# GIS

*and related resources*

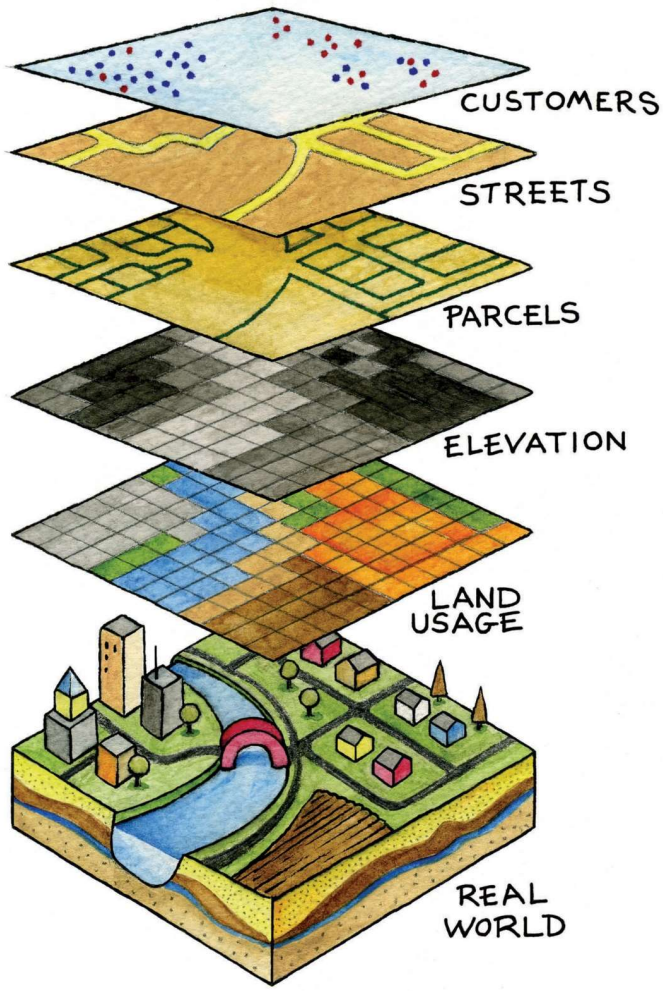
Rob Shepard, PhD  GIS Librarian @ University of Chicago

## Geographic Information Systems

### Geographic Information Science

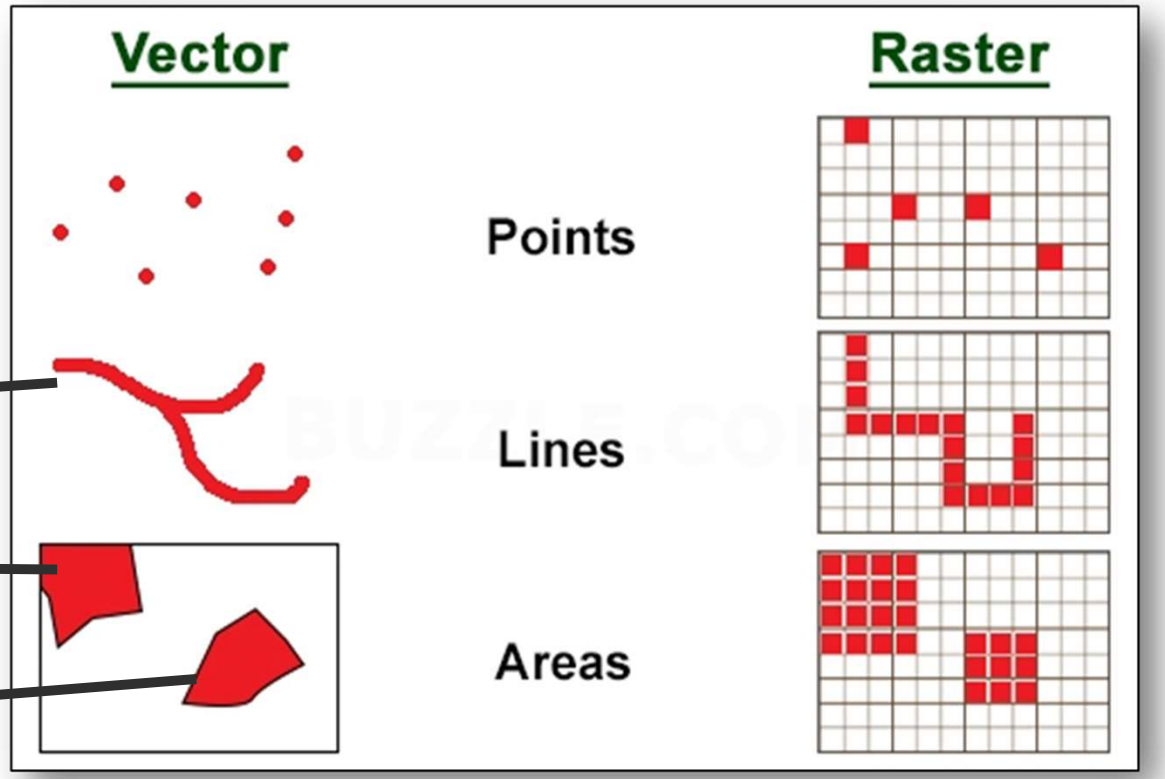
•Unique content management system that can store data by attaching layers of descriptive information to absolute location as well as to a database

• Among its unique benefits is the ability to relate otherwise disparate data sources on the basis of common geography, revealing patterns that are otherwise invisible



# GIS Data

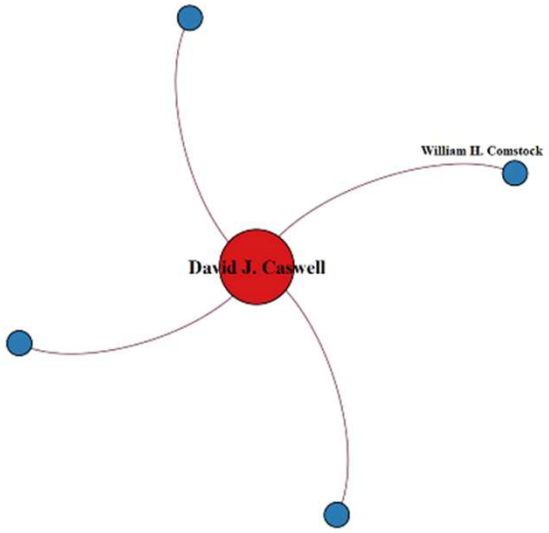
| Shape | quantity |
|---|---|
| 1 | 30 |
| 2 | 50 |
| 3 | 1,000 |

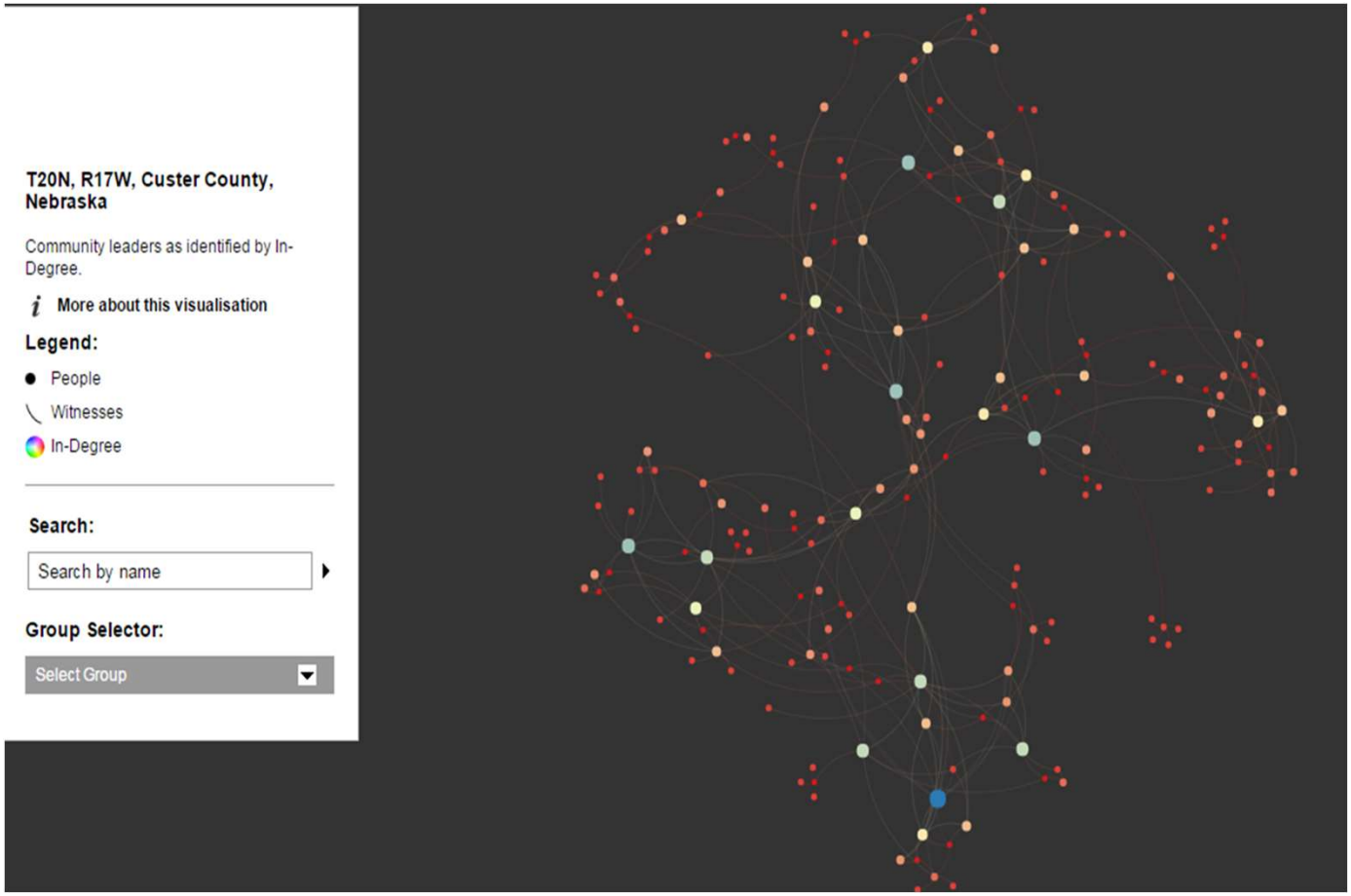


# Many technologies (not an exhaustive list)

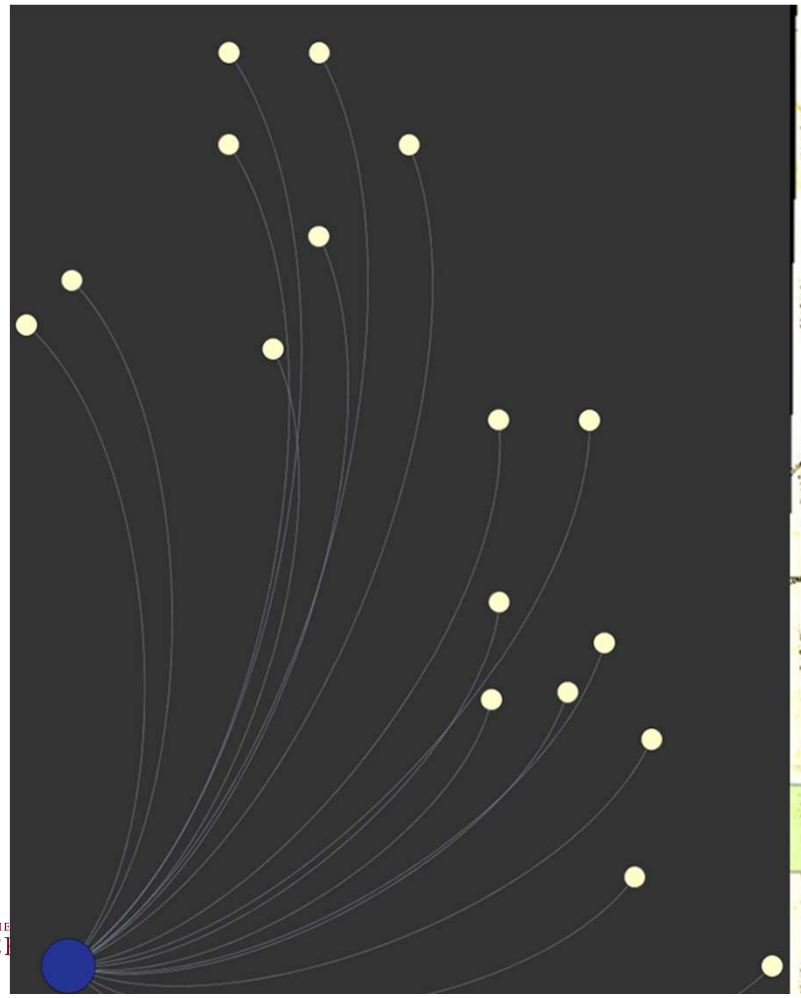
| Processing+ Tools | Visualization Tools |
|---|---|
| ***ArcGIS*** *Pro* | *Google Earth* |
| ***QGIS*** *& GRASS* | *JavaScript Applications* |
| ***GeoDa*** | *Neatline* |
| *Excel (yes)* | *Gephi* |
| *R* | *StoryMap JS* |
| … | … |

