

# purple America

**KEVIN WAYNE**

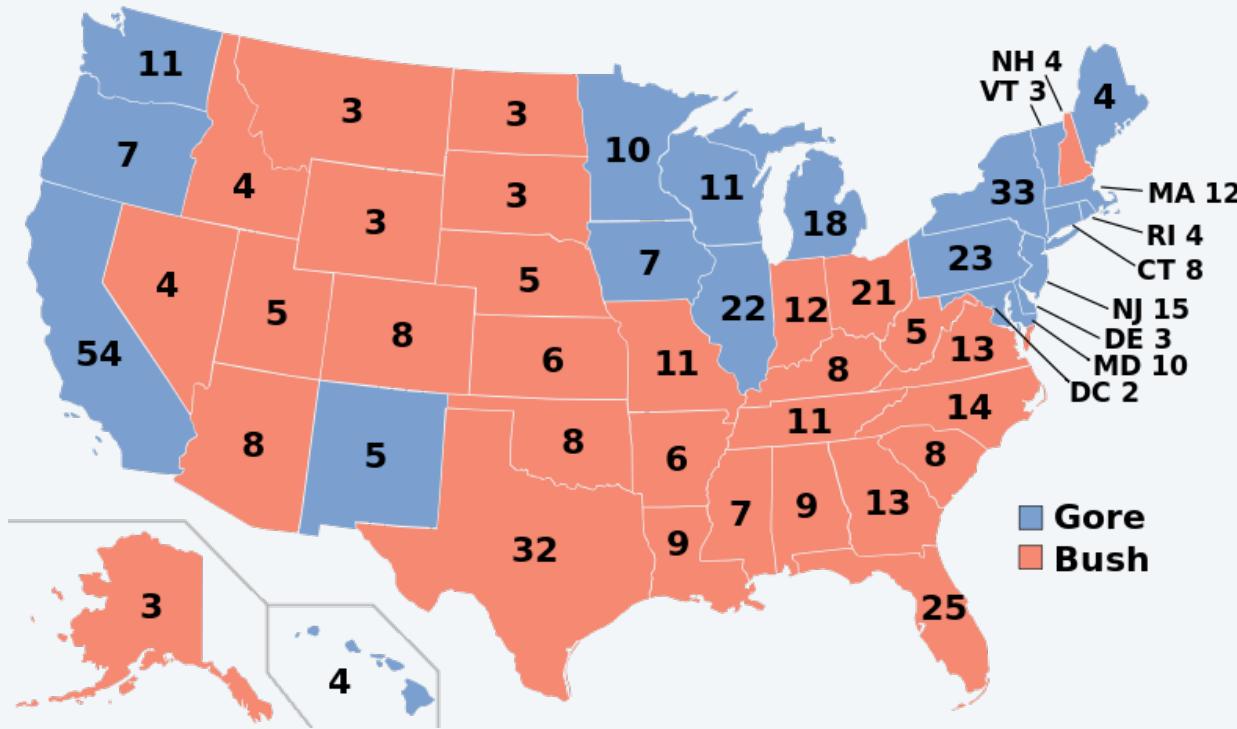


**PRINCETON  
UNIVERSITY**

# 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

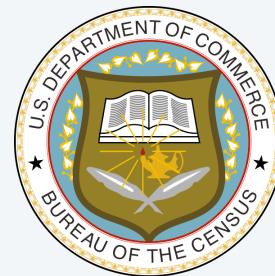
requirements: filled-polygon primitive

## Step 0. Collect the data (optional)

---

Geometric data. [www.census.gov/tiger/boundary](http://www.census.gov/tiger/boundary)

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



Election returns. [www.uselectionatlas.org](http://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

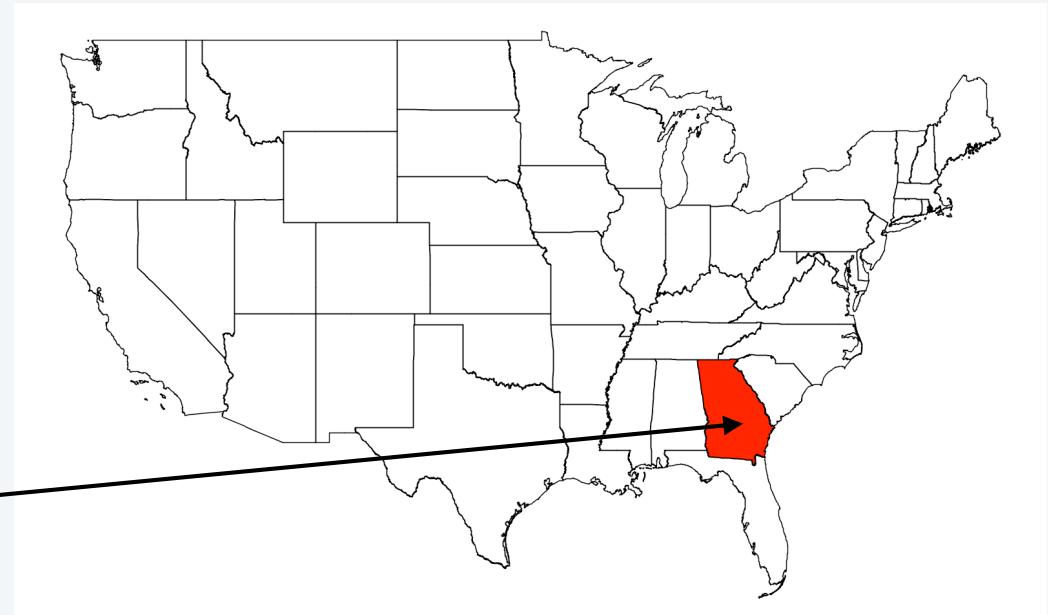
:

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

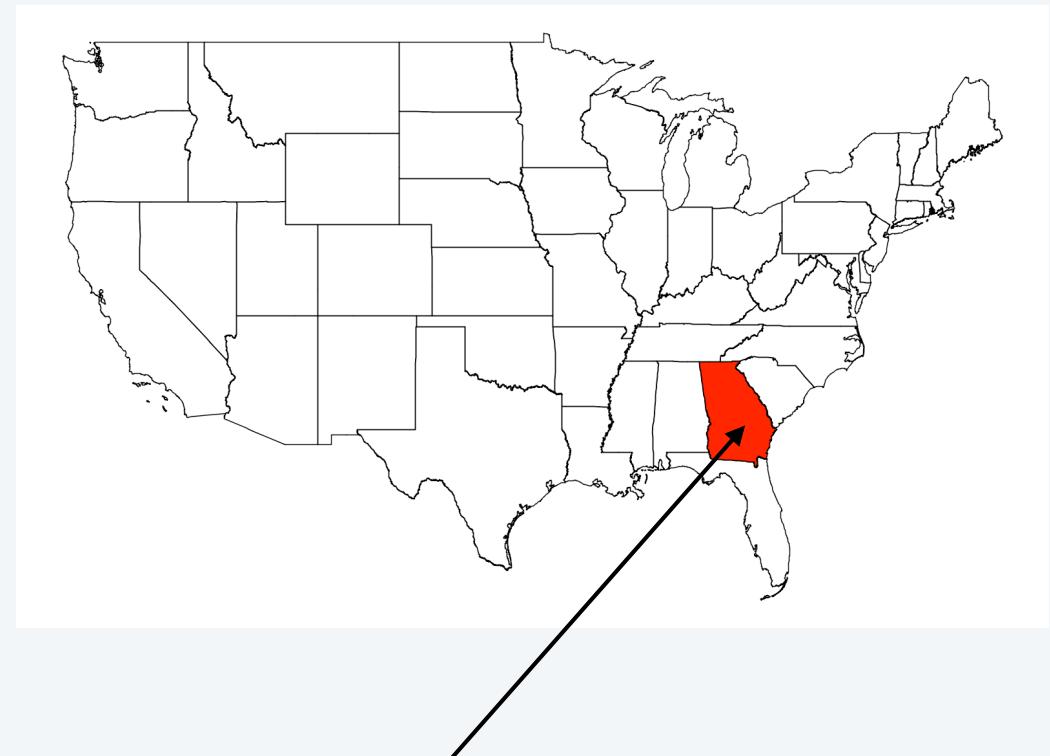
:

Washington,1290670,1755396,99892

West Virginia,417655,238269,14743

Wisconsin,1407966,1620985,39483

Wyoming,170962,69286,8813

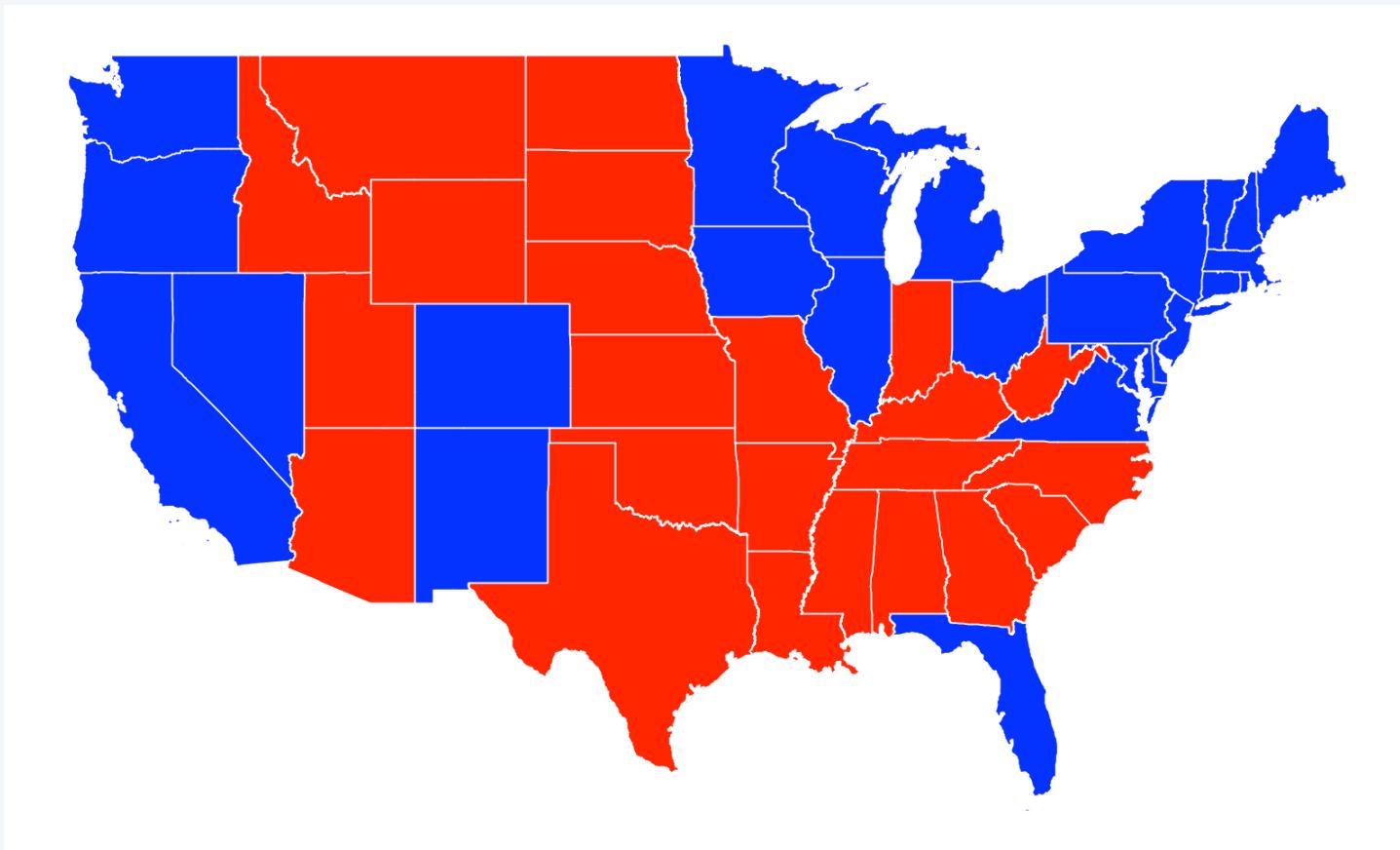


2,078,688 Romney  
1,773,827 Obama  
55,854 Other

## Step 3. Plot the results

---

Red states, blue states. Pretty picture.



