

In Part II of this special article on the 75th Anniversary of the State Water Commission, we will focus on the period from the construction of the mainstem Missouri dams through today.

The Commission Takes A Larger Role & A Changing Federal Role

“The lake [Sakakawea] would cover thousands of acres of the best bottom lands on both sides of the Missouri River for half its length in North Dakota.”

While the 1937 State Water Plan provided a solid foundation for future efforts, it took events downstream of North Dakota to initiate the development of the Missouri River and the next significant phase in the history of the Water Commission.

The Flood Control Act of 1944 provided for the construction of six dams on the mainstem Missouri River, which already had a century-long history of flooding people in lower basin states. The dams were built primarily for flood control, navigation, irrigation and hydropower. While the 1937 Plan examined the possibility of a dam on the Missouri River, it rejected the idea, stating *“The lake [Sakakawea] would cover thousands of acres of the best bottom lands on both sides of the Missouri River for half its length in North Dakota.”* and, *“The chief objection to the building of such a large dam is the uncertain foundation conditions which are clay, shale, and soft sandstone. The dam could be built presumably safe, but, if it should ever fail, the sudden release of so enormous a body of water would be such a stupendous disaster that it is not permissible to run such a risk.”* It should be noted, that changes in the proposed location of and design improvements of the dam later overcame those obstacles to construction.



Garrison Dam, in 1951, prior to completion. Credit: ND Historical Society

Because a Missouri River reservoir in North Dakota provided little benefit to the state, and resulted in significant impacts, including the loss of 550,000 acres of good quality farmland, the state was promised as much as 2.5 million acres of irrigation in compensation. Significant efforts were made to determine irrigation

feasibility throughout the state, including an area east of the Missouri River, that was later called the Garrison Diversion project. For a variety of reasons; environmental, legal, and political, it became clear that the project as originally envisioned would not be possible. So, although Garrison Dam had been built, largely to the benefit of downstream states, the benefits promised for lost land in North Dakota never materialized.

Baldhill Dam (1944), Jamestown Dam (1953), and Garrison Dam (1953) represented the high point in federal involvement in North Dakota dams. The era that began with the response to the Great Depression and Dust Bowl was coming to an end. The state now had to grapple with the gradual decline of large federal projects, along with increasingly complex hurdles. However, the same variability of climate that had caused the creation of the Water Commission had not ended with the Dust Bowl, and the need for some means of mitigating for inherent environmental variability was still a shadow hanging over the state. If another Dust Bowl happened, would the state be ready?

As federal involvement began to decrease in the 1960s, and control over the smaller federal works, such as the WPA dams were gradually handed over to the Water Commission, it became apparent that a large federal project to irrigate the state was increasingly unlikely. However, the need to manage the state’s resources for the benefit of its people was just as important in the face of environmental uncertainty as it had been at the Water Commission’s creation. As a result, the Water Commission spent considerable time and effort quantifying the water resources of the state, developing engineering studies of rivers and streams, repairing existing structures, building small projects, and working to persuade the state’s citizens that changes at the state and local level were needed to counteract the natural challenges the state faced.

One major advancement, was the adoption of the *“prior appropriation”* doctrine for use as

the basis for granting water permits. Previously, the state had used a mix of prior appropriation; where first beneficial permitted use has priority, and the riparian doctrine, where the landowner adjacent to water, had certain rights to that water.



President Dwight Eisenhower at the Garrison Dam closure ceremony, June 11, 1953. Credit: Institute for Regional Studies, NDSU, Fargo

Another major change was passed by the state legislature in 1965, which allowed legal entities, such as counties, to manage water across county lines. Prior to that time, management of water ended at the county boundary, representing a real challenge to watershed-based management strategies. Because water seldom stops at the

county’s edge; drainage, irrigation, and flood control were areas that needed a basin-wide strategy.



A drag-line excavating the main canal for the Buford-Trenton irrigation district in Williams County, ND.

The scope and size of the state’s water projects had decreased, but arguably, those projects that were getting built, were of more importance and value to the state because the Water Commission was directing them in reflection of local needs. Drainage improvements, irrigation districts, and small flood control and water supply projects had a direct positive impact on the people of North Dakota.

DIVISIONS OF THE STATE WATER COMMISSION

Administration & Support Services

Data collection, management, support, and distribution

Appropriations Division

Administer, process, adjudicate, and evaluate water rights; monitor water resources; develop and evaluate supplies; and conduct research

Atmospheric Resource Board

Atmospheric and meteorological data collection and analysis; weather modification for hail suppression and rain enhancement

Development Division

Prepare engineering and feasibility reports for the construction, maintenance, and repair of water resource projects; review and make recommendations for water structures and sovereign land; provide technical assistance to water boards; assist communities in floodplain management; coordinate water supply programs

Planning Division

Maintain a water project inventory for the state’s future water development needs; coordinate agency strategic planning efforts; monitor water resource issues for impacts to North Dakota; water education and; Project WET; and special studies

Oil Booms, Droughts, & Management Of Water On A Basin-Wide Basis

“If I have seen further than others, it is by standing upon the shoulders of giants.”

