

Data and the State

PUBPOL 2130 / INFO 3130



The science of
place

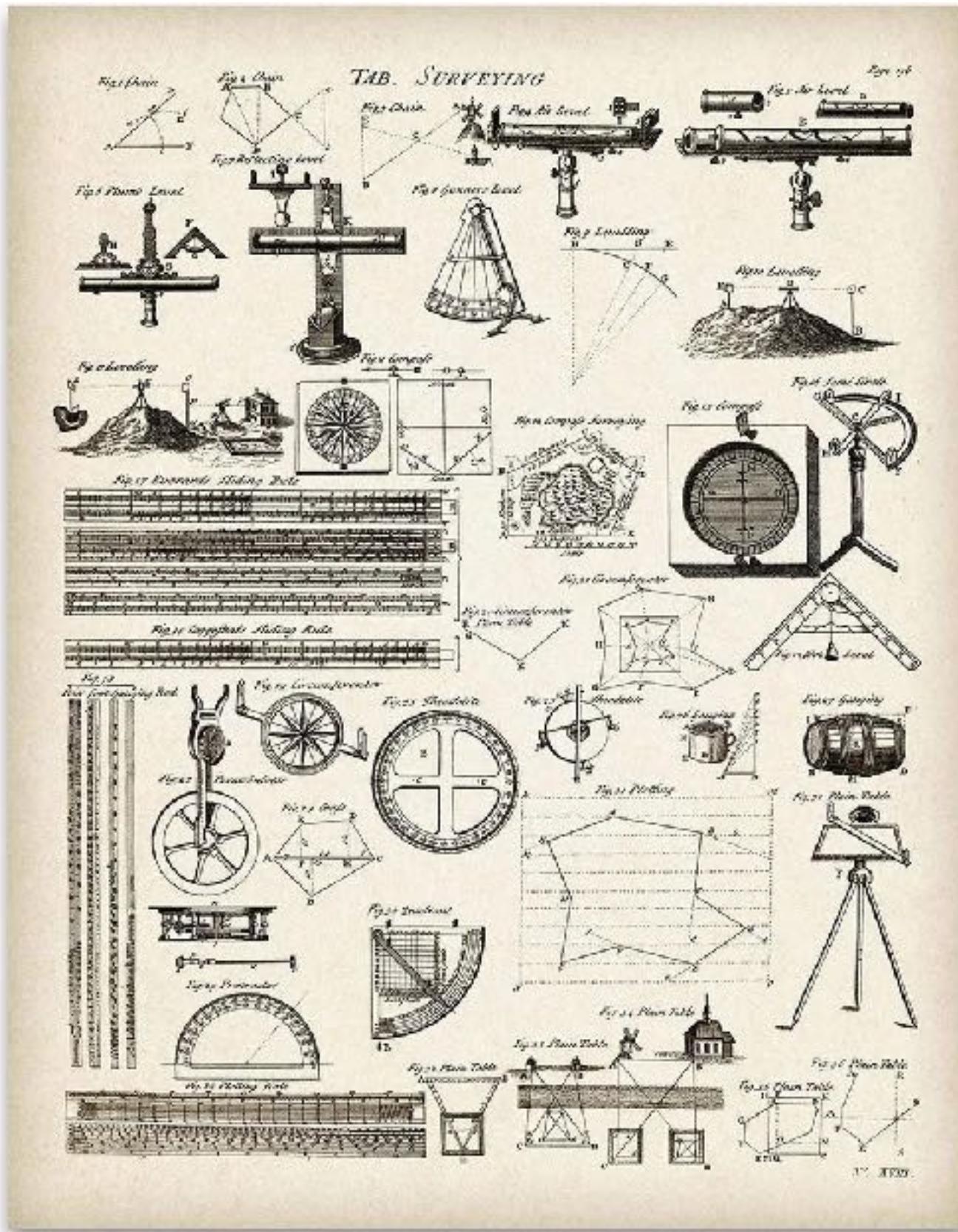
Lecture 6, Thursday Feb 6

Helpful terms for geography and mapping

- Map projection, coordinate reference system
- Vector / raster
- “Metes and bounds” / address ranges / polygons
- Shapefile, attribute table
- GEOID
- Choropleth
- Visual correspondence

Land Surveying

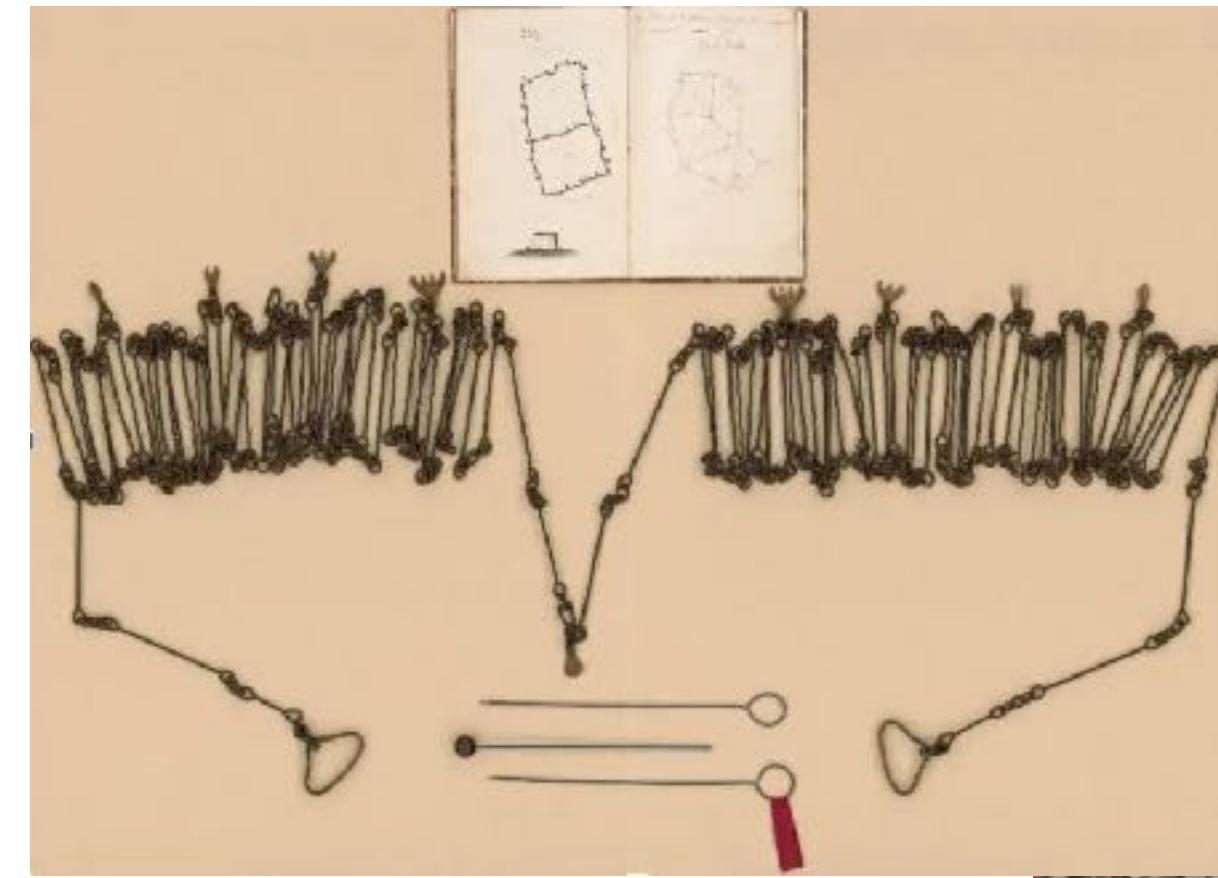
- it's a job!
- it has tools!



