2018 LNNRD IMP Annual Report

September 3, 2019

Annually the Lower Niobrara Natural Resource District (LNNRD), the Nebraska Department of Natural Resources (NDNR) and the IMP Stakeholder Committee met to review the data collected and tasks completed to accomplish the goals of the IMP.

The following is an overview of the LNNRD activities to accomplish the goals of the IMP:

Goal 1 is to develop and implement processes for the adequate collection of hydrologic and other related data to assess water resources within the District.

The staff has researched the data available through the United State Geological Survey, Nebraska Conservation and Survey and other sources to determine the information available. The research shows there are five hydrologic areas within the District. These five areas can be further divided into twelve hydrologic sub-areas within the District based on the static water level data. The static water levels were then overlaid onto each of the twelve hydrologic areas. After evaluating the twelve area and overlaying the irrigated acres we determine to best show the static water level changes we combine the twelve into four distinct areas: Keya Paha, Ponca, Middle Niobrara and Lower Niobrara. Included with this report is the Lower Niobrara NRD 2019 Spring Static Water Level Report prepared by the District's Water Coordinator Wade Ellwanger. (Appendix 1) In addition to the spring and fall static water level measurements the District has:

- purchased and installed 4 pressure transducers that record daily water levels at our 4 dedicated monitoring sites.
  - Data is attached (Appendix 2).
- applied for and received a NET grant to expand our dedicated monitoring well program from 4 to 10 sites. All with pressure transducers.
  - Initial test hole drilling for the first 2 areas was completed in August 2019.

The next two goals work hand in hand, because if you maintain sustainability you will minimize conflicts between all users. Goal 2 requires the District to develop systematic approaches for the development and sustainability of water resources within the District, and Goal 3 is to prevent, resolve, and minimize water related conflicts among and between surface water and groundwater users.

The first step to accomplish these goals was to revised rules and regulation of the LNNRD to address development, sustainability and minimization of water related conflicts. The first of these rules and regulations enacted gives the Directors the ability to evaluate the District's groundwater supply along with other factors in June of each year to determine if new irrigated acres should or should not be added within the District boundaries. At the June 3, 2019 meeting the Board decided to add up to 500 new irrigated acres with the following criteria. Preference is to be given to completing a circle—example removing an old farmstead so the pivot can make a complete circle; must be less than 25% of the total certified acres of the field; no new wells can be added. Application are due by August 31, 2019.

Secondly, the District has certifying all the irrigated acres within its boundary and keeps the data base up to date. Currently there one irrigated field which are not certified. For this field we have received the signed documents, but there are issues with the well registration which need to be corrected before we sign off on them. (Appendix 3)

The District does allow for the replacement of high capacity wells with the condition they can only be constructed to pump the same GPM as the well being replaced and are placed within 300-feet of the well to be replace. In 2018, the District received and approved six well permit applications for irrigation replacement wells. The District also developed rules and regulations for helper/supplemental wells. In 2018 there were one request for a helper/supplemental well, it is currently going through the process to see if it meets our requirements.

Flowmeters are required on all new or modified wells in the District. The District also requires a flowmeter on systems which are applying for a supplemental/helper well. The District had applied for and received a NET Grant in 2009-2011 for flowmeter purchases. Many producers took advantage of the cost-share and installed meters on their system. As a condition of receiving the cost-share the producer is to submit their meter reading annually. At this time flowmeter readings are on a voluntary base, so, not all submit their readings in a timely manner. For the meters which reported readings the District average 8.31 inches of irrigation which is down slightly from last year. Appendix 4 is a spreadsheet showing the flowmeter usage for those which reported.

In addition to the rules and regulations the District is working with four other Districts and Nebraska Game and Parks Commission to purchase the water appropriation held by Nebraska Public Power District at the Spencer Hydro Facility. There are many reasons this is a win-win but the three main ones are: brings the control of the river back to local control, provides a way to satisfy the National Parks Service desire for a Federal Reserve water right and maintains the river for fish, wildlife, recreation, agriculture and industry.

Goal 4 requires the District and the Department to develop and provide educational opportunities and outreach materials about hydrologically connected surface water and groundwater, water conservation, and to keep the constituents of the District informed about the IMP as it is implemented. Our Programs Assistant has been visiting the schools in the District providing information on the NRD and groundwater issues. She is also brought back 8th Grade Conservation Day where 8th graders learn about both ground and surface water issues.

Even though the IMP does not deal with nitrates directly they are a part of the overall water picture in the District. Included with the report is the District's Annual Phase II Report. This report shows the relation between water usage, types of crops and nitrates in the District. This is a useful tool to the District and is considered in the discussion process of to add or not add new irrigated acres.

Appendix 1

Lower Niobrara Natural Resources District
410 Walnut Street, P.O. Box 350
Butte, NE 68722-0350
Phone: (402) 775-2343
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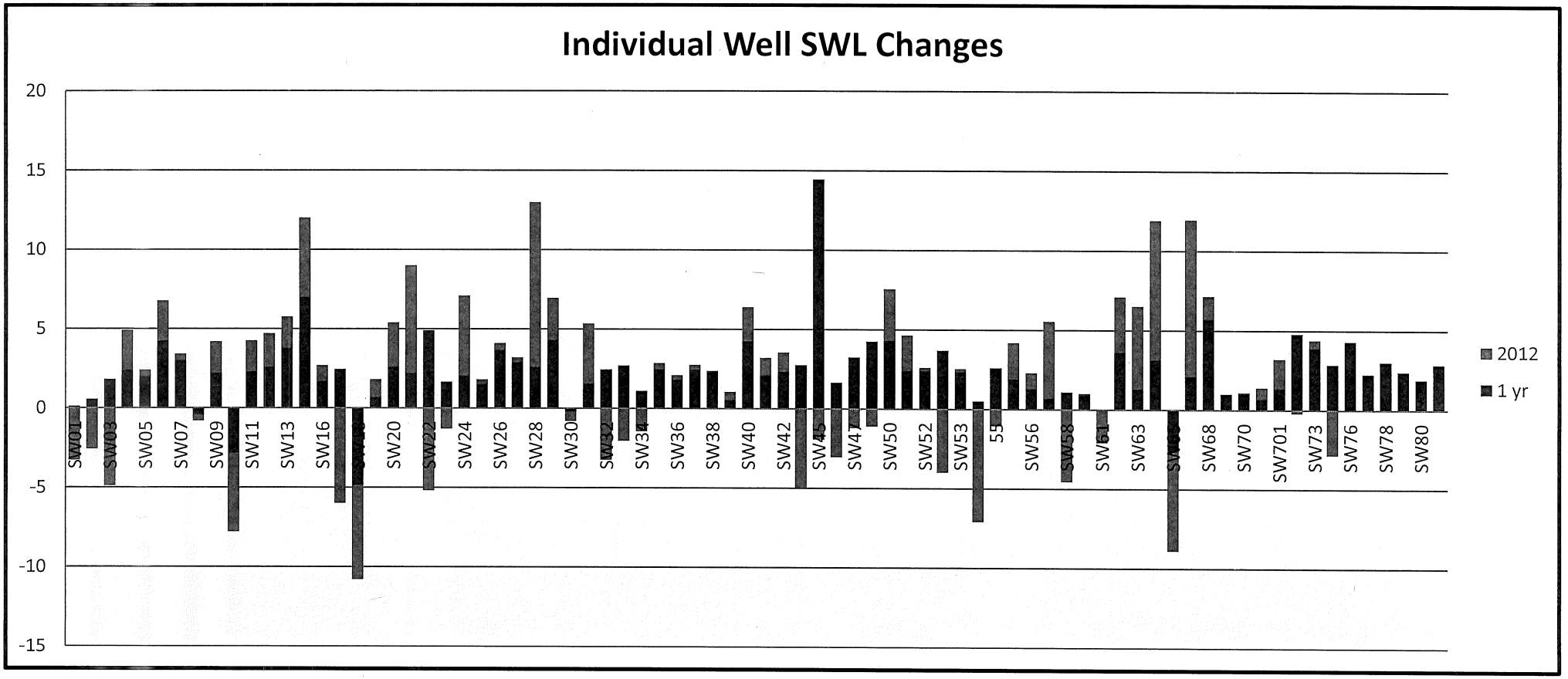
2019 Spring Static Water Level Report

Wade Ellwanger
Water Resources Coordinator



The **blue** line for each well indicates the change from 2018.
The **red** line for each well indicates the change from 2012.

