



# Nebraska Department of Natural Resources 2024 Annual Report of 2023 Data

for the jointly developed

## Lower Big Blue Natural Resources District Integrated Management Plan

Prepared by the  
Nebraska Department of Natural Resources  
November 20, 2024

**NEBRASKA**

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## **INTRODUCTION**

In 2022, the Lower Big Blue Natural Resources District (LBBNRD or District) and the Nebraska Department of Natural Resources (NeDNR or Department) completed work on a voluntary Integrated Management Plan<sup>1</sup> (IMP). The IMP was developed in accordance with the Nebraska Groundwater Management and Protection Act<sup>2</sup> and as such, was drafted in consultation with District stakeholders and includes goals and objectives for maintaining a desired balance between uses and supplies of both surface water and groundwater in the District. By order of the LBBNRD and NeDNR, the IMP—with its included surface water and groundwater controls and monitoring plan—became effective on April 6, 2022.

This annual report covers the actions taken and data collected by NeDNR in 2023 for the implementation of the District's voluntary IMP. It was drafted to be consistent with the IMP's Monitoring Plan and includes data related to surface water uses and supplies in the District. The LBBNRD completed a separate report that describes the District's actions and data collected in implementing the voluntary IMP—with a focus on groundwater.

## **DEPARTMENT REPORTING**

The IMP requires that NeDNR report on the following water data within the LBBNRD on an annual Basis:

- Surface water new and cancelled permits,
- Transfers and transfer permits,
- Variances granted by the Department,
- Voluntary reporting of surface water irrigation,
- Manufacturing, and industrial uses,
- Groundwater permitting,
- Surface water administration,
- NeDNR streamgages,
- Models and studies with new data or model/study results.

In addition to the required reporting, NeDNR reports on other additional actions that are not required by the IMP.

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<sup>1</sup>[https://dnr.nebraska.gov/sites/dnr.nebraska.gov/files/doc/water-planning/blue-river/LBBNRD/April2022\\_LBBNRD\\_FINAL\\_IMP.pdf](https://dnr.nebraska.gov/sites/dnr.nebraska.gov/files/doc/water-planning/blue-river/LBBNRD/April2022_LBBNRD_FINAL_IMP.pdf)

<sup>2</sup> Neb. Rev. Stat. §46-715(1)(b), §46-715 to 46-717, and subsections (1) and (2) of §46-718

## SURFACE WATER PERMITS

The Nebraska Department of Natural Resources is authorized by statute to oversee the permitting and adjudication of surface water appropriations in the State<sup>3</sup>. This section provides a summary of all active surface water appropriations in the Lower Big Blue NRD as of December 31, 2023, and includes details about all permitting actions taken by the Department in 2023.

This report addresses surface water appropriations in three categories: irrigation permits, storage permits, and 'other' permits. Irrigation permits include diversions from a naturally flowing source for irrigation (IR), supplemental irrigation from a reservoir on acres with an existing IR appropriation (SI), and store-only irrigation from a reservoir on acres not covered by an existing IR appropriation. Storage permits allow water from a naturally flowing source to be stored in a reservoir. 'Other' permits include permits for municipal, industrial, domestic, and environmental uses. A summary of all active surface water permits in the LBBNRD can be found in **Table 1**.

There are 412 IR permits in the LBBNRD that allow 28,682.18 acres to be irrigated at a maximum combined rate of 360.72 cfs. Fourteen SI permits provide an additional 814.8 af of water for irrigation from a reservoir on 1,257.6 acres that are already served by an IR appropriation. There are also 126 permits allowing 6,567.98 af of water from reservoirs to be applied on 14,000.4 acres that are not served by an IR appropriation.

There are 268 ST permits in the LBBNRD that allow 31,204.06 af of reservoir storage, and 9 SS permits that allow for 359.47 af of supplemental storage. The remaining six 'other' permits combined allow the use of 36.81 af of water annually and represent a relatively small proportion of surface water uses in the District.

### HEADWATERS AND RE-USE PIT EXEMPTIONS

In the LBBNRD, there are 32 surface water appropriations that are exempt from administration under Neb. Rev. Stat. §§ 46-283 to 46-287. These exempt permits are for groundwater re-use pits that were built to capture and re-use runoff from groundwater irrigation, and for diversions from an ephemeral stream.

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<sup>3</sup> Neb. Rev. Stat. §61-206 and all of Chapter 46, Article 2

Table 1: All surface water appropriations in the LBBNRD as of December 31, 2023.

<b>ACTIVE SURFACE WATER APPROPRIATIONS IN THE LOWER BIG BLUE NRD as of December 31, 2023</b>				
<b>Purpose</b>	<b>Number of Permits</b>	<b>Acres Approved for Irrigation</b>	<b>Grant (cfs)</b>	<b>Grant (af)</b>
<b>Irrigation Permits</b>				
Irrigation from Natural Stream (Exempt)	31	1,686.1	24.52	N/A
Irrigation from Natural Stream (Not Exempt)	381	26,996.08	336.2	1,916.46
Supplemental Irrigation (Exempt)	1	131	N/A	7.3
Supplemental Irrigation (Not Exempt)	13	1,126.6	N/A	807.5
Store-only	126	14,000.4	28	6,567.98
<b>All Irrigation Permits</b>	<b>552</b>	<b>43,940.18</b>	<b>388.72</b>	<b>9,299.24</b>
<b>Storage Permits</b>				
ST – Storage (Exempt)	1	0	N/A	7.2
ST – Storage (Not Exempt)	267	0	N/A	31,196.86
SS - Supplemental storage	9	0	N/A	359.47
<b>All Storage Permits</b>	<b>277</b>	<b>0</b>	<b>N/A</b>	<b>31,563.53</b>
<b>Other Permits</b>				
DO - Domestic	1	0.6	0.02	N/A
DS - Domestic Storage Use	1	N/A	N/A	0.05
FC - Fish Culture	2	0	2.67	26.77
WT - Wetlands	2	N/A	N/A	9.99
<b>All Other Permits</b>	<b>6</b>	<b>0.6</b>	<b>2.69</b>	<b>36.81</b>

