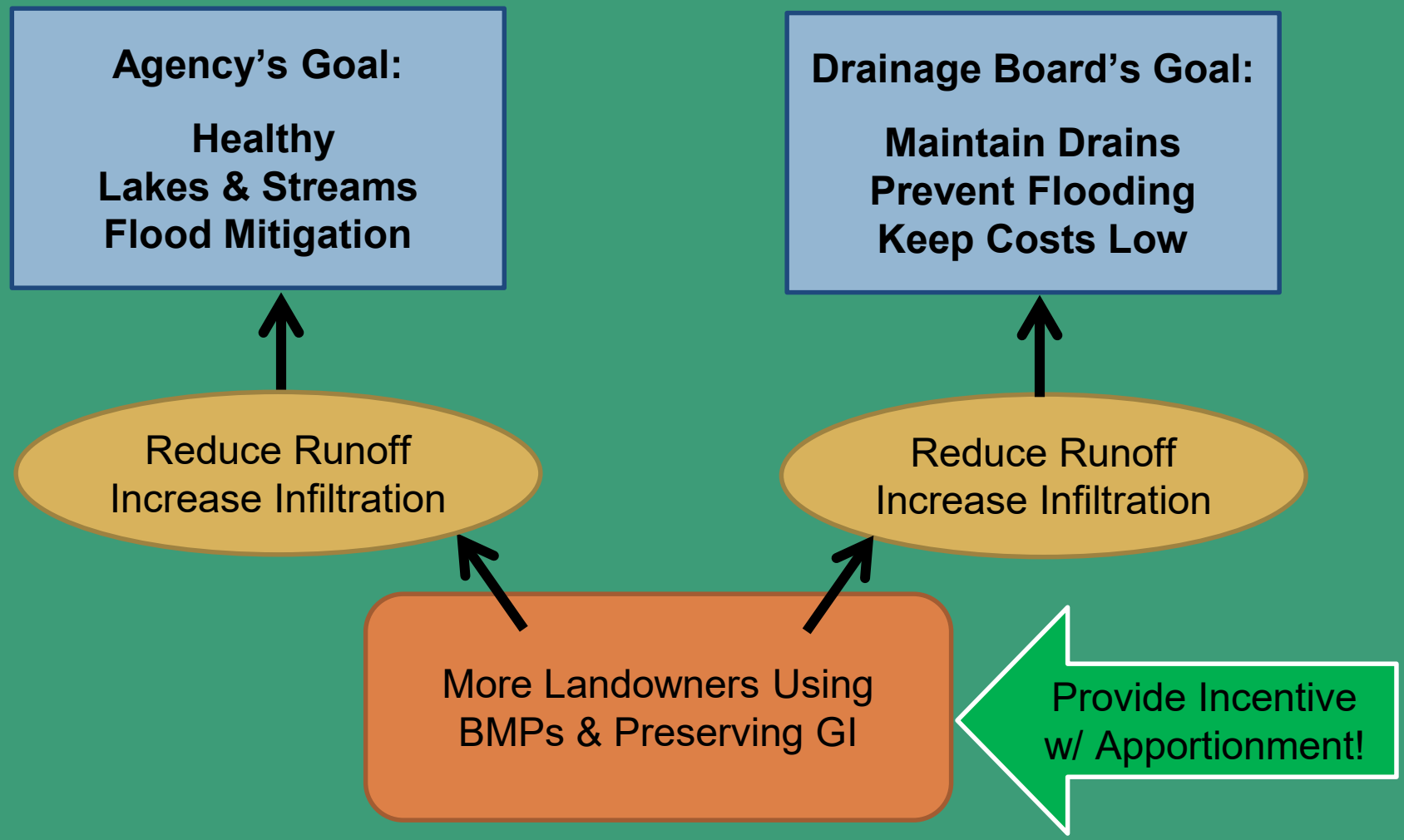
St. Joseph River Basin Commission

Encouraging Soil & Water Conservation Through Benefit Apportionment

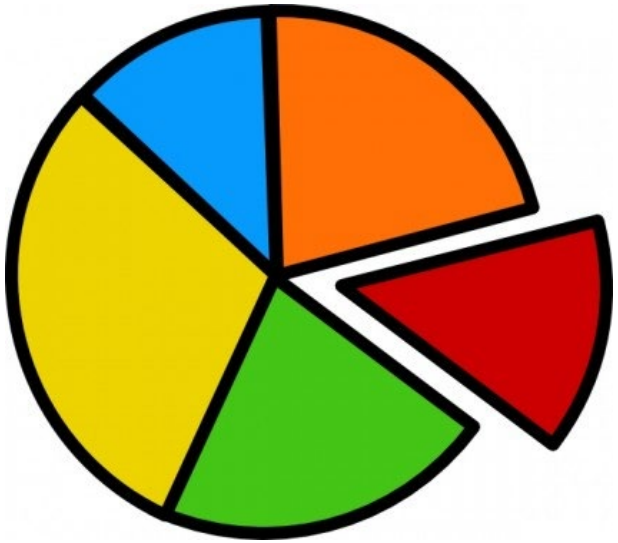
a.k.a. Creating Financial Incentives to Reduce Stormwater Infrastructure Burden

How our interests align



What is benefit apportionment?

