

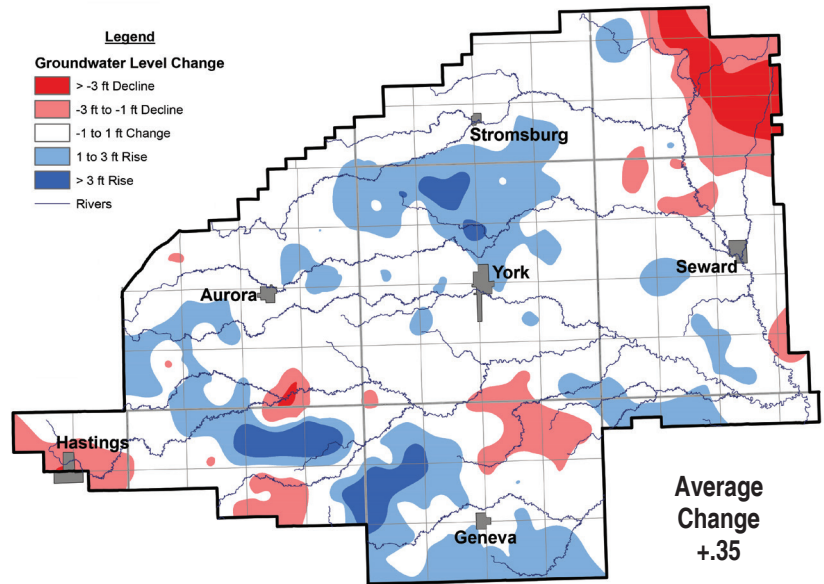


DISTRICT WATER LEVELS RISE

During March and April 2021, NRD staff measured roughly 500 observation wells throughout the district. The goal of these well measurements is to determine an average water level change for the district, based on a weighted change from each well. For spring 2021 water level measurements, the NRD has determined that the average groundwater level change shows an increase of 0.35 feet from last spring. The findings show that the spring 2021 average groundwater level is 9.13 feet above the “Allocation Trigger.” Thus, there will be no allocation restrictions for the 2022 irrigation season.

based on distances from other wells. This method gives the average groundwater level change a weighted average.

Last year’s spring 2020 level showed an increase of 3.67 feet and spring 2019 showed



Spring 2020-2021 Groundwater Level Change

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

an increase of 1.22 feet. 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 different factors like rainfall and pumping affect how the aquifer reacts.

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Soil Carbon Project, page 7

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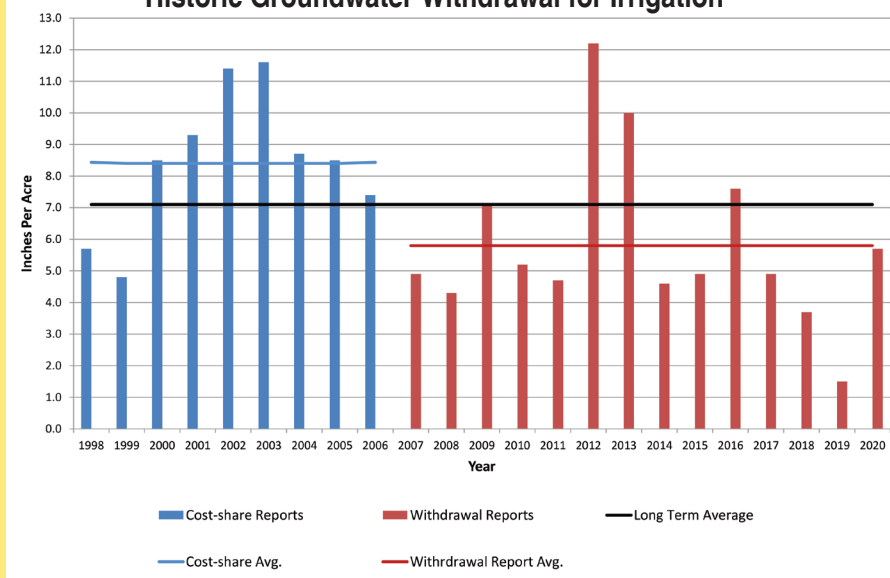
In recent years, producers have done an exceptional job of managing use of this water resource.

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 2020 district average groundwater usage

was 5.7 inches. Since 2007, the overall district average groundwater usage is 5.8 inches/year.

