

Editorial

Water Challenges

I just returned from a two-week trip to Israel and discovered some of the very same problems with water over there that we have here and in other parts of the western United States. For example, the Oglala Aquifer has been lowered in parts of western Nebraska and Kansas, and while it currently provides an enormous economic engine with the irrigation provided, water folks are contemplating solutions to replenish the water level of the aquifer. One solution that has been mentioned is the import of water from other water sources, like the Missouri River. Closer to home, we are seeking to provide Missouri River water throughout our state to areas that have desperate shortages or quality that is not suitable for human consumption. The NAWS, SWPP, WAWS, and RRVWS projects are about providing domestic and municipal water for a population base that is both urban and rural and also providing water for industry, energy, manufacturing, and other uses as well. The Colorado River is overextended, with Arizona, Los Angeles, and other states and communities and industry and irrigation depending on water from the Colorado.

In Israel, the Jordan River between the Sea of Galilee and the Dead Sea provides the boundary between Israel and Jordan. Both countries have appropriated water from the Sea of Galilee, the Jordan River, and other rivers that flow into the Jordan, substantially reducing the amount of water that flows into the Dead Sea. These appropriations of water support extensive irrigation and agriculture endeavors and provide significant economic growth and stability. However, the Dead Sea has been lowered about three feet per year over the last 20 years, resulting in a substantial decline in its elevation. It already is about 1,300 feet below sea level, and the Mediterranean is not that far away. So naturally, there is some consideration about diverting water from the Mediterranean Sea into the Dead Sea.

While the purpose of our trip was to learn about the lands and stories of the Bible and to see firsthand the places and events that have shaped both lives and history ever since, it was very interesting to see the water challenges being faced in another part of our planet that are very similar to ours. Makes me want to wave a magic wand and get all of our water infrastructure projects done to provide both economic growth and quality of life. Since that is not possible, we will continue to seek progress on all of our water supply and

flood control needs during this next legislative session. I look forward to seeing North Dakota's water community at our upcoming annual water convention. See you there. North Dak

Al water Executive Director North Dakota Water Education Foundation





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Humor column by rancher Dean Meyer

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"Ice Jewel," by Henry Borysewicz of Larimore. This photo was 1st Runner Up in the 2016 North Dakota Waterways Photo Contest, sponsored by the North Dakota Water Education Foundation.



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NDRWSA Recognizes 2016 Expo Sponsors

By Lisa Schatz

The North Dakota Rural Water Systems Association (NDRWSA) staff and board of directors would like to thank the sponsors of this year's annual Water Systems Expo and Conference. The generous support of these sponsors helped make NDRWSA's mission a reality by defraying costs associated with hosting such an event. "Our mission would be unobtainable without the commitment and dedication of our sponsors," says Eric Volk, executive director of NDRWSA. "As we continue to provide 'hands-on' technical assistance and training during this event, we know that the sponsorships played a vital role in our success."

NDRWSA wants to dedicate this feature article to its sponsors, as well as give our readers an overview of the companies that work endlessly to provide expertise and product knowledge to our members. We look forward to hosting next year's Water Systems Expo and Conference in Bismarck.

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and its unique brand of extreme client service to clients in the Upper Midwest. Its primary service is water – meaning water, wastewater, and water resources system consulting, which represents more than 70 percent of its annual revenues. Within these primary services, it offers a total solution by providing master planning, capital improvement planning, study and report, design, bidding administration, and construction administration/ observation. Surveying, mapping, geographic information systems (GIS), instrumentation and controls, general civil engineering, structural engineering, electrical engineering, and site development are also provided as stand-alone services or in support of its primary services.

Bartlett & West has 14 offices in 10 states, including



a Bismarck location made up of more than 120 employee owners. The firm provides engineering, technology solutions, and other professional services to a wide range of clients. Bartlett & West serves water districts, local and regional municipalities, energy and rail companies, land developers, architects, private industry, and other clients.

Moore Engineering, Inc., offers professional consulting services in



nine specialties: municipal engineering, water resources engineering, surveying, GIS, land and site development, water and wastewater engineering, transportation engineering, airport engineering, and municipal administration. Moore's engineers are trusted advisors and partners with the company's clients, working side by side to find complete solutions to infrastructure challenges. Moore covers all components of a project, from initial concept, permitting, and funding to implementation and maintenance. Its engineers know how to work with multiple jurisdictional agencies to turn ideas into reality. Everything Moore does revolves around the desire to strengthen the region and improve the lives of its residents.

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The Hawkins Water Treatment Group supplies products to customers in 18 states across much of the United States, utilizing a route/



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DSG Waterworks was established in

was established in 1898. This 100 percent employee-owned company is one of the



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Ferguson Waterworks is a company that is all about relationships



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Since 1938, **KLJ** has provided multidisciplinary engineering-based solutions for national, large-scale operations, with the local



expertise to drive projects forward and deliver successful results. Its strong regional connections, in-depth local knowledge, responsive personal service, and industry experience create strategic advantages for all clients. As an employee-owned firm with a focus on innovation and hard work, KLJ helps clients succeed by developing lasting infrastructure that responds to the social, civic, and economic needs of the communities it serves.

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Short Elliott Hendrickson

Inc., (SEH[®]) is an employeeowned company providing engineering, architectural, planning, and environmental services to public and private clients throughout the country. Its more than 800 employee owners deliver valuable solutions



Building a Better World for All of Us[®]

in the buildings, energy, environmental, infrastructure, transportation, and water markets. Its collective purpose and body of work is focused on Building a Better World for All of Us[®]. The planet's water systems are integrated. So is SEH's approach. Whether challenges reside in surface water, storm water, wastewater, or drinking water, its integrated teams design sustainable solutions that are mindful of the integrity of the entire water system. While its projects often include new and innovative ideas, it always looks for budget-appropriate solutions that maximize every valuable drop. When the purity of the most precious resource is concerned, SEH knows every decision matters and every drop counts. Since 1927, it has helped clients overcome challenges through strategically tailored services. It understands its public clients - local governments and state, regional, and federal governmental agencies - must meet a wide array of needs with often limited resources. When working with clients in the private sector – commercial

developers as well as industrial businesses: oil and gas, food and beverage, and mining-SEH helps businesses respond to the dynamic needs of the marketplace. Its clients can be found across the country, with evidence of its work in 42 states.

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Bismarck State College offers an online certificate program in water and



wastewater treatment. The program can be completed in two semesters over nine months. Courses emphasize the safety of communities, personnel, and the environment while focusing on the biological, chemical, and mechanical knowledge and skills needed in all types of water treatment facilities. Students also complete a job shadow experience. This experience requires students to observe and assist in the daily operations of a functional water or wastewater treatment facility. The program prepares students for certification examinations. Select e-Learning courses offered through the American Water Works Association may qualify towards program completion requirements.

