



LOWER ELKHORN

Natural Resources District



**Lower Platte River Basin Coalition Plan –
Annual Report (March 1, 2023)**

Table of Contents

- 1.0 Introduction**
- 2.0 Certified Irrigated Acres**
- 3.0 Municipal Water-Use Data**
- 4.0 New GW Consumptive Uses**
- 5.0 Transfers of Water Uses**
- 6.0 Well Construction Permits Granted**
- 7.0 Retirement of GW Consumptive Uses**
- 8.0 Flow Meter Data – Irrigation, Commercial/Industrial, and Livestock**
- 9.0 Water Banking Activities**
- 10.0 Stream Flow Accretion Activities**
- 11.0 Groundwater Elevation Data**
- 12.0 Stream Gage Measurements**
- 13.0 NRD Regulation and Management Activities**
- 14.0 New Depletions Accounting Report**
- 15.0 New Data Collected Through Models or Studies**

1.0 Introduction

The Lower Elkhorn Natural Resource District (LENRD) covers approximately 2,591,300 acres; with predominant land uses divided among agriculture (76%), pasture/grassland (20%), and small areas of forests, open water, wetlands, and urbanized areas (<4%).

The District’s Board of Directors approved the interlocal agreement which agreed to the adoption of the Lower Platte River Basin Water Management Plan on November 21st, 2017. This action, along with the six other Natural Resource Districts and the Nebraska Department of Natural Resources, set forth a collective effort to work cooperatively towards the management and development of the water resources within the Lower Platte Basin.

For future reference, the Board of Directors for the Lower Elkhorn NRD approved acceptance of the terms of the Interlocal Cooperative Agreement #3 for the Lower Platte River Basin Water Management Plan Coalition on March 24, 2022, which also sets forth the amounts of available depletions as part of the second increment.

Since 2009, the Lower Elkhorn NRD has utilized a managed-growth philosophy when considering the decision to allow new groundwater uses for agricultural irrigation purposes. Prior to December of 2008, no restrictions were in place that limited property owners regarding the development of agricultural land for irrigation purposes. Current policy requires an approved variance from the District before expanding groundwater use for irrigation purposes. This requirement has been in place since April of 2009 within the LENRD. No limitations have been enacted on the approval of permits for high-capacity groundwater wells for other uses, such as commercial, industrial, livestock, or municipal wells, however, any request to construct a new well for any of those purposes is reviewed for any potential impacts to existing groundwater supplies and/or impacts to groundwater quality prior to approval.

The Lower Platte River Basin Water Management Plan provides guidance to the partners in respect to the amount of (excess) available water that can be allotted for new uses (depletions). Coalition partners have, in return, agreed to adhere to the suggested limits for the second five-year increment of the plan. Table 1 lists the allowable depletions for each sub-basin of the Lower Platte Basin and Table 2 breaks it down into the available amount for each Natural Resource District. As listed in Table 4.2, the amount of depletions available during the second increment, to be shared between the Lower Elkhorn Natural Resource District and the Nebraska Department of Natural Resources is **8,347** Acre-Foot of allowable new depletions.

Table 1. – Second 5-year Increment Allowable New Depletions by Basin

Basin	Average Peak Season Excess Supply (acre-feet)	Second 5-year increment Allowable Development (acre-feet)
Full Lower Platte Basin	228,894	22,889
Loup Basin (46% BSW)	105,291	10,529
Elkhorn Basin (32% BWS)	73,246	7,325
Lower Platte Subbasins (22% BWS)	50,357	5,036

NRD	Allowable Depletions by NRD - 2nd Increment	1st Increment Carryover	Total
Upper Loup NRD	3,369	2,065	5,435
Lower Loup NRD	7,160	4,749	11,908
Upper Elkhorn NRD	1,831	1,134	2,965
Lower Elkhorn NRD	5,493	2,853	8,347
Papio-Missouri NRD	1,057	768	1,825
Lower Platte South NRD	1,209	890	2,098
Lower Platte North NRD	2,770	966	3,736
TOTAL	22,889	13,425	36,315

Table 2. – Second 5-Year Increment Allowable New Depletions by NRD

This report and its content will serve to fulfill the annual data collection and reporting requirement of the Lower Platte River Basin Management Plan for the LENRD for the year 2022, as required in *Section 5.0 – Plan Review and Monitoring, Lower Platte River Basin Management Plan*.

2.0 Certified Irrigated Acres

The District initiated the process of certifying irrigated acres in January of 2013, and conducts public hearings to certify new irrigated acres, or modifications to existing certified acres on an annual, or as needed basis.

Rule 14 of the Lower Elkhorn Districts Rules & Regulations for the Enforcement of the Nebraska Groundwater Management and Protection Act indicates that the District will certify, as irrigated, any tract of land greater than two acres that (1) has been irrigated any one out of ten years, from 1999 to 2008, (2) is currently enrolled in a federal, state, or local conservation program and was classified as irrigated land by the local County Assessor within one year prior to being enrolled in such a program, (3) has otherwise been allowed to develop under an approval granted by the District’s Board of Directors since 2007, (4) has otherwise been allowed to develop under an approval granted by the NeDNR since 2007, or (5) is irrigated by wastewater effluent from a livestock operation or municipality that is operating in compliance with a Clean Water Act permit.

Table 3. – LENRD Certified Irrigated Acres – 12/31/2022

LENRD CERTIFIED IRRIGATED ACRES BY SOURCE				
	GROUNDWATER	SURFACE WATER	WASTEWATER	TOTAL ACRES BY COUNTY
ANTELOPE	435.94	-	-	435.94
BURT	16,450.19	1,077.36	1,505.06	19,032.61
CEDAR	48,933.97	529.80	432.94	49,896.71
COLFAX	24,864.53	407.87	2,249.11	27,521.51
CUMING	59,801.61	2,040.74	14,258.59	76,100.94
DAKOTA	-	-	-	-
DIXON	15,412.82	422.12	191.79	16,026.73
DODGE	67,777.23	3,954.06	2,428.12	74,159.41
KNOX	11,451.90	70.00	-	11,521.90
MADISON	125,017.34	2,067.67	3,585.54	130,670.55
PIERCE	156,529.67	1,338.15	476.94	158,344.76
PLATTE	24,323.06	-	2,220.71	26,543.77
STANTON	39,723.80	1,216.11	1,940.44	42,880.35
THURSTON	12,098.81	373.87	634.80	13,107.48
WAYNE	50,345.70	913.42	1,761.00	53,020.12
TOTAL IRRIGATED ACRES BY SOURCE	653,166.57	14,411.17	31,685.04	
<i>Net change from previous report</i>	+10,690.92	-8.48	+237.70	
TOTAL IRRIGATED ACRES	699,262.78			

