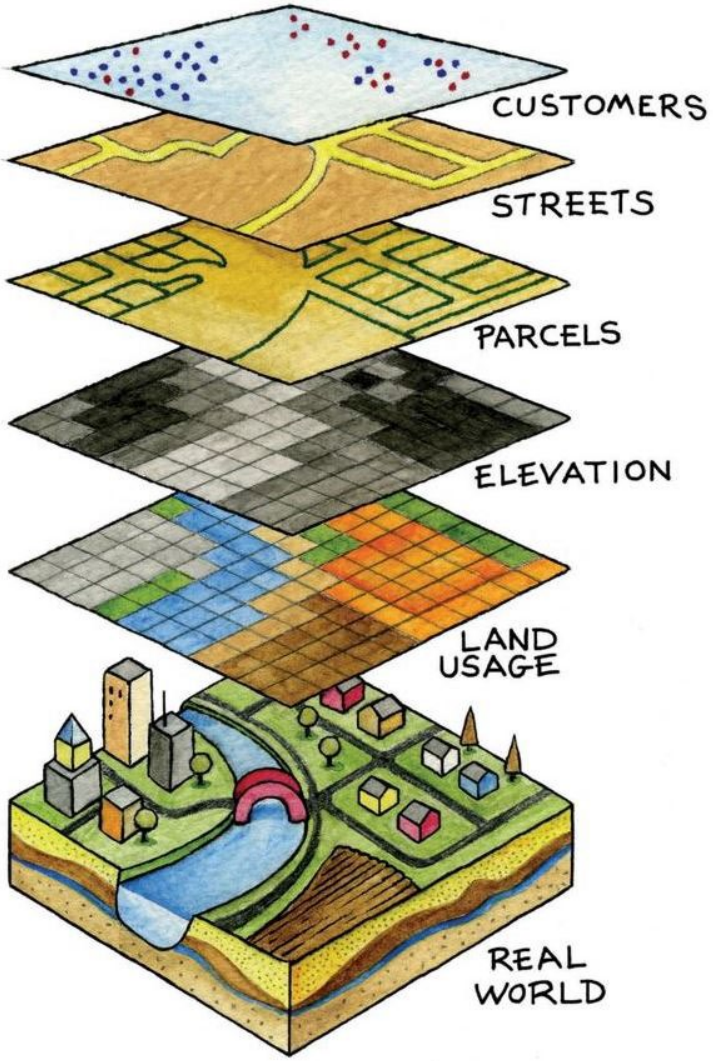
Introduction to Geographic Information Systems

Chris Gist, MS GISP
Drew MacQueen, MS
GIS Specialists
University of Virginia Library
uvagis@virginia.edu

THE SCHOLARS' LAB

What is GIS?



- An Information System
  Hardware, software, & analysis tools
- A system for **Viewing**, **Managing**, and **Analyzing** spatial data
- The Science of Where

What is a GIS?

GIS = Spatial Data + Spatial Analysis + Maps

What makes data spatial?

Grid coordinates

Place name

Latitude / Longitude

Government Geographies

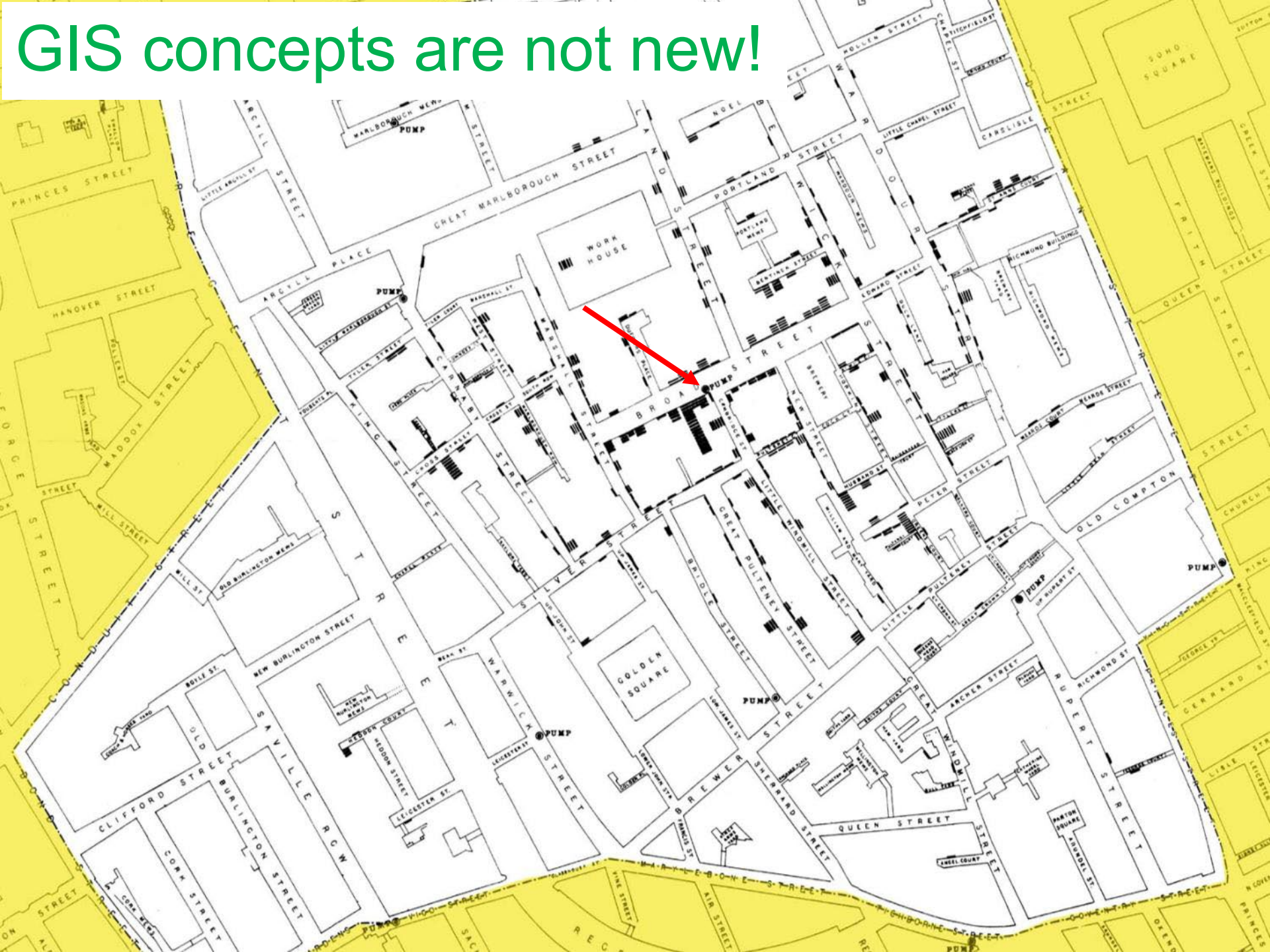
Real world objects

Distance & bearing

Why is GIS unique?

- GIS handles SPATIAL information
  - Information referenced by its location in space
- GIS makes connections between activities based on spatial proximity
- Creates relationships between otherwise unrelatable data

GIS concepts are not new!

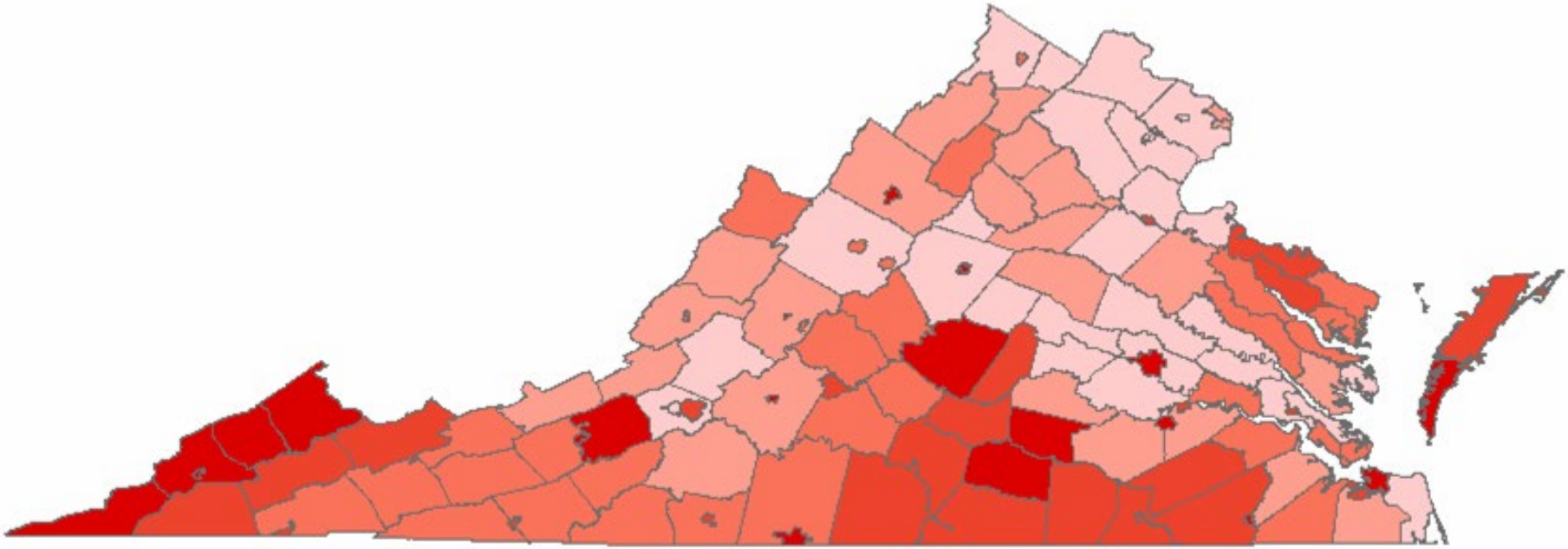


London Cholera Epidemic 1854

Visualizing Data

FIPS_1	NAME_1	TOTPOP	PERAA	PERNATIVE	PERASIAN	PEROTHER	PERMALE	PERFEMALE	PERLT5	PERGT65	PERPOV
51163	Rockbridge County, Virginia	20808	2.72	0.06	0.59	1.24	50.34	49.66	5.27	15.61	9.59
51143	Pittsylvania County, Virgini	61745	23.66	0.17	0.12	1.03	48.65	51.35	5.68	14.26	11.75
51105	Lee County, Virginia	23589	0.43	0.44	0.35	0.82	48.75	51.25	5.8	15.49	23.92
51019	Bedford County, Virginia	60371	5.94	0.23	0.96	1.19	49.8	50.2	5.78	12.86	7.11
51027	Buchanan County, Virginia	26978	2.34	0	0.2	0.4	50.87	49.13	4.87	11.39	23.17
51185	Tazewell County, Virginia	44598	2.17	0.07	0.5	0.87	47.51	52.49	5.36	15.37	15.30
51051	Dickenson County, Virginia	16395	0.3	0.09	0.16	0.53	49	51	5.42	14.49	21.31
51021	Bland County, Virginia	6871	4.58	0.22	0.23	0	54.37	45.63	4.48	14.76	12.36
51155	Pulaski County, Virginia	35127	5.65	0.29	0.07	1.51	49.41	50.59	5.74	15.35	13.09
51067	Franklin County, Virginia	47286	9.55	0.11	0.19	1.22	49.28	50.72	5.37	14.27	9.70
51195	Wise County, Virginia	40123	1.57	0.17	0.26	1.04	48.91	51.09	5.67	14	19.99
51121	Montgomery County, Virginia	83629	3.89	0.19	3.75	1.95	52.21	47.79	4.83	8.64	23.24
51197	Wythe County, Virginia	27599	2.64	0.12	0.43	1.37	47.52	52.48	5.49	15.79	11.05
51077	Grayson County, Virginia	17917	6.89	0.09	0.02	1.93	51.81	48.19	4.71	17	13.62
51167	Russell County, Virginia	30308	2.97	0.16	0.09	1.01	50.54	49.46	5.23	13.35	16.35
51173	Smyth County, Virginia	33081	2	0.24	0.1	0.93	48.24	51.76	5.34	16.31	13.33
51720	Norton city, Virginia	3904	5.97	0.15	1.08	2.64	43.78	56.22	5.48	15.7	22.76
51191	Washington County, Virginia	51103	1.54	0.12	0.43	0.7	48.45	51.55	5.06	15.33	10.93
51169	Scott County, Virginia	23403	0.87	0.27	0.06	0.54	48.16	51.84	5.06	17.75	16.76
51520	Bristol city, Virginia	17367	5.2	0.13	0.41	1.61	45.17	54.83	5.11	20.45	16.24
51023	Botetourt County, Virginia	30496	3.67	0.15	0.39	0.97	49.8	50.2	5.7	13.23	5.19
51045	Craig County, Virginia	5091	0.26	0.12	0.33	0.2	50.95	49.05	5.17	13.67	10.26
51071	Giles County, Virginia	16657	1.56	0.01	0.16	1.09	48.83	51.17	5.58	16.65	9.55
51750	Radford city, Virginia	15859	7.49	0.06	1.26	2.3	45.15	54.85	3.73	9.79	31.35
51005	Alleghany County, Virginia	12926	2.54	0	0.56	0.39	50.31	49.69	5.6	15.7	7.14
51580	Covington city, Virginia	6303	13.1	0	0.4	1.6	47.18	52.82	6.38	20.45	12.89
51678	Lexington city, Virginia	6867	10.27	0.19	1.09	1.78	56.53	43.47	3.07	16.37	21.57
51161	Roanoke County, Virginia	85778	3.15	0.15	1.16	1.42	47.31	52.69	5.25	15.82	4.46
51515	Bedford city, Virginia	6299	22.84	0.13	0.51	1.51	47.28	52.72	5.64	21.84	19.68
51770	Roanoke city, Virginia	94911	26.75	0.28	1.06	2.85	46.76	53.24	6.52	16.4	15.95
51775	Salem city, Virginia	24747	5.72	0.15	1.03	1.26	47.38	52.62	4.87	16.92	6.71
51063	Floyd County, Virginia	13874	1.33	0	0.15	1.74	49.06	50.94	5.72	15.79	11.72
51035	Carroll County, Virginia	29245	0.71	0.1	0.22	1.85	49.96	50.04	5.59	17.18	12.46
51141	Patrick County, Virginia	19407	6.81	0.1	0.45	1.59	48.96	51.04	5.82	16.46	13.41
51089	Henry County, Virginia	57930	22.88	0.37	0.27	2	48.68	51.32	5.3	14.89	11.65
51640	Galax city, Virginia	6837	7.3	0.12	0.23	6.1	47.68	52.32	5.47	18.62	18.61
51690	Martinsville city, Virginia	15416	41.84	0.06	0.45	1.58	44.81	55.19	5.76	20.87	19.19
51590	Danville city, Virginia	48411	44.19	0.3	0.5	1.26	45.4	54.6	5.9	19.68	19.96
51017	Bath County, Virginia	5048	5.74	0	0.32	0.69	49.76	50.24	4.46	17.12	7.79
51091	Highland County, Virginia	2536	0.08	0.24	0	0.35	49.92	50.08	3.67	20.19	12.56
51003	Albemarle County, Virginia	79236	9.72	0.2	3.1	1.75	48.15	51.85	6.29	12.5	6.74
51033	Caroline County, Virginia	22121	34.61	0.8	0.48	1.43	50.13	49.87	6.09	13.07	9.35

Visualizing Data

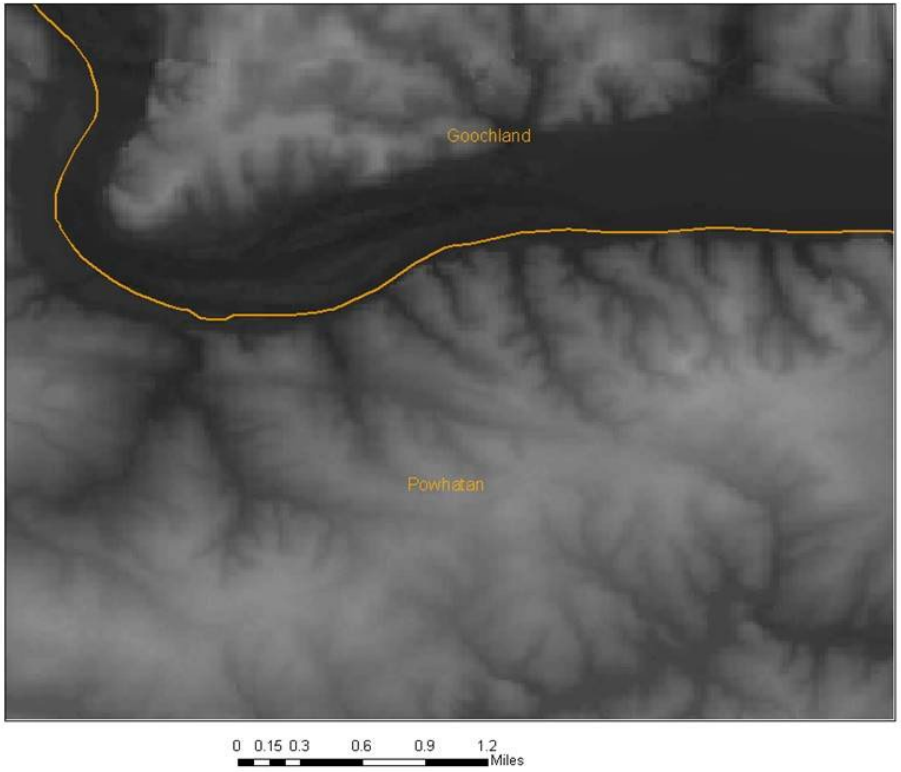


Considerations

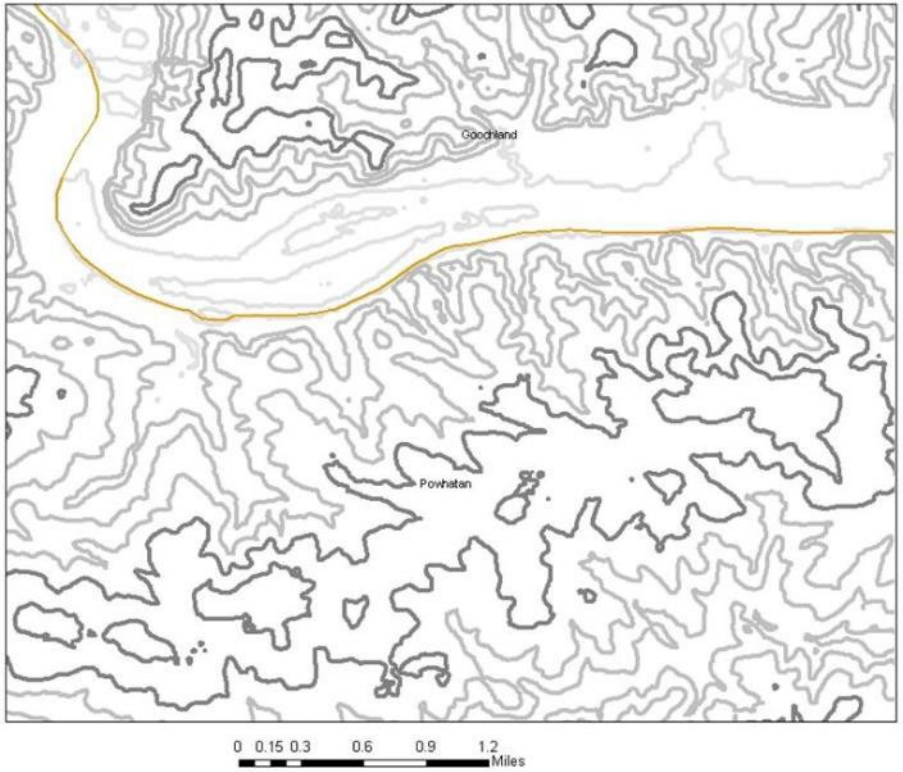
- Data Type
- Projection
- Accuracy/Quality
- Scale
- Resolution

