EXHIBIT A

IN THE UNITED STATES DISTRICT COURT FOR THE NORTHERN DISTRICT OF GEORGIA ATLANTA DIVISION

GEORGIA STATE CONFERENCE OF THE NAACP, et al. *Plaintiffs*, v. STATE OF GEORGIA, et al. *Defendants.*	Case No. 1:21-CV-5338-ELB-SCJ-SDG
COMMON CAUSE, et al., *Plaintiffs*, v. BRAD RAFFENSPERGER *Defendant*.	Case No. 1:22-CV-00090-ELB-SCJ-SDG

Expert Report of Dr. Moon Duchin

Analysis of Race and Redistricting in Georgia

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Contents

1 Background and qualifications

I am a Professor of Mathematics and a Senior Fellow in the Jonathan M. Tisch College of Civic Life at Tufts University. At Tisch College, I am the director and principal investigator of an interdisciplinary research group called the MGGG Redistricting Lab, focused on geometric and computational aspects of redistricting. My areas of research and teaching include the structure of census data, the history of the U.S. Census, the design and implementation of randomized algorithms for generating districting plans, and the analysis of redistricting more broadly. In 2019, I was awarded a major grant from the National Science Foundation to study *Network Science of Census Data*.

I am compensated at $400/hour for my work in this case. I have previously written reports and provided testimony by deposition, a hearing, or at trial in North Carolina, Pennsylvania, Wisconsin, Alabama, South Carolina, and Texas.[1] A full copy of my CV is attached to this report.

1.1 Assignment

I have been asked to examine the Congressional, state Senate, and state House districts enacted in Georgia this year in connection with challenges under the Voting Rights Act of 1965 (VRA) and the U.S. Constitution.

[1] *NC League of Conservation Voters, et al. v. Hall, et al.* No. 21-cvs-500085 (Wake Cnty. Sup. Ct. 2021); *Carter v. Chapman*, No. 7 MM 2022, 2022 WL 702894 (Pa. Mar. 9, 2022); *Johnson v. Wis. Elections Comm'n*, No. 2021AP1450-OA, 2022 WL 621082 (Wis. Mar. 3, 2022); *Milligan, et al. v. Merrill, et al.*, Case No. 2:21-cv-01530-AMM and *Thomas, et al. v. Merrill, et al.*, Case No. 2:21-cv-01531-AMM (N.D. Ala. 2021); *SC NAACP et al. v. Alexander, et al.*, Case No. 3-21-cv-03302-MBS-TJH-RMG (D.S.C.) (three-judge ct.); *TX NAACP et al. v. Abbott*, Case No. 1:21-CV-00943-RP-JES-JVB.

In particular, I review the maps' conformance with traditional districting principles (§6), then supply demonstration maps for the "Gingles 1" prong of a VRA challenge. Using a notion of district "effectiveness" based on electoral history (§5), I show that it is readily possible to draw additional majority-minority districts, while simultaneously increasing the number of effective districts (§7). These effective districts are shown to be highly likely to provide an opportunity for Black and Latino voters to elect candidates of their choice.

I have also assessed the maps to investigate the possibility of excessively race-conscious line-drawing (§10), especially noting when traditional districting principles have been undermined in a manner that results in "packing" and "cracking"—the related practices of over-concentrating Black and Latino voters on one hand, or splitting communities and dispersing their voters over multiple districts on the other. I have considered whether or not the design of the districts ultimately leads to discernible dilution of voting opportunity for Black voters in Georgia, or for coalitions of Black and Latino voters, and have found ample evidence to support that conclusion.

All work in this report was completed by me and by research assistants working under my direct supervision.

1.2 Materials

Materials consulted in the preparation of this report include the following.

- A major source is Census data, primarily the Decennial Census releases (i.e., the PL 94-171). Other data products from the Census Bureau, including the American Community Survey and the TIGER/Line shapefiles, were also used.
- For priorities and criteria, I consulted the "2021–22 Guidelines for the House Legislative and Congressional Reapportionment Committee." These are reprinted in full in the corresponding publication by the Senate Committee on Reapportionment and Redistricting.
- Shapefiles for the enacted plans are available on the state's redistricting website, hosted at `legis.ga.gov`.
- A collection of precinct shapefiles with historical election data joined to the shapes was provided by counsel, as well as addresses for incumbent representatives. I was also provided with written transcriptions of oral testimony in public hearings in Georgia about redistricting, and with corresponding written communication.

2 Summary of findings

- Census data shows that the state of Georgia is rapidly diversifying, and in fact now has a population very nearly evenly split between White people and people of color. At the same time, it has shifted to become what we might call "bright purple," with recent elections repeatedly demonstrating that candidates preferred by Black and Latino voters can be elected by simple majority on a statewide basis.
- At a high level, an examination of recent electoral history shows that the enacted plans at all three levels are conspicuously uncompetitive, which has been fueled by acutely race-conscious moves in the recent redistricting. In particular:
  - A Congressional district that had proved to perform for the preferences of Black and Latino voters—CD 6—has been targeted to eliminate electoral opportunity. This was achieved by excising parts of urban counties and adding conservative White counties to the north of the benchmark configuration.
  - In a ripple effect from the reconfiguration of CD 6, a dense, urban, largely Black residential segment of Cobb County has been submerged in CD 14.

  - On the western edge of Georgia, CD 3 has been drawn to retain its character as a firewall between racially and politically diverse parts of the state in metro Atlanta and the Southwest region. Meanwhile, CD 13 has been kept highly packed, which is cemented in the enacted plan through race-conscious county splitting.
  - In the enacted Senate map, numerous districts that had trended into diverse and competitive population configurations were targeted for "dismantling," i.e, were re-drawn in a way that splits the population of the benchmark district across numerous new districts. This is especially visible in the reconfiguration of SD 17 and 48, which flouts traditional districting principles and creates districts that lock out opportunity.
  - There is strikingly low core retention in the enacted House plan, with roughly three in every five Georgia residents assigned to a new district today relative to the benchmark plan. This dovetails with a pattern of "dismantling" districts in a way that usually eliminates electoral opportunity for Black and Latino voters, using racially imbalanced transfers of population.

- I have introduced a label of district "effectiveness" in §5: by definition, a district is deemed effective if candidates of choice for Black and Latino voters can frequently win both primary and general elections. To make this concrete, I have used a list of four primary and eight general statewide elections selected as being highly probative for the preferences of Black and Latino Georgians. To be effective, a district must have an electoral history such that the candidate of choice would win in at least 3/4 primary elections and 5/8 general elections from this dataset. I have confirmed that this is well aligned with actual 2022 electoral performance at the Congressional and state legislative level.

- A review of metrics associated with traditional districting principles (and other principles cited in the state's redistricting guidelines) is presented in §6. My alternative plans are shown to be highly compact, to respect the integrity of counties and cities, and to be far more cognizant of the integrity of state precincts than the enacted plans.

- I present Gingles 1 alternatives on a regional/district cluster basis in §7. These plans increase both the number of majority-BHVAP districts and the number of majority-BHCVAP districts, relative to the state, while also securing the "effective" label on the basis of electoral history. The modular design of the legislative alternatives will make it easy to mix and match plans from different clusters.

- If we foreground effectiveness instead of majority demographics, we find that districts can frequently be effective even well under the 50%+1 demographic threshold. This provides helpful examples leading in to a discussion of racial gerrymandering in the following section.

- Counties are often split in a racially sorted way, beyond what the partisan geography would suggest from a race-neutral process. In many cases this secures a high partisan differential as well; in some cases, the racial differential significantly exceeds the partisan gap.

- It is extremely frequent for precinct splits to show major racial disparity. If mapmakers were using cast vote history to track partisan lean, as is frequently done around the country, then these splits of state precincts are especially telling, since the vote history can not provide a partisan basis for the decision. These splits are shown to essentially always align with packing and cracking. Again, my alternative maps show that far less precinct splitting is possible.

- Public input, such as the record of strong pushback against the targeting of CD 6 and the encroachment of CD 14 into Cobb, also explains why the enacted plans are dissonant in terms of shared community interests.

3 Demographics of Georgia

3.1 Regions, counties, and cities

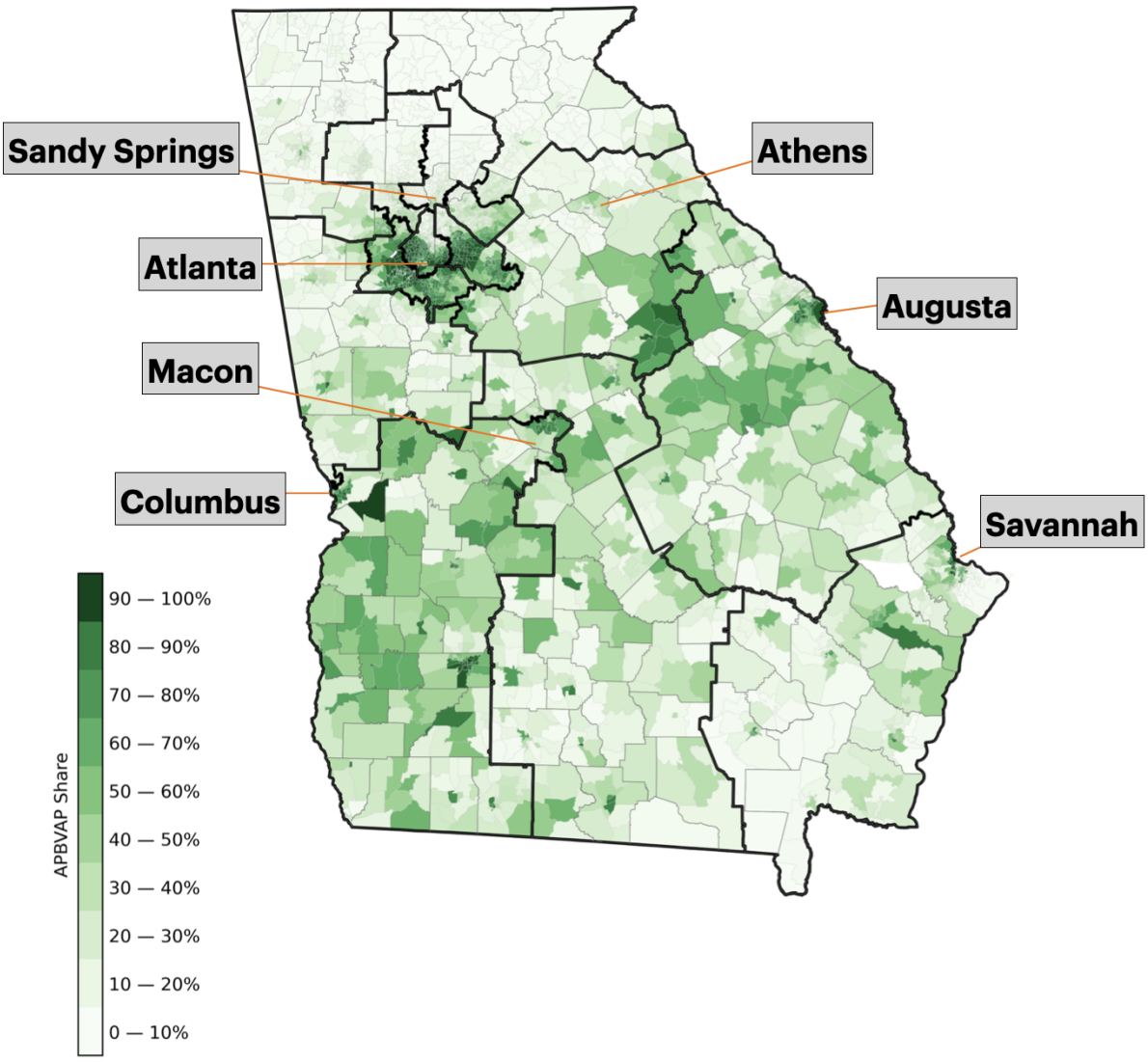


Figure 1: Choropleth of Black voting age population by state precinct, with the enacted Congressional map overlaid. County lines are shown in gray. The Atlanta metro area has dense Black population, while high proportions of Black residents in smaller cities and rural areas can be found in the swath of the state from Columbus to Augusta, broadly called Georgia's "Black Belt" region.

Georgia has 159 counties, the second highest number in the nation (after Texas with 254). Georgia's counties vary in population from Fulton County, with over a million residents, to Taliaferro County, with just 1559 residents, so that they differ by a factor of over 680×. Twenty-two of the counties are majority-Black, from DeKalb (pop. 764,382) to Taliaferro.

In Georgia, the cities proper are not very populous; even Atlanta has under 500,000 people by the 2020 Census numbers, smaller than the ideal Congressional district population of 765,136. However, the Atlanta metro area (formally the “Atlanta–Sandy Springs–Alpharetta, GA Metropolitan Statistical Area") is the eighth largest in the country, with over six million residents (6,089,815), making up nearly 57% of Georgia’s total population.

3.2 Sources of population data

Apportionment and redistricting was the fundamental motivation for the establishment of the U.S. Census. The primary source of ground-truth data for redistricting is the Decennial Census tables in the PL94-171 (also called the *redistricting data release*). There are many reasons to rely on the 2020 Decennial data: it is the most recent available, it is based on a more extensive enumeration of the population (rather than a survey), it is available on the smallest geographic units (census blocks), it offers a high level of detail in its categories of race and ethnicity, and it includes both total population (TOTPOP) and voting age population (VAP).

An important secondary source of data, also produced by the Census Bureau, is the American Community Survey, or ACS. This has the advantage of being collected every year rather than at ten-year intervals, and it includes an estimate of citizen voting age population (CVAP), but this trades off with a number of well-known caveats. Since it is survey-based, it is known to have wider error bars on small geography: accordingly, the Bureau only releases single-year estimates at the tract level; 5-year estimates are released at the level of block groups, but this is still not sufficiently detailed to get exact totals on electoral districts. Furthermore, the ACS racial and ethnic categories are significantly simplified relative to the Decennial data, so that for instance it is not possible to tabulate Any-Part Black population with the same set of multiracial categories or even to tabulate Afro-Latino (Black and Hispanic) population. In addition, the use of a 5-year average will mean that the numbers are somewhat out of date, since even the most recent currently available data draws partly from 2016, which is quite a long time ago in a rapidly diversifying state. Finally, the 2020 ACS was so badly compromised by the COVID pandemic that the Bureau has cautioned people to treat the numbers that year as "experimental."[2]

For these reasons I have chosen to emphasize VAP in discussing the demographics of districts in this report, such as when counting the majority-Black districts in a plan. However, the plaintiffs’ claims involve a coalition of Black and Latino voters, and the voting eligibility rate for Latino voters can be significantly lower than other groups, particularly due to a lower rate of citizenship. Therefore litigation involving Latino plaintiffs typically uses a secondary data source to validate that Gingles plans meet the 50%+1 threshold. Below, I will rely on estimated CVAP built from block-level adjusted VAP, where the citizenship rate (CVAP/VAP) for Black, Latino, White, and Other residents is pulled from the 2020 5-year ACS on larger geographies, namely census tracts. I judge this to be significantly more accurate than using the 2016-2020 5-year CVAP numbers directly. For one vivid illustration of why this is important, consider that the total voting age population of Georgia is 8,220,274 in the redistricting data, but only 8,011,265 in the 2016-2020 5-year numbers. That is, there is a shortfall of more than 200,000 adults if we pull from the ACS directly.

A full description of racial categories and of the construction of CVAP for this report can be found in Appendix A. In §8 I will confirm that my alternative plans satisfy the Gingles 1 standard for coalition districts using estimated Black and Hispanic CVAP as well as using VAP.

[2] "The Census Bureau will not release its standard 2020 ACS 1-year supplemental estimates because of the impact of the COVID-19 pandemic on data collection. Experimental estimates, developed from 2020 ACS 1-year data[,] are available on the ACS Experimental Data page. They will not be available on data.census.gov or the Application Programming Interface (API)." From www.census.gov/data/developers/data-sets/ACS-supplemental-data/2020.html, accessed January 4, 2023.

3.3 Demographic trends

A snapshot of the demographics of Georgia can be extracted from data products by the Census Bureau, as in Table 1.[3] Below, I will use the abbreviations B, H, BH, W, and POC to denote the share of population (or VAP, etc.) that is Black, Latino, Black and/or Latino, White, and people of color respectively. Detailed definitions of the racial and ethnic groupings can be found in Appendix A.

	All	Black alone	Black (APB)	Hispanic	BH Coalition	AfroLatino	White alone	POC
TOTPOP	10,711,908	3,278,119 30.60%	3,538,146 33.03%	1,123,457 10.49%	4,578,941 42.75%	82,662 0.77%	5,362,156 50.06%	5,349,752 49.94%
VAP	8,220,274	2,462,933 29.96%	2,607,986 31.73%	742,918 9.04%	3,302,581 40.18%	48,323 0.59%	4,342,333 52.82%	3,877,941 47.18%
CVAP	7,598,787	2,422,569 31.88%	2,537,328 33.39%	429,562 5.65%	2,920,522 38.43%	— —	4,285,394 56.40%	3,313,393 43.60%

Table 1: Demographics overview. The TOTPOP and VAP figures are taken from the 2020 Decennial Census. The CVAP figures use citizenship rates drawn from the most recent 5-year ACS (ending in 2020), applied to decennial VAP.

Georgia's fast growth is entirely due to the expansion in the population of people of color. In fact, the (non-Hispanic) White population of Georgia actually dropped from 2010 to 2020—from 5,413,920 to 5,362,156—while the state overall grew by over a million people. As a result, the population share of Black and Latino residents expanded from 39.75% to 42.75% in the time between the 2010 and the 2020 Census data release, while the White population share dropped markedly from 55.88% to 50.06%. Thus, to within a tenth of a percent, current redistricting data finds Georgia evenly split between White residents and people of color.

The steady diversification is visible in the citizen voting age population as well, for which we can get a snapshot each year from the American Community Survey (Table 2).[4]

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
BCVAP	1,961,750 0.3029	2,008,587 0.3049	2,055,423 0.3071	2,096,295 0.3089	2,140,693 0.3110	2,179,729 0.3123	2,228,551 0.3155	2,276,776 0.3182	2,322,275 0.3201	2,376,110 0.3230
HCVAP	188,878 0.0292	210,412 0.0319	230,724 0.0345	245,517 0.0362	263,787 0.0383	282,158 0.0404	290,840 0.0412	306,713 0.0429	324,368 0.0447	344,182 0.0468
BHCVAP	2,150,628 0.3321	2,218,999 0.3368	2,286,147 0.3415	2,341,812 0.3451	2,404,480 0.3493	2,461,887 0.3528	2,519,391 0.3567	2,583,489 0.3610	2,646,643 0.3648	2,720,292 0.3698
POC CVAP	2,239,082 0.3457	2,299,730 0.3491	2,358,789 0.3524	2,415,907 0.3560	2,477,036 0.3599	2,538,250 0.3637	2,603,198 0.3685	2,671,269 0.3733	2,738,577 0.3775	2,811,677 0.3822
WCVAP	4,237,007 0.6543	4,288,602 0.6509	4,335,200 0.6476	4,369,477 0.6440	4,405,843 0.6401	4,440,410 0.6363	4,460,606 0.6315	4,484,704 0.6267	4,516,116 0.6225	4,544,881 0.6178
total CVAP	6,476,089	6,588,332	6,693,989	6,785,384	6,882,879	6,978,660	7,063,804	7,155,973	7,254,693	7,356,558

Table 2: Georgia has seen significant growth in its citizen adult population, and nearly all of it is from communities of color. This table shows the 1-year ACS figures from 2010 through 2019.

[3] As noted in the last section, the American Community Survey (ACS) is based on an annual survey, often presented in 5-year rolling averages, where not all of the same racial and ethnic categories from the PL94-171 are available. Since the methodology, categories, and time periods are different between the ACS and the Decennial data, there is no contradiction in observing WCVAP>WVAP, for instance.

[4] As described above, the 2020 ACS was not recommended for standard use on a 1-year basis, which is why it is excluded from Table 2.

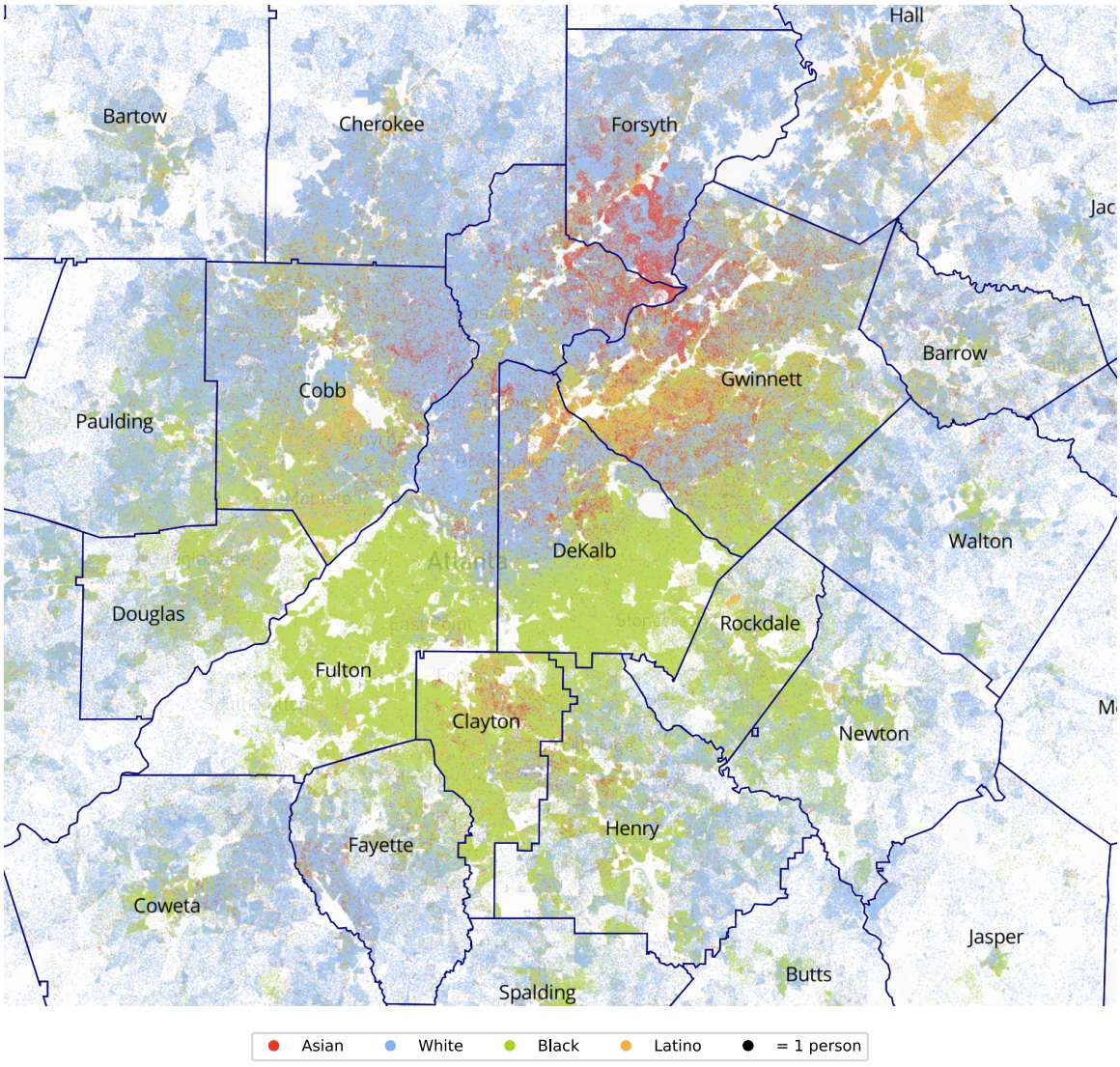


Figure 2: Racial dot density plot in the counties of the Atlanta metro area. Dense concentrations of Black population are visible in Cobb, Douglas, Fulton, Clayton, DeKalb, and southern Gwinnett Counties. Gwinnett is the heart of Georgia's Latino population, and following the I-85/I-985 corridor north connects to a substantial Latino community in Hall County.

4 Overview of enacted plans for Congress, Senate, and House

4.1 Congress

As discussed in the last section, the last decade has seen substantial growth in the Black and Latino population of Georgia and a reduction in White population. At the same time, and in a climate where the racial polarization between White Georgians and voters of color is essentially undisputed, Black and Latino candidates of choice are now routinely competitive in statewide elections, and now can frequently win outright. Despite this, the newly enacted Congressional plan makes major changes to the benchmark and does so in a way that reduces the number of performing districts for Black- and Latino-preferred candidates from 6 out of 14 (42.9%) to just 5 out of 14 (35.7%).

In 2018, Democratic candidate Lucy McBath won a surprise victory in CD 6, north of Atlanta, unseating Republican Karen Handel. She then defended her seat in 2020. My study of the Congressional plan enacted in Georgia in 2021 is completely consistent with the scenario that line-drawers targeted McBath's district, specifically by removing Black and Hispanic voters from CD 6 and replacing them with White suburban, exurban, and rural voters in Forsyth and Dawson counties. This displacement ripples across CD 11 and ends up submerging Black urban voters in rural CD 14. This is corroborated by the core retention numbers that show that CD 6 was singled out for major reconfiguration (see §10).

Correspondingly, the community of interest narratives supplied to the state in a series of public hearings and communications show that coherent and salient local identities were disregarded in the process: rural, mountainous, and industrial interests in the Northwest counties; metro Atlanta's urban counties with large Black populations and clear shared needs for infrastructure, transit, and housing; and largely suburban Forsyth and Dawson. (See §10.3.)

Strikingly, all fourteen new districts had wider than a ten-point margin between Biden and Trump in the 2020 Presidential voting—there are zero remotely competitive districts. In particular, the completely reconfigured CD 6 is now far out of reach for a Black-preferred candidate; Biden had just 42.5% of the major-party vote against Trump in the district. This lean held up in actual Congressional voting under the new lines in 2022, where the closest of the fourteen outcomes was Sanford Bishop's margin of 9.95 percentage points over opponent Chris West in CD 2; every other race was a blowout. The overall effect of the Congressional redistricting in Georgia is the instrumentalization of Black and Latino voters to achieve a profoundly uncompetitive plan in which the line-drawers have gone a long way to locking in the outcomes.

In this section I will show images, and in the following section I will present statistics, for the enacted Congressional plan compared to the benchmark plan from ten years prior. I will also consider a map I have labeled **Duncan-Kennedy**, a draft congressional map released to the public by Lt. Governor Geoff Duncan and Chairman John F. Kennedy on September 27, 2021.

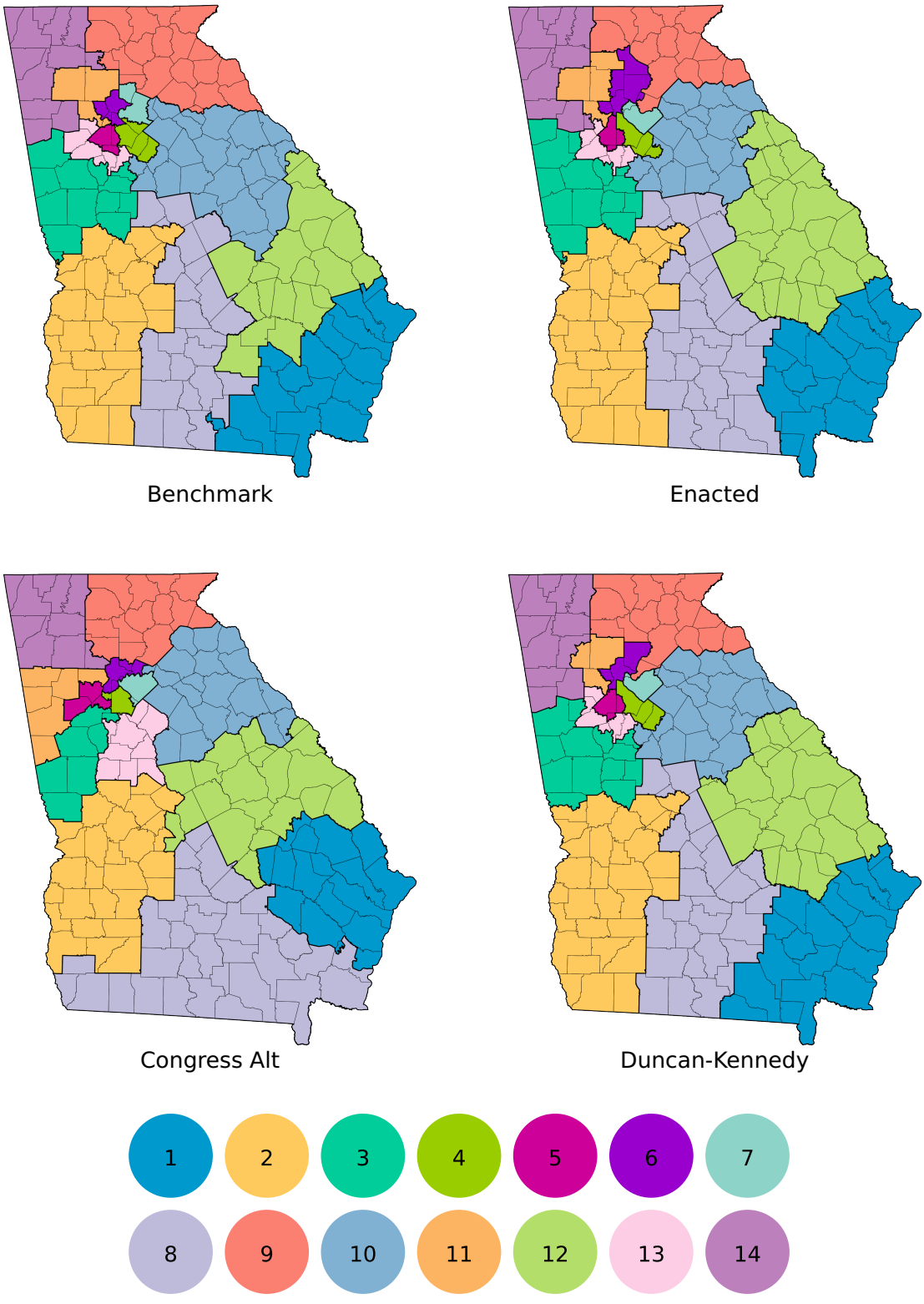


Figure 3: Congressional plans.

