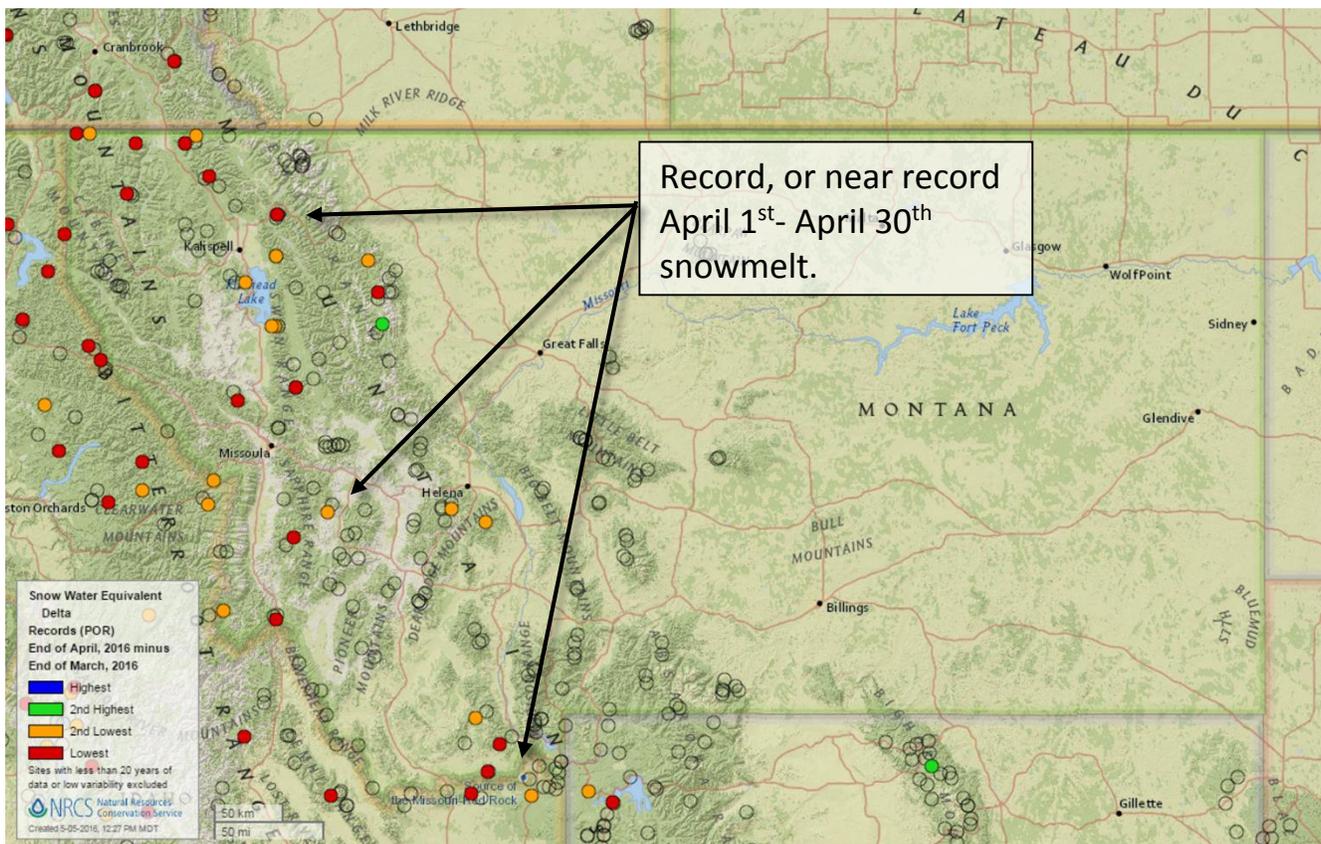


# Montana

## Water Supply Outlook Report

### May 1<sup>st</sup>, 2016



Clear sunny days with well above average temperatures caused substantial melt during the month of April. SNOTEL sites and snowcourses across the state set new records for monthly melt, which reduced snowpack percentages from near normal in most basins on April 1<sup>st</sup> to below normal on May 1<sup>st</sup>, 2016. Peak snow water equivalent (SWE) occurred during the first week in many river basins, and 2016 peaks were near, or slightly below, average (87% to 108%). Both peak SWE and melt are ahead of this schedule this year, adding water to the river systems earlier than average. A return to more seasonal weather would be welcome and would help to prolong the mountain snowpack.

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<http://www.nrcs.usda.gov/wps/portal/nrcs/main/mt/snow/>

## Montana Water Supply Outlook Report as of May 1<sup>st</sup>, 2016

### How forecasts are made

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Most of the annual streamflow in the Western United States originates as snowfall that has accumulated high in the mountains during winter and early spring. As the snowpack accumulates, hydrologists estimate the runoff that will occur when it melts. Predictions are based on careful measurements of snow water equivalent at selected index points. Precipitation, temperature, soil moisture and antecedent streamflow data are combined with snowpack data to prepare runoff forecasts. Streamflow forecasts are coordinated by Natural Resources Conservation Service and National Weather Service hydrologists. This report presents a comprehensive picture of water supply conditions for areas dependent upon surface runoff. It includes selected streamflow forecasts, summarized snowpack and precipitation data, reservoir storage data, and narratives describing current conditions.

Snowpack data are obtained by using a combination of manual and automated SNOTEL measurement methods. Manual readings of snow depth and water equivalent are taken at locations called snow courses on a monthly or semi-monthly schedule during the winter. In addition, snow water equivalent, precipitation and temperature are monitored on a daily basis and transmitted via meteor burst telemetry to central data collection facilities. Both monthly and daily data are used to project snowmelt runoff.

Forecast uncertainty originates from two sources: (1) uncertainty of future hydrologic and climatic conditions, and (2) error in the forecasting procedure. To express the uncertainty in the most probable forecast, four additional forecasts are provided. The actual streamflow can be expected to exceed the most probable forecast 50% of the time. Similarly, the actual streamflow volume can be expected to exceed the 90% forecast volume 90% of the time. The same is true for the 70%, 30%, and 10% forecasts. Generally, the 90% and 70% forecasts reflect drier than normal hydrologic and climatic conditions; the 30% and 10% forecasts reflect wetter than normal conditions. As the forecast season progresses, a greater portion of the future hydrologic and climatic uncertainty will become known and the additional forecasts will move closer to the most probable forecast.

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# Table of Contents

## State-Wide Overview

Snowpack .....	1
Snowpack Maps .....	2-4
Precipitation.....	5
Precipitation Maps.....	6-9
Reservoir Storage.....	10
Reservoir Map.....	11
Streamflow Forecasts.....	12
Streamflow Map .....	13
Surface Water Supply Index (SWSI) .....	14
SWSI Map.....	15

## Individual Basin Summaries

Kootenai River Basin .....	16
Flathead River Basin.....	22
Upper Clark Fork River Basin.....	28
Bitterroot River Basin.....	34
Lower Clark Fork River Basin.....	40
Jefferson River Basin .....	46
Madison River Basin.....	52
Gallatin River Basin .....	58
Headwaters Mainstem (Missouri) River Basin.....	64
Smith-Judith-Musselshell River Basin .....	70
Sun-Teton-Marias River Basin.....	76
St. Mary-Milk River Basin .....	82
Upper Yellowstone River Basin .....	88
Lower Yellowstone River Basin .....	94

## Snowpack Data Report

SNOTEL and Snowcourse Data Summary.....	100
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## Snowpack – Overview

Solar radiation is the primary driver of snowmelt and during the month of April there were plenty of sunny and very warm days where temperatures at low and mid elevations barely got to freezing overnight. These periods of record warmth under high pressure caused substantial melt at many snow measurement locations during the month, which resulted in decreases in snowpack percentages ranging from 5 to 34 percent across the state.

This weather pattern has played out consistently this winter, warm and dry periods followed by unsettled weather for a few days. Unfortunately, there wasn't an abundance of snowfall in the basins during the month of April. West of the Continental Divide only one storm impacted the basin mid-month which caused marginal increases in snow water equivalent (SWE), however it did cause the snowpack to slow its melt for a few days. Basins east of the Divide received more snowfall during the event mid-month but to similar effect, little in the way of major SWE increases and decreased melt. Cloudy and cooler weather caused snowmelt to slow during the last week of the month and some basins received some snowfall. One major basin saw major increases in SWE during the month, the Lower Yellowstone received abundant moisture from a few closed lows which impacted the sub-basins. This moisture was needed in the basins which had been very low for snow totals through mid-March.

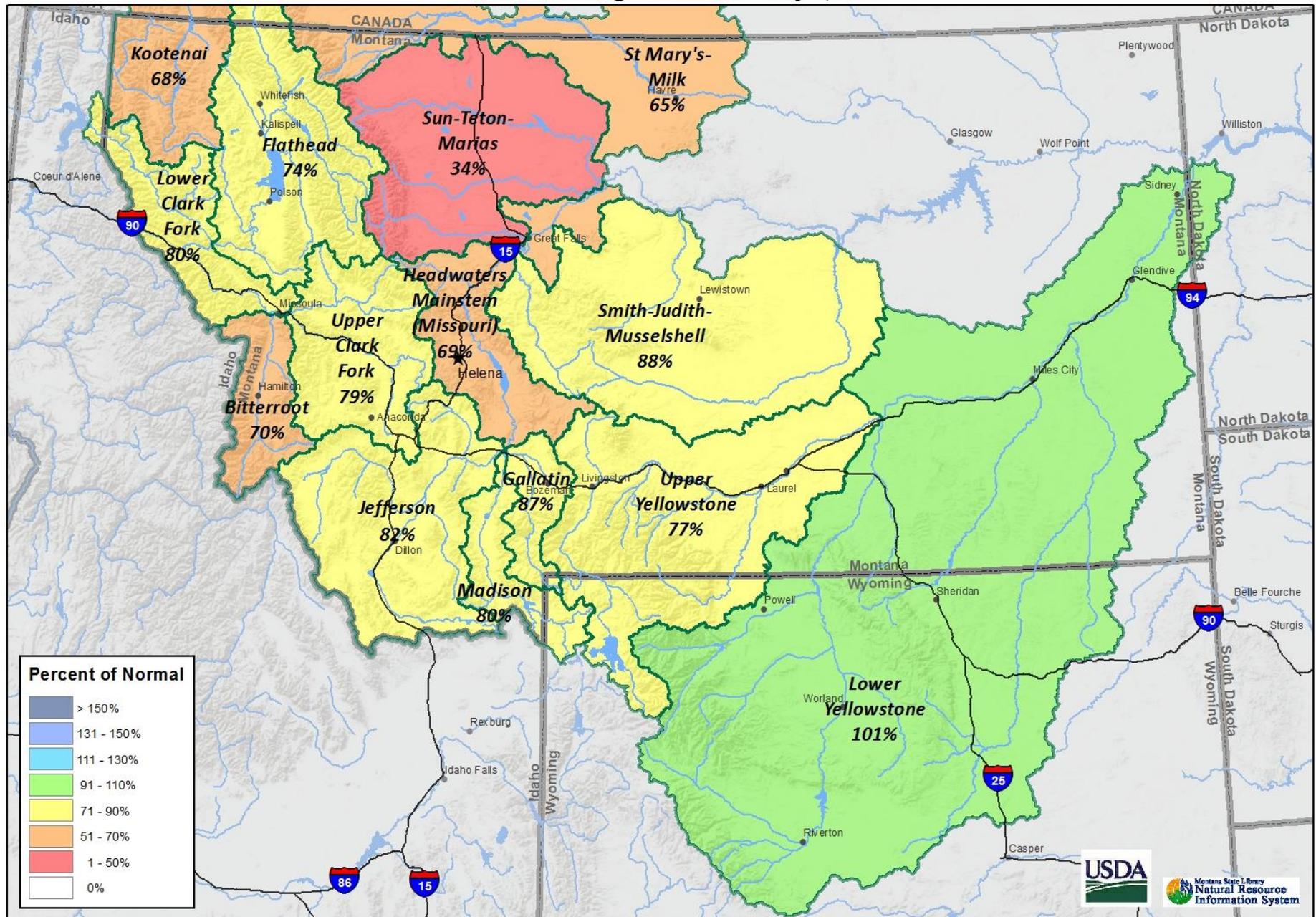
Peak snow water equivalent for this year occurred around the first of April west of the Divide, and between the 1<sup>st</sup> and 15<sup>th</sup> of April East of the Divide. Some high elevation sites have been able to retain their snowpack east of the Divide, but most sites have started to make the transition to melt on May 1<sup>st</sup>. Peak snow water has come early this year, one to two weeks early west of the Divide, and up to four weeks early at high elevation sites east of the Divide. On a positive note, peak snow water this year exceeded last year in all basins except for the Sun-Teton-Marias. Unfortunately, the warm temperatures caused melt and the movement of water ahead of schedule in almost all of the basins. 14 measurement locations west of the Divide experienced the most April snowmelt on record at SNOTEL and snowcourses, 10 sites had second highest melt on record. Early movement of the snow water contained in the mountains will have implications later in the spring and summer when we typically rely on the slow release of snow water into the river systems.

This year has been extremely dry in the Rocky Mountain Front and water users should be prepared for well below average streamflows due to the lack of mountain snowpack. Basin-wide snowpack in the basin in the lowest for this date in the last 35 years, and water users will be dependent on reservoir storage and spring and summer precipitation to augment streamflows.

### ***Snow Water Equivalent***

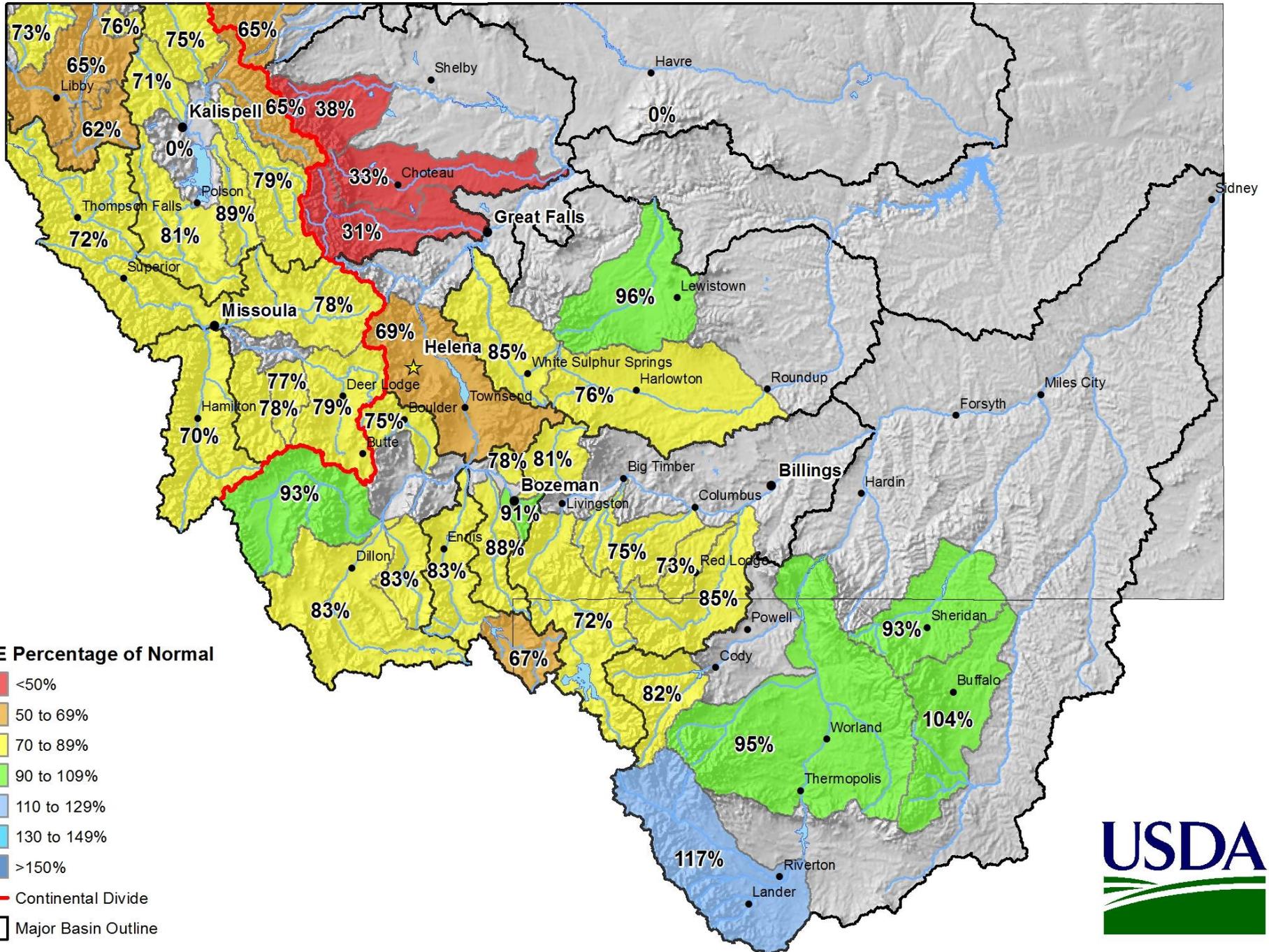
<b>5/1/2016</b>	<i>% Normal</i>	<i>Monthly Δ</i>	<i>% Last Year</i>
<b>Columbia River Basin</b>	<b>73</b>	<b>-23</b>	<b>118</b>
Kootnenai in Montana	68	-26	162
Flathead in Montana	74	-25	107
Upper Clark Fork	79	-16	116
Bitterroot	70	-27	111
Lower Clark Fork	80	-16	118
<b>Missouri River Basin</b>	<b>74</b>	<b>-24</b>	<b>125</b>
Jefferson	82	-29	124
Madison	80	-20	145
Gallatin	87	-11	138
Headwaters Mainstem	69	-34	113
Smith-Judith-Musselshell	88	-19	114
Sun-Teton-Marias	34	-31	87
St. Mary-Milk	65	-5	141
<b>Yellowstone River Basin</b>	<b>91</b>	<b>-3</b>	<b>126</b>
Upper Yellowstone	77	-17	108
Lower Yellowstone	101	+9	144
<b>West of Divide</b>	<b>73</b>	<b>-23</b>	<b>118</b>
<b>East of Divide</b>	<b>81</b>	<b>-15</b>	<b>129</b>
<b>Montana State-Wide</b>	<b>74</b>	<b>-23</b>	<b>119</b>

Montana Data Collection Office  
 Current Snow Water Equivalent  
 Basin Percentage of Normal - May 1, 2016

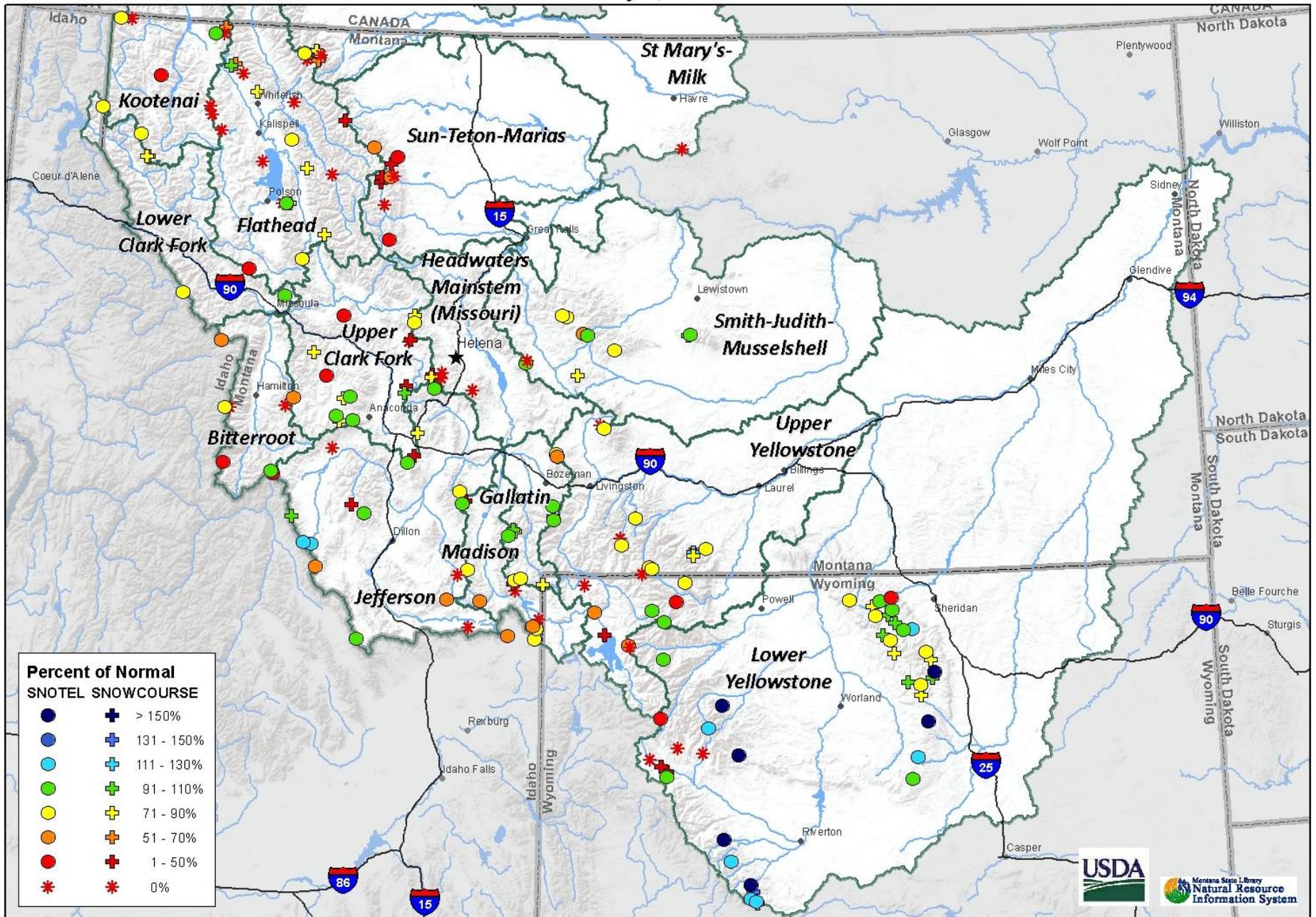


Note: Data includes SNOTEL and Snowcourse Measurements on May 1, 2016

Montana Data Collection Office  
 Sub-Basin Snow Water Equivalent - May 1st, 2016



Montana Data Collection Office  
 Current Snow Water Equivalent  
 May 1, 2016



## Precipitation - Overview

April marks a turning point in the state where basins west of the Divide typically start a slow trend of declining monthly precipitation totals, while basins east of the Divide start to see an increase during the months of April through June. The weather patterns experienced this month didn't yield average precipitation in any of the major basins except the Headwaters Mainstem around Helena and Lower Yellowstone in Wyoming.

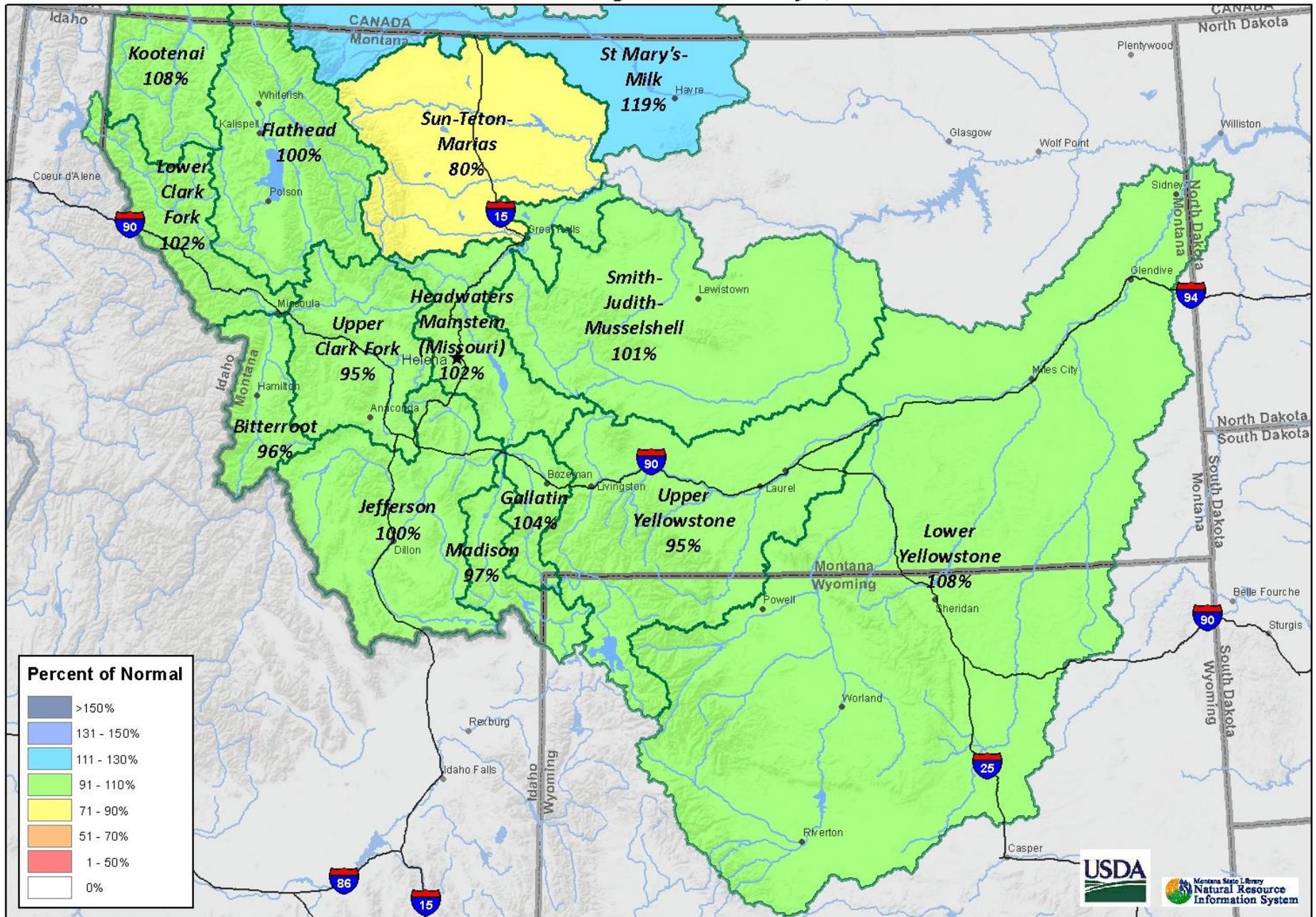
The dominant pattern of this winter and spring has been periods of high pressure (sunny and above average temperatures) followed by unsettled weather and some precipitation and cooling. Mountain SNOTEL locations west of the Divide received 56% to 82% of average precipitation during the month of April. East of the Divide mountain SNOTEL sites received 75% to 172% of average precipitation. Valley locations generally received more precipitation than the mountains percentage wise over the month.

The above normal precipitation in almost all basins during the month of March helped to improve the water year-to-date precipitation as of April 1<sup>st</sup>, and helped to buffer the below average precipitation for the month of April. Currently on May 1<sup>st</sup> all basins are near to slightly above average for water year (October 1<sup>st</sup> – Current) except the Sun-Teton-Marias which is below average at 80%.

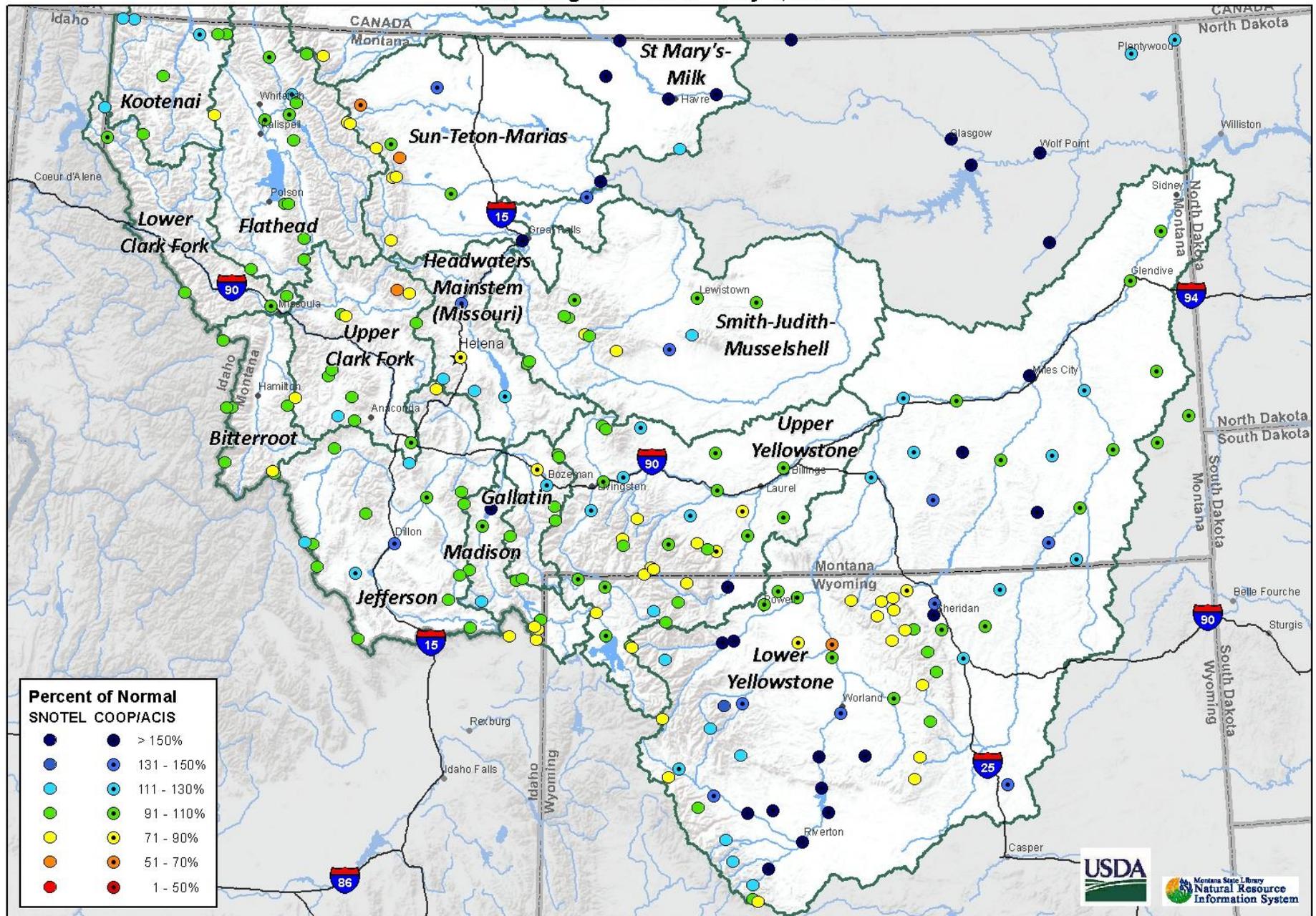
### *Precipitation*

<b>5/1/2016</b>	<i>Monthly % Avg</i>	<i>Water Year % Avg</i>	<i>WY % Last Year</i>
<b>Columbia River Basin</b>	<b>69</b>	<b>100</b>	<b>101</b>
Kootnenai in Montana	56	108	110
Flathead in Montana	69	100	97
Upper Clark Fork	82	95	102
Bitterroot	67	96	95
Lower Clark Fork	59	102	103
<b>Missouri River Basin</b>	<b>103</b>	<b>101</b>	<b>113</b>
Jefferson	86	100	122
Madison	75	97	131
Gallatin	83	104	114
Headwaters Mainstem	106	102	106
Smith-Judith-Musselshell	88	101	105
Sun-Teton-Marias	90	80	79
St. Mary-Milk	172	119	112
<b>Yellowstone River Basin</b>	<b>124</b>	<b>103</b>	<b>118</b>
Upper Yellowstone	69	95	107
Lower Yellowstone	153	108	127
<b>West of Divide</b>	<b>69</b>	<b>100</b>	<b>101</b>
<b>East of Divide</b>	<b>105</b>	<b>99</b>	<b>114</b>
<b>Montana State-Wide</b>	<b>93</b>	<b>101</b>	<b>109</b>

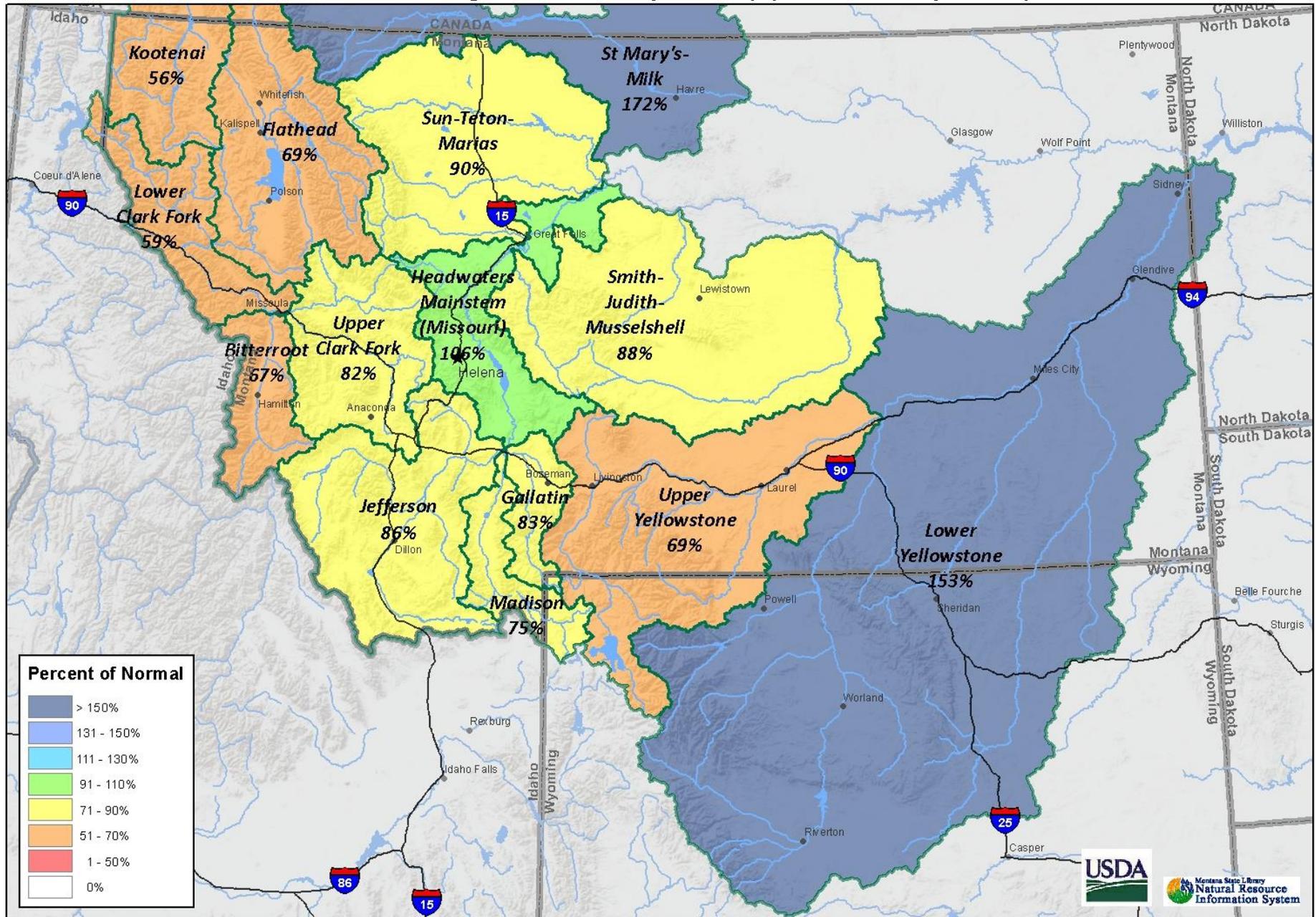
Montana Data Collection Office  
 Water Year to Date Precipitation  
 Basin Percentage of Normal - May 1, 2016



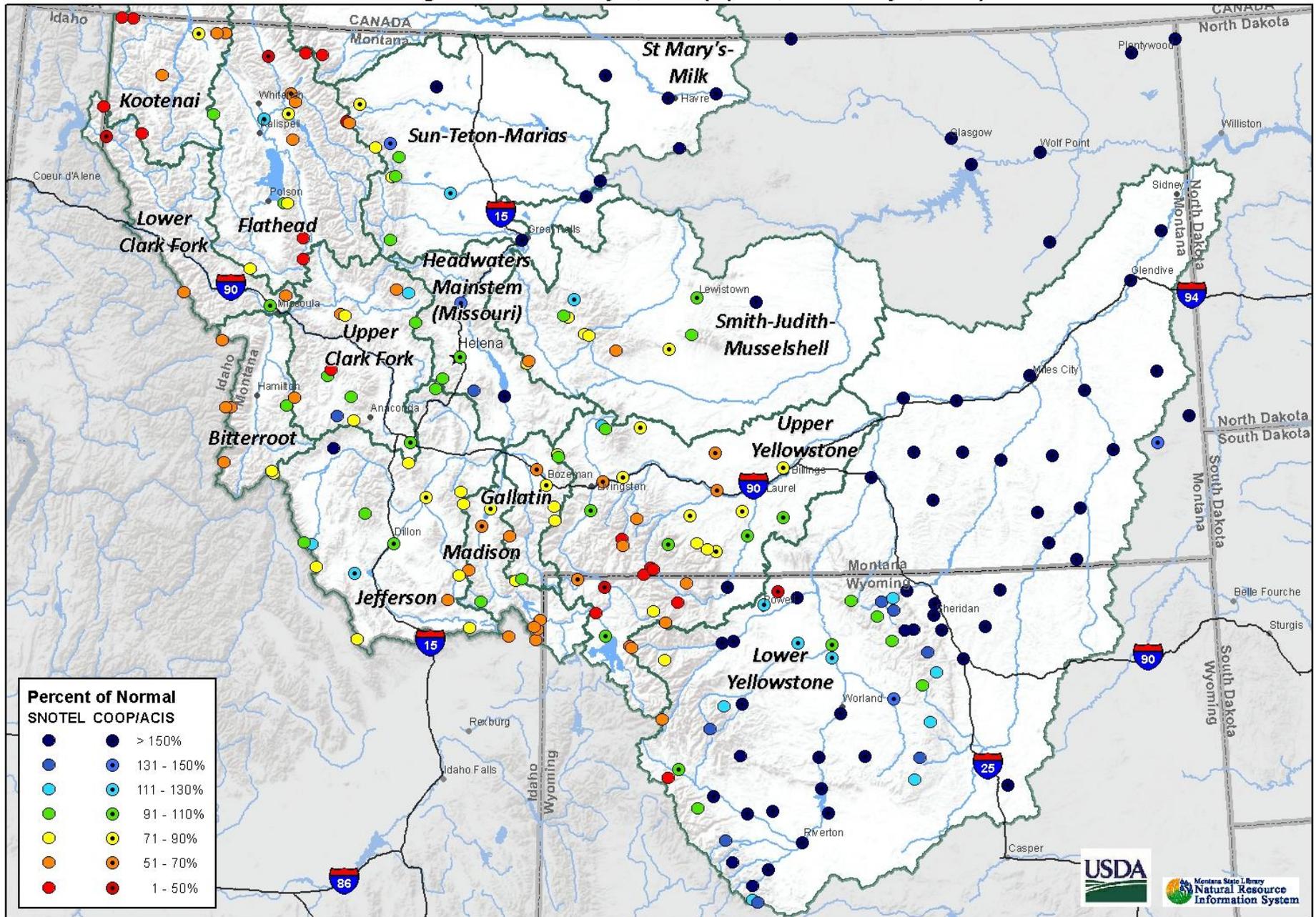
Montana Data Collection Office  
 Water Year to Date Precipitation  
 Percentage of Normal - May 1, 2016



Montana Data Collection Office  
 Monthly Precipitation  
 Basin Percentage of Normal - May 1, 2016 (April 1, 2016 - May 1, 2016)



Montana Data Collection Office  
 Monthly Precipitation  
 Percentage of Normal - May 1, 2016 (April 1, 2016 - May 1, 2016)



## Reservoirs - Overview

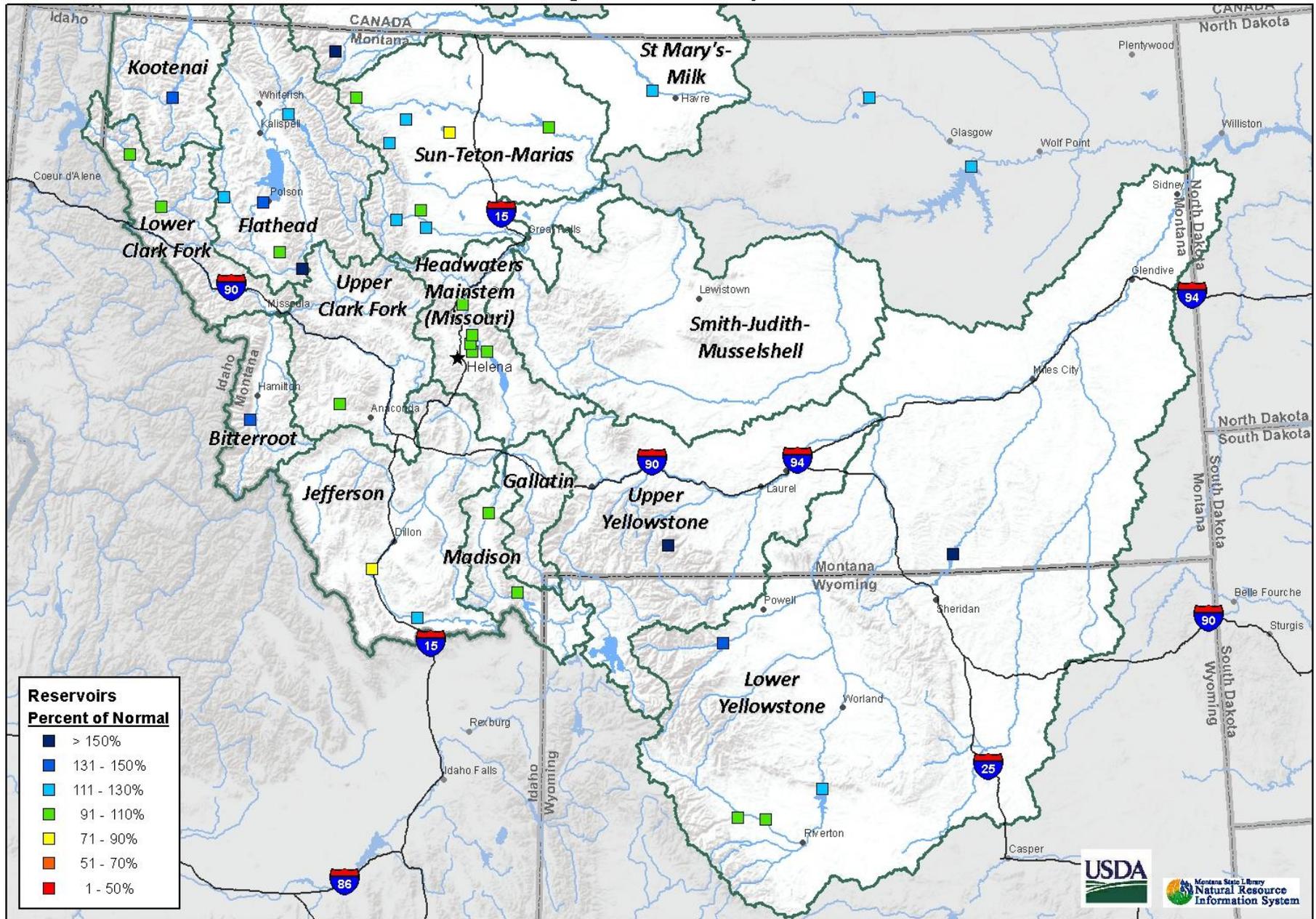
Reservoir storage has been near to above average in most basins throughout the winter, and continues to be in good standing in most locations. The early spring runoff has been captured in most reservoirs, boosting the percentages of average for May 1<sup>st</sup>.

The early spring runoff may come into play for water managers later this water year if spring and summer are dry with regards to precipitation. As water is used this irrigation season the reservoir levels will drop, and early snowmelt means there would be less water to slowly refill the reservoirs if there is high demand.

### *Reservoir Storage*

<b>5/1/2016</b>	<i>% Average</i>	<i>% Capacity</i>	<i>% Last Year</i>
<b>Columbia River Basin</b>	<b>132</b>	<b>71</b>	<b>95</b>
Kootenai in Montana	137	62	87
Flathead in Montana	130	78	102
Upper Clark Fork	106	85	96
Bitterroot	153	94	101
Lower Clark Fork	105	96	101
<b>Missouri River Basin</b>	<b>113</b>	<b>78</b>	<b>97</b>
Jefferson	95	59	104
Madison	110	81	94
Gallatin	112	68	86
Headwaters Mainstem	114	80	97
Smith-Judith-Musselshell	131	86	86
Sun-Teton-Marias	103	57	86
St. Mary-Milk	125	66	82
<b>Yellowstone River Basin</b>	<b>107</b>	<b>60</b>	<b>97</b>
Upper Yellowstone	121	56	114
Lower Yellowstone	106	60	96
<b>West of Divide</b>	<b>132</b>	<b>71</b>	<b>95</b>
<b>East of Divide</b>	<b>113</b>	<b>76</b>	<b>97</b>
<b>Montana State-Wide</b>	<b>118</b>	<b>75</b>	<b>97</b>

Montana Data Collection Office  
 Reservoir Levels  
 Percentage of Normal - May 1, 2016



## Streamflow - Overview

The warm weather in April began the snowmelt runoff for this year in many basins, and streamflows rose during the month accordingly. During the second week of April sunny days and well above average temperatures transitioned the snowpack towards melt and streamflows rose from near average to well above average from April 9<sup>th</sup>-15<sup>th</sup> before cooler temps and unsettled weather slowed the daily melt freeze cycle. A return to high pressure brought streamflows up again April 21<sup>st</sup>– 26<sup>th</sup>, before cooler weather ended the month, again slowing snowmelt.

Some river basins in northwestern Montana may have seen their snowmelt driven peaks during the month of April. Snowmelt peaks are the daily average flow in a stream or river driven only by snowmelt and not snowmelt and daily precipitation that may fall, this differs from the true numerical peak during a year if that is influenced by rain. On April 23<sup>rd</sup>, the Middle Fork of the Flathead at West Glacier hit 12,500 cfs due to snowmelt under dry high pressure, and many other rivers in the area responded in a similar fashion. Rivers east of the Divide are rising and should see their snowmelt peaks in the next few weeks if sunny and warm weather patterns persist.

Long duration streamflow forecasts are down in most basins from April 1<sup>st</sup> due to the lack of snowfall and accelerated melt. Although better than last year at this time, streamflows are near to below average for many of Montana’s rivers and streams. The lowest streamflow forecasts for the May 1<sup>st</sup> – July 31<sup>st</sup> time period are in the Sun-Teton-Marias River basin where both water year precipitation and snowpack are well below normal for this date. Most rivers are forecasted to receive slightly below average streamflows this runoff season, but well above last year’s flows.

Streamflow forecasts assume normal conditions from this point forward, and the weather we have experienced this water year is far from normal temperature wise. Early snowmelt runoff will occur if temperatures continue to be above average, and spring and summer precipitation will be key unless there is a major pattern change.

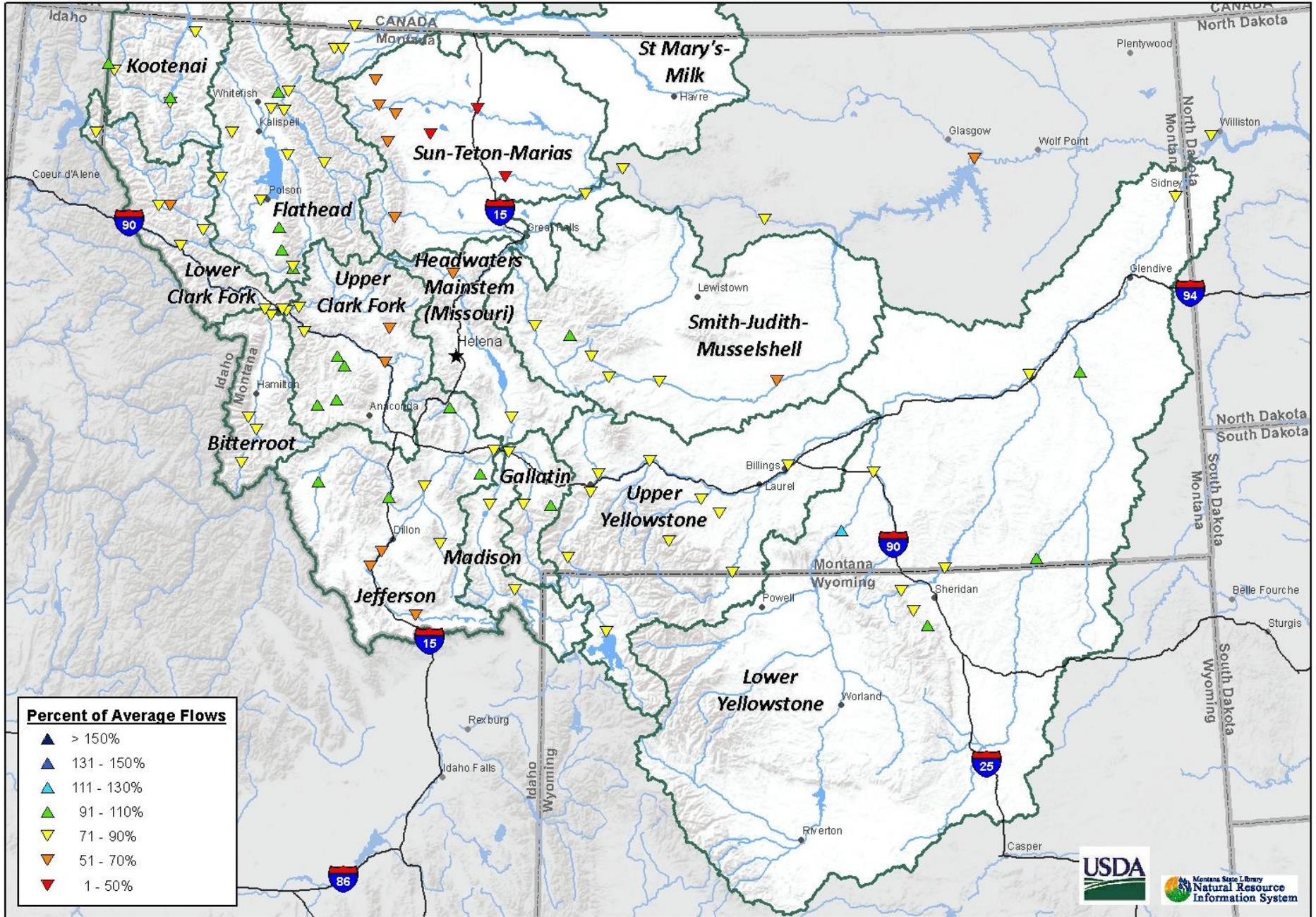
For more information on streamflow forecasts and how to interpret these forecasts [click here](#).