Visualization bug. Misleading and polarizing picture.

# Purple America

---

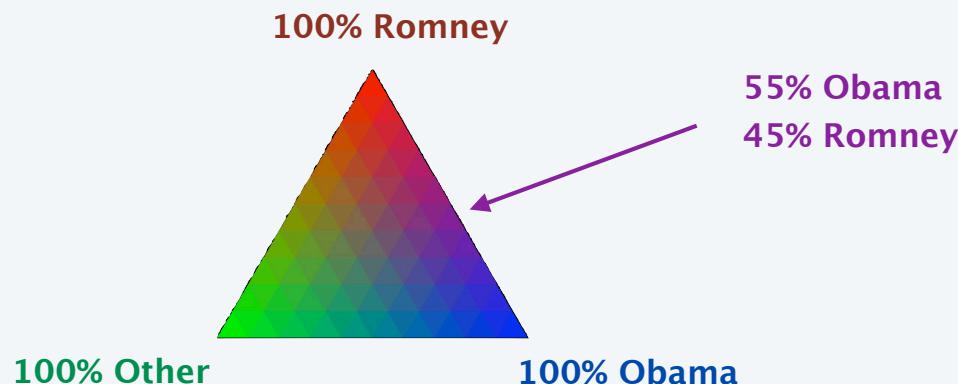
Key idea. Assign color based on number of votes.

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



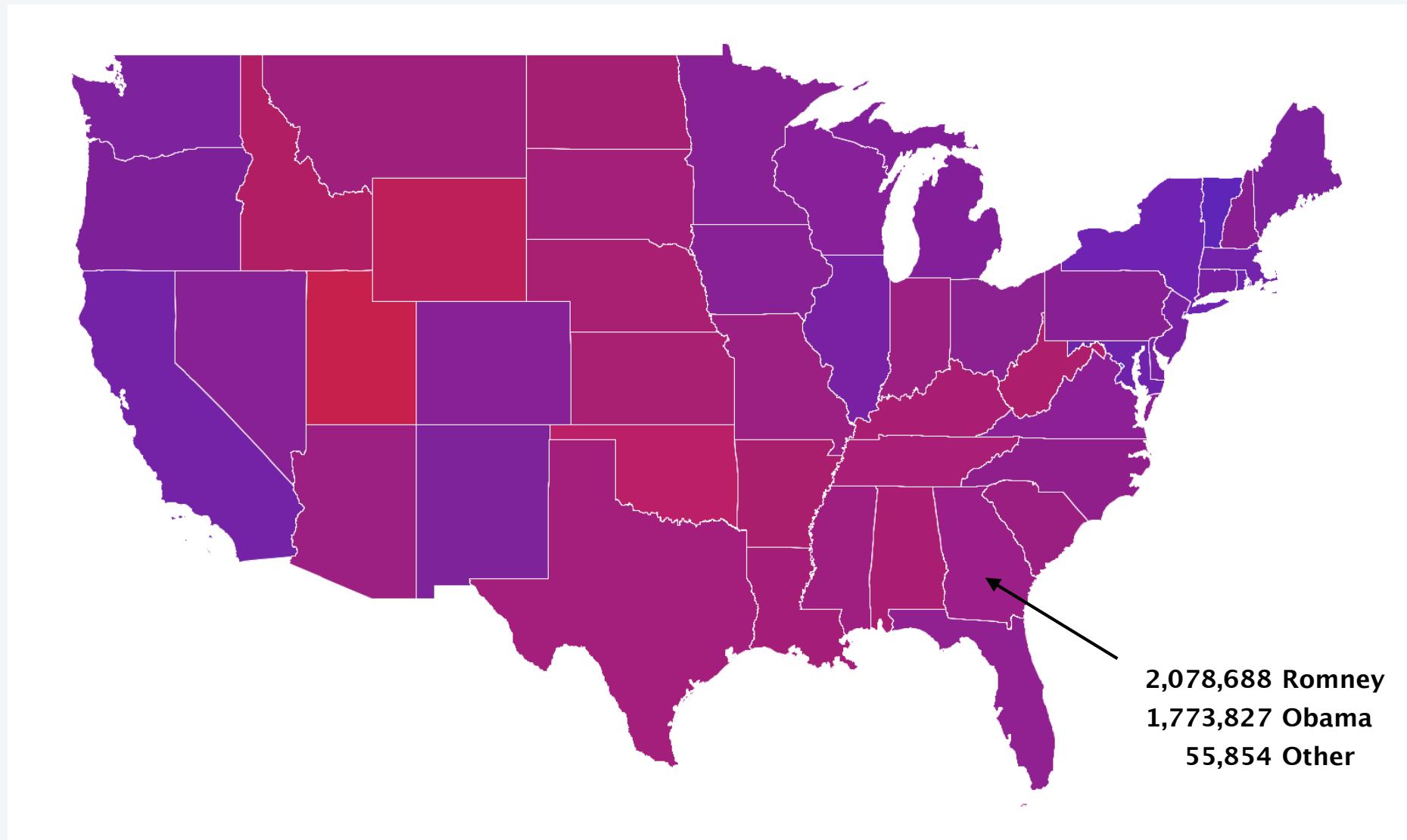
**Bob Vanderbei**  
Princeton University

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



# Purple America

---



# 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

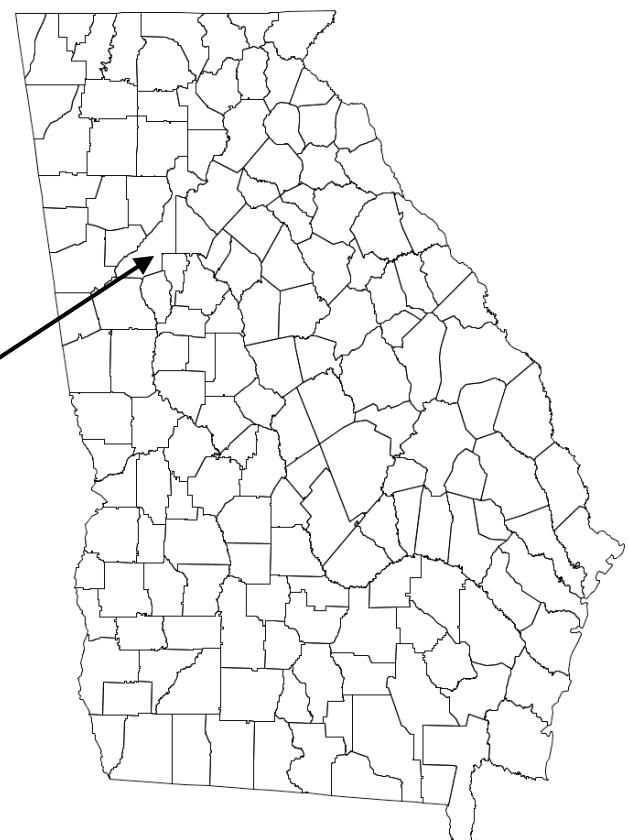
149 points  
(longitude, latitude)

}

:

-84.418404	34.052898
------------	-----------

:



