Iowa Wetland Assessment and Restoration Plan

The Opportunity

- LiDAR – provides a new ability to map and model our landscape
- Billions need to be spent on Iowa's drainage infrastructure
- Public support for changes in water quality, flooding, and habitat management is high and rising
- Precedent for high dollar restorations has been set (Chesapeake Bay, Everglades)

Long Term Objectives

- Develop a defensible understanding of the breadth of wetland restorations required to have a significant impact on water quality, flooding, and habitat concerns both in Iowa and nationally
- Effectively educate decision makers and the public on both the scale of the issues and the scale of the solutions
- Develop a system to effectively plan, track, and communicate the restorations and the effects of those restorations

The Goals

- Accurately delineate and catalogue all restorable wetlands
- Capture "depression statistics" for all restorable wetlands (SA, DA, Vol, Basin Order, *etc*.)
- Develop a depression-level hydrologic model for the state (starting with the Des Moines Lobe)
- Model depression restoration impacts for water quality, flooding, wildlife, agriculture, and economy

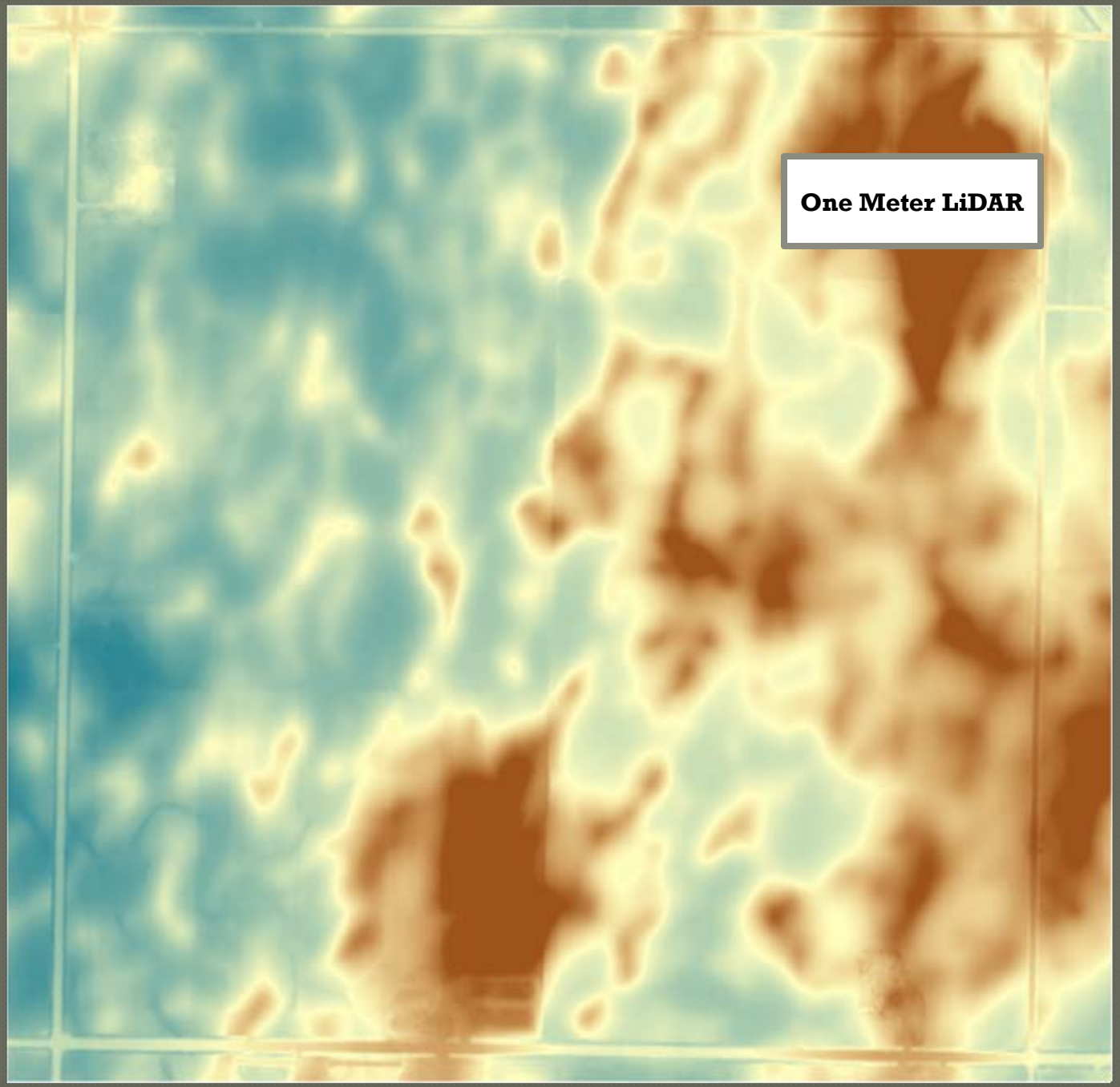
Goals Continued

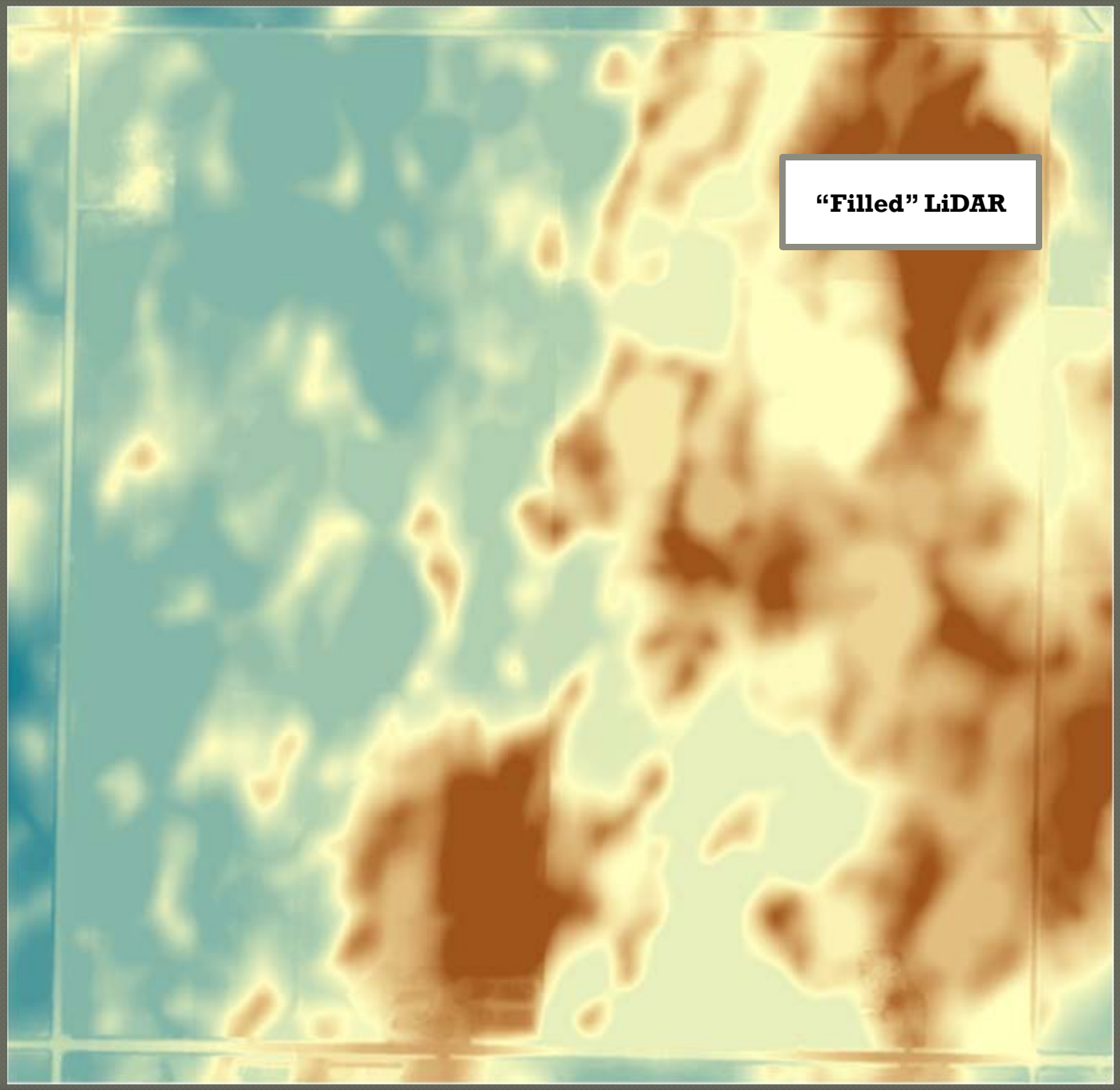
- Determine total loads (H_20, nutrients, sediment, *etc*.) at outlet of HUC-12s
- Assign load results to individual depressions as a percent of total impact to HUC-12
- Run scenarios (*e.g*. Gulf Hypoxia, Des Moines Flooding, Scaup Habitat, *etc*.)
- Present data and findings through interactive, web-based, GIS tools

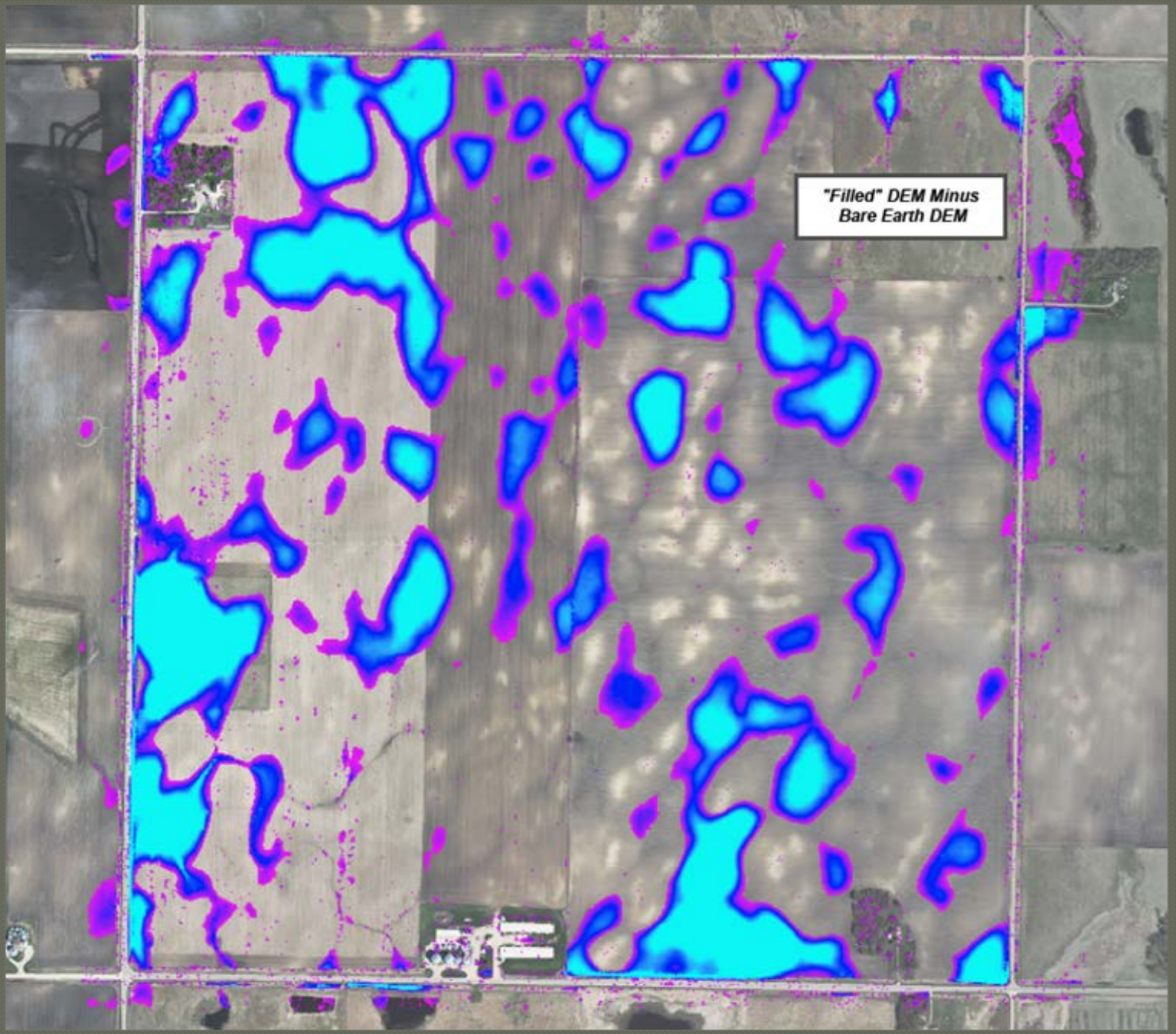
The "Iowa Plan"

- What are they doing right?
  - Plan is a response to a specific problem with lots of national recognition (Gulf Hypoxic Zone)
  - Proposed a quantified solution
    - "Wetlands can help this problem" vs. "X million acres of wetland restoration in these exact locations will fix this problem"
  - Enough science to make the solution credible to decision makers
  - Identified viable mitigation offerings for agriculture and economic losses
  - Marketing!