Well changes from 2018

73 wells increased SWL
5 wells decreased SWL

0 wells had no change in SWL

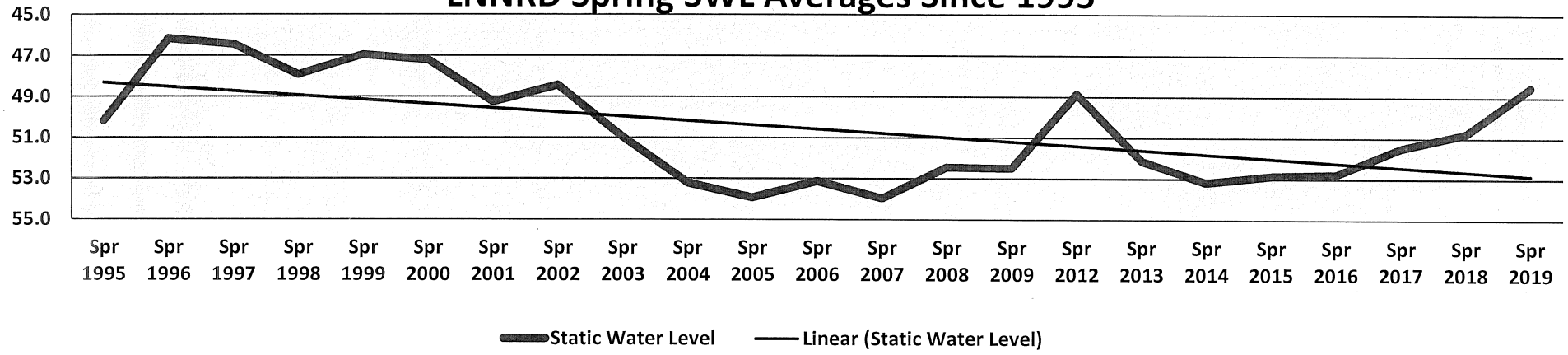
Range of SWL change = **-4.85' to +14.45'**
Average change in SWL = **+2.295'**

Well changes from 2012

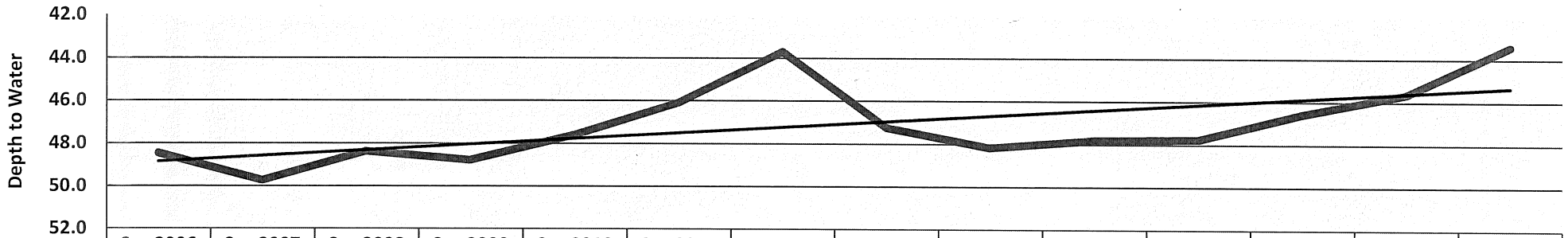
45 wells increased SWL
27 wells decreased SWL
0 wells had no change in SWL

Range of SWL change = **-6.3' to +10.4'**
Average change in SWL = **+0.32'**

LNNRD Spring SWL Averages Since 1995

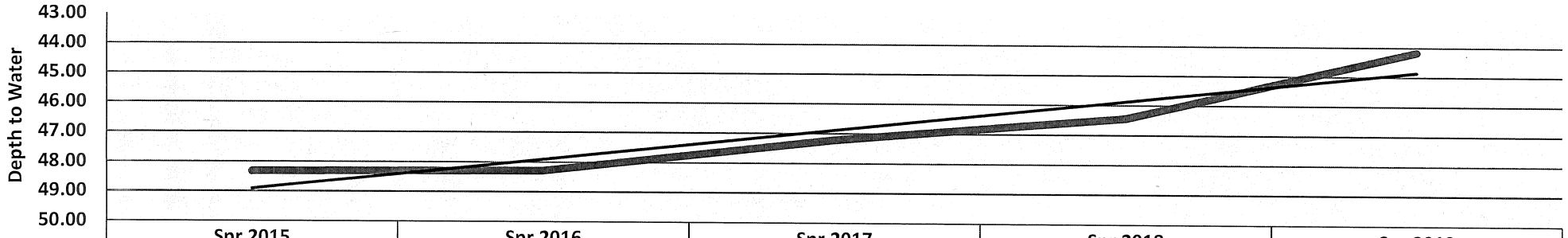


LNNRD Spring SWL Averages Since 2006



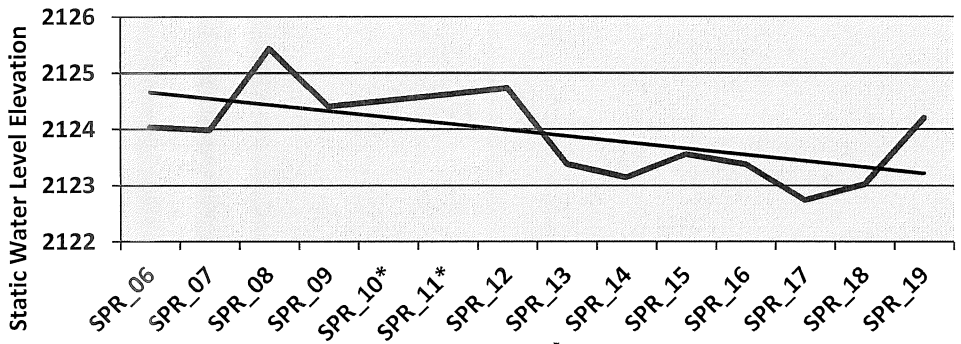
	Spr 2006	Spr 2007	Spr 2008	Spr 2009	Spr 2010	Spr 2011	Spr 2012	Spr 2013	Spr 2014	Spr 2015	Spr 2016	Spr 2017	Spr 2018	Spr 2019
SWL	48.5	49.7	48.4	48.8	47.6	46.1	43.7	47.2	48.2	47.8	47.8	46.6	45.7	43.4

LNNRD Spring SWL Averages Since 2015

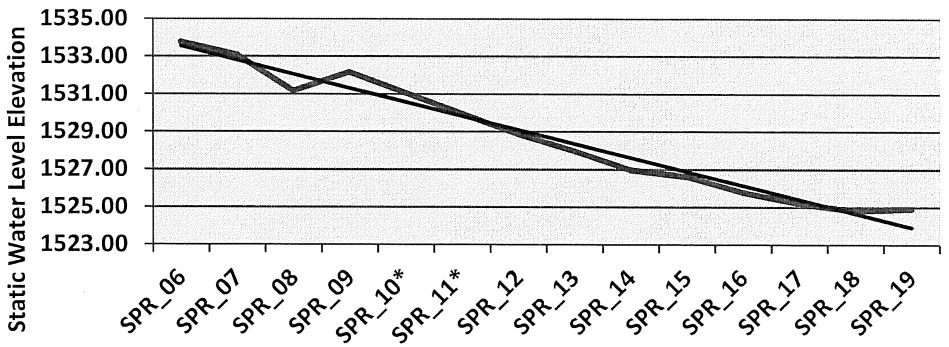


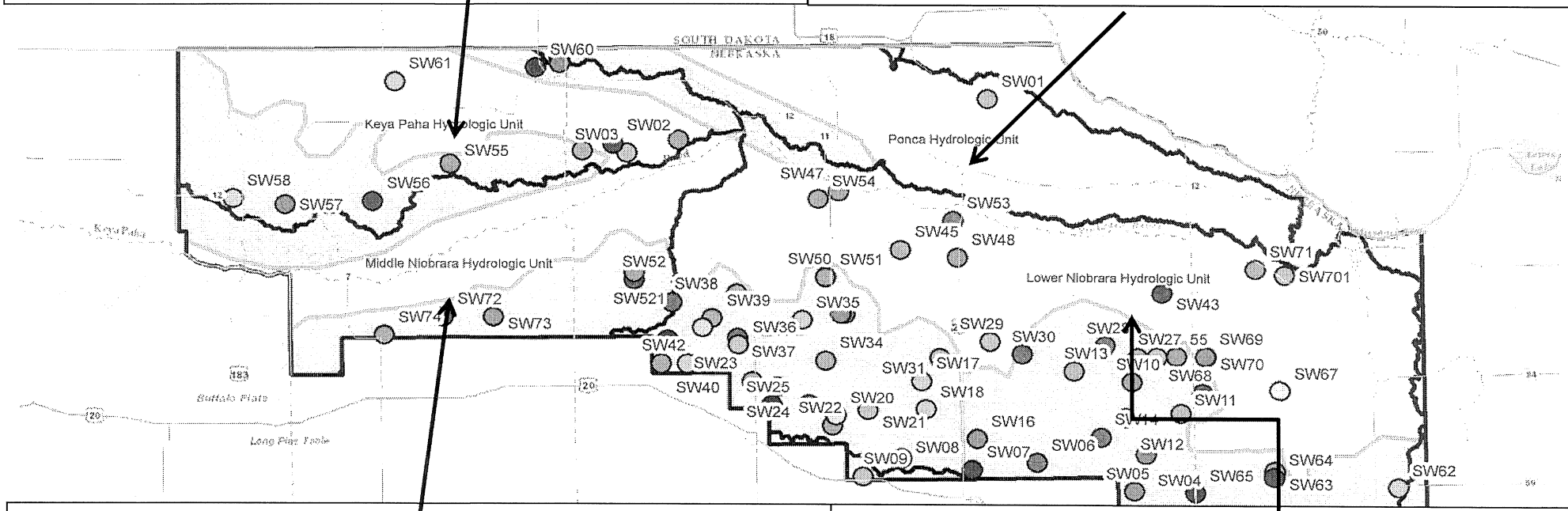
	Spr 2015	Spr 2016	Spr 2017	Spr 2018	Spr 2019
SWL	48.32	48.29	47.22	46.45	44.18

