

CARTOGRAPHY

Sandeep Talasila, GISP



DEFINITIONS

- Cartography: *The discipline dealing with the art, science and technology of making and using maps.*
- Map: *A medium designed for communication of generalized spatial information and relationships. (Cartographic Body of Knowledge, ICA Working Group)*



WHAT IS A MAP?

- A reduced, selective, and symbolized graphical representation of cultural and physical environment.



A BRIEF HISTORY

- Çatalhöyük Map, around 7000 B.C.



Umut Özdemir, Ministry of Culture and Tourism, UNESCO,
<https://whc.unesco.org/en/documents/131746>



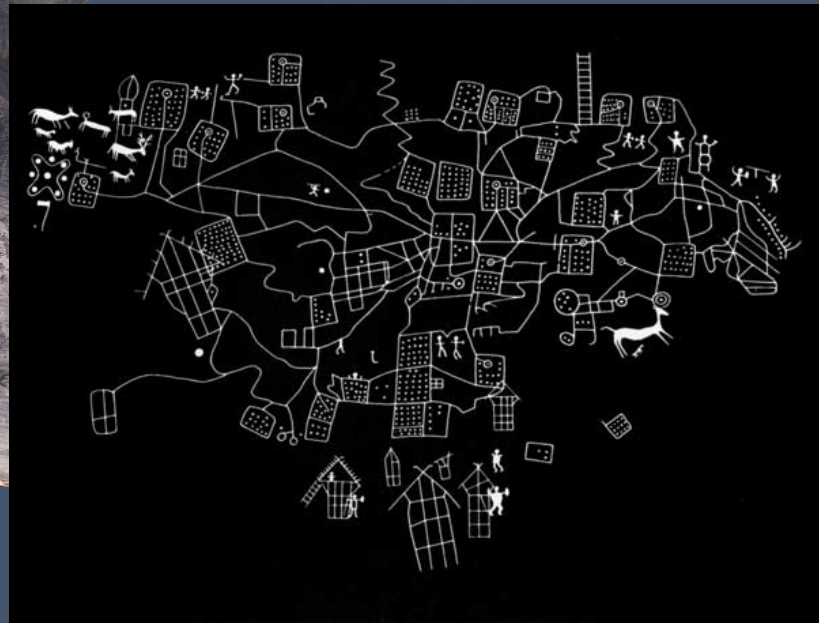
Neolithic mural in Çatalhöyük, Turkey, and its interpretive drawing. Image credit: Ataman Hotel / John Swogger.

A BRIEF HISTORY (CONT.)

- Bedolina Petroglyph at Valcamonica, 2500 B.C.

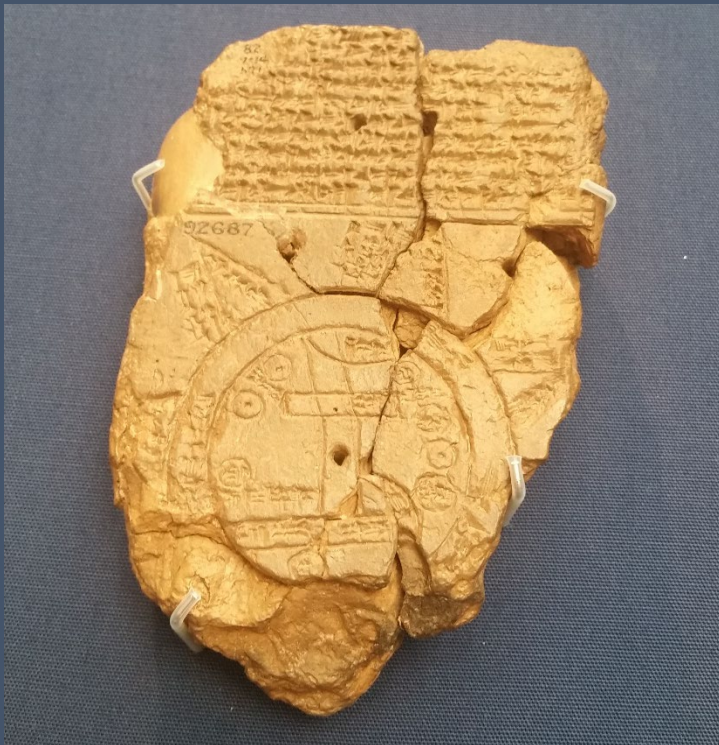


Geometrical composition called "Bedolina map". R.1, Parco di Seradina e Bedolina. Capo di Ponte, Italy. Luca Giarelli / CC-BY-SA 3.0



A BRIEF HISTORY (CONT.)

- Babylonian Clay tablets, 2300 B.C.



Babylon Map of the world. British Museum. (Shadsluiter, wikimedia.org)

- The Peutinger Table – worldwide road network, Roman Period.

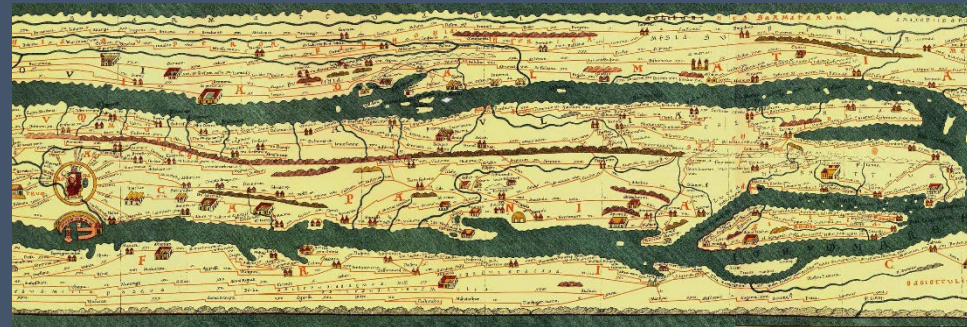


Image: Partial section of the Tabula

A BRIEF HISTORY (CONT.)

- Modern cartographic ideas date to the Greeks, to 4th century.
- In 1744, Cesar Francois Cassini, completed a baseline project using triangulation, led to Surveying of France.
- In 1801, Ordnance Survey of Great Britain published a national survey.
- Thematic and Social (human phenomena) Cartography – nineteenth and twentieth centuries
- Academic discipline in twentieth century

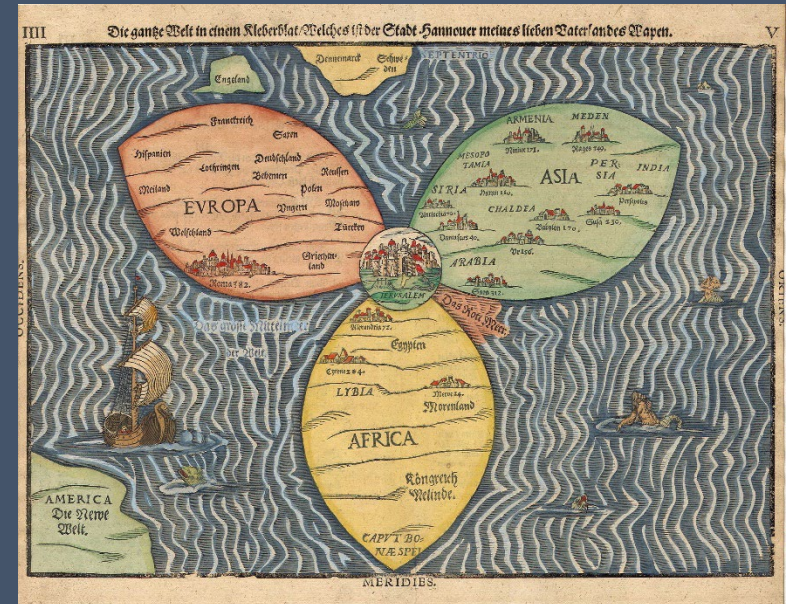
A BRIEF HISTORY (CONT.)

- Orbis Terrarum (T-in-O) Maps/Isidorian Map – Medieval Period.



Etymologiae, by Isidore of Seville, Wikimedia.org

- Bunting Clover Leaf Map, 1581



By Heinrich Bünting - [1], Public Domain, <https://commons.wikimedia.org/w/index.php?curid=698773>

A BRIEF HISTORY (CONT.)

- Navigation Maps



America newly delineated / by Jodocus Hondius; engraved by H. Picard. A 17th-century map of the Americas. Wikimedia.org



Edmond Halley's New and Correct Chart Shewing the Variations of the Compass (1701), the first chart to show lines of equal magnetic variation. Wikimedia.org

A BRIEF HISTORY (CONT.)

