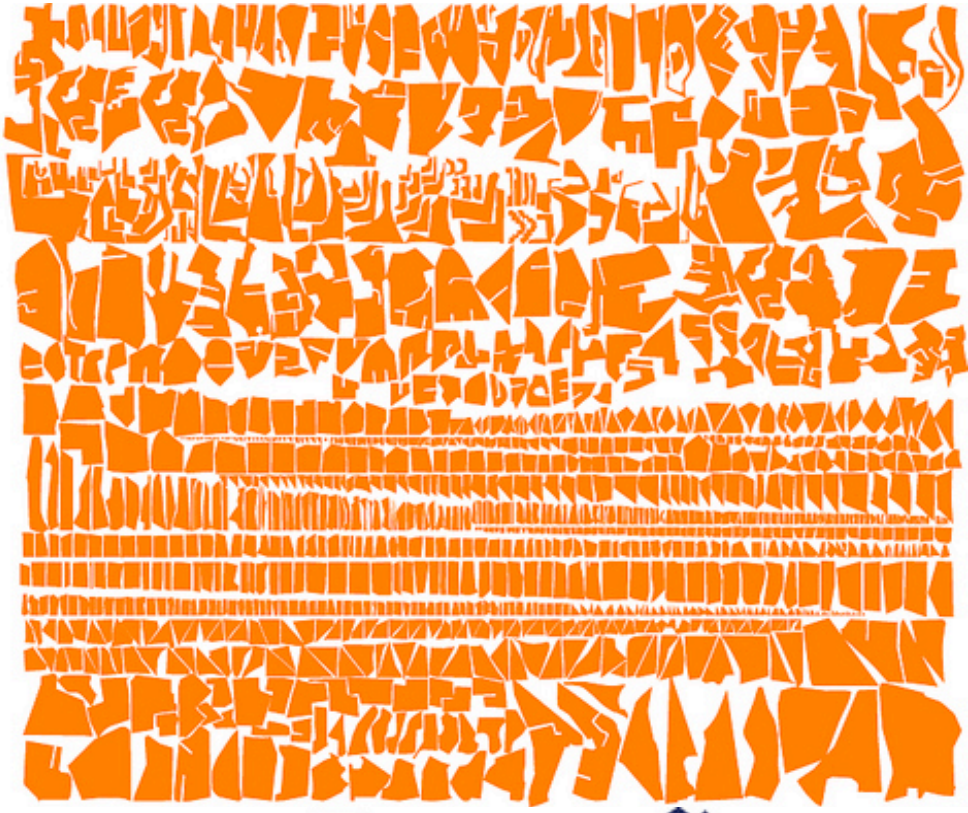
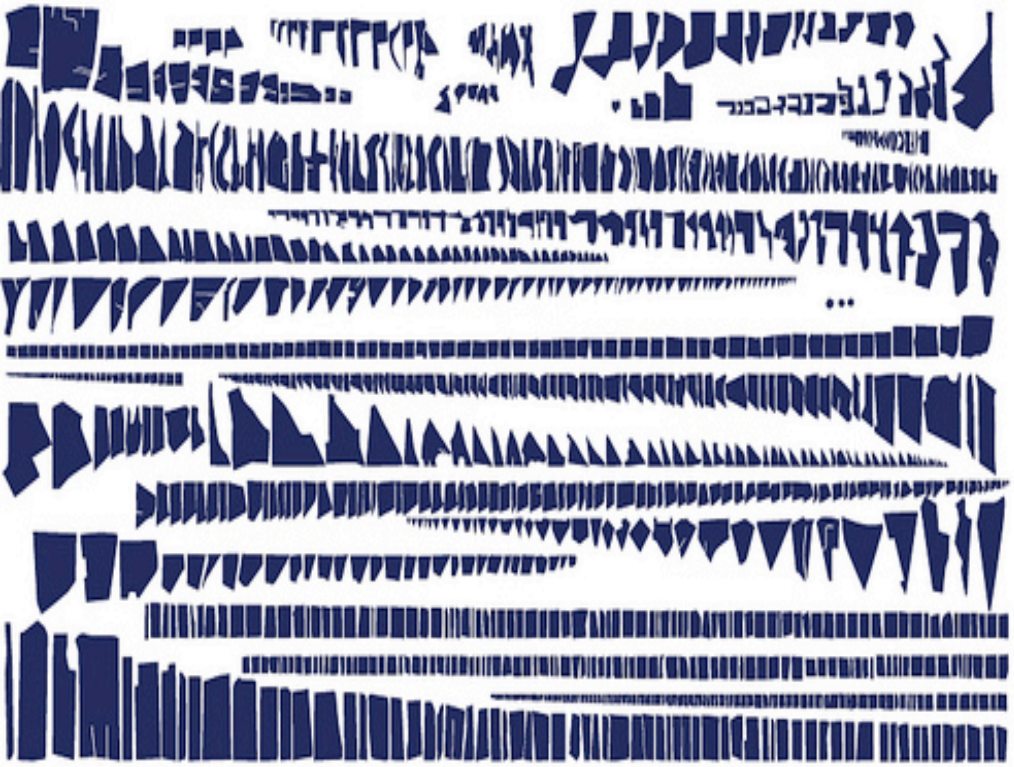




Turning worlds into GIS datasets

1. Questions? (You're not the only one with your question!)
2. From Phenomena to Data
3. The Layer Model for GIS data and its consequences
4. GIS data have location and attributes
5. 'Location' can mean different types of geometry in GIS
6. Attribute data have 'levels of measurement'

From phenomena in your worlds to data…

As Krygier and Wood put it:

