REDRAWING THE MAP ON REDISTRICTING

2012 ADDENDUM

REDISTRICTING THE NATION

azavea   cicero

Using geographical analysis to measure electoral district compactness following the 2010 U.S. Census

An Azavea White Paper

Azavea • 340 North 12th Street
Philadelphia, Pennsylvania • 19107

(215) 925-2600
www.azavea.com

INTRODUCTION

In 2006, Azavea released its first white paper related to redistricting and gerrymandering in the United States. In anticipation of the Census release and subsequent redistricting, we released a completely revised white paper in September 2010 as well as an Addendum that focused on the Philadelphia region. With the Congressional redistricting now complete we thought it might be useful to deliver another revision that would examine how the most recent round of redistricting has affected the geometry and geography of legislative districts in the United States.

Similar to previous versions of Azavea's redistricting work, this document is based on the districts we assemble through maintenance and expansion of the database that drives our Cicero product, a web API that supports data queries and mapping related to legislative districts in several countries.

This second addendum to our 2010 white paper is not a standalone document. It is a much shorter document focused on what has changed since 2010, and we are not providing much of the background documentation that is in the full white paper
(http://www.azavea.com/redistricting-white-papers).

BACKGROUND

According to the U.S. Census, the population of the United States grew by 9.7% to 308.7 million in 2010. As it does every ten years, this resulted in a reapportionment of all 435 seats in the House of Representatives based on new population numbers for each state. Eighteen states lost or gained seats. Texas gained the most, with four more seats, while Florida gained two more seats. Six other states gained one seat. The biggest losers were New York and Ohio, which lost two seats each. Other states that lost seats include Illinois, Iowa, Louisiana, Massachusetts, Michigan, Missouri, Pennsylvania and New Jersey.

Once the population figures are released and states' seats reapportioned, the Census Bureau makes available detailed demographic data to each state's legislature. This demographic data contains information on race and voting age population aggregated to the Census block level. The data that is released is aimed primarily at supporting the redistricting and reapportionment process and is delivered in stages beginning in January 2011 with all states delivered on or before April 1, 2011. This full count of the population—known as Summary File 1—enables each state as well as many local legislatures to begin the process of redrawing the congressional and legislative districts. Prior to 1962, many states had vastly unequal districts. The landmark Supreme Court decision of Baker v. Carr (1962) was the first step of the Supreme Court's role in redistricting. The Court's decision demands that congressional districts be "as equal as possible" in population while state legislative districts may have up to a 10% deviation if just cause exists. In addition, federal courts also enforce Section 2 of the Voting Rights Act to protect the voting rights of minorities. To comply with the Voting Rights Act, states must draw districts that ensure minority representation if enough minority population is concentrated in an area. This is done through a "majority-minority" district, in which racial or ethnic minorities constitute a majority (50% plus 1 or more) of the population. Alternatively, if enough minority population exists but not enough to make a majority of the population, an "opportunity" district may be created. An opportunity district contains enough population to provide minority voters with an equal opportunity to elect a candidate of their choice. In addition to complying with Section 2 of the Voting Rights Act, some states must also receive pre-clearance from the U.S. Department of Justice. To obtain pre-clearance, the state must demonstrate their redistricting plan does not discriminate against racial or ethnic minorities. States and counties that must receive approval from the D.O.J. are mostly in the South and have a history of discriminatory voting practices.

Despite these federal requirements on congressional districts, there is no legal standard for compactness. In fact, some districts that have a low measure of compactness can be justified on the grounds of the Voting Rights Act. Therefore, we do not offer any definitive judgment of what is considered "gerrymandering". Rather the purpose of both this document and its previous iterations is to inform the public of the quantitative methods commonly used to determine district compactness and their results.

METHODS

The nature of the spatial data received from various state redistricting authorities required a way to provide a fair comparison to current districts. One issue that we have faced in all of our previous studies continues. When assembling the new district boundaries, we found both detailed and "generalized" versions of new congressional districts developed by states. Maryland, for example, produced a "generalized" version of districts that was not clipped to the Chesapeake Bay shoreline and therefore did not have all of the fractal details of the Chesapeake edge. In contrast, Wisconsin's boundary data was neatly trimmed around Lake Michigan, resulting in a very fine-grained boundary. In order to resolve these differences in the treatment of shorelines, we elected to use a generalized shoreline of the United States for use in both the 2000 and 2010 districts prior to beginning the analysis in order

to support a more even-handed comparison between the two sets of districts[1].

As noted in the 2010 white paper, the Polsby-Popper and Schwartzberg ratios place high importance on district perimeter. Thus, they are highly susceptible to bias due to shoreline complexity. Therefore, districts that are trimmed around shorelines may end up with a low compactness score through no fault of the district's authors and may not necessarily be a true indicator of gerrymandering. This is precisely why it's important to use multiple compactness scores (in this case the Polsby-Popper, Schwartzberg, Reock and Convex Hull measures) and let the reader judge which one is a better fit based on the geography of the district and method of calculation each score uses. A higher score means more compact, but the scores using different measures cannot be directly compared to each other.

