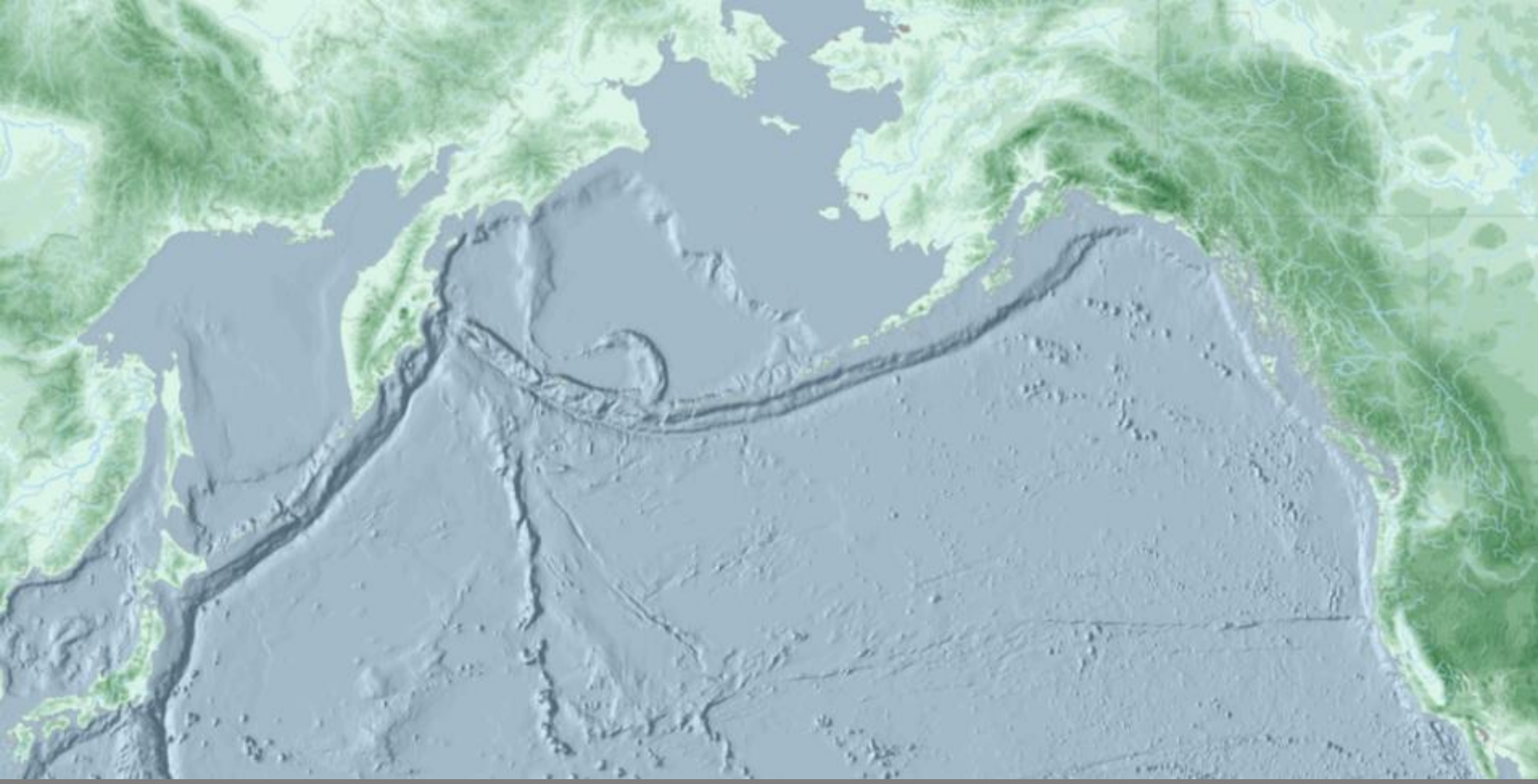


Intro to GIS – In Review

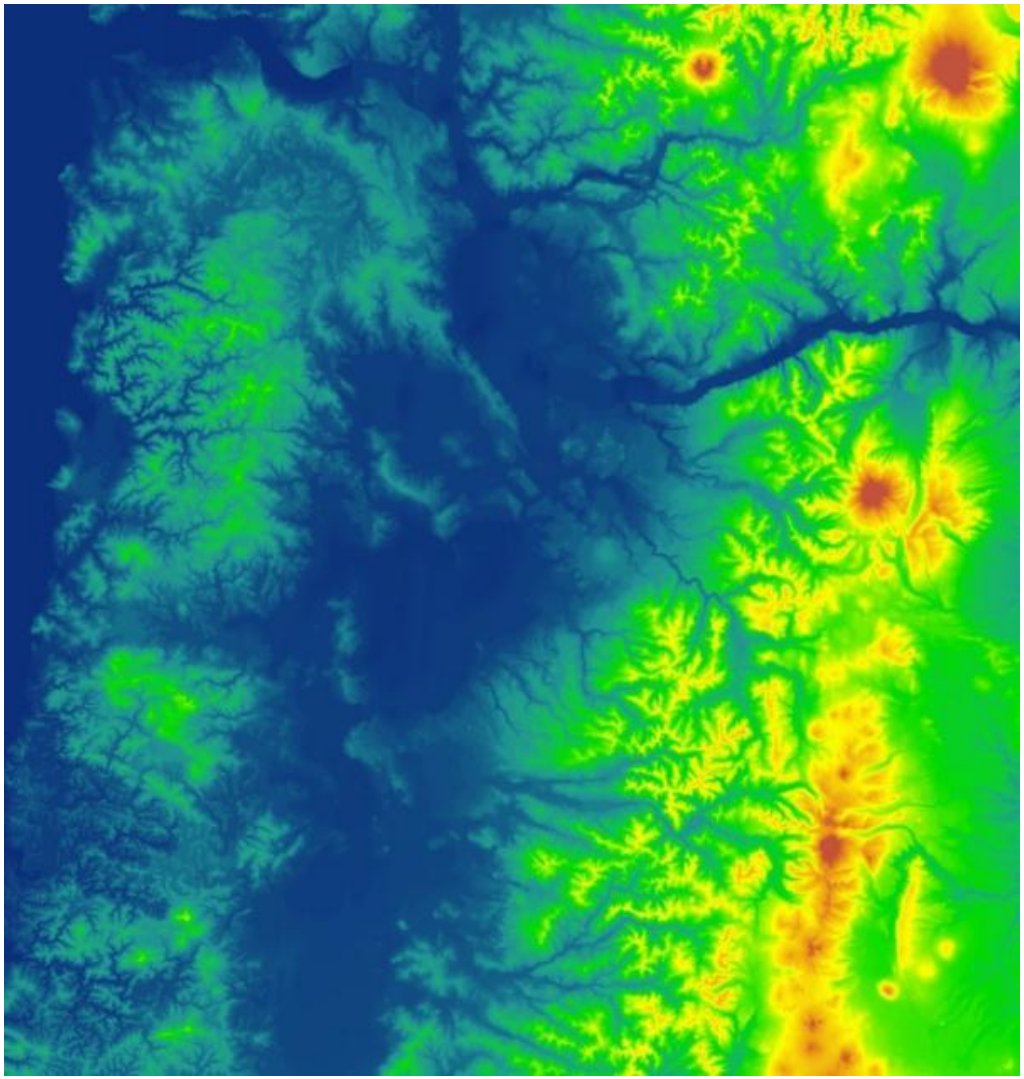
GIS Analysis| Winter 2016

GIS – A quarter in review

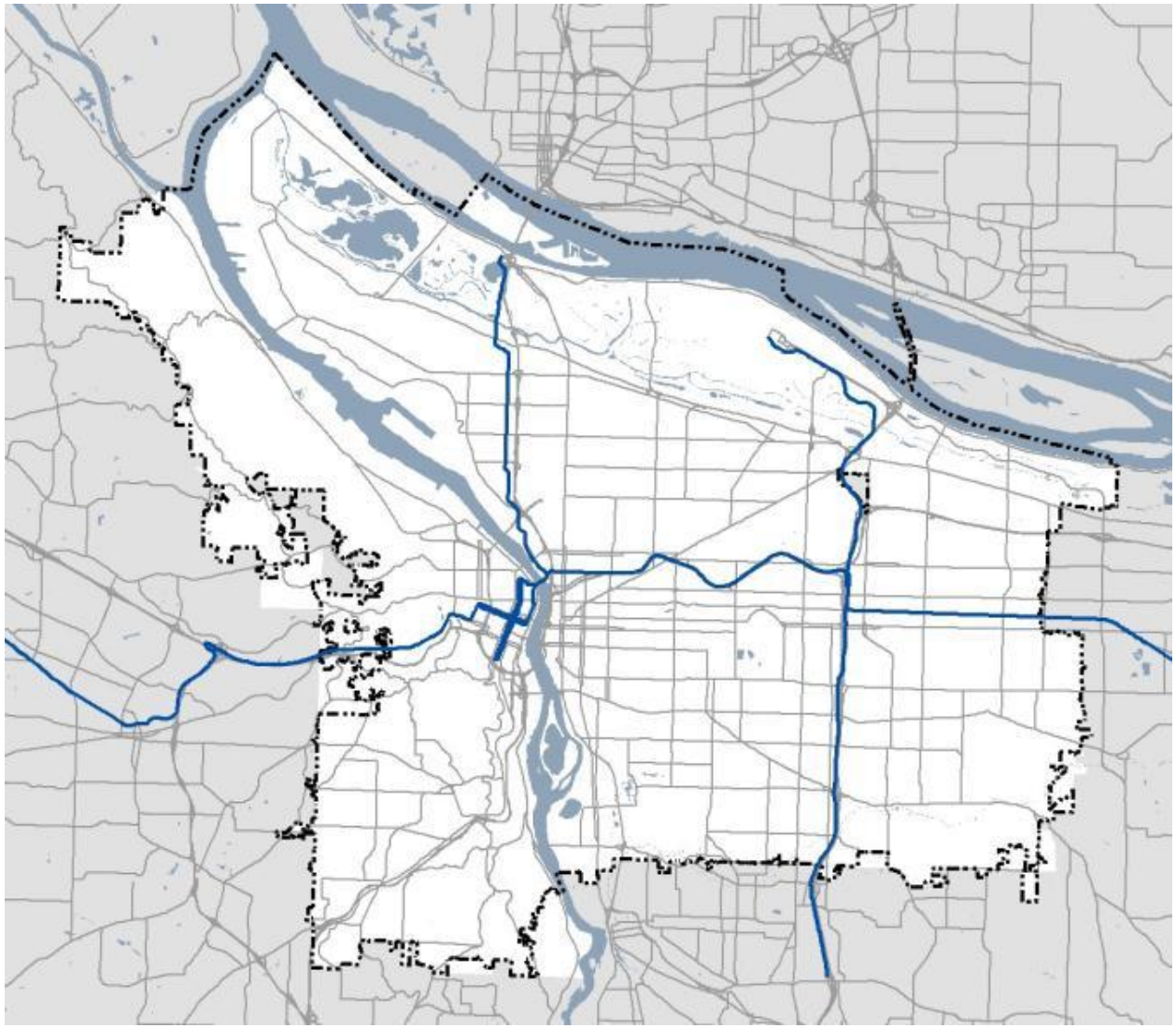
- Geographic data types
- Acquiring GIS data
- Projections / Coordinate systems
- Working with attribute tables
- Data classification
- Map design & production

