

Assessing Water Supply Conditions for Southeast Wyoming in 2007

By Melissa Goering, Science Operations Officer, NOAA National Weather Service Weather Forecast Office, Cheyenne, Wyoming

For the 7th year in a row, Wyoming is facing a state-wide drought, and the National Weather Service Weather Forecast Office in Cheyenne (NWS Cheyenne) is predicting another year of below average spring streamflows for the southeastern part of the state. There are a variety of hydrologic factors that contribute to the below average to much below average conditions in streamflow and the extreme to severe drought conditions that are expected across Southeast Wyoming in early 2007. These factors include (but are not limited to) precipitation, snowpack, and soil moisture. This article will discuss the hydrologic factors that have contributed to the much below to below normal volume forecast for spring runoff and the extreme to severe drought conditions for 2007 across southeast Wyoming.

Spring runoff from the high mountains in the western part of Wyoming provides needed water to lower elevations. Agriculture, recreation, water supply, and hydro-electric power are a few of the things dependent on this renewable resource. Precipitation and snowpack are always critical to water supply in the Intermountain West, but especially so this spring because of the pre-existing drought conditions reported by NOAA's Climate Prediction Center (CPC).

In the fall of 2005, CPC reported moderate-to-severe drought conditions across southeast Wyoming. Snowpack and snow liquid water equivalents (SWE's) started the 2006 water year much above normal, but these conditions didn't persist through the winter. While snowpack telemetry (SNOTEL) sites in the Medicine Bow and Sierra Madre mountain ranges, located in southern Wyoming, initially recorded SWE's nearly 130% of average in February 2006, much of the SNOTEL sites in Wyoming east of



Powder River near Arvada, WY, July 2002 (Photo courtesy of D. Peterson, USGS)

the Continental Divide recorded below or much below average SWE's by May 2006.

Precipitation affects both snowpack, and soil moisture conditions. Therefore, NWS Cheyenne examines recent precipitation trends and how that has impacted the snowpack and soil moisture. At the beginning of the 2007 water year in October 2006, the Upper North Platte and Little Snake river basins (located in southeast Wyoming) recorded much above normal precipitation compared to the Lower North Platte, Laramie, Crow and Lodgepole Creek river basins (Figure 15a). But by November (not shown), all river basins across southeast Wyoming recorded much below normal precipitation values. In fact, many locations along the Lower North Platte River basin did not have any precipitation for the entire month. There was a brief reprieve for far

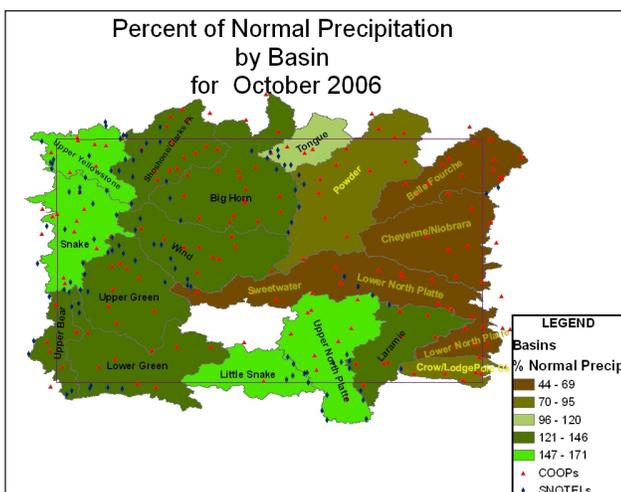


Figure 15a: Percent of normal precipitation by basin for Wyoming for October 2006 (courtesy of Jim Fahey, service hydrologist at the Riverton Weather Forecast Office).

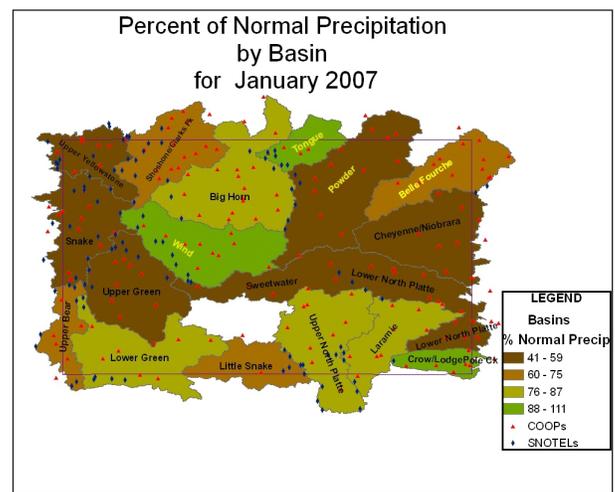


Figure 15b: As in Figure 15a, but for January 2007 (courtesy of Jim Fahey, service hydrologist at the Riverton Weather Forecast Office).



southeast river basins in December, as two storm systems at the end of month brought nearly 18 inches of snow across far southeast Wyoming. This precipitation brought the percent of normal precipitation (not shown) to much above normal in the Lower Platte River basin and near normal precipitation for the Laramie and Niobrara river basins. However, all other major river basins remained below normal for December. Finally, conditions worsened once again in January 2007 with all major river basins receiving below to much below normal precipitation (Figure 15b). The below average conditions in snowpack are observed at all the SNOTEL sites within the Sierra Madre and Medicine Bow mountain ranges, located in southern Wyoming. The North French Creek SNOTEL site illustrates that as of March 2007, the 2007 water year precipitation and SWE are below both the average and the 2006 precipitation and SWE values (Figure 15c). Due to low precipitation and snowpack levels, soil moisture is also below average in parts of Wyoming. Both the calculated ranking percentile of soil moisture for November (not shown) and March indicated significant soil moisture deficits over southern Wyoming. (Figure 15d).