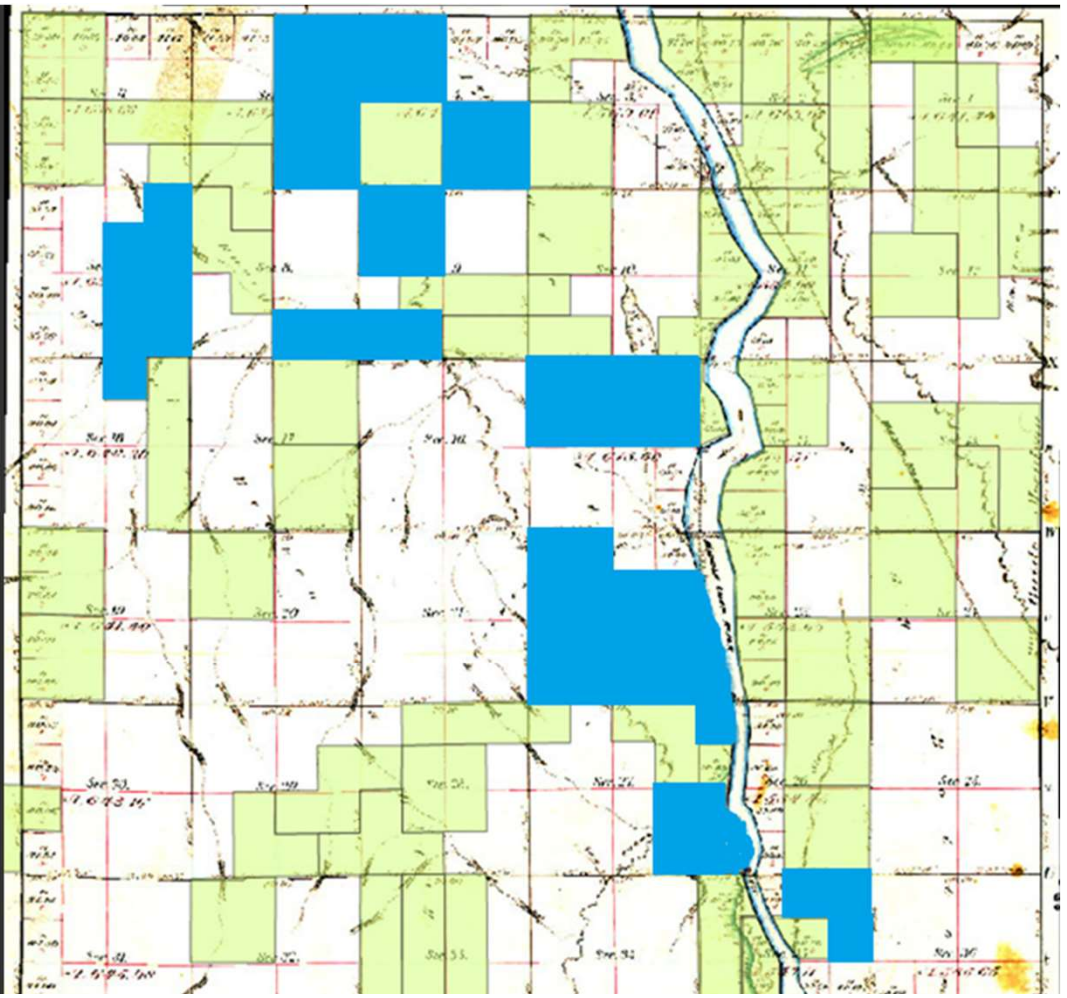
# Visualizing & Exploratory Data Analysis



