

WATER RESOURCES FORECASTING IN THE NORTH PLATTE BASIN

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ABSTRACT

Water needs have increased dramatically in many areas of the west. The North Platte and Platte River basins are no exception. Over the years water has become extremely valuable in the North Platte River basin. Downstream uses on the North Platte and Platte Rivers in Nebraska necessitate the need for both flood and water supply forecasts. In times of drought the water in the North Platte River is not enough to meet the needs of the users. As such, they are dependent on water that is stored in reservoirs such as Lake McConaughy in the Nebraska panhandle, near Ogallala.

INTRODUCTION

The North Platte River has its headwaters in the northern Colorado and southern Wyoming mountains. Surrounding North Park in Colorado the Rawahs (Medicine Bow Mountains) and the Park Range are the source of runoff for the North Platte. In southern Wyoming the Sierra Madres and Snowy Range are the primary source of snowmelt runoff. At the same time the southern end of the Wind River Range contributes a small amount of snowmelt runoff via the Sweetwater River to the North Platte system. The North Platte flows north from Colorado into southern Wyoming before curving east and southeast to enter Nebraska near the small town of Henry, NE. The

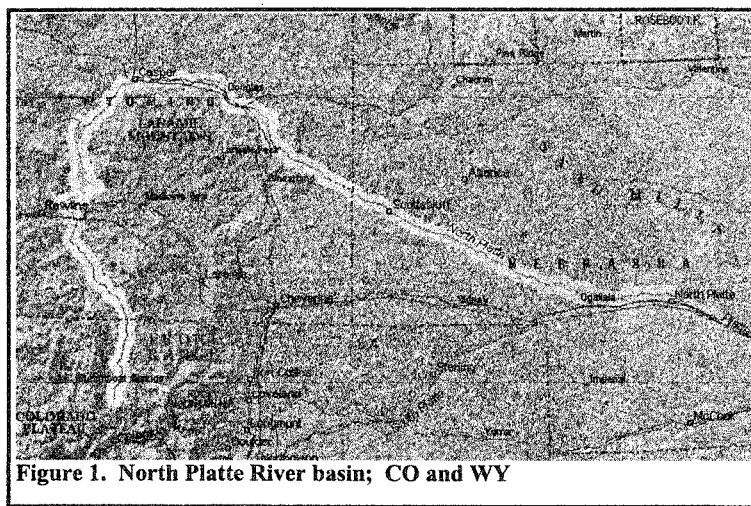


Figure 1. North Platte River basin; CO and WY

largest tributary is the Laramie River whose headwaters are in northern Colorado and southern Wyoming as well. The Laramie River's main source of snowmelt runoff are the east slopes of the Rawahs and Snowy Range. Oftentimes heavy rainfall in the Laramie Range can generate floodwaters in the Laramie River. In Nebraska the river continues to flow generally southeast where it flows into Lake McConaughy, north of Ogallala, NE. Lake McConaughy is a large earthfill lake which is used for power generation, irrigation and flood control. It is owned and operated by Central Nebraska Public Power. Below Lake McConaughy, approximately 60 miles, the North Platte joins the South Platte River at North Platte, NE to form the Platte River.

The largest city along the North Platte is Casper, WY. It is in Casper (Mills) where the Bureau of Reclamation (BuRec) has their Wyoming State Office. It is from Casper where the BuRec manages the large reservoirs, except Lake McConaughy, in the North Platte system. Seminoe and Pathfinder, each with about 1 million acre-feet capacity are located southwest of Casper. Downstream from Casper are Glendo and Guernsey Reservoirs. Seminoe and Pathfinder are primarily irrigation project reservoirs, while Glendo has some flood control capability. It is from Pathfinder downstream that the irrigation projects, such as Kendrick are located. Above Seminoe Reservoir is the small town of Saratoga, where flooding can be a problem. In 1995, snowmelt runoff came right up to the houses along the river and some sandbagging was necessary. Below Guernsey Dam,

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flooding can be quite severe at times. This is due in many cases to heavy rainfall along the Laramie Range from Casper to south of Wheatland, WY which comes in the springtime and generally coincides with the spring snowmelt runoff. The Laramie River can provide significant floodwaters (eg. June 1995) to the North Platte below Guernsey Dam. There is a large reservoir, Grayrocks, however it is only used for power generation by Dakota Utilities and does not usually have any storage capacity for flood control. In the North Platte basin there are two large coal-fired generating plants. The first is located outside Glenrock, WY and uses water from the North Platte for cooling. The second is located adjacent to Grayrocks Reservoir along the Laramie River.

