

Mapmaking for Digital Humanities using Open Source Tools

Sarah Cordivano
presentation at:
ph.ly/villanovamaps
@Mapadelphia



Workshop Materials



Ph.ly/villanovamaps

About Me



My interests are **Geography** and **open access** to software tools and data.

Education:

Temple University, Geography and Urban Studies
Univ. of Pennsylvania, Urban Spatial Analytics

Work:

Current: Project Manager, Data Analytics at Azavea
Past: City of Philadelphia, Penn Museum

@mapadelphia

About this Workshop

Part 1: Presentation:
provide comprehensive
background to the purpose
and function of GIS in
Digital Humanities

Part 2: Hands on web
mapping tutorial

Part 3: (Time permitting)
Hands on Desktop
Mapping (GIS analysis)
tutorial

What you will get from this session?

- An Introduction to GIS concepts
- Familiarity with GIS data and tools
- Step by Step guide to completing your first mapping project!

Azavea



Founded in 2000

40+ people

Geospatial + web + mobile

Software development

Spatial analysis services

Certified



Corporation

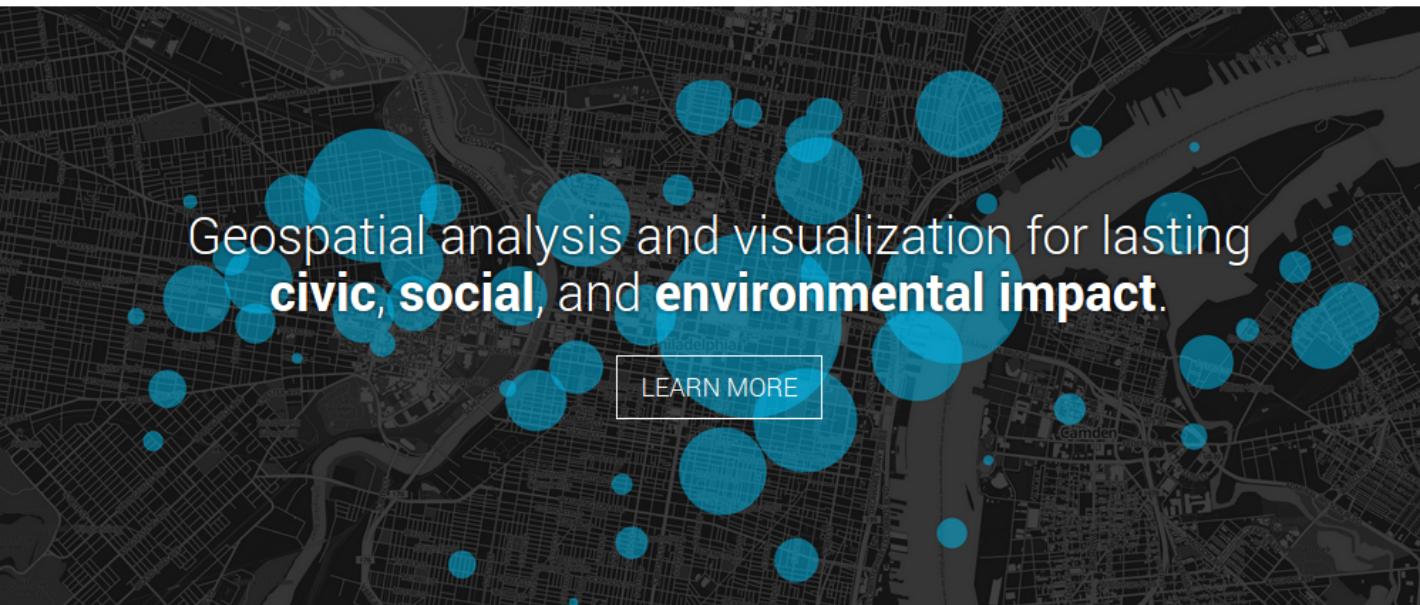
bcorporation.net

Data Analytics Team



ABOUT SERVICES CLIENTS FELLOWSHIPS GET INVOLVED

CONTACT



Geospatial analysis and visualization for lasting
civic, social, and environmental impact.

[LEARN MORE](#)

analytics.azavea.com

Summer of Maps



AZAVEA **SUMMER** *of* **MAPS**

\$5,000 Fellowship for Student GIS Analysts

Work on pro-bono projects for nonprofits

Mentored by Azavea Staff

"The Summer of Maps fellowship was an amazing experience! The opportunity to work alongside inspiring non-profits and experienced mentors was hugely rewarding and educational. This program pushed us to grow not only as a GIS analysts, but also as effective communicators and critical thinkers."

- Tim St. Onge 2014 Fellow

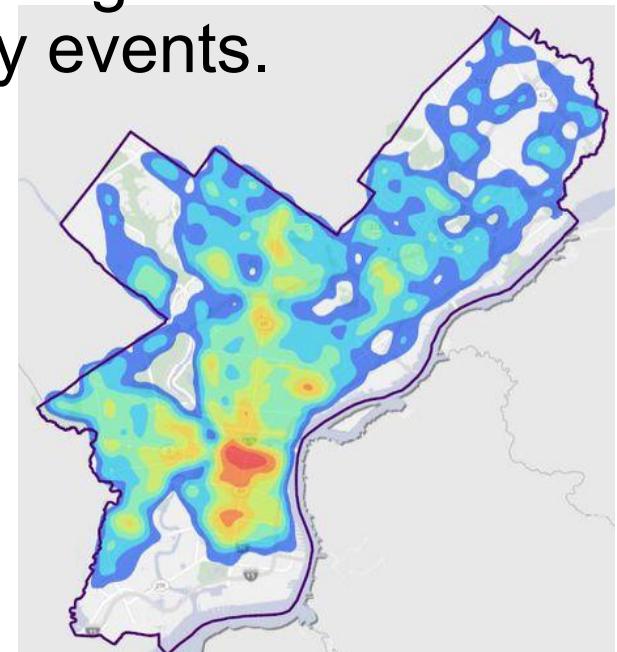
More info at Summerofmaps.org

GeoPhilly

GEOPHILLY

Building community around map making in Philadelphia: 450 members, monthly events.

- Workshops
- Happy Hours
- Film Screenings
- Lightning Talks
- Conferences



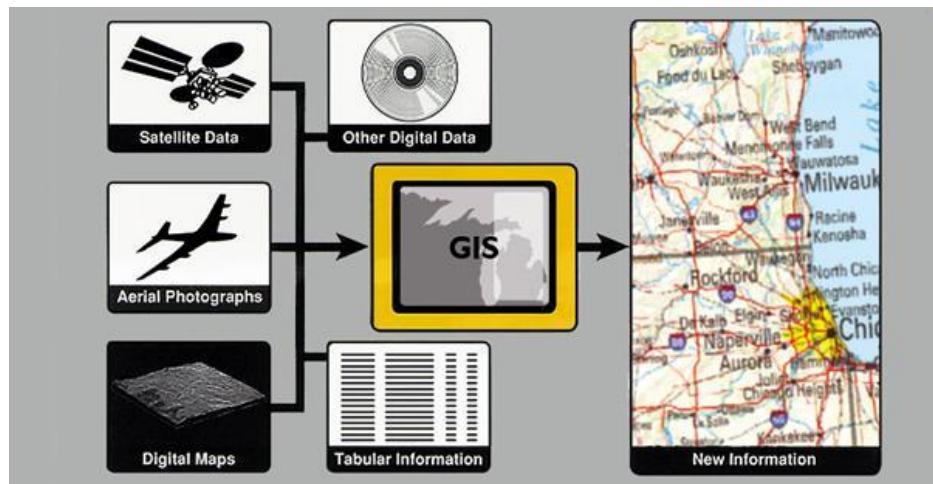
Agenda



- **(BRIEF) Introduction to GIS**
 - What is GIS?
 - Why and How is GIS used?
 - How GLAM uses GIS?
 - What is Spatial Data?
 - Downloading and Preparing Spatial Data
 - What is Geocoding?
 - Projections & GIS Analysis (short film)
 - Desktop and Web Map Tools
- **Let's Get Started:**
 - Let's download some data
 - A Web Mapping project
 - A Desktop Analysis GIS project (optional)

