Nos. 21-1086, 21-1087

In The Supreme Court of the United States

JOHN H. MERRILL, ET AL.,

Appellants,

v.

EVAN MILLIGAN, ET AL.,

Appellees.

JOHN H. MERRILL, ET AL.,

Petitioners,

v.

MARCUS CASTER, ET AL.,

Respondents.

On Appeal From And Writ Of Certiorari To The United States District Court For The Northern District Of Alabama

SUPPLEMENTAL JOINT APPENDIX

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[1] "JA" refers to the Joint Appendix. "SJA" refers to the Supplemental Joint Appendix – a separate volume, printed on 8.5" x 11" paper, comprising documents that contain maps and charts that are easier to read in their original format. "MSA" and "CSA" refer to the Milligan Stay Appendix and Caster Stay Appendix, respectively, with pages corresponding to the booklet-format versions of those appendices.

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IN THE UNITED STATES DISTRICT COURT
NORTHERN DISTRICT OF ALABAMA
SOUTHERN DIVISION

EVAN MILLIGAN, et al.,

Plaintiffs,

vs.

JOHN H. MERRILL, et al.,

Defendants.

No. 2:21-cv-01530-AMM

Preliminary Expert Report of Baodong Liu, Ph.D.

December 10, 2021

I. Introduction

I have been retained as an expert by counsel for the Plaintiffs in the above-captioned litigation. I have prepared this report pursuant to Federal Rule of Civil Procedure 26(a)(2)(B).

I have been asked to express opinions on whether racially polarized voting (RPV) exists in Alabama, and whether or not RPV has resulted in the defeats of Black-preferred candidates in Alabama Congressional elections.

I am being compensated at $300 per hour for my work on this case. My compensation is not contingent on or affected by the substance of my opinions or the outcome of this litigation. My work in this matter is ongoing, and I reserve the right to amend, modify, or supplement my analysis and opinions.

II. Background on Racially Polarized Voting

In the landmark *Thornburg v. Gingles* (1986), the Supreme Court provided the precise three-prong dilution test in litigation arising under Section 2 of the Voting Rights Act (VRA). The *Gingles* test asks whether: 1) the racial or

language minority group is "sufficiently large and geographically compact to constitute a majority in a single-member district"; 2) the minority group is "politically cohesive" (meaning its members tend to vote for the same candidate); and 3) the "majority votes sufficiently as a bloc to enable it ... usually to defeat the minority's preferred candidate." In particular, the second and the third preconditions under the *Gingles* test have become the legal definition of RPV.

III. Summary of Professional Qualifications

I am a tenured professor of political science in the Department of Political Science at the University of Utah. I have done extensive research regarding the relationship between election systems and the ability of minority voters to participate fully in the political process and to elect representatives of their choice.

My research has won the Byran Jackson Award for the best study/dissertation about racial voting from the Urban Politics Section of the American Political Science Association, and the Ted Robinson Award from the Southwest Political Science Association. The results of my research have been published in peer-reviewed journals, including Social Science Quarterly, American Politics Research, Sociological Methods and Research, PS: Political Science and Politics, Urban Affairs Review, Political Behavior, Journal of Urban Affairs, Southeastern Political Review, and American Review of Politics, among other journals. I am also an author or editor of eight scholarly books including Political Volatility in the United States: How Racial and Religious Groups Win and Lose; Solving the Mystery of the Model Minority; The Election of Barack Obama: How He Won, and Race Rules: Electoral Politics in New Orleans, 1965-2006. I have also served as a member of the Board of Directors/Advisors on many national and international organizations such as the National Association for Ethnic Studies, Urban Affairs Review, Journal of Behavioral and Social Sciences, and International Encyclopedia of Political Science (CQ Press).

As an expert on RPV analysis, I have published peer-reviewed journal articles and books on the cutting-edge techniques used by academic professionals and supported by courts in voting rights cases and on the electoral history of the South. I have served as an expert witness in dilution cases in several states, including Alabama, Arkansas, New York, Louisiana, Utah, and Tennessee. Furthermore, I have provided my expertise to the US Department of Justice and others on census differential privacy policy and methodological issues concerning RPV. I have also been an invited instructor for expert training programs on RPV analysis concerning both the 2010 and 2020 rounds of redistricting.

My applied research and grants have included analyses of ranked-choice voting, economic development, racial voting patterns, public school science education, school districts' economic impact on the local economy, and various citizen surveys. My grants have come from New America, the National Science Foundation, American Political Science Association, the National Humanities Center, Wisconsin Security Research Consortium, Fond du Lac School District, Johnson Controls, Inc, City of Waupaca (WI), the League of Women Voters, American Democracy Project, and Wisconsin Public Service. I also served as the editor of Urban News for the American Political Science Association's Urban Politics Section, and I was elected as a co-chair of the Asian Pacific American Caucus of the American Political Science Association.

I have served as a commentator or opinion writer for the Salt Lake Tribune, ABC4News, Hinkley Forum, NPR, AP, Daily Utah Chronicle, Milwaukee Sentinel Journal, Daily Caller, and KSL, among other media outlets.

At my university, I served as Associate Chair of the Department of Political Science and the Interim Director of the Ethnic Studies Program, the MLK Committee Chair, and a faculty senator.

Attached as Appendix 1 is a curriculum vitae setting forth my professional background, which includes a list of all publications I have authored or co-authored, including forthcoming publications.

IV. Opinions

I have formed the following opinions:

Based on the data available at the time of writing this report, voting in Alabama since 2008 is "racially polarized" in that Black voters in 13 of the 13 elections analyzed have expressed a clear preference for the same candidate, and in each of the elections analyzed, the candidate preferred by Black voters was a Black candidate. Furthermore, this preference was not shared by the white voters who were the majority of the electorate. As a result, the Black preferred candidates were typically defeated in biracial elections in Alabama.

V. Elections Analyzed

In a case challenging a redistricting plan of Congressional districts under Section 2 of the Voting Rights Act, such as this one, I am aware of case law stating that endogenous elections providing a choice between voting for a white candidate and voting for a minority (in this case, Black) candidate are generally considered the most probative for assessing RPV.[1] My focus on

[1] See *Wright v. Sumter Cnty.*, 979 F. 3d 1282, 1292-93 (11th Cir. 2020) ("[E]vidence drawn from elections involving black candidates is more probative in Section Two cases"); *Clark v. Calhoun Cnty.*, Miss., 88

biracial endogenous elections is consistent with scholarly research, which finds that minority voters are mobilized in elections involving a minority candidate running against white candidates.[2] Congressional elections in the districts at issue in this litigation are called endogenous elections. I identified and reviewed endogenous elections in which there were both a Black candidate and a white candidate (i.e., biracial elections) since 2008.[3] The reason to select only biracial elections is because these elections satisfy the necessary conditions on which Black voters and non-Black voters had a realistic opportunity to vote for the candidate of their choice which is not available in uni-racial elections involving only white candidates (or involving only Black candidates). Seven endogenous biracial elections were analyzed in this report.

Since there were only seven such endogenous biracial elections during the period under study, I also identified and reviewed six biracial elections for statewide elected offices in the same period. The elections that did not concern the electoral offices at issue in this matter are called exogenous elections.[4] Two of these state-wide biracial exogenous elections were for Lt. Governor (2018 and 2014), two were for the 2018 State Auditor election and 2014 Secretary of State election, and the other two were for the presidential elections in 2008 and 2012 which involved a Black candidate, Barack Obama, as the nominee for a major political party. In addition, I reviewed exit poll data from the 2008 presidential primary, presidential general, and Senate general elections in Alabama.

VI. Measurement of RPV

I used the following two-step operational rules to measure whether a particular election is racially polarized: 1) I first estimate the Black and white group support[5] for the Black candidate in a biracial election; and 2) if in this biracial election the majority of Black voters cast their vote for the Black candidate, and only a minority of white voters cast their vote for the same Black candidate, then this election is racially polarized.

F.3d 1393, 1397 (5th Cir. 1996) ("[E]xogenous elections-those not involving the particular office at issue-are less probative than elections involving the specific office that is the subject of the litigation.").

[2] Matt A. Barreto. 2012. Ethnic Cues: The Role of Shared Ethnicity in Latino Political Participation. University of Michigan Press; Karen M. Kaufmann. 2004. The Urban Voter: Group Conflict and Mayoral Voting Behavior in American Cities. University of Michigan Press; .

[3] While more recent elections are more probative than distant past elections, my decision to include biracial elections since 2008 also took into consideration of the two census datasets (the 2010 and 2020 datasets) that provided a longitudinal analysis for a period long enough to allow the examination of RPV pattern over time (or lack of).

[4] Evidence from exogenous elections can be used to supplement evidence from endogenous elections, particularly where there is little data from recent endogenous elections.

[5] Support is defined as over 50% of votes for a particular candidate.

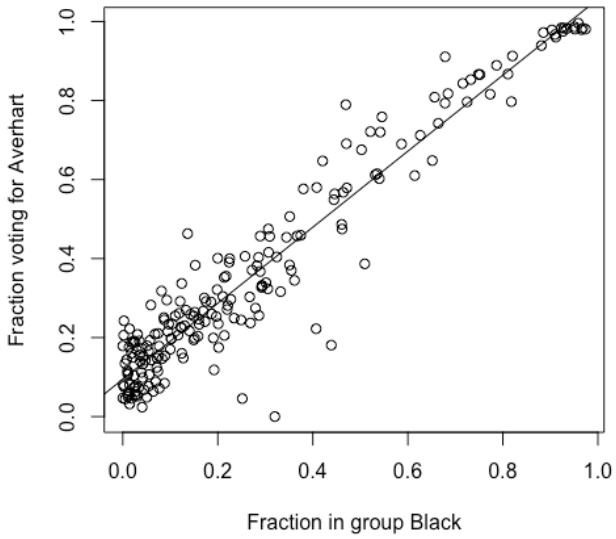
Since voting in the United States takes place in privacy, the only way to determine whether or not RPV existed in a given election is through statistical procedures. In this report, I analyzed the biracial elections using the award-winning Ecological Inference (EI) method developed by Professor Gary King of Harvard University.[6] EI is a statistical procedure for estimating voting results of voter groups (in this case grouped by race), and it has been widely used as the most-advanced and reliable statistical procedure for RPV estimates in not only academic research but also voting rights cases in the last two decades. To run an EI operation, the specific election return data at the precinct-level needed to be matched with the voting-age population (VAP) data for the non-Hispanic white-majority, and the Black, Hispanic, and "all other" racial groups at the level of the Voting Tabulation District (VTD) or other reporting unit based on the closest census regarding Alabama.[7]

There are other statistical procedures that have been used to analyze RPV. One such procedure that has been used in dilution cases relies on various regression tools. The regression tools are inadequate for the analysis necessary for the RPV analysis here, and I explain why. To demonstrate the use of such regression tools, Figure 1 uses the 2020 Congressional District 1 general election in Alabama as an example. It shows a scatterplot for the relationship between the Black-voter proportion in precincts and the proportion of votes cast for the James Averhart, the Black candidate who ran against the white candidate, Jerry Carl.

[6] See Gary King, A Solution to the Ecological Inference Problem: Reconstructing Individual Behavior from Aggregate Data (Princeton University Press, 1997).

[7] I also ran the same EI operations for all the elections analyzed in this report based on the American Community Survey (ACS) data, and results are very similar to those provided in Tables 1 and 2 of this report. Election results were compiled from https://www.sos.alabama.gov and, per my specifications, precinct-level results data was provided by Plaintiffs' counsel using the process described in Appendix 3.

Figure 1
Regression Method to Measure RPV: An Example



Each circle in Figure 1 represents a voting precinct in Congressional District 1. It is clear from Figure 1 that as the fraction in the Black group increases in a precinct, so does Averhart's share of votes. To capture this positive relationship, regression methods use a straight line to make the best fit for the data. The Single Regression Method (also called Goodman Regression) uses the slope and the intercept of the regression line to estimate the Black and non-Black voters' support for Averhart in Congressional District 1. Based on this procedure, it is estimated that the Black voting group provided Averhart with 105.7% of their votes while the non-Black group voted for him at the 9.5% level. Of course, based on the two-step operational rules specified above, the Congressional District 1 election in Alabama in 2020 was racially polarized, in that Black voters overwhelmingly supported Averhart whereas the super-majority of the non-Black voters voted against him.

If the above regression procedure is adopted to analyze all biracial elections in Alabama, it will unfortunately provide a misleading result. Obviously, Averhart's Black support should never surpass the 100% maximum value which is exactly the rule that the Single Regression Method violates in the Congressional District 1 example. There are other limitations of the Single Regression Method that make it a subpar tool for RPV analysis. For example, it assumes that all Black voters, regardless of which precinct they are located, voted at the same rate for the Black candidate in a given election; and in making estimates for racial groups' support for the Black candidate, the Single Regression Method treated all precincts with exactly the same weight

regardless of how many voters in that precinct cast their votes.[8] As a result of the aforementioned limitations and errors, experts in this field have increasingly replaced the regression-related tools with more advanced statistical procedures.

Thus, rather than regression-related tools, I instead analyzed the biracial elections based on EI method. One of the main reasons to use the EI method in the estimation of single-member district elections, rather than the regression methods, is because it *always* generates realistic estimates.[9] With respect to the Congressional District 1 election in Alabama in 2020, for example, the EI method estimated that Averhart received 93.3 % of the votes from the Black voter group and 12.6% of the votes from the white voter group. The realistic estimation of group votes is guaranteed through EI's method of bounds feature, which adopts the mathematical rule to determine the maximum and minimum number of votes cast by a particular racial group for a particular candidate. For example, if a precinct has only five Black registered voters and the total votes cast for the only Black candidate in the election is 10, then at least five of the total 10 votes are from non-Black registered voters, which is a mathematical necessity.

EI also provides not only the point estimates for racial voting patterns, but also the standard errors (or 95% confidence interval) associated with these point estimates, which is to be understood as the uncertainty boundaries beyond the point estimates. The point estimates are to be considered as the most likely vote percentages cast for a given candidate by different racial groups in a given election.[10]

The point estimates and the uncertainty boundaries can be visually displayed by the EI technology. We can once again use the 2020 Congressional District 1 election as an example. The data at the precinct-level for Black, white, and Hispanic voting age population (VAP) and the votes cast for Averhart and his white opponent, Jerry Carl are available at the time of writing this report. Figure 2 is the Density Plot based on the Ecological Inference (EI) estimations

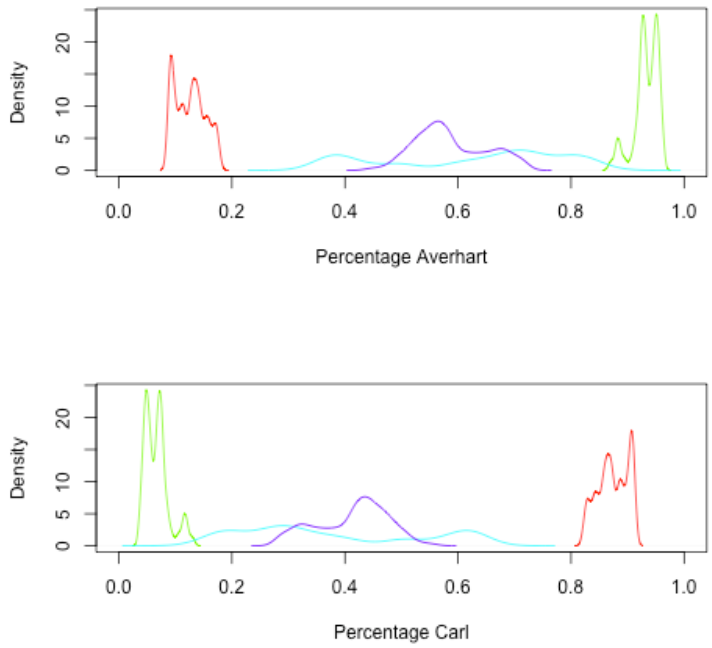
[8] Because of the clear limitations of the Single Regression Method concerning RPV analysis, some scholars proposed some alternatives such as weighted regression or double-regression method to remedy the specific limitations. But none of the regression tools can avoid a vital mistake in all circumstances, that is, to generate unrealistic estimates (e.g., more than 100% Black support for a Black candidate, or less than 0% support from the non-Black group for a Black candidate).

[9] For detailed discussions of EI method, compared to previous statistical procedures, see my article: Liu, Baodong. (2007). "EI Extended Model and the Fear of Ecological Fallacy," *Sociological Methods and Research* 36 (1): 3-25.

[10] In statistical analysis, point estimates are estimated through the empirical data on which theorems (especially the central limit theorem) are applied. The point estimates are the exact numbers (for example, Black voters cast exact 86.3% of their vote for a Black candidate) which are "the best" estimation, given the data, but also are "uncertain" in that the reality may be "off" from this best estimation. The extent to which the reality may deviate from it is known as standard errors. Scholars accept conventionally a 95% confidence interval where the lowest possible value and the highest possible value around the best point estimate are specified based on the central limit theorem.

of data for multiple racial groups.[11] The red curve on the left shows the boundary of the white vote for Averhart, and the green curve on the right displays that of the Black vote, which is a clear picture of RPV. Note that there are also two other curves in the middle of the plot. These two curves (in blue and pink colors) showed the support for Averhart from Hispanic voters and the "other" minority racial group (which includes, for example, Asians and Indigenous Americans). Note also that the bottom panel shows the plot for Carl.

Figure 2: Density Plot based on EI Operation



VII. The Findings

As explained above, the selection of the elections for my RPV analysis is based on three critical criteria: 1) biracial elections involving at least one Black candidate and one white candidate; 2) endogenous biracial elections supplemented by exogenous biracial elections (i.e., non-Congressional biracial elections); and 3) elections during the last 15 years. My analysis focuses on elections in the last 15 years as more recent elections are most probative in identifying RPV.[12]

[11] I used the eiPack R-package to derive the racial estimates for multiple groups.

[12] As a statistical rule, more recent elections help us understand what just happened and predict what will happen in the near future. Biracial endogenous electoral competitions are the most probative elections to analyze.

A) Endogenous Elections

Table 1: Estimated Racial Support for Black Candidate in Endogenous Elections

Election	Black Candidate(s)	White Candidate(s)	% vote cast for Black Cand	Black Support for Black Cand (95% CI)[13]	White Support for Black Cand (95% CI)	Black-Cand Won?	RPV?
2020 CD1, primary	James Averhart	Kiani Gardner and Frederick Collins	40.2%	53.8% (.52-.56)	16.7% (.13-.20)	Into Runoff	Yes
2020 CD1, general	James Averhart	Jerry Carl	35.6%	93.3% (.88-.96)	12.6% (.09, .17)	No	Yes
2020 CD2, general	Phyllis Harvey-Hall	Barry Moore	34.5%	93.4% (.88-.96)	5.2% (.04-.1)	No	Yes
2020 CD3, general	Adia Winfrey	Mike Rogers	32.4%	92.6% (.88-.95)	6.6% (.03-.12)	No	Yes
2018 CD1, general	Robert Kennedy, Jr.	Bradley Byrne	36.8%	94.6% (.92-.96)	8.1% (.08-.13)	No	Yes
2012 CD7, general	Terri Sewell	Don Chamberlain	75.8%	96.3% (.94-.98)	26.1% (.20-36)	Yes	Yes
2010 CD7, general	Terri Sewell	Don Chamberlain	72.5%	95.5% (.93-.97)	19.3% (.16-23)	Yes	Yes

Seven endogenous elections were analyzed. Table 1 shows the results of EI operations on these seven elections during the last decade.

To be more specific, the Black candidate, James Averhart, was involved in two of these five elections. He received 53.8% of votes cast by Black voters and only 16.7% from white voters in the 2020 Democratic primary. Black voters were the majority of the electorate in the primary. Averhart received 93.3% of votes cast by Black voters and 12.6% from white voters in the general election for Congressional District 1. In the 2020 Congressional District 2 general election, Phyllis Harvey-Hall, the Black candidate, received 93.4% of the votes from Black voters and 5.2% from white voters. In the 2020 Congressional District 3 general election, Adia

[13] See footnote 10 for the explanation of uncertainty estimates (i.e., 95% confidence interval).

