



UPPER BIG BLUE NATURAL RESOURCES DISTRICT  
**BLUEPRINT**



## *Fun in the Sun at NRD Rec Areas*

With hot dogs and applause, the Upper Big Blue NRD staff and board members celebrated during an open house event at Bruce L. Anderson Recreation Area in April. About 75 people gathered to enjoy a picnic supper and explore the newly installed playground equipment overlooking Recharge Lake.

The NRD board of directors voted to replace the playground equipment at Anderson Recreation Area in February 2022. The plan was to install the new equipment in summer 2022 and to celebrate it along with the 50th anniversary of Nebraska’s NRDs. However, due to construction delays, the equipment was not installed until November and it was decided to hold off

on the community celebration until spring. Since then, benches and other finishing touches have been added to the area, creating a welcoming space for families.

This year, there is an added incentive to enjoy recreation areas managed by Nebraska’s 23 NRDs: the NRD Recreation Exploration Challenge. Nebraska’s NRDs are challenging outdoor enthusiasts to visit as many of the state’s NRD recreation areas as they can between March 1 and September 15. Visitors can submit a photo from their trip to the rec area for a chance to win prizes. There are monthly drawings as well as a grand prize drawing. Full details are at [www.nrdnet.org/recreation](http://www.nrdnet.org/recreation). ♦♦♦

**In This Issue...**

- Rec Area Improvement.....1
- Water Levels Decline.....2-3
- VRI Benefits.....4
- Notes for Irrigators .....5
- Irrigation Withdrawals & Groundwater Levels .....6-7
- Water Quality Concerns.....8-9
- Monitoring Uranium.....10
- Recognitions ..... 11
- Julesgard Hired.....12
- RO Rebate Program Extended.....12



# Groundwater Levels Decline Significantly: No Allocation for Upcoming Season

During March and April 2023, staff of the Upper Big Blue Natural Resources District measured roughly 500 observation wells throughout the district to determine the average water level change, based on a weighted change from each well. For spring 2023 water level measurements, the NRD has determined that the average groundwater level change shows a decline of 2.21 feet from last spring. The spring 2023 average groundwater level is now 6.68 feet above the "Allocation Trigger." Thus, there will be no allocation restrictions for the 2024 irrigation season.

Observation wells are measured in the spring of each year, allowing the water table to rebound from the previous irrigation season. The wells that are measured are uniformly

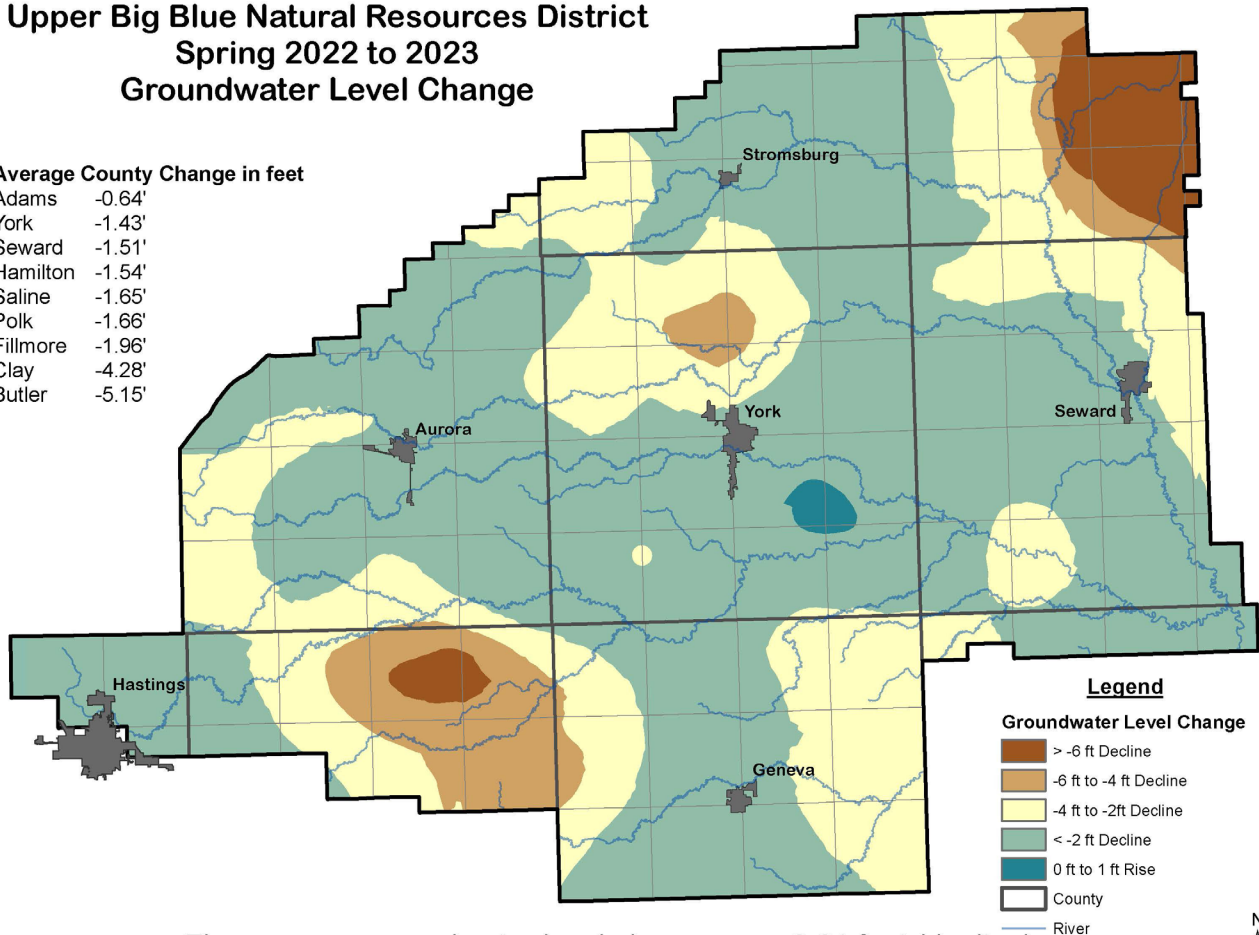
distributed throughout the district to provide an accurate profile of the average groundwater level change. Each well measured is assigned an area of the district based on distances from other wells. This method gives the average groundwater level change a weighted average.