### 2023 SURFACE WATER PERMITTING ACTIONS

In 2023, the Department acted on 11 surface water appropriations in the district. Nine of the actions were to approve new surface water appropriations, one was to cancel an appropriation and one was to conduct groundwater.

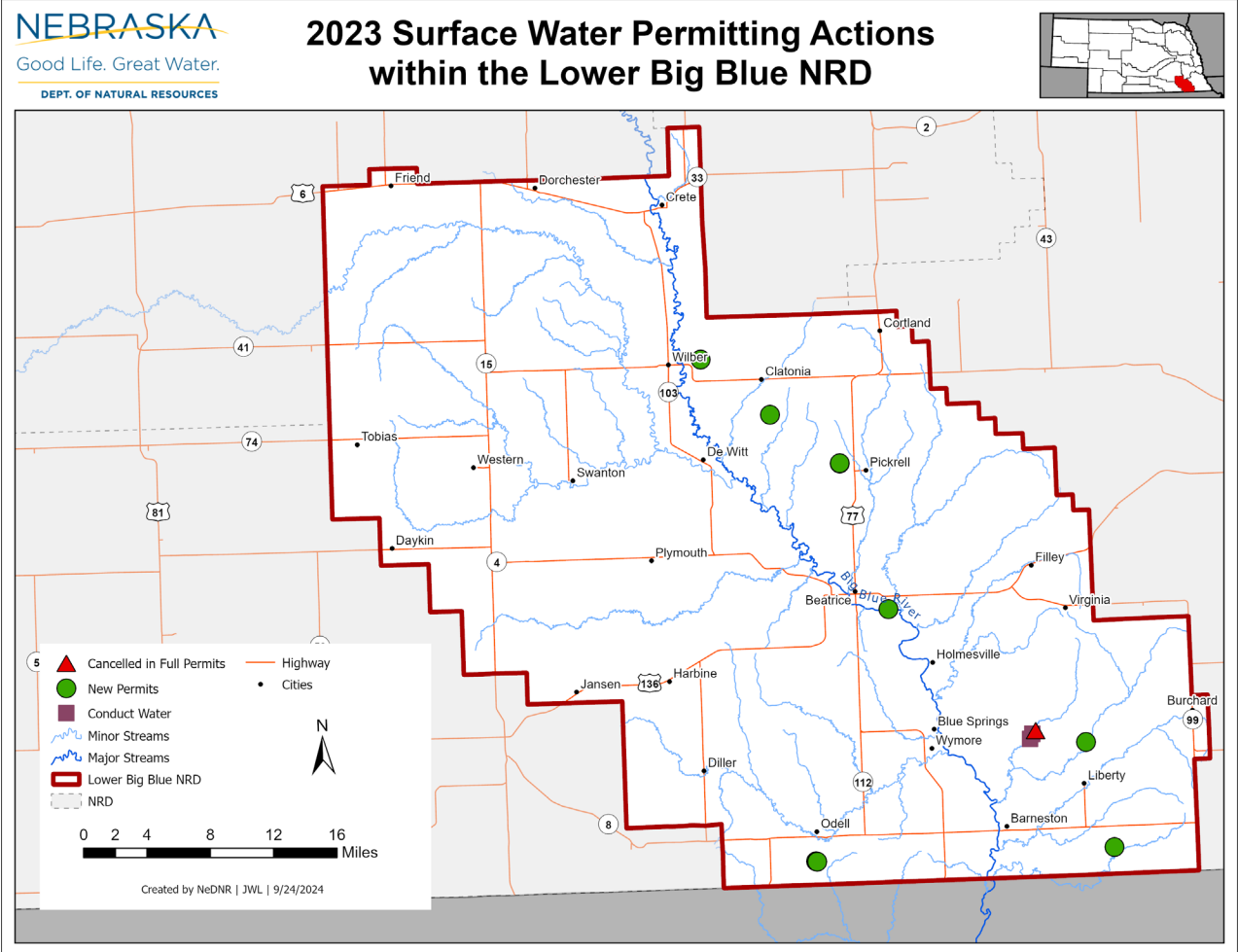


Figure 1: Surface water permitting actions in the LBBNRD in 2023.

### NEW SURFACE WATER APPROPRIATIONS

In 2023, the Department approved five new IR appropriations in the LBBNRD allowing a total 600.3 acres to be irrigated from a naturally flowing source at a combined rate of 2.45 cfs with a total of 773.98 acre-feet of water. Three new ST permits allowing a total of 114.08 af of storage were also approved by NeDNR in 2023. All new surface water permits approved in 2023 are summarized in **Table 2**.

Table 2: Surface water appropriations approved in 2023 in the LBBNRD.