Winfrey, the Black candidate, received 92.6% of the votes from Black voters and 6.6% from white voters. In the 2018 Congressional District 1 general election, Robert Kennedy Jr., the Black candidate, received 94.6% of the votes from Black voters and only 8.1% from white voters. The only Black candidate who was able to win a biracial Congressional election in Alabama was Terri Sewell who ran in Congressional District 7 which has been a Black-majority district since the 1990s. Her two contested elections in 2010 and 2012 were both highly racially polarized. In 2010, she won 95.5% of the Black vote but only 19.3% of the white vote. In 2012, as an incumbent running against the same white Republican candidate, Don Chamberlain, Sewell won 96.3% of the Black vote and only 26.1% of the white vote.

These endogenous election analyses revealed the same pattern of RPV which led to the same result in non-Black-majority districts, that is, the defeat of the Black candidate by his/her white opponent in each election despite Black voters' clear support for the Black candidate, though Averhart did make into the Democratic Primary runoff for Congressional District 1 in 2020 and later was defeated in the general election.

It should also be noted that I have examined the RPV pattern, or lack of it, in the Congressional Districts at issue in this litigation by using the election returns in those districts from state-wide elections. My analysis shows consistently that RPV existed in these Congressional Districts in those state-wide biracial elections. I will show the results of RPV analyses in these elections in the following section.

B) Exogeneous Elections

All exogeneous elections analyzed in this report showed a high level of racial polarized voting, as shown in Table 2.

Specifically, Will Boyd and Miranda Joseph as the Black candidates in the 2018 Lt. Governor and State Auditor elections received 95.5% and 95.4% of the votes cast by Black voters, respectively, whereas votes from white voters were as low as 11.0% and 12.1% respectively.

In the 2014 general election, James Fields, a Black candidate running against the white incumbent Republican candidate, Kay Ivey. Fields received 94.0% of the Black vote and 14.9% of the white vote, and was defeated with 36.7% of total votes cast. In the same year, Lula Albert-Kaigler, a Black candidate competed in the Secretary of State election, and received 35.6% of the total votes. She was defeated by her white Republican opponent, John Merrill. She received 95.1% of the Black vote and only 12.0% of the white vote in this highly racially polarized state-wide election.

Table 2. Estimated Racial Support for Black Candidate in Exogenous Elections

Election	Black Candidate	White Candidate(s)	% vote cast for Black Cand	Black Support for Black Cand (st error)	White Support for Black Cand (st error)	Black-Cand Won?	RPV?
2018 Lt Governor	Will Boyd	Will Ainsworth	38.7%	95.5% (.92-.96)	11.0% (.1-.14)	No	Yes
2018 State Auditor	Miranda Joseph	Jim Zeigler	39.5%	95.4% (.93-.96)	12.1% (.11-.14)	No	Yes
2014 Lt Governor	James Fields	Kay Ivey	36.7%	94.0% (.92-.95)	14.9% (.14-16)	No	Yes
2014 Secretary of State	Lula Albert-Kaigler	John Merrill	35.6%	95.1% (.94-.96)	12.0% (.11-.13)	No	Yes
2012 Presidential	Barack Obama	Mitt Romney	36.9%	93.9% (.90-.96)	13.9% (.13-.17)	No	Yes
2008 Presidential	Barack Obama	John McCain	36.8%	92.0% (.88-.94)	15.0% (.14-.17)	No	Yes

Finally, the 2008 and 2012 presidential elections in Alabama revealed the same consistent pattern of RPV.[14] In 2008 Obama received less than 40% of the total votes cast in Alabama, and thus failed to win Alabama. His defeat was clearly a result of RPV as his Black support was about 92% while his white support was around 14%. Racial bloc voting by the white-majority led to his defeat. Despite running as an incumbent in 2012, Obama was not able to overcome the deep racial divide in Alabama in his reelection. His white vote further declined one percentage point, while his Black support increased by roughly the same margin.

[14] The dataset from the Alabama Secretary of State's website for my analysis of the 2012 presidential election was missing election returns from Bullock, Butler, Hale, and Wilcox Counties. For my Effectiveness analysis, I relied on data that, per my specifications, Plaintiffs' counsel provided to me. I understand that these data consist of statewide election results projected onto Census VTDs retrieved from the Redistricting Data Hub, https://redistrictingdatahub.org, with each VTD associated with one or more congressional districts from Plaintiffs' Demonstrative Plans B and D using a Census Block Equivalency File provided by Dr. Moon Duchin.

As mentioned above, I also examined the detailed RPV results in Congressional districts by using state-wide election results in the 2018 Lt. Governor race and the 2012 and 2008 presidential races. In my analysis, the Black candidates lost every Congressional district except CD7 because of RPV. For example, in the 2008 presidential election, the Congressional districts revealed the same pattern. Table 3 provides the RPV statistics based on the same EI operation that was applied to 7 Congressional districts separately.

As shown in Table 3, Black voters were almost uniformly supportive of Obama in the 2008 Presidential election. But CD7 provided the highest level of support for him and made him the winner of the District with 70.1% of the votes cast. This was largely due to the almost universal Black support there (at 97%), and the white bloc voting at the 13% level did not lead to his failure of winning this majority-Black district.

Table 3: the RPV Patterns of Congressional Districts in the 2008 Presidential Election in Alabama

Congressional District	Black Candidate	White Candidate(s)	% vote cast for Black Cand	Black Support for Black Cand (st error)	White Support for Black Cand (st error)	Black-Cand Won?	RPV?
1	Barack Obama	John McCain	36.3%	92.0% (.88-.94)	12.6% (.10-.16)	No	Yes
2	Barack Obama	John McCain	33.4%	90.3% (.83-.93)	8.1% (.06-.13)	No	Yes
3	Barack Obama	John McCain	44.0%	89.5% (.83-.93)	16.2% (.13-.21)	No	Yes
4	Barack Obama	John McCain	22.9%	90.6% (.87-.94)	16.0% (.15-.17)	No	Yes
5	Barack Obama	John McCain	36.6%	88.6% (.86-.91)	24.0% (.22-.25)	No	Yes
6	Barack Obama	John McCain	23.5%	56.6% (.41-.76)	17.1% (.14-.19)	No	Yes
7	Barack Obama	John McCain	70.1%	97.0% (.95-.98)	13.1% (.10-.19)	Yes	Yes

The RPV in the other six districts, however, produced an opposite result. Obama lost all other Congressional districts in Alabama in 2008. Even in CD6 where Obama's Black support was in the 50% range, by far the lowest in Alabama, the white bloc voting at 17% support level for him was enough to defeat him in CD6.[15] The RPV results in CDs 1 through 5 displayed similar patterns as the racial gap was more than 60%, and even reached 80% in CD1. In short, RPV was instrumental in Obama's defeat in all these Congressional districts.

VIII. Review of Exit Polls

The RPV results based on EI in this report regarding Obama's 2008 and 2012 general elections are consistent with the exit poll results conducted by major media networks. Because voters do not register by party in Alabama, the exit polls also help us understand the votes of self-identified Democrats and Republicans. For example, according to the 2008 exit poll, Obama won 98% of Black voters in Alabama, and John McCain, a white Republican, won 88% of white voters. McCain won a majority (51%) of white Democrats, and Obama won only 47% of white Democrats.[16] And, in the 2012 Presidential election, 84% of white people in Alabama voted for Romney while white support for Obama was only 15%.[17]

In addition, I reviewed exit poll data for the 2008 Presidential Democratic Primary[18] and the 2008 U.S. Senate elections[19] in Alabama which revealed a similar pattern of racially polarized voting. In the 2008 Primary, Hilary Clinton, a white woman, received 72% of the white vote, and Obama received 84% of the Black vote. In the 2008 Senate race, white voter support for U.S. Senator Jeff Sessions was 89% against Vivian Figures, a Black candidate. Sessions received 58% of the white Democratic vote and 96% of the white Republican vote. Figures won 90% of the black vote.

IX. Effectiveness Analysis: Different Plans Compared

I have also conducted a comparative study of three Alabama Congressional redistricting plans based on their performance in the most recent statewide elections in Alabama. These three plans are the Adopted Congressional Plan, and the two versions of CD Plans provided to me by Plaintiffs' counsel (named as PLSCD_Plan B and PLSCD_Plan D,

[15] Note also that CD6's RPV result showed a higher level of uncertainty based on 95% confidence interval.
[16] See http://www.cnn.com/ELECTION/2008/results/polls/#val=ALP00p1. Also see Table 7.1 of my book, *The Election of Barack Obama: How He Won*, for the comparison of RPV in Alabama in 2008, compared to other states (Liu, 2010, p. 117)
[17] See https://www.amren.com/features/2012/11/race-and-the-2012-election/.
[18] See https://abcnews.go.com/images/PollingUnit/ALDemHorizontal.pdf.
[19] See http://www.cnn.com/ELECTION/2008/results/polls/#val=ALP00p1.

respectively). I reported my analysis based on their performance using the 2018 Lt. Governor and 2018 State Auditor election results.[20]

The most important findings of my comparative study concern CDs 2 and 7. With respect to CD2, the Adopted Congressional Plan led to the defeat of the Black candidates whereas the two Plaintiffs' Plans did not.

Table 4: CD2
Plans Compared, based on the RPV Analysis of the 2018 Lt. Gov Election

Adopted Plan

Group	Turnout	Blk Candidate	Wht Candidate
Black	0.432 (0.404, 0.448)	0.932 (0.897, 0.952)	0.068 (0.048, 0.103)
White	0.425 (0.419, 0.432)	0.043 (0.032, 0.071)	0.957 (0.929, 0.968)
Total	0.424	0.355	0.645

PLSCD_PlanB

Group	Turnout	Blk Candidate	Wht Candidate
Black	0.47 (0.454, 0.48)	0.962 (0.946, 0.972)	0.038 (0.028, 0.054)
White	0.433 (0.427, 0.439)	0.08 (0.067, 0.118)	0.92 (0.882, 0.933)
Total	0.448	0.568	0.432

PLSCD_PlanD

Group	Turnout	Blk Candidate	Wht Candidate
Black	0.462 (0.448, 0.474)	0.957 (0.939, 0.968)	0.043 (0.032, 0.061)
White	0.451 (0.436, 0.466)	0.092 (0.075, 0.119)	0.908 (0.881, 0.925)
Total	0.452	0.555	0.445

As shown in Table 4, the RPV pattern was present in all three plans. But the Adopted Plan minimized the Black VAP percentage at less than 30% in CD2 while the two Plaintiffs' plans increased it to around 50%. This major difference led to different election outcomes in that Will Boyd, the Black Democratic candidate in the Lieutenant Governor's race, would have been the winner had he run in the CD2 of the Plaintiffs' plans, but would have lost CD2 in the Adopted Congressional Plan.

[20] For my effectiveness analysis, I used any-part Black VAP for the Black racial group measurement.

If one evaluates the effectiveness of different plans based on the 2018 State Auditor election results, the CD2 also produces the similar results of the 2018 Lt. Governor election (see Table 5).

Table 5: CD2
Plans Compared, based on the RPV Analysis of the 2018 State Auditor Election

Adopted Plan

Group	Turnout	Blk Candidate	Wht Candidate
Black	0.437 (0.423, 0.456)	0.946 (0.907, 0.967)	0.054 (0.033, 0.093)
White	0.417 (0.407, 0.426)	0.049 (0.037, 0.077)	0.951 (0.923, 0.963)
Total	0.419	0.366	0.634

PLSCD Plan B

Group	Turnout	Blk Candidate	Wht Candidate
Black	0.472 (0.465, 0.48)	0.964 (0.947, 0.973)	0.036 (0.027, 0.053)
White	0.433 (0.423, 0.444)	0.102 (0.085, 0.125)	0.898 (0.875, 0.915)
Total	0.442	0.578	0.422

PLSCD Plan D

Group	Turnout	Blk Candidate	Wht Candidate
Black	0.456 (0.438, 0.467)	0.952 (0.91, 0.967)	0.048 (0.033, 0.09)
White	0.444 (0.434, 0.459)	0.111 (0.075, 0.188)	0.889 (0.812, 0.925)
Total	0.446	0.564	0.436

With respect to CD7, though all three plans produced the same result, that is, the election of the Black candidates in both 2018 state-wide election, the Adopted plan packed the Black voting age population to about 54% while the two Plaintiffs' plans made the district around 50-52% Black majority. The comparisons are shown using the two state-wide election results in Tables 6 and 7.

Table 6: CD7
Plans Compared, based on the RPV Analysis of the 2018 Lt Governor Election

Adopted Plan

Group	Turnout	Blk Candidate	Wht Candidate
Black	0.503 (0.49, 0.513)	0.963 (0.932, 0.975)	0.037 (0.025, 0.068)
White	0.415 (0.406, 0.425)	0.159 (0.13, 0.214)	0.841 (0.786, 0.87)
Total	0.454	0.659	0.341

PLSCD_PlanB

Group	Turnout	Blk Candidate	Wht Candidate
Black	0.508 (0.482, 0.523)	0.959 (0.943, 0.973)	0.041 (0.027, 0.057)
White	0.41 (0.397, 0.429)	0.143 (0.11, 0.204)	0.857 (0.796, 0.89)
Total	0.447	0.617	0.383

PLSCD_PlanD

Group	Turnout	Blk Candidate	Wht Candidate
Black	0.509 (0.496, 0.523)	0.946 (0.914, 0.964)	0.054 (0.036, 0.086)
White	0.409 (0.394, 0.428)	0.19 (0.153, 0.243)	0.81 (0.757, 0.847)
Total	0.449	0.628	0.372

Table 7: CD7
Plans Compared, based on the RPV Analysis of the 2018 State Auditor Election

Adopted Plan

Group	Turnout	Blk Candidate	Wht Candidate
Black	0.507 (0.498, 0.516)	0.952 (0.93, 0.974)	0.048 (0.026, 0.07)
White	0.396 (0.375, 0.408)	0.162 (0.138, 0.192)	0.838 (0.808, 0.862)
Total	0.449	0.661	0.339

PLSCD PlanB

Group	Turnout	Blk Candidate	Wht Candidate
Black	0.498 (0.487, 0.508)	0.959 (0.934, 0.975)	0.041 (0.025, 0.066)
White	0.398 (0.385, 0.415)	0.132 (0.091, 0.204)	0.868 (0.796, 0.909)
Total	0.443	0.619	0.381

PLSCD PlanD

Group	Turnout	Blk Candidate	Wht Candidate
Black	0.501 (0.491, 0.511)	0.96 (0.929, 0.973)	0.04 (0.027, 0.071)
White	0.401 (0.391, 0.411)	0.155 (0.129, 0.23)	0.845 (0.77, 0.871)
Total	0.444	0.629	0.371

X. Conclusion

The empirical analyses clearly revealed that in 13 out of the 13 elections (100%) in which Black voters expressed a preference for Black candidates, that preference was not shared by white majority voters. This RPV pattern is confirmed not only by the seven endogenous biracial elections, but also by the six statewide biracial elections during the last decade. Despite Black voters uniting cohesively behind their preferred candidates, the white majority voted sufficiently as a bloc to typically defeat all the Black candidates in these elections. The only Black success in winning a biracial endogenous election since the 2008 elections was Terri Sewell who ran in a Black-majority congressional district. Furthermore, it is also shown in this empirical analysis, Obama won only in Congressional District 7 in the 2008 and 2012 elections where Black voters were the majority and white bloc voting was not enough to defeat him, thanks to the very high level of Black-voter cohesion there.

Thus, my empirical analysis indicates that the characteristics of "racial polarization," meaning Black voters tend to vote for the same candidate and the white majority votes as a bloc to usually to defeat the Black preferred candidate, has been met in the Congressional districts at issue here in recent endogenous and exogenous elections.

My effectiveness analysis also shows that the two plans proposed by Plaintiffs that I analyzed clearly offer Black voters in Alabama more opportunities to elect candidates of their choice than does the Adopted Congressional Redistricting Plan.

XI. Appendices

Appendix 1 is my curriculum vita.

Appendix 2 is the list of voting-rights cases for which I served as an expert witness.

Appendix 3 is the Data Acquisition, Processing, and Aggregation Process

Per 28 U.S. Code § 1746, I declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct. Executed on December 10, 2021.

Baodong Liu, Ph.D.

FILED
2021 Dec-14 PM 04:09
U.S. DISTRICT COURT
N.D. OF ALABAMA

UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF ALABAMA

EVAN MILLIGAN, et al.,

Plaintiffs,

v.

JOHN H. MERRILL, et al.,

Defendants.

Civil Case No. 2:21-CV-01530-AMM

DECLARATION OF MOON DUCHIN, PH.D.

I, Moon Duchin, declare:

1. My name is Moon Duchin. I am over 18 years of age and have personal knowledge of the facts set forth in this Declaration.

2. I hold a Ph.D. and an M.S in Mathematics from the University of Chicago as well as an A.B. in Mathematics and Women's Studies from Harvard University.

3. I am a Professor of Mathematics and a Senior Fellow in the Jonathan M. Tisch College of Civic Life at Tufts University. I hold an affiliation as Collaborating Faculty in the American Studies track within the Department of Race, Colonialism, and Diaspora Studies.

4. A copy of my expert report and exhibits in support, including a current copy of my full CV, are attached as Exhibit 1 to this declaration.

5. All of the quantitative work described in my report was performed by myself with the support of research assistants working under my direct supervision.

6. I am compensated at the rate of $300 per hour. My compensation for my work on this case is not dependent on the substance of my opinions or the outcome of the case.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge.

Executed on December 10, 2021 in Medford, Massachusetts.

Moon Duchin

Exhibit 1

Presentation of Alternative Congressional Districting Plans for Alabama

Moon Duchin
Professor of Mathematics, Tufts University
Collaborating Faculty in Race, Colonialism, and Diaspora Studies
Senior Fellow, Tisch College of Civic Life

December 10, 2021

1 Background, qualifications, and materials consulted

I am a Professor of Mathematics and a Senior Fellow in the Jonathan M. Tisch College of Civic Life at Tufts University. I hold an affiliation as Collaborating Faculty in Department of Race, Colonialism, and Diaspora Studies (American Studies track). I hold a Ph.D. and an M.S in Mathematics from the University of Chicago as well as an A.B. in Mathematics and Women's Studies from Harvard University.

My general research areas are geometry, topology, dynamics, and applications of mathematics and computing to the study of elections, voting, and civil rights. My redistricting-related work has been published in venues such as the Election Law Journal, Political Analysis, Foundations of Data Science, the Notices of the American Mathematical Society, Statistics and Public Policy, the Virginia Policy Review, the Harvard Data Science Review, Foundations of Responsible Computing, and the Yale Law Journal Forum. My research has had continuous grant support from the National Science Foundation since 2009, including a CAREER grant from 2013–2018 and a Convergence Accelerator grant from 2019–2021 entitled "Network Science of Census Data." I am currently on the editorial board of the journals Advances in Mathematics and the Harvard Data Science Review. I was elected a Fellow of the American Mathematical Society in 2017 and was named a Radcliffe Fellow and a Guggenheim Fellow in 2018.

Materials

I consulted a range of materials while preparing this report:

- Data products published by the Census Bureau, especially the PL94-171 Decennial Census release, the 2015-19 American Community Survey, and the ACS Special Tabulation from the same 5-year period. The Census Places dataset was used to extract block assignments to cities and towns. TIGER/Line shapefiles were used to pair demographics with geography.
- Block equivalency files defining the State's new enacted districts from `www.sos.alabama.gov/alabama-votes/state-district-maps`.
- The Alabama Legislature's *Reapportionment Committee Redistricting Guidelines* [1], as well as the other articles cited in the bibliography below.

2 Introduction

On November 3, 2021, the Alabama Legislature enacted four districting plans: maps of 7 U.S. Congressional districts, 35 state Senate districts, 105 state House districts, and 8 state Board of Education districts. They were signed into law by Governor Kay Ivey the next day. This report presents alternative plans for Alabama Congressional districts and contrasts them with the enacted plan. I was asked to draw plans that establish that it is possible to create two majority-Black districts in a map that maintains population balance, reasonable compactness, respect for political boundaries, and other traditional districting principles. In particular, I was instructed to emphasize the Polsby-Popper (isoperimetric) definition of compactness.