Given the hydrologic conditions examined, NWS Cheyenne, in conjunction with the Missouri and Colorado Basin Forecast Center, expect a below average to much below average volume forecast for spring runoff and extreme to severe drought conditions for 2007 across southeast Wyoming. The preliminary average volume spring runoff forecasts for spring 2007 are expected to be much below average for river basins in southeast Wyoming (Table 1). However, in addition to the current snowpack, the peak flow magnitudes depend on the late spring temperatures and any additional snowpack in the next couple months. Spring conditions may add to or further diminish the late spring and early summer peak streamflows. The CPC three-month outlooks for temperature and precipitation during March, April, and May indicated slightly above normal temperatures and near normal precipitation. (See pages 13-15 for current Temperature and Precipitation outlooks from CPC.)

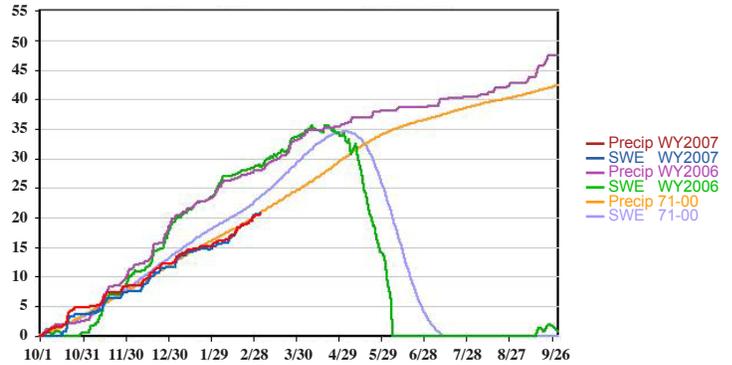


Figure 15c: The average precipitation (orange) and SWE (light blue), 2006 precipitation (purple) and SWE (green), and 2007 precipitation (red) and SWE (dark blue) shown for North French Creek SNOTEL site in the Upper North Platte River basin at 10,103 feet (courtesy of Natural Resources Conservation Services), March 5, 2007.

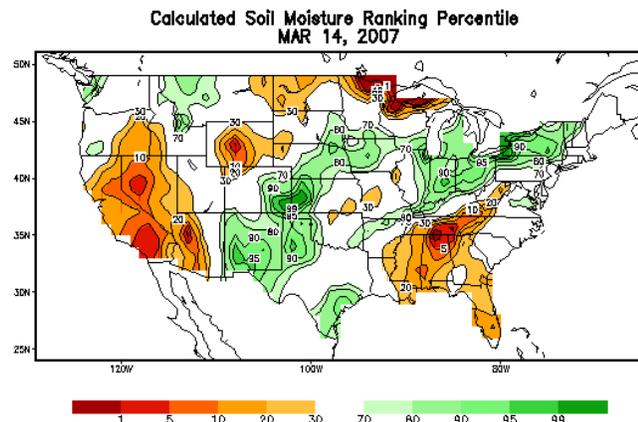


Figure 15d: Calculated soil moisture ranking percentile for March 14, 2007 (courtesy of CPC).

		Volume	Forecast			Volume	Forecast		
Stream & Station	Period	1000 AF	% of Avg	Stream & Station	Period	1000 AF	% of Avg		
North Platte River				Encampment River					
	Northgate	Apr-Sep	230	85		Encampment	Apr-Sep	137	83
	Seminole Reservoir	Apr-Sep	650	81	Laramie River				
	Glendo	Apr-Sep	750	76		Woods Landing	Apr-Sep	138	102
	Guemsey Reservoir	Apr-Sep	180	77	Little Laramie River				
	Alcova to Orin	Apr-Sep	135	84		Filamore	Apr-Sep	53	83
Rock Creek				Little Snake River					
	Arlington	Apr-Sep	46	81		Slater	Apr-Jul	115	72
La Prele Creek									
	La Prele Reservoir	Apr-Sep	14.2	59		Dixon	Apr-Jul	205	62

Table 1: Preliminary streamflow volume forecasts for April-September 2007 across southeast Wyoming, released in February 2007.

On the Web

- National Weather Service Weather Forecast Office, Cheyenne: <http://www.crh.noaa.gov/cys/>.
- Hydrologic Outlook, issued weekly by the NWS Cheyenne WFO: <http://www.crh.noaa.gov/product.php?site=CYS&product=ESF&issuedby=CYS&glossary=1>.
- Wyoming Drought Outlook, a collaborative effort issued monthly by NOAA's National Weather Service and the National Climatic Center, the NRCS, Wyoming State Climatologist's Office, regional center climatologists, and the National Drought Mitigation Center: http://www.crh.noaa.gov/images/riw/hydro/drought_info.pdf.
- Wyoming Water Resources Data System and State Climate Office: <http://www.wrds.uwyo.edu/>.
- Wyoming Natural Resources Conservation Service Snow Survey: <http://www.wrds.uwyo.edu/wrds/nrcs/>.

