

ANNUAL
INTEGRATED
MANAGEMENT
PLAN REPORT

2018



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 21, 2019



LOWER PLATTE SOUTH
natural resources district

NEBRASKA
DEPT. OF NATURAL RESOURCES

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2018 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 21, 2019

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 overarching 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.

This Annual Report covers the progress made towards Voluntary IMP implementation for both the LPSNRD and NeDNR in 2018. 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 2018 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 2018 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 adopted in October 2018.

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 21, 2019, at LPSNRD’s regularly scheduled Board meeting. Notice of the Board meeting was published in the Lincoln Journal Star on August 8, 2019 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, Figure 1). 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: Listing of USGS streamgages in LPSNRD.

Gage Name	Gage Number	Begin Date	LPSNRD assist in funding?
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 th 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

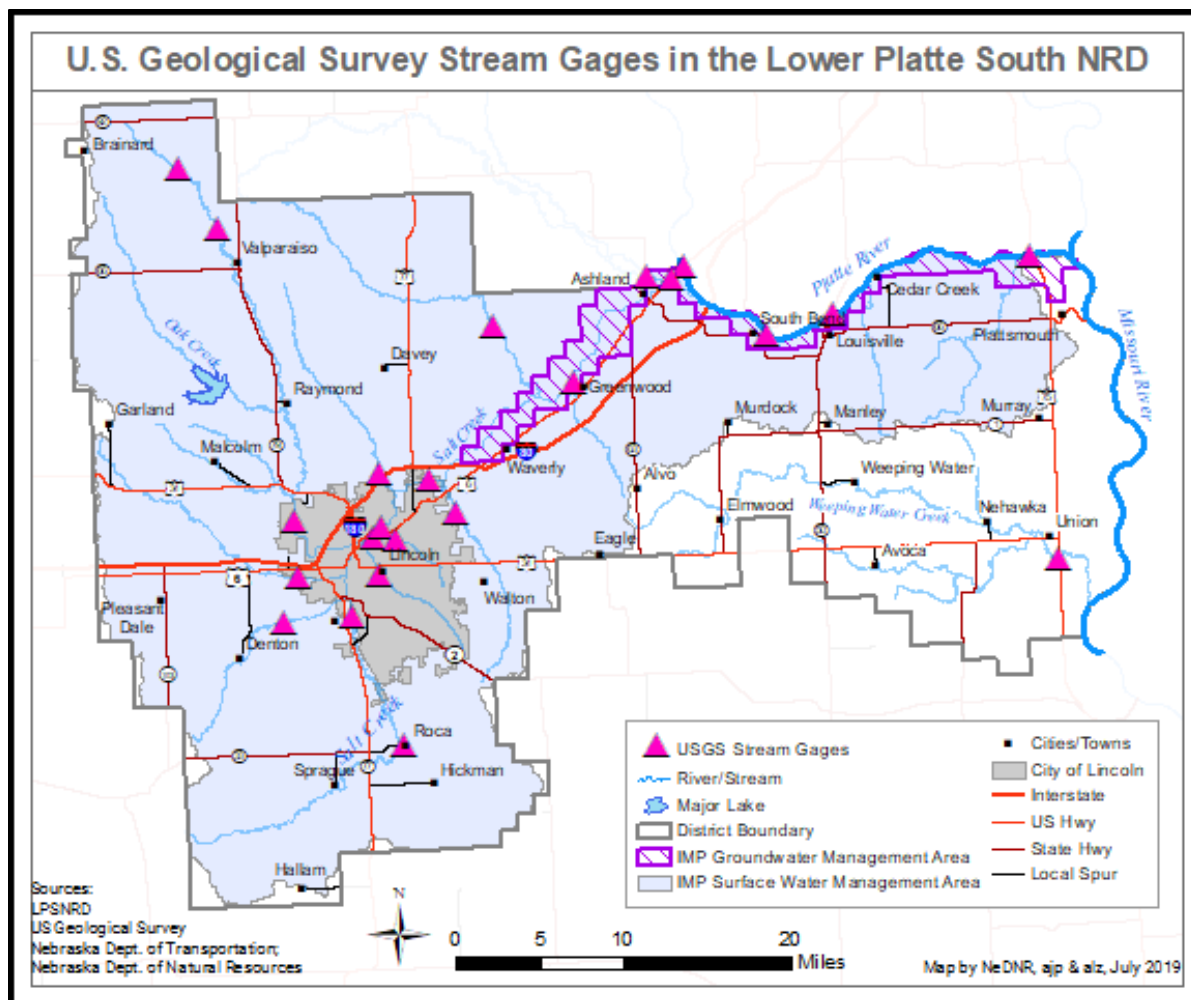


Figure 1: Location of USGS streamgages in the LPSNRD.

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 Salt Creek mainstem (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 following figures (Figure 2 to Figure 6). For Salt Creek and its tributaries, the average annual discharge was at or slightly above the period of record average, with the exception of Salt Creek at Roca, whose discharge was slightly below the period of record average. The Platte River at Louisville had much higher (40%) than average flows, due to increased precipitation in the Platte River Basin, where most drainage areas received 150% or more than average annual precipitation.

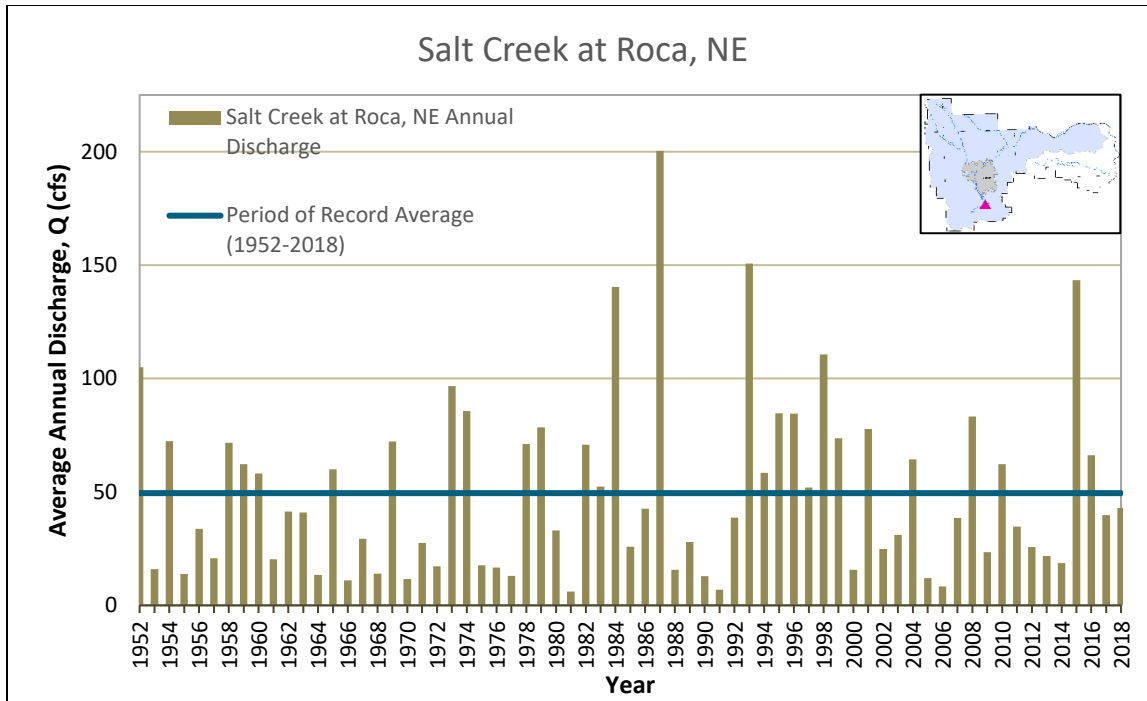


Figure 2: Historical annual discharge for Salt Creek at Roca, NE (source: USGS-NWIS. Some provisional data used).

