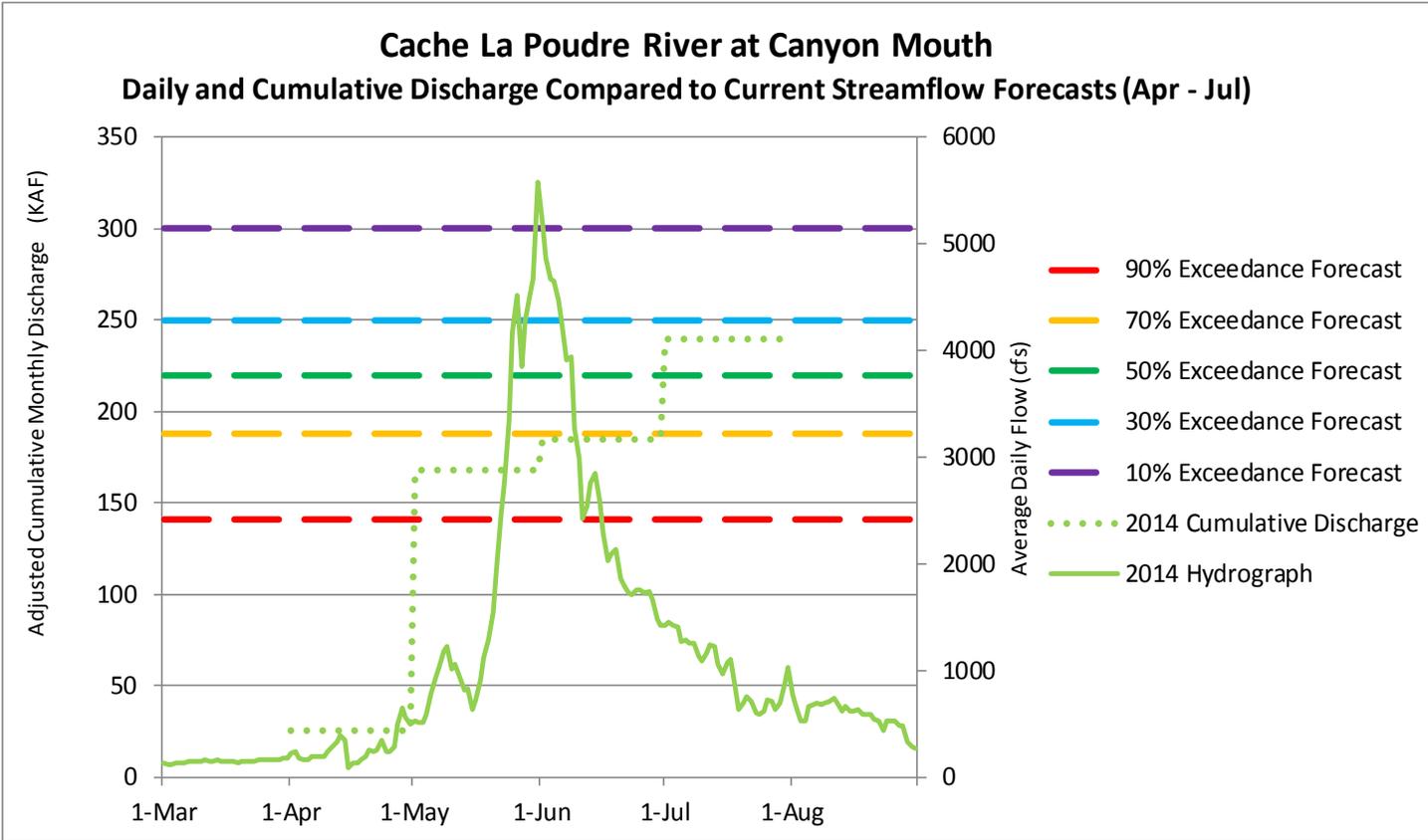
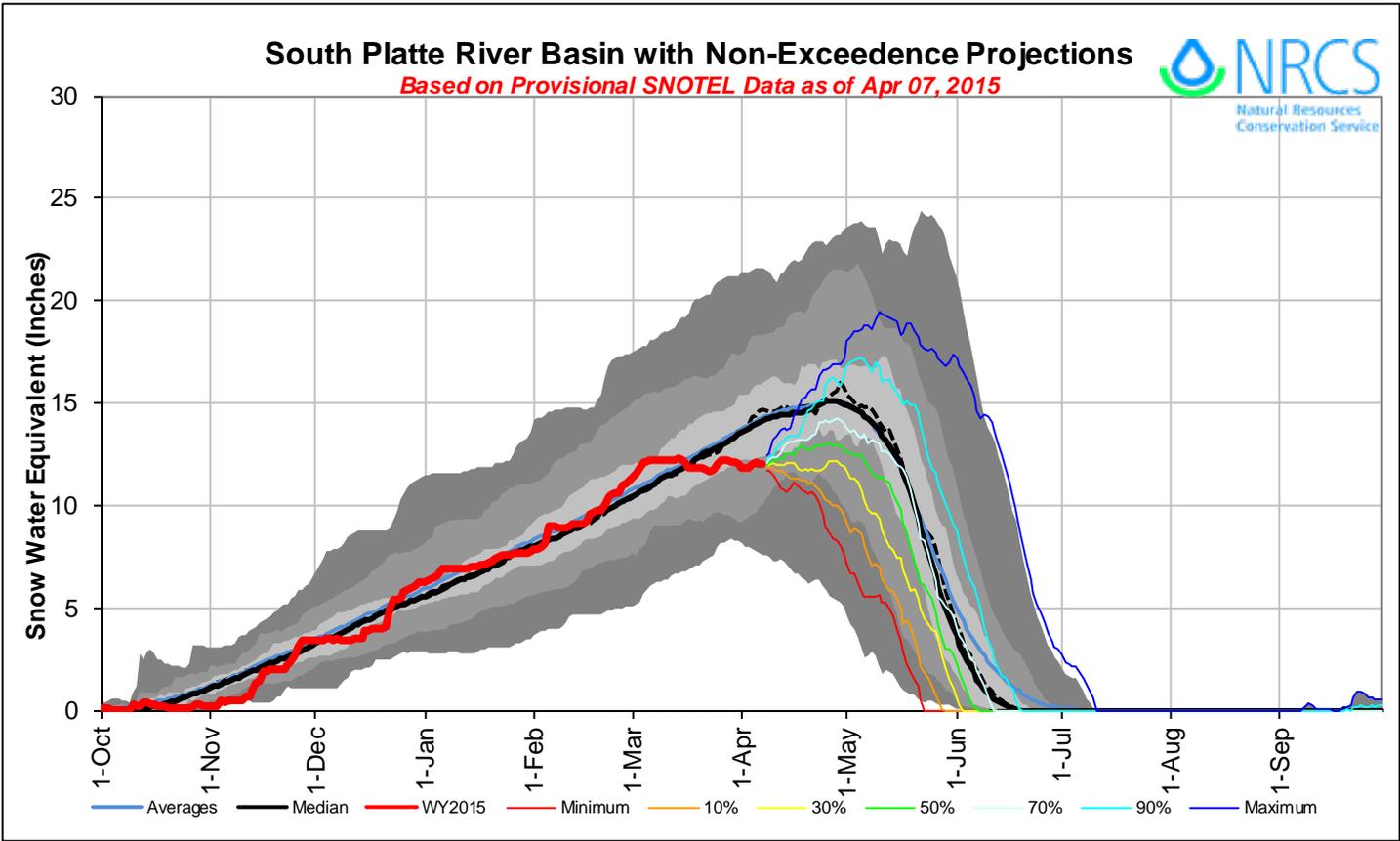
1) 90% and 10% exceedance probabilities are actually 95% and 5%

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<br>End of March, 2015 | Current (KAF) | Last Year (KAF) | Average (KAF) | Capacity (KAF) |
|---|---------------|-----------------|---------------|----------------|
| Antero Reservoir                        | 15.9          | 15.9            | 14.9          | 19.9           |
| Barr Lake                               | 28.9          | 29.1            | 27.8          | 30.1           |
| Black Hollow Reservoir                  | 4.3           | 3.5             | 2.8           | 6.5            |
| Boyd Lake                               | 31.3          | 32.3            | 28.7          | 48.4           |
| Cache La Poudre                         | 10.6          |                 | 8.1           | 10.1           |
| Carter Lake                             | 105.2         | 93.0            | 94.9          | 108.9          |
| Chambers Lake                           | 6.9           | 6.7             | 3.2           | 8.8            |
| Cheesman Lake                           | 73.2          | 77.2            | 65.1          | 79.0           |
| Cobb Lake                               | 19.6          | 19.6            | 11.6          | 22.3           |
| Elevenmile Canyon Reservoir             | 99.3          | 99.6            | 96.4          | 98.0           |
| Empire Reservoir                        | 34.8          | 35.1            | 31.2          | 36.5           |
| Fossil Creek Reservoir                  | 9.3           | 9.5             | 8.0           | 11.1           |
| Gross Reservoir                         | 24.3          | 30.2            | 22.4          | 41.8           |
| Halligan Reservoir                      | 6.4           | 6.4             | 4.1           | 6.4            |
| Horsecreek Reservoir                    | 12.4          | 12.3            | 12.7          | 14.7           |
| Horsetooth Reservoir                    | 146.8         | 115.3           | 113.7         | 149.7          |
| Jackson Lake Reservoir                  | 25.7          | 25.7            | 26.9          | 26.1           |
| Julesburg Reservoir                     | 20.5          | 20.6            | 19.4          | 20.5           |
| Lake Loveland Reservoir                 | 11.2          | 8.4             | 6.8           | 10.3           |
| Lone Tree Reservoir                     | 7.0           | 7.5             | 7.4           | 8.7            |
| Mariano Reservoir                       | 4.4           | 4.4             | 3.6           | 5.4            |
| Marshall Reservoir                      | 9.6           | 9.5             | 6.6           | 10.0           |
| Marston Reservoir                       | 0.0           | 1.9             | 6.7           | 13.0           |
| Milton Reservoir                        | 22.0          | 22.5            | 19.1          | 23.5           |
| Point Of Rocks Reservoir                | 69.7          | 68.9            | 64.4          | 70.6           |
| Prewitt Reservoir                       | 24.6          | 21.6            | 21.4          | 28.2           |
| Ralph Price Reservoir                   | 13.0          | 13.6            |               | 16.2           |
| Riverside Reservoir                     | 55.5          | 54.5            | 53.1          | 55.8           |
| Spinney Mountain Reservoir              | 43.0          | 33.8            | 28.2          | 49.0           |
| Standley Reservoir                      | 41.2          | 41.2            | 36.2          | 42.0           |
| Terry Reservoir                         | 6.0           | 6.0             | 4.8           | 8.0            |
| Union Reservoir                         | 11.0          | 11.9            | 10.6          | 13.0           |
| Windsor Reservoir                       | 10.7          | 13.2            | 9.7           | 15.2           |
| Basin-wide Total                        | 980.7         | 937.3           | 862.4         | 1081.4         |
| # of reservoirs                         | 31            | 31              | 31            | 31             |

| Watershed Snowpack Analysis<br>April 1, 2015 | # of Sites | % Median | Last Year % Median |
|--|------------|----------|--------------------|
| BIG THOMPSON BASIN                           | 7          | 86%      | 140%               |
| BOULDER CREEK BASIN                          | 6          | 93%      | 154%               |
| CACHE LA POUDDRE BASIN                       | 10         | 84%      | 145%               |
| CLEAR CREEK BASIN                            | 4          | 86%      | 136%               |
| SAINT VRAIN BASIN                            | 3          | 85%      | 198%               |
| UPPER SOUTH PLATTE BASIN                     | 16         | 88%      | 131%               |
| SOUTH PLATTE RIVER BASIN                     | 46         | 87%      | 143%               |