For consistency purposes, measures for this study have been calculated using the same formulas used in our previous study in 2010, though with a slightly different workflow for Schwartzberg[2]. Also, z-scores were calculated for each compactness measure and averaged for each district and state. In addition, it is important to note that we used an n = 428 as at-large congressional districts (states with a single district) were excluded. Finally, like in our previous white paper, all compactness scores were multiplied by 100.

THE LEAST COMPACT CONGRESSIONAL DISTRICTS

The following table outlines the least compact districts based on the four compactness metrics we selected.

Table 1: Top 10 least compact districts

District	Polsby-Popper	Schwartzberg	Convex Hull	Reock
NC-12	2	2	1	2
FL-5	4	4	2	3
MD-3	1	1	3	27
OH-9	14	14	4	1
TX-35	12	12	5	5
NC-4	10	10	6	13
LA-2	11	11	7	28
FL-22	23	23	18	6
MD6	31	31	8	9
NY-10	42	42	16	4

DISTRICT STORIES

The top offender on our revised 2010 list of least compact districts is North Carolina's 12th District. At 120 miles long but only 20 miles wide at its widest part, the district has the lowest z-score of any district in our analysis. It includes chunks of Charlotte and Greensboro connected by a thin strip - on average only a few miles wide - meandering along Interstate 85 between the two cities (traveling on 85 between Charlotte and Greensboro would take you in and out of the district 4 times). An appendage extends northwest from just south of Greensboro, offering Winston-Salem part of the district. The 12th district was created after the 1990 census and meant to be a majority-minority district. However, in the Supreme Court case Shaw v. Reno, 517 U.S. 899 (1995) the district was found unconstitutional as a racial gerrymander. After the state redrew the district slightly, it was justified as political gerrymandering and thus legal[3]. Using 2010 census data, this district is still a majority-minority district, with 51% of the population African-American[4]. Despite the 12th district, the U.S. Department of Justice gave preclearance to North Carolina's congressional redistricting plan in 2011[5].
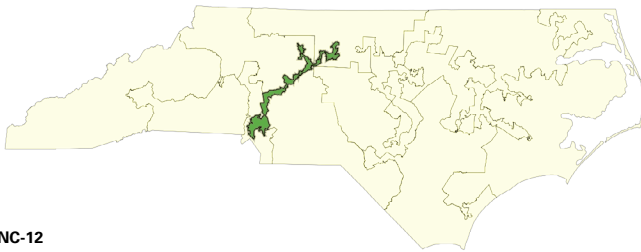

NC-12

Florida's new 5th District is the second least compact of all congressional districts, containing pieces of Jacksonville and Orlando, without keeping either city intact. Similar to NC-12, this district connects two majority African-American neighborhoods with a thin strip stretching across the state, occasionally stopping to pick up more minority voters in Gainesville and Palatka. The district appears to be constructed out of the remnants of FL-3, currently represented by Connie Mack, yet it is narrower and less compact. This is also a majority-minority district, with an African-American population of 52%[6]. While Florida's redistricting plan has been pre-cleared by the U.S. Depart-

ment of Justice, there is currently a complaint in state court filed against the plan. The complaint argues Florida's redistricting plan violates state constitutional requirements regarding partisan and racial gerrymandering. The case specifically refers to the 5th congressional district as an example of racial packing[7]. Moreover, the case cites the districts' lack of compactness.

MD-3
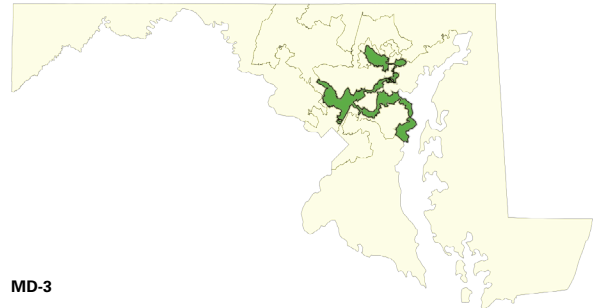
Another offender on our list of least compact districts is Maryland's 3rd District. The district, which straddles the western shore of the Chesapeake Bay and includes Annapolis, then, diverts inland to include northern Washington, DC suburbs such as Olney and Sandy Springs, before reversing course all the way to the City of Baltimore. The district includes a chunk of East Baltimore, before narrowing to less than 600 feet across as it snakes through a small neighborhood near Clifton Park in Baltimore. The northern part of the district contains two lopsided chunks in the northeastern and northwestern suburbs of Baltimore connected by a thin strip barely a half-mile wide. There is no doubt that part of the district is affected by the shoreline of the Chesapeake Bay, however there is seemingly no other reason for the district to snake through various communities in three different metropolitan areas the way it does[8].

