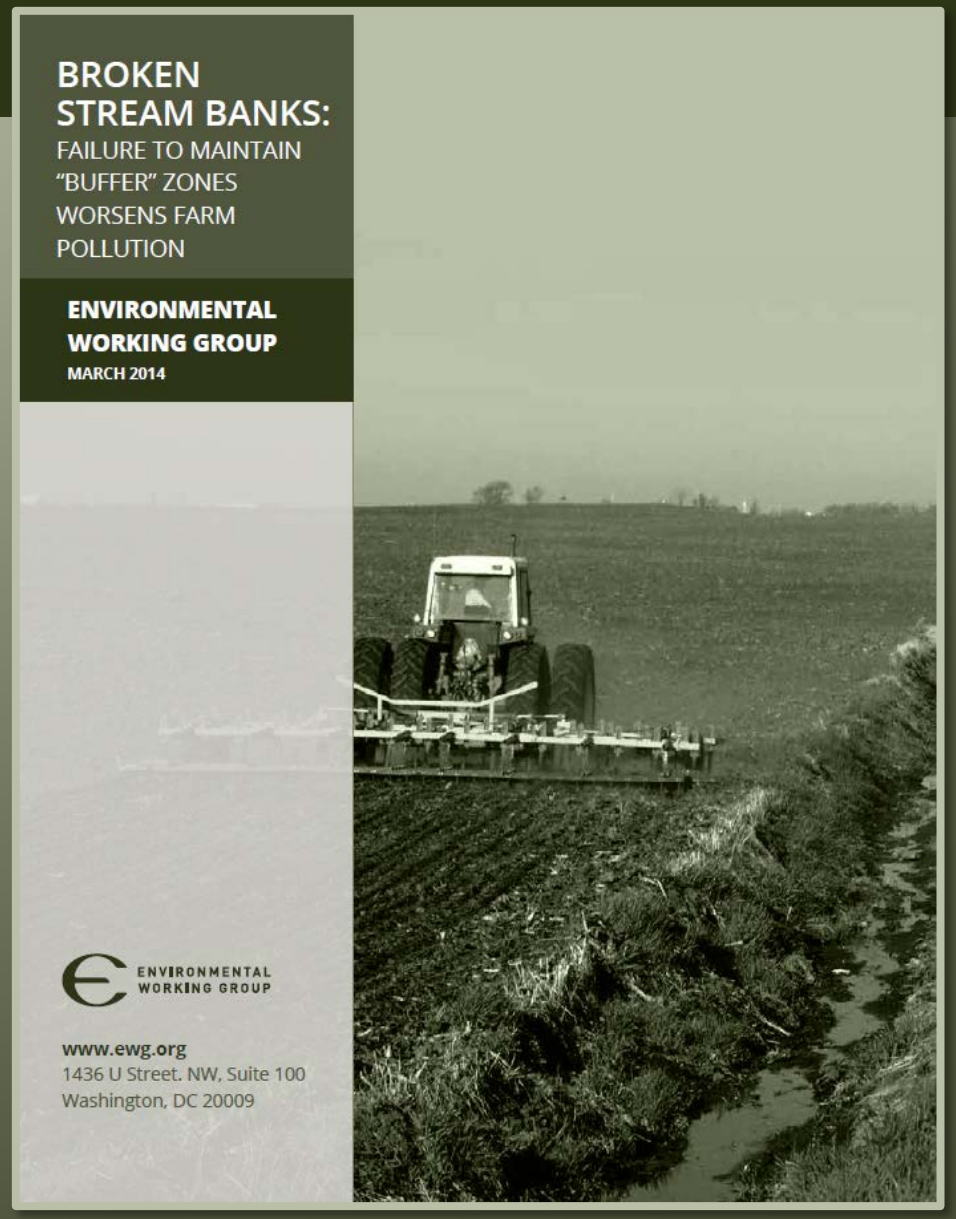
EWG Spatial Analysis:

Buffers & Beyond

Environmental Working Group 2016

Buffer Assessment



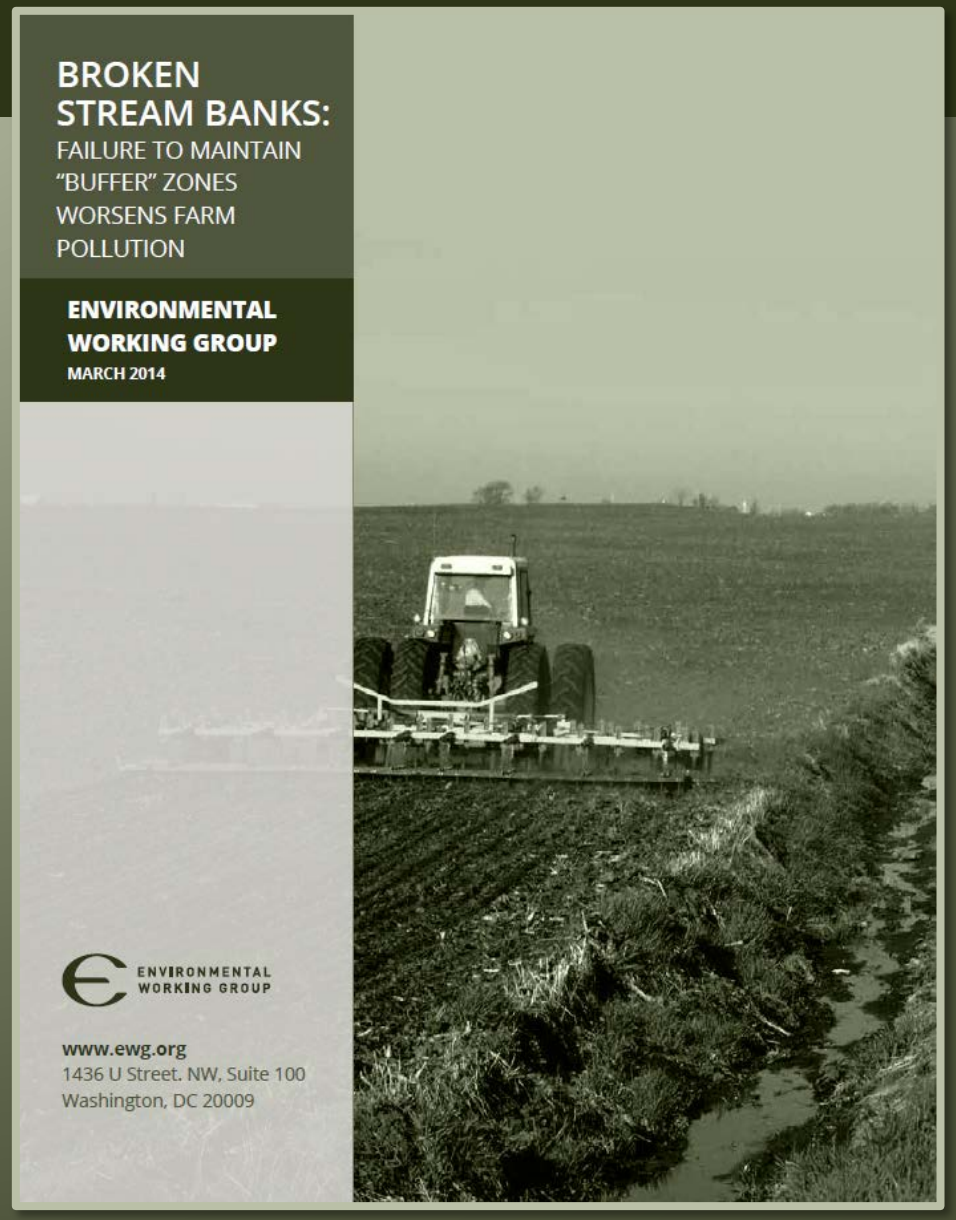
EWG's Ames office is home to our Landscape and Spatial Analysis team

- **Currently 3 members, led by Soren Rundquist**

MN state offices needed data to make decisions about how to address their buffer law reform

- **Legislative action was needed, but they lacked on-the-ground information about the nature of the problems**
  - **How much land was affected?**
  - **Is it a problem of state or local enforcement?**
  - **How much land is out of compliance? How much would it cost to get it in compliance? How many landowners would be affected?**