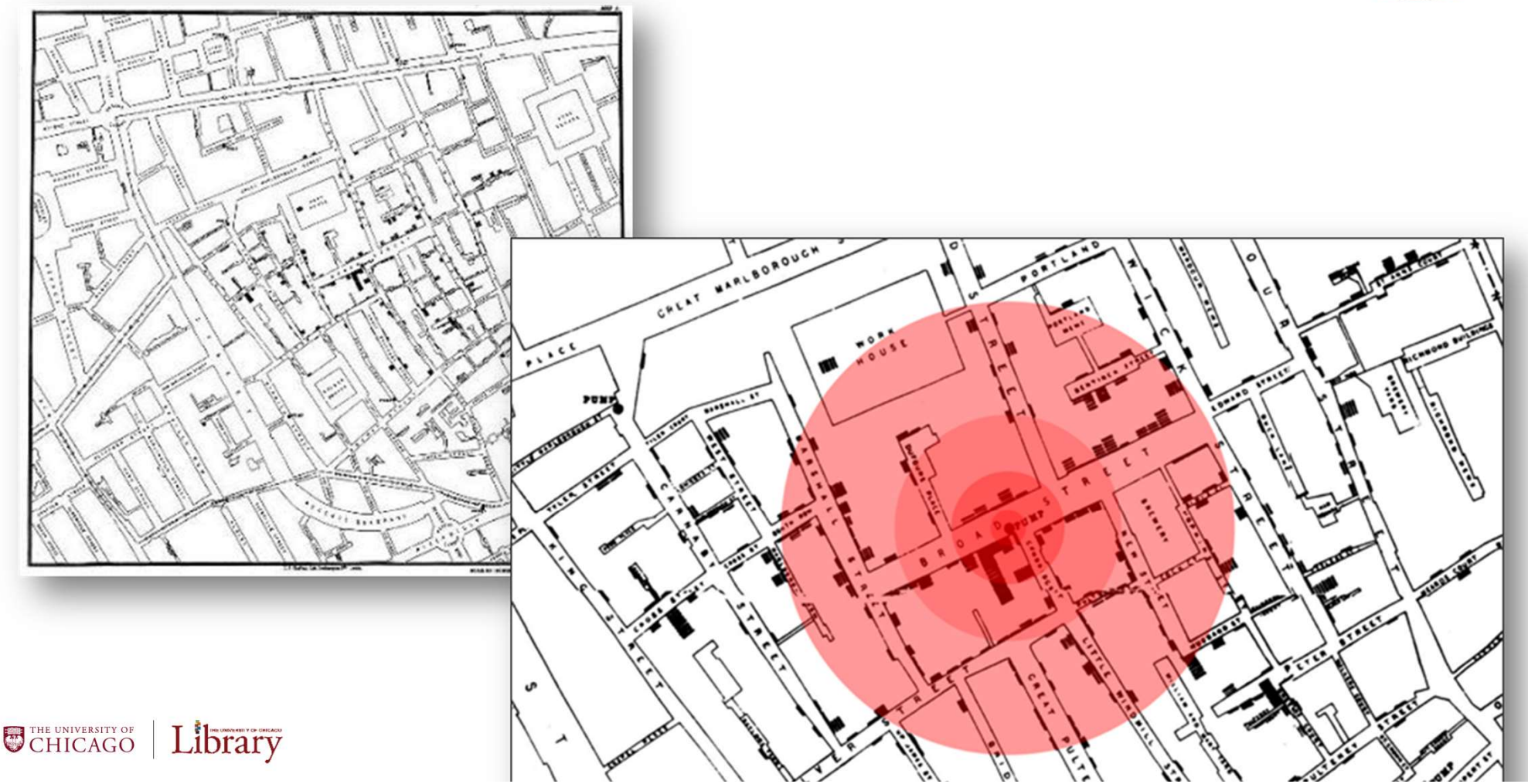



# Visualizing & Exploratory Data Analysis

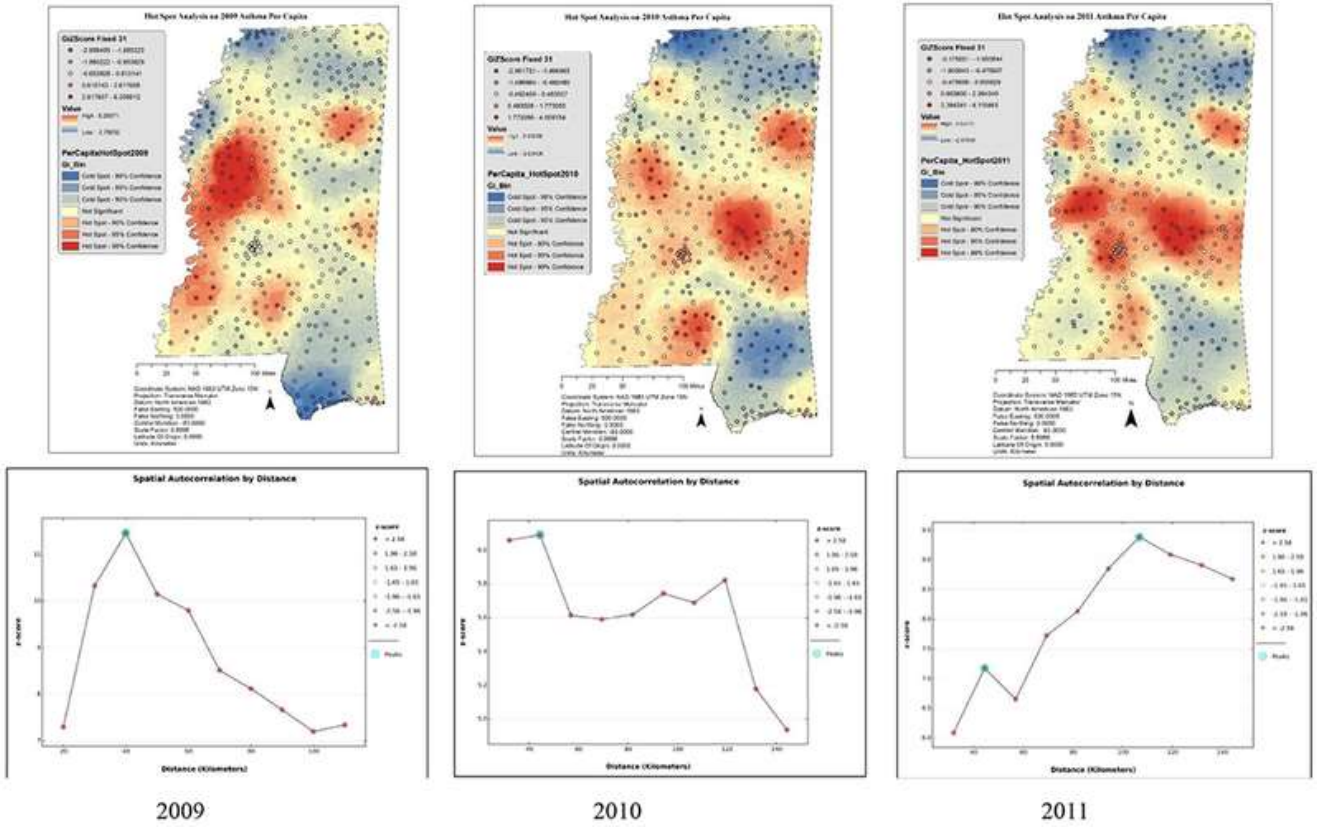




# Hotspot and Cluster Analyses

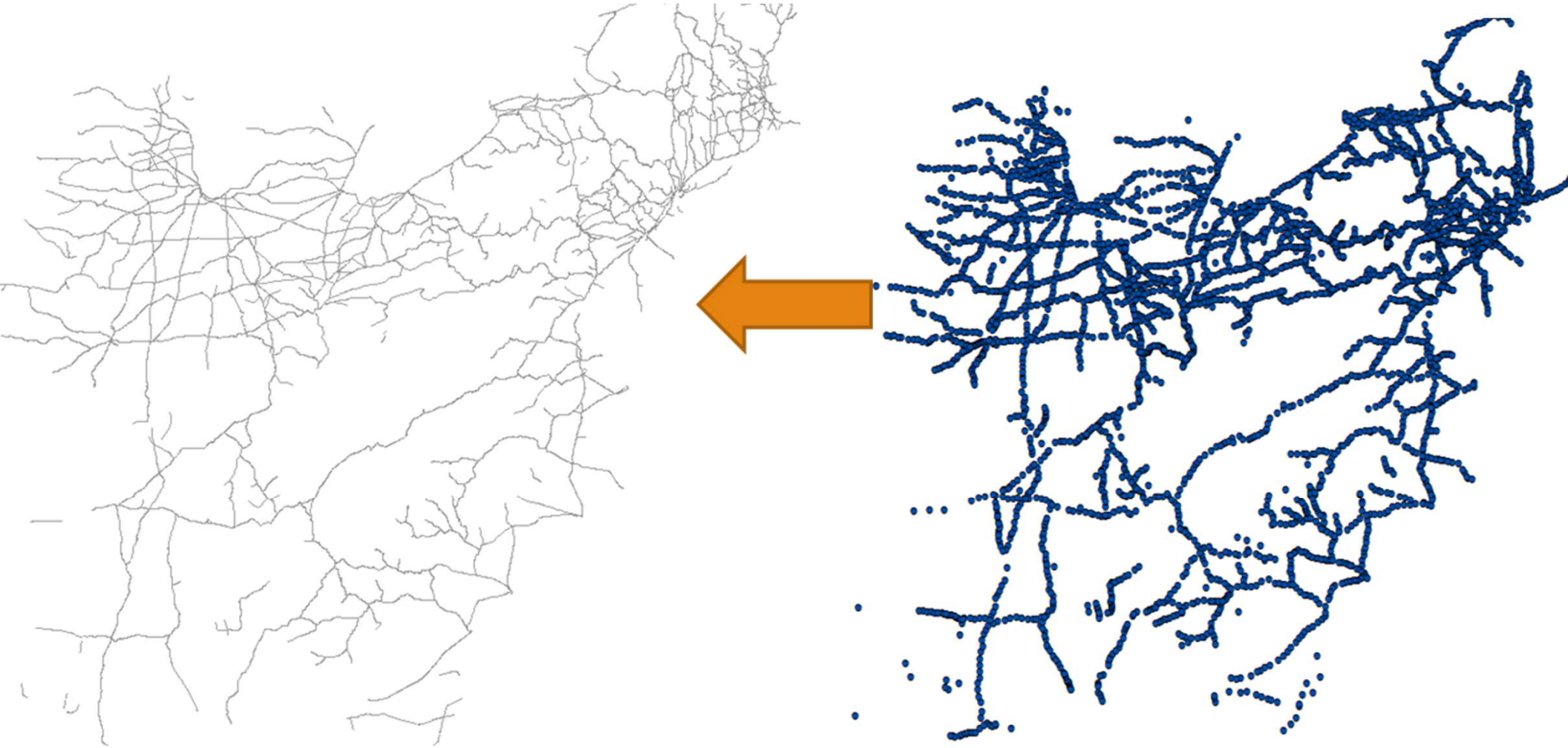


# Quantitative spatial analysis



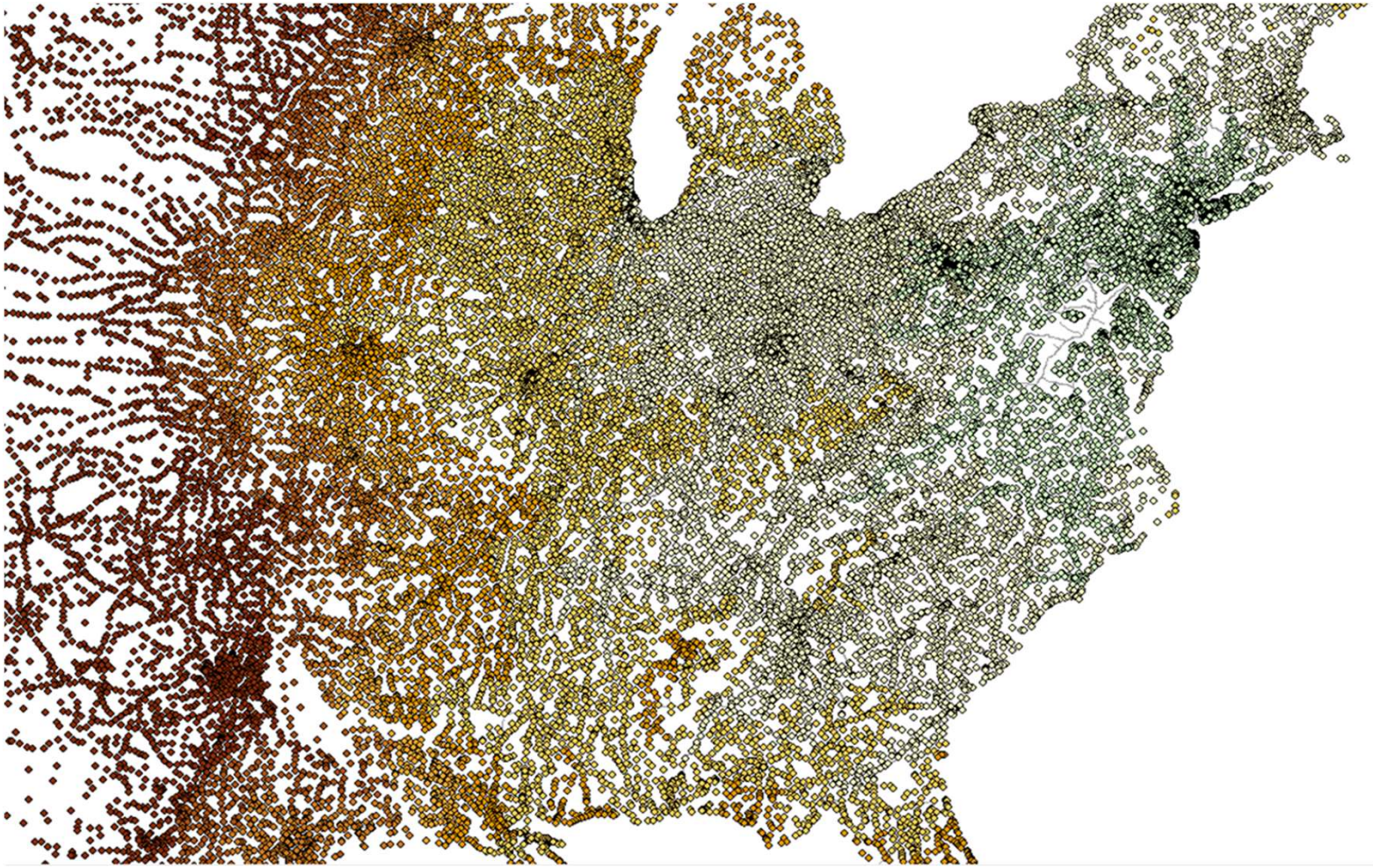

2009 2010 2011

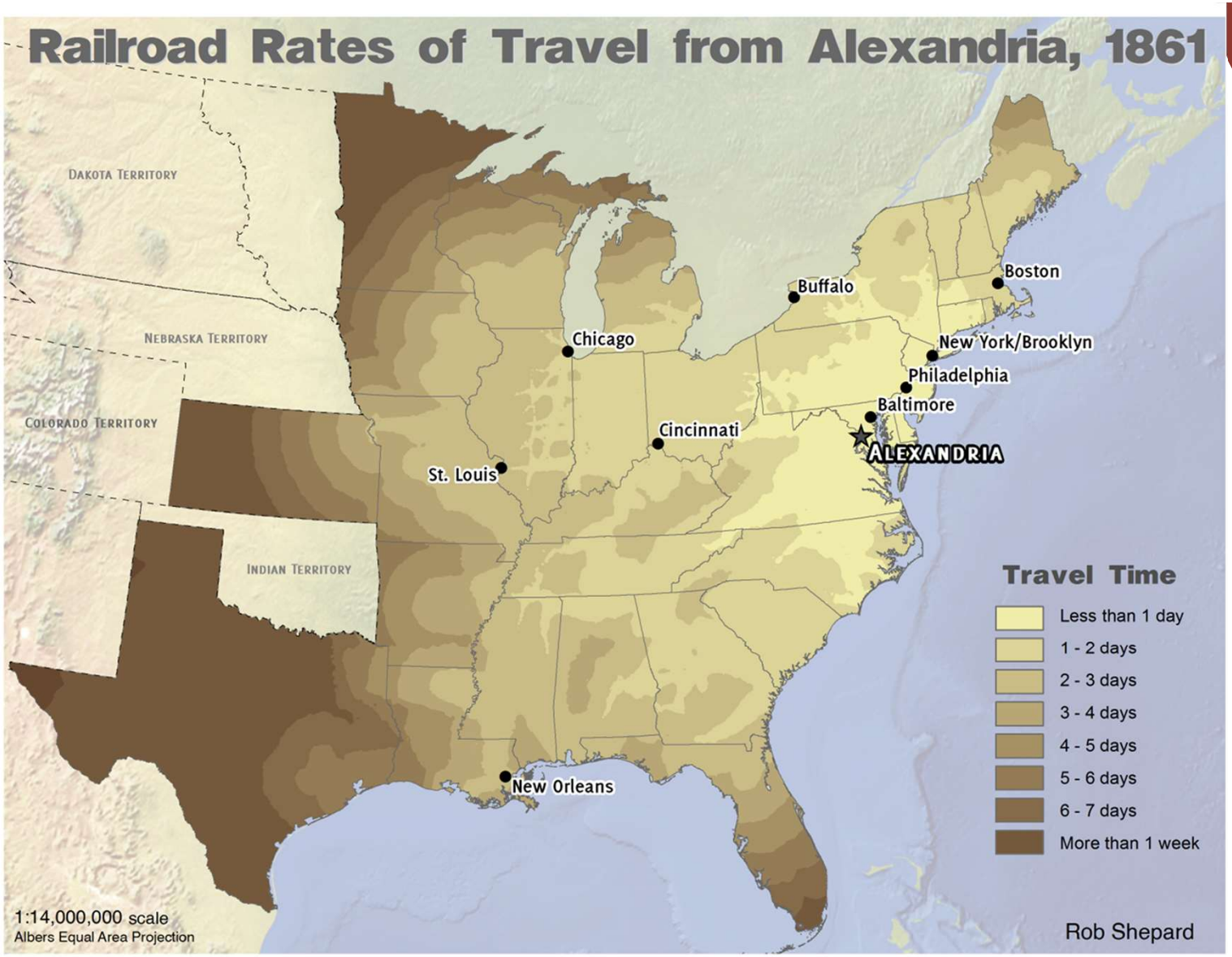
# Building and Analyzing Networks



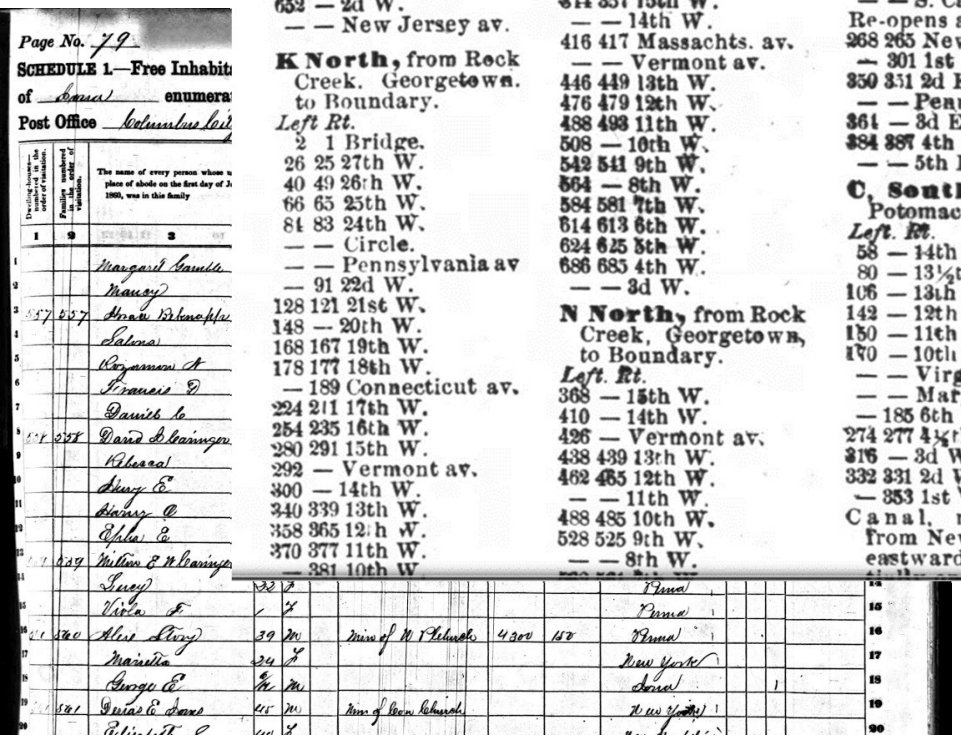
# Building and Analyzing Networks

# Building & Analyzing Networks




Railroad Rates of Travel from Alexandria, 1861
Dakota Territory
Nebraska Territory
Colorado Territory
Indian Territory
Buffalo
Boston
Chicago
New York/Brooklyn
Philadelphia
Baltimore
Cincinnati
ALEXANDRIA
St. Louis
New Orleans
Travel Time
Less than 1 day
1 - 2 days
2 - 3 days
3 - 4 days
4 - 5 days
5 - 6 days
6 - 7 days
More than 1 week
1:14,000,000 scale
Albers Equal Area Projection
Rob Shepard