theodolite



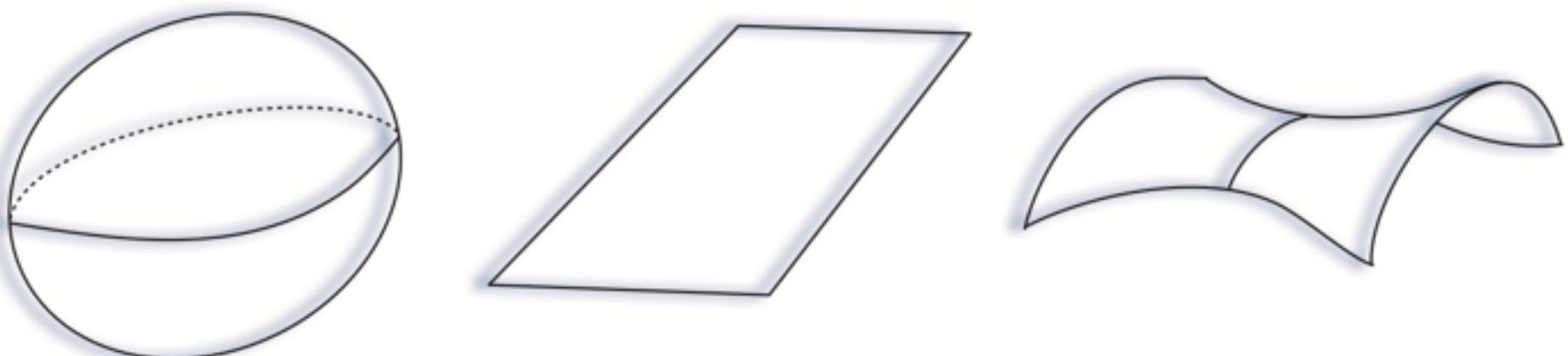
Gunter's chain



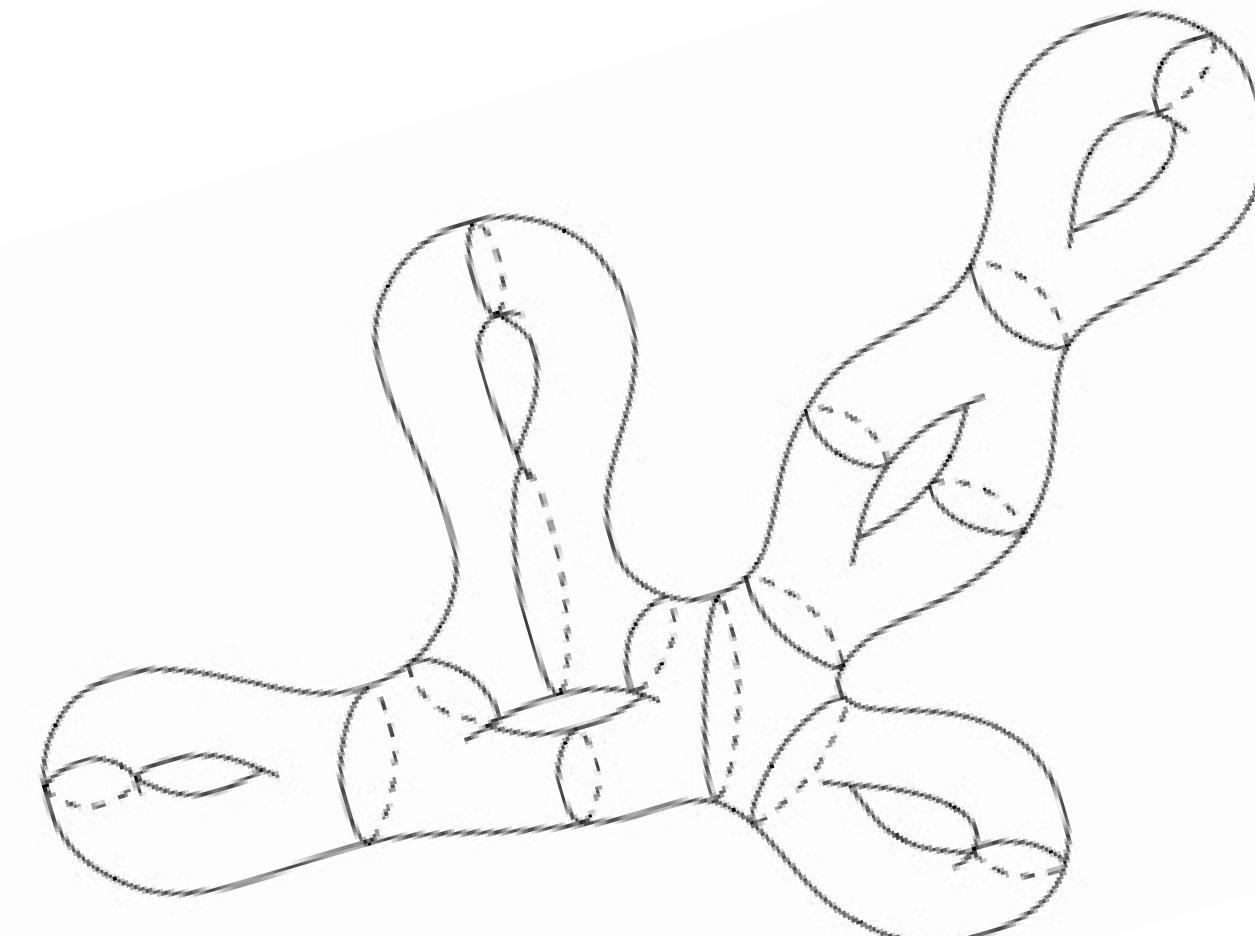
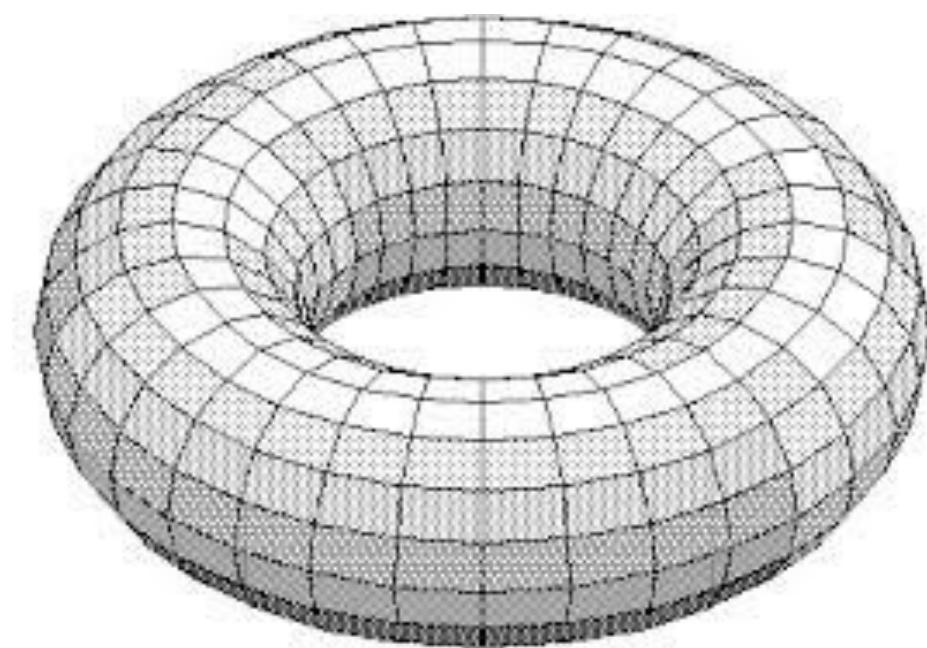
*the Wheel an Expedient Instrum:
to Measure Roads, Rivers, &c either
for Walking or apply'd to a Coach, Gun-
tors, Rathborne, Wings & 450 foot.
Chains, are of great Use in Surveying.*

History of geo-metry

- Geometry — geo (land), metric (measurement)
- C.F. Gauss born 1777 in what's now Germany (German Empire formed 1871) — Gauss ran the land survey of Hanover, commissioned by King George III of Britain
- Gauss's theorem egregium ("surprising theorem") says that you can define **curvature** with a measurement K , and it stays the same when you bend in ways that preserve distance.
- Leads to Gauss-Bonnet Theorem that tells you that its total value over a whole surface only depends on what's called "topology." Application: a whole new kind of pure math.



$K > 0$, $K = 0$, $K < 0$



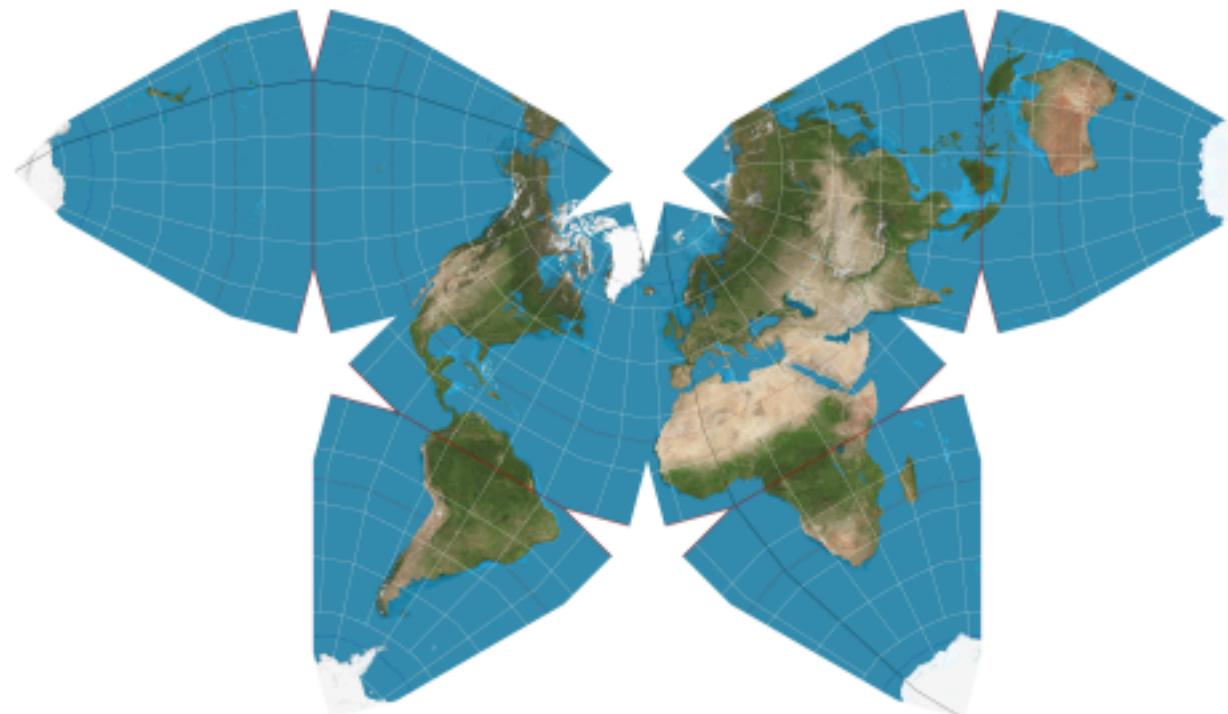
Map projection

- Gauss tells us that you can't be true to distance if you're taking a curved surface to a flat one — some distortion must take place
- Modern projections are part of **coordinate reference systems** that try to compromise between different attributes that matter. Often achieved by projecting from a sphere to a cylinder at a tangency point near area you are studying.