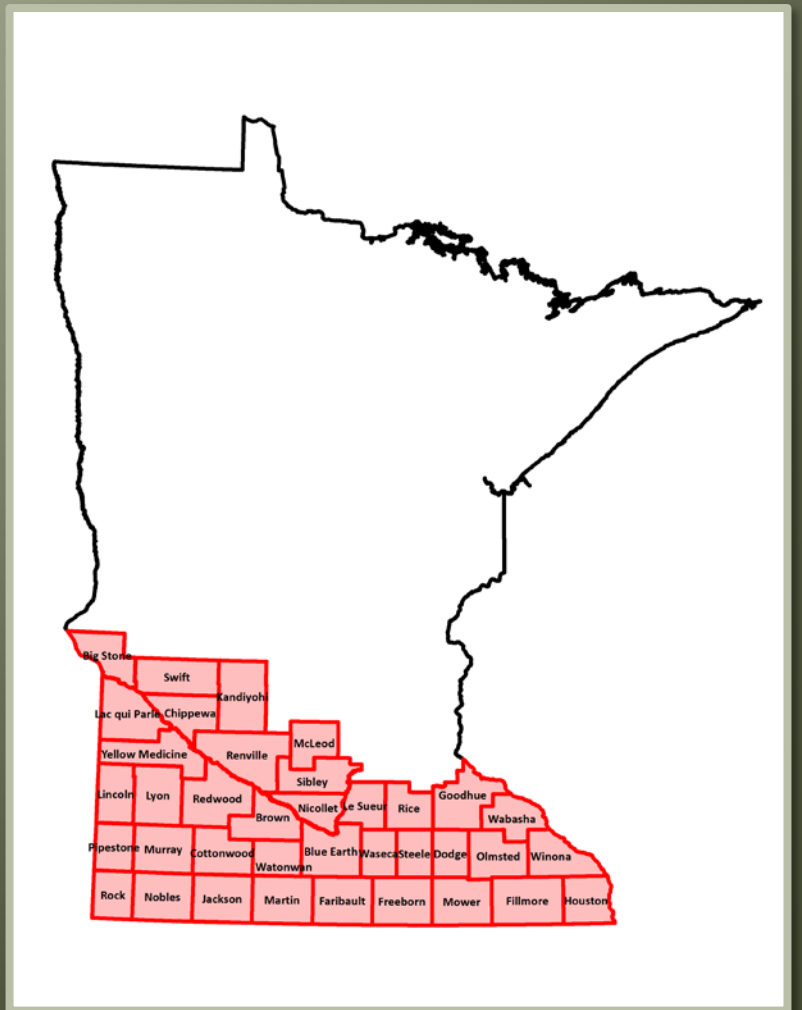
Buffer Assessment



Partnered with EWG to explore the extent to which the shoreland rules were enabling the conservation of a 50 ft. vegetative buffer along cropland and provide data on which to build policy solutions.

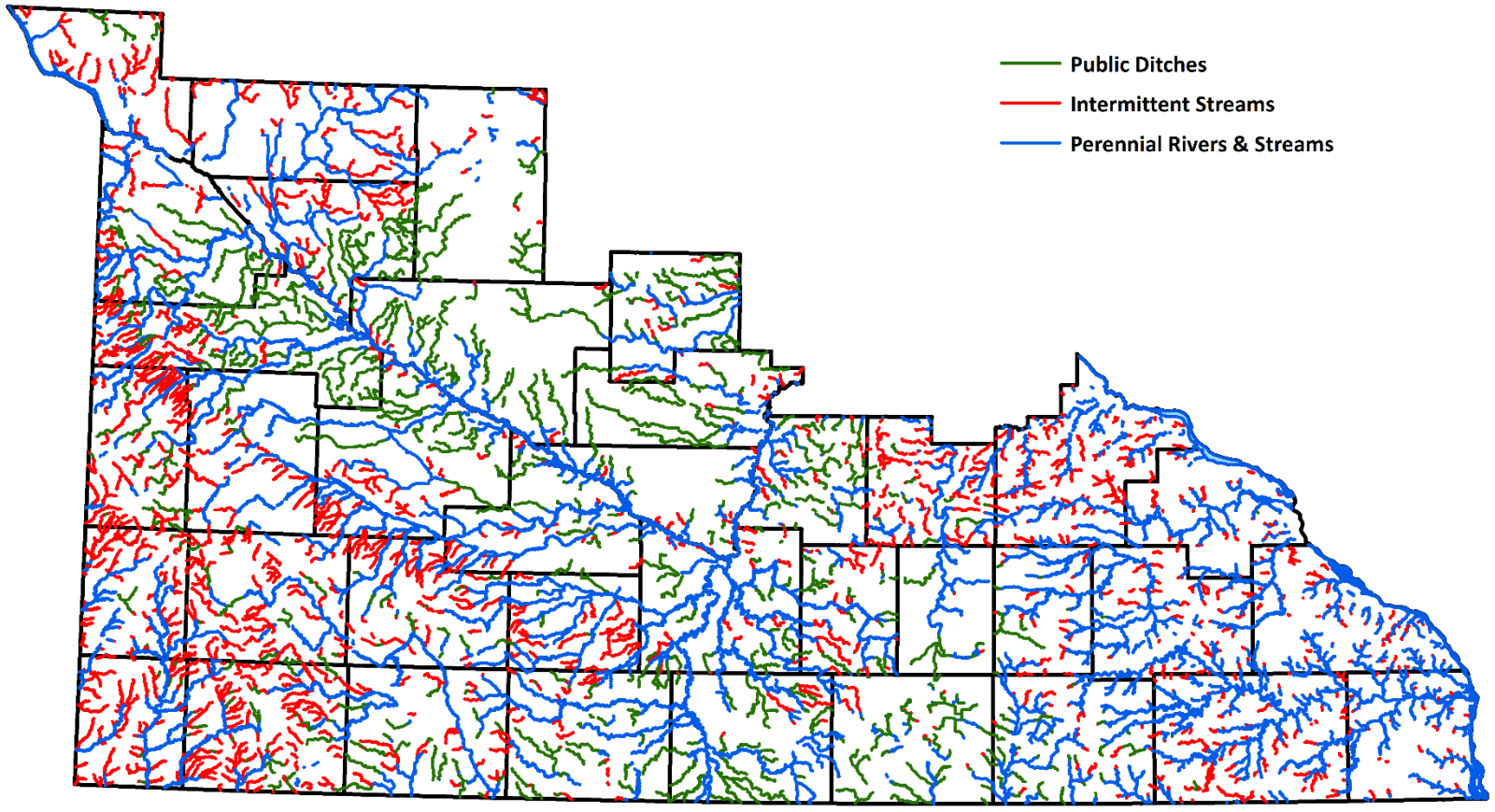
- **Data reflects the landscape in 2011, but QC was done with 2012/2013 imagery**
- **Only assessed public perennial waterways within 200 ft. of agriculture (and more than 1 mile long) and a small subset of ditches and intermittent streams**
- **CIR aerials only available for southernmost 37 counties in Minnesota**

Methods - DATA



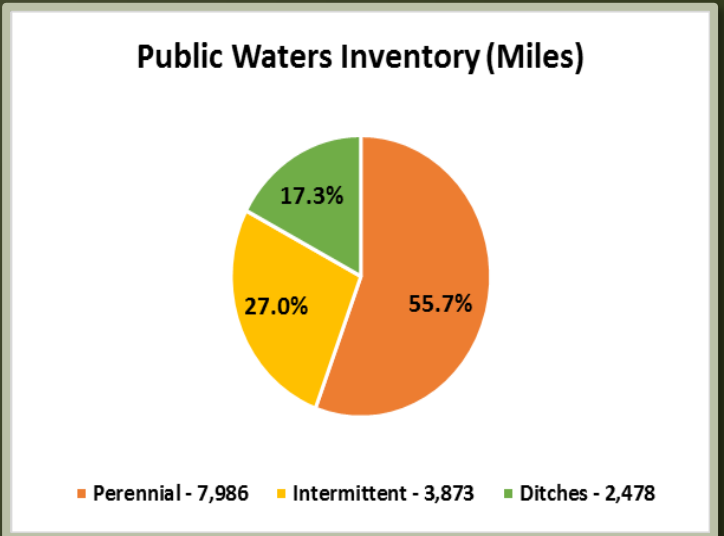
- Minnesota DNR 2011 CIR Spring Aerial Photography
- Minnesota DNR Public Waters Inventory GIS Layer
- USDA Farm Services Agency Common Land Units GIS Layer
- USGS National Hydrography Dataset (Naming Waterways)

Public Waters Inventory



Source: MN Public Waters Inventory (GIS Layer)

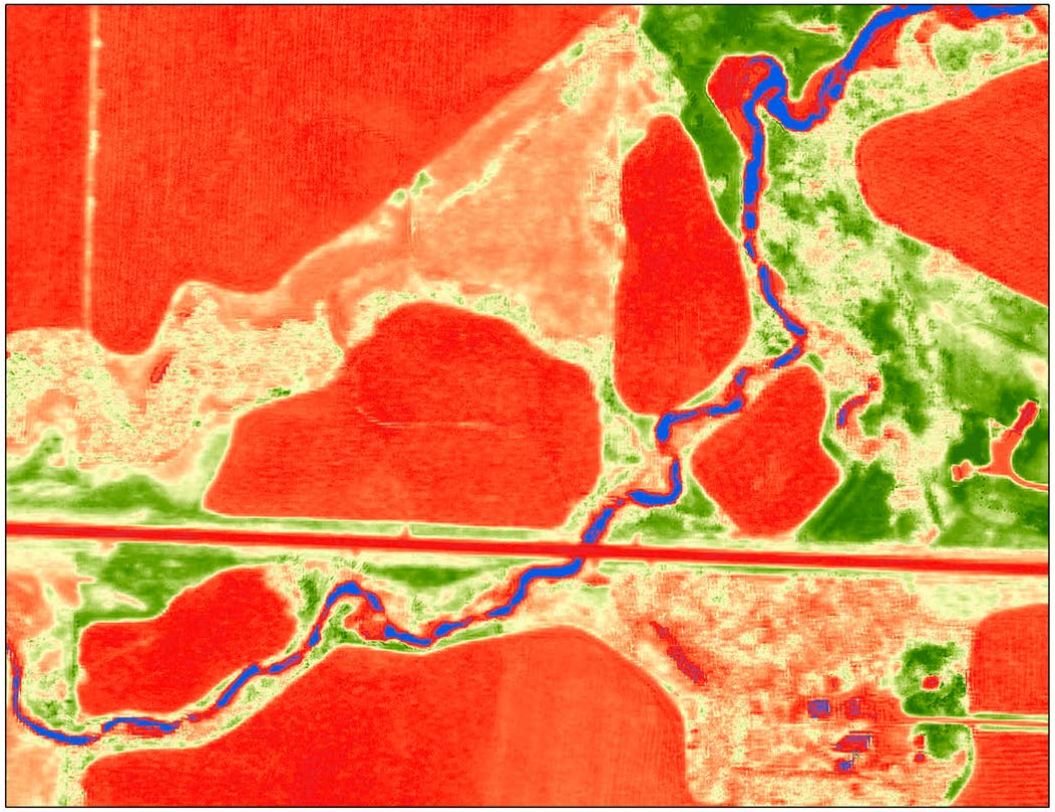
EWG analyzed approximately 8,000 miles of perennial waterways within 200 ft. of agriculture



