

Connecting Geospatial Education with Industry and Government: A New York Experience

Susan Hoskins

Heather Pierce

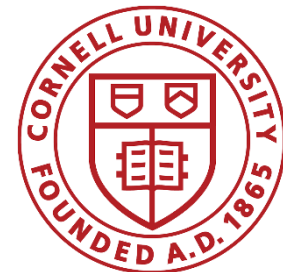
Andy Mendola

Connecting Geospatial Education with Industry and Government: A New York Experience

4-H Geospatial Science and Technology



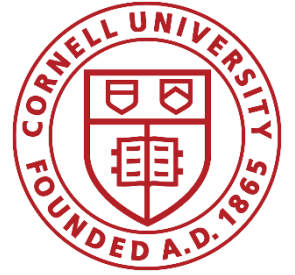
Susan B. Hoskins
Institute for Resource Information Sciences
Section of Soil and Crop Sciences
Cornell University
Ithaca, New York 14853



What is 4-H?



- In New York
 - 133,846 youth
 - 200 educators
 - 12,775 adult volunteers



4-H is the nation's largest positive youth development and youth mentoring organization, empowering six million young people in the U.S.

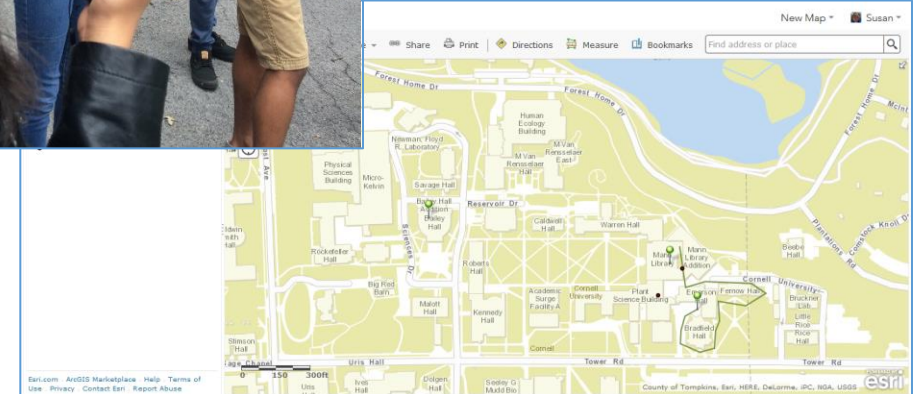
In partnership with 110 universities, 4-H life changing programs are research-backed & available through 4-H clubs, camps, afterschool & school enrichment programs in every county & parish in the U.S.

4-H is the youth development program of our nation's Cooperative Extension System & USDA.

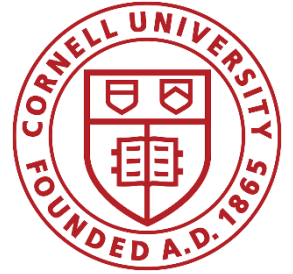


4-H Geospatial Science and Technology

- Educator Professional Development
 - GPS
 - GIS
 - Remote sensing
 - Community Mapping Projects
- Equipment loan
- Consultation
- Youth Map Recognition



Primary Connections

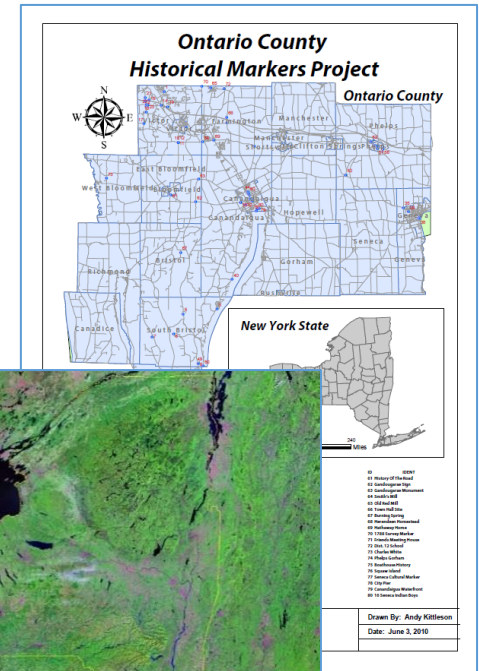


- ESRI 4-H Grants
 - ArcGISOnline for Organizations
 - EdUC, San Diego, CA
 - GGLEAD
- NASA Landsat
 - Adopt-a-Pixel
 - iGETT to HiGETT
- Pictometry, Inc.
 - Pictometry Online

