The Oxbow

FROM THE NORTH DAKOTA STATE WATER COMMISSION

Emergency at Mount Carmel Dam

By Patrick Fridgen

On March 29, 2003, a local high school student taking pictures at Mount Carmel Dam discovered that water was flowing under the chute spillway and was exiting uncontrolled from a large hole at the bottom of the dam. In photo 1, it is possible to see the uncontrolled flow that was occurring under the spillway. Engineers at the State Water Commission estimate that the peak discharge during that event was as high as 500 cubic feet per second, or 323 million gallons per day.

In an effort to stop the flow of water through the dam, the State Water Commission made arrangements to have an emergency earthen cofferdam constructed around the spillway the following day (photo 2). The cofferdam proved to be effective, and the uncontrolled flow was stopped. This was a critical project to complete, as the reservoir serves as a water supply source for nearly 5,000 people, including the city of Langdon.

Also, in the interest of dam safety, the Commission opted to open an old spillway pipe that had been closed off and buried. This was done to draw the reservoir down to a lower level, which in turn, provided additional flood storage and a much safer situation.

Days after the emergency cofferdam was constructed, a more permanent sheet pile cofferdam was put in place around the inlet of the spillway (photo 3). This was done to serve as a more reliable temporary solution to stopping the flows until the dam is completely repaired. The sheet pile wall should allow the dam to pass any large flood event through the emergency spillway, without further compromising the integrity of the dam.

Once flows were stopped with the cofferdams, inspections of the

Mount Carmel Dam General Information

- Originally constructed in 1970 at a total cost of $323,000.
- Purposes of the dam are water supply and recreation.
- The dam is an earthen embankment, 46 feet high and 670 feet in length.
- Located 10 miles north, and 2 miles east of Langdon.
- Peak storage is about 6,000 acre-feet.
- In 1995, the dam was modified – blocked principal spillway, widened and raised emergency spillway, constructed a low-level drawdown, built a new concrete spillway, and embankment was raised 4 feet to current 46 feet.

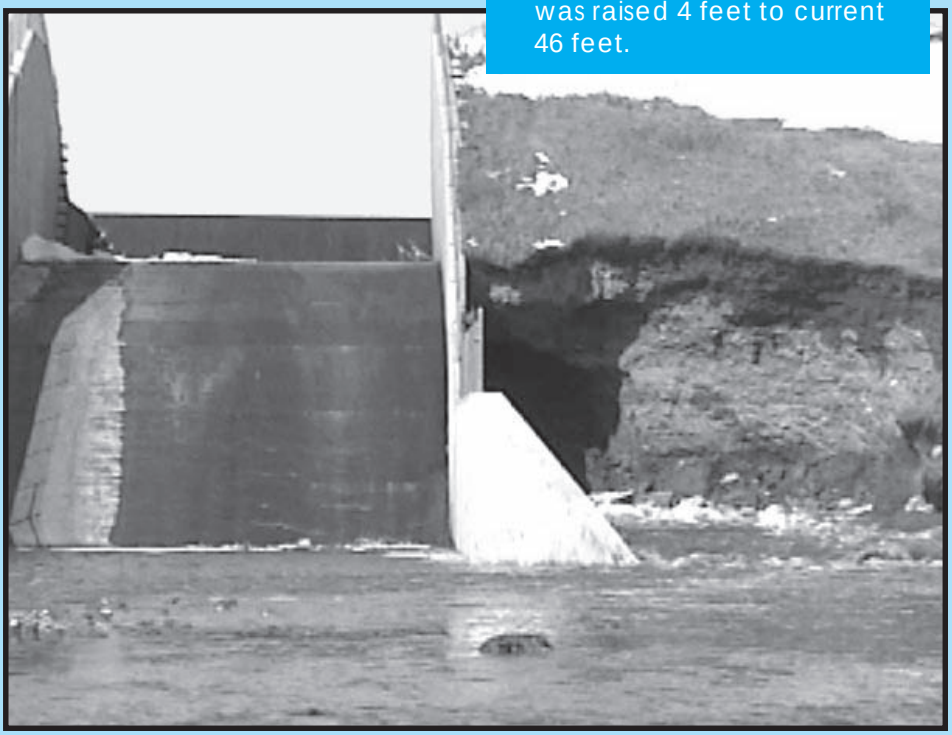


Photo 1: Uncontrolled flow occuring under the spillway of Mount Carmel Dam, March 2003.

North Dakota State Water Commission
Dale L. Frink, State Engineer
900 East Boulevard • Bismarck, ND 58505 • (701)328-2750
http: //www.swc.state.nd.us/

Patrick Fridgen, Editor

dam revealed that the void (or washout) under the spillway was quite extensive, with approximately 45 feet of the downstream section of the spillway unsupported. The remainder of the material under the spillway also appears to be unstable, but the exact condition is yet to be determined.

Before the dam can be permanently repaired, it is necessary to determine the cause of the incident, which in turn, will provide insight as to the best solutions for repairing the dam. To make these determinations, the Water Commission and Cavalier County Water Resource District agreed to contract with a private consulting firm to prepare a forensic analysis report that will identify the possible causes of the dam failure. The dam is owned by the Cavalier County Water Resource District, however, they have asked the State Water Commission to take the lead in the consultant hiring process, and ultimately with the management of the study and repair processes.

Photo 2 (above): An emergency earthen cofferdam was constructed around the spillway.

