SPRING 2018
CornsTalk
A publication of the Nebraska Corn Board

WATER

ALSO IN THIS ISSUE

The lifeblood of Nebraska

Aquamart: Positioning agriculture as a leader in water management

In this issue of *CornsTalk*, you'll discover how Nebraska corn farmers are continually improving their use of Nebraska's most precious resource—water—and how their corn checkoff investments are funding innovative programs designed to ensure an abundant supply of water for all of us.

Agriculture is the largest user of water not only in Nebraska, but around the globe. However, there are other stakeholders such as municipalities, recreation, wildlife, and business and industry that need a reliable supply of abundant, high quality water.

Encouraging collaboration among all water users—and positioning farmers as leaders in water stewardship—is the impetus behind Aquamart, an initiative of the Nebraska Water Balance Alliance.

Aquamart, supported in part by the Nebraska Corn Board, is a catalyst for farmer-led, field-level statewide water conservation. Aquamart leverages grassroots networking, precision technologies and best practices to create a blueprint for individual farmers to follow as they continually strive to improve their management of water.

"This is about helping farmers develop water management strategies that fit their specific operations to not only improve water stewardship, but also improve on-farm profitability," said John T. Heaston, who leads the Aquamart effort. "At the same time, we want to demonstrate to other stakeholders that ag producers can be leaders in water management."

Farmers participate in Aquamart voluntarily. Currently, Aquamart has a number of projects in the Nebraska Panhandle to help farmers gather and use data to enhance water quality, reduce water consumption and improve irrigation timing.

John Heaston *(right in blue shirt)* leads a workshop with farmers participating in the Aquamart initiative.

Heaston said Aquamart takes a holistic approach to water management in Nebraska, knowing that water issues affect everyone in the state.

"The City of Lincoln grows a crop of humans every year on about 8 inches of water. If you flooded Memorial Stadium up to the press box—and multiplied that by about 50—that would equate to Lincoln's annual water usage," Heaston said. "That same amount of water would grow about 10 square miles of corn. That's how much bigger agricultural water use is in Nebraska—and that's why it's important to give farmers the tools they need to continually improve efficiency and stewardship."

Information-sharing is a significant cornerstone of Aquamart. "We're building peer learning networks for farmers so they can share information and talk with each other about what works and what doesn't," Heaston said. "This isn't simply about getting new toys for farmers. It's about figuring out a way to maximize the benefit of our state's most abundant resource—water."

For more information, visit **aquamart.org**

Strange Bedfellows?

Nebraska farmers working with leading environmental group to improve water efficiency.

Farmers and environmental groups are frequently at odds with each other and don't always see eye to eye.

But that is changing in Nebraska as The Nature Conservancy is working in partnership with farmers to improve irrigation efficiency and overall conservation that extends well beyond the state's borders.

"Unfortunately, farmers are frequently framed as villains when it comes to stewardship," said Mace Hack, Nebraska state director for The Nature Conservancy. "The fact is farmers are very innovative in terms of their environmental management while improving yields and productivity. We see our role as catalyzing that innovation by engaging directly with farmers, who we see as important solution providers."

The Nature Conservancy has redoubled its outreach to Nebraska farmers, supported in part by a wide range of agribusiness, corporate and non-profit entities. An overarching goal of the organization is to reduce the level of nutrients such as nitrogen and phosphorus entering the Mississippi River system and eventually the Gulf of Mexico. Runoff from irrigation of agricultural land is seen as a significant source of these nutrients, so it makes sense to help farmers implement practices that improve irrigation efficiency.

