

DIGITAL MAPPING TECHNIQUES 2014

The following was presented at DMT'14
(June 1-4, 2014 - Delaware Geological Survey,
Newark, DE)

The contents of this document are provisional

See Presentations and Proceedings
from the DMT Meetings (1997-2014)

<http://ngmdb.usgs.gov/info/dmt/>

Ohio Karst

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Outline

- What is karst
- Methods
- Field + Photos



What is Karst

- Forms by dissolution of
 - Carbonates (limestone or dolomite)
 - Evaporites (gypsum or salt)

- Characterized by:
 - Sinkholes
 - Disappearing streams
 - Caves
 - Springs

Columbus Ls.



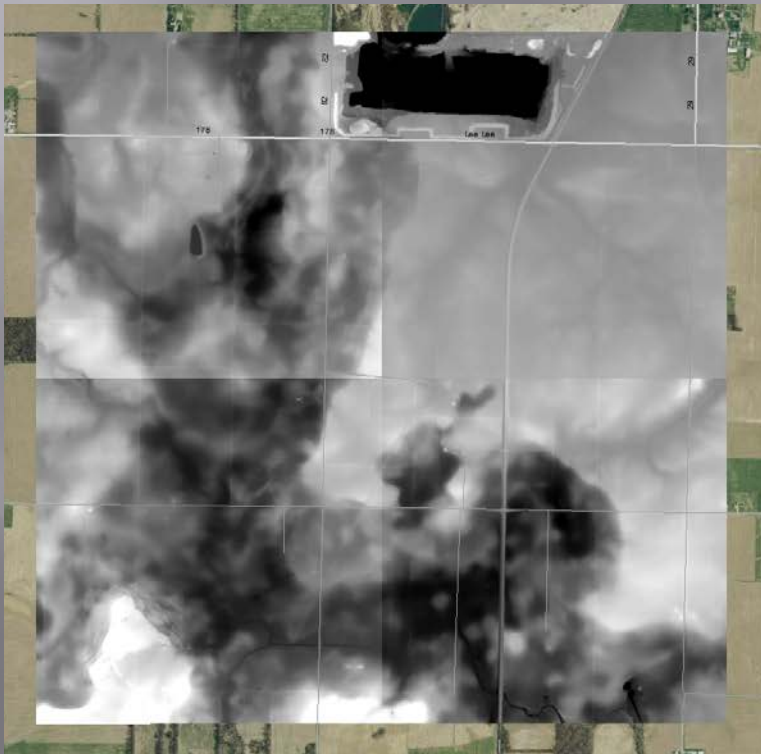
Methods

- ▣ LiDAR (Light Distance And Ranging)
 - 2006 @ 0.5ft vertical accuracy (OSIP)
 - DEM mosaicing
 - 'Fill Sinks'
 - Create grid code
- ▣ Imagery
 - 2012 and older @ 6in per-pixel OSIP II.



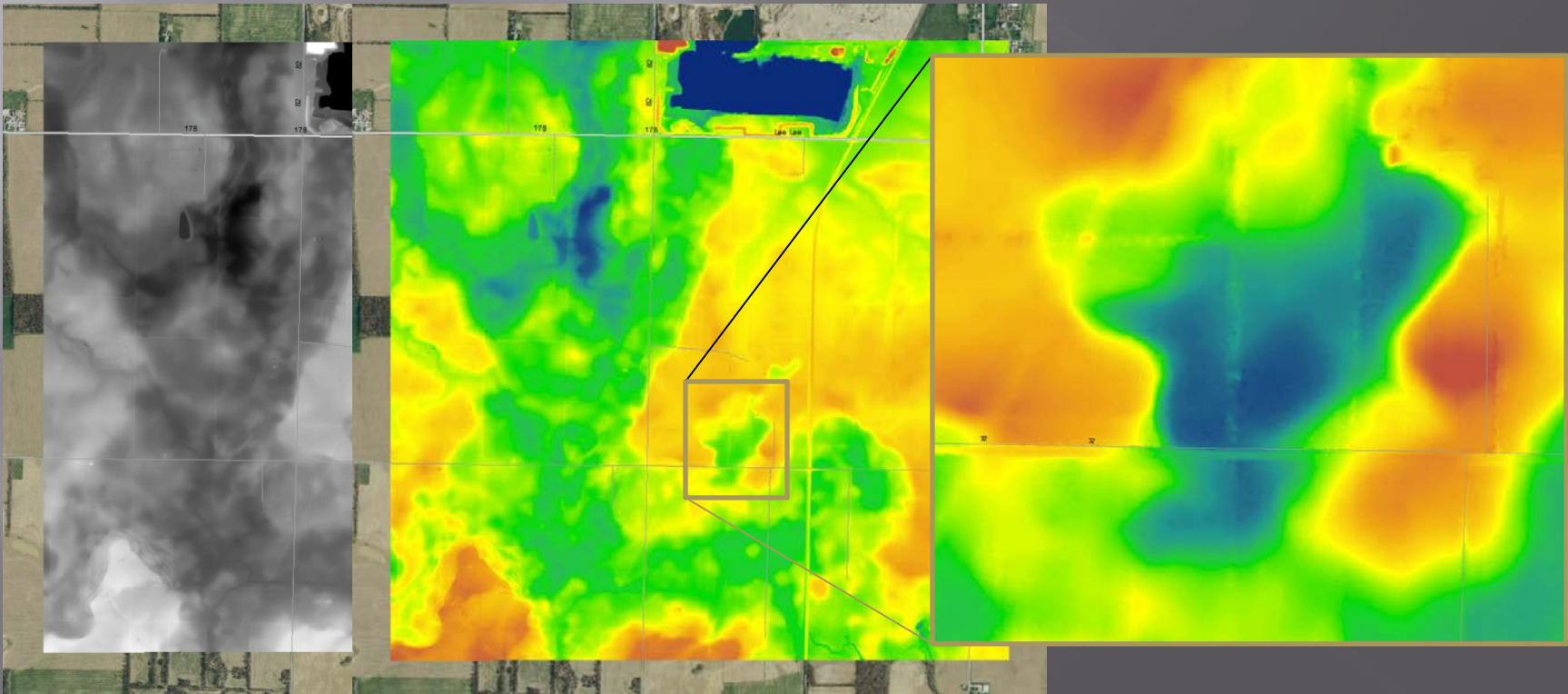
Mosaic

- ▣ Clip the LiDAR to the project extent.
- ▣ Mosaic to new raster (in parts) 16bit+-, 1band.



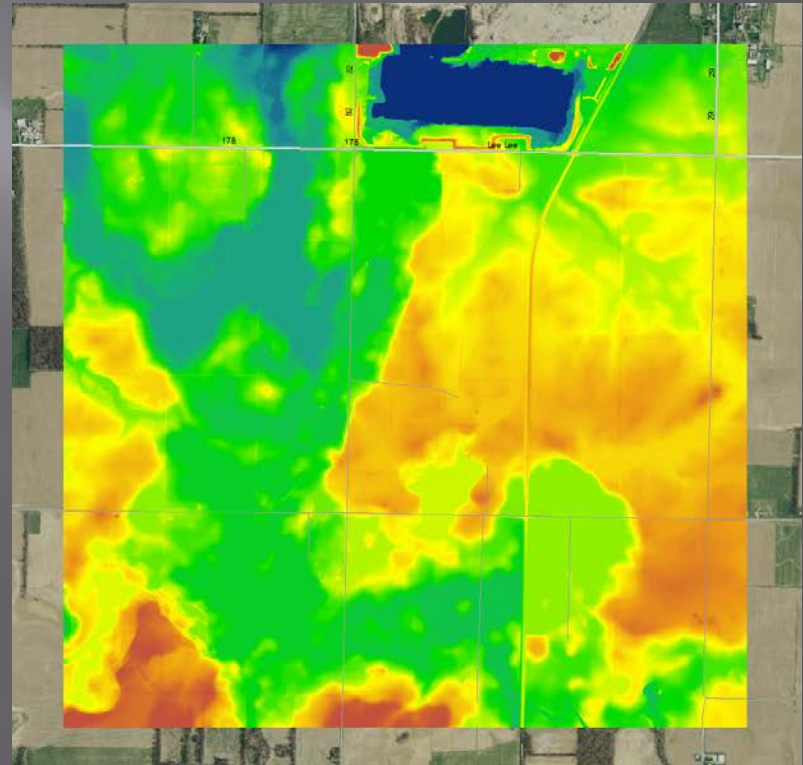
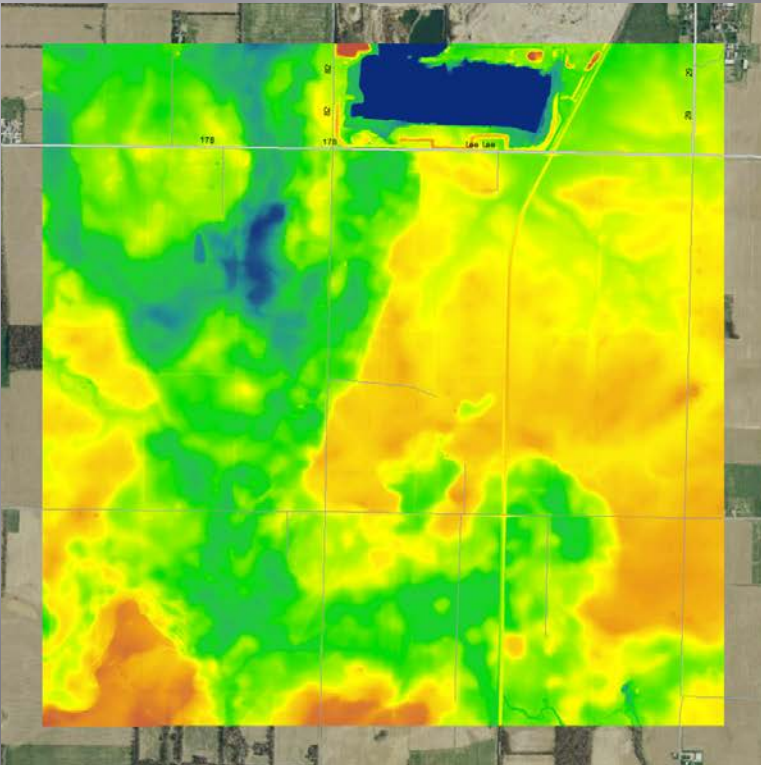
Loss of Contrast (If Using DEM)