**FOR FORECASTS ABOVE AND BELOW THE 50 PERCENT EXCEEDANCE, LOOK TO THE SPECIFIC BASIN REPORTS.**

### **MAY-JUL Streamflow Forecasts**

<b>5/1/2016</b>	<b>% Average</b>	<b>% Last Year</b>
<b>Columbia River Basin</b>	<b>86</b>	<b>145</b>
Kootenai in Montana	88	140
Flathead in Montana	87	155
Upper Clark Fork	81	134
Bitterroot	82	108
Lower Clark Fork	85	146
<b>Missouri River Basin</b>	<b>74</b>	<b>106</b>
Jefferson	84	171
Madison	76	117
Gallatin	90	131
Headwaters Mainstem	74	101
Smith-Judith-Musselshell	77	83
Sun-Teton-Marias	49	94
St. Mary-Milk	80	119
<b>Yellowstone River Basin</b>	<b>87</b>	<b>89</b>
Upper Yellowstone	82	98
Lower Yellowstone	91	84
<b>West of Divide</b>	<b>86</b>	<b>145</b>
<b>East of Divide</b>	<b>80</b>	<b>97</b>
<b>Montana State-Wide</b>	<b>83</b>	<b>118</b>

Montana Data Collection Office  
 Streamflow Forecast  
 Percentage of Normal - May 1, 2016



## Surface Water Supply Index (SWSI)

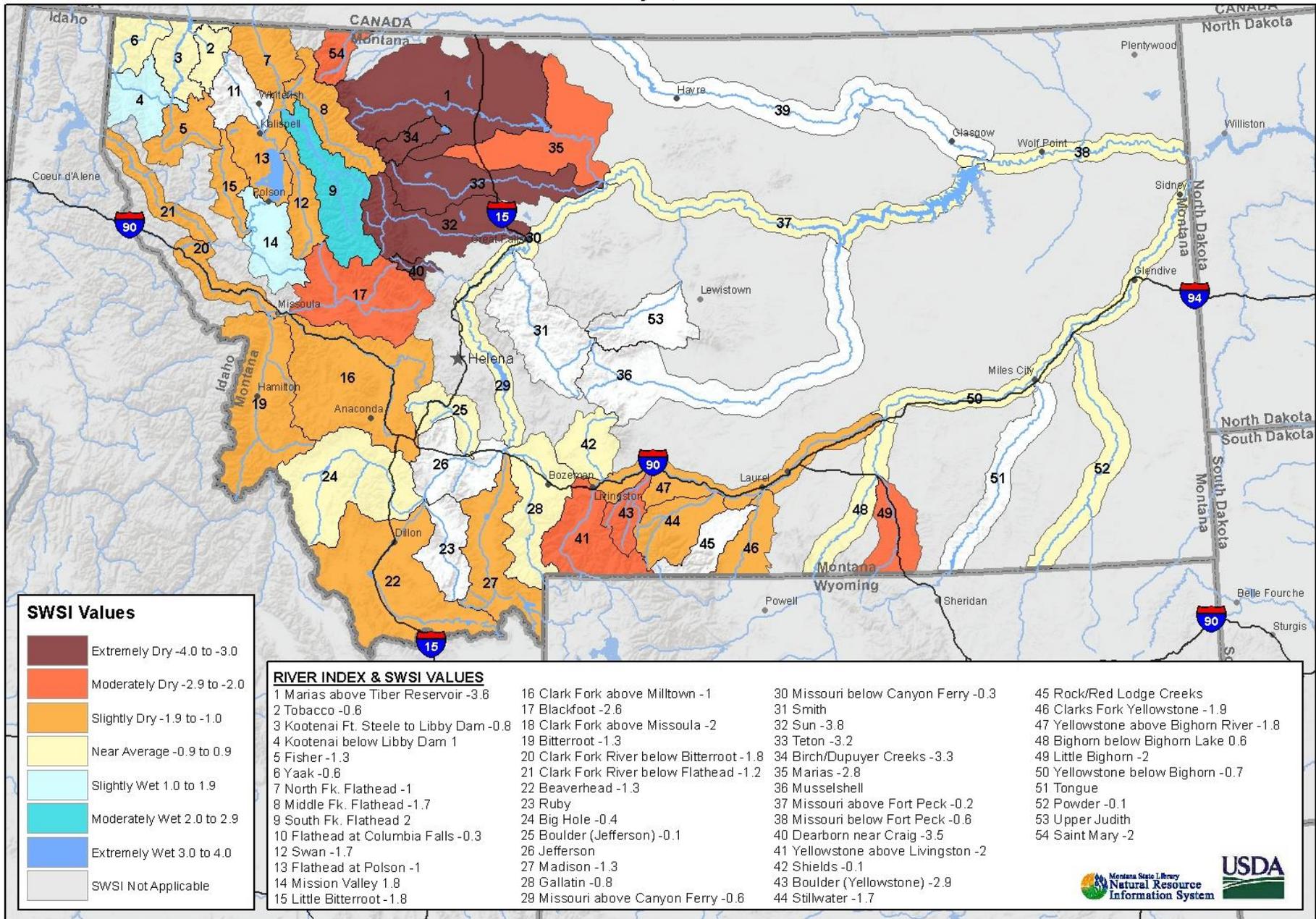
The Surface Water Supply Index (SWSI) is a measure of available surface water availability for the spring and summer months. Water users that rely on mountain precipitation can use the index to evaluate seasonal surface water supplies. The SWSI accounts for mountain snowpack, mountain precipitation, streamflow, reservoir storage, and soil moisture.

Watershed	This month's SWSI	Last Year's SWSI
Marias above Tiber Reservoir	-3.6	-2.7
Tobacco	-0.6	-2.7
Kootenai Ft. Steele to Libby Dam	-0.8	-0.9
Kootenai below Libby Dam	1.0	2.1
Fisher	-1.3	-3.3
Yaak	-0.6	-2.4
North Fk. Flathead	-1.0	-2.5
Middle Fk. Flathead	-1.7	-1.4
South Fk. Flathead	2.0	2.7
Flathead at Columbia Falls	-0.3	0.2
Swan	-1.7	-0.7
Flathead at Polson	-1.0	1.6
Mission Valley	1.8	-0.2
Little Bitterroot	-1.8	-0.9
Clark Fork above Milltown	-1.0	-2.5
Blackfoot	-2.6	-3.1
Clark Fork above Missoula	-2.0	-2.9
Bitterroot	-1.3	-2.5
Clark Fork River below Bitterroot	-1.8	-2.8
Clark Fork River below Flathead	-1.2	-2.0
Beaverhead	-1.3	-3.1
Ruby	-0.4	-4.0
Big Hole	-0.4	-1.1
Boulder (Jefferson)	-0.1	-2.4
Jefferson	0.1	-3.3
Madison	-1.3	-3.8
Gallatin	-0.8	-2.9
Missouri above Canyon Ferry	-0.6	-3.6
Missouri below Canyon Ferry	-0.3	-3.3
Smith	0.2	-0.8
Sun	-3.8	-2.2
Teton	-3.2	-1.0
Birch/Dupuyer Creeks	-3.3	-0.7
Marias	-2.8	-0.4
Musselshell	-0.3	-0.2
Missouri above Fort Peck	-0.2	-0.9
Missouri below Fort Peck	-0.6	-0.9
Milk		
Dearborn near Craig	-3.5	-2.7
Yellowstone above Livingston	-2.0	-2.5
Shields	-0.1	-2.4
Boulder (Yellowstone)	-2.9	-2.9
Stillwater	-1.7	-1.6
Rock/Red Lodge Creeks	-0.8	-1.3
Clarks Fork Yellowstone	-1.9	-1.8
Yellowstone above Bighorn River	-1.8	-2.3
Bighorn below Bighorn Lake	0.6	-0.7
Little Bighorn	-2.0	-1.8
Yellowstone below Bighorn	-0.7	-1.6
Tongue	-0.3	-1.4
Powder	-0.1	-2.5
Upper Judith	1	-1.4
Saint Mary	-2.0	-2.2

### SWSI Scale

+3.0 to +4.0	Extremely Wet
+2.0 to +2.9	Moderately Wet
+1.0 to +1.9	Slightly Wet
+0.9 to -0.9	Near Average
-1.0 to -1.9	Slightly Dry
-2.0 to -2.9	Moderately Dry
-3.0 to -4.0	Extremely Dry

**Montana Data Collection Office  
Surface Water Supply Index (SWSI)  
May 1, 2016**



*Note: Data used to generate this map are PROVISIONAL and SUBJECT TO CHANGE*

# Kootenai River Basin



Peak basin-wide snow water equivalent occurred on March 29<sup>th</sup> in the Kootenai River basin this year, which was 98% of the average peak and 11 days early. As of May 1<sup>st</sup> much of the Kootenai's mid to low elevation snow melted out. On April 24<sup>th</sup> Grave Creek SNOTEL (4300 ft) was the first site in the basin to melt out this year. The basin-wide melt rate averaged 0.5 inches (SWE) per day over the last 2 weeks. If normal weather patterns persist over the next month, all SNOTEL sites in the basin will be melted out by early June, about a month early.

April precipitation at SNOTEL sites in the Kootenai River basin was well below average. Fortunately monthly precipitation has been mostly above average this water year. October, January, and April have been the only months in which precipitation was below average. Currently water-year-to date precipitation in the basin is at 108% of average. Mountain SNOTEL sites received 55% of average precipitation for the month of April, while valley weather stations received 130% of average precipitation in the Kootenai River basin.

Reservoir storage in Lake Koocanusa is currently above average at 137%.

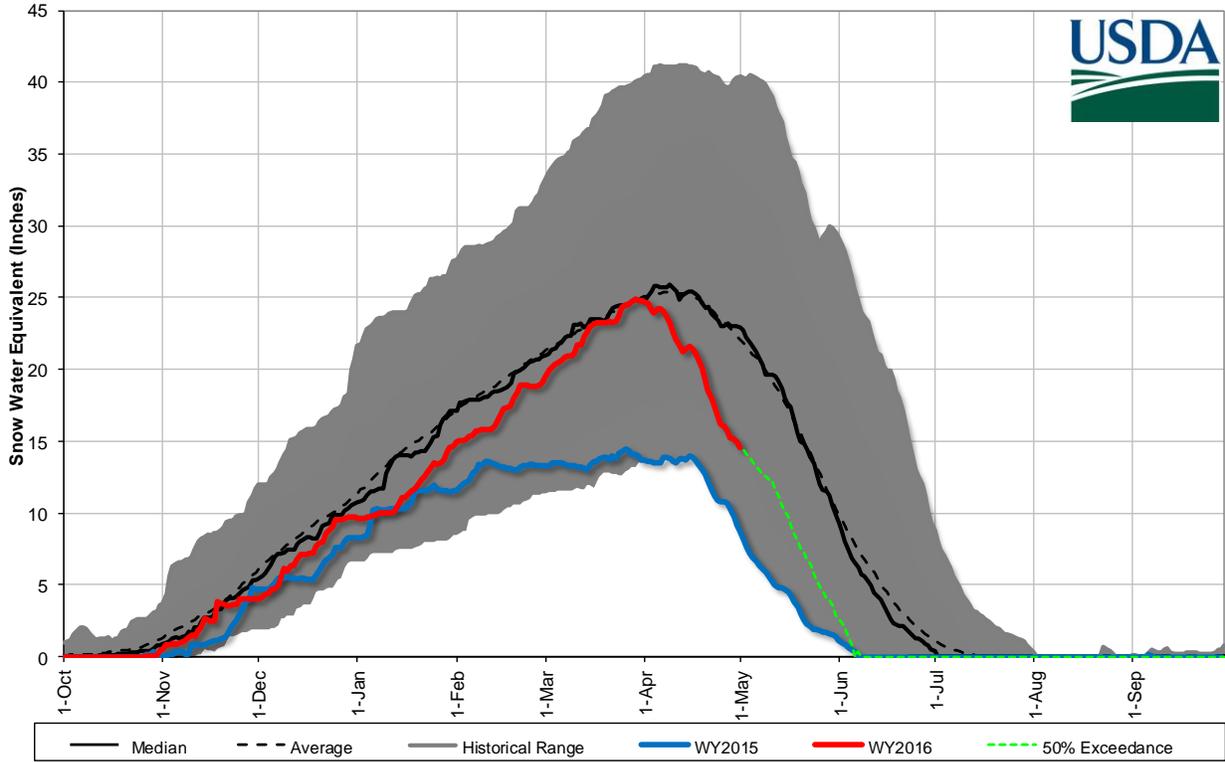
Basin-wide streamflow forecasts vary greatly across the basin, so consult the table at the end of this section for individual forecast points. Current basin-wide streamflow forecasts for the 50% exceedance are 88% of average for the May-July time period.

<b>Kootenai River Basin Data Summary</b>		<b>5/1/2016</b>	
<b>Snowpack</b>	Percent of 1981-2010 Normal (Median)	Last Year Percentage of Normal (Median)	
Basin-Wide	68%	42%	
<b>Precipitation</b>	Monthly Percentage of Average	WYTD Percentage of 1981-2010 Average*	Last Year Percentage of Average
Mountain Precipitation	55%	108%	98%
Valley Precipitation	71%	130%	124%
Basin Precipitation	56%	108%	98%
<b>Reservoir Storage</b>	Percentage of Average	Percentage of Capacity (Total)	Last Year Percentage of Average
Basin-Wide Storage	137%	62%	158%
<b>Streamflow Forecast</b>	50 % Exceedance Forecast Percentage of Average	50 % Exceedance Forecast % of Last Year's Flows	Last Year Percentage of Average
Basin-Wide Apr-July	88%	140%	63%

\*Water Year-to-Date (WYTD) Precipitation is October 1st - Current

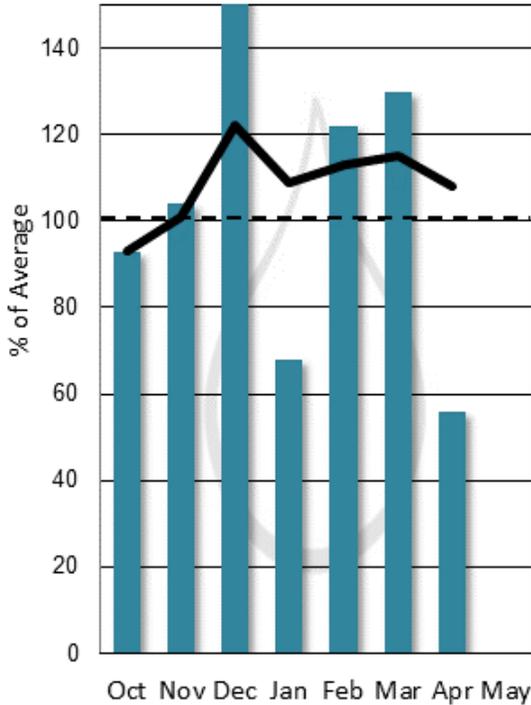
\*\*Basin-wide streamflows are an average of the individual streamflow points within the basin for the 50 percent exceedance forecast. Consult the individual streamflow forecasts in the table below for the range of forecasts at an individual point.

**Kootenai River Basin Snowpack with Non-Exceedence Projections**  
*Based on provisional SNOTEL daily data as of 5/1/2016*



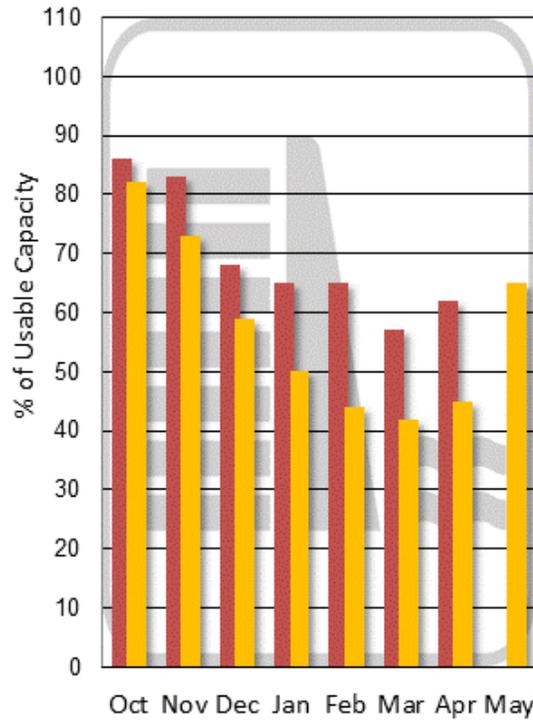
**Mountain and Valley  
Precipitation**

Monthly    Year-to-date



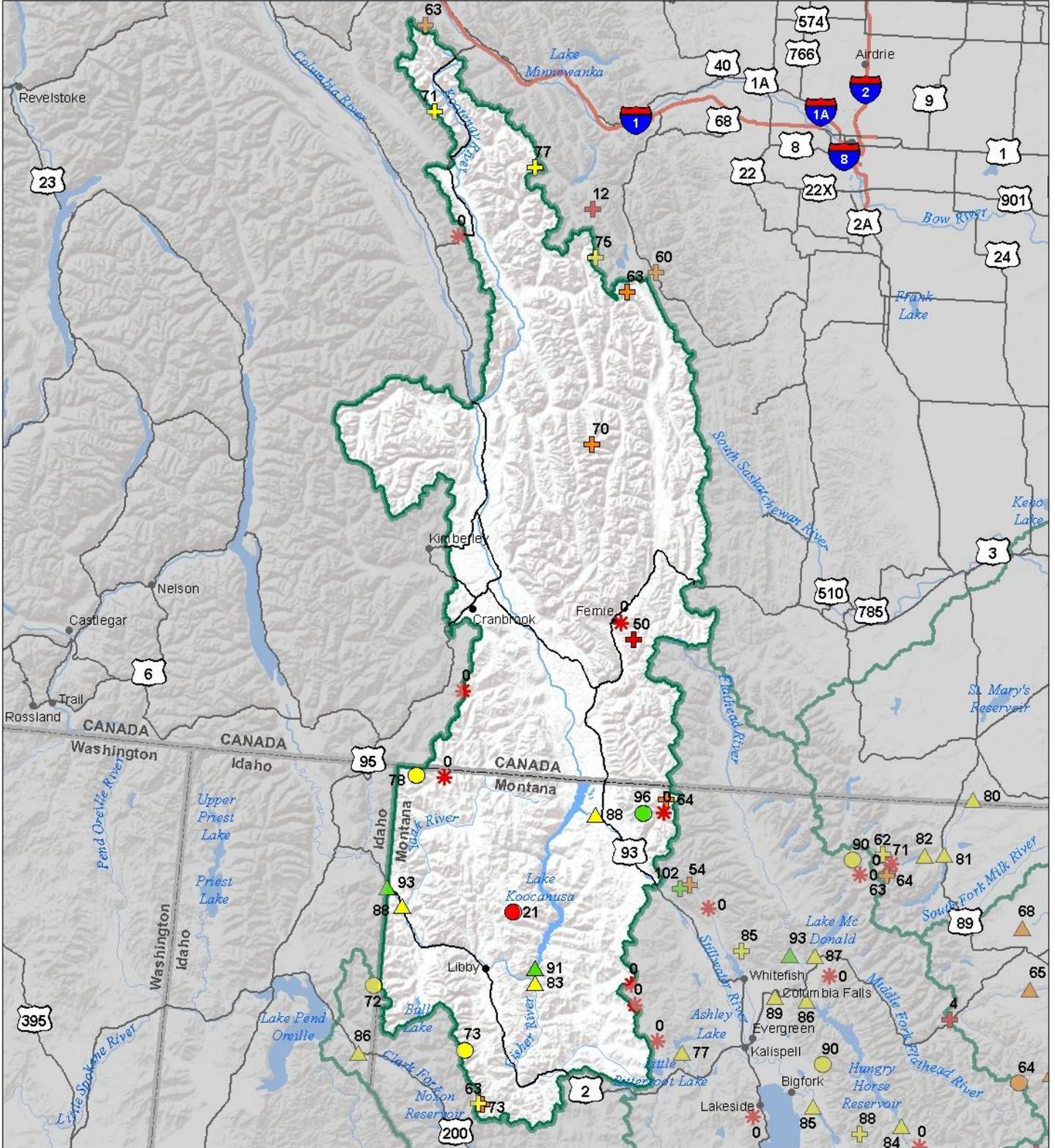
**End of Month Reservoir  
Storage**

% Capacity    Avg % Capacity



Storage above is averaged for all reservoirs in the basin. For individual reservoirs see table below.

# Kootenai River Basin Streamflow Forecast, Snow Water Equivalent Percentage of Normal May 1, 2016



### Snow Water Equivalent Percent of Normal

#### SNOTEL

- > 150%
- 131 - 150%
- 111 - 130%
- 91 - 110%
- 71 - 90%
- 51 - 70%
- 1 - 50%
- \* 0%

#### Snowcourse

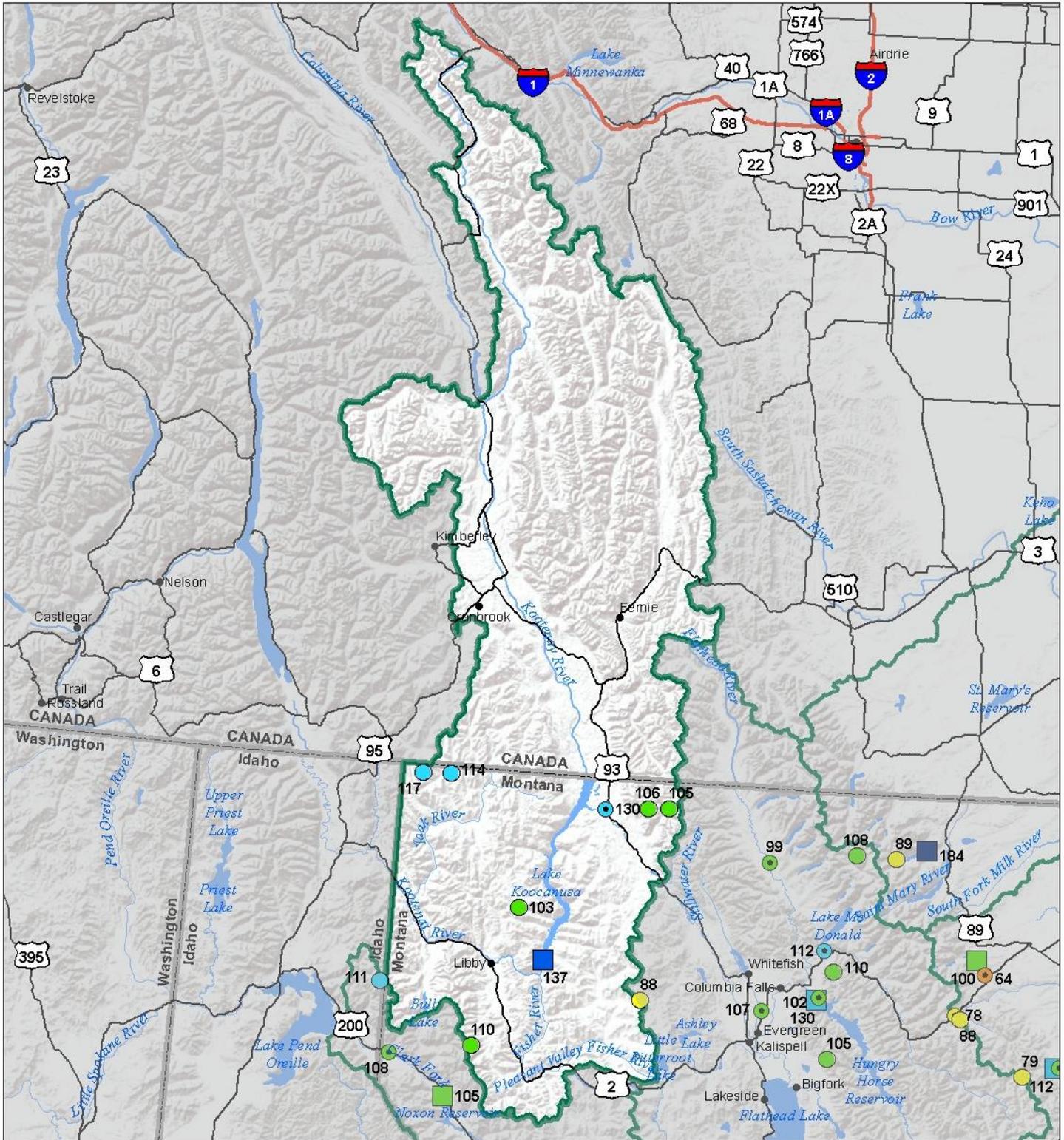
- ⊕ > 150%
- ⊕ 131 - 150%
- ⊕ 111 - 130%
- ⊕ 91 - 110%
- ⊕ 71 - 90%
- ⊕ 51 - 70%
- ⊕ 1 - 50%
- \* 0%

### Streamflow Forecast Percent of Average Flows

- ▲ > 150%
- ▲ 131 - 150%
- ▲ 111 - 130%
- ▲ 91 - 110%
- ▲ 71 - 90%
- ▲ 51 - 70%
- ▲ 1 - 50%



# Kootenai River Basin Water Year to Date Precipitation and Reservoir Levels Percentage of Normal May 1, 2016



### Precipitation Percent of Normal

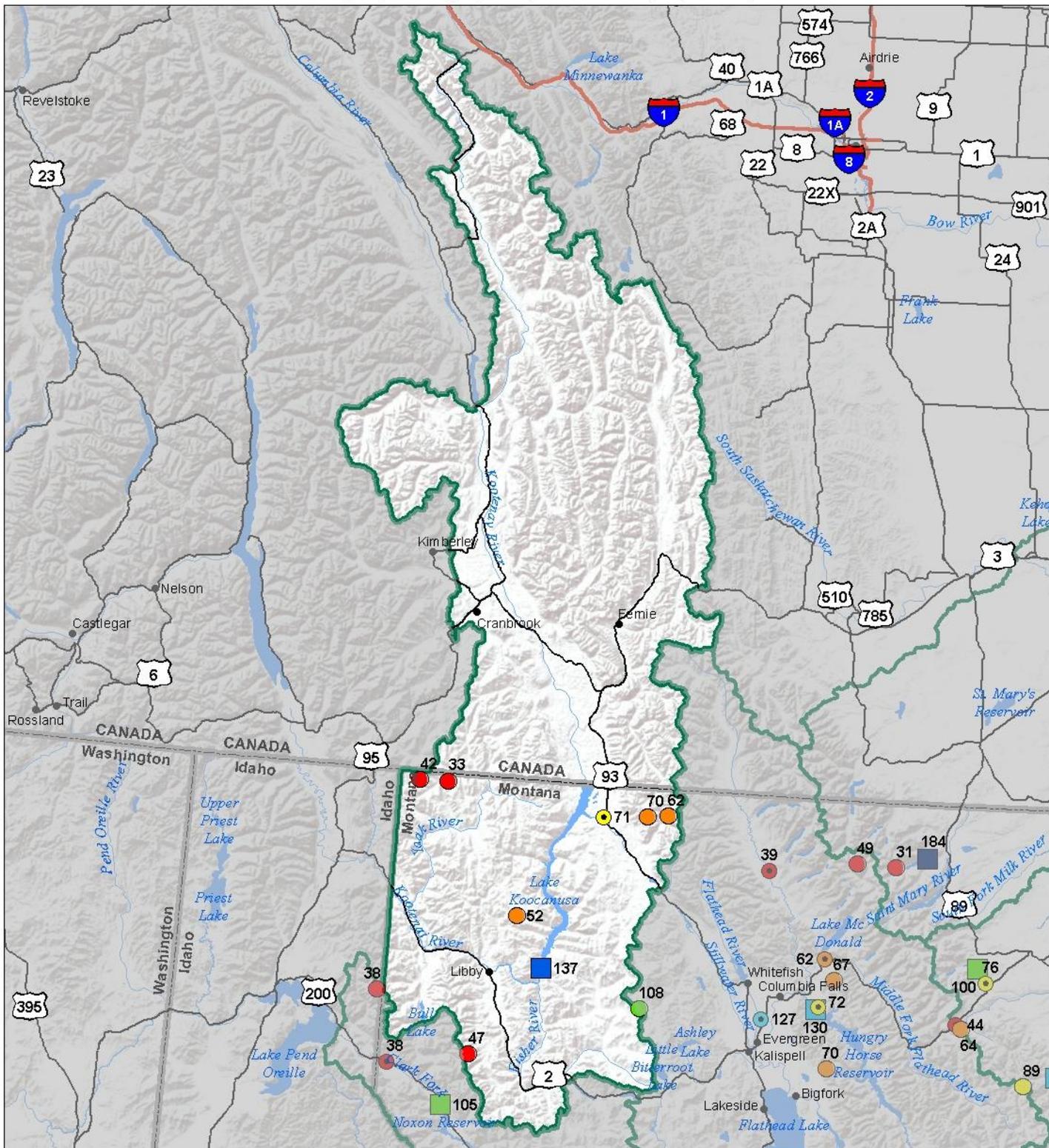
SNOTEL		COOP/ACIS	
● > 150%	● 71 - 90%	● > 150%	● 71 - 90%
● 131 - 150%	● 51 - 70%	● 131 - 150%	● 51 - 70%
● 111 - 130%	● 1 - 50%	● 111 - 130%	● 1 - 50%
● 91 - 110%		● 91 - 110%	

### Reservoirs Percent of Normal

■ > 150%
■ 131 - 150%
■ 111 - 130%
■ 91 - 110%
■ 71 - 90%
■ 51 - 70%
■ 1 - 50%



# Kootenai River Basin Monthly Precipitation and Reservoir Levels Percentage of Normal May 1, 2016 (April 1, 2016 - May 1, 2016)



### Precipitation Percent of Normal

SNOTEL		COOP/ACIS	
● > 150%	● 71 - 90%	● > 150%	● 71 - 90%
● 131 - 150%	● 51 - 70%	● 131 - 150%	● 51 - 70%
● 111 - 130%	● 1 - 50%	● 111 - 130%	● 1 - 50%
● 91 - 110%		● 91 - 110%	

### Reservoirs Percent of Normal

■ > 150%
■ 131 - 150%
■ 111 - 130%
■ 91 - 110%
■ 71 - 90%
■ 51 - 70%
■ 1 - 50%



## Kootenai River Basin In Montana Streamflow Forecasts - May 1, 2016

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

KOOTENAI RIVER BASIN in MONTANA	Forecast Period	90% (KAF)	70% (KAF)	50% (KAF)	% Avg	30% (KAF)	10% (KAF)	30yr Avg (KAF)
Tobacco R nr Eureka	MAY-JUL	63	79	90	89%	101	117	101
	MAY-SEP	69	87	100	88%	113	131	114
Libby Reservoir Inflow <sup>1</sup>	MAY-JUL	3560	4160	4430	92%	4700	5300	4820
	MAY-SEP	4300	4930	5220	91%	5510	6140	5733
Fisher R nr Libby	MAY-JUL	73	97	112	82%	128	151	136
	MAY-SEP	83	108	125	83%	142	166	150
Yaak R nr Troy	MAY-JUL	186	235	270	87%	305	355	310
	MAY-SEP	200	255	290	88%	325	375	330
Kootenai R at Leonia <sup>1,2</sup>	MAY-JUL	3960	4880	5300	92%	5720	6640	5730
	MAY-SEP	4990	5860	6250	93%	6640	7510	6730

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

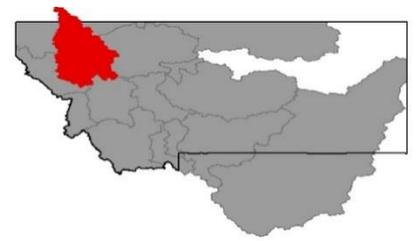
2) Forecasts are for unimpaired flows. Actual flow will be dependent on management of upstream reservoirs and diversions

3) Median value used in place of average

Reservoir Storage End of April, 2016	Current (KAF)	Last Year (KAF)	Average (KAF)	Capacity (KAF)
Lake Koocanusa	3581.1	4121.8	2614.0	5748.0
Basin-wide Total	3581.1	4121.8	2614.0	5748.0
# of reservoirs	1	1	1	1

Watershed Snowpack Analysis May 1, 2016	# of Sites	% Median	Last Year % Median
KOOTENAY in CANADA	7	46	50
KOOTENAI MAINSTEM	3	65	27
TOBACCO	3	76	61
FISHER	5	62	31
YAAK	2	73	72
KOOTENAI RIVER BASIN in MONTANA	13	68	42
KOOTENAI ab BONNERS FERRY	19	61	46

# Flathead River Basin



March was a relatively snowy month in the Flathead River basin and on April 1<sup>st</sup> it appeared the basin was going to reach its normal peak snow water equivalent near its normal date of April 8<sup>th</sup>. Shortly after the April 1<sup>st</sup> Water Supply Outlook Report was written high pressure arrived and snow started melting. It melted at a fairly consistent rate of 0.3 inches (SWE) per day over the month of April with the exception of a small snow storm that hit mid-month. Currently at 74% of normal, the snowpack is at a very similar level than last year at this time. If normal weather patterns persist over the next month and a half, all SNOTEL sites in the basin will be melted out by mid-June, about a week or two early.

April precipitation at SNOTEL sites in the Flathead River basin was well below average. Fortunately precipitation has been near average this water year, with the exception of October which was well below average. Currently water-year-to date precipitation in the basin is at 100% of average. Mountain SNOTEL sites received 68% of average precipitation for the month of April, while valley weather stations received 127% of average precipitation in the Flathead River basin.

Reservoir capacities in the Flathead River basin are currently above average at 130%.

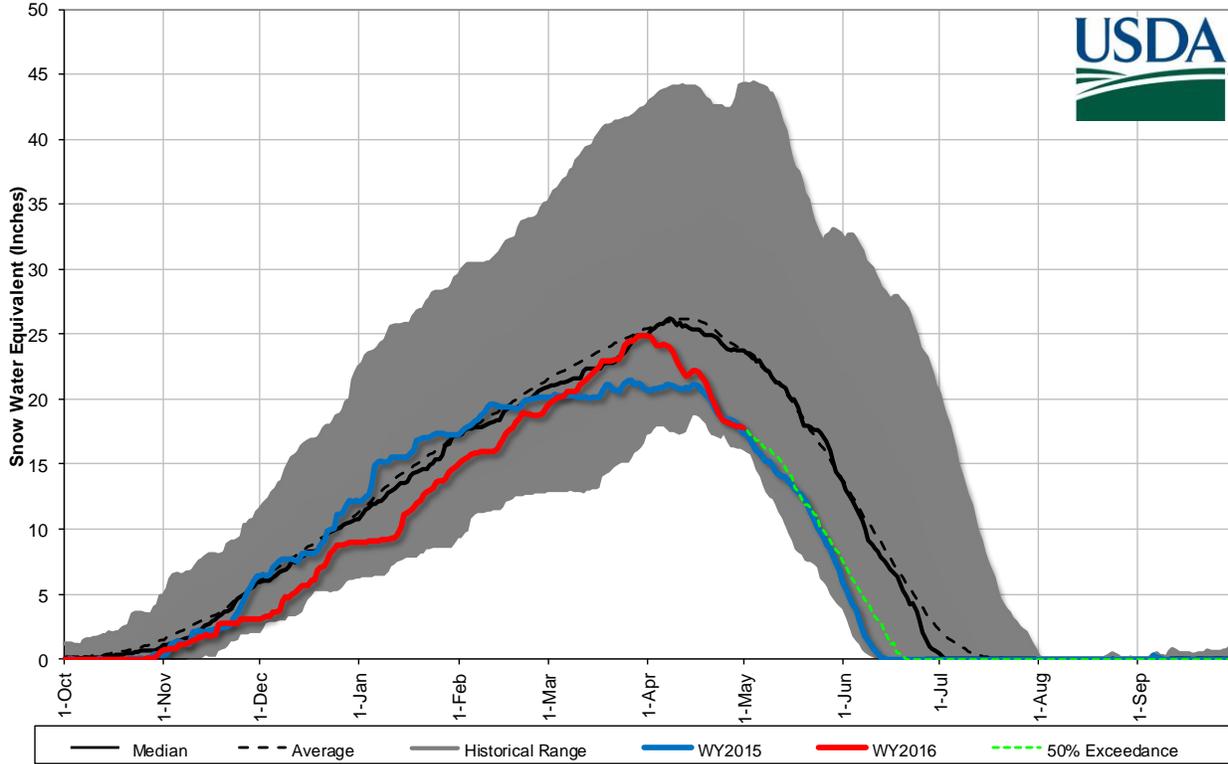
Basin-wide streamflow forecasts vary greatly across the basin, so consult the table at the end of this section for individual forecast points. Current basin-wide streamflow forecasts for the 50% exceedance are 87% of average for the May-July time period.

<b>Flathead River Basin Data Summary</b>		<b>5/1/2016</b>	
	Percent of 1981-2010 Normal (Median)	Last Year Percentage of Normal (Median)	
<b>Snowpack</b>			
Basin-Wide	74%	69%	
	Monthly Percentage of Average	WYTD Percentage of 1981-2010 Average*	Last Year Percentage of Average
<b>Precipitation</b>			
Mountain Precipitation	68%	100%	102%
Valley Precipitation	127%	107%	135%
Basin Precipitation	69%	100%	103%
	Percentage of Average	Percentage of Capacity (Total)	Last Year Percentage of Average
<b>Reservoir Storage</b>			
Basin-Wide Storage	130%	78%	127%
	50 % Exceedance Forecast Percentage of Average	50 % Exceedance Forecast % of Last Year's Flows	Last Year Percentage of Average
<b>Streamflow Forecast</b>			
Basin-Wide Apr-July	87%	155%	56%

\*Water Year-to-Date (WYTD) Precipitation is October 1st - Current

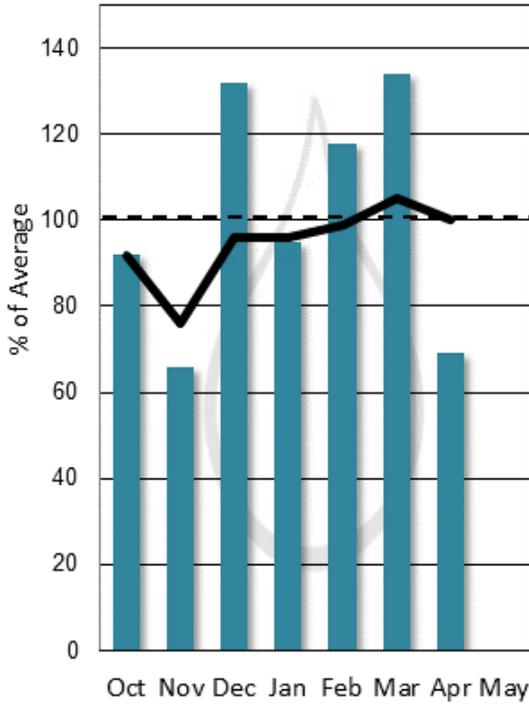
\*\*Basin-wide streamflows are an average of the individual streamflow points within the basin for the 50 percent exceedance forecast. Consult the individual streamflow forecasts in the table below for the range of forecasts at an individual point.

**Flathead River Basin Snowpack with Non-Exceedence Projections**  
*Based on provisional SNOTEL daily data as of 5/1/2016*



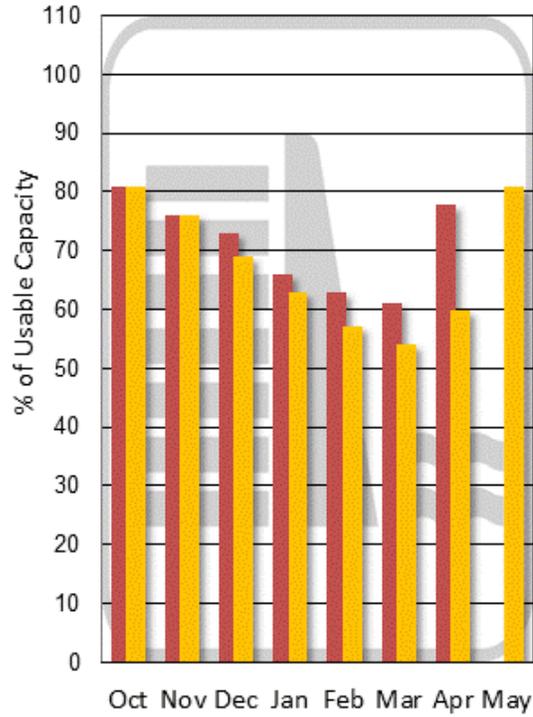
**Mountain and Valley Precipitation**

Monthly Year-to-date



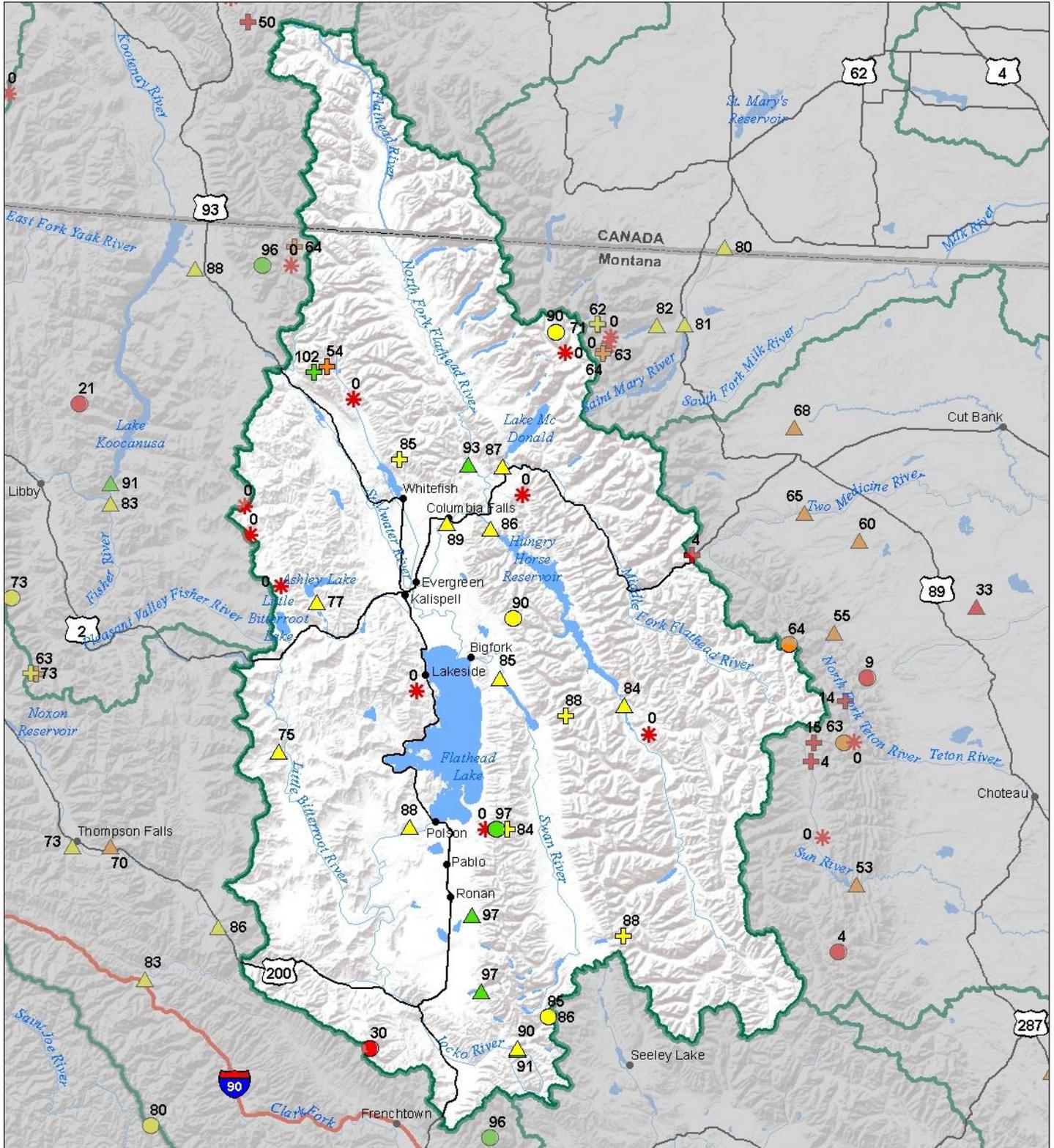
**End of Month Reservoir Storage**

% Capacity Avg % Capacity



Storage above is averaged for all reservoirs in the basin. For individual reservoirs see table below.

# Flathead River Basin Streamflow Forecast, Snow Water Equivalent Percentage of Normal May 1, 2016



### Snow Water Equivalent Percent of Normal

#### SNOTEL

- > 150%
- 131 - 150%
- 111 - 130%
- 91 - 110%
- 71 - 90%
- 51 - 70%
- 1 - 50%
- 0%

#### Snowcourse

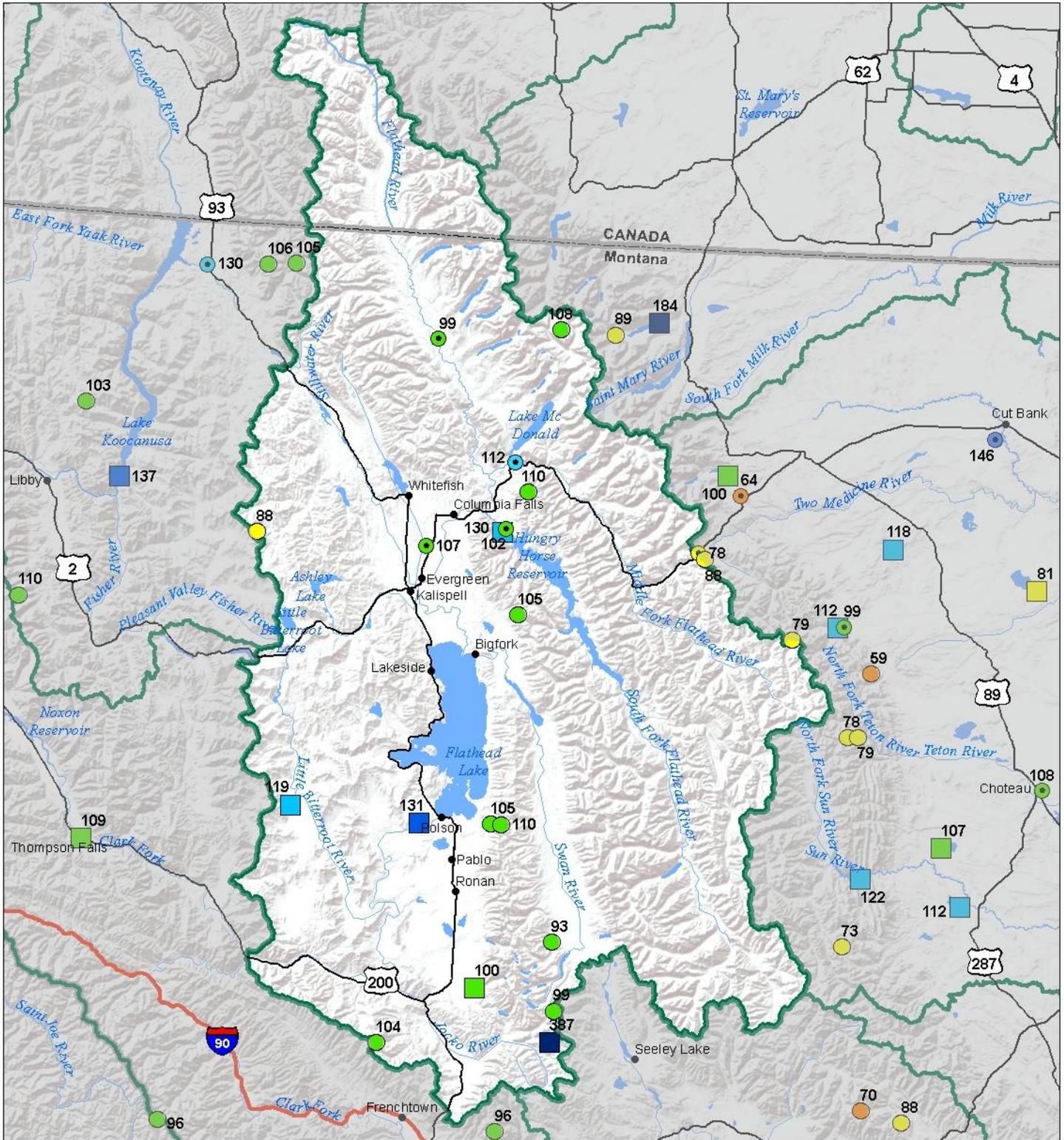
- ⊕ > 150%
- ⊕ 131 - 150%
- ⊕ 111 - 130%
- ⊕ 91 - 110%
- ⊕ 71 - 90%
- ⊕ 51 - 70%
- ⊕ 1 - 50%
- ⊕ 0%

### Streamflow Forecast Percent of Average Flows

- ▲ > 150%
- ▲ 131 - 150%
- ▲ 111 - 130%
- ▲ 91 - 110%
- ▲ 71 - 90%
- ▲ 51 - 70%
- ▲ 1 - 50%



# Flathead River Basin Water Year to Date Precipitation and Reservoir Levels Percentage of Normal May 1, 2016



### Precipitation Percent of Normal

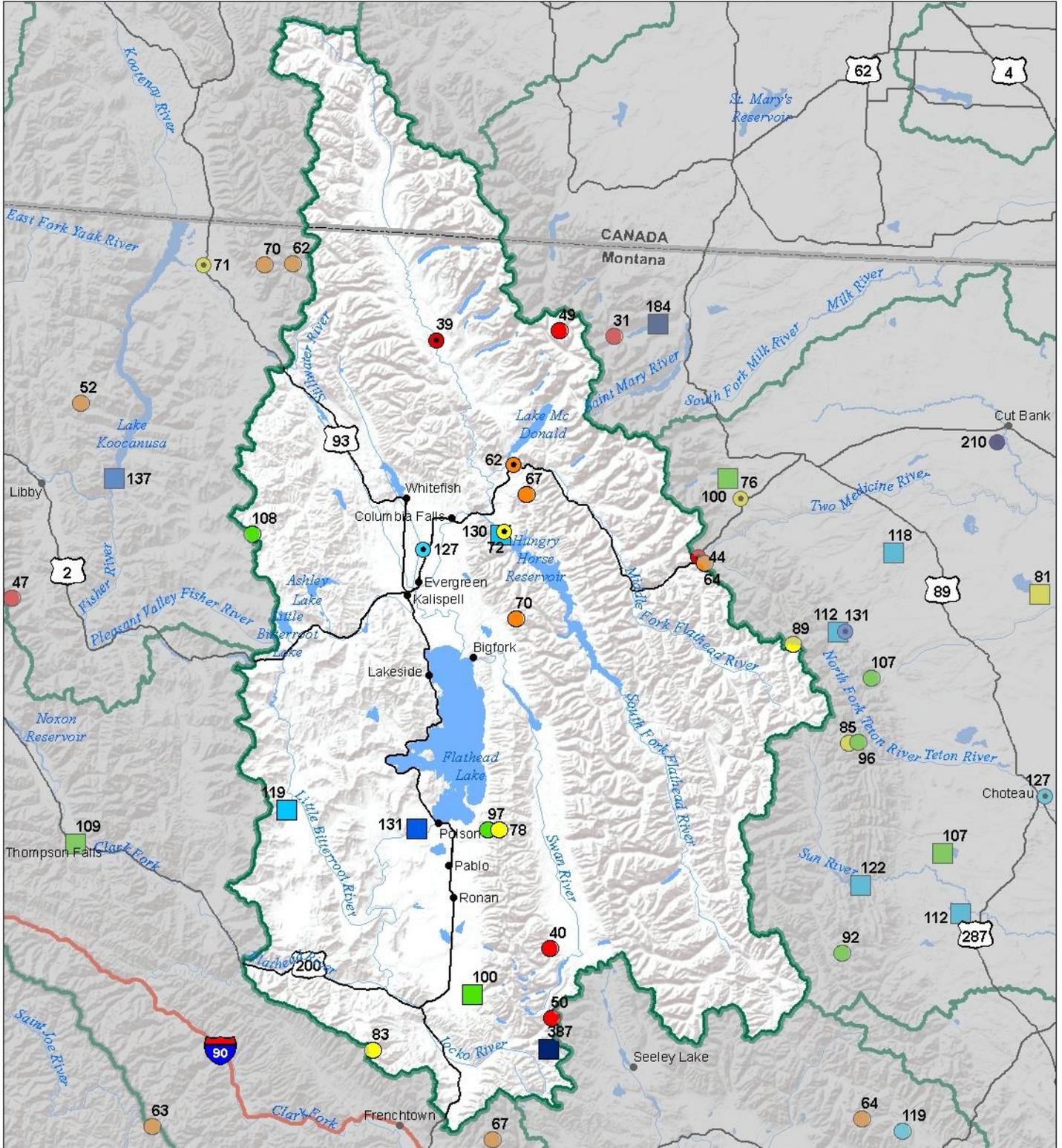
SNOTEL		COOP/ACIS	
<span style="color: blue;">●</span> > 150%	<span style="color: yellow;">●</span> 71 - 90%	<span style="color: blue;">●</span> > 150%	<span style="color: yellow;">●</span> 71 - 90%
<span style="color: darkblue;">●</span> 131 - 150%	<span style="color: orange;">●</span> 51 - 70%	<span style="color: darkblue;">●</span> 131 - 150%	<span style="color: orange;">●</span> 51 - 70%
<span style="color: cyan;">●</span> 111 - 130%	<span style="color: red;">●</span> 1 - 50%	<span style="color: cyan;">●</span> 111 - 130%	<span style="color: red;">●</span> 1 - 50%
<span style="color: green;">●</span> 91 - 110%		<span style="color: green;">●</span> 91 - 110%	

### Reservoirs Percent of Normal

<span style="color: darkblue;">■</span> > 150%
<span style="color: blue;">■</span> 131 - 150%
<span style="color: cyan;">■</span> 111 - 130%
<span style="color: green;">■</span> 91 - 110%
<span style="color: yellow;">■</span> 71 - 90%
<span style="color: orange;">■</span> 51 - 70%
<span style="color: red;">■</span> 1 - 50%



# Flathead River Basin Monthly Precipitation and Reservoir Levels Percentage of Normal May 1, 2016 (April 1, 2016 - May 1, 2016)



### Precipitation Percent of Normal

#### SNOTEL

- > 150%
- 131 - 150%
- 111 - 130%
- 91 - 110%
- 71 - 90%
- 51 - 70%
- 1 - 50%

#### COOP/ACIS

- > 150%
- 131 - 150%
- 111 - 130%
- 91 - 110%
- 71 - 90%
- 51 - 70%
- 1 - 50%

### Reservoirs Percent of Normal

- > 150%
- 131 - 150%
- 111 - 130%
- 91 - 110%
- 71 - 90%
- 51 - 70%
- 1 - 50%



## Flathead River Basin Streamflow Forecasts - May 1, 2016

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

FLATHEAD RIVER BASIN	Forecast Period	90% (KAF)	70% (KAF)	50% (KAF)	% Avg	30% (KAF)	10% (KAF)	30yr Avg (KAF)
NF Flathead R nr Columbia Falls	MAY-JUL	1030	1150	1220	92%	1300	1420	1320
	MAY-SEP	1160	1290	1380	93%	1470	1600	1480
MF Flathead R nr West Glacier	MAY-JUL	895	1030	1120	86%	1210	1340	1300
	MAY-SEP	1000	1140	1240	87%	1340	1480	1430
Sf Flathead R nr Hungry Horse	MAY-JUL	710	800	860	84%	920	1010	1020
	MAY-SEP	765	860	925	84%	985	1080	1100
Hungry Horse Reservoir Inflow <sup>1,2</sup>	MAY-JUL	1050	1250	1340	85%	1440	1640	1580
	MAY-SEP	1120	1350	1450	86%	1550	1780	1690
Flathead R at Columbia Falls <sup>2</sup>	MAY-JUL	3190	3540	3770	88%	4010	4350	4290
	MAY-SEP	3530	3920	4180	89%	4440	4820	4720
Ashley Ck nr Marion <sup>2</sup>	MAY	0.86	1.48	1.91	73%	2.3	3	2.6
	MAY-JUL	1.47	2.4	3	77%	3.7	4.6	3.9
Swan R nr Bigfork	MAY-JUL	305	345	375	86%	405	445	435
	MAY-SEP	355	405	435	85%	465	515	510
Flathead Lake Inflow <sup>1,2</sup>	MAY-JUL	3400	4020	4310	87%	4590	5220	4940
	MAY-SEP	3700	4410	4740	88%	5070	5780	5400
Mill Ck ab Bassoo ck nr Niarada	MAY-JUL	0.83	1.61	2.1	72%	2.7	3.4	2.9
	MAY-SEP	1.1	1.9	2.4	75%	3	3.8	3.2
South Crow Ck nr Ronan	MAY-JUL	7	8.2	9	98%	9.8	10.9	9.2
	MAY-SEP	8.1	9.4	10.3	97%	11.2	12.6	10.6
Mission Ck nr St. Ignatius	MAY-JUL	20	22	23	96%	25	27	24
	MAY-SEP	24	26	28	97%	30	32	29
SF Jocko R nr Arlee	MAY-JUL	21	24	27	93%	29	32	29
	MAY-SEP	25	28	30	91%	33	36	33
NF Jocko R bl Tabor Feeder Canal	MAY-JUL	22	24	25	89%	27	29	28
	MAY-SEP	24	26	27	90%	29	31	30

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

2) Forecasts are for unimpaired flows. Actual flow will be dependent on management of upstream reservoirs and diversions

3) Median value used in place of average

Reservoir Storage End of April, 2016	Current (KAF)	Last Year (KAF)	Average (KAF)	Capacity (KAF)
Camas (4)	31.9	40.0	26.9	45.2
Lower Jocko Lake	3.3	1.7	0.8	6.4
Mission Valley (8)	40.3	35.7	40.1	100.0
Hungry Horse Lake	2845.7	2941.0	2188.0	3451.0
Flathead Lake	1274.5	1072.8	971.5	1791.0
Basin-wide Total	4195.7	4091.2	3227.3	5393.6
# of reservoirs	5	5	5	5

Watershed Snowpack Analysis May 1, 2016	# of Sites	% Median	Last Year % Median
NF FLATHEAD in CANADA	0		
NF FLATHEAD in MONTANA	8	75	65
MIDDLE FORK FLATHEAD	4	65	65
SOUTH FORK FLATHEAD	6	79	77
STILLWATER-WHITEFISH	9	71	64
SWAN	6	89	86
MISSION VALLEY	4	77	79
LITTLE BITTERROOT-ASHLEY	5	0	0
JOCKO	4	81	82
FLATHEAD in MONTANA	32	74	69
FLATHEAD RIVER BASIN	32	74	69

# Upper Clark Fork River Basin



Peak basin-wide snow water equivalent occurred on April 1<sup>st</sup> in the Upper Clark Fork River basin this year, which was 92% of the average peak and 13 days early. The snowpack was primed and melting at a significant rate by then end of the first week in April. At the end of the second week a storm dropped a significant amount of snow at higher elevations. Warm Springs SNOTEL (7800 ft) received 14 inches of snow (1.2 inches SWE) during this storm bumping it up to 109% of normal. The remainder of the month brought more melt and as of May 1<sup>st</sup> the Upper Clark Fork River basin was at 79% of normal. Last year at this time the snowpack was at 68% of normal.

