

GIS at Skidmore

Charlie Bettigole - Director of the GIS
Center for Interdisciplinary Research

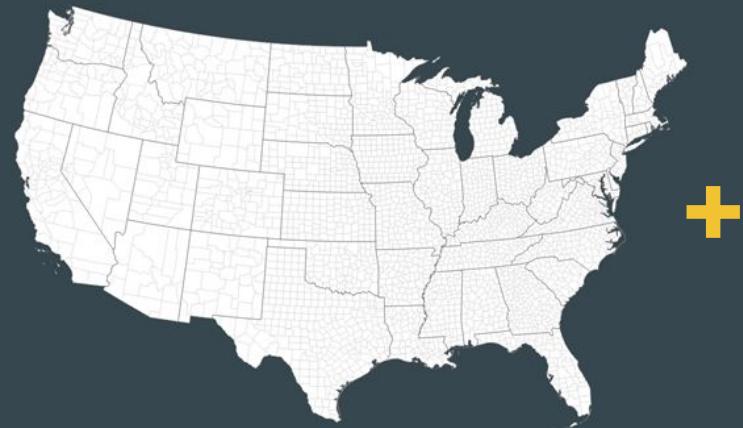
What we'll do today

- **What is GIS?**
- **GIS at Skidmore**
- **Map Projections**
- **Cartographic Principles**
- **Wind Power Analysis**
- *Log into your computers, you'll use them a couple times today*
- *To follow along download slides at bit.ly/mf351slides*

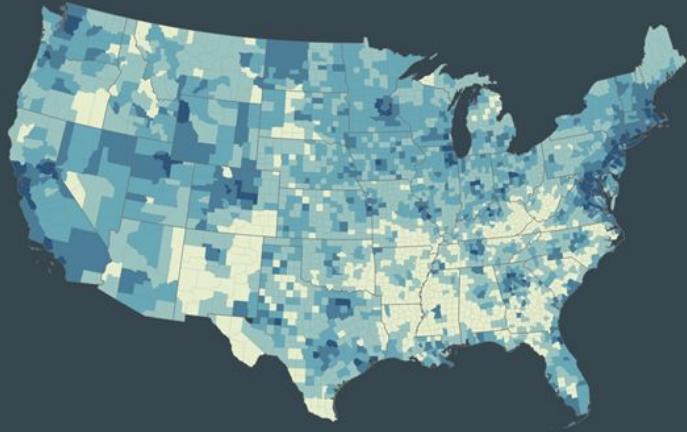
So....What is GIS?

“A Geographic Information System is a computer-based tool that analyzes, stores, manipulates and visualizes geographic information, usually in a map.” -GIS Geography

Most data has a geographic component.

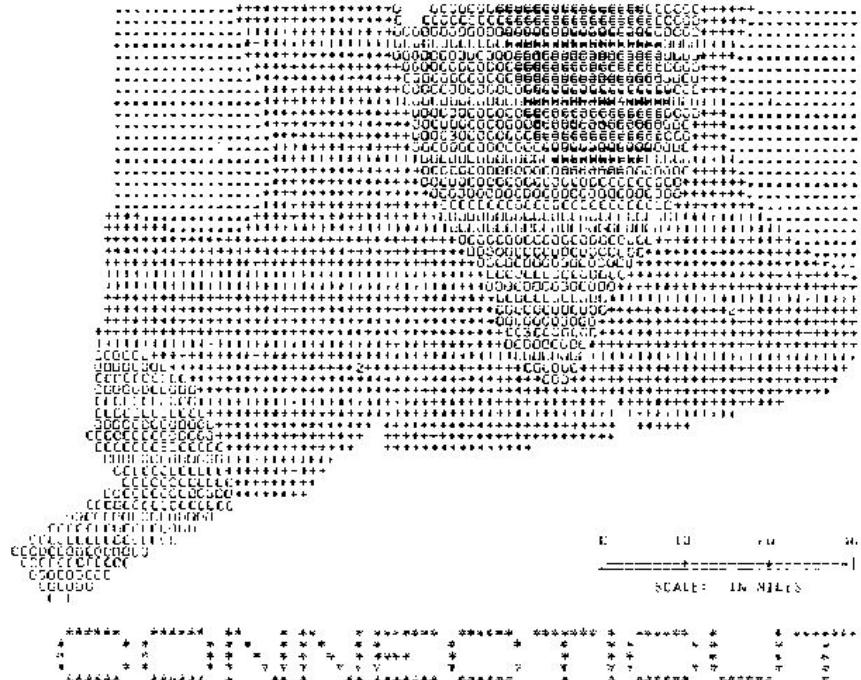


State	County	Median Income
NY	Warren	\$ 74,531
NY	Schenectady	\$ 75,056
NY	Albany	\$ 78,829
NY	Saratoga	\$ 97,038

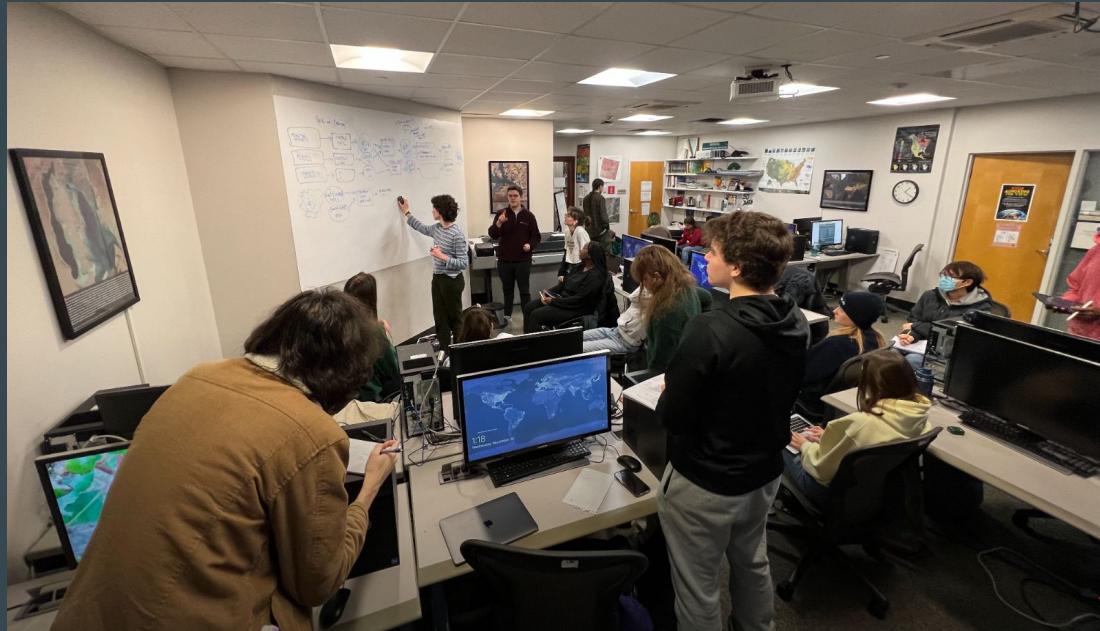


Digital Maps + Data = GIS

This is one of the first computer maps ever produced. From the Graduate School of Design at Harvard.



Now we've got super-fast computers, with “intuitive” software platforms, and free, readily available data anywhere on the web



As a GIS professional and an academic I've made lots and lots of maps:

- Ranching and Farming
- Counting all the trees in the world
- Census and Ag Census
- Hydrology
- Wildlife Conservation
- Invasive Plant Species
- Social & Environmental Justice
- Renewable Energy
- Coral Reef Mapping
- Residential Planning
- Transportation Planning
- Art and Dance Collaborations
- Conflict Mapping
- Archeology
- Redistricting/Gerrymandering

My GIS Background



GIS at Skidmore

- Classes
 - Intro GIS (ID 210)
 - Advanced GIS (ID 351d)
 - Landscape Analysis with Drones (ID 351a)
- Research and Resources
 - GPS units, data, computers
 - Lab assistants
 - Summer research

Some mapping projects we work on in Intro GIS

- Food justice
- Gerrymandering
- Climate change impacts
- Avalanche risk modeling
- Working with US Census data
- Trends in Social Media
- COVID-19 Mapping
- Much More!

Some mapping projects we worked on for class in Advanced GIS (s24)

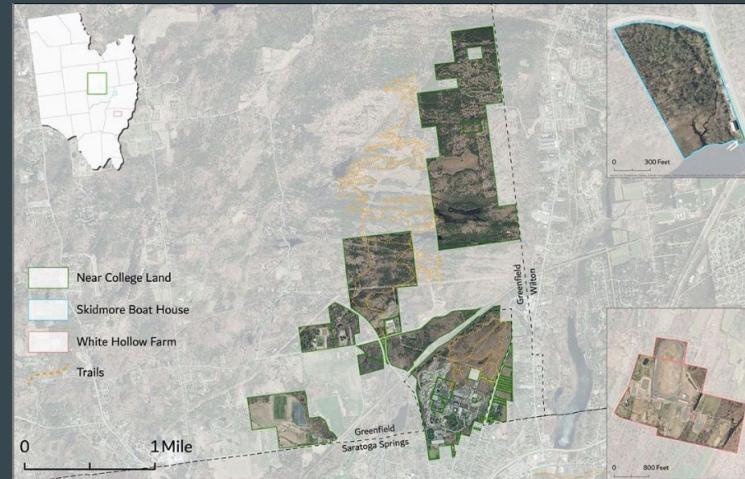
- Exploring redlining and current spatial inequalities
- Paleolithic human movement patterns
- Wildlife population modeling
- Land cover change
- Coding and map publication
- Civic engagement with local organizations

Summer Research Over the Last 5 Years

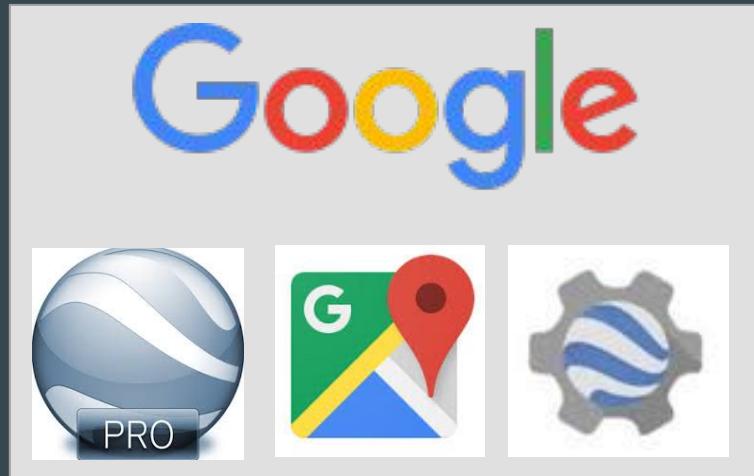
- Collaborations with ESS students (e.g. Dome Island)
- Spatial analysis at Al Gore's farm in TN
- New Visions Mapping Collaborative
- Hemlock Woolly Adelgid
- Spongy Moth
- Mapping Trail Potential on Skidmore Land

GIS Center Lab Assistants

- Serve as hybrid teaching assistant / research assistants
- Get to work on cool projects internal to Skidmore and with community partners
- ***Here to help students, even if you're not in a GIS class!***



The Software

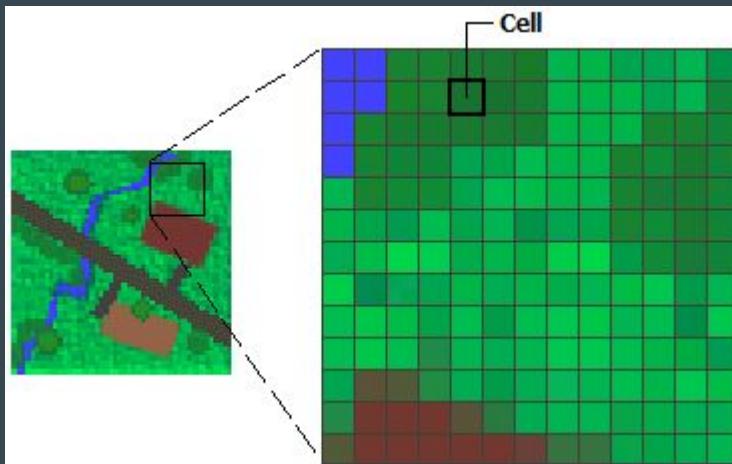


Representing the world with data models:

Raster

Vs.