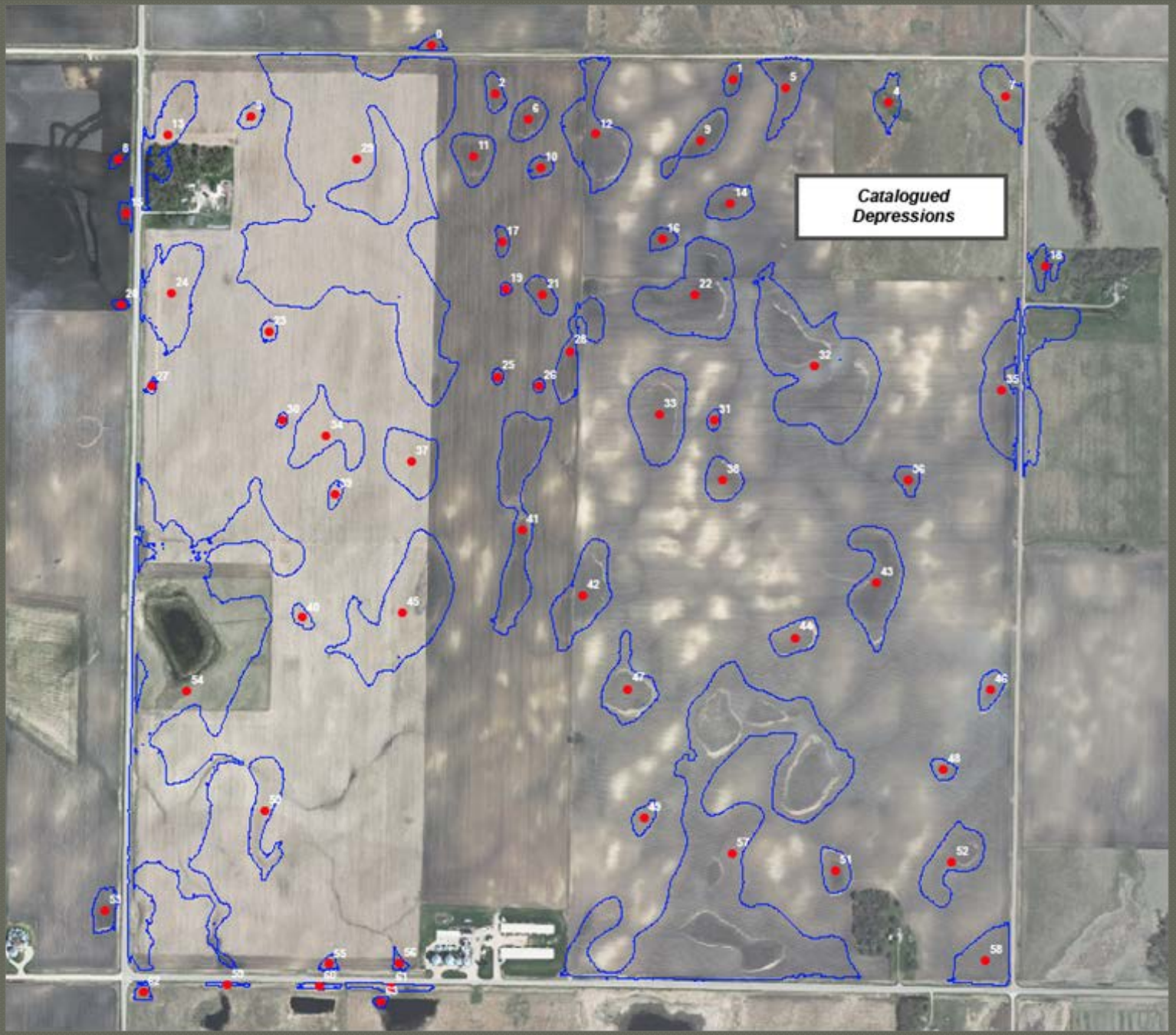
Data Development Process


One Meter LiDAR

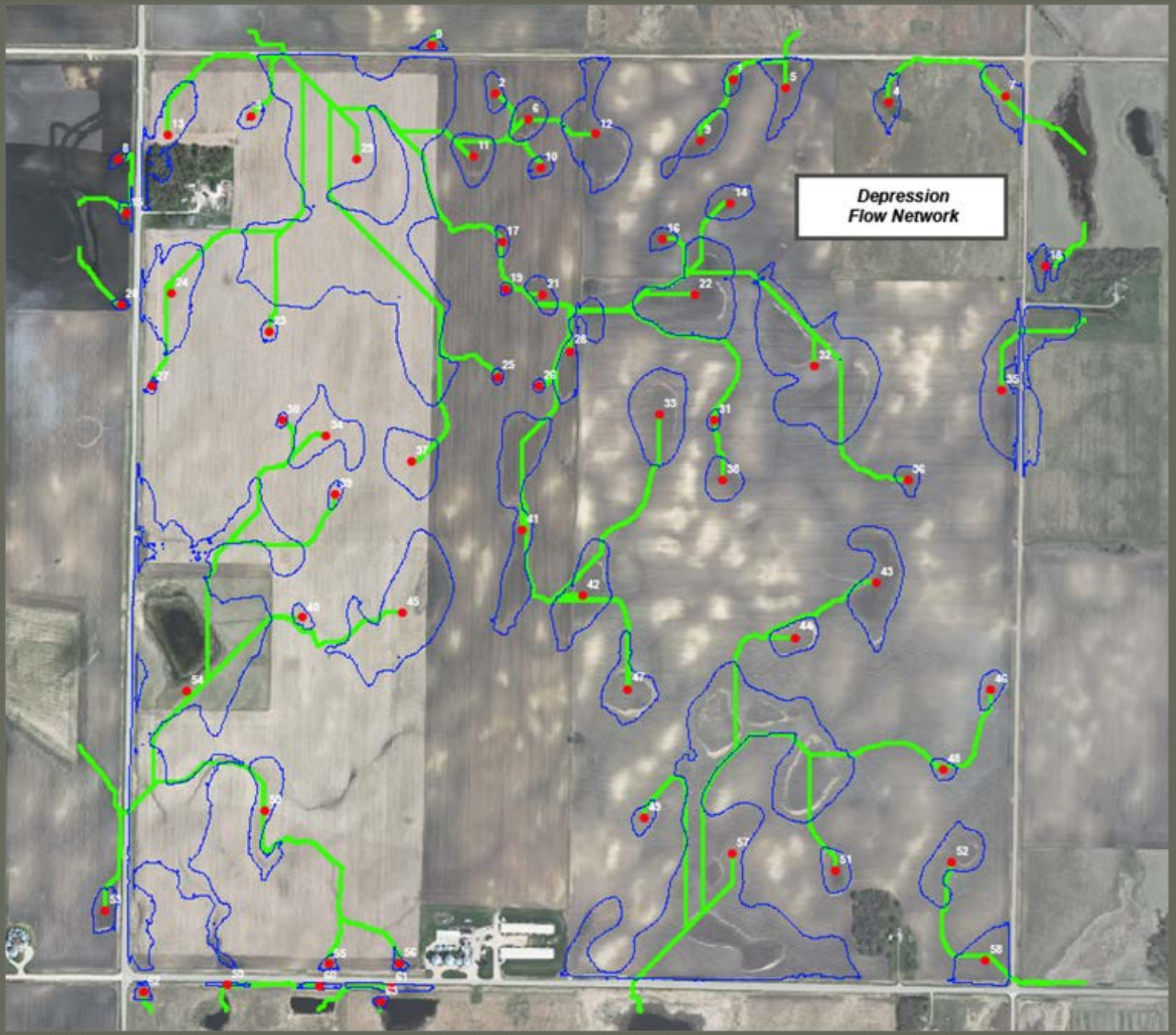

“Filled” LiDAR

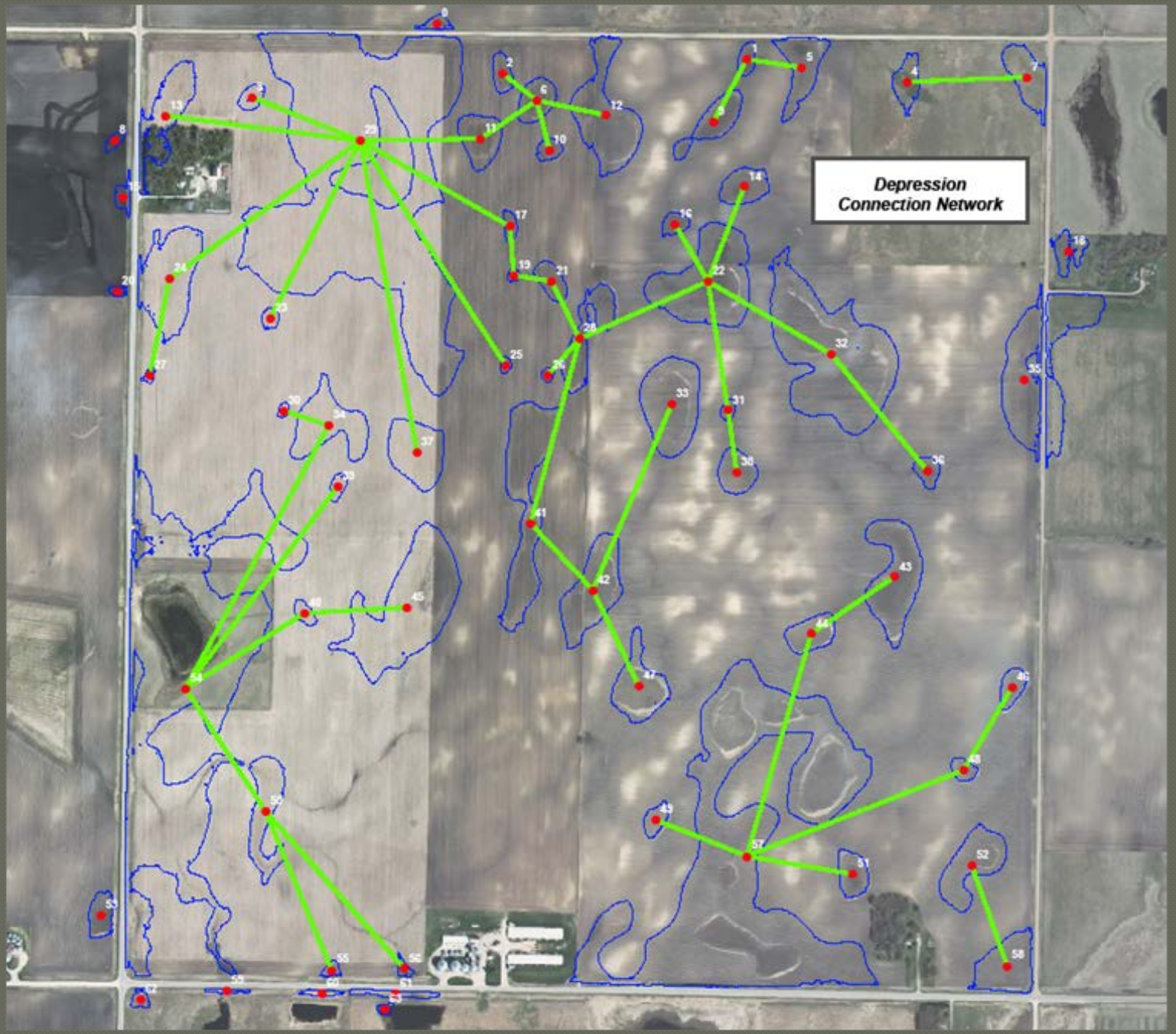

"Filled" DEM Minus
Bare Earth DEM

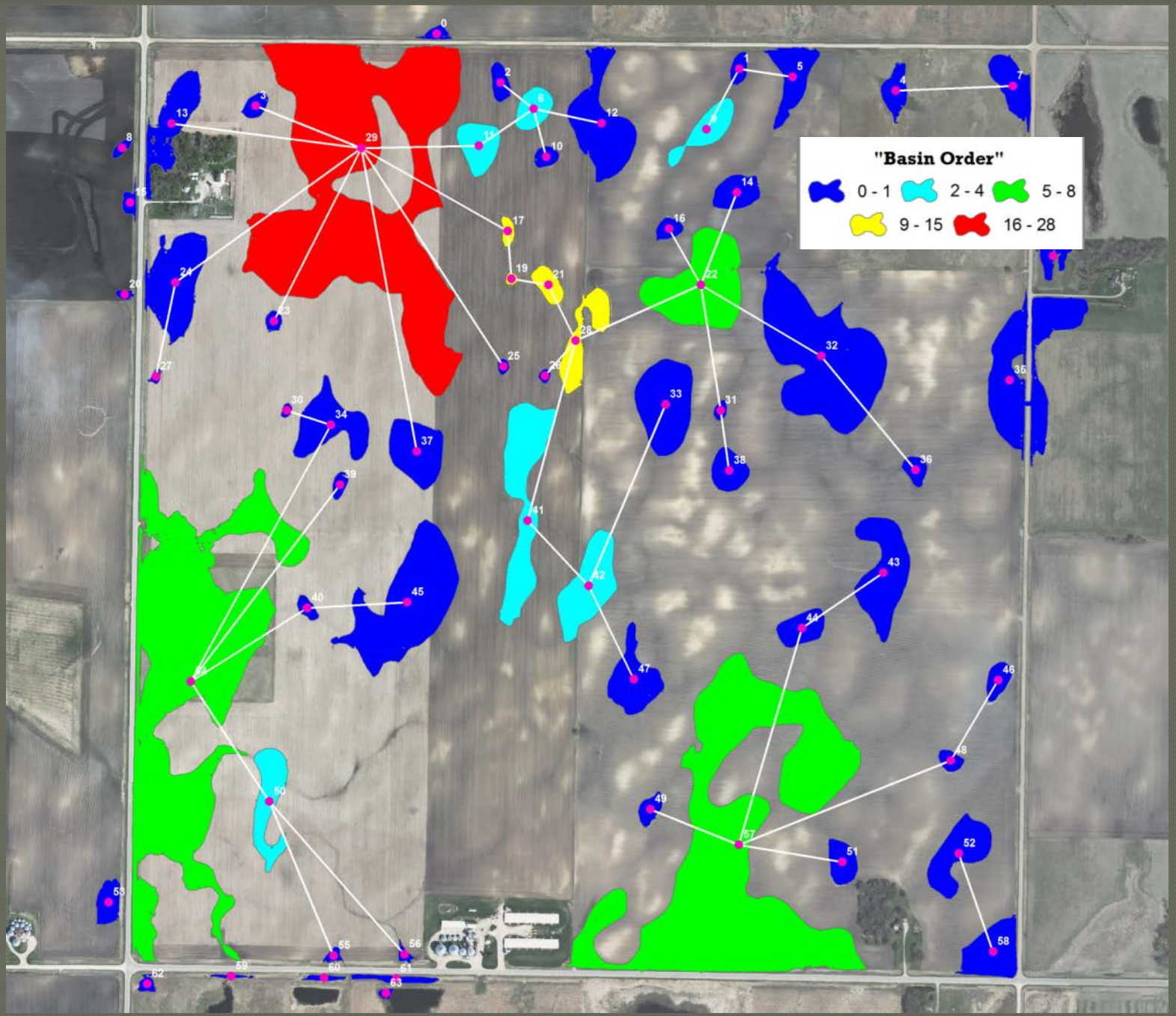

Depressions
> 10 cm Deep

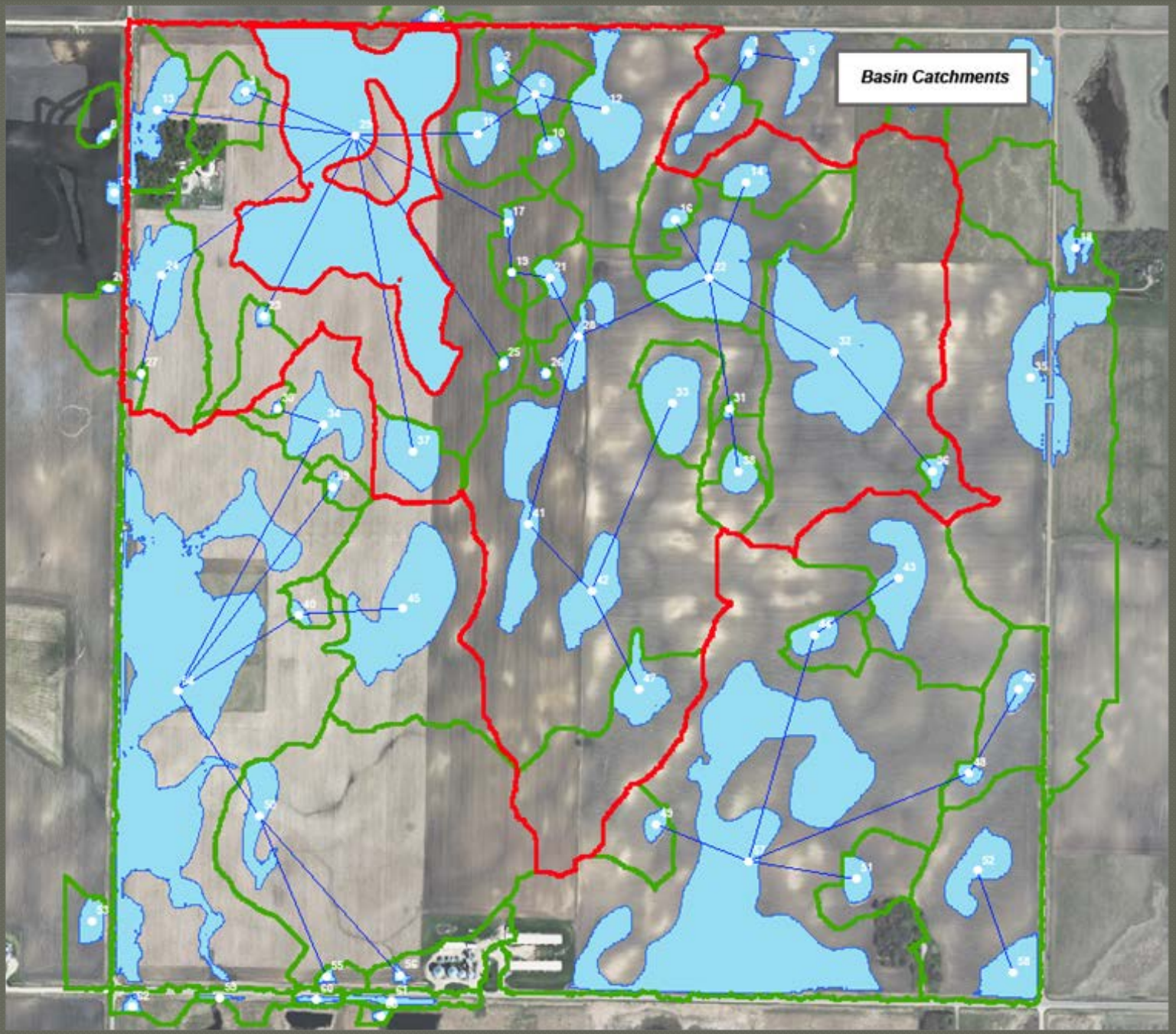

Catalogued
Depressions

Basin ID	Surface Area (sqm)	Acres	Volume (acft)	Surface Elev (m)	Bottom Elev (m)	Max Depth (ft)	Mean Depth (ft)
1	7,409.00	1.83	7.04	259.62	257.48	7.02	3.85
2	11,219.00	2.77	8.22	250.86	249.18	5.51	2.96
3	19,622.00	4.85	5.50	249.39	248.72	2.20	1.13
4	13,341.00	3.30	6.13	249.35	248.35	3.28	1.86
5	8,927.00	2.21	5.67	248.66	247.20	4.79	2.57
6	26,786.00	6.62	23.80	249.99	248.18	5.94	3.60
7	4,133.00	1.02	2.19	247.94	246.87	3.51	2.14
8	28,844.00	7.13	18.41	242.00	240.64	4.46	2.58
9	7,140.00	1.76	3.55	247.69	246.75	3.08	2.01
10	19,404.00	4.79	10.00	241.92	240.45	4.82	2.09
11	57,799.00	14.28	56.86	249.55	247.67	6.17	3.98
12	5,766.00	1.42	2.02	249.24	248.27	3.18	1.42
13	29,109.00	7.19	13.15	241.48	240.40	3.54	1.83
14	3,329.00	0.82	3.19	271.51	268.42	10.14	3.88
15	4,919.00	1.22	1.10	249.25	248.75	1.64	0.91