SURFACE WATER APPROPRIATIONS APPROVED IN 2023 IN LOWER BIG BLUE NRD						
Appropriation Number	Order Date	Use	Source	Acres	Grant (af)	Diversion Location (S-T-R)
A-19909	9/12/2023	ST	Indian Creek, Big, Trib. To	0.0	34.09	S25-T1-R5E
A-19908	4/17/2023	IR	Wolf Creek	45.1	135.30	S24-T2-R8E
A-19887	2/16/2023	ST	Soap Creek, Trib to	0.0	16.30	S3-T5-R5E
A-19910	10/4/2023	IR	Kostal Dam	125.6	34.09	S25-T1-R5E
A-19935	10/2/2023	IR	Huneke Reservoir	63.9	51.90	S13-T6-R4E
A-19946	10/20/2023	IR	Blue River, Big	127.0	381.00	S1-T3-R6E
A-19951	11/27/2023	ST	Possum Creek, Trib to	0.0	63.69	S21-T5-R6E
A-19952	11/27/2023	IR	Carstens Reservoir	112.0	63.69	S21-T5-R6E
A-19961	12/18/2023	IR	Mission Creek Watershed Structure 6-B	126.7	108.00	S30-T1-R9E

### CANCELLED SURFACE WATER APPROPRIATIONS

In 2023, NeDNR cancelled one ST permit for a total 4.2 acre-feet. There were no dismissed/denied or cancelled in part permits. Information about the cancelled appropriation can be found in **Table 3**.

Table 3: Surface water appropriations cancelled in 2023 in LBBNRD.

SURFACE WATER APPROPRIATIONS CANCELLED IN 2023 IN LOWER BIG BLUE NRD							
Appropriation Number	Cancellation Date	Use	Source	Acres	Grant	Reason for Cancellation	Diversion/ Reservoir Location (S-T-R)
A-19879	8/30/2023	ST	Wildcat Creek	N/A	4.2 af	See footnote below <sup>4</sup>	S16-T2-R8E

<sup>4</sup> Plans were not filed causing permit to be cancelled.

## SURFACE WATER TRANSFERS

Expedited transfer permits are issued by NeDNR and allow a permit holder to change the location of acres approved for surface water irrigation. Expedited transfers must meet the following requirements<sup>5</sup>:

- Must be an irrigation appropriation
- No increase in the number of acres
- Location of use may only change to adjacent lands
- Land must all be owned by the same landowner or be under the same irrigation district
- The point of diversion may not change significantly

In 2023, there were no surface water transfers in the LBBNRD.

There was one conduct groundwater permit (CGW-19938) that was issued and covers a total of 89.90 acres. A CGW permit allows for groundwater to be pumped into a stream from a well and pumped out at a downstream location.

## VARIANCES ISSUED

No moratoriums exist in Blue River Basin and no variances were sought from the Department to allow actions contrary to any other existing rule or regulation.

## GROUNDWATER PERMITS

The Department issued no groundwater permits in the Lower Big Blue NRD in 2023.

## PUMP SITE INSPECTIONS

The NeDNR field office staff regularly inspects pump sites of surface water diversion points as conditions allow. Not all pump sites are inspected every irrigation season and some pump sites may be visited more than once per season. In 2023 NeDNR field office staff made a total of 422 inspections on 389 pump sites and observed that 158 of the sites were set up for irrigation. See **Table 4** and **Figure 2** below.

*Table 4: Surface water pump site inspections in the LBBNRD in 2023.*

SURFACE WATER PUMP SITE INSPECTIONS		
Number of Pump sites Inspected	Number of Pump Sites Set up for Irrigation	Total Observations Made <sup>6</sup>
389	158	422

<sup>5</sup> Neb. Rev. Stat. §46-291(1)

<sup>6</sup> Includes multiple visits to same site for water administration.

