

purple America

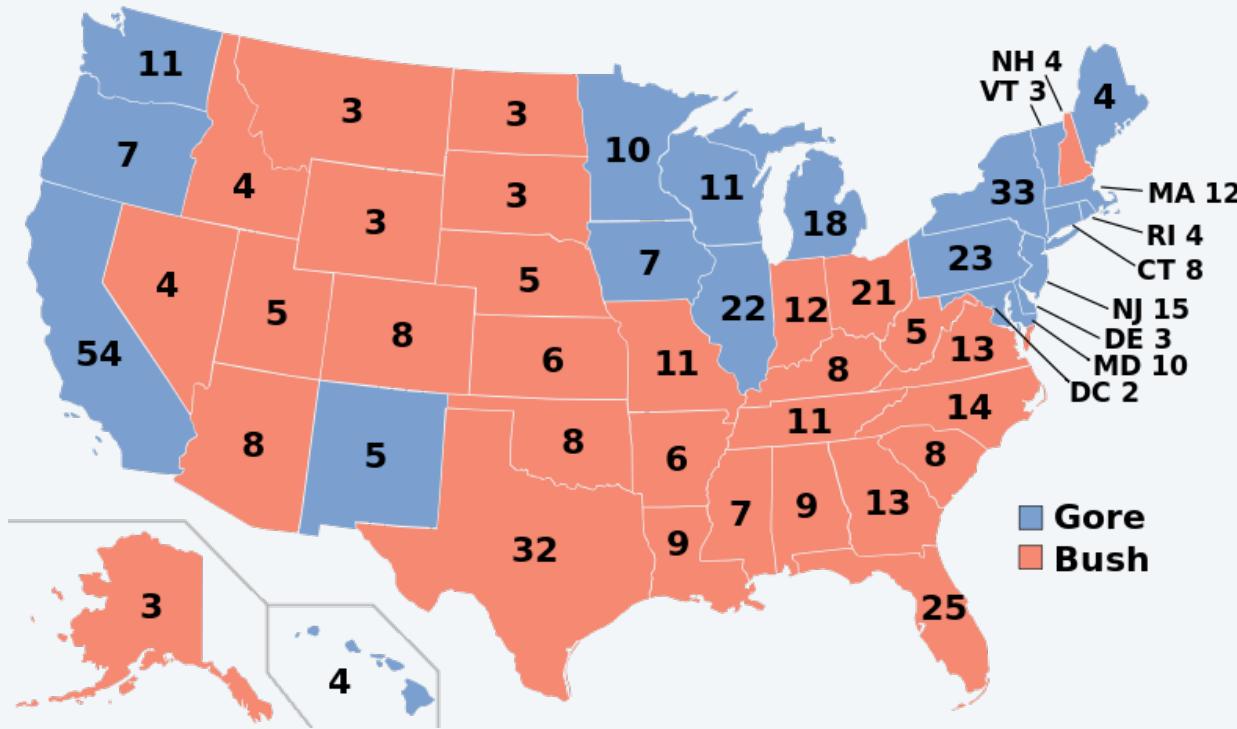
KEVIN WAYNE



**PRINCETON
UNIVERSITY**

Red states, blue states

Goal. Write program to visualize presidential election results.



Tim Russert
Meet the Press
(2000)

intended: late CS 1

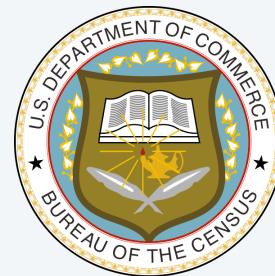
concepts: data visualization, OOP, map data type

requirements: filled-polygon primitive

Step 0. Collect the data (optional)

Geometric data. www.census.gov/tiger/boundary

- Text files encode geographic information.
- Format useful for programmers.



Election returns. www.uselectionatlas.org

- Web site displays election results.
- Screen scrape to extract raw data.



irony

Step 1. Process the geometric data

State names and boundary points.

% more USA.txt

Alabama

498

-88.200027 34.995548
-88.202919 35.007942

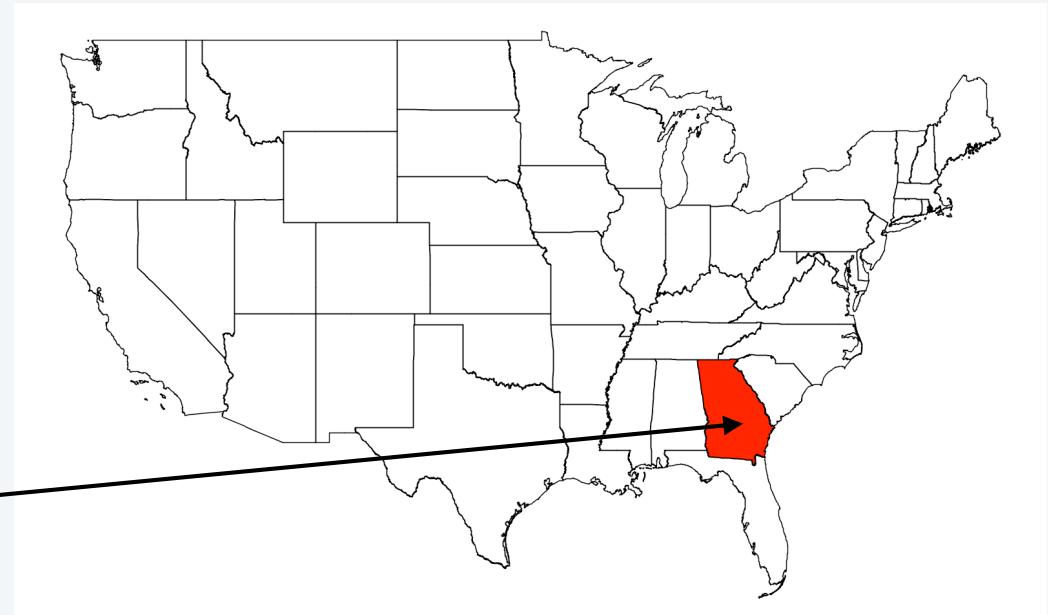
:

Georgia

1363

-84.321953 34.988327
-84.129639 34.987423
-84.005501 34.987251
:
-84.621552 34.988251

1363 points
(longitude, latitude)



Step 2. Process the election return data

Votes for Romney, Obama, and other, by state.

% more USA2012.txt

Alabama,1255925,795696,22717

Alaska,164676,122640,13179

Arizona,1233654,1025232,47673

Arkansas,647744,394409,27315

:

Georgia,2078688,1773827,55854

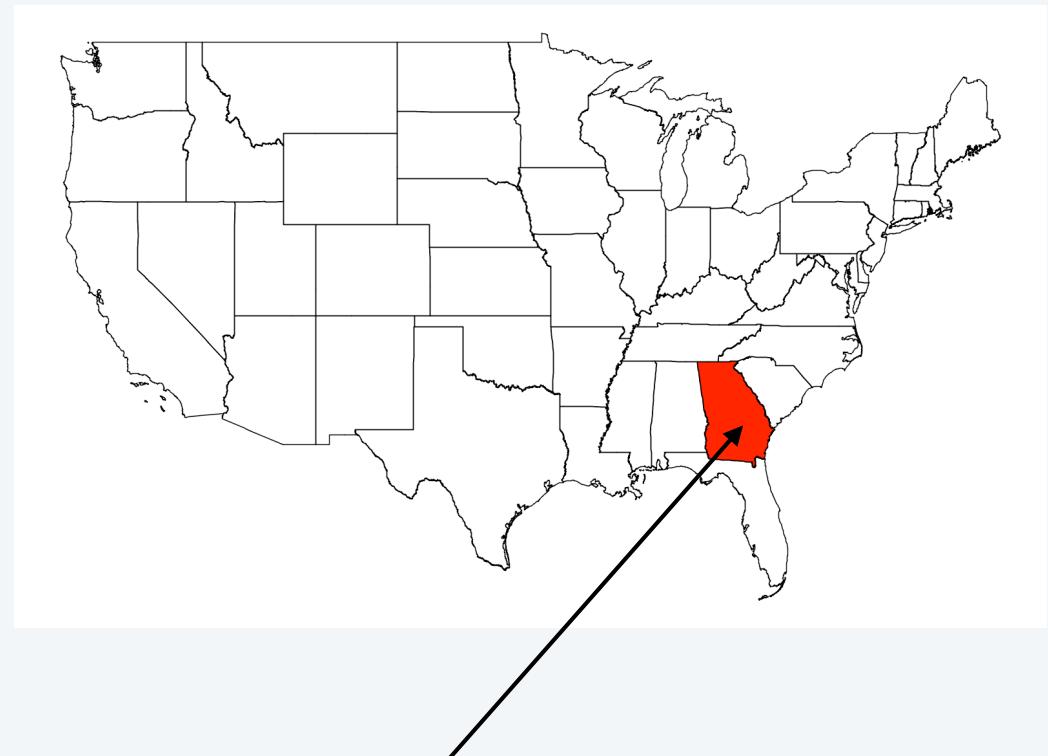
:

Washington,1290670,1755396,99892

West Virginia,417655,238269,14743

Wisconsin,1407966,1620985,39483

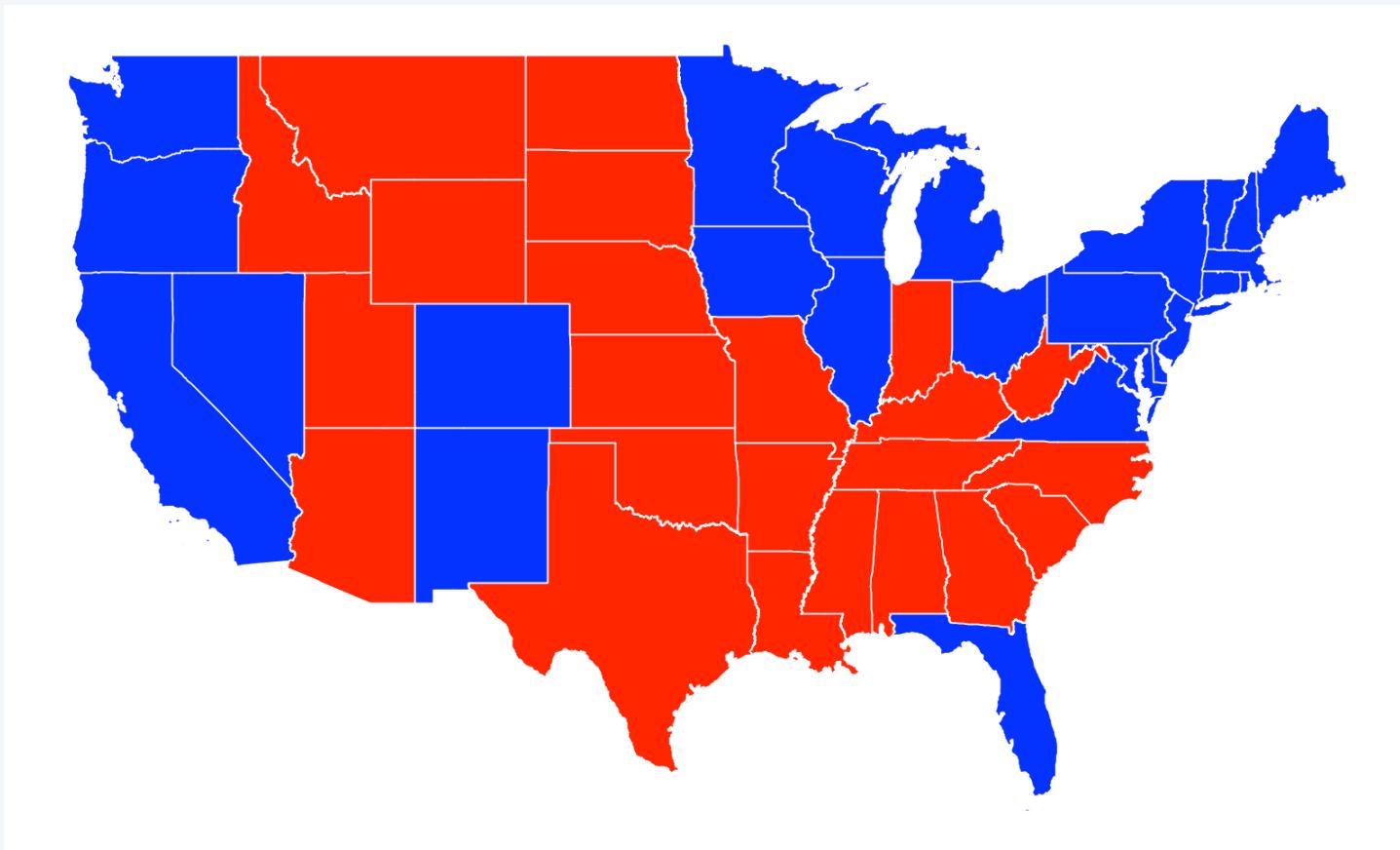
Wyoming,170962,69286,8813



2,078,688 Romney
1,773,827 Obama
55,854 Other

Step 3. Plot the results

Red states, blue states. Pretty picture.