As indicated by the data in Table 3, groundwater is the primary water source for agricultural irrigation in the Lower Elkhorn NRD with current inventory totaling **653,166.57** acres irrigated by this source. **Note: This current inventory only includes a portion of the total new irrigated acres approved in conjunction with the Lower Platte River Basin Management Plan, since only a portion of the new irrigated acres have been formally certified as irrigated by the District.**

The LENRD is also home to many livestock operations and species include: beef cattle (feedlot and cow/calf), dairy, swine, and poultry operations (both egg and meat-bird production). Current production trends for livestock and poultry operations indicate that large numbers of animals are situated on individual farms, which will require large volumes of water necessary for production. Many of these operations are also required to have operating permits to comply with the Clean Water Act requirements. Some of these locations will apply groundwater, as necessary, alongside animal waste/lagoon effluent for irrigation of growing crops. To date, records indicate that **31,685.04** acres utilize wastewater as a source of irrigation water.

To date, certification records show that surface water irrigation comprises the smallest increment of the total irrigated acreage in the District, estimated at **14,411.17**.

3.0 Municipal, Water-Use Data

Table 4 (below) contains municipal water-use data from public water supply systems located within the LENRD.

Table 4: LENRD_Municipal Water-Use Data_2022

System Name	2020 Pop.	2022 Usage/Gal.	Gal/Capita/Day
City of Battle Creek	1,397	84,644,230.00	166.00
City of Clarkson	641	32,175,666.00	137.52
City of Hooper	857	32,954,637.00	105.35
City of Humphrey	857	57,384,077	183.45
City of Laurel	972	73,840,198	208.13
City of Lyons	824	52,109,677.60	173.26
City of Madison	2,561	112,685,570	120.55
City of Norfolk	24,955	1,799,643,216	197.58
City of Oakland	1,571	107,412,097.80	187.32
City of Osmond	873	61,750,286.00	193.79
City of Pierce	2,013	106,745,361.02	145.28
City of Plainview	1,398	115,513,116.00	226.38
City of Randolph	1,035	63,637,270.00	168.45
City of Scribner	754	46,782,947.90	169.99
City of Stanton	1,814	86,243,262.00	130.26
City of Tilden	1,105	72,987,319.00	180.96
City of Wakefield	1,545	109,474,760	194.13
City of Wayne	5,973	369,540,136.00	169.50
City of West Point	3,481	201,175,930.00	158.34
City of Wisner	1,323	52,031,408.00	107.75
Village of Beemer	610	39,097,340.00	175.60
Village of Belden	127	Served by WauCoIRWS	NA
Village of Bancroft	458	25,056,000	149.88
Village of Carroll	237	16,608,960	192.00
Village of Concord	162	5,972,130	101.00
Village of Craig	202	17,288,137.00	234.48
Village of Creston	206	8,346,090.00	111.00
Village of Dixon	125	5,083,771.00	111.43
Village of Dodge	550	30,488,781.00	151.87
Village of Emerson	902	50,174,652.00	152.40
Village of Hoskins	281	10,848,023.00	105.77
Village of Howells	657	65,035,116.00	217.20
Village of Leigh	396	30,895,549.00	213.75
Village of Magnet	54	Served by WauCoIRWS	NA
Village of McLean	25	Served by WauCoIRWS	NA
Village of Meadow Grove	249	12,468,528.92	137.19
Village of Nickerson	334	12,434,820.00	102.00
Village of Pender	1,204	58,061,455	132.12
Village of Pilger	305	18,738,224.00	168.32
Village of Snyder	327	20,434,769.55	171.21
Village of Tilden	1,105	64,120,608.50	158.98
Village of Uehling	271	15,064,754.50	152.30
Village of Wausa	562	19,673,947.61	95.91
Village of Winside	574	13,789,200.00	65.82
Woodland Park CDP	1,621	80,466,440.00	136.00
Logan East Rural Water District	NA	267,874,210.03	NA
Cardinal Health	NA	9,204,771.05	NA
Henningsen Foods Inc	NA	9,734,438.02	NA

4.0 New Groundwater Allocations and Depletion Impact

Prior to participation in the Lower Platte River Basin Management Plan, the only accounting for new groundwater consumptive uses by the Lower Elkhorn Natural Resource District would be the new irrigated acres located within the hydrologically connected areas authorized by an approved Variance from the District, and most importantly those acres approved under the prior requirements of LB 483. The LENRD has required an approved variance to expand irrigated acres districtwide since early 2009. A variance is required for both the Hydrologically Connected and Non-Hydrologically Connected portions of the District, which under the current boundaries (as recognized by the District and the Nebraska Department of Natural Resources) equals approximately a 1/3rd (Hydrologically Connected) and 2/3rd (Non-Hydrologically Connected) split.

In October of 2022, due to the record drought conditions that were impacting the District, the Board of Directors decided to forego consideration of variance requests for new groundwater irrigated acres. This decision will allow for the completion of previously approved projects and will allow the District to monitor groundwater conditions in the District prior to considering requests for new groundwater irrigated acres.