In spring 2022, the NRD reported an average decrease of 0.24 feet. Spring 2021 showed an increase of 0.35 feet on average. Fluctuations from year to year are common throughout the district. The Upper Big Blue NRD sits above the High Plains Aquifer, which stretches from South Dakota to Texas. This portion of the aquifer is dynamic and factors like rainfall and pumping affect how the aquifer reacts.

## Upper Big Blue Natural Resources District Spring 2022 to 2023 Groundwater Level Change

### Average County Change in feet

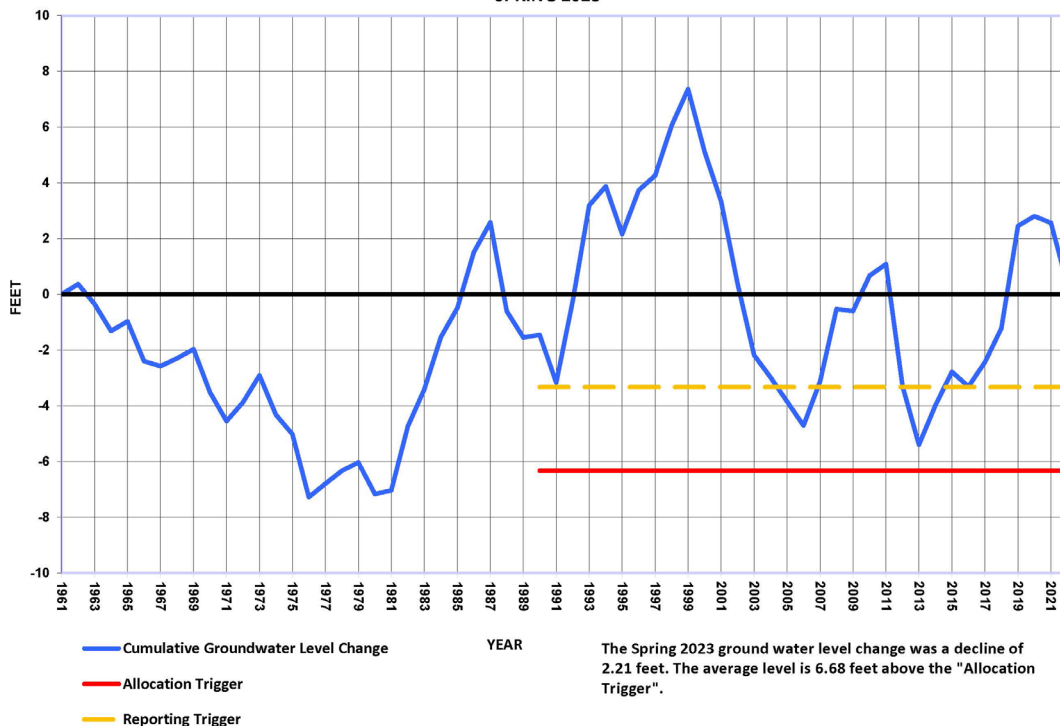
Adams	-0.64'
York	-1.43'
Seward	-1.51'
Hamilton	-1.54'
Saline	-1.65'
Polk	-1.66'
Fillmore	-1.96'
Clay	-4.28'
Butler	-5.15'



The average groundwater level change was -2.21 feet (decline)

UPPER BIG BLUE NRD - AVERAGE GROUNDWATER LEVELS  
TRIGGERS COMPARED TO HISTORIC LEVELS  
SPRING 2023

In addition to the average change, the NRD also provides a more detailed look at water levels across the district. Water levels declined most significantly in Butler County and Clay County, each with a drop of more than 4 feet. Adams County saw the smallest decline, only dropping 0.64 feet. The rest of the district including York, Seward, Hamilton, Polk, and Fillmore Counties all saw a decrease between 1 and 2 feet.



**Water use records enable informed management decisions and practices**

In recent years, producers have done an exceptional job of managing use of district water resources and cooperating with the NRD on conservation activities and monitoring. Along with NRD staff measuring observation wells, all groundwater users are required to annually report their water use. This is how the NRD maintains records on historic groundwater usage. Groundwater use records are very important to the district for making informed management decisions. The 2022 district average groundwater usage was 7.53 inches/acre. The district average groundwater usage is 5.97 inches/year since 2007.

The district's goal is to hold the average groundwater level at or above the 1978 level. In 2005, the district average groundwater level reached the "Reporting Trigger", initiating mandatory reporting of annual groundwater use to the district and certification of irrigated acres. If the district average water level falls below the 1978 level ("Allocation Trigger"), groundwater allocation will begin.