Photo 3 (at left): Some days after the emergency cofferdam was constructed, a more permanent sheet pile cofferdam was put in place around the inlet of the spillway.

Since there are two additional dams in North Dakota with similar design features, the state is interested in finding out through the forensic report if those other dams pose potential risks for failure. The other two dams are located near Epping and Bisbee.

The forensic report will be completed by the end of the year, which means construction on any permanent repairs will likely not begin until next spring or summer.

Additional photos of the incident can be viewed on the State Water Commission website at http://www.swc.state.nd.us/mtcarmel.html. ■

COMMISSION MEETING MINUTES

The North Dakota State Water Commission (Commission), chaired by Governor John Hoeven, held a telephone conference call in the Governor's Conference Room, April 22, 2003. In action items, the Commission:

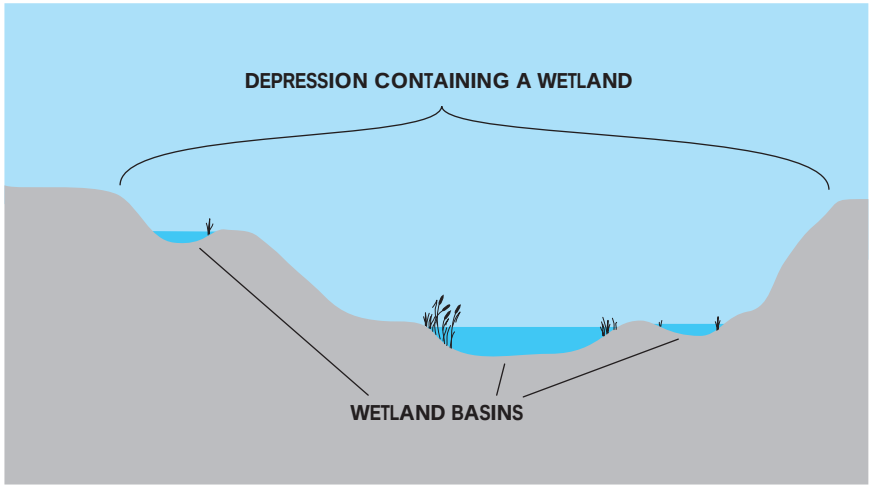
• Authorized the State Engineer to award Northwest Area Water Supply project Contract 2-1B, to Coughlin Construction of Minot. Award of the contract is contingent upon legal review and concurrence by the Bureau of Reclamation that required contract prerequisites have been satisfied. This contract is for the installation of about 9 1/2 miles of pipeline and a pressure reducing valve station. The apparent low bid received from Coughlin was in the amount of $4,711,424.

• Approved 80 percent cost-share in the amount of $320,000 for emergency repairs and consulting engineer services at Mount Carmel Dam.

• Approved 50 percent cost-share, or $21,513 to conduct a research study on the potential for nitrate removal from Karlsruhe aquifer. ■

Understanding Wetland Storage: Part I

By Michael Noone



The Wetland Issue

Devils Lake has been plagued with flooding problems for nearly a decade, and has likely experienced flooding since the basin was formed during the last ice age. Between 1993 and 2002, Devils Lake rose nearly 25 feet, resulting in $400 million in damages to businesses, homes, farmland, and public infrastructure. Some argue that wetland drainage in the upper portion of the Devils Lake basin is a key reason that the lake is now flooding. Over the next two issues of the Primer, the basics of wetland storage, and its complexities will be explored.

Upper Basin Storage

The desire to prevent further damages from flooding in the Devils Lake basin led North Dakota's water managers to develop the "three-pronged approach." The "three-pronged approach" includes; upper basin water management, the construction of an outlet to the Sheyenne River, and additional infrastructure protection. Progress on all three prongs is essential to prevent or control further damages should Devils Lake continue to rise.

Despite the claims of some, numerous studies have shown that while wetland drainage does play a role, it certainly is not the cause of the flooding that plagues Devils Lake today. In fact, studies done on wetlands in the region have determined that wetland storage only plays a significant role during moderate rainfall events. As a result, flooding from the decade-long wet cycle that has stricken the Devils Lake basin would not have been prevented, had there been no wetland drainage at all.

The Difference Between Depressions and Wetlands

One of the greatest causes of confusion for people trying to understand the issue of wetland storage is the difference between a depression and a wetland. A depression is a basin of some sort that has the potential to be filled with water to a certain level. A wetland, is often found in the lowest point of a depression, and is a feature of the landscape that has characteristics that people often associate with wetlands, such as cattails, bull rush, ducks, wetland soils, and open water. While a wetland is often filled with water for at least some portion of the year, a depression is seldom completely filled. This is for the simple reason that it would take a significantly greater volume of runoff to fill a depression than it would to fill a wetland within that depression.

The importance of understanding this point lies in the fact that many studies talk about depressional storage, as opposed to wetland storage. While this provides a convenient means to quantify storage, it is not the same as wetland area or storage. As a result, while a study may state that there are X number of acres of depressional storage, the actual wetland storage acreage could be much less. Additionally, while a wetland may be completely drained, thus taking away some of the storage it has, the depression containing that wetland or other wetlands may not be drained at all, which means that water was only transferred within the depression. As a result, the depression would not contribute any additional water to Devils Lake.

As you can see, the issue of depressional storage is more complicated than it first appears. In the next article, we will examine some of the difficulties that are commonly found when trying to determine depressional storage. ■