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 groundwater users to report annual groundwater use to the district and to certify their irrigated acres. If the district average water level falls below the 1978 level ("Allocation Trigger"), groundwater allocation will begin. ♦♦♦

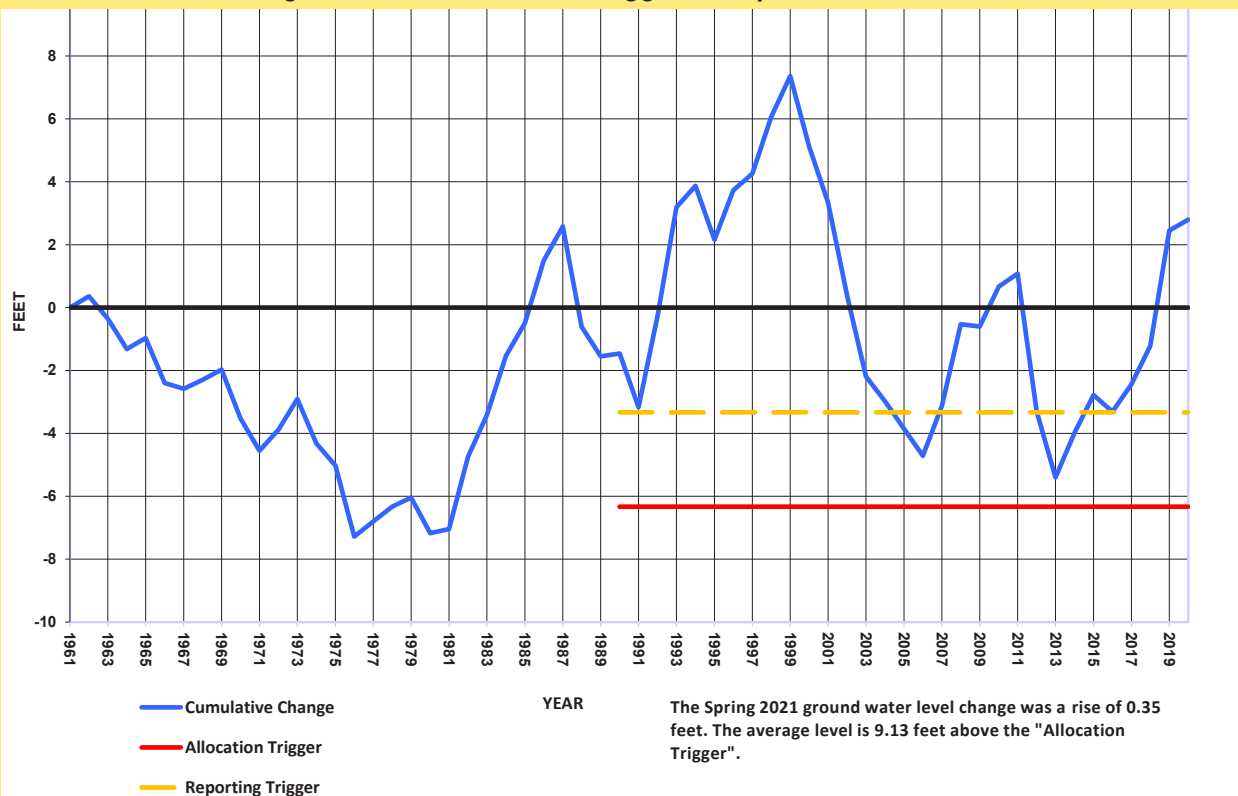
Historic Groundwater Withdrawal for Irrigation



Average County Change

Clay	+1.00
Polk	+0.55
Fillmore	+0.57
Hamilton	+0.39
York	+0.74
Saline	+0.77
Adams	-0.78
Butler	-1.30
Seward	+0.27

Average Groundwater Levels--Triggers compared to Historic Levels





What's Water Worth?

Study looks at the value of irrigation

In an era of extreme weather, growers across the globe are more focused than ever on adequate irrigation to sustain crops through periods of drought. Severe drought can threaten a farmer's livelihood, as it leads to crop damage and reduced yield.

While everyone recognizes that water is valuable, it is challenging to come up with a standard value for irrigation water because it is not equally available, or necessary, at all times and all locations across a region. This variability also makes it difficult to understand the economic impact of efforts to conserve water, as the cost and return on investment of irrigation is constantly fluctuating, even in a single location.

Nebraska has an abundant supply of groundwater stored in the High Plains Aquifer, but it is not a limitless quantity. What are the financial considerations of policies to ensure that there is sufficient water for all for decades to come? Is there a greater economic argument to be made for why conservation efforts, including cover crops and irrigation management, are so important?

A recent study from researchers at the Daugherty Water for Food Global Institute at the University of Nebraska Lincoln sheds light on the conversation by examining the dollar value of irrigation water. The study indicates that the average value of irrigation water is highest in rainfed production areas where irrigation is used only supplementally. Researchers suggest that drought mitigation planning as well as implementing water management and allocation in locations where crop production is under

rainfed conditions is of the utmost importance—especially where water sustainability has not traditionally been prioritized.