Keya Paha Hydrologic Unit

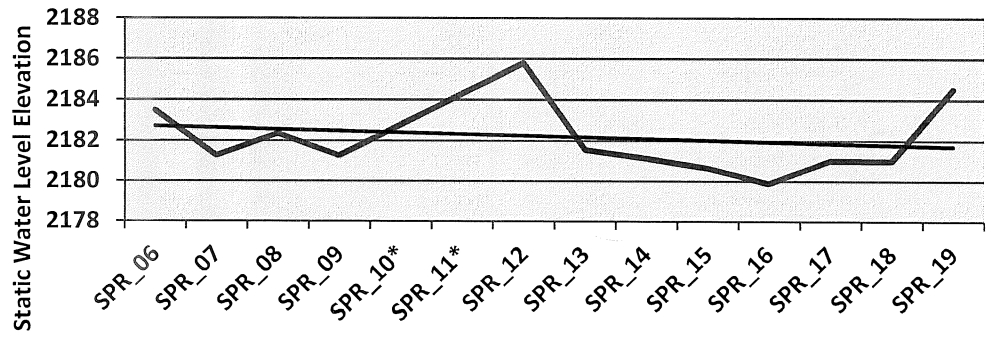


Ponca Hydrologic Unit

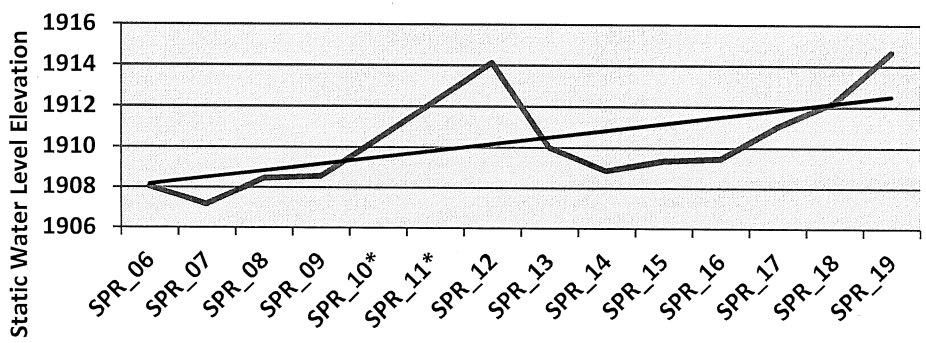




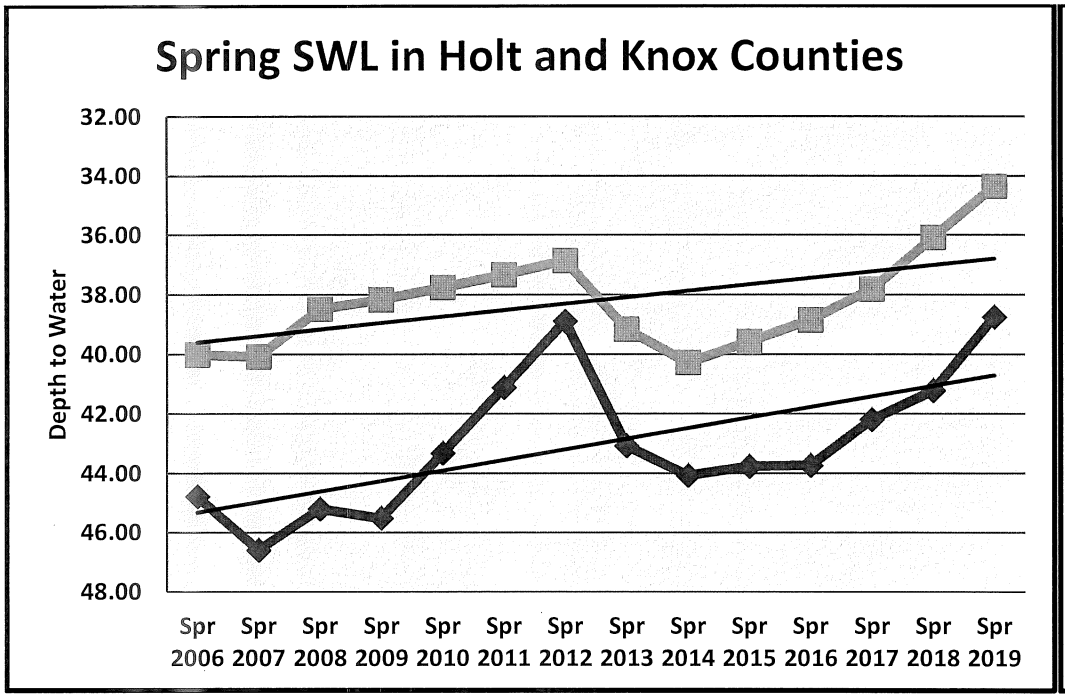
Middle Niobrara Hydrologic Unit

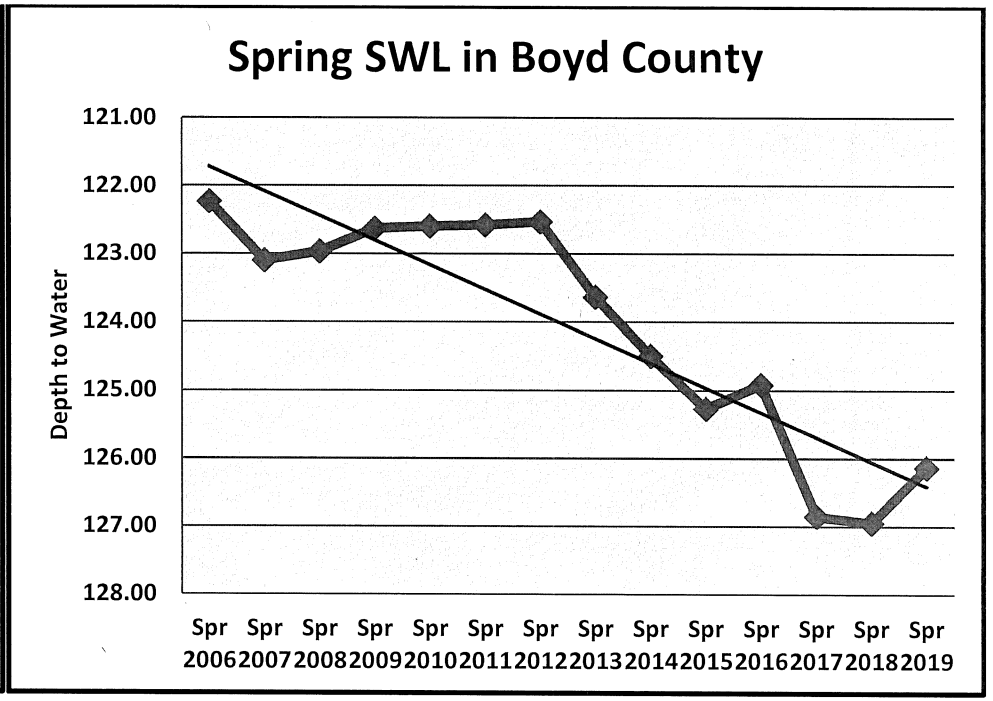