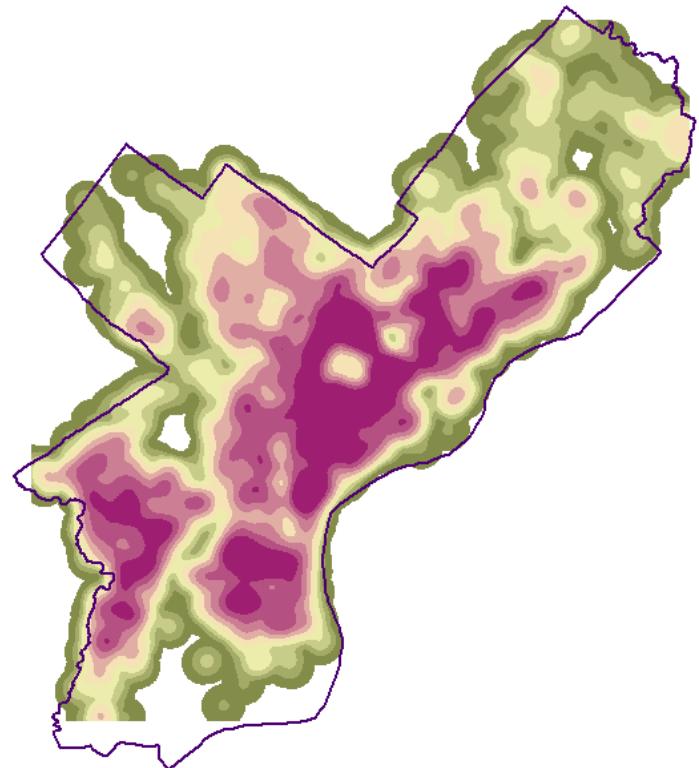
What is a GIS?

- **Geographic**
 - Data has a spatial location which can be located on a map
- **Information**
 - Data has additional information (street name, length, etc)
- **System**
 - Multiple components working together: Database, display, processing, etc.



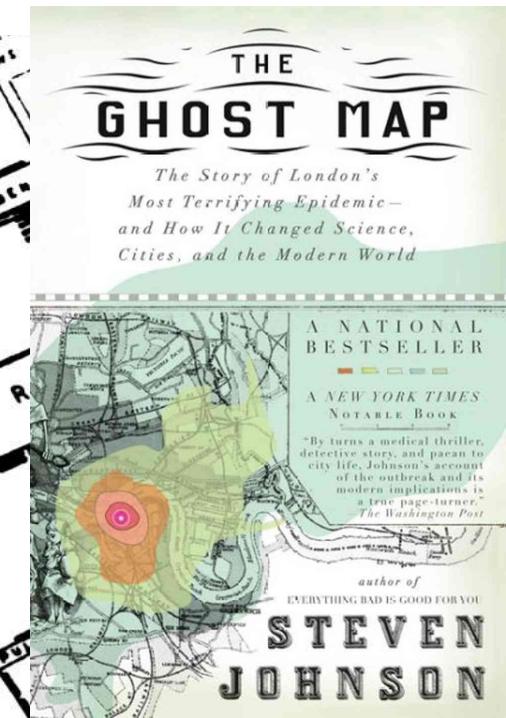
Why use GIS to map your data?

- **Visualize** both complex and simple data
- **Tell a story** in a simple and compelling way
- **Find** hidden patterns in your data
- **Solve** problems



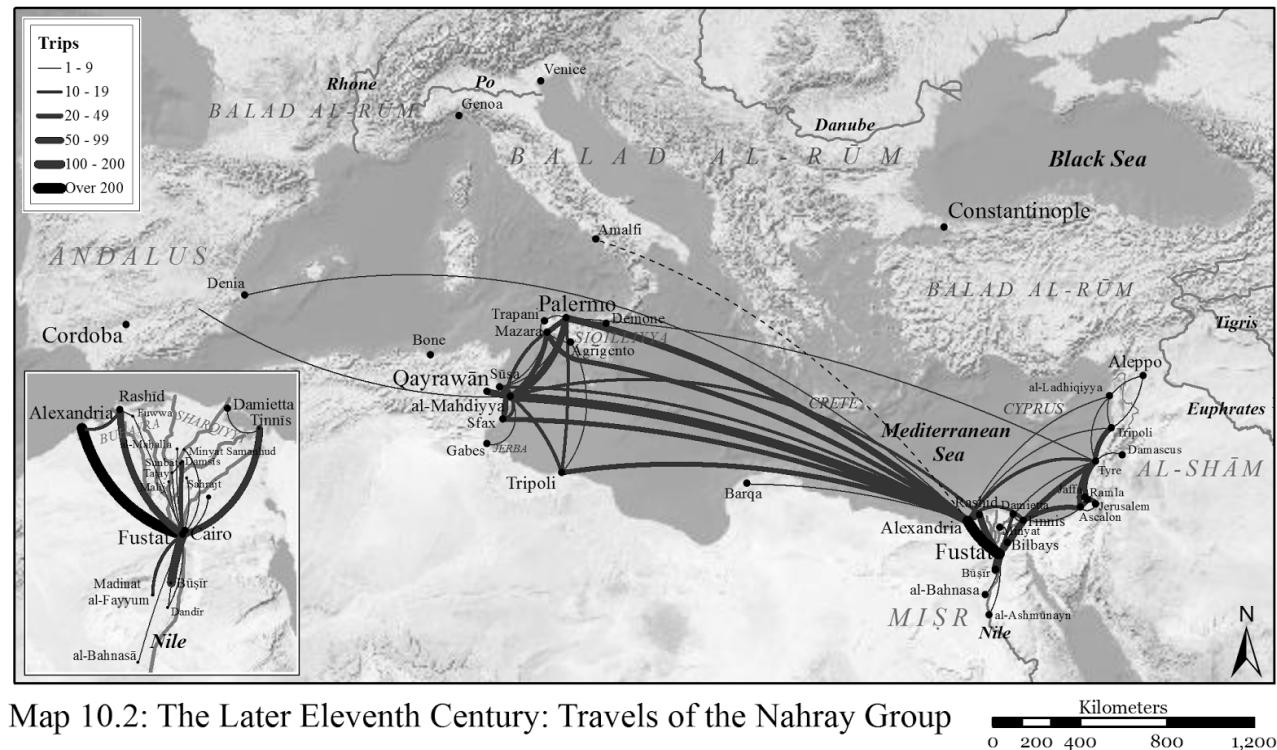
GIS is used to solve problems.

- 1850's London Physician, **John Snow**, mapped Cholera outbreaks to determine the source of the outbreak: a contaminated water pump.



How GLAM uses GIS?

