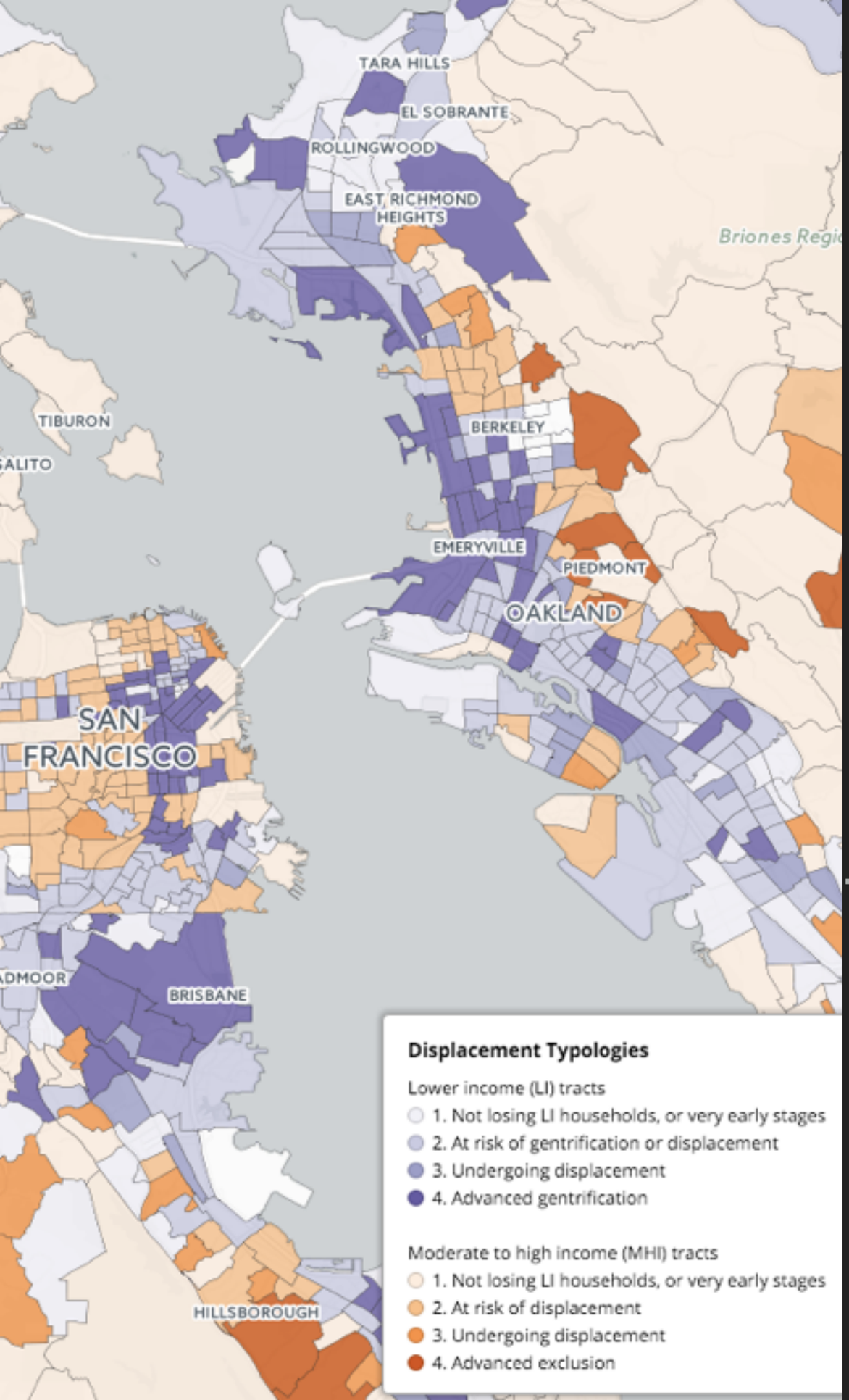


INTRO TO GIS

SPATIAL DATA AGGREGATION

Source: http://www.urbandisplacement.org/map

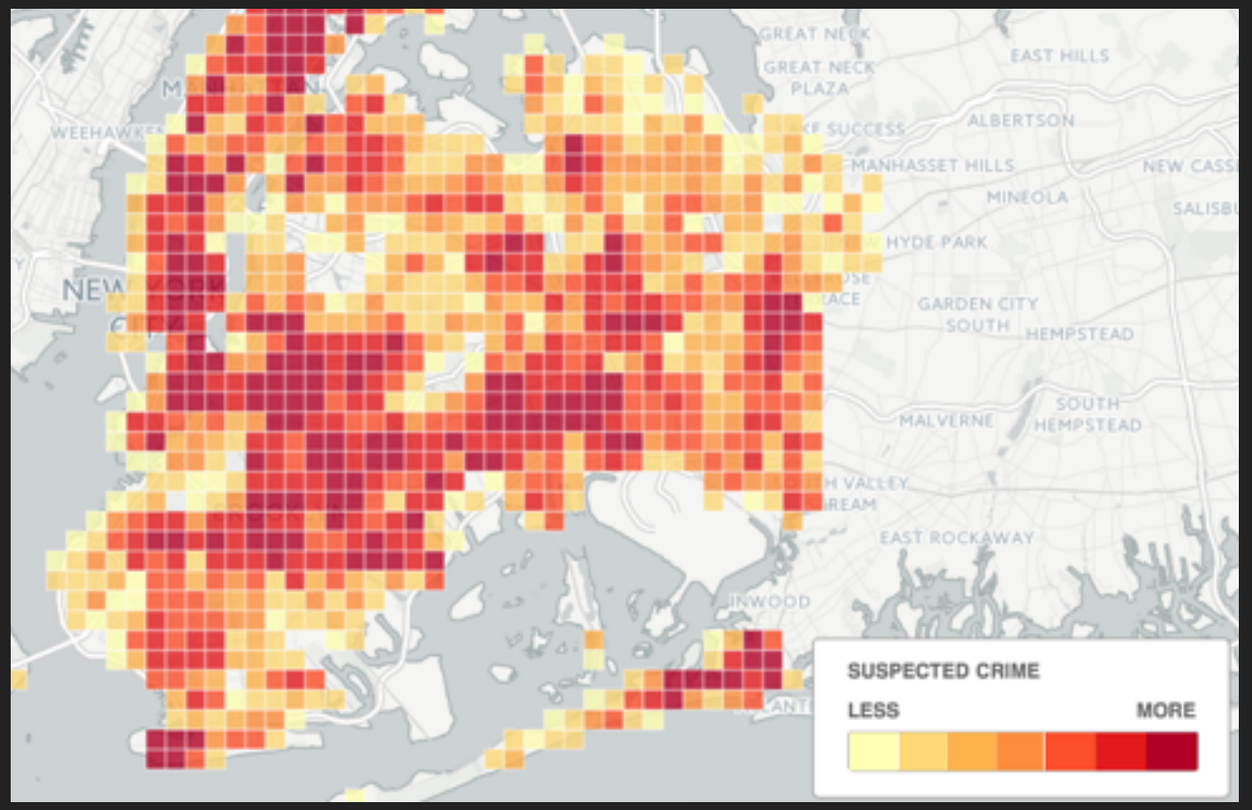
WRITING PROMPT

- You are trying to characterize the degree and extent of a natural gas leak from a hypothetical underground storage facility in Porter Ranch. Using a portable handheld measurement device (e.g., flame ionization detector), you and your team collect several hundred ambient air samples (with locational information) near and far from the source of the leak.
- Take 5 minutes to brainstorm ideas for how you would try to analyze these data. What types of information might be useful? Are there ways of organizing the data to make the data easier to work with?