Researchers arrived at their conclusions by studying rainfed and irrigated acres in Colorado, Nebraska, and Kansas from 2010-2017. Notably, this period contains the severe drought year of 2012. They created a value equation that multiplied the yield differential (irrigated versus dryland fields) by the crop price, then divided by the irrigation requirement. Their formula did not include irrigation specific costs such as water pumping, as the fuel and equipment needs for irrigation systems vary greatly.



Using this formula, the value of irrigation water for this time period and region was between \$10 and \$87 per acre-inch. For the exceptionally dry 2012 growing season, researchers found that supplemental irrigation had a direct impact of \$600 to \$1,250/acre.

Why should the impact be greater in rainfed fields than those more consistently irrigated? The research suggests that water is particularly valuable in terms of the additional crop production during drought conditions, but that where irrigation requirements are already high, the average physical benefit of irrigation decreases; although irrigation makes a large difference to yields in irrigated fields, a more than corresponding amount of irrigation is needed to provide this benefit. Thus, where irrigation is seldom used, it makes the greatest economic impact.

(Continued page 9)

Water Quality Impairments Lead to Changes & Partnerships

When it comes to water quality, the facts are clear and the water is murky: Beaver Creek and Recharge Lake (York) have chemical loads above the standard set by the state of Nebraska for optimum health. The quantity of atrazine, nitrogen, and phosphorus contaminating these waterbodies is causing problems for aquatic life. The evidence is easy to see with the naked eye—water that is cloudy with suspended sediments that won't settle, no matter how long you wait. These sediments are the carriers of the chemicals, which have reduced the populations of many species in the creek and lake.

No one is disputing the fact that these waterbodies are compromised and that the problem needs to be addressed at the source by keeping soils and agrochemicals on the fields and out of the water.

How to accomplish that while keeping producers profitable is another matter.

An EPA-approved Water Quality Management Plan that targets these impaired waterbodies is already in place; however, the NRD has asked those that live and farm in the watershed for direction on next steps for implementation. The landowners, operators, agribusiness owners, and livestock producers involved in a recent stakeholder process came to this discussion with a variety of knowledge and experience. Some are already doing a lot to reduce erosion and runoff on their farms. Others said that there are significant barriers to adoption of practices that would improve water quality.

Jess Spotanski was one of the farmers involved in the discussion. His family has been farming in York County since the 1980s. In the 15 years since he took over the operation, he has tried a number of practices to reduce erosion. "I think that there are so many options and solutions to the problems that it's mind boggling. Even though [this watershed] is such a small area...it

encompasses so many growers and landowners. I think the task of finding solutions that work for everyone is daunting for sure." Spotanski and other producers say they are ready to tackle that challenge. The NRD is ready to partner with them to do it.

A group of 14 stakeholders from across the watershed (including Hamilton, York, and Seward Counties) recently met to discuss best agricultural land management practices for improving water quality. A few practices rose to the top as those that stakeholders believe more producers would utilize if the NRD and other agencies could increase cost-share and provide additional technical resources.

The group discussions culminated in a public open house in March. The purpose of the event was to provide information about water quality issues and proposed solutions, and to gather feedback from the public. This feedback will guide additional federal grant proposals, said Marie Krausnick, Upper Big Blue NRD water department manager. Ideally, the NRD will receive federal funds that will combine with local and state funds to provide greater cost-share dollars to help producers implement best management practices. The stakeholders group identified four key practices they would like to see implemented more widely in the Beaver Creek and Recharge Lake watershed area: cover crops, buffer strips, no-till, and irrigation water management.



There are a variety of reasons these practices are not already widespread, from cost to culture to the status quo, explains York grower Tony Kreifels.

“There are different kinds of producers out there. Some are willing to change and try new things and some just want to do what their dad or their grandpa did without even thinking maybe there is a better way,” said Kreifels.

Spotanski says he doesn't believe producers are doing anything intentionally harmful, but sometimes doing the same thing that's been done for years isn't the best thing to keep doing. “We all like short-term results, but these practices are all for the long-term.... You can see the dollars going into implementing these things, and the headaches they're going to cause... but to get to the profitability, that's the hardest part to explain or understand.”

Spotanski says when it comes to convincing producers to change their practices, profitability is key. If producers believe there's a chance that they will lose money on a practice, they aren't going to try it, no matter how much others tout its environmental impact. “Some of these practices aren't necessarily going to increase your profitability in the short-term. How do you convince somebody to change their practices, when it's going to affect their bottom line?” he said.

