



2019

LOWER PLATTE RIVER BASIN COALITION ANNUAL REPORT



FINAL

February 28, 2020

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2019 ANNUAL DOCUMENTATION OF IN THE LOWER LOUP NRD

REQUIREMENT OF LOWER PLATTE RIVER BASIN COALITION (LPRBC)

BASINWIDE WATER MANAGEMENT PLAN

CERTIFIED IRRIGATED ACRES

The Lower Loup Natural Resources District (LLNRD or District) began the process of irrigated acres certification in 2006 and it was completed January 1, 2008. The District required that both groundwater and surface water irrigated acres be certified through its process. The acres to be certified must be capable of receiving groundwater or surface water through irrigation works, mechanisms or facilities at the time. The certification must include a completed District certification form, an assessor document with a raised seal, and FSA aerial photo with irrigated fields delineated. A District Geographic Information System (GIS) dataset of the field boundary was created using ArcGIS to allow accounting and compliance reviews.

Subsequent to January 1, 2008, to certify a property as being irrigated, a landowner must show proof of irrigation at least 2 out of the 10 years for the period from 1997 – January 1, 2008. Documentation considered for the process of certification includes, but is not limited to: FSA historical photos and “578” forms depicting certified irrigated boundaries, county assessed records, and conservation easement agreements with programs such as CRP. Certification is constantly tracked through GIS, and field boundary adjustments take place as needed. Additionally, the entire District is flown for active chlorophyll measurements recorded through infrared photography. Irrigation totals are measured and policed to prevent deviation from the original certification by NRD staff. The 4-band imagery is collected in late August into early September to ensure crop maturity and further differentiate between those areas impacted by irrigation and those without.

Detailed data regarding amount and water source of certified irrigated acres in the period between January 1, 2019, and December 31, 2019, can be found in **TABLE 1. Certified Acres** below. The LLNRD GIS has been synched with its data management system to allow for more accurate drawings and better database access through the District program. This process assists with identification of duplicates and erroneously drawn fields and allows staff to “clean” the database.

Table 1. Certified Acres 2019

Year	Total Acres Certified	Acres of Groundwater	Acres of Surface Water	Acres of Co-Mingled
2019	1,222,623.19	1,021,728.46	153,680.81	47,213.92

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MUNICIPAL AND INDUSTRIAL GROUNDWATER USE

The LLNRD is in the fourth year of collecting municipal water use data. Developing and maintaining a comprehensive inventory of the location and source of the District's current and future water supplies, water uses, and outflows was Objective 1.1 of the Integrated Management Plan developed by the NRD and the Nebraska Department of Natural Resources. To collect this data, a Municipal Accounting Form was developed and sent to the water operators of each community.

As of 2/28/2020, 42 out of 43 public water supplies have sent in their water accounting information for 2019. Mason City failed to report, so an estimate was included in the 2019 data chart. Each year, the NRD calculates the daily use per person. This year, due to the increased rainfall, overall use was down slightly to 207 gallons, per person per day, being used, compared to 225 gallons in 2018.

In April of 2019, the LLNRD updated the Groundwater Management Area Rules and Regulations to include commercial, industrial, and high-capacity (greater than 50 gallons per minute) livestock well use and accounting. The LLNRD is in its first year collecting this type of well use information.

City Name	2019 Water Pumped	Population	Gal/per capita/per day	Connections	Metered
Albion, City of	99,916,000	1,650	165.9	850	Yes
Anselmo, Village of	29,986,100	159	516.7	100	Yes
Ansley, Village of	32,633,500	441	202.7	262	Yes
Arcadia, Village of	25,904,300	311	228.2	200	No
Arnold, Village of	53,000,000	597	243.2	388	Yes
Ashton, Village of	12,554,000	196	175.5	140	Yes
Bartlett, Village of	15,348,000	124	339.1	70	No
Belgrade, Village of	15,141,100	138	300.6	82	No
Boelus, Village of	8,222,000	189	119.2	108	Yes
Broken Bow, City of	291,067,034	3,600	0.0	1,700	Yes
Burwell, City of	47,630,000	1,210	0.0	615	Yes
Cairo, Village of	44,024,000	800	150.8	325	Yes
Callaway, Village of	56,877,058	537	290.2	353	Yes
Cedar Rapids, Village of	25,436,000	382	182.4	265	Yes
Columbus, City of	1,712,240,579	22,797	205.8	9,048	Yes
Comstock, Village of	6,217,000	110	154.8	61	Yes
Dannebrog, Village of	21,757,900	350	170.3	154	Yes
Duncan, Village of	8,077,000	351	63.0	171	Yes
Elba, Village of	8,678,500	215	110.6	125	Yes
Ericson, Village of	18,795,900	90	572.2	32	No