4.2 State Senate

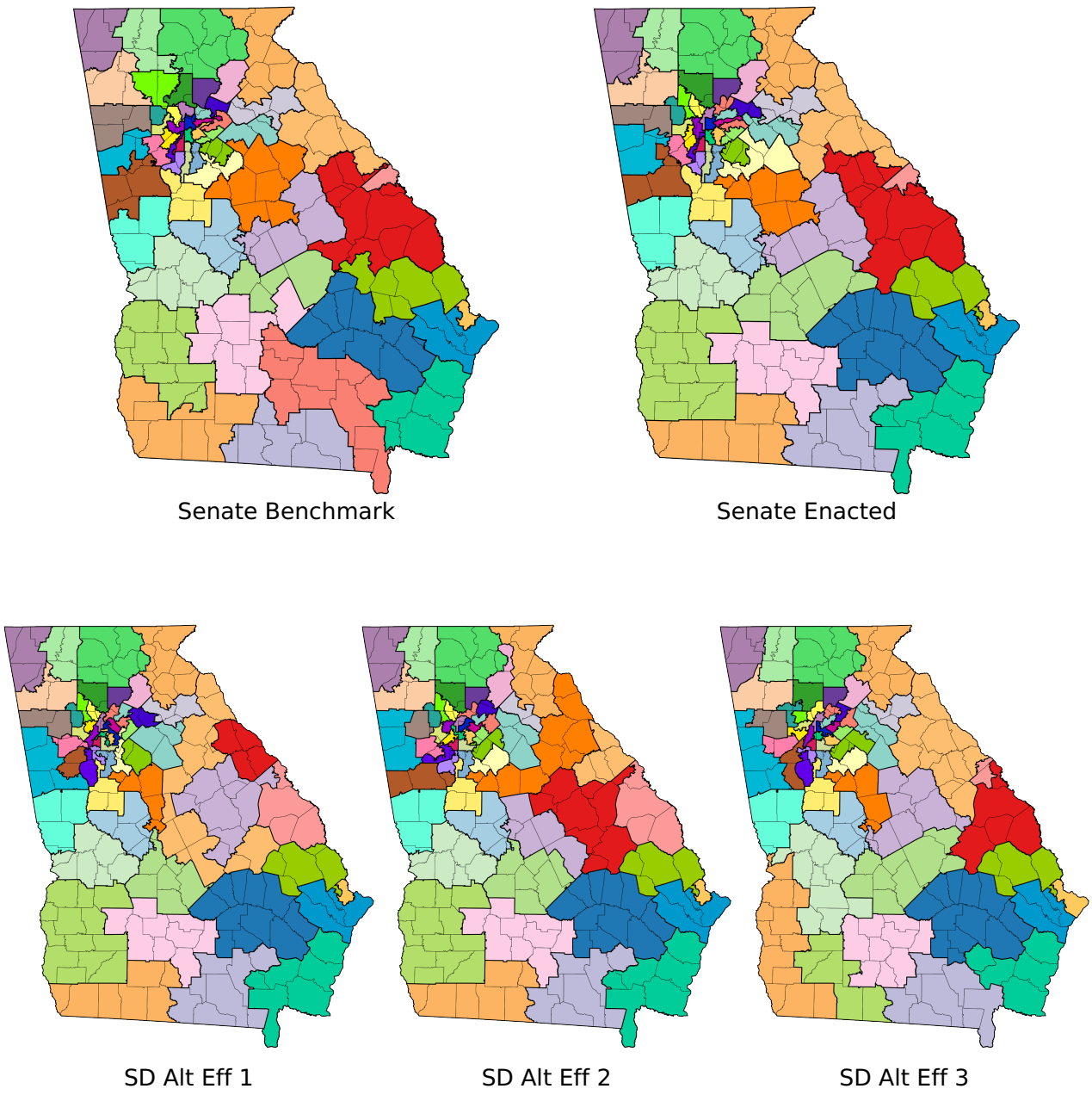


Figure 4: State Senate plans.

The state Senate plan enacted in Georgia is also remarkable in its lack of competitiveness. Despite Georgia's clear status as a new swing state, only one of the districts (SD 48) would have been within a ten-percentage-point margin (i.e., 55-45 or closer) in the Biden-Trump presidential contest of 2020. And indeed, only two of 56 districts (SD 7 and 14) were within a ten-point margin in the actual legislative voting of 2022. (Note that Georgia state Senators stand for election every two years, as for U.S. House and Georgia's state House.) More than half of the districts—30 out of 56—were uncontested.

Below, I will propose alternative districts with a *modular* approach, starting by dividing the 56 districts in the enacted plan into six district clusters, shown in Figure 5. In three of the six—Atlanta, Gwinnett, and East Black Belt—I will present alternative "Gingles 1" plans that increase the number of majority-Black and/or the number of majority-coalition districts, while ensuring that new districts are effective at securing electoral opportunity for Black and Latino voters. I will supplement the Gingles plans with regional maps showing improved effectiveness in additional clusters to create plans that span many regions of the state to form SD Alt Eff 1 and SD Alt Eff 2. Finally, I will offer an all-clusters alternative keyed to increased effectiveness alone, called SD Alt Eff 3. (See Table 10.) This is accomplished while maintaining scores for traditional districting principles that are comparable or superior to those of the enacted plan, and while giving great deference to the enacted plan by reconfiguring its own districts in clusters rather than starting from a blank map.

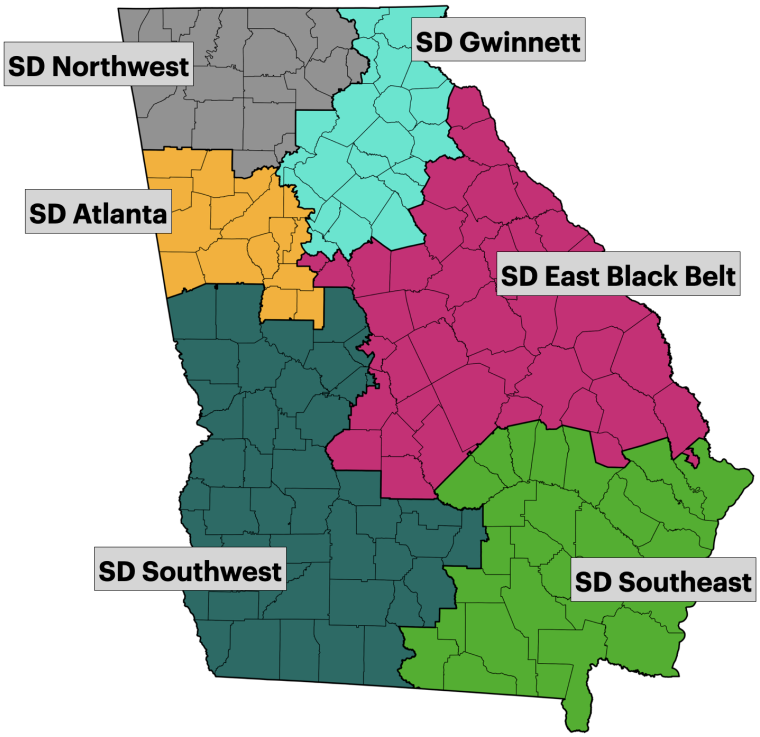


Figure 5: Six "modular" Senate clusters made up of groups of enacted districts. Below, Gingles demonstrative plans will be offered in selected clusters and effectiveness-oriented demonstrative plans will be presented in all six.

Senate Clusters

- SD Atlanta (14 districts): 6, 10, 16, 28, 30, 31, 33, 34, 35, 36, 38, 39, 42, 44
- SD Gwinnett (16 districts): 5, 7, 9, 14, 17, 27, 40, 41, 43, 45, 46, 47, 48, 49, 50, 55
- SD Southwest (6 districts): 11, 12, 13, 15, 18, 29
- SD East Black Belt (7 districts): 4, 20, 22, 23, 24, 25, 26
- SD Southeast (5 districts): 1, 2, 3, 8, 19
- SD Northwest (8 districts): 21, 32, 37, 51, 52, 53, 54, 56

4.3 State House

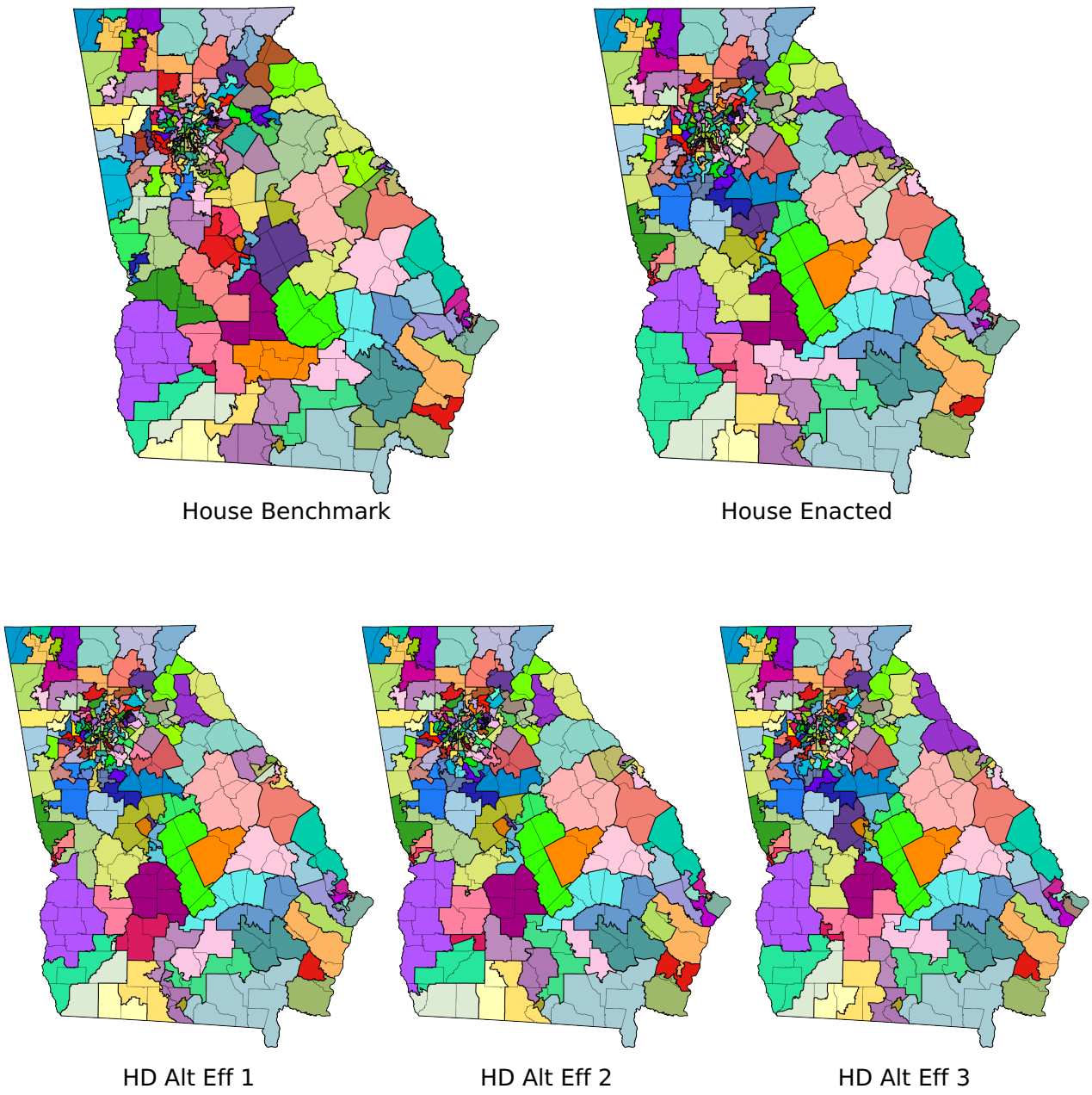


Figure 6: State House plans.

The state House plan repeats the uncompetitive design found in the other levels of redistricting; only fifteen of the 180 districts were within a ten-point margin for Biden-Trump, and only nine (HD 48, 50, 53, 99, 101, 105, 108, 117, and 151) had 2022 legislative outcomes in that range.Like in the Senate, more than half of the House districts—93 out of 180—were uncontested in 2022.

I have extended the modular approach from state Senate to the House, using seven regions formed by clusters of enacted districts, as in Figure 7. Each can be reconfigured to create

additional majority-coalition districts, and I offer up to two demonstration maps per cluster (Alt 1 and Alt 2) as Gingles 1 demonstratives in §7. As overviewed in Table 10, the alternative plans can be completed to highly effective alternatives statewide, which I call HD Alt Eff 1 and HD Alt Eff 2; a third all-clusters effective alternative is also offered, called HD Alt Eff 3.

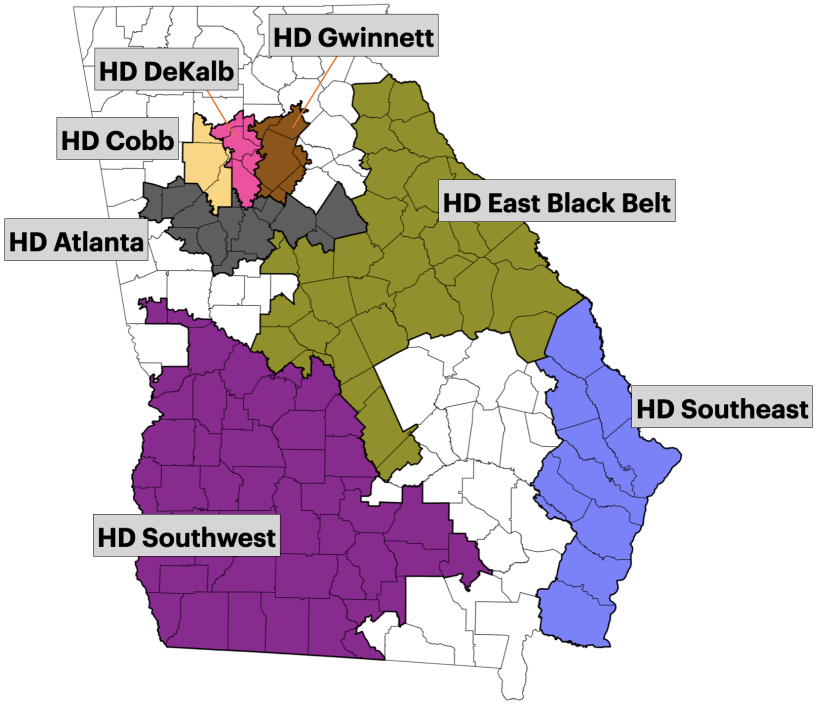


Figure 7: Seven "modular" House clusters made up of groups of enacted districts.

House Clusters

- HD Atlanta (25 districts): 61, 64, 65, 66, 67, 68, 69, 71, 73, 74, 75, 76, 77, 78, 79, 90, 91, 92, 93, 112, 113, 114, 115, 116, 117
- HD Cobb (25 districts): 20, 22, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 53, 54, 55, 56, 57, 58, 59, 60, 62, 63
- HD DeKalb (22 districts): 21, 24, 25, 47, 48, 49, 50, 51, 52, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 96, 97, 98
- HD Gwinnett (18 districts): 26, 29, 30, 94, 95, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111
- HD Southwest (18 districts): 137, 140, 141, 146, 147, 148, 150, 151, 152, 153, 154, 169, 170, 171, 172, 173, 175, 176
- HD East Black Belt (18 districts): 33, 118, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 142, 143, 144, 145, 149
- HD Southeast (12 districts): 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 179, 180

Together, these cover 138 of the 180 districts in the Georgia House. All of my demonstrative plans will leave the other 42 House districts unchanged.

5 Assessing effective opportunity-to-elect districts

The Gingles demonstration maps shown below in Section 7 are presented to satisfy the Gingles 1 condition for use with a Voting Rights Act challenge. In part, they are designed to show that it is (readily) possible to draw additional districts with a majority of Black and Latino adults in many parts of the state of Georgia, and for each of the three levels of districting plan, even while giving great deference to the Legislative enacted plan by only replacing its districts in modular clusters.[5]

In addition to demographic composition, I have offered alternative districts that showcase *effective electoral opportunity*. This shows that the harms to voters can be remedied by better design and, in the context of racial gerrymandering, demonstrates that better performance on traditional districting principles is completely compatible with greater electoral opportunity for Black and Latino voters.

There are many reasons that we should not rely on the 50%+1 line as a predictor of electoral opportunity. Some have argued that the Gingles/Bartlett 50%+1 requirement requires an element of race-consciousness that is in tension with other aspects of best practices in map-making. Additionally, a demographic share alone does not take into account voting eligibility, registration levels, and turnout. It has long been well understood that a majority-minority district is neither necessary nor sufficient to secure electoral opportunity.

Therefore it is critical to use electoral history to gauge whether a district affords a reasonable opportunity for a group to elect a candidate of its choice. I will describe an effectiveness analysis here and will provide demonstration maps emphasizing increased electoral opportunity for Black and Latino voters, without any racial threshold in play, in §9.

5.1 Identifying probative elections

In the voting rights sphere, it is well understood that certain past elections are more probative—that is, provide better and clearer evidence of polarization patterns and preferences—than others. The peer-reviewed literature is certainly clear that some factors flagging probative contests include the following: all other things being equal, elections are more suitable for an effectiveness analysis when they are more recent, when they have a viable POC candidate on the ballot, and when we can make confident statistical inferences about each group's preference. They are less suitable when they are blowouts or, of course, uncontested.

To this end, I have designated the following eight general elections and four Democratic primary elections (Tables 3) to be especially probative for analyzing effective electoral opportunity for Black and Latino voters in Georgia. All are recent statewide elections (held since 2018), most have a Black candidate on the ballot, and most are quite close on a statewide basis.[6]

[5] It is my understanding that the VRA, as clarified in *Bartlett v. Strickland*, requires a demonstration of additional districts that are have at least 50%+1 minority population. The usual standard uses VAP, or voting age population, when Black voters are the main minority group in a challenge; sometimes, CVAP, or citizen voting age population, is used when the principal group of plaintiffs has a large share of immigrants, as for Latino or Asian plaintiffs. In this case, the claims are for a coalition of Black and Latino voters, and I have used both VAP and CVAP, as explained in §3.2.

[6] Even Robinson's primary election, which was won with nearly 63% of the statewide vote, shows substantial district-level variation. By contrast, in the Democratic primary for Governor in 2018, Abrams won with 76.4% and with little regional variation, making it a less informative contest, which explains why it is not included.

Year	Contest	R Candidate	D Candidate	D share
2016	President	Trump-Pence	Clinton-Kaine	.4734
2018	Governor	Brian Kemp	Stacey Abrams (B)	.4930
2018	Super. Pub. Instruc.	Richard Woods	Otha Thornton (B)	.4697
2020	President	Trump-Pence	Biden-Harris (B)	.5013
2020	Public Serv. Commiss.	Lauren McDonald	Daniel Blackman (B)	.4848
2021	Senate Runoff	David Perdue	Jon Ossoff	.5061
2021	Senate Runoff Special	Kelly Loeffler	Raphael Warnock (B)	.5104
2022	Governor	Brian Kemp	Stacey Abrams (B)	.4620

Year	Contest	BH-Preferred Candidate	D share (outcome)
2018	Lt. Governor	Triana Arnold James (B)	.4475 (L)
2018	Super. Primary	Otha Thornton (B)	.4387 (1st of 3)
2018	Super. Runoff	Otha Thornton (B)	.5914 (W)
2018	Insurance Commiss.	Janice Laws Robinson (B)	.6286 (W)

Table 3: Eight general elections and four primaries and primary runoffs are chosen for the score of effectiveness.

5.2 Constructing and evaluating a score of electoral alignment

Using the four primary and eight general elections listed here, I will deem a district to be *effective* if it is electorally aligned with the preferences of Black and Latino voters in at least three out of four primaries and at least five out of eight general elections. This standard ascertains that minority-preferred candidates can be both nominated and elected from the district, and it distinguishes minority preferences from (related, but distinct) Democratic party preferences. This same core idea of measuring district effectiveness—keyed to electoral history, not to demographics of the district—appears frequently in the peer-reviewed literature, for instance in [1].

The enacted plans starkly limit the number of districts that earn the label of effective. Tables 4-6 show that five out of 14 Congressional districts are likely to give Black and Latino voters an effective opportunity to elect candidates of choice.

Similarly, the enacted plans have 19 expected effective districts out of 56 in the Senate, and 68/180 in the House. (For detailed supporting tables, see Appendix B.)

Since elections were conducted under these new districts in 2022, we can review some basic evidence about the success of the classification of "effective" opportunity districts. I have not conducted a racially polarized voting analysis, but we can nonetheless use information about whether each district elected candidates of color as a rough proxy for the preferences of voters of color. Since White and/or Republican candidates can certainly be preferred by voters of color, this is imperfect, but it is at least an indication that can help us assess the labeling mechanism.[7] Here is what we find for the enacted plans:

- 5/5 Congressional districts marked effective elected POC Democrats (100%);
- 0/9 Congressional districts marked ineffective elected POC Democrats (0%);
- 18/19 Senate districts marked effective elected POC Democrats (94.7%);
- 1/37 Senate districts marked ineffective elected POC Democrats (2.7%);
- 58/68 House districts marked effective elected POC Democrats (85.3%);
- 4/112 House districts marked ineffective elected POC Democrats (3.6%).

CD	Primaries out of 4	Generals out of 8	Effective?
1	3	0	N
2	4	8	Y
3	3	0	N
4	3	8	Y
5	3	8	Y
6	0	0	N
7	3	8	Y
8	3	0	N
9	2	0	N
10	3	0	N
11	3	0	N
12	3	0	N
13	4	8	Y
14	3	0	N

Table 4: By the standard of requiring that the candidate of choice should win at least three out of four primaries and at least five out of eight generals, the enacted plan has five districts that present an effective opportunity: CD 2, 4, 5, 7, and 13.

CD overall	James18P 0.4475	Thornton18P 0.4387	Thornton18R 0.5914	Robinson18P 0.6286
1	0.4992	0.4997	0.7150	0.6967
2	0.5515	0.4720	0.6379	0.7430
3	0.4177	0.4185	0.5388	0.6178
4	0.4566	0.4444	0.5622	0.6034
5	0.3747	0.4082	0.5611	0.5184
6	0.2815	0.3458	0.4720	0.4789
7	0.4489	0.4515	0.5968	0.6082
8	0.4861	0.4403	0.6273	0.6940
9	0.3411	0.3811	0.5444	0.5560
10	0.4112	0.4294	0.6444	0.5898
11	0.3603	0.4200	0.5276	0.5549
12	0.4928	0.4196	0.6462	0.7626
13	0.5594	0.5089	0.6524	0.7190
14	0.4190	0.3863	0.5049	0.6123

Table 5: Vote shares for the candidate of choice in probative primary and runoff elections. (Note that the Superintendent primary from 2018 (Thornton18P) is a race with three candidates, so a win is recorded if Thornton has the most votes, even if that does not exceed 50% of cast votes.)

[7] Indeed, Nan Orrock of SD 36, the only White Democrat in the Senate to be elected from a district marked effective, is an Associate Member of the Georgia Black Legislative Caucus, suggesting with high likelihood that she is the Black candidate of choice.

CD	Clinton16	Abrams18	Thornton18	Biden20	Blackman20	Ossoff21	Warnock21	Abrams22
overall	0.4734	0.4930	0.4697	0.5013	0.4848	0.5061	0.5104	0.4620
1	0.4149	0.4245	0.4105	0.4322	0.4193	0.4379	0.4386	0.3950
2	0.5463	0.5508	0.5354	0.5524	0.5445	0.5611	0.5624	0.5188
3	0.3168	0.3287	0.3119	0.3476	0.3312	0.3524	0.3564	0.3130
4	0.7692	0.7886	0.7567	0.7917	0.7789	0.7927	0.7982	0.7707
5	0.8352	0.8418	0.7910	0.8366	0.8080	0.8203	0.8287	0.8072
6	0.3603	0.3878	0.3498	0.4250	0.3851	0.4068	0.4151	0.3602
7	0.5727	0.6113	0.5788	0.6307	0.6136	0.6366	0.6421	0.5874
8	0.3430	0.3427	0.3280	0.3604	0.3473	0.3648	0.3664	0.3185
9	0.2650	0.2822	0.2668	0.3081	0.2897	0.3084	0.3129	0.2554
10	0.3510	0.3654	0.3518	0.3814	0.3650	0.3864	0.3903	0.3480
11	0.3708	0.4014	0.3741	0.4223	0.3972	0.4163	0.4233	0.3696
12	0.4324	0.4319	0.4174	0.4487	0.4331	0.4511	0.4526	0.4023
13	0.7790	0.8112	0.7916	0.8048	0.8068	0.8230	0.8261	0.8056
14	0.2767	0.2961	0.2873	0.3105	0.3015	0.3217	0.3234	0.2778

Table 6: Vote shares for the candidate of choice in probative general/runoff elections.

In addition, this method works quite well to distinguish race from party: if we flag districts with 0/4 primary wins and at least 5/8 general wins, these might reasonably be considered likely to elect White-preferred Democrats. There are no such districts in the enacted Congressional map, but the Senate map has three (which elected three White Democrats and one Asian Democrat in November 2022) and the House map has eight (which elected seven White Democrats and one Asian Democrat).

6 Metrics for enacted plans

Georgia has 14 Congressional districts, 56 state Senate districts, and 180 state House districts, making the task of redistricting into an extremely complicated balancing act. The list of substantive criteria for assessing districting plans that was published by each chamber of the Legislature reads as follows, in full:

```
A. GENERAL PRINCIPLES FOR DRAFTING PLANS
1. Each congressional district should be drawn with a total population of plus
   or minus one person from the ideal district size.
2. Each legislative district of the General Assembly should be drawn to
   achieve a total population that is substantially equal as practicable,
   considering the principles listed below.
3. All plans adopted by the Committee will comply with Section 2 of the
   Voting Rights Act of 1965, as amended.
4. All plans adopted by the Committee will comply with the United States
   and Georgia Constitutions.
5. Districts shall be composed of contiguous geography. Districts that
   connect on a single point are not contiguous.
6. No multi-member districts shall be drawn on any legislative redistricting plan.
7. The Committee should consider:
   a.  The boundaries of counties and precincts;
   b.  Compactness; and
   c.  Communities of interest.
8. Efforts should be made to avoid the unnecessary pairing of incumbents.
9. The identifying of these criteria is not intended to limit the consideration
   of any other principles or factors that the Committee deems appropriate.
```

This is unusually terse for a redistricting framework at the state level, declining to specify more detail, for example, about the operative principles of racial fairness, the definition of communities of interest, or even whether to encourage the use of quantitative metrics of compactness.

All of the plans under consideration are contiguous, and I will systematically discuss the other principles below.

6.1 Population balance

All plans are tightly balanced in population terms, using the Census redistricting data.

