

# ANNUAL INTEGRATED MANAGEMENT PLAN REPORT

# 2021



JOINTLY PREPARED BY  
THE LOWER PLATTE  
SOUTH NATURAL  
RESOURCES DISTRICT  
AND THE NEBRASKA  
DEPARTMENT OF  
NATURAL RESOURCES

Submitted at the Lower Platte South Board Meeting/IMP Annual Review  
August 17, 2022



**LOWER PLATTE SOUTH**  
natural resources district

**NEBRASKA**

Good Life. Great Water.

DEPT. OF NATURAL RESOURCES

## TABLE OF CONTENTS

<b>LIST OF FIGURES.....</b>	<b>3</b>
<b>LIST OF TABLES.....</b>	<b>3</b>
<b>INTRODUCTION.....</b>	<b>4</b>
<b>MONITORING AND DATA COLLECTION .....</b>	<b>5</b>
<b>Surface Water Monitoring .....</b>	<b>5</b>
Streamgaging .....	5
Surface Water Permitting Actions.....	10
Voluntary Surface Water Use Reporting .....	12
Surface Water Pump-Site Visits .....	13
<b>Groundwater Monitoring.....</b>	<b>14</b>
IMP Groundwater Management Area.....	14
Metering and Groundwater Level Monitoring.....	15
Groundwater Permitting Activities .....	17
Land Use and Land Cover (LULC) Monitoring and Actions .....	18
<b>2021 IMP REGULATORY ACTIONS.....</b>	<b>21</b>
<b>LPSNRD Groundwater Acres Limitations.....</b>	<b>21</b>
<b>NeDNR Surface Water Acres Limitations.....</b>	<b>21</b>
<b>Future limits on water use .....</b>	<b>21</b>
<b>STUDIES AND PLANNING .....</b>	<b>22</b>
Additional IMP Components.....	22
Stream Accretion and Depletion Calculator Expansion .....	23
Lower Platte Missouri Tributaries Model Development.....	23
<b>WATER INVENTORY AND WATER USE/SUPPLY MANAGEMENT .....</b>	<b>25</b>
LPSNRD Accomplishments .....	25
NeDNR's INSIGHT Web Portal.....	25
<b>EDUCATION/OUTREACH.....</b>	<b>26</b>
<b>NeDNR Activities .....</b>	<b>26</b>
Events.....	26
Educational Interactive Web Applications .....	26
<b>LPSNRD Activities .....</b>	<b>28</b>
<b>COLLABORATION WITH OTHER ENTITIES.....</b>	<b>30</b>
Eastern Nebraska Water Resources Assessment.....	30
Lower Platte River Basin Coalition .....	30

Lower Platte River Consortium .....	30
Lower Platte River Corridor Alliance .....	30
Other Collaborations .....	31
<b>JOINTLY IDENTIFIED ACTIONS FOR SUCCEEDING TWO YEARS.....</b>	<b>32</b>

## LIST OF FIGURES

FIGURE 1: USGS STREAM GAGES MAP, LPSNRD LOCATIONS.....	6
FIGURE 2: HISTORICAL ANNUAL DISCHARGE FOR SALT CREEK AT ROCA, NE (USGS-NWIS).....	7
FIGURE 3: HISTORICAL ANNUAL DISCHARGE FOR SALT CREEK AT GREENWOOD, NE (USGS-NWIS).....	7
FIGURE 4: HISTORICAL ANNUAL DISCHARGE FOR LITTLE SALT CREEK NEAR LINCOLN, NE (USGS-NWIS).....	8
FIGURE 5: HISTORICAL ANNUAL DISCHARGE FOR STEVENS CREEK NEAR LINCOLN, NE (USGS-NWIS).....	8
FIGURE 6: HISTORICAL ANNUAL DISCHARGE FOR THE PLATTE RIVER AT LOUISVILLE, NE (USGS-NWIS).....	9
FIGURE 7: NEDNR 2021 SURFACE WATER APPROPRIATIONS AND ACTIONS WITHIN LPSNRD.....	10
FIGURE 8: LPSNRD 2021 VOLUNTARY SURFACE WATER USE REPORTING.....	13
FIGURE 9: LPSNRD GROUNDWATER USE IN THE HYDROLOGICALLY CONNECTED AREA (HCA).....	14
FIGURE 10: LPSNRD 2021 REGISTERED DOMESTIC AND PUBLIC SUPPLY WELLS (HCA).....	15
FIGURE 11: 2021 GROUNDWATER LEVEL MEASUREMENT COMPARISON, SPRING 2020 AND SPRING 2021.....	16
FIGURE 12: LPSNRD 2021 GROUNDWATER WELL PERMITS APPROVED OR COMPLETED.....	18
FIGURE 13: 2021 HCA CERTIFIED GROUNDWATER IRRIGATED ACRES, LPSDNR.....	19
FIGURE 14: 2021 DISTRICT-WIDE CERTIFIED GROUNDWATER IRRIGATED ACRES.....	20
FIGURE 15: LOWER PLATTE AND MISSOURI TRIBUTARIES MODELS' GEOGRAPHIC LOCATIONS.....	24
FIGURE 16: NEDNR'S EDUCATIONAL INTERACTIVE WEB APPLICATION.....	24
FIGURE 17: INTERACTIVE ILLUSTRATION: GROUNDWATER PUMPING AND STREAM DEPLETION.....	27
FIGURE 18: INTERACTIVE ILLUSTRATION: RUNOFF, RECHARGE, AND STREAMFLOW.....	27

## LIST OF TABLES

TABLE 1: USGS STREAM GAGES, LPSNRD LOCATIONS.....	5
TABLE 2: 2021 IRRIGATED ACRE CHANGES ASSOCIATED WITH SURFACE WATER PERMITTING ACTION.....	12
TABLE 3: 2021 FULLY CANCELLED SURFACE WATER PERMITS.....	12
TABLE 4: NEDNR 2021 APPROVED SURFACE WATER APPLICATIONS, LPSNRD.....	13
TABLE 5: GROUNDWATER RESERVOIR AVERAGE WELL LEVEL CHANGE, SPRING 2021 TO SPRING 2022.....	17
TABLE 6: LPSNRD 2021 APPROVED AND COMPLETED GROUNDWATER WELLS.....	18

# **2021 ANNUAL REPORT FOR LOWER PLATTE SOUTH NATURAL RESOURCES DISTRICT and NEBRASKA DEPARTMENT OF NATURAL RESOURCES INTEGRATED MANAGEMENT PLAN**

Jointly prepared by the Lower Platte South NRD and the Nebraska Department of Natural Resources  
Submitted on August 17, 2022

## **Introduction**

The Lower Platte South Natural Resources District (LPSNRD) and the Nebraska Department of Natural Resources (NeDNR) jointly adopted a voluntary Integrated Management Plan (IMP), which became effective on May 15, 2014. The over-arching purpose of the IMP is to jointly manage groundwater and surface waters within the LPSNRD in order to sustain a balance between water uses and supplies for the near and long term. An in-depth public involvement plan, which included focus groups, a 13-month stakeholder process, a virtual town hall, and outside agency outreach, was an integral part in developing goals and objectives for the IMP.

The 2021 Annual Report covers the progress made towards Voluntary IMP implementation for both the LPSNRD and NeDNR in 2021. It is consistent with Chapter 9 of the IMP, which outlines the procedures for review and potential modification of the Voluntary IMP. Here, LPSNRD and NeDNR will report on data collected, new groundwater or surface permits and uses, and will review progress made toward achieving the goals and objectives.

As a part of the process, the LPSNRD and NeDNR staff met to discuss progress made in 2021 towards the goals and objectives of the plan, action steps for the next two years (see the “Jointly Identified Actions” section), and whether modifications to the IMP were needed. The LPSNRD and NeDNR jointly decided that no modifications to the IMP were needed at the time of the 2021 annual review. The LPSNRD and NeDNR will continue to discuss the need for modifications to achieve consistency between the IMP and the Lower Platte Basin Water Management Plan, which was finalized in October 2017.

The LPSNRD and NeDNR worked collaboratively to write this report. Highlights from the report were presented to the LPSNRD Board and the public on August 17, 2022, at LPSNRD’s regularly scheduled Board meeting. Notice of the Board meeting was published in the Lincoln Journal Star on August 4, 2022, and a public announcement of the IMP review was posted on both the LPSNRD and NeDNR websites at least one week prior to the Board meeting.

As the LPSNRD regulates groundwater and the NeDNR regulates surface water, some sections were written individually. But wherever possible, sections were written jointly to reflect the partnership between LPSNRD and NeDNR in integrated groundwater and surface water management. This annual report provides transparency to each other, and to the public, about the progress made by LPSNRD and NeDNR in implementing the Voluntary IMP as a means to protect interconnected groundwater and surface water resources for the near and long term.

## Monitoring and Data Collection

### *Surface Water Monitoring*

#### Streamgaging

The U.S. Geological Survey (USGS) owns and operates 21 streamgages in LPSNRD. All but one (Weeping Water Creek at Union, NE) are located in the IMP surface water management area (Table 1: USGS Stream gages, LPSNRD locations). Streamflow data on these gages is available on the USGS's National Water Information System (NWIS) at <http://waterdata.usgs.gov/>. NeDNR regularly assesses the need for modifications to the network in the IMP area.

**Table 1: USGS Stream gages, LPSNRD locations.**

Gage Name	Gage Number	Begin Date	LPSNRD funding assistance
Salt Creek at Roca, Nebr.	06803000	5/14/1951	yes
Salt Creek at Pioneers Boulevard at Lincoln, Nebr.	06803080	6/20/1994	yes
Haines Branch at SW 56th St at Lincoln, Nebr.	06803093	6/20/1994	yes
Middle Creek at SW 63rd St at Lincoln, Nebr.	06803170	6/20/1994	yes
Oak Creek at Air Park Road at Lincoln, Nebr.	06803486	5/21/1987	yes
Salt Creek at Fairgrounds at Lincoln, Nebr.	06803495	6/20/1994	no
Salt Creek at 27 <sup>th</sup> ST, Lincoln, Nebr.	06803500	5/11/1942	yes
Little Salt Creek near Lincoln, Nebr.	06803510	5/11/1942	yes
Salt Creek at 70th Street at Lincoln, Nebr.	06803513	5/31/1994	yes
Stevens Creek near Lincoln, Nebr.	06803520	10/14/1968	yes
Rock Creek near Ceresco, Nebr.	06803530	4/1/1970	yes
Salt Creek at Greenwood, Nebr.	06803555	1/16/1952	no
Wahoo Creek at Ashland, Nebr.	06804700	2/22/1990	yes
Weeping Water Creek at Union, Nebr.	06806500	1/11/1950	yes
Antelope Creek at 27th St at Lincoln, Nebr.	06803300	3/14/2012	yes
Deadman's Run at 38th Street at Lincoln, Nebr.	06803502	08/27/2014	no
Salt Creek near Ashland, Nebr.	06805000	10/01/2007	yes
North Oak Creek at Valparaiso, Nebr.	06803430	8/12/2016	yes
North Oak Creek near Touhy, Nebr.	06803420	8/12/2016	yes
Platte River near Ashland, Nebr.	06801000	8/20/1928	no
Platte River at Louisville, Nebr.	06805500	5/15/1953	no