# 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

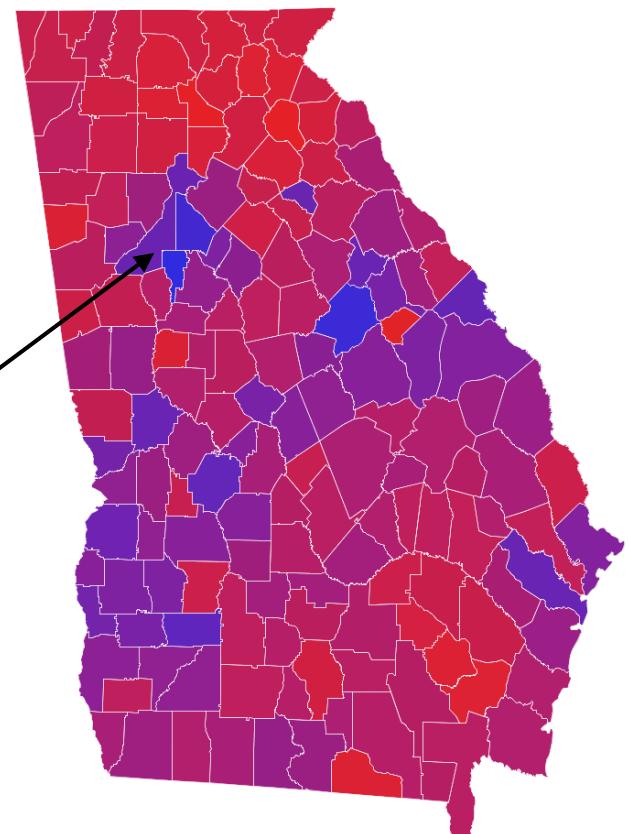
Worth,5869,2487,80

137,124 Romney

255,470 Obama

5,752 Other

→



# Thirst for more data

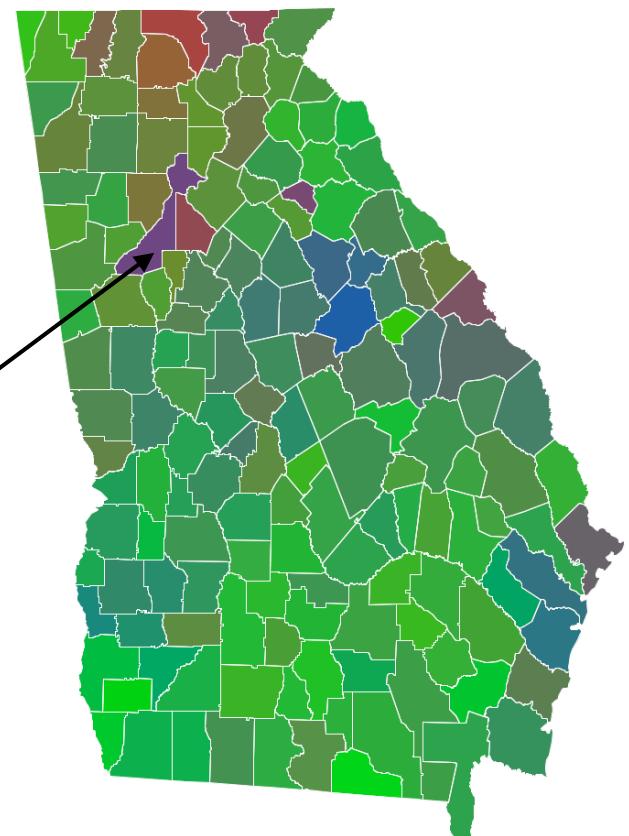
---

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

% more GA1968.txt

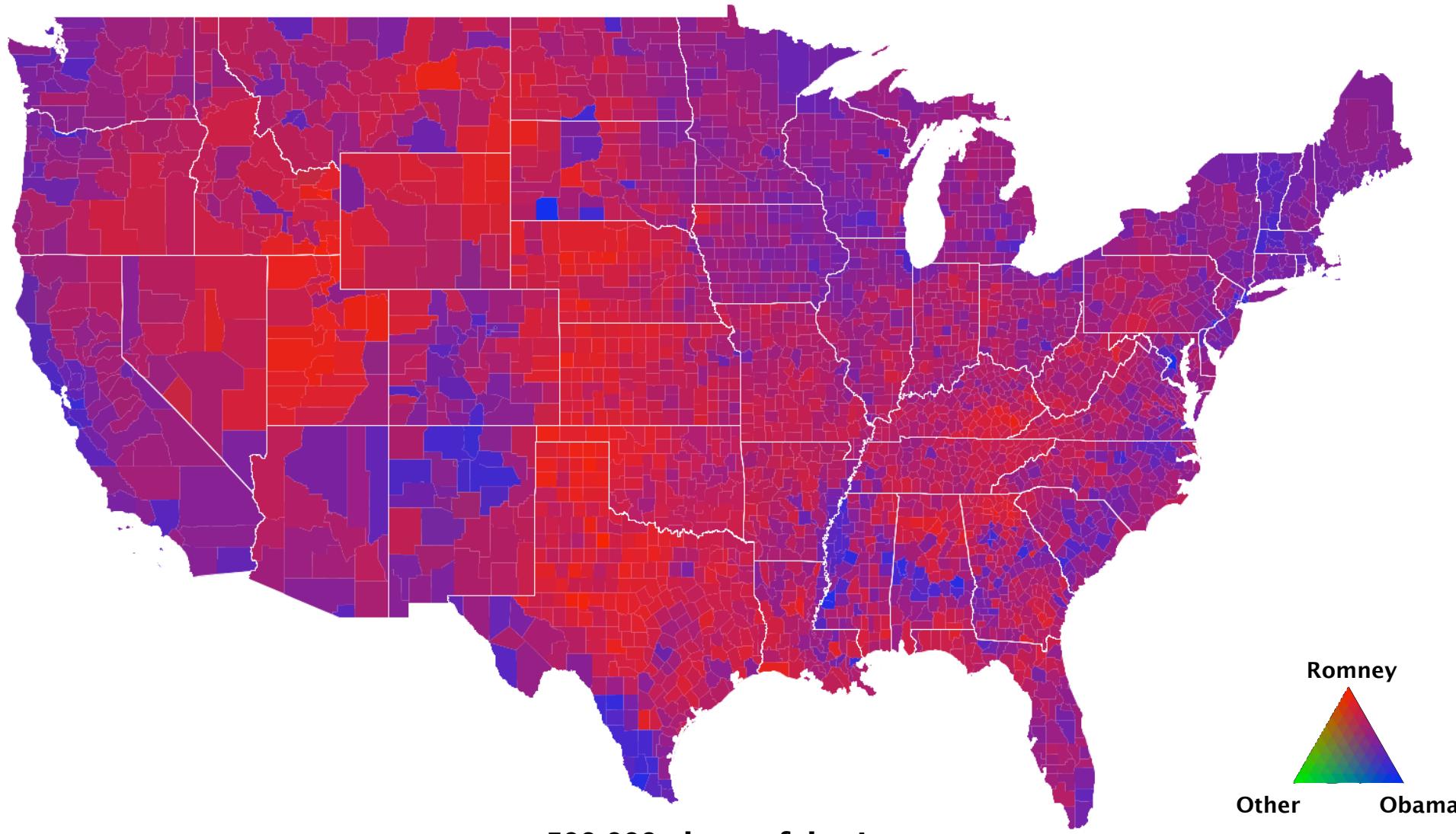
Appling,795,760,2678,  
Atkinson,288,686,1554,  
Bacon,586,279,1935,  
Baker,99,548,1067,  
Baldwin,2318,2109,2678,  
Banks,398,296,1434,  
Barrow,1372,1070,2731,  
:  
Fulton,64153,77847,36995,  
:  
Wilkinson,685,829,1870,  
Worth,603,719,3049,

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



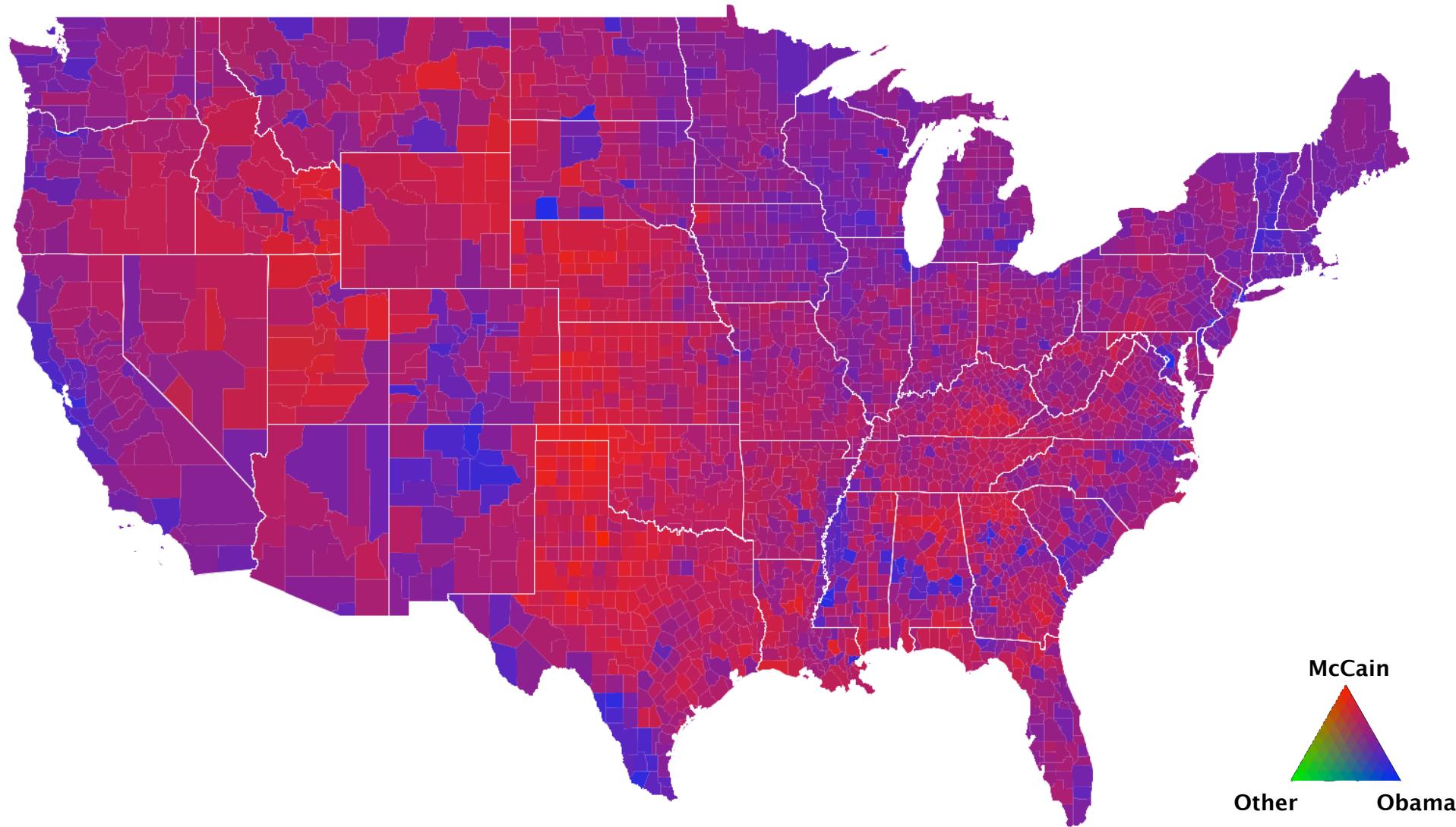
# Purple America: 2012 Presidential Election