- ❑ Symbology -> Stretched -> Statistics -> From Current Display Extent.
- ❑ Shows full ramp when zoomed in.



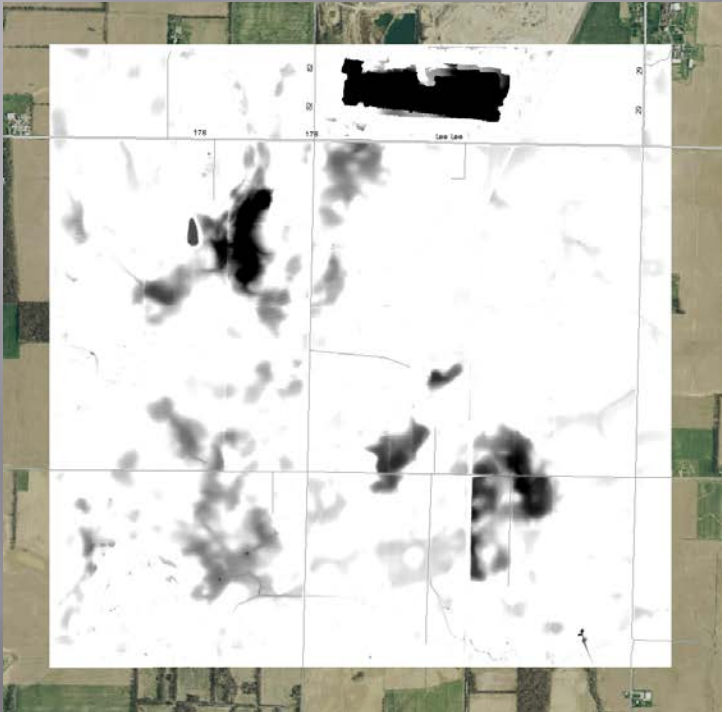
Fill (Spatial Analyst)

- ▣ Removes low enclosed areas.



Minus (Spatial Analyst)

- ▣ Subtract the filled from the unfilled (ID lows).
- ▣ Reclassify (spatial analyst) using a gridcode.



Reclassify

Input raster
Minus

Reclass field
Value

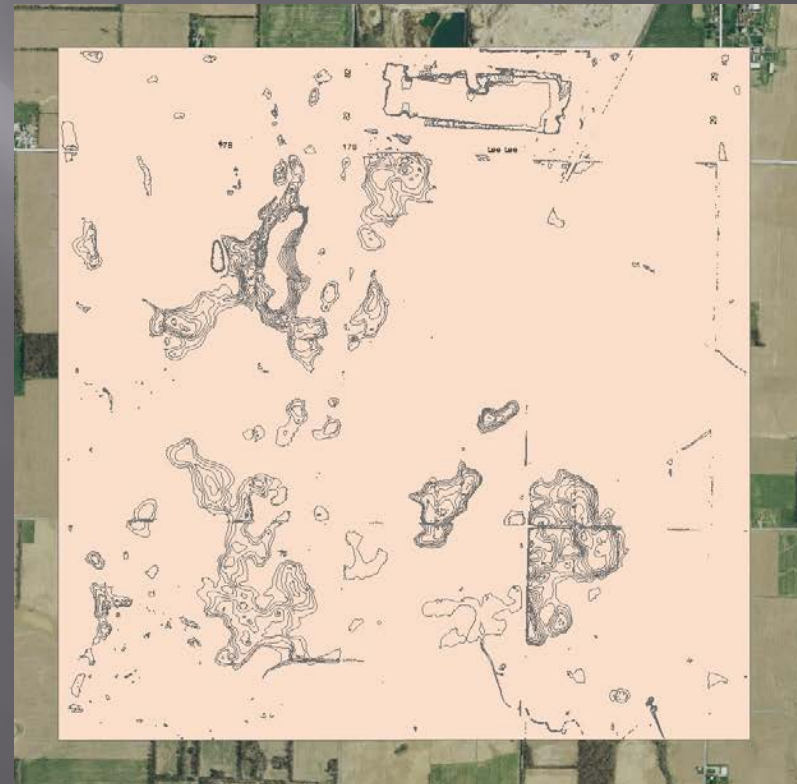
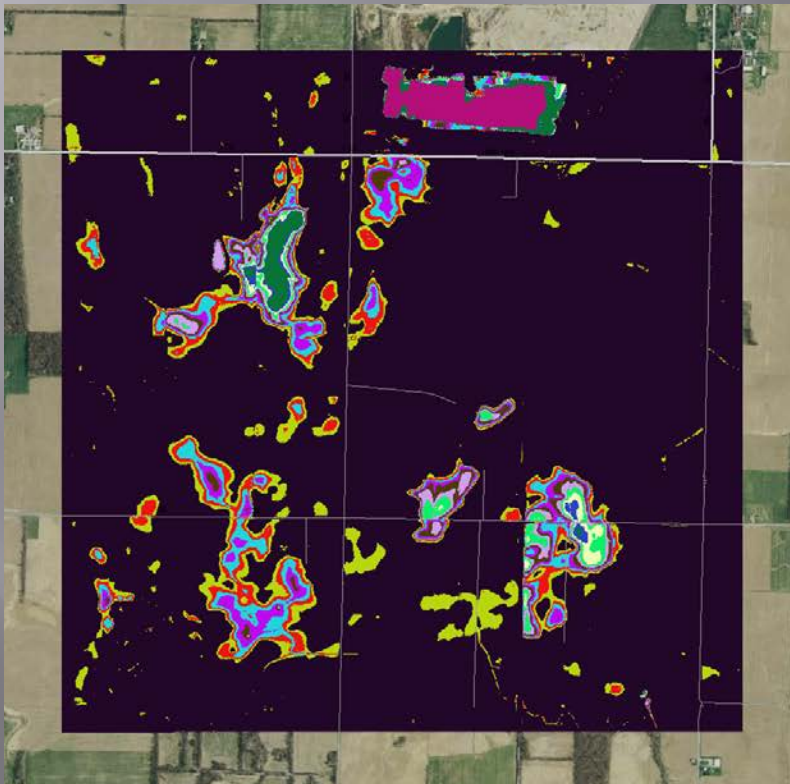
Reclassification

Old values	New values
-36.780029 - -25	100
-25 - -10	25
-10 - -9	10
-9 - -8	9
-8 - -7	8
-7 - -6	7
-6 - -5	6
-5 - -4	5

Classify...
Unique
Add Entry
Delete Entries
Load... Save... Reverse New Values Precision...