Other stakeholders also suggested a barrier to adoption of these practices was communication: farmers are more interested in hearing from other farmers about what works, not from the NRD or other agencies. “One of the things that came up in the stakeholder meetings repeatedly... is the importance of crop consultants,

farm managers, people at the cooperatives, the vendors, the people involved with the fertilizer industry. They have a continuing interaction with farm operators and the farming community... That is a very good avenue for promotion of things like cover crops and filter strips,” suggested Doyle Onnen, a farm manager with Farmer's National.

Onnen and Spotanski both spoke about the dangers of short-term thinking when it comes to farming. All farm practices need to be oriented toward greater stewardship, they said.

“Going forward, I have this hope and I know there are a lot of other people too, that we do sustain and actually improve our production practices and improve our farms,” said Onnen, who has more than 30 years' experience in agriculture. “We really are in the job of preservation. We are trying to preserve our environment for future generations, for the farmers that are going to come.” Onnen sees the future of agriculture as inextricably linked to soil health. “Maintaining our soil and sustaining it and having that productivity for future generations... it's encouraging that we're seeing more of that.”

Spotanski agrees. A farmer's ultimate goal shouldn't only be about profit or yield, he says. “It should be about stewardship of the land. It's a finite resource. Everyone probably feels like they're doing some kind of stewardship, but what's the next level of stewardship that you can do? My advice is to try something. Start small. Learn from it. If you get some positive results, maybe expand on it. Maybe start with some of the worst-case-scenario fields that need more attention. Grow from there.” ♦♦♦



Water quality concerns: Recharge Lake in York, where the fishery has been harmed by nutrients. (top left)

Outstanding in his field: Jess Spotanski stands amid rows of cover crops. (left)

Eyes on the future: Anthony Kreifels' children Rachel and Jackson represent the fifth generation of the family's farming operation in York County. (above)

For an enhanced article, video interviews, and additional resources on this topic, visit www.upperbigblue.org/wqmp.

Soil Health Still GROWing in Demonstration Fields

Now in its fourth year, the Project GROW (Growing Rotational crops on Wellfield) demonstration fields on the City of York wellfield are trying something new: alfalfa and sorghum.

The five-year collaboration between the city and the NRD involves farming 120 acres using soil health practices including diverse crop rotations, cover crops, livestock grazing, and reduced tillage. Soil health practices are shown to reduce the leaching of nitrogen and other agrochemicals into the groundwater supply. The goal of this project is to improve the soils above the wellfield (where water for residents of the City of York is drawn) and thus protect water quality.

This growing season, alfalfa will be planted on the south field and sorghum on the north. This is the first time either of these crops have been cultivated at the NRD site. Introducing new crops into the rotation provides natural pest and weed control, which means less inputs of pesticide and herbicide are needed, said Dan Leininger, NRD water conservationist. Additionally, alfalfa roots can reach lengths of 20 feet. These elaborate root structures break up compaction in the soil and increase aeration and water holding capacity. When these roots decompose over time, they release nutrients throughout the soil profile that feed the diverse microbiome required for a healthy soil system. “With these kinds of crop practices, you have more natural mineralization, so that over time you don’t need as much commercial fertilizer,” added Leininger.

Currently, the north field has a cover crop mix of rye and hairy vetch growing on it. In the next few weeks, the sorghum will be planted “green” using a drill--seeds will be deposited into a narrow furrow of soil cut into the cover crops. The rye and hairy vetch will then be terminated, but will continue to provide soil protection and feed the microbiome as they decompose. Sorghum, also known as milo, is a popular ingredient for cattle and bird feed. Leininger says there is increasing demand for this crop, which requires less water to grow than corn and is ideal for dryland acres.

Each year, the soil at Project GROW is tested in two ways. A conventional soil test is conducted that measures the amount of nutrients in the soil. These measures provide

a guide for how much fertilizer will be necessary for a particular crop and yield goal. Leininger says this year, cooperating farmer Scott Gonnerman will add 80 lbs of phosphorus per acre to the alfalfa, but likely no other inputs. A Haney Test will also be run on soil samples from the GROW fields, which will indicate the amount of nutrients available to microbes, as a proxy for soil health. After three years of soil health practices implemented on this ground, Leininger expects the Haney Test to show significant improvement in soil microbial activity.

There are some soil health improvements that require no testing to document. In previous years, a section of the north field had gullies developing where heavy rains would wash out the soil. Erosion like this can be a major problem in Nebraska. The solution is cover crops, explains Leininger. Keeping the soil covered year-round strengthens the soil structure and protects the topsoil from washing away in a heavy rain. “You can really see how we are healing this land,” said Leininger proudly.