SPATIAL DATA AGGREGATION

- The process of combining data across one or more datasets using spatial information and/or other variables to group or classify the data. It is also used to transform data from a finer to coarser scale.

SPATIAL DATA AGGREGATION



SPATIAL AGGREGATION METHODS

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- Point-to-Polygon (spatial join)
- Polygon-to-Polygon (spatial join or merge)
- Polygon-to-Point (spatial join using distance or buffers)
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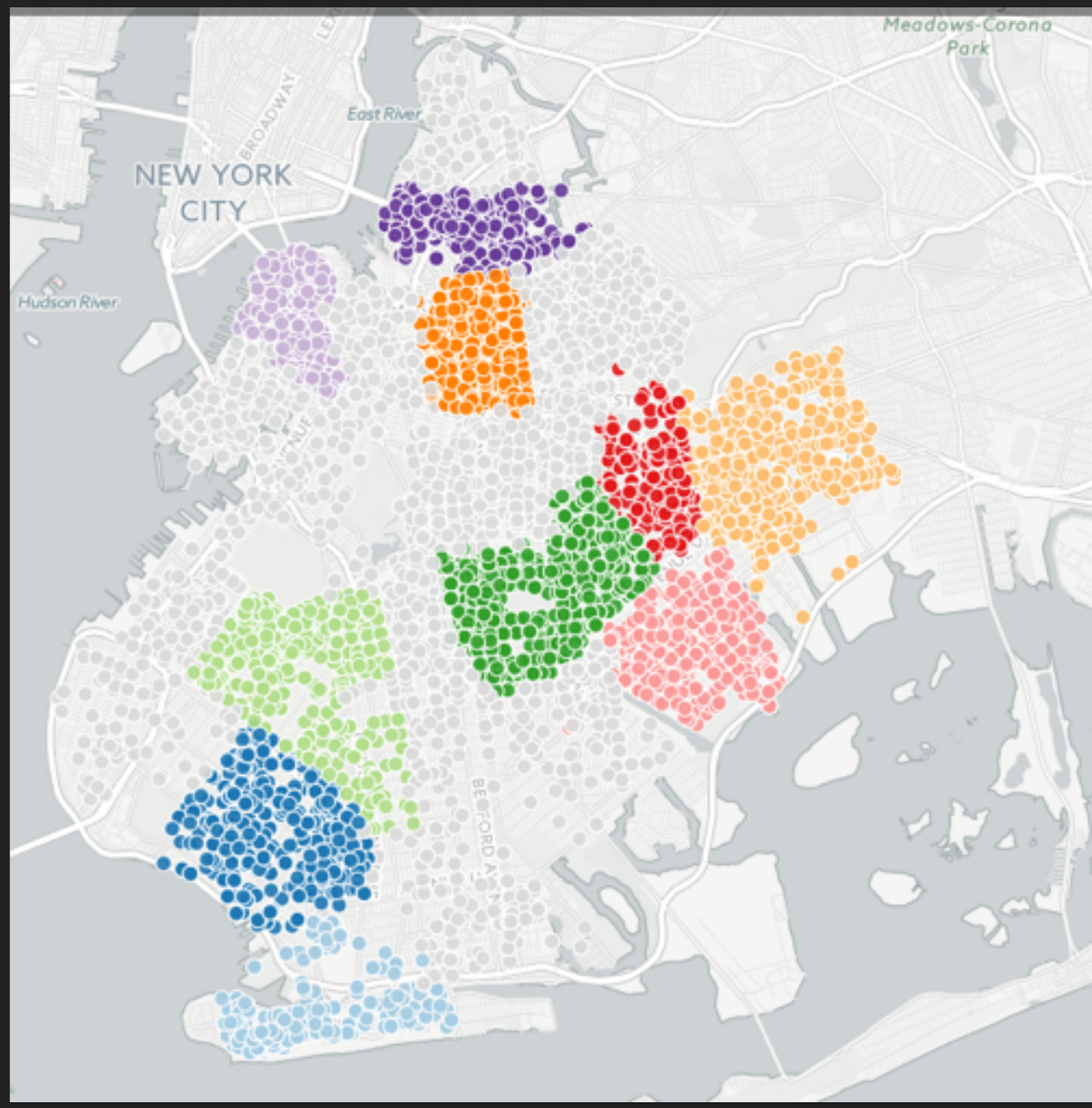