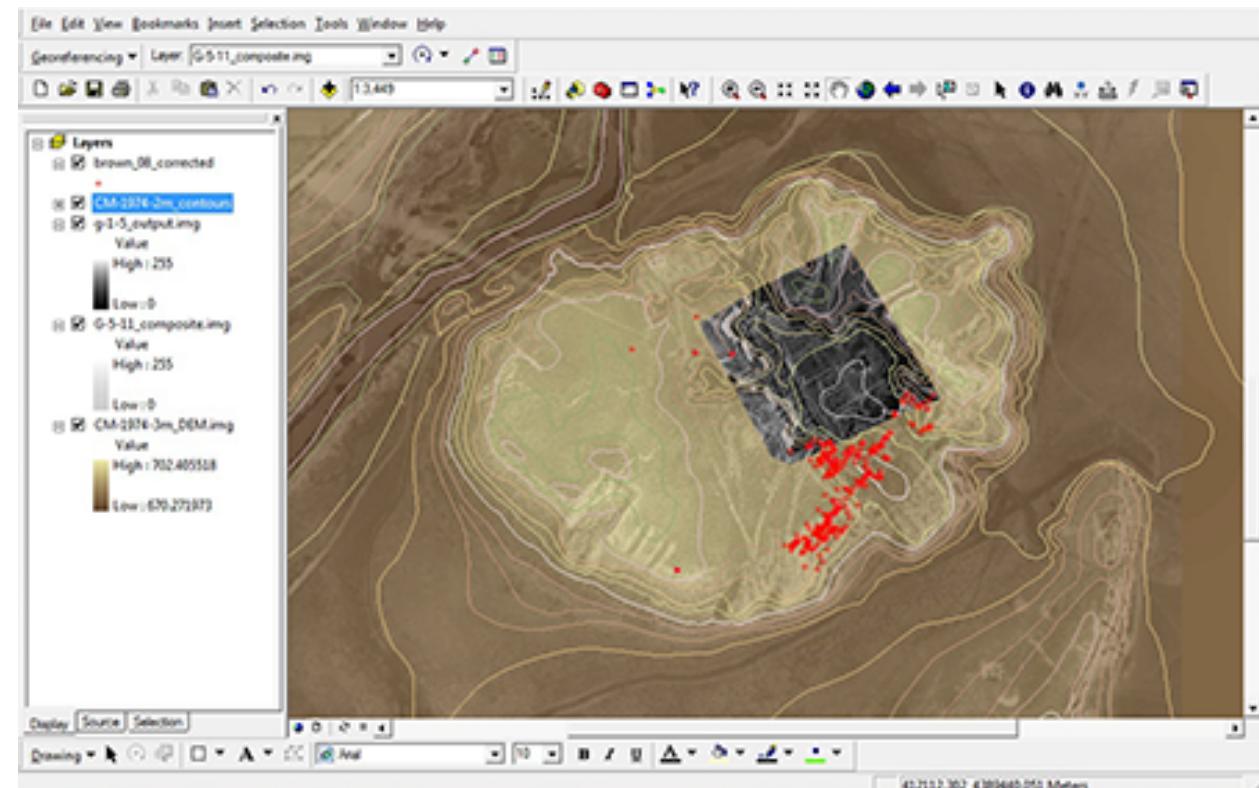
- Mapping Collections
- Spatially Linking Records
- Creating Easy Data Discovery by the Public
- Visualizing Connections
- Reach new audiences
- and More!



Museums are using GIS

Digital Gordion Mapping Project

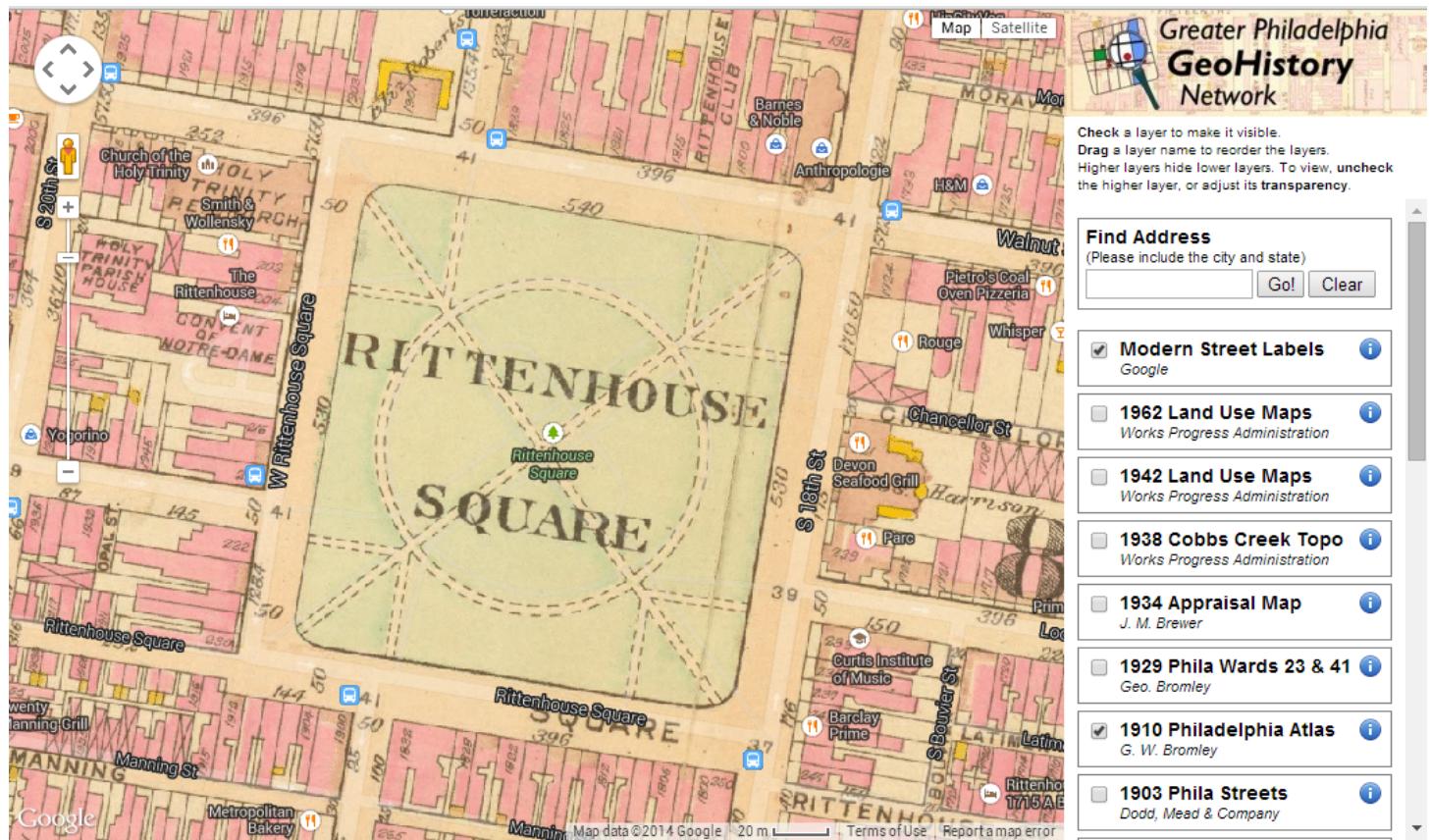
- Georeferencing excavation maps based on aerial imagery (balloon maps) from 1940-present.



<http://sites.museum.upenn.edu/gordion/archaeology/mapping>

Archives are using GIS

Philly GeoHistory: These maps lived in drawers, now they live online and are easily searchable.



Archives are using GIS

[PhillyHistory](#): Liberating 97,000 historic photos, identifying their geographic location and generating revenue.

313-315 Chestnut Street

The screenshot shows a historical black and white photograph of a large, multi-story building with classical architectural details, identified as the First National Bank. The photo is set against a map of Philadelphia's Center City area, specifically around Independence National Historical Park. A green star marks the exact location of the building at 313-315 Chestnut Street. The map also shows surrounding streets like S 5th St, N 4th St, and S 6th St, along with other landmarks like the Philadelphia Museum of Art and the Franklin Institute. Below the map, a table provides detailed metadata for the photograph.

Title	313-315 Chestnut Street
Description	313-315 Chestnut Street. First National Bank on Corner
Address	313 Chestnut St
Date	1/24/1952
Photographers	Bender, Charles J
Collection	DOR Archives

Historians are using GIS.

The Ward: Race and Class in Du Bois' Seventh Ward

Ward: Digitization of WEB Du Bois historical social work Survey Maps. Now searchable by name, property and theme.



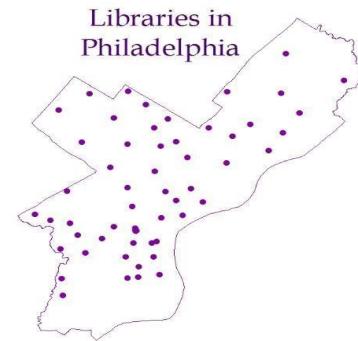
What is Spatial Data? (General)

Spatial Data: Data that defines a geographic location or boundary

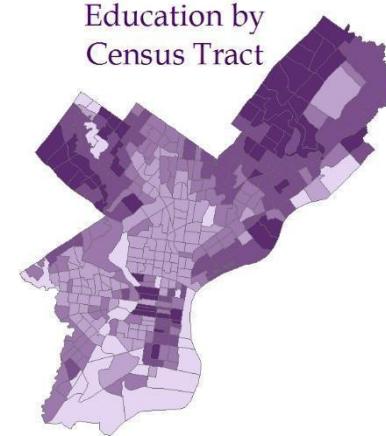
Examples

- Tabular Data with Addresses
 - Databases & Spreadsheets
- Points on a map
 - Client Locations
- Boundary Data (Polygons)
 - Population by Census Tract
- Raster Data (Images and Grids)
 - Satellite imagery, temperature, density