I will be comparing the following plans: the enacted plan HB-1 and a set of alternative plans that I have drawn, labeled Plan A, Plan B, Plan C, and Plan D. They are shown in Figures 1-2.

The focus of this report is to establish that the first Gingles factor, known as "Gingles 1," is met:

> *First, the minority group must be able to demonstrate that it is sufficiently large and geographically compact to constitute a majority in a single-member district.*[1]

Together with Gingles 2 and 3, the factors establishing racially polarized voting, these stand as the threshold conditions for advancing litigation under the Voting Rights Act.

Alabama's largest minority group is Black, with 1,364,736 out of 5,024,279 residents—27.16% of the total population—identifying as Black, possibly in combination with other races, of any ethnicity, on their Census forms. This group is therefore large enough to constitute majorities of three out of seven congressional districts.[2] However, the second half of the Gingles 1 condition requires that we take the human geography into account, considering whether the group's residential location is sufficiently geographically compact to achieve majority-minority districts. The constraints of geography make it impossible to create three, but I will show that **it is readily possible to create two majority-Black Congressional districts in Alabama today**.

Furthermore, these two majority-Black districts can be drawn without sacrificing traditional districting principles like population balance (§3.1), contiguity (§3.2), respect for political subdivisions like counties, cities, and towns (§3.3), or the compactness of the districts (§3.4), and with heightened respect for communities of interest (§3.5).

[1] *Thornburg v. Gingles*, 478 U.S. 30 (1986)

[2] Since each district will contain 1/7 (or about 14.3%) of the population, it follows that 7.2% of the population is enough to constitute the majority in a district. Alabama's Black population is more than three-and-a-half times this numerous. Thus, in terms of numbers alone, three districts could have Black population majorities by a comfortable margin.

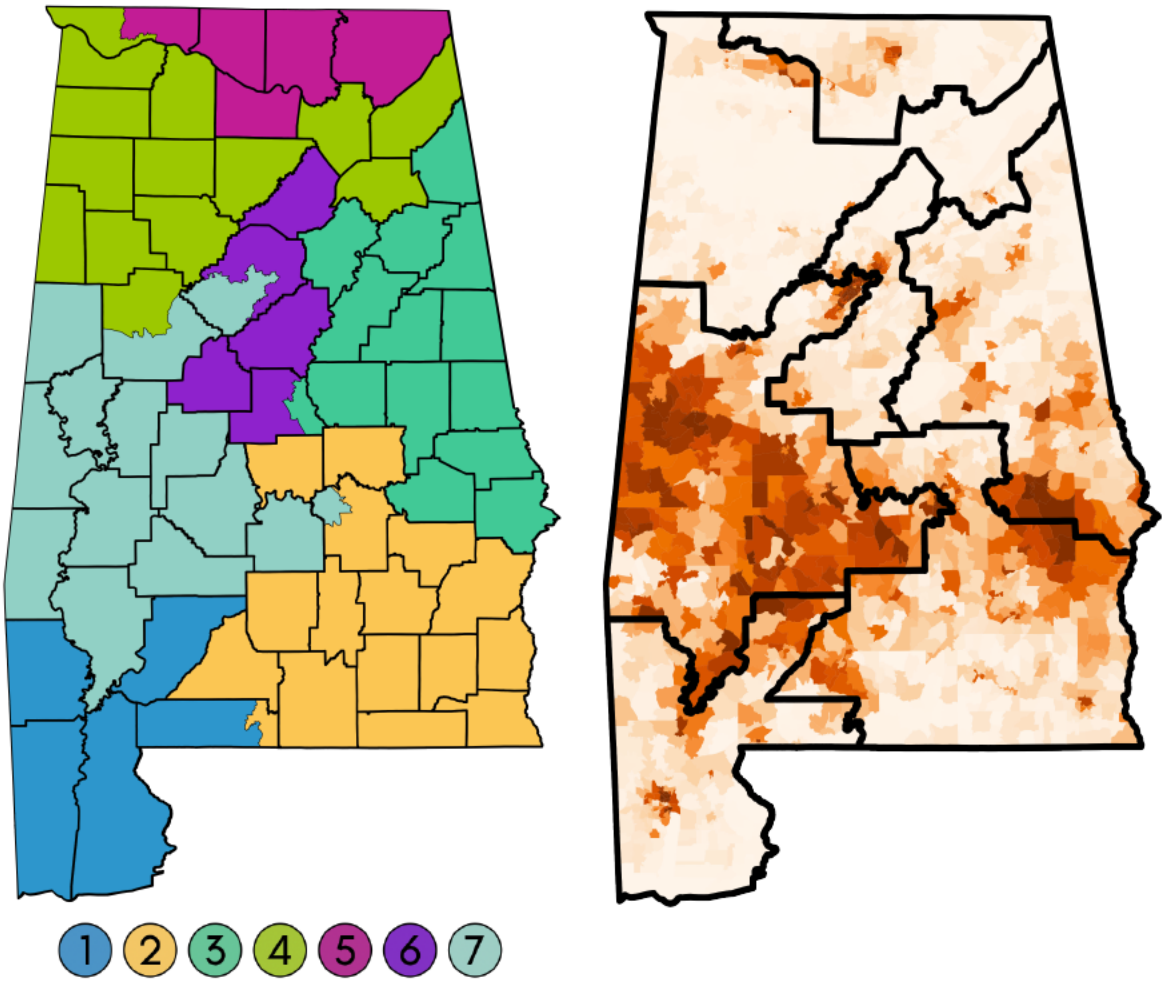


Figure 1: The State's plan HB-1 is shown (left) next to a demographic map (right). Darker shading indicates precincts with a higher share of BVAP, or Black voting age population. The State's plan packs Black population into District 7 at an elevated level of over 55% BVAP, then cracks Black population in Mobile, Montgomery, and the rural Black Belt across Districts 1, 2, and 3, so that none of them has more than about 30% BVAP.

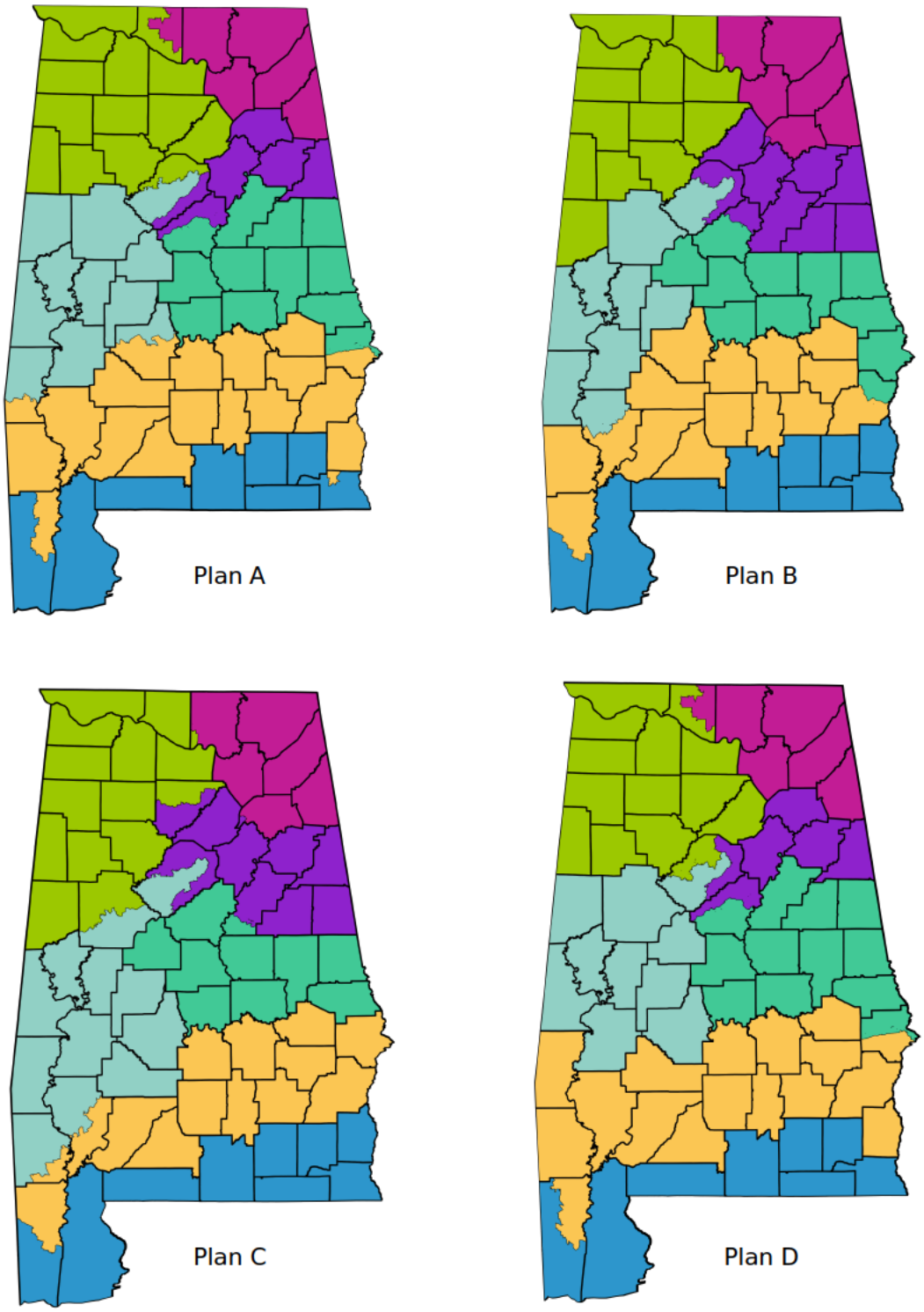


Figure 2: The four alternative plans presented in this report.

3 Traditional districting principles

I will begin by surveying the criteria discussed in the Alabama Legislature's *Reapportionment Committee Redistricting Guidelines* (henceforth, "the Guidelines") [1].

3.1 Population balance

The standard interpretation of *One Person, One Vote* for Congressional districts is that districts should be balanced to as near mathematical equality of population as possible, using total population from the Decennial Census. As the Guidelines put it, "*Congressional districts shall have minimal population deviation.*" The State's plan and all four alternative plans have very tight population balance, with each district within one-person deviation from the rounded ideal population of 717,754.

3.2 Contiguity

A district formed from census blocks can be called *contiguous* if it is possible to transit from any part of the district to any other part through a sequence of blocks that share boundary segments of positive length. As is traditional in Alabama (and affirmed in Section II.j.ii of the Guidelines), contiguity through water is accepted. The State's plan and the four alternative plans all satisfy contiguity.

3.3 Respect for political subdivisions

The Guidelines call for districting plans to "*respect communities of interest, neighborhoods, and political subdivisions*"; in redistricting terms, respect for political subdivisions can be interpreted as attempting to keep intact as many localities (counties, cities, and towns) as possible. In order to make seven finely population-tuned districts, it is necessary to split at least six of Alabama's 67 counties into two pieces, or to split some counties into more than two pieces. All of the plans under consideration—the State's plan and the four alternative maps—split nine counties or fewer, giving them high marks for respecting these major political subdivisions. Plan D in fact splits only five counties, with the largest county (Jefferson) touching three districts. On the municipal level, Alabama has 172 cities and 290 towns, according to the 2020 Census. All of the alternative plans are comparable to the State's plan on locality splits, with Plan B splitting fewer localities than HB-1.

Number of localities split, by type

	localities (out of 529)	counties (out of 67)	municipalities (out of 462)	majority-Black cities (out of 32)
HB-1	42	6	36	Adamsville, Bessemer, Birmingham, Montgomery, Tarrant (5)
Plan A	48	8	40	Adamsville, Bessemer, Birmingham, Pritchard (4)
Plan B	39	7	32	Bessemer, Birmingham (2)
Plan C	51	9	42	Adamsville, Bessemer, Birmingham (3)
Plan D	49	5	44	Adamsville, Bessemer, Birmingham, Pleasant Grove, Tarrant (5)

Table 1: Comparing the plans' conformance to political boundaries. Municipalities are defined as cities and towns, and localities includes these as well as counties.

3.4 Compactness

The two compactness metrics most commonly appearing in redistricting are the *Polsby-Popper score* and the *Reock score*. Polsby-Popper is the name given in this setting to a metric from ancient mathematics: the isoperimetric ratio comparing a region's area to its perimeter via the formula $4\pi A/P^2$. Higher scores are considered more compact, with circles uniquely achieving the optimum score of 1. Political scientist Ernest Reock created a different score based on the premise that circles were ideal: it is computed as the ratio of a region's area to that of its circumcircle, where the circumcircle is defined as the smallest circle in which the region can be circumscribed. Polsby-Popper is thought to be relevant as a measure of how erratically the geographical boundaries divide the districts, but this sometimes penalizes districts for natural features like coastlines of bays and rivers. Reock has a much weaker justification, since the primacy of circles is the goal rather than the consequence of the definition.[3]

These scores depend on the planar contours of a district and have been criticized as being too dependent on map projections or on cartographic resolution [2, 3]. Besides having the weakest relevance to redistricting, the Reock score is also technically flawed, subject to large distortions among different equally reasonable methods of computation. Recently, some mathematicians have argued for using discrete compactness scores, taking into account the units of Census geography from which the district is built. The most commonly cited discrete score for districts is the *cut edges* score, which counts how many adjacent pairs of geographical units receive different district assignments. In other words, cut edges measures the "scissors complexity" of the districting plan: how much work would have to be done to separate the districts from each other? Plans with a very intricate boundary would require many separations. Relative to the contour-based scores, this better controls for factors like coastline and other natural boundaries, and focuses on the units actually available to redistricters rather than treating districts like free-form Rorschach blots.

Compactness

	block cut edges (lower is better)	average Polsby-Popper (higher is better)	average Reock (higher is better)
HB-1	3230	0.222	0.427
Plan A	3417	0.256	0.378
Plan B	3127	0.282	0.365
Plan C	3774	0.255	0.338
Plan D	3540	0.249	0.399

Table 2: Comparing compactness scores via one discrete and two contour-based metrics. Plan B is the most compact by cut edges. All four alternative plans are superior to the State's plan on the Polsby-Popper metric and have very reasonable Reock scores, especially Plan D.

3.5 Additional principles

- **Communities of interest.** The Guidelines describe communities of interest in terms that are congruent with the usage across many states: "*A community of interest is defined as an area with recognized similarities of interests, including but not limited to ethnic, racial, economic, tribal, social, geographic, or historical identities.*"

  In Alabama, there was no sustained effort by any state authority to formally collect community of interest (COI) maps, to my knowledge. Without this, it is difficult to produce a suitable metric based on public testimony or submissions.

[3] Reock took the idealization of the circle for granted: "The most compact plane figure is the circle, for here the maximum area is enclosed within a given perimeter. The circle, therefore, can be used as the ideal of compactness..." [4]. No further justification is given for why non-circular shapes are plausible indicators of gerrymandering.

However, it is possible to identify several clear examples of communities of interest of particular salience to Black Alabamians. The "Black Belt" of 18 mostly rural counties will be discussed below in §4.2.2.

- **Cores of prior districts.** The State's plan HB-1 bears a close resemblance to the plan from the prior Census cycle, which was engineered to have one district with a Black supermajority, while the other six do not approach one-third Black population. Therefore it should be expected that plans designed to address Voting Rights Act concerns would disrupt the structure of the prior plans, which can be confirmed in the alternative plans presented here.

4 Racial demographics

4.1 Demographics

Over 1.3 million Alabamians, or 1,364,736 to be precise, identified as Black or African-American on the 2020 Decennial Census.[4] Over a million of these, namely 1,014,372, are of voting age. Black residents constitute 27.16% of total population, 25.9% of voting-age population, and 26.3% of citizen voting-age population in the state.[5] But in the last Census cycle as in the State's new proposed plan, just one district out of seven had close to a Black majority—that one district constitutes just under 14.3% of the seats, while two majority-Black districts can readily be produced in alternative districting plans.

VAP **CVAP**

BVAP Share by District

CD	HB-1	Plan A	Plan B	Plan C	Plan D
1	25.61%	14.50%	15.73%	15.73%	15.36%
2	30.12%	51.37%	51.06%	50.06%	50.05%
3	24.99%	23.96%	22.28%	19.64%	23.96%
4	7.70%	8.30%	10.86%	11.03%	8.58%
5	18.06%	16.02%	15.66%	15.66%	16.02%
6	18.93%	15.44%	15.32%	15.51%	15.37%
7	55.26%	51.50%	50.24%	53.50%	51.73%

BCVAP Share by District

CD	HB-1	Plan A	Plan B	Plan C	Plan D
1	25.77%	14.54%	15.77%	15.77%	15.41%
2	30.49%	52.05%	51.75%	50.78%	50.71%
3	25.21%	24.26%	22.63%	19.97%	24.26%
4	7.70%	8.35%	10.91%	11.10%	8.62%
5	18.23%	16.25%	15.84%	15.84%	16.25%
6	19.33%	15.62%	15.48%	15.66%	15.53%
7	56.34%	52.40%	51.28%	54.51%	52.64%

WVAP Share by District

CD	HB-1	Plan A	Plan B	Plan C	Plan D
1	66.00%	76.25%	75.20%	75.20%	75.47%
2	62.03%	42.33%	42.60%	43.14%	43.56%
3	67.74%	67.78%	68.47%	70.99%	67.78%
4	82.41%	82.98%	80.12%	79.98%	82.63%
5	70.89%	71.62%	72.56%	72.56%	71.62%
6	71.16%	75.39%	76.73%	76.49%	75.58%
7	38.60%	42.08%	42.71%	40.04%	41.82%

WCVAP Share by District

CD	HB-1	Plan A	Plan B	Plan C	Plan D
1	65.17%	75.19%	74.13%	74.13%	74.40%
2	61.43%	41.89%	42.19%	42.65%	43.14%
3	67.49%	67.61%	68.37%	71.04%	67.61%
4	82.50%	82.62%	79.88%	79.78%	82.30%
5	70.42%	71.24%	72.28%	72.28%	71.24%
6	71.23%	75.83%	76.63%	76.35%	76.01%
7	38.02%	41.51%	42.24%	39.53%	41.22%

Table 3: Demographics broken out as a comparison of Black and White population.

[4]Here and throughout, we use the so-called "Any Part Black" definition, which counts people who self-identified as Black on the Census form, possibly in combination with other races, whether Hispanic or not, for total population and voting-age population. Abbreviations such as BVAP refer to this construction. Citizen voting-age population is derived from the American Community Survey (ACS) in combination with the Decennial Census. The racial group constructions are fully defined in the supplemental material.

[5]Black citizen voting-age population is derived from the 5-year ACS, 2015–2019. The supplemental material contains an explanation of how BCVAP and WCVAP are constructed.