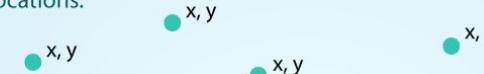
Vector



Source: GRASS-Wiki

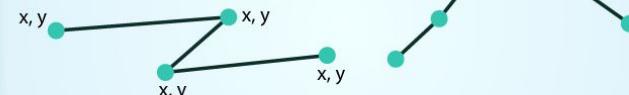
POINTS: Individual x, y locations.

ex: Center point of plot locations, tower locations, sampling locations.



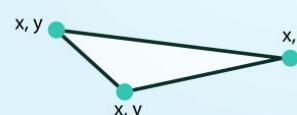
LINES: Composed of many (at least 2) vertices, or points, that are connected.

ex: Roads and streams.



POLYGONS: 3 or more vertices that are connected and **closed**.

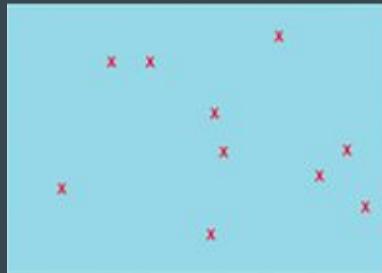
ex: Building boundaries and lakes.



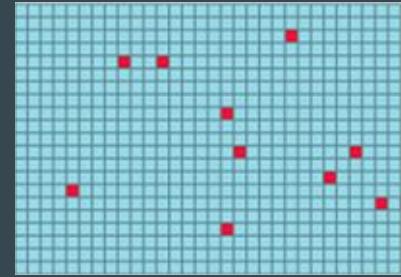
neon

Source: Data Carpentry

Raster Vs. Vector



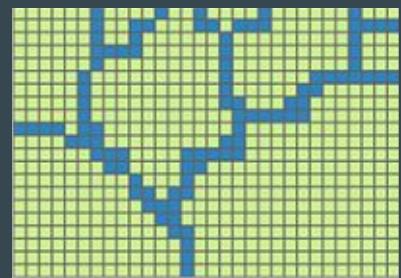
Point



Raster Point



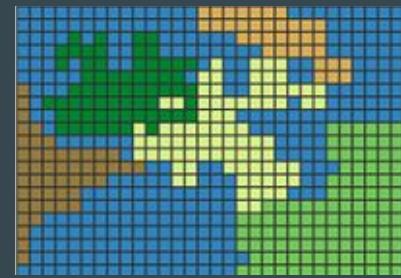
Line



Raster Line

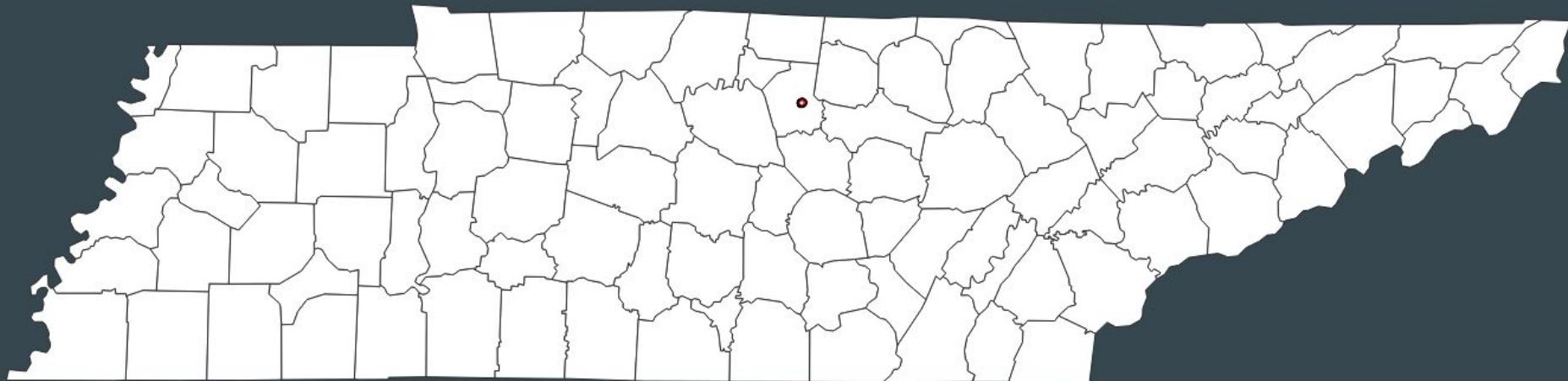


Polygon



Raster Polygon

Raster or Vector?



GIS Center for Interdisciplinary Research: Find GIS Data

[Home](#) | [GIS Software](#) | [Find GIS Data](#) | [Skidmore's GIS Network](#) | [Collect Data](#) | [Peer Help](#) | [Tutorials & Training](#) | [Other Resources](#)

Library Databases

- [GeoRef](#)

GeoRef indexes journal articles, books, maps, conference papers, reports, and theses covering a variety of geosciences topics. Geology of North America is covered from 1785 to the present and geology of the world is covered from 1933 to the present.

- [Web of Science Core Collection](#)

Web of Science™ Core Collection provides researchers, administrators, faculty, and students with quick, powerful access to the world's leading citation databases.

Authoritative, multidisciplinary content covers over 12,000 of the highest impact journals worldwide—including open access journals—and over 160,000 conference proceedings. You'll find current and retrospective coverage in the sciences, social sciences, arts, and humanities, with coverage dating back to 1900. Focus on the essential data from across more than 250 disciplines.

- [Global Commodities](#)

This resource brings together manuscript, printed and visual primary source materials for the study of global commodities in world history. The commodities featured in this resource have been transported, exchanged and consumed around the world for hundreds of years. They helped transform societies, global trading operations, habits of consumption and social practices. Click on the "Data & Maps" tab to dig deeper.

- [ICPSR](#)

General Data

- [ArcGIS Hub](#) ⓘ
- [Data.gov](#) ⓘ
- [DIVA-GIS](#) ⓘ
- [Earth Explorer](#) ⓘ
- [Geoplatform.gov](#) ⓘ
- [Natural Earth Data](#) ⓘ
- [USGS National Map](#) ⓘ
- [GIS Data Starting Points](#) ⓘ
- [ESRI Data & Maps](#) ⓘ
- [Wikipedia List of GIS data sources](#) ⓘ
- [Living Atlas of the World](#) ⓘ
- [Data Planet Statistical Data Sets](#) ⓘ
- [Data Planet LibGuides Subject Guide](#)
- [List of 1,400 GIS Data Servers by Joseph Elfelt-MappingSupport.com](#) ⓘ

United States Socio-Economic Data

- [US Census Bureau Tools & Apps](#) ⓘ
- [US Census Bureau Fact Finder Search](#) ⓘ
- [US Census Bureau TIGER Products](#) ⓘ
- [National Historical GIS](#) ⓘ

New York State & Local Data

- [NY State GIS Clearinghouse](#)
- [Capital District Regional Planning Commission \(CDRPC\) Census Data](#)
- [Cornell University Geospatial Information Repository \(CUGIR\)](#)
- [NY State data.gov](#)
- [NY State Health Data](#)
- [NY Department of Labor](#)
- [NY State Geological Survey](#)
- [NY State Orthoimagery](#)
- [NY Climate Change Science Clearinghouse](#)
- [Bytes of the Big Apple](#) ⓘ

State Data

- [Data for the US \(by state\)](#)
A variety of links to state GIS data from MIT Libraries.
- [List of 1,400 GIS Data Servers by Joseph Elfelt-MappingSupport.com](#) ⓘ
- [Data by State](#)
List of state GIS portals from Northwestern University.