Types of Geographic Data

Raster



Vector



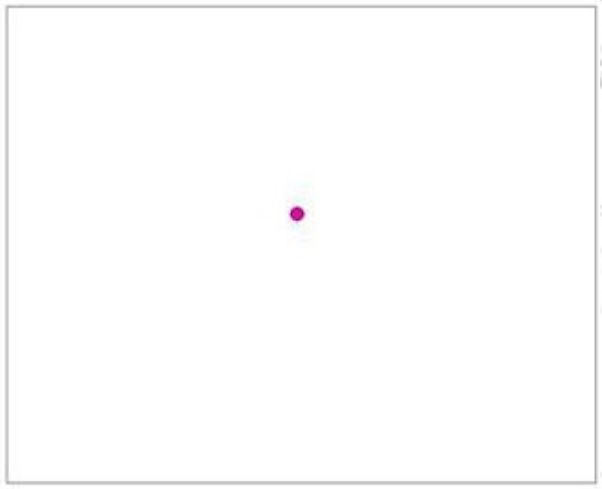
Types of Geographic Data

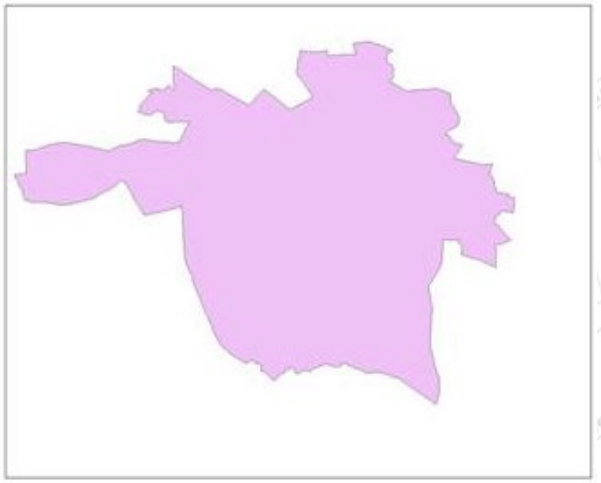
Vector

Point

Arc(Polyline)

Polygon

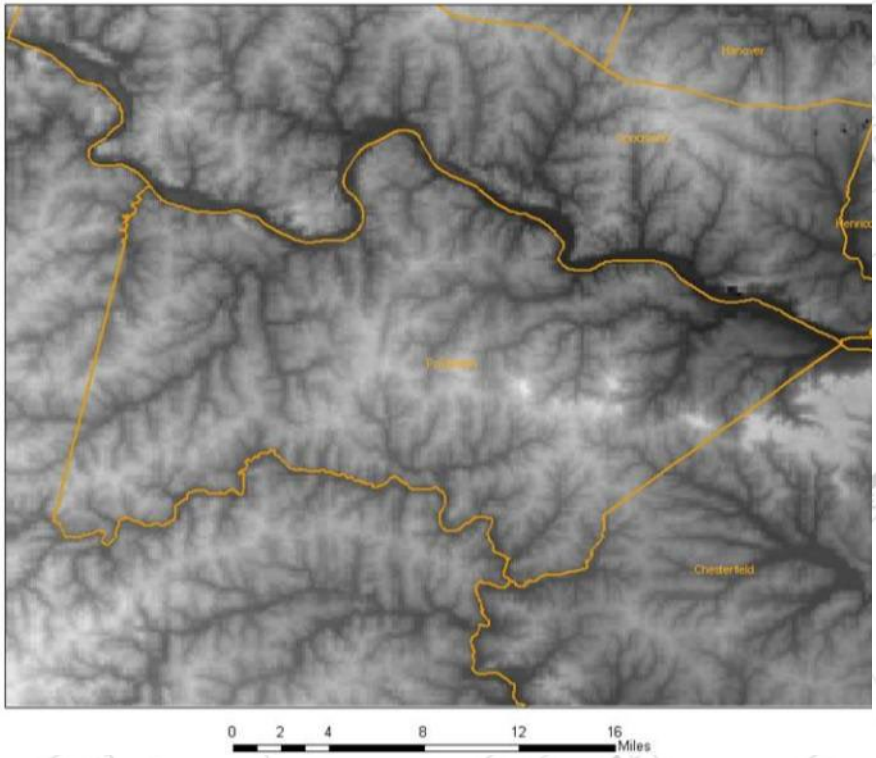


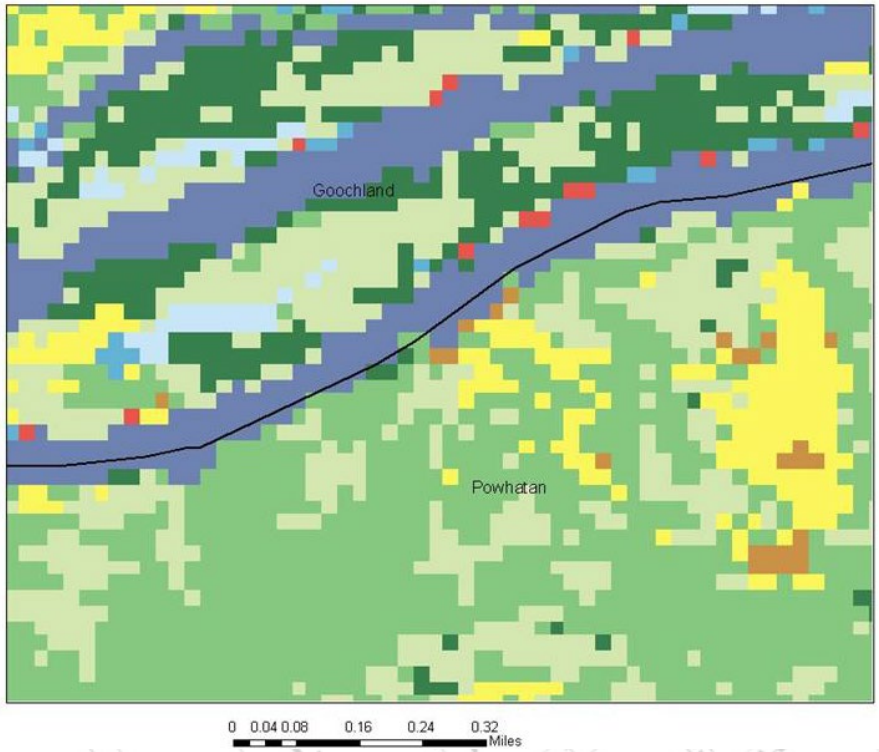


Types of Geographic Data

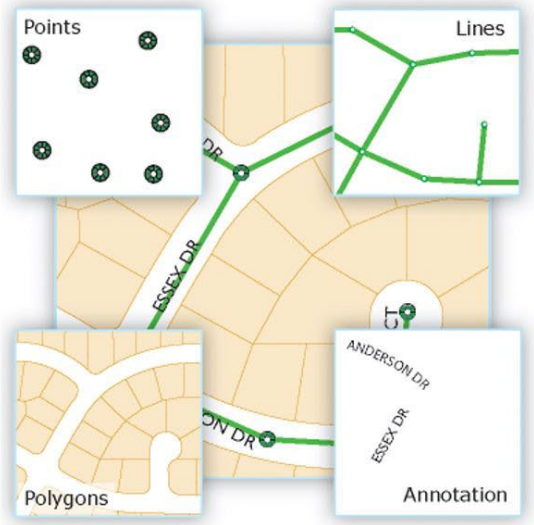
Raster

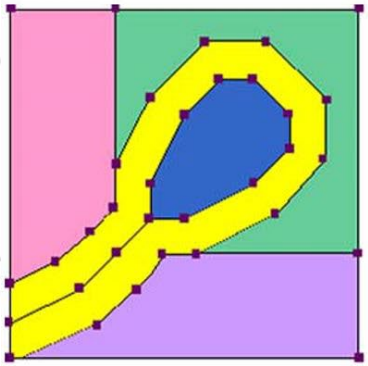
Collection of cells or pixels, each with a specific value



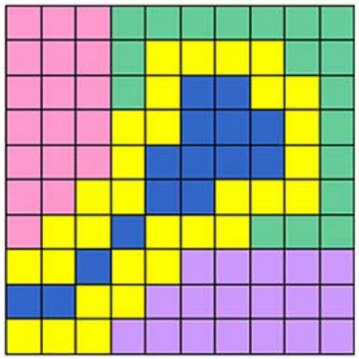


Types of Geographic Data



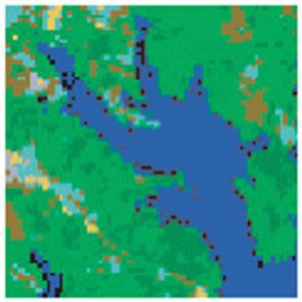


Vector

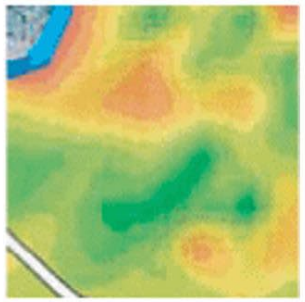


Raster

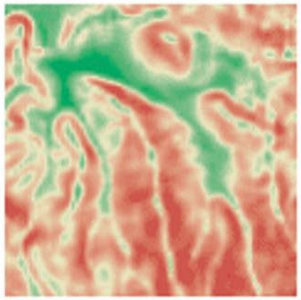
Orthophoto



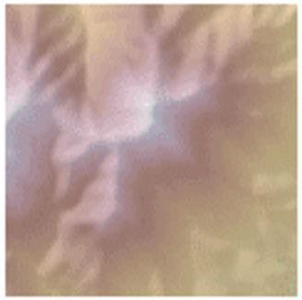
Land Use



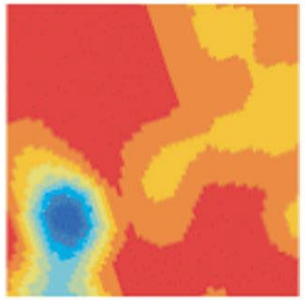
Concentration



Slope

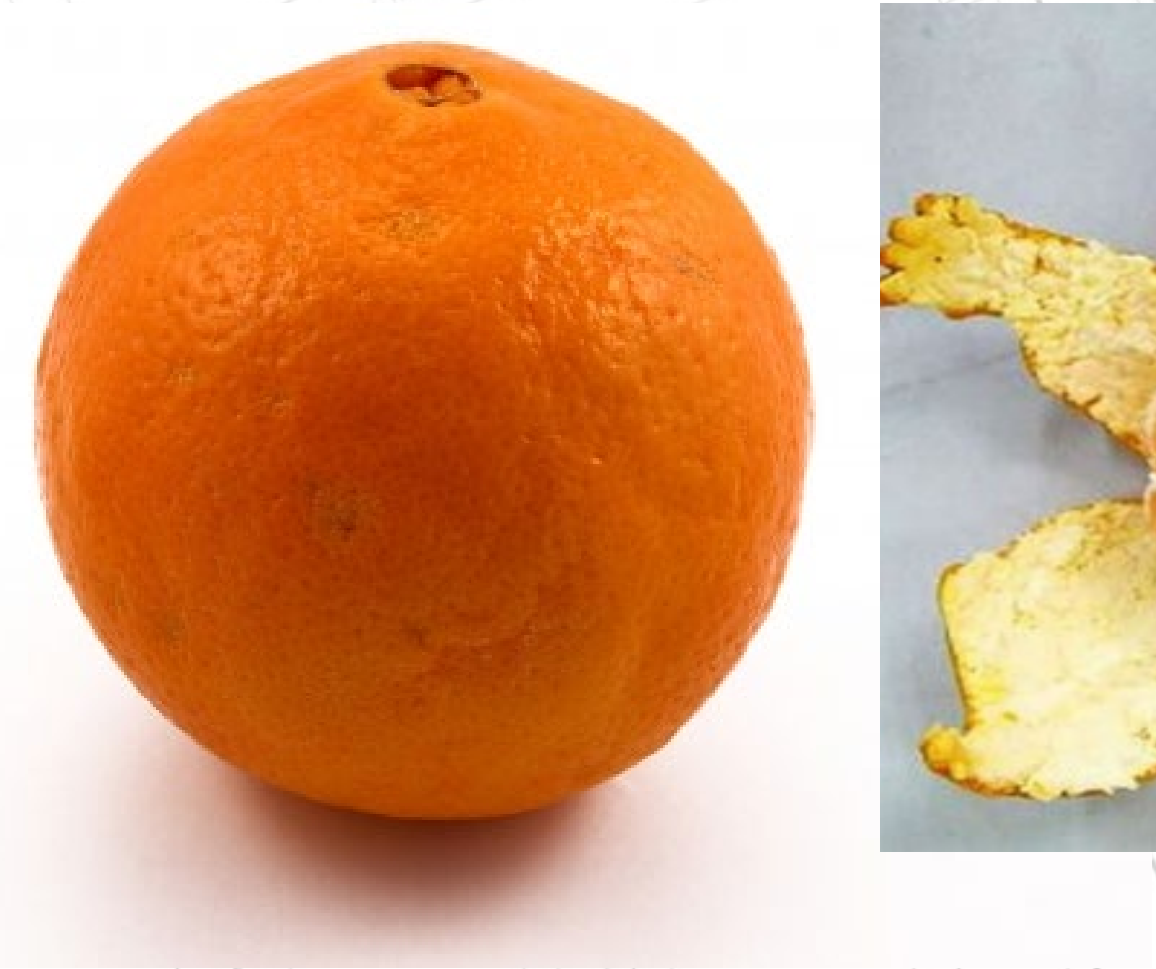


Elevation



Population

Map Projection = 3D to 2D



Projection System

- Also known as “coordinate system”
- Dependent upon:
  - Local standards
  - Uses and needs
- Multiple data sources can mean multiple projections

THE WORLD
IS OUR CAMPUS

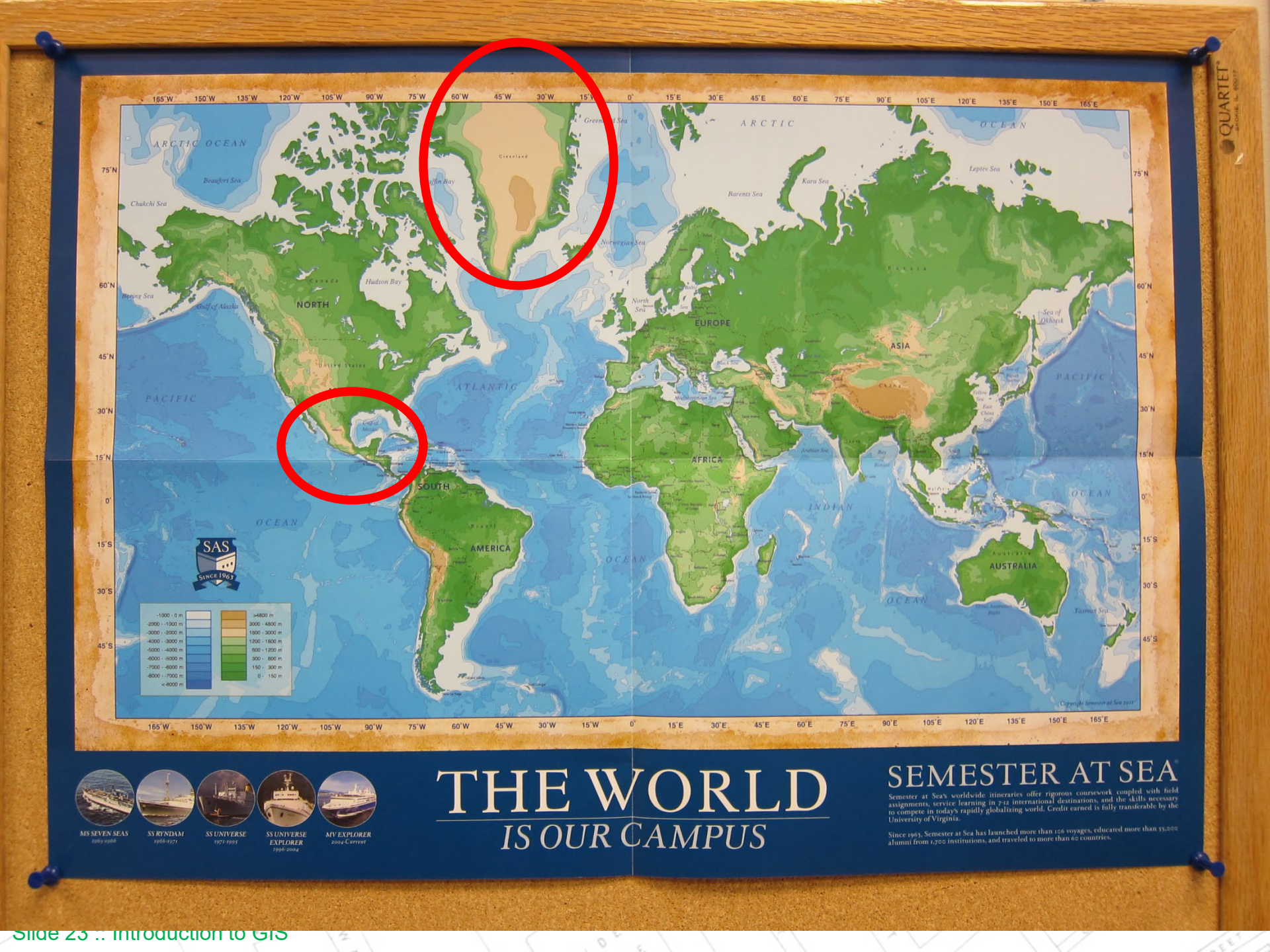
SEMESTER AT SEA

Semester at Sea's worldwide itineraries offer rigorous coursework coupled with field assignments, service learning in 7-12 international destinations, and the skills necessary to compete in today's rapidly globalizing world. Credit earned is fully transferable by the University of Virginia.

Since 1963, Semester at Sea has launched more than 126 voyages, educated more than 35,000 alumni from 1,700 institutions, and traveled to more than 60 countries.