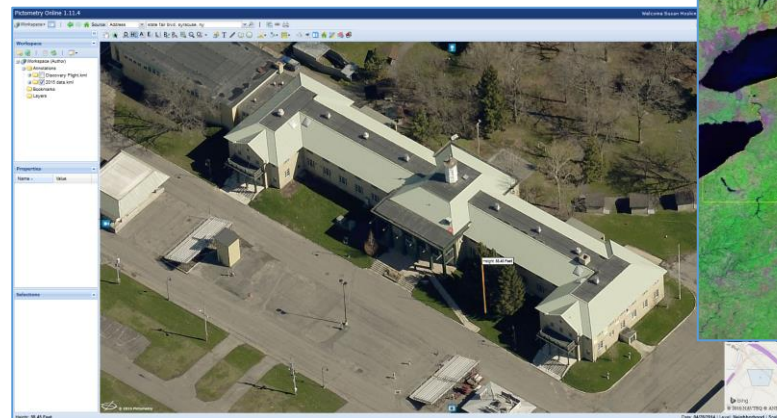


4-H Educator Training CCE Oneida

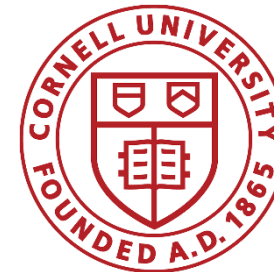
ESRI ArcMap for
Community Service



Pictometry at the Youth Building at NY State Fair

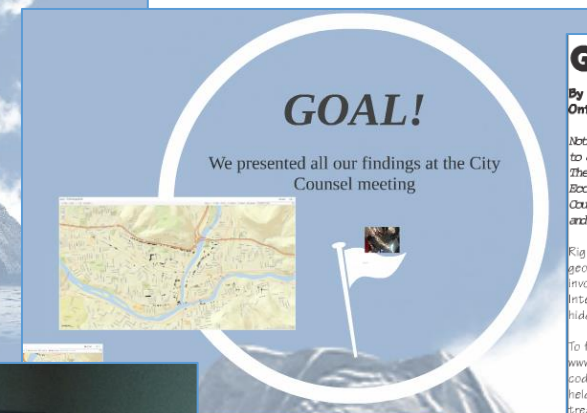
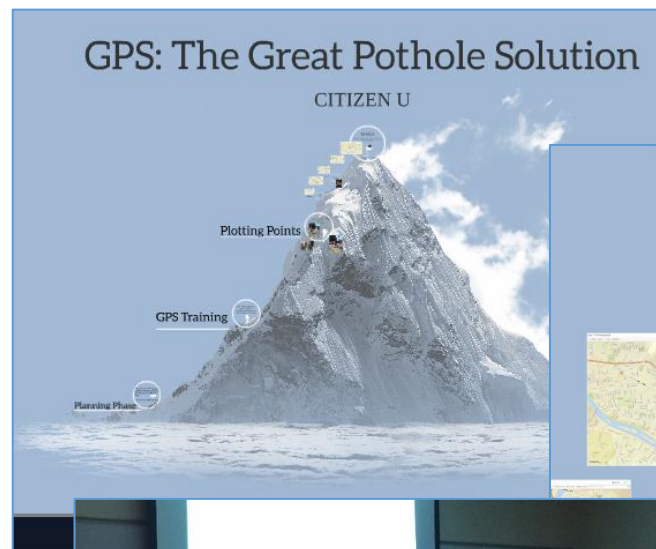


New York Landsat Mosaic



Local Connections

- CCE Broome 4-H
 - Binghamton City Council
 - Pothole Mapping
- CCE Ontario – Local Agriculture
 - Farm Stand Maps
- CCE Genesee – Business/Education Alliance
 - Math Science Technology Summer Camp



Geospacial Adventures

By Elliott Padnole, Geoseekers 4-H Club, Ontario County

Note: The Ontario County 4-H program received a grant to develop a 4-H club to explore Geospacial Science. The members are working with the Agricultural Economic Development program of CCE of Ontario County to map out a local food guide for farm stands and local produce.

