

# Introduction to GIS

Workshop for Interdisciplinary Social Sciences Research

Zachary Raslan

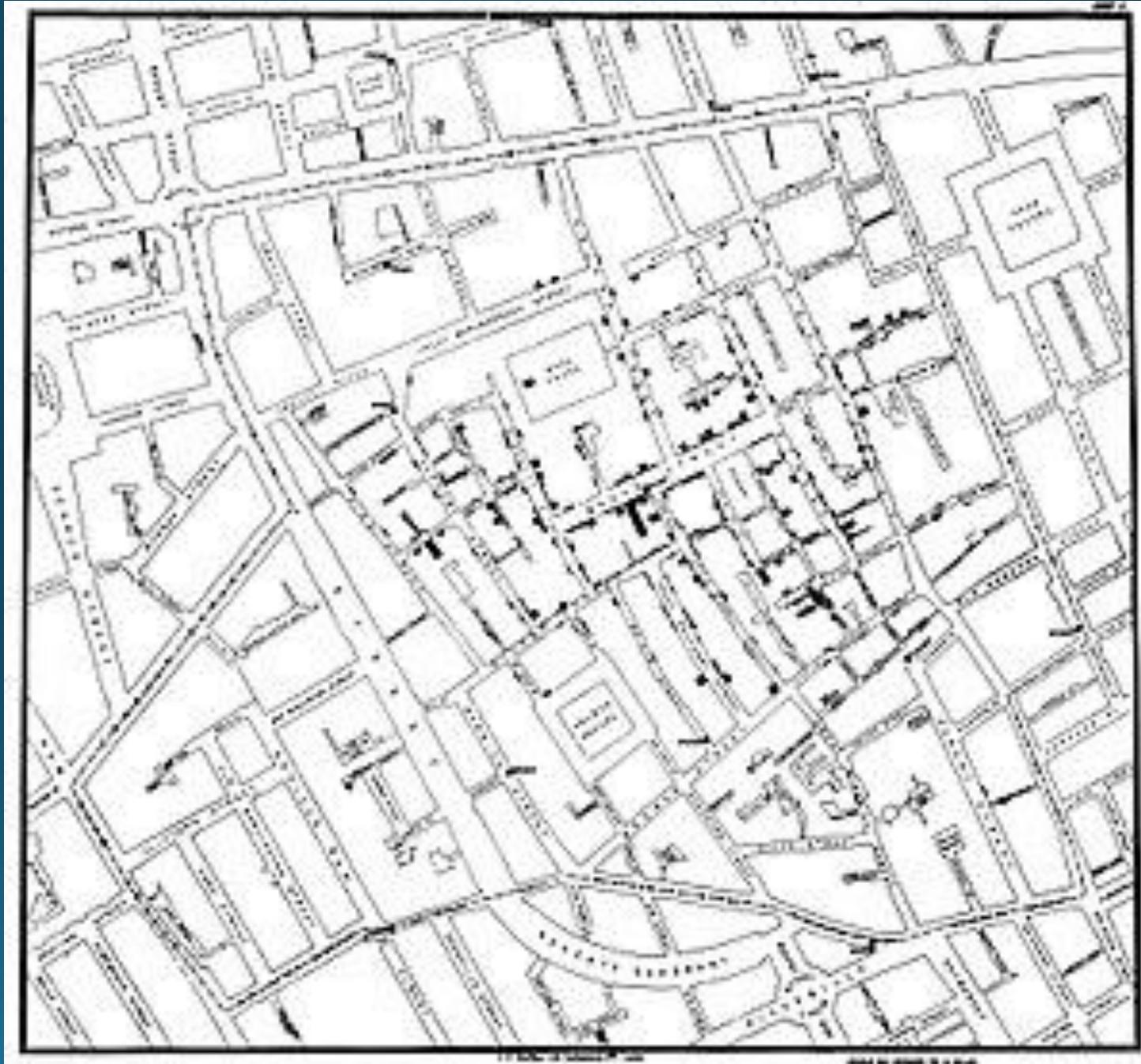
Research Associate

Critical Health and Social Ecology Lab

Wesleyan University

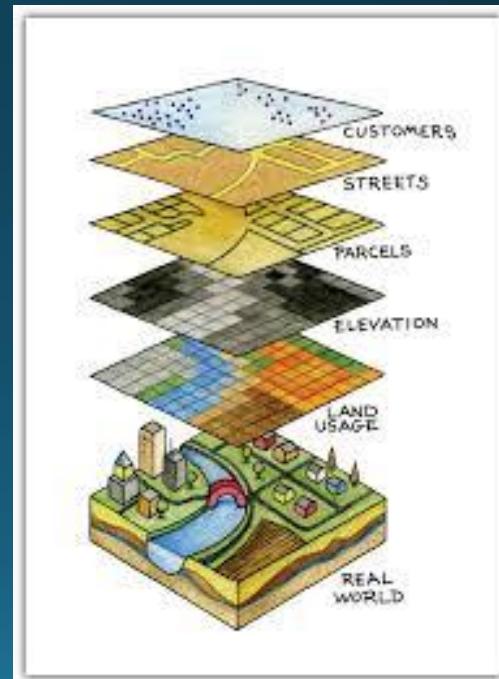
# Dr. John Snow (1813-1858)

- English physician
- Cholera mapping in 1854
- Marked number of cases by house
- Spatially visualized data to support:
  - “germ theory of disease”
- Deduced which well was spreading cholera
- Significant history of public health and geography



# What is GIS?

- Geographic Information System
- Computer-based system
- Aid in spatial data collection, maintenance, storage, analysis, distribution
- A tool for geographers and others
- Interdisciplinary GIS
- ESRI [video](#)



# Early Development c. 1960's

- Roger Tomlinson, Canadian GIS (CGIS)
  - Aided Canadian Land Inventory (CLI)
  - Natural resource inventory system
- Howard Fisher, Harvard Lab for Computer Graphics
  - Computerized thematic map production
    - Choropleth, isolines, dot density, etc.
  - Developed mapping package – SYMAP
- Improved technology in the 1970's and 1990's
  - 1999 – ESRI releases ArcGIS
  - GIS becomes mainstream in geographical use/education
  - Used increasingly more in other fields

# Interdisciplinary GIS

- Digital Humanities and Social Sciences
  - GIS has an “inherently integrative capacity”
  - Three components GIS data:
    - Spatial, attribute, and temporal
- Historical GIS
  - Organize and store historical sources and information
  - Visualize historical data
  - Complex spatial analysis on historical data
- Applied GIS
  - Critical Health and Social Ecology Lab
  - Methods for mapping social ecology
  - How place factors into this research