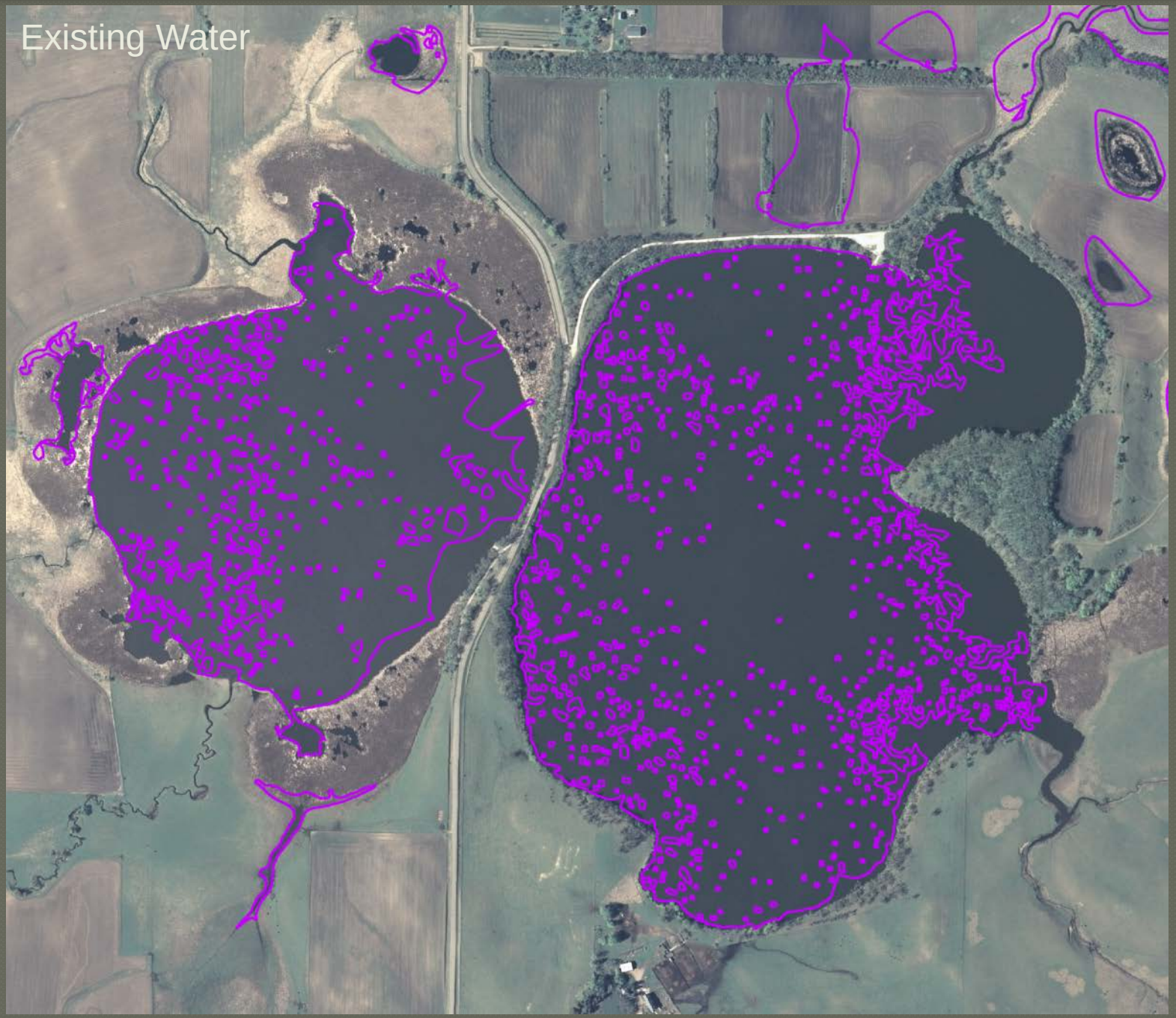

Depression
Flow Network

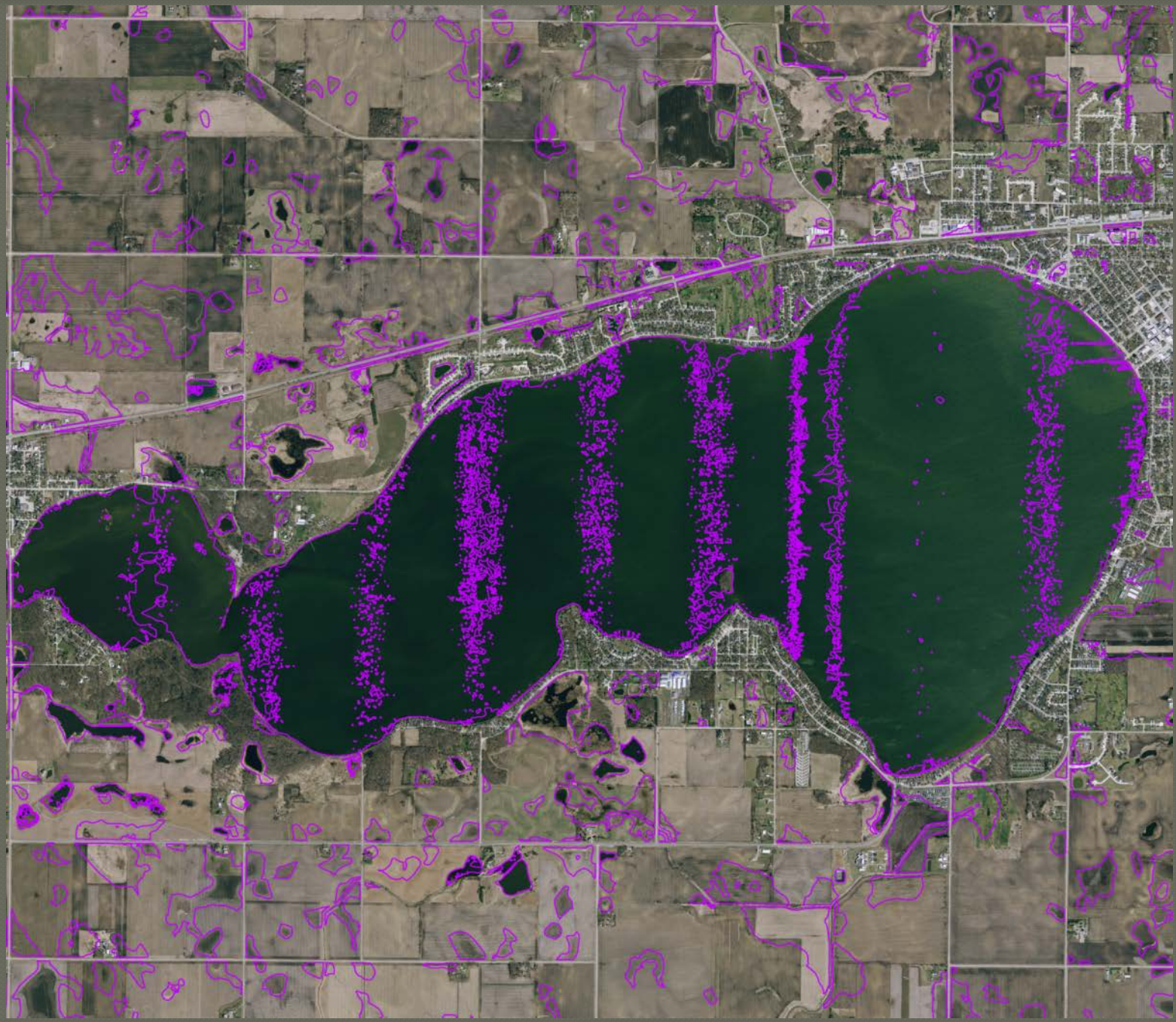

Depression
Connection Network


"Basin Order"
0 - 1
2 - 4
5 - 8
9 - 15
16 - 28


Basin Catchments

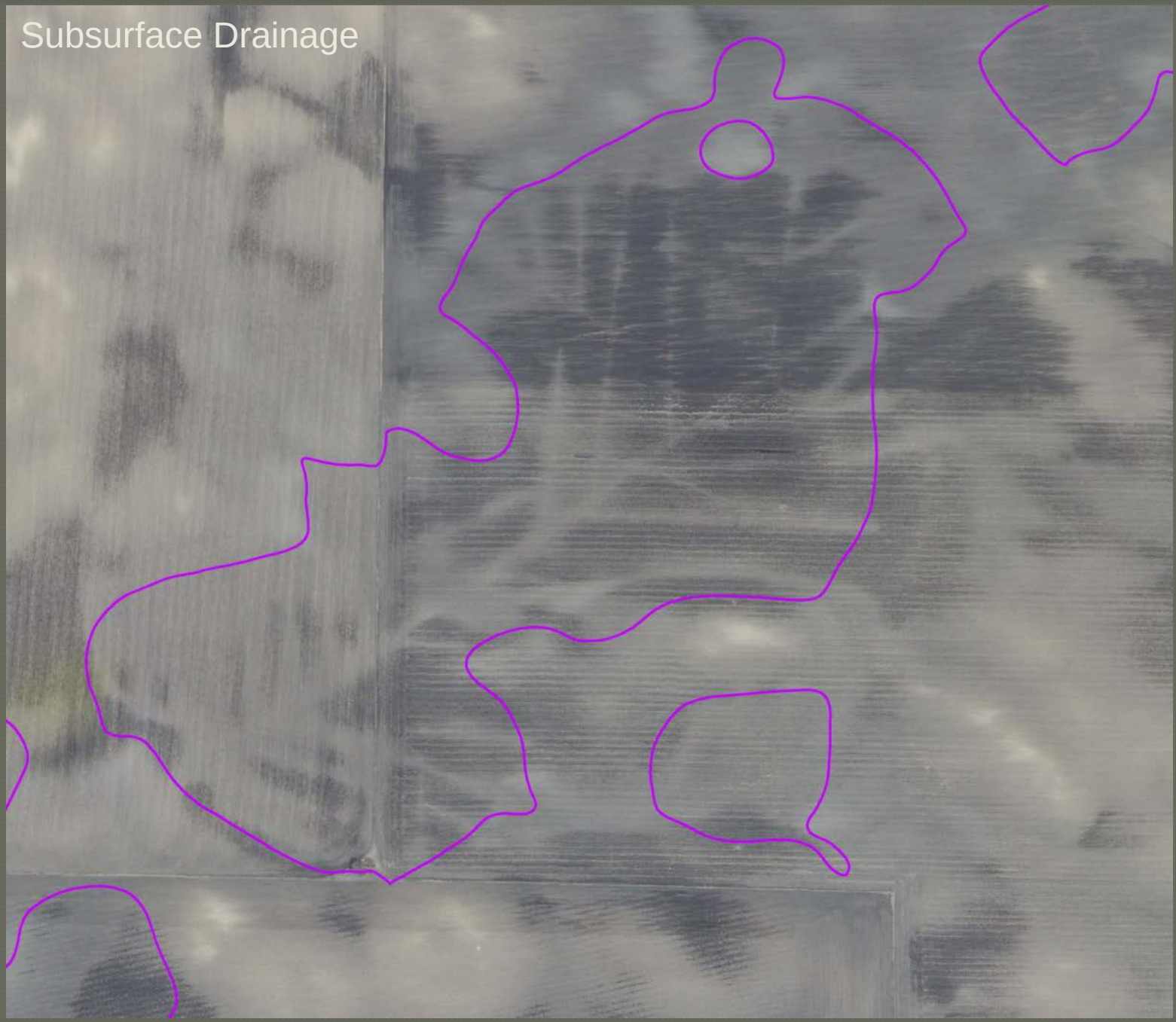
Issues


Existing Water



Subsurface Drainage

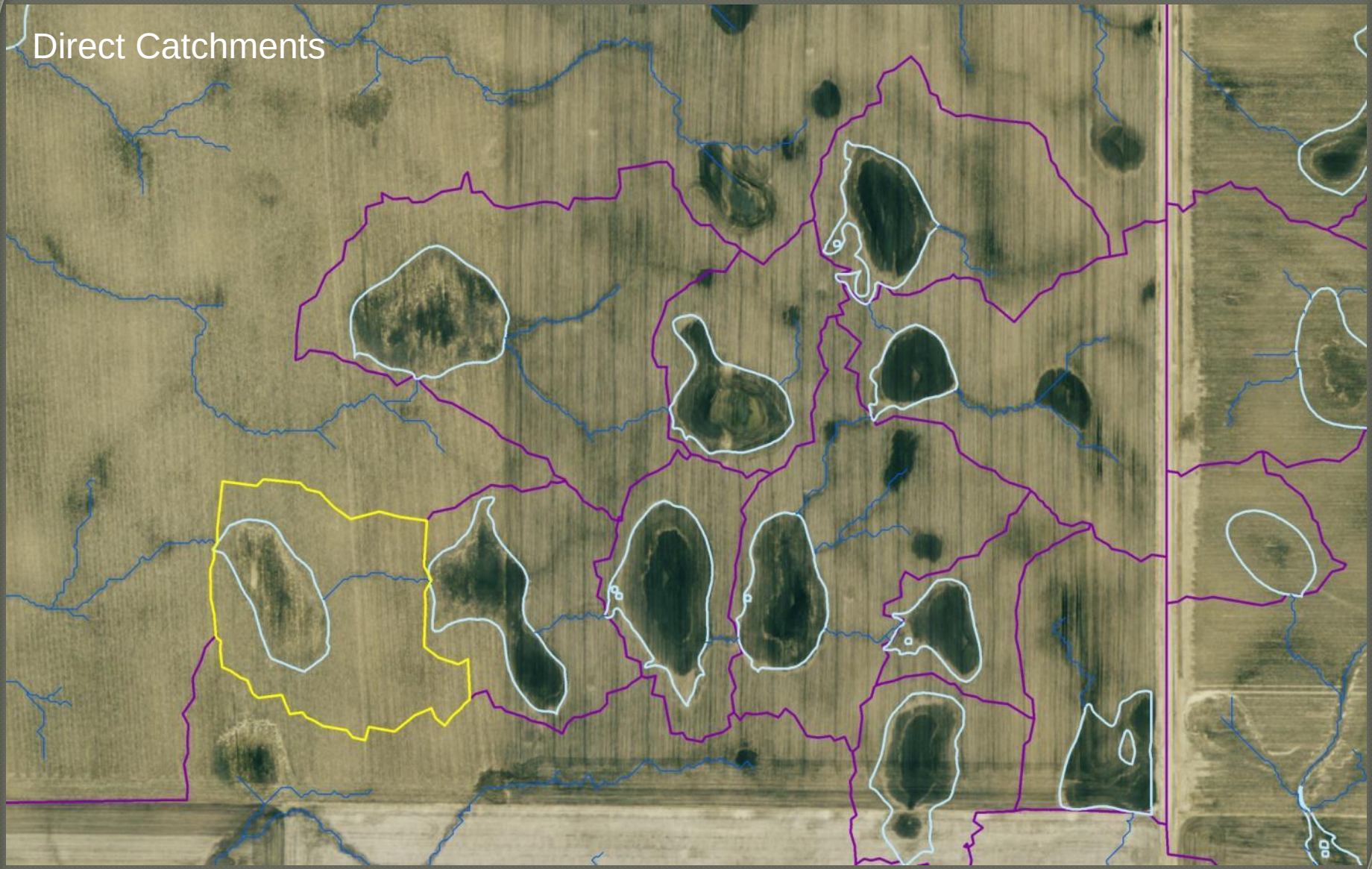
Subsurface Drainage



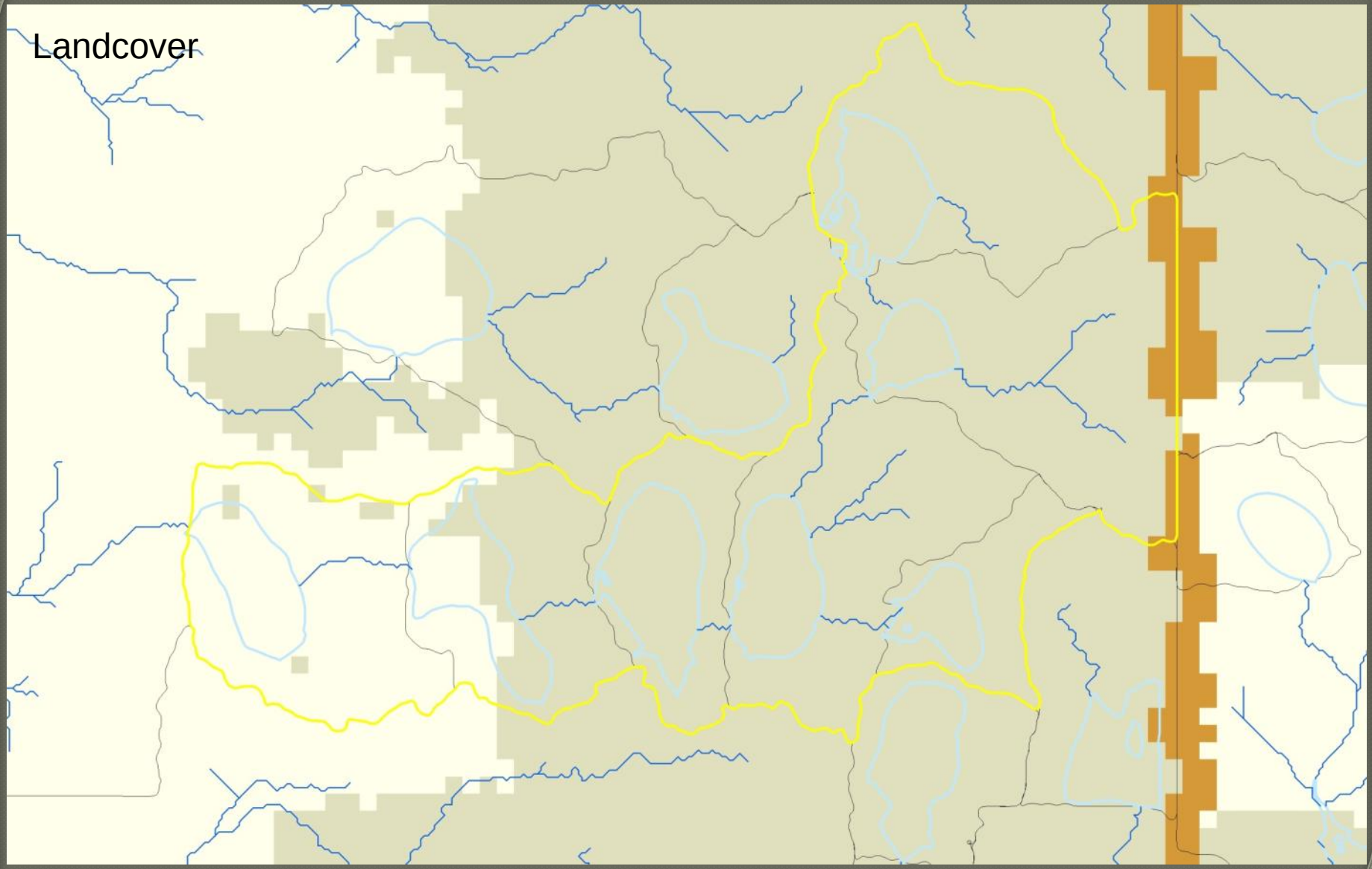
Hydrologic Enforcement

Phase II – In Progress

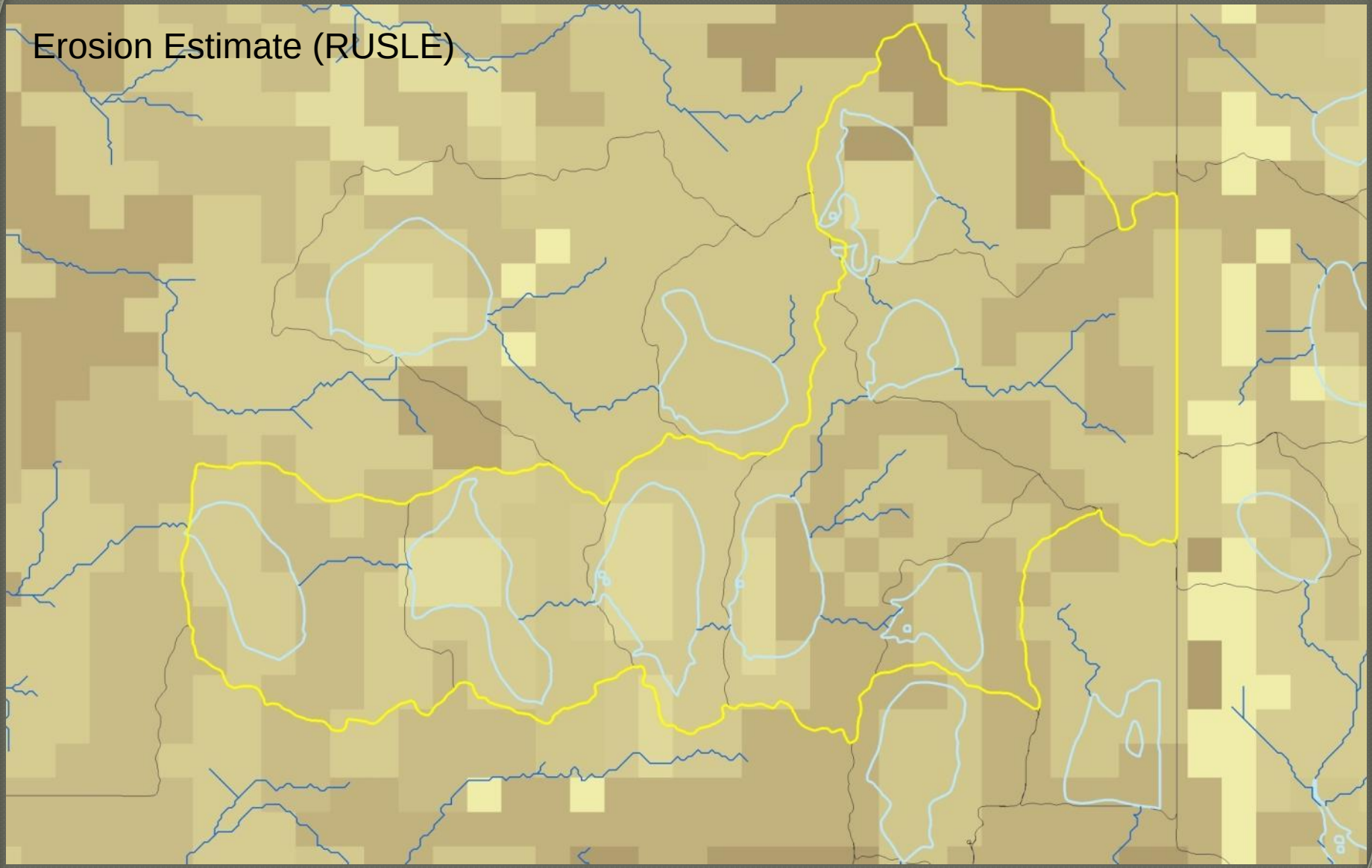
Basin ID	Surface Area (SqM)	ACRES	Volume (Acft)	Surface Elevation (m)	Deep Elevation (m)	Max Depth (ft)	Mean Depth (ft)	Depression Order	Direct Catchment (ac)	Total Catchment (ac)	Row Crop Acres	Percent Row Crop	RUSLE Total (t/y)	RUSLE Avg (t/a/y)	Total P (lbs)	Avg P (lbs/ac)	Total N (lbs)	Avg N (lbs/ac)	Fill Event (inches)
2	4,436.00	1.10	1.37	326.27	325.55	2.36	1.25	0	5.42	8.35	3.39	62.55	9.64	1.78	15.42	2.84	118.31	21.82	3.02
3	19,502.00	4.82	11.29	330.34	328.88	4.79	2.34	0	12.42	23.06	10.23	82.37	35.53	2.86	56.85	4.58	271.00	21.82	10.91
4	2,964.00	0.73	1.12	332.46	331.62	2.76	1.53	0	3.27	3.27	1.89	57.76	3.34	1.02	5.35	1.63	71.41	21.82	4.10
5	4,393.00	1.09	1.70	344.08	343.24	2.76	1.57	0	7.89	7.93	5.95	75.37	31.77	4.02	50.83	6.44	172.22	21.82	2.59
6	7,230.00	1.79	3.10	337.96	336.94	3.35	1.73	0	13.19	13.26	8.40	63.64	37.71	2.86	60.33	4.57	287.84	21.82	2.82
7	6,592.00	1.63	2.02	340.75	339.81	3.08	1.24	0	8.17	8.18	7.89	96.62	40.66	4.98	65.05	7.96	178.29	21.82	2.97
8	4,342.00	1.07	1.34	343.33	342.48	2.79	1.25	1	5.67	13.70	5.06	89.25	18.90	3.33	30.24	5.33	123.70	21.82	2.83