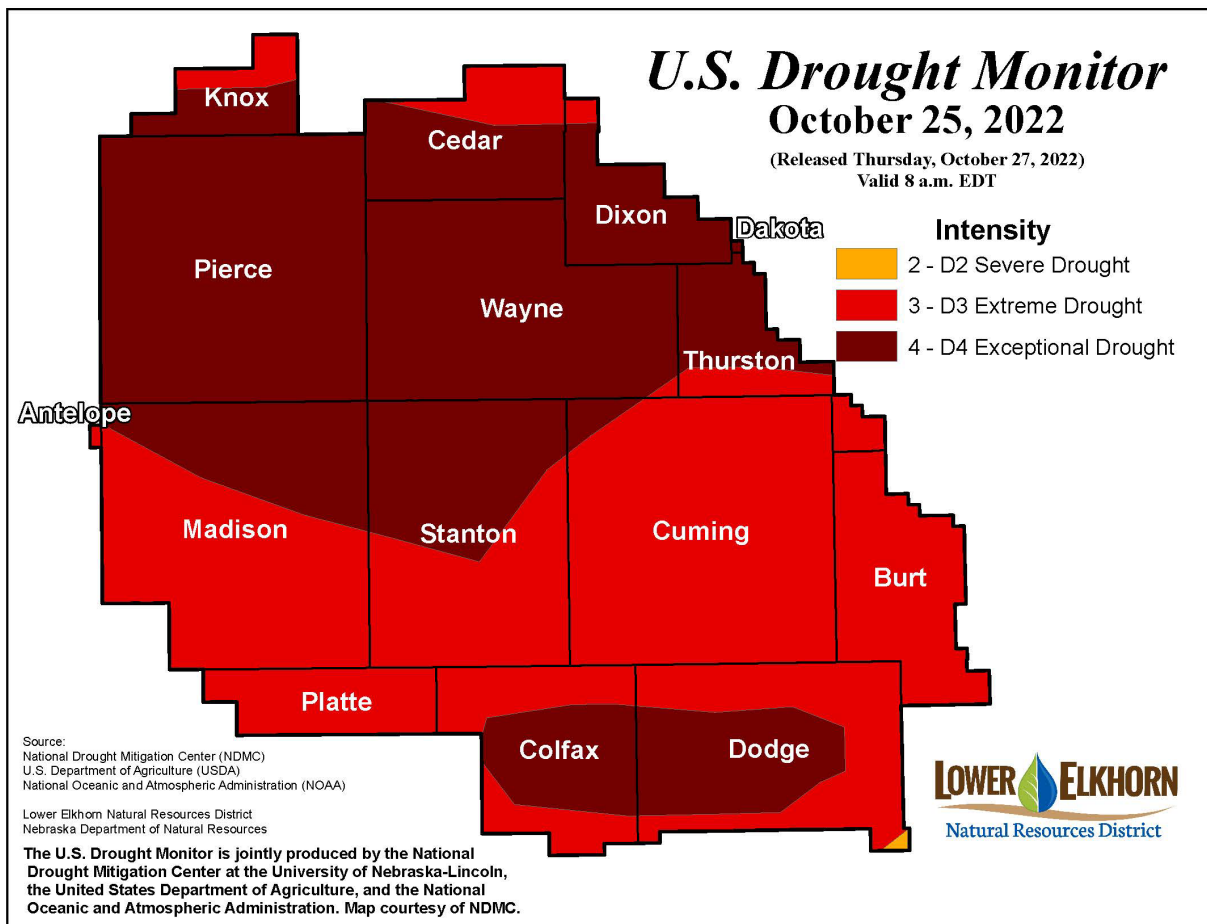


Figure 1. U.S. Drought Monitor map for the Lower Elkhorn Natural Resources District for October 27, 2022.

5.0 Transfers

The Lower Elkhorn Natural Resource District did not process any groundwater use transfer requests from within the hydrologically connected boundary area (in the LENRD) during this reporting period, and therefore no data is provided for this section.

6.0 Permits for High-Capacity Wells

Permits are only required to construct a high capacity well (any well constructed or equipped to pump greater than 50 gallons per minute) in the Lower Elkhorn NRD. Table 5 lists the well permits issued for construction of high-capacity wells in the Lower Elkhorn NRD between January 1, 2022 through December 31, 2022. A breakdown of this inventory includes permits for: irrigation (34) (24 replacement well permits), commercial/industrial (1), livestock (4), public water supply (1), and other (3).

Table 5. 2022 Well Permits in the LENRD

High Capacity Well Permit Type	Number of Approved Permits	Average Capacity (GPI)
Irrigation (New wells)	10	800
Irrigation (Replacement)	24	825
Livestock	4	270
Other (High capacity well to fill lake)	1	1000
Other (Pressure relief well)	2	2000
Public Water Supply	1	1200
Commercial/Industrial	1	1000
Total	43	1013

7.0 Retirement of Groundwater Consumptive Uses

During the 2022 reporting period, there were no retirements of groundwater uses inventoried or reviewed within the Lower Elkhorn NRD.

8.0 Flow Meter Data

As of January 1, 2019, all active high-capacity wells are required to be equipped with a flow meter to measure the total annual groundwater withdrawal, and to report water-use readings to the LENRD by December 1 of each calendar year. The water use information is inventoried into a central data management system that was developed for the LENRD by Phoenix Webgroup (PWG) of Waverly, NE. This data management system, which houses

the information from over 5,000 flow meters, also contains a user interface that allows well owners or operators to submit their information using a web-based interface.

The summary table below captures the preliminary information collected from flow meter reports for irrigation wells in the Lower Elkhorn NRD for the 2022 irrigation pumping season.

The entry labeled “Irrigation” represents information from irrigation wells located throughout the entire District, and the QM Subarea information is gathered from irrigation wells located in two Quantity Management Subareas (Eastern Madison and Wayne Counties), in which irrigation wells are subject to an annual groundwater allocation.

Also included in Table 6 is pumping data from well uses identified as Commercial/Industrial, and Livestock.

Well Use	Number of Locations	Minimum Withdrawal	Maximum Withdrawal	Median/AI per acre
Irrigation (all other)	5,129	0 Acre In.	32.68 Ac In.	9.61 Acre inches
Quantity Management Subareas				
Eastern Madison County	96	0 Acre In.	22.68 Acre In.	9.78 Acre Inches
Wayne County	77	0 Acre In.	11.27 Acre In.	7.37 Acre Inches
New Wells				
Irrigation - 9 Ac. In. Allocation	179	0.68 Acre In.	19.89 Acre In.	8.36 Acre Inches
Commercial/Industrial				
Golf course, ethanol plants, ready-mix plants, food processing other industries	48	0.00 gal.	37,149,901 gal.	24,391,080 gal.
Livestock				
	55	536 gal.	9,734,438 gal.	1,025,459 gal.

Table 6. Flow meter data for the Lower Elkhorn NRD for the 2022 pumping season.

9.0 Water Banking Activities

The Lower Elkhorn NRD does not currently participate in any water banking activities and therefore no data exists for this reporting requirement.

10.0 Stream-flow Accretion Activities

Within the Lower Elkhorn NRD there are currently no operating projects that would create reporting data associated with stream flow augmentation or to compensate for any conjunctive management requirements.

were observed in some locations within the District while others showed declines that were less severe.