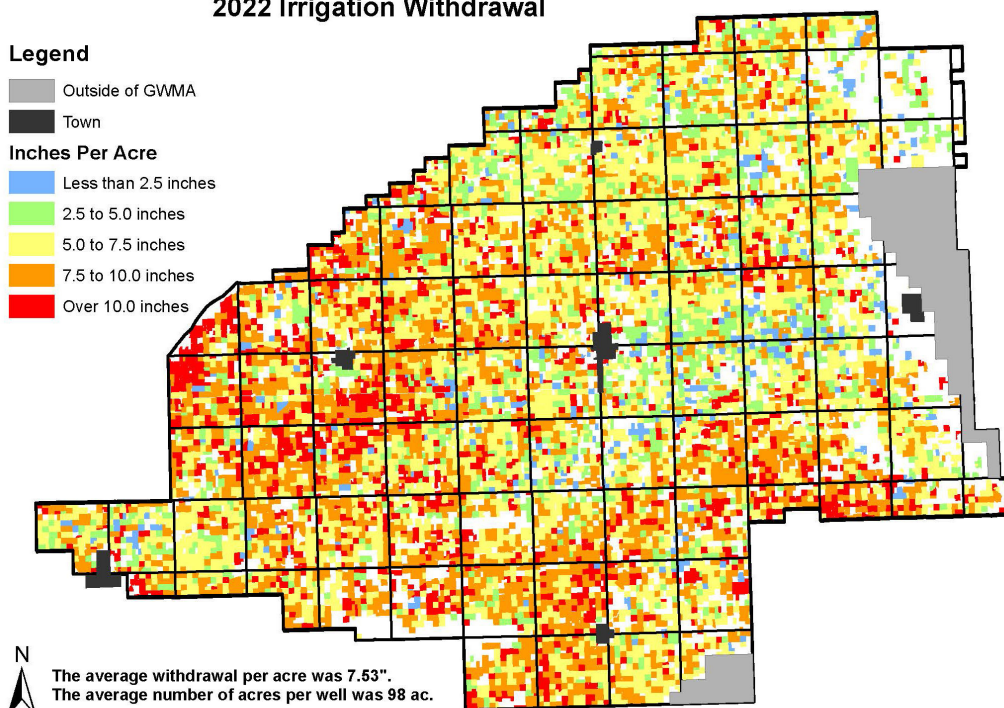
**Upper Big Blue NRD  
2022 Irrigation Withdrawal**

**Legend**

Outside of GWMA  
Town

**Inches Per Acre**

- Less than 2.5 inches
- 2.5 to 5.0 inches
- 5.0 to 7.5 inches
- 7.5 to 10.0 inches
- Over 10.0 inches



The average withdrawal per acre was 7.53".  
The average number of acres per well was 98 ac.

# VRI: Increasing Irrigation Efficiency To Increase Profit Margins

In 2017, the Rainwater Basin Joint Venture (RWBJV) worked with a landowner in Hamilton County to implement Variable Rate Irrigation (VRI) on his Wetlands Reserve Easement Program (WREP) enrollment. Electroconductivity (EC) mapping was completed on both the cropped area of the property and the wetland area to assess the soil composition. Soil moisture probes were installed to report moisture content, soil temperature, and salinity at various depths in the soil profile. A new control panel (including new software) and GPS antenna were added to the center irrigation pivot, as well as fitting the pivot with a new sprinkler package. The pivot was then capable of optimizing irrigation application throughout the site. All of the pivot modifications, in combination with the EC mapping/soil moisture probes, allowed for specialists at Precision Agronomy to develop prescriptions for irrigating the crop ground. The RWBJV provided 85% cost-share funding for a three-year subscription to the prescription irrigation services. Throughout the growing season, landowners received daily email updates on when and how much to water.



Today, the RWBJV has provided cost-share funding to 11 landowners to implement VRI on their properties. These sites are in four different Natural Resource Districts (Upper Big Blue, Little Blue, Central Platte, and Tri-Basin) in the Rainwater Basin. Recently, data was collected from each of

these NRDs/landowners to determine the efficacy of the VRI following the 2022 growing season. For each site, data was provided on the number of acre-inches of water used for irrigation in 2022. Each NRD provided the average water usage for producers in their region. This allowed for a comparison between each RWBJV cooperator with VRI water usage versus the average water usage in that NRD.

The irrigation water savings for each of the NRDs was as follows:

- Upper Big Blue (5 sites): 7.88%
- Little Blue (3 sites): 24.33%
- Central Platte (2 sites): 10.35%
- Tri-Basin (1 site): 48.7%

The average irrigation water usage across all four NRDs in 2022 was 8.68 ac-in. The average irrigation water usage of RWBJV cooperators with VRI in 2022 was 7.21 ac-in. Thus, the RWBJV cooperators with VRI used 1.48 ac-in less to irrigate than other producers in their area in 2022. These cooperating landowners used 16.5% less water than many of their neighbors. It can be assumed that other producers in the NRDs are using VRI as well, so the actual irrigation water savings are likely even higher. In 2022, RWBJV cooperating landowners with VRI on average spent 16.5% less on irrigation than their neighbors.

The RWBJV plans to continue monitoring irrigation water use at each of these sites over the next several years to continue assessing how much water, and thereby how much money, producers are saving by implementing VRI technology on their sites and following irrigation prescriptions. Additional sites may be added to this project as well.

It is also important to note that less irrigation water being used on these sites results in more groundwater recharge. So, while individual landowners are benefitting from using less water on their properties, all Nebraskans will benefit from the conservation of limited groundwater resources.



