

Mapping basics



Amelia McNamara

@AmeliaMN



The problem with maps is that the world looks like a map. We don't have that problem with other visualizations. @tmcw #NICAR14

9:15 AM - 28 Feb 2014



Amelia is @amelia@vis.social on Mastodon
@AmeliaMN

The problem with maps is that the world looks like a map. We don't have that problem with other visualizations. @tmcw #NICAR14

2/28/2014, 10:15:19 AM

Favs: 8 Retweets: 1 [link](#)

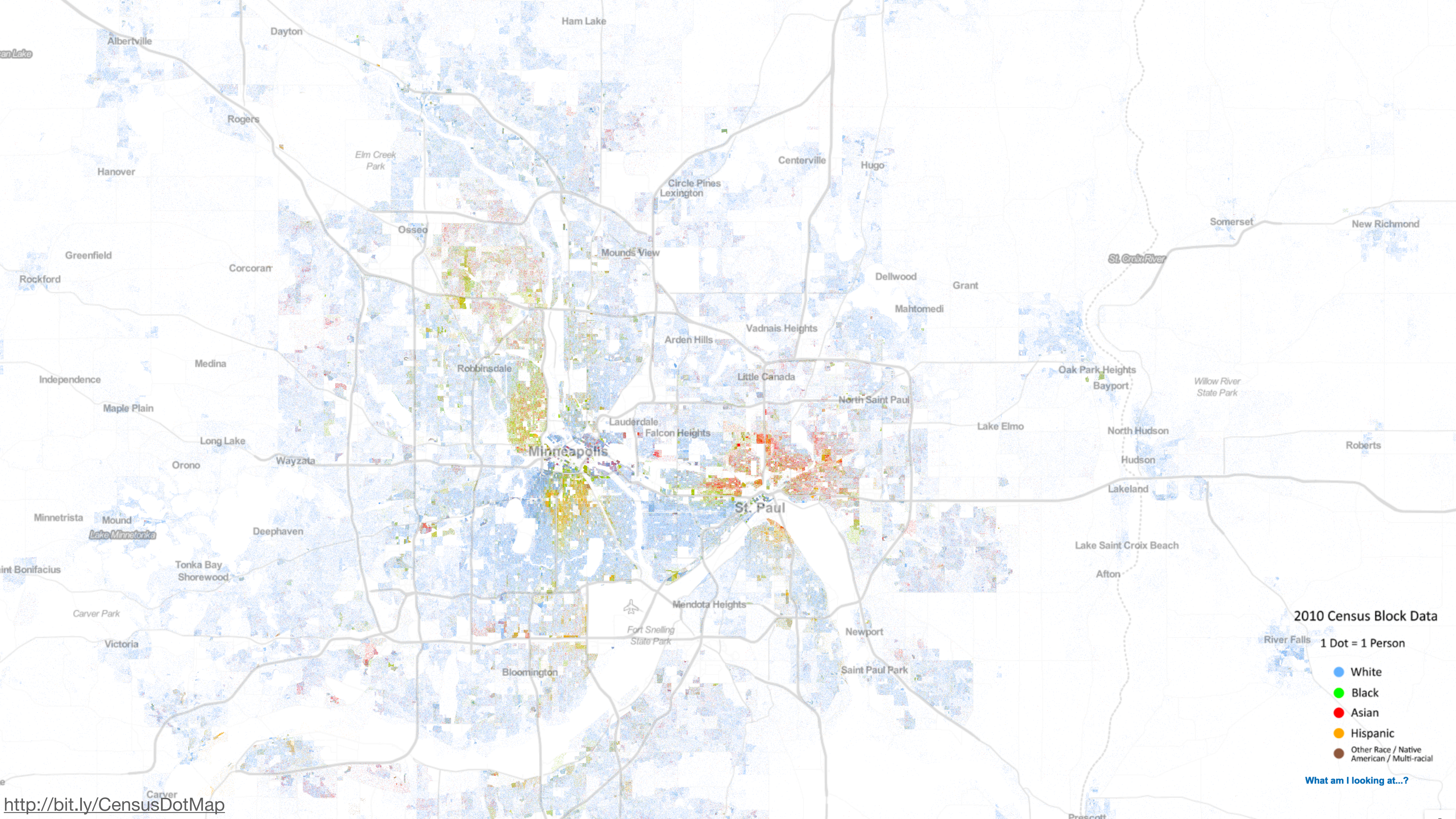
Types of geographic data

Points

Lines

Polygons

Points



2010 Census Block Data

1 Dot = 1 Person

- White
- Black
- Asian
- Hispanic
- Other Race / Native American / Multi-racial

What am I looking at...?



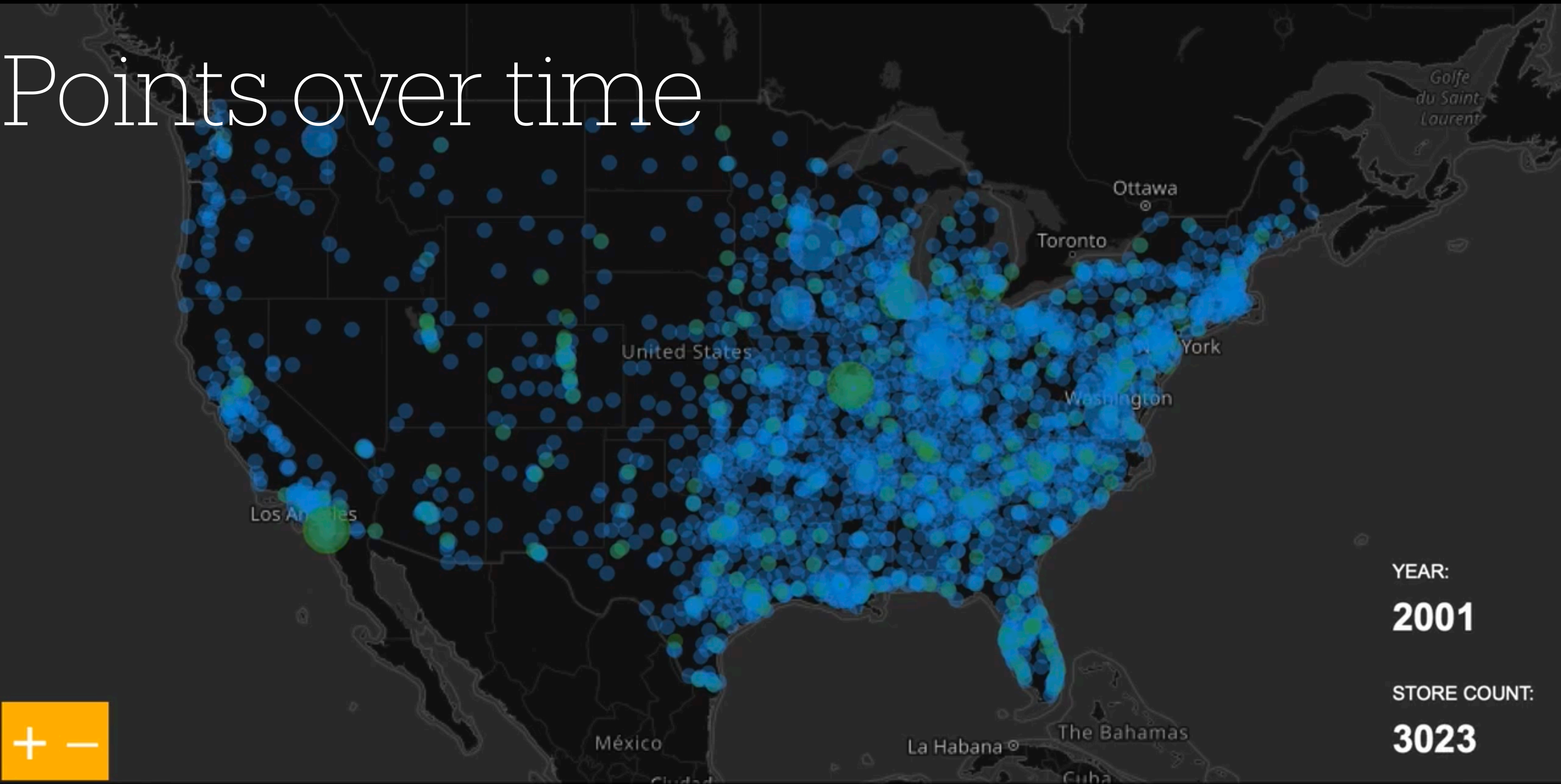
WHY WE HAVE REMOVED THE RACIAL DOT MAP

After nine years and millions of views, the 2010 Racial Dot Map has reached its expiration date. We have taken it offline as it no longer provides the most accurate depiction of the nation's population distribution and changing racial composition. Several factors contributed to this decision:

1. The 2020 Census count released by the U.S. Census Bureau on August 12, 2021 provides a new snapshot of the U.S. population by race and ethnicity, making 2020 the most current data of record. As demographers committed to data integrity, we cannot continue to host a map that does not accurately tell the story of race in the United States.
2. Between the 2010 and 2020 censuses, the multi-race and "Some Other Race" categories show significant growth. In the 2020 Census, ten percent of the population identified as multi-race compared to three percent in 2010; and "Some Other Race" became the second largest racial group, surpassing the population identifying themselves as Blacks or African-Americans. Both the dynamic growth of these populations and complexity of reflecting this rich diversity through color-coded dots made the model used for the Racial Dot Map inadequate to the task.
3. Producing a new map, equally elegant in its simplicity but capable of reflecting many more racial/ethnic groups is beyond our organization's financial and personnel resources.

We appreciate that so many of you have been passionate advocates for the 2010 Racial Dot Map and the ways it has helped to promote equity in your communities.

Points over time



YEAR:

2001

STORE COUNT:

3023

Opinion | They Stormed the Cap X

https://www.nytimes.com/2021/02/05/opinion/capitol-attack-cellphone-data.html

The New York Times

OPINION | They Stormed the Capitol. Their Apps Tracked Them.

Share full article

720

From Trump's Rally to Congress

This time-lapse animation shows smartphones as they moved from Donald Trump's rally to the Capitol.

They Stormed the Capitol. Their Apps Tracked Them. Charlie Warzel and Stuart A. Thompson
<https://www.nytimes.com/2021/02/05/opinion/capitol-attack-cellphone-data.html>

Opinion | They Stormed the Cap X

https://www.nytimes.com/2021/02/05/opinion/capitol-attack-cellphone-data.html

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From Trump's Rally to Congress

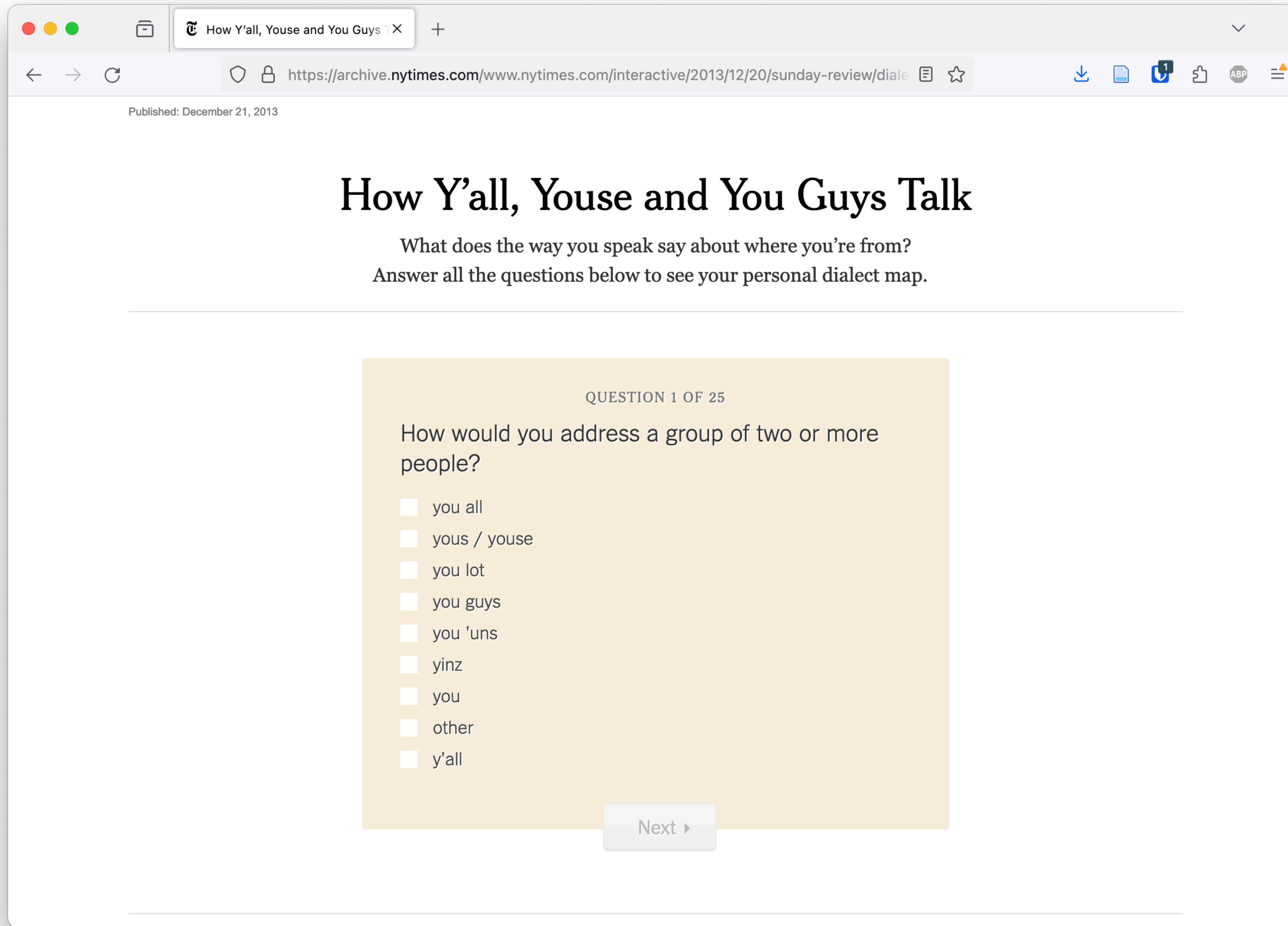
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They Stormed the Capitol. Their Apps Tracked Them. Charlie Warzel and Stuart A. Thompson

