



Cottonwood Creek Dam in 2009, as the emergency spillway eroded.

Ensuring North Dakota Dam Safety

The incident at Oroville Dam in California that occurred in February, has brought the issue of dam safety and maintenance back into the forefront of people's minds. Oroville Dam, which is the tallest dam in the United States, experienced high inflows into the reservoir from heavy rains. Spillway operations resulted in damage to the main spillway structure. The reservoir continued to rise and water flowed over the dam's emergency spillway for the first time in its nearly 50-year history, causing significant erosion to the emergency spillway as well, before the situation was brought under control. Because of the risk caused by erosion of the spillways, 180,000 people were evacuated downstream.

With the regulatory authority and inspection of dams in North Dakota under the authority of the Office of the State Engineer, it's certainly understandable that questions have been raised about the safeguards that exist in this state to reduce risks associated with dams.

Two incidents similar in nature, though not in scale to the Oroville Dam incident, happened in North Dakota in 2009. After a heavy winter, Cottonwood Creek Dam and Clausen Springs Dam, both experienced significant erosion of their emergency spillways. The spring of 2013 also brought record high reservoir levels to a number of dams in the northeastern part of North Dakota due to a combination of rain and snowmelt runoff. One of these dams was Renwick Dam, where high water levels in the reservoir led to the evacuation of more than 1,000 residents of Cavalier. These incidents illustrate the need for dam safety, including emergency preparedness, regular inspections of dams throughout the state, and proper design and maintenance of those structures to ensure their safety.

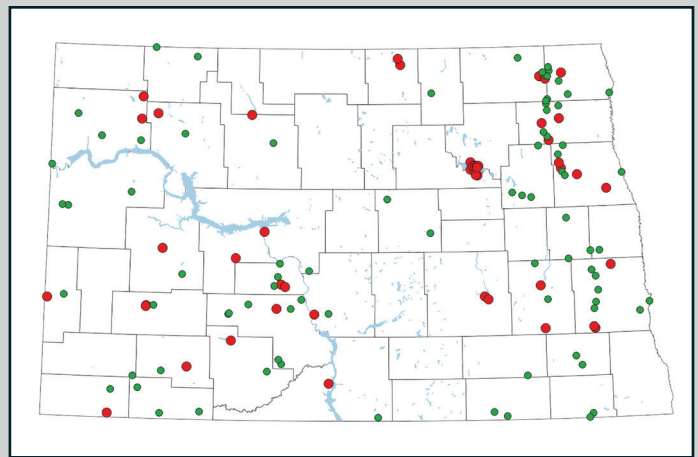
Dam safety begins with the proper design and construction of dams. The Regulatory Division of the Office of the State Engineer is tasked with permitting the

construction of new dams and modifications of existing dams. The purpose of the construction permitting process is to ensure the dam is properly designed and does not pose a safety risk to the public, which the State Engineer accomplishes through technical review and property right requirements.

All dams require ongoing inspection, maintenance, and repairs to ensure that they remain in a safely functioning condition. North Dakota's Dam Safety Program works to ensure that these occur, with the goal of minimizing any risk to life and property associated with potential failure of dams in the state. The program was initiated to continue and build on a national dam inspection program that took place from 1978-1981, under the direction of the U.S. Army Corps of Engineers, following a series of dam failures across the country in the 1970s. Dam Safety Program staff conduct dam inspections and provide recommendations for maintenance and repairs to dam owners. Other activities of the Dam Safety Program include maintaining an inventory of dams in North Dakota, determining the hazard classification of dams, and assisting with emergency preparedness activities.

Currently more than 60 percent of dams in the state capable of storing more than 1,000 acre-feet of water, are 50 years old or more, and more than 80 percent are more than 40 years old. As dams age, the need for repairs and maintenance becomes even more of an issue. Dam maintenance and repair activities are the responsibility of the dam owner. "The State Water Commission is dedicated to efforts to help ensure the safety of dams in the state," said Karen Goff, Dam Safety Program Manager. "We have a cost-share program available to assist with dam safety repairs, as well as emergency planning. But we can't do it alone. Dam owners must be aware that they are responsible for the safety of their dams. From basic maintenance such as preventing tree and shrub growth on dam structures, to more extensive repairs, to emergency planning, dam owners are the key to keeping the state's dams in good condition."

The majority of dams in the state are small, privately owned dams, most of which were built for livestock, irrigation, recreation, or fish and wildlife uses. In the 1930s and 1940s, a number of small dams, usually used for recreation, livestock, or water supply, were constructed by the Civilian Conservation Corps and the Works Progress Administration to provide work for people impacted by the Great Depression. The big federal dams, such as Garrison, Baldhill, Pipestem, and Jamestown, were built for flood control and power generation, as well as to provide water for irrigation and other water supply needs. In the 1960s through today, a number of medium-sized dams were built, often with the use of State Water Commission funding, for the primary purposes of flood control or recreation.