9	25,414.00	6.28	10.84	337.99	336.85	3.74	1.73	1	15.40	28.63	14.07	91.35	92.07	5.98	147.31	9.57	336.00	21.82	8.44
10	4,610.00	1.14	1.78	339.93	338.90	3.38	1.57	0	5.66	5.65	5.78	100.00	40.46	7.15	64.73	11.44	123.42	21.82	3.78
11	44,861.00	11.09	24.17	348.25	346.77	4.86	2.18	0	36.70	36.68	27.69	75.45	127.97	3.49	204.76	5.58	800.71	21.82	7.90
12	32,042.00	7.92	21.42	333.11	331.51	5.25	2.71	0	42.03	42.10	20.57	48.95	93.85	2.23	150.16	3.57	917.07	21.82	6.12
13	18,439.00	4.56	11.21	327.52	326.27	4.10	2.46	0	26.93	26.99	11.68	43.36	45.10	1.67	72.16	2.68	587.58	21.82	5.00
14	1,258.00	0.31	1.62	310.94	308.74	7.22	5.22	0	3.32	3.38	0.44	13.39	4.05	1.22	6.48	1.95	72.49	21.82	5.86
15	5,046.00	1.25	1.51	350.05	349.11	3.08	1.21	1	7.35	24.86	7.34	99.83	24.73	3.36	39.56	5.38	160.41	21.82	2.47
16	11,683.00	2.89	8.14	347.69	346.27	4.66	2.82	4	35.46	110.28	30.86	87.02	123.66	3.49	197.86	5.58	773.69	21.82	2.75
17	11,660.00	2.88	9.77	310.74	308.36	7.81	3.39	0	8.58	8.48	0.00	0.00	0.81	0.09	1.30	0.15	187.16	21.82	13.66
18	4,906.00	1.21	5.17	317.23	313.94	10.79	4.26	2	123.71	163.35	33.08	26.74	194.92	1.58	311.87	2.52	2,699.42	21.82	0.50
19	2,133.00	0.53	0.87	311.54	310.32	4.00	1.64	0	3.33	3.33	0.00	0.00	2.31	0.69	3.70	1.11	72.65	21.82	3.12
20	10,252.00	2.53	4.36	350.32	349.08	4.07	1.72	0	17.62	17.61	14.90	84.54	50.09	2.84	80.15	4.55	384.57	21.82	2.97
21	10,351.00	2.56	3.29	341.52	340.65	2.85	1.29	1	17.60	24.55	15.96	90.68	65.34	3.71	104.54	5.94	383.98	21.82	2.24
22	4,388.00	1.08	1.32	343.72	342.92	2.62	1.22	0	6.96	6.96	4.73	67.89	46.22	6.64	73.96	10.62	151.88	21.82	2.28
23	3,691.00	0.91	4.52	315.75	312.91	9.32	4.95	0	5.59	5.66	0.00	0.00	2.20	0.39	3.52	0.63	122.07	21.82	9.69