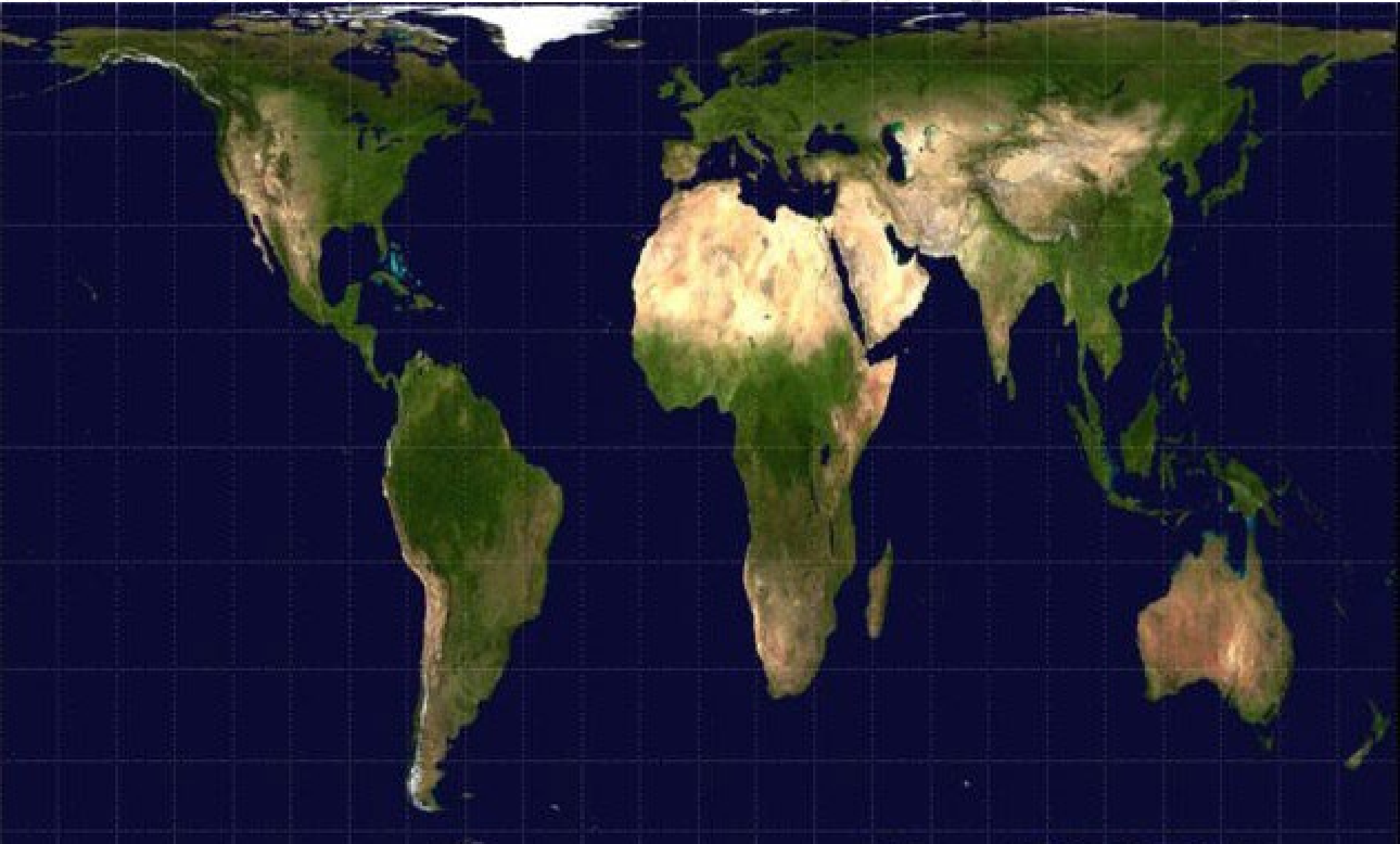

ARCTIC OCEAN
Beaufort Sea
Chukchi Sea
Bering Sea
Gulf of Alaska
Canada
Hudson Bay
NORTH
AMERICA
United States
PACIFIC
ATLANTIC
SOUTH
AMERICA
OCEAN
Greenland
Baffin Bay
Greenland Sea
Barents Sea
Kara Sea
Leptev Sea
Norwegian Sea
North Sea
EUROPE
ASIA
Russia
Sea of Okhotsk
China
Arabian Sea
AFRICA
INDIAN
OCEAN
AUSTRALIA
Tasman Sea
SAS
SINCE 1963
THE WORLD
IS OUR CAMPUS
MS SEVEN SEAS
1965-1968
SS RYNDAM
1968-1971
SS UNIVERSE
1971-1995
SS UNIVERSE EXPLORER
1996-2004
MV EXPLORER
2004-Current
SEMESTER AT SEA
Semester at Sea's worldwide itineraries offer rigorous coursework coupled with field assignments, service learning in 7-12 international destinations, and the skills necessary to compete in today's rapidly globalizing world. Credit earned is fully transferable by the University of Virginia.
Since 1963, Semester at Sea has launched more than 126 voyages, educated more than 35,000 alumni from 1,700 institutions, and traveled to more than 60 countries.
QUARTET


ARCTIC OCEAN
Greenland
Beaufort Sea
Chukchi Sea
Baffin Bay
Greenland Sea
Barents Sea
Kara Sea
Leptev Sea
Norwegian Sea
Canada
Hudson Bay
Bering Sea
Gulf of Alaska
NORTH
AMERICA
United States
PACIFIC
ATLANTIC
North Sea
EUROPE
ASIA
Sea of Okhotsk
AFRICA
SOUTH
AMERICA
OCEAN
INDIAN
AUSTRALIA
Tasman Sea
SAS
SINCE 1963
THE WORLD
IS OUR CAMPUS
MS SEVEN SEAS
1965-1988
SS RYNDAM
1968-1971
SS UNIVERSE
1971-1993
SS UNIVERSE EXPLORER
1996-2004
MV EXPLORER
2004-Current
SEMESTER AT SEA
Semester at Sea's worldwide itineraries offer rigorous coursework coupled with field assignments, service learning in 7-12 international destinations, and the skills necessary to compete in today's rapidly globalizing world. Credit earned is fully transferable by the University of Virginia.
Since 1963, Semester at Sea has launched more than 126 voyages, educated more than 35,000 alumni from 1,700 institutions, and traveled to more than 60 countries.
QUARTET

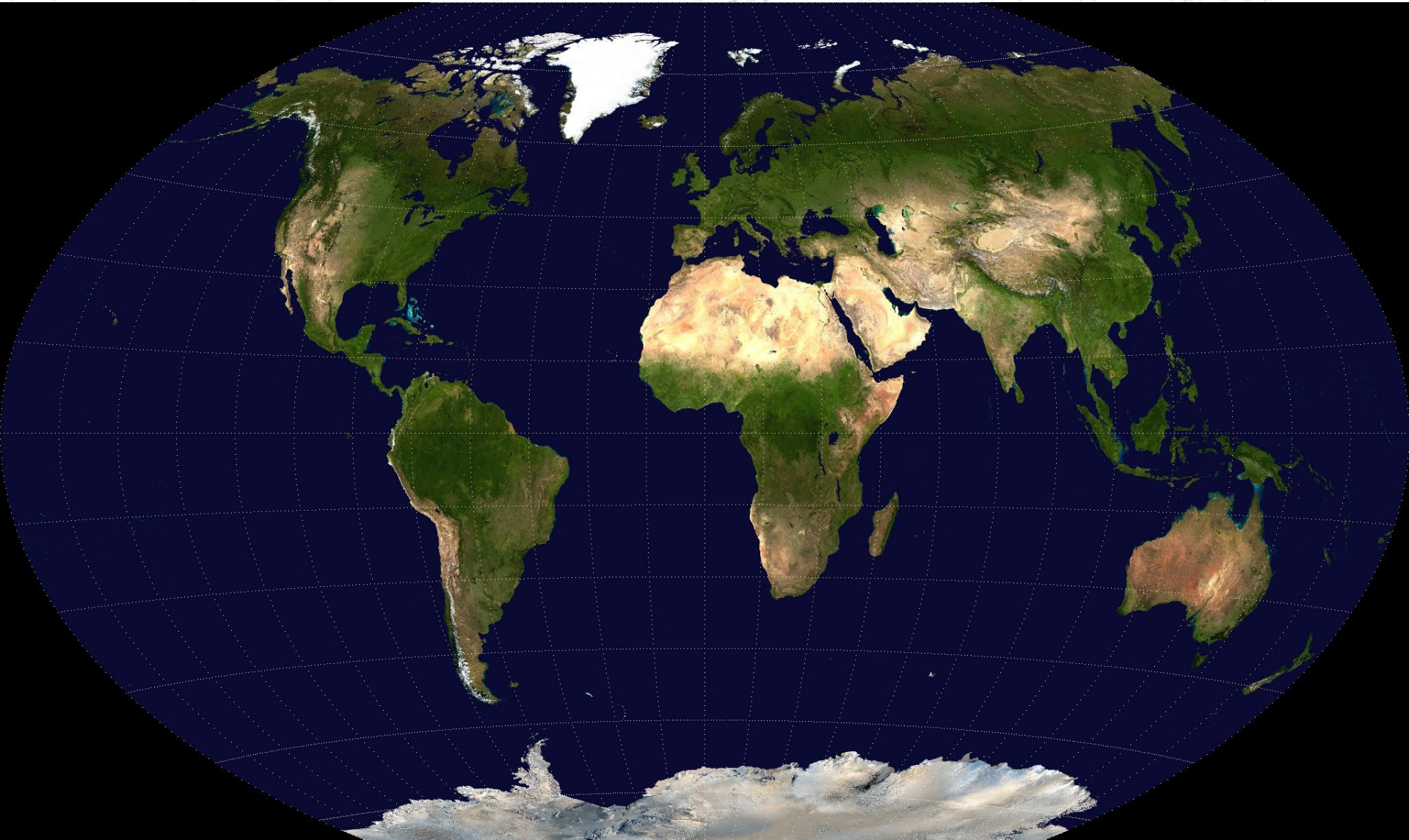

ARCTIC OCEAN
Greenland
Beaufort Sea
Chukchi Sea
Baffin Bay
Hudson Bay
Canada
Bering Sea
Gulf of Alaska
NORTH
AMERICA
United States
PACIFIC
ATLANTIC
Gulf of Mexico
SOUTH
AMERICA
Brazil
OCEAN
Greenland Sea
Barents Sea
Kara Sea
Leptev Sea
Norwegian Sea
North Sea
EUROPE
ASIA
Russia
Sea of Okhotsk
China
Yellow Sea
East China Sea
Mediterranean Sea
Black Sea
Caspian Sea
Arabian Sea
Bay of Bengal
AFRICA
INDIAN
OCEAN
AUSTRALIA
Tasman Sea
SAS
SINCE 1963
-1000 - 0 m
-2000 - -1000 m
-3000 - -2000 m
-4000 - -3000 m
-5000 - -4000 m
-6000 - -5000 m
-7000 - -6000 m
-8000 - -7000 m
<-8000 m
>4800 m
3000 - 4800 m
1800 - 3000 m
1200 - 1800 m
600 - 1200 m
300 - 600 m
150 - 300 m
0 - 150 m
165°W 150°W 135°W 120°W 105°W 90°W 75°W 60°W 45°W 30°W 15°W 0° 15°E 30°E 45°E 60°E 75°E 90°E 105°E 120°E 135°E 150°E 165°E
75°N 60°N 45°N 30°N 15°N 0° 15°S 30°S 45°S
MS SEVEN SEAS
1965-1968
SS RYNDAM
1968-1971
SS UNIVERSE
1971-1995
SS UNIVERSE EXPLORER
1996-2004
MV EXPLORER
2004-Current
THE WORLD
IS OUR CAMPUS
SEMESTER AT SEA
Semester at Sea's worldwide itineraries offer rigorous coursework coupled with field assignments, service learning in 7-12 international destinations, and the skills necessary to compete in today's rapidly globalizing world. Credit earned is fully transferable by the University of Virginia.
Since 1963, Semester at Sea has launched more than 126 voyages, educated more than 35,000 alumni from 1,700 institutions, and traveled to more than 60 countries.
QUARTET

Mercator Projection Preserves Shape & Direction

Gall-Peters Projection
Preserves Area – Distorts Shape



Winkel Tripel Projection
Compromise Projection – Nat Geo



North Korea's missile threat

Type	Maximum range	Payload	Status
Nodong	1,300 km (810 miles)	700 kg (1,550 pounds)	Currently deployed
Taepodong-1	Up to 10,000 km	Several hundred kg	Test failed 1998, not yet operational
Taepodong-2	10,000-15,000 km	Several hundred kg	Not yet tested

Source: Task Force for US Korea Policy, Centre for International Policy

North Korea's missile threat

Type	Maximum range	Payload	Status
Nodong	1,300 km (810 miles)	700 kg (1,550 pounds)	Currently deployed
Taepodong-1	Up to 10,000 km	Several hundred kg	Test failed 1998, not yet operational
Taepodong-2	10,000–15,000 km	Several hundred kg	Not yet tested

Source: Task Force for US Korea Policy, Centre for International Policy

Projections

Summary

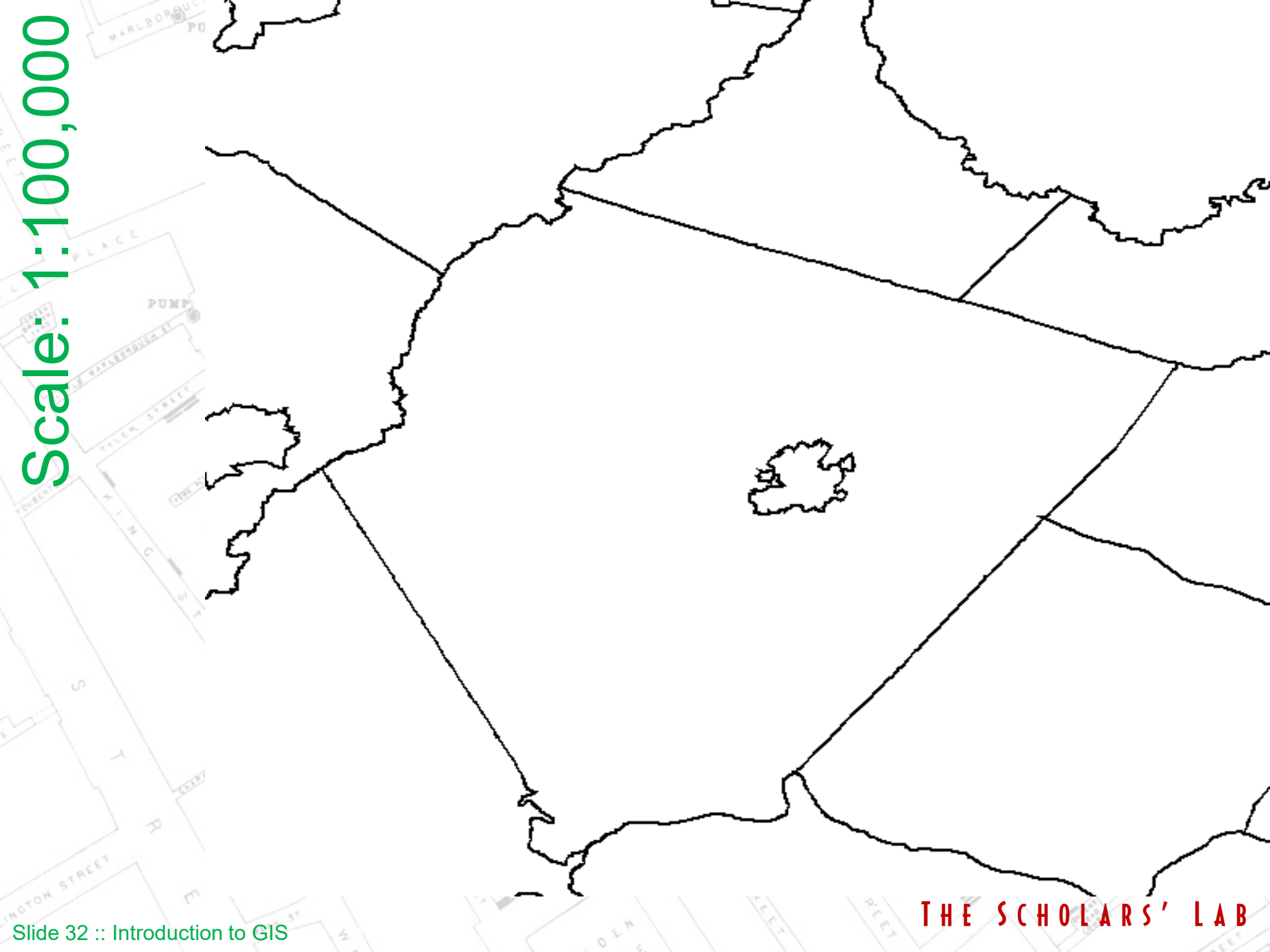
● = Yes
○ = Partly

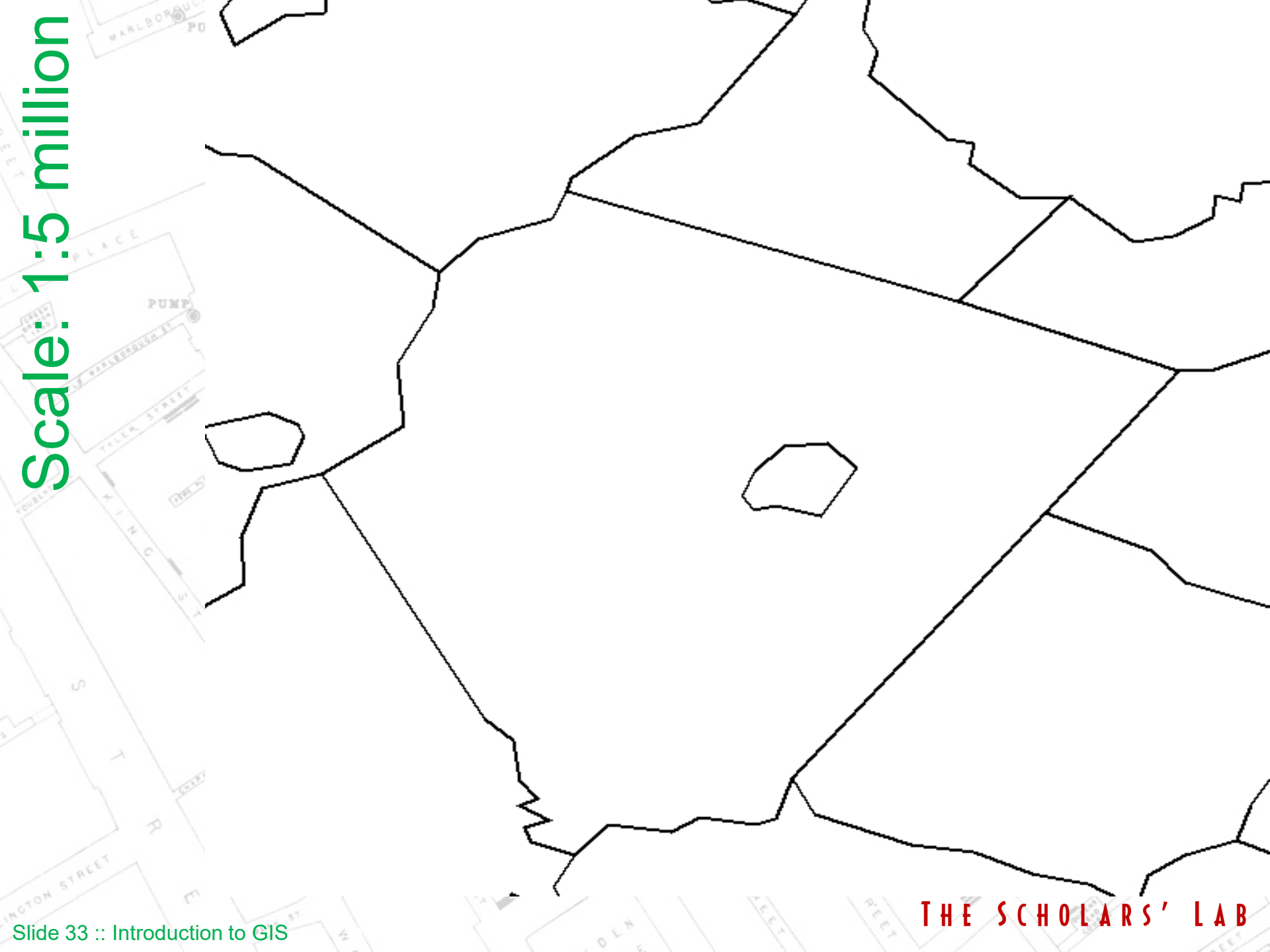
Projection	Type	Properties: Conformal	Equal area	Equidistant	True direction	Perspective	Compromise	Straight rhumbs	Suitable for Mapping: World	Hemisphere	Continent/Ocean	Region/Sea	Medium Scale	Large Scale	General Use: Topographic Maps	Geological Maps	Thematic Maps	Presentations	Navigation	USGS Maps
Globe	Sphere	●	●	●	●				●								●	●		
Mercator	Cylindrical	●			○		●		○			●			●	●			●	●
Transverse Mercator	Cylindrical	●									●	●	●	●	●	●				●
Oblique Mercator	Cylindrical	●									●	●	●	●	●					●
Space Oblique Mercator	Cylindrical	●												●	●					●
Miller Cylindrical	Cylindrical						●		●								●			●
Robinson	Pseudocylindrical						●		●								●	●		
Sinusoidal Equal Area	Pseudocylindrical		●	○					●		●						●			●
Orthographic	Azimuthal				○	●				○										●
Stereographic	Azimuthal	●			○	●				●	●	●	●	●	●	●			●	●
Gnomonic	Azimuthal				○	●						○						●	●	
Azimuthal Equidistant	Azimuthal			○	○				○	●	●	●		○	●					●
Lambert Azimuthal Equal Area	Azimuthal		●		○					●	●	●						●	●	●
Albers Equal Area Conic	Conic		●								●	●	●					●	●	●
Lambert Conformal Conic	Conic	●			○						●	●	●	●	●	●		●	●	●
Equidistant Conic (Simple Conic)	Conic			○							●	●								
Polyconic	Conic			○			●						○	○	●					●
Bipolar Oblique Conic Conformal	Conic	●									●					●				●