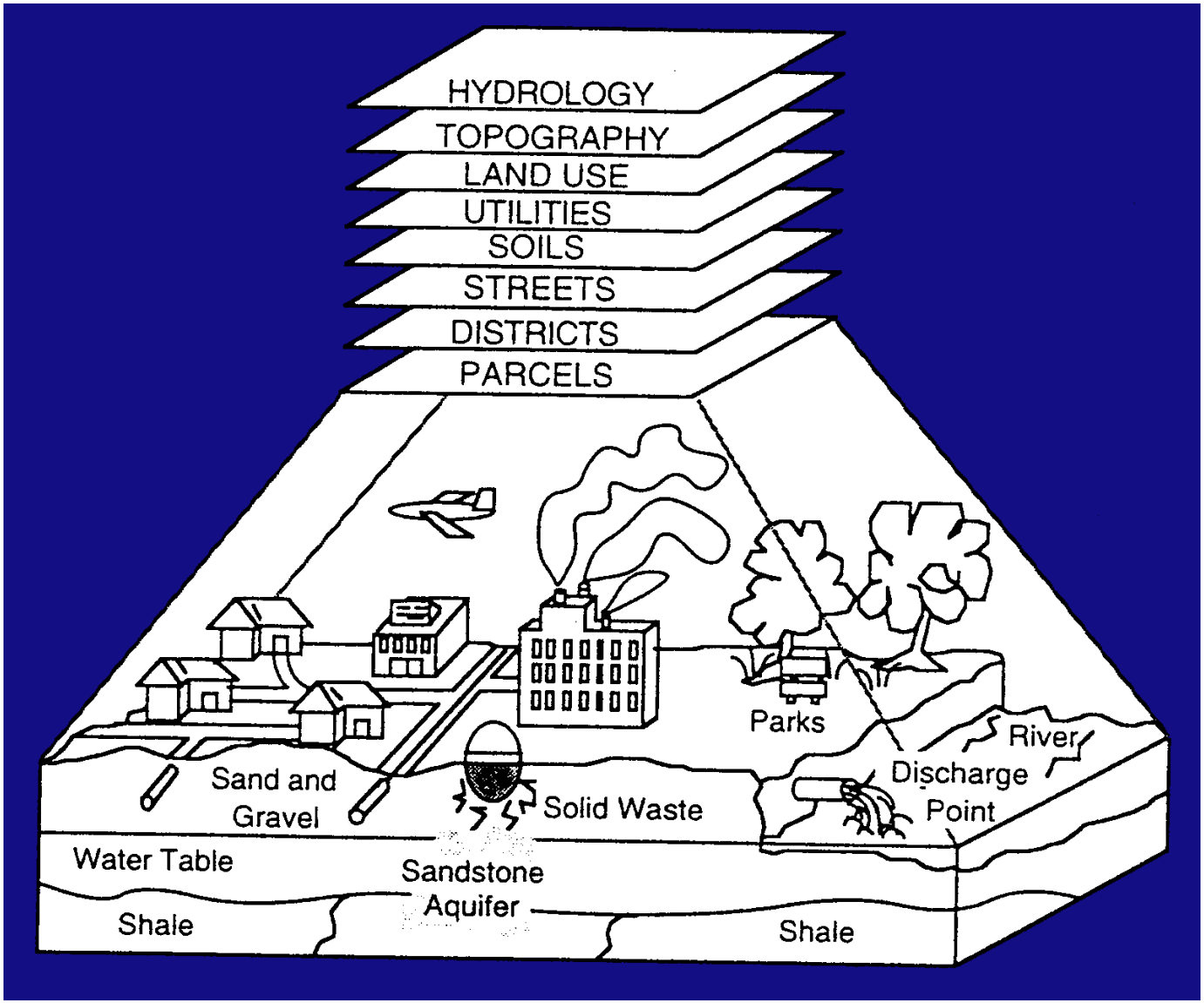
- **"Phenomena** are all the stuff in the real world."
- **"Data** are records of observations of phenomena."
  - Data are **models** of phenomena
  - There are different approaches to modeling and thus different ways of making data.

"Maps show us data, not phenomena."

We think about phenomena, but we act with data.

Always be thinking about the differences between *phenomena* and *data* in your particular case.

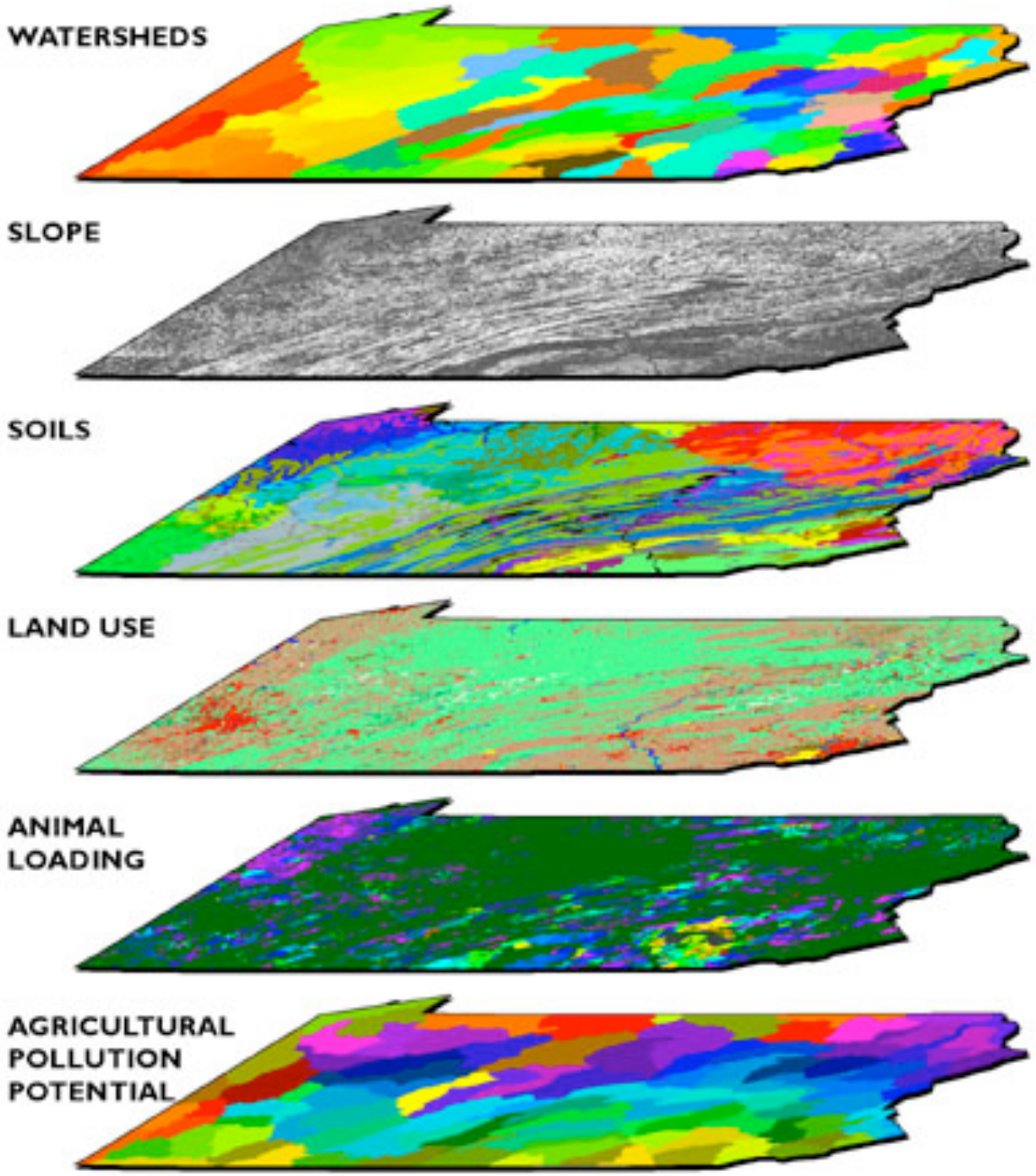
In today's GIS, we separate the world into different *thematic layers*…