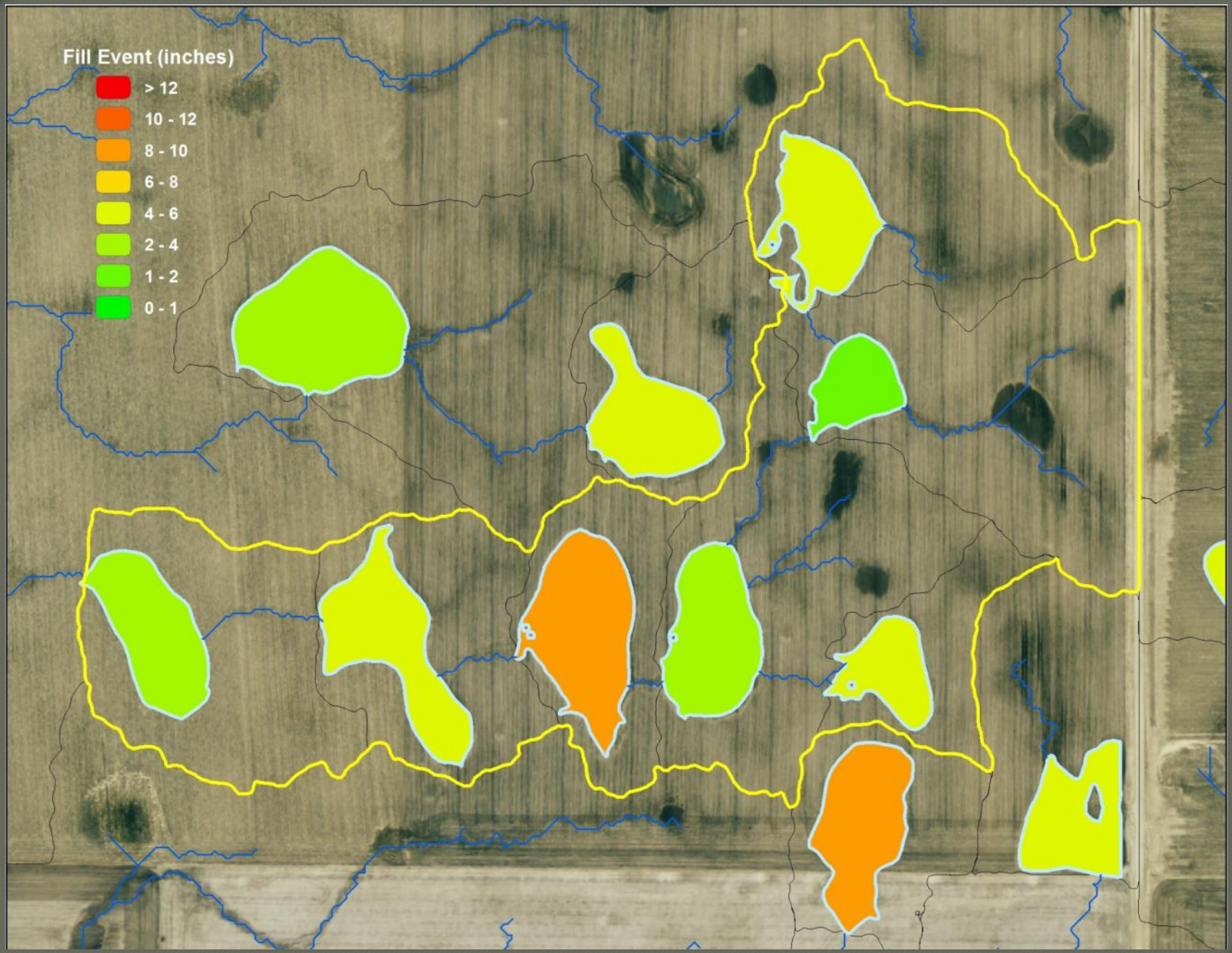

Direct Catchments


Total Catchments

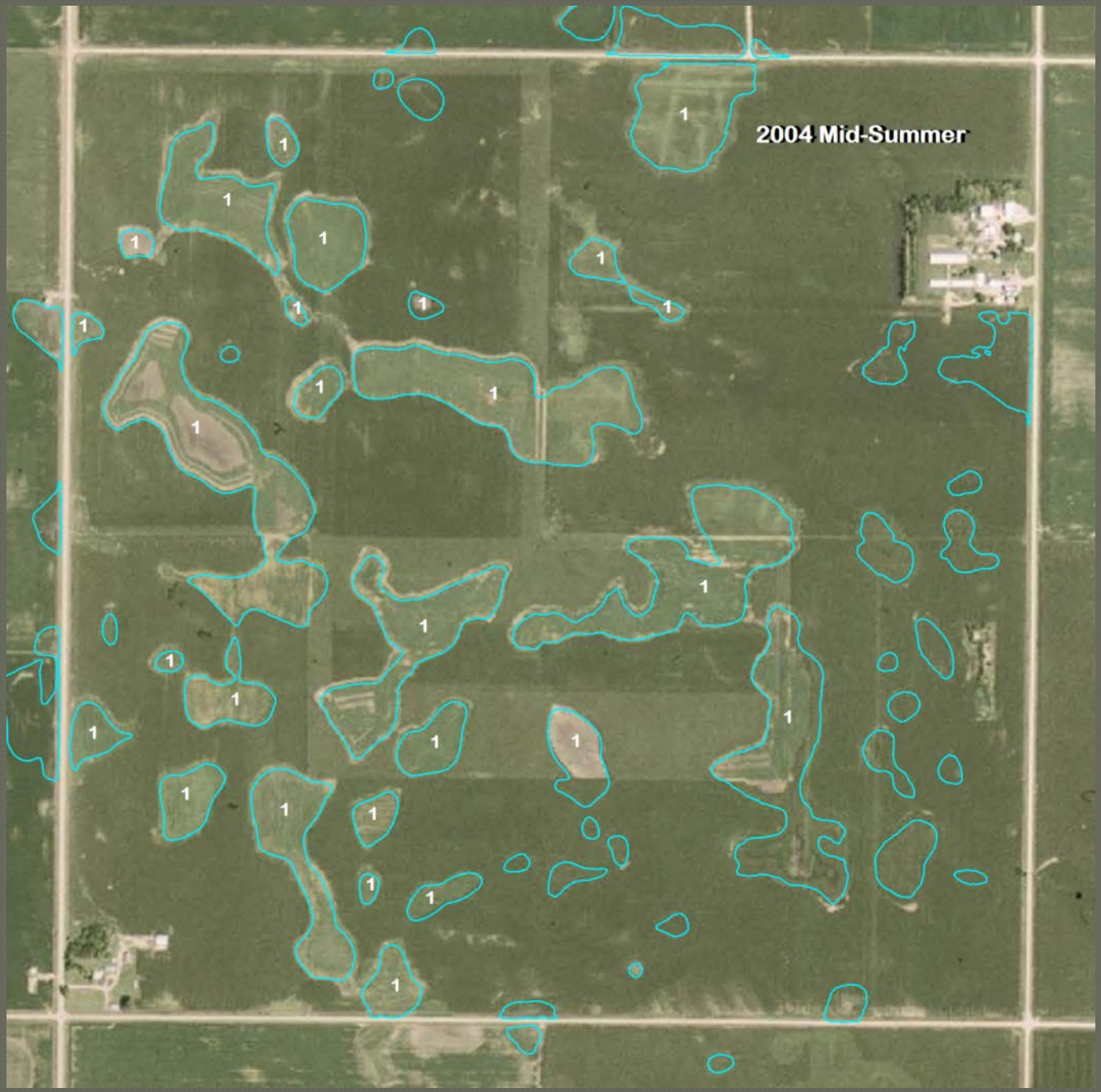

Landcover

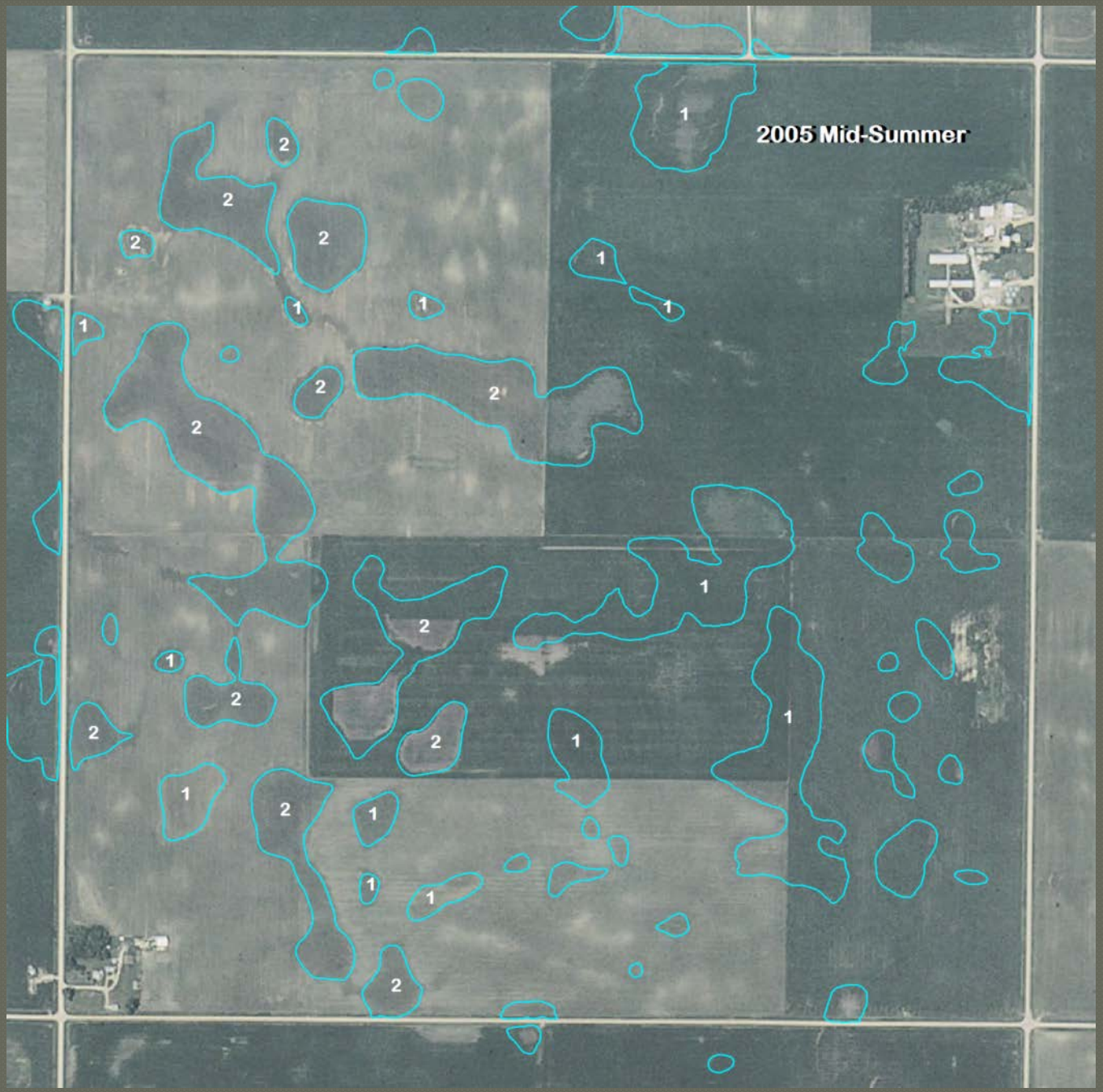
Erosion Estimate (RUSLE)