preserves angle



compromise



preserves area

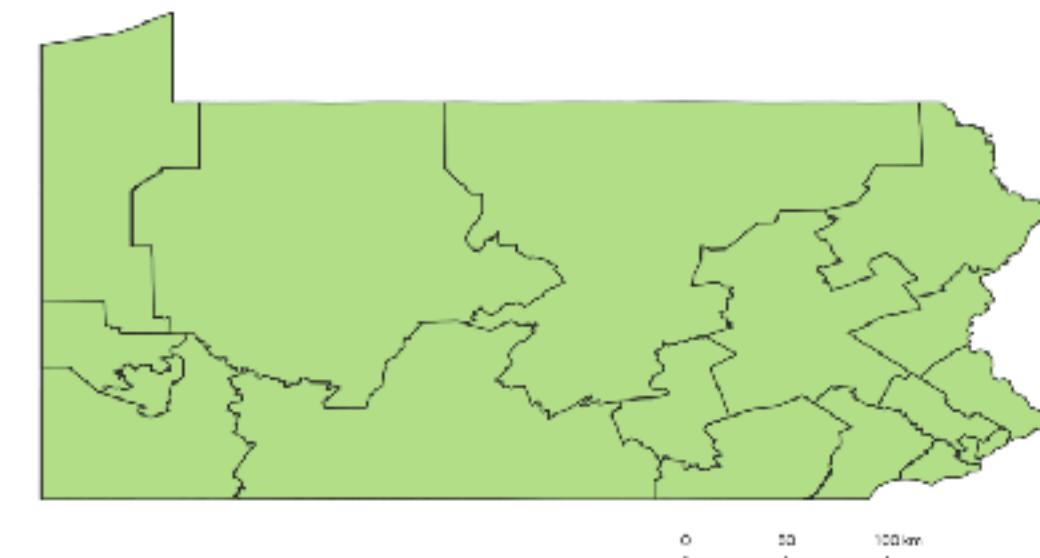
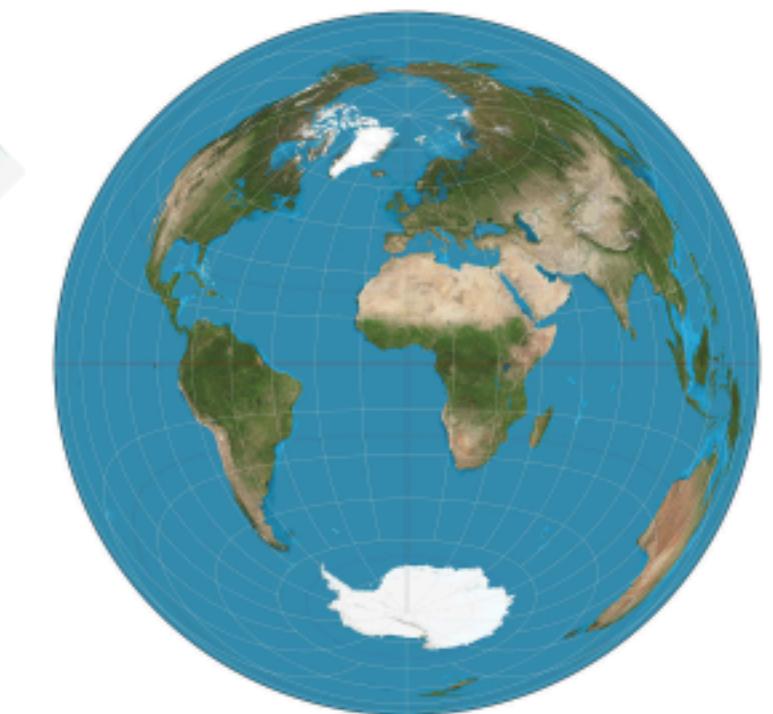
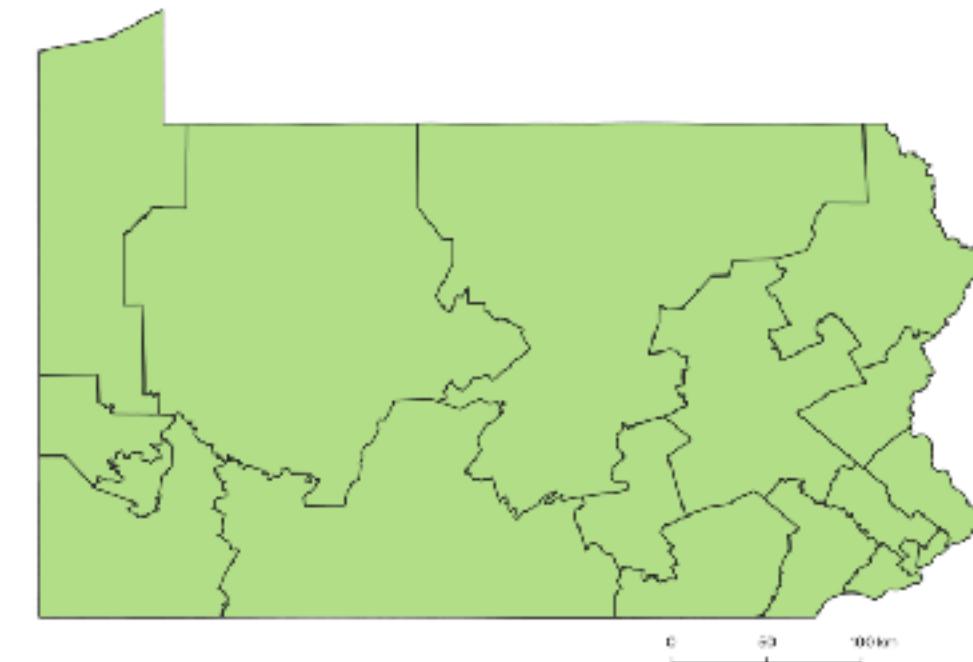
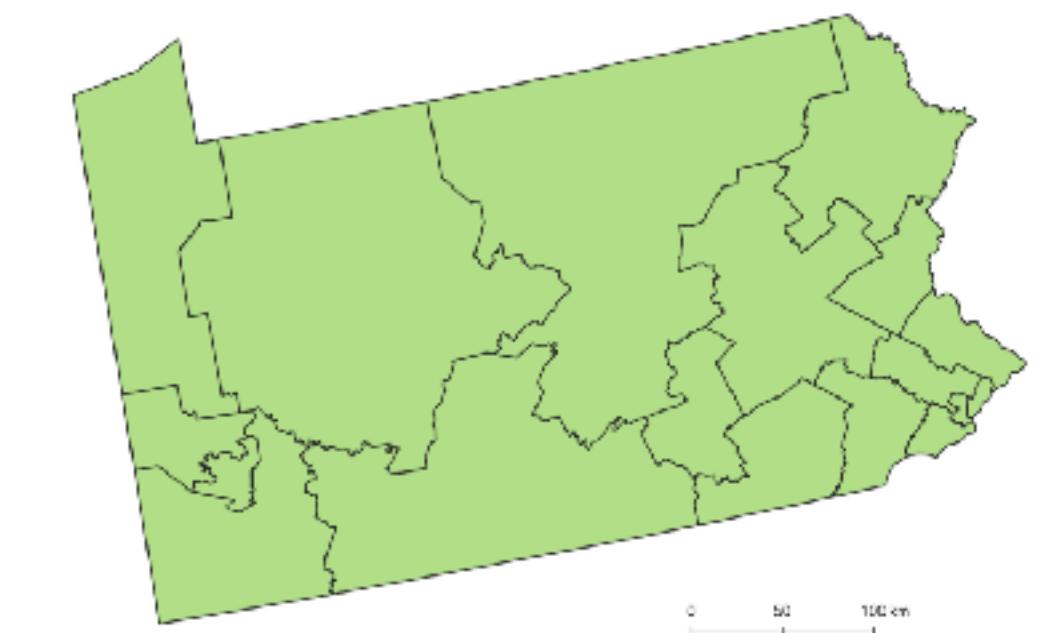


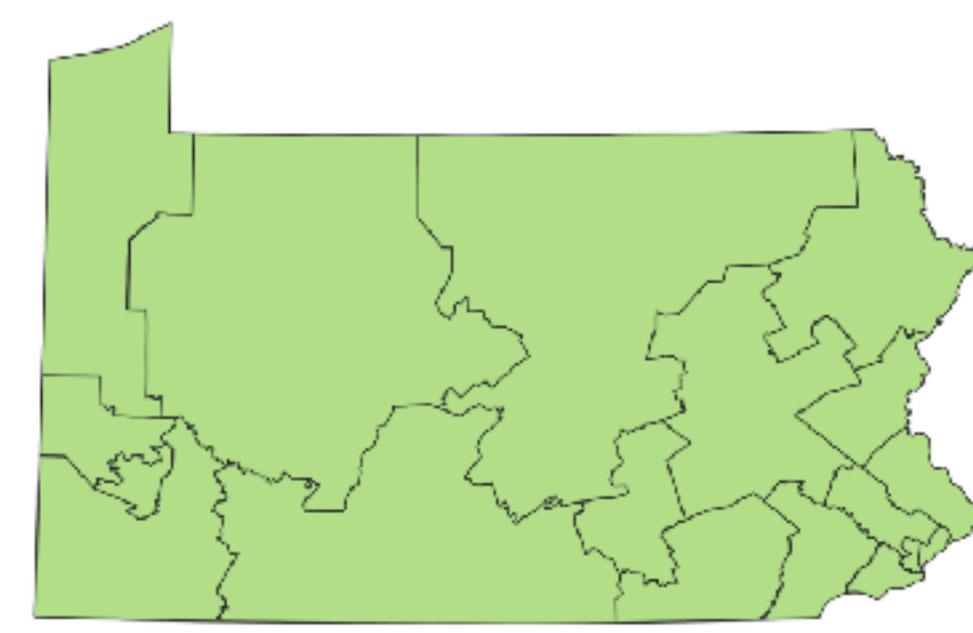
Plate Carrée



Web Mercator



USA Contiguous Albers Equal Area



PA DEP Albers Equal Area

Geography as data, then

- Traditional “metes and bounds” gives natural language description, using landmarks and distances.

Beginning at the confluence of the Big River and Pine Creek in the northwest corner of the district, proceed east along the centerline of Pine Creek for 12 miles to its intersection with State Highway 42.

From there, follow State Highway 42 southeast for 18 miles to its junction with County Road 17. Turn south along County Road 17 for 10 miles until reaching the southern boundary of Springfield County.

Follow the Springfield County line eastward for 22 miles to the boundary of Adams County. Continue south along the Adams County line for 15 miles to the intersection with the Middle Fork River.

Proceed west along the centerline of the Middle Fork River for 30 miles until reaching the intersection with U.S. Highway 81. Follow U.S. Highway 81 north for 12 miles to the city limits of Westfield.

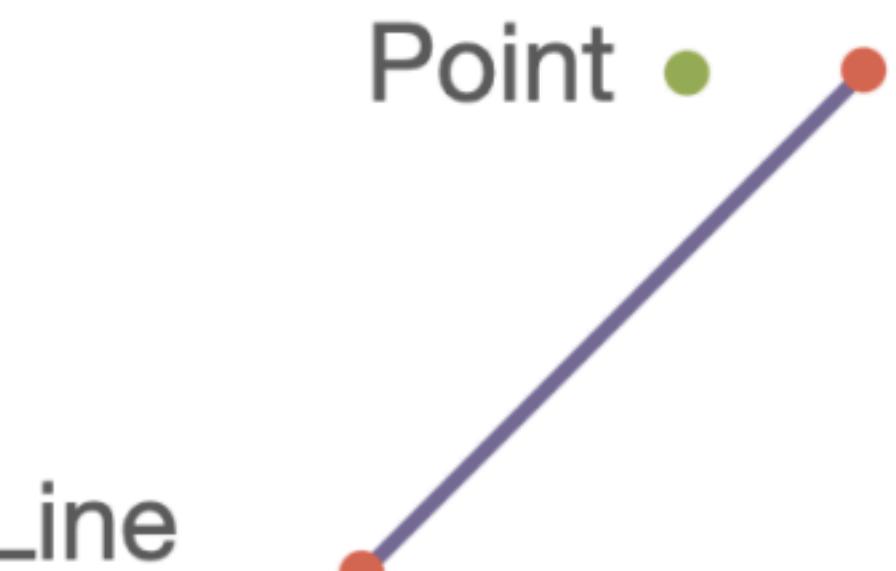
From the city limits of Westfield, proceed west along the northern boundary of the city until reaching the intersection with Interstate 77. Follow Interstate 77 northward for 14 miles until it crosses the Big River.