<https://www.nytimes.com/2021/02/05/opinion/capitol-attack-cellphone-data.html>

Heat maps

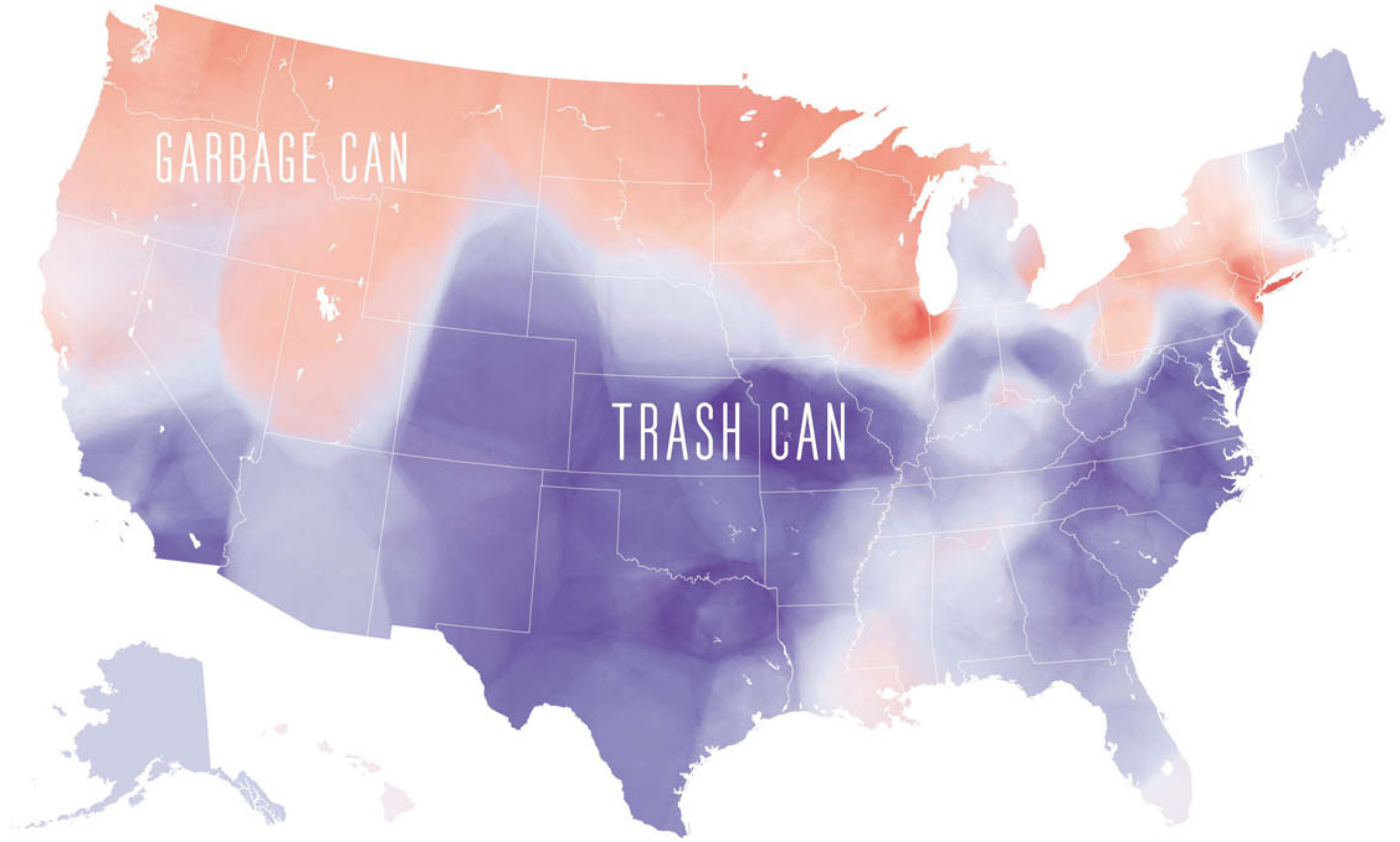
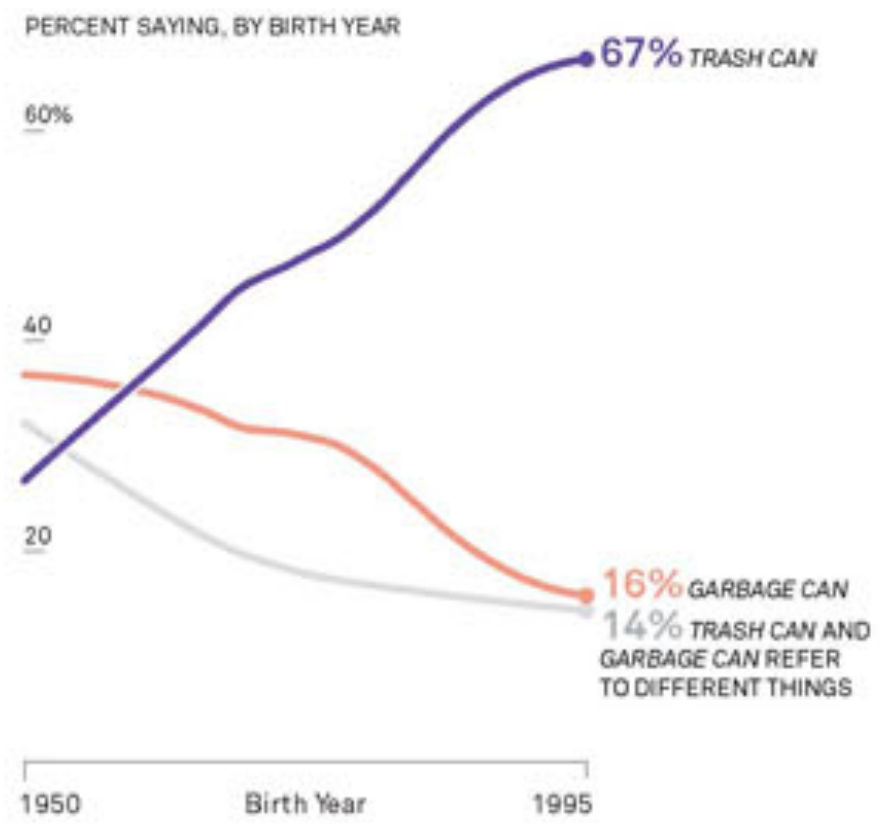


How Y'all, Youse and You Guys Talk. Josh Katz and Wilson Andrews

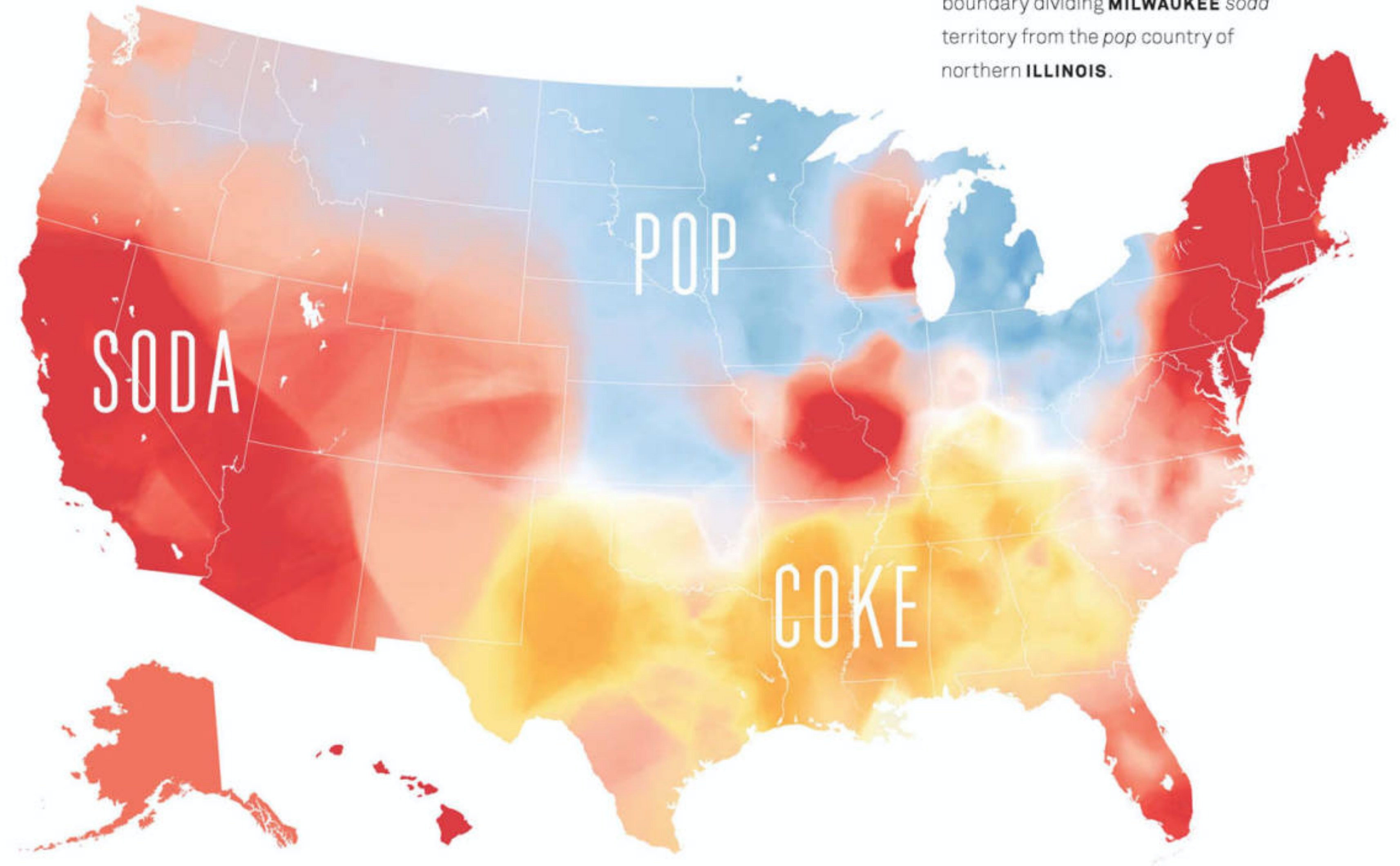
<https://archive.nytimes.com/www.nytimes.com/interactive/2013/12/20/sunday-review/dialect-quiz-map.mobile.html>

WHERE WE THROW OUR TRASH

Since the 1950s, trash can has become increasingly common in American speech. Two in three people born in the 1990s would say trash can over garbage can.

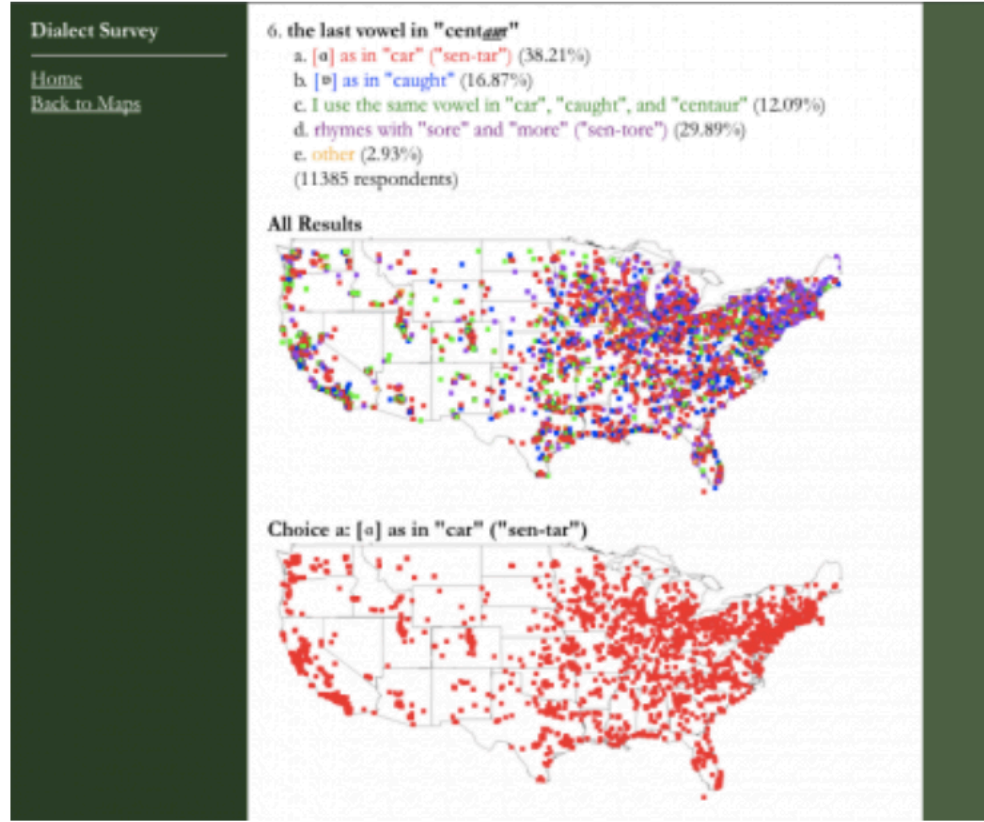


Sometimes the boundaries between terms are fuzzier. In **OKLAHOMA**, *soda*, *pop*, and *coke* all mix together. Contrast this with the sharp boundary dividing **MILWAUKEE** *soda* territory from the *pop* country of northern **ILLINOIS**.



Behind the dialect map interactive

https://knightlab.northwestern.edu/2014/01/20/behind-the-dialect-map-interactive-how-a



The Harvard Dialect Survey maps created by researchers in 2003.

Last March Katz was a grad student in the Department of Statistics at North Carolina State University and had recently decided he wanted to look more closely at an interesting set of data he'd seen 10 years prior, the Harvard Dialect Survey.