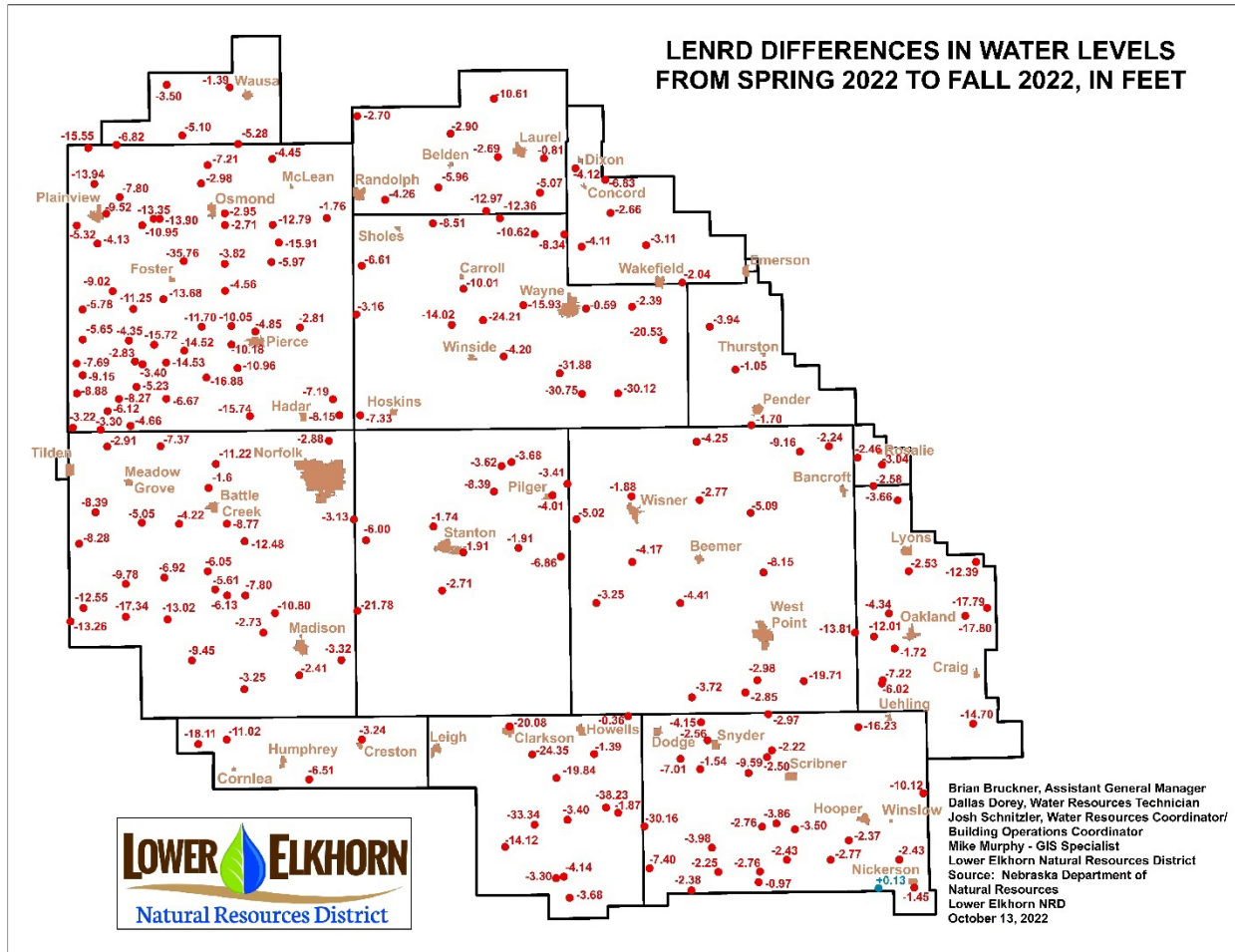


Figure 3. Map of the LENRD that indicates the changes in depths to groundwater between the measurements obtained in the Spring of 2022 and the Fall of 2022 for the LENRD Observation Well Network.

Fall 2022/Fall 2012

The map below (Figure 4) illustrates the differences between the observation levels from 2012 to 2022, since 2012 was the most recent year (in history) which presented acute drought conditions for this portion of northeast Nebraska.

On average, the in-season changes that were recorded during the Fall of 2022 paralleled those observed in the Fall of 2012.