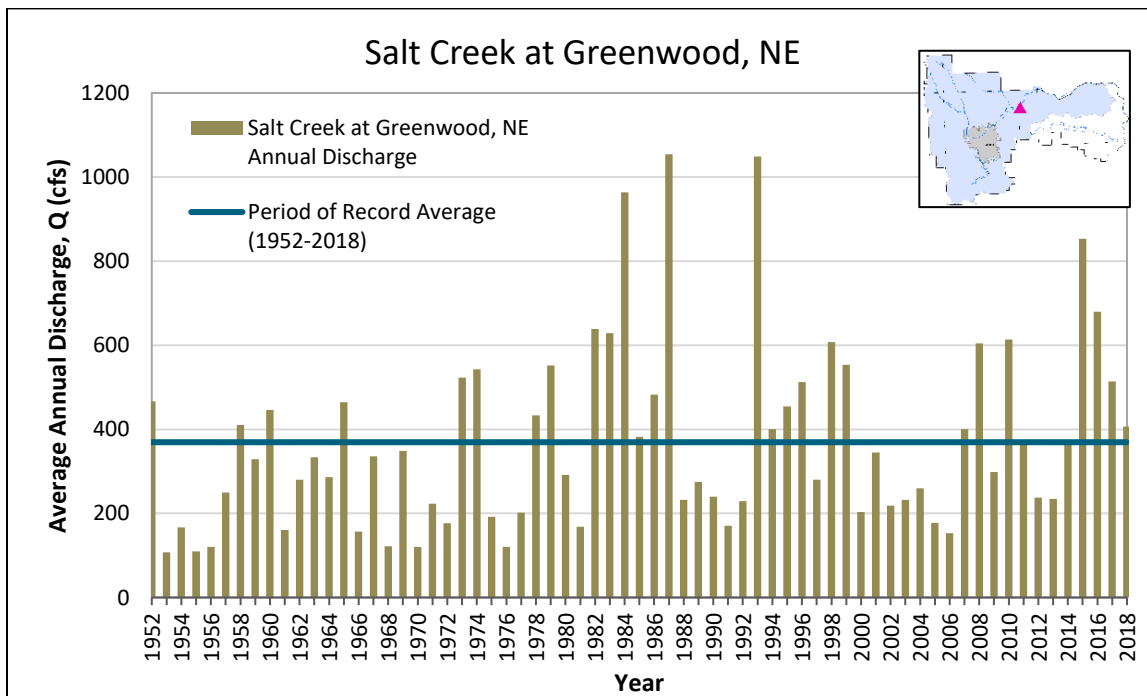


Figure 3: Historical annual discharge Salt Creek at Greenwood, NE (Source: USGS-NWIS. Some provisional data used).

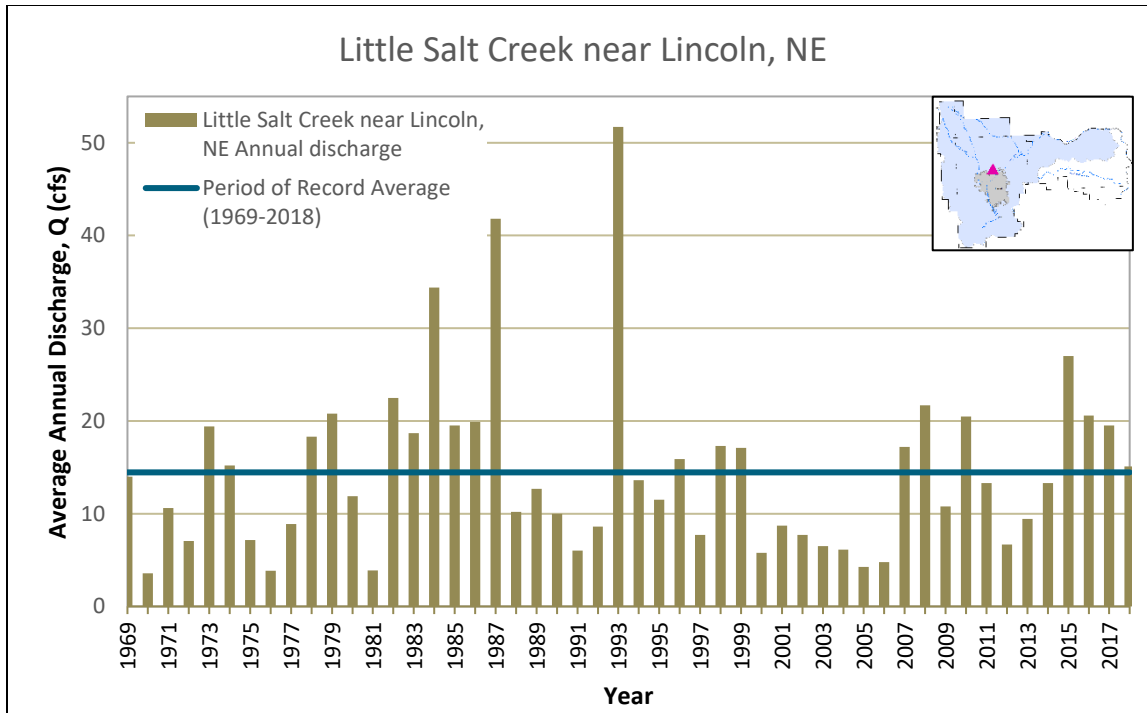


Figure 4: Historical annual discharge for Little Salt Creek near Lincoln, NE (Source: USGS-NWIS. Some provisional data used).

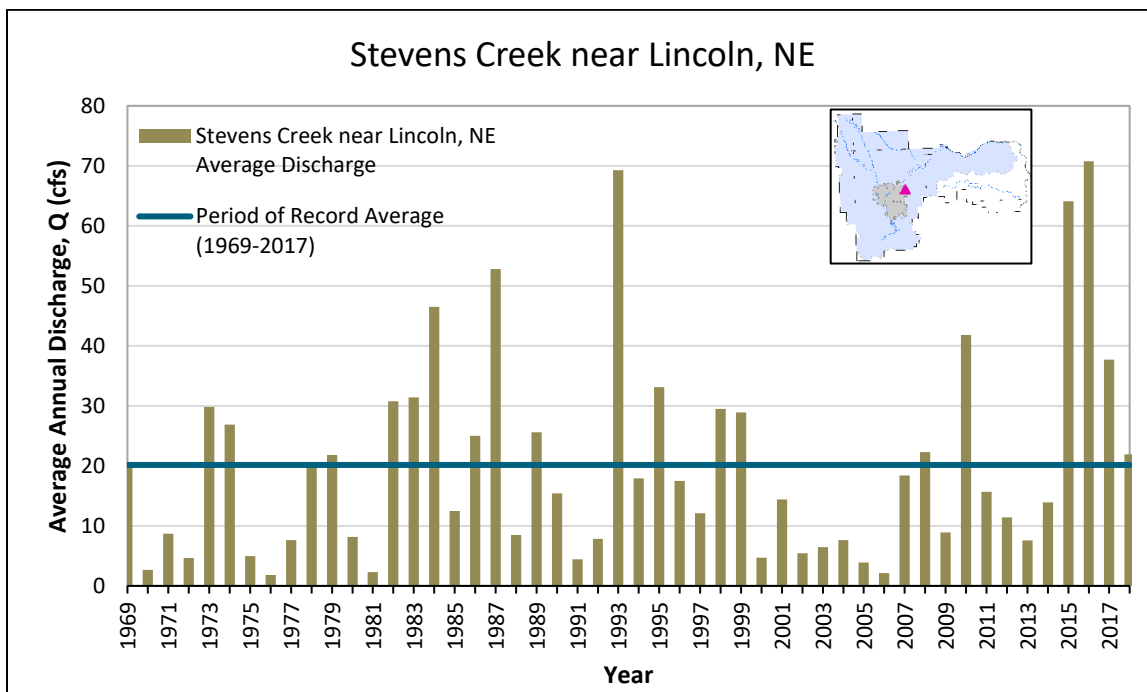


Figure 5: Historical annual discharge for Stevens Creek near Lincoln, NE (Source: USGS-NWIS. Some provisional data used).

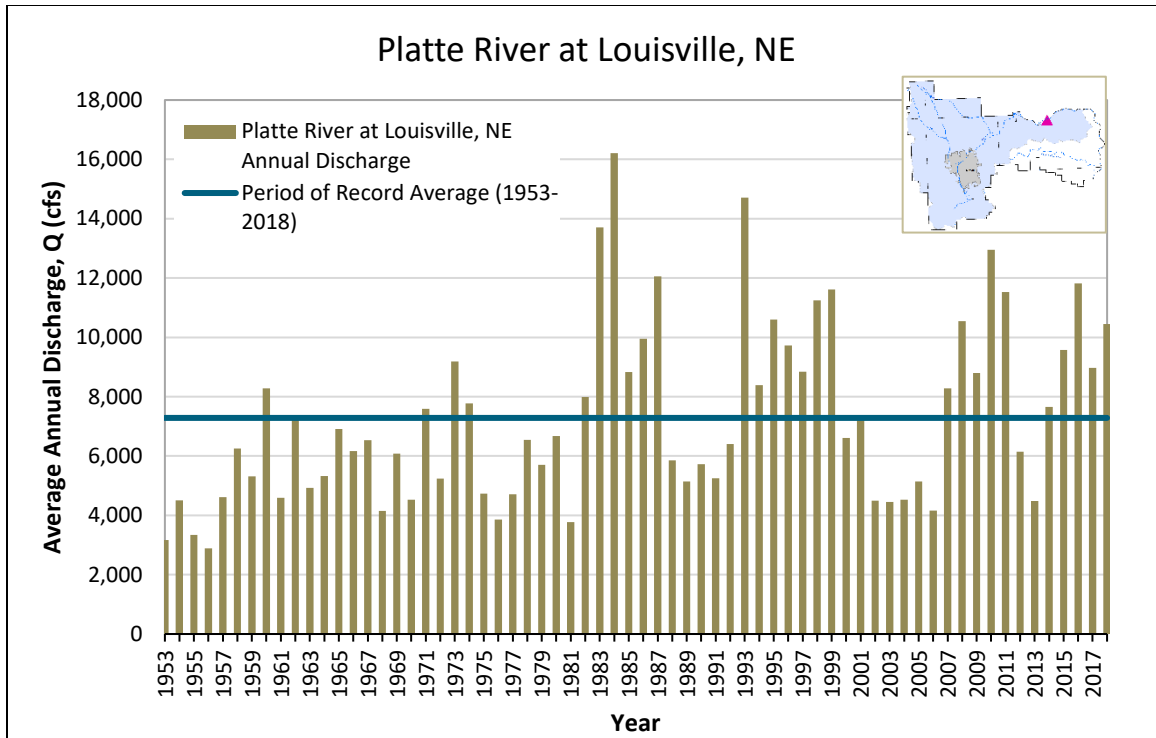


Figure 6: Historical annual discharge for the Platte River at Louisville, NE (Source: USGS-NWIS. Some provisional data used).