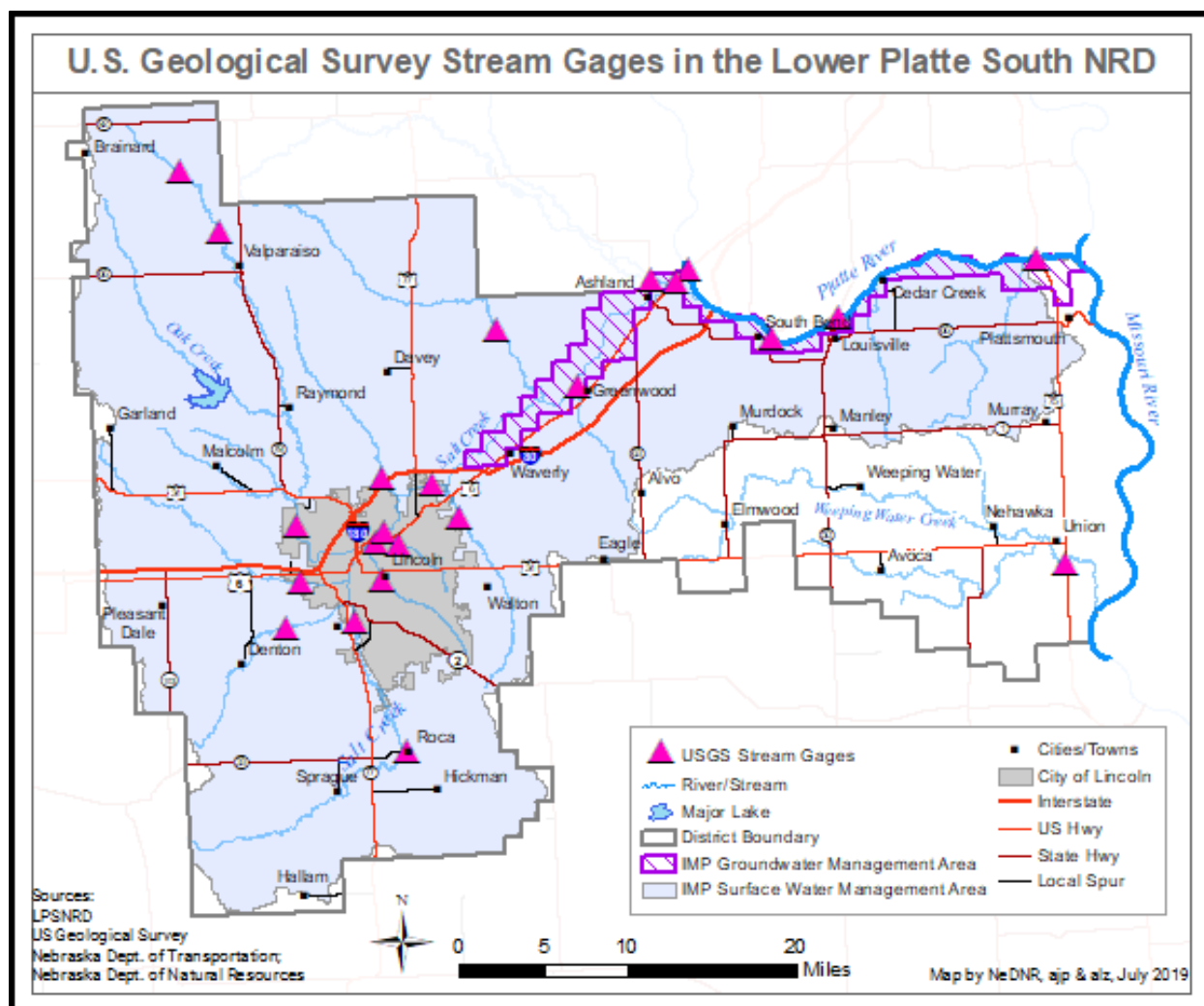
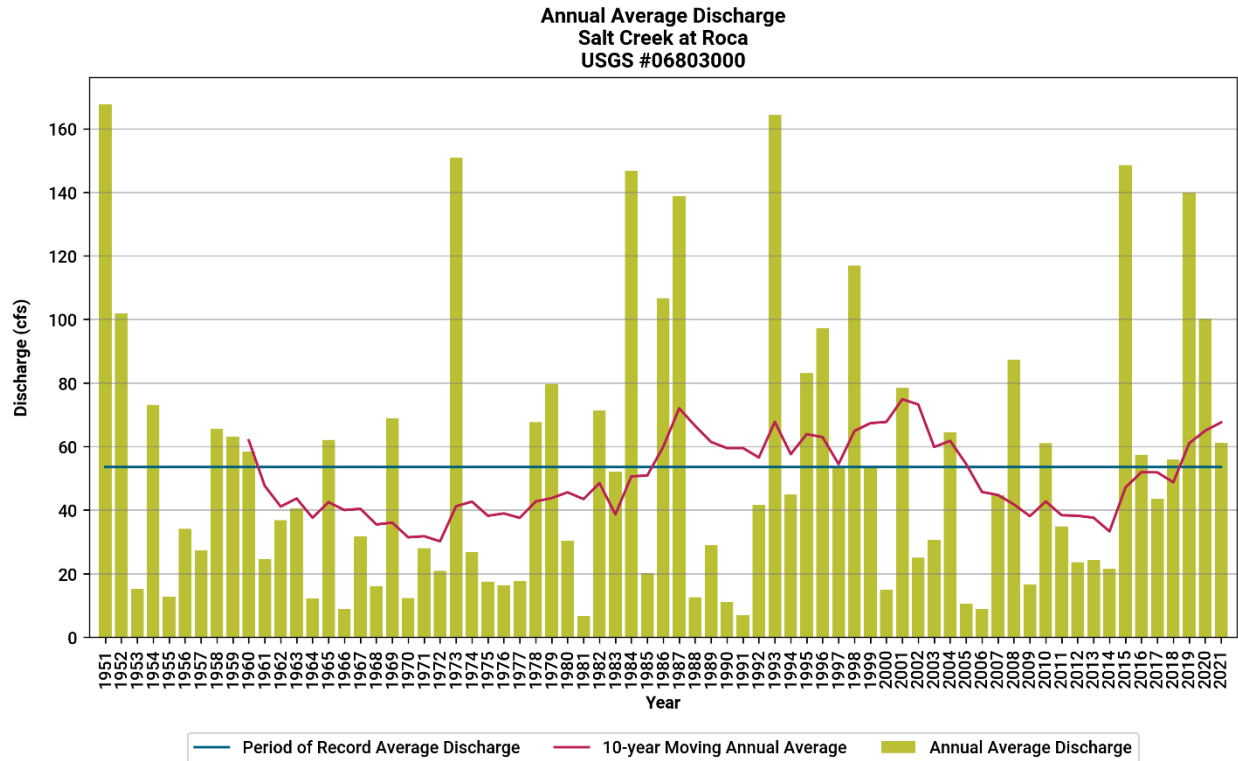


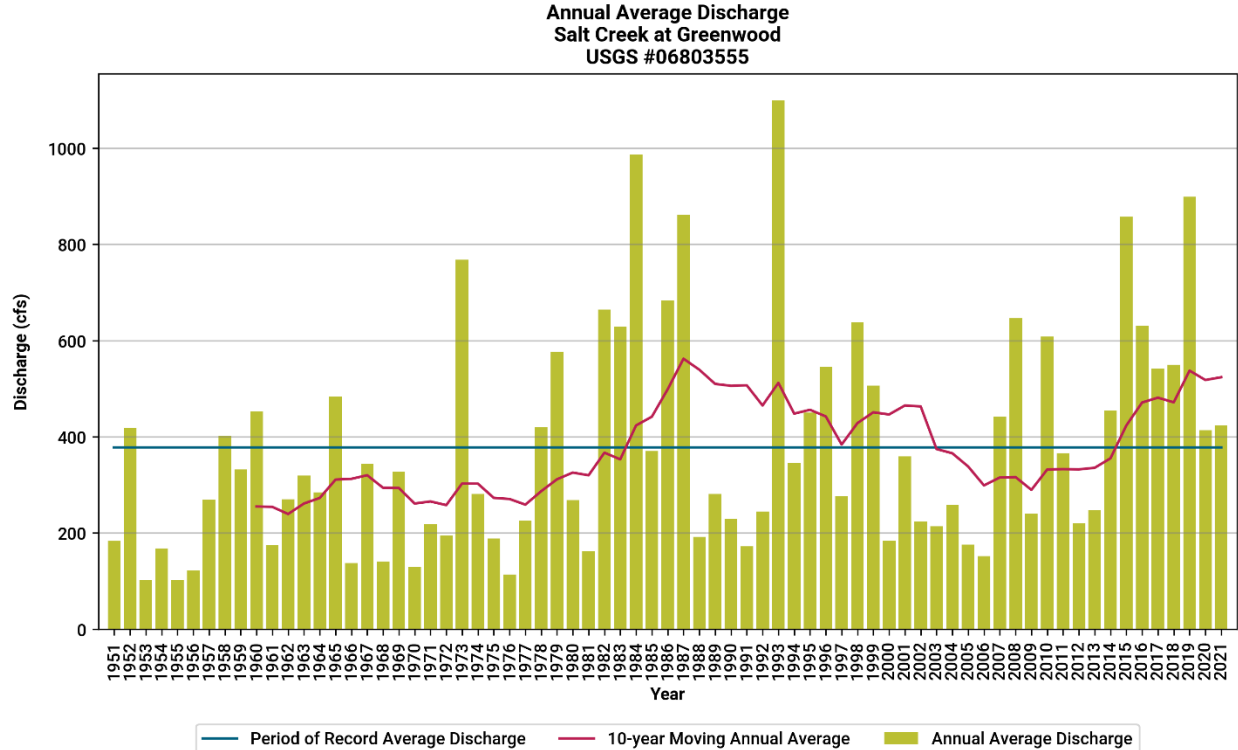
Figure 1: USGS Streamgages map, LPSNRD locations.

As a part of this report, NeDNR downloaded annual streamflow data from the USGS NWIS portal for select streamgages. These streamgages included two locations on the mainstem of the Salt Creek (Roca and Greenwood), two locations on tributaries to the Salt Creek (Little Salt Creek and Stevens Creek), and one location on the Platte River (Platte River at Louisville). These locations have long periods of record (near or over 50 years) and provide general insight to the overall water supply for a given year.

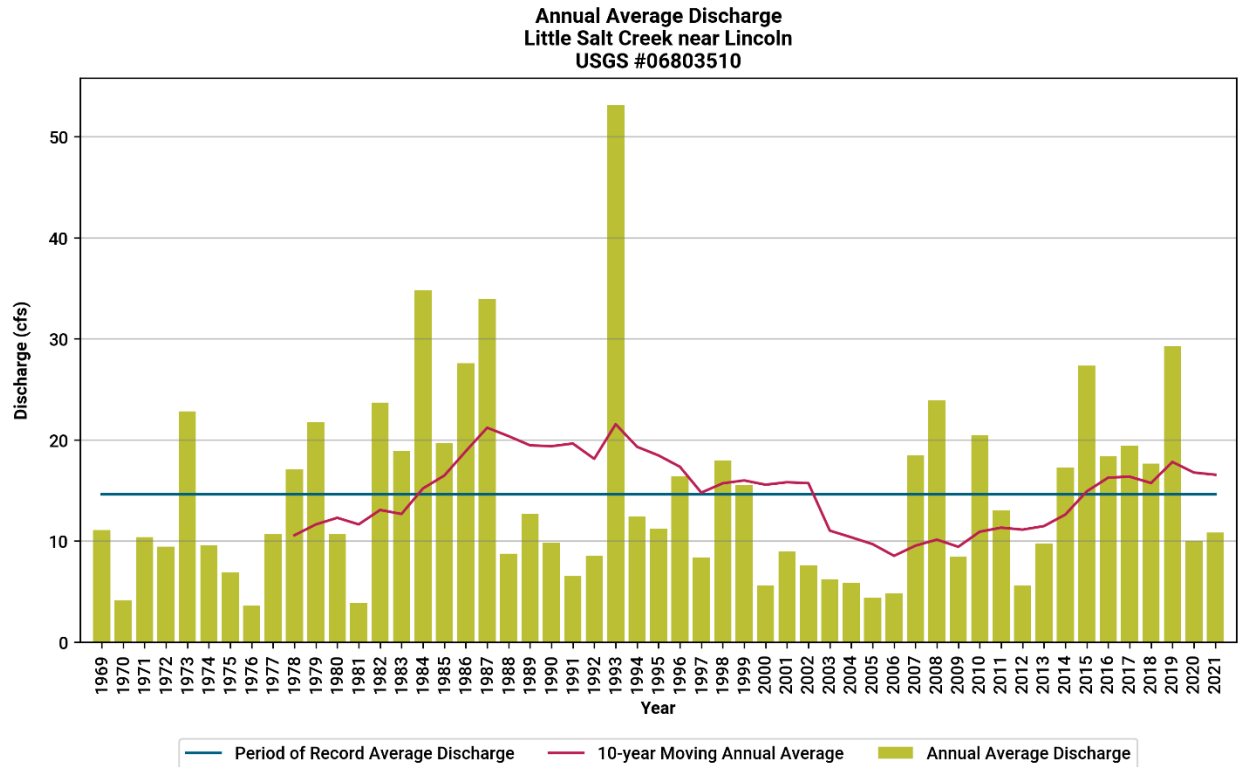
The average annual discharge over the period of record for the select streamgages is shown in the figures 2 through 6.