	Maximum positive deviation	Maximum negative deviation	Top-to-bottom deviation
EnactedCD	+1	−1	2
DuncanKennedy	+2	−1	3
CD Alt	+1	−1	2
EnactedSD	+1879	−1964	3843 (2.01%)
SD Alt Eff 1	+2457	−2598	5055 (2.64%)
SD Alt Eff 2	+2547	−2490	5037 (2.63%)
SD Alt Eff 3	+3200	−3305	6505 (3.40%)
EnactedHD	+797	−833	1630 (2.74%)
HD Alt Eff 1	+1194	−1176	2370 (3.98%)
HD Alt Eff 2	+1222	−1097	2319 (3.90%)
HD Alt Eff 3	+1173	−1026	2199 (3.70%)

Table 7: Population deviation in each plan.

6.2 Compactness

In redistricting, the notion of *compactness* is connected to the shapes of the districts, where simple boundaries and regular shapes are traditionally thought to indicate a "natural" division of population, while eccentric boundaries and contorted shapes can signal that some other agenda has predominated.

The two most common compactness metrics are the Polsby-Popper score and the Reock score. These are both *contour-based* scores that rely on the outline of the district on a map. *Polsby-Popper* is a ratio formed by comparing the district's area to its perimeter via the formula $4\pi A/P^2$. *Reock* considers how much of the smallest bounding circle is filled out by the district's area. Recently, mathematicians (such as myself) have argued for the use of discrete compactness metrics that de-emphasize the outline and instead consider how the districts are formed from units of census geography. The simplest discrete metric is called *(block) cut edges*, found by counting the number of pairs of census blocks that are adjacent to each other in the state, but are assigned to different districts. This assesses the "scissors complexity" of a plan, giving a measure of how many blocks would have to be separated from one another to divide up all the districts.

An advantage of the contour scores is that they are familiar and in wide use. An advantage of discrete scores is that they do not excessively penalize districts for having winding boundaries when those boundaries come from physical geography, like coastlines or rivers.

	avg Polsby-Popper (higher is better)	**avg Reock** (higher is better)	**Block cut edges** (lower is better)
BenchmarkCD	0.238	0.452	5775
EnactedCD	0.267	0.441	5075
DuncanKennedy	0.295	0.471	4665
CD Alt	0.287	0.452	4729
BenchmarkSD	0.250	0.421	12,549
EnactedSD	0.287	0.418	11,005
SD Alt Eff 1	0.287	0.427	10,897
SD Alt Eff 2	0.296	0.440	10,349
SD Alt Eff 3	0.295	0.431	10,479
BenchmarkHD	0.244	0.382	24,001
EnactedHD	0.278	0.391	22,014
HD Alt Eff 1	0.275	0.399	21,360
HD Alt Eff 2	0.281	0.406	21,301
HD Alt Eff 3	0.279	0.403	20,917

Table 8: Compactness scores for each plan.

Note that compactness scores should only be used to make relative assessments, comparing plans to others in the same state and at the same level of redistricting.

6.3 Respect for political boundaries

The most populous Georgia counties by 2020 population are Fulton County (pop. 1,066,710), Gwinnett County (pop. 957,062), Cobb County (pop. 766,149), and DeKalb County (pop. 764,382). Both Cobb and DeKalb are within 0.1% of ideal Congressional district size of 765,136, with Cobb slightly larger and DeKalb slightly smaller.[8]

Since there are four times as many Senate as Congressional districts, this also means that Cobb (4.005) and DeKalb (3.996) are ideally suited in population terms to make up four Senate districts; in addition, Gwinnett (5.003) is very nearly five times ideal Senate population. Instead, Cobb touches six Senate districts, DeKalb touches seven, and Gwinnett is split among nine in the enacted Senate plan. This observation spotlights the fact that it is important to consider not only how many counties are split, but into how many pieces, as in Table 9. If a unit is split in two, that adds two to the "pieces" count; likewise, if it is split into three parts, this counts as three "pieces," and so on. Unsplit units do not count toward "pieces." (A forensic look at the nature of the county and precinct splits can be found below in §10.2.) In this table, the "muni" units are Census places with functional status A ("Active government providing primary general-purpose functions").[9] These primarily include cities and towns.

	County Splits (out of 159)	**County Pieces**	**Muni Splits** (out of 538)	**Muni Pieces**	**Precinct Splits** (out of 2685)	**Precinct Pieces**
BenchmarkCD	16	38	67	141	67	134
EnactedCD	15	36	64	136	86	172
DuncanKennedy	15	36	53	114	66	132
CD Alt	13	30	58	127	47	95
BenchmarkSD	37	100	114	269	154	309
EnactedSD	29	89	109	266	144	289
SD Alt Eff 1	33	95	112	275	110	221
SD Alt Eff 2	26	78	108	264	97	196
SD Alt Eff 3	29	84	108	264	106	213
BenchmarkHD	72	284	169	506	303	630
EnactedHD	69	278	166	494	352	724
HD Alt Eff 1	73	276	164	492	279	570
HD Alt Eff 2	69	266	168	494	276	567
HD Alt Eff 3	69	265	165	478	277	567

Table 9: Number of county, muni, and precinct splits and pieces in each plan.

[8] This means that only three Georgia counties are larger than the ideal population of a Congressional district. Twelve Georgia counties are larger than ideal Senate size, and thirty-nine Georgia counties, from Fulton down to Effingham (pop. 64,769) are larger than ideal House size.

[9] https://www.census.gov/library/reference/code-lists/functional-status-codes.html

6.4 Racial demographics

Though majority-minority districts are not demanded for compliance with the Voting Rights Act, they nonetheless play a significant role in VRA litigation, especially in the Gingles 1 threshold test. For that purpose, plaintiffs must show maps with additional districts that are at least 50%+1 person composed of members of the specified minority group. Typically, when Black residents are the largest minority group, the basis for measurement is BVAP, or voting age population, as tabulated in the Decennial Census data. For a coalition of Black and Latino voters, we additionally use a secondary basis of population, in this case BHCVAP.

Here, I review the plans discussed in this report and enumerate the number of districts that have a majority of voting age population that is Black by VAP, Black and Latino by VAP, or Black and Latino by CVAP. The final column enumerates the number of districts that, according to their recent electoral history in statewide contests, are likely to provide an effective opportunity for Black and Latino voters to nominate and elect candidates of their choosing. Racial and ethnic categories are described in Appendix A, and the concept of measuring district effectiveness is delineated in §5.

	majority BVAP	majority BHVAP	majority BHCVAP	effective
BenchmarkCD	4	4	4	5
EnactedCD	2	5	4	5
Duncan-Kennedy	3	5	4	5
CD Alt	4	6	6	6
BenchmarkSD	14	17	17	19
EnactedSD	14	17	17	19
SD Alt Eff 1	17	23	22	23
SD Alt Eff 2	15	21	21	23
SD Alt Eff 3	8	17	16	28
BenchmarkHD	46	57	57	62
EnactedHD	49	62	60	68
HD Alt Eff 1	50	77	74	77
HD Alt Eff 2	44	75	71	79
HD Alt Eff 3	37	62	54	83

Table 10: The first three columns report the number of majority-BVAP, majority-BHVAP, and majority-BHCVAP districts, in the plans under discussion in this report. Overall, the state is 31.7% Black by VAP, 40.18% Black and Latino by VAP, and 38.43% Black and Latino by CVAP. The final column reports the number of districts labeled as effective in terms of electoral opportunity for Black and Latino voters.

6.5 Incumbency and core retention

Next, we review the handling of incumbency and the more general issue of reassigning voters to new districts in the plans under consideration. Note that members of Congress do not have to establish residency in the district that they represent, while Georgia law does have a district residency requirement for members of the state legislature.[10] In this section, I am relying on address data for incumbents that was supplied by counsel and there is certainly a strong possibility that it is not fully up-to-date or accurate.

The enacted Congressional plan double-bunked two pairs of incumbents: Nikema Williams (D) and David Scott (D) in CD 5; Jody Hice (R) and Andrew Clyde (R) in CD 10. However, Hice did not run for Congress in 2022, shifting to an unsuccessful run for Secretary of State, and David Scott already lived in CD 5 in the benchmark plan.

The enacted Senate plan also double-bunked two pairs of incumbents: Tyler Harper (R) and Carden Summers (R) in SD 13; Chuck Hufstetler (R) and Bruce Thompson (R) in SD 52. But Harper ran a successful campaign for Agriculture Commissioner, leaving Summers to win SD 13, while Thompson ran a successful campaign for Labor Commissioner, leaving SD 52 for Hufstetler. This leaves no meaningful pairings in the Senate map.

The shifting of incumbents is also apparent in the state House map. The enacted House plan seemingly double-bunks seventeen pairs of incumbents: nine R/R pairs, six D/D pairs, and two R/D pairs.

However, the apparent HD 10 collision is suspect (likely due to an inaccurate address for Lauren "Bubba" McDonald) because McDonald was reelected in HD 26, which contains no incumbent address from our list. Several seeming collisions are not meaningful because one of the Representatives had already retired or resigned: this includes Micah Gravley (now located in HD 19), Wes Cantrell (HD 21), Tommy Benton (HD 31), Matt Dollar (HD 45), Susan Holmes (HD 118), and Dominic LaRiccia (HD 176). The HD 100 collision is real, and Bonnie Rich lost to David Clark in the Republican primary; the HD 149 collision also ended in a primary showdown.

Among Democratic collisions, we note that Matthew Wilson (placed in HD 52) made an unsuccessful primary run for Insurance Commissioner; William Boddie made an unsuccessful run for Labor Commissioner; and David Dreyer (HD 62) did not run. Mitchell and Hutchinson did face off in a primary in HD 106.

Among the R/D collisions, Mickey Stephens (HD 74) died in office; Timothy Barr (HD 101) ran an unsuccessful primary for CD 10; and Winifred Dukes (HD 154) ran an unsuccessful primary for Agriculture Commissioner.

In all, this means that of 17 apparent collisions of incumbents, only three ended in a contest between incumbents. By far most of the others seem to be explained by retirement, resignation, or a run for another office.[11]

While incumbent pairings were therefore avoided, this is not to say that the new House plan was very favorable to incumbents in other ways. As I will discuss throughout this report, the state's line-drawers clearly placed a low priority on *core retention*, i.e., on maintaining voters in the same districts as they belonged to in the benchmark plan. The enacted plans for Congress and for state Senate each reassign more then two million residents to new districts relative to the prior assignment of their census block. But the House plan is on another level, with 6,135,234 people—roughly three out of every five Georgia residents—voting in a different district than before. This unusually high displacement is certainly permissible under the law, but it reveals that the legislature was willing to accept major changes to the map in pursuit of other goals. Below, in §10.1, I will present a closer look at which districts were particularly targeted for wholesale reconfiguration.

[10] See law.georgia.gov/opinions/2001-3-0.

[11] With the caveat that these numbers may not be highly meaningful without considering who planned to run again, and that they may not be wholly accurate, here are the numbers of districts with more than one incumbent address for the alternative plans. Benchmark CD - 1, SD - 0, HD - 5; Duncan-Kennedy - 3; CD Alt - 3; SD Alt Eff 1 - 11; SD Alt Eff 2 - 8; SD Alt Eff 3- 9; HD Alt Eff 1 - 35; HD Alt Eff 2 - 31; HD Alt Eff 3 - 31.

7 Gingles demonstration plans

7.1 Congressional alternatives

The state's enacted Congressional plan has two majority-BVAP districts (CD 4 and CD 13). Moving to the Black and Latino coalition, three more districts (CD 2, CD 5, and CD 7, by a hair) join these in being majority-BHVAP. However, if we switch the basis of population to CVAP rather than VAP, the number of coalition districts in the state's enacted plan drops to 4, losing CD 7.

Here, I have provided an alternative plan with 4/6/6 majority districts (by BVAP, BHVAP, and BHCVAP, respectively). That is, the six coalition-majority districts (CD 2, 3, 4, 5, 7, and 13) are still BH-majority on the basis of CVAP, making this a gain of two districts over the state. The newcomer to the list is CD 3, which runs along Georgia's western border, connecting the metro Atlanta area to Sanford Bishop's district in the southwest. By the notion of electoral effectiveness outlined in §5 below, all six of these districts offer an effective opportunity for Black and Latino voters to elect candidates of choice (Table 50).

	CD Enacted (Statewide)						**CD Alt 1**					
CD	Black VAP	Hisp VAP	BH VAP	White VAP	Polsby Popper	Reock	Black VAP	Hisp VAP	BH VAP	White VAP	Polsby Popper	Reock
1	28.2%	6.8%	35.0%	60.4%	0.285	0.456	30.3%	6.9%	37.2%	58.5%	0.312	0.633
2	49.3%	5.1%	54.4%	42.7%	0.267	0.458	47.7%	4.7%	52.4%	44.5%	0.315	0.494
3	23.3%	5.3%	28.6%	66.8%	0.275	0.461	51.2%	7.2%	58.4%	37.4%	0.278	0.411
4	54.5%	10.1%	64.6%	28.3%	0.246	0.307	50.6%	8.2%	58.8%	33.8%	0.295	0.481
5	49.6%	6.7%	56.3%	37.9%	0.322	0.512	50.1%	11.4%	61.5%	33.4%	0.216	0.424
6	9.9%	9.1%	19.0%	66.6%	0.198	0.424	13.7%	10.9%	24.6%	57.1%	0.232	0.346
7	29.8%	21.3%	51.1%	32.8%	0.386	0.496	34.3%	22.4%	56.7%	29.4%	0.351	0.518
8	30.0%	6.1%	36.1%	60.5%	0.210	0.338	27.3%	6.9%	34.2%	63.0%	0.227	0.377
9	10.4%	12.9%	23.3%	68.3%	0.253	0.380	4.6%	11.5%	16.1%	77.9%	0.403	0.512
10	22.6%	6.5%	29.1%	66.2%	0.284	0.558	17.6%	6.9%	24.5%	69.8%	0.335	0.576
11	17.9%	11.2%	29.1%	64.0%	0.207	0.480	17.6%	7.6%	25.2%	68.1%	0.283	0.364
12	36.7%	4.9%	41.6%	54.6%	0.278	0.502	39.2%	4.6%	43.8%	51.9%	0.181	0.489
13	66.7%	10.5%	77.2%	18.8%	0.157	0.380	52.0%	6.8%	58.8%	37.8%	0.276	0.510
14	14.3%	10.6%	24.9%	71.3%	0.373	0.426	7.6%	11.0%	18.6%	77.0%	0.514	0.484
Avg					0.267	0.441					0.301	0.473

Table 11: VAP statistics and compactness comparison by district for the enacted Congressional plan and an alternative plan. The alternative plan has more majority-minority districts; it is also more compact by all three scores of compactness, including both contour-based scores in the table as well as 4665 rather than 5075 cut edges. The alternative also splits only 13 counties while the enacted plan splits 15. CVAP comparison is shown below in Table 24.

7.2 State Senate alternatives

Overall, the enacted state Senate plan creates majority BVAP/BHVAP/BHCVAP majority districts in the numbers 14/17/17 out of 56. By mixing and matching the options I have provided, my modular alternatives can replace that with a new Senate plan with and additional 1-6 majority districts.

The increase is accomplished while maintaining other traditional principles—like compactness and splitting scores—that are generally comparable to or better than those of the state's enacted plan.

Below, I will review the Gingles demonstration alternatives one cluster at a time, showing the enacted plan and alternatives (which sometimes include both an Alt 1 and an Alt 2) for each cluster. The purpose of showing multiple alternatives is to illustrate the kinds of tradeoffs present in all redistricting problems, and to give a sense of the enormous range of possible directions for satisfying the Gingles 1 threshold test.

7.2.1 SD Atlanta

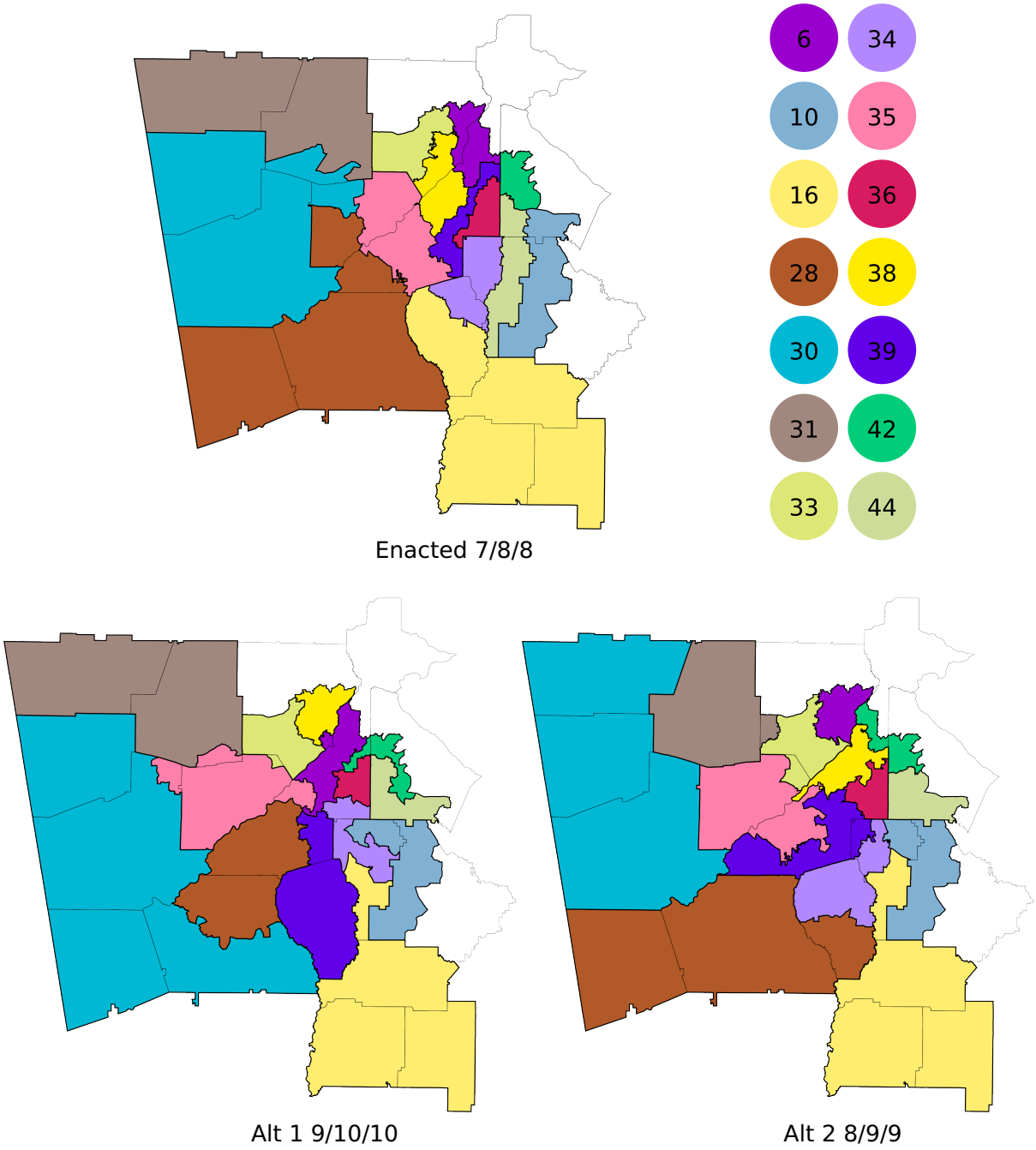


Figure 8: SD Atlanta (14 districts).

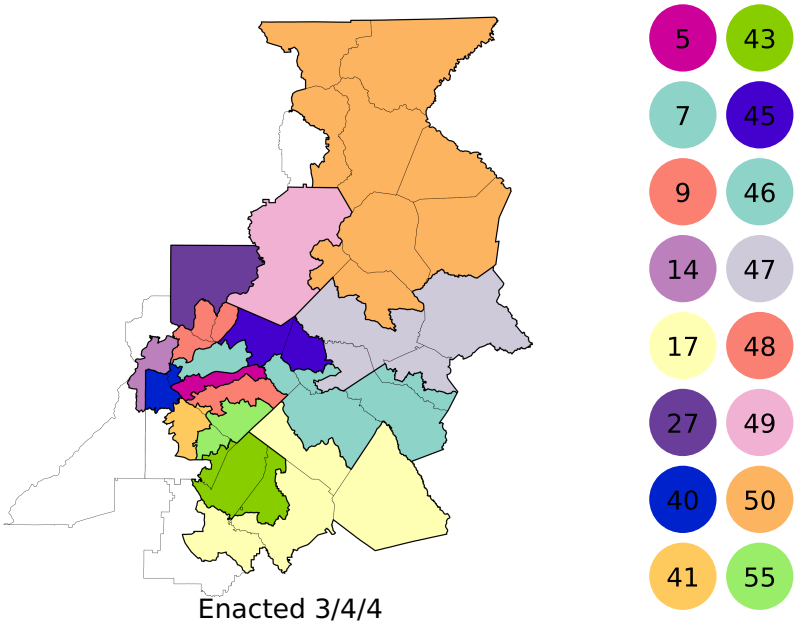
	SD Atlanta Enacted						**SD Alt 1**					
SD	Black VAP	Hisp VAP	BH VAP	White VAP	Polsby Popper	Reock	Black VAP	Hisp VAP	BH VAP	White VAP	Polsby Popper	Reock
6	23.9%	8.2%	32.1%	57.8%	0.236	0.405	50.1%	6.1%	56.2%	39.8%	0.169	0.246
10	71.5%	5.2%	76.7%	19.6%	0.231	0.281	59.5%	11.0%	70.5%	23.4%	0.238	0.420
16	22.7%	5.0%	27.7%	66.9%	0.314	0.368	50.2%	6.2%	56.4%	40.9%	0.254	0.354
28	19.5%	6.4%	25.9%	69.4%	0.246	0.445	50.6%	6.8%	57.4%	39.3%	0.335	0.489
30	20.9%	6.1%	27.0%	69.4%	0.407	0.597	14.3%	5.1%	19.4%	76.9%	0.286	0.361
31	20.7%	7.4%	28.1%	68.3%	0.379	0.366	19.7%	7.2%	26.9%	69.4%	0.470	0.395
33	43.0%	22.9%	65.9%	30.2%	0.215	0.401	50.4%	18.1%	68.5%	27.9%	0.381	0.528
34	69.5%	12.7%	82.2%	13.4%	0.335	0.451	72.2%	11.6%	83.8%	11.5%	0.163	0.326
35	71.9%	7.5%	79.4%	18.8%	0.263	0.472	50.9%	8.0%	58.9%	38.2%	0.347	0.400
36	51.3%	7.1%	58.4%	36.2%	0.305	0.321	50.0%	5.7%	55.7%	38.8%	0.339	0.452
38	65.3%	8.4%	73.7%	21.9%	0.208	0.361	27.9%	15.4%	43.3%	46.1%	0.271	0.487
39	60.7%	5.6%	66.3%	27.9%	0.128	0.166	51.2%	5.4%	56.6%	38.6%	0.277	0.357
42	30.8%	8.6%	39.4%	51.4%	0.321	0.479	35.8%	9.6%	45.4%	43.5%	0.112	0.289
44	71.3%	8.6%	79.9%	15.3%	0.185	0.180	61.6%	3.6%	65.2%	31.0%	0.237	0.356
Avg					0.270	0.378					0.277	0.390

Table 12: SD Atlanta Alt 1 splits 8 counties within the cluster compared to 7 in the enacted plan and has a better discrete compactness score, with 2017 cut edges rather than 2197, to go with comparable Polsby-Popper and superior Reock compactness.

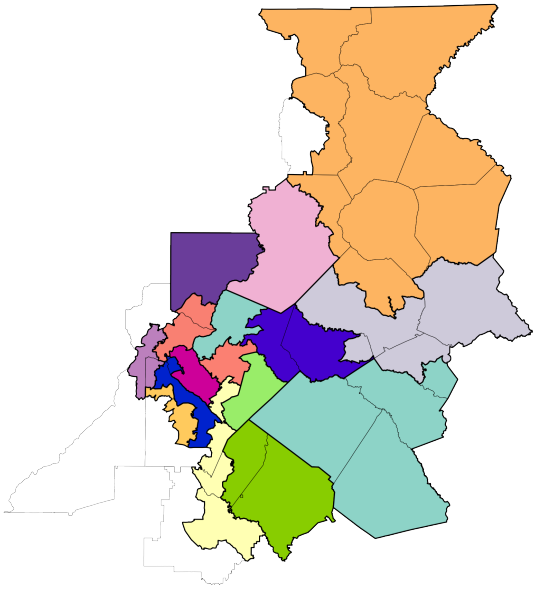
	SD Atlanta Enacted						**SD Alt 2**					
SD	Black VAP	Hisp VAP	BH VAP	White VAP	Polsby Popper	Reock	Black VAP	Hisp VAP	BH VAP	White VAP	Polsby Popper	Reock
6	23.9%	8.2%	32.1%	57.8%	0.236	0.405	28.0%	14.9%	42.9%	46.7%	0.256	0.477
10	71.5%	5.2%	76.7%	19.6%	0.231	0.281	59.7%	9.8%	69.5%	23.3%	0.307	0.416
16	22.7%	5.0%	27.7%	66.9%	0.314	0.368	48.4%	6.1%	54.5%	42.4%	0.258	0.366
28	19.5%	6.4%	25.9%	69.4%	0.246	0.445	15.8%	6.1%	21.9%	72.8%	0.347	0.371
30	20.9%	6.1%	27.0%	69.4%	0.407	0.597	15.7%	6.6%	22.3%	74.2%	0.473	0.508
31	20.7%	7.4%	28.1%	68.3%	0.379	0.366	25.9%	6.7%	32.6%	63.6%	0.591	0.636
33	43.0%	22.9%	65.9%	30.2%	0.215	0.401	50.6%	18.2%	68.8%	27.4%	0.224	0.463
34	69.5%	12.7%	82.2%	13.4%	0.335	0.451	54.4%	11.9%	66.3%	27.9%	0.246	0.381
35	71.9%	7.5%	79.4%	18.8%	0.263	0.472	60.9%	7.5%	68.4%	29.3%	0.206	0.490
36	51.3%	7.1%	58.4%	36.2%	0.305	0.321	54.0%	6.8%	60.8%	33.6%	0.263	0.466
38	65.3%	8.4%	73.7%	21.9%	0.208	0.361	51.0%	5.6%	56.6%	37.6%	0.154	0.260
39	60.7%	5.6%	66.3%	27.9%	0.128	0.166	86.5%	5.5%	92.0%	7.0%	0.118	0.271
42	30.8%	8.6%	39.4%	51.4%	0.321	0.479	17.0%	10.7%	27.7%	61.4%	0.144	0.282
44	71.3%	8.6%	79.9%	15.3%	0.185	0.180	76.3%	3.2%	79.5%	18.7%	0.374	0.456
Avg					0.270	0.378					0.283	0.417

Table 13: SD Atlanta Alt 2 splits 6 counties within the cluster and has just 1985 cut edges, better than the enacted plan's 7 and 2197, while also improving on both contour-based compactness scores.

7.2.2 SD Gwinnett



Enacted 3/4/4



Alt 1 4/7/6

Figure 9: SD Gwinnett (16 districts).

	SD Gwinnett Enacted						**SD Alt 1**					
SD	Black VAP	Hisp VAP	BH VAP	White VAP	Polsby Popper	Reock	Black VAP	Hisp VAP	BH VAP	White VAP	Polsby Popper	Reock
5	29.9%	41.7%	71.6%	15.7%	0.207	0.166	20.3%	34.6%	54.9%	28.0%	0.285	0.384
7	21.4%	16.6%	38.0%	37.8%	0.339	0.344	17.1%	14.3%	31.4%	45.5%	0.278	0.401
9	29.5%	18.8%	48.3%	35.8%	0.213	0.233	29.3%	27.0%	56.3%	26.2%	0.234	0.498
14	19.0%	12.1%	31.1%	57.1%	0.242	0.273	18.1%	11.4%	29.5%	57.6%	0.208	0.296
17	32.0%	5.1%	37.1%	59.4%	0.168	0.342	51.1%	6.6%	57.7%	35.9%	0.113	0.188
27	5.0%	10.2%	15.2%	71.5%	0.456	0.499	4.7%	10.2%	14.9%	70.8%	0.500	0.497
40	19.2%	21.6%	40.8%	46.3%	0.345	0.508	50.1%	17.7%	67.8%	25.1%	0.130	0.208
41	62.6%	6.7%	69.3%	21.4%	0.302	0.509	57.3%	10.0%	67.3%	23.3%	0.149	0.279
43	64.3%	6.9%	71.2%	26.5%	0.346	0.635	52.0%	7.0%	59.0%	38.3%	0.420	0.537
45	18.6%	13.1%	31.7%	55.5%	0.305	0.350	19.8%	12.1%	31.9%	58.8%	0.226	0.380
46	16.9%	7.0%	23.9%	69.9%	0.207	0.365	16.5%	5.0%	21.5%	73.4%	0.416	0.514
47	17.4%	9.6%	27.0%	67.5%	0.187	0.353	16.7%	8.7%	25.4%	68.5%	0.176	0.326
48	9.5%	7.0%	16.5%	52.2%	0.342	0.348	10.1%	6.4%	16.5%	54.8%	0.266	0.387
49	8.0%	21.9%	29.9%	65.6%	0.341	0.461	8.1%	24.6%	32.7%	62.8%	0.382	0.573
50	5.6%	8.8%	14.4%	81.5%	0.228	0.450	5.4%	6.1%	11.5%	84.3%	0.232	0.462
55	66.0%	8.7%	74.7%	20.6%	0.271	0.333	50.0%	13.9%	63.9%	30.0%	0.419	0.451
Avg					0.281	0.386					0.277	0.399

Table 14: SD Gwinnett Alt 1 has 9 splits and 2024 cut edges, both better than the enacted plan (10 and 2232). The Polsby-Popper scores are comparable while the alternative plan has a better Reock score.