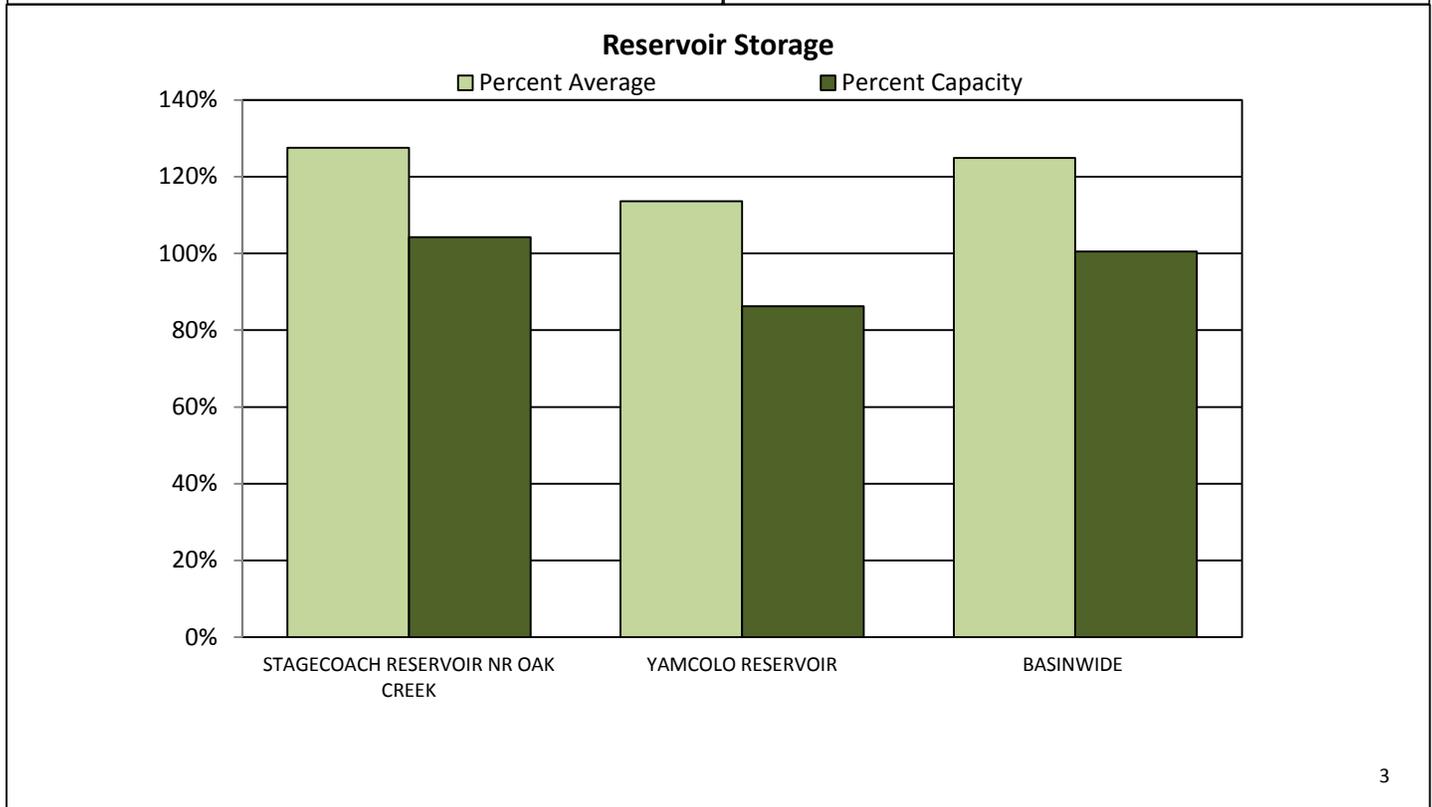
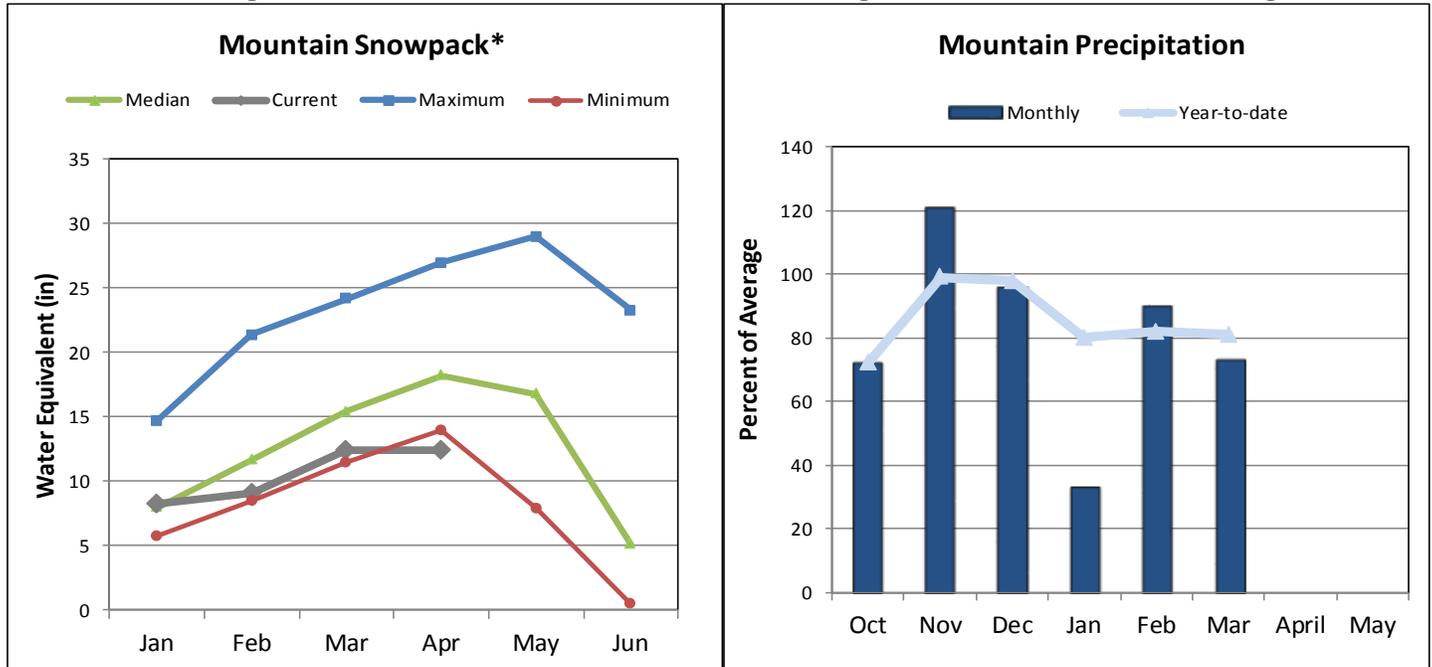


Please refer to the sections at the end of this report for further explanation concerning these graphs.

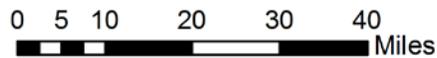
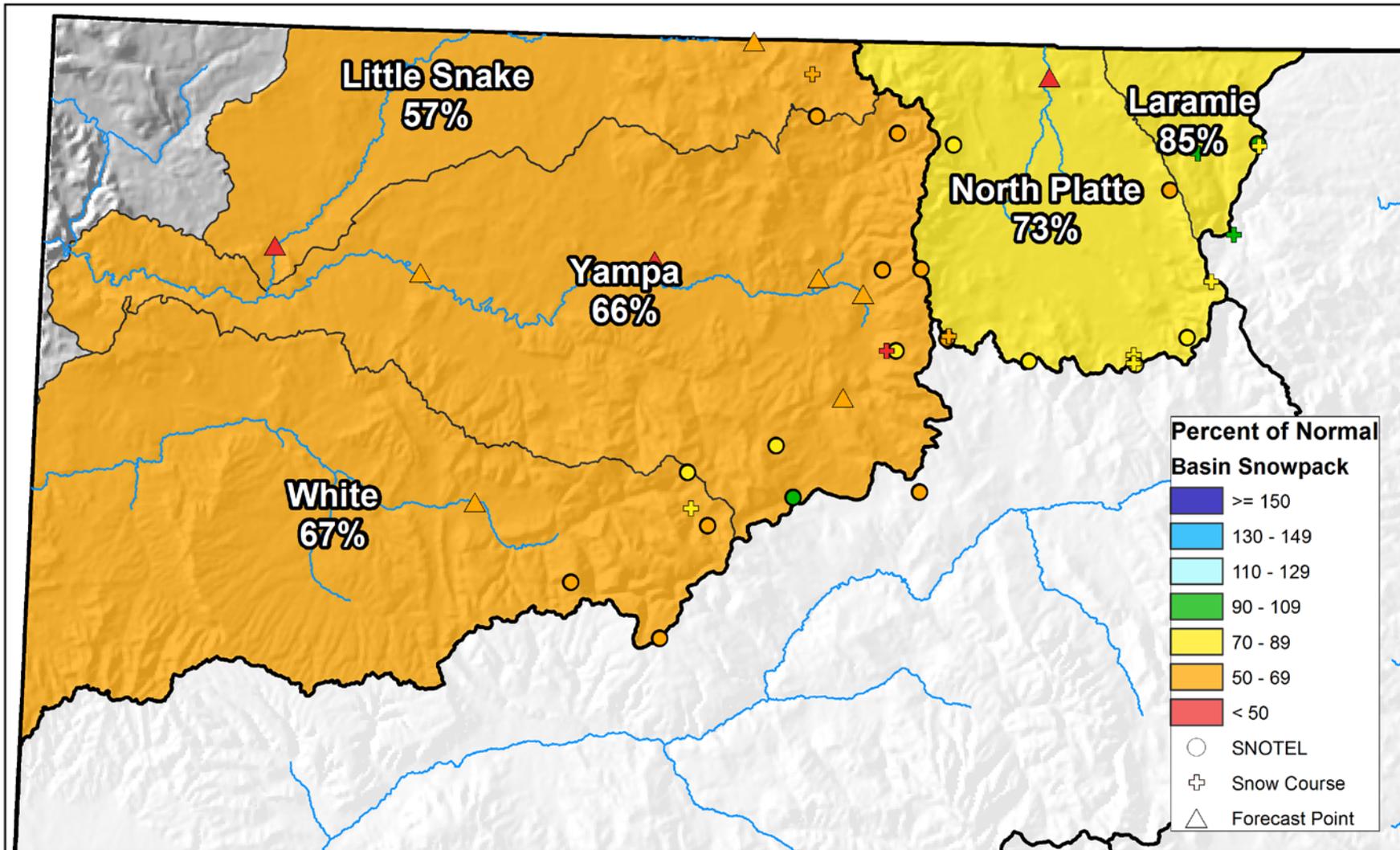
# YAMPA, WHITE, NORTH PLATTE AND LARAMIE RIVER BASINS

April 1, 2015

Snowpack in the Yampa, White, North Platte & Laramie basins is below normal at 68% of the median. Precipitation for March was 73% of average which brings water year-to-date precipitation to 81%. Reservoir storage at the end of March was 125% of average compared to 105% last year. Streamflow forecasts range from 69% of average for the Elk River near Milner to 37% of average for Elkhead Creek above Long Gulch.



# Yampa, White, and North Platte River Basins Snowpack and Streamflow Forecasts April 1, 2015



## Yampa-White-North Platte River Basins Streamflow Forecasts - April 1, 2015

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

| YAMPA-WHITE-NORTH PLATTE RIVER BASINS        | Forecast Period | 90% (KAF) | 70% (KAF) | 50% (KAF) | % Avg | 30% (KAF) | 10% (KAF) | 30yr Avg (KAF) |
|--|-----------------|-----------|-----------|-----------|-------|-----------|-----------|----------------|
| North Platte R nr Northgate                  | APR-JUL         | 17.5      | 73        | 110       | 49%   | 148       | 205       | 225            |
|  | APR-SEP         | 19.4      | 82        | 125       | 50%   | 168       | 230       | 250            |
| Laramie R nr Woods <sup>2</sup>              | APR-JUL         | 38        | 61        | 77        | 67%   | 93        | 116       | 115            |
|  | APR-SEP         | 42        | 68        | 85        | 67%   | 104       | 130       | 126            |
| Yampa R ab Stagecoach Reservoir <sup>2</sup> | APR-JUL         | 5.9       | 9.8       | 13        | 57%   | 16.7      | 23        | 23             |
| Yampa R at Steamboat Springs <sup>2</sup>    | APR-JUL         | 116       | 147       | 170       | 65%   | 195       | 235       | 260            |
| Elk R nr Milner                              | APR-JUL         | 137       | 184       | 220       | 69%   | 260       | 320       | 320            |
| Elkhead Ck ab Long Gulch                     | APR-JUL         | 11.4      | 19.9      | 27        | 37%   | 35        | 49        | 73             |
| Yampa R nr Maybell <sup>2</sup>              | APR-JUL         | 330       | 460       | 555       | 59%   | 660       | 835       | 935            |
| Little Snake R nr Slater <sup>2</sup>        | APR-JUL         | 52        | 68        | 80        | 51%   | 93        | 115       | 156            |
| Little Snake R nr Dixon <sup>2</sup>         | APR-JUL         | 58        | 102       | 139       | 40%   | 182       | 255       | 345            |
| Little Snake R nr Lily <sup>2</sup>          | APR-JUL         | 57        | 101       | 138       | 40%   | 180       | 255       | 345            |
| White R nr Meeker                            | APR-JUL         | 109       | 144       | 155       | 55%   | 198       | 245       | 280            |

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

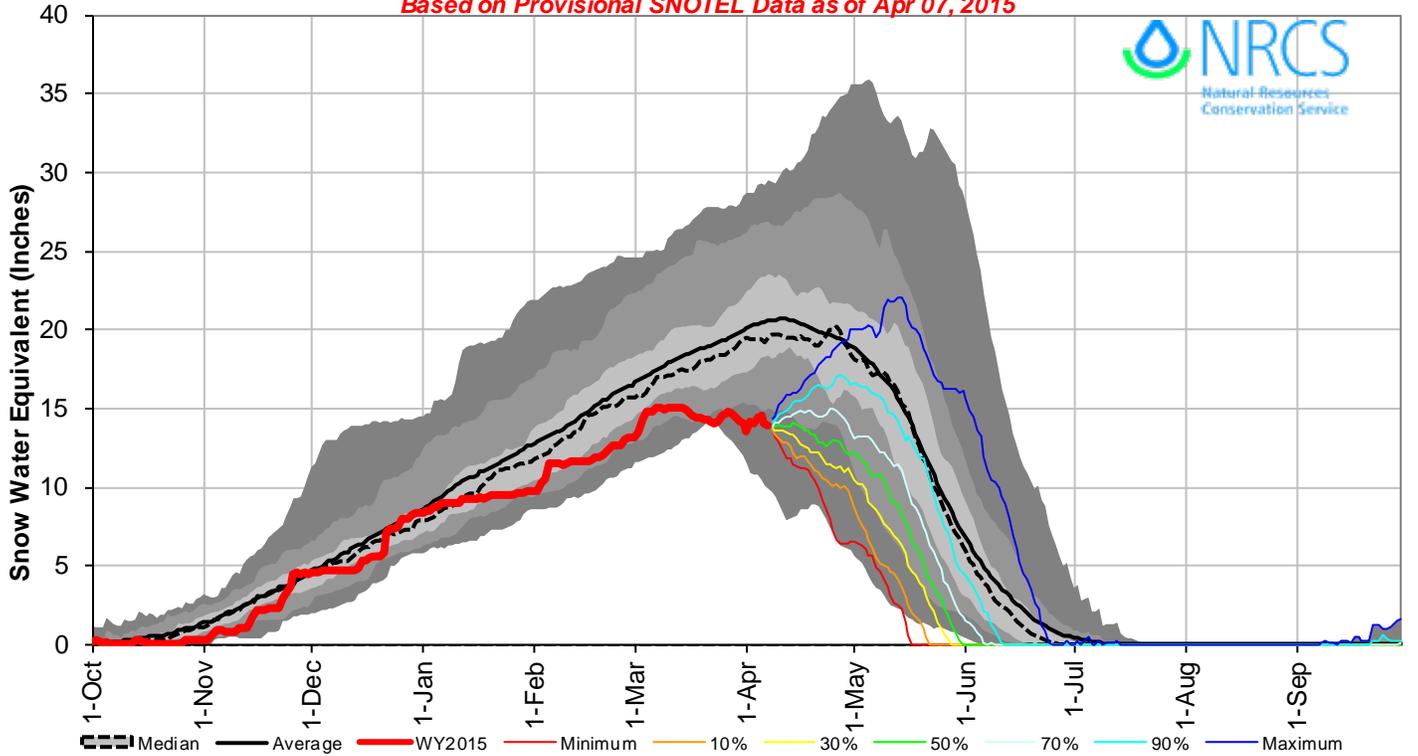
3) Median value used in place of average

| Reservoir Storage<br>End of March, 2015 | Current (KAF) | Last Year (KAF) | Average (KAF) | Capacity (KAF) |
|---|---------------|-----------------|---------------|----------------|
| Stagecoach Reservoir nr Oak Creek       | 34.7          | 30.3            | 27.2          | 33.3           |
| Yamcolo Reservoir                       | 7.5           | 5.3             | 6.6           | 8.7            |
| Basin-wide Total                        | 42.2          | 35.6            | 33.8          | 42.0           |
| # of reservoirs                         | 2             | 2               | 2             | 2              |

| Watershed Snowpack Analysis<br>April 1, 2015 | # of Sites | % Median | Last Year % Median |
|--|------------|----------|--------------------|
| LARAMIE RIVER BASIN                          | 5          | 85%      | 156%               |
| NORTH PLATTE RIVER BASIN                     | 12         | 73%      | 137%               |
| LARAMIE & NORTH PLATTE RIVER BASINS          | 17         | 75%      | 141%               |
| ELK RIVER BASIN                              | 2          | 60%      | 123%               |
| YAMPA RIVER BASIN                            | 11         | 66%      | 133%               |
| WHITE RIVER BASIN                            | 5          | 67%      | 107%               |
| YAMPA & WHITE RIVER BASINS                   | 15         | 65%      | 125%               |
| LITTLE SNAKE RIVER BASIN                     | 9          | 57%      | 124%               |
| YAMPA-WHITE-NORTH PLATTE RIVER BASINS        | 37         | 68%      | 129%               |