From the Indiana Drainage Code 369-27-39:



The percentage of the estimated cost of periodically maintaining the drain to be assessed against each tract of land… **shall be based on the benefit accruing** to each tract of land from the maintenance…

Determining benefits accrued

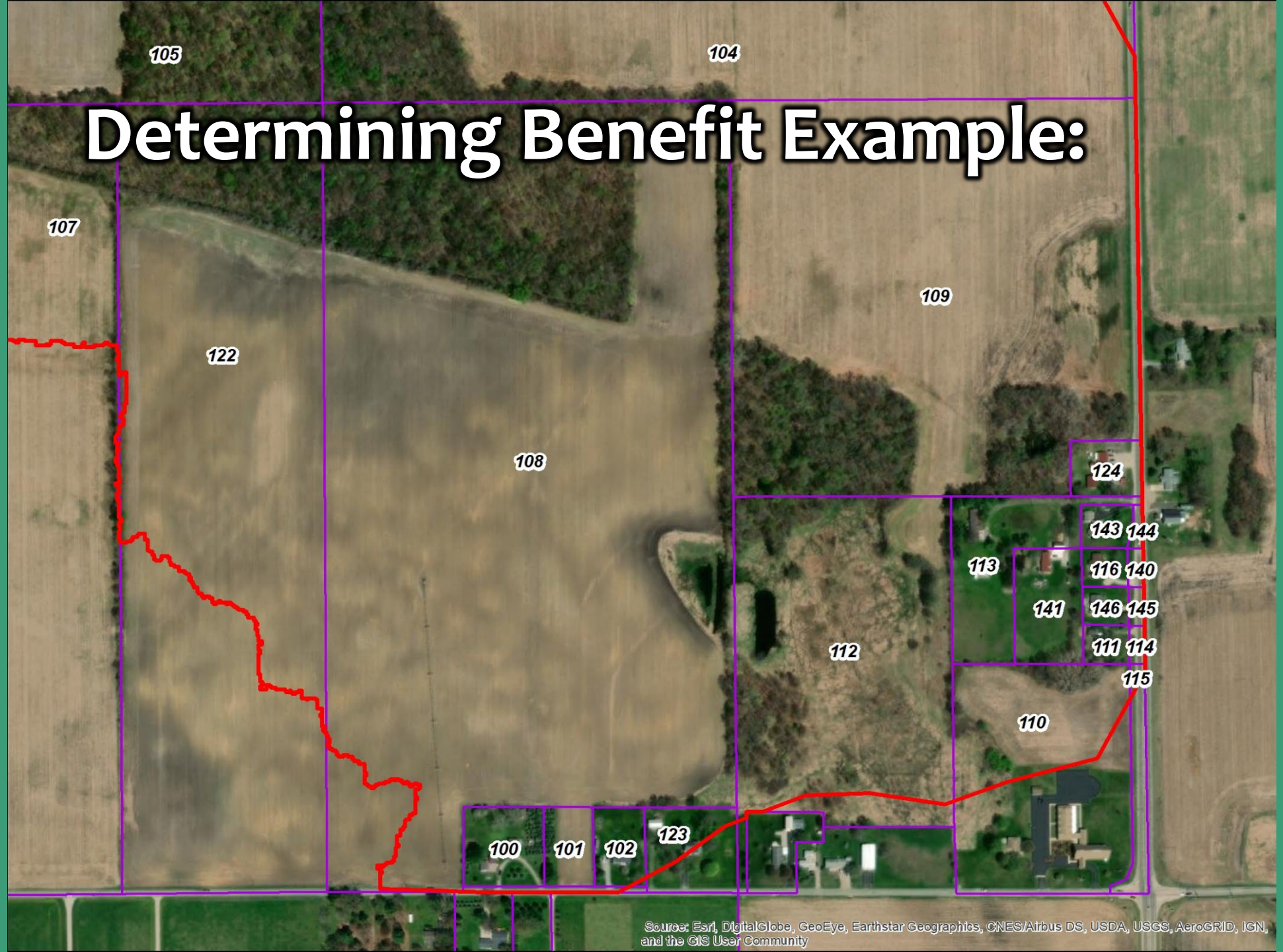
Some benefits are accrued uniformly, but some are determined by the land…

From the Indiana Drainage Code 36-9-27-112:

In determining benefits to land under Section 39, the board may consider:

1. The watershed affected by the drain to be maintained;
2. The number of acres in each tract;
3. The total volume of water draining into or through the drain and the amount of water contributed by each land owner;
4. The land use;
5. The increased value accruing to each tract of land from the maintenance;
6. Whether the various tracts are adjacent, upland, upstream or downstream in relation to the main trunk of the drain;
7. Elimination or reduction of damage from floods;
8. The soil type; and
9. Any other factors affecting the maintenance.