# Synthesizing Sources...


Page No. 79
SCHEDULE 1.—Free Inhabit
of Ward enumera
Post Office Columbus Ohio

| Dwelling-houses numbered in the order of visitation. | Families numbered in the order of visitation. | The name of every person whose place of abode on the first day of J 1860, was in this family |
|---|---|---|
| 1 | 2 | 3 |
| | | Margaret Sands |
| | | Mary |
| 557 | 557 | Hiram Blanchfla |
| | | Salena |
| | | Benjamin A |
| | | Frances D |
| | | Daniels |
| 558 | 558 | David L Garinger |
| | | Rhesa |
| | | Henry E |
| | | Harry C |
| | | Ella E |
| 559 | 559 | Milton E M Garinge |
| | | Jerry |
| | | Vesta E |
| 560 | 560 | Alice Berg |
| | | Marietta |
| | | George E |
| 561 | 561 | Orrin C Sons |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | 32 | F | | | | Penna | |
| | 1 | M | | | | Penna | |
| 560 | 39 | M | Mine of M Schmidt | 4300 | 150 | Penna | |
| | 24 | F | | | | New York | |
| | 4 | M | | | | Penna | 1 |
| 561 | 45 | M | Mine of Orrin Schmidt | | | New York | 1 |

WASHINGTON STREET DIRECTORY.

496 493 7th W.
526 531 6th W.
— — Massachts. av.
528 555 5th W.
604 605 4th W.
622 — 3d W.
652 — 2d W.
— — New Jersey av.

**K North**, from Rock Creek. Georgetown. to Boundary.
*Left Rt.*
2 1 Bridge.
26 25 27th W.
40 49 26th W.
66 65 25th W.
84 83 24th W.
— — Circle.
— — Pennsylvania av
— 91 22d W.
128 121 21st W.
148 — 20th W.
168 167 19th W.
178 177 18th W.
— 189 Connecticut av.
224 211 17th W.
254 235 16th W.
280 291 15th W.
292 — Vermont av.
300 — 14th W.
340 339 13th W.
358 365 12th W.
370 377 11th W.
— 381 10th W.

204 195 19th W.
— — 18th W.
— — Connecticut av.
— — 17th W.
Creek, not open.
314 327 16th W.
344 357 15th W.
— — 14th W.
416 417 Massachts. av.
— — Vermont av.
446 449 13th W.
476 479 12th W.
488 493 11th W.
508 — 10th W.
542 541 9th W.
564 — 8th W.
584 581 7th W.
614 613 6th W.
624 625 5th W.
686 685 4th W.
— — 3d W.

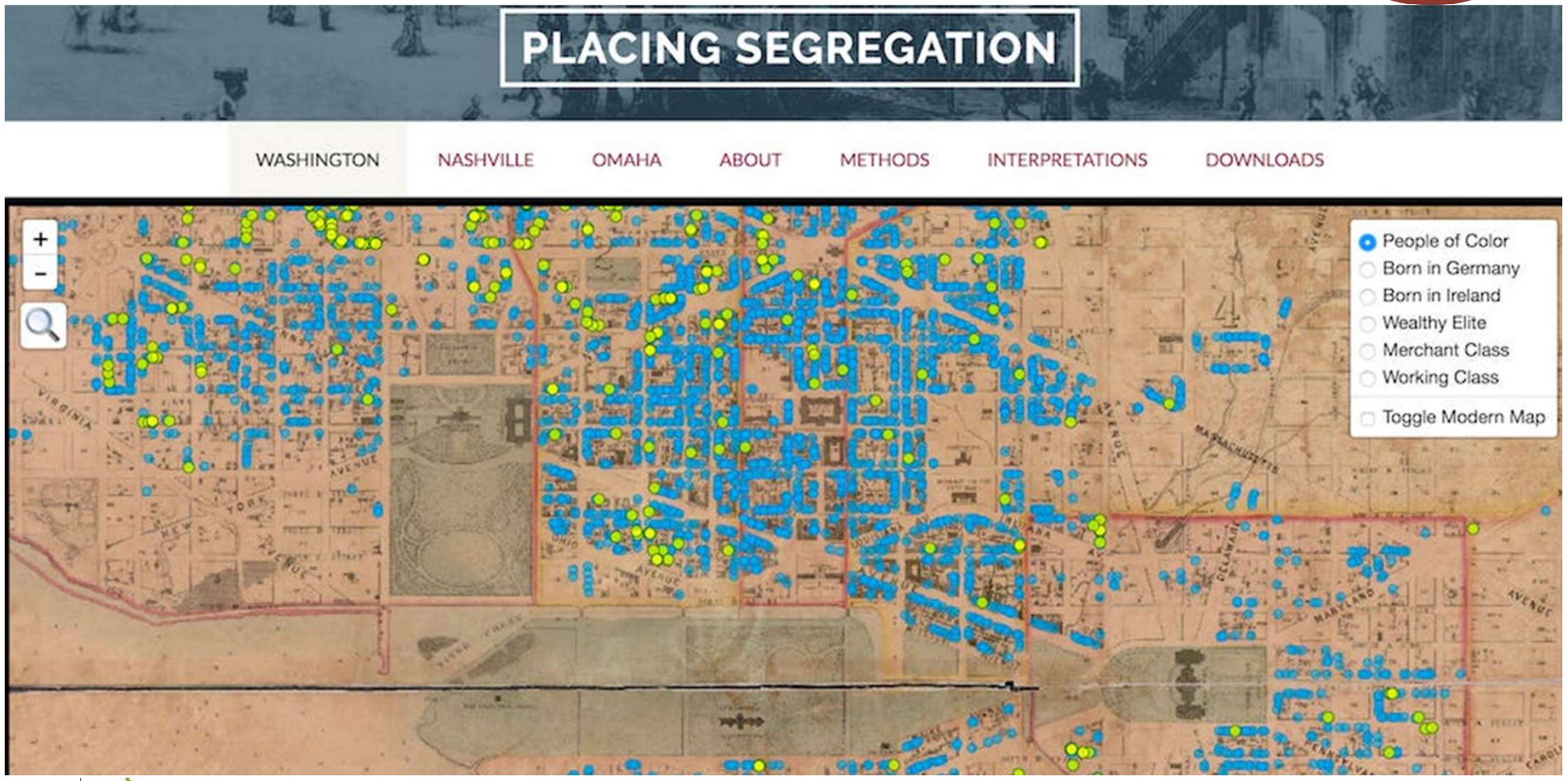
**N North**, from Rock Creek, Georgetown, to Boundary.
*Left Rt.*
368 — 15th W.
410 — 14th W.
426 — Vermont av.
438 439 13th W.
462 465 12th W.
— — 11th W.
488 485 10th W.
528 525 9th W.
— — 8th W.

— — 8th W.
— 215 7th W.
— 257 6th W.
Re-opens at
208 — 2d W.
242 239 1st W.
— — S. Capitol.
Re-opens at
268 265 New Jersey av.
— 301 1st E.
350 351 2d E.
— — Pennsylvania av
364 — 3d E.
384 387 4th E.
— — 5th E.

**C, South**, from the Potomac to 19th East.
*Left Rt.*
58 — 14th W.
80 — 13½th W.
106 — 13th W.
142 — 12th W.
150 — 11th W.
170 — 10th W.
— — Virginia av.
— — Maryland av.
— 185 6th W.
274 277 4½th W.
316 — 3d W.
332 331 2d W.
— 353 1st W.
Canal, no Bridge, from New Jersey av. eastward. But par-


teenth.
Dellone Frederick, carpenter, res 565 Thirteenth.
Delor S A, barber and Wigmaker, 491 Eleventh.
DeMary C S, (C T Whitmore & Co) res e s Twelfth bet Howard and Jackson.
Deming James, stableman, M Hunt, bds Douglas House.
Demorest George B, (Demorest & Phelps) res 295 Howard.
Demorest Peter A, farmer, res s s Capitol av bet Ninth and

# ...to answer social questions



# GIS Data Resources

# Common GIS Data Resources

**U.S. T.I.G.E.R. file (*census.gov/cgi-bin/geo/shapefiles*)**


United States Census Bureau

## TIGER/Line® Shapefiles

Select the year and layer you are interested in from the dropdown menus below and click "Submit" for a list of the available geographic areas.

Access our FTP site for additional downloading options

Select year 2023

Select a layer type Roads

- Consolidated Cities
- Core Based Statistical Areas
- Counties (and equivalent)
- County Subdivisions
- International Boundary
- Estate
- Places
- Public Use Microdata Areas
- School Districts
- School District Administrative Areas (SDADM)
- States (and equivalent)
- State Legislative Districts
- Subbarrio (SubMinor Civil Division)
- Urban Areas
- ZIP Code Tabulation Areas
- **Features**
- All Lines
- Coastline

ource: US Census Bureau,

CONNECT

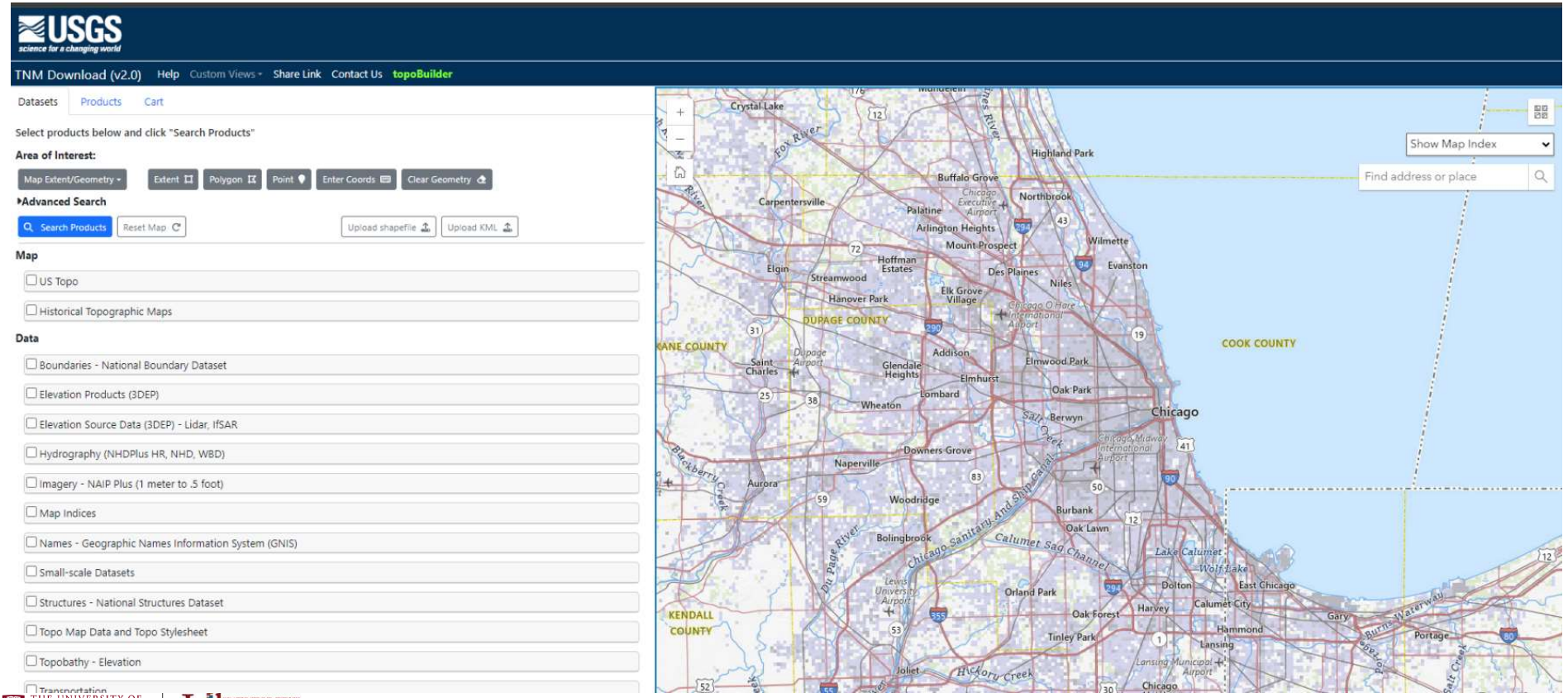
Informatio ction and Privacy Policy | Accessibility | FOIA | Inspector General | No FEAR Act | U.S.