Map of all the medium (green) and high (red) hazard dams in the state.

There are currently 3,156 dams in North Dakota's dam inventory. Of these, 48 dams are currently classified as High Hazard, and 82 are classified as Medium Hazard, meaning that there is the potential for loss of life or significant property damage downstream if one of those dams were to fail.

OWNERSHIP OF ND DAMS

Private – 71%

Local – 12%

Federal – 9%

State – 4 %

Other/Unlisted – 4%

Emergency Action Plans (EAPs) are required for all high hazard and medium hazard dams under North Dakota Century Code 61-03-25. An EAP is a document that defines a pre-planned strategy for an individual dam to help minimize loss of life and property damage in the event of a dam failure. An EAP identifies potential emergency situations that could occur at the dam and specifies the course of action to be taken when an emergency situation arises. Dam owners are responsible for developing, testing, and updating an EAP for their dam.

North Dakota's dams are a vital part of the infrastructure of the state, and it is vitally important that they be properly designed, inspected and maintained to avoid potential impacts to people and property that are located downstream.

North Dakota

Counties Receive Section 22 Studies

Several flood mitigation-related studies that the State Water Commission has played an important role in advancing are nearing completion. These studies, also known as Section 22 studies, are the result of a cooperative effort between the counties, Silver Jackets, State Water Commission, and U.S. Army Corps of Engineers.

Section 22 of the Water Resources Development Act of 1974, was created to develop studies on flood inundation mapping, dam safety and failure modeling, water supply and demand analysis, water quality assessments, environmental restoration concepts, flood damage reduction assessments, wetlands delineations, and biological assessments.

The Section 22 studies that are the focus of these ongoing efforts are concentrating on Emmons and Mercer counties – including the communities of Linton, Beulah, and Zap. Several times in the past, Linton has been afflicted with flood-related problems from Beaver Creek, while Beulah, and Zap have experienced impacts from the Knife River and Spring Creek respectively. When completed, the Section 22 studies will provide these communities with information that will allow them to:

- Assess the risk of flooding to their community;
- Evaluate flood mitigation options (e.g. levees, channel improvements, home flood-proofing or property acquisition) to help protect their communities; and
- Support the development of Emergency Action Plans (EAP) for future short and long-term flooding events.

The cost of the study is split between the federal government and the counties. At the request of the counties, the State Water Commission used in-kind staff time to offset the work provided by the federal government. This contribution totaled about \$303,000 of in-kind services from the State Water Commission, towards the approximately \$685,000 total cost of the studies.

“The information developed from the Section 22 studies should prove to be of great benefit to communities in Emmons and Mercer Counties that have a long history of flood-related challenges,” said Mitch Weier, Water Resource Engineer in the Investigations Section of the State Water Commission. “Once completed, they will provide them with the tools they need to determine how to best target their flood mitigation efforts in the future.”

The Investigations Section of the State Water Commission provided the in-kind cost-share through the work of its engineers and technicians, who conducted survey hydrology and hydraulics analyses. The Corps will then complete the studies after the State Water Commission report is completed. The studies, which began after the 2009 floods, involved Water Commission staff conducting on-site analysis of the focus communities along Beaver Creek and the Knife River. The information obtained from site visits was then coupled with survey data and Light Detection and Ranging (LiDAR) data, followed by rigorous hydraulics and hydrology analysis to provide flood mitigating tools for the communities.

Initially, the studies in the two counties were a cooperative effort between the Silver Jackets and counties, which in turn brought in the Corps for the Section 22 Program. In order to qualify for Section 22, the counties submitted a request to the Corps, which then met with the ND’s Silver Jackets Coordinator along with the State Water Commission to discuss the proposed scope of the studies, and prepare a project management plan that described the tasks, deliverables, schedules, and cost estimates. Once the parties agreed on the project management plan, the counties and Corps signed a Letter of Agreement. The Corps then initiated the study upon receipt of both federal and sponsor funding.

“The Section 22 program provides communities with more affordable opportunities to identify options that reduce their vulnerabilities to future flood events,” said Weier. “In the end, it takes cooperation from a variety of partners to make these efforts successful, and we were happy to be a part of it.”



North Dakota State Water Commission
Garland Erbele, P.E., State Engineer
900 East Boulevard Ave. • Bismarck, ND 58505
(701) 328-2750 • <http://swc.nd.gov>

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