



Repairs Vs. Improvements

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AMC Drainage Seminar



§ 103E.701

The term "repair," as used in this section, means to restore all or a part of a drainage system as nearly as practicable to the same hydraulic capacity as originally constructed and subsequently improved.....

§ 103E.215

In this section "improvement" means the tiling, enlarging, extending, straightening, or deepening of an established and constructed drainage system including construction of ditches to reline or replace tile and construction of tile to replace a ditch.

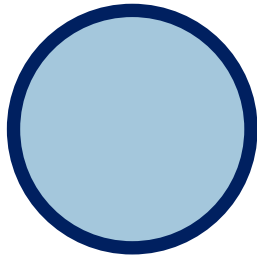




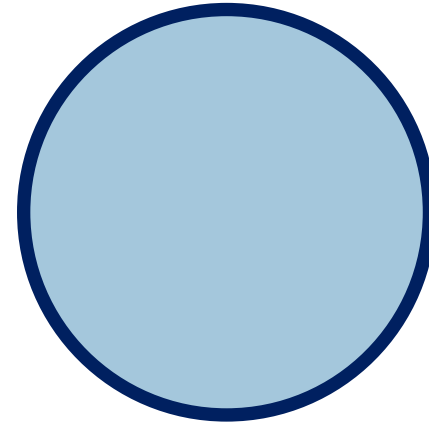
Repair

VS.

Improvement



***Fix at the
same size***



***Fix at bigger /
deeper size***

What is a repair? What is an improvement?



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Why is this important?



	Repair	Improvement
Initiated by...	Drainage Authority or Petition	Petition
Petition Standard	1 Landowner	26% of Landowners/Lands
Proceeding Cost Borne by..	Benefitting Landowners	Initially... Petitioners
Wetland Impact Exemptions	Many	Few
DNR Advisory Reviews	None	Two
Public Hearings Required	0-1	2
<i>Minimum Time to Completion</i>	<i>1 Day</i>	<i>1 Year</i>



§ 103E.701

The term "repair," as used in this section, means to restore all or a part of a drainage system as nearly as practicable to the same hydraulic capacity as originally constructed and subsequently improved, including resloping of ditches

**BUFFALO CREEK WATERSHED DISTRICT
CONSTRUCTION PLANS FOR
JUDICIAL DITCH 15 BRANCH M20 TILE IMPROVEMENT
HECTOR TOWNSHIP, RENVILLE COUNTY
MINNESOTA**

RECORD DRAWING DECEMBER 2022

What if the record is unclear?



M.S. 103E.101 Subd. 4a. If, after investigation of drainage system records, the drainage authority finds that the records are lost, destroyed, or otherwise incomplete, it may, by order, reestablish records defining the alignment; cross-section; profile; hydraulic structure locations, materials, dimensions, and elevations; or right-of-way of the drainage system as originally constructed or subsequently improved





Major Objectives of Record Reestablishment

1. Process legally defines the public drainage system
2. Establish as-constructed and subsequently improved condition or ACSIC (the drainage system geometry as originally constructed, including all subsequent legal repairs and alterations, such as alignment, cross-section, and profile.)



Record Reestablishment Proceeding



- Order initiation of proceedings, appoint engineer
- Engineer's Report
- Noticing (all benefitting landowners)
- Public hearing
- Order to reestablish the record





1. Investigate the historical records of the system
2. Field survey
3. Establish the “As-Constructed and Subsequently Improved Condition”
4. Describe the right-of-way of the system



