

ETHICS, STANDARDS & METADATA

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ETHICS IN CARTOGRAPHY

- Always have a straightforward agenda, and have a defining purpose or goal for each map.
- Always strive to know your audience.
- Do not intentionally lie with data.
- Always show all relevant data whenever possible.
- Data should not be discarded simply because they are contrary to the position held by the cartographer.
- At a given scale, strive for an accurate portrayal of the data.

Contd..

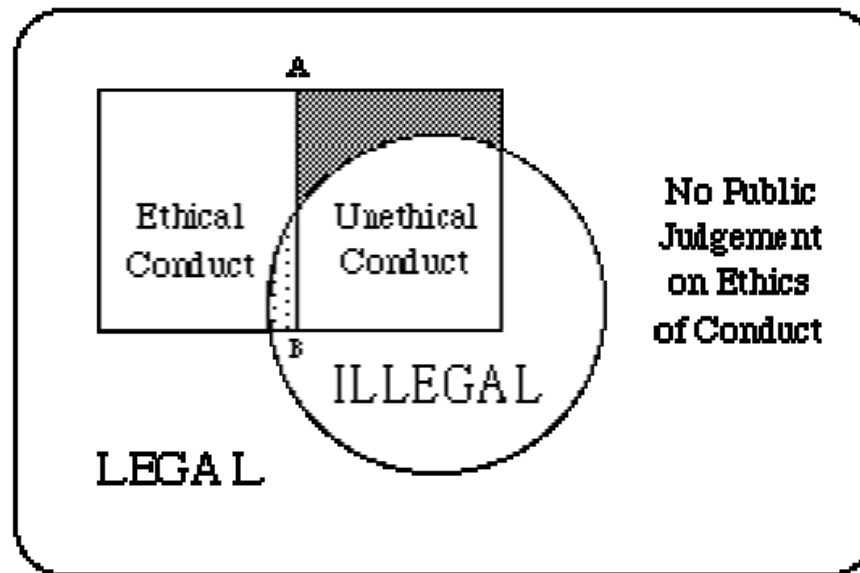
DON'T STEAL DATA...



- The cartographer should avoid plagiarizing: report all data sources.
- Symbolization should not be selected to bias the interpretation of the map.
- The mapped result should be able to be repeated by other cartographers.
- Attention should be given to different cultural values and principles.

ETHICS IN GIS

- Governments, militaries, commercial enterprises, and others have relied on maps and aerial surveillance technologies for centuries.
- Computerized geographic information systems (GIS), digital remote sensing, and satellite navigation systems are relatively recent developments, and became widespread in the late 1980s and early 1990s.
- As these automated technologies matured, scholars and practitioners began to express concerns about the ethical implications of their use.

WHAT IS LEGAL MAY NOT BE ETHICAL



-  — Ethical but Illegal
-  — Unethical but Legal

CALIFORNIA SUPREME COURT SAYS GIS DATA ARE PUBLIC DATA; SIDES WITH PUBLIC & SIERRA CLUB

Monday, July 08, 2013

Orange County's attempt to get more money from people trying to access its database of information about land parcels is contrary to the law, the California Supreme Court says. ...

- "We hold that although GIS mapping software falls within the ambit of ... statutory exclusion, a GIS-formatted database like the OC Landbase does not. Accordingly, such databases are public records that, unless otherwise exempt, must be produced upon request at the actual cost of duplication," says the opinion.

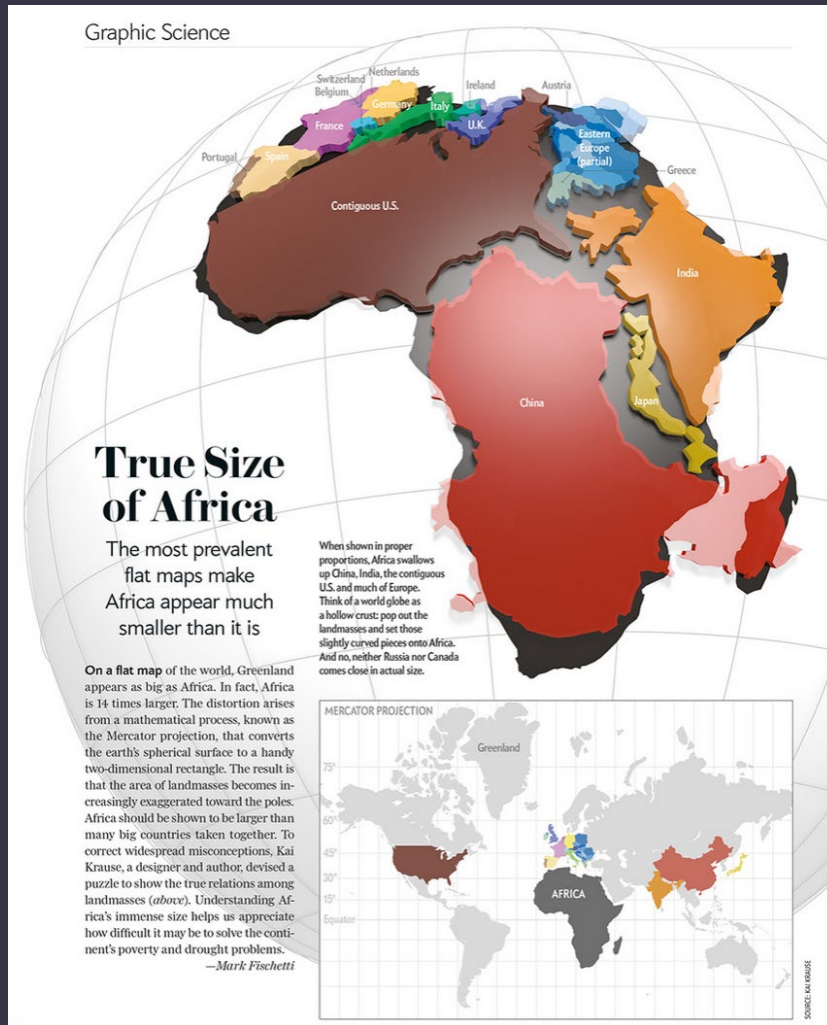
LYING WITH MAPS...

- A GIS can promote the good by providing accurate data quickly, a GIS can also cause harm through misrepresentations and biases. Curry (1995) defines a “**good map**” as a map **without misrepresentations or biases**.
- By contrast, Friedman and Nissenbaum (1996) show that biases seem inherent in every information system. They classify information system biases into three types: **preexisting, technical, and emergent**.

LYING WITH MAPS...

- **Preexisting bias** is a personal or societal bias that occurs before data are added to a computer system. A preexisting bias could be intentional or unintentional.
- **Technical bias** results from limitations on hardware, software, or algorithms.
- **Emergent bias** arises after an information system is in use.

LYING WITH MAPS...



Map Projections

<http://cartonerd.blogspot.com/2015/06/true-size-of-africa-now-in-three-dec.html>

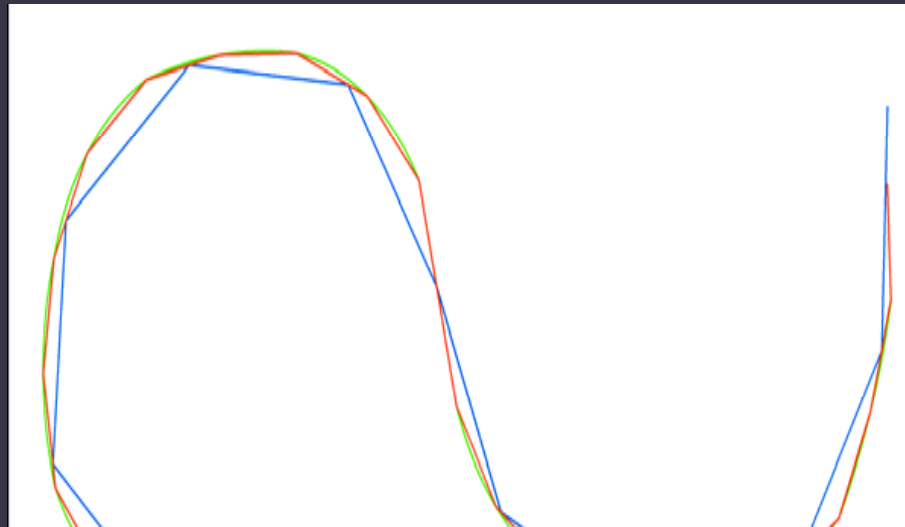
TYPES OF MAP ERRORS

- Measurement Errors – error in measurement
- Systematic Errors – features are displaced
- Random Errors – difficult to find
- Errors of Omission – features that should be on the map but is not
- Errors of Commission – features are on the map that should not be

MAP ERRORS

- Human mistakes and technical limitations are the two greatest causes of map errors.

Example: A curving road is digitized to approximate the original curve. One has 10 line segments and the other has 20 line segments at 1:36000 scale.



THEMATIC MAP ERRORS

- Source Errors
 - Source Map Error: Scale, Detail, Accuracy, Projection, Currency
 - Data Entry Error: Inaccurate data creation/download, Digitizing, Incorrect data entry, incomplete data
- Processing Errors
 - Computational errors
 - Data classification
- Design Errors
 - Thematic map type, scale, projection, generalization, symbolization, use of color

A CODE OF CONDUCT

- A code of conduct was derived from observation and analysis of current practice contexts and moral conditions and lessons learned.
- Compliance with a GIS Code of Ethics is included among the requirements for “GIS Professional” (GISP) certification by the GIS Certification Institute.
- As GIS&T continues to evolve emerging technologies introduce increasingly worrisome ethical challenges, including location-based services.
- There is an urgent need for practical ethics education that bridges the gap between academic and professional practice in GIS.

WHY A CODE OF ETHICS?

- We are expected to make decisions rapidly
- GIS used to make important decisions.....:
 - Forecasting environmental risk
 - Disaster management
- Decisions made a local level have global impacts and visa versa
- Data creep: data collected for one purpose being used for another
- Data privacy and what is in the public domain?