7.2.3 SD East Black Belt

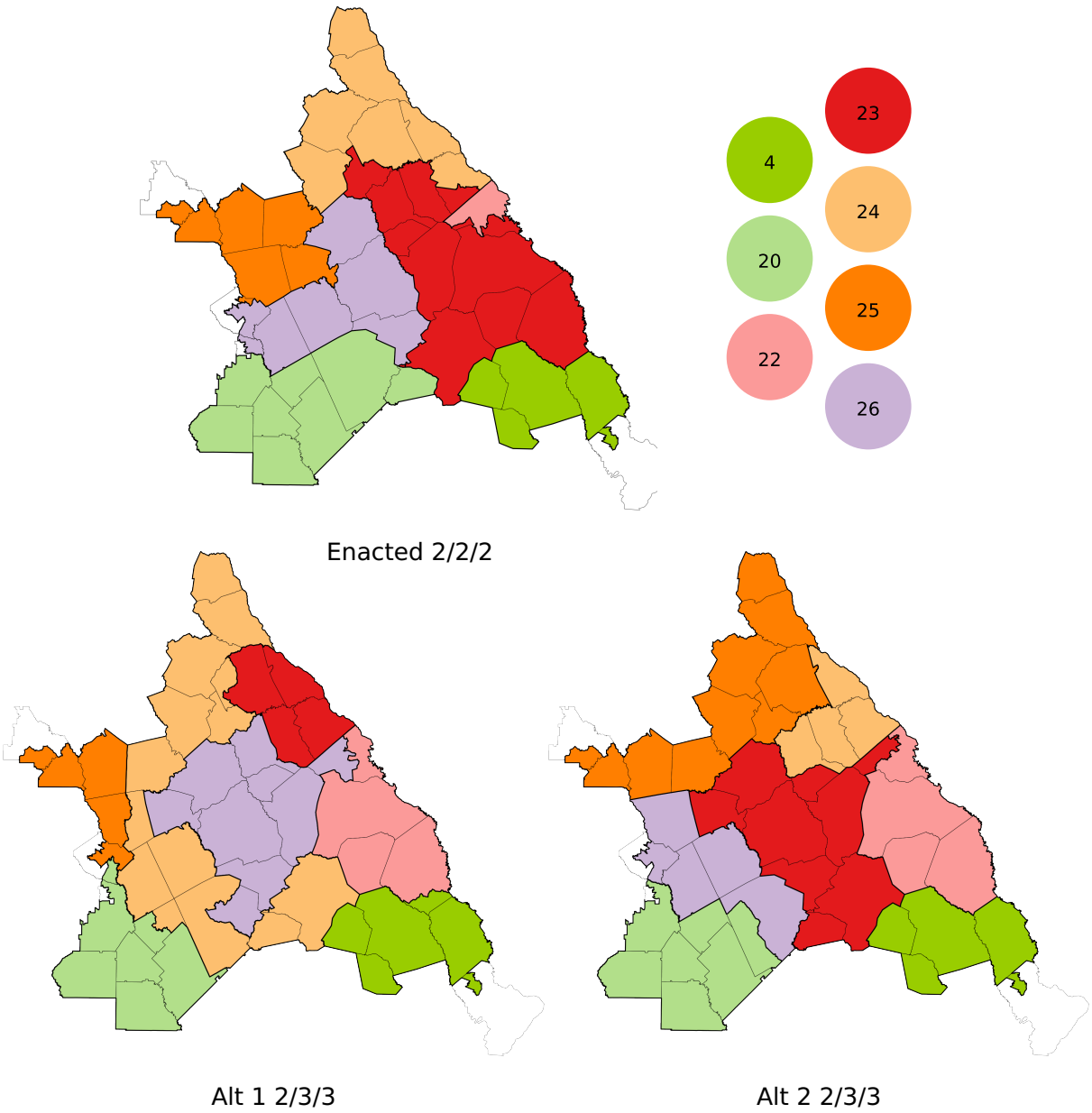


Figure 10: SD East Black Belt (7 districts).

	SD East Black Belt Enacted						**SD Alt 1**					
SD	Black VAP	Hisp VAP	BH VAP	White VAP	Polsby Popper	Reock	Black VAP	Hisp VAP	BH VAP	White VAP	Polsby Popper	Reock
4	23.4%	5.5%	28.9%	66.8%	0.265	0.471	23.5%	5.5%	29.0%	66.7%	0.284	0.495
20	31.3%	3.5%	34.8%	61.7%	0.358	0.404	34.4%	5.1%	39.5%	56.5%	0.231	0.498
22	56.5%	5.3%	61.8%	34.4%	0.288	0.404	50.5%	3.8%	54.3%	42.6%	0.241	0.455
23	35.5%	4.5%	40.0%	56.9%	0.164	0.365	23.0%	5.6%	28.6%	64.6%	0.466	0.497
24	19.9%	4.4%	24.3%	69.8%	0.213	0.366	25.0%	3.5%	28.5%	69.1%	0.083	0.229
25	33.5%	3.7%	37.2%	59.9%	0.241	0.386	50.0%	4.0%	54.0%	43.4%	0.174	0.344
26	57.0%	4.2%	61.2%	36.6%	0.203	0.469	50.1%	3.7%	53.8%	43.4%	0.209	0.472
Avg					0.247	0.409					0.241	0.427

Table 15: SD East Black Belt Alt 1 has more cut edges than the state (1301 vs. 1021 from the enacted plan), paired with a comparable Polsby-Popper and a superior Reock score. This alternative plan splits seven counties while the state splits four within the cluster.

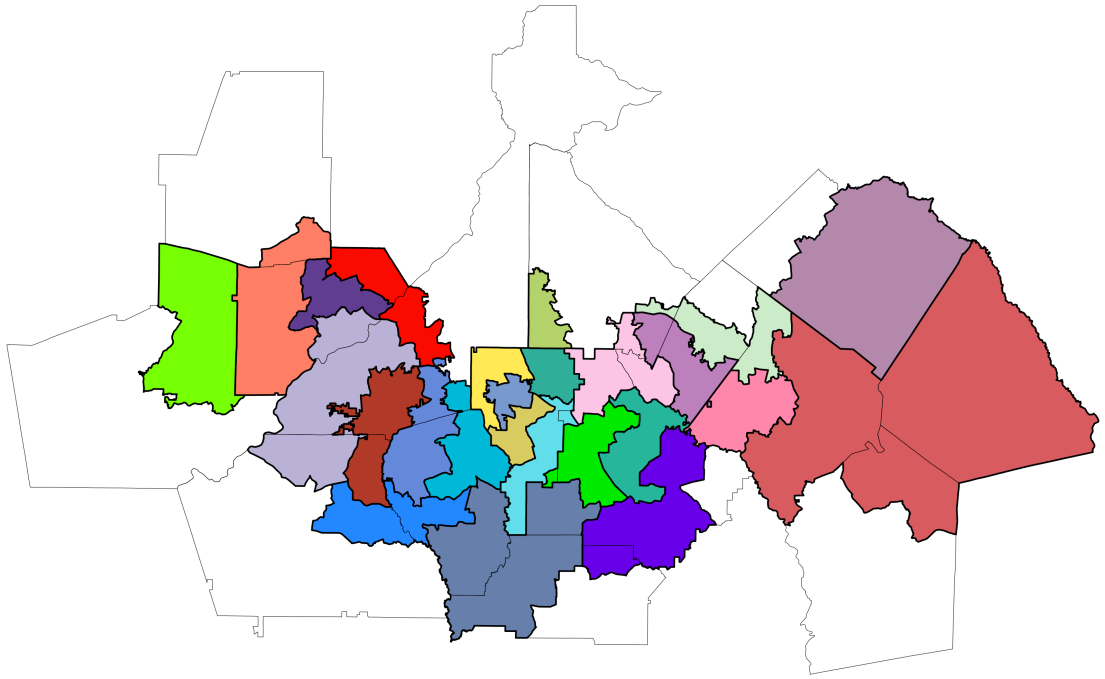
	SD East Black Belt Enacted						**SD Alt 2**					
SD	Black VAP	Hisp VAP	BH VAP	White VAP	Polsby Popper	Reock	Black VAP	Hisp VAP	BH VAP	White VAP	Polsby Popper	Reock
4	23.4%	5.5%	28.9%	66.8%	0.265	0.471	23.4%	5.5%	28.9%	66.8%	0.265	0.471
20	31.3%	3.5%	34.8%	61.7%	0.358	0.404	32.5%	4.9%	37.4%	58.7%	0.304	0.586
22	56.5%	5.3%	61.8%	34.4%	0.288	0.404	50.4%	3.5%	53.9%	42.9%	0.264	0.432
23	35.5%	4.5%	40.0%	56.9%	0.164	0.365	47.4%	4.1%	51.5%	45.8%	0.231	0.441
24	19.9%	4.4%	24.3%	69.8%	0.213	0.366	23.1%	5.6%	28.7%	64.5%	0.327	0.458
25	33.5%	3.7%	37.2%	59.9%	0.241	0.386	28.2%	4.5%	32.7%	64.3%	0.176	0.311
26	57.0%	4.2%	61.2%	36.6%	0.203	0.469	51.2%	3.1%	54.3%	43.5%	0.205	0.331
Avg					0.247	0.409					0.253	0.433

Table 16: SD East Black Belt Alt 2 has just two county splits, compared to four in the state's plan. With just 1008 cut edges, it also executes a clean sweep of compactness scores relative to the enacted plan.

7.3 State House alternatives

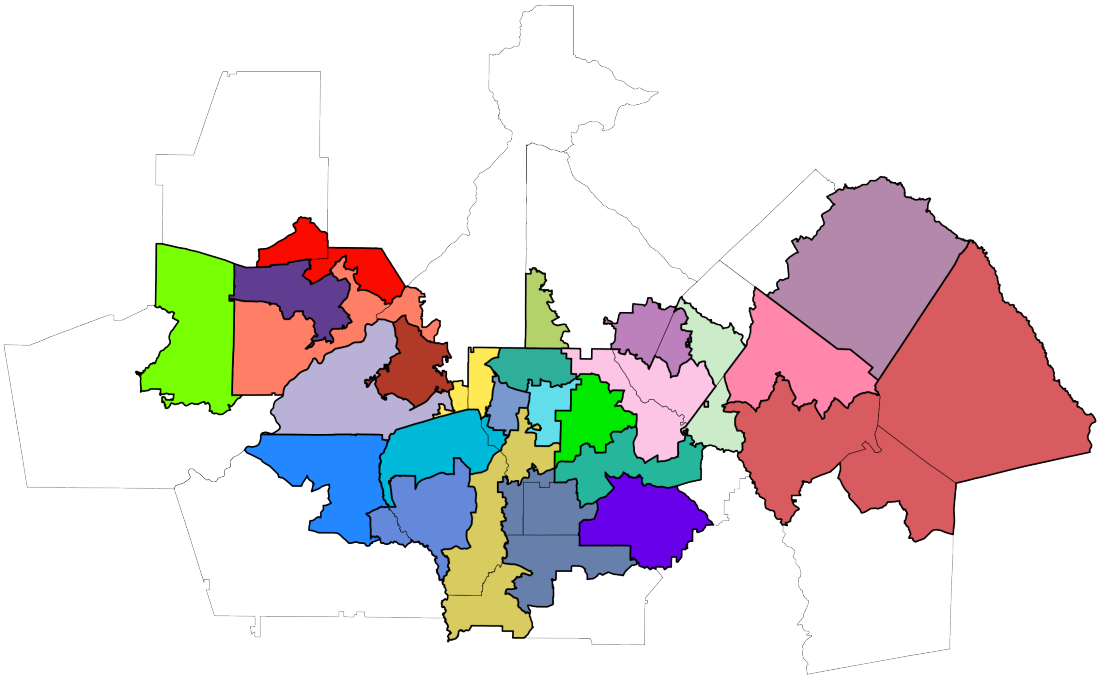
In the state House, the enacted plan creates majority districts for BVAP/BHVAP/BHCVAP in the numbers 49/62/60 out of 180. Taken together, my modular alternatives can combine to replace that with a new House plan with up to 77 majority-BHVAP districts and up to 74 majority-BHCVAP districts.

7.3.1 HD Atlanta

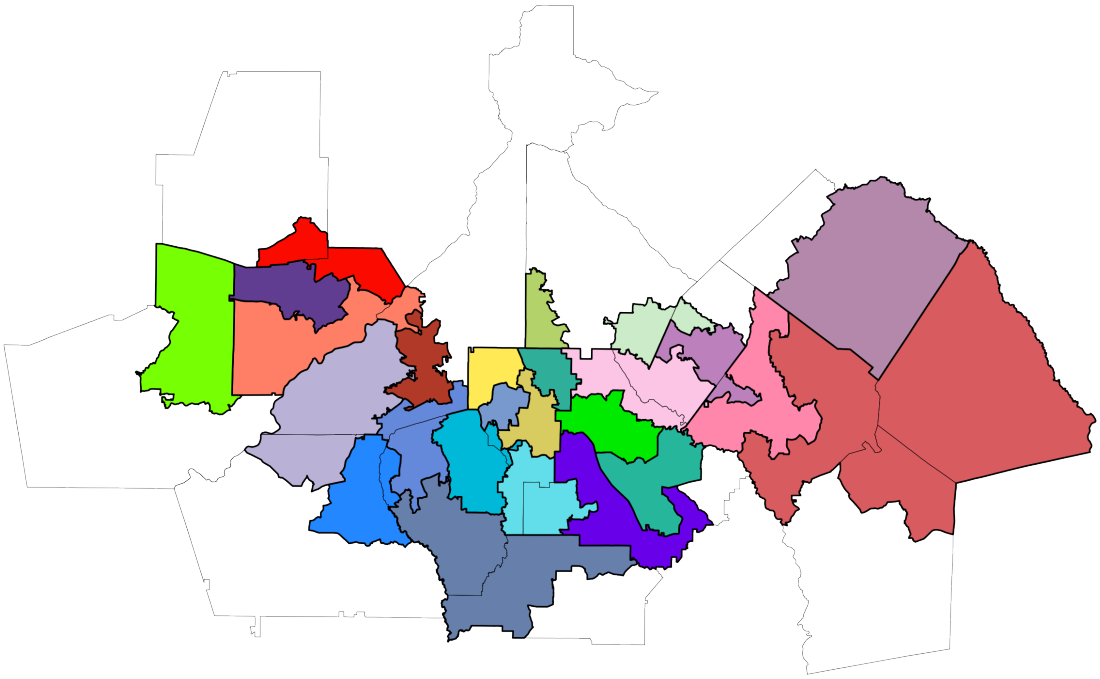


Enacted 18/18/18

Figure 11: HD Atlanta (25 districts).



Alt 1 20/20/20



Alt 2 19/20/20

Figure 12: HD Atlanta (25 districts).

	HD Atlanta Enacted						**HD Alt 1**					
HD	Black VAP	Hisp VAP	BH VAP	White VAP	Polsby Popper	Reock	Black VAP	Hisp VAP	BH VAP	White VAP	Polsby Popper	Reock
61	74.3%	7.6%	81.9%	16.8%	0.198	0.247	50.1%	10.0%	60.1%	37.1%	0.229	0.265
64	30.7%	7.4%	38.1%	57.8%	0.361	0.365	50.9%	6.5%	57.4%	40.0%	0.132	0.263
65	62.0%	4.5%	66.5%	31.5%	0.172	0.454	81.7%	4.7%	86.4%	12.5%	0.222	0.350
66	53.4%	9.5%	62.9%	33.9%	0.246	0.356	51.0%	9.0%	60.0%	36.2%	0.256	0.386
67	58.9%	7.8%	66.7%	30.9%	0.122	0.357	89.9%	5.4%	95.3%	4.4%	0.195	0.515
68	55.7%	6.3%	62.0%	33.9%	0.172	0.318	13.7%	6.6%	20.3%	71.5%	0.310	0.518
69	63.6%	5.4%	69.0%	26.9%	0.247	0.403	51.9%	8.8%	60.7%	34.0%	0.339	0.409
71	19.9%	6.2%	26.1%	69.8%	0.352	0.441	19.9%	6.2%	26.1%	69.8%	0.350	0.441
73	12.1%	7.0%	19.1%	72.6%	0.198	0.278	11.8%	6.4%	18.2%	75.9%	0.335	0.417
74	25.5%	5.6%	31.1%	64.4%	0.247	0.496	50.8%	6.9%	57.7%	39.7%	0.205	0.461
75	74.4%	11.3%	85.7%	11.3%	0.285	0.420	54.2%	7.7%	61.9%	34.1%	0.133	0.230
76	67.2%	13.2%	80.4%	10.5%	0.509	0.524	61.6%	20.0%	81.6%	11.2%	0.460	0.409
77	76.1%	12.2%	88.3%	7.6%	0.211	0.396	89.6%	5.0%	94.6%	3.5%	0.211	0.292
78	71.6%	8.9%	80.5%	15.0%	0.194	0.210	64.2%	11.3%	75.5%	15.4%	0.256	0.414
79	71.6%	16.0%	87.6%	7.1%	0.209	0.498	73.3%	14.6%	87.9%	8.0%	0.370	0.444
90	58.5%	4.3%	62.8%	34.0%	0.286	0.359	58.5%	4.3%	62.8%	34.0%	0.286	0.359
91	70.0%	5.9%	75.9%	22.0%	0.202	0.447	50.3%	5.2%	55.5%	40.7%	0.245	0.384
92	68.8%	4.7%	73.5%	24.1%	0.198	0.361	87.6%	3.5%	91.1%	8.3%	0.260	0.543
93	65.4%	9.6%	75.0%	22.9%	0.112	0.260	62.1%	10.4%	72.5%	25.4%	0.160	0.232
112	19.2%	3.3%	22.5%	73.7%	0.522	0.619	19.2%	3.3%	22.5%	73.7%	0.522	0.619
113	59.5%	6.7%	66.2%	31.8%	0.318	0.501	51.0%	5.1%	56.1%	41.2%	0.338	0.425
114	24.7%	3.7%	28.4%	68.8%	0.283	0.502	32.8%	4.4%	37.2%	60.3%	0.267	0.438
115	52.1%	7.0%	59.1%	36.9%	0.226	0.436	50.2%	6.0%	56.2%	38.6%	0.193	0.282
116	58.1%	7.3%	65.4%	27.2%	0.280	0.407	54.8%	8.0%	62.8%	29.6%	0.333	0.478
117	36.6%	5.4%	42.0%	54.5%	0.275	0.408	51.0%	7.2%	58.2%	39.0%	0.409	0.511
Avg					0.257	0.402					0.281	0.403

Table 17: In HD Atlanta, the enacted plan has 10 county splits and 2221 cut edges. Alt 1 maintains 10 county splits and improves to 1988 cut edges.

	HD Atlanta Enacted						**HD Alt 2**					
HD	Black VAP	Hisp VAP	BH VAP	White VAP	Polsby Popper	Reock	Black VAP	Hisp VAP	BH VAP	White VAP	Polsby Popper	Reock
61	74.3%	7.6%	81.9%	16.8%	0.198	0.247	47.4%	10.1%	57.5%	39.6%	0.290	0.276
64	30.7%	7.4%	38.1%	57.8%	0.361	0.365	50.5%	6.8%	57.3%	40.0%	0.201	0.271
65	62.0%	4.5%	66.5%	31.5%	0.172	0.454	67.6%	4.1%	71.7%	26.6%	0.302	0.458
66	53.4%	9.5%	62.9%	33.9%	0.246	0.356	51.2%	9.1%	60.3%	36.0%	0.336	0.407
67	58.9%	7.8%	66.7%	30.9%	0.122	0.357	90.4%	5.3%	95.7%	4.0%	0.131	0.428
68	55.7%	6.3%	62.0%	33.9%	0.172	0.318	58.2%	6.8%	65.0%	31.0%	0.168	0.329
69	63.6%	5.4%	69.0%	26.9%	0.247	0.403	54.6%	6.3%	60.9%	34.4%	0.310	0.538
71	19.9%	6.2%	26.1%	69.8%	0.352	0.441	19.9%	6.2%	26.1%	69.8%	0.352	0.441
73	12.1%	7.0%	19.1%	72.6%	0.198	0.278	11.9%	7.0%	18.9%	73.6%	0.373	0.498
74	25.5%	5.6%	31.1%	64.4%	0.247	0.496	12.8%	5.7%	18.5%	75.5%	0.192	0.320
75	74.4%	11.3%	85.7%	11.3%	0.285	0.420	61.4%	12.0%	73.4%	17.6%	0.225	0.404
76	67.2%	13.2%	80.4%	10.5%	0.509	0.524	70.4%	13.2%	83.6%	9.6%	0.352	0.416
77	76.1%	12.2%	88.3%	7.6%	0.211	0.396	77.0%	12.6%	89.6%	7.0%	0.491	0.510
78	71.6%	8.9%	80.5%	15.0%	0.194	0.210	68.6%	8.4%	77.0%	21.0%	0.325	0.540
79	71.6%	16.0%	87.6%	7.1%	0.209	0.498	73.1%	15.5%	88.6%	7.5%	0.357	0.549
90	58.5%	4.3%	62.8%	34.0%	0.286	0.359	58.5%	4.3%	62.8%	34.0%	0.286	0.359
91	70.0%	5.9%	75.9%	22.0%	0.202	0.447	53.0%	5.2%	58.2%	38.4%	0.231	0.369
92	68.8%	4.7%	73.5%	24.1%	0.198	0.361	69.6%	6.9%	76.5%	21.3%	0.174	0.330
93	65.4%	9.6%	75.0%	22.9%	0.112	0.260	85.5%	7.2%	92.7%	7.0%	0.201	0.329
112	19.2%	3.3%	22.5%	73.7%	0.522	0.619	19.2%	3.3%	22.5%	73.7%	0.522	0.619
113	59.5%	6.7%	66.2%	31.8%	0.318	0.501	53.9%	5.6%	59.5%	37.9%	0.153	0.355
114	24.7%	3.7%	28.4%	68.8%	0.283	0.502	24.9%	3.8%	28.7%	68.6%	0.235	0.487
115	52.1%	7.0%	59.1%	36.9%	0.226	0.436	50.3%	6.9%	57.2%	39.8%	0.304	0.475
116	58.1%	7.3%	65.4%	27.2%	0.280	0.407	53.2%	7.9%	61.1%	31.0%	0.382	0.452
117	36.6%	5.4%	42.0%	54.5%	0.275	0.408	50.1%	6.5%	56.6%	38.4%	0.155	0.323
Avg					0.257	0.402					0.282	0.419

Table 18: With 9 county splits and 1995 cut edges, Alt 2 dominates the enacted plan.

7.3.2 HD Southwest

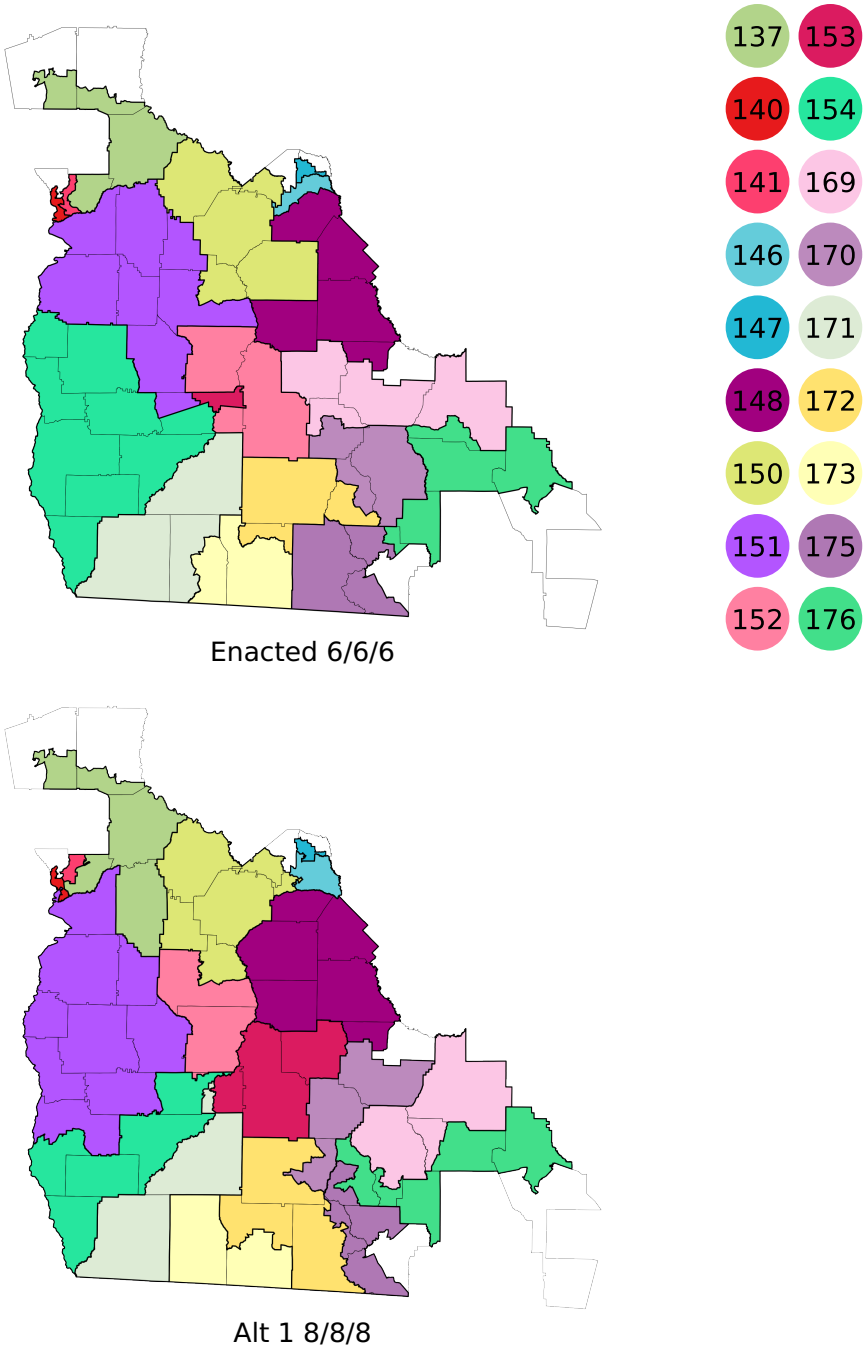


Figure 13: HD Southwest (18 districts).

