Introduction to GIS &
A Rural Home Healthcare Needs Project (Demo)

Brian Chen

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What is GIS?
What's your definition?

GIS = Geographic Information System

What is GIS

- Most asked question that is also hardest to answer in a clear manner.
- Selected definitions of GIS:

"an automated set of functions that provides professionals with advanced capabilities for the storage, retrieval, manipulation, and display of geographically located data."
"a powerful set of tools for collecting, storing, retrieving at will, transforming and displaying spatial data from the real world."
"a decision support system involving the integration of spatially referenced data in a problem-solving environment."
"a form of MIS [Management Information System] that allows map display of the general information."

What is GIS (cont.)

- Formal definition:

  A computer-based system to aid in the

  collection,

  maintenance,

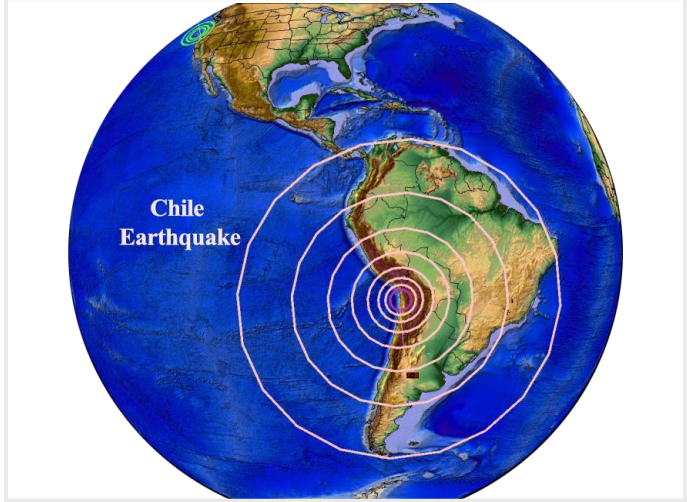
  storage,

  analysis,

  output, and distribution

  of spatial data and information.

What can GIS do
Any Example?