FL-5
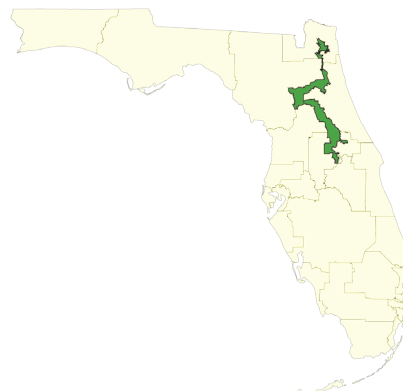
If you have never seen a Lake Erie water snake, look no further than Ohio's 9th District. At 100 miles long but never more than several miles wide, this elongated district stretches across Ohio's northern border with Lake Erie from west of Toledo to Cleveland. At one point, it is only as wide as a beach. The district resulted from a combination of the former 9th and 10th district, represented by Marcy Kaptur and Dennis Kucinich, respectively. Democrats charge that Republicans in control of the state's redistricting process deliberately drew both incumbents into the same narrow district to result in a member versus member primary, which Kucinich eventually lost.
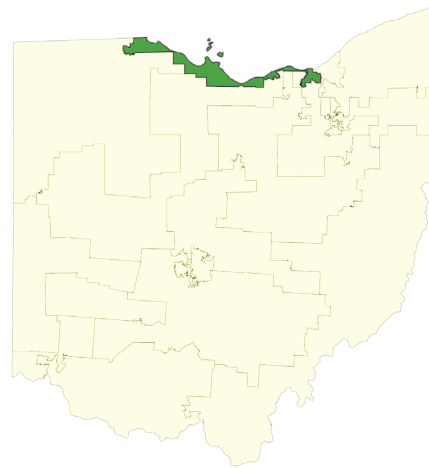
OH-9

Due to very strong population growth, Texas gained four U.S. House seats. One of those new seats now makes our list as the fifth least compact in the nation. Texas' 35th District contains portions of Austin and San Antonio, connected by a thin strip along Interstate 35 through the south central part of the state. Texas had one of the most complicated redistricting stories in the country. When the state failed to get pre-clearance for its new congressional map, a federal court redrew the districts in a way considered much more favorable to the Democrats than the GOP-led legislature preferred. After a successful appeal to the Supreme Court, the lower court had to redraw the congressional districts with more deference to what the legislature preferred. Thus the 35th district was created out of pieces of six other districts, picking up Democratic voters in both Austin and San Antonio, while not making up a majority of voters in either city. This district is the third majority-minority district in the top 5, with a 58% Hispanic voting age population[9].
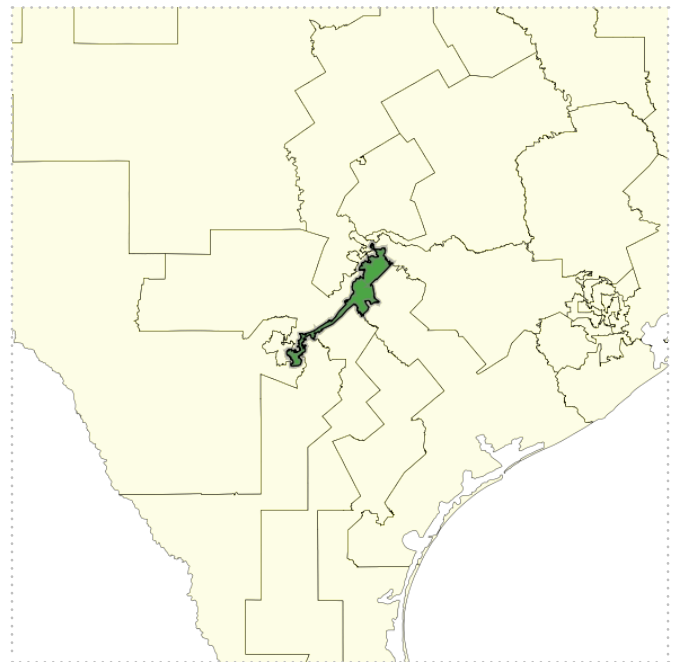
TX-35

Table 2: Top 10 least compact districts by compactness score

Polsby-Popper	Schwartzberg	Convex Hull	Reock
MD-3	MD-3	NC-12	OH-9
NC-12	NC-12	FL-5	NC-12
NC-3	NC-3	MD-3	FL-5
FL-5	FL-5	OH-9	NY-10
NC-1	NC-1	TX-35	TX-35
PA-7	PA-7	NC-4	FL-22
WA-2	WA-2	LA-2	TX-34
TX-33	TX-33	MD-6	TX-15
MD-2	MD-2	MI-14	MD-6
NC-4	NC-4	CA-33	PA-1

Table 3: Summary statistics for compactness scores

	Polsby-Popper	Schwartzberg	Convex Hull	Reock
Mean	22.81	46.12	69.59	37.29
Standard Deviation	11.77	12.43	12.36	11.27
Minimum	(MD-3) 02.68	(MD-3) 16.38	(NC-12) 24.99	(OH-9) 06.87
Maximum	(NV-2) 58.97	(NV-2) 76.79	(TX-16) 94.25	(FL-17) 67.96

TOP 10 STATES

In addition to measuring the compactness of individual congressional districts, we also measured average compactness scores for all congressional districts in a given state. Similar to our previous paper, we compiled a top 10 list by converting each compactness measure into a z-score than averaging the state's z-scores across the four measures.