Visualization bug. Misleading and polarizing picture.

Purple America

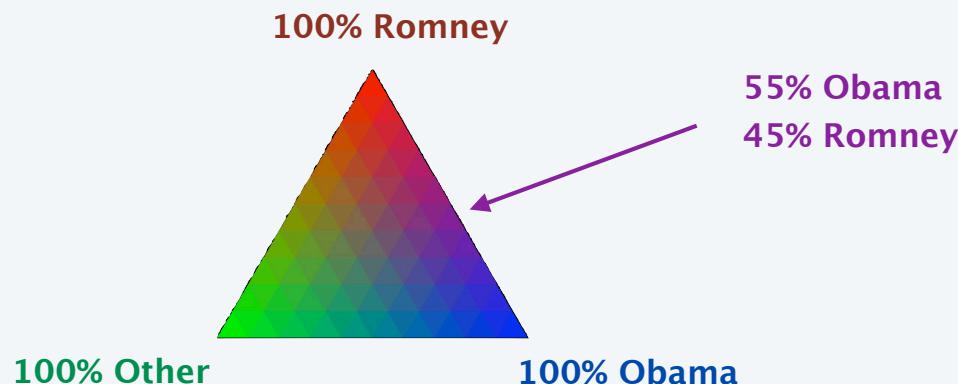
Key idea. Assign color based on number of votes.

- a_1 = Romney votes.
- a_2 = Other votes.
- a_3 = Obama votes.

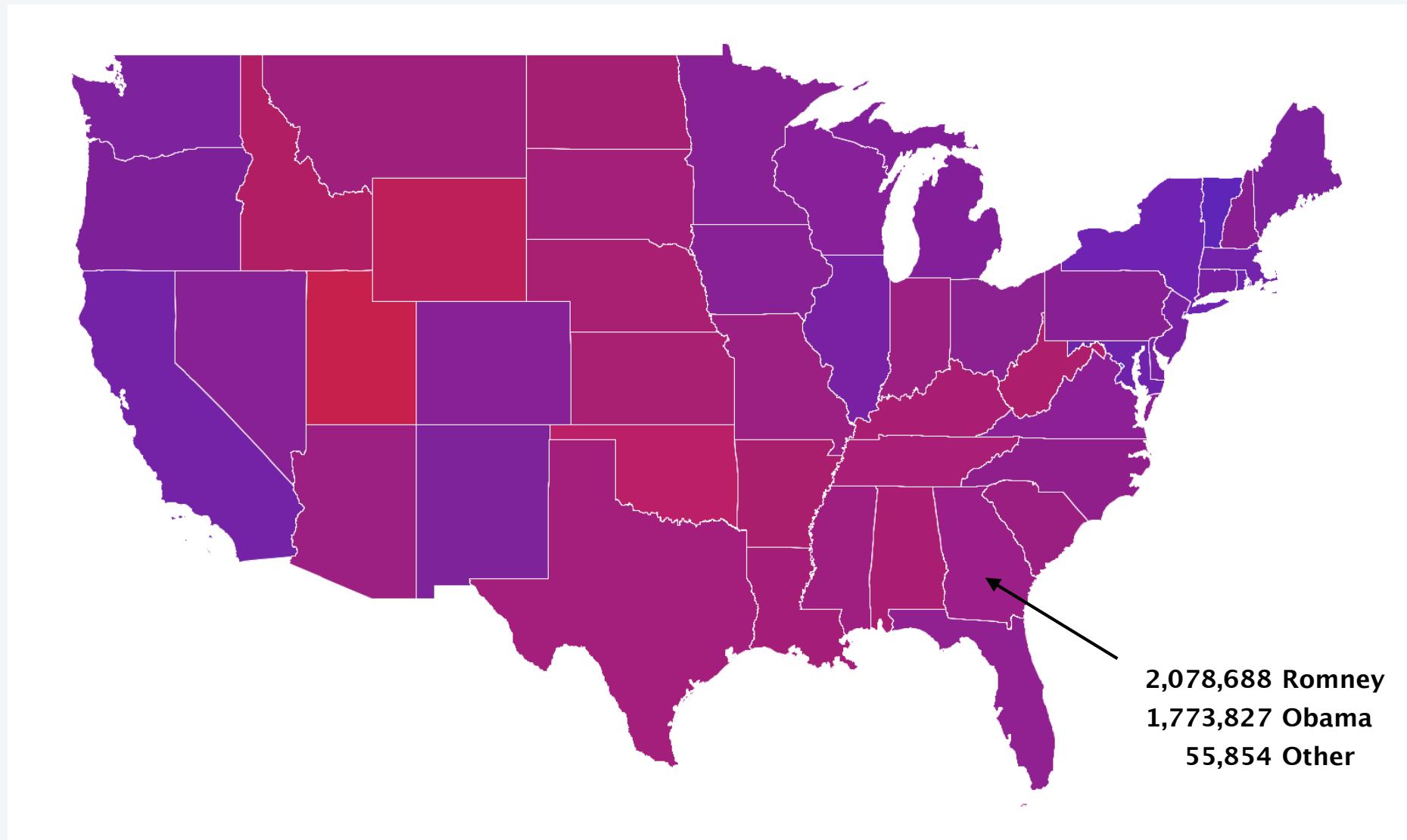


Bob Vanderbei
Princeton University

$$(R, G, B) = \left(\frac{a_1}{a_1 + a_2 + a_3}, \frac{a_2}{a_1 + a_2 + a_3}, \frac{a_3}{a_1 + a_2 + a_3} \right)$$



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More data

Geometric data by county. County names and boundary points.

```
% more GA.txt
```

Rabun

162

| | |
|------------|-----------|
| -83.483398 | 34.993198 |
| -83.108665 | 35.000683 |

:

Fulton

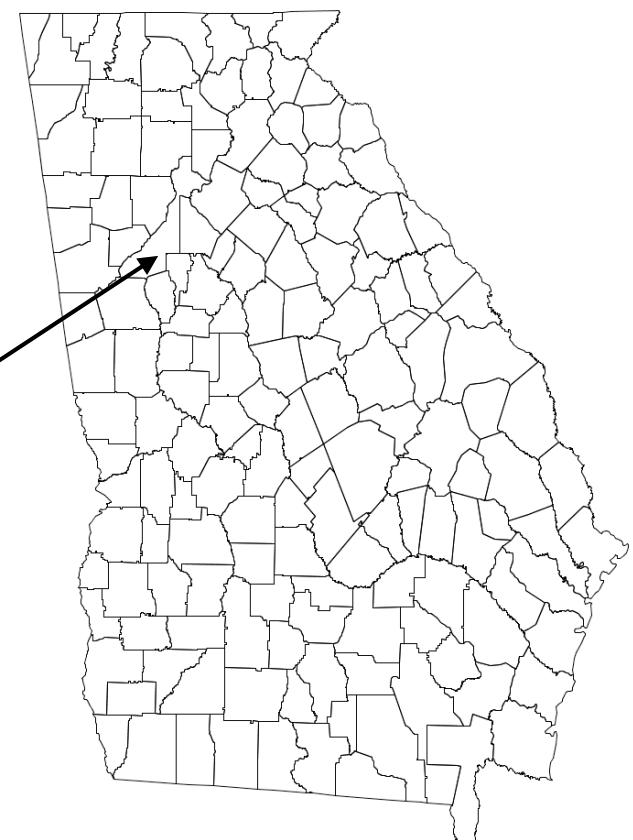
149

| | |
|------------|-----------|
| -84.418999 | 34.073200 |
| -84.418503 | 34.108799 |
| -84.414597 | 34.110100 |

149 points
(longitude, latitude)

}

:



Thirst for more data

Election results by county. County names and votes for each candidate.

% more GA2012.txt

Appling,5233,1758,102

Atkinson,1938,930,39

Bacon,3093,791,52

Baker,785,794,12

Baldwin,7589,8483,198

Banks,5354,780,70,

Barrow,18725,6028,517,

:

Fulton,137124,255470,5752

:

Wilkinson,2246,2181,29

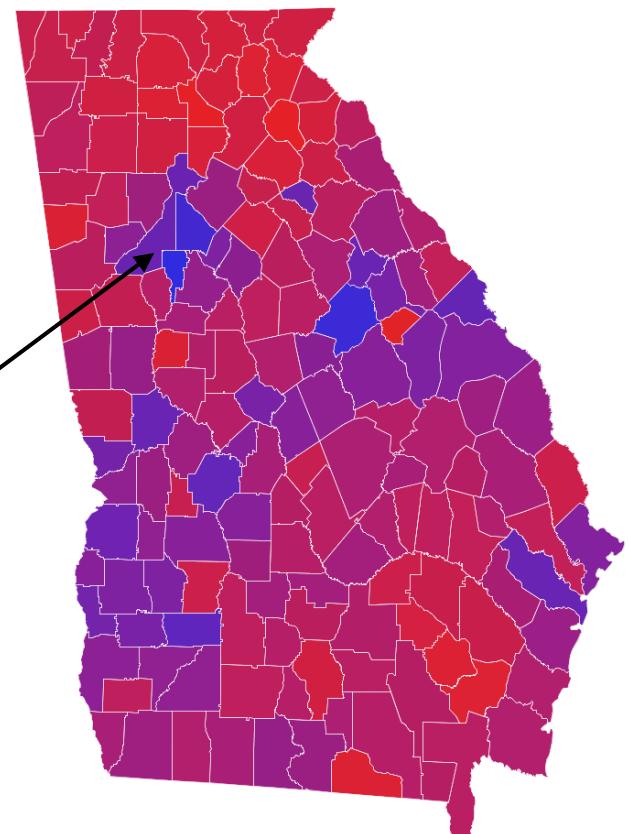
Worth,5869,2487,80

137,124 Romney

255,470 Obama

5,752 Other

↓



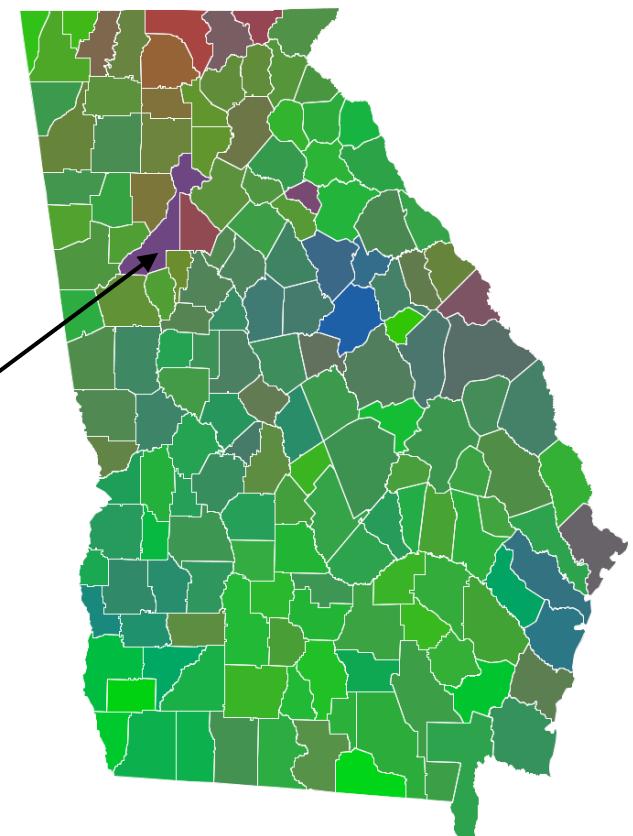
Thirst for more data

Election results by county. County names and votes for each candidate.

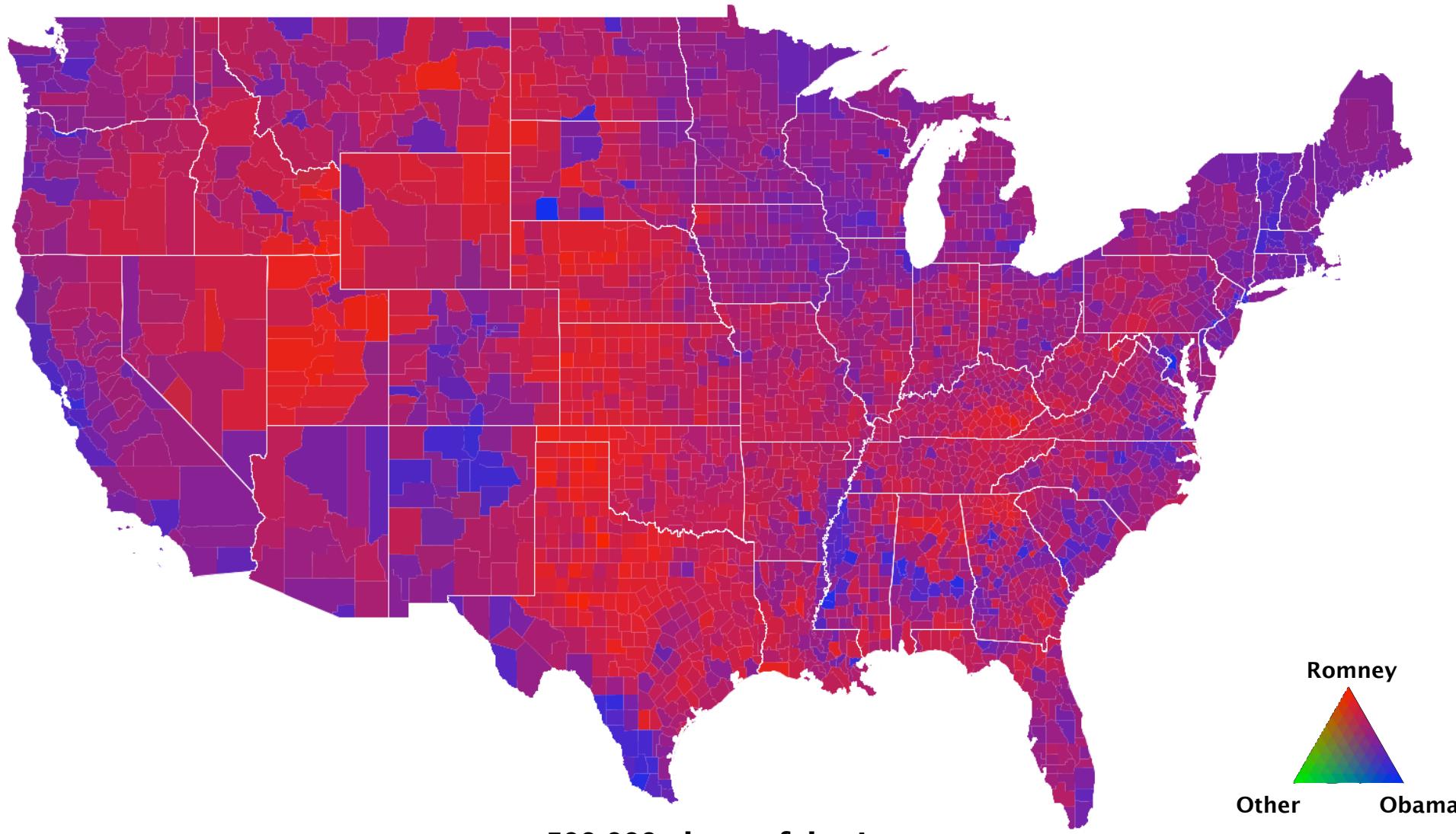
% more GA1968.txt

Appling,795,760,2678,
Atkinson,288,686,1554,
Bacon,586,279,1935,
Baker,99,548,1067,
Baldwin,2318,2109,2678,
Banks,398,296,1434,
Barrow,1372,1070,2731,
:
Fulton,64153,77847,36995,
:
Wilkinson,685,829,1870,
Worth,603,719,3049,

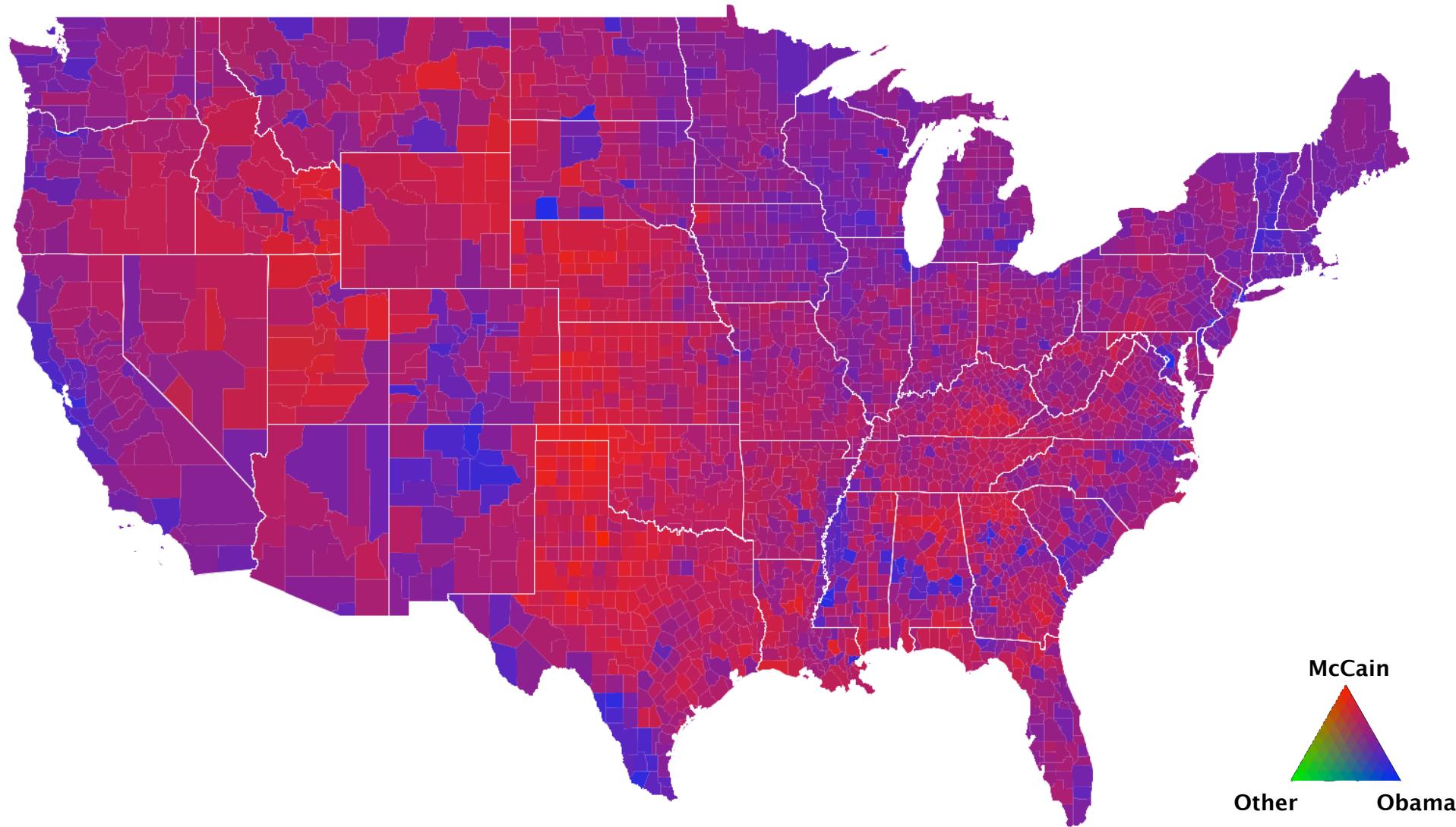
64,153 Nixon
77,847 Humphrey
36,995 Wallace