Right now you're probably reading this wondering what geocaching is? Right? Well, geocaching is a sport involving a GPS, or global positioning system, and the Internet. You use the GPS to find caches that contain hidden treasure.

To find out about geocaches in your area, log onto www.geocaching.com, where you can track caches by zip code. You can upload the cache coordinates to a handheld GPS unit. The GPS unit helps you track down the treasure.

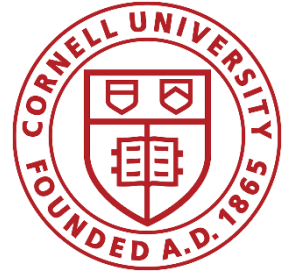
Caches are usually hidden "in plain view" on public property. They are most often in a weatherproof container.



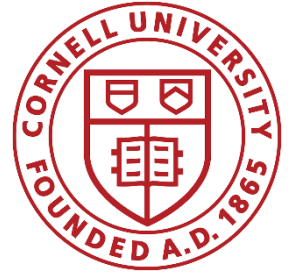
Geoseekers 4-H Club finding a hidden cache at Dryer Road Park.



Making the Connection....



The image shows a screenshot of the AAG (Association of American Geographers) website. The top navigation bar includes links for Home, Join AAG, Knowledge Communities, Jobs, Contribute, Bookstore, Contact Us, and RSS. The main content area features a green header with navigation links: About AAG, Membership, Annual Meeting, Projects & Programs, Education, Publications, Calendar Of Events, and Jobs & Careers. A sidebar on the left lists options: GeoMentors, About, Participate, Prepare, Connect, Communicate, Share, and Review. The main content area displays a photograph of a teacher and three students working at computers. Below the photo is the text: "AAG-Esri ConnectED GeoMentors Program: Give Back, Be a GeoMentor!". To the right of the photo is a large graphic with the heading "GIVE BACK—BE A GeoMentor". This graphic contains the following text: "What is the AAG/Esri ConnectED GeoMentors Program? Esri and the Association of American Geographers (AAG) are working together to develop a nationwide network of GeoMentors to support the U.S. Department of Education's ConnectED Program, for which Esri has agreed to donate free GIS software to all K-12 schools in the U.S. GeoMentors will help schools and teachers introduce GIS and associated geographic concepts into classrooms across the country." Below this text are two maps of the United States. The first map, titled "Current GeoMentors Network", shows blue dots representing mentors. The second map, titled "Current Schools with ConnectED GIS", shows red dots representing schools. Below the maps is the text: "Who can be a GeoMentor? From undergraduate and graduate students to professors and geographic information scientists, we welcome the entire GIS and geography community to volunteer their skills and experience as GeoMentors." Further down, it says: "What do GeoMentors do? GeoMentors play a pivotal role in improving GIS and geography education. The wide variety of outreach opportunities include advocating GIS adoption, helping schools get their free software, demonstrating available classroom exercises to teachers, and providing information about career and educational opportunities." At the bottom of the graphic, it says: "To become a GeoMentor, sign up at: www.GeoMentors.net" with a small arrow pointing to the right. The footer of the graphic includes the logos for AAG, ConnectED Initiative, and Esri.



Example: NUAIR/AUVSI Industry Days

- Andro
- AUVSI
- Avyon
- Cognizant
- CTM Machinists
- DragonFly Unmanned Aerial Solutions

The screenshot shows the NUAIR Alliance website. The header is dark blue with the NUAIR Alliance logo and the tagline "MAKING FUTURE SKIES SAFER". The navigation menu includes HOME, ABOUT, SERVICES, FACILITIES, PARTNERS, CONTACT, and INDUSTRY DAYS. A search bar is located in the top right corner. The main content area features a section titled "Industry Days" with the subtitle "Collaboration for Innovation". Below this, it states "Presented by NUAIR Alliance and Empire State Chapter of AUVSI" and "September 22 & 23, 2015". The location is listed as "Turning Stone Resort & Casino, 5218 Patrick Rd, Verona, NY 13478". On the right side, there is a "NUAIR Partners" section with a "View All »" link and a red banner featuring the Cornell University logo and name.