Geographic data types

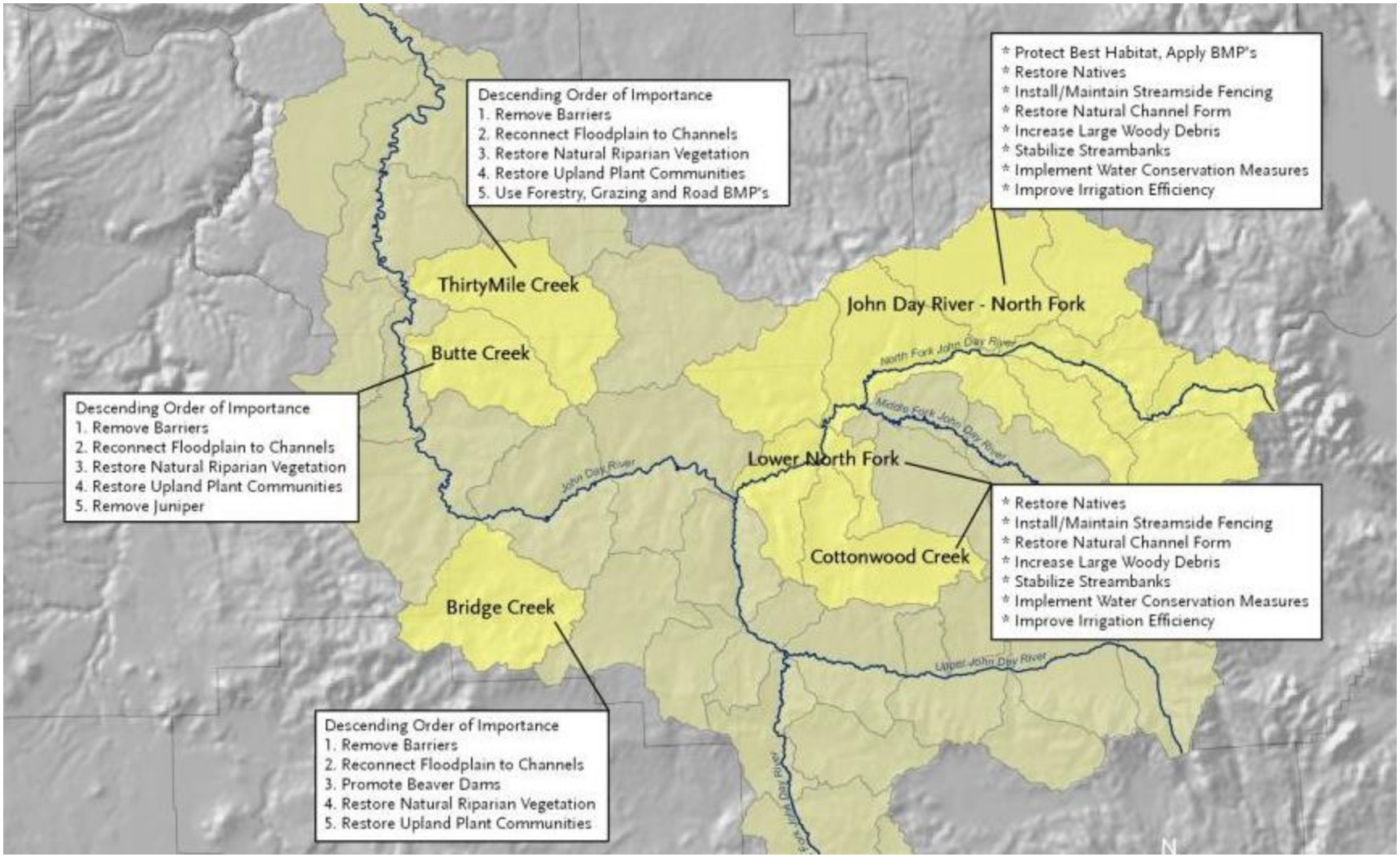
Discrete or Continuous Phenomena? Raster or Vector?



Discrete or Continuous Phenomena? Raster or Vector?



Raster and Vector Data Layered Together



1. What are some typical Raster Data formats?
2. What are some typical Vector data formats?
3. Which data type usually shows continuous data? Discrete data?

Acquiring GIS data

What are some examples of spatial data sources?

Acquiring GIS Data

- What are some places YOU go to acquire data?

Acquiring GIS Data

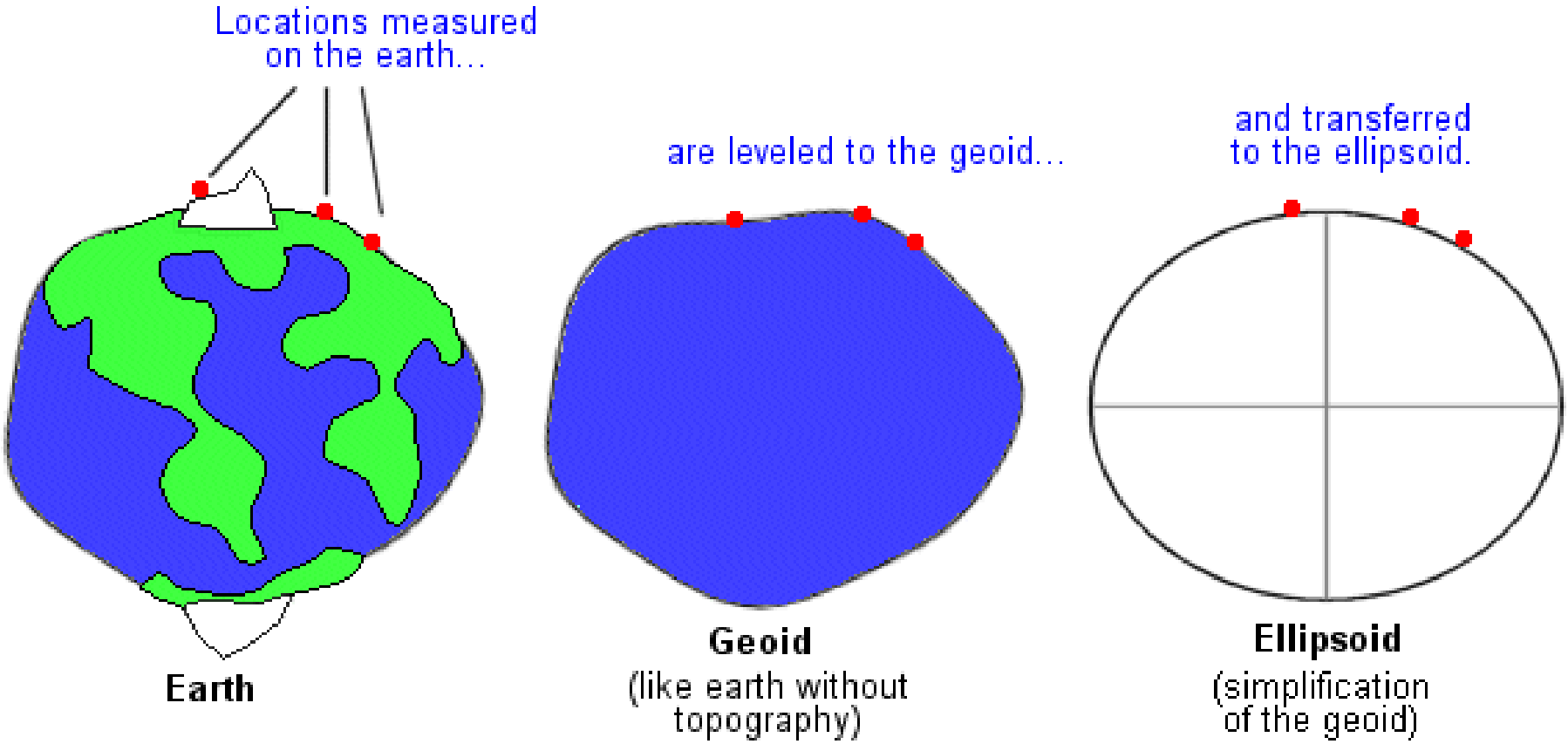
- Links on course website for local, state, regional, national and international datasets
  - http://www.christinafriedle.com/gis-data-links.html
- RLIS – Regional Land Information Systems
  - Compiled & distributed by Metro
  - Available on lab computers

Geographic & Projected Coordinate systems

Student: I thought I could forget about this!