10 Dr. and Mrs. Ge	241 S. 6th Street Apt #1101	Philadelphia	PA	19106
11 Mrs. Susan Ker	929 Lawnton Te	Glenolden	PA	19036
12 Mrs. Nancy Mei	638 Fitzwater St	Philadelphia	PA	19147
13 Mrs. Margaret S	31 Eagle Rd	Phoenixville	PA	19460
14 Ms. Deborah Sc	1252 Charleston	Cherry Hill	NJ	08034
15 Ms. Kathy Dunn	806 Pine Street	Philadelphia	PA	19107



Libraries in Philadelphia

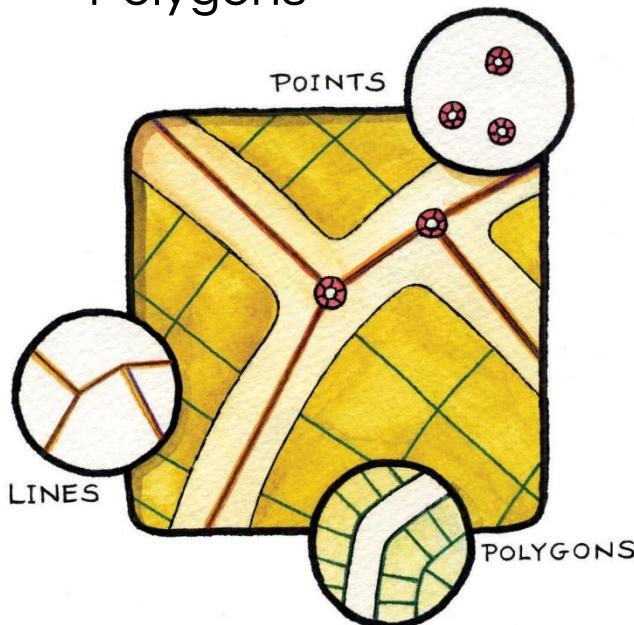


Education by Census Tract

What is Spatial Data? (Types)

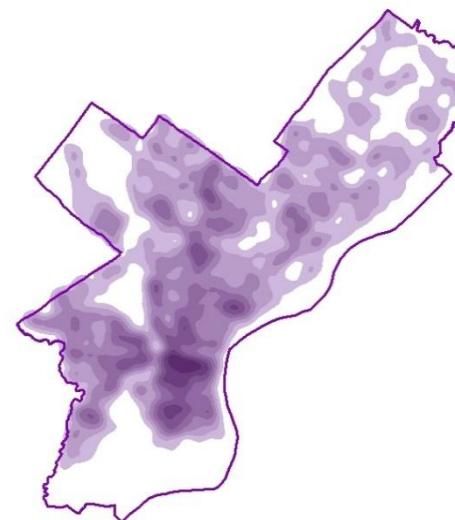
- **Vector**

- Points
- Lines
- Polygons



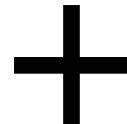
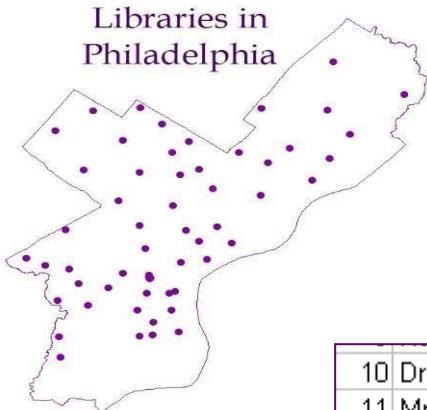
- **Raster**

- Imagery
- Land Cover
- Density



ROWS	COLUMNS	
		Water
Grass		
		Forest

GIS Data has Attributes



Why is this so important??

10	Dr. and Mrs. Ge	241 S. 6th Street Apt #1101		Philadelphia	PA	19106
11	Mrs. Susan Ker	929 Lawnton Te		Glenolden	PA	19036
12	Mrs. Nancy Mei	638 Fitzwater S		Philadelphia	PA	19147
13	Mrs. Margaret S	31 Eagle Rd		Phoenixville	PA	19460
14	Ms. Deborah St	1252 Charleston		Cherry Hill	NJ	08034
15	Ms. Kathy Dunr	806 Pine Street		Philadelphia	PA	19107

= GIS Data

Discovering Spatial Data: Open Data



OpenDataPhilly

Provides searchable catalog of open spatial data for Philadelphia available for access and download.



More Open Data



- **Federal**

- Data.gov
- Geodata.gov



- **State**

- data.CA.gov
- Pennsylvania Spatial Data Access (PASDA)



- **Local**

- NYC Data Mine
- Open Data Philly
- London Datastore



Spatial Data Preparation: Cleanliness

Clean Data (properly formatted)

ID	FirstName	LastName	Address_1	Address_2	City	State	Zip	Phone	Email
1	Nikki	Bleggi	2515 Panama St		Philadelphia	PA	19103	215-227-1372	nikki@bleggi.com
2	Steve	Sivia	1061 Bridge St		Philadelphia	PA	19124	215-227-5562	steve@sivia.com
3	Nelson	Smith	800 Spruce St	2A	Philadelphia	PA	19107	215-236-7117	nelson@rudnic.com
4	Sybil	Quare	3001 Market St		Philadelphia	PA	19104	215-244-7049	sybil@quaresma.com
5	Modesto	Shelvin	1831 Pemberton St	Rear	Philadelphia	PA	19146	215-245-1893	modesto@shel.com
6	Adam	Moun	1614 N Felton St		Philadelphia	PA	19151	215-245-2856	adam@moun.com
7	Donnell	Sibilia	3034 Fairfield St		Philadelphia	PA	19136	215-245-4825	donnell@sibilia.com
8	Bethany	Bearup	734 N Judson St		Philadelphia	PA	19130	215-245-7889	bethany@bearup.com
9	Iva	Harpold	2831 S Warnock St		Philadelphia	PA	19148	215-256-0199	iva@harpold.com

Dirty Data (poorly formatted)

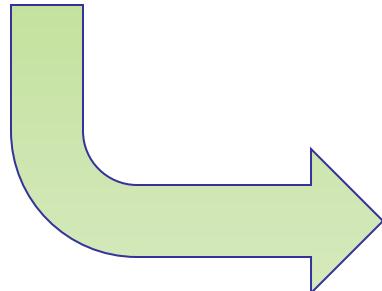
FirstName	LastName	Address	Phone	Email
Nikki	Bleggi	Panama St Philly PA	215-227-1372	nikki@bleggi.com
Steve A. Silvia	Jr.	1061-1065 Bridge St Philadelphia Penna 19124	215-227-5562	steve@sivia.com
Nelson	Smith	800 Spruce St Apartment 2A Philadelphia 19107	not given	nelson@rudnic.com
Mrs. Sybil	Quare	30?? Market St Philadelphia PA 19104	215-244-7049	sybil@quaresma.com
Modesto	Shelvin	Missing	215-245-1893	modesto@shel.com
Adam	Moun	1614 N Felton St Philadelphia PA 19151	missing	adam@moun.com
Donnell and Jeff	Sibilia	3034 Fairfield St Phila. Pennsylvania 19136	215-245-4825	donnell@sibilia.com
Bethany (Beth)	Bearup	734 N Judson Street Philadelphia PA 215-256-3930	215-245-7889	bethany@bearup.com
Iva Harpold	(esquire)	2831 N/S Warnock St Phila PA 19148	215-256-0199	iva@harpold.com