Methods - HYDROGRAPHY

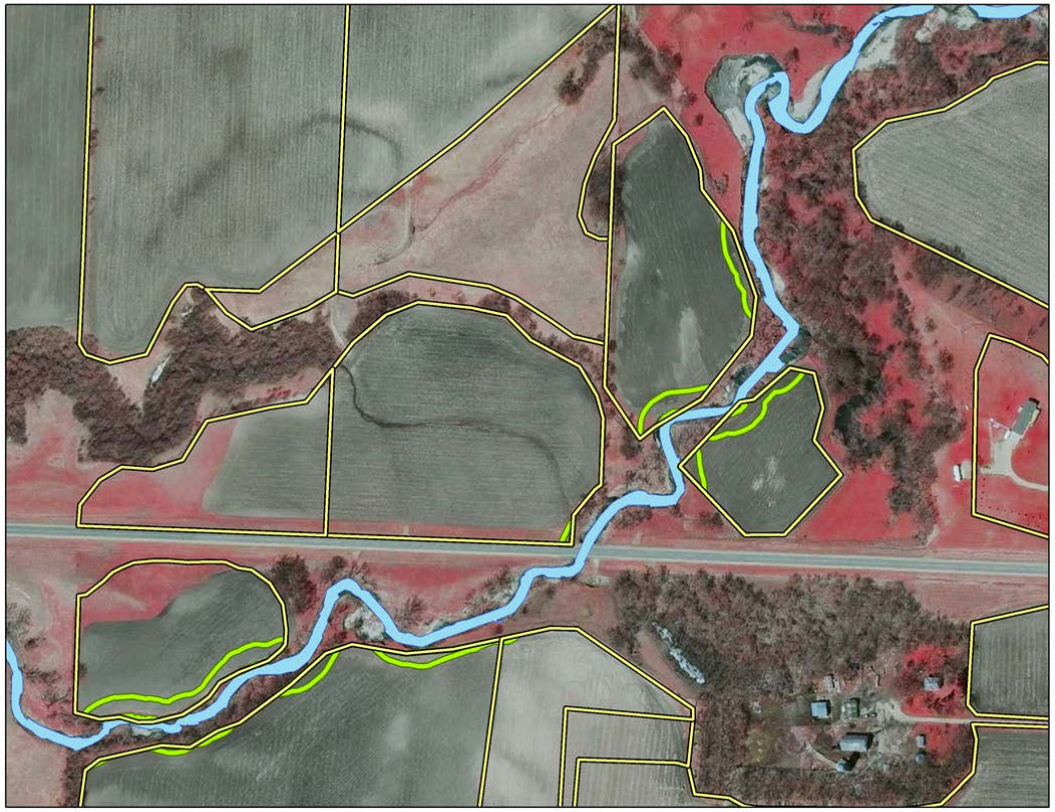
- Create an accurate picture of the perennial shoreline with remote sensing (aerial photos)
- Using the PWI as a proxy for public perennial waterways within 200 ft. of agriculture
- Attributing the remote sensed shoreline with PWI data

Methods - VEGETATION



- Utilize Normalized Difference Vegetation Index (NDVI) to create a vegetative footprint within 50 ft. agricultural buffers
- Establish the percent of buffer present/absent for all 50 ft. buffers

Methods - CROPLAND



- Create a 50 ft. buffer from shoreline and intersect with tracts classified as agriculture in the common land unit (in green)
- Quantify the existence of vegetation within the 50 ft. ag buffer universe

Methods – MISSING BUFFER

- Classify missing cropland buffer universe for waterway name, and waterway size
- Intersect missing buffer universe with cold water habitat, impaired waterways and highly erodible land tracts
- Aggregate statistics at waterway, watershed, county and state level

Methods – QUALITY CONTROL

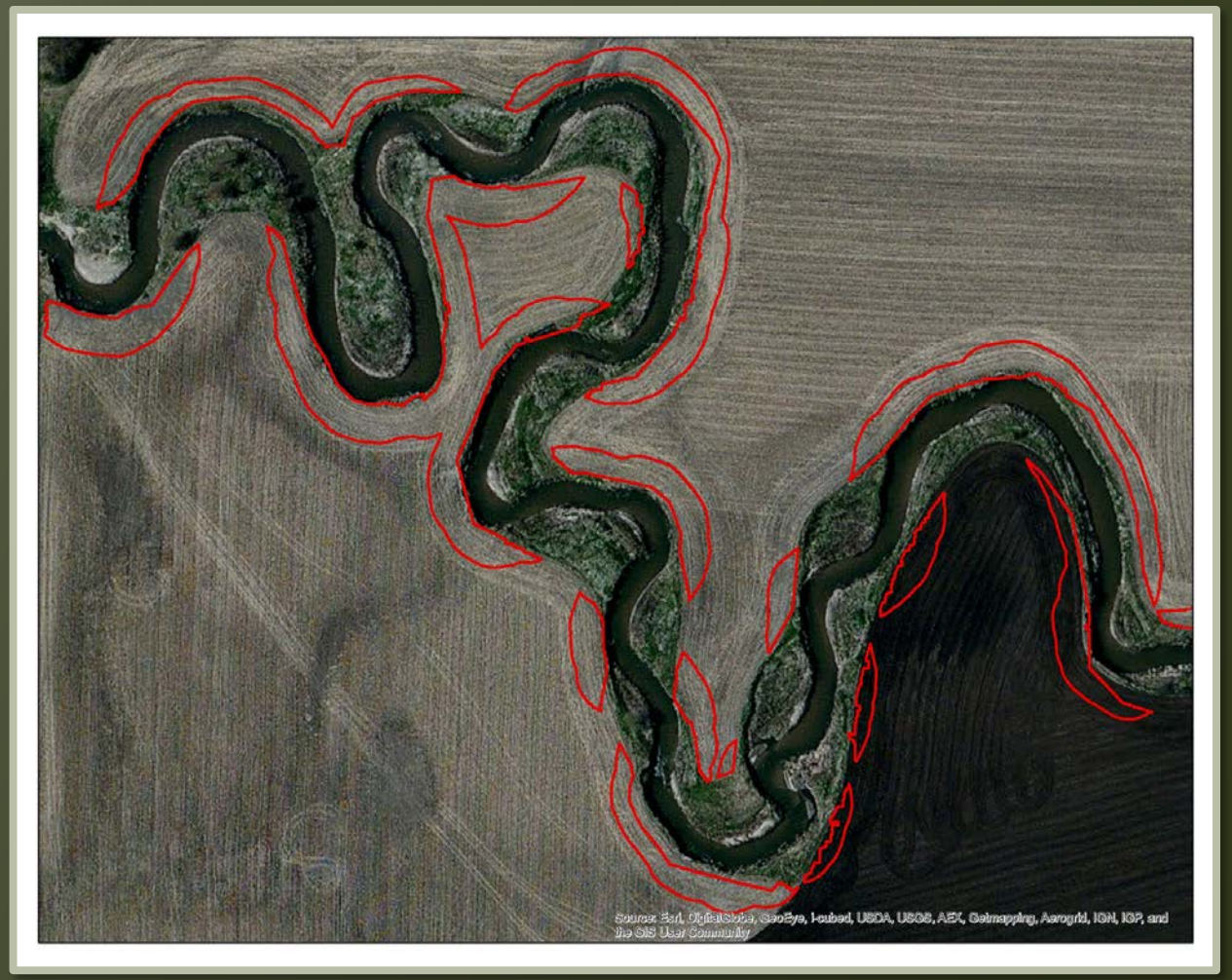
- All missing buffer polygons were check with recent imagery as a quality control measure

- If buffers were in vegetation after the analysis date (2011) the buffer was deleted, if the new areas of missing buffers appeared they <u>were not</u> added to the universe