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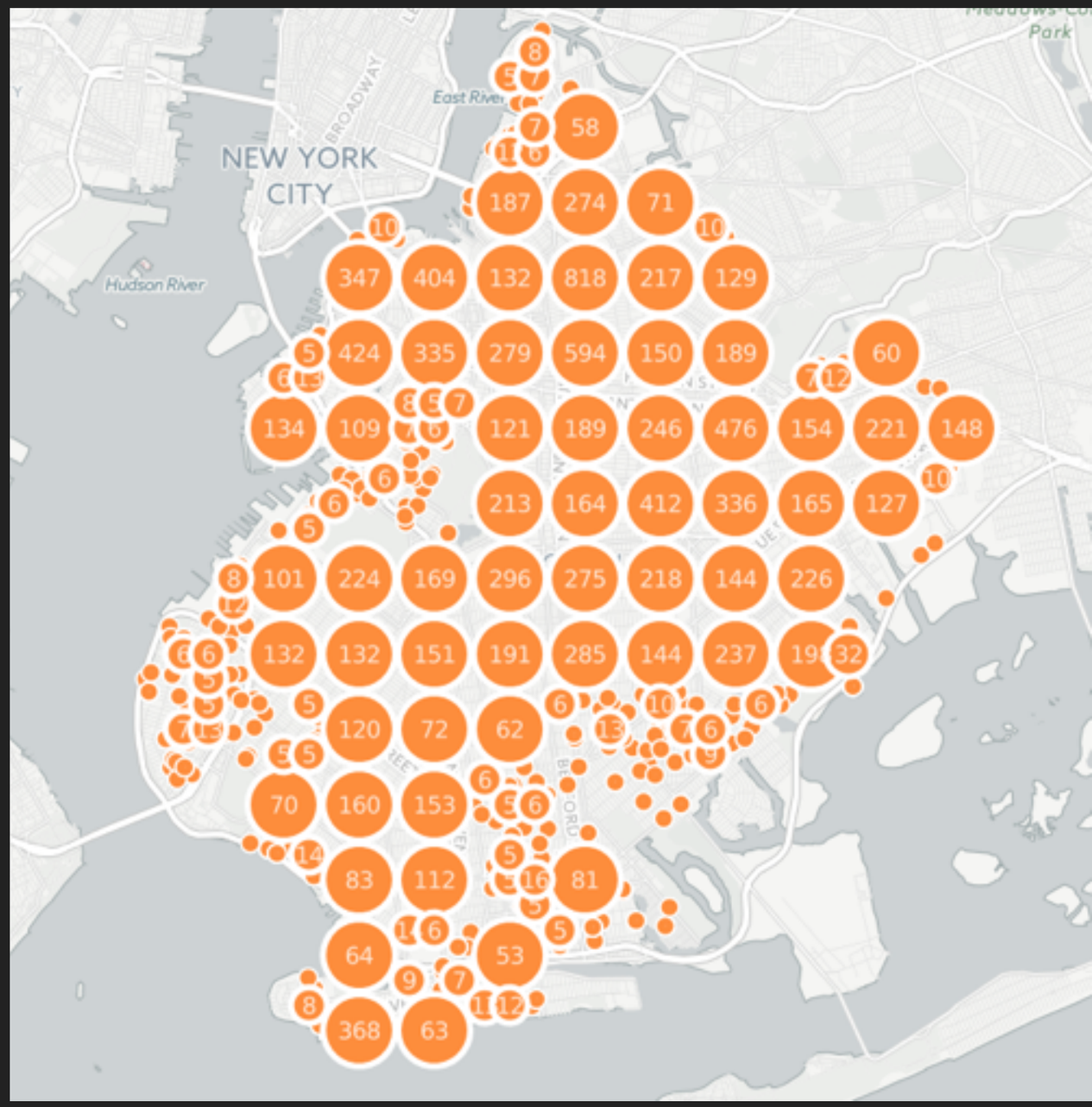

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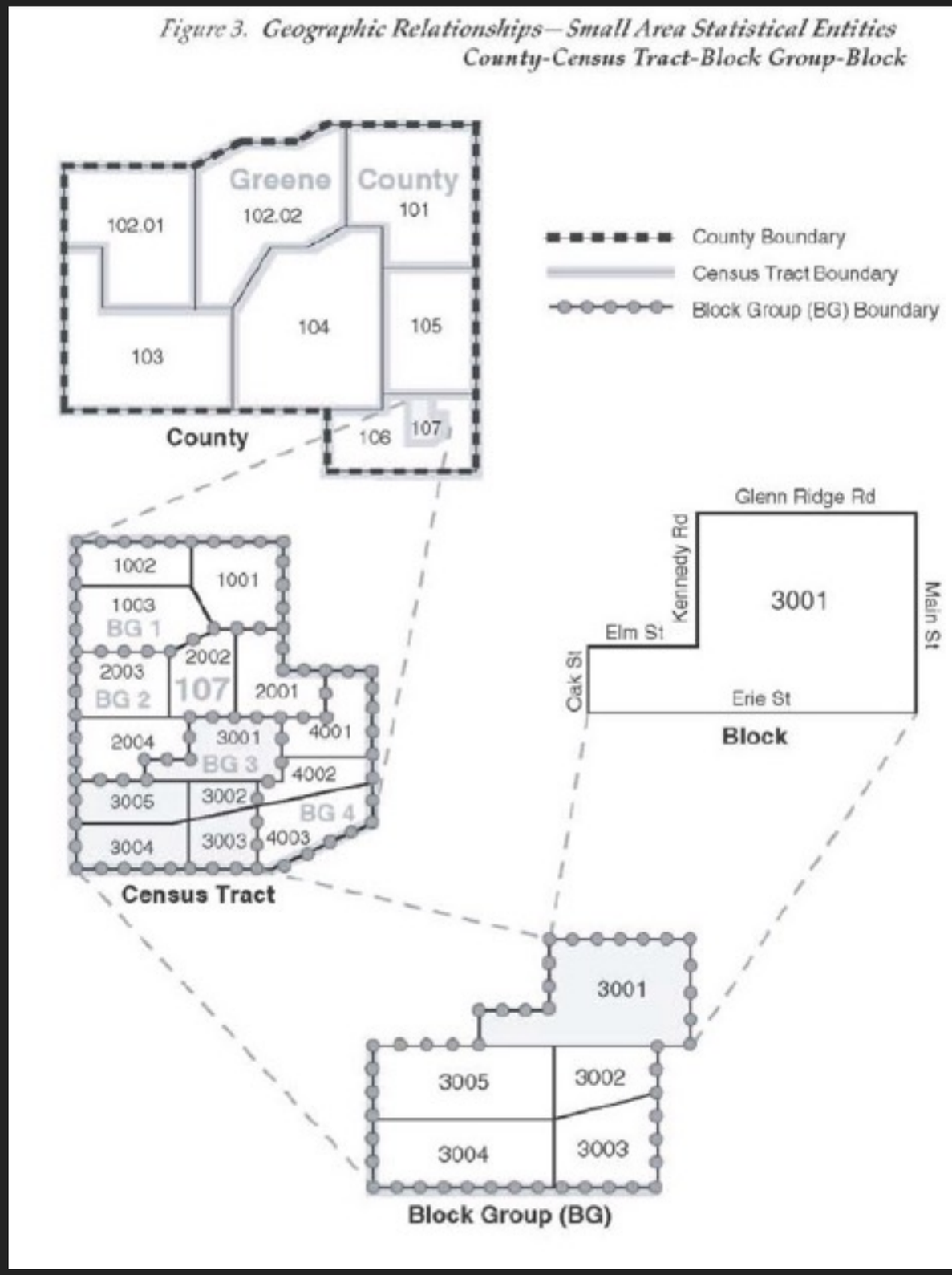