Black Mountain Software designs, engineers, and delivers easy-to-use utility billing, fund



accounting, payroll, and cash-receipting software. Its products are full-featured, highly integrated, and proven to deliver operational efficiency. Across 24 states, more than 570 customers in city and county governments, schools, utility, and special districts rely on Black Mountain Software products and knowledgeable, "small-town," friendly customer support. Software can be locally installed or hosted on Black Mountain's reliable, secure cloud network. For more information about Black Mountain Software, call 800-353-8829, visit *www.blackmountainsoftware.com*, or find it on Facebook or LinkedIn.

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Company has been committed to offering the best in equipment solutions and dealer support. Founded in 1955 in Fargo, third-generation, family-owned Butler Machinery serves the construction industry in North and South Dakota, along with Clay County, Minn. Butler Ag Equipment, a division of Butler Machinery, provides quality ag products for Nebraska. It represents many manufacturers, including Caterpillar, AGCO, Lexion, Drago, Horsch, and many more. Butler promises to provide the best in sales, rental, parts, and service from the initial purchase to beyond. Providing exceptional customer support has always been its number one priority and is what sets its apart from the competition. Its mission is to build long-term relationships with its customers founded on trust, generating mutual growth, and success.

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there are fundamental property and casualty risks they need to understand and prepare for. That's why **Howalt+McDowell** custom designs risk management programs that fit its customers' one-of-a-kind needs and control their costs of risk. Howalt+McDowell will take care of the insurance issues so its customers can take care of business. Turn to Howalt+McDowell, a Marsh & McLennan Agency, and discover a partner that understands change, crisis, and how to manage the risks of both.

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for business in 2014. Having been named the new Badger Meter



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family business founded in 1975 by Earnest Alexander. Specializing in trenchless technologies, Visu-Sewer is one of the largest full-service sewer inspection, maintenance, and rehabilitation contractors in the Midwest. From start to finish, Visu-Sewer's specialized equipment and skilled personnel make it one of the few companies that can investigate, diagnose, and complete collection system rehabilitation projects.

Natural Resources Trust Celebrates

By Angela Magstadt

What began as an effort by then-Governor George Sinner and a handful of water and wildlife leaders to facilitate collaboration between wildlife and agriculture interests has grown far beyond anyone's initial expectations. The organization created by this effort is now known as the North Dakota Natural Resources Trust (Trust), and this year it is celebrating 30 years of on-theground programs benefiting both agriculture producers and wildlife conservation.

Garrison Diversion

The Trust was born out of the controversy over the Garrison Diversion Unit. In its early days, the Garrison Diversion Unit project promised North Dakota 250,000 acres of irrigation as the state's repayment for giving up 500,000 acres of Missouri River bottomland, pasture, and cropland for the creation of the Garrison Dam and its reservoir, Lake Sakakawea.

As the project progressed in

SMITH GROVE WILDLIFE MANAGEMENT AREA IT WAS THE VISION OF GLEN SMITH AND HIS FATHER, GEORGE, TO CONSERVE THIS PROPERTY ALONG THE MISSOURI RIVER IN ITS

NATURAL STATE FOR FUTURE GENERATIONS. THE NORTH DAKOTA GAME AND FISH DEPT., ALONG WITH SEVERAL CONTRIBUTING PARTNERS, PURCHASED THIS LAND FOR THE PURPOSE OF WILDLIFE

MANAGEMENT AND PUBLIC USE.

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the 1960s to the 1980s, various features were constructed. However, government entities, including Minnesota and Manitoba, as well as environmental organizations, began raising issues about:

- The project's environmental impacts,
- Acquisition of land,
- · Economics of irrigation, and
- · Canadian concerns about water quality flowing from the Missouri River Basin into the Hudson Bay Basin.

These controversies would soon halt construction of the original project.

The Wetland Wars

During the same time, wildlife interests and farmers, especially in the Devils Lake Basin, were at odds with each other regarding the draining of wetlands. Farmers were draining wetlands on their farms, which allowed them to farm as much land as possible, and wildlife groups were attempting to stop this from happening. The North Dakota Chapter of the Wildlife Society went as far as suing the State Water Commission on a number of drainage projects in the state.

Things got ugly. Some banks in Devils Lake refused to cash or accept U.S. Fish and Wildlife Service (FWS) payroll checks. A FWS Wildlife Management District employee was having lunch at a local café, and when a farmer sitting next to him saw the patch on his uniform, he got up and put his cigarette out on the man's hamburger. A wetland acquisition officer wouldn't eat pasta because it was made of durum wheat. The son of a refuge manager told his classmate his dad was a used car salesman so he wouldn't get picked on at

school. In the midst of all this conflict, then-Governor Sinner, after a meeting in Washington, D.C., with

various water and wildlife interests, looked at all of them, and told them to, "just figure it out," says Mike McEnroe, former project leader with the FWS. "He asked us to work together to find solutions to the wetland problems. And that was the beginning of what developed as the North Dakota Wetlands Trust."

Creation of the Trust

The Wetlands Trust was part of the 1986 Garrison Diversion Reformulation Act, which significantly changed the original Garrison Diversion project, emphasizing municipal, rural, and industrial water supply rather than irrigation for crop production. The Wetlands Trust's original mission was to preserve, restore, manage, and enhance wetlands and associated wildlife habitat in North Dakota. In 2000, that mission was broadened to include grassland conservation and riparian areas with the passage of the Dakota Water Resources Act, and its name was changed to the North Dakota Natural Resources Trust. To ensure its success, Congress originally authorized \$12 million in federal funding with a \$1.2 million state match. An additional \$25 million was added to this funding as part of the Dakota Water Resources Act of 2000. Only the interest from Trust funds can be spent.

The Trust is governed by a board of six directors, three appointed by the governor and three representing the National Audubon Society, the National Wildlife Federation, and the North Dakota Chapter of the Wildlife Society. Because of the equal representation on both sides, wetland and agriculture organizations worked together to achieve benefits for agriculture, water, conservation, and wildlife.

The Trust's Many Accomplishments

Over the last 30 years, the Natural Resources Trust has worked on a broad array of projects from short-term landowner agreements to large land acquisitions. In the late 1980s and early 1990s, when the Trust was operated by the board without any staff members, many of its programs were land acquisitions. Some of these early land acquisition projects, which helped further the Trust's mission, are:

- Kenner Marsh is a wetland mitigation site in Ramsey County that serves as a water storage site for farmers in the upper watershed who want to drain wetlands on their property. The Trust continues to own the Kenner Marsh property under a long-term lease and management agreement with the North Dakota Game and Fish Department.
- Chase Lake Wildlife Project is a North American Waterfowl Management Plan flagship wetland and grassland conservation project in Stutsman County, completed in partnership with many state agencies and supported by agriculture and conservation interests.
- The Maple River properties were lands the Trust purchased to serve as a test site for conservation practices. Landowners could rent land on this property to experiment with new conservation practices to see if they are something they would like to implement on their own land. The Trust installed a grazing system and purchased equipment such as a no-till drill for this purpose. This program helped reduce the risk for farmers who implement conservation practices on their land.