	HD Southwest Enacted						**HD Alt 1**					
HD	Black VAP	Hisp VAP	BH VAP	White VAP	Polsby Popper	Reock	Black VAP	Hisp VAP	BH VAP	White VAP	Polsby Popper	Reock
137	52.1%	4.5%	56.6%	40.8%	0.165	0.328	51.7%	3.7%	55.4%	42.0%	0.143	0.259
140	57.6%	8.0%	65.6%	31.7%	0.192	0.289	57.1%	7.9%	65.0%	32.4%	0.197	0.257
141	57.5%	6.6%	64.1%	31.8%	0.200	0.261	53.6%	6.7%	60.3%	35.5%	0.299	0.423
146	27.6%	4.7%	32.3%	61.8%	0.195	0.257	23.3%	4.9%	28.2%	64.4%	0.208	0.468
147	30.1%	7.2%	37.3%	55.3%	0.261	0.331	31.8%	7.2%	39.0%	55.1%	0.220	0.341
148	34.0%	3.1%	37.1%	60.4%	0.235	0.438	38.6%	3.4%	42.0%	56.1%	0.388	0.590
150	53.6%	6.1%	59.7%	38.3%	0.275	0.439	51.2%	5.3%	56.5%	41.5%	0.250	0.544
151	42.4%	7.3%	49.7%	47.2%	0.222	0.528	51.0%	7.5%	58.5%	38.6%	0.275	0.424
152	26.1%	2.3%	28.4%	67.9%	0.297	0.394	34.2%	3.2%	37.4%	58.7%	0.314	0.473
153	67.9%	2.5%	70.4%	27.7%	0.297	0.298	52.9%	2.7%	55.6%	43.0%	0.400	0.536
154	54.8%	1.7%	56.5%	42.2%	0.332	0.410	50.1%	2.1%	52.2%	45.7%	0.175	0.261
169	29.0%	7.7%	36.7%	61.0%	0.226	0.283	24.0%	9.0%	33.0%	64.6%	0.296	0.456
170	24.2%	8.7%	32.9%	64.2%	0.342	0.531	26.8%	12.5%	39.3%	57.9%	0.223	0.285
171	39.6%	4.6%	44.2%	53.9%	0.368	0.347	51.0%	4.0%	55.0%	43.4%	0.249	0.275
172	23.3%	13.4%	36.7%	61.0%	0.316	0.437	25.1%	9.4%	34.5%	63.1%	0.217	0.375
173	36.3%	5.4%	41.7%	55.7%	0.378	0.564	35.4%	5.6%	41.0%	56.4%	0.412	0.424
175	24.2%	5.0%	29.2%	66.5%	0.374	0.472	21.0%	5.7%	26.7%	68.7%	0.143	0.273
176	22.7%	8.2%	30.9%	66.2%	0.160	0.335	23.8%	6.2%	30.0%	67.1%	0.116	0.227
Avg					0.269	0.386					0.252	0.383

Table 19: HD Southwest Alt 1 splits 12 counties within the cluster, to the state's 10 split counties. Its 2290 cut edges are more than the state's 2094, though the Reock scores are nearly identical.

7.3.3 HD East Black Belt

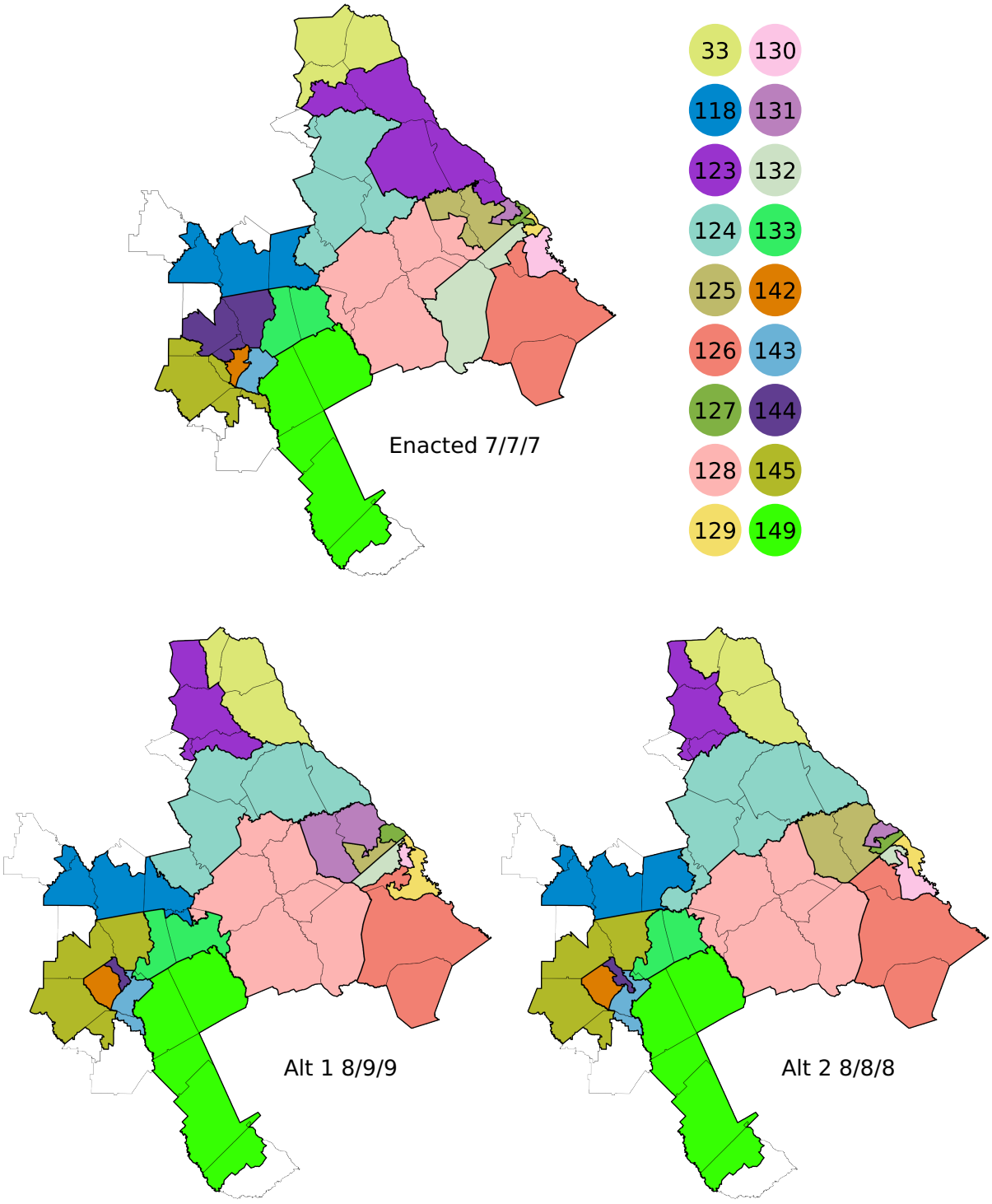


Figure 14: HD East Black Belt (18 districts).

	HD East Black Belt Enacted						**HD Alt 1**					
HD	Black VAP	Hisp VAP	BH VAP	White VAP	Polsby Popper	Reock	Black VAP	Hisp VAP	BH VAP	White VAP	Polsby Popper	Reock
33	11.2%	3.1%	14.3%	82.3%	0.371	0.487	18.7%	3.8%	22.5%	74.6%	0.405	0.343
118	23.6%	3.7%	27.3%	69.7%	0.223	0.350	23.2%	3.1%	26.3%	70.6%	0.218	0.329
123	24.3%	4.3%	28.6%	68.1%	0.178	0.295	13.3%	5.8%	19.1%	76.3%	0.281	0.357
124	25.6%	6.2%	31.8%	65.0%	0.233	0.442	28.4%	4.7%	33.1%	64.4%	0.224	0.362
125	23.7%	7.7%	31.4%	63.0%	0.173	0.409	24.1%	8.0%	32.1%	61.5%	0.255	0.328
126	54.5%	3.2%	57.7%	40.0%	0.414	0.516	52.5%	3.5%	56.0%	41.6%	0.322	0.534
127	18.5%	4.8%	23.3%	68.1%	0.201	0.351	14.6%	4.9%	19.5%	70.1%	0.585	0.546
128	50.4%	1.7%	52.1%	46.5%	0.319	0.601	50.1%	1.6%	51.7%	46.7%	0.357	0.628
129	54.9%	4.3%	59.2%	37.2%	0.254	0.482	51.9%	3.5%	55.4%	40.7%	0.108	0.314
130	59.9%	3.9%	63.8%	33.7%	0.255	0.508	54.4%	4.3%	58.7%	38.7%	0.253	0.451
131	17.6%	5.9%	23.5%	68.2%	0.283	0.377	27.1%	5.1%	32.2%	63.3%	0.285	0.604
132	52.3%	7.8%	60.1%	35.6%	0.296	0.270	53.6%	8.2%	61.8%	33.1%	0.293	0.243
133	36.8%	2.1%	38.9%	58.4%	0.415	0.543	48.7%	2.0%	50.7%	47.2%	0.178	0.385
142	59.5%	3.7%	63.2%	34.8%	0.229	0.353	50.8%	3.7%	54.5%	42.3%	0.539	0.605
143	60.8%	4.7%	65.5%	32.3%	0.299	0.502	52.4%	6.3%	58.7%	38.4%	0.176	0.332
144	29.3%	2.6%	31.9%	63.0%	0.325	0.510	50.4%	4.3%	54.7%	41.3%	0.299	0.298
145	35.7%	5.9%	41.6%	55.1%	0.194	0.376	23.1%	2.8%	25.9%	71.1%	0.204	0.422
149	32.1%	5.7%	37.8%	61.0%	0.223	0.325	32.1%	5.7%	37.8%	61.0%	0.223	0.325
Avg					0.271	0.428					0.289	0.411

Table 20: The Alt 1 map has 10 split counties within the HD East Black Belt cluster, while the enacted plan has 9. Its 1775 cut edges improves on the state's 1887, while also being more compact by Polsby-Popper.

	HD East Black Belt Enacted						**HD Alt 2**					
HD	Black VAP	Hisp VAP	BH VAP	White VAP	Polsby Popper	Reock	Black VAP	Hisp VAP	BH VAP	White VAP	Polsby Popper	Reock
33	11.2%	3.1%	14.3%	82.3%	0.371	0.487	18.3%	3.5%	21.8%	75.2%	0.370	0.323
118	23.6%	3.7%	27.3%	69.7%	0.223	0.350	27.0%	4.1%	31.1%	65.9%	0.229	0.342
123	24.3%	4.3%	28.6%	68.1%	0.178	0.295	13.7%	6.0%	19.7%	75.8%	0.293	0.395
124	25.6%	6.2%	31.8%	65.0%	0.233	0.442	25.5%	3.8%	29.3%	68.1%	0.234	0.381
125	23.7%	7.7%	31.4%	63.0%	0.173	0.409	30.2%	6.1%	36.3%	60.1%	0.396	0.670
126	54.5%	3.2%	57.7%	40.0%	0.414	0.516	50.7%	4.2%	54.9%	42.3%	0.394	0.494
127	18.5%	4.8%	23.3%	68.1%	0.201	0.351	17.6%	6.2%	23.8%	67.2%	0.267	0.264
128	50.4%	1.7%	52.1%	46.5%	0.319	0.601	50.2%	1.5%	51.7%	46.8%	0.409	0.672
129	54.9%	4.3%	59.2%	37.2%	0.254	0.482	50.4%	3.6%	54.0%	41.8%	0.248	0.323
130	59.9%	3.9%	63.8%	33.7%	0.255	0.508	57.1%	4.7%	61.8%	35.4%	0.231	0.325
131	17.6%	5.9%	23.5%	68.2%	0.283	0.377	17.6%	5.7%	23.3%	67.8%	0.318	0.373
132	52.3%	7.8%	60.1%	35.6%	0.296	0.270	54.4%	7.1%	61.5%	34.1%	0.219	0.278
133	36.8%	2.1%	38.9%	58.4%	0.415	0.543	46.6%	2.1%	48.7%	49.0%	0.296	0.438
142	59.5%	3.7%	63.2%	34.8%	0.229	0.353	50.1%	3.8%	53.9%	42.9%	0.436	0.605
143	60.8%	4.7%	65.5%	32.3%	0.299	0.502	52.9%	6.3%	59.2%	38.0%	0.143	0.316
144	29.3%	2.6%	31.9%	63.0%	0.325	0.510	51.0%	4.2%	55.2%	40.8%	0.226	0.243
145	35.7%	5.9%	41.6%	55.1%	0.194	0.376	23.1%	2.8%	25.9%	71.1%	0.190	0.359
149	32.1%	5.7%	37.8%	61.0%	0.223	0.325	32.1%	5.7%	37.8%	61.0%	0.223	0.325
Avg					0.271	0.428					0.285	0.396

Table 21: Alt 2 eliminates one county split relative to the enacted plan and has a sharply improved 1604 cut edges.

7.3.4 HD Southeast

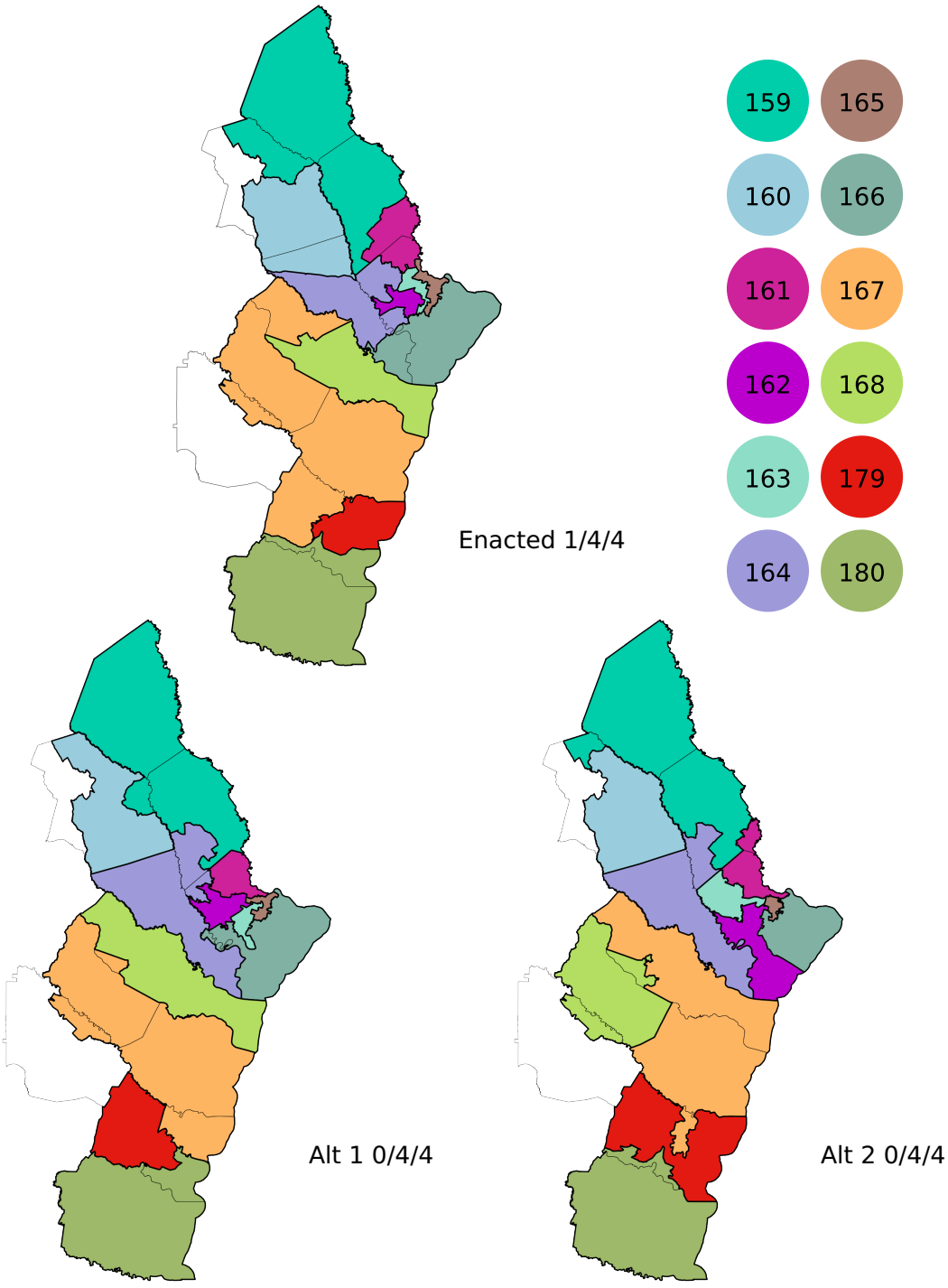


Figure 15: HD Southeast (12 districts).

	HD Southeast Enacted						**HD Alt 1**					
HD	Black VAP	Hisp VAP	BH VAP	White VAP	Polsby Popper	Reock	Black VAP	Hisp VAP	BH VAP	White VAP	Polsby Popper	Reock
159	24.5%	2.9%	27.4%	69.4%	0.219	0.345	22.2%	3.7%	25.9%	70.5%	0.204	0.358
160	22.6%	5.0%	27.6%	68.5%	0.369	0.483	26.6%	5.1%	31.7%	64.7%	0.242	0.373
161	27.1%	6.8%	33.9%	60.2%	0.306	0.511	42.1%	8.8%	50.9%	42.7%	0.359	0.475
162	43.7%	9.6%	53.3%	40.6%	0.211	0.366	39.9%	10.5%	50.4%	42.6%	0.147	0.372
163	45.5%	7.4%	52.9%	41.9%	0.175	0.271	44.0%	6.9%	50.9%	43.7%	0.244	0.335
164	23.5%	8.5%	32.0%	60.6%	0.167	0.299	12.9%	5.1%	18.0%	76.5%	0.143	0.309
165	50.3%	5.3%	55.6%	39.2%	0.162	0.230	47.3%	4.7%	52.0%	42.9%	0.189	0.380
166	5.7%	4.1%	9.8%	84.7%	0.364	0.429	7.2%	4.7%	11.9%	82.4%	0.245	0.459
167	22.3%	7.4%	29.7%	66.0%	0.192	0.417	20.0%	6.2%	26.2%	70.1%	0.266	0.327
168	46.3%	10.3%	56.6%	39.3%	0.258	0.243	45.9%	10.7%	56.6%	39.2%	0.236	0.246
179	27.0%	6.4%	33.4%	63.7%	0.417	0.451	32.0%	7.5%	39.5%	56.9%	0.433	0.539
180	18.2%	5.6%	23.8%	71.2%	0.396	0.606	17.0%	5.4%	22.4%	72.8%	0.348	0.594
Avg					0.270	0.388					0.255	0.397

Table 22: HD Southeast Alt 1 has fewer county splits (5 vs. 6) and a better cut edges score (1122 vs. 1245) than the enacted plan.

	HD Southeast Enacted						**HD Alt 2**					
HD	Black VAP	Hisp VAP	BH VAP	White VAP	Polsby Popper	Reock	Black VAP	Hisp VAP	BH VAP	White VAP	Polsby Popper	Reock
159	24.5%	2.9%	27.4%	69.4%	0.219	0.345	22.0%	3.6%	25.6%	70.7%	0.192	0.356
160	22.6%	5.0%	27.6%	68.5%	0.369	0.483	26.3%	5.1%	31.4%	64.9%	0.333	0.515
161	27.1%	6.8%	33.9%	60.2%	0.306	0.511	41.6%	10.0%	51.6%	42.2%	0.180	0.332
162	43.7%	9.6%	53.3%	40.6%	0.211	0.366	43.0%	8.5%	51.5%	42.5%	0.191	0.341
163	45.5%	7.4%	52.9%	41.9%	0.175	0.271	42.7%	7.7%	50.4%	43.1%	0.282	0.411
164	23.5%	8.5%	32.0%	60.6%	0.167	0.299	13.4%	5.5%	18.9%	75.6%	0.168	0.290
165	50.3%	5.3%	55.6%	39.2%	0.162	0.230	45.5%	5.0%	50.5%	44.4%	0.229	0.501
166	5.7%	4.1%	9.8%	84.7%	0.364	0.429	7.2%	4.1%	11.3%	83.0%	0.391	0.653
167	22.3%	7.4%	29.7%	66.0%	0.192	0.417	36.5%	7.4%	43.9%	52.5%	0.204	0.331
168	46.3%	10.3%	56.6%	39.3%	0.258	0.243	40.9%	10.8%	51.7%	44.3%	0.327	0.555
179	27.0%	6.4%	33.4%	63.7%	0.417	0.451	18.7%	6.0%	24.7%	71.6%	0.196	0.454
180	18.2%	5.6%	23.8%	71.2%	0.396	0.606	18.6%	5.7%	24.3%	70.7%	0.346	0.577
Avg					0.270	0.388					0.253	0.443

Table 23: Alt 2 also has just 5 county splits, to go with 1263 cut edges.

8 Secondary population estimates for coalition districts

Above, in §3.2, I described my construction of an estimated citizen voting age population for the state of Georgia. In this section, I confirm that nearly all of the majority-BHVAP districts in my alternative plans are still majority districts by BHCVAP.

	CD enacted	
CD	BH VAP	BH CVAP
1	34.5%	33.4%
2	54.0%	53.5%
3	28.3%	27.2%
4	63.9%	63.3%
5	55.6%	55.8%
6	18.7%	16.6%
7	50.2%	46.6%
8	35.8%	34.5%
9	23.0%	18.2%
10	28.8%	27.2%
11	28.7%	25.1%
12	41.2%	40.7%
13	76.3%	76.0%
14	24.6%	20.5%

	CD Alt	
CD	BH VAP	BH CVAP
1	36.6%	35.6%
2	51.8%	51.6%
3	57.7%	57.1%
4	58.0%	57.7%
5	60.6%	59.8%
6	24.0%	21.6%
7	55.5%	52.4%
8	33.8%	32.0%
9	15.9%	11.0%
10	24.2%	22.5%
11	24.7%	22.6%
12	43.2%	43.1%
13	57.9%	57.0%
14	18.3%	13.9%

Table 24: The enacted Congressional plan has 5 majority-BHVAP districts, but only four majority districts by BHCVAP. My alternative Congressional plan has 6 majority-BH districts by both either basis of population.

Next, I will present the statistics for the Alt Eff 1 and Alt Eff 2 plans in Senate and House, which use the Alt 1 and Alt 2 Gingles demonstrative plans above and add more modular effectiveness-boosting changes.

	SD enacted	
SD	BH VAP	BH CVAP
1	31.9%	31.2%
2	53.8%	54.0%
3	27.1%	24.8%
4	28.6%	27.1%
5	70.4%	65.7%
6	31.5%	30.3%
7	37.2%	34.7%
8	36.3%	35.4%
9	47.4%	44.4%
10	75.7%	75.8%
11	38.4%	36.2%
12	61.2%	60.7%
13	32.8%	31.2%
14	30.5%	26.8%
15	59.8%	59.8%
16	27.5%	26.7%
17	36.6%	35.4%
18	34.6%	33.8%
19	33.7%	31.2%
20	34.5%	34.2%
21	16.0%	13.5%
22	61.2%	61.3%
23	39.6%	39.0%
24	24.0%	23.4%
25	36.8%	36.3%
26	60.8%	60.6%
27	15.0%	11.6%
28	25.6%	24.3%
29	31.0%	30.8%
30	26.6%	24.8%
31	27.7%	25.4%
32	24.9%	21.8%
33	65.1%	61.5%
34	81.2%	80.9%
35	78.5%	78.3%
36	57.7%	57.6%
37	27.5%	24.7%
38	72.9%	73.3%
39	65.6%	67.1%
40	40.2%	33.0%
41	68.5%	69.1%
42	38.9%	37.4%
43	70.5%	69.8%
44	79.0%	79.3%
45	31.1%	28.7%
46	23.6%	22.0%
47	26.8%	24.0%
48	16.1%	16.1%
49	29.6%	20.2%
50	14.3%	10.5%
51	5.5%	3.9%
52	21.1%	18.1%
53	8.2%	6.7%
54	26.2%	16.7%
55	73.6%	73.2%
56	15.0%	13.2%

	SD Alt Eff 1	
SD	BH VAP	BH CVAP
1	31.8%	31.2%
2	53.7%	54.0%
3	26.9%	24.8%
4	28.6%	27.2%
5	53.9%	45.2%
6	55.5%	55.4%
7	30.6%	28.6%
8	36.2%	35.4%
9	55.1%	51.6%
10	69.4%	68.9%
11	38.4%	36.2%
12	61.1%	60.7%
13	32.8%	31.2%
14	28.8%	26.0%
15	59.7%	59.8%
16	55.6%	54.6%
17	56.8%	56.4%
18	34.5%	33.8%
19	33.6%	31.2%
20	39.1%	38.4%
21	15.9%	13.5%
22	53.6%	53.8%
23	28.0%	27.7%
24	28.3%	27.5%
25	53.5%	53.5%
26	53.4%	53.5%
27	14.7%	11.4%
28	56.7%	56.1%
29	31.0%	30.8%
30	19.2%	17.3%
31	26.4%	24.3%
32	24.8%	21.8%
33	67.5%	65.0%
34	82.6%	83.2%
35	58.0%	56.8%
36	54.9%	55.3%
37	27.4%	24.7%
38	42.4%	40.2%
39	55.9%	56.1%
40	66.6%	64.4%
41	66.4%	66.3%
42	44.6%	44.3%
43	58.2%	57.2%
44	64.5%	65.2%
45	31.3%	28.8%
46	21.2%	19.8%
47	25.2%	23.0%
48	16.1%	15.4%
49	32.4%	22.2%
50	11.4%	8.9%
51	5.5%	3.9%
52	21.1%	18.1%
53	8.2%	6.7%
54	26.2%	16.7%
55	62.6%	60.9%
56	14.9%	13.2%

	SD Alt Eff 2	
SD	BH VAP	BH CVAP
1	31.8%	31.2%
2	53.7%	54.0%
3	26.9%	24.8%
4	28.5%	27.1%
5	58.6%	52.2%
6	42.0%	39.8%
7	46.2%	43.2%
8	36.2%	35.4%
9	53.1%	50.5%
10	68.5%	68.5%
11	38.4%	36.2%
12	61.1%	60.7%
13	32.8%	31.2%
14	26.5%	24.6%
15	59.7%	59.8%
16	53.7%	52.7%
17	51.2%	50.3%
18	34.5%	33.8%
19	33.6%	31.2%
20	37.0%	36.4%
21	15.9%	13.5%
22	53.3%	53.5%
23	51.1%	51.2%
24	28.1%	27.8%
25	32.4%	31.4%
26	53.9%	53.9%
27	15.0%	11.6%
28	21.6%	20.3%
29	31.0%	30.8%
30	22.0%	19.4%
31	32.0%	30.3%
32	24.8%	21.8%
33	67.7%	65.4%
34	65.4%	64.4%
35	67.4%	66.8%
36	59.9%	60.5%
37	27.4%	24.7%
38	55.8%	56.4%
39	90.9%	91.5%
40	44.9%	35.6%
41	69.8%	70.6%
42	27.0%	23.7%
43	61.0%	60.3%
44	78.6%	79.0%
45	27.2%	24.9%
46	21.2%	19.5%
47	27.2%	24.7%
48	19.3%	17.7%
49	30.7%	20.6%
50	12.6%	10.3%
51	5.5%	3.9%
52	21.1%	18.1%
53	8.2%	6.7%
54	26.2%	16.7%
55	64.9%	64.7%
56	14.9%	13.2%

Table 25: The enacted Senate plan has 17 coalition districts, whether by VAP or CVAP. Both alternative plans add numerous districts, finding additional majority districts in several areas of the state.