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 surface water permitting actions that resulted in a change in surface water irrigated acres. Table 2 provides a summary of the irrigated acres change from all surface water permitting actions in 2018.

New surface water permits resulted in an additional 113 acres in the Lower Platte River Basin and 75 acres in the Missouri River Tributaries Basin, for a total of 187 acres for the whole NRD. Cancelled surface water permits totaled 681 acres, most of which (556 acres) were in the Lower Platte Basin portion of the District. Cancellations either applied to a portion surface water permitted acres (345 total acres), or to the entirety of the acres associated with a surface water permit (336 total acres). Cancellations of surface water permits were due to non-use, user relinquishment or failure to beneficially use the water in the time given.

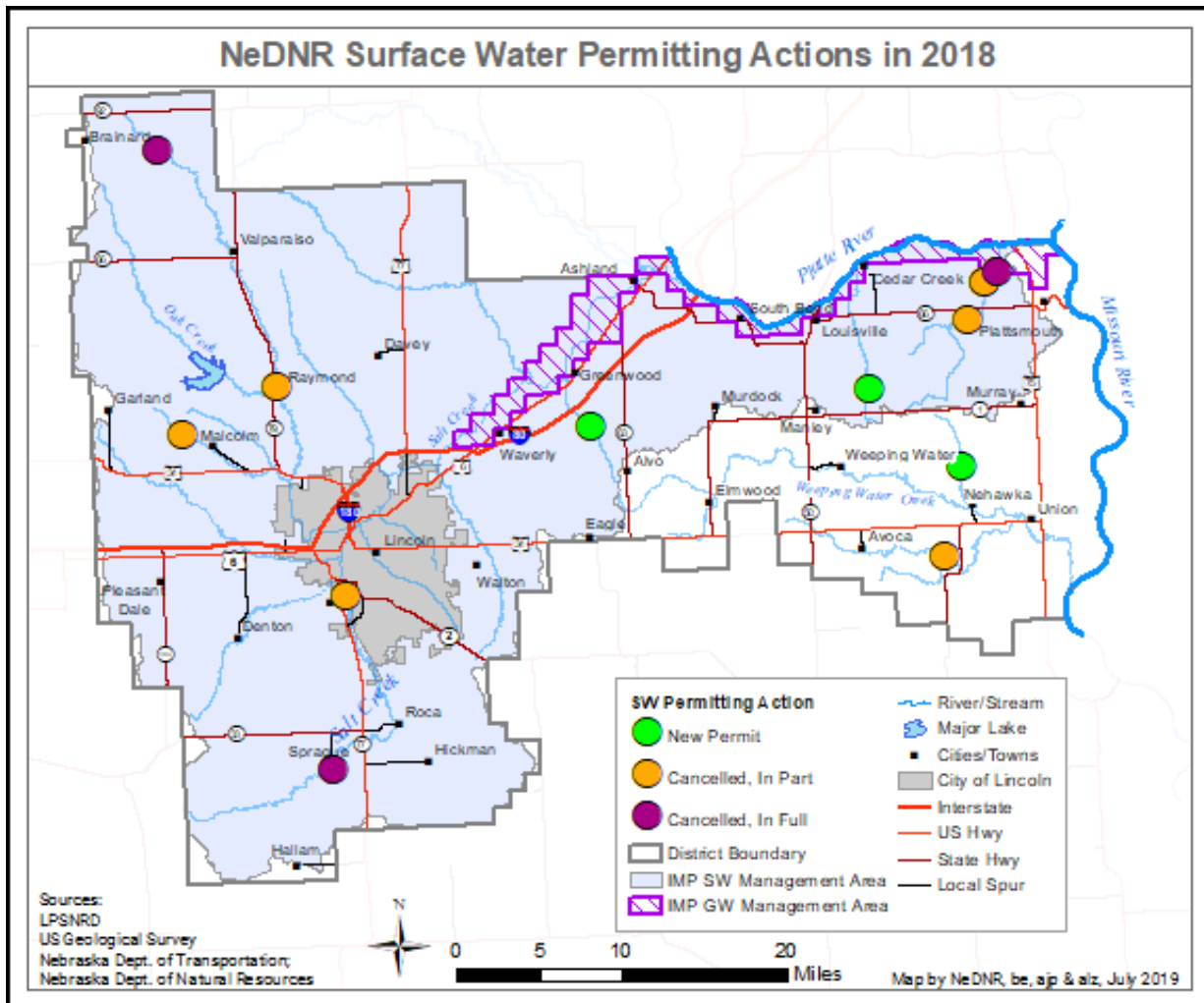


Figure 7: Map showing the location of surface water permitting actions in 2018.

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

Irrigated Acres Changes Associated with Surface Water Permitting Actions				
Geographic Area	Newly Permitted	Cancelled, in Full, Acres	Cancelled, in Part, Acres	Total Cancelled Acres
Lower Platte River Basin	113	336	219	556
Missouri River Tributaries Basin	75	0	125	125
Total (Whole NRD)	187	336	345	681

Table 3 through Table 6 provide individual listings of all surface water permitting actions in 2018, including new permits, partially cancelled permits, fully cancelled permits, and surface water permit transfers. The tables also provide information such as the type of surface water use, date of the actions, source of the supply, and volume for pumping and associated acreage (if applicable).

In 2018, NeDNR approved two surface water applications for irrigation from a natural stream and one temporary permit for use in road construction (Table 3). NeDNR partially cancelled seven surface water rights (Table 4) and fully cancelled three surface water rights (Table 5). The cancellations included ten permits to irrigate using surface water from natural flows. Two surface water rights were transferred in 2018 (Table 6). The transfers were expedited transfers of the location of use, which means no increase in the number of acres and the diversion point may not change significantly.

Table 3: New surface water permits approved in 2018.

New Surface Water Permits Approved in 2018						
Appropriation Number	Approval Date	Use	Source	Acres	Grant in cfs	Location of Diversion
A-19462	1/8/2018	Irrigation	Cedar Creek	112.7	1.61	S7-T11-R12E
A-19582	3/27/2018	Irrigation	Weeping Water Creek, North Branch	74.8	1.07	S6-T10-R13E
A-19598	6/7/2018	Construction (Temporary)	Dee Creek	NA	1.00	S21-T11-R9E

Table 4: Surface water permits partially cancelled in 2018.

Partially Cancelled Surface Water Permits in 2018						
Appropriation Number	Cancellation Date	Use	Source	Grant Cancelled	Acres Cancelled	Location of Diversion
A-13137	1/8/2018	Irrigation	Fourmile Creek	0.27 cfs	19.1	S9- T12- R13E
A-14032	1/8/2018	Irrigation	Fourmile Creek	0.28 cfs	19.5	S9- T12- R13E
A-11078	3/27/2018	Irrigation	Elk Creek	0.23 cfs	16.6	S18- T11- R5E
A-10863	4/16/2018	Irrigation	Salt Creek	0.14 cfs	10.0	S2- T9- R6E
A-6173	4/16/2018	Irrigation	Oak Creek, North	0.01 cfs	0.9	S6- T11- R6E
A-19122	11/1/2018	Irrigation	Weeping Water Creek, South Branch	1.79 cfs	125.2	S36- T10- R12E
A-9108	11/15/2018	Irrigation	Eight Mile Creek	2.19 cfs	153.4	S20- T12- R13E

Table 5: Surface water permits fully cancelled in 2018.