Determination of the As-Constructed Alignment



Current Aerial Photos and Survey

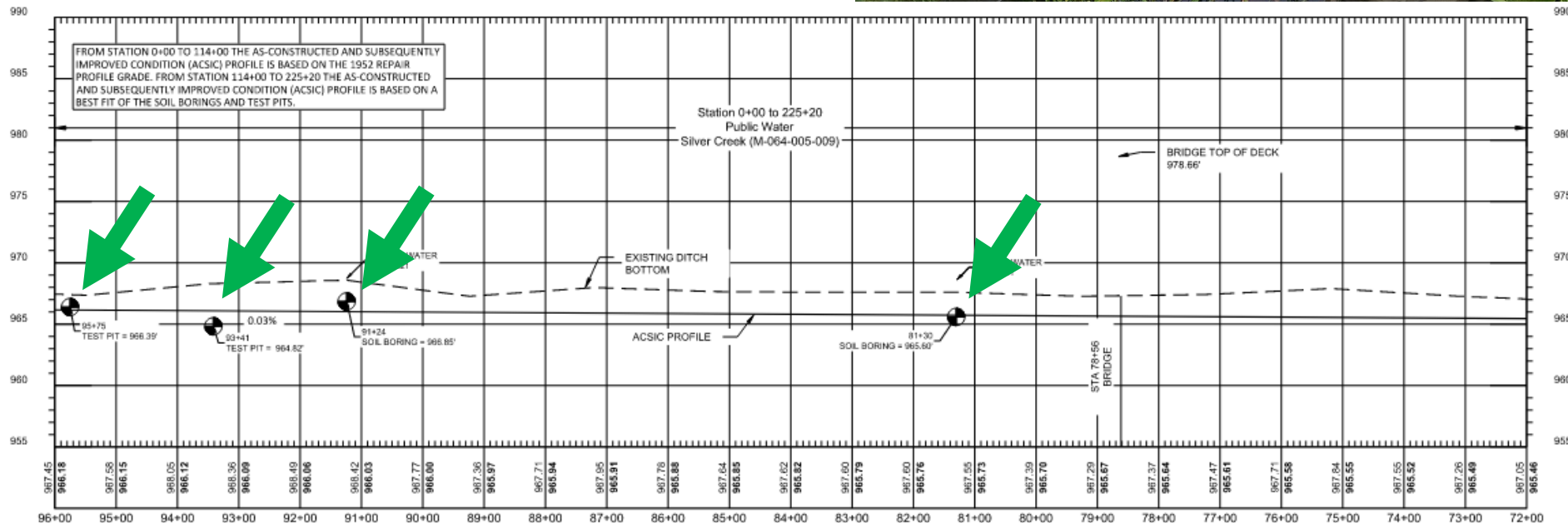


Determination of the As-Constructed Grade



Soil borings and probes identify the bottom of excavated open channel ditch

Soil borings



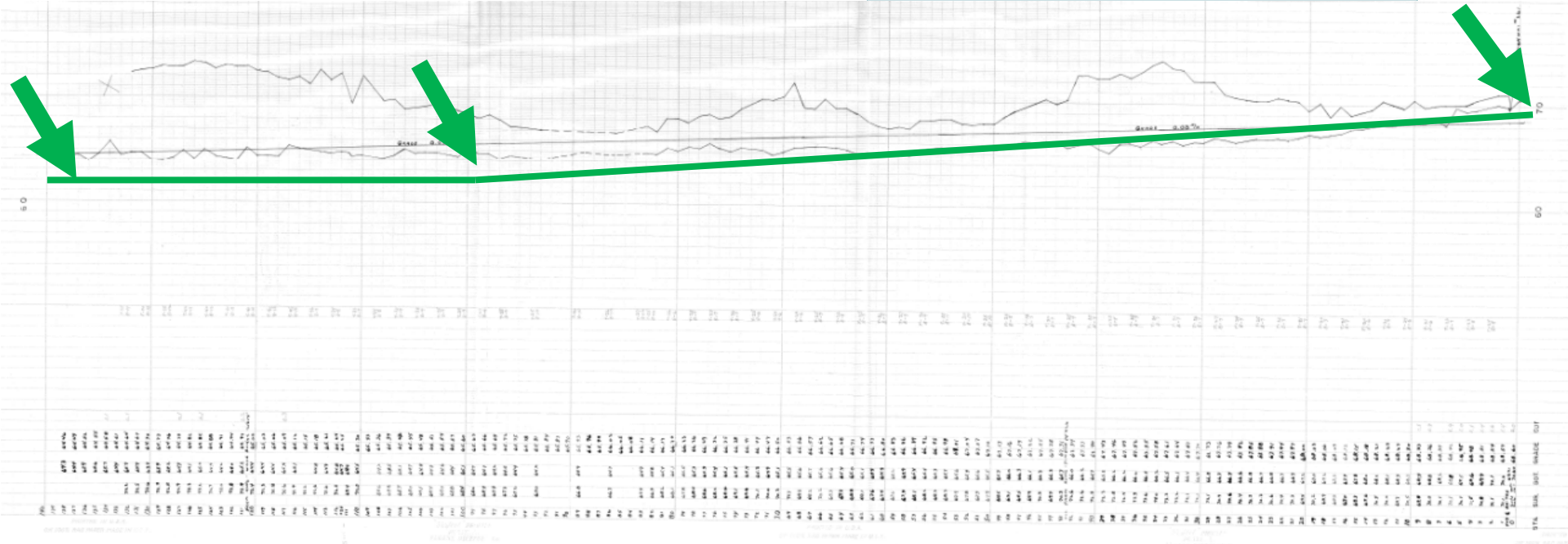
Determination of the As-Constructed Grade



Surveyed bottom of sediment locations are compared to the historic design grades.

Current CD 5 Alignment Station	Soil Boring Elev.	1926 Profile Elev.*	Deviation of Soil Boring from Repair Profile Elev.	ACSIC Profile Based on Best Fit of Soil Borings	Deviation of Soil Boring from ACSIC Grade
1+53	964.31	963.32	0.99	963.35	0.96
11+13	965.58	963.61	1.97	963.63	1.95
19+81	965.16	963.87	1.29	963.89	1.27
31+24	964.21	964.21	0.00	964.24	-0.03
40+54	964.07	964.49	-0.42	964.52	-0.45
50+82	964.73	964.80	-0.07	964.82	-0.09
60+90	965.56	965.10	0.46	965.13	0.43
70+69	965.95	965.40	0.55	965.42	0.53
81+01	965.60	965.71	-0.11	965.73	-0.13
90+95	966.85	966.01	0.84	966.03	0.82
93+41**	964.83	966.08	-1.26	966.11	-1.28
95+75**	966.39	966.16	0.24	966.18	0.22
101+18	967.31	966.31	1.00	966.34	0.97
103+71**	966.52	966.38	0.14	966.41	0.11
107+03**	966.32	966.49	-0.17	966.51	-0.19
111+38	967.12	966.62	0.50	966.64	0.48
114+56	965.47	966.71	-1.24	966.72	-1.25
123+44	965.23	966.98	-1.75	966.72	-1.49
163+16	967.06	968.17	-1.11	966.90	0.16
174+23	966.76	968.51	-1.75	967.45	-0.69
183+22	968.02	968.78	-0.76	967.90	0.12
194+42	968.76	969.11	-0.35	968.46	0.30
204+28	969.06	969.41	-0.35	968.95	0.11
214+21	969.20	969.71	-0.51	969.45	-0.25

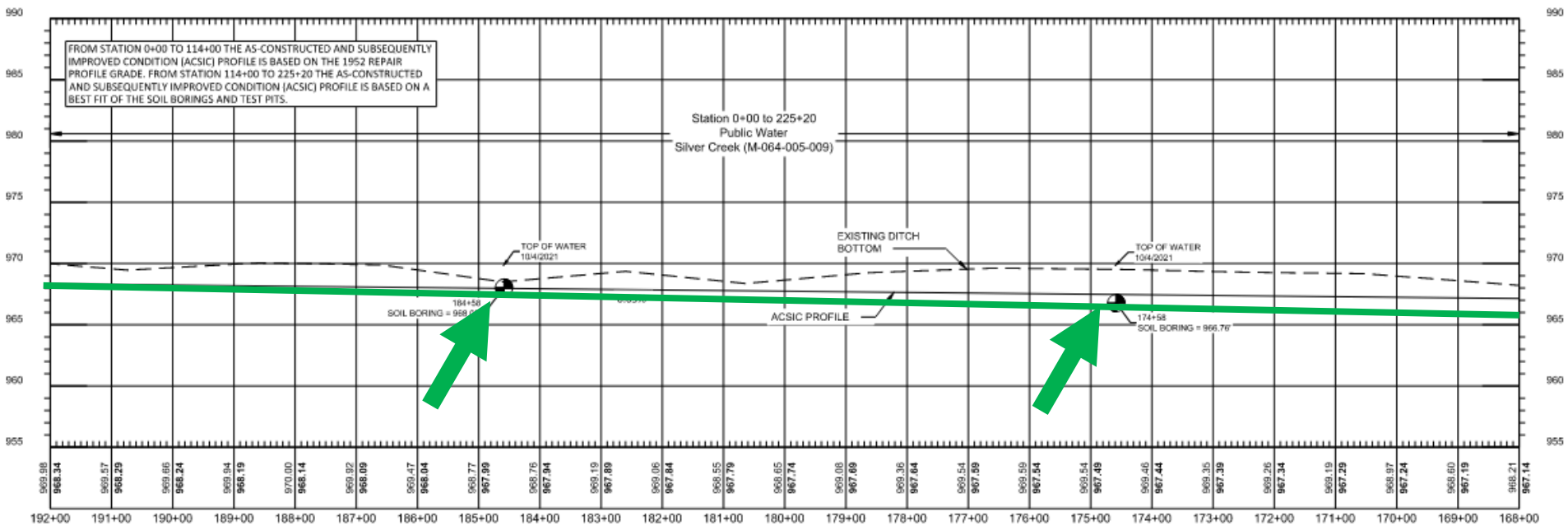
* Adjusted to NAVD 88
** Indicates test pit