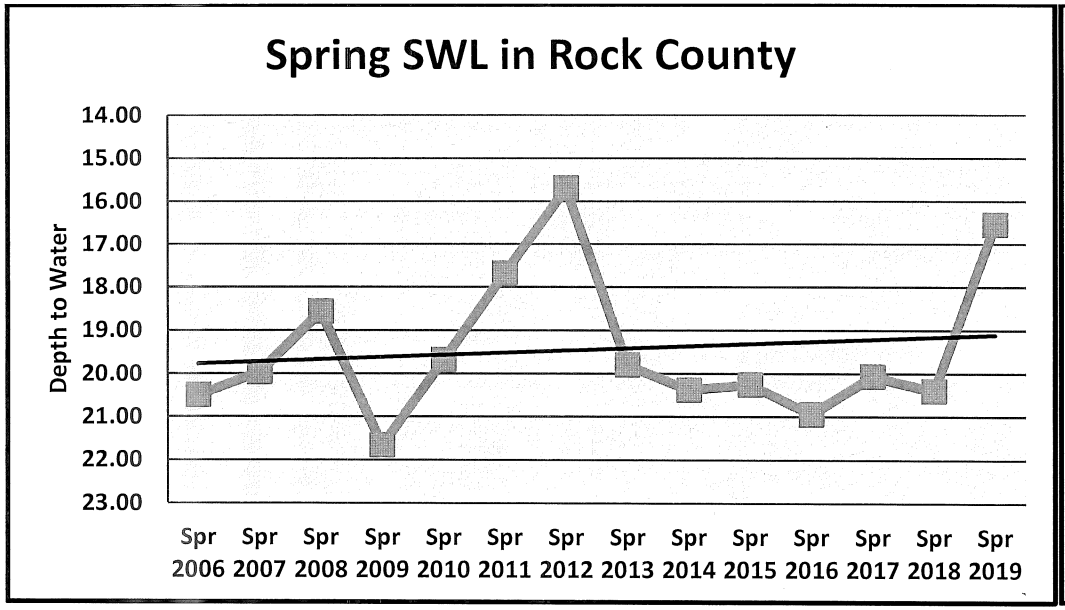
Lower Niobrara Hydrologic Unit

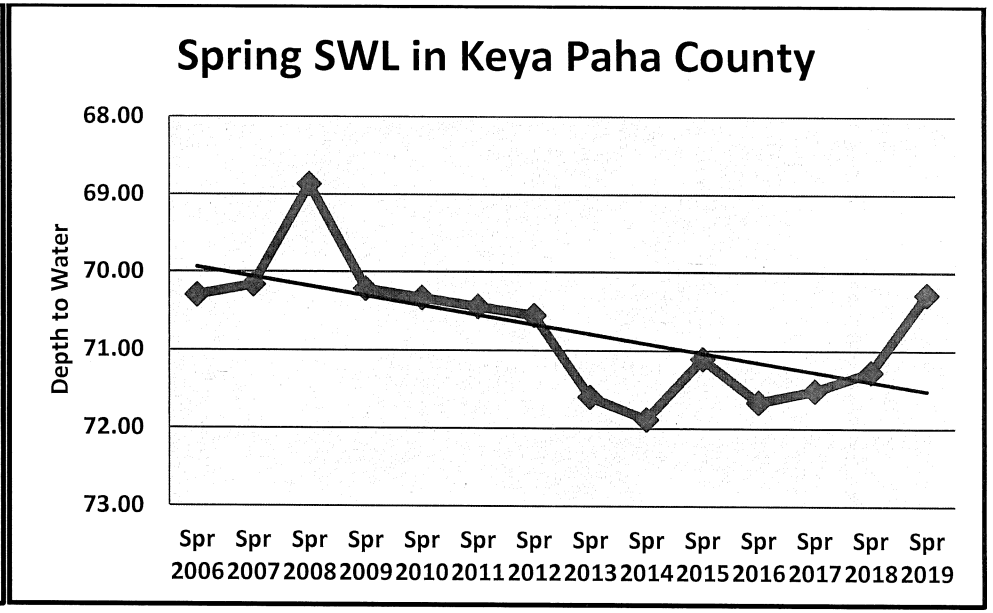


LNNRD Spring Static Water Levels by County

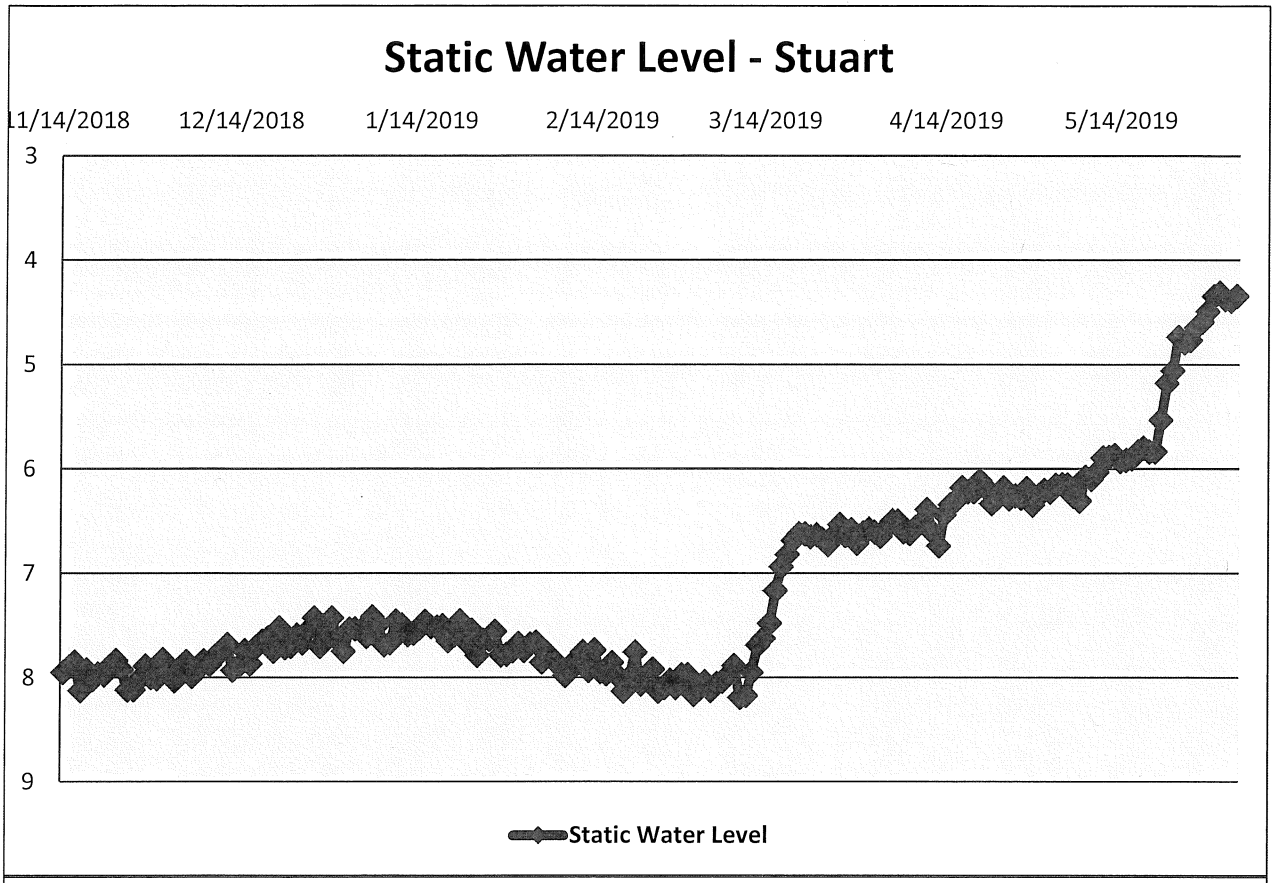


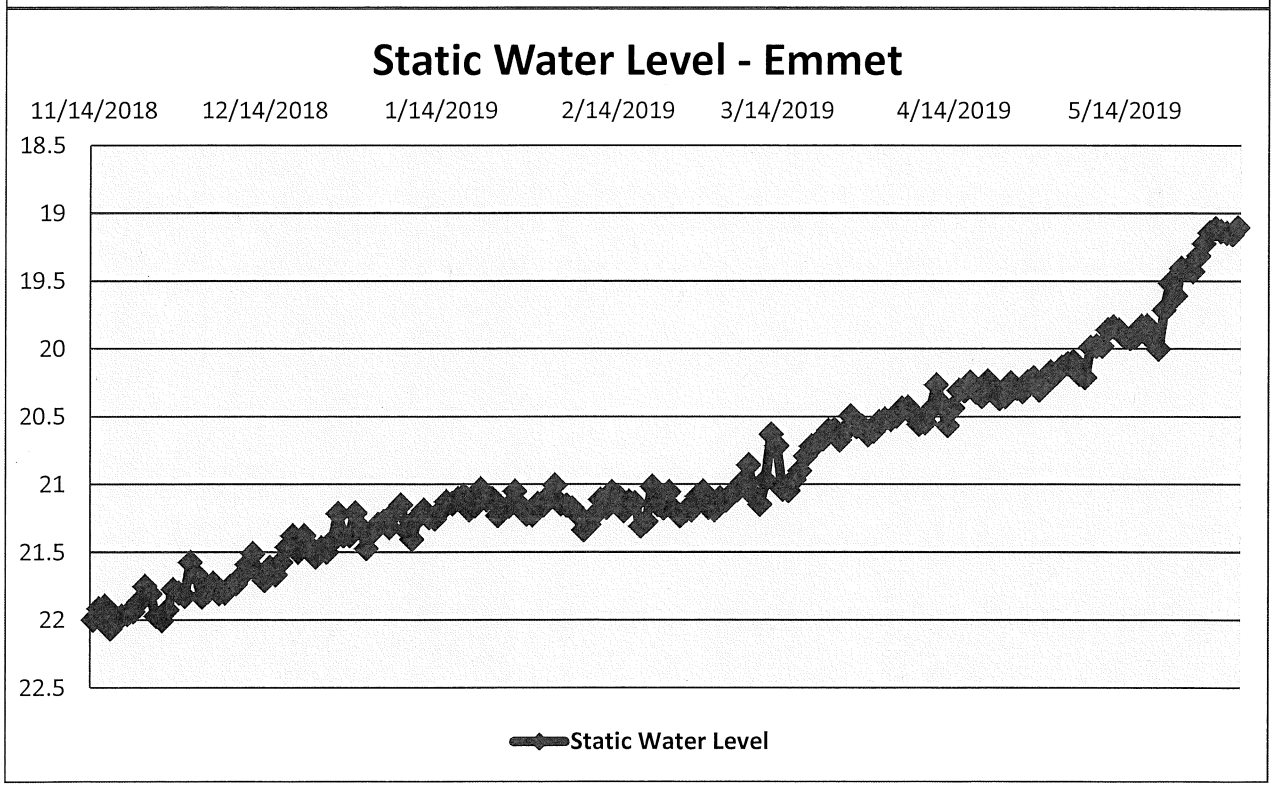


