

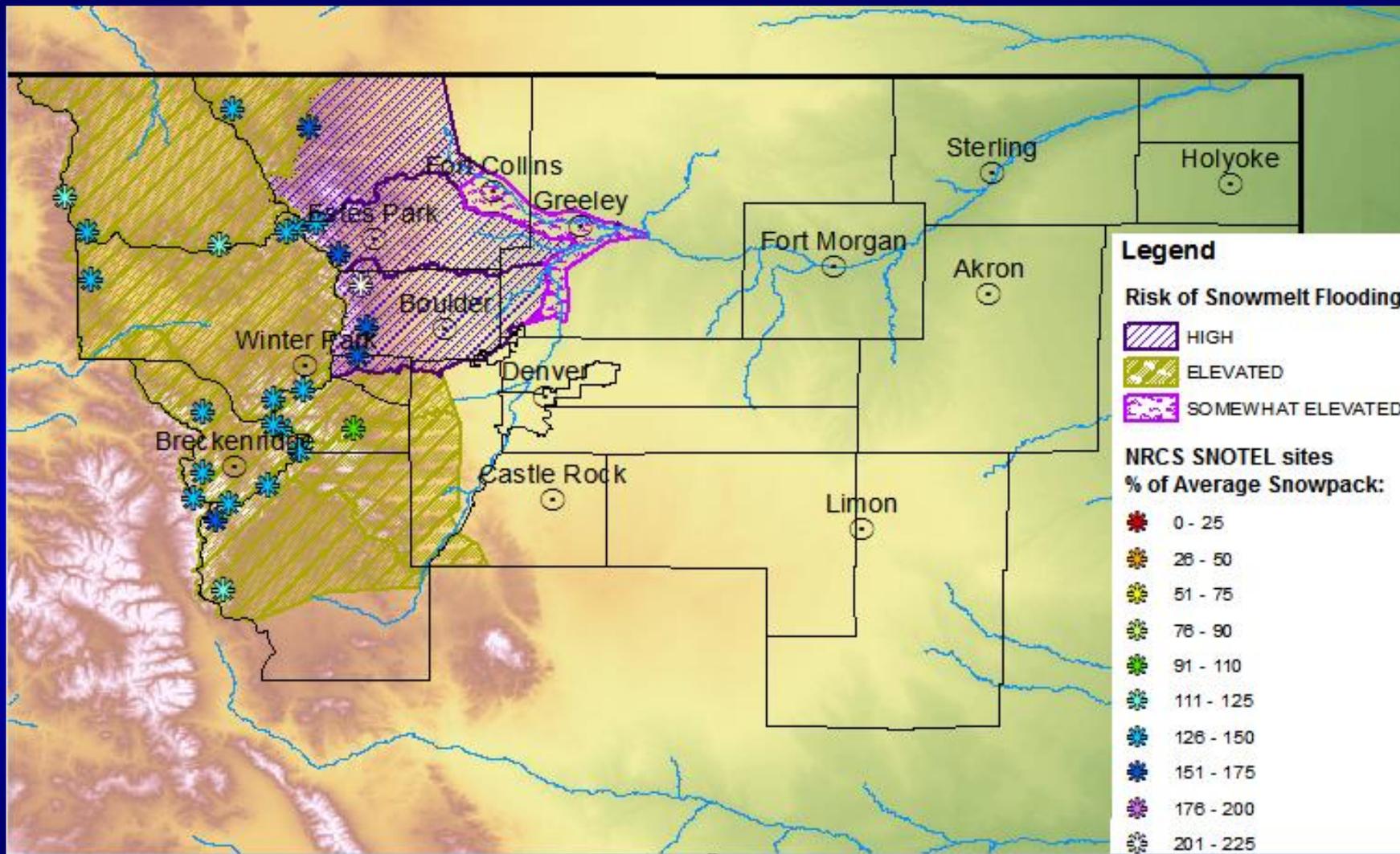
Spring Snowmelt Flood Potential Outlook

North Central & Northeast Colorado

- The potential for flooding is high in Saint Vrain (including Boulder) Creek, Big Thompson River and the upper Cache La Poudre River drainages due to the September 2013 flood combined with much above average mountain snowpack in these basins.
- The risk of spring snowmelt flooding is elevated elsewhere in the north central mountains and northern Colorado Front Range due to the above average snowpack.
- The flood risk is somewhat elevated in southwest Weld County, and also along lower Cache La Poudre River in eastern Larimer and western Weld Counties due to flooding last September.
- There is a near normal spring flood risk elsewhere on the northeast plains, and the urban corridor from Broomfield County southward.

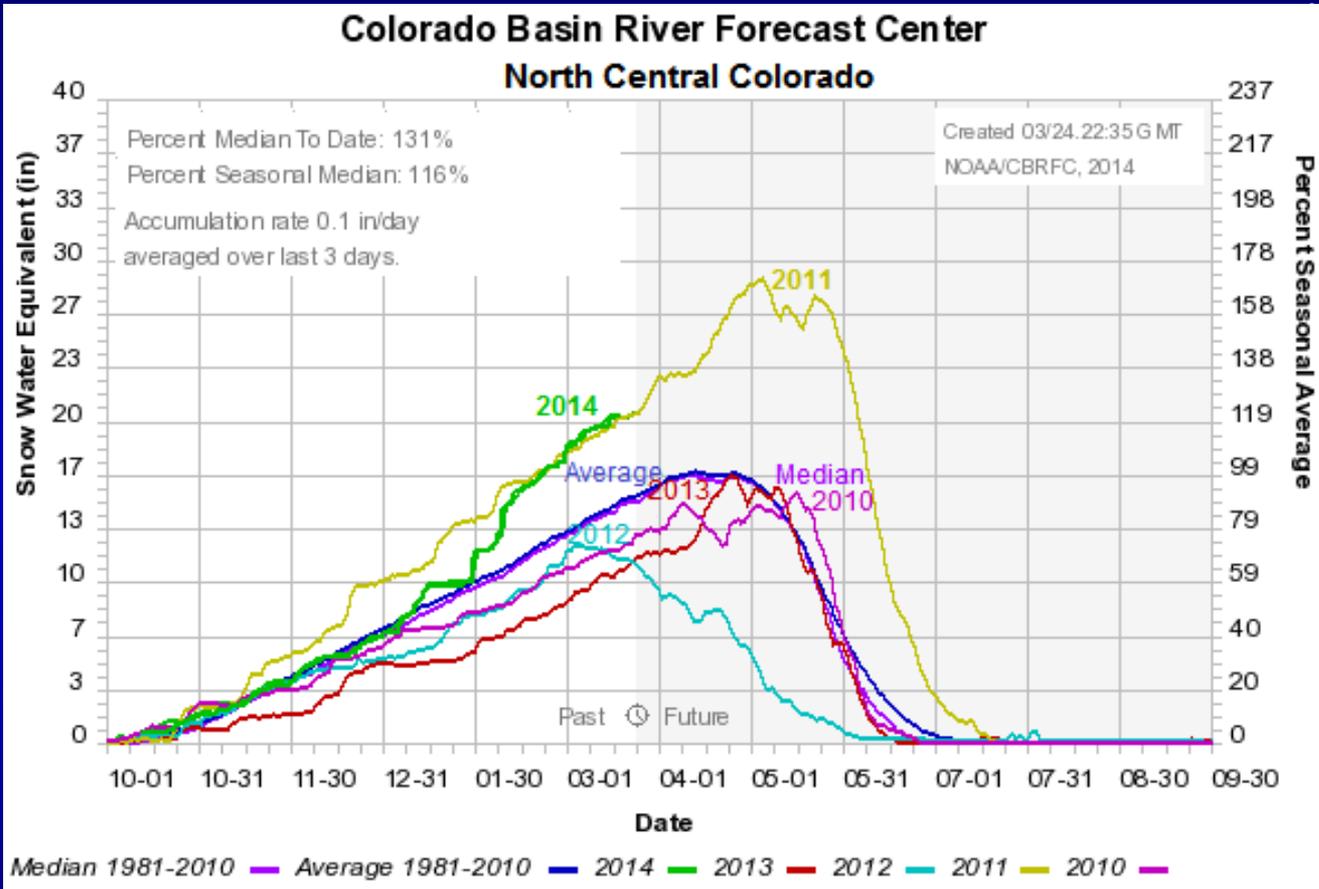
Spring Snowmelt Flood Potential Outlook Graphic

March 24th, 2014



Mountain Snowpack Timeseries Graph

(each line is one of the past 5 years)