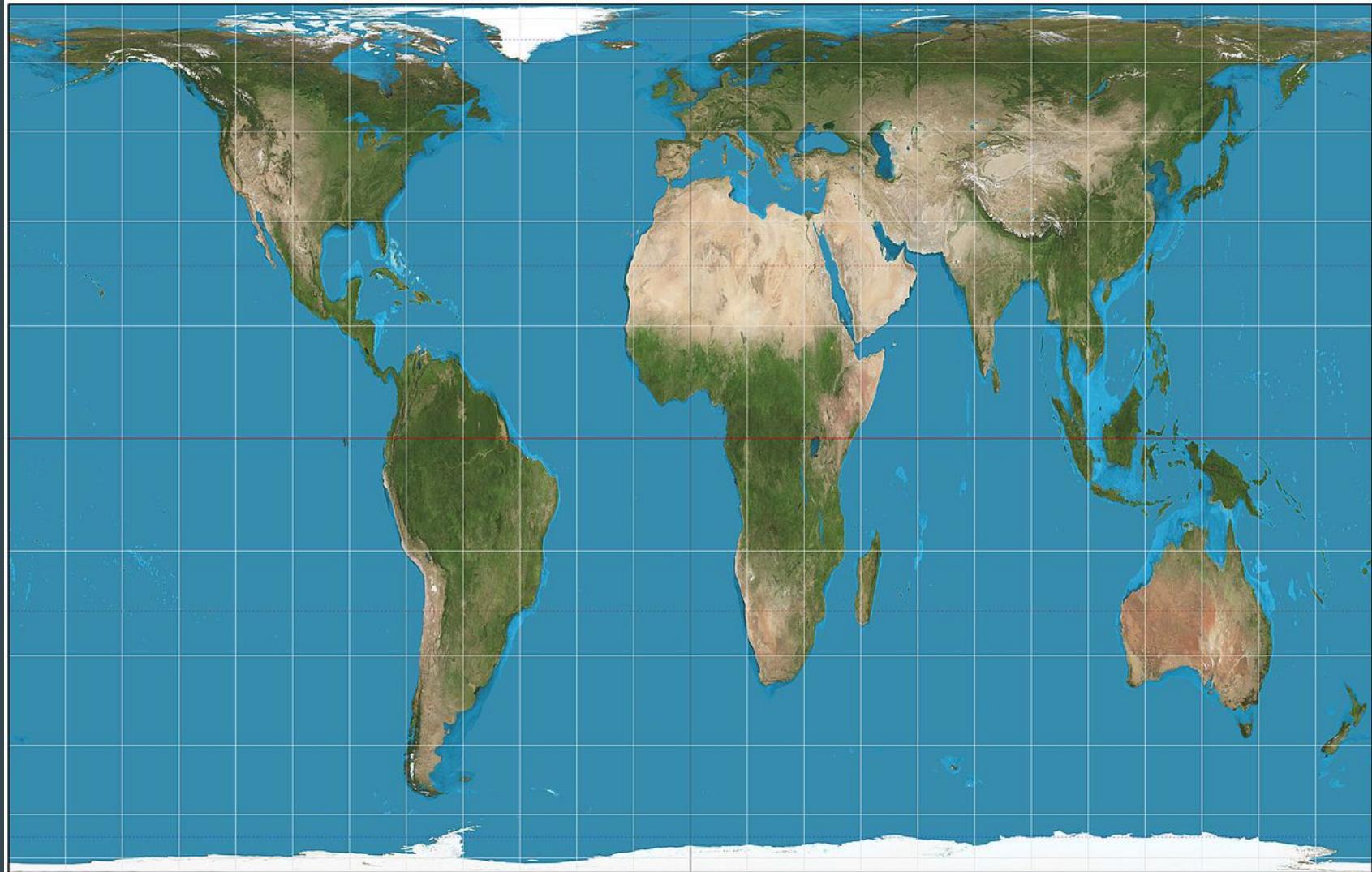
International Data

What's the best way to represent our
“round” earth on a map?



What's the best way to represent our
“round” earth on a map?





thetruesize.com

Data Visualization

“Graphical excellence is that which gives to the viewer the greatest number of ideas in the shortest time with the least ink in the smallest space.”

-Edward Tufte

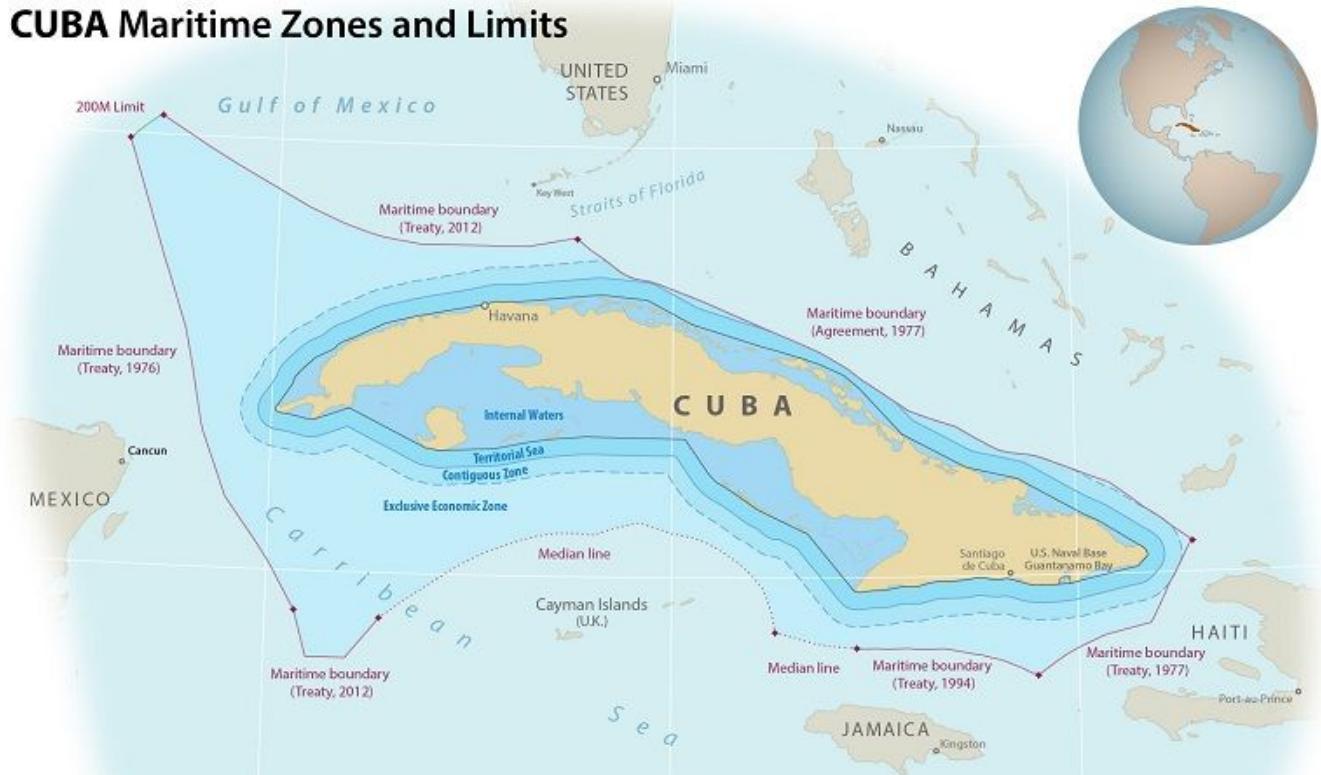
Remove
to improve
(the **data-ink** ratio)

Overarching Principle:

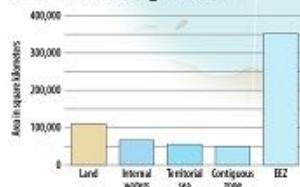
**DON'T ACCEPT THE DEFAULTS
&
BE CONSISTENT**

Visual Hierarchy

CUBA Maritime Zones and Limits



Cuban Sovereign Areas



Limits

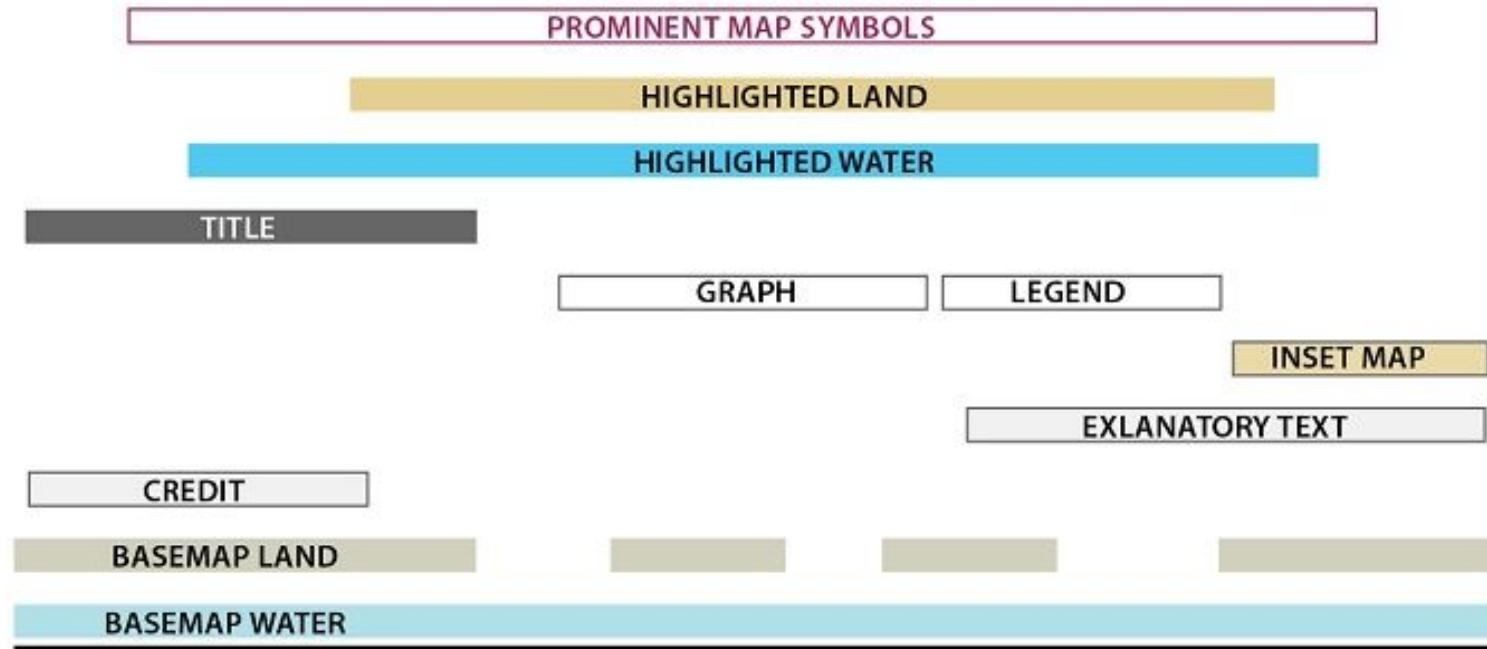
- Maritime boundary
- Median line
- 200 nautical mile limit
- Contiguous zone
- Territorial sea
- Straight baseline

Explanation

Lorem ipsum dolor sit amet, consectetuer adipiscing elit, sed diam nonummy nibh euismod tincidunt ut laoreet dolore magna aliquam erat volutpat. Ut wisi enim ad minim veniam, quis nostrud exerci tation ullamcorper suscipit lobortis nisl ut laoreet dolore magna aliquam erat volutpat. Ut wisi enim ad minim veniam, quis nostrud exerci

Visual Hierarchy

Visual Hierarchy



OPINION

Obama's Divided Nation

Visual Contrast

Now Obama presides over a more divided America than at any time in 50 years. That was riven by racial lines gathered in 2008 to elect its first black president. That president has spent four years dividing the country on the basis of economy. The campaign revealed no evidence that Mr. Obama will close the chasm he has created between his voters and those he attacked and vilified.