Five states are in the Top 10 least compact states for each compactness score; Maryland, North Carolina, Louisiana, West Virginia and Illinois. Of all states in the Top 10, Maryland stands out as having the least compact districts by every measure, except for Reock. Many of the states in the top 10 have notable geography issues which may create lower compactness scores, such as Hawaii and Rhode Island. However, states where geography can not necessarily be demonstrably explained as resulting in such low compactness scores include Illinois and Pennsylvania.

  Even considering their shorelines, Maryland and North Carolina also seem to indicate the potential for gerrymandering. Louisiana, West Virginia, Virginia and New Hampshire also have geographical issues which may be reducing their compactness score but other factors may be at play here. Table 5 is a list of all states with their average compactness score for all measures ranked by the state's calculated z-score.

Table 4: Top 10 states whose districts have the lowest average compactness

	Polsby-Popper	Shwartzberg	Convex Hull	Reock
MD	1	1	1	2
NC	4	4	4	5
LA	3	3	3	7
WV	5	5	2	8
VA	7	7	13	4
HI	2	2	25	18
NH	8	8	12	1
IL	9	9	5	6
PA	10	10	6	11
RI	18	18	10	3

Table 5: Average compactness scores for all states with more than one congressional district

	Mean Score, Polsby-Popper	Mean Score, Schwartzberg	Mean Score, Convex Hull	Mean Score, Reock	# of Districts
MD	08.08	27.67	49.63	24.68	8
NC	11.51	32.17	59.62	29.46	13
LA	11.10	32.14	59.53	32.14	6
WV	13.65	36.66	54.76	32.29	3
VA	14.42	37.28	67.58	27.89	11
HI	08.56	29.10	67.58	36.85	2
NH	16.45	40.53	67.53	23.81	2
IL	16.64	39.91	61.03	31.07	18
PA	17.14	39.52	62.42	34.15	18
RI	20.14	42.35	62.42	26.38	2
OH	17.22	39.91	63.74	33.79	16
MA	18.45	41.74	63.19	35.85	9
ME	14.04	37.04	72.83	36.62	2
TX	19.17	42.09	67.35	36.12	36
NJ	18.96	42.92	63.71	38.92	12
AL	18.43	42.41	69.20	37.70	7
KY	19.21	42.81	68.82	37.16	6
WA	21.19	44.74	71.39	34.00	10
AR	19.89	43.98	68.49	38.87	4
SC	20.50	43.85	72.91	37.42	7
TN	20.48	44.68	70.48	40.20	9
FL	24.61	48.18	69.24	36.93	27
OK	24.98	49.91	68.58	36.00	5
MI	26.03	49.38	69.73	35.10	14
CA	22.58	46.86	72.64	38.47	53
CO	24.60	48.00	69.77	39.12	7
UT	27.65	52.28	69.17	34.18	4
MS	23.33	47.58	76.84	38.08	4
WI	21.85	47.58	75.64	44.43	8
ID	25.01	49.51	77.41	37.69	2
CT	26.61	50.94	71.85	42.19	5
GA	25.83	50.46	75.50	44.07	14
MO	27.08	51.49	75.25	44.60	8
NY	31.81	55.24	73.53	40.35	27
OR	31.15	56.06	75.28	42.43	5
AZ	30.05	53.30	74.82	45.21	9
MN	33.03	56.85	76.80	40.88	8
NM	35.17	59.07	78.36	44.36	3
IA	39.97	62.92	78.02	44.13	4
KS	40.52	62.92	83.05	41.10	4
IN	41.03	63.59	81.73	44.07	9
NE	39.27	62.54	83.73	46.54	3
NV	52.44	72.22	89.20	48.12	4

COMPACTNESS BY REDISTRICTING AUTHORITY AND PARTY CONTROL

Moving beyond the work in the 2010 white paper, we performed an additional analysis focusing on the conditions under which redistricting processes occurred, including types of redistricting authority and the party controlling the process.

