

ANNUAL REPORT OF 2017 DATA FOR
THE LOWER NIOBRARA NATURAL RESOURCES DISTRICT AND
NEBRASKA DEPARTMENT OF NATURAL RESOURCES
INTEGRATED MANAGEMENT PLAN

Prepared by the Nebraska Department of Natural Resources
For the Annual Meeting August 2, 2018

Introduction

The Lower Niobrara Resources District (LNNRD) and the Nebraska Department of Natural Resources (NeDNR) jointly adopted an Integrated Management Plan (IMP) which became effective on May 1, 2014, with the goal of jointly managing ground and surface water within the LNNRD to sustain a balance between water uses and supplies for the long term. The purpose of this report is to fulfill NeDNR's responsibilities under the IMP annual reporting obligations and provide updates to current monitoring projects or studies as outlined in the IMP.

Reporting and exchanging information gathered from monitoring projects, streamflow data, or other studies provides a basis to increase understanding of the surface water and hydrologically connected groundwater system. The data gathered through the IMP's monitoring plan is designed to evaluate and measure the success of the objectives of the IMP. This information exchange also helps to test the validity of the conclusions and information upon which the IMP is based. This report contains information from January 1 through December 31, 2017.

Department Reporting: Data

The IMP requires that NeDNR report on the following water data within the LNNRD on an annual basis:

1. Streamflow measurements;
2. Surface water permits issued and/or denied;
3. Surface water usage data such as voluntary water use reports, flow meter data, crops irrigated, and acreage irrigated;
4. Groundwater transfers approved; and
5. Offsets provided for depletions resulting from increased consumptive use related to any of the above-listed items.

Details for each of these items follow.

1. Streamflow Measurements

The one-time streamflow measurements made by NeDNR's field office staff within the LNNRD, in seven locations, during 2017 are included in Table 1 below.

Table 1. Streamflow measurements taken by NeDNR staff in 2017

ID	Date	Discharge (cfs)	Stream	Location
1	10/12/2017	28.5	Ponca Creek	SW¼NW¼ Sec. 17-34-12W
2	10/23/2017	3.54	Middle Br. Verdigre Creek	NE¼SE¼ Sec. 12-29-9W
3	11/1/2017	27.9	Middle Br. Verdigre Creek	SE¼NE¼ Sec. 26-30-8W
4	11/1/2017	11.7	Steele Creek	SE¼NE¼ Sec. 18-32-8W
5	11/14/2017	0.67	Trib. to Louse Creek	NE¼NW¼ Sec. 30-32-9W
6	11/14/2017	7.75	Eagle Creek, East Branch	NE¼NW¼ Sec. 31-31-12W
7	11/28/2017	39.4	Big Sandy Creek	NE¼NW¼ Sec. 13-33-14W

The locations of streamgages yielding continuous streamflow measurements made within the LNNRD by USGS and NeDNR are shown in Figure 1. Daily streamflow measurements from these streamflow gages for calendar year 2017 are shown in Appendix 1. Also on Figure 1 are the streamgages that do not collect discharge data and the inactive gages that may have historical data. This streamflow data can be acquired from USGS's National Water Information System at <http://waterdata.usgs.gov/>.