April precipitation at SNOTEL sites in the Upper Clark Fork River basin was slightly below average. The mid-month storm that delivered snow up high, delivered rain at valley elevations. Lubrecht Flume SNOTEL (4680 ft) received 0.4 inches of rain during this event. Mountain SNOTEL sites received 82% of average precipitation for the month of April, while valley weather stations received 99% of average precipitation in the Upper Clark Fork River basin. Currently water-year-to date precipitation in the basin is at 95% of average.

Reservoir storage in Georgetown Lake is currently at 106% of average.

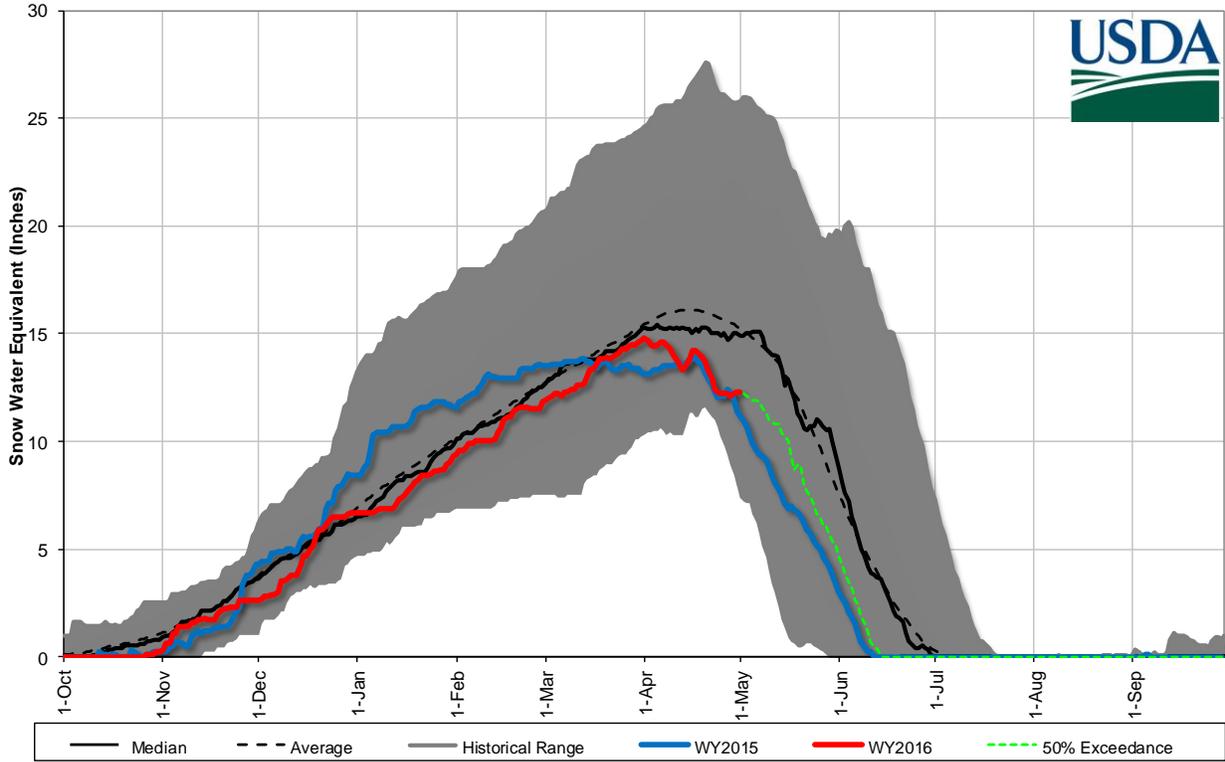
Basin-wide streamflow forecasts vary greatly across the basin, so consult the table at the end of this section for individual forecast points. Current basin-wide streamflow forecasts for the 50% exceedance are 81% of average for the May-July time period.

<b>Upper Clark Fork River Basin Data Summary</b>		<b>5/1/2016</b>	
<b>Snowpack</b>	Percent of 1981-2010 Normal (Median)	Last Year Percentage of Normal (Median)	
Basin-Wide	79%	68%	
<b>Precipitation</b>	Monthly Percentage of Average	WYTD Percentage of 1981-2010 Average*	Last Year Percentage of Average
Mountain Precipitation	82%	94%	94%
Valley Precipitation	99%	102%	84%
Basin Precipitation	82%	95%	93%
<b>Reservoir Storage</b>	Percentage of Average	Percentage of Capacity (Total)	Last Year Percentage of Average
Basin-Wide Storage	106%	85%	110%
<b>Streamflow Forecast</b>	50 % Exceedance Forecast Percentage of Average	50 % Exceedance Forecast % of Last Year's Flows	Last Year Percentage of Average
Basin-Wide Apr-July	81%	134%	60%

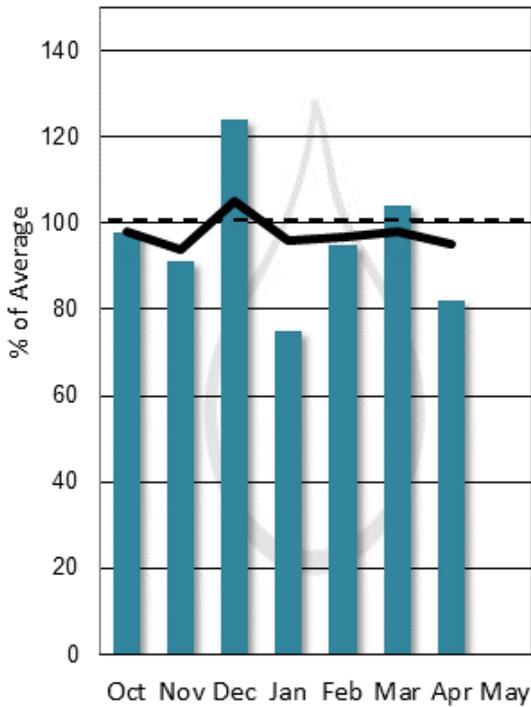
\*Water Year-to-Date (WYTD) Precipitation is October 1st - Current

\*\*Basin-wide streamflows are an average of the individual streamflow points within the basin for the 50 percent exceedance forecast. Consult the individual streamflow forecasts in the table below for the range of forecasts at an individual point.

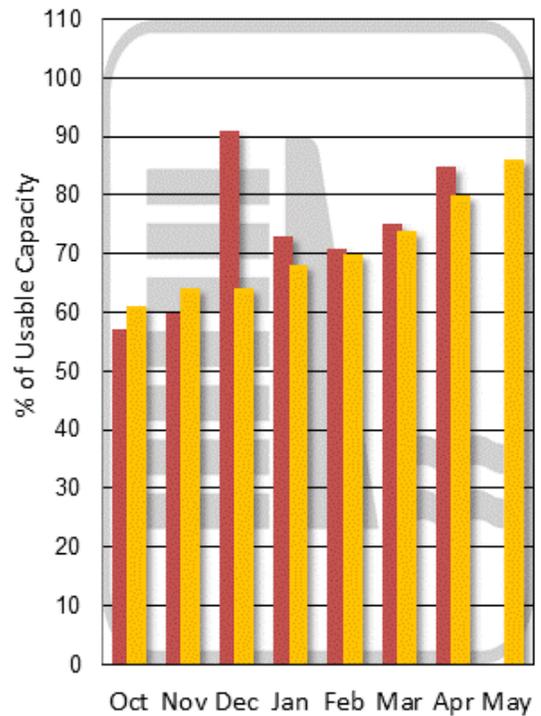
**Upper Clark Fork River Basin Snowpack with Non-Exceedence Projections**  
*Based on provisional SNOTEL daily data as of 5/1/2016*



**Mountain and Valley  
Precipitation**

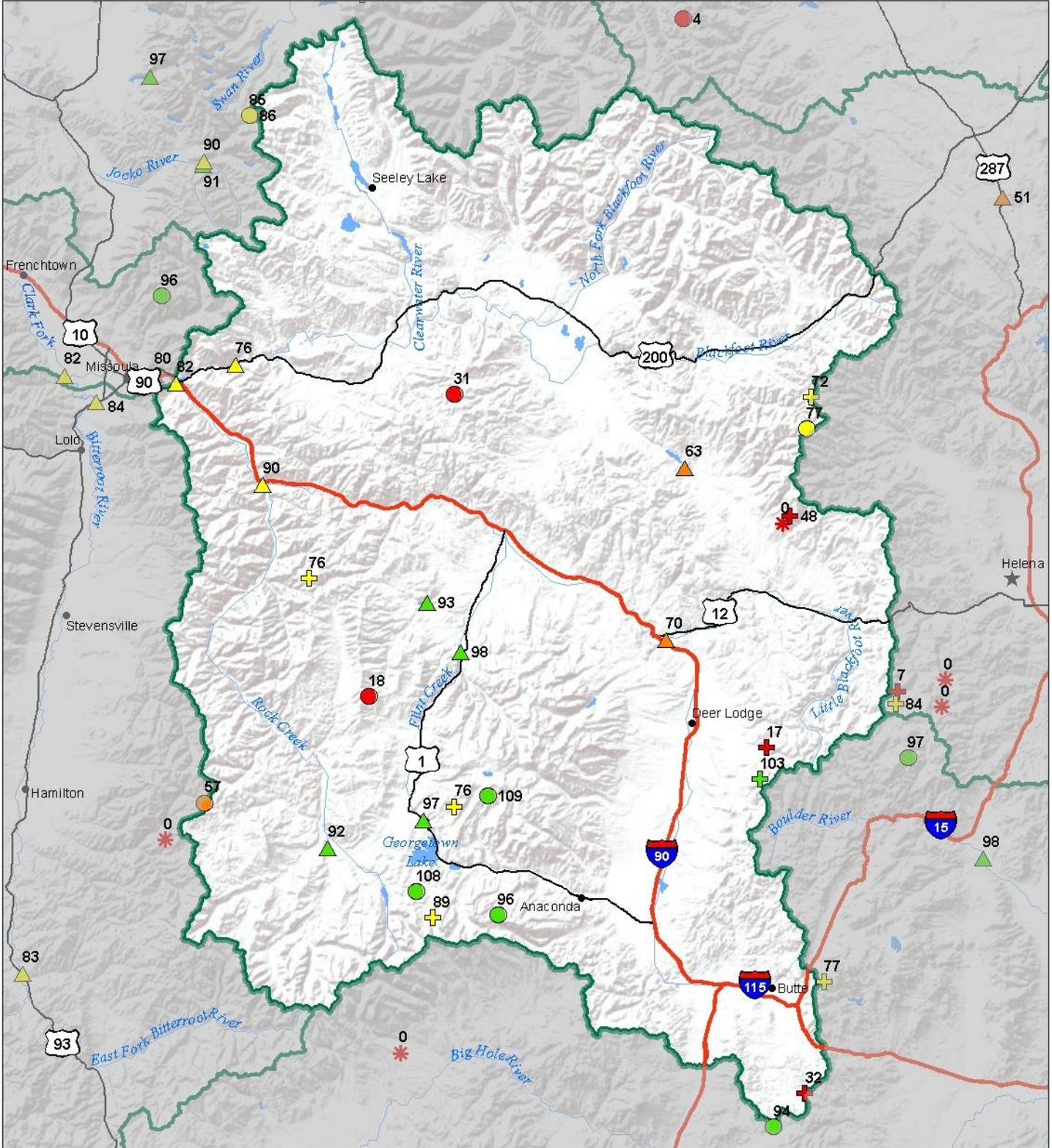


**End of Month Reservoir  
Storage**



Storage above is averaged for all reservoirs in the basin. For individual reservoirs see table below.

# Upper Clark Fork River Basin Streamflow Forecast, Snow Water Equivalent Percentage of Normal May 1, 2016



### Snow Water Equivalent Percent of Normal

#### SNOTEL

- > 150%
- 131 - 150%
- 111 - 130%
- 91 - 110%

- 71 - 90%
- 51 - 70%
- 1 - 50%
- \*

#### Snowcourse

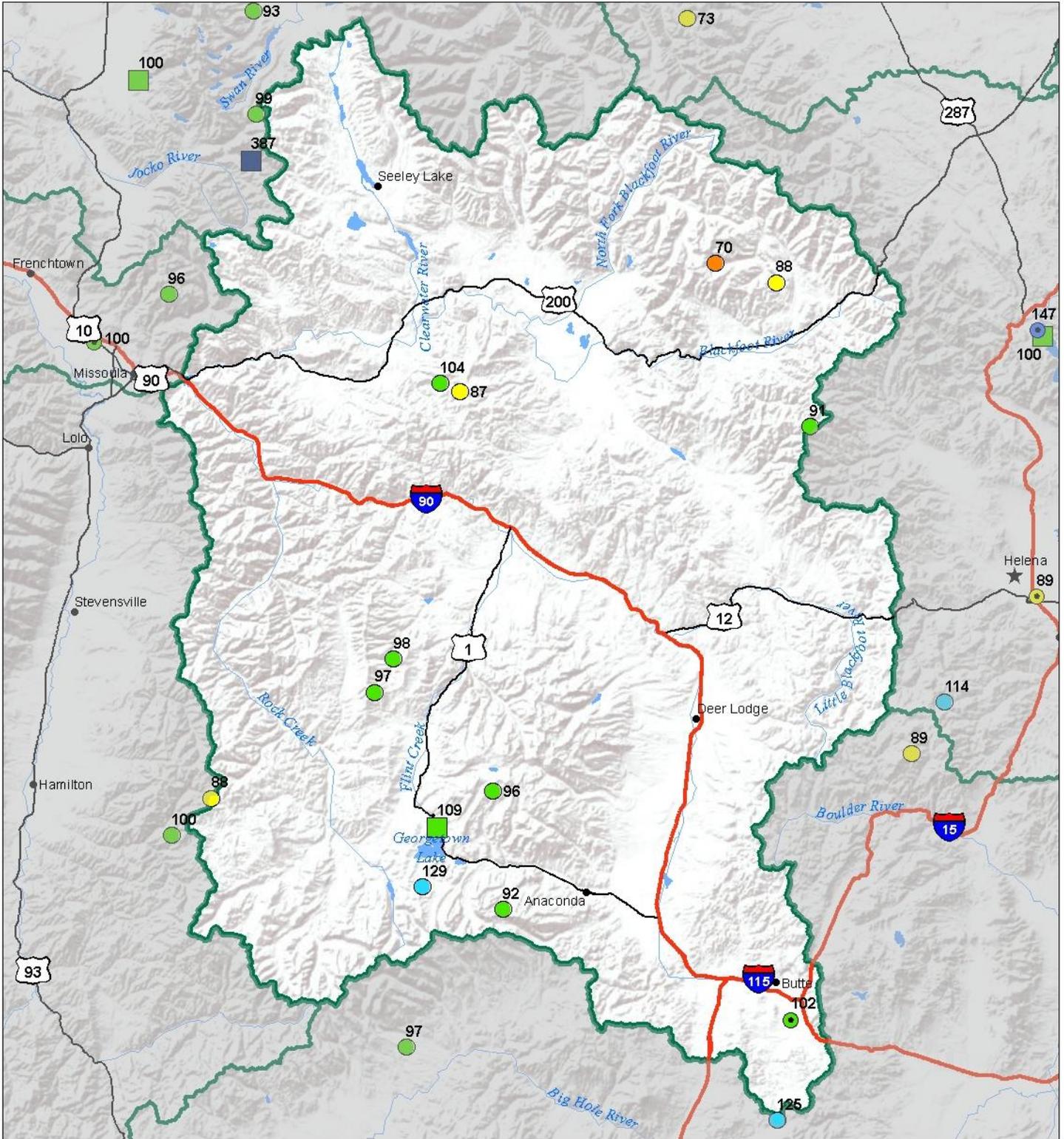
- ⊕ > 150%
- ⊕ 131 - 150%
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- ⊕ 91 - 110%
- ⊕ 71 - 90%
- ⊕ 51 - 70%
- ⊕ 1 - 50%
- ⊕ \*

### Streamflow Forecast Percent of Average Flows

- ▲ > 150%
- ▲ 131 - 150%
- ▲ 111 - 130%
- ▲ 91 - 110%
- ▲ 71 - 90%
- ▲ 51 - 70%
- ▲ 1 - 50%



# Upper Clark Fork River Basin Water Year to Date Precipitation and Reservoir Levels Percentage of Normal May 1, 2016



### Precipitation Percent of Normal

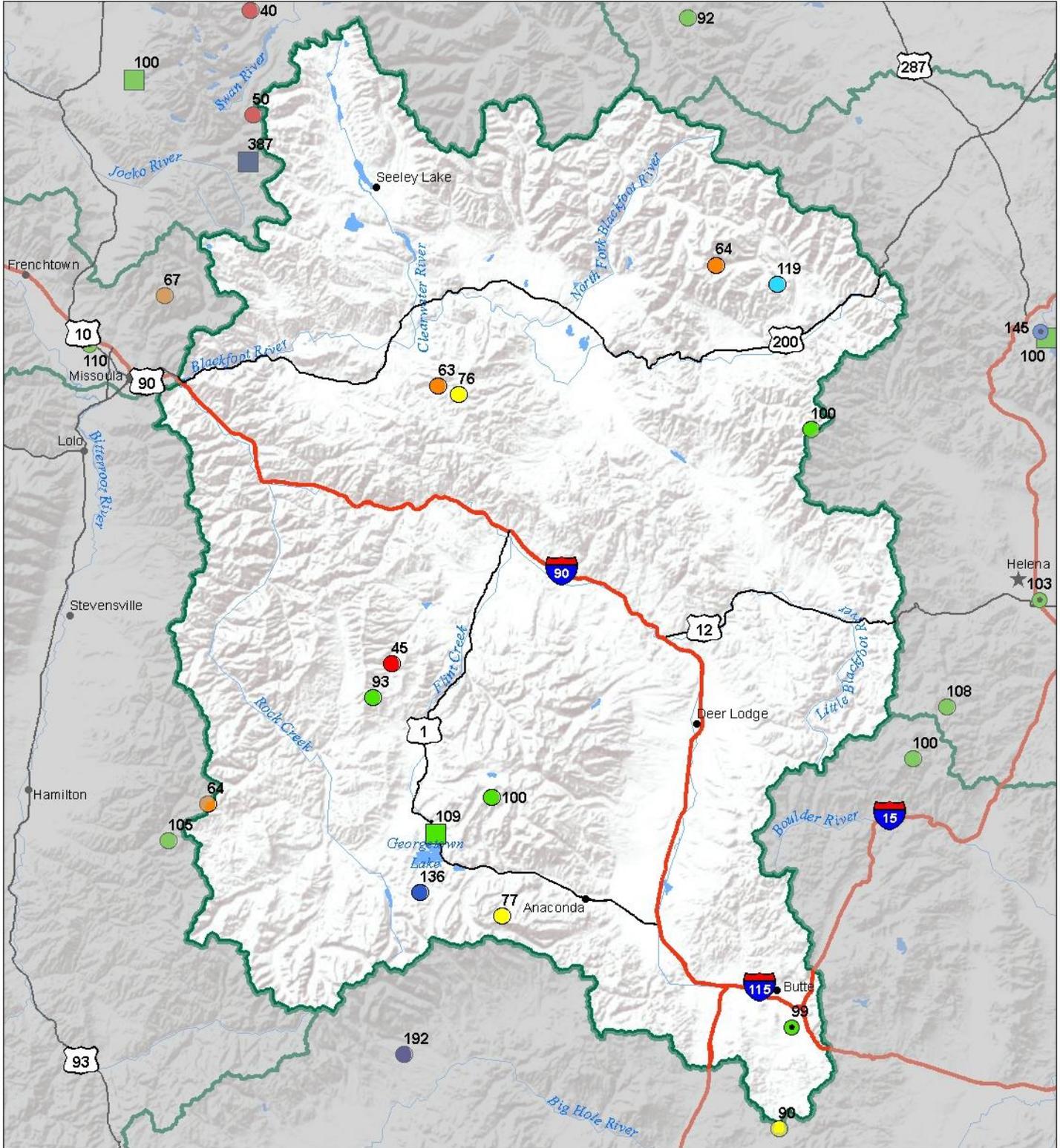
SNOTEL		COOP/ACIS	
<span style="color: blue;">●</span> > 150%	<span style="color: yellow;">●</span> 71 - 90%	<span style="color: blue;">●</span> > 150%	<span style="color: yellow;">●</span> 71 - 90%
<span style="color: lightblue;">●</span> 131 - 150%	<span style="color: orange;">●</span> 51 - 70%	<span style="color: lightblue;">●</span> 131 - 150%	<span style="color: orange;">●</span> 51 - 70%
<span style="color: cyan;">●</span> 111 - 130%	<span style="color: red;">●</span> 1 - 50%	<span style="color: cyan;">●</span> 111 - 130%	<span style="color: red;">●</span> 1 - 50%
<span style="color: green;">●</span> 91 - 110%		<span style="color: green;">●</span> 91 - 110%	

### Reservoirs Percent of Normal

<span style="color: darkblue;">■</span> > 150%
<span style="color: blue;">■</span> 131 - 150%
<span style="color: lightblue;">■</span> 111 - 130%
<span style="color: green;">■</span> 91 - 110%
<span style="color: yellow;">■</span> 71 - 90%
<span style="color: orange;">■</span> 51 - 70%
<span style="color: red;">■</span> 1 - 50%



# Upper Clark Fork River Basin Monthly Precipitation and Reservoir Levels Percentage of Normal May 1, 2016 (April 1, 2016 - May 1, 2016)



### Precipitation Percent of Normal

SNOTEL		COOP/ACIS	
● > 150%	● 71 - 90%	● > 150%	● 71 - 90%
● 131 - 150%	● 51 - 70%	● 131 - 150%	● 51 - 70%
● 111 - 130%	● 1 - 50%	● 111 - 130%	● 1 - 50%
● 91 - 110%		● 91 - 110%	

### Reservoirs Percent of Normal

■ > 150%
■ 131 - 150%
■ 111 - 130%
■ 91 - 110%
■ 71 - 90%
■ 51 - 70%
■ 1 - 50%



## Upper Clark Fork River Basin Streamflow Forecasts - May 1, 2016

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

UPPER CLARK FORK RIVER BASIN	Forecast Period	90% (KAF)	70% (KAF)	50% (KAF)	% Avg	30% (KAF)	10% (KAF)	30yr Avg (KAF)
Little Blackfoot nr Garrison	MAY-JUL	14.6	30	40	71%	50	65	56
	MAY-SEP	16.2	33	44	70%	55	72	63
Flint Ck nr Southern Cross	MAY-JUL	4.8	8	10.2	97%	12.4	15.6	10.5
	MAY-SEP	5.6	9.6	12.3	97%	15	19	12.7
Flint Ck bl Boulder Ck	MAY-JUL	24	36	44	98%	52	65	45
	MAY-SEP	34	48	58	98%	68	82	59
Lower Willow Ck Reservoir Inflow <sup>2</sup>	MAY	1.8	3.5	4.7	94%	5.9	7.6	5
	MAY-JUL	3.6	6.2	7.9	93%	9.7	12.2	8.5
MF Rock Ck nr Philipsburg	MAY-JUL	31	42	49	92%	56	67	53
	MAY-SEP	35	47	55	92%	63	75	60
Rock Ck nr Clinton	MAY-JUL	115	165	199	90%	235	285	220
	MAY-SEP	134	188	225	90%	260	315	250
Clark Fork R ab Milltown	MAY-JUL	141	275	370	83%	465	600	445
	MAY-SEP	183	335	435	82%	535	685	530
Nevada Ck nr Helmville	MAY	-0.22	2	3.6	69%	5.1	7.3	5.2
	MAY-JUL	-0.23	4	6.9	63%	9.8	14.1	11
Blackfoot R nr Bonner	MAY-JUL	305	385	445	75%	500	580	590
	MAY-SEP	360	450	510	76%	570	660	675
Clark Fork R ab Missoula	MAY-JUL	470	680	825	80%	970	1180	1030
	MAY-SEP	575	800	955	80%	1110	1340	1200

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

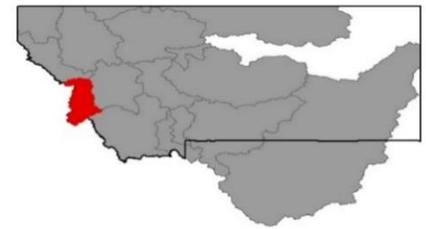
2) Forecasts are for unimpaired flows. Actual flow will be dependent on management of upstream reservoirs and diversions

3) Median value used in place of average

Reservoir Storage End of April, 2016	Current (KAF)	Last Year (KAF)	Average (KAF)	Capacity (KAF)
East Fork Rock Creek Res	9.5	11.9	9.2	15.6
Georgetown Lake	30.8	29.0	28.2	31.0
Lower Willow Creek Reservoir		5.0	4.1	4.9
Nevada Creek Res	9.8	11.2	9.9	12.6
Basin-wide Total	50.1	52.1	47.3	59.2
# of reservoirs	3	3	3	3

Watershed Snowpack Analysis May 1, 2016	# of Sites	% Median	Last Year % Median
CLARK FORK ab FLINT CREEK	11	84	71
FLINT CREEK	5	77	56
ROCK CREEK	4	78	62
CLARK FORK ab BLACKFOOT	18	79	65
BLACKFOOT	13	78	72
UPPER CLARK FORK RIVER BASIN	29	79	68

# Bitterroot River Basin



Peak basin-wide snow water equivalent occurred on March 29<sup>th</sup> in the Bitterroot River basin this year, which was 94% of the average peak and 3 days early. Last year the basin peaked at 84% of average and about 22 days early. Since peaking this year the basin has experienced above average melt at SNOTEL sites. The average melt rate since April 1<sup>st</sup> has been about 0.3 inches (SWE) per day and currently the basin-wide snowpack is similar to last year at this time. If normal weather patterns persist over the next month, all SNOTEL sites within the basin will be melted out in early June, about two weeks early.

Monthly precipitation averages have been inconsistent since the start of the water year. October, January, and April had well below average precipitation. Other months were near average and December was well above average. Currently water-year-to date precipitation is at 67% of average in the Bitterroot River basin.

Reservoir storage is currently above average in Lake Como at 136%, and 172% at Painted Rocks.

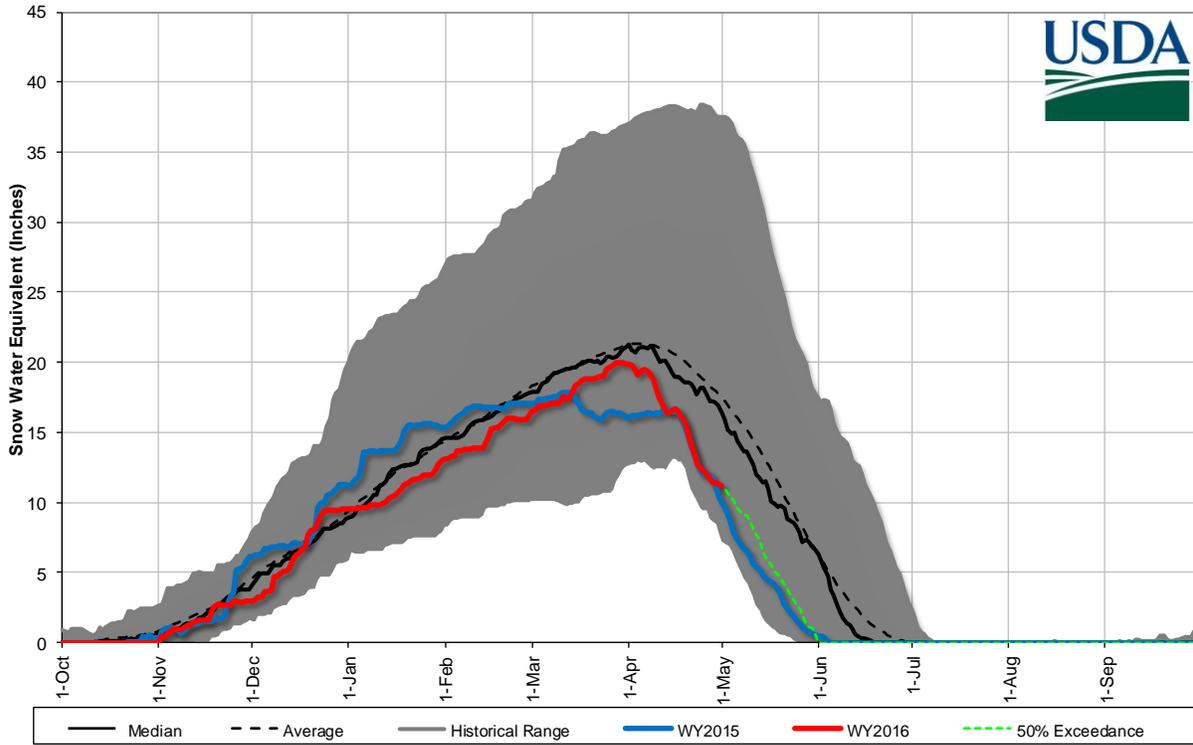
Basin-wide streamflow forecasts vary greatly across the basin, so consult the table at the end of this section for individual forecast points. Current basin-wide streamflow forecasts for the 50% exceedance are 82% of average for the May-July time period.

<b>Bitterroot River Basin Data Summary</b>		<b>5/1/2016</b>	
<b>Snowpack</b>			
	Percent of 1981-2010 Normal (Median)	Last Year Percentage of Normal (Median)	
Basin-Wide	70%	63%	
<b>Precipitation</b>			
	Monthly Percentage of Average	WYTD Percentage of 1981-2010 Average*	Last Year Percentage of Average
Mountain Precipitation	67%	96%	101%
Valley Precipitation	%	%	%
Basin Precipitation	67%	96%	101%
<b>Reservoir Storage</b>			
	Percentage of Average	Percentage of Capacity (Total)	Last Year Percentage of Average
Basin-Wide Storage	153%	94%	151%
<b>Streamflow Forecast</b>			
	50 % Exceedance Forecast Percentage of Average	50 % Exceedance Forecast % of Last Year's Flows	Last Year Percentage of Average
Basin-Wide Apr-July	82%	108%	71%

\*Water Year-to-Date (WYTD) Precipitation is October 1st - Current

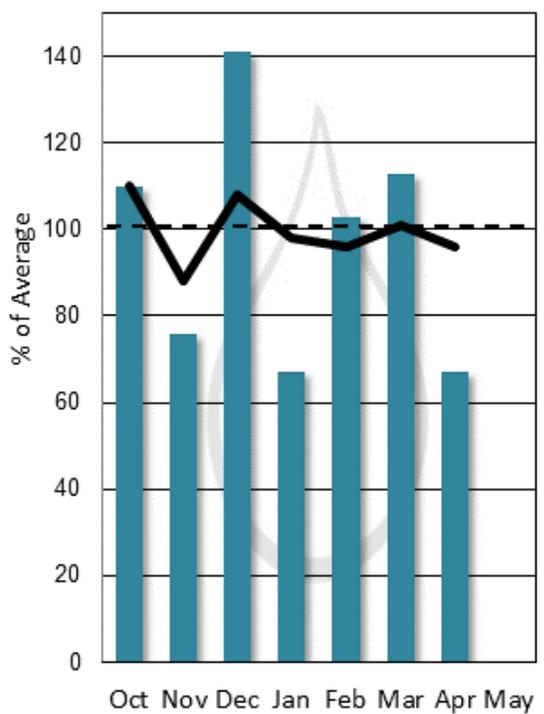
\*\*Basin-wide streamflows are an average of the individual streamflow points within the basin for the 50 percent exceedance forecast. Consult the individual streamflow forecasts in the table below for the range of forecasts at an individual point.

**Bitterroot River Basin Snowpack with Non-Exceedence Projections**  
*Based on provisional SNOTEL daily data as of 5/1/2016*



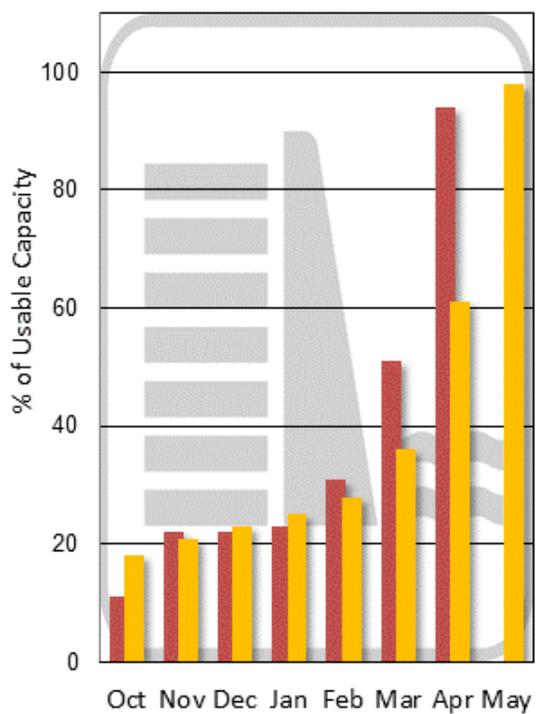
**Mountain and Valley  
Precipitation**

■ Monthly    — Year-to-date



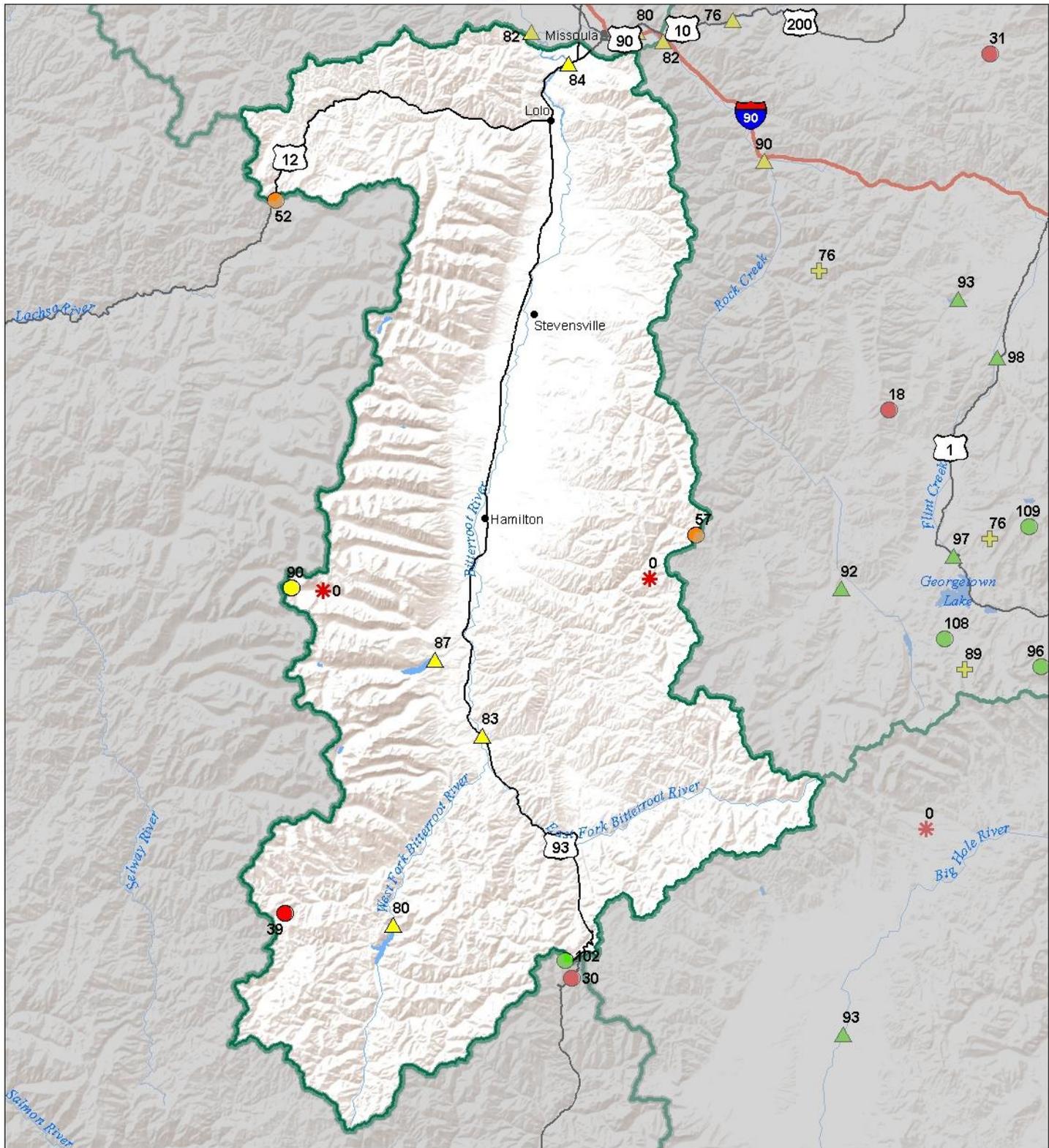
**End of Month Reservoir  
Storage**

■ % Capacity    ■ Avg % Capacity



Storage above is averaged for all reservoirs in the basin. For individual reservoirs see table below.

# Bitterroot River Basin Streamflow Forecast, Snow Water Equivalent Percentage of Normal May 1, 2016



### Snow Water Equivalent Percent of Normal

#### SNOTEL

- > 150%
- 131 - 150%
- 111 - 130%
- 91 - 110%
- 71 - 90%
- 51 - 70%
- 1 - 50%
- \*

#### Snowcourse

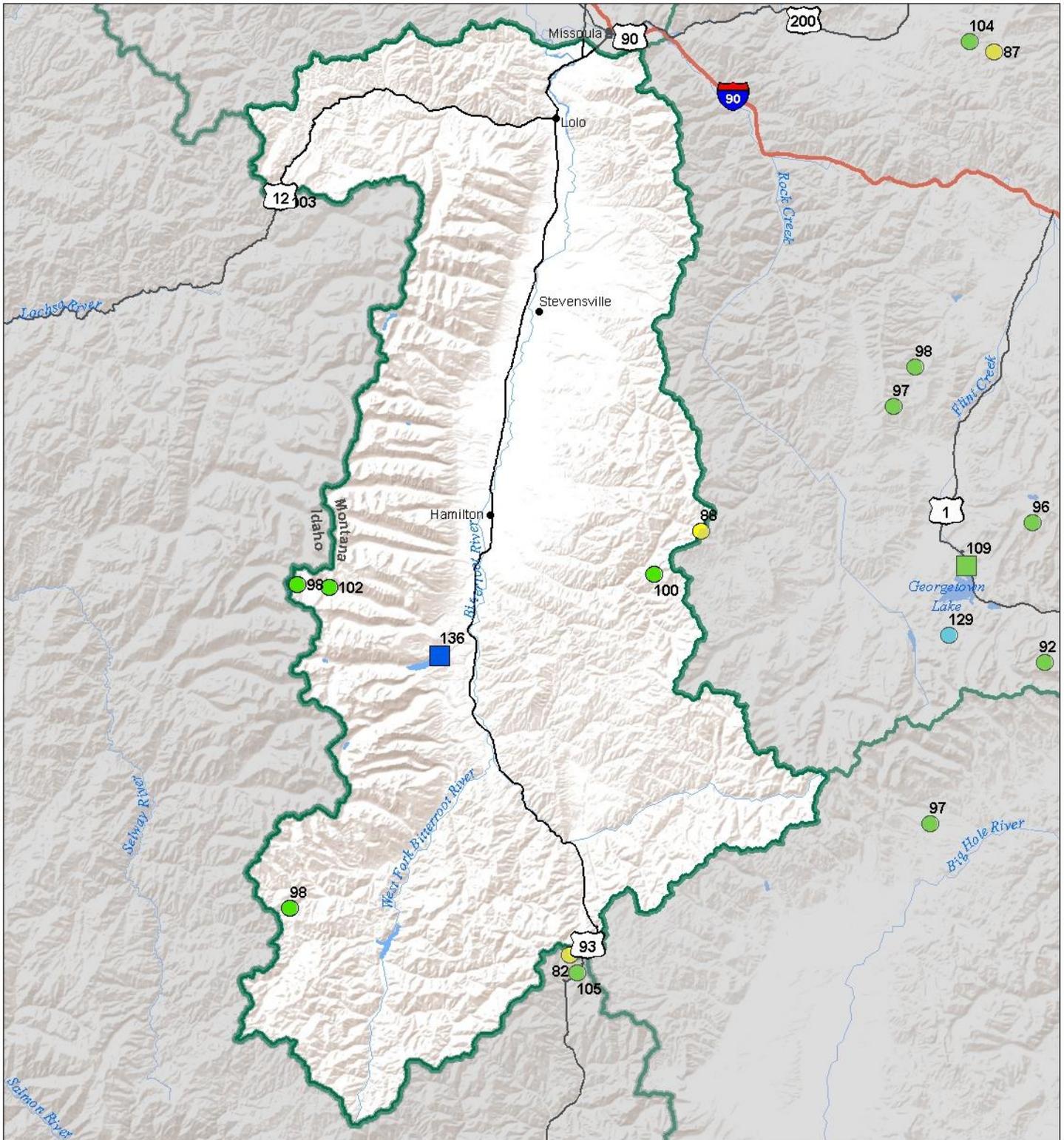
- ⊕ > 150%
- ⊕ 131 - 150%
- ⊕ 111 - 130%
- ⊕ 91 - 110%
- ⊕ 71 - 90%
- ⊕ 51 - 70%
- ⊕ 1 - 50%
- ⊕ \*

### Streamflow Forecast Percent of Average Flows

- ▲ > 150%
- ▲ 131 - 150%
- ▲ 111 - 130%
- ▲ 91 - 110%
- ▲ 71 - 90%
- ▲ 51 - 70%
- ▲ 1 - 50%



# Bitterroot River Basin Water Year to Date Precipitation and Reservoir Levels Percentage of Normal May 1, 2016



### Precipitation Percent of Normal

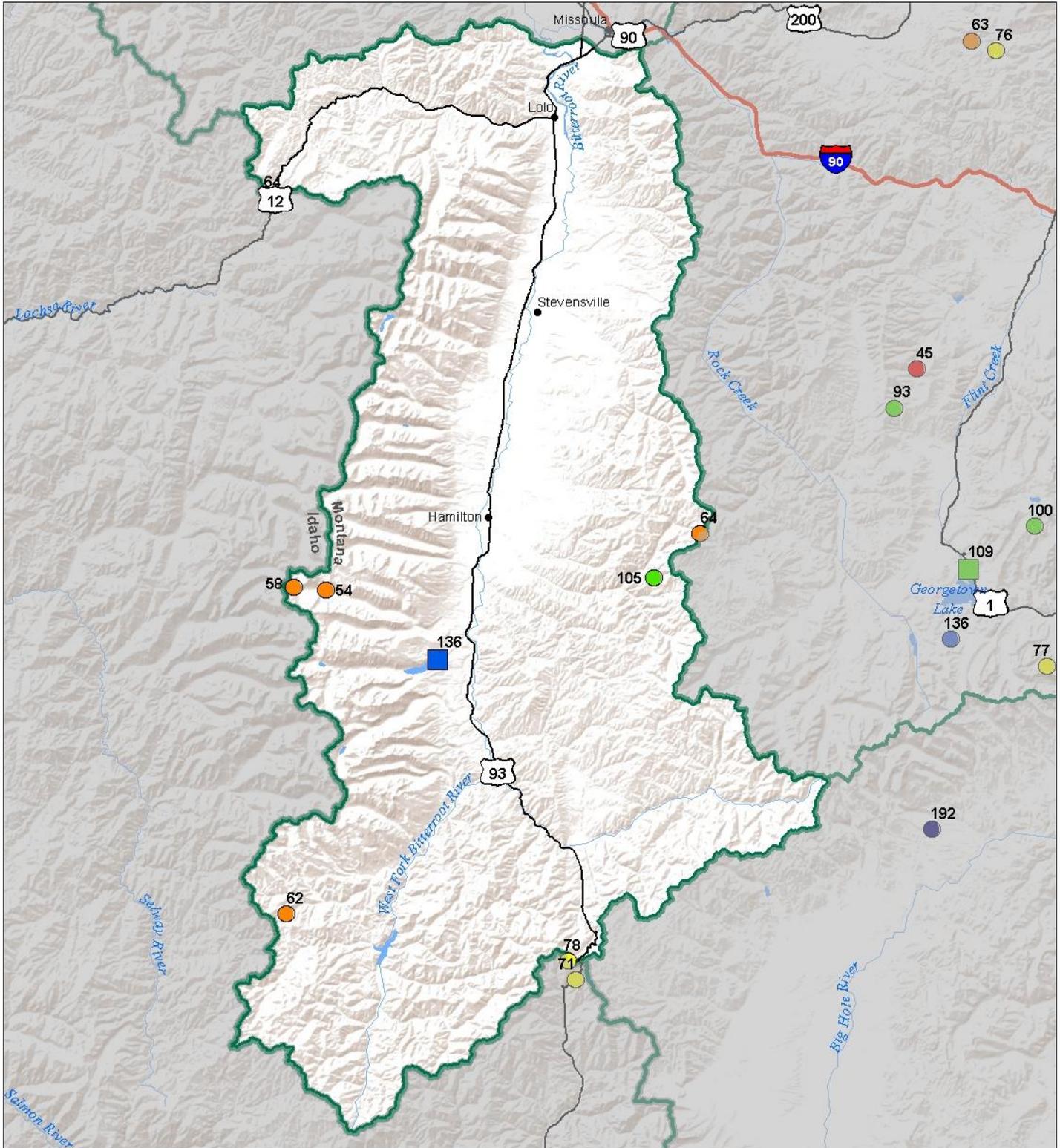
SNOTEL		COOP/ACIS	
● > 150%	● 71 - 90%	● > 150%	● 71 - 90%
● 131 - 150%	● 51 - 70%	● 131 - 150%	● 51 - 70%
● 111 - 130%	● 1 - 50%	● 111 - 130%	● 1 - 50%
● 91 - 110%		● 91 - 110%	

### Reservoirs Percent of Normal

■ > 150%
■ 131 - 150%
■ 111 - 130%
■ 91 - 110%
■ 71 - 90%
■ 51 - 70%
■ 1 - 50%



# Bitterroot River Basin Monthly Precipitation and Reservoir Levels Percentage of Normal May 1, 2016 (April 1, 2016 - May 1, 2016)



### Precipitation Percent of Normal

SNOTEL		COOP/ACIS	
Dark Blue	> 150%	Dark Blue	> 150%
Blue	131 - 150%	Blue	131 - 150%
Cyan	111 - 130%	Cyan	111 - 130%
Light Green	91 - 110%	Light Green	91 - 110%
Yellow	71 - 90%	Yellow	71 - 90%
Orange	51 - 70%	Orange	51 - 70%
Red	1 - 50%	Red	1 - 50%

### Reservoirs Percent of Normal

Dark Blue	> 150%
Blue	131 - 150%
Cyan	111 - 130%
Light Green	91 - 110%
Yellow	71 - 90%
Orange	51 - 70%
Red	1 - 50%



## Bitterroot River Basin Streamflow Forecasts - May 1, 2016

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

BITTERROOT RIVER BASIN	Forecast Period	90% (KAF)	70% (KAF)	50% (KAF)	% Avg	30% (KAF)	10% (KAF)	30yr Avg (KAF)
WF Bitterroot R Nr Conner <sup>2</sup>	MAY-JUL	52	72	86	79%	100	121	109
	MAY-SEP	55	79	96	80%	113	138	120
Bitterroot R Nr Darby	MAY-JUL	188	250	290	81%	330	390	360
	MAY-SEP	245	305	350	83%	390	455	420
Como Reservoir Inflow <sup>2</sup>	MAY-JUL	44	52	57	86%	61	69	66
	MAY-SEP	47	55	60	87%	65	72	69
Bitterroot R nr Missoula	MAY-JUL	605	735	820	83%	910	1040	990
	MAY-SEP	680	825	920	84%	1020	1160	1090

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

2) Forecasts are for unimpaired flows. Actual flow will be dependent on management of upstream reservoirs and diversions

3) Median value used in place of average

Reservoir Storage End of April, 2016	Current (KAF)	Last Year (KAF)	Average (KAF)	Capacity (KAF)
Painted Rocks Lake	32.3	32.4	18.7	31.7
Lake Como	30.1	29.4	22.1	34.9
Basin-wide Total	62.3	61.8	40.8	66.6
# of reservoirs	2	2	2	2

Watershed Snowpack Analysis May 1, 2016	# of Sites	% Median	Last Year % Median
WEST FORK BITTERROOT	2	83	74
EAST SIDE BITTERROOT	3	74	67
WEST SIDE BITTERROOT	3	72	64
BITTERROOT RIVER BASIN	7	70	63

# Lower Clark Fork River Basin



As of April 1<sup>st</sup> the Lower Clark Fork River basin snowpack percent of normal was 20% higher than last year at this time. This year the basin peaked on March 30<sup>th</sup> at 93% of average, which was about 10 days early. Unfortunately melt rates have been slightly higher than normal and the basin’s snowpack is currently approaching last year’s condition at this time, which set record lows. The Lower Clark did receive a mid-month storm that delivered mixed rain and snow to the higher elevation SNOTEL sites. Currently on May 1<sup>st</sup>, the Lower Clark Fork River basin has a 67% of normal basin-wide snowpack.

April precipitation at SNOTEL sites in the Lower Clark Fork River basin was well below average. April actually had the largest departure from average precipitation since the start of the water year. Mountain SNOTEL sites received 58% of average precipitation for the month of April, while valley weather stations received 62% of average precipitation. Fortunately December and March delivered well above average precipitation. Currently water-year-to date precipitation is at 102% of average in the Lower Clark Fork River basin.

Reservoir storage in Noxon Rapids Reservoir is currently above average at 105%.