### 2023 Pump Site Inspections within the Lower Big Blue NRD

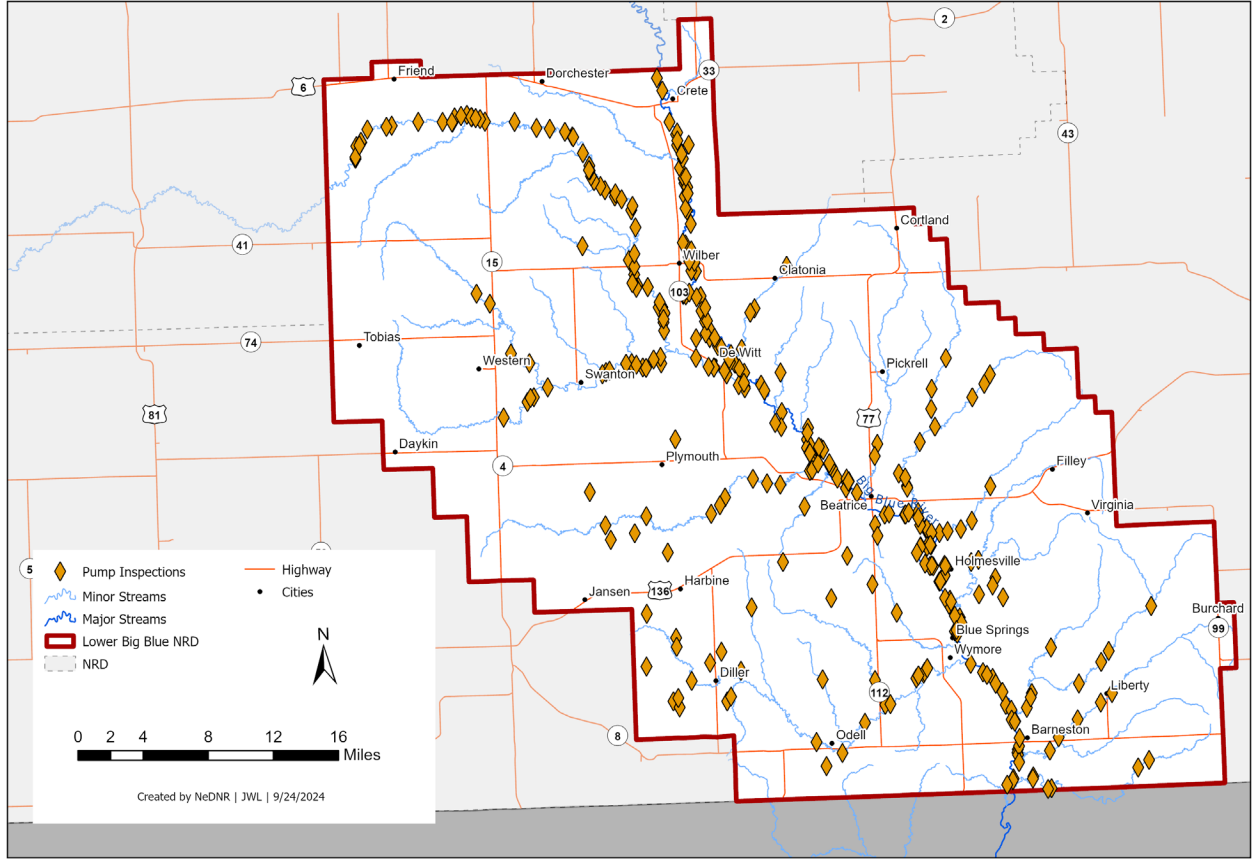
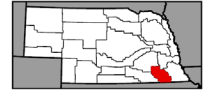


Figure 2: Pump site inspections within the LBBNRD in 2023.



## VOLUNTARY WATER USE REPORTING

NeDNR collects surface water use data in the LBBNRD through its voluntary water use reporting program. Surveys requesting information about the number of irrigated acres, estimated amount of water applied, type of crops grown and reasons for non-use are sent to all non-exempt surface water irrigation permit holders in the basin. See **Table 5** below for data compiled from 2023 voluntary water use surveys.

*Table 5: Voluntary surface water reporting within the LBBNRD in 2023.*

VOLUNTARY SURFACE WATER REPORTING IN LOWER BIG BLUE IN 2023						
Surveys Sent	Surveys Returned	SW Irrigated	Reported Not Used	GW Irrigated <sup>7</sup>	SW Irrigated Acres	SW Inches Per Acre
517	143	98	45	29	8,107	5.9

## STREAMGAGING

There are currently five active streamgages in the LBBNRD (**Table 6**). Three gages monitor Big Blue River flows and two monitor flows in Turkey Creek as shown in **Figure 3**. NeDNR operates two gages in the district, one on Turkey Creek near Wilbur (#06881200), and one on the Big Blue River near Beatrice (#06881500). Both gages have been in operation since 1994. Charts comparing 2023 streamgage data to the historical record are available in **Appendix A**. The United States Geological Survey (USGS) operates three gages in the District, one on the Big Blue River near Crete (#06881000), one on Turkey Creek near DeWitt (#06881380), which is partially funded by LBBNRD, and one near the state line on the Big Blue River at Barneston (#06882000).

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<sup>7</sup> This number will include GW irrigated and comingled permits.