Streamgage Locations within the Lower Niobrara Natural Resources District

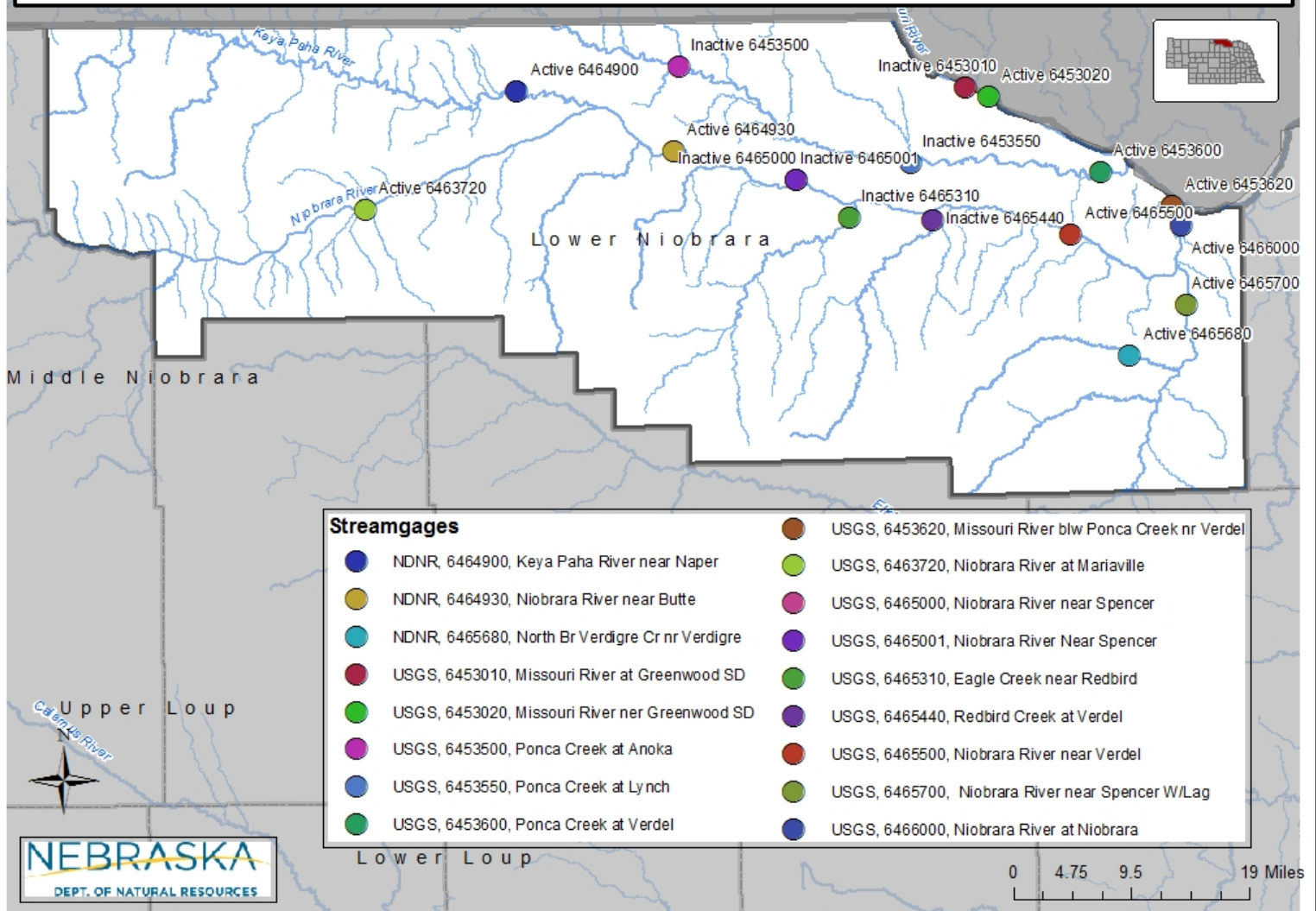


Figure 1. Streamgage locations within the LNNRD

2. Surface Water Permitting

In 2017, three applications for permits to appropriate surface water were approved by NeDNR, and are listed below in Table 2. One application, A-19406 was divided into 5 parts and given a suffix of A through E, due to the differing seasonal quantities of water provided by this permit, and allowing NeDNR to conduct water administration effectively. The applicant of A-19563 filed a relinquishment of an existing permit, A-15182, in order to change the location of diversion from the Niobrara River, to the new location at Keya Paha River. The same 88.7 acres will be irrigated with the new permit; therefore, no new acres are being irrigated. The third application is to store water in a reservoir.

Table 2. Surface water applications approved in calendar year 2017 within the LNNRD

Appropriation Number	Approval Date	S-T-RW	Status	Use	Acres	CFS	Number of New Irrigated Acres
A-19406A	10/19/2017	30-33-11W	Active	IF	0	2084	0
A-19406B	10/19/2017	30-33-11W	Active	IF	0	2270	0
A-19406C	10/19/2017	30-33-11W	Active	IF	0	2270	0
A-19406D	10/19/2017	30-33-11W	Active	IF	0	1765	0
A-19406E	10/19/2017	30-33-11W	Active	IF	0	1969	0
A-19563	12/27/2017	30-34-14W	Active	IR	88.7	1.27	0
A-19517	7/12/2017	13-32-16W	Active	ST	0	0	0

While the IMP does not specifically require the reporting of cancelled surface water appropriations (in-full or in-part), NeDNR is providing this information for a more complete picture of surface water permitting activities within the LNNRD. In 2017, five permits to irrigate using surface water from a flowing source (IR), two permits to irrigate using water stored in a reservoir (SO), and one domestic-use permit (DO) were cancelled in-full or in-part, as summarized in Table 3. This results in a cancellation of 244.6 acres previously approved for irrigation purposes using naturally flowing surface water, and 295.4 acres of irrigation using stored water. The basis for NeDNR's action taken on each is listed below Table 3.