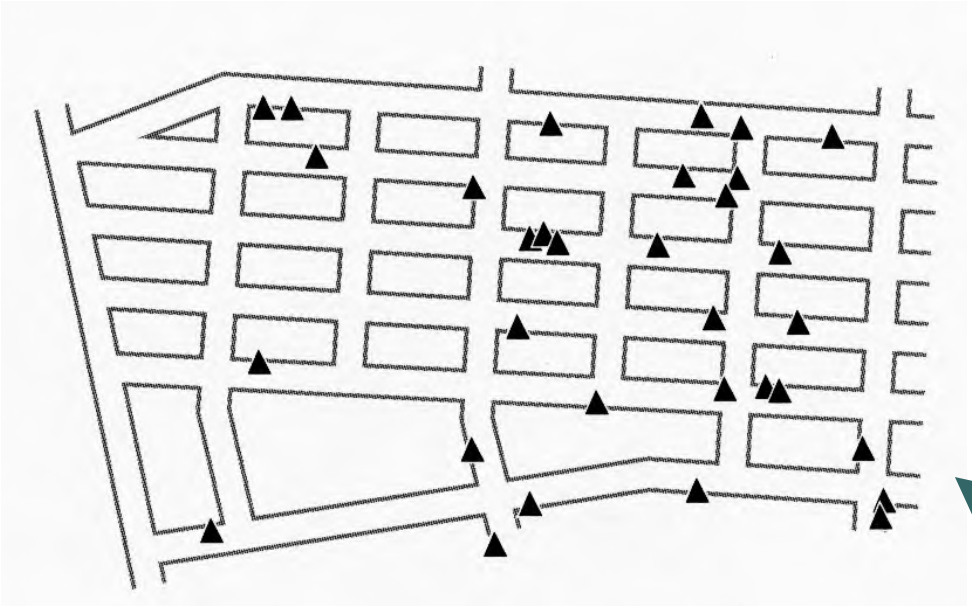
[which allows for]

Map Overlay

(and conceptually related analyses)

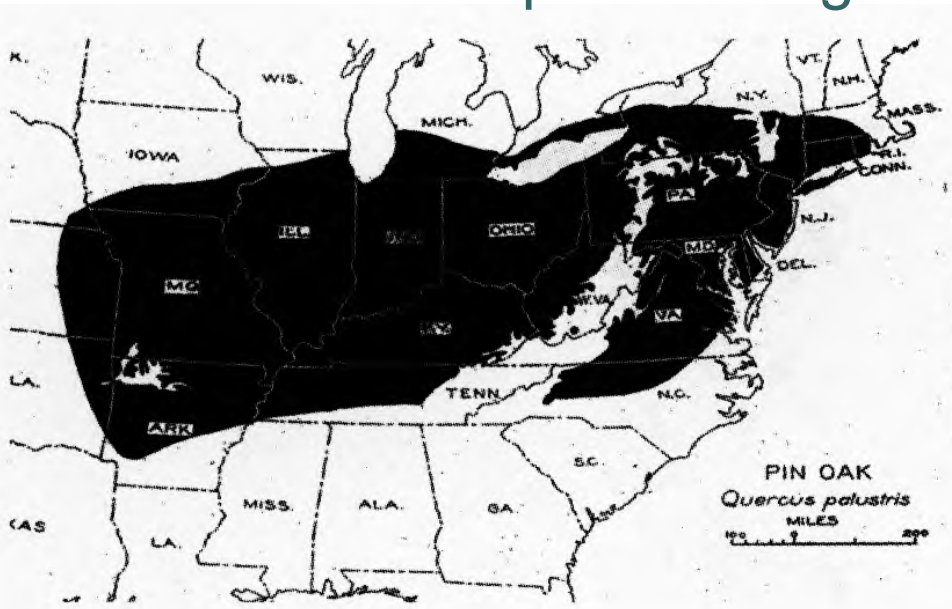


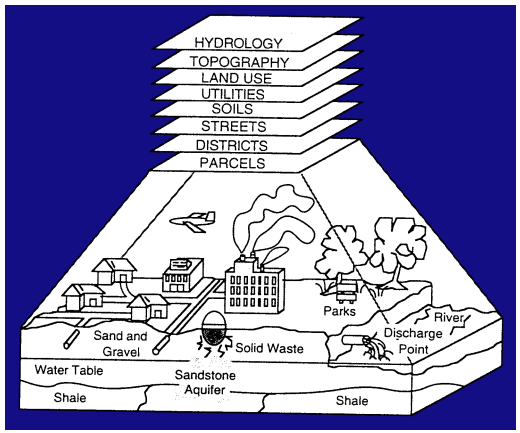
Individual versus aggregate data representations



Individual Pin Oak trees

Pin Oak species range





Any modeling approach has consequences. The layer approach is no different!

- *Imagine representing people and their pets ...in two separate layers.*
  - Pets do share something in common with other pets. …Placing them in a single layer reflects this.
  - But pets also share a close relationship to people in their houses. You *could* have modeled this more directly.

- Every act of representation has consequences—after it's been done, you are more able and likely to follow it up with some types of analysis and visualization and conclusions than with others.

Side note: This distinction is similar to geography's complementary perspectives of 'space' vs. 'place'/region (pets-across-space vs. a family whose relationships are thicker in place.)

GIS data tend to have two types of components:

- Location:
  - Where is it located?
  - What shape is it?
- Qualities:
  - What is it?
  - What ways can we describe it?
- Or, in GIS terminology:
  - "**spatial data**" and "**attribute data**"

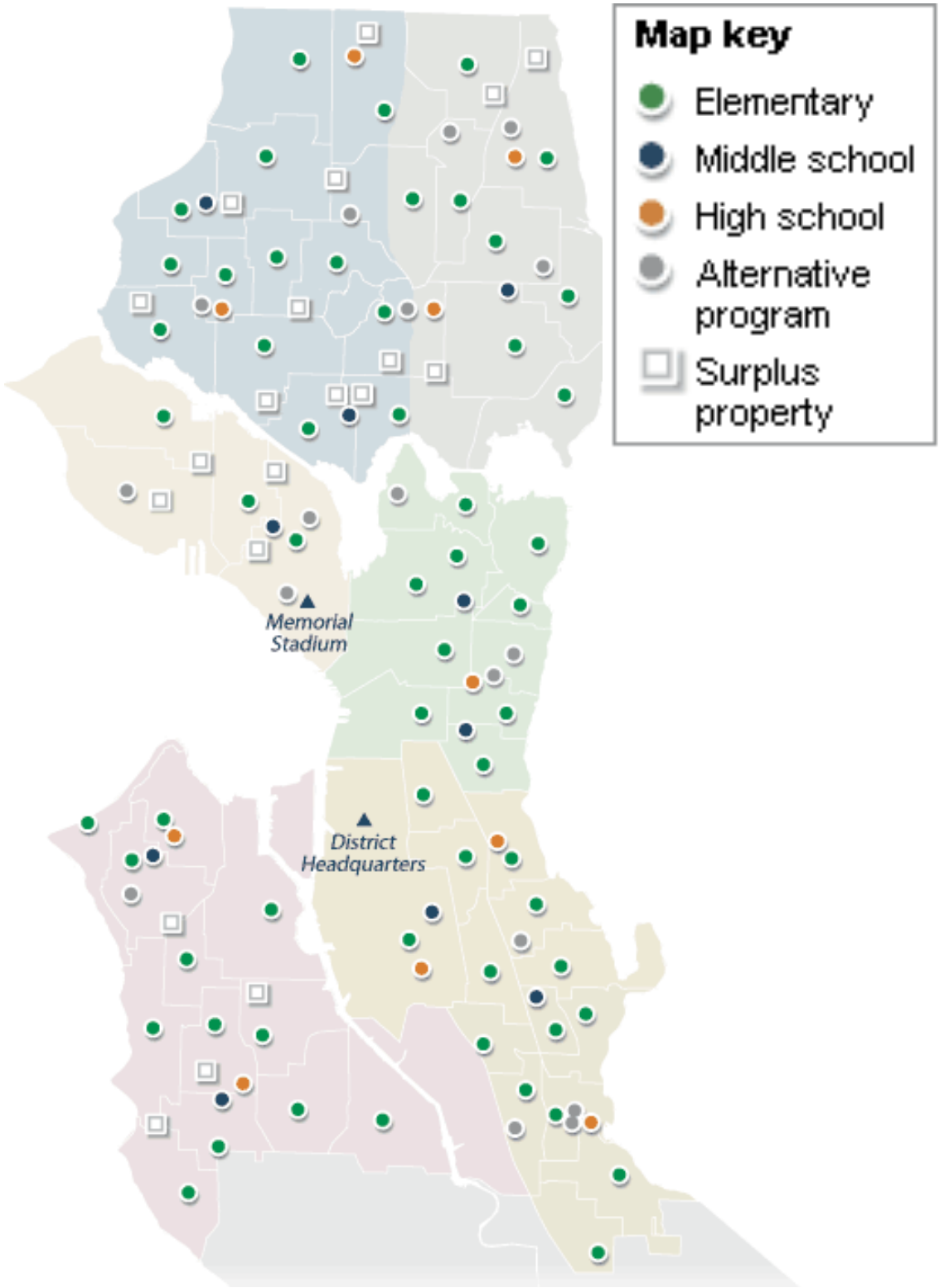
Location in GIS data can take different types of shape and geometric representation:

1. Points
2. Lines
3. Polygons

These are the building blocks you use to represent geographic features in ['vector'] GIS. They are 'spatial primitives.'

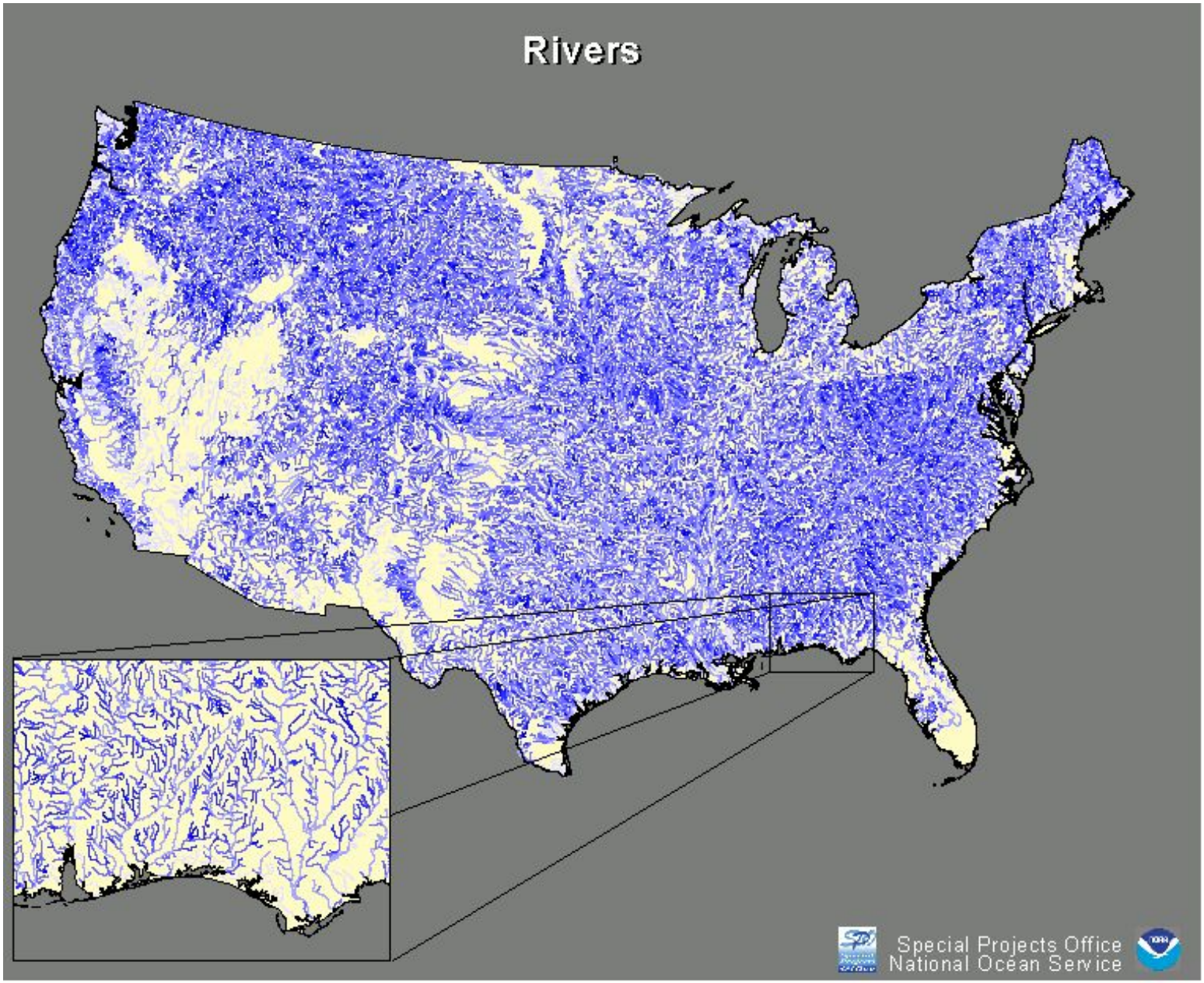
Side note: This is a 'feature model' approach to phenomena in the world. You can differentiate this from a 'field' modeling approach for continuous data (e.g., you might model temperature change over space by using 'raster' data). We'll get to all that later.