	HD enacted	
HD	BH VAP	BH CVAP
1	6.2%	5.7%
2	10.6%	7.4%
3	6.2%	4.7%
4	49.2%	34.8%
5	17.0%	11.1%
6	13.4%	7.8%
7	6.1%	3.7%
8	4.1%	2.9%
9	6.2%	4.9%
10	13.6%	9.2%
11	6.0%	4.8%
12	15.7%	12.6%
13	29.8%	25.8%
14	12.6%	10.4%
15	23.6%	21.3%
16	20.1%	16.7%
17	29.4%	27.4%
18	10.3%	9.4%
19	30.4%	28.8%
20	18.1%	14.5%
21	12.3%	10.0%
22	26.2%	22.6%
23	20.5%	14.1%
24	17.1%	14.1%
25	10.8%	11.0%
26	14.6%	11.0%
27	13.2%	9.5%
28	15.2%	10.6%
29	52.9%	37.6%
30	24.0%	18.9%
31	26.3%	19.6%
32	12.7%	10.7%
33	14.3%	13.4%
34	23.2%	20.2%
35	38.7%	34.8%
36	23.1%	21.6%
37	46.1%	41.2%
38	65.9%	64.0%
39	73.2%	70.6%
40	38.1%	38.6%
41	67.2%	63.0%
42	50.2%	47.9%
43	39.9%	38.6%
44	22.1%	20.2%
45	9.9%	9.1%
46	15.1%	14.0%
47	17.8%	18.2%
48	23.8%	20.0%
49	14.8%	13.5%
50	18.3%	18.4%
51	36.4%	30.0%
52	23.0%	24.5%
53	21.5%	19.6%
54	27.7%	23.8%
55	59.7%	60.2%
56	50.7%	53.6%
57	25.6%	23.8%
58	67.5%	67.9%
59	73.8%	73.9%
60	68.3%	68.1%

	HD Alt Eff 1	
HD	BH VAP	BH CVAP
1	6.2%	5.7%
2	10.6%	7.4%
3	6.2%	4.7%
4	49.2%	34.8%
5	17.0%	11.1%
6	13.4%	7.8%
7	6.1%	3.7%
8	4.1%	2.9%
9	6.2%	4.9%
10	13.6%	9.2%
11	6.0%	4.8%
12	15.7%	12.6%
13	29.8%	25.8%
14	12.6%	10.4%
15	23.5%	21.3%
16	20.0%	16.7%
17	29.3%	27.4%
18	10.2%	9.4%
19	30.2%	28.8%
20	14.4%	11.7%
21	12.3%	10.1%
22	34.4%	31.3%
23	20.4%	14.1%
24	12.9%	10.8%
25	11.5%	11.8%
26	14.2%	11.6%
27	13.2%	9.5%
28	15.2%	10.6%
29	54.8%	39.4%
30	21.8%	16.7%
31	26.2%	19.6%
32	12.7%	10.7%
33	22.4%	21.7%
34	19.5%	17.2%
35	31.9%	29.3%
36	26.5%	24.8%
37	52.9%	47.2%
38	51.9%	50.3%
39	61.7%	58.8%
40	50.7%	50.5%
41	52.5%	50.3%
42	54.9%	50.5%
43	51.0%	51.1%
44	27.5%	22.5%
45	12.7%	11.5%
46	14.0%	13.0%
47	23.0%	23.9%
48	17.9%	16.2%
49	11.3%	10.1%
50	19.2%	19.3%
51	43.3%	36.2%
52	19.5%	19.2%
53	26.3%	22.5%
54	23.0%	20.8%
55	56.0%	58.6%
56	50.7%	52.4%
57	25.2%	23.8%
58	57.2%	57.6%
59	93.5%	93.5%
60	64.5%	64.6%

	HD Alt Eff 2	
HD	BH VAP	BH CVAP
1	6.2%	5.7%
2	10.6%	7.4%
3	6.2%	4.7%
4	49.2%	34.8%
5	17.0%	11.1%
6	13.4%	7.8%
7	6.1%	3.7%
8	4.1%	2.9%
9	6.2%	4.9%
10	13.6%	9.2%
11	6.0%	4.8%
12	15.7%	12.6%
13	29.8%	25.8%
14	12.6%	10.4%
15	23.5%	21.3%
16	20.0%	16.7%
17	29.3%	27.4%
18	10.2%	9.4%
19	30.2%	28.8%
20	15.3%	11.6%
21	12.3%	10.1%
22	36.0%	32.4%
23	20.4%	14.1%
24	14.8%	12.6%
25	10.6%	10.6%
26	14.1%	11.6%
27	13.2%	9.5%
28	15.2%	10.6%
29	52.8%	37.6%
30	22.4%	17.0%
31	26.2%	19.6%
32	12.7%	10.7%
33	21.7%	21.1%
34	16.7%	14.9%
35	34.1%	30.8%
36	23.3%	19.5%
37	56.2%	50.6%
38	53.4%	51.3%
39	60.7%	58.3%
40	51.0%	50.8%
41	52.6%	50.6%
42	54.6%	50.3%
43	51.7%	50.7%
44	25.1%	24.5%
45	10.5%	10.0%
46	13.8%	13.2%
47	22.9%	23.6%
48	18.9%	16.8%
49	11.3%	10.1%
50	18.4%	18.2%
51	40.6%	34.0%
52	20.7%	21.0%
53	27.8%	23.5%
54	20.6%	18.5%
55	95.7%	95.9%
56	50.5%	52.6%
57	26.1%	25.0%
58	52.6%	54.3%
59	64.4%	64.8%
60	55.7%	55.7%

	HD enacted	
HD	BH VAP	BH CVAP
61	81.0%	80.4%
62	78.2%	78.3%
63	77.8%	77.3%
64	37.6%	36.2%
65	65.7%	65.8%
66	62.0%	60.6%
67	66.1%	65.3%
68	61.4%	61.5%
69	68.2%	68.2%
70	35.4%	33.4%
71	25.8%	23.6%
72	27.4%	24.9%
73	18.8%	17.9%
74	30.6%	29.2%
75	84.5%	84.9%
76	79.6%	80.9%
77	87.3%	87.4%
78	79.4%	79.2%
79	86.5%	86.7%
80	36.6%	28.0%
81	42.1%	34.5%
82	23.2%	22.2%
83	43.0%	28.0%
84	75.7%	76.6%
85	67.9%	71.9%
86	78.5%	80.9%
87	78.8%	79.0%
88	72.5%	73.5%
89	65.3%	65.6%
90	62.2%	62.2%
91	75.0%	74.7%
92	72.7%	72.4%
93	74.1%	73.2%
94	75.3%	75.8%
95	74.0%	73.5%
96	58.1%	52.9%
97	45.0%	42.0%
98	74.8%	68.4%
99	22.9%	23.0%
100	19.6%	18.1%
101	41.6%	39.4%
102	57.8%	53.8%
103	33.0%	29.2%
104	27.8%	25.3%
105	44.9%	42.5%
106	46.7%	45.3%
107	59.6%	55.6%
108	35.9%	30.2%
109	67.4%	64.6%
110	56.7%	55.0%
111	30.6%	28.2%
112	22.3%	21.9%
113	65.5%	64.6%
114	28.1%	26.8%
115	58.2%	57.0%
116	64.4%	64.2%
117	41.5%	40.7%
118	27.1%	26.0%
119	23.6%	21.0%
120	21.2%	19.3%

	HD Alt Eff 1	
HD	BH VAP	BH CVAP
61	59.3%	57.1%
62	88.0%	88.6%
63	65.4%	64.8%
64	56.6%	55.9%
65	85.5%	86.8%
66	58.9%	58.1%
67	94.2%	94.5%
68	19.9%	19.2%
69	59.7%	58.8%
70	35.3%	33.4%
71	25.7%	23.6%
72	27.4%	24.9%
73	17.9%	17.0%
74	56.7%	55.1%
75	60.9%	60.2%
76	80.5%	80.4%
77	93.4%	94.0%
78	74.3%	75.6%
79	86.6%	87.1%
80	60.6%	50.4%
81	51.6%	40.1%
82	16.9%	15.9%
83	22.6%	21.7%
84	80.0%	80.5%
85	58.2%	60.3%
86	94.3%	94.4%
87	63.3%	64.8%
88	68.1%	67.6%
89	68.8%	69.6%
90	62.0%	62.2%
91	54.9%	54.1%
92	90.1%	90.5%
93	71.4%	70.4%
94	85.0%	85.2%
95	56.4%	55.6%
96	52.2%	50.1%
97	58.5%	50.7%
98	68.8%	63.7%
99	24.5%	24.6%
100	20.5%	18.6%
101	37.4%	35.3%
102	54.7%	52.1%
103	30.0%	26.3%
104	26.7%	24.2%
105	52.8%	50.2%
106	57.5%	53.1%
107	54.4%	50.2%
108	53.5%	51.3%
109	56.0%	51.2%
110	52.6%	50.9%
111	31.2%	29.5%
112	22.3%	21.9%
113	55.3%	54.3%
114	36.7%	35.4%
115	55.2%	54.9%
116	61.8%	61.6%
117	57.2%	56.6%
118	26.1%	25.2%
119	23.5%	21.0%
120	21.1%	19.3%

	HD Alt Eff 2	
HD	BH VAP	BH CVAP
61	56.7%	54.2%
62	87.5%	88.1%
63	70.8%	70.5%
64	56.5%	55.8%
65	70.9%	71.4%
66	59.2%	58.2%
67	94.6%	95.0%
68	64.3%	64.4%
69	59.9%	59.6%
70	35.3%	33.4%
71	25.7%	23.6%
72	27.4%	24.9%
73	18.6%	17.6%
74	18.1%	17.0%
75	72.3%	73.0%
76	82.6%	83.5%
77	88.2%	88.6%
78	75.6%	75.0%
79	87.2%	87.6%
80	58.5%	50.1%
81	51.1%	36.6%
82	18.4%	17.6%
83	25.4%	23.5%
84	78.2%	79.2%
85	71.3%	75.0%
86	64.5%	65.9%
87	92.8%	93.2%
88	59.8%	57.8%
89	67.7%	68.8%
90	62.0%	62.2%
91	57.4%	56.7%
92	75.4%	74.9%
93	91.6%	92.0%
94	84.8%	85.0%
95	58.0%	57.3%
96	54.0%	50.0%
97	53.5%	47.3%
98	68.8%	63.7%
99	26.3%	26.2%
100	27.9%	26.4%
101	54.7%	50.4%
102	53.0%	50.6%
103	24.4%	19.5%
104	30.3%	28.2%
105	42.3%	41.4%
106	51.8%	50.7%
107	54.3%	50.4%
108	56.2%	50.4%
109	55.1%	50.4%
110	51.8%	50.4%
111	22.9%	20.4%
112	22.3%	21.9%
113	58.7%	58.1%
114	28.3%	27.0%
115	56.1%	55.6%
116	60.0%	59.8%
117	55.6%	55.2%
118	30.9%	29.9%
119	23.5%	21.0%
120	21.1%	19.3%

	HD enacted	
HD	BH VAP	BH CVAP
121	15.0%	13.8%
122	39.9%	36.6%
123	28.4%	27.9%
124	31.6%	29.3%
125	30.6%	29.6%
126	57.2%	57.2%
127	22.9%	22.1%
128	51.9%	51.9%
129	58.5%	58.9%
130	63.2%	63.1%
131	23.0%	23.1%
132	59.5%	59.5%
133	38.7%	38.7%
134	37.1%	36.5%
135	25.4%	24.9%
136	32.2%	32.0%
137	55.9%	56.1%
138	22.4%	21.9%
139	26.2%	25.8%
140	64.8%	64.9%
141	63.1%	63.6%
142	62.6%	62.4%
143	65.1%	65.0%
144	31.7%	31.6%
145	41.2%	40.3%
146	32.0%	32.0%
147	36.9%	36.1%
148	36.9%	36.3%
149	37.1%	34.2%
150	59.5%	58.7%
151	49.4%	47.5%
152	28.3%	27.9%
153	70.2%	70.2%
154	56.2%	56.1%
155	37.9%	37.8%
156	37.0%	35.1%
157	33.4%	30.9%
158	35.5%	34.3%
159	27.2%	26.8%
160	27.3%	25.4%
161	33.4%	32.2%
162	52.6%	52.6%
163	52.5%	52.5%
164	31.4%	30.4%
165	55.2%	55.7%
166	9.6%	8.4%
167	29.2%	28.2%
168	55.2%	55.3%
169	36.5%	34.9%
170	32.7%	30.2%
171	44.0%	42.8%
172	36.6%	32.3%
173	41.4%	39.6%
174	25.2%	21.3%
175	29.0%	28.5%
176	30.7%	28.2%
177	59.4%	59.4%
178	19.7%	18.2%
179	33.1%	30.8%
180	23.5%	22.1%

	HD Alt Eff 1	
HD	BH VAP	BH CVAP
121	14.9%	13.8%
122	39.8%	36.6%
123	19.0%	17.0%
124	32.9%	31.6%
125	31.2%	29.9%
126	55.5%	55.6%
127	19.1%	19.2%
128	51.5%	51.6%
129	54.7%	55.2%
130	58.0%	58.0%
131	31.5%	31.5%
132	60.8%	61.1%
133	50.4%	50.5%
134	37.0%	36.5%
135	25.4%	24.9%
136	32.1%	32.0%
137	54.9%	55.1%
138	22.4%	21.9%
139	26.1%	25.8%
140	64.0%	64.5%
141	59.1%	59.4%
142	53.9%	53.9%
143	58.2%	57.6%
144	54.2%	54.4%
145	25.6%	25.2%
146	27.8%	27.5%
147	38.4%	37.8%
148	41.7%	41.1%
149	37.0%	34.2%
150	56.2%	55.6%
151	58.0%	56.9%
152	37.1%	36.6%
153	55.3%	54.9%
154	51.9%	51.7%
155	37.8%	37.8%
156	36.9%	35.1%
157	33.4%	30.9%
158	35.4%	34.3%
159	25.6%	24.9%
160	31.2%	29.6%
161	50.1%	50.0%
162	49.7%	49.6%
163	50.3%	50.1%
164	17.6%	16.8%
165	51.5%	52.5%
166	11.6%	10.5%
167	25.6%	25.1%
168	55.0%	55.2%
169	32.9%	30.3%
170	39.1%	35.7%
171	54.8%	54.1%
172	34.3%	31.4%
173	40.7%	38.8%
174	24.7%	21.3%
175	26.3%	25.8%
176	29.8%	28.3%
177	59.4%	59.4%
178	19.7%	18.2%
179	39.0%	36.8%
180	22.0%	20.6%

	HD Alt Eff 2	
HD	BH VAP	BH CVAP
121	14.9%	13.8%
122	39.8%	36.6%
123	19.5%	17.6%
124	29.1%	27.9%
125	35.6%	35.0%
126	54.4%	54.4%
127	23.2%	22.5%
128	51.5%	51.6%
129	53.2%	53.7%
130	61.1%	61.0%
131	22.7%	22.7%
132	60.6%	61.1%
133	48.4%	48.4%
134	37.0%	36.5%
135	25.4%	24.9%
136	32.1%	32.0%
137	51.4%	51.5%
138	22.4%	21.9%
139	26.1%	25.8%
140	70.8%	71.4%
141	55.0%	55.3%
142	53.3%	53.4%
143	58.6%	58.0%
144	54.7%	54.9%
145	25.7%	25.2%
146	29.4%	29.2%
147	37.2%	36.5%
148	43.9%	43.2%
149	37.0%	34.2%
150	56.9%	56.3%
151	52.6%	51.2%
152	36.2%	35.7%
153	63.9%	63.9%
154	64.1%	63.7%
155	37.8%	37.8%
156	36.9%	35.1%
157	33.4%	30.9%
158	35.4%	34.3%
159	25.3%	24.6%
160	30.9%	29.3%
161	50.9%	50.0%
162	50.8%	50.6%
163	49.8%	50.5%
164	18.4%	17.7%
165	49.9%	50.7%
166	11.2%	10.0%
167	43.1%	42.5%
168	50.2%	50.1%
169	35.6%	34.2%
170	35.2%	33.4%
171	40.1%	37.7%
172	39.0%	35.8%
173	34.4%	33.1%
174	24.7%	21.3%
175	22.5%	21.7%
176	32.2%	29.6%
177	59.4%	59.4%
178	19.7%	18.2%
179	24.4%	22.3%
180	23.9%	22.5%

Table 26: Overall, the enacted House plan has 62 majority-BHVAP districts, dropping to 60 majority districts by BHCVAP. Both Gingles 1 demonstrative alternatives add to the count significantly.

9 Effectiveness-oriented demonstration plans

In §7 above, I presented a number of alternative plans as Gingles 1 demonstrative maps. Each of these plans increases the number of majority districts for the coalition of Black and Latino Georgians, while simultaneously ensuring that traditional districting principles are highly respected and that the new majority districts are likely to provide effective opportunity-to-elect.

In this section, I will offer an additional set of alternative plans—one new example per legislative cluster—that illustrate that my notion of effectiveness is capable of identifying opportunity districts short of the Gingles 1 demographic threshold of 50%+1. Indeed, the existence of crossover support for Black and Latino candidates of choice by Asian-American, White, and other voters is a certainty. The ease of finding alternative plans that draw on broader voting coalitions will bolster the racial gerrymandering discussion below in §10. That is, in the enacted plans, the state has not just avoided majority districts but has even conspicuously limited the number of districts providing effective opportunity-to-elect well below the level that is easily attainable from a race-neutral mapping process.

9.1 Congressional effectiveness

As a matter of mapmaking, it is extremely easy to improve on the very limited number of effective districts—just five—in the state's enacted plan (see Table 4). To do this involves relieving the packing and cracking from the enacted plan.

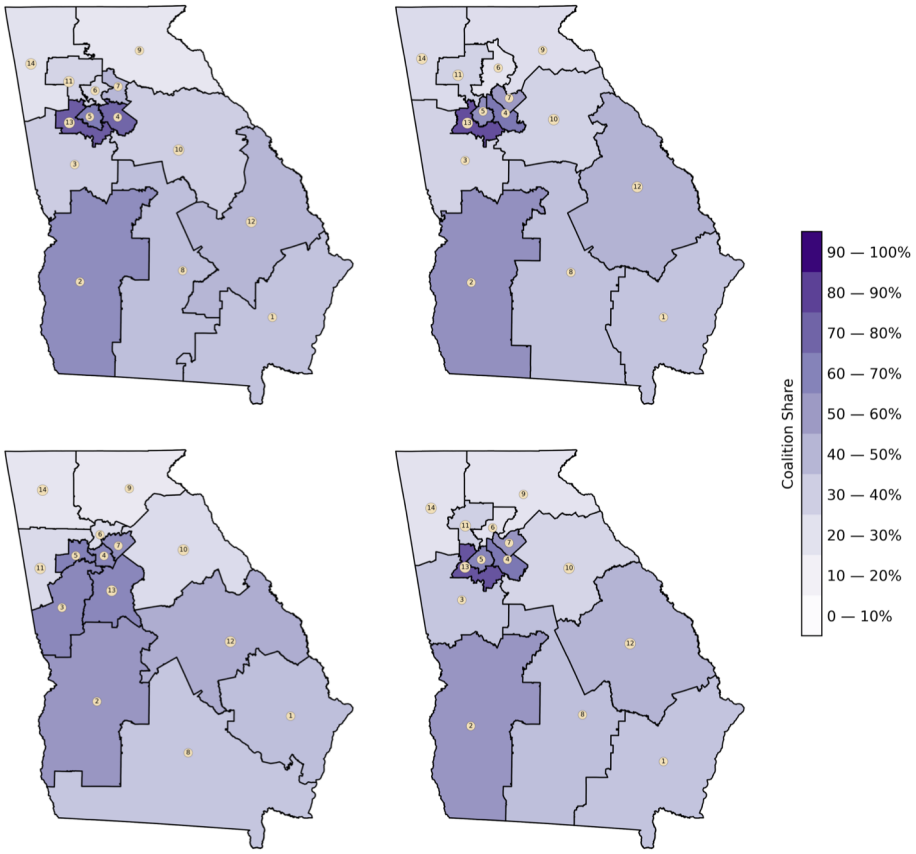


Figure 16: The benchmark plan (top left), the enacted plan (top right), and the Duncan-Kennedy plan (bottom right) all exhibit a pronounced pattern of packing and cracking relative to the alternative Congressional plan presented here (CD Alt, bottom left).

9.2 State Senate alternatives

The "Alt Eff 3" plans shown here are another set of effective alternatives; these cover the entire state, working modularly in the clusters from Atlanta, Gwinnett, Southwest, East Black Belt, Southeast, and Northwest Georgia.

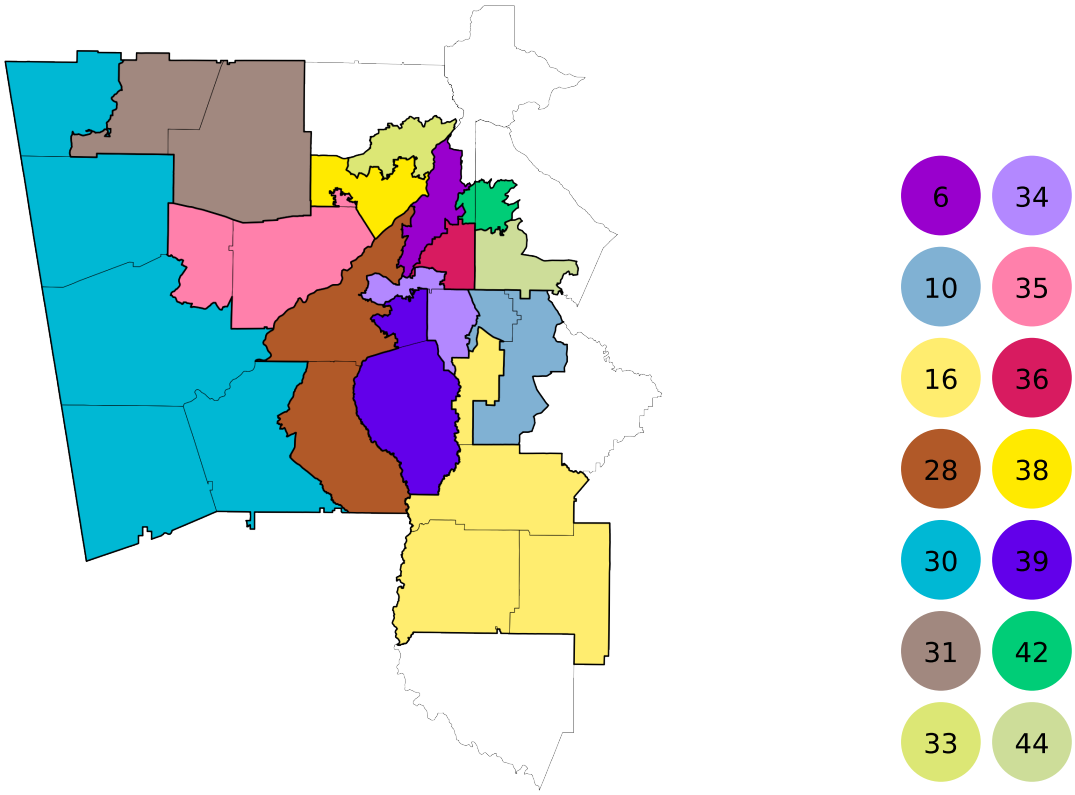


Figure 17: SD Atlanta alternative effective plan.

	SD Atlanta Enacted			
SD	BVAP	BHVAP	Primaries out of 4	Generals out of 8
6	23.9%	32.1%	0	8
10	71.5%	76.7%	4	8
16	22.7%	27.7%	3	0
28	19.5%	25.9%	2	0
30	20.9%	27.0%	2	0
31	20.7%	28.1%	3	0
33	43.0%	65.9%	4	8
34	69.5%	82.2%	4	8
35	71.9%	79.4%	4	8
36	51.3%	58.4%	3	8
38	65.3%	73.7%	4	8
39	60.7%	66.3%	3	8
42	30.8%	39.4%	0	8
44	71.3%	79.9%	4	8

	SD Atlanta Alt Eff 3			
SD	BVAP	BHVAP	Primaries out of 4	Generals out of 8
6	43.8%	50.3%	3	8
10	60.7%	70.3%	4	8
16	47.5%	53.4%	4	8
28	51.9%	57.5%	4	8
30	17.3%	24.2%	1	0
31	21.6%	27.6%	3	0
33	30.3%	50.2%	3	8
34	76.8%	88.7%	4	8
35	42.8%	51.4%	4	8
36	60.1%	66.4%	3	8
38	46.3%	59.2%	3	8
39	49.7%	55.6%	3	8
42	17.2%	27.3%	0	8
44	76.9%	80.1%	3	8

Table 27: SD Atlanta (14 districts).

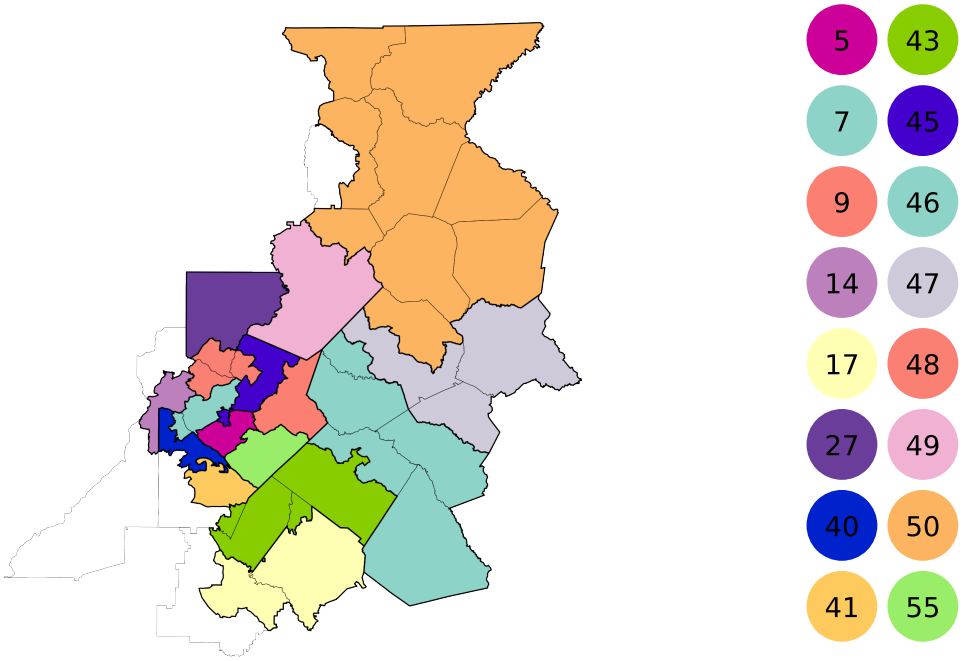


Figure 18: SD Gwinnett alternative effective plan.

	SD Gwinnett Enacted			
SD	BVAP	BHVAP	Primaries out of 4	Generals out of 8
5	29.9%	71.6%	3	8
7	21.4%	38.0%	3	8
9	29.5%	48.3%	3	8
14	19.0%	31.1%	0	8
17	32.0%	37.1%	3	0
27	5.0%	15.2%	0	0
40	19.2%	40.8%	0	8
41	62.6%	69.3%	3	8
43	64.3%	71.2%	4	8
45	18.6%	31.7%	3	0
46	16.9%	23.9%	1	0
47	17.4%	27.0%	3	0
48	9.5%	16.5%	1	0
49	8.0%	29.9%	1	0
50	5.6%	14.4%	1	0
55	66.0%	74.7%	4	8

	SD Gwinnett Alt Eff 3			
SD	BVAP	BHVAP	Primaries out of 4	Generals out of 8
5	25.2%	61.5%	3	8
7	20.2%	46.4%	3	8
9	32.1%	49.2%	3	6
14	19.0%	31.1%	0	8
17	46.9%	52.7%	4	7
27	4.7%	14.9%	0	0
40	25.6%	39.1%	0	8
41	84.8%	89.6%	4	8
43	45.4%	51.8%	4	7
45	22.4%	42.0%	3	5
46	12.0%	19.4%	1	0
47	18.8%	27.5%	2	7
48	9.9%	16.3%	2	0
49	8.2%	32.8%	1	0
50	5.3%	11.3%	1	0
55	44.0%	54.8%	4	8

Table 28: SD Gwinnett (16 districts).

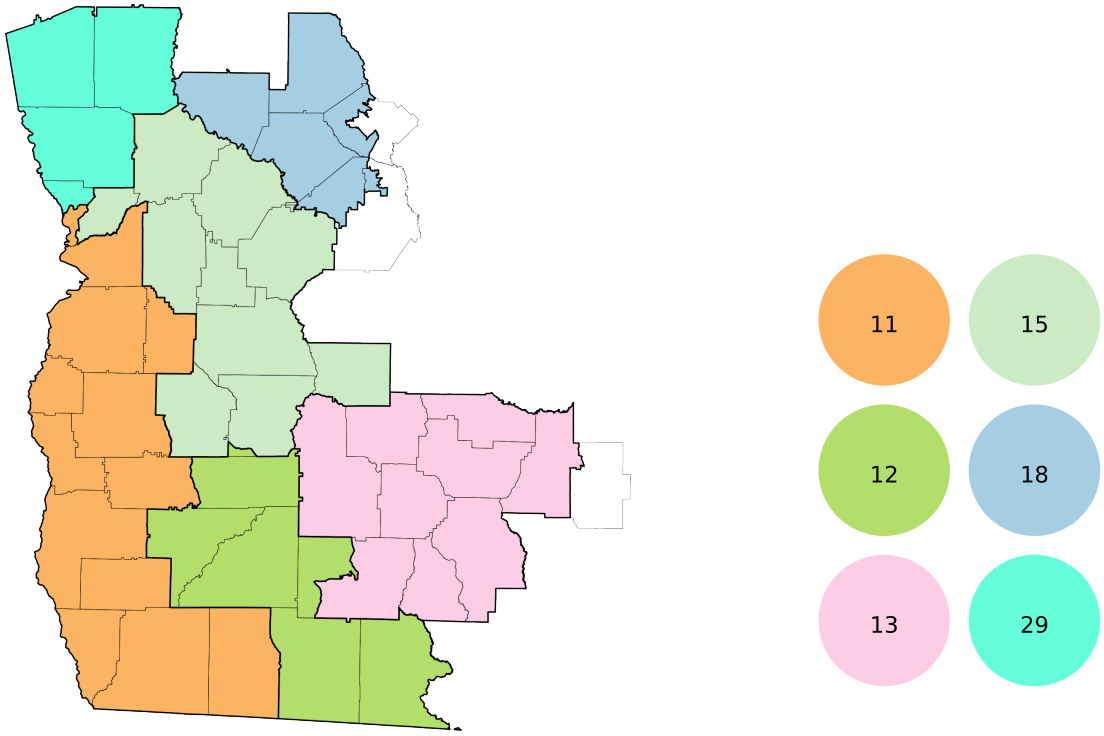


Figure 19: SD Southwest alternative effective plan.