– Isaac Newton

Starting in the late 1960s, changes that were sweeping across the country began to affect North Dakota as well, having an increasingly significant impact on how the state looked at water. Swampbuster, the federal program protecting wetlands, clean water laws for municipal supplies, and a host of other new and expanded environmental laws meant that building projects such as dams, diversions, and drains was increasingly complicated. During that same period, several of the state’s largest communities like Fargo, Grand Forks, and Minot, were impacted by significant flooding events, resulting in almost \$2.5 million (\$18 million in 2012 dollars) in flood protection being built.

The 1968 Water Plan wisely noted, “*Since little can be done to increase nature’s water allotment to our State, North Dakotans must learn to use their existing supplies more judiciously. This means redoubling of our efforts to achieve the most efficient level of water management possible. Our world is changing rapidly; society is becoming increasingly more complex, and providing solutions to the host of water management problems which will likely develop within the framework of such a changing world could become North Dakota’s greatest challenge of the future.*”

It was during this period, that the agency’s diligent and meticulous efforts at water data collection and engineering studies began to start bearing fruit, with the emergence of computers, allowing for more rapid analysis of collected data. That information was becoming vital in determining if an aquifer was being drawn down faster than it was being recharged, or if a flood was a commonplace event. The technologies that were becoming available allowed the Water Commission to make better determinations.

In the 1970s, the agency was split into divisions by then State Engineer Vern Fahy. Where before, employees’ duties were somewhat broad, the creation of the four current agency divisions; Administration, Appropriations, Development, and Planning, with the addition

of the Atmospheric Resource Board (ARB) in 1981, set the stage for the Water Commission’s ability to efficiently focus their efforts.

ARB represented a logical addition to the Water Commission, with their efforts to increase knowledge of, and improving the effectiveness of cloud seeding science in order to increase rainfall and reduce hail damage.



A plane being used for cloud seeding by the Atmospheric Resources Board.

With the support of the Legislature, the Water Commission continued and accelerated the collection and analysis of water data for aquifers, stream flow, and water quality, which is still unprecedented in its scope today. Perhaps most importantly, the methodology used to collect and analyze this data was uniform, consistent, and scientifically defensible. Isaac Newton is credited with saying “*If I have seen further than others, it is by standing upon the shoulders of giants.*” The efforts of the 1970s are still fundamental to the level of precision, range of analysis, and quality of information we utilize today. As Mike Hove, an employee in the Appropriations Division puts it “*I want to know what’s going on, not think I know what’s going on.*”

The water development needs of the state were in many ways increasing. The \$27.4 million (\$170 million in 2012 dollars) flood control project in Minot, in response to the 1969 flood, was the last of the big federal flood control projects in the state for nearly 30 years. As the availability of federal funding for large projects

was decreasing, the rise of the environmental movement and laws that required that projects analyze and mitigate their impacts presented new obstacles to building projects of almost any size.



The Southwest Pipeline was officially turned on in 1991.

In the 1980s, the re-formulation of Garrison Diversion led to the Garrison Diversion Project’s Municipal Rural and Industrial Water Supply Program. This program provided up to 75% of the cost for development of water supply projects. Making water supply projects eligible to access these funds made it possible to satisfy a chronic water supply problem in southwestern North Dakota. In 1983, the State Legislature authorized the Water Commission to construct and operate the Southwest Pipeline Project (SWPP) to provide water to southwestern North Dakota. Construction of the SWPP began on the main transmission lines in Mercer County in 1986, and today serves most of the region south west of the Missouri River in North Dakota.



Educators learn about the water resources of North Dakota in 2011.

In 1984, the Water Commission created Project WET (Water Education for Teachers), a multidisciplinary educational program on water science and water education for K-12 educators and students, facilitating and promoting the learning, awareness, appreciation, knowledge, exploration, and stewardship of North Dakota’s water resources.

That water education concept has since grown to national and international levels - highlighting the importance of educational efforts. As President

Abraham Lincoln said, “*The philosophy of the schoolroom in one generation will be the philosophy of the government in the next.*”



Construction on Dead Colt Creek in 1983.

During this period, there were two droughts; a minor one in the early eighties, and a fairly severe one from the late eighties into the early nineties. Both stressed agriculture, industry and even municipal supplies. An open question was whether the state was eventually going to dry up and blow away. Despite the droughts, the Water Commission was able to realize its mission of managing water for the benefit of its citizens through projects for municipal and industrial uses, such as SWPP. However, demographic changes in the state, from rural to urban, and west to east, were continuing, presenting a serious challenge to getting the state’s water to where it was most needed.