Determination of the As-Constructed Grade



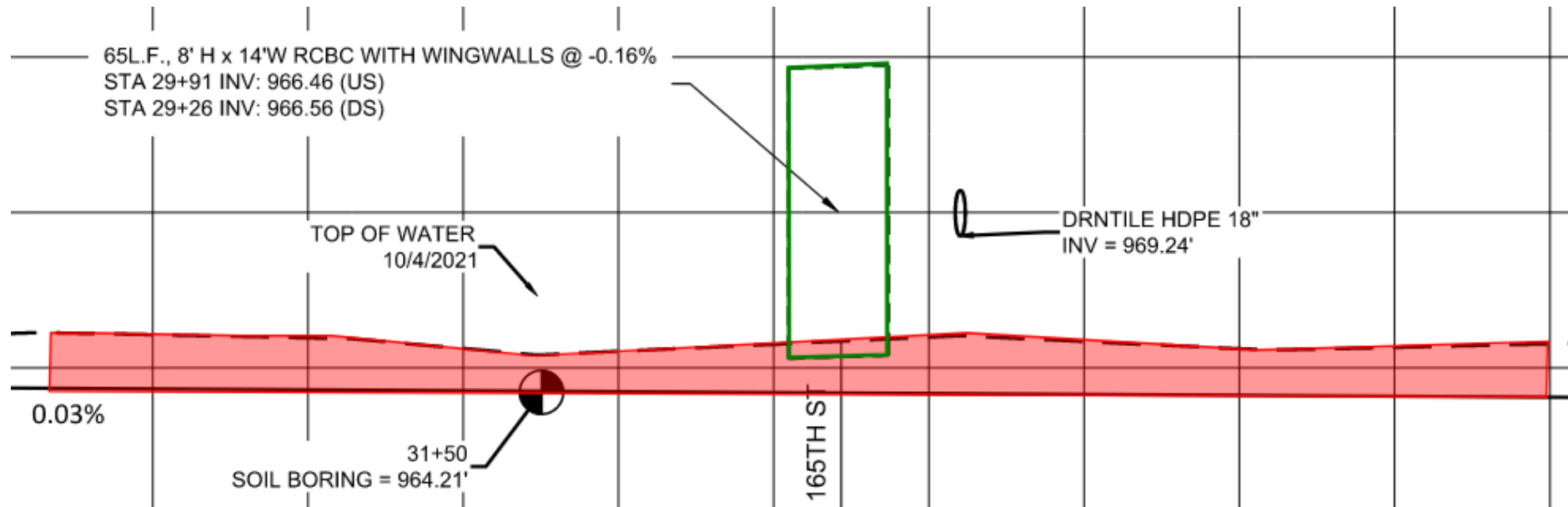
Sometimes design grades don't fit...ditches weren't always dug per plan



Why are so many culverts higher than as-built grade?



- Over years, sediment accumulates in the channel
- New or replacement culverts are placed on top of existing sediment
- Culverts also may heave over time

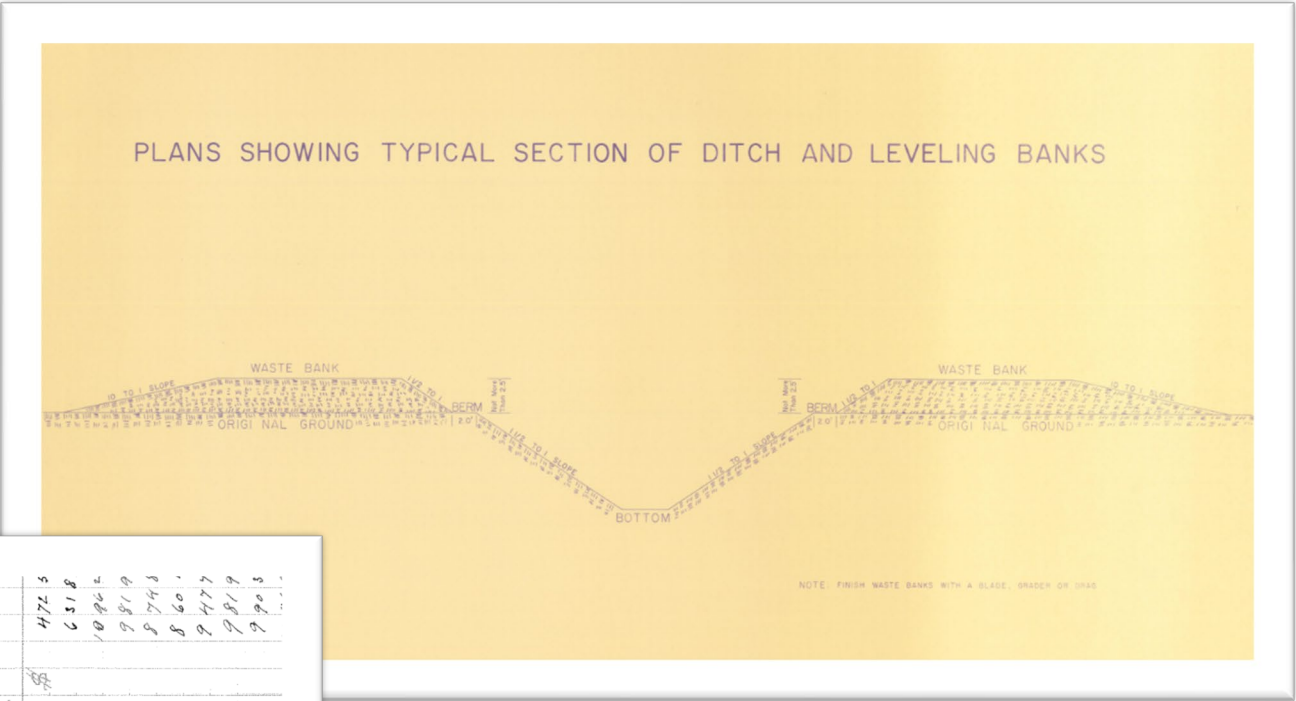




- Damages awarded during drainage system establishment for the:
 - Area physically occupied by the ditch
 - Area required to construct and maintain the drainage system
- Based on channel depths, visible spoil areas, topography

Branch	Upstream Station	Downstream Station	Right-of-Way [ft]
Main Trunk	35+00	0+00	100
Main Trunk	225+15	35+00	130
Branch A	2+20	0+00	75
Branch B	18+11	0+00	80

Right-of-Way

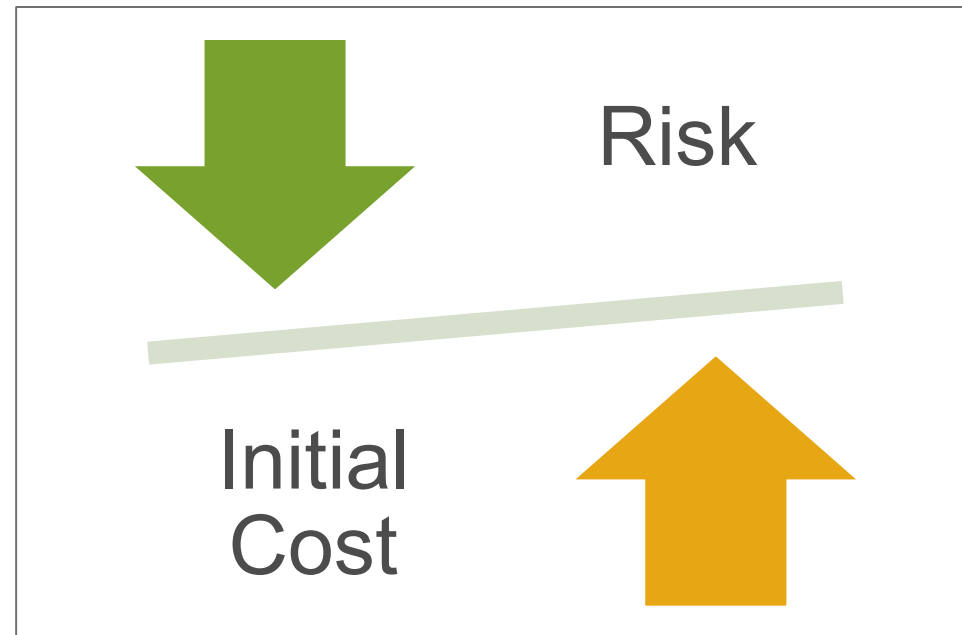


Estimated Cost per Station		472.5
Estimated Cost per yard	9.65	6.518
Nº of Cubic yards in Each Station		10.462
Width of Top	14.00 ft.	9.819
Width of Bottom	10 ft.	8.601
Depth of cut	5.2	9.477
	8.95	9.819
	8.47	9.905
	8.80	
	8.02	
	8.25	
	8.37	
	8.40	
	8.42	

When to initiate a Reestablishment of Records



- Missing recent and/or critical documents
- DNR public waters along system
- Lack of consensus on components/extent of system
- Condition of system
- Cost of necessary repairs



Are all changes to the as-built condition “improvements?”