Snow accumulation is greatest on the west side of the basin in the Park Range and Sierra Madres where snow water equivalents (SWE) can reach 30 to 50 inches of water. At the Tower SNOTEL site, generally east of Steamboat Springs, CO the average annual snow water equivalent is right around 50 inches. Lesser amounts of snow accumulate in the Medicine Bow Mountains and Rawahs. Generally snow water equivalents of 15 to 30 inches are found in these areas.

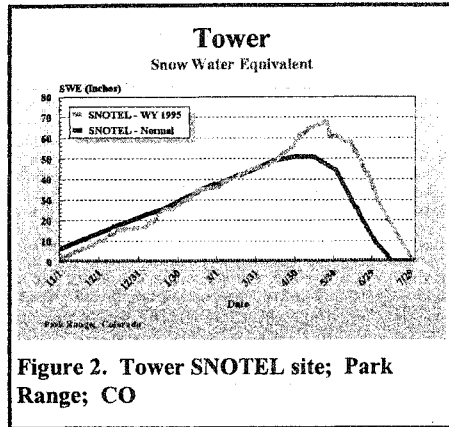


Figure 2. Tower SNOTEL site; Park Range; CO

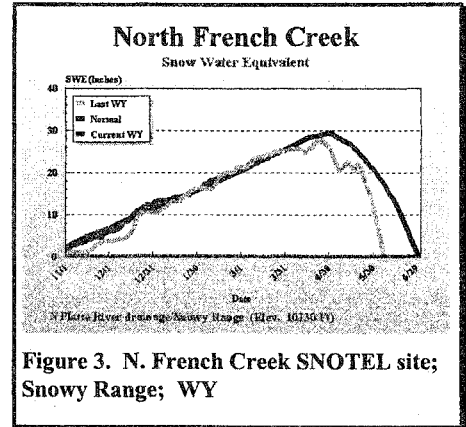


Figure 3. N. French Creek SNOTEL site; Snowy Range; WY

Both flood forecasting and water management forecasts depend on the cooperation of many Federal, State and local agencies. Lake McConaughy itself is maintained and operated by the Central Nebraska Public Power. Data from the reservoir is used for downstream water management activities, including waterfowl (Sandhill Crane) habitat enhancement, power generation, flood control, irrigation as well as flood forecasting.

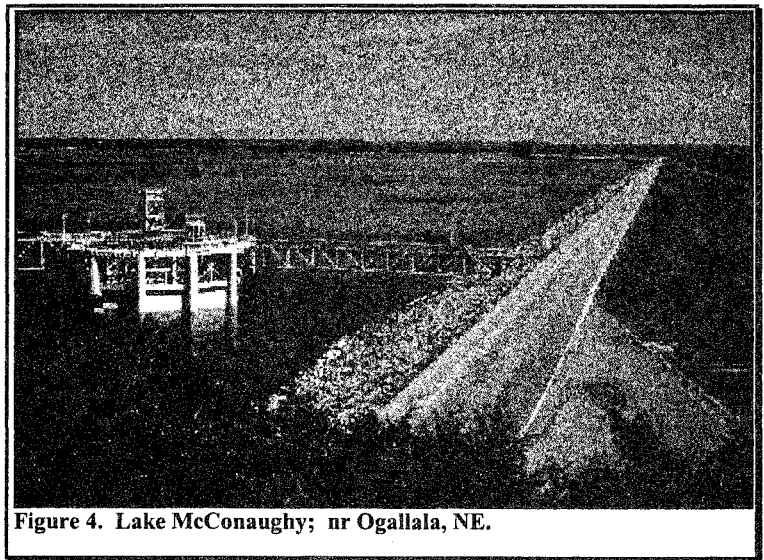


Figure 4. Lake McConaughy; nr Ogallala, NE.