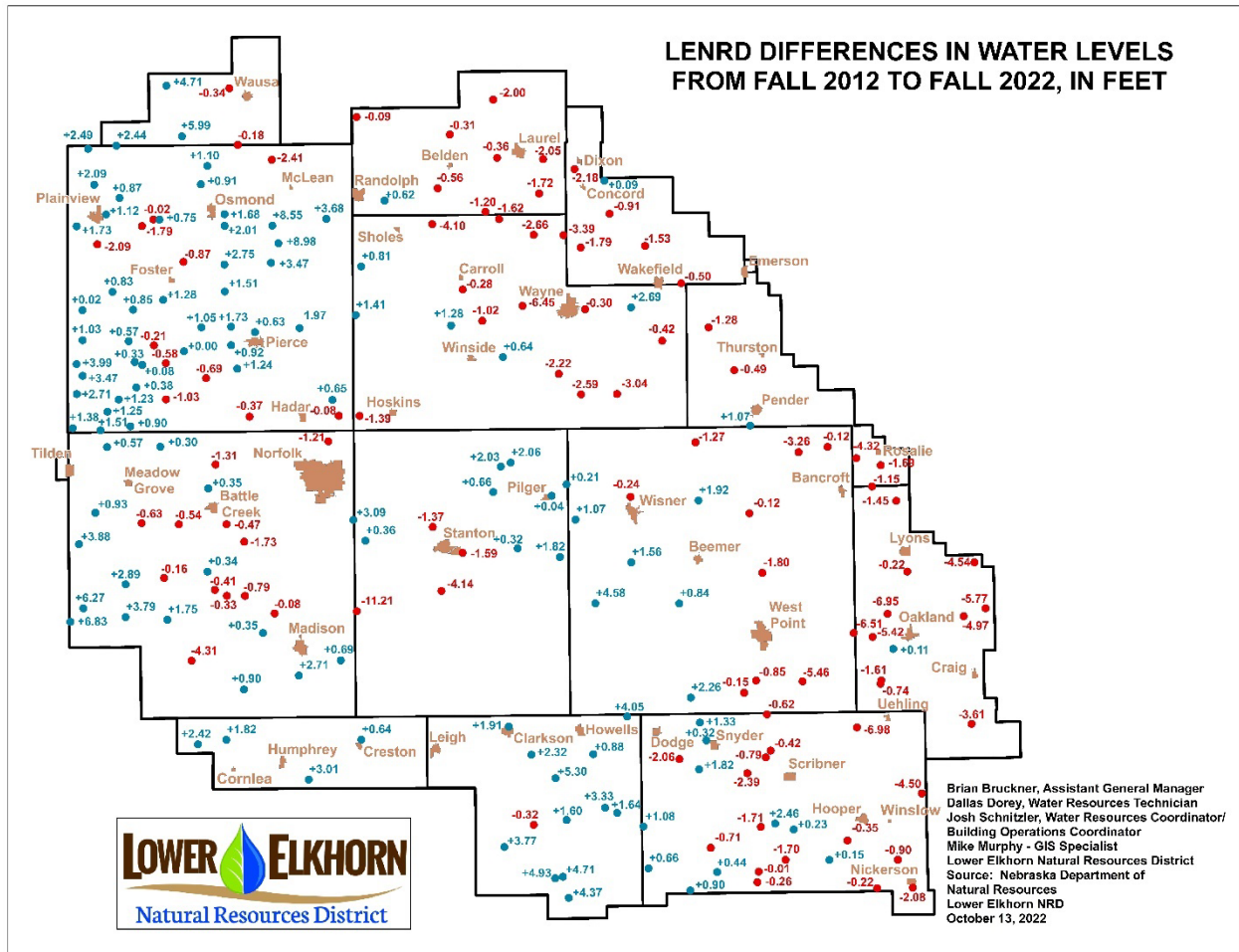


Figure 4. Map of the locations that comprise the LENRD Observation Well Network and illustrate the amount of difference (blue – greater, red – lesser) between the measurement collected during the Fall of 2022 compared with the measurement collected during the Fall of 2012.

As the previous maps help to illustrate, the aquifer systems in the Lower Elkhorn NRD are geologically diverse, and subsequently the groundwater levels react differently by location. This phenomenon presents a situation where the year-to-year water level data will vary significantly at the local level. That being stated, groundwater levels have generally been very resilient in the Lower Elkhorn NRD and have (in the past) recovered from periods of deficit precipitation coupled with increased groundwater demand. However, groundwater inventories could become stressed if acute drought persists into subsequent pumping seasons, especially since the Lower Elkhorn has allowed for the development of nearly 25,000 new groundwater irrigated acres since 2016. Those factors weighed into the Board’s decision not to consider applications for variances for new irrigated acres in late 2022.

12.0 Stream-gage Measurements

The Lower Elkhorn NRD does not maintain any stream gages within the District that are independent of gage-data collected by the United States Geological Survey (USGS) or the Nebraska Department of Natural Resources (NeDNR). However, a Joint Funding Agreement is in place with USGS to assist in the expenses associated with the operation and maintenance of gages located on the North Fork of the Elkhorn River near Pierce, and on the Elkhorn River near Pilger.

13.0 NRD Regulations and Management Activities

Modifications to Rules and Regulations

There were no amendments considered during 2022 to the Lower Elkhorn NRD's Rules and Regulations for the Management of Groundwater, nor to the Groundwater Management Plan. The District continues to collect information relevant to a prior recommendation to delineate a groundwater management area in portions of Cuming, Colfax, and Dodge Counties for groundwater quality purposes. Pending the review of laboratory results from additional water and vadose core sampling, a public hearing may be scheduled during 2023 to receive public input on the proposed management area.

Enforcement Activities

2022 presented numerous challenges that required the District to engage in additional activities when enforcing its policies. It is not uncommon for the District to issue Notices of Violation for failure to submit flow meter readings, management area reports, or for non-compliance with other groundwater related matters. During 2022, two (2) producers were issued Cease and Desist Orders for failure to complete the Nitrogen Certification Requirement, and as of this writing have failed to achieve compliance with that requirement. Typically, farm operators will come into compliance after receiving a Notice of Violation, though some operators are becoming more resistant to the NRD's requirements.

LENRD Drought Management Plan – Drought Response Measures

As previously mentioned, the Lower Elkhorn NRD has been caught in the grips of historic drought conditions that grew more severe as the year progressed. In light of this fact and given that the LENRD had previously adopted a provision into the Groundwater Management Plan which outlined a strategy that can be utilized when faced with drought conditions, the Board of Directors enacted annual limits on groundwater withdrawals from irrigation wells (not previously subject to an allocation) and municipal wells for locations within a D3 or D4 designated area on the U.S. Drought Monitor. The Groundwater Management Plan requires the board to enact drought response measures by November 1 for the upcoming calendar year. On October 27, 2022, the Board of Directors approved a measure which imposed a 15 acre inch allocation on any irrigation well, and a 250 gallon capita/day (averaged annually) on municipal wells located in any D3 or D4 designated area within the District. This measure would automatically be lifted for any location that might at some point in the future improve to a D2 designation for a period of 14 consecutive days and cannot be re-imposed even if conditions

were to revert to more serious drought conditions. The District is working diligently to prepare guidance documents which will be sent to well owners to aid them in compliance with this requirement.

Violation of Annual Allocation - Enforcement Hearings

New Wells

Since 2017, the Lower Elkhorn NRD has authorized the construction of 179 *new* irrigation wells, which were approved with Conditions for Approval. This policy allows the well owner to utilize 9 acre inches for irrigation of a primary crop, along with the possibility to use an additional 2 acre inches to establish a cover crop. The drought conditions caused a spike in demand for supplemental irrigation, and subsequently 32 locations were found to be out of compliance due to groundwater withdrawals in excess of what is authorized by the Conditions for Approval policy. Subsequently, hearings were conducted to present information compiled by the District, and to allow the well owner to provide relevant information on the matter. At the conclusion of the hearings the Board of Directors discussed the matters related to each hearing and determined that the annual allocation for the 2023 and 2024 pumping seasons will be deducted by an amount equal to that exceeded during the 2022 pumping season.

Quantity Management Subareas

Also, the District has identified six (6) locations in the Madison County Quantity Management Subarea that exceeded their allocation during 2022 and hearings are tentatively scheduled for March 23, 2023 to address the matters. For reference, those wells have been subject to an allocation since 2013 and are limited to 14 acre inches for irrigation of a primary crop, and are also authorized to utilize an additional 2 acre inches, after September 15, for establishing a cover crop.

14.0 New Depletions Accounting Report

Table 7 inventories the amounts for peak-season depletions allowed within the LENRD for each year of the first increment, and for the first year of the second increment.

As indicated earlier in this report, the Lower Elkhorn Natural Resources District did not process Standard Variance applications in the Fall of 2022 due to the acute drought conditions, and therefore has yet to allocate any of the allowable depletion for the first year of the second increment.