- Frere de Montizon's Population Map of France, 1830

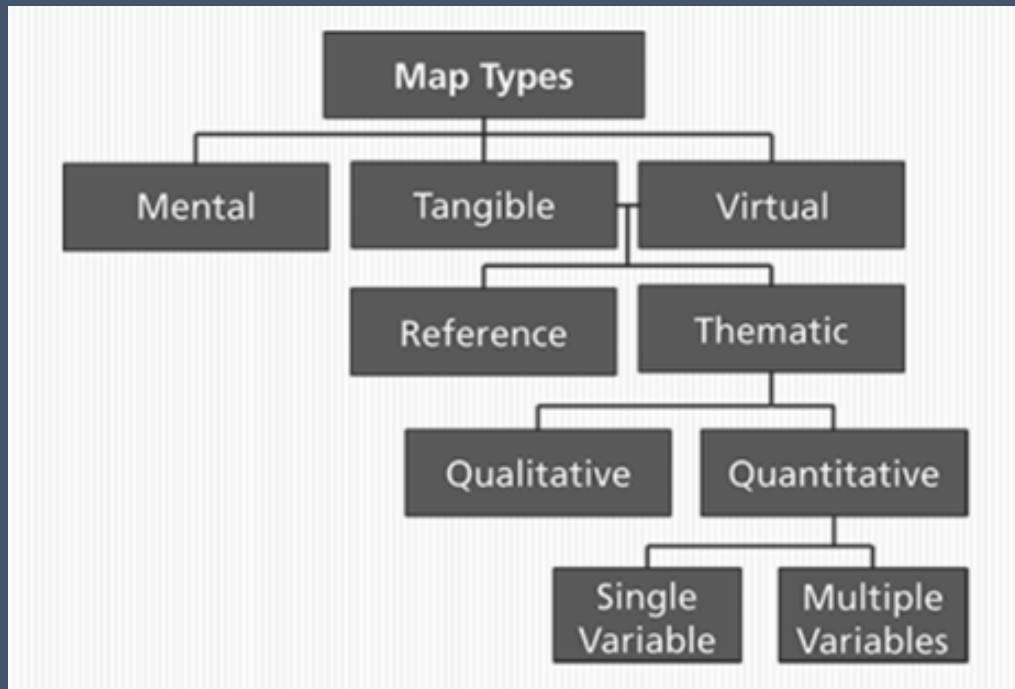


- Dr. John Snow's Cholera Map, 1854

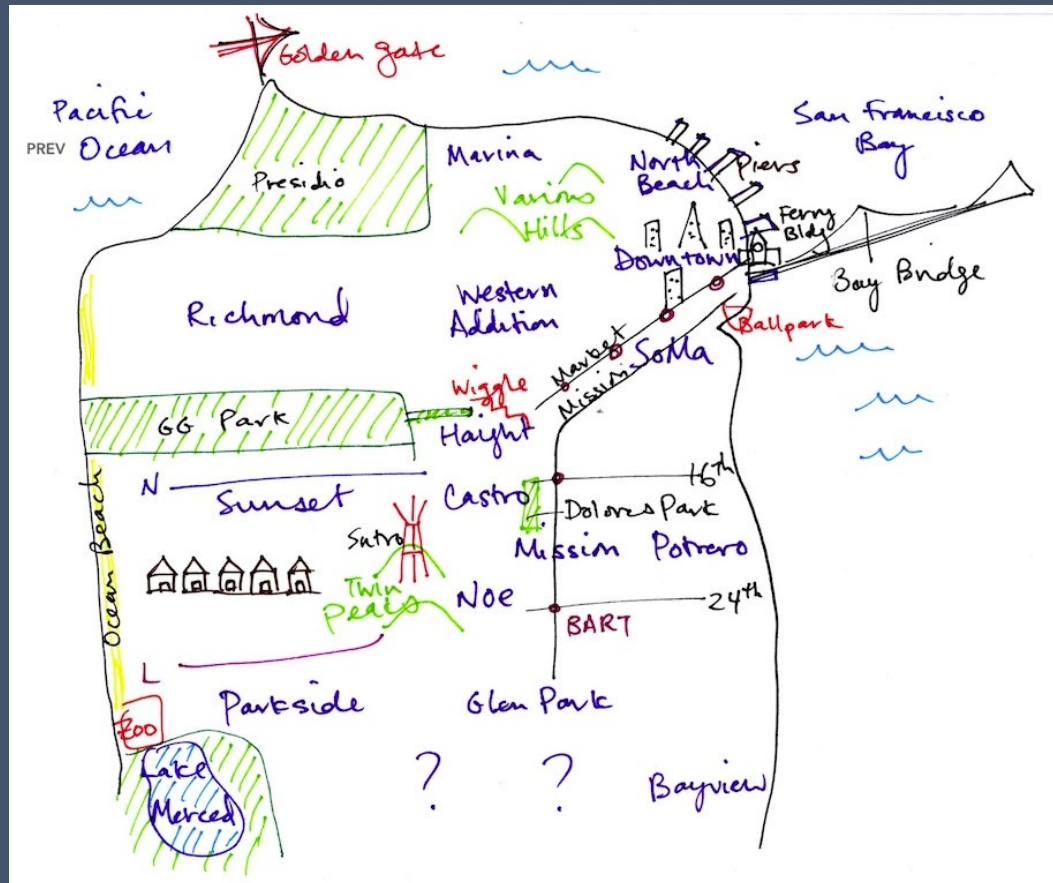


Original map by John Snow showing the clusters of cholera cases in the London epidemic of 1854, drawn and lithographed by Charles Cheffins.

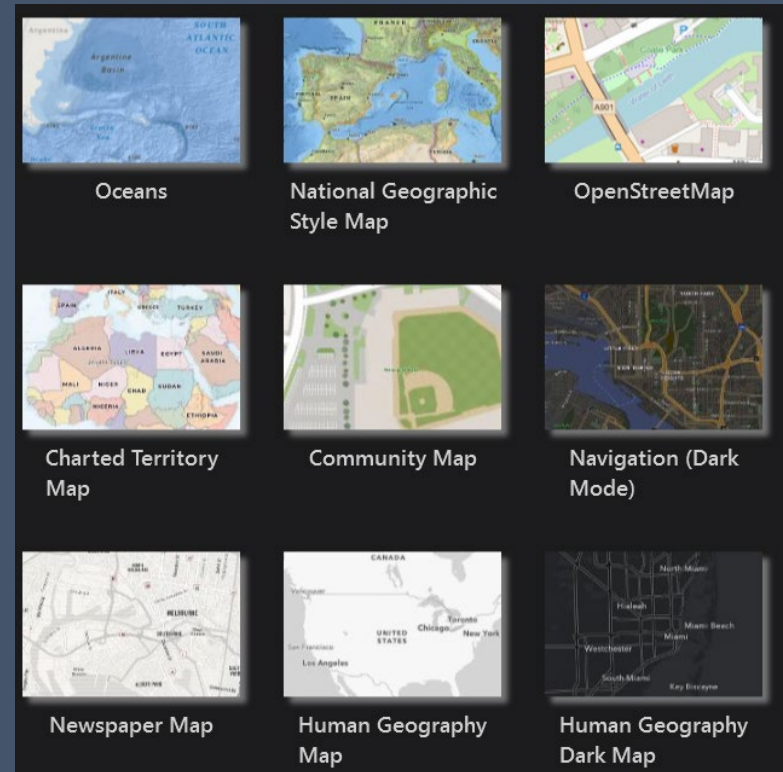
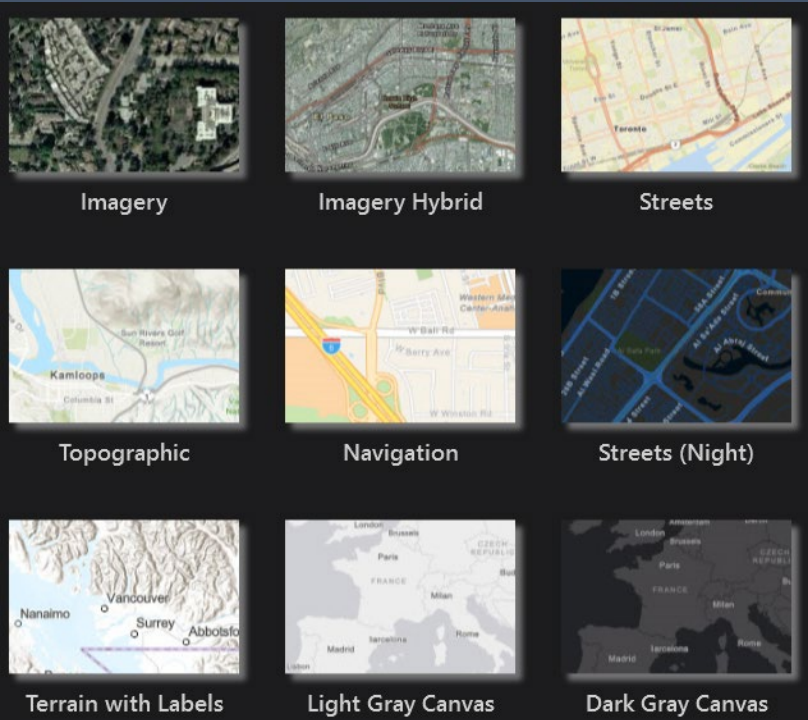
MAP TAXONOMY



MENTAL MAPS



REFERENCE MAPS

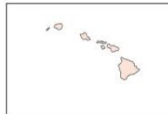
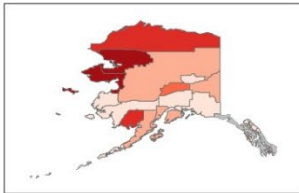
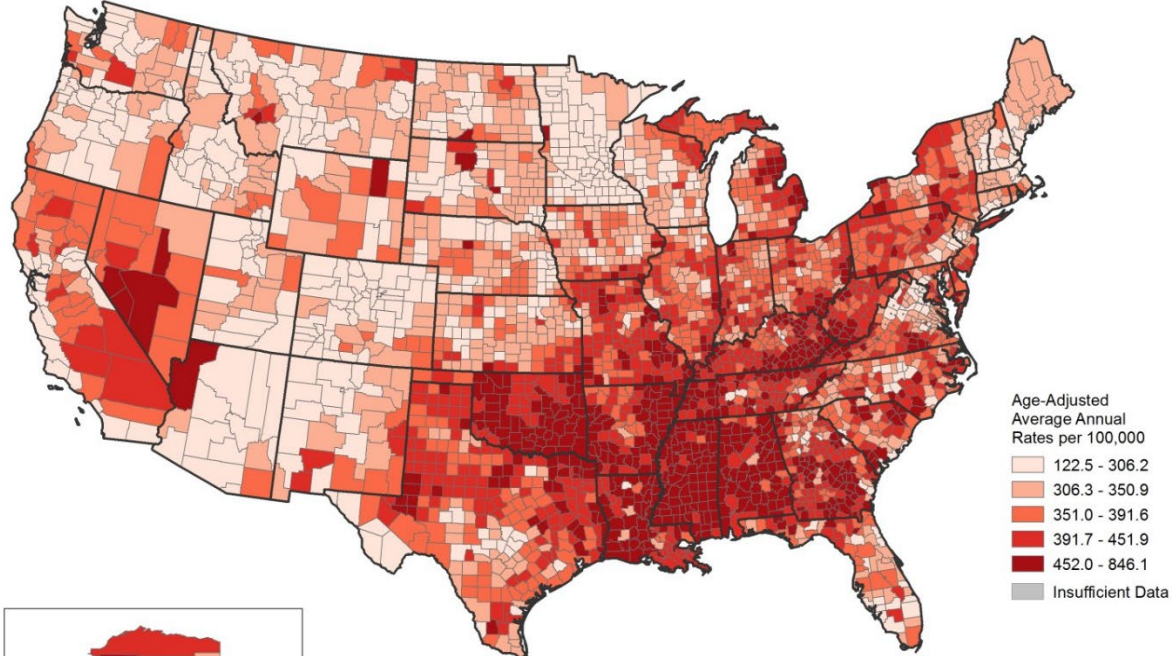