Table 3. Surface water appropriations cancelled or dismissed in 2017 in the LNNRD

Appropriation Number	Cancellation Date	S-T-RW of Pump-site or Reservoir	Status	Use	Begin Acres	Cancelled Acres	Cancelled CFS	Cancelled AF	Reason for Department Action
A-10092	1/10/2017	17-32-13W	Cancelled in Full	SO ¹	148.2	148.2	0	26.4	See Item 2 below
A-4211R	8/14/2017	3-34-18W	Active	IR ²	31.7	12.1	0	0	See Item 1 below
A-18556	11/15/2017	19-34-14W	Cancelled in Full	SO	147.2	147.2	0	15.4	See Item 3 below
A-19031	11/15/2017	13-29-9W	Cancelled in Full	IR	80.0	80.0	1.14	0	See Item 3 below
A-18886	12/8/2017	35-33-7W	Active	IR	57.9	6.7	0.10	0	See Item 3 below
A-19104	12/8/2017	25-30-7W	Active	IR	67.6	57.1	0.82	0	See Item 3 below
A-19302	12/8/2017	28-32-12W	Cancelled in Full	DO ³	0	0	0.06	0	See Item 3 below
A-15182	12/27/2017	30-34-14W	Cancelled in Full	IR	88.7	88.7	1.27	0	See Item 2 below
Totals					621.3	540.0	3.39	41.8	

¹ SO = Diverting water stored in a reservoir for irrigation

² IR = Diverting water from a naturally flowing source for irrigation

³ DO = Using surface water for domestic purposes

Basis for NeDNR Actions noted in Table 3

1. Appropriation A-4211 was granted an allotment of one cfs for every 115 acres irrigated, and a maximum rate of diversion of 0.28 cfs to irrigate 31.7 acres. The appropriator in filing expedited transfer EXT-6199 requested a diversion rate of one cfs per seventy (70) acres, using the same maximum diversion rate of 0.28 cfs to irrigate fewer (19.6) acres.

Authority upon which the action was based: *Neb. Rev. Stat. §46-229.02*: An allotment from the natural flow of streams shall not exceed one cfs for every 70 acres of land irrigated.

2. The owner signed and submitted a voluntary relinquishment of surface water appropriation.

Authority upon which the action was based: *Department Rules for Surface Water, Neb. Admin. Code. Title 457, Chapter 3*: Any appropriation, or part of any appropriation, may be voluntarily relinquished. The relinquishment shall be made on a form provided by the Department.

3. The appropriator failed to perfect the appropriation in the time allowed.

Authority upon which the action was based: *Neb. Rev. Stat. §46-229.02(7)*: A water appropriation that has not been perfected pursuant to the terms of the permit may be canceled by the department without complying with sections 46-229.01 to 46-229.04 if the owner of such appropriation fails to comply with any of the conditions of approval in the permit, except that this subsection does not apply to appropriations to which subsection (2) of section 46-237 applies.

3. Voluntary Surface Water Usage Reporting

NeDNR received responses from 94 surface water users in the LNNRD out of a possible 378, a 25% response rate, to its voluntary surface water use reporting program in 2017. This response rate is up 7% from 2016. A total of 8,944 acres were reported, categorized by irrigated vs. non-irrigated and estimation of water use, or unknown water use. This acreage is up from the 2016 reported 6,957 acres. Crop types reported include: corn, forage/hay/grass, alfalfa, millet, CRP, fallow and other. In 2017, the voluntary water use survey did not collect the number of acres under each crop type, as in the past. This change was made in an effort to reduce user error, and make the process simpler. NeDNR is committed to making the process of voluntary reporting surface water use as accurate and easy for the user as possible, and modifications are made annually to achieve this. Statewide, the completion of surveys that a user “started but not completed” went from 30% to 3%. The reported data is shown in Table 4.

Table 4. Voluntarily reported surface water use in 2017, within the LNNRD.

	Acres		Acres	Estimated water use in
Irrigated	5,656	Irrigated, estimated water use	2,289	1,966 AF or 10.4"/Acre
		Irrigated, no estimate of use	3,367	Not Available
Non-Irrigated	3,608			
Total Reported	9,264			

4. Groundwater Transfers

NeDNR did not act on any groundwater permit applications during 2017.

5. Offsets approved

No offsets were required in 2017.

Department Education and Outreach Activity in 2017

Each year, NeDNR dedicates a portion of staff time and resources to education and outreach efforts that promote a better understanding of integrated water management and why it is important to the state’s citizens. NeDNR’s outreach efforts range from informal conversations with local citizens about how we envision and strive for collaborative water management, to more complex presentations, discussions and demonstrations about the hydrologic connection between surface and groundwater.