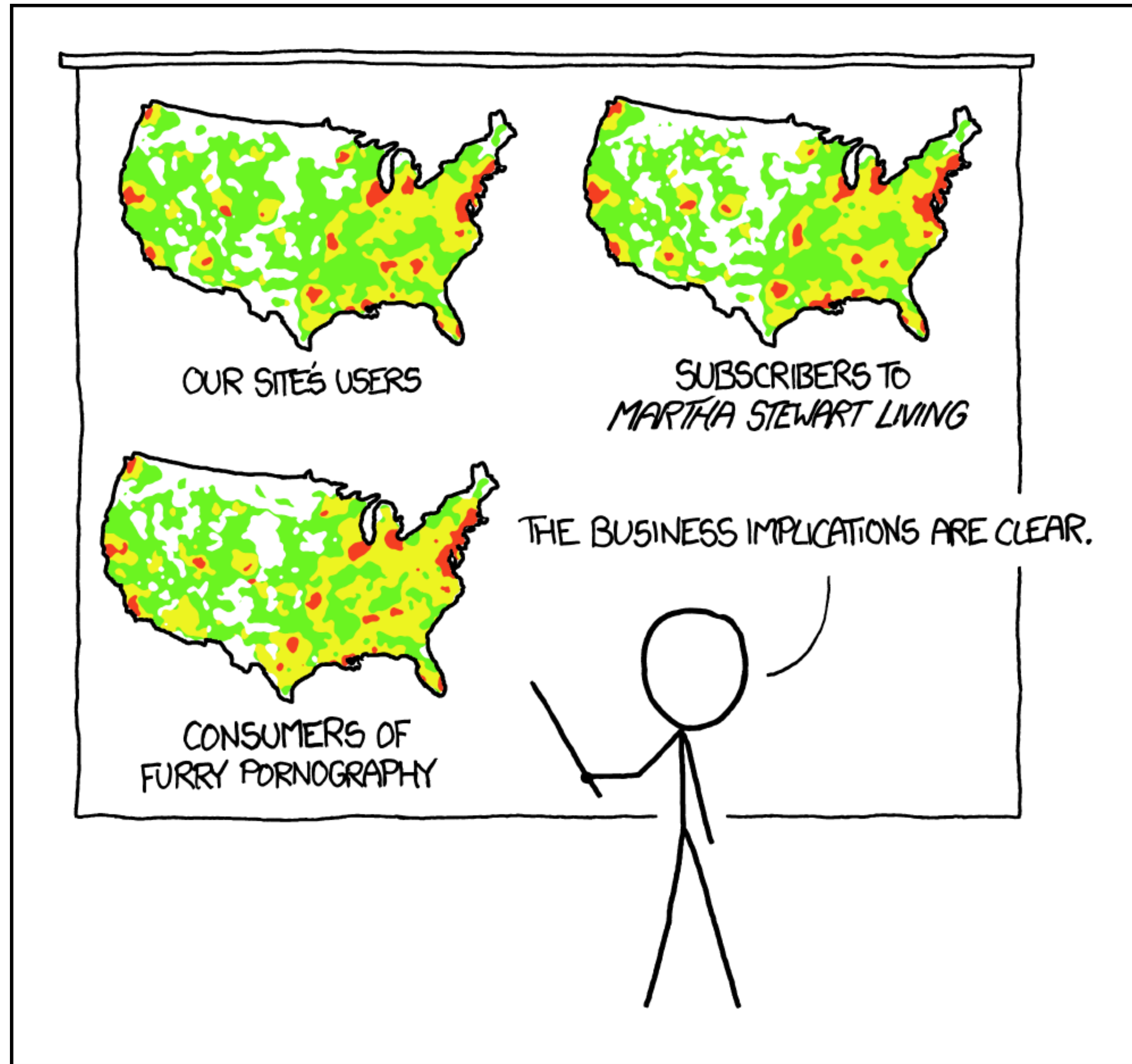
The study was based on the responses of more than 50,000 people to 122 questions on dialect, and had been presented by the researchers (Bert Vaux and Scott Golder) as a series of colored points on a map. While the data was interesting, Katz wanted to show a more elegant “smoothed estimate” of the same data.

Using the k-nearest neighbor algorithm and kernel density estimation (more detail [here](#)) he created a series of maps that showed the Harvard data in a series of maps most of us would call heat maps.

In June he posted those maps on the North Carolina State University website and on [RStudio.com](#), a community site for R developers.

By August the graphics desk at the Times had discovered them and invited him to New York for an internship starting in September.

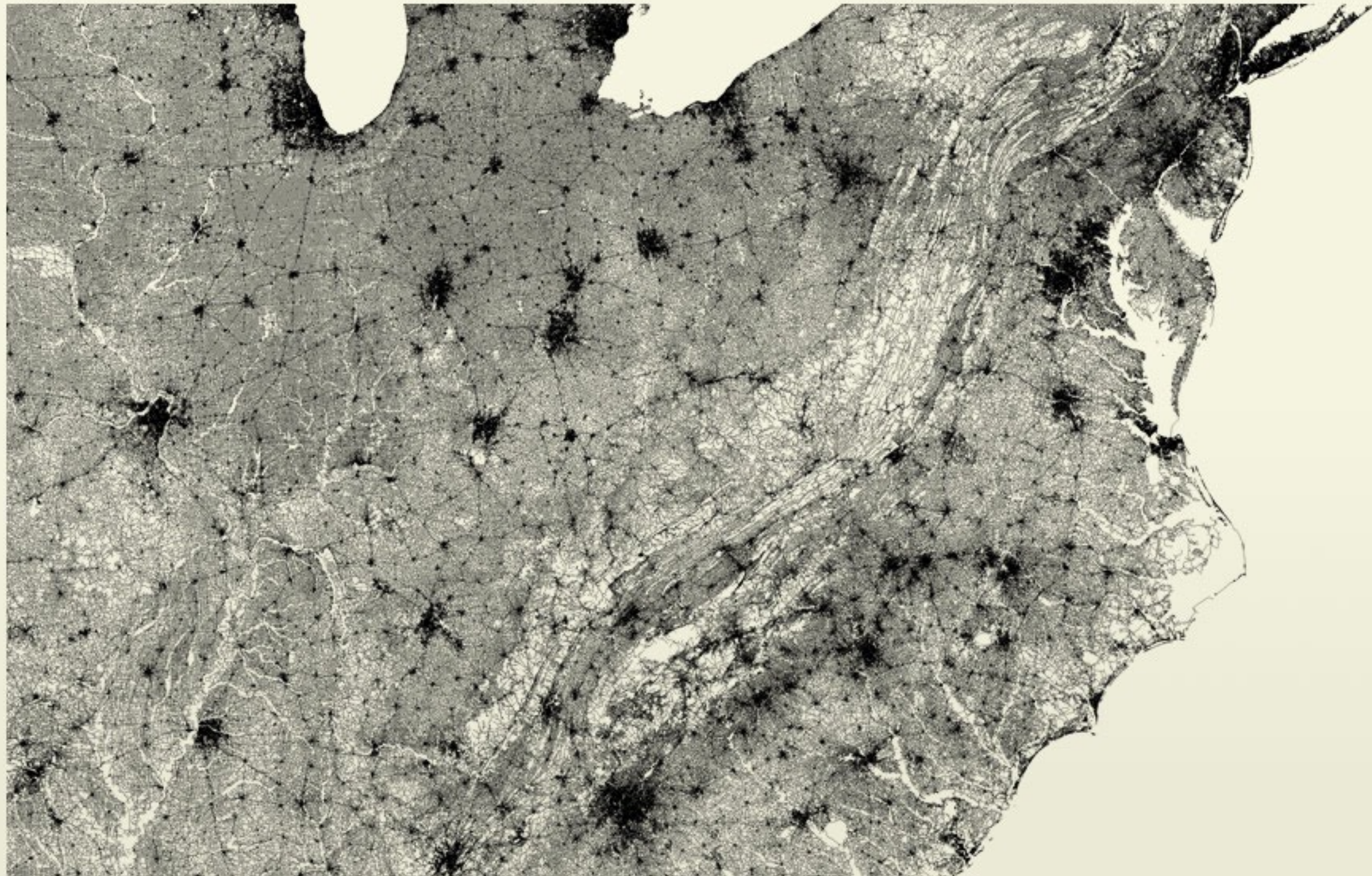
Though satisfied with the work he'd done with the data thus far, Katz had also come up with a plan to verify and update the data and turn it in to a quiz.



PET PEEVE #208:
GEOGRAPHIC PROFILE MAPS WHICH ARE
BASICALLY JUST POPULATION MAPS

Lines







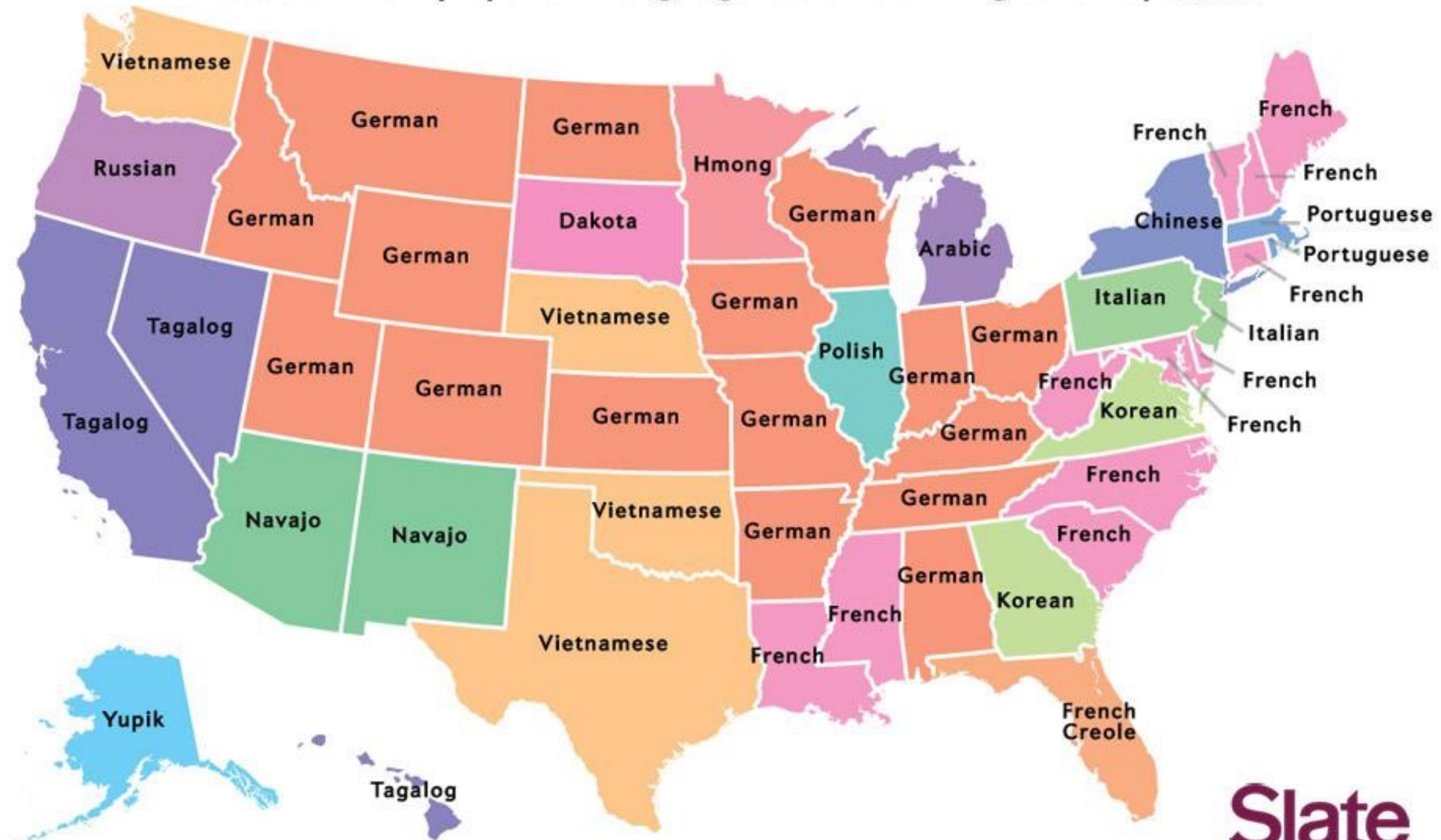
Polygons

Choropleth maps



Choropleth maps

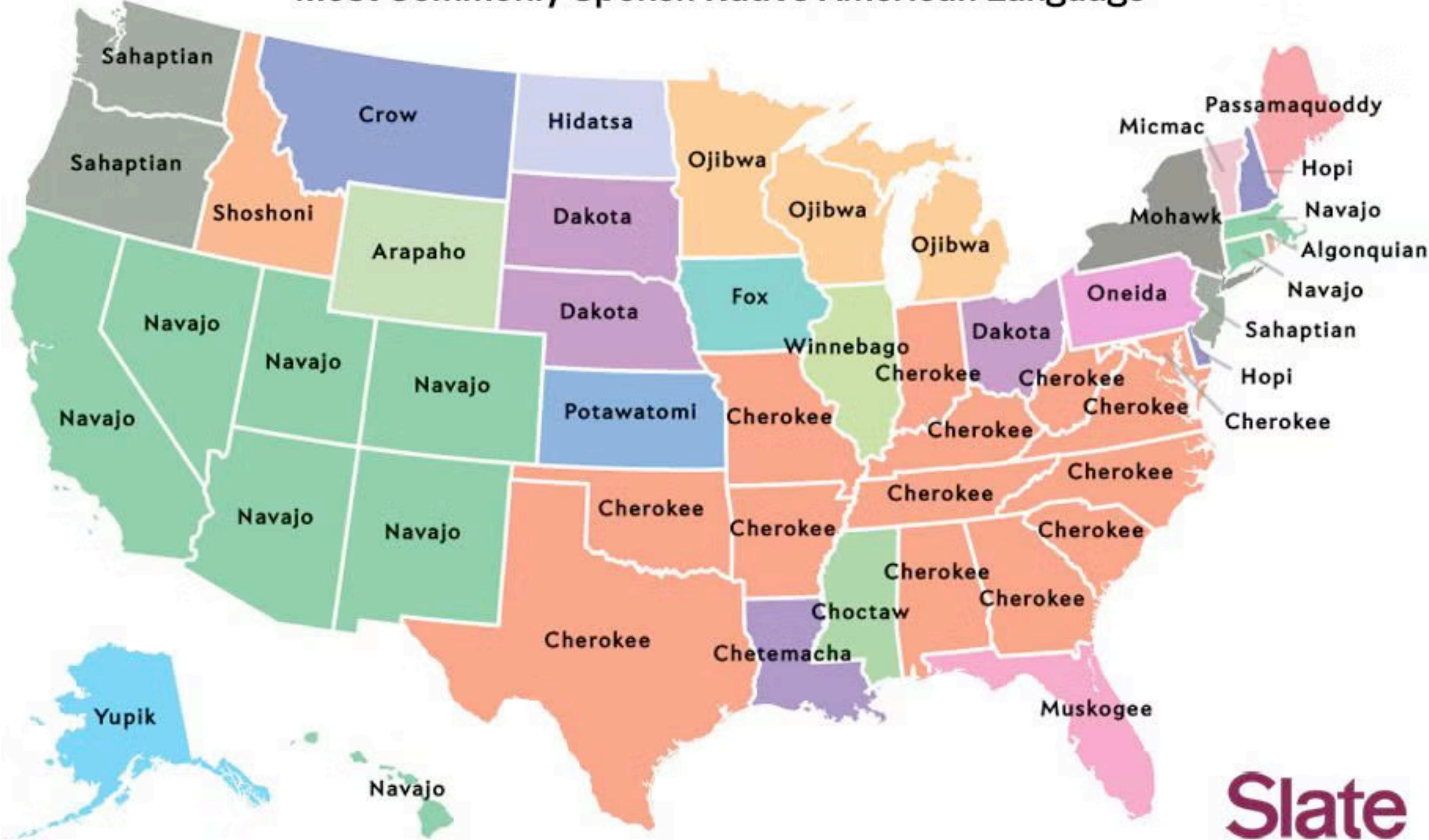
Most Commonly Spoken Language Other than English or Spanish