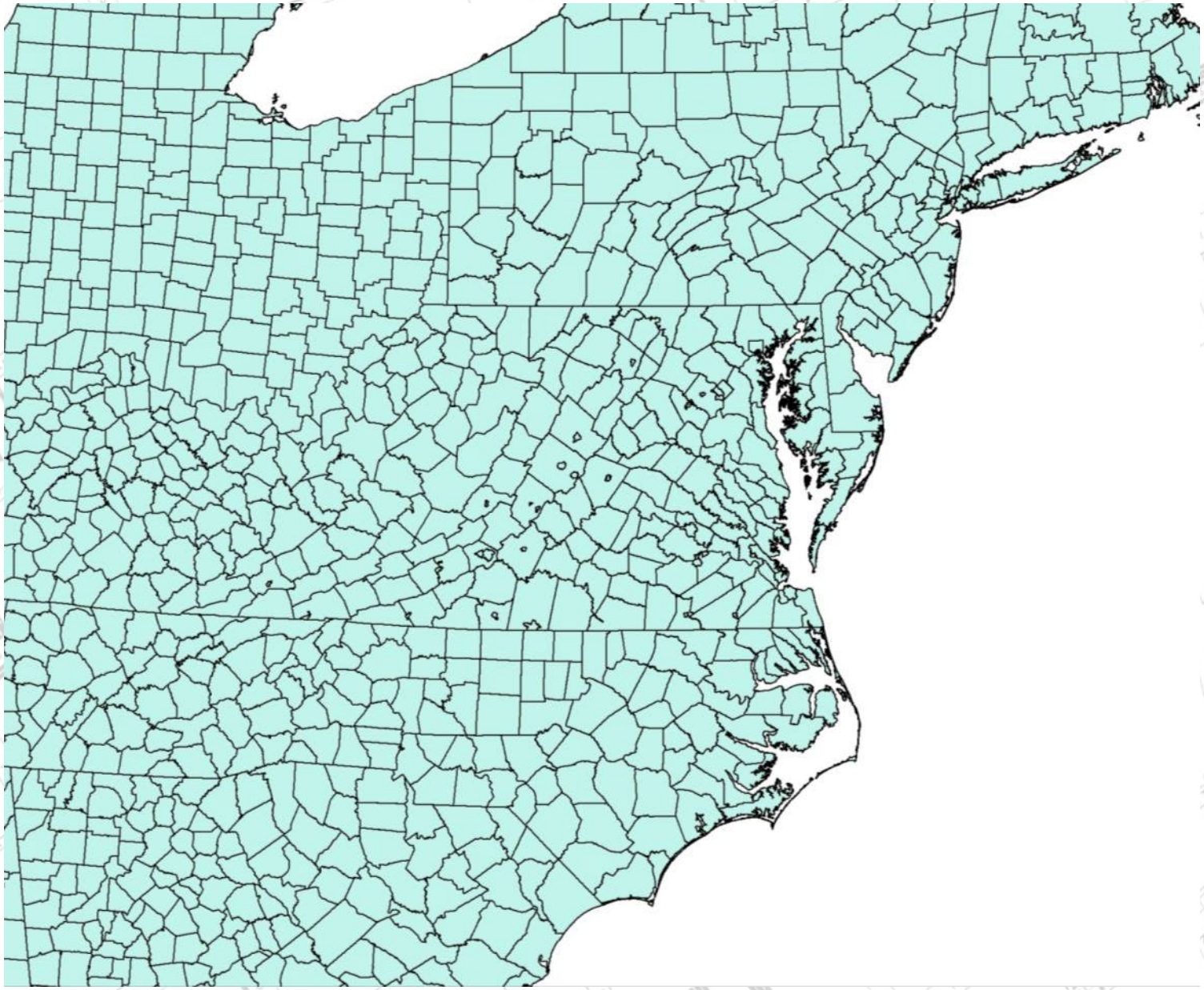
All above projections (except Robinson) are explained in detail in *Map Projections—A Working Manual*, John P. Snyder, Geological Survey Professional Paper 1395 (Washington: USGPO, 1987, 383 pp.)

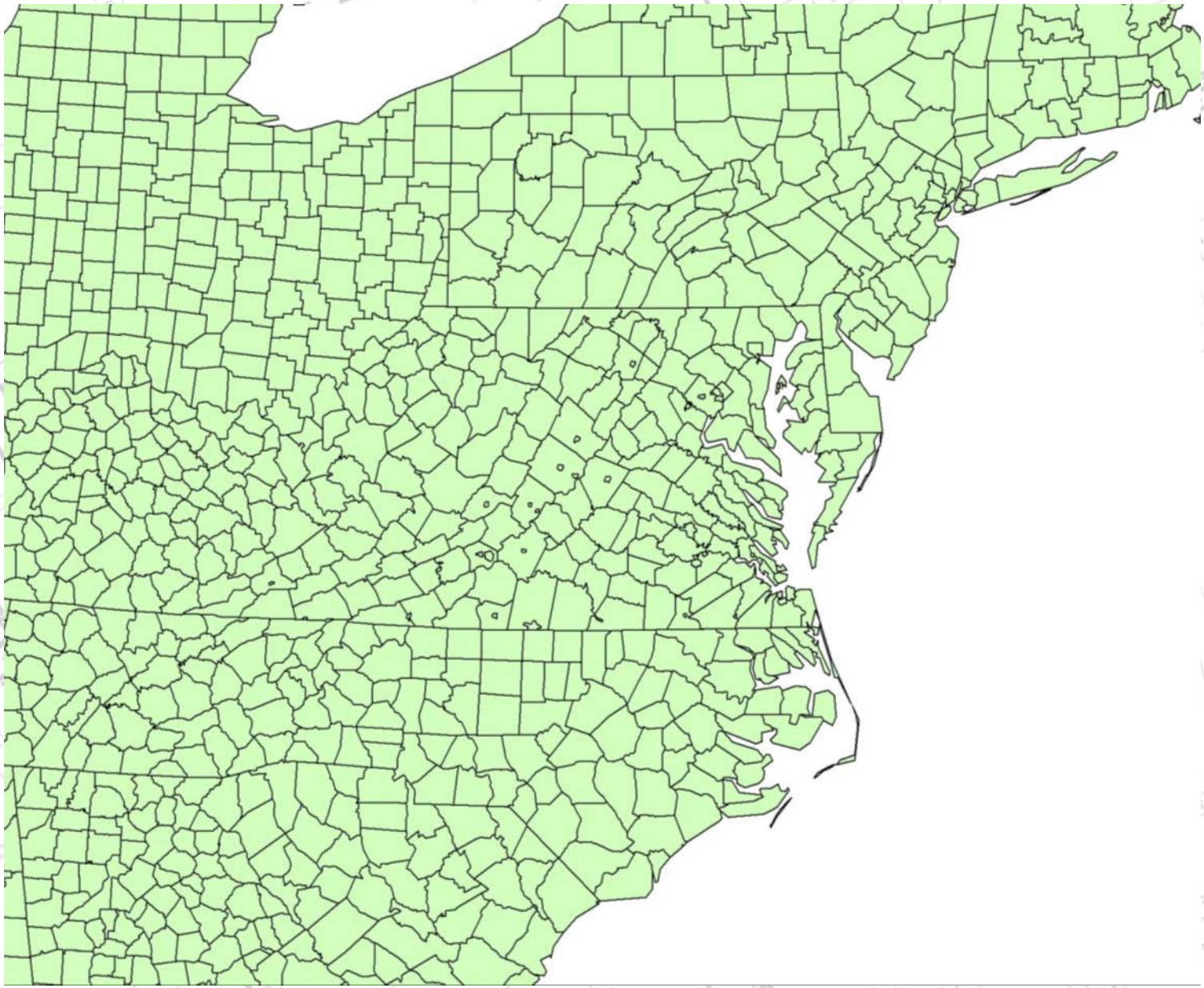
Accuracy: Census Streets Data

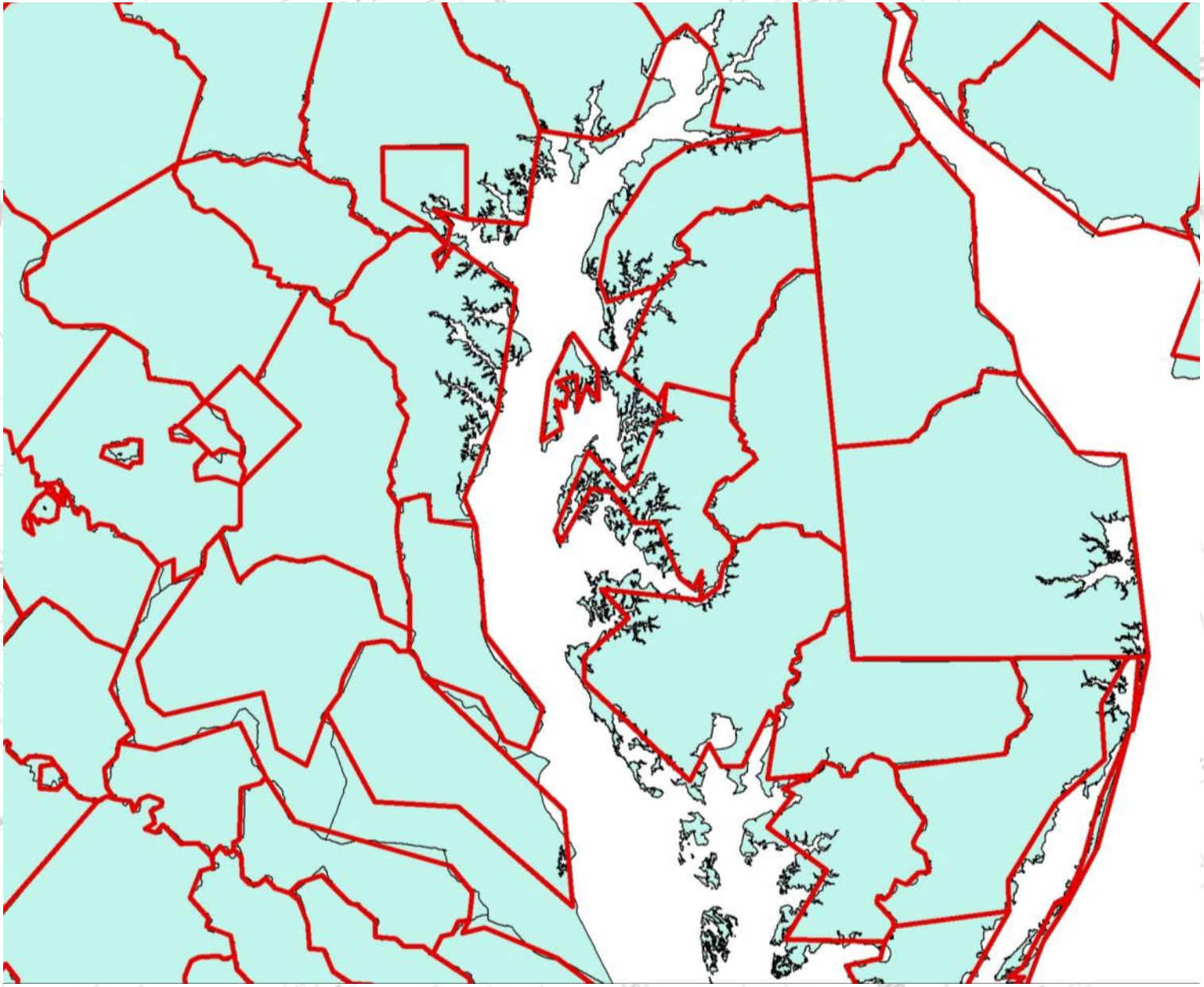
Accuracy: City Planning Data


Scale: 1:100,000


Scale: 1:5 million







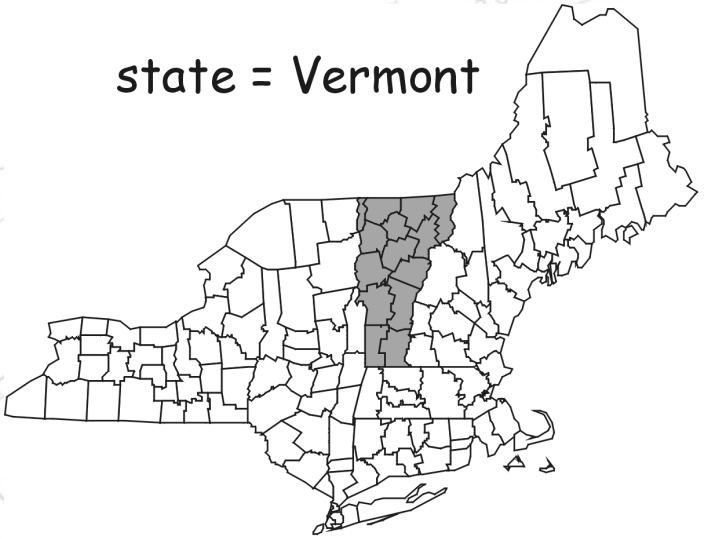
Resolution: 1-foot/pixel

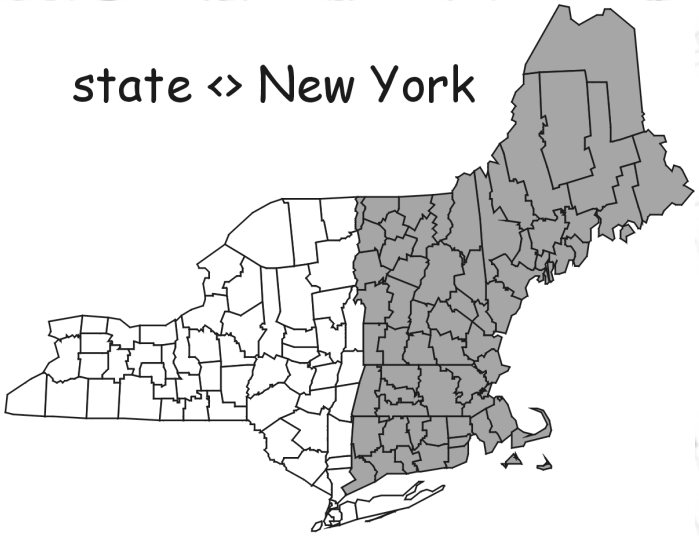
Resolution: 1-meter/pixel

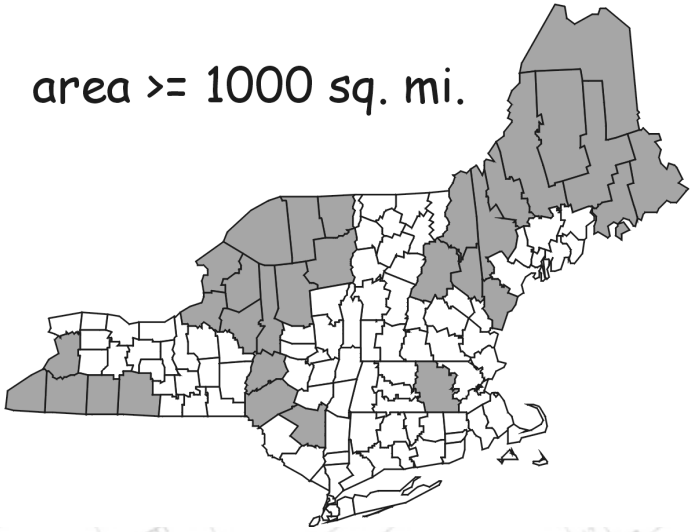
Spatial Analysis

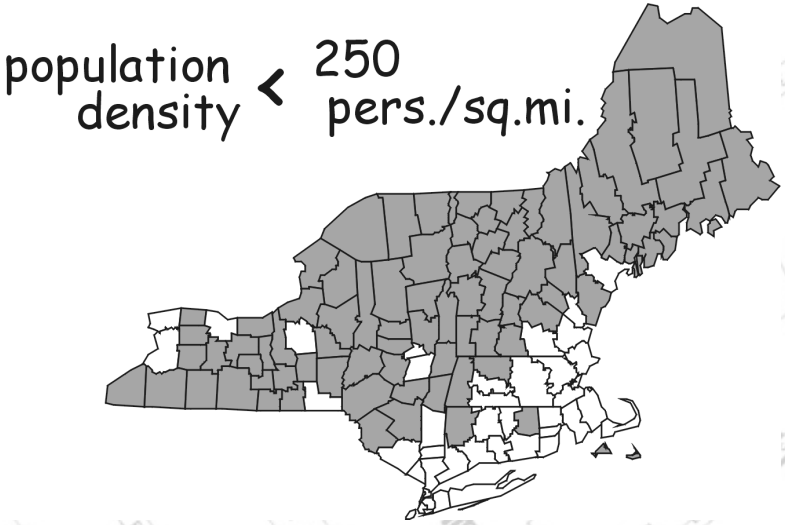
- Selection and Classification
- Dissolve
- Proximity and Buffering
- Network Analysis
- Overlay
  - Clip
  - Intersection
  - Union
- Extract by Point