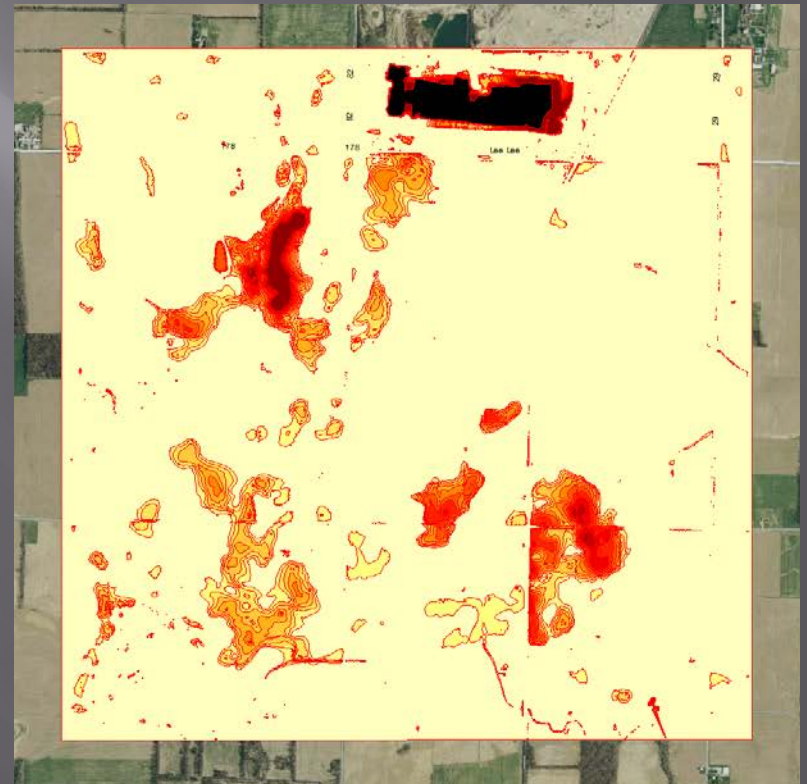
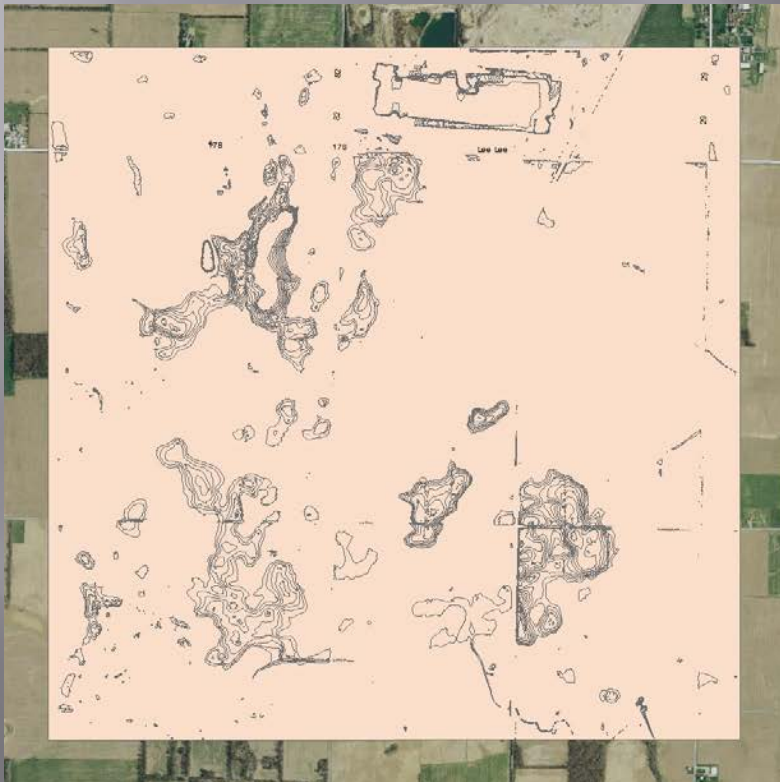
Convert

- ▣ Convert .grid to .shp to allow editing (raster to polygon).



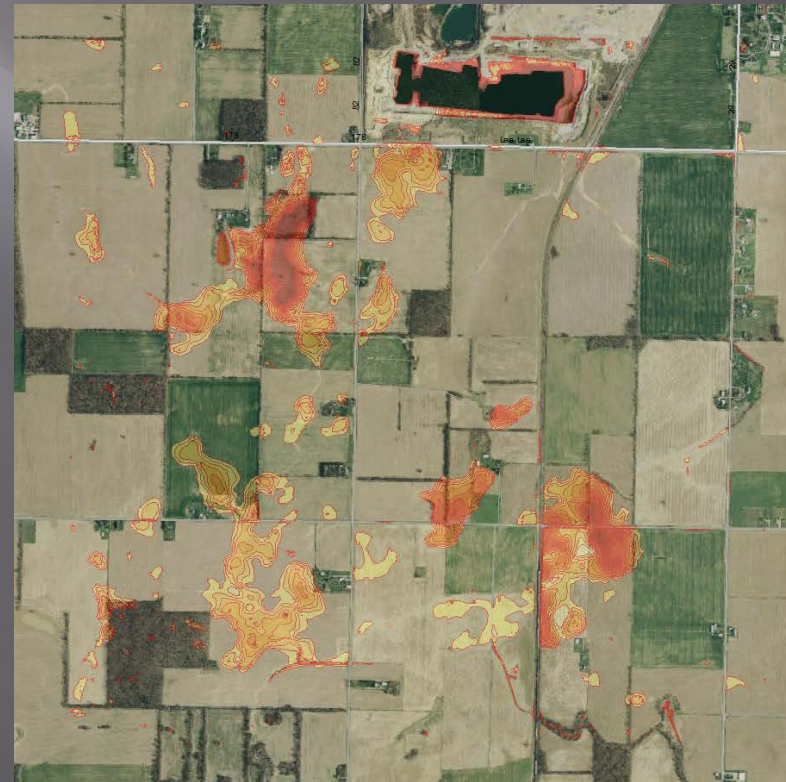
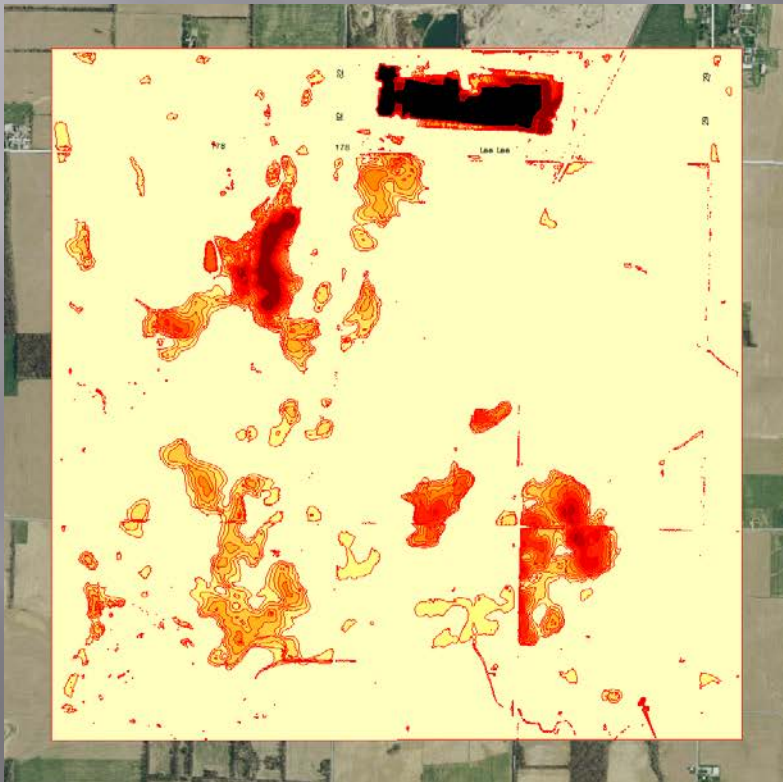
Color

- ▣ Assign a custom color ramp to gridcode.



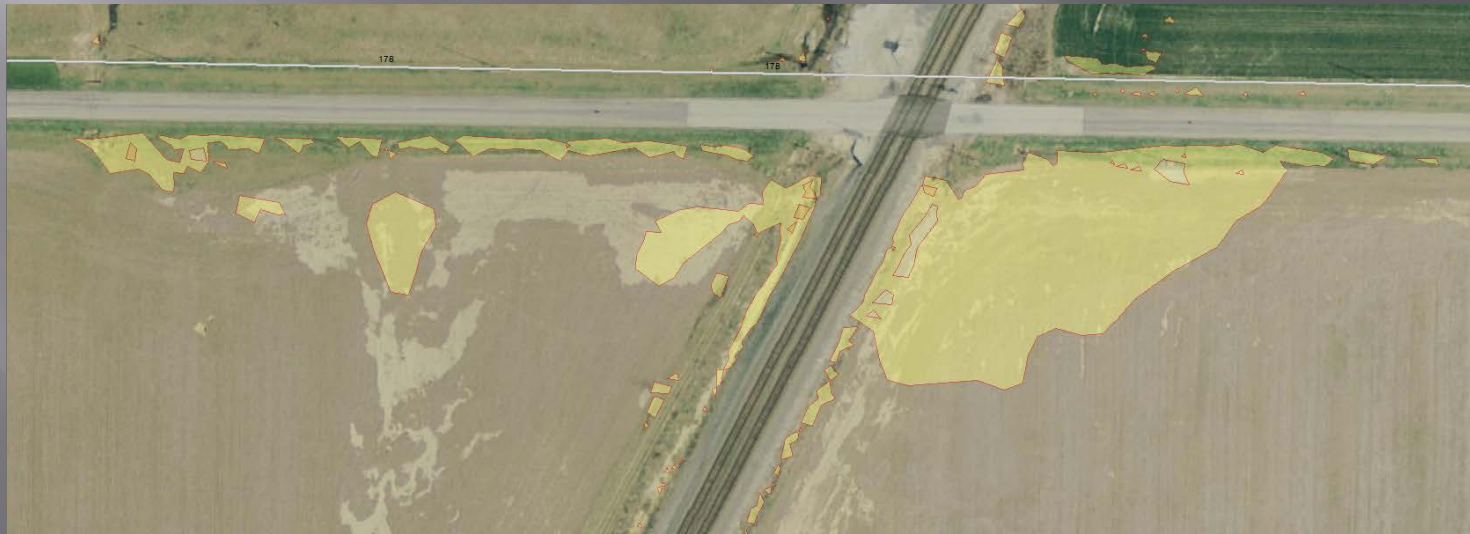
Cleaning Up

- ▣ Begin Removing Polygons (especially 1ft)
- ▣ Adjust transparency (60%)



Small Polygons

- ▣ Features such as ground roughness, ditches, and waves on bodies of water contribute hundreds of thousands of tiny polygons.
- ▣ How to delete these isolated pocks without affecting the larger groups of polygons?