Buffer Grade Examples

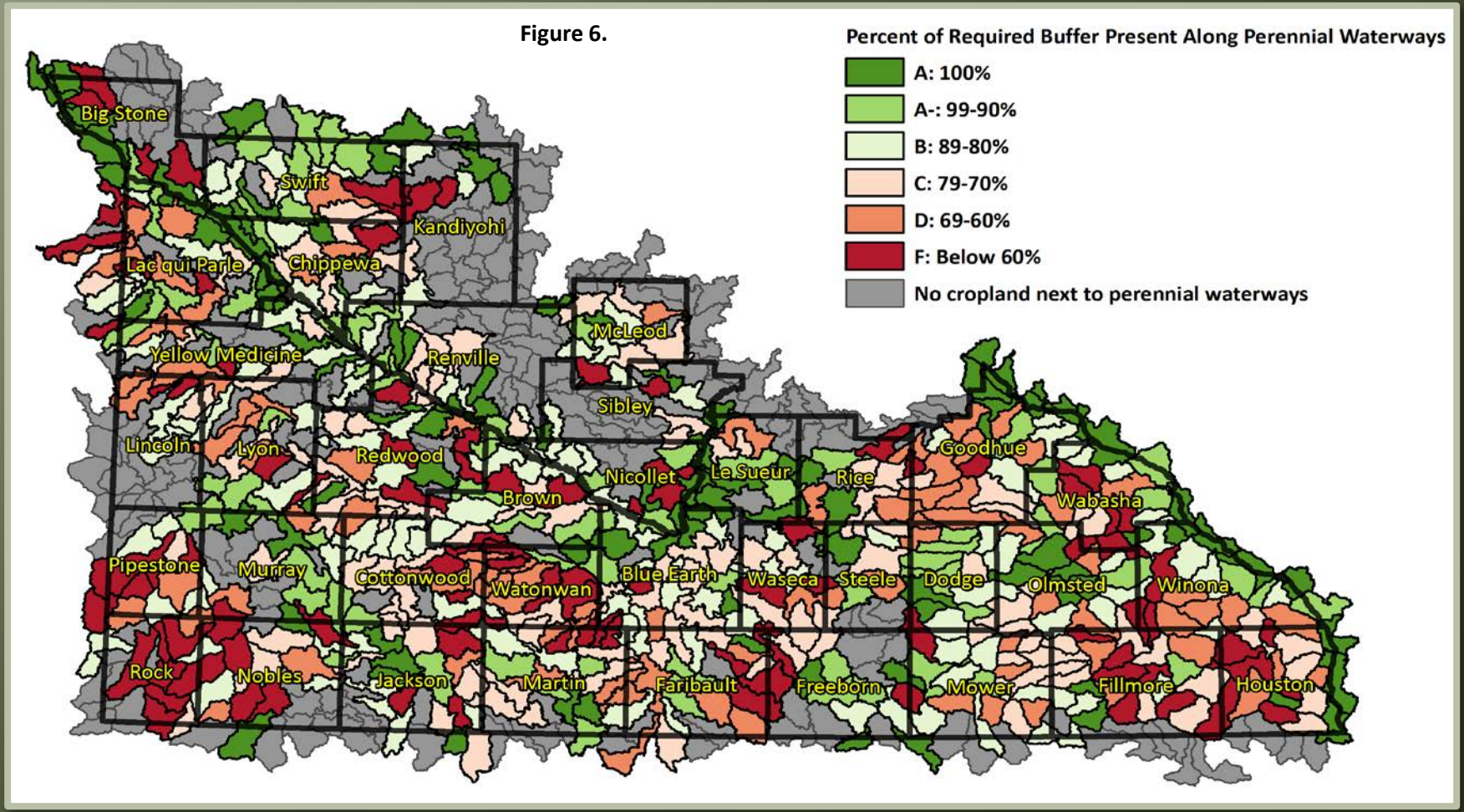
A

F



Perennial Watershed Scores

Figure 6. Spatial Distribution of Missing Buffer Aggregated by Watershed



EWG's analysis found a jumbled pattern in which watersheds and waterways that earn top grades are frequently next door to areas with failing grades.

Public Perennial Waterway Report Card

Overall southern Minnesota scored a 72 percent (C - Grade) for the existence of 50 ft. vegetative buffer along cropland.

Alarmingly, 35 percent of all the assessed waterways received a D or below.

2011 - Perennial Rivers and Streams Buffer Report Card				
Grade	Percent Required Buffer Present	Missing Buffer Acres	Number of Waterways	Percent of Waterways
A	100%	0	87	18%
A-	99%-90%	59.4	57	12%
B	89%-80%	235.3	81	17%
C	79%-70%	626.1	93	19%
D	69%-60%	673.7	66	14%
F	59%-0%	690.5	101	21%
	Total	**2,285**	**485**	**100%**

Waterway Size Distribution

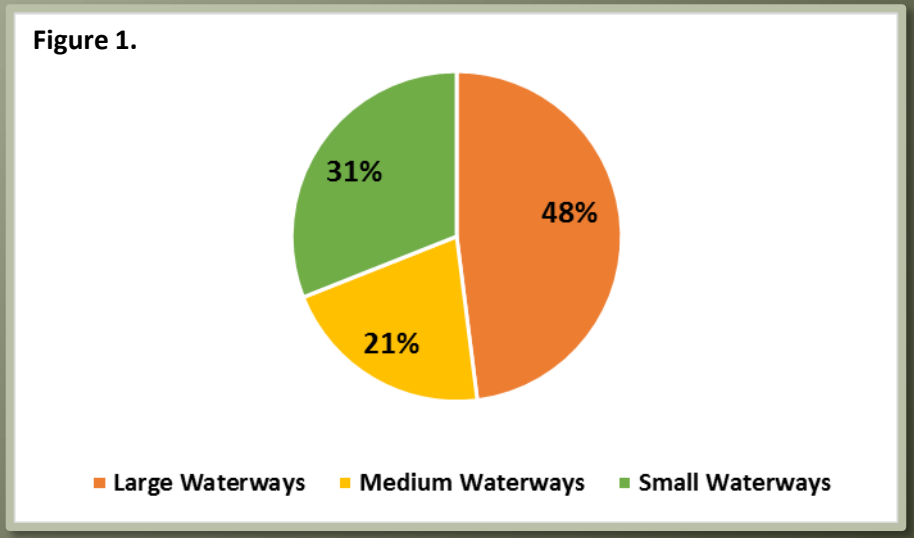


Figure1. Miles of Public Perennial Waterways Within the Study Area

- Small streams make up only 31 percent of total miles of perennial waterways.

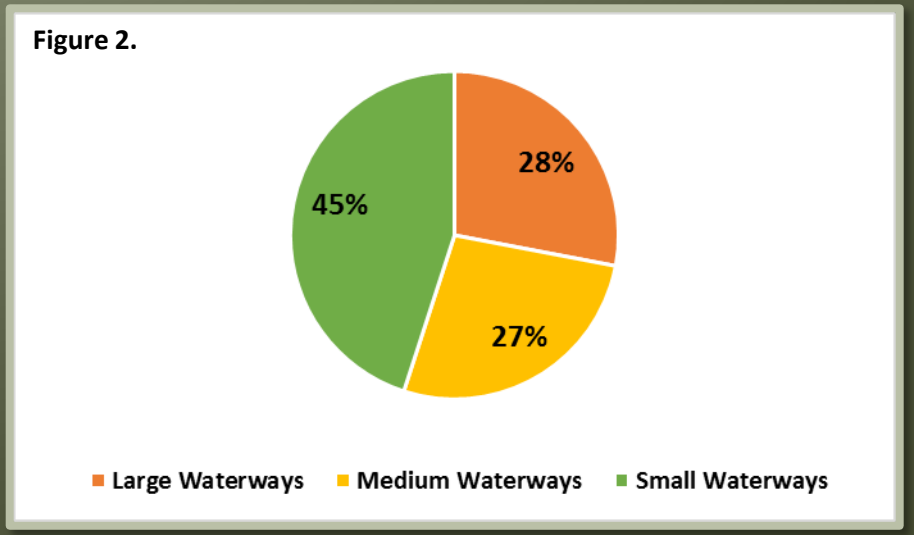


Figure 2. Acres of Missing Cropland Buffer By Water Size

- Small streams account for 45 percent of all missing buffers along perennial waterways.