A CODE OF ETHICS...

- Deters unethical behavior.
- Provides a support system for GIS Professionals.
- Serves as an enabling document.
- Serves as a basis for deliberating disputes.
- Enhances a profession's reputation.
- Serves as a source for public evaluation.
- Aids with professional socialization.

SEVEN STEP GUIDE TO ETHICAL DECISION MAKING

- **Step 1. State problem**

For example, “there's something about this decision that makes me uncomfortable” or “do I have a conflict of interest?”

- **Step 2. Check facts**

Many problems disappear upon closer examination of situation, while others change radically.

- **Step 3: Identify relevant factors**

For example, persons involved, laws, professional code, other practical constraints.

SEVEN STEP GUIDE TO ETHICAL DECISION MAKING

- **Step 4: Develop list of options**

Be imaginative, try to avoid “dilemma”; not a “yes” or “no” list, but whom to go to, what to say.

- **Step 5: Test options**

Use such tests as the following:

- *Harm test*: does this option do less harm than alternatives?
- *Publicity test*: would I want my choice of this option published in the newspaper?
- *Defensibility test*: could I defend choice of option before Congressional committee or committee of peers?

SEVEN STEP GUIDE TO ETHICAL DECISION MAKING

- **Step 6: Make a choice based on steps 1-5**
- **Step 7: Review steps 1-6**
 - What could you do to make it less likely that you would have to make such a decision again?
 - Are there any precautions can you take as individual (announce your policy on question, change job, etc.)?
 - Is there any way to have more support next time?
 - Is there any way to change the organization (for example, suggest policy change at next departmental meeting)?

MAPPING SCIENCES CODE OF ETHICS

- URISA – Urban and Regional Information Systems Association (www.urisa.org/)
- ASPRS – American Society for Photogrammetry and Remote Sensing (www.asprs.org/)
- GISCI – GIS Certification Institute (www.gisci.org/)

GISCI CODE OF ETHICS

- Society
 - Recognize the impact of your work on society as a whole, subgroups including geographic or demographic minorities and future generations.
- Employers
 - Recognize that you've been hired to deliver needed products and services. The employer (or funder) expects quality work and professional conduct.
- Colleagues and the Profession
 - Recognize the value of being part of a community of other professionals. Together, we support each other and add to the stature of the field.
- Individuals at Large
 - Recognize the impact of his or her work on individual people and will strive to avoid harm to them.

STANDARDS

Cartographic and Data Standards

STANDARDS

Know them, Use them

- Industry
 - What are they?
 - How affect your work?
- Organization
 - Are they different than industry standards
- Personal
 - Something to think about.....
- Examples: FGDC, State Standards

FGDC MAP SYMBOLIZATION STANDARDS

Federal Geographic Data Committee
FGDC Digital Cartographic Standard for Geologic Map Symbolization

FGDC Document Number FGDC-STD-013-2006
Appendix A

28—TRANSPORTATION FEATURES

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
28.1	Highway (generic)		line weight .325 mm; line color 70% black	May be used on non-topographic maps to show highways and streets.
28.2	Road or street (generic)		line weight .25 mm; line color 50% black	
28.3	Primary highway, undivided (Class 1)		outlines: line weight .125 mm in 100% black fill: line weight .5 mm; line color 100% red	
28.4	Primary highway, divided by centerline (Class 1)		line weight .5 mm; centerline line weight .5 mm	
28.5	Primary highway, divided by median strip (Class 1)		line weight .5 mm; median strip line weight .5 mm; spacing may vary	
28.6	Secondary highway, undivided (Class 2)		fill: dash length 3.0 mm; space 3.0 mm	
28.7	Secondary highway, divided by centerline (Class 2)		line weight .5 mm; centerline line weight .5 mm	
28.8	Secondary highway, divided by median strip (Class 2)		line weight .5 mm; median strip line weight .5 mm; spacing may vary	

Federal Geographic Data Committee
FGDC Digital Cartographic Standard for Geologic Map Symbolization

FGDC Document Number FGDC-STD-013-2006
Appendix A

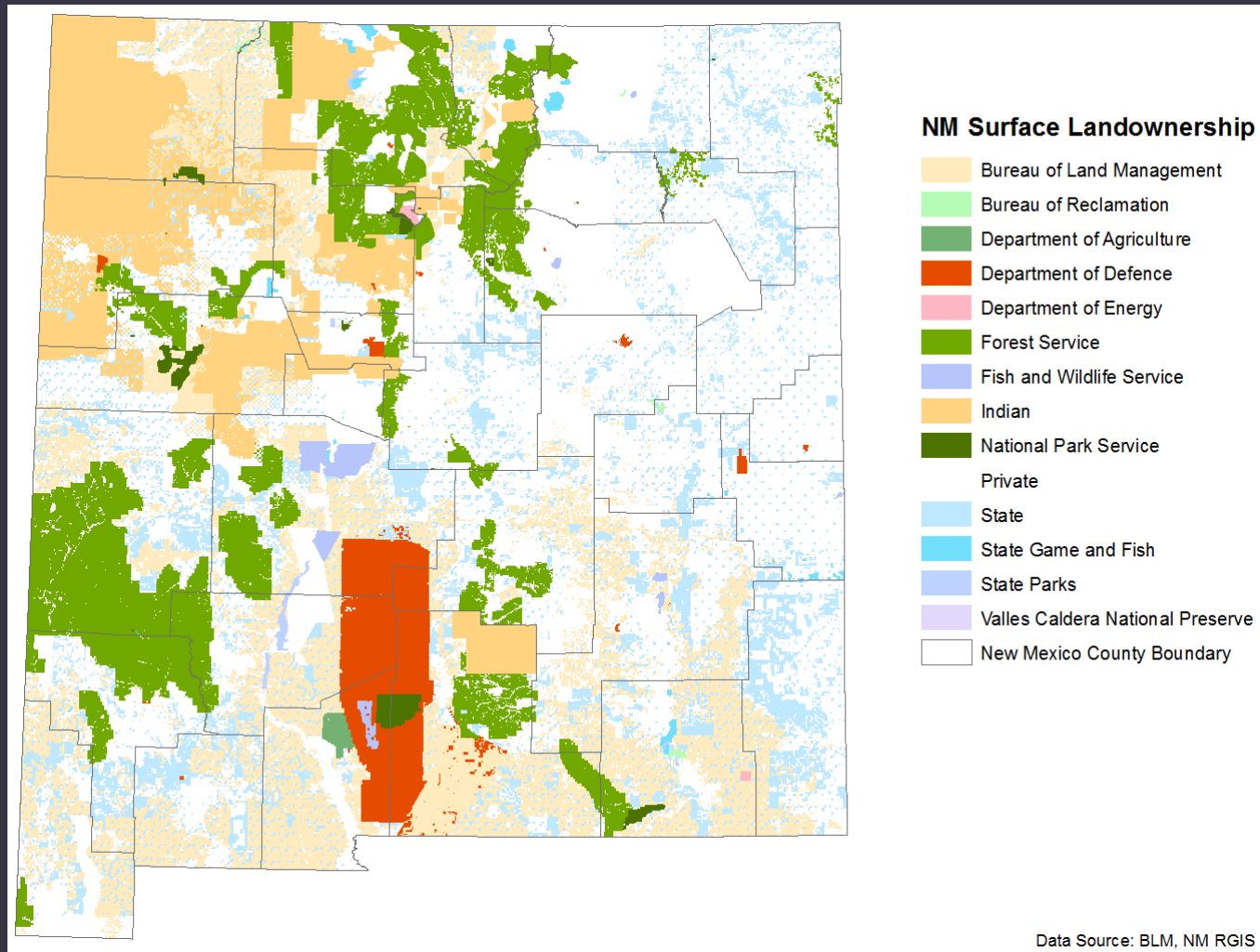
26—GEOHYDROLOGIC FEATURES

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
26.1—Water wells				
26.1.1	Water well, type unspecified		line weight .15 mm diameter 1.75 mm	May also be shown in cyan or other colors.
26.1.2	Unused water well		bar line weight .3 mm circle line weight 2 mm diameter 3.725 mm	
26.1.3	Capped water well		line weight 1.235 mm; diameter 1.125 mm	
26.1.4	Shut-in water well		all line weights .2 mm diameter 1.125 mm	
26.1.5	Dry hole used for water exploration		line weight 1.0 mm; diameter 2.0 mm	
26.1.6	Well used for collection of water data		all line weights .2 mm diameter 1.0 mm	
26.1.7	Well used for domestic-water supply		diameter 1.75 mm	
26.1.8	Flowing artesian well used for domestic-water supply		line weight 2.0 mm; diameter 1.25 mm arrow line weight .15 mm	
26.1.9	Nonflowing artesian well used for domestic-water supply		line weight 1.375 mm; diameter .3125 mm radius .175 mm	
26.1.10	Recharge or waste-injection well, once used for domestic-water supply		line weight 2.0 mm; diameter 1.25 mm arrow line weight .15 mm	

1.2.39	Clinkered coal bed—Identity and existence certain, location concealed			
1.2.40	Clinkered coal bed—Identity or existence questionable, location concealed		2.0 mm	
1.2.41	Area of clinkered coal bed		contact [line weight .15 mm] pattern 317-R	Add name if more than one type is shown on map (see Section 1.4).
1.2.42	Outcrop area of key bed or bed of economically important commodity (1st option)		scratch boundary [line weight 0.0] 100% black	Outcrop areas may either overprint other geologic map units or be used as stand-alone geologic map units. Each type of outcrop area may also be shown in other values of black or in other colors; add name(s) if more than one type is shown on map (see Section 1.4).
1.2.43	Outcrop area of key bed or bed of economically important commodity (2nd option)		scratch boundary [line weight 0.0] 30% black	
1.2.44	Outcrop area of clay bed		scratch boundary [line weight 0.0] 100% green	
1.2.45	Outcrop area of coal bed		scratch boundary [line weight 0.0] 100% red	