NO

§ 103E.701

The term "repair," as used in this section, means to restore all or a part of a drainage system as nearly as practicable to the same hydraulic capacity as originally constructed and subsequently improved, including resloping of ditches and leveling of spoil banks if necessary to prevent further deterioration, realignment to original construction if necessary to restore the effectiveness of the drainage system, and routine operations that may be required to remove obstructions and maintain the efficiency of the drainage system.

"Repair" also includes:

(1) incidental straightening of a tile system resulting from the tile-laying technology used to replace tiles; and

(2) replacement of tiles with the next larger size that is readily available, if the original size is not readily available.



Open Ditches

- “Capacity” is hard to define
- Many factors in determining “Functional Capacity”
 - Top of bank
 - Cross-section
 - Tile outlets
 - Roadway overtopping
 - Culvert sizing



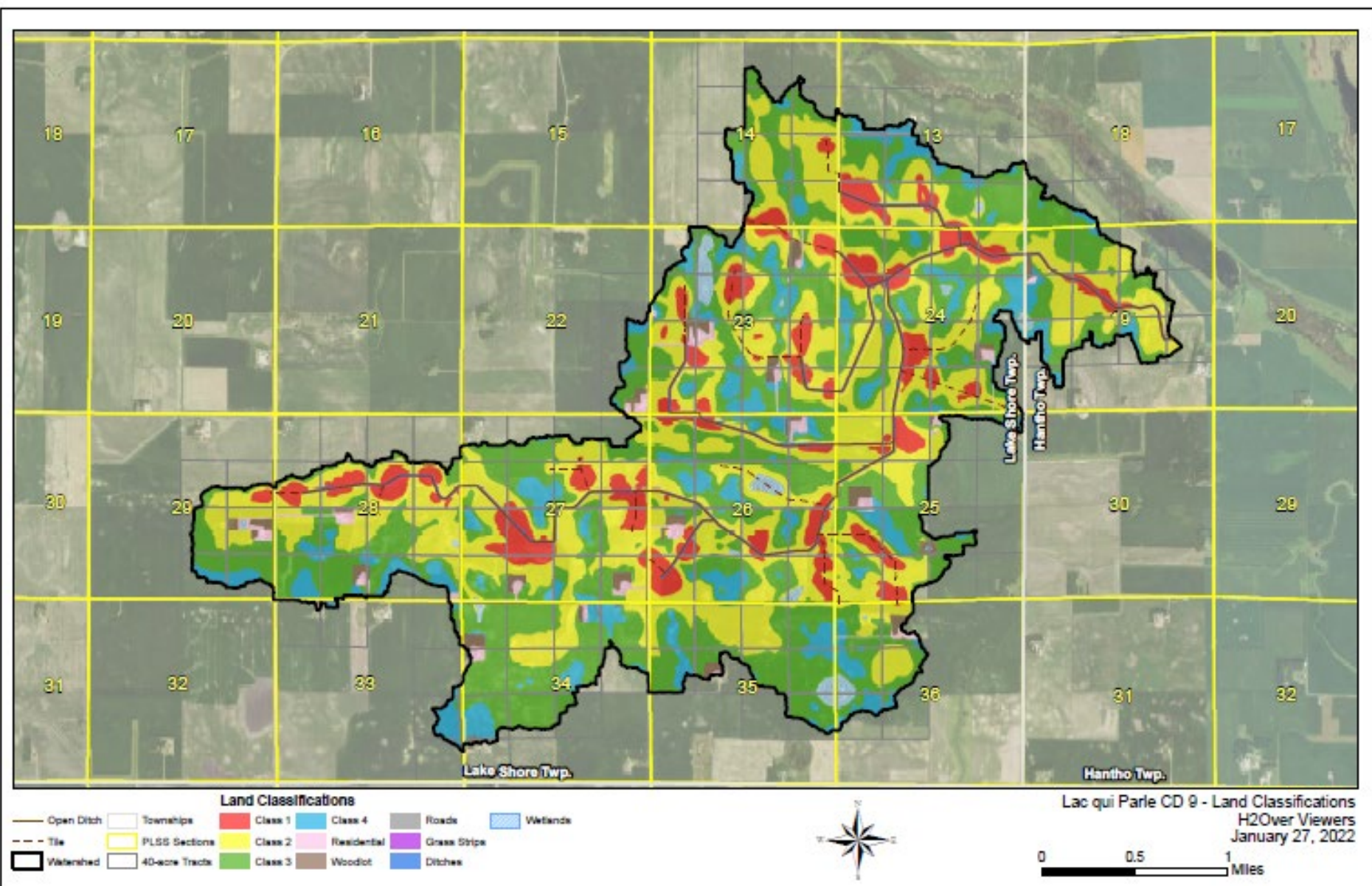


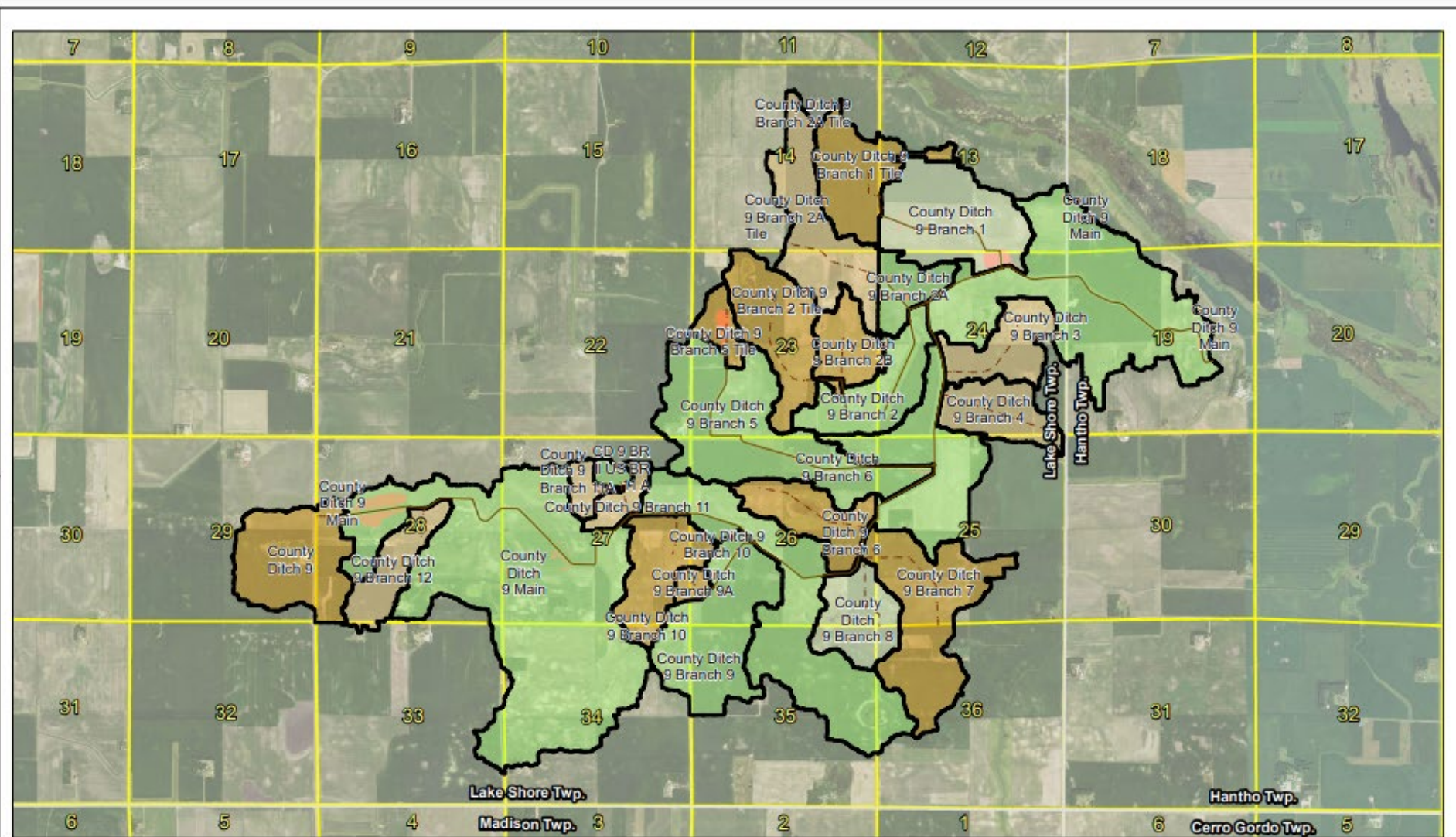
Tiles

- Historic Capacity (aka Drainage Coefficient) ~ 1/8 to 1/4 inch per day
- Modern Design = 3/8 to 1/2 inch per day
- Tile repairs affect system function via:
 - Removing obstructions
 - Smoother pipe (sometimes)
 - “Next size pipe” (some cases)
- Capacity is only as good as smallest downstream size
- Landowners should consider all of these factors prior to an improvement petition

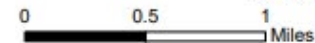
Branch	Size	Existing Coeff.	Repair Coeff. (in/day)
A	14”	0.30	0.41
B	10”	0.13	0.15
C	8”	0.18	0.20