Redistricting by Type of Authority

For the purpose of this analysis, we will define two types of legislative and two types of non-partisan redistricting authorities. Since all Congressional districts have now been redrawn, we now know which type of authority was actually responsible for drawing a state's congressional districts. We evaluated the type of authority that ultimately drew the districts, rather than the type of authority that was *intended* to draw the lines. So, for example, the category for court-drawn districts is a result of the final outcome of redistricting, not who is *supposed* to redraw the state's districts. Types of redistricting authorities are found in Table 6.
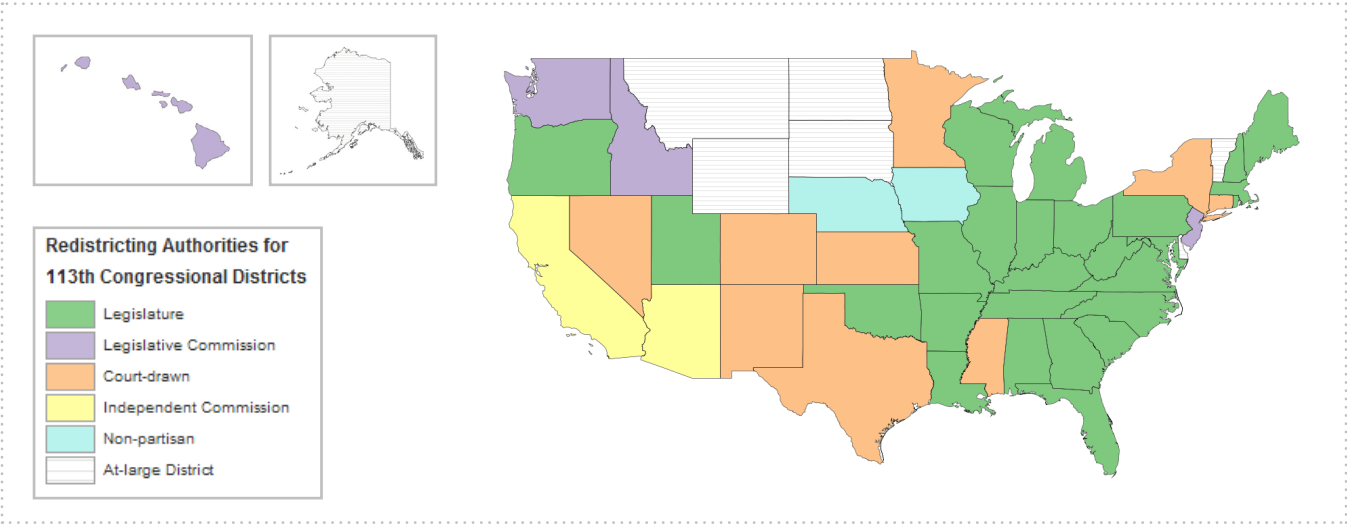

Redistricting Authorities for 113th Congressional Districts
- Legislature
- Legislative Commission
- Court-drawn
- Independent Commission
- Non-partisan
- At-large District

Table 6: Average compactness by redistricting authority

Type of Authority	Description
Legislature	Districts redrawn by an act of the state legislature
Legislative Commission	A state legislature appoints a commission to redraw the congressional districts. The commission is often made up of appointees by the majority and minority parties in the state legislature, and sometimes another by other state executives
Independent Commission or Non-partisan	An independent commission made up of citizens redraws districts or non-partisan state agency is responsible
Court-drawn	As a result of litigation, legislative gridlock or inaction, congressional districts were drawn up or enacted by a Court

Compiling districts by redistricting authority (Table 7), we find that the most compact districts are a result of a court action or independent commissions. For Polsby-Popper, Court-enacted districts have a score of 0.2744; these districts were even more compact than those drawn by independent or non-partisan processes. The same holds true for the Schwartzberg measure. For Convex Hull and Reock, independent commissions and non-partisan processes produced districts more compact than those enacted by a Court. Furthermore, those independent commissions and non-partisan processes also produced districts that were more compact than the national average. It is perhaps most notable that districts produced by legislatures or legislative commissions produced districts less compact than the national average by all measures.

Table 7: Average compactness by redistricting authority

Redistricting Authority	Polsby-Popper	Schwartzberg	Convex Hull	Reock	# of Districts	# of States
Legislature	20.54	43.64	**67.31**	**35.73**	235	26
Legislative Commission	**19.45**	**43.06**	68.37	36.77	26	4
Independent Commission or non-partisan	25.29	49.31	**73.72**	**40.03**	69	4
Court-enacted	**27.44**	**50.64**	72.48	39.22	98	9
Nationwide Mean	22.82	46.12	69.59	37.29	428	43