Selection and Classification



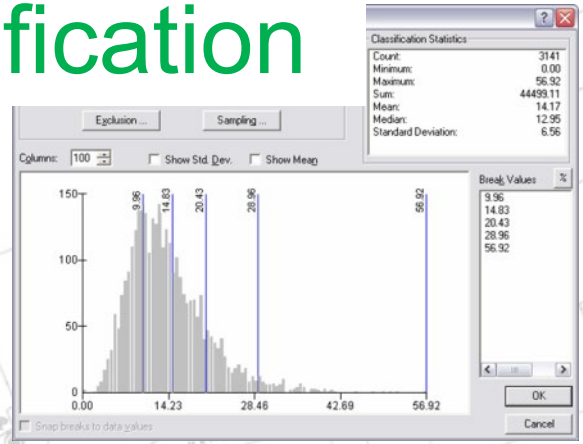


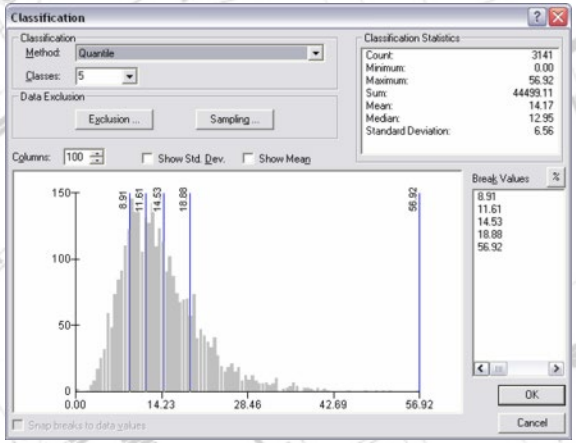


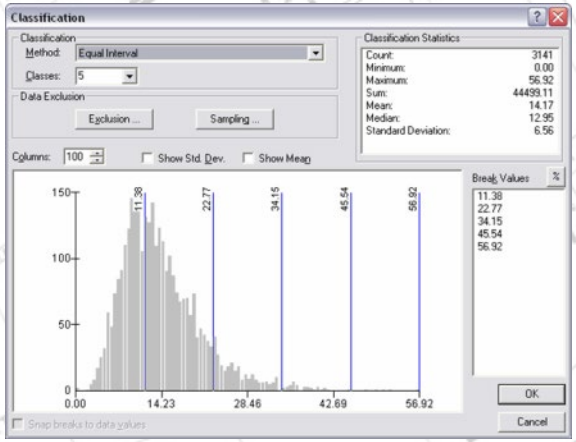


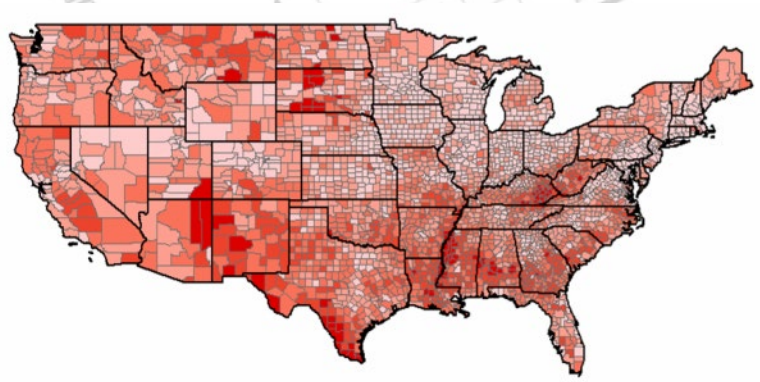
Selection and Classification

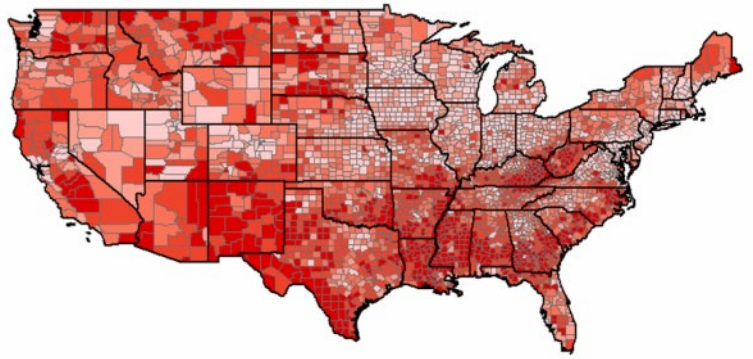
Classification

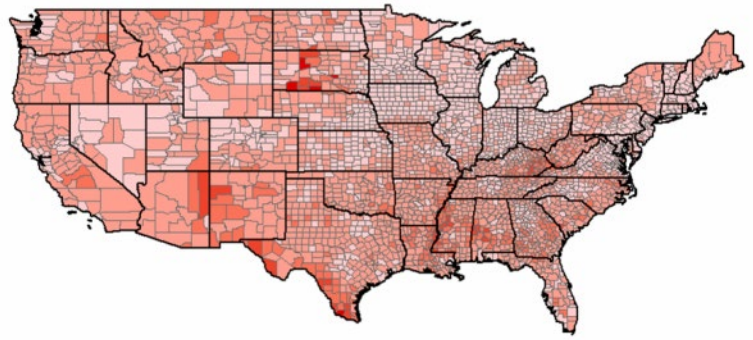




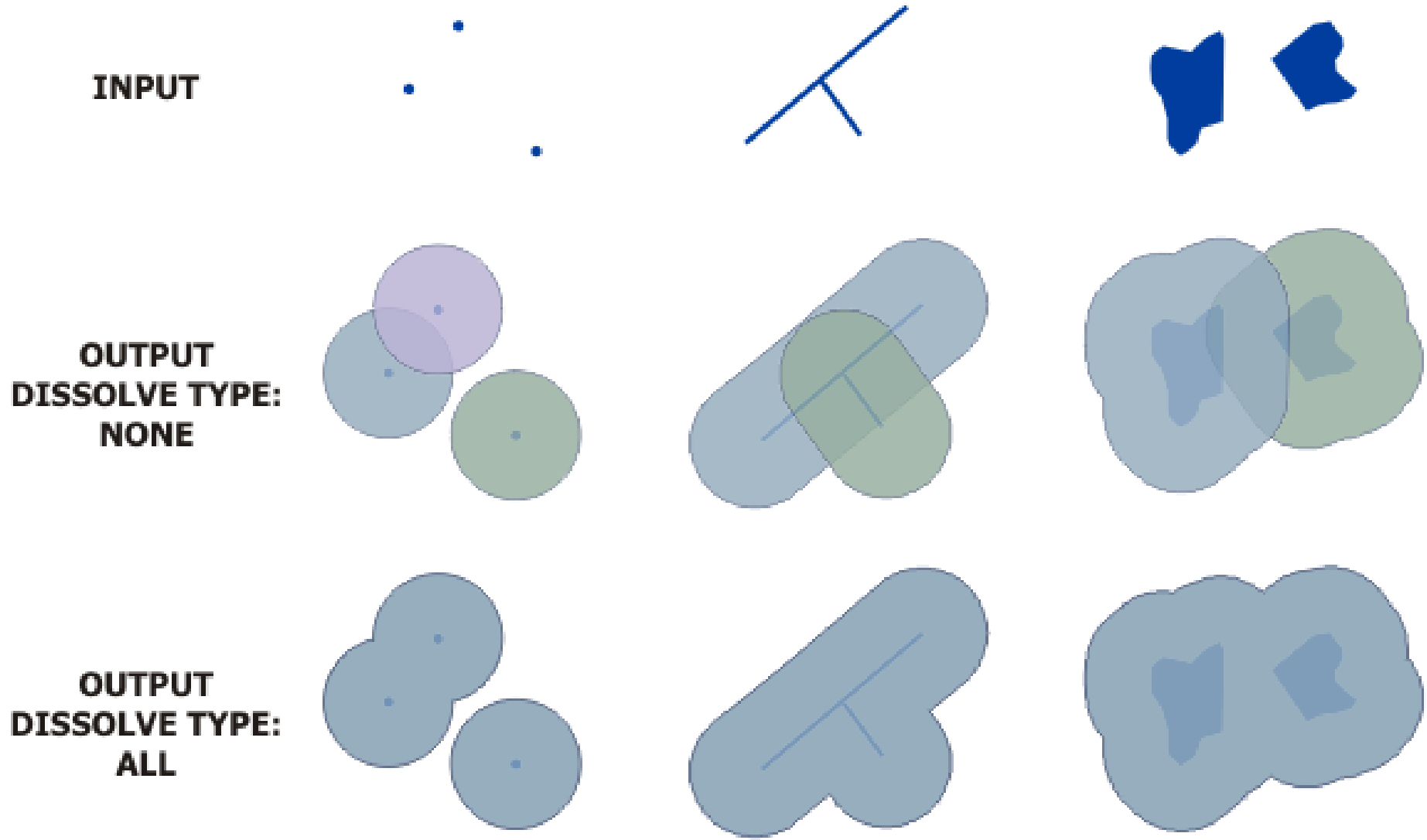




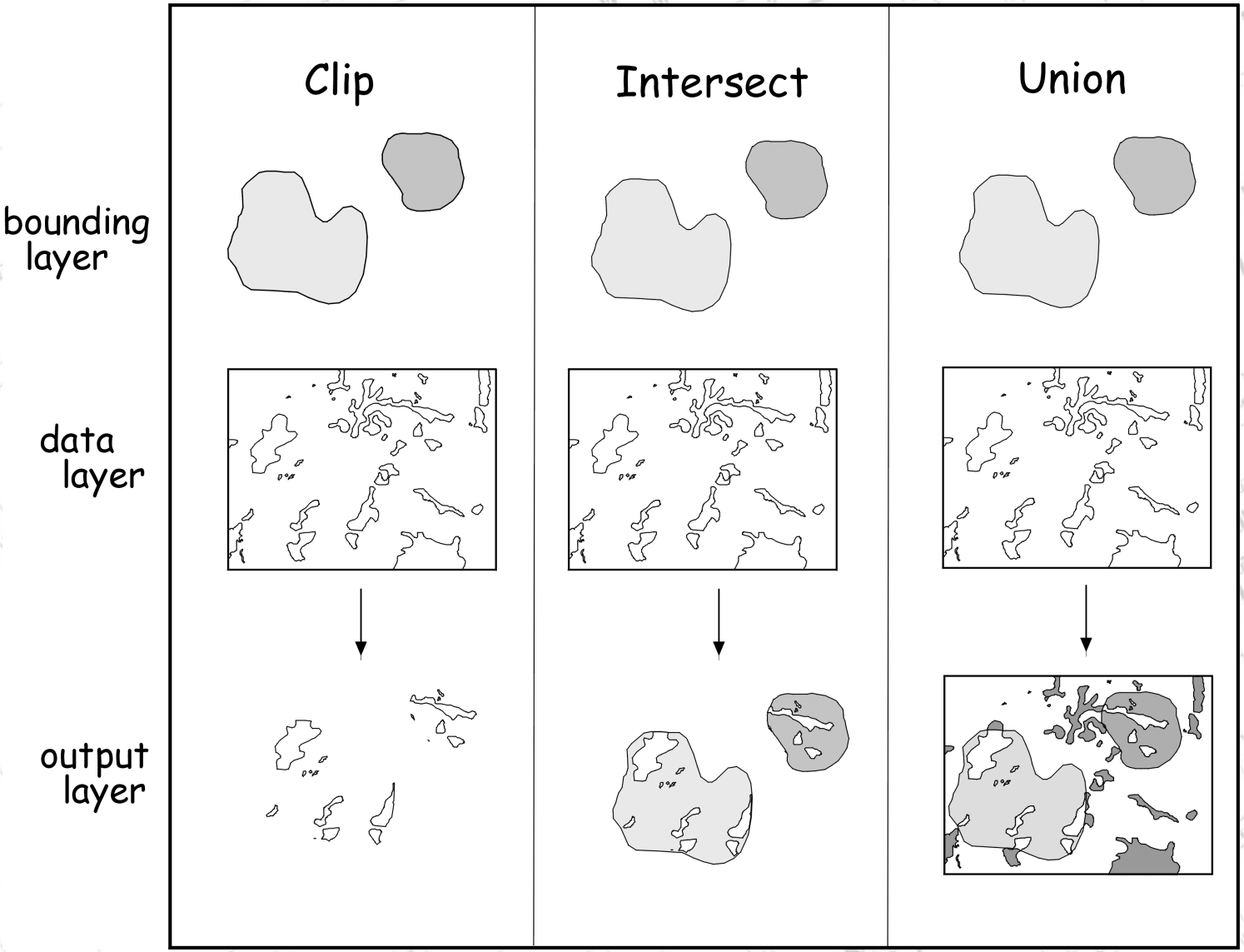




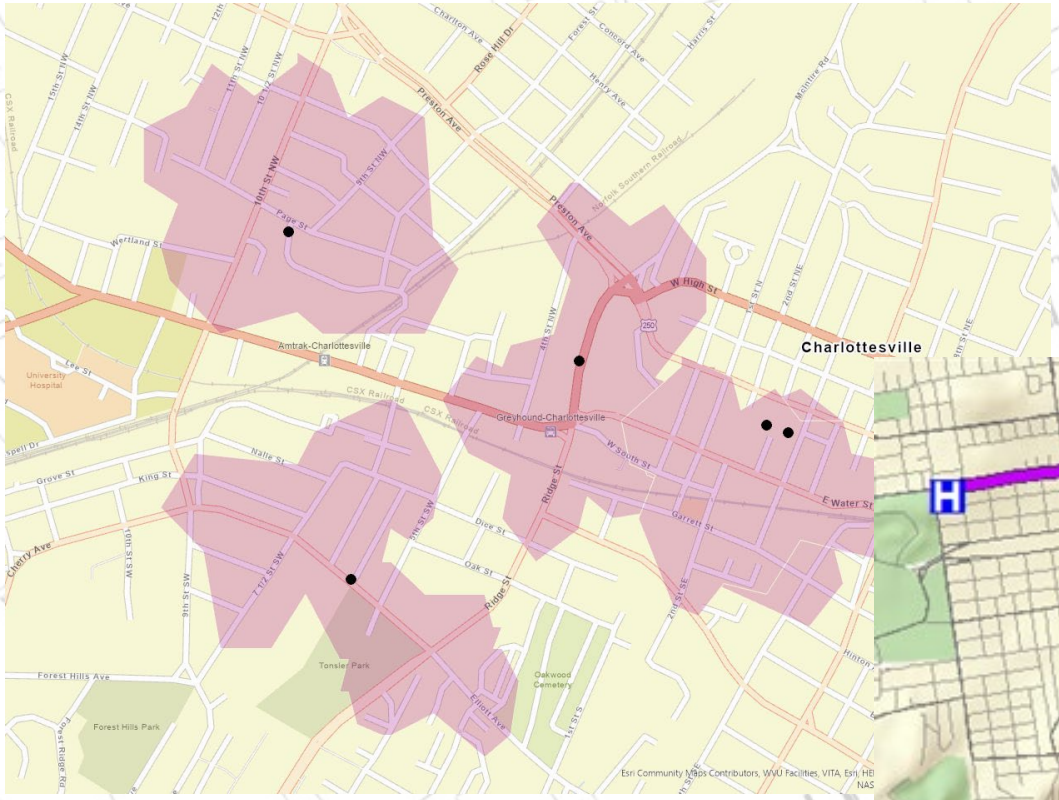
Proximity and Buffering

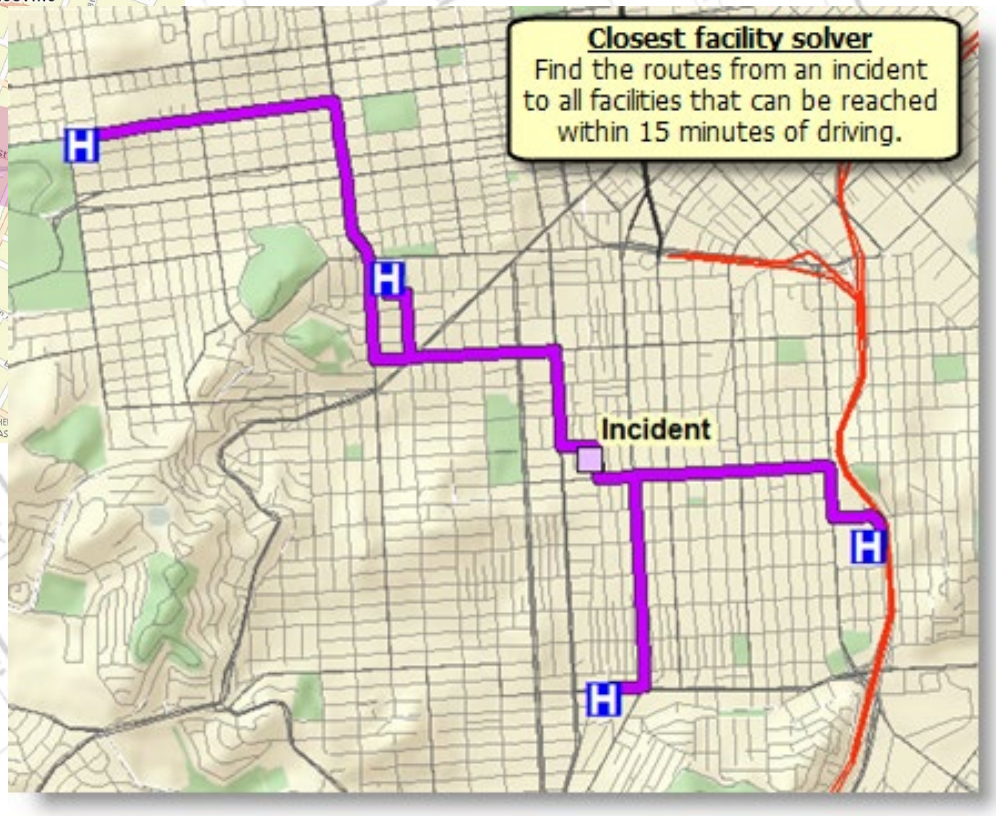