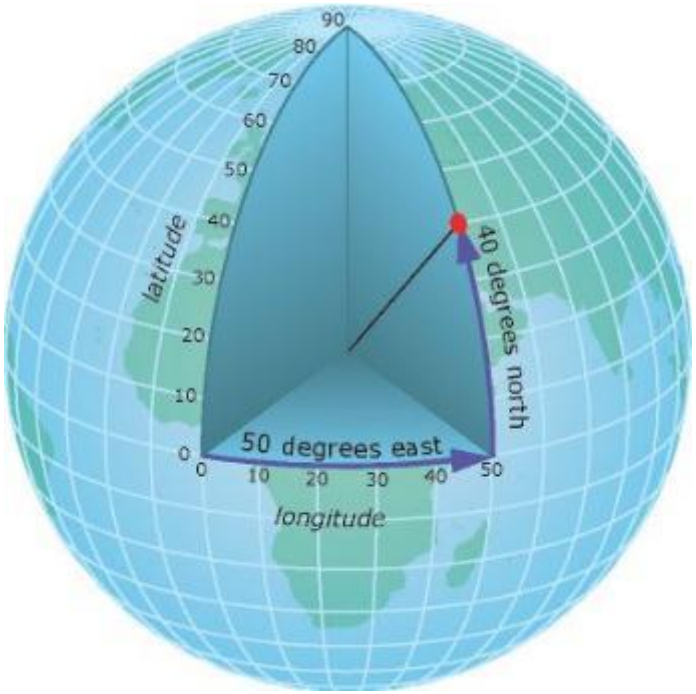
Instructor: NEVER!!!

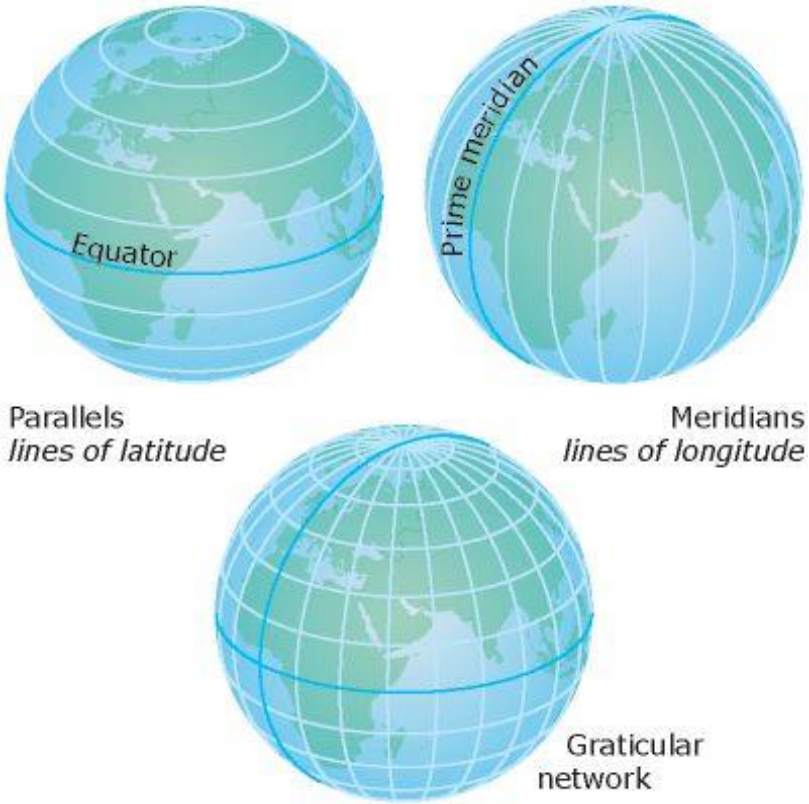
- How do we measure the shape of the Earth's surface?
- *Ellipsoid*


Locations measured
on the earth...
are leveled to the geoid...
and transferred
to the ellipsoid.
Earth
Geoid
(like earth without
topography)
Ellipsoid
(simplification
of the geoid)

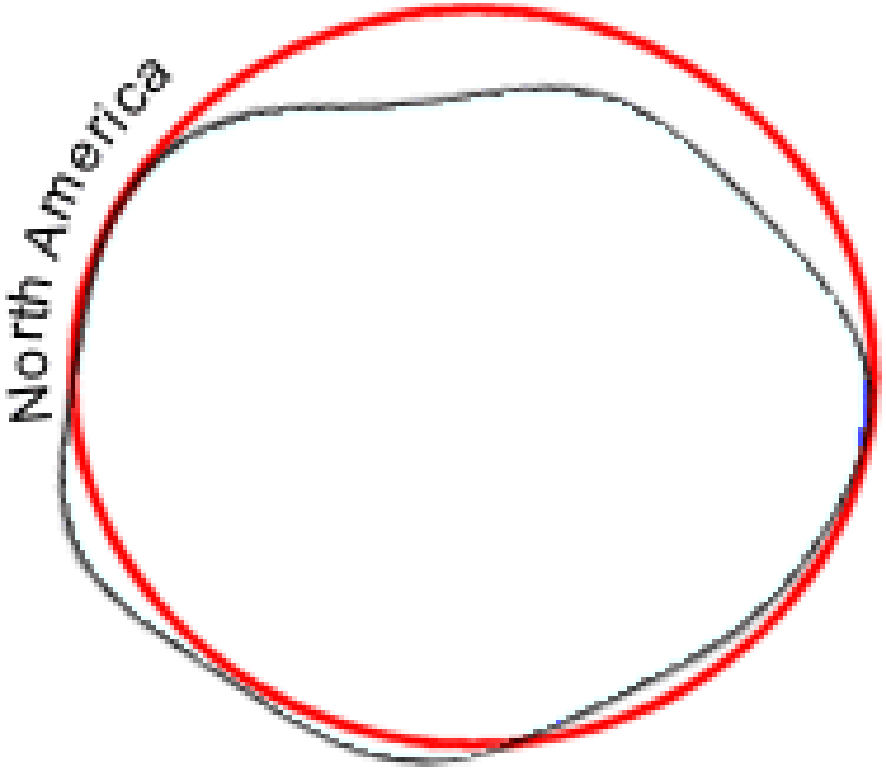
- How do we measure points on the Earth's Ellipsoid
- *Geographic Coordinate Systems*

Geographic Coordinate Systems

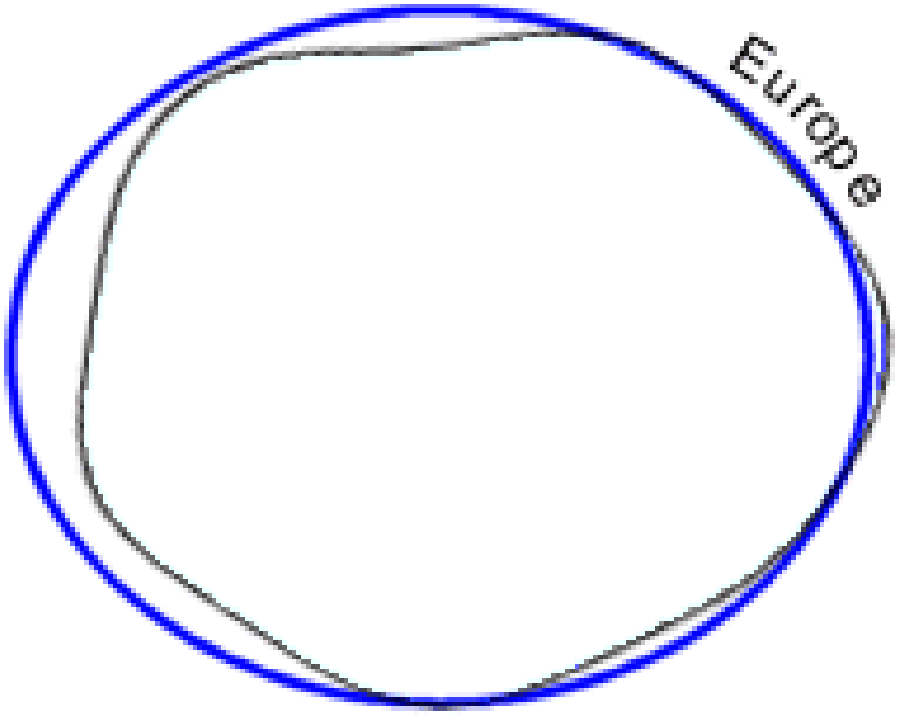




- How is latitude & longitude tied to the Ellipsoid
- *Geodetic Datum*

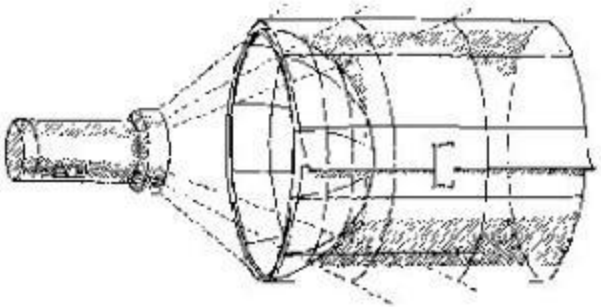


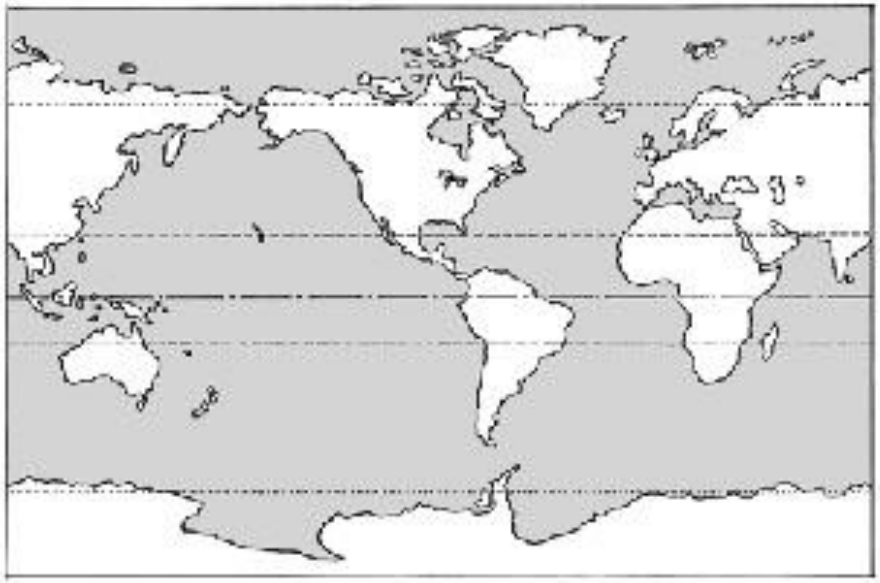
The red ellipsoid fits the geoid well in North America.



The blue ellipsoid fits the geoid well in Europe.