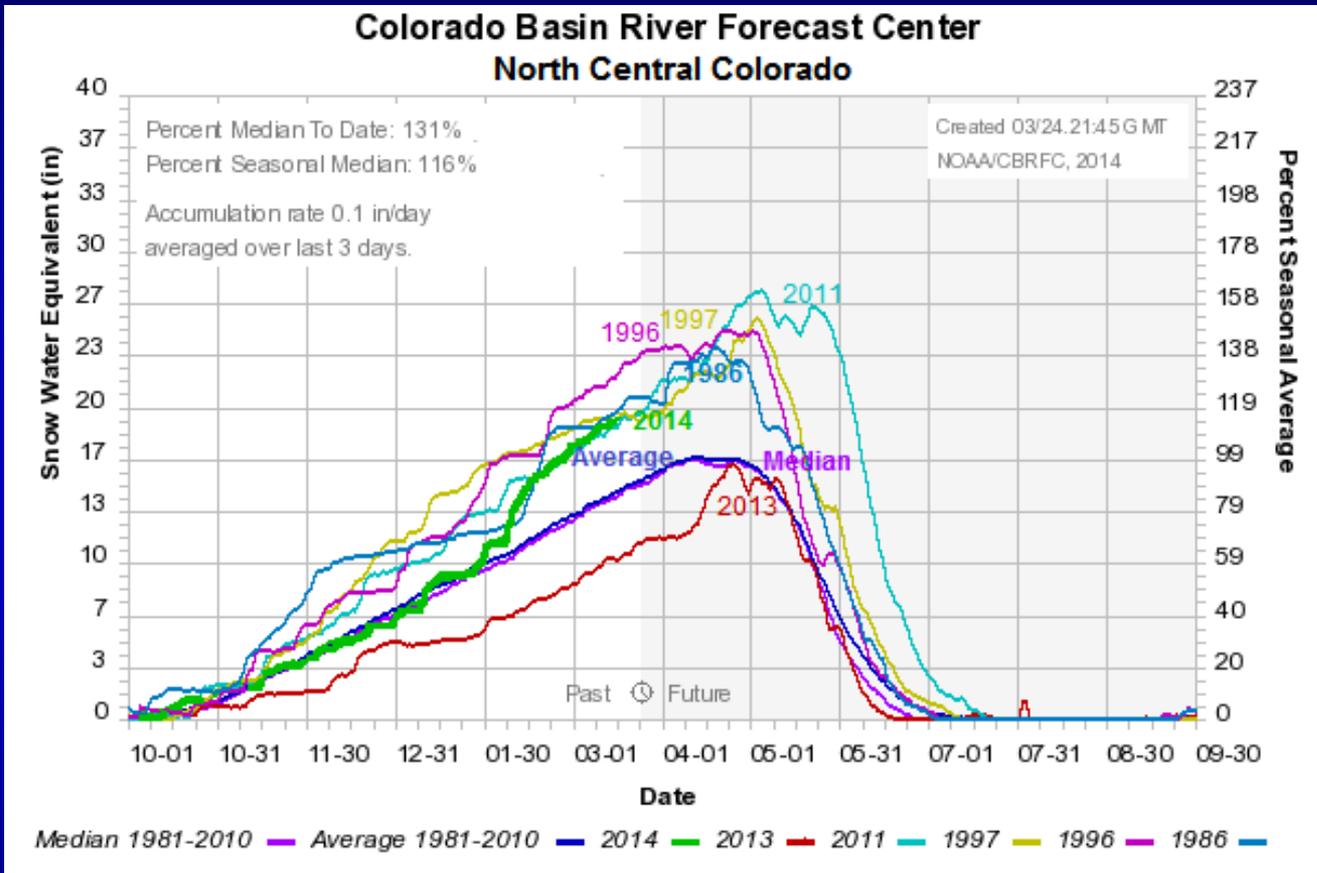


Mountain snowpack is above average. The highest snowpack compared to average was just east of the Continental Divide in the headwaters of basins severely impacted by the September 2013 floods.

* SNOTEL data for this graph provided by the NRCS.

Additional time series graphs can be produced on the Colorado Basin RFC website at: <http://www.cbrfc.noaa.gov/station/swep/plot/snowgroup.php>

Mountain Snowpack Timeseries Graph (5 highest years & 2013)



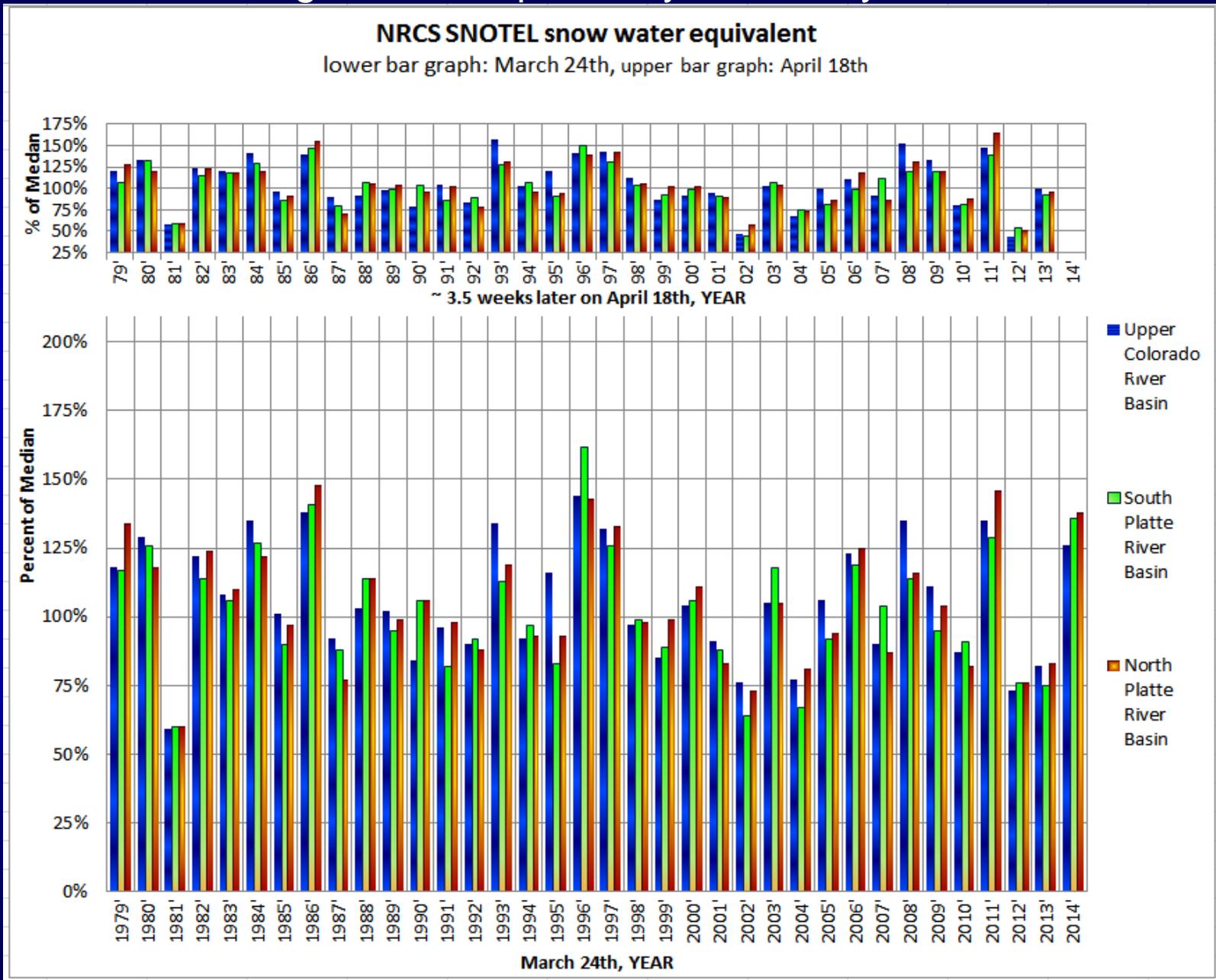
Snowpack in the north central mountains this year is running neck and neck with the snowpack in 1986, 1997 and 2011.

The current high country snowpack is already ~ 116% of the typical seasonal peak values. Roughly 15 percent of the snow accumulation season remains.