TYPES OF THEMATIC MAPS

- Choropleth
- Dot Density
- Proportional Symbol
- Flow
- Isarithmic
- Cartogram

CHOROPLETH MAP

**Heart Disease Death Rates, 2008-2010
Adults, Ages 35+, by County**

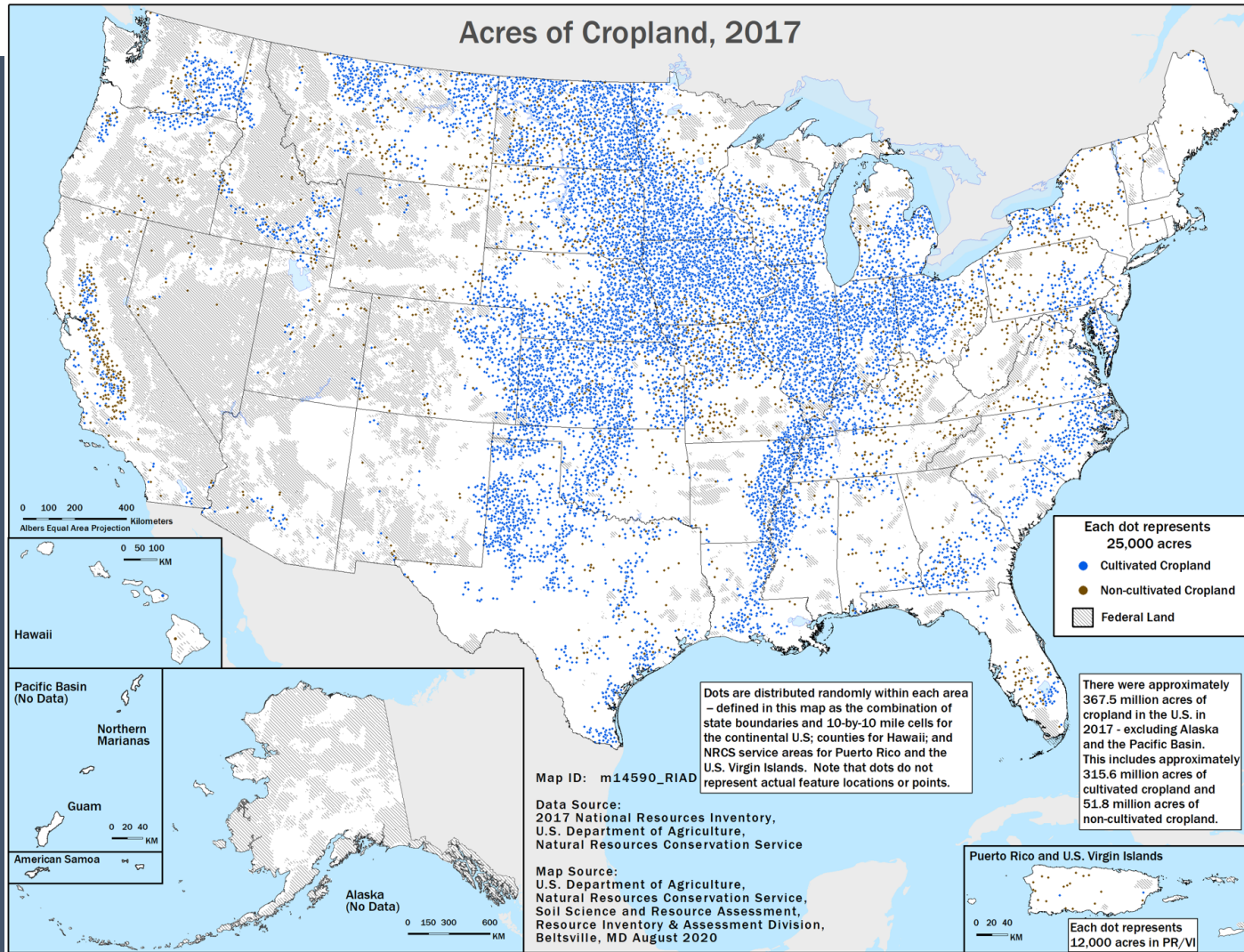


Rates are spatially smoothed to enhance the stability of rates in counties with small populations.

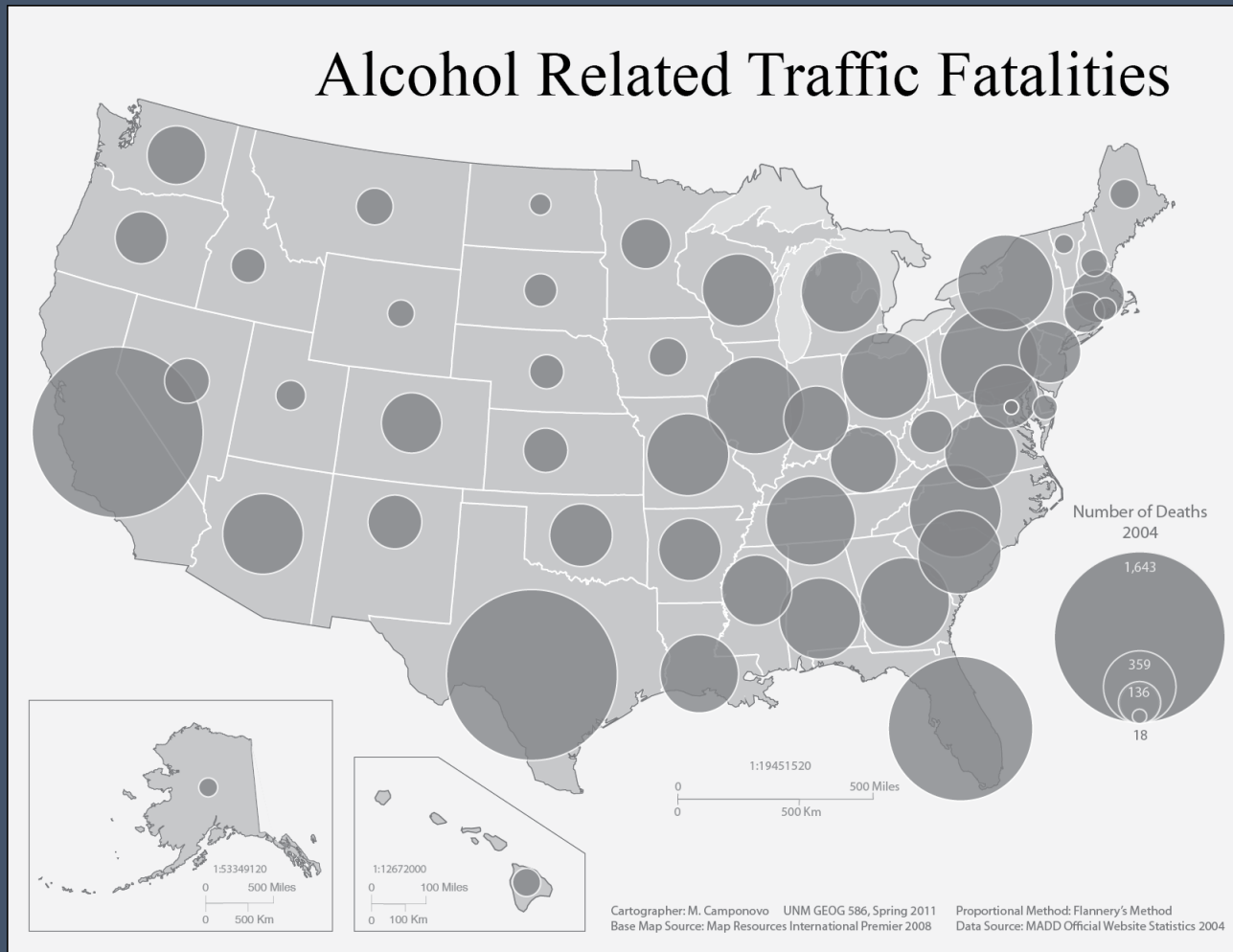
Data Source:
National Vital Statistics System
National Center for Health Statistics