Clip, Intersect, Union

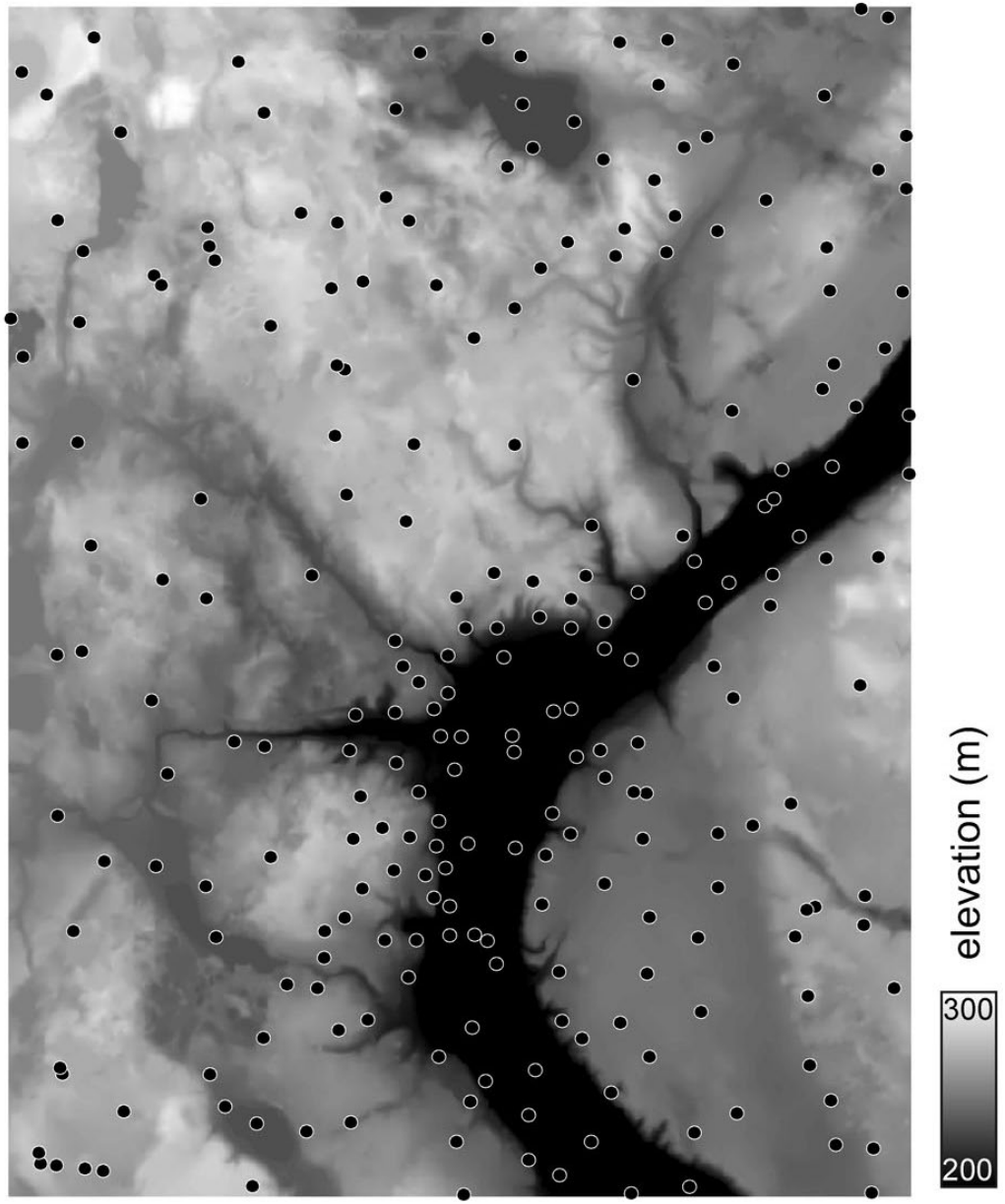


Network Analysis





Extract by Point

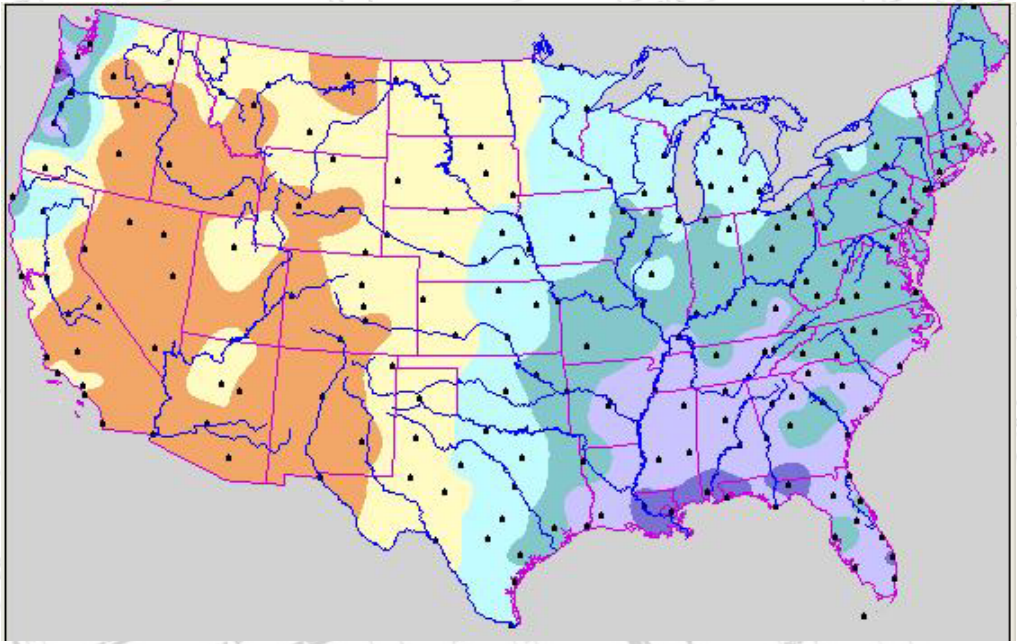


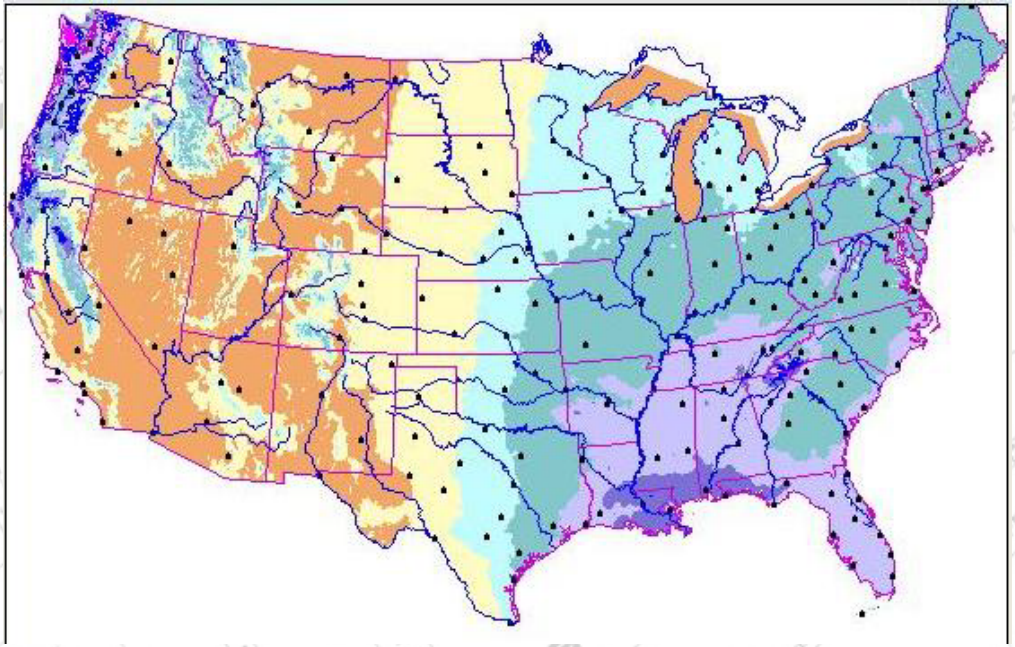
Making surfaces from points…

200 weather stations

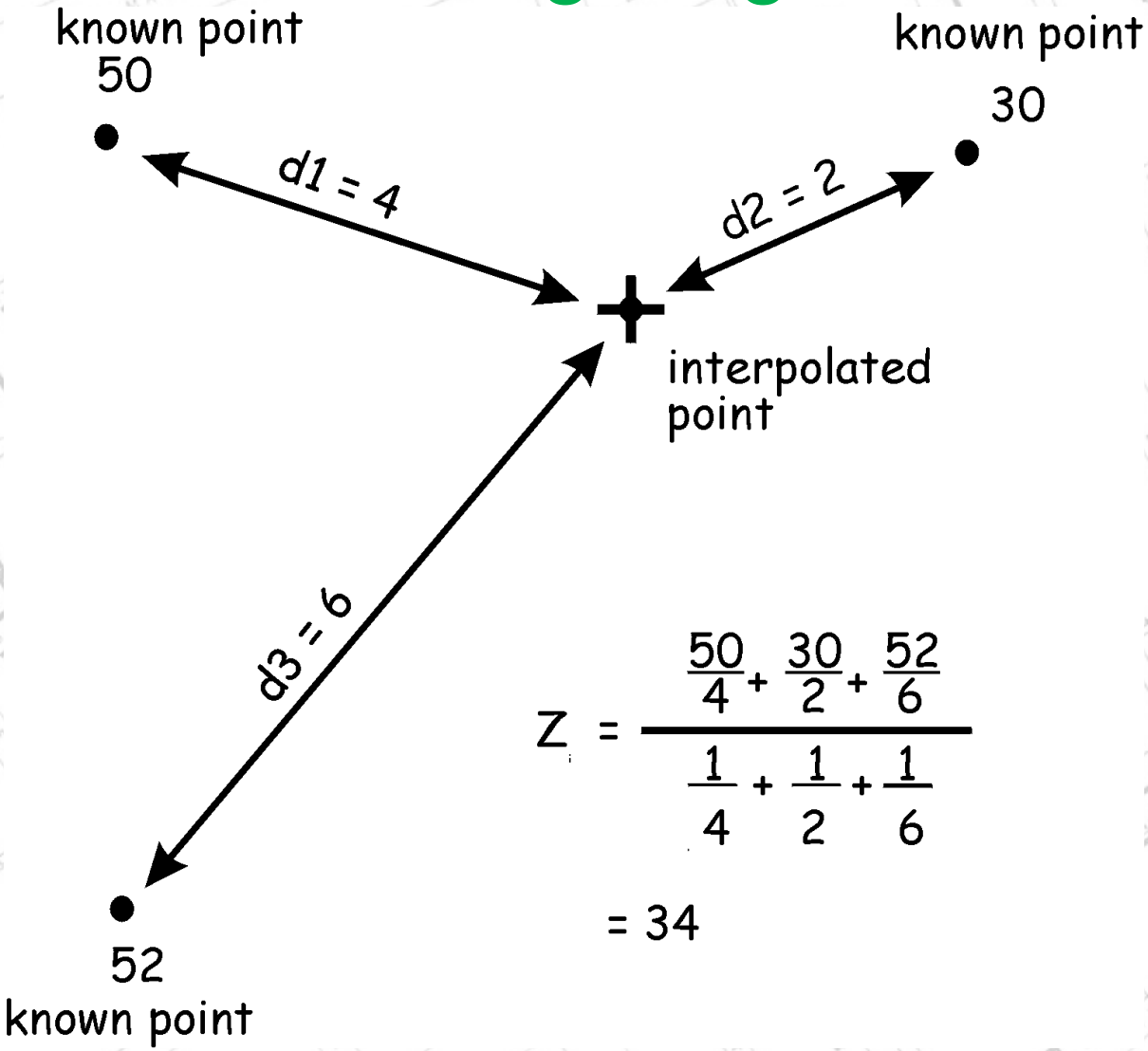
vs.

9000 weather stations





Interpolation
Inverse Distance Weighting

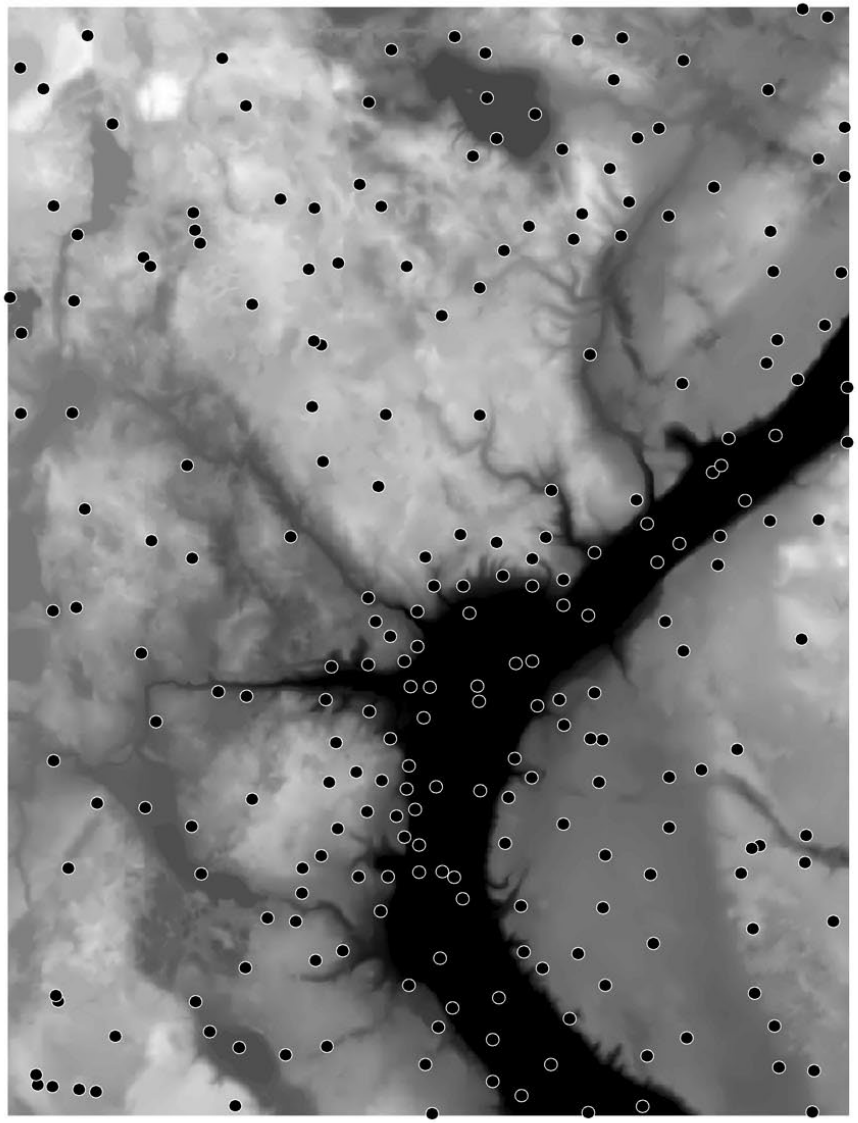


$$Z = \frac{\frac{50}{4} + \frac{30}{2} + \frac{52}{6}}{\frac{1}{4} + \frac{1}{2} + \frac{1}{6}}$$