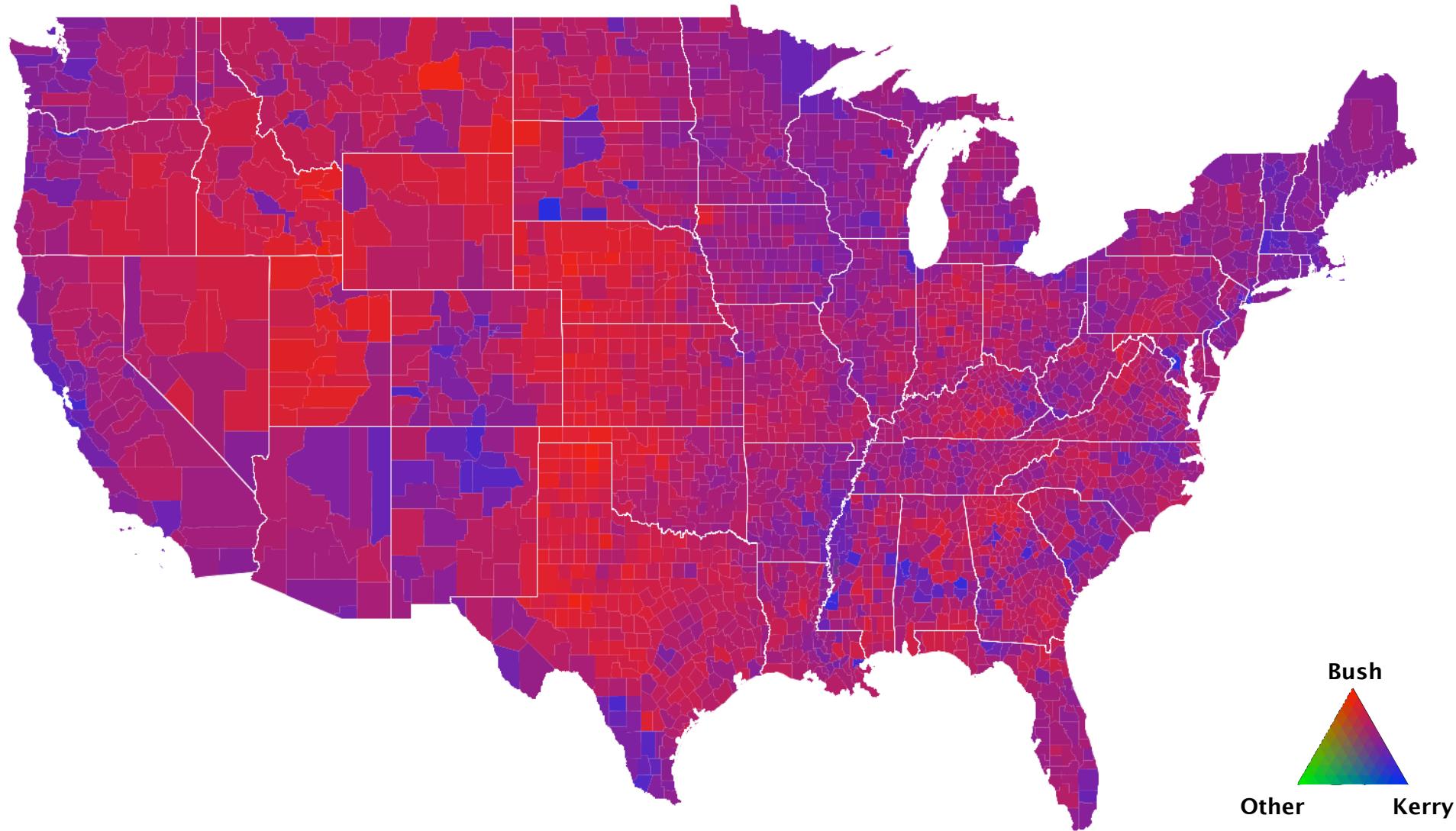
Purple America: 2012 Presidential Election



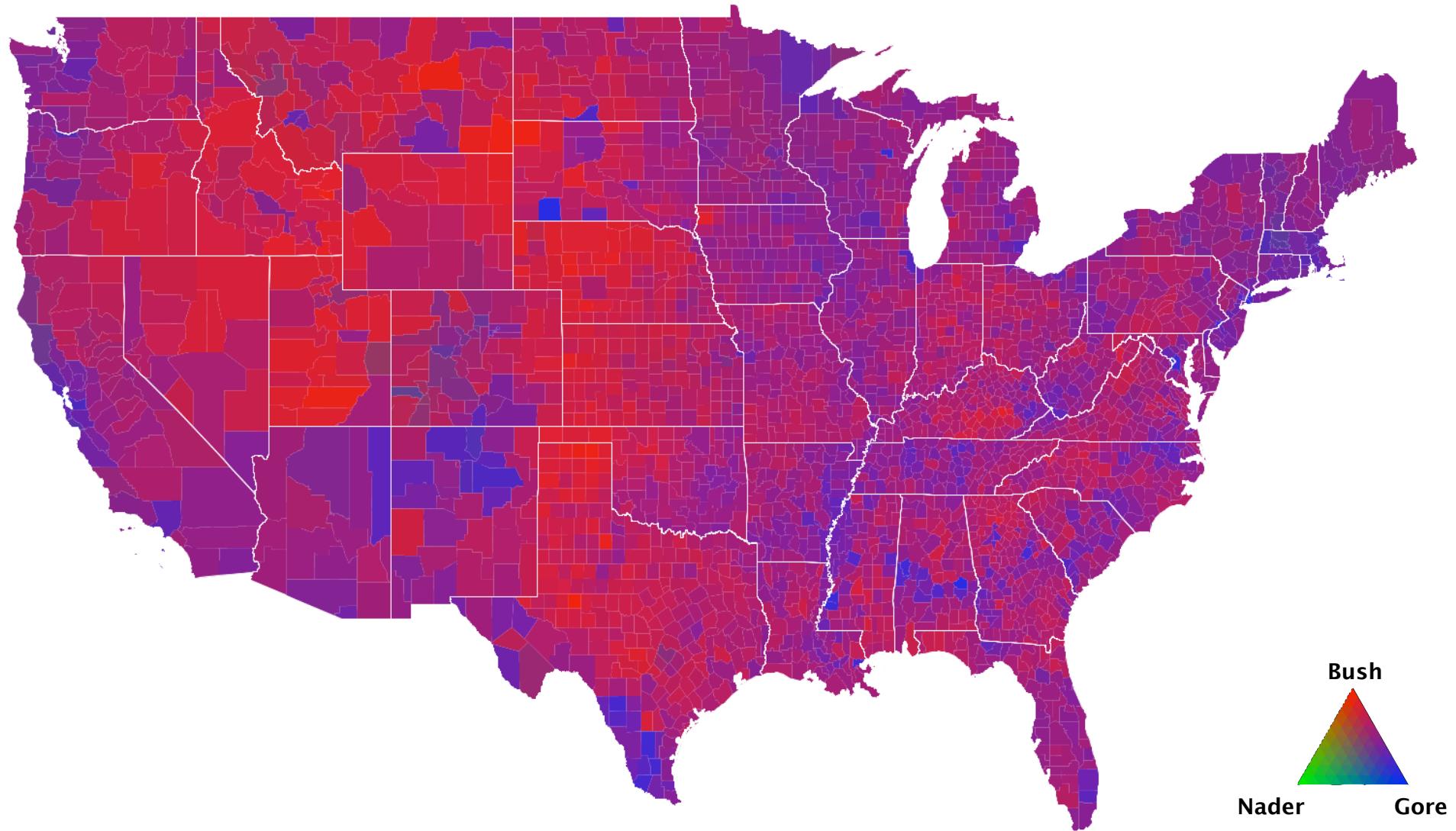
Purple America: 2008 Presidential Election



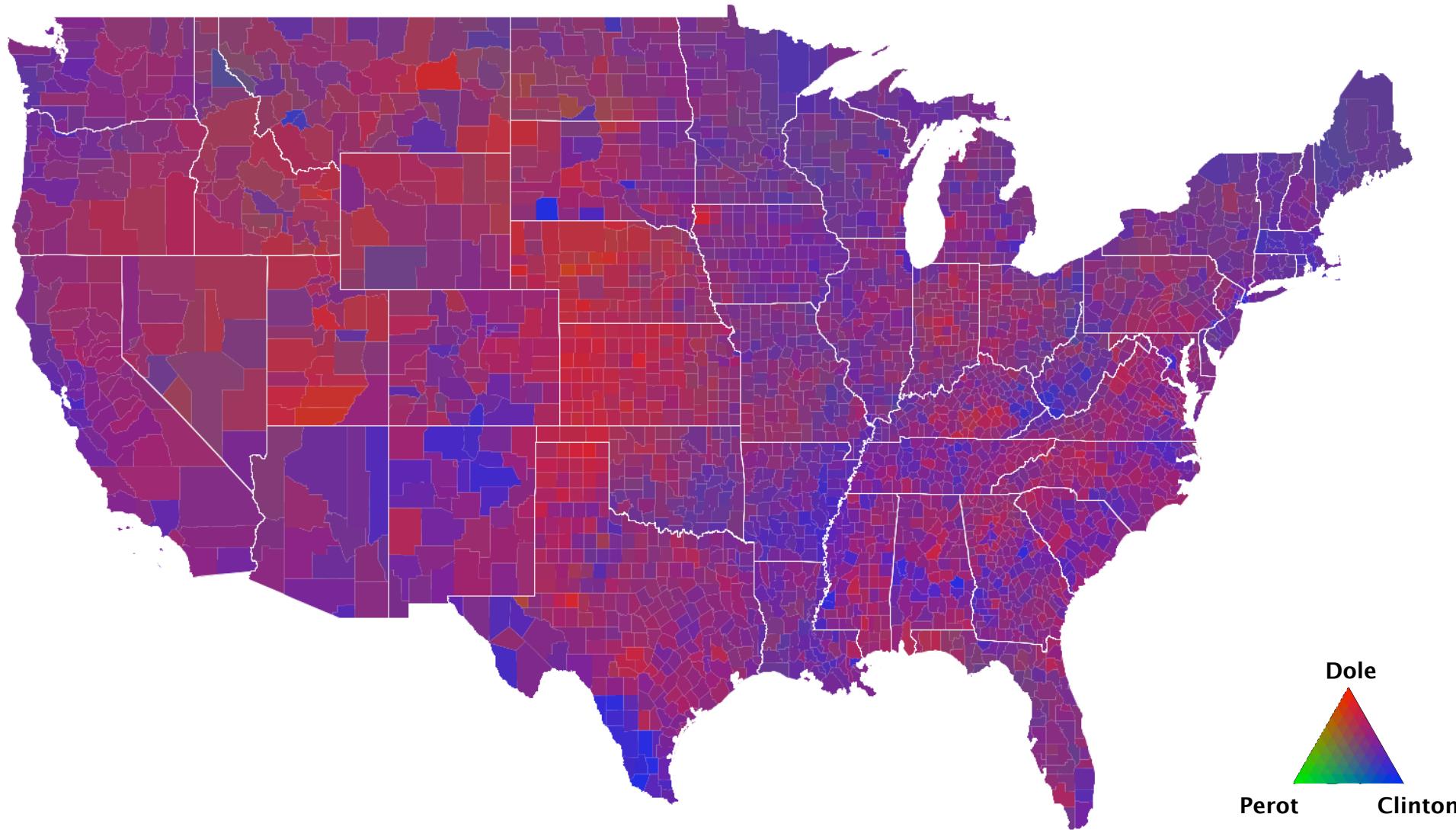
Purple America: 2004 Presidential Election