Slate

Choropleth maps

Most Commonly Spoken Native American Language



Slate

“all maps of parameter estimates are misleading”

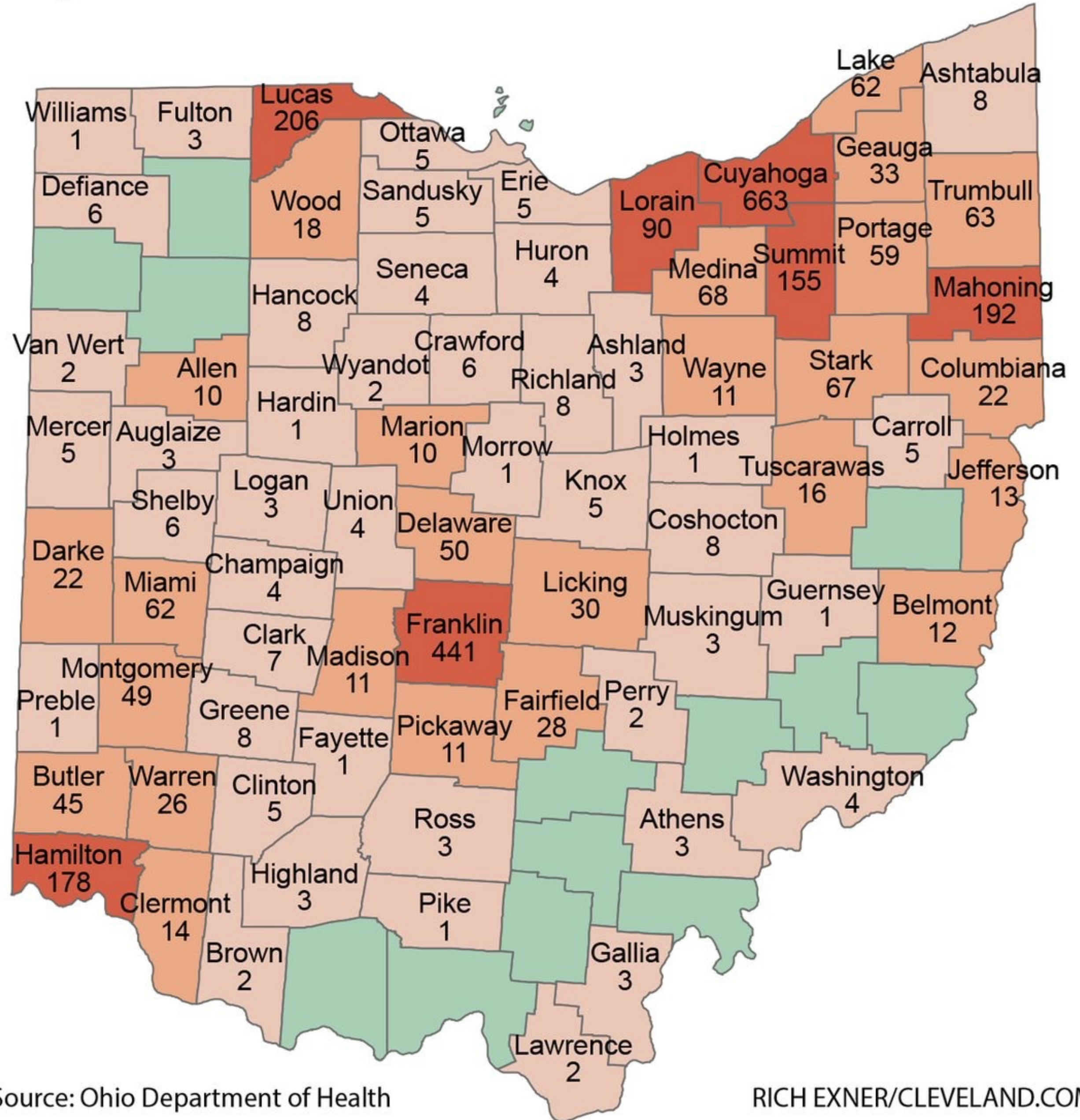
- Gelman and Price

Andrew Gelman and Phillip Price. "All maps of parameter estimates are misleading.

[https://doi.org/10.1002/\(sici\)1097-0258\(19991215\)18:23%3C3221::aid-sim312%3E3.0.co;2-m](https://doi.org/10.1002/(sici)1097-0258(19991215)18:23%3C3221::aid-sim312%3E3.0.co;2-m)

2,902 confirmed coronavirus cases

Showing raw numbers
highlights
high-
population
areas

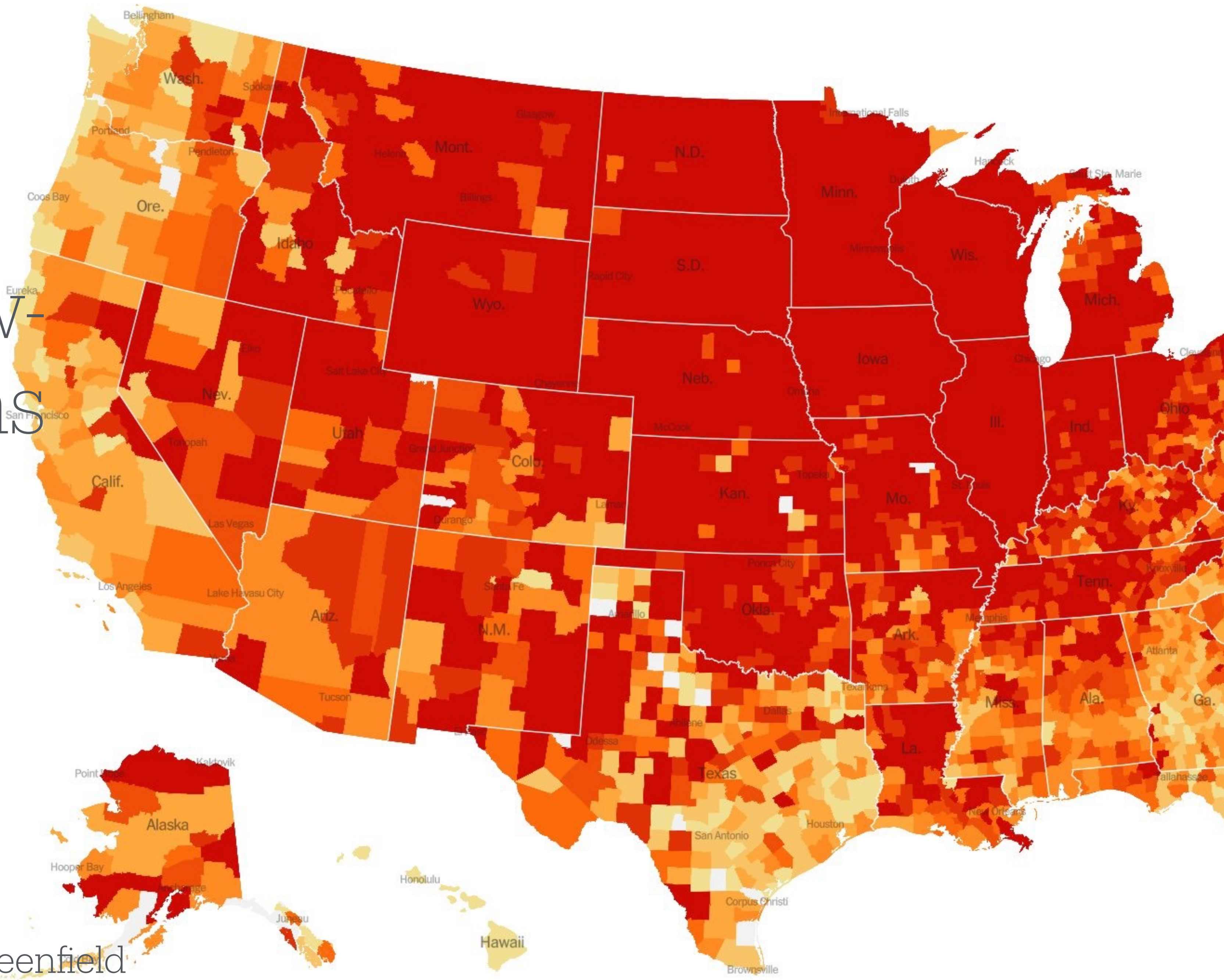


Source: Ohio Department of Health

RICH EXNER/CLEVELAND.COM

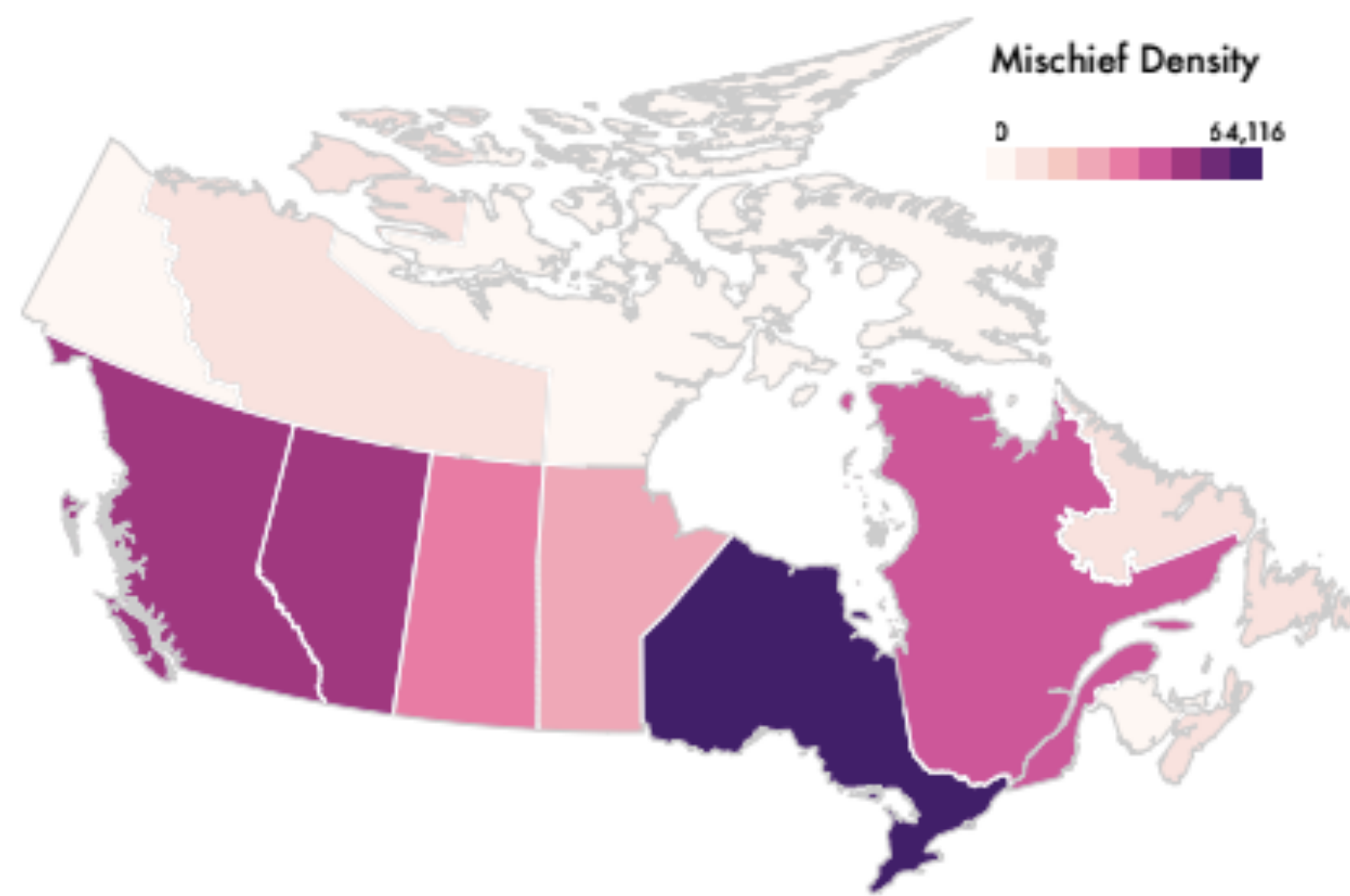
via https://twitter.com/nick_suarezc/status/1246235329985744902