Measuring

THE UNIVERSITY OF CHICAGO | Library

# Common GIS Data Resources

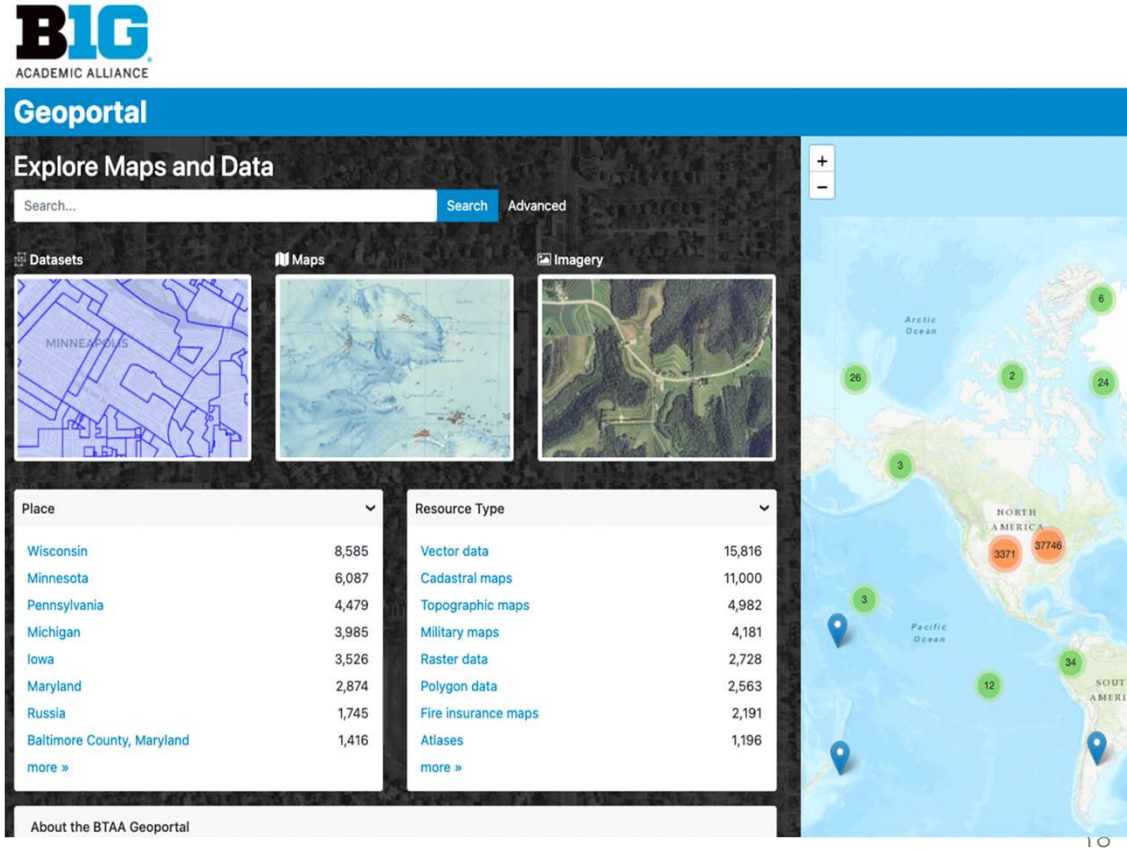
## The National Map (*nationalmap.gov*)



# Overlooked GIS Data Resources

## Big Ten Academic Alliance Geoportal (*geo.btaa.org*)

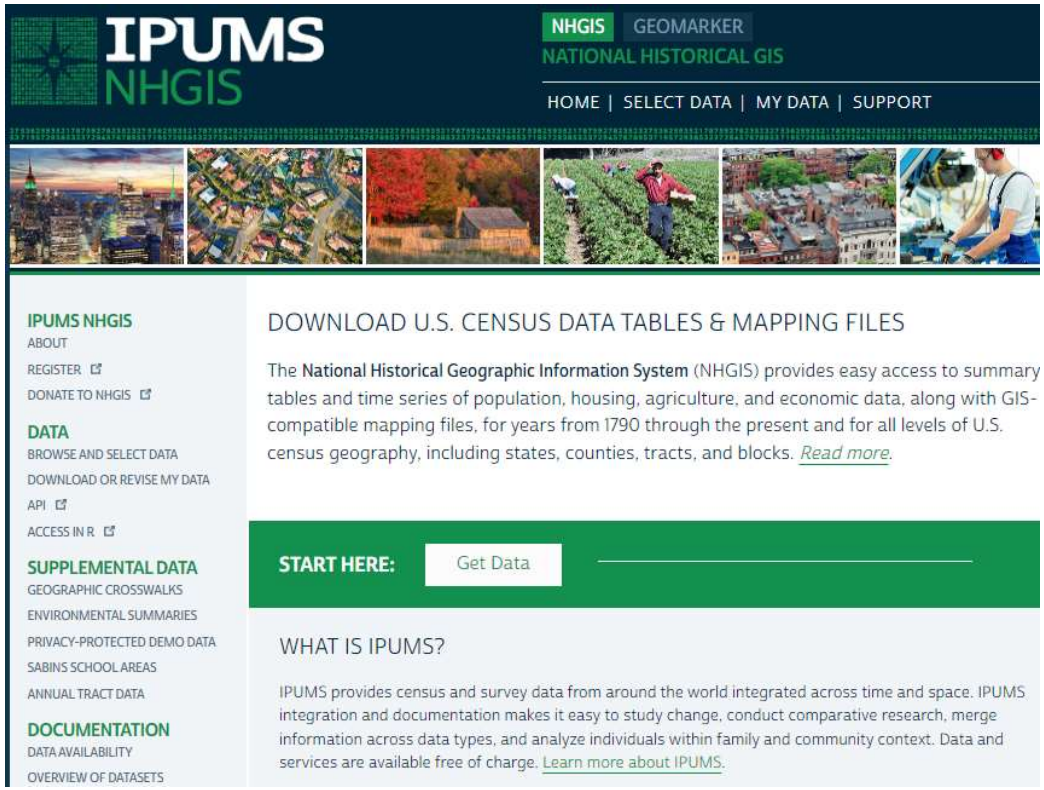
- 97,662 unique datasets in BTAA geoportal
  - GIS data, web map services,
- Includes 38,874 scanned/digitized maps, many are georeferenced
- Thousands of records for Illinois/Chicago
  - Everything from UChicago CAMEL!



# Overlooked GIS Resources

## Historical Geographic Information System (*nhgis.org*)

- Population
  - Time-series versions
- Agriculture
- Business & Economy
- Housing Details

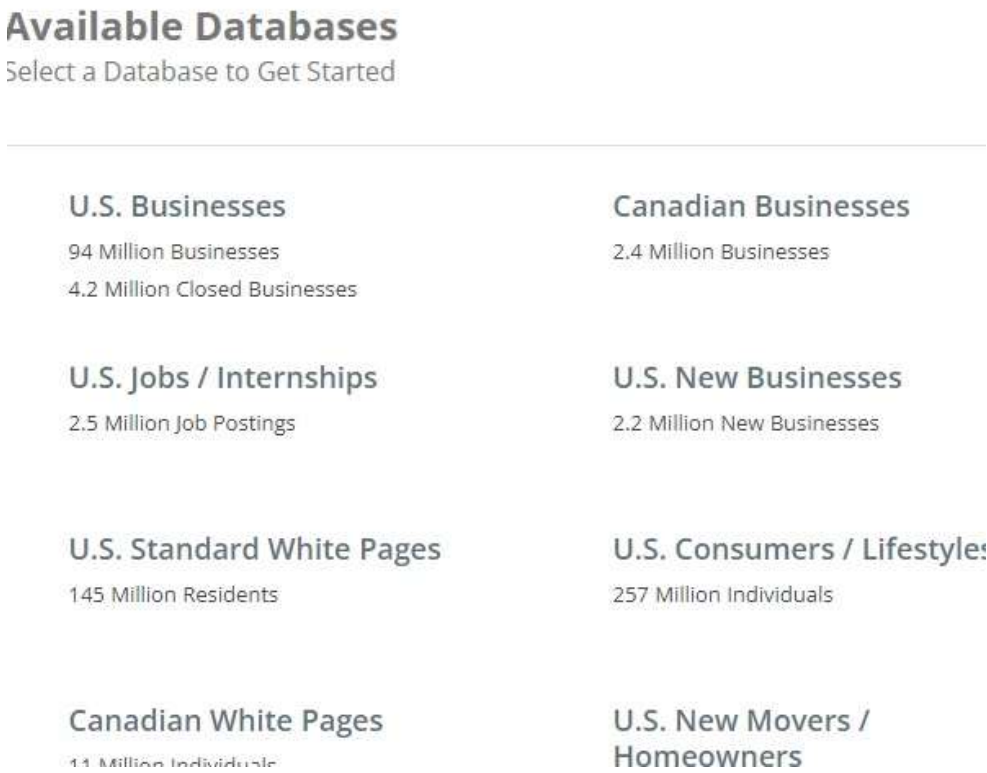


# Overlooked GIS Resources

## Data Axle Reference Solutions*

- **Business information**
  - Current and historic
  - Number of employees
  - Sales
  - Owner demographics
  - Size
  - Latitude/longitude

- **Filtering and custom downloads**



# Overlooked GIS Resources

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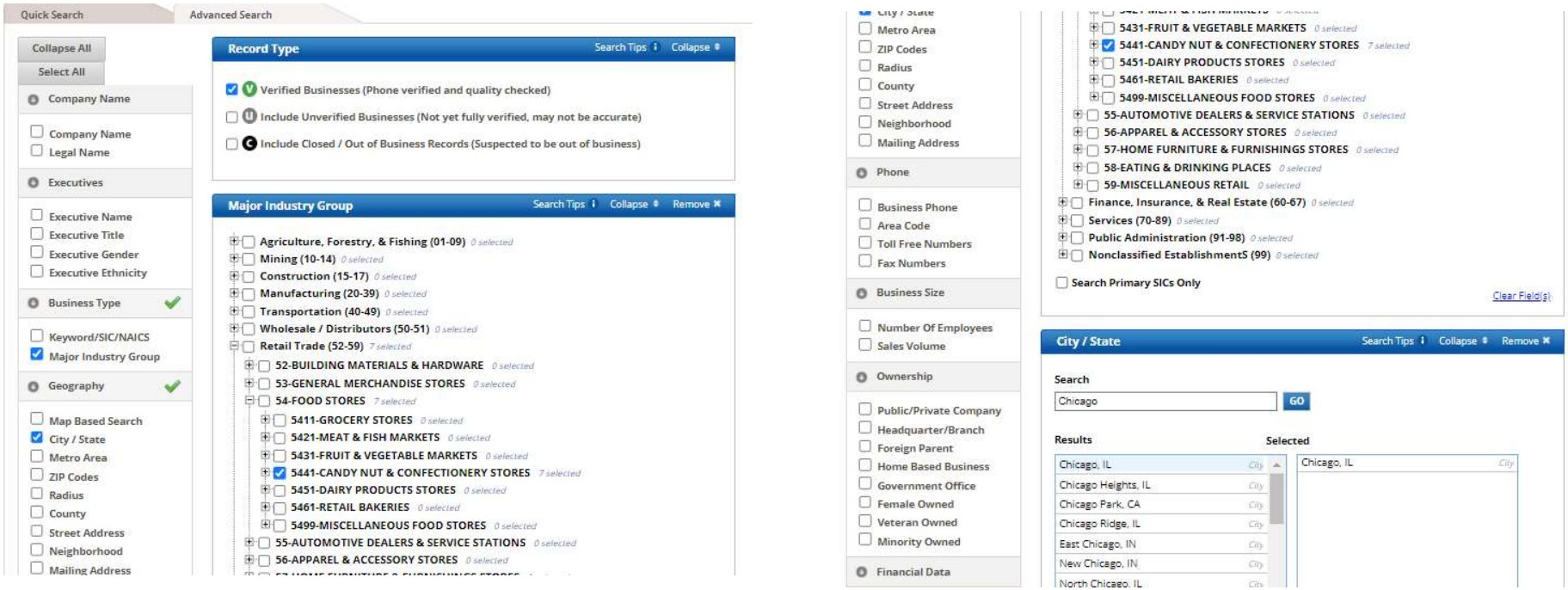