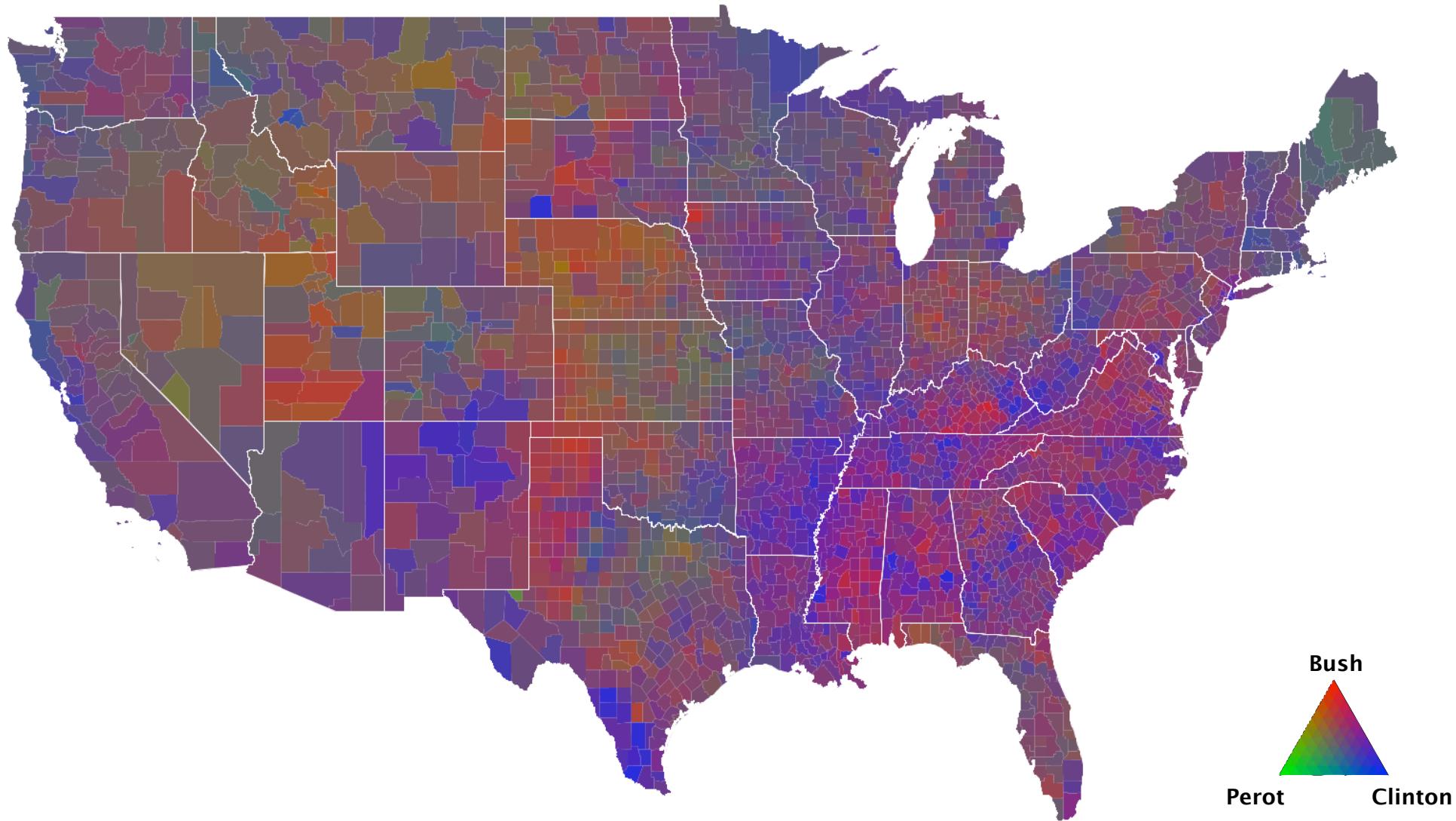
Purple America: 2000 Presidential Election



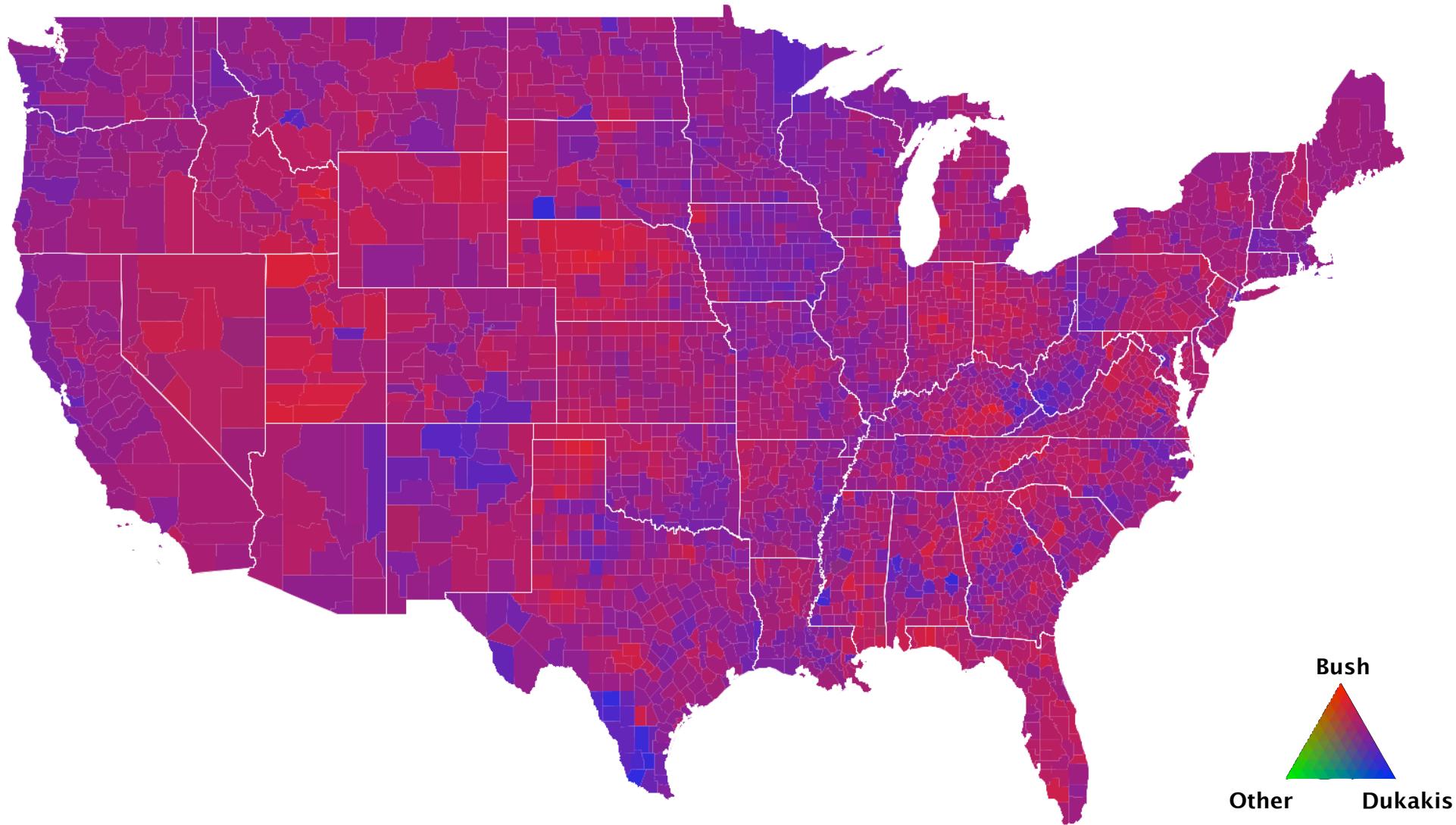
Purple America: 1996 Presidential Election



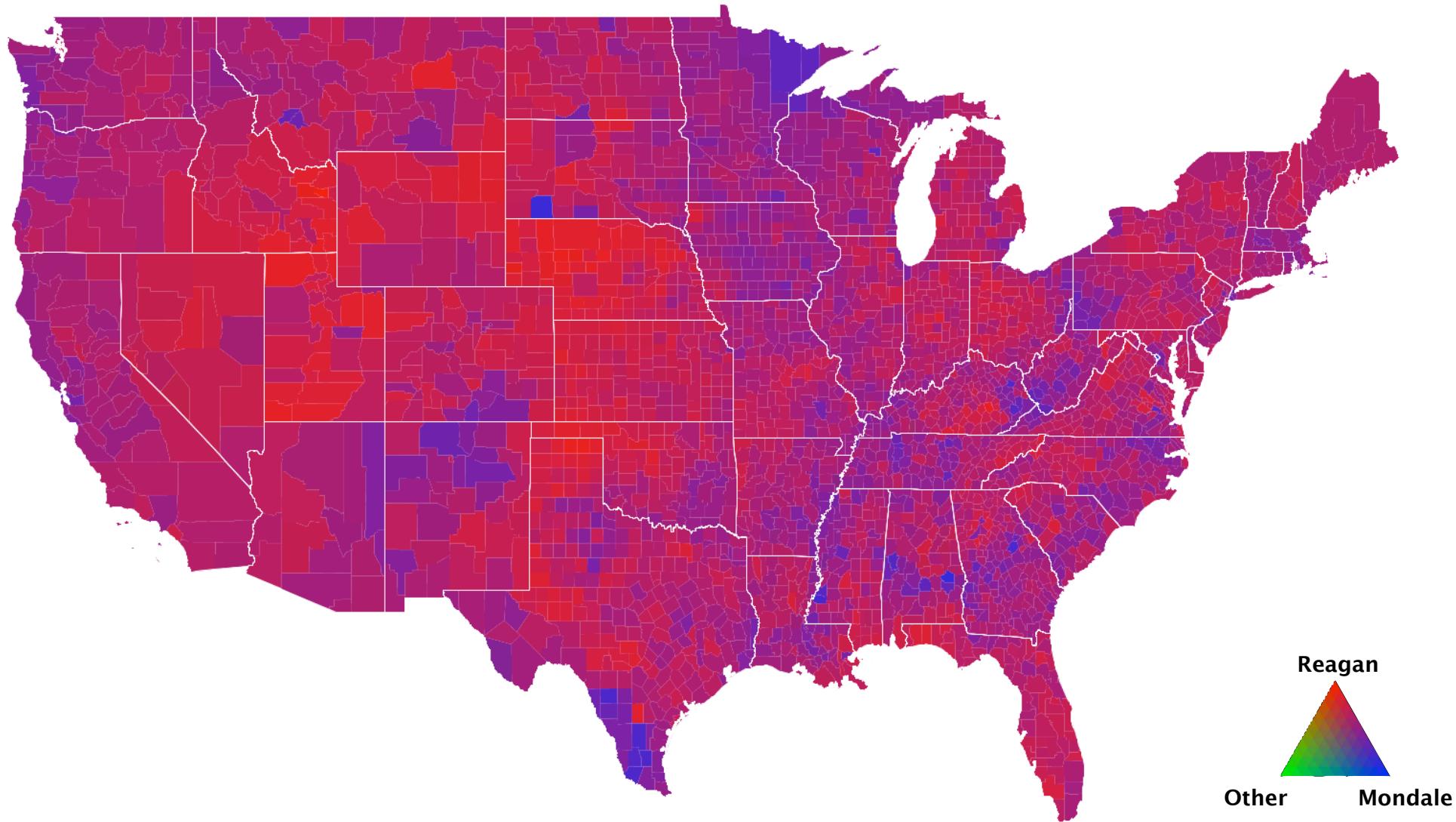
Purple America: 1992 Presidential Election