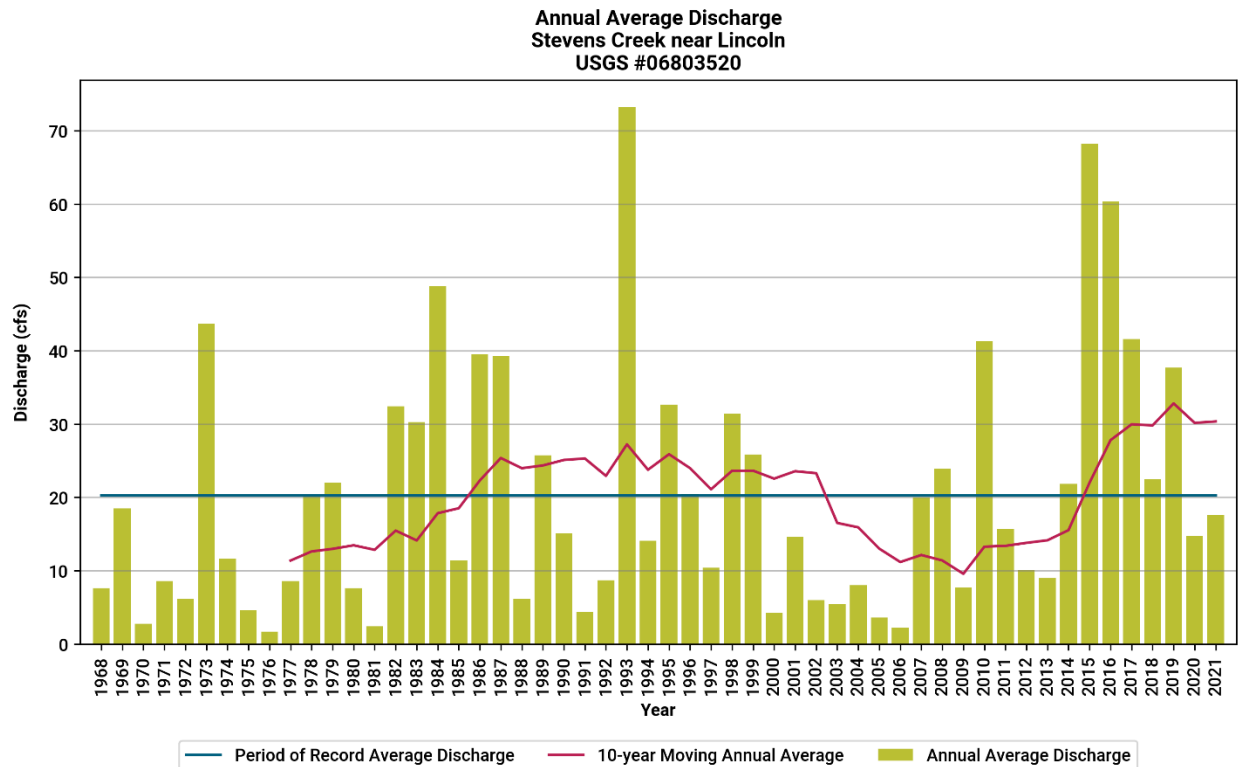
**Figure 2: Historical annual discharge for Salt Creek at Roca, NE (USGS-NWIS).**



**Figure 3: Historical annual discharge for Salt Creek at Greenwood, NE (USGS-NWIS).**

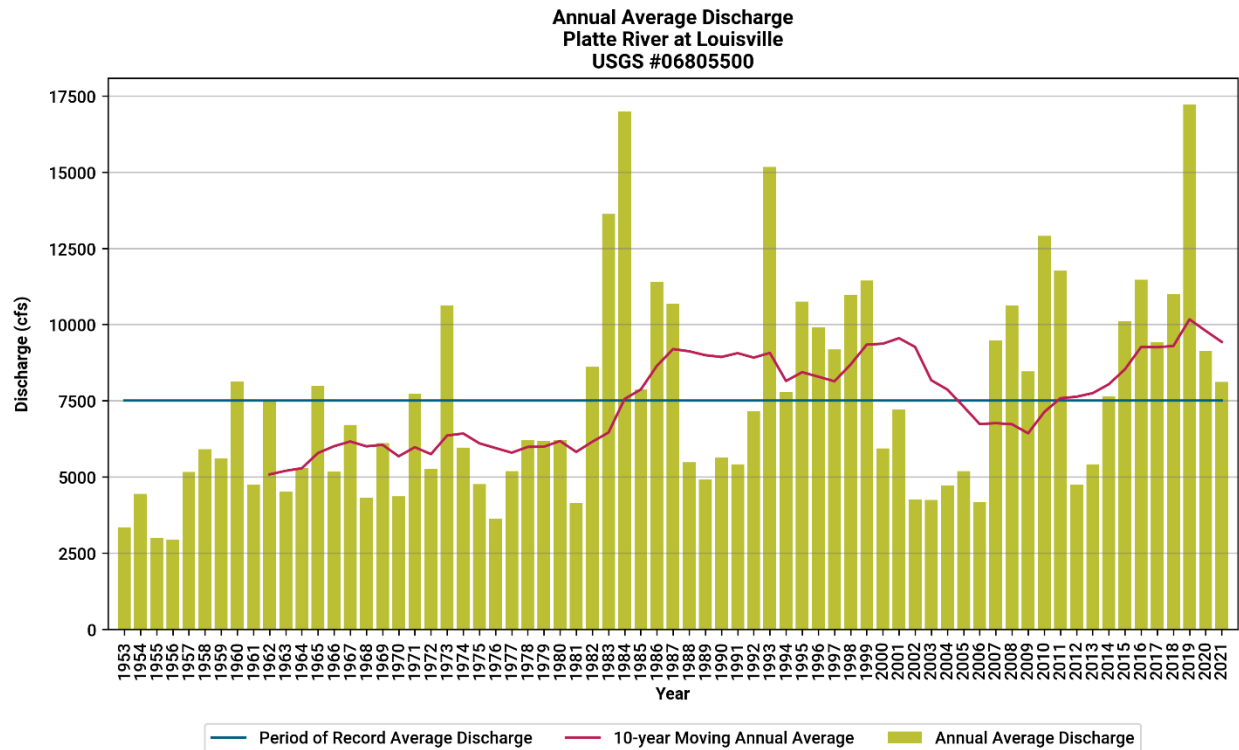


**Figure 4: Historical annual discharge at Little Salt Creek near Lincoln, NE (USGS-NWIS).**



**Figure 5: Historical annual discharge for Stevens Creek near Lincoln, NE (USGS-NWIS).**

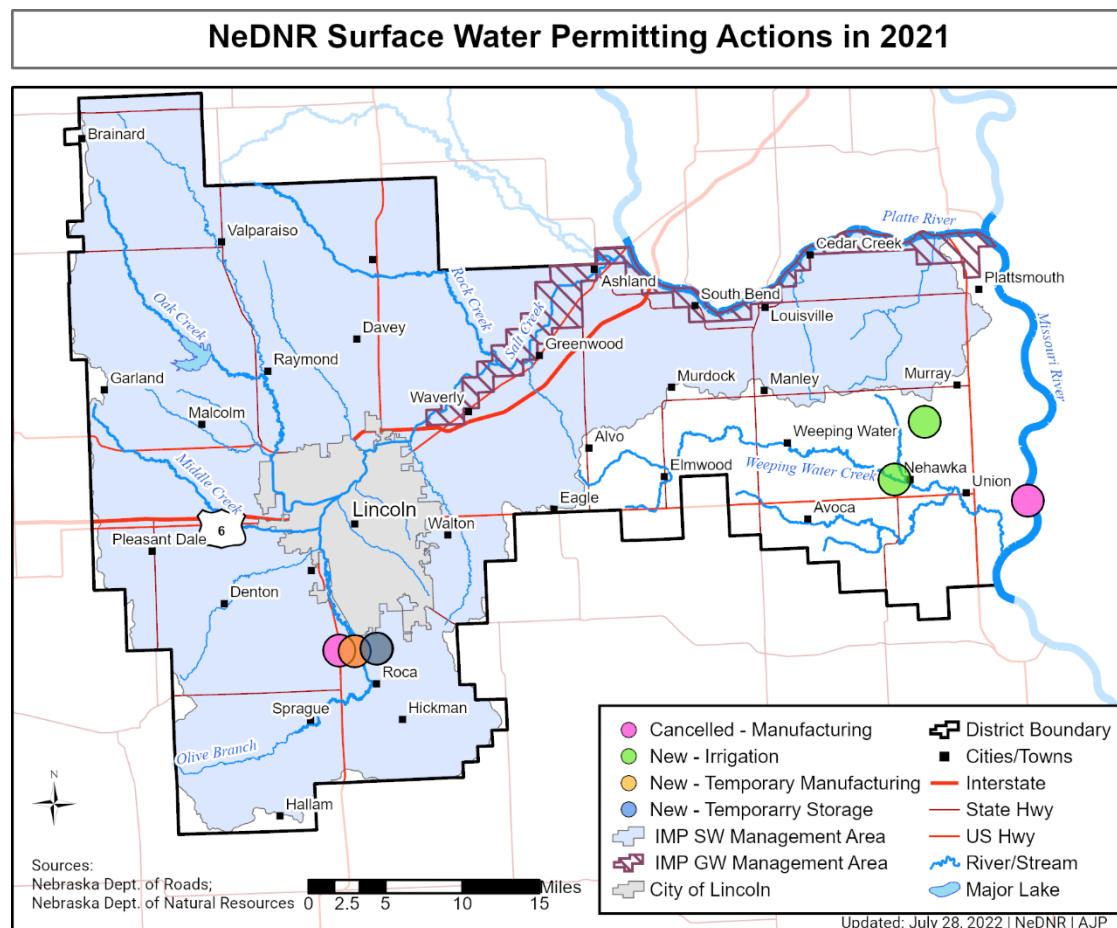




**Figure 6: Historical annual discharge for the Platte River at Louisville, NE (USGS-NWIS).**

## Surface Water Permitting Actions

NeDNR continued to monitor and administer surface water appropriations and maintain records for new, cancelled, or transferred surface water permits. Figure 7 shows the general location of the new surface water permitting actions that resulted in no change in surface water irrigated acres. Table 2: "2021 Irrigated acres changes associated with surface water permitting actions" provides a summary of the 2021 irrigated acres change from all surface water permitting actions.



**Figure 7: NeDNR surface water permitting actions occurring in 2021 within LPSNRD.**

Surface water controls apply only to the area of the District that is the Surface Water IMP area shown on Figure 7. Three new surface water permits were issued in the Platte basin of IMP area in 2021. None of them had any effect on the total number of permitted surface water irrigated acres in the district because they were for manufacturing or storage purposes. Outside of the Platte basin, two surface water permits were approved in the Missouri Tribes basin. Two surface water permits were cancelled, as they expired one year from the approval date.

**Table 2: 2021 Irrigated acres changes associated with surface water permitting actions.**

2021 Irrigated Acres Changes Associated with Surface Water Permitting Actions		
Geographic Area	Newly Permitted Acres	Cancelled Acres
Lower Platte River Basin	0	0
Missouri River Tributaries Basin	193.6	0
<b>Total (Whole NRD)</b>	193.6	0

**Table 3: 2021 Fully cancelled surface water permits.**

2021 Cancelled Surface Water Appropriations							
Appropriation Number	Cancellation Date	Use	Source	NeDNR Action	Cancelled		Diversion Location
					Grant	Acres	
A-19703	5/15/2021	MF	Salt Creek	Expired	4.90	NA	S1-T8N-R6E
A-19713	5/27/2021	MF	Salt Creek, Trib to	Expired	4.90	NA	S2-T8N-R6E

Three new surface water applications were approved from January 1, 2021, to December 31, 2021, within the IMP area. All are shown on Figure 7 and are summarized in Table 4. Permit use codes are MF (Manufacturing), which is a permit to divert water for manufacturing, construction, or industrial uses; SS (Supplemental Storage), which is a permit to store water in a reservoir with a previous storage appropriation; and ST (Storage), which is a permit to store water.