Surface Water Appropriations Fully Cancelled in 2018						
Appropriation Number	Cancellation Date	Use	Source	Grant Cancelled	Acres Cancelled	Location of Diversion
A-5542	2/23/2018	Irrigation	Salt Creek	0.28 cfs	39.0	S34, T8, R6E
A-15332	5/23/2018	Irrigation	Bachelor Creek	1.56 cfs	109.1	S3-T12-R13E
A-13862A	6/7/2018	Irrigation	Oak Creek, North, Trib. To	2.68 cfs	188.0	S19-T14-R5E

Table 6: Surface water permits transferred in 2018.

Surface Water Appropriations Transferred in 2018					
Appropriation Number	Approval Date	Transfer Type	Use	Source	Location of Diversion
A-14032	3/2/2018	Expedited Transfer of the Location of Use	Irrigation	Four Mile Creek	S9-T12-R13E
A-13137	3/2/2018	Expedited Transfer of the Location of Use	Irrigation	Four Mile Creek	S9-T12-R13E

Voluntary Surface Water Use Reporting

2018 was NeDNR's fourth year of implementing a voluntary water use reporting program in LPSNRD to estimate water use in areas where reporting is not currently required. To do this, NeDNR sent out postcards and letters to surface water irrigation permit holders within LPSNRD, inviting them to participate in the voluntary reporting program. Participants could submit information via a hardcopy form, an online form, or by calling in to NeDNR. In 2018, 58 reports were received out of 206 potential water rights, resulting in a 28 percent response rate. This response rate is similar to the 29 percent response rate in 2017. The 2015 and 2016 response rates were 30 percent and 22 percent, respectively.

The data collected through the voluntary water use reporting program includes information about whether a surface water permit holder irrigated that year, what types of crops were grown, and reasons for not irrigating (if applicable). In 2018, about 76% of surface water appropriators did not utilize their surface water permit. Figure 8 provides a graphic of general reasons for non-use of a surface water permit. Primary reasons in 2018 include adequate precipitation (62%) and no equipment set up to irrigate (18%). Other reasons for non-use of a surface water permit include land use change from cropland (8%), inadequate local supply (2%) and an individual producer preference to use groundwater for irrigation (2%).

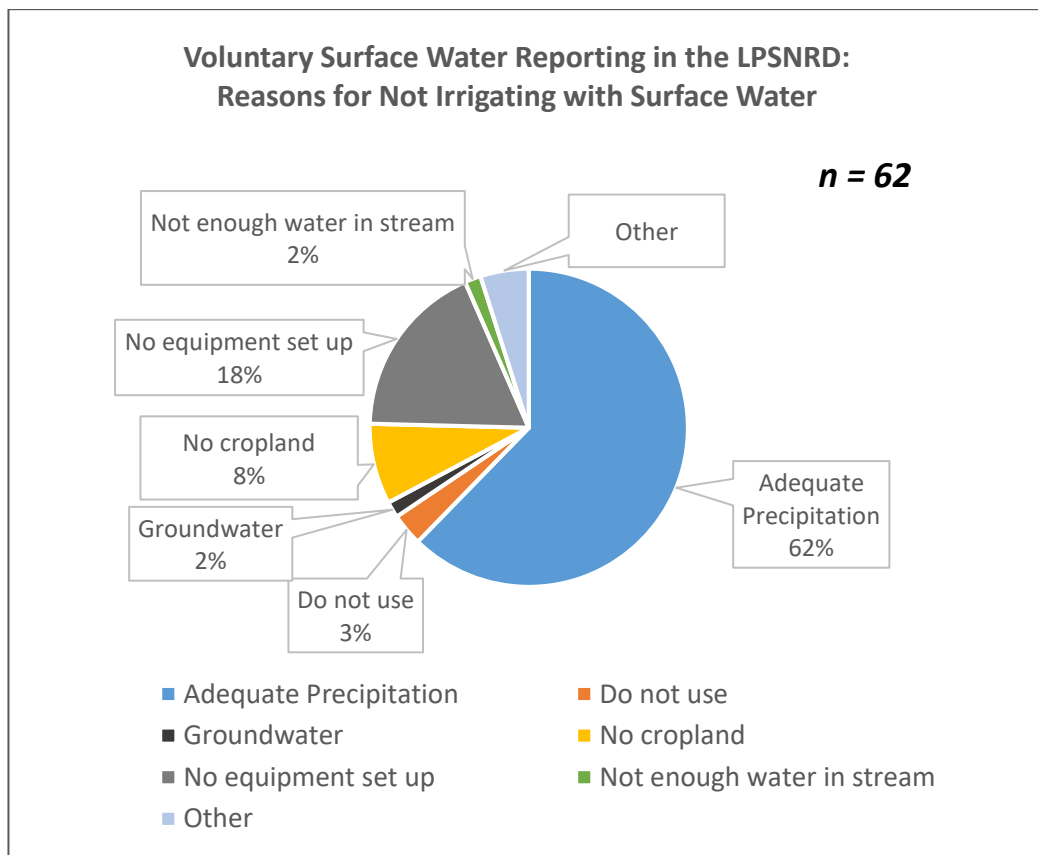


Figure 8: Graphic showing general reasons for non-use of surface water permits in 2018.

Surface Water Pump-Site Visits

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

In 2018, 50 surface water pump-sites out of 208 total for LPSNRD (24%) were inspected by NeDNR Field Office staff. Of the inspected pump-sites, 48 were for surface water irrigation from a natural flow (stream or river) and two were for surface water irrigation from storage facilities (pond or reservoir). Six of the pump-sites were set up for surface water irrigation at the time of inspection.

Groundwater Monitoring

IMP Groundwater Management Area

There are a total of 381 wells in the Hydrologically Connected Area (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 33 irrigation wells, 6 commercial wells, and 6 other wells which, when combined, account for 295 million gallons of groundwater pumped (Figure 9). Also in the HCA area, there are 213 registered domestic wells, 70 registered public water supply wells, and 53 unregistered domestic wells (Figure 10). 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.

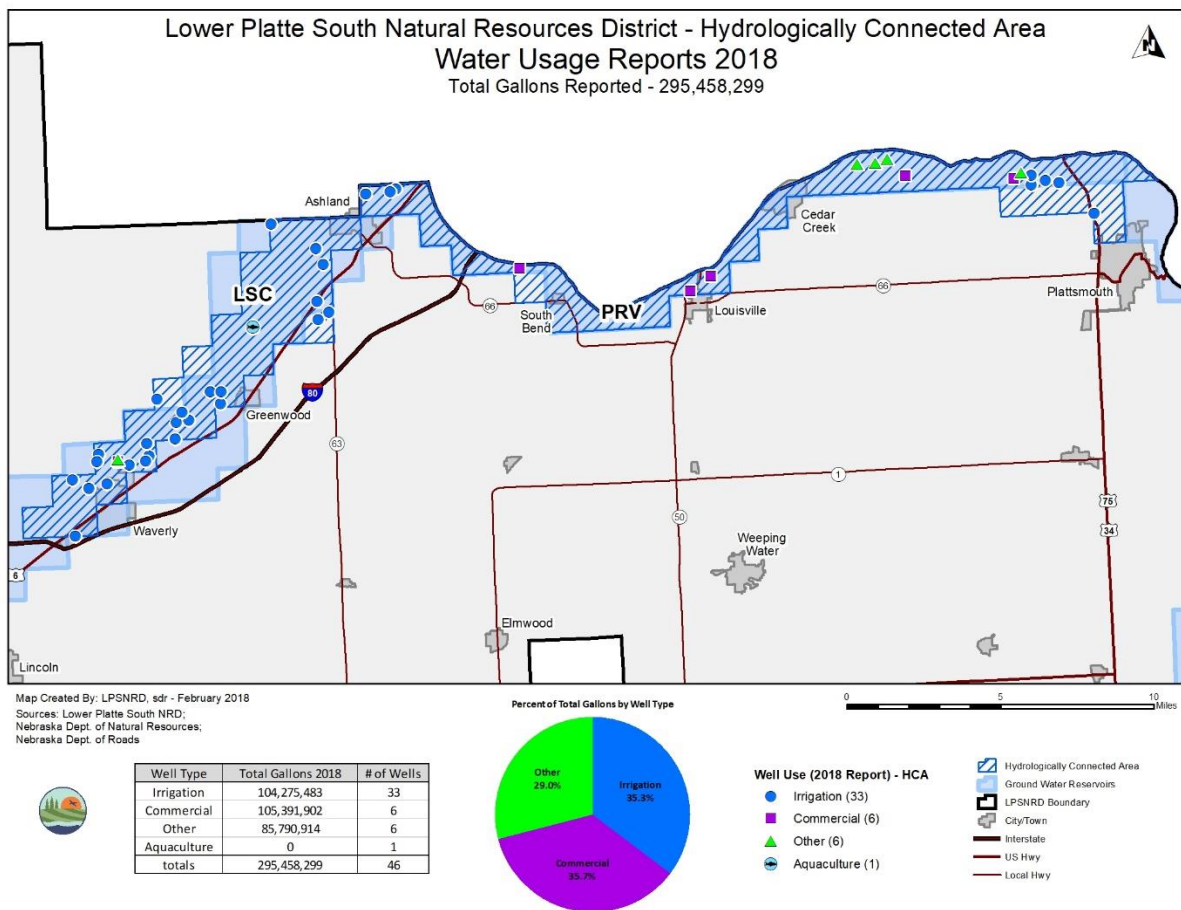


Figure 9: Groundwater use in the hydrologically connected area (HCA) of LPSNRD.