Points



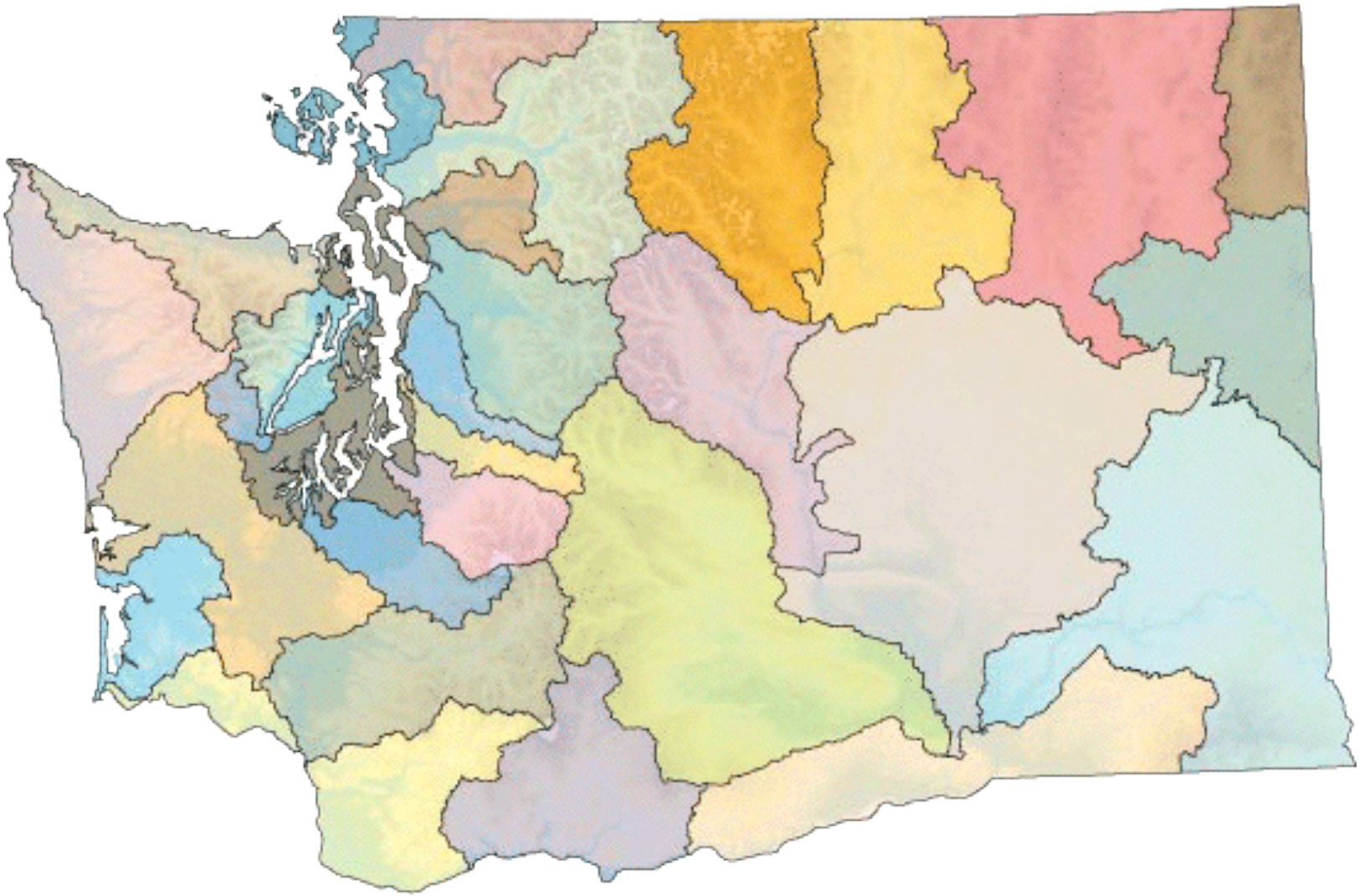
http://seattletimes.com/news/education/links/2005profile/

Lines



http://coastalgeospatial.noaa.gov/images/rivers.jpg

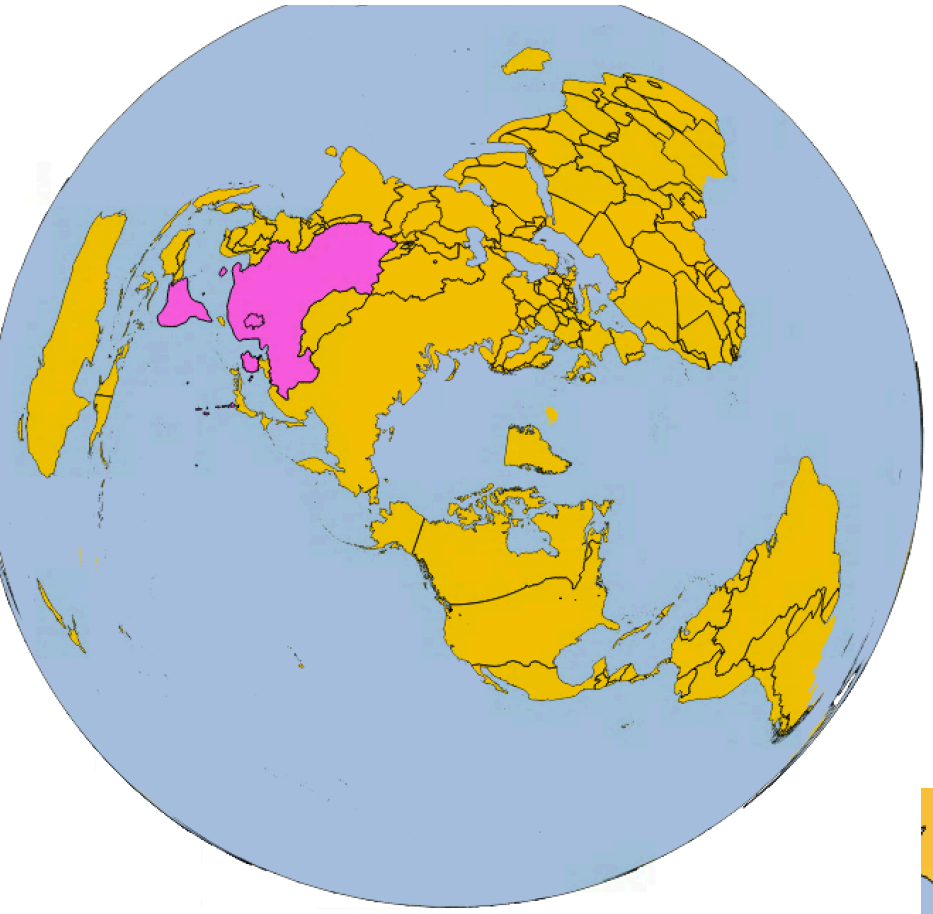
Polygons



http://wa.water.usgs.gov/data/realtime/adr/interactive/maps/State_map.png

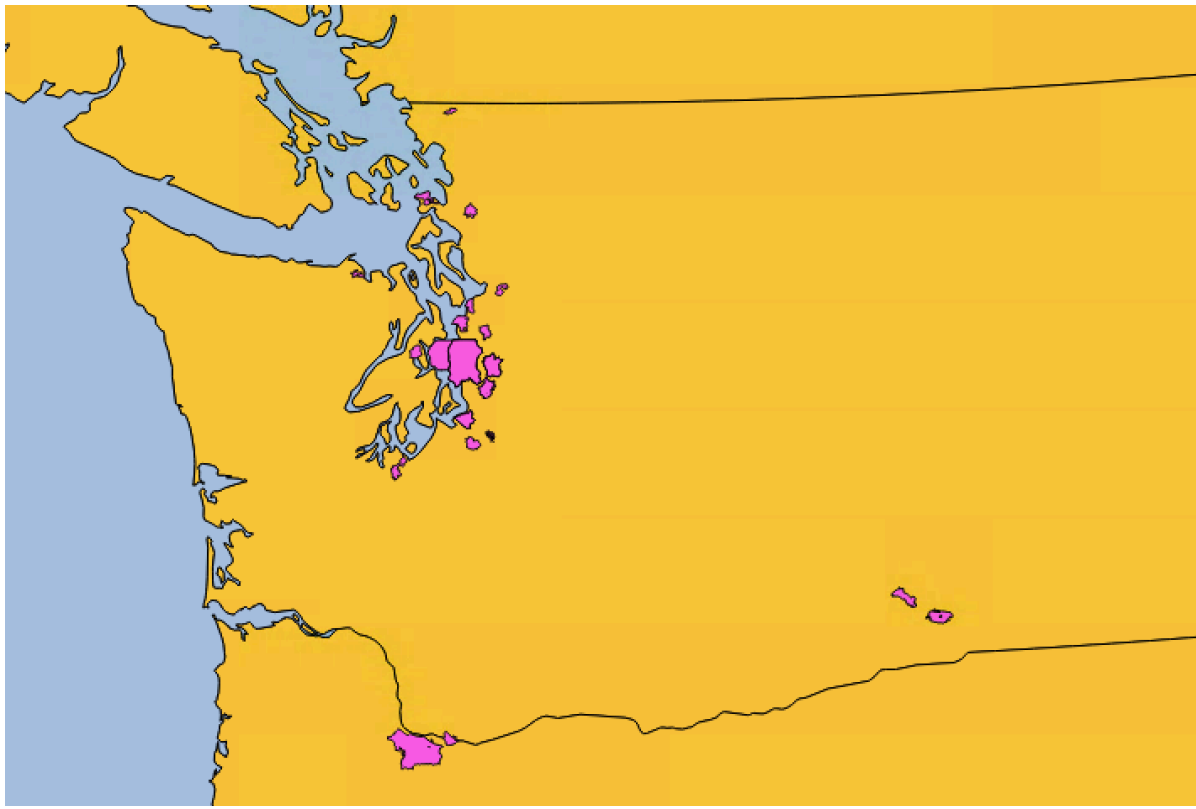
Which geometry (point, line, or polygon) do you use to represent…