Missing Buffer Distribution

Figure 3. Distribution of Missing Buffer Acres By Waterway Size and Grade

- Buffers along small perennial streams are in bad shape

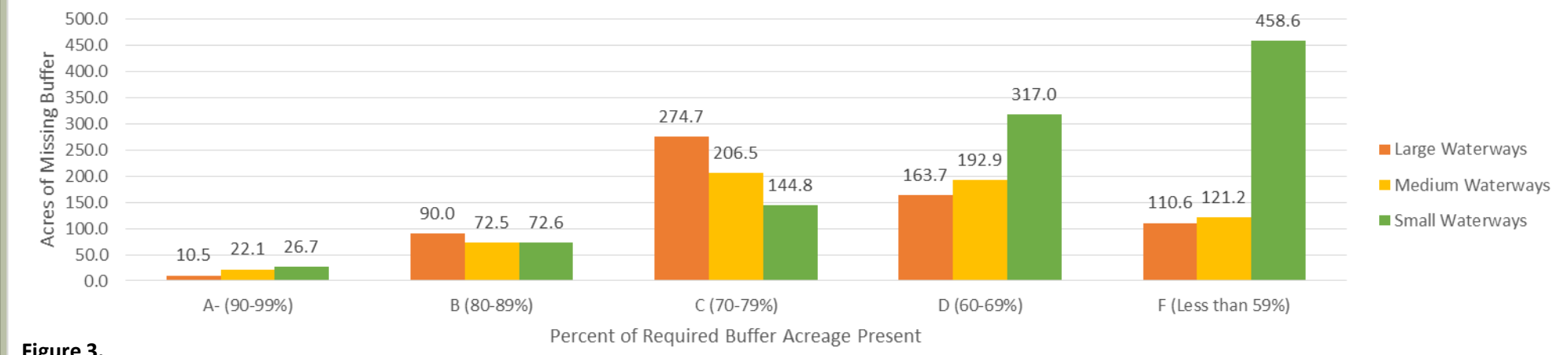
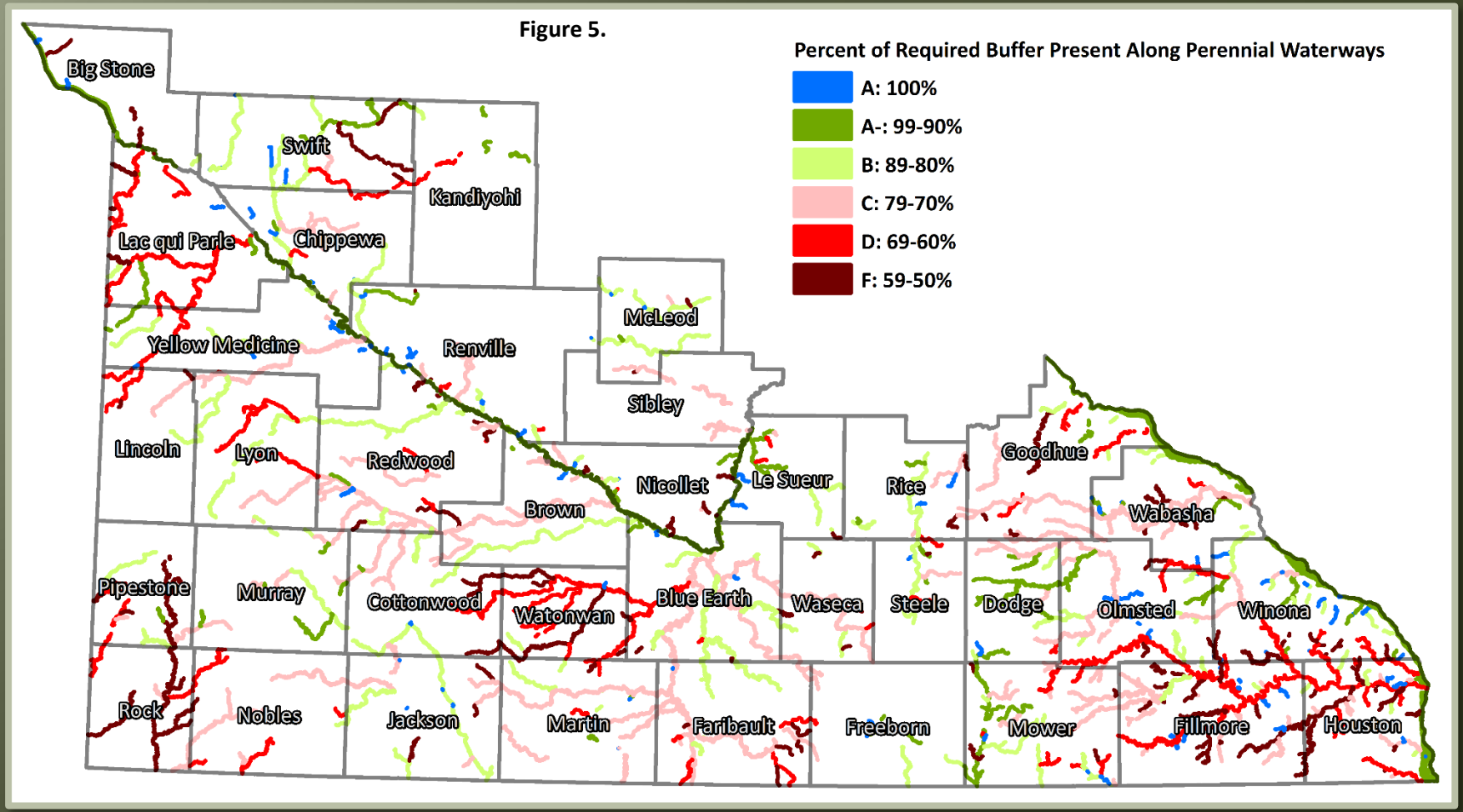


Figure 3.

Perennial Waterway Scores

Figure 5. Spatial Distribution of Scored Unique Perennial Waterways



Public Ditches and Intermittent Stream Report Cards

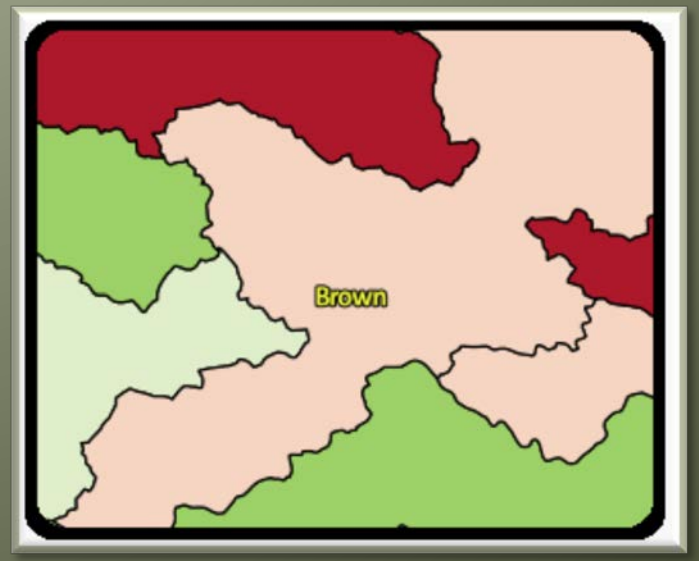
2011 - Public Ditches Buffer Report Card				
Watershed Name	Grade	Percent of 50ft. Buffer Present	Missing Buffer Acres	Existing Buffer Acres
Headwaters Tenmile Creek	F	48%	104	94
Stony Run Creek	F	56%	72	93
City of Raymond-Hawk Creek	D	60%	31	47
County Ditch No. 15	F	50%	64	63
Upper Le Sueur Creek	F	56%	56	72
Judicial Ditch No. 13	F	51%	45	47
County Ditch No. 11	C	74%	21	62
Total	**F**	**55%**	**393**	**478**

2011 - Intermittent Streams Buffer Report Card				
Watershed Name	Grade	Percent of 50ft. Buffer Present	Missing Buffer Acres	Existing Buffer Acres
Upper Beaver Creek	F	54%	48	57
Upper Flandreau Creek	F	53%	14	16
Willow Creek-Flandreau Creek	F	52%	27	29
Total	**F**	**54%**	**89**	**102**

EWG found that 99 percent of the 16.5 feet of buffer required by Minnesota's drainage law was maintained along the public ditches we assessed. In contrast, only 55 percent of the acres within 50 feet of the ditch banks were buffered – a failing grade under the far more protective Shoreland Management Act.

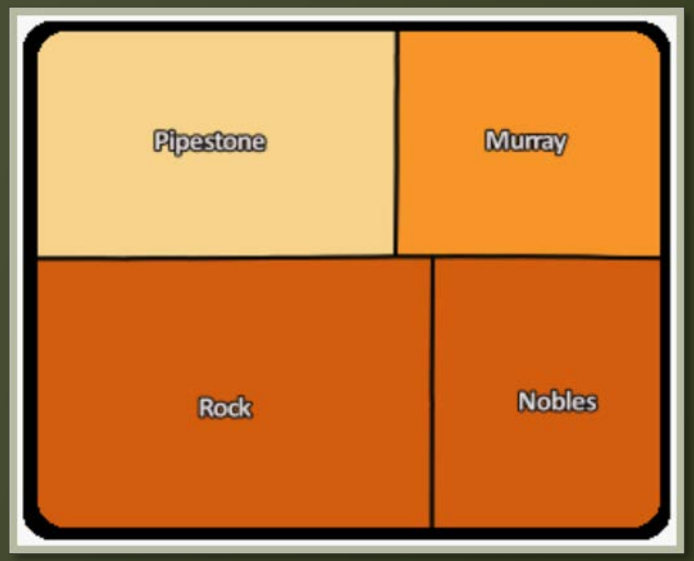
An independent MCEA found on average, only 51 percent of the acres within 50 ft. of the ditch bank were buffered.

Interactive Web Maps



Watershed Map

Satellite Map



County Map

Iowa's Low Hanging Fruit

Same basic analysis in 5 Iowa sample counties.

Available data reflects the landscape in leaf off imagery from 2007, 2009 and 2010.