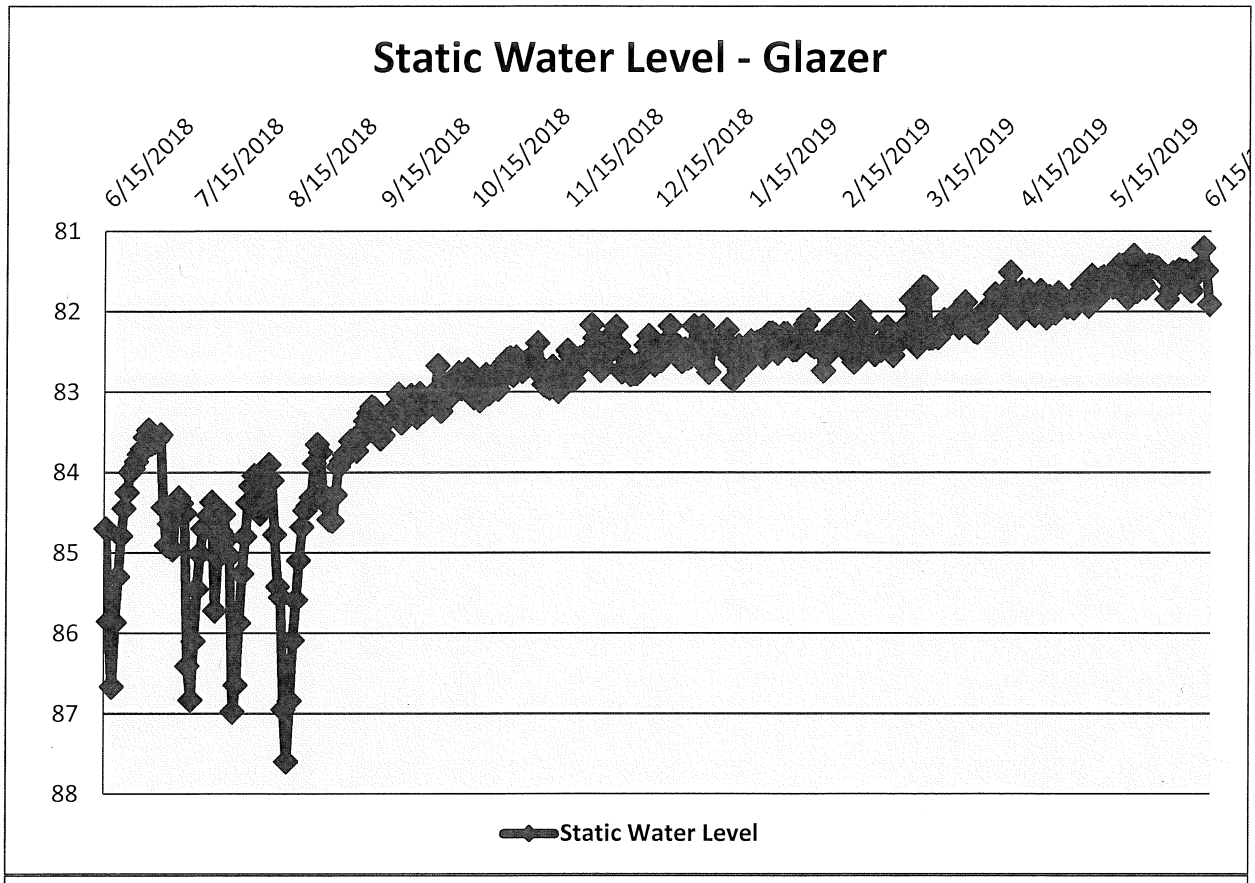


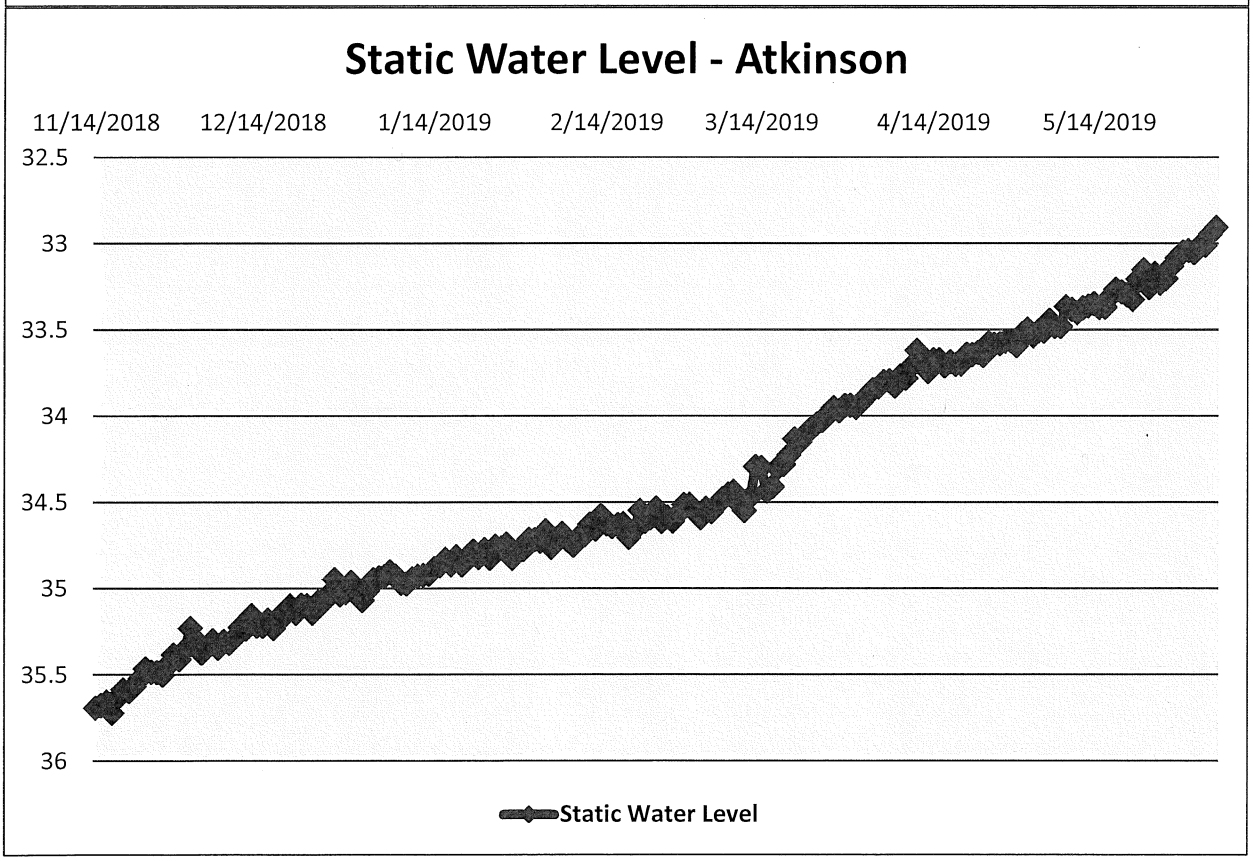


Appendix 2


Static Water Level - Stuart
11/14/2018
12/14/2018
1/14/2019
2/14/2019
3/14/2019
4/14/2019
5/14/2019
3
4
5
6
7
8
9
Static Water Level