	SD Southwest Enacted			
SD	BVAP	BHVAP	Primaries out of 4	Generals out of 8
11	31.0%	38.6%	4	0
12	58.0%	61.5%	4	8
13	27.0%	33.0%	4	0
15	54.0%	60.6%	4	8
18	30.4%	34.9%	3	0
29	26.9%	31.4%	3	0

	SD Alt Eff 3			
SD	BVAP	BHVAP	Primaries out of 4	Generals out of 8
11	44.0%	50.9%	4	6
12	50.1%	53.4%	4	7
13	25.6%	34.7%	4	0
15	50.4%	54.7%	4	8
18	30.4%	34.9%	3	0
29	27.3%	31.9%	3	0

Table 29: SD Southwest (6 districts).

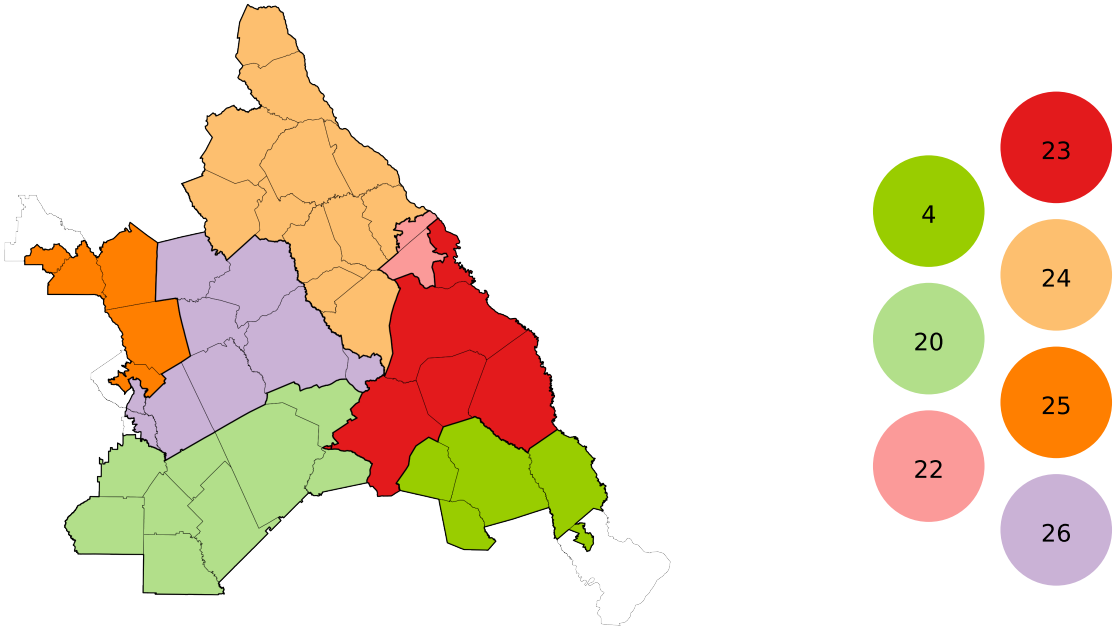


Figure 20: SD East Black Belt alternative effective plan.

	SD East Black Belt Enacted			
SD	BVAP	BHVAP	Primaries out of 4	Generals out of 8
4	23.4%	28.9%	3	0
20	31.3%	34.8%	3	0
22	56.5%	61.8%	4	8
23	35.5%	40.0%	3	0
24	19.9%	24.3%	3	0
25	33.5%	37.2%	3	0
26	57.0%	61.2%	3	8

	SD East Black Belt Alt Eff 3			
SD	BVAP	BHVAP	Primaries out of 4	Generals out of 8
4	23.4%	28.9%	3	0
20	32.0%	35.3%	3	0
22	39.1%	46.1%	4	8
23	46.1%	49.6%	3	7
24	26.5%	30.3%	3	0
25	45.7%	49.6%	3	8
26	44.0%	48.2%	3	5

Table 30: SD East Black Belt (7 districts).

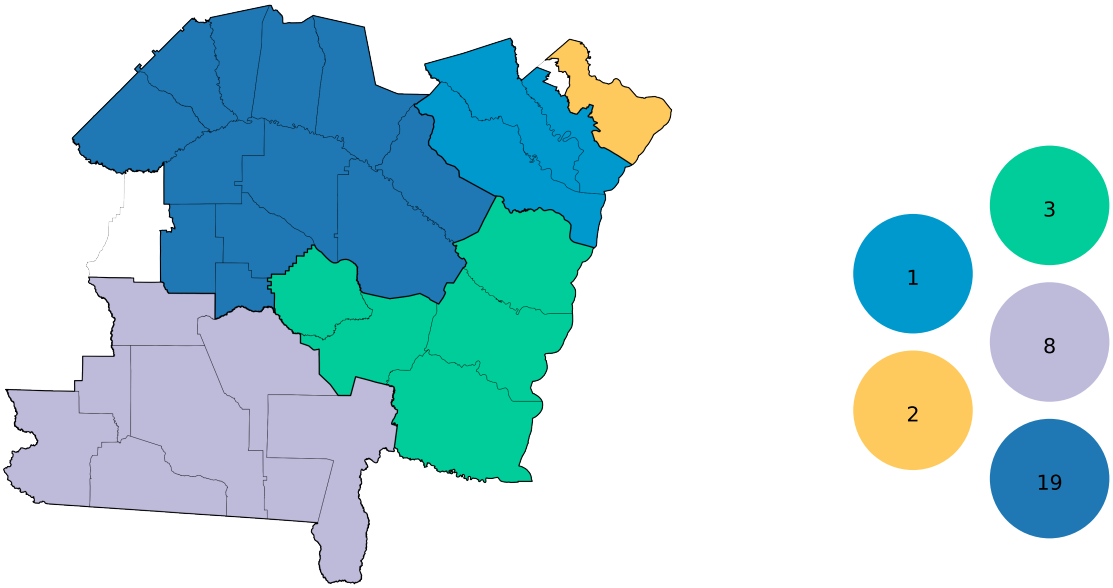


Figure 21: SD Southeast alternative effective plan.

	SD Southeast Enacted			
SD	BVAP	BHVAP	Primaries out of 4	Generals out of 8
1	25.1%	32.6%	3	0
2	46.9%	54.4%	4	8
3	21.2%	27.4%	3	0
8	30.4%	36.6%	4	0
19	25.7%	34.1%	4	0

	SD Southeast Alt Eff 3			
SD	BVAP	BHVAP	Primaries out of 4	Generals out of 8
1	34.8%	43.7%	4	6
2	37.4%	43.6%	3	8
3	19.1%	24.3%	3	0
8	32.5%	39.7%	4	0
19	25.5%	33.8%	4	0

Table 31: SD Southeast (5 districts).

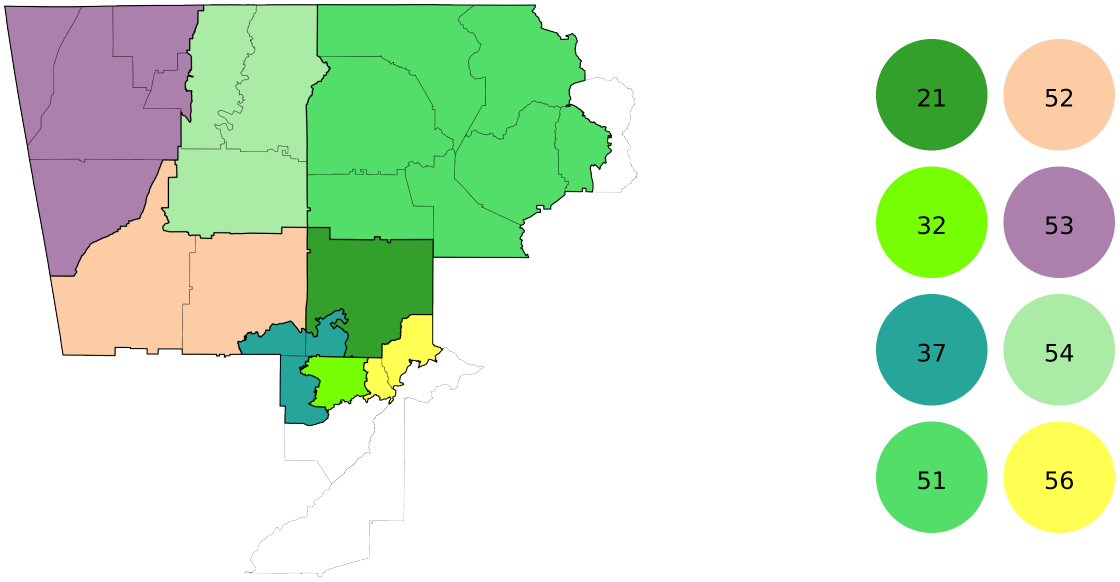


Figure 22: SD Northwest alternative plan that increases effectiveness by creating a competitive SD 32 that is well aligned with Black and Latino preferences in primary elections.

	SD Northwest Enacted			
SD	BVAP	BHVAP	Primaries out of 4	Generals out of 8
21	7.5%	16.3%	2	0
32	14.9%	25.4%	3	0
37	19.3%	28.0%	3	0
51	1.2%	5.5%	0	0
52	13.0%	21.2%	1	0
53	5.1%	8.3%	1	0
54	3.8%	26.4%	1	0
56	7.6%	15.3%	0	0

	SD Northwest Alt Eff 3			
SD	BVAP	BHVAP	Primaries out of 4	Generals out of 8
21	6.5%	16.5%	1	0
32	21.0%	31.2%	3	3
37	13.1%	22.1%	3	0
51	1.2%	5.5%	0	0
52	13.3%	22.0%	1	0
53	4.6%	7.5%	1	0
54	3.8%	26.6%	1	0
56	8.3%	14.6%	0	0

Table 32: SD Northwest (8 districts).

9.3 State House alternatives

The "Alt Eff" (alternative effective) districts in the House cover all of the regional clusters listed above: Atlanta, Cobb, DeKalb, Gwinnett, Southwest, East Black Belt, and Southeast Georgia.

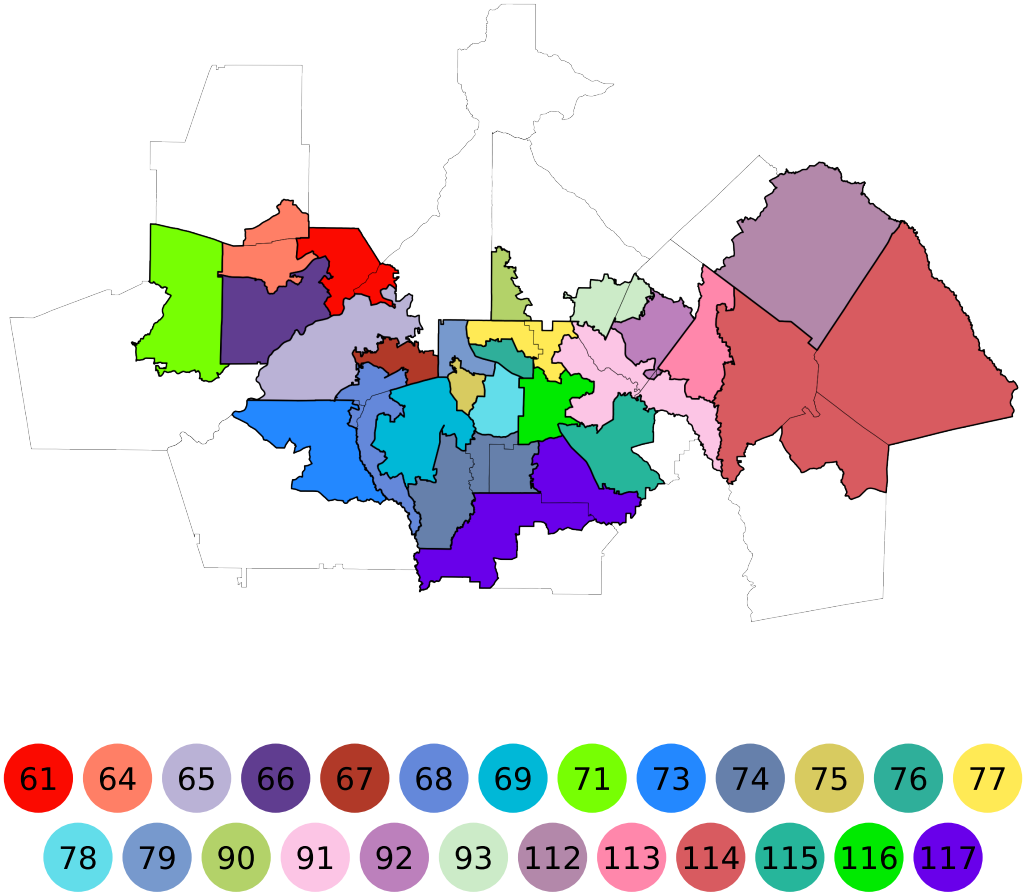


Figure 23: HD Atlanta Alt Eff 3 plan.

	HD Atlanta Enacted			
HD	BVAP	BHVAP	Primaries out of 4	Generals out of 8
61	74.3%	81.9%	4	8
64	30.7%	38.1%	3	0
65	62.0%	66.5%	4	8
66	53.4%	62.9%	4	8
67	58.9%	66.7%	4	8
68	55.7%	62.0%	4	8
69	63.6%	69.0%	4	8
71	19.9%	26.1%	3	0
73	12.1%	19.1%	2	0
74	25.5%	31.1%	3	0
75	74.4%	85.7%	4	8
76	67.2%	80.4%	4	8
77	76.1%	88.3%	4	8
78	71.6%	80.5%	4	8
79	71.6%	87.6%	4	8
90	58.5%	62.8%	2	8
91	70.0%	75.9%	4	8
92	68.8%	73.5%	4	8
93	65.4%	75.0%	4	8
112	19.2%	22.5%	1	0
113	59.5%	66.2%	4	8
114	24.7%	28.4%	3	0
115	52.1%	59.1%	4	8
116	58.1%	65.4%	4	8
117	36.6%	42.0%	3	0

	HD Atlanta Alt Eff 3			
HD	BVAP	BHVAP	Primaries out of 4	Generals out of 8
61	64.9%	74.5%	4	8
64	43.7%	52.4%	4	7
65	87.0%	90.2%	4	8
66	40.5%	48.1%	4	5
67	89.1%	94.7%	4	8
68	36.7%	44.4%	3	5
69	33.6%	40.3%	3	6
71	19.9%	26.1%	3	0
73	11.5%	17.9%	2	0
74	48.5%	54.7%	4	8
75	78.7%	90.0%	4	8
76	59.5%	76.4%	4	8
77	66.1%	80.0%	4	8
78	70.6%	79.9%	4	8
79	80.7%	91.3%	4	8
90	58.5%	62.8%	2	8
91	43.2%	48.3%	4	6
92	64.4%	71.2%	4	8
93	85.1%	92.0%	4	8
112	19.2%	22.5%	1	0
113	61.1%	66.9%	4	8
114	26.0%	30.0%	3	0
115	47.3%	53.9%	4	5
116	57.3%	65.3%	4	8
117	39.6%	45.8%	4	5

Table 33: HD Atlanta (25 districts).

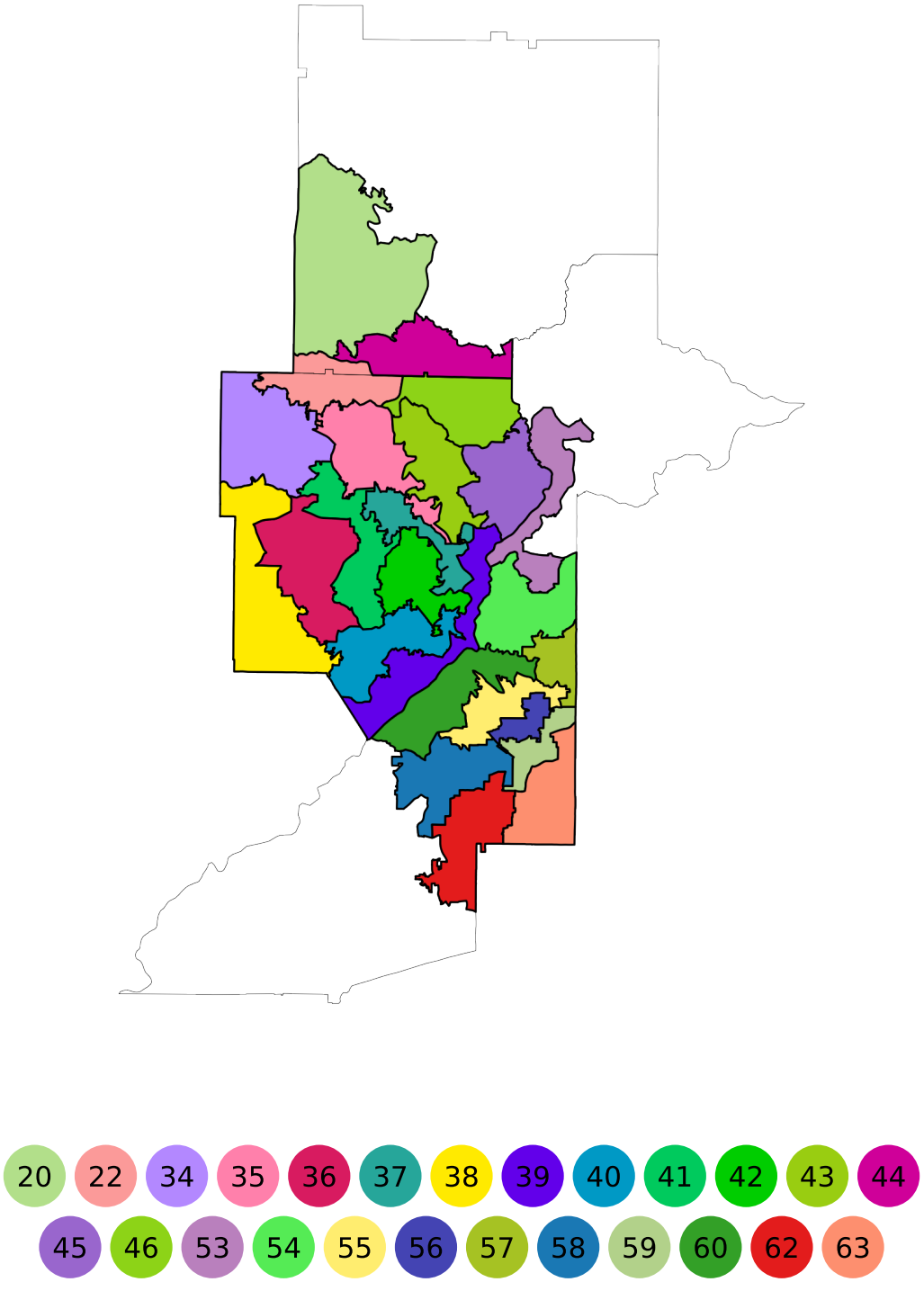


Figure 24: HD Cobb Alt Eff 3 plan.

	HD Cobb Enacted			
HD	BVAP	BHVAP	Primaries out of 4	Generals out of 8
20	9.3%	18.5%	1	0
22	15.1%	26.7%	3	0
34	15.7%	23.5%	3	0
35	28.4%	39.6%	3	8
36	17.0%	23.5%	3	0
37	28.2%	46.8%	3	8
38	54.2%	66.8%	4	8
39	55.3%	74.0%	4	8
40	33.0%	38.9%	3	8
41	39.4%	68.0%	4	8
42	33.7%	51.1%	3	8
43	26.5%	40.6%	3	8
44	12.0%	22.5%	2	0
45	5.3%	10.2%	0	0
46	8.1%	15.5%	0	0
53	14.5%	21.9%	0	1
54	15.5%	28.3%	0	7
55	55.4%	60.4%	3	8
56	45.5%	51.3%	3	8
57	18.1%	26.1%	0	8
58	63.0%	68.1%	3	8
59	70.1%	74.5%	3	8
60	63.9%	69.0%	3	8
62	72.3%	79.1%	3	8
63	69.3%	78.6%	3	8

	HD Cobb Alt Eff 3			
HD	BVAP	BHVAP	Primaries out of 4	Generals out of 8
20	6.9%	14.5%	1	0
22	22.9%	34.3%	3	5
34	15.5%	24.2%	3	0
35	31.2%	44.9%	3	8
36	38.9%	50.9%	3	8
37	33.7%	51.8%	3	8
38	41.9%	51.6%	3	8
39	45.5%	56.6%	3	8
40	39.9%	53.3%	3	8
41	32.3%	52.3%	3	8
42	28.4%	51.1%	3	8
43	16.2%	25.9%	3	5
44	11.2%	24.7%	1	0
45	5.0%	9.8%	0	0
46	9.2%	16.6%	0	0
53	17.5%	32.1%	0	7
54	12.4%	17.5%	0	1
55	50.6%	56.1%	3	8
56	44.2%	51.0%	3	8
57	18.9%	27.1%	0	8
58	93.1%	95.3%	4	8
59	51.2%	56.1%	3	8
60	57.0%	63.1%	3	8
62	81.5%	88.7%	3	8
63	61.6%	70.8%	3	8

Table 34: HD Cobb (25 districts).

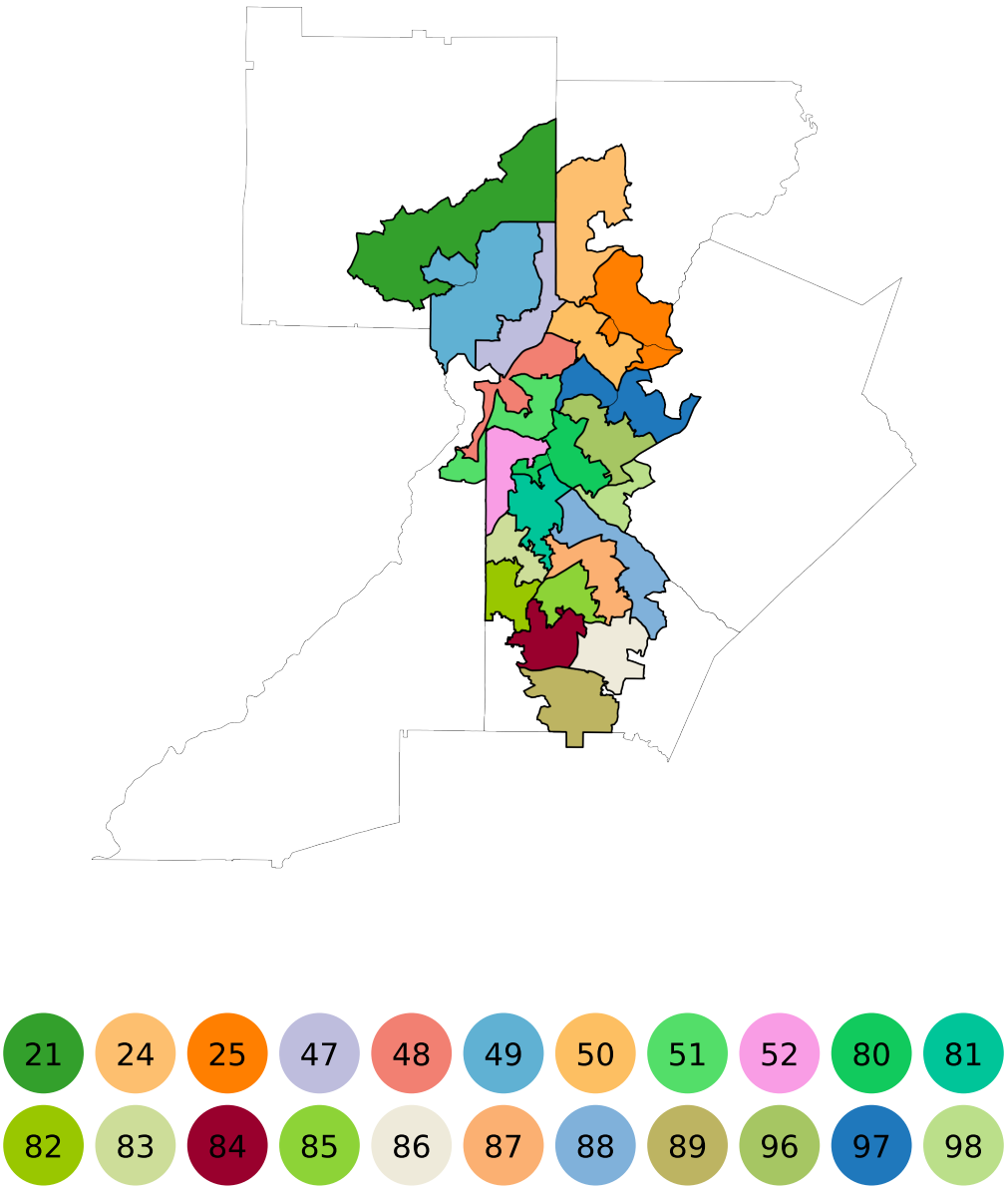


Figure 25: HD DeKalb Alt Eff 3 plan.

	HD DeKalb Enacted			
HD	BVAP	BHVAP	Primaries out of 4	Generals out of 8
21	5.1%	12.5%	1	0
24	7.0%	17.3%	1	0
25	5.9%	11.0%	0	0
47	10.7%	18.1%	2	0
48	11.8%	24.2%	0	1
49	8.4%	15.1%	0	0
50	12.4%	18.8%	2	8
51	23.7%	37.0%	0	8
52	16.0%	23.4%	0	8
80	14.2%	37.3%	0	8
81	21.8%	42.7%	0	8
82	16.8%	23.6%	0	8
83	15.1%	43.6%	0	8
84	73.7%	76.7%	3	8
85	62.7%	68.6%	3	8
86	75.1%	79.4%	3	8
87	73.1%	79.8%	4	8
88	63.3%	73.3%	3	8
89	62.5%	65.9%	2	8
96	23.0%	59.0%	3	8
97	26.8%	46.0%	3	8
98	23.2%	76.0%	3	8

	HD DeKalb Alt Eff 3			
HD	BVAP	BHVAP	Primaries out of 4	Generals out of 8
21	5.1%	12.4%	1	0
24	7.0%	17.3%	1	0
25	5.9%	10.7%	0	0
47	15.7%	31.4%	3	5
48	20.8%	32.2%	3	8
49	5.8%	11.0%	0	0
50	12.6%	19.7%	2	7
51	16.1%	24.4%	0	6
52	10.9%	16.4%	0	7
80	27.2%	60.1%	3	8
81	16.0%	49.2%	0	8
82	16.9%	23.2%	0	8
83	15.0%	36.5%	0	8
84	62.6%	67.7%	3	8
85	54.8%	59.4%	3	8
86	90.8%	94.5%	4	8
87	60.6%	68.7%	3	8
88	45.9%	59.3%	3	8
89	94.7%	97.0%	4	8
96	20.5%	50.2%	3	8
97	19.0%	32.8%	3	8
98	24.4%	71.2%	3	8

Table 35: HD DeKalb (22 districts).

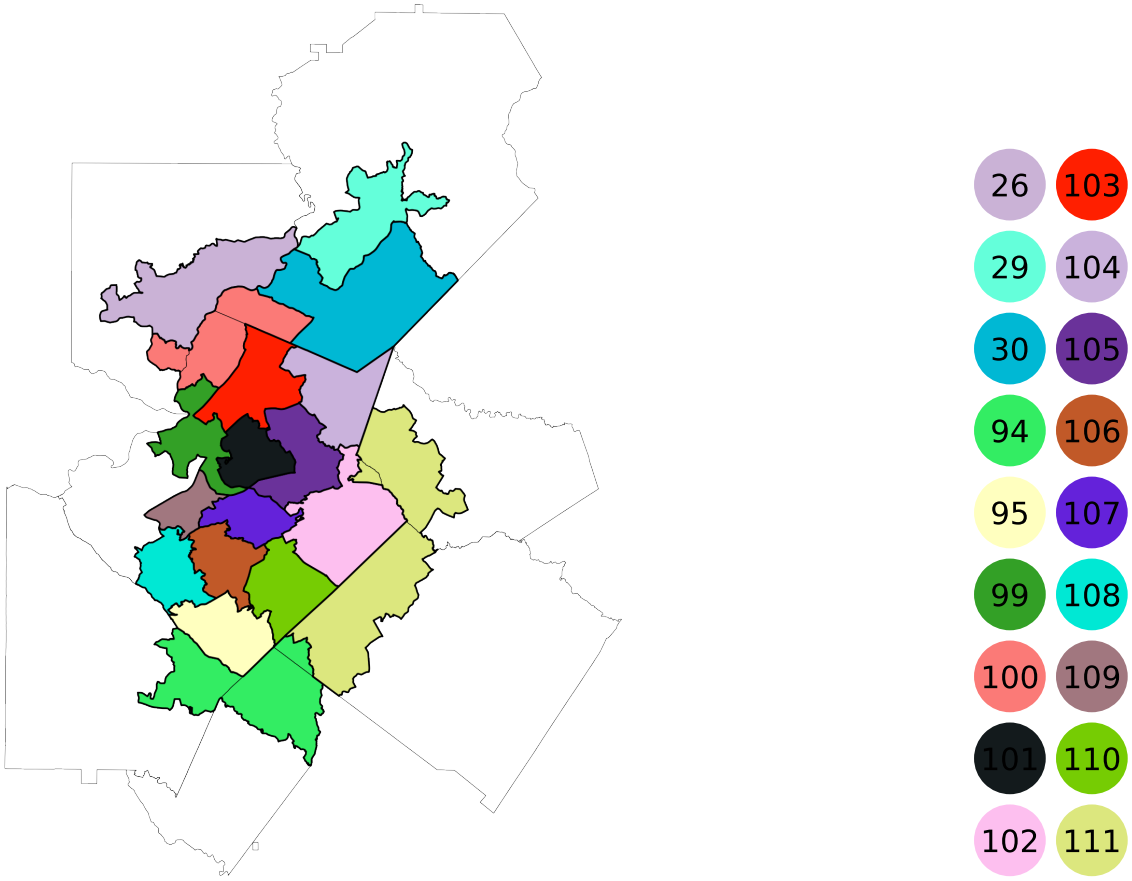


Figure 26: HD Gwinnett Alt Eff 3 plan.