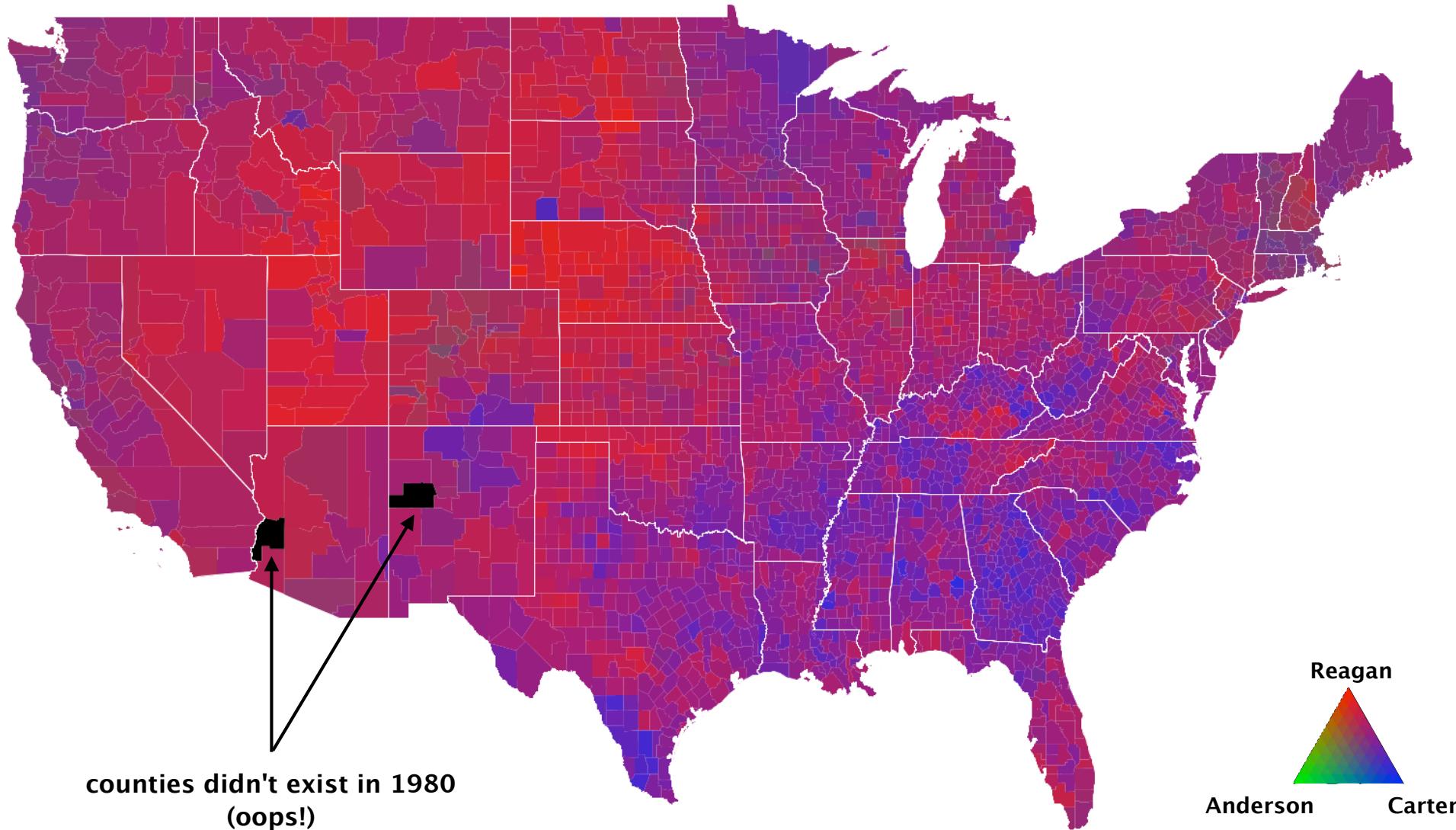
Purple America: 1988 Presidential Election



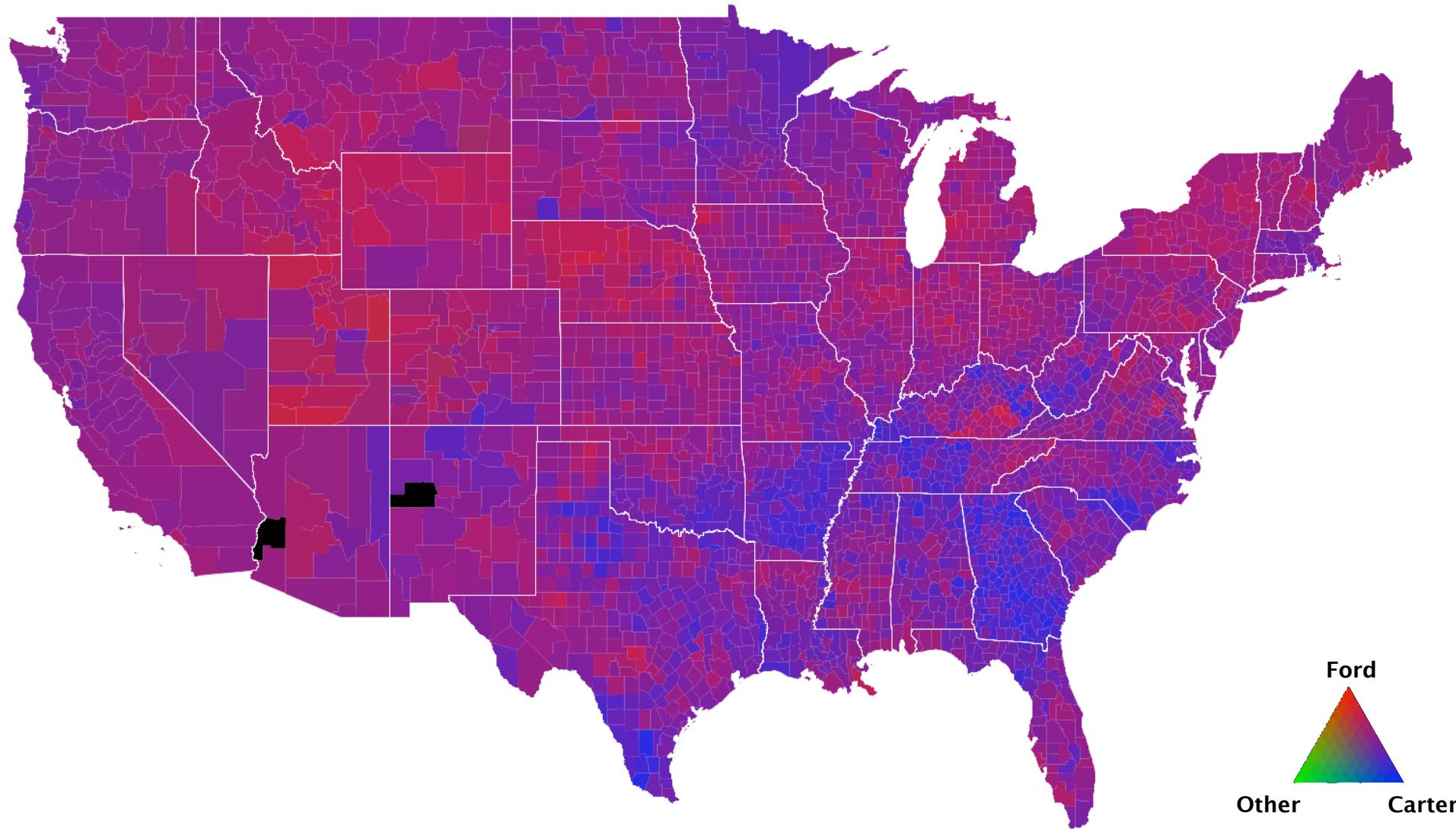
Purple America: 1984 Presidential Election



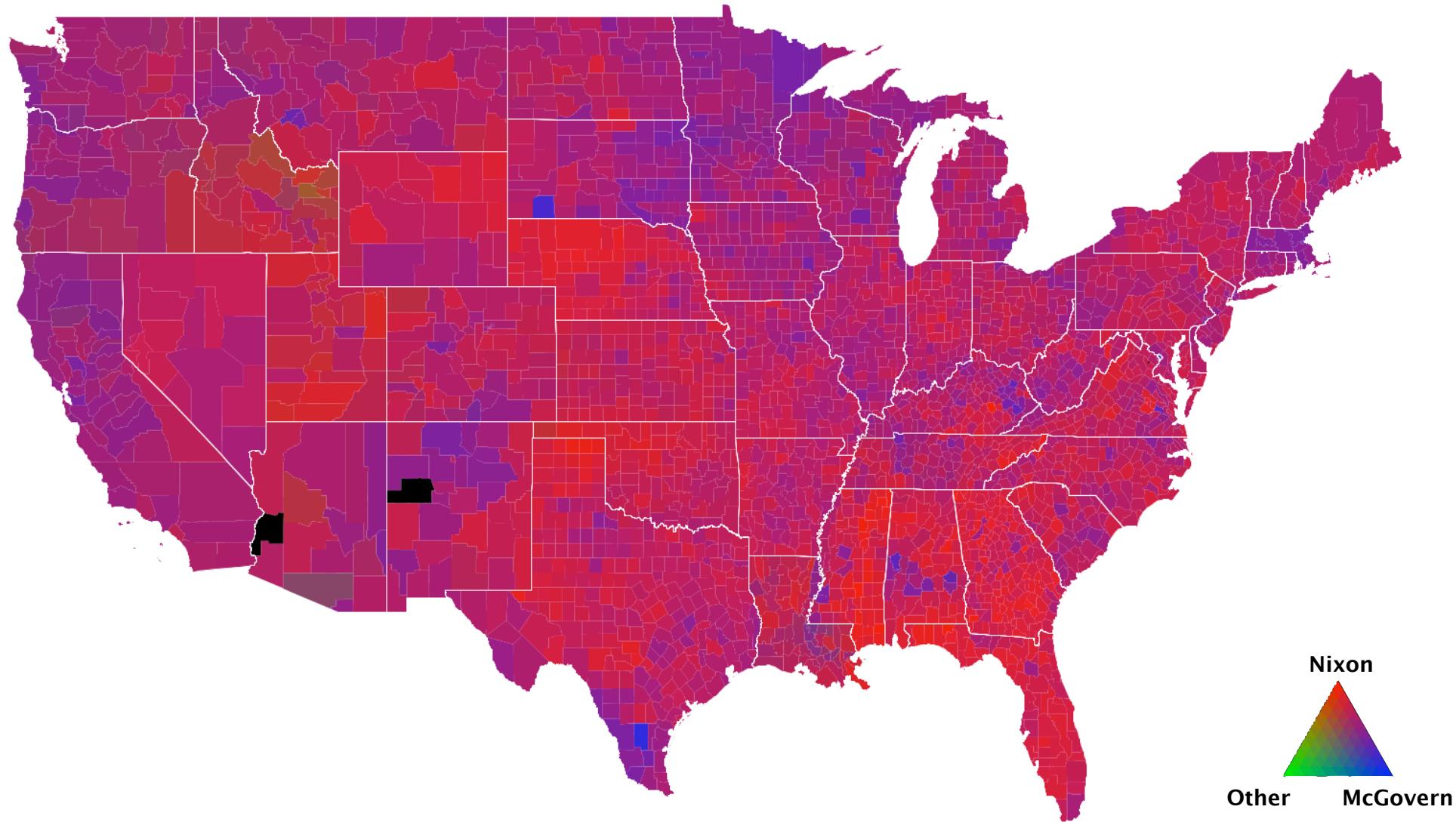
Purple America: 1980 Presidential Election