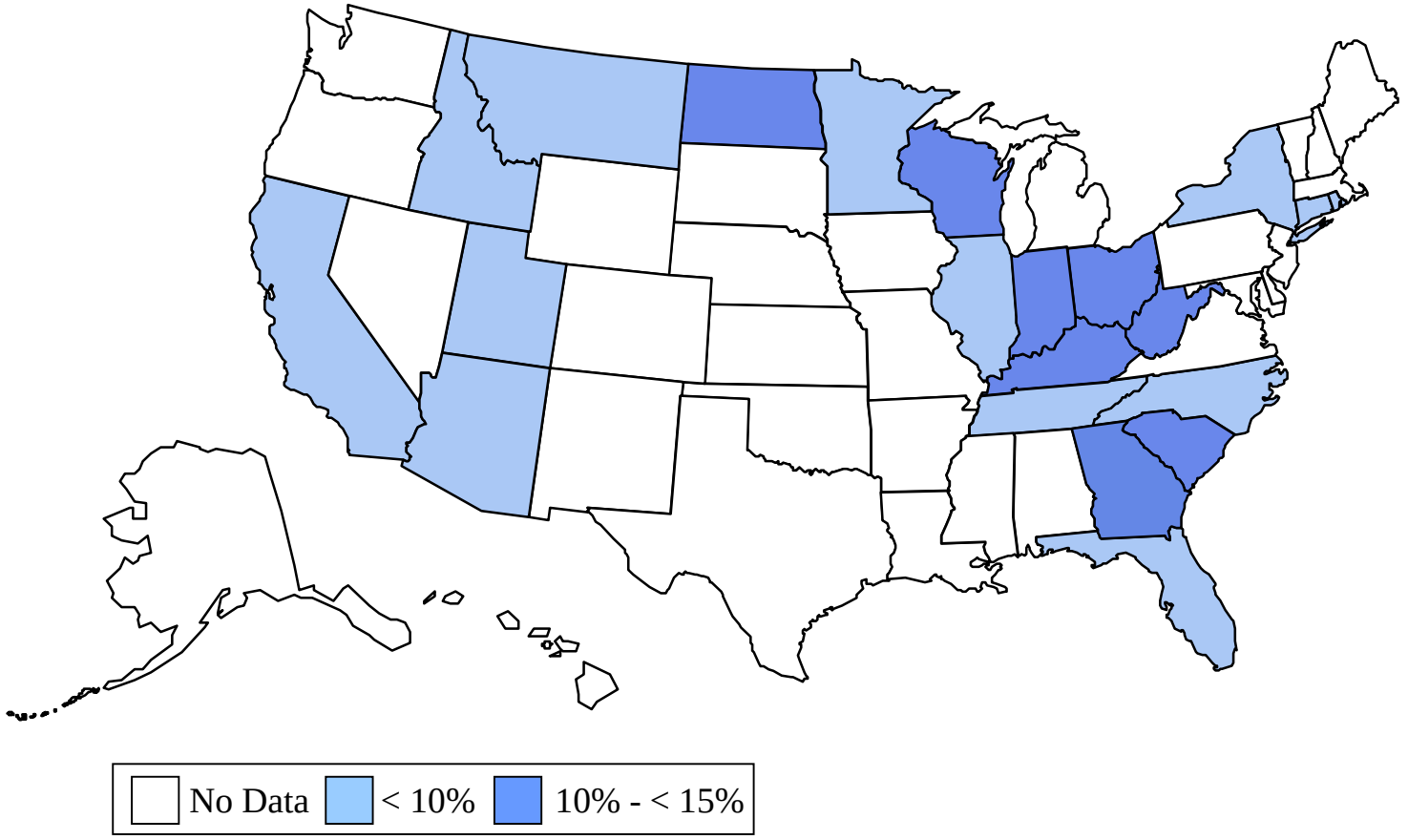
Chile Earthquake

Highest-Paid Public Employees

March 2014 Activities in Taiwan

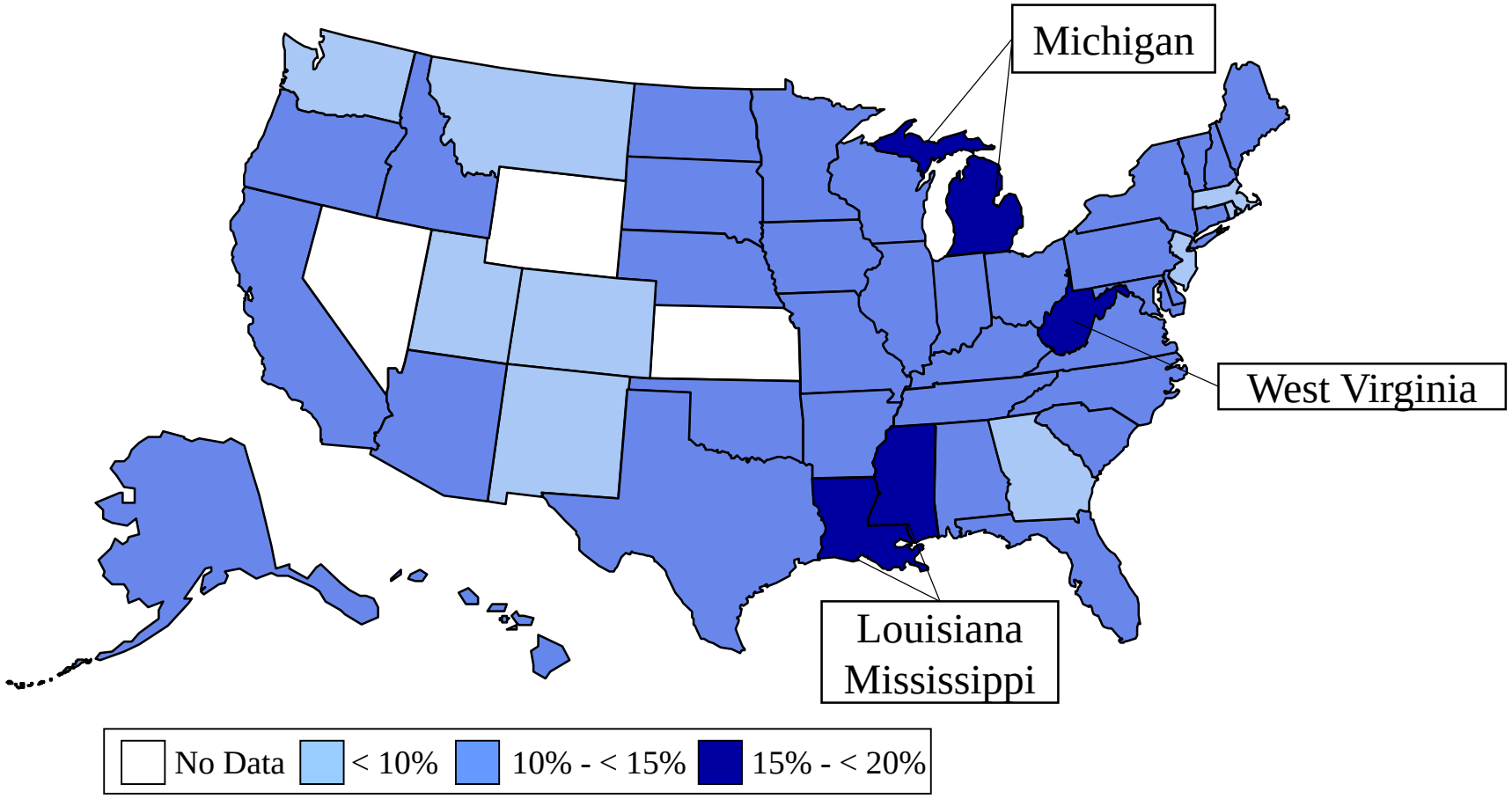
What can GIS do

US Obesity Prevalence, 1985



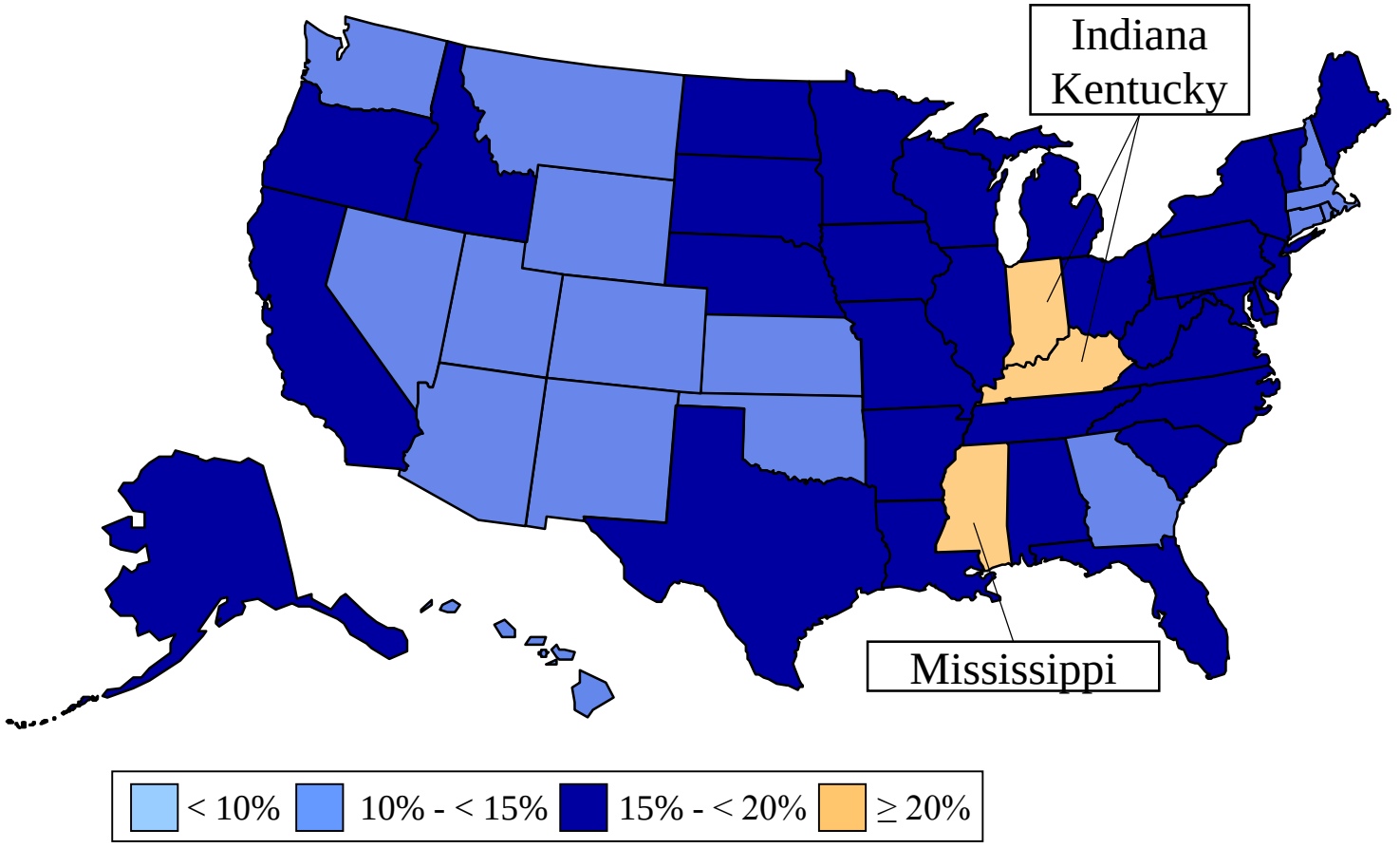