In 2017, NeDNR staff attended the Sandhills Ranch Expo held in Bassett, Nebraska. This event provided many people who otherwise may not have had direct contact with NeDNR staff an opportunity to learn about NeDNR in general and the Water Planning Division’s focus on integrated water management specifically. NeDNR staff discussed IMPs, and fielded questions. In addition to the Sandhills Ranch Expo, NeDNR staff set up educational booths at the Nebraska State Fair, Husker Harvest Days, the Governor’s Ag Conference, and the University of Nebraska-Lincoln’s Women in Agriculture Conference.

In addition to NeDNR’s web portal, INSIGHT, which provides citizens with a convenient and user friendly experience when they need to access water resources related information or data, the Water Planning Division debuted the first of a series of new educational interactive apps, which can be found on the NeDNR’s website. Currently, for example, users can explore how the relative positions of the water table and stream levels affect the direction of flow and rate of interaction between the stream and aquifer; or how soil textures affect recharge and streamflow. The app features a tutorial, as well as a description and hydrograph of the user’s effect on streamflow. Users can transition between different simulations and conditions using the drop-down menu and slider bar.

Appendix 1 – Discharge in cubic feet per second

	DNR Keya Paha River @ Naper	DNR Niobrara River @ Butte	USGS Ponca Creek @ Verdel	USGS Niobrara River @ Mariaville	USGS Niobrara River @ Verdel	USGS Verdigre Creek @ Verdigre
Gage Number	6464900	6464930	6453600	6463720	6465500	6465700
1/1/2017	60	1760	15	1270	2090	121
1/2/2017	59	1690	14	1240	2000	121
1/3/2017	60	1610	13	1200	1880	117
1/4/2017	67	1450	13	1130	1780	113
1/5/2017	71	1210	12	1030	1650	111
1/6/2017	78	1160	12	1030	1540	111
1/7/2017	68	1100	12	1070	1380	112
1/8/2017	73	1200	13	1100	1290	114
1/9/2017	69	1190	14	1110	1340	116
1/10/2017	69	1340	15	1110	1330	117
1/11/2017	63	1500	15	1060	1550	119
1/12/2017	74	1470	16	1060	1640	118
1/13/2017	82	1360	18	1070	1660	116
1/14/2017	83	1270	19	1110	1520	115
1/15/2017	84	1410	22	1180	1580	115
1/16/2017	84	1520	21	1250	1660	119
1/17/2017	89	1570	28	1290	1750	121
1/18/2017	88	1550	38	1360	1850	122
1/19/2017	98	1730	40	1410	1880	121
1/20/2017	98	1960	40	1460	1870	120
1/21/2017	96	1950	35	1490	1880	121
1/22/2017	94	1940	26	1510	1900	120
1/23/2017	99	1910	26	1510	1920	117
1/24/2017	98	1710	29	1490	1870	116
1/25/2017	98	1610	25	1400	1760	113
1/26/2017	98	1580	17	1310	1710	115
1/27/2017	107	1630	16	1310	1650	115
1/28/2017	115	1630	32	1350	1740	117
1/29/2017	121	1760	41	1380	1610	120
1/30/2017	124	1890	51	1400	1590	122
1/31/2017	127	1910	62	1410	1820	122
2/1/2017	116	1950	65	1420	1800	120
2/2/2017	110	1810	59	1410	1780	117
2/3/2017	112	1710	56	1390	1740	114
2/4/2017	116	1690	76	1410	1720	113
2/5/2017	113	1910	71	1410	1760	112
2/6/2017	114	1980	84	1410	1800	112
2/7/2017	133	1660	76	1440	1780	110

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Gage Number	6464900	6464930	6453600	6463720	6465500	6465700
2/8/2017	135	1580	68	1440	1810	106
2/9/2017	137	1600	64	1470	1830	111
2/10/2017	143	1900	66	1540	1930	133
2/11/2017	216	2120	131	1760	2050	237
2/12/2017	251	2060	249	1990	2240	306
2/13/2017	290	2070	431	1960	2550	321
2/14/2017	378	2310	568	2040	2820	316
2/15/2017	518	2400	649	2190	3110	275
2/16/2017	620	2440	798	2220	3320	228
2/17/2017	681	2670	936	2260	3640	210
2/18/2017	697	2930	1030	2300	4130	203
2/19/2017	624	3110	964	2320	4530	177
2/20/2017	599	3250	754	2340	4440	183
2/21/2017	578	3380	598	2290	3470	166
2/22/2017	506	3410	490	2160	4020	157
2/23/2017	488	3330	420	2200	4090	147
2/24/2017	450	3170	359	2150	4020	150
2/25/2017	404	2570	300	2040	3570	147
2/26/2017	352	2240	252	2010	3520	154
2/27/2017	326	2120	234	2050	3380	145
2/28/2017	301	2240	233	2310	2690	152
3/1/2017	284	2580	229	2670	2960	155
3/2/2017	276	2690	219	2290	2780	153
3/3/2017	283	2710	203	2020	2510	149
3/4/2017	279	2940	200	2470	2930	160
3/5/2017	318	2710	211	2530	2960	176
3/6/2017	356	2880	248	2650	3330	196
3/7/2017	331	2730	276	2390	2910	172
3/8/2017	292	2530	231	2080	2450	167
3/9/2017	315	2380	190	1950	2730	165
3/10/2017	353	2370	163	1820	2220	142
3/11/2017	337	2280	142	1860	1860	139
3/12/2017	291	2090	128	1790	2580	124
3/13/2017	271	1890	116	1910	2940	142
3/14/2017	176	1880	106	2030	2600	144
3/15/2017	182	2020	97	2090	2410	136
3/16/2017	224	2030	97	2270	2030	153
3/17/2017	256	1990	103	2490	2320	160