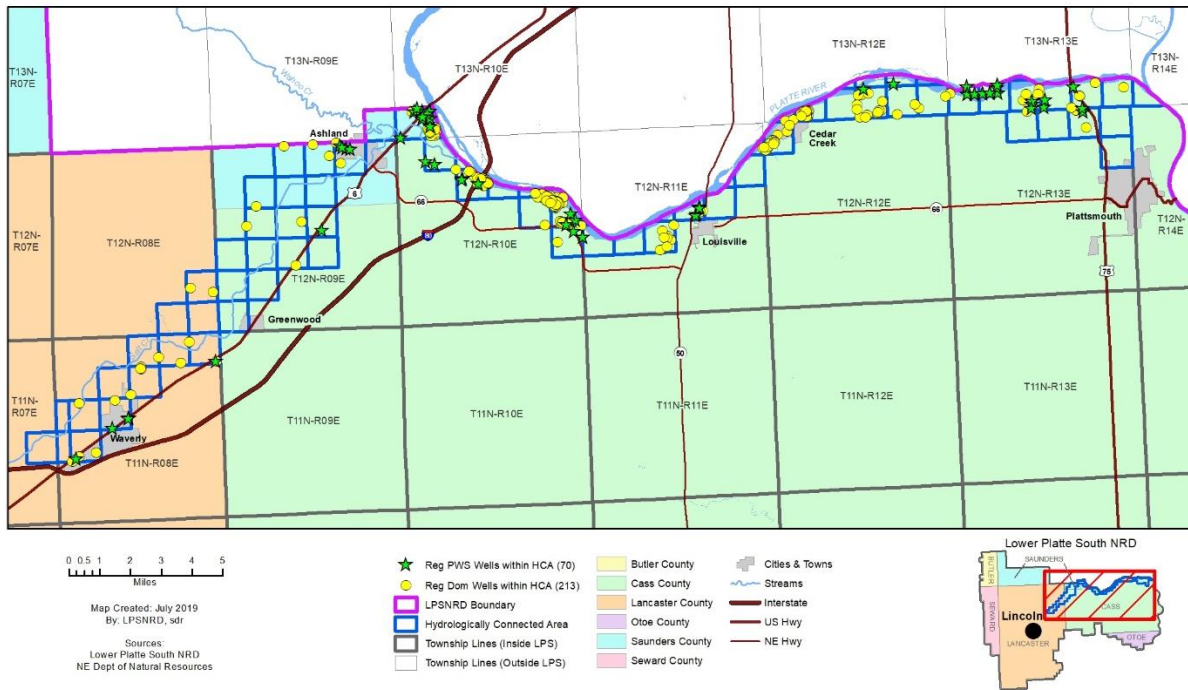


Figure 10: Registered domestic and public supply wells in the hydrologically connected area (HCA) of LPSNRD.

Metering and Groundwater Level Monitoring

All wells with capacity to pump over 50 gallons per minute (gpm) are metered, which numbered 412 in LPSNRD at the close of 2018. LPSNRD collected records of usage from these wells and all public supply wells. The calculated total pumping for 2018 from the 412 metered wells was 3.4 billion gallons, with 312 irrigation wells accounting for 59.37 percent of the total measured pumping. This total pumping volume did not include the public supply wells. In addition, LPSNRD inspected and read 119 groundwater well meters during 2018.

LPSNRD also collected groundwater level data from 137 wells in the spring and fall of 2018 and 134 of those wells are part of LPSNRD’s official water level network. Of those, 81 wells showed declines and 53 wells showed an increase from spring 2017 to spring 2018; the maximum decline was 10.5 feet while the maximum increase was 7.95 feet, with an average static water level decrease of 0.39 feet. Figure 11 shows a spatial representation of groundwater level changes. The average change by groundwater reservoir is shown in Table 7.

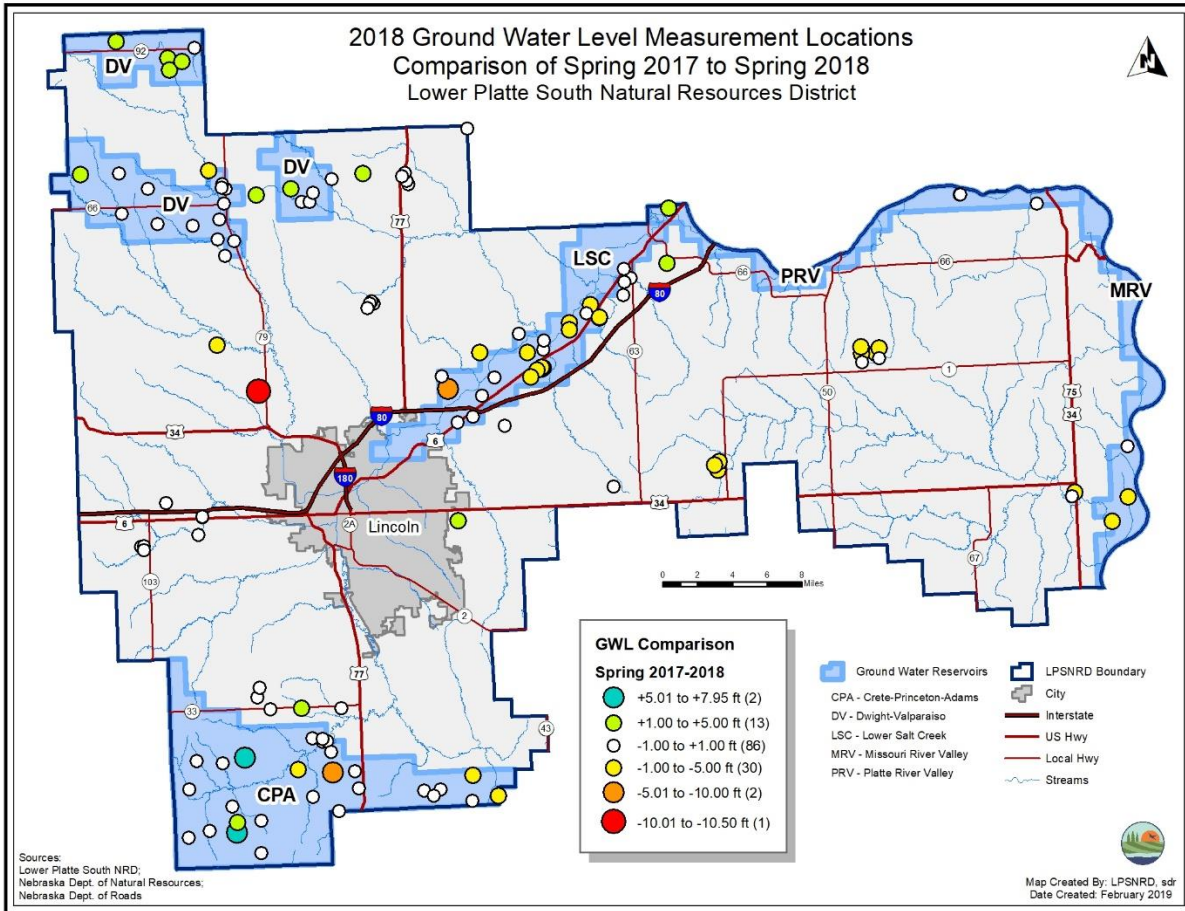


Figure 11: 2018 groundwater level comparison of spring 2017 to spring 2018 measurements.

Table 7: Average well level change by groundwater reservoir, spring 2017 to spring 2018.

Average Well Level Change by Groundwater Reservoir	
GW Reservoir	Spring '17 to Spring '18 (ft)
Crete-Princeton-Adams	-0.42
Dwight-Valparaiso	0.48
Lower Salt Creek	-1.31
Missouri River Valley	-1.98
Platte River Valley	1.46
Remaining Area	-0.28

Groundwater Permitting Activities

LPSNRD issued 11 well permits in 2018 for varied uses, as reported in Table 8 and the locations of which are shown in Figure 12. Figure 13 shows the permitting activities for the hydrologically connected area; there, one water well permit was completed in 2018. All statutory well-spacing minimum requirements were followed for all new and replacement wells.

Table 8: LPSNRD approved or completed groundwater wells in 2018.