- How do we represent the Earth's Ellipsoid on a flat surface?
- *Projected Coordinate System*





1. What type of coordinate system (geographic or projected) is required for calculating distance & areas?
2. What units are used in a Geographic Coordinate System?
3. What units are used in a Projected Coordinate System?
4. What type of coordinate system is based on a Cartesian grid?
5. What are the 4 types of distortion with Projected Coordinate Systems?

6. How does ArcGIS know the coordinate system of an individual data set?
7. How is the file created (if it does not already exist)?
8. How do I permanently change the coordinate system of an individual dataset?
9. When ArcGIS uses the term ‘projection’, why can it be misleading?

10. How does ArcMap go about setting the coordinate system of a data frame?
11. What is the process called that allows datasets with different projections to still overlay?
12. How do you change the projection of a data frame?
13. What happens when you change the projection of a data frame?

Working with tables in ArcGIS

How do you connect different tables together?

Forests

Forest Name	Forest ID	Location	Size
Nantahala	1	N. Carolina	184,447
Cherokee	2	N. Carolina	92,271

Trails

Trail Name	Forest-ID
Bryson's Knob	1
Slickrock Falls	2
North Fork	1
Cade's Cove	1
Cade's Cove	2
Appalachian	1
Appalachian	2

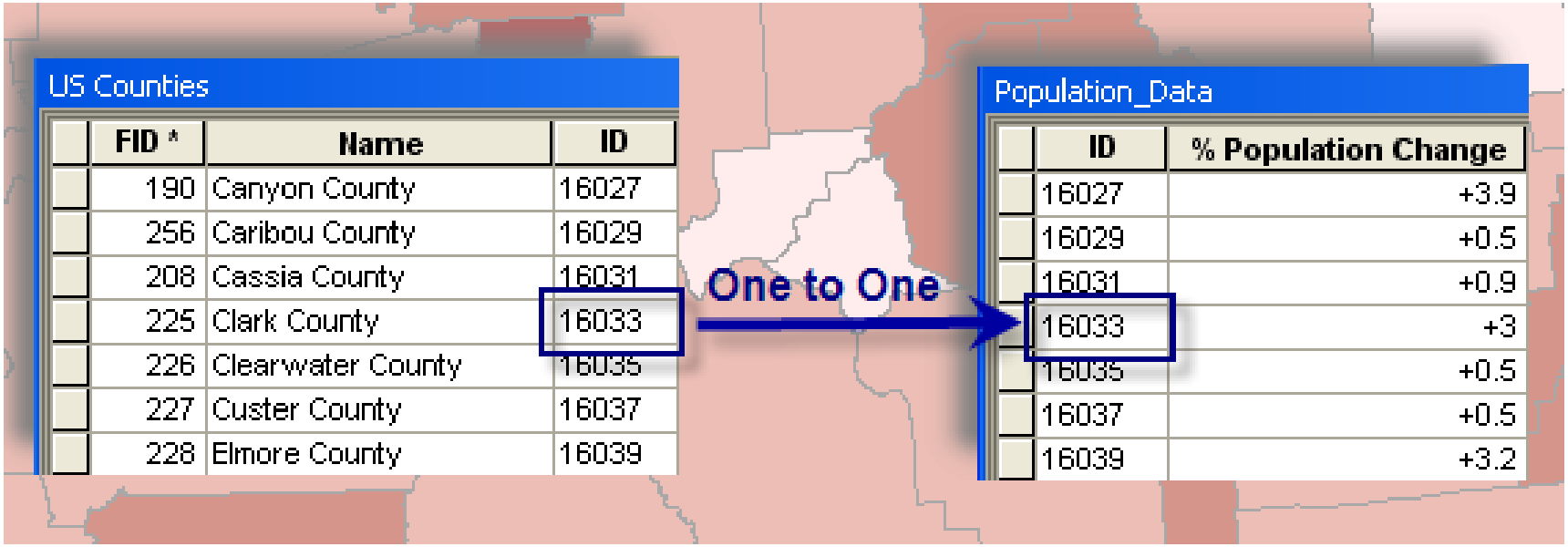
Forest Name	Forest-ID	Location	Size	Trail Name
Nantahala	1	N. Carolina	184,447	Bryson's Knob
Nantahala	1	N. Carolina	184,447	North Fork
Nantahala	1	N. Carolina	184,447	Cade's Cove
Nantahala	1	N. Carolina	184,447	Appalachian
Cherokee	2	N. Carolina	92,271	Slickrock Falls
Cherokee	2	N. Carolina	92,271	Cade's Cove
Cherokee	2	N. Carolina	92,271	Appalachian

Connecting tables

1. What does a ‘join’ operation do to attribute tables?
2. What does the output table look like?
3. Does it change the appearance of the geographic data?
4. Is a join temporary or permanent?
5. How does a ‘relate’ differ from a ‘join’?

One-to-One Table Relationship

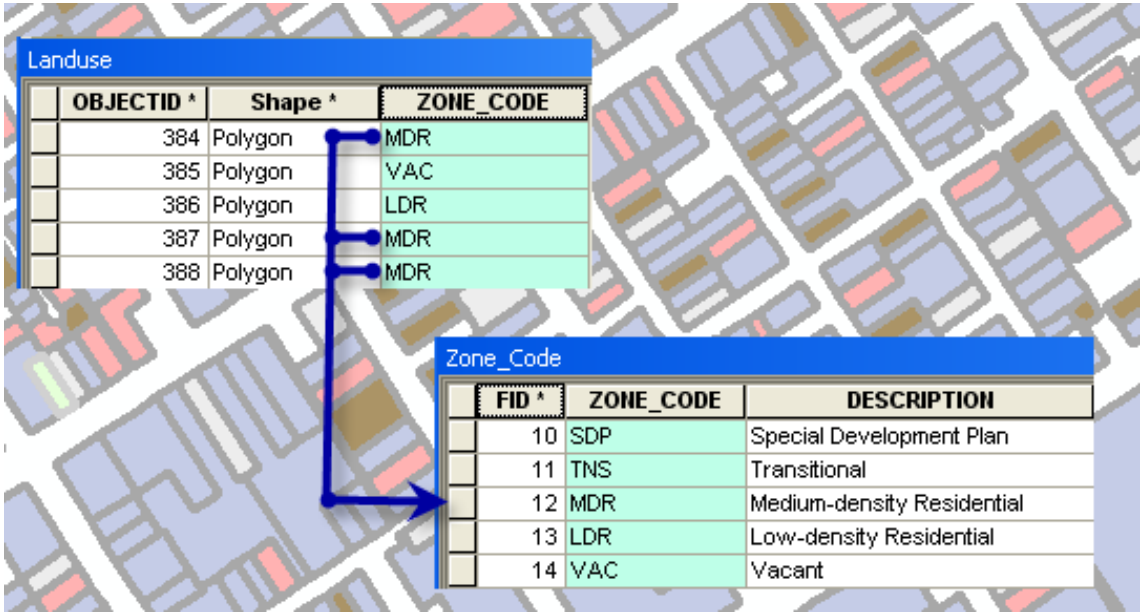
- A record in table A can match one and only one possible record in table B.



What type of connection operation(s) can use this type of table relationship?

Many-to-one Table Relationship

- Multiple records in Table A can match to a single record in Table B



What type of connection operation(s) can use this type of table relationship?

One-to-Many Table Relationship

- A record in Table A can match to multiple records in Table B

Table A

Coord.	EPA Reg
John	1
Judy	2
Doug	3
Bob	4
Larry	5
Sue	6
Frank	7

Table B

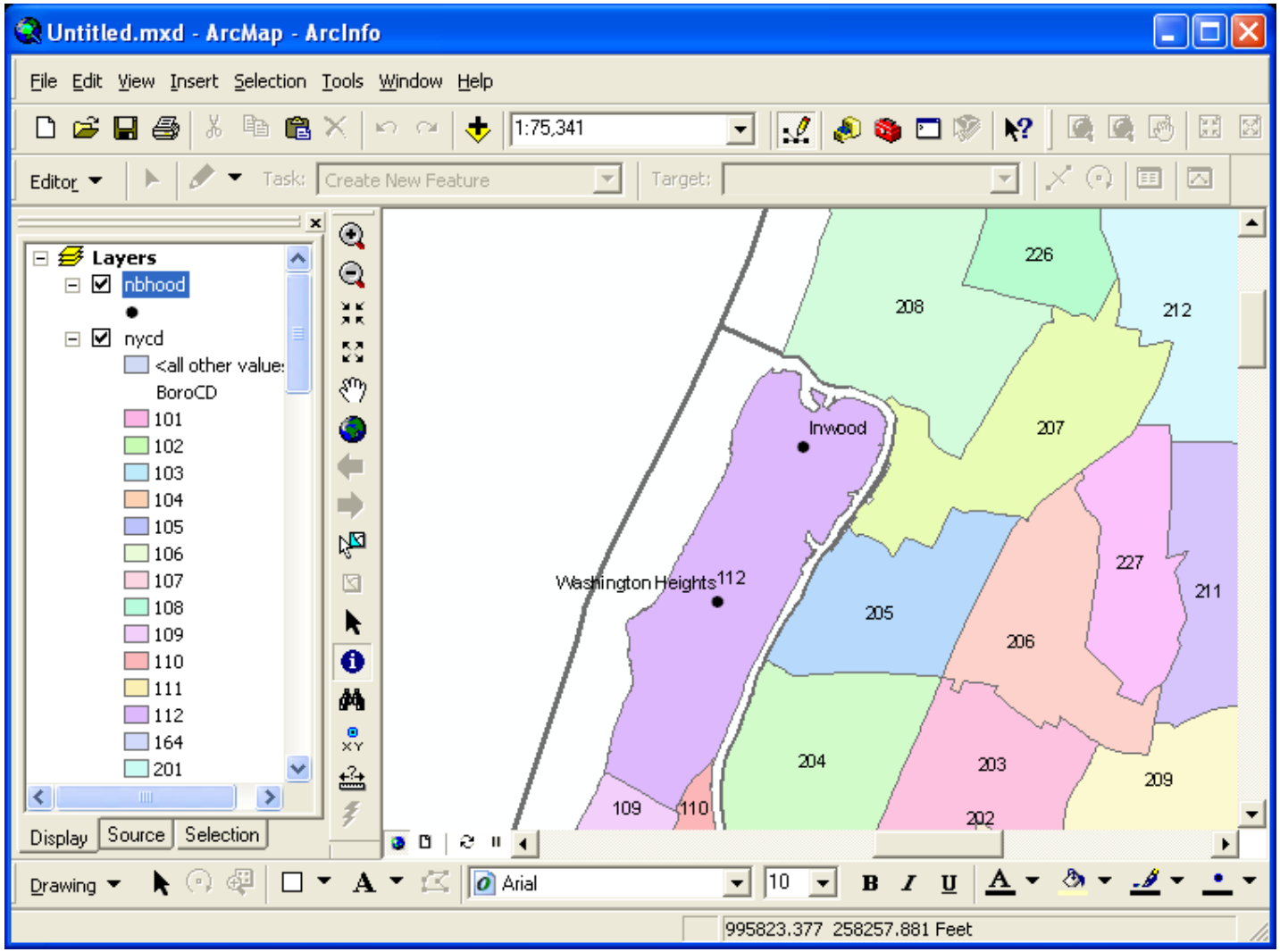
EPA Reg.	State
3	PA
3	WV
3	DE
4	TN
4	NC
1	RI
2	NY

What type of connection operation(s) can use this type of table relationship?