In the headwaters of the North Platte, inter-agency coordination includes the Natural Resources Conservation Service (NRCS) for snowpack measurements. Much of the snow accumulation area lies in the state of Colorado, with the remaining portion in southern Wyoming. The Park Range and the Rawahs in Colorado have numerous SNOTEL sites, in addition to a number of snow courses. The snow course (manual) sites are often read by U.S. Forest Service crews that go out once a month and take the manual snow course readings. These reports, in turn, are relayed to the state NRCS offices and finally to the Missouri Basin River Forecast Center (NWS) in Kansas City, MO. SNOTEL (automated) readings are monitored on a daily basis, with the readings transmitted from NRCS downlink sites in either Ogden, UT or Boise, ID. Altogether the North Platte River basin has approximately 25 - 30 snow monitoring sites. This includes both snow course and SNOTEL snow water equivalent observations.



Figure 5. USGS gaging station Laramie River @ Woods Landing, WY w/ NWS DCP

The U.S. Geological Survey (U.S.G.S.) in Colorado, Wyoming and Nebraska also serve as partners in collecting of

streamflow/stage measurements. While the National Weather Service uses the data for streamflow/flood forecasting, state engineers use the data for monitoring irrigation diversions and water rights administration. Many of the U.S.G.S. stations now have Data Collection Platforms (DCPs) to monitor the streams via satellite. While the U.S.G.S. has installed some of the DCPs, the Bureau of Reclamation (BuRec) has installed many of them in order to forecast inflows into their reservoirs. State agencies, such as the Nebraska Dept of Water Resources also install and maintain stream gages to monitor streamflow.

The Bureau of Reclamation is primarily interested in meeting irrigation requirements of farmers in the North Platte River basin, although there is some flood control storage in Glendo Reservoir in southeast Wyoming. In order to meet irrigation requirements, the BuRec uses coop data from the NWS, as well as snow course/SNOTEL data from the NRCS and stream gaging data from both their own gages and those of the U.S.G.S. The BuRec also tries to manage their reservoirs to provide water for irrigation during low runoff years, and produce some flood control benefits during high runoff or flood periods. If the North Platte River has excessive runoff and water begins to get stored in the flood control pool at Glendo, then the Corps of Engineers also ends up involved in the process by managing reservoir releases from Glendo to minimize flood damages in downstream communities, such as Scottsbluff and North Platte, NE.

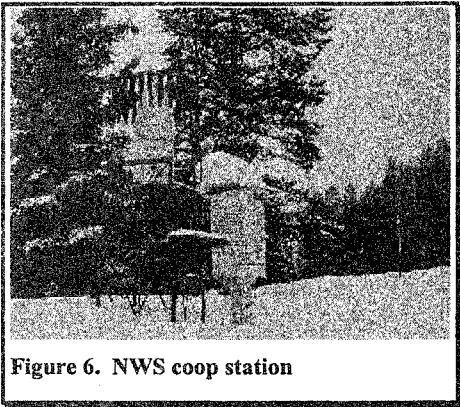


Figure 6. NWS coop station

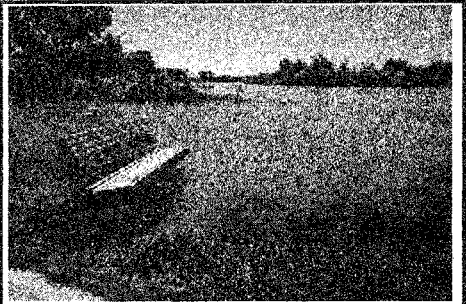


Figure 7. North Platte River @ Scottsbluff, NE (June '97)

The Missouri Basin River Forecast Center (NWS) in Kansas City, MO also ends up as a link in this whole process by collecting the various agencies' hydrological/ meteorological data and then preparing both water supply forecasts for water management activities, as well as flood forecasts when they are needed. Providing hydrologic forecasts for the North Platte River requires coordinating with numerous state and Federal agencies, as well as utility companies.

CONCLUSION

Managing water is the lifeblood of the North Platte River basin. From recreation in the headwaters to irrigation and flood control in the central and lower end of the basin it is driven by driven inter-agency cooperation. Water is "liquid gold" in the west; the economy of the North Platte River basin depends on both forecasts for water management activities, as well as accurate flood forecasts. Throughout the entire process, inter-agency coordination and cooperation makes it all happen.