NM SURFACE LAND OWNERSHIP - BLM



COMMON SENSE GUIDES

- Who owns the data?
 - Use data with permission of creator
 - Give credit for data utilized
- Do you need IRB review?
 - De-identify data
 - Make sure that an individual person cannot be identified in your analysis (particularly when made public)

METADATA

Data about data

KEY ELEMENTS OF METADATA

title

supplemental
information

abstract



time period

author

sources

(file) size

KEY ELEMENTS OF METADATA



entity

attributes

Nutrition Facts	
Serving Size ½ cup (114g)	
Servings Per Container 4	
Amount Per Serving	
Calories 90	Calories from Fat 30
% Daily Value*	
Total Fat 3g	5%
Saturated Fat 0g	0%
Cholesterol 0mg	0%
Sodium 300mg	13%
Total Carbohydrate 13g	4%
Dietary Fiber 3g	12%
Sugars 3g	
Protein 3g	
Vitamin A 80%	Vitamin C 60%
Calcium 4%	Iron 4%
* Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:	
	Calories: 2,000 2,500
Total Fat	Less than 65g 80g
Sat Fat	Less than 20g 25g
Cholesterol	Less than 300mg 300mg
Sodium	Less than 2,400mg 2,400mg
Total Carbohydrate	300g 375g
Dietary Fiber	25g 30g
Calories per gram:	
Fat 9 • Carbohydrate 4 • Protein 4	

KEY ELEMENTS OF METADATA

- Source (where did you get data?)
- Process (what did you do to it?)
- Purpose (what is it used for?)
- Attributes (what are they?)
- Date (when did you do it?)
- Description (what is it?)
- Contact (who knows about the data?)
- Access (who can use it?)

METADATA STANDARDS

- Infrastructure for Spatial Information in the European Community (INSPIRE)
- Content Standard for Digital Geospatial Metadata (CSDGM)
- ISO 19115 “Geographic Information – Metadata”
- North American Profile (NAP) of ISO 19115
- ISO 19139 “Geographic Information – Metadata – XML Schema Implementation”

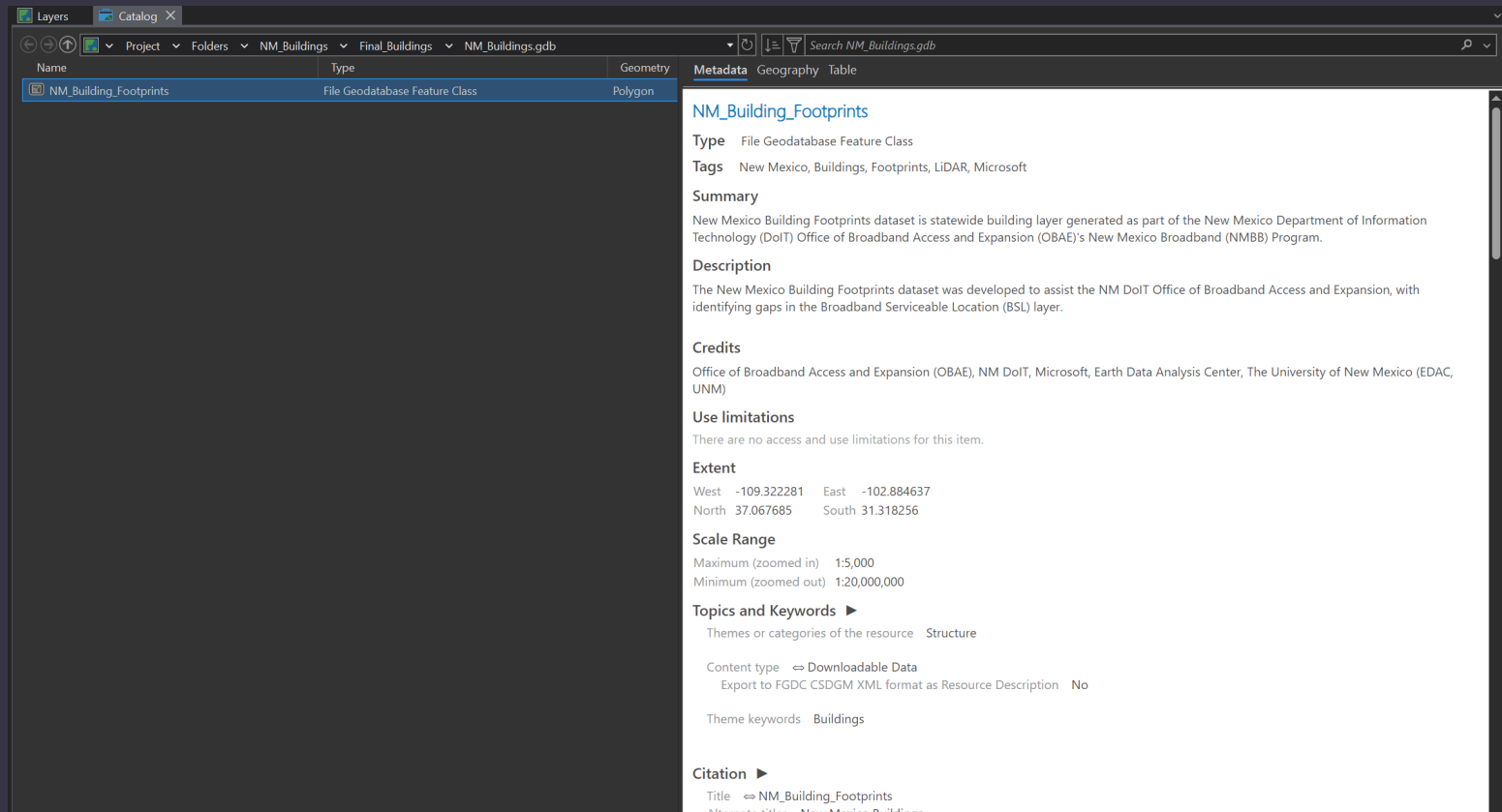
BENEFITS OF METADATA

Support geographic data producers and users in their efforts to:

- Manage geographic data, projects, and services
- Inventory and organize geographic data and services
- Minimize duplication efforts: all personnel are aware of available data, data maintain value as personnel change
- Advertise and promote available geographic data and services
- Publish info about available geographic data and services
- Discover the data they need
- Access the data they need
- Evaluate the quality of the data
- Assess the fitness for use of available data
- Determine how best to use the data

DOCUMENTING METADATA

- Catalog is ideal for viewing and editing metadata



The screenshot displays the ArcGIS Catalog window. The left pane shows a tree view with 'NM_Building_Footprints' selected under 'Final_Buildings'. The right pane shows the metadata for this feature class, including sections for Type, Tags, Summary, Description, Credits, Use limitations, Extent, Scale Range, Topics and Keywords, and Citation.

Name	Type	Geometry
NM_Building_Footprints	File Geodatabase Feature Class	Polygon

NM_Building_Footprints

Type File Geodatabase Feature Class

Tags New Mexico, Buildings, Footprints, LiDAR, Microsoft

Summary
New Mexico Building Footprints dataset is statewide building layer generated as part of the New Mexico Department of Information Technology (DoIT) Office of Broadband Access and Expansion (OBAE)'s New Mexico Broadband (NMBB) Program.

Description
The New Mexico Building Footprints dataset was developed to assist the NM DoIT Office of Broadband Access and Expansion, with identifying gaps in the Broadband Serviceable Location (BSL) layer.

Credits
Office of Broadband Access and Expansion (OBAE), NM DoIT, Microsoft, Earth Data Analysis Center, The University of New Mexico (EDAC, UNM)

Use limitations
There are no access and use limitations for this item.

Extent
West -109.322281 East -102.884637
North 37.067685 South 31.318256

Scale Range
Maximum (zoomed in) 1:5,000
Minimum (zoomed out) 1:20,000,000

Topics and Keywords ▶
Themes or categories of the resource Structure

Content type ⇌ Downloadable Data
Export to FGDC CSDGM XML format as Resource Description No