More….Connecting Tables

1. What if my tables do not share a common field?
2. How is a spatial join different from a join or relate?
3. Is a spatial join temporary or permanent?
4. What does the output table of a spatial join look like?

e.g. How many neighborhoods (points) are inside each borough (polygon)?



Working with Excel

Bringing Non-Spatial data into ArcGIS

1. How do you connect Excel tables to your spatial data?
2. Can you use just ANY excel table?

- What are reasons a join might fail?

Downloaded Census attribute file (.CSV format)

ACS_12_5YR_DP02_with_ann.csv

	A	B	C	D	E	F	G
1	GEO.id	GEO.id2	GEO.display-label	HC01_VC03	HC02_VC03	HC03_VC03	HC04_VC03
2	0100000US		United States	115226802	238575	115226802	(X)
3	1400000US41001950100	41001950100	Census Tract 9501, Baker County, Oreg	1244	107	1244	(X)
4	1400000US41001950200	41001950200	Census Tract 9502, Baker County, Oreg	1289	128	1289	(X)
5	1400000US41001950300	41001950300	Census Tract 9503, Baker County, Oreg	1100	119	1100	(X)
6	1400000US41001950400	41001950400	Census Tract 9504, Baker County, Oreg	1393	102	1393	(X)
7	1400000US41001950500	41001950500	Census Tract 9505, Baker County, Oreg	1133	79	1133	(X)
8	1400000US41001950600	41001950600	Census Tract 9506, Baker County, Oreg	915	79	915	(X)
9	1400000US41003000100	41003000100	Census Tract 1, Benton County, Orego	2852	112	2852	(X)
10	1400000US41003000202	41003000202	Census Tract 2.02, Benton County, Ore	2309	125	2309	(X)
11	1400000US41003000400	41003000400	Census Tract 4, Benton County, Orego	3218	159	3218	(X)
12	1400000US41003000500	41003000500	Census Tract 5, Benton County, Orego	1267	88	1267	(X)
13	1400000US41003000600	41003000600	Census Tract 6, Benton County, Orego	2155	112	2155	(X)
14	1400000US41003000900	41003000900	Census Tract 9, Benton County, Orego	2263	150	2263	(X)
15	1400000US41003001001	41003001001	Census Tract 10.01, Benton County, Or	1769	103	1769	(X)
16	1400000US41003001002	41003001002	Census Tract 10.02, Benton County, Or	1245	86	1245	(X)
17	1400000US41003001101	41003001101	Census Tract 11.01, Benton County, Or	1152	120	1152	(X)
18	1400000US41003001102	41003001102	Census Tract 11.02, Benton County, Or	1883	190	1883	(X)
19	1400000US41003010100	41003010100	Census Tract 101, Benton County, Ore	3156	194	3156	(X)
20	1400000US41003010200	41003010200	Census Tract 102, Benton County, Ore	1554	82	1554	(X)
21	1400000US41003010300	41003010300	Census Tract 103, Benton County, Ore	1309	93	1309	(X)
22	1400000US41003010400	41003010400	Census Tract 104, Benton County, Ore	1547	82	1547	(X)

Downloaded Census attribute file (.CSV format)

ACS_12_5YR_DP02_metadata.csv

	A	B
1	GEO.id	Id
2	GEO.id2	Id2
3	GEO.display-label	Geography
4	HC01_VC03	Estimate; HOUSEHOLDS BY TYPE - Total households
5	HC02_VC03	Margin of Error; HOUSEHOLDS BY TYPE - Total households
6	HC03_VC03	Percent; HOUSEHOLDS BY TYPE - Total households
7	HC04_VC03	Percent Margin of Error; HOUSEHOLDS BY TYPE - Total households
8	HC01_VC04	Estimate; HOUSEHOLDS BY TYPE - Family households (families)
9	HC02_VC04	Margin of Error; HOUSEHOLDS BY TYPE - Family households (families)
10	HC03_VC04	Percent; HOUSEHOLDS BY TYPE - Family households (families)
11	HC04_VC04	Percent Margin of Error; HOUSEHOLDS BY TYPE - Family households (families)
12	HC01_VC06	Estimate; HOUSEHOLDS BY TYPE - Family households (families) - With own children under 18 years
13	HC02_VC06	Margin of Error; HOUSEHOLDS BY TYPE - Family households (families) - With own children under 18 ye
14	HC03_VC06	Percent; HOUSEHOLDS BY TYPE - Family households (families) - With own children under 18 years
15	HC04_VC06	Percent Margin of Error; HOUSEHOLDS BY TYPE - Family households (families) - With own children unc
16	HC01_VC07	Estimate; HOUSEHOLDS BY TYPE - Family households (families) - Married-couple family
17	HC02_VC07	Margin of Error; HOUSEHOLDS BY TYPE - Family households (families) - Married-couple family
18	HC03_VC07	Percent; HOUSEHOLDS BY TYPE - Family households (families) - Married-couple family
19	HC04_VC07	Percent Margin of Error; HOUSEHOLDS BY TYPE - Family households (families) - Married-couple family
20	HC01_VC08	Estimate; HOUSEHOLDS BY TYPE - Family households (families) - Married-couple family - With own chi
21	HC02_VC08	Margin of Error; HOUSEHOLDS BY TYPE - Family households (families) - Married-couple family - With o
22	HC03_VC08	Percent; HOUSEHOLDS BY TYPE - Family households (families) - Married-couple family - With own chil

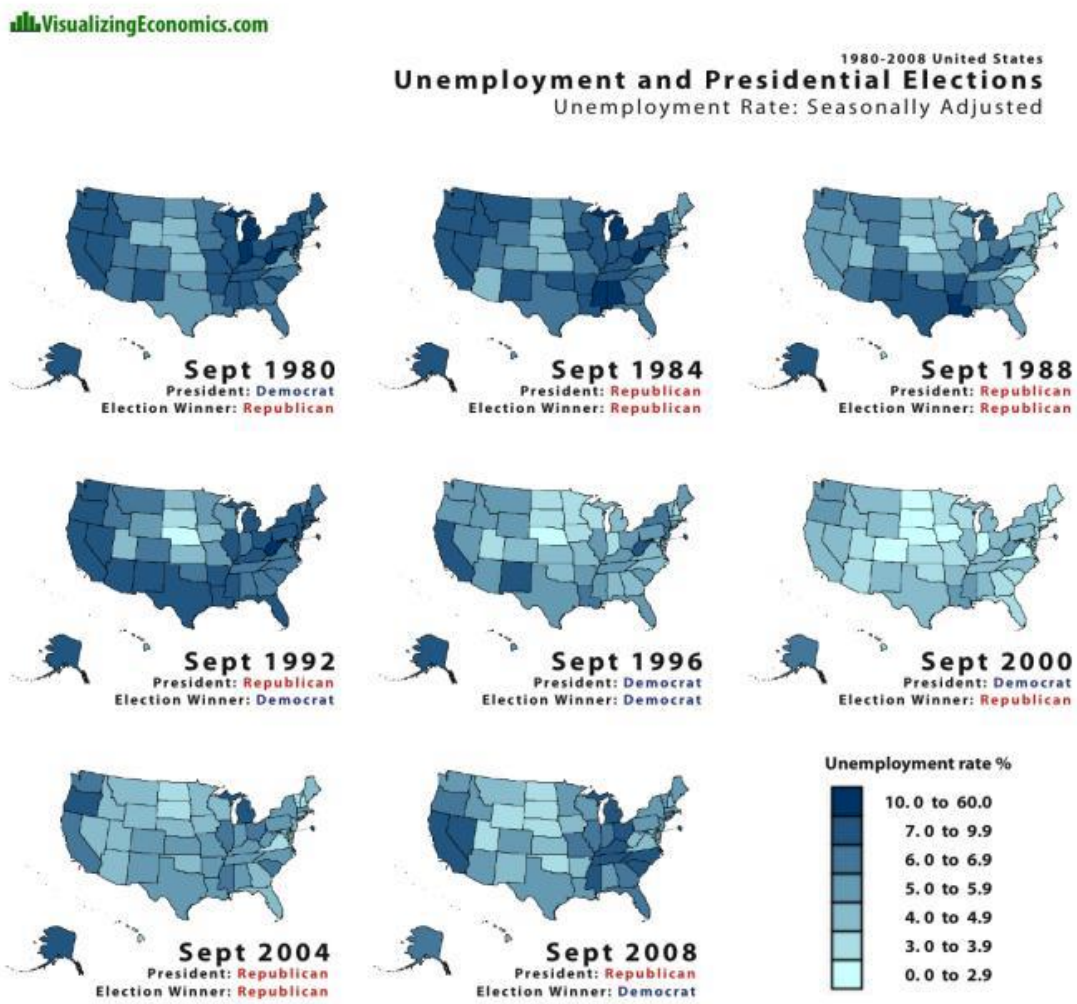
“Cleaned up” Excel file – ready for Join