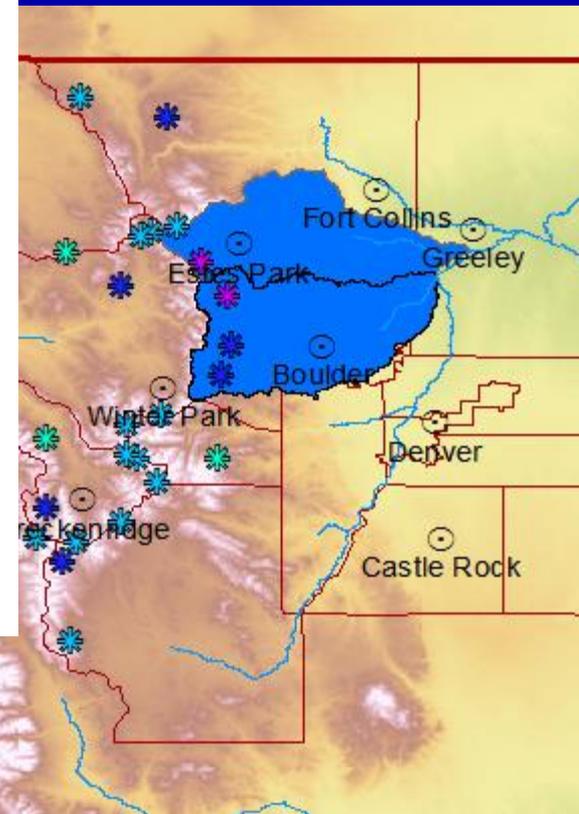
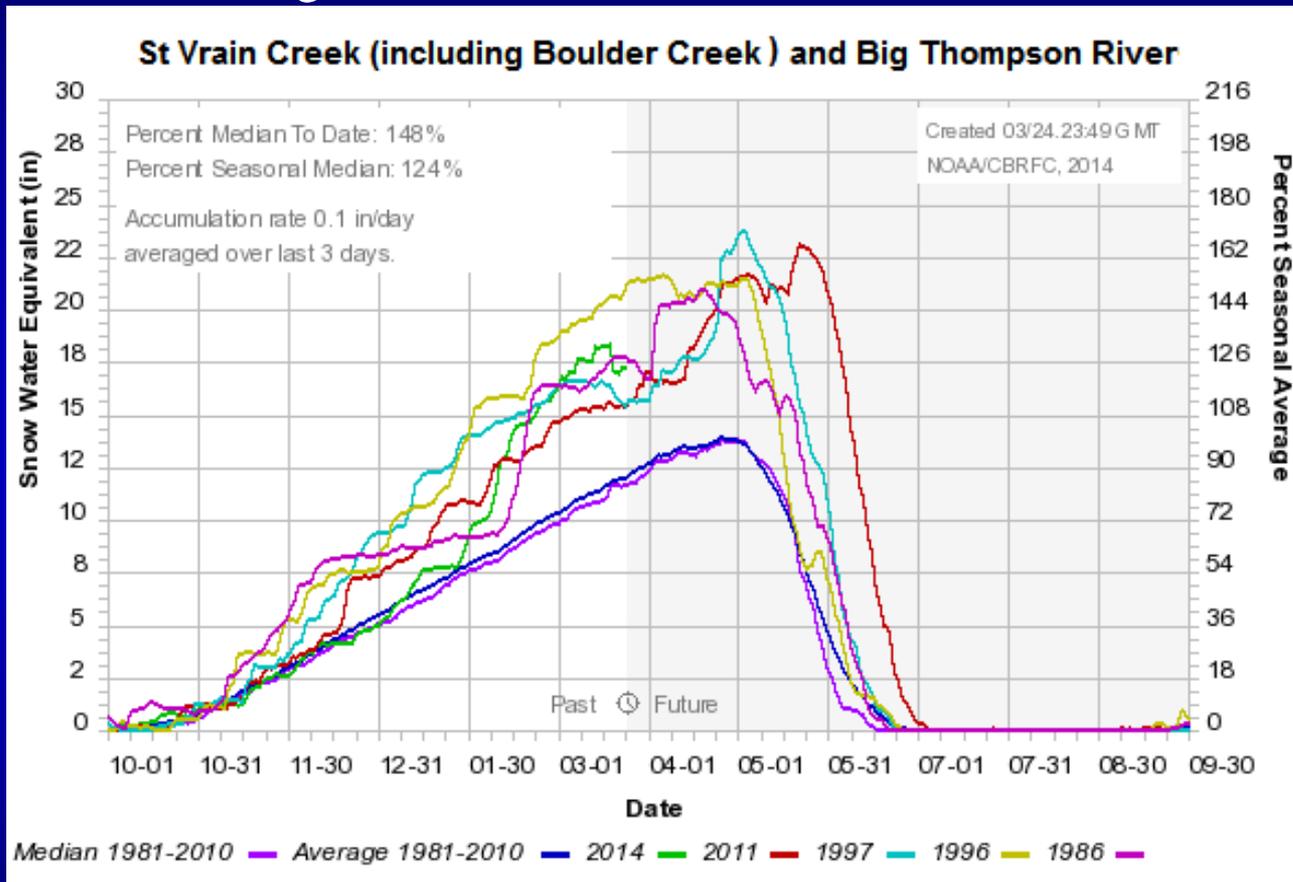
* SNOTEL data for this graph provided by the NRCS.

The March 24th % of average mountain snowpack in the South Platte River Basin this year was the 3rd highest in the past 35 years. Only March 24th 1986 & 1996 were higher.

In the North Platte River Basin (flowing north in Jackson County) the March 24th % of average snowpack was the 4rd highest (behind 1986, 1996, and 2011).



- The green line on the time series graph shows the NRCS SNOTEL SWE (snow water equivalent in the snowpack) from October 2013 through March 24th in the Big Thompson and St. Vrain Creek Drainages. The blue/violet lines show the 1981-2010 average/median.



- The mountain snowpack in the St Vrain and Boulder Creek Drainages is about the highest compared to average of any basin in Colorado.

The September 2013 flood was a hydrologic event (flooding & streams changing their channels), a geologic event (sedimentation & landslides), and a hydrogeologic event (high water table). All of the antecedent conditions for another flood are here:

Due to last September's rain and flooding; the risk of flooding and flash flooding is higher this year primarily in the Front Range Foothills extending into the urban corridor in Boulder, Larimer, SW Weld and extreme Nrn Jefferson Counties.

- A small amount of water could start moving large quantities of sediment in affected streams.
- There are reduced creek and river capacities due to the increased sedimentation, rocky debris and stream bank erosion.
- Debris flows and landslides may cause access issues and obstruct creek flows.
- Woody debris along streams could potentially cause debris dams and subsequent flooding.
- Altered locations and conditions of streams may impact structures and infrastructures at risk.
- Some reservoirs in these areas are at or near capacity and will spill earlier than usual causing additional flow during the runoff and thunderstorm season.

Other Issues:

High groundwater:

- The water table is high particularly in areas severely impacted by the September 2013 rains. High groundwater and saturated soils will cause more runoff and higher streamflows.

Landslides:

- The September 2013 rains destabilized hillsides and steep slopes . High groundwater can be a trigger for deep cut landslides. Increased landslides and rock slides will be possible this spring, particularly with heavier and/or prolonged rainfall.

Some Factors than will impact the mountain snowmelt:

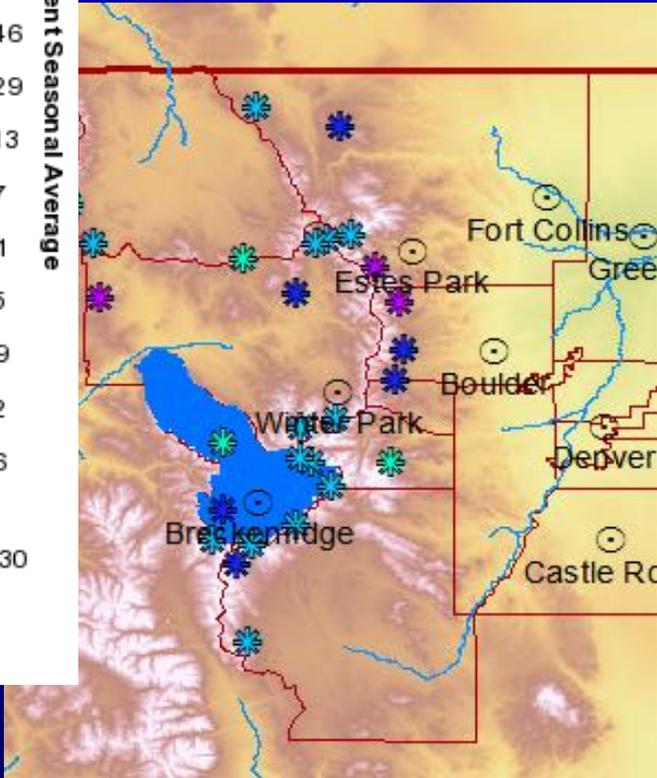
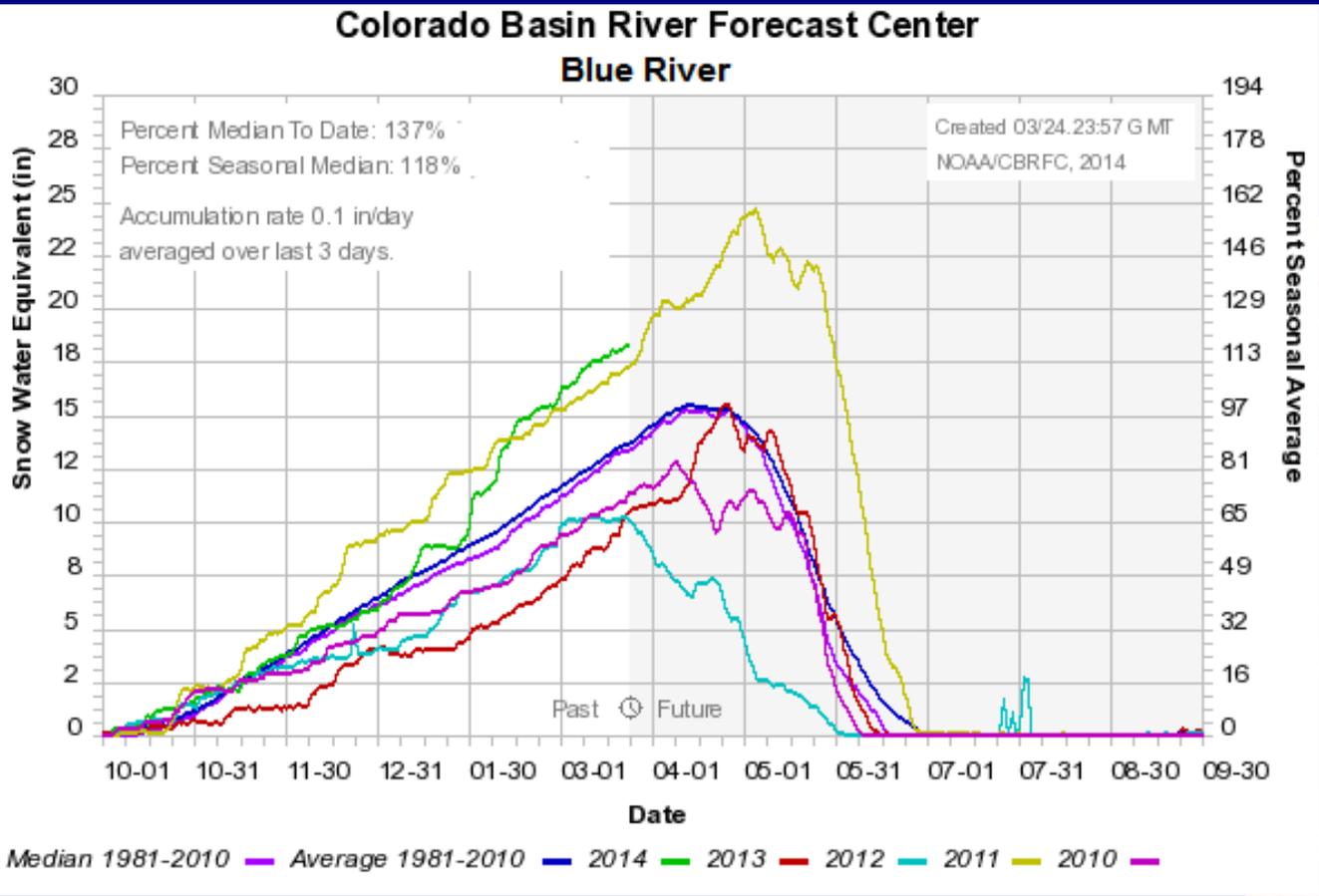
- **Future snowfall**
- **Stream levels during the melt**
- **When and how fast the snow melts (freezing and thawing in the mountains)**
- **Future rainfall amounts and timing**
- **Whether rain (especially a warm rain) falls on the snowpack**
- **Groundwater/soil moisture**
- **Dry winds**