HB-1

CD	WVAP	BVAP	HVAP	WCVAP	BCVAP	HCVAP
1	66.00%	25.61%	3.23%	65.17%	25.77%	2.45%
2	62.03%	30.12%	3.57%	61.43%	30.49%	2.55%
3	67.74%	24.99%	3.07%	67.49%	25.21%	2.29%
4	82.41%	7.70%	5.66%	82.50%	7.70%	2.84%
5	70.89%	18.06%	5.28%	70.42%	18.23%	3.31%
6	71.16%	18.93%	5.38%	71.23%	19.33%	2.81%
7	38.60%	55.26%	3.65%	38.02%	56.34%	2.05%

Plan A

CD	WVAP	BVAP	HVAP	WCVAP	BCVAP	HCVAP
1	76.25%	14.50%	4.00%	75.19%	14.54%	3.07%
2	42.33%	51.37%	2.68%	41.89%	52.05%	1.77%
3	67.78%	23.96%	3.98%	67.61%	24.26%	2.62%
4	82.98%	8.30%	4.58%	82.62%	8.35%	2.58%
5	71.62%	16.02%	6.50%	71.24%	16.25%	3.67%
6	75.39%	15.44%	3.91%	75.83%	15.62%	2.26%
7	42.08%	51.50%	4.18%	41.51%	52.40%	2.32%

Plan B

CD	WVAP	BVAP	HVAP	WCVAP	BCVAP	HCVAP
1	75.20%	15.73%	3.99%	74.13%	15.77%	3.06%
2	42.60%	51.06%	2.60%	42.19%	51.75%	1.71%
3	68.47%	22.28%	4.59%	68.37%	22.63%	2.92%
4	80.12%	10.86%	4.68%	79.88%	10.91%	2.70%
5	72.56%	15.66%	6.23%	72.28%	15.84%	3.40%
6	76.73%	15.32%	3.46%	76.63%	15.48%	2.11%
7	42.71%	50.24%	4.29%	42.24%	51.28%	2.41%

Plan C

CD	WVAP	BVAP	HVAP	WCVAP	BCVAP	HCVAP
1	75.20%	15.73%	3.99%	74.13%	15.77%	3.06%
2	43.14%	50.06%	2.93%	42.65%	50.78%	1.95%
3	70.99%	19.64%	4.46%	71.04%	19.97%	2.82%
4	79.98%	11.03%	4.70%	79.78%	11.10%	2.69%
5	72.56%	15.66%	6.23%	72.28%	15.84%	3.40%
6	76.49%	15.51%	3.51%	76.35%	15.66%	2.13%
7	40.04%	53.50%	4.01%	39.53%	54.51%	2.26%

Plan D

CD	WVAP	BVAP	HVAP	WCVAP	BCVAP	HCVAP
1	75.47%	15.36%	4.01%	74.40%	15.41%	3.07%
2	43.56%	50.05%	2.68%	43.14%	50.71%	1.79%
3	67.78%	23.96%	3.98%	67.61%	24.26%	2.62%
4	82.63%	8.58%	4.66%	82.30%	8.62%	2.61%
5	71.62%	16.02%	6.50%	71.24%	16.25%	3.67%
6	75.58%	15.37%	3.93%	76.01%	15.53%	2.25%
7	41.82%	51.73%	4.08%	41.22%	52.64%	2.30%

Table 4: Demographics by district in the State's plan HB-1 and the alternative plans.

By contrast, the non-Hispanic White population share in Alabama is 63.12% and the corresponding shares of voting-age population and citizen voting-age population are 65.47% and 65.07%, respectively. By any of these measures, proportional representation for White voters would be between 4.4 and 4.6 of Alabama's 7 seats in the U.S. House. The State's map HB-1 orchestrates a non-Hispanic White VAP share of at least 60% in all districts besides CD-7—that is, in 6 out of 7 Congressional districts.

4.2 Centers of Black population

4.2.1 Urban

The four largest cities in Alabama today are Huntsville (population 215,006), Birmingham (population 200,733), Montgomery (population 200,603), and Mobile (population 187,041). Together, they have over 400,000 Black residents, comprising roughly 1/3 of the Black population in the state. Of these cities, Birmingham, Montgomery, and Mobile are majority-Black, with population shares of 69.9%, 60.8%, and 51.5%, respectively, making them two among Alabama's 52 majority-Black cities.

Of those four largest cities, the State's plan HB-1 only includes parts of Birmingham and parts of Montgomery in a majority-Black district. In particular, this means that the hundreds of thousands of Black voters in Montgomery and Mobile are located in districts in which Black population share falls short of one-third.

All four alternative plans retain most of Birmingham in a majority-Black district, but by adding a second majority district the alternative plans are able to include all of Montgomery and most of Mobile as well.

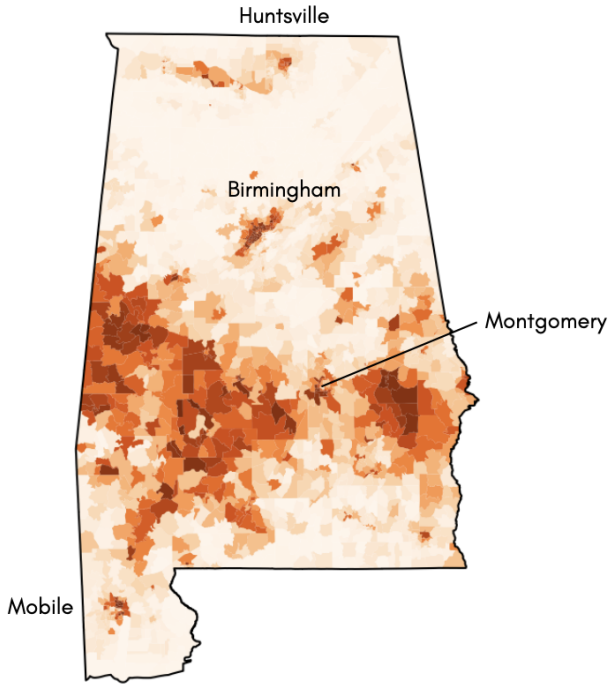


Figure 3: Black voting-age population share is shown by shading at the precinct level. The major cities have visible concentrations of Black population, and the Black Belt rural counties are clearly visible running East-West across the state.

4.2.2 Rural: Alabama's Black Belt

Alabama also has a significant Black population in rural counties, especially in the 18 "Black Belt" counties of Barbour, Bullock, Butler, Choctaw, Crenshaw, Dallas, Greene, Hale, Lowndes, Macon, Marengo, Montgomery, Perry, Pickens, Pike, Russell, Sumter, and Wilcox. These counties have a long shared history from plantation slavery to sharecropping to Jim Crow and up to the present—these constitute very clear communities of interest by the Guidelines definition. (Recalling from above, that definition holds that "*A community of interest is defined as an area with recognized similarities of interests, including but not limited to ethnic, racial, economic, tribal, social, geographic, or historical identities.*")

The Black Belt includes 8 of the 10 least populous counties in the state, each with under 13,000 residents. Together, the Black Belt region has over 300,000 Black residents.

In the State's plan, eight of these are partially or fully excluded from majority-Black districts: Barbour, Bullock, Butler, Crenshaw, Macon, Pike, and Russell are excluded from CD-7 while Montgomery County is split.

Each of the 18 Black Belt counties is contained in majority-Black districts in at least some of the alternative plans presented here: Plan A and Plan D include all but part of Russell County, Plan B includes all but Russell and part of Barbour County, and Plan C includes the entirety of the Black Belt. Forming a district that reaches south into Mobile County and eastward across the Black Belt is natural for a mapmaker following traditional principles. In fact, the State's own recently enacted State Board of Education map, which has two majority-Black districts out of eight, does just this in a manner similar to my illustrative Congressional plans.

5 Conclusion

I have presented four alternative maps that all secure population majorities for Black Alabamians in two districts, rather than just one district, out of seven.

- The State's map and all four alternative plans have districts balanced to within ±1 person from rounded ideal size. All four plans are contiguous, and all split five to nine counties, at or close to the theoretical minimum level of splitting.
- All four alternative plans have strong compactness scores; in fact, all four are significantly superior to the State's plan in the most common compactness metric, the average Polsby-Popper score.
- The State's plan splits Montgomery County and Montgomery City, even though Montgomery County is less than one-third the size of a Congressional district. All four alternative plans hold the city and county whole.
- Proportionality for the White non-Hispanic population in Alabama would amount to roughly 4.5 out of 7 seats in Congress, but the State's map would lock in fully 6 out of 7 seats for White-preferred candidates—a massively super-proportional showing.
- All four alternative plans place thousands of Black voters in the population centers of Montgomery and Mobile, as well as voters across the rural Black Belt, in majority-Black districts. Seven Black Belt counties are wholly excluded from the sole majority-Black district, and another is split, in the State's plan. Relative to HB-1, each one of the alternative plans allows over 300,000 additional Black Alabamians—including plaintiffs Shalela Dowdy (Mobile), Evan Milligan (Montgomery), and Khadidah Stone (Montgomery)—to live in majority-Black districts.

References

[1] Alabama Legislative Reapportionment Committee Redistricting Guidelines, dated May 5, 2021. *Available at* www.legislature.state.al.us.

[2] Assaf Bar-Natan, Elle Najt, and Zachary Schutzmann, *The gerrymandering jumble: Map projections permute districts' compactness scores*. Cartography and Geographic Information Science, Volume 47, Issue 4, 2020, 321–335.

[3] Richard Barnes and Justin Solomon, *Gerrymandering and Compactness: Implementation Flexibility and Abuse.* Political Analysis, Volume 29, Issue 4, October 2021, 448–466.

[4] Ernest C. Reock, Jr., *A Note: Measuring Compactness as a Requirement of Legislative Apportionment.* Midwest Journal of Political Science, Vol. 5, No. 1 (Feb., 1961), 70–74.

A Supplemental information

Definition of Black by Census Codes (within **total population**)

```
Black or African American alone P0010004
White; Black or African American P0010011
Black or African American; American Indian and Alaska Native P0010016
Black or African American; Asian P0010017
Black or African American; Native Hawaiian and Other Pacific Islander P0010018
Black or African American; Some Other Race P0010019
White; Black or African American; American Indian and Alaska Native P0010027
White; Black or African American; Asian P0010028
White; Black or African American; Native Hawaiian and Other Pacific Islander P0010029
White; Black or African American; Some Other Race P0010030
Black or African American; American Indian and Alaska Native; Asian P0010037
Black or African American; American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander P0010038
Black or African American; American Indian and Alaska Native; Some Other Race P0010039
Black or African American; Asian; Native Hawaiian and Other Pacific Islander P0010040
Black or African American; Asian; Some Other Race P0010041
Black or African American; Native Hawaiian and Other Pacific Islander; Some Other Race P0010042
White; Black or African American; American Indian and Alaska Native; Asian P0010048
White; Black or African American; American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander P0010049
White; Black or African American; American Indian and Alaska Native; Some Other Race P0010050
White; Black or African American; Asian; Native Hawaiian and Other Pacific Islander P0010051
White; Black or African American; Asian; Some Other Race P0010052
White; Black or African American; Native Hawaiian and Other Pacific Islander; Some Other Race P0010053
Black or African American; American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander P0010058
Black or African American; American Indian and Alaska Native; Asian; Some Other Race P0010059
Black or African American; American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander; Some Other Race P0010060
Black or African American; Asian; Native Hawaiian and Other Pacific Islander; Some Other Race P0010061
White; Black or African American; American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander P0010064
White; Black or African American; American Indian and Alaska Native; Asian; Some Other Race P0010065
White; Black or African American; American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander; Some Other Race P0010066
White; Black or African American; Asian; Native Hawaiian and Other Pacific Islander; Some Other Race P0010067
Black or African American; American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander; Some Other Race P0010069
White; Black or African American; American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander; Some Other Race P0010071
```