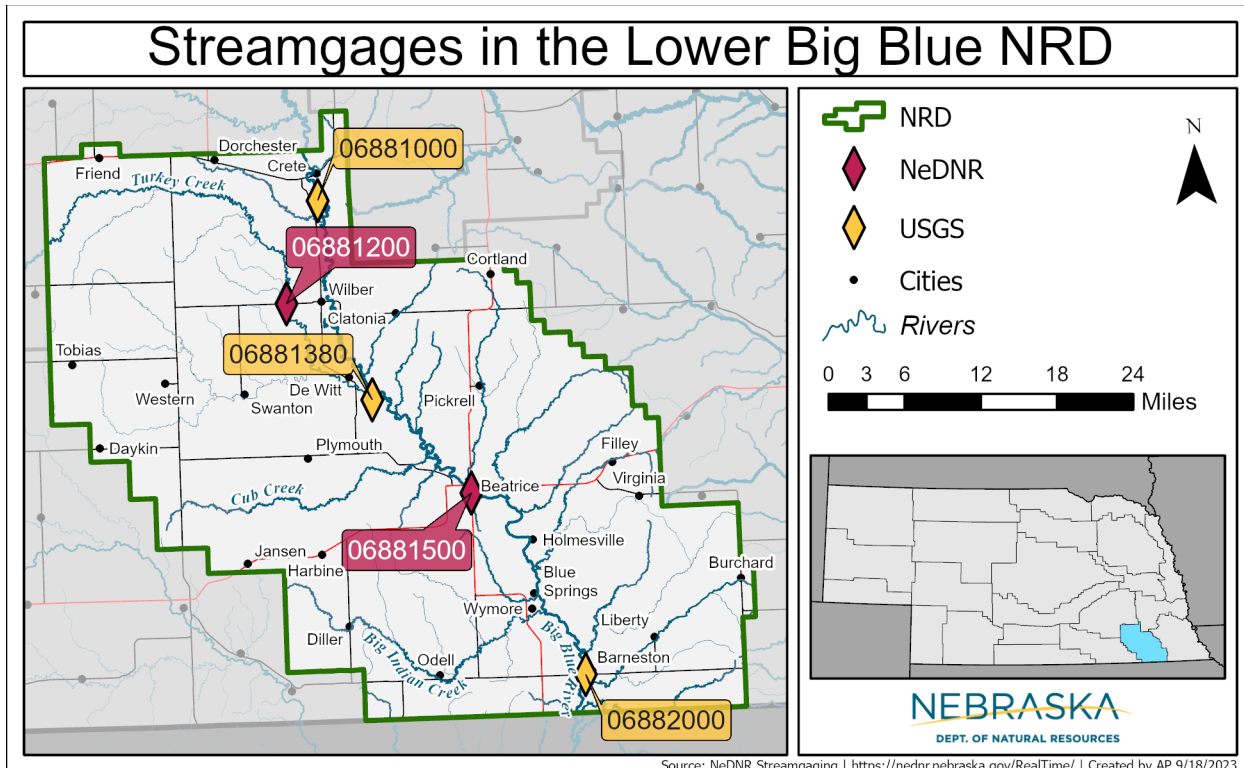


Figure 3: Active streamgages in LBBNRD.

Table 6: Active streamgages in LBBNRD

ACTIVE STREAMGAGES IN THE LOWER BIG BLUE NRD				
Name of Gage	Funding Source(s)	Gage ID	Active Since	Operator
Big Blue River near Crete	USACE / USGS	06881000	1954	USGS
Turkey Creek near Wilbur	NeDNR	06881200	1994	NeDNR
Turkey Creek near DeWitt	Lower Big Blue Natural Resources District / USGS	06881380	2002	USGS
Big Blue River at Beatrice	NeDNR	06881500	1994	NeDNR
Big Blue River at Barneston	Kansas-Nebraska Big Blue River Compact Association / USGS	06882000	1933	USGS

The USGS gage at Barneston is of particular interest because it is the official measurement point on the Big Blue River for compliance with the Kansas-Nebraska Big Blue River Compact<sup>8</sup>. As stated in the Compact, Nebraska must act when necessary to maintain the following minimum mean daily flows at the Barneston gage:

- May 45 cfs
- June 45 cfs
- July 80 cfs
- August 90 cfs
- September 65 cfs

<sup>8</sup> <https://dnr.nebraska.gov/water-planning/big-blue-river-compact>

**Figure 4** below compares the 2023 mean daily discharge and cumulative volumetric discharge to the historical record for the gage. In 2023, the estimated cumulative volumetric discharge at the Barneston streamgage was 134,758 af, which is significantly lower than the period of record median of 523,087 af. The minimum annual volumetric discharge at the Barneston gage was observed in 1934 when approximately 95,568 af passed the gage.

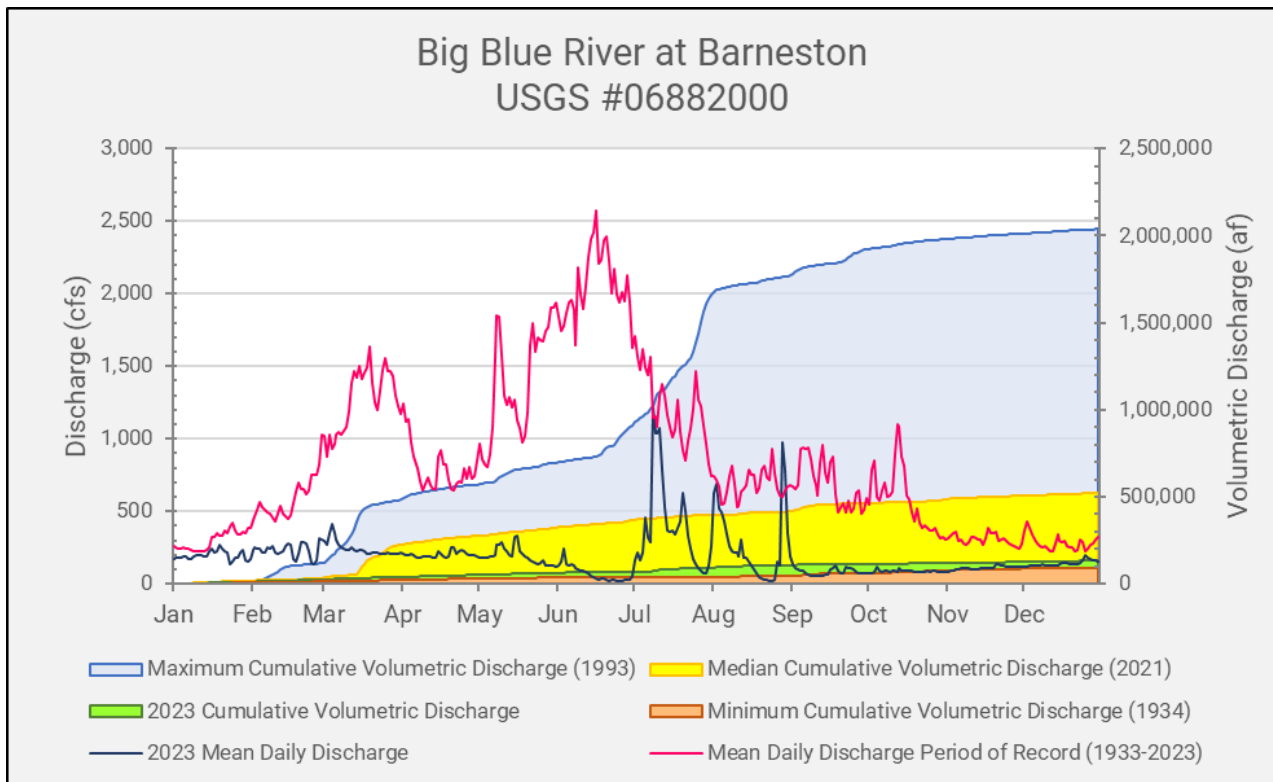


Figure 4: 2023 streamgage data for the Big Blue River at Barneston, NE, compared to the historical record.