'Automated' removal

- ▣ Select polys smaller than area 6.25 (res. is 2.5^2).
- ▣ Export small polys to a file and delete from main set (after backup). Save.
- ▣ Start editing small polys.
- ▣ 'Select by location' small polys set that intersects the main set (sans small polys).
- ▣ Switch selection, delete selection, save.
- ▣ Right click main feature class -> load -> load data (choose small polys feature class).
- ▣ Consider deleting Grid code 1 polys this way.

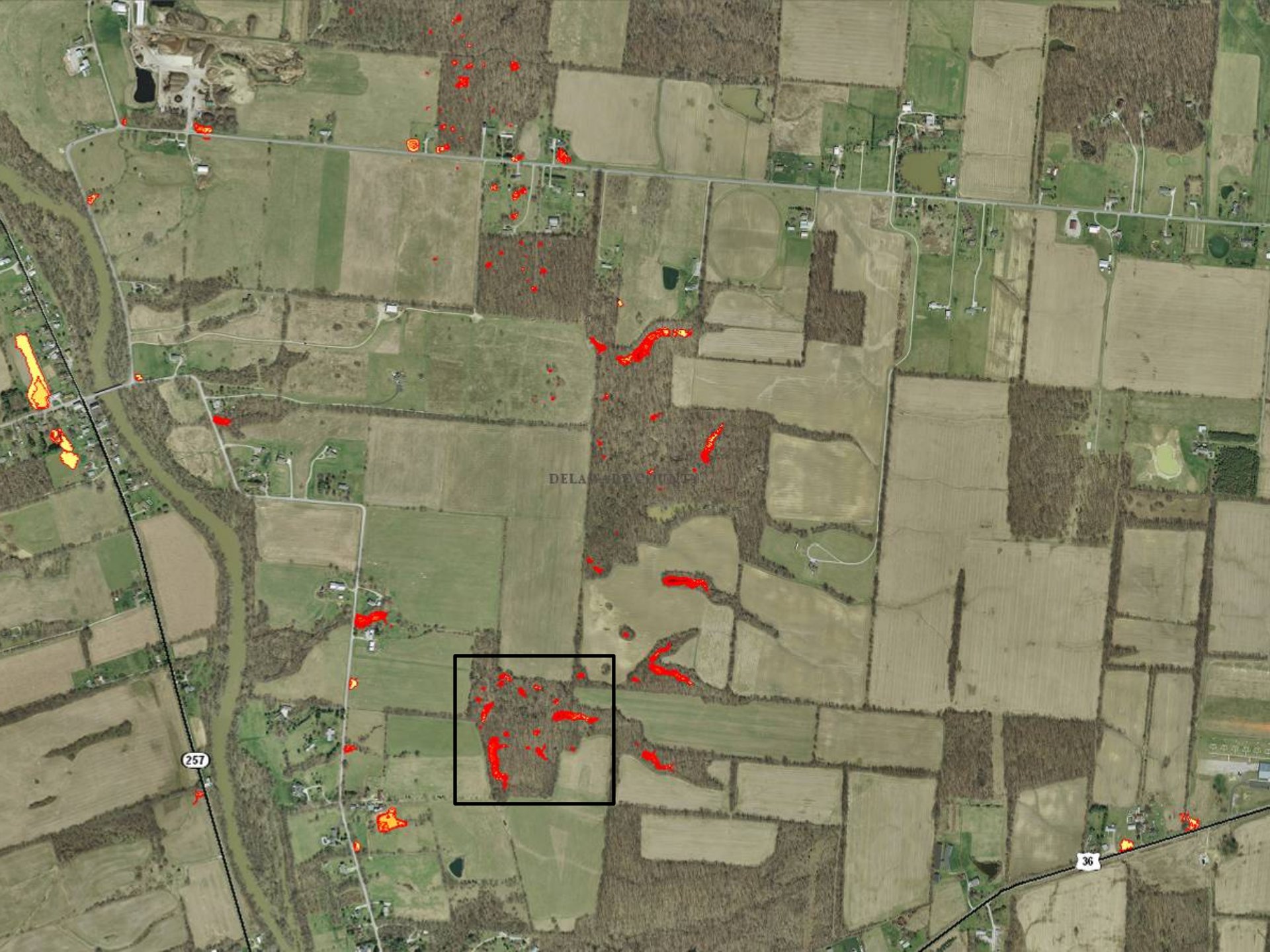




DELAWARE COUNTY

257

36



DELAWARE COUNTY

257

36





1988

- Photos can monitor growth over time

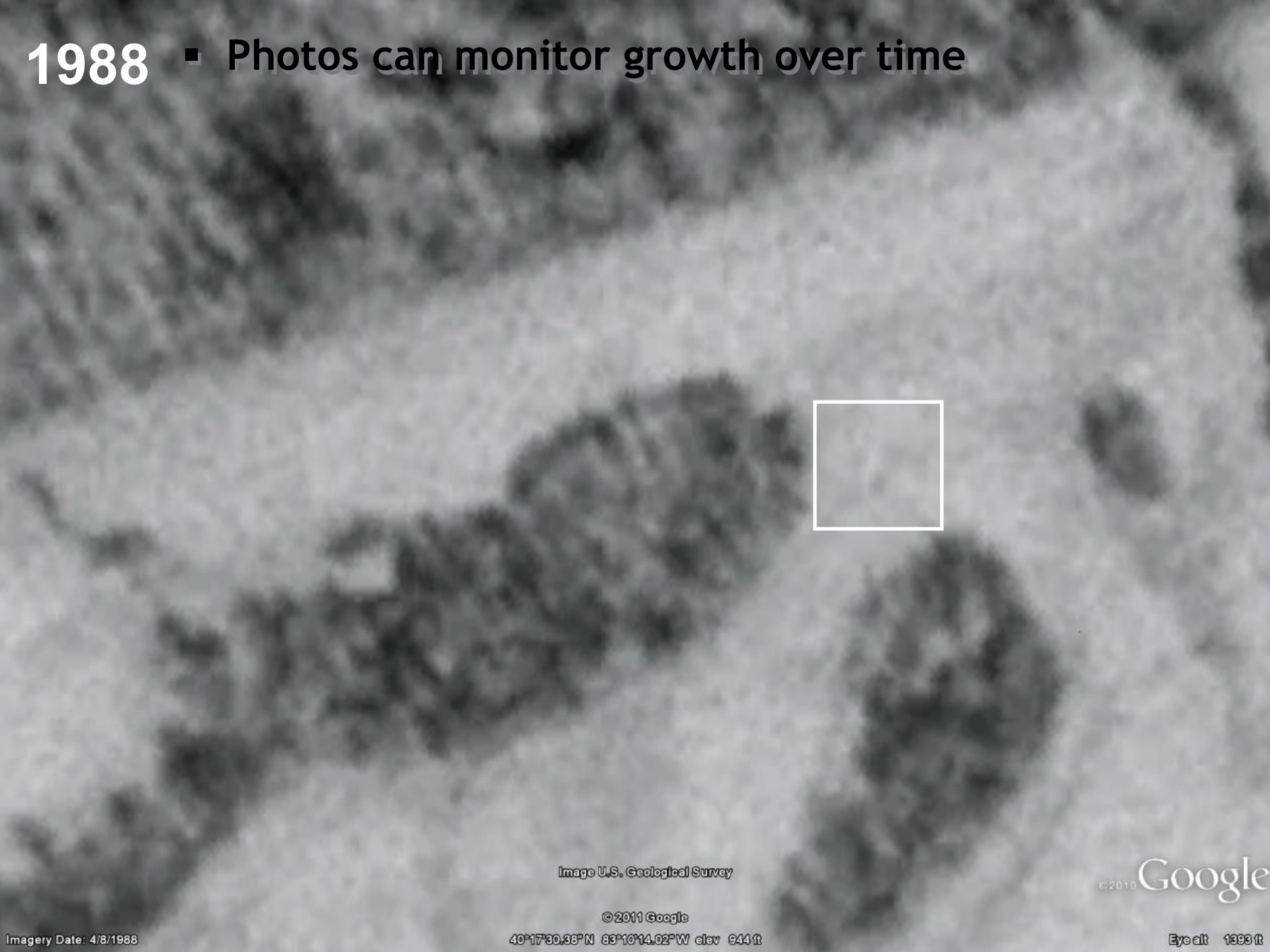


Image U.S. Geological Survey

©2010 Google

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40°17'30.38"N 83°10'14.02"W elev 944 ft