Table

The screenshot shows a GIS application window with a toolbar at the top and a table view below. The table is titled 'Ward\_census\_join' and contains 10 rows of data. The columns are labeled: OBJECTID \*, Ward \*, ToPop\_1920, M, and Fe. The data rows are as follows:

OBJECTID *	Ward *	ToPop_1920	M	Fe
1	1	12271	5915	635
2	2	21330	1163	969
3	3	16552	8121	843
4	4	9968	4539	542
5	5	13099	6913	618
6	6	10079	5442	463
7	7	9402	4591	481
8	8	18947	9507	944
9	9	14445	6893	755
10	10	11943	5546	639

# Schlichting, Kurt. "Historical GIS: New Ways of Doing History."

"GIS can illuminate spatial patterns in the historic data that are impossible to see in the source data. The historic property records for Concord, Massachusetts, could be assembled in a database, but it would be impossible to see which properties are adjacent to other properties and the spatial distribution of ownership without GIS. The spatial patterns and accompanying maps are not mere updated cartography; they allow historians to analyze previously hidden patterns in the data"

- Historical Methods: A Journal of Quantitative and Interdisciplinary History 41.4 (2008): 191-96.

# Examples – Virtual Hartford

- Digital humanities research team
- Studying microhistories of Hartford, CT
- Allison Horrocks – history of Parks and Recreation in early 20<sup>th</sup>c
- Effort to facilitate order in growing city
  - Population increase 80,000 (1900) – 138,000 (1920)

“This project suggests that a history of infants, children, young adults, and even the elderly is possible, if we know where and how to look for it. The history of recreation is one way to access that history, for it was in parks and playgrounds that these groups received special recognition and remade America’s urban landscape.”

# (Virtual Hartford)

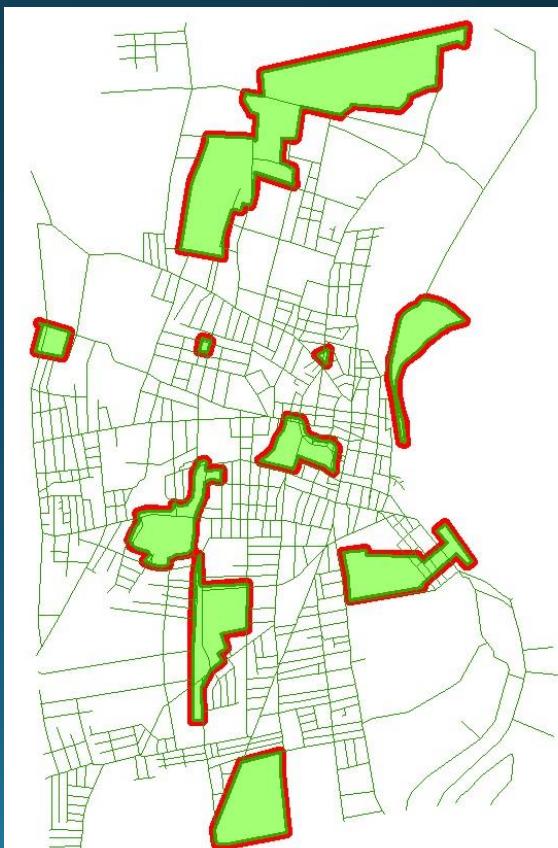
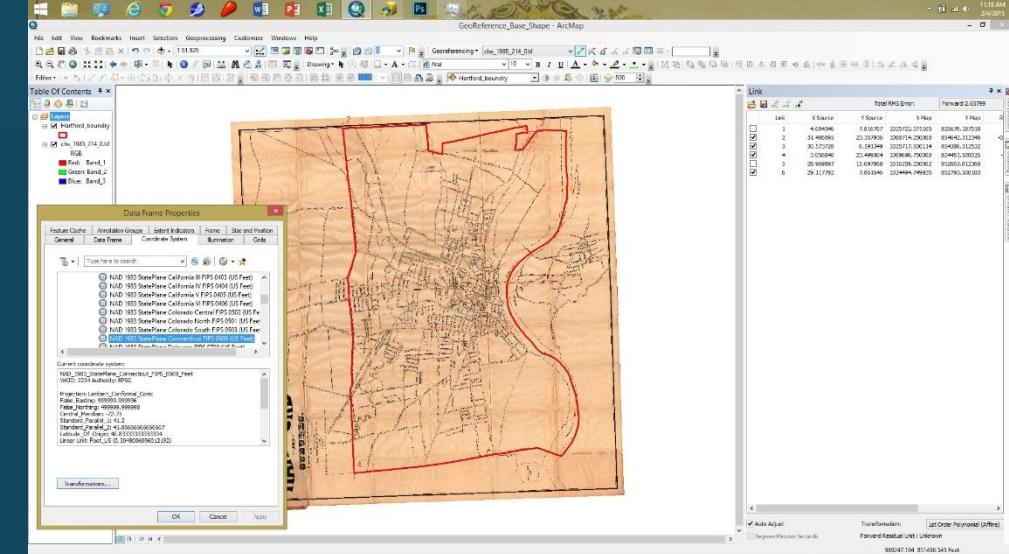
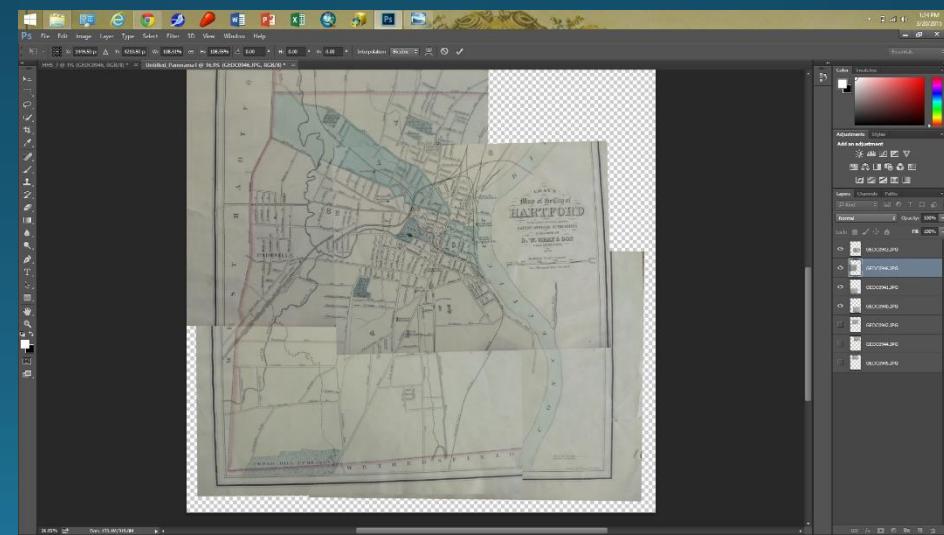
- How will GIS be applied?
  1. Are there any spatial patterns?
    1. Indicate a consistency with Horrocks' thesis?
      1. parks were a conscious effort to promote/facilitate order within the city
  2. Where are the parks?
    1. What voting wards have the most park space?
  3. Where are the people?
    1. Visualize historical demography of Hartford
    2. Are the parks evenly distributed?
    3. Is there a spatial correlation between child population distribution and park placement?