- A Nation-State?
- A National Park?
- A River?
- A City?
- An Airport runway?



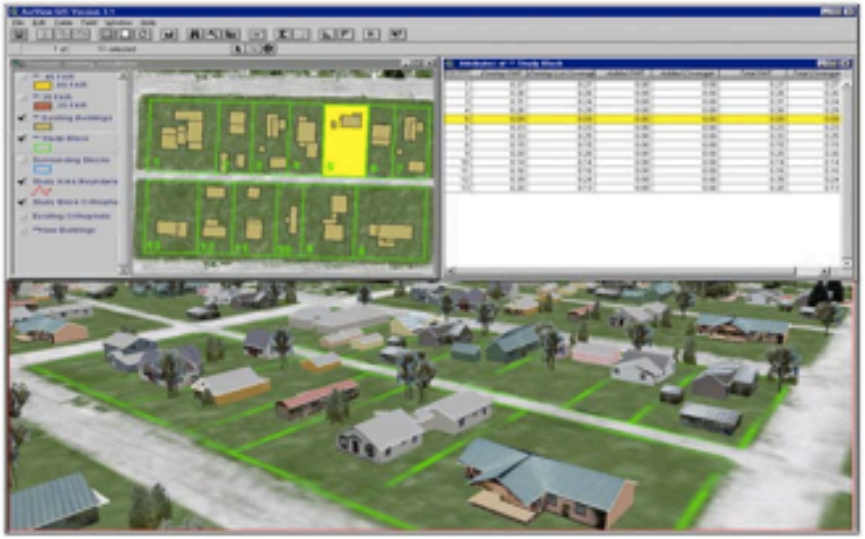
Remember how I modeled your text responses to my questions about where you were from?

- The geocoder actually gave me back *polygons, lines, and points* depending on what you told me.
- But I reduced them all to just points.
- Why?



Most GIS do not allow for a single ‘layer’ or ‘feature class’ to have more than one type of geometry.

Can you guess reasons why?
What is being gained and lost?



Existing Floor Area to Lot Area Ratio (FAR) = .23 (average)

http://www.simcenter.org

http://www.geosimulation.org/geosim/3d.htm

http://www.u-data.com

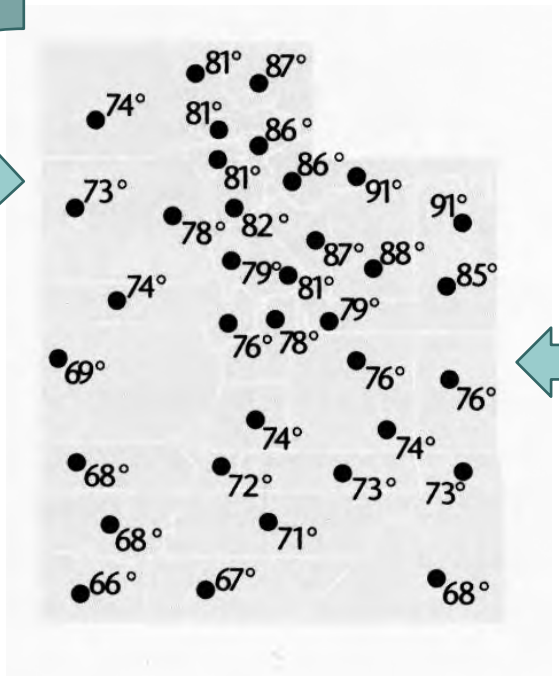
https://www.behance.net/gallery/24276859/City-Layouts

3D data (another geometry)

Data have spatial character

- We can describe the spatial character of data as "discrete" or "continuous"