# Irrigation Notes

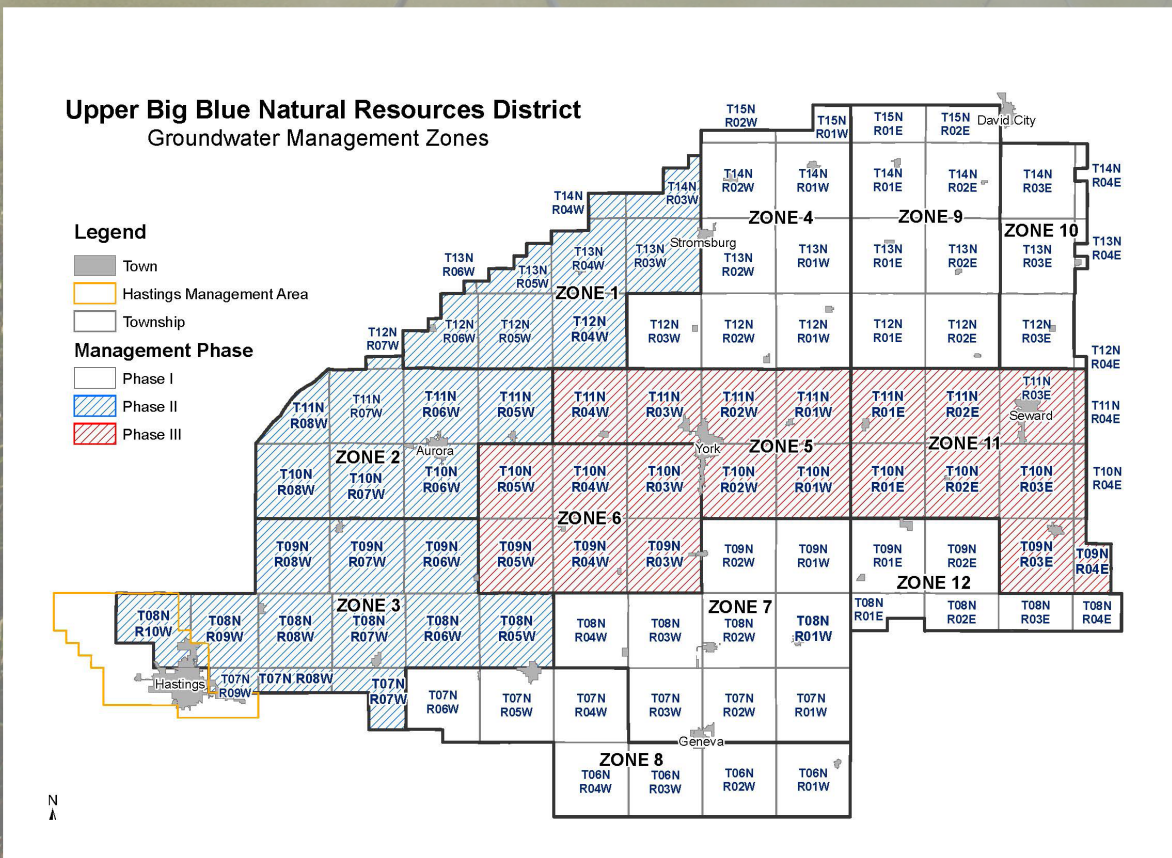
- **Flow meter repair:** If you've had your flow meter repaired or if you have converted from a mechanical to an electric flow meter, you must have your meter inspected by NRD staff.

- **Irrigation water samples:** Zone 5 (see map below) samples were due April 1, 2023. If you have not submitted a sample, please do so by the end of the 2023 irrigation season. Zone 6 and Zone 11 samples are due April 1, 2025. Please bring in a sample during the 2023 and 2024 irrigation seasons. All active irrigation wells in a Phase III area must be sampled for nitrates once every three years. Please contact the NRD if you need a list of your wells or have questions. Bottles are available at our office.

- **Water sensors:** Please install your water sensors ASAP if you haven't already done so.
- **Operator change:** If you have an operator change, please let us know by July 1. To update an operator, you can call the office and ask for Miranda or Amanda or email [wateruse@upperbigblue.org](mailto:wateruse@upperbigblue.org).
- **Chemigation Incentive Program:** The NRD offers an incentive program to help producers get started with chemigation. For approved applications, the maximum cost-share rate is 50 percent of the actual cost, up to \$1,000 per site, for the purchase of new chemigation equipment and chemigation permit.

This program is intended for new chemigation sites and those that have not had an active chemigation permit in the last 10 years. Eligible applicants will need to keep their permit active for 3 years. Any equipment purchased prior to application authorization is ineligible for cost-share. Application approval will be based on fund availability.

For more information or to apply, visit [www.upperbigblue.org/chemigation](http://www.upperbigblue.org/chemigation) or contact the NRD at (402) 362-6601. ♦♦♦



# Irrigation Withdrawals and Groundwater Levels

Irrigation plays a vital role in Nebraska's agriculture. This is especially apparent in the Upper Big Blue Natural Resources District, which is the most heavily groundwater irrigated district in the state. In this district, 1.2 million acres are irrigated farmland, representing more than 12,000 active irrigation wells. However, irrigation can also put a strain on the area's water resources when rainfall amounts aren't enough to support a growing crop and irrigators turn to groundwater to fill the gap.