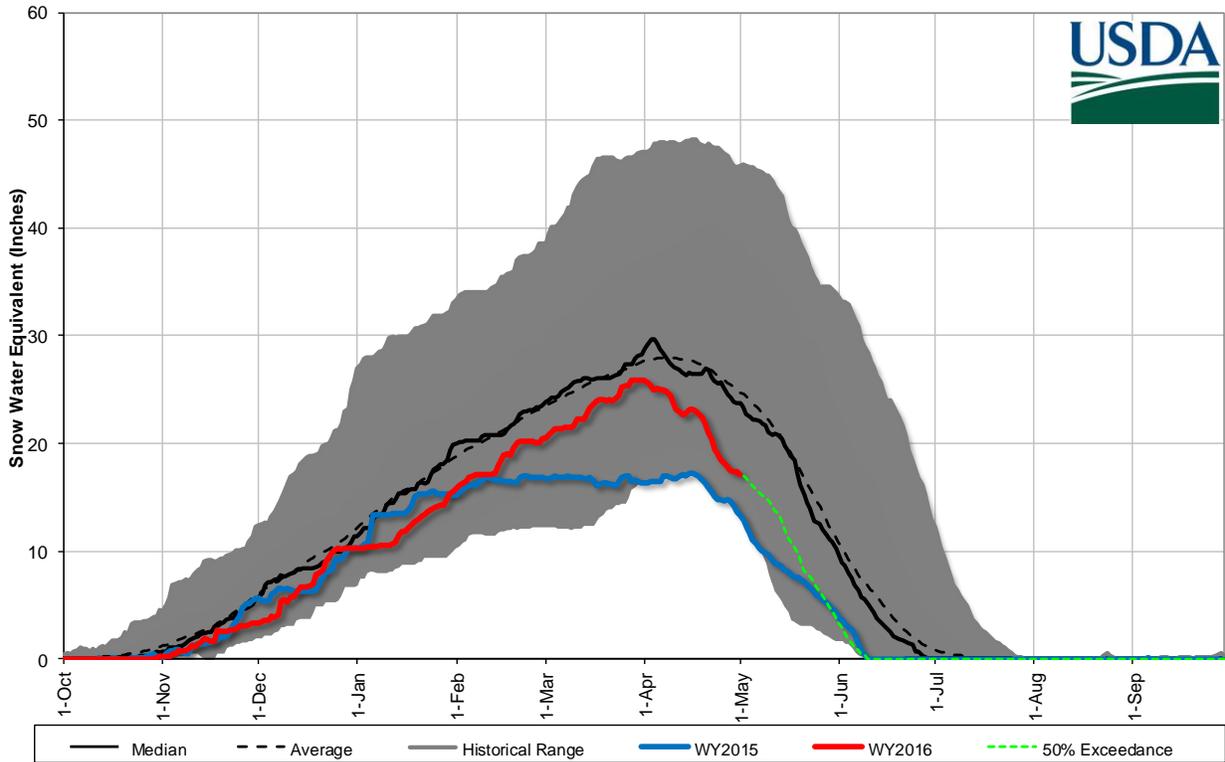
Basin-wide streamflow forecasts vary greatly across the basin, so consult the table at the end of this section for individual forecast points. Current basin-wide streamflow forecasts for the 50% exceedance are 85% of average for the May-July time period.

<b>Lower Clark Fork River Basin Data Summary</b>		<b>5/1/2016</b>	
<b>Snowpack</b>	Percent of 1981-2010 Normal (Median)	Last Year Percentage of Normal (Median)	
Basin-Wide	67%	47%	
<b>Precipitation</b>	Monthly Percentage of Average	WYTD Percentage of 1981-2010 Average*	Last Year Percentage of Average
Mountain Precipitation	58%	101%	99%
Valley Precipitation	62%	106%	106%
Basin Precipitation	59%	102%	99%
<b>Reservoir Storage</b>	Percentage of Average	Percentage of Capacity (Total)	Last Year Percentage of Average
Basin-Wide Storage	105%	96%	104%
<b>Streamflow Forecast</b>	50 % Exceedance Forecast Percentage of Average	50 % Exceedance Forecast % of Last Year's Flows	Last Year Percentage of Average
Basin-Wide Apr-July	85%	146%	34%

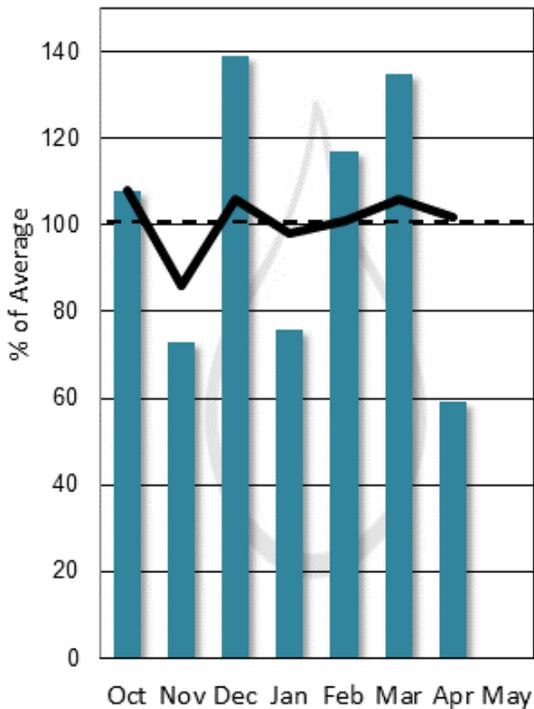
\*Water Year-to-Date (WYTD) Precipitation is October 1st - Current

\*\*Basin-wide streamflows are an average of the individual streamflow points within the basin for the 50 percent exceedance forecast. Consult the individual streamflow forecasts in the table below for the range of forecasts at an individual point.

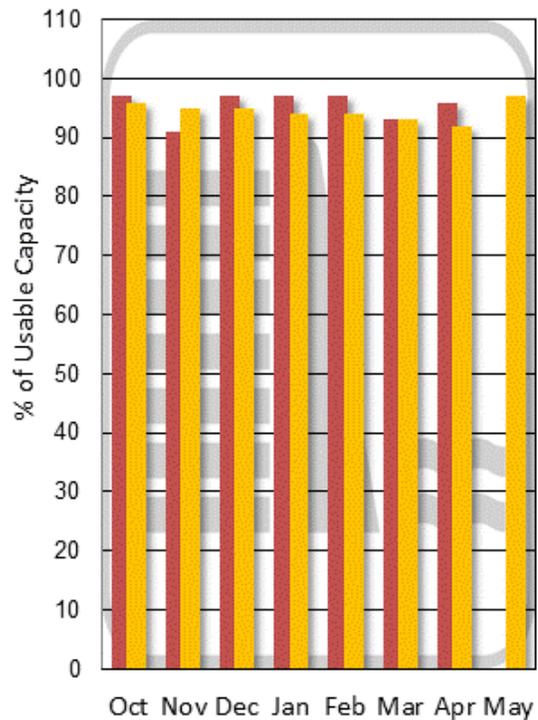
**Lower Clark Fork River Basin Snowpack with Non-Exceedence Projections**  
*Based on provisional SNOTEL daily data as of 5/1/2016*



**Mountain and Valley Precipitation**

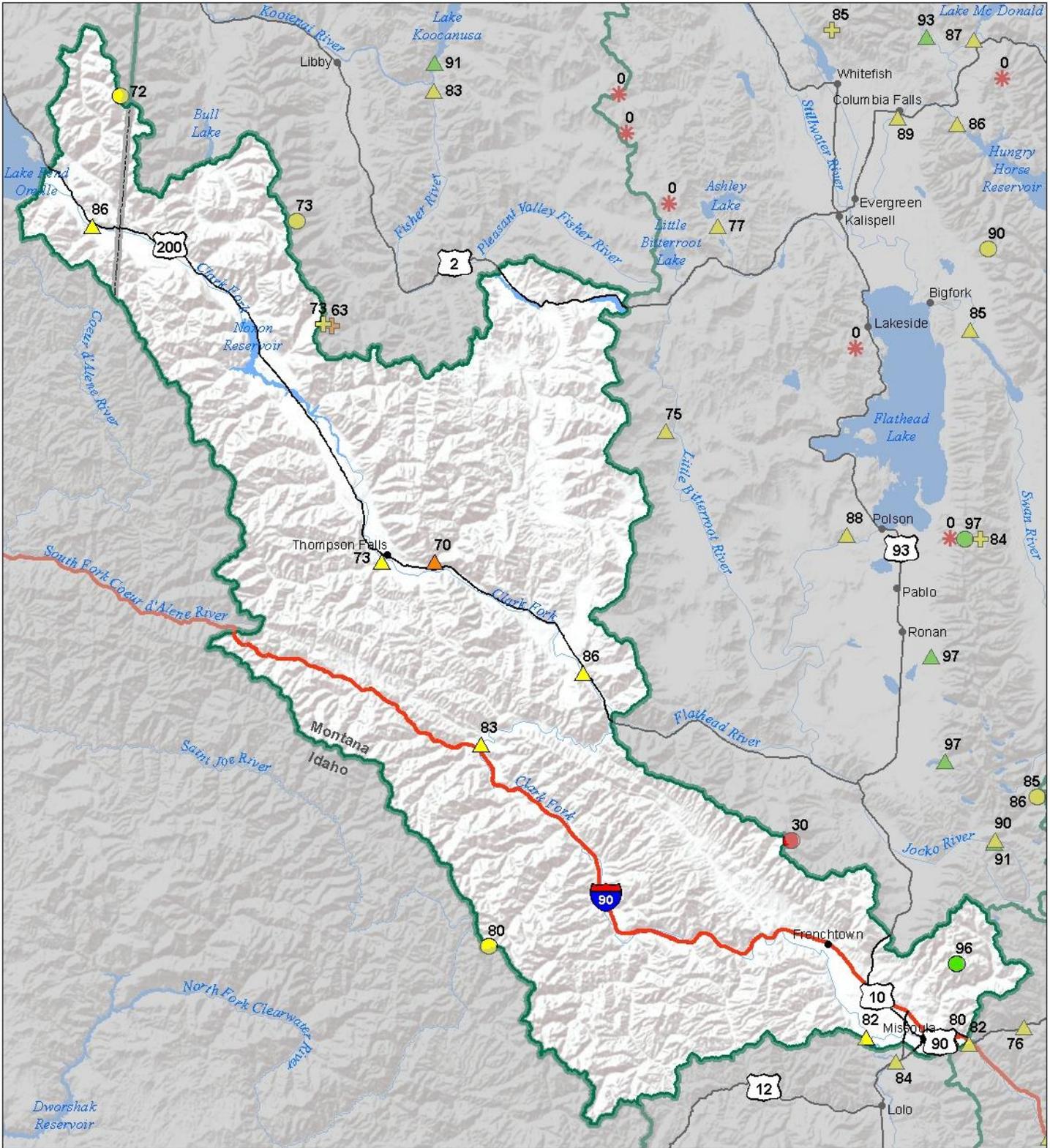


**End of Month Reservoir Storage**



Storage above is averaged for all reservoirs in the basin. For individual reservoirs see table below.

# Lower Clark Fork River Basin Streamflow Forecast, Snow Water Equivalent Percentage of Normal May 1, 2016



### Snow Water Equivalent Percent of Normal

#### SN OTEL

- > 150%
- 131 - 150%
- 111 - 130%
- 91 - 110%

- 71 - 90%
- 51 - 70%
- 1 - 50%
- \* 0%

#### Snowcourse

- ⊕ > 150%
- ⊕ 131 - 150%
- ⊕ 111 - 130%
- ⊕ 91 - 110%

- ⊕ 71 - 90%
- ⊕ 51 - 70%
- ⊕ 1 - 50%
- \* 0%

### Streamflow Forecast Percent of Average Flows

- ▲ > 150%
- ▲ 131 - 150%
- ▲ 111 - 130%
- ▲ 91 - 110%
- ▲ 71 - 90%
- ▲ 51 - 70%
- ▲ 1 - 50%

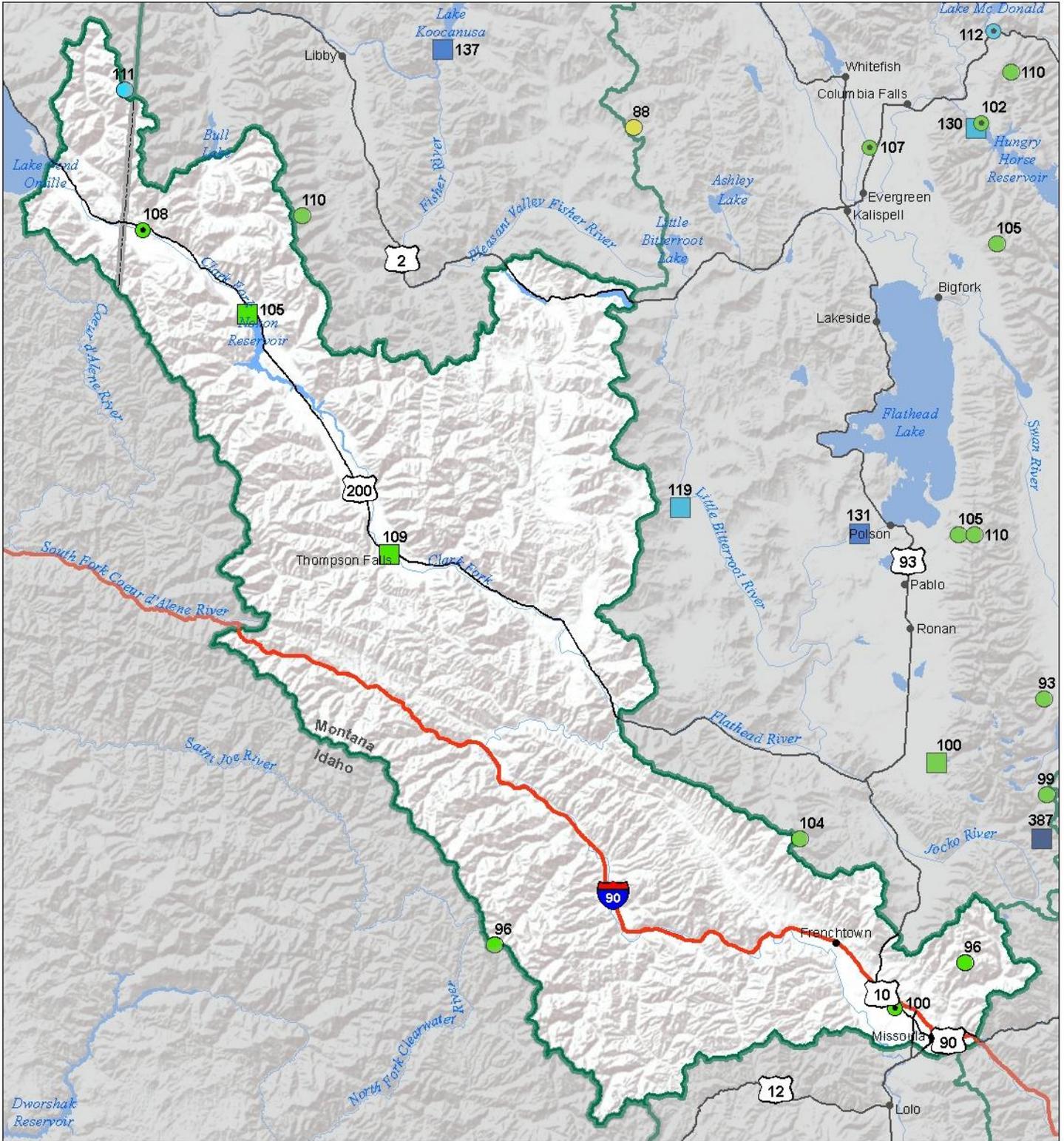


# Lower Clark Fork River Basin

## Water Year to Date Precipitation and Reservoir Levels

### Percentage of Normal

#### May 1, 2016



### Precipitation Percent of Normal

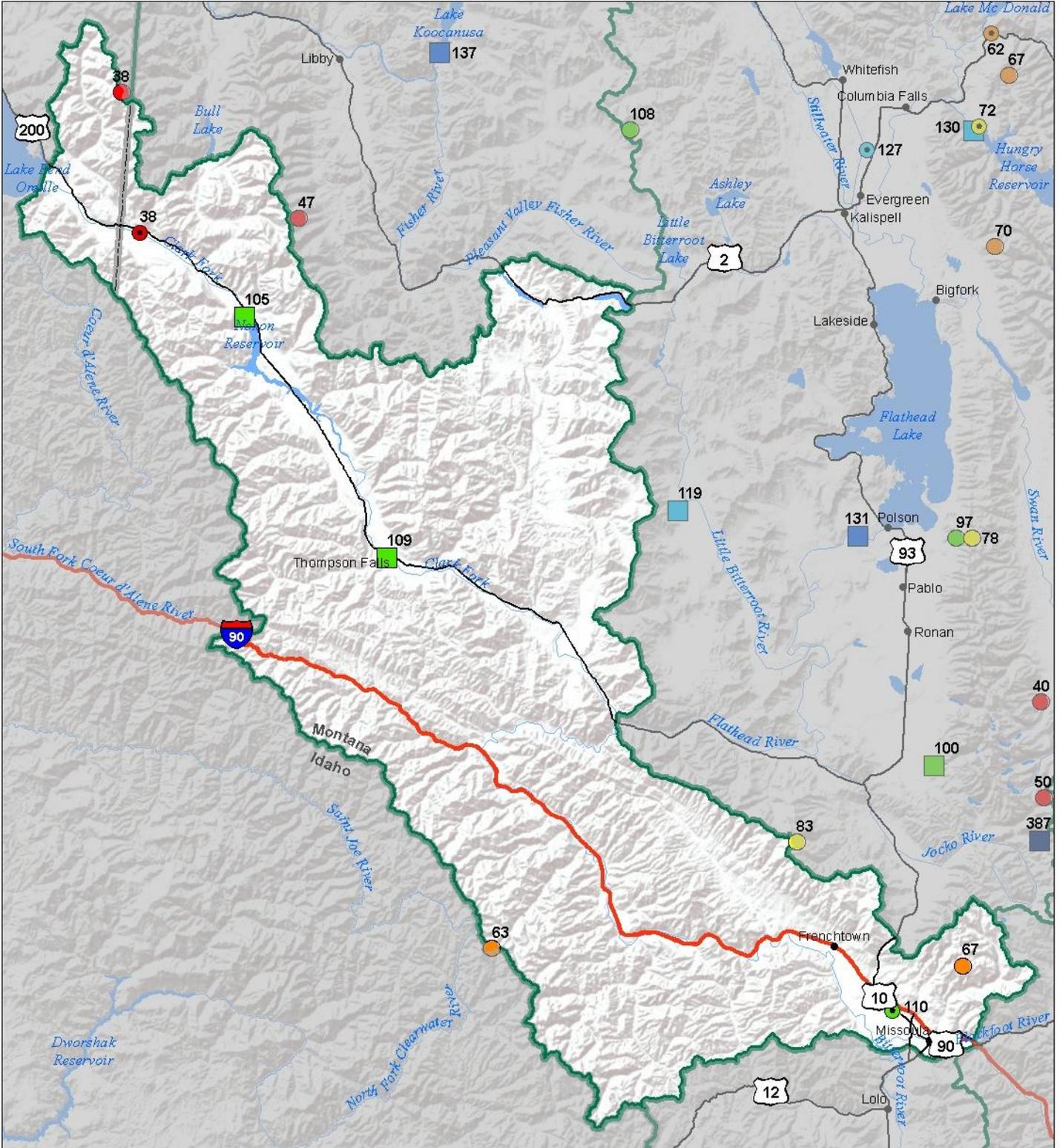
SNOTEL		COOP/ACIS	
<span style="color: blue;">●</span> > 150%	<span style="color: yellow;">●</span> 71 - 90%	<span style="color: blue;">■</span> > 150%	<span style="color: yellow;">■</span> 71 - 90%
<span style="color: lightblue;">●</span> 131 - 150%	<span style="color: orange;">●</span> 51 - 70%	<span style="color: lightblue;">■</span> 131 - 150%	<span style="color: orange;">■</span> 51 - 70%
<span style="color: cyan;">●</span> 111 - 130%	<span style="color: red;">●</span> 1 - 50%	<span style="color: cyan;">■</span> 111 - 130%	<span style="color: red;">■</span> 1 - 50%
<span style="color: green;">●</span> 91 - 110%		<span style="color: green;">■</span> 91 - 110%	

### Reservoirs Percent of Normal

<span style="color: darkblue;">■</span> > 150%
<span style="color: blue;">■</span> 131 - 150%
<span style="color: lightblue;">■</span> 111 - 130%
<span style="color: green;">■</span> 91 - 110%
<span style="color: yellow;">■</span> 71 - 90%
<span style="color: orange;">■</span> 51 - 70%
<span style="color: red;">■</span> 1 - 50%



**Lower Clark Fork River Basin  
 Monthly Precipitation and Reservoir Levels  
 Percentage of Normal  
 May 1, 2016 (April 1, 2016 - May 1, 2016)**



**Precipitation  
 Percent of Normal**

SNOTEL		COOP/ACIS	
● > 150%	● 71 - 90%	● > 150%	● 71 - 90%
● 131 - 150%	● 51 - 70%	● 131 - 150%	● 51 - 70%
● 111 - 130%	● 1 - 50%	● 111 - 130%	● 1 - 50%
● 91 - 110%		● 91 - 110%	

**Reservoirs  
 Percent of Normal**

■ > 150%
■ 131 - 150%
■ 111 - 130%
■ 91 - 110%
■ 71 - 90%
■ 51 - 70%
■ 1 - 50%



## Lower Clark Fork River Basin Streamflow Forecasts - May 1, 2016

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

LOWER CLARK FORK RIVER BASIN	Forecast Period	90% (KAF)	70% (KAF)	50% (KAF)	% Avg	30% (KAF)	10% (KAF)	30yr Avg (KAF)
Clark Fork R. bl Missoula	MAY-JUL	1110	1430	1650	81%	1870	2190	2030
	MAY-SEP	1290	1640	1880	82%	2120	2470	2300
Clark Fork R. at St. Regis <sup>1</sup>	MAY-JUL	1310	1890	2160	82%	2430	3010	2640
	MAY-SEP	1540	2180	2470	83%	2760	3400	2990
Clark Fork R. nr Plains <sup>1,2</sup>	MAY-JUL	4970	6150	6680	86%	7210	8390	7780
	MAY-SEP	5520	6860	7470	86%	8080	9420	8650
Thompson nr Thompson Falls	MAY-JUL	45	73	92	67%	112	140	138
	MAY-SEP	60	91	112	70%	133	164	161
Prospect Ck at Thompson Falls	MAY-JUL	35	46	54	71%	62	74	76
	MAY-SEP	40	52	61	73%	69	81	84
Clark Fork R. at Whitehorse Rapids <sup>1,2</sup>	MAY-JUL	5620	6890	7460	85%	8030	9300	8740
	MAY-SEP	6300	7730	8380	86%	9030	10500	9760

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

2) Forecasts are for unimpaired flows. Actual flow will be dependent on management of upstream reservoirs and diversions

3) Median value used in place of average

Reservoir Storage End of April, 2016	Current (KAF)	Last Year (KAF)	Average (KAF)	Capacity (KAF)
Noxon Rapids Reservoir	322.8	318.2	307.4	335.0
Basin-wide Total	322.8	318.2	307.4	335.0
# of reservoirs	1	1	1	1

Watershed Snowpack Analysis May 1, 2016	# of Sites	% Median	Last Year % Median
LOWER CLARK FORK RIVER BASIN	11	67	47

# Jefferson River Basin



Basin-wide snowpack in the Jefferson River basin peaked early around the 1<sup>st</sup> of April and has seen a slow decline throughout the month of April due to the periods of clear sunny skies, and well above average temperatures. The high elevation Darkhorse SNOTEL site peaked later on May 1<sup>st</sup>, and the Mule Creek SNOTEL site in the pioneer range peaked during mid-April. Sites below 7000' in the Beaverhead and Ruby River basins melted out by May 1<sup>st</sup> while mid-elevation SNOTEL sites in these basins have a snowpack that is 65 to 80% of normal for this date. The Big Hole basin continues to have the best snowpack for this date with most sites above 7000' with near to slightly above average SWE. The Boulder River basin that feeds the Jefferson from the north also has snowpack that is slightly below normal at mid-elevations, and near average at higher elevations. Peak snow water equivalent for this year was near to above normal basin-wide, but the weather patterns have caused many areas within the basin to melt early and ahead of schedule. Fortunately the mid-month storm event helped to slow the melt and add some snow water, and the cooler pattern at the end of the month also helped to prolong the mountain snowpack. Currently, the Jefferson River basin as a whole is 82% of normal for May 1<sup>st</sup>, down 29% from April 1<sup>st</sup>, but well above last year at this time.

Precipitation in the basin was below average for the month of April in the Beaverhead (84%) and Ruby (75%) basins, and near average in the Big Hole (94%) and Boulder River (99%) basins. Valley precipitation was near to slightly above average basin-wide. Although April didn't yield the normal amount of precipitation the basin overall continues to be in good standing for water year-to-date precipitation. Currently, water year-to-date for the Jefferson River basin is 100% of average for May 1<sup>st</sup>.

Reservoir storage in the basin is slightly below average (87%) at Clark Canyon Reservoir and above average for May 1<sup>st</sup> at Lima and Ruby Reservoirs.

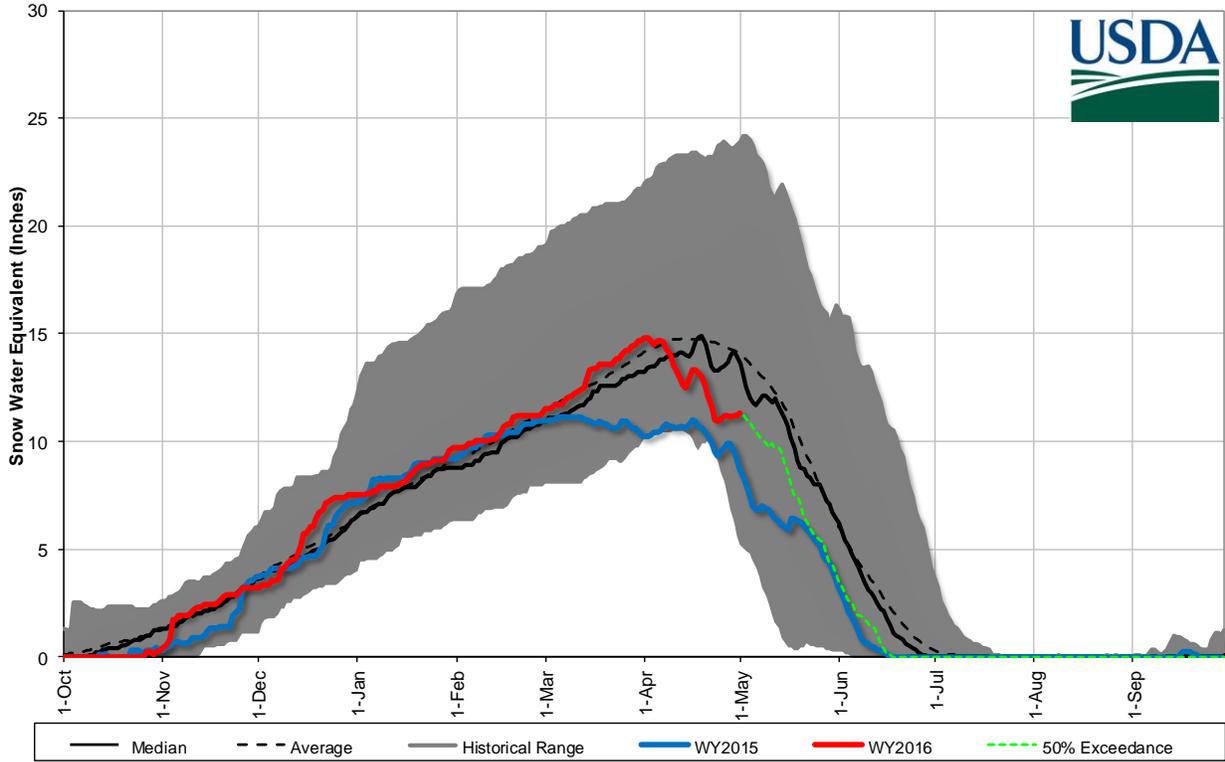
Basin-wide streamflow forecasts vary greatly across the basin, so consult the table at the end of this section for individual forecast points. Current basin-wide streamflow forecasts for the 50% exceedance are 84% of average for the May-July time period.

<b>Jefferson River Basin Data Summary</b>		<b>5/1/2016</b>	
	Percent of 1981-2010 Normal (Median)	Last Year Percentage of Normal (Median)	
<b>Snowpack</b>			
Basin-Wide	82%	66%	
	Monthly Percentage of Average	WYTD Percentage of 1981-2010 Average*	Last Year Percentage of Average
<b>Precipitation</b>			
Mountain Precipitation	86%	99%	82%
Valley Precipitation	102%	124%	85%
Basin Precipitation	87%	100%	82%
	Percentage of Average	Percentage of Capacity (Total)	Last Year Percentage of Average
<b>Reservoir Storage</b>			
Basin-Wide Storage	95%	59%	91%
	50 % Exceedance Forecast Percentage of Average	50 % Exceedance Forecast % of Last Year's Flows	Last Year Percentage of Average
<b>Streamflow Forecast</b>			
Basin-Wide Apr-July	84%	171%	49%

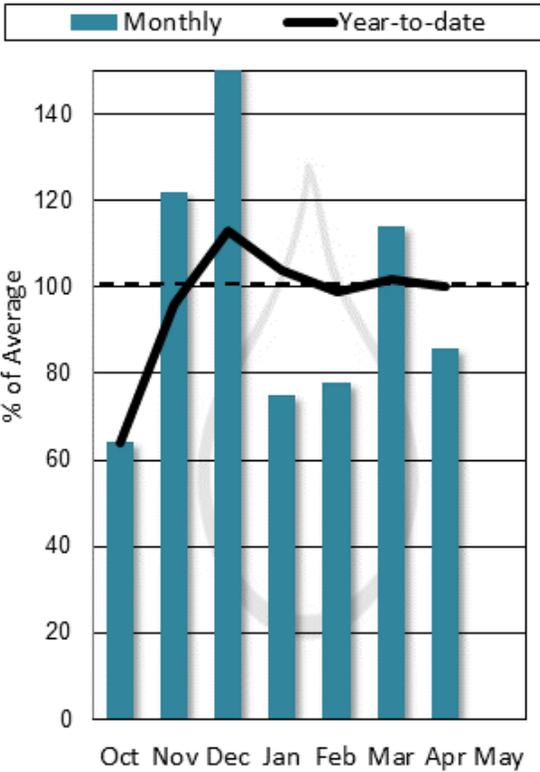
\*Water Year-to-Date (WYTD) Precipitation is October 1st - Current

\*\*Basin-wide streamflows are an average of the individual streamflow points within the basin for the 50 percent exceedance forecast. Consult the individual streamflow forecasts in the table below for the range of forecasts at an individual point.

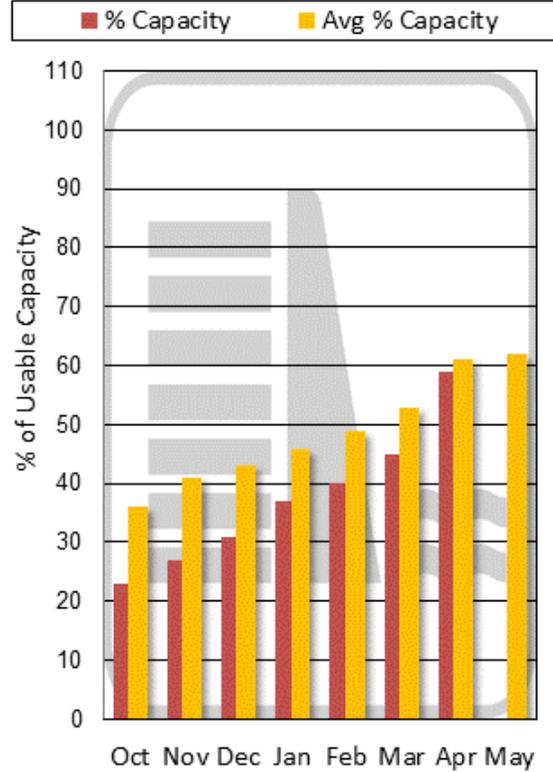
**Jefferson River Basin Snowpack with Non-Exceedence Projections**  
*Based on provisional SNOTEL daily data as of 5/1/2016*



**Mountain and Valley  
Precipitation**

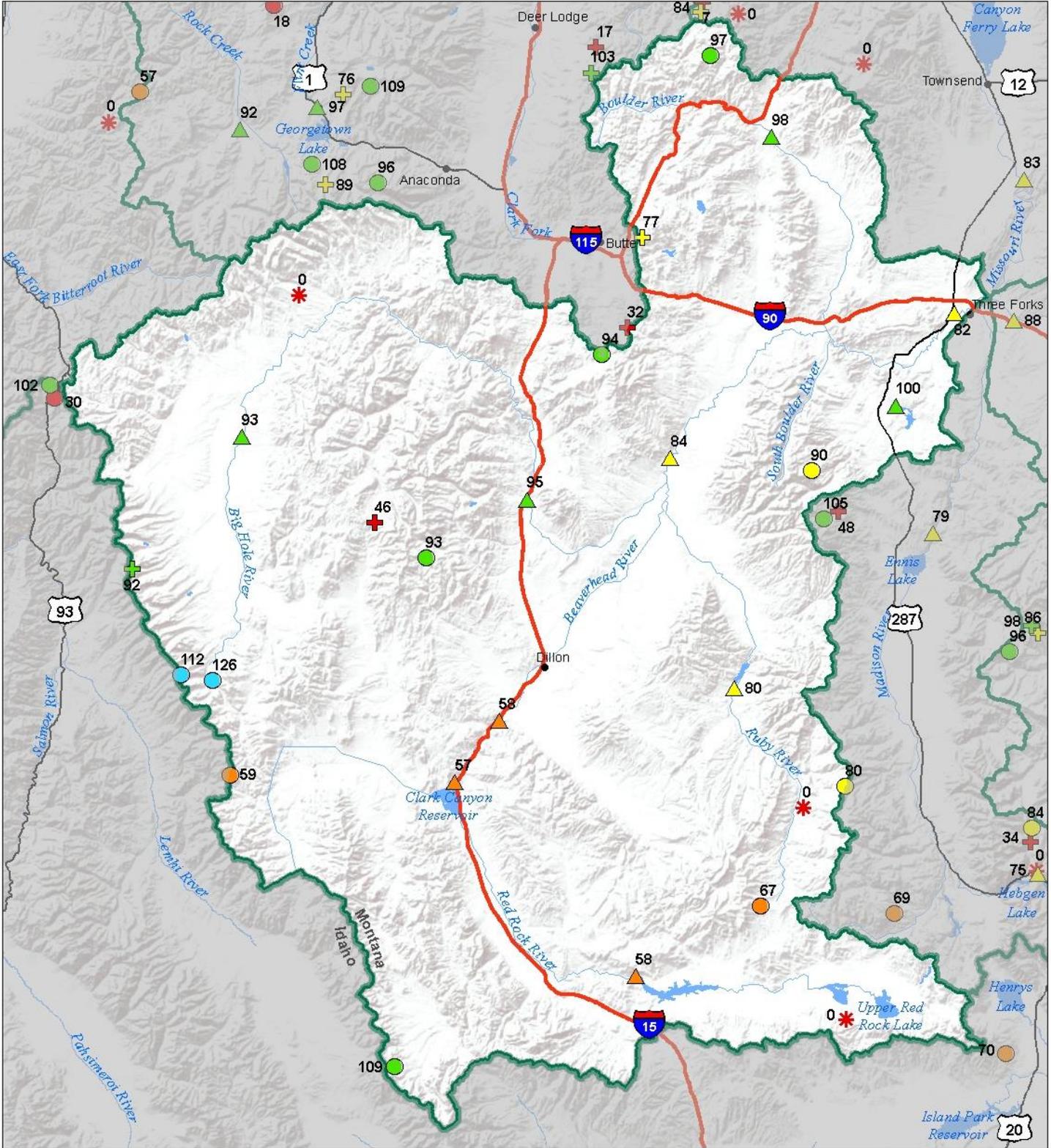


**End of Month Reservoir  
Storage**



Storage above is averaged for all reservoirs in the basin. For individual reservoirs see table below.

# Jefferson River Basin Streamflow Forecast, Snow Water Equivalent Percentage of Normal May 1, 2016



### Snow Water Equivalent Percent of Normal

#### SNOTEL

- > 150%
- 131 - 150%
- 111 - 130%
- 91 - 110%
- 71 - 90%
- 51 - 70%
- 1 - 50%
- \*

#### Snowcourse

- ⊕ > 150%
- ⊕ 131 - 150%
- ⊕ 111 - 130%
- ⊕ 91 - 110%
- ⊕ 71 - 90%
- ⊕ 51 - 70%
- ⊕ 1 - 50%
- ⊕ \*

### Streamflow Forecast Percent of Average Flows

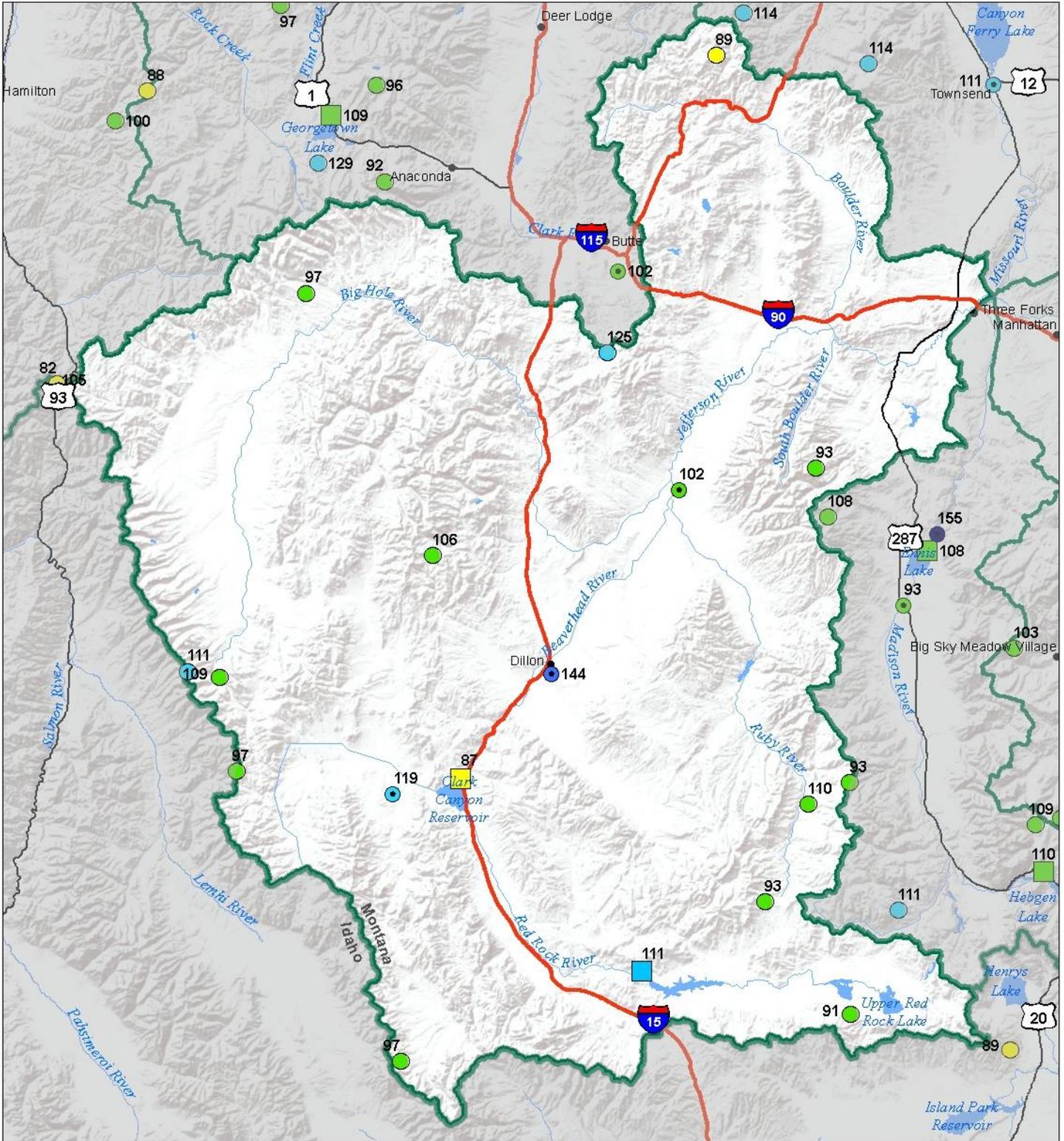
- ▲ > 150%
- ▲ 131 - 150%
- ▲ 111 - 130%
- ▲ 91 - 110%
- ▲ 71 - 90%
- ▲ 51 - 70%
- ▲ 1 - 50%



# Jefferson River Basin

## Water Year to Date Precipitation and Reservoir Levels Percentage of Normal

### May 1, 2016

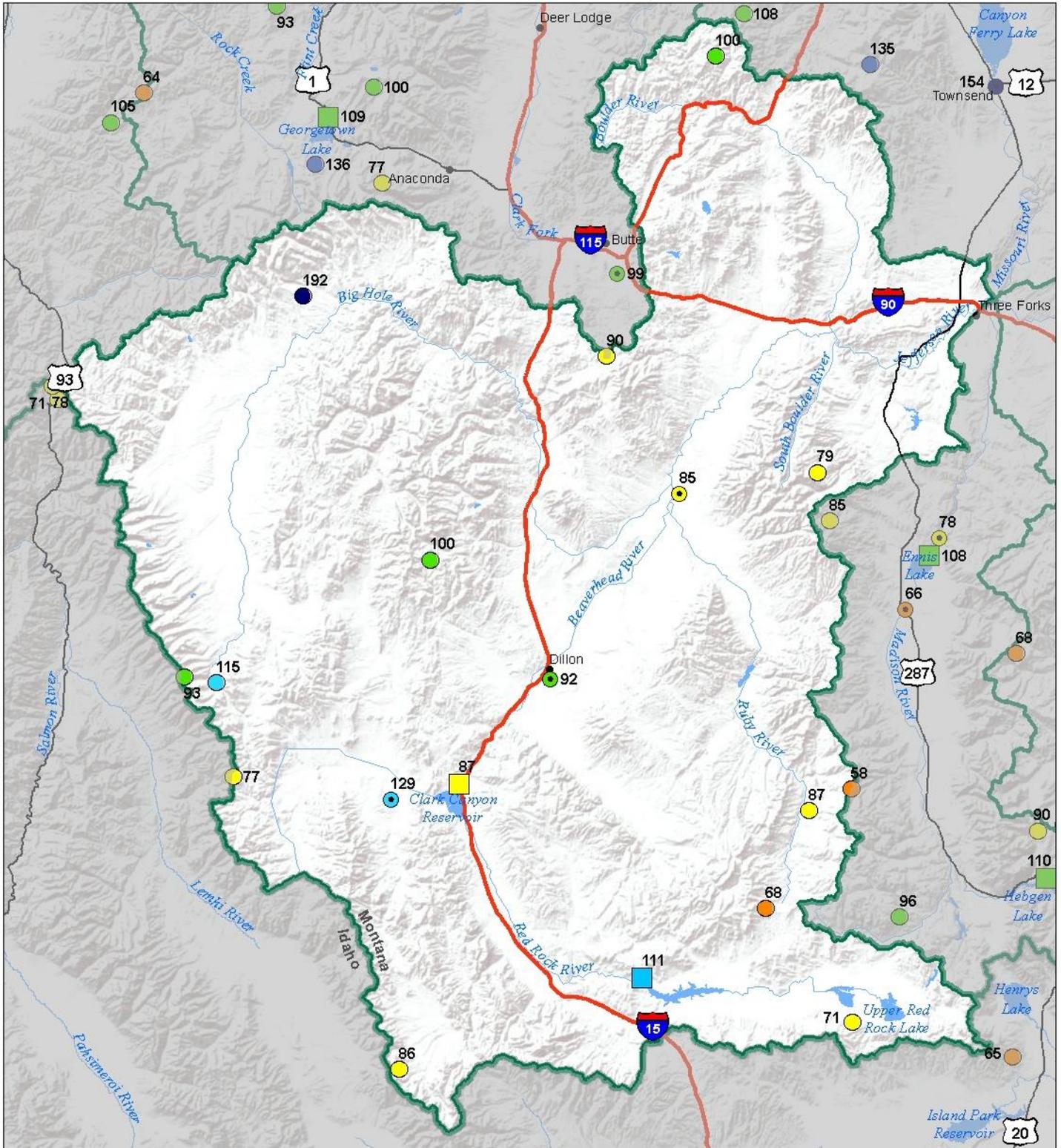


Precipitation Percent of Normal	
SNOTEL	COOP/ACIS
Dark Blue: > 150%	Dark Blue: > 150%
Blue: 131 - 150%	Blue: 131 - 150%
Cyan: 111 - 130%	Cyan: 111 - 130%
Green: 91 - 110%	Green: 91 - 110%
Yellow: 71 - 90%	Yellow: 71 - 90%
Orange: 51 - 70%	Orange: 51 - 70%
Red: 1 - 50%	Red: 1 - 50%

Reservoirs Percent of Normal
Dark Blue: > 150%
Blue: 131 - 150%
Cyan: 111 - 130%
Green: 91 - 110%
Yellow: 71 - 90%
Orange: 51 - 70%
Red: 1 - 50%



# Jefferson River Basin Monthly Precipitation and Reservoir Levels Percentage of Normal May 1, 2016 (April 1, 2016 - May 1, 2016)



### Precipitation Percent of Normal

SNOTEL		COOP/ACIS	
<span style="color: blue;">●</span> > 150%	<span style="color: yellow;">●</span> 71 - 90%	<span style="color: blue;">●</span> > 150%	<span style="color: yellow;">●</span> 71 - 90%
<span style="color: lightblue;">●</span> 131 - 150%	<span style="color: orange;">●</span> 51 - 70%	<span style="color: lightblue;">●</span> 131 - 150%	<span style="color: orange;">●</span> 51 - 70%
<span style="color: cyan;">●</span> 111 - 130%	<span style="color: red;">●</span> 1 - 50%	<span style="color: cyan;">●</span> 111 - 130%	<span style="color: red;">●</span> 1 - 50%
<span style="color: green;">●</span> 91 - 110%		<span style="color: green;">●</span> 91 - 110%	

### Reservoirs Percent of Normal

<span style="color: darkblue;">■</span> > 150%
<span style="color: blue;">■</span> 131 - 150%
<span style="color: lightblue;">■</span> 111 - 130%
<span style="color: green;">■</span> 91 - 110%
<span style="color: yellow;">■</span> 71 - 90%
<span style="color: orange;">■</span> 51 - 70%
<span style="color: red;">■</span> 1 - 50%



## Jefferson River Basin Streamflow Forecasts - May 1, 2016

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

JEFFERSON RIVER BASIN	Forecast Period	90% (KAF)	70% (KAF)	50% (KAF)	% Avg	30% (KAF)	10% (KAF)	30yr Avg (KAF)
Lima Reservoir Inflow <sup>2</sup>	MAY-JUL	15.1	26	34	60%	42	53	57
	MAY-SEP	14.7	28	37	58%	46	59	64
Clark Canyon Inflow <sup>2</sup>	MAY-JUL	-24	11.3	35	55%	59	94	64
	MAY-SEP	-16.4	21	47	57%	73	110	83
Beaverhead R at Barretts <sup>2</sup>	MAY-JUL	-7	12.2	50	59%	88	143	85
	MAY-SEP	4	18.6	64	58%	109	176	111
Ruby R Reservoir Inflow <sup>2</sup>	MAY-JUL	30	44	53	79%	62	76	67
	MAY-SEP	39	55	66	80%	77	93	82
Big Hole R at Wisdom	MAY-JUL	23	50	68	91%	86	113	75
	MAY-SEP	25	54	74	93%	94	123	80
Big Hole R nr Melrose	MAY-JUL	315	375	415	94%	455	515	440
	MAY-SEP	340	410	455	95%	500	570	480
Jefferson R nr Twin Bridges <sup>2</sup>	MAY-JUL	156	315	425	83%	535	695	515
	MAY-SEP	147	335	465	84%	595	785	555
Boulder R nr Boulder	MAY-JUL	41	52	59	98%	66	77	60
	MAY-SEP	43	56	64	98%	72	85	65
Willow Ck Reservoir Inflow <sup>2</sup>	MAY-JUL	6.5	11.2	14.4	100%	17.6	22	14.4
	MAY-SEP	8.3	13.4	16.8	100%	20	25	16.8
Jefferson R nr Three Forks <sup>2</sup>	MAY-JUL	188	360	480	83%	595	770	575
	MAY-SEP	190	385	520	82%	655	850	635

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

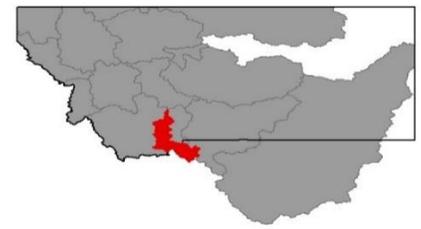
2) Forecasts are for unimpaired flows. Actual flow will be dependent on management of upstream reservoirs and diversions

3) Median value used in place of average

Reservoir Storage End of April, 2016	Current (KAF)	Last Year (KAF)	Average (KAF)	Capacity (KAF)
Lima Reservoir	60.2	53.8	54.4	84.0
Clark Canyon Res	123.5	119.8	141.6	255.6
Ruby River Reservoir	38.3	37.8	36.7	38.8
Basin-wide Total	221.9	211.4	232.7	378.4
# of reservoirs	3	3	3	3

Watershed Snowpack Analysis May 1, 2016	# of Sites	% Median	Last Year % Median
BEAVERHEAD	9	83	55
RUBY	5	83	62
BIGHOLE	10	93	79
BOULDER	6	75	79
JEFFERSON RIVER BASIN	24	82	66

# Madison River Basin



The Madison River basin likely experienced the peak snow water equivalent during the first week of April, two weeks earlier than normal. Although early, the peak this year on April 6<sup>th</sup> was only slightly below normal at 93% of the average peak, and 138% of last year's peak snow water. Sunny skies with well above average temperatures started the melt of the low elevation snowpack at the beginning of the second week of April, and melt continued through the month when high pressure moved in behind passing storms. Unsettled weather mid-month added some snow water to the basin and slowed melt and at the end of the month cooler cloudy weather helped to prolong the snowpack. Early melt during the month has dropped the basin's snowpack for May 1<sup>st</sup>, the snowpack above Hebgen Lake is currently 74% of normal for the date, while snowpack below Hebgen is 83% of normal. Overall, the basin-wide snowpack is 80% of normal for May 1<sup>st</sup>, down 20% from April 1<sup>st</sup>, and 145% of last year at this time.

Precipitation was below average across the basin at mountain and valley locations. April totals for valley locations were 73% of average, while mountain totals at SNOTEL sites were 74% of average. Precipitation favored the lower Madison over the month with SNOTEL sites below Hebgen receiving 80% of average precipitation for April, while sites above Hebgen received only 63% of average precipitation. While April totals were less than stellar the moisture earlier in the year has helped to keep water year totals (beginning October 1<sup>st</sup>) near average at mountain locations (96%) and above average for valley locations (127%). Overall basin-wide precipitation for the water year is currently 97% for May 1<sup>st</sup>, well above last year at this time.

Reservoir storage in the basin is above average for this date and is currently 110% of average for May 1<sup>st</sup>.

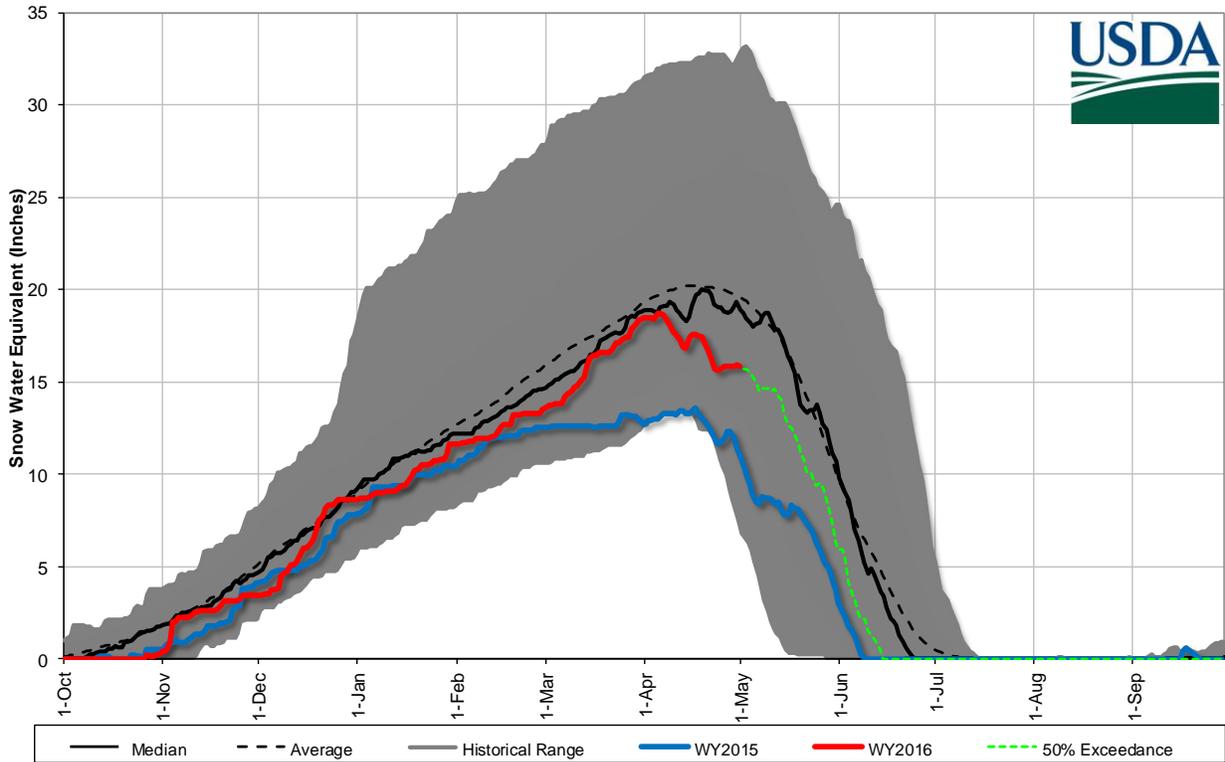
Basin-wide streamflow forecasts vary greatly across the basin, so consult the table at the end of this section for individual forecast points. Current basin-wide streamflow forecasts for the 50% exceedance are 76% of average for the May-July time period.