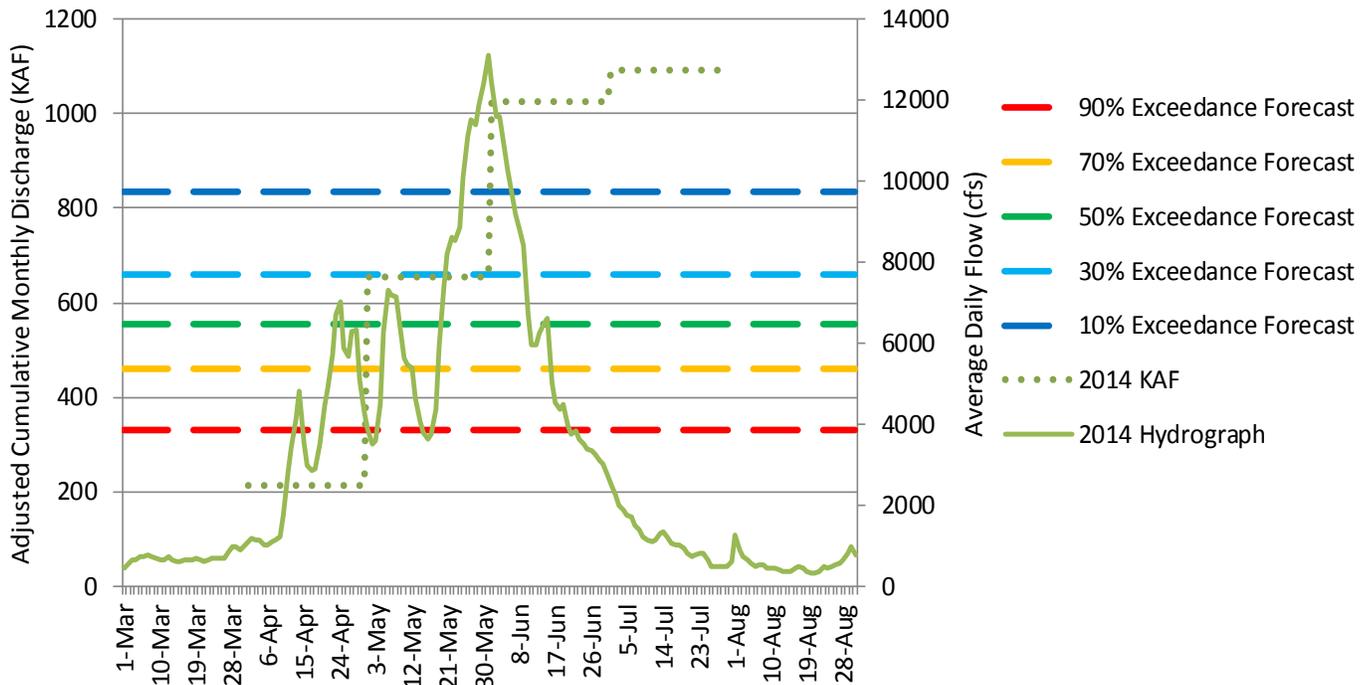
## Yampa, White & North Platte River Basins with Non-Exceedance Projections

Based on Provisional SNOTEL Data as of Apr 07, 2015



## Yampa River near Maybell

Daily and Cumulative Discharge Compared to Current Streamflow Forecasts (Apr - Jul)

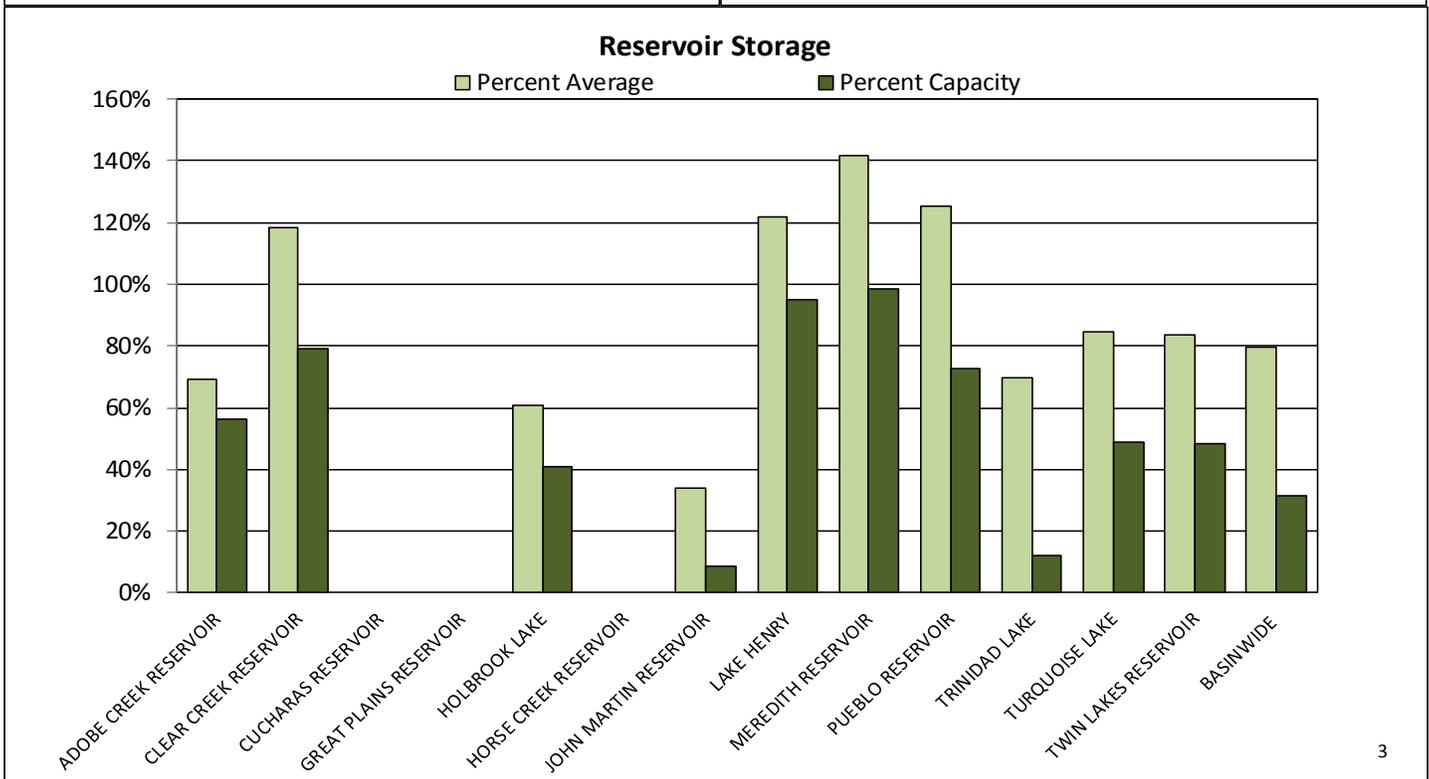
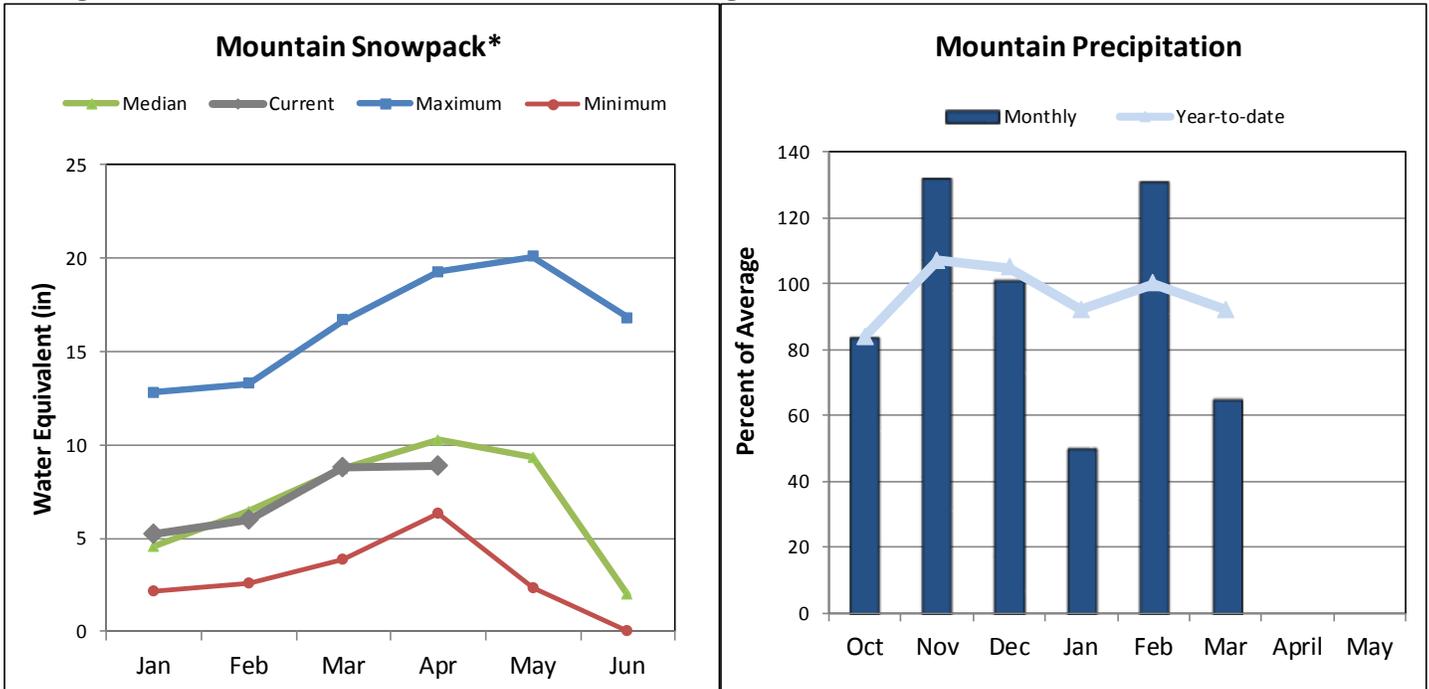


Please refer to the sections at the end of this report for further explanation concerning these graphs.

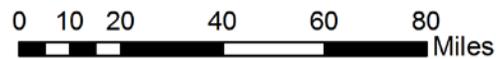
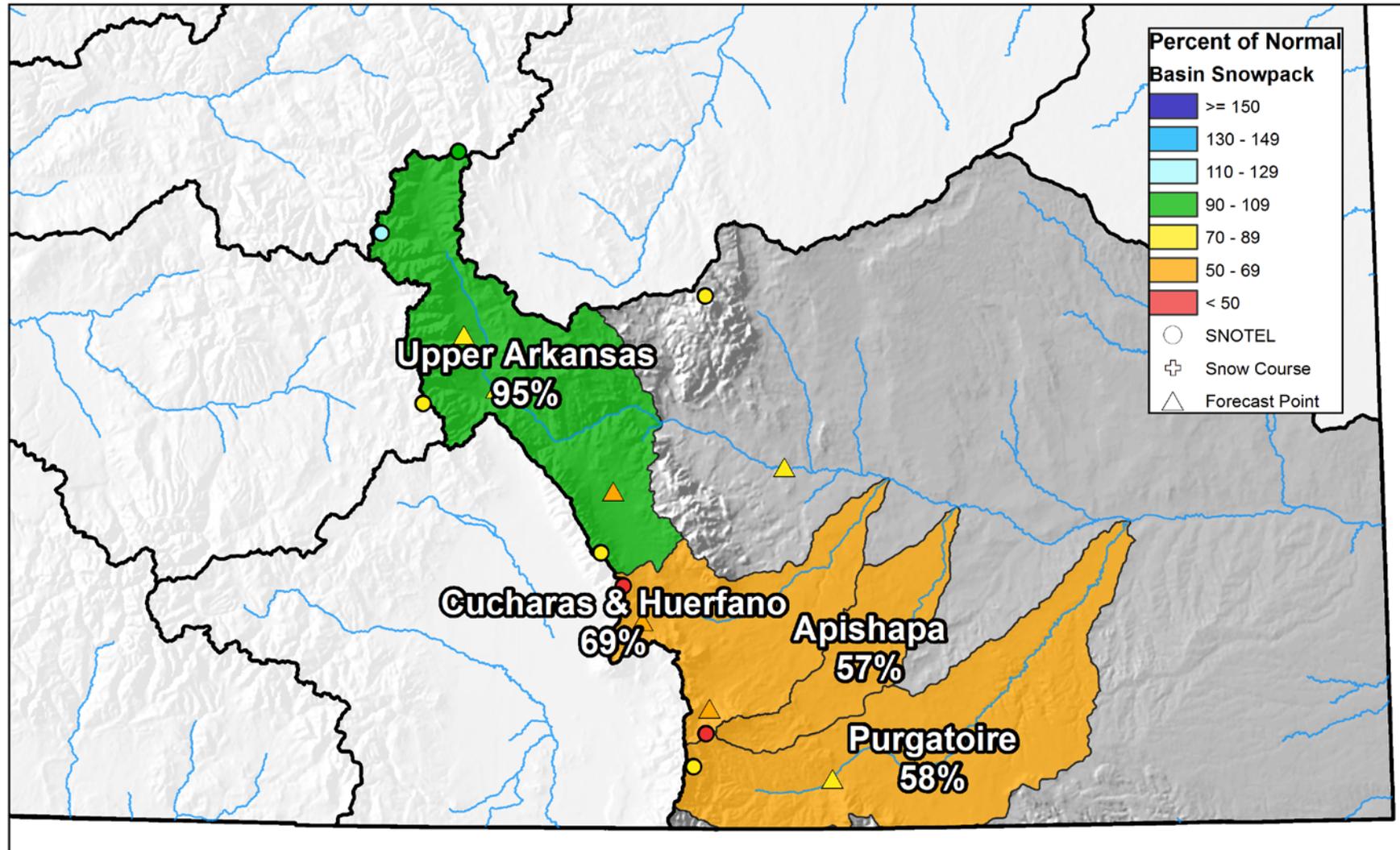
# ARKANSAS RIVER BASIN

April 1, 2015

Snowpack in the Arkansas River basin is below normal at 87% of the median. Precipitation for March was 65% of average which brings water year-to-date precipitation to 92% of average. Reservoir storage at the end of March was 80% of average compared to 60% last year. Current streamflow forecasts range from 80% of average for the Arkansas River at Salida to 62% of average for the Cucharas River at La Veta.