It may be true that Mitt Romney failed to respond



Source: AP

drawn attention to what hap-

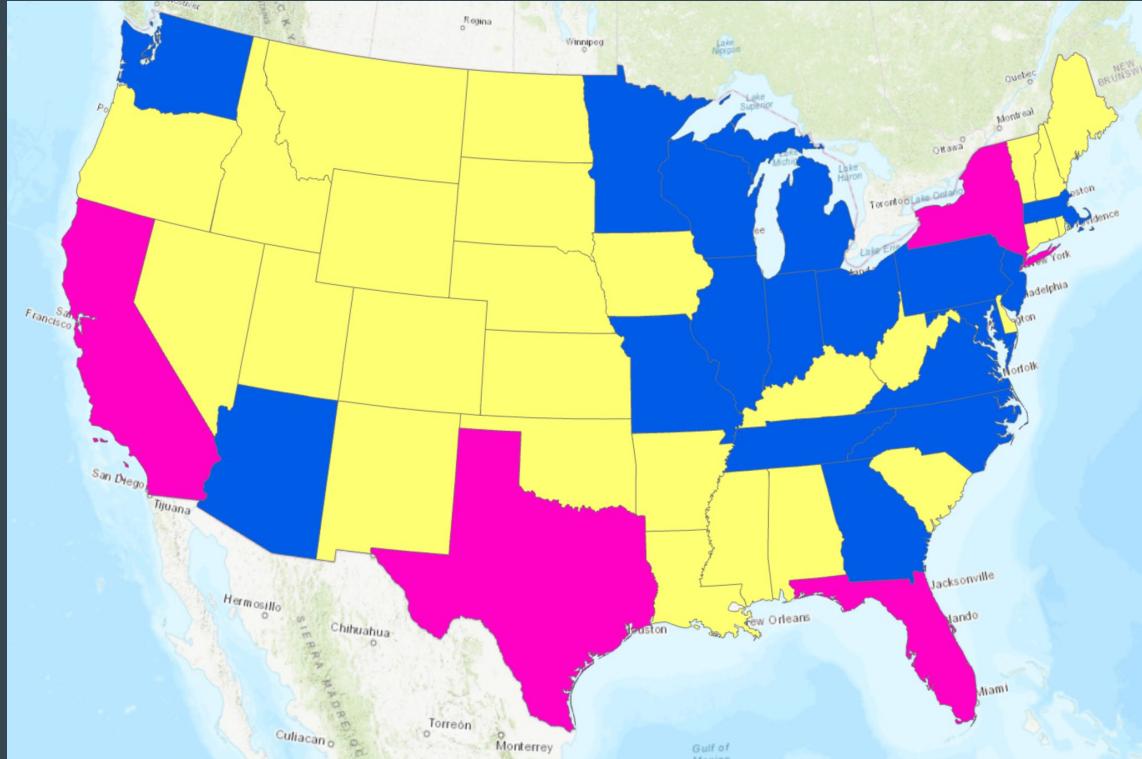
Obama spokesman replied: "It's right and you're wrong. It

problem with pols, especially when it comes to the economy, is that it's verbally facile as Mr. Obama likes to say. But in crunch time, it's not always clear what that means. In fact, it often reverts to No. 1. Exit polls show that 9% of the electorate voted for just one candidate on Tuesday; and among those who did, 42% said Mr. Obama's response to Hurricane Sandy was the tie photo-op—was the factor. Of those, 58% voted for Mr. Obama. The other 42% voted for Mr. Christie or Mr. Romney. Mr. Christie is one of the few politicos who is actually doing something.

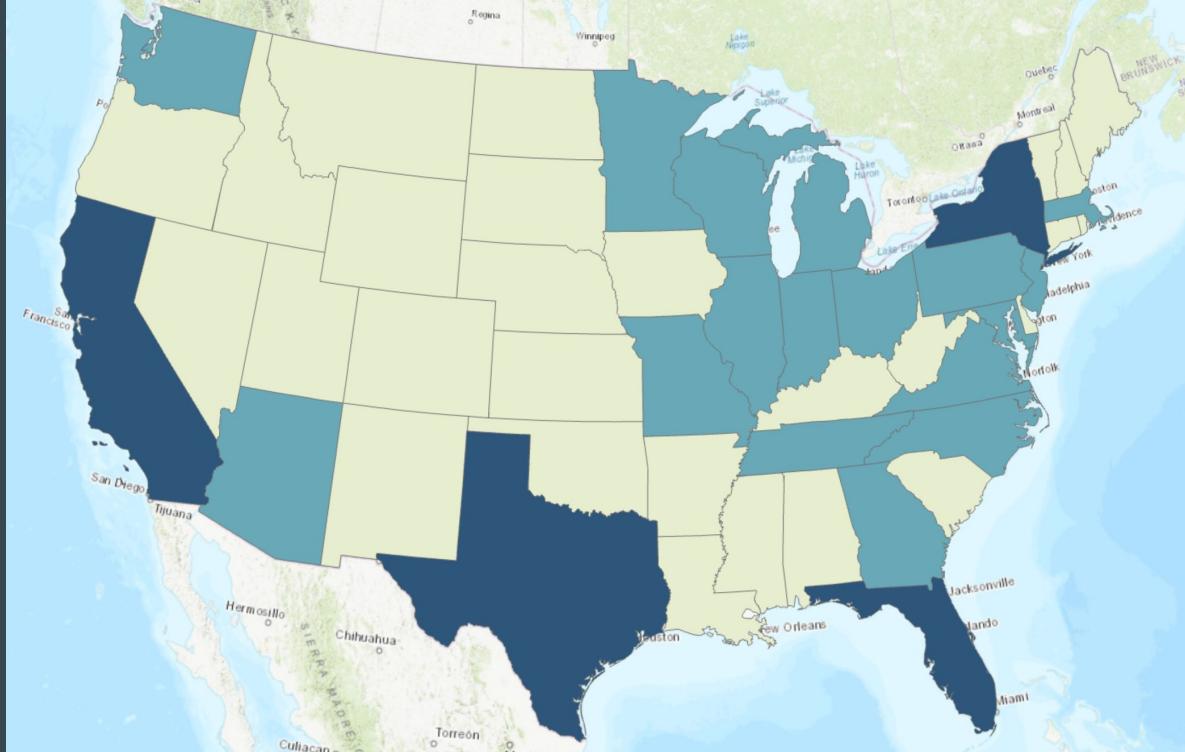
Yes, Republicans are across two presidents that there are some differences, but how crudely they handle an issue like immigration. Blowing up the White House if you thought the election day's results were unfair.

VOX

**Yes, there's
such a thing
as too much
Visual
Contrast**

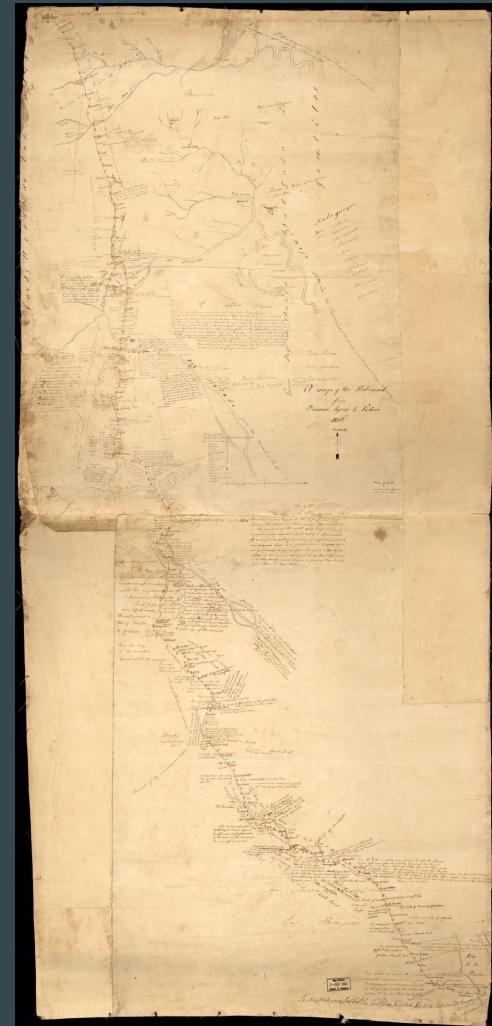


**Yes, there's
such a thing
as too much
Visual
Contrast**

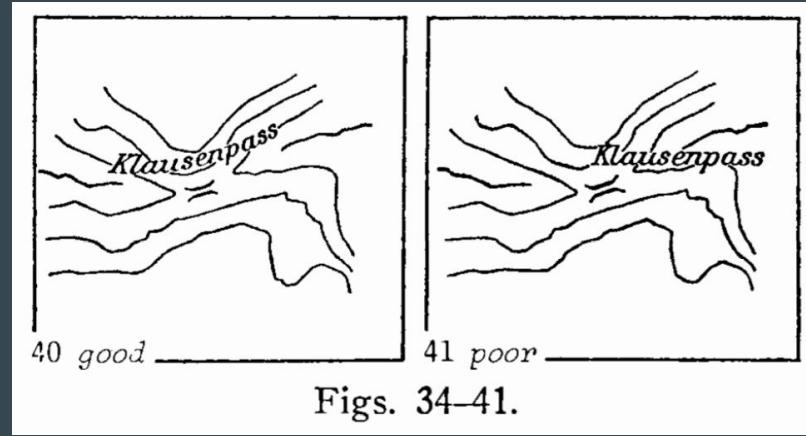
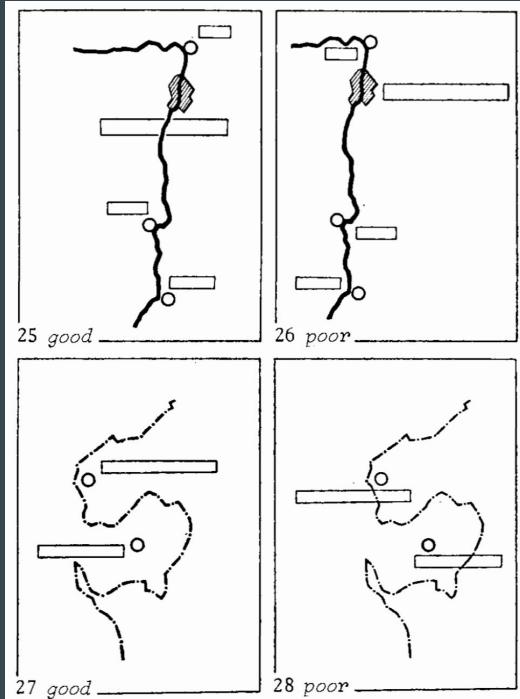


Legibility

(scale matters)



Legibility (scale matters)



Figs. 34–41.

The names should, in spite of their incorporation into the dense graphics of the map, be easily read, easily discriminated, and easily and quickly located.

Legibility depends not only on type form, type size, and type color but also on the position or arrangement of other names.

Eduard Imhoff (1975)

Layout Balance

CUBA MARITIME LIMITS



Explanation

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Explanation

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CUBA MARITIME LIMITS

CUBA MARITIME LIMITS



Explanation

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CUBA MARITIME LIMITS



Explanation

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How can you make your own maps without expensive GIS software?

- Datawrapper:
 - *app.datawrapper.de/create/map*
- Dave's Redistricting Tool
 - *Davesredistricting.org*
- Google Maps
- Google Earth
- QGIS

Tabular Data (Delimited Text)

Decision Tree

Does my spreadsheet contain a field that can link to existing spatial data?

Does my spreadsheet contain Latitude (Y) and Longitude (X) columns?

Does my spreadsheet contain address information?