<b>Madison River Basin Data Summary</b>		<b>5/1/2016</b>	
	Percent of 1981-2010 Normal (Median)	Last Year Percentage of Normal (Median)	
<b>Snowpack</b>			
Basin-Wide	77%	53%	
	Monthly Percentage of Average	WYTD Percentage of 1981-2010 Average*	Last Year Percentage of Average
<b>Precipitation</b>			
Mountain Precipitation	75%	96%	72%
Valley Precipitation	73%	127%	113%
Basin Precipitation	75%	97%	74%
	Percentage of Average	Percentage of Capacity (Total)	Last Year Percentage of Average
<b>Reservoir Storage</b>			
Basin-Wide Storage	110%	81%	117%
	50 % Exceedance Forecast Percentage of Average	50 % Exceedance Forecast % of Last Year's Flows	Last Year Percentage of Average
<b>Streamflow Forecast</b>			
Basin-Wide Apr-July	76%	117%	65%

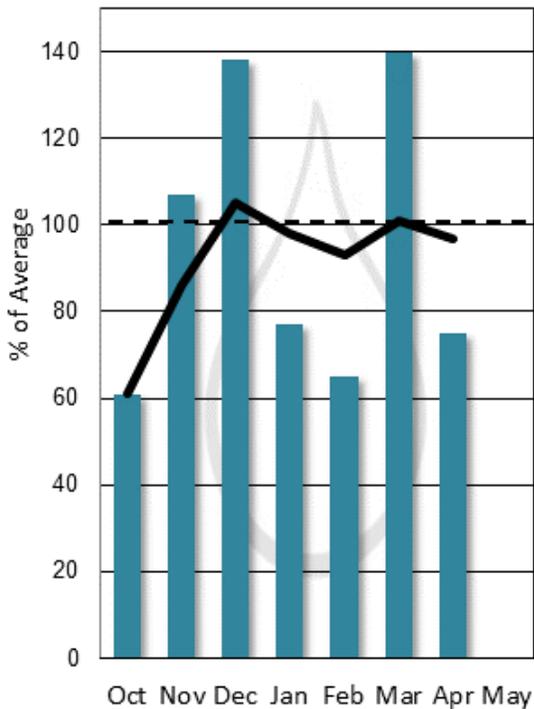
\*Water Year-to-Date (WYTD) Precipitation is October 1st - Current

\*\*Basin-wide streamflows are an average of the individual streamflow points within the basin for the 50 percent exceedance forecast. Consult the individual streamflow forecasts in the table below for the range of forecasts at an individual point.

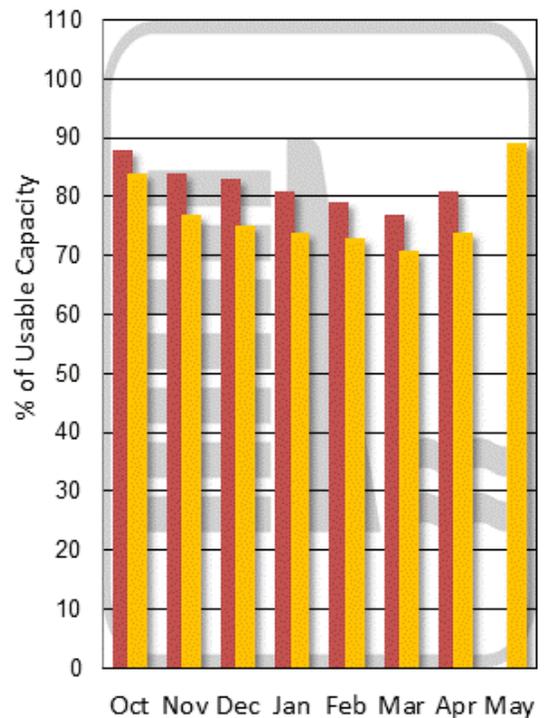
**Madison River Basin Snowpack with Non-Exceedence Projections**  
*Based on provisional SNOTEL daily data as of 5/1/2016*



**Mountain and Valley Precipitation**

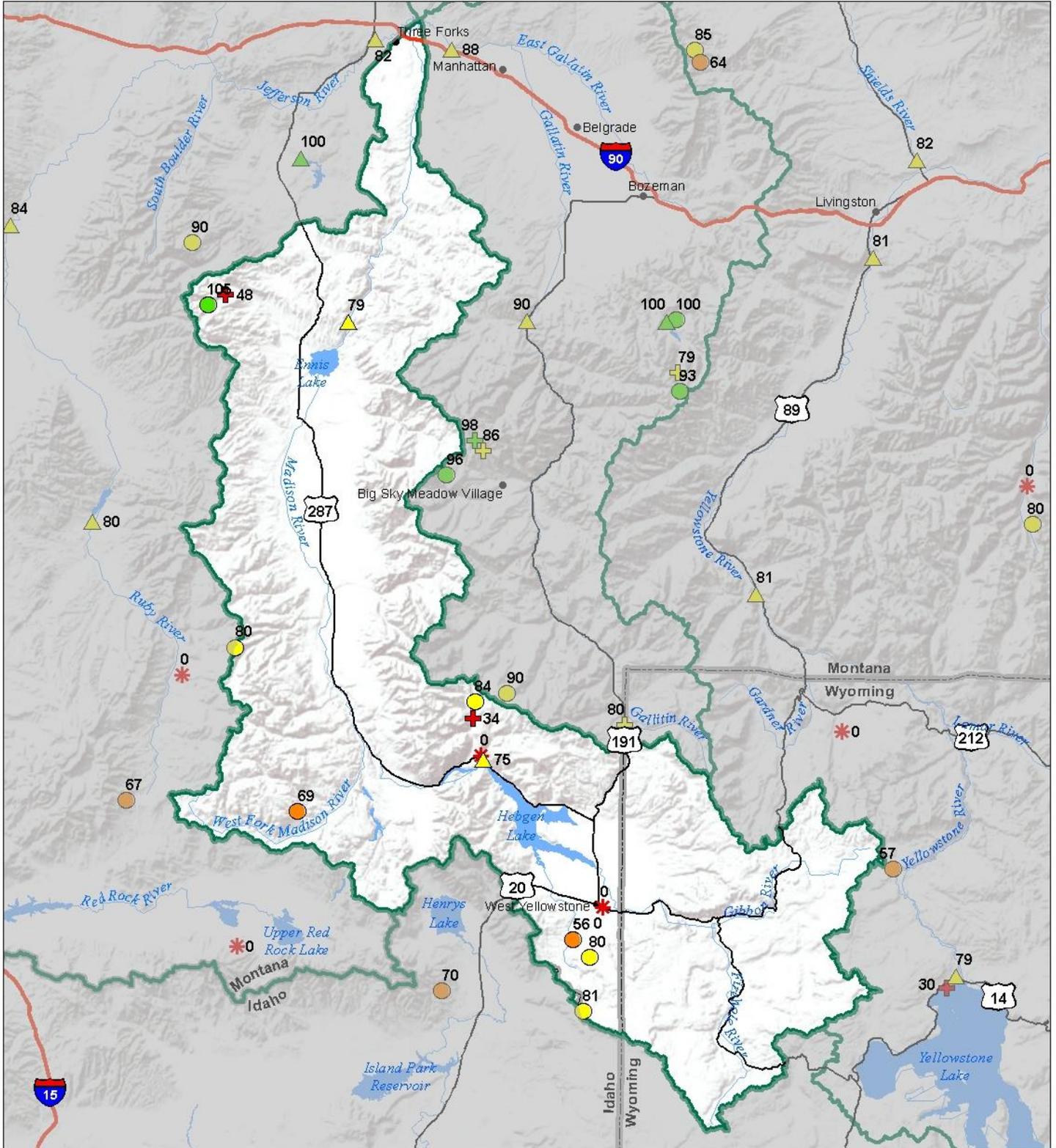


**End of Month Reservoir Storage**



Storage above is averaged for all reservoirs in the basin. For individual reservoirs see table below.

# Madison River Basin Streamflow Forecast, Snow Water Equivalent Percentage of Normal May 1, 2016



### Snow Water Equivalent Percent of Normal

SNOTEL

- > 150%
- 131 - 150%
- 111 - 130%
- 91 - 110%
- 71 - 90%
- 51 - 70%
- 1 - 50%
- \* 0%

Snowcourse

- + > 150%
- + 131 - 150%
- + 111 - 130%
- + 91 - 110%
- + 71 - 90%
- + 51 - 70%
- + 1 - 50%
- \* 0%

### Streamflow Forecast Percent of Average Flows

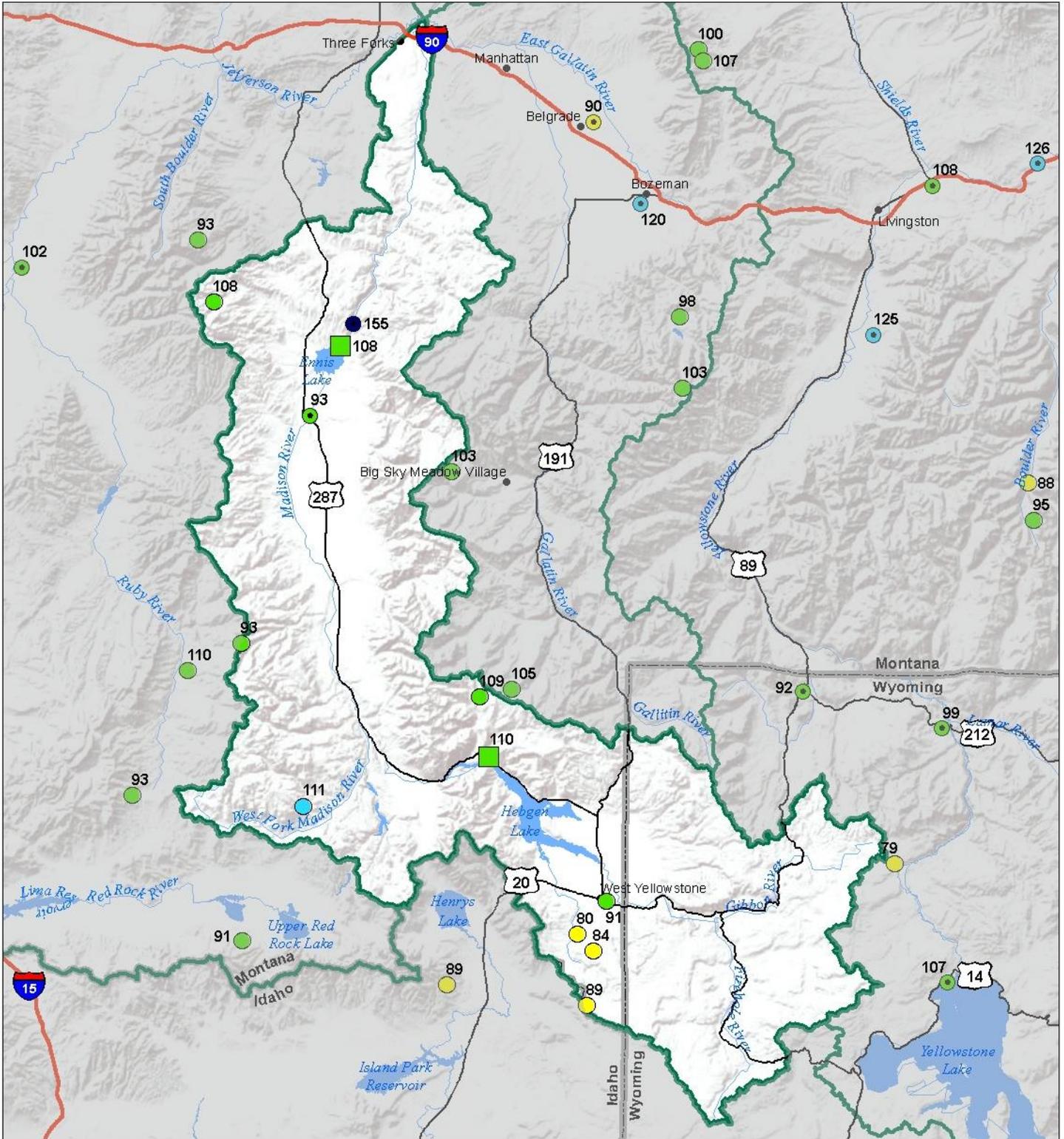
- ▲ > 150%
- ▲ 131 - 150%
- ▲ 111 - 130%
- ▲ 91 - 110%
- ▲ 71 - 90%
- ▲ 51 - 70%
- ▲ 1 - 50%



# Madison River Basin

## Water Year to Date Precipitation and Reservoir Levels Percentage of Normal

### May 1, 2016



#### Precipitation Percent of Normal

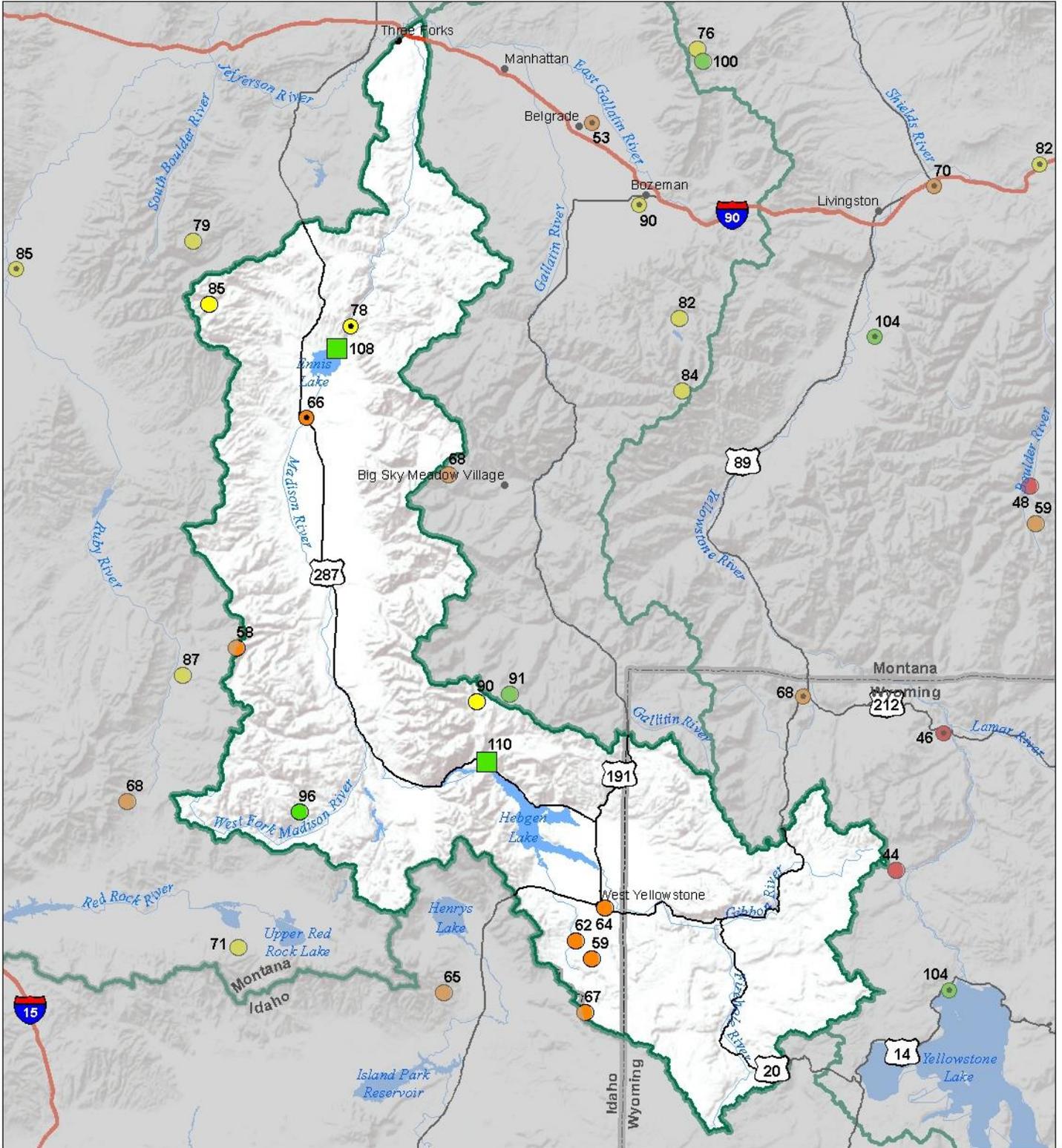
SNOTEL		COOP/ACIS	
<span style="color: blue;">●</span> > 150%	<span style="color: yellow;">●</span> 71 - 90%	<span style="color: blue;">●</span> > 150%	<span style="color: yellow;">●</span> 71 - 90%
<span style="color: lightblue;">●</span> 131 - 150%	<span style="color: orange;">●</span> 51 - 70%	<span style="color: lightblue;">●</span> 131 - 150%	<span style="color: orange;">●</span> 51 - 70%
<span style="color: cyan;">●</span> 111 - 130%	<span style="color: red;">●</span> 1 - 50%	<span style="color: cyan;">●</span> 111 - 130%	<span style="color: red;">●</span> 1 - 50%
<span style="color: green;">●</span> 91 - 110%		<span style="color: green;">●</span> 91 - 110%	

#### Reservoirs Percent of Normal

<span style="color: darkblue;">■</span> > 150%
<span style="color: blue;">■</span> 131 - 150%
<span style="color: lightblue;">■</span> 111 - 130%
<span style="color: green;">■</span> 91 - 110%
<span style="color: yellow;">■</span> 71 - 90%
<span style="color: orange;">■</span> 51 - 70%
<span style="color: red;">■</span> 1 - 50%



# Madison River Basin Monthly Precipitation and Reservoir Levels Percentage of Normal May 1, 2016 (April 1, 2016 - May 1, 2016)



### Precipitation Percent of Normal

SNOTEL		COOP/ACIS	
● > 150%	● 71 - 90%	● > 150%	● 71 - 90%
● 131 - 150%	● 51 - 70%	● 131 - 150%	● 51 - 70%
● 111 - 130%	● 1 - 50%	● 111 - 130%	● 1 - 50%
● 91 - 110%		● 91 - 110%	

### Reservoirs Percent of Normal

■ > 150%
■ 131 - 150%
■ 111 - 130%
■ 91 - 110%
■ 71 - 90%
■ 51 - 70%
■ 1 - 50%



## Madison River Basin Streamflow Forecasts - May 1, 2016

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

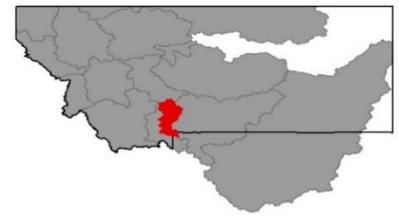
MADISON RIVER BASIN	Forecast Period	90% (KAF)	70% (KAF)	50% (KAF)	% Avg	30% (KAF)	10% (KAF)	30yr Avg (KAF)
Hebgen Reservoir Inflow <sup>2</sup>	MAY-JUL	173	205	225	74%	245	275	305
	MAY-SEP	245	280	305	75%	330	365	405
Ennis Reservoir Inflow <sup>2</sup>	MAY-JUL	300	365	410	77%	455	520	530
	MAY-SEP	410	485	540	79%	595	670	680

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

Reservoir Storage End of April, 2016	Current (KAF)	Last Year (KAF)	Average (KAF)	Capacity (KAF)
Ennis Lake	35.1	34.3	32.4	41.0
Hebgen Lake	303.7	328.2	276.7	378.8
Basin-wide Total	338.8	362.5	309.1	419.8
# of reservoirs	2	2	2	2

Watershed Snowpack Analysis May 1, 2016	# of Sites	% Median	Last Year % Median
MADISON abv HEBGEN LAKE	4	74	47
MADISON blw HEBGEN LAKE	10	83	58
MADISON RIVER BASIN	14	80	55

## Gallatin River Basin



Peak snow water equivalent occurred in the Gallatin River basin at low elevations at the beginning of April, and at higher elevations at the end of the month. Basin-wide peak snow water was two to three weeks early this year, but was only slightly below average at 93% of the long term peak SWE average. Low and mid elevation SNOTEL sites and snowcourses experienced melting of the snowpack during the month of April, while higher elevation sites experienced increases in snow water, or very little melt. Storms mid-month and at the end of the month added snow water to the snowpack and helped to delay melt at lower elevations. The Upper Gallatin snowpack is currently 88% of normal for May 1<sup>st</sup>, Hyalite snowpack is currently 91% and the Bridger Range snowpack is 78% of normal. Basin percentages have declined across the basin due to the early low elevation melt. Currently the basin-wide snowpack is 87% of normal for May 1<sup>st</sup>, down 11% from last month. Snowpack in the basin is 138% of last year at this time and should provide more snow water to our rivers this year.

Precipitation was below average at both mountain and valley locations for the month of April. Valley locations reported 75% of average precipitation and mountain SNOTEL sites received 84% of average precipitation. March helped to boost the water year-to-date totals, so even though April precipitation was below average water year-to-date (October 1<sup>st</sup>-current) totals are above average. Basin-wide water year precipitation is currently 104% of average for May 1<sup>st</sup>.

Reservoir storage was not reported on May 1<sup>st</sup>, but given conditions from April 1<sup>st</sup> should be near average at this time.

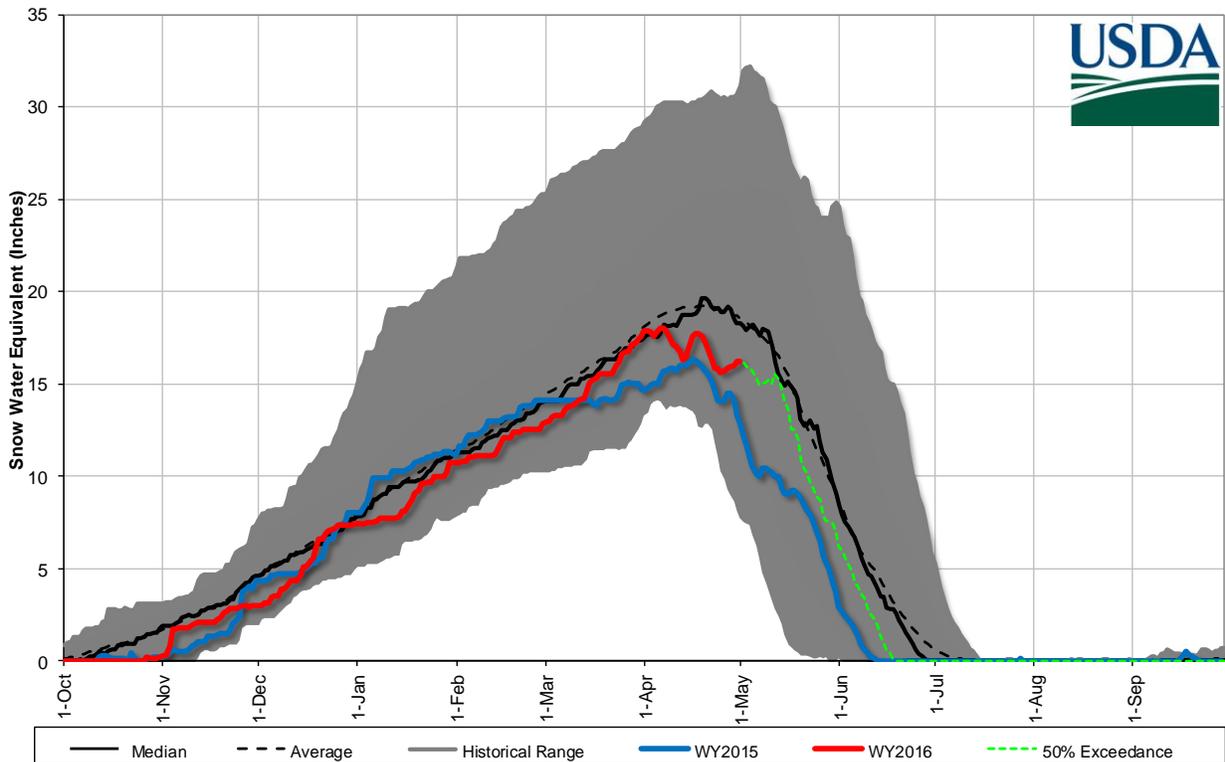
Basin-wide streamflow forecasts vary greatly across the basin, so consult the table at the end of this section for individual forecast points. Current basin-wide streamflow forecasts for the 50% exceedance are 90% of average for the May-July time period.

<b>Gallatin River Basin Data Summary</b>		<b>5/1/2016</b>	
<b>Snowpack</b>	Percent of 1981-2010 Normal (Median)	Last Year Percentage of Normal (Median)	
Basin-Wide	87%	63%	
<b>Precipitation</b>	Monthly Percentage of Average	WYTD Percentage of 1981-2010 Average *	Last Year Percentage of Average
Mountain Precipitation	84%	104%	92%
Valley Precipitation	75%	108%	80%
Basin Precipitation	83%	104%	91%
<b>Reservoir Storage</b>	Percentage of Average	Percentage of Capacity (Total)	Last Year Percentage of Average
Basin-Wide Storage	112%	68%	121%
<b>Streamflow Forecast</b>	50 % Exceedance Forecast Percentage of Average	50 % Exceedance Forecast % of Last Year's Flows	Last Year Percentage of Average
Basin-Wide Apr-July	90%	131%	67%

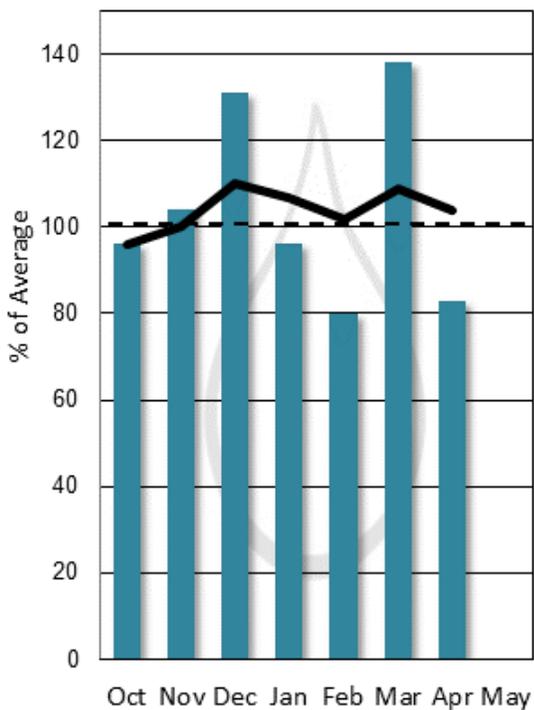
\*Water Year-to-Date (WYTD) Precipitation is October 1st - Current

\*\*Basin-wide streamflows are an average of the individual streamflow points within the basin for the 50 percent exceedance forecast. Consult the individual streamflow forecasts in the table below for the range of forecasts at an individual point.

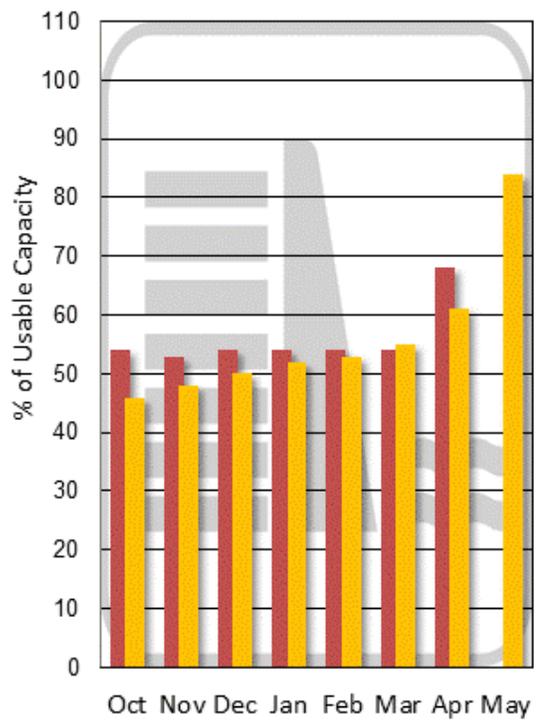
**Gallatin River Basin Snowpack with Non-Exceedence Projections**  
*Based on provisional SNOTEL daily data as of 5/1/2016*



**Mountain and Valley Precipitation**

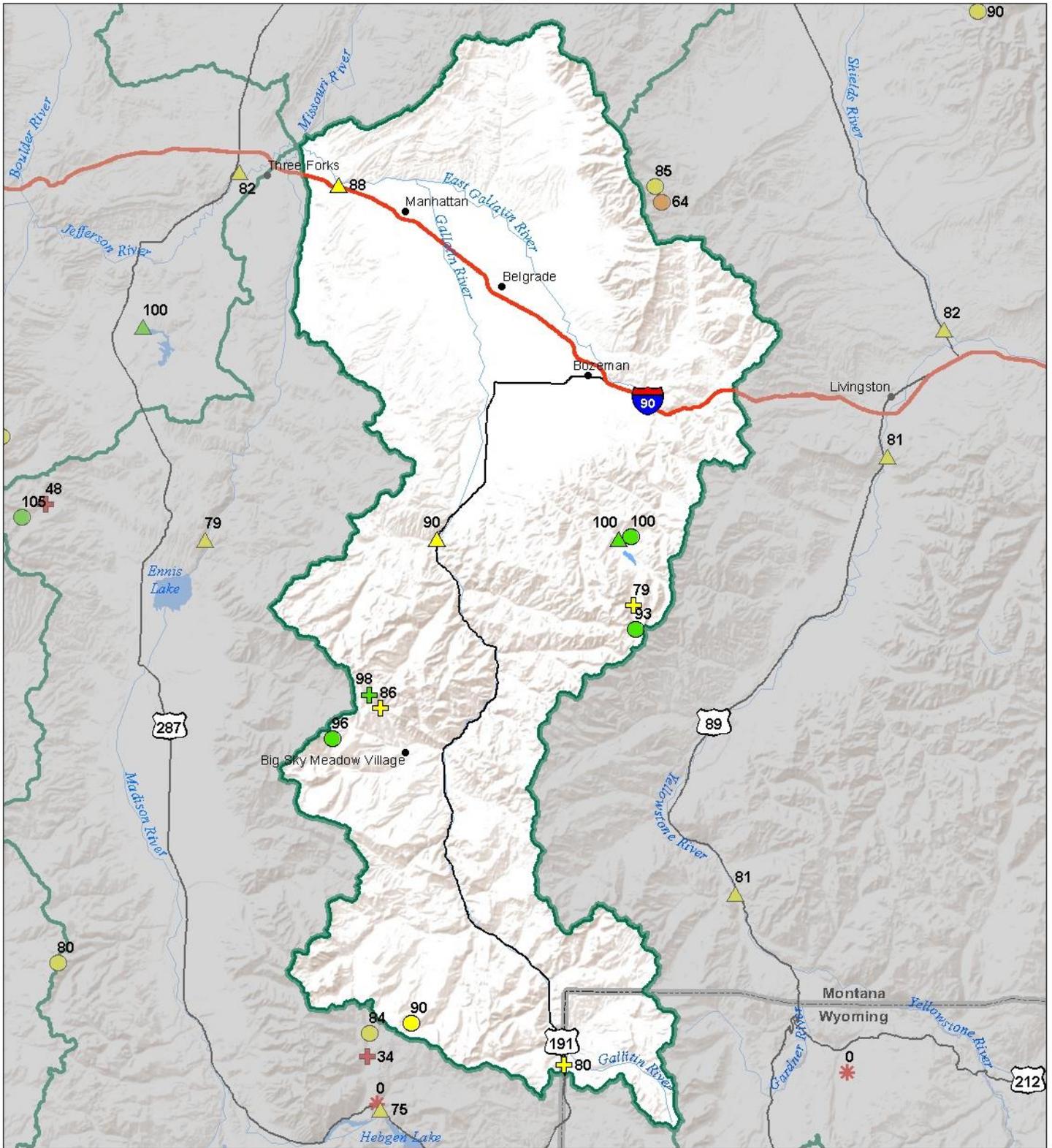


**End of Month Reservoir Storage**



Storage above is averaged for all reservoirs in the basin. For individual reservoirs see table below.

# Gallatin River Basin Streamflow Forecast, Snow Water Equivalent Percentage of Normal May 1, 2016



### Snow Water Equivalent Percent of Normal

#### SN OTEL

- > 150%
- 131 - 150%
- 111 - 130%
- 91 - 110%
- 71 - 90%
- 51 - 70%
- 1 - 50%
- \* 0%

#### Snowcourse

- + > 150%
- + 131 - 150%
- + 111 - 130%
- + 91 - 110%
- + 71 - 90%
- + 51 - 70%
- + 1 - 50%
- \* 0%

### Streamflow Forecast Percent of Average Flows

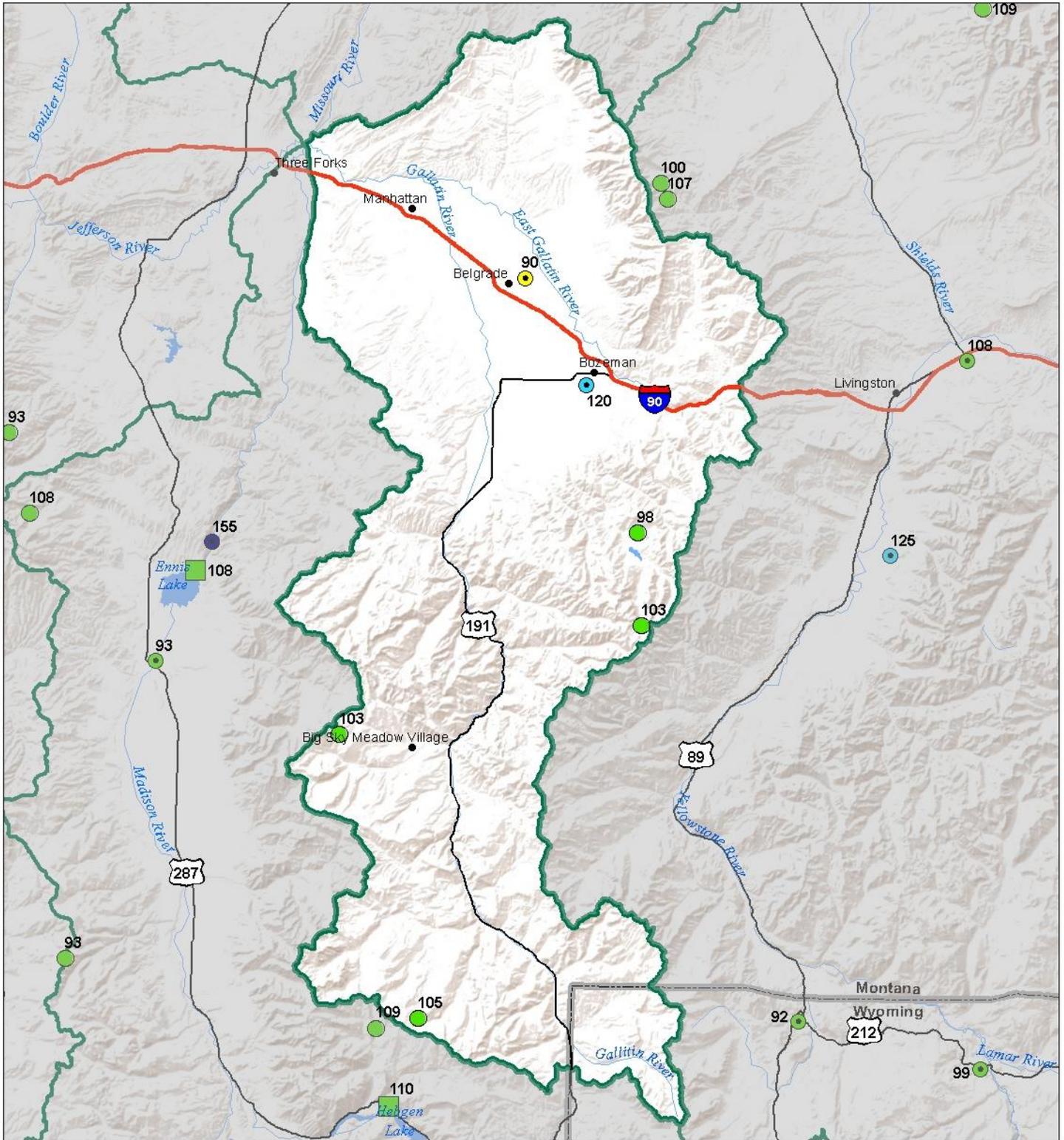
- ▲ > 150%
- ▲ 131 - 150%
- ▲ 111 - 130%
- ▲ 91 - 110%
- ▲ 71 - 90%
- ▲ 51 - 70%
- ▲ 1 - 50%



# Gallatin River Basin

## Water Year to Date Precipitation and Reservoir Levels Percentage of Normal

### May 1, 2016

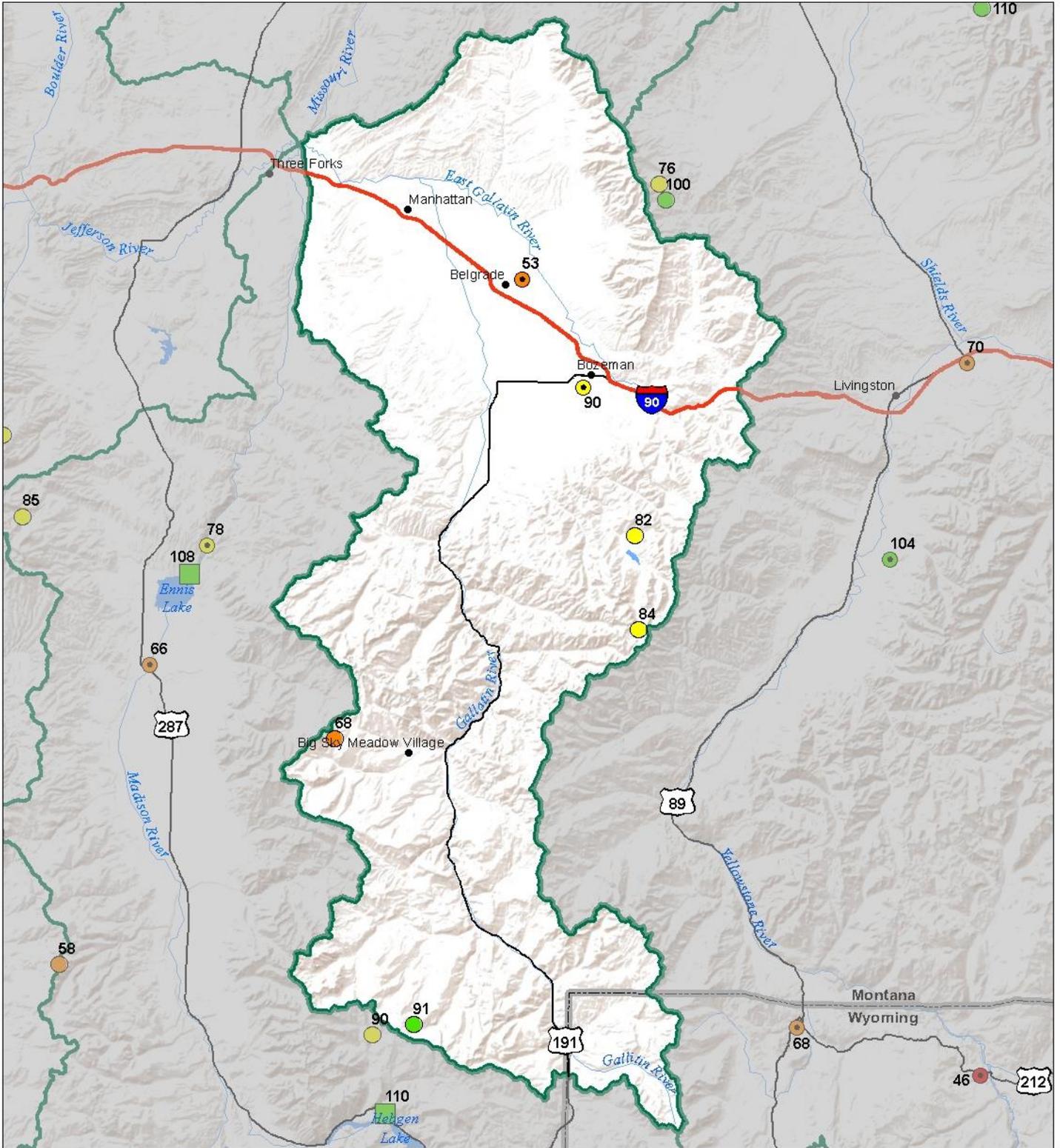


Precipitation Percent of Normal	
SNOTEL	COOP/ACIS
● > 150%	● > 150%
● 131 - 150%	● 131 - 150%
● 111 - 130%	● 111 - 130%
● 91 - 110%	● 91 - 110%
● 71 - 90%	● 71 - 90%
● 51 - 70%	● 51 - 70%
● 1 - 50%	● 1 - 50%

Reservoirs Percent of Normal	
■ > 150%	■ 131 - 150%
■ 111 - 130%	■ 91 - 110%
■ 71 - 90%	■ 51 - 70%
■ 1 - 50%	



# Gallatin River Basin Monthly Precipitation and Reservoir Levels Percentage of Normal May 1, 2016 (April 1, 2016 - May 1, 2016)



### Precipitation Percent of Normal

SNOTEL		COOP/ACIS	
<span style="color: blue;">●</span> > 150%	<span style="color: yellow;">●</span> 71 - 90%	<span style="color: blue;">●</span> > 150%	<span style="color: yellow;">●</span> 71 - 90%
<span style="color: lightblue;">●</span> 131 - 150%	<span style="color: orange;">●</span> 51 - 70%	<span style="color: lightblue;">●</span> 131 - 150%	<span style="color: orange;">●</span> 51 - 70%
<span style="color: cyan;">●</span> 111 - 130%	<span style="color: red;">●</span> 1 - 50%	<span style="color: cyan;">●</span> 111 - 130%	<span style="color: red;">●</span> 1 - 50%
<span style="color: green;">●</span> 91 - 110%		<span style="color: green;">●</span> 91 - 110%	

### Reservoirs Percent of Normal

<span style="color: darkblue;">■</span> > 150%
<span style="color: blue;">■</span> 131 - 150%
<span style="color: lightblue;">■</span> 111 - 130%
<span style="color: cyan;">■</span> 91 - 110%
<span style="color: yellow;">■</span> 71 - 90%
<span style="color: orange;">■</span> 51 - 70%
<span style="color: red;">■</span> 1 - 50%



## Gallatin River Basin Streamflow Forecasts - May 1, 2016

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

GALLATIN RIVER BASIN	Forecast Period	90% (KAF)	70% (KAF)	50% (KAF)	% Avg	30% (KAF)	10% (KAF)	30yr Avg (KAF)
Gallatin R nr Gateway	MAY-JUL	265	310	335	91%	360	405	370
	MAY-SEP	315	365	395	90%	425	475	440
Hyalite Reservoir Inflow <sup>2</sup>	MAY-JUL	14.9	16.7	17.9	97%	19.1	21	18.5
	MAY-SEP	17.2	19.2	21	100%	22	24	21
Gallatin R at Logan	MAY-JUL	205	285	335	88%	385	465	380
	MAY-SEP	235	325	390	88%	455	545	445

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

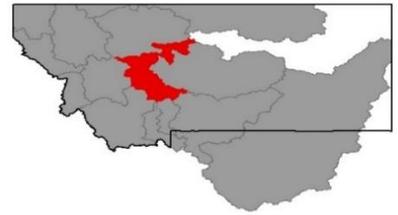
2) Forecasts are for unimpaired flows. Actual flow will be dependent on management of upstream reservoirs and diversions

3) Median value used in place of average

Reservoir Storage End of April, 2016	Current (KAF)	Last Year (KAF)	Average (KAF)	Capacity (KAF)
Middle Creek Res	6.9	7.5	6.2	10.2
Basin-wide Total	6.9	7.5	6.2	10.2
# of reservoirs	1	1	1	1

Watershed Snowpack Analysis May 1, 2016	# of Sites	% Median	Last Year % Median
UPPER GALLATIN	5	88	56
HYALITE	3	91	72
BRIDGER	2	78	70
GALLATIN RIVER BASIN	10	87	63

# Headwaters Mainstem (Missouri) River Basin



Seasonal snowpack in the basin peaked near April 1<sup>st</sup>, which is about 17 days earlier than when the average peak typically occurs. The basin-wide peak for the 2016 season was 93% of peak average. The snowpack then went on a downward spiral until mid-month when a snowpack saving storm occurred. Significant snowfall fell at the higher elevations and melt was delayed at the lower elevations. Unfortunately, this cold temperature system was short lived and another round of major melt occurred at all elevations until the end of April when another smaller storm hit the area. As of May 1, snowpack percentages ranged from near average in the higher upper reaches of the basin to below to well below average. Currently basin-wide snowpack is 69% of normal, down 34% from last month, but 113% of last year at this time.

April showers for those May flowers did occur throughout the basin at both valley and mountain stations. The mid-month storm dropped over an inch of precipitation which those flowers appreciated. Another storm which was not as juicy as the previous one made it into the basin at the end of the month. May mountain precipitation was 109% of average. Valley precipitation was 106% of average. Basin-wide water Year-to-date precipitation for May 1<sup>st</sup> is currently 101% of average for May 1<sup>st</sup>.

Reservoir storages for May 1<sup>st</sup> is currently 114% of average.

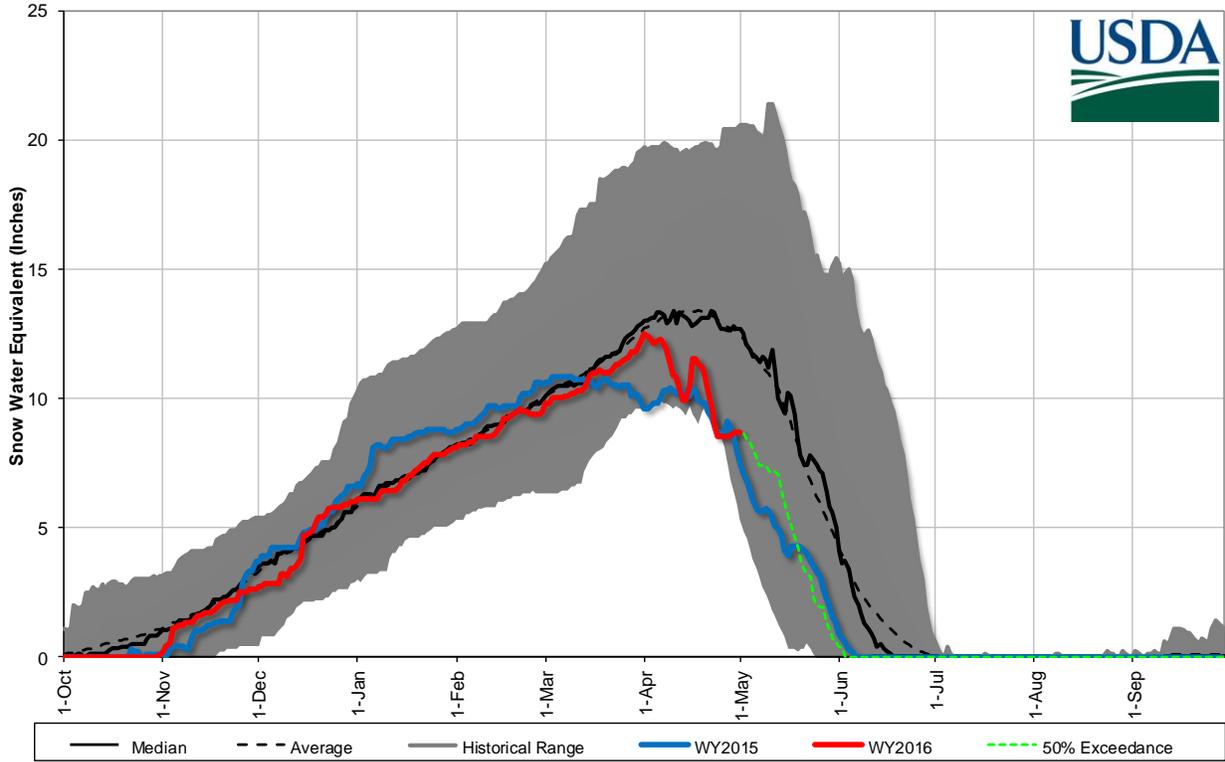
Basin-wide streamflow forecasts vary greatly across the basin, so consult the table at the end of this section for individual forecast points. Current basin-wide streamflow forecasts for the 50% exceedance are 74% of average for the May-July time period.

<b>Missouri Mainstem River Basin Data Summary</b>		<b>5/1/2016</b>	
<b>Snowpack</b>	Percent of 1981-2010 Normal (Median)	Last Year Percentage of Normal (Median)	
Basin-Wide	69%	61%	
<b>Precipitation</b>	Monthly Percentage of Average	WYTD Percentage of 1981-2010 Average*	Last Year Percentage of Average
Mountain Precipitation	101%	100%	94%
Valley Precipitation	135%	117%	107%
Basin Precipitation	106%	102%	96%
<b>Reservoir Storage</b>	Percentage of Average	Percentage of Capacity (Total)	Last Year Percentage of Average
Basin-Wide Storage	114%	79%	116%
<b>Streamflow Forecast</b>	50 % Exceedance Forecast Percentage of Average	50 % Exceedance Forecast % of Last Year's Flows	Last Year Percentage of Average
Basin-Wide Apr-July	74%	101%	63%

\*Water Year-to-Date (WYTD) Precipitation is October 1st - Current

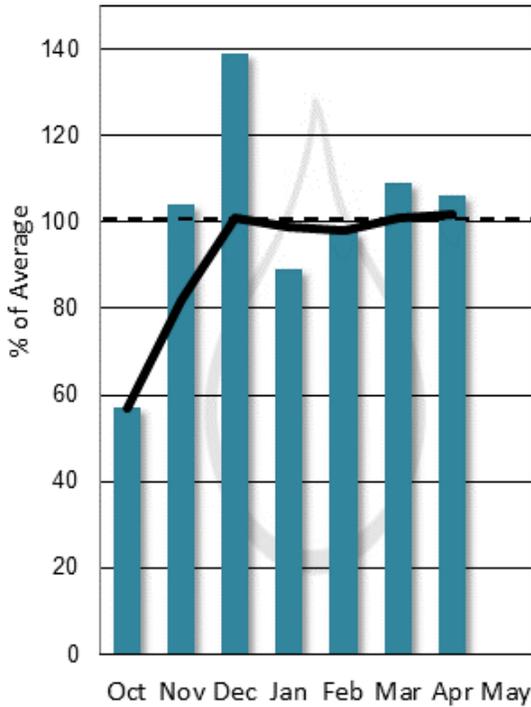
\*\*Basin-wide streamflows are an average of the individual streamflow points within the basin for the 50 percent exceedance forecast. Consult the individual streamflow forecasts in the table below for the range of forecasts at an individual point.