REDISTRICTING UNDER PARTISAN CONTROL

Conventional wisdom might suggest that Republicans had overwhelming control of redrawing the nation's congressional districts. After the 2010 midterm election the GOP controlled 25 state legislatures while the Democrats had control of only 16. In addition, many states where the GOP took control of the redistricting process were crucial swing states that contained many Republicans who won by a slim majority in 2010. However, a final analysis shows that the GOP only had total control over redrawing of 159 districts. We are not arguing that the GOP (or Democratic Party, for that matter) may have had other methods of influencing the process, simply that the structure of the redistricting process only enabled the GOP to completely control 159 districts. For example, one could claim that the Texas court-approved redistricting maps were in fact originally drawn by the GOP. Nevertheless, of districts where the process was controlled by one political party, the GOP did control the outcome of many more than the Democrats.
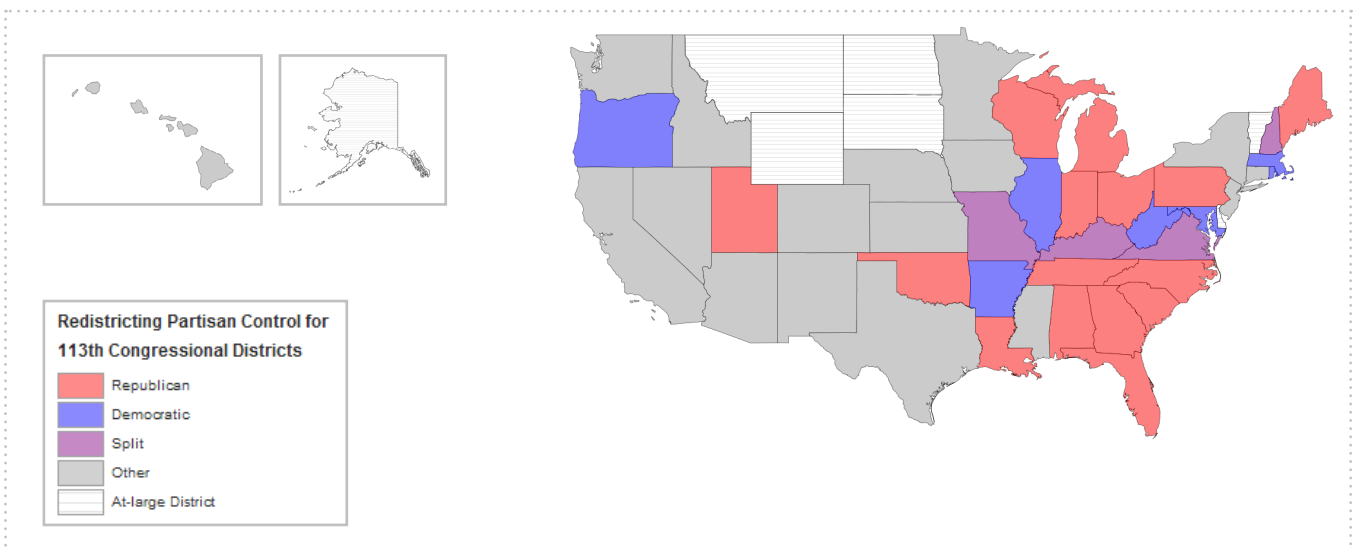
Excluding districts drawn by Independent Commissions, Legislative Commissions, Non-partisan processes or the Court system, we find that 235 districts remain, about 54% of the House of Representatives. Of those 235, more than half were controlled by the GOP and only 49 by the Democratic Party. Twenty-seven districts were drawn in states with either split control of the legislature (such as in the case of Kentucky) or a Governor of a different party than the legislature (New Hampshire).

Table 8: Average compactness by partisan control

Partisan Control	Polsby-Popper	Schwartzberg	Convex Hull	Reock	# of Districts	# of States
GOP	**21.73**	**44.88**	68.64	**36.90**	159	15
Democratic Party	17.28	39.98	**61.44**	**32.59**	49	7
Split	19.39	42.96	**70.12**	34.60	27	4
Total					235	26

The mean Polsby-Popper, Schwartzberg and Reock scores indicate that districts drawn with total GOP control have a higher compactness score than districts drawn with total Democratic control under those measures. States with split control fall in the middle. Nevertheless, districts with a political party in control remain less compact than the national average by every measure. In addition, districts where a party has control are significantly less compact than districts drawn by a non-partisan process (see Table 9). Using the convex hull measure shows a different story. Districts drawn by a split in control come out with a higher compactness score, with districts drawn by the GOP not far behind. Districts drawn by the Democratic Party are much less compact than either.

Redistricting Partisan Control for 113th Congressional Districts
Republican
Democratic
Split
Other
At-large District

Table 9: Average compactness by partisan or non-partisan control

Partisan Control	Polsby-Popper	Schwartzberg	Convex Hull	Reock	# of Districts	# of States
GOP or Democratic Party	20.71	43.72	66.94	35.88	208	22
Non-partisan (incl. court-drawn)[10]	26.55	50.09	72.99	39.56	167	13
Total					375	35

While districts drawn by Republicans in this decennial redistricting process may be somewhat more compact than those drawn by Democrats, it is also clear that both parties appeared to take advantage of their situation and draw districts more favorable to their party's election. For example, Democrats took advantage in Maryland and Illinois while Republicans took advantage in Ohio and Pennsylvania. Republicans just had many more states, which may have buffered their average.

COMPARISON TO 109TH CONGRESSIONAL DISTRICTS

As noted previously, we compiled average compactness scores across all four measures for each congressional district and also aggregated to an average of each state's congressional districts. The districts are also clipped to the same shoreline boundaries as those produced for the last Census. Consequently, we can now make useful comparisons between districts drawn up for the 109th Congress and districts drawn up for the 113th Congress.

In Table 10, one can see that average compactness scores increased, very slightly, overall for all congressional districts. Polsby-Popper noted a 4.8% increase in compactness. Compactness measured using the Schwartzberg ratio increased by 2.3% from the previously drawn districts.