The district measures the groundwater levels each spring to determine the change from season to season. This spring the static water levels are below last spring by 2.21 feet, which is 6.68 feet above the allocation trigger. This trigger point was set by the board and is three feet above the lowest levels recorded in 1978. If the trigger point is reached in Control Area #1 (see map), the Board of Directors will vote to implement allocation.

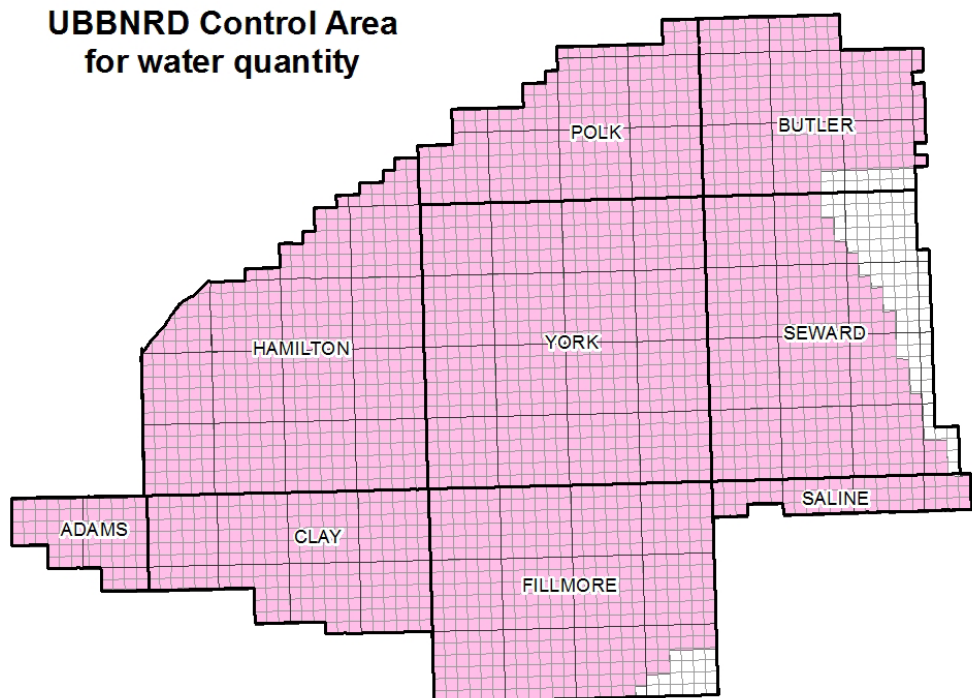
NRD staff also monitor annual water withdrawals and groundwater level changes (see pages 2-3). When historic data is graphed, it's observable that if groundwater pumping is held at an average of just below 7 acre inches, there is little fluctuation in groundwater level (see Graph 1). During the 2012 pumping season, where in-season rainfall totaled 7.6", the average groundwater pumping was 12.2 acre inches, resulting in a groundwater level change of -4.38 feet. Comparatively, in 2022 using the same in-season rainfall data of 17.70" inches along with the average pumping of 7.5 acre inches, a groundwater level change of -2.21 feet was recorded.

The NRD Board of Directors has safety measures in place to ensure groundwater levels are sustainable for future generations of producers. Part of those safety measures

would be the triggering of allocation in the event of prolonged drought conditions resulting in groundwater level declines. Currently, the NRD's rules and regulations allow for 30 acre inches of irrigation water use over three years for every certified acre in the event that allocation triggers are met. Looking at more than 10 years of data (Graph 2), it is evident that most producers in the district would be unaffected by an allocation event at current levels.

For fields where irrigation efficiency could be challenging, there are a number of things that producers can do, especially in a time of water scarcity.

**UBBNRD Control Area for water quantity**

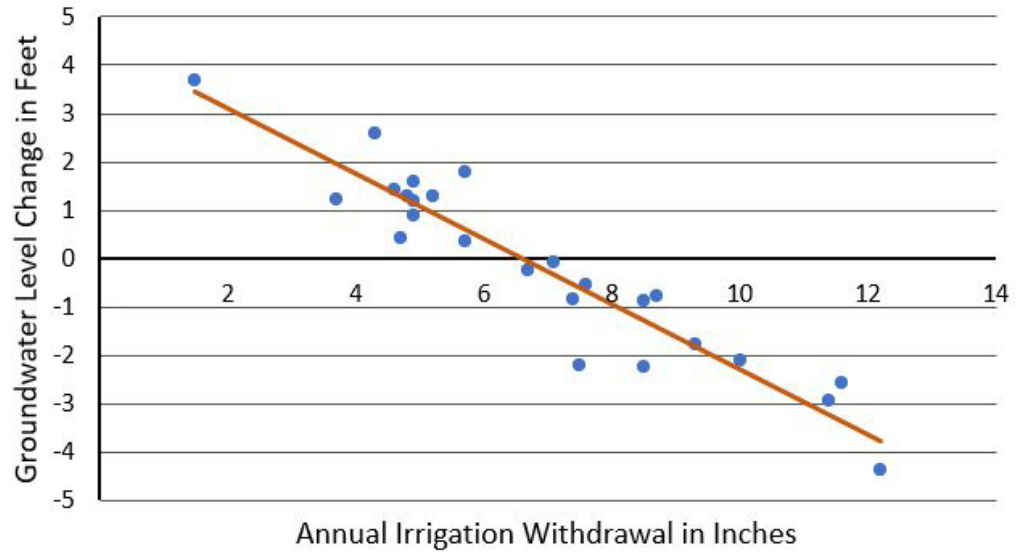


- **Upgrade your irrigation equipment:** Moving from gated pipe to center pivots can greatly reduce the amount of water you'll need to apply to raise a healthy crop. Adopting variable rate irrigation allows producers to better distribute irrigation applications across fields with elevation change and soil variability (see page 4).
- **Water at the right time and rate:** Corn plants need water throughout the growing season, but they are most sensitive to water stress during the early stages of growth. Applying water too early or too late can reduce yields.
- **Add soil health and conservation practices:** Improving your soil's health by moving to no-till farming and adding cover crops will increase your soil's water

infiltration and holding capacity. These practices also prevent soil from drying out rapidly.