In addition to land acquisitions, the Trust has also played the role of project coordinator on some large acquisition projects, such as:

- The Joliet Ferry and Walhalla Wildlife Management Areas are properties that were severely damaged by flooding on the Red River. The Trust worked with the owners of these properties and federal, state, and local partners to facilitate the purchase of the land, which could no longer be used for farming. Large wetlands were restored on these lands, as well as restoration of tall-grass prairie. Both of these areas are public-access properties.
- The land surrounding the **Missouri and Yellowstone River Confluence** in McKenzie County is prone to flooding and has high wildlife values and enormous historical significance. The Trust facilitated a large, complex partnership that worked over 10 years to acquire nearly 2,857 acres. This area is popular for public activities such as fishing, hunting, canoeing, and birdwatching. The Missouri-Yellowstone Confluence Interpretive Center also overlooks this protected land.

The above-mentioned projects, i.e. Chase Lake Wildlife Project, the Maple River properties, and the Joliet Ferry and Walhalla Wildlife Management Area, as well as the Missouri and Yellowstone River Confluence, are all still active projects and are now owned and managed by the North Dakota Game and Fish Department.

The Trust has also created and managed several voluntary private land programs throughout its existence, including:

- The Create-a-Wetland Program was developed during the drought period of the late '80s and early '90s. This program plugged drains used to empty wetlands, trapping water until the spring when the structures were removed and the water was drained off the fields so it could be cropped. Because this was a form of flood irrigation, these areas would produce crops, even during the drought. The Createa-Wetland Program was very successful and well received by Bottineau County landowners who participated in it.
- The Beginning Farmer Program was the only one of its kind in North Dakota. In this program, the Trust assisted beginning farmers with securing loans, helping them lower their down payments, and suggesting practices that were both agriculture and conservation friendly, such as rotational grazing, grass seeding, conservation tillage, and cover crop planting. This project continues to be a Trust focus under an Outdoor Heritage Fund grant that was received in 2015.



It's all about collaboration and partnerships. Participants gathered for one of many grassland tours the Trust has sponsored.

Merle Bennett examining another successful native grass restoration project at the Wildlife Management Area.

- Ongoing habitat projects include grass seeding as part of the Conservation Reserve Program (CRP), wetland restoration, wetland creation, conversion of marginal cropland to grass, and grassland restoration. These projects represent the voluntary private land conservation that is so popular among North Dakota farmers and ranchers.
- The Working Grassland Partnership (WGP) is a new program recently approved by the Outdoor Heritage Fund board, with funding and delivery support from the North Dakota Association of Soil Conservation Districts, Ducks Unlimited, and Pheasants Forever. WGP provides landowners with funding assistance to install the infrastructure needed to transition expired or expiring CRP contracts into healthy grazing grasslands. The program promotes livestock grazing for retaining and improving grassland habitat. A 60 percent costshare grant is available through this program to assist landowners with installing livestock and grassland bird-friendly development practices, including livestock watering systems and fencing.

In addition to all the programs the Trust has facilitated and managed, it has also provided more than \$5 million in grants for education, wetland, and grassland restoration projects, habitat conservation projects, and sustainable agriculture projects, such as grazing systems and conservation ag equipment like no-till drills.



Conservation land that was restored to native grass for wildlife habitat.

North Dakota Natural Resources Trust Board of Directors History by Organization

North Dakota Chapter TWS

- Randy Renner 2015-Present
- Scott Peterson 2001-2014
- Harris Hoistad 1996-2000
- Mike McEnroe 1986-1995

National Wildlife Federation

- Dave Dittloff 2016-Present
- Tom France 2010-2015
- Dick Kroger 1995-2009
- Ray Linder 1993-1994
- John VanDerwalker 1986-1992

National Audubon Society

- Marshall Johnson 2013-Present
- Genevieve Thompson 1999-2012
- Dan Beard 1997-1998
- Bruce Barbour 1996
- Scott Reed 1986-1995

Governor Appointees

- Duane Hauck 2014-Present
- Gary Melby 2008-Present
- Jerry Doan 2015-Present
- Jack Olin 2003-2014
- Duane Liffrig 1998-2013
- Bruce Adams 2003-2007
- Alan Hausauer 1994-2002
- Ray Horne 1998-2002
- Steven Hoetzer 1994-1997
- Clarice Liechty 1994-1997
- Norm Rudel 1986-1993
- Cliff Issendorf 1986-1993
- Russ Dushinske 1986-1993

N.D. Game and Fish Department Director (non-voting member)

- Terry Steinwand 2006-Present
- Dean Hildebrand 1997-2005
- K.L. Cool 1994-1996
- Lloyd Jones 1989-1993
- Dale Henegar 1988

30th Anniversary Thoughts from the **Executive Director**

By Keith Trego

It is not uncommon to consider 30 years as a generation. In that context, the Trust has now been around for a full generation. Refreshing our collective memories regarding the Trust's origins, the collaboration, the compromise, and the truly amazing leadership needed to move the Garrison Diversion project forward in 1986 as part of this 30th anniversary article has been both educational and a bit humbling. The Trust is a one-of-a-kind venture, the product of the fertile minds and exemplary leadership of a small group of organizational and political leaders who figured out how to turn controversy into compromise. The organization was designed to be innovative and flexible—to invest in

partnerships and conservation solutions agencies or other nongovernmental organizations (NGOs) were not well equipped to handle.

The Trust, both board and staff, have more than fulfilled those expectations over the last 30 years. We have partnered with federal and state agencies; NGOs in agriculture, water, energy, and conservation; political subdivisions across the state; and hundreds upon hundreds of private landowners to bring practical solutions to landscape needs. But perhaps the most rewarding aspects of the Trust's first 30 years have been addressing the nearly insatiable appetite for voluntary private land conservation expressed by North Dakota's farmers and ranchers.

North Dakota Natural Resources (Wetlands) Trust Employee History

Pam Dryer	Executive Director	
Keith Trego	Executive Director	1998-Present
Arnold Kruse	Biologist	
Sharon Clancy	Wetland Program Manager	
	Conservation Ag Project Coordinator	
Linda Roeder	Executive Assistant	
Larry Baesler	Biologist	
Merle Bennett	CRP/EIP Coordinator & Biologist	
Terry Allbee	Business Manager/Biologist	1999-Present
Faye Boucher	Maple River Technician	
Randi Kading	Conservation Agriculture GIS Technician	
Karen Kreil	NAWCA/NAWMP/Biologist	
Jesse Beckers	Conservation Program Coordinator	2015-Present
Rick Warhurst	NAWCA/NAWMP/Biologist	2016-Present
Mary Bandle	Administrative Assistant/Bio Tech	2016-Present

I grew up on a very small family farm in northwest Cass County, back in the day when the term "family" in "family farming" had a significant meaning to me. I was lucky enough to be surrounded by immediate and extended family who worked closely together on the land. Those formative years cemented my love of agriculture, my respect for the land, and my lifelong commitment to protect our natural resources for future generations. The opportunity to play a role in guiding the resources of the Trust to solve unique problems or capture unique conservation opportunities that benefit all North Dakotans has been one of the most satisfying aspects of my career.