Determining Benefits for Improvements vs. Repairs





Lac qui Parle CD 9 - Subwatershed Factors
H2Over Viewers
January 24, 2022



CAPACITY GRADING CRITERIA

1/2" Coefficient

100% Total Benefits

3/8" Coefficient

87.5% Total Benefits

1/4" Coefficient

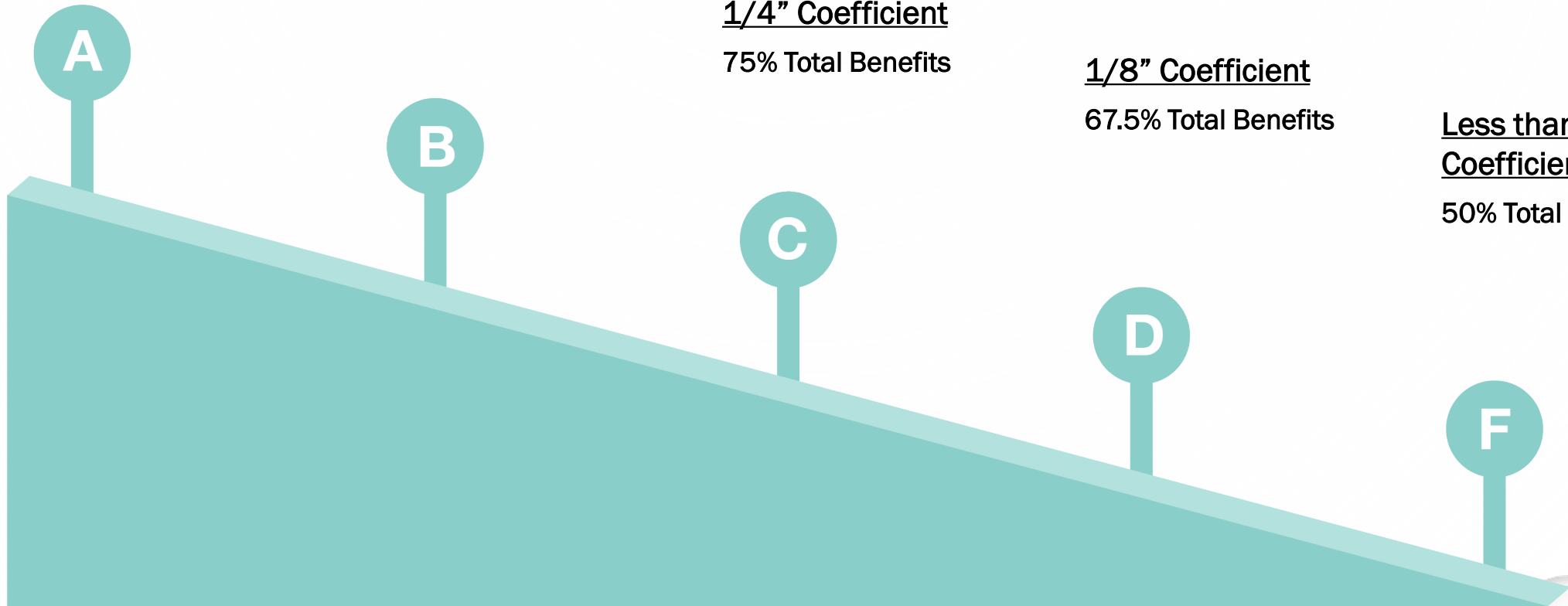
75% Total Benefits

1/8" Coefficient

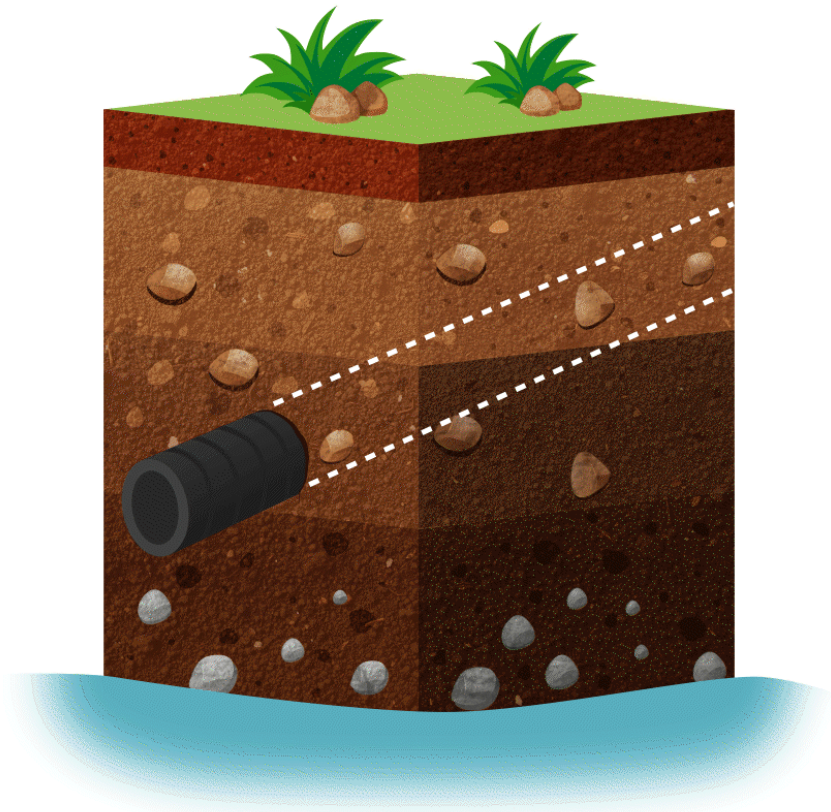