---



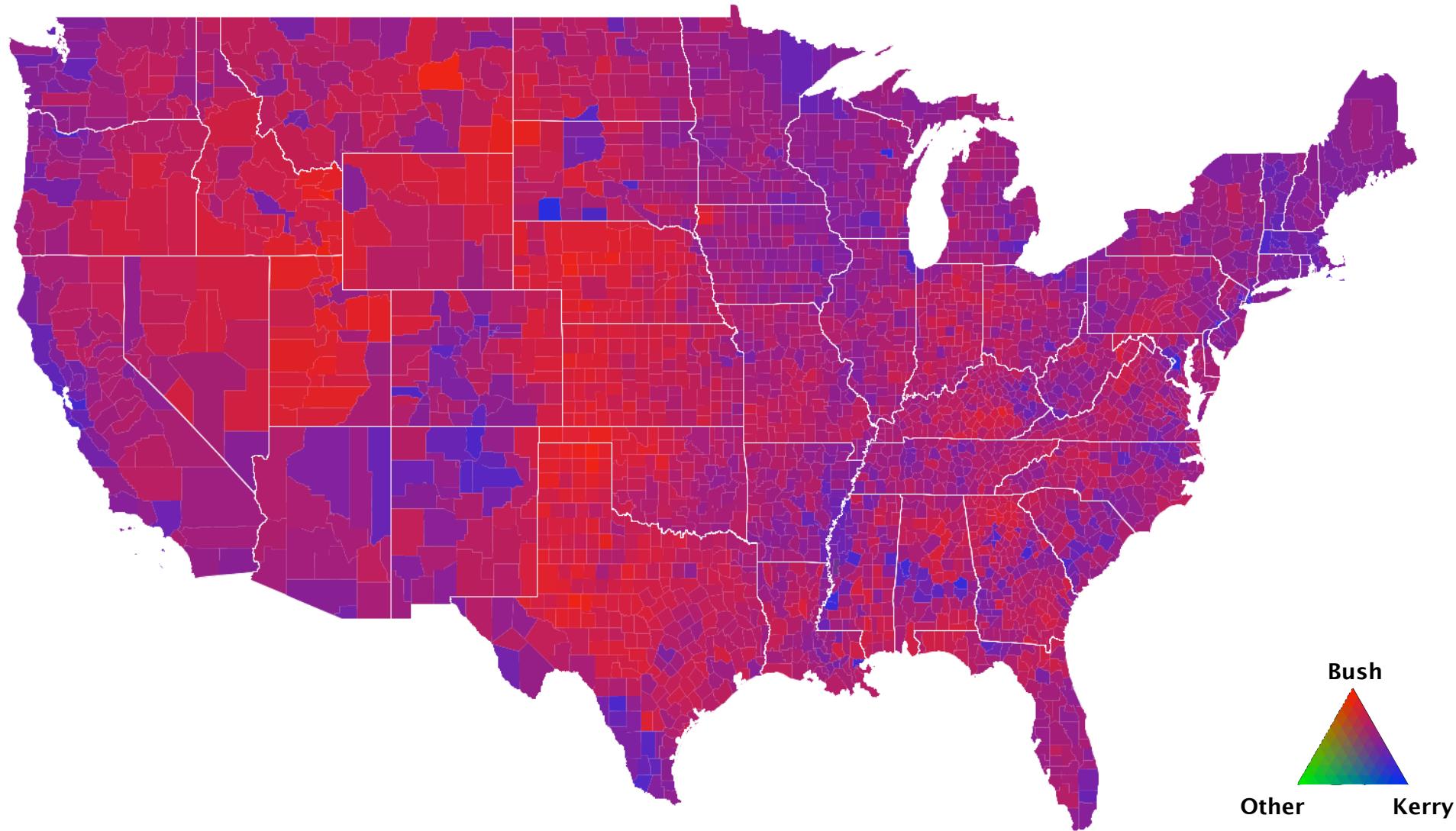
# Purple America: 2008 Presidential Election

---



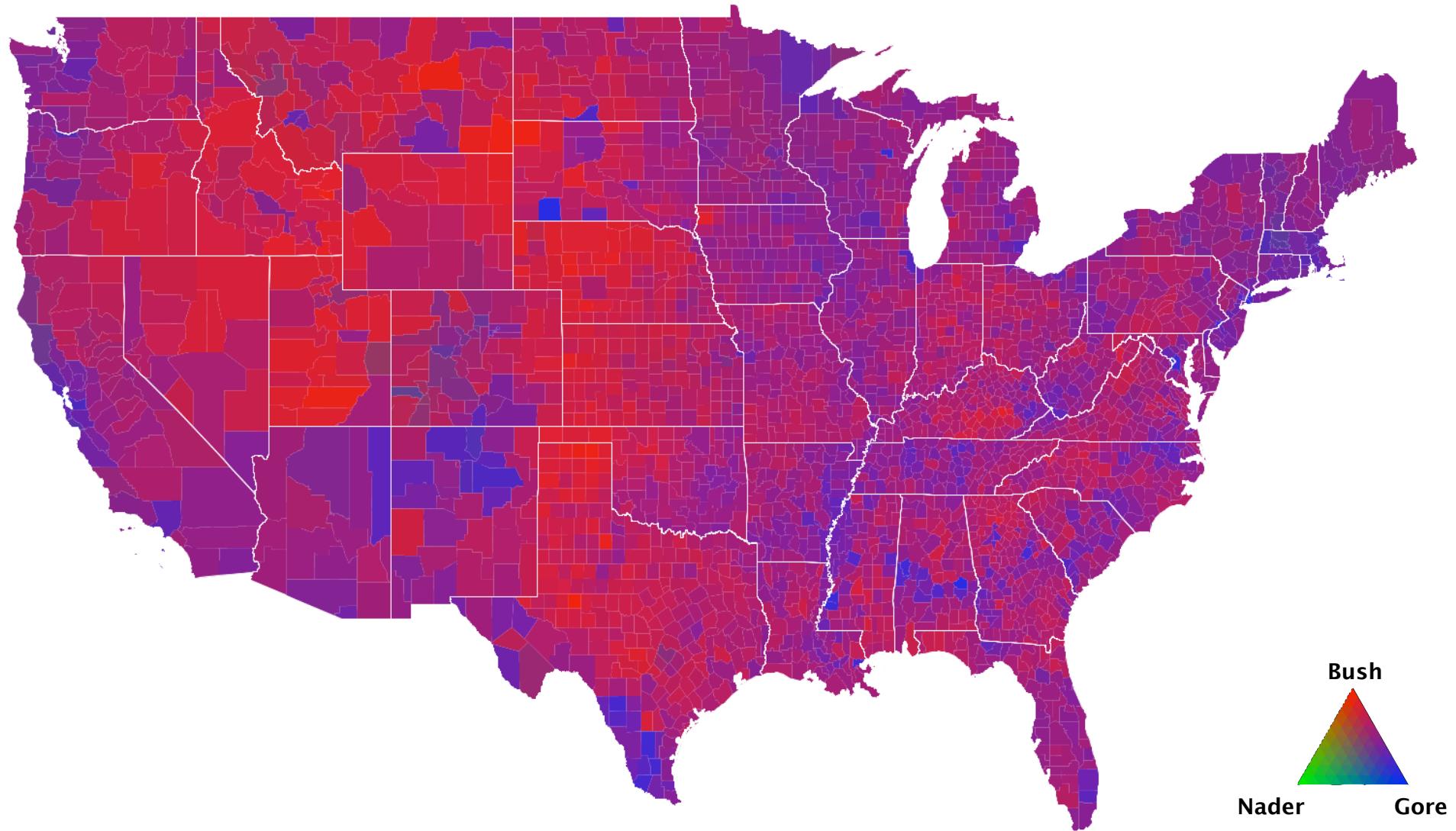
# Purple America: 2004 Presidential Election

---



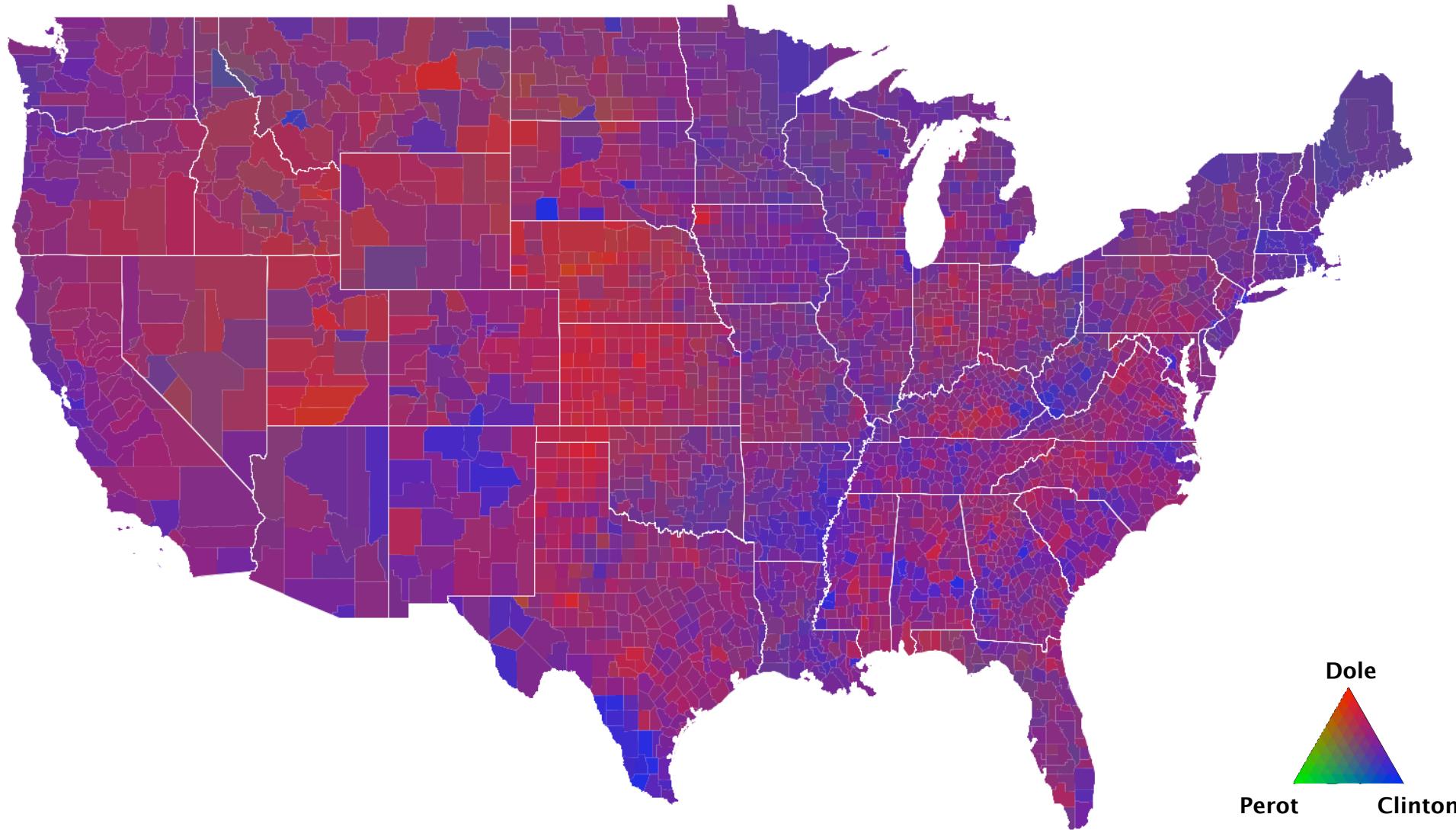
# Purple America: 2000 Presidential Election