What can GIS do

US Obesity Prevalence, 1991



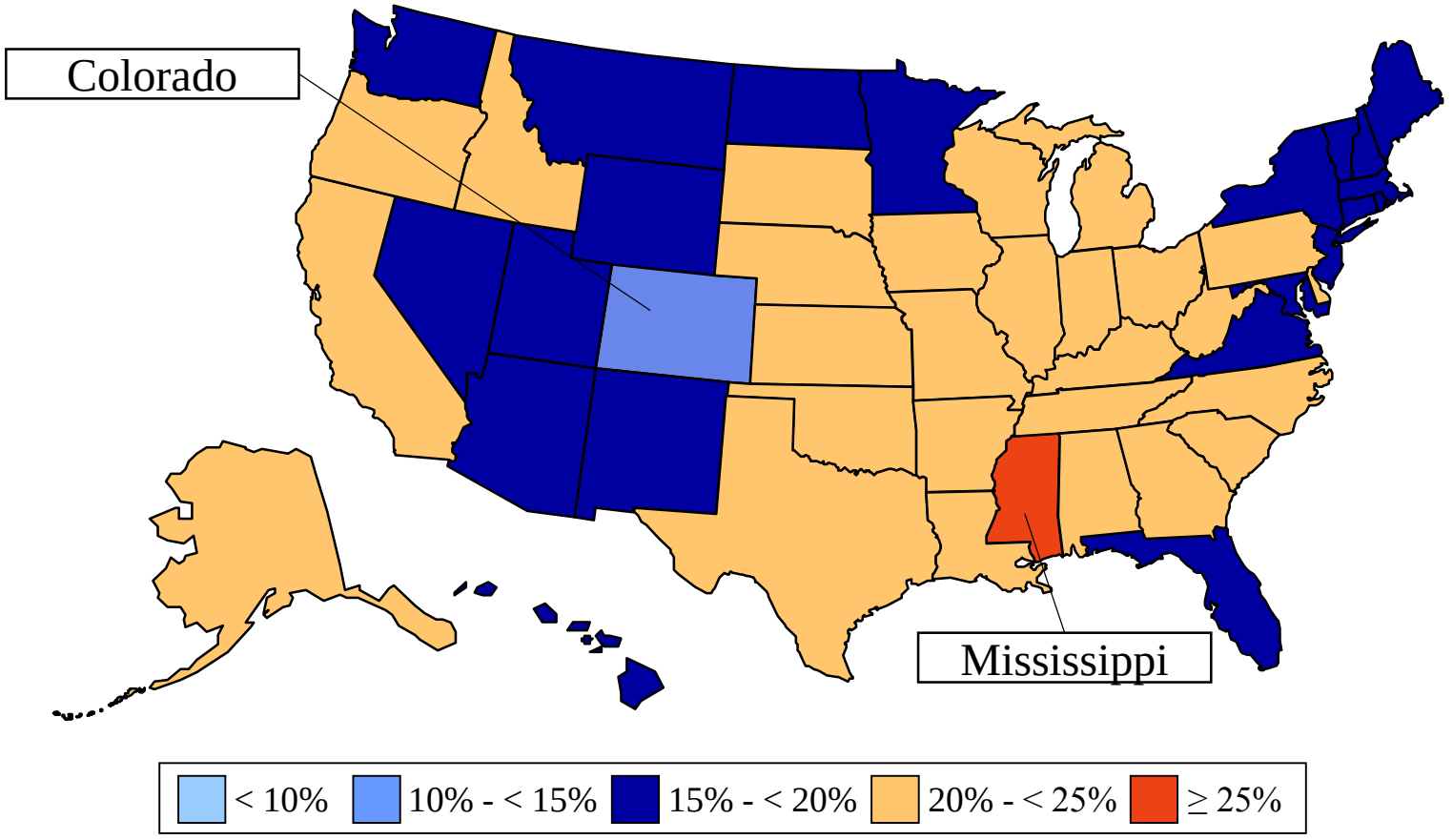
What can GIS do

US Obesity Prevalence, 1997



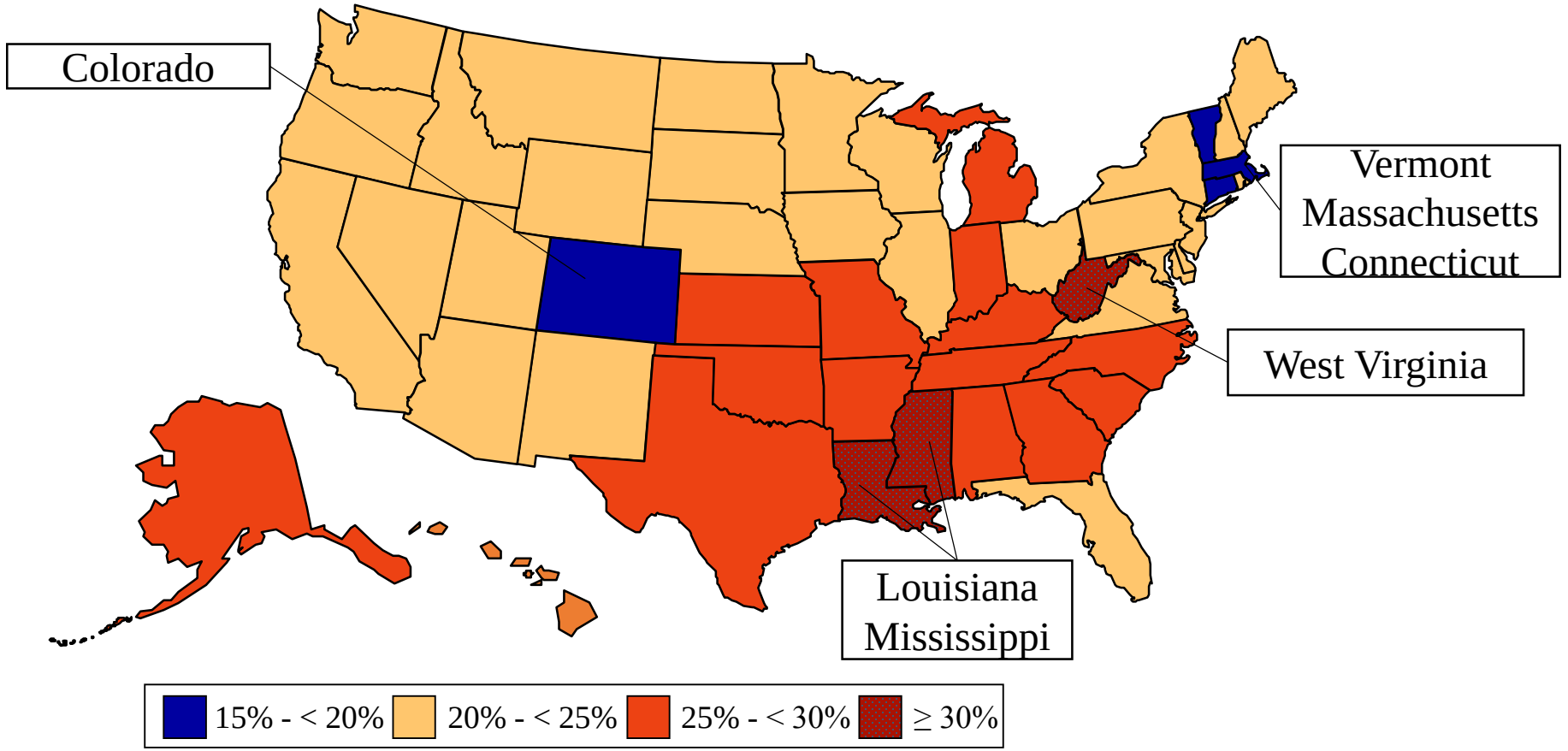
What can GIS do

US Obesity Prevalence, 2001



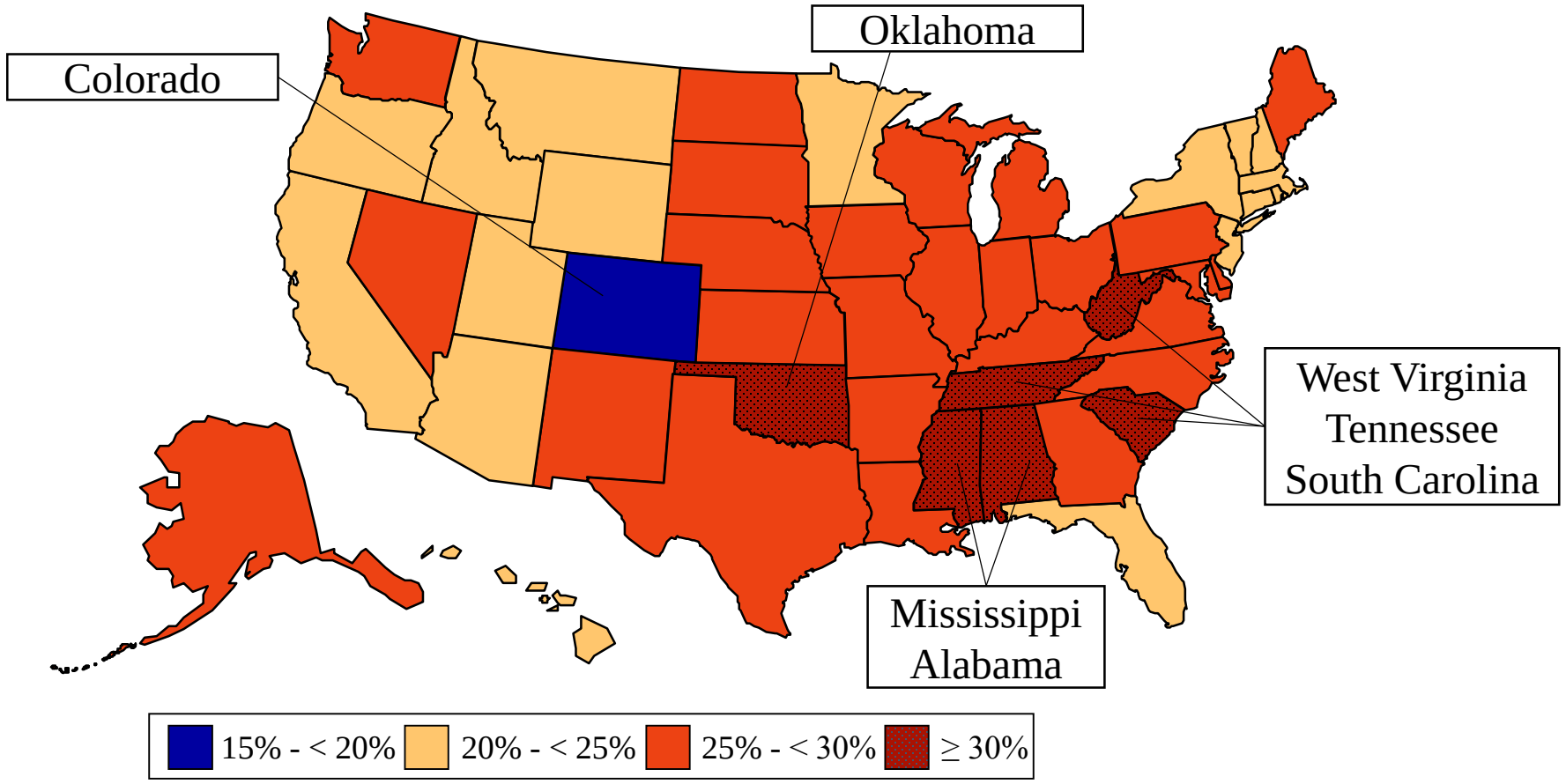