Determining benefits accrued using spatial data & modeling


Determining Benefit Example:
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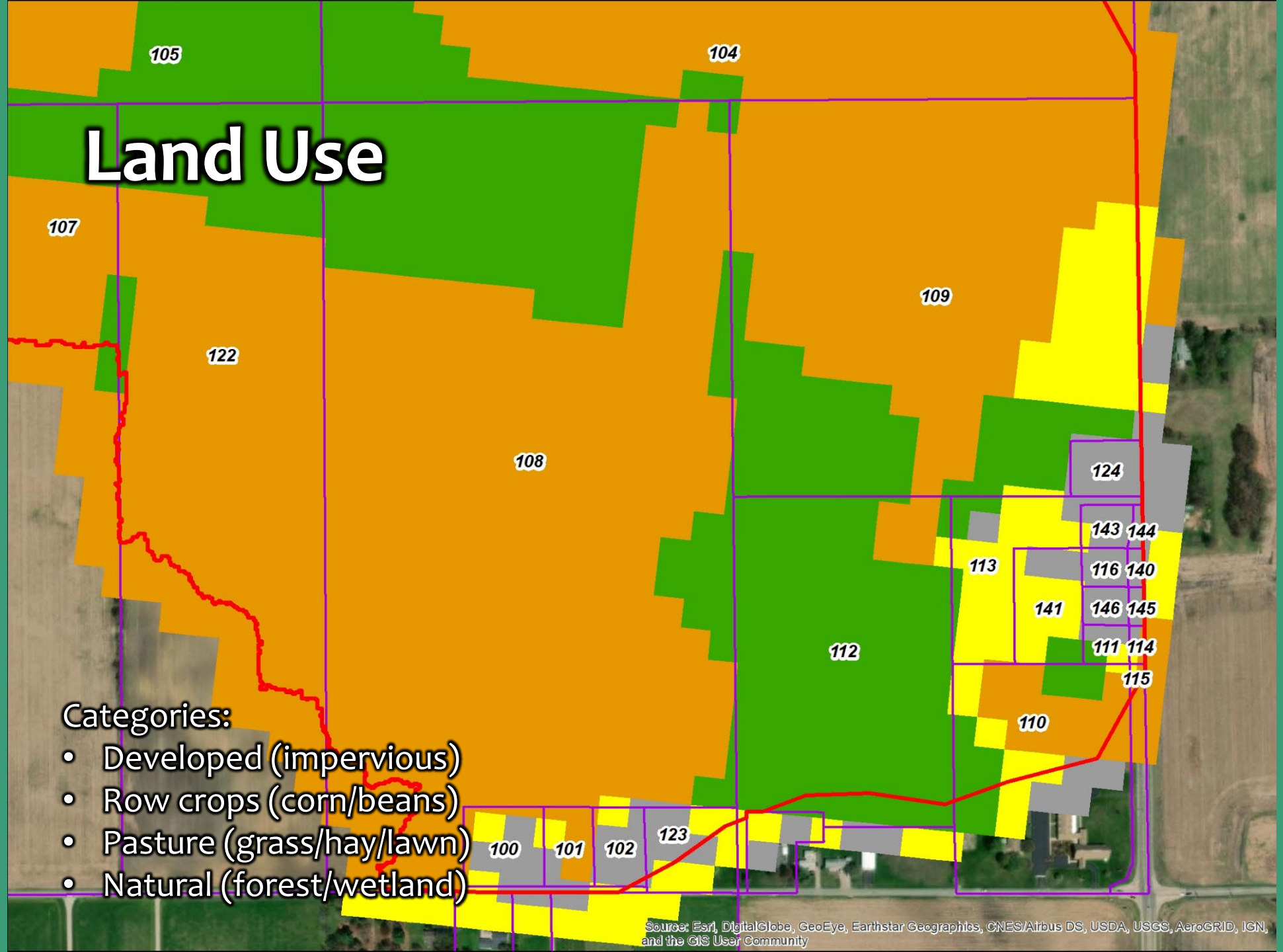
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community