Definition of Black by Census Codes (within **voting-age population**)

```
Black or African American alone P0030004
White; Black or African American P0030011
Black or African American; American Indian and Alaska Native P0030016
Black or African American; Asian P0030017
Black or African American; Native Hawaiian and Other Pacific Islander P0030018
Black or African American; Some Other Race P0030019
White; Black or African American; American Indian and Alaska Native P0030027
White; Black or African American; Asian P0030028
White; Black or African American; Native Hawaiian and Other Pacific Islander P0030029
White; Black or African American; Some Other Race P0030030
Black or African American; American Indian and Alaska Native; Asian P0030037
Black or African American; American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander P0030038
Black or African American; American Indian and Alaska Native; Some Other Race P0030039
Black or African American; Asian; Native Hawaiian and Other Pacific Islander P0030040
Black or African American; Asian; Some Other Race P0030041
Black or African American; Native Hawaiian and Other Pacific Islander; Some Other Race P0030042
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White; Black or African American; American Indian and Alaska Native; Some Other Race P0030050
White; Black or African American; Asian; Native Hawaiian and Other Pacific Islander P0030051
White; Black or African American; Asian; Some Other Race P0030052
White; Black or African American; Native Hawaiian and Other Pacific Islander; Some Other Race P0030053
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Black or African American; Asian; Native Hawaiian and Other Pacific Islander; Some Other Race P0030061
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White; Black or African American; American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander; Some Other Race P0030066
White; Black or African American; Asian; Native Hawaiian and Other Pacific Islander; Some Other Race P0030067
Black or African American; American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander; Some Other Race P0030069
White; Black or African American; American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander; Some Other Race P0030071
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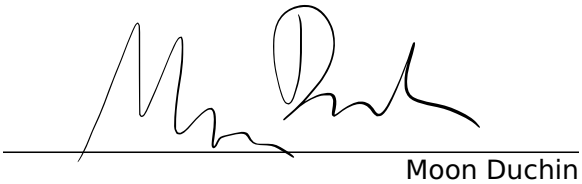
Definition of Black via Census products (within **citizen voting-age population**)

The 2015-2019 5-year ACS Special Tabulation produces 2010 tract-level estimates of citizen voting age population (CVAP) with some subpopulations. I selected the Non-Hispanic White (WCVAP), Non-Hispanic Black or African American (BCVAP), and Hispanic (HCVAP) categories. The 2015-2019 ACS also provides 2010 tract-level voting age population (VAP) estimates by tract, from which we use White (WVAP), Black or African American (BVAP), and Hispanic (HVAP). From these two products I have calculated the citizenship share for each subpopulation in each 2010 Census tract in Alabama. This citizenship share tracks, for example, BCVAP / BVAP—the share of non-Hispanic Black citizens of voting age over the total number of Black citizens, independent of ethnicity. To calculate 2020 CVAP estimates on 2020 Census blocks, I start with the 2020 PL-94 to determine the VAP share in each block for each subpopulation, then multiply by the corresponding citizenship share. For instance, we compute the 2020 BVAP count in each block *b* (independent of ethnicity) and multiply it by the BCVAP / BVAP citizenship share assigned to the 2010 tract that contains *b*. An exactly similar method is used for WCVAP and HCVAP.

I declare under penalty of perjury that the foregoing is true and correct.

Executed this 10th day of December, 2021.



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IN THE UNITED STATES DISTRICT COURT
NORTHERN DISTRICT OF ALABAMA
SOUTHERN DIVISION

EVAN MILLIGAN, et al.,

Plaintiffs,

vs.

JOHN H. MERRILL, et al.,

Defendants.

No. 2:21-cv-01530-AMM

Rebuttal Report of Baodong Liu, Ph.D.

December 20, 2021

I have been asked to express my opinion on the expert report of Dr. M.V. Hood III, an expert for the Defendants in the above captioned litigation. This report serves as a rebuttal to Dr. Hood's report dated December 10, 2021.

This rebuttal summarizes the areas of agreement and the limitations of Dr. Hood's report.

Areas of Agreement with Dr. Hood

Despite my concerns about his methodology, Dr. Hood and I agree in four important areas. First, Dr. Hood rightly concluded in his report that "racially polarized voting is present [in Alabama] with black voters overwhelmingly supporting the Democratic candidate and more than a majority of white voters casting a ballot for the Republican candidate." (Hood p. 13) Second, Dr. Hood and I agree that white bloc voting will usually result in the defeat of Black-preferred candidates in white-majority districts in Alabama. (Hood p. 14, Liu p. 18) Third, Dr. Hood is correct about the necessity of using Gary King's ecological inference (ei) method for estimating the candidate of choice for different racial groups (Hood p. 3) Finally, Dr. Hood and I agree that, "[i]n a Democratic primary, white and black voters may support different candidates. If there is an insufficient number of black voters to constitute a majority in a Democratic primary, the black community may be unable to elect their candidate of choice." (Hood p. 14). Indeed, my initial report used ei to show racially polarized voting in the 2020 congressional district (CD) 1 primary election (Liu p. 10) and I reviewed exit poll data that showed racially polarized voting in the 2008 Democratic presidential primaries (Liu p. 14).

The Methodology in Dr. Hood's Study of Racial Turnout Rates

Dr. Hood rightly acknowledged the need to consider racial turnout disparities when offering his opinion on functionality analysis (FA). His method for his FA was an attempt to predict what will happen in the future given how different plans including the "enacted plan" provide different opportunity structures for racial groups to vote for their candidate of choice.

In his first step of FAs, Dr. Hood used ei to derive his racial group vote estimates for candidates. For example, his Table 1 shows the racial estimates (Black, White and Other) for the vote choice between the Democratic candidate (Biden) and the Republican candidate (Trump) by using the 2020 Presidential election dataset. His Table 1 indicates the racially polarized voting (RPV) results between Black and white voters with respect to the enacted CD 7.

Strangely, after showing the results of RPV in Table 1, Dr. Hood went on to estimate racial turnout disparities by using what he labeled as "historical registration and turnout data". This procedure is odd because his Table 1 results were already derived along with the racial turnout disparities. To be more specific, the ei package he used (eiPack) and the RxC procedure in his ei operation allowed him to estimate racial turnouts as well as racial vote estimates for candidates. This is the appropriate approach for his FA, and his R-code in his "Replication" folder showed that he indeed engaged in such R operation. Thus, he should already have had his racial turnout rates as he completed his Table 1 procedure. But Dr. Hood choose not to report these racial turnout estimates from his own ei operations. Instead, he went further to use a different dataset and a different method to derive his Tables 2 and 3 about racial turnout breakdown in enacted CD 7.

After being asked to provide a detailed explanation for how his method for arriving at the results reported in his Tables 2 and 3, Dr. Hood did not provide the requested explanation.

The Selected Elections in Dr. Hood's Report

In Dr. Hood's published article, "From Legal Theory to Practical Application: A How-To for Performing Vote Dilution Analyses," the appropriate approach to an RPV analysis, according to Dr. Hood and his two co-authors, "must also consider the race/ethnicity of the candidates running for election. Of the elections available for analysis, the more relevant are those that feature a minority candidate from the racial/ethnic group suing the jurisdiction in question. For example, in a vote dilution suit brought by Latino voters, one would seek election contests featuring Hispanic candidates, while also keeping in mind the other criteria previously discussed" (Hood, Morrison and Bryan, 2017, p.546).[1] But the two elections Dr. Hood analyzed (i.e., the 2020 Presidential Election and the 2018 Gubernatorial Election) did not directly involve a minority candidate. The 2018 Gubernatorial Election did not involve a minority candidate at all. Though the Democratic Vice-Presidential candidate was a minority (Black/Asian) candidate

[1] M.V. Hood III, Peter A. Morrison, and Thomas M. Bryan. 2017. "From Legal Theory to Practical Application: A How-To for Performing Vote Dilution Analyses." *Social Science Quarterly* 99 (2): 536-552.

(Kamala Harris), the 2020 Presidential Election featured two white men on the top of the tickets for both major parties.[2]

The Misleading Assertion about Black Republican Candidate "Success" in Dr. Hood's Report

Dr. Hood next switched his attention to "minority Republican candidates" (p. 15). Arguing that "white conservatives support minority Republican candidates at the same rates or at significantly higher rates than Anglo (non-Hispanic white) GOP nominees", Dr. Hood attempted to relate what happened in Alabama to his own 2015 publication on Public Opinion Quarterly. Without doing any RPV analysis for a single election that did take place in Alabama, Dr. Hood cited Kenneth Paschal from HD 73 as an example for his claim. Paschal won the Republican runoff election in 2021 with 51.1% votes cast, according to Dr. Hood, and he defeated his white Democratic opponent in the Special General Election at the end with 74.7% of the vote.

But as Dr. Hood indicated, Paschal, as an African American, "ran in a Shelby County district which is 84.1% white VAP." Such a super white-majority district, unfortunately, does not allow any realistic opportunity to estimate the extent to which RPV, or lack thereof, may have any influence on the election outcome in a typical racially contested election in Alabama. To verify Dr. Hood's claim, I ran an RxC ei operation by using the precinct-level election data from the 2021 special election in HD 73. The results of my RPV analysis shows that it is indeed an unreliable election to estimate white support for a Black Republican candidate. The turnout was low overall at 5.3% of the voting-age population. Especially among the white electorate, only 1.7% of the white voting-age population turned out to vote, which suggests that white voters were not highly interested in this election featuring a Black Republican candidate. Furthermore, both white and black racial vote estimates had an extremely large confidence interval[3] to the extent that the wide range for the ei results are not useful and cannot be taken seriously. The white vote, for instance, may be as low as 22% for Paschal or as high as 88.9%, while his Black support was similarly estimated between 15% and 72%.

To gauge the willingness of white voters in Alabama to vote for a Black Republican candidate, one should pay attention to state-wide elections where white voters are given a chance to vote for a Black Republican candidate with high name-recognition in a racially contested election.[4] To evaluate Dr. Hood's claim, I conducted a RPV analysis of the 2016 Republican Presidential Primary in Alabama in which Ben Carson, a highly publicized Black candidate, ran against ten other candidates including President Donald Trump.

I report the RPV findings about this election in Table A below. Ben Carson, as shown in the table, received only about 9% of the white vote in Alabama. In contrast, Carson received about 31% of the Black Republican vote. Thus, Black Republicans were over three times more likely

[2] As a verification study, I ran a RxC ei operation for the 2020 Presidential election, and the state-wide results showed that indeed it was highly racially polarized in that Biden/Harris won around 95% of the Black vote and only 12% of the white vote.

[3] I explained confidence intervals in footnote 10 of my initial report.

[4] For example, national polls from October 2015 showed Carson as the lead Republican candidate. NBC/WSJ Poll: Carson Surges Into Lead of National GOP Race (Nov. 2, 2015), https://www nbcnews.com/politics/2016-election/nbc-wsj-poll-carson-surges-lead-national-gop-race-n456006.

than whites to support Carson. Donald Trump, on the other hand, received more than 44% of the white vote and essentially tied with Carson with 33% of the Black Republican vote. When the primary outcome was announced, Trump was the overwhelming winner with more than 43% of the total votes cast while Carson was in the fourth place with barely over 10% of the votes.

Table A: RPV in the 2016 Republican Presidential Primary, Alabama

Group	**Turnout**	**Carson**	**Trump**	**All-others**
Black	0.013 (0.011, 0.022)	0.307 (0.268, 0.338)	0.333 (0.299, 0.368)	0.36 (0.326, 0.397)
White	0.312 (0.296, 0.319)	0.089 (0.078, 0.094)	0.447 (0.443, 0.455)	0.464 (0.461, 0.467)
Total	0.217	0.103	0.439	0.458

It is also worth noting that only 1.3% of Black voters participated in this Republican primary. Dr. Hood's assertion of the white conservative support for Black Republican candidates in Alabama has little, if any, empirical support.

***

Per 28 U.S. Code § 1746, I declare under penalty of perjury that the forgoing is true and correct. Executed on December 20, 2021.

Baodong Liu, Ph.D.

IN THE UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF ALABAMA
SOUTHERN DIVISION

EVAN MILLIGAN, *et al.*,	)	
	)	
Plaintiffs,	)	
	)	
v.	)	Case No. 2:21-cv-1530-AMM
	)	
JOHN H. MERRILL, in his official capacity as Alabama Secretary of State, *et al.*,	)	**THREE-JUDGE COURT**
	)	
Defendants.	)	

DECLARATION OF THOMAS BRYAN

Attached hereto is the expert report which I have prepared for filing in this case, along with a copy of my curriculum vitae. The conclusions I express in my report are provided to a reasonable degree of professional certainty.

Pursuant to 28 U.S.C. §1746, I declare under penalty of perjury under the laws of the United States that the foregoing, my expert report, and my curriculum vitae are true and correct to the best of my knowledge and belief.

Done on this 14th day of December, 2021.

Thomas Bryan

Table 4.1 Hatcher Plan Total Population by District

District	Total Pop	Black Alone Pop	All Black Pop	% Black Alone	% All Black
1	717,754	110,043	121,355	15.3%	16.9%
2	717,755	369,876	383,401	**51.5%**	**53.4%**
3	717,753	153,144	163,967	21.3%	22.8%