## SURFACE WATER ADMINISTRATION

Since 1895, Nebraska has had an administrative system overseeing the orderly use of the state’s surface water resources. All diversions of surface water for irrigation, hydropower, industrial use, municipal use, domestic use, storage, and other uses require a state permit and each permit has certain responsibilities, limitations, and conditions associated with it. The Department has jurisdiction over all matters pertaining to surface water rights for storage, irrigation, power, manufacturing, instream flows, and other beneficial uses. This includes the distribution of available supply during times of water shortages and adjudication of established water rights. The activity of distributing the supply of surface water on a stream during shortages is called “surface water administration.” Surface water administration is set out in Nebraska Revised Statutes, Chapter 46, and operates on a first-in-time, first-in-right principle.

In order to meet minimum mean daily discharge requirements, set forth in the Kansas-Nebraska Big Blue River Compact, NeDNR prohibited surface water appropriations junior to November 1, 1968, from diverting water for a total of 29 days in 2023, see **Table 7** below.

Table 7: Surface water administration in the Lower Big Blue NRD in 2023.

SURFACE WATER ADMINISTRATION							
Water Division	Date of Closure	Date Reopened	Days Closed	Permit Type	No. Affected	Reason for Closure	Reason for Reopening
1D – Big Blue River Basin	6/16	7/2	16	Natural flow	404	Blue River Compact	Flows in excess of Compact target at Barneston
				Storage	384		
	7/29	7/31	2	Natural flow	405		
				Storage	384		
	8/21	8/28	7	Natural flow	406		
				Storage	384		
	9/11	9/15	4	Natural flow	407		
				Storage	385		

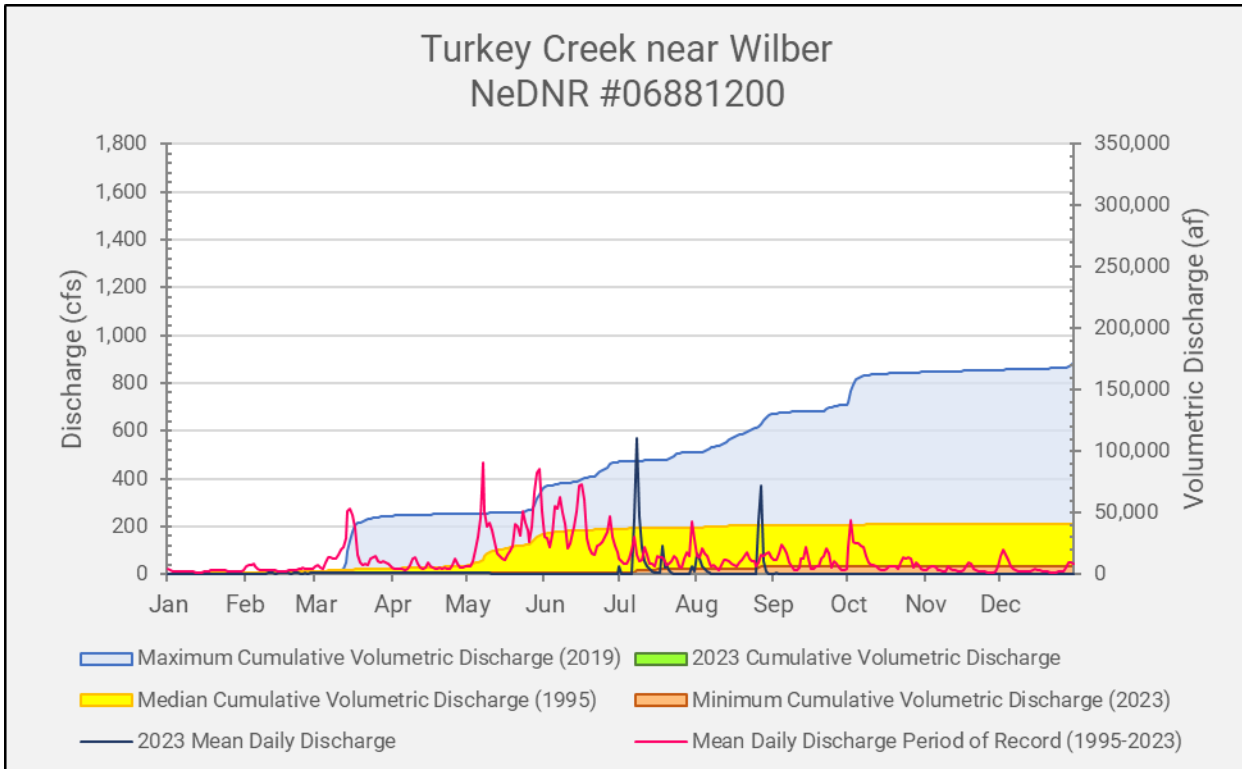
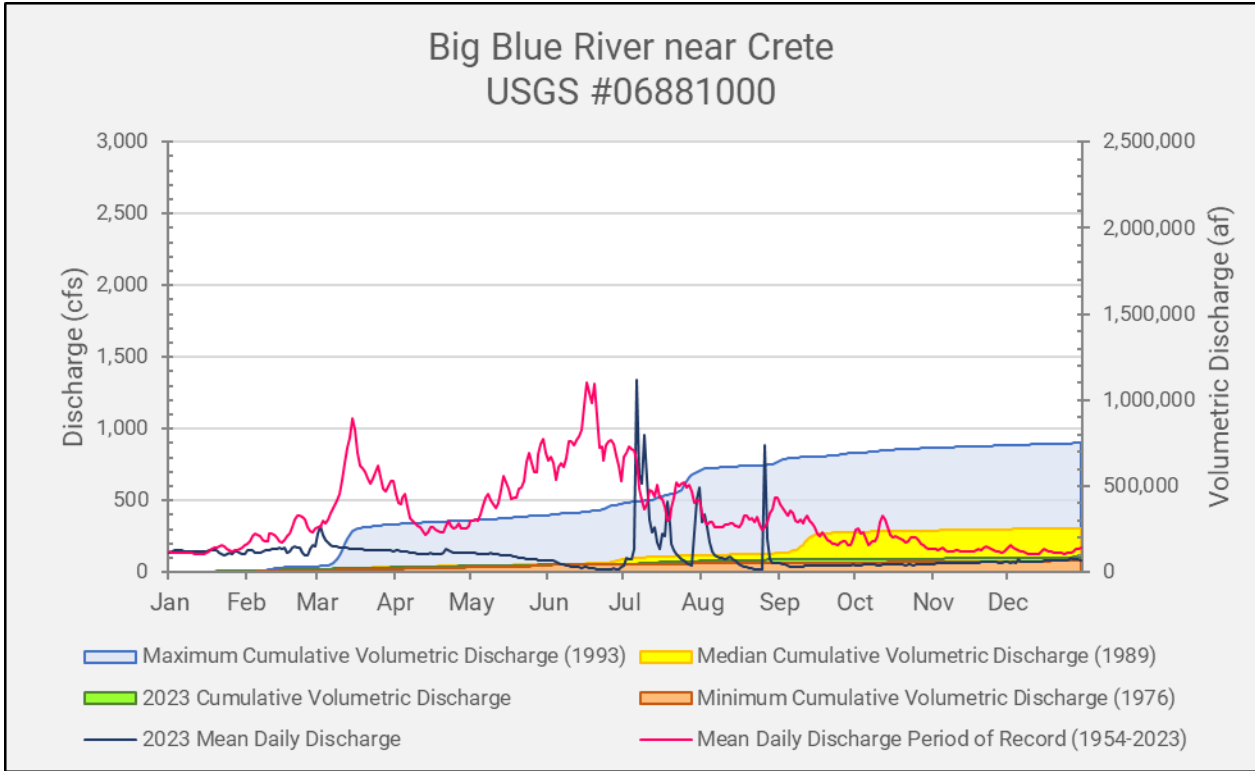
### NEW DATA COLLECTED AND MODEL UPDATES