ACS_12_5YR_DP02_with_ann.csv

	A	B	C	D	E	F	G
1	GEO_id	GEO_id2	Label	Households	MOE_HH	Percent_HH	Familes
2	1400000US41001950100	41001950100	Census Tract 9501, Baker County, Oreg	1244	107	1244	930
3	1400000US41001950200	41001950200	Census Tract 9502, Baker County, Oreg	1289	128	1289	941
4	1400000US41001950300	41001950300	Census Tract 9503, Baker County, Oreg	1100	119	1100	704
5	1400000US41001950400	41001950400	Census Tract 9504, Baker County, Oreg	1393	102	1393	878
6	1400000US41001950500	41001950500	Census Tract 9505, Baker County, Oreg	1133	79	1133	761
7	1400000US41001950600	41001950600	Census Tract 9506, Baker County, Oreg	915	79	915	567
8	1400000US41003000100	41003000100	Census Tract 1, Benton County, Orego	2852	112	2852	1634
9	1400000US41003000202	41003000202	Census Tract 2.02, Benton County, Ore	2309	125	2309	1271
10	1400000US41003000400	41003000400	Census Tract 4, Benton County, Orego	3218	159	3218	2096
11	1400000US41003000500	41003000500	Census Tract 5, Benton County, Orego	1267	88	1267	961
12	1400000US41003000600	41003000600	Census Tract 6, Benton County, Orego	2155	112	2155	1124
13	1400000US41003000900	41003000900	Census Tract 9, Benton County, Orego	2263	150	2263	1303
14	1400000US41003001001	41003001001	Census Tract 10.01, Benton County, Or	1769	103	1769	750
15	1400000US41003001002	41003001002	Census Tract 10.02, Benton County, Or	1245	86	1245	646
16	1400000US41003001101	41003001101	Census Tract 11.01, Benton County, Or	1152	120	1152	195
17	1400000US41003001102	41003001102	Census Tract 11.02, Benton County, Or	1883	190	1883	406
18	1400000US41003010100	41003010100	Census Tract 101, Benton County, Ore	3156	194	3156	2416
19	1400000US41003010200	41003010200	Census Tract 102, Benton County, Ore	1554	82	1554	1241
20	1400000US41003010300	41003010300	Census Tract 103, Benton County, Ore	1309	93	1309	990
21	1400000US41003010400	41003010400	Census Tract 104, Benton County, Ore	1547	82	1547	1027
22	1400000US41003010600	41003010600	Census Tract 106, Benton County, Ore	1893	202	1893	329

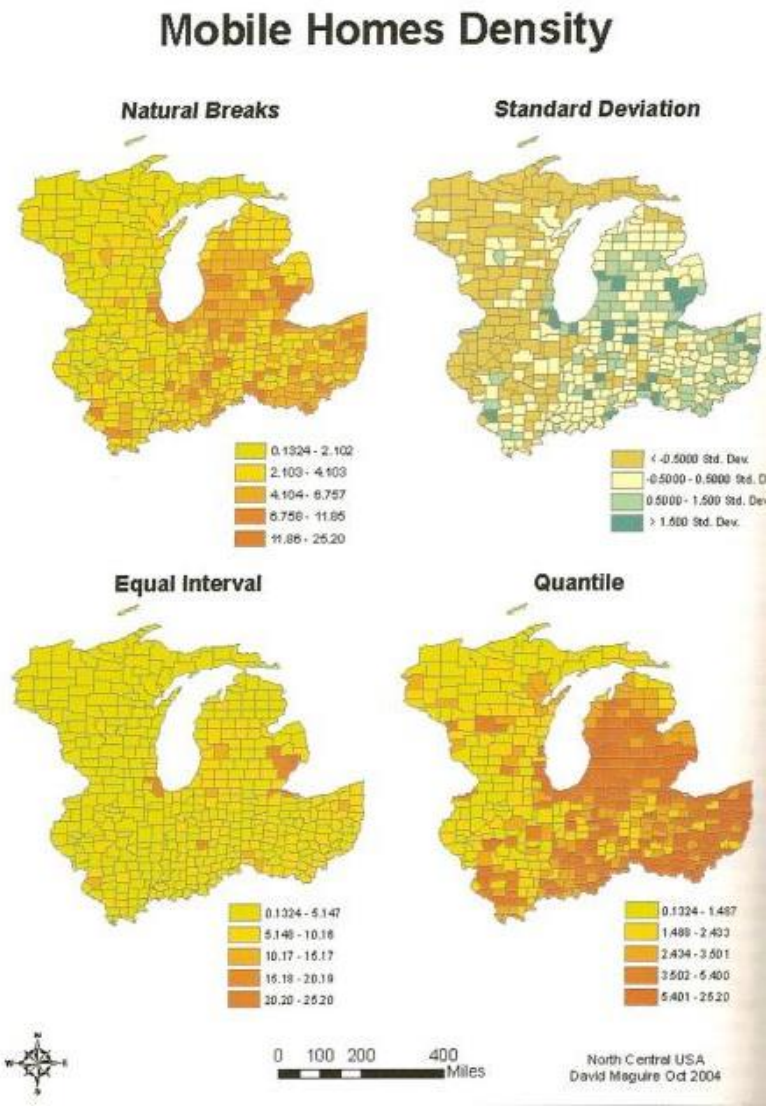
Data Classification

Choropleth Maps – Shaded area polygons convey quantitative data values



How do these data values get grouped into "color bins" or classes?

Types of Classification Methods



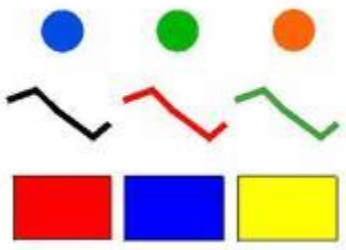
Data Classification methods influence data visualization

1. What does it mean to ‘normalize’ your data?
2. How do you ‘normalize’ your data?
3. When do you want to do this?

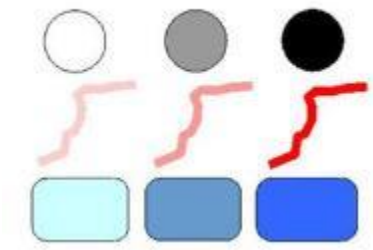
Map design & production

Properties of Map Symbology

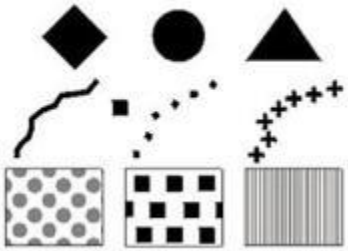
Color (hue)



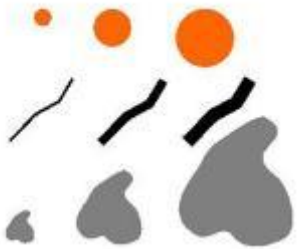
Color (value)