Join to shapes based on that common field. Use Datawrapper or QGIS

Add as delimited text, to create a point file in QGIS. Or load into Datawrapper

Use a GEOCODING in QGIS or Google Sheets

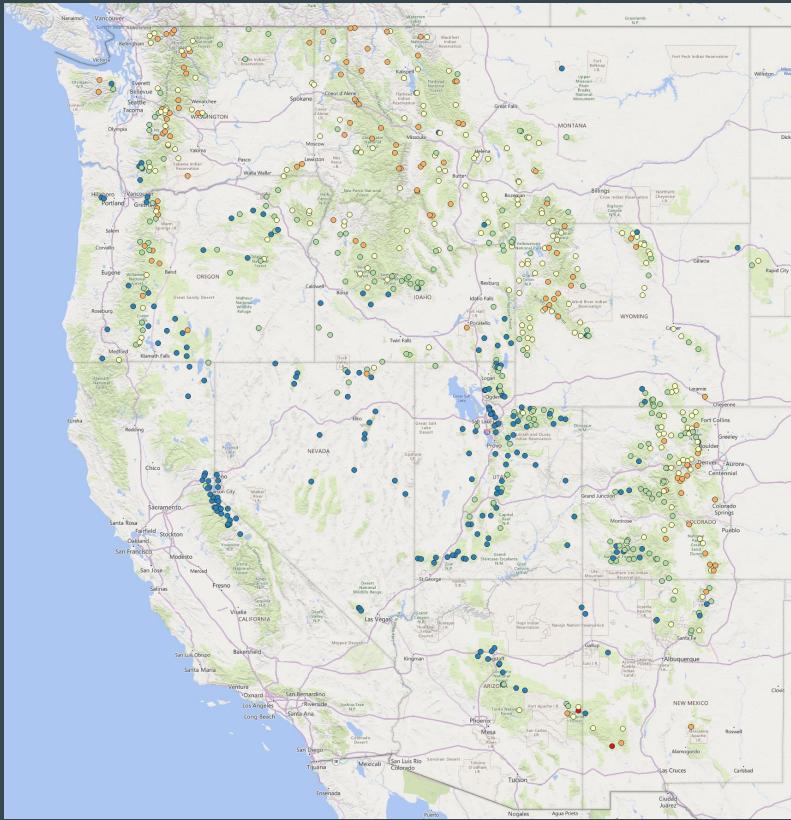
XY Data

A red arrow points from the F, G, and H columns of the table to the map below.

	A	B	C	D	E	F	G	H
1	Name	ID	State	Network	County	Elevation	Latitude	Longitude
2	Adin Mtn	301	California	SNOTEL	Modoc	6190	41.23583	-120.792
3	Agnew Pa:AGP		California	Cooperative	Madera	9450	37.724	-119.143
4	Agua Can:907		Utah	SNOTEL	Kane	8900	37.52217	-112.271
5	Aiken Lake:4A30P		British Col	Cooperative		3481	56.43333	-125.733
6	Albro Lake:916		Montana	SNOTEL	Madison	8300	45.59723	-111.959
7	Alexander:1267		Alaska	SNOTEL	Matanuska	160	61.74967	-150.89
8	Alpha:ALP		California	Cooperative	El Dorado	7600	38.805	-120.215
9	Alpine Me:908		Washington	SNOTEL	King	3500	47.77957	-121.698
10	American:1189		Alaska	SNOTEL	Southeast	1050	64.78969	-141.234
11	Anchor Rv:1062		Alaska	SNOTEL	Kenai Peni	1653	59.85972	-151.315
12	Anchorage:1070		Alaska	SNOTEL	Anchorage	2080	61.11483	-149.667
13	Aneroid:L:302		Oregon	SNOTEL	Wallowa	7400	45.21328	-117.193
14	Annie Sprl:1000		Oregon	SNOTEL	Klamath	6010	42.87007	-122.165
15	Apishapa:303		Colorado	SNOTEL	Huerfano	10027	37.33067	-105.068
16	Arapaho F:1030		Colorado	SNOTEL	Grand	10976	40.35098	-106.381
17	Arbuckle M:304		Oregon	SNOTEL	Morrow	5770	45.19085	-119.254
18	Atlanta Su:306		Idaho	SNOTEL	Elmore	7580	43.7569	-115.239
19	Atwater:1308		Utah	SNOTEL	Salt Lake	8753	40.59124	-111.638
20	Azure:1E08P		British Col	Cooperative		5331	52.58333	-119.717
21	Badger Pa:307		Montana	SNOTEL	Pondera	6900	48.13088	-113.023
22	Baker Butt:308		Arizona	SNOTEL	Coconino	7363	34.45654	-111.407
23	Baker Butt:1140		Arizona	SNOTEL	Coconino	7752	34.45552	-111.383
24	Bald Mtn:309		Wyoming	SNOTEL	Big Horn	9380	44.8007	-107.844
25	Baldy:310		Arizona	SNOTEL	Apache	9221	33.97845	-109.504
26	Banfield N:311		Montana	SNOTEL	Lincoln	5600	48.5712	-115.446
27	Banner Su:312		Idaho	SNOTEL	Boise	7040	44.30342	-115.234
28	Bar M:1212		Arizona	SNOTEL	Coconino	6397	34.86142	-111.605
29	Barker Lak:313		Montana	SNOTEL	Deer Lodg	8250	46.09713	-113.13
30	Barkerville 1A03P		British Col	Cooperative		4865	53.05	-121.483
31	Barnes Cr:2B06P		British Col	Cooperative		5233	50.06667	-118.35
32	Base Cam:314		Wyoming	SNOTEL	Teton	7060	43.94019	-110.445
33	Basin Cree:315		Montana	SNOTEL	Silver Bow	7180	45.79737	-112.52
34	Bassoo Pe:1190		Montana	SNOTEL	Sanders	5150	47.85562	-114.758
35	Bateman:316		New Mex	SNOTEL	Rio Arriba	9240	36.51174	-106.315
36	Battle Mo:317		Wyoming	SNOTEL	Carbon	7498	41.05402	-107.267
37	Beach Me:BCH		California	Cooperative	Tulare	7650	36.127	-118.293
38	Beagle Spr:318		Montana	SNOTEL	Beaverhead	8850	44.47147	-112.982
39	Bear Basir:319		Idaho	SNOTEL	Adams	5350	44.95222	-116.143