Finally, follow the centerline of the Big River northwest for 20 miles back to the point of beginning.

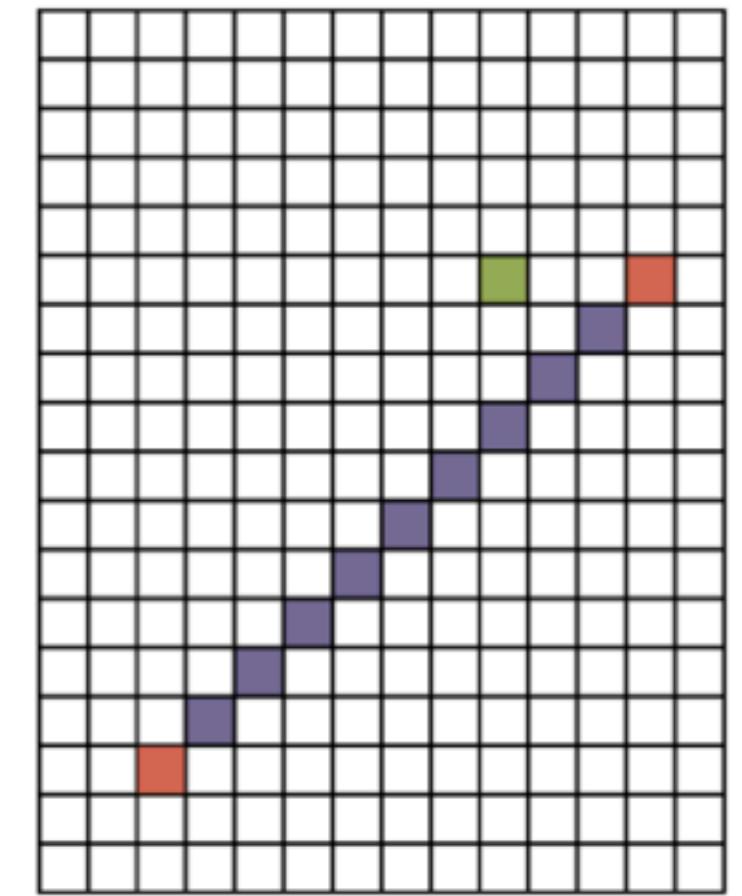
Geography as data, now

- **vector**: sets of coordinates; points are coordinates with real-number precision; units are polygons. GIS standard.
- **raster**: lattice is imposed, creating pixel-like data. More common with remote sensing, like satellite imagery.
- unfortunately we're largely stuck with a proprietary **file format** (from ESRI corporation, early 1990s) called the shapefile – actually a package of files (`blah.shp`, `blah.dbf`, `blah.prj`, `blah.shx`, `blah.cpg`)
- why people hate shapefiles: no coordinate reference system definition, limited attributes and attribute names, limited data types, doesn't have topology data structure, no distinction between 0 and empty, etc etc
- purists prefer GeoPackage, GeoJSON, even CSV