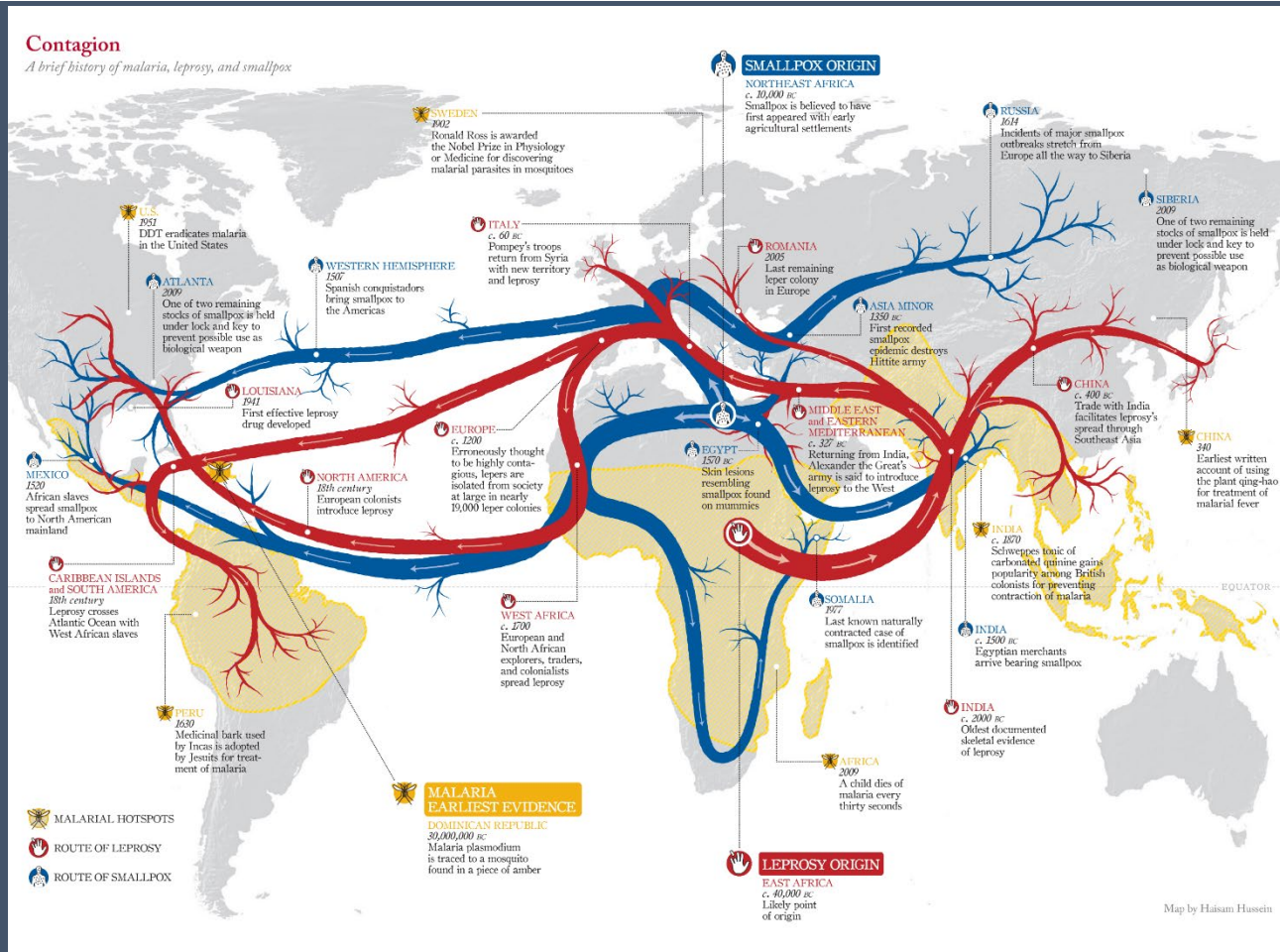
DOT DENSITY MAP



PROPORTIONAL SYMBOL MAP



FLOW MAP

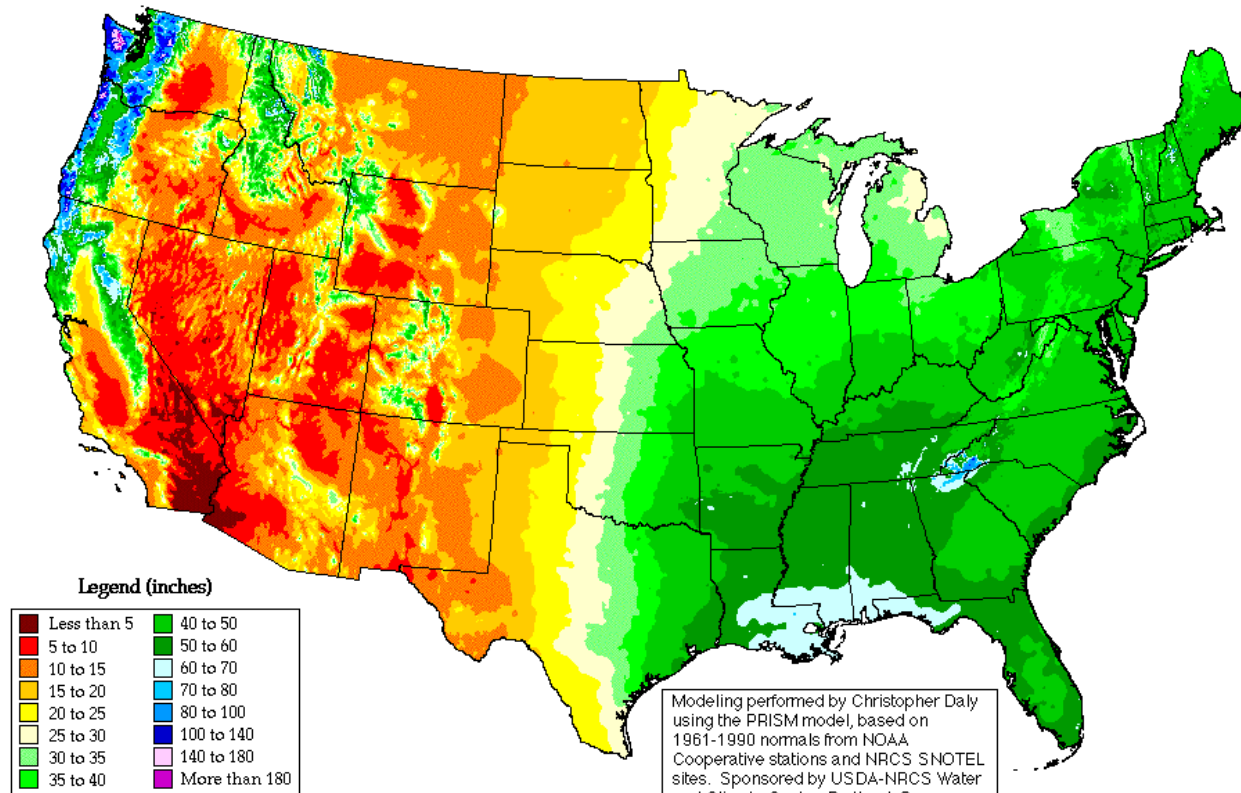


Credit: Spread of Disease by Haisam Hussein shows the origins and pathways of some of the most historically common and deadly of the world's diseases, especially those with a global reach. <http://www.laphamsquarterly.org/medicine/maps/contagion>

ISARITHMIC MAP

Annual Average Precipitation

United States of America

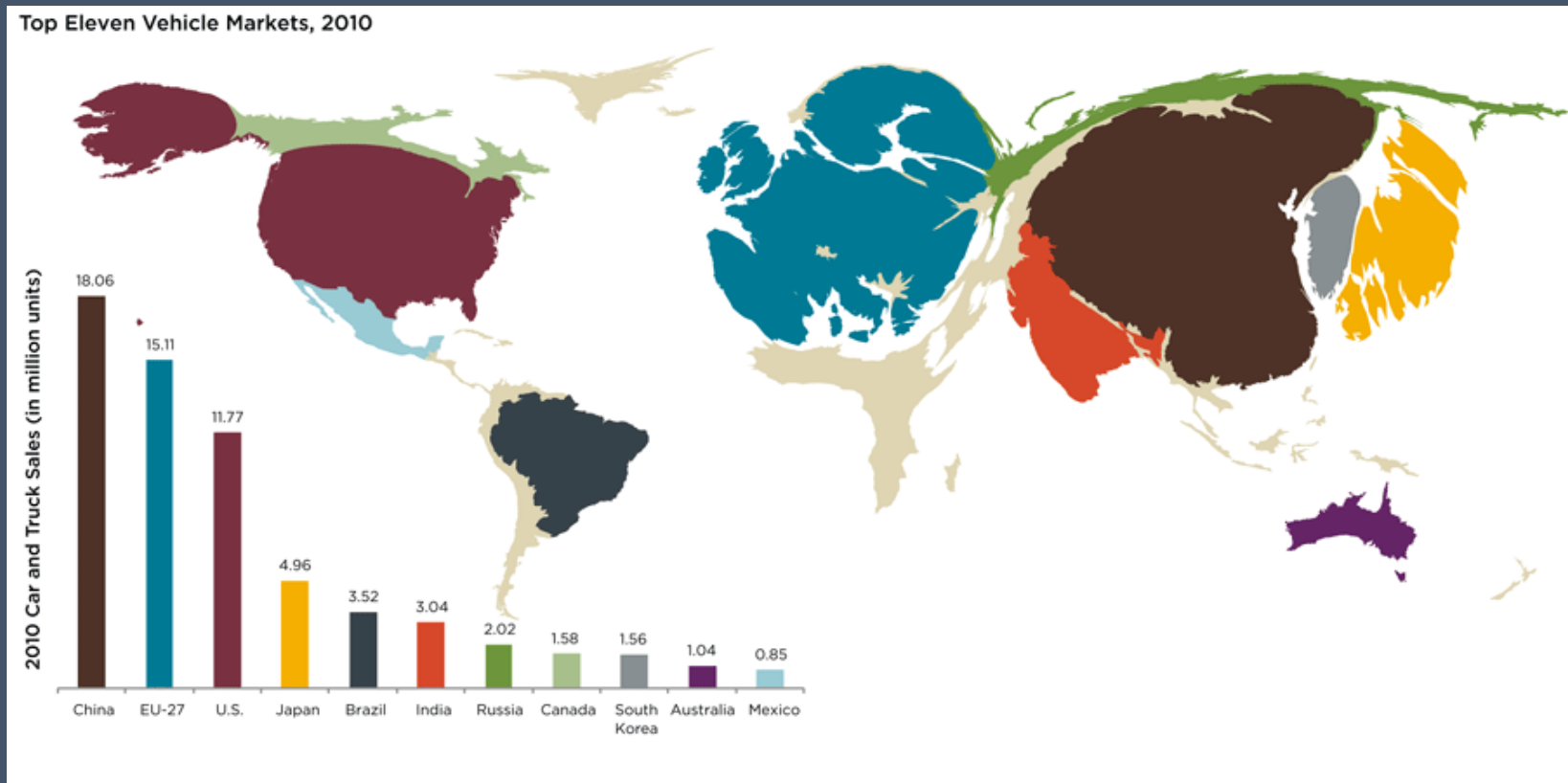


Period: 1961-1990

Modeling performed by Christopher Daly using the PRISM model, based on 1961-1990 normals from NOAA Cooperative stations and NRCS SNOTEL sites. Sponsored by USDA-NRCS Water and Climate Center, Portland, Oregon.

Oregon Climate Service
George Taylor, State Climatologist
(541) 737-5705

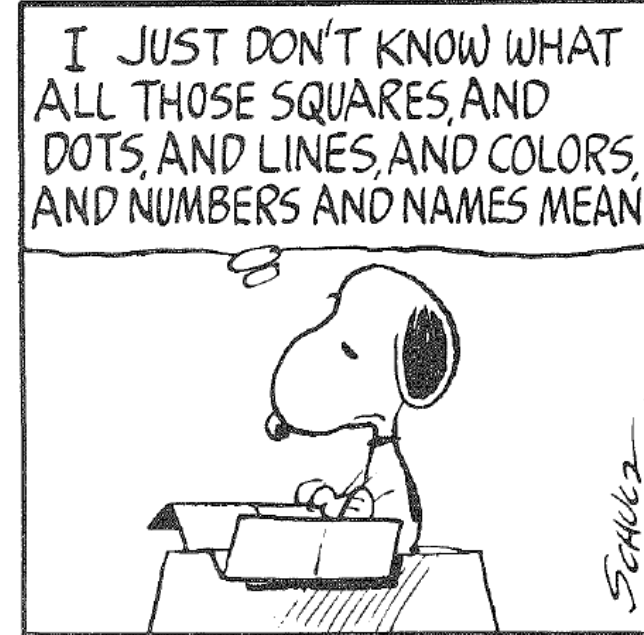
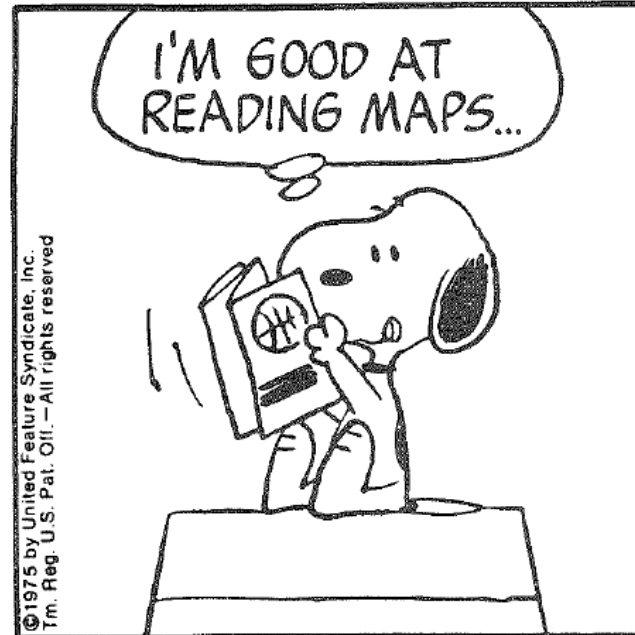
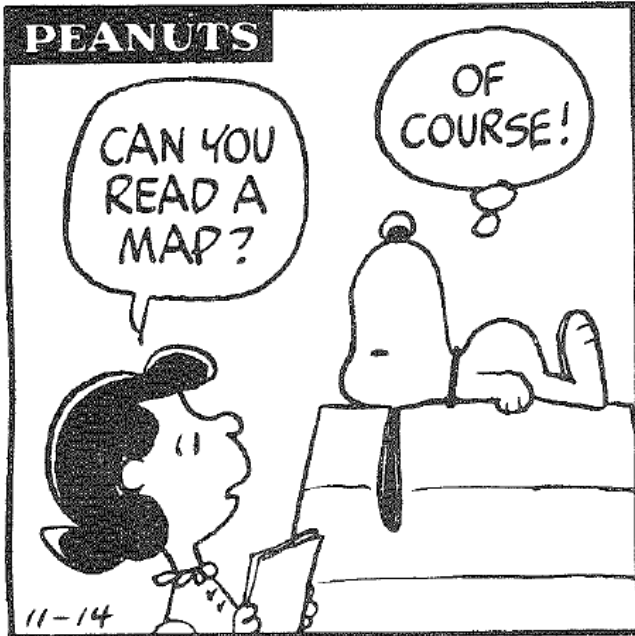
CARTOGRAM