What can GIS do

US Obesity Prevalence, 2005



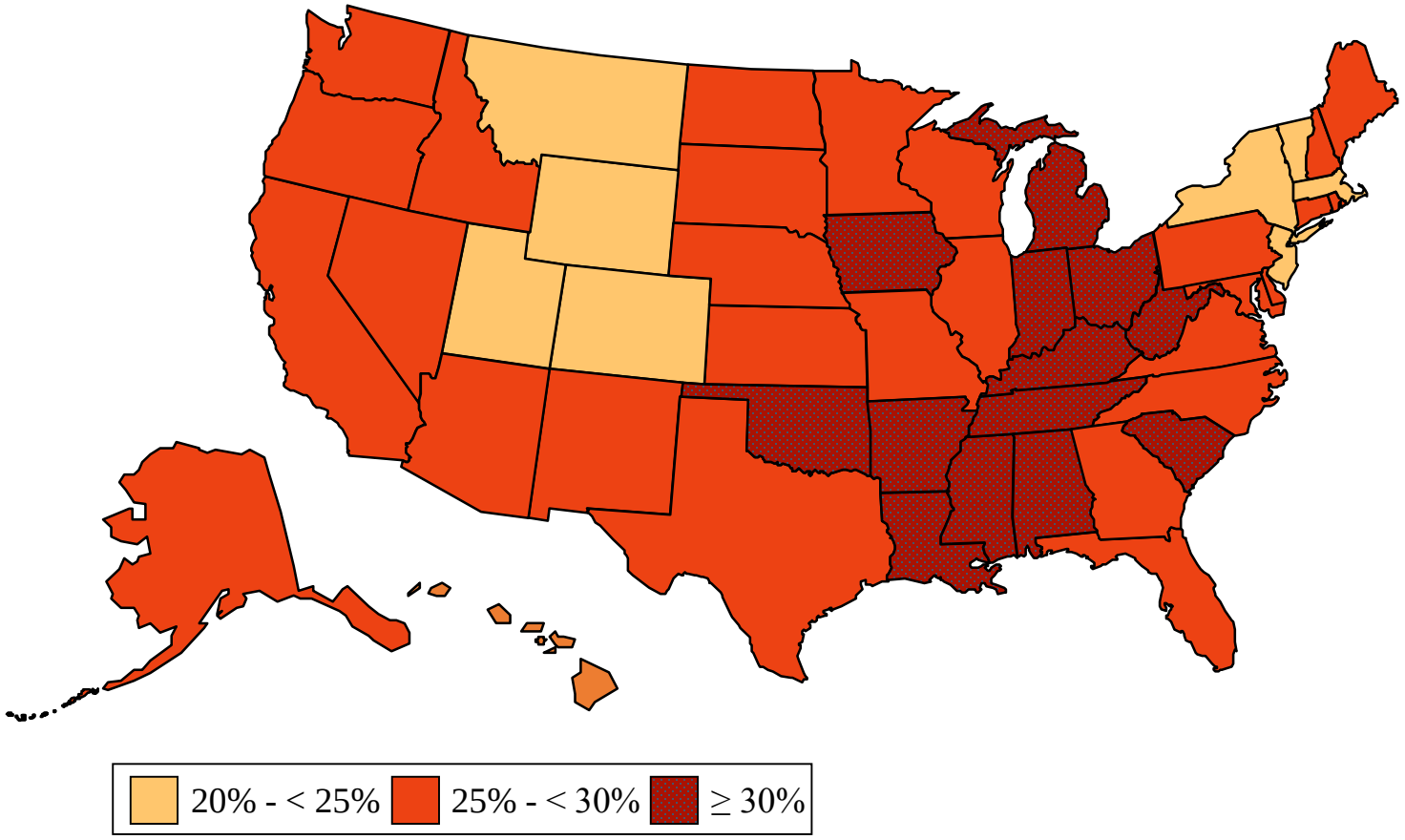
What can GIS do

US Obesity Prevalence, 2008



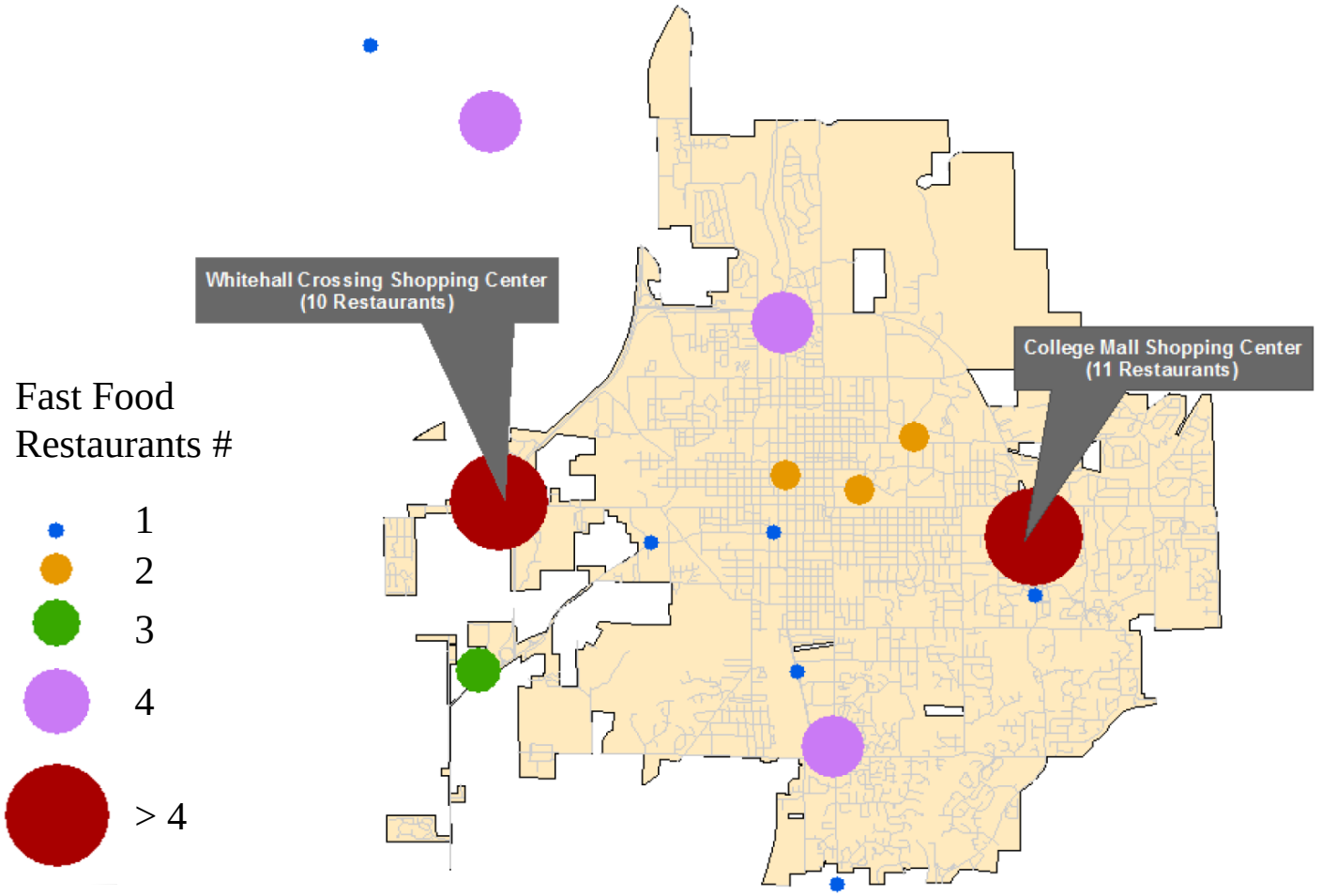
What can GIS do

US Obesity Prevalence, 2012