# Arkansas River Basin Snowpack and Streamflow Forecasts April 1, 2015



## Arkansas River Basin Streamflow Forecasts - April 1, 2015

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

| ARKANSAS RIVER BASIN                 | Forecast Period | 90% (KAF) | 70% (KAF) | 50% (KAF) | % Avg | 30% (KAF) | 10% (KAF) | 30yr Avg (KAF) |
|--------------------------------------|-----------------|-----------|-----------|-----------|-------|-----------|-----------|----------------|
| Chalk Ck nr Nathrop                  | APR-JUL         | 8.2       | 12.2      | 15.3      | 73%   | 18.8      | 25        | 21             |
|                                      | APR-SEP         | 10.2      | 15.1      | 18.9      | 73%   | 23        | 30        | 26             |
| Arkansas R at Salida <sup>2</sup>    | APR-JUL         | 174       | 185       | 192       | 80%   | 200       | 210       | 240            |
|                                      | APR-SEP         | 205       | 220       | 235       | 80%   | 250       | 270       | 295            |
| Grape Ck nr Westcliffe               | APR-JUL         | 7.8       | 9.6       | 11        | 69%   | 12.4      | 14.7      | 15.9           |
|                                      | APR-SEP         | 10.9      | 12.5      | 13.6      | 69%   | 14.8      | 16.5      | 19.6           |
| Pueblo Reservoir Inflow <sup>2</sup> | APR-JUL         | 155       | 225       | 280       | 78%   | 340       | 440       | 360            |
|                                      | APR-SEP         | 195       | 285       | 355       | 78%   | 430       | 560       | 455            |
| Huerfano R nr Redwing                | APR-JUL         | 4.2       | 6.4       | 8.1       | 68%   | 10        | 13.2      | 11.9           |
|                                      | APR-SEP         | 5.6       | 8.3       | 10.4      | 68%   | 12.7      | 16.6      | 15.2           |
| Cucharas R nr La Veta                | APR-JUL         | 3.2       | 5.6       | 7.6       | 62%   | 9.9       | 14        | 12.2           |
|                                      | APR-SEP         | 4.7       | 7.3       | 9.5       | 67%   | 11.9      | 16        | 14.1           |
| Trinidad Lake Inflow <sup>2</sup>    | MAR-JUL         | 11        | 19.9      | 28        | 76%   | 37        | 54        | 37             |
|                                      | APR-JUL         | 8.2       | 17.1      | 25        | 71%   | 34        | 51        | 35             |
|                                      | APR-SEP         | 10.2      | 23        | 34        | 72%   | 47        | 71        | 47             |

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

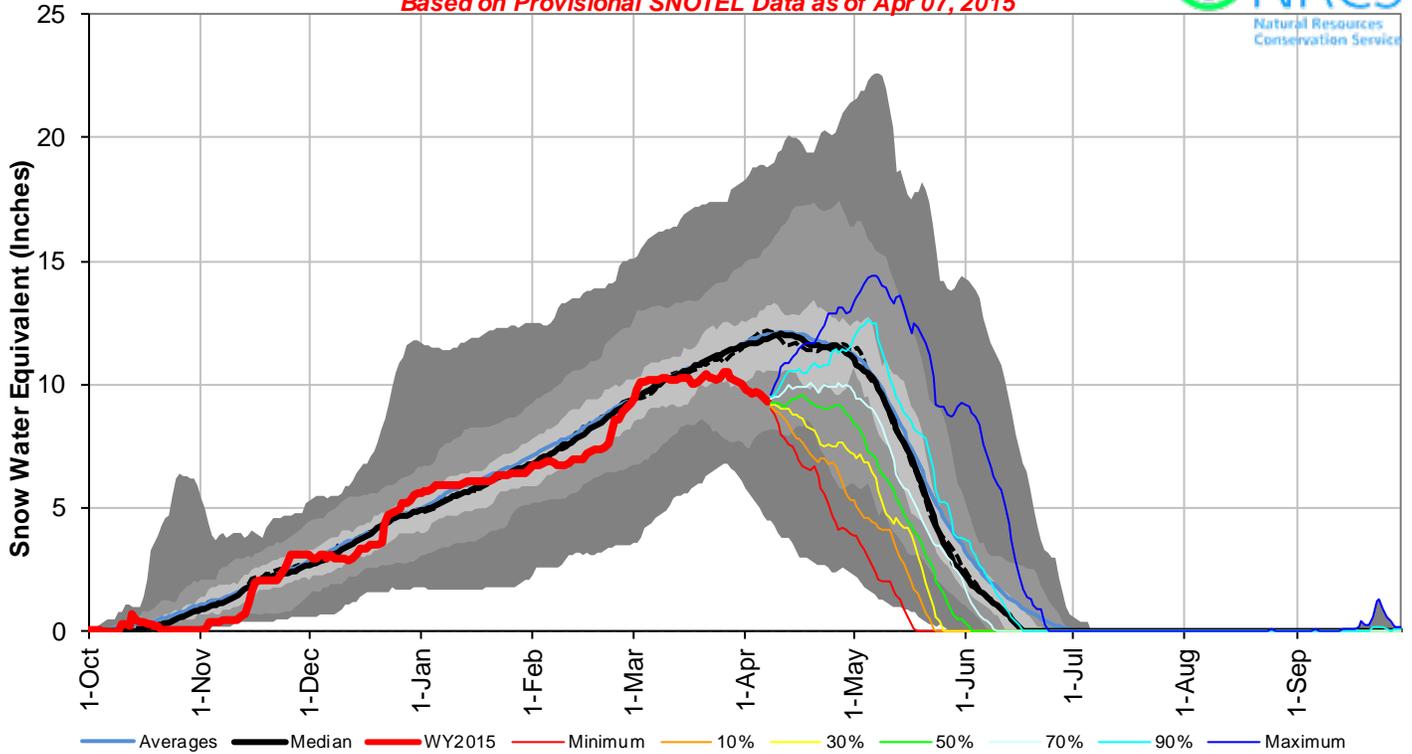
3) Median value used in place of average

| Reservoir Storage<br>End of March, 2015 | Current (KAF) | Last Year (KAF) | Average (KAF) | Capacity (KAF) |
|---|---------------|-----------------|---------------|----------------|
| Adobe Creek Reservoir                   | 34.8          | 20.4            | 50.4          | 62.0           |
| Clear Creek Reservoir                   | 9.0           | 8.7             | 7.6           | 11.4           |
| Cucharas Reservoir                      | 0.0           |                 | 5.9           | 40.0           |
| Great Plains Reservoir                  | 0.0           | 0.0             | 37.0          | 150.0          |
| Holbrook Lake                           | 2.9           | 0.2             | 4.7           | 7.0            |
| Horse Creek Reservoir                   | 0.0           | 0.0             | 12.8          | 27.0           |
| John Martin Reservoir                   | 52.4          | 45.1            | 155.0         | 616.0          |
| Lake Henry                              | 8.9           | 8.6             | 7.3           | 8.0            |
| Meredith Reservoir                      | 41.4          | 23.6            | 29.2          | 42.0           |
| Pueblo Reservoir                        | 257.6         | 183.7           | 205.8         | 354.0          |
| Trinidad Lake                           | 19.9          | 18.1            | 28.5          | 167.0          |
| Turquoise Lake                          | 62.2          | 64.4            | 73.5          | 127.0          |
| Twin Lakes Reservoir                    | 41.4          | 24.1            | 49.6          | 86.0           |
| Basin-wide Total                        | 530.5         | 396.9           | 661.4         | 1657.4         |
| # of reservoirs                         | 12            | 12              | 12            | 12             |

| Watershed Snowpack Analysis<br>April 1, 2015 | # of Sites | % Median | Last Year % Median |
|--|------------|----------|--------------------|
| UPPER ARKANSAS BASIN                         | 9          | 95%      | 134%               |
| CUCHARAS & HUERFANO BASINS                   | 5          | 69%      | 72%                |
| PURGATOIRE RIVER BASIN                       | 2          | 58%      | 58%                |
| ARKANSAS RIVER BASIN                         | 16         | 87%      | 112%               |

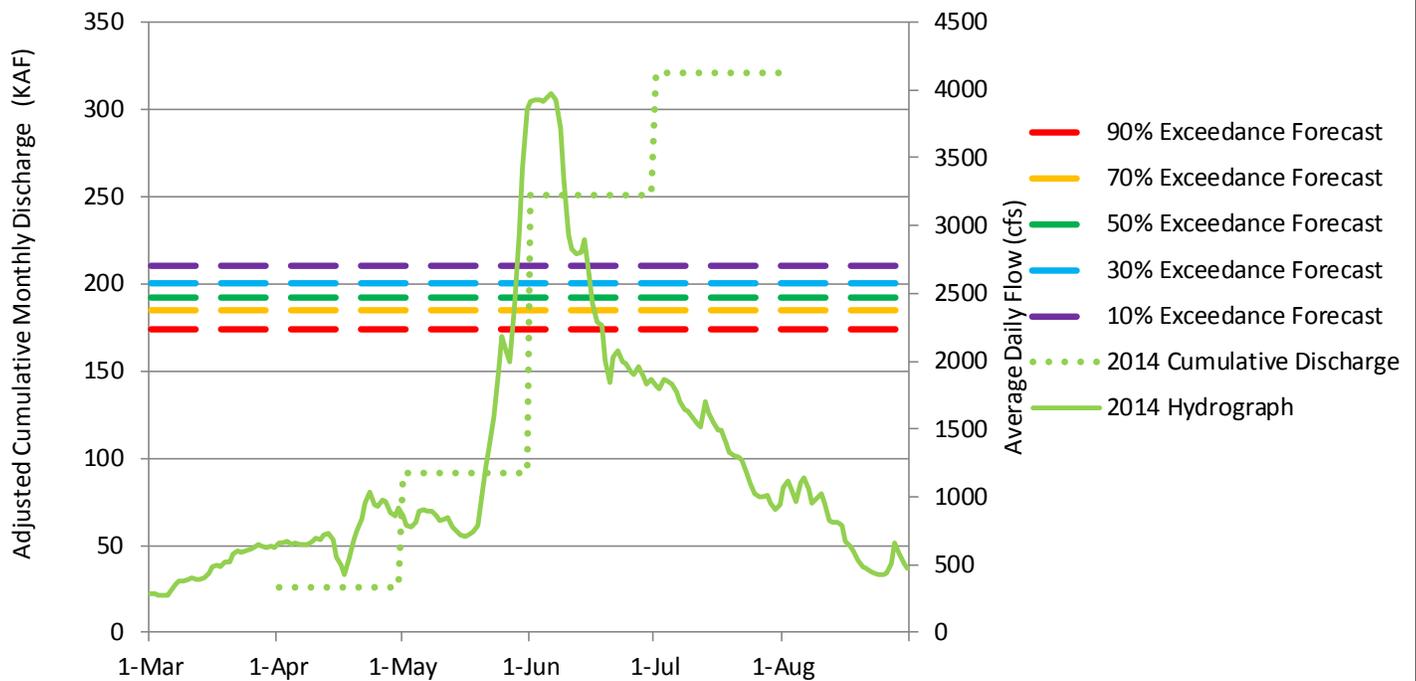
## Arkansas River Basin with Non-Exceedence Projections