Approved GW Well Permits in 2018	Number of Permits	Completed wells in 2018	
Irrigation	3		
Commercial	1	From 2017 Permits	4
Domestic	2	From 2018 Permits	2
Geothermal	1		
Livestock	3		
Other	1		
Total	11	Total	6

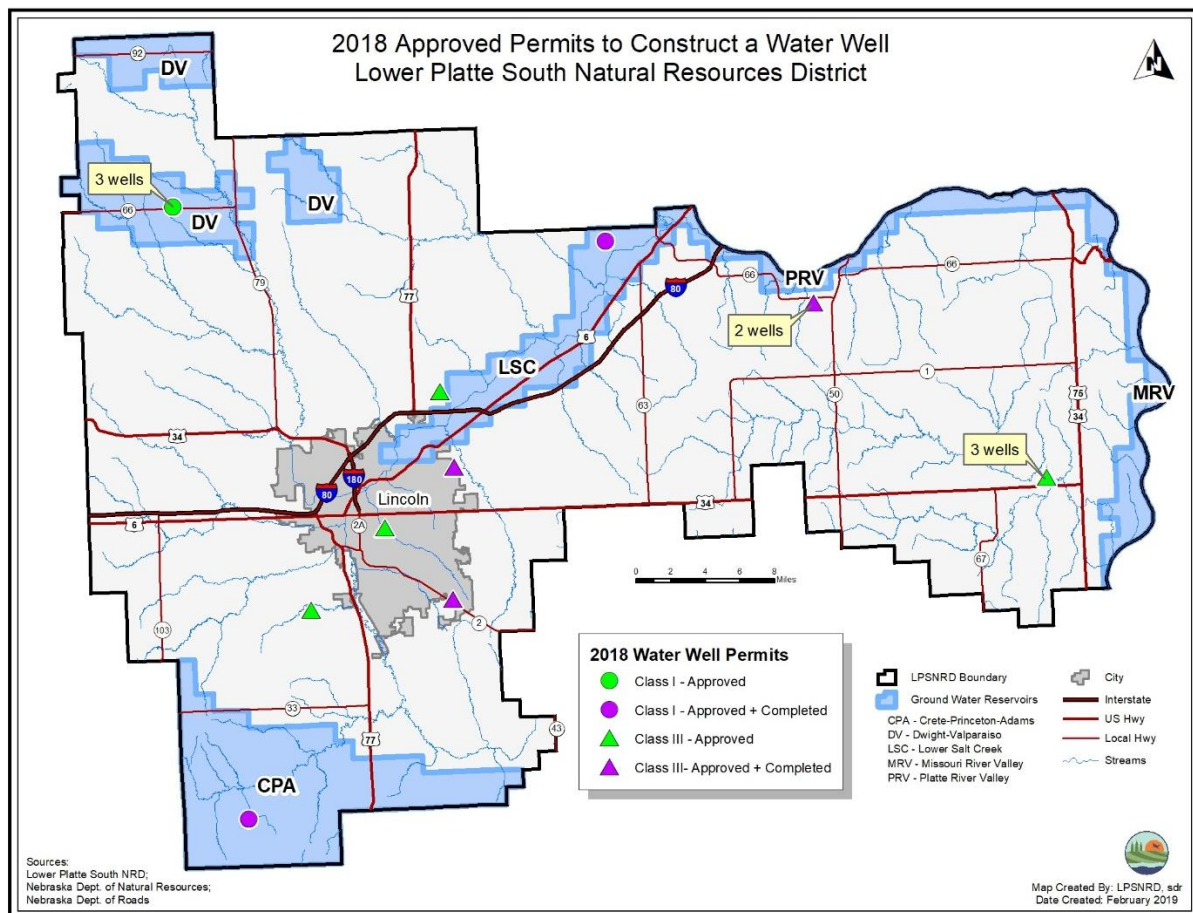


Figure 12: LPSNRD groundwater well permits approved or completed in 2018.

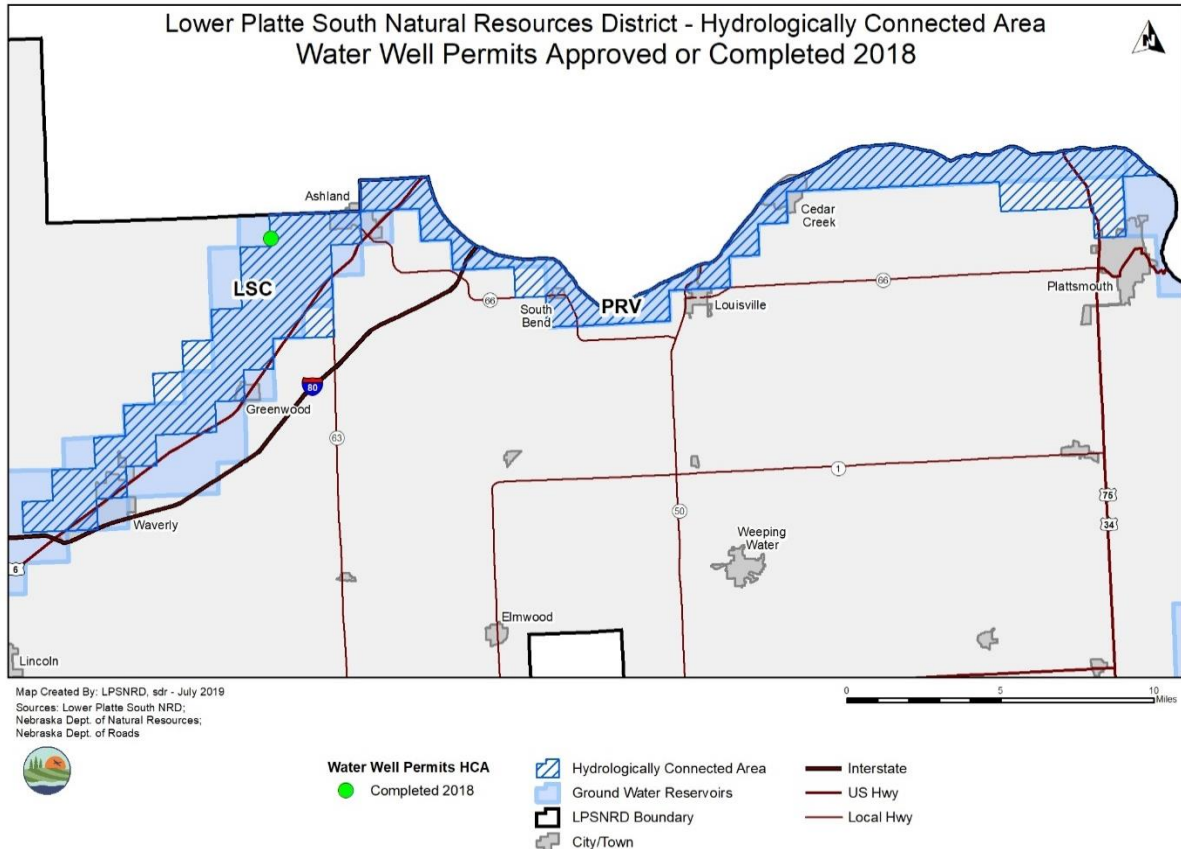


Figure 13: One LPSNRD groundwater well permit was approved in the HCA in 2018.

Land Use and Land Cover (LULC) Monitoring and Actions

In 2018, 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 14. In the remainder of LPSNRD, an additional 434.23 groundwater irrigated acres were certified in 2018, for a total of 27,492.33 acres district-wide. The district-wide extent of certified acres is shown in Figure 15. There were no requests for variances in 2018.