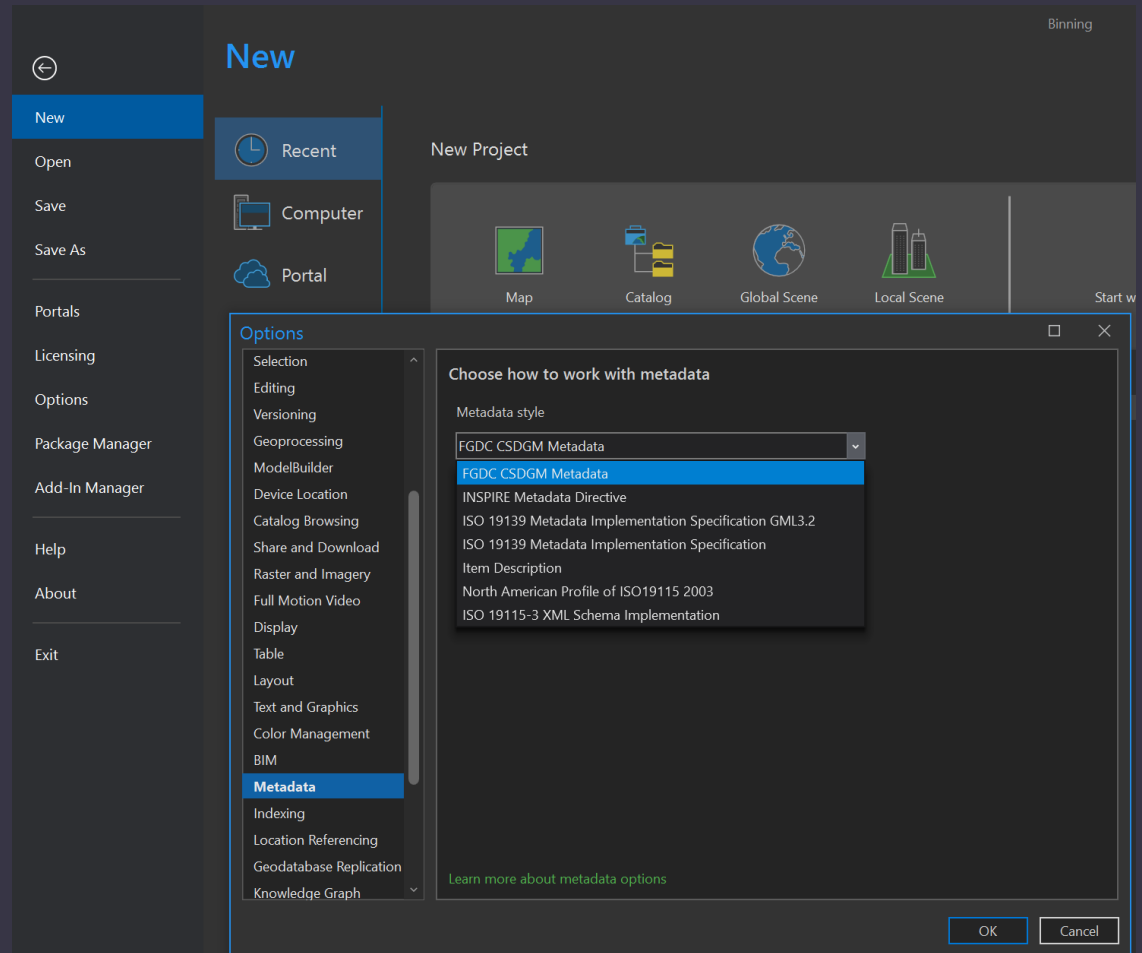
Theme keywords Buildings

Citation ▶
Title ⇌ NM_Building_Footprints
Alternate titles New Mexico Buildings

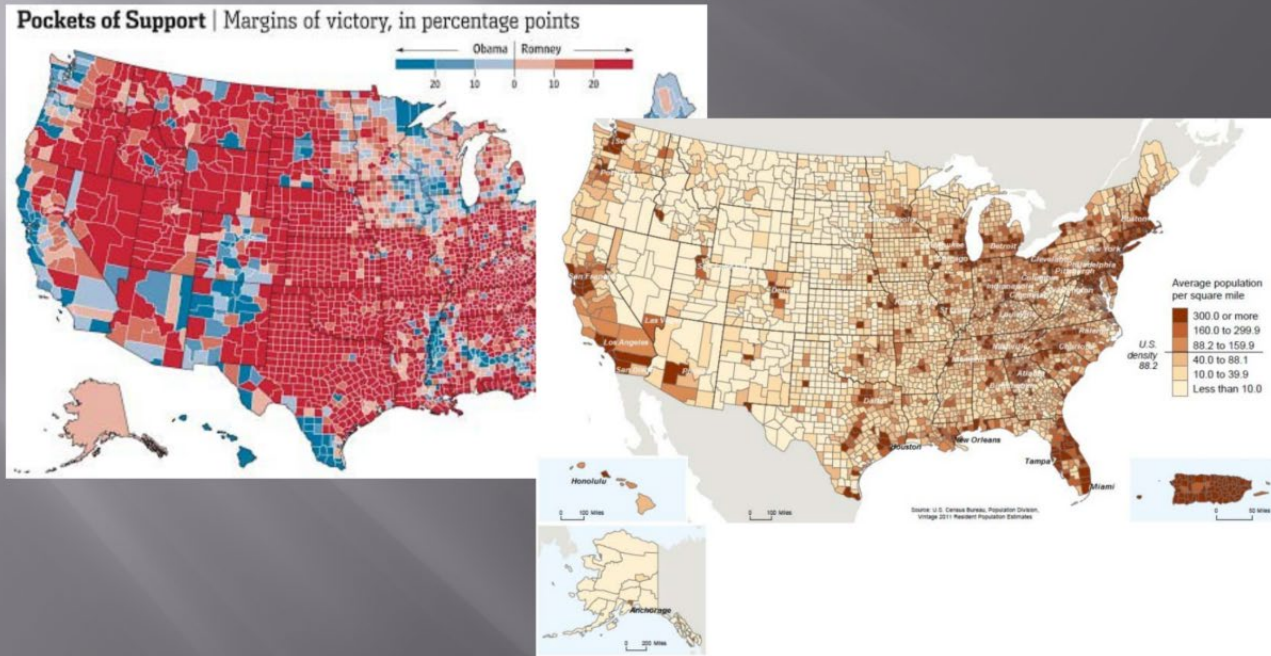
DOCUMENTING METADATA

- A list of metadata styles can be viewed under Metadata tab from ArcCatalog Options

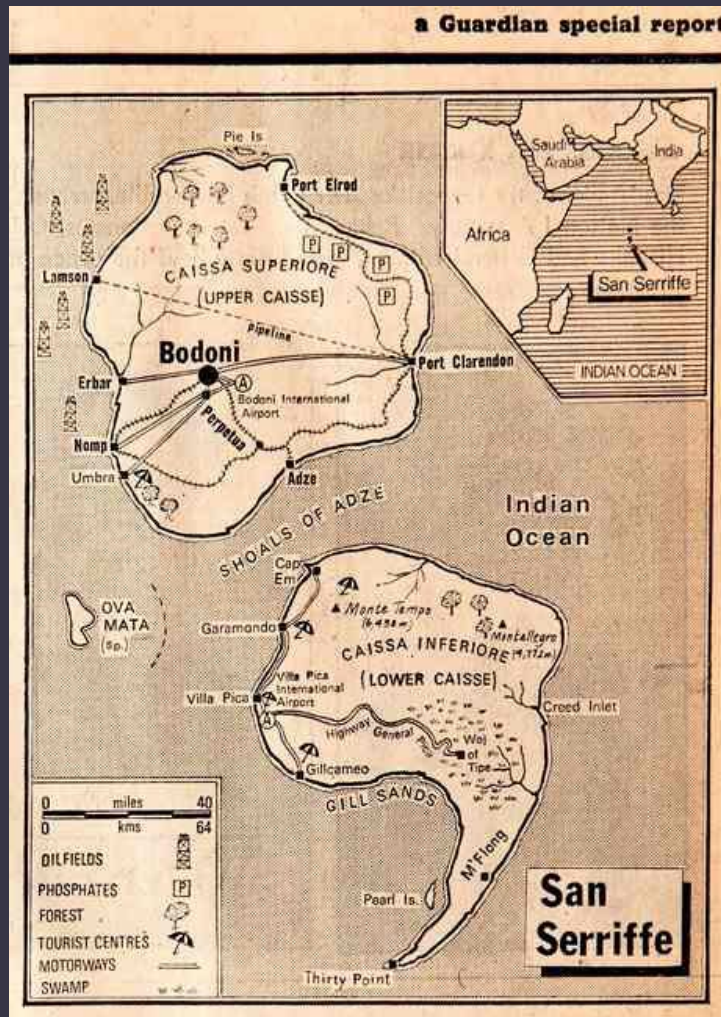
ArcGIS Pro
Options > Metadata



INTENTION VS INTERPRETATION



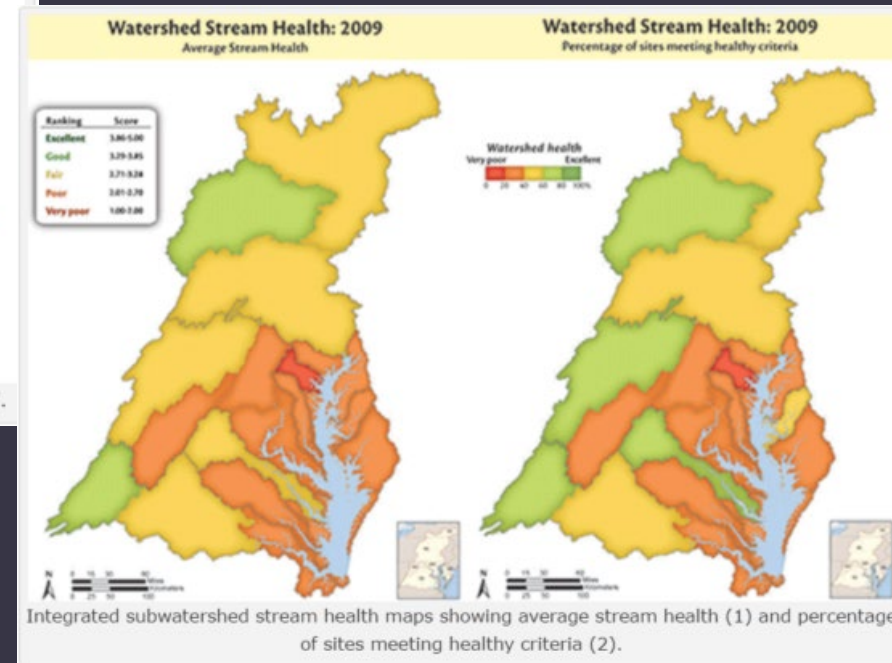
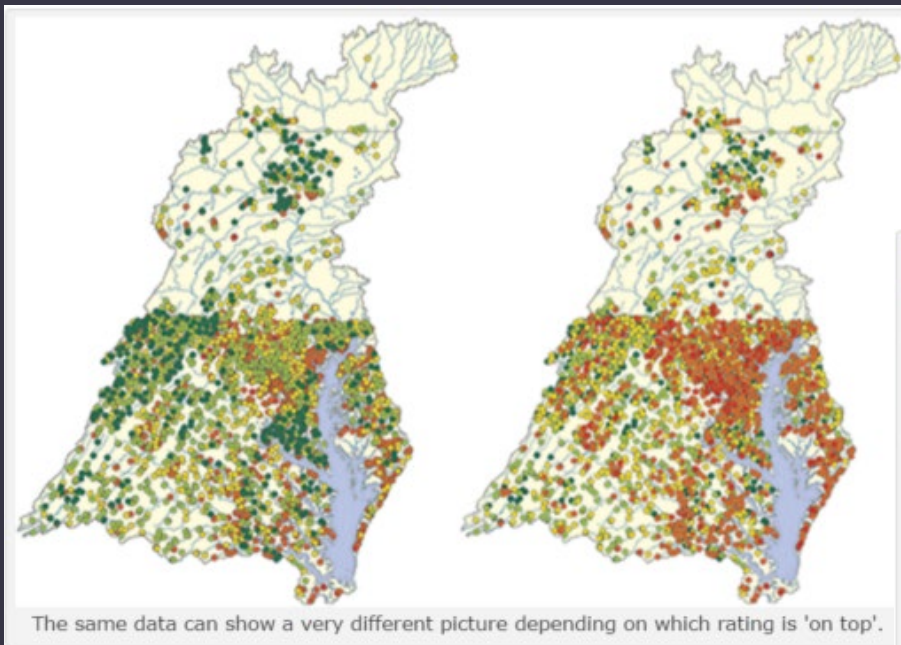
APRIL FOOL'S JOKE – AN ERROR OF COMMISSION



HOW MAPS CAN LIE

- Chesapeake watershed stream health

Depends on the type of thematic map you choose as well.