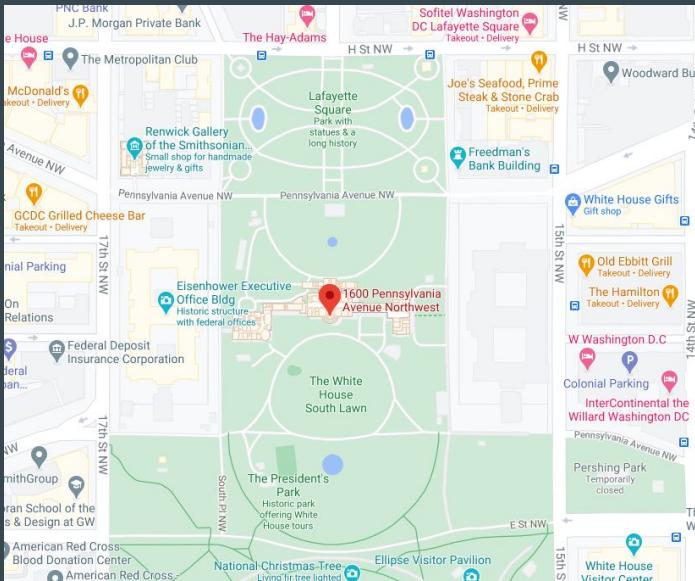
Snow Water Equivalent, March 19

Ready



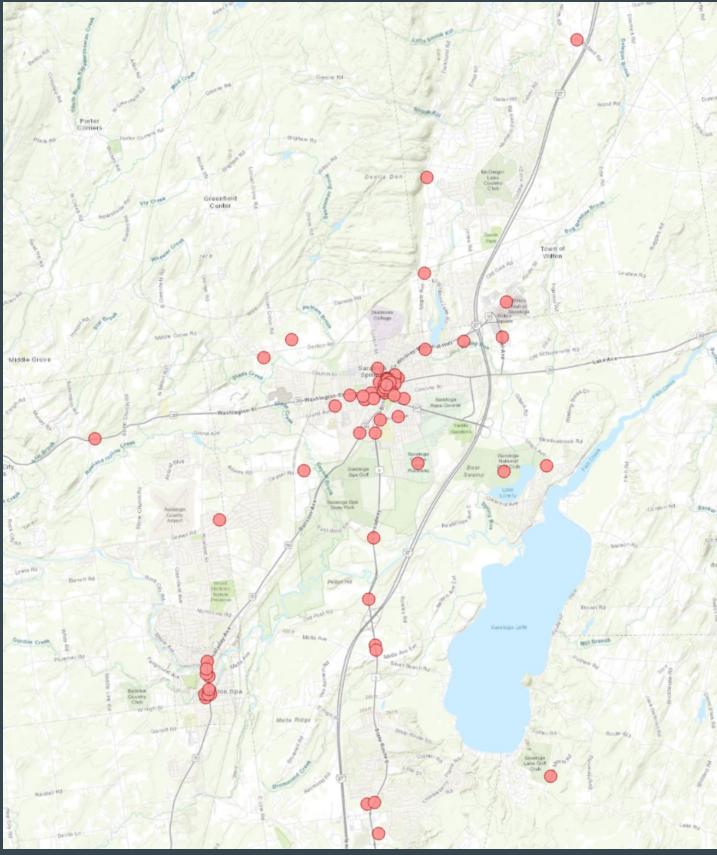
Geocoding

1600 Pennsylvania Ave NW,
Washington DC

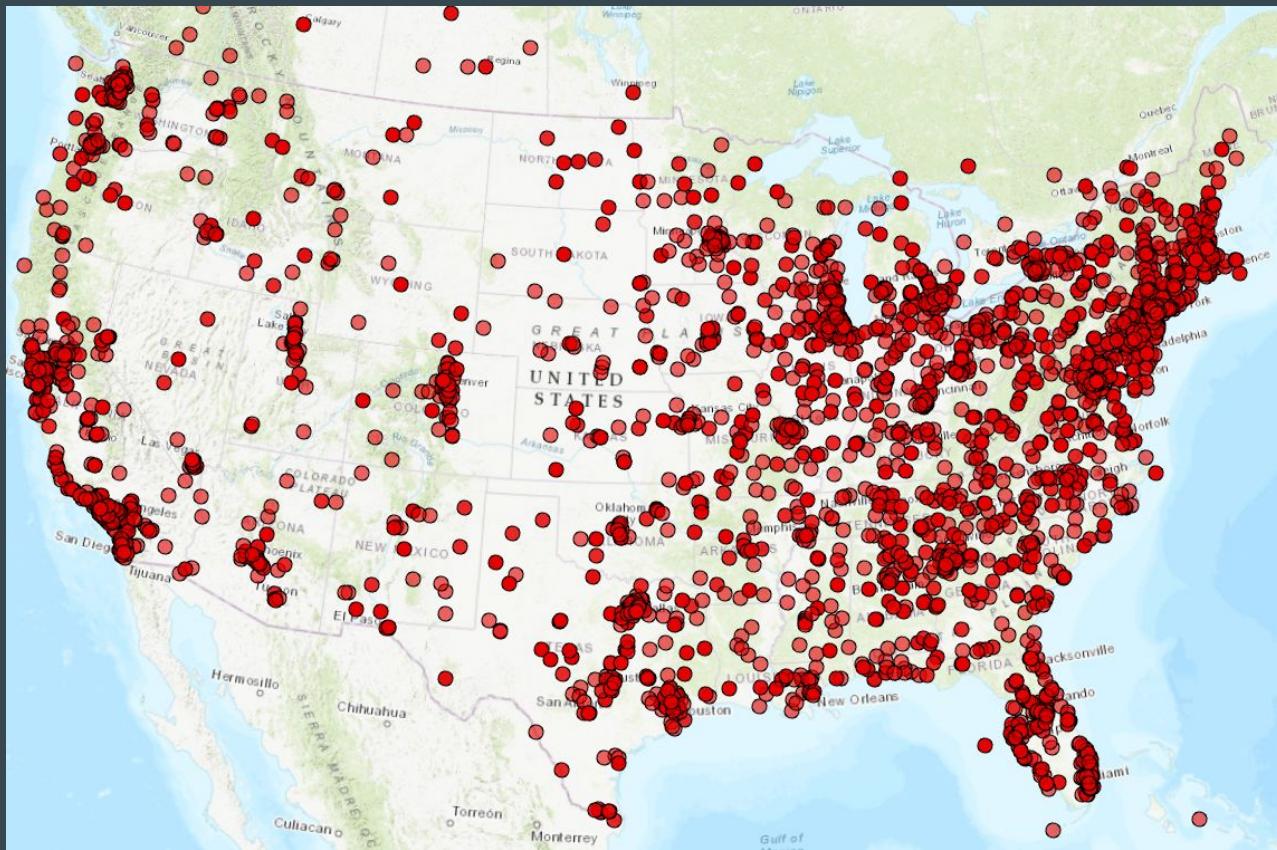


Geocoding Toga Restaurants

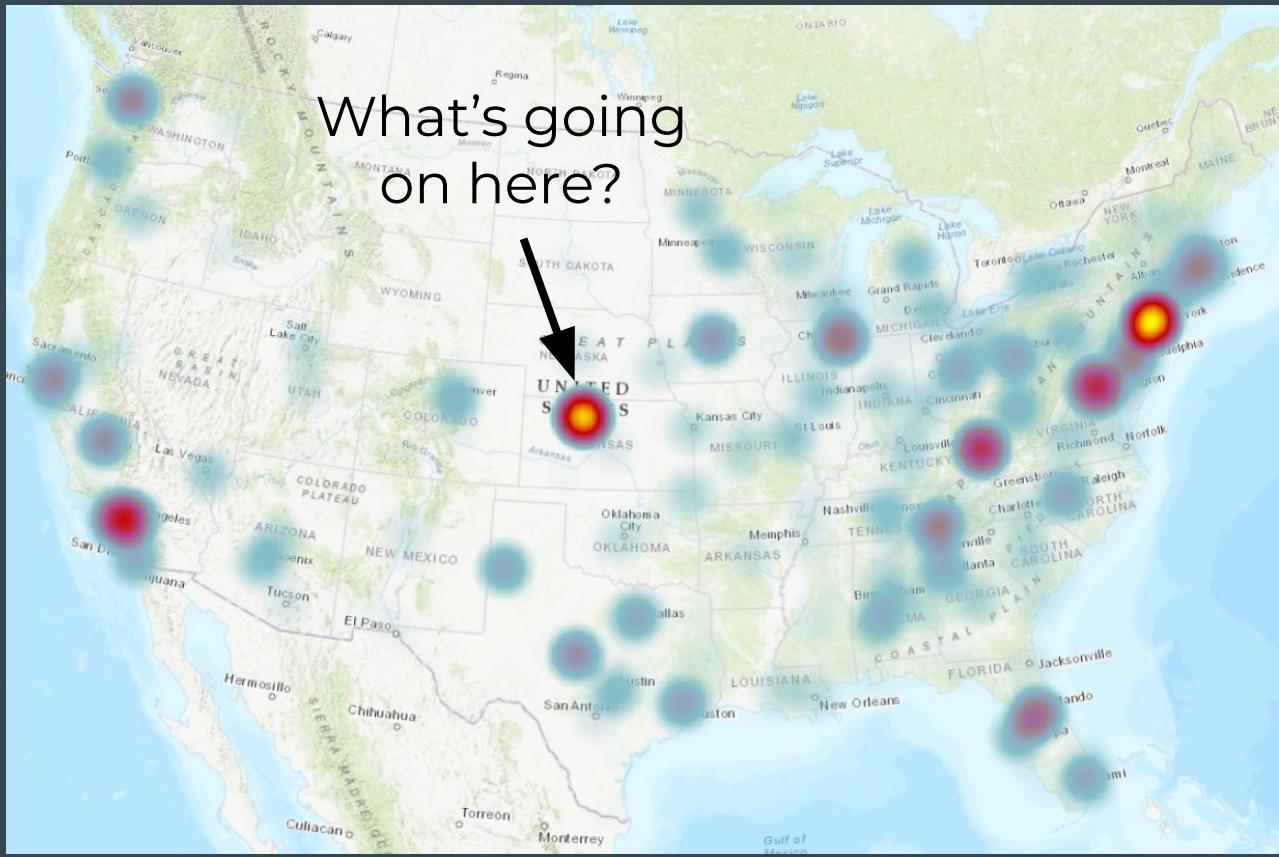
A	B	C	D	E	F
OID	name	city	number	web	formatted
2	0 13 North Restaurant	saratoga	518-400-1746	http://13northerns	2955 U.S. 9, Malta, NY 12020, USA
3	1 30 Lake	saratoga	518-539-3474	https://30lake.co/30	Lake Ave, Saratoga Springs, NY 12866, USA
4	2 9 Miles East	saratoga	518-514-8106	www.pizzadelive	136 Goff Rd, Schuylerville, NY 12871, USA
5	3 Alarco Mediterranean Grill Restaurant	saratoga	518-490-2338	www.alarco	grill 2007 Doubleday Ave, Ballston Spa, NY 12020, USA
6	4 Andy's Adirondack Grille	saratoga	518-580-1269	http://www.andys	1272 U.S. 9, Malta, NY 12020, USA
7	5 Antipasto's	saratoga	518-383-1209	www.antipastos.	1026 NY-146, Clifton Park, NY 12065, USA
8	6 Artisanal Brew Works	saratoga	518-306-4344	https://artisanal	41 Geyser Rd, Saratoga Springs, NY 12866, USA
9	7 Augie's Restaurant	saratoga	518-884-8600	www.augiesresta	17 Low St, Ballston Spa, NY 12020, USA
10	8 Bellini's Italian Eatery	saratoga	518-348-2090	http://www.marr	19 Clifton Country Rd, Clifton Park, NY 12065, USA
11	9 Beverly Eatery	saratoga	518-885-2848	https://www.face	256 Milton Ave, Ballston Spa, NY 12020, USA
12	10 BurgerFi	saratoga	518-450-7652	www.burgerfi.co	460 Broadway, Saratoga Springs, NY 12866, USA
13	11 BWP	saratoga	518-763-2975	www.BeerWineP	70 Weibel Ave, Saratoga Springs, NY 12866, USA
14	12 By the Bottle Wine and Spirits	saratoga	518-860-0299	https://www.byt	556 Maple Ave, Saratoga Springs, NY 12866, USA
15	13 C & R Restaurant	saratoga	518-882-1300	http://www.good	1396 NY-29, Galway, NY 12074, USA
16	14 Caputos Pizza	saratoga	518-581-0011	https://www.ca	p 3039 NY-50, Saratoga Springs, NY 12866, USA
17	15 Carney's Tavern	saratoga	518-280-7959	http://www.carn	17 Main St, Ballston Lake, NY 12019, USA
18	16 Chez Pierre	saratoga	518-793-3350	https://www.che	1144, 1144, 979, Saratoga Rd, Gansevoort, NY 12831, USA
19	17 Clark's Steakhouse	saratoga	518-695-2073	http://www.clark	1 Ferry St, Schuylerville, NY 12871, USA
20	18 Coffee Planet	saratoga	518-884-9913	https://www.face	100 Milton Ave, Ballston Spa, NY 12020, USA
21	19 Common Roots Brewing	saratoga	518-409-8248	www.commonro	c 58 Saratoga Ave, South Glens Falls, NY 12803, USA
22	20 Comptons Restaurant	saratoga	518-584-9632	http://www.sarat	457 Broadway, Saratoga Springs, NY 12866, USA
23	21 Crackerbarrel Old Country Store	saratoga	518-873-8156	https://crackerba	r 4 Tower Way, Clifton Park, NY 12065, USA
24	22 Dizzy Chicken Barbecue	saratoga	518-583-3411	https://www.dizz	102 Congress St, Saratoga Springs, NY 12866, USA
25	23 Dominoes Pizza Halfmoon	saratoga	518-383-8888	https://www.don	1683 Route 9, Halfmoon, NY 12065, USA
26	24 Dominoes Pizza Saratoga	saratoga	518-587-2244	https://www.don	86 Washington St, Saratoga Springs, NY 12866, USA
27	25 Dunning Street Station Bar & Grill	saratoga	518-587-2000	https://www.dun	2853 State Hwy 9, Malta, NY 12020, USA
28	26 Eddie F's Eatery	saratoga	518-450-7830	https://www.face	119 Clinton St, Saratoga Springs, NY 12866, USA
29	27 Esperanto	saratoga	518-466-9453	https://esperant	o 4 Caroline St, Saratoga Springs, NY 12866, USA
30	28 Five Guys	saratoga	518-583-3135	www.fivegu	y.co 3057 NY-50, Saratoga Springs, NY 12866, USA
31	29 Flatbread Social	saratoga	518-886-1198	https://flatbread	.84 Henry St, Saratoga Springs, NY 12866, USA
32	30 Four Seasons Natural Foods	saratoga	518-584-4670	https://fourseaso	n 120 Henry St, Saratoga Springs, NY 12866, USA
33	31 Gennaro's Pizza Parlor	saratoga	518-584-1900	https://www.gen	.46 Marion Ave, Saratoga Springs, NY 12866, USA
34	32 Geppetto's Italian Restaurant	saratoga	518-695-5500	https://geppetos	Schuylerville, NY 12871, USA
35	33 Greenhouse Salads	saratoga	518-450-1036	www.eatgreenh	e 33 Railroad Pl, Saratoga Springs, NY 12866, USA
36	34 Halftime Bar + Grill	saratoga	518-792-4869	https://www.face	1498 U.S. 9, Fort Edward, NY 12828, USA
37	35 Hamlet & Ghost Cocktail Bar	saratoga	(919) 624-8839	http://www.ham	24 Caroline St, Saratoga Springs, NY 12866, USA
38	36 Hattie's Chicken Shack- Wilton	saratoga	518-226-0000	http://www.hatti	3057 Rt 50 Wilton Plaza, Saratoga Springs, NY 12866, USA
39	37 Henry Street Taproom	saratoga	518-886-8938	https://www.hen	86 Henry St, Saratoga Springs, NY 12866, USA
40	38 Iron Root	saratoga	518-309-3535	www.ironroot	st.36 Front St, Ballston Spa, NY 12020, USA
41	39 Jacob & Anthony's American Grille	saratoga	518-871-1600	http://www.marr	38 High Rock Ave, Saratoga Springs, NY 12866, USA
42	40 Jimmys Pizza & Pasta	saratoga	518-899-2939	https://jimmyspi	31 Kendall Way, Ballston Spa, NY 12020, USA
43	41 JoAnn's Candy House	saratoga	518-581-0405	https://www.face	3076 NY-50, Saratoga Springs, NY 12866, USA
44	42 KaffeeHouse	saratoga	518-729-8480	www.kaffeehous	120 West Ave, Saratoga Springs, NY 12866, USA
45	43 Karavalli Regional Cuisine of India	saratoga	518-580-1144	https://www.kar	47 Caroline St, Saratoga Springs, NY 12866, USA
46	44 Lake Ridge Restaurant	saratoga	518-899-6000	www.lake	35 Burlington Ave, Round Lake, NY 12151, USA
47	45 Longfellows Hotel, Restaurant & Conference	saratoga	518-587-0108	http://www.long	500 Union Ave, Saratoga Springs, NY 12866, USA
48	46 Mama Mia's Restaurant	saratoga	518-583-7783	www.mamamia	185 Ballston Ave, Saratoga Springs, NY 12866, USA
49	47 MORTON'S THE STEAKHOUSE	saratoga	518-682-5999	https://mort	342 Jefferson St, Saratoga Springs, NY 12866, USA
50	48 Mouzon House	saratoga	518-226-0014	https://mouzoh	n 1 York St, Saratoga Springs, NY 12866, USA
51	49 Mrs. London's Now Full Market!	saratoga	518-581-8100	https://www.mrs	464 Broadway, Saratoga Springs, NY 12866, USA