Examples: In the spring of 2010 the snowpack was near average, but heavier spring rains fell during the spring runoff causing localized minor flood issues. In the spring of 2011 there were concerns due to the high snowpack. However, the snow melted out in an orderly fashion with no major flood issues (although the flooding in the spring of 2011 was more widespread compared with the spring of 2010).

Before a flood:

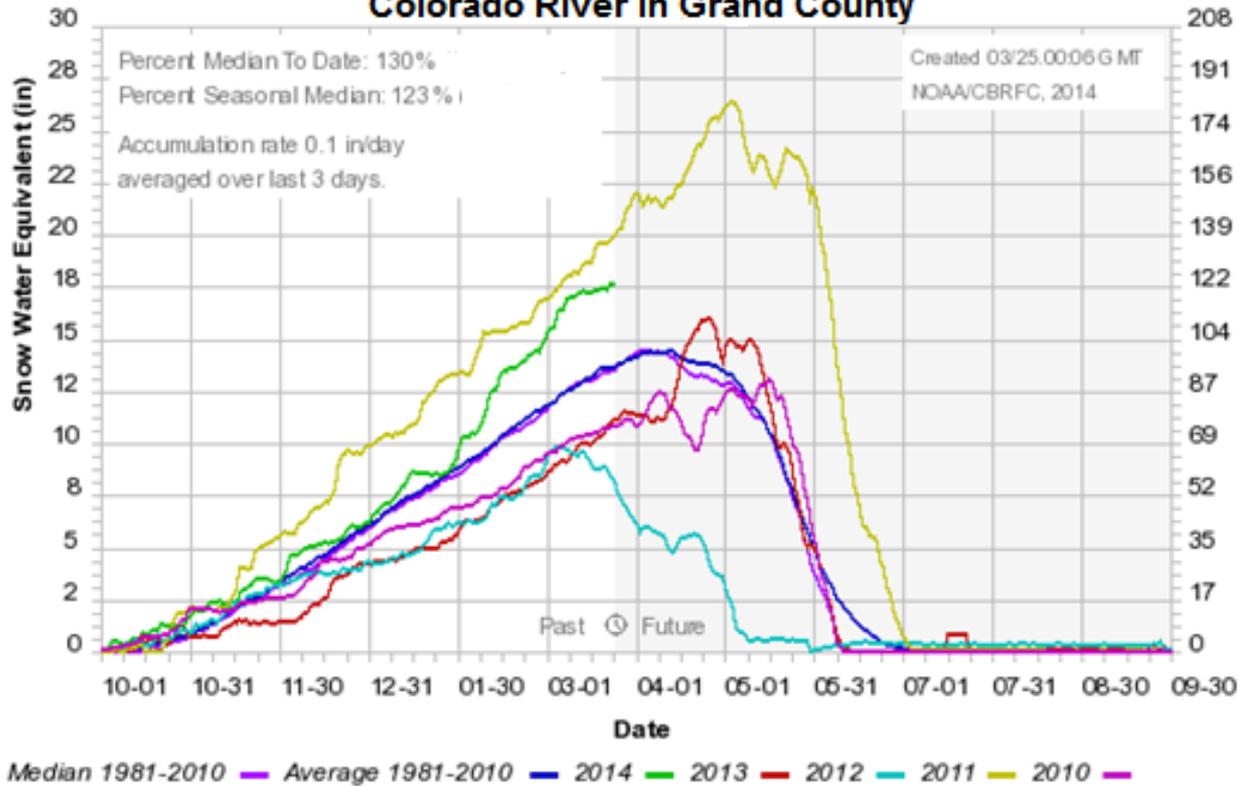
- Create a Communications Plan - It is important to be able to communicate with your family and friends in the event of a disaster. Whether it is having a specific person identified to contact for status updates or a safe location to meet up with family members, having a plan in place will give you peace of mind if disaster does strike.
- Prepare your Family & Pets – Planning can help you and your family evacuate faster. Also, have a plan for your pets so you won't be delayed in the danger zone. Don't wait until the last moment to gather the essentials for yourself, your family and/or your pets.
- Plan to Go to a Safe Location – Identify locations located at higher ground in case of flooding. Know more than one way to get to your safe locations on foot if necessary.
- Assemble an Emergency Kit - It is good practice to have enough food, water and medicine on hand at all times to last you at least 3 days in the case of an emergency. Water service may be interrupted or unsafe to drink and food requiring little cooking and no refrigeration may be needed if electric power is interrupted. You should also have batteries, blankets, flashlights, first aid kit, rubber boots, rubber gloves, and a NOAA Weather Radio or other battery operated radio easily available.
- Prepare Your Home - If you have access to sandbags or other materials, you may be able to use them to protect your home from flood waters if you have sufficient time to do so. Filling sandbags can take more time than you may think.

The remainder of the slides display graphs of recent years' snowpack time series in areas of north central Colorado (Graphs east of the Divide may not include data for all NRCS SNOTEL sites. Average/median data was not available for the last 2 slides).

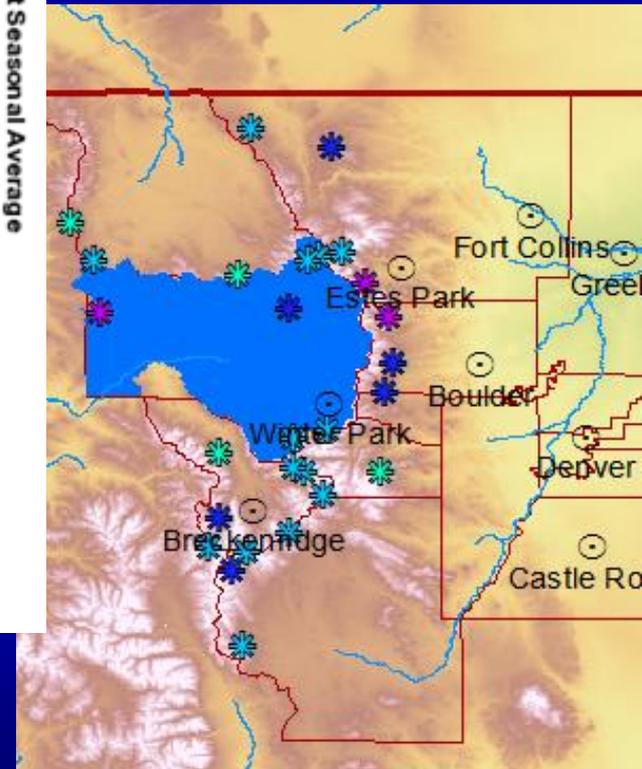


2014 water year on graph from October 2013 through March 24th, 2014.