Table 7. LENRD Summary of Allowable Depletions	Column1	Column2	Column3	Column4
Depletion Description	Peak Season Depletion (AF)			Balance (AF)
LENRD 2016/2021 Allowable Dep.				4514.00
2016/2017 LENRD			223.10	4290.90
2016/2017 NeDNR			117.00	4173.90
2017/2018 LENRD			292.00	3881.90
2017/2018 NeDNR			97.00	3784.90
2018/2019 LENRD			292.20	3492.70
2018/2019 NeDNR			70.00	3422.70
2019/2020 LENRD			286.40	3136.30
2019/2020 NeDNR			-103.60	3239.90
2020/2021 LENRD			292.00	2947.90
2020/2021 NeDNR			94.65	2853.25
LENRD_1st Increment Carryover				2853.25
LENRD_2nd Increment Allowable Depletions				5493.00
Total				8346.25
2021/2022 LENRD			0.00	8346.25
2021/2022 NeDNR			0.00	8346.25

Table 7. Accounting table for new depletions allowed in the Lower Elkhorn Natural Resources District from 2016 through 2022.

15.0 New Data Collected Through Models or Studies

Groundwater Quality

During 2022, the Lower Elkhorn NRD continued efforts to collect groundwater quality data in support of a proposed groundwater management area in portions of Cuming, Colfax, and Dodge Counties, and to monitor trends in existing management areas.

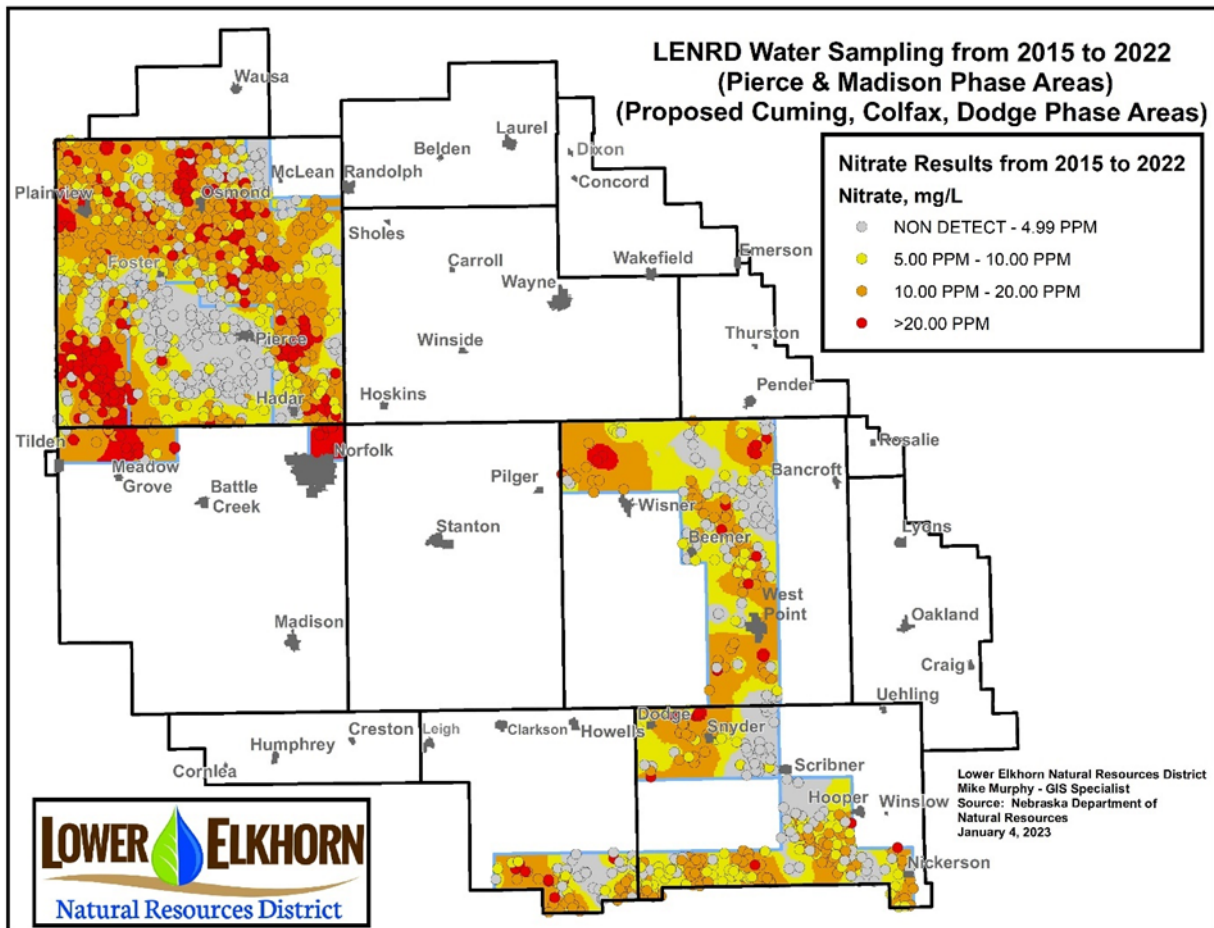


Figure 5. Nitrate concentration map depicting data collected from 2015 through 2022 of the Phase 2 and 3 Area (Pierce and northern Madison County) and of the proposed groundwater management area in Cuming, Colfax, and Dodge Counties.

In addition to its activities associated with the annual monitoring of groundwater quality, the District is focusing efforts to collect water quality data from locations in Dixon, Thurston, and Burt Counties, which is revealing additional pockets of nitrate contamination that warrant additional field sampling to assess the need for any potential management area. District samplers have targeted those portions of the District during the 2021 and 2022 irrigation seasons, and plans to visit wells in those areas again during 2023.