Table 4 summarizes new surface water applications that were approved within the Lower Platte South NRD in calendar year 2021. No surface water rights were transferred in 2021.

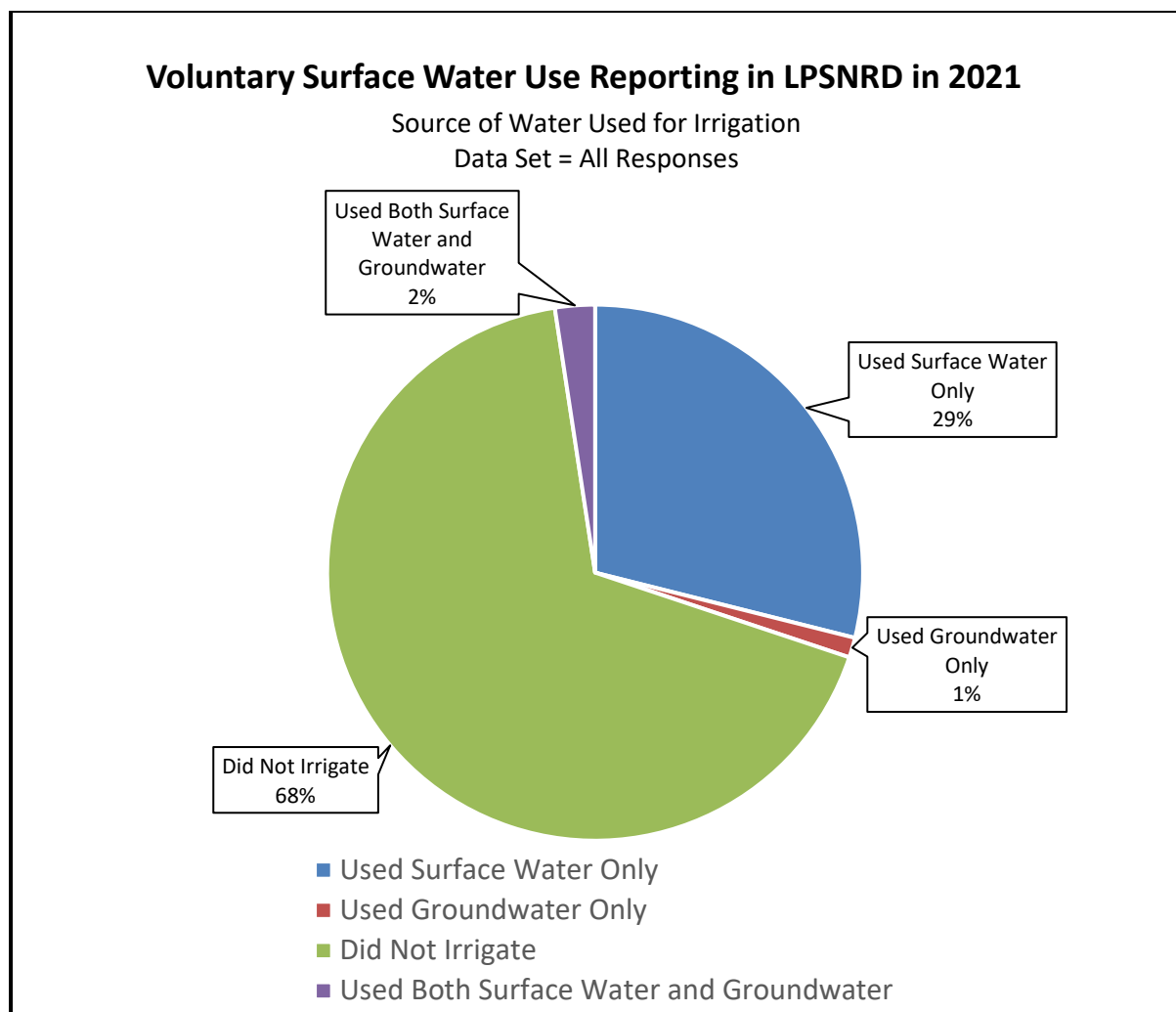
**Table 4: NeDNR 2021 Approved surface water applications, LPSNRD.**

Surface Water Applications Approved within the LPSNRD January 1, 2021, to December 31, 2021								
Appropriation Number	Date Approved	Source	Diversion/ Reservoir Location (S-T-R)	Use	Grant		Acres	New Acres
					CFS	AF		
A-19760	4/28/2021	Butch Cassidy Pond	S5-T8N-R7E	MF	NA	10.0	NA	NA
A-19765	4/28/2021	Salt Creek, Trib. To	S5-T8N-R7E	ST	NA	10.0	NA	NA
A-19779	6/14/2021	Salt Creek	S1-T8N-R6E	MF	NA	4.9	NA	NA

#### **Voluntary Surface Water Use Reporting**

In 2021 NeDNR implemented for the eighth year LPSNRD's voluntary water use reporting program to estimate water use. NeDNR invites surface water irrigation permit holders within LPSNRD, to participate in the voluntary reporting program. Participants could submit information via an online form, or by directly calling NeDNR. Eighty-three reports from a possible 208 water rights were received in 2021 for a response rate of 39%. Sixty-one reports from a possible 207 water rights were received in 2020, as compared to only 34 reports in 2019 from the same number of water rights. 2020 response rates (29%) were almost double the 2019 rates (16%). The 2019 response rate was likely lower due to excess moisture received that year.

The data collected through the voluntary water use reporting program includes information about whether a surface water permit holder irrigated that year, if they used groundwater or surface water, how many acres they irrigated, what types of crops were grown, and reasons for not irrigating (if applicable). Common reasons provided by respondents for not irrigating in 2020 included sufficient rainfall, CRP enrollment acres, not economical, lack of equipment, groundwater is used, insufficient surface water, and discontinuing irrigation. Figure 8 provides a graphic with the voluntarily reported irrigation water sources used.



**Figure 8: LPSNRD 2021 Voluntary surface water use reporting.**

### **Surface Water Pump-Site Visits**

The NeDNR Field Office staff has been conducting surface water pump-site inspections across Nebraska for the past seven years. Pump-site inspections complement the voluntary water use reporting program and provide further information about surface water use. The field office staffs' goal is to inspect each pump-site at least once every two years as time and conditions allow.

In 2021, NeDNR Field Office staff inspected 181 of a possible 208 pump-sites (78%). Three of the inspected pump-sites were running at the time of inspection, and 32 had been set up.

## Groundwater Monitoring

### IMP Groundwater Management Area

The IMP Groundwater Management Area is limited to the Hydrologically Connected Area (HCA). There are a total of 401 wells in the HCA. Flow measurement meters and water use reports are required for any well with the capacity to pump 50 gallons per minute or greater. Of these, there are 29 irrigation wells, 5 commercial wells, and 4 other wells which, when combined, account for nearly 874 million gallons of groundwater pumped. Also in the HCA area, there are 228 registered domestic wells, and 70 registered public water supply wells. Municipal water wells in the HCA include wells for Waverly, Ashland, Louisville, Lincoln, Metropolitan Utilities District, Omaha Fish & Wildlife Club, Cass SID #5, and Cass Rural Water District #1.

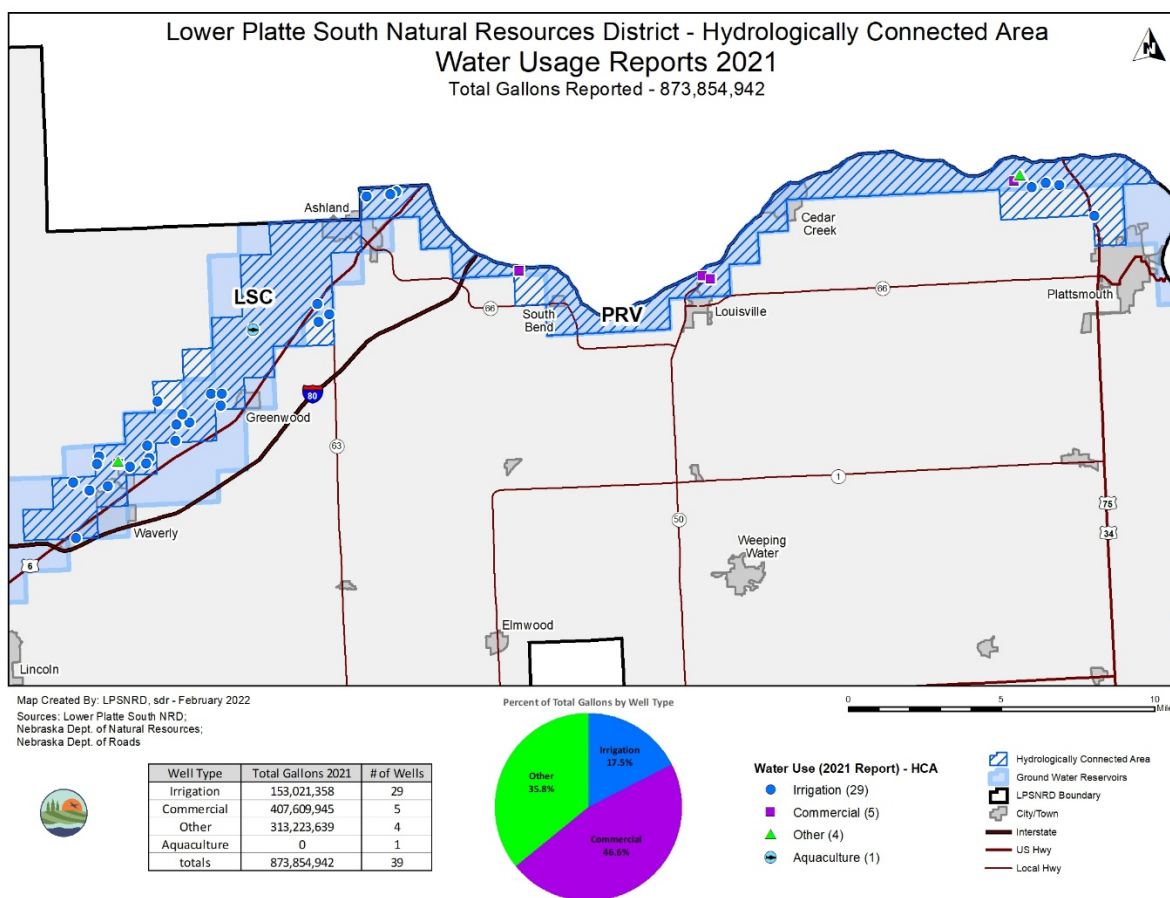


Figure 9: LPSNRD 2021 Groundwater use in the hydrologically connected area (HCA).