Last fall, cattle were used to graze the rye cover crop, providing a secondary income stream for the property, as well as an additional opportunity for improvement to the soil. Incorporating livestock grazing with cover crops can be exceptionally beneficial to the soil system, says Leininger, as livestock fertilize the soil naturally. ♦♦♦

Dan Leininger examines the healthy soil in a field of rye and hairy vetch cover crops at Project GROW. More at www.upperbigblue.org/projectgrow.



Pediatric Cancer Study

Looks for Possible Link to Common Water Contaminants

Why is the rate of cancer in children so high in Nebraska?

The Upper Big Blue NRD is partnering with the University of Nebraska Medical Center (UNMC) to conduct a groundwater quality study on domestic wells to see if elevated levels of common agricultural contaminants may be linked to pediatric cancer.

Nebraska is in the top seven states for rates of pediatric cancer in the US and is ranked first for incidence of certain malignant pediatric brain tumors. Researchers believe that the cause of pediatric cancers is likely to be a combination of genetic and environmental factors.

The Nebraska Cancer Registry has shown that between 1987 and 2016, 37 cases of pediatric cancer have been diagnosed within the Upper Big Blue NRD area. Could there be a link between these cases and water quality, the new study asks? Upper Big Blue NRD staff will collect samples from domestic wells in the district located close to where cases of pediatric cancer have been documented. The samples will be analyzed for nitrates, arsenic, atrazine, uranium, and uranium decay products. Due to season variability, samples will be collected in intervals over a two-year period.

Samples will be collected in April/May (pre irrigation), June/July (during irrigation), and October/November (after irrigation). The goal is to sample 50 wells across the district that are located near known cases of pediatric cancer. Water quality information will be sent to the homeowner responsible for the well with an explanation of their results. If elevated levels of contaminants are detected, the participants will be provided with information about technologies for removing these compounds from drinking water.



By *Erinn Wilkins*
Water Technician

At the conclusion of the study, location-based result maps will be generated to show where areas with high pediatric cancer incidence intersect with areas that have elevated agrochemical concentrations in drinking water. All data reported to the public will be aggregated, so that individual results cannot be tracked to a specific home, well, or family.

The findings from this research will allow for development of a comprehensive monitoring program for environmental contaminants in areas where elevated incidence rates for pediatric cancer have been documented. UNMC anticipates development of techniques that will enable them to draw preliminary conclusions about water quality and pediatric cancer. NRD staff will collaborate with UNMC researchers on the release of this information when the study is complete. ◆◆◆



You want to improve your soil's health. We want to help you do it.

New funds are available for cover crops, no-till, and diverse crop rotation, up to \$45/acre, through the Nebraska Soil Carbon Project. First cohort deadline for application is June 15. Start today!

upperbigblue.org/SoilCarbonProject

Irrigators...

It's time to check your flow meter!

Be sure to check that your flow meters are functioning properly before you start irrigating. A properly functioning meter should not have condensation inside. Irrigators in the district can now take advantage of an increase in the amount of cost-share funds available for flow meter repair. Thanks to a program change, the cost-share funds are now offered at a maximum of 50 percent not to exceed \$300. Previously, the funds allowed for 50 percent up to \$150 for flow meter repair.

To access these funds, irrigators should complete forms on the NRD website to ensure that they qualify prior to completing the repairs. The maximum cost-share per landowner for flow meter repair is \$1,000 per fiscal year. The minimum cost-share payment is \$100.

Stop Uncontrolled Runoff

It is illegal to operate an irrigation system that contributes to wasting groundwater. State law prohibits uncontrolled irrigation runoff. The NRD is responsible for enforcement of this law.

Need help controlling irrigation runoff on your land? As part of the NRD Land Treatment Program, you can access cost-share funds to improve your irrigation system through sub-surface drip or VRI. Technical assistance is available from the NRCS for solving runoff problems. For more information contact your county NRCS office or call the NRD at (402)362-6601.



Plan Ahead to Get Irrigation Decisions Right

Kevin Schulz | Nebraska Farmer
(reprinted with permission)



There are no free refills for farmers relating to crop inputs, except for precipitation that replenishes the soil water. The problem is, just as with the alleged “free refills” of soft drinks and coffees at restaurants, we do not know when we will get them. Thus, irrigation scheduling almost becomes a daily decision.

Steve Melvin, Nebraska Extension irrigated cropping systems educator, says the daily decision whether to turn on the irrigation system obviously needs to be made with optimization of the crop yield and returns in mind.

Getting irrigation right

This sounds simple enough, but becomes difficult when trying to keep the crop well-watered, but not over-watered — with a limited capacity to put water on the field, but wanting to delay the application as long as possible in the hope that it will rain.