Land Use
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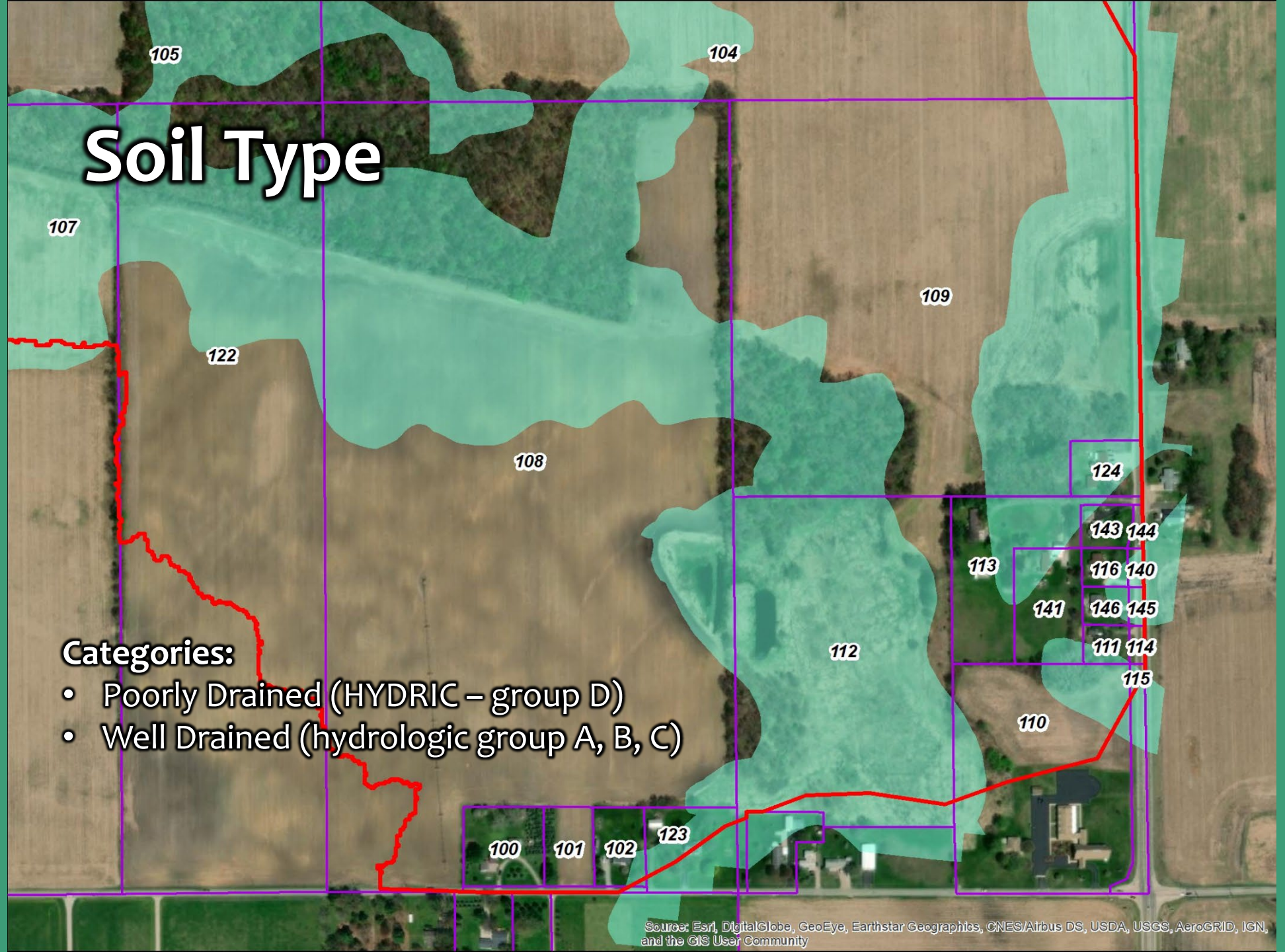
Categories:
• Developed (impervious)
• Row crops (corn/beans)
• Pasture (grass/hay/lawn)
• Natural (forest/wetland)
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community


Soil Type
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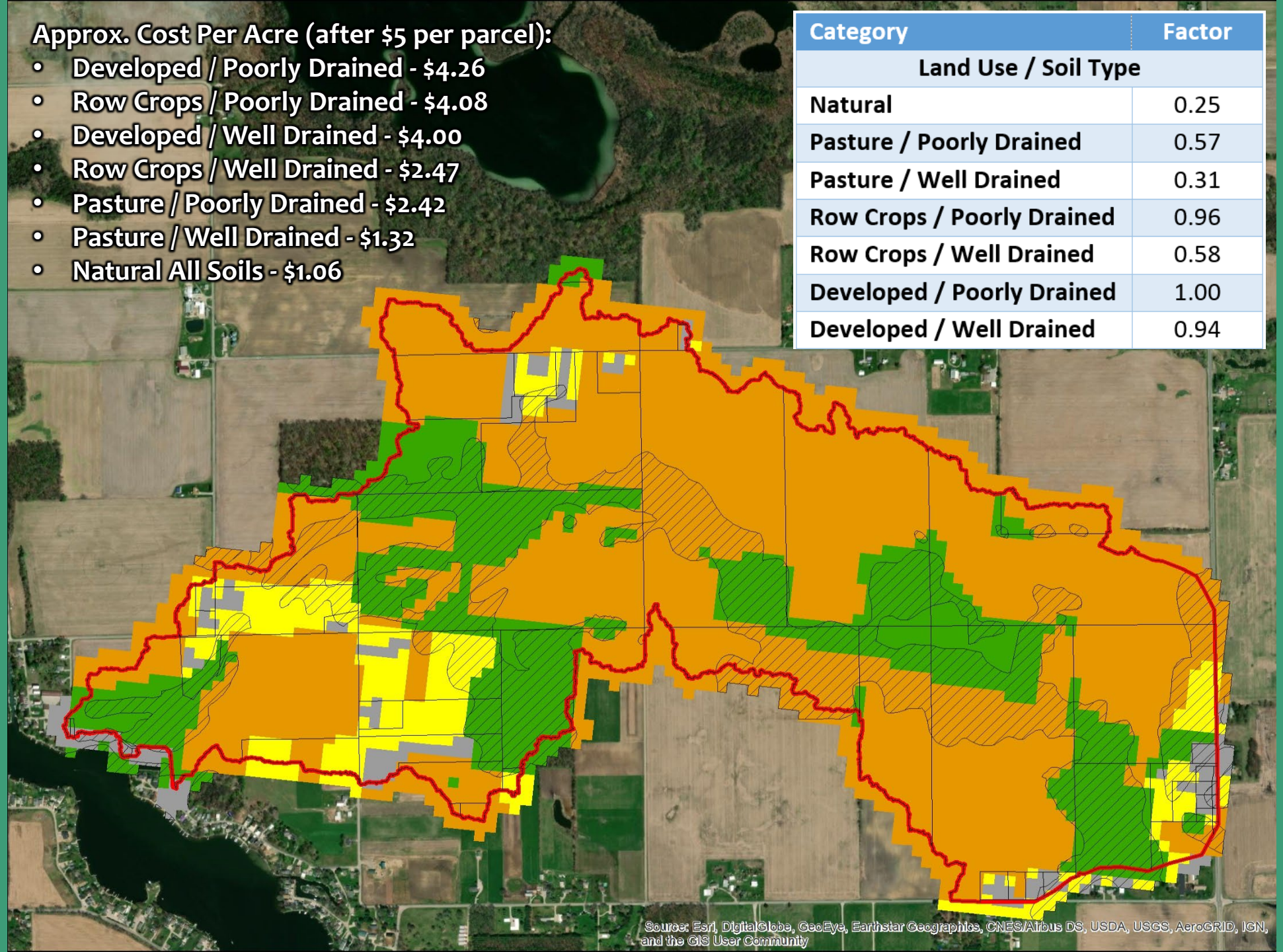
Categories:
• Poorly Drained (HYDRIC – group D)
• Well Drained (hydrologic group A, B, C)
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Approx. Cost Per Acre (after $5 per parcel):