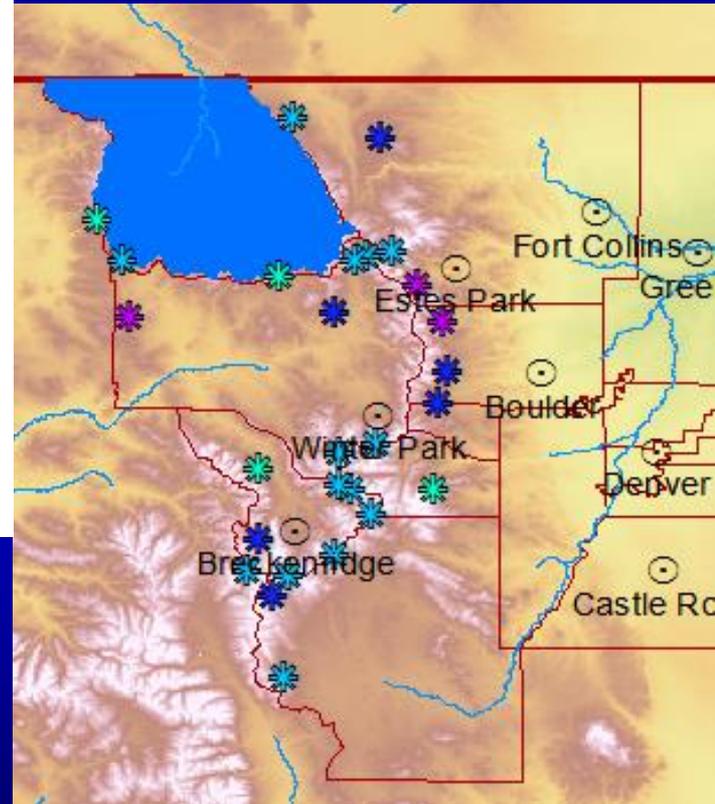
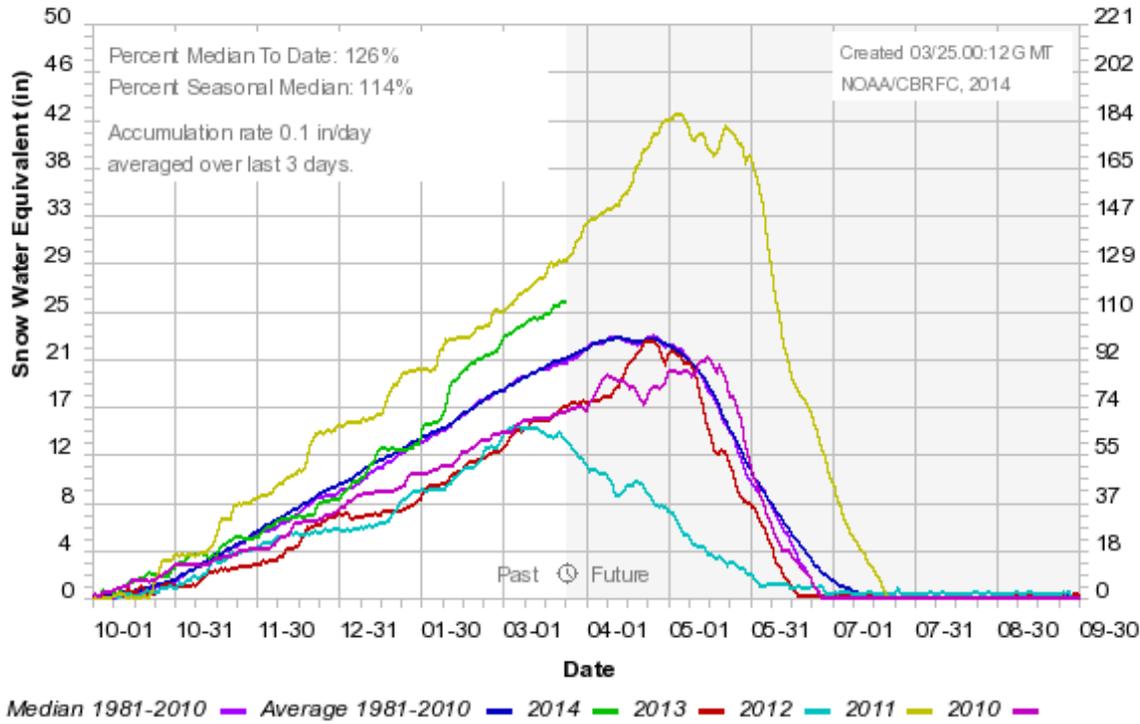
Colorado Basin River Forecast Center Colorado River in Grand County