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City Name	2019 Water Pumped	Population	Gal/per capita/per day	Connections	Metered
Farwell, Village of	17,212,000	120	393.0	60	Yes
Fullerton, City of	66,734,600	1,307	139.9	635	Yes
Genoa, City of	69,929,000	981	0.0	486	Yes
Greeley, Village of	27,852,000	431	177.0	235	Yes
Litchfield, Village of	14,075,200	285	135.3	160	Yes
Loup City, City of	46,740,000	1,029	124.4	560	Yes
Mason City, Village of	10,000,000	178	0.0	115	Yes
Merna, Village of	17,347,000	365	130.2	205	Yes
Monroe, Village of	13,969,600	284	134.8	139	Yes
*North Loup, Village of	0		0.0		
Ord, City of	409,578,000	2,409	465.8	1,334	Yes
Palmer, Village of	18,507,000	472	107.4	239	Yes
Petersburg, Village of	19,000,000	333	156.3	220	Yes
Pleasanton, Village of	20,450,000	341	164.3	188	Yes
Primrose, Village of	4,305,000	61	0.0	35	Yes
Ravenna, City of	95,153,000	1,300	0.0	625	Yes
Rockville, Village of	3,095,500	106	80.0	48	Yes
Sargent, City of	27,853,000	550	138.7	392	Yes
Scotia, Village of	16,421,916	320	140.6	150	Yes
Spalding, Village of	24,927,000	497	137.4	255	Yes
St. Edward, Village of	61,420,960	705	238.7	340	No
St. Paul, City of	110,546,000	2,300	131.7	1,019	Yes
Wolbach, Village of	61,190,000	287	584.1	188	No
Total	3,689,812,747	48,907		22,561	

*City of Ord provides water for the Village of North Loup and Green Plains Inc. Ethanol Plant

-Population numbers were supplied by the municipality

NEW GROUNDWATER CONSUMPTIVE USE – WELL CONSTRUCTION PERMITS GRANTED

The LLNRD established a well moratorium in 2007. Before this date, all high-capacity wells (greater than 50 gallons per minute) were required to be permitted via a certified well permit issued by the LLNRD as dictated by the Groundwater Management Plan. New well permits are still required for all high-capacity wells and may still

be issued for supplemental and replacement wells that are for non-irrigation uses. Any new high-capacity irrigation well must be previously approved through the variance process (see “Variance” portion of this report). LLNRD has approved 66 well permits in 2019 for varied uses as reported in the table below.

TABLE 3: APPROVED GROUNDWATER WELL PERMITS IN THE LLNRD IN 2019.

Groundwater Well Permit Types	Number of Permits	Average Pump Capacity (gpm)
Public Water Supply	1	800.00
Truck Wash	1	300.00
Irrigation (Total)	32	672.00
(Irrigation) Transfer	1	800.00
(Irrigation) Supplemental	2	250.00
(Irrigation) Variance	2	700.00
(Irrigation) New Acre	8	771.00
(Irrigation) Replacement	19	839.00
Livestock	13	174.00
TOTAL	47	579.00

APPROVED WATER TRANSFERS

The LLNRD Rules and Regulations allow any person to transfer groundwater irrigation rights from one location to another if the acres are certified by the District. Transfers can only occur downstream or to the adjacent section and cannot have a net increase impact on any stream based on the most recent stream depletion factor from the best groundwater model available. Acre transfers are only allowed to occur once per year. The deadline for application for transfer is March 1 of each year. In 2019, the LLNRD approved 31 **Agreements to Transfer Certified Irrigated Acres & Right to Use Groundwater**. There were no denials to any transfer requests. See the summary in Table 4 below. Transfer agreements are classified both by landowners who are moving their irrigated acre rights (off) and those that are receiving the rights in another location (in). Wells resulting from an approved transfer may not be reflected in the “Well Permit Granted” table under the current year.

TABLE 4: APPROVED CERTIFIED IRRIGATED ACRES TRANSFERS IN THE LLNRD IN 2019.

County	# of Agreements Receiving Land owners	# of Agreements Transferring Land owners	Acres Transferred in	# New wells resulting from Transfer	Acres Transferred off	Avg Transferred In SDF	Avg Transferred Off SDF
Boone	9	7	225.12	2	37.02	.65	.65
Buffalo	7	3	58.80	1	18.80	.23	.38
Custer	6	10	92.24	0	138.58	.35	.40
Garfield	0	8	0	0	469.14	NA	.39
Greeley	3	0	81.69	1	0	.31	NA
Nance	2	0	21.40	0	0	.44	NA
Platte	2	0	65.00	1	0	.26	NA
Wheeler	2	3	224.60	1	161.00	.38	.63
Total	31	31	768.85	6	824.54	.37	.49