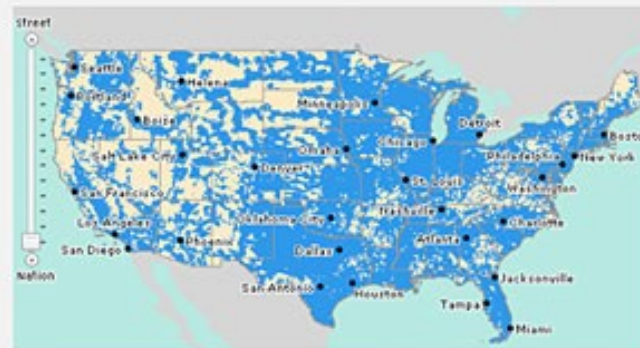
WILLFUL MISDIRECTION

There's a misrepresentation for that

Verizon's ads suggest that AT&T has no data coverage in much of the country by comparing only AT&T's newer, faster 3.2 Mbit 3G network against its own 1.4 Mbit 3G EVDO while excluding any mention of AT&T's slower but functional EDGE service, as well as its free WiFi access points.



Verizon's advertised 3G maps



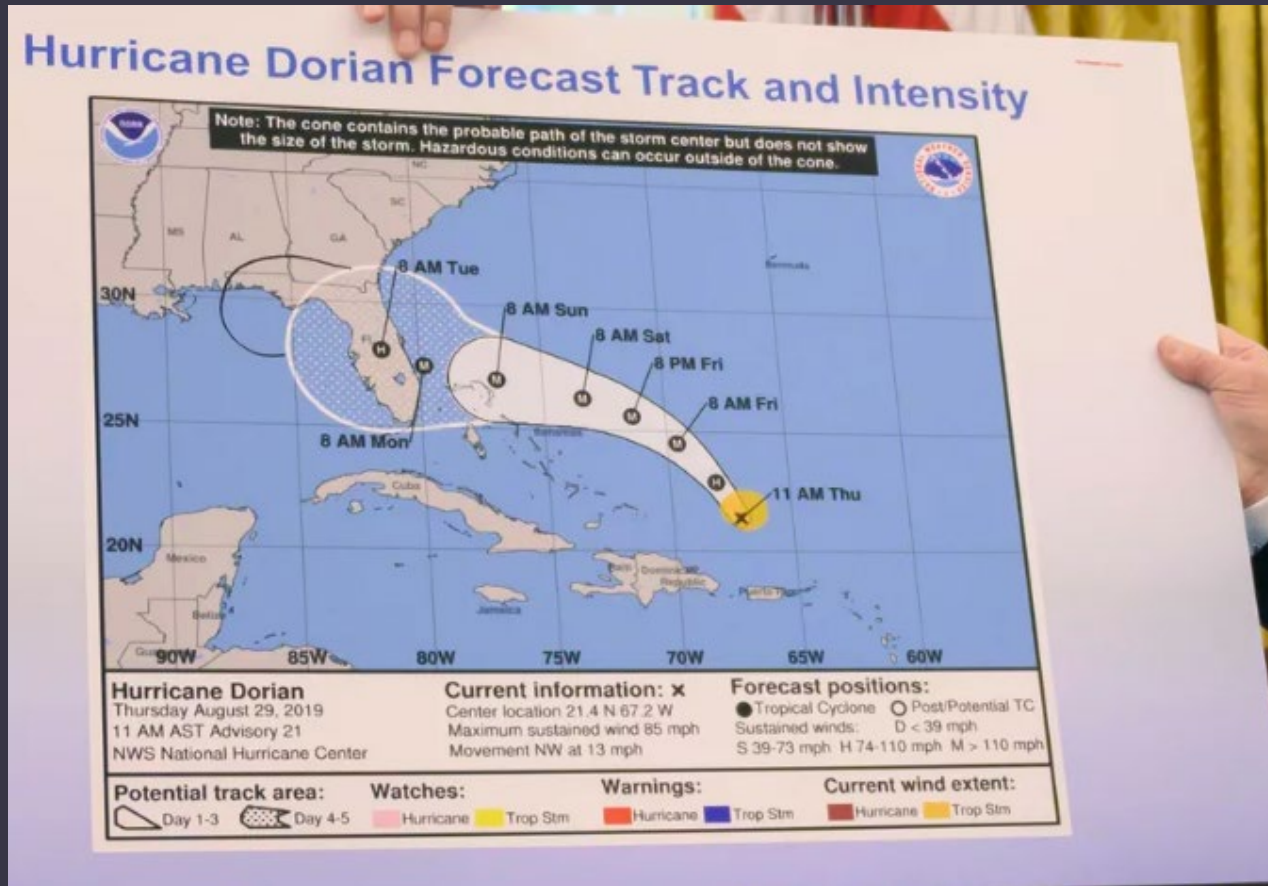
AT&T's own data coverage map

A comparison of US population density explains why AT&T hasn't focused its 3G deployment on Nevada and rural areas of the Mountain Time Zone.

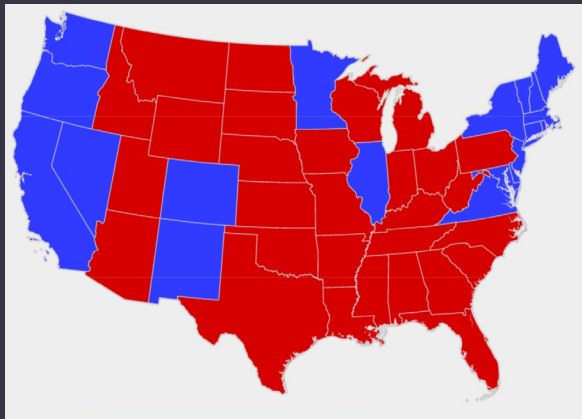


Actual US population map

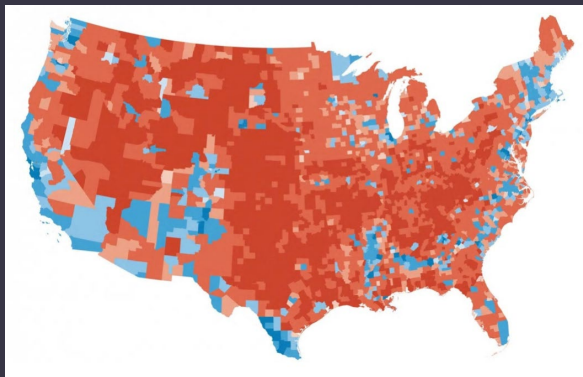
HURRICANE DORIAN



MODIFIABLE AREAL UNIT PROBLEM (MAUP)

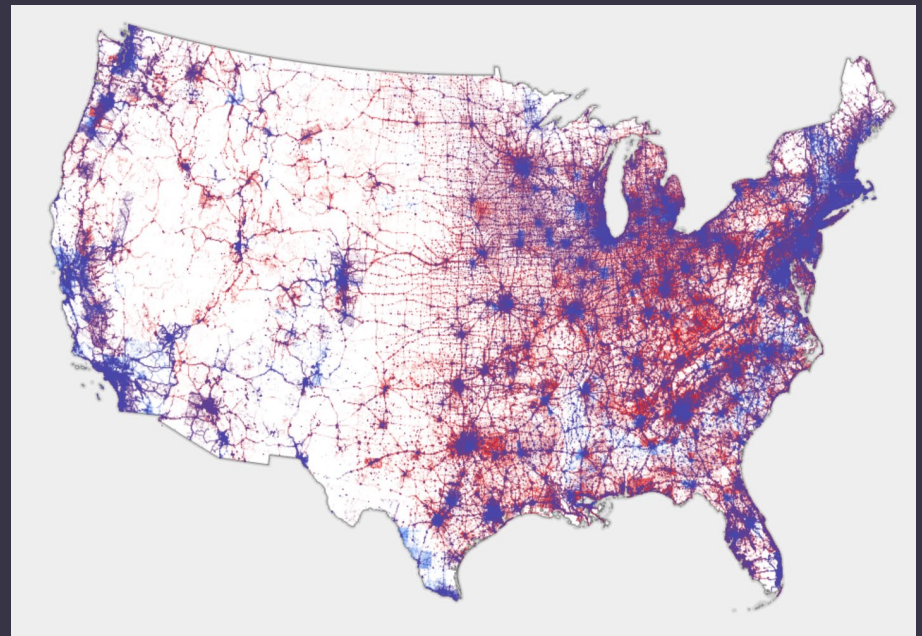


By State.
Source: <http://carto.maps.arcgis.com/apps/MinimalGallery/index.html?appid=b3d1fe0e8814480993ff5ad8d0c62c32#>



By County.
Source: <https://www.washingtonpost.com/news/politics/wp/2018/07/30/presenting-the-least-misleading-map-of-the-2016-election/>