- **Make data-driven decisions about when to irrigate and how much:** Take the guesswork out of irrigation decisions. There are many options available from the NRD and other sources, including low-cost soil moisture sensors. Visit [www.upperbigblue.org/groundwater-programs](http://www.upperbigblue.org/groundwater-programs) for details on the discount program or call the office at (402) 362-6601.

### Groundwater Level Change vs. Annual Irrigation Withdrawal

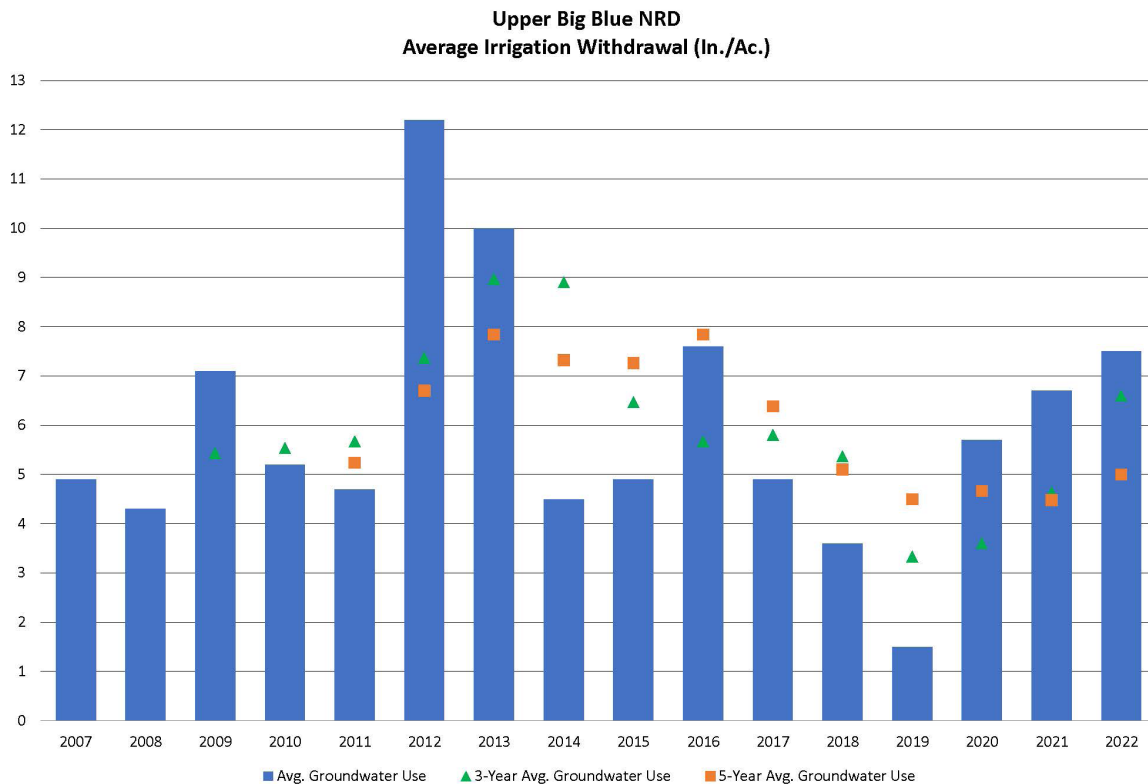


Graph 1 (above): Annual irrigation withdrawal in the Upper Big Blue NRD plotted against groundwater level change. Based on measured data, the graph shows that if pumping is held to just below 7" annually we see little fluctuation in groundwater level change.

By using more efficient irrigation practices, growers can save water, reduce costs, and protect the environment. ♦♦♦

Graph 2 (below): Average irrigation withdrawal in the Upper Big Blue NRD from 2007 to 2022, showing that most producers would be unaffected by allocation limits most years.

\*Calculated using the York 2W weather station hosted at Recharge Lake from April 1 – September 30.



# State's Water Quality Challenges Explored

What is the impact of impaired water quality on human health and what can be done about water challenges in the Cornhusker State? These topics and others were addressed at a recent Wellhead Protection Network Meeting held at the Upper Big Blue NRD office. Hosted by Nebraska Department of Environment and Energy, University of Nebraska Medical Center, and Nebraska Extension, the meeting drew close to 60 participants from across the state.

The audience was mostly comprised of staff from municipal water departments and other natural resource districts, but the event also drew from a variety of agencies and the local agricultural and business communities.

The purpose of the event was to inform those with a stake in water quality issues about strategies and resources available to protect and improve water quality in Nebraska. It was a valuable opportunity for those who manage water resources across the state to network and discuss what challenges they experience in their communities and possible solutions.

“It was great to see a diverse audience that was eager to learn about and discuss water quality issues in our state,” said event organizer Laura Nagengast. “As Nebraskans, we are blessed to have the great water that we do, and it is our responsibility to protect it.”