Heather Pierce, Instructor, Monroe Community College

October 30, 2015

Jonathon Little, Assistant Professor, Monroe Community College

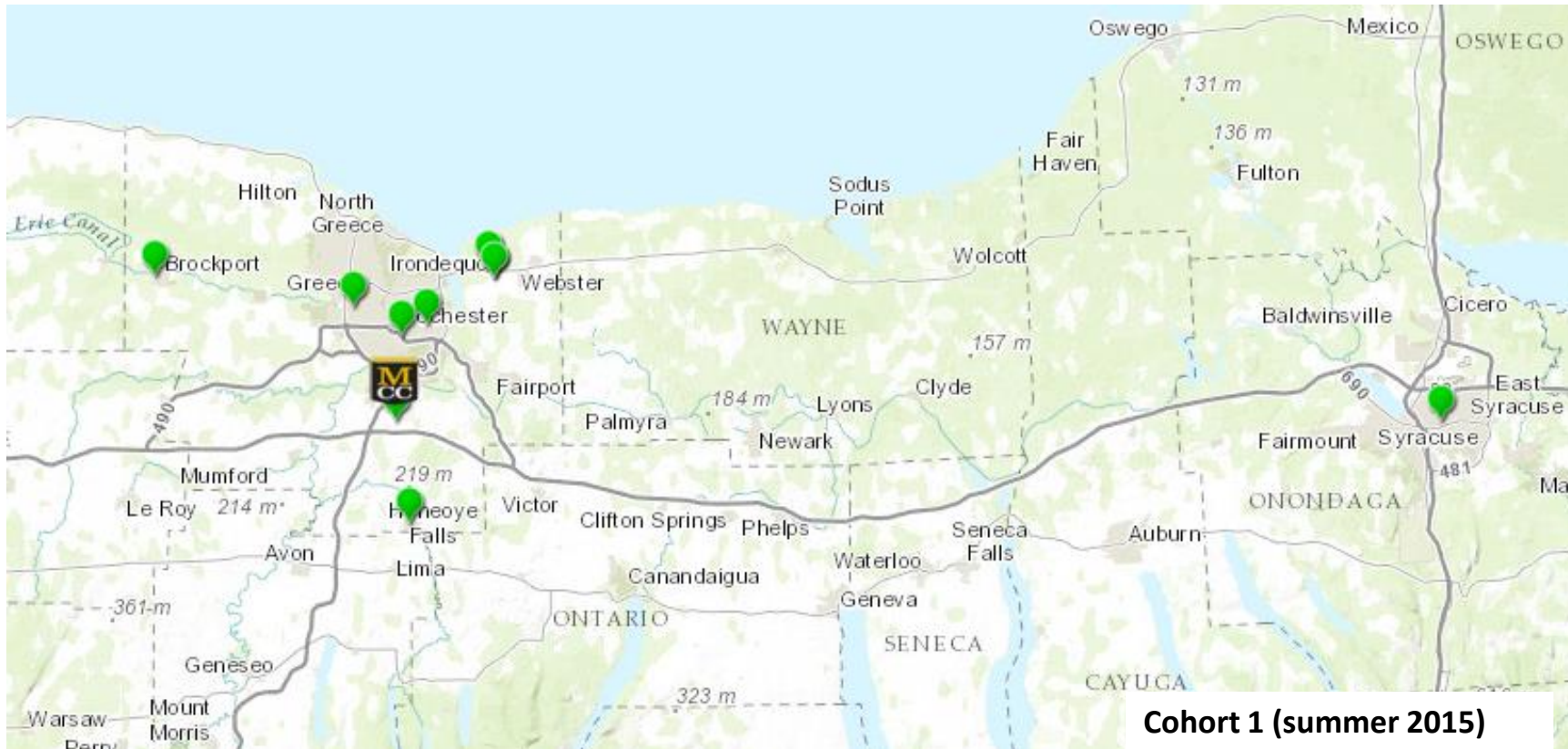


The GeoTech Consortium of Western New York was funded through the U.S. National Science Foundation (NSF) Office of Advanced Technological Education under Grants Award # 1501076 to Monroe Community College.