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Gage Number	6464900	6464930	6453600	6463720	6465500	6465700
3/18/2017	316	2010	101	2360	2150	151
3/19/2017	311	1940	100	2190	1990	163
3/20/2017	310	1910	94	2140	1690	171
3/21/2017	303	1880	92	2230	1900	162
3/22/2017	281	1830	88	1970	2150	171
3/23/2017	278	1890	87	1930	2330	173
3/24/2017	264	2120	97	2040	3330	258
3/25/2017	242	2200	92	2060	3350	240
3/26/2017	245	2060	87	1850	2880	217
3/27/2017	230	2090	85	1830	2560	214
3/28/2017	214	2090	80	1860	2360	198
3/29/2017	213	1880	76	1910	2580	188
3/30/2017	221	1850	72	1840	2480	201
3/31/2017	230	1710	68	1870	2510	182
4/1/2017	225	1830	65	1860	2240	181
4/2/2017	210	2120	63	1630	2110	183
4/3/2017	209	2060	63	1770	2040	186
4/4/2017	231	2000	93	1740	2230	205
4/5/2017	248	1770	96	1540	1710	197
4/6/2017	268	1800	88	1500	1620	196
4/7/2017	264	1810	80	1770	1500	187
4/8/2017	249	1770	74	1830	1630	188
4/9/2017	233	1750	73	2090	1780	185
4/10/2017	272	1910	78	2010	2220	203
4/11/2017	344	1810	94	1840	2340	188
4/12/2017	411	1660	105	1810	2370	183
4/13/2017	410	1650	111	1810	2370	181
4/14/2017	381	1960	108	1820	2420	186
4/15/2017	357	2080	232	1830	3050	231
4/16/2017	434	2330	165	1930	2580	223
4/17/2017	379	2100	142	1760	2240	192
4/18/2017	345	2110	159	1710	2350	230
4/19/2017	320	2100	166	1720	2150	256
4/20/2017	336	1970	153	1550	2340	242
4/21/2017	344	1950	135	1730	2040	214
4/22/2017	321	2140	130	1830	2110	211
4/23/2017	275	2330	118	1780	2100	203
4/24/2017	242	2270	106	1800	1800	198

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4/25/2017	217	2120	97	1700	1410	207
4/26/2017	201	2180	90	1480	1410	215
4/27/2017	189	2270	84	1410	1680	206
4/28/2017	182	2270	78	1390	1620	183
4/29/2017	178	2160	70	1410	1690	190
4/30/2017	182	2260	78	1410	1800	227
5/1/2017	186	2130	209	1420	2500	536
5/2/2017	162	1890	221	1420	2520	646
5/3/2017	159	2110	163	1410	2450	417
5/4/2017	152	2130	135	1410	2420	316
5/5/2017	144	2100	117	1460	2340	263
5/6/2017	138	2090	102	1660	2470	252
5/7/2017	131	2220	91	1720	2310	227
5/8/2017	127	2200	81	1750	2310	214
5/9/2017	113	2170	71	1590	2360	207
5/10/2017	117	2120	69	1620	2370	199
5/11/2017	119	2090	69	1520	2380	201
5/12/2017	121	2090	61	1710	2100	181
5/13/2017	113	2010	53	1750	2270	178
5/14/2017	109	2040	46	1840	2180	163
5/15/2017	105	2090	41	1890	2100	150
5/16/2017	110	2140	40	1850	2530	168
5/17/2017	141	2270	63	1980	2870	243
5/18/2017	284	2460	86	2060	3080	338
5/19/2017	489	2510	138	1940	2920	382
5/20/2017	406	2590	209	2070	3000	468
5/21/2017	928	2940	270	2170	3560	511
5/22/2017	1070	2710	324	2130	4160	361
5/23/2017	763	2630	304	2130	3770	294
5/24/2017	574	2500	349	1900	3460	257
5/25/2017	428	2440	317	1920	2780	243
5/26/2017	396	2510	273	1910	2780	233
5/27/2017	522	2370	237	1770	3070	225
5/28/2017	437	2140	205	1920	2950	209
5/29/2017	361	2020	178	1960	2470	198
5/30/2017	288	1800	156	1650	2370	156
5/31/2017	241	1630	139	1530	2110	151
6/1/2017	209	1780	124	1590	1920	123