---



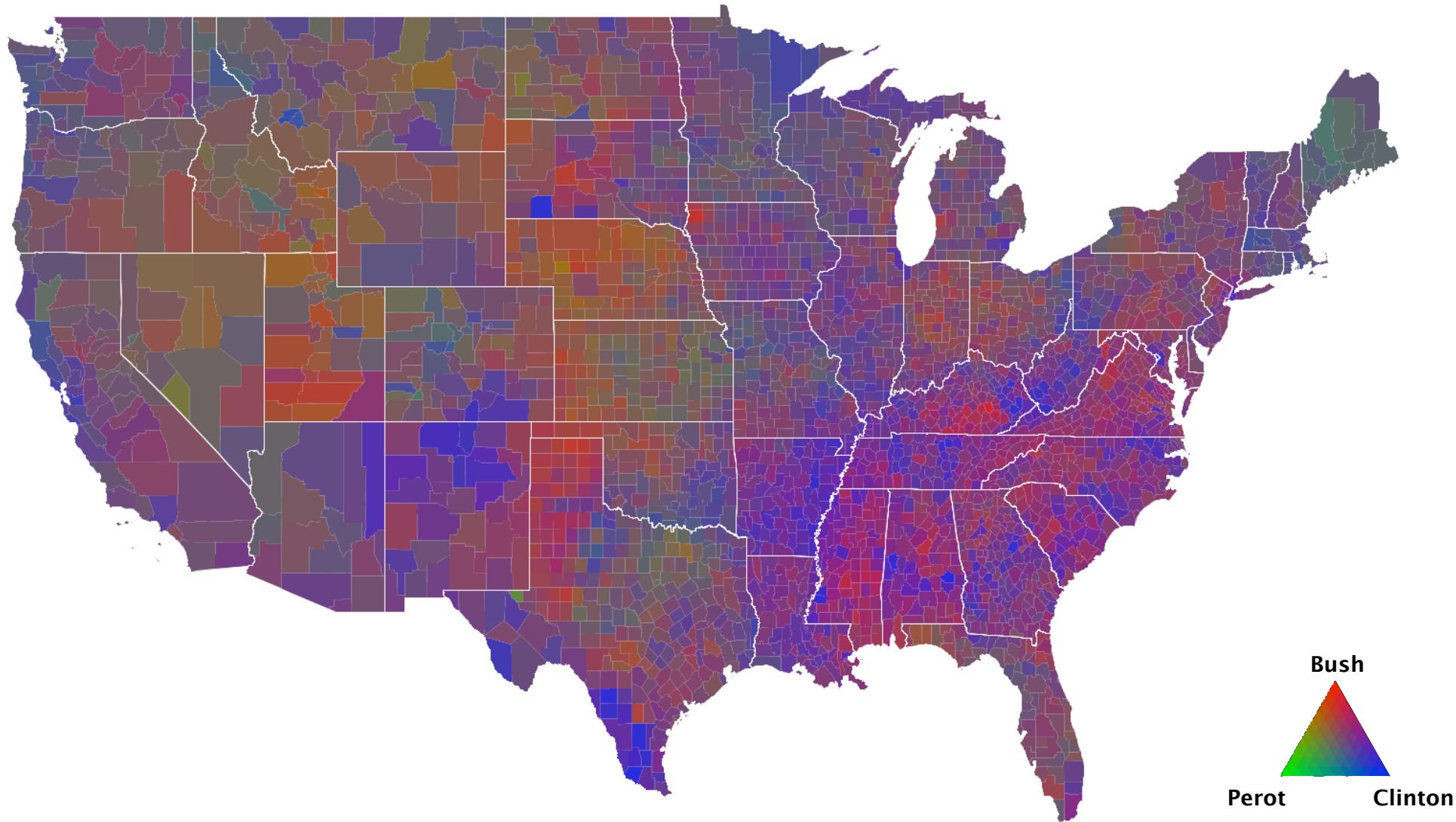
# Purple America: 1996 Presidential Election

---



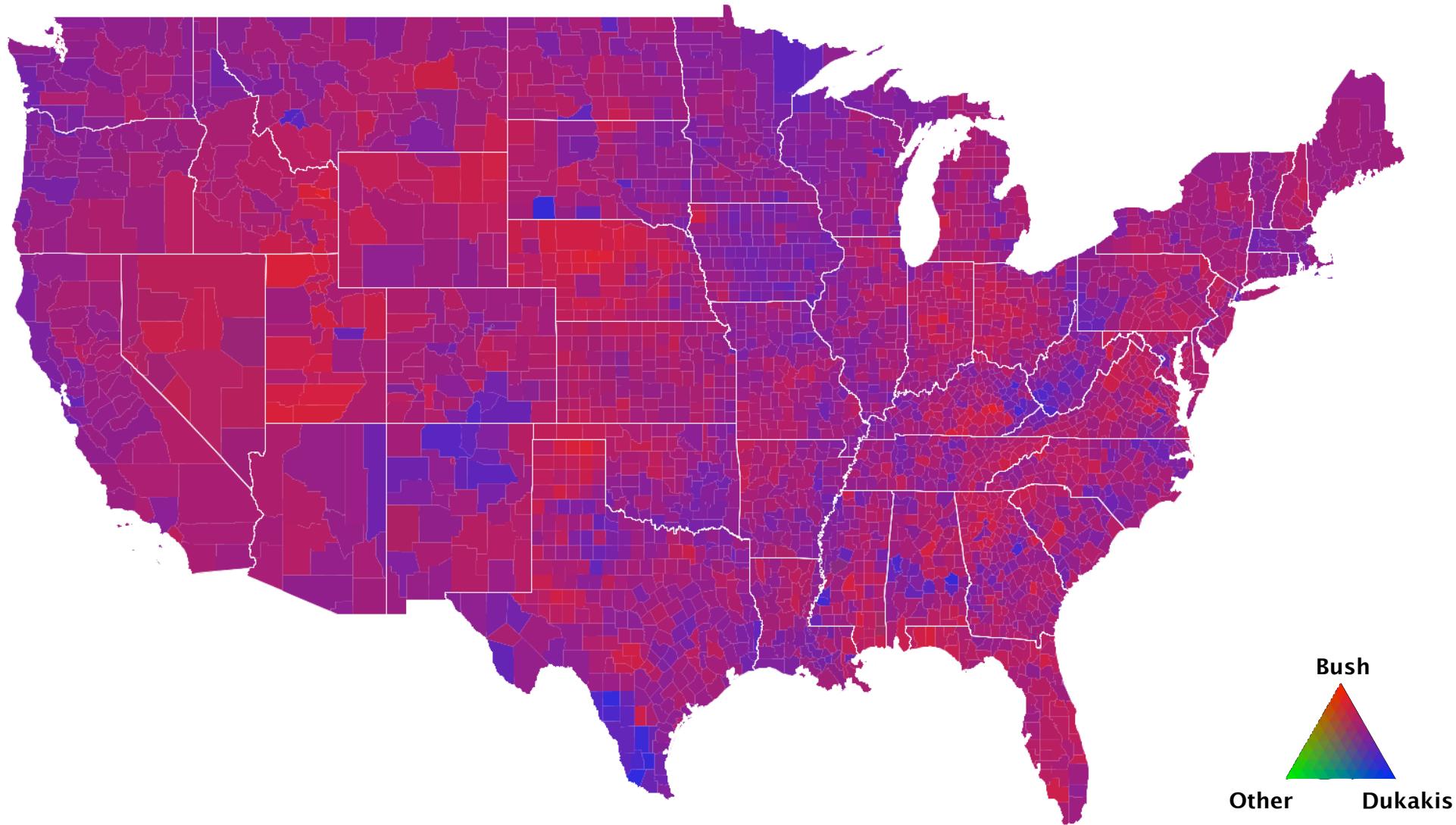
# Purple America: 1992 Presidential Election

---



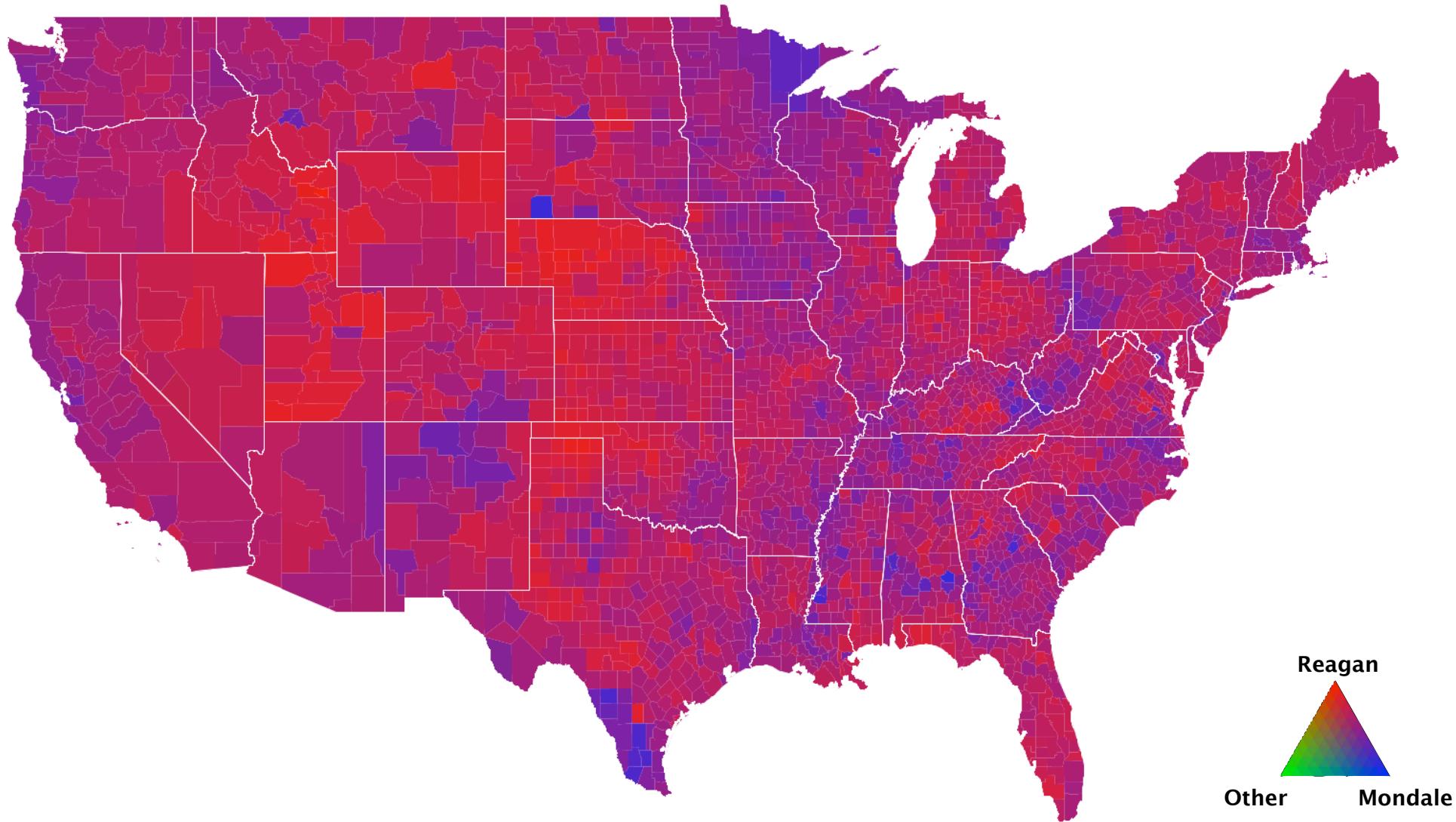
# Purple America: 1988 Presidential Election