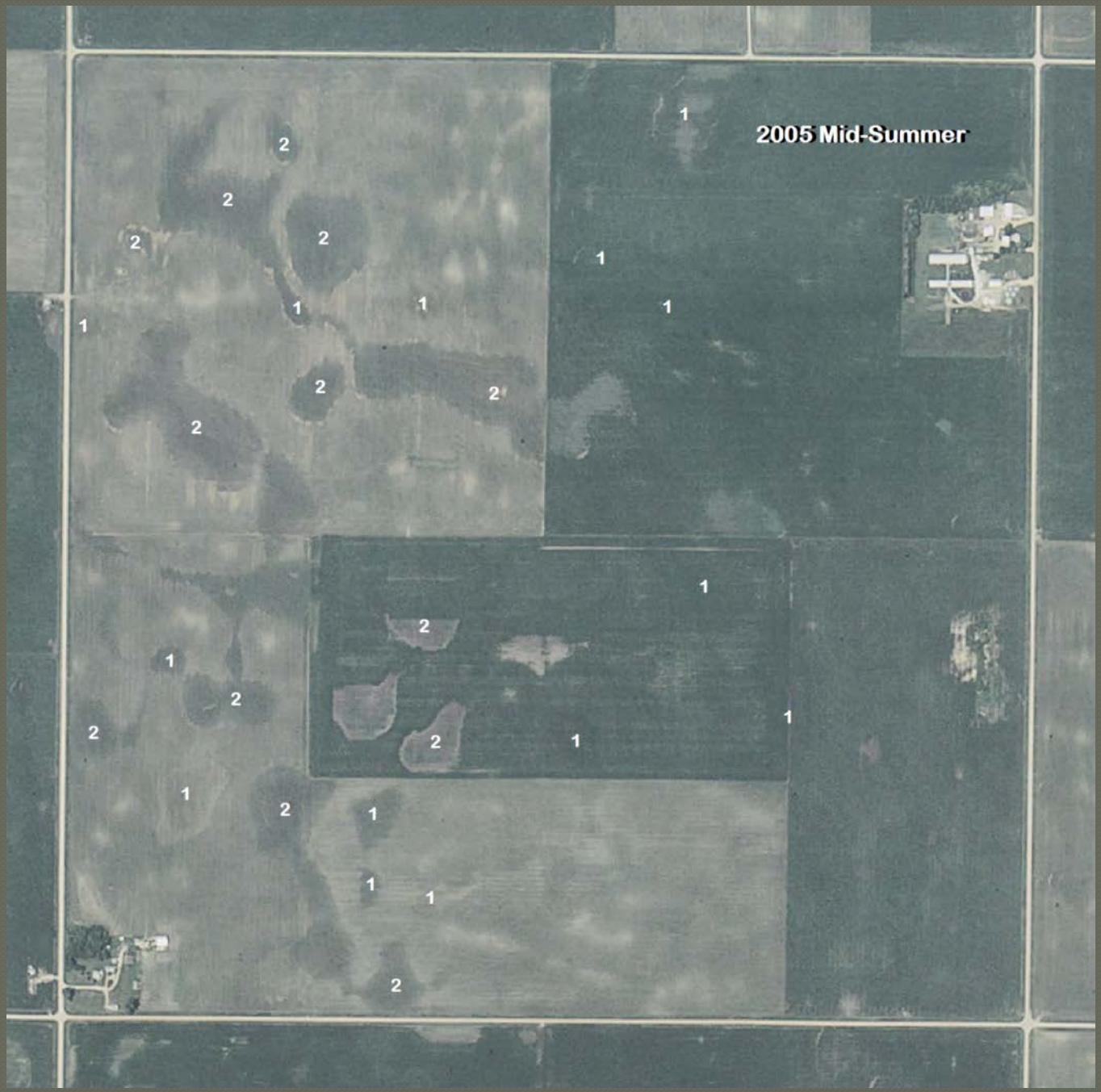


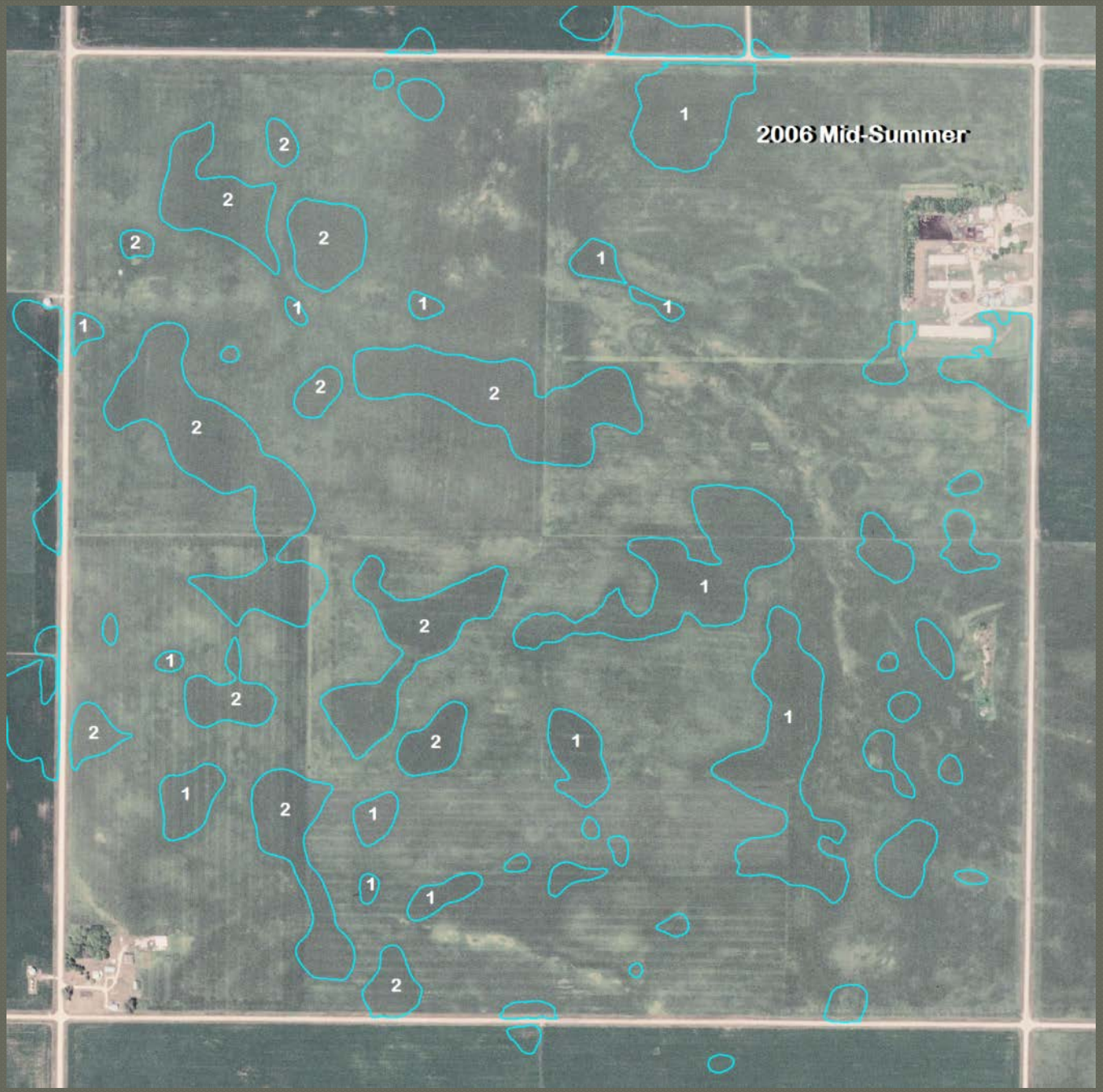

Fill Event (inches)
> 12
10 - 12
8 - 10
6 - 8
4 - 6
2 - 4
1 - 2
0 - 1

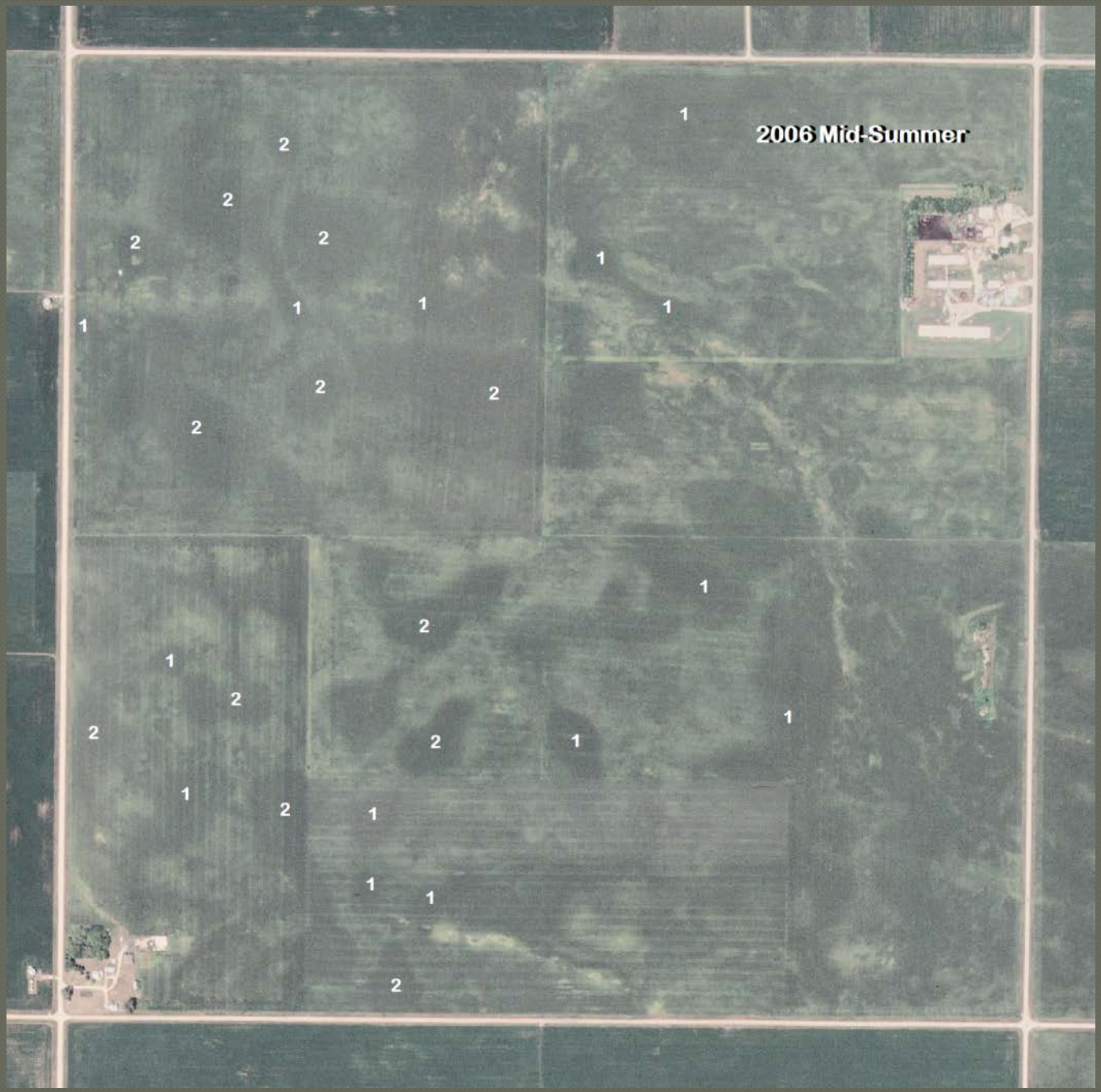

2002 Spring (Leaf Off)


2004 Mid-Summer


2005 Mid-Summer


2005 Mid-Summer


2006 Mid-Summer


2006 Mid-Summer
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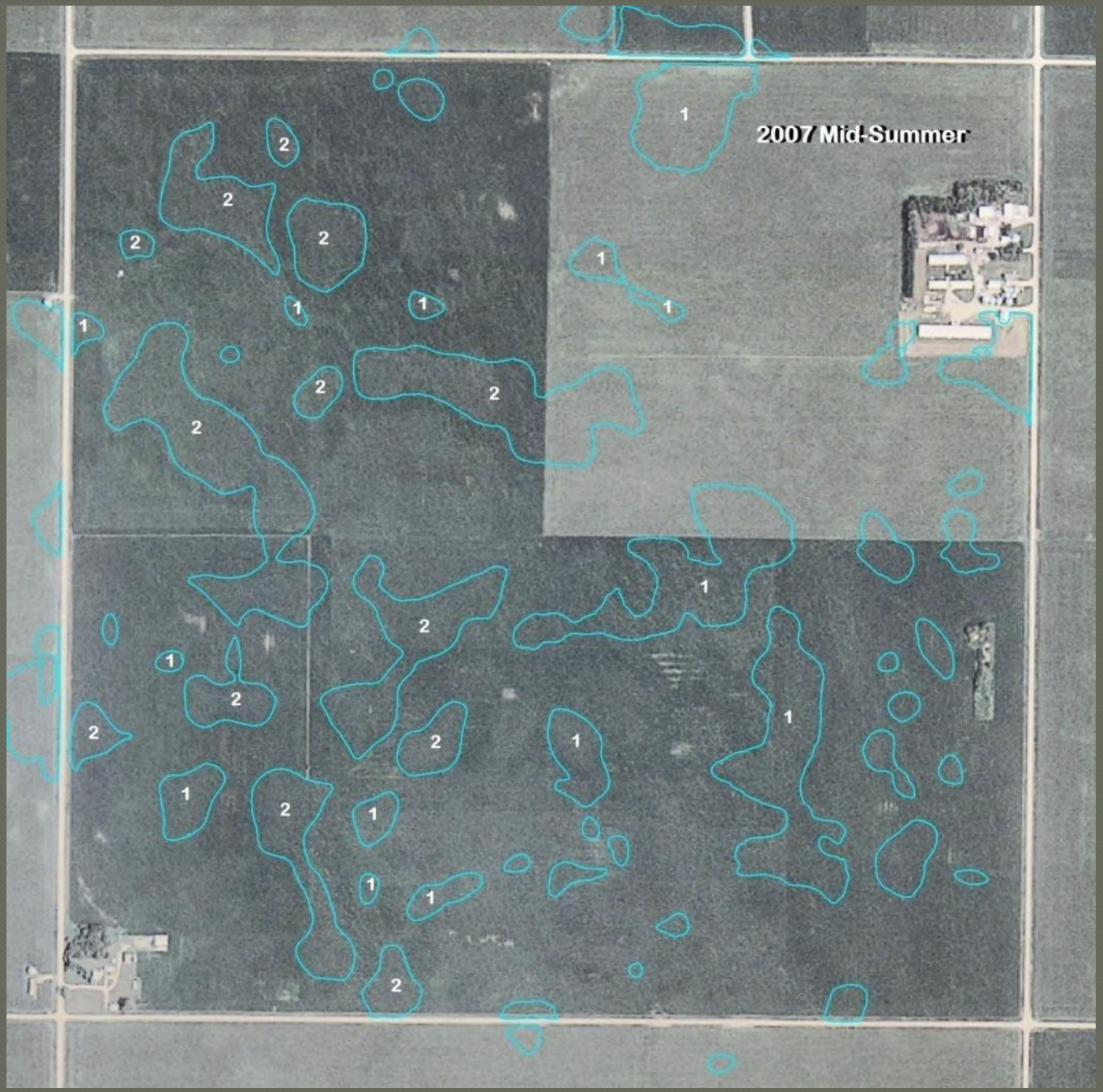
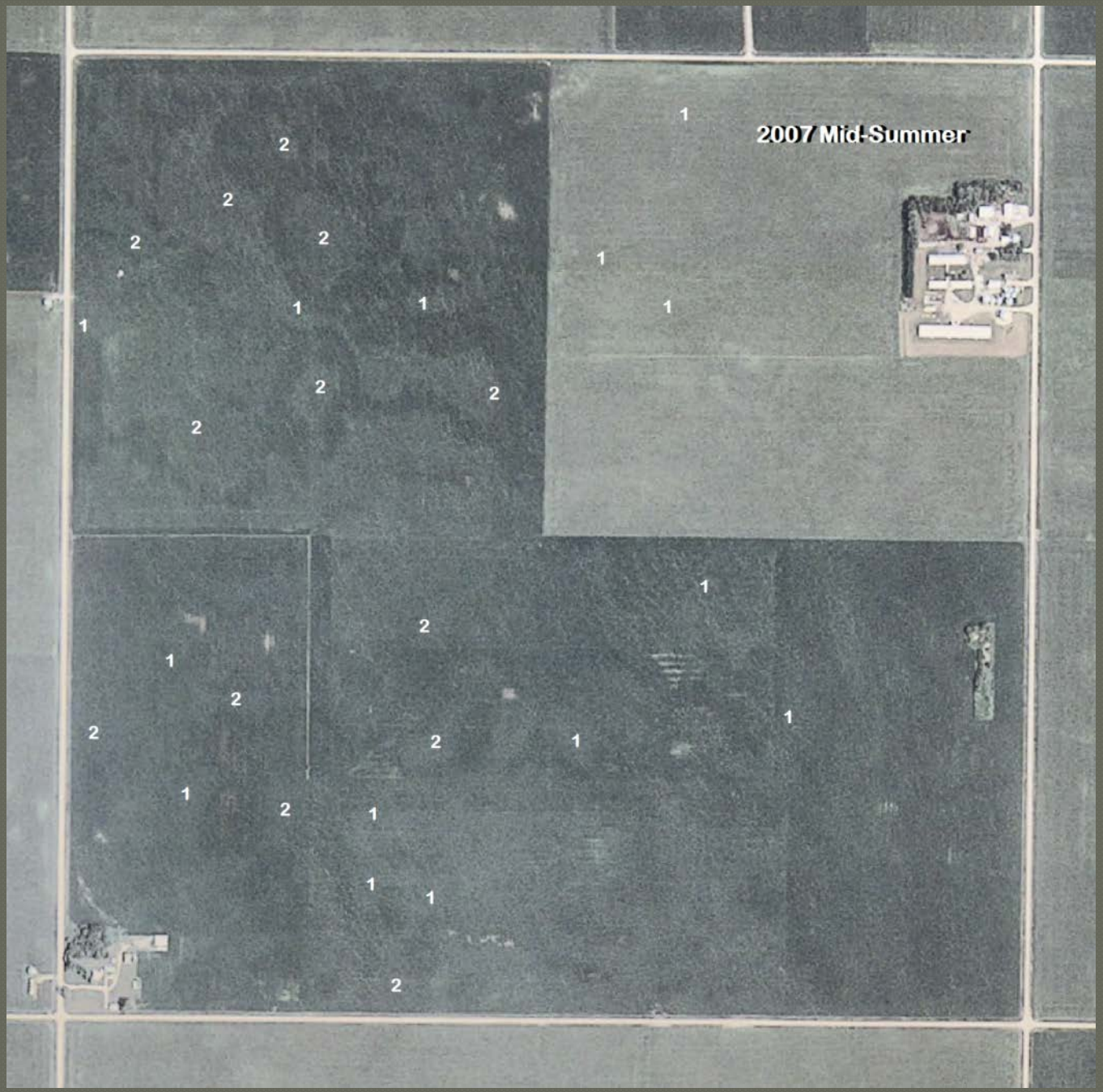