# Overlooked GIS Resources

Data Axle Reference Solutions

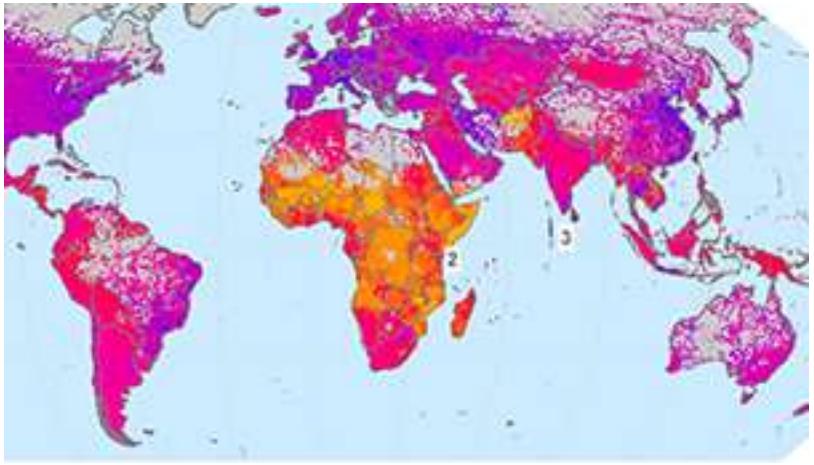
- Restricted UChicago Library site has ALL data, 1997-2021

**www.lib.uchicago.edu/restricted/db/infogroup-historical-datafile**

# Underused datasets…

## NASA's Socioeconomic Data and Applications Center (*https://sedac.ciesin.columbia.edu*)

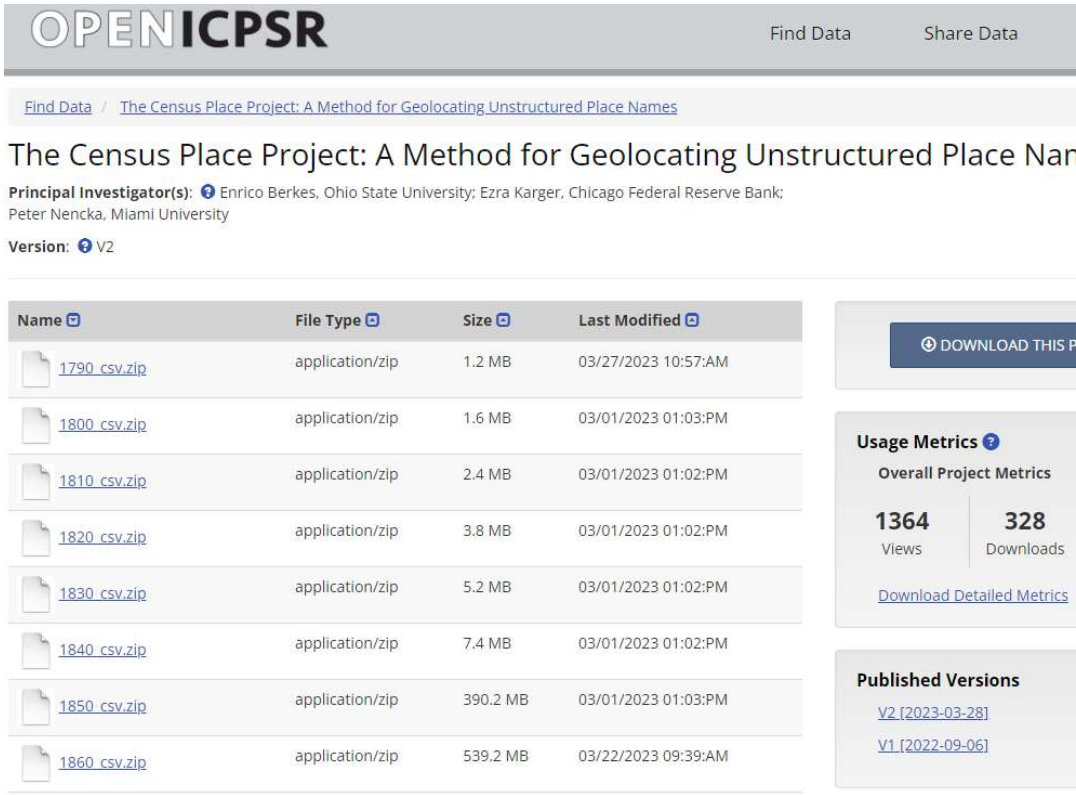
- Gridded Population Data
  - 30 arc-seconds (~1km at equator, less at higher latitudes)
  - 2005, 2010, 2015, 2020
- Digital Elevation Models
- Climate Risk and Vulnerability
- Food Insecurity
- Poverty



# Overlooked GIS datasets

## Census Place Project

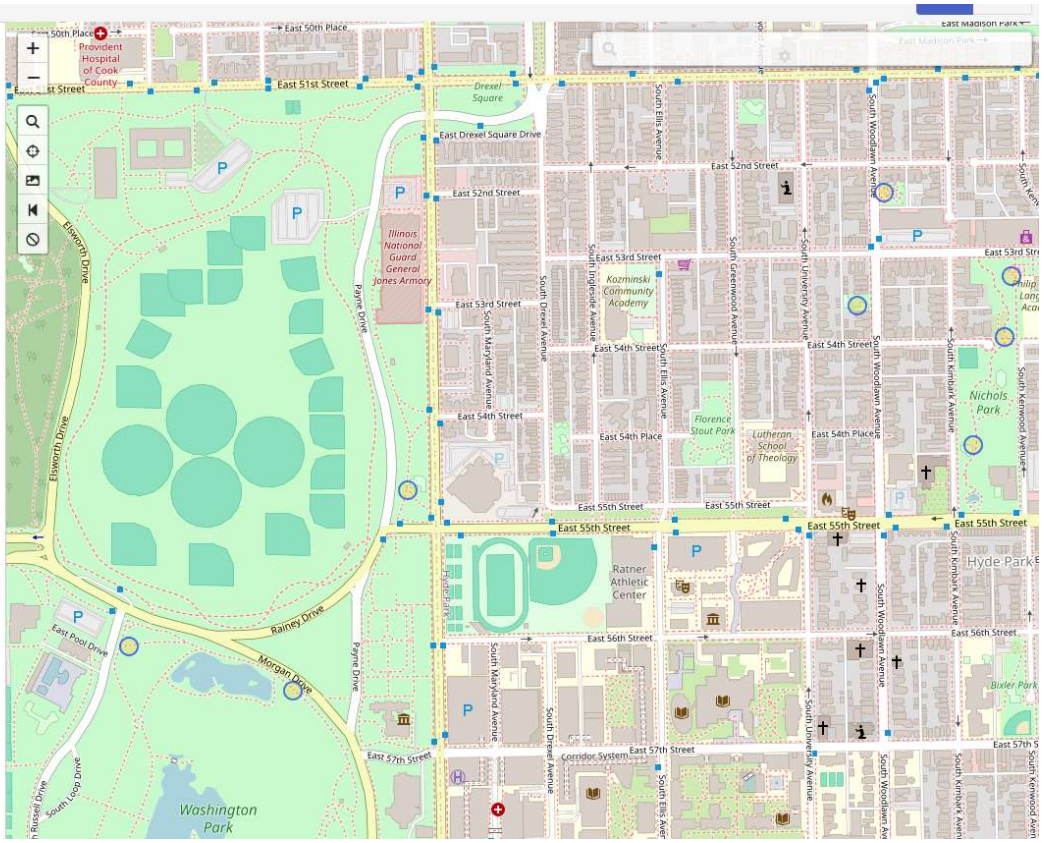
- linking individuals and households to consistently-defined place names, longitude-latitude, counties, states.
- we geocode an average of 83% of the individuals and households in 1790--1940 census microdata,
  - compared to 23% in conventional crosswalks.
- In years with individual-level microdata (1850--1940), average match rate is 94% relative to 33% in widely-used crosswalks.



# Overlooked GIS Data Resources

## OpenStreetMap/Overpass API (*overpass-turbo.eu*)

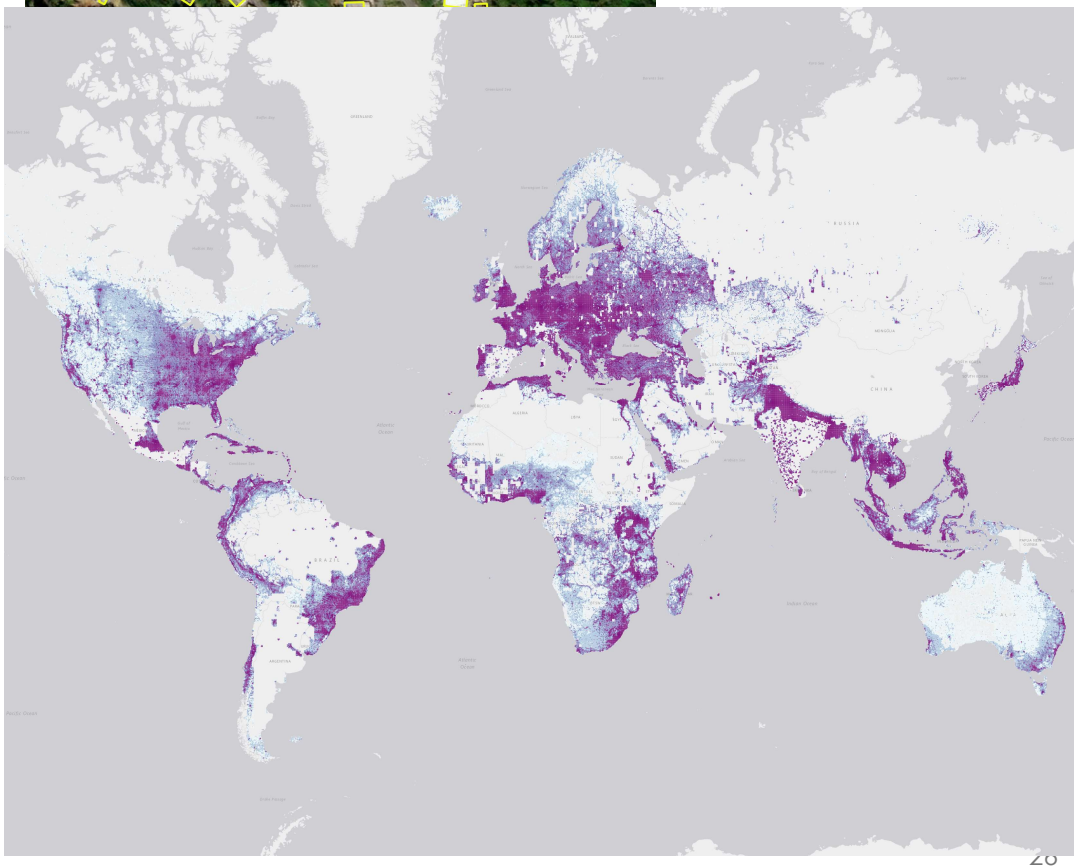
```
/*
This is an example Overpass query for fountains/drinking water in Hyde Park.
Try it out by pressing the Run button above!
You can find more examples with the Load tool.
*/
node
  [amenity=drinking_water]
  ({{bbox}});
out;
```



# Overlooked…

## Microsoft (Bing Maps) GlobalML Footprints

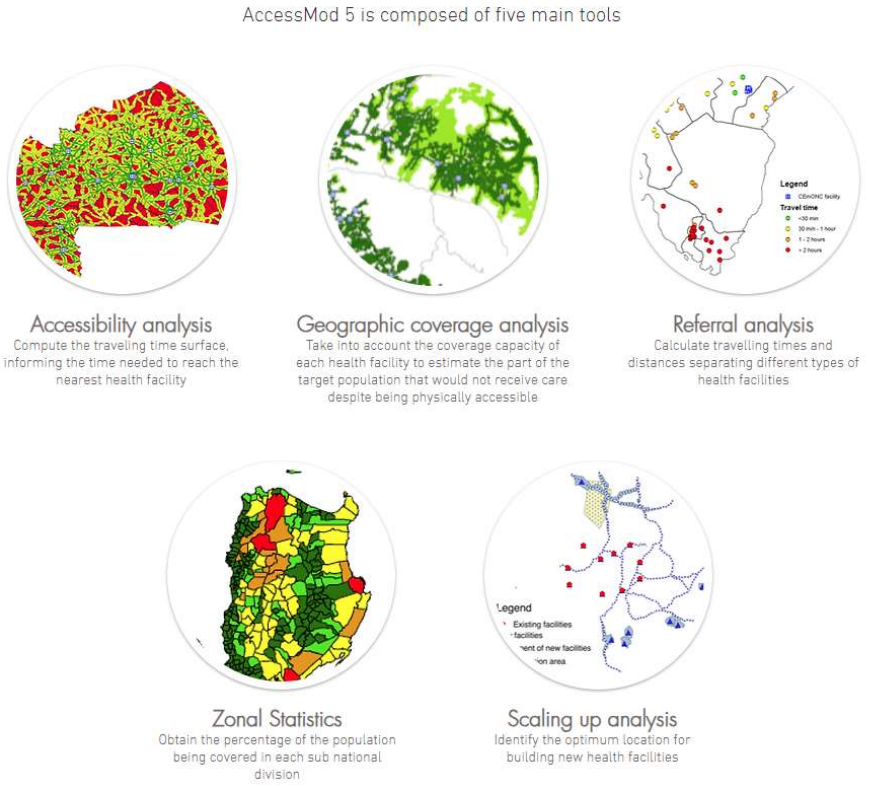
- 1.3B buildings
- GeoJSON format
- Coverage map to the right →
- US, Canada, Western Europe*, Australia also have height information
- Enormous file sizes…