Showing rates
highlights high
variability in low-
population areas

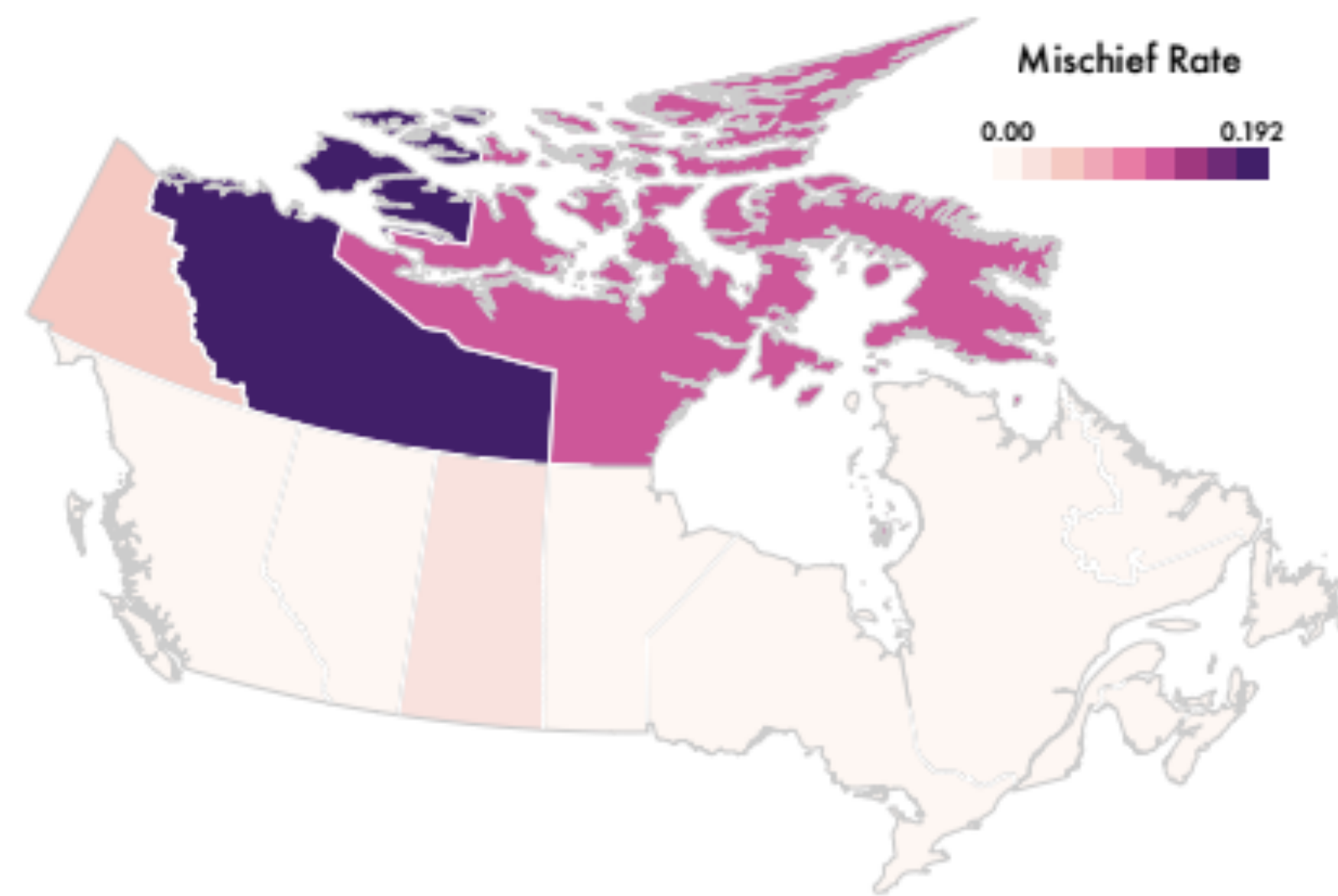


Coronavirus Cases Expanding. Doug Greenfield
<https://mapoftheweek.blogspot.com/2020/11/coronavirus-cases-expanding.html>

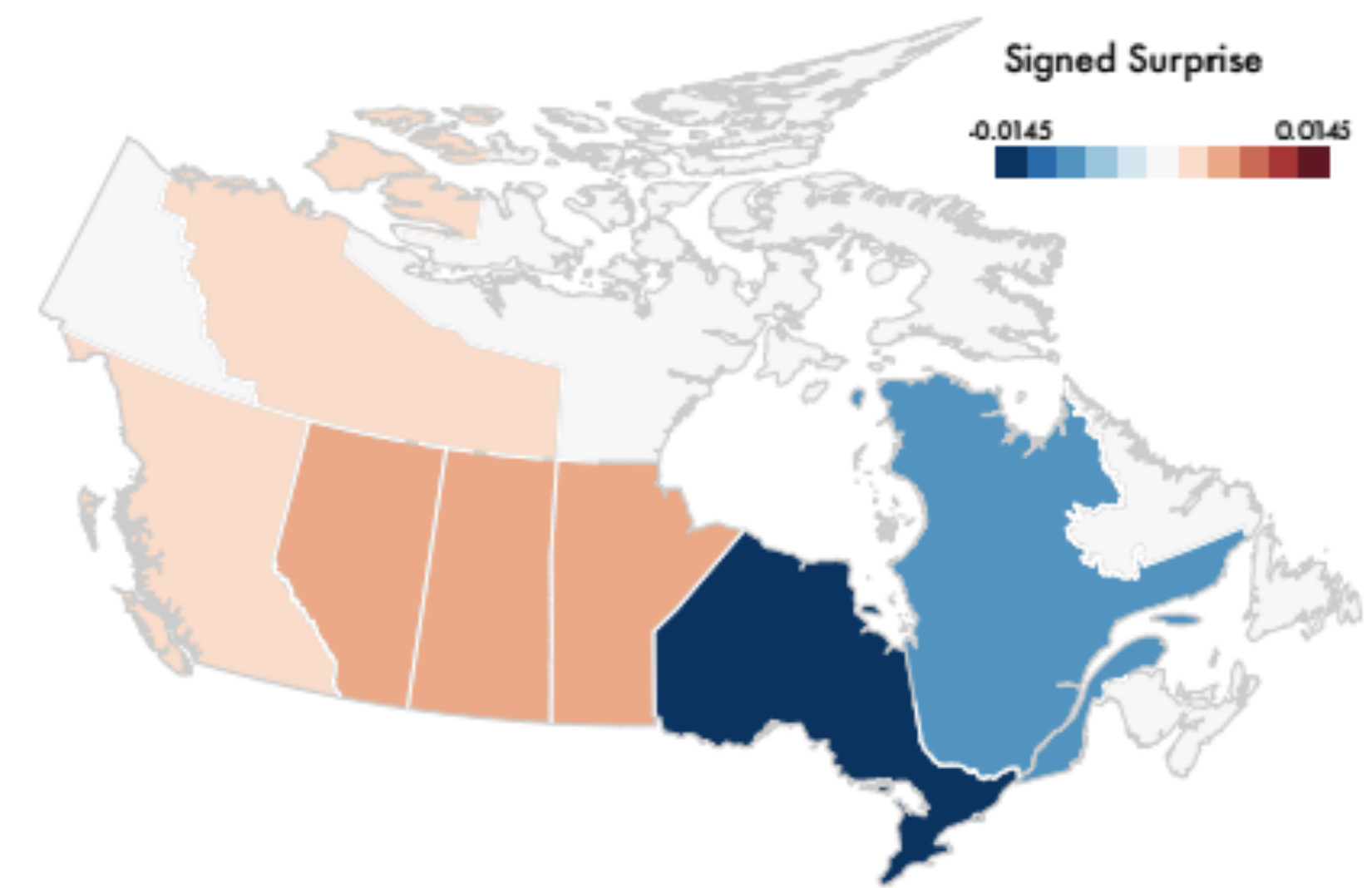
Surprise! Bayesian Weighting for De-Biasing Thematic Maps.



(a) The **Event Density** of “mischief” in Canada.



(b) The per-capita **Event Rate** of mischief.



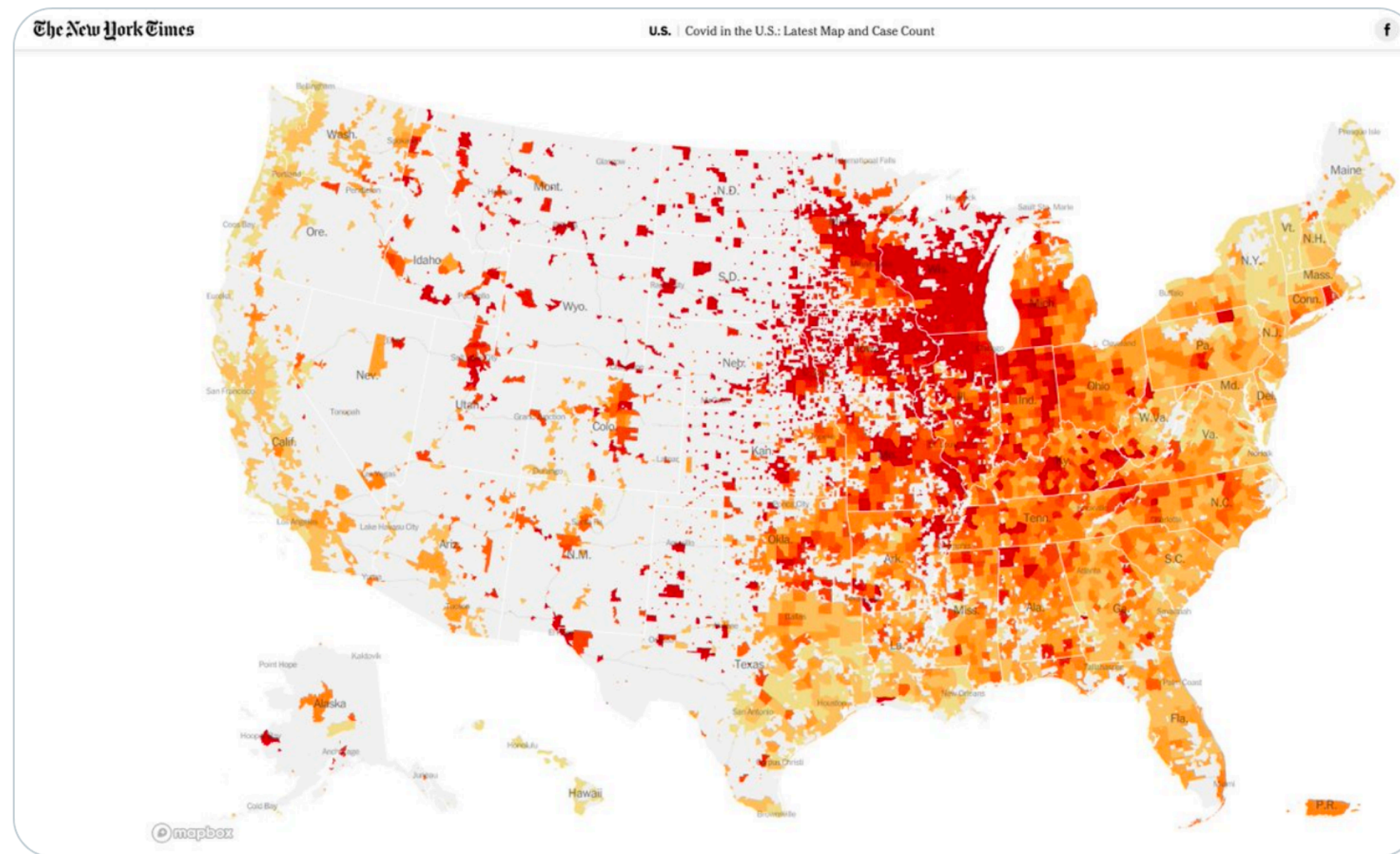
(c) The **Surprise Map** of mischief.



Ben Lamb
@bennyfactor

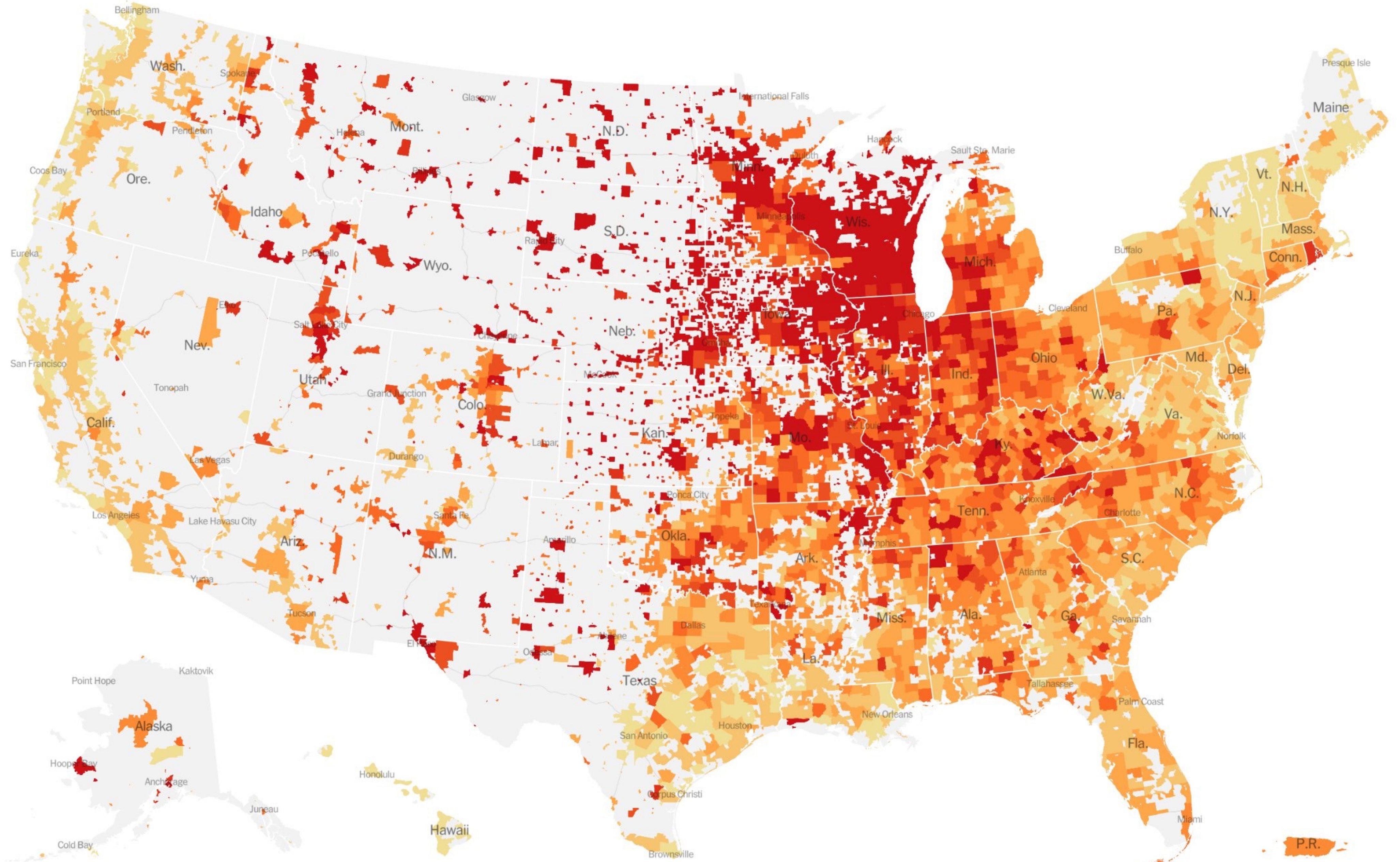


While I hate the sheer amount of covid illness this map represents, I think it's really smart what the NYT did here in not coloring in areas where the population density is below 10/sq mile. Gives a vastly more useful understanding of who is sick, where than a usual choropleth