Credit: Chris Malins, <http://www.theicct.org/blogs/staff/cartogram-top-vehicle-markets-2010>

MAP DESIGN

A map must be readable, understandable, and accurate

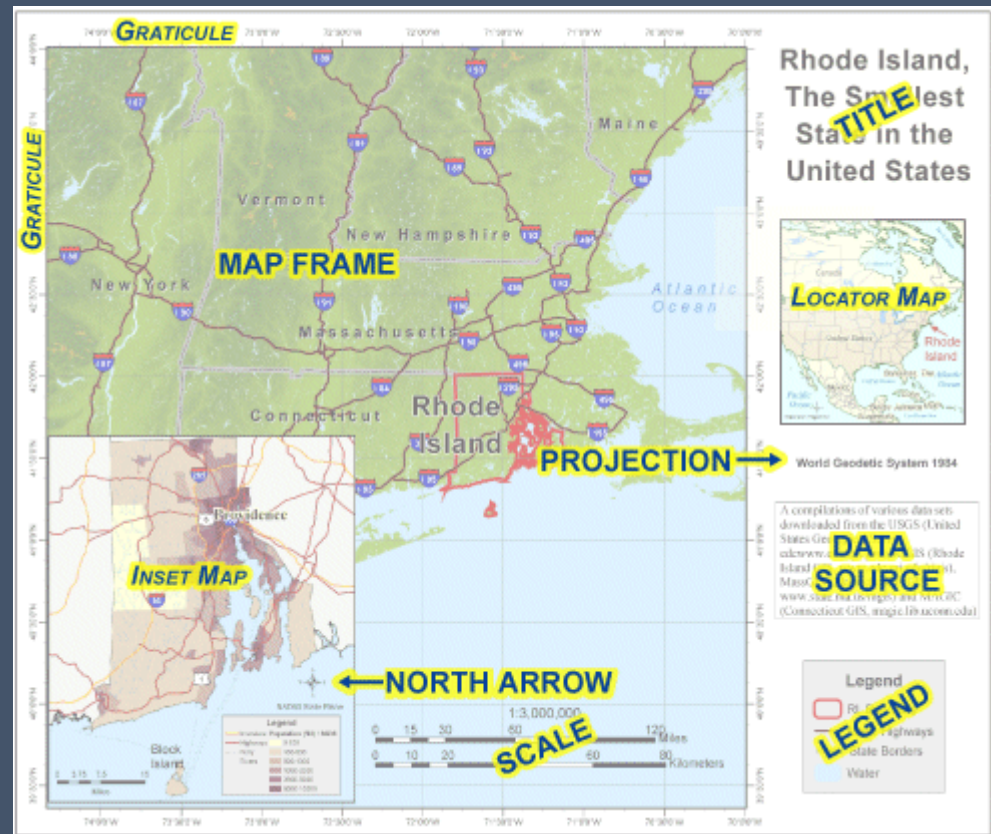


PROCESS

- Define purpose and meaning
- Choose scale
- Determine map format, printing limitations, and economics of re/production
- Abstract and Generalize
- Design Layout

MAP ELEMENTS

- Neatline
- Map Body
- Insets
- Title
- Legend
- Ancillary Text
- Ancillary Object
- Scale bar
- Directional Indicator
- Graticule
- Metadata



ESRI Resource Center. How maps convey geographic information













TALDOGS

- T – Title
- A – Author
- L – Legend
- D – Date
- O – Orientation*
- G – Grid*
- S – Scale

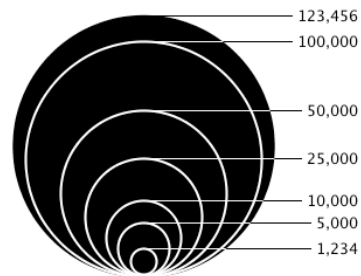
Source: South Carolina Geographic Alliance

LEGEND

LEGEND

	township		lot
	section		right of way (ROW)
	quarter quarter		drainage ditch
	subdivision		corporate limits
	block		road
	parcel		railroad

Population



Map Legend

Transportation

	Limited Access Hwy
	Multi-lane Divided Road
	Private Road
	Residential Street
	On-ramp
	Railroad Track
	Airport
	Interstate Route
	U.S. Route
	State/Provincial Route
	County or Other Route

Political Features

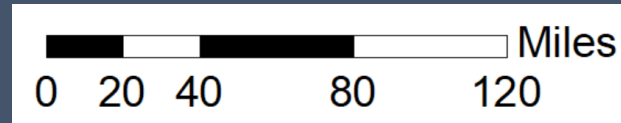
	State/Provincial/International Boundary
	Capital City
	Larger City
	Smaller City/Town/Neighborhood
	Urban Area
	Rural Area
	Body of Water
	Recreational Area/Park

Places of Interest

	Golf Course
	Sporting Venue
	Shopping Center
	Hospital
	Government/Military/Education Facility

SCALE

- Graphic



- Verbal

- Example: One inch on a map equals twenty feet on the ground

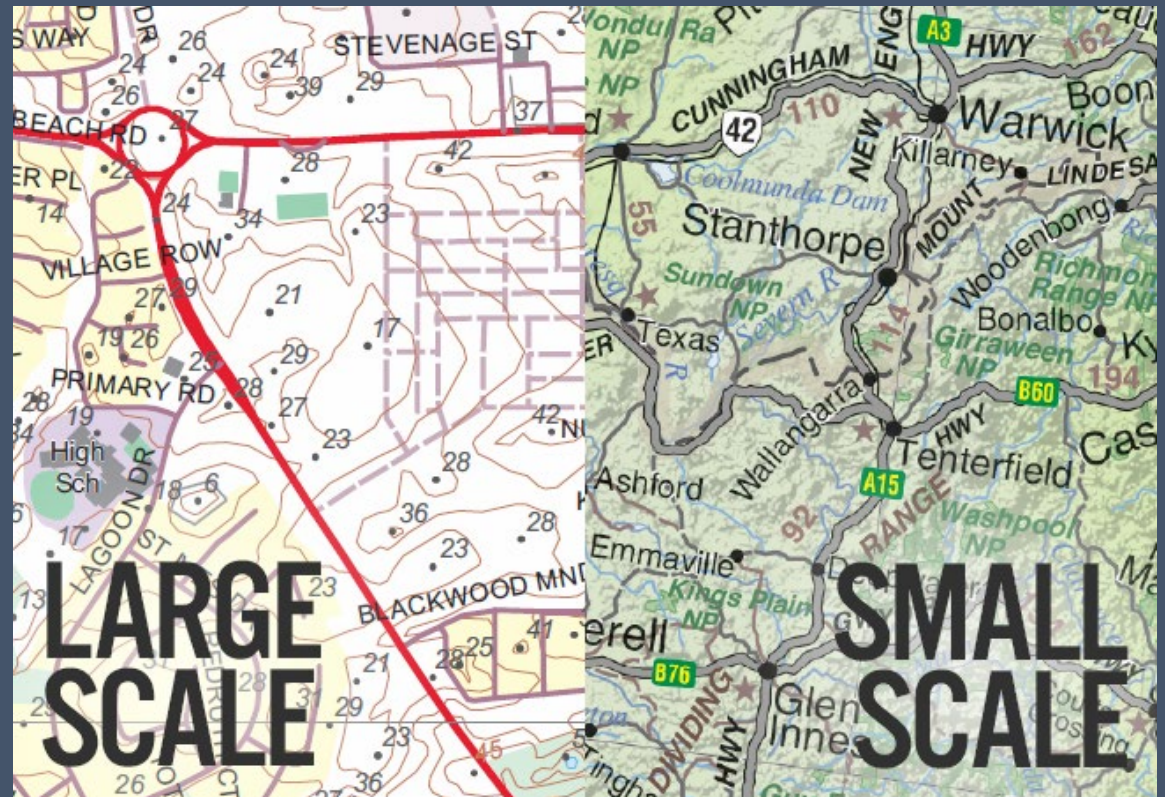
- Ratio or Representative Fraction

- Example: 1:24,000 or $1/24,000$

- Remember: scale bar on a map should be large enough to be found and small enough to be subtle!