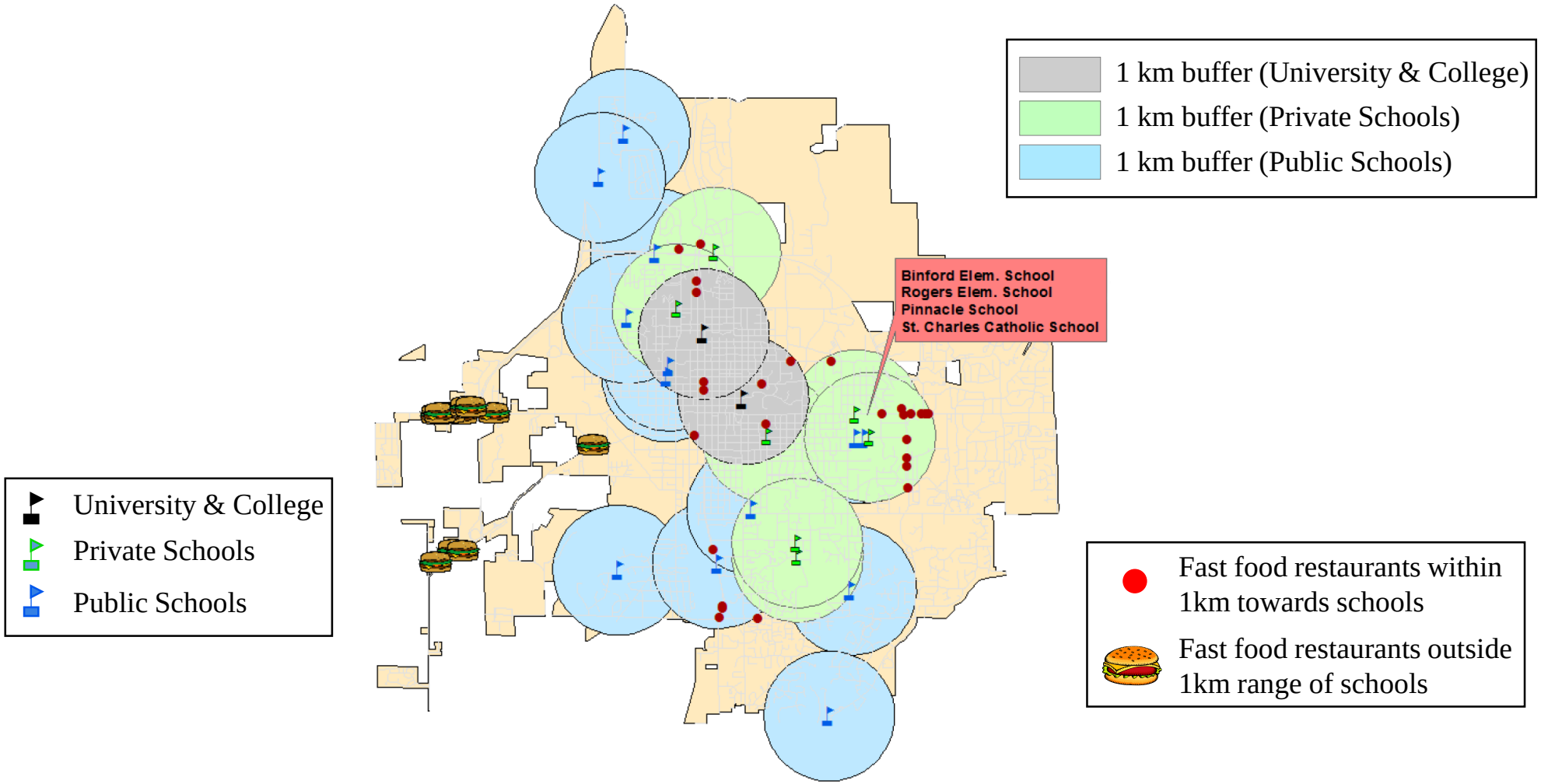
What can GIS do

“B-Town” Fast Food Restaurant Distribution Map



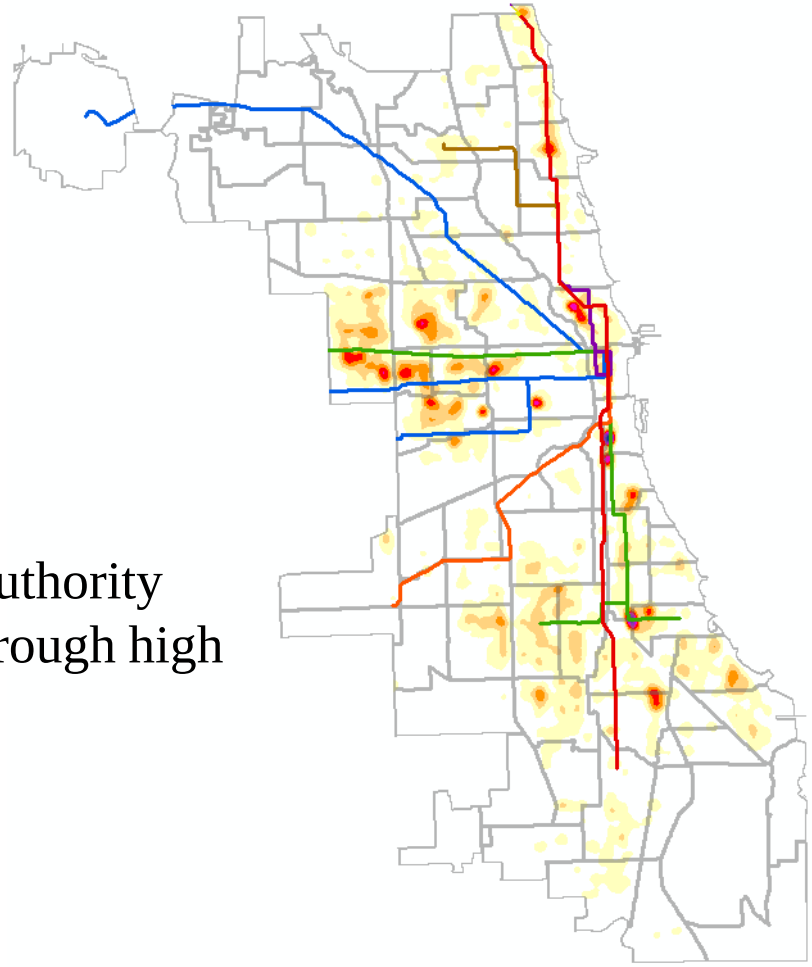
What can GIS do

Schools and Fast Food Restaurants in Bloomington, IN



What can GIS do

Where Are Chicago Crime Hotspots?