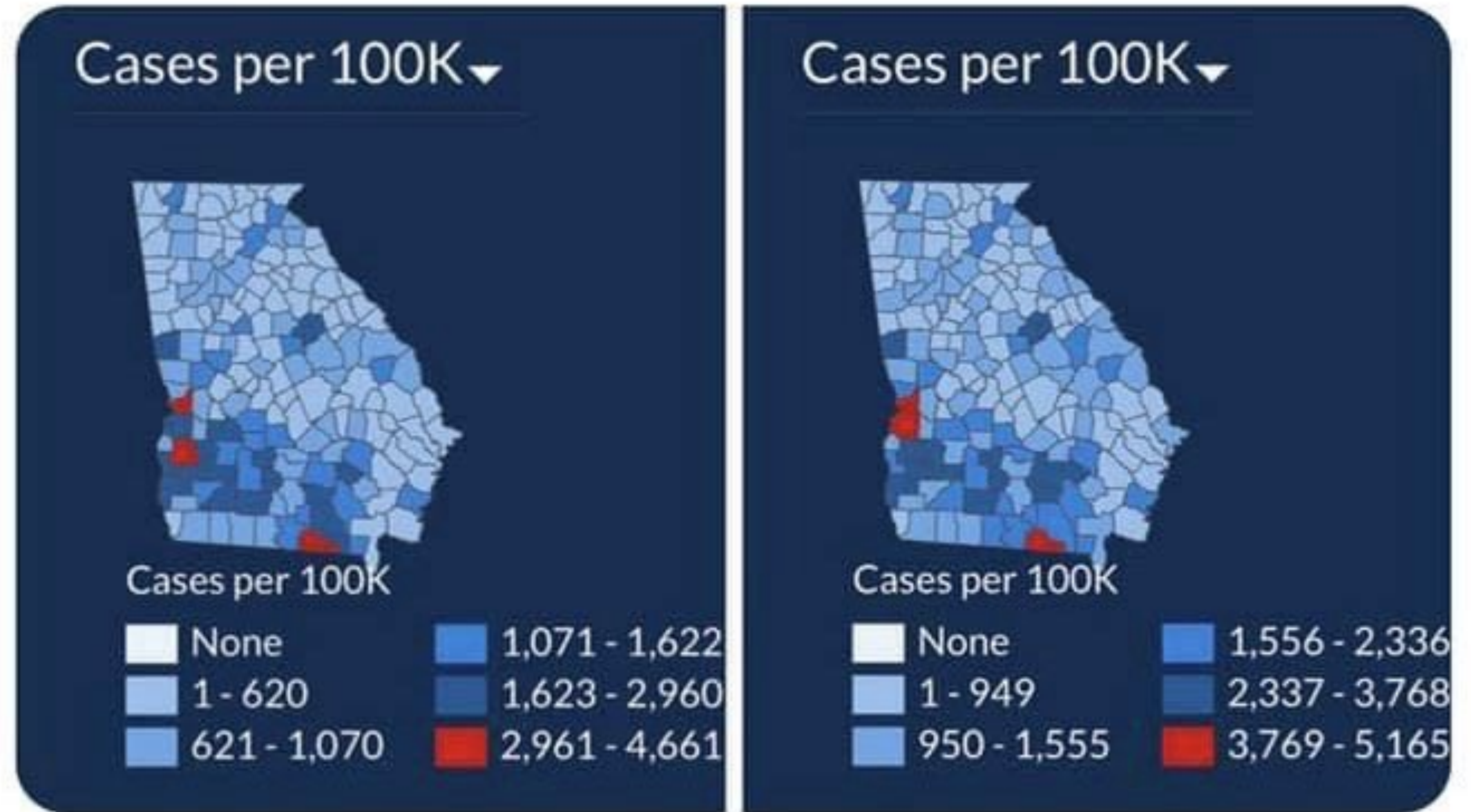


10:22 PM · Nov 4, 2020 · Twitter Web App

2 Retweets 6 Likes



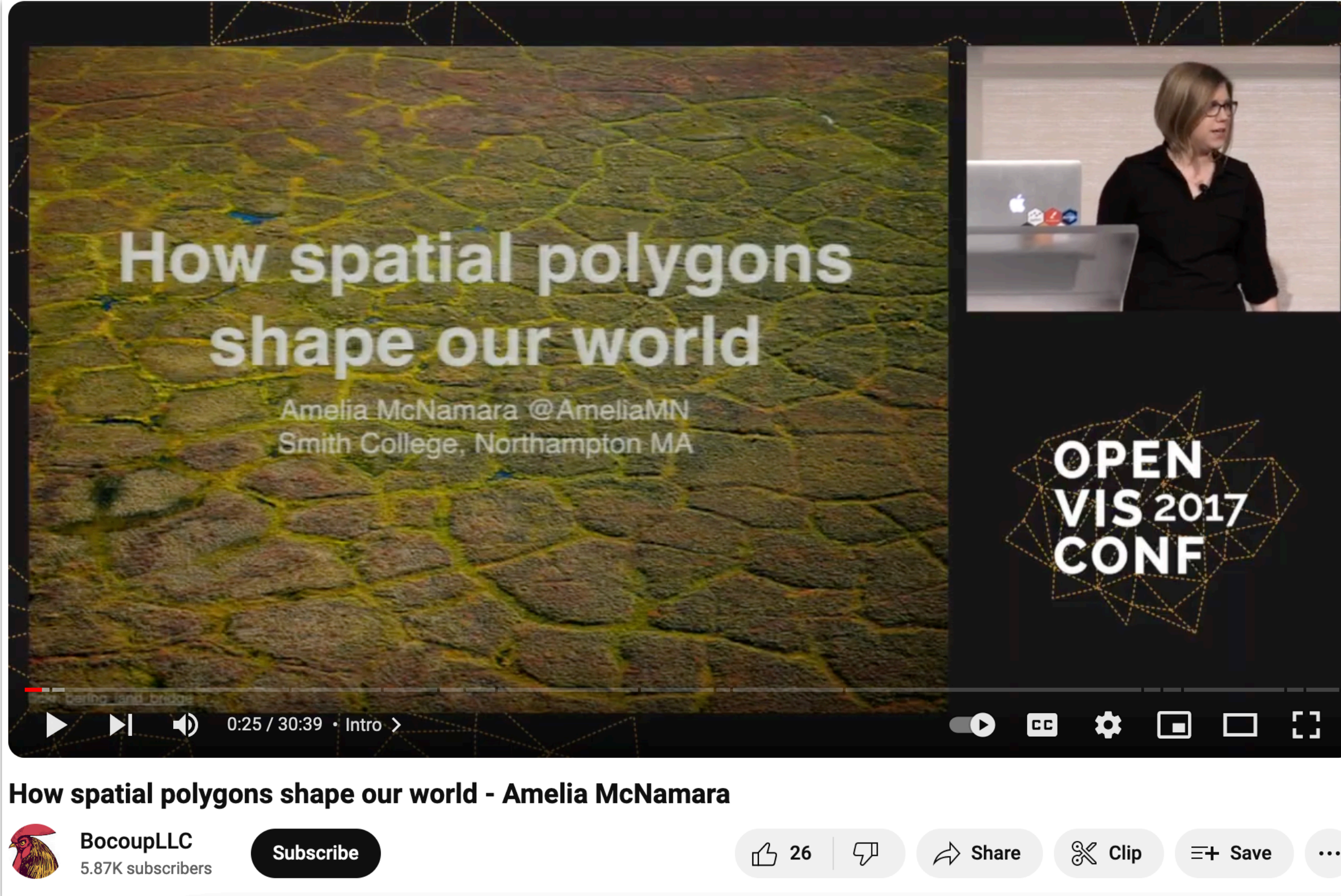
If things are changing over time, watch the legend



via Corona-cartography: what we learned from a year of COVID-19 maps

<https://hi.stamen.com/corona-cartography-what-we-learned-from-a-year-of-covid-19-maps-bd1f022bc5e0>

Modifiable Areal Unit Problem



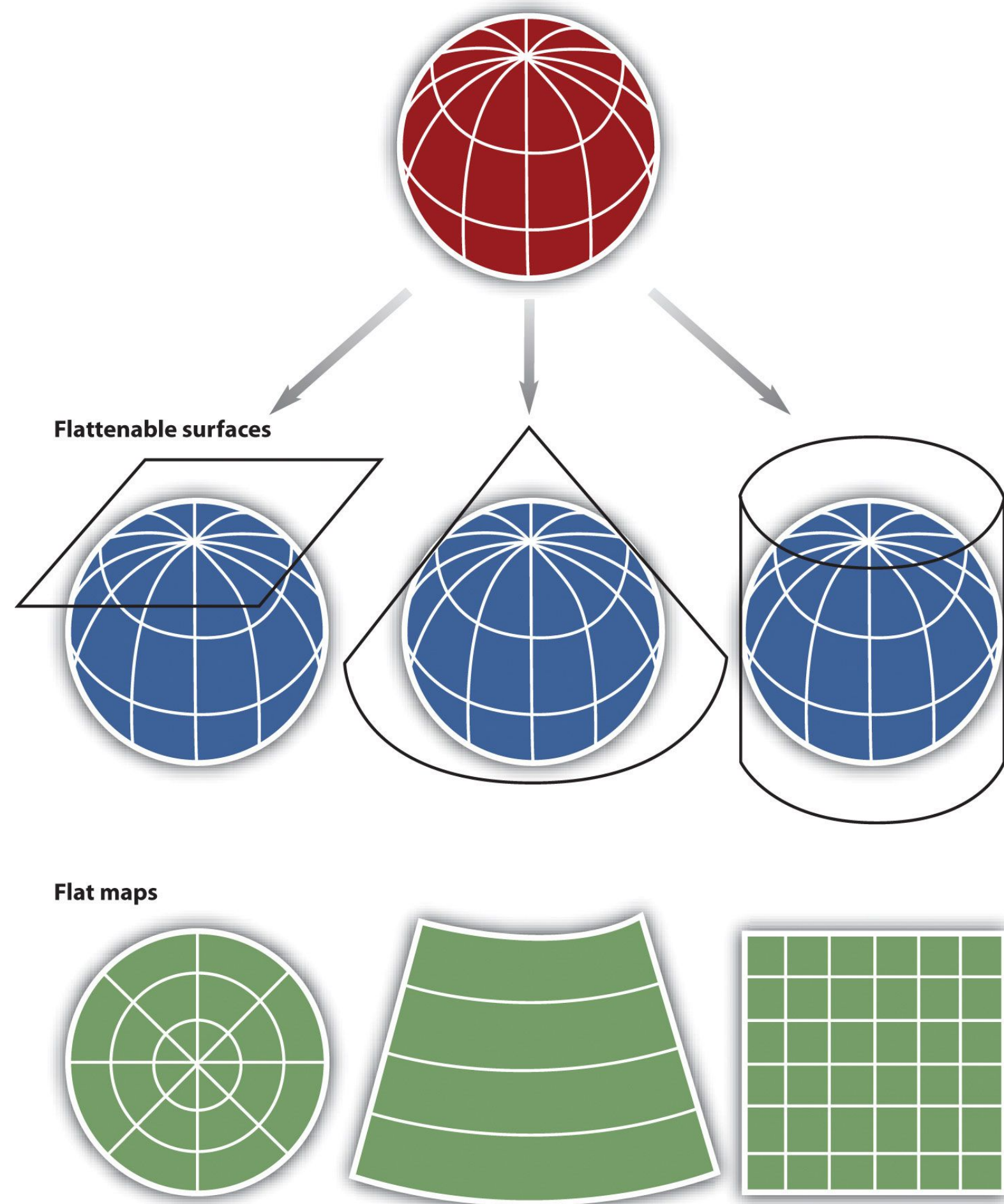
The image shows a YouTube video player interface. The main video area displays a satellite-style map of a landscape with yellow and green polygons overlaid, representing spatial units. The text on the map reads: "How spatial polygons shape our world" in large white font, followed by "Amelia McNamara @AmeliaMN" and "Smith College, Northampton MA" in smaller white font. In the top right corner of the video frame, there is a small inset video of a woman with glasses and a black top, identified as Amelia McNamara, standing behind a podium with a laptop. The video player controls at the bottom show a progress bar at 0:25 / 30:39, with "Intro" selected. Below the video player, the title "How spatial polygons shape our world - Amelia McNamara" is displayed. The channel name "BocoupLLC" with a rooster icon and "5.87K subscribers" is shown, along with a "Subscribe" button. Interaction buttons for "26" likes, "Share", "Clip", "Save", and a menu icon are also visible.

2017 version (30 minutes) <https://www.youtube.com/watch?v=wn5larsRHro>

2018 version (60 minutes) <https://www.youtube.com/watch?v=bjFzWElyD3o>

Projections

Map projections



Campbell, J.E., & Shin, M. (2012). Geographic Information System Basics.

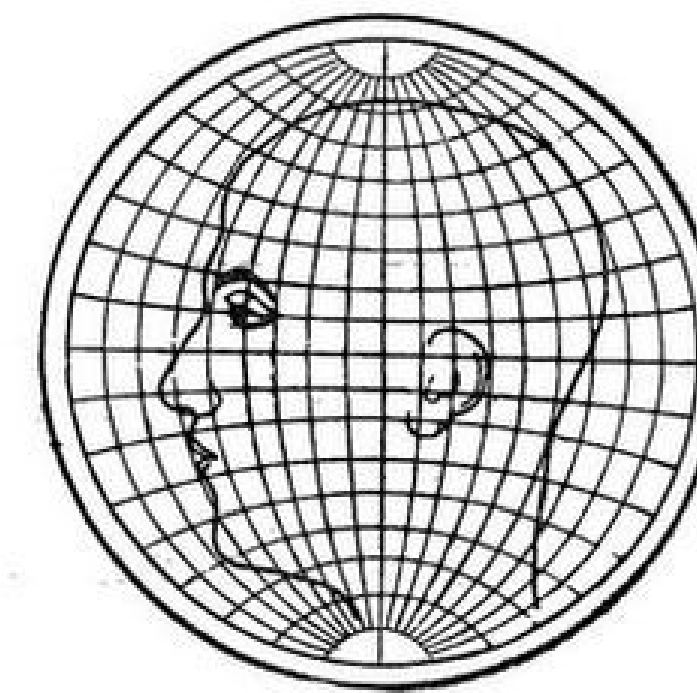


FIG. 42.—Man's head drawn on globular projection.