Based on Provisional SNOTEL Data as of Apr 07, 2015



## Arkansas River at Salida, CO

### Daily and Cumulative Discharge Compared to Current Streamflow Forecasts (Apr - Jul)

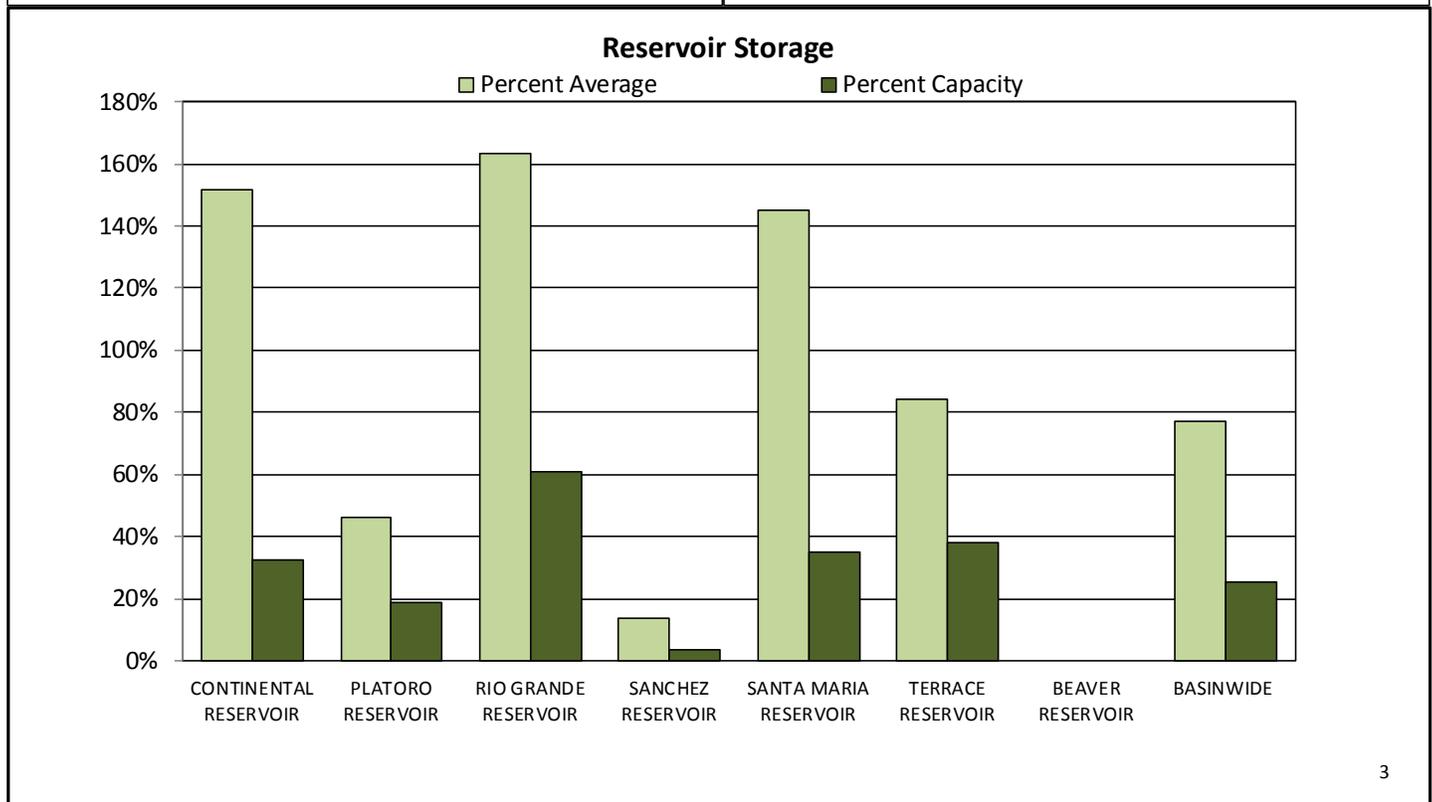
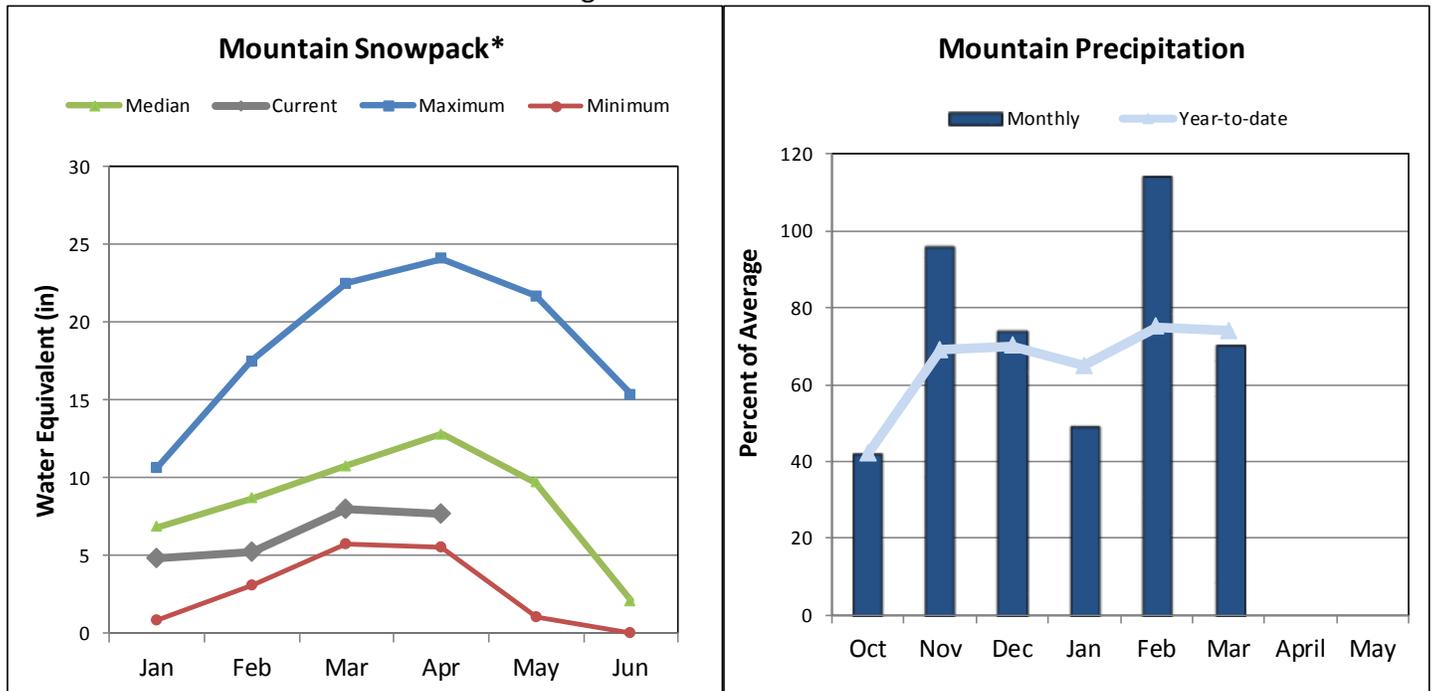


Please refer to the sections at the end of this report for further explanation concerning these graphs.

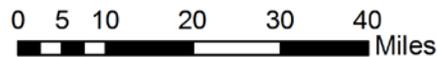
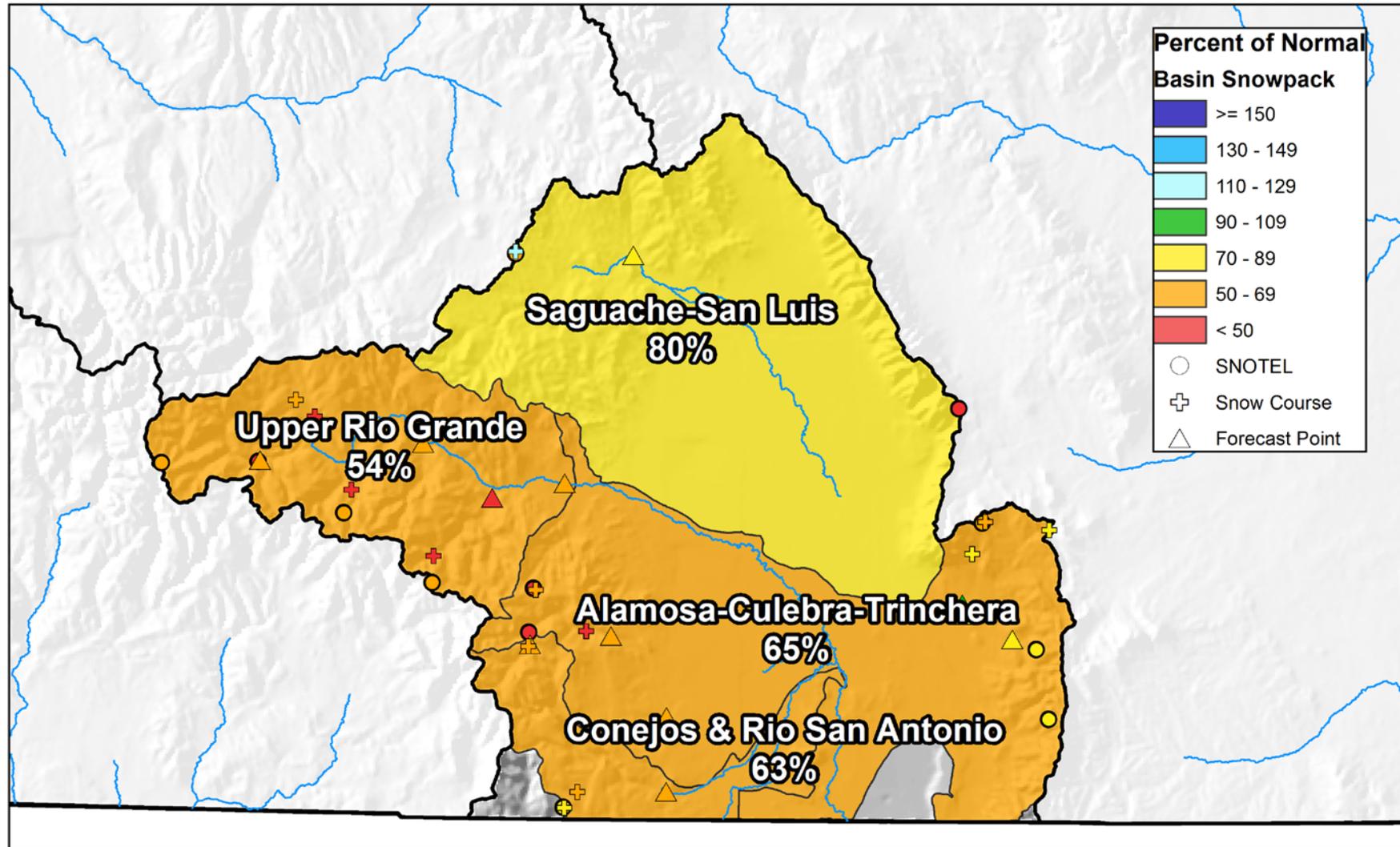
# UPPER RIO GRANDE RIVER BASIN

April 1, 2015

Snowpack in the Upper Rio Grande River basin is below normal at 59% of median. Precipitation for March was 71% of average which brings water year-to-date precipitation to 74% of average. Reservoir storage at the end of March was 77% of average compared to 70% last year. Streamflow forecasts range from 95% of average for Ute Creek near Fort Garland to 36% of average for the San Antonio River at Ortiz.



# Upper Rio Grande River Basin Snowpack and Streamflow Forecasts April 1, 2015



## Upper Rio Grande Basin Streamflow Forecasts - April 1, 2015

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

| UPPER RIO GRANDE BASIN                        | Forecast Period | 90% (KAF) | 70% (KAF) | 50% (KAF) | % Avg | 30% (KAF) | 10% (KAF) | 30yr Avg (KAF) |
|---|-----------------|-----------|-----------|-----------|-------|-----------|-----------|----------------|
| Rio Grande at Thirty Mile Bridge <sup>2</sup> | APR-JUL         | 44        | 58        | 68        | 60%   | 80        | 98        | 113            |
|   | APR-SEP         | 48        | 66        | 79        | 61%   | 94        | 118       | 129            |
| Rio Grande at Wagon Wheel Gap <sup>2</sup>    | APR-SEP         | 128       | 175       | 210       | 62%   | 250       | 315       | 340            |
| SF Rio Grande at South Fork <sup>2</sup>      | APR-SEP         | 39        | 51        | 60        | 47%   | 69        | 85        | 127            |
| Rio Grande nr Del Norte <sup>2</sup>          | APR-SEP         | 185       | 250       | 300       | 58%   | 350       | 435       | 515            |
| Saguache Ck nr Saguache                       | APR-SEP         | 15.2      | 22        | 28        | 88%   | 34        | 44        | 32             |
| Alamosa Ck ab Terrace Reservoir               | APR-SEP         | 22        | 29        | 34        | 50%   | 40        | 50        | 68             |
| La Jara Ck nr Capulin                         | MAR-JUL         | 2.4       | 3.7       | 4.8       | 54%   | 6.1       | 8.3       | 8.9            |
|   | APR-JUL         | 1.51      | 2.8       | 3.9       | 48%   | 5.2       | 7.4       | 8.2            |
| Trinchera Ck ab Turners Ranch                 | APR-SEP         | 8         | 9.8       | 11.2      | 89%   | 12.6      | 14.9      | 12.6           |
| Sangre de Cristo Ck <sup>2</sup>              | APR-SEP         | 6.3       | 10.4      | 13.8      | 85%   | 17.6      | 24        | 16.3           |
| Ute Ck nr Fort Garland                        | APR-SEP         | 7.1       | 10        | 12.2      | 95%   | 14.7      | 18.7      | 12.8           |
| Platoro Reservoir Inflow                      | APR-JUL         | 23        | 28        | 32        | 57%   | 36        | 43        | 56             |
|   | APR-SEP         | 24        | 30        | 35        | 56%   | 40        | 48        | 62             |
| Conejos R nr Mogote <sup>2</sup>              | APR-SEP         | 71        | 91        | 107       | 55%   | 124       | 151       | 194            |
| San Antonio R at Ortiz                        | APR-SEP         | 2.8       | 4.4       | 5.6       | 36%   | 7         | 9.4       | 15.6           |
| Los Pinos R nr Ortiz                          | APR-SEP         | 26        | 33        | 38        | 52%   | 44        | 53        | 73             |
| Culebra Ck at San Luis                        | APR-SEP         | 10.9      | 15.6      | 19.2      | 83%   | 23        | 30        | 23             |
| Costilla Reservoir Inflow                     | MAR-JUL         | 5.5       | 7.8       | 9.6       | 86%   | 11.6      | 14.9      | 11.1           |
|   | APR-JUL         | 4.7       | 7         | 8.8       | 85%   | 10.8      | 14.1      | 10.3           |
| Costilla Ck nr Costilla <sup>2</sup>          | MAR-JUL         | 11        | 16.6      | 21        | 81%   | 26        | 35        | 26             |
|   | APR-JUL         | 8.6       | 14.2      | 18.6      | 78%   | 24        | 33        | 24             |