**Missouri Headwaters Mainstem River Basin (below Toston, above the Smith) Snowpack with Non-Exceedence**  
*Based on provisional SNOTEL daily data as of 5/1/2016*



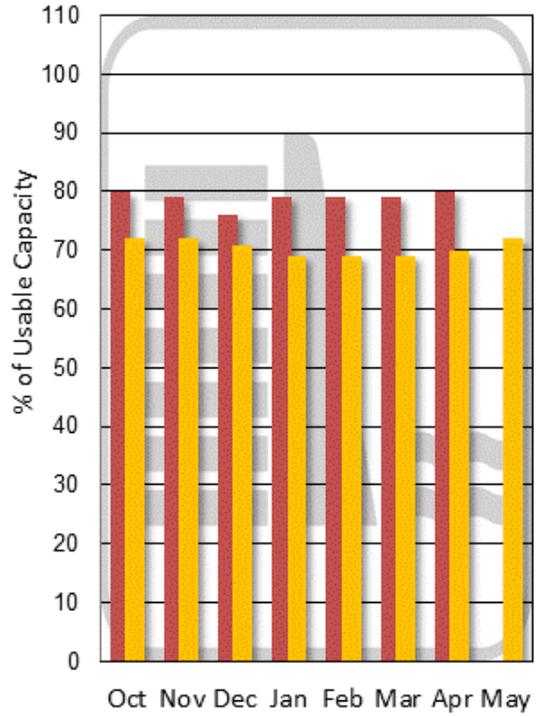
**Mountain and Valley  
Precipitation**

Monthly (teal bar), Year-to-date (solid black line)



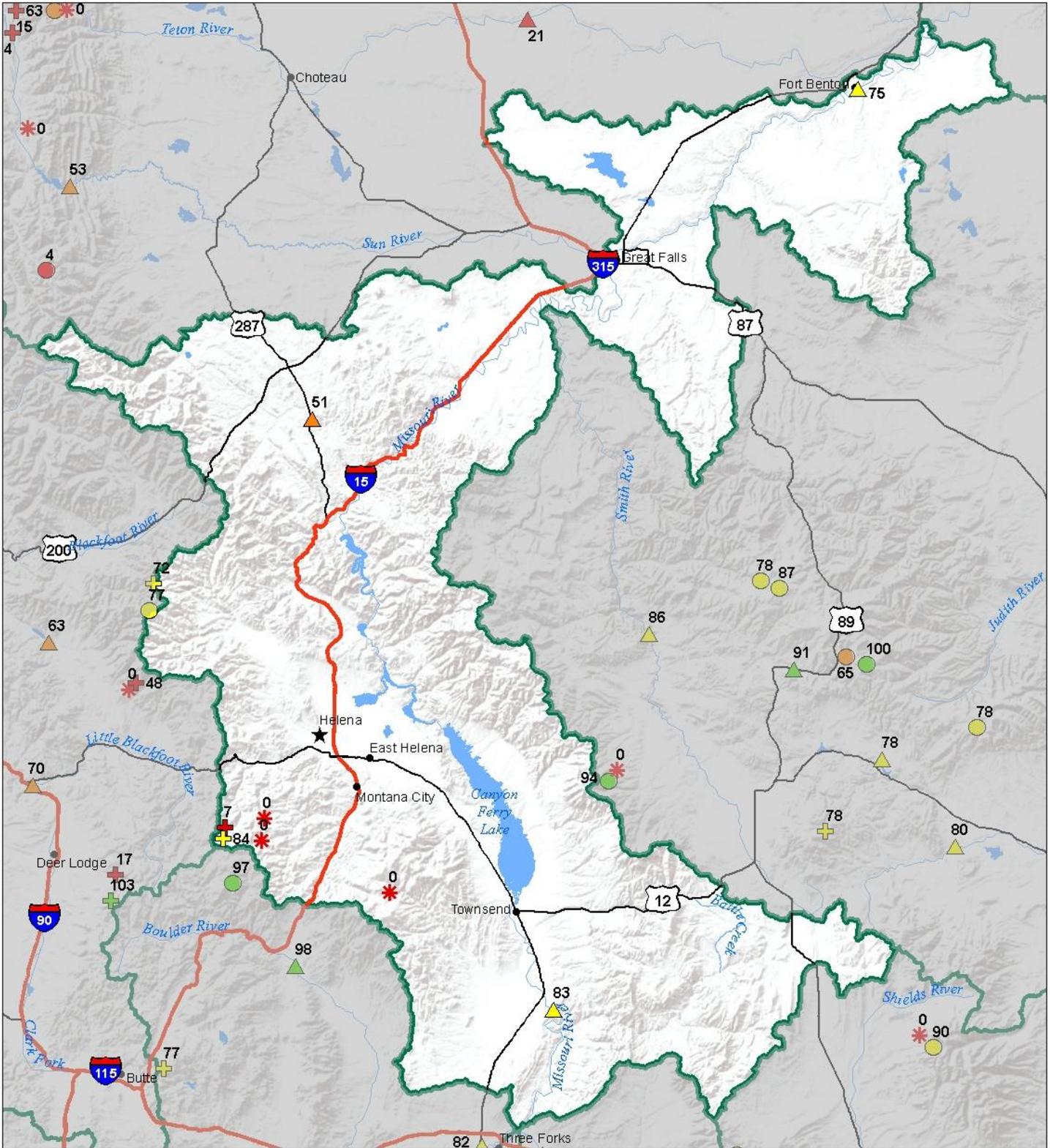
**End of Month Reservoir  
Storage**

% Capacity (red bar), Avg % Capacity (yellow bar)



Storage above is averaged for all reservoirs in the basin. For individual reservoirs see table below.

# Headwaters Mainstem (Missouri) River Basin Streamflow Forecast, Snow Water Equivalent Percentage of Normal May 1, 2016



### Snow Water Equivalent Percent of Normal

#### SNOTEL

- > 150%
- 131 - 150%
- 111 - 130%
- 91 - 110%

- 71 - 90%
- 51 - 70%
- 1 - 50%
- ✱ 0%

#### Snowcourse

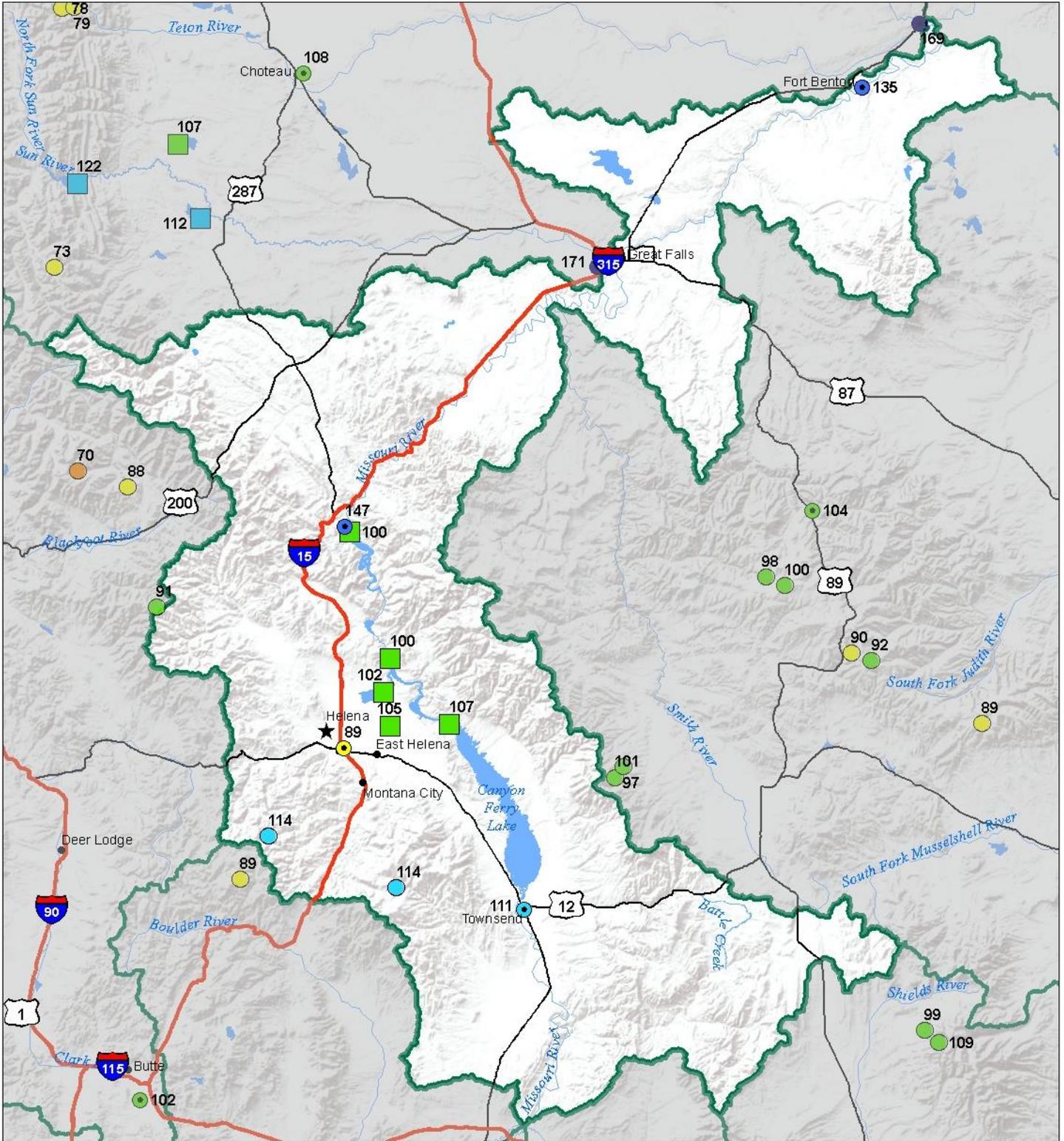
- + > 150%
- + 131 - 150%
- + 111 - 130%
- + 91 - 110%
- + 71 - 90%
- + 51 - 70%
- + 1 - 50%
- ✱ 0%

### Streamflow Forecast Percent of Average Flows

- ▲ > 150%
- ▲ 131 - 150%
- ▲ 111 - 130%
- ▲ 91 - 110%
- ▲ 71 - 90%
- ▲ 51 - 70%
- ▲ 1 - 50%



# Headwaters Mainstem (Missouri) River Basin Water Year to Date Precipitation and Reservoir Levels Percentage of Normal May 1, 2016



### Precipitation Percent of Normal

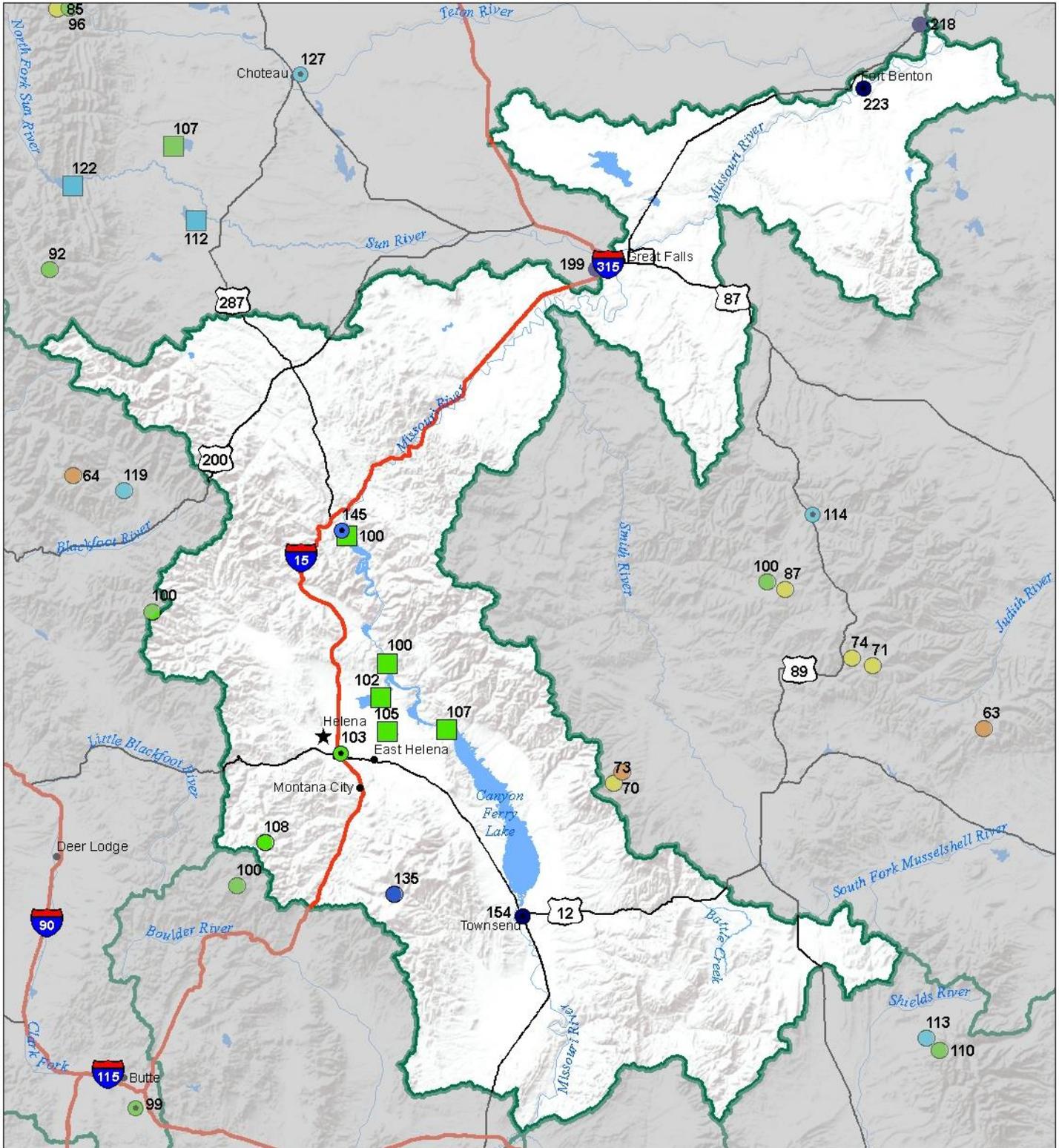
SNOTEL		COOP/ACIS	
<span style="color: blue;">●</span> > 150%	<span style="color: yellow;">●</span> 71 - 90%	<span style="color: blue;">●</span> > 150%	<span style="color: yellow;">●</span> 71 - 90%
<span style="color: lightblue;">●</span> 131 - 150%	<span style="color: orange;">●</span> 51 - 70%	<span style="color: lightblue;">●</span> 131 - 150%	<span style="color: orange;">●</span> 51 - 70%
<span style="color: cyan;">●</span> 111 - 130%	<span style="color: red;">●</span> 1 - 50%	<span style="color: cyan;">●</span> 111 - 130%	<span style="color: red;">●</span> 1 - 50%
<span style="color: green;">●</span> 91 - 110%		<span style="color: green;">●</span> 91 - 110%	

### Reservoirs Percent of Normal

<span style="color: darkblue;">■</span> > 150%
<span style="color: blue;">■</span> 131 - 150%
<span style="color: lightblue;">■</span> 111 - 130%
<span style="color: green;">■</span> 91 - 110%
<span style="color: yellow;">■</span> 71 - 90%
<span style="color: orange;">■</span> 51 - 70%
<span style="color: red;">■</span> 1 - 50%



# Headwaters Mainstem (Missouri) River Basin Monthly Precipitation and Reservoir Levels Percentage of Normal May 1, 2016 (April 1, 2016 - May 1, 2016)



### Precipitation Percent of Normal

SNOTEL		COOP/ACIS	
● > 150%	● 71 - 90%	● > 150%	● 71 - 90%
● 131 - 150%	● 51 - 70%	● 131 - 150%	● 51 - 70%
● 111 - 130%	● 1 - 50%	● 111 - 130%	● 1 - 50%
● 91 - 110%		● 91 - 110%	

### Reservoirs Percent of Normal

■ > 150%
■ 131 - 150%
■ 111 - 130%
■ 91 - 110%
■ 71 - 90%
■ 51 - 70%
■ 1 - 50%



## Missouri Mainstem Basin Streamflow Forecasts - May 1, 2016

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

MISSOURI MAINSTEM BASIN	Forecast Period	90% (KAF)	70% (KAF)	50% (KAF)	% Avg	30% (KAF)	10% (KAF)	30yr Avg (KAF)
Missouri R at Toston <sup>2</sup>	MAY-JUL	775	1050	1240	84%	1420	1700	1480
	MAY-SEP	885	1230	1460	83%	1690	2030	1760
Dearborn R nr Craig	MAY-JUL	1	19.1	36	47%	53	79	76
	MAY-SEP	1	24	42	51%	60	86	82
Missouri R at Fort Benton <sup>2</sup>	MAY-JUL	940	1330	1600	73%	1870	2260	2190
	MAY-SEP	1150	1650	2000	75%	2340	2850	2680
Missouri R nr Virgelle <sup>2</sup>	MAY-JUL	995	1440	1750	70%	2050	2490	2510
	MAY-SEP	1170	1760	2160	71%	2560	3150	3030
Missouri R nr Landusky <sup>2</sup>	MAY-JUL	1100	1530	1830	69%	2120	2550	2650
	MAY-SEP	1300	1880	2270	71%	2660	3240	3200
Missouri R bl Fort Peck Dam <sup>2</sup>	MAY-JUL	900	1420	1780	66%	2130	2650	2700
	MAY-SEP	885	1600	2080	66%	2560	3270	3160
Lake Sakakawea Inflow <sup>2</sup>	MAY-JUL	3950	5010	5730	79%	6450	7510	7230
	MAY-SEP	3910	5480	6540	79%	7600	9170	8320

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

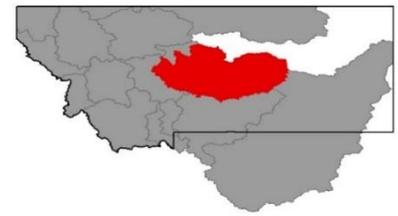
2) Forecasts are for unimpaired flows. Actual flow will be dependent on management of upstream reservoirs and diversions

3) Median value used in place of average

Reservoir Storage End of April, 2016	Current (KAF)	Last Year (KAF)	Average (KAF)	Capacity (KAF)
Canyon Ferry Lake	1581.1	1563.6	1480.0	2043.0
Helena Valley Reservoir	8.6	8.0	8.2	9.2
Lake Helena	11.0	11.0	10.8	12.7
Hauser Lake & Lake Helena	74.2	74.5	74.2	74.6
Holter Lake	80.8	81.1	80.6	81.9
Fort Peck Lake	15040.4	15374.3	13138.0	18910.0
Basin-wide Total	16796.1	17112.3	14791.8	21131.4
# of reservoirs	6	6	6	6

Watershed Snowpack Analysis May 1, 2016	# of Sites	% Median	Last Year % Median
HEADWATERS MAINSTEM	9	69	61
SMITH-JUDITH-MUSSELSHELL	11	88	77
SUN-TETON-MARIAS	10	34	39
MAINSTEM ab FT PECK RES	29	64	60
MILK RIVER BASIN	3	0	0
MISSOURI MAINSTEM BASIN	34	62	57

# Smith-Judith-Musselshell River Basin



Snowpack started out the month of April in good shape with some melt. A snowpack saving storm hit between April 4 and 5 with accumulating snowfall at the higher elevations. Basin-wide snowpack peaked April 1 or April 2 and was 108% of the maximum average peak. This year's peak was only a few days ahead of the average peak date. The rest of the month brought melt at all of the sites until the end of the month when a small storm reached the area and slowed the melt down a little. Snowpack ranges from 76% of normal in the Musselshell Drainage to 96% of normal in the Judith. Overall, the basin snowpack percentage on May 1<sup>st</sup> is 88% of normal, down 19% from April 1<sup>st</sup>, and 114% of last year at this time.

April precipitation from the couple of storms fell in the form of rain at the lower elevation and valley stations and snow at the higher elevations. April mountain precipitation was 89% of average in the Musselshell, 79% of average in the Smith and 77% of average in the Judith Basin. Valley precipitation for April was slightly better at 115% of average. The combined basin-wide mountain/valley totals for April was 88% of average. Below average precipitation during April which dropped the basin-wide water year-to-date total to 101% of average and for the water year. Overall, the basin looks to be in good shape.

Reservoir continues to be well above average basin-wide.

Basin-wide streamflow forecasts vary greatly across the basin, so consult the table at the end of this section for individual forecast points. Current basin-wide streamflow forecasts for the 50% exceedance are 77% of average for the May-July time period.

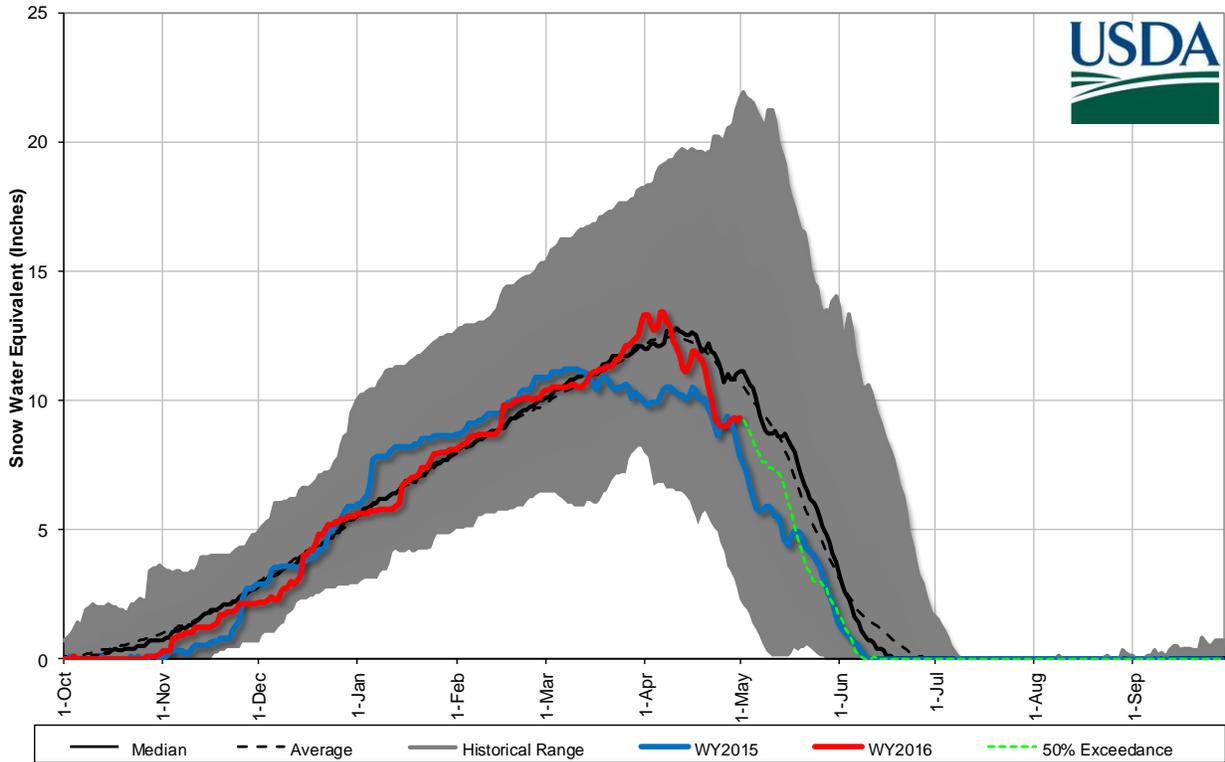
<b>Smith-Judith-Musselshell River Basin Data Summary</b>		<b>5/1/2016</b>	
	Percent of 1981-2010 Normal (Median)	Last Year Percentage of Normal (Median)	
<b>Snowpack</b>			
Basin-Wide	88%	77%	
	Monthly Percentage of Average	WYTD Percentage of 1981-2010 Average*	Last Year Percentage of Average
<b>Precipitation</b>			
Mountain Precipitation	83%	99%	95%
Valley Precipitation	115%	111%	104%
Basin Precipitation	88%	101%	96%
	Percentage of Average	Percentage of Usable Capacity	Last Year Percentage of Average
<b>Reservoir Storage</b>			
Basin-Wide Storage	131%	86%	152%
	50 % Exceedance Forecast Percentage of Average	50 % Exceedance Forecast % of Last Year's Flows	Last Year Percentage of Average
<b>Streamflow Forecast</b>			
Basin-Wide Apr-July	77%	83%	91%

\*Water Year-to-Date (WYTD) Precipitation is October 1st - Current

\*\*Basin-wide streamflows are an average of the individual streamflow points within the basin for the 50 percent exceedance forecast. Consult the individual streamflow forecasts in the table below for the range of forecasts at an individual point.

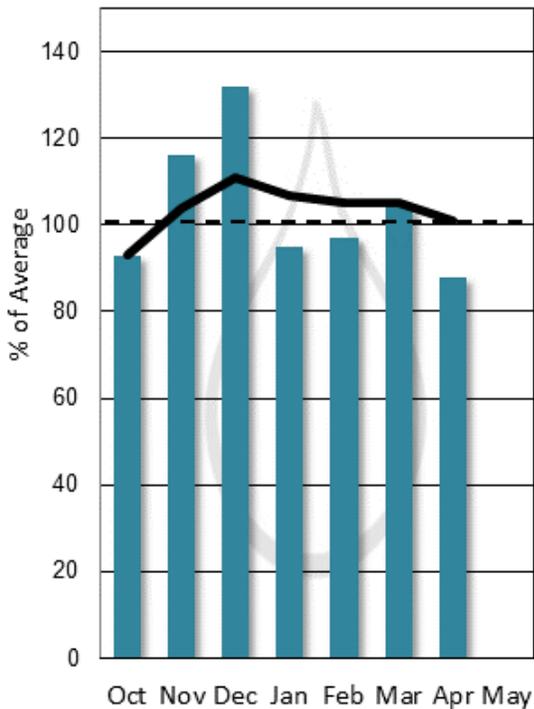
**Smith-Judith-Musselshell River Basin Snowpack with Non-Exceedence Projections**

*Based on provisional SNOTEL daily data as of 5/1/2016*



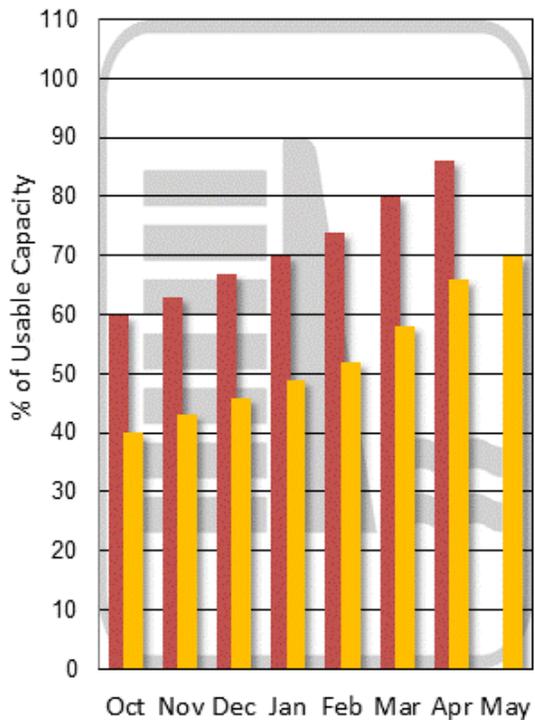
**Mountain and Valley Precipitation**

Monthly (teal bar)    Year-to-date (black line)



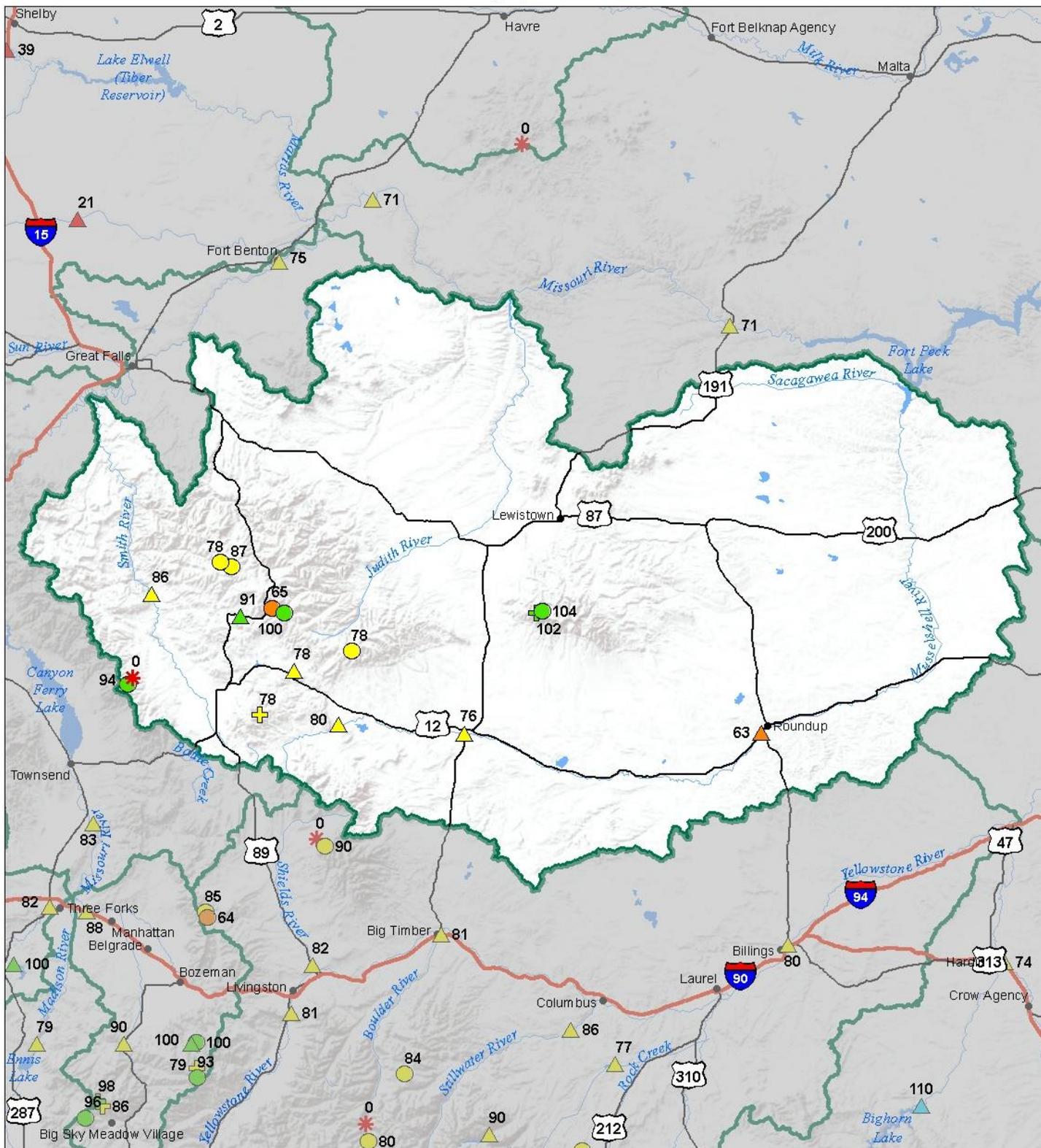
**End of Month Reservoir Storage**

% Capacity (red bar)    Avg % Capacity (yellow bar)



Storage above is averaged for all reservoirs in the basin. For individual reservoirs see table below.

# Smith-Judith-Musselshell River Basin Streamflow Forecast, Snow Water Equivalent Percentage of Normal May 1, 2016



### Snow Water Equivalent Percent of Normal

#### SNOTEL

- > 150%
- 131 - 150%
- 111 - 130%
- 91 - 110%
- 71 - 90%
- 51 - 70%
- 1 - 50%
- 0%

#### Snowcourse

- ⊕ > 150%
- ⊕ 131 - 150%
- ⊕ 111 - 130%
- ⊕ 91 - 110%
- ⊕ 71 - 90%
- ⊕ 51 - 70%
- ⊕ 1 - 50%
- ⊕ 0%

### Streamflow Forecast Percent of Average Flows

- ▲ > 150%
- ▲ 131 - 150%
- ▲ 111 - 130%
- ▲ 91 - 110%
- ▲ 71 - 90%
- ▲ 51 - 70%
- ▲ 1 - 50%

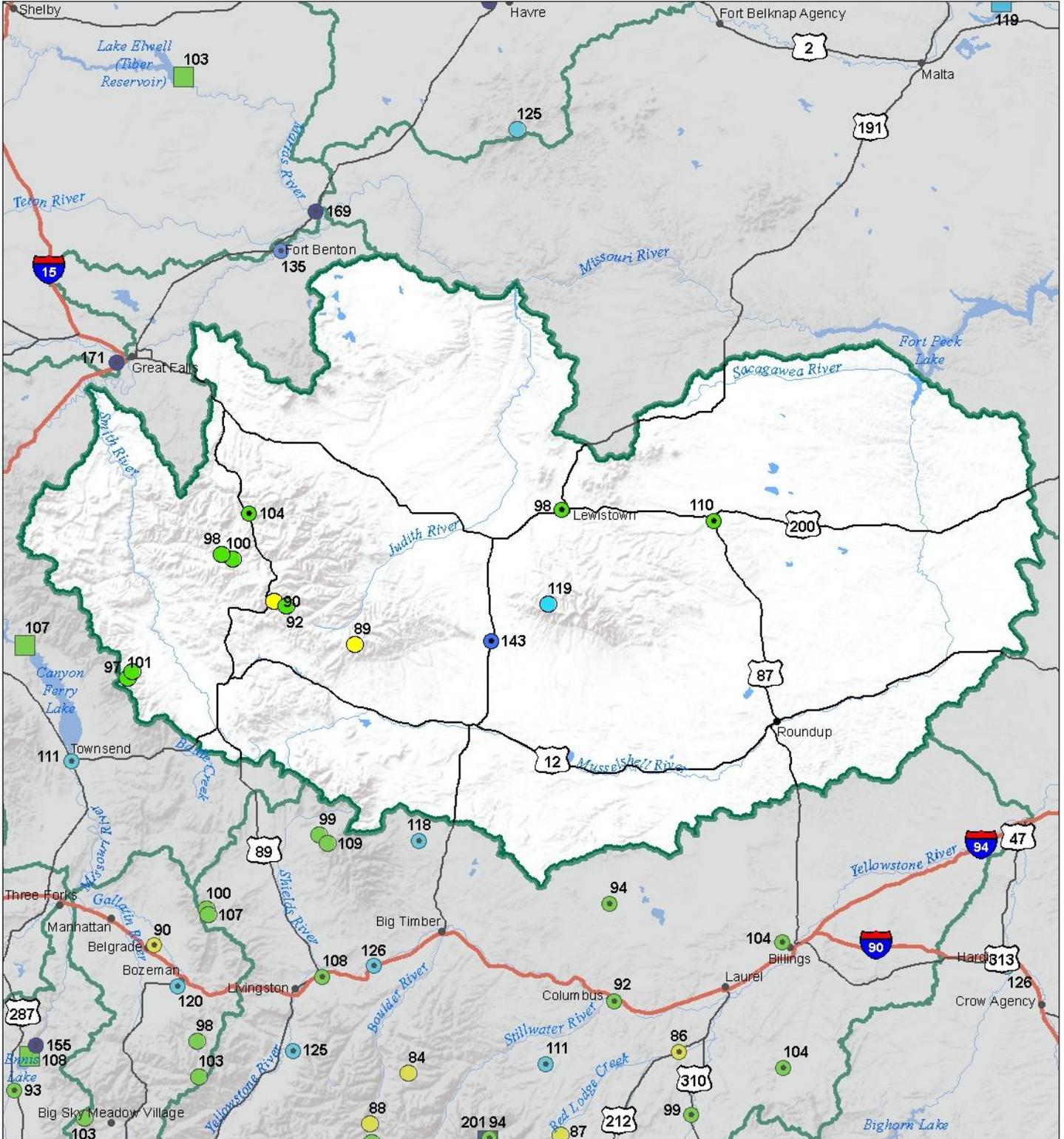


# Smith-Judith-Musselshell River Basin

## Water Year to Date Precipitation and Reservoir Levels

### Percentage of Normal

#### May 1, 2016



### Precipitation Percent of Normal

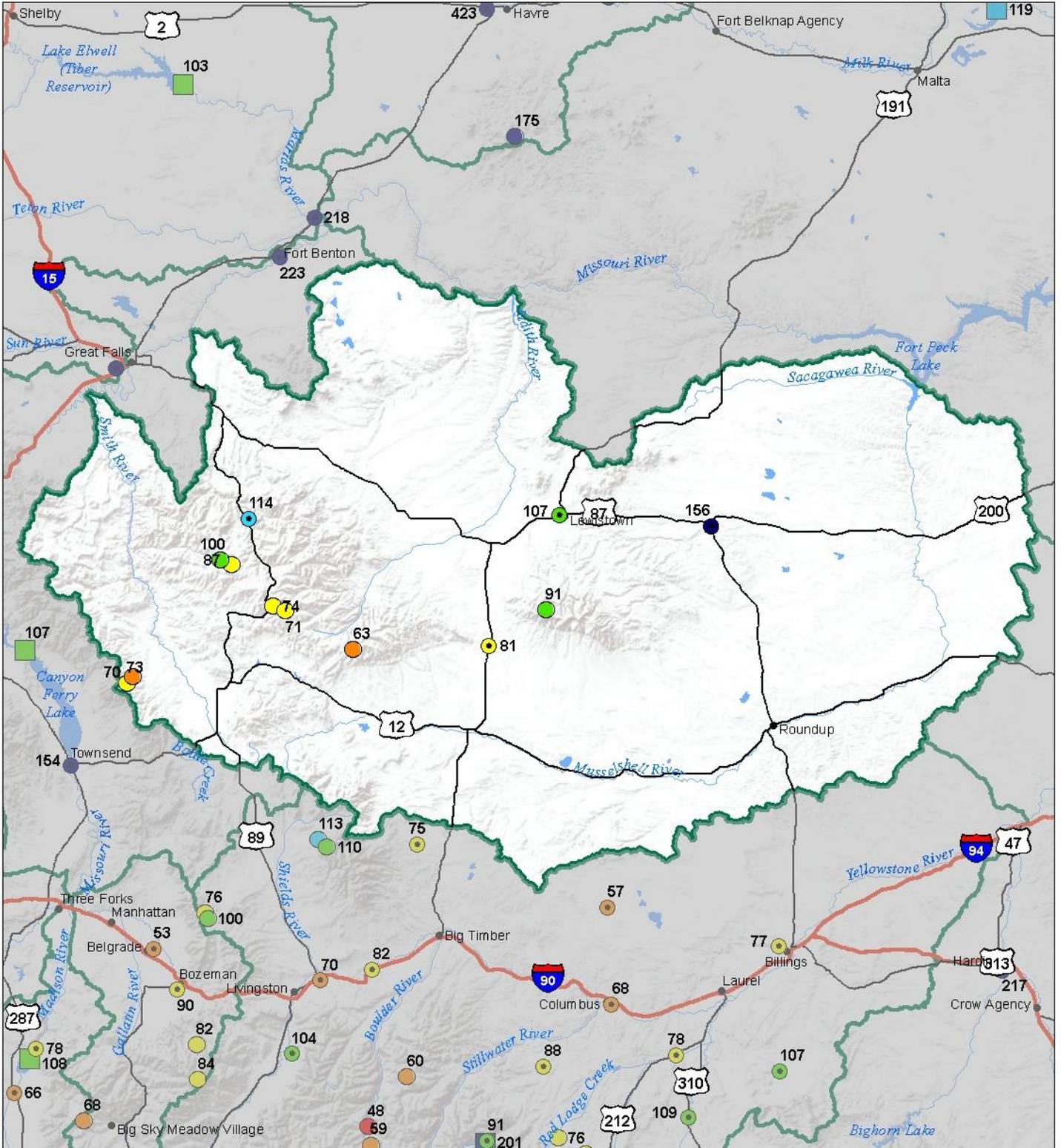
SNOTEL		COOP/ACIS	
<span style="color: blue;">●</span> > 150%	<span style="color: yellow;">●</span> 71 - 90%	<span style="color: blue;">●</span> > 150%	<span style="color: yellow;">●</span> 71 - 90%
<span style="color: lightblue;">●</span> 131 - 150%	<span style="color: orange;">●</span> 51 - 70%	<span style="color: lightblue;">●</span> 131 - 150%	<span style="color: orange;">●</span> 51 - 70%
<span style="color: cyan;">●</span> 111 - 130%	<span style="color: red;">●</span> 1 - 50%	<span style="color: cyan;">●</span> 111 - 130%	<span style="color: red;">●</span> 1 - 50%
<span style="color: green;">●</span> 91 - 110%		<span style="color: green;">●</span> 91 - 110%	

### Reservoirs Percent of Normal

<span style="color: darkblue;">■</span> > 150%
<span style="color: blue;">■</span> 131 - 150%
<span style="color: lightblue;">■</span> 111 - 130%
<span style="color: green;">■</span> 91 - 110%
<span style="color: yellow;">■</span> 71 - 90%
<span style="color: orange;">■</span> 51 - 70%
<span style="color: red;">■</span> 1 - 50%



# Smith-Judith-Musselshell River Basin Monthly Precipitation and Reservoir Levels Percentage of Normal May 1, 2016 (April 1, 2016 - May 1, 2016)



### Precipitation Percent of Normal

SNOTEL		COOP/ACIS	
<span style="color: blue;">●</span> > 150%	<span style="color: yellow;">●</span> 71 - 90%	<span style="color: blue;">●</span> > 150%	<span style="color: yellow;">●</span> 71 - 90%
<span style="color: lightblue;">●</span> 131 - 150%	<span style="color: orange;">●</span> 51 - 70%	<span style="color: lightblue;">●</span> 131 - 150%	<span style="color: orange;">●</span> 51 - 70%
<span style="color: cyan;">●</span> 111 - 130%	<span style="color: red;">●</span> 1 - 50%	<span style="color: cyan;">●</span> 111 - 130%	<span style="color: red;">●</span> 1 - 50%
<span style="color: green;">●</span> 91 - 110%		<span style="color: green;">●</span> 91 - 110%	

### Reservoirs Percent of Normal

<span style="color: darkblue;">■</span> > 150%
<span style="color: blue;">■</span> 131 - 150%
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<span style="color: yellow;">■</span> 71 - 90%
<span style="color: orange;">■</span> 51 - 70%
<span style="color: red;">■</span> 1 - 50%



## Smith-Judith-Musselshell Streamflow Forecasts - May 1, 2016

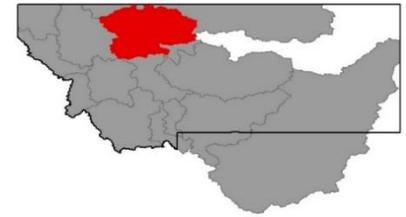
Forecast Exceedance Probabilities for Risk Assessment  
Chance that actual volume will exceed forecast

SMITH-JUDITH-MUSSEL SHELL	Forecast Period	90% (KAF)	70% (KAF)	50% (KAF)	% Avg	30% (KAF)	10% (KAF)	30yr Avg (KAF)
Sheep Ck nr White Sulphur Springs								
	MAY-JUL	6.9	9.9	11.9	89%	13.9	16.9	13.4
	MAY-SEP	8.6	12.2	14.7	91%	17.2	21	16.2
Smith R bl Eagle CK <sup>2</sup>								
	MAY-JUL	28	55	74	83%	93	120	89
	MAY-SEP	29	62	85	86%	108	141	99
NF Musselshell R nr Delpine								
	MAY-JUL	0.5	1.53	2.5	76%	3.5	4.9	3.3
	MAY-SEP	0.5	2.1	3.2	78%	4.3	6	4.1
SF Musselshell R ab Martinsdale								
	MAY-JUL	1	16.2	29	78%	42	61	37
	MAY-SEP	1	18.7	32	80%	45	65	40
Musselshell R at Harlowton <sup>2</sup>								
	MAY-JUL	-5	16.2	37	77%	58	89	48
	MAY-SEP	-5	15.6	38	76%	60	93	50
Musselshell R nr Roundup <sup>2</sup>								
	MAY-JUL	4.7	23	35	65%	47	65	54
	MAY-SEP	2.5	21	34	63%	47	66	54

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

Reservoir Storage End of April, 2016	Current (KAF)	Last Year (KAF)	Average (KAF)	Capacity (KAF)
Smith River Res	9.8	10.4	8.3	10.6
Ackley Lake	4.5	4.9	3.3	7.0
Bair Res	5.4	6.4	4.5	7.0
Martinsdale Res	17.9	22.9	11.8	23.1
Deadman's Basin Res	66.0	75.7	51.0	72.2
Basin-wide Total	103.7	120.3	78.9	119.9
# of reservoirs	5	5	5	5

Watershed Snowpack Analysis May 1, 2016	# of Sites	% Median	Last Year % Median
SMITH	7	85	73
HIGHWOOD	0		
JUDITH	5	96	84
MUSSEL SHELL	3	76	88
SMITH-JUDITH-MUSSEL SHELL	11	88	77



## Sun-Teton-Marias River Basin

Another month of anomalously dry and warm conditions in the Front Range has left the Sun-Teton-Marias River basin with the lowest basin-wide snowpack totals in the state, and many measurement locations are the lowest or second lowest on record for May 1<sup>st</sup>. Last year was also a low snowpack year and this year's basin-wide peak snowpack is lower, only 90% of last year's peak. Snowpack this year peaked in the basin during the first week of April at 65% of the average peak, and all sites have seen a steady decline over the month due to the well above average temperatures. Since the beginning of the second week of April the basin-wide snowpack totals have been the lowest in the last 26 years for automated SNOTEL sites in the basin. Storms during the middle of the month did add some snow water to the basin, but this only prolonged the melt that was actively occurring. Water users in the basin should prepare for a second year of well below average snowmelt contribution to streamflows this spring and summer. Currently, the combined Sun-Teton-Marias River basin is 34% of normal for May 1<sup>st</sup>, down 30% from April 1<sup>st</sup>, and 87% of last year at this time.

Last year mountain SNOTEL locations received <50% of their normal summer precipitation between the months of June and September. Luckily there was a turnaround in this pattern and a few average to slightly above average months were experienced until Jan 1<sup>st</sup>, 2016. Since then the basin has received below average precipitation, and April was the fourth consecutive month this happened. Mountain precipitation was 50 to 85% at of average for the month of April at mountain SNOTEL locations, while valley locations fared better receiving near to above normal precipitation. Currently the combined Sun-Teton-Marias water year-to-date precipitation is 80% of average for May 1<sup>st</sup>, and 77% of last year at this time. Spring and summer will be critical for irrigators in the basin, and a major turnaround will be needed for any improvement to occur.

Reservoir storage is above average for this date at all reservoirs in the basin. Early runoff has allowed water managers to fill the reservoirs early, but the lack of snowpack means that the snow water component of streamflow will be much lower than average, and is trending towards running out earlier given the unseasonably warm and dry conditions. Spring and summer precipitation will play a key role in reservoir operations this summer. Basin-wide reservoir storage is currently 103% of average for May 1<sup>st</sup>.

Streamflow forecasts look to be well below average this year give current conditions. Basin-wide streamflow forecasts vary greatly across the basin, so consult the table at the end of this section for individual forecast points. Current basin-wide streamflow forecasts for the 50% exceedance are 49% of average for the May-July time period.

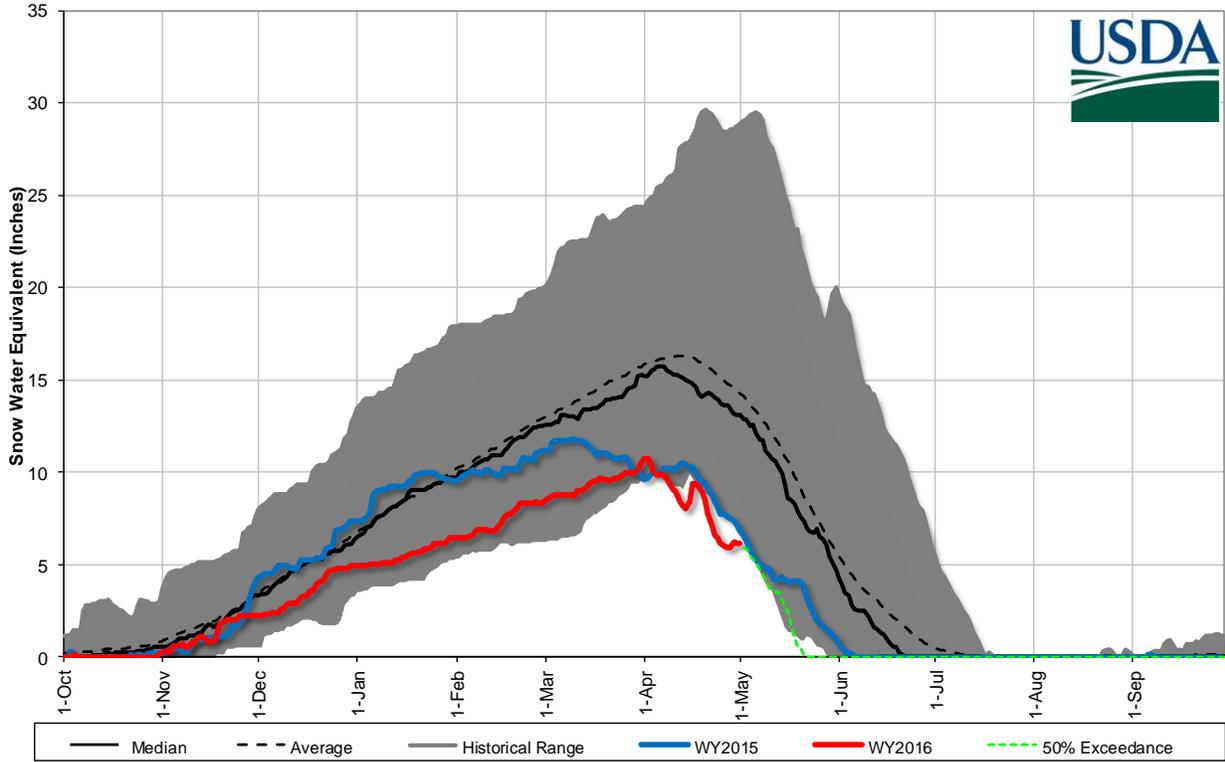
<i>Sun-Teton-Marias River Basin Data Summary</i>		<i>5/1/2016</i>	
	Percent of 1981-2010 Normal (Median)	Last Year Percentage of Normal (Median)	
<b>Snowpack</b>			
Basin-Wide	34%	39%	
	Monthly Percentage of Average	WYTD Percentage of 1981-2010 Average*	Last Year Percentage of Average
<b>Precipitation</b>			
Mountain Precipitation	87%	78%	99%
Valley Precipitation	97%	83%	107%
Basin Precipitation	90%	80%	101%
	Percentage of Average	Percentage of Usable Capacity	Last Year Percentage of Average
<b>Reservoir Storage</b>			
Basin-Wide Storage	103%	57%	120%
	50 % Exceedance Forecast Percentage of Average	50 % Exceedance Forecast % of Last Year's Flows	Last Year Percentage of Average
<b>Streamflow Forecast</b>			
Basin-Wide Apr-July	49%	94%	48%

\*Water Year-to-Date (WYTD) Precipitation is October 1st - Current

\*\*Basin-wide streamflows are an average of the individual streamflow points within the basin for the 50 percent exceedance forecast. Consult the individual streamflow forecasts in the table below for the range of forecasts at an individual point.

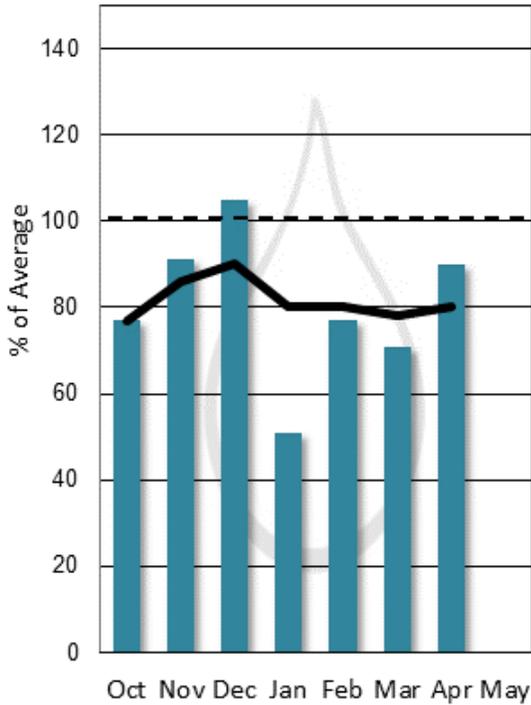
### Sun-Teton-Marias River Basin Snowpack with Non-Exceedence Projections

Based on provisional SNOTEL daily data as of 5/1/2016



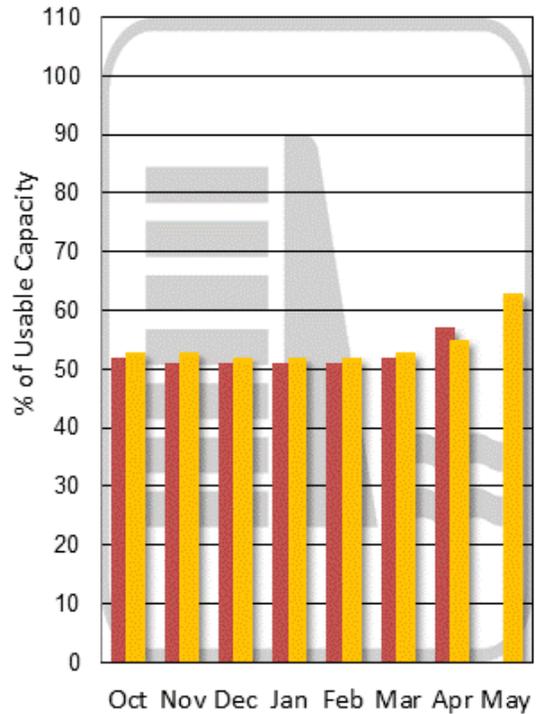
#### Mountain and Valley Precipitation

Monthly (teal bar) Year-to-date (black line)



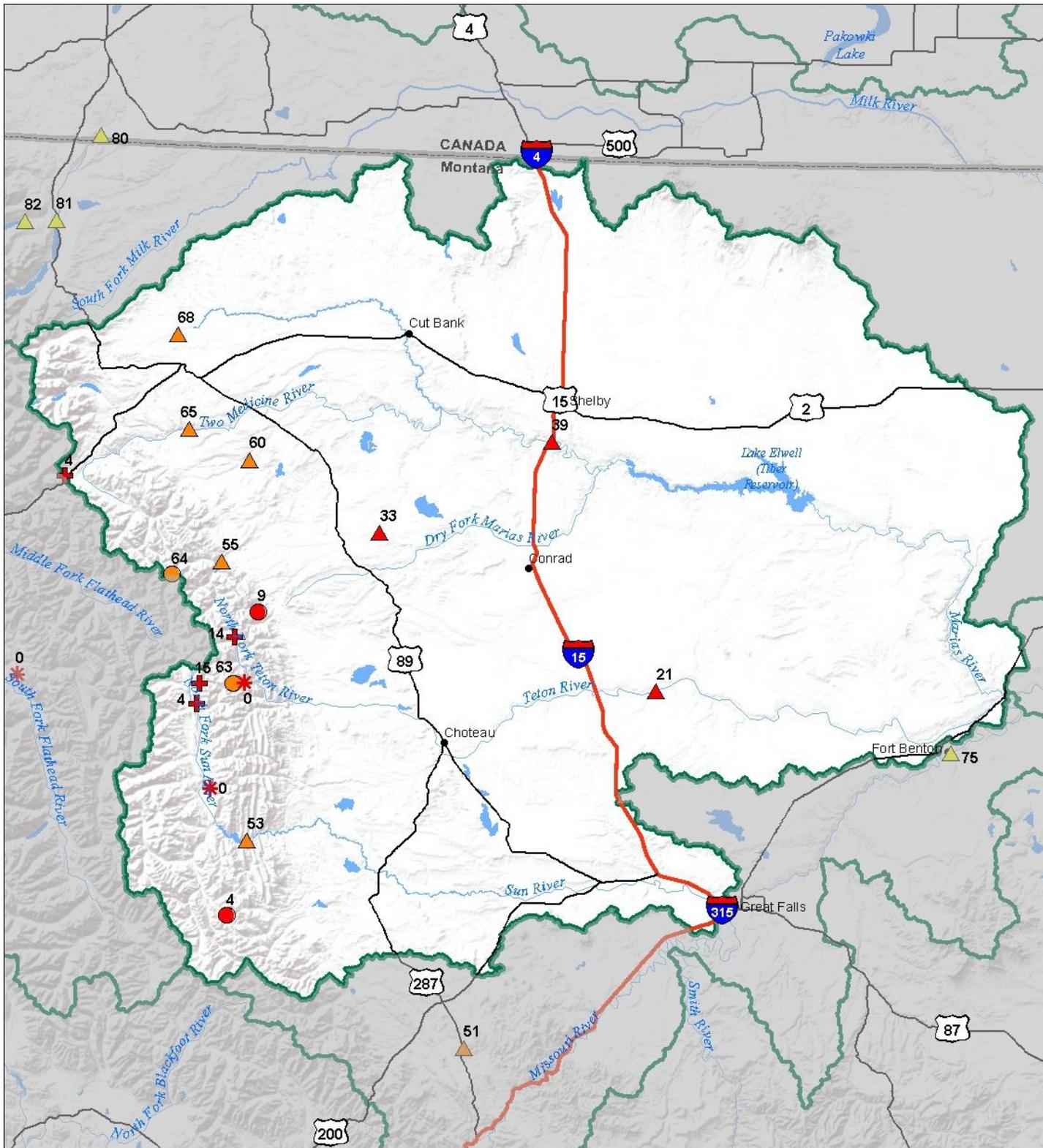
#### End of Month Reservoir Storage

% Capacity (red bar) Avg % Capacity (yellow bar)



Storage above is averaged for all reservoirs in the basin. For individual reservoirs see table below.