---

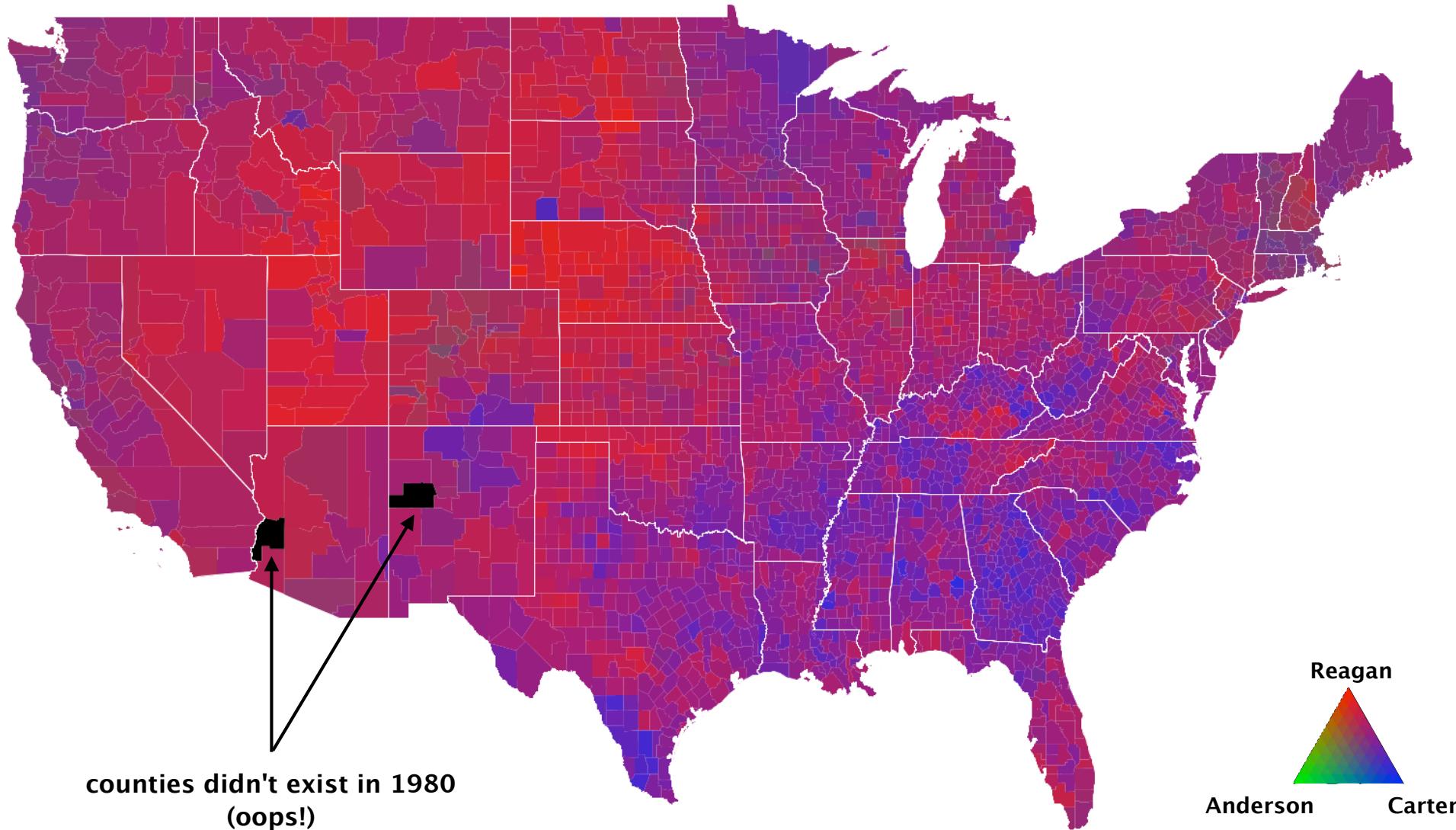


# Purple America: 1984 Presidential Election

---

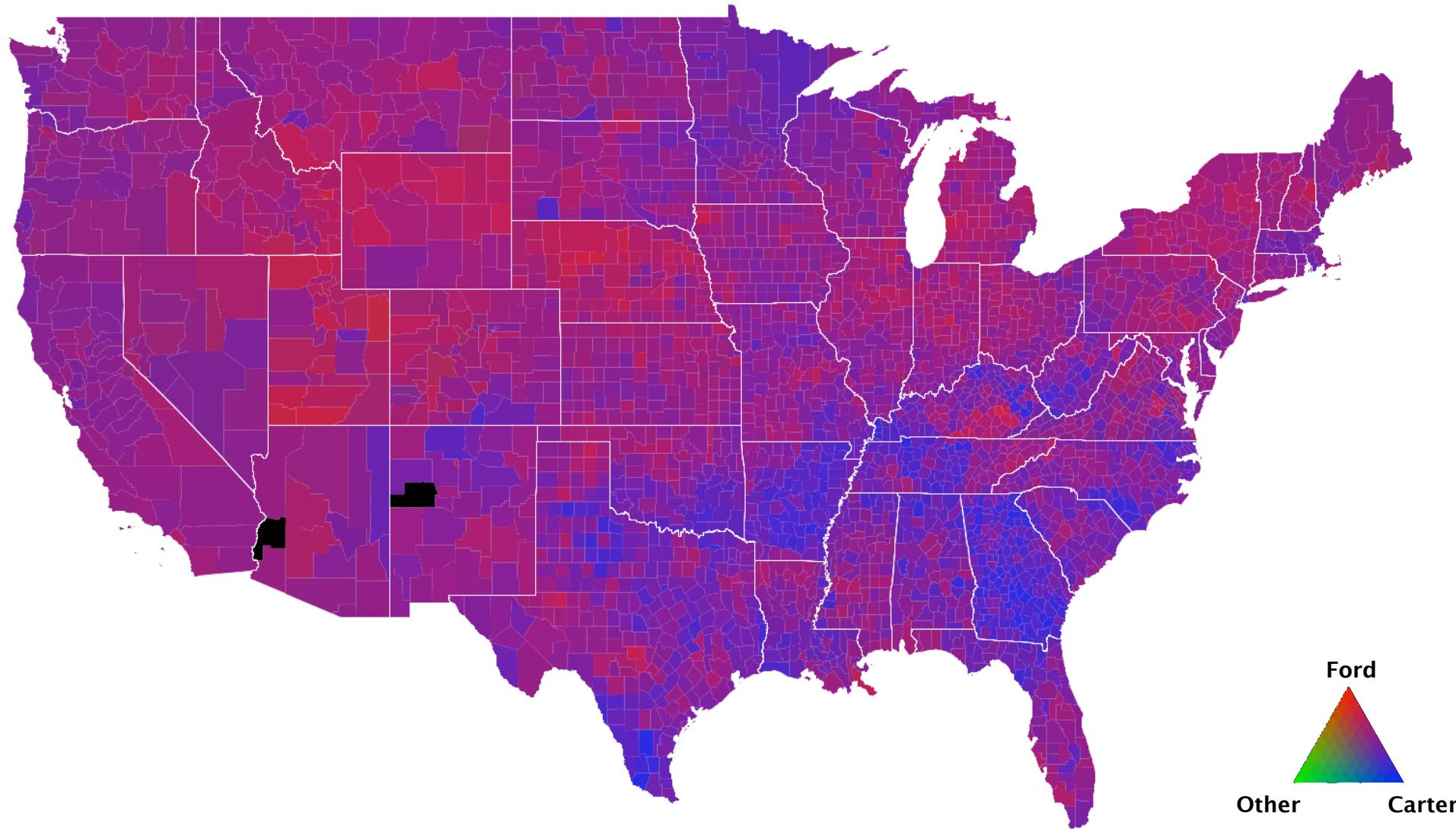


# Purple America: 1980 Presidential Election



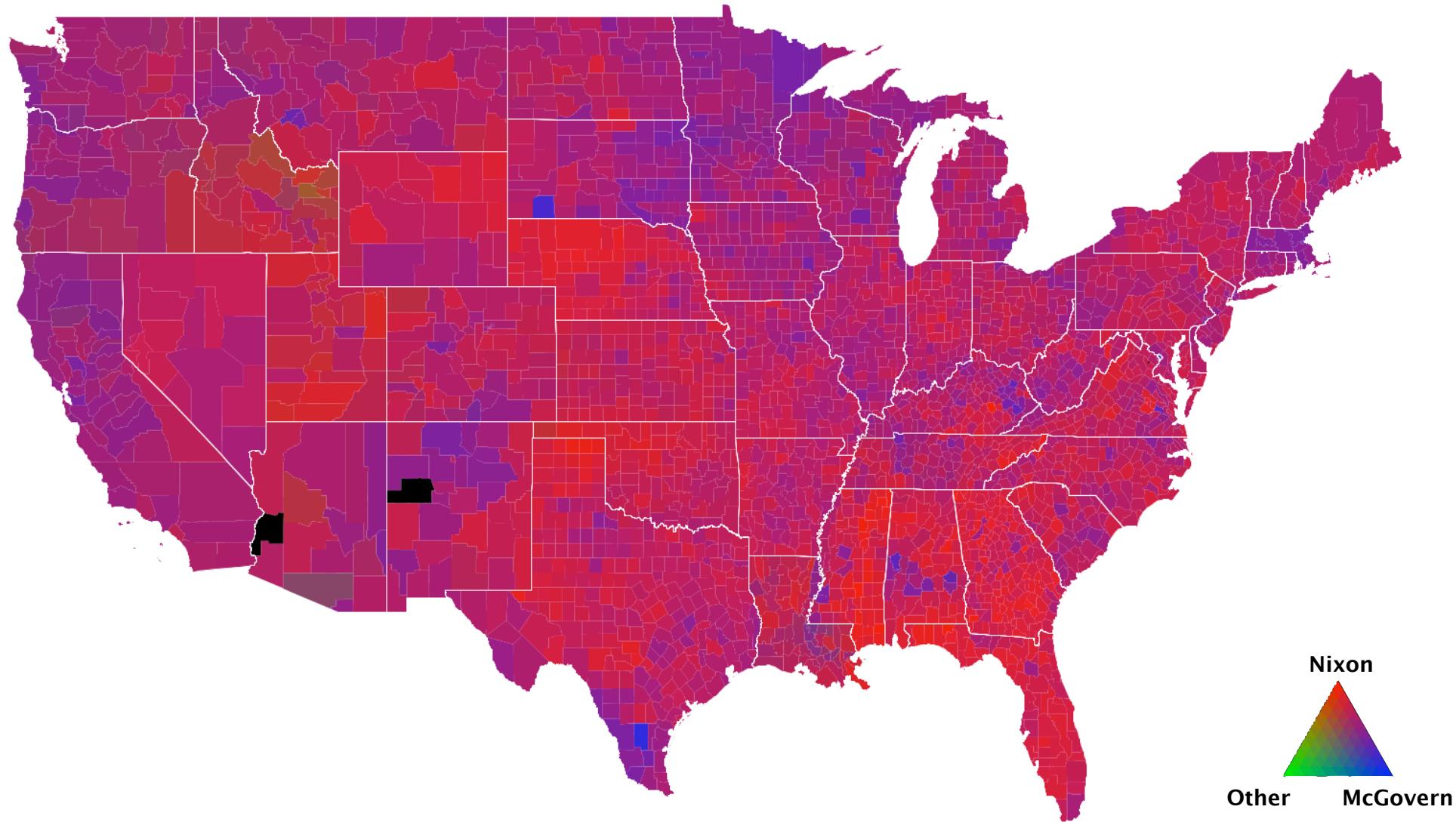
# Purple America: 1976 Presidential Election