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

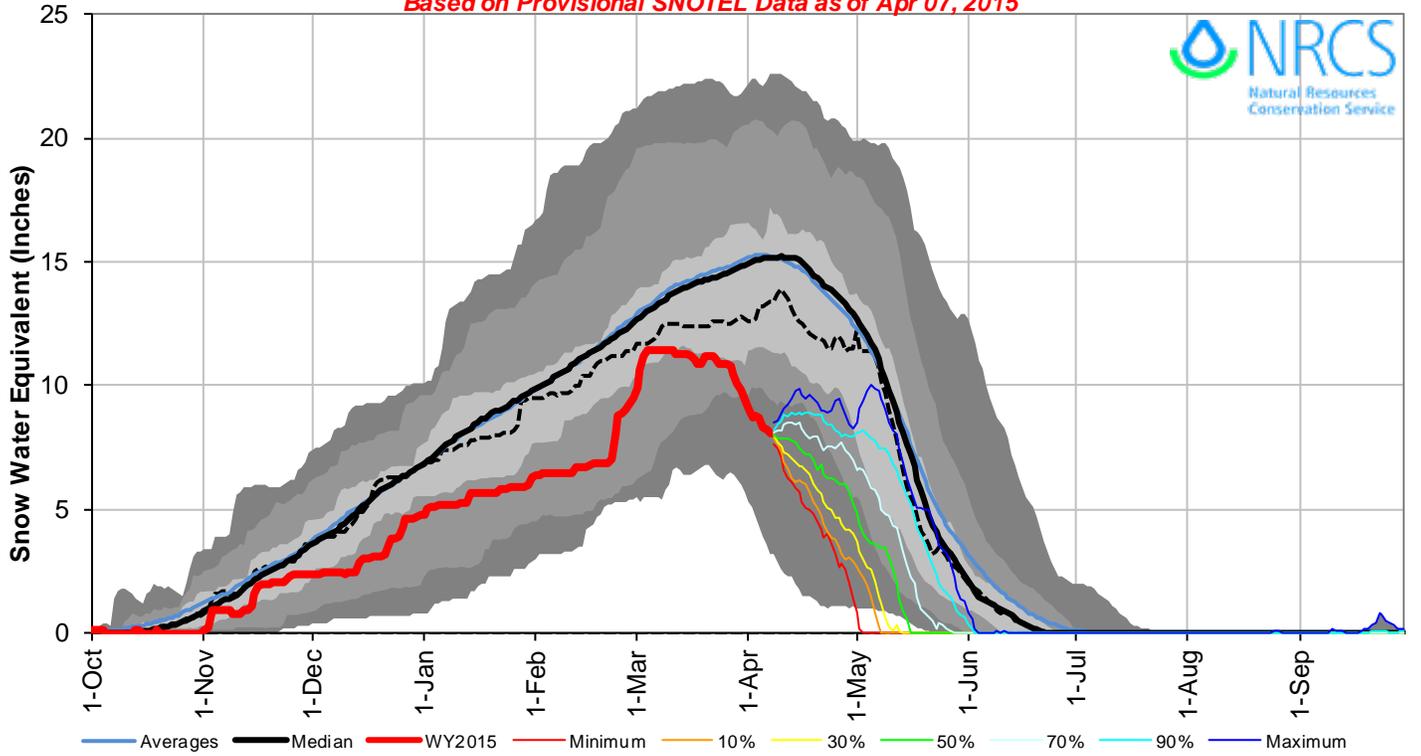
3) Median value used in place of average

| Reservoir Storage<br>End of March, 2015 | Current (KAF) | Last Year (KAF) | Average (KAF) | Capacity (KAF) |
|---|---------------|-----------------|---------------|----------------|
| Beaver Reservoir                        | 0.0           | 2.5             | 4.3           | 4.5            |
| Continental Reservoir                   | 8.8           | 10.9            | 5.8           | 27.0           |
| Platoro Reservoir                       | 11.2          | 10.0            | 24.2          | 60.0           |
| Rio Grande Reservoir                    | 31.2          | 24.2            | 19.1          | 51.0           |
| Sanchez Reservoir                       | 3.8           | 6.8             | 28.1          | 103.0          |
| Santa Maria Reservoir                   | 15.8          | 9.2             | 10.9          | 45.0           |
| Terrace Reservoir                       | 6.9           | 6.6             | 8.2           | 18.0           |
| Basin-wide Total                        | 77.7          | 70.2            | 100.6         | 308.5          |
| # of reservoirs                         | 7             | 7               | 7             | 7              |

| Watershed Snowpack Analysis<br>April 1, 2015 | # of Sites | % Median | Last Year % Median |
|--|------------|----------|--------------------|
| ALAMOSA CREEK BASIN                          | 3          | 43%      | 85%                |
| CONEJOS & RIO SAN ANTONIO BASINS             | 4          | 61%      | 75%                |
| CULEBRA & TRINCHERA BASINS                   | 6          | 74%      | 79%                |
| HEADWATERS RIO GRANDE RIVER BASIN            | 13         | 54%      | 81%                |
| UPPER RIO GRANDE BASIN                       | 25         | 59%      | 79%                |

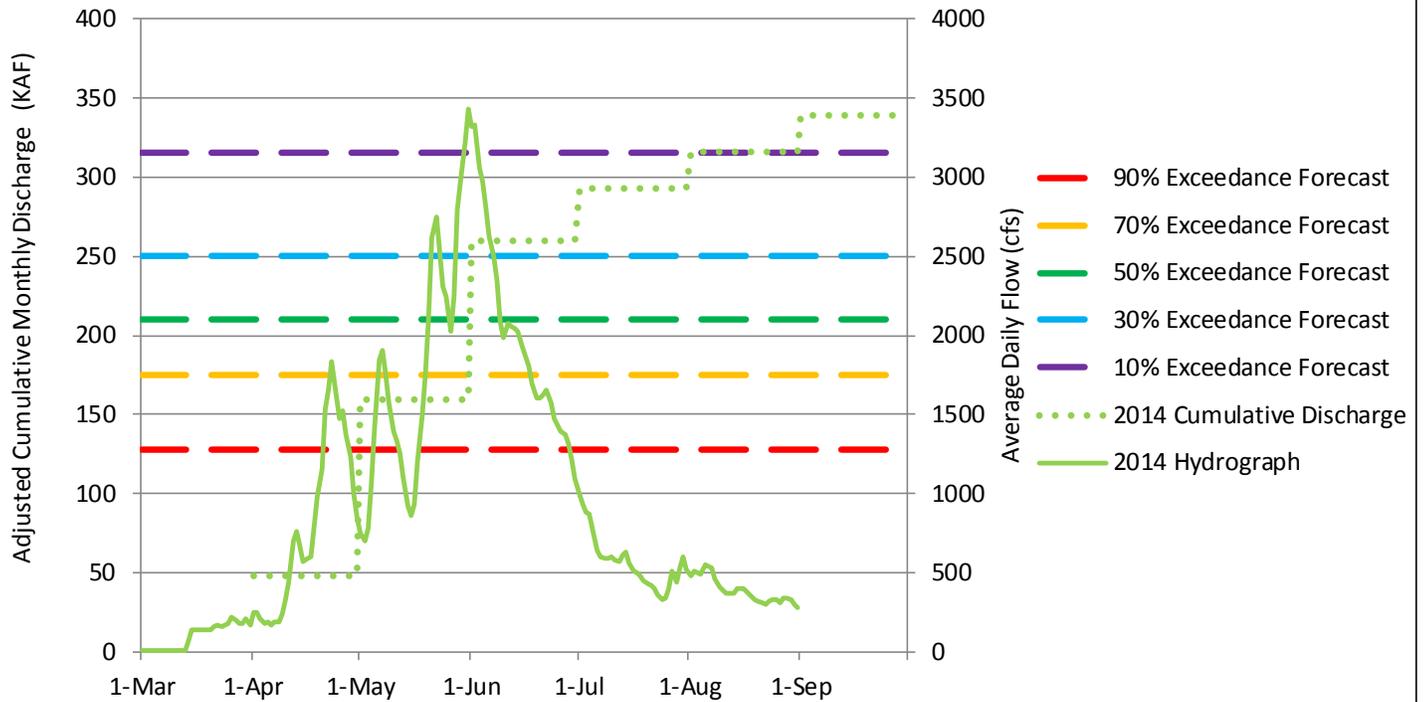
## Upper Rio Grande River Basin with Non-Exceedence Projections

Based on Provisional SNOTEL Data as of Apr 07, 2015



## Rio Grande at Wagon Wheel Gap

Daily and Cumulative Discharge Compared to Current Streamflow Forecasts (Apr-Sep)

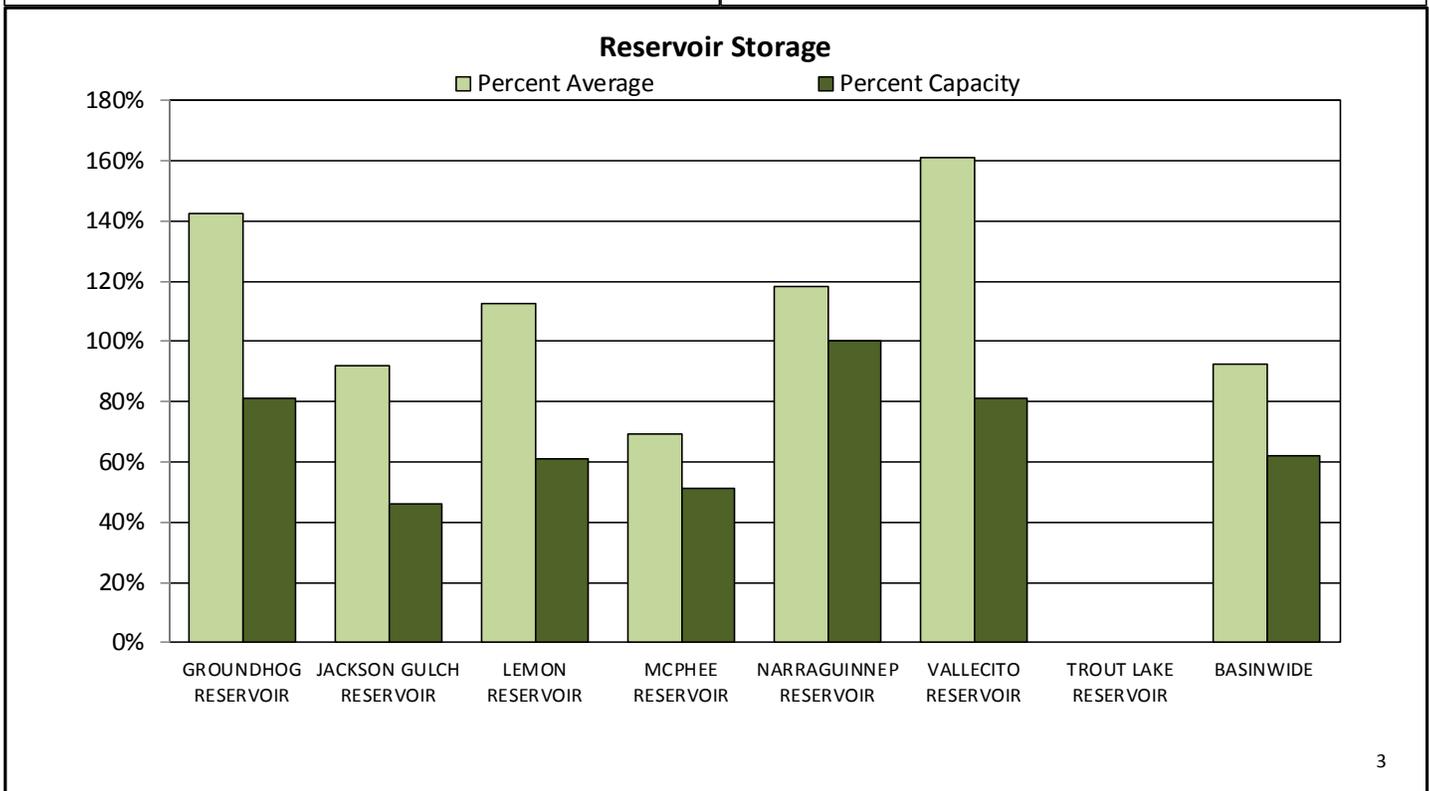
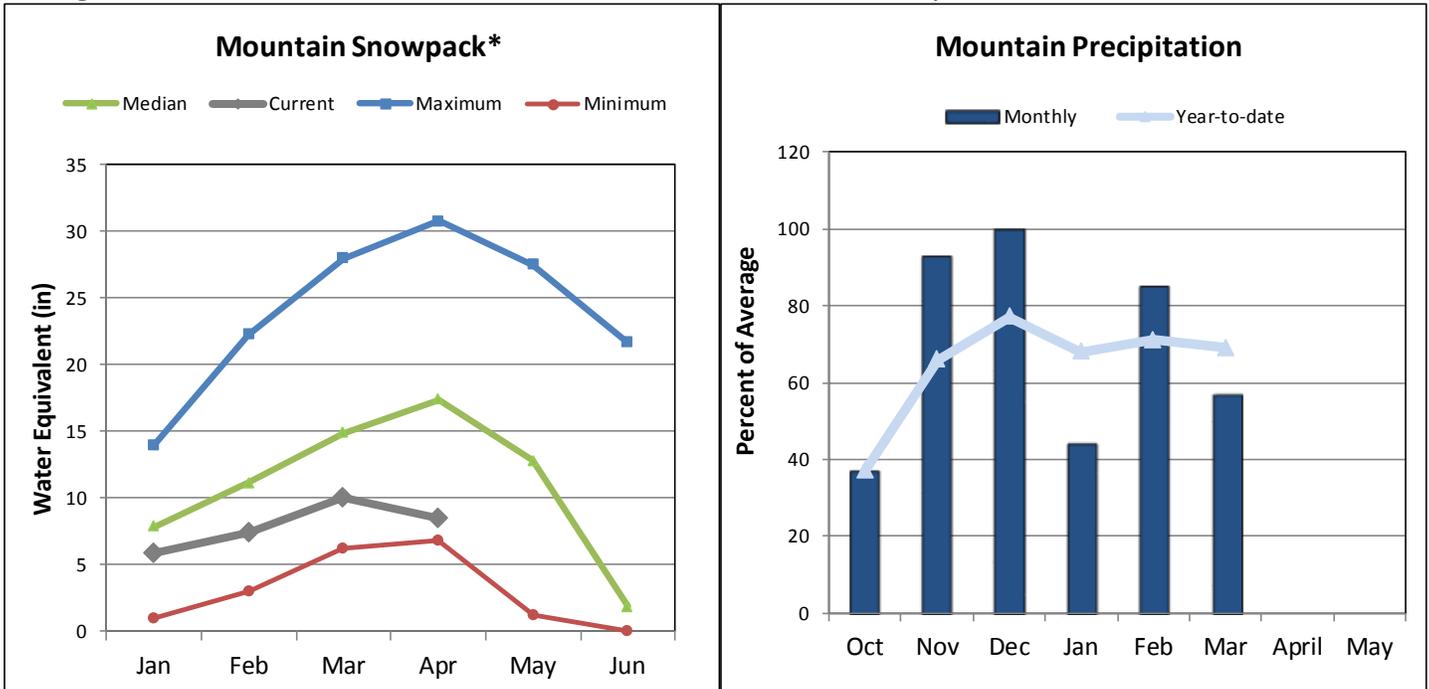


Please refer to the sections at the end of this report for further explanation concerning these graphs.