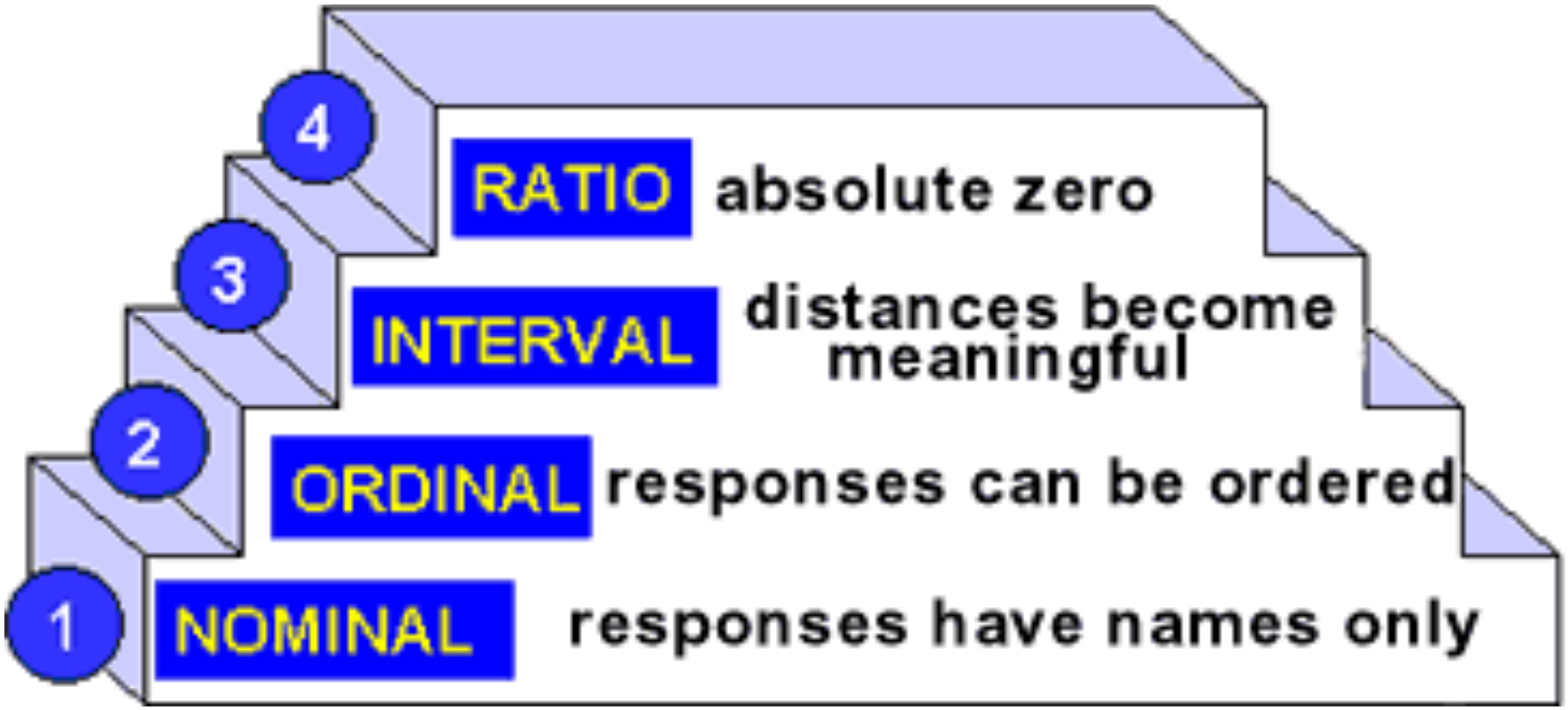
Air temperature data from stations



'Interpolating' the data into a continuous/'field' dataset

- Keep in mind: Does the phenomenon the data is modeling have sharply defined borders?

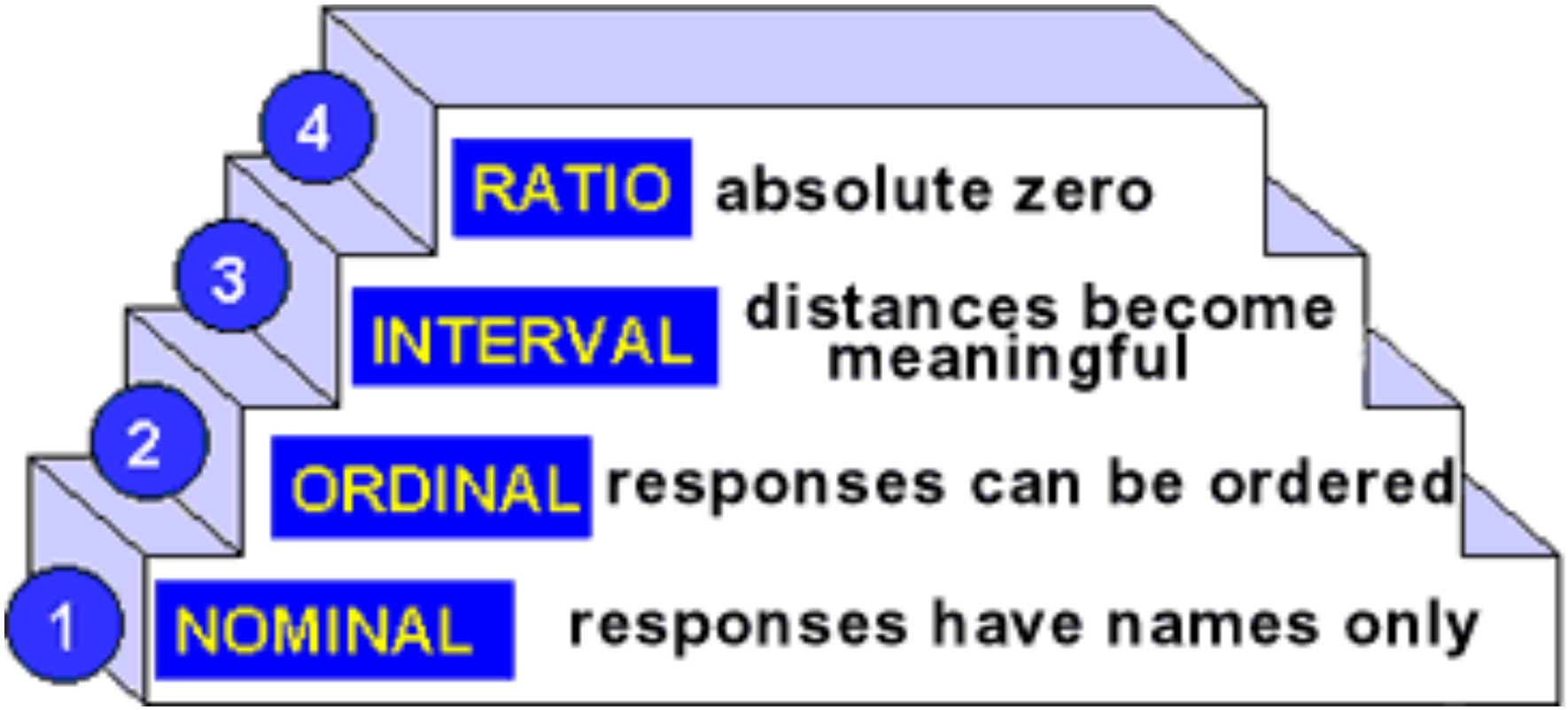
Attribute data have levels of measurement



Levels are cumulative:

Example: Ratio data can also be used as if they were interval, ordinal, or nominal.