It is impossible to predict what the next 30 years will bring for the Trust, but one thing is certain. The needs of the state, our farmers and ranchers, as well as our water and energy partners, will evolve. The Trust will respond to and change with those needs, working with partners at all levels and in all venues. I have no doubt the Trust will be as valuable an entity for protecting the state's natural resources and bringing common-sense solutions to both public policy and on-the-ground conservation needs in 2046 as it has been over the past 30 years.

We could not conclude our 30th anniversary reflection without mentioning, and thanking, a few of the key individuals who created meaning out of chaos in the early 1980s, leading up to the Garrison Diversion Reformulation Act of 1986. Foremost among those is former-Governor George "Bud" Sinner, who laid out a challenge to a diverse group of organizational and political leaders to figure things out and move forward. The state's senators and congressmen, including Quentin Burdick, Mark Andrews, Byron Dorgan, Kent Conrad, and Earl Pomeroy, played key roles in the Trust's formation and funding. At the state and local level, agency and organizational leaders like Mike McEnroe, Lloyd Jones, Mike McKenna, Mike Dwyer, Emerson Murray, and Charon Johnson played key roles. And there were more, many more, who contributed to a new vision of the Garrison Diversion project, which included the Trust. Their hard work, vision, and leadership on behalf of North Dakota needs to be noted and celebrated.

CONSERVE NORTH DAKOTA AND YOU BENEFIT, TOO.

To preserve, enhance, restore, manage wetlands and associated wildlife habitat, grassland conservation and riparian areas in the State of North Dakota is the Trust's mission. We are committed to preserving our natural resources for future generations to come. North Dakota is one of the most sought after states for hunting, fishing and other outdoor activities. We need to preserve these resources not only for our enjoyment, but also as an important piece of our state's economy.

We are asking for your help in these efforts. Your support of the North Dakota Natural Resources Trust Endowment Fund called "Conserve ND" means you can support North Dakota's natural resources and receive significant tax benefits, too. In 2011 the state statue was amended to include gifts of cash or property. Now your minimum gift of \$5,000 to Conserve ND gives you a 40 percent tax credit. Your \$5,000 gift could result in \$1,400 of federal tax savings and \$2,000 in state tax savings or a net cost of only \$1,600. The credit is up to \$10,000 per year for individuals or \$20,000 for couples filing a joint return. The 40 percent tax credit also applies to corporations and business entities, with different limitations.

The combination of federal and state tax deductions for charitable gifts offers North Dakota taxpayers a great tool for income tax reduction while supporting North Dakota charities. Please join in our efforts to preserve our natural resources. For more information or questions please contact Mary at the Trust: 701-223-8501 or mary@naturalresourcestrust.com.

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NATURAL RESOURCES

RUST



IRRIGATION IN ANCIENT CIVILIZATIONS

By Jerry Schaack, Field Representative, North Dakota Irrigation Association

- All the water that will ever be is right now.

Several irrigation-based civilizations developed as far back as 6,000 years ago. These included the Babylonians, Assyrians, and Sumerians in the Mesopotamia area, who developed and practiced irrigation in the lower Tigris and Euphrates River Basins, now present-day Iraq. This area was known as the land between the rivers in an area commonly referred to as "The Fertile Crescent." Other ancient, irrigation-based civilizations developed in the Indus River Basin of Pakistan and India, around the Yellow River in north-central China, and later in the western hemisphere in central Mexico, Peru, and the southwestern United States. These civilizations each saw the rise and fall of an advanced society rooted in irrigated agriculture.

This article focuses on the rise and fall of the Mesopotamian area from the viewpoint of irrigated agriculture and related issues. There were other factors, along with irrigation, which contributed to the buildup and deterioration of these cultures; these will be discussed, but in some instances, the actual causes are lost in history. The other civilizations mentioned above probably failed for some of the same reasons as those in Mesopotamia, but each has a unique and partially unknown story. Common threads in most of the failures are salinization, long-term climate change, and poor management, along with political upheaval. Sandra Postel's "Pinnacle of Sand" provides an excellent discussion of the history of world irrigation. Ideas from her book are included in this article.

The Sumerians were the first people to migrate to Mesopotamia, which is considered the cradle of civilization, about 5,500 years ago. They built seven extensive city-states and made many advances in technology, such as inventing the wheel, plow, and writing. At first glance, and perhaps this should have been a signal, it does not look like an area for a civilization to flourish. It is hot and very dry, and there is very little rainfall in lower Mesopotamia. However, snow melting in the mountains to the north in Turkey, at the source of the Euphrates and Tigris Rivers, created annual flooding. The flooding deposited silt, a fertile rich soil, on the banks of the river each year. This eventually formed the "fertile crescent," which when it receives water, can be very productive.

The development of irrigation systems in Mesopotamia was one of the major avenues toward more advanced civilizations and modernization. The farmers in Sumer created levees to hold back the floods from their fields and cut canals and gated ditches to channel and distribute river water to their fields. It is believed they were the first to irrigate. Irrigation, however, was difficult due to the erratic and untimely flows (floods) of the Tigris and Euphrates Rivers, which occurred at the "wrong" time. The major flows occurred April through June, which was too late for the summer crops and too early for the winter crops. Secondly, the two rivers carried a very high sediment load. The small incline or slope of the alluvial plain and the fine texture of the soil caused waterlogging and salinization due to lack of natural drainage. Since water was scarce when it was most needed, it was a precious and valuable resource, and each city-state had an army to protect its water rights, resulting in frequent fighting. The fight for water continues today throughout the inhabited world!

In spite of these problems, the local inhabitants practiced irrigated basin agriculture as successfully as conditions permitted throughout much of the turbulent history of the area. The principal practice against salinization, often a result of long-term irrigation, was alternate-year fallowing. During this time, deep-rooted wild plants, like the Shok and Agul, were allowed to grow, which lowered the water table sufficiently (two meters) to grow a crop the following year. Water from the subsequent irrigation leached the soil to allow crop growth. This system to combat salinity worked because it was traditional and accepted and understood by the villagers, but eventually it did not prevent salts from being slowly brought to the surface and inhibiting growth. Some attempts were made to remove the salty top layer of soil, but it was largely ineffective and eventually the land was abandoned.