2007 Mid-Summer


2007 Mid-Summer
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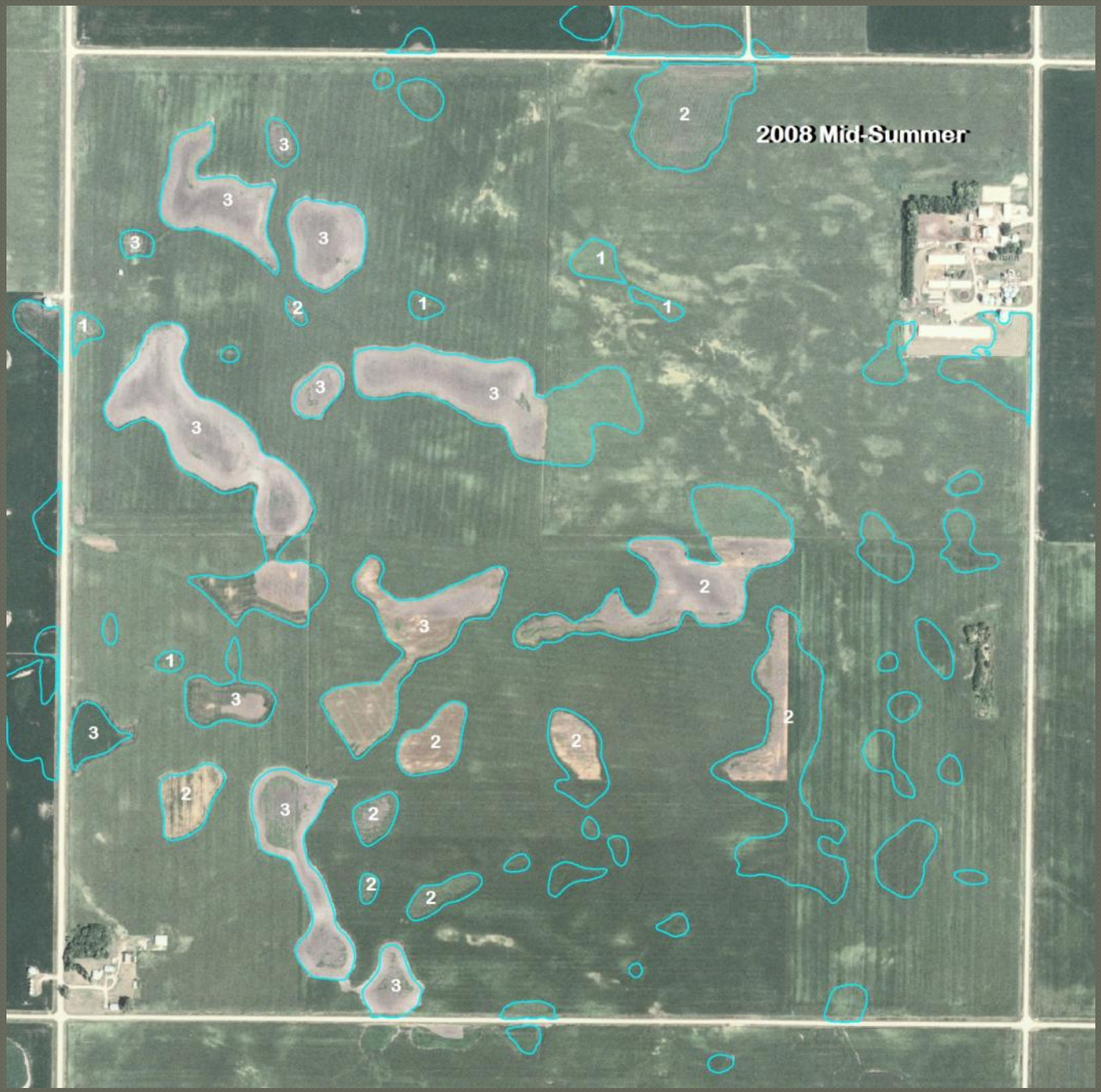
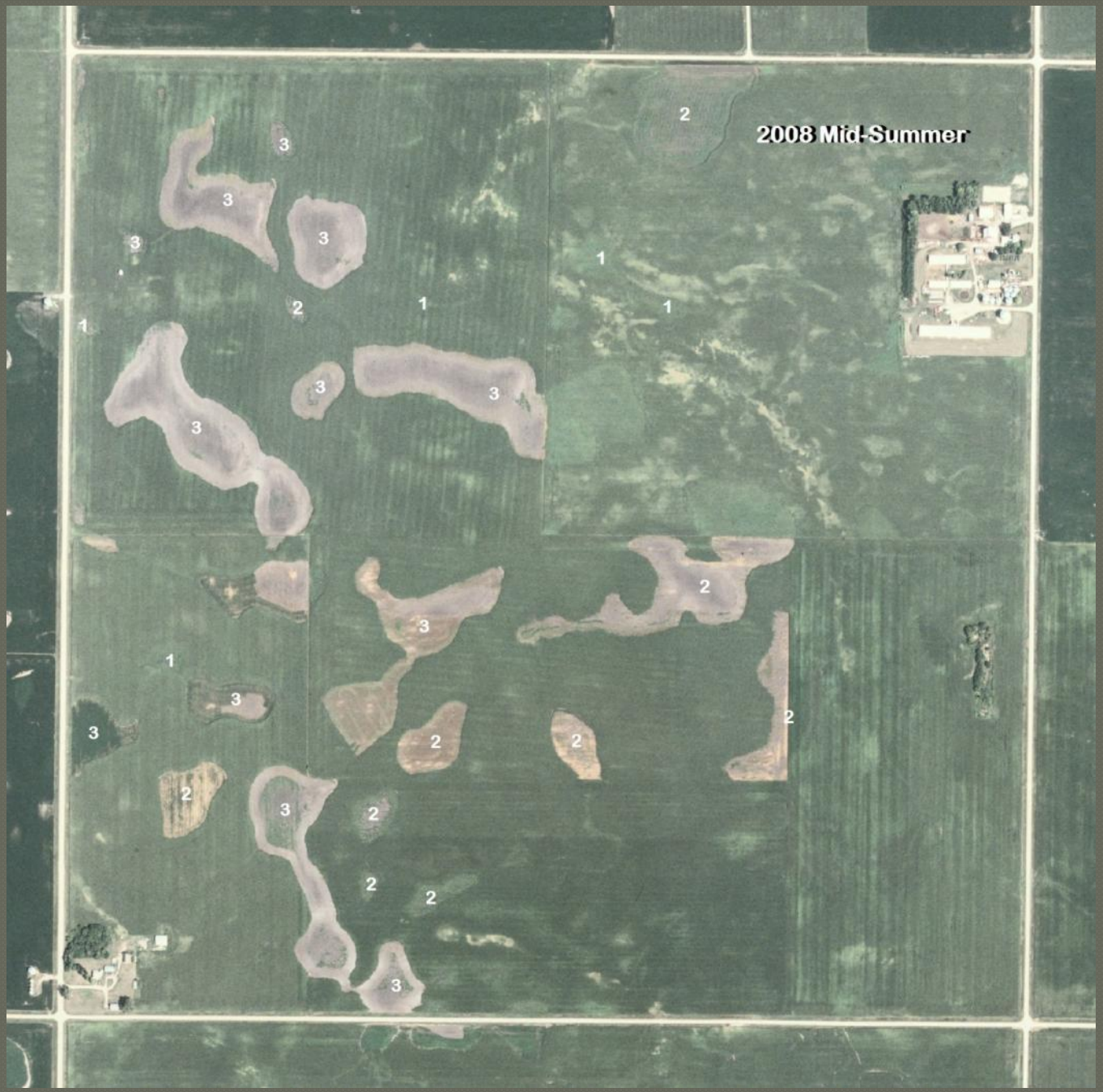
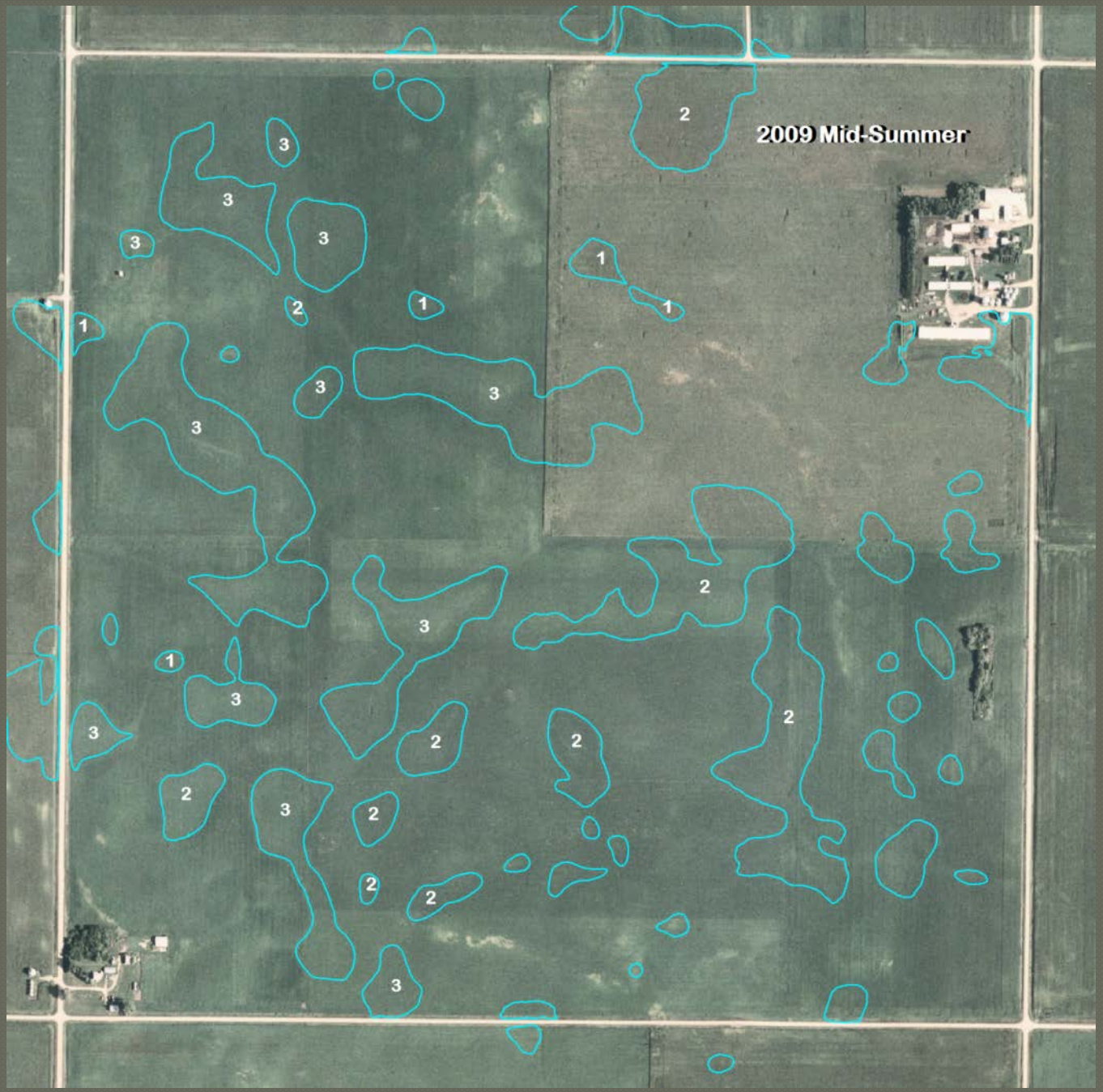

2008 Mid-Summer


2008 Mid-Summer


2009 Mid-Summer


2009 Mid-Summer
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Year w/ insurance

45 bu/acre county avg.