# Sun-Teton-Marias River Basin Streamflow Forecast, Snow Water Equivalent Percentage of Normal May 1, 2016



### Snow Water Equivalent Percent of Normal

SNOTEL

- > 150%
- 131 - 150%
- 111 - 130%
- 91 - 110%

- 71 - 90%
- 51 - 70%
- 1 - 50%
- \*

Snowcourse

- ⊕ > 150%
- ⊕ 131 - 150%
- ⊕ 111 - 130%
- ⊕ 91 - 110%
- ⊕ 71 - 90%
- ⊕ 51 - 70%
- ⊕ 1 - 50%
- ⊕ \*

### Streamflow Forecast Percent of Average Flows

- ▲ > 150%
- ▲ 131 - 150%
- ▲ 111 - 130%
- ▲ 91 - 110%
- ▲ 71 - 90%
- ▲ 51 - 70%
- ▲ 1 - 50%

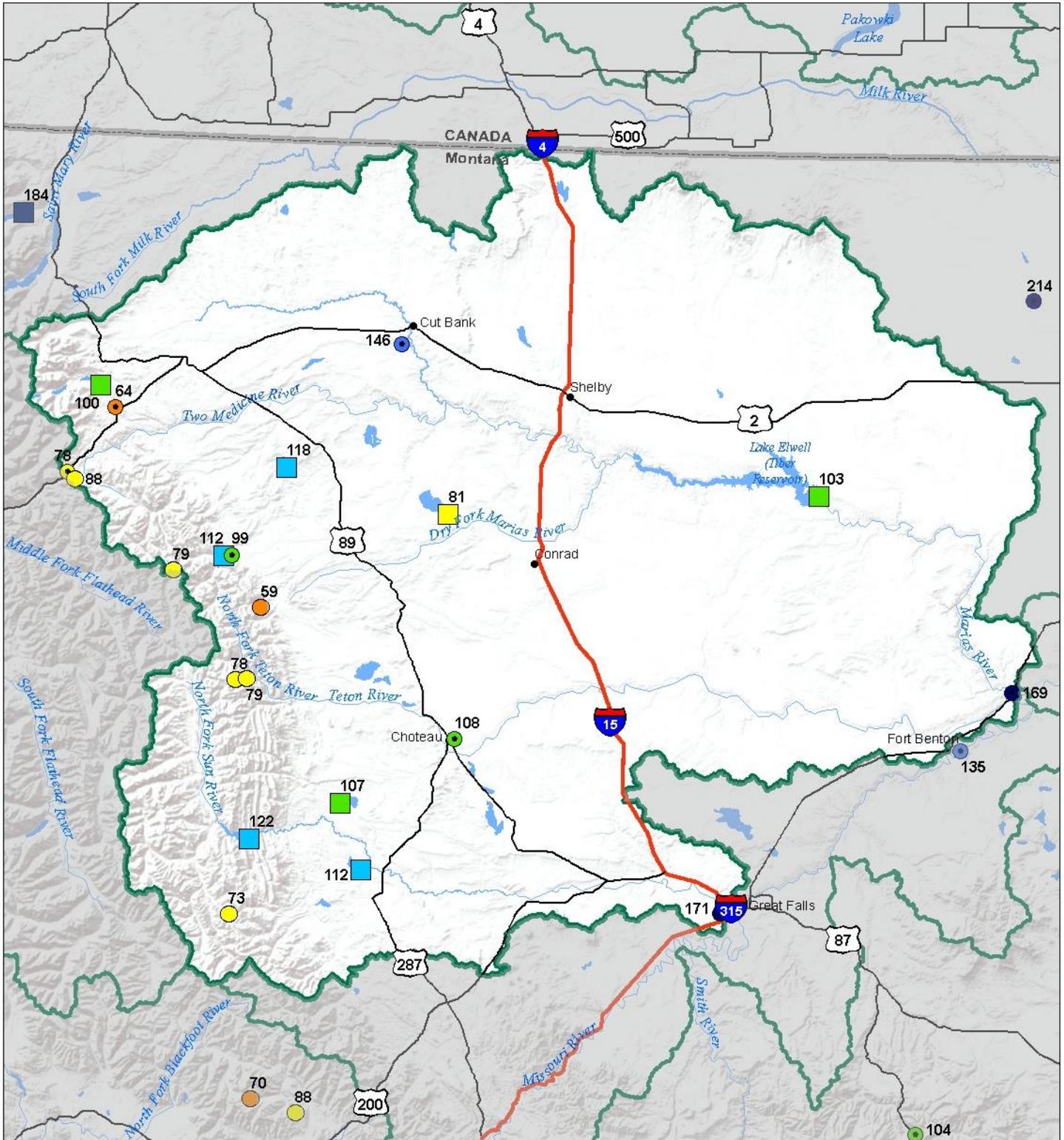


# Sun-Teton-Marias River Basin

## Water Year to Date Precipitation and Reservoir Levels

### Percentage of Normal

May 1, 2016



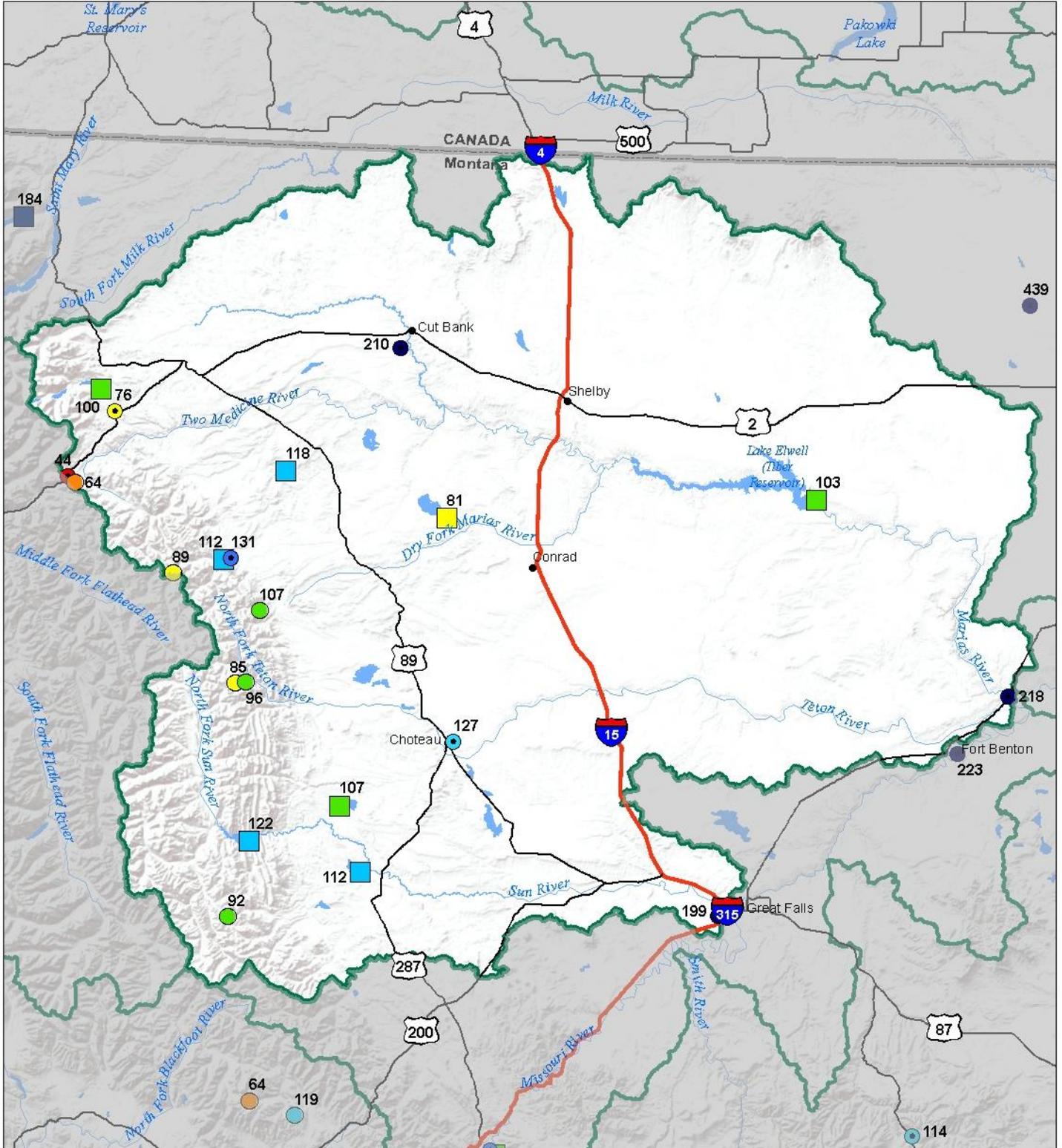
SNOTEL		COOP/ACIS	
● > 150%	● 71 - 90%	● > 150%	● 71 - 90%
● 131 - 150%	● 51 - 70%	● 131 - 150%	● 51 - 70%
● 111 - 130%	● 1 - 50%	● 111 - 130%	● 1 - 50%
● 91 - 110%		● 91 - 110%	

**Reservoirs**  
**Percent of Normal**

■ > 150%
■ 131 - 150%
■ 111 - 130%
■ 91 - 110%
■ 71 - 90%
■ 51 - 70%
■ 1 - 50%



# Sun-Teton-Marias River Basin Monthly Precipitation and Reservoir Levels Percentage of Normal May 1, 2016 (April 1, 2016 - May 1, 2016)



### Precipitation Percent of Normal

SNOTEL		COOP/ACIS	
● > 150%	● 71 - 90%	● > 150%	● 71 - 90%
● 131 - 150%	● 51 - 70%	● 131 - 150%	● 51 - 70%
● 111 - 130%	● 1 - 50%	● 111 - 130%	● 1 - 50%
● 91 - 110%		● 91 - 110%	

### Reservoirs Percent of Normal

● > 150%
● 131 - 150%
● 111 - 130%
● 91 - 110%
● 71 - 90%
● 51 - 70%
● 1 - 50%



## Sun-Teton-Marias Streamflow Forecasts - May 1, 2016

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

SUN-TETON-MARIAS	Forecast Period	90% (KAF)	70% (KAF)	50% (KAF)	% Avg	30% (KAF)	10% (KAF)	30yr Avg (KAF)
Gibson Reservoir Inflow	MAY-JUL	113	151	177	50%	205	240	355
	MAY-SEP	137	179	210	53%	235	280	395
Two Medicine R nr Browning <sup>2</sup>	MAY-JUL	65	85	98	64%	111	131	153
	MAY-SEP	71	92	107	65%	122	143	164
Badger Ck nr Browning	MAY-JUL	25	36	43	56%	50	61	77
	MAY-SEP	33	46	55	60%	64	77	92
Swift Reservoir Inflow <sup>2</sup>	MAY-JUL	9.1	18.6	25	51%	31	41	49
	MAY-SEP	14.3	25	33	55%	41	52	60
Dupuyer Ck nr Valier	MAY-JUL	0.5	1	2.6	29%	7	13.4	9.1
	MAY-SEP	0.5	1.5	3.5	33%	8.4	15.6	10.7
Cut Bank Ck nr Browning	MAY-JUL	24	35	42	68%	49	60	62
	MAY-SEP	26	38	46	68%	54	66	68
Marias R nr Shelby <sup>2</sup>	MAY-JUL	15	52	110	39%	168	255	285
	MAY-SEP	20	51	116	39%	181	275	300
Teton R nr Dutton	MAY-JUL	0.5	2.9	6.3	18%	21	43	35
	MAY-SEP	0.5	3	8.7	21%	25	49	41

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

2) Forecasts are for unimpaired flows. Actual flow will be dependent on management of upstream reservoirs and diversions

3) Median value used in place of average

Reservoir Storage End of April, 2016	Current (KAF)	Last Year (KAF)	Average (KAF)	Capacity (KAF)
Gibson Res	76.3	80.7	62.6	99.1
Pishkun Res	24.9	31.0	23.3	32.0
Willow Creek Res - Augusta	28.7	30.7	25.6	32.2
Lower Two Medicine Lake	10.5	12.6	10.5	11.9
Four Horns Lake	12.3	11.2	10.5	19.2
Swift Res	20.3	19.4	18.1	30.0
Lake Frances	53.8	89.9	66.6	112.0
Lake Elwell (Tiber)	735.9	844.8	716.2	1347.0
Nilan Reservoir	9.3	10.6	7.8	11.0
Basin-wide Total	972.1	1130.8	941.2	1694.4
# of reservoirs	9	9	9	9

Watershed Snowpack Analysis May 1, 2016	# of Sites	% Median	Last Year % Median
SUN	5	31	40
TETON	4	33	32
MARIAS	4	38	42
SUN-TETON-MARIAS	10	34	39

# St. Mary-Milk River Basin



The snowpack in the St. Mary-Milk River basin has been sub-par throughout this winter and the warm temperatures didn't do much to help the cause this month. High elevation snowpack at the Flattop Mountain SNOTEL site (6300') made the transition to melt mid-month, but lower elevations made the transition much earlier during the first week of April. The low elevation Many Glacier SNOTEL site (4900') made the transition to snowmelt on 4/1 and had melted out completely by April 13<sup>th</sup>. Mid elevation snowcourses above the Many Glacier SNOTEL sites were 62% to 71% of normal for the date. Further east in the Bearpaw Mountains, snowcourses and SNOTEL sites were snow free on April 1<sup>st</sup>. It has been warm and relatively dry, with regards to snow, this year on the east side of Glacier National Park. Spring events can help to add some snow water at this point, but the snowpack has started its decline. The movement of snow water into the river systems has caused the basin snowpack percentages to decrease for May 1<sup>st</sup>, and it is currently 65% of normal, down 5% from April 1<sup>st</sup>. As bad as this sounds, it is 141% of last year at this time.

Precipitation favored the eastern half of the Milk River basin, where well above average precipitation fell during the month of April. Precipitation at Valley locations during the month was 423% of average in the Milk River basin, with some locations receiving up to 4" of rain. Mountain SNOTEL locations in the St. Mary's basin weren't so lucky however, receiving only 40% of average precipitation for the month. Overall basin water year-to-date precipitation (beginning Oct 1) is currently 100% of normal for the mountain SNOTEL sites in the St. Mary's, and 188% of average for valley locations in the Milk River basin. Overall, St. Mary-Milk basin water year-to-date precipitation is 119% of normal for May 1<sup>st</sup>, and 112% of last year on this date.

Basin-wide reservoir storage is currently 80% of average for May 1<sup>st</sup>.

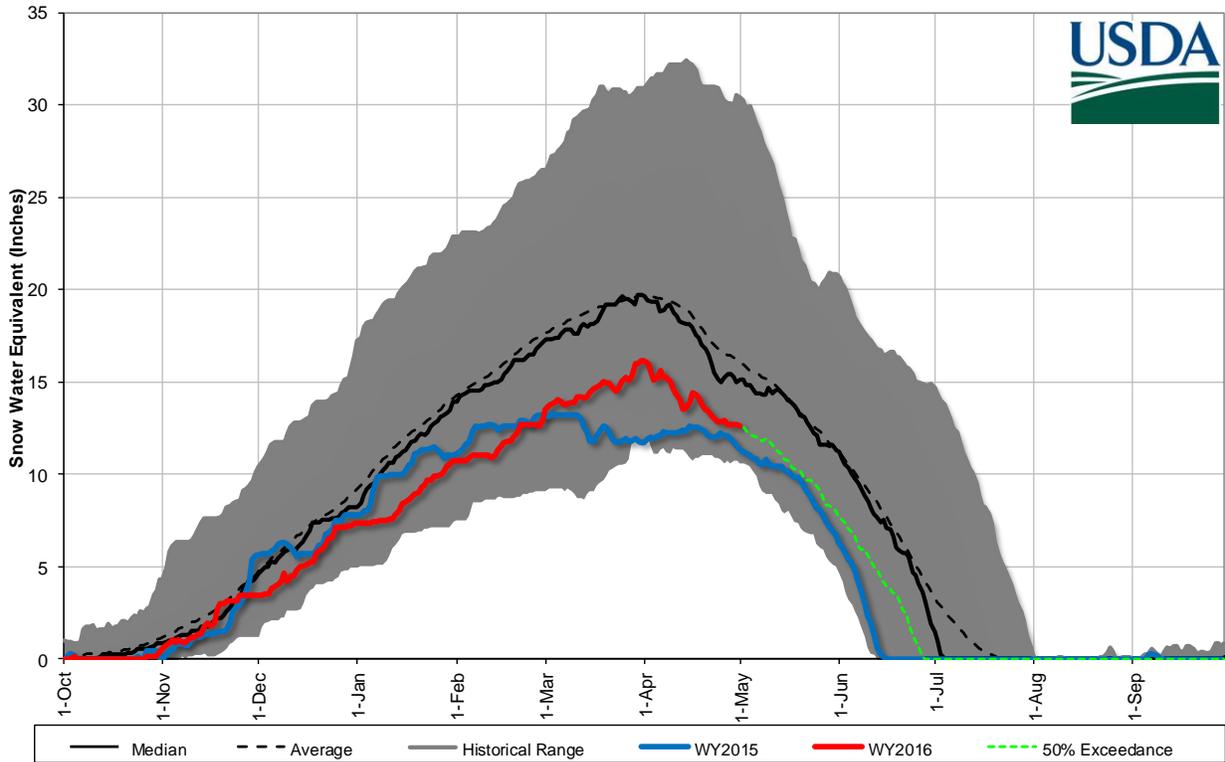
Basin-wide streamflow forecasts vary greatly across the basin, so consult the table at the end of this section for individual forecast points. Current basin-wide streamflow forecasts for the 50% exceedance are 80% of average for the May-July time period.

<b>St. Mary-Milk River Basin Data Summary</b>		<b>5/1/2016</b>	
<b>Snowpack</b>			
	Percent of 1981-2010 Normal (Median)	Last Year Percentage of Normal (Median)	
Basin-Wide	65%	46%	
<b>Precipitation</b>			
	Monthly Percentage of Average	WYTD Percentage of 1981-2010 Average*	Last Year Percentage of Average
Mountain Precipitation	101%	107%	109%
Valley Precipitation	423%	188%	88%
Basin Precipitation	172%	119%	106%
<b>Reservoir Storage</b>			
	Percentage of Average	Percentage of Capacity (Total)	Last Year Percentage of Average
Basin-Wide Storage	125%	66%	153%
<b>Streamflow Forecast</b>			
	50 % Exceedance Forecast Percentage of Average	50 % Exceedance Forecast % of Last Year's Flows	Last Year Percentage of Average
Basin-Wide Apr-July	80%	119%	67%

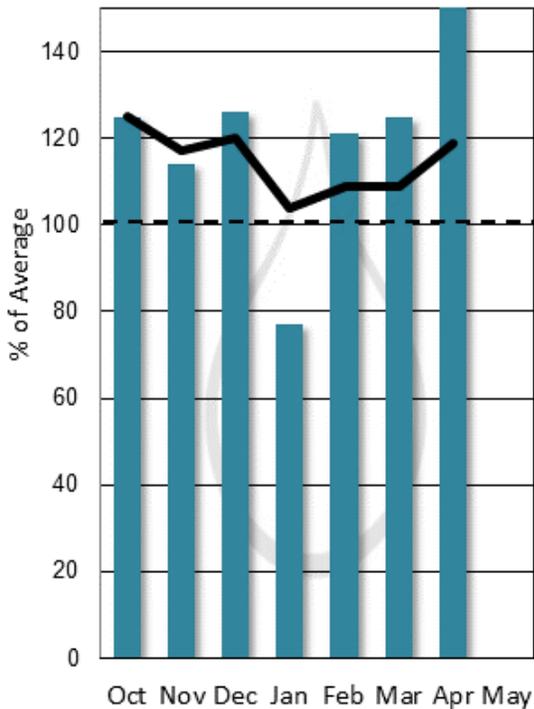
\*Water Year-to-Date (WYTD) Precipitation is October 1st - Current

\*\*Basin-wide streamflows are an average of the individual streamflow points within the basin for the 50 percent exceedance forecast. Consult the individual streamflow forecasts in the table below for the range of forecasts at an individual point.

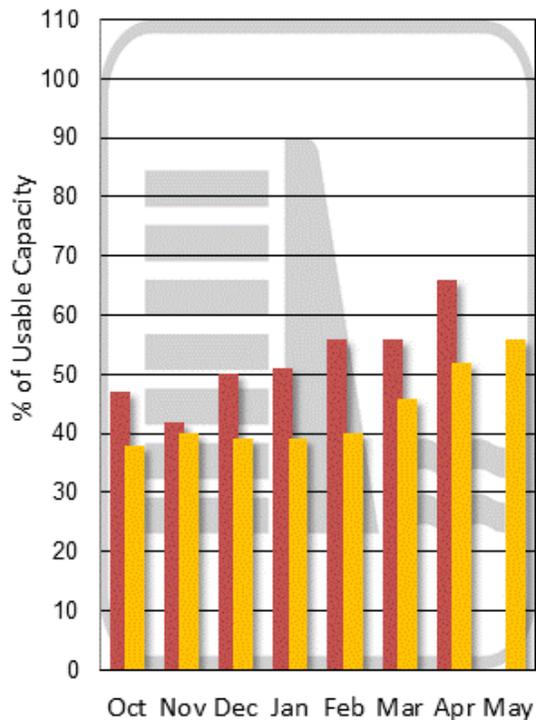
**St. Mary-Milk River Basin Snowpack with Non-Exceedance Projections**  
*Based on provisional SNOTEL daily data as of 5/1/2016*



**Mountain and Valley Precipitation**

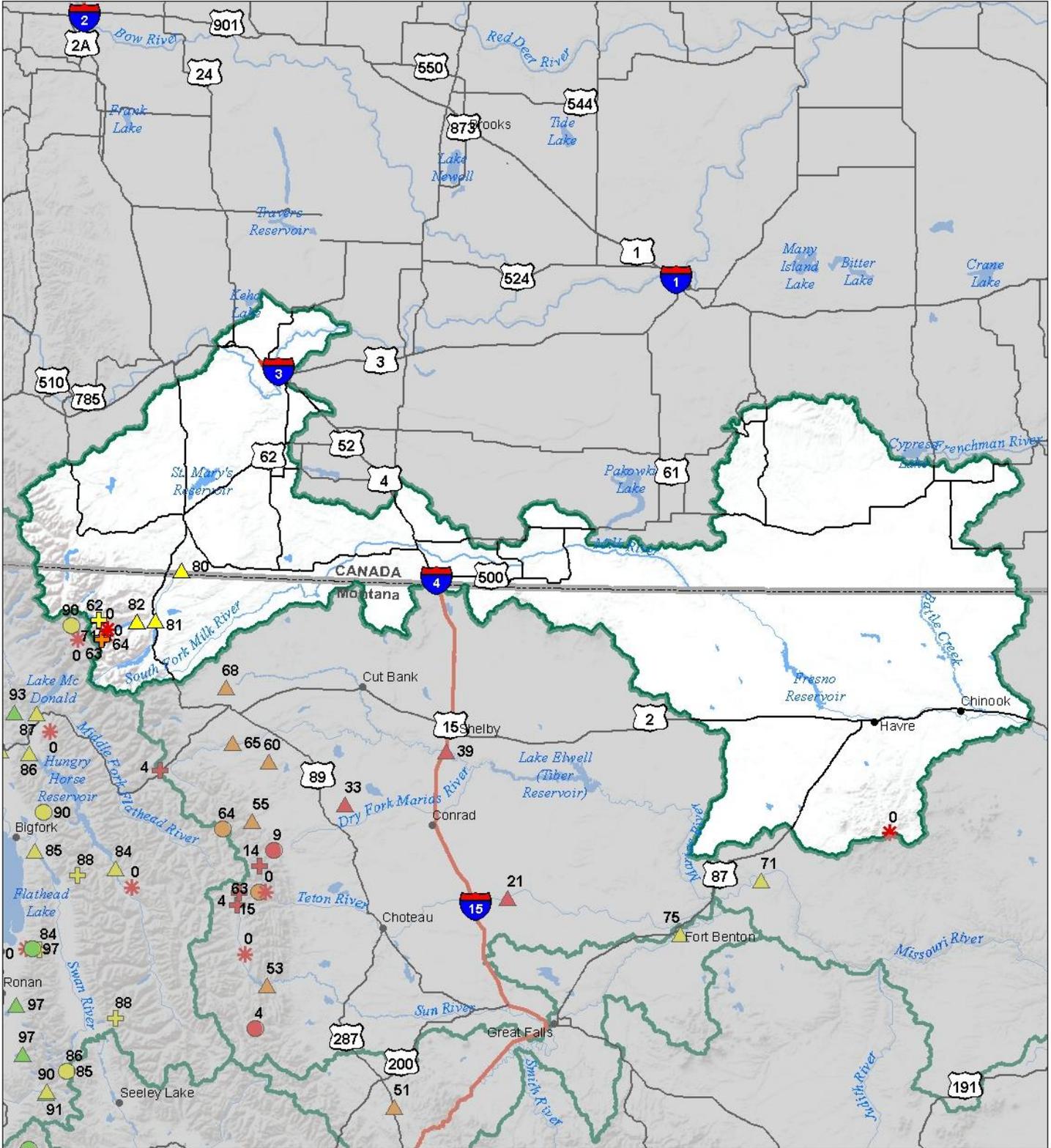


**End of Month Reservoir Storage**



Storage above is averaged for all reservoirs in the basin. For individual reservoirs see table below.

# St Mary's-Milk River Basin Streamflow Forecast, Snow Water Equivalent Percentage of Normal May 1, 2016



### Snow Water Equivalent Percent of Normal

#### SNOTEL

- > 150%
- 131 - 150%
- 111 - 130%
- 91 - 110%

- 71 - 90%
- 51 - 70%
- 1 - 50%
- \* 0%

#### Snowcourse

- ⊕ > 150%
- ⊕ 131 - 150%
- ⊕ 111 - 130%
- ⊕ 91 - 110%
- ⊕ 71 - 90%
- ⊕ 51 - 70%
- ⊕ 1 - 50%
- \* 0%

### Streamflow Forecast Percent of Average Flows

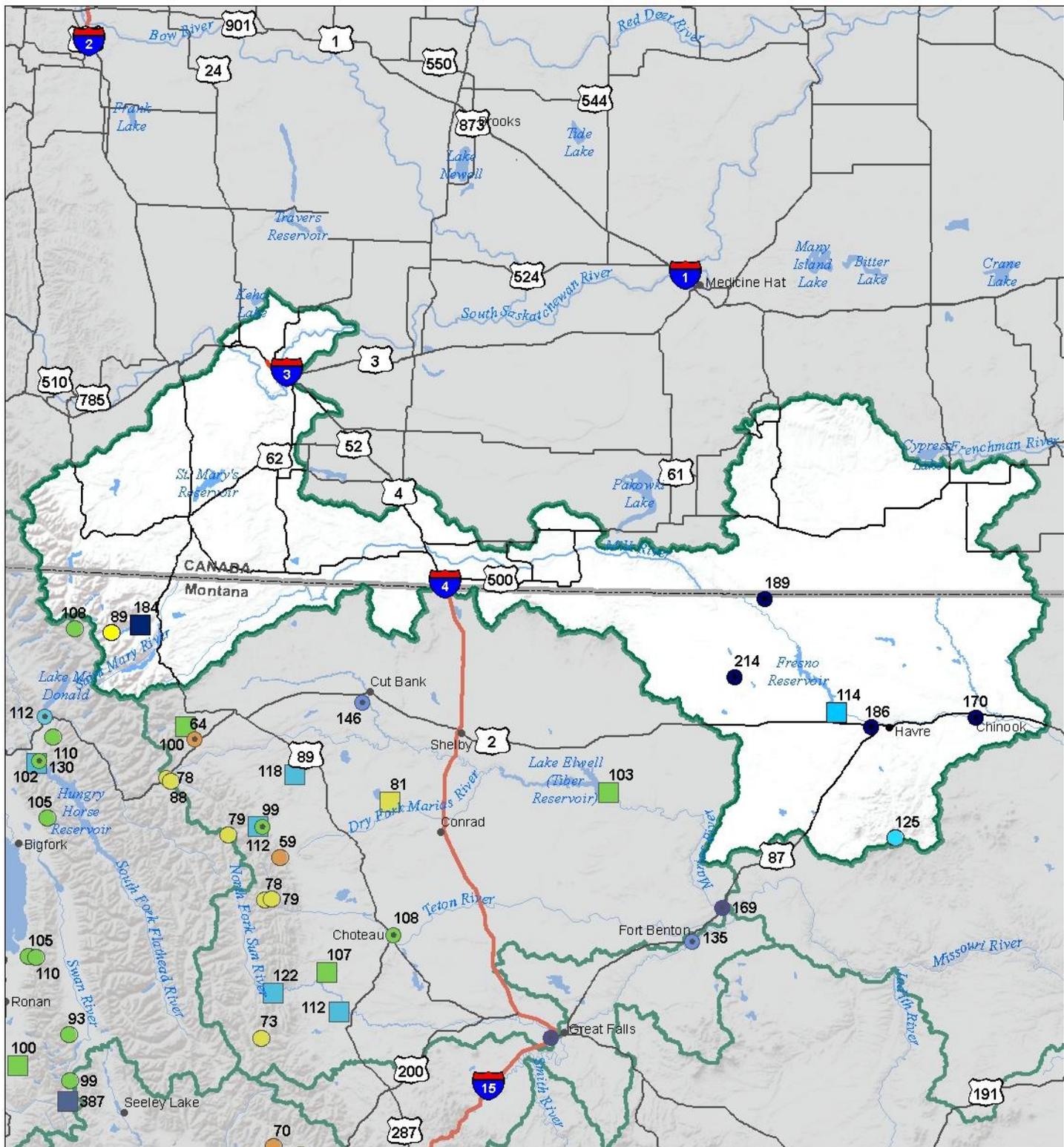
- ▲ > 150%
- ▲ 131 - 150%
- ▲ 111 - 130%
- ▲ 91 - 110%
- ▲ 71 - 90%
- ▲ 51 - 70%
- ▲ 1 - 50%



# St Mary's-Milk River Basin

## Water Year to Date Precipitation and Reservoir Levels Percentage of Normal

### May 1, 2016



#### Precipitation Percent of Normal

##### SNOTEL

- > 150%
- 131 - 150%
- 111 - 130%
- 91 - 110%

##### COOP/ACIS

- > 150%
- 131 - 150%
- 111 - 130%
- 91 - 110%

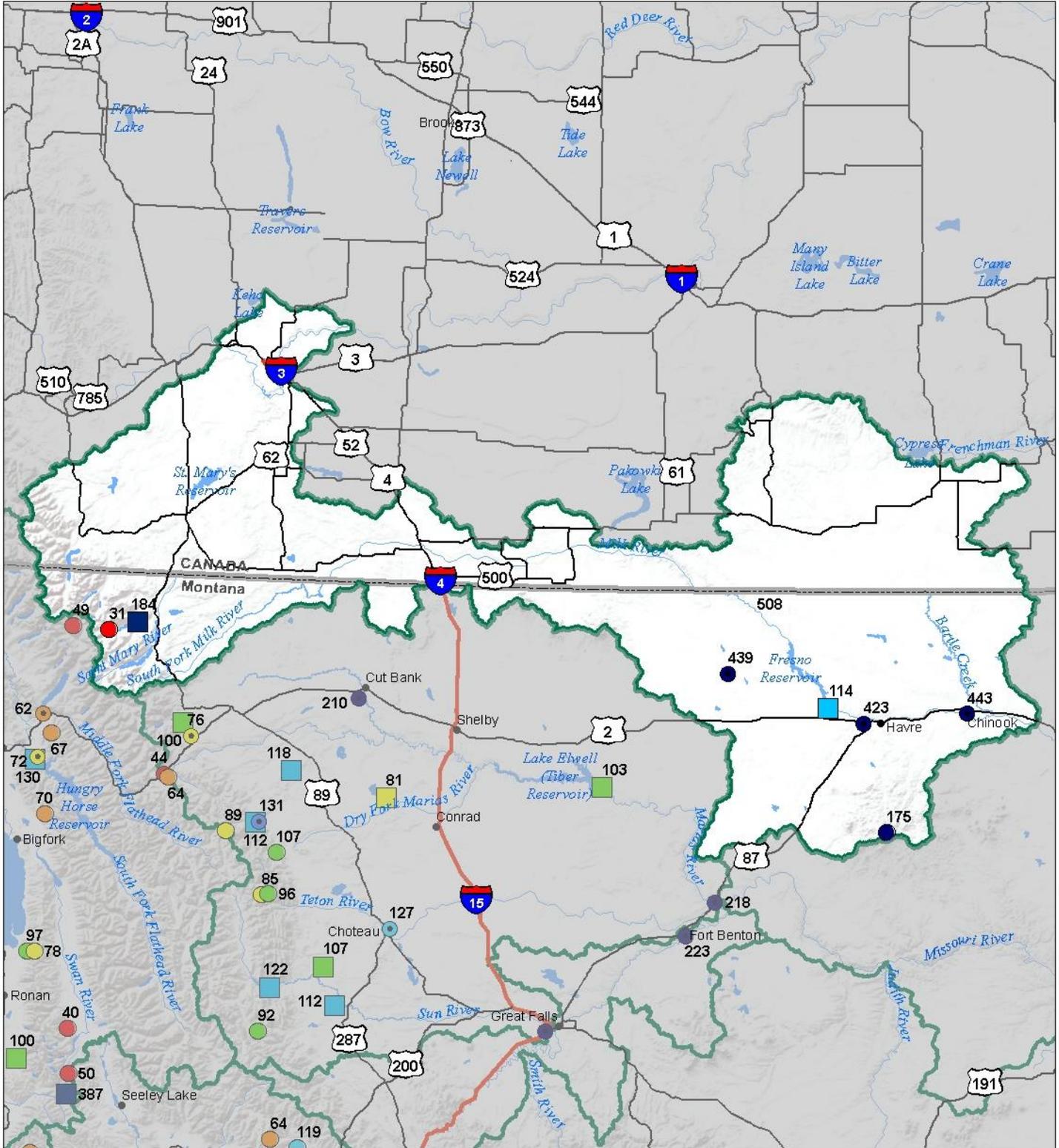
- 71 - 90%
- 51 - 70%
- 1 - 50%

#### Reservoirs Percent of Normal

- > 150%
- 131 - 150%
- 111 - 130%
- 91 - 110%
- 71 - 90%
- 51 - 70%
- 1 - 50%



**St Mary's-Milk River Basin  
 Monthly Precipitation and Reservoir Levels  
 Percentage of Normal  
 May 1, 2016 (April 1, 2016 - May 1, 2016)**



**Precipitation  
 Percent of Normal**

SNOTEL		COOP/ACIS	
● > 150%	● 71 - 90%	● > 150%	● 71 - 90%
● 131 - 150%	● 51 - 70%	● 131 - 150%	● 51 - 70%
● 111 - 130%	● 1 - 50%	● 111 - 130%	● 1 - 50%
● 91 - 110%		● 91 - 110%	

**Reservoirs  
 Percent of Normal**

■ > 150%
■ 131 - 150%
■ 111 - 130%
■ 91 - 110%
■ 71 - 90%
■ 51 - 70%
■ 1 - 50%



## St. Mary & Milk Basins Streamflow Forecasts - May 1, 2016

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

ST. MARY & MILK BASINS	Forecast Period	90% (KAF)	70% (KAF)	50% (KAF)	% Avg	30% (KAF)	10% (KAF)	30yr Avg (KAF)
Lake Sherburne Inflow								
	MAY-JUL	55	63	69	80%	75	83	86
	MAY-SEP	67	76	83	82%	90	99	101
St. Mary R nr Babb <sup>2</sup>								
	MAY-JUL	215	250	275	81%	300	335	340
	MAY-SEP	250	290	320	81%	350	390	395
St. Mary R at Intl Boundary <sup>2</sup>								
	MAY-JUL	230	280	315	79%	350	400	400
	MAY-SEP	280	335	375	80%	415	470	470
Milk R at Western Crossing of Intl Bndry, AB								
Milk R at Eastern Crossing of Intl Bndry								

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

Reservoir Storage End of April, 2016	Current (KAF)	Last Year (KAF)	Average (KAF)	Capacity (KAF)
Lake Sherburne	33.1	53.7	18.0	64.3
Fresno Res	85.7	94.2	74.9	127.0
Nelson Res	50.4	59.4	42.4	66.8
Basin-wide Total	169.2	207.3	135.3	258.1
# of reservoirs	3	3	3	3

Watershed Snowpack Analysis May 1, 2016	# of Sites	% Median	Last Year % Median
ST. MARY	8	65	46
BEARPAW MOUNTAINS	3	0	0
CYPRESS HILLS, CANADA	0		
MILK RIVER BASIN	3	0	0
ST. MARY & MILK BASINS	11	65	46

# Upper Yellowstone River Basin



The greater Upper Yellowstone River basin experienced peak snow water at many low to mid elevation locations during the first week of April and at higher elevation during the second and third week of the month. Basin-wide peak snow water was two weeks early this year, and was 87% of the long term peak snow water average. The sunny and warm weather during the month caused the low, and some mid elevations, to transition to snowmelt during the month, causing basin percentages of normal to decrease from April 1<sup>st</sup>. Higher elevation sites with deeper snowpack which could insulate themselves produced little melt, and saw some gains in snow water mid-month. Snowpack percentages for May 1<sup>st</sup> in the sub-basins are as follows: Yellowstone above Livingston (72%), Shields River basin is (81%), Boulder Stillwater (75%), Red Lodge-Rock Creek (73%), Clark's Fork (85). Early melt of the snowpack this month resulted in below normal SWE for this date. Currently the Upper Yellowstone is 77% of normal for snowpack on May 1<sup>st</sup>, down 17% from April 1<sup>st</sup>, and 108% of last year at this time.

Mountain and valley precipitation were both below average for the month of April, valley received 78% of average precipitation, while mountain SNOTEL sites received 67% of average. The warm periods of high pressure blocked our normal spring patterns which are typically wetter, but the above average March helped to keep water year totals near average. Mountain precipitation is currently 93% of average for the water year (Oct 1<sup>st</sup>-current) on May 1<sup>st</sup> and valley locations are 103%. Basin-wide precipitation is currently 95% of average for water year-to-date precipitation for this date. May and June are the big months of the year historically with regards to precipitation, and hopefully we see a switch and they provide some moisture this spring and early summer.

Reservoir storage is above average for May 1<sup>st</sup> at both reservoirs in the basin.

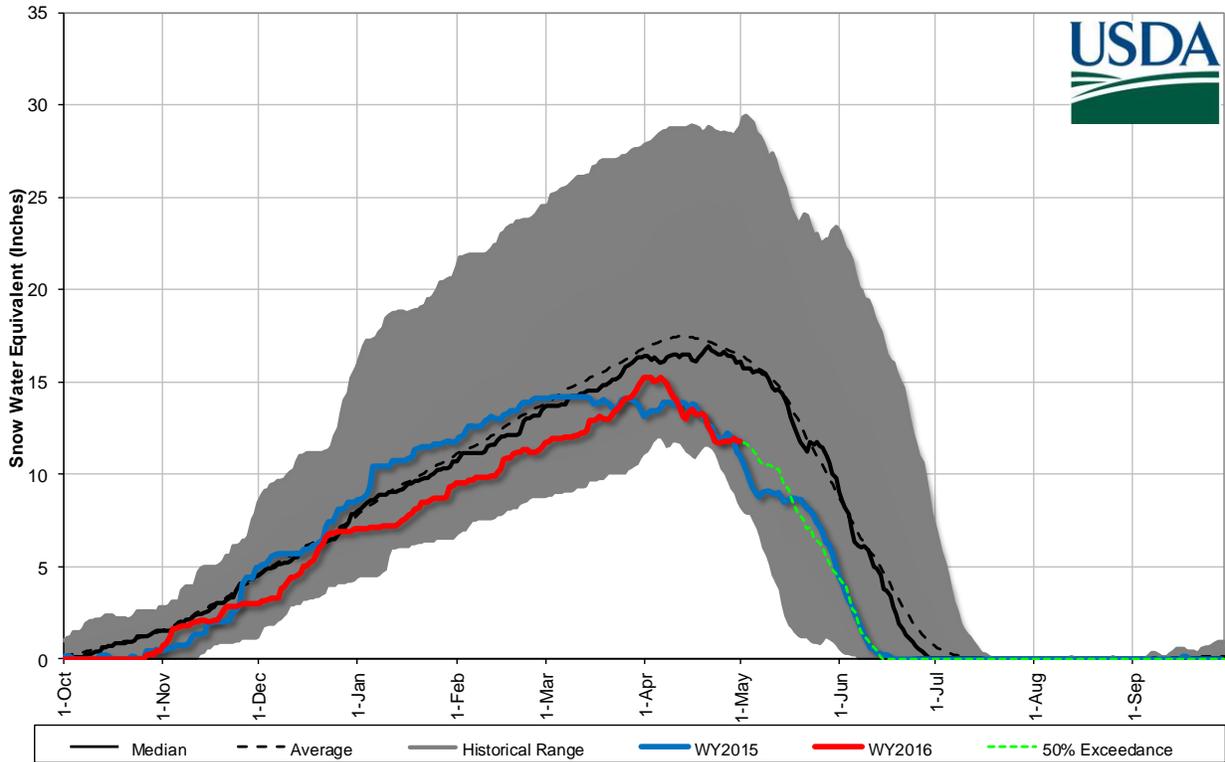
Basin-wide streamflow forecasts vary greatly across the basin, so consult the table at the end of this section for individual forecast points. Current basin-wide streamflow forecasts for the 50% exceedance are 82% of average for the May-July time period.

<b>Upper Yellowstone River Basin Data Summary</b>		<b>5/1/2016</b>	
	Percent of 1981-2010 Normal (Median)	Last Year Percentage of Normal (Median)	
<b>Snowpack</b>			
Basin-Wide	77%	71%	
	Monthly Percentage of Average	WYTD Percentage of 1981-2010 Average *	Last Year Percentage of Average
<b>Precipitation</b>			
Mountain Precipitation	67%	93%	90%
Valley Precipitation	78%	103%	87%
Basin Precipitation	69%	95%	89%
	Percentage of Average	Percentage of Capacity (Total)	Last Year Percentage of Average
<b>Reservoir Storage</b>			
Basin-Wide Storage	121%	56%	106%
	50 % Exceedance Forecast Percentage of Average	50 % Exceedance Forecast % of Last Year's Flows	Last Year Percentage of Average
<b>Streamflow Forecast</b>			
Basin-Wide Apr-July	82%	98%	84%

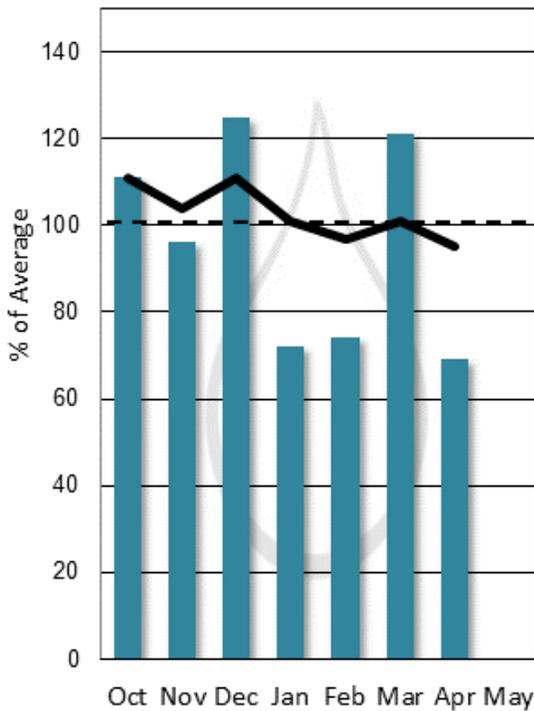
\*Water Year-to-Date (WYTD) Precipitation is October 1st - Current

\*\*Basin-wide streamflows are an average of the individual streamflow points within the basin for the 50 percent exceedance forecast. Consult the individual streamflow forecasts in the table below for the range of forecasts at an individual point.

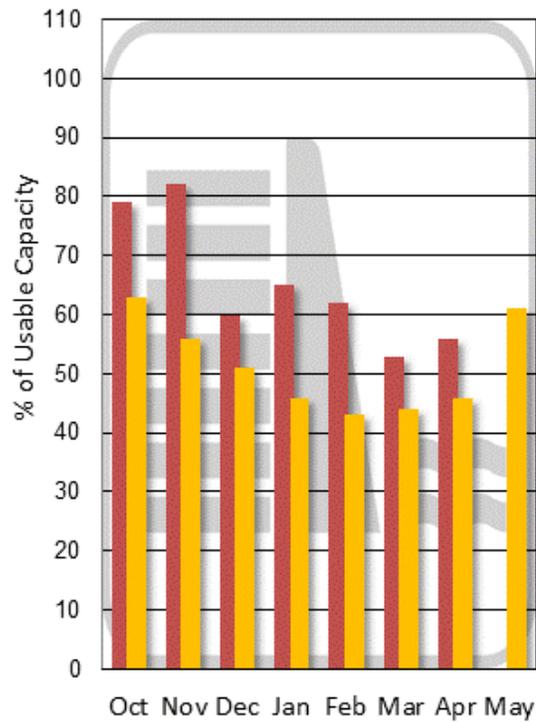
**Upper Yellowstone River Basin Snowpack with Non-Exceedance Projections**  
*Based on provisional SNOTEL daily data as of 5/1/2016*



**Mountain and Valley Precipitation**

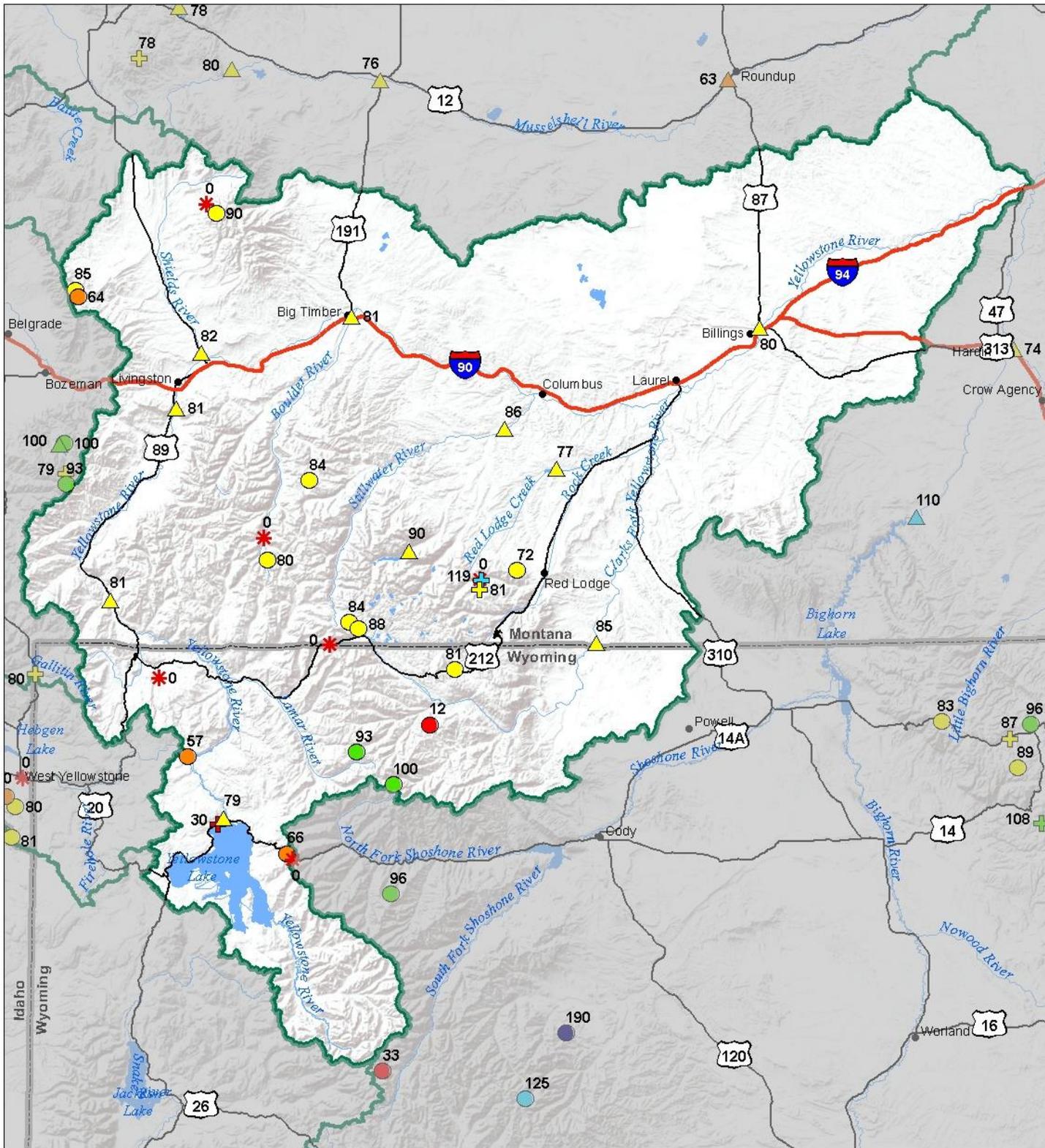


**End of Month Reservoir Storage**



Storage above is averaged for all reservoirs in the basin. For individual reservoirs see table below.