Vector



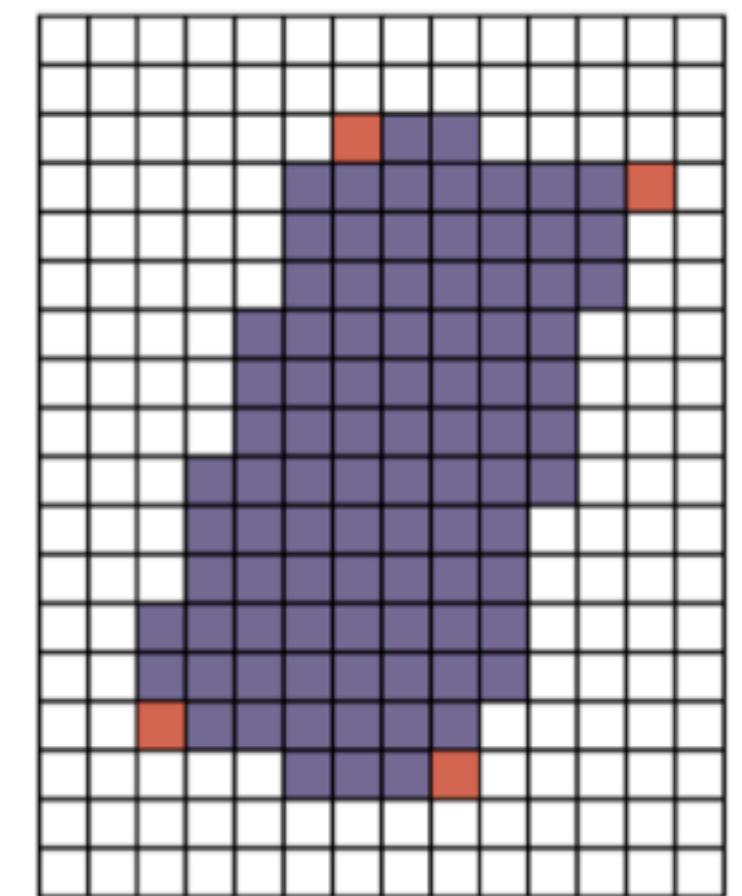
Raster



Line

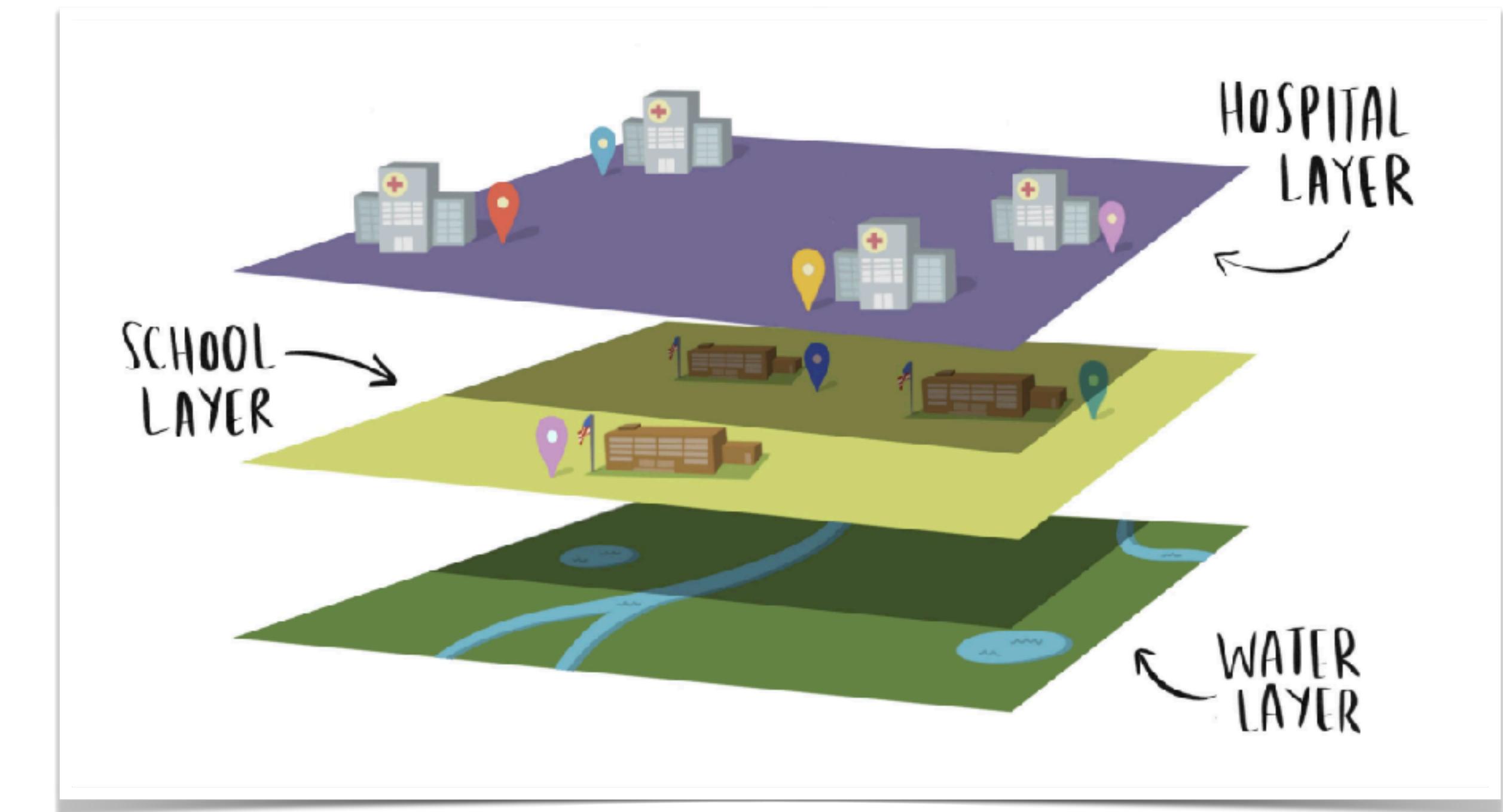


Polygon



What's in the data

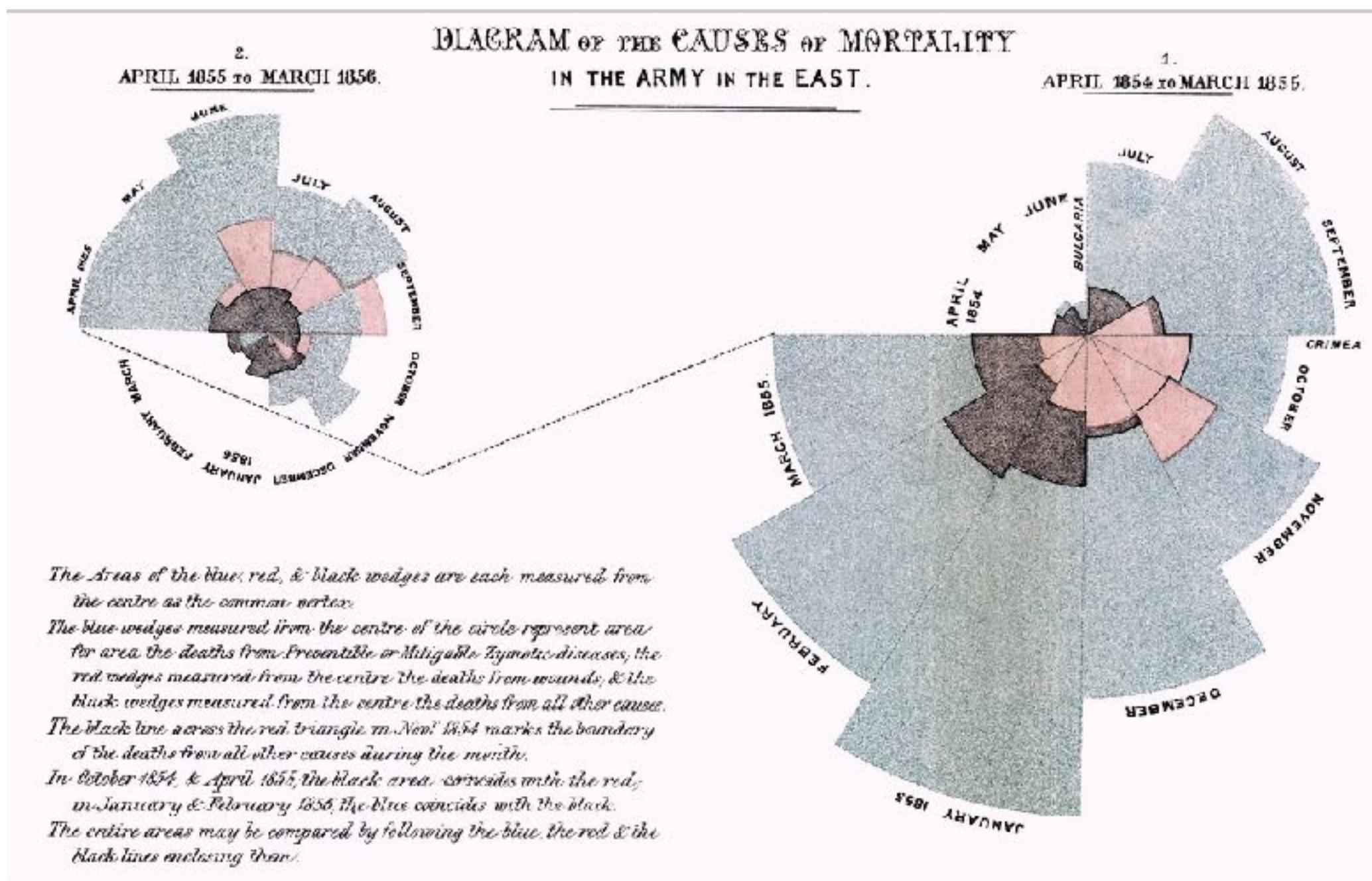
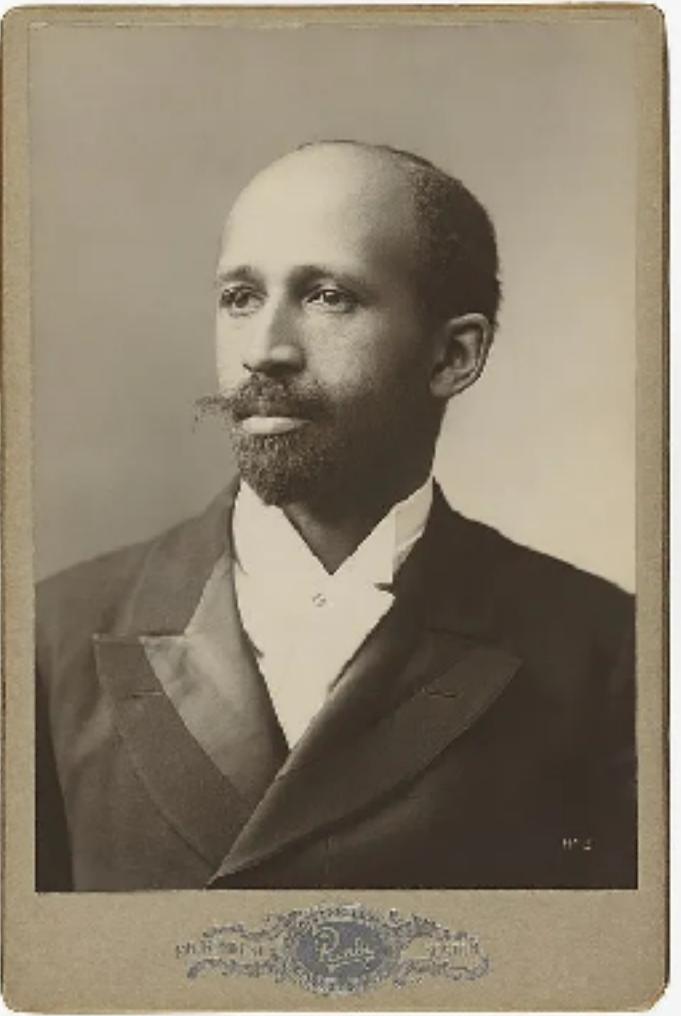
- GIS often presented with layers
- attribute tables: entities, attributes, relation
- data can be **joined** along an identifying column



GEOID	Name	Location
36059	Nassau County, NY	(list of vertices)
36081	Queens County, NY	(list of vertices)
36103	Suffolk County, NY	(list of vertices)

notes on cartography

DuBois



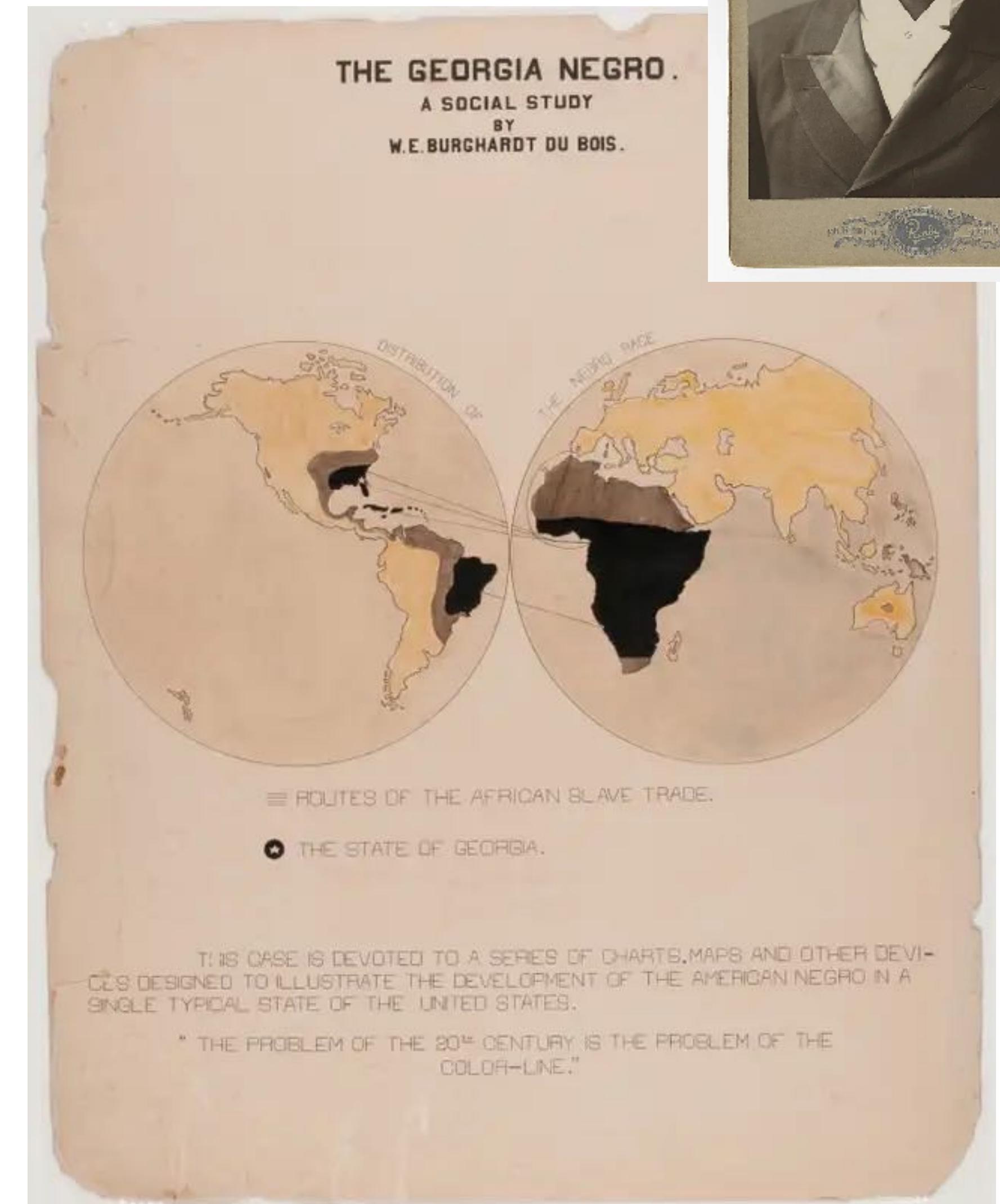
The areas of the blue, red, & black wedges are each measured from the centre as the common vertex.
The blue-wedges measured from the centre of the circle represent area for area the deaths from Preventable or Mitigable Typhotic diseases, the red-wedges measured from the centre the deaths from wounds, & the black-wedges measured from the centre the deaths from all other causes.
The black line across the red triangle in Nov. 1854 marks the boundary of the deaths from all other causes during the month.
In October 1854, & April 1855, the black area coincides with the red;
in January & February 1856, the blue coincides with the black.
The entire areas may be compared by following the blue, the red & the black lines enclosing them.