Imagery Date: 4/8/1988

Eye alt 1393 ft

2006 ■ Photos can monitor growth over time



Image State of Ohio / OSIP

©2010 Google

©2011 Google

40°17'30.38"N 83°10'14.02"W elev 944 ft

Imagery Date: 2/28/2006

Eye alt 1393 ft

2007

DELAWARE COUNTY

103



2008

DELAWARE COUNTY

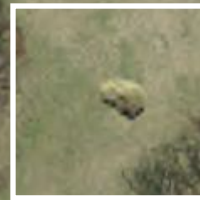
103



2010

DELAWARE COUNTY

103



Mid.
2011

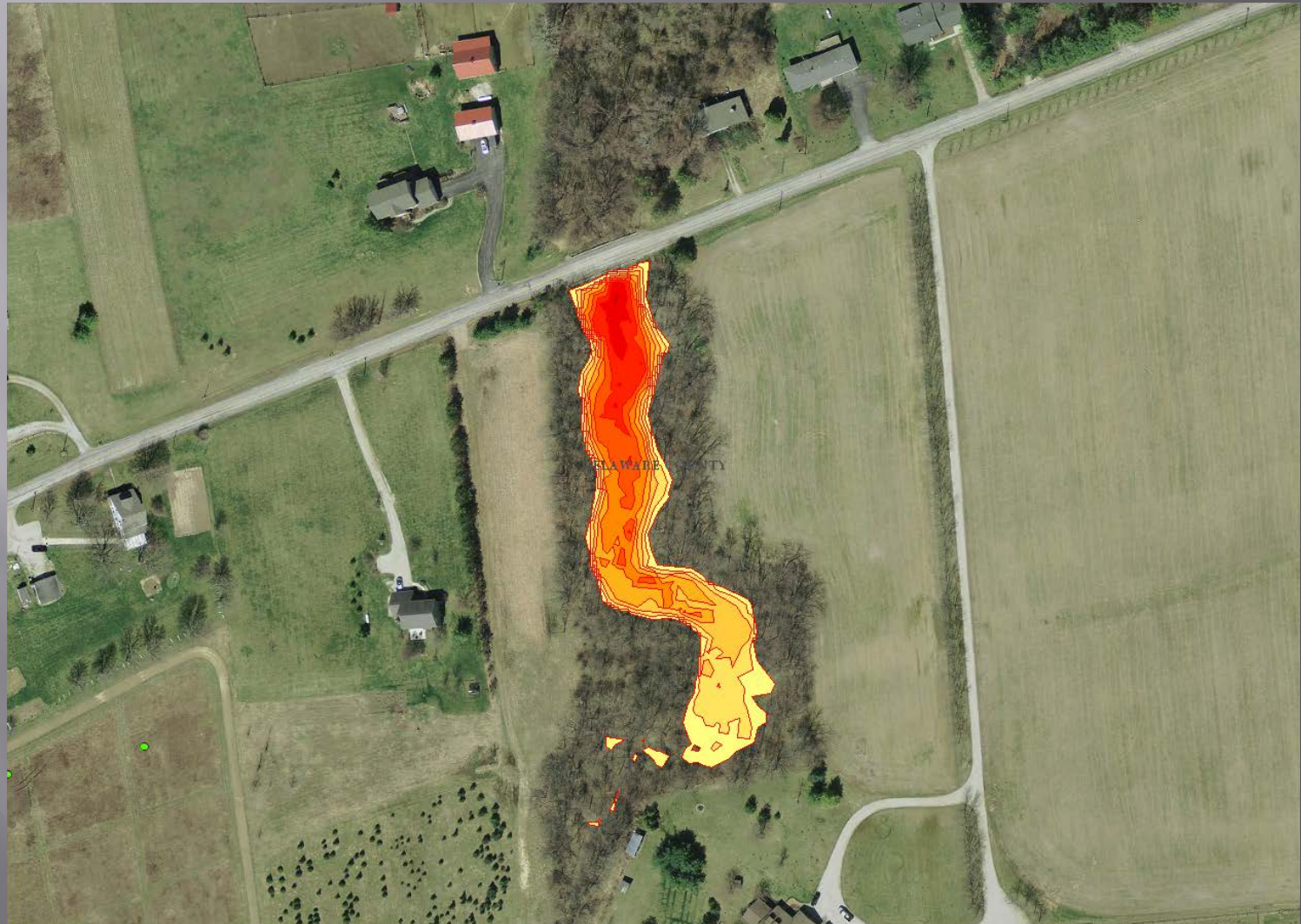


Field Verification

- ▣ Stream bank/ water reflections
- ▣ Culverts/ bridges
- ▣ Storm drains
- ▣ Foundations

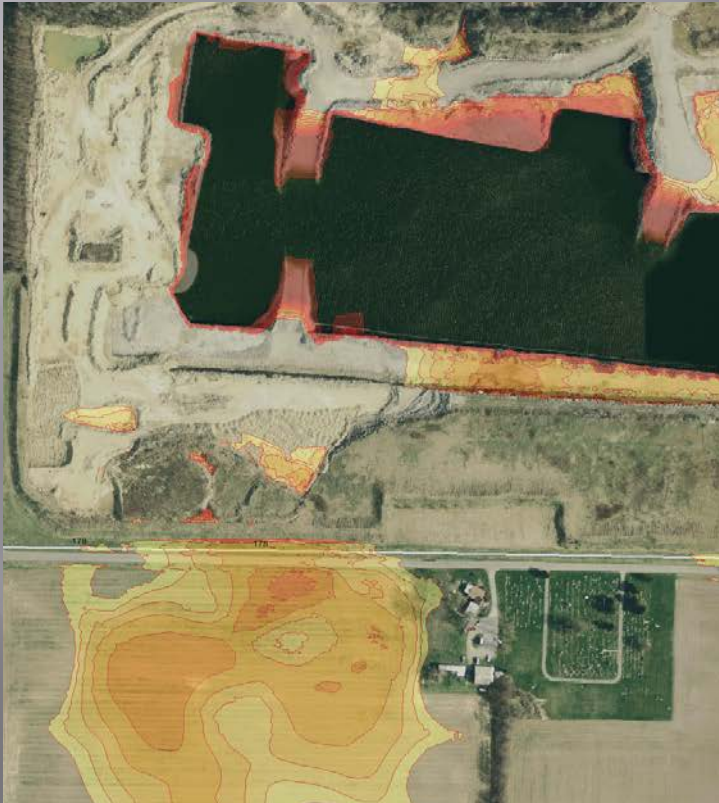


Bridge interrupts LiDAR



Non Karst Lows

- ▣ Quarries and stream channels.