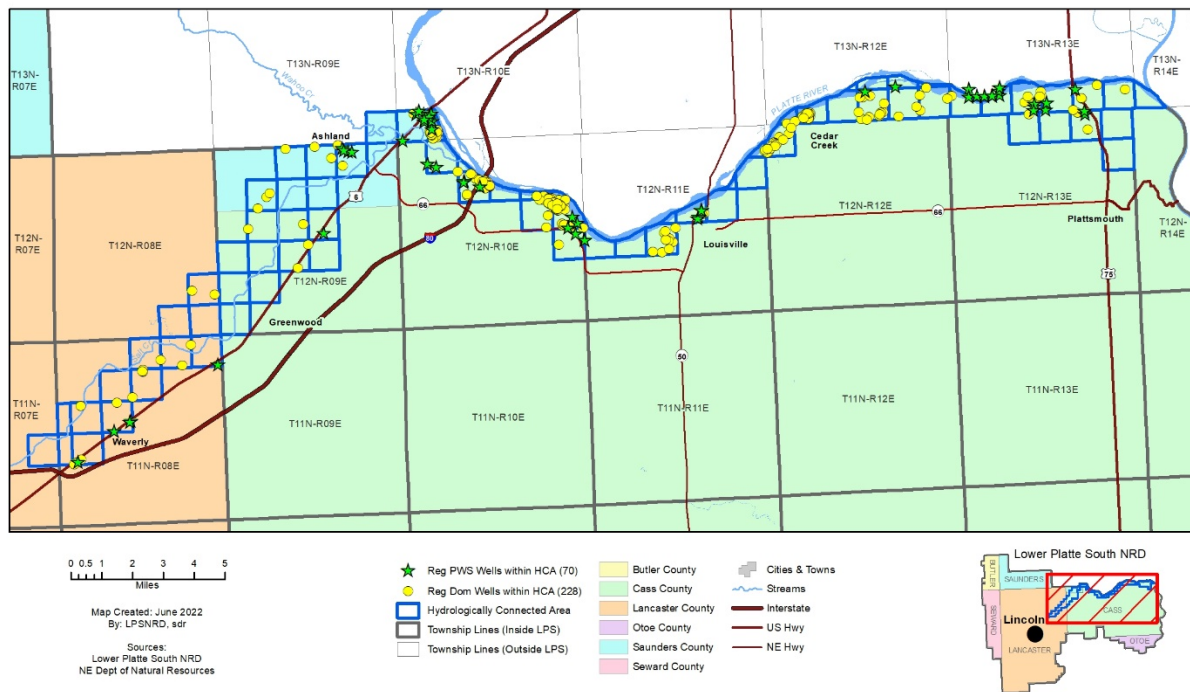


Figure 10: LPSNRD 2021 Registered domestic and public supply wells (HCA).

### Metering and Groundwater Level Monitoring

All wells with capacity to pump over 50 gallons per minute (gpm) are metered, which numbered 358 in LPSNRD at the close of 2021. LPSNRD collected records of usage from these wells and several public supply wells (PWS). The calculated total pumping for 2021 from these metered wells was 4.6 billion gallons, with 284 irrigation wells accounting for 54 percent of the total measured pumping. This total pumping did not include all the PWS, as the District is still establishing uniform procedures for PWS well reporting. In addition, LPSNRD inspected and read 142 groundwater well meters during 2021.

LPSNRD also collected groundwater level data from 140 wells in the spring and fall of 2021 and all of those wells are part of LPSNRD's official water level network. Of those, 93 wells showed an increase and 47 wells showed a decline from spring 2020 to spring 2021; the maximum decline was 6.92 feet while the maximum increase was 4.68 feet, with an average static water level decrease of 0.71 feet. Figure 11 shows a spatial representation of groundwater level changes. The average change by groundwater reservoir is shown in Table 4: Average well level change by



groundwater reservoir, spring 2020 to spring 2021.

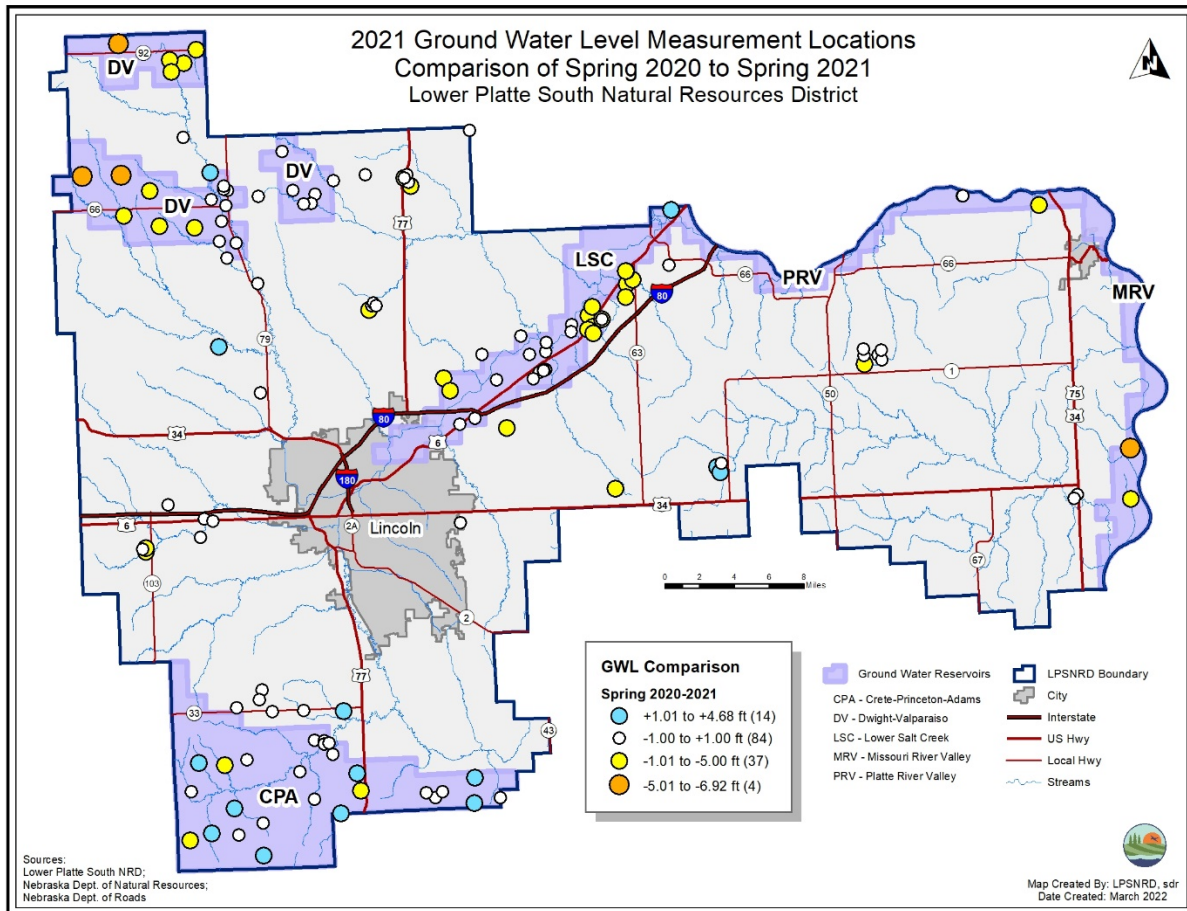


Figure 11: 2021 Groundwater level measurement comparison, spring 2020 and spring 2021.

Table 5: Groundwater reservoir average well level change, spring 2020 to spring 2021.

Average Well Level Change by Groundwater Reservoir	
GW Reservoir	Spring '20 to Spring '21 (ft)
Crete-Princeton-Adams	0.42
Dwight-Valparaiso	-1.97
Lower Salt Creek	-1.01
Missouri River Valley	-4.72
Platte River Valley	-0.43
Remaining Area	-0.49



### **Groundwater Permitting Activities**

LPSNRD issued 10 well permits throughout the District in 2021 for varied uses, as reported in Table 6. In 2021, none of the five wells completed were located in the hydrologically connected area. All statutory well-spacing minimum requirements were followed for all new and replacement wells.

**Table 6: LPSNRD 2021 Approved or completed groundwater wells.**

<b>Well Type</b>	<b>Approved Well Permits, 2021</b>	<b>Completed Wells, 2021<sup>1</sup></b>
<b>Irrigation</b>	6	4
<b>Commercial</b>	3	3
<b>Domestic</b>	2	0
<b>Geothermal</b>	0	0
<b>Livestock</b>	0	0
<b>Other</b>	1	1
<b>Totals</b>	<b>10</b>	<b>8</b>

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<sup>1</sup> Wells completed in 2021 may have been approved in a prior year

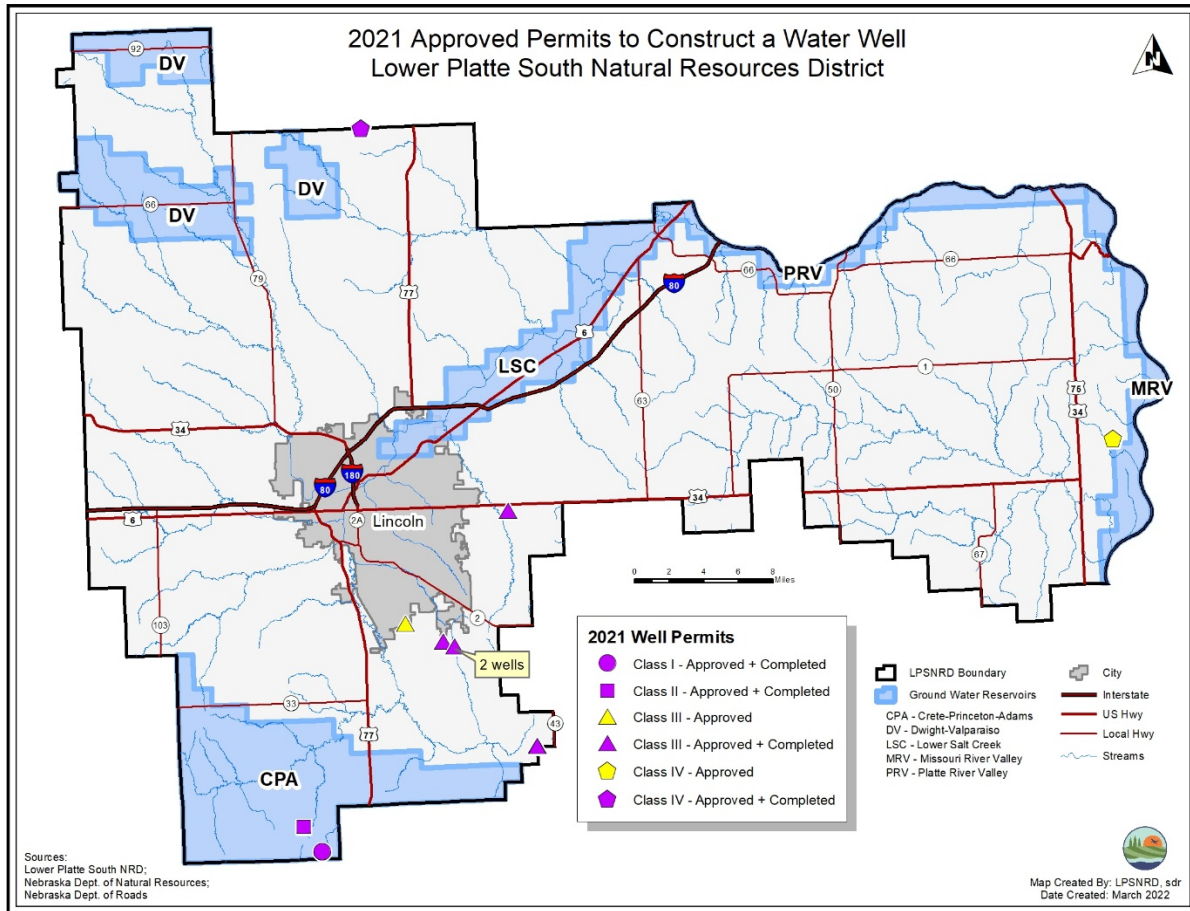


Figure 12: LPSNRD 2021 Groundwater well permits approved or completed.

### Land Use and Land Cover (LULC) Monitoring and Actions

In 2021, LPSNRD did not certify any additional groundwater irrigated acres within the HCA. As specified in the IMP, newly certified groundwater irrigated acres within the HCA did not exceed 20 percent (593 acres) of the total certified groundwater irrigated acres in the same area. The total number of certified acres in the HCA is 3,268 and the extent of these acres is shown in Figure 13. In the remainder of LPSNRD, 61.32 additional groundwater irrigated acres were certified in 2021, for a total of 24,636.71 acres district-wide. The district-wide extent of certified acres is shown in Figure 14. There was one variance granted in 2021 (Monolith aquifer testing requirement).