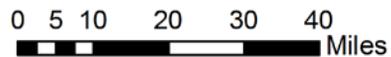
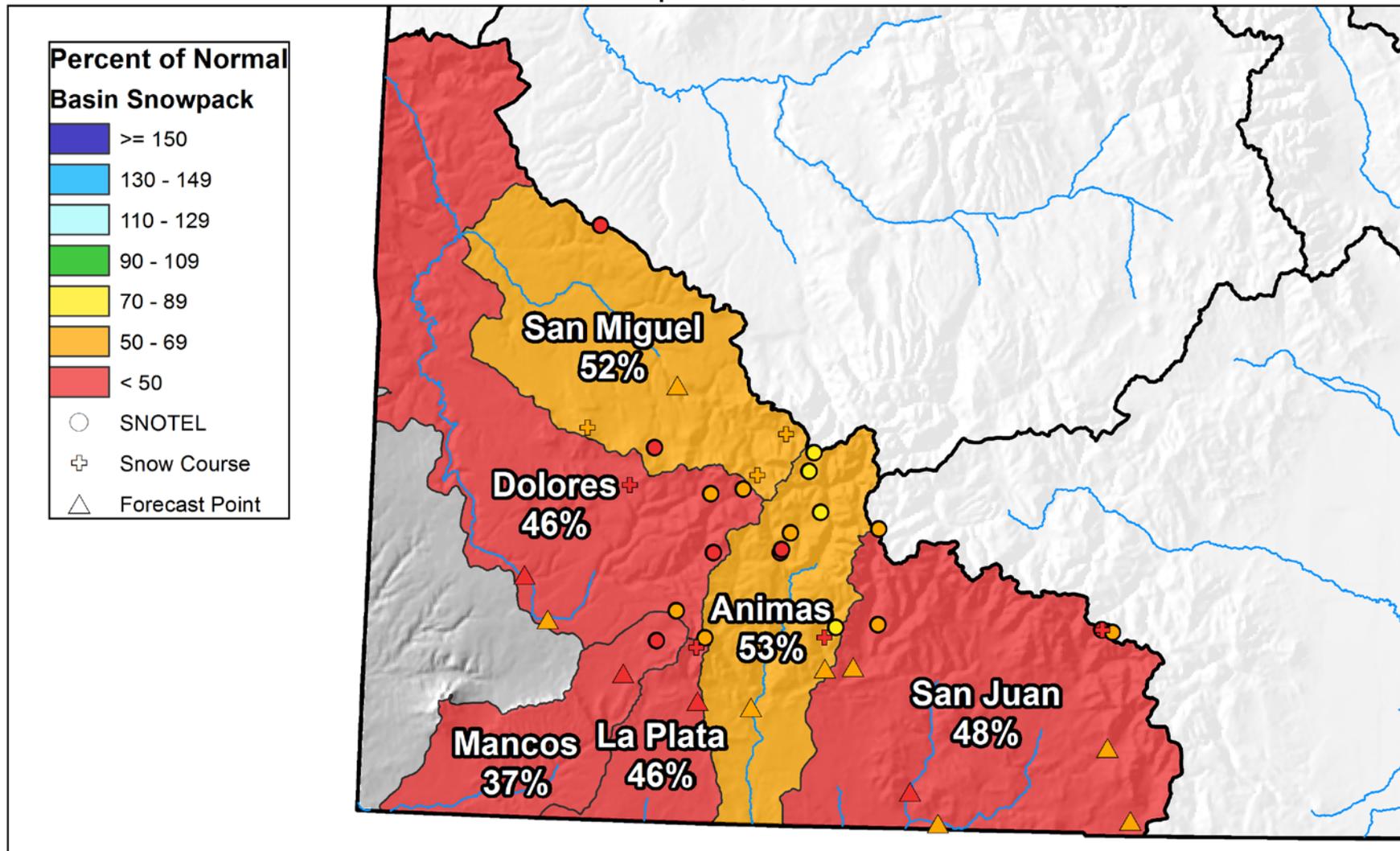
# SAN MIGUEL, DOLORES, ANIMAS, AND SAN JUAN RIVER BASINS

April 1, 2015

Snowpack in the combined southwest river basins is below normal at 49% of median. Precipitation for March was 57% of average which brings water year-to-date precipitation to 69% of average. Reservoir storage at the end of March was 90% of average compared to 82% last year. Current streamflow forecasts range from 67% of average for the Cone Reservoir Inlet to 43% for the La Plata River at Hesperus.



# San Miguel, Dolores, Animas, and San Juan River Basins Snowpack and Streamflow Forecasts April 1, 2015



## San Miguel-Dolores-Animas-San Juan River Basins Streamflow Forecasts - April 1, 2015

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

| SAN MIGUEL-DOLORES-ANIMAS-SAN JUAN RIVER BASINS | Forecast Period | 90% (KAF) | 70% (KAF) | 50% (KAF) | % Avg | 30% (KAF) | 10% (KAF) | 30yr Avg (KAF) |
|---|-----------------|-----------|-----------|-----------|-------|-----------|-----------|----------------|
| Dolores R at Dolores                            | APR-JUL         | 89        | 115       | 135       | 55%   | 156       | 190       | 245            |
| McPhee Reservoir Inflow                         | APR-JUL         | 83        | 113       | 135       | 46%   | 159       | 199       | 295            |
| San Miguel R nr Placerville                     | APR-JUL         | 51        | 68        | 80        | 63%   | 94        | 116       | 128            |
| Cone Reservoir Inlet                            | APR-JUL         | 1.34      | 1.72      | 2         | 67%   | 2.3       | 2.8       | 3              |
| Gurley Reservoir Inlet                          | APR-JUL         | 7.5       | 9.3       | 10.6      | 65%   | 12.1      | 14.3      | 16.4           |
| Lilywands Reservoir Inlet                       | APR-JUL         | 0.58      | 0.95      | 1.25      | 65%   | 1.59      | 2.2       | 1.92           |
| Rio Blanco at Blanco Diversion <sup>2</sup>     | APR-JUL         | 19.4      | 25        | 30        | 56%   | 35        | 43        | 54             |
| Navajo R at Oso Diversion <sup>2</sup>          | APR-JUL         | 23        | 30        | 36        | 55%   | 41        | 50        | 65             |
| San Juan R nr Carracas <sup>2</sup>             | APR-JUL         | 119       | 161       | 194       | 51%   | 230       | 285       | 380            |
| Piedra R nr Arboles                             | APR-JUL         | 64        | 85        | 100       | 48%   | 117       | 143       | 210            |
| Vallecito Reservoir Inflow                      | APR-JUL         | 81        | 100       | 115       | 59%   | 131       | 156       | 194            |
| Navajo Reservoir Inflow <sup>2</sup>            | APR-JUL         | 205       | 275       | 330       | 45%   | 395       | 490       | 735            |
| Animas R at Durango                             | APR-JUL         | 170       | 215       | 245       | 59%   | 280       | 335       | 415            |
| Lemon Reservoir Inflow                          | APR-JUL         | 19.8      | 25        | 29        | 53%   | 33        | 40        | 55             |
| La Plata R at Hesperus                          | APR-JUL         | 6.5       | 8.5       | 10        | 43%   | 11.6      | 14.2      | 23             |
| Mancos R nr Mancos <sup>2</sup>                 | APR-JUL         | 7.8       | 11.3      | 14        | 45%   | 17        | 22        | 31             |

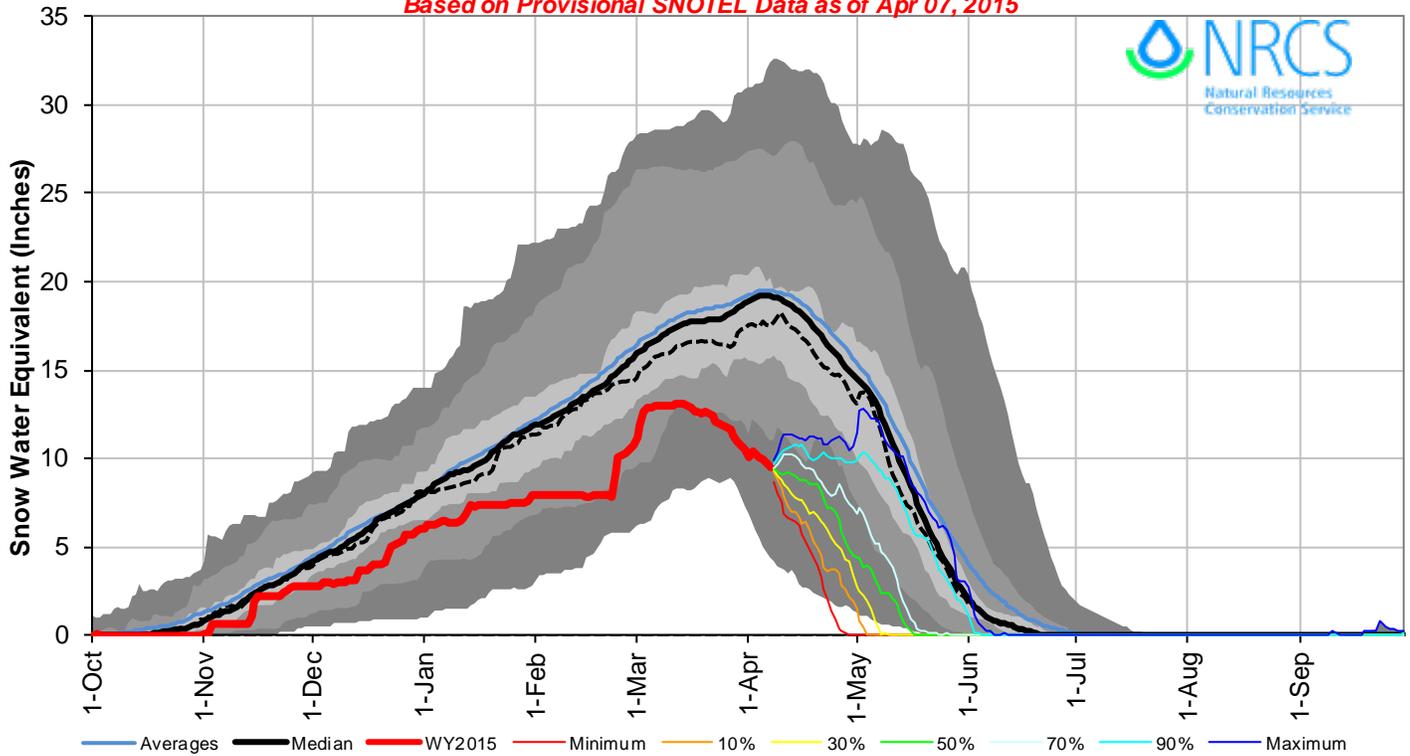
- 1) 90% and 10% exceedance probabilities are actually 95% and 5%
- 2) Forecasts are for unimpaired flows. Actual flow will be dependent on management of upstream reservoirs and diversions
- 3) Median value used in place of average

| Reservoir Storage<br>End of March, 2015 | Current (KAF) | Last Year (KAF) | Average (KAF) | Capacity (KAF) |
|---|---------------|-----------------|---------------|----------------|
| Groundhog Reservoir                     | 17.8          | 7.3             | 12.5          | 22.0           |
| Jackson Gulch Reservoir                 | 4.6           | 3.5             | 5.0           | 10.0           |
| Lemon Reservoir                         | 24.4          | 18.2            | 21.7          | 40.0           |
| Mcphee Reservoir                        | 195.4         | 193.3           | 282.2         | 381.0          |
| Narraguinnep Reservoir                  | 19.0          | 13.6            | 16.1          | 19.0           |
| Trout Lake Reservoir                    | 0.0           | 1.2             | 1.4           | 3.2            |
| Vallecito Reservoir                     | 101.9         | 94.4            | 63.3          | 126.0          |
| Basin-wide Total                        | 363.1         | 331.5           | 402.2         | 601.2          |
| # of reservoirs                         | 7             | 7               | 7             | 7              |

| Watershed Snowpack Analysis<br>April 1, 2015    | # of Sites | % Median | Last Year % Median |
|---|------------|----------|--------------------|
| ANIMAS RIVER BASIN                              | 11         | 53%      | 85%                |
| DOLORES RIVER BASIN                             | 7          | 46%      | 79%                |
| SAN MIGUEL RIVER BASIN                          | 6          | 52%      | 86%                |
| SAN JUAN RIVER BASIN                            | 4          | 48%      | 75%                |
| SAN MIGUEL-DOLORES-ANIMAS-SAN JUAN RIVER BASINS | 26         | 49%      | 81%                |