2016 Election Results



Dasymetric Dot Density
Source: <http://cartonerd.blogspot.com/2018/03/dotty-election-map.html>

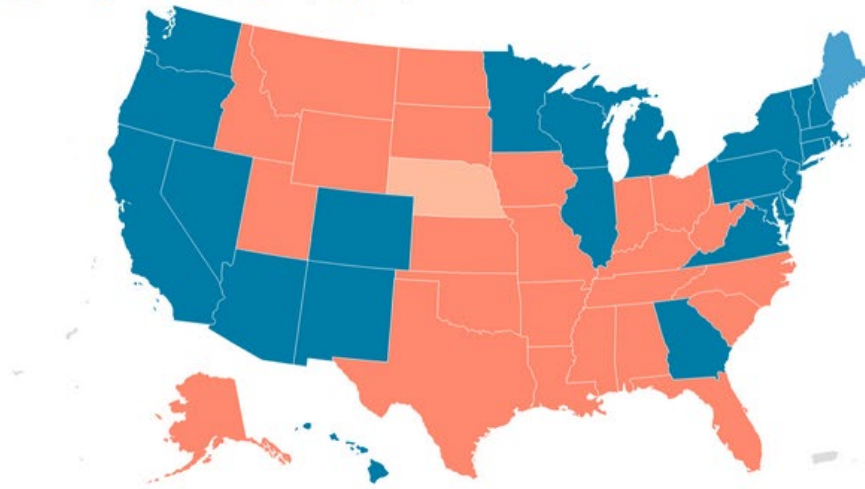
More visualizations at
<http://carto.maps.arcgis.com/apps/MinimalGallery/index.html?appid=b3d1fe0e8814480993ff5ad8d0c62c32#>

MODIFIABLE AREAL UNIT PROBLEM (MAUP)

Conventional Map of 2020 US Presidential Election Results

Maine and Nebraska allow some electoral votes to be split by district

■ Biden ■ Biden + Trump ■ Trump ■ Trump + Biden

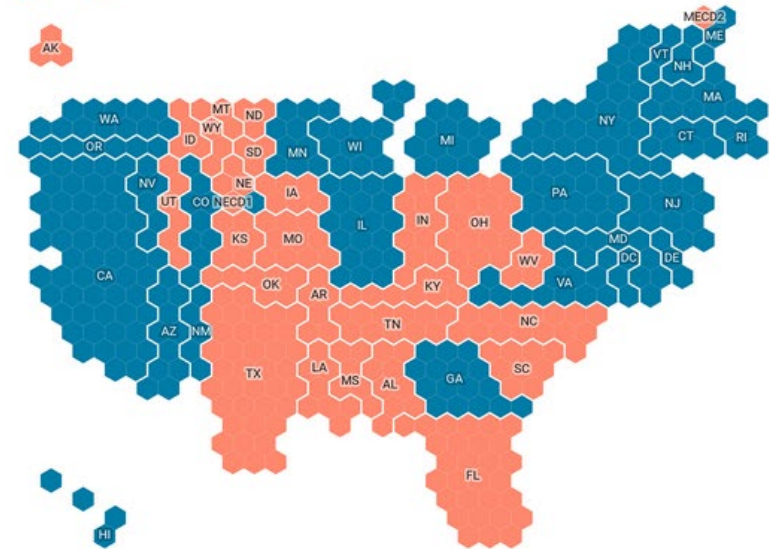


Created with Datawrapper

Cartogram of 2020 US Presidential Election Results

Each hexagon represents one electoral college vote

■ Biden ■ Trump

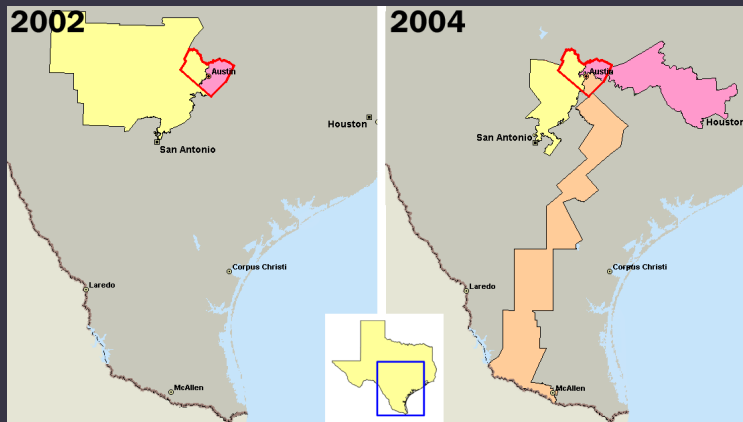


The US 2020 Presidential electoral vote displayed in a conventional US map (left) versus a cartogram (right), both created with Datawrapper. <https://handsondataviz.org/spatial-bias.html>

GERRYMANDERING

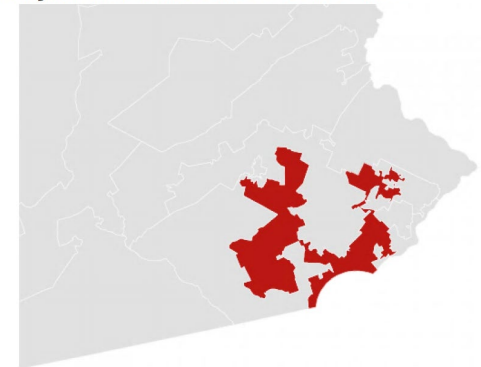
U.S. congressional districts covering Travis County, Texas (outlined in red) in 2002, left, and 2004, right. In 2003, the majority of Republicans in the Texas legislature redistricted the state, diluting the voting power of the heavily Democratic county by parceling its residents out to more Republican districts.

By PHenry at English Wikipedia - Transferred from en.wikipedia to Commons., Public Domain, <https://commons.wikimedia.org/w/index.php?curid=1838278>



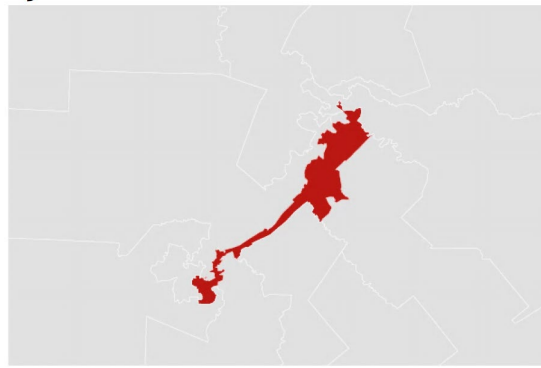
PENNSYLVANIA'S 7TH DISTRICT ("Goofy kicking Donald Duck")

Gerrymander index score: 96.05



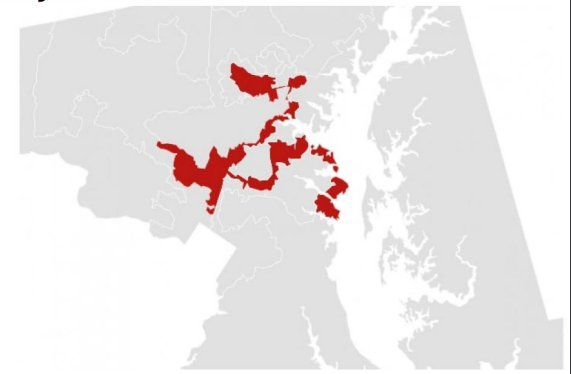
TEXAS'S 35TH DISTRICT ("The upside-down elephant")

Gerrymander index score: 94.63



MARYLAND'S 3RD DISTRICT ("The praying mantis")

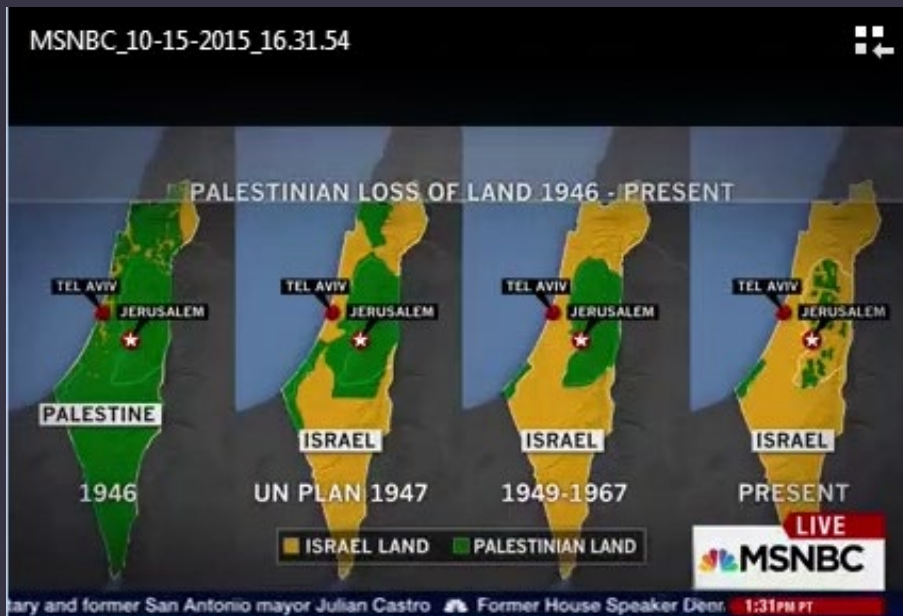
Gerrymander index score: 96.79



<https://www.washingtonpost.com/news/wonk/wp/2014/05/15/americas-most-gerrymandered-congressional-districts/>