The meeting included a series of presentations followed by a tour of the Project GROW demonstration site in York, Nebraska. Since 2017, the City of York and the Upper Big Blue NRD have worked together to protect water quality in the city's wellfield through Project GROW (Growing Rotational Crops On Wellfield).

Project GROW highlights how NDEE Source Water Protection grant funding can be used to safeguard a community's water supply, which in turn provides many

additional benefits to the community. The innovative partnership has prioritized restoring the soil in the wellfield as a means of protecting the water consumed by the residents of York. Healthy soil acts as a filtering system that decreases nitrogen leaching and contamination of the drinking water. Project GROW focuses on 160 acres of the total 400-acre wellfield and includes demonstration fields, community garden plots, a fruit orchard, and an extensive pollinator habitat. Using no-till, cover crops, livestock integration, and diverse crop rotations, the project seeks to improve soil health, decrease soil erosion, and improve water holding capacity, all while maintaining profitability.

## Wellhead Protection Areas in Nebraska

According to the Environmental Protection Agency, a wellhead protection area is defined as “the surface and subsurface area surrounding a water well or wellfield, supplying a public water system, through which contaminants are reasonably likely to move toward and reach such water well or wellfield.” Nebraska's Wellhead Protection Program (WHP) is a voluntary program which assists communities and other public water suppliers in preventing contamination of their water supplies. The Nebraska Legislature passed LB 1161 in 1998 authorizing the Wellhead Protection Area Act. This Act sets up a process for public water supply systems to use if they choose to implement a local Wellhead Protection plan. The Nebraska Department of Environment and Energy is the lead agency for Wellhead Protection Plan approval.

The goal of Nebraska's Wellhead Protection Program is to protect the land and groundwater surrounding public drinking water supply wells from contamination. Since approximately 85 percent of Nebraskans receive their drinking water from groundwater, preventing groundwater contamination is vital.

## Project GROW Partnership Featured

Dan Leininger, NRD water conservationist, and Brandon Osentowski, water superintendent for the City of York, presented on the unique partnership between the city and the NRD. The two discussed the challenges both organizations have addressed in the first five years of the project, from angry calls from area residents after manure application, to paperwork and budget process headaches.





## Water Quality and Human Health

Extension Educator Laura Nagengast provided insights into common water quality concerns in Nebraska and their documented links to negative health impacts. A main source of contamination to drinking water in Nebraska is nitrogen fertilizers, commonly used in row crop agriculture practices. The current regulatory limit for nitrate allowed in public water systems is 10 ppm, however private wells are not regulated by any agency. Therefore, it is up to the private well owner to test and treat their own drinking water to ensure what they are consuming is safe. Of special concern in Nebraska is the correlation researchers are seeing between nitrate in drinking water and adverse health impacts on the young, including birth defects and pediatric cancers.

The Upper Big Blue NRD offers free water testing to district residents, either in the NRD lab or via an at-home test. These results can help you determine if action should be taken, such as installing a reverse osmosis system (*see page 12*).

For communities in the Upper Big Blue NRD struggling with water quality, funding is available through the district's Municipal Water Assistance Program. This program is intended to help communities with WHPA plans in place to improve their water system to mitigate the impacts of non-point source groundwater contamination. The end goal of the program is to protect the health of residents in the community.

Funding for qualifying community water system improvements may also be available through the Nebraska Department of Environment and Energy's Source Water Protection grant program.

## Soil Health and the Future of Agriculture

Carolina Cordova, assistant professor and soil health specialist at UNL, also presented at the Wellhead Network Meeting, discussing soil health—what it is, why it is important, how to assess it, and ways to improve it. Cordova touched on how to measure and increase soil organic matter/carbon, which is useful for soil fertility and carbon sequestration that reduces greenhouse gas in the atmosphere. She also presented simple strategies to build and



maintain healthy soils including: conservation tillage, organic amendments, and cover cropping. Cordova also pointed to the future of agriculture with greater emphasis on precision agriculture (remote sensing, precision planting and nutrient management, irrigation management technologies) and the economic incentives provided by the burgeoning carbon market.

Producers in the Upper Big Blue NRD as well as the Central Platte NRD have access to additional funding for the soil health practices Cordova touted, as well as access to carbon market incentives, through the Nebraska Soil Carbon Project.

There are additional events in the months ahead on soil health topics available through the UNL College of Agricultural Sciences and Natural Resources, including a soil health and cover crops driving tour in the York area. There will also be additional Wellhead Protection Network meetings held at various locations across the state in 2023. Contact Laura Nagengast for more information on these meetings at [lnagengast3@unl.edu](mailto:lnagengast3@unl.edu). ♦♦♦



# Monitoring Uranium in Drinking Water in the NRD

By Erinn Wilkins  
Water Resources Technician

The Upper Big Blue NRD recently finished a five-year study that used our monitoring wells to look at arsenic, selenium, and uranium concentrations within the district. From this study, it was observed that these concentrations are increasing over time, as well as fluctuating seasonally. While none of the wells sampled hit the maximum contaminant level (MCL), it is still important to monitor and chart trends.

Other studies have examined the relationship between nitrate levels and uranium concentrations. These studies have shown that high levels of nitrates have been correlated to elevated uranium concentrations. Shallow groundwater was the most likely cause of co-contamination with nitrates and uranium. In fact, primary nitrate contamination can be a factor leading to secondary uranium contamination, as high levels of nitrate can help transport uranium from soil particles to the groundwater.

When uranium undergoes an oxidation reaction (a reaction where uranium loses electrons), nitrate gains the electrons through a reduction reaction, which will bond the two elements. This type of reaction is better known as a redox reaction. Nitrate can then easily move uranium from the soil into the groundwater.