Melvin sees farmers possibly throwing money down the drain — or on the field, as the case may be — by not properly scheduling their irrigations for the most benefit. To prove his point, he has reviewed data gathered by the Upper Big Blue Natural Resources District.

These data are garnered from the Upper Big Blue NRD requiring farmers to use soil water monitoring equipment in one irrigated field and turn that data over to the NRD.

Sifting through the data, about one-third of farmers apply the correct amount of water to produce top yields while minimizing deep percolation. Those findings mean that two-thirds of producers could use better management to achieve top crop yields, while also saving a little — or, in some cases, a lot — of money and water.

Plan ahead

Many of today's irrigation systems offer the potential for automation. They can easily be operated from a smartphone or other device. Many of these systems also offer data showing the machine's operation, providing farmers with data to analyze operational efficiency.

It is what farmers do with that data that makes the difference in optimum operation versus poor application uniformity because of low pressure.

“I think that setting the stage ahead of time, to be able to make those decisions quickly with some soil water monitoring data or irrigation scheduling system of some sort, is really important to think about ahead of time, versus when you get in the heat of the battle of keeping the crop well-watered,” Melvin says. “In other words, figure out how are you going to make those decisions quickly and efficiently and not have to put on a little extra water just to make sure you’re not shorting the crop.”

What worked last time, or even what worked last year, may not translate to the same plan for the 2021 growing season.

“The process can be similar year to year, but the weather conditions are always different in Nebraska,” Melvin says. “In Nebraska, we do get rain, even though last summer didn’t seem like it. In general, we get good rain — so we need to be ready to respond to supplement the rain with irrigation when and only when we need to.”

Know your capacity

Knowing how much your fields need is key, as well as how long it takes your irrigation system to provide the water. Depending on the well capacity, it can take two to seven days to supply the desired amount to a field.

In addition to knowing your irrigation system output, Melvin stresses the importance of knowing your soil’s water-holding capacity. Deep loam soils found in the aforementioned Upper Big Blue NRD provide “a big reservoir, if you will,” he says, while farmers of sandy soils won’t have that luxury, and three or four days without moisture during a hot, windy period may cause crop harm.

Keeping an eye on the skies is also worthwhile so farmers can plan their irrigation schedules on the weather forecast, but be prepared to turn the pivot on if Mother Nature fails to come through. For farmers averse to doing their own irrigation scheduling, Melvin suggests turning to crop consultants or other irrigation scheduling professionals.

Read more of Melvin’s irrigation articles at cropwatch.unl.edu. ◆◆◆

(WATER WORTH? continued from page 3)

Why does this finding matter? Most previous research to determine the value of water in agriculture has focused on regions where irrigation is essential for crop growth, rather than rainfed agriculture where irrigation is supplemental. For this study, average gross water values were highest not at points in time and space where the water supply was scarcest in absolute terms, but where irrigation could make the largest improvement in average crop productivity.

This is significant, as researchers suggest these findings are useful when anticipating where new disputes over water use in agriculture may arise. As climate change continues to impact agriculture through more extreme weather patterns, areas where rainfed agriculture is the norm and water management infrastructure is minimal are ripe for future dispute. Projections using these metrics can help determine where water policy should be prioritized to prevent disputes. Researchers suggest that increased management ahead of potential shortages would be less costly than doing it while simultaneously managing a drought crisis that pits agricultural, residential, and commercial water needs against one another.

For more information, see “Informing drought mitigation policy by estimating the value of water for crop production” by Rimsaite, Gibson, and Brozović. ◆◆◆



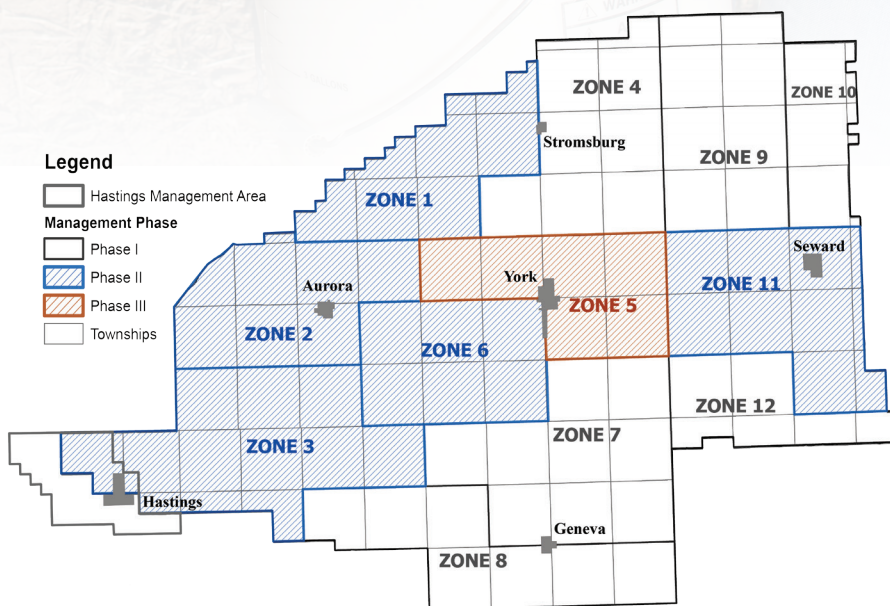
Vadose Zone Study Examines What Lies Beneath