Another system of irrigation, although its history is somewhat unclear, helped to deal with the salinization issue and consisted of utilizing and, perhaps, enhancing the social structure between irrigation farmers and nomadic tribes in the area. A relationship or evolution between these groups was established through marriage ties, economic interests, and agreements to allow animals to pasture on fallow fields. When traditional irrigation became difficult, the farmers would revert to pastoral nomadism. The livestock provided not only an income, but an "insurance policy" against drought, salinization, loss of land, or other crisis. This system seemed to work and was sustained because of the tradition of hospitality and mutual obligations of its different members, which spread risks and strengthened cooperation in operating and maintaining this cultural and physical system. This process seemed to prevent the concentration of wealth and power. It was run by the Shavkh, or chief, who was regarded as an "equal," had no political power (but prestige was important), and was not allowed to build up large land holdings. However, no system is perfect, and revolutions were frequent to replace the Shaykh, usually from a different group.

Irrigation continued in Mesopotamia as described above; however, sometime during the third millennium, there seems to have been a massive increase in constructing major "irrigation" canals in the Euphrates and Tigris River Basins. These works were more often to satisfy the needs of a rapidly increasing urban society, or kingdom, and its leaders rather than irrigation. Particularly significant, and ultimately followed by others, was a very large canal in southern Iraq to irrigate about two million acres, built around 2400 B.C. The water from this canal was apparently misused and led to seepage, over irrigation, and a rise in the groundwater. Literary texts state, "the black fields become white and choked with salt." A sharp decline in soil fertility resulted in wheat being replaced by barley, which is more salt tolerant, and an eventual decline in barley yields by 60 percent by 1700 B.C. As a result, many of the great Sumerian cities dwindled to villages or were left in ruins.

From around this time to the sixth century A.D., other massive canals were built by various kings and dynasties to bring the Tigris and Euphrates River water to the Fertile Crescent with apparently little regard for initial costs or future management. The largest of these was the Nahrawan Canal, which was to supply unlimited water from the Tigris. Three



hundred kilometers of this canal are still visible today. It seems the construction of these "great" water projects were sometimes built to satisfy the ruler's vanities and to support an increasing population, rather than for sustained irrigation and a thriving future.

It is not entirely clear why and how these systems and cultures failed, but it appears that mismanagement by governments, soil deterioration (salinization), disrepair of canals, and dwindling water supplies, which caused significant social, economic, and ecological problems, were the major reasons. By the 16th century, only trickles passed through the main canals to supply a few dying towns in the now hostile desert. As history has often pointed out and been verified by those who have worked in this area, irrigation is generally more successful if managed on a local basis, likely because local farmers better understand "what best works for them." They are more likely to take ownership and manage and maintain their projects, while state/country management often does not have a good understanding, desire, or presence to deal with these issues on a sustained basis.

Since the 1960s, irrigation and water resource development in the Euphrates and Tigris River Basins has been ongoing. Iraq, Iran, Turkey, and the Syrian Arab Republic are located within these basins, with a total of about 44 million acres of irrigated land. Extensive plans are ongoing by these countries to further develop their water resources. One of the main problems has been the distribution of the water in an equitable manner among the countries. Significant progress has been made through treaties and agreements, and numerous dams and related facilities have and are being constructed.



The North Dakota Irrigation Frontier pages are provided by the North Dakota Irrigation Association with the support of:

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P.O. Box 2254 Bismarck, ND 58502 • 701-223-4615 • 701-223-4645 (fax) • e-mail: ndirrigation@btinet.net



Dickinson Water Festival

On Sept. 22 and 23, the Southwest Water Authority and North Dakota State Water Commission cooperatively sponsored the 17th annual "Make a Splash" Water Festival at the West River Ice Center in Dickinson.

Over the course of the two-day event, more than 540 fifth grade students from elementary schools in the Southwest Water Authority's 12-county region participated in the event. Three half-day blocks were available for students to take in 10 different presentations and activities. In addition, 250 people attended the everpopular Family Night on the first night of the program.

The festival consisted of structured learning stations, demonstrations, and exhibits where student were actively engaged in hands-on water activities and investigations. And, what makes this event and others like it around the state so popular is the festivals provide students with an opportunity to learn about water resources in a way that both compliments and reinforces their traditional classroom learning in a fun and informative manner.

Southwest Water Authority staff and Tina Harding, director of the State Water Commission's Water Education Program, organized the event. Harding coordinates water education programs and services for North Dakota K-12 teachers, pre-service teachers, natural resource educators, K-12 youth, and youth leaders throughout the state.

The program's purpose is to facilitate and promote awareness, appreciation, knowledge, and stewardship of North Dakota's water resources.

FESTIVAL STATIONS

STATION 1: THE LONG HAUL

Water use and conservation in the late 1800s. Sharleen Stigen, Project WET facilitator

STATION 2: 8-4-1, ONE FOR ALL

Who uses water, for what reasons, and where it comes from. Bailey Elkins and Rod Stroh, ND Rural Water Systems Association

<u>STATION 3: WATERSHED MODEL/</u> <u>GROUNDWATER MODEL</u>

What watershed (ground and surface water) pollution is and how to prevent it. Bonnie Twogood, Jolyn Wasem and Kaylee Stein, Dunn County Soil Conservation District

STATION 4: H2OLYMPICS

Investigating the physical properties of water. Michael Noone, ND State Water Commission

STATION 5: REACHING YOUR LIMITS

The relationship between water quality and water treatment. Jim Jeske, Project WET facilitator

STATION 6: BLUE BEADS

Movement of water in a river system through the seasons. Hank LaBore, Project WET facilitator

STATION 7: PUCKER EFFECT (DAY ONE)

Ground water contamination. CaraLee Heiser, Dickinson High School and Project WET facilitator

STATION 7: HIDDEN WATER (DAY TWO)

How much water it takes to create products we use. Treva Slaughter, USFS Dakota Prairie Grasslands

STATION 8: THUNDER & LIGHTNING & HAIL, OH MY!

Understanding thunderstorms and cloud seeding. Mark Schneider, ND State Water Commission

STATION 9: PETE BOGG & THE AMAZING WATER MACHINE

"Pete Bogg" shares some ways that we all can conserve water. Tom Gibson

STATION 10: THE INCREDIBLE JOURNEY

The movement of water through earth's systems within the water cycle. Tina Harding, ND State Water Commission

CHANGES TO WATER COMMISSION COST-SHARE POLICY APPROVED

At its Oct. 12 meeting, the State Water Commission modified its cost-share policy. The two main changes relate to flood protection project grants.

Specifically, for projects with a total cost of more than \$100 million, the State Water Commission may consider a greater level of cost-share beyond the standard 60 percent of eligible costs for projects without federal participation and 50 percent of eligible costs for those with federal participation.

In order to qualify for a higher cost-share percentage, projects under the flood protection program must be of basin-wide or regional benefit.

Additionally, costs for property acquired by easement or fee title to preserve the existing conveyance of a breakout corridor recognized as essential to FEMA system accreditation may be eligible for State Water Commission cost-share participation under the flood protection program.

For questions about the recent cost-share policy changes or the program in general, please contact the cost-share program administrator at (701) 328-4862 or email *bnangare@nd.gov*.