ISRAEL/PALESTINE

MSNBC



Alternate View

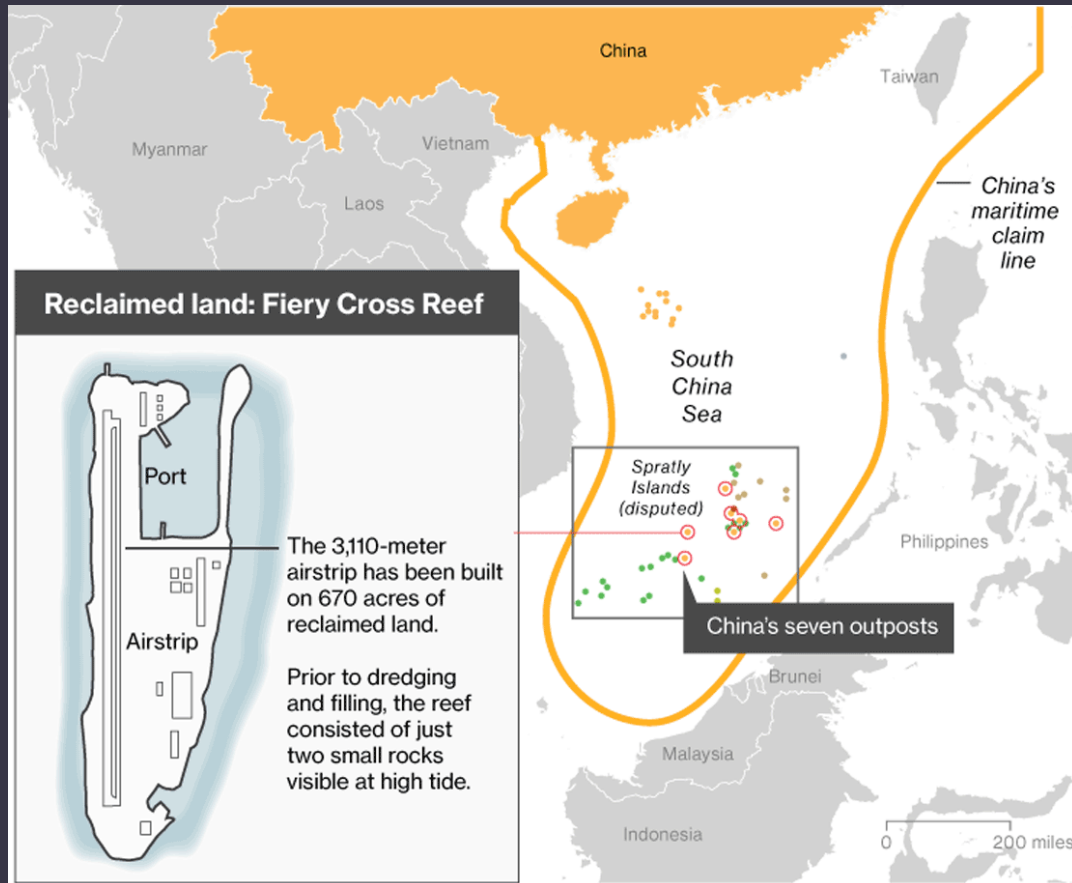


CHINA

- Chinese Passports – Map including territories in South China Sea



SPRATLY ISLANDS



INDIA



<http://www.bbc.com/news/world-south-asia-13529512>
<http://www.wefightcensorship.org/censored/india-cannot-stand-media-neutrality-kashmir-border-disputeshtml.html>

WAR PROPAGANDA

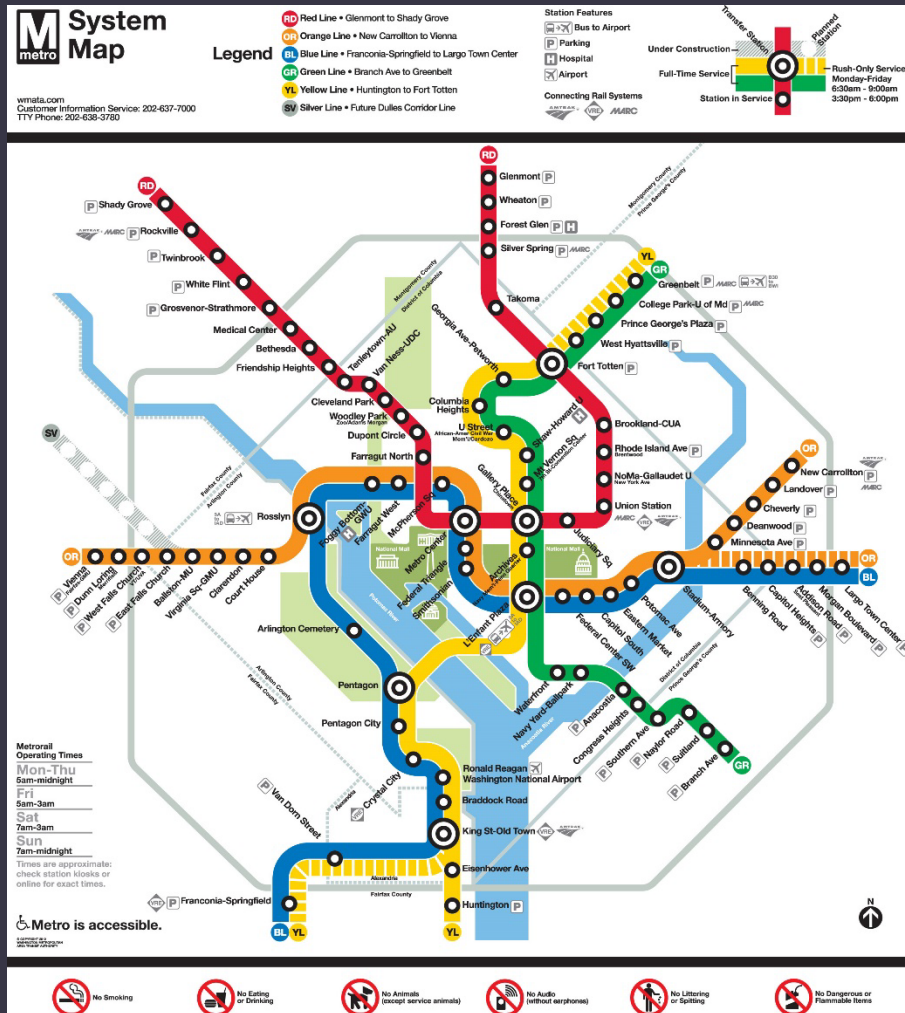


DELIBERATE LIES



Created by Michigan Department of Transportation, as displayed at Garrett, Bob (October 31, 2008). "Beatosu and Goblu, Ohio". Archives Image of the Month. Archives of Michigan, Michigan Historical Center, Michigan Department of Natural Resources. Retrieved August 9, 2009.

WHITE LIES...TRANSIT MAPS



Washington DC Metro Map

MAPS FOR CHANGE



Look forward, women, always; utterly cast away
The memory of hate and struggle and bitterness;
Bonds may endure for a night, but freedom comes with the day,
And the free must remember nothing less.

Forget the strife; remember those who strove—
The first defeated women, gallant and few,
Who gave us hope, as a mother gives us love,
Forget them not, and this remember, too:

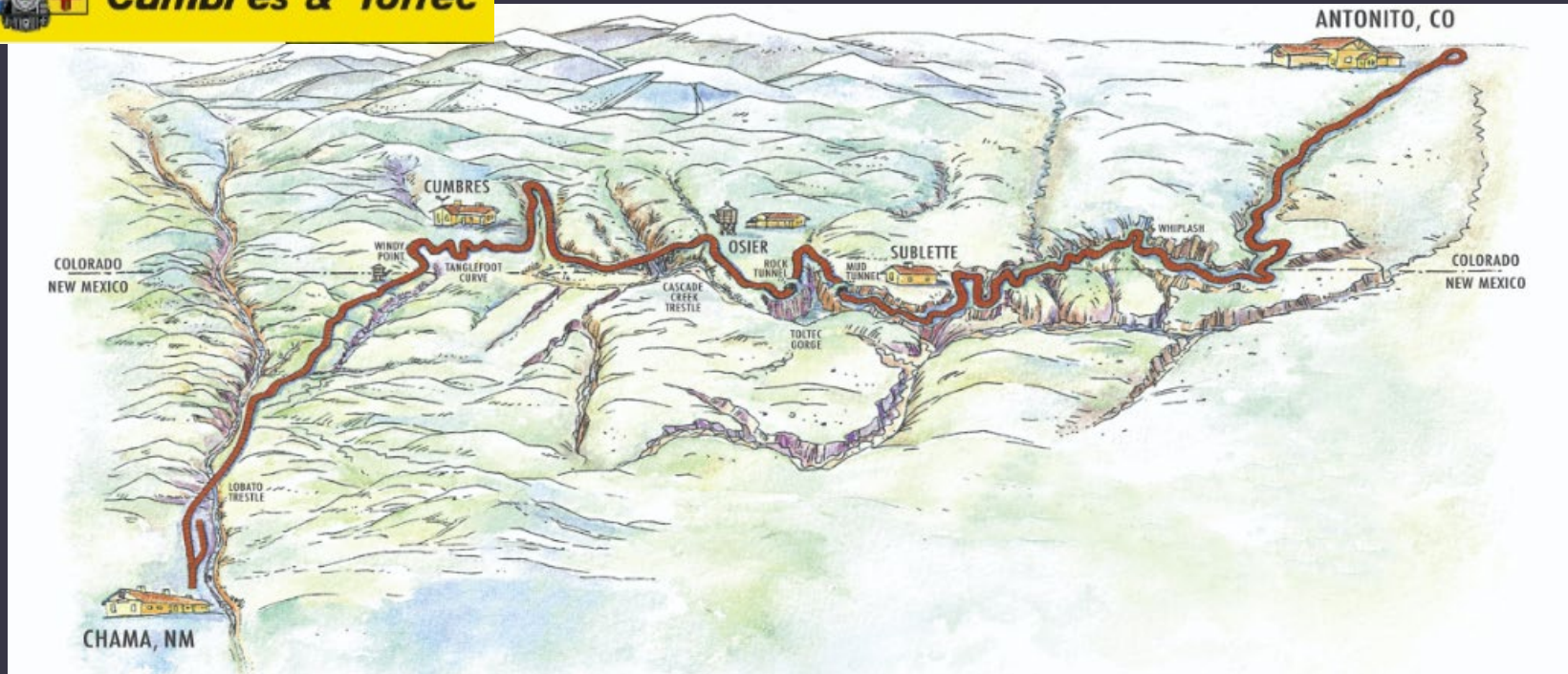
How at the later call to come forth and unite,
Women untaught, unchosen, alone and apart,
Rank upon rank came forth in unopposed might,
Each one answering: "The will of her own wise heart."