Water pipeline being installed, as part of SWPP.

But, something unprecedented in the state’s history was just over the horizon, which would impact the state, and the Water Commission forever.

The Wet Cycle & The Bakken

“There is no possibility of replenishment of Devils Lake from natural precipitation in the Sub-basin.”

In 1992, North Dakota started the fifth year of a drought. Throughout the state, the emphasis was on how to deal with the drought’s impact on the water resources of the state. In Devils Lake, people were worried that the fishery would collapse due to low lake levels. In the rest of the state, concern was over developing more irrigation to combat the drought, and securing adequate water supplies for cities.

AND THEN IT BEGAN TO RAIN

At first, the rain solved many of the state’s problems. Crops were receiving enough moisture, cities that drew their supplies from rivers had no worries about running out, reservoirs filled up, and the fishery in Devils Lake was saved. But then, the rain continued.

Looking back, it is clear that this was the beginning of the wet cycle. A pattern of weather that saw most parts of the state receiving annual precipitation in greater amounts than the “normal” historical average. It wasn’t always a record-breaking year, but on the whole, the state began seeing wetter years. And all that moisture started leading to problems. Precipitation records for Fargo, Bismarck, and Williston, for the period of 1907-1992, versus 1993-2011 (the current wet cycle), showed increases in average annual moisture of 29%, 28%, and 11%, respectively. A few inches of moisture from what is considered “normal,” can result in significantly wetter conditions over successive years.

Devils Lake was the first region in the state where the wet cycle became a problem. This provides an interesting contrast to the Water Commission’s early understanding in the 1937 Water Plan of how the lake reacted during a drought, where it was described “*There is no possibility of replenishment of Devils Lake from natural precipitation in the Sub-basin. This is already completely used by evaporation from shallow lakes and earth’s surface and by transpiration from plants.*” As Devils Lake rose, it quickly surpassed the historical high elevation. Local, state, and federal entities began

furiously working to stay ahead of the rising lake, but the lake kept growing. Flood protection infrastructure started at hundreds of thousands of dollars, progressed to millions, then hundreds of millions. If the authors of the 1937 water plan could see the big lake today, one can’t help but wonder what they would think.

THEN CAME 1997

The flood of 1997 has been chronicled exhaustively elsewhere. What it represented was a new era in the Water Commission’s efforts in regards to water management. Flooding impacted the entire Red River Valley, North Dakota’s most populous region. Although the battle was not lost in Fargo, in many other areas in the basin, notably Grand Forks, the floodwaters burst through flood protections. All told, nearly 1 in 10 houses in Grand Forks were flooded by the Red River. In the end, local, state, and federal funding totaling \$350 million was directed towards building a series of permanent flood control structures in Grand Forks.



Bruce Engelhardt, Director of the Water Development Division at the West Devils Lake Outlet in 2005.

Devils Lake continued its inexorable rise, swallowing roads, homes, and necessitating an ever-increasing expenditure of local, state, and federal funds to combat its rise. A federal outlet from the lake to the Sheyenne River was examined in the late 1990s but was later abandoned. Years later, a more cost efficient and practical West Devils Lake Outlet, sponsored by the Water Commission, was completed in 2005. A state East Devils Lake Outlet, along

with a control structure on the Tolna Coulee was constructed in 2012. All told, over a billion dollars have been spent on infrastructure protection in the Devils Lake basin since 1993.

By 2008, it seemed as if perhaps the wet cycle, which had caused so many headaches in the state, was easing somewhat. Unfortunately, things were just going to get more complicated.



An aerial view of 96” pipe being staged for installation along the route of the East Devils Lake Outlet in 2011.

While Fargo was spared from the worst of the flooding in 1997, through a combination of hard work and good luck, two significant floods in 2009 and 2011 sorely tested the city and nearly overwhelmed its levees, highlighting the need for Fargo to build flood control on par with what had already been completed in Grand Forks.

2011 was a year of flooding in the Red River Valley, but it was also record breaking in the Missouri River and Souris River basins. A combination of extremely full reservoirs, significant snowpack, and record breaking rainfall in May and June put the region in a crisis. The cities of Bismarck and Mandan saw significant flooding, but avoided the worst-case scenario. In Minot however, the flooding was catastrophic.



A house collapses into the Missouri River due to bank erosion during the record 2011 flood.

Approximately one in three homes in Minot were flooded to some degree, resulting in a FEMA estimated \$1.2 billion in damages.

Damages from the Red and Missouri Rivers were estimated at \$50 million from the 2011 flood.