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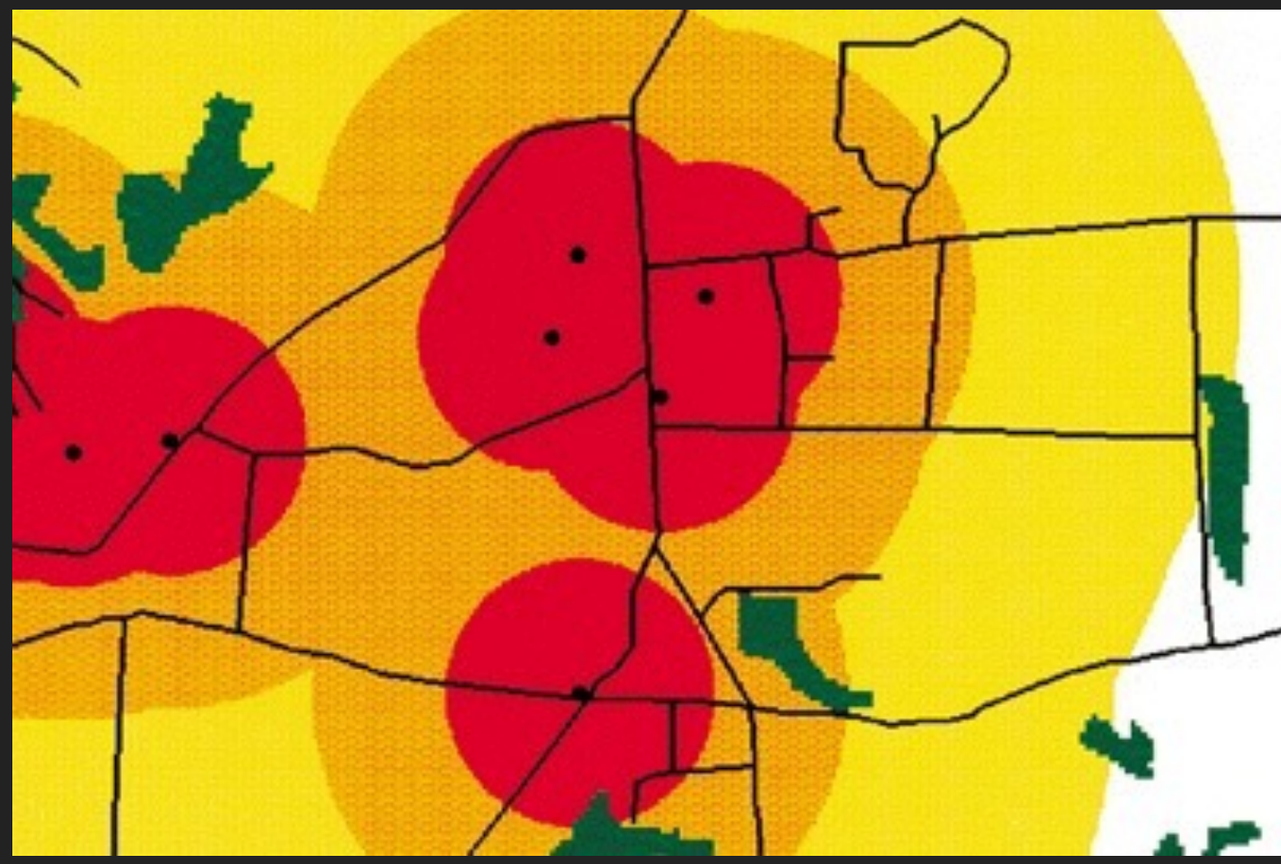

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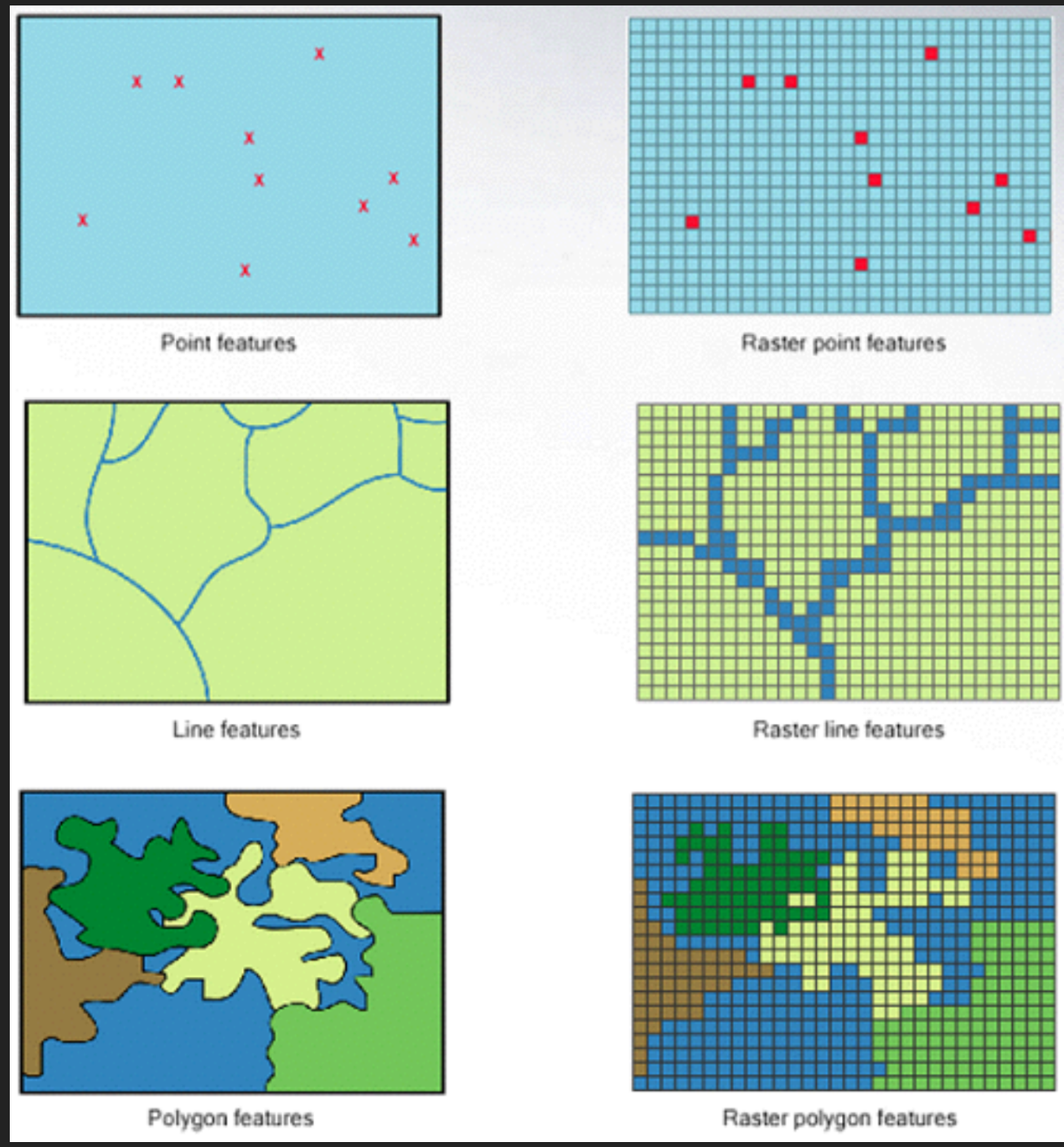