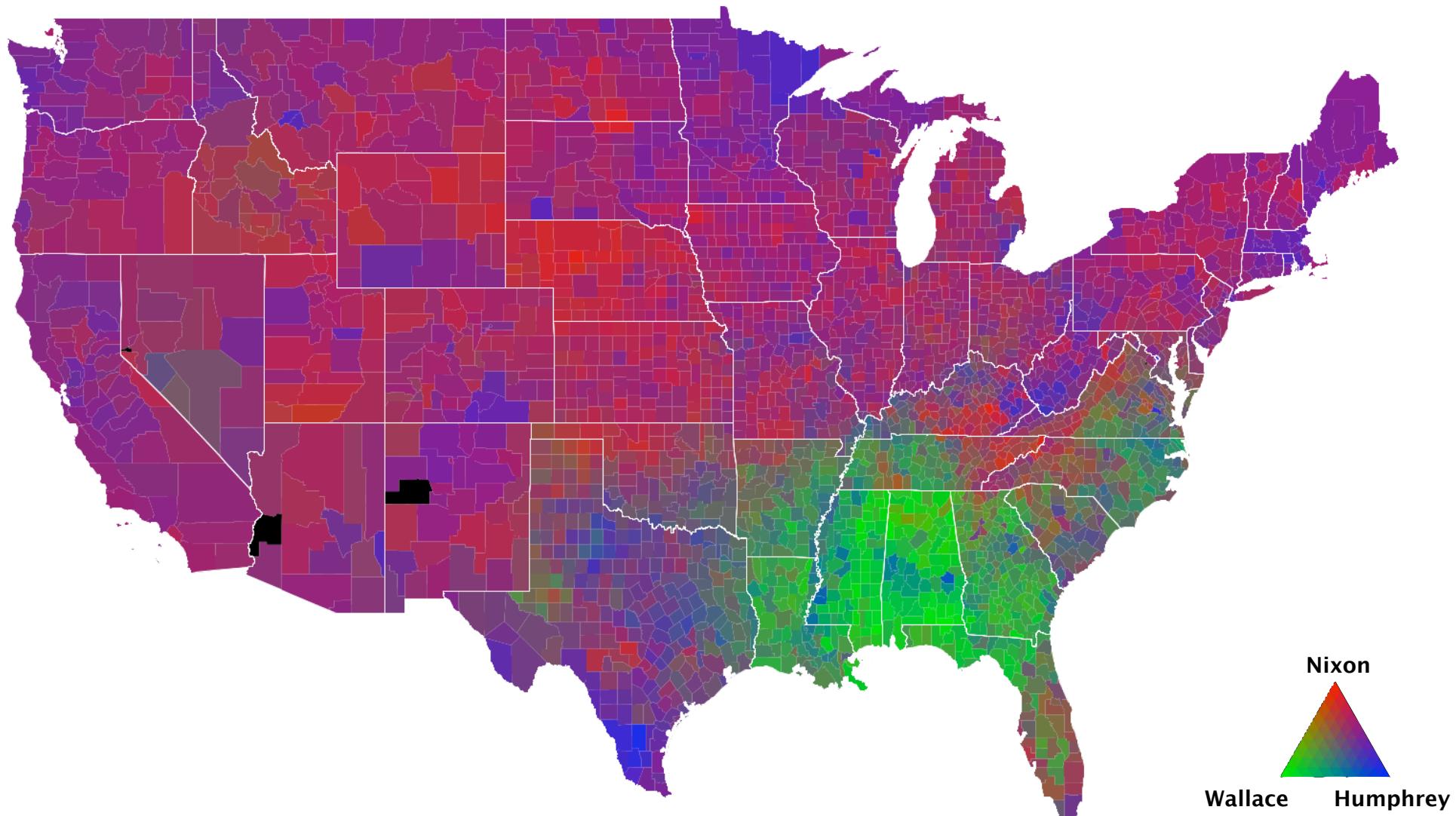
Purple America: 1976 Presidential Election



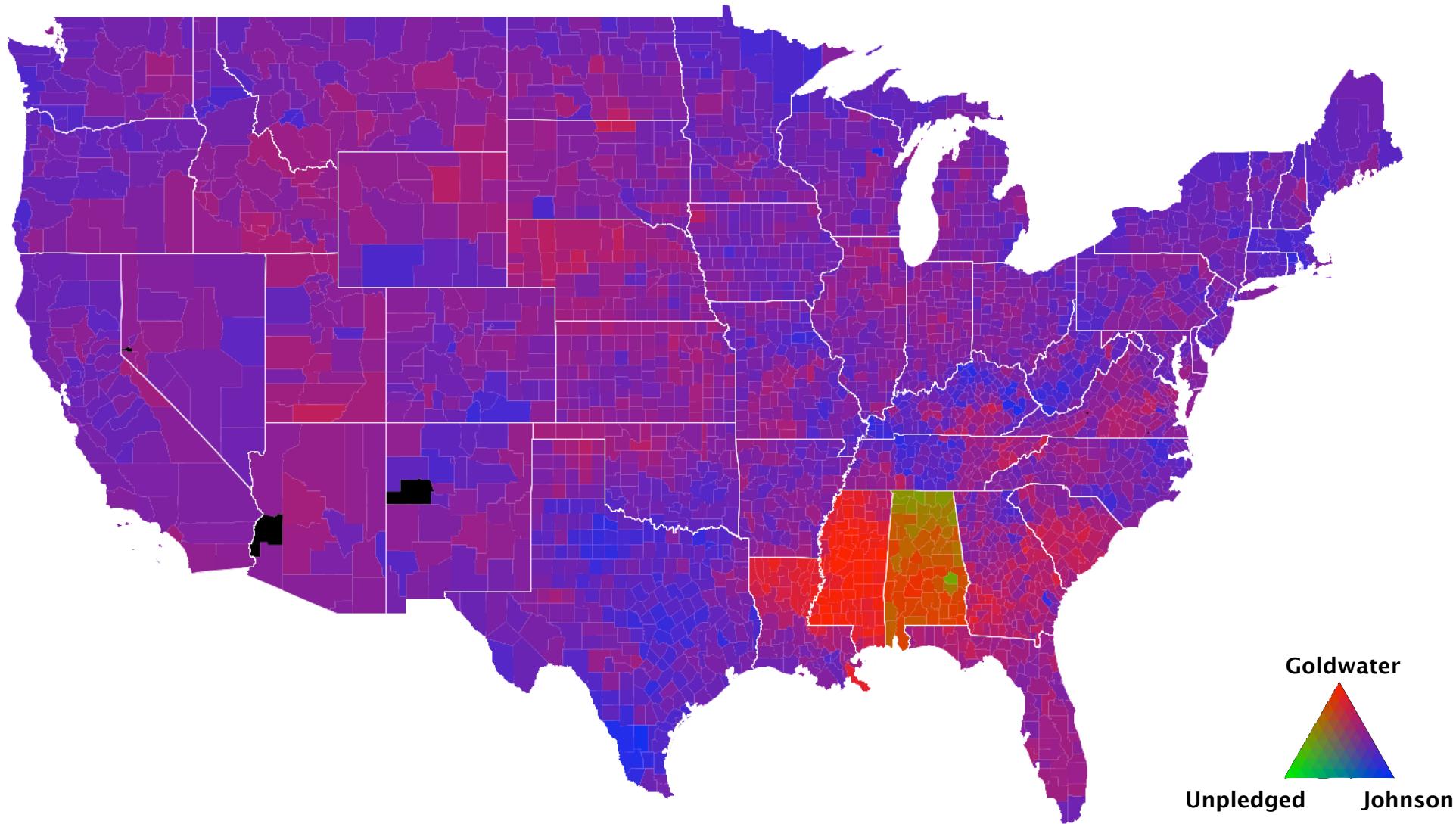
Purple America: 1972 Presidential Election



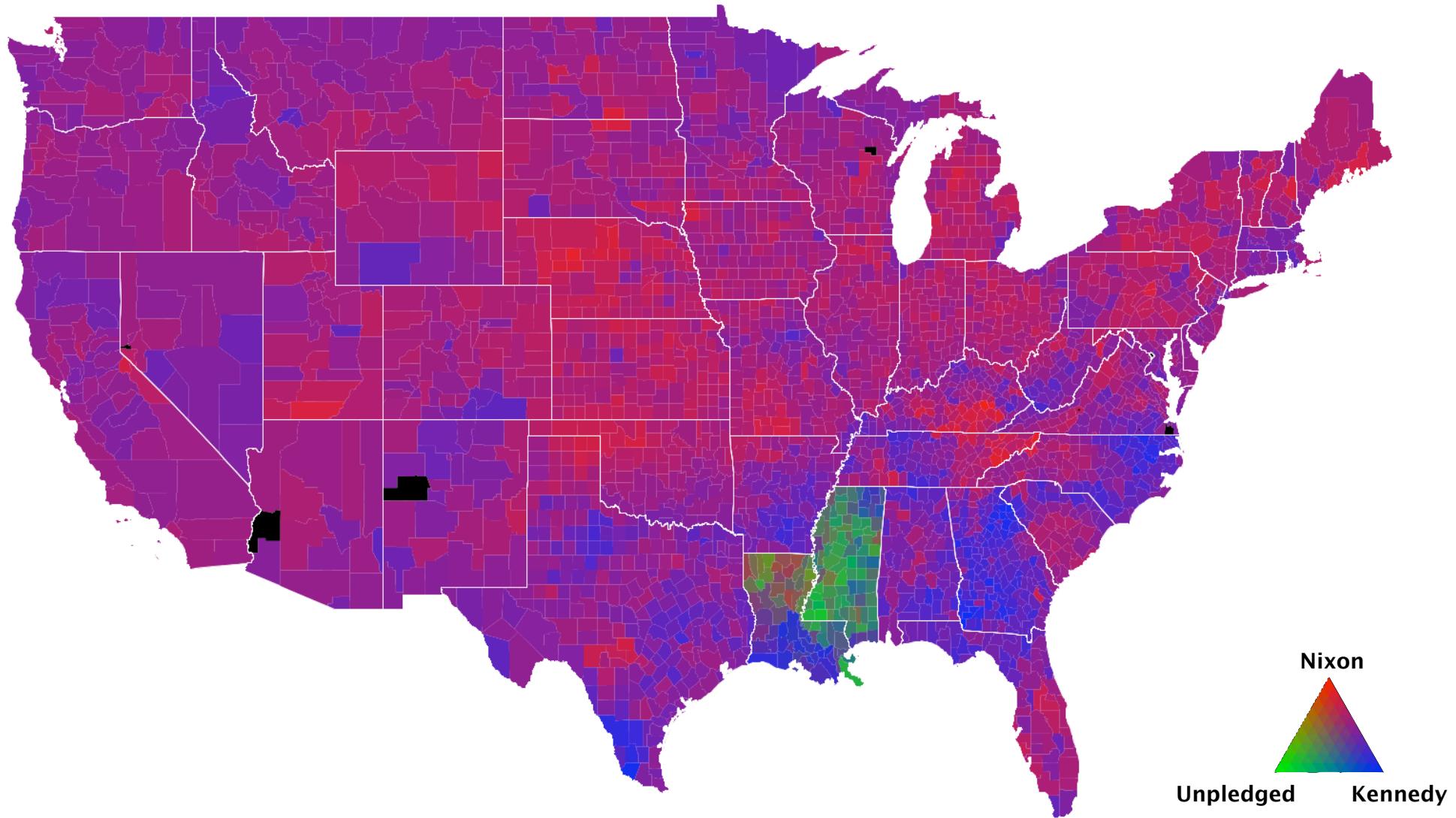
Purple America: 1968 Presidential Election



Purple America: 1964 Presidential Election



Purple America: 1960 Presidential Election



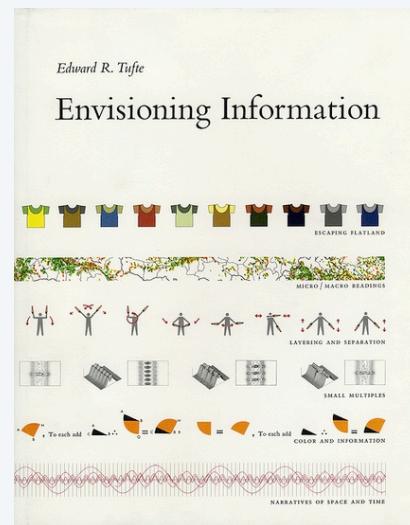
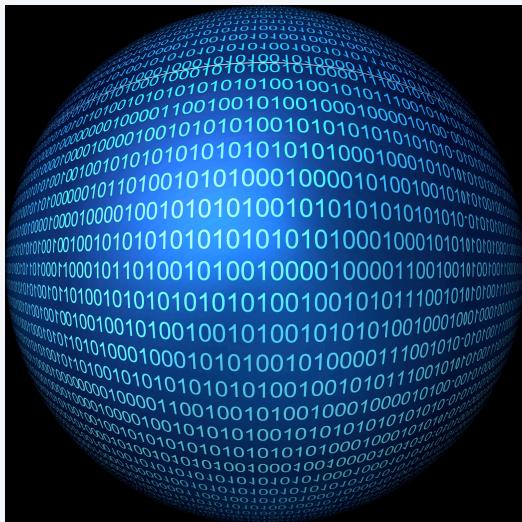
Why nifty?