Convert a Spreadsheet to a Map

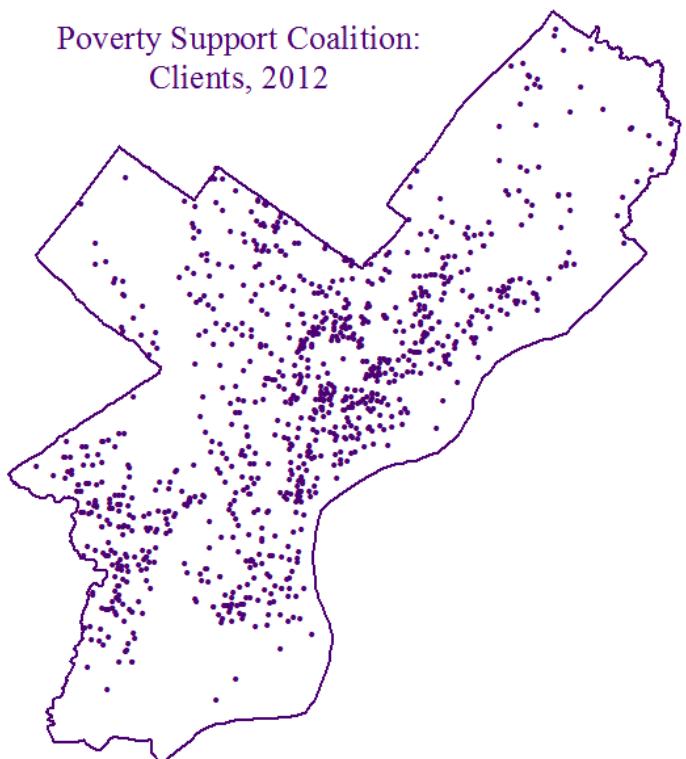
ID	First	Last	Address	Add_2	City	State	Zip	Phone
1	Nikki	Bleggi	2515 Panama St		PHILADELPHIA	PA	19103	215-227-1372
2	Steve	Sivia	1061 Bridge St		PHILADELPHIA	PA	19124	215-227-5562
3	Nelson	Rudnick	800 Spruce St 2nd		PHILADELPHIA	PA	19107	215-236-7117
4	Sybil	Quares	3001 Market St		PHILADELPHIA	PA	19104	215-244-7049
5	Modest	Shelvin	1831 Pemberton St	Apt 1	PHILADELPHIA	PA	19146	215-245-1893
6	Adam	Moun	1614 N Felton St		PHILADELPHIA	PA	19151	215-245-2856
7	Donnell	Sibilia	3034 Fairfield St		PHILADELPHIA	PA	19136	215-245-4825
8	Bethany	Bearup	734 N JUDSON St	F1 3	PHILADELPHIA	PA	19130	215-245-7889
9	Iva	Harpold	2831 S Warnock St		PHILADELPHIA	PA	19148	215-256-0199
10	Elsa	Hailston	1617 J F Kennedy		PHILADELPHIA	PA	19103	215-257-4758
11	Carmen	Rohan	1901 Walnut St	Apt A	PHILADELPHIA	PA	19103	215-289-6754
12	Francis	Kingore	717 S Columbus		PHILADELPHIA	PA	19147	215-322-6663
13	Christe	Kennau	100 West Ave		PHILADELPHIA	PA	19046	215-331-2098
14	Angel	Checa	235 Bainbridge St		PHILADELPHIA	PA	19147	215-332-8110
15	Saundr	Trochhi	2434 Brown St	Rear	PHILADELPHIA	PA	19130	215-336-7023
16	Addie	Aspri	407 Gaskill St		PHILADELPHIA	PA	19147	215-348-8084

Solution:

Geocoding!



Poverty Support Coalition:
Clients, 2012



Geocode 101

Address information

Street Location Data

Point on a map

Google

340 n 12th

SIGN IN

Get directions My places

A 340 N 12th St Philadelphia, PA 19107

Directions Search nearby more ▾

At this address:

- Bryan Hanes Studio
- Counterpole Records Entertainment Inc
- Coyopa Productions Inc
- Elder Health Inc Pa
- Free People Photo Studio
- G & D Garment Corporation
- Inspiritech
- Internet Order LLC
- Menzfit
- Pennsylvania General Store
- Stroll
- Suretybondcom
- T & Q Fashion Inc
- Wolf Building

Map data ©2013 Google, Sanborn - Edit in Google Map Maker Report a problem

6 Steps of a GIS Project

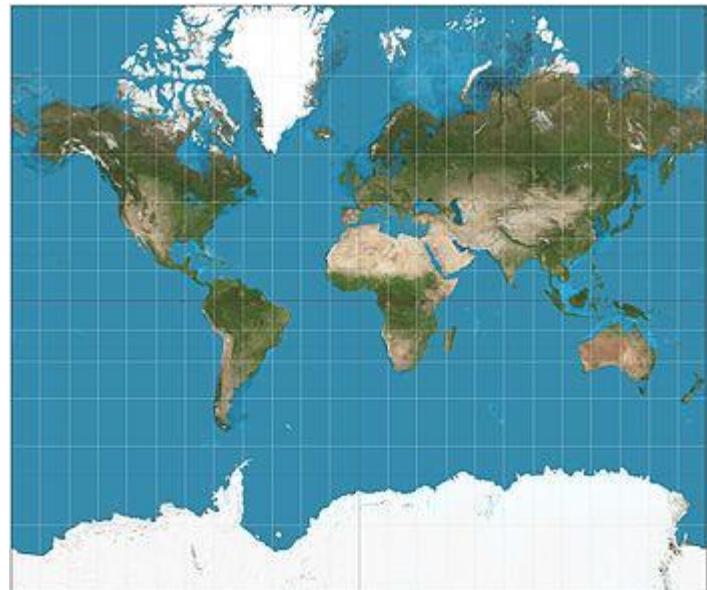
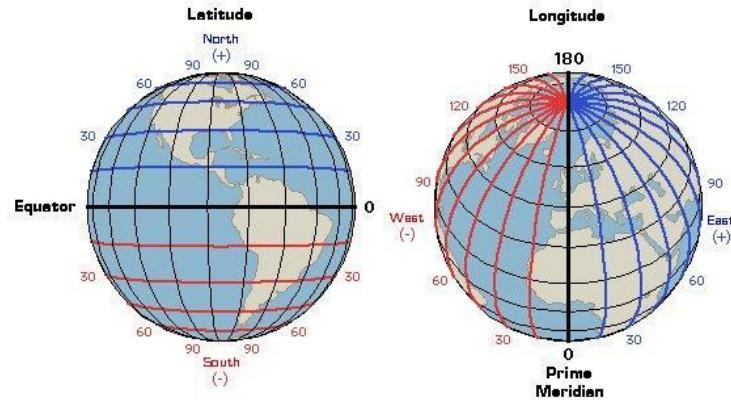


1. Formulate a Spatial Question
2. Collect your Data
3. Geocode your Data
4. Assemble Additional Data
5. Analyze Data
6. Publish your Map

How do we know where data is?



- Coordinate systems
 - Latitude and Longitude (degrees)
 - Degrees on a circle
 - Web Mercator (meters)
 - Easy math
 - Sooo many more...



How do we know where data is?



- Projections
 - World is round
 - Maps are flat
 - How do we deal with the distortion?
- Challenge:
 - Data has to use same coordinates / projection as your map/tool.
 - Web mercator, lat/lon
 - State Plane, meters



Mercator Projection



Gall-Peters Projection



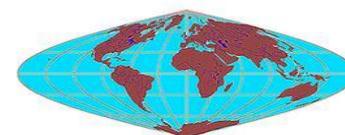
Miller Cylindrical Projection



Mollweide Projection



Goode's Homolosine Equal-area Projection



Sinusoidal Equal-Area Projection



Robinson Projection

Let's get spatial!



Short film on projections.

GIS = Complex Analysis



Queries
Operations
Thematic Map

Data Analysis - Queries

Provide an example of how each Query can solve a problem.