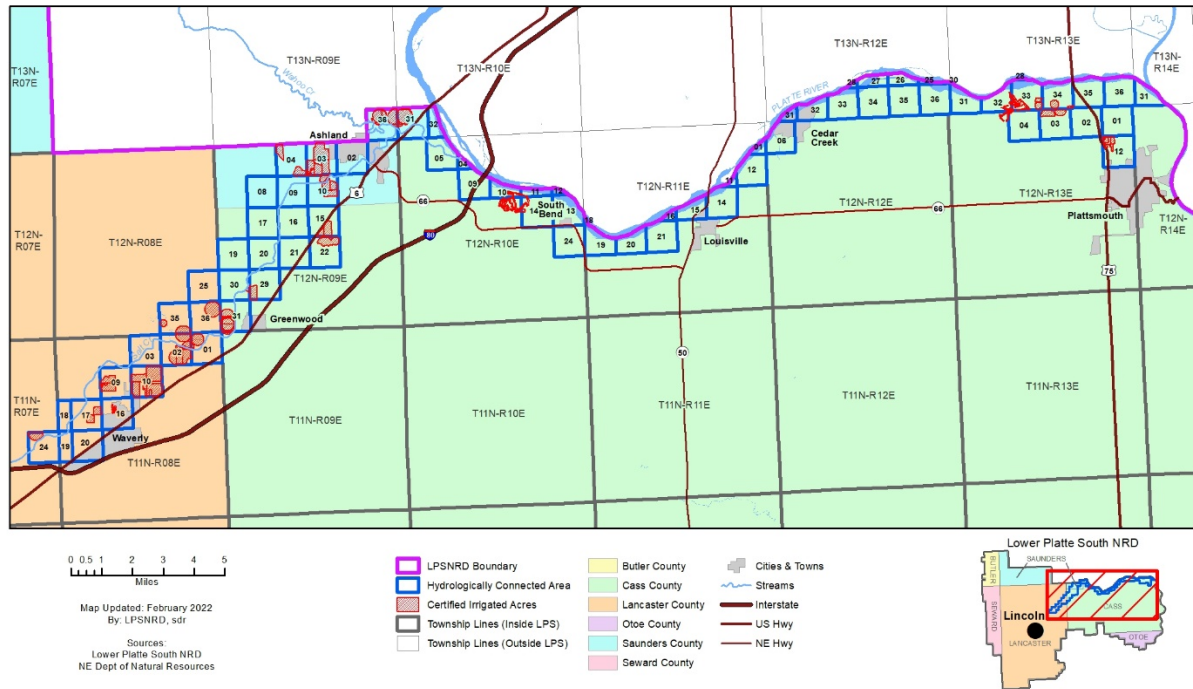
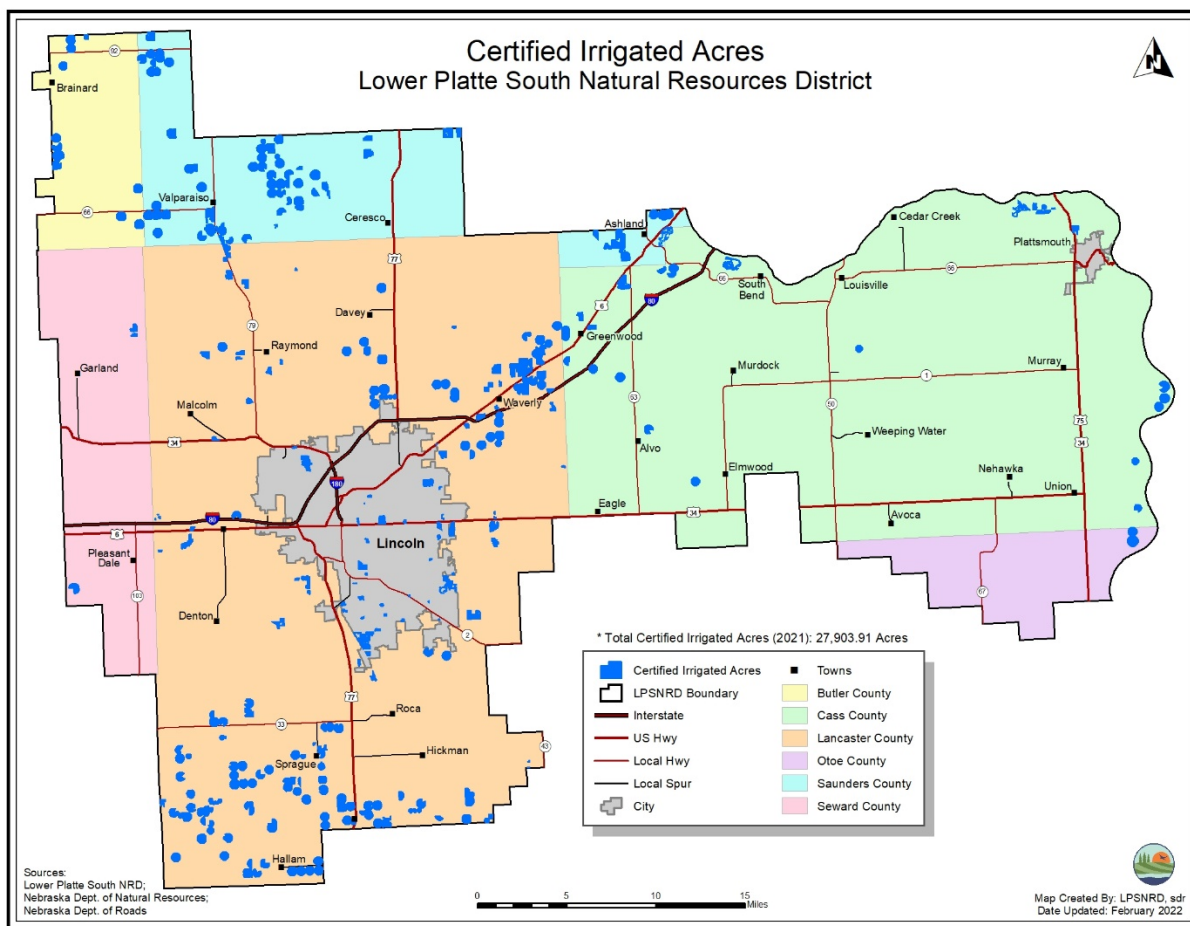


Figure 13: 2021 HCA Certified groundwater irrigated acres, LPSNRD.



**Figure 14: 2021 LPSNRD certified groundwater irrigated acres.**

## 2021 IMP Regulatory Actions

### ***LPSNRD Groundwater Acres Limitations***

An annual limitation of 593 additional certified irrigated acres continues to be in place on hydrologically connected areas within the LPSNRD. A temporary moratorium on the Dwight-Valparaiso area was lifted in 2014 following designation of the Dwight-Valparaiso-Brainard Special Management Area. A rule to not allow an increase in irrigated acres and pumping allocations for irrigated land continues to be in effect for the western portion of the Special Management Area.

### ***NeDNR Surface Water Acres Limitations***

Pursuant to the IMP, NeDNR sets its surface water limitations to 1/3 the amount of acres that the LPSNRD allows for new groundwater irrigated acres, as of January 1<sup>st</sup> for each year. A limit of 198 surface water acres has been and continues to be in place for the surface water management area in LPSNRD. The limit has remained consistent since the IMP was adopted, as the LPSNRD groundwater acres limit (593 acres) has stayed consistent throughout this time.

### ***Future limits on water use***

The LPSNRD and NeDNR have been and will continue to hold discussions about the method of limiting water development, in light of the adoption of the Lower Platte Basin Water Management Plan (Basin Plan). The Basin Plan has established limits on new water development basin-wide and by individual NRD for a five-year increment that ends in 2021; these limits are based on stream depletions rather than irrigated acres limitations. In late 2021, LPSNRD continued to cooperate with the other Basin NRDs, and was considering to agree to implement the second five-year increment based on remaining new uses from the first increment. Approval of the second five-year increment is anticipated in 2022. The LPSNRD and NeDNR will continue to work together to ensure compliance with the Basin Plan, as well as assess the need to incorporate new language in the IMP to be consistent with the Basin Plan.

## Studies and Planning

The following studies were continued or recently completed by the LPSNRD and NeDNR, to gather and evaluate data, information, and methodologies that could be used to increase understanding of the surface water and groundwater supplies and uses within, and, as appropriate, outside LPSNRD. These studies help to meet the goals and objectives that were developed through the IMP stakeholder process.

### ***Additional IMP Components***

In 2014, LPSNRD retained HDR, Inc. to provide professional services to address the following additional components for the IMP. These specific IMP components were completed in 2015 and will be added to the IMP. In general, the tasks were to develop:

- A process to collect and record water use data from all municipalities and rural water districts and from all major non-municipal industrial water users. (LPSNRD IMP, Chapter 7: I(e)(i) and I(f)(i), page 8),
- Procedures to track depletions and gains to streamflows resulting from new, retired, or other changes to water uses within LPSNRD. (LPSNRD IMP, Chapter 8: II(d), page 11),
- An Emergency Response/Drought Mitigation Plan, which included holding a Drought Tournament, in which 30 stakeholders participated. (LPSNRD IMP, Chapter 7: V(a), page 11).

LPSNRD contracted with HDR, Inc. again in 2016 to perform additional services associated with LPSNRD's IMP Planning Components. The purpose of the project was to build on the planning components provided in the LPSNRD IMP Planning Components Methodology Report, finalized in November 2015. The amendment is used for developing and completing tools and recommendations from the original contract for use by the LPSNRD to help implement the IMP. These will continue to help LPSNRD to observe, quantify, and manage the water resources within its boundary. Specifically, the methodologies developed as part of this project include the following:

- Implement the GIS database recommendations made during the first phase of the project,
- Review and analyze drought response plans of the public water suppliers within LPSNRD,
- Research conservation programs for water use management, and
- Develop science-based protocols for estimating unmeasured water uses.

In addition, LPSNRD and NeDNR partnered with Lower Platte North NRD, Papio-Missouri River NRD, Metropolitan Utilities Department (MUD), and the Lincoln Water System (LWS) to form the Lower Platte River Consortium (LPRC) in 2016. The Consortium contracted with HDR, Inc. to develop a Drought Contingency Plan. The primary focus of the plan will be to further refine the Consortium's collective understanding of drought vulnerabilities, develop more robust monitoring and forecasting tools coupled with timely triggers, new mitigation strategies and responsive actions, create a sound operational framework, and finally, improve critical water supply needs of the area through drought periods. The planning area includes the Lower Platte River upstream of the Platte River at Louisville and downstream of the Platte River at Duncan. This Plan was completed in October 2019.

### ***Stream Accretion and Depletion Calculator Expansion***

NeDNR has expanded the stream accretions/depletions calculator to the Lower Platte River Basin. The calculator utilizes stream depletion factors derived from NeDNR's Lower Platte Missouri Tributaries model and the CENEB model. The calculator allows users to calculate consumptive use resulting from land use changes and estimate the impacts to streamflow as a result of the land use change. This provides a uniform platform for tracking water use changes and estimating streamflow and consumptive use impacts within the Lower Platte River Basin.

### ***Lower Platte Missouri Tributaries Model Development***

NeDNR has completed the development of a regional numerical groundwater model for the Lower Platte and northern Missouri River Tributaries basins (i.e. "Northern Model")(Figure 15). The model may be used for future updates to NeDNR's Annual Evaluation of Availability of Hydrologically Connected Water Supplies. A future refinement to this model is being considered as the Lower Platte Basin NRDs discuss how airborne electromagnetic (AEM) data will be incorporated into this model. The first step in evaluation of the AEM data for use in the model is occurring via a study with the Lower Elkhorn NRD. The first phase with them concluded in FY 2019, the second phase was initiated in early FY 2020, and continued through FY 2022. Subsequently, the Papio-Missouri River and Lower Platte North NRDs conducted a similar scope project through a Water Sustainability Fund (WSF) award (#5303) with NeDNR in FY2021 and FY2022. Following FY2022, the Lower Platte South NRD applied for, and was awarded, a WSF grant #5311: LPSNRD 3-D Hydrologic Framework, to build a 3-D geologic model delivered in a user-friendly platform useable between NRD boundaries in support of the neighboring NRD efforts with NeDNR.

Once work on the northern portion of the model concludes, NeDNR will continue development of the southern portion of the model (Nemaha Model) (Figure 15). Additional AEM flights were conducted in the summer of 2020 for the Nemaha NRD with results data available in FY2021. Upon completion, the Nemaha model will also be incorporated into the INSIGHT and FAB analyses. NeDNR will also continue to support efforts of the eastern Nebraska NRDs to evaluate the hydrogeology whether or not the coupling of groundwater modeling tools and airborne geophysical studies will help improve understanding of hydrologic connections between aquifers and streams.