Real data: Motivates and excites students.

Data visualization: Communicates data in clear and engaging manner.

History: Captures changing colors of America.

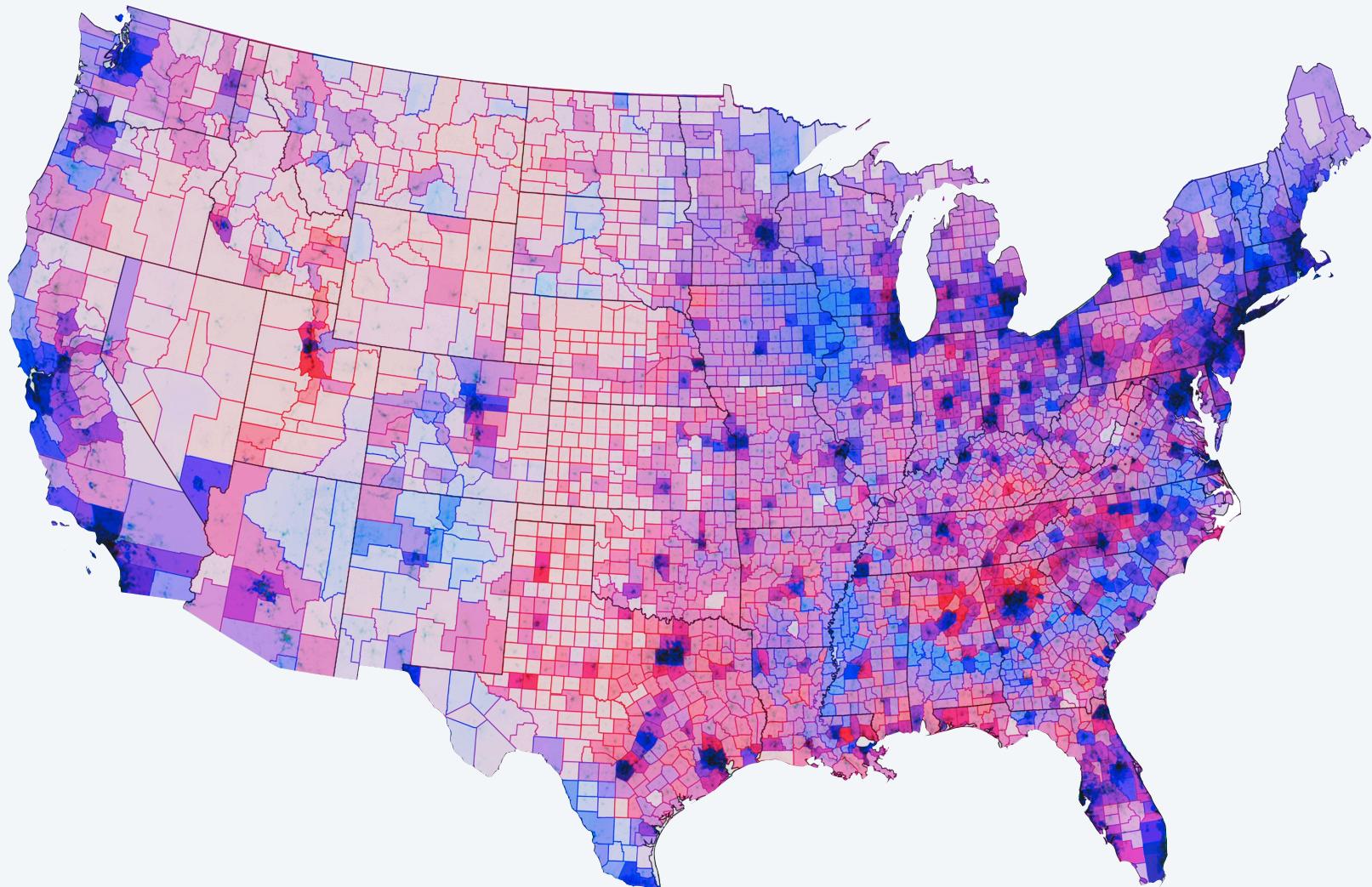
Open ended...



Opportunities for creativity, enrichment, and inspiration

Colors. Explore different color palettes.

How? Lookup table.

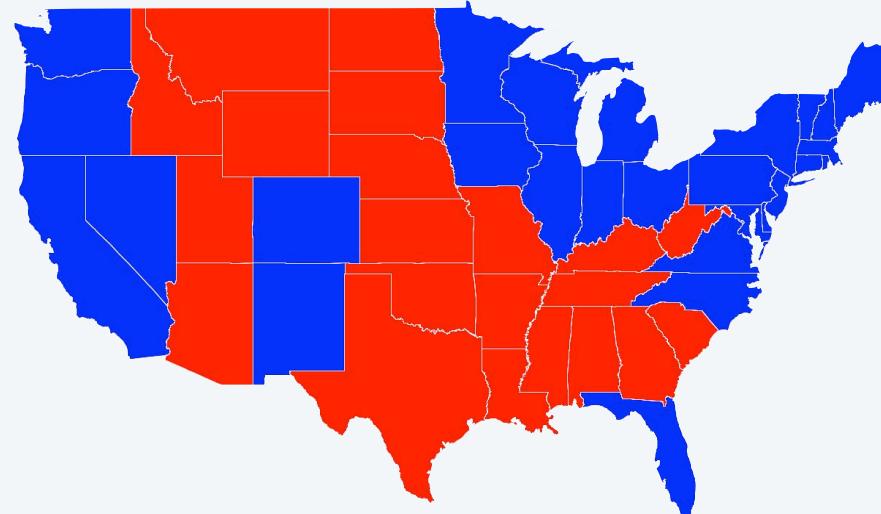


Opportunities for creativity, enrichment, and inspiration

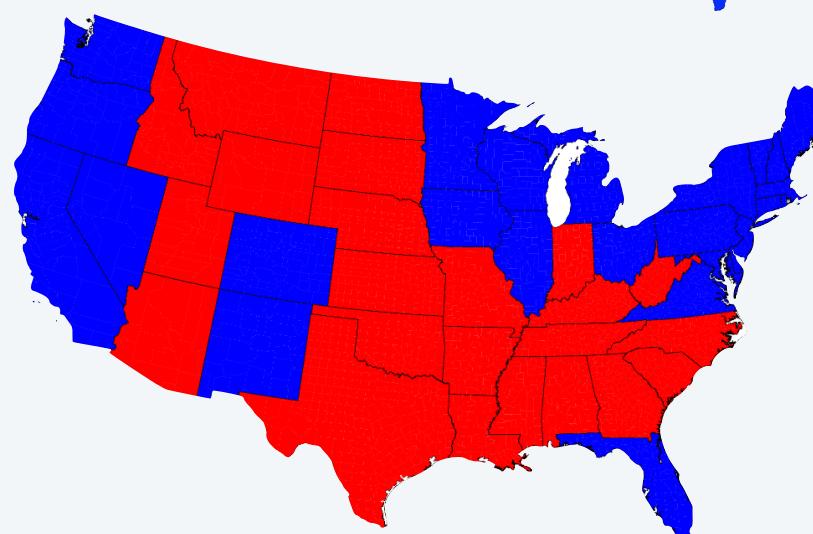
Map projections. Mercator, azimuthal, Albers, Gall-Peters, ...

How? Spherical geometry.

unprojected

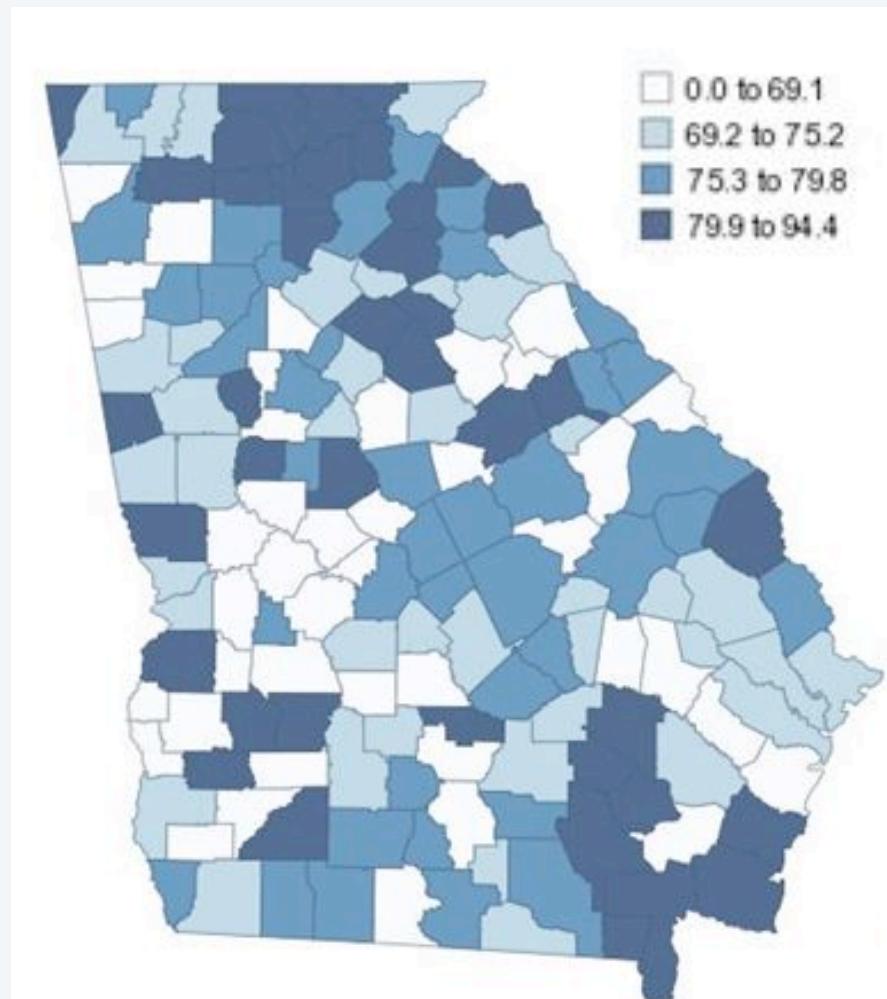


Mercator projection



Opportunities for creativity, enrichment, and inspiration

Use different data sets. High-school graduation rates by county.
How? Screen-scrape (and scrub) data.



http://mediad.publicbroadcasting.net/p/wabe/files/201312/2013_GA_county_grad_rates.JPG

Opportunities for creativity, enrichment, and inspiration

Add a GUI. As user hovers over county, display election results.

How? Point-inside-polygon, GUI widgets.