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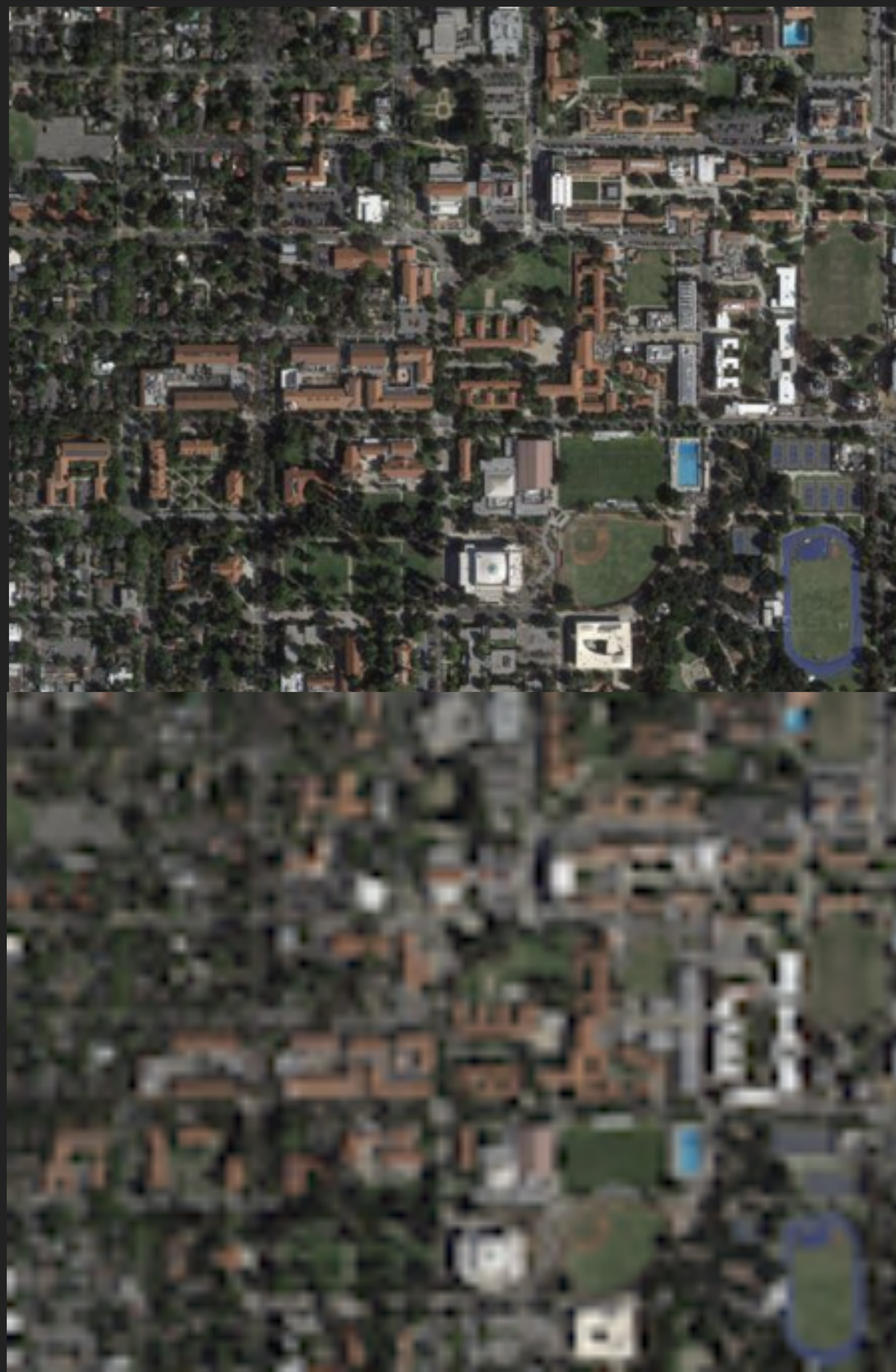