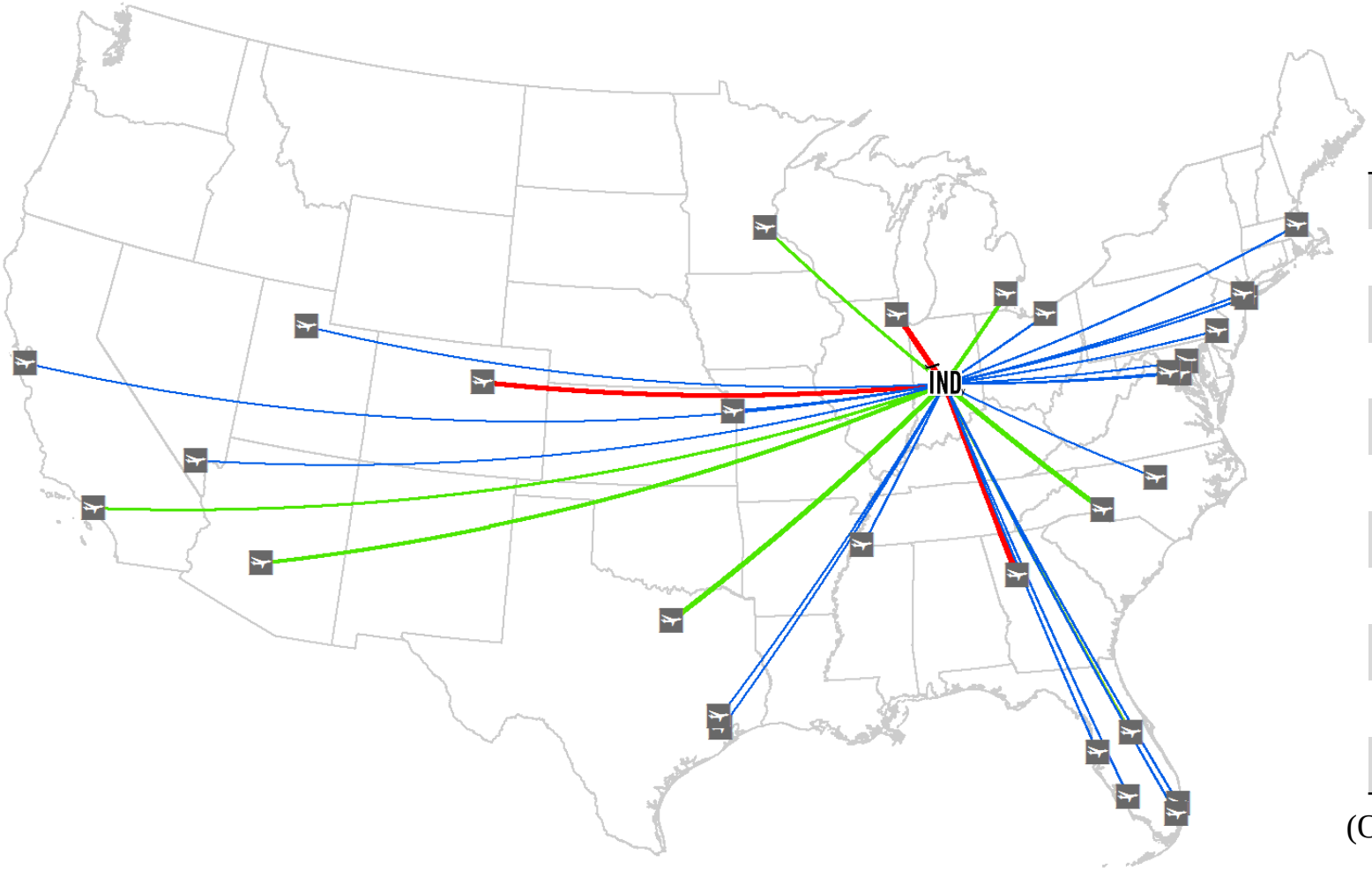
Analytic Approach:

- Feb-March 2005 Crime Data
- Calculate density
- Target question(s):

  "Does Chicago Transit Authority (CTA) Green Line run through high crime neighborhoods?"

What can GIS do

Busiest Domestic Routes from Indianapolis Airport



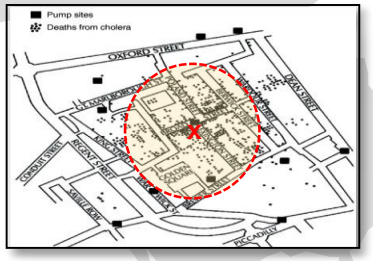
Rank	City
1	Atlanta, GA
2	Chicago, IL
3	Denver, CO
4	Charlotte, NC
5	Dallas, TX
6	Phoenix, AZ
7	Detroit, MI
8	Orlando, FL
9	Minneapolis, MN
10	Las Vegas, NV

(October 2012 - September 2013)

Contents

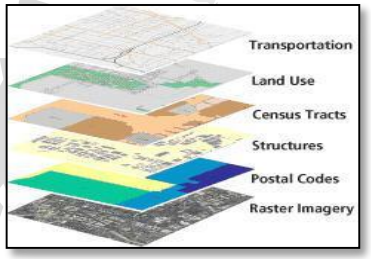
Brief History

1854



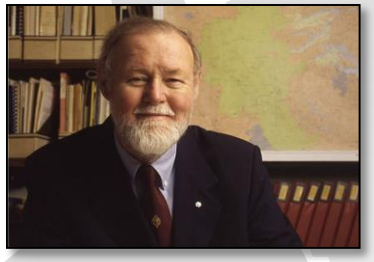
John Snow drew a map of points showing the locations that some cholera cases and the location of water pumps.

1900



Fundamental concept for the GIS - Individual drawing layers.

1960



The world's first fully operational GIS center was developed by Dr. Roger Tomlinson. He is the father of GIS.

1980

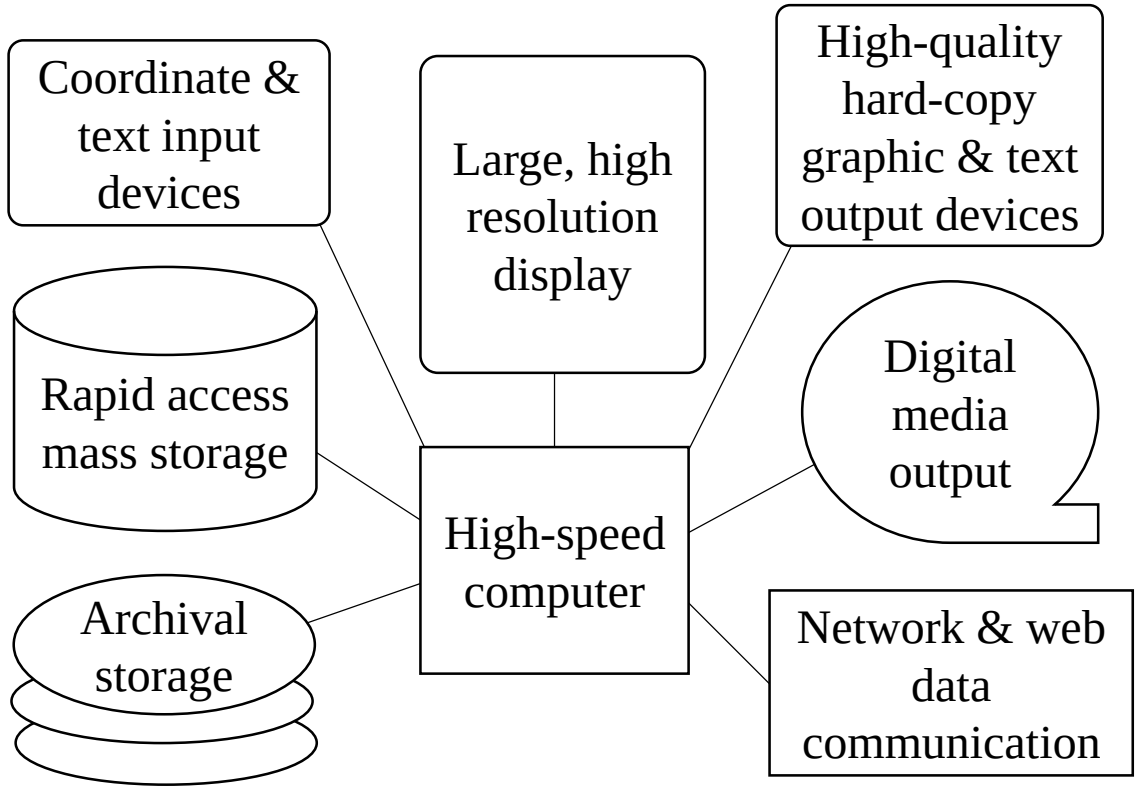
Real development took place with developments in computer hardware.