The 2011 flood of the Mouse River inundated large portions of the city of Minot.

ND’S OIL DEVELOPMENT

In the mid-2000s, a combination of high oil prices and emerging technologies such as hydraulic fracturing, made possible the recovery of oil from petroleum-bearing shale in western North Dakota. While groundwater can be used for hydraulic fracturing, limited availability and quality in the locations in North Dakota with oil-bearing rock meant the Missouri River and Lake Sakakawea represented the best



Ribbon cutting ceremony to celebrate NAWS providing water service to Fort Berthold in 2008.

available water source. With the Missouri River providing nearly 96 percent of the available surface water in North Dakota, demand for its water has never been greater. Water supply projects, such as SWPP and Northwest Area Water Supply Project (NAWS), had been in existence for years, but these projects had been designed with the goal of meeting needs based upon 1980s population projections. For this reason, another project, the Western Area Water Supply (WAWS) was conceived in order to meet the needs of a population that was suddenly increasing due to oil-related jobs, and to provide water from the Missouri River for hydrofracturing. These increases in demand were challenged by an effort by the United States Army Corps of Engineers to claim that water in the Missouri River mainstem reservoirs in North Dakota was the property of the federal government, and to require users to pay the

The Wet Cycle & The Bakken

“Having the data collection driving the evolving technologies, not the other way around.”

federal government for storage of these waters. This position of the Corps is in direct conflict with that held by North Dakota; that at a minimum, the natural flows of the Missouri River have, and always will belong to the state for the beneficial use of its citizens. Further, as long as natural flows in the river are sufficient, the reservoirs on the Missouri River provide no service to water users, and in fact, impede access to the state’s waters. With the Missouri River belonging to the states most valuable resources, the Water Commission will continue to work diligently to protect our citizen’s rights to those waters.

THE DIGITAL AGE

Another significant development was the dramatic reduction in the price of electronic

data storage in the late 1990s and early 2000s, which made it feasible to have most of the Water Commission’s paper records digitized and made available to the public for free on-line. Further accessibility of the immense amounts of collected data, approximately 50 terabytes (50 trillion bytes), via the Water Commission’s MapService and website, which has everything from survey plats, to pictures of dams, to well driller logs, and more, is a valuable tool, now available to the public for free. Having in-house information technology professionals, who also have science backgrounds, allowed the Water Commission to customize its systems to meet the needs of the agency and the public. Chris Bader, Information Technology Manager for the Water Commission describes it as “*Having the data collection driving the evolving technologies, not the other way around.*”



East Devils Lake Outlet in 2012.



Missouri River

The Future

“The results of the decisions made and actions we take today will be with us for a long time. It is up to us to choose as wisely as our predecessors did.”

As the Water Commission reached its 75th year, North Dakota faced an unprecedented abundance of projects and needs:

- Flood control for Fargo, Minot, Bismarck, Valley City and many other smaller communities;
- Devils Lake outlets, a Tolna Coulee Control Structure, and additions to the City of Devils Lake levee; and
- Expansion and development of water supply projects like Northwest Area Water Supply (NAWS), Western Area Water Supply (WAWS), Red River Valley Water Supply, and several other rural/regional and municipal water supplies, and further expansion of Southwest Pipeline Project (SWPP);

Coupled with those project needs, the Water Commission is grappling with several major issues.

- The Corps of Engineers assertion of ownership of and access to the waters of the Missouri River;
- A wet cycle that has lasted for two decades, and gives no sign of ending;
- A much reduced role of the federal government in the funding of projects in the state;
- Dramatic population increases in the western half of the state, along with increases in the need for infrastructure;
- Aging infrastructure (smaller dams, drain maintenance) and requirements for municipal, rural, and regional water supply system upgrades;
- Floodplain management; and
- Sovereign land management.

A large part of the Water Commission’s success in dealing with the challenges it has faced since its creation in 1937 has been its flexibility and foresight. In a region known for dramatic swings in climate; from the most extreme floods, to punishing droughts, a tradition of gaining a better understanding of the resources of the state has its root in the era that the Water Commission was created. As State Engineer Todd Sando



17th State Engineer Todd Sando

notes “*Today, during what may be the wettest portion of a decades-long wet cycle that has also had catastrophic affects, we are facing challenges of the same magnitude as the “Dirty Thirties,” but from too much moisture.*” Sando went on to say that “*Just as the decisions made in those early years guided the development of the state far into the future; the results of the decisions made and actions we take today will be with us for a long time. It is up to us to choose as wisely as our predecessors did.*”

In the 75 years it has existed, North Dakota’s Water Commission has faced flood and drought, and economic downturns and prosperity. With a history of service, and a mission of managing the state’s water resources for the people of the state, the next 75 years promise an even brighter future.