Appendix 1 – Discharge in cubic feet per second

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Gage Number	6464900	6464930	6453600	6463720	6465500	6465700
6/2/2017	187	1760	112	1690	2010	125
6/3/2017	173	1760	103	1570	1990	127
6/4/2017	159	1770	93	1540	1790	121
6/5/2017	132	1790	84	1450	1530	117
6/6/2017	134	1890	75	1380	1670	112
6/7/2017	131	1840	69	1210	1870	141
6/8/2017	129	1850	67	1150	1860	148
6/9/2017	125	1610	68	1190	1910	133
6/10/2017	112	1510	58	1110	1790	118
6/11/2017	105	1520	47	1170	1640	141
6/12/2017	99	1440	43	1220	1620	146
6/13/2017	101	1380	42	1240	1690	137
6/14/2017	118	1500	39	1120	1780	122
6/15/2017	96	1550	37	1070	1650	115
6/16/2017	83	1520	34	1120	1560	111
6/17/2017	78	1550	35	1140	1550	115
6/18/2017	80	1500	34	1100	1560	113
6/19/2017	77	1460	31	1000	1500	113
6/20/2017	69	1420	28	943	1420	103
6/21/2017	67	1380	25	938	1360	101
6/22/2017	65	1360	21	962	1300	97.2
6/23/2017	65	1440	22	946	1310	92.9
6/24/2017	63	1410	22	918	1330	97.9
6/25/2017	58	1360	20	905	1260	98.7
6/26/2017	57	1310	19	924	1220	102
6/27/2017	55	1240	18	967	1180	94.4
6/28/2017	57	1260	18	1060	1190	101
6/29/2017	55	1280	17	1010	1180	98.2
6/30/2017	51	1220	16	953	1220	92.8
7/1/2017	50	1190	16	957	1200	89.5
7/2/2017	45	1150	15	1000	1190	81
7/3/2017	42	1180	14	1000	1210	83.9
7/4/2017	40	1150	13	1010	1210	82
7/5/2017	39	1130	12	1030	1170	86.3
7/6/2017	40	1170	12	1080	1170	87.9
7/7/2017	36	1110	12	1050	1140	79.5
7/8/2017	34	1050	12	1030	1110	80.2
7/9/2017	32	1020	10	1000	1060	82.5

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Gage Number	6464900	6464930	6453600	6463720	6465500	6465700
7/10/2017	29	980	8	989	1060	83.4
7/11/2017	29	994	11	989	984	78.4
7/12/2017	29	976	10	972	1000	74.1
7/13/2017	31	980	9	1010	907	82.2
7/14/2017	27	933	8	1040	875	80.1
7/15/2017	23	914	7	1020	857	67.1
7/16/2017	23	914	6	1020	833	63.3
7/17/2017	21	900	5	1010	808	65.5
7/18/2017	20	903	5	1010	844	64.1
7/19/2017	25	969	5	974	865	69.5
7/20/2017	29	1040	7	955	1090	81.5
7/21/2017	31	962	11	992	1130	88.8
7/22/2017	27	963	10	985	1150	91.7
7/23/2017	26	927	9	1020	1140	90.1
7/24/2017	23	935	7	1000	1090	78.1
7/25/2017	25	1010	6	1140	1130	72.7
7/26/2017	57	1280	18	1280	1340	118
7/27/2017	68	1230	15	1080	1500	130
7/28/2017	60	1030	11	1030	1420	110
7/29/2017	55	966	8	991	1260	101
7/30/2017	50	954	7	1100	1210	98.5
7/31/2017	46	1070	9	1310	1190	105
8/1/2017	56	1180	8	1160	1270	97
8/2/2017	62	1140	8	952	1440	93.1
8/3/2017	64	1080	9	900	1570	95.1
8/4/2017	66	1030	8	883	1460	96.3
8/5/2017	68	1100	18	877	1480	116
8/6/2017	67	1080	19	865	1470	131
8/7/2017	65	1090	14	905	1420	116
8/8/2017	64	1110	11	872	1410	111
8/9/2017	61	1130	10	1030	1360	102
8/10/2017	51	1210	8	1110	1290	92.7
8/11/2017	49	1230	8	1040	1290	85.6
8/12/2017	51	1200	8	1060	1290	90.9
8/13/2017	161	1520	16	1110	1420	121
8/14/2017	179	1340	13	972	1710	131
8/15/2017	140	1430	18	1200	1870	536
8/16/2017	153	1420	76	1210	2350	954