a strong visual contains rich information
that is still digestible



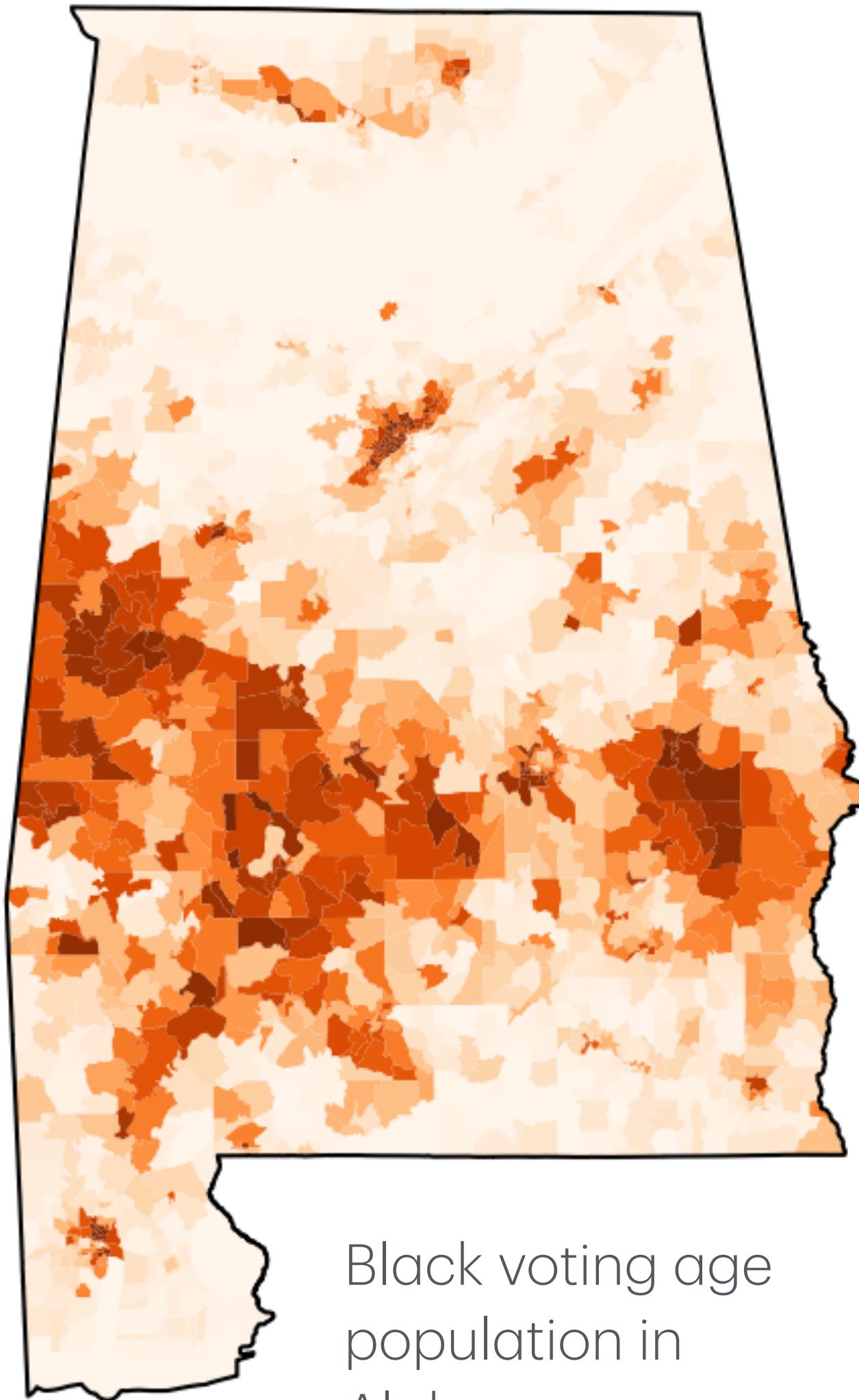
Nightingale

rich info plus place
makes compelling maps

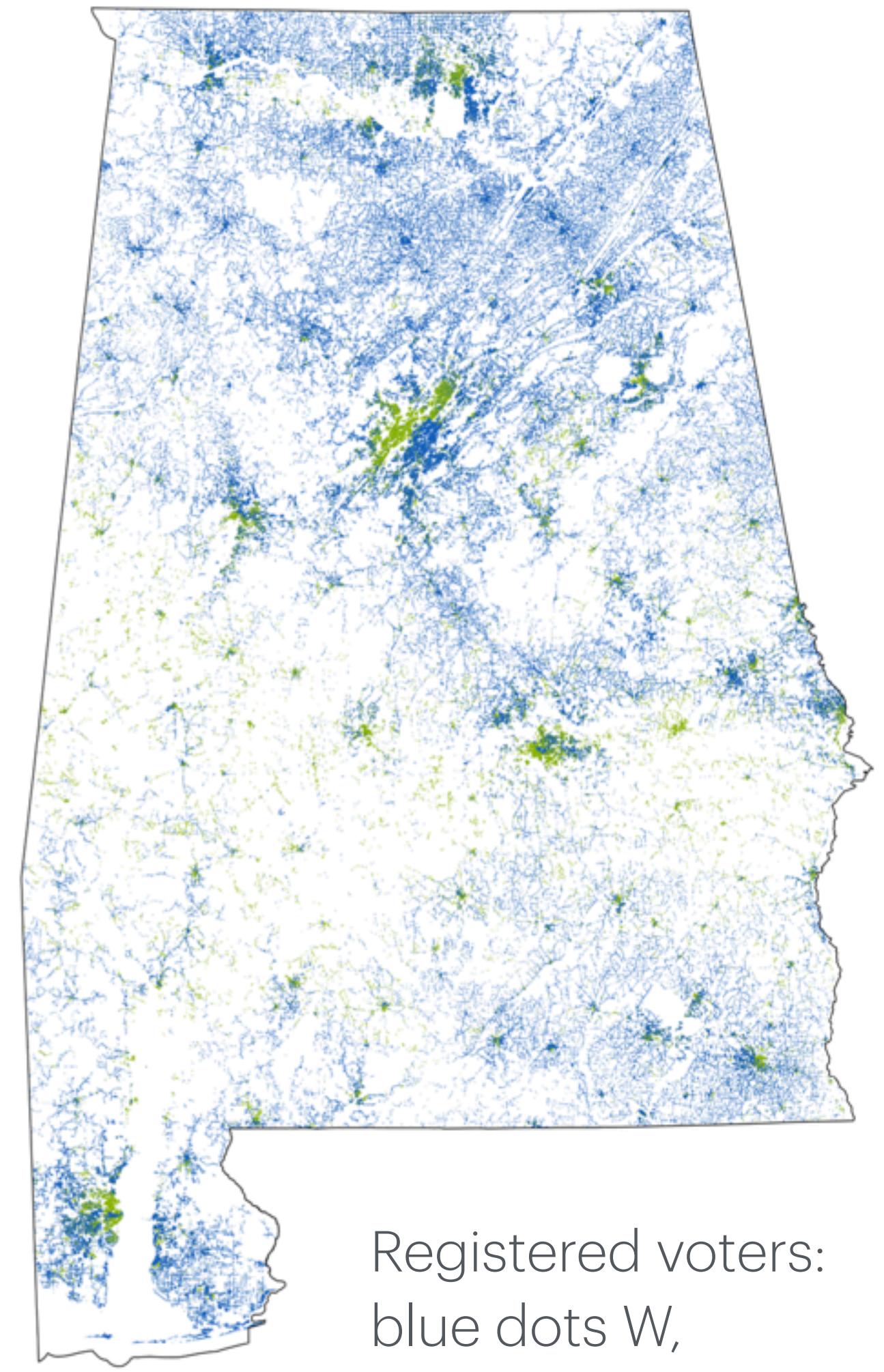


Many styles of mapping quantitative data

- **choropleth** – shading for quantity
- **dot density**
- proportional symbol / graduated symbol
- isopleth / contour map
- heat map
- cartogram
- flow map