Convex Hull increased by 1.5% and Reock scores increased by 4.9%. Our Gerrymandering Index white paper released in 2006 showed that compactness scores decreased in the 109th Congress compared to the 104th. However, the slight increase in the 113th Congress' scores is still lower than those of the 104th Congress.

**Table 10: Average compactness for all 2002 and 2012 districts**

	109th Congress	113th Congress
Polsby-Popper	21.77	22.82
Schwartzberg	45.07	46.12
Convex Hull	68.56	69.59
Reock	35.55	37.29

Since the national scores show little change, it might be most useful to look at the degree to which individual states' scores changed. Most notably, we find that Maryland continues to have the lowest compactness scores of any state. As a matter of fact, for every score calculated Table 11, the average compactness of Maryland's 113th Congressional districts declined from the districts drawn a decade ago.

Table 11: Average compactness for Maryland's 2002 and 2012 districts

|	109th Congress	113th Congress
Polsby-Popper	11.59	08.08
Schwartzberg	32.63	27.67
Convex Hull	60.13	49.63
Reock	27.00	24.68
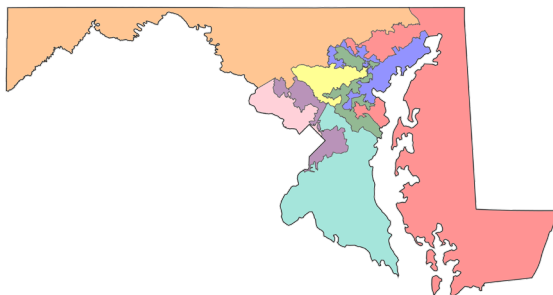
**2002 Maryland Districts**
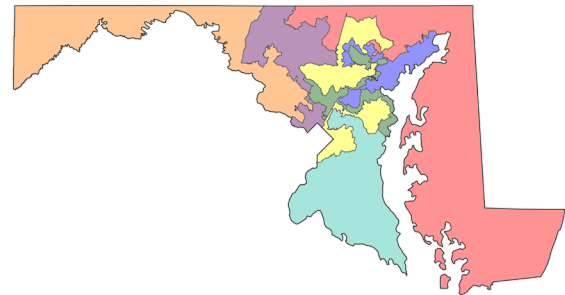
2012 Maryland Districts

On the opposite end of the spectrum, Florida's congressional districts are drastically more compact than previously. This is despite two of Florida's districts showing up in the top 10 least compact. What could be the reason for the overall improvement in Florida's districts? In 2010, voters approved the Florida Congressional District Boundaries Amendment. The amendment orders that all redistricting plans must be compact, as equal in population as feasible, and where feasible must make use of existing geographical boundaries[11]. This appears to have resulted in significantly more compact districts, even though they were drawn by legislators. While the state previously had six districts with a Polsby-Popper score of less than 0.1, the state now has just two with their new districts.

Table 12: Average compactness for Florida's 2002 and 2012 districts

|	109th Congress	113th Congress
Polsby-Popper	16.87	24.61
Schwartzberg	39.13	48.18
Convex Hull	61.50	69.24
Reock	28.56	36.93
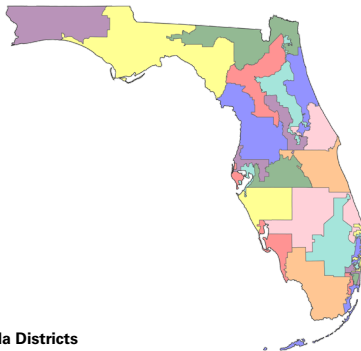
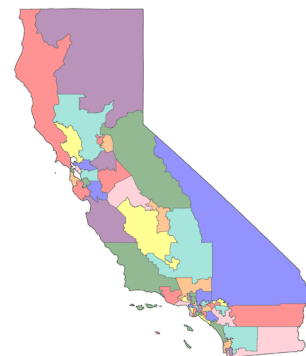**2002 Florida Districts**
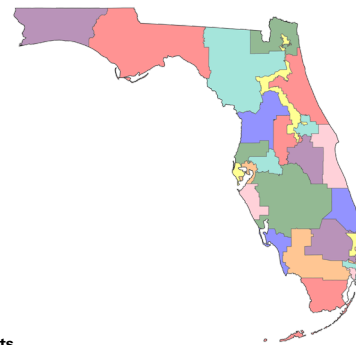
2012 Florida Districts

California was another state that significantly changed its redistricting process, implementing a Citizen Commission approach. This appears to have results in significantly more compact districts, as outlined in Table 13.

Other states that showed notable increases in compactness include New Jersey, and Tennessee, which fell out of our Top 10 least compact this year.