---



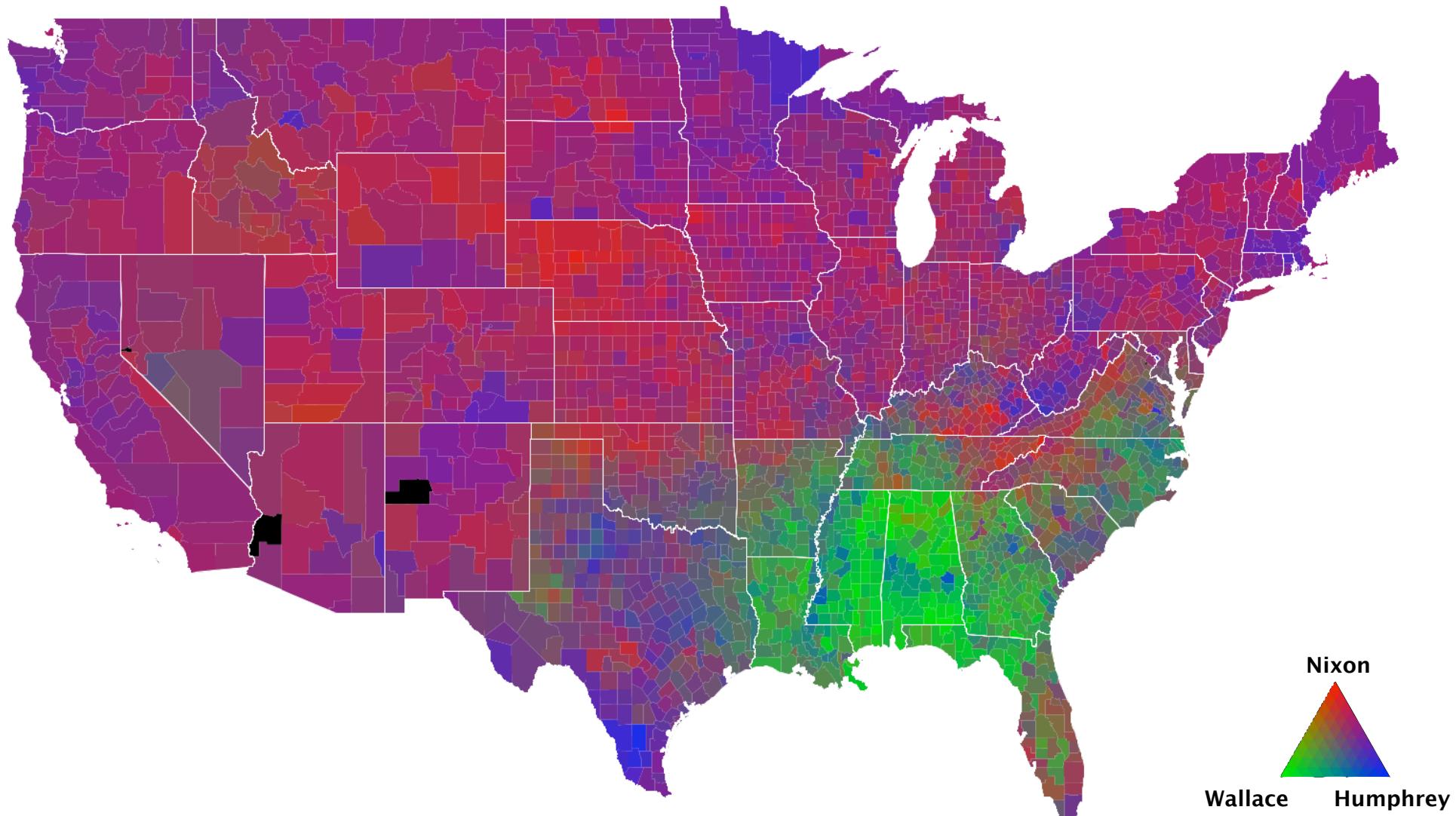
# Purple America: 1972 Presidential Election

---



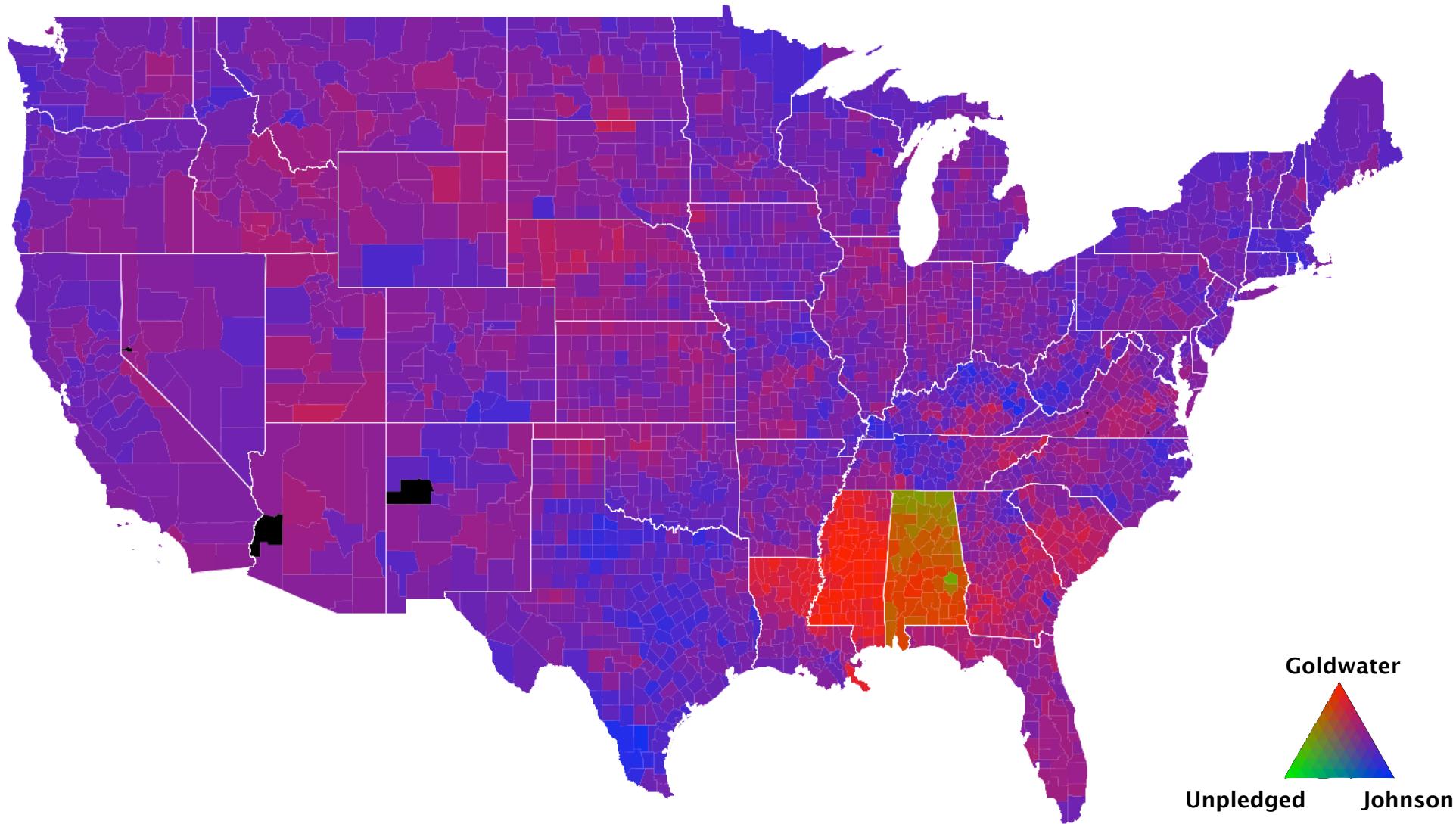
# Purple America: 1968 Presidential Election

---



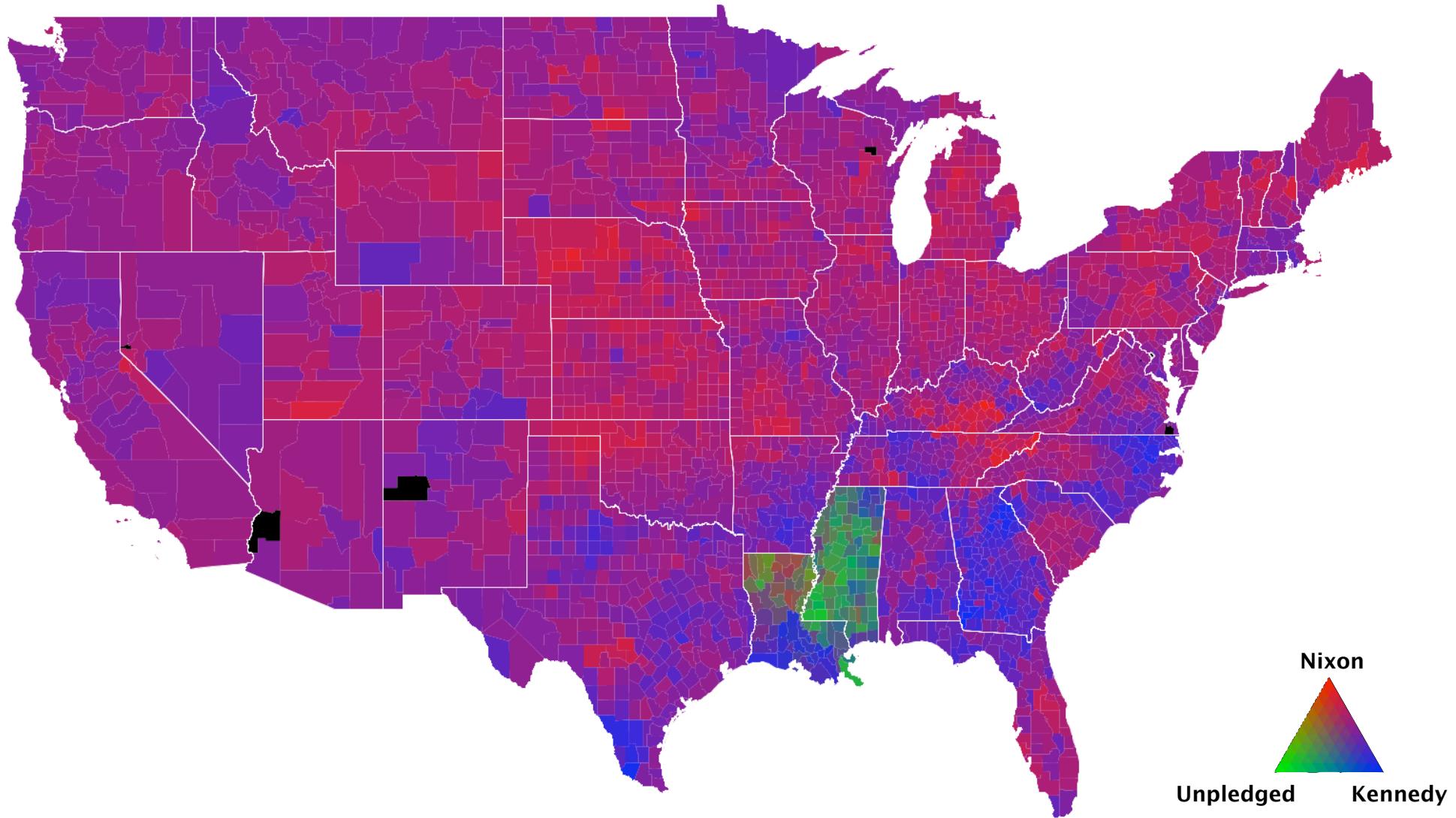
# Purple America: 1964 Presidential Election