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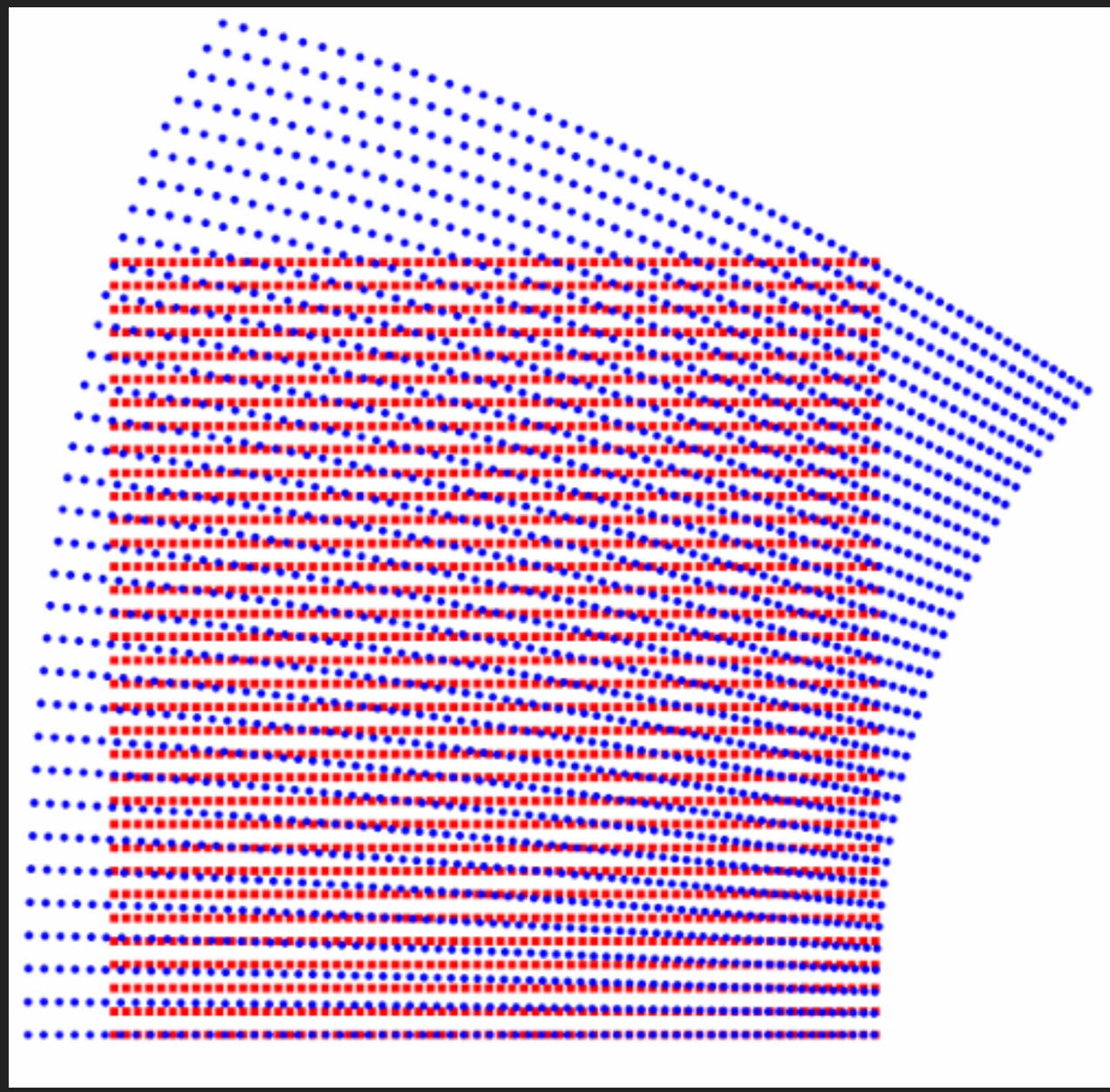


THINKING SPATIALLY ABOUT DATA

- How (over what geographical extents) and why (versus using discrete data points) might we aggregate the following types of data?
  - Votes for a political candidate
  - Incarceration rates
  - Precipitation rates
  - Soil and groundwater contamination
  - Endangered species habitat

PROBLEMS ENCOUNTERED IN AGGREGATING DATA

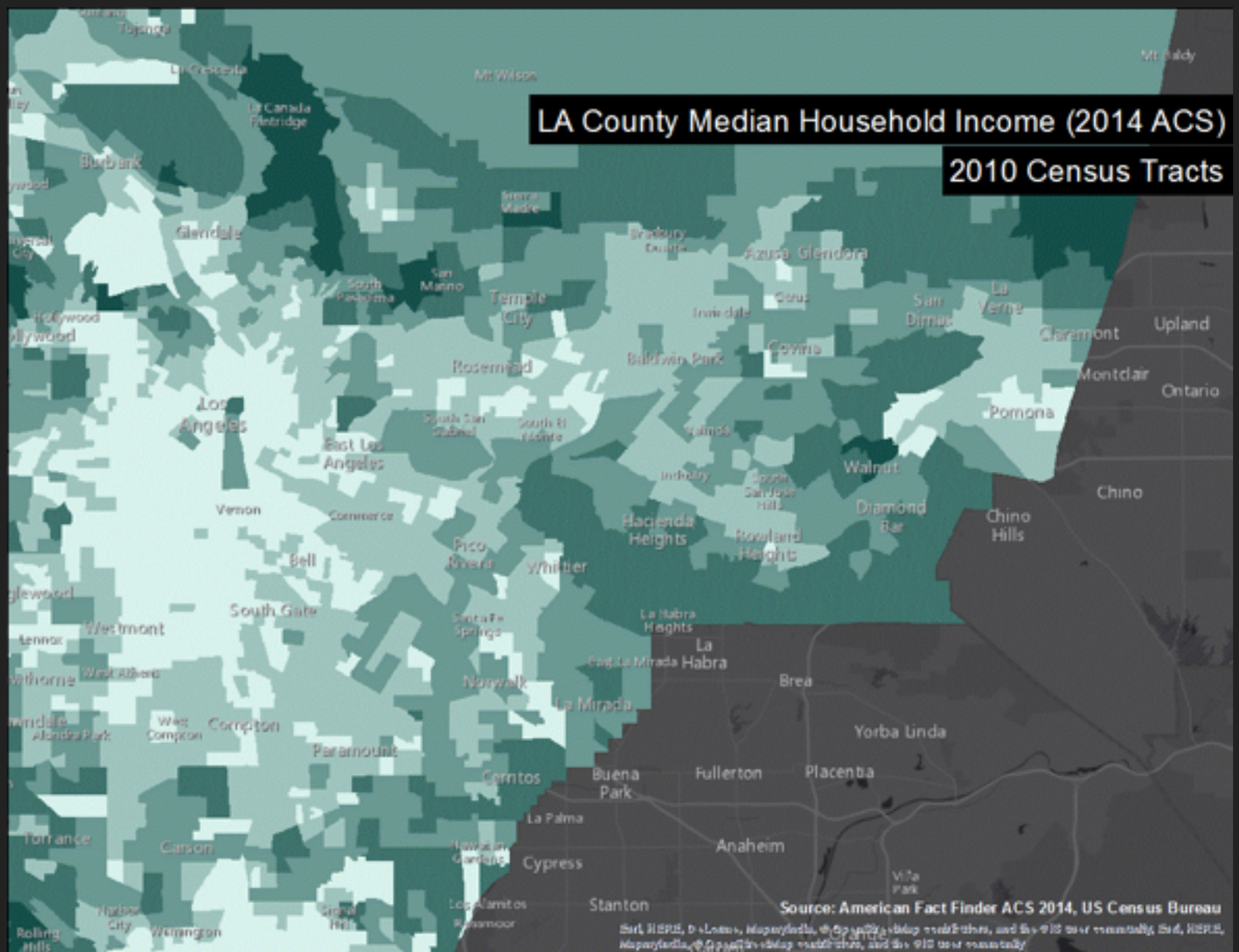
- How will the unit of aggregation relate to the underlying data?
- What am I trying to understand about my data?
- How large should my aggregation units be?
- How will I determine where to draw boundaries between data points.
- (Refer to the table in the notes for specific issues you need to be aware of when aggregating data)

THE MODIFIABLE AREAL UNIT PROBLEM

- By modifying the areal boundaries or areal size of the unit of aggregation, the results of spatial analysis will be altered.
- By using units of aggregation that remain consistent across datasets, time, space, political jurisdictions, etc., the inferences derived from analysis are more repeatable, expandable, and portable.
- The problem is figuring out how to define boundaries that meet these various criteria and are appropriate to our data.