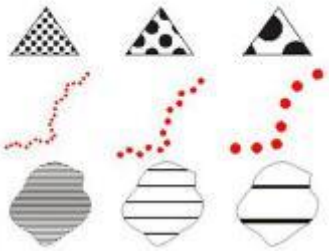
Shape



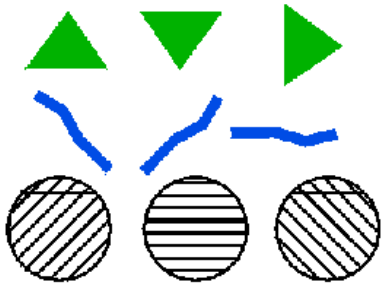
Size



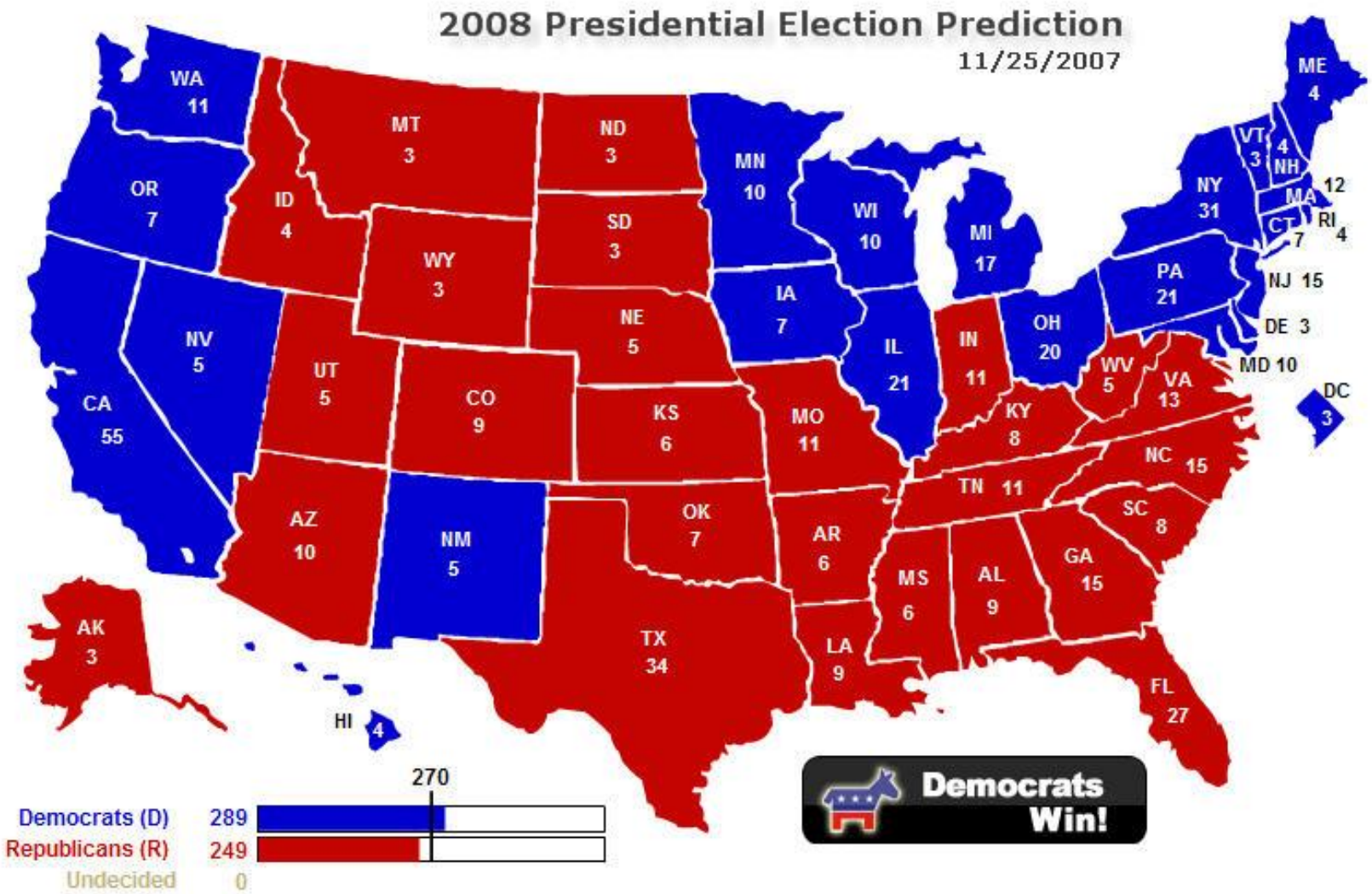
Texture



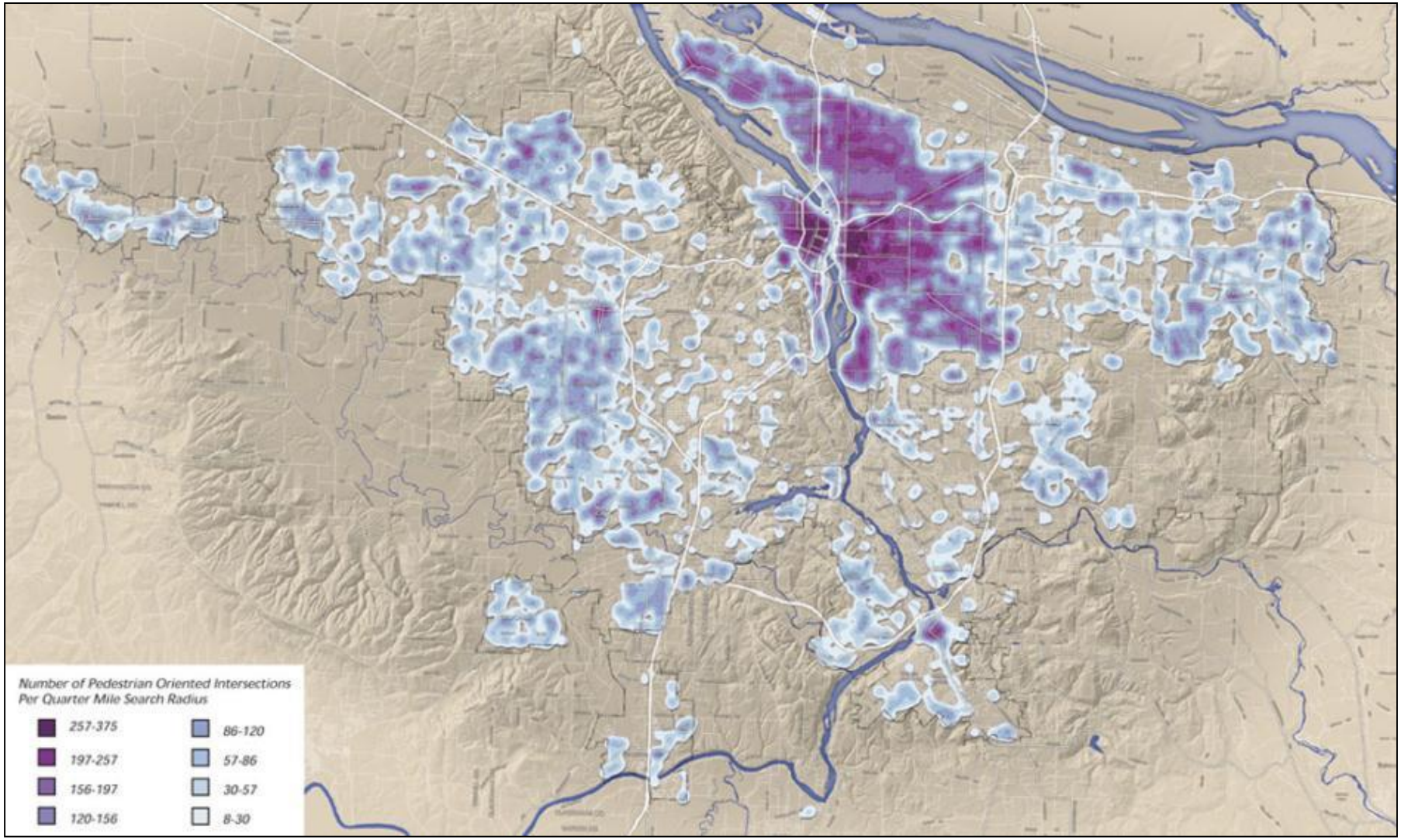
Orientation



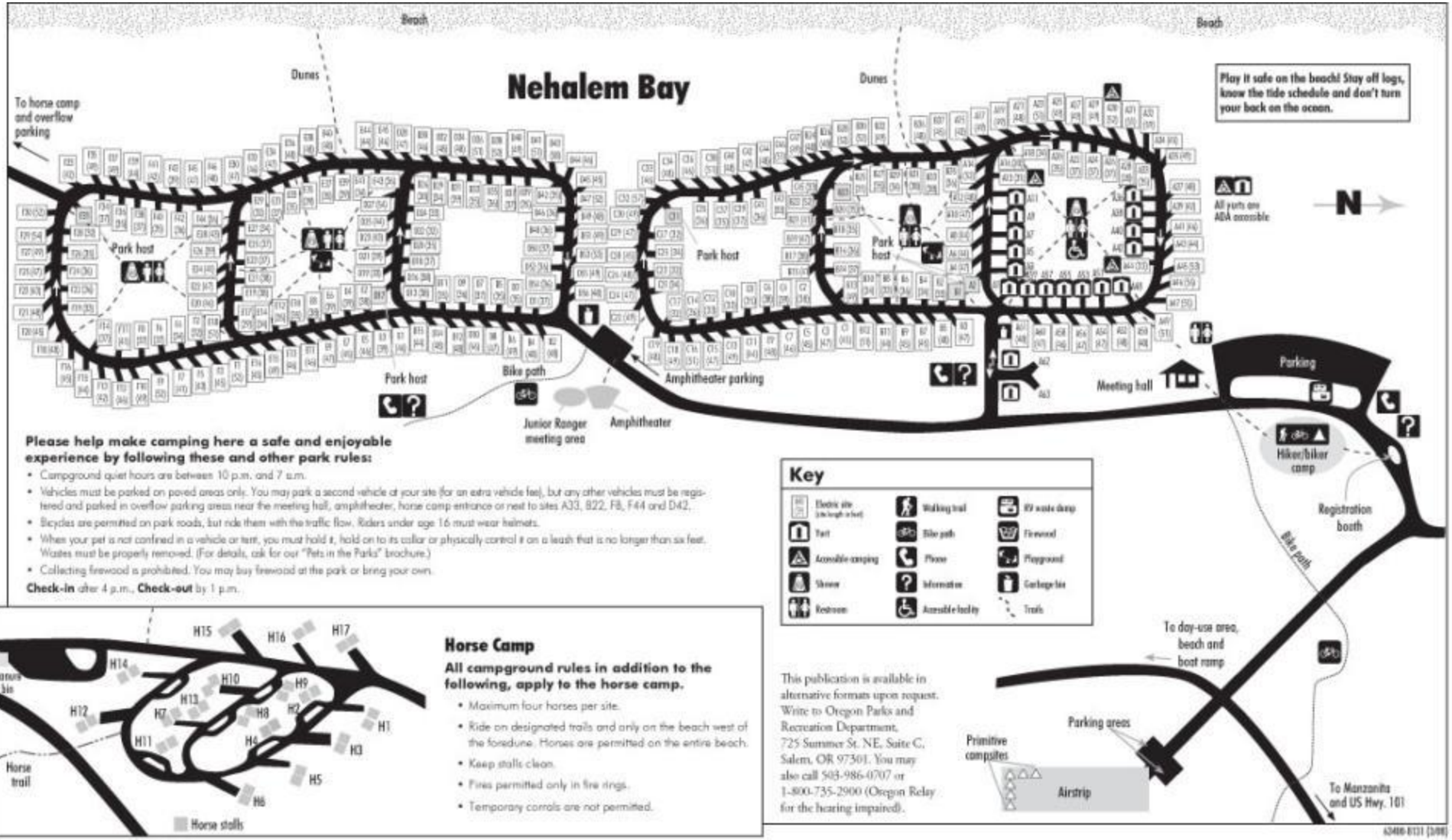
Color (Hue) – Qualitative or Quantitative Data?