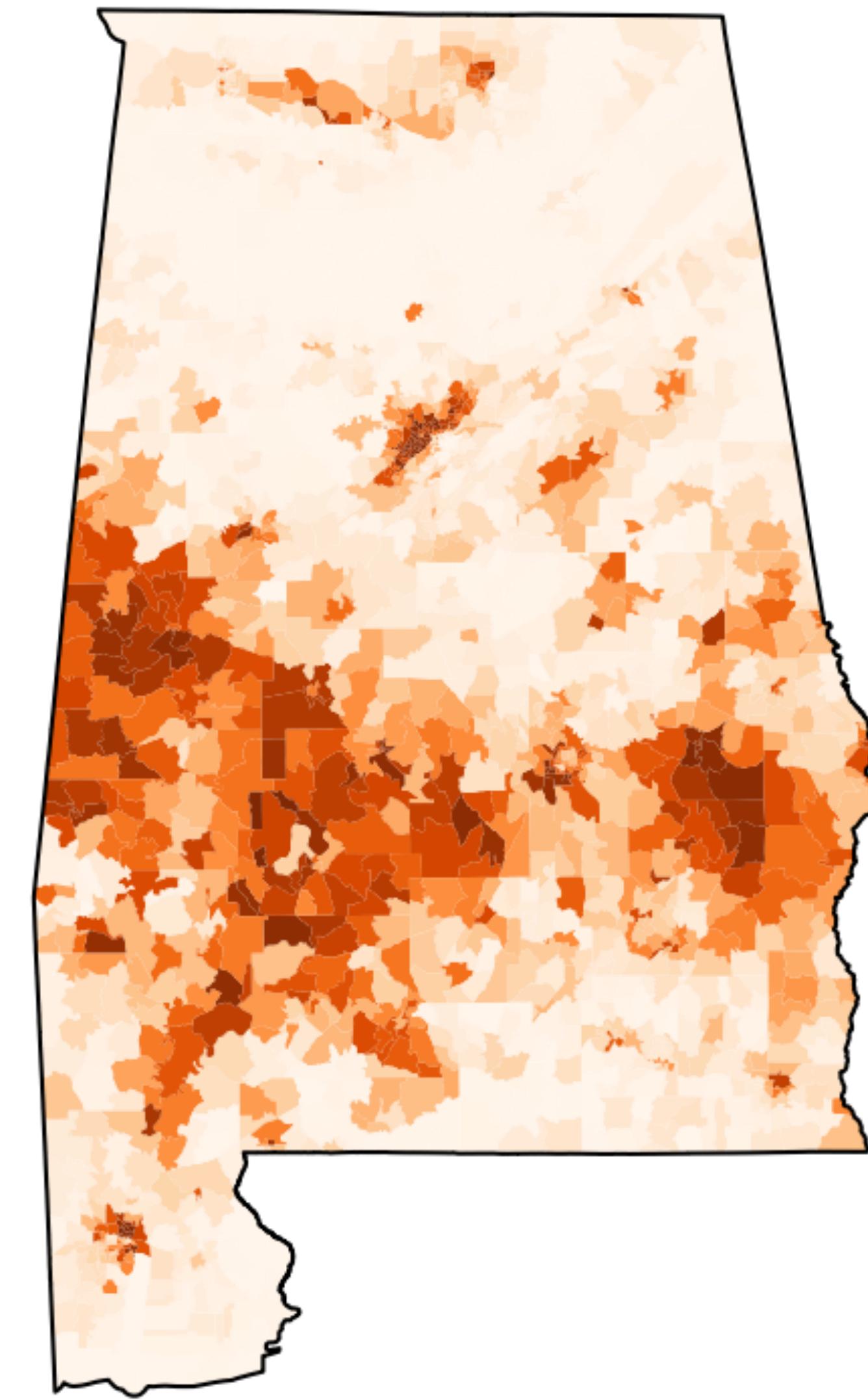
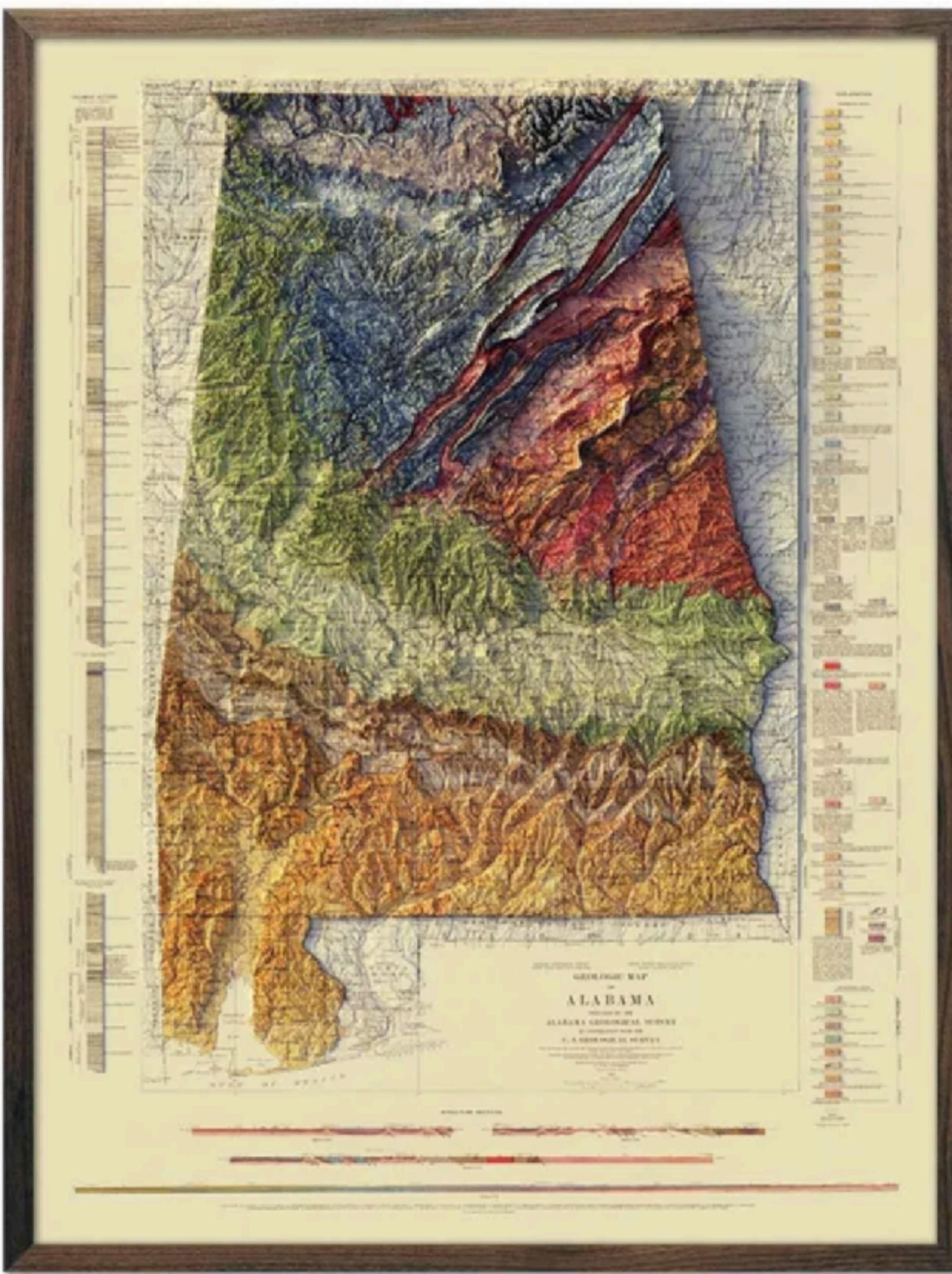


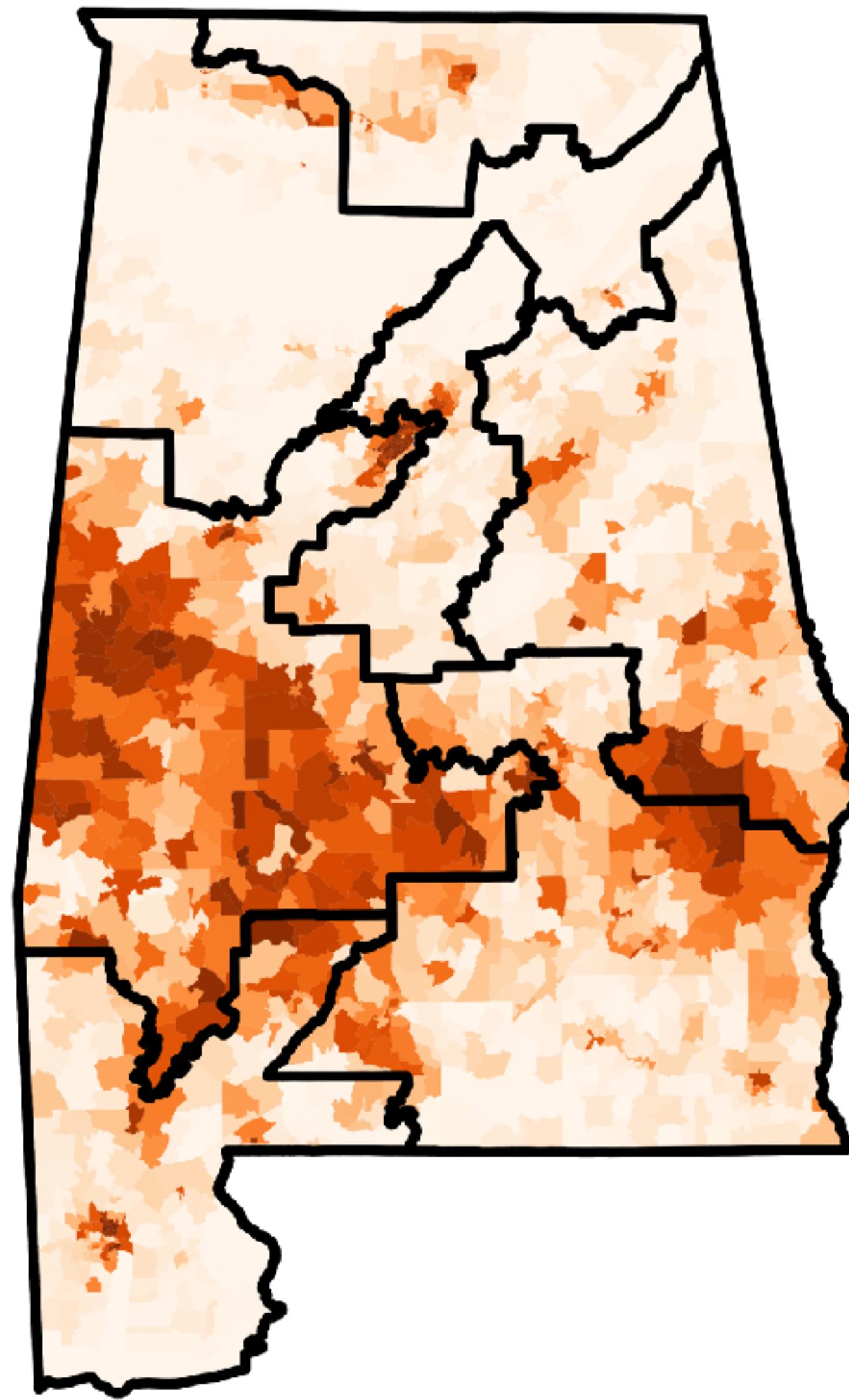
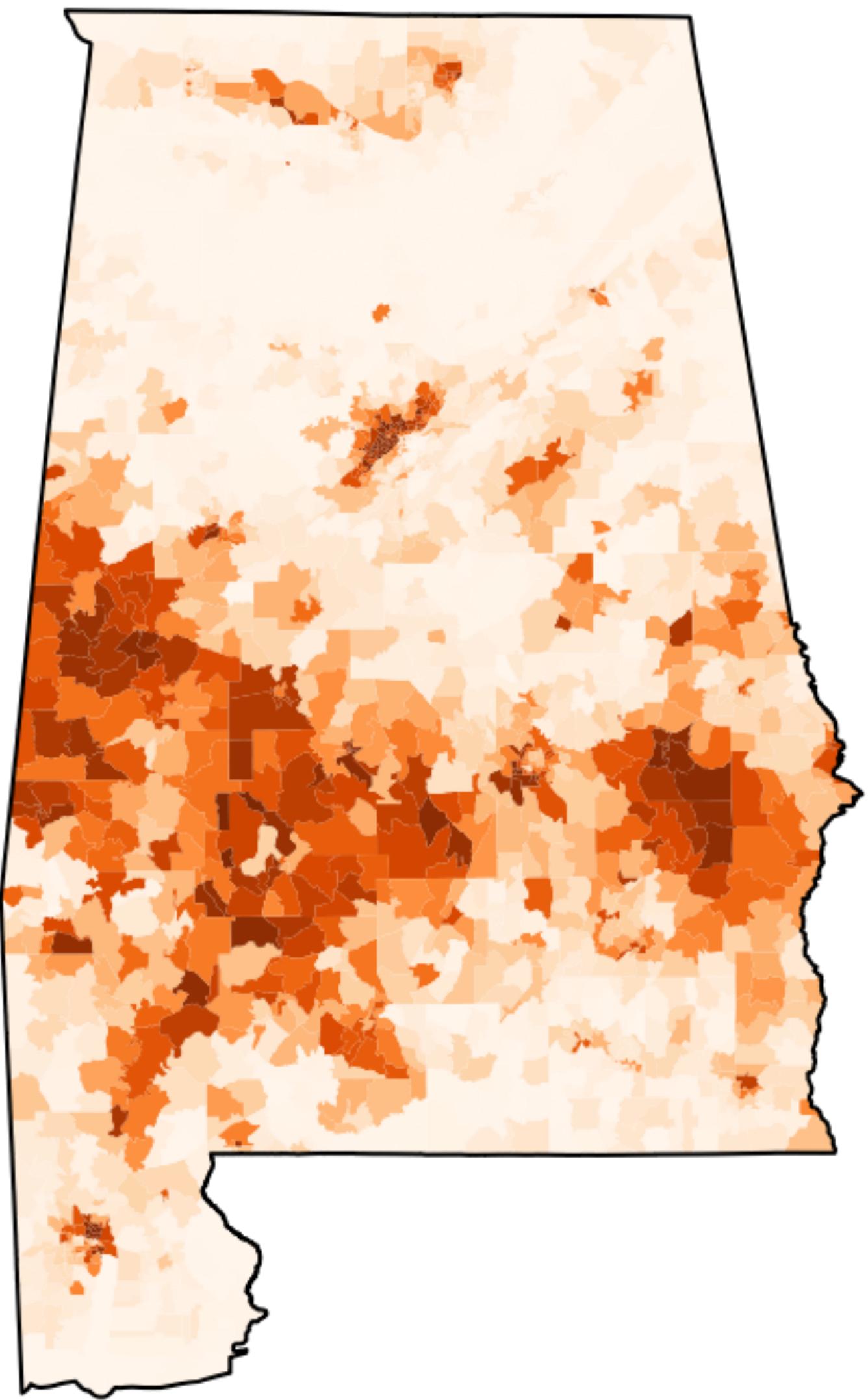
Black voting age population in Alabama