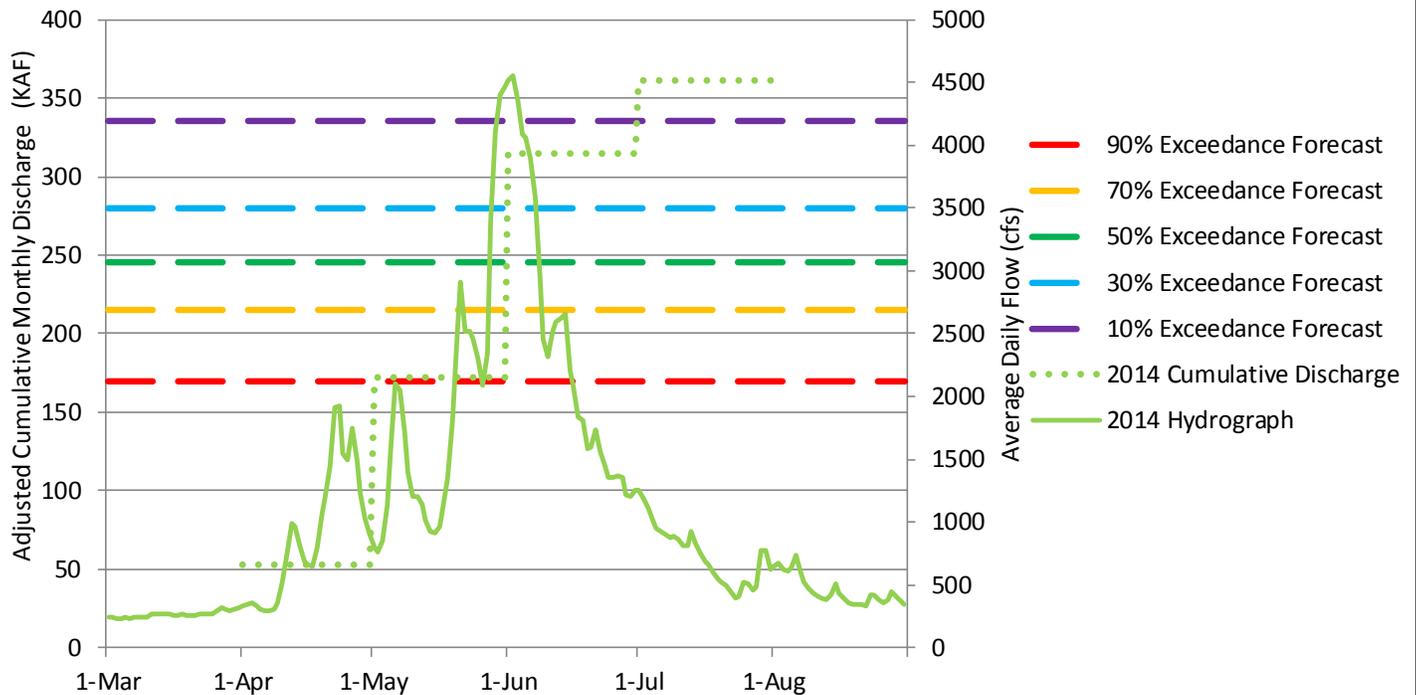
# San Miguel, Dolores, Animas and San Juan River Basin with Non-Exceedence Projections

Based on Provisional SNOTEL Data as of Apr 07, 2015



## Animas River at Durango, CO

Daily and Cumulative Discharge Compared to Current Streamflow Forecasts (Apr - Jul)



Please refer to the sections at the end of this report for further explanation concerning these graphs.

# How to Read Non-Exceedance Projections Graphs

The graphs show snow water equivalent (SWE) projections (in inches) for the October 1 through September 30 water year. Basin “observed” SWE values are computed using SNOTEL sites which are characteristic of the snowpack of the particular basin. The SWE observations at these sites are averaged and normalized to produce these basin snowpack graphs. This new graph format uses non-exceedance projections.

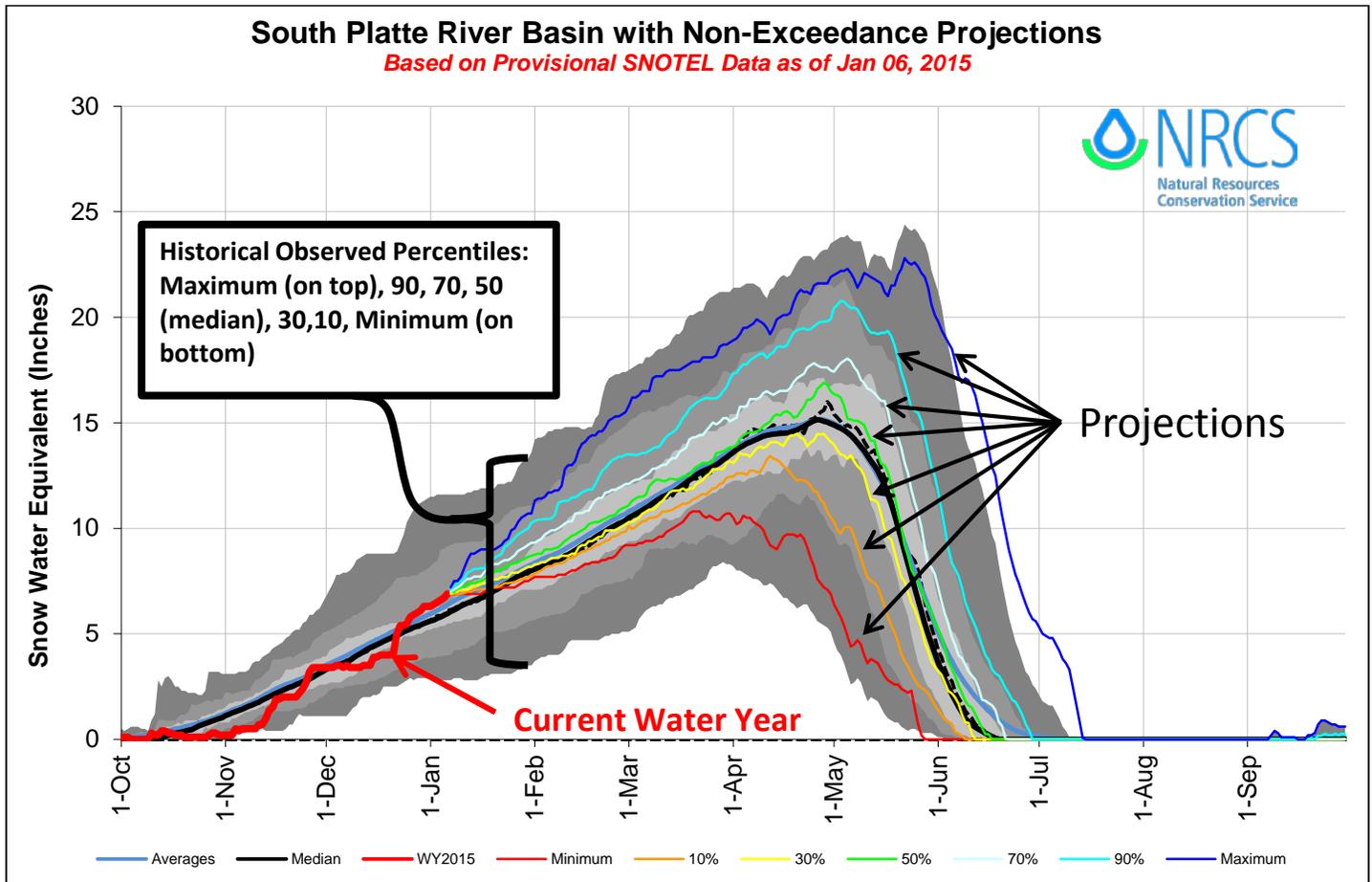
**Current** water year is represented by the heavy red line terminating on the last day the graphic was updated.

**Historical** observed percentile range is shown as a gray background area on the graph. Shades of gray indicate maximum, 90 percentile, 70 percentile, 50 percentile (solid black line), 30 percentile, 10 percentile, and minimum for the period of record.

**Projections** for maximum, 90 percent, 70 percent, 50 percent (most probabilistic snowpack projection, based on median), 30 percent, 10 percent, and minimum exceedances are projected forward from the end of the current line as different colored lines.

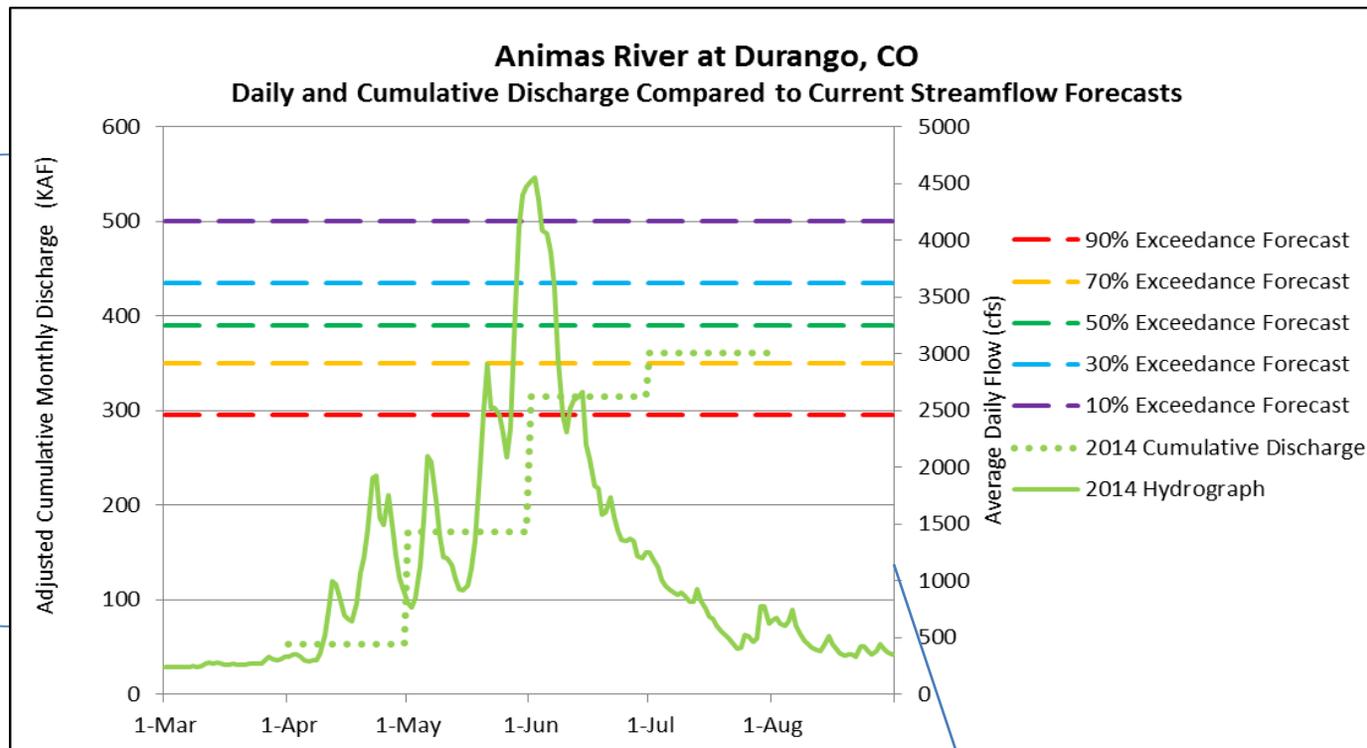
For more detailed information on these graphs visit:

[http://www.nrcs.usda.gov/Internet/FSE\\_DOCUMENTS/nrcs144p2\\_062291.pdf](http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs144p2_062291.pdf)



# Explanation of Flow Comparison Charts

The flow comparison charts were developed to provide a quick comparison between the previous years' observed hydrograph, cumulative seasonal discharge, the current streamflow forecasts, and the current years' observed discharge (both hydrograph and cumulative discharge, as the season progresses). Forecast points for these products were generally chosen to be lower in the basin to best represent the basin-wide streamflow response for the season; the true degree of representativeness will vary between basins. When making comparisons of how the shape of the hydrograph relates to the monthly (and seasonal) cumulative discharges it is important to note that the hydrograph represents observed daily flows at the forecast point while the cumulative values may be adjusted for changes in reservoir storage and diversions to best represent what would be "natural flows" if these impoundments and diversions did not exist. This product can provide additional guidance regarding how to most wisely utilize the five exceedance forecasts based on past observations, current trends, and future uncertainty for a wide variety of purposes and water users.



The left y-axis represents values of adjusted cumulative discharge (KAF). This axis is to be used for comparing the current and previous years to the current five volumetric seasonal exceedance forecasts. This graphic only displays the previous years data but data for the current water year will be added as the season progresses.

The legend displays the symbology and color schemes for the various parameters represented. Exceedance forecasts represent total cumulative discharge for the April through July time period with the exception of the Rio Grande at Wagon Wheel Gap (Apr-Sep).

The right y-axis represents observed daily average discharge at the forecast point of interest. This graphic only displays the previous years data but data for the current water year will be added as the Season progresses.

# How Forecasts Are Made

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Most of the annual streamflow in the western United States 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 SNOTEL sites, along with precipitation, antecedent streamflow, and indices of the El Niño / Southern Oscillation are used in computerized statistical and simulation models to prepare runoff forecasts. Unless otherwise specified, all forecasts are for flows that would occur naturally without any upstream influences.

Forecasts of any kind, of course, are not perfect. Streamflow forecast uncertainty arises from three primary sources: (1) uncertain knowledge 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 others can be interpreted similarly.

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 if they wish to increase their chances of having an adequate supply of water for their operations, they may want to base their decisions on the 90% or 70% exceedance probability forecasts, or something in between. On the other hand, if users are concerned about receiving too much water (for example, threat of flooding), they may want to base their decisions on the 30% or 10% exceedance probability forecasts, or something in between. Regardless of the forecast value users choose for operations, they should be prepared to deal with either more or less water. (Users should remember that even if the 90% exceedance probability forecast is used, there is still a 10% chance of receiving less than this amount.) By using the exceedance probability information, users can easily determine the chances of receiving more or less water.

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In addition to the water supply outlook reports, water supply forecast information for the Western United States is available from the Natural Resources Conservation Service and the National Weather Service monthly, January through June. The information may be obtained from the Natural Resources Conservation Service web page at <http://www.wcc.nrcs.usda.gov/wsf/westwide.html>

*Issued by*

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**Colorado**  
**Water Supply Outlook Report**  
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