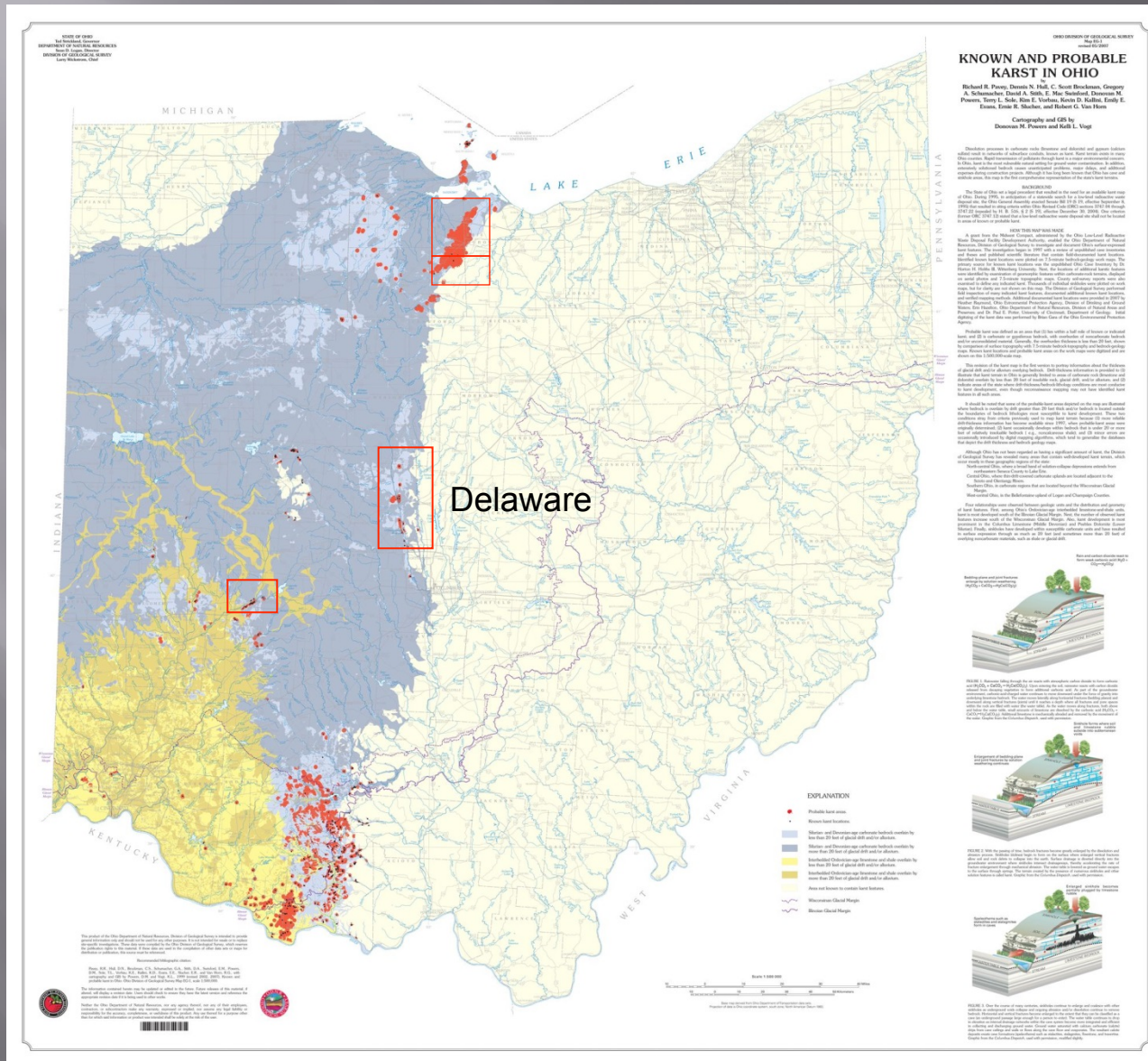


Failing drain tile



Known and Probable Karst in Ohio EG-1

revised 5-2007



KNOWN AND PROBABLE KARST IN OHIO

Richard B. Pevay, Dennis N. Huff, C. Scott Brockman, Gregory A. Schrammer, David A. Sells, E. Mac Sandwell, Donovan M. Powers, Terry L. Sals, Kim E. Vorhies, Kevin D. Kubba, Emily E. Evans, Eric R. Shuster, and Robert C. Van Horn

Cartography and GIS by
Doreen M. Powers and Rob L. Vug

Ohio's karst geology is characterized by the presence of soluble rocks and the resulting karst features. Karst features are formed by the dissolution of soluble rocks such as limestone, dolomite, and gypsum. Karst features include sinkholes, caves, and underground rivers. Karst features are found throughout Ohio, particularly in the western and southern parts of the state.

The Ohio Department of Geological Survey (ODGS) has been instrumental in the study of karst in Ohio. The ODGS has conducted numerous studies and investigations into the karst geology of Ohio. The ODGS has also been instrumental in the development of karst management plans and regulations. The ODGS has been instrumental in the development of the Ohio Karst Inventory, which is a comprehensive inventory of karst features in Ohio.

The Ohio Karst Inventory is a comprehensive inventory of karst features in Ohio. The inventory includes information on the location, type, and depth of karst features. The inventory is used to identify areas of karst and to develop karst management plans. The inventory is also used to identify areas of karst that are at risk of development and to develop regulations to protect these areas.

Although Ohio has not been considered a leading karst state, the Ohio Department of Geological Survey (ODGS) has been instrumental in the study of karst in Ohio. The ODGS has conducted numerous studies and investigations into the karst geology of Ohio. The ODGS has also been instrumental in the development of karst management plans and regulations. The ODGS has been instrumental in the development of the Ohio Karst Inventory, which is a comprehensive inventory of karst features in Ohio.

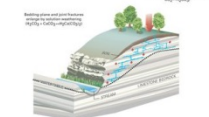


FIGURE 1. Karst formation in a typical karst landscape. The diagram shows a cross-section of the ground surface with a sinkhole. Below the surface, there are layers of limestone and dolomite. A cave system is shown forming within these layers. The diagram illustrates how water seeps through the ground and dissolves the soluble rocks, creating the karst features.



FIGURE 2. Karst formation in a karst landscape with a karst basin. The diagram shows a cross-section of the ground surface with a karst basin. Below the surface, there are layers of limestone and dolomite. A karst basin is shown forming within these layers. The diagram illustrates how water seeps through the ground and dissolves the soluble rocks, creating the karst features.

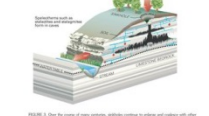


FIGURE 3. Karst formation in a karst landscape with a karst basin and a karst basin. The diagram shows a cross-section of the ground surface with a karst basin and a karst basin. Below the surface, there are layers of limestone and dolomite. A karst basin and a karst basin are shown forming within these layers. The diagram illustrates how water seeps through the ground and dissolves the soluble rocks, creating the karst features.

Sink mapped in 2011

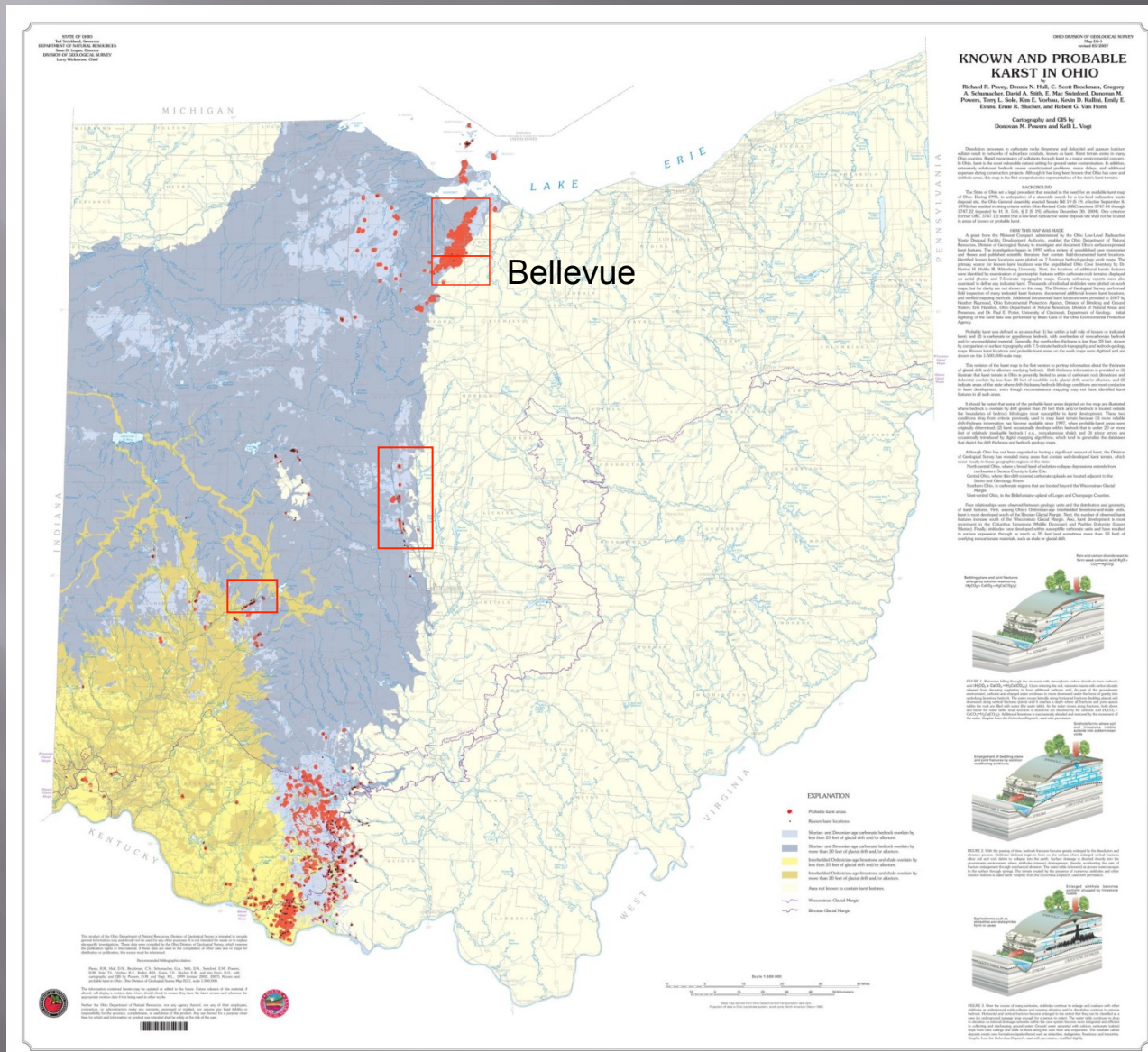


Sink revisited in 2014



Known and Probable Karst in Ohio EG-1

revised 5-2007



KNOWN AND PROBABLE KARST IN OHIO

Richard B. Pevay, Dennis N. Hall, C. Scott Brockman, Gregory A. Schrammer, David A. Sells, E. Mac Sandwell, Donovan M. Powers, Terry L. Sals, Kim E. Ueber, Kevin D. Kubba, Emily E. Evans, Eric R. Shuster, and Robert C. Van Horn

Cartography and GIS by
Doreen M. Powers and Rob L. Vign

Executive Summary
This report presents a synthesis of known and probable karst features in Ohio. It is based on a review of the literature, field observations, and a synthesis of data from various sources. The map shows the distribution of karst features across the state, with a concentration in the western and southern regions. The map is color-coded to show the depth of glacial drift and alluvium overlying the karst features.