Registered voters:
blue dots W,
green dots B

Visual correspondence





Maps can be polemical



Bunge



Warren

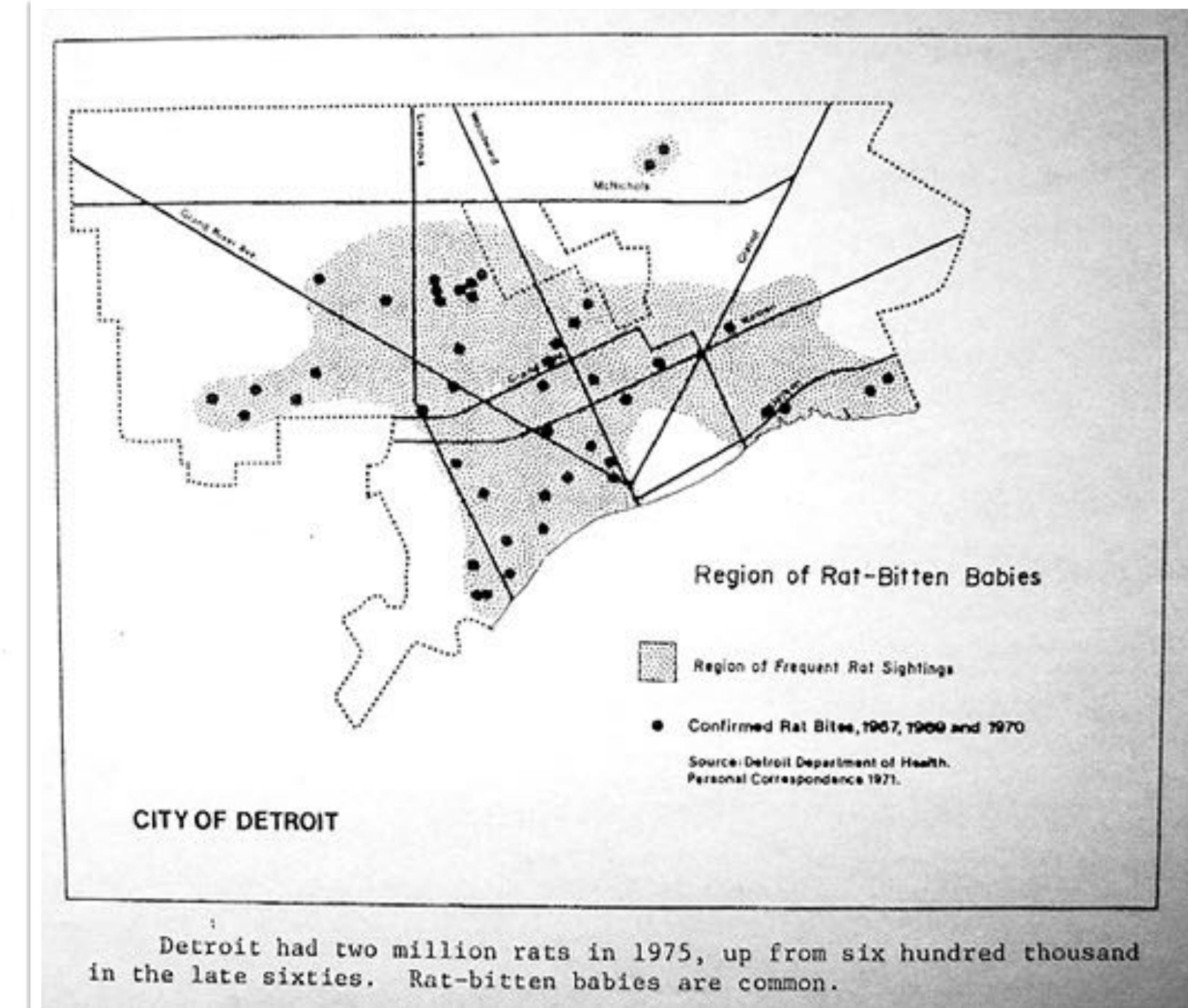
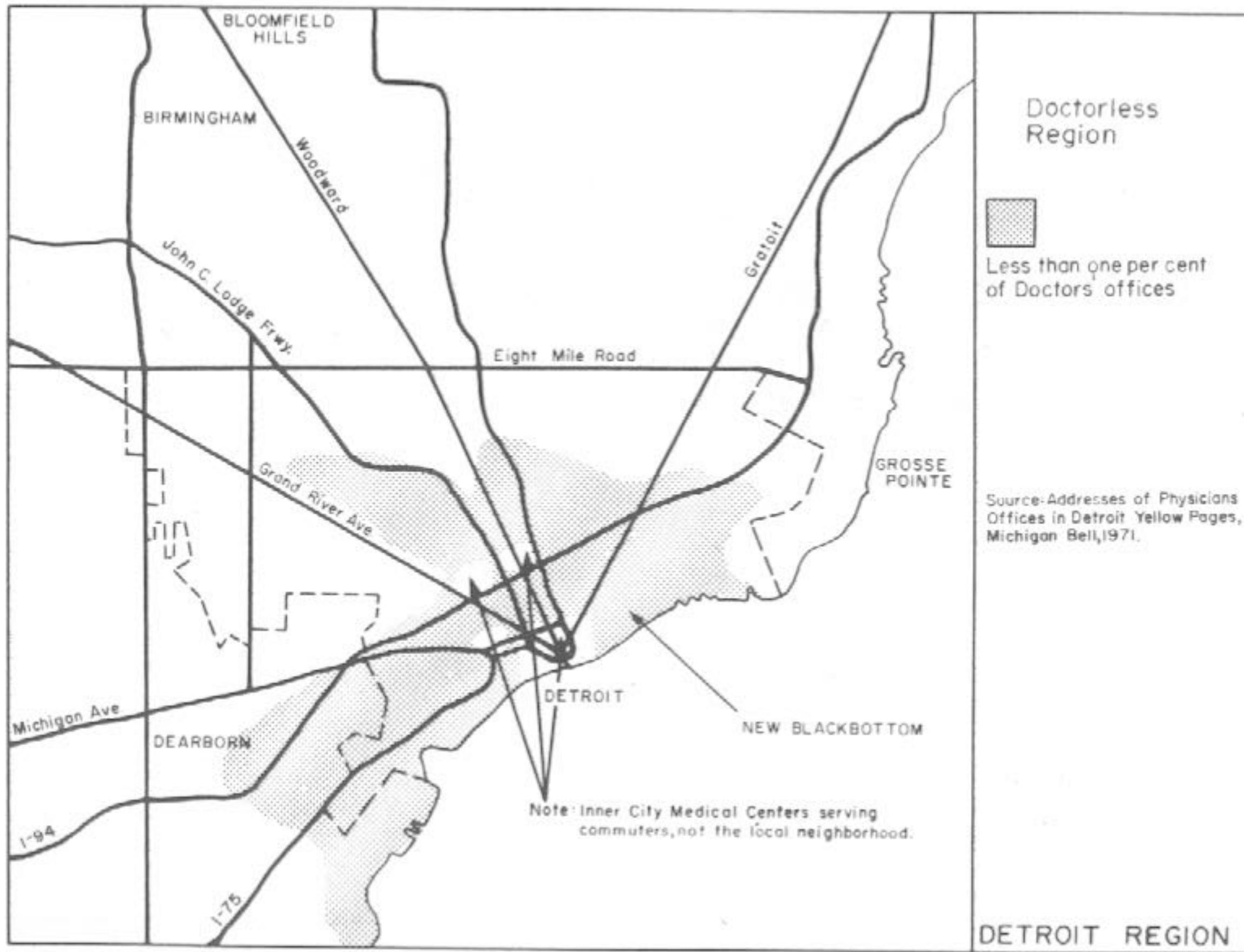


Fig. 144

Cornell library has a “persuasive maps collection”!