## NeDNR's Lower Platte Missouri Tributaries Models

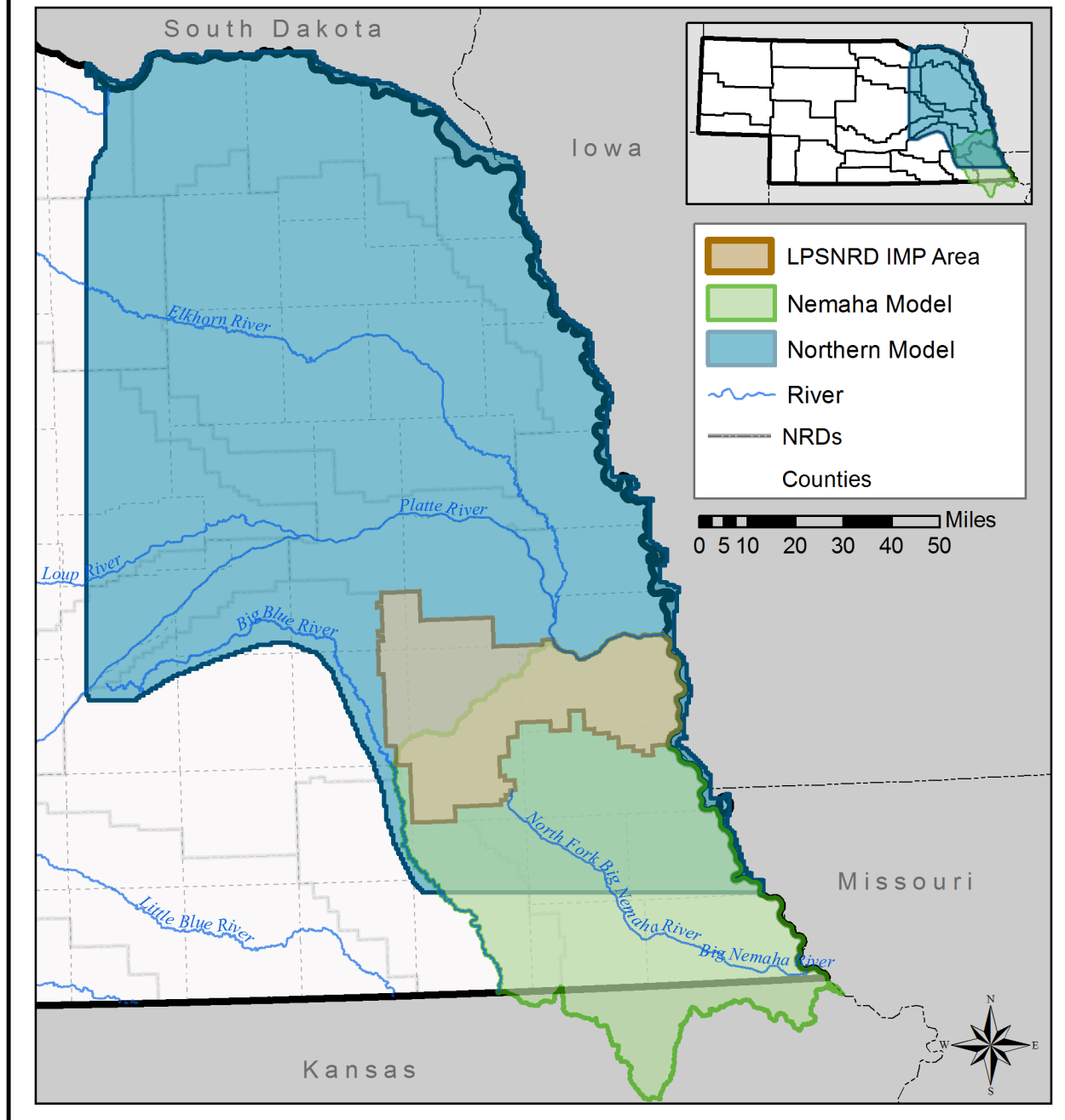


Figure 15: Lower Platte and Missouri tributaries models' geographic locations.



## Water Inventory and Water Use/Supply Management

### ***LPSNRD Accomplishments***

LPSNRD has continued to collect and share data and has worked to improve the database that houses the information. LPSNRD further reviewed groundwater well permits relative to aquifer capacity and sustainability. LPSNRD also continued an open dialogue with public water suppliers on current and future water supplies and supported storm water capture and reuse projects in the district. LPSNRD continues to participate with the Lower Platte River Weed Authority and the Lancaster County Weed Authority on invasive species control relative to water supply.

### ***NeDNR's INSIGHT Web Portal***

The Integrated Network of Scientific Information and Geohydrologic Tools (INSIGHT) web portal at <https://nednr.nebraska.gov/INSIGHT/> is a water use, supply, and balance tool that was developed by NeDNR and was released in 2014. INSIGHT aids water managers and other interested parties in better understanding current and future water demands, effectiveness of water management strategies, and critical areas of water shortage. The user can access information pertaining to water supplies and demands (precipitation, irrigation, hydropower, etc.), as well as view maps with associated charts that show overall water balance (current, near-term, or long-term) at a subbasin scale. A valuable feature of INSIGHT is that all the datasets that are used to compile the water balance analyses are also stored within the web portal and are available for download.

NeDNR will continue to update the current INSIGHT analysis and add other basins to the web portal as new data become available. At this time, NeDNR has compiled data for the Lower Platte River, from North Bend, NE, to Louisville, NE, which covers a large portion of the LPSNRD IMP area. It does not include the portion of LPSNRD that is a part of the Nemaha River Basin. That area will be added to INSIGHT subsequent to the completion of the Lower Platte Missouri Tributaries models. The last major update for INSIGHT was the addition of data for the Upper Platte River Basin in 2019. Data for the Lower Platte River Basin is expected to be added during calendar year 2022.

## Education/Outreach

### ***NeDNR Activities***

#### **Events**

NeDNR's statewide public outreach activities are broadly focused and intended to provide all interested citizens with a better understanding of how integrated water management affects them. In 2021, NeDNR participated in Husker Harvest Days, as well as the Nebraska State Fair.

#### **Educational Interactive Web Applications**

NeDNR has released a series of interactive educational applications called Stream Simulations (Figures 16-18). The applications introduce users to basic surface water and groundwater interaction principles. One application illustrates how water flows between a stream and an adjacent aquifer and how precipitation and soil texture affect runoff, recharge and streamflow.

Another application shows the relationship between groundwater pumping and stream depletions under different hydrologic systems—a gaining stream, a losing stream, and a disconnected stream. It also shows how pumping can change the connectivity of a stream to its adjacent aquifer. Depending on which simulation they are exploring, users can change water table levels, precipitation intensity, soil texture, well location, or pumping intensity. The applications also feature a tutorial and optional voice narration.

These applications can be accessed on NeDNR's website, at <https://dnr.nebraska.gov/water-planning/education>. NeDNR also has an offline, portable version of each application that can be taken to public outreach events. NeDNR can provide a copy of the offline version to an NRD for its own outreach use upon request.

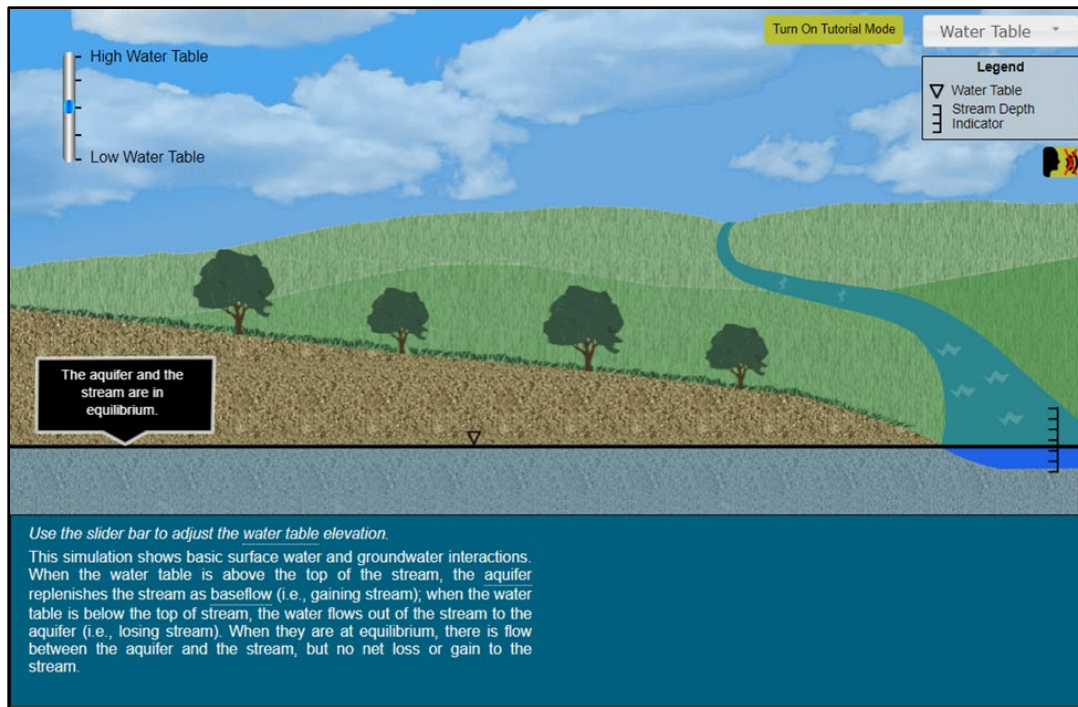


Figure 16: NeDNR's educational interactive web application that illustrates the interaction between groundwater table elevation, the direction of groundwater flow and streamflow.