GeoTech Consortium of Western NY

- Goal: develop a career pipeline between high schools, MCC, and the geospatial industry.



Fall 2016 (anticipated)

- Geography A.S. Degree
 - with a geospatial technology concentration
- Geospatial Technology Certificate

GIST Certificate Two-semester Sequence

Fall Semester:

Physical Geography Lab (GEG 100) – 1 cr.

Physical Geography (GEG 101) – 3 cr.

Digital Earth (GEG 130) – 3 cr.

Cartography (GEG 131) – 3 cr.

Intro to Remote Sensing (GEG 133) – 3 cr.

Spring Semester:

Human Geography (GEG 102) – 3 cr.

Spatial Analysis and GIS (GEG 230) – 3 cr.

Capstone Course in Geospatial Technology
(GEG 239) – 2 cr.

Elective (see below*)

***Elective Options:**

Students should consult with their advisor to select an elective based on their career goals or transfer plan.

- Technical Communication (ENG 251) – 3 cr.
- Programming in Python (CPT 101) – 4cr.
- Business GIS (GEG 135) – 3 cr.

Partners

- Pictometry
- GIS-SIG
- Lighttower Fibertech
- Monroe County GIS



Mapping septic fields with Remote Sensing



*Paul L. Richards and Marine David
Department of Earth Sciences
The College at Brockport
Montpellier SupAgro, France*

OBJECTIVES

- Determine if PICTOMETRY Oblique Imagery can be used to map Septic Leach Fields
- Determine the best way to use the data
- Determine errors and bias involved in the process including:

Sites Hidden by Tree Canopy

Sites that are simply not observable from the data

Other uncertainties/bias

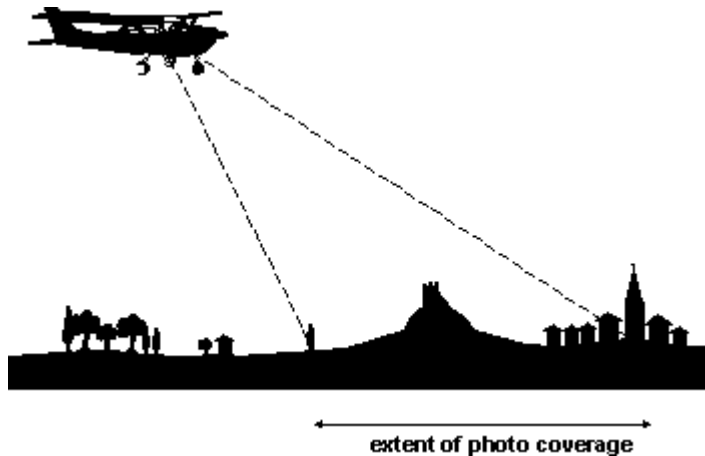
Map all Septic Fields in Oak Orchard Watershed

Why Bother Mapping Septic Fields?

- Very little spatial information about them available
- They are potential sources of Nutrients, and potentially pharmaceuticals.
- They are a source of water and are hydrologically active every day of the year.
- Currently they are modelled strictly based on census data with no thought on their location relative to streams. Yet field studies of septic fields suggest that distance to streams, gradient, soil type and distance above water table are all important factors that govern nutrient fluxes from them.
- Recent Well Contamination events from spring spreading of manure have been analyzed using DNA techniques and Human E Coli have been found. This had to be from septic systems.

Pictometry: oblique imagery

- *Aerial images taken at a 40 degree angle: Enables the eye to perceive the relief*
- *Views from 4 orientations, different years and seasons*
- *True color (no near-infrared bands)*
- *Resolution is 3 to 6 inches, depending on the type of data collected*
- *Multiple dates available*



Differences in color: darker green above the septic field

- *Pipes release the wastewater into the surrounding ground*
- *Microenvironment is richer in nutrient and water*
- *Vegetation (grass) grows darker*





March 2013



April 2010



The start time of the growing season can have a large impact on the results

Leaking septic fields



Shape of ground: raised septic fields

- Mostly the trenches
- Sometimes indirectly (leaves during Fall)