Queries (Attribute)

- field, operator, value

"Library_Name" = 'Fankford'

"Books" > 2000

"Age" < 1908

"ROAD_TYPE" = 'Interstate'

Queries (Spatial)

- Relationships:
 - near
 - adjacent
 - intersect
 - inside
- selection layer, relationship, related layer

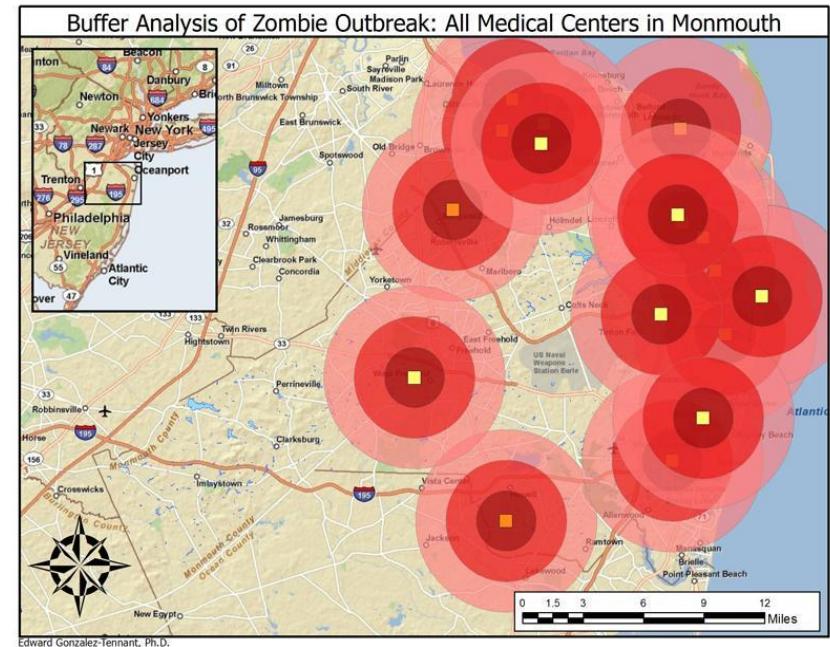
What addresses in my points layer are inside council district 6 ?

10	Dr. and Mrs. Ge	241 S. 6th Street	Apt #1101		Philadelphia	PA	19106
11	Mrs. Susan Ker	929 Lawnton Te			Glenolden	PA	19036
12	Mrs. Nancy Me	638 Fitzwater S			Philadelphia	PA	19147
13	Mrs. Margaret S	31 Eagle Rd			Phoenixville	PA	19460
14	Ms. Deborah Sc	1252 Charleston			Cherry Hill	NJ	08034
15	Ms. Kathy Dunn	806 Pine Street			Philadelphia	PA	19107

Data Analysis - Buffer Operation

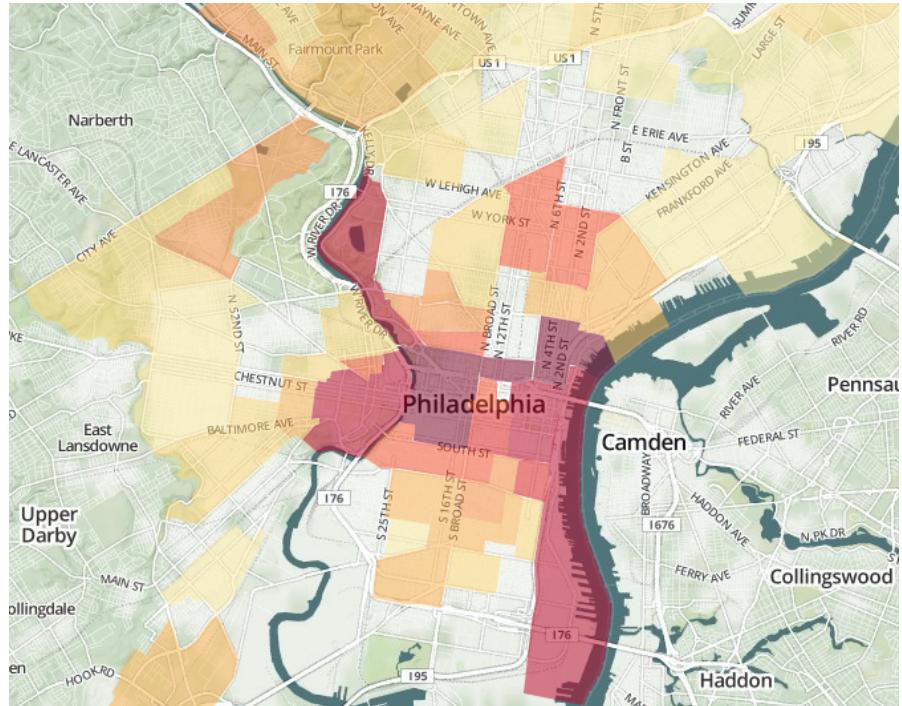
- Buffer
 - creates new polygons of area around other features
 - Can use in later analysis steps

How can this analysis tool help us find spatial relationships?



Data Analysis - Thematic Mapping

- Choropleth
 - Works with polygons
 - Census tracts
 - Council districts
 - Each polygon has a numerical attribute representing a calculated value (population, etc.)
 - Vary intensity of colors based on the attribute
 - Rental prices in neighborhoods
 - % unemployed by census tract



Map Making Tools

Desktop

- Pros:

- Strong tool for GIS Analysis
- Easy export to PDF

- Cons:

- Steeper Learning Curve
- Not suitable for web mapping
- Can be expensive



Web

- Pros:

- Easier to use
- Simple to make and share a web map

- Cons:

- Price depends on usage (Software as a Service Model)
- Limitations on use (File size, number of geocodes, page visits, privacy)



Desktop Map Making Tools

Proprietary Software

Esri's ArcGIS Desktop

\$250 for nonprofits or \$100 for Home Use License



Free Open Source Software

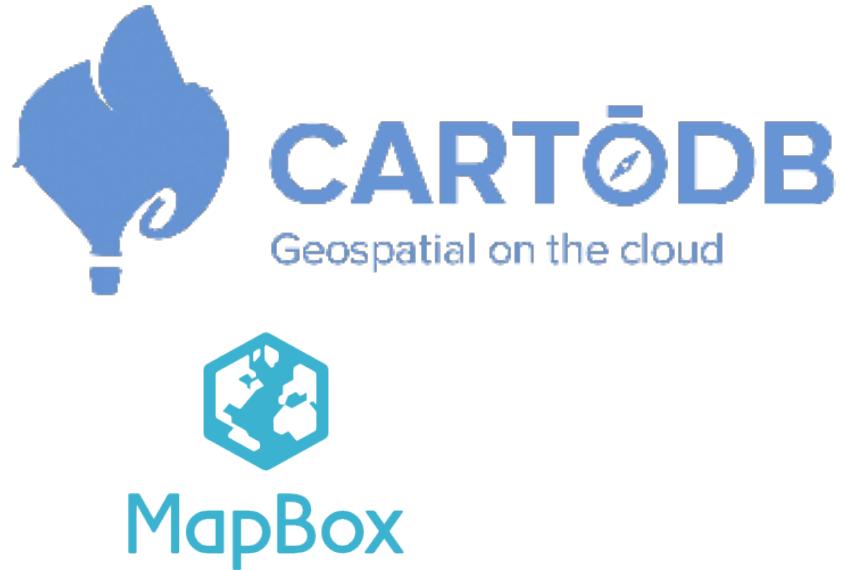
QGIS

Open source software with free training manuals
and community support



Web Map Making Tools

- CartoDB (\$29 per month but **generous free tier**)
- ArcGIS Online (\$2500 per year, personal free tier)
- MapBox (good for making basemaps)



Web Map Making Tools



Hands on!

We will use Google docs and CartoDb to make a web map.

Tutorial: Step by step guide to convert a spreadsheet of data into a quick and free interactive web map. We will also combine additional data sources and share our map to the web.

Web Map Making Tools



Hands on!

Tutorial: Step by Step guide on how QGIS is used to conduct spatial analysis of our historic site data.

We will use QGIS to conduct Spatial Analysis.