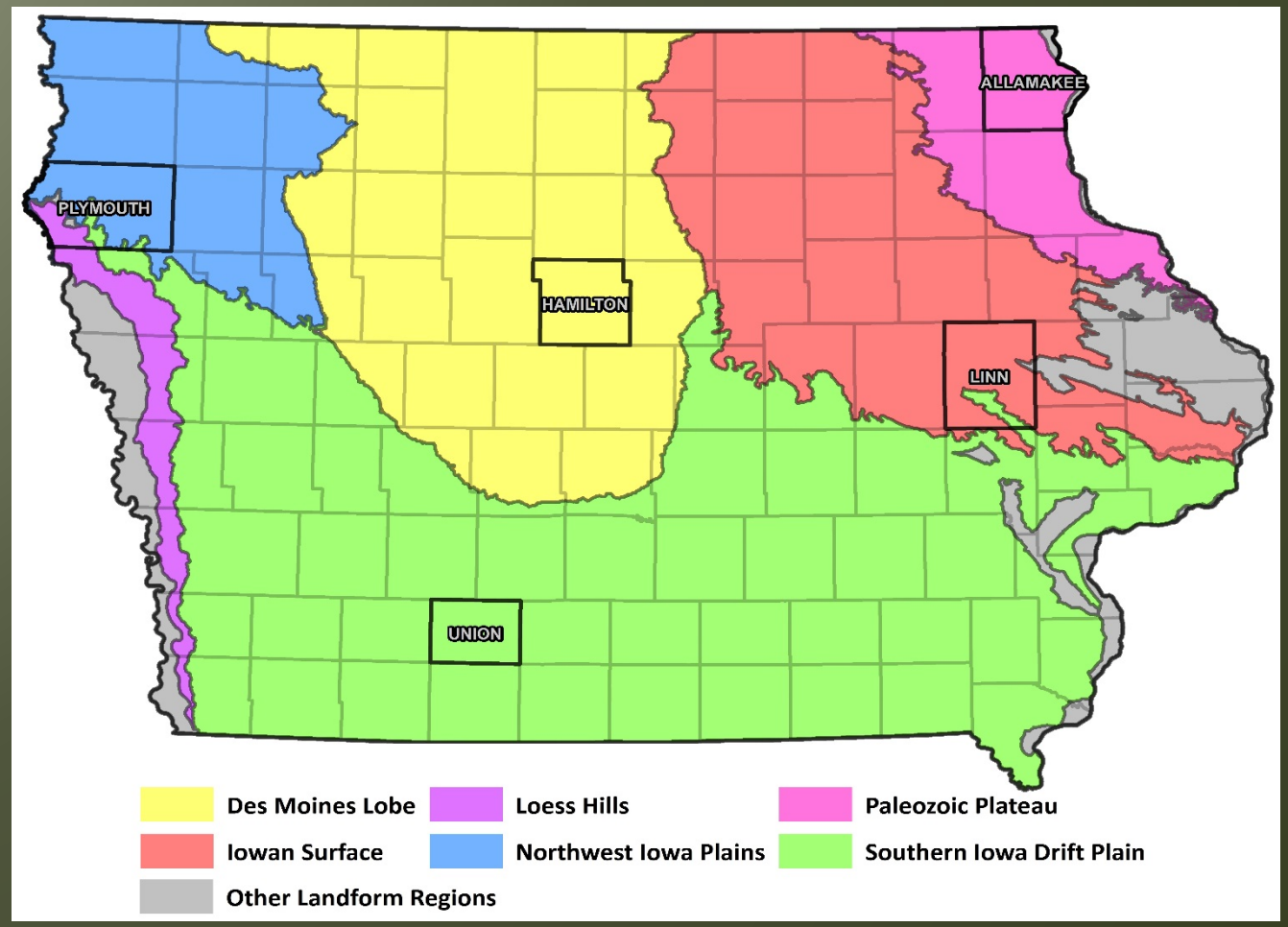
Only assessed named (GNIS) waterways found in the USGS National Hydrography Dataset.

Looking at buffer existence adjacent to agriculture at 35 ft. (recommendation in NRS), 50 ft. (neighboring state, MN) , and 75 ft. Quality controlled against 2013 NAIP.

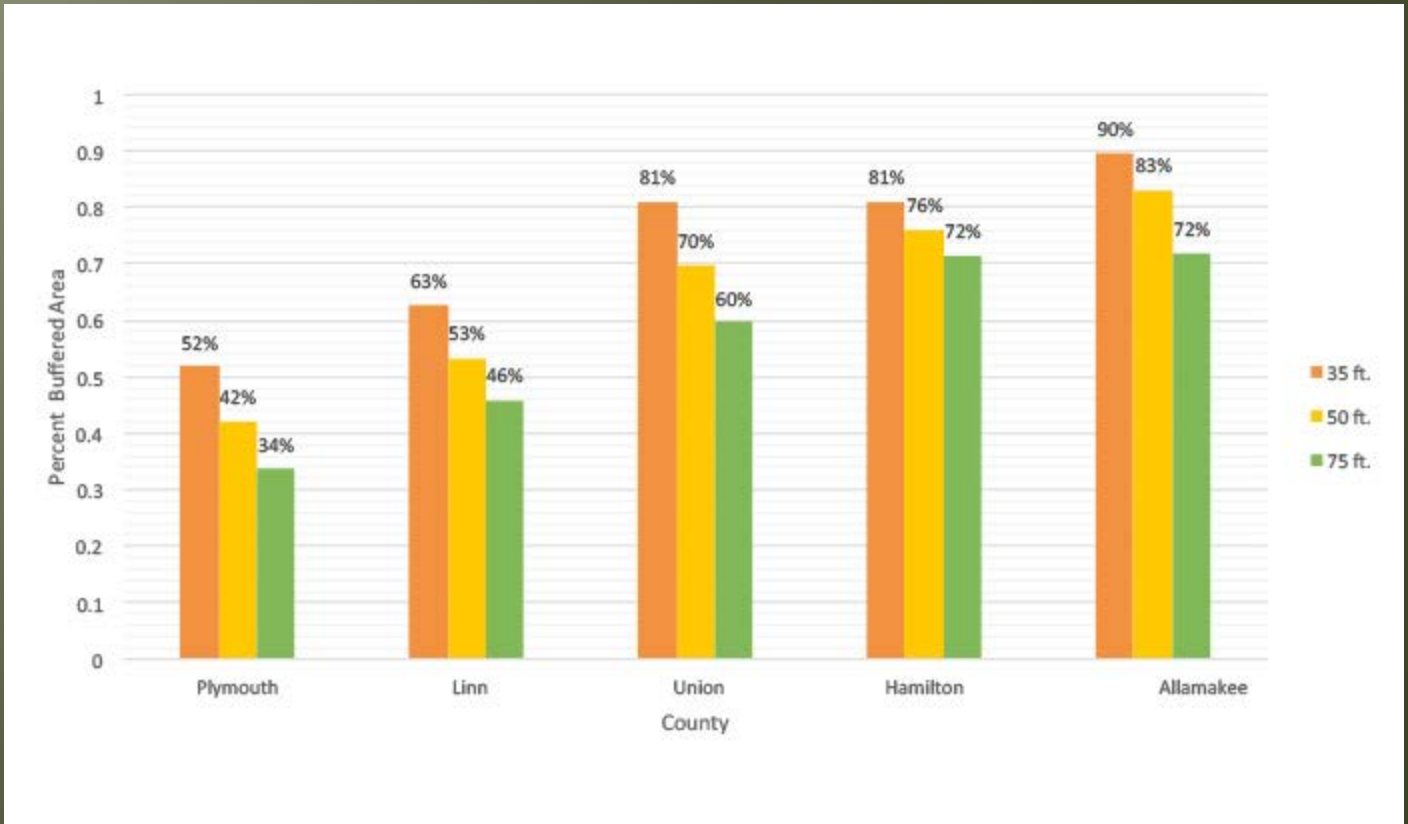
County land records.

Iowa's Low Hanging Fruit

Area of Interest



Iowa's Low Hanging Fruit



In the 5 counties EWG assessed approximately 1,780 miles of waterway.