WATER BANKING

The LLNRD requires that all transfers result in no new net increase in depletions to any stream utilizing the most current stream depletion number extracted from each section. The section number is averaged from the best available groundwater/surface water model for use by LLNRD. The 2019 section-assigned stream depletion

factor (SDF) was utilized using the USGS Elkhorn-Loup Model (ELM) in its Phase 3 capacity. Any transferring of irrigated acre rights from a low to a higher SDF requires an offset. Acres transferred from a higher SDF to a lower SDF are only allowed at a 1:1 ratio, with the LLNRD banking the remaining difference. As a result of the 2019 transfers, the LLNRD has banked a total of **133.97** groundwater-irrigated acres. Additional information regarding the ELM project can be found here:

<https://pubs.er.usgs.gov/publication/sir20185106>

EXPEDITED VARIANCES

The LLNRD Board of Directors has designated a set of conditions under which specific requests for a variance may be approved by methods other than the Variance Committee process. An expedited variance is a variance that meets LLNRD Board pre-approved conditions and as such does not need to be reviewed by the NRD Variance Committee. These expedited variances all have a Supplemental Well Agreement. There were no denials to any expedited variance requests. In 2019, there were a total of 3 expedited variances (Table 5) that were approved through NRD processes.

TABLE 5: APPROVED EXPEDITED VARIANCES IN 2019 IN THE LLNRD.

County	# of Supplemental Well Agreements	Permit Approved	Agreement Approved, but waiting on a Permit
Custer	1	2	0
Howard	1	0	1
Valley	1	0	1
Total	3	2	2

NRD MANAGEMENT: WELL AGREEMENTS

In 2019, there were 6 well agreements approved. These well agreements were granted based on the stipulation that the landowner relinquish all or part of the existing surface water right held through the Department of Natural Resources processes. There were no denials to any variances with a well agreement request.

TABLE 6: APPROVED WELL AGREEMENTS IN THE LLNRD IN 2019.

County	# of Well Agreements	SW Agreed upon to be Relinquished: full or partial	Permit Approved	SW Right Relinquishment Date
Custer	1	A-3912A, A-13352A	0	5/22/2019
Custer	1	A-8892B	0	7/31/2019
Custer	1	A-14753	0	NOT AS OF 1/6/2020
Howard	1	A-5661, A-14239R, A-3702, A-14239	0	6/24/2019
Howard	1	F UNIT 567	0	11/6/2019
Valley	1	A-10344	1	NOT AS OF 1/6/2020
Total	6		1	

NRD MANAGEMENT: ACRE ROTATIONS

Acre rotations are agreements set forth by a participating landowner and the LLNRD, which allows a landowner options to choose how they distribute certified acres over a tract of land. In 2019, there were zero acre rotations approved by the LLNRD. Acre Rotation Agreements have 2 or 3 options the landowner can choose in one calendar year. After an option is selected, the landowner notifies the LLNRD in writing prior to May 1st of that calendar year, before any irrigation is authorized. There were no requests in 2019 for any additional acre rotation agreements. Enforcement is conducted by the LLNRD through annual infrared imagery and field personnel visitation.

TABLE 7: APPROVED ACRE ROTATIONS IN THE LLNRD IN 2019.

County	# of Acre Rotation Agreements Approved
NO ACRES ROTATIONS IN 2019	0
Total	0

FLOWMETER DATA

The LLNRD has collected groundwater and surface water use information for irrigation on an annual basis since 2010. Flowmeters have been cost-shared across the District on a voluntary basis since 2009. However, the LLNRD required that all high-capacity irrigation wells in Groundwater Management Area 28 be outfitted with a flowmeter to track irrigation total withdrawals starting in 2016.

In 2019, LLNRD collected records of usage from 931 irrigation sites with 876 of those sites being verified as having an actual irrigation total water volume. The District average pumping withdrawals for irrigation for the 2019 season was 3.79 inches, down from 4.91 inches in 2018. The potato crop was the highest consumer of irrigation water with an average of 10.11 inches/acre pumped in 2019. Valley County recorded the least average irrigation at 0.65 inches/acre pumped, and Platte County had the highest irrigation rates at 6.75 inches/acre applied mostly to corn and soybean crops.