Introduction
Karst is a type of landscape that is formed by the dissolution of soluble rocks such as limestone, dolomite, and gypsum. It is characterized by underground drainage systems with sinkholes, caves, and other features. Karst features are found in various parts of Ohio, and their distribution is related to the geology and topography of the region.

Methods
The data for this map were collected from a variety of sources, including field observations, literature reviews, and data from various agencies. The data were analyzed and synthesized to create the map. The map is color-coded to show the depth of glacial drift and alluvium overlying the karst features.

Results
The map shows the distribution of karst features across the state. Karst features are most common in the western and southern regions of Ohio. The map is color-coded to show the depth of glacial drift and alluvium overlying the karst features.

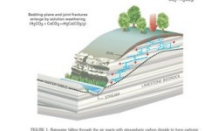


FIGURE 1. A karst basin with a sinkhole. The diagram shows the relationship between the karst features and the overlying glacial drift and alluvium.



FIGURE 2. A karst basin with a sinkhole. The diagram shows the relationship between the karst features and the overlying glacial drift and alluvium.



FIGURE 3. A karst basin with a sinkhole. The diagram shows the relationship between the karst features and the overlying glacial drift and alluvium.

Urban development

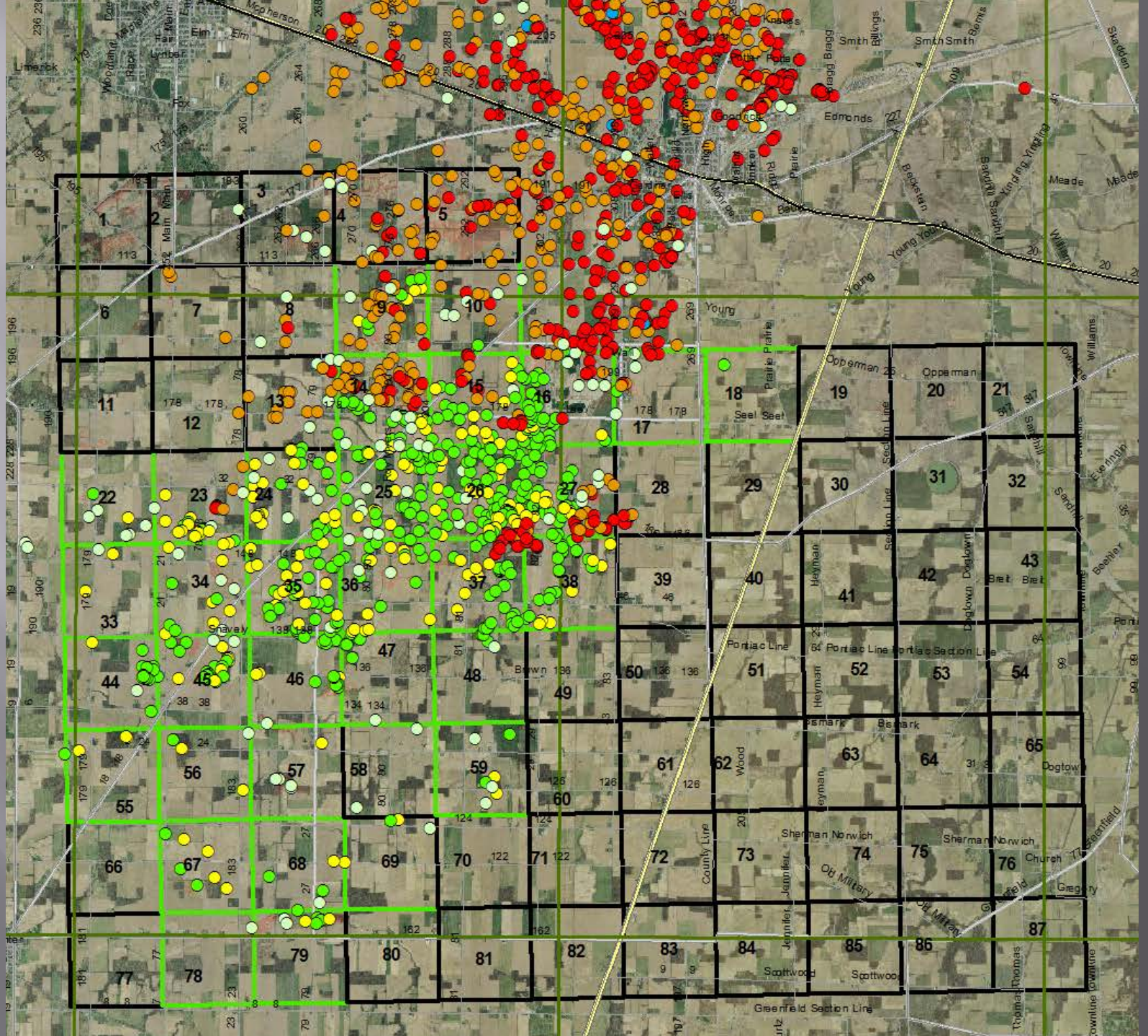


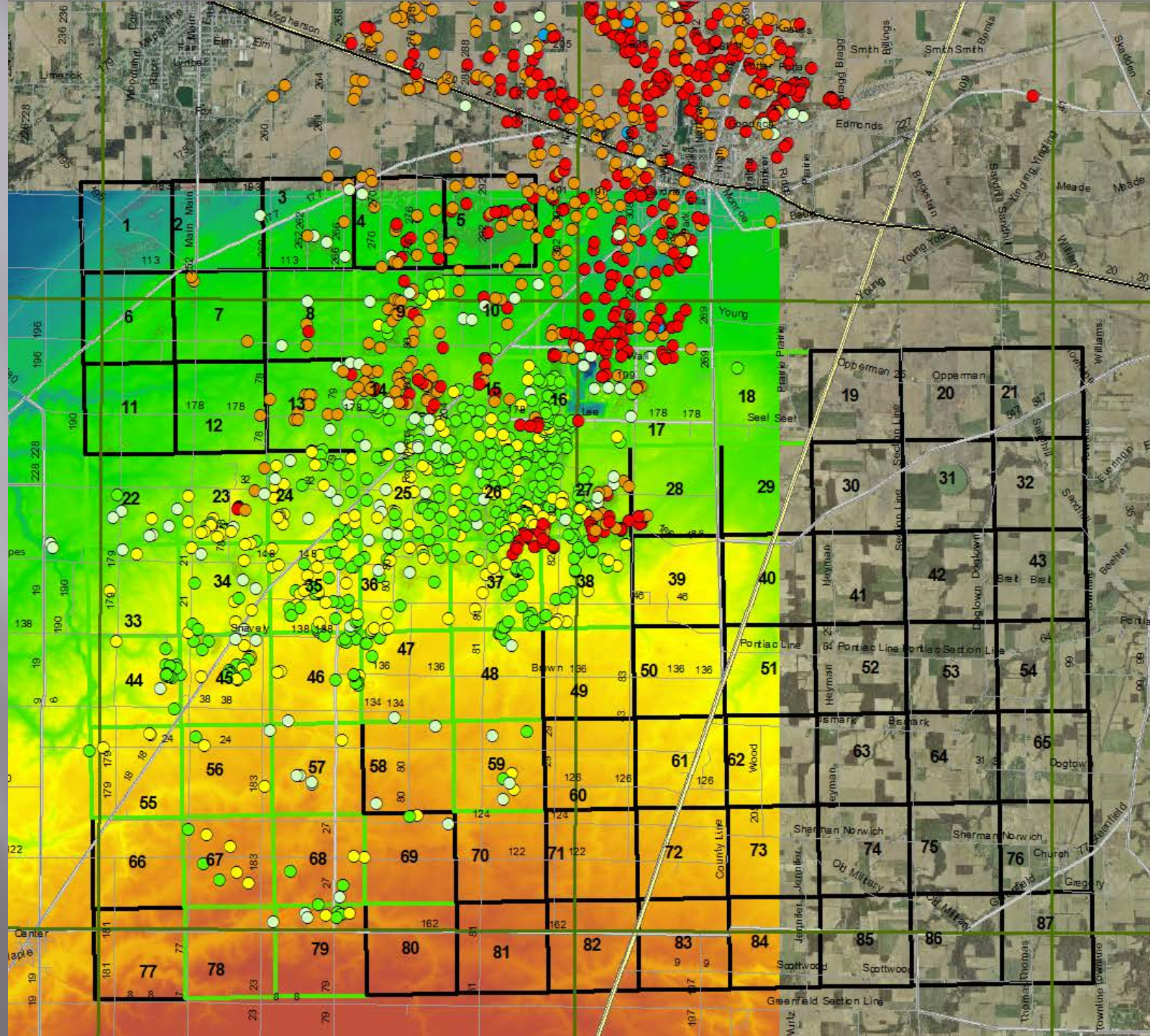
Infrastructure

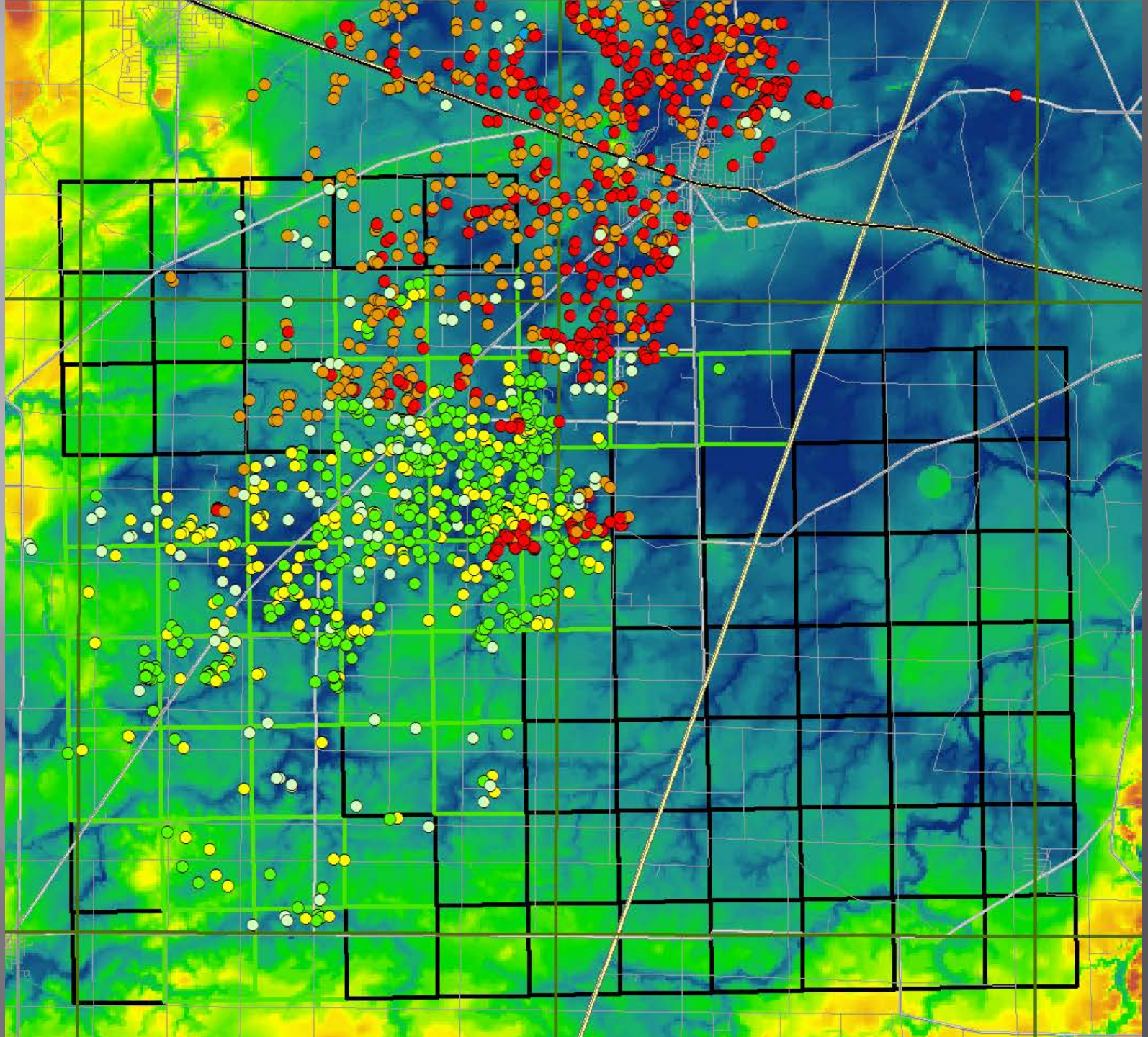


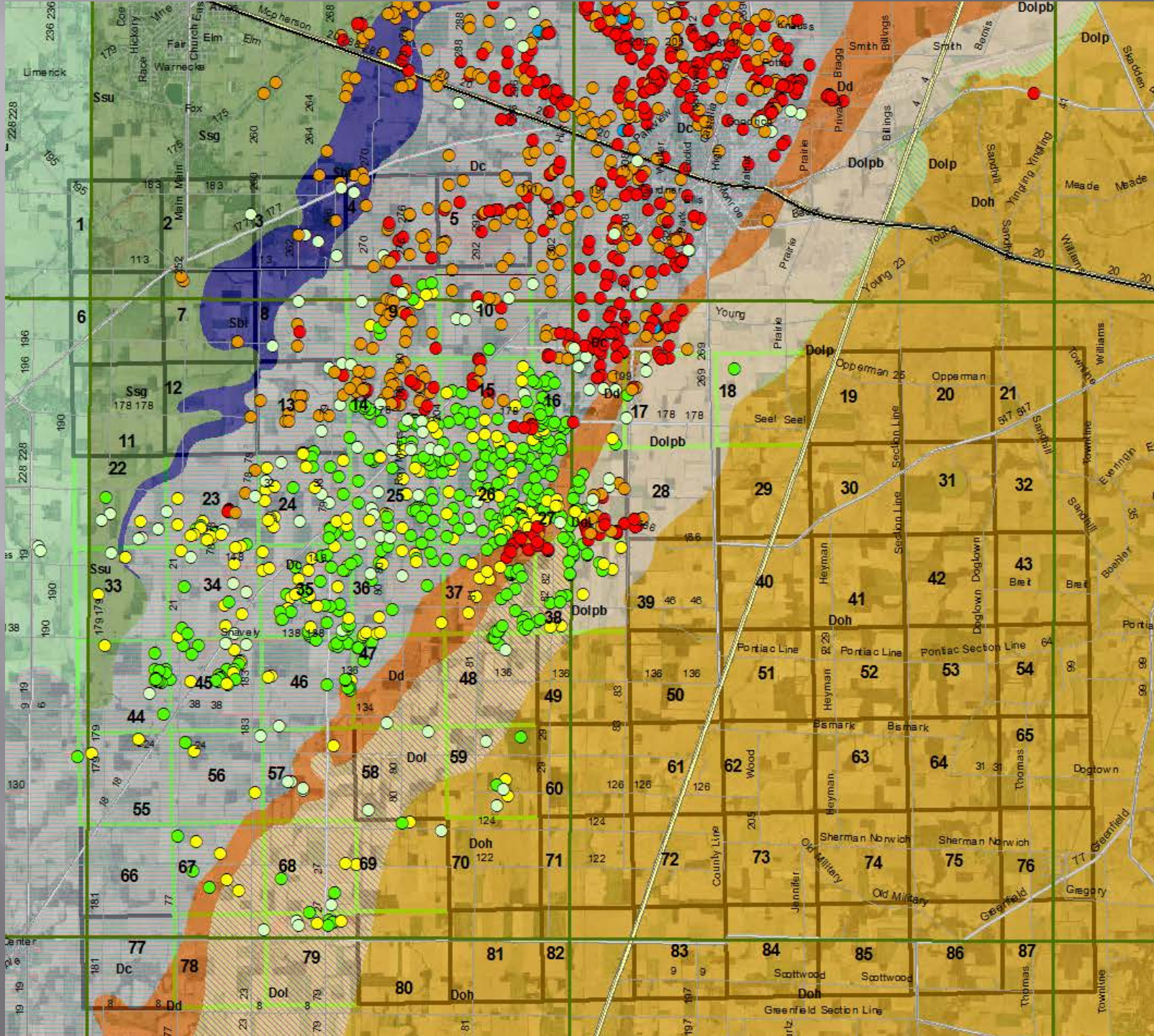
Groundwater contamination











A photograph of a rural landscape under an overcast sky. In the foreground, a weathered wooden sign is mounted on two wooden posts. The sign has the words "Sinkholes in Area" written on it in black, hand-painted letters. The sign is tilted slightly to the left. The background shows a wide, flat field with patches of green grass and brown, dry vegetation. A dirt road or path runs across the middle ground. In the distance, there is a line of trees and a body of water, possibly a pond or a reservoir, under a grey, cloudy sky.

Sinkholes
in Area

Drainage and erosion



Diagonal sink



Sink from field



Trash filled



Trash in sink throat



Deer bones



Clean sink



Diagonal Sink

- ▣ Large recent collapse near a house.
- ▣ Many sinks in this field.



Bellevue South statistics

- 937 total points of interest (502 left to check)
 - 159 Confirmed sinkholes
 - 180 Suspect visited points
 - 96 Suspect Not Visited (poor LiDAR/aerial)
 - 412 photos
-
- Many rock or concrete filled sinks
 - Many stand pipes (more than elsewhere)
 - Some trash filled (less than other areas)