4	717,753	50,872	58,822	7.1%	8.2%
5	717,755	129,314	143,250	18.0%	20.0%
6	717,754	85,270	93,167	11.9%	13.0%
7	717,755	389,640	400,774	**54.3%**	**55.8%**
Grand Total	**5,024,279**	**1,288,159**	**1,364,736**	**25.6%**	**27.2%**

Table 4.2 Hatcher Plan Voting Age Population by District

District	Total Pop	Black Alone Pop	All Black Pop	% Black Alone	% All Black
1	556,317	81,316	86,113	14.6%	15.5%
2	**559,876**	**278,856**	**286,698**	**49.8%**	**51.2%**
3	563,228	117,517	122,319	20.9%	21.7%
4	555,304	38,846	41,937	7.0%	7.6%
5	562,504	99,539	106,140	17.7%	18.9%
6	553,734	64,095	67,699	11.6%	12.2%
7	**566,203**	**296,563**	**303,466**	**52.4%**	**53.6%**
Grand Total	**3,917,166**	**976,732**	**1,014,372**	**24.9%**	**25.9%**

Table 4.3 HB1 Plan Total Population by District

District	Total Pop	Black Alone Pop	All Black Pop	% Black Alone	% All Black
1	717,754	185,771	196,827	25.9%	27.4%
2	717,755	216,019	228,648	30.1%	31.9%
3	717,754	175,783	187,284	24.5%	26.1%
4	717,754	51,314	59,655	7.1%	8.3%
5	717,754	123,355	136,782	17.2%	19.1%
6	717,754	137,209	145,897	19.1%	20.3%
7	717,754	398,708	409,643	**55.5%**	**57.1%**
Grand Total	**5,024,279**	**1,288,159**	**1,364,736**	25.6%	27.2%

Table 4.4 HB1 Plan Voting Age Population by District

District	Total Pop	Black Alone Pop	All Black Pop	% Black Alone	% All Black
1	557,535	137,354	142,777	24.6%	25.6%
2	557,677	161,893	167,971	29.0%	30.1%
3	564,281	135,659	141,011	24.0%	25.0%
4	556,133	39,507	42,819	7.1%	7.7%
5	561,187	95,014	101,339	16.9%	18.1%
6	552,286	100,385	104,551	18.2%	18.9%
7	568,067	306,920	313,904	**54.0%**	**55.3%**
Grand Total	**3,917,166**	**976,732**	**1,014,372**	**24.9%**	**25.9%**

Table 4.5 Existing 2011 Plan Total Population by District

District	Total Pop	Black Alone Pop	All Black Pop	% Black Alone	% All Black
1	726,276	188,431	199,586	25.9%	27.5%
2	693,466	211,862	224,221	30.6%	32.3%
3	735,132	186,438	198,228	25.4%	27.0%
4	702,982	46,919	54,662	6.7%	7.8%
5	761,102	130,351	144,648	17.1%	19.0%
6	740,710	120,130	128,681	16.2%	17.4%
7	664,611	404,028	414,710	**60.8%**	**62.4%**
Grand Total	**5,024,279**	**1,288,159**	**1,364,736**	**25.6%**	**27.2%**

Table 4.6 Existing 2011 Plan Voting Age Population by District

District	Total Pop	Black Alone Pop	All Black Pop	% Black Alone	% All Black
1	564,302	139,380	144,863	24.7%	25.7%
2	539,812	159,212	165,202	29.5%	30.6%
3	576,455	143,415	148,910	24.9%	25.8%
4	543,423	36,006	39,038	6.6%	7.2%
5	595,873	100,325	107,050	16.8%	18.0%
6	572,838	89,754	93,787	15.7%	16.4%
7	524,463	308,640	315,522	**58.8%**	**60.2%**
Grand Total	**3,917,166**	**976,732**	**1,014,372**	**24.9%**	**25.9%**

Precision here is important. Plaintiffs cite numerous demographic figures without defining them. In districts they are proposing such as D2, the Black alone population is 49.8% - e.g. not a majority.[14] While the Black alone *or in combination* population is 51.2%. Whether D2 is defensible as a majority district depends on the definition being used. In this case, if the plaintiffs use any other definition of Black besides "Black alone" an analysis of the voting behavior of those incremental, not Black alone voters would be warranted for a Gingles claim.

Using the tables above and Appendix 1(P.31) / Appendix 2 (P.32) I documented the demographic references by paragraph in the Milligan report and attempted to replicate them.

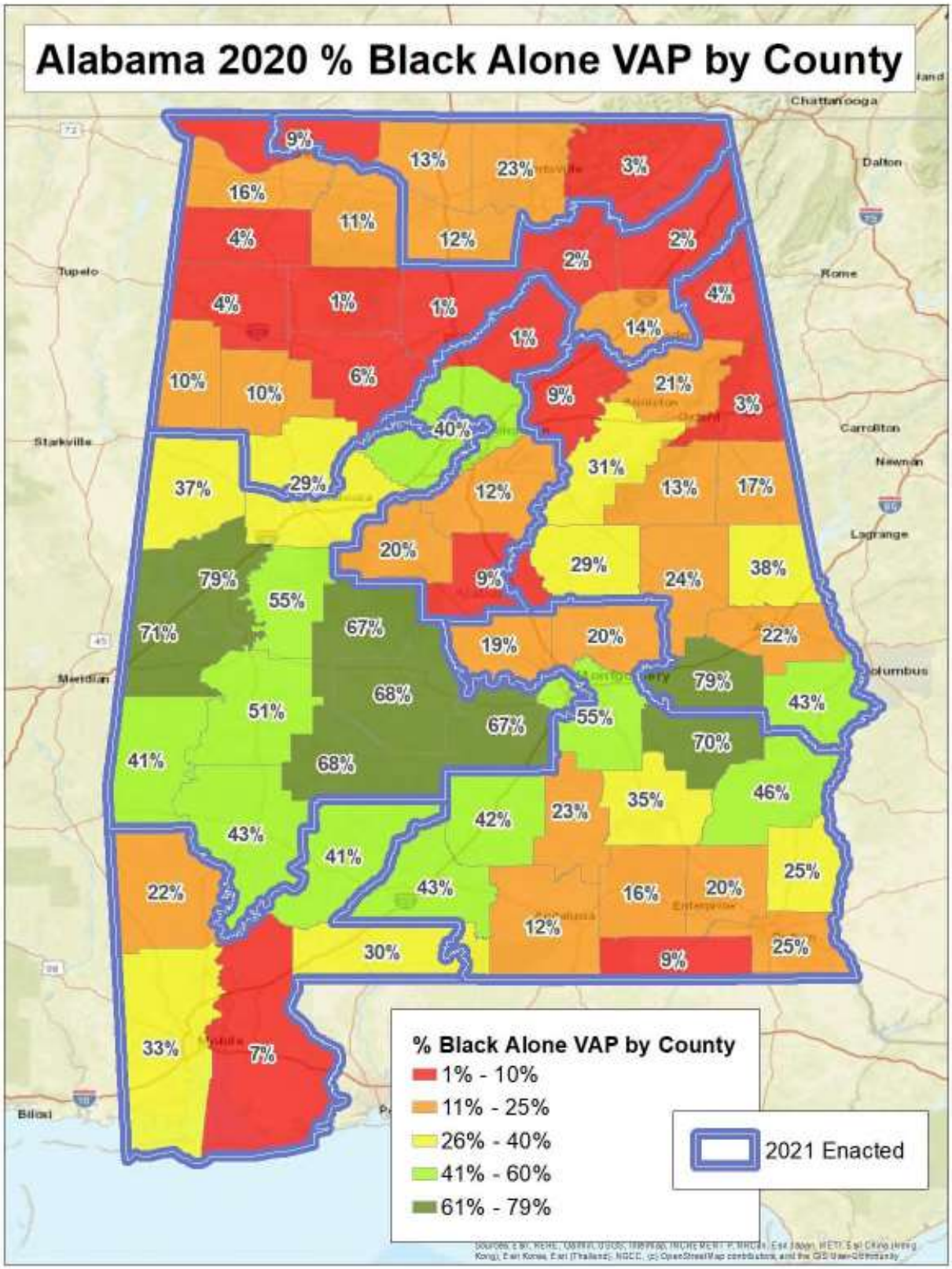
- Para 42. "On August 12, 2021, the U.S. Census Bureau released the results of the 2020 Census. Alabama's population grew by 5.1% between 2010 and 2020. Alabama's current population identifies as 63.1% non-Hispanic white, 26.9% as any part Black, 5.3% as Hispanic or Latino, 2.3% as any part American Indian/Alaska Native, and 2% as any part Asian." My analysis shows that the 26.9% Black here is actually Black alone and Hispanic and Black + White and Hispanic. The true % any part Black is in fact 27.2%

[14] *Milligan* complaint paragraph 88

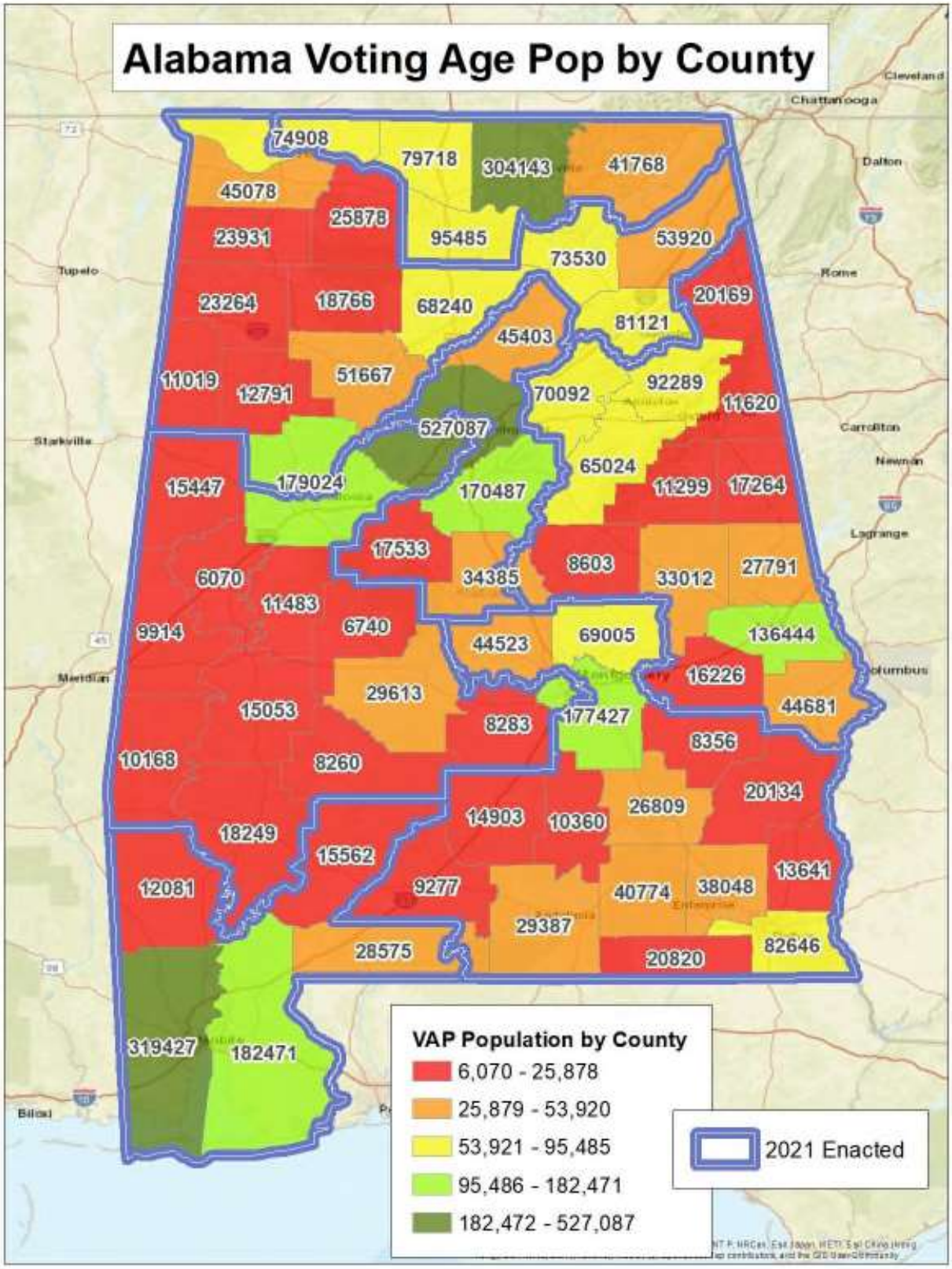
Map Appendices

Alabama Enacted Plan
Map Appendices
% Black Alone and VAP
By County and VTD

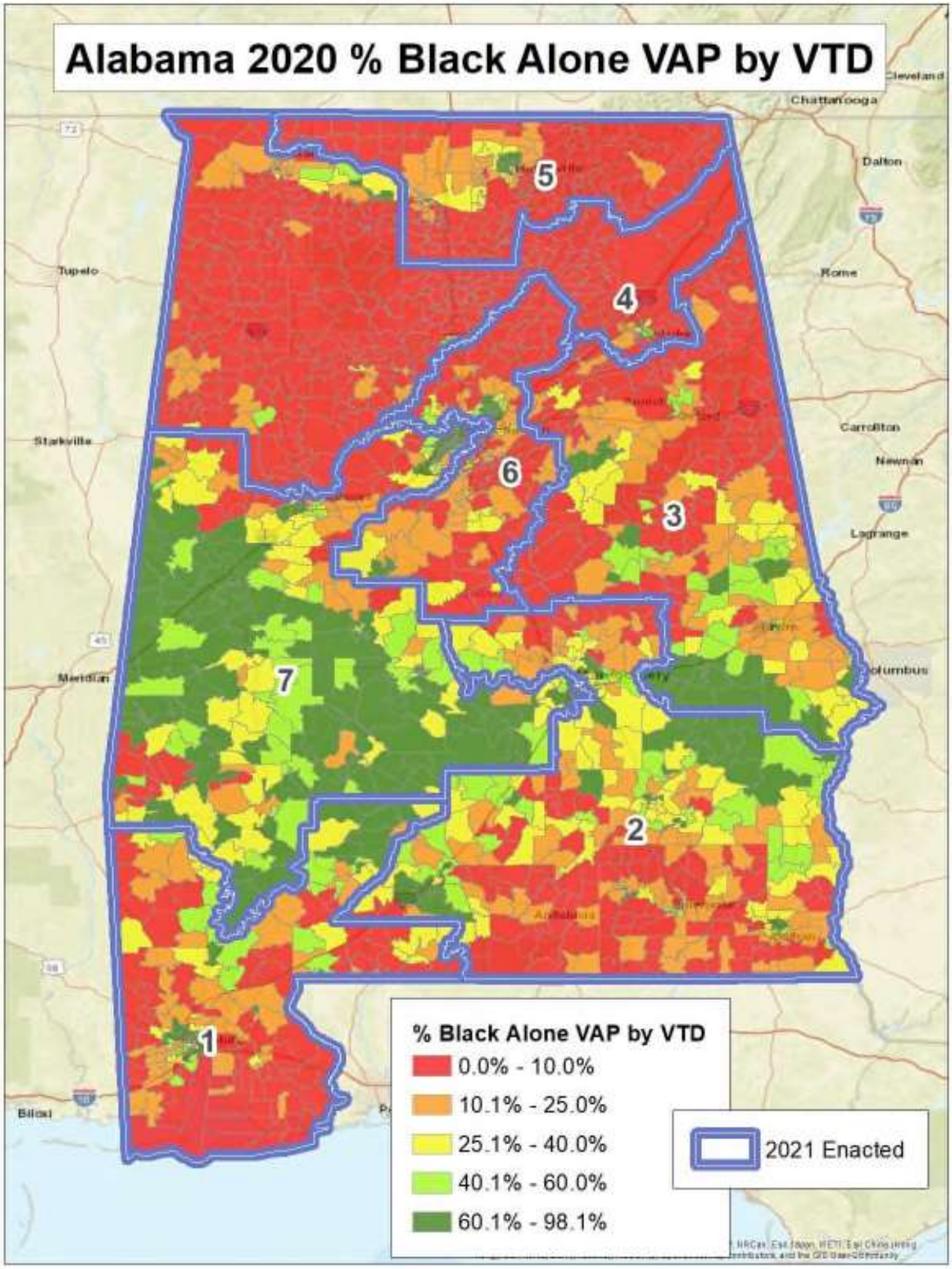
Map Appendix 1 (State of Alabama Enacted Plan Percent Black Alone VAP by County)



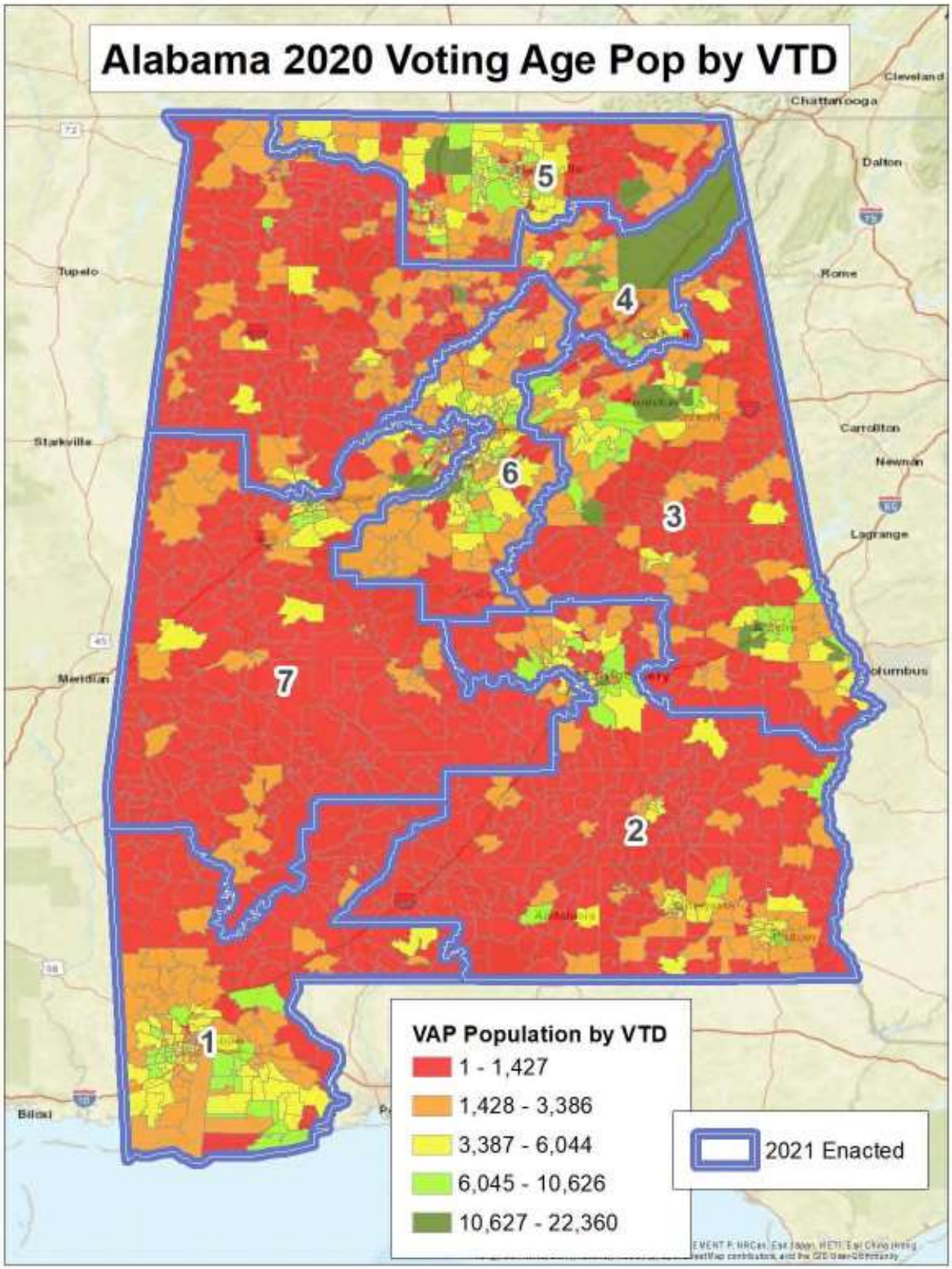
Map Appendix 2 (State of Alabama Enacted Plan Voting Age Population by County)



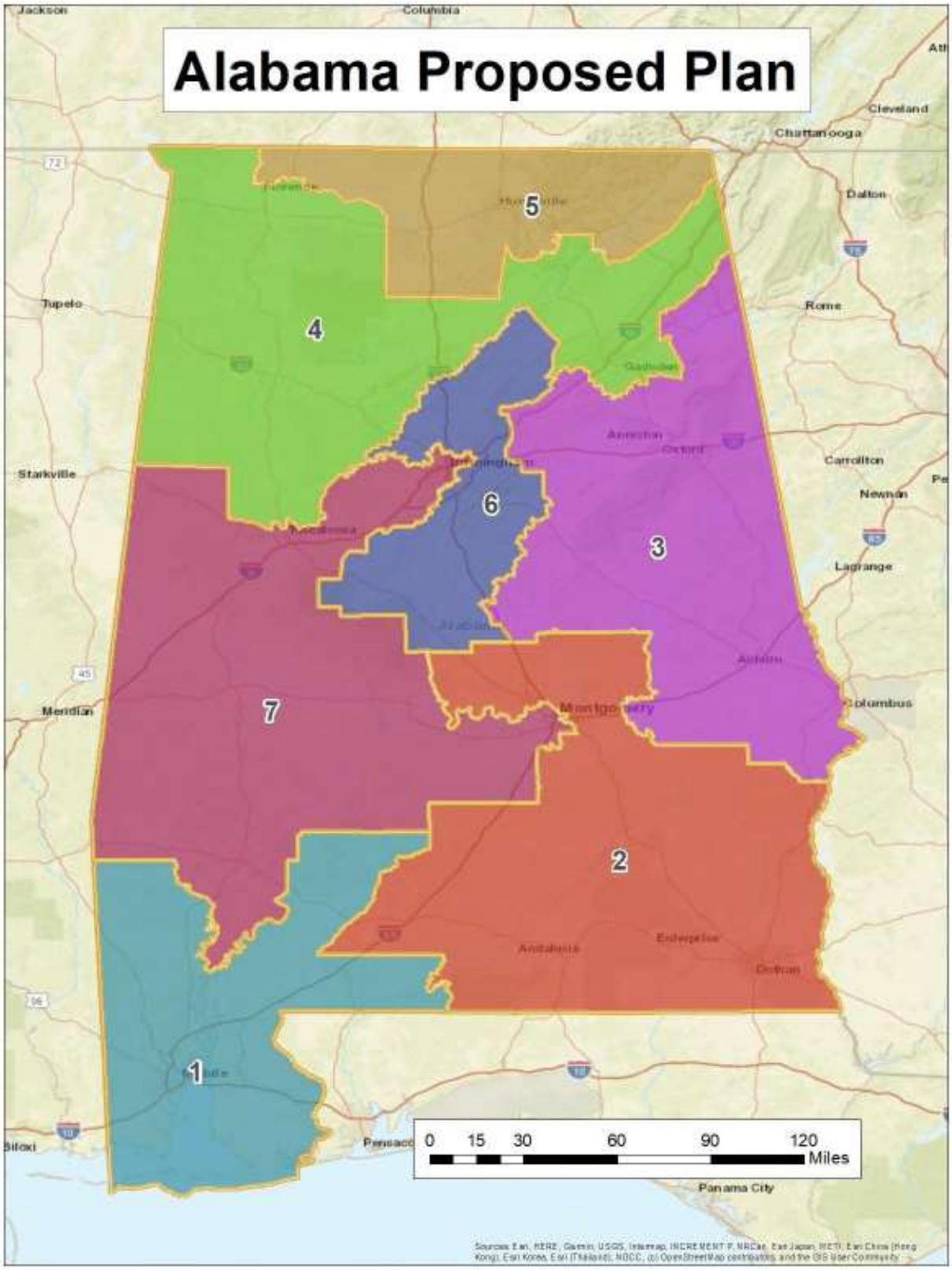
Map Appendix 3 (State of Alabama Enacted Plan Percent Black Alone VAP by VTD)


Alabama 2020 % Black Alone VAP by VTD
Chattanooga
Dalton
Tupelo
Rome
Starkville
Carrollton
Newnan
LaGrange
Meridian
Columbus
Biloxi
5
4
6
3
7
2
1
% Black Alone VAP by VTD
0.0% - 10.0%
10.1% - 25.0%
25.1% - 40.0%
40.1% - 60.0%
60.1% - 98.1%
2021 Enacted

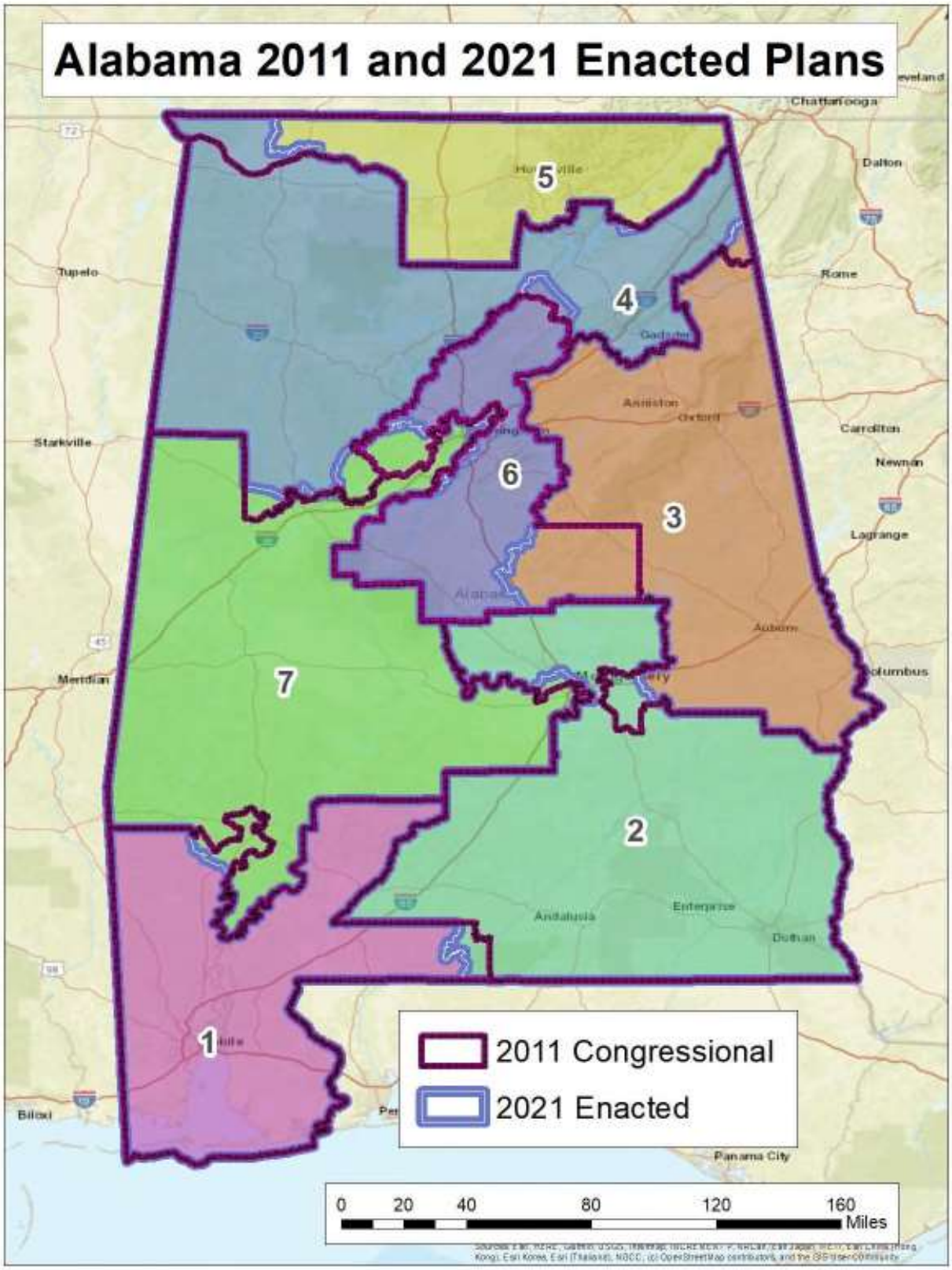
Map Appendix 4 (State of Alabama Voting Age Population by VTD)



Map Appendix 12 (State of Alabama Proposed Plan)



Map Appendix 13 (State of Alabama 2011 and 2021 Enacted Plans)



IN THE UNITED STATES DISTRICT COURT NORTHERN DISTRICT OF ALABAMA SOUTHERN DIVISION

Milligan *et al*.

Plaintiffs,

v.

Merrill *et al*.

Defendents.

EXPERT REPORT

Kosuke Imai, Ph.D.

December 10, 2021

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I. INTRODUCTION AND SCOPE OF WORK

1. My name is Kosuke Imai, Ph.D., and I am a Professor in the Department of Government and the Department of Statistics at Harvard University. I specialize in the development of statistical methods for and their applications to social science research. I am also affiliated with Harvard's Institute for Quantitative Social Science.

2. I have been asked by counsel representing the plaintiffs in this case to analyze relevant data and provide my expert opinions related to the role that race played in drawing Alabama's congressional district plan (HB1). To do so, I simulated two sets of 10,000 possible Alabama congressional districting plans that adhere to other redistricting considerations. The simulations allow me to determine whether and to what extent the Alabama legislature's inclusion or exclusion of Black voters in Districts 2 and 7 in HB1 is consistent with the likelihood of particular outcomes in the simulated plans that are generated without consideration of race.[1]

3. These simulated plans are at least as compact as the enacted plan and have fewer than or an equal number of county splits. Like the enacted plan, none of these simulated plans pair incumbents. The first set of 10,000 alternative plans were generated without any consideration of race. I call them "race-blind" simulated plans. These race-blind simulations allow me to determine how race would be treated in districting plans if the districts were drawn without using any consideration of race. I also generated the second set of 10,000 alternative plans that have one majority-minority district (MMD) but otherwise followed the same criteria as the race-blind simulation procedure used for the first set. They were referred to as "one-MMD" simulated plans. These one-MMD simulations allow me to examine how the racial composition of the other districts would look if the districts were drawn with the constraint of including one MMD but otherwise not considering race at all.

II. SUMMARY OF OPINIONS

1. My analysis focused on Districts 2 and 7, the districts with the highest proportion of Black voters, where the role of race was most apparent. Other types of analysis may uncover similar evidence in Districts 1 and 3, but the simulations run here focus on the predominance of race in Districts 2 and 7.

4. The comparison of the race-blind simulated plans with the enacted plan yields the following findings: The enacted plan draws Black voters who live in Jefferson and Montgomery Counties into District 7 at a rate not present in the race-blind simulated plans. Indeed, the enacted plan is a clear statistical outlier in this regard when compared to the ensemble of the race-blind simulated plans. As a result of the enacted plan including an unusually large number of Black voters into District 7, the Black voting age population (BVAP) proportion of District 2 is much lower than a vast majority of the simulated plans.[2]

5. The comparison of the one-MMD simulated plans with the enacted plan yields the following findings: The enacted plan sweeps about 39,000 Black voters who live in Montgomery County into District 7 in the ways that render it a statistical outlier when compared to the simulated plans. In contrast, about 90% of the one-MMD simulated plans include fewer than 4,000 Black voters from Montgomery in the MMD, and instead include most Black voters from Montgomery in other districts. As a result of packing Black voters who live in Montgomery into District 7 in the enacted plan, the district with the second highest BVAP proportion (i.e., District 2) has a BVAP of only 30.1%. In contrast, a large proportion of the one-MMD simulated plans avoid packing Black voters into the MMD and the district with the second highest BVAP proportion achieves, on average, 4.4 percentage points or higher BVAP proportion than the enacted plan. This difference is statistically significant using the conventional standard.

6. My simulation analyses, therefore, provide evidence that race was a significant factor in drawing the enacted plan.

III. QUALIFICATIONS, EXPERIENCE, AND COMPENSATION

7. I am trained as a political scientist (Ph.D. in 2003, Harvard) and a statistician (MA in 2002, Harvard). I have published more than 60 articles in peer reviewed journals, including premier political science journals (e.g., *American Journal of Political Science*, *American Political Science Review*, *Political Science*), statistics journals (e.g., *Biometrika*, *Journal of the American*

2. I define BVAP as people who are some part Black per the Census definition.

Statistical Association, *Journal of the Royal Statistical Society*), and general science journals (e.g., *Lancet*, *Nature Human Behavior*, *Science Advances*). My work has been widely cited across a diverse set of disciplines. For each of the past four years, Clarivate Analytics, which tracks citation counts in academic journals, has named me as a highly cited researcher in the cross-field category for producing "multiple highly cited papers that rank in the top 1% by citations for field and year in Web of Science."

8. I started my academic career at Princeton University, where I played a leading role in building interdisciplinary data science communities and programs on campus. I was the founding director of Princeton's Program in Statistics and Machine Learning from 2013 to 2017. In 2018, I moved to Harvard, where I am Professor jointly appointed in the Department of Government and the Department of Statistics, the first such appointment in the history of the university. Outside of universities, between 2017 and 2019, I served as the president of the Society for Political Methodology, a primary academic organization of more than one thousand researchers worldwide who conduct methodological research in political science. My introductory statistics textbook for social scientists, *Quantitative Social Science: An Introduction* (Princeton University Press, 2017), has been widely adopted at major research universities in the United States and beyond.

9. Computational social science is one of my major research areas. As part of this research agenda, I have developed simulation algorithms for evaluating legislative redistricting since the beginning of this emerging literature. At Harvard, I lead the Algorithm-Assisted Redistricting Methodology (ALARM; https://alarm-redist.github.io/) Project, which studies how algorithms can be used to improve legislative redistricting practice and evaluation.

10. Back in 2014, along with Jonathan Mattingly's team at Duke, my collaborators and I were the first to use Monte Carlo algorithms to generate an ensemble of redistricting plans. Since then, my team has written several methodological articles on redistricting simulation algorithms (Fifield, Higgins, et al. 2020; Fifield, Imai, et al. 2020; McCartan and Imai 2020; Kenny et al. 2021).

11. I have also developed an open-source software package titled `redist` that allows

researchers and policy makers to implement the cutting-edge simulation methods developed by us and others (Kenny et al. 2020). This software package can be installed for free on any personal computer with Windows, Mac, or Linux operating system. According to a website that tracks the download statistics of R packages, our software package has been downloaded about 30,000 times since 2016 with an increasing download rate.[3]

12. In addition to redistricting simulation methods, I have also developed the methodology for ecological inference referenced in voting rights cases (Imai, Lu, and Strauss 2008; Imai and Khanna 2016). For example, my methodology for predicting individual's race using voter files and census data was extensively used in a recent decision by the Second Circuit Court of Appeals regarding a redistricting case (Docket No. 20-1668; Clerveaux *et al* v. East Ramapo Central School District).

13. A copy of my curriculum vitae is attached as Exhibit A.

14. I am being compensated at a rate of $450 per hour. My compensation does not depend in any way on the outcome of the case or on the opinions and testimony that I provide.

IV. METHODOLOGY

15. I conducted simulation analyses to help evaluate whether the enacted plan was drawn using race as a primary factor. Redistricting simulation algorithms generate a representative sample of all possible plans that satisfy a specified set of criteria. These criteria may, for example, include requiring a certain degree of population equality, avoiding pairing of incumbents, drawing compact districts, and limiting the number of counties being split. The resulting simulated plans represent a set of alternative plans that the state could have drawn while being compliant with these redistricting criteria. One can then evaluate the properties of a proposed plan by comparing it against the simulated plans. If the proposed plan unusually treats particular racial groups in a certain way *when compared to* the ensemble of simulated plans, this serves as empirical evidence that the proposed plan was likely drawn using race as a predominant factor.

3. https://ipub.com/dev-corner/apps/r-package-downloads/ (accessed on December 6, 2021)

16. Furthermore, statistical theory allows us to quantify the degree to which the proposed plan is extreme in terms of racial composition, relative to the ensemble of simulated plans. For example, we can estimate the probability of a simulated plan packing Black people into a district at least as much as a proposed plan does. If this probability is small, then the proposed plan is a statistical outlier because the enacted plan is highly unlikely to come from the race-blind distribution that is used to generate the simulated plans.