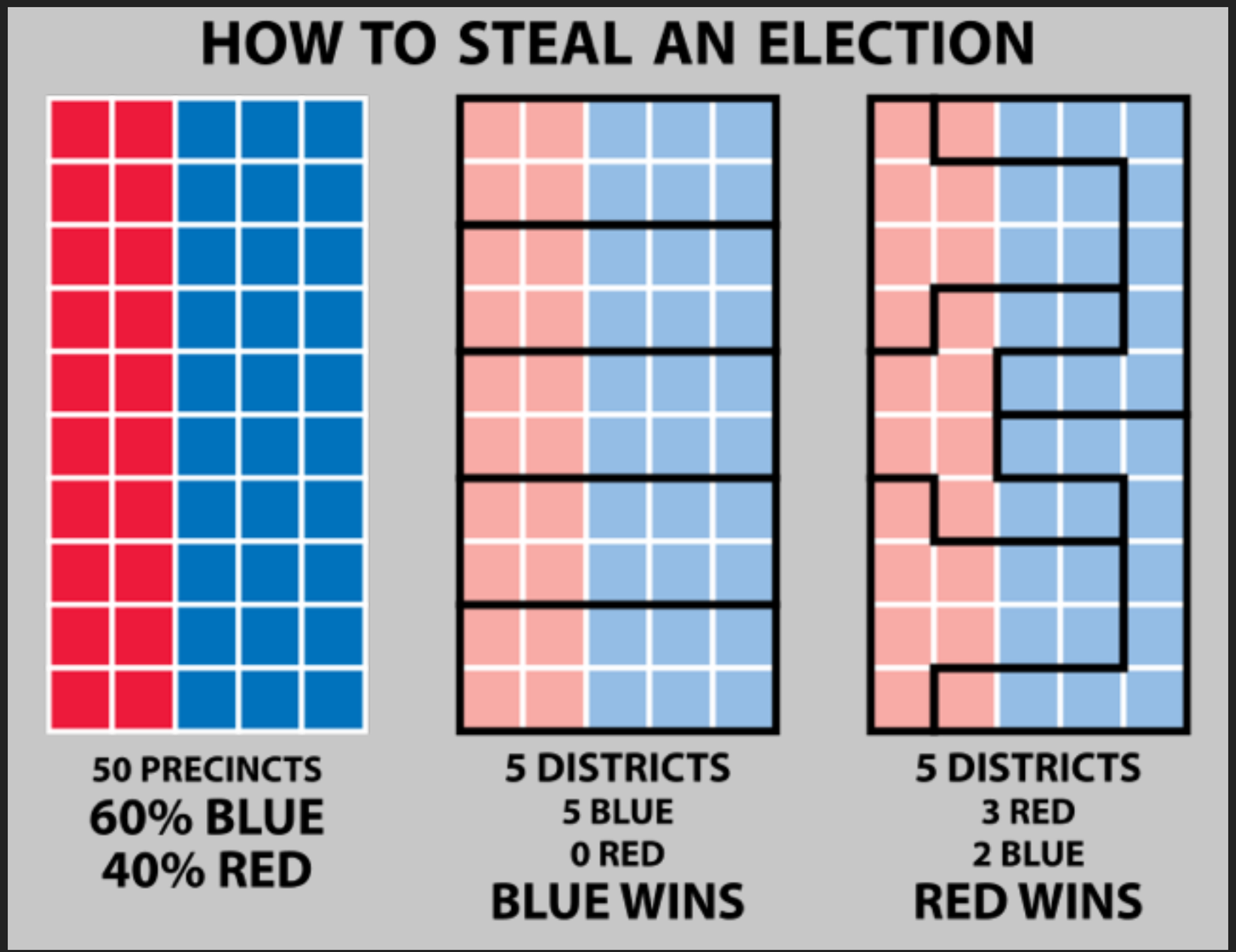
SCALE

- The aggregation unit can be of varying sizes.
- The larger the unit of aggregation, the more the data are homogenized over space and the less influence each individual data point has over the aggregate statistics.