Static Water Level - Emmet
11/14/2018
12/14/2018
1/14/2019
2/14/2019
3/14/2019
4/14/2019
5/14/2019
18.5
19
19.5
20
20.5
21
21.5
22
22.5
Static Water Level


Static Water Level - Glazer
6/15/2018
7/15/2018
8/15/2018
9/15/2018
10/15/2018
11/15/2018
12/15/2018
1/15/2019
2/15/2019
3/15/2019
4/15/2019
5/15/2019
81
82
83
84
85
86
87
88
Static Water Level


Static Water Level - Atkinson
11/14/2018
12/14/2018
1/14/2019
2/14/2019
3/14/2019
4/14/2019
5/14/2019
32.5
33
33.5
34
34.5
35
35.5
36
Static Water Level

Appendix 3

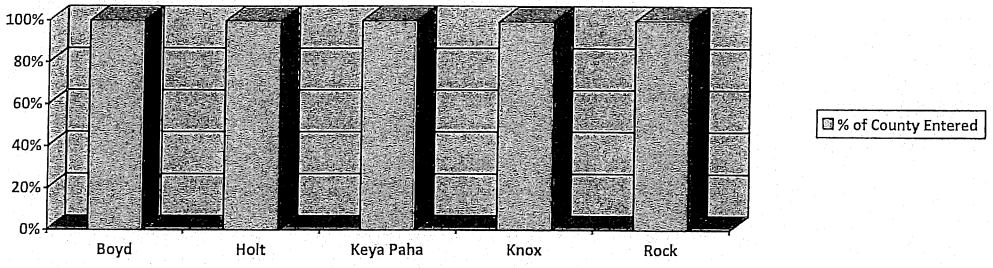
The following report reflects the percentage of the District which is certified.

Programs Assistant Report

September 2019

Acre Certification–

	Certifications Sent (ac.)	Certifications Received (ac.)	Total Acres	% of County Entered	% of District Entered
Boyd	9,186	9,186	9,186	100.00%	3.85%
Holt	181,348	181,410	181,745	99.82%	75.99%
Keya Paha	16,073	16,073	16,073	100.00%	6.73%
Knox	23,627	23,627	23,627	100.00%	9.90%
Rock	7,966	8,102	8,102	100.00%	3.39%
Total	**238,200**	**238,398**	**238,733.00**		**99.86%**



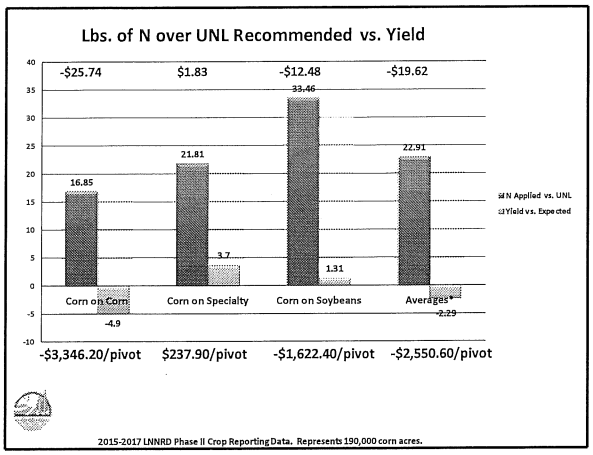
Appendix 4

1/4	Sec	Twp	Rng	Co	Acres	Fall 2017	Fall 2018	Inches/acre
NW	30	29	9	Holt	130	940894	954257	1.23
NW	7	29	10	Holt	131	289792	532937	6.84
NE	7	29	10	Holt	131	192410	459398	7.51
SE	8	29	11	Holt	134	389488	611617	6.10
NE	10	29	11	Holt	132	892533	52984	4.48
SE	11	29	11	Holt	131	439095	686612	6.96
NE	11	29	11	Holt	132	293864	542681	6.94
SW	11	29	11	Holt	134	441386	593103	4.17
NE	17	29	11	Holt	133	415991	589968	4.82
NW	17	29	11	Holt	155	521829	792865	6.44
SE	10	30	10	Holt	135	251464	390610	3.80
NW	2	30	13	Holt	122	505901	531007	7.58
SE	21	30	13	Holt	146	116261	167535	1.29
NE	10	30	14	Holt	148.3	21854	121685	8.08
SE	10	30	14	Holt	149.1	957410	81611	10.00
SE	3	31	13	Holt	137	276312	305142	0.77
NE	3	31	13	Holt	129.11	245612	330578	7.90
NE	10	31	13	Holt	131	189403	262244	6.67
SE	29	31	13	Holt	60	381548	422502	8.19
SW	12	31	14	Holt	102	522940	878029	12.82
SW	14	31	14	Holt	147	244021	383764	11.41
SE	28	31	14	Holt	133	908105	358022	12.46
SE	30	31	14	Holt	135	707720	334263	17.09
SW	30	31	14	Holt	129	667891	284263	17.60
NW	31	31	14	Holt	132	207432	384248	4.93
SW	31	31	14	Holt	133	265288	426514	14.55
SE	34	31	14	Holt	127	144018	285270	4.10
NW	34	31	14	Holt	133	66343	283611	6.02
SW	1	31	15	Holt	133	156242	242765	7.81
NE	11	31	15	Holt	134.9	27918	103070	6.69
SW	26	31	15	Holt	131	98288	216790	10.86
NW	26	31	15	Holt	99	699208	796898	11.84
SW	27	31	15	Holt	135	145737	307141	14.35
NW	31	31	15	Holt	130	478753	106336	17.78
NE	34	31	15	Holt	132	109753	240914	11.92
SE	34	31	15	Holt	134	158801	295766	12.27
SW	34	31	15	Holt	135	214857	388268	15.41
NE	24	32	7	Knox	70	913986	913986	0

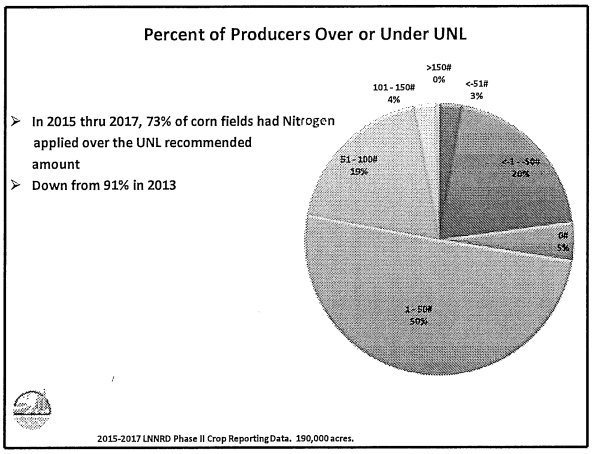
1/4	Sec	Twp	Rng	Co	Acres	Fall 2017	Fall 2018	Inches/acre
SE	24	32	7	Knox	110	195578	195578	0
SW	19	33	19	KP	130	221972	288120	18.74
NE	20	33	21	KP	130	963869	170270	5.85
NW	20	33	21	KP	130	724990	13415	8.17
SE	20	33	21	KP	130	803284	133754	9.36
SE	21	33	21	KP	130	337265	636245	8.47
NE	21	33	21	KP	130	105605	418594	8.87
NW	21	33	21	KP	130	186899	420944	6.63
SW	24	33	21	KP	130	774032	12101	6.74
NE	15	31	13	Holt	148	402689	584695	4.53
SW	7	31	14	Holt	138	90962	171368	6.99
E1/2	8	31	14	Holt	296	458807	826638	4.58
NE	33	31	14	Holt	144	923338	3892	6.71
NE	1	31	15	Holt	155	243361	377584	10.39
SW	2	31	15	Holt	30	107482	116001	3.41
SE	18	31	15	Holt	130	375540	929312	15.69
SE	15	32	12	Holt	130	182520	392970	5.96
SE	28	33	20	KP	113	740512	791570	5.42
NW	33	31	13	Holt	132.03	996807	129919	12.10
E1/2	9	31	14	Holt	12	463634	517980	16.68
E1/2	16	31	14	Holt	14	564196	633243	18.16
S1/2	16	31	14	Holt	14	463410	528107	17.02
NE	22	31	14	Holt	151.68	725603	64668	8.23
NE	18	31	15	Holt	130	563877	46887	13.68
NE	23	31	15	Holt	160	233469	284075	1.16
NW	19	33	19	KP	130	375096	407958	9.31
NE	28	33	19	KP	130	323328	348810	7.22
NW	25	33	20	KP	130	323939	341804	5.06
NE	25	33	20	KP	130	328408	352867	6.93
SW	26	33	20	KP	130	299258	329185	8.48
NW	26	33	20	KP	130	382032	411654	8.39
SE	8	33	21	KP	135.08	133753	248534	10.20
SW	28	31	13	Holt	21.41	355654	396379	7.01
NE	31	31	13	Holt	153	730378	851975	9.54
Ct	33	31	13	Holt	105.53	705926	9184	10.58
SE	18	33	14	Holt	126	988146	55135	6.38
NE	18	33	14	Holt	126	46761	63937	1.64
SW	12	33	15	Holt	112	965319	115035	16.04
SE	12	33	15	Holt	125	8829	126424	11.29