LARGE SCALE VS. SMALL SCALE

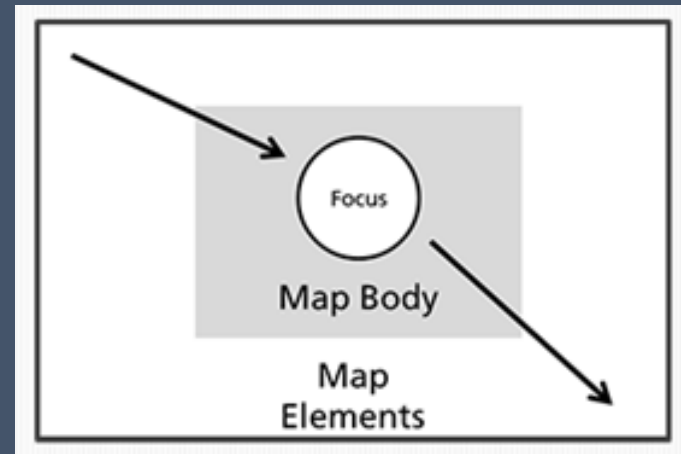
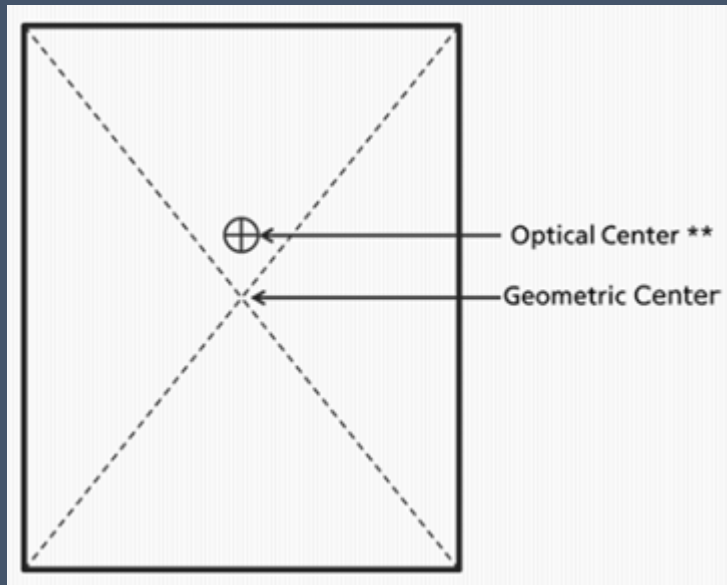
- Small Scale Maps
 - Less detailed
 - Covers large areas
- Large Scale Maps
 - More detailed
 - Cover small areas



PRINCIPLES OF MAP DESIGN

- Balance
 - Weight, Direction, and White Balance
- Figure Ground Orientation
- Visual Contrast
- Legibility
- Hierarchical Organization

BALANCE



BALANCE

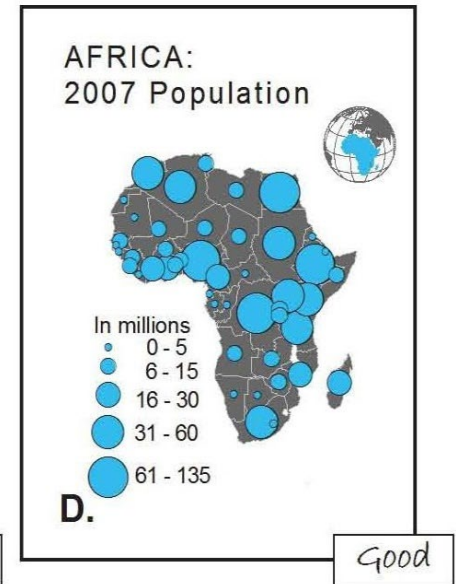
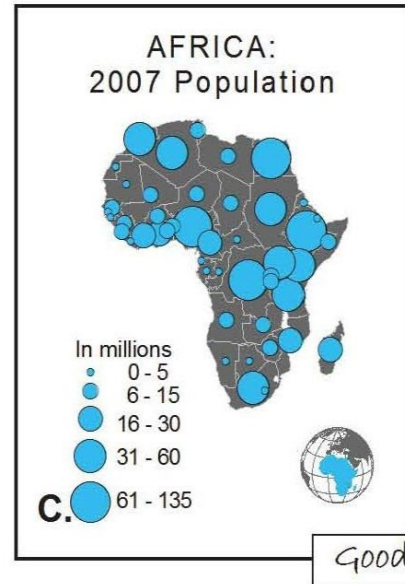
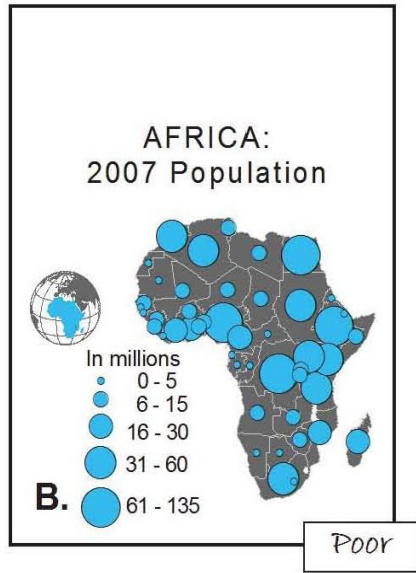
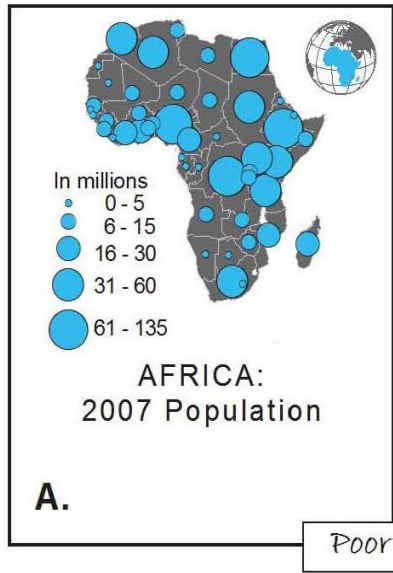
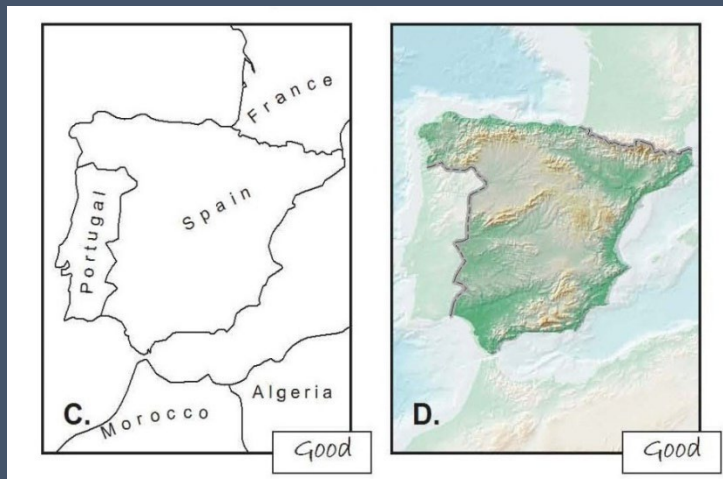
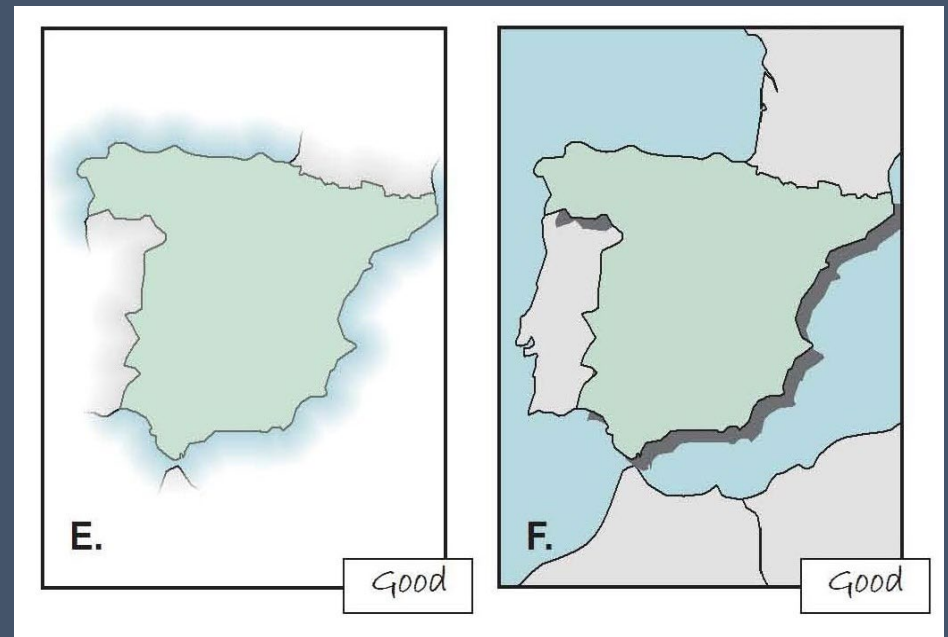
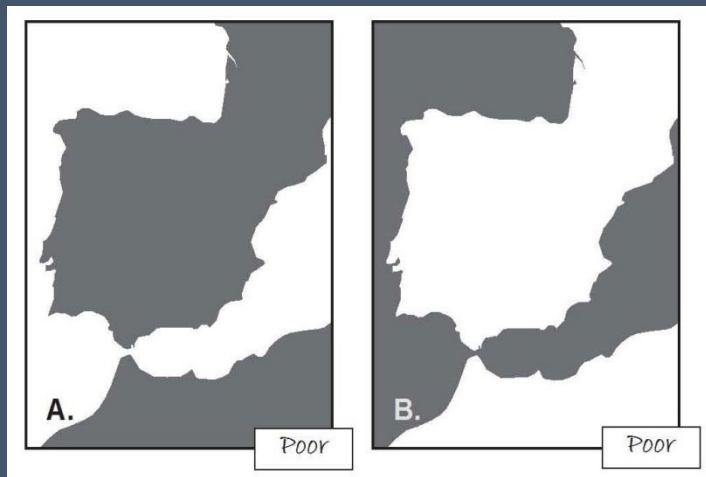