Iowa's Low Hanging Fruit

Not Much Cropland Required

County	2013 corn and soy acres	Acres Needed to Meet Standard			Percent of Total Corn and Soy Acres Needed to Meet Standard		
		35-foot	50-foot	75-foot	35-foot	50-foot	75-foot
Allamakee	89,502	23	79	288	0.03%	0.09%	0.32%
Hamilton	301,683	81	164	457	0.03%	0.05%	0.15%
Linn	245,438	72	183	455	0.03%	0.07%	0.19%
Plymouth	402,304	338	793	1,813	0.08%	0.20%	0.45%
Union	179,103	51	212	509	0.03%	0.12%	0.28%
Grand Total	**1,218,028**	**565**	**1,430**	**3,522**	**0.05%**	**0.12%**	**0.29%**

Iowa's Low Hanging Fruit

Not Many Landowners Affected

County	Percent of all landowners affected			Percent of landowners with cropland along streams affected		
	35-foot	50-foot	75-foot	35-foot	50-foot	75-foot
Plymouth	13%	15%	17%	67%	77%	86%
Linn	6%	8%	10%	22%	33%	42%
Hamilton	6%	8%	10%	27%	36%	46%
Union	9%	13%	16%	31%	45%	57%
Allamakee	4%	8%	11%	18%	35%	45%
Total	**8%**	**11%**	**13%**	**34%**	**46%**	**56%**

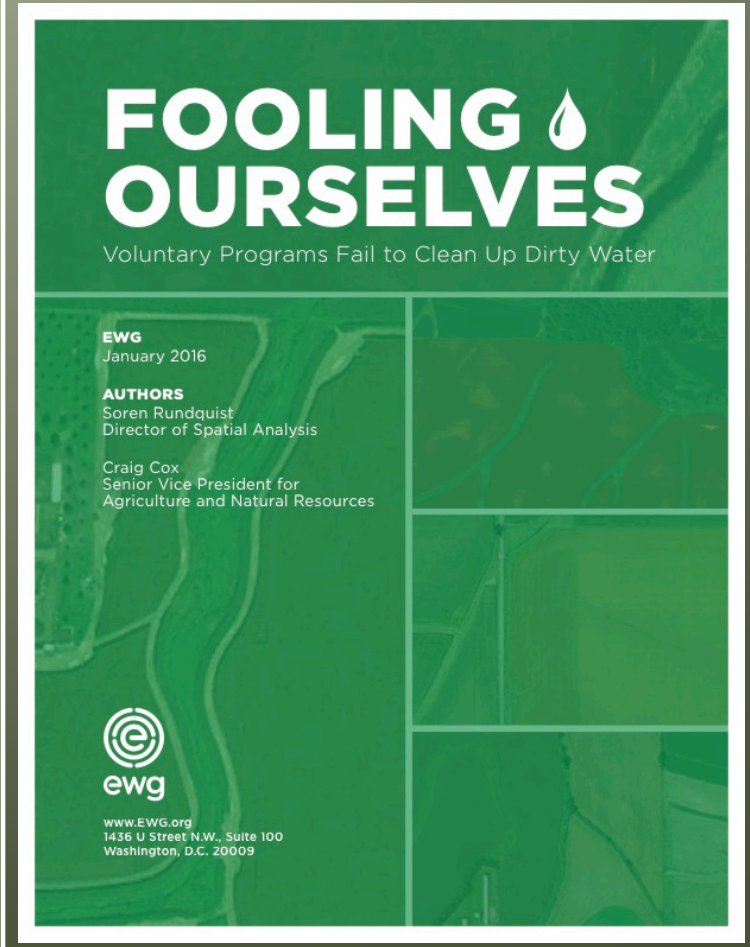
Iowa's Low Hanging Fruit

Small Land Investments

Additional Streamside Buffer Acres Needed to Meet Each Standard	35 ft.	50 ft.	75 ft.
0.01-0.25 acres	56%	43%	27%
0.26-0.5 acres	13%	14%	13%
0.51-1 acres	16%	14%	14%
1.01-2 acres	10%	15%	14%
2.01-3 acres	3%	7%	10%
3.01-4 acres	1%	3%	7%
4.01-5 acres	0%	2%	4%
more than 5 acres	0%	2%	10%

Fooling Ourselves

Durability of Conservation



What can landscape and spatial analysis tell us about the permanence of conservation?

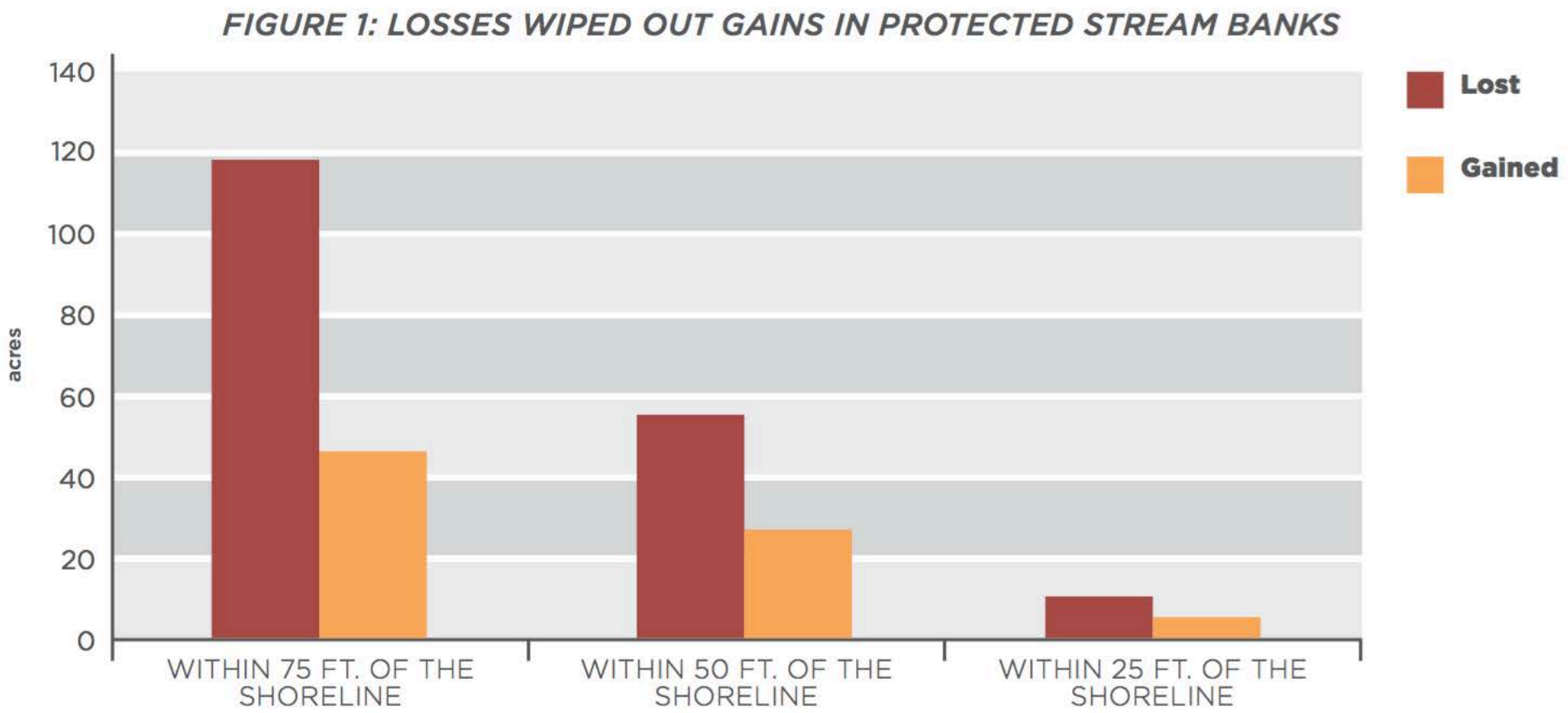
If our primary method of measuring progress at the outset of the NRS is “practices deployed via voluntary efforts”, whether or not those practices are on the ground and functioning matters, not whether the paperwork was filed.

And more importantly they have to stay on the ground long term, or the benefits are overstated.