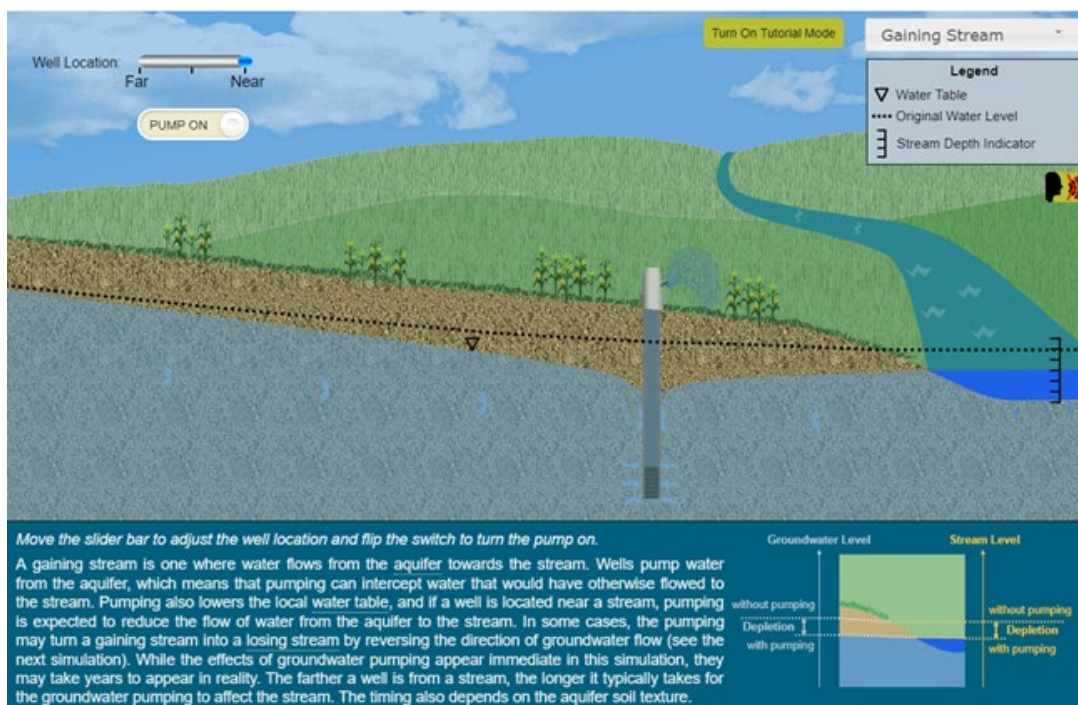
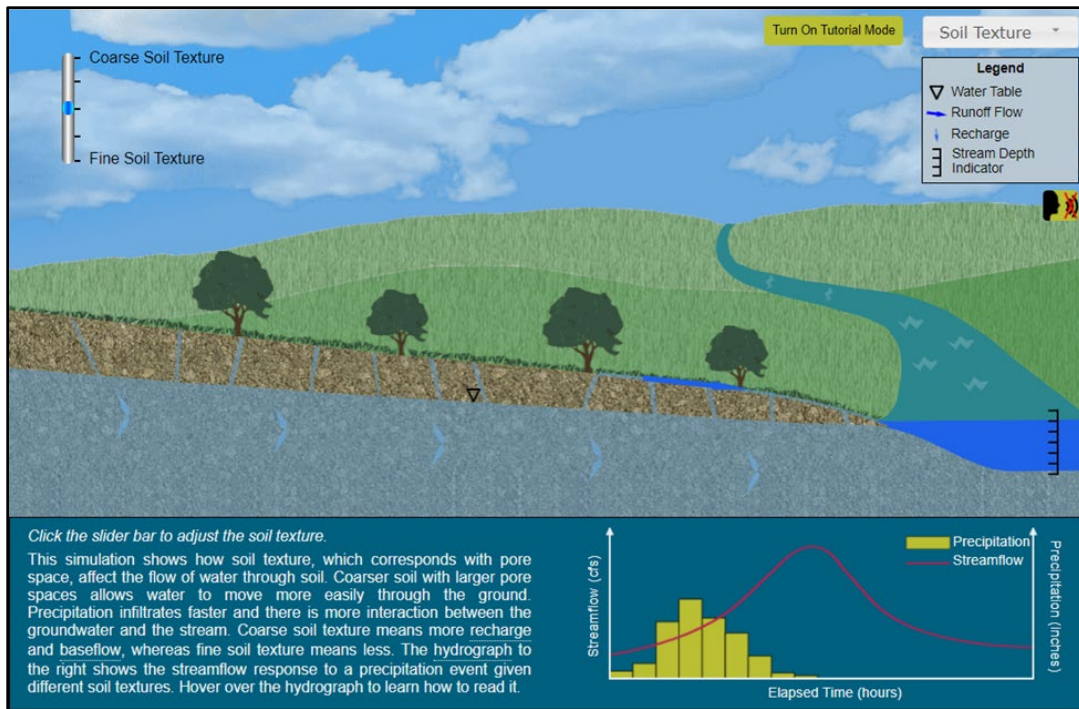


Figure 17: Users can view the relationship between groundwater pumping and stream depletions under different hydrologic systems, and how pumping can change the connectivity of a stream to its adjacent aquifer.



**Figure 18:** This application illustrates how water flows between a stream and an adjacent aquifer, and how precipitation and soil texture affect runoff, recharge and streamflow.

### ***LPSNRD Activities***

Each February, LPSNRD compiles a Ground Water Management Plan Review; a report of all groundwater activities completed in the previous calendar year. The report includes results of well sampling and measuring, progress made in ongoing groundwater programs, the status of each groundwater management area, and more. The review is presented as a summary to the LPSNRD Board of Directors and the complete review is posted on LPSNRD's website, <http://www.lpsnrd.org>. The posted review is promoted on the LPSNRD website home page and in LPSNRD's newsletter.

As noted on the following page under Collaboration with Other Entities, LPSNRD continues hydrogeologic assessment activities with the Eastern Nebraska Water Resources Assessment (ENWRA).

The NRD has continued to host "Test Your Well Nights" events for specific areas each year. Private well owners can bring water samples for nitrates testing, and LPSNRD worked with local FFA chapters and science students to test the water. One "Test Your Well Nights" during 2021 was held at Elmwood-Murdock in February.

The LPSNRD worked with UNL Extension to implement a Certification Program for irrigators and continued to provide cost-share and educational support for irrigation best management practices.

LPSNRD also promoted its groundwater activities through social media platforms Instagram and

Facebook. Information was shared about groundwater levels, samples, data loggers, and monitoring wells.

The stakeholder advisory group for the Dwight-Valparaiso-Brainard Special Management Area (DVB) was kept updated on DVB activities. The group held annual meetings in December 2014, February 2015 (this was an update on aerial electromagnetic imaging activity in DVB), January 2016, March 2017, March 2018, and April 2019, where they were updated by LPSNRD staff and contributed their own input. Most recently, committee input from the 2019 meeting resulted in LPSNRD adopting a uniform allocation amount for all forms of irrigation (both sprinkler and flood/furrow irrigation) as well as changing the three-year allocation period to a “rolling” allocation where the allocation amount continually advances in three-year increments rather than a discrete, pre-set three-year period.

LPSNRD continually seeks to maintain public awareness to information about groundwater levels, available cost-sharing and conservation best management practices through its publications, website, and through LPSNRD media.

LPSNRD worked with NeDNR to schedule quarterly coordination meetings to discuss IMP and related action items. Quarterly meetings were held on February 16, 2021 and May 27, 2021.

## **Collaboration with Other Entities**

### ***Eastern Nebraska Water Resources Assessment***

Both LPSNRD and NeDNR participated in the Eastern Nebraska Water Resources Assessment (ENWRA) program in 2021 to cooperate for hydrogeologic data research and modeling. LPSNRD continued financial and administrative handling of ENWRA in FY2022 which is organized through an interlocal cooperative agreement with the six NRDs in eastern Nebraska. As part of the ENWRA study efforts, ENWRA applied for, and was awarded Water Sustainability Fund (WSF) contract #5312 ENWRA Groundwater Recharge Mapping and Focus Area Assessments, a three-phase collaborative effort with Conservation and Survey Division, School of Natural Resources, University of Nebraska-Lincoln (UNL CSD) and the U.S. Geological Survey (USGS) to better understand and map aquifer recharge in Eastern Nebraska. Additionally, LPSNRD has continued to collaborate with UNL CSD on the test hole drilling program and the 10 NRD Interlocal for the Nebraska GeoCloud Project through cooperation with ENWRA.

### ***Lower Platte River Basin Coalition***

Both the LPSNRD and NeDNR are active participants in the Lower Platte River Basin Coalition (LPRBC), a group comprised of the seven Lower Platte River Basin NRDs and NeDNR. The purpose of this group was to develop, and now implement, a voluntary water management plan for the Lower Platte River Basin. Plan components will be subsequently incorporated into individual IMPs to provide consistency in water management actions across NRD boundaries. Both NeDNR and LPSNRD have representatives that serve on the managers and technical committees. The second 5-year increment of the voluntary water management plan will end in December 2026. For more information about the Coalition, please see <https://lprbc.nebraska.gov/>.

### ***Lower Platte River Consortium***

LPSNRD and NeDNR are participating members of the Lower Platte River Consortium (LPRC). The LPRC was formed through an interlocal agreement in 2016 and also includes Lower Platte North NRD, Papio-Missouri River, MUD, and LWS as members. The Consortium is working together to develop regional solutions to improve water supply reliability and drought resiliency of the Lower Platte River.

The Lower Platte River Drought Contingency Plan (LPRDCP) is a collaborative project among these six water management agencies, along with the Bureau of Reclamation. The LPRDCP had been submitted to the Bureau of Reclamation for review and was finalized in October 2019. The LPRDCP will analyze available water in the area and develop a plan to retain or acquire water for this part of the state and its population in years of drought.

### ***Lower Platte River Corridor Alliance***

Both the LPSNRD and NeDNR are active members of the Lower Platte River Corridor Alliance (LPRCA), which is a group comprised of the eight agencies, including the LPSNRD, Papio-Missouri River NRD, NeDNR, Nebraska Department of Environment and Energy, Nebraska Department of Health and Human Services, Nebraska Game and Parks Commission, Nebraska State Military



Department, and the University of Nebraska Institute of Agriculture and Natural Resources. The LPRCA is dedicated to working with people to protect the long-term vitality of the Lower Platte River Corridor. The mission of the LPRCA is to foster the development and implementation of locally-drawn strategies, actions, and practices to protect, enhance, and restore the vitality of the Lower Platte River's resources. Created in 1996 through an interlocal agreement, the Alliance uses a variety of tools to assist counties, communities, governments, resource management organizations, and the general public to meet Lower Platte River Corridor management challenges. These tools include public awareness events, educational workshops, recreation studies, water quality studies, floodplain studies, land-use planning assistance, and a variety of other projects. For more information about the LPRCA, please see [www.lowerplatte.org](http://www.lowerplatte.org).

### ***Other Collaborations***

The LPSNRD and USGS cooperated to collect surface water/streamflow data. In 2015, LPSNRD staff contacted USGS personnel to begin identification of new streamgage locations in the Oak Creek drainage of the Dwight-Valparaiso-Brainard Special Management Area. Two new gages were installed in 2016 near the village of Valparaiso and the unincorporated community of Touhy. The effort utilized 2013 AEM data, and will ultimately be aimed at further defining the relationship between groundwater and surface water in this area. The LPSNRD also cooperated with UNL, USGS, adjoining NRDs, and NeDNR on groundwater data sharing.

In mid-2021, LPSNRD applied for a Water Sustainability Fund (WSF) grant in the amount of \$247,500 for a Three-Dimensional Hydrogeologic Framework Project. This request, to be matched by \$169,000 of LPSNRD funds for a total project cost of \$416,500, was granted in late 2021. Selection of a contractor was to begin in early 2022, and the project is slated to be completed by December 2023. This project builds on work completed and/or underway by the Lower Elkhorn, Papio-Missouri River, and Lower Platte North NRDs.

## Jointly Identified Actions for Succeeding Two Years

As stated in the IMP, LPSNRD and NeDNR will jointly identify action steps for the succeeding two years as a part of annual reviews. The following actions were identified by the LPSNRD and NeDNR as priorities for the next two years. These actions will help ensure that progress continues towards meeting the goals and objectives of the IMP.

1. Continue to participate in basin-wide or regional groups such as ENWRA, the Lower Platte River Consortium, Lower Platte River Basin Coalition, and the Lower Platte River Corridor Alliance. (LPSNRD and NeDNR)
2. Continue to assess the need to amend the IMP to achieve consistency with the Lower Platte Basin Water Management Plan, specifically with stream depletion-based limits on new groundwater and surface water uses. (LPSNRD and NeDNR)
3. Continue respective public outreach activities and participate in one joint public outreach activity per year, as time and resources permit. (LPSNRD and NeDNR)
4. Continue to evaluate the need for modifications to the LPSNRD streamgauge network. (LPSNRD and NeDNR)
5. Continue to conduct quarterly coordination meetings with LPSNRD and NeDNR staff to discuss IMP and related action items. Include the LPSNRD Integrated Management Subcommittee members on coordination meetings twice per year. (LPSNRD and NeDNR)
6. Development, testing and incorporation of AEM data for the LPMT model. (LPSNRD and NeDNR)
7. Ongoing Annual reporting and tracking requirements for IMP and Basin Plan. (LPSNRD and NeDNR)
8. Continue to monitor groundwater level changes through its network of groundwater monitoring wells. (LPSNRD)
9. Continue to meter and require annual pumping reports for groundwater wells that have capacity to pump over 50 gpm, as well as public supply wells, and assimilate the data into a comprehensive dataset. (LPSNRD)
10. Continue to collect information on municipal, rural water, and non-municipal industrial water use, land use and population changes, and changes in climate. (LPSNRD)
11. Develop recommendations for the development and management of geographic areas with limited aquifers. (LPSNRD)
12. Conduct discussions with municipalities and rural water districts on coordinating services with regional systems and on water shortage action plans. (LPSNRD)
13. Continue surface water monitoring activities including tracking surface water permit changes, pumpsite inspections and the voluntary surface water use reporting program. (NeDNR)
14. Continue technical analyses and development of tools (INSIGHT) for water management,



expanding the network to eastern Nebraska as data become available. (NeDNR)

15. Continue development of the Lower Platte Missouri Tributaries models and convey progress and outcomes to LPSNRD. (NeDNR)