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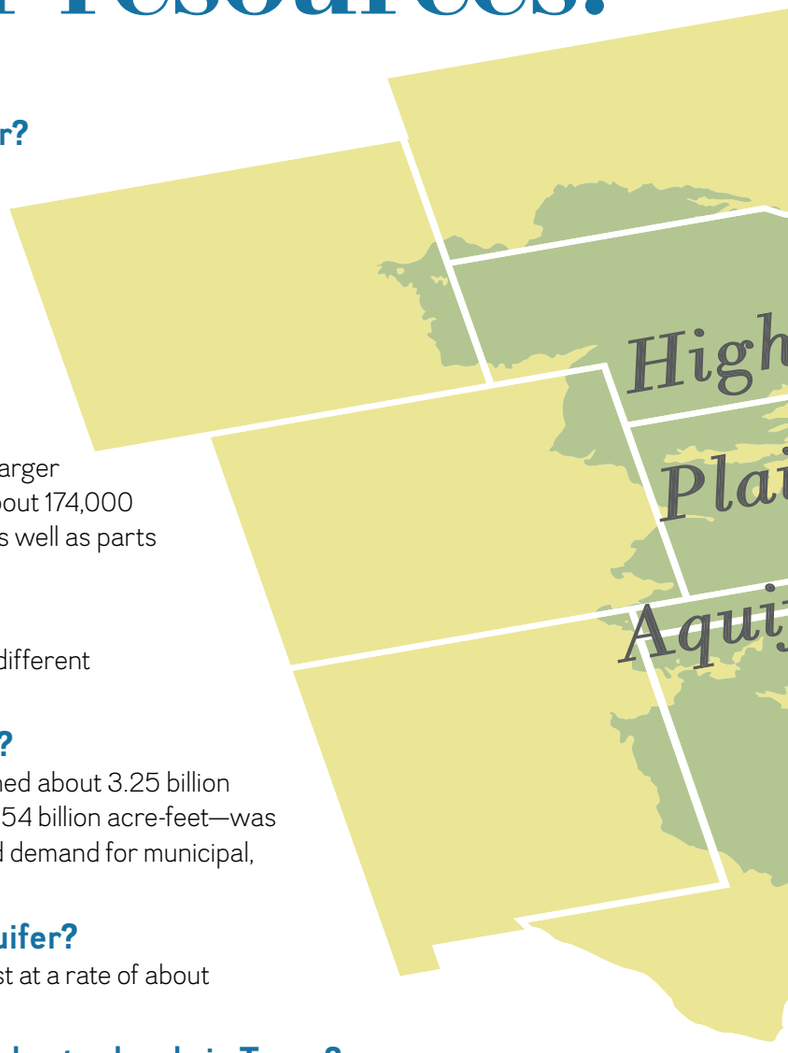
Jacob Fritton *(left)* with The Nature Conservancy discusses an irrigation efficiency project with John Heaston.

aquifer 101

The facts behind Nebraska's tremendous groundwater resources.



Is an aquifer an "underground ocean" of water?

No. The term "aquifer" actually refers to earth materials, often formations of solid rock, that can store and transmit water. So the aquifer is not water; it's saturated sediments that have been deposited over the past 35 million years. When we pull water from the aquifer, it's a bit like sucking water out of a sponge made of rock, gravel, sand and other geologic materials.

What is the Ogallala Aquifer?

The Ogallala Aquifer that lies beneath Nebraska is part of a larger system known as the High Plains Aquifer, which underlies about 174,000 square miles across Nebraska, Kansas, Oklahoma, Texas—as well as parts of Wyoming, Colorado and New Mexico.

Is this the only aquifer in Nebraska?

While the Ogallala is the largest, there are actually up to six different aquifers under Nebraska—all part of the High Plains Aquifer.

How much water is in the High Plains Aquifer?

In 1980, it was estimated that the High Plains Aquifer contained about 3.25 billion acre-feet of drainable water. About 66 percent—or some 2.154 billion acre-feet—was in Nebraska. Those figures change with rainfall, drought and demand for municipal, recreational and agricultural usage.

How quickly does water move through the aquifer?

Groundwater in the Ogallala Aquifer moves from west to east at a rate of about 150 feet per year.

How does irrigation in Nebraska affect groundwater levels in Texas?

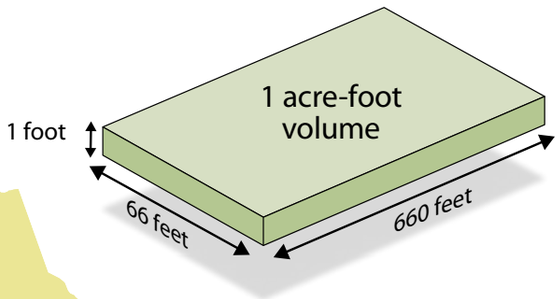
The Ogallala Aquifer in Nebraska is not continuous to Texas. The Republican River valley in Nebraska has cut through the Ogallala Aquifer, effectively creating a barrier that keeps Nebraska separate from Texas. Declines in Texas stay within Texas, and declines or rises in Nebraska levels stay in Nebraska.