To increase the understanding of hydrologically connected water, LBBNRD is participating with the Tri-Basin, Upper Big Blue, and Little Blue NRDs and NeDNR to develop a new numerical Blue Basin Groundwater Model. The model is intended to:

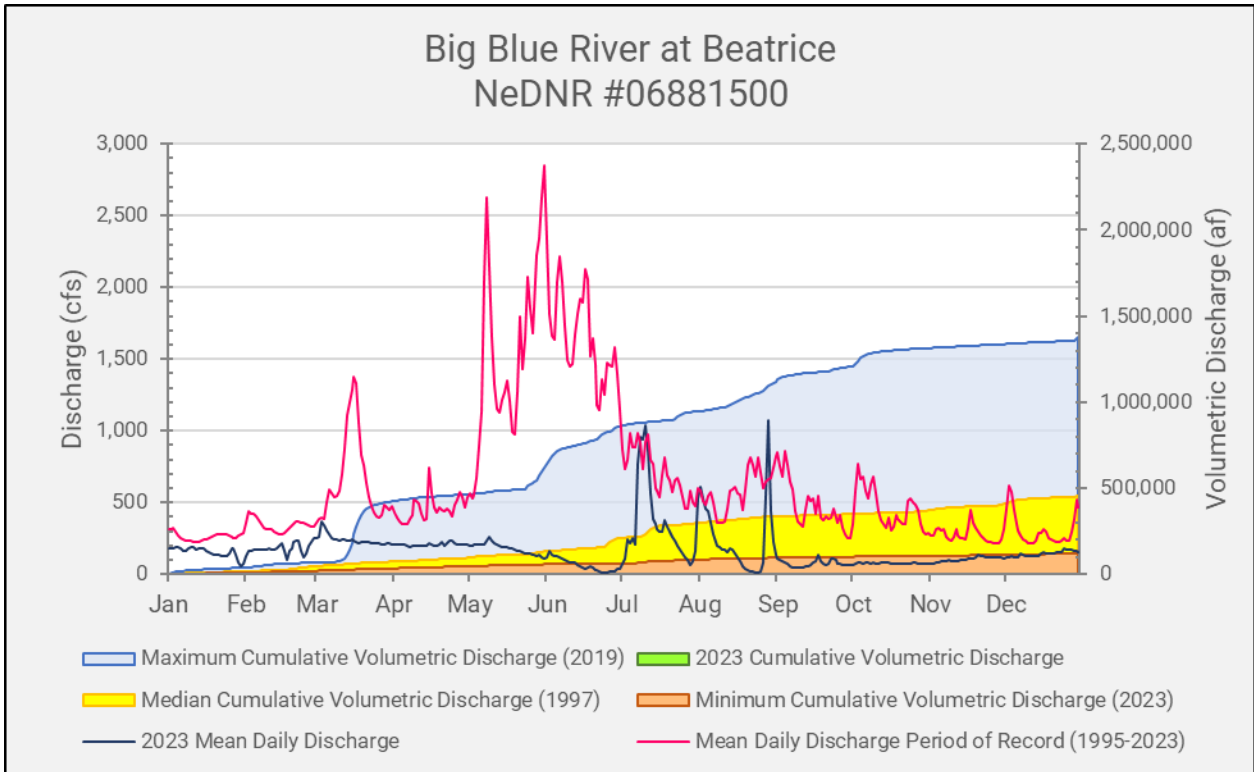
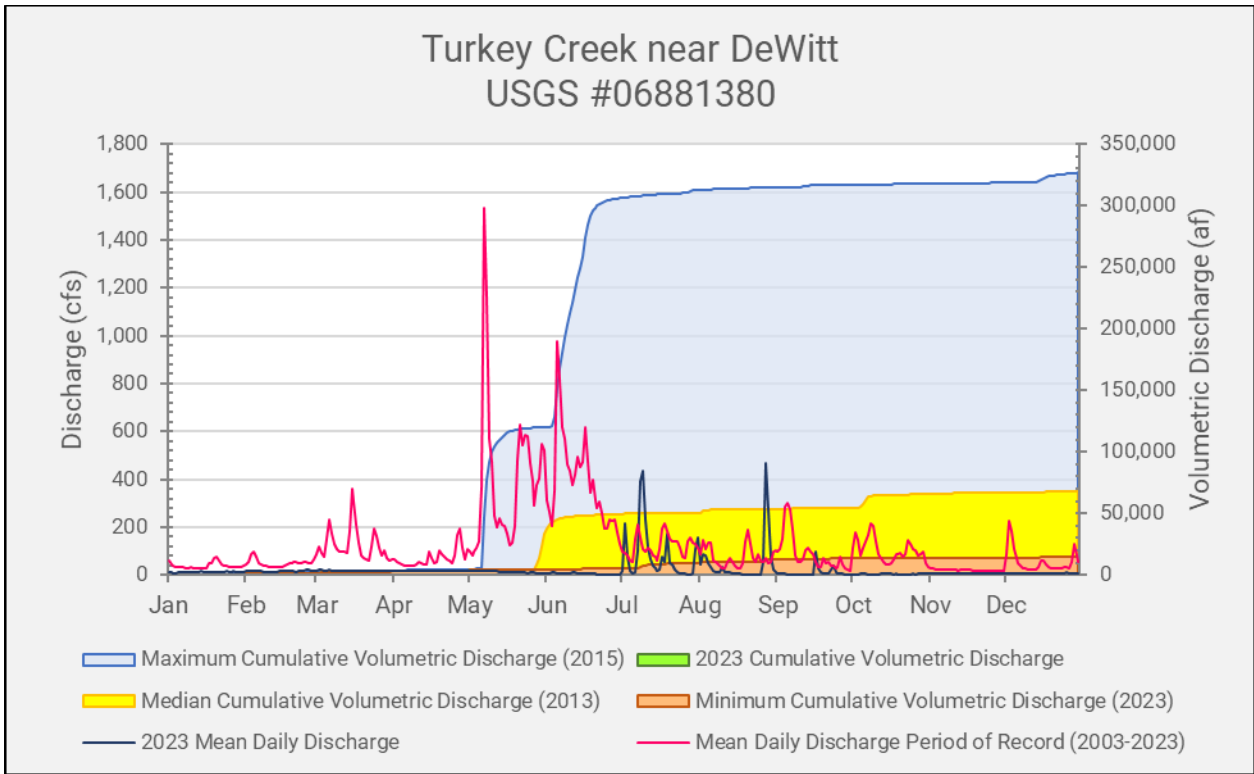
- Refine the delineations of hydrologically connected groundwater and surface water of the Blue River Basin.
- Simulate groundwater level changes and their impacts on stream baseflow and assess potential streamflow depletions, both spatially and temporally.
- Support NeDNR’s evaluation of the appropriation status of the Blue River Basin and other management decisions related to how groundwater pumping impacts streamflows; and
- Provide a platform and datasets representing the best available data for evaluation of local-scale water issues.

This project was completed near the end of 2023 and final documentation for the updated model was provided to NeDNR and the NRD partners. Since that time, the Department has undertaken a comprehensive review of the model and its documentation, which includes baseline and scenario model runs and a preliminary delineation of areas with hydrologically connected surface water and groundwater. Progress on this review is underway and the Department expects to share its findings with the NRD partners in late 2024.

# Appendix A



Note: For Turkey Creek near Wilber, Minimum Cumulative Volumetric Discharge (2023) and 2023 Cumulative Volumetric Discharge are identical so Cumulative Volumetric Discharge (2023) is hidden.



Note: For Turkey Creek near Dewitt and Big Blue at Beatrice, Minimum Cumulative Volumetric Discharge (2023) and 2023 Cumulative Volumetric Discharge are identical so Cumulative Volumetric Discharge (2023) is hidden.