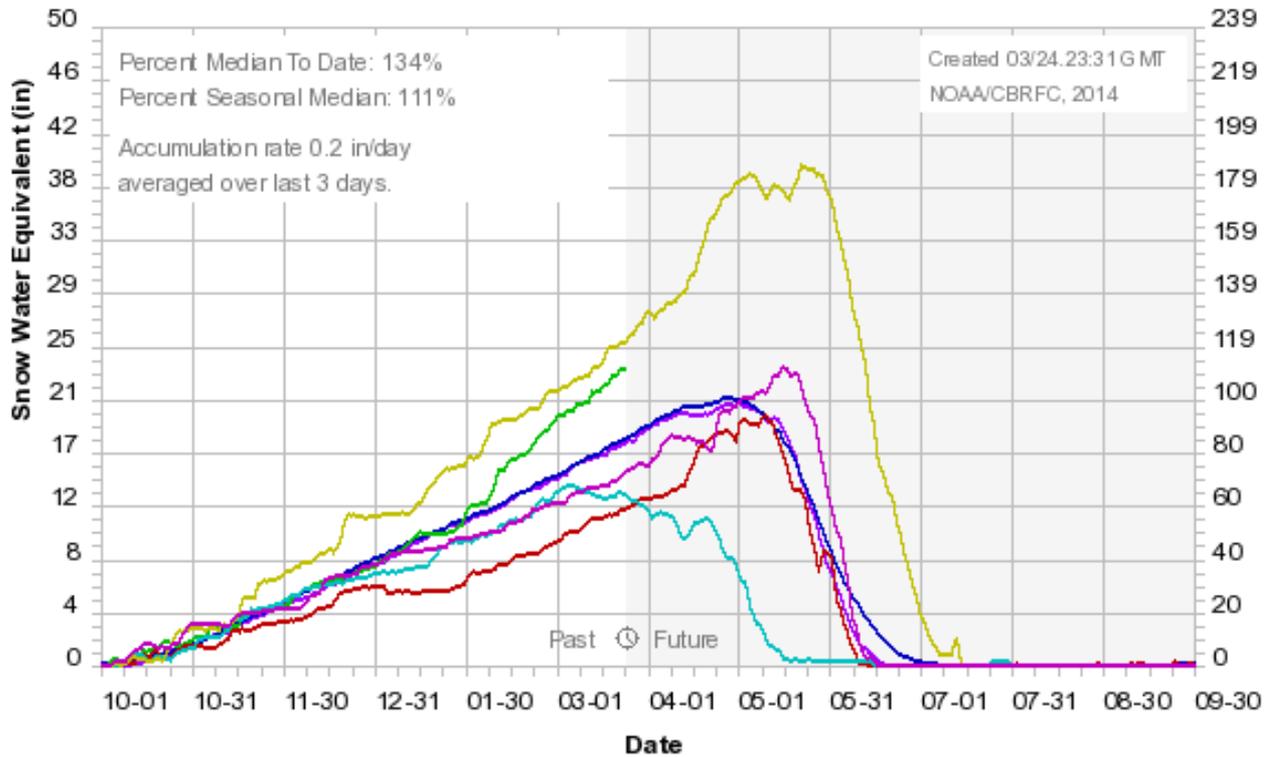
Percent Seasonal Average



North Platte River

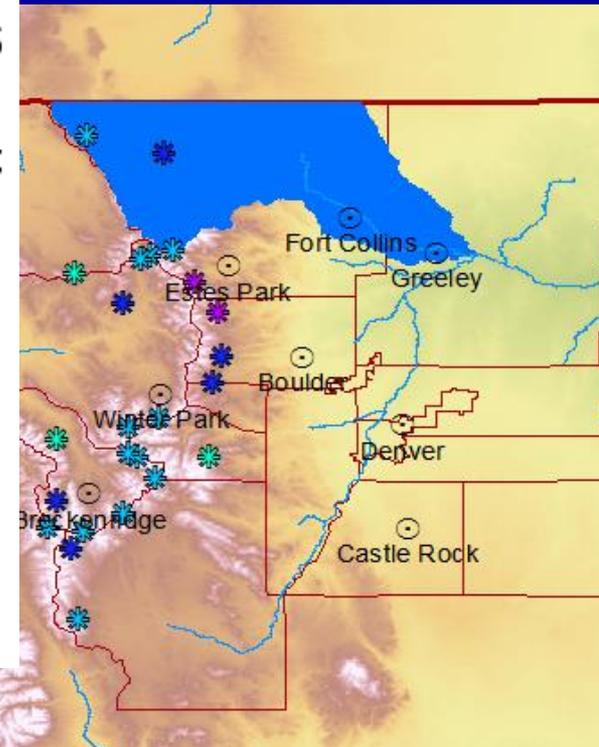


Cache La Poudre & Laramie Rivers

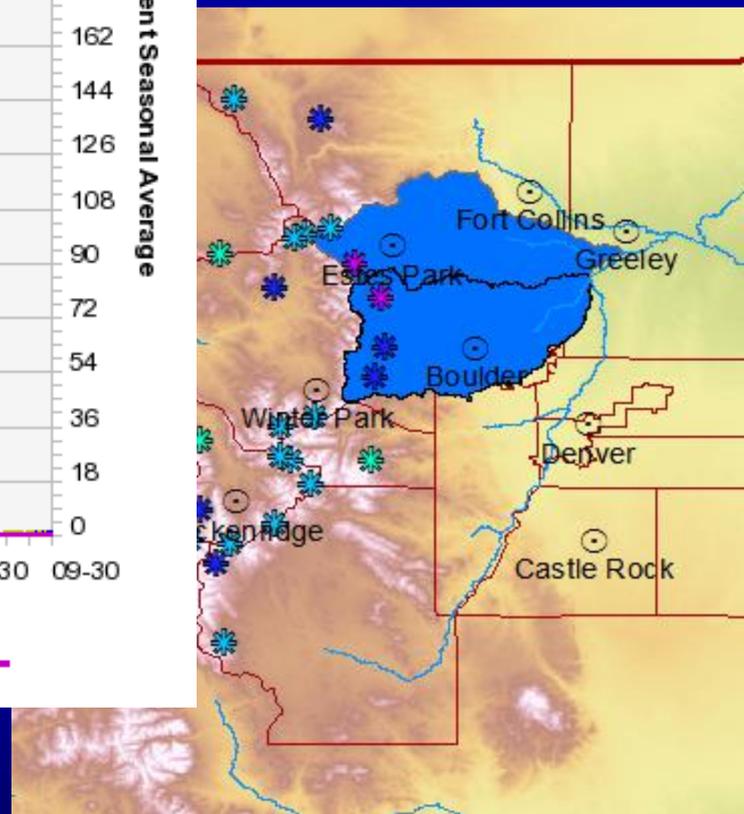
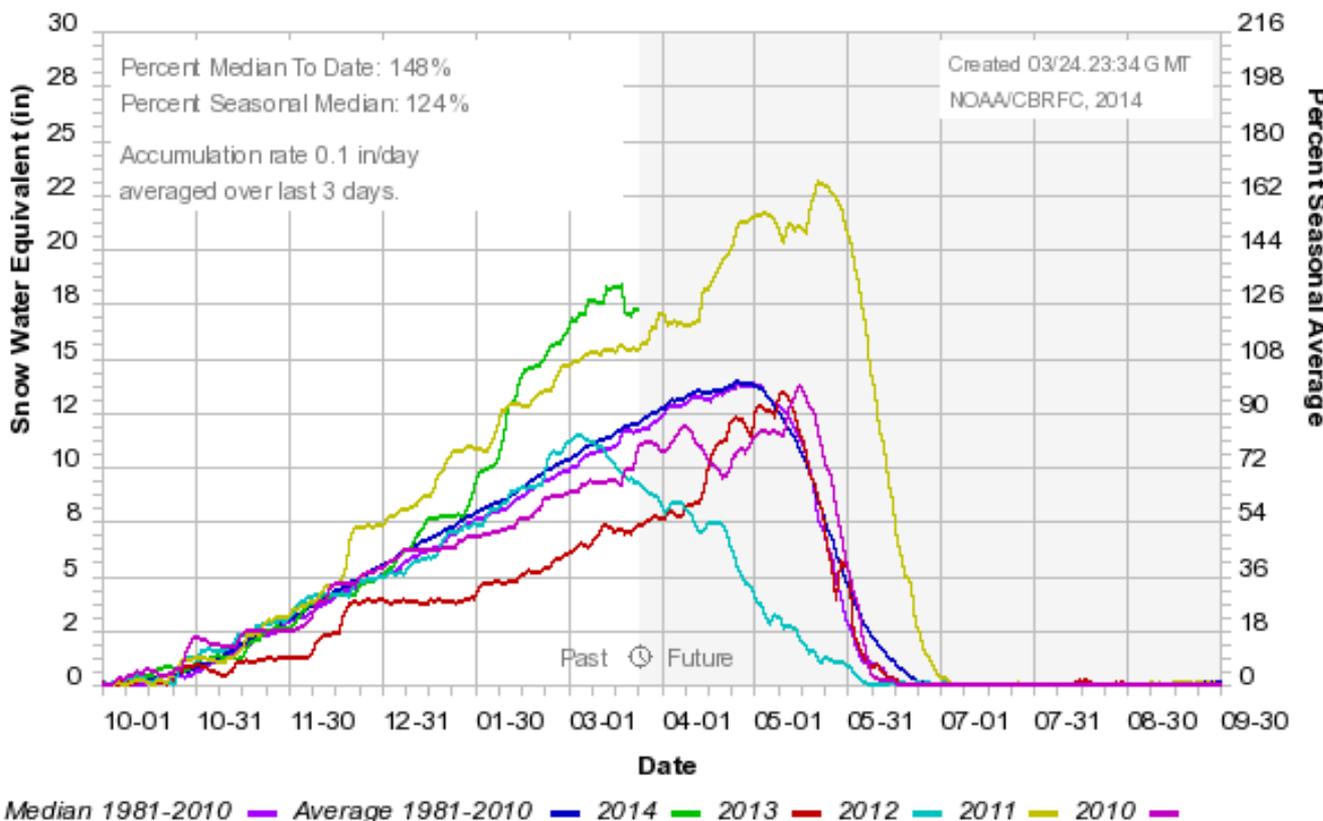


Median 1981-2010 Average 1981-2010 2014 2013 2012 2011 2010 2014

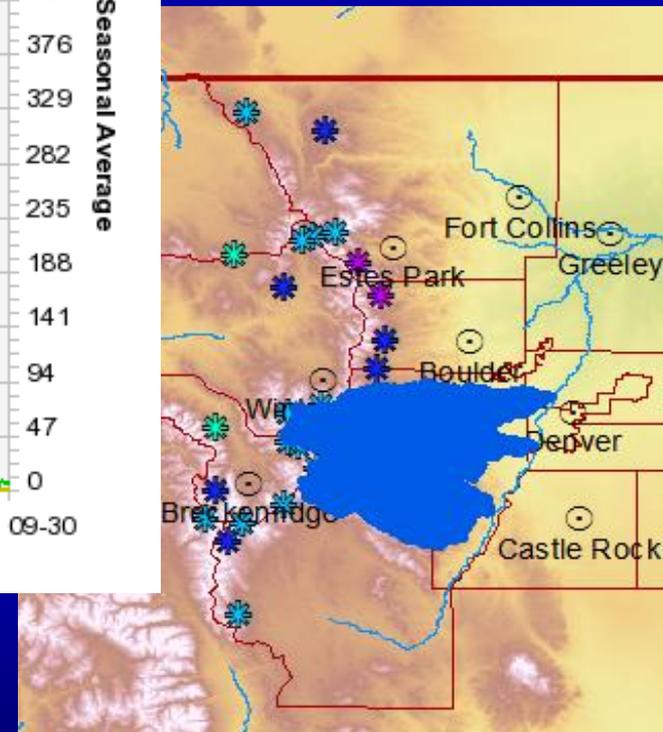
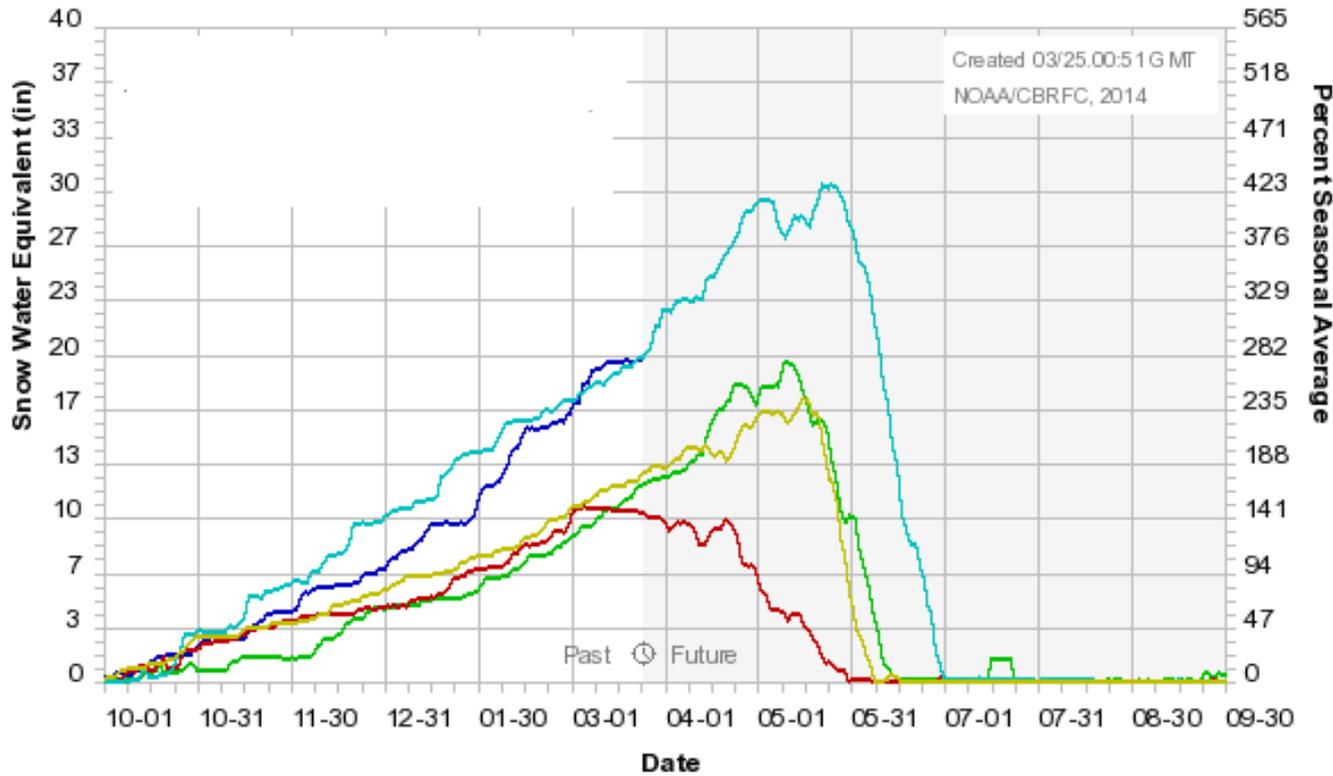
Percent Seasonal Average