# Overlooked GIS tools...

## WHO AccessMOD 5 (*accessmod.org*)

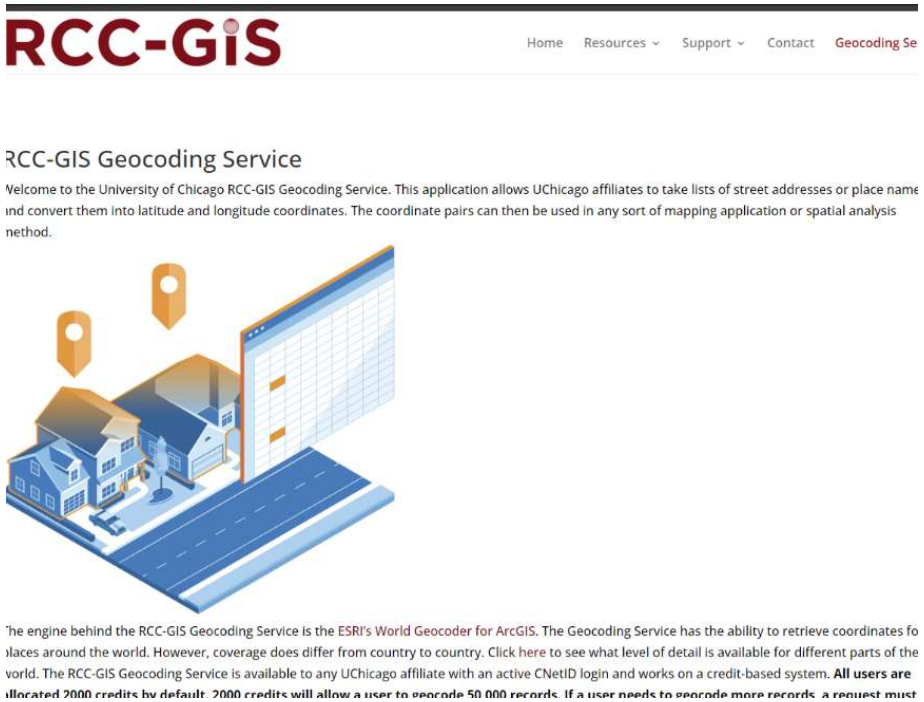
- Free and open-source standalone software to model physical accessibility of existing health services relative to target population, to:
  - estimate the part of the target population that would not receive care despite being physically accessible due to shortage of capacity in services (human/equipment)
  - measure referral times and distances between health facilities,
  - identify where to place new health facilities to increase population coverage through the scaling up analysis.



# Overlooked GIS tools…

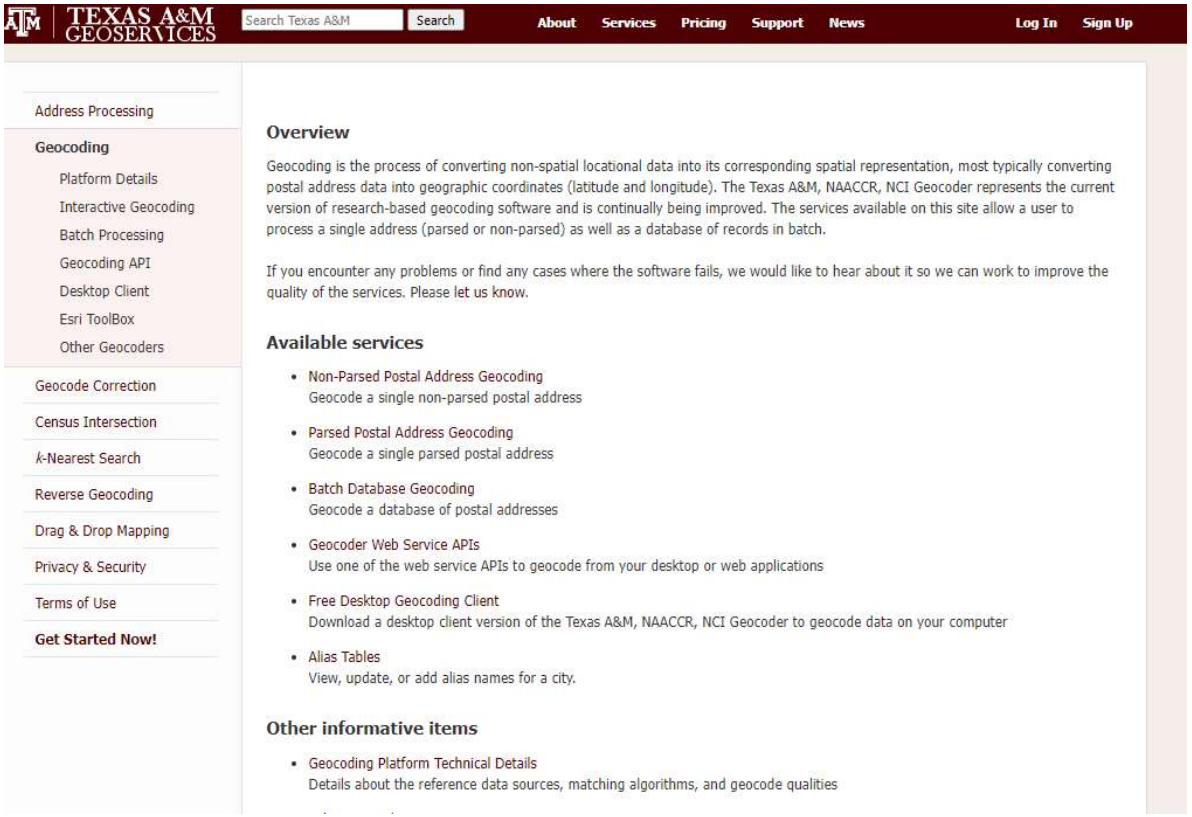
**RCC Geocoder (@ *gis.rcc.uchicago.edu*)**

- Quickly turn tens of thousands of addresses (from a CSV/spreadsheet) into coordinates for use in GIS, analysis/mapping tools

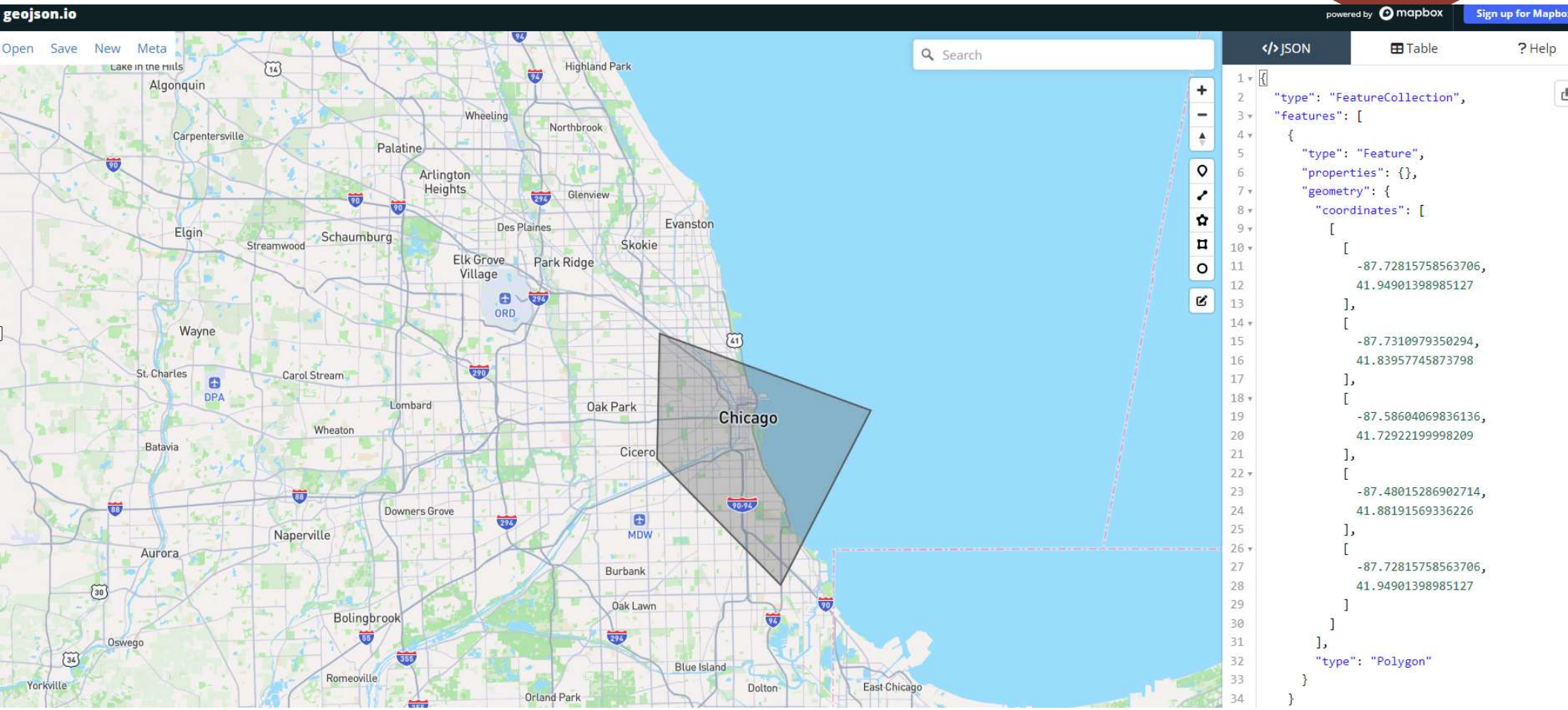


# Overlooked GIS tools...

Alternative: **Texas A&M Geocoder (*https://geoservices.tamu.edu/Services/Geocode/*)**



# Overlooked GIS tools



# GIS @ UChicago

# Mapping Chicagoland

NEH funded project to make over **5,000 maps** of Chicago publicly available from:

UChicago Library | **Newberry Library** | **Chicago History Museum**

Workflow includes:

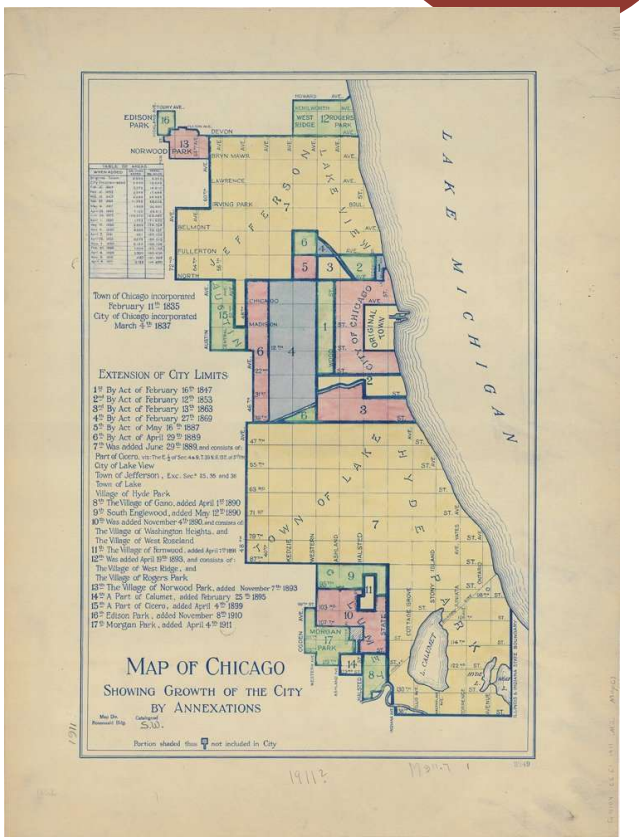
- Scanning
- Georeferencing (adding spatial data)
- Enriching catalog records
- Making available in public portals
  - UChicago Library
  - Chicago Collections
  - BTAA Geoportal

# Mapping Chicagoland

UChicago – all our maps up to1940

Maps from 1853-1940

- Social Science Research Committee
- Transportation
- Utility companies
- Civic institutions
- Topics covering social, urban, and economic features such as land use, parks, and urban planning.