6 Steps of a GIS Project



1. Collect your Data
2. Geocode your Data
3. Formulate a Spatial Question
4. Assemble Additional Data
5. Analyze Data
6. Publish your Map

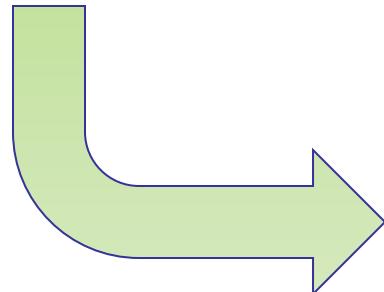
1. Collect your Data

- **Sustainable data collection processes from the Start**
 - Use forms with drop downs and multiple choice, not free form text
 - Accurately record address and other location information
- **Prepare your internal Data**
 - **Clean** your data
 - **Maintain** data in a spreadsheet (*not a word file or PDF*)
 - Assign a **Unique ID** to all Records
 - When naming fields, avoid special characters & starting with a number
 - Create new **field for each address element** (Street name, City, State, Zip)
 - Save as **CSV, Tab Delimited** or **Excel** file
 - Store Zip Codes fields as Text (08755)

2. Geocode your Data



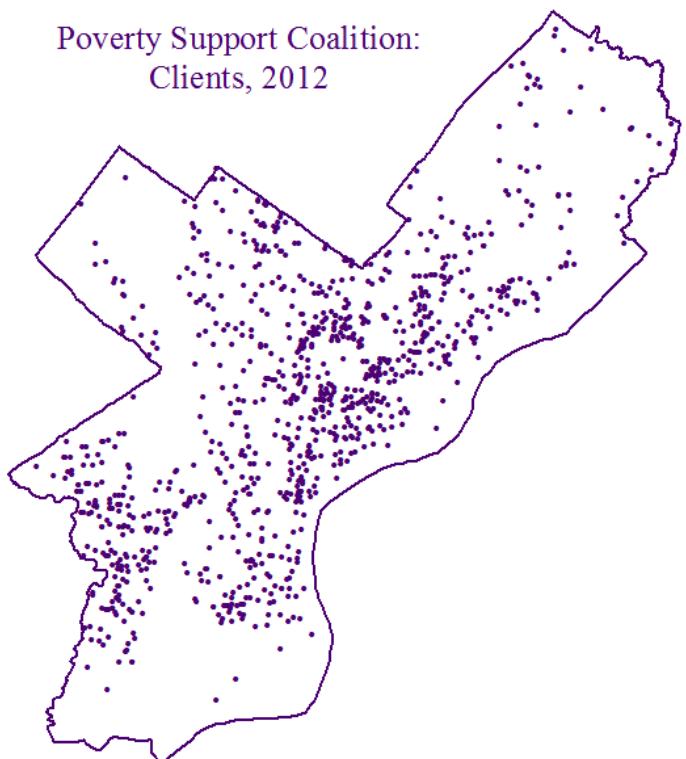
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4	Sybil	Quares	3001 Market St		PHILADELPHIA	PA	19104	215-244-7049
5	Modest	Shelvin	1831 Pemberton St	Apt 1	PHILADELPHIA	PA	19146	215-245-1893
6	Adam	Moun	1614 N Felton St		PHILADELPHIA	PA	19151	215-245-2856
7	Donnell	Sibilia	3034 Fairfield St		PHILADELPHIA	PA	19136	215-245-4825
8	Bethany	Bearup	734 N JUDSON St	F1 3	PHILADELPHIA	PA	19130	215-245-7889
9	Iva	Harpold	2831 S Warnock St		PHILADELPHIA	PA	19148	215-256-0199
10	Elsa	Hailston	1617 J F Kennedy		PHILADELPHIA	PA	19103	215-257-4758
11	Carmen	Rohan	1901 Walnut St	Apt A	PHILADELPHIA	PA	19103	215-289-6754
12	Francis	Kingore	717 S Columbus		PHILADELPHIA	PA	19147	215-322-6663
13	Christe	Kennau	100 West Ave		PHILADELPHIA	PA	19046	215-331-2098
14	Angel	Checa	235 Bainbridge St		PHILADELPHIA	PA	19147	215-332-8110
15	Saundr	Trochhi	2434 Brown St	Rear	PHILADELPHIA	PA	19130	215-336-7023
16	Addie	Aspri	407 Gaskill St		PHILADELPHIA	PA	19147	215-348-8084



Solution:

Geocoding!

Poverty Support Coalition:
Clients, 2012



3. Formulate a Spatial Question



- **Formulate a Spatial Question**
 - How many of our manuscripts originated from Athens, Greece?
 - Where are our excavation sites located?
 - Where were our Archive's photos taken?
- **When framing your question, approach the problem geographically**
 - Be Specific & Concise
- **Keep in mind: data must exist in order to answer these questions**
 - Known geographic locations of artifacts or historic geographic boundaries.

4. Assemble Additional Data

2010 Decennial Census

- Population survey data

TIGER/Line Files:

- Boundary Files



- **Federal**

- Data.gov
- Geodata.gov

- **State**

- data.CA.gov
- Pennsylvania Spatial Data Access (PASDA)

- **Local**

- NYC Data Mine



- London Datastore



5. Analyze Data (optional)

Analyze your data using desktop GIS software

Geoprocessing tools allow you to:

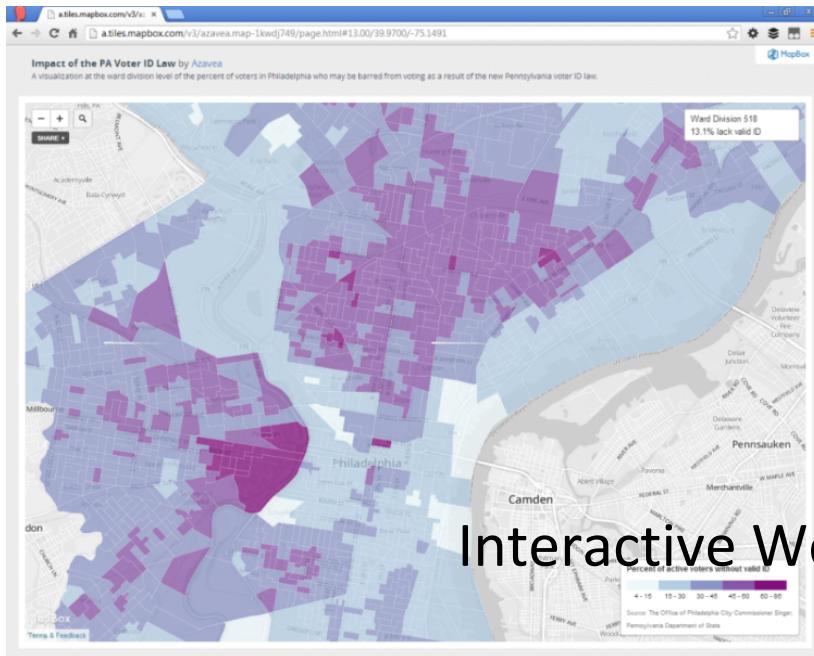
- Buffer
- Clip
- Merge
- Spatial Join
- Query
- Overlay
- Symbolize



6. Publish your Map

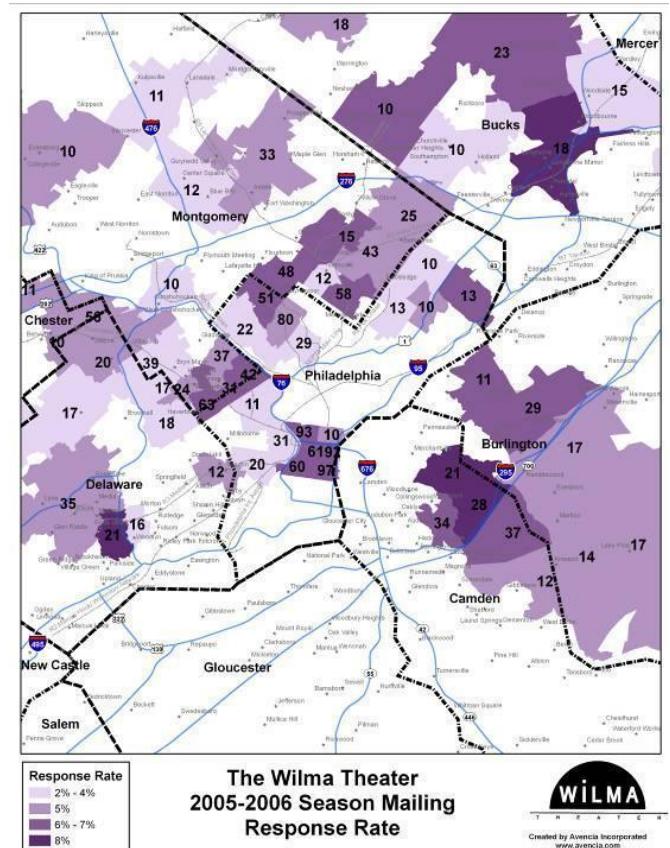
- Publish your maps in various formats

- Print Maps
- Web Maps
- Spreadsheets with data calculations



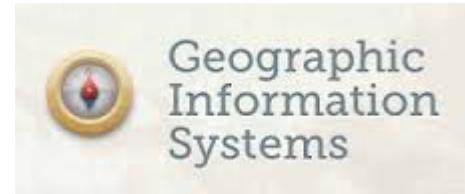
Interactive Web Map

Print PDF Map

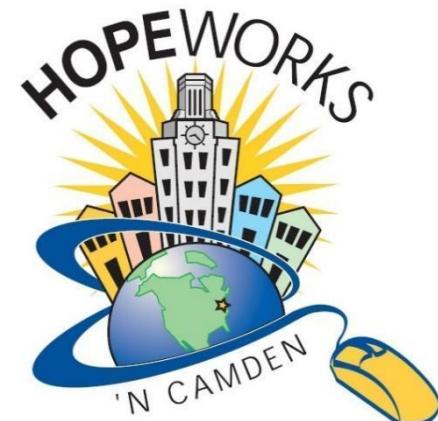


How to Seek help!