80% insure for

36 bu/acre

x 18 acres

648 total bushels

$12/bu

$7776

<1700> inputs

$6076 ÷ 18 acres = $338/acre

Plant $20 x 18 = $360

Spray 2x $15 x 18 = $270

Harvest $35 x 18 = $630

Insurance $10 x 18 = $180

$80 x 18 = 1440

Seed = 100

Trucking = 100

1640

Year w/o insurance

18 acres

55 bu. acre

990 bushels

x $12 per bu.

$11,880

<1700>

$10,180 ÷ 18 acres = $566/acre

w/o ins. Ins. (Goods)

$566 $338

x 35% x 65%

$198 + $220 = $418/acre

18 acres

$7524

30 yrs.

$225,720

÷ 20 acres

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Spray 2x $15 x 18 = $270

Harvest $35 x 18 = $630

Insurance $10 x 18 = $180

$80 x 18 = 1440

Seed = 100

Trucking = 100

1640

Year w/o insurance

18 acres

55 bu. acre

990 bushels

x $12 per bu.

$11,880

<1700>

$10,180 ÷ 18 acres = $566/acre

w/o ins.	Ins. (Goods)
$566	$338
x 35%	x 65%
$198	+ $220 = $418/acre

18 acres

$7524

30 yrs.

$225720

÷ 20 acres

$11,286/acre

Year w/ insurance

45 bu/acre county avg.

80% insure for

36 bu/acre

x 18 acres

648 total bushels

$12/bu

$7776

<1700> inputs

$6076 ÷ 18 acres = $338/acre

Year w/o insurance

18 acres

55 bu. acre

990 bushels

x $12 per bu.

$11,880

<1700>

$10,180 ÷ 18 acres = $566/acre

Plant $20 x 18 = $360

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w/o ins.	Ins. (Goods)
$566	$338
x 35%	65%
$198	+ $220 = $418/acre

18 acres

$7524

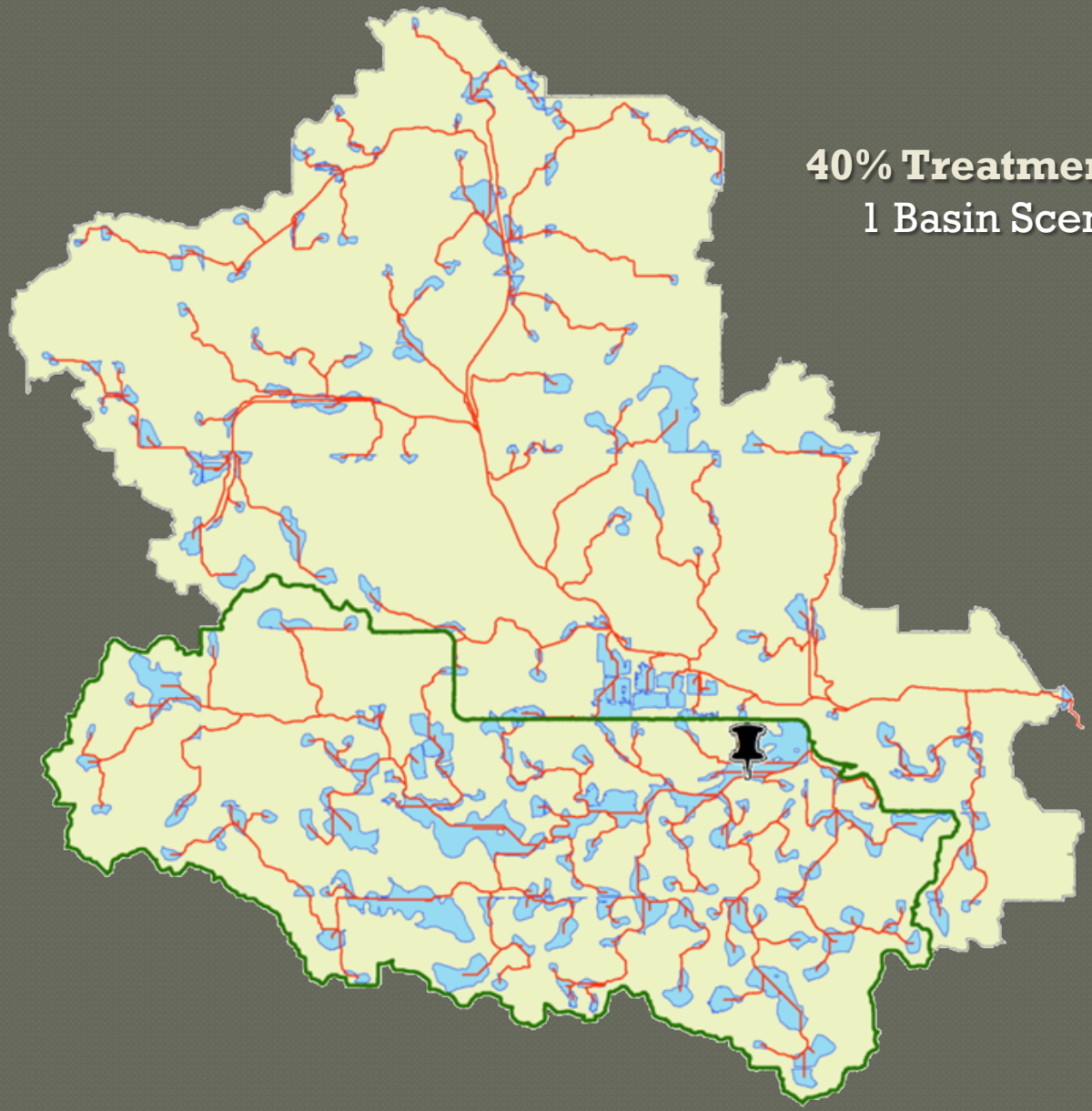
30 yrs.

$225,720

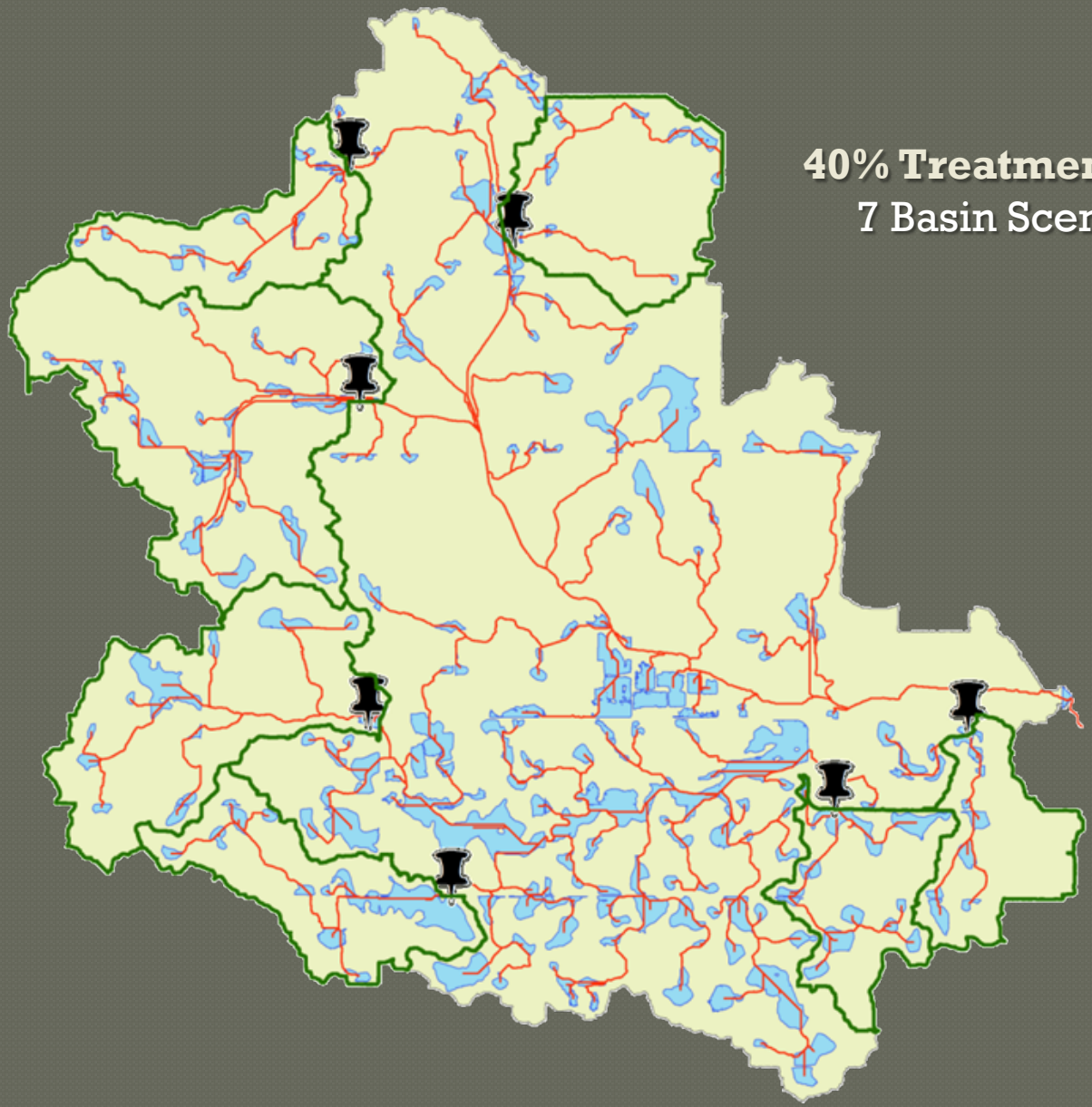
÷ 20 acres

$11,286/acre

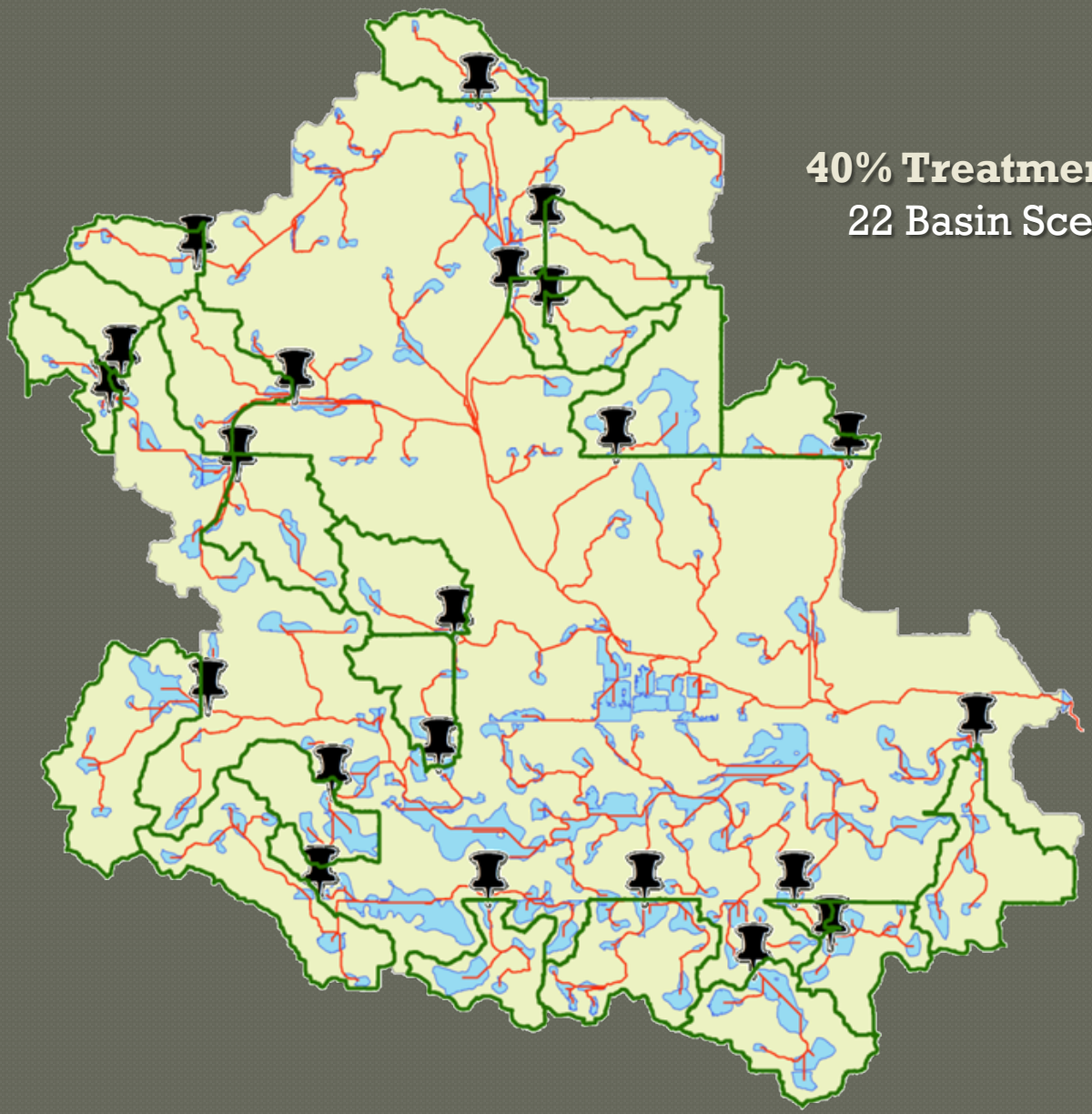
100% of Basin Treatment
1 Constructed Wetland
Establishes Baseline



40% Treatment Goal
1 Basin Scenario



40% Treatment Goal
7 Basin Scenario



40% Treatment Goal
22 Basin Scenario

Phase III – Coming Soon

Phase III – Coming Soon

- Model depression restoration impacts for water quality, flooding, wildlife, agriculture, and economy
- Determine total loads (H_20, nutrients, sediment, *etc*.) at outlet of HUC-12s
- Assign load results to individual depressions as a percent of total impact to HUC-12
- Run scenarios (*e.g*. Gulf Hypoxia, Des Moines Flooding, Scaup Habitat, *etc*.)
- Present data and findings through interactive, web-based, GIS tools