- Developed / Poorly Drained - $4.26
- Row Crops / Poorly Drained - $4.08
- Developed / Well Drained - $4.00
- Row Crops / Well Drained - $2.47
- Pasture / Poorly Drained - $2.42
- Pasture / Well Drained - $1.32
- Natural All Soils - $1.06

Category	Factor
Land Use / Soil Type	
Natural	0.25
Pasture / Poorly Drained	0.57
Pasture / Well Drained	0.31
Row Crops / Poorly Drained	0.96
Row Crops / Well Drained	0.58
Developed / Poorly Drained	1.00
Developed / Well Drained	0.94



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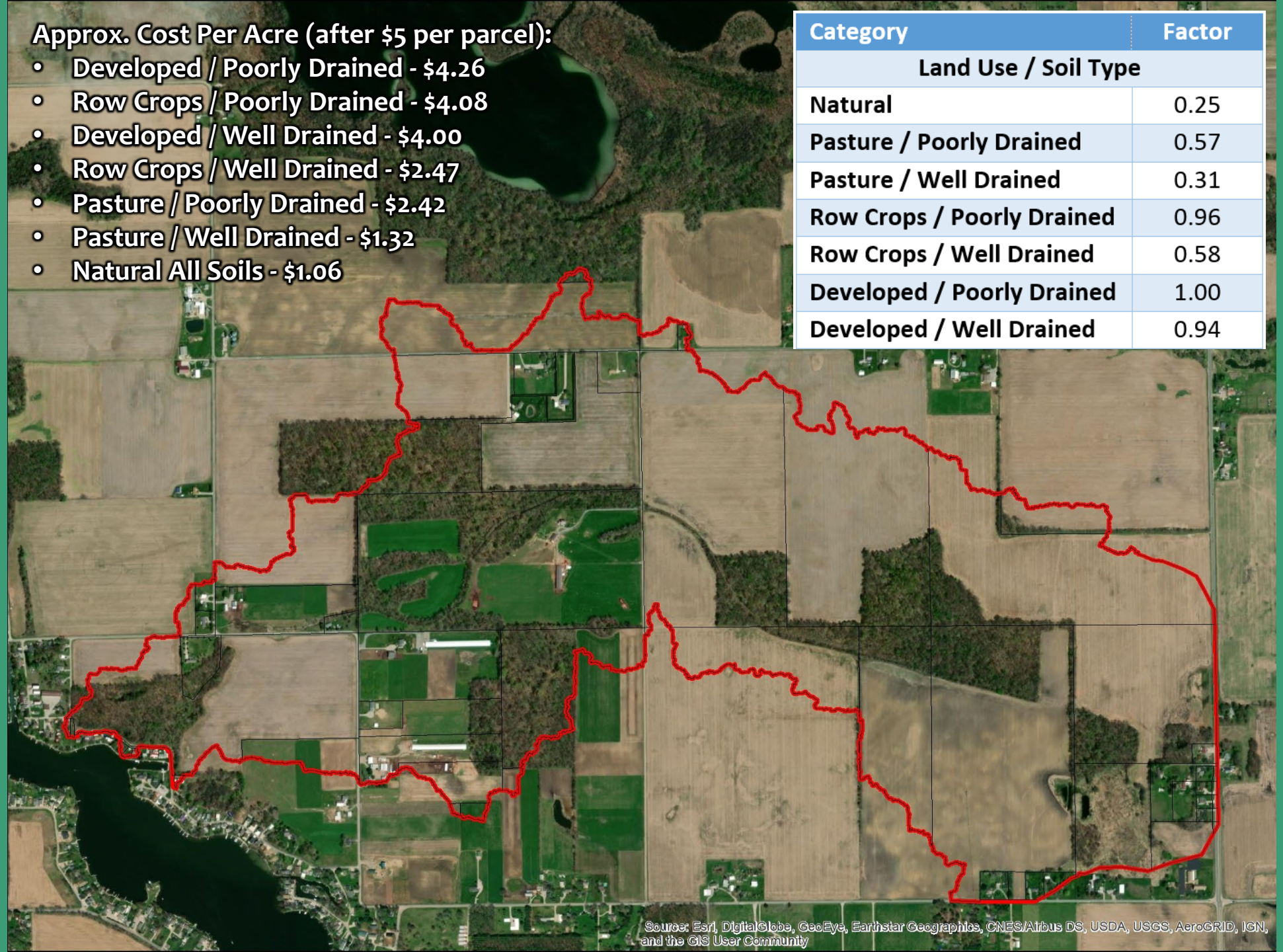
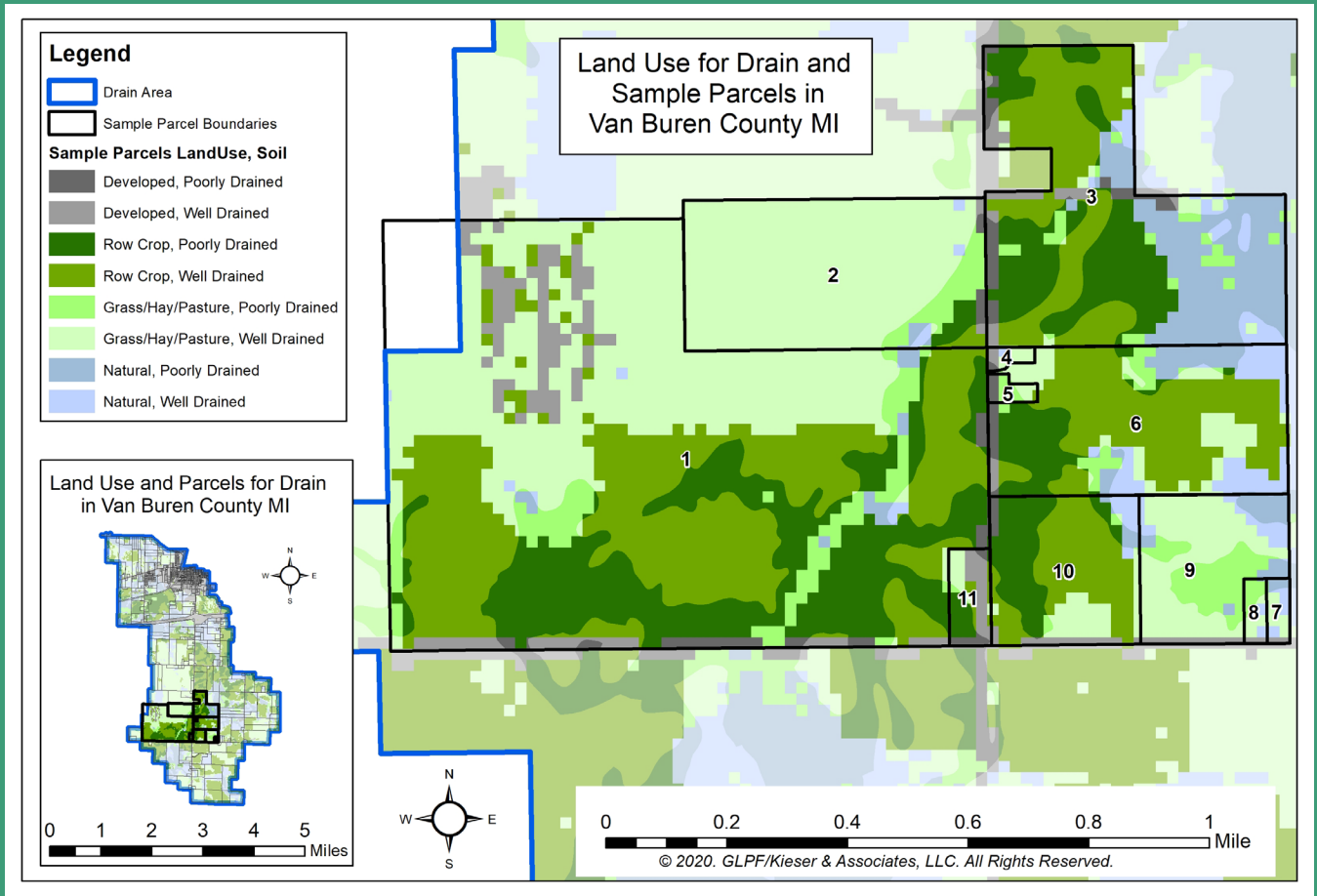


Next Step: Management Factor

BMPs	
None	1.00
10m Buffer	0.84
Cover Crops	0.79
Conservation Tillage	0.89
No-Till	0.74

Alternative Apportionment: Example Case with Management



This example looks at a sample of 11 parcels within a larger, 5,937 acre county drainage watershed including at least a portion of 887 parcels.