1/4	Sec	Twp	Rng	Co	Acres	Fall 2017	Fall 2018	Inches/acre
NW	32	33	19	KP	130	223848	246453	6.40
NW	32	33	19	KP	130	223848	245453	6.12
E 1/2	32	33	19	KP	130	140621	154246	3.86
SW	25	33	20	KP	130	86441	96261	2.78
NE	25	35	17	KP	158	181627	189100	1.74
SE	25	35	17	KP	138	163645	165105	0.39
SW	10	29	10	Holt	130	449723	636900	5.30
NE, SW	13	29	11	Holt	131.6	499432	168287	18.72
					10,714.74			
					126.06		**Avg Inches/Acre**	**8.31**

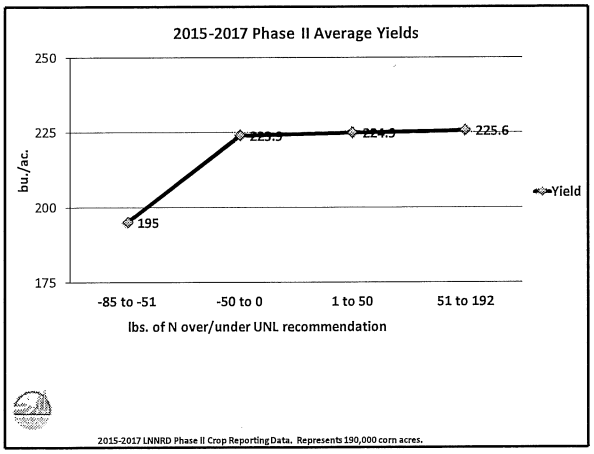
Appendix 5


Lbs. of N over UNL Recommended vs. Yield
-$25.74
$1.83
-$12.48
-$19.62
16.85
-4.9
21.81
3.7
33.46
1.31
22.91
-2.29
Corn on Corn
Corn on Specialty
Corn on Soybeans
Averages*
-$3,346.20/pivot
$237.90/pivot
-$1,622.40/pivot
-$2,550.60/pivot
N Applied vs. UNL
Yield vs. Expected
2015-2017 LNNRD Phase II Crop Reporting Data. Represents 190,000 corn acres.

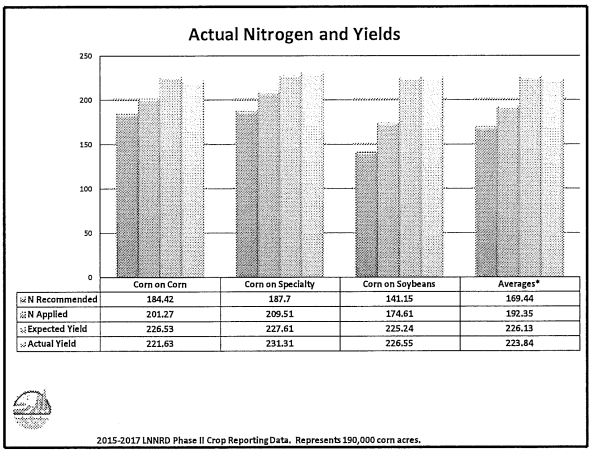
1


Percent of Producers Over or Under UNL
In 2015 thru 2017, 73% of corn fields had Nitrogen applied over the UNL recommended amount
Down from 91% in 2013
>150# 0%
<-51# 3%
101 - 150# 4%
51 - 100# 19%
-51 - 50# 20%
0# 5%
1 - 50# 50%
2015-2017 LNNRD Phase II Crop Reporting Data. 190,000 acres.

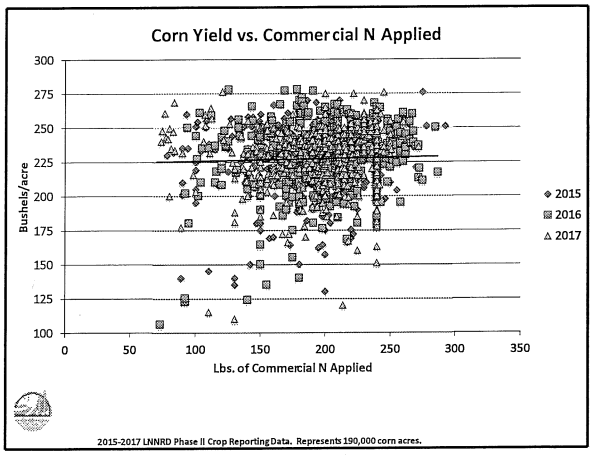
2


2015-2017 Phase II Average Yields
bu./ac.
195
225.3
224.3
225.6
Yield
-85 to -51
-50 to 0
1 to 50
51 to 192
lbs. of N over/under UNL recommendation
2015-2017 LNNRD Phase II Crop Reporting Data. Represents 190,000 corn acres.

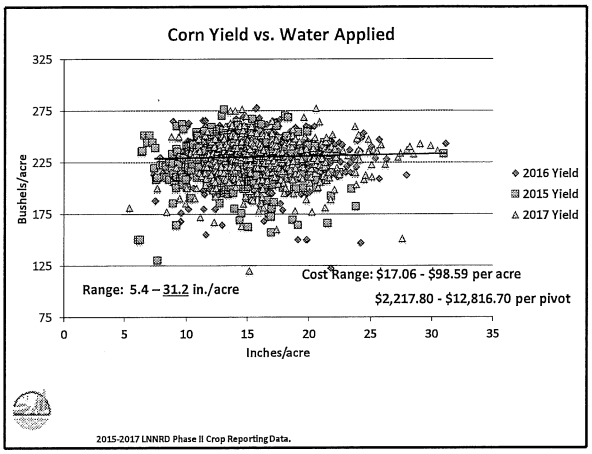
3


Actual Nitrogen and Yields
Corn on Corn
Corn on Specialty
Corn on Soybeans
Averages*
N Recommended 184.42 187.7 141.15 169.44
N Applied 201.27 209.51 174.61 192.35
Expected Yield 226.53 227.61 225.24 226.13
Actual Yield 221.63 231.31 226.55 223.84
2015-2017 LNNRD Phase II Crop Reporting Data. Represents 190,000 corn acres.

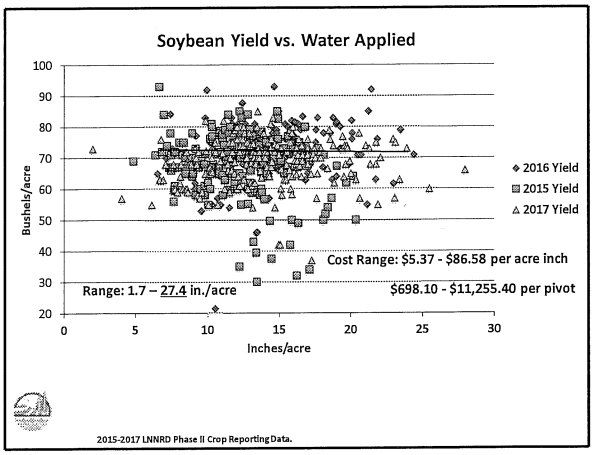
4


Corn Yield vs. Commercial N Applied
Bushels/acre
Lbs. of Commercial N Applied
2015
2016
2017
2015-2017 LNNRD Phase II Crop Reporting Data. Represents 190,000 corn acres.