Appendix 1 – Discharge in cubic feet per second

	DNR Keya Paha River @ Naper	DNR Niobrara River @ Butte	USGS Ponca Creek @ Verdel	USGS Niobrara River @ Mariaville	USGS Niobrara River @ Verdel	USGS Verdigre Creek @ Verdigre
Gage Number	6464900	6464930	6453600	6463720	6465500	6465700
8/17/2017	209	1520	56	1310	2070	572
8/18/2017	248	1580	44	1340	1910	299
8/19/2017	265	1410	29	1190	1940	215
8/20/2017	205	1320	33	1130	1610	174
8/21/2017	162	1290	70	1090	1580	171
8/22/2017	131	1220	75	1070	1550	167
8/23/2017	107	1130	60	1060	1510	145
8/24/2017	95	1090	51	1030	1490	142
8/25/2017	82	1070	45	1100	1500	158
8/26/2017	100	1280	76	1510	1740	374
8/27/2017	211	1360	77	1260	1880	231
8/28/2017	189	1220	51	1210	1810	167
8/29/2017	147	1180	40	1160	1650	151
8/30/2017	116	1170	34	1120	1560	142
8/31/2017	104	1200	31	1050	1480	134
9/1/2017	95	1220	31	1010	1440	143
9/2/2017	91	1190	30	1000	1450	152
9/3/2017	83	1130	25	999	1470	145
9/4/2017	74	1110	22	1000	1450	137
9/5/2017	67	1070	20	1020	1420	128
9/6/2017	64	1080	18	1050	1370	121
9/7/2017	63	1080	17	1050	1340	131
9/8/2017	61	1110	15	1060	1270	130
9/9/2017	68	1230	17	1040	1330	115
9/10/2017	57	1160	22	955	1470	128
9/11/2017	51	1140	17	945	1390	130
9/12/2017	48	1150	13	944	1360	126
9/13/2017	43	1170	12	912	1390	132
9/14/2017	40	1170	10	929	1350	122
9/15/2017	41	1230	10	988	1290	117
9/16/2017	58	1330	9	1090	1290	124
9/17/2017	68	1360	10	1040	1340	128
9/18/2017	70	1320	11	1040	1330	128
9/19/2017	70	1350	11	1050	1330	124
9/20/2017	71	1360	9	1030	1330	129
9/21/2017	69	1340	8	968	1350	125
9/22/2017	59	1340	8	938	1350	124
9/23/2017	61	1390	9	1150	1380	123

Appendix 1 – Discharge in cubic feet per second

	DNR Keya Paha River @ Naper	DNR Niobrara River @ Butte	USGS Ponca Creek @ Verdel	USGS Niobrara River @ Mariaville	USGS Niobrara River @ Verdel	USGS Verdigre Creek @ Verdigre
Gage Number	6464900	6464930	6453600	6463720	6465500	6465700
9/24/2017	222	1800	19	1630	2960	131
9/25/2017	541	1700	80	1470	4670	181
9/26/2017	411	1640	98	1350	4070	187
9/27/2017	402	1580	116	1300	3600	155
9/28/2017	291	1490	147	1130	3410	139
9/29/2017	217	1420	121	1010	3030	140
9/30/2017	165	1440	102	957	2970	148
10/1/2017	133	1370	91	962	3010	159
10/2/2017	128	1430	129	1020	3570	280
10/3/2017	130	1400	190	997	3440	1440
10/4/2017	143	1300	142	985	3040	673
10/5/2017	154	1350	107	1100	2430	353
10/6/2017	168	1500	117	1210	2550	1260
10/7/2017	273	1530	220	1190	3070	1600
10/8/2017	408	1610	251	1260	2480	799
10/9/2017	313	1670	181	1160	2290	547
10/10/2017	218	1640	150	964	2260	456
10/11/2017	170	1550	120	901	2050	364
10/12/2017	149	1460	99	858	1910	330
10/13/2017	127	1380	84	852	1890	306
10/14/2017	134	1410	75	848	1920	293
10/15/2017	139	1340	66	867	1640	281
10/16/2017	128	1310	58	932	1420	231
10/17/2017	121	1350	52	1010	1830	218
10/18/2017	118	1400	48	1030	1790	233
10/19/2017	116	1360	44	1140	1830	225
10/20/2017	112	1350	43	1370	2160	205
10/21/2017	110	1390	40	1410	2220	215
10/22/2017	109	1430	39	1510	2260	210
10/23/2017	109	1430	36	1410	2370	211
10/24/2017	108	1470	35	1350	2220	202
10/25/2017	109	1790	35	1360	2130	179
10/26/2017	108	1970	35	1290	2050	179
10/27/2017	104	1900	37	1330	1960	154
10/28/2017	100	1840	37	1440	2220	157
10/29/2017	100	1710	37	1490	2220	157
10/30/2017	102	1650	36	1190	1960	159
10/31/2017	98	1740	37	1240	2230	162