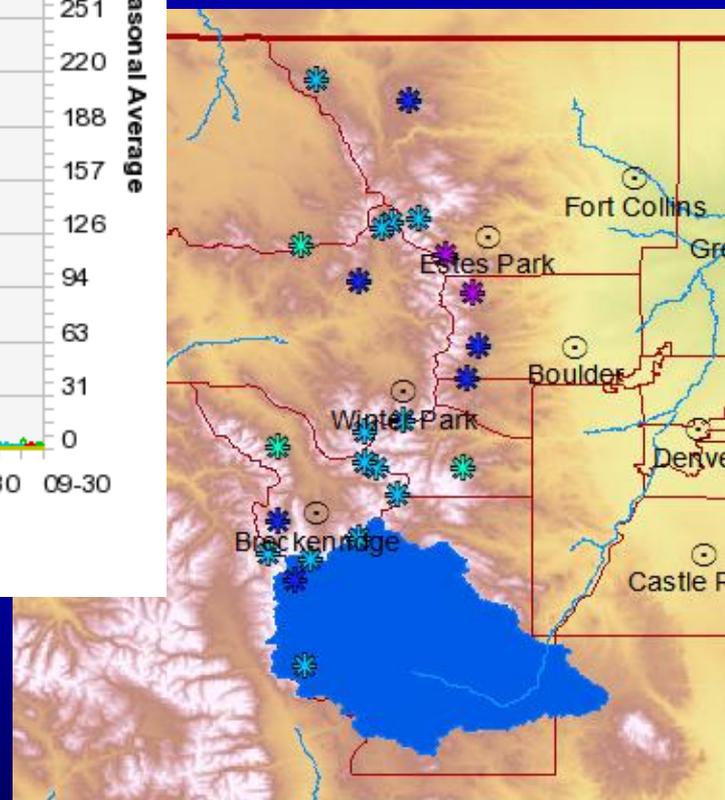
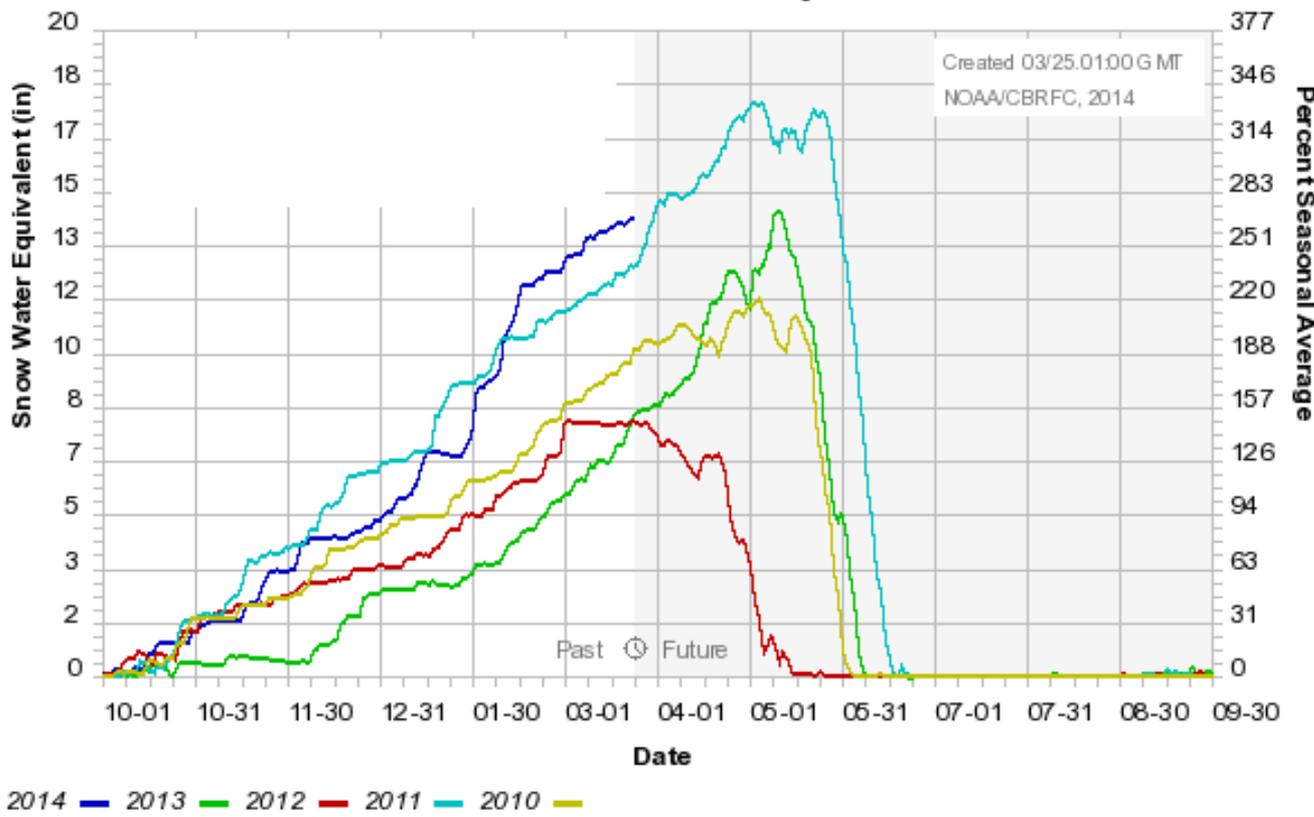
St Vrain Creek (including Boulder Creek) and Big Thompson River