# (Virtual Hartford)

- Digitizing
- formatting
- Georeferencing
- Heads-up digitizing
- Attribute query and geoprocessing

Table

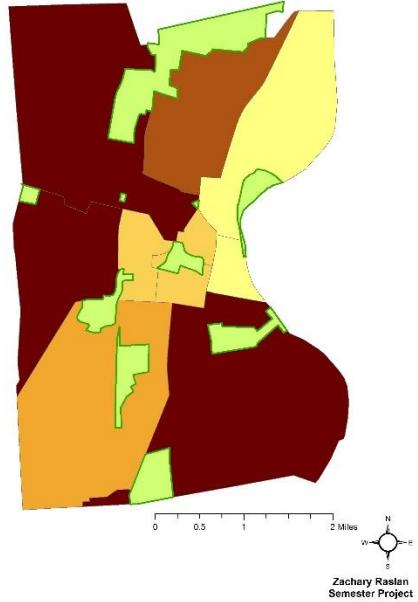
OBJECTID *	SHAPE *	Park_Name	SHAPE_Length	SHAPE_Area	ParkAcres
1	Polygon	Riverside	13380.422524	3518538.325969	80.774848
2	Polygon	Keney	36729.419621	24215685.107915	555.91786
3	Polygon	Sigourney	1496.347876	134842.405026	3.095568
4	Polygon	Tunnel	1482.822126	104600.661201	2.40131
5	Polygon	Bushnell	8438.043897	2714506.014752	62.316733
6	Polygon	Elizabeth	4210.014265	966427.159468	22.186204
7	Polygon	Pope	12818.559664	4546470.789886	104.373025
8	Polygon	Rocky_Ridge	15503.234665	5444019.530986	124.977991
9	Polygon	Colt	14056.26126	5163272.478666	118.5329
10	Polygon	Goodwin	10180.516656	6064862.762905	139.230648



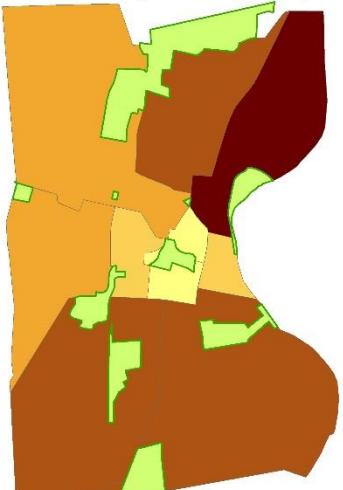
# (Virtual Hartford)

- Display maps
  - Historical population and demographic distribution
- Spatial relations
  - Historical parks and recreation overlay

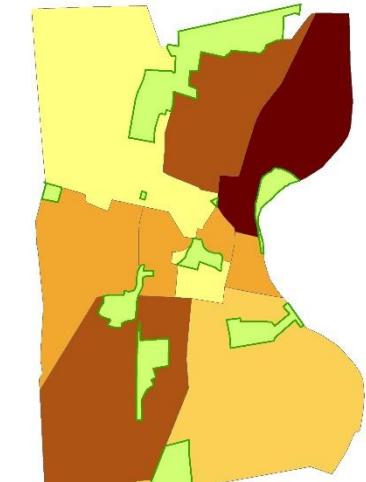
Hartford Wards by White Population, 1910



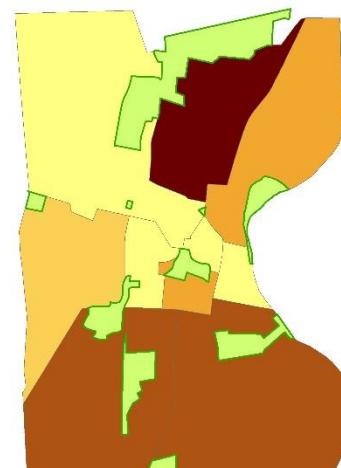
Hartford Wards by Child Population, 1910