The relationship between groundwater and surface water.

The Dismal River *(right)* in the Nebraska Sandhills is just one surface water element that is connected to Nebraska's groundwater resources.

A snail moves 1575 times faster than water moves through the aquifer!

A snail can cover 656 feet per day. Water in the aquifer travels about 5 inches per day.



What is an acre-foot?

An acre-foot is a unit of volume used in reference for large-scale water resources such as reservoirs, lakes, etc. An acre-foot is defined as the volume of one acre of surface area to the depth of one foot. One acre-foot contains about 325,853 gallons of water.

It's only been in the past few decades that we have begun to understand the relationship between groundwater and surface water. "We know now that groundwater and surface water such as lakes and streams are basically the same thing," said Jim Goeke, Emeritus Research Hydrogeologist for the University of Nebraska—Lincoln. "Groundwater becomes surface water, because they are hydrologically connected."

"You can see it in the Sandhills, where gusher springs in Garden County discharge about 2,000 gallons of groundwater per minute—24 hours a day—adding millions and millions of gallons into the surface water in Nebraska," he added.

Goeke said water stewardship has improved dramatically over the past 50 years. "The formation of Nebraska's natural resources districts (NRDs) in 1972 led to a quantum leap in terms of groundwater understanding and stewardship. Groundwater management has become very, very sophisticated—and this has become key in terms of increasing awareness and conservation practices all across the state," he said.

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Jacob Fritton, Project Lead for the Water and Agriculture Program with The Nature Conservancy, coordinates the effort. "We wanted to evaluate the water savings potential of irrigation technologies at both the field scale and the local watershed level," Fritton said. "We provide farmers with a variety of technology tools and help them understand how to use them, interpret the data and leverage those tools and information."

The first initiative was the Western Nebraska Irrigation Project which involved 11 farmers and 8,000 total acres. In just three years, the farmers combined to save more than 124 million gallons of water, without sacrificing yields. The Nature Conservancy is now working in the Central Platte area.

While reducing the amount of water used is a priority for farmers, Fritton noted that farmers were even more interested in reducing energy costs to run their pivots and the labor savings gained from remote control of their irrigation systems.

"If we want to accomplish our goals in conservation, it's in our best interest to work in partnership with producers," Fritton said. "We don't necessarily need to have the same motivations for why we do what we do, but if we can identify practices that make sense to farmers—practices that also have a conservation outcome—that's a win-win for everyone."

Technology Tools for Improving Irrigation Efficiency

The Nature Conservancy provides a number of technologies to its farmer-partners in an effort to improve water efficiency and water quality:

Soil Moisture Probes Help farmers know how water is behaving below the soil surface.

On-Field Weather Stations Provide remote, real time weather data so farmers know what's happening on their fields, rather than relying on a weather station that may be dozens of miles away.

Flowmeters Give farmers remote access to real time information on how much water they are applying to their fields throughout the growing season.

Pivot Telemetry Allows farmers to remotely monitor and control irrigation systems using their cell phones, improving efficiency and reducing labor costs.

Electro-Conductivity Mapping Provides a better understanding of soil types and textures, which affects irrigation decisions.

Variable Rate irrigation Uses data from field mapping and pivot telemetry to change the speed of the pivot to adjust the amount of water applied on different parts of the field.

The Nature Conservancy provides on-farm weather stations to help farmers understand weather conditions specific to their location.

Farmers Become Gamers in TAPS Competition

Roric Paulman *(right)* of Sutherland took the prestigious award for "most profitable farm," due in large part to his effective grain marketing strategies.

It's a unique combination of virtual farming and real life—with the winners claiming some very nice cash prizes.

It's called TAPS—Testing Ag Performance Solutions, an innovative competition created by Nebraska Extension that pits farmers against each other as they manage a real corn crop from the comfort of their home office.

"Farmers are making management decisions without really knowing just how well they are doing in relationship to other farmers," said Chuck Burr, Nebraska Extension educator. "As a participant in TAPS, they can compare themselves to their peers—and it challenges them to up their game a bit."

Nebraska Extension established pivot-irrigated corn plots at its West Central Research and Extension Center in North Platte. The results for each plot were extrapolated to 3,000 acres for competition judging results.