TEMPORARY WATER USE PERMIT BROCHURE AVAILABLE

In some cases, a water user only needs access to water for a limited period of time. In those instances, that person should consider a Temporary Water Permit. One benefit of a Temporary Water Permit is that the application process does not take as long as what is required for Conditional Water Permits.

A brochure explaining when a Temporary Water Use Permit is required, and how to obtain one, is now available.

The brochure can be accessed via the State Water Commission website at *http://www.swc.nd.gov/pdfs/temp_water_permit.pdf*.

The survey helicopter takes off near Jamestown, N.D.

A Geotech helicopter collected aquifer data.

STATE WATER COMMISSION CONDUCTS AERIAL SURVEY OVER THE SPIRITWOOD AQUIFER

The State Water Commission recently conducted an airborne electromagnetic survey (AEM) over the Spiritwood Aquifer, east of Jamestown, N.D. The survey, performed in October, will provide a high-resolution map of the Spiritwood Aquifer and will help water managers identify and optimize local sources of available groundwater.

The Spiritwood Aquifer is an underground water supply. The top of the aquifer is generally between 110 feet and 120 feet below the surface of the ground, and the deepest parts are more than 300 feet below the surface.

The airborne survey implemented a helicopter towing an antenna about 100 feet above the ground, which sends and receives electromagnetic signals to characterize the geology beneath the surface. "It's like getting an MRI of the earth," explained Jon Patch, Water Appropriations Division director for the State Water Commission. "The data will allow us to see the deepest and most transmissive part of the aquifer and really identify the geometry of the glacial environment."

The geophysical data was collected by the helicopter flying in a grid pattern in an area about five miles wide, extending from Wallum, N.D., in the north to Montpelier, N.D., in the south. The helicopter traversed the area at intervals of about a quarter mile. "The company hired to collect the data, Geotech, is an industry leader worldwide. AEM has proven to be a safe, dependable, and cost-effective way to collect a tremendous amount of data and may revolutionize the way we do data collection in the future. It's truly amazing and leading edge," said Patch.

The estimated cost of the project is between \$250,000 and \$300,000 and will be paid for by the North Dakota State Water Commission. Flights for the study began on Oct. 6 and were completed on Oct. 24.

"The project has considerable promise, and it's also a very cost-effective method to gather great amounts of input," noted Patch. "Preliminary data is starting to materialize and so far it's generated exceptional information, which is very exciting."



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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THE

MOSPHERIC RESERVOIR

Examining the Atmosphere and Atmospheric Resource Management

ICE VS. WRTER: DENSITY MRTTERS * Hydroger

By Mark D. Schneider

The average ice fisherman isn't contemplating the density of ice vs. water while jigging for walleye. Water is unique, however, because its solid state (ice) is actually less dense than its liquid phase, allowing walleye and other aquatic life the ability to survive underneath the ice in cold but unfrozen waters each winter. Density is equal to mass per unit volume and can be changed by either increasing or decreasing the temperature or pressure. When we freeze a liquid, we lower its temperature and it becomes a solid. The solid states of other liquids are denser because the molecules pack together tightly when the kinetic energy (temperature) decreases.

The hydrogen bonds in water ice are indeed strong, but their orientation causes molecules to push apart, actually lowering density. As pictured in the above diagram, slightly positive hydrogen atoms are attracted to slightly negative oxygen atoms and, when these bonds occur during freezing, a lattice or crystalline structure is formed. The extra hydrogen bonds that occur when water freezes increase the space between molecules, causing a decrease in overall density. In fact, each water ice molecule forms hydrogen bonds with four other molecules, while water molecules only form hydrogen bonds with an average of 3.4 other molecules.

Water has a peak density at a temperature of approximately four degrees Celsius, which means the bottom layers of water in the lake will usually maintain this peak density temperature even though the top layers have frozen. The layer of ice on the surface of a lake works to insulate the water below. Air pockets form in the ice, like the air bubbles inside an ice cube, and these trap heat much like the multiple layers of blankets or clothes that we're accustomed to using during the winter months. It would be disastrous to aquatic

life if lakes froze from the bottom up! Another scientific consideration is the compression of water. The upper levels of a body of water provide a compressional force that acts to heat the lower levels, but this is a relatively small contributor to the overall temperature.

There are other benefits to water's greater density. Imagine how difficult it would be for giant cargo or cruise ships to float on water if it were less dense. Our oceans contain salt water, and this further benefits the shipping industry because salt water has greater mass (and thus density) than fresh water, so this helps with overall buoyancy. Try this water density experiment at home: First, place an egg in a glass of water and observe what happens to it. Next, remove the egg, sprinkle salt into the water, and stir. Keep adding salt until it won't dissolve in the water. Finally, place the egg back in the water and observe what happens.

Water is indeed essential to sustain life on Earth. When we look at specific properties such as density and its applications to science, it becomes more clear just how intricately woven it is into our lives.

Atmospheric Resource Board I North Dakota State Water Commission I 900 East Boulevard, Bismarck, ND 58505 (701) 328-2788 I http://swc.nd.gov

ND Weather Modification Association I PO Box 2599 I Bismarck, ND 58502 I (701) 223-4232

THE SPIGOT from the NORTH DAKOTA RURAL WATER SYSTEMS ASSOCIATION

31st Annual Water Systems Expo & Conference

Feb. 14-16 • Best Western Ramkota Hotel, Bismarck

- TENTATIVE AGENDA -

Feb. 14	8:00 a.m. 9:00 a.m. 2:00 p.m. 3:00 p.m. 4:00 p.m. 5:00 p.m. 6:00 p.m.	Registration Opens USDA Rural Development Engineer Training Opening Ceremony Exhibit Hall Opens Meter Change-Out Competition, Preliminary Round Legislative Reception and Exhibitor Appreciation Exhibit Hall Closes for Evening		
Feb. 15	7:30 a.m. 8:30 a.m.	Breakfast/Exhibit Hall Opens Concurrent Sessions • Board of Directors Track: Roundtable Discussions • Operation and Maintenance Track: Exhibitor Demonstrations		
	11:00 a.m.	Meter Change-Out Competition, Final Round		
	11:30 a.m.	Exhibit Hall Prize Drawings		
	Noon	Exhibit Hall Closes		
	Noon	Deli Buffet Luncheon		
	1:00 p.m.	Concurrent Sessions		
		 Board/Management Track: State Revolving Loan Fund Update, Strategic & Succession Planning, State Cooperative Purchasing and Open Meetings & Records 		
	5:00 p.m.	Social Hour		
	6:00 p.m.	Awards Banquet		
		Awards Ceremony - Honoring the Best in the Business		
		Corporate Elite and Diamond Sponsor Recognition 2017 Water Tests Contest, Final Judging		
		 Scholarship "Live" Auction and Equipment Fund Bucket Raffle Drawing 		
		Scholdiship Live Adetion and Equipment Fund Backet Kame Brawing		
Feb. 16	7:30 a.m.	Breakfast Buffet		
	8:30 a.m.	Concurrent Sessions		
		Operation/Maintenance Track: Current O&M Topics		
		Board/Management Track: Making Meetings Effective Again, When Robert's Bulas of Order Researce Disorderly, New Overtime Pulse and Creat Websites for		
		Smart Water Systems Demo		
		• Safety Track: TBD		
	11:45 a.m.	Closing Session and Grand Prize Drawing - Must Be Present to Win!		
A block of rooms has been reserved under ND Rural Water at the Best Western Ramkota Hotel, Bismarck, reservations 701-258-7700. Reserve your room prior to Jan. 12, 2017. Watch your mail or visit www.ndrw.org for more information.				