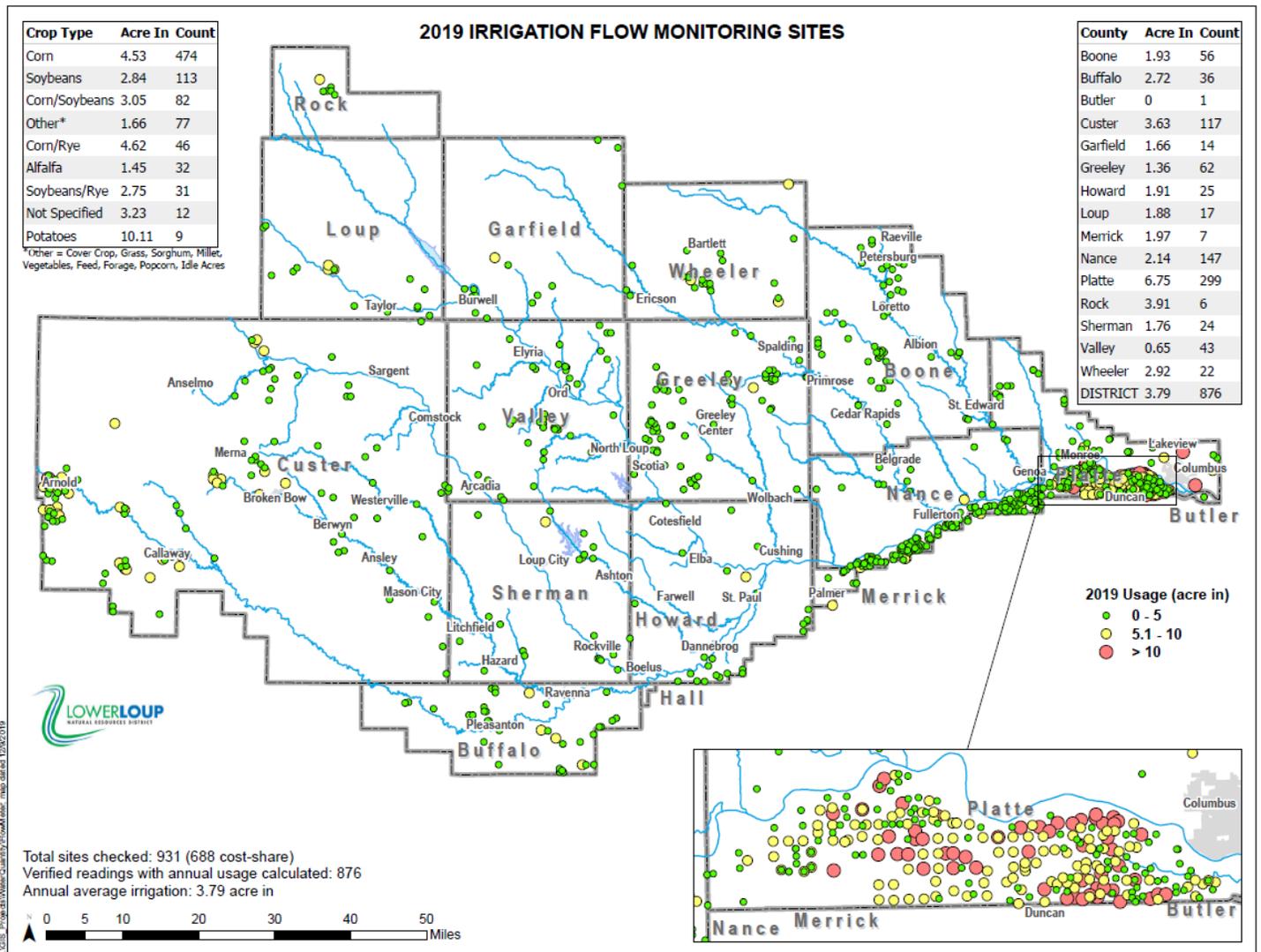


FIGURE 1: IRRIGATION MEASURING AND REPORTING SITES IN THE LLNRD IN 2019

GROUNDWATER ACRES ALLOCATIONS

The LLNRD has the option to issue additional groundwater acre allocations each year based on the conditions of water resources in the District. New acres applications are accepted from September 1-20 when the Board authorizes additional development. In 2019, new acres applications were accepted in the North Loup River, Beaver Creek, and Middle Loup Sub-Basins for a total of 2,367.34 new irrigated acres and have been approved by the LLNRD Board of Directors. The North Loup and Beaver Creek basins continued to show upward or stable trends in both surface and groundwater resources (static water levels and stream gages). The Middle Loup River Basin, while showing upward trends in the stream gages, has had downward static water levels measured in the vicinity, especially south of the river. The criteria includes Stream Depletion Factors, the status of nearby groundwater and surface water resources, the size of applications being applied for, and the soil classification. In 2019, additional points were awarded to applications located in the designated groundwater increase area.