Geocoding - Heatmap Version



Geocoding - Heatmap Version



Geocoding Can Get Weird

Search

- Illinois, USA
- In a van down by the river.
- In departure lounge at mbj
- Indianapolis, IN
- Indianapolis, Indiana

- The Gym
- The High Country
- The Hills,
- the land of the rising sun
- The Lone Star State
- The Mitten
- The moon
- The NATION of TEXAS
- The North Woods
- The Old Dominion
- The Other Side of the Moon
- The Palmetto State
- the rim
- The S.S Tipton

- United State of America
- United States
- United States (Alabama)
- United States Midwest
- United States of America
- United States of America, USA
- United States of Florida
- United States of Texas
- United States, Ohio
- United States.
- United States<U+0001F1FA><
- United States<U+0001F1FA><
- United States-ohio
- Universal

ArcGIS Pro - Model Builder: *Wind Energy Suitability in Ag*

- We will be assessing suitability for wind development based on:
 - Land cover (existing ag land) from NLCD
 - Wind speed at 100m from Global Wind Atlas
 - Distance to Transmission Lines from Dept of Homeland Security

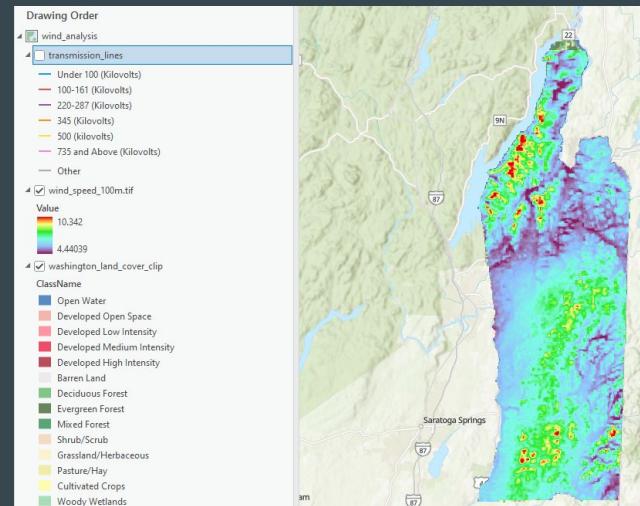
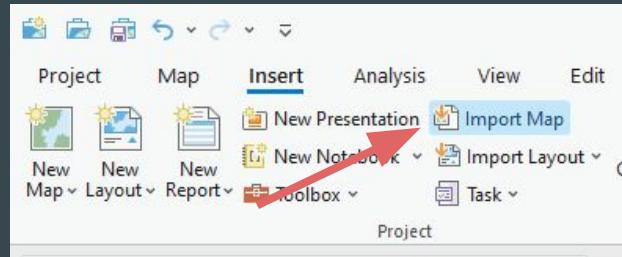


ArcGIS Online Signup

- Open a web browser (phone or computers)
- Go to skid.maps.arcgis.com
- Your username is: *yourid_Skid*
 - Capital **S** in Skid
 - For example Emilio's is *evavarella_Skid*
- Your temporary password is: *gis4ever*

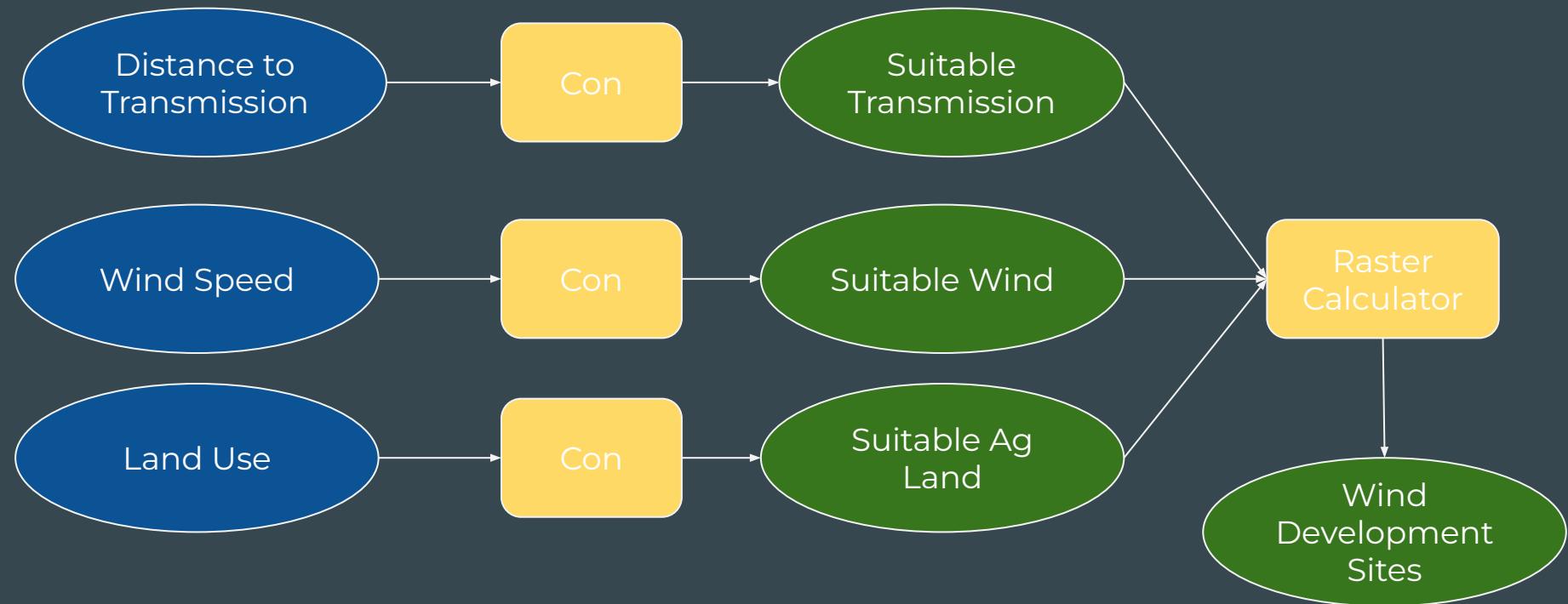
ArcGIS Pro - Model Builder: *Wind Energy Suitability in Ag*

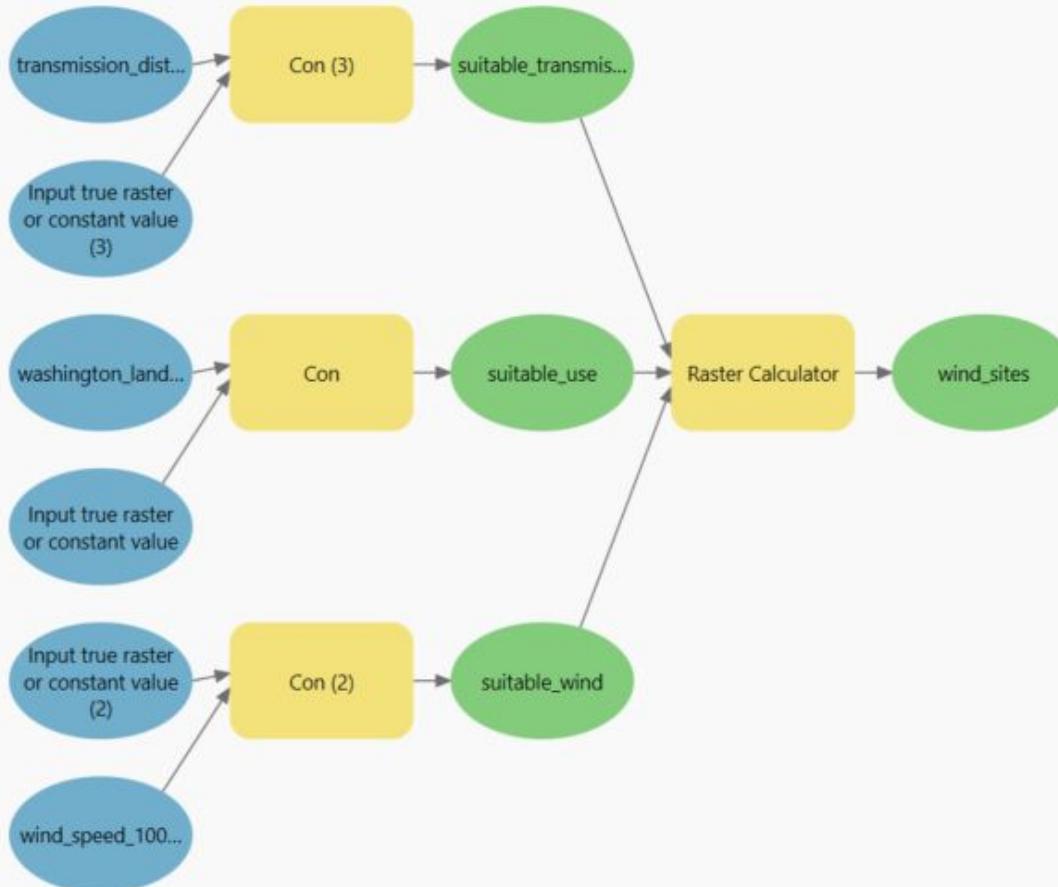
- Open up ArcGIS Pro and login with your AGOL credentials
- Create a new project called “wind”
- Click on Insert, then select Import Map
- Navigate to Portal->Groups and click on **wind_analysis_mf351**
- This should launch a new map tab with all the raster/vector layers needed for the project