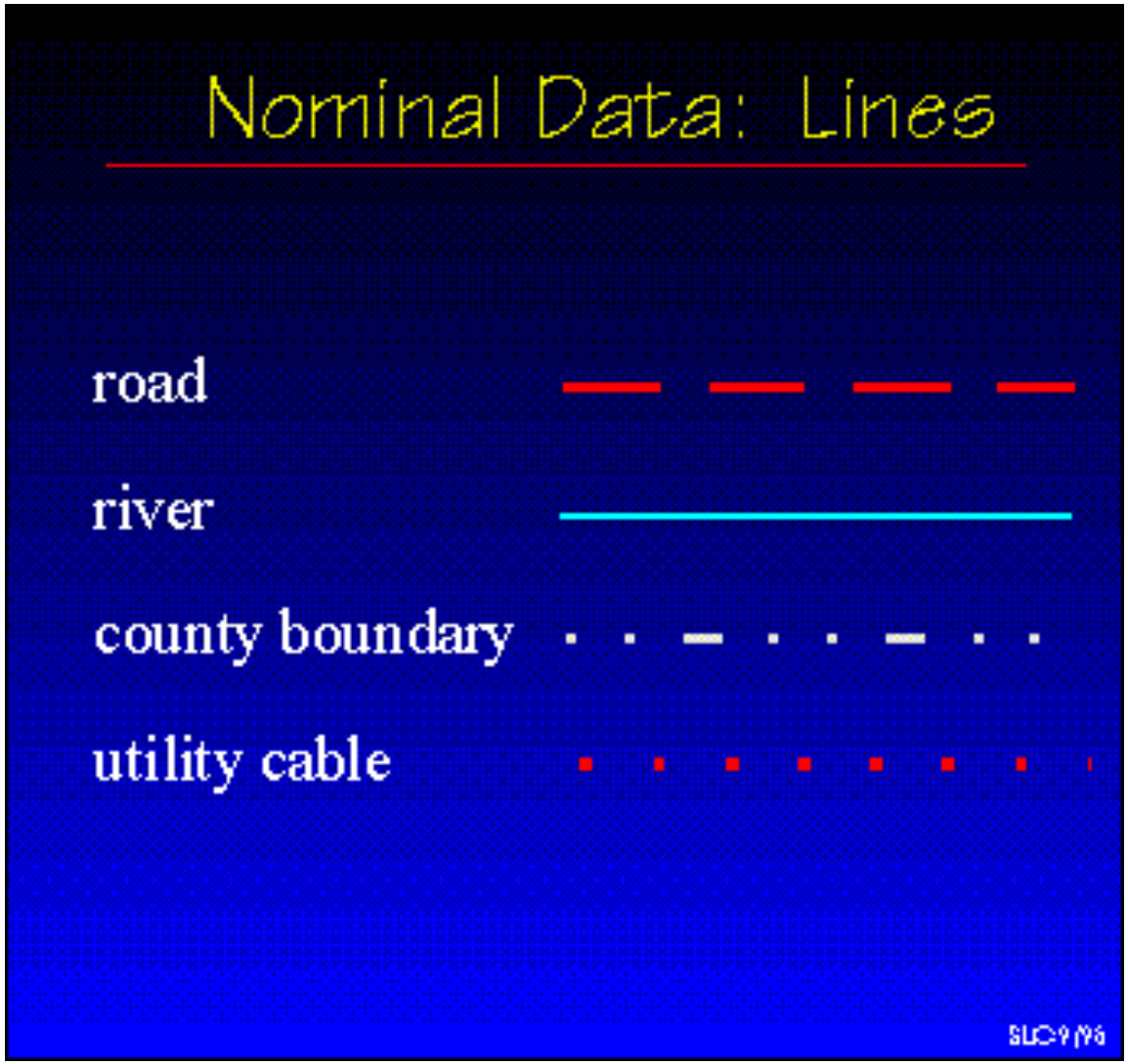
Attribute data have levels of measurement



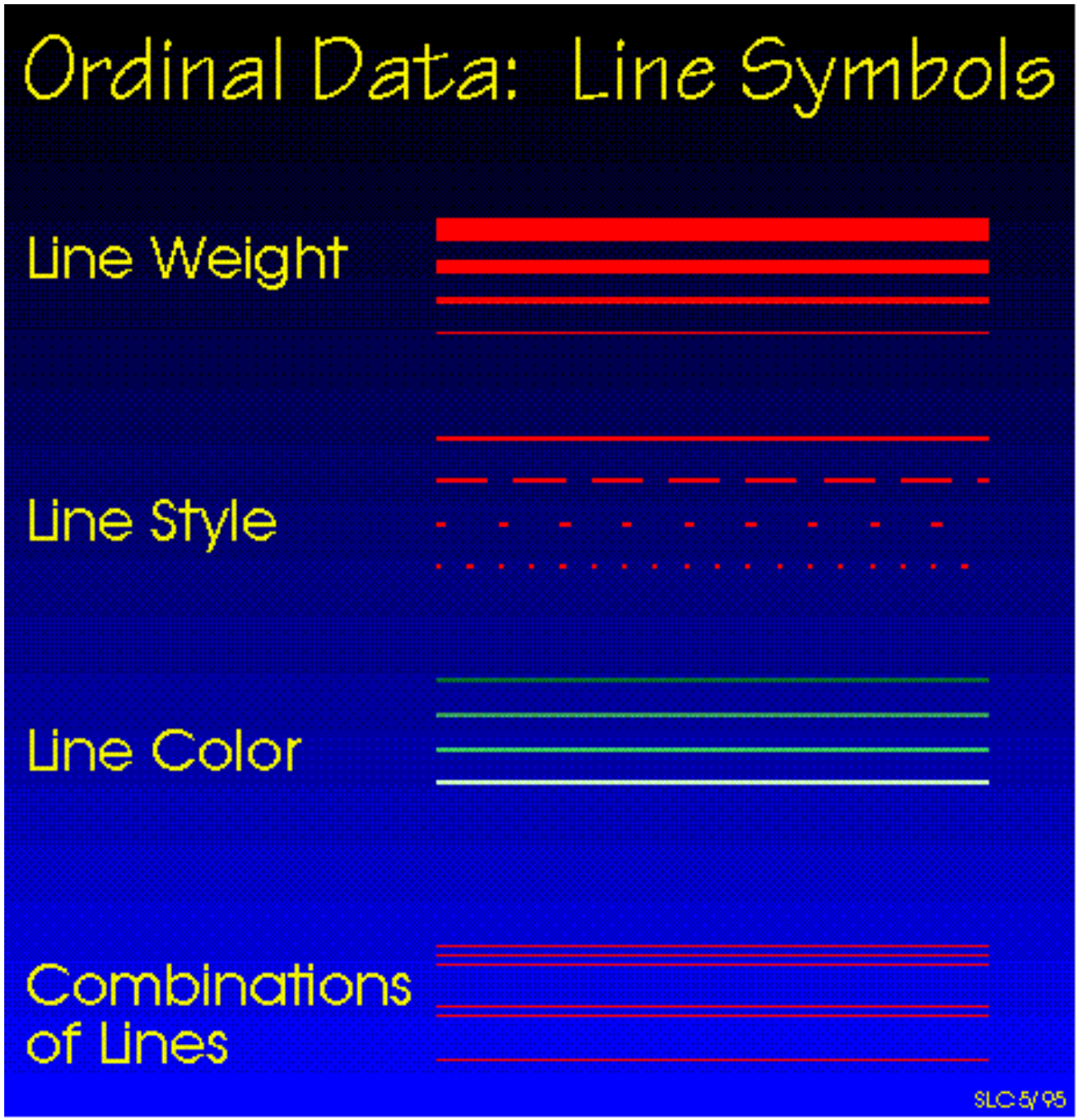
The level of measurement has implications for:

- how to visualize/map the data,
- how data can be analyzed (especially manipulated mathematically)

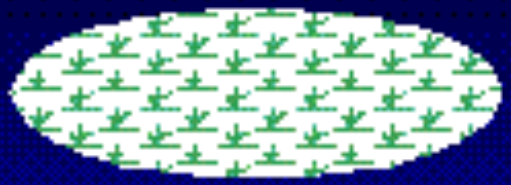
We use different symbolization for different data:



Ordinal Data: Line Symbols



Nominal Data: Areas



Grassland

Submerged marsh

Census Regions

Data also have a perspective

Data are never merely simple mirrors of phenomena in the world.

Data are constructed out of complex interactions among people, computers, and the richness of the more-than-human world.

Ideas matter.

> Example: Data models aren't just natural and True. They have complex histories. We will have different ones in the future.

Contemporary GIS don't offer much explicit consideration of what perspectives data are embodying, how they may differ from phenomena (beyond what is in the 'metadata', which you should read!)…

...so you have to be aware of the assumptions behind your data and what they mean for what you can/can't do.