Note *Parcel 1* (large western property):

- NW corner of property is out of the drainage watershed
- Within the drainage watershed, *Parcel 1* contains all possible land use and soil type combinations.

Data for Standard Apportionment Method Example		Data for Alternative Apportionment Method Example			
	Total Parcel Acres	**Natural Acres**	**Grass/Hay/Pasture Acres**	**Row Crop Ag Acres**	**Developed Acres**
Parcel 1	361.1	26.8	136.2	193.6	4.5
Parcel 2	79.9	1.4	74.2	2.9	1.5
Parcel 3	114.2	8.0	7.2	65.1	33.8
Parcel 4	1.6	0.5	0.9	0.0	0.2
Parcel 5	2.0	0.6	1.3	0.1	0.0
Parcel 6	75.3	1.8	12.9	46.7	13.9
Parcel 7	2.6	0.2	1.2	0.0	1.2
Parcel 8	2.6	0.3	1.9	0.0	0.4
Parcel 9	34.2	1.2	26.9	0.0	6.0
Parcel 10	39.3	2.3	5.7	29.1	2.3
Parcel 11	7.1	3.1	1.6	2.5	0.0
All Other Parcels	5,216.7	1,453.8	1,609.8	1,588.0	565.0

Alternative Apportionment: Changes in Cost (w/o Mgmt)

For this example, a model was set up and the following results were obtained:

Model Set Up

- Annual fees cover the removal of sediment loading from the whole 887-parcel drainage watershed.
- Excavation costs $30/yd^3 to remove the sediment.

Model Results

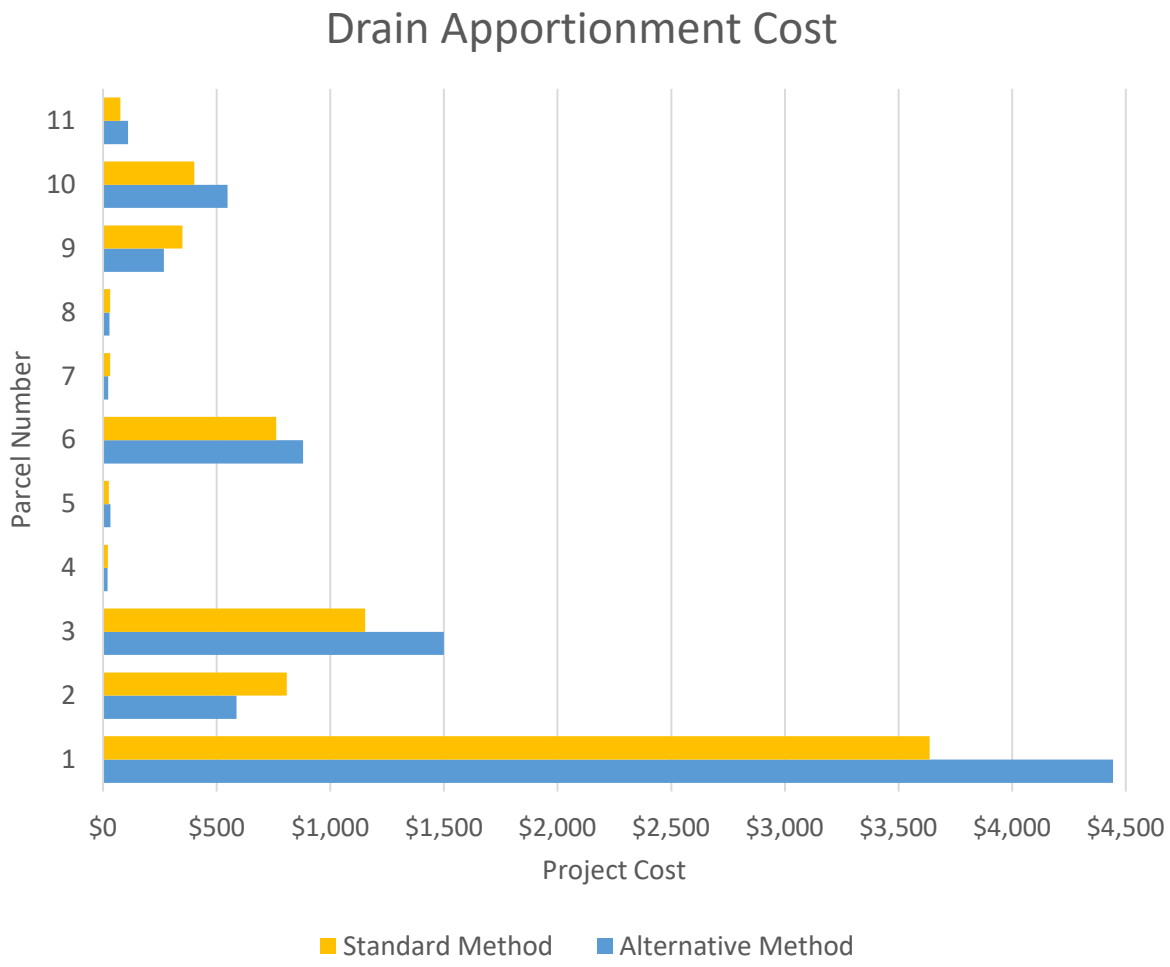
- There are 2,139 tons/year of modeled soil loss from the whole drainage watershed.
- Annual drain cleanout costs about $64,150.