The soil under your feet can tell you a lot about the quality of the water hundreds of feet below. A new research collaboration between the Upper Big Blue NRD and the University of Nebraska-Lincoln will focus on measuring indicators in the vadose zone across the district. The vadose zone is the area beneath the plant root zone and above the groundwater table. It is also referred to as the unsaturated zone.

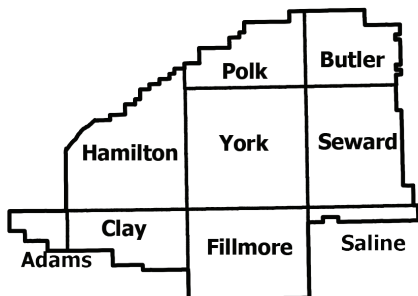
The focus of the study will be to look at groundwater nitrate and other agrochemical contaminant and other agrochemical contaminant occurrence in the vadose zone. To do this, researchers will examine both historic and spatial changes in groundwater nitrate throughout the district's 12 water quality management zones to compare the changes in nitrate levels. Nitrate levels will be determined by drilling test holes for chemical analysis, along with characterizing the soil type and physical characteristics.

For the past few decades, NRD staff have documented a steady increase in nitrogen concentration in some parts of the district. While some areas of the district have seen decreases in nitrate levels, the district overall has had an increase of 54 percent. This research will begin in the fall of 2021.

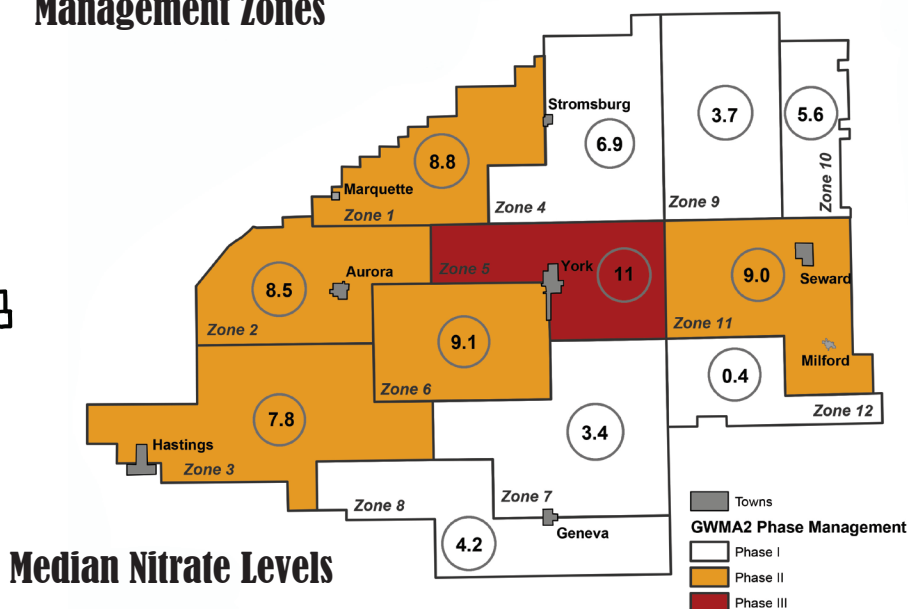
The NRD is recruiting volunteers to take part in the study who have agricultural land. Selected study participants will be asked to fill out a survey to document current and historical management practices on the fields used in the study. Research will begin sampling in Zones 4 and 5 in fall 2021. It will proceed throughout the district until 2024, including two to three zones each year. If you have any questions, or are interested in participating in the study, feel free to contact Jacob Maslonka at the Upper Big Blue NRD at jmaslonka@upperbigblue.org or call (402) 362-6601.