31st Annual Water Systems Expo & Conference

North Dakota Rural Water Systems Association Feb. 14-16 • Best Western Ramkota Hotel, Bismarck

Name – to be used on name badge	Title – to be used on name bac	Title – to be used on name badge	
Representing:			
Address:	_ City/State:	_ Zip:	
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A. Full Registration (\$225):			
(Includes: training sessions, breaks, social he	ours, exhibit hall, and ALL MEALS)		
	On or before Jan. 27: \$225		
	After Jan. 27: \$250		
B. Partial Registration (\$140 plus meals):			
(Includes: training sessions, breaks, social	hours, and exhibit hall)		
Individual costs if full registration is not se	lected.		
	On or before Jan. 27: \$140		
	After Jan. 27: \$165		
	Breakfast Buffet (Feb. 15): \$16		
	Lunch Buffet (Feb. 15): \$17		
	Awards Banquet (Feb. 15): \$36		
	Breakfast Buffet (Feb. 16): \$16		
C. Spouse/Guest Registration			
Name:			
Please indicate any meals your spouse/gu	est is planning to attend.		
	Breakfast Buffet (Feb. 15): \$16		
	Lunch Buffet (Feb. 15): \$17		
	Awards Banquet (Feb. 15): \$36		
	Breakfast Buffet (Feb. 16): \$16		
	Total Fees for Registration and Mea	ls:	
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Room reservations are available at the follo Ask for	owing locations: Best Western Ramkota Ho r the Rural Water block.	otel, 701-258-7700.	
Online registration is now availab payment to: NDRWSA, 2718 G	le at www.ndrw.org or mail complet ateway Ave., Suite 201, Bismarck, N	ed form and ID 58503.	
Cancellation Policy: A \$50 administration Jan. 27, 2017. There will be no refunds for attend the event, you a	ve fee will be charged on all refund request r cancellations received after Jan. 27, 2017. re complying with the cancellation policy.	s on or before By registering to	

Environmental



North Dakota Department of Health

Environmental Health Section

Ice Fishing and Water Quality

By Jim Collins, Jr., Environmental Scientist, North Dakota Department of Health



As temperatures start dropping, a portion of the state's population starts smiling in anticipation of the formation of ice on lakes. Ice means ice fishing, and those who are "hooked" are hooked for life. Most ice anglers will agree there is something therapeutic about watching a little bobber circle the hole and then slowly disappear under the water's surface. It is much cheaper than a therapist's couch; however, there can be a cost to water quality.

The Problems

Ice fishing, like other outdoor activities, can impact water quality. Sources of impacts include:

- Antifreeze used to keep holes from icing over
- Gas/oil mixes leaking from ice augers, ATVs, and vehicles
- Human and pet waste
- Litter including food scraps, cigarette butts, paper, and small propane tanks
- Disposal of live bait

The Solutions

• Never use antifreeze or fertilizers to keep North Dakota Department of Health Environmental Health Section Gold Seal Center, 4th Floor 918 East Divide Ave. Bismarck, ND 58501-1947 701-328-5150 www.ndhealth.gov

holes free of ice. An ice scoop with a long handle is best.

- Make sure your ice auger and vehicles are serviced regularly. Fix leaks before you head to your favorite lake.
- If you have to "go," do not go on the ice or down a hole in the ice. Human waste contains pathogens that are harmful to other humans and animals. Take along a portable toilet or locate nearby bathrooms to take care of business.
- Take a trash bag to pick up litter before you leave the ice. If you see others leave trash behind, please pick up theirs too. It's the right thing to do.
- Live bait can carry pathogens that are dangerous to aquatic life. Never dump bait on the ice or down a hole. Carry it off the lake and dispose of it in the trash.

Always remember, if you Pack It In...Pack It Out!



Make sure your equipment is in good working condition before going onto your favorite lake.

Voters Approve Long-Term Sales Tax Extension for FM Area Diversion Project

Voters in the City of Fargo and Cass County last month overwhelmingly approved a long-term extension of three sales taxes for flood protection until 2084. These funding measures in Fargo and Cass County passed with 66 and 64 percent, respectively. Sales taxes collections will be used to pay for the FM Area Diversion Project and could be sunset prior to 2084 when all project expenditures are paid.

"We have seen a consistent message from residents time and time again. Residents of

Fargo and Cass County are willing to do what is necessary to provide for the safety of the city so we never have to sandbag again," said Tim Mahoney, mayor of Fargo. "We are pleased to have our local funding in place as the Army Corps of Engineers prepares to start construction later this year."

"It is clear this project is needed and the desire of the people is to get it done," said Darrell Vanyo, Diversion Authority chair and Cass County appointee to the Diversion Authority. "This vote solidifies funding for the project and, with the financial plan in place, it is time to move forward to the construction phase of this critically important project."

Federal, State, and Local Funding Commitments in Place

With recent voter approval of the sales tax extensions, funding commitments for the FM Area Diversion Project are now all in place, though additional action still needs to happen to assure those commitments remain.

The North Dakota Legislature has committed \$570 million to flood protection efforts. To date, \$244 million



has been appropriated, and it is anticipated another \$66.5 million will be included during the 2017 Legislative Session. In total, the project is estimated to cost \$2.2 billion. The federal government has committed \$450 million, on top of the \$40 million in design and planning funds it has already spent. To date, the federal government has appropriated \$5 million for construction, and it is anticipated up to \$70 million could be included in 2017 appropriations.

Construction Contract in December

Award Anticipated in December

The FM Area Diversion Project continues to be a top priority for the U.S. Army Corps of Engineers, St. Paul District. The Corps is anticipating awarding its first contract for the project in late November or December.

Public safety is the Corps' main concern. More than 230,000 people live and work in the Fargo-Moorhead communities. A failed flood fight in the metro area could result in the loss of human life, \$10 billion in damages, and put thousands of Minnesotans and North Dakotans

out of work. "Sandbagging should not be viewed as a long-term solution for any community and certainly not for the Fargo-Moorhead metropolitan area, where the Red River of the North has exceeded flood stage in 51 of the past 113

ND \$570 Million

State of

Local Funding \$1.1 Billion (Sales Tax proceeds)

Federal

Government

\$450 Million

State of MN \$43 Million (proposed)

years," said Col. Sam Calkins, St. Paul District commander. "The potential loss of life and economic devastation

that would result from a failure of emergency measures are not acceptable risks."