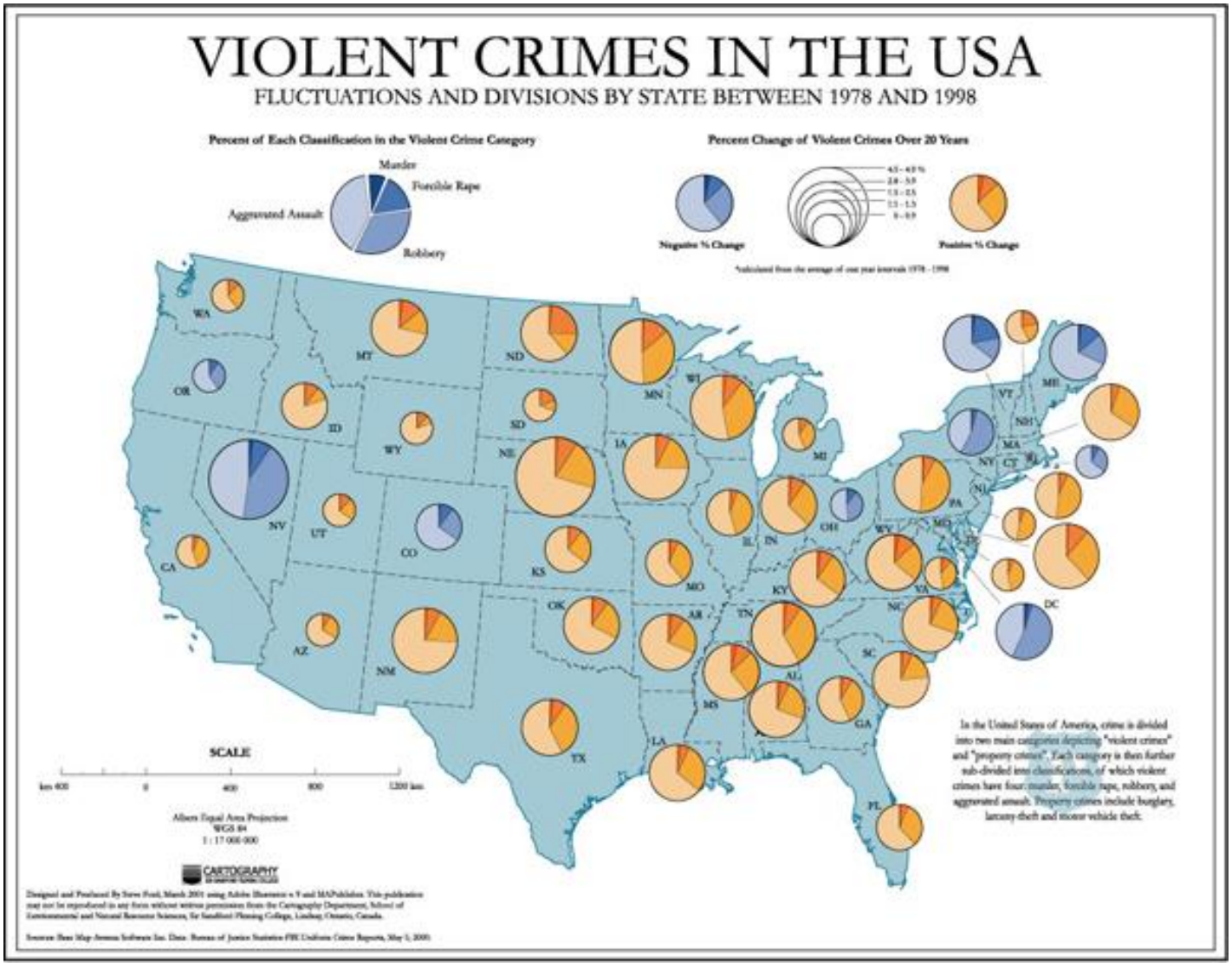
Color (Value) – Qualitative or Quantitative Data?



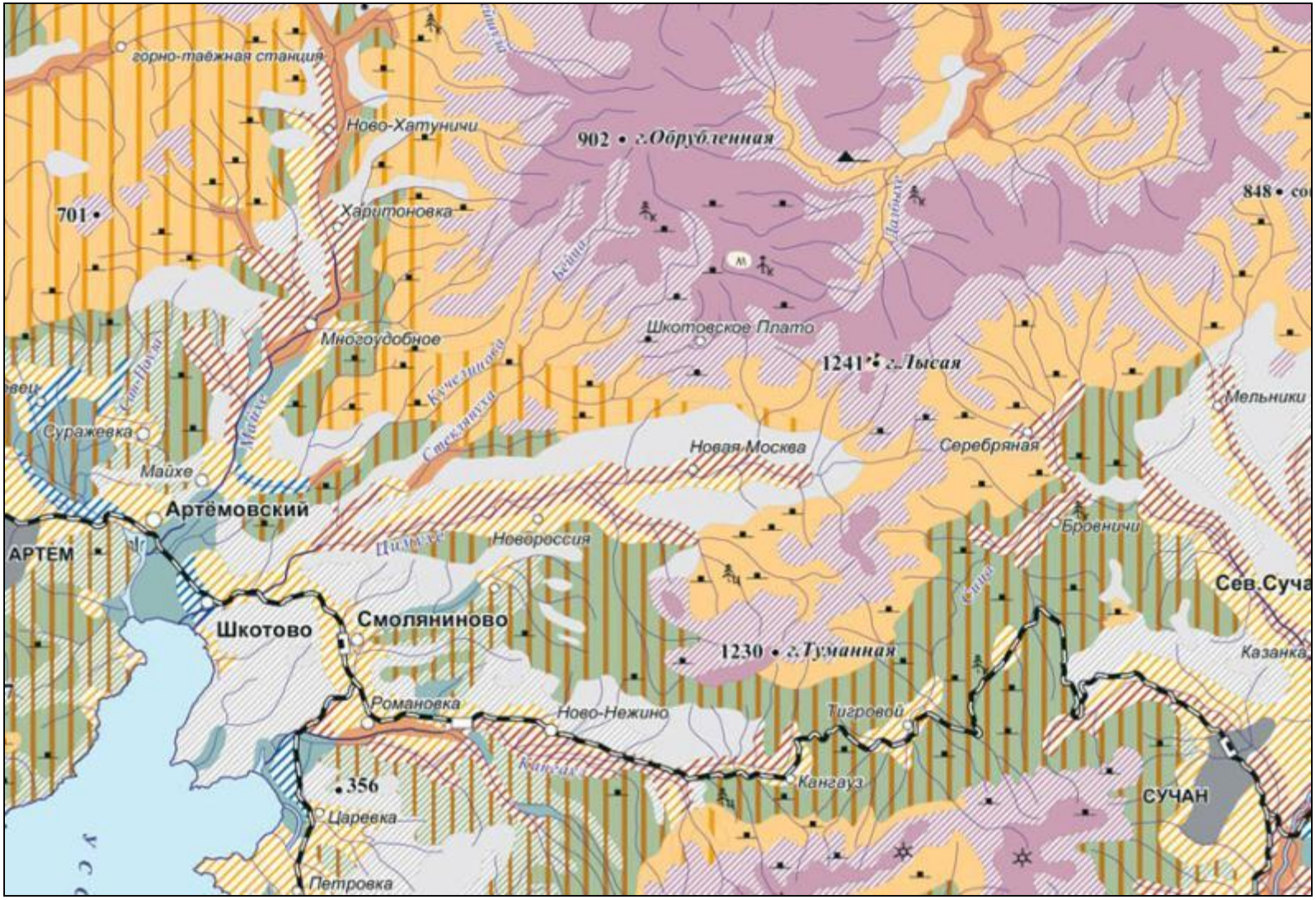
Shape – Qualitative or Quantitative Data?



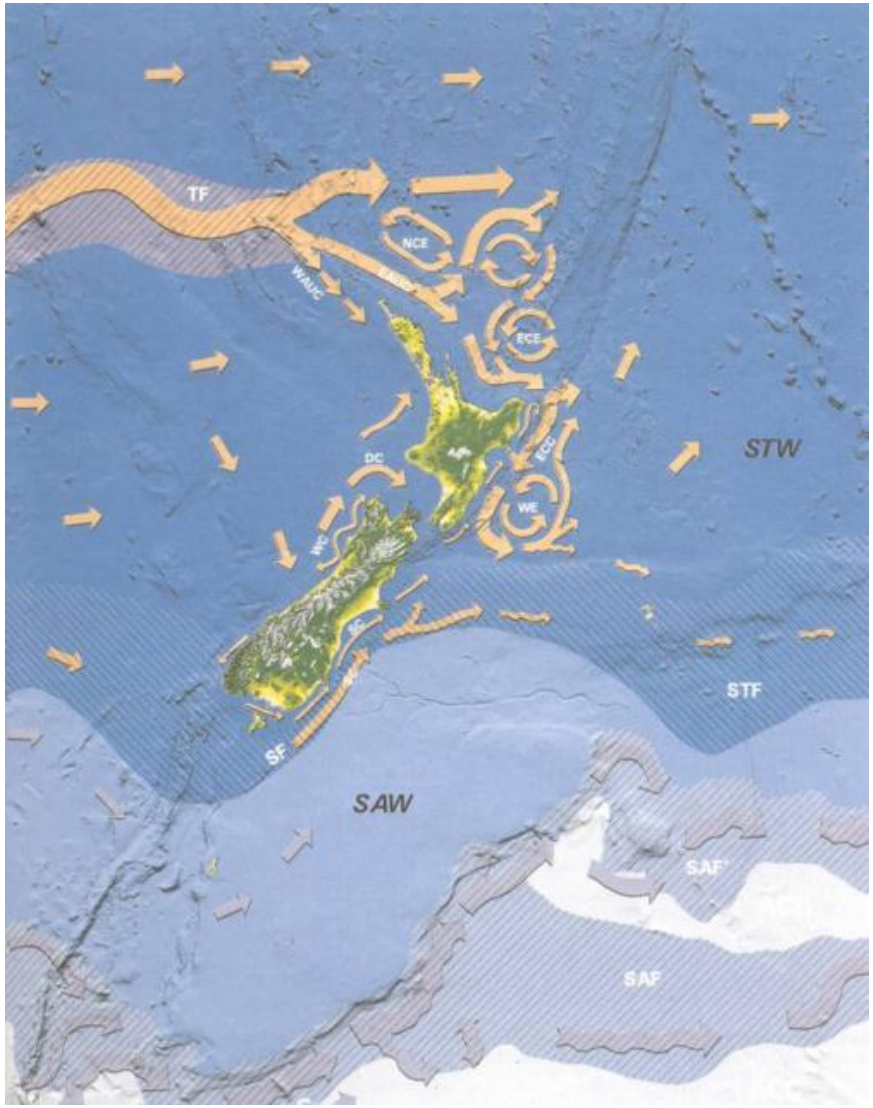
Size – Qualitative or Quantitative Data?



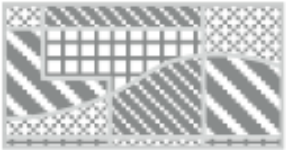
Texture – Qualitative or Quantitative Data?



Orientation – Qualitative or Quantitative Data? or Other?



Summary of Symbology and Use with Qualitative/Quantitative Data

	Points	Lines	Areas	Best to show
Shape		possible, but too weird to show	cartogram	qualitative differences
Size			cartogram	quantitative differences
Color Hue				qualitative differences
Color Value				quantitative differences
Color Intensity				qualitative differences
Texture				qualitative & quantitative differences

Potential Elements of a Map Layout