Management Zones



The District



Recognitions & Awards

Several staff members were recognized in April for their years of service to the people of the district. Carleen Light (far left) and Marie Krausnick (far right) were thanked for their 15 and 20 years (respectively) of service in the NRD water department where Light is a secretary and Krausnick is the department manager. NRD General Manager David Eigenberg (center left) was honored for his five years in the leadership role. (Also pictured, board chairperson Lynn Yates.)



In addition to her service as a director for the Upper Big Blue NRD, Linda Luebbe also has served as the president of the national Groundwater Management Districts Association for the past year. The organization’s mission states “To protect and preserve groundwater quality and quantity for future generations, GMDA promotes conservation and conjunctive use, public education and state sovereignty.” The NRD thanks Luebbe for her service and for representing Nebraska and the district in this important way. ♦♦♦



BLUEPRINT



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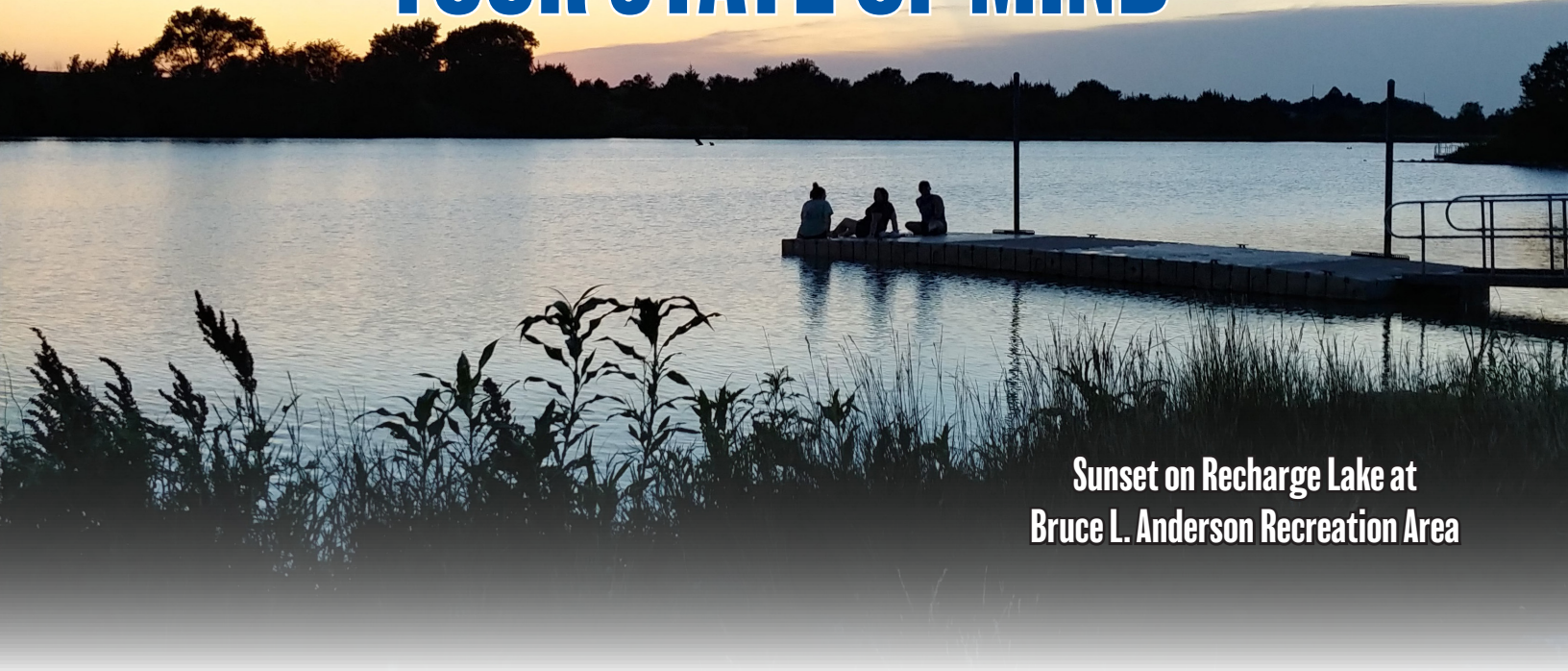
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reCREATE YOUR STATE OF MIND



Sunset on Recharge Lake at
Bruce L. Anderson Recreation Area

Visit one of our five recreation areas this summer. Locations near York, Aurora, Ulysses, and Utica offer a variety of activities. There's something for everyone!

- RV Pads and Tent Camping Sites
- Hiking & Biking Trails
- Boat Docks
- Fishing
- Archery Range
- Picnic Shelters
- Playgrounds
- Swimming
- Wildlife Viewing
- Fire Rings & Grills



Start your summer adventures at
upperbigblue.org/recreation