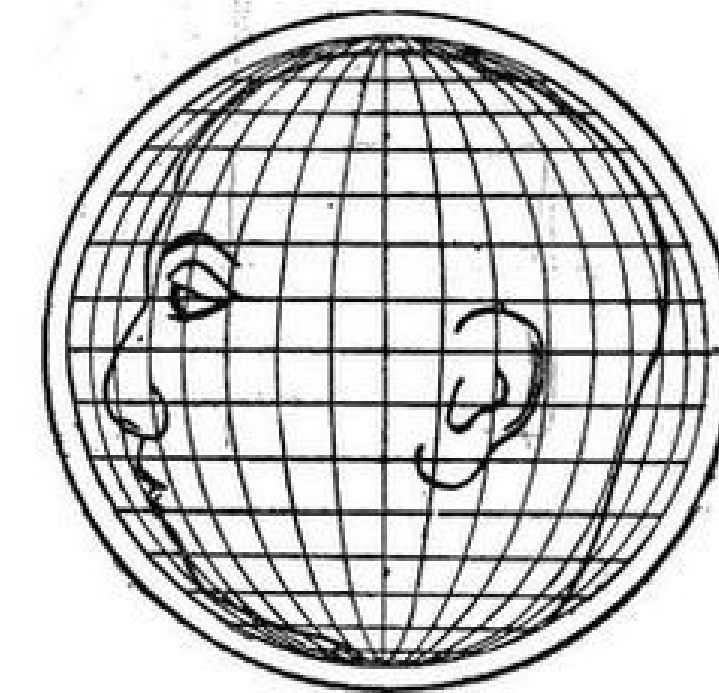


FIG. 43.—Man's head plotted on orthographic projection.

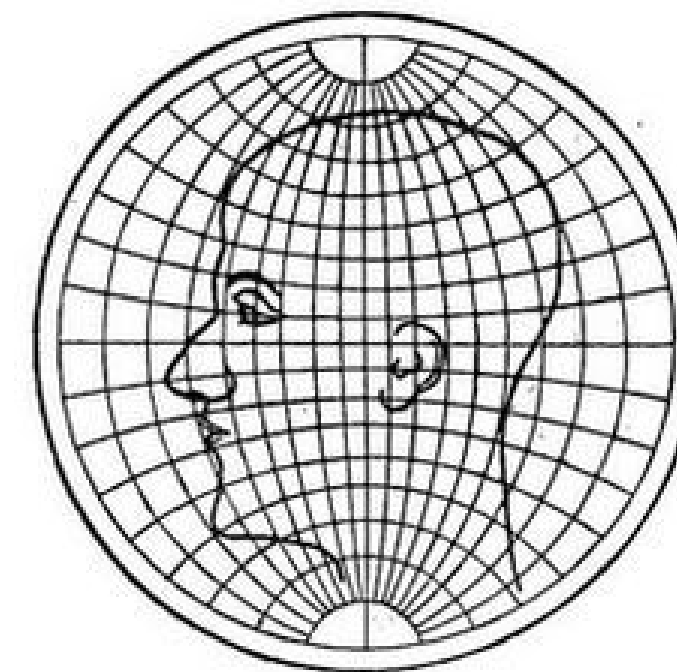


FIG. 44.—Man's head plotted on stereographic projection.

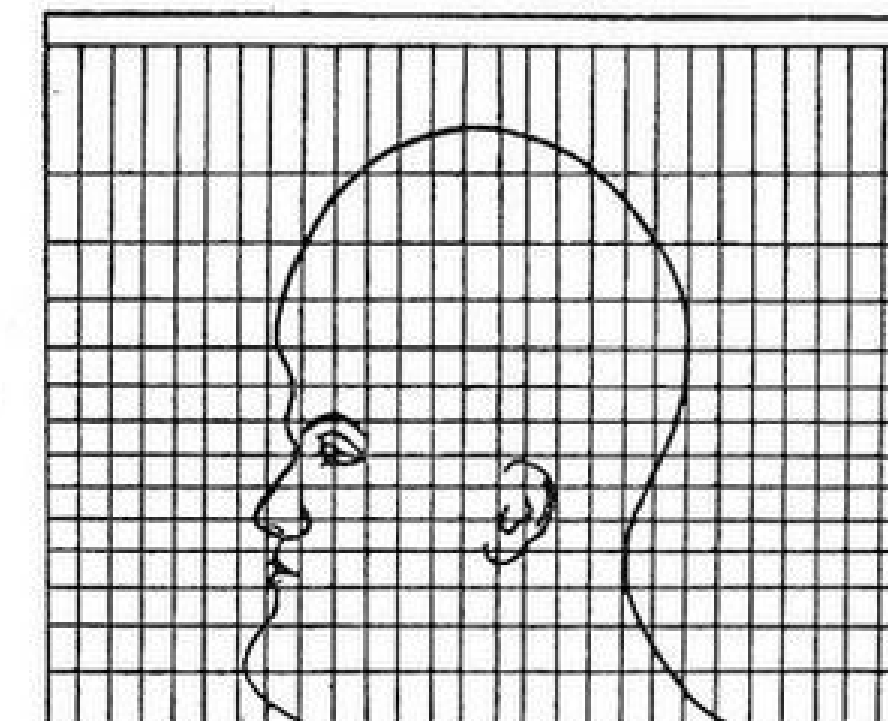
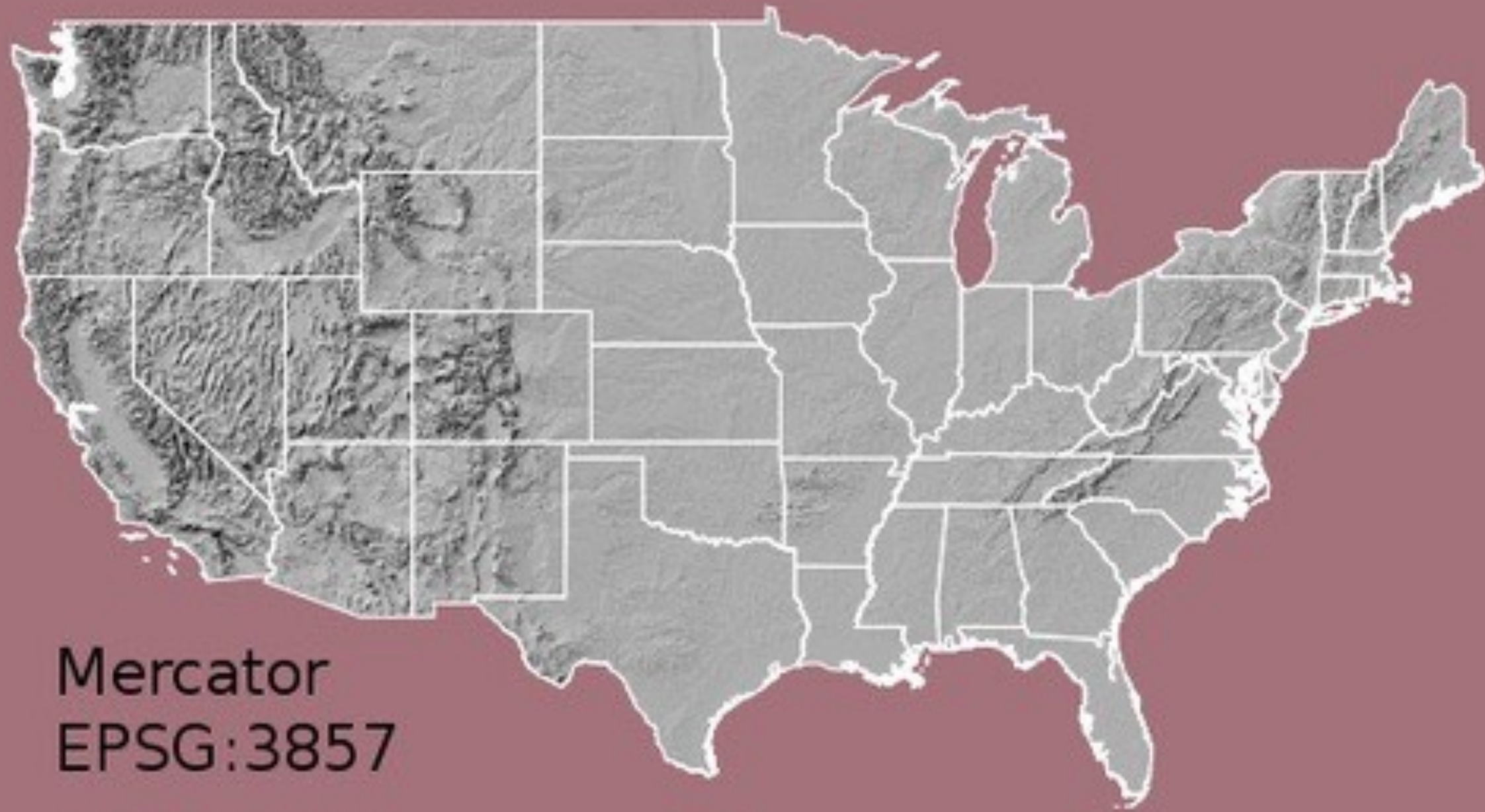
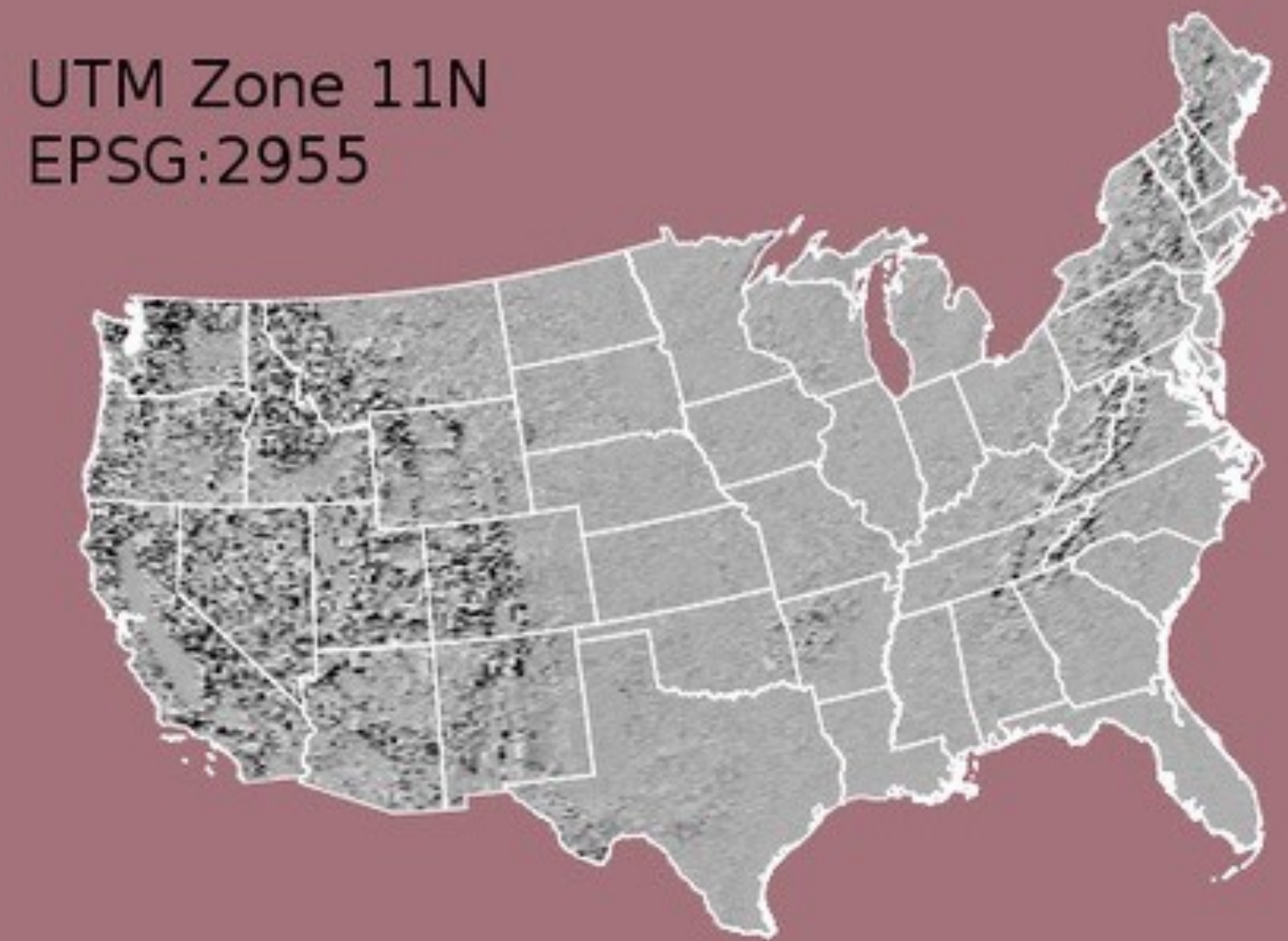


FIG. 45.—Man's head plotted on Mercator projection.

Deetz, C. H., & Adams, O. S. (1921). Elements of map projection with applications to map and chart construction.



Mercator
EPSG:3857



UTM Zone 11N
EPSG:2955



U.S. National Atlas
Equal Area
EPSG:2163



WGS 84
EPSG:4326

The True Size of Africa

A small contribution in the fight against rampant *Immappancy*, by Kai Krause

In addition to the well known social issues of *illiteracy* and *innumeracy*, there also should be such a concept as "*immappancy*", meaning *insufficient geographical knowledge*.

A survey with random American schoolkids let them guess the population and land area of their country. Not entirely unexpected, but still rather unsettling, the majority chose "1-2 billion" and "largest in the world", respectively. Even with Asian and European college students, geographical estimates were often off by factors of 2-3. This is partly due to the highly distorted nature of the predominantly used mapping projections (such as *Mercator*).

A particularly extreme example is the worldwide misjudgement of the true size of Africa. This single image tries to embody the massive scale, which is larger than the *USA*, *China*, *India*, *Japan* and *all of Europe* - combined!