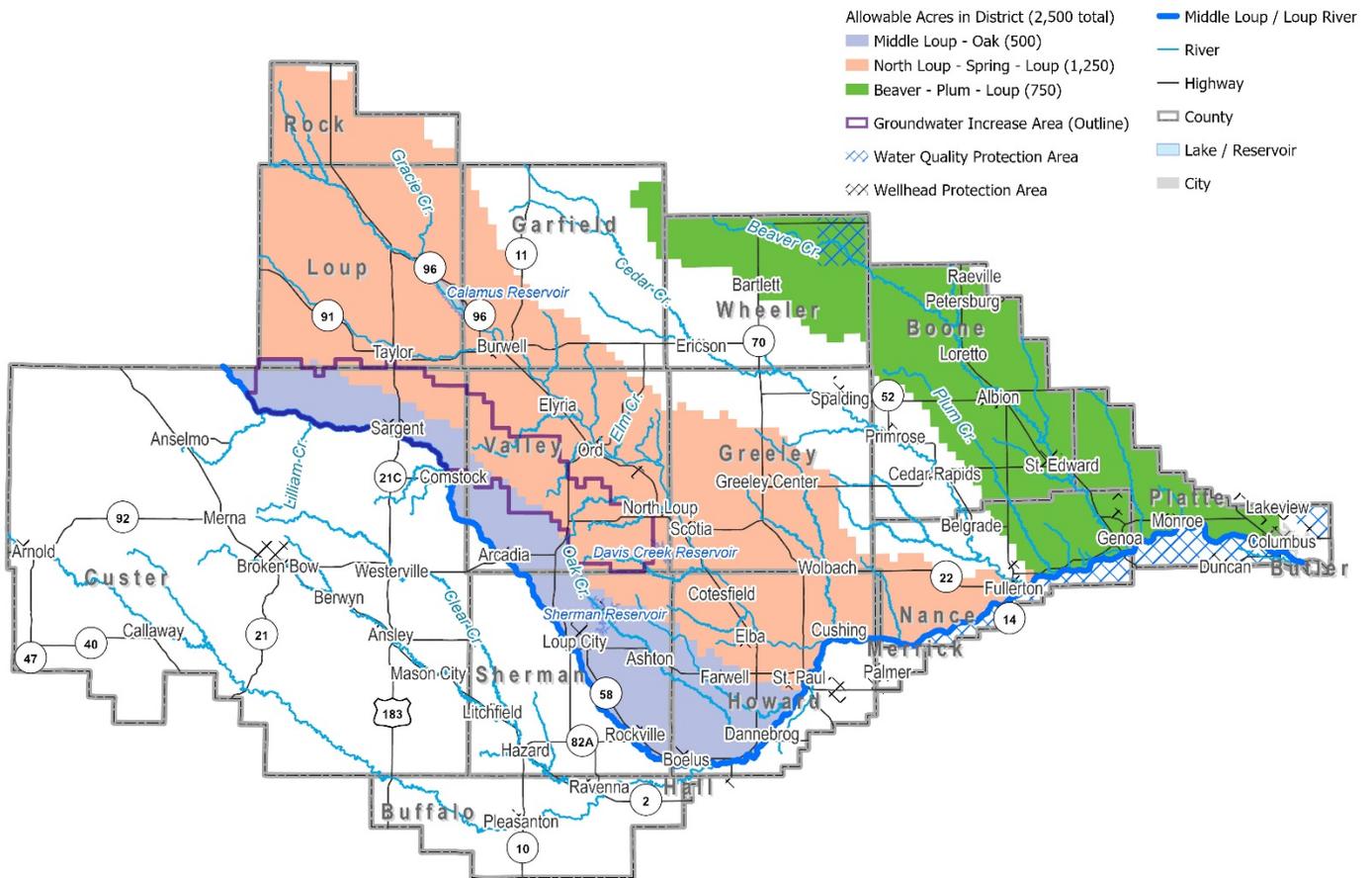


FIGURE 2: MAP OF ALLOWABLE CERTIFIED IRRIGATED ACRES IN THE LLNRD IN 2019.

There were 50 applications for new irrigation: 19 in the North Loup River Basin, 15 in the Beaver Creek Basin, and 16 in the Middle Loup River Basin. The total number of acres requested in all three basins was 3,092.61. The average application size requested 61.67 acres and the average application ranking was 276 points, ranked by LLNRD processes.

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At their meeting on October 24, 2019, the LLNRD Board of Directors unanimously approved 43 applications that ranked 225 points or greater. This meant approval of 18 new irrigated acres applications in the North Loup River Basin, 14 applications in the Beaver Creek Basin, and 11 applications in the Middle Loup River Basin. There were 1,103.06 new acres approved in the North Loup, 699.34 in Beaver Creek, and 564.94 in the Middle Loup River Basin.

TABLE 8: NEW GROUNDWATER-IRRIGATED ACRES APPROVED IN THE LLNRD IN 2019.