WHEN THE WELL GOES DRY

Hello,

Kind of a long story. But you know how on Christmas, at least on TV, the family goes out and cuts a Christmas tree. That's what our family always did. And I hated it. It never worked like it did on TV. First you had to find the chainsaw. We run the only ranch in the world where you could lose a chainsaw. Lots of times. I guess we have a general rule. Leave stuff where you used it last. The trouble is that if the guy who used it last is not around, it's tough.

Last year it took two days to find the saw. And then you load everyone in the pickup and go down in the beautiful Badlands to find a tree. And the kids, who are now in their 20s, hate going with Mom and Dad to cut a tree. 'Cause they know what has happened every year since they were born.

We spot a perfect tree up on a high clay butte. Mom can see it is perfect. We climb up this slippery hill, pausing often so Dad can catch his breath, and have a smoke. As we near the tree, we see it is actually two trees. Both one sided. Ugly things with not near enough branches. Dad swears and starts down the hill.

Most years we spend about \$30 in fuel and a half day looking for a tree. Once we find a tree, a tree, not the perfect tree, the fun really begins. By now the gas cap has jiggled off the saw and we are out of gas. Or the rope comes off when you go to start it. Or the chain jumps off when it sees the tree. Eventually the saw ends up in a washout and the tree gets run over by the pickup. Mom and the kids get upset and Dad swears never again.

But this year, thanks to our neighbors, it went smooth. Bill and Ginny live up the road. And we borrow stuff from them. Cause that's what we do out here. We borrow. See, Bill and Ginny don't stay all winter. They go south when the last goose flies over the Badlands. Oh, they are Christmas spirited. They put up a tree. They invite us all up for Christmas supper. We exchange gifts. It is actually the most pleasant Christmas party of the year. We drink fine wine and eat fine food. Life is good.

But, like the wild geese, when the lake freezes over, they are out of here. I knew they were gone. I was unloading hay above their house and you could see it was abandoned. I slipped down to see if they left any food in the fridge. They didn't. And there stood their tree. Abandoned in their living room. It still had the lights on it. It was already cut. It wasn't at the top of a clay butte. I didn't need the chainsaw. Oh, I made a little mess. When I drug it out of the house. I spilled a little water on the carpet. Yes, I took the stand too. And I lost a few needles as I hurried through the house. You hate to get caught stealing a tree. But I made it! And it fit just perfect in our dining room!

Merry Christmas Bill and Ginny! And thanks!

Later,



GDCD News

Garrison Diversion Operations and Maintenance: Snake Creek Pumping Plant By Kimberly Cook

The Garrison Diversion Conservancy District (Garrison Diversion) was created in 1959 by the North Dakota Legislature to establish, construct, develop, maintain, and operate the Garrison Diversion Unit and all its parts. Working cooperatively with other agencies, Garrison Diversion's Operations and Maintenance (O&M) staff completes a wide variety of projects each year.

O&M Staff

Garrison Diversion maintains an impressive staff with high levels of expertise. Full-time employees include a professional engineer, master electrician, certified diesel mechanic, painting and coating specialists, vegetative management specialists, GIS specialist, and multiple heavy equipment operators. In addition, the majority of full-time O&M employees have their CDL (commercial

An aerial view of the Snake Creek Pumping Plant.



driver's license). A safety coordinator promotes safety procedures and implements a comprehensive safety program to ensure a safe work environment for all employees. The O&M staff is spread between offices in McClusky, New Rockford, Oakes, and Carrington, with the majority of the O&M staff stationed in McClusky.

Garrison Diversion also maintains a large fleet of equipment, including dozers, loaders, backhoes, excavators, dump trucks, tractors, and many specialized pieces enabling the completion of many diverse jobs. O&M staff performs equipment maintenance to keep the equipment in excellent working condition.

Expertise in canal maintenance, earth moving, and other construction areas enables Garrison Diversion to assist federal and state government agencies. Cooperative agreements with the State Water Commission, Bureau of Reclamation (Reclamation), North Dakota Game and Fish, and U.S. Fish and Wildlife Service benefit everybody involved.

Snake Creek Pumping Plant

The Snake Creek Pumping Plant (SCPP) is the primary facility for lifting Missouri River water from Lake Sakakawea to Lake Audubon to keep Lake Audubon at desired elevations for wildlife purposes. Owned and operated by Reclamation, the SCPP is an important feature of the Garrison Diversion Unit (GDU) Principal Supply Works. Garrison Diversion helps complete annual maintenance at the SCPP through an O&M Cooperative Agreement with Reclamation.

There are three large discharge pipes that move water from Lake Sakakawea into Lake Audubon and run from the SCPP underneath Hwy 83 into Lake Audubon. As part of the annual work items completed at the SCPP by Garrison Diversion O&M staff, each discharge pipe is opened every two years and examined to determine its condition. As part of the 2016 O&M Work Plan, Garrison Diversion O&M staff took on the large job of coating the #1 discharge pipe at the SCPP.

After assessing the project needs, the O&M staff began the lengthy process to prepare the discharge pipe for a new coating. The coating process is important to prevent the structure from corrosion and failure, ultimately extending the life of the structure.

The photo at left is looking inside of the discharge pipe during the process of preparing the pipe for a new coating.

The discharge pipe is approximately 450 feet long and 12 feet in diameter. It can be accessed in two ways, through a hatch cover on the Lake Audubon side or through a small manhole in the SCPP, only about two feet in diameter. While the coating process isn't very difficult for the experienced crew, the prep work, along with job setup and cleanup, makes it a long process. The limited access points increase the difficulty level of the project, as all equipment and necessary materials must enter and exit through the small access points.

First, the tunnels need to be dewatered, and then stop logs are put down on the Lake Audubon side to begin this process. The stop logs prevent water from coming into the tunnel. Once dewatered, the pipe gets pressure washed and sediment that has collected inside the pipe is removed. At this point, O&M workers inspect the original coatings to determine areas of peeling and chipping and remove the old coating at any loose points. Next, the pipe is sandblasted in order for the subsequent coating to stick.

The pipe is then coated in order to prevent corrosion, and the project area is cleaned. O&M workers rely on regional salesmen for advice on materials to use for coatings and guidance on sandblasting equipment and products in order to end up with the best result.

The process for the coating project ran from March through May and took anywhere from three to five employees at all times, depending on the work being completed.

In addition to the coating project completed at the SCPP in 2016, O&M staff also provides ordinary maintenance of the SCPP buildings, equipment, grounds, janitorial work, road maintenance, and vegetation control through the Cooperative Agreement.

Routine O&M work and special projects completed by Garrison Diversion employees are important to maintaining the GDU features. The purpose of these features varies from supplying water for irrigators to sustaining recreation areas and wildlife management locations. Though the functions of the GDU features vary, the importance of maintaining them remains the same.

The photo at right shows an access hole into one of the discharge pipes inside the plant.



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