COUNTRY	AREA x 1000 km ²
USA	9.629
China	9.573
India	3.287
Mexico	1.964
Peru	1.285
France	633
Spain	506
Papua New Guinea	462
Sweden	441
Japan	378
Germany	357
Norway	324
Italy	301
New Zealand	270
United Kingdom	243
Nepal	147
Bangladesh	144
Greece	132
TOTAL	30.102
AFRICA	30.221
Just for Reference: The Surface of the MOON	37.930

Please note:

The graphical layout of this map is meant purely as a *visualization* to illustrate the fact: Africa is *much* larger than *almost everyone* assumes! Even totally blurred outlines could have been used to make that point, however the table at left is very accurate, citing: http://en.wikipedia.org/wiki/List_of_countries_and_outlying_territories_by_total_area

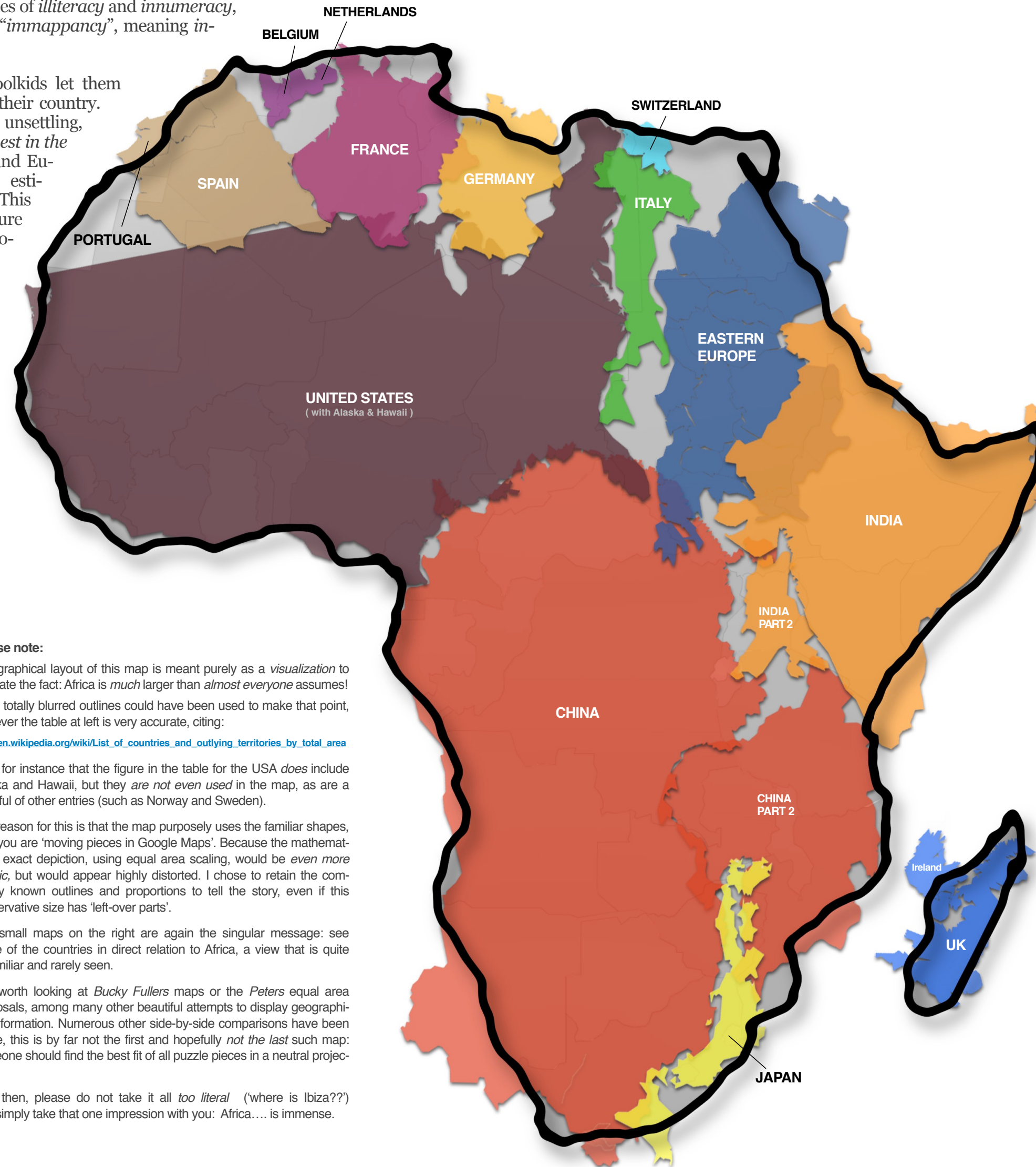
Note for instance that the figure in the table for the USA *does* include Alaska and Hawaii, but they *are not even used* in the map, as are a handful of other entries (such as Norway and Sweden).

The reason for this is that the map purposely uses the familiar shapes, as if you are 'moving pieces in Google Maps'. Because the mathematically exact depiction, using equal area scaling, would be *even more drastic*, but would appear highly distorted. I chose to retain the commonly known outlines and proportions to tell the story, even if this conservative size has 'left-over parts'.

The small maps on the right are again the singular message: see some of the countries in direct relation to Africa, a view that is quite unfamiliar and rarely seen.

It is worth looking at *Bucky Fullers* maps or the *Peters* equal area proposals, among many other beautiful attempts to display geographical information. Numerous other side-by-side comparisons have been made, this is by far not the first and hopefully *not the last* such map: someone should find the best fit of all puzzle pieces in a neutral projection.

Until then, please do not take it all *too literal* ('where is Ibiza??') and simply take that one impression with you: Africa.... is immense.

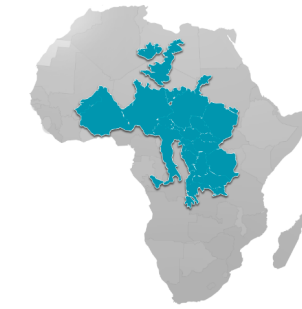


Top 100 Countries

Area in square kilometers, Percentage of World Total
Sources: Britannica, Wikipedia, Almanac 2010



United States



Europe



India



Japan



China

	AREA km ²	%	
1	Russia	17.098.242	11,50
2	Canada	9.984.670	6,70
3	China	9.596.961	6,40
4	United States	9.629.091	6,40
5	Brazil	8.514.877	5,70
6	Australia	7.692.024	5,20
7	India	3.287.263	2,30
8	Argentina	2.780.400	2,00
9	Kazakhstan	2.724.900	1,80
10	Sudan	2.505.813	1,70
11	Algeria	2.381.741	1,60
12	Congo	2.344.858	1,60
13	Greenland	2.166.086	1,50
14	Saudi Arabia	2.149.690	1,40
15	Mexico	1.964.375	1,30
16	Indonesia	1.860.360	1,30
17	Libya	1.759.540	1,20
18	Iran	1.628.750	1,10
19	Mongolia	1.564.100	1,10
20	Peru	1.285.216	0,86
21	Chad	1.284.000	0,86
22	Niger	1.267.000	0,85
23	Angola	1.246.700	0,85
24	Mali	1.240.192	0,83
25	South Africa	1.221.037	0,82
26	Colombia	1.141.748	0,76
27	Ethiopia	1.104.300	0,74
28	Bolivia	1.098.581	0,74
29	Mauritania	1.025.520	0,69
30	Egypt	1.002.000	0,67
31	Tanzania	945.087	0,63
32	Nigeria	923.768	0,62
33	Venezuela	912.050	0,61
34	Namibia	824.116	0,55
35	Mozambique	801.590	0,54
36	Pakistan	796.095	0,53
37	Turkey	783.562	0,53
38	Chile	756.102	0,51
39	Zambia	752.612	0,51
40	Myanmar	676.578	0,45
41	Afghanistan	652.090	0,44
42	Somalia	637.657	0,43
43	France	632.834	0,43
44	C. African Rep	622.984	0,42
45	Ukraine	603.500	0,41
46	Madagascar	587.041	0,39
47	Botswana	582.000	0,39
48	Kenya	580.367	0,39
49	Yemen	527.968	0,35
50	Thailand	513.120	0,34
51	Spain	505.992	0,34
52	Turkmenistan	488.100	0,33
53	Cameroon	475.442	0,32
54	Papua New Guinea	462.840	0,31
55	Uzbekistan	447.400	0,30
56	Morocco	446.550	0,30
57	Sweden	441.370	0,30
58	Iraq	438.317	0,29
59	Paraguay	406.752	0,27
60	Zimbabwe	390.757	0,26
61	Japan	377.930	0,25
62	Germany	357.114	0,24
63	Rep o.t. Congo	342.000	0,23
64	Finland	338.419	0,23
65	Vietnam	331.212	0,22
66	Malaysia	330.803	0,22
67	Norway	323.802	0,22
68	Côte d'Ivoire	322.463	0,22
69	Poland	312.685	0,21
70	Oman	309.500	0,21
71	Italy	301.336	0,20
72	Philippines	300.000	0,20
73	Burkina Faso	274.222	0,18
74	New Zealand	270.467	0,18
75	Gabon	267.668	0,18
76	Western Sahara	266.000	0,18
77	Ecuador	256.369	0,20
78	Guinea	245.857	0,17
79	United Kingdom	242.900	0,16
80	Uganda	241.038	0,16
81	Ghana	238.539	0,16
82	Romania	238.391	0,16
83	Laos	236.800	0,16
84	Guyana	214.969	0,14
85	Belarus	207.600	0,14
86	Kyrgyzstan	199.951	0,13
87	Senegal	196.722	0,13
88	Syria	185.180	0,12
89	Cambodia	181.035	0,12
90	Uruguay	176.215	0,12
91	Suriname	163.820	0,11
92	Tunisia	163.610	0,11
93	Nepal	147.181	0,10
94	Bangladesh	143.998	0,10
95	Tajikistan	143.100	0,10
96	Greece	131.957	0,09
97	Nicaragua	130.373	0,09
98	North Korea	120.538	0,08
99	Malawi	118.484	0,08
100	Eritrea	117.600	0,08
	TOP 100 TOTAL	132.632.524	89,34



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← → ↻ https://blocks.roadtolarissa.com/zanarmstrong/raw/caa2da1ea1558cdc3357/index.html

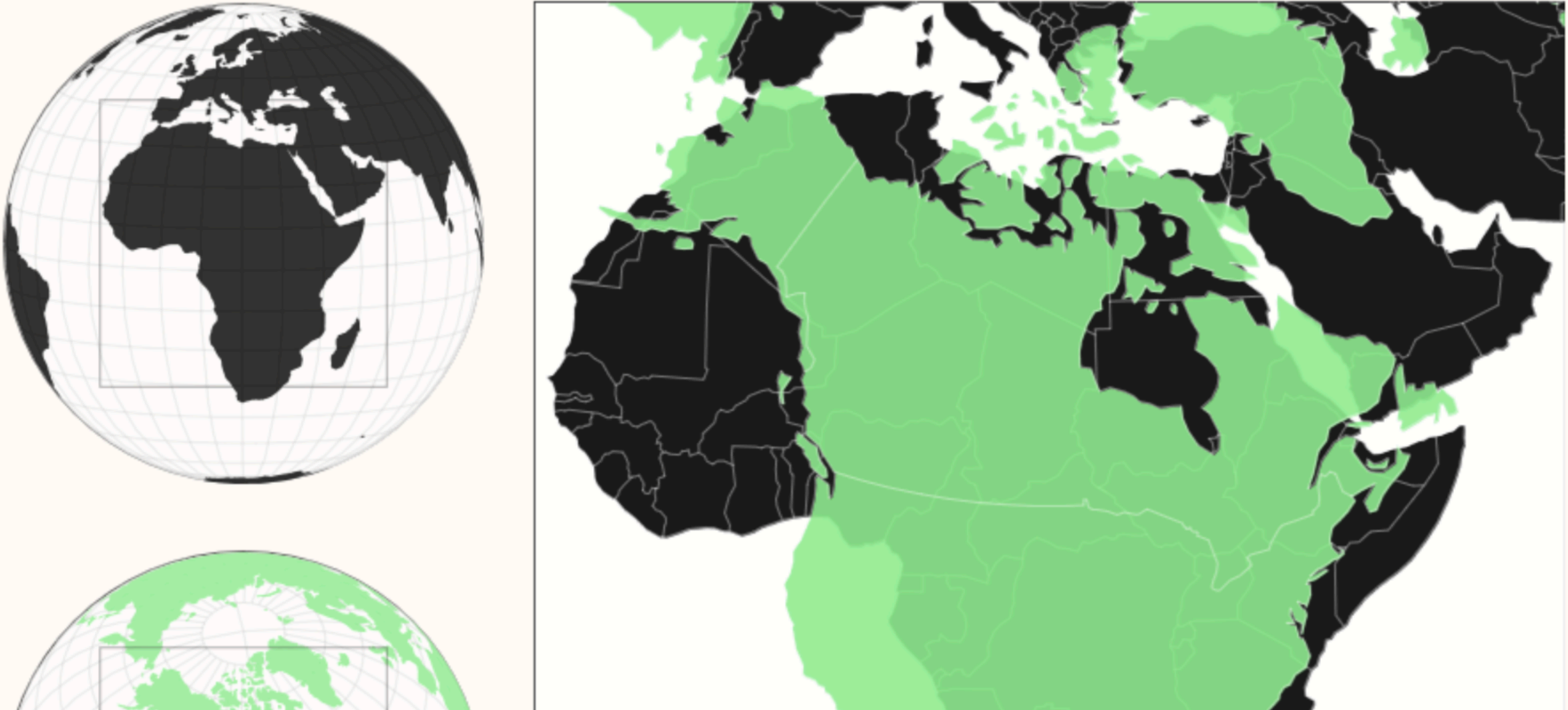
Is Africa bigger than North America?

Yes! In fact, North America, including United States, Canada, Mexico, and Greenland, could easily fit inside Africa with plenty of room left to add Central America, Argentina, Chile, and Bolivia too.

Most of the maps we use day to day distort the relative sizes of countries, making countries near the equator look relatively small and countries near the north and south pole look relatively huge. However, we can compare the true sizes of countries by using a different type of map.

Sweden vs Madagascar Australia vs Antarctica Europe vs Brazil United States vs Australia South America vs Greenland
Brazil vs United States Africa vs North America Africa vs Russia Saudi Arabia vs Alaska Europe vs Antarctica

Drag on the small world maps to compare different parts of the world.



Is Africa bigger than North America? Zan Armstrong.

<https://blocks.roadtolarissa.com/zanarmstrong/raw/caa2da1ea1558cdc3357/index.html>