2000

Digital Data: Wireless Technology/ Internet/GPS…

Hardware

- Fast computer
- Large data storage capacities
- High-quality, large display



Software

- Provides the functions and tools needed to store, analyze, and display geographic information.
- Key components:

Tools for the input and manipulation of geographic information
A database management system
Tools that support geographic query, analysis, and visualization
A graphical user interface for easy access to tools

- Software:

TETRAD

Google earth

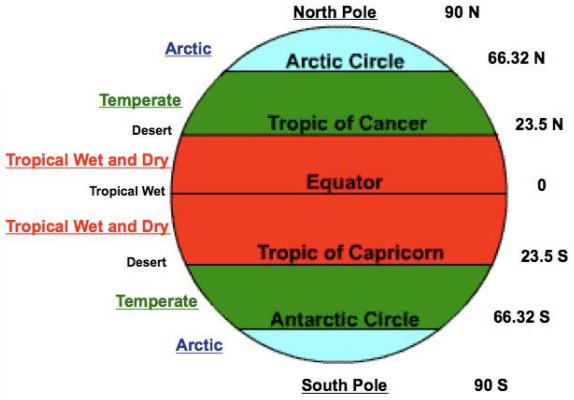
AutoCAD

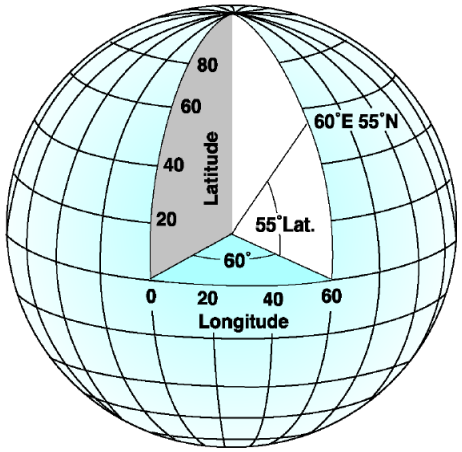
+

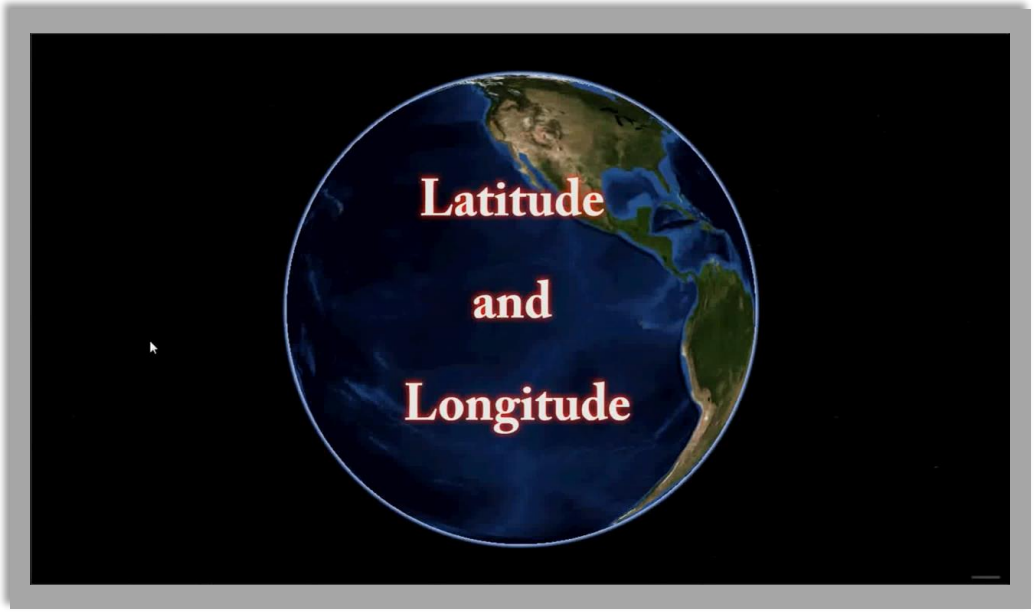
Contents

Coordinate System

- Based on angles, not distances
- Positions on the Earth surface are represented by latitudes & longitudes





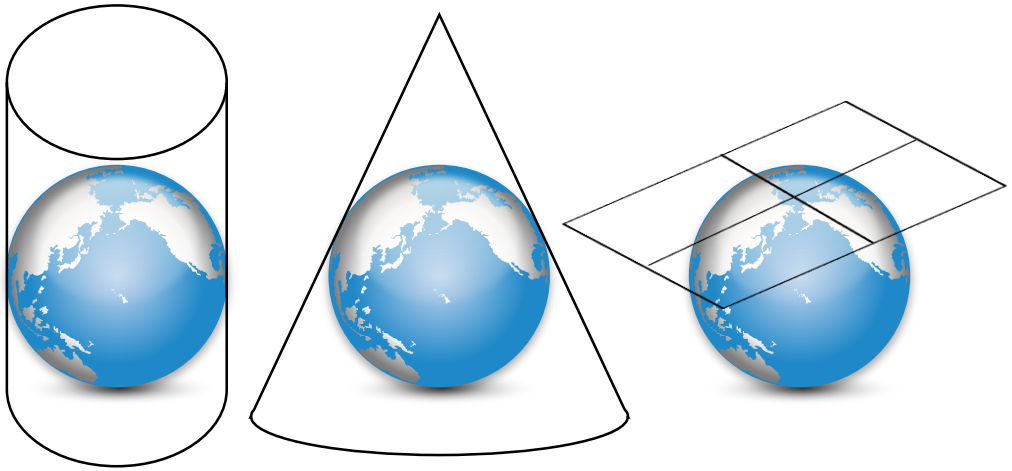


How to read Latitude and Longitude coordinates

Sydney Opera House, Australia:	33º 51’S 151º12’E
Uluru (Ayers Rock), Australia:	25º 20’S 131º02’E
Mount Cook 3754M, New Zealand:	43º 35’S 170º08’E

Projection

- A mathematically described technique of how to represent the Earth's curved surface on a flat map.