FIGURE GROUND ORIENTATION



Source: Aileen Buckley, ESRI, ArcUser Winter 2010

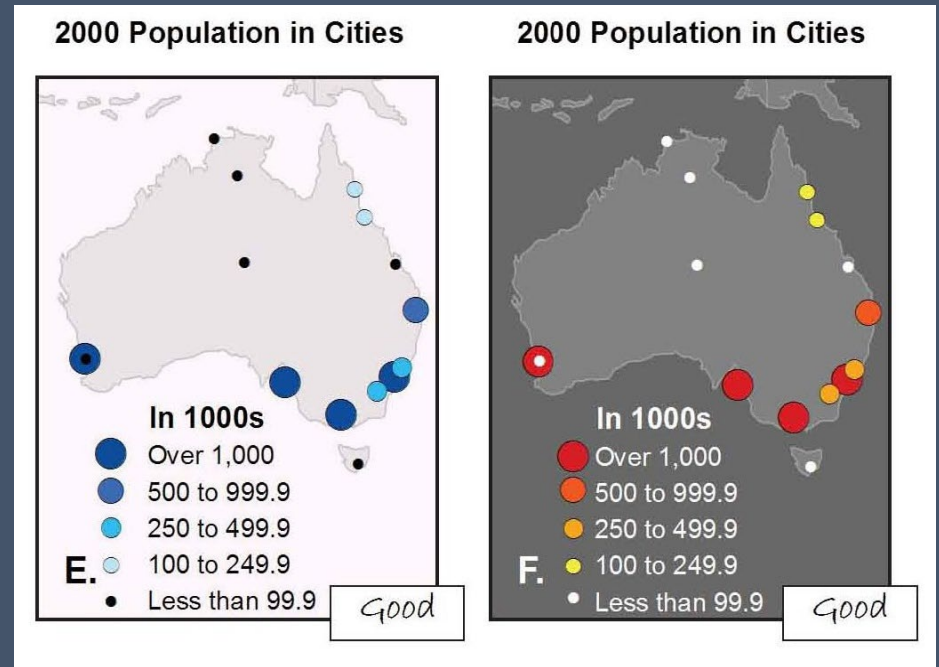
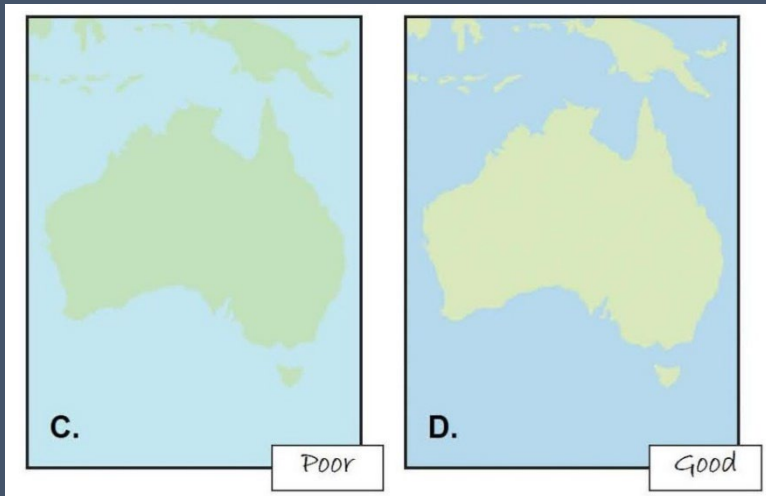
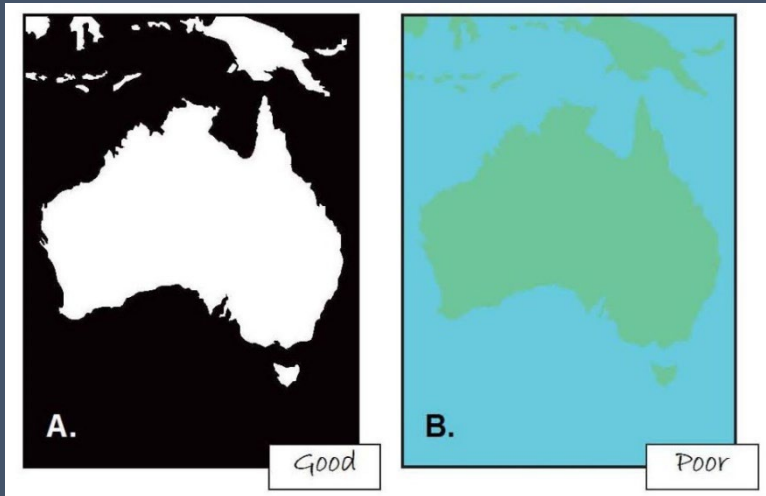
VISUAL CONTRAST

- Line, Texture, Value, Detail, and Color

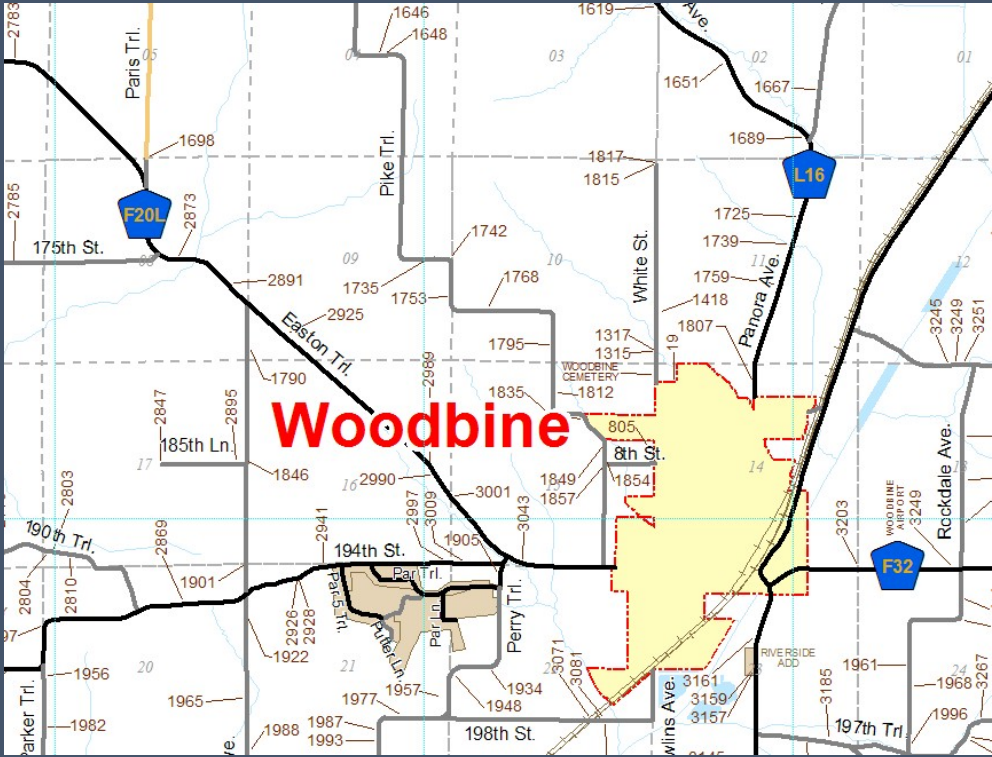


Image Credit: Richard Smith, Del Mar College ©National Information Security, Geospatial Technologies Consortium (NISGTC). CC by 3.0

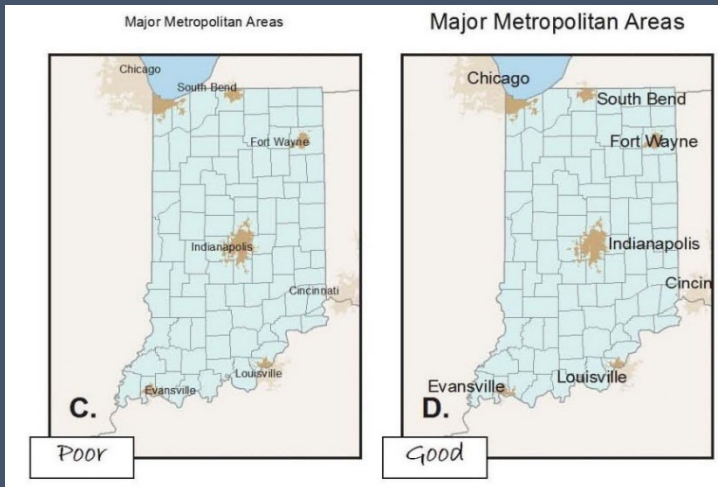
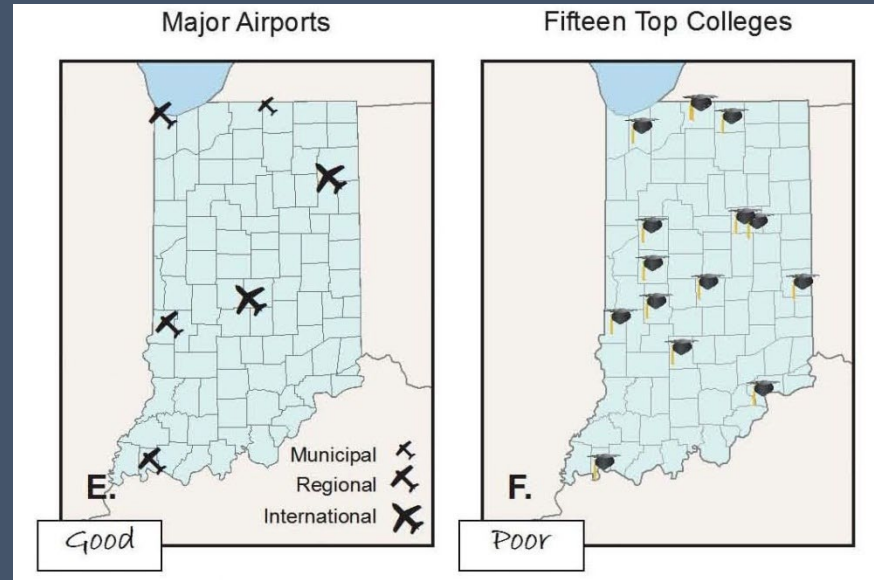
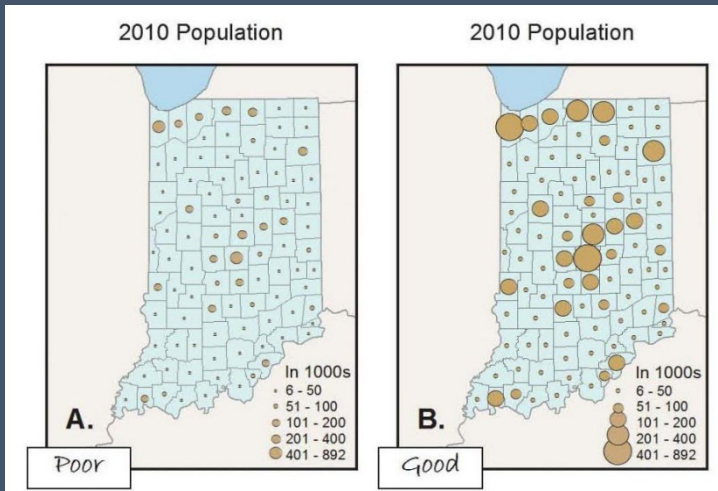
VISUAL CONTRAST