67.5% Total Benefits

Less than 1/8"
Coefficient

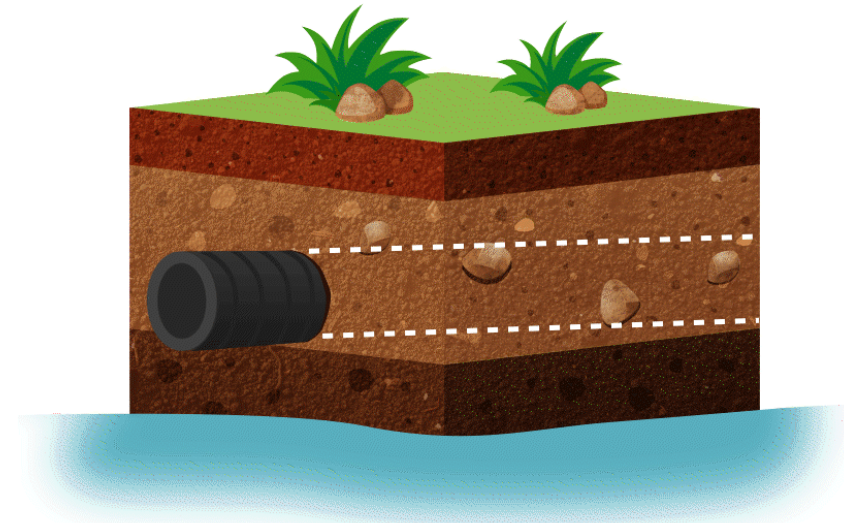
50% Total Benefits



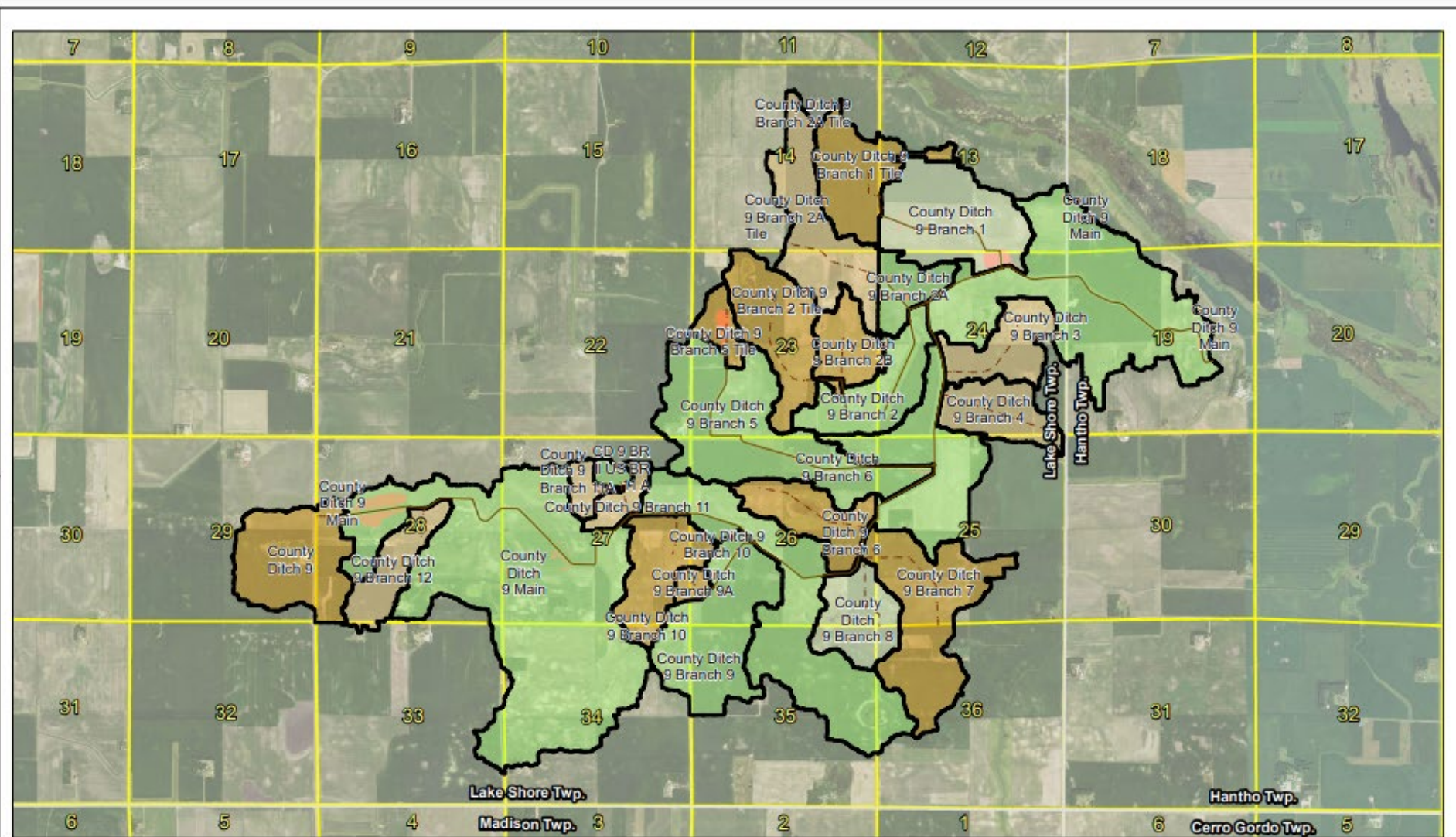
CAPACITY GRADING CRITERIA



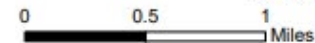
optimum

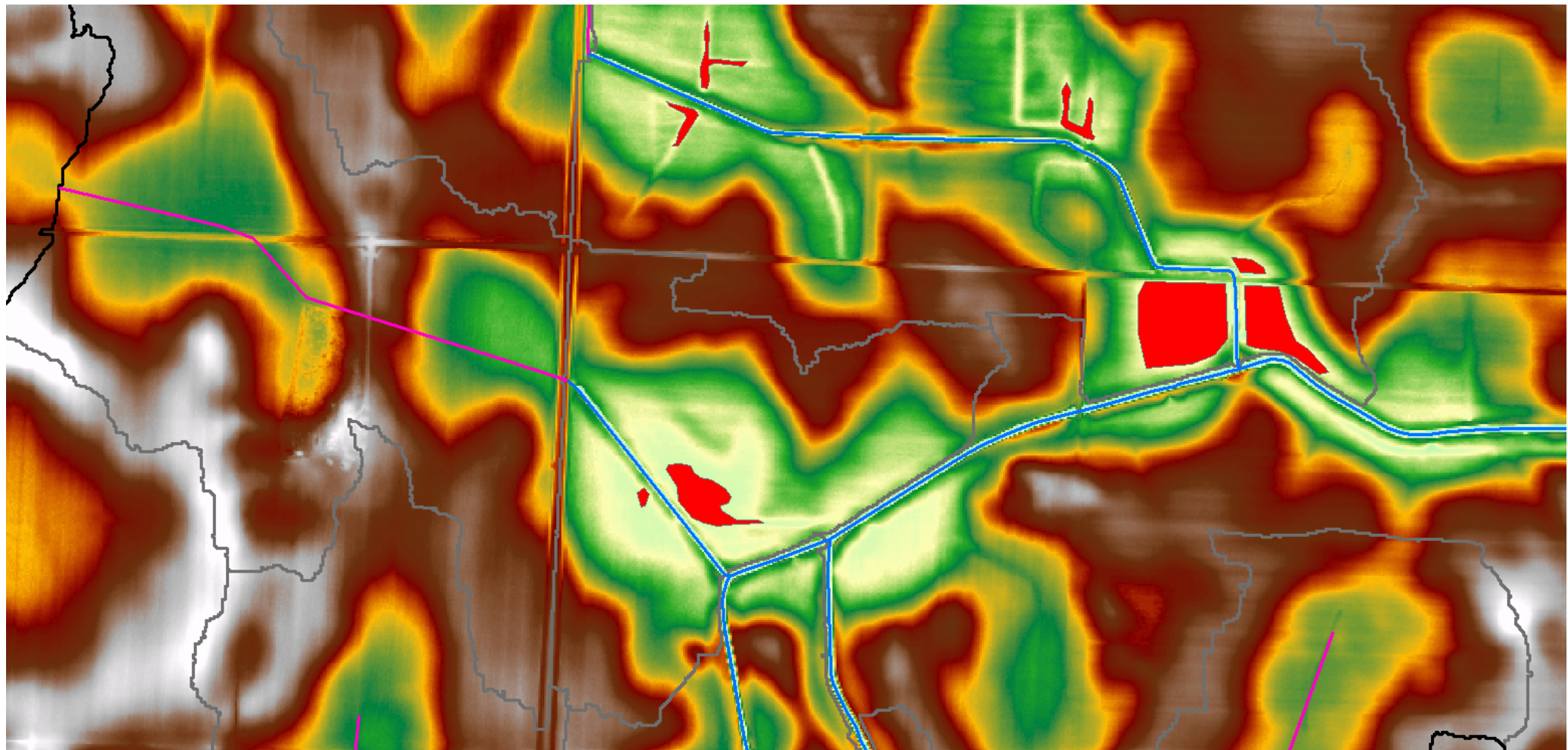


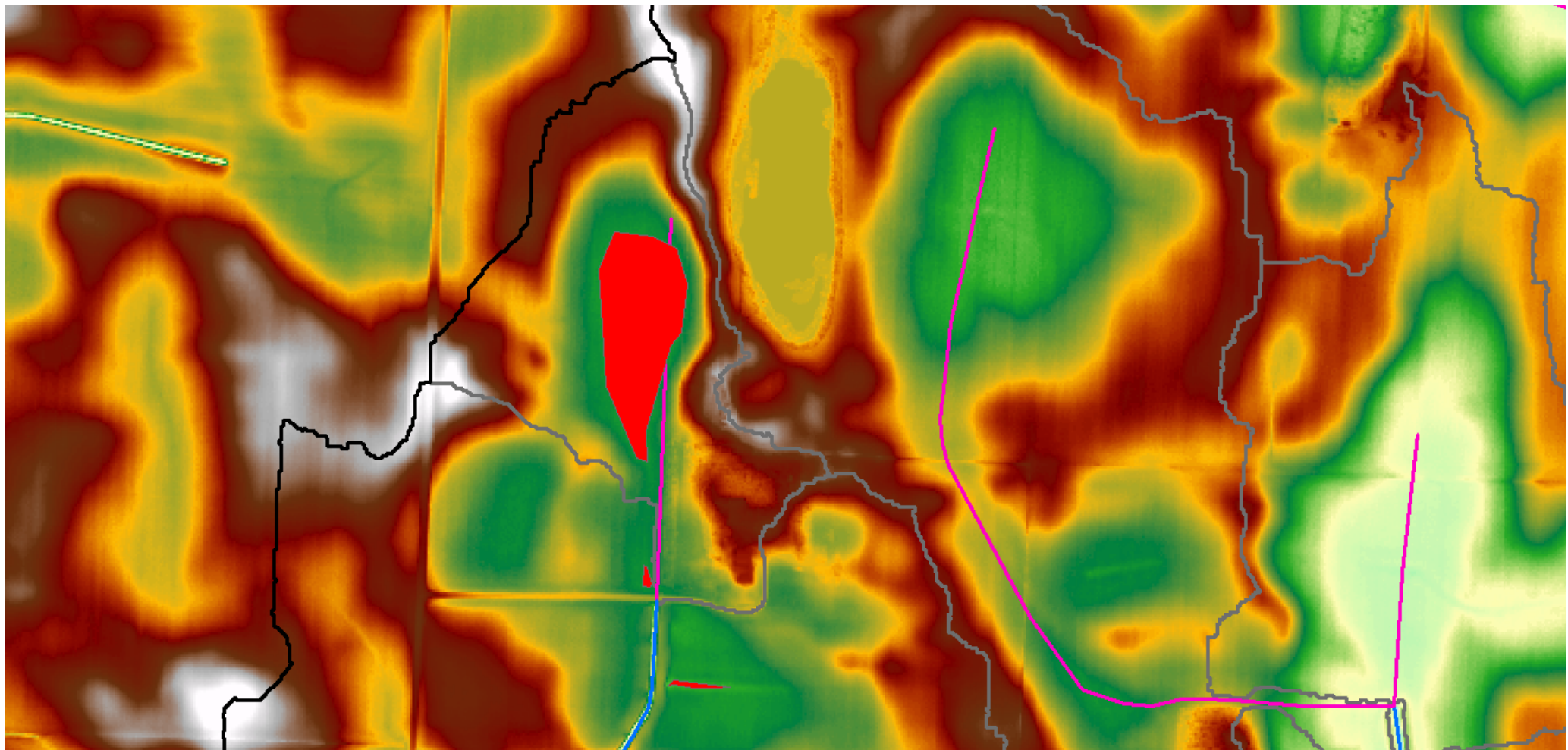
less than optimum



Lac qui Parle CD 9 - Subwatershed Factors