	HD Gwinnett Enacted			
HD	BVAP	BHVAP	Primaries out of 4	Generals out of 8
26	4.0%	14.8%	0	0
29	13.6%	53.3%	2	0
30	8.1%	24.2%	0	0
94	69.0%	76.3%	4	8
95	67.2%	75.1%	4	8
99	14.7%	23.4%	3	3
100	10.0%	20.0%	1	0
101	24.2%	42.4%	3	7
102	37.6%	58.9%	3	8
103	16.8%	33.7%	3	0
104	17.0%	28.1%	3	0
105	29.0%	45.8%	3	6
106	36.3%	47.4%	3	7
107	29.6%	60.7%	3	8
108	18.4%	36.6%	3	6
109	32.5%	68.6%	3	8
110	47.2%	57.7%	4	8
111	22.3%	31.1%	3	0

	HD Gwinnett Alt Eff 3			
HD	BVAP	BHVAP	Primaries out of 4	Generals out of 8
26	4.1%	14.8%	0	0
29	13.6%	53.3%	2	0
30	6.6%	22.7%	0	0
94	79.8%	84.3%	4	8
95	59.7%	71.1%	4	8
99	16.9%	27.3%	3	5
100	10.1%	21.3%	2	0
101	24.4%	41.9%	3	7
102	40.2%	53.3%	4	7
103	19.5%	35.8%	3	3
104	18.9%	29.3%	3	0
105	33.2%	53.2%	3	8
106	25.4%	40.4%	3	6
107	30.2%	55.7%	3	8
108	19.8%	39.6%	3	6
109	33.5%	72.2%	4	8
110	47.5%	58.8%	4	8
111	14.1%	23.0%	3	0

Table 36: HD Gwinnett (18 districts).

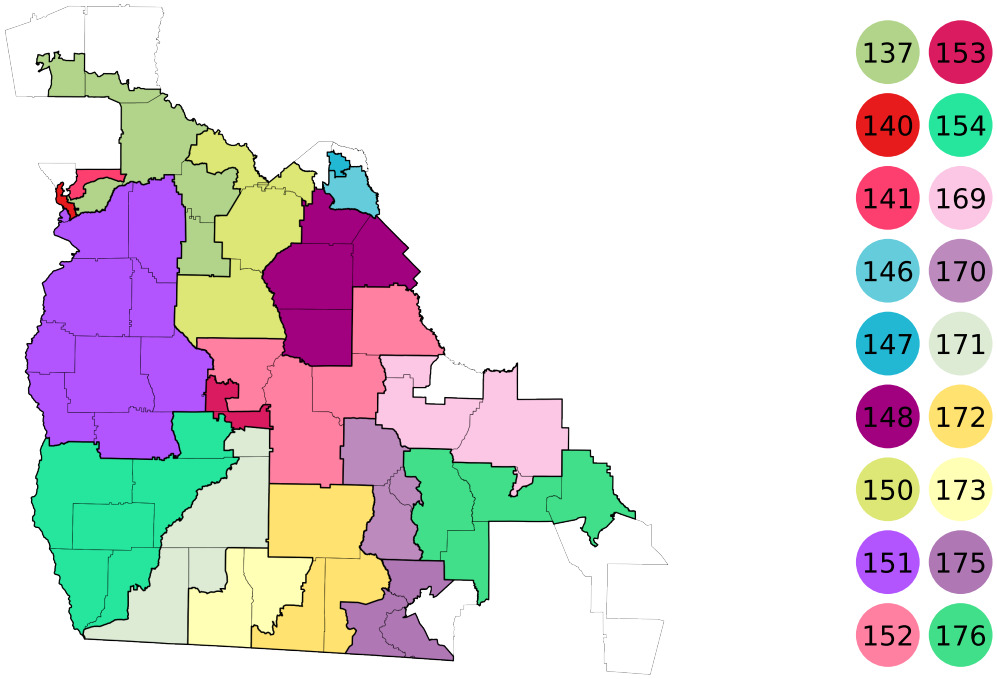


Figure 27: HD Southwest Alt Eff 3 plan.

	HD Southwest Enacted			
HD	BVAP	BHVAP	Primaries out of 4	Generals out of 8
137	52.1%	56.6%	4	8
140	57.6%	65.6%	4	8
141	57.5%	64.1%	4	8
146	27.6%	32.3%	4	0
147	30.1%	37.3%	4	0
148	34.0%	37.1%	4	0
150	53.6%	59.7%	4	8
151	42.4%	49.7%	4	0
152	26.1%	28.4%	4	0
153	67.9%	70.4%	4	8
154	54.8%	56.5%	4	7
169	29.0%	36.7%	3	0
170	24.2%	32.9%	3	0
171	39.6%	44.2%	4	0
172	23.3%	36.7%	4	0
173	36.3%	41.7%	4	0
175	24.2%	29.2%	4	0
176	22.7%	30.9%	4	0

	HD Southwest Alt Eff 3			
HD	BVAP	BHVAP	Primaries out of 4	Generals out of 8
137	55.2%	58.4%	4	8
140	59.3%	66.9%	4	8
141	49.2%	56.1%	4	8
146	23.9%	29.4%	4	0
147	31.2%	38.0%	4	0
148	39.2%	42.4%	4	0
150	55.0%	60.9%	4	8
151	45.7%	54.0%	4	7
152	28.3%	30.7%	4	0
153	60.3%	62.8%	4	8
154	50.7%	52.9%	4	6
169	27.2%	37.2%	3	0
170	27.7%	36.6%	2	0
171	47.5%	51.8%	4	0
172	23.2%	36.2%	4	0
173	34.5%	39.9%	4	0
175	24.1%	29.5%	4	0
176	20.3%	25.7%	4	0

Table 37: HD Southwest (18 districts).

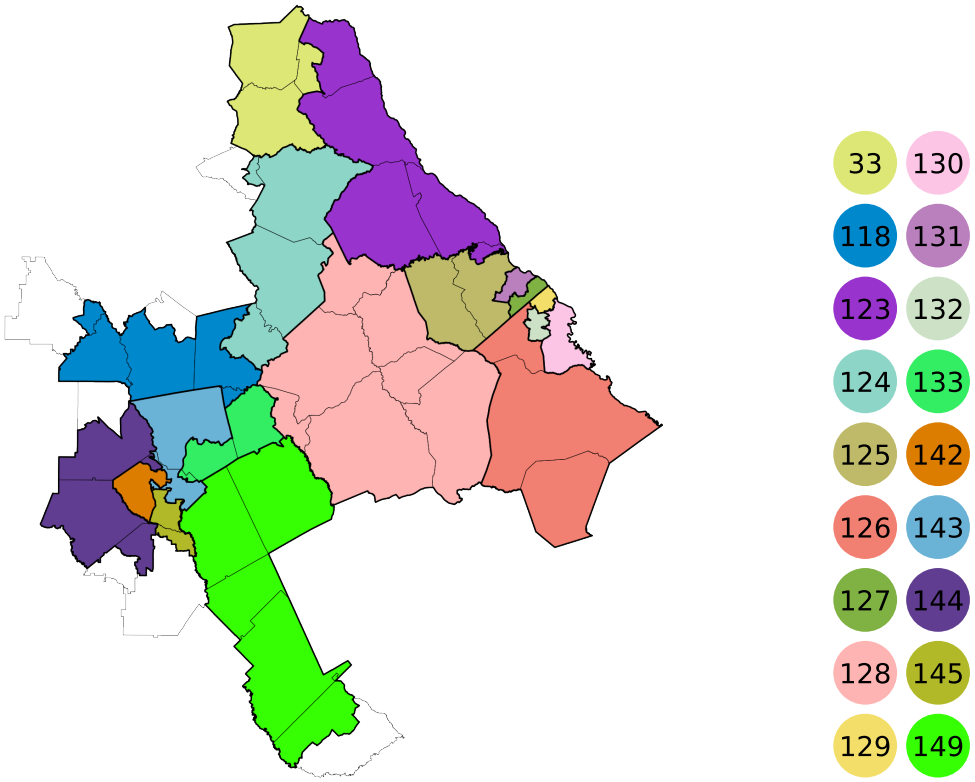


Figure 28: HD East Black Belt Alt Eff 3 plan.

	HD East Black Belt Enacted			
HD	BVAP	BHVAP	Primaries out of 4	Generals out of 8
33	11.2%	14.3%	3	0
118	23.6%	27.3%	3	0
123	24.3%	28.6%	3	0
124	25.6%	31.8%	2	0
125	23.7%	31.4%	3	0
126	54.5%	57.7%	4	8
127	18.5%	23.3%	3	0
128	50.4%	52.1%	2	4
129	54.9%	59.2%	3	8
130	59.9%	63.8%	4	8
131	17.6%	23.5%	3	0
132	52.3%	60.1%	4	8
133	36.8%	38.9%	3	0
142	59.5%	63.2%	3	8
143	60.8%	65.5%	3	8
144	29.3%	31.9%	3	0
145	35.7%	41.6%	3	0
149	32.1%	37.8%	2	0

	HD East Black Belt Alt Eff 3			
HD	BVAP	BHVAP	Primaries out of 4	Generals out of 8
33	9.3%	13.8%	3	0
118	22.8%	26.2%	3	0
123	25.5%	28.5%	3	0
124	25.3%	31.7%	2	0
125	30.7%	36.6%	3	0
126	41.0%	47.5%	4	8
127	17.2%	23.4%	3	0
128	51.9%	53.4%	2	7
129	38.2%	43.1%	3	5
130	60.6%	63.9%	4	8
131	18.0%	24.0%	3	0
132	74.7%	79.5%	4	8
133	45.4%	47.6%	3	8
142	42.1%	45.1%	3	6
143	54.8%	58.7%	3	8
144	26.0%	29.3%	3	0
145	55.1%	62.0%	4	8
149	32.1%	37.8%	2	0

Table 38: HD East Black Belt (18 districts).

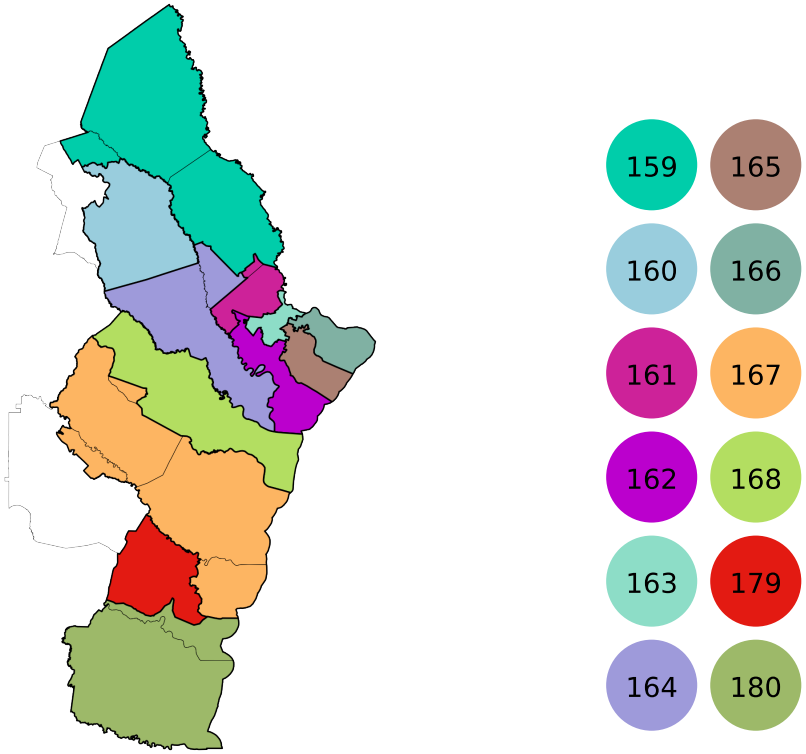


Figure 29: HD Southeast Alt Eff 3 plan.

	HD Southeast Enacted			
HD	BVAP	BHVAP	Primaries out of 4	Generals out of 8
159	24.5%	27.4%	2	0
160	22.6%	27.6%	2	0
161	27.1%	33.9%	4	0
162	43.7%	53.3%	4	8
163	45.5%	52.9%	3	8
164	23.5%	32.0%	3	0
165	50.3%	55.6%	4	8
166	5.7%	9.8%	3	0
167	22.3%	29.7%	3	0
168	46.3%	56.6%	4	8
179	27.0%	33.4%	3	0
180	18.2%	23.8%	3	0

	HD Southeast Alt Eff 3			
HD	BVAP	BHVAP	Primaries out of 4	Generals out of 8
159	22.3%	25.8%	3	0
160	26.4%	31.5%	1	0
161	34.1%	42.7%	4	6
162	38.9%	47.3%	4	8
163	50.0%	59.4%	4	8
164	13.6%	19.2%	3	0
165	27.1%	32.2%	3	5
166	29.9%	33.7%	3	8
167	18.7%	24.5%	3	0
168	45.9%	56.6%	4	8
179	31.8%	39.4%	4	0
180	18.2%	23.8%	3	0

Table 39: HD Southeast (12 districts).

10 Racial gerrymandering

10.1 Retention, displacement, and district disruption

In this section, I will examine the *core retention*, or conversely, the *population displacement*, of the districts in the enacted plan—that is, how much of the population retains the same district assignment before and after the redistricting? I will pay particular attention to the tendency to use racially imbalanced transfers of population in rebalancing the districts, and to the impact on the districts' effectiveness for electing Black and Latino candidates of choice.

10.1.1 Congress

In Congress, the ideal district population is 765,136. Of the fourteen districts, twelve are at least reasonably similar to their benchmark configuration, i.e., at least 2/3 of their population had been assigned to the same district before redistricting. The two with more than one-in-three new voters are districts 6 and 7.

District 6 was nearly at ideal size before the redistricting, having 771,431 residents enumerated in the Census—less than seven thousand off from the target size. However, it was subjected to major reconfiguration, with at least 40,000 people from the benchmark district reassigned to each of districts 4, 5, 7, and 11, while at least 40,000 different people were drawn in from each of districts 7, 9, and 11. In all, this represents reassignment of several hundred thousand people.

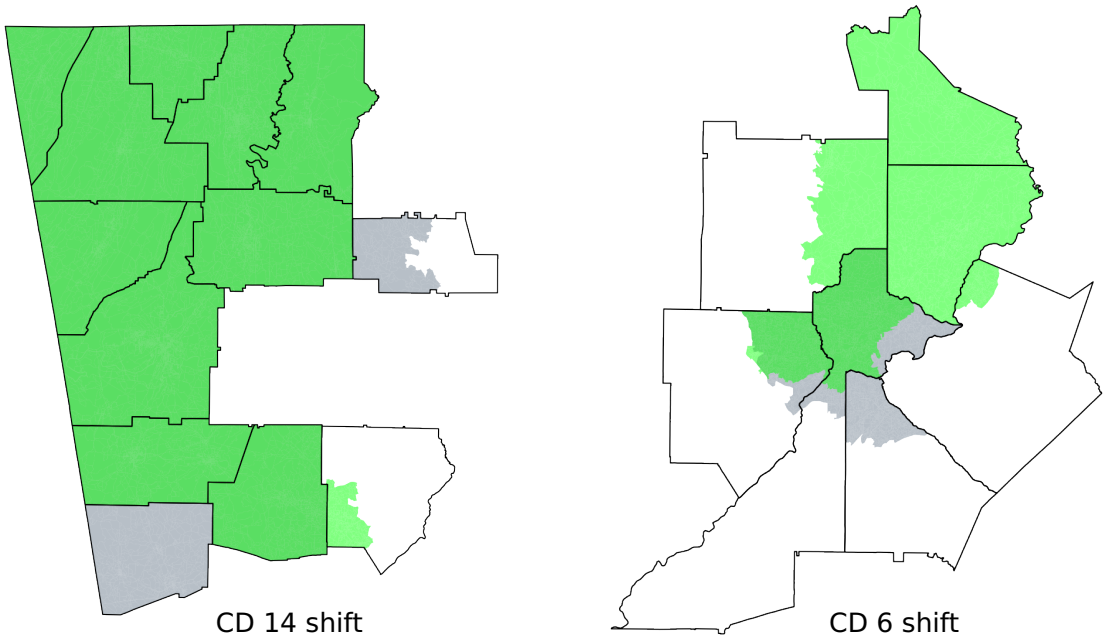


Figure 30: These before-and-after plots show benchmark configurations in gray, while new district placement is in light green. We can see that CD 14 made a new incursion into Cobb County while shedding rural Haralson and part of Pickens County. Meanwhile, CD 6 went sharply the other way, withdrawing from its metro Atlanta coverage and picking up rural counties to the north. Compare to Figure 31.

These swaps transfer more urban, more Black and Hispanic neighborhoods out of CD 6, while bringing in Whiter suburban areas. For instance, the largest reassignment out of the district goes from CD 6 to CD 4, and the largest reassignment into the district goes from CD 7 to CD 6—each of those moves roughly 200,000 Georgians to a new district, which is a massive shift. But the CD 6 to CD 4 transfer is 37.5% Black or Latino Georgians; by contrast, the CD 7 to CD 6 transfer is 16.1% Black or Latino. Since CD 6 was a performing district for the coalition of Black and Latino voters before its transformation, and none of the transfers improves representational prospects in non-performing districts, this transition looks to be plainly dilutive of voting power.

Meanwhile, the changes to CD 14 are smaller in terms of land area but are distinctive in terms of density and racial composition. CD 14 has expanded into Cobb to include two majority-Black cities—Powder Springs and Austell. Besides the further fracturing of Cobb County, Figure 31 makes it clear that the movement of those areas of Cobb into the district can't be justified in terms of compactness or respect for urban/rural communities of interest. (See §10.3 for references to the public record of community testimony.)

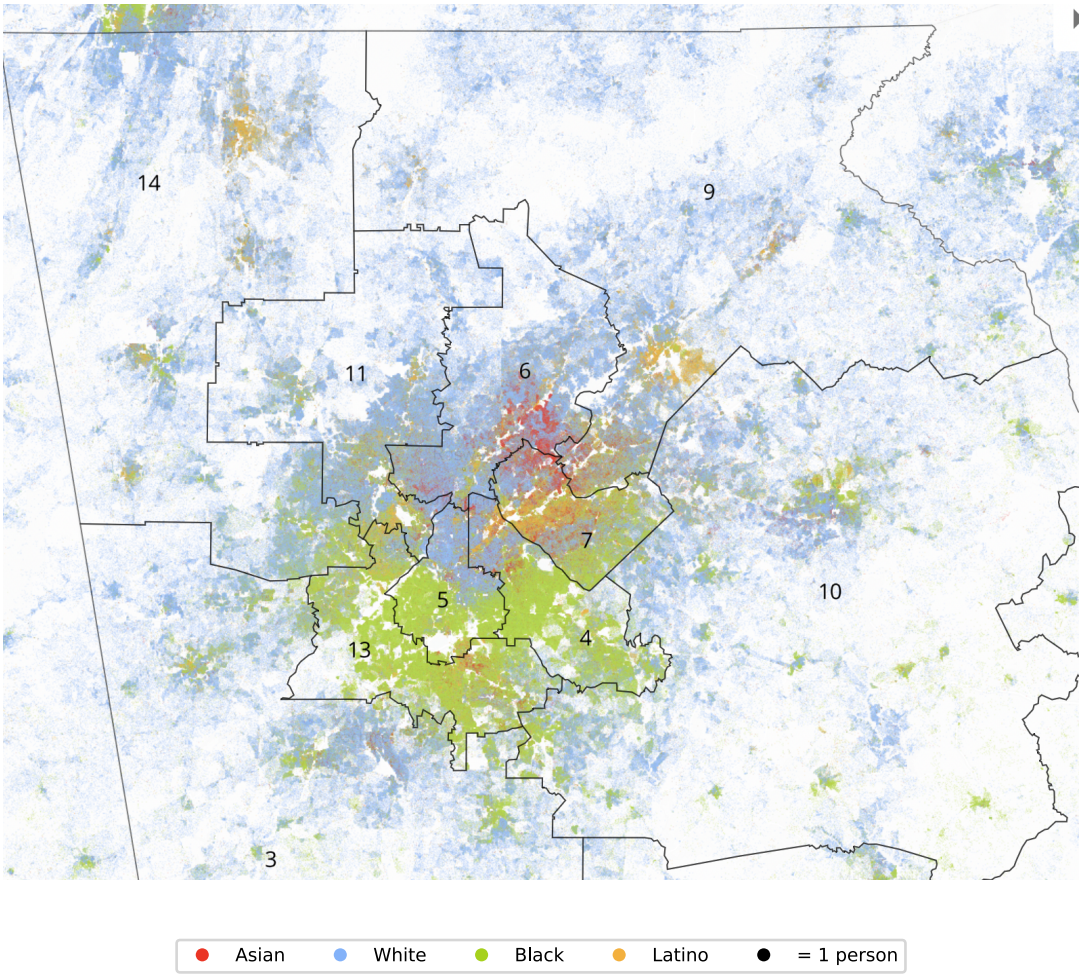


Figure 31: This dot density plot makes it clear—through thicker arrangement of dots, with green dots predominating—that dense African-American neighborhoods in Cobb were brought in at the southern tip of CD 14. These voters were therefore submerged among more numerous, dissimilar communities from CD 14. Meanwhile, the changes to district 6 added suburban/exurban/rural areas—seen with the sparsity at the north of CD 6 in the the dot density plot—unlike the bulk of the district.

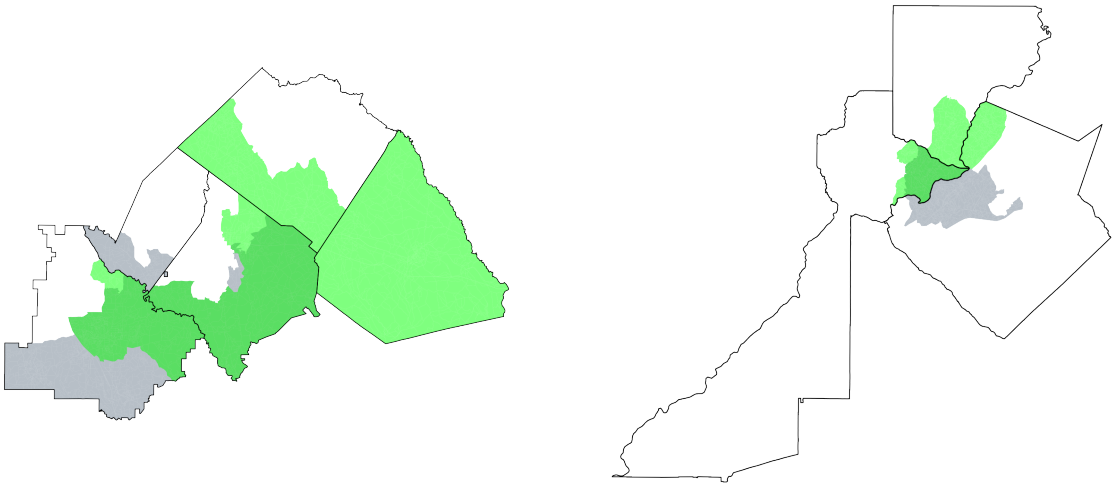
This incursion of CD 14 into Cobb is emphatically not required by adherence to traditional districting principles. For one vivid illustration of that, consider the comparison between the Duncan-Kennedy draft map and the map that was ultimately enacted. The benchmark plan from ten years ago had split Pickens County and included Haralson County in its construction of CD 14. Duncan-Kennedy retains Haralson, keeps Pickens whole in CD 9, and splits (low-density, mostly White) Bartow County to achieve population balance. Thus the shift in the final enacted plan—submerging a dense, majority-Black segment of Cobb in CD 14—was not necessary to balance population while keeping Pickens intact.

10.1.2 State Senate

When we move to smaller and more numerous districts in the Senate (ideal population 191,284), we might reasonably expect somewhat less core retention as line-drawers balance the traditional principles. However, the disruption in some cases is more than we would expect if retention were a highly prioritized goal. In the Senate, SD 7 and SD 14 have zero overlap with their previous population in the Benchmark configuration, and four other districts—SD 6, 32, 48, and 56—have less than half of their population retained.

New SD 14 is largely composed of benchmark SD 56, which was represented by Republican John Albers. The previous SD 56, which had become competitive over time (with four Republican victories and four Democratic victories across the elections in our probative dataset), was completely moved off of itself, to a new position that gave Biden only 43.7% support. Thus Albers could stay in the district numbered 56, facing largely new but very Republican-leaning voters, and win easily. This was achieved by racially imbalanced shifts: 56 → 14 has 35.5% BHVAP (substantial but still failing to secure electoral alignment in SD 14 with Black and Latino candidates of choice), while each group moved into SD 56 has under 19% BHVAP.

Another consequential district disruption occurred in benchmark district 48, which was represented by Democrat Michelle Au. Roughly two-thirds of the previous population of SD 48 was reassigned into SD 7 (see Figure 32 for geographical displacement). But the 7th district was already Democratic-controlled and was now facing the candidacy of progressive Nabilah Islam, who had been endorsed by civil rights groups including GALEO. The new SD 48 was built to be highly ineffective for Black and Latino preferences (aligned in only one of four primaries and zero of eight general elections from our probative dataset). Rather than run in the new district, Au switched to a run for the lower chamber, ultimately winning HD 50 in 2022. This district makeover was carried out with highly racially imbalanced transfers of population. Of more than 130,000 people moved from SD 48 to SD 7, 37.8% are Black and Latino, while the retained population has only 17.8% BHVAP share; and no territory reassigned into the district has BHVAP share exceeding 23.5%.



SD 17 shift SD 48 shift

Figure 32: These before-and-after plots show benchmark configurations in gray, while new district placement is in light green. The new configurations are clearly not made to improve compactness, and they increase the number of county traversals.

SD 17 also underwent a makeover: the district had become mildly overpopulated but was changed much more than needed, retaining only about half of its residents. (See, again, Figure 32.) Meanwhile, the district was transformed from effective (4/4 primaries, 5/8 generals) to ineffective (3/4 primaries, 0/8 generals). Outgoing population was roughly half Black and Latino (17 → 10 has 52.6% BHVAP, 17 → 25 has 49.0%, and 17 → 43 has 51.3%) while the significant incoming reassignments have much lower shares (25 → 17 has 20.9% and 46 → 17 has 23.8%). Notably, none of the districts that received population from SD 17 thereby became effective.

10.1.3 State House

At the House level, the ideal district size of just 59,511 necessitates substantial shifts to the districts, but once again the state's enacted map is highly disruptive, well beyond what is required. Fully 57 districts out of 180 were moved to positions completely disjoint from their benchmark locations. Furthermore, a startling 32 districts were not only moved or relabeled but effectively *dismantled*, with fewer than 30,000 prior residents assigned to any single district, so that no candidate can have the usual benefits of incumbency in terms of familiarity to their voters.

One notable category within these "dismantled" districts is those for which the ten-year demographic shifts had made the benchmark districts amenable to political swings, so that candidates from each major party would have won 2-6 out of 8 general contests in the dataset of probative elections. This includes seven districts: HD 35, 44, 48, 49, 52, 104, and 109. *Zero* of these remain in this "swingy" category after redrawing. Yet five are rebuilt to be ineffective for Black and Latino voters, while only two are made effective. Those that are rebuilt to be ineffective are subjected to racially imbalanced population transfers.