TEXT CONTRAST



LEGIBILITY



VISUAL HIERARCHY

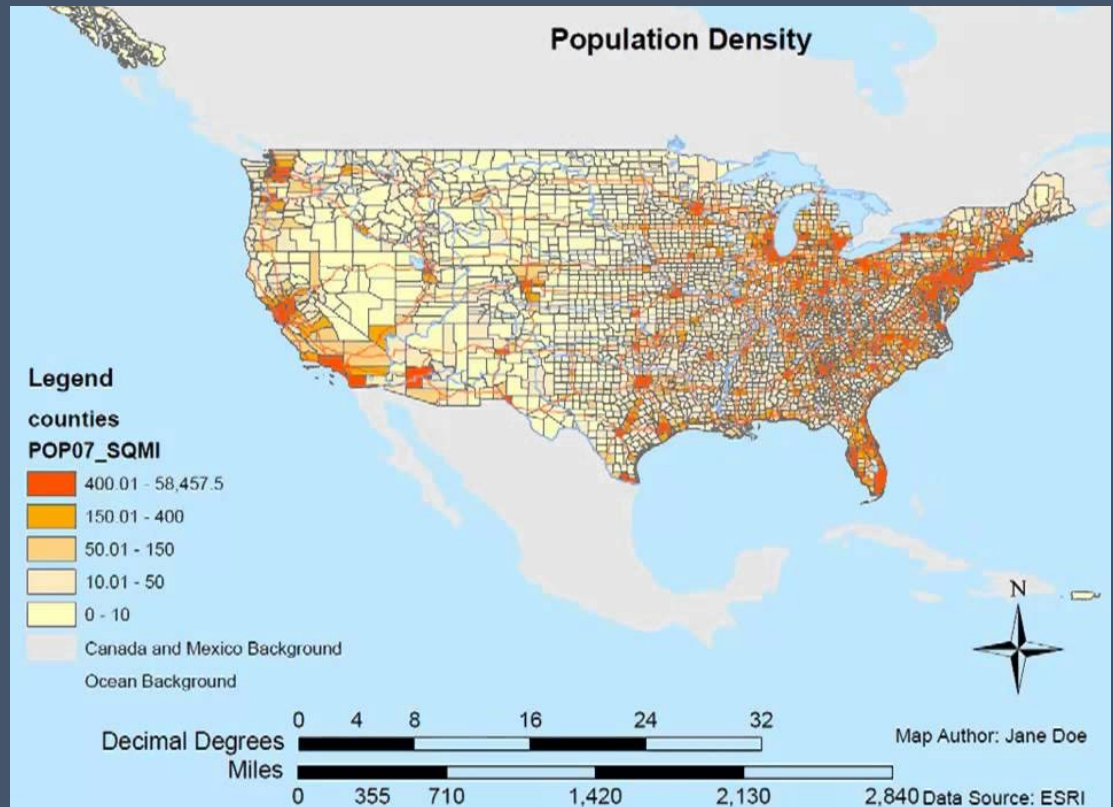


Visual Level	Object
1	Thematic Symbols
1	Title, Legend, Symbols, and Labels
2	Base map – Land areas (political/physical)
2	Base map – Water
3	Scale, Graticule, Inset map, North Arrow
4	Metadata
5	Neatline

Cartography: Thematic map design/Borden D. Dent, Jeffery S. Torguson, Thomas W. Hodler. – 6 Ed.

EXERCISE

- Evaluate the map below based on the Map Design Principals learned in this class.
- What type of thematic map is this?



<https://www.youtube.com/watch?v=wypuraskRAE>

Population Density

Legend

counties

POP07_SQMI

400.01 - 58,457.5

150.01 - 400

50.01 - 150

10.01 - 50

0 - 10

Canada and Mexico Background

Ocean Background

Decimal Degrees

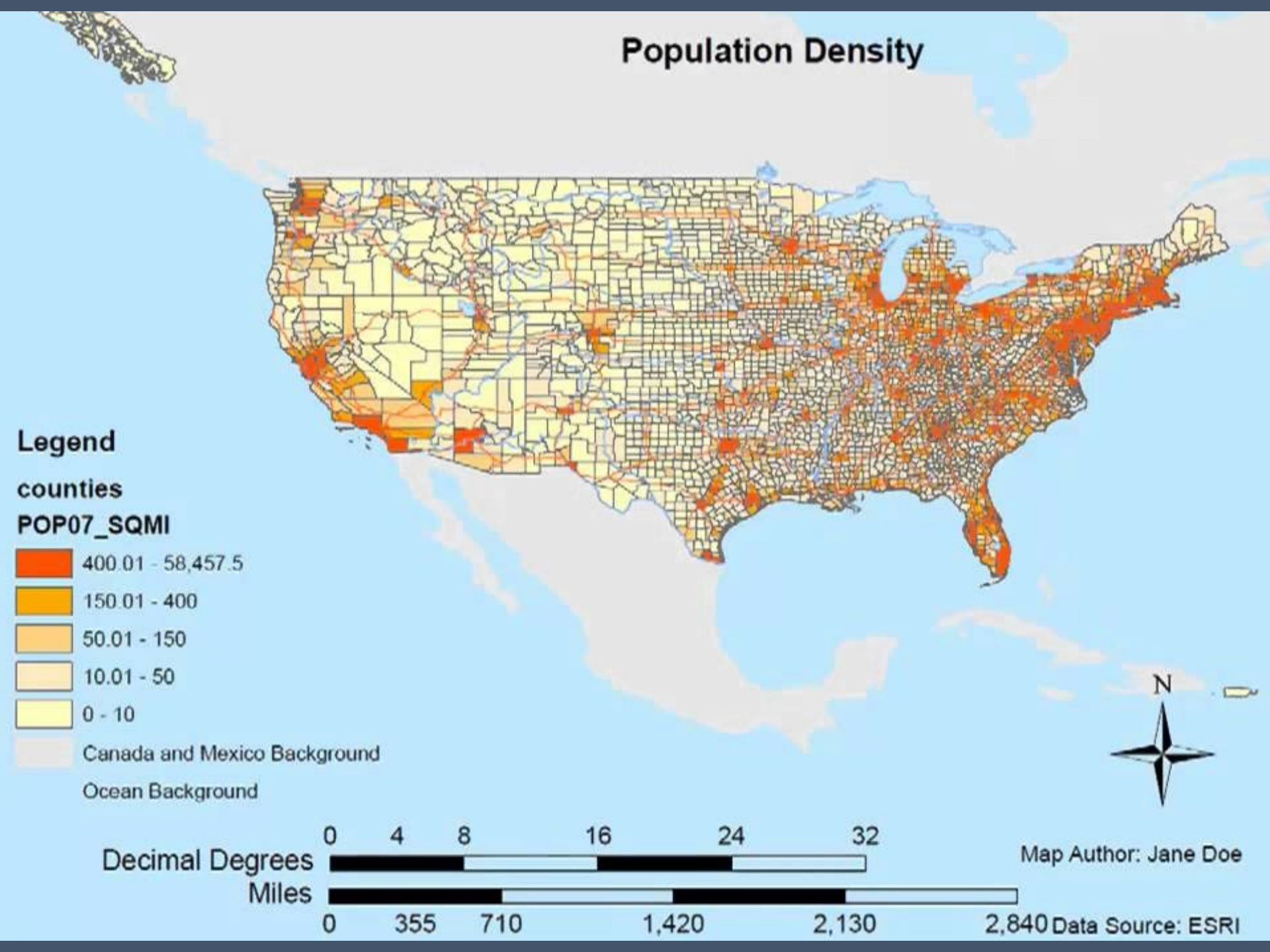
0 4 8 16 24 32

Miles

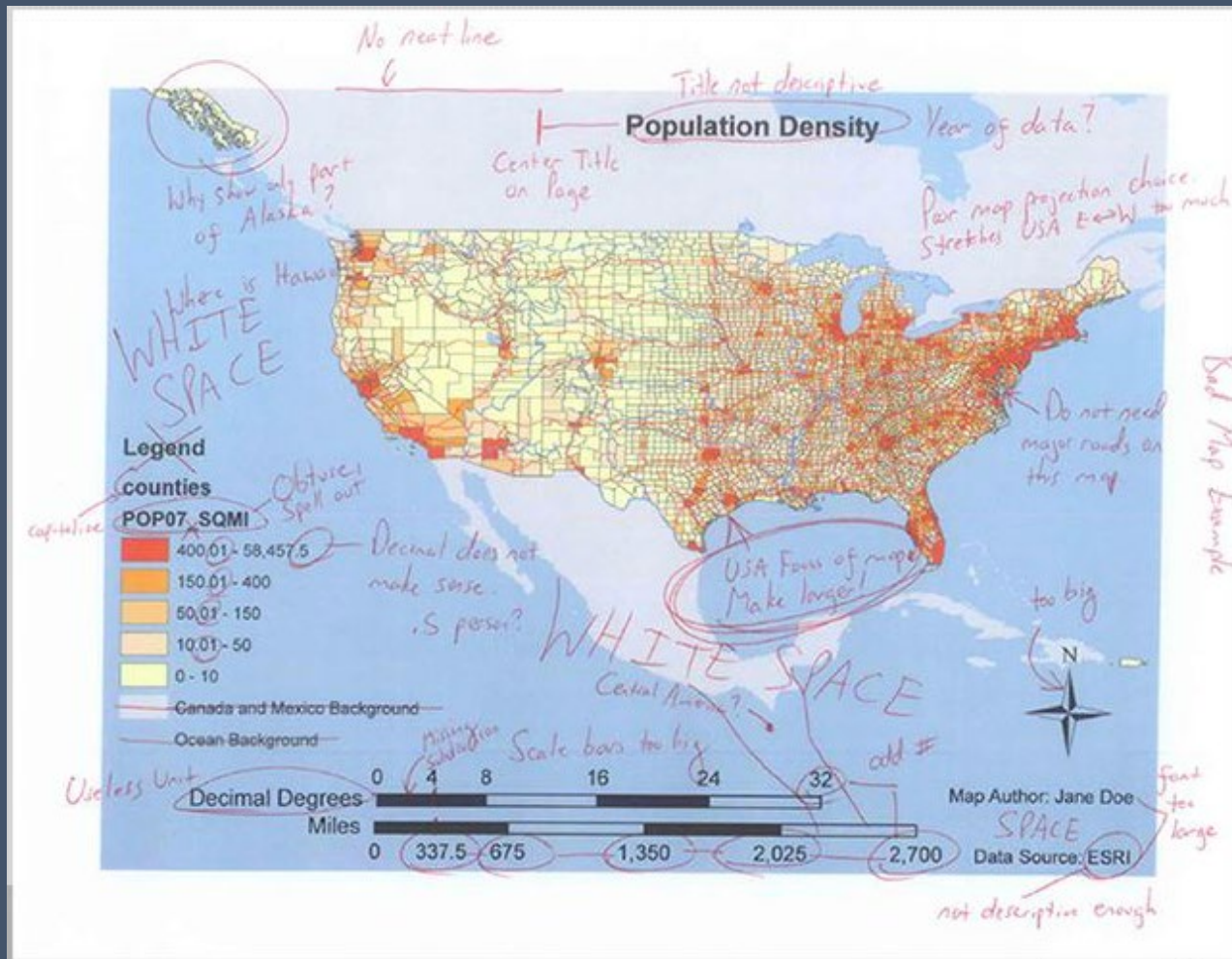
0 355 710 1,420 2,130 2,840

Map Author: Jane Doe

Data Source: ESRI



MAP CRITIQUE



REDESIGNED MAP