H2Over Viewers
January 24, 2022







CAPACITY GRADING CRITERIA

1/2" Coefficient

100% Total Benefits

Optimum

A

3/8" Coefficient

87.5% Total Benefits

.1%-2.5% of agricultural
acres below optimum

B

1/4" Coefficient

75% Total Benefits

2.5%-7.5% of agricultural
acres below optimum

C

1/8" Coefficient

67.5% Total Benefits

7.5%-12.5% of
agricultural acres
below optimum

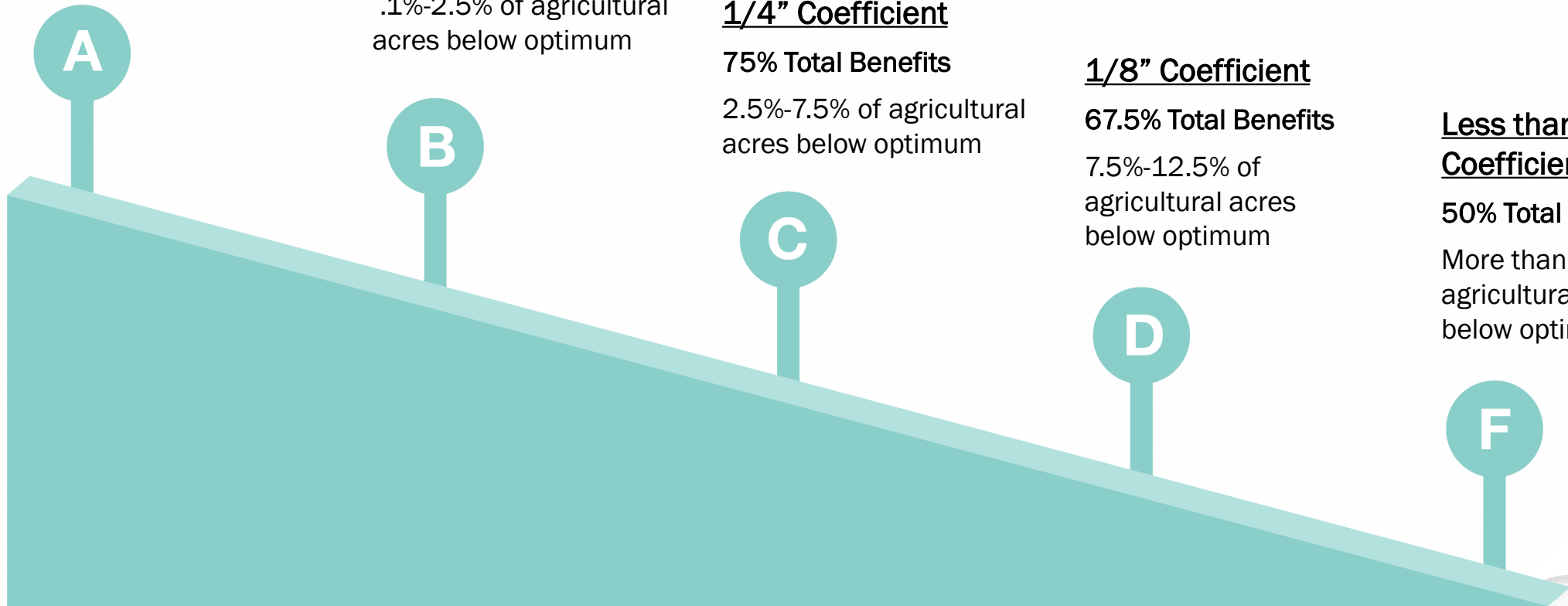
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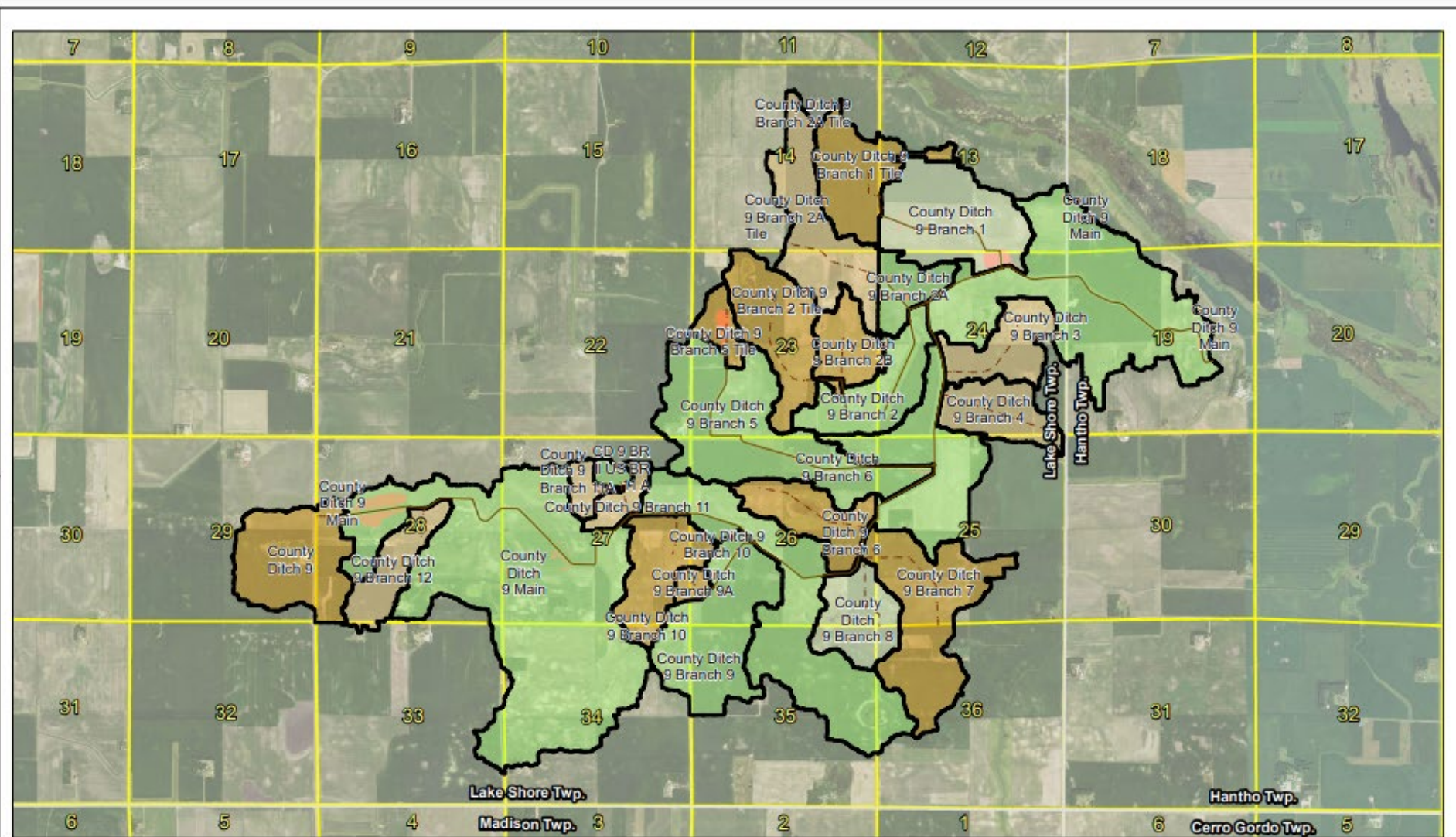
Less than 1/8" Coefficient

50% Total Benefits

More than 12.5% of
agricultural acres
below optimum

F





Lac qui Parle CD 9 - Subwatershed Factors
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