# Upper Yellowstone River Basin Streamflow Forecast, Snow Water Equivalent Percentage of Normal May 1, 2016



### Snow Water Equivalent Percent of Normal

SNOTEL

- > 150%
- 131 - 150%
- 111 - 130%
- 91 - 110%

- 71 - 90%
- 51 - 70%
- 1 - 50%
- \*

Snowcourse

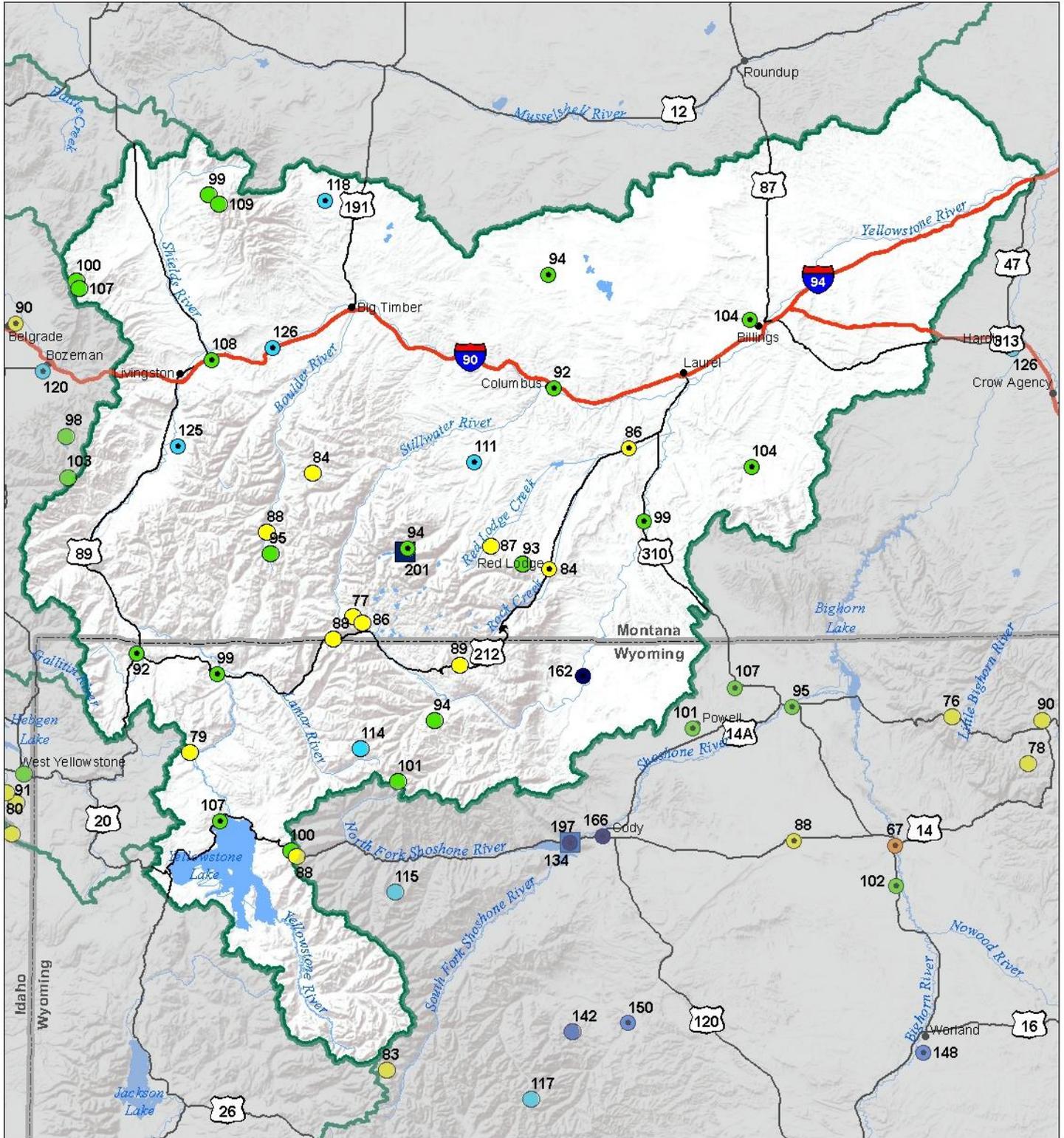
- + > 150%
- + 131 - 150%
- + 111 - 130%
- + 91 - 110%
- + 71 - 90%
- + 51 - 70%
- + 1 - 50%
- + \*

### Streamflow Forecast Percent of Average Flows

- ▲ > 150%
- ▲ 131 - 150%
- ▲ 111 - 130%
- ▲ 91 - 110%
- ▲ 71 - 90%
- ▲ 51 - 70%
- ▲ 1 - 50%



# Upper Yellowstone River Basin Water Year to Date Precipitation and Reservoir Levels Percentage of Normal May 1, 2016



### Precipitation Percent of Normal

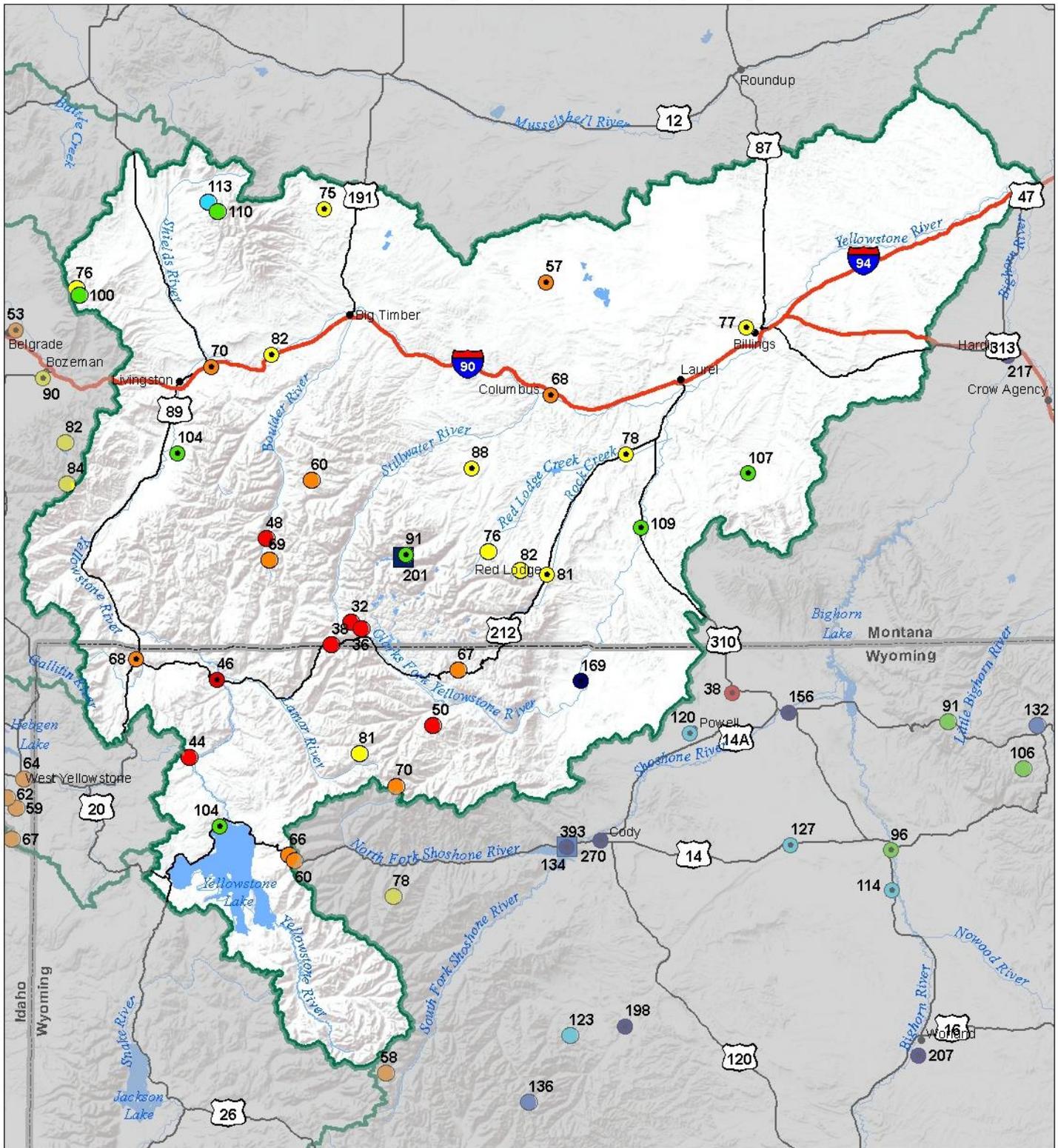
SNOTEL		COOP/ACIS	
<span style="color: blue;">●</span> > 150%	<span style="color: yellow;">●</span> 71 - 90%	<span style="color: blue;">●</span> > 150%	<span style="color: yellow;">●</span> 71 - 90%
<span style="color: lightblue;">●</span> 131 - 150%	<span style="color: orange;">●</span> 51 - 70%	<span style="color: lightblue;">●</span> 131 - 150%	<span style="color: orange;">●</span> 51 - 70%
<span style="color: cyan;">●</span> 111 - 130%	<span style="color: red;">●</span> 1 - 50%	<span style="color: cyan;">●</span> 111 - 130%	<span style="color: red;">●</span> 1 - 50%
<span style="color: green;">●</span> 91 - 110%		<span style="color: green;">●</span> 91 - 110%	

### Reservoirs Percent of Normal

<span style="color: darkblue;">■</span> > 150%
<span style="color: blue;">■</span> 131 - 150%
<span style="color: lightblue;">■</span> 111 - 130%
<span style="color: green;">■</span> 91 - 110%
<span style="color: yellow;">■</span> 71 - 90%
<span style="color: orange;">■</span> 51 - 70%
<span style="color: red;">■</span> 1 - 50%



# Upper Yellowstone River Basin Monthly Precipitation and Reservoir Levels Percentage of Normal May 1, 2016 (April 1, 2016 - May 1, 2016)



### Precipitation Percent of Normal

SNOTEL		COOP/ACIS	
● > 150%	● 71 - 90%	● > 150%	● 71 - 90%
● 131 - 150%	● 51 - 70%	● 131 - 150%	● 51 - 70%
● 111 - 130%	● 1 - 50%	● 111 - 130%	● 1 - 50%
● 91 - 110%		● 91 - 110%	

### Reservoirs Percent of Normal

■ > 150%
■ 131 - 150%
■ 111 - 130%
■ 91 - 110%
■ 71 - 90%
■ 51 - 70%
■ 1 - 50%



## Upper Yellowstone River Basin Streamflow Forecasts - May 1, 2016

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

UPPER YELLOWSTONE RIVER BASIN	Forecast Period	90% (KAF)	70% (KAF)	50% (KAF)	% Avg	30% (KAF)	10% (KAF)	30yr Avg (KAF)
Yellowstone R at Yellowstone Lake Outlet	MAY-JUL	335	395	435	80%	475	535	545
	MAY-SEP	455	530	580	79%	630	705	735
Yellowstone R at Corwin Springs	MAY-JUL	955	1110	1210	82%	1310	1470	1480
	MAY-SEP	1120	1300	1430	81%	1560	1740	1770
Yellowstone R at Livingston	MAY-JUL	1060	1240	1370	82%	1500	1690	1670
	MAY-SEP	1250	1480	1630	81%	1780	2010	2010
Shields R nr Livingston	MAY-JUL	26	65	92	85%	119	158	108
	MAY-SEP	26	71	101	82%	131	176	123
Boulder R at Big Timber	MAY-JUL	169	200	220	81%	240	270	270
	MAY-SEP	175	210	235	81%	260	295	290
Mystic Lake Inflow <sup>2</sup>	MAY-JUL	44	48	51	89%	54	58	57
	MAY-SEP	54	61	65	90%	69	76	72
Stillwater R nr Absarokee <sup>2</sup>	MAY-JUL	275	325	360	86%	395	445	420
	MAY-SEP	320	385	425	86%	465	530	495
Clarks Fk Yellowstone R nr Belfry	MAY-JUL	345	385	415	86%	440	485	480
	MAY-SEP	360	410	445	85%	480	530	525
Cooney Reservoir Inflow	MAY-JUL	8.3	18.2	25	76%	32	42	33
	MAY-SEP	14.8	26	33	77%	40	51	43
Yellowstone R at Billings	MAY-JUL	1740	2150	2430	81%	2710	3120	3000
	MAY-SEP	1950	2460	2800	80%	3150	3660	3490

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

2) Forecasts are for unimpaired flows. Actual flow will be dependent on management of upstream reservoirs and diversions

3) Median value used in place of average

Reservoir Storage End of April, 2016	Current (KAF)	Last Year (KAF)	Average (KAF)	Capacity (KAF)
Mystic Lake	1.1	0.3	0.6	21.0
Cooney Res	26.0	23.6	21.9	27.4
Basin-wide Total	27.1	23.8	22.5	48.4
# of reservoirs	2	2	2	2

Watershed Snowpack Analysis May 1, 2016	# of Sites	% Median	Last Year % Median
YELLOWSTONE ab LIVINGSTON	10	72	62
SHIELDS	4	81	72
BOULDER-STILLWATER	3	75	74
RED LODGE-ROCK CREEK	5	73	89
CLARK'S FORK	7	85	83
UPPER YELLOWSTONE RIVER BASIN	26	77	71

# Lower Yellowstone River Basin



After March ended with well above normal snow accumulation in the Lower Yellowstone basin, it looked as though the snowpack in the sub-basins had reached their seasonal peaks by April 1<sup>st</sup>. Rapid melt ensued and the snowpack at the lower elevation SNOTEL sites in the basin had completely melted out by mid-month. Winter reared its lovely head again around April 17<sup>th</sup> when moisture and cooler temperatures returned to the region. The storms were mainly focused over the Big Horn and Wind River mountain ranges where they delayed melt and postponed the seasonal snowpack peak to May 1<sup>st</sup> for both the Tongue and Powder River basins. Despite setting record low snowpack totals early in the season, peak snowpack ended up at 88% of the average peak in the Tongue and 91% in the Powder. On the west side of the basin nominal amounts of snow accumulated during the late April storms, but the cooler temperatures aided in slowing melt rates. The snowpack in the Shoshone River basin reached its peak on March 31<sup>st</sup> at 87% of the average peak; the basin typically peaks in mid-April. As a whole the Lower Yellowstone hit its peak snow water equivalent on April 1<sup>st</sup> and again on May 1<sup>st</sup>! On average the snowpack in the basin peaks on April 11<sup>th</sup> and this year's peak value came in below normal at 88% of the average peak. As of May 1<sup>st</sup> the snowpack in the basin was at 102% of normal.

For the second month in a row, the Lower Yellowstone River basin received well above average precipitation in the mountains and valleys. In the Bighorn, Tongue & Powder sub-basins April outdid March in terms of monthly precipitation totals and recorded the highest monthly precipitation totals for this water year. In the Wind River basin precipitation received in April was slightly less than March with both months reporting well above average totals. The Shoshone River basin is the only sub-basin that recorded totals that were below average for April, at just 69%; the Powder River basin had the highest monthly total as a percent at 140% of average. The moisture the Lower Yellowstone basin received the past two months was just what the doctor ordered to boost water year-to-date precipitation percentages. For the entire basin year-to-date precipitation in the mountains and valleys is now at 108% of average.

Reservoir storage in the basin remains in good condition with totals remaining above normal for this time of year and at 60% of capacity.

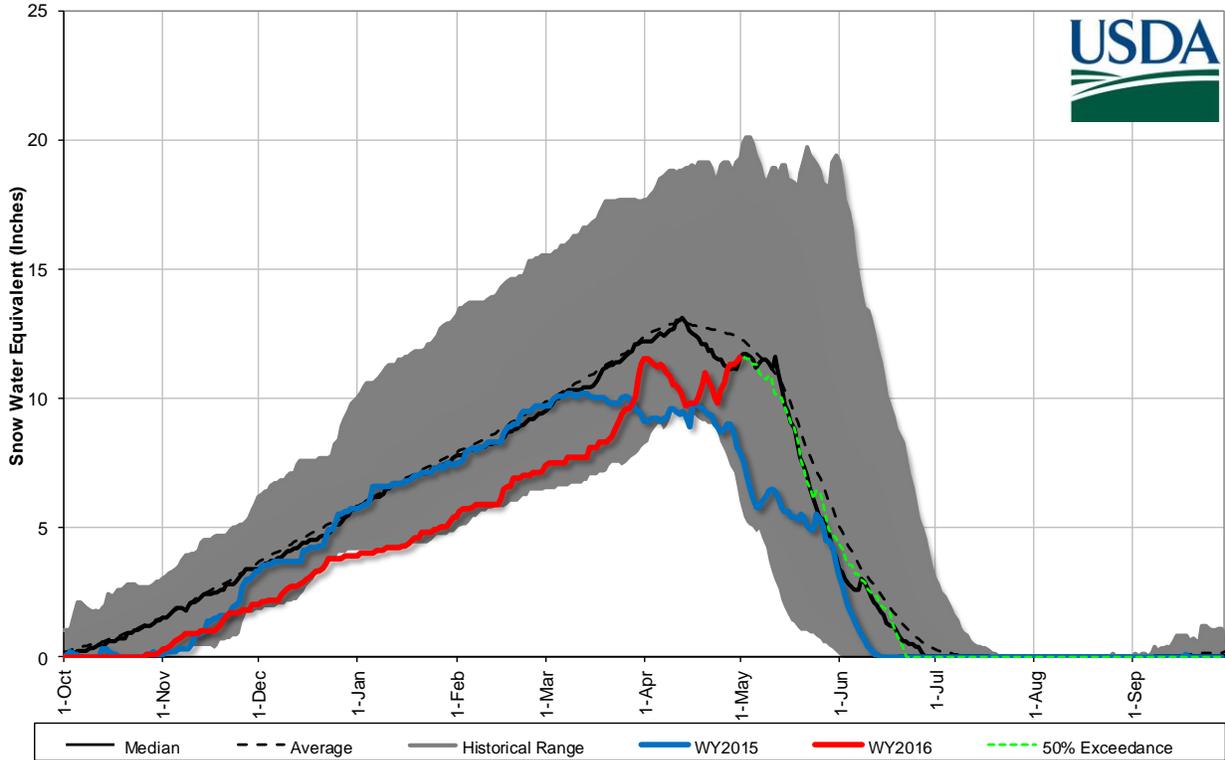
Streamflow volumes are now expected to be closer to normal for the remainder of the runoff season, but forecasts vary greatly across the basin. Please consult the table at the end of this section for individual forecast points. Current basin-wide forecasts at the 50 percent exceedance are 91 percent of average for the May-July time period.

<b>Lower Yellowstone River Basin Data Summary</b>		<b>5/1/2016</b>	
<b>Snowpack</b>	Percent of 1981-2010 Normal (Median)	Last Year Percentage of Normal (Median)	
Basin-Wide	101%	70%	
<b>Precipitation</b>	Monthly Percentage of Average	WYTD Percentage of 1981-2010 Average*	Last Year Percentage of Average
Mountain Precipitation	118%	97%	83%
Valley Precipitation	205%	129%	90%
Basin Precipitation	153%	108%	85%
<b>Reservoir Storage</b>	Percentage of Average	Percentage of Capacity (Total)	Last Year Percentage of Average
Basin-Wide Storage	106%	60%	110%
<b>Streamflow Forecast</b>	50 % Exceedance Forecast Percentage of Average	50 % Exceedance Forecast % of Last Year's Flows	Last Year Percentage of Average
Basin-Wide Apr-July	91%	84%	109%

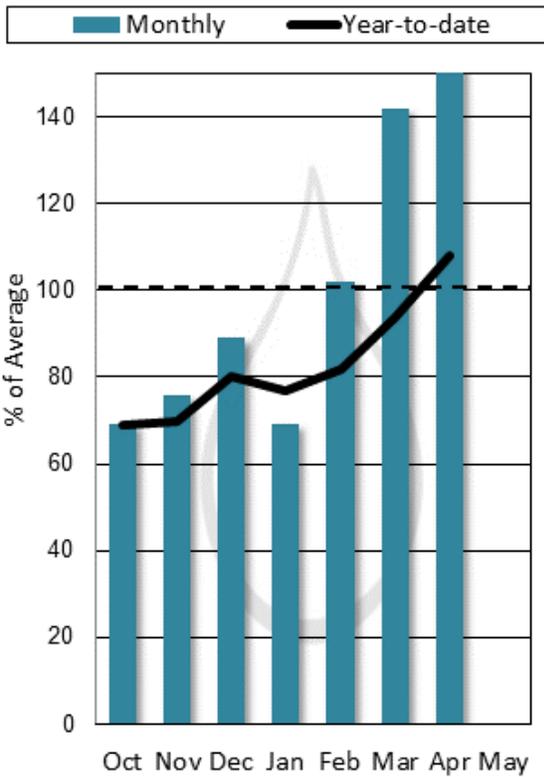
\*Water Year-to-Date (WYTD) Precipitation is October 1st - Current

\*\*Basin-wide streamflows are an average of the individual streamflow points within the basin for the 50 percent exceedance forecast. Consult the individual streamflow forecasts in the table below for the range of forecasts at an individual point.

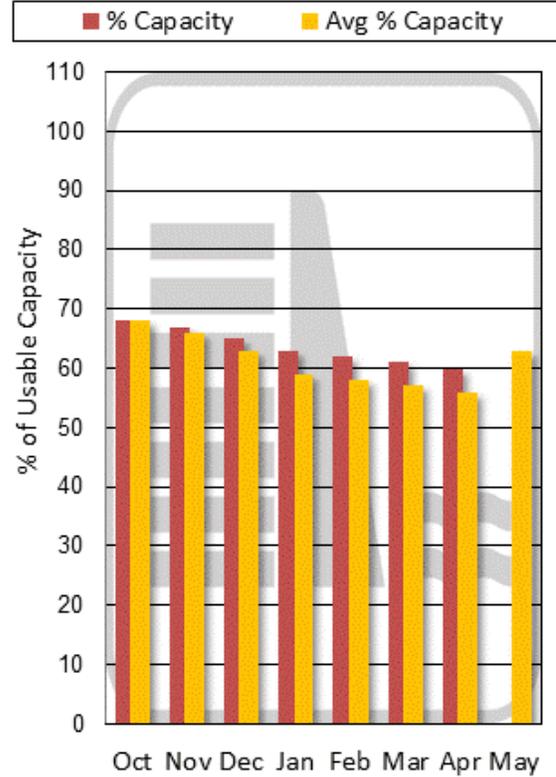
**Lower Yellowstone River Basin Snowpack with Non-Exceedance Projections**  
*Based on provisional SNOTEL daily data as of 5/1/2016*



**Mountain and Valley Precipitation**

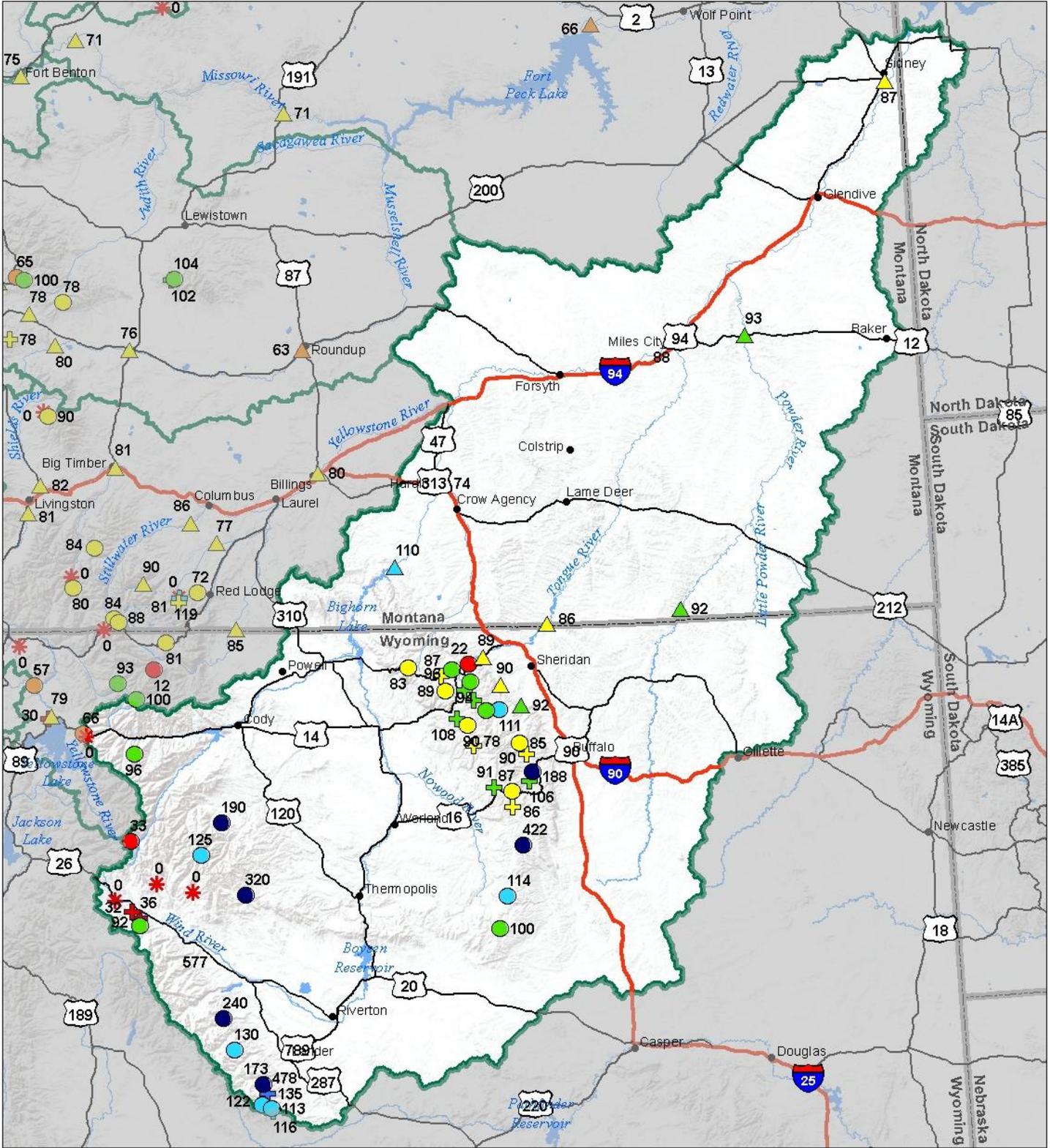


**End of Month Reservoir Storage**



Storage above is averaged for all reservoirs in the basin. For individual reservoirs see table below.

# Lower Yellowstone River Basin Streamflow Forecast, Snow Water Equivalent Percentage of Normal May 1, 2016



### Snow Water Equivalent Percent of Normal

SN OTEL		Snowcourse	
● > 150%	● 71 - 90%	⊕ > 150%	⊕ 71 - 90%
● 131 - 150%	● 51 - 70%	⊕ 131 - 150%	⊕ 51 - 70%
● 111 - 130%	● 1 - 50%	⊕ 111 - 130%	⊕ 1 - 50%
● 91 - 110%	* 0%	⊕ 91 - 110%	* 0%

### Streamflow Forecast Percent of Average Flows

▲ > 150%
▲ 131 - 150%
▲ 111 - 130%
▲ 91 - 110%
▲ 71 - 90%
▲ 51 - 70%
▲ 1 - 50%

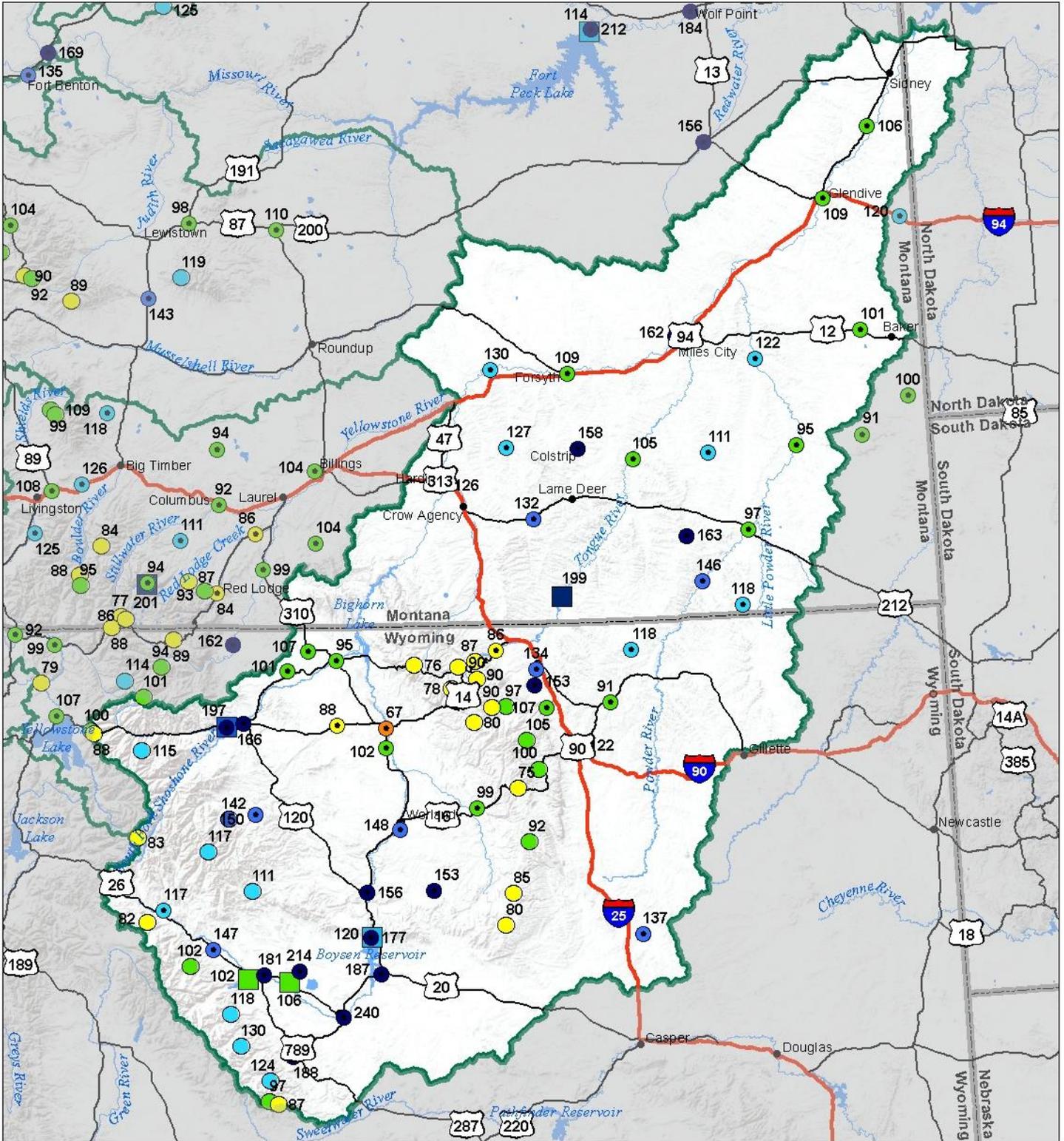


# Lower Yellowstone River Basin

## Water Year to Date Precipitation and Reservoir Levels

### Percentage of Normal

#### May 1, 2016



### Precipitation Percent of Normal

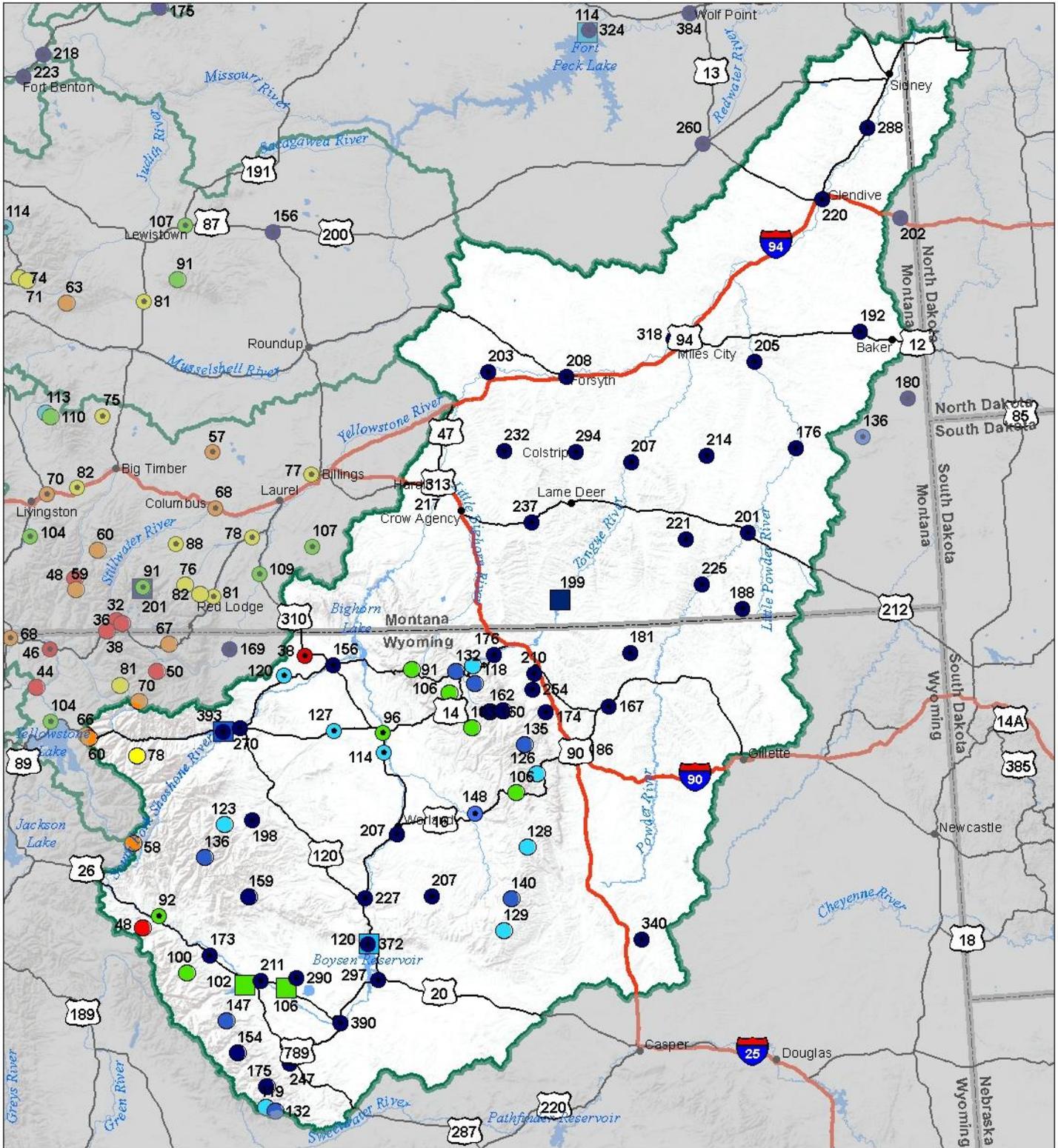
SNOTEL		COOP/ACIS	
<span style="color: blue;">●</span> > 150%	<span style="color: yellow;">●</span> 71 - 90%	<span style="color: blue;">●</span> > 150%	<span style="color: yellow;">●</span> 71 - 90%
<span style="color: lightblue;">●</span> 131 - 150%	<span style="color: orange;">●</span> 51 - 70%	<span style="color: lightblue;">●</span> 131 - 150%	<span style="color: orange;">●</span> 51 - 70%
<span style="color: cyan;">●</span> 111 - 130%	<span style="color: red;">●</span> 1 - 50%	<span style="color: cyan;">●</span> 111 - 130%	<span style="color: red;">●</span> 1 - 50%
<span style="color: green;">●</span> 91 - 110%		<span style="color: green;">●</span> 91 - 110%	

### Reservoirs Percent of Normal

<span style="color: darkblue;">■</span> > 150%
<span style="color: blue;">■</span> 131 - 150%
<span style="color: lightblue;">■</span> 111 - 130%
<span style="color: green;">■</span> 91 - 110%
<span style="color: yellow;">■</span> 71 - 90%
<span style="color: orange;">■</span> 51 - 70%
<span style="color: red;">■</span> 1 - 50%



**Lower Yellowstone River Basin  
Monthly Precipitation and Reservoir Levels  
Percentage of Normal  
May 1, 2016 (April 1, 2016 - May 1, 2016)**



**Precipitation  
Percent of Normal**

**SNOTEL**

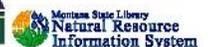
- > 150%
- 131 - 150%
- 111 - 130%
- 91 - 110%
- 71 - 90%
- 51 - 70%
- 1 - 50%

**COOP/ACIS**

- > 150%
- 131 - 150%
- 111 - 130%
- 91 - 110%
- 71 - 90%
- 51 - 70%
- 1 - 50%

**Reservoirs  
Percent of Normal**

- > 150%
- 131 - 150%
- 111 - 130%
- 91 - 110%
- 71 - 90%
- 51 - 70%
- 1 - 50%



## Lower Yellowstone River Basin (Wyoming) Streamflow Forecasts - May 1, 2016

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

LOWER YELLOWSTONE RIVER BASIN (Wyoming)	Forecast Period	90% (KAF)	70% (KAF)	50% (KAF)	% Avg	30% (KAF)	10% (KAF)	30yr Avg (KAF)
Bighorn R nr St. Xavier <sup>2</sup>	MAY-JUL	1000	1240	1390	110%	1550	1790	1260
	MAY-SEP	1040	1300	1480	110%	1660	1920	1340
Little Bighorn R nr Hardin	MAY-JUL	31	49	61	72%	73	91	85
	MAY-SEP	40	59	72	74%	85	104	97
Tongue R nr Dayton <sup>2</sup>	MAY-JUL	43	59	70	88%	81	97	80
	MAY-SEP	53	70	82	89%	93	111	92
Big Goose Ck nr Sheridan	MAY-JUL	25	34	39	89%	44	53	44
	MAY-SEP	33	41	47	90%	53	61	52
Little Goose Ck nr Bighorn	MAY-JUL	18.7	24	27	93%	30	35	29
	MAY-SEP	25	30	34	92%	38	43	37
Tongue River Reservoir Inflow <sup>2</sup>	MAY-JUL	60	114	150	86%	186	240	175
	MAY-SEP	75	132	171	86%	210	265	198
Yellowstone R at Miles City <sup>2</sup>	MAY-JUL	2940	3500	3880	89%	4270	4830	4370
	MAY-SEP	3170	3910	4420	88%	4930	5670	5030
Powder R at Moorehead	MAY-JUL	53	104	139	92%	174	225	151
	MAY-SEP	67	121	157	92%	193	245	170
Powder R nr Locate	MAY-JUL	44	109	153	93%	197	260	164
	MAY-SEP	53	124	172	93%	220	290	185
Yellowstone R nr Sidney <sup>2</sup>	MAY-JUL	2740	3410	3870	88%	4330	5000	4380
	MAY-SEP	2830	3720	4330	87%	4940	5830	4980

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

2) Forecasts are for unimpaired flows. Actual flow will be dependent on management of upstream reservoirs and diversions

3) Median value used in place of average

Reservoir Storage End of April, 2016	Current (KAF)	Last Year (KAF)	Average (KAF)	Capacity (KAF)
Bighorn Lake	791.0	825.3	773.6	1356.0
Tongue River Res	69.0	66.5	34.7	79.1
Basin-wide Total	860.0	891.9	808.3	1435.1
# of reservoirs	2	2	2	2

Watershed Snowpack Analysis May 1, 2016	# of Sites	% Median	Last Year % Median
WIND RIVER (Wyoming)	17	117	64
SHOSHONE RIVER (Wyoming)	4	82	60
BIGHORN RIVER (Wyoming)	16	95	69
LITTLE BIGHORN (Wyoming)	3	88	84
TONGUE RIVER (Wyoming)	10	93	82
POWDER RIVER (Wyoming)	7	104	73
LOWER YELLOWSTONE RIVER BASIN (Wyoming)	42	101	70

## Data Summary (SNOTEL and Snowcourse)

Site Name	Network	Elevation (ft)	Depth (in)	SWE (in)	Median (in)	% Median	Last Year SWE (in)	Last Year % Median
Albro Lake	SNOTEL	8300	46	17.1	18.9	90	14.6	77
Ambrose	SC	6480			9.6		0.9	9
Arch Falls	SC	7350	25	8.5	10.7	79	4.1	38
Ashley Divide	SC	4820	0	0.0	0.0		0.0	
Badger Pass	SNOTEL	6900	41	18.8	29.4	64	22.6	77
Banfield Mountain	SNOTEL	5600	5	2.7	13.1	21	1.6	12
Baree Creek	SC	5500	54	25.3	34.8	73	15.4	44
Baree Midway	SC	4600	33	14.2	22.7	63	4.5	20
Baree Trail	SC	3800	0	0.0	0.0		0.0	
Barker Lakes	SNOTEL	8250	53	15.6	16.3	96	13.0	80
Basin Creek	SNOTEL	7180	25	8.5	9.0	94	6.8	76
Bassoo Peak	SC	5150	0	0.0	0.0		0.0	
Beagle Springs	SNOTEL	8850	27	9.5	8.7	109	2.7	31
Bear Basin	SC	8150	42	16.8	17.2	98		
Bear Mountain	SNOTEL	5400	73	38.6	53.7	72	18.3	34
Beartooth Lake	SNOTEL	9360	56	18.5	22.8	81	20.6	90
Beaver Creek	SNOTEL	7850	43	15.2	18.2	84	10.5	58
Big Snowy	SC	7150	56	21.1	20.6	102	18.5	90
Bisson Creek	SNOTEL	4920	0	0.0	4.3	0	0.0	0
Black Bear	SNOTEL	8170	72	30.2	37.4	81	21.4	57
Black Mountain	SC	7750	43	16.4	15.9	103	11.8	74
Black Pine	SNOTEL	7210	3	1.5	8.5	18	0.0	0
Blacktail	SC	5650	0	0.0	7.0	0	0.0	0
Blacktail Mtn	SNOTEL	5650	0	0.0			0.0	
Bloody Dick	SNOTEL	7600	30	10.7	8.5	126	5.0	59
Bots Sots	SC	7750	0	0.0	4.5	0	0.0	0
Boulder Mountain	SNOTEL	7950	56	19.7	20.9	94	14.1	67
Box Canyon	SNOTEL	6670	0	0.0	3.0	0	0.0	0
Boxelder Creek	SC	5100	0	0.0	1.6	0	0.0	0
Brackett Creek	SNOTEL	7320	40	17.1	20.1	85	18.5	92
Bristow Creek	SC	3900						
Brush Creek Timber	SC	5000	0	0.0	1.0	0	0.0	0
Bull Mountain	SC	6600			0.0		0.0	
Burnt Mtn	SNOTEL	5880	0	0.0	0.0		0.0	
Cabin Creek	SC	5200	0	0.0	0.2	0	0.0	0
Calvert Creek	SNOTEL	6430	0	0.0	0.7	0	0.0	0
Camp Senia	SC	7890	21	6.4	5.4	119	10.8	200
Canyon	SNOTEL	7870	16	5.9	10.4	57	3.6	35
Carrot Basin	SNOTEL	9000	69	25.7	28.6	90	18.0	63
Chessman Reservoir	SC	6200	0	0.0	0.4	0	0.2	50
Chicago Ridge	SC	5800	60	27.0			18.8	
Chicken Creek	SC	4060	0	0.0	4.8	0	0.4	8
Clover Meadow	SNOTEL	8600	43	14.0	17.4	80	11.9	68

Site Name	Network	Elevation (ft)	Depth (in)	SWE (in)	Median (in)	% Median	Last Year SWE (in)	Last Year % Median
Cole Creek	SNOTEL	7850	40	12.0	16.6	72	13.8	83
Combination	SNOTEL	5600	0	0.0	0.0		0.0	
Copper Bottom	SNOTEL	5200	0	0.0			0.0	
Copper Camp	SNOTEL	6950	40	20.0			20.1	
Copper Mountain	SC	7700	25	7.4	9.6	77	11.2	117
Cottonwood Creek	SC	6400	5	1.3	7.8	17	0.0	0
Coyote Hill	SC	4200	0	0.0	0.0		0.0	
Crevice Mountain	SC	8400						
Crystal Lake	SNOTEL	6050	31	11.8	11.3	104	8.1	72
Dad Creek Lake	SC	8800			15.6			
Daisy Peak	SNOTEL	7600	28	8.0	10.2	78	10.1	99
Daly Creek	SNOTEL	5780	0	0.0	3.3	0	0.0	0
Darkhorse Lake	SNOTEL	8600	81	33.6	30.1	112	31.3	104
Deadman Creek	SNOTEL	6450	8	3.4	5.2	65	0.0	0
Desert Mountain	SC	5600					2.8	
Discovery Basin	SC	7050	20	6.7	8.8	76	6.3	72
Divide	SNOTEL	7800	22	7.4	11.1	67	1.1	10
Dix Hill	SC	6400	0	0.0	0.2	0	0.0	0
Dupuyer Creek	SNOTEL	5750	3	0.6	6.7	9	0.0	0
Eagle Creek	SC	7000						
East Boulder Mine	SNOTEL	6335	0	0.0			0.0	
El Dorado Mine	SC	7800						
Elk Horn Springs	SC	7800	10	3.1	6.7	46	2.2	33
Elk Peak	SNOTEL	7600	46	19.2			15.9	
Elk Peak	SC	8000	35	11.9	15.2	78	13.0	86
Emery Creek	SNOTEL	4350	0	0.0	5.7	0	0.0	0
Fatty Creek	SC	5500	37	17.5	20.9	84	15.7	75
Fish Creek	SC	8000			11.0		8.7	79
Fisher Creek	SNOTEL	9100	67	27.6	32.7	84	29.4	90
Flattop Mtn.	SNOTEL	6300	89	37.8	42.2	90	34.0	81
Fleecer Ridge	SC	7500			8.0		2.6	33
Foolhen	SC	8280	37	13.4	15.4	87		
Forest Lake	SC	6400						
Four Mile	SC	6900	6	2.2	4.6	48	0.6	13
Freight Creek	SC	6000	4	1.3	9.0	14	0.5	6
Frohner Meadow	SNOTEL	6480	0	0.0	6.4	0	0.0	0
Garver Creek	SNOTEL	4250	0	0.0	1.9	0	0.6	32
Gibbons Pass	SC	7100						
Goat Mountain	SC	7000			5.4			
Government Saddle	SC	5270	56	24.8			13.8	
Grave Creek	SNOTEL	4300	0	0.0	5.0	0	0.0	0
Griffin Creek Divide	SC	5150	0	0.0	2.0	0	0.0	0
Hand Creek	SNOTEL	5035	0	0.0	5.5	0	0.0	0
Hawkins Lake	SNOTEL	6450	45	20.3	25.9	78	19.5	75
Haymaker	SC	8050						

Site Name	Network	Elevation (ft)	Depth (in)	SWE (in)	Median (in)	% Median	Last Year SWE (in)	Last Year % Median
Hebgen Dam	SC	6550	0	0.0	3.7	0	0.0	0
Hell Roaring Divide	SC	5770	49	22.6	26.6	85	19.6	74
Herrig Junction	SC	4850	32	11.3	20.9	54	12.2	58
Highwood Divide	SC	5650						
Highwood Station	SC	4600			0.0			
Holbrook	SC	4530		0.0	0.0		0.0	
Hoodoo Basin	SNOTEL	6050	74	31.7	39.8	80	26.8	67
Humboldt Gulch	SNOTEL	4250	0	0.0	1.4	0	0.0	0
Jakes Canyon	SC	9040						
Johnson Park	SC	6450			0.0			
Kishenehn	SC	3890						
Kraft Creek	SNOTEL	4750	0	0.0			0.0	
Lake Camp	SC	7780	7	2.0	6.6	30	0.0	0
Lakeview Canyon	SC	6930			8.5		0.0	0
Lakeview Ridge	SNOTEL	7400	0	0.0	7.9	0	0.0	0
Lemhi Ridge	SNOTEL	8100	18	5.9	10.0	59	1.1	11
Lick Creek	SNOTEL	6860	23	8.7	8.7	100	5.8	67
Little Park	SC	7400	31	10.8	12.6	86	8.2	65
Logan Creek	SC	4300	0	0.0	0.0		0.0	
Lolo Pass	SNOTEL	5240	18	8.9	17.2	52	7.9	46
Lone Mountain	SNOTEL	8880	44	17.7	18.5	96	13.4	72
Lookout	SNOTEL	5140	13	5.8	22.7	26	0.0	0
Lower Twin	SNOTEL	7900	56	19.3	18.4	105	15.8	86
Lubrecht Flume	SNOTEL	4680	0	0.0	0.0		0.0	
Lubrecht Forest No 3	SC	5450	0	0.0	0.0		0.0	
Lubrecht Forest No 4	SC	4650	0	0.0	0.0		0.0	
Lubrecht Forest No 6	SC	4040	0	0.0	0.0		0.0	
Lubrecht Hydroplot	SC	4200	0	0.0	0.0		0.0	
Lupine Creek	SC	7380	0	0.0	1.2	0		
Madison Plateau	SNOTEL	7750	44	17.1	21.3	80	9.6	45
Many Glacier	SNOTEL	4900	0	0.0	0.6	0	0.0	0
Marias Pass	SC	5250	1	0.4	10.4	4	0.0	0
Mineral Creek	SC	4000	0	0.0	6.5	0	0.0	0
Monument Peak	SNOTEL	8850	46	16.7	21.0	80	16.7	80
Moss Peak	SNOTEL	6780	81	37.4	38.7	97	40.2	104
Moulton Reservoir	SC	6850			1.5		0.0	0
Mount Allen No 7	SC	5700	50	22.5	35.0	64	15.5	44
Mount Lockhart	SNOTEL	6400	27	10.6	16.9	63	11.3	67
Mudd Lake	SC	7650			16.2			
Mule Creek	SNOTEL	8300	45	15.0	16.1	93	14.5	90
N Fk Elk Creek	SNOTEL	6250	5	2.3	7.5	31	2.3	31
Nevada Ridge	SNOTEL	7020	24	9.5	12.3	77	7.8	63
New World	SC	6900	20	7.3				
Nez Perce Camp	SNOTEL	5650	5	3.8	9.7	39	3.8	39

Site Name	Network	Elevation (ft)	Depth (in)	SWE (in)	Median (in)	% Median	Last Year SWE (in)	Last Year % Median
Noisy Basin	SNOTEL	6040	85	39.6	44.0	90	40.5	92
Norris Basin	SC	7550			5.4			
North Fork Jocko	SNOTEL	6330	68	32.5	38.2	85	28.0	73
Northeast Entrance	SNOTEL	7350	0	0.0	3.0	0	0.0	0
Onion Park	SNOTEL	7410	29	11.7	13.5	87	12.0	89
Ophir Park	SC	7150	17	6.6	13.8	48	3.5	25
Parker Peak	SNOTEL	9400	55	19.8	21.3	93	16.5	77
Peterson Meadows	SNOTEL	7200	34	11.6	10.7	108	6.5	61
Pickfoot Creek	SNOTEL	6650	0	0.0	3.7	0	0.0	0
Pike Creek	SNOTEL	5930	0	0.0			0.0	
Pipestone Pass	SC	7200	3	1.1	3.4	32	1.5	44
Placer Basin	SNOTEL	8830	46	14.7	17.6	84	14.1	80
Poorman Creek	SNOTEL	5100	42	20.7	28.2	73	5.9	21
Porcupine	SNOTEL	6500	0	0.0	0.8	0	0.0	0
Potomageton Park	SC	7150	6	2.4	7.1	34	0.0	0
Revais	SC	4800	0	0.0	0.0		0.0	
Rock Creek Mdws	SC	3400	0	0.0			0.0	
Rocker Peak	SNOTEL	8000	44	14.4	14.9	97	14.5	97
Rocky Boy	SNOTEL	4700	0	0.0	0.0		0.0	
Roland Summit	SC	5120						
S Fork Shields	SNOTEL	8100	44	16.0	17.8	90	13.8	78
Sacajawea	SNOTEL	6550	14	6.6	10.3	64	2.8	27
Saddle Mtn.	SNOTEL	7940	53	22.9	22.5	102	20.1	89
Short Creek	SNOTEL	7000	0	0.0	3.8	0	0.0	0
Shower Falls	SNOTEL	8100	60	22.3	23.9	93	21.1	88
Skalkaho Summit	SNOTEL	7250	31	12.7	22.1	57	12.0	54
Sleeping Woman	SNOTEL	6150	8	3.3	11.0	30	4.0	36
Slide Rock Mountain	SC	7100	23	9.9	13.0	76	7.8	60
Spotted Bear Mountain	SC	7000	0	0.0	7.7	0	0.0	0
Spur Park	SNOTEL	8100	60	22.4	22.4	100	21.9	98
Stahl Peak	SNOTEL	6030	69	34.1	35.4	96	24.8	70
Stemple Pass	SC	6600	16	5.0	6.9	72	4.0	58
Storm Lake	SC	7780	38	12.8	14.4	89	10.8	75
Stringer Creek	SNOTEL	6550	17	6.3	8.1	78	4.1	51
Stryker Basin	SC	6180	67	30.8	30.3	102	26.3	87
Stuart Mountain	SNOTEL	7400	66	28.1	29.4	96	32.5	111
Taylor Road	SC	4080	0	0.0	0.0		0.0	
Ten Mile Lower	SC	6600	2	0.2	2.7	7	0.6	22
Ten Mile Middle	SC	6800	24	7.9	9.4	84	7.4	79
Tepee Creek	SNOTEL	8000	24	9.2	13.4	69	2.2	16
Timberline Creek	SC	8850	35	11.2	13.8	81	11.1	80
Tizer Basin	SNOTEL	6880	0	0.0	8.2	0	1.1	13
Trinkus Lake	SC	6100	70	34.2	38.8	88	35.5	91
Truman Creek	SC	4060	0	0.0	0.0		0.0	

Site Name	Network	Elevation (ft)	Depth (in)	SWE (in)	Median (in)	% Median	Last Year SWE (in)	Last Year % Median
Twelvemile Creek	SNOTEL	5600	0	0.0	3.4	0	0.0	0
Twenty-One Mile	SC	7150	22	9.0	11.3	80	0.0	0
Twin Lakes	SNOTEL	6400	58	29.8	33.0	90	26.2	79
Upper Holland Lake	SC	6200		26.8	30.4	88	21.9	72
Waldron	SNOTEL	5600	0	0.0	4.8	0	0.0	0
Warm Springs	SNOTEL	7800	63	23.3	21.4	109	22.5	105
Weasel Divide	SC	5450	42	18.5	28.8	64	17.3	60
West Yellowstone	SNOTEL	6700	0	0.0	1.8	0	0.0	0
Whiskey Creek	SNOTEL	6800	21	8.2	14.6	56	4.1	28
White Elephant	SNOTEL	7710	41	16.7	24.0	70	9.9	41
White Mill	SNOTEL	8700	48	20.9	23.8	88	22.2	93
Wolverine	SNOTEL	7650	2	0.3	2.5	12	0.0	0
Wood Creek	SNOTEL	5960	2	0.3	6.8	4	0.0	0
Wrong Creek	SC	5700	1	0.2	4.7	4	0.1	2
Wrong Ridge	SC	6800		2.0	13.0	15	5.2	40
Younts Peak	SNOTEL	8350	10	5.1	15.5	33		

*Issued by:*

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

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**Montana**  
**Water Supply Outlook**  
**Report**  
**Natural Resources Conservation Service**