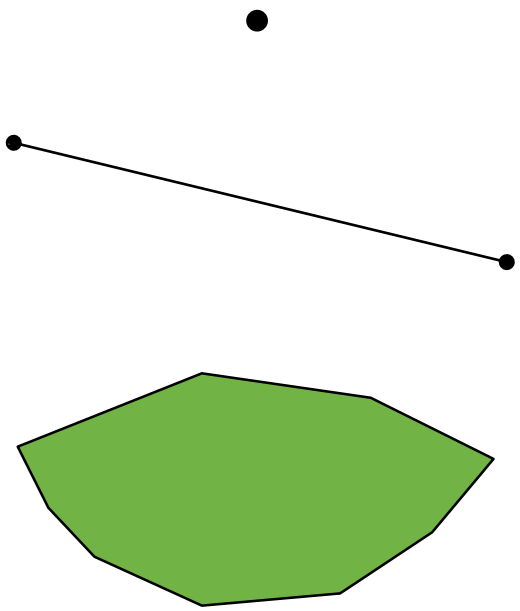


Cylindrical Conical Azimuthal

Map Projections

Vector Data Model

- Based on geometry of



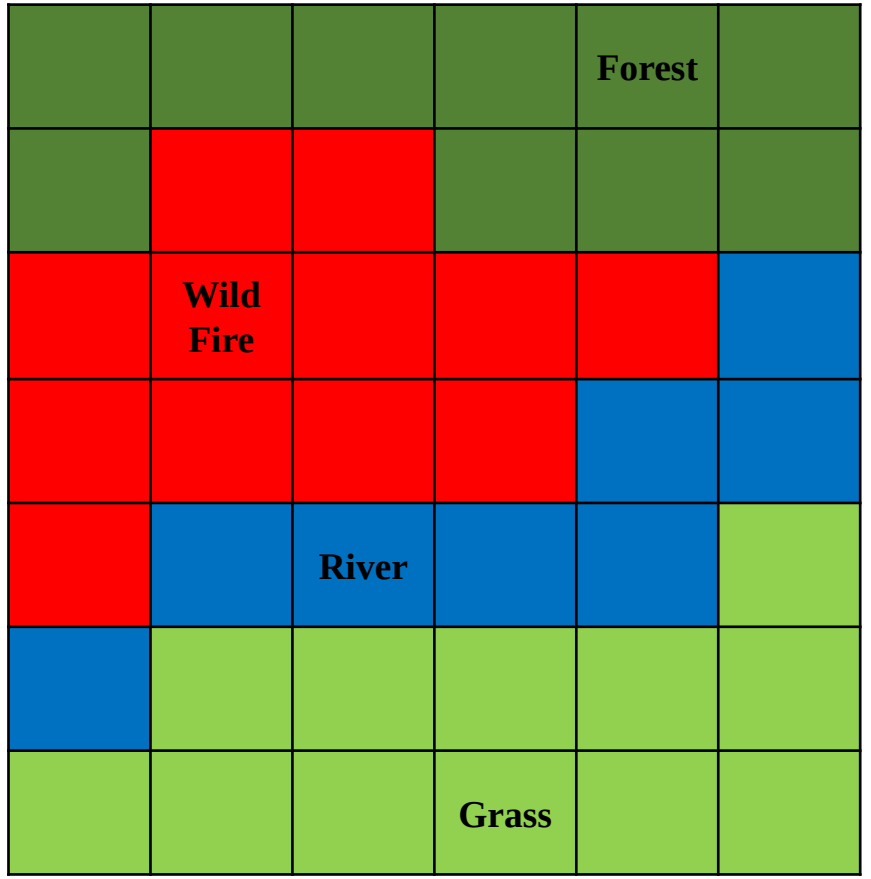
Points: simplest element

Lines: set of connected points

Polygons: set of connected lines

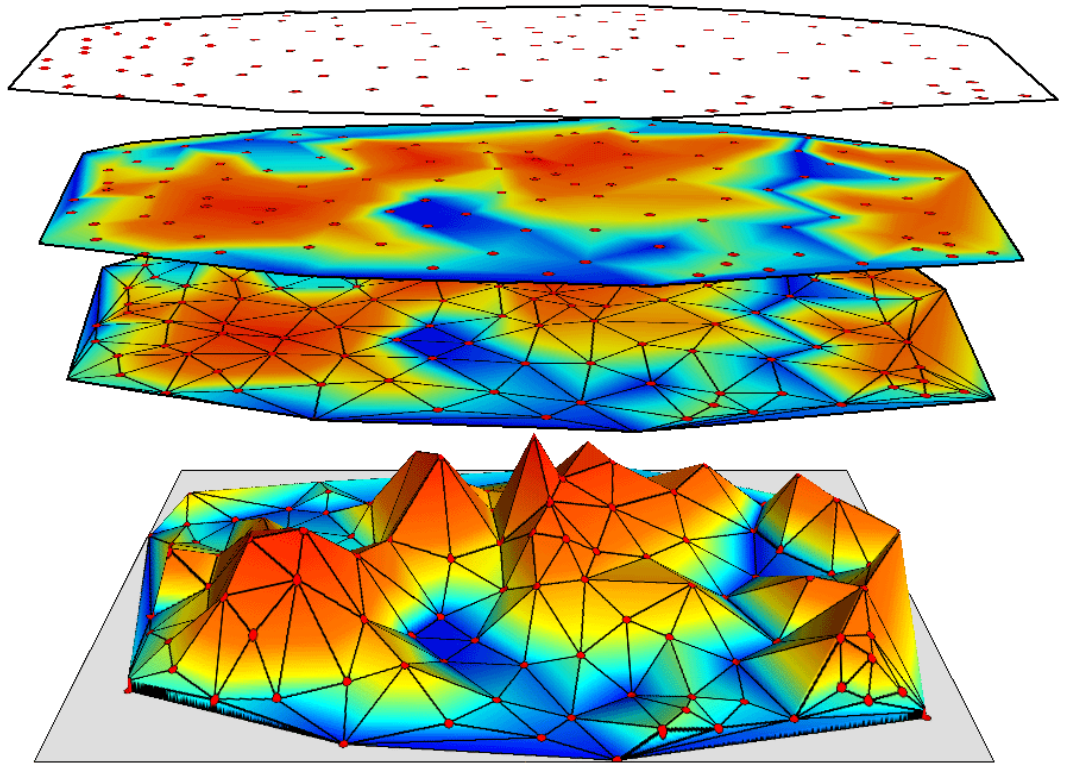
Raster Data Model

- Definition of Raster: A pattern of closely spaced rows of dots that form an image
- Units are usually represented as square grid cells that are uniform in size



TINs Data Model

- TINs = Triangulated Irregular Networks
- Store 3D surface information, such as elevation
- Use a set of nodes and triangles



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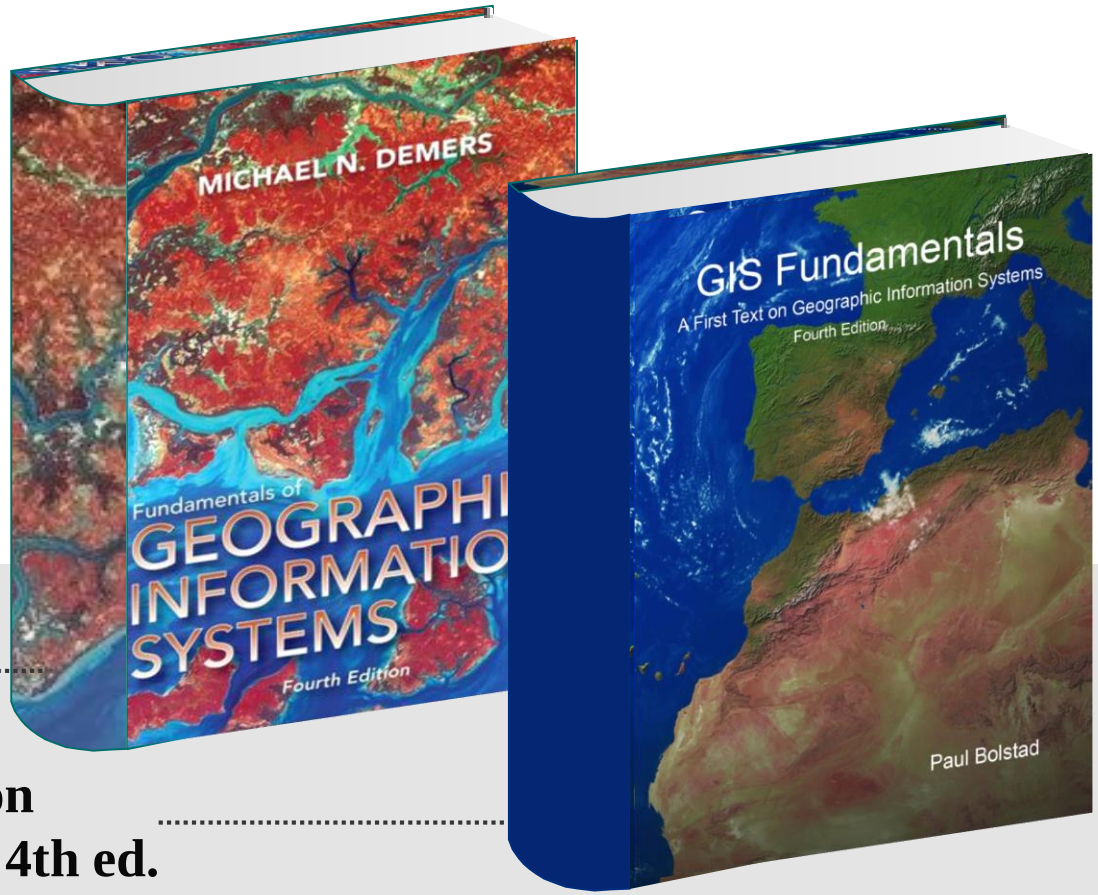
Fundamentals of Geographical Information Systems, 4th ed.

GIS Fundamentals: A First Text on Geographic Information Systems, 4th ed.



Book Resources

Thank you.

Brian Chen