ZONING

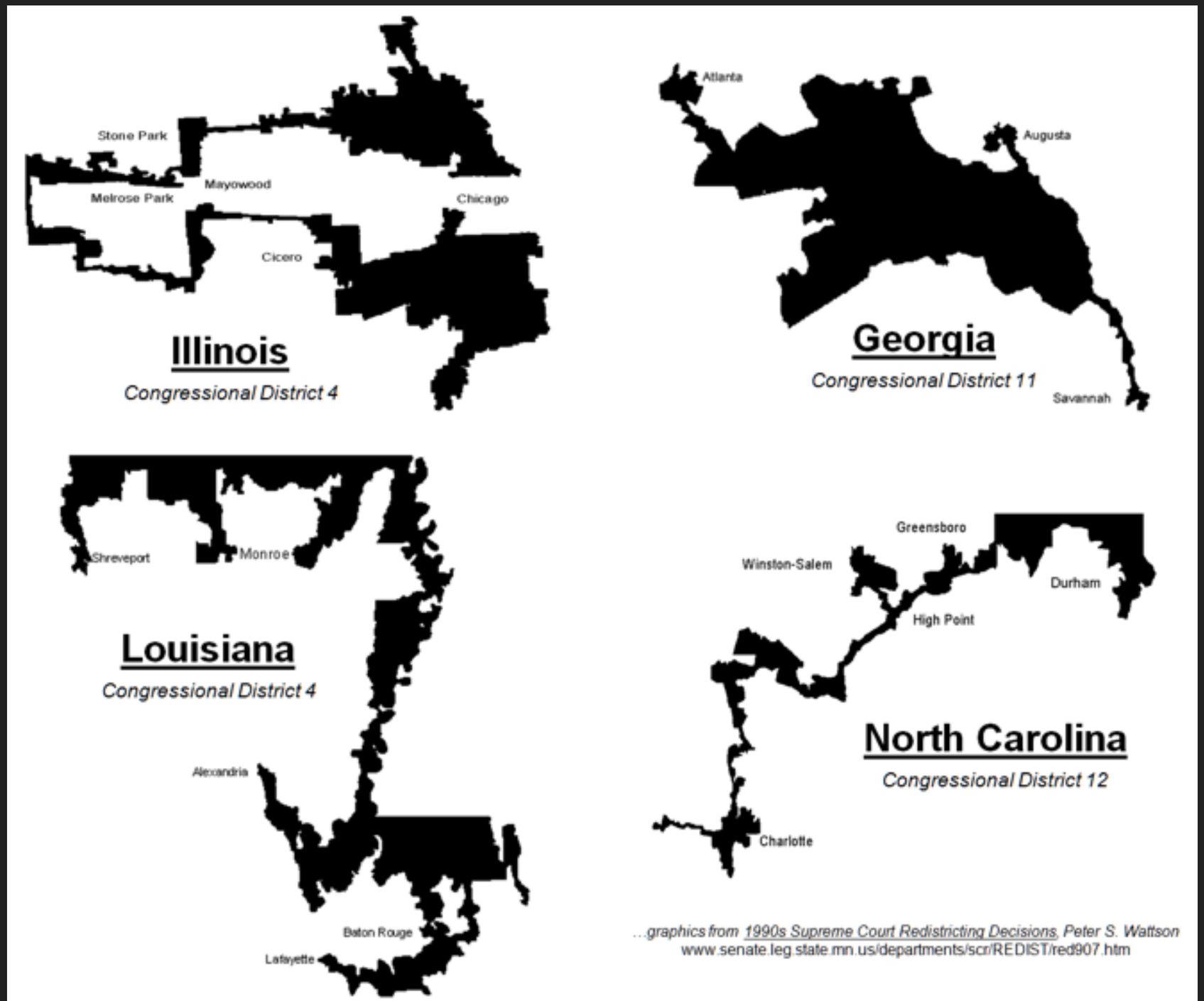
- The shape of the aggregation unit (i.e., where boundaries are drawn) affects which data points get included in each unit.



GERRYMANDERING

- When politicians draw political boundaries in a way that will likely shape the outcome of elections and keep them or their party (or themselves) in power.
- It often results in oddly shaped electoral districts with odd protrusions, snake-like shapes, or narrow strips connecting different neighborhoods.

GERRYMANDERING DONE BY THE PROS



GERRYMANDERING AND THE MAUP

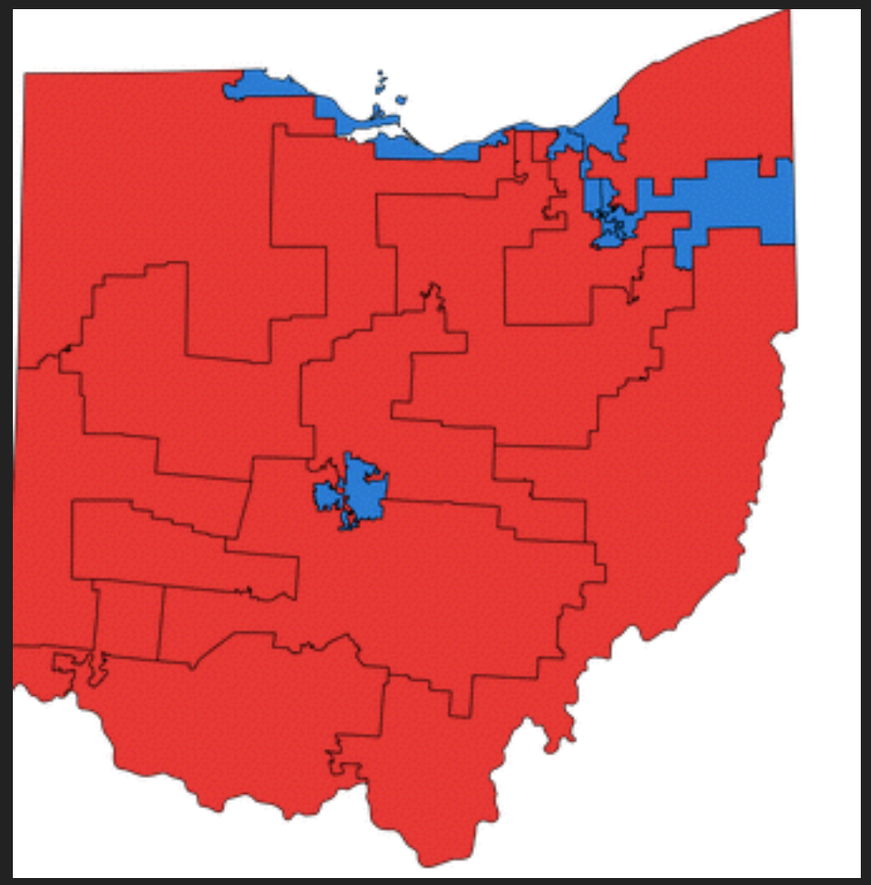
- How does gerrymandering relate to the MAUP?
  - Individual voters are discrete data points
  - Electoral districts are aggregation units
  - Election outcomes are a statistical summary of the voters within each district
  - Redistricting is literally the process of modifying areal units.

HOW TO GERRYMANDER LIKE AN AMATEUR

- Create a choropleth map of existing electoral districts
- Use demographic information such as income, race, household size, employment industries, etc., or privately obtained survey data to categorize Census blocks
- Aggregate the voting data within electoral districts
- Symbolize map based on likelihood of votes going the way you want
- Identify electoral districts that look like they’re headed the wrong direction and start tweaking those district boundaries.
- Profit!

HOW TO GERRYMANDER LIKE A PRO

- Use machine learning on historical election results + detailed demographic data
- Add local knowledge and survey data
- Math (optimization functions)
- You are now the state of Ohio!
- Blue margin >68%
- Red margin 53% – 63%



BLOG ASSIGNMENT

- Discuss how the logics of gerrymandering, or data aggregation in general, might apply to your end-of-semester GIS project.
- What specific factors will influence how you aggregate your data?
- Review the problems associated with data aggregation and explain how your methodology will account for any of those that apply to your project.
- If you don't think you will need any data aggregation in your project, use the example provided at the beginning of this lesson to complete this assignment.