ArcGIS Pro - Model Builder:

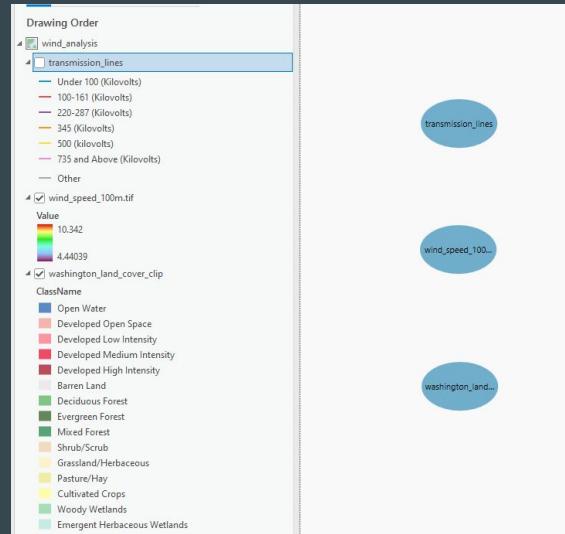
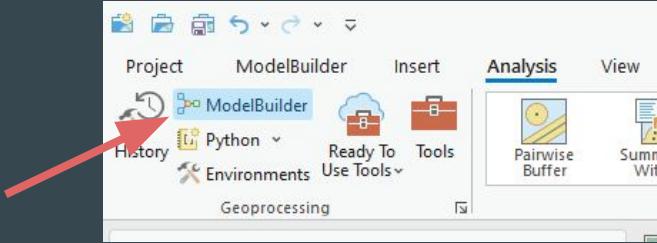
Wind Energy Suitability in Ag





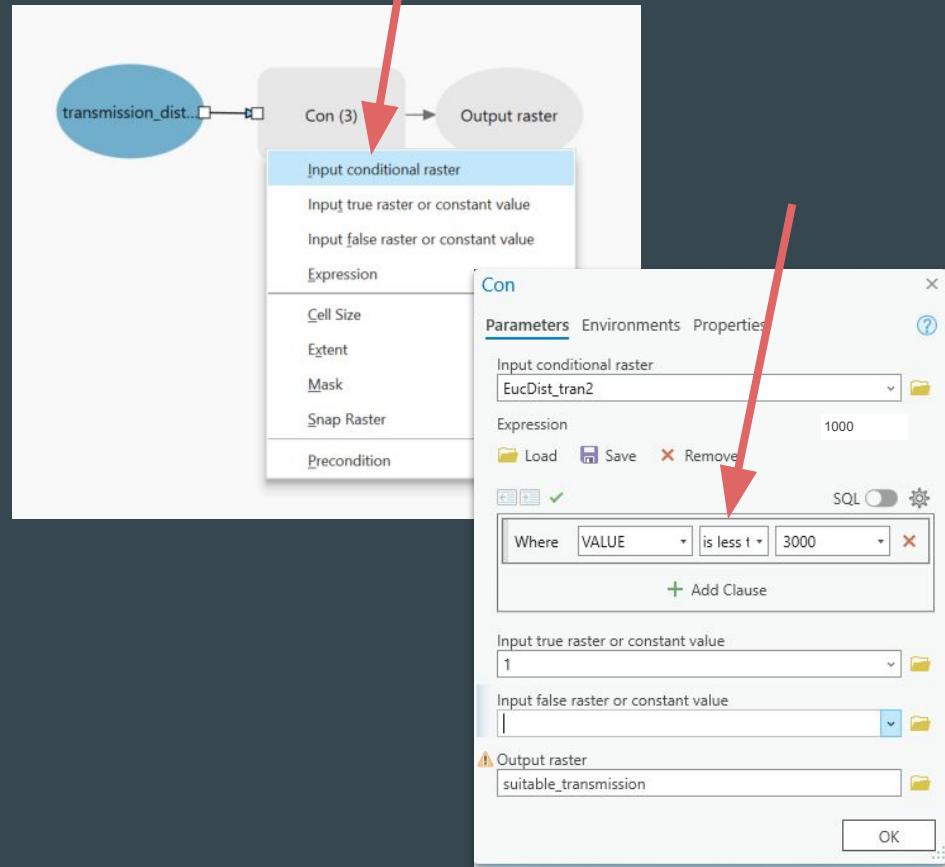
Open Model Builder

- Click on Analysis -> Model Builder
- In this space, drag your three RASTER map layers onto the canvas (space them out a bit)



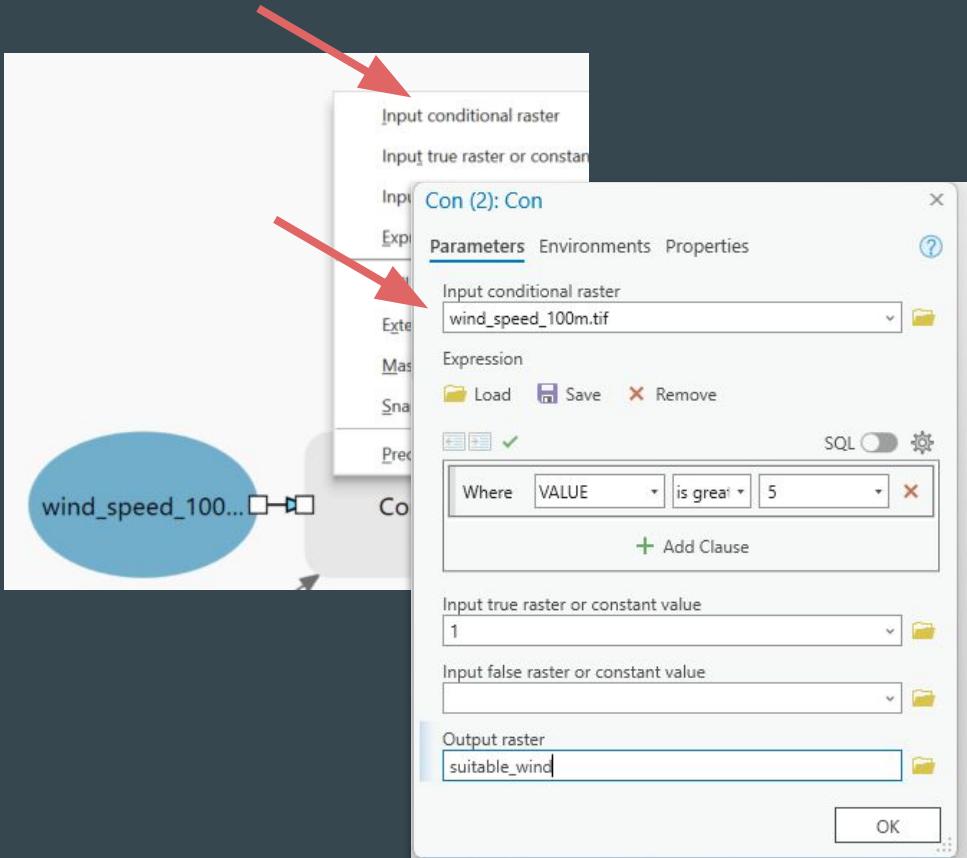
Con Tool - Transmission Distance

- The Con tool is a powerful tool for raster reclassification.
- Start typing Con, then drag it onto the canvas
- Drag an arrow from transmission_distance to con and set as input conditional raster
- Double click on the con tool
- Build an expression where Value is Less than 1000 (e.g. 1 km)
- Set True to 1 and leave False blank
- Set output as **suitable_transmission**



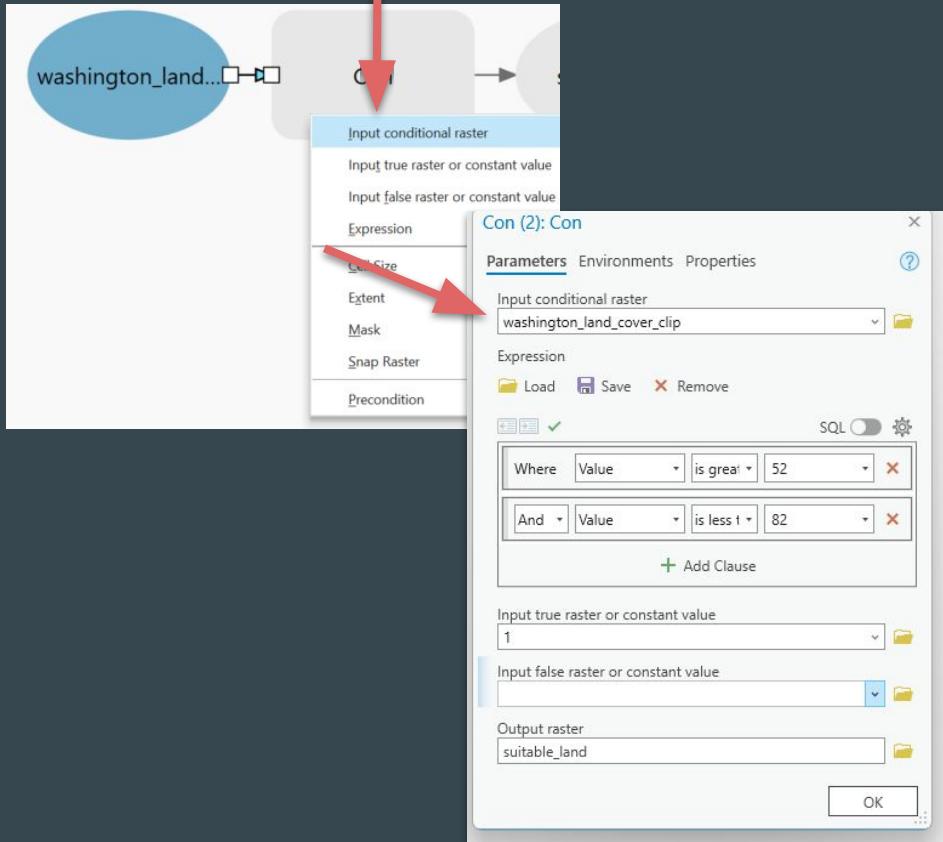
Con Tool - Wind Speed

- Again, start typing Con, then drag it onto the canvas
- Drag an arrow from transmission_distance to con and set as input conditional raster
- Double click on the con tool
- Build an expression where Value is Greater than 5 (minimum speed for wind turbines)
- Set True to 1 and leave False blank
- Set output as **suitable_wind**



Con Tool - Land Use

- Again, start typing Con, then drag it onto the canvas
- Drag an arrow from `washington_land_cover` to con and set as input conditional raster
- Double click on the con tool
- Build an expression where Value is Greater than or Equal to 52 AND Less than or Equal to 82
- Set True to 1 and leave False blank
- Set output as **suitable_land**



Raster Calculator

- We'll be adding all three suitability layers here, simple as that!
- Double click each layer you'd like to add, then separate with a +
- Rename as wind_sites
- When done, right click the output of Raster Calculator and click Add to Map
- Then, you can run your whole model!