As of late, uranium has been getting attention as an emerging contaminant to be on the lookout for. However, uranium has been in our groundwater for a long time. Uranium is a naturally occurring radioactive mineral present in certain types of rocks and soils. Uranium can also be introduced to groundwater through human activities, such as mining, nuclear power production, and combustion of coal and other fuels.

Drinking water may naturally contain small amounts of uranium, but water that is high in uranium can present health effects over time. Some studies have suggested that long-term ingestion of water with high levels of uranium can lead to kidney damage and an increased risk of some cancers.



Uranium in water cannot be detected by taste or smell. The only way to know if your water has uranium is to test it. Public wells are already monitoring for a variety of contaminants, including nitrate and uranium. However, private wells do not have regulations in place for testing or monitoring; it is up to the well owner to periodically test their well. Currently, the only lab in Nebraska that is certified to test for uranium is the DHHS Public Health Environmental Laboratory in Lincoln.

For treatment, a reverse osmosis system is the best option (*see page 12*). Other options include distillation, special adsorbent media, and anion exchange. These can remove uranium and a variety of other contaminants found in groundwater. It should be noted that boiling water is not an effective way to remove uranium. Activated carbon filters, like Brita filters, cannot remove uranium and other contaminants, like nitrates. ◆◆◆

*Domestic well users in Nebraska who have high nitrates in their drinking water are eligible for reverse osmosis funding through the Nebraska Department of Environment and Energy. See page 12 for more details or visit NDEE's website at <http://dee.ne.gov/Publications/Pages/22-051>.*



# Recognitions

DeeDee Novotny was recognized in May for 15 years of service. Novotny is a secretary in the water department, responsible for chemigation, water meters (inspections and maintenance), well permits, well inspections, and several cost-share programs.

In April, three long-serving members of the board of directors were recognized: Micheal Nuss, Roger Houdersheldt, and Doug Dickinson. Nuss has served on the NRD board for 20 years and hails from Sutton. Houdersheldt has served for 30 years, including terms as chairman of the board, and is from Shelby. Dickinson has served for 40 years in a variety of leadership positions on the board. He is currently the board treasurer and is from Seward.

In June, Water Conservationist Dan Leininger will retire after 19 years with the NRD. Dan's tireless efforts to improve soil health and reduce the impacts of agricultural water use on water quality and quantity are greatly appreciated.

*Photos (L-R): DeeDee Novotny & Dan Leininger Lynn Yates, Roger Houdersheldt, Micheal Nuss, & Douglas Dickinson*



## BLUEPRINT



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- Lynn Yates, Geneva, Sub-district 4
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- Jay Geiger ..... Maintenance Worker
- Andy Larkin ..... Maintenance Worker

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# Welcome, Terry!

## Water department manager hired



Terry Julesgard has been hired to fill the role of water department manager for the Upper Big Blue NRD. Julesgard began in February, taking over the position held for seven years by Marie Krausnick, who was promoted to assistant general manager in 2022.

Julesgard is not new to Nebraska's Natural Resources Districts. He previously served as the general manager of the Lower Niobrara NRD, a resources technician at the Lewis and Clark NRD, and a conservation technician at the Upper Republican NRD. Other related career experiences include 11 years in production agriculture and four years as superintendent of Lincoln County Noxious Weed Control.

"We are pleased to have Terry join our staff," said David Eigenberg, general manager. "He brings a wealth of natural

resources experiences as well as leadership skills. We know he will do a great job for the people of this district."

Julesgard holds a degree in Conservation and Environmental Systems with a business emphasis from the Nebraska College of Technical Agriculture. In his free time, he enjoys being out in nature, spending time with family, and cooking.

The water department is the largest department in the Upper Big Blue NRD, representing a third of the staff and the annual budget. This department is tasked with the vital work of monitoring the quality and quantity of groundwater in the district. ♦♦♦

## NDEE Extends Private Well Reverse Osmosis Rebate Program

The Nebraska Department of Environment and Energy (NDEE) has extended the Private Well Reverse Osmosis Rebate Program.

Applications will now be accepted and reviewed for consideration on a month-to-month basis. Submitted applications will be given equal consideration as long as

funding for the program remains available in the month in which the application is submitted. Participation in the rebate program still requires pre-approval from NDEE. The installation of any reverse osmosis small water treatment system cannot begin until a rebate agreement is signed between the private well owner and NDEE.

Testing costs, purchase price of the system, and installation costs are eligible expenses that can be included in a rebate application.

Applicants will need to ensure that their well is registered with the Nebraska Department of Natural Resources. A water well registration document can be downloaded from the Department of Natural Resources website. Applicants will be required to submit water quality data from the State laboratory with testing results dated no earlier than January 1, 2022.

All requirements for the Reverse Osmosis Rebate Program, including the application forms and an instructional video, can be found on NDEE's website at <http://dee.ne.gov/Publica.nsf/pages/22-051>. Inquiries can also be made to NDEE State Revolving Fund Section Supervisor Steve McNulty at [steve.mcnulty@nebraska.gov](mailto:steve.mcnulty@nebraska.gov) or 402-471-4200. ♦♦♦



Private well reverse osmosis system rebates are available to property owners of private wells with drinking water test levels above 10 parts per million (ppm) of nitrate. Applicants will be eligible for up to \$4,000 in rebates per small treatment installation that is effective in the removal of nitrate to a level below 10 ppm.