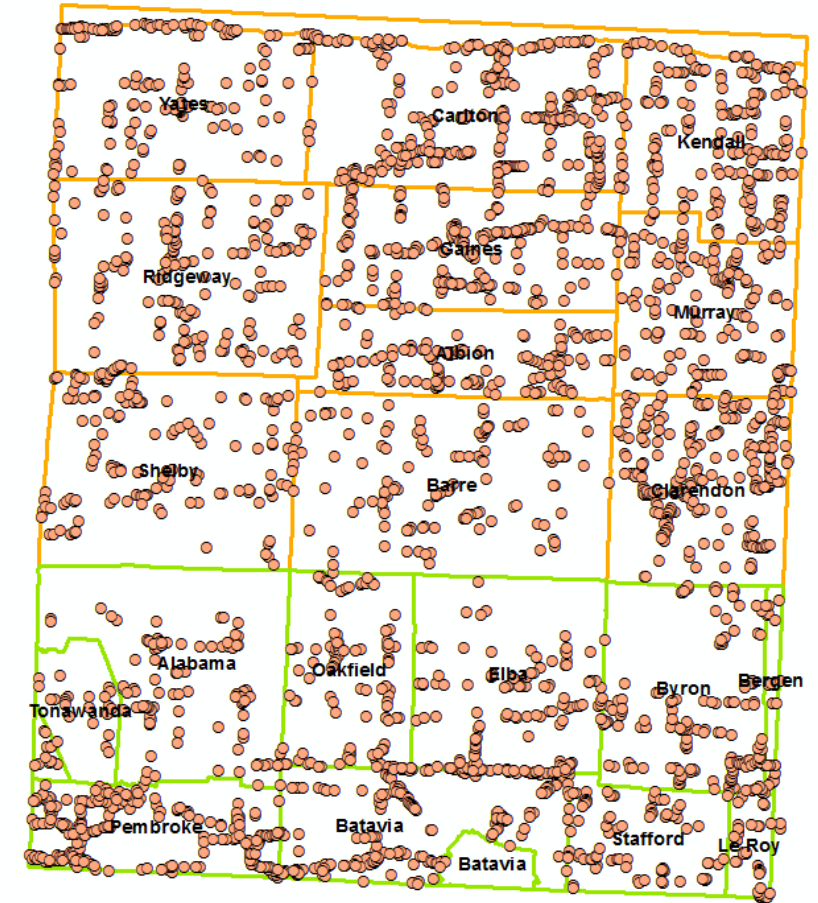


Ground truthing the results

- Comparison with data from Health Departments of Genesee and Orleans county
- Leach field dbf: Orleans, no GPS coordinates
- Distribution box (indirect) dbf, the same properties as leach field file
- GPS position, description of spots
- Evaluate how many of them we could spot using previous tools