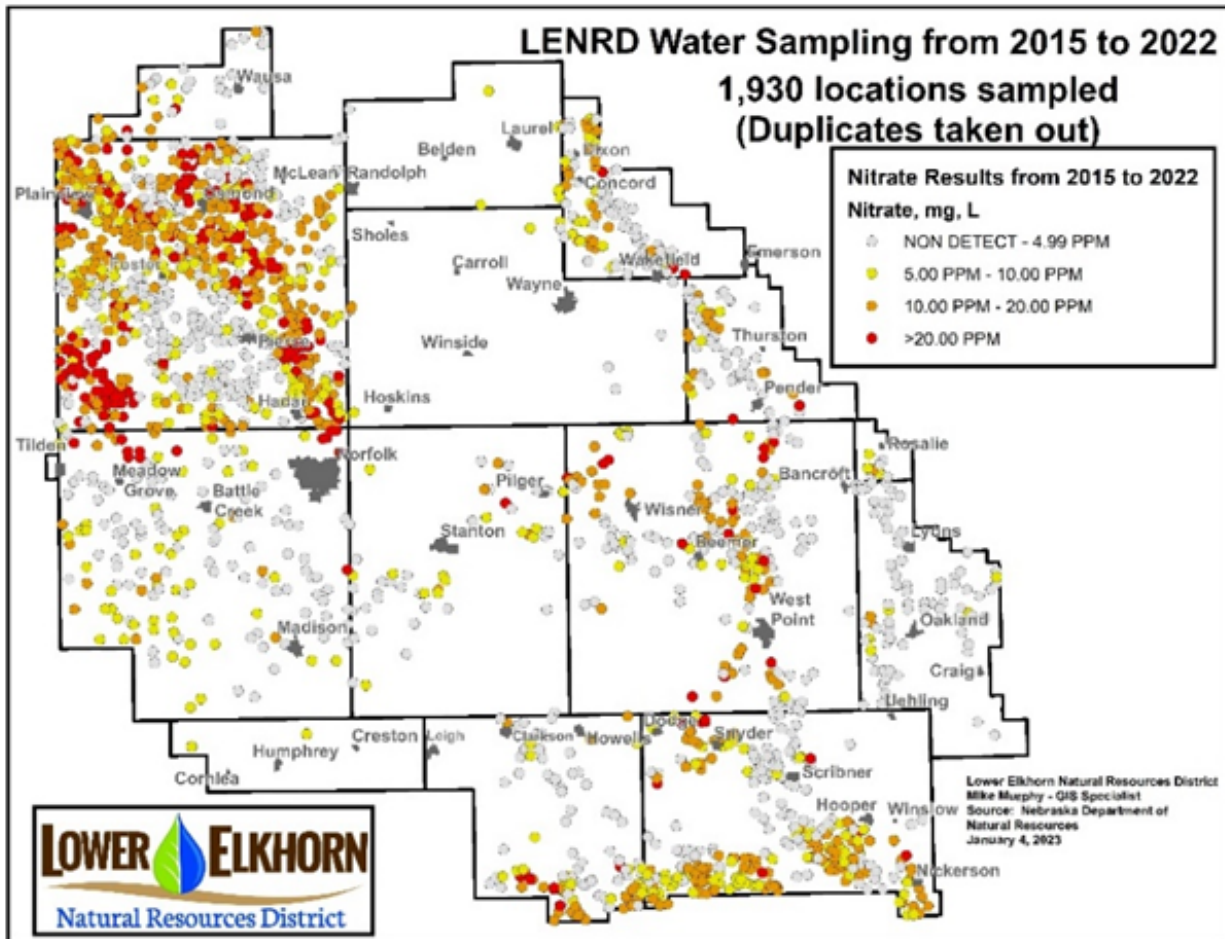


Figure 6. Map of the LENRD that displays the locations sampled for groundwater nitrate for the period 2015-2022. Note the locations in the northeast portion of the District, which are located in Dixon and Thurston Counties, which indicate locations with elevated levels of groundwater nitrate.

LENRD Vadose Sampling and Characterization of Isotopes

To assist in the definition of the source of the nitrate contamination, isotope characterization is being utilized, in cooperation with the University of Nebraska Water Sciences Laboratory, to answer some questions and to help define the appropriate set of management area controls.

The collection of water samples for isotope characterization was initiated in 2021, and approximately 25 locations were sampled in the Pierce County Phase 3 Area, along with some locations in Cuming and Dodge Counties. The effort was completed in 2022, and Figure 7 (below) illustrates the approximate locations of the seventy-two (72) sites that were targeted due to their proximity within the proposed boundaries of the management area, in addition to the presence of historical groundwater nitrate data which indicates locations with acute concentration levels.