Completed Irrigation Certifications in Hydrologically Connected Area - Lower Platte South Natural Resources District

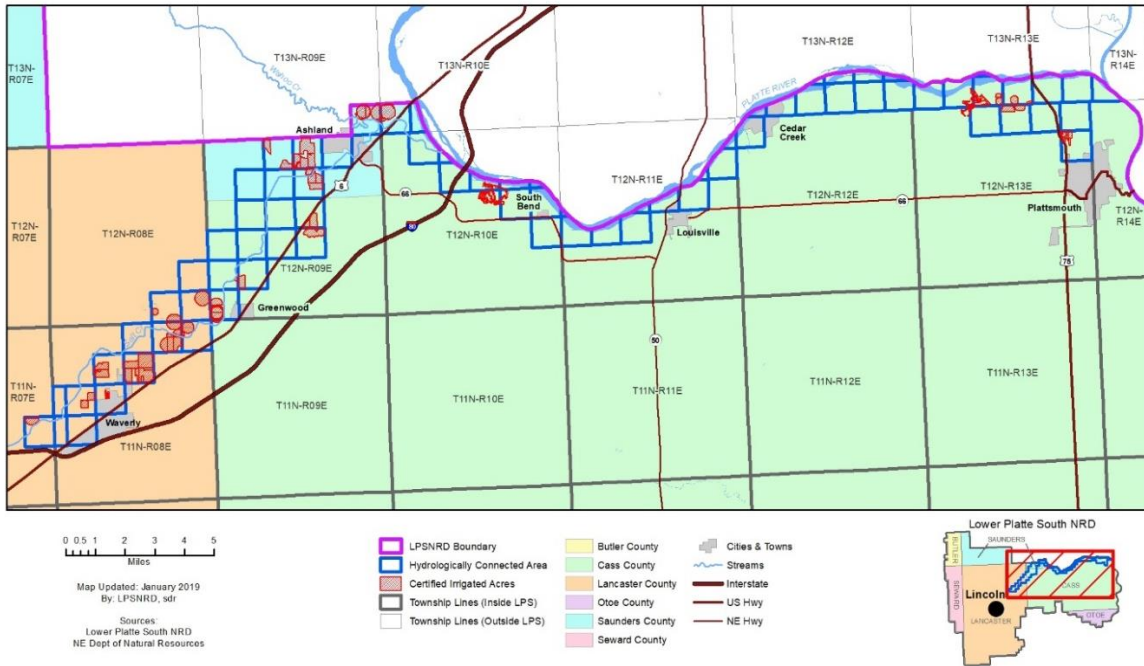


Figure 14: 2018 HCA certified groundwater irrigated acres.

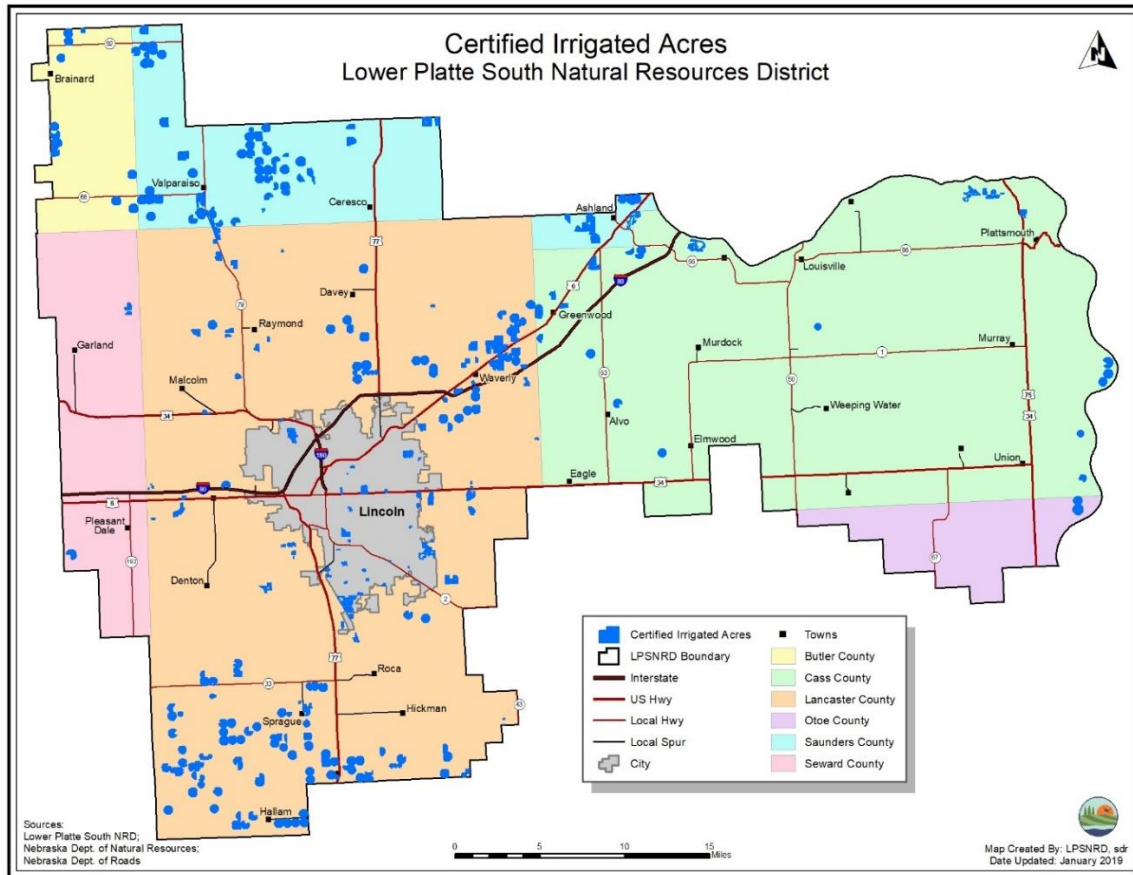


Figure 15: 2018 District-wide certified groundwater irrigated acres.

2018 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 Dwight-Valparaiso-Brainard Special Management Area (Figure 12), but a rule to not allow an increase in irrigated acres and pumping allocations for irrigated land continues to be in effect.

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 for each year. A limit of 198 surface water acres has and continues to be in place for the surface water management area in LPSNRD. This 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 acres limitations. 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 completed recently 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. This 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 LPSNRD’s 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 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 while developing more robust monitoring and forecasting tools coupled with timely triggers, new mitigation strategies and responsive actions to create a sound operational framework, and 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 is expected to be completed in September 2019.

Stream Accretion and Depletion Calculator Expansion

NeDNR is planning to expand the stream accretions/depletions calculator that is currently used in the Upper Platte Basin to the Lower Platte River Basin. The calculator will utilize stream depletion factors derived from NeDNR’s Lower Platte Missouri Tributaries model. The calculator will allow 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 will provide 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 16). The model is currently being used to assess changes in the extent of the hydrologically connected area and may be used for future updates to NeDNR’s Annual Evaluation of Availability of Hydrologically Connected Water Supplies. The model is also intended to support IMP monitoring

and will be made available for use by NRDs through the NeDNR’s SUSTAIN tool, which provides a user-friendly environment to run various management action scenarios through NeDNR’s models. Additional modeling activities have been ongoing with the Lower Elkhorn NRD to evaluate approaches for future integration of Airborne Electromagnetic (AEM) data into the model. The first phase of these activities concluded in FY 2019 and the second phase is expected to initiate in early FY 2020 and continue through FY 2021.

NeDNR will continue development of the southern portion (Nemaha Model) (Figure 16), with completion of this model expected to occur in FY 2021. Upon completion, the Nemaha model will also be incorporated into the INSIGHT and FAB analyses. NeDNR will also continue to support efforts of ENWRA to evaluate whether the coupling of groundwater modeling tools and airborne geophysical studies will help improve understanding of hydrologic connections between aquifers and streams.

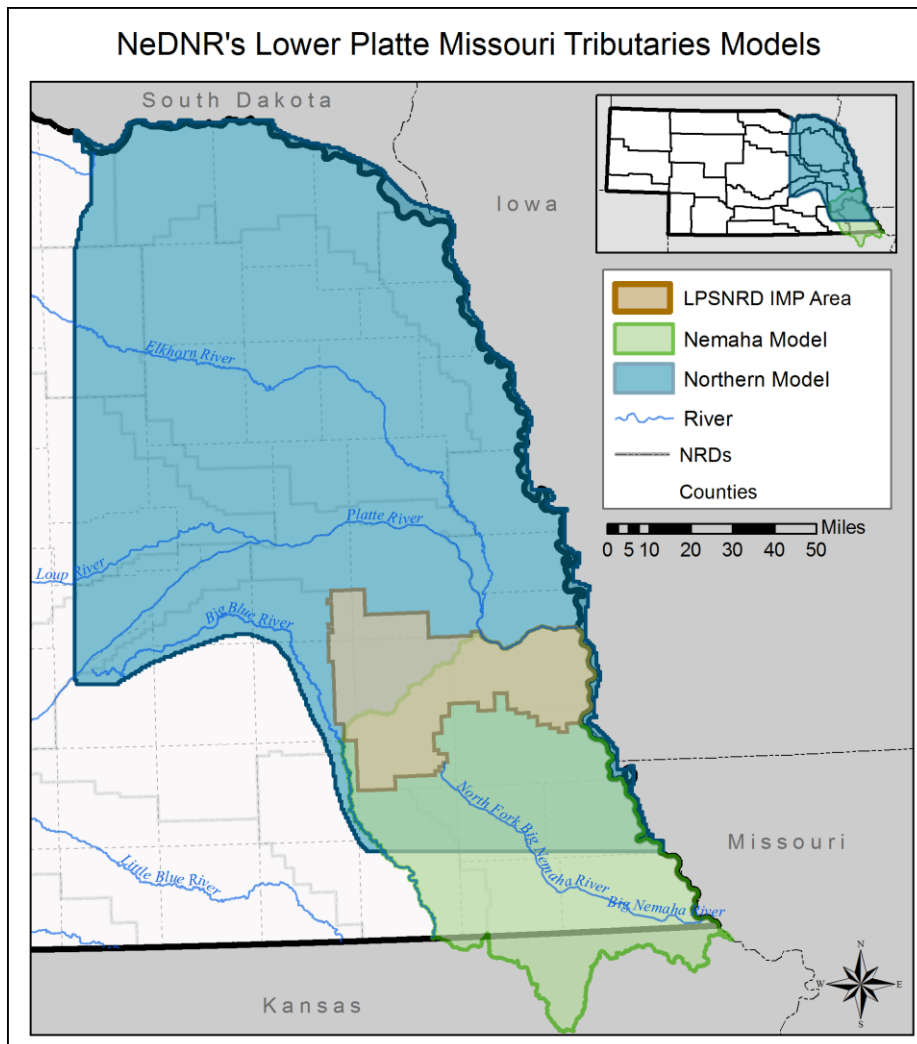


Figure 16: Geographic areas of NeDNR’s Lower Platte and Missouri Tributaries models.