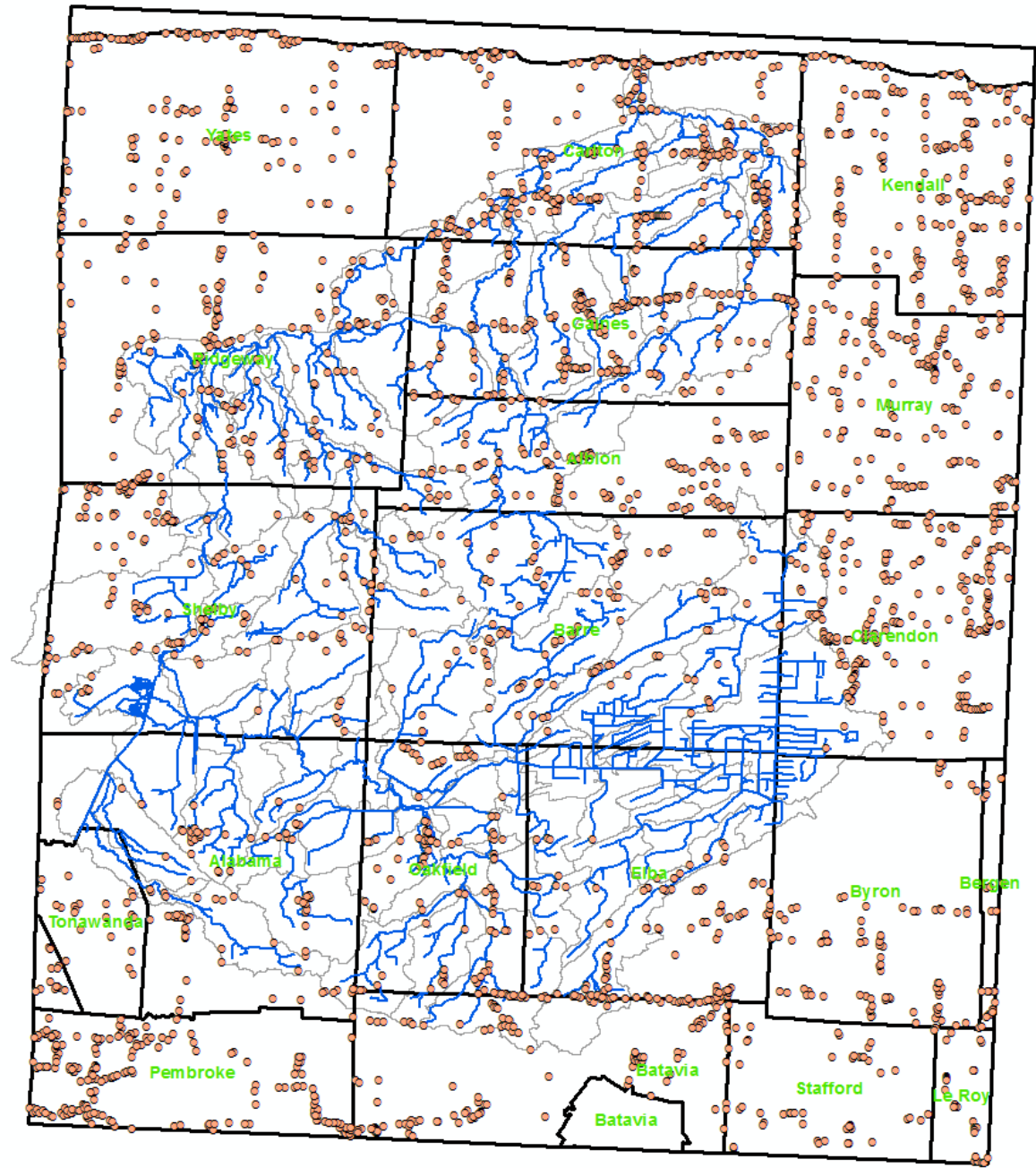
Results: efficiency of the mapping

Township	Yates	Carlton	Kendall	Ridgeway	Gaines	Albion	Murray	Shelby	Barre	Clarendon
Septic fields mapped	71%	74%	75%	78%	66%	67%	76%	76%	73%	77%
Presence of trees	10%	8%	11%	11%	10%	2%	5%	9%	10%	7%
Others	6%	6%	4%	5%	15%	12%	10%	3%	0%	13%
Couldn't be spotted	12%	11%	11%	8%	10%	19%	10%	12%	17%	3%
Township	Alabama	Oakfield	Elba	Byron	Bergen	Pembroke	Batavia	Stafford	Leroy	Tonawanda
Septic fields mapped	78%	67%	75%	81%	75%	73%	72%	74%	73%	na
Presence of trees	3%	9%	3%	3%	0%	7%	9%	5%	9%	na
Others	16%	0%	16%	13%	0%	15%	9%	14%	9%	na
Couldn't be spotted	3%	24%	6%	3%	25%	5%	9%	7%	9%	na



Results: efficiency of the mapping

- 3075 mapped so far, 1154 in the watershed
- More than 70% of the septic fields spotted by the departments could be mapped
- 10% where trees were blocking the view
- Between 0-15% of the errors in the mapping appear to be due to inconsistencies in the Dept. of Health data.
- This method cannot identify septic systems that don't have leach fields (i.e. Cess Pools).



Conclusions

- The approach appears to be practical for mapping septic fields.
- Spatial information on these features are essential if we want to start addressing the role that septic fields have on our streams and waterbodies
- Septic flux calculations based on demographics could be greatly improved if we incorporate distance to streams, gradients, and account for spatial heterogeneities of septic fields.
- We can't really regulate them or even start to consider addressing the messy politics about them if we don't know where they are.