Per Acre Cost for Standard Apportionment Method		Per Acre Average Cost for Alternative Apportionment Method			
	Standard Method Acres	**Natural Acres**	**Grass/Hay/ Pasture Acres**	**Row Crop Ag Acres**	**Developed Acres**
Poorly Drained Soil	$10.06	$5.81	$11.15	$21.61	$23.23
Well Drained Soil		$5.81	$6.27	$12.08	$13.01

Each of the 887 parcels also pays a $5.00 Base Fee to cover benefits accrued equally (regardless of parcel size), such as administration (mailings, publications, staff time, etc.), transportation and public health.

Standard and Alternative Drain Apportionment Comparison

- The figure at right shows annual project fees for the sample parcels under the standard and alternate apportionment methods. This simplified sample considers 11 parcels in a larger, 887-parcel Michigan county drain.
- The Alternative Method involves changing the fee structure from a straight acre basis to a need, use and management basis.
  - Need = poorly drained vs. well drained soils
  - Use = land uses with different contributions to the drain
  - Management = conservation practices (BMPs) on row cropped land
- In this figure, the fee goes down for some parcel owners with mostly natural or grass/hay/pasture land use, and up for some parcel owners with mostly developed or row crop land use.
- No Management practices have been accounted for yet.



Alternative Apportionment: Sediment Reduction w/ BMPs

Model Set Up

- Modeling was used to determine baseline sediment loading and the effectiveness of BMPs.
- The Management Factor (BMPs) is only modeled for Row Crop Ag Land.
- The whole drainage watershed has 1,928 acres of Row Crop Ag land.
- *Parcel 1* has 193.6 acres of Row Crop Ag land.
- If *Parcel 1* installs a buffer strip (BMP) sediment loading decreases by 111 tons/year and a Management discount factor is used to recalculate apportionment.

Model Results for BMP Implementation across the whole drainage watershed

BMP Adoption Rate for Row Crop Acres	Sediment Loading for Row Crop Acres (tons/year)
0 %	2,139
5 %	2,098
10 %	2,057
20 %	1,976
30 %	1,895
40 %	1,814
50 %	1,733

Data for Standard Apportionment Method Example Percentages			Data for Alternative Apportionment Method Example Percentages			
	Standard Method		**Alternative Method**		**Alternative Method with BMPs**	
	Annual Cost	Annual Percent	Annual Cost	Annual Percent	Annual Cost	Annual Percent
Parcel 1 (361 ac)	$3,638	6.08%	$4,444	7.43%	$3,344	5.59%
Parcel 2 (80 ac)	$808	1.35%	$587	0.97%	$599	0.99%
Parcel 3 (114 ac)	$1,154	1.92%	$1,500	2.50%	$1,530	2.55%
Parcel 4 (1.6 ac)	$21	0.03%	$20	0.02%	$20	0.03%
Parcel 5 (2 ac)	$25	0.03%	$32	0.05%	$33	0.05%
Parcel 6 (75 ac)	$762	1.27%	$880	1.46%	$897	1.49%
Parcel 7 (2.6 ac)	$32	0.04%	$23	0.03%	$23	0.03%
Parcel 8 (2.6 ac)	$31	0.04%	$28	0.04%	$28	0.04%
Parcel 9 (34 ac)	$349	0.58%	$267	0.44%	$273	0.45%
Parcel 10 (39 ac)	$401	0.66%	$548	0.91%	$559	0.93%
Parcel 11 (7.1 ac)	$77	0.12%	$110	0.18%	$113	0.18%
All Other Parcels	$56,857	87.88%	$55,715	85.97%	$56,737	87.67%

Parcel 1 has a lot of developed and row crop land with some poorly drained soil so that owner pays more until applying BMPs.
Parcel 2 is mostly grass/hay/pasture on well drained soil so that owner pays less.
For smaller parcels like Parcel 4 at 1.6 total acres, differences may be quite small.

Row Crop Ag Acres are eligible for reduced fees if Conservation Practices (BMPs) are installed.

St. Joseph River Basin Commission

Questions??

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