Water Inventory and Water Use/Supply Management

LPSNRD Accomplishments

LPSNRD has continued collection and sharing of data and has worked to improve the database that houses this information. LPSNRD further reviewed groundwater well permits relative to aquifer capacity and sustainability. LPSNRD also continued the open dialogue with public water suppliers on current and future water supplies and supported storm water capture and reuse projects in the district. LPSNRD previously contracted with JEO to conduct a preliminary study on alternatives and estimated costs to provide a potable water supply to the Interstate 80-Exit 426 interchange area in Cass County, supplied by the City of Ashland wellfield. There has been additional discussion regarding a similar study at the Interstate 80-Exit 420 interchange area. LPSNRD has continued 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 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, but this 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 Republican River Basin in 2017.

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 2018, NeDNR participated in the following statewide or regional events:

- Husker Harvest Days,
- Nebraska State Fair,
- Nebraska Women in Agriculture conference,
- Nebraska Association of Resource Districts conferences,
- Nebraska State Irrigation Association/Nebraska Water Resources Association joint convention, and
- Nebraska Planning and Zoning Association/American Planning Association--Nebraska Planning conference.

In FY 2019, NeDNR also engaged with stakeholders and local partnering agencies at the following community events:

- Various, locally-sponsored water tours, and
- World O! Water in Papillion.

Educational Interactive Web Applications

In 2018, NeDNR released the second application in a series of new educational applications, called Stream Simulations (Figure 17). This interactive application illustrates the relationship between groundwater pumping and stream depletions under different hydrologic systems—a gaining stream, a losing stream, and a disconnected stream—as well as how pumping can change the connectivity of a stream to its adjacent aquifer. Depending on which simulation they are exploring, users can change well location or pumping intensity. The application also features a tutorial and optional voice narration. Also in 2018, NeDNR updated and added some additional features to the first application in the Stream Simulations series, which introduces users to basic interactions between surface water and groundwater, such as how water flows between a stream and an adjacent aquifer and how precipitation and soil texture affect runoff, recharge, and streamflow.

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

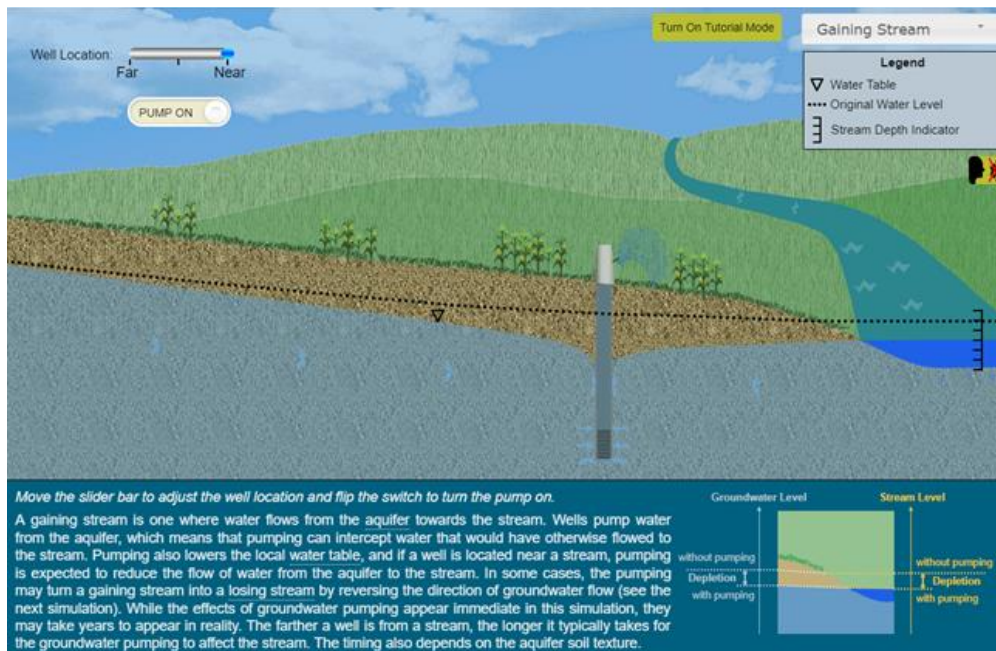


Figure 17: Screenshots of NeDNR's educational interactive web applications.

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 website Home page and in LPSNRD's newsletter.

As noted on the following page under Collaboration with Other Entities, LPSNRD has completed a collection of airborne electromagnetic (AEM) data for the NRD. Information and reports on the AEM flights can be accessed and downloaded from the Eastern Nebraska Water Resources Assessment (ENWRA) website at www.enwra.org/aem2016.html.

The NRD has continued to host "Test Your Well Nights" events for specific areas each year. Private well owners are able to bring water samples in to be tested for nitrates and LPSNRD worked with local FFA chapters and science students to test the water.

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, January 2016, March 2017, and in March 2018, where they were updated by LPSNRD staff and contributed their own input. The group also met back in February 2015 to be updated on aerial electromagnetic imaging activity in DVB.

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.

Collaboration with Other Entities

Eastern Nebraska Water Resources Assessment

Both LPSNRD and NeDNR participated in the Eastern Nebraska Water Resources Assessment (ENWRA) program in 2018 to cooperate on hydrogeologic data research and modeling. ENWRA's participants include six NRDs in eastern Nebraska and NeDNR. As a part of that study effort, LPSNRD continued both the interlocal cooperative agreement with ENWRA and the Water Sustainability Fund (WSF) contract no. 5189 with NeDNR for additional helicopter based-geophysical remote sensing, termed Airborne Electromagnetic Survey (AEM), to determine aquifer locations and thicknesses.

In FY 2018, LPSNRD cooperated with the other ENWRA NRDs on the \$1.968 million WSF contract no. 5189 project award to further the AEM mapping of eastern Nebraska. Through the award allocations LPSNRD received \$510,000 of these WSF funds and budgeted \$340,000 of its own funds to complete the AEM data collection efforts in LPSNRD. This final effort collected AEM data over the western portion of the LPSNRD, and concentrated on Community Water System Protection Areas (CWSPAs) for the communities of Ceresco, Davey, Raymond, Malcolm, Emerald, Garland, Pleasant Dale, and Denton. Additional grid transect flights provided data on the rural areas of the western portion of LPSNRD, especially the areas around Branched Oak and Pawnee Lakes, where residential acreage development is increasing. The final report for the 2018 AEM flights in LPSNRD is anticipated in November 2019.

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 could subsequently be 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. 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 the 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 is expected to be finalized in September 2019. The LPRDCP will analyze the 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 Environmental Quality, 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.

Other Collaborations

The LPSNRD cooperated with the USGS on collection of surface water/streamflow data. In 2015, LPSNRD staff initiated contact with USGS personnel to begin identification of new streamgage locations in the Oak Creek drainage of the Dwight-Valparaiso-Brainard Special Management Area, and two new gages were installed in 2016 near the village of Valparaiso and the unincorporated community of Touhy. This effort utilized the AEM data from 2013, 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.

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 is continued 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 monitor groundwater level changes through its network of groundwater monitoring wells. (LPSNRD)
6. 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)
7. Continue to collect information on municipal, rural water, and non-municipal industrial water use, land use and population changes, and changes in climate. (LPSNRD)
8. Develop recommendations for the development and management of geographic areas with limited aquifers. (LPSNRD)
9. Conduct discussions with municipalities and rural water districts on coordinating services with regional systems and on water shortage action plans. (LPSNRD)
10. Continue surface water monitoring activities including tracking surface water permit changes, pumpsite inspections and the voluntary surface water use reporting program. (NeDNR)
11. Continue technical analyses and development of tools (INSIGHT, SUSTAIN) for water management, expanding the network to eastern Nebraska as data become available. (NeDNR)
12. Continue development of the Lower Platte Missouri Tributaries models and convey progress and outcomes to LPSNRD. (NeDNR)