17. A primary advantage of the simulation-based approach, over other traditional methods, is its ability to account for the political and geographic features that are specific to each state, including spatial distribution of voters and configuration of administrative boundaries. Simulation methods can also incorporate each state's redistricting rules. These state-specific features limit the types of redistricting plans that can be drawn, making comparison across states and over time difficult. The simulation-based approach therefore allows us to compare the enacted plan to a representative set of alternate districting plans subject to Alabama's administrative boundaries, political realities, and legal requirements. Appendix A provides a brief introduction to redistricting simulation.

A. Simulation Setup

18. For the purposes of my analyses, I have ensured that all of my simulated plans have the following properties:

- there are a total of seven geographically contiguous districts
- all districts do not exceed an overall population deviation of $\pm$ 0.5%
- districts are more compact than the enacted plan on average
- fewer than or equal to the number of county boundaries split under the enacted plan
- no more than one incumbent is placed in each district[4]
- no partisan information is used for simulation

19. I provide an overview of my simulation procedure while leaving the detailed infor-

4. I exclude Representative Mo Brooks who has announced his candidacy for the United States Senate from the list of incumbents.

mation about the simulation algorithms to Appendix B. I generated two sets of 10,000 simulated plans. The first set is generated by only considering the above criteria, using the Sequential Monte Carlo (SMC) simulation algorithm (McCartan and Imai 2020; Kenny et al. 2021; briefly described in Appendix B). Importantly, the simulation procedure does not use the information about race at all. I call this "race-blind" simulation analysis.

20. The second set of simulated plans also satisfy the above criteria, but use the information about race to create one majority-minority district (MMD). At the request of counsel for plaintiffs, the MMD is drawn as a district with the proportion of Black voting age population (BVAP) between 50% and 51%. I use the short-burst Markov chain Monte Carlo (MCMC) algorithm (Cannon et al. 2020; briefly described in Appendix B) to find different MMDs by running this algorithm multiple times. Then, for each simulated MMD, I use the same race-blind simulation procedure as the one used for the race-blind simulation analysis to generate the remaining six districts. Specifically, I run the SMC algorithm on the rest of the state without using any information about race. Each of the resulting simulated plans, therefore, has one MMD and the remaining districts created in the race-blind fashion. I call this "one-MMD" simulation analysis.

21. Neither of my two simulation analyses use any partisan information. Lastly, Appendix E.1 provides the detailed information about data sources used in my analysis.

B. Description of Redistricting Simulation Software

22. In my analysis, I use the open-source software package for redistricting analysis `redist` (Kenny et al. 2020), which implements a variety of redistricting simulation algorithms as well as other evaluation methods. My collaborators and I have written the code for this software package, so that other researchers and the general public can implement these state-of-the-art methods on their own. I supplement this package with code written primarily to account for the redistricting rules and criteria that are specific to Alabama. All of my analyses are conducted on a laptop. Indeed, all of my analysis code can be run on any personal computer once the required software packages, which are also freely available and open-source, are installed.

V. EVALUATION OF THE ENACTED PLAN

23. Using the redistricting simulation methodology described above, I evaluate evidence regarding whether race was a primary factor in drawing the enacted plan. This is done by instructing the algorithms to adhere to all of the other redistricting rules and then comparing how the enacted plan treats race to the treatment of race in the resulting simulated plans. Specifically, I simulated two sets of 10,000 alternative plans ("race-blind" and "one-MMD"), using the simulation procedure described in Section IV.

24. In Appendix C, I show that the simulated plans are on average at least as compact as the enacted plan based on the standard compactness measures. For example, virtually all of the race-blind simulated plans are more compact than the enacted plan. Appendix D shows that most of the simulated plans have fewer than or equal to the number of county splits the enacted plan does. Indeed, almost all of the race-blind simulated plans split at most four counties while the enacted plan splits six counties. As mentioned above, all simulated plans have at most one incumbent located in any given district. This allows me to number the districts of each simulated plan according to the incumbents contained in them.

25. I can easily generate additional plans by running the algorithm longer, but for the purpose of my analysis, 10,000 simulated plans for each set will yield statistically precise conclusions. In other words, generating more than 10,000 plans, while possible, will not materially affect the conclusions of my analysis.

A. Race-blind Simulation Analysis

26. I start with the evaluation of the enacted plan based on the race-blind simulation analysis. I show that the way in which the enacted plan deviates from the simulated plans implies that race was a predominant factor in drawing the district boundaries of the enacted plan.

A.1. Outlier Analysis of Districts 2 and 7

27. I first conduct an outlier analysis of District 7, which is the sole MMD under the enacted plan. This analysis examines how extreme the BVAP proportion of District 7 is under the enacted plan when compared to that under the race-blind simulated plans. Figure 1 presents

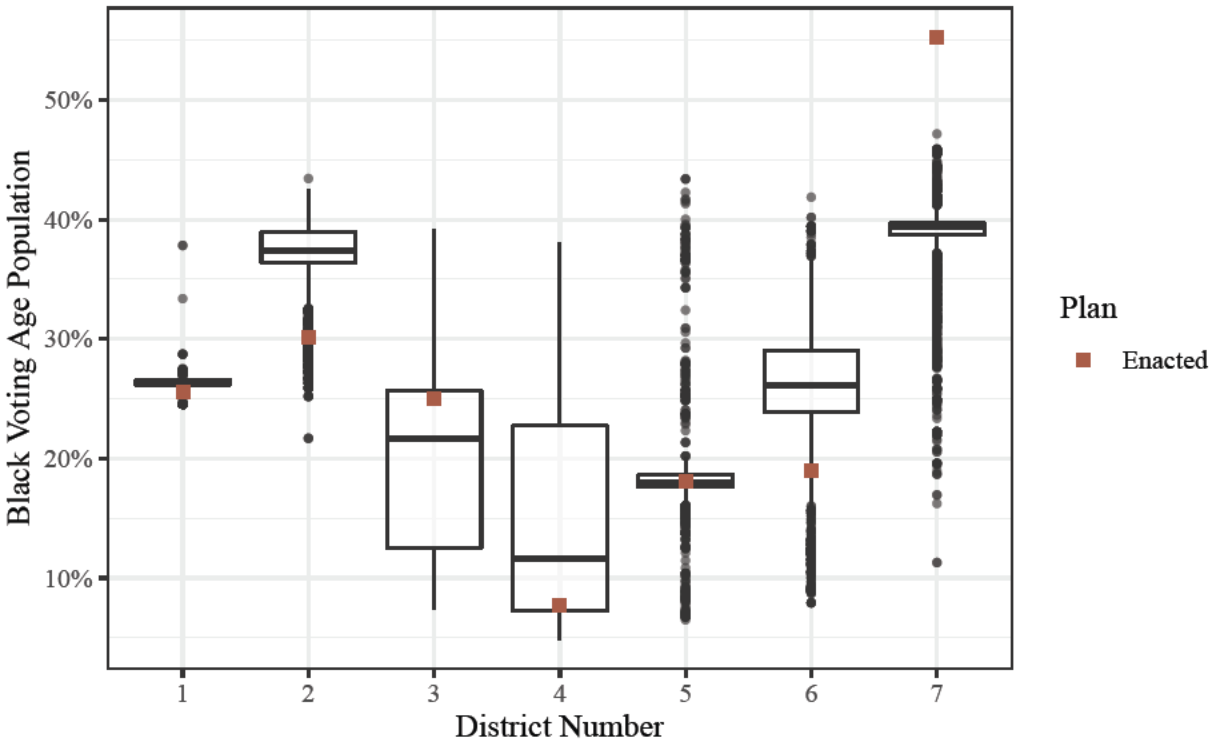

Figure 1: Proportion of Black voting age population (BVAP) for each district of the enacted plan (represented by the red square) compared to the distribution of BVAP proportion for the corresponding district under the simulated plans (represented by a boxplot). District 7 of the enacted plan is a clear outlier.

the distribution of the BVAP proportion for each district under the simulated plans (boxplot) with the red square representing the BVAP proportion for the corresponding district under the enacted plan (matched based on the incumbent location). Note that in a boxplot, the "box" contains 50% of the data points (those from 25 percentile to 75 percentile to be exact) with the horizontal line indicating the median value whereas the vertical lines coming out of the box, called "whiskers", indicate the range, which contains most data. Any data points that are beyond these whiskers are considered as outliers.

28. For the BVAP proportion of District 7, the enacted plan is a clear outlier, including many more Black people than the corresponding district of the simulated plans. In fact, none of my 10,000 simulated plans has a district that has anywhere near as high a BVAP percentage as District 7 of the enacted plan. In other words, the enacted plan considers race beyond what is required

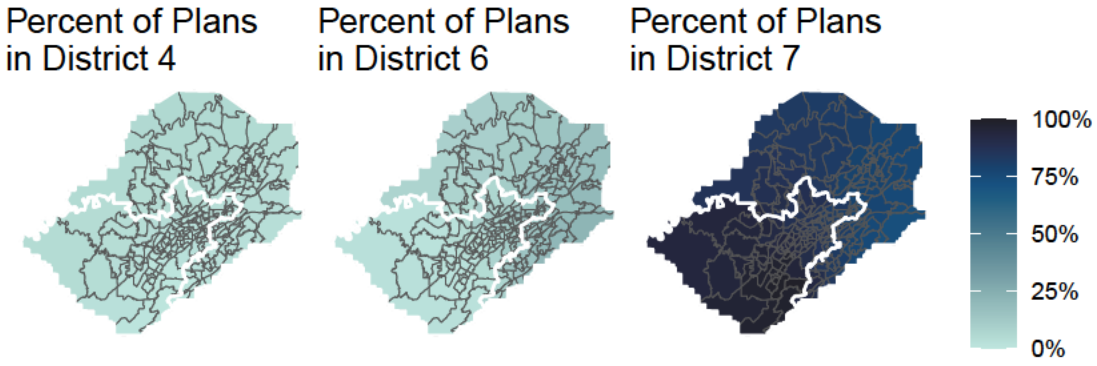

Figure 2: Precinct assignments to Districts 4 (left plot), 6 (middle plot), and 7 (right) across the simulated plans within Jefferson County. Darker colors indicate precincts that are often assigned to that district in simulated plans, while lighter colors indicate precincts that are less likely to be included in that district. The white line represents the district boundary of the enacted plan.

to satisfy the other redistricting criteria. Given the extent to which the BVAP of District 7 is an outlier, I conclude that race was a predominant factor" in drawing the district.

29. As a result of the high percentage of BVAP in District 7, the BVAP of District 2 under the enacted plan, which is 30.1%, is much lower than that under a vast majority of the simulated plans. Most simulated plans achieve a BVAP between 36.4% and 38.9% for this district.

A.2. Analysis of Jefferson County

30. I next analyze Jefferson County, where the city of Birmingham is located. The enacted plan splits this county by including a large part of Birmingham into District 7 while assigning the rest of the county to District 6. I examine how this decision differs from the way in which the simulated plans treat Jefferson County. First, unlike the enacted plan, more than half of the simulated plans (53.3%) do not split Jefferson County at all. These simulated plans include the entire county as part of District 7.

31. Second, the way in which the enacted plan splits Jefferson County is highly unusual. Figure 2 presents the proportion of simulated plans that assign each precinct from Jefferson County to Districts 4 (left), 6 (middle), and 7 (right). Darker colors indicate precincts that are likely to be assigned to each district under the simulated plans, whereas lighter colors represent the ones that tend to be part of other districts. As discussed above, the figure shows that the whole Jefferson

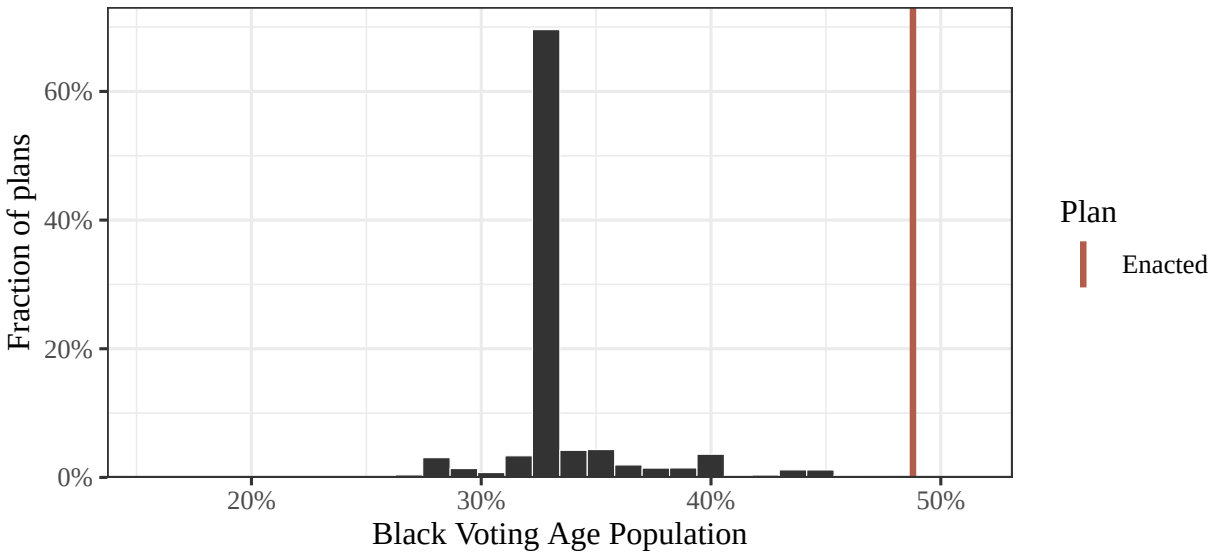

Figure 3: Comparison of Black Voting Age Population percent within Jefferson County and District 7 between simulated plans (black bars) and the enacted plan (red line).

County is usually part of District 7, indicated by the fact that the entire county is colored dark in the right map. Even when split, the simulated plans tend to assign much of the county to District 7. This pattern is in sharp contrast to the way in which the enacted plan splits Jefferson County — it groups precincts where more Black Alabamians reside and includes them into District 7 while assigning the rest of the county to District 6.

32. The examination of the BVAP within Jefferson County also confirms that the enacted plan is an outlier with respect to how it packs many Black residents of Jefferson County into District 7. Figure 3 presents the distribution of BVAP proportions within both Jefferson County and District 7 across simulated plans and compares it against the enacted plan (red line). The enacted plan is a clear outlier in that it packs many more Black residents of Jefferson County into District 7 than 9,992 of the 10,000 simulated plans. In other words, only 0.08% of simulated plans pack as many Black residents of Jefferson County into District 7 as the enacted plan.

A.3. Analysis of Montgomery County

33. In addition to Jefferson, Montgomery is another key county where many Black Alabamians live. The enacted plan splits this county into Districts 2 and 7. Importantly, the enacted plan divides the city of Montgomery into those two districts. I examine how often Montgomery

County is split in the simulated plans to determine whether the decision to split Montgomery County in the enacted plan was likely to occur in order to satisfy other redistricting criteria. I find that over 97% of the simulated plans do not split Montgomery County at all. Indeed, about 94% of these simulated plans assign the entire Montgomery County to Districts 2 or 6 rather than District 7. It is clear that the enacted plan packs Black voters who live in the western part of the city of Montgomery into District 7 while leaving District 2 with fewer Black voters.

34. Based on these findings, it is my opinion that the enacted plan splits Montgomery County in a way that includes a disproportionate number of Black people into District 7, even though doing so was unnecessary to satisfy the other redistricting criteria.

B. One-MMD Simulation Analysis

35. I next conduct the one-MMD simulation analysis. As described in Section IV, this simulation procedure first uses a simulation algorithm to find an MMD with the BVAP proportion of 50–51% and then runs another simulation algorithm on the rest of the state without using any information about race. Like in the race-blind simulation, I created a total of 10,000 plans (see Appendix B for details).

B.1. Analysis of the Majority-Minority District

36. I find that all of the simulated plans use Birmingham as part of the MMD. In fact, many of the simulated plans split Jefferson County and incorporate the city of Birmingham into the MMD in a similar way to the enacted plan. In addition, all of the simulated plans split Tuscaloosa County and within this county draw district boundaries similar to those in the enacted plan.

37. The key difference between the enacted plan and simulated plans is how Montgomery County is treated. The enacted plan packs an unnecessarily large number of Black voters into the MMD, i.e., District 7, when compared to the simulated plans. Specifically, the enacted plan splits the City of Montgomery into two and includes its western part along with its northern and southern environs into the MMD. In contrast, a majority (62.2%) of the simulated plans do not split Montgomery County at all and instead assign the whole county to a non-MMD. Moreover, even in 37.8% of the simulated plans that split Montgomery County, a much smaller part of the

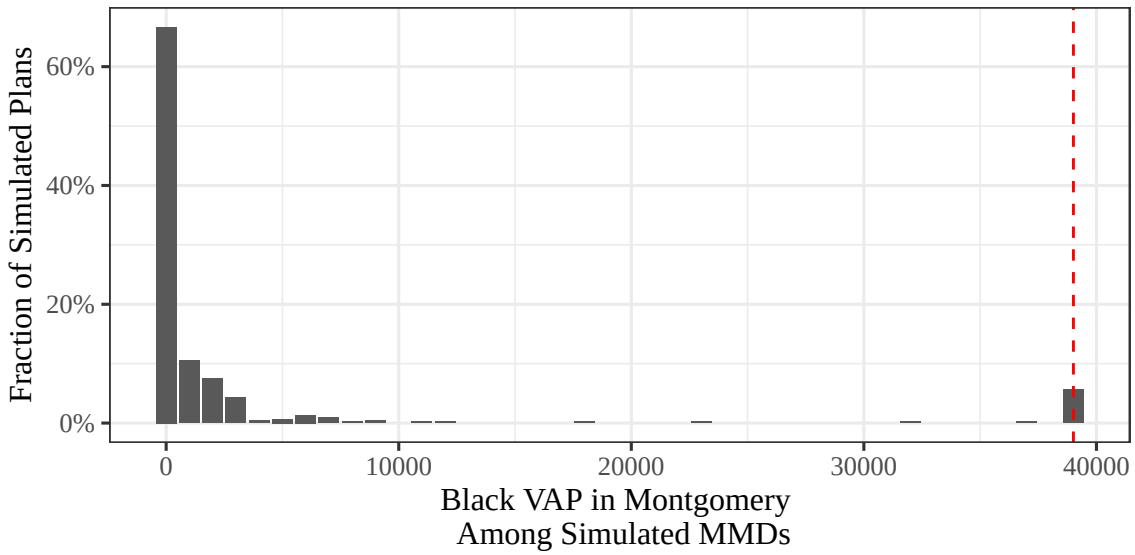

Figure 4: Black voting age population (BVAP) in Montgomery among each simulated majority-minority district (MMD). The enacted plan (red) places considerably more Black population in Montgomery than most simulated MMDs.

county's population gets assigned to the MMD.

38. Figure 4 shows the distribution of the BVAP in Montgomery County that is assigned to the MMD across the simulated plans. The enacted plan (red dashed line) assigns about 39,000 Black residents of voting age to the MMD. In contrast, the simulated plans include a much smaller percentage of BVAP of Montgomery County in the MMD. The distribution for the simulated plans is highly skewed with a large spike at zero because a majority of the simulated plans do not assign any part of Montgomery County to the MMD and instead keep Montgomery County as a whole. And, even when the MMD incorporates a part of Montgomery County in 37.8% of the simulated plans, it includes much less than 4,000 Black residents of voting age most of the time as opposed to 39,000 in the enacted plan.

39. Figure 5 shows which parts of Montgomery County, if any, are likely to be included in the MMD under the simulated plans. In this map, a precinct with darker shade means that it is part of the MMD in a greater number of simulated plans. Consistent with the finding above, most of Montgomery County has almost zero chance of being part of the MMD. The only area that is somewhat likely to be included in the MMD is the western edge of the City of Montgomery. But,