The "players" log on to a password-protected website twice a week to make their decisions regarding everything from hybrid selection to planting population; from crop insurance to marketing; from fertility to irrigation scheduling. Farmers can also select from a variety of precision farming technologies to use on their plots.

Nebraska Extension educators take care of implementing those farmer-directed strategies on each farmer's plot. Several farmers never visited their plots, relying instead on photos and updates provided on the website.

"Every decision they make is directly relatable to what they would do on their own farm, though the specific agronomic responses may not be depending on their location and other factors," said Dr. Daran Rudnick, assistant professor and irrigation management specialist for Nebraska Extension. "Farmers are able to use new and emerging methods and tools and determine what might work on their operations."

In the inaugural year of TAPS (2017), a total of 17 farmers and teams from Brule to Lincoln competed, including students from UNL and the Nebraska College of Technical Agriculture in Curtis. The contestants competed for three possible awards. Each with cash prizes: 1) Most Profitable Farm; 2) Efficiency of Nitrogen and Water Use; and 3) Productivity (Highest Yield). The Nebraska Corn Board helps fund the TAPS program.

Tim Schmeeckle of Gothenburg took both the productivity and nitrogen/water use awards at the end of 2017. "This was an exciting result because it dispels the myth that you have to sacrifice yield in order to improve water and nitrogen efficiency," Burr said.

In 2018, more than 70 individuals will be competing in TAPS, some competing as a team.

"We actually treat the TAPS competition as a research experiment. We collect a lot of data to help us understand not only who won, but why they won," Rudnick said. "This information will be shared with other farmers in our continuing effort to improve irrigation efficiency, nutrient management and overall farm profitability."

Reading ~~Tea~~ Corn Leaves Key to Protecting Groundwater Quality

Canopy sensors improve nitrogen application efficiency

While the amount of water available in Nebraska is a significant factor, the quality of that water is also critically important. Farmers are continually working to reduce the amount of nitrogen-based fertilizer they use on their crops in order to protect the quality of groundwater, which is also the source of drinking water for the entire state.

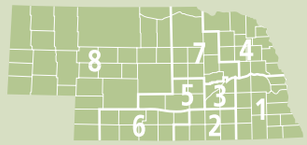
Project SENSE is an initiative of Nebraska Extension designed to help farmers determine exactly when their crop needs nitrogen fertilizer—and how much. The Nebraska Corn Board helps fund this initiative.

The state's Natural Resource Districts (NRDs) have been leaders in supporting Project SENSE. "Monitoring levels of nitrogen in groundwater is a continual process," said Dean Krull, a UNL researcher who offices at Central Platte NRD in Grand Island. "NRDs are responsible for groundwater quality, so we've invested a great deal in educating farmers on ways to improve nitrogen efficiency and reduce application rates."

"Project SENSE is focused on efficient late-season application of nitrogen on corn as opposed to broadcast applications earlier in the season," said Lyndon Vogt, general manager of Central Platte NRD. "This is about applying the right amount of nitrogen at the right time so the fertilizer is used by the corn instead of potentially leaching into groundwater."

Sensors on the fertilizer application equipment "read" the crop canopy (leaves) to determine the nitrogen level in the plants in real time. Data from these sensors then control the amount of nitrogen applied at specific points within the field, ensuring the crop gets exactly what it needs, where it needs it.

Drones may well be the next step on crop sensing technology. "If we can use data from drones, we can manage the crop by applying prescriptive amounts of nitrogen through the pivot irrigation system rather than running fertilizer application equipment through the field," said Joe Luck, precision agriculture engineer with Nebraska Extension. "While this may not be as specific and targeted as the canopy sensors on application equipment, the cost of entry is much lower—and farmers are watering their crop anyway. Adding nitrogen into the irrigation stream is very efficient and effective."



Nebraska Corn Board 40 years

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Friend, NE

District 6
Dennis Gengenbach
Smithfield, NE

District 2
John Greer
Edgar, NE

District 7
David Merrell
St. Edward, NE

District 3
Brandon Hunnicutt
Giltner, NE

District 8
Jon Holzfaster
Paxton, NE

District 4
Debbie Borg
Allen, NE

At-large
Jay Reiners
Juniata, NE

District 5
Tim Scheer
St. Paul, NE

Nebraska Corn Board members represent the eight districts indicated on the map and are appointed by the Governor. One at-large member is elected by the other Board members.

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