Basin	Number of Acres Approved	Pending Wells	Average SDF
Beaver	699.34	8	67%
North Loup	1,103.06	13	40%
Middle Loup	564.94	5	48%
Total	2,367.34	26	52%

NEW GROUNDWATER ACRES ALLOCATIONS DEPLETION IMPACT

As part of the agreement to the Coalition planning effort, the associated Districts developed new depletion limits for the basin to evaluate basin water supplies moving forward. The Lower Platte River Basin Coalition approved a methodology for determining the impact of individual allocations as well as accounting for the total amount of acre-feet (AF) impact moving forward. For agricultural uses, allowable number of irrigated acres in the hydrologically connected area can be determined by multiplying the number of acres, times the net irrigation requirement for corn in feet, times the SDF as a decimal, times 30% depletions occurring during peak season. The Lower Loup NRD, being primarily encompassed by the Loup Basin, has agreed to 5,883 AF of allowable development over a five-year period.

After applying the agreed-upon methodology to the 2019 allowed irrigated acres, the AF impact was 246.07 AF of agriculture depletions. Table 9 shows a breakdown of the numbers associated with the 43 applications.

TABLE 9: NEW GROUNDWATER-IRRIGATED ACRES DEPLETIONS CALCULATED FROM THE 2019 ALLOCATION

Application	Legal	Basin	Acres	ELM3 SDF	NIR (ft)	Depletion (acre-ft)
ABEJO1	SW-02-17-02W	Beaver - Plum - Loup	54.72	82.90	0.71	9.63
BJOJE1	NW-34-19-10W	North - Spring - Loup	86.71	22.18	0.75	4.30
BROLA1	NE-04-18-10W	North - Spring - Loup	12.51	18.65	0.73	0.51
BURMA1	NE-33-22-15W	North - Spring - Loup	17.71	45.48	0.84	2.02
DOMDA1	NW-31-15-12W	Middle - Oak	139.08	27.36	0.71	8.07
DUGRA1	SW-25-18-10W	North - Spring - Loup	73.11	11.19	0.74	1.81
EBNCA1	NW-08-17-01W	Beaver - Plum - Loup	50.00	76.99	0.68	7.88
ELMCD1	SW-08-17-03W	Beaver - Plum - Loup	147.44	92.39	0.80	32.62
ELMCD2	NW-17-17-03W	Beaver - Plum - Loup	84.81	93.61	0.80	19.01
FAMCO1	NE-33-19-10W	North - Spring - Loup	135.87	22.18	0.75	6.74
FARJS1	SW-27-20-06W	Beaver - Plum - Loup	9.21	80.56	0.59	1.32
FAUJE1	NW-14-20-14W	North - Spring - Loup	9.91	50.27	0.78	1.17
GROPH1	SE-05-17-02W	Beaver - Plum - Loup	6.63	86.91	0.73	1.25
HENHE1	NE-12-22-07W	Beaver - Plum - Loup	146.22	26.81	0.61	7.17
HOSRI1	NE-24-18-16W	Middle - Oak	24.90	34.07	0.77	1.96

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JOHCO1	SW-32-21-17W	North - Spring - Loup	6.56	88.18	0.83	1.45
KARST1	NW-22-20-13W	North - Spring - Loup	53.17	44.08	0.75	5.29
KLIRO1	NE-07-17-01W	Beaver - Plum - Loup	24.93	81.37	0.69	4.20
KLIRO2	NW-08-17-01W	Beaver - Plum - Loup	24.38	76.99	0.68	3.84
KOELA1	NW-30-18-14W	North - Spring - Loup	129.04	23.93	0.78	7.21
KOPRA1	NW-14-14-12W	Middle - Oak	49.10	27.45	0.69	2.78
LAMRO1	NE-34-19-10W	North - Spring - Loup	149.98	22.18	0.75	7.45
MORMA1	NW-10-15-13W	Middle - Oak	45.68	22.37	0.70	2.15
MYEPE1	SE-28-20-20W	Middle - Oak	50.09	83.09	0.89	11.07
PRETI1	NW-21-20-05W	Beaver - Plum - Loup	24.52	44.34	0.59	1.94
PROJJ1	SW-18-19-10W	North - Spring - Loup	6.97	31.33	0.78	0.51
PROJJ2	NW-19-19-10W	North - Spring - Loup	68.91	26.99	0.78	4.33
REITE1	NW-36-20-04W	Beaver - Plum - Loup	9.40	11.54	0.61	0.20
SHATE1	SW-16-18-06W	Beaver - Plum - Loup	26.44	35.11	0.63	1.75
SHEJA1	NW-35-21-20W	Middle - Oak	147.57	62.38	0.88	24.35
SMYDA1	NW-16-14-12W	Middle - Oak	45.50	30.87	0.69	2.90
SPRLE1	NE-22-18-03W	Beaver - Plum - Loup	24.70	67.41	0.63	3.13
SPRTI1	NE-33-18-01W	Beaver - Plum - Loup	65.94	75.72	0.56	8.43
STEJA1	NW-14-13-12W	Middle - Oak	24.92	60.94	0.69	3.13
STEJA2	NE-15-13-12W	Middle - Oak	13.46	61.55	0.69	1.71
STEPH1	NW-01-15-10W	North - Spring - Loup	75.66	77.62	0.69	12.10
THOTO1	SE-31-18-14W	North - Spring - Loup	10.58	19.21	0.77	0.47
WALEV1	SW-02-18-13W	North - Spring - Loup	16.77	84.99	0.89	3.81
WALSC1	SW-02-14-14W	Middle - Oak	5.21	67.23	0.81	0.85
WIEKA1	SW-03-17-13W	North - Spring - Loup	143.20	47.29	0.75	15.27
WOIKE1	NW-31-14-12W	Middle - Oak	19.43	47.95	0.69	1.92
WOORI1	NW-18-19-10W	North - Spring - Loup	49.42	31.33	0.77	3.59
WOORI2	SW-07-19-10W	North - Spring - Loup	56.98	36.33	0.77	4.78
Total Acres:			2,367.34	Total Depletions:		246.07