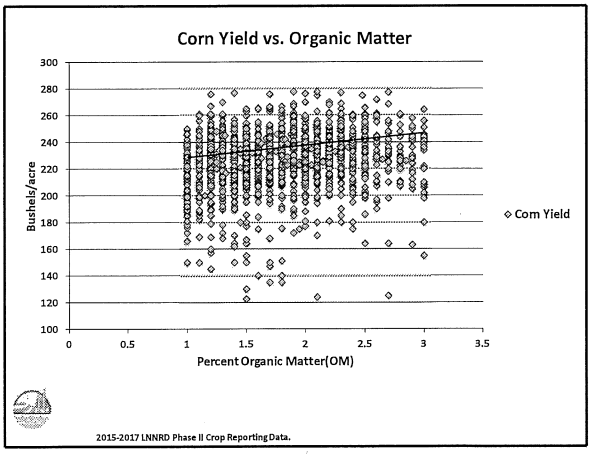
5


Corn Yield vs. Water Applied
Bushels/acre
Inches/acre
2016 Yield
2015 Yield
2017 Yield
Cost Range: $17.06 - $98.59 per acre
Range: 5.4 – 31.2 in./acre
$2,217.80 - $12,816.70 per pivot
2015-2017 LNNRD Phase II Crop Reporting Data.

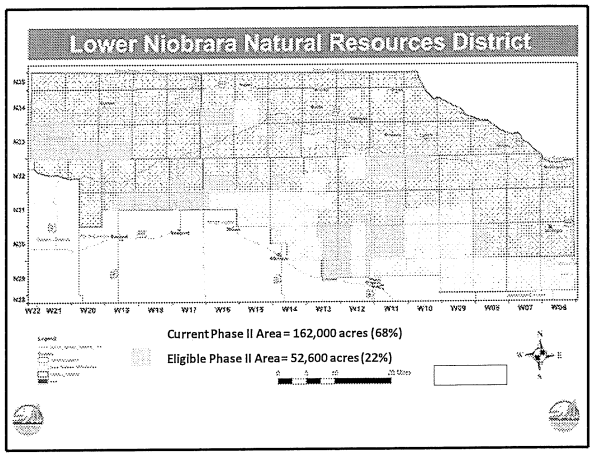
6


Soybean Yield vs. Water Applied
Bushels/acre
Inches/acre
2016 Yield
2015 Yield
2017 Yield
Cost Range: $5.37 - $86.58 per acre inch
Range: 1.7 – 27.4 in./acre
$698.10 - $11,255.40 per pivot
2015-2017 LNNRD Phase II Crop Reporting Data.

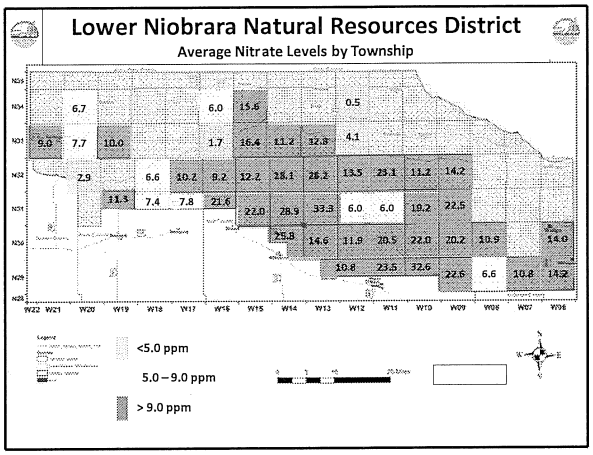
7


Corn Yield vs. Organic Matter
Bushels/acre
Percent Organic Matter(OM)
Corn Yield
2015-2017 LNNRD Phase II Crop Reporting Data.

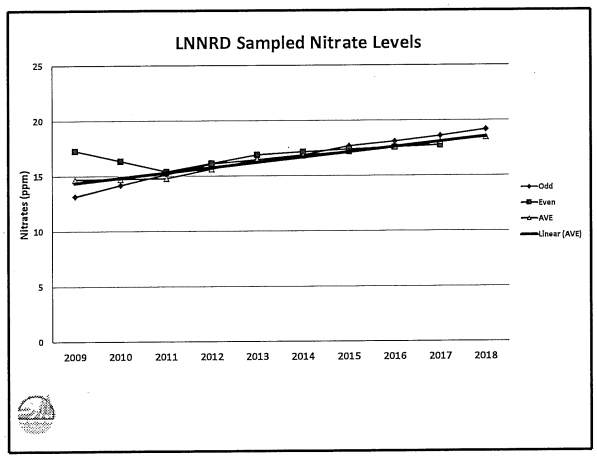
8


Lower Niobrara Natural Resources District
Current Phase II Area = 162,000 acres (68%)
Eligible Phase II Area = 52,600 acres (22%)

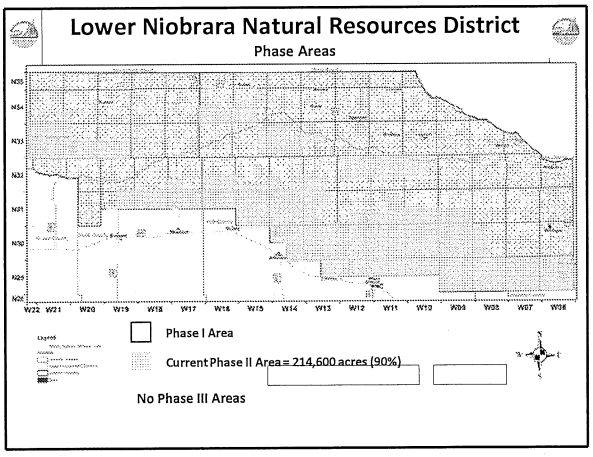
9


Lower Niobrara Natural Resources District
Average Nitrate Levels by Township
<5.0 ppm
5.0 – 9.0 ppm
> 9.0 ppm

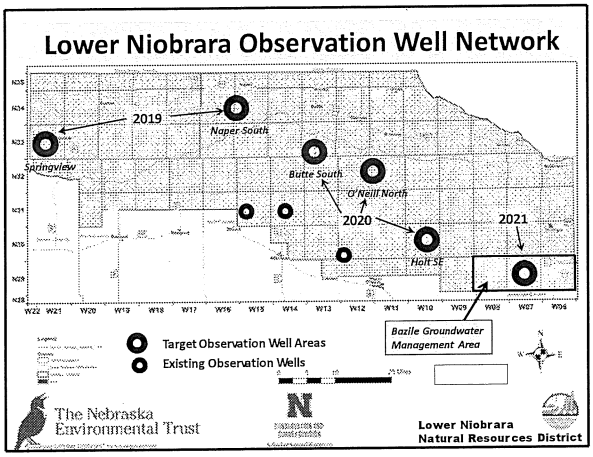
10


LNNRD Sampled Nitrate Levels
Nitrates (ppm)
25
20
15
10
5
0
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
Odd
Even
AVE
Linear (AVE)

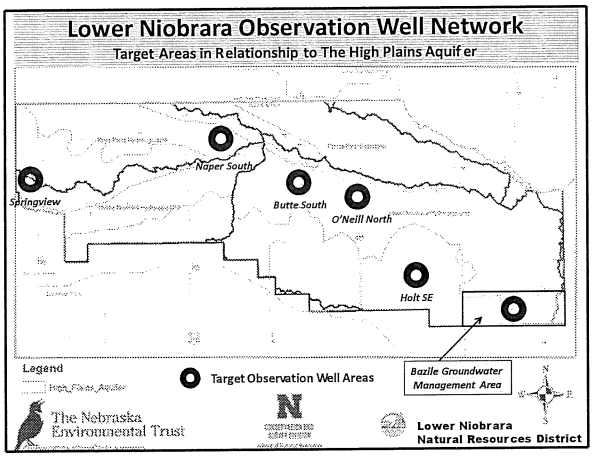
11


Lower Niobrara Natural Resources District
Phase Areas
Phase I Area
Current Phase II Area = 214,600 acres (90%)
No Phase III Areas

12


Lower Niobrara Observation Well Network
2019
Naper South
Springview
Butte South
O'Neill North
2020
2021
Holt SE
Bazile Groundwater Management Area
Target Observation Well Areas
Existing Observation Wells
The Nebraska Environmental Trust
Lower Niobrara Natural Resources District

13


Lower Niobrara Observation Well Network
Target Areas in Relationship to The High Plains Aquifer
Naper South
Springview
Butte South
O'Neill North
Holt SE
Legend
Target Observation Well Areas
Bazile Groundwater Management Area
The Nebraska Environmental Trust
Lower Niobrara Natural Resources District

14