They came from toil and want, from leisure and ease,
Those who knew only life, and learned women of fame,
Girls and the mothers of girls, and the mothers of them,
No one knew whence or how, but they came, they came.

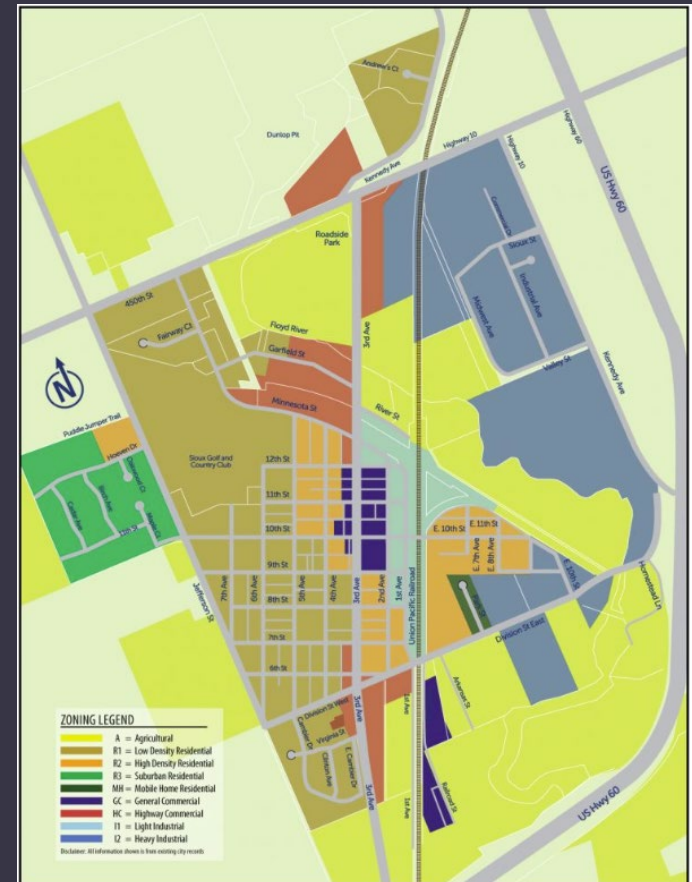
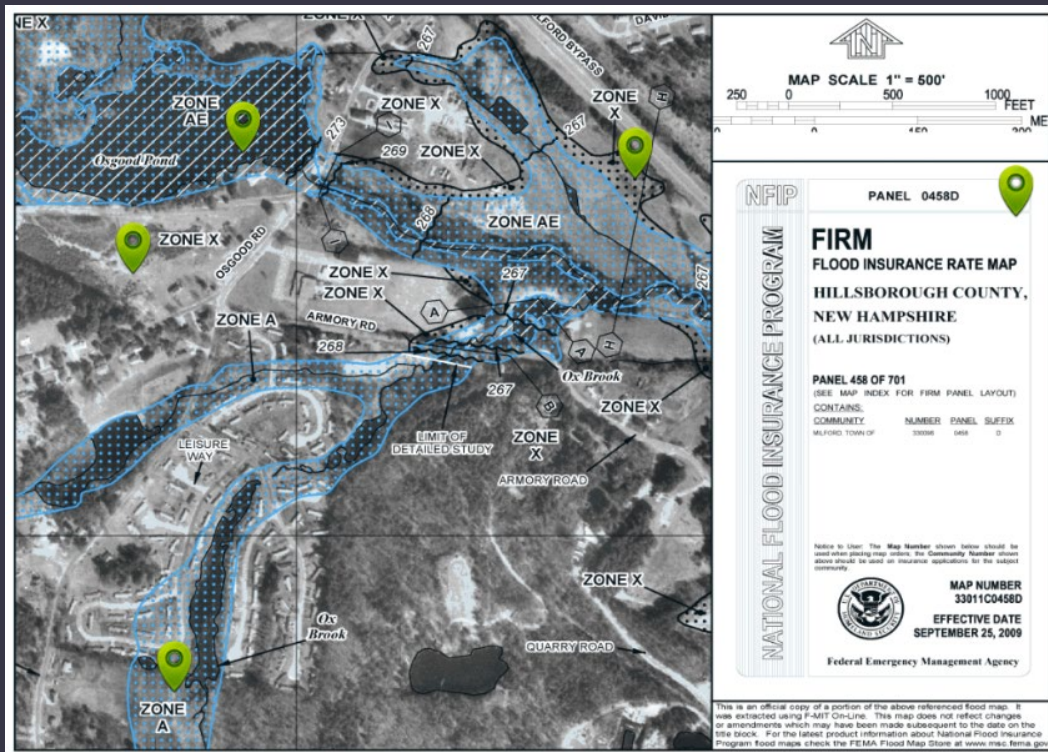
The face of some were stern, and some were gay,
And some were pale with the terror of unmet dangers;
But their hearts knew this: that hereafter come what may,
Women to women would never again be strangers.

Alice Duer Miller.

ADVERTISING WITH MAPS



DEVELOPMENT MAPS



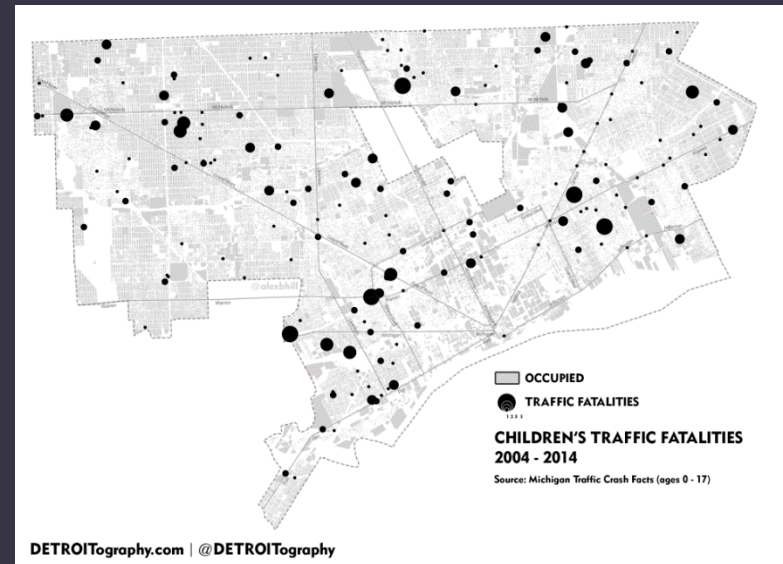
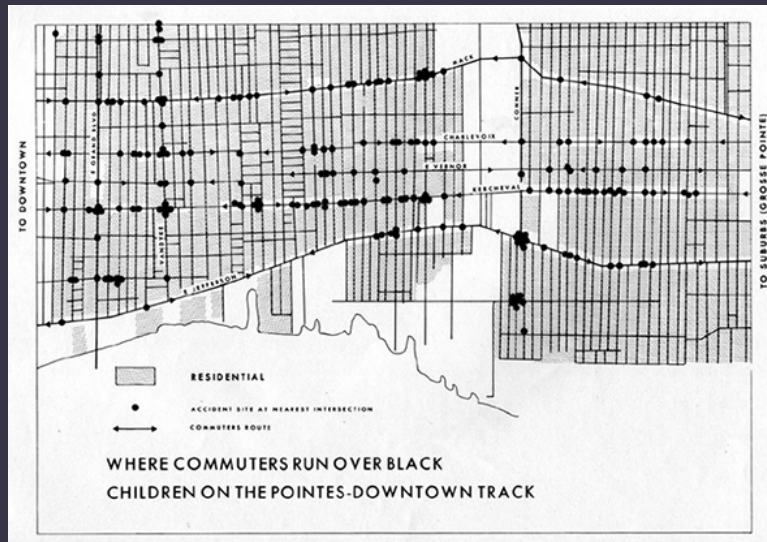
<https://www.fema.gov/flood-insurance-rate-map-firm>

<http://altoniowa.us/serve-protect/planning-and-zoning-maps/>

MAPS AS ADVOCACY

Detroit Geographical Expedition, 1968

DETROITography.com



<http://nhutchpersonalgeog.weebly.com/1-where-commuters-run-over-black-children.html>
<http://makingmaps.net/2009/06/06/making-advocacy-humanitarian-maps/>
<http://detroitography.com/>

MAPS IN DEFENSE

- Masking sensitive areas or systematic falsification
 - Ex: Military installations, nuclear plants
- Distortion and Displacement
- Maintain separate sets of maps
 - Expensive to maintain
- Paper maps or plastic film
 - To protect facilities from hackers and cyber attacks
 - Threat to magnetic media from EMP or Solar flares

DATA SOURCES

Fantastic Data and Where to Find them!

DATA SOURCES

- USGS National Map <https://apps.nationalmap.gov/downloader/#/>
- USGS Earth Explorer <https://earthexplorer.usgs.gov/>
- ESRI Open Data Hub <https://hub.arcgis.com/search>
- US Government Open Data Hub: Data.gov <https://data.gov/>
- US Census Bureau <https://www.census.gov/>
- State Geospatial Data Clearinghouses
 - Ex: New Mexico Resource Geographic Information System (RGIS) <https://rgis.unm.edu/>
 - Bureau of Business and Economic Research (BBER) <https://bber.unm.edu/data>
- State, Federal, Local, Tribal Agency sources
- Other Curated sources:
<https://researchguides.dartmouth.edu/gisdata/usdata>