DEPLETION ACCOUNTING

As mentioned in "Approved Water Transfers," LLNRD Rules and Regulations allow any person to transfer irrigation rights from one location to another if they meet the criteria set forth by the District. Because of the established criteria of not allowing any new net increase in depletions to any stream, the net amount of acre-feet impact should be either relatively similar by a transfer or actually decreased due to any transferring of irrigated acre rights to a higher SDF, which would require an offset in acres. Transfers from a higher SDF to a lower SDF are only allowed at a 1:1 ratio. The same agricultural methodologies used to apply towards groundwater acre application was applied to transfers. Both the transferring location, where the acres were removed, and the newly developed acres, where the right was transferred to, were assessed. Table 10 represents the net effect of these transfers in acre-feet for the year 2019.

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From the 2019 transfer agreements, the sum impact of the transferred depletions removed was 90.34 AF, while the impact of the receiving acres with new development was 70.50 AF. The difference and beneficial impact was 19.85 AF back to the basin as a positive gain.

Due to LLNRD Rules and Regulations on transferring irrigated acres, an overall beneficial gain to the Loup Basin in four years of transfers totals 197.06 AF according to LPRBC methodology. This is sufficient proof that LLNRD has taken the correct course for allowing transfers, and the water banking process is working. The LLNRD will continue to reassess the banking process to find ways to improve the efficiency and streamline reporting through both the IMP and Coalition requirements.

Some minor adjustments were made to Table 10 in this year's report. First, the 2018 New Irrigated Acres depletion value was updated to 275.30 AF from 277.54 AF. This change was a result of 3 applications (BRURO1, GORMA1, and HANCO1) not being certified for all the acres that were allowed. The certifications of those applications occurred after the 2018 annual report was finalized, which is why it is being reported in this year's report. Second, the 2016 Transfers, 2017 Transfers, and 2018 Transfers depletion values were updated based on minor corrections made to some of the transfer applications regarding stream depletion factors and net irrigation requirement values, which slightly affected the sum depletion impact of all three years of transfers; changed from 177.52 AF to 177.21 AF.

TABLE 10: SUMMARY OF ALLOWABLE DEPLETION IMPACT

Lower Loup Natural Resources District	
Project	5,883.00 AF
2016 New Irrigated Acres	204.52
2016 Transfers	-69.66*
2017 New Irrigated Acres	164.65
2017 Transfers	-40.88*
2018 New Irrigated Acres	275.30^
2018 Transfers	-66.67*
2019 New Irrigated Acres	246.07
2019 Transfers	-19.85
2020 New Allowable Depletion	5,189.52 AF

^revised June 2019; not all approved acres were certified by applicants in 2018

*revised February 2020; corrections made to some transfers for 2016, 2017, and 2018

GROUNDWATER ELEVATION DATA

One of the LLNRD's primary responsibilities since its inception in 1972 has been collecting groundwater elevation data. Each year, District personnel measure groundwater elevations in both the spring and fall to compare against historical levels. Spring levels are used to report the status of groundwater, whether increasing or decreasing, and to determine if potential changes are needed in the District. Changes can include recommendations against issuing additional irrigated acres or for developing a flowmeter requirement with a potential allocation system. Recommendations also include either allowing or denying transfers into a particular area. Fall levels are used as an indicator of stress that has been placed on the aquifer during the irrigation season. The District has also employed the use of pressure transducers to get continual monitoring at various

locations through the NRD. To date, the LLNRD has 61 active transducers across the District recording water levels every 8 hours. Additionally, the District implemented a real-time transducer network in the Columbus vicinity as part of the recharge project. Dedicated monitoring wells contain telemetry equipment that collects an hourly reading on 3 monitoring well sites, as well as an artificial lake in the area that will be used as part of the recharge basin.