---



# Purple America: 1960 Presidential Election

---

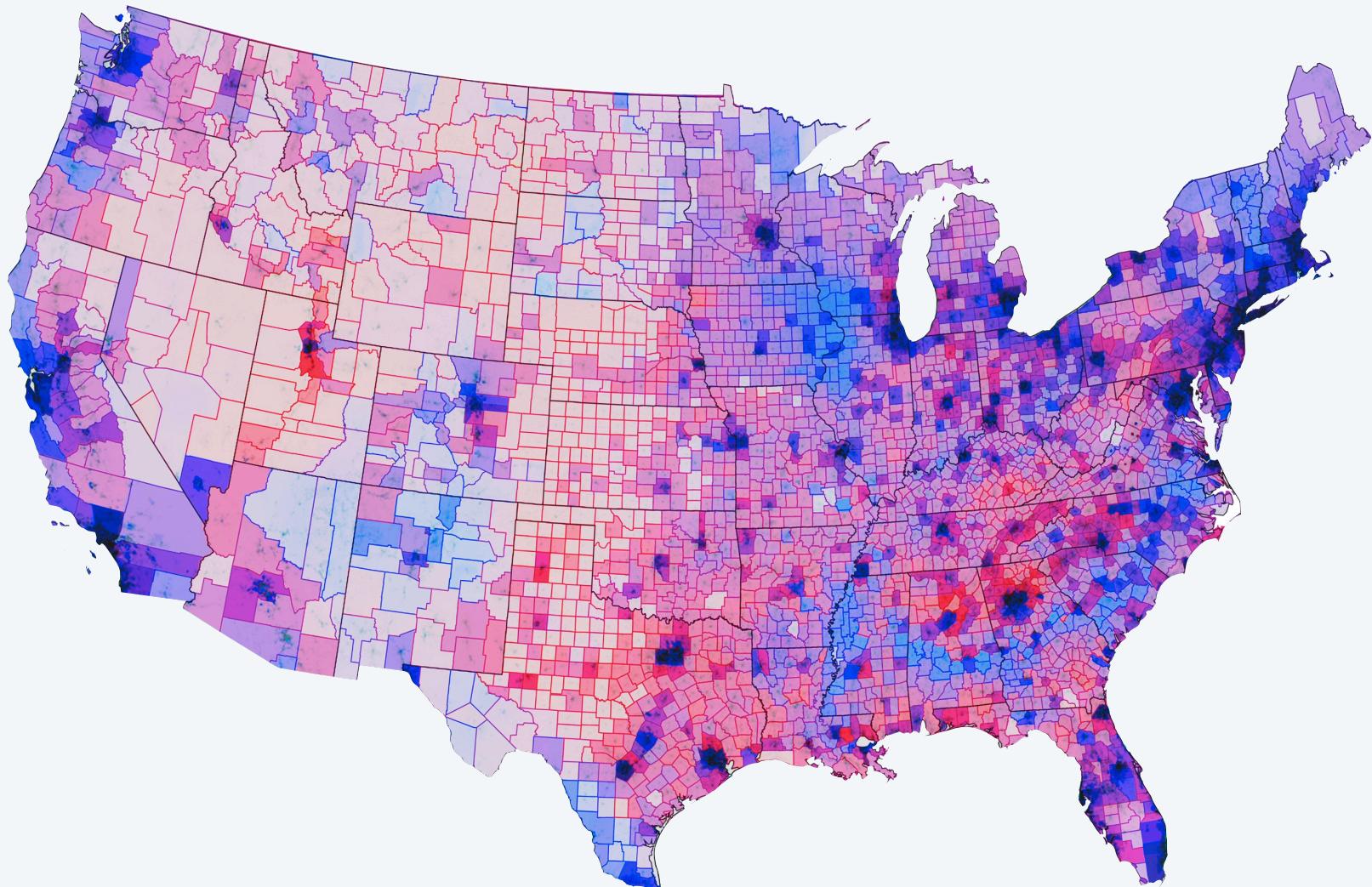


# Opportunities for creativity, enrichment, and inspiration

---

Colors. Explore different color palettes.

How? Lookup table.



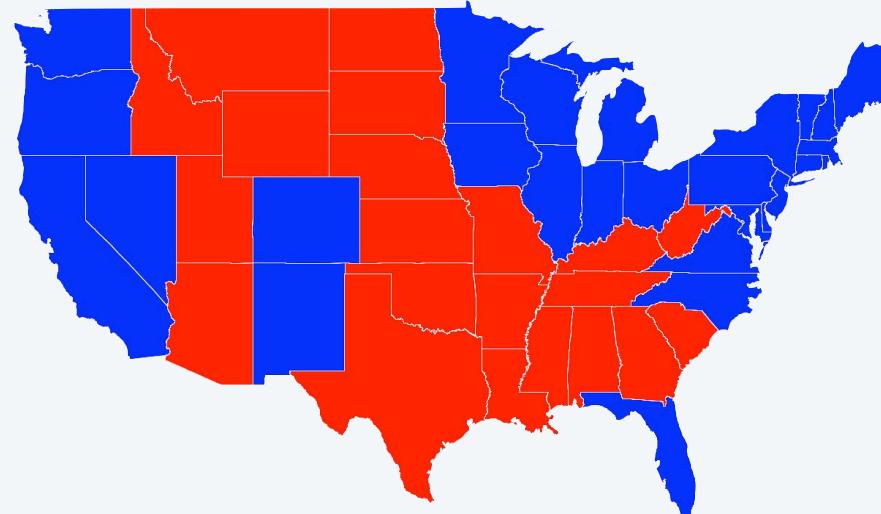
# Opportunities for creativity, enrichment, and inspiration

---

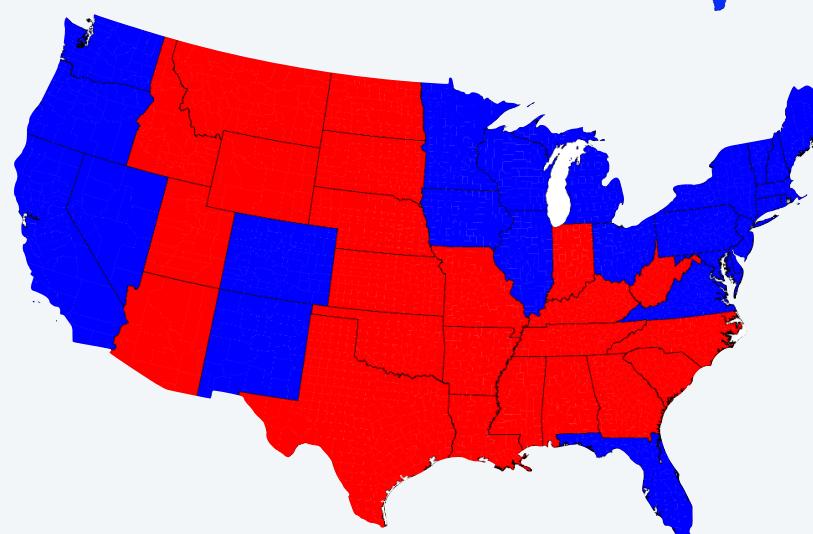
Map projections. Mercator, azimuthal, Albers, Gall-Peters, ...

How? Spherical geometry.

unprojected



Mercator projection

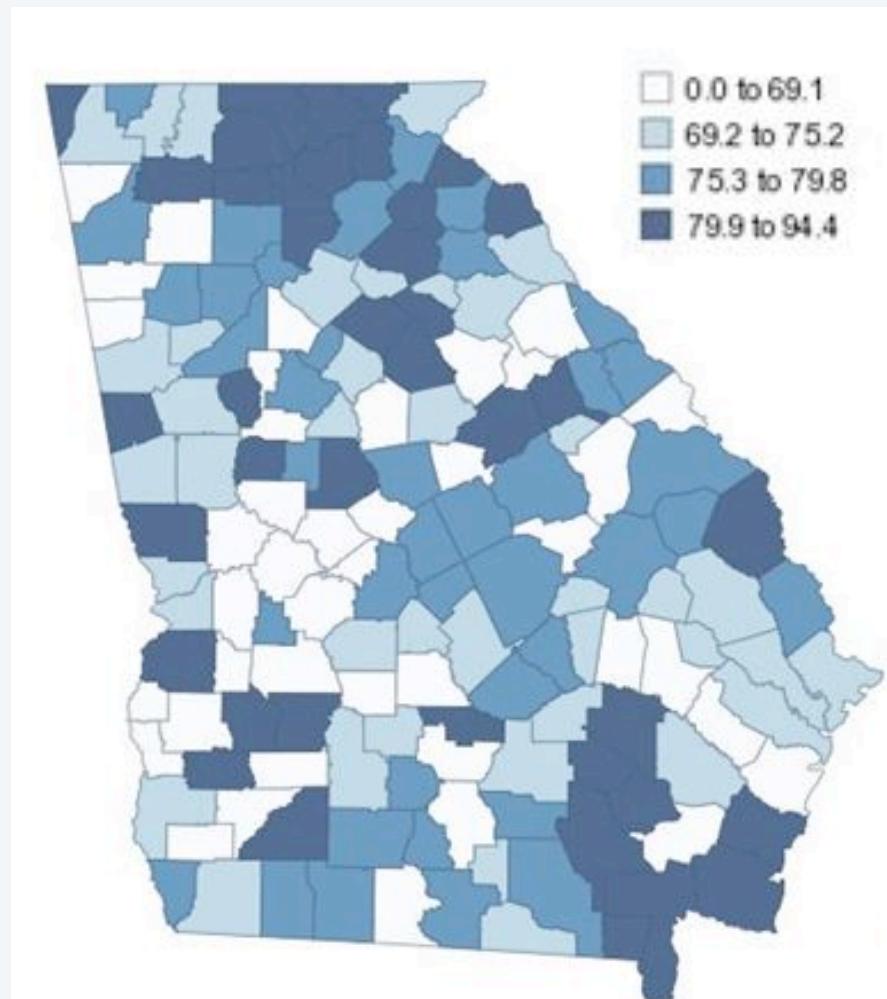


# Opportunities for creativity, enrichment, and inspiration

---

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](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.