We examined flow lines and buffers in those same counties

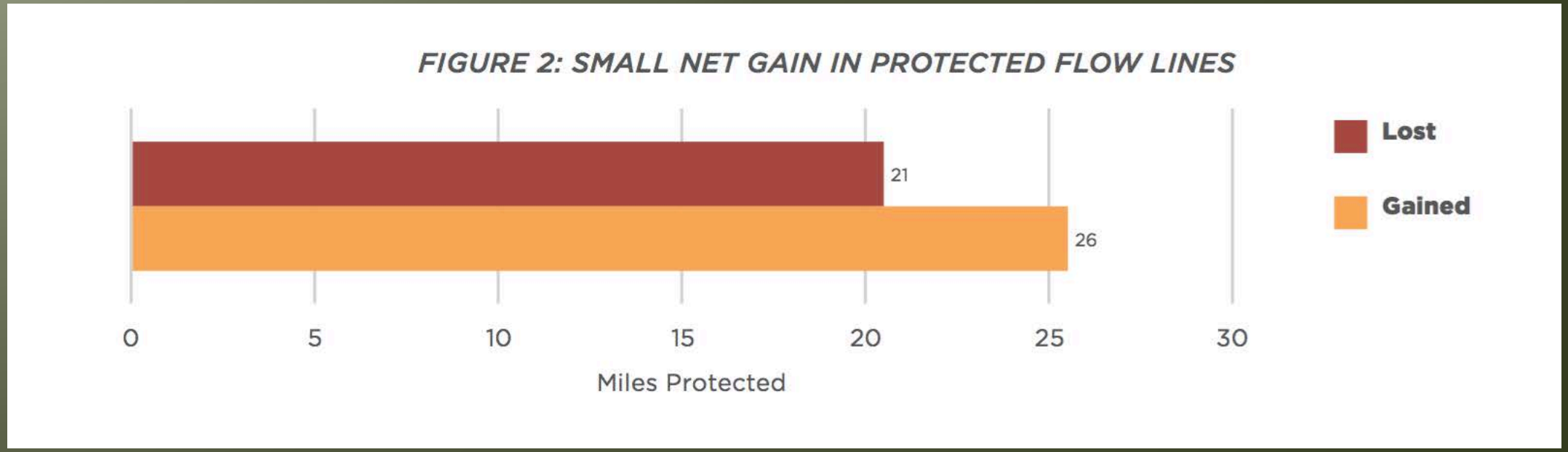
Buffers 2011-2014

For every acre of buffer installed since 2011, two were removed



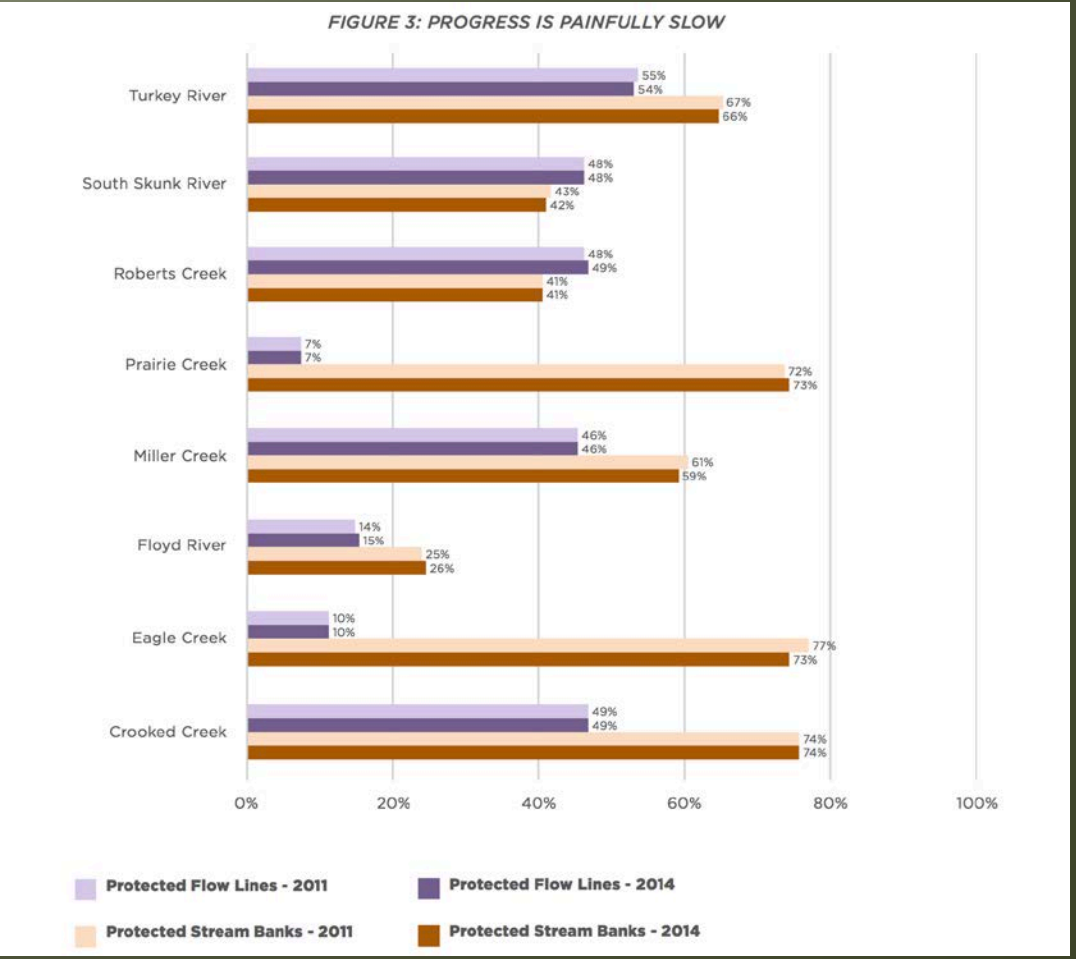
Grass Waterways 2011-2014

For every 10 miles of new grass waterway installed, 8 miles of existing waterways have been plowed under



Conservation Gains 2011-2014

Net gain in practices in low single digit percentages, if there were gains at all



Durability of Conservation

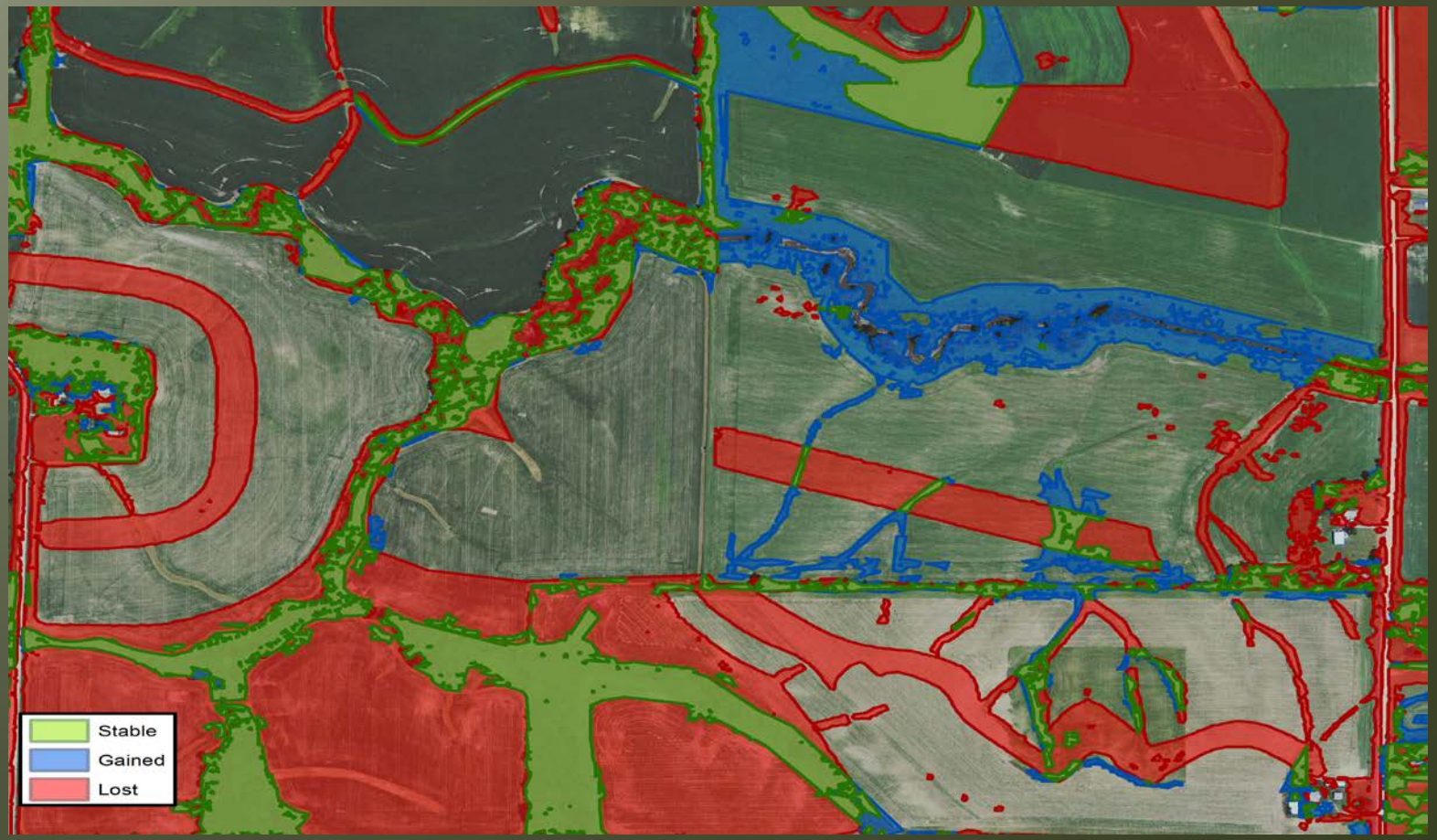
What are the results of 30 years of voluntary efforts?
Marshall County, Iowa 1980

Durability of Conservation

Marshall County, Iowa 2009

Durability of Conservation

Marshall County, Iowa Net change 1980 -2009



It’s All About What’s On The Ground

Production Statistics,
such as acres of cover crops planted or acres of buffers contracted,
are important measures of landowner interest and intentions,
but there is no actual established correlation to water quality improvements.

Unless the cover crops grow, or the buffers and other practices are left in place, those statistics over-estimate conservation effects and public benefits. And that distortion gets worse with each passing year.

Water quality improvement depends upon what is on the ground, and effectively measuring progress requires pro-active landscape analysis.

Takeaways

- Minnesota experience shows farmers will follow clear regulations in large numbers
  - Even when standard was debated by industry, many of them followed higher standard
- Iowa data suggests we lose as much or more basic conservation every year than we deploy
  - Our progress reports do not account for that and overstate results
- Long term data suggests a net loss in conservation since voluntary programs started
- Data in both states shows a small percentage of landowners (not just farmers) are responsible for the bulk of missing practices, and the bulk of pollution problems
  - Only way to address that is targeting and setting clear expectations
- At least some NRS estimates of costs for implementing basic regulations appear to be greatly overstated—should be checked with actual landscape analysis

Thank You

Feel free to contact us with any questions or follow-ups

Brett Lorenzen
brett@ewg.org