In 2019, the LLNRD staff collected groundwater level depths on 427 sites which includes both dedicated monitoring and irrigation wells. The District average increased from 2018 readings by 1.84 feet. The District average still maintains a level well above the 1982 levels by 5.04 feet. The 1982 level is used by the Lower Loup NRD's Groundwater Management Plan as the keystone level to implement additional management action.

NEW DATA COLLECTED OR MODEL/STUDY RESULTS

The LLNRD partnered with the USGS and Upper Loup NRD to assess groundwater and drought resiliency of the South Loup River by determining the age of springs discharging into the river. Water was sampled at specific focal points along identified springs and a collection of specific environmental tracer samples were examined to help estimate the previous atmospheric exposure, thereby deducing when the recharge of the groundwater took place. Environmental tracers sampled include sulfur hexafluoride (SF6), tritium (3H), carbon-14 (C-14), and dissolved noble gases from approximately 20 springs. A report from the USGS is anticipated by summer 2020. The older the groundwater age-dating proves to be, the more resilient the springs and wells are likely to be to multi-year droughts because of the longer transit times. Alternatively, more recent atmospheric exposure could prove that the springs and groundwater wells are susceptible to short-term droughts.

In October 2019, LLNRD contracted with Aqua Geo Frameworks, LLC (AGF) to conduct an Airborne Electromagnetic (AEM) survey along the South Loup River within Buffalo County covering approximately 108.6 square miles. This survey was partially funded through a grant from the Nebraska Natural Resources Commission Water Sustainability Fund. Data was collected by helicopter along lines spaced approximately 820 feet apart. AGF, along with assistance from scientists from University of Nebraska Conservation and Survey Division (CSD), are currently in the process of developing a 3D hydrogeologic framework of the project area, with data interpretations and final report expected in March 2020. Upon completion of the study, all AEM data will be shared with the Nebraska GeoCloud for public use.

COMMERCIAL/INDUSTRIAL, LIVESTOCK HIGH-CAPACITY USE

To comply with the implementation of *Rule 15, Commercial or Industrial Use and Accounting* that was adopted into the LLNRD's Groundwater Management Area Rules & Regulations this past year, letters were sent to any owners/operators that had registered commercial/industrial wells. This includes high capacity livestock wells (pump greater than 50 gallons per minute).

RULE 15 – COMMERCIAL OR INDUSTRIAL USE AND ACCOUNTING

- A. The District will calculate baseline of commercial and industrial use for each commercial or industrial water user in the District based on historic consumptive use data for an appropriate interval. Consumptive use will be determined from groundwater pumping volumes and, where applicable, wastewater discharge volumes. The baseline will be used to determine changes in consumptive use annually.*

- B. Changes in consumptive use will be tracked for each commercial or industrial user annually through a reporting system administered by the District.*
- C. Any permanent reduction in consumptive use of water associated with a new commercial or industrial use of less than twenty-five million gallons (e.g., by taking irrigated acres out of production), between July 14, 2006, and January 1, 2026, shall accrue to the District's benefit.*

Letters were sent in late December with reports required back by January 31, 2020. Currently, a total of 88 facilities have sent in water use information. Since 2019 was the first year that LLNRD has required commercial use information, not everyone has sent in their accounting forms and well usage numbers. Staff will continue to update the database and collect these types of commercial/industrial uses. Examples of reports that the NRD has received are cattle feedlots, swine facilities, ethanol plants, manufacturing companies, fertilizer dealers and numerous private business owners.

Use numbers range from de minimis to facilities that have net annual water usage numbers of greater than 1.5 billion gallons. It is important to note that larger facilities have multiple wells included in their water use figures. Not all wells have flowmeters installed, so water use estimates were also allowed at this time.

NON-ACTION/REPORTING ITEMS

The Coalition members are responsible for reporting on a number of items that are currently not included as part of the LLNRD day-to-day operations. These Items include:

- Retirement of Groundwater Consumptive Uses
 - Some retirement of groundwater irrigation takes place due to the transfer process. See the section "TRANSFERS" above.
 - The LLNRD does not have a need for wide scale retirement of groundwater consumptive use.
- Stream Flow Accretion activities
 - Transfers allowed by the NRD do not have a negative net impact on the stream and theoretically result in neutral or positive effects on streamflow, see "TRANSFERS" above.
 - Under "NRD MANAGEMENT: WELL AGREEMENTS" the LLNRD is taking proactive measures to reduce surface water allocations, switching those primary sources to groundwater which would result in an immediate reduction to streamflow impacts and likely cause accretion to flows in the impacted stream.
- Stream gage measurements on NRD maintained gages
 - LLNRD has no stream gages under its operational jurisdiction at this time; however, the LLNRD is a partner with both the NeDNR and USGS in the operations of various streams across the Loup Basin.