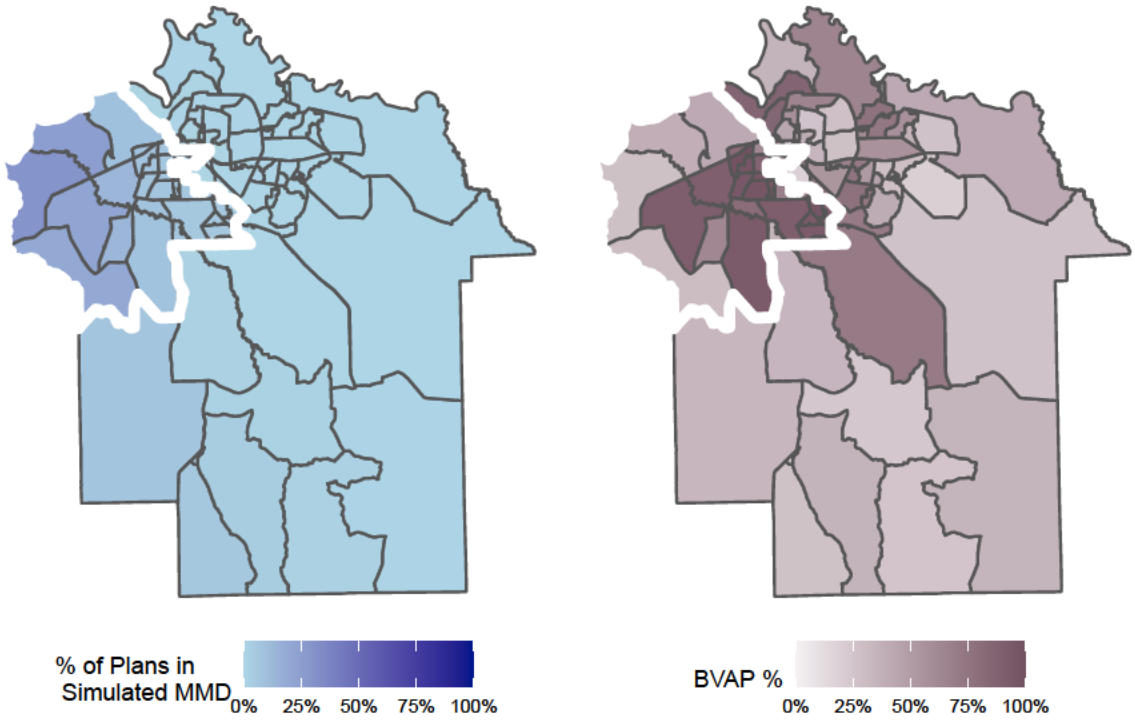

Figure 5: The fraction of times that each Montgomery precinct was assigned to a simulated majority-minority district compared to the enacted plan (white) on left, and the black voting age population share of each precinct in Montgomery county on right.

this area is much smaller than the area that is part of the MMD under the enacted plan as delineated by the white line.

40. In sum, the above analysis demonstrates that the enacted plan places Black voters who live in Montgomery County into District 7 in a manner that suggests race was a predominant factor in drawing district boundaries. In contrast, most of the simulated plans place none or few of these voters in the MMD.

B.2. Analysis of the Second Highest BVAP District

41. The consequence of packing Black voters who live in Montgomery County into the MMD is that it leaves fewer Black voters for other districts. Figure 6 shows the distribution of BVAP proportion for the district that has the second highest BVAP proportion under each simulated plan. Note that under more than 90% of the simulated plans, District 2 has the second highest BVAP proportion. When compared to the enacted plan (represented by the red dashed line), under

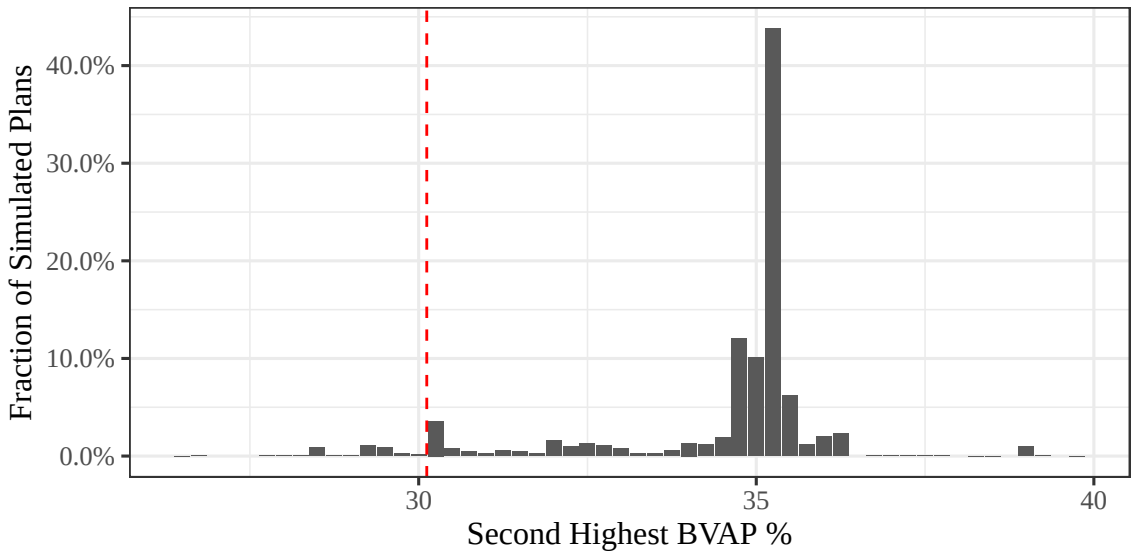

Figure 6: The second highest Black voting age population (BVAP) proportion (after the simulated majority-minority district) in each simulated plan. The vast majority of simulated plans have greater BVAP than the enacted (red).

the simulated plans, this district has a much higher BVAP proportion with the maximum value of 39.7%. Although all of non-MMD districts were generated without using any information about race, the simulation plan has, on average, the second highest district-level BVAP proportion at 34.5%, which is 4.4 percentage point higher than the corresponding BVAP proportion under the enacted plan (30.1%). Only 3.7% of the simulated plans have the second highest district-level BVAP proportion to be less than the one for the enacted plan (30.1%).

Pursuant to 28 U.S.C. § 1746, I hereby declare under penalty of perjury that the forgoing is true and correct:

Executed, this day, December 10, 2021, in Cambridge, Massachusetts.

Kosuke Imai, Ph.D.

IN THE UNITED STATES DISTRICT COURT NORTHERN DISTRICT OF ALABAMA SOUTHERN DIVISION

Milligan *et al*.

Plaintiffs,

v.

Merrill *et al*.

Defendents.

REBUTTAL EXPERT REPORT

Kosuke Imai, Ph.D.

December 20, 2021

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I. INTRODUCTION AND SCOPE OF WORK

1. My name is Kosuke Imai, Ph.D., and I am a Professor in the Department of Government and the Department of Statistics at Harvard University. I specialize in the development of statistical methods for and their applications to social science research. I am also affiliated with Harvard's Institute for Quantitative Social Science. My qualifications and compensation are described in my initial report.

2. I understand from Plaintiffs' counsel that one of Defendants' experts offered the opinion that Mobile and Baldwin Counties are communities of interest and should not be divided across congressional districts. I also understand from Plaintiffs' counsel that there is evidence supporting the Black Belt, as defined below, as a community of interest. I express no opinions on these issues.

3. I have been asked by Plaintiff's counsel to re-run my "one-MMD (majority-minority district) simulation" from my initial report with additional weighting that encourages the algorithm to keep Mobile/Baldwin and the Black Belt together and to examine the likely effect on the range of black voting-age population (BVAP) proportion of non-MMD districts, particularly District 2. The original one-MMD simulation I conducted for my initial report generated 10,000 alternative plans, each of which was designed to have exactly one MMD with the proportion of black voting-age population (BVAP) ranging from 50% to 51%. The other six districts of each simulated plan were generated without any consideration of race. This time, however, I instructed the algorithm to generate, with a high probability, plans which keep Mobile and Baldwin Counties together and the Black Belt together. Other than this additional weight, the new one-MMD simulation procedure I employed is identical to the one used in my initial expert report. Like the original one-MMD simulation, my new 10,000 simulated plans are, on average, more compact and have no more county splits than the enacted plan.

II. SUMMARY OF OPINIONS

4. The comparison of the new one-MMD simulated plans with the enacted plan yields the following findings: the district with the second highest BVAP proportion in simulated plans achieves, on average, 6.2 percentage points higher BVAP proportion than the enacted plan. This difference is statistically significant using the conventional standard. The new one-MMD simulations generated many more plans with a greater BVAP proportion for the second highest BVAP district than my initial one-MMD simulation, which did not encourage the algorithm to avoid splitting Mobile/Baldwin Counties and the Black Belt.

5. My simulation analyses, therefore, provide evidence that race was a significant factor in drawing the enacted plan, and that, taking into account the identified communities of interest, the enacted plan is still an outlier in terms of how it cracks the Black community.

III. METHODOLOGY

6. The simulation procedure used for this report is identical to that of the one-MMD simulation from my initial report with the exception of one additional weighting I added to discourage the simulation algorithm from splitting Mobile and Baldwin Counties as well as the Black Belt. I was instructed by Plantiffs' counsel to use the following set of counties for the Black Belt: Barbour, Bullock, Butler, Choctaw, Clarke, Conecuh, Crenshaw, Dallas, Escambia, Greene, Hale, Lowndes, Macon, Marengo, Monroe, Montgomery, Perry, Pickens, Pike, Russell, Sumter, Washington, and Wilcox Counties. As standard in the literature, I used the so-called Gibbs measure to incorporate this constraint into the simulation algorithm (Autry et al. 2020; Carter et al. 2019; McCartan and Imai 2020; Kenny et al. 2021).[1] One MMD whose BVAP proportion is between 50% and 51% was generated for each simulated plan in the exactly same manner as done in the one-MMD simulation for my initial report. Finally, I used the same data set as the one analyzed in my initial report.

1. Specifically, I used the indicator variable for splitting each of these two county clusters with a penalty weight of 25.

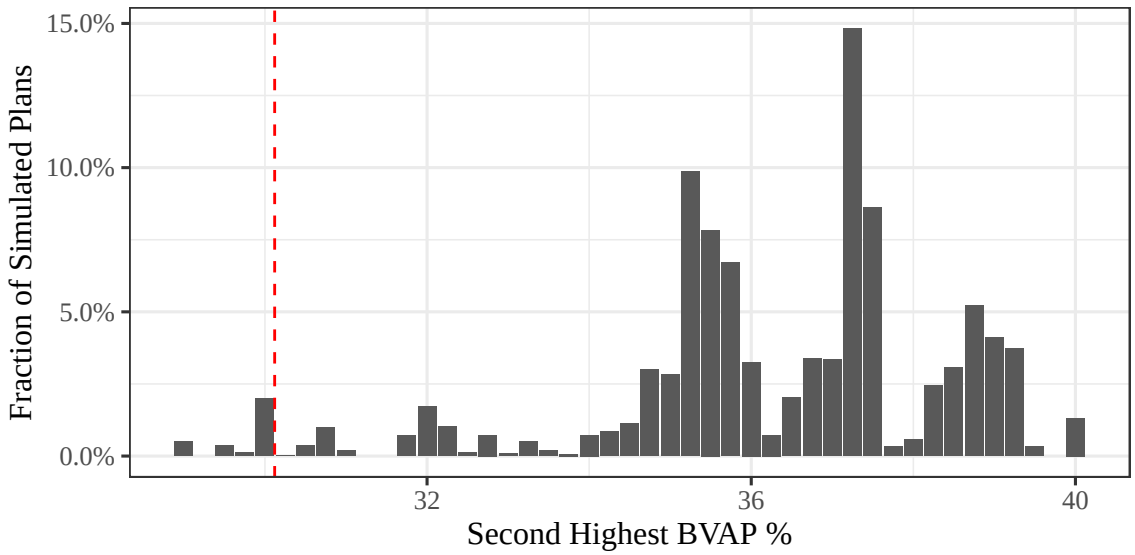


Figure 1: The second highest Black voting age population (BVAP) proportion (after the simulated majority-minority district) in each simulated plan. The vast majority of simulated plans have greater BVAP than the enacted (red).

IV. EVALUATION OF THE ENACTED PLAN

7. Using the redistricting simulation methodology described above, I evaluate evidence regarding whether race was a primary factor in drawing the enacted plan. In Appendix A, I demonstrate that the simulated plans are on average at least as compact as the enacted plan based on the standard compactness measures. Appendix B further shows that all of the simulated plans have fewer than or equal to the number of county splits the enacted plan does. In addition, like the original one-MMD analysis conducted for my initial report, all simulated plans have at most one incumbent located in any given district.

8. I can easily generate additional plans by running the algorithm longer, but for the purpose of my analysis, 10,000 simulated plans for each set will yield statistically precise conclusions. In other words, generating more than 10,000 plans, while possible, will not materially affect the conclusions of my analysis.

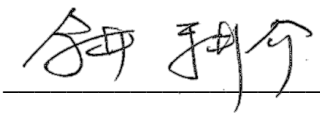
9. Figure 1 shows the distribution of BVAP proportion for the district that has the second highest BVAP proportion under each simulated plan. Note that under more than 99% of the simulated plans, District 2 has the second highest BVAP proportion. When compared to the en-

acted plan (represented by the red dashed line), under the simulated plans, this district has a much higher BVAP proportion with a maximum value of 39.9%. Although all of non-MMD districts were generated without using any information about race, the simulation plan has, on average, the second highest district-level BVAP proportion at 36.3%, which is 6.2 percentage points higher than the corresponding BVAP proportion under the enacted plan (30.1%). Only 3% of the simulated plans have the second highest district-level BVAP proportion to be less than the one for the enacted plan. In other words, this difference between the simulated plans and the enacted plan is statistically significant.

10. When compared to the original one-MMD simulation reported in my initial report, this new one-MMD simulation generated many more plans with a greater BVAP proportion for the second highest district-level BVAP proportion. This implies that keeping Mobile and Baldwin Counties together and the Black Belt together is likely to significantly increase the second highest district-level BVAP proportion.

Pursuant to 28 U.S.C. § 1746, I hereby declare under penalty of perjury that the forgoing is true and correct:

Executed, this day, December 20, 2021, in Cambridge, Massachusetts.



Kosuke Imai, Ph.D.

Supplemental Report

Moon Duchin
Professor of Mathematics, Tufts University
Collaborating Faculty in Race, Colonialism, and Diaspora Studies
Senior Fellow, Tisch College of Civic Life

December 27, 2021

1 Background and assignment

I am a Professor of Mathematics and a Senior Fellow in the Jonathan M. Tisch College of Civic Life at Tufts University. I have previously submitted an expert report in the current case and have been asked by counsel to provide a supplement presenting the findings from a racial analysis of the voter registration database. In addition I am submitting updated block assignment files correcting the minor anomalies (a small number of mis-assigned census blocks) flagged by Mr. Bryan. None of these corrections has any material effect on any of the findings in my original report. The block assignment files are Appendices A, B, C, and D to this affidavit, and I understand that they will be provided to the court in native format.

2 Voter registration data

As noted in my report of December 20, 2021, a voter registration file can be a useful supporting tool for confirming that districts are indeed majority-Black in the manner most relevant to voting opportunity. The U.S. Census allows for multiple ways for an individual to identify as Black in combination with various other races and any ethnicity, but the Alabama voter registration process asks individuals to choose a single racial identity. We can then see, for each district, how many registered voters self-identified unambiguously as being Black.

I was provided with a voter registration file by counsel and asked to examine it and to determine the share of Black-identified individuals among the registered voters in each plan.

I first geocoded the addresses using the Mapbox API, then used the lat-long coordinates to identify a census block for each individual address in the voter file. (When an address is on the border between two census blocks, I choose one at random to make the assignment.) This allows me to tabulate the total registered population and active registered population in any larger geographical area defined by blocks, such as the districts in the respective plans. Within those totals, I can tabulate the subpopulation that is Black.

The total voting age population of Alabama in the 2020 Decennial Census is 3,917,166. The geolocated addresses in the Alabama voter registration file show a total registered population of 3,610,261, and an active registered population of 3,161,725.[1]

[1]There are 3,614,742 rows in the original file, of which 3494 have no address listing or a Nonstandard Physical Address. Among the remaining entries, there were 987 addresses that the Mapbox API was unable to geolocate. This is far too few to change the finding that CD2 and CD7 are majority-Black in each of the alternative plans. Active status is defined by the "Registrant Status" field in the voter file, which has each row coded A (active) or I (inactive).

Below, I first report the Black voting age population of each district in each plan using what I understand to be the preferred definition—individuals who checked the box indicating that they are Black or African-American on their census form. Alongside that, I record the share of people who self-identified as Black when registering to vote, in the full database (BRPOP%) and then among active registered voters (BARPOP%). This confirms that the alternative plans have two majority-Black districts by this functional definition as well as by Census demographics.

HB-1

CD	BVAP%	BRPOP%	BARPOP%
1	0.2561	0.2575	0.2566
2	0.3012	0.3023	0.2971
3	0.2499	0.2500	0.2431
4	0.0770	0.0776	0.0744
5	0.1806	0.1848	0.1714
6	0.1893	0.1869	0.1834
7	0.5526	0.5943	0.5983

Plan A

CD	BVAP%	BRPOP%	BARPOP%
1	0.1450	0.1397	0.1384
2	0.5137	0.5334	0.5297
3	0.2396	0.2442	0.2395
4	0.0830	0.0828	0.0801
5	0.1602	0.1662	0.1529
6	0.1544	0.1432	0.1374
7	0.5150	0.5515	0.5539

Plan B

CD	BVAP%	BRPOP%	BARPOP%
1	0.1573	0.1523	0.1502
2	0.5106	0.5311	0.5275
3	0.2228	0.2246	0.2198
4	0.1086	0.1082	0.1048
5	0.1566	0.1642	0.1504
6	0.1532	0.1467	0.1409
7	0.5024	0.5367	0.5404

Plan C

CD	BVAP%	BRPOP%	BARPOP%
1	0.1573	0.1523	0.1502
2	0.5006	0.5217	0.5188
3	0.1964	0.1951	0.1922
4	0.1103	0.1100	0.1067
5	0.1566	0.1642	0.1504
6	0.1551	0.1487	0.1433
7	0.5350	0.5690	0.5730

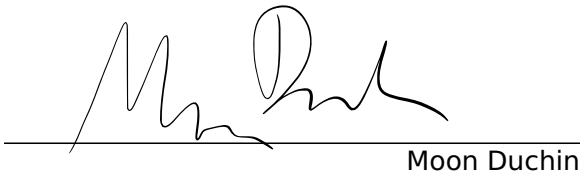
Plan D

CD	BVAP%	BRPOP%	BARPOP%
1	0.1536	0.1487	0.1466
2	0.5005	0.5193	0.5157
3	0.2396	0.2442	0.2395
4	0.0858	0.0845	0.0816
5	0.1602	0.1662	0.1529
6	0.1537	0.1426	0.1367
7	0.5173	0.5530	0.5553

Table 1: The enacted plan only has one majority-Black district, whether considering voting age population, registered voters, or active registered voters. All four alternative plans have two majority-Black districts by any of these ways of counting.

I declare under penalty of perjury that the foregoing is true and correct.

Executed this 27th day of December, 2021.



Moon Duchin

FILED
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U.S. DISTRICT COURT
N.D. OF ALABAMA

**IN THE UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF ALABAMA
SOUTHERN DIVISION**

MARCUS CASTER, LAKEISHA CHESTNUT, BOBBY LEE DUBOSE, BENJAMIN JONES, RODNEY ALLEN LOVE, MANASSEH POWELL, RONALD SMITH, and WENDELL THOMAS, Plaintiffs, v. JOHN H. MERRILL