Table 13: Average compactness for California's 2002 and 2012 districts

	109th Congress	113th Congress
Polsby-Popper	18.47	22.58
Schwartzberg	42.01	46.86
Convex Hull	64.59	72.64
Reock	31.53	38.47
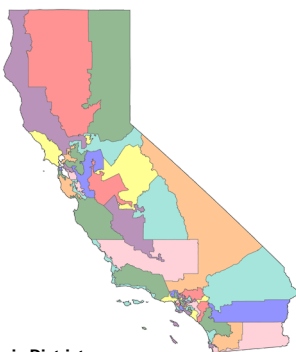
2002 California Districts

2012 California Districts

CONCLUSION

With any study of legislative district compactness, one must look at the score in context of several factors. One of those factors is the state's geography. For example, Washington State contains a rugged shoreline around the Puget Sound. This affects three of the states 10 districts and drags down the state's overall compactness score for the Polsby-Popper and Schwartzberg measures. West Virginia is a similar example. West Virginia's 2nd District contains most of the state's eastern panhandle, an appendage that seems to reduce some measures of compactness, despite being the state's legal border. The unique geographic features within a state can be an additional factor. This rings true in the case of Louisiana, with the Mississippi river winding through the state.

Additionally, one must consider other more subjective factors, such as the need for minority representation. The district outlines of LA-2, NC-12, FL-5 may at first appear to be meandering without reason, but in fact they are majority-minority districts meant to ensure that minorities have an equal opportunity to elect a representative of their choice. While ostensibly for a social justice purpose, this can also be seen as "packing", which is characterized by voters of a party are drawn out of surrounding districts and lumped together in the often awkwardly-shaped remnants. So where do we draw the proverbial line between a valid majority-minority district and packing of minorities into a single district? Ultimately, this is when lawsuits are filed to challenge the districts in court. As in previous white papers, we do not argue that compactness is the metric for identifying gerrymandering. Rather, it is a means of identifying potential gerrymandering and should always be considered in context of the district's geographical surroundings.

What we can say with some degree of certainty is that districts drawn by independent commissions are more compact, regardless of requirements under the Voting Rights Act (VRA). Maybe this means that even when majority-minority districts must be drawn, they need not be drawn in such a way that defies common sense. California is an example of a state that has a substantial minority population as well as the need for majority-minority districts. However, California ranks right in the middle (25th) of all states for average compactness. Arizona, another state with an independent commission and VRA requirements, ranks even higher for compactness (36th least compact). Iowa with its non-partisan process is ranked 39th, though the state has no need for majority-minority districts. Furthermore, Florida's dramatic increase in compactness shows us that higher quality districts can also be enforced through stricter requirements on the legislature for drawing districts in a fair, impartial manner. As we have noted in previous papers on this topic, the advent of GIS technologies have created an opportunity to improve the quality of our legislative districts as well as powerful tools to use for gerrymandering. We are encouraged by the increased number of independent commissions as well as more widespread requirements for public input. We hope to see these trends continue both the ongoing state and local redistricting processes as well as in future decennial censuses.

ENDNOTES

[1] Using Esri ArcGIS software, the "clip" tool trimmed the new districts shapefile at the shorelines of the current districts

[2] In our previous white paper, Schwartzberg scores were calculated on a more generalized shapefile in an attempt to remove bias that results from states with detailed coastlines. For this study, all scores were calculated on the same somewhat generalized coastline shapefile. Readers will notice that this results in the same ranking for Polsby-Popper and Schwartzberg, whereas our previous study had different rankings.

3 *Hunt vs. Cromartie*, 526 U.S. 541 (1999)

[4] 2011 North Carolina General Assembly. District Statistics Plan CST1A Rucho Lewis Congress 3 – District 12. http://www.ncga.state.nc.us/GIS/Download/District_Plans/DB_2011/Congress/Rucho-Lewis_Congress_3/Reports/DistrictStats/SingleDistAdobe/rptDistrictStats-12.pdf

[5] Perez, Thomas E. letter to Alexander McC. Peters. 1 November 2011.

[6] Florida Senate. District 5 Demographic Profile (H000C9047). http://www.flsenate.gov/PublishedContent/Session/Redistricting/Plans/H000C9047/H000C9047_district_details.pdf

7 *Romo, Weaver et al. v. Detzner*, *Bondi* No. 37-2012-CA-00412 (Florida Circuit Court, Leon County)

[8] It is worth noting that excluding the Chesapeake Bay shoreline, MD-3 ranks with the second lowest Polsby-Popper and Schwartzberg score, only slightly more compact than NC-12.

[9] Texas Legislative Council. Hispanic Population Profile Using Census, American Community Survey, and Voter Registration Data Congressional Districts – Plan C235. ftp://ftpgis1.tlc.state.tx.us/PlanC235/Reports/PDF/PlanC235_RED119_Hispanic_Population_Profile%202006-2010.pdf

[10] Keep in mind that districts approved by a Court may have been influenced by partisans, such as the case in Texas or Colorado. Legislative commissions, while non-partisan in theory, not included in this calculation.

[11] Florida Department of State Division of Elections. Standards for Legislature to Follow in Congressional Redistricting. http://election.dos.state.fl.us/initiatives/initdetail.asp?account=43605&seqnum=1