Clear & Bear Creeks and North Fork South Platte River

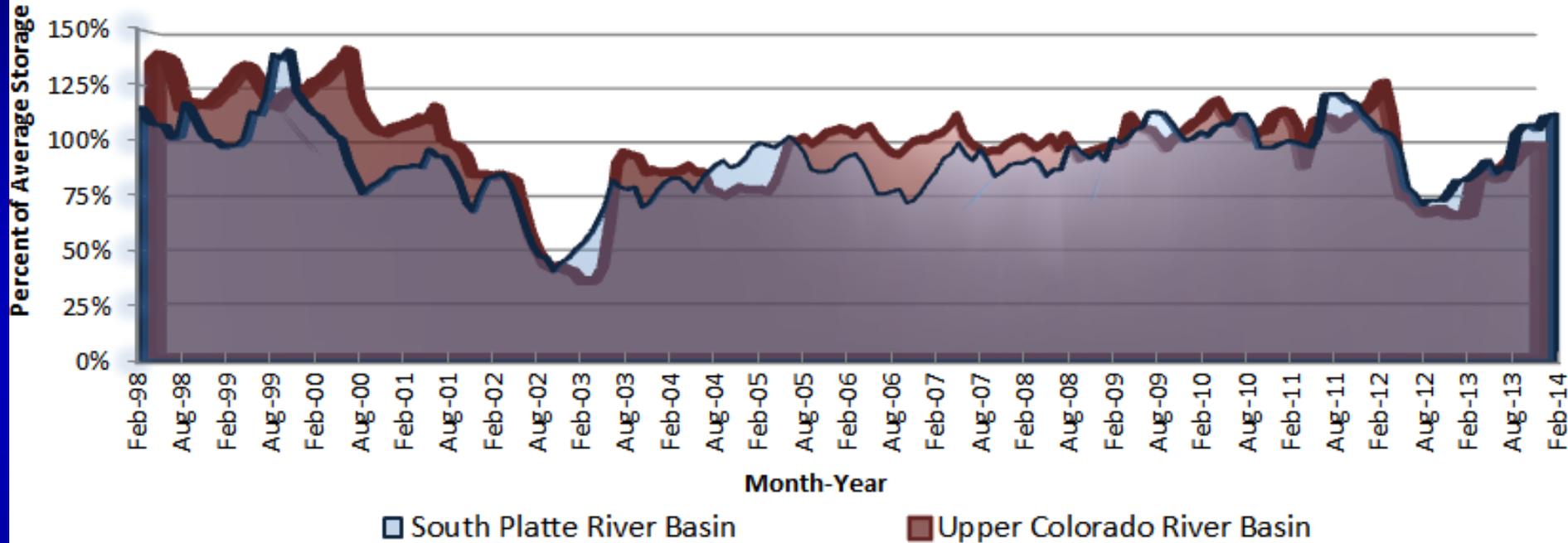


South Platte River and Tarryall Creek



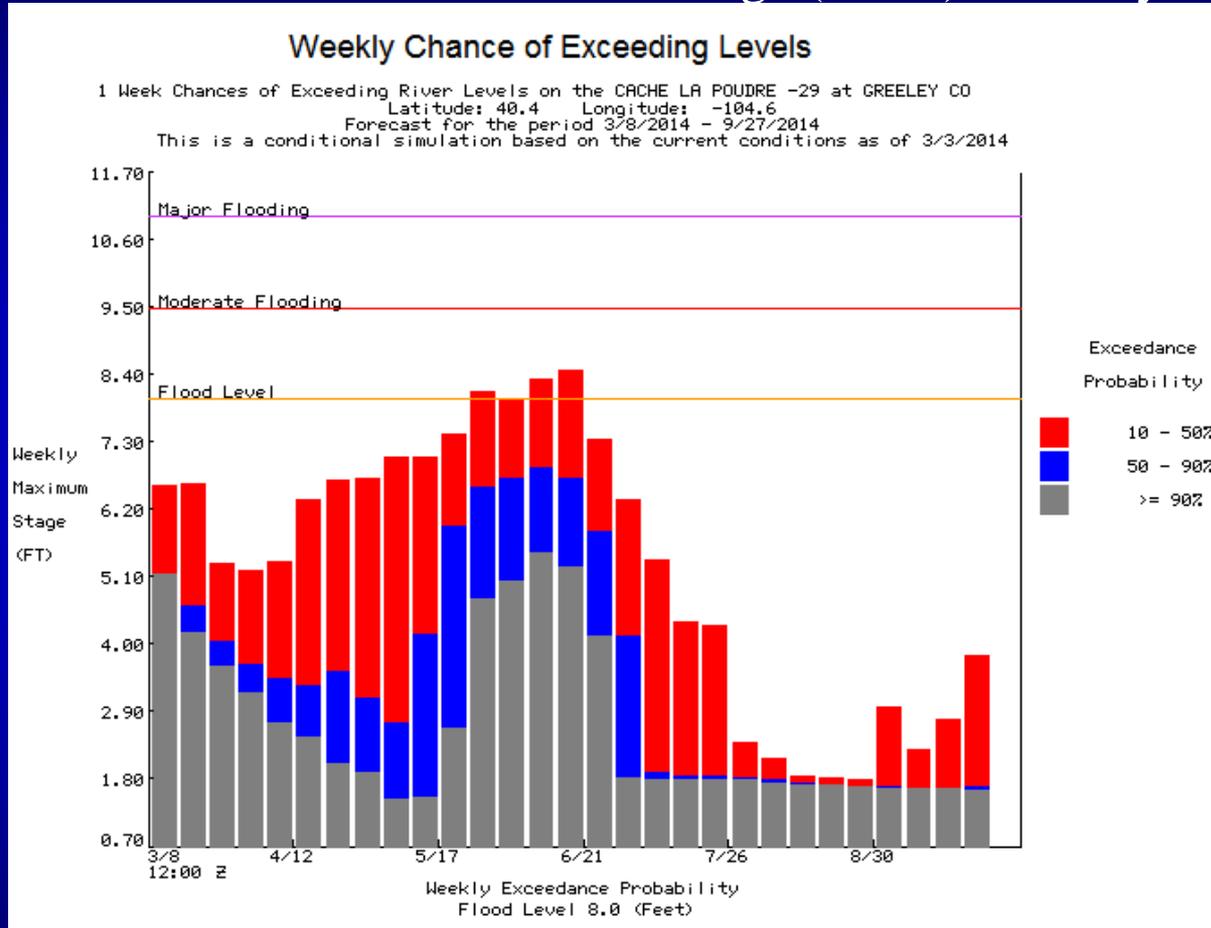
Reservoir Storage through the end of February 2014

Combined Reservoir Storage for Basins in North Central and Northeast Colorado
1998 - 2014



The graph shows the percent of average combined reservoir storage (which is currently at or above average and 125% to 150% of storage last year at the same time). The combined storage is around 83% of capacity in the South Platte Basin, and 64% of capacity in the Upper Colorado River.

The NWS AHPS graph below gives the probability that the maximum stage on the Cache La Poudre River near Greeley will exceed a particular value each week from early March through September 2014. There is a 10% to 50% chance the Cache La Poudre river at this location will rise to flood stage (8 feet) late May to mid June 2014.



Graphics of probabilistic river outlooks can be found on the AHPS website at <http://water.weather.gov/ahps2/>. The probabilistic forecast points are marked by circles on the AHPS map. The probabilistic outlook graphics are accessible by clicking the tabs above the forecast point's hydrograph.

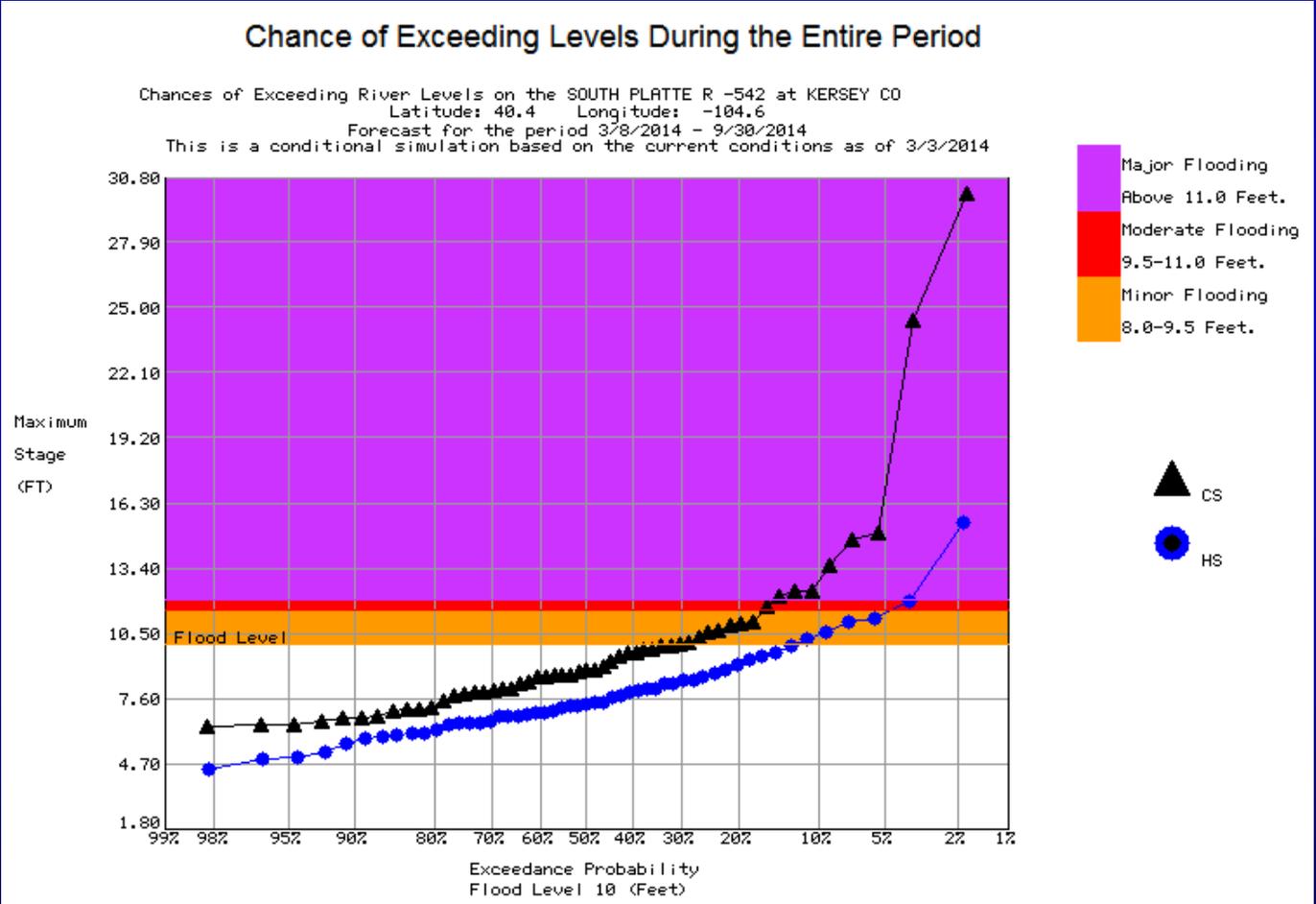
This AHPS probabilistic graph gives the chances of the stage going above various levels during the forecast period (March through September). The graph shows the South Platte River at Kersey has a 31% chance of reaching flood stage (of 10 feet) this year. In an ‘average’ year, the South Platte River at Kersey has a 12% chance of reaching flood stage. It has a 17% chance of moderate flooding this year, compared with a 5% chance in an ‘average’ year.

▲_{CS} = **Conditional Simulation**

- The conditional simulation (CS) line indicates chances of the river going above given levels based on current conditions.

●_{HS} = **Historical Simulation**

- The historical simulation (HS) line indicates the chances of the river going above given levels based on the total range of past levels.



The Kersey forecast point is just downstream of the confluence of the Cache La Poudre and South Platte Rivers in Weld County.