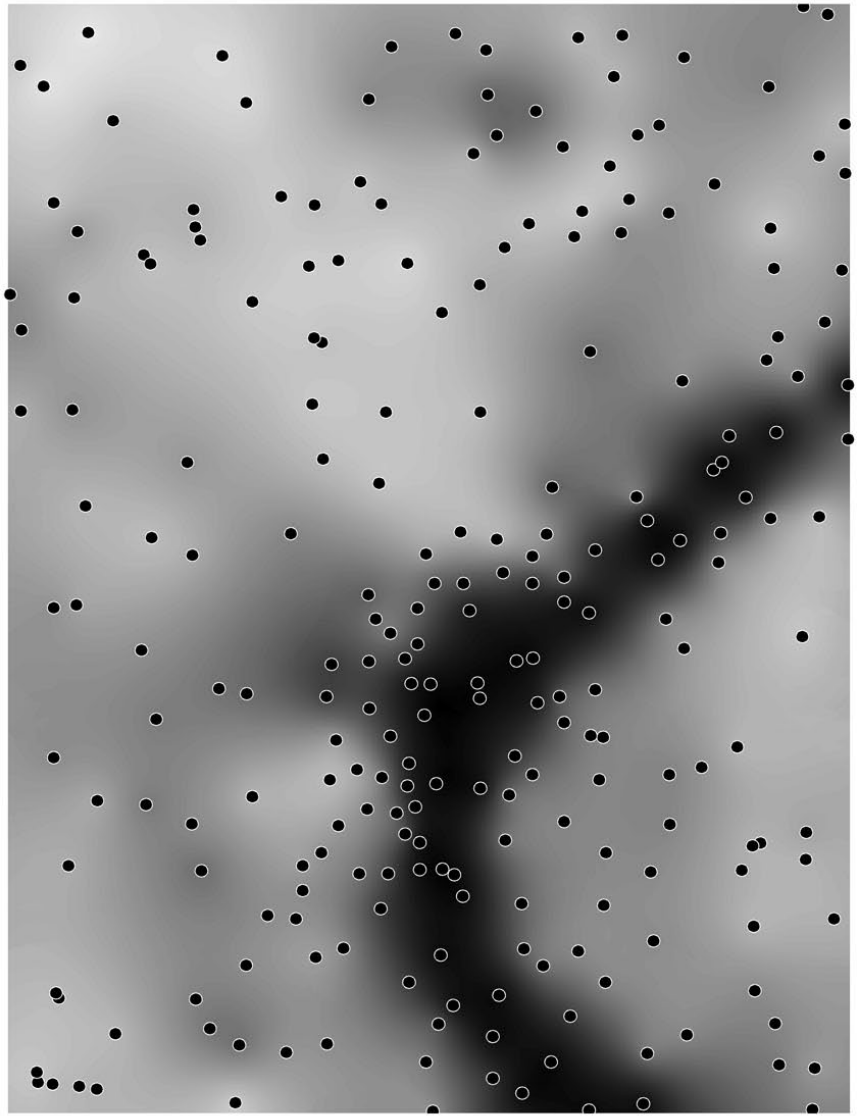
$$= 34$$

Kriging

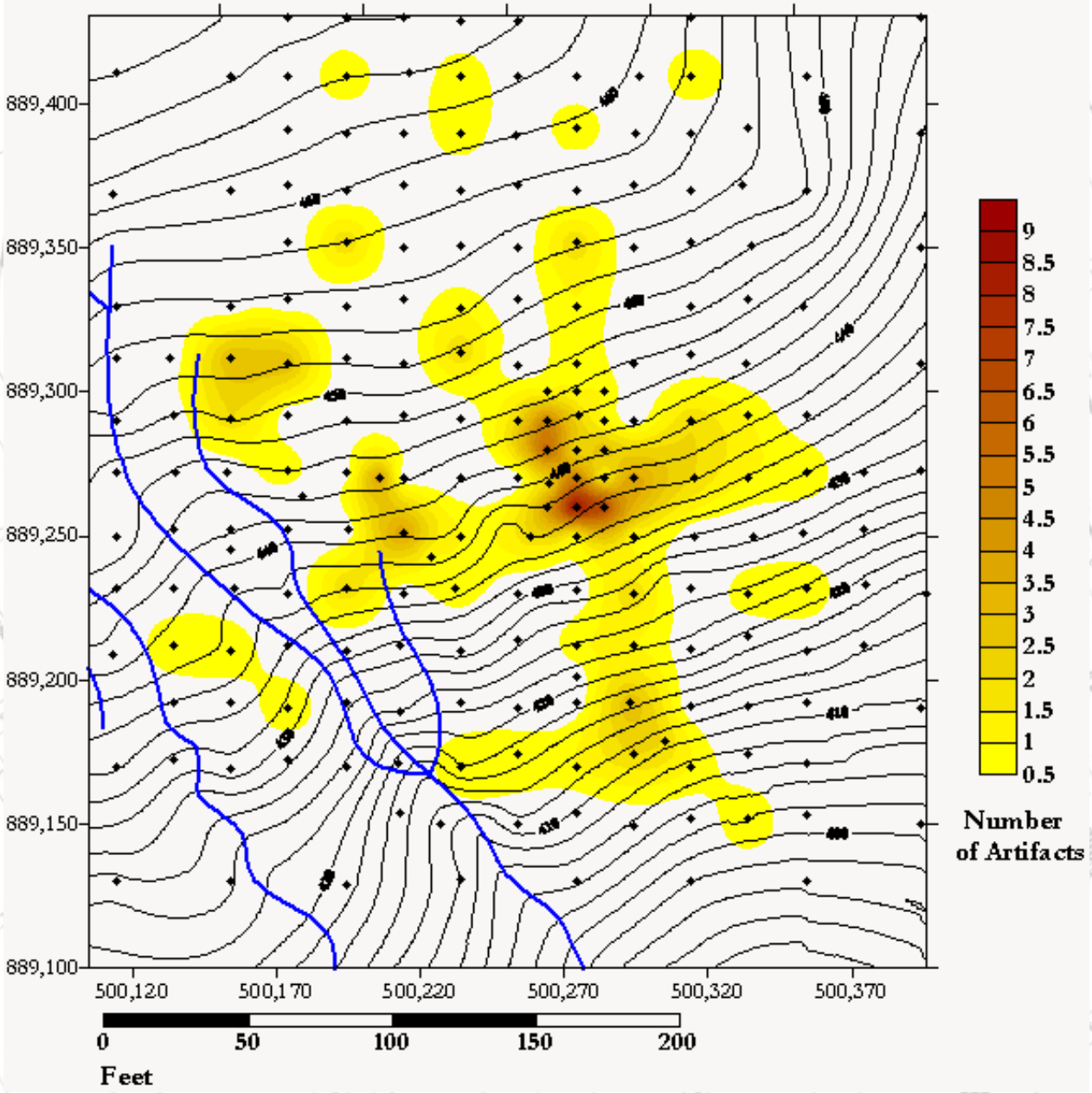
Original surface



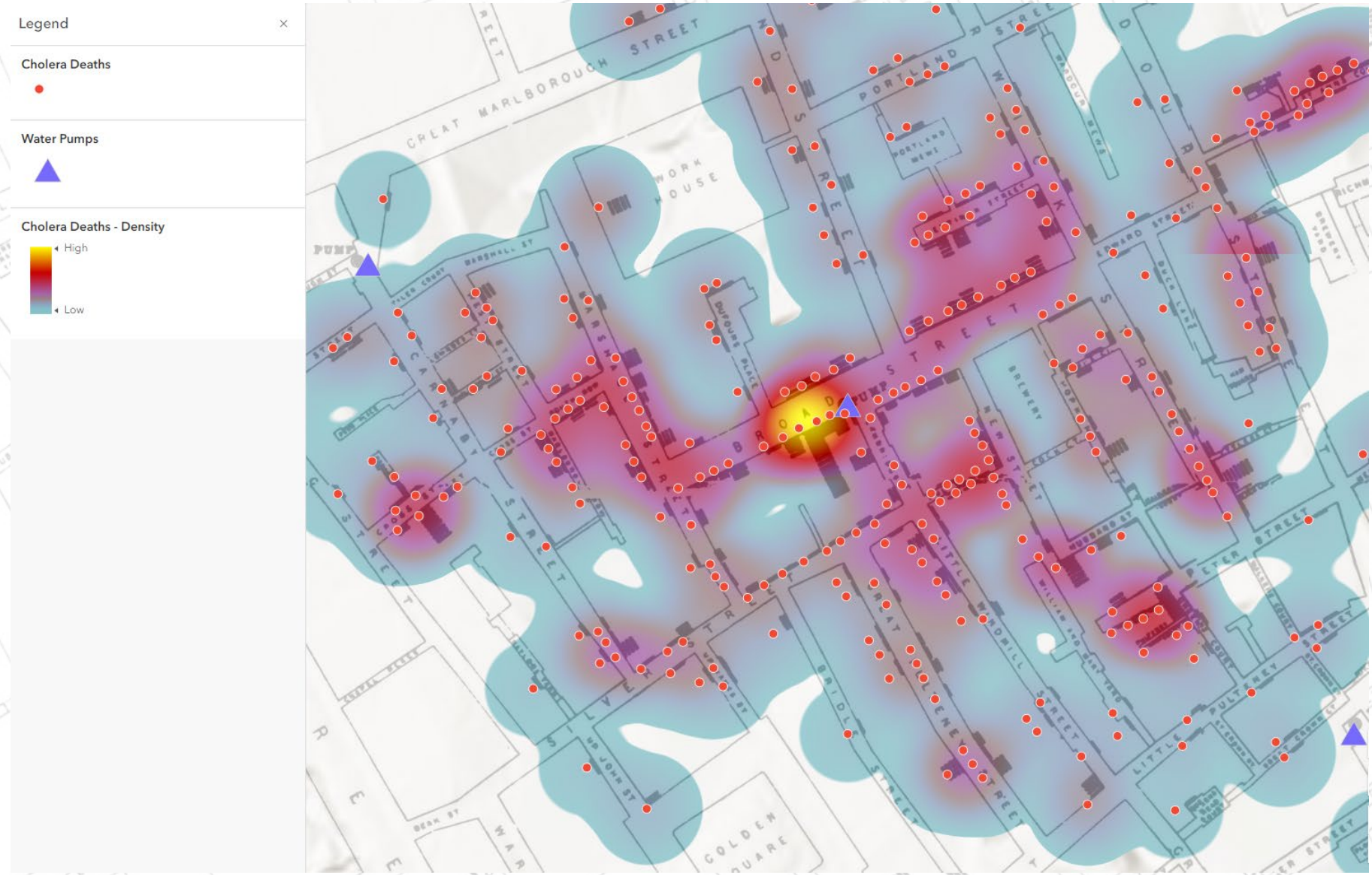
Kriged surface



Density

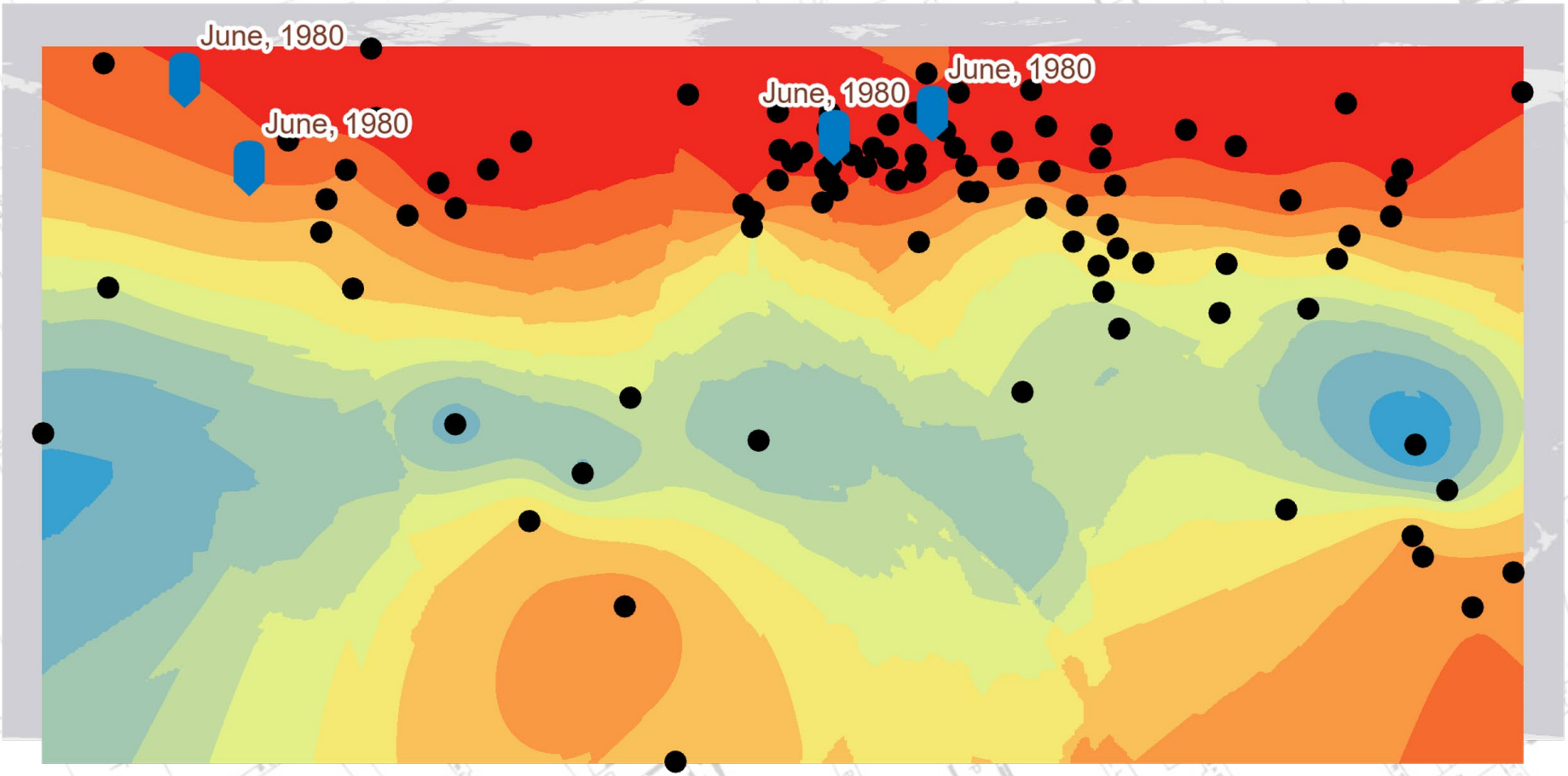

889,400
889,350
889,300
889,250
889,200
889,150
889,100
500,120
500,170
500,220
500,270
500,320
500,370
0
50
100
150
200
Feet
9
8.5
8
7.5
7
6.5
6
5.5
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
Number of Artifacts

Density



THE SCHOLARS' LAB

Spatial Analysis – Kriging and Extract



Which Charlottesville Neighborhood contains the highest total population?

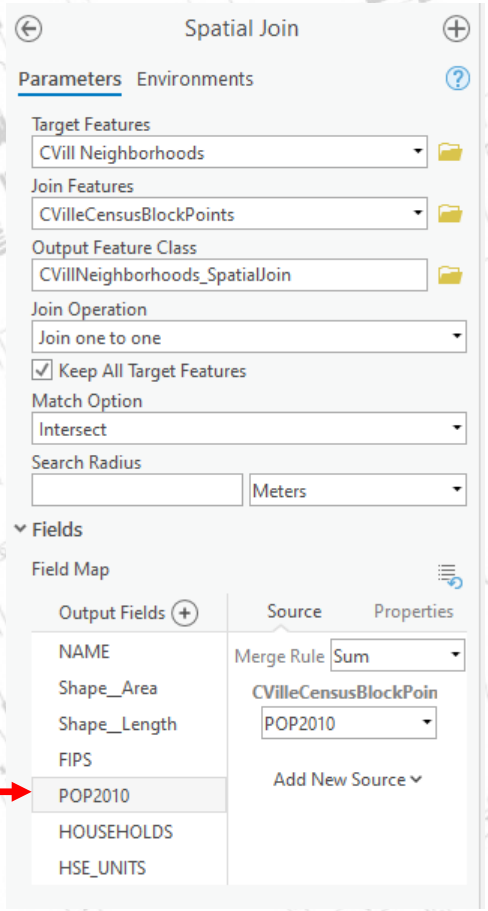
Neighborhood Attributes

FID *	NAME
1	Barracks Road
2	Lewis Mountain
3	North Downtown
4	Johnson Village
5	Fry's Spring
6	10th & Page
7	Jefferson Park Avenue
8	Starr Hill
9	Fifeville
10	Ridge Street
11	Belmont
12	Woolen Mills
13	Martha Jefferson
14	Locust Grove
15	Venable
16	Rose Hill
17	Barracks / Rugby
18	The Meadows
19	Greenbrier

Block Point Attributes

	OBJECTID *	FIPS	POP2010	HOUSEHOLDS	HSE_UNITS
1	1	515400004012014	64	26	26
2	2	515400004012013	4	1	1
3	3	515400004012012	59	27	28
4	4	515400005025007	14	10	12
5	5	515400005025005	254	102	116
6	6	515400005024003	248	110	119
7	7	515400005025001	101	22	31
8	8	515400005025006	85	37	40
9	9	515400005024004	142	55	59
10	10	515400005025008	105	48	54
11	11	515400005023011	192	80	90
12	12	515400005024007	35	15	19
13	13	515400005021002	780	311	327
14	14	515400005024001	24	9	10
15	15	515400005023013	87	43	47
16	16	515400005024000	126	60	68
17	17	515400005024006	58	23	23
18	18	515400005024005	33	16	17
19	19	515400005023012	25	12	15

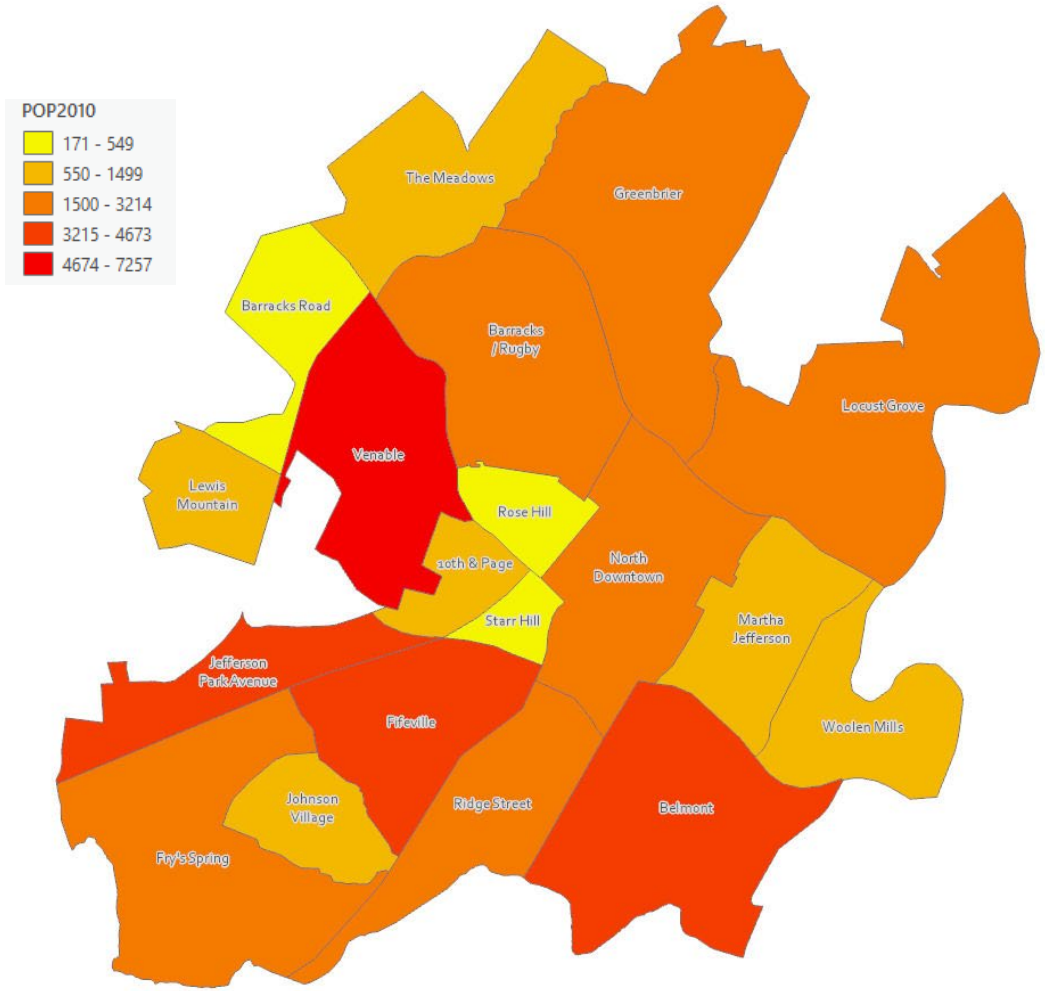
Spatial Join



New Neighborhood Layer, with…

Aggregated Census Attributes

	FID *	Shape *	Join_Count	TARGET_FID	NAME	FIPS	POP2010	HOUSEHOLDS	HSE_UNITS
1	1	Polygon	3	1	Barracks Road	515400007003005	549	71	68
2	2	Polygon	14	2	Lewis Mountain	515400007004018	1035	23	13
3	3	Polygon	54	3	North Downtown	515400004011003	2914	27	35
4	4	Polygon	10	4	Johnson Village	515400005021002	1461	59	94
5	5	Polygon	32	5	Fry's Spring	515400005025007	3214	45	38
6	6	Polygon	21	6	10th & Page	515400002021026	1190	22	24
7	7	Polygon	27	7	Jefferson Park Avenue	515400006002015	4349	57	64
8	8	Polygon	7	8	Starr Hill	515400010001050	171	12	10
9	9	Polygon	37	9	Fifeville	515400005013004	3595	40	46
10	10	Polygon	20	10	Ridge Street	515400004012014	1928	41	51
11	11	Polygon	94	11	Belmont	515400004024010	4673	24	32
12	12	Polygon	15	12	Woolen Mills	515400003022019	1154	33	39
13	13	Polygon	37	13	Martha Jefferson	515400003021040	1409	18	20
14	14	Polygon	37	14	Locust Grove	515400009001001	2265	28	29
15	15	Polygon	51	15	Venable	515400002022010	7257	47	74
16	16	Polygon	15	16	Rose Hill	515400010002039	474	14	14
17	17	Polygon	34	17	Barracks / Rugby	515400007002010	2193	27	26
18	18	Polygon	13	18	The Meadows	515400008004018	1499	44	56
19	19	Polygon	28	19	Greenbrier	515400008003008	2143	32	29


POP2010
171 - 549
550 - 1499
1500 - 3214
3215 - 4673
4674 - 7257
The Meadows
Greenbrier
Barracks Road
Barracks / Rugby
Locust Grove
Venable
Lewis Mountain
Rose Hill
10th & Page
North Downtown
Starr Hill
Martha Jefferson
Jefferson Park Avenue
Fifeville
Woolen Mills
Johnson Village
Ridge Street
Belmont
Fry's Spring

Other Direction – Join Points to Polygons

Before

	OBJECTID *	FIPS	POP2010	HOUSEHOLDS	HSE_UNITS
1	1	515400004012014	64	26	26
2	2	515400004012013	4	1	1
3	3	515400004012012	59	27	28
4	4	515400005025007	14	10	12
5	5	515400005025005	254	102	116
6	6	515400005024003	248	110	119
7	7	515400005025001	101	22	31
8	8	515400005025006	85	37	40
9	9	515400005024004	142	55	59
10	10	515400005025008	105	48	54
11	11	515400005023011	192	80	90
12	12	515400005024007	35	15	19
13	13	515400005021002	780	311	327
14	14	515400005024001	24	9	10
15	15	515400005023013	87	43	47
16	16	515400005024000	126	60	68
17	17	515400005024006	58	23	23
18	18	515400005024005	33	16	17
19	19	515400005023012	25	12	15

After

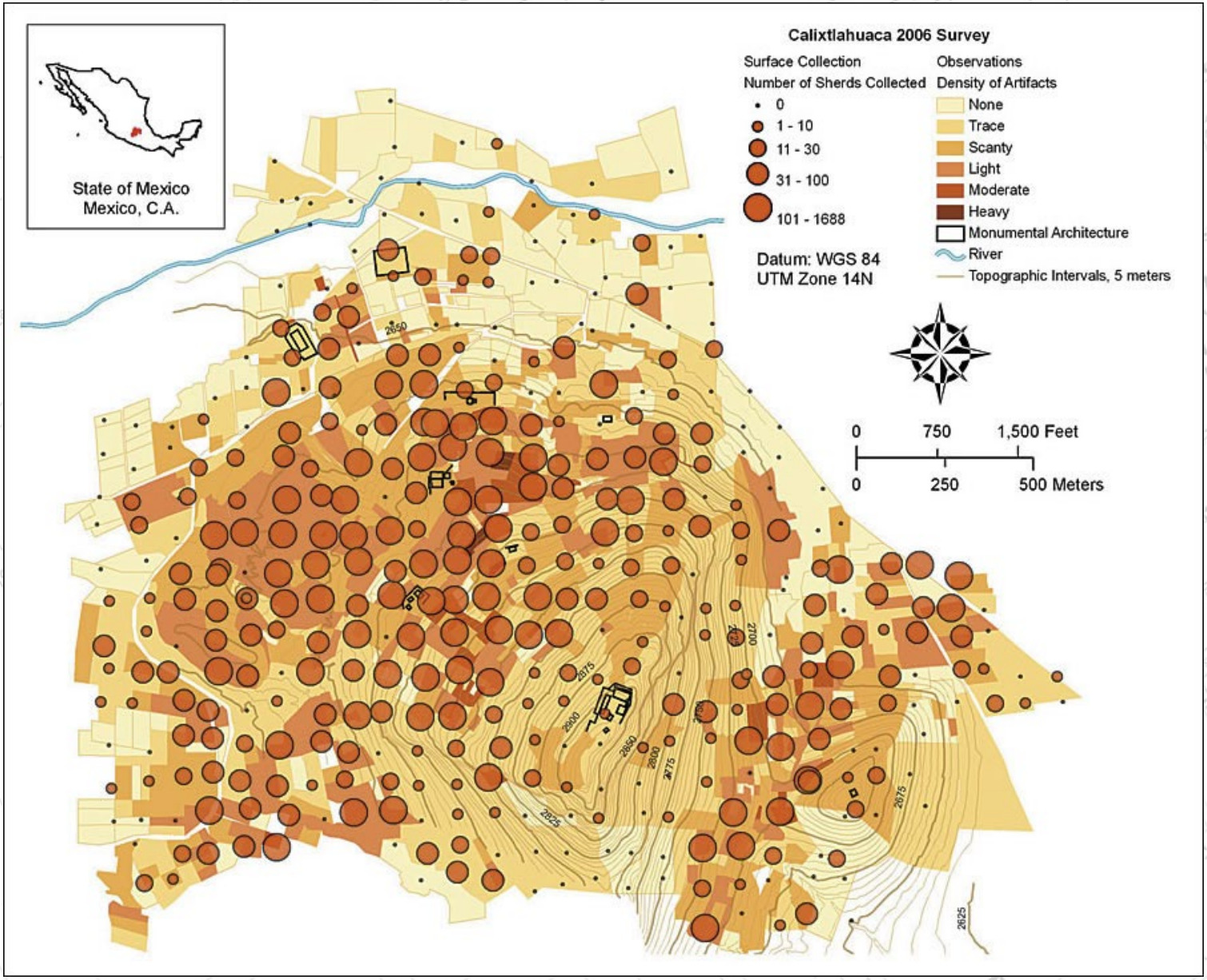
	OBJECTID *	Shape *	Join_Count	FIPS	POP2010	HOUSEHOLDS	HSE_UNITS	NAME
1	1	Point	1	515400004012014	64	26	26	Ridge Street
2	2	Point	1	515400004012013	4	1	1	Ridge Street
3	3	Point	1	515400004012012	59	27	28	Ridge Street
4	4	Point	1	515400005025007	14	10	12	Fry's Spring
5	5	Point	1	515400005025005	254	102	116	Fry's Spring
6	6	Point	1	515400005024003	248	110	119	Fry's Spring
7	7	Point	1	515400005025001	101	22	31	Fry's Spring
8	8	Point	1	515400005025006	85	37	40	Fry's Spring
9	9	Point	1	515400005024004	142	55	59	Fry's Spring
10	10	Point	1	515400005025008	105	48	54	Fry's Spring
11	11	Point	1	515400005023011	192	80	90	Fry's Spring
12	12	Point	1	515400005024007	35	15	19	Fry's Spring
13	13	Point	1	515400005021002	780	311	327	Johnson Village
14	14	Point	1	515400005024001	24	9	10	Fry's Spring
15	15	Point	1	515400005023013	87	43	47	Fry's Spring
16	16	Point	1	515400005024000	126	60	68	Fry's Spring
17	17	Point	1	515400005024006	58	23	23	Fry's Spring
18	18	Point	1	515400005024005	33	16	17	Fry's Spring
19	19	Point	1	515400005023012	25	12	15	Fry's Spring
20	20	Point	1	515400005021004	87	32	33	Johnson Village

GIS Good For:

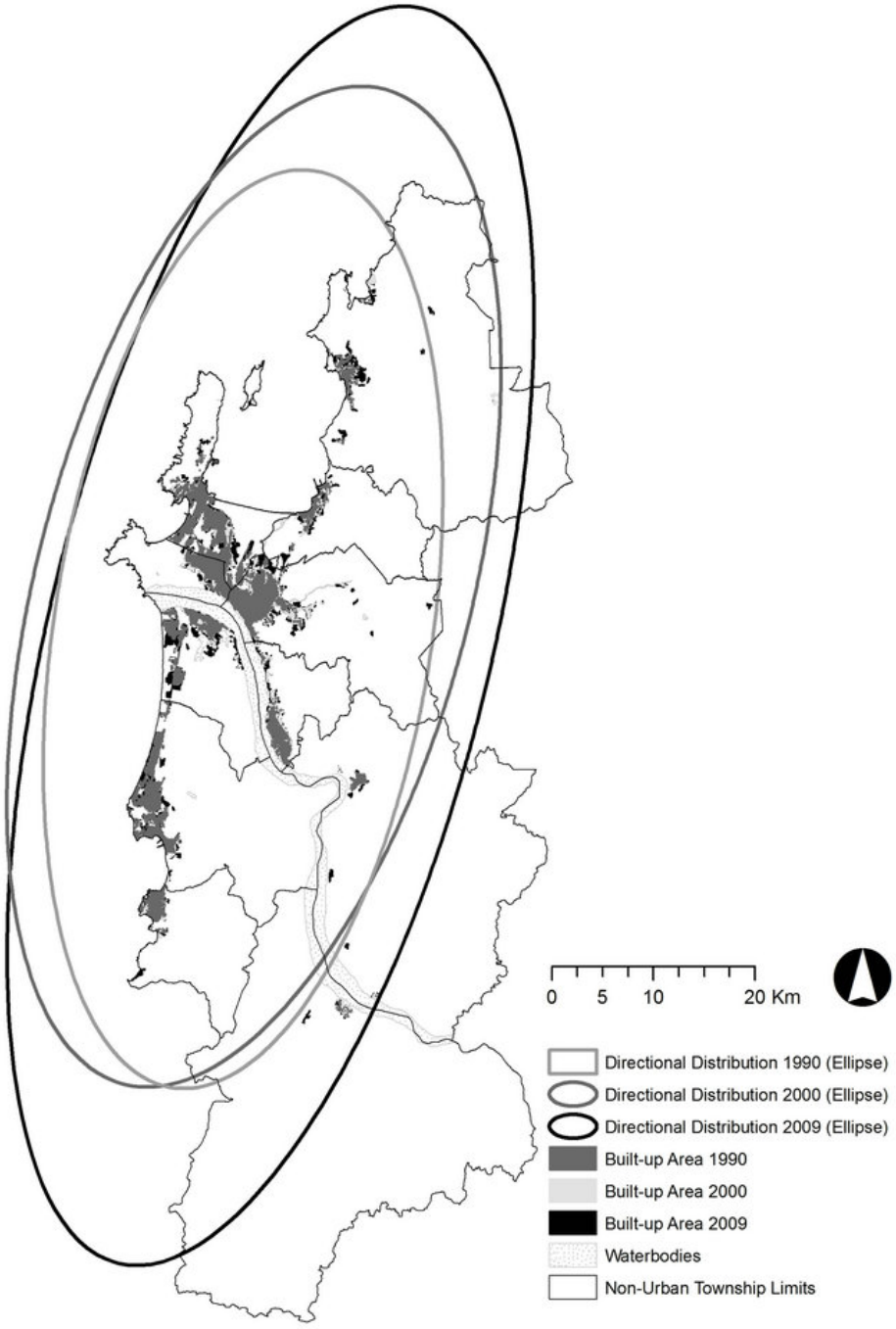
- Visualization
- Locations
- Trends
- Routing
- Modeling

Visualizations

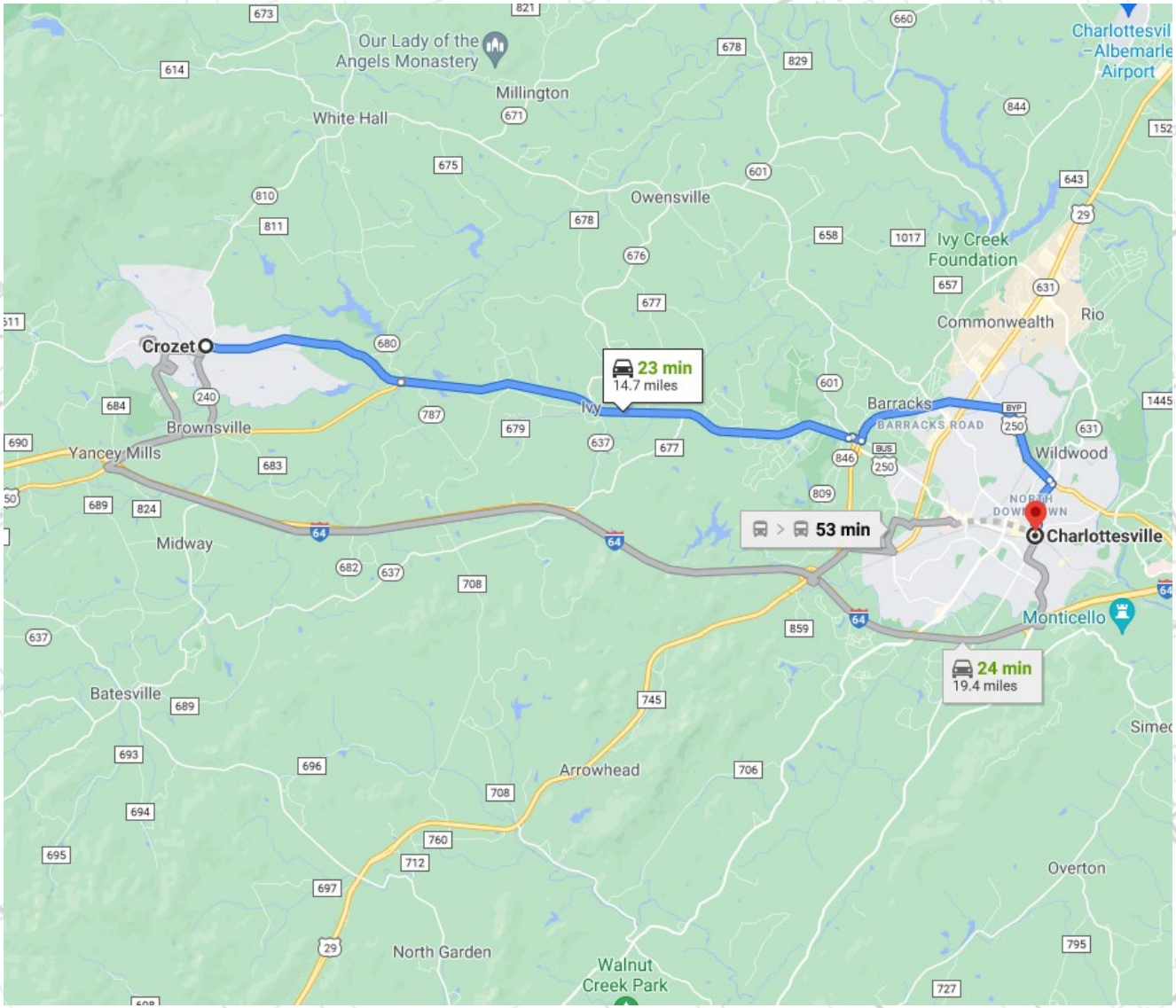
Visualizations



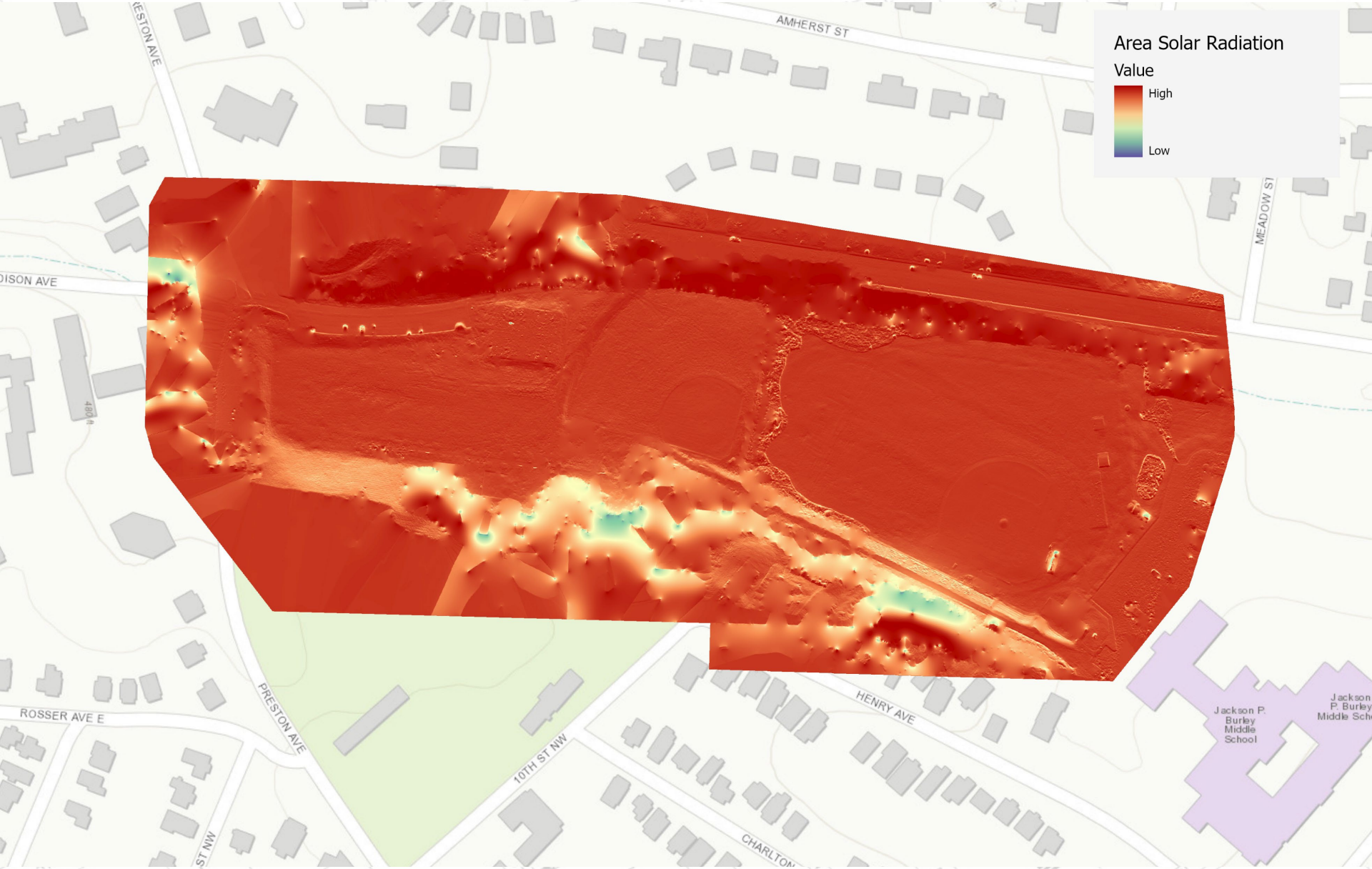
Trends


0 5 10 20 Km
Directional Distribution 1990 (Ellipse)
Directional Distribution 2000 (Ellipse)
Directional Distribution 2009 (Ellipse)
Built-up Area 1990
Built-up Area 2000
Built-up Area 2009
Waterbodies
Non-Urban Township Limits

Routing


Our Lady of the Angels Monastery
Millington
White Hall
Owensville
Ivy Creek Foundation
Commonwealth
Rio
Crozet
23 min
14.7 miles
Ivy
Barracks
BARRACKS ROAD
Wildwood
Brownsville
Yancey Mills
Midway
53 min
Charlottesville
Monticello
24 min
19.4 miles
Batesville
Arrowhead
North Garden
Walnut Creek Park
Overton

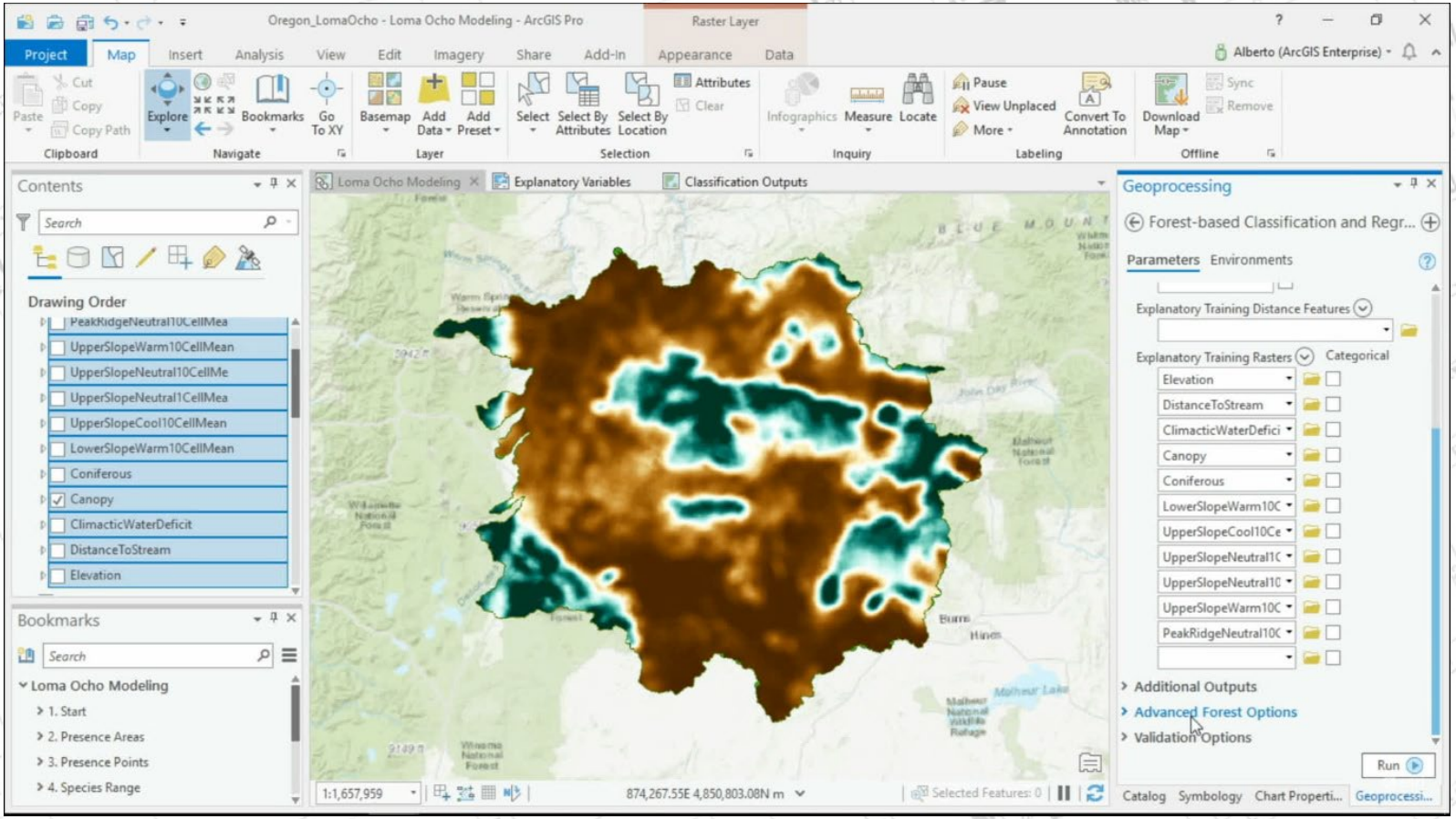
Modeling


Area Solar Radiation
Value
High
Low
AMHERST ST
MEADOW ST
ROSSER AVE E
PRESTON AVE
10TH ST NW
HENRY AVE
Jackson P. Burley Middle School

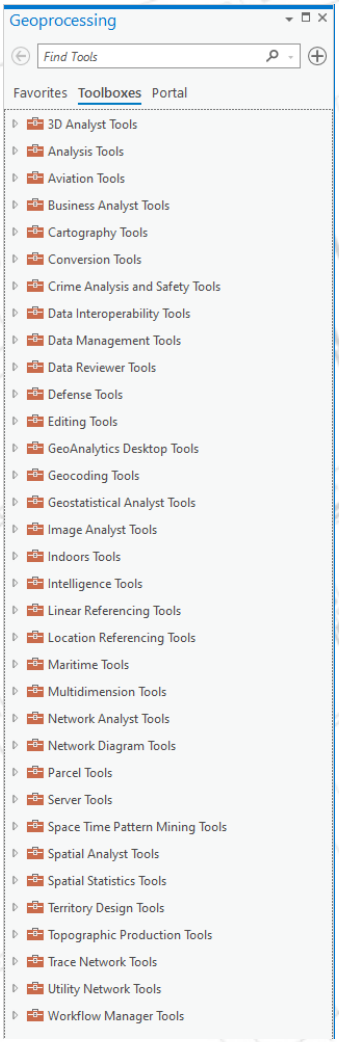
Desktop GIS

Esri –
- ArcMap
- ArcGIS Pro
(PC Only)

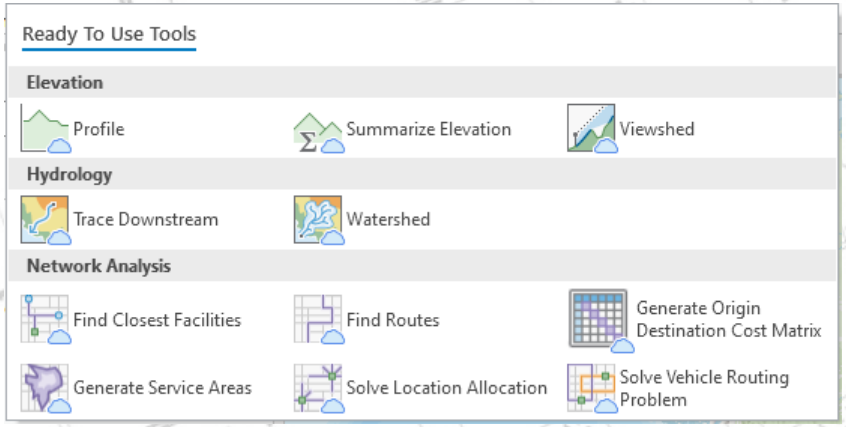
Open Source –
- QGIS
(PC, Mac and Linux)



Geoprocessing Tools



Ready To Use Tools



ArcGIS Online

A place to explore data, create maps, and share stories

- Use and create maps and scenes(3D)
- Access ready-to-use maps, layers and analytics
- Publish your own data
- Create and collect new data
- Share and collaborate
- Access from any device

ArcGIS Online

What can you do with ArcGIS Online?

Make maps

Learn more about the role of maps for sharing GIS with your users.

- Get started creating maps
- Share maps
- View maps in the map viewer
- Use Story Maps to tell your story
- Learn how to use smart mapping in three steps

Work with 3D GIS

Gain a new perspective by visualizing your information in 3D. Use 3D GIS capabilities to address problems that cannot be addressed in a 2D context.

- Get started creating scenes
- View scenes in the scene viewer
- Access ready-to-use 3D scenes in Living Atlas
- Use Drone2Map for ArcGIS to generate 3D layers

Perform analysis

Combine information from multiple layers and apply spatial operations to address a wide range of problems. Explore and visualize your results to make decisions and gain deeper insights.

- Get started with analysis
- Perform analysis with maps
- Explore child poverty using demographic analysis
- Answer spatial questions with smart mapping

Access Living Atlas

Jumpstart your GIS with Living Atlas of the World, a curated, global collection of the best available maps, apps, and data from ArcGIS users and Esri and its partners.

- Access Living Atlas
- Explore Living Atlas through a story map
- Browse Living Atlas layers to add to your map
- Add Living Atlas content to your scene
- Use a Living Atlas map to find spatial patterns

Manage data

Make your data come alive. Share features and more by publishing layers others can use in their maps and scenes. Enable editing to collect community feedback.

- Publish features, tiles, and more as layers
- Edit features
- Take maps offline
- Learn best practices for using layers in maps

Share your work

Share your rich geographic information items to reach your users. Put your valuable information to work by providing access through numerous apps and Story Maps.

- Get started with sharing
- Use apps to share your story
- Learn best practices for sharing
- Share data through open standards
- Share with Open Data for ArcGIS

Use apps

ArcGIS apps are focused interfaces and tools for your maps, scenes, and data. ArcGIS Online comes with dozens of apps that enable your organization to get its work done.

- Review apps for the field
- Review apps for the office
- Review apps for the community
- Build your own apps

Discover and manage items

ArcGIS Online gives you access to a searchable GIS of the world with a broad range of maps, scenes, layers, analytics, and apps contributed by the GIS community, your organization, and you. These items are organized into information galleries so you can quickly discover content that's relevant for your work.

- Review the ArcGIS information model
- Add your items to ArcGIS Online
- Use groups for sharing information
- Find maps and more in Living Atlas
- Discover items in ArcGIS Online

Administer your organization

From configuring custom roles and security settings to managing licenses to viewing usage reports, ArcGIS Online includes everything you need to administer your organization.

- Get started with administration
- Learn best practices and resources for administrators
- Understand levels, roles, and privileges
- Understand credits
- Review ArcGIS security
- Browse additional admin tools


Chesapeake Bay OpenData
Virginia_Impaired_Waters_and_Causes_of_Impairment_(303d_List)
Summary
Start Navigation