- GIS Stack Exchange
- Workshops
- MOOCs
- Civic Hackers
- Professional Consultants
- Probono Services



GEOPHILLY
AZAVEA
SUMMER *of* MAPS



Learn More about Desktop Mapping:

- Download and Install QGIS (<http://www.qgis.org/en/site/>)
- Complete Modules 1-7 in QGIS (http://docs.qgis.org/2.2/en/docs/training_manual/index.html)
- Create a Free CartoDB account and make a map
 - Download a shapefile from OpenDataPhilly
 - Use the **tutorial** to create an account, add data and share a map with CartoDb

To learn more about upcoming GeoPhilly events Visit our Meetup page: geophilly.com

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Learn More:



- **Other Tutorials available on the google drive:**
 - **GIS & Spatial Data 101**
 - This document describes the basics of GIS and spatial data as well as the tools available to create print and web maps.
 - **Approaching Geospatial Projects**
 - This document describes 3 case studies featuring complex geospatial questions and lists the steps used to approach a new project.
 - **Tutorial: Database to Map**
 - This tutorial describes the technical steps needed to turn a spreadsheet of data into a quick and free interactive web map.

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Additional Resources



More Spatial History Projects

[Dabbling in History: Digital History Course 2014](#)

Historic Data Available Online for Download

National Register of Historic Places <http://www.nps.gov/nr/research/>

The Spatial History Project (Stanford)

Visualization of historical data in time and space illuminates patterns of movement and transformation in the past. <http://www.stanford.edu/group/spatialhistory/cgi-bin/site/index.php>

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PhilaPlace – <http://www.philaplace.org/>

PhillyHistory.org – <http://www.phillyhistory.org>

Greater Philadelphia GeoHistory Network – <http://www.philageohistory.org/geohistory/>

New York Public Library MapWarper – <http://maps.nypl.org/warper/>

Visualizing Emancipation – <http://dsl.richmond.edu/emancipation/>

HyperCities – <http://hypercities.com/>

The Spatial History Project, Stanford University – <http://www.stanford.edu/group/spatialhistory>

Cleveland Historical – <http://clevelandhistorical.org/>

Mapping DuBois – <http://www.mappingdubois.org/>

Gilded Age Plains City – <http://gildedage.unl.edu/>

Spatial Humanities – <http://spatial.scholarslab.org/>

Google Map Engine Lite – <https://support.google.com/mapsengineelite/answer/3024396>

Neatline – <http://neatline.org/>

Google Earth – <http://earth.google.com/>

Crowdmap – <https://crowdmap.com/>

Social Explorer – <http://www.socialexplorer.com/>

CartoDB – <http://cartodb.com/>

MapStory – <http://mapstory.org/>

GeoCommons – <http://geocommons.com/>

MapBox - <https://www.mapbox.com/>



GEOPHILLY & MaptimPHL UPCOMING EVENTS

Monday Nov 10th
MapTimePHL Hand Drawn Map
Workshop
[meetup.com/maptimephl](https://www.meetup.com/maptimephl)

Thursday Nov 20th
2014 Geo Open Source
Conference presented by
GeoPhilly and LocationTech
ph.ly/opengeo

Other Events:

Geography Week is coming
up!

Girl Develop It
Coding classes for Women

Phila Historical Map Society
Lots of cool stuff all the time!

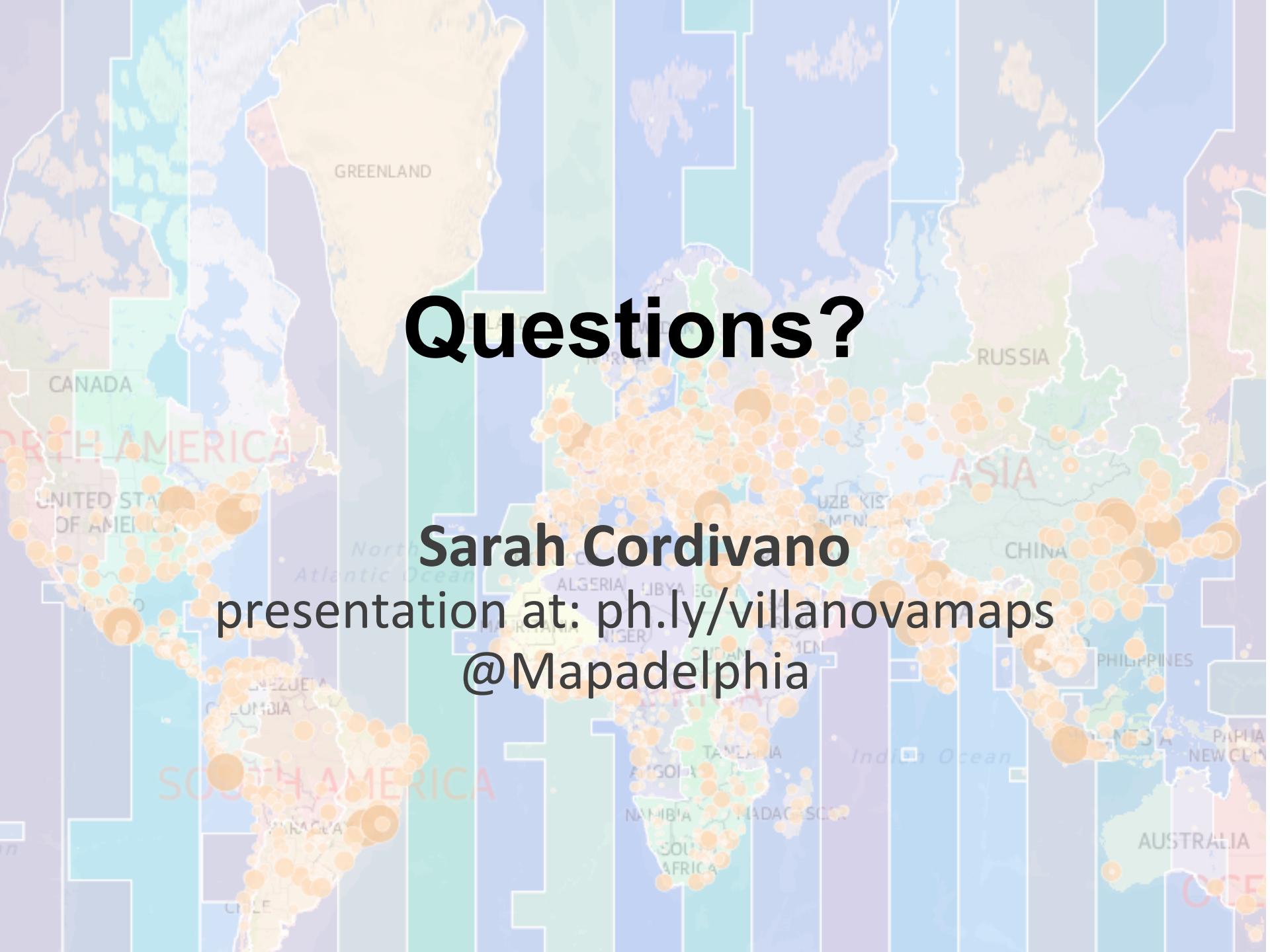
2014 Geo Open Source Conference

Thursday, 20 November 2014 from 1:00 PM to 5:30 PM



Presented by **GeoPhilly** and **LocationTech**

rsvp @ ph.ly/opengeo



Questions?

Sarah Cordivano

presentation at: ph.ly/villanovamaps
@Mapadelphia