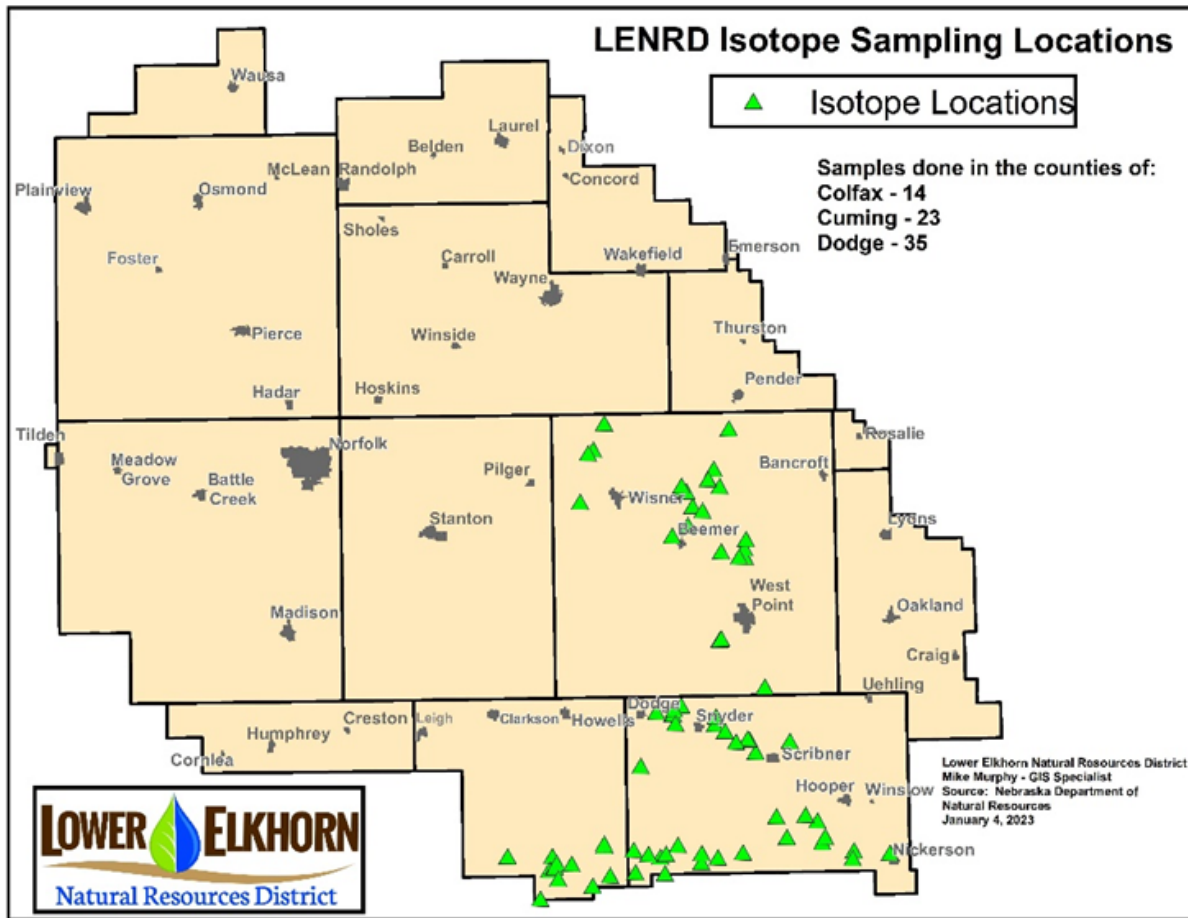


Figure 7. Map of locations within the proposed groundwater management area boundaries that were sampled as part of the isotope characterization project within the LENRD during 2022.

As expected, the results for most of the locations will generate a signal that indicate a synthetic source of nitrogen, while some locations generate a signal that would point towards an organic source.

Groundwater nitrate isotopes compared to source ranges

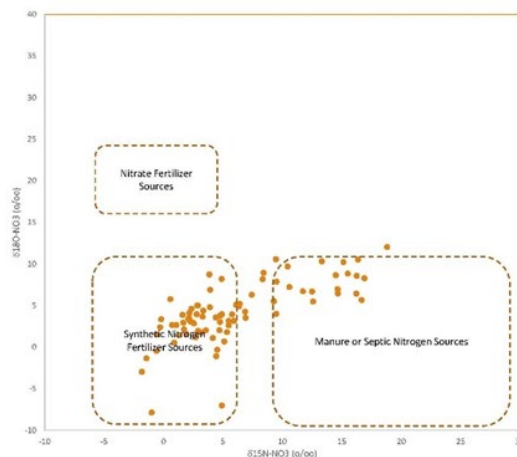


Figure 8. Plot diagram that depicts the potential source of nitrogen, as determined by laboratory analysis. (Source: UNL Water Sciences Laboratory; Dan Snow, Oct. 2022)

The District continues to invest resources into the collection of vadose cores as an additional tool to assess the soil profile for residual nitrates. This effort was expanded into Cuming, Colfax, and Dodge Counties in 2022.

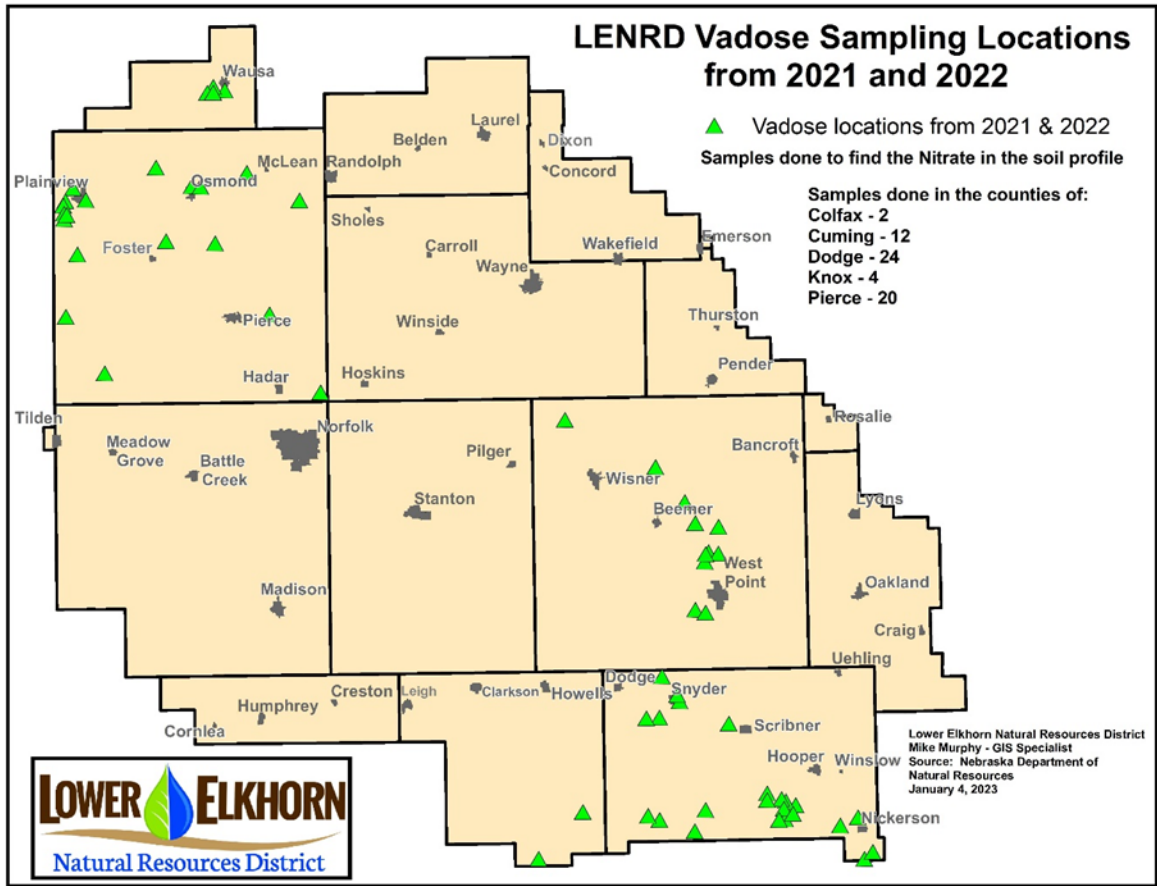


Figure 9. Map of locations within the LENRD that have been utilized as part of the vadose coring project which was initiated in 2021. To date, 62 locations have been sampled, selected as priority sites due to their proximity within an existing, or proposed, groundwater management area. Additional coring is planned for 2023 in Cuming, Colfax, and Dodge Counties.

LENRD Hydrogeologic Groundwater Model and Graphic User Interface (GUI)

The hydrogeologic groundwater model and graphic user interface (GUI) projects have been completed, and the LENRD staff has been working with the GUI; running scenarios and interpreting the outputs; in preparation for future application of the tool in analyzing requests for new and expanded uses of groundwater in the District.