Appendix 1 – Discharge in cubic feet per second

	DNR Keya Paha River @ Naper	DNR Niobrara River @ Butte	USGS Ponca Creek @ Verdel	USGS Niobrara River @ Mariaville	USGS Niobrara River @ Verdel	USGS Verdigre Creek @ Verdigre
Gage Number	6464900	6464930	6453600	6463720	6465500	6465700
11/1/2017	99	1680	38	1380	2340	190
11/2/2017	112	1470	36	1490	2430	206
11/3/2017	114	1330	37	1340	2880	192
11/4/2017	102	1740	37	1190	2550	198
11/5/2017	102	1550	38	1230	2350	200
11/6/2017	106	1470	41	1400	3000	190
11/7/2017	114	1530	42	1300	3010	180
11/8/2017	122	1630	43	1400	3400	178
11/9/2017	131	1660	45	1480	3420	181
11/10/2017	126	1790	44	1250	3960	205
11/11/2017	118	1540	44	1190	3920	213
11/12/2017	132	1570	43	1160	3570	206
11/13/2017	134	1680	43	1090	2920	190
11/14/2017	138	1620	42	1190	2250	206
11/15/2017	134	1710	44	1270	1830	215
11/16/2017	123	1670	49	1150	1960	196
11/17/2017	119	1720	47	1120	2320	184
11/18/2017	116	1690	45	1140	2520	195
11/19/2017	111	1660	45	1180	3110	188
11/20/2017	110	1650	47	1200	3020	179
11/21/2017	123	1830	47	1170	2930	192
11/22/2017	114	1870	49	1200	2840	176
11/23/2017	117	1780	42	1180	3330	191
11/24/2017	123	1670	50	1430	3300	214
11/25/2017	123	1700	47	1430	3360	202
11/26/2017	121	1690	48	1460	3160	190
11/27/2017	121	1650	46	1640	2800	215
11/28/2017	117	1620	44	1730	2840	208
11/29/2017	113	1460	44	1950	3460	183
11/30/2017	105	1470	43	1750	3130	172
12/1/2017	98	1580	45	1510	3490	171
12/2/2017	95	1830	42	1550	3880	163
12/3/2017	98	1970	42	1330	3650	192
12/4/2017	97	2020	42	1390	3770	194
12/5/2017	91	1740	45	1360	3590	197
12/6/2017	80	1790	39	1130	2390	184
12/7/2017	37	1490	33	960	1320	160
12/8/2017	44	1660	19	1340	1630	187

Appendix 1 – Discharge in cubic feet per second						
	DNR Keya Paha River @ Naper	DNR Niobrara River @ Butte	USGS Ponca Creek @ Verdel	USGS Niobrara River @ Mariaville	USGS Niobrara River @ Verdel	USGS Verdigre Creek @ Verdigre
Gage Number	6464900	6464930	6453600	6463720	6465500	6465700
12/9/2017	95	1720	24	1550	2690	195
12/10/2017	164	1690	44	1530	3590	172
12/11/2017	166	1660	58	1710	2630	210
12/12/2017	159	1810	52	1670	2530	198
12/13/2017	155	1730	64	1600	2580	192
12/14/2017	148	1620	62	1610	2700	180
12/15/2017	156	1530	63	1460	2640	184
12/16/2017	144	1360	60	1340	2540	195
12/17/2017	131	1300	58	1580	2330	174
12/18/2017	126	1280	57	1480	2570	180
12/19/2017	124	1310	55	1690	2460	190
12/20/2017	125	1340	54	1430	2670	179
12/21/2017	115	1110	Ice	1060	2430	Ice
12/22/2017	94	894	Ice	998	Ice	Ice
12/23/2017	83	1010		955	Ice	Ice
12/24/2017	79	1040		907	Ice	Ice
12/25/2017	75	814		873	Ice	Ice
12/26/2017	72	696		804	Ice	Ice
12/27/2017	69	650		804	Ice	Ice
12/28/2017	68	570		865		Ice
12/29/2017	65	638		824		Ice
12/30/2017	61	767		758		Ice
12/31/2017	56	888		686		Ice