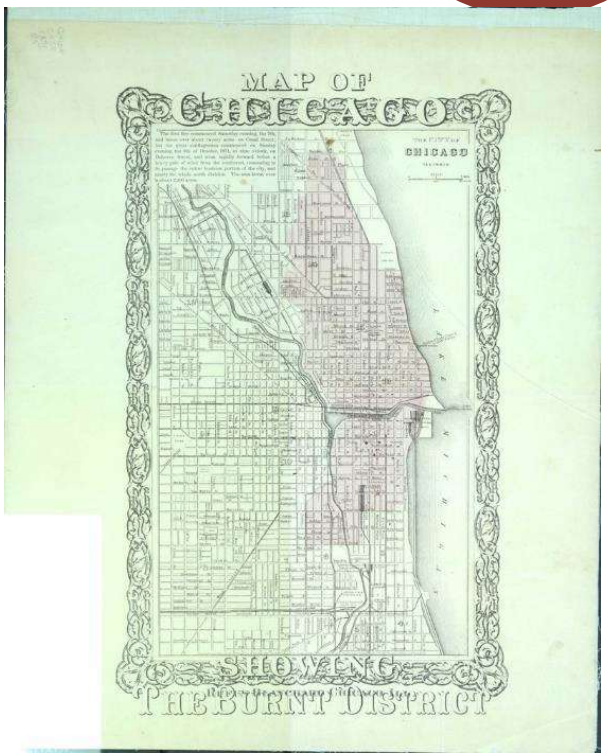

Map of Chicago showing growth of the city by annexations [map]. Scale not given. Chicago: [Chicago], 1911. The University of Chicago Library.

# Mapping Chicagoland

Chicago History Museum – all maps up to 1940

Maps from 1812-1940

- Annexations
- Communities
- Parks
- Wards
- Industries
- Transportation
- Topography
- Cemeteries
- Population




Map of Chicago Showing the Burnt District (1871) by Blanchard, Rufus. Chicago History Museum.

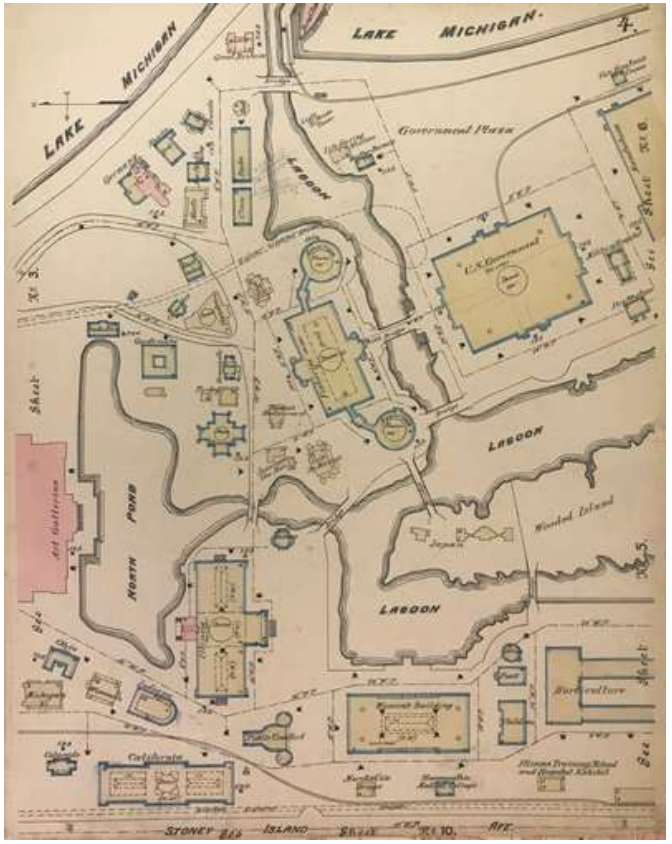
# Mapping Chicagoland

## Newberry Library – a selection of atlases

Maps from 1872-1924

- Large-scale real estate
- Fire insurance
- Land valuation

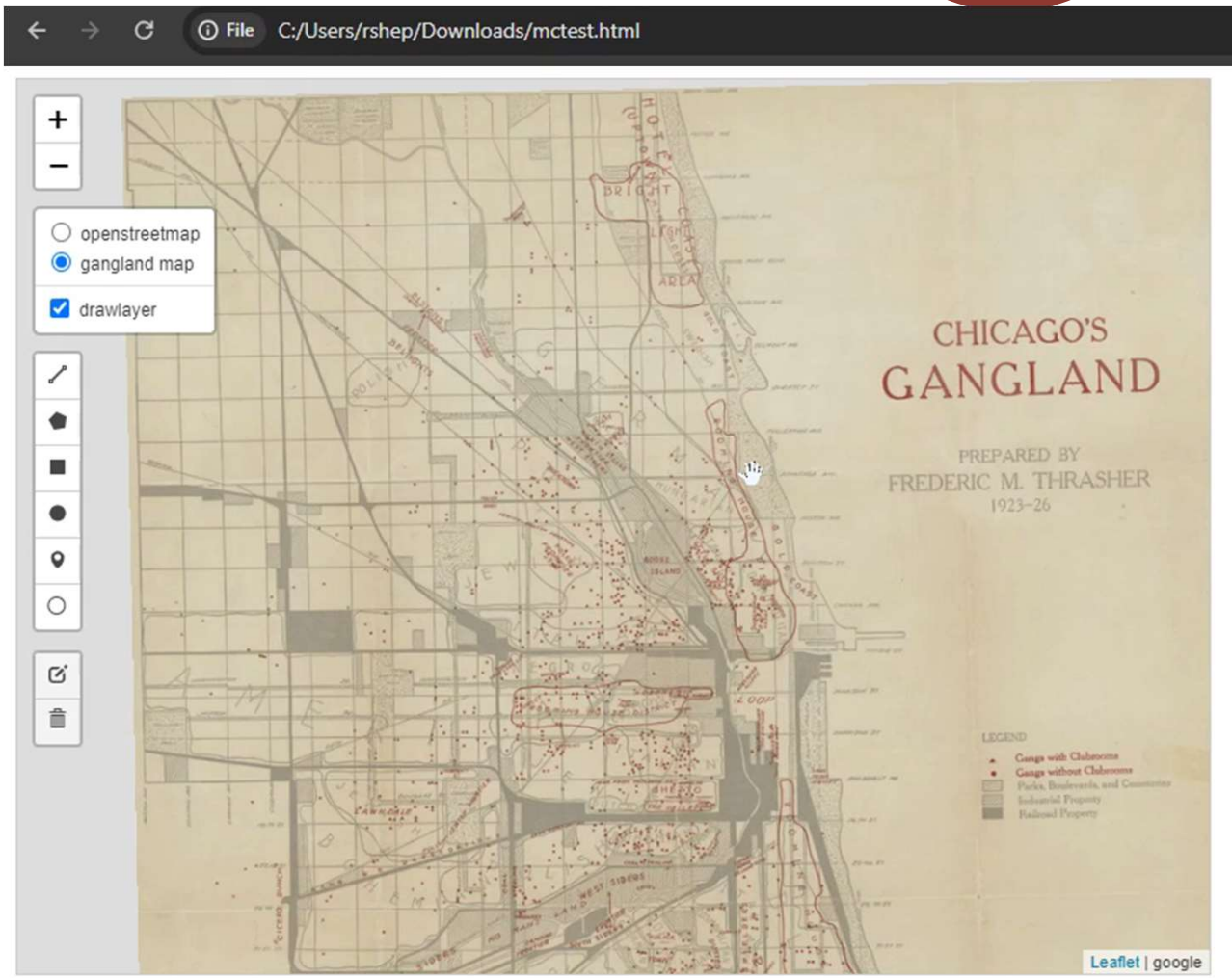
The atlases show footprints of individual structures and lots, providing large scale details for studying Chicago's cultural geography.




Yerkes, Chas. S. Insurance map of the World's Columbian Exposition, Jackson Park, Chicago. 152 Monroe Street, Chicago: Chas. S. Yerkes, April, 1893. Newberry Library.

# Data mining opportunities...?

https://allmaps.xyz/maps/da2b72099eaa12d7/{z}/{x}/{y}.png

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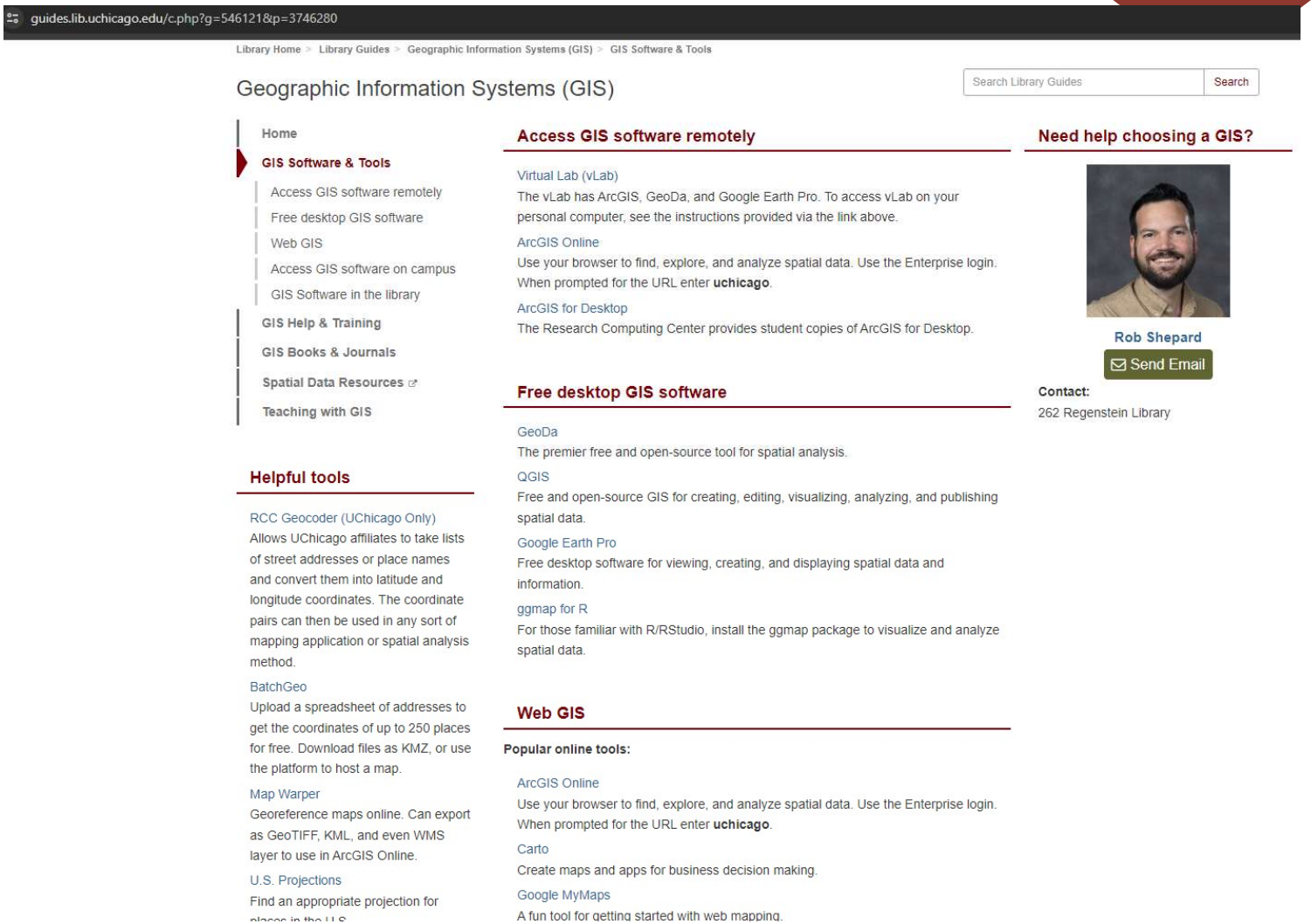
# GIS @ University of Chicago

**LibGuide for reference**



# Thank you

ask me a question if you want