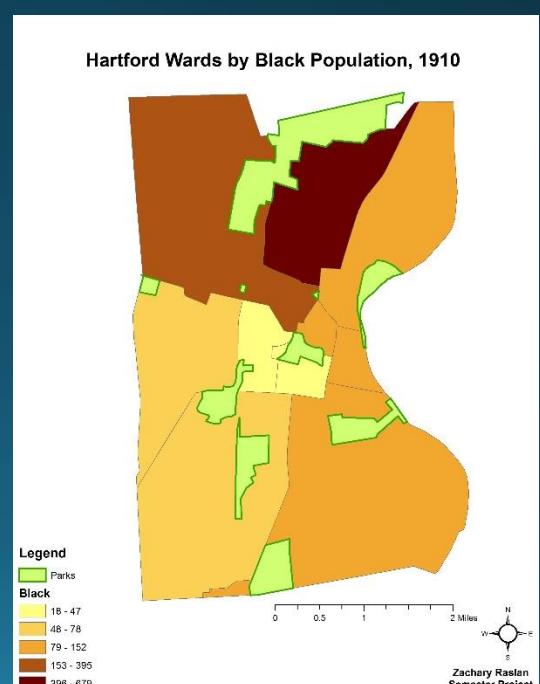
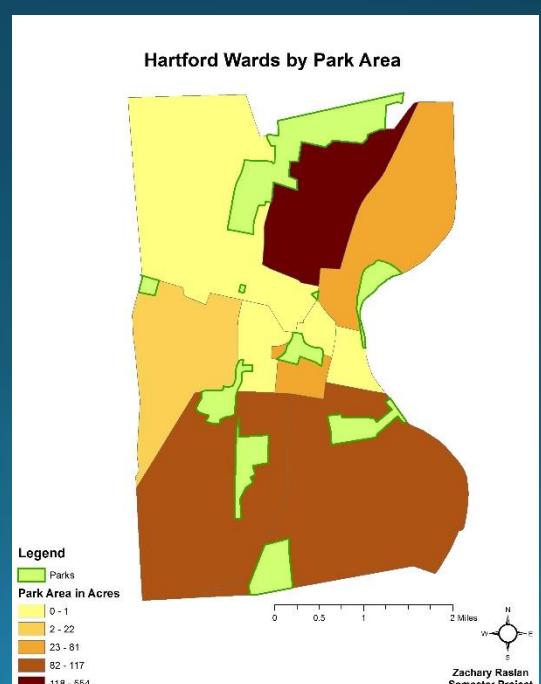
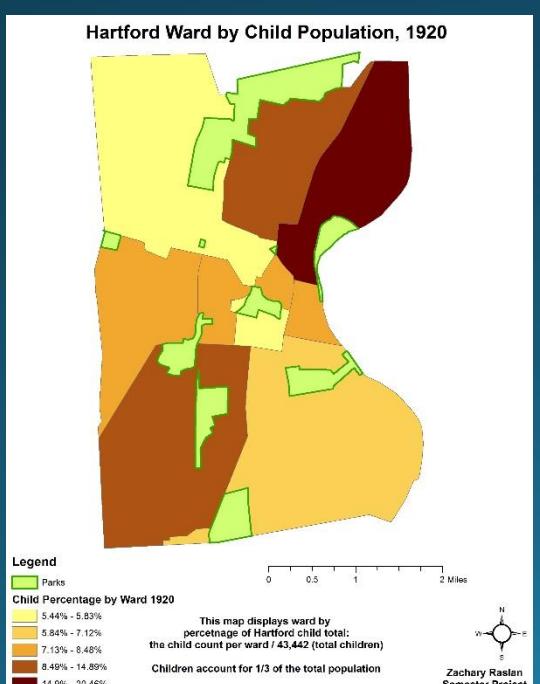
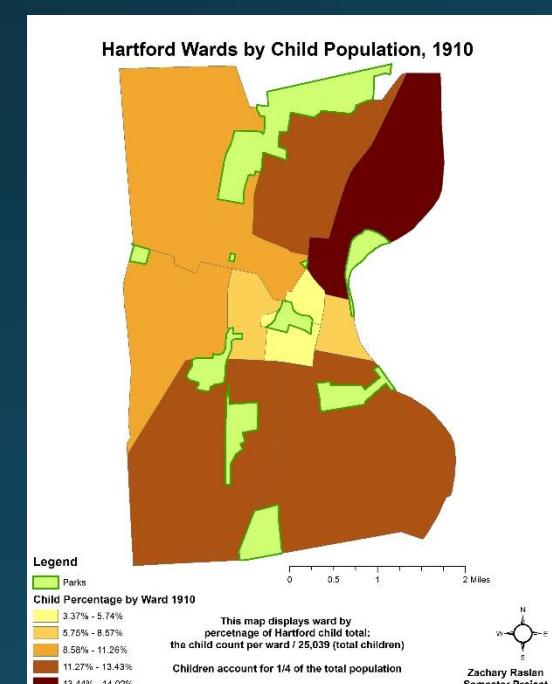
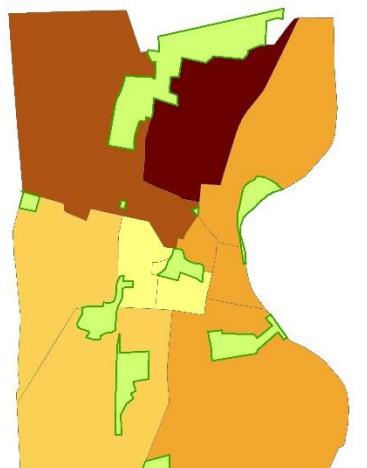
Hartford Ward by Child Population, 1920



Hartford Wards by Park Area

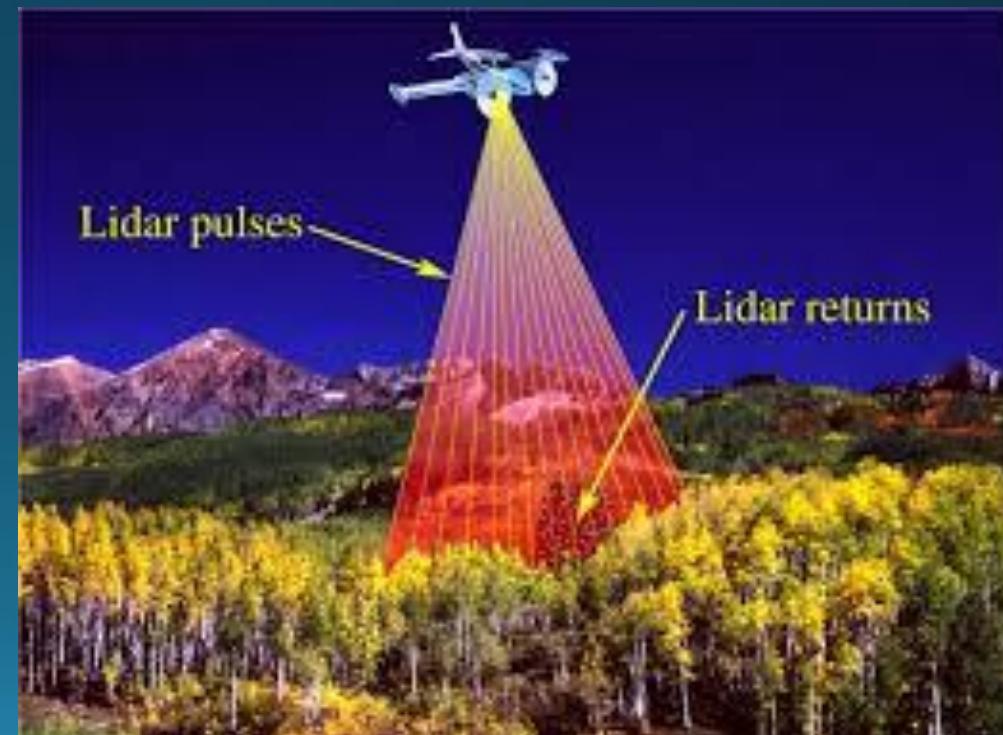


Hartford Wards by Black Population, 1910



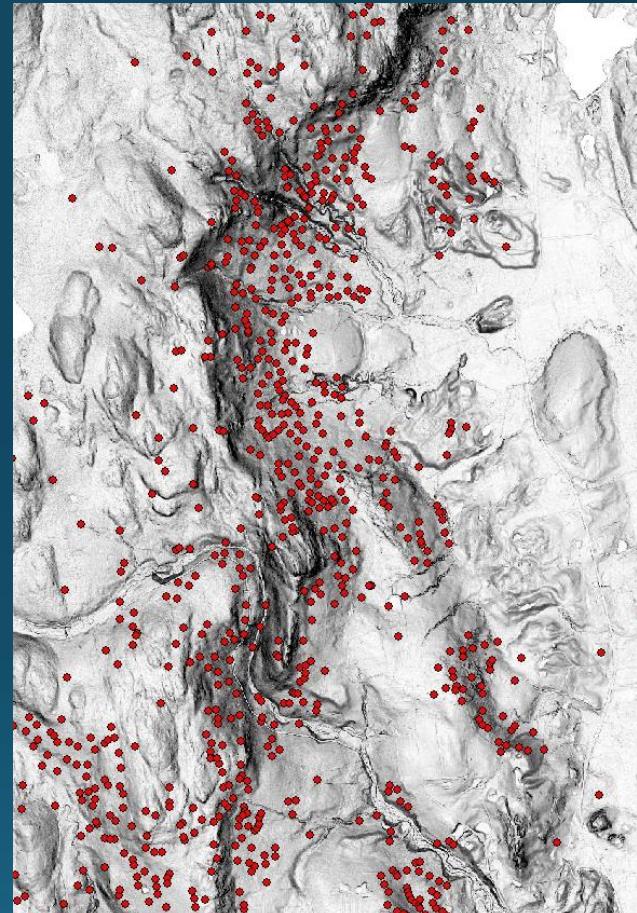
# Examples – Geomorphology and Earth Processes Research Team

- Geosciences research team
- Studying history, mechanics, and evolution of northwestern Connecticut landscape from 17<sup>th</sup>-20<sup>th</sup> centuries
- LiDAR (Light Detection and Ranging)
  - Spatial modeling
  - Digital Elevation Models
  - Identify key geographic features using GIS

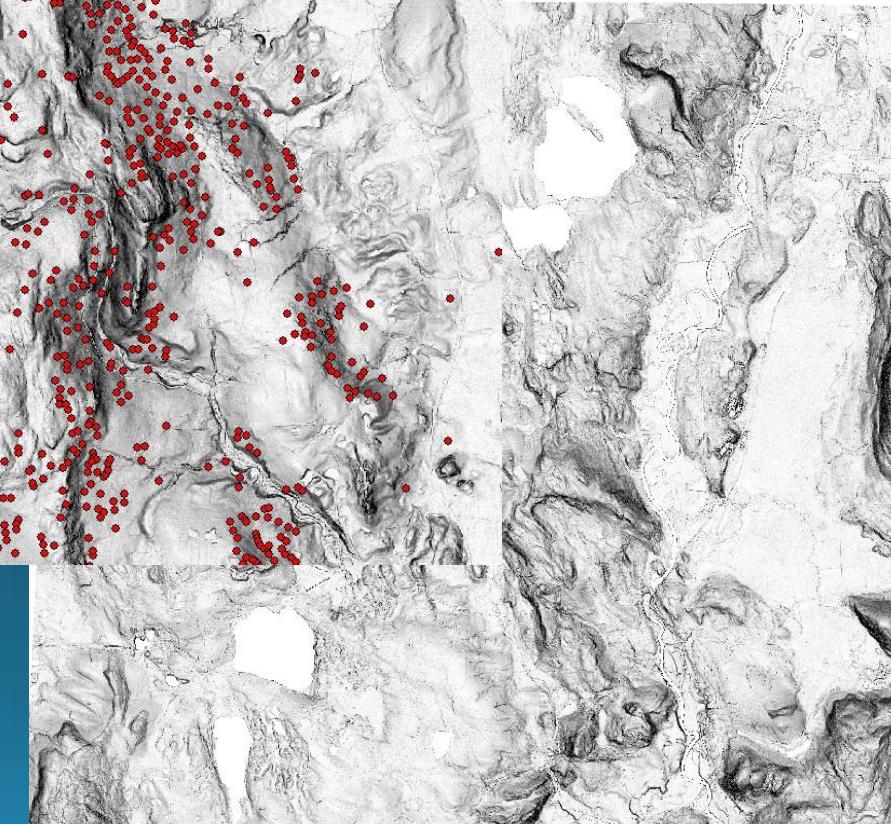


# (Geomorphology and Earth Processes Research Team)

- GIS to process LiDAR data
  - Hillshape, slope maps
- These models made charcoal hearths visible
- GIS to identify and map these features
- Used as standard in automation process

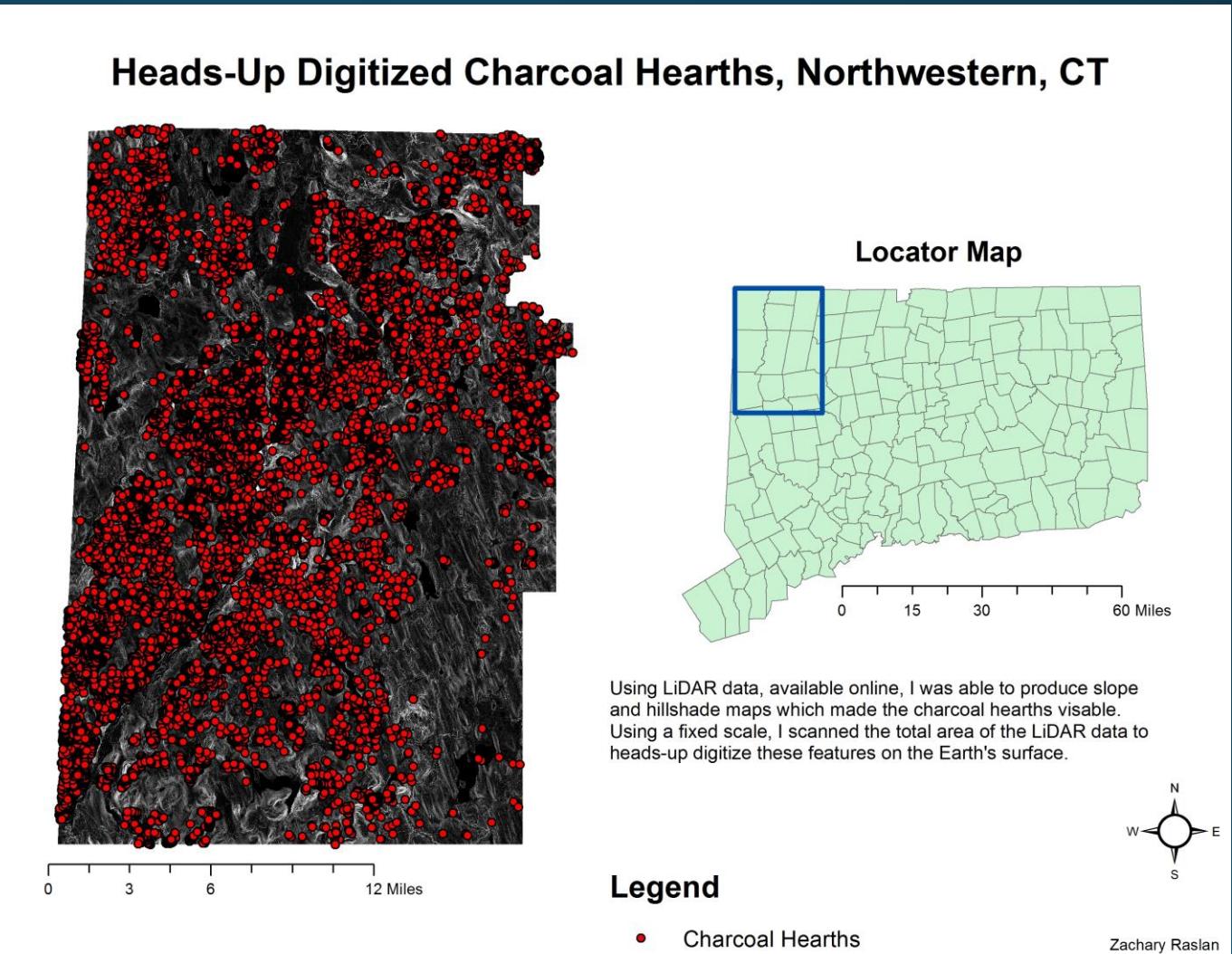


Hillshade Model



# (Geomorphology and Earth Processes Research Team)

- About 24,000 charcoal hearths were ID'd

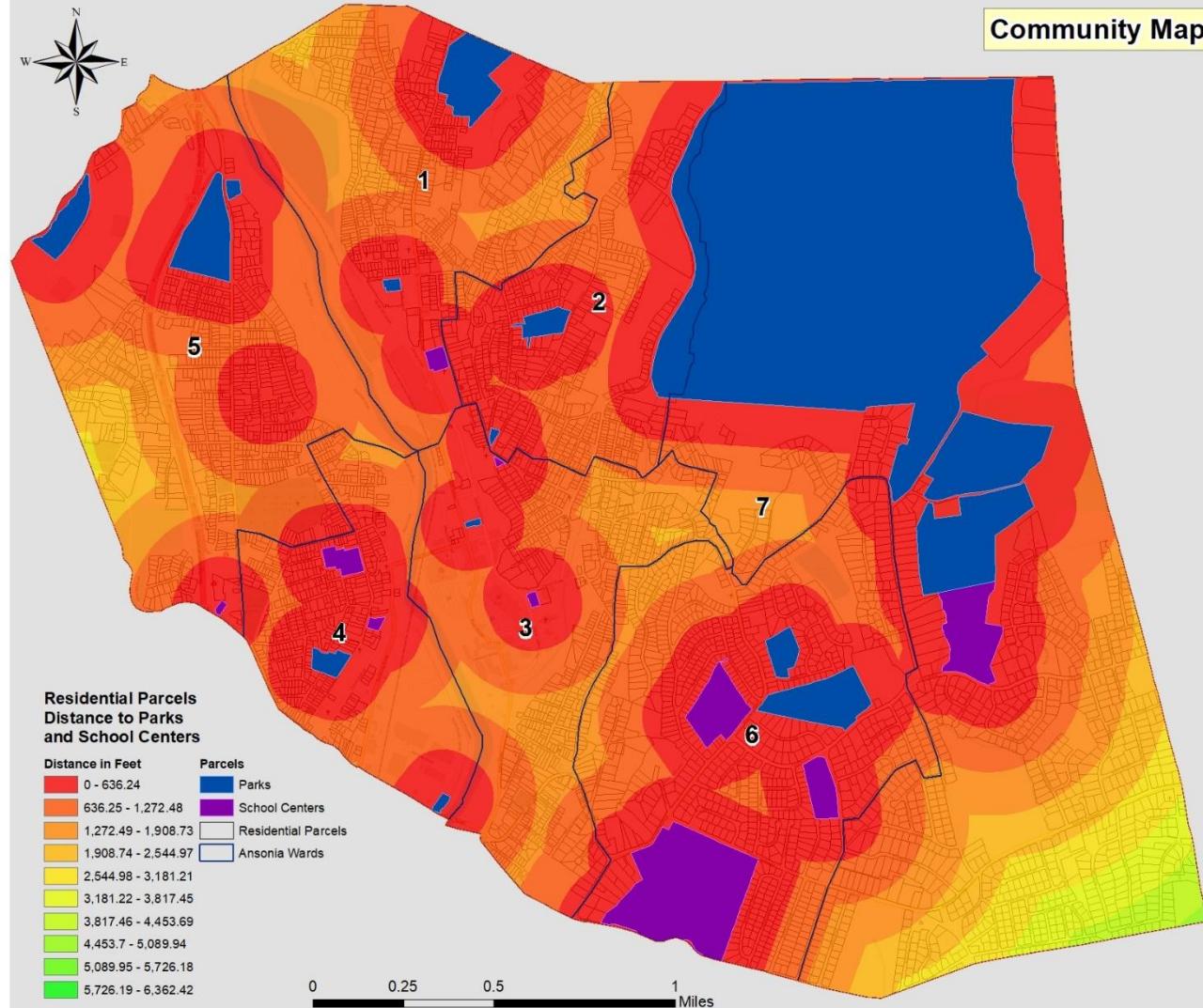


# (Geomorphology and Earth Processes Research Team)

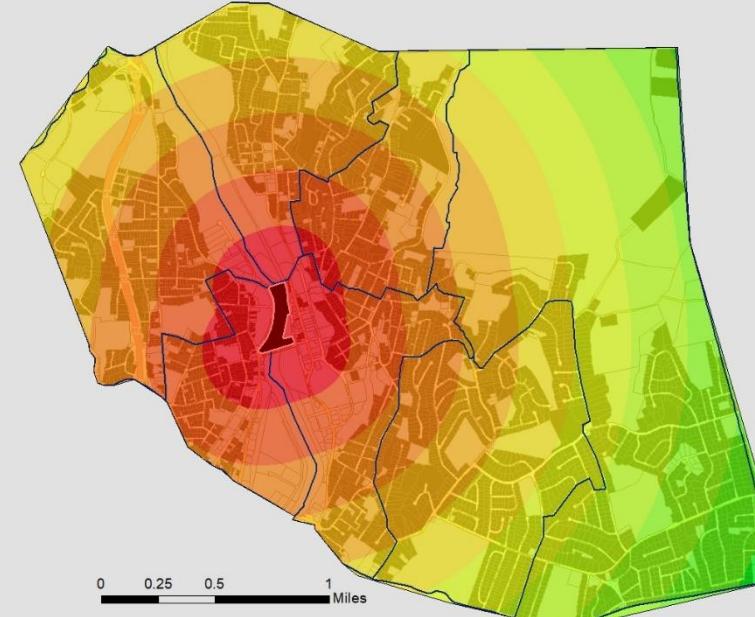
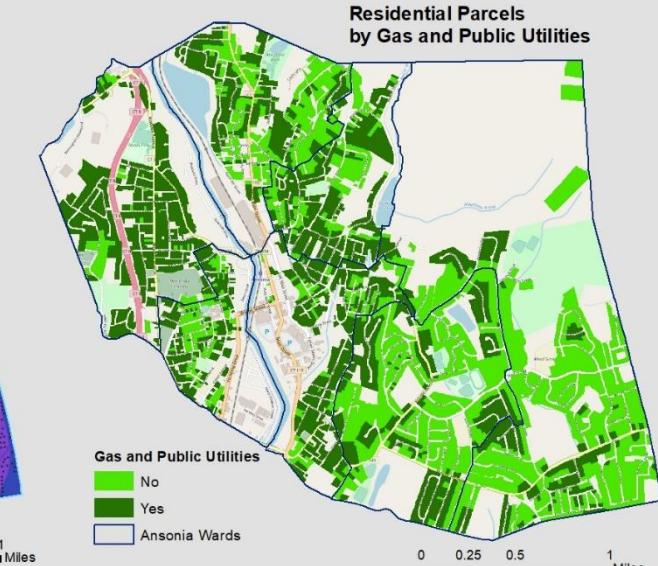
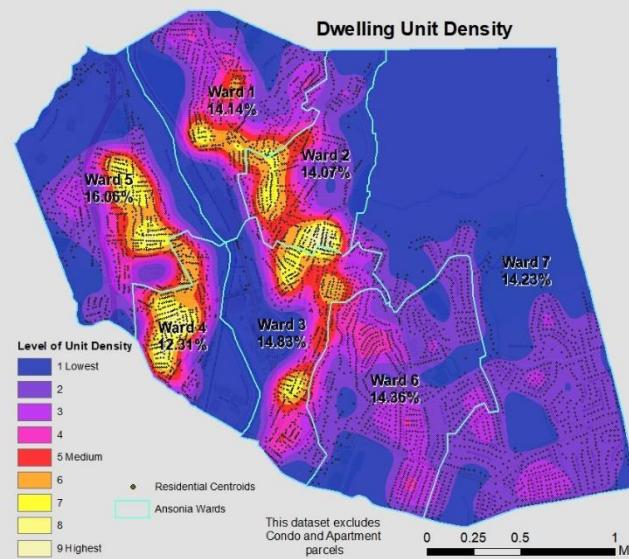
- npr [interview](#) of lead professor, William Ouimet
- Geological Society of America (GSA) [Conference presentation](#)

# Examples – Mayoral Campaign

- Ansonia, CT campaign for Mayor
- Progressive political campaign
- GIS to support policy research and platform
- Municipal data
  - Assessor's dataset on parcels and their attributes
  - Available for every municipality in US
- Canvassing and sign placement



## Community Maps of Ansonia, CT



### Residents of Ansonia have access to the Greater New York area via the rail system that connects New Jersey, New York, and Connecticut.

Adult Residents within 2,604 feet, or just under 0.50 miles, are considered walking distance to the train station.

24% of residential parcels (1,247 / 5,198) are within walking distance of the town's train station.

One trademark of a great town is a high level of walkability. For this analysis, 1,272.5 feet or just under 0.25 miles is considered walking distance. 79% of residential parcels (4,104 / 5,198) are within walking distance from either a park or school center.

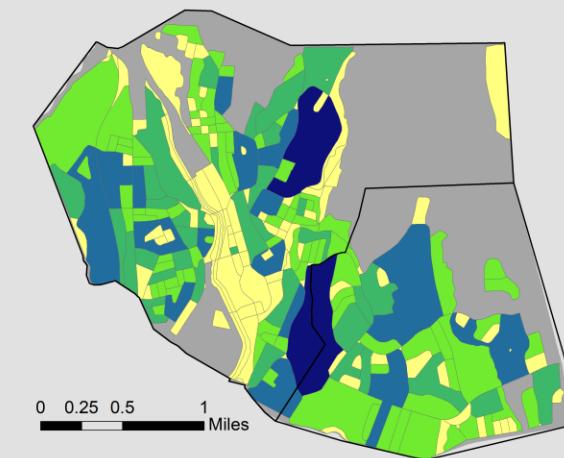
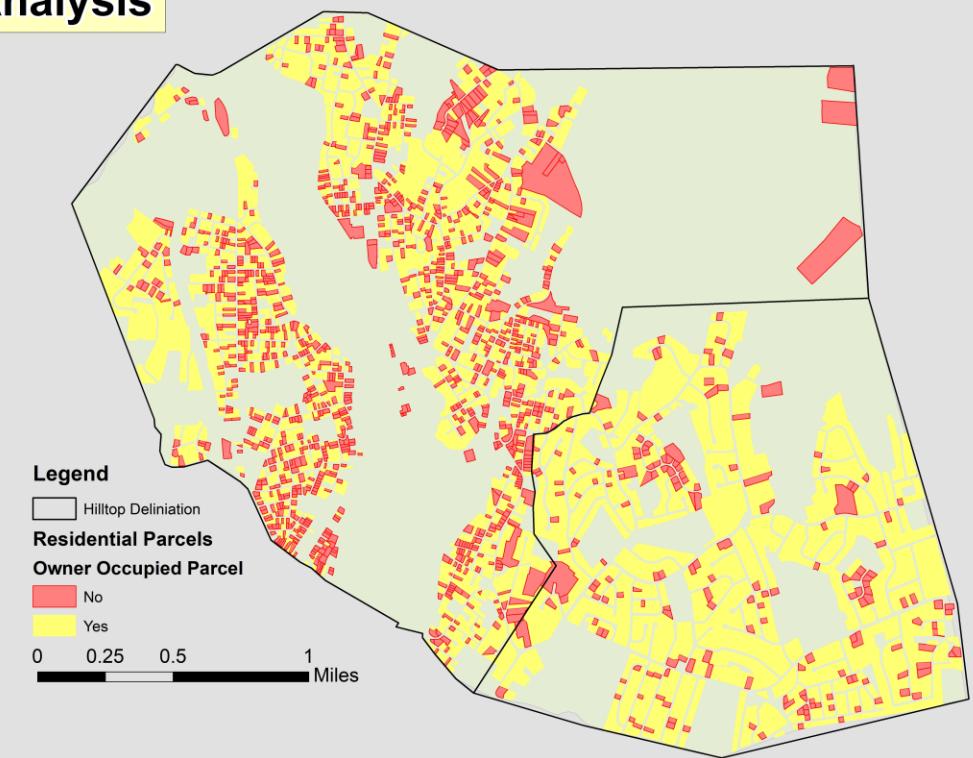
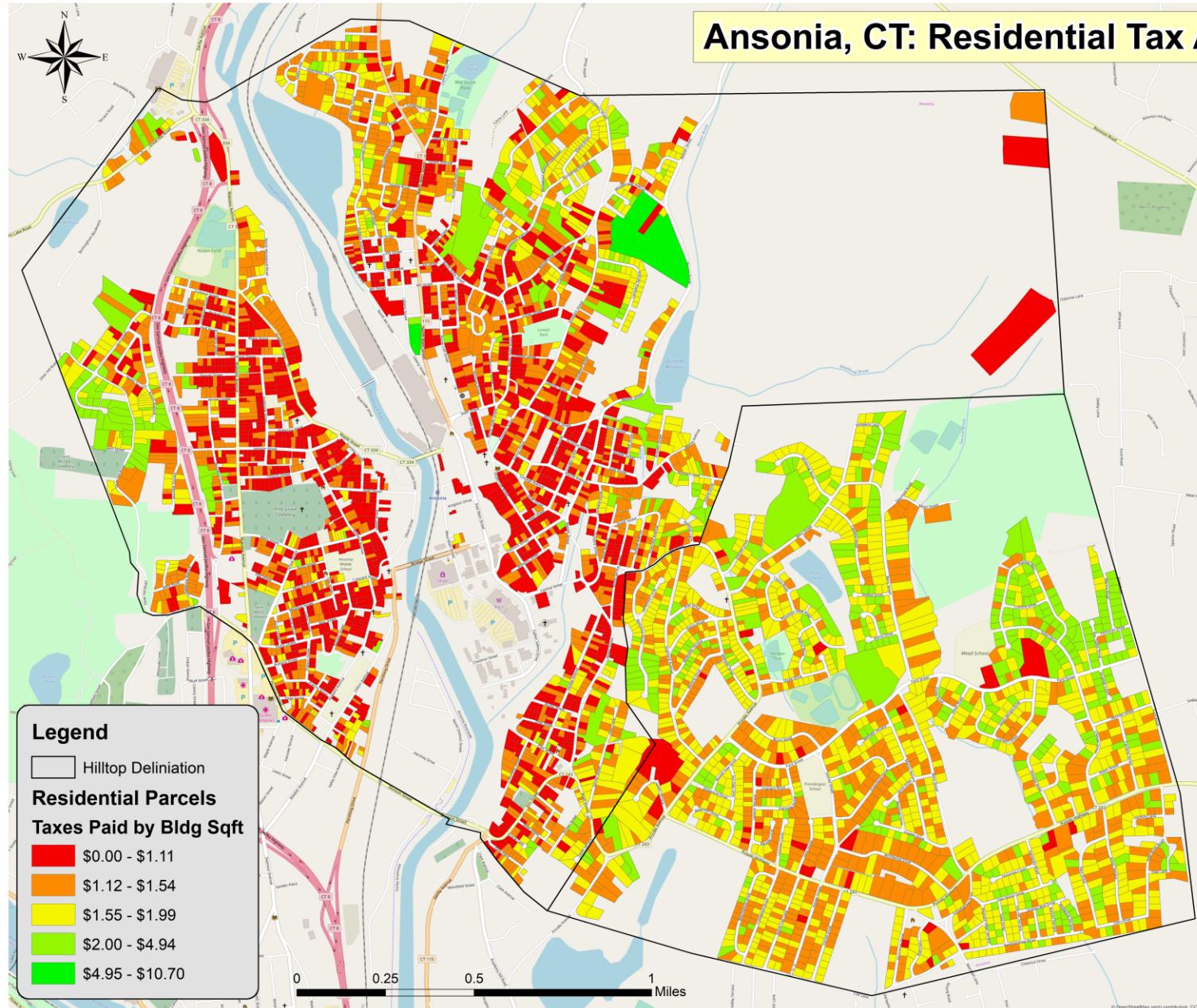
Although by these standards Ansonia could be considered walkable, 1,094 residential parcels (21%) are still outside a walkable radius of a school center or public park. This kind of geospatial modeling can help the community identify and plan for areas in need of future development.

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for Strategic Planning

Contact us:  
cliographica.raslan@gmail.com

# Ansonia, CT: Residential Tax Analysis



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Information Mapping  
for Strategic Planning

Contact us:  
[cliographica.raslan@gmail.com](mailto:cliographica.raslan@gmail.com)

# Data Sources

- Wesleyan University GIS – (not a repository)
  - <http://www.wesleyan.edu/gis/index.html>
- Map and Geographic Information Center, University of Connecticut
  - <http://magic.lib.uconn.edu/>
- National Historical GIS
  - <https://www.nhgis.org/>
- Census
  - <https://www.census.gov/>
- United States Geological Survey
  - <https://www.usgs.gov/>
- Municipal Government
- Critical Health and Social Ecology Lab digital repository?

# Resources to you

- As a Research Associate with the CHSE Lab
- GIS project planning
- Support/tutoring services for GIS projects
- Map design for presentation
- Support “CHSE Geospatial Data Repository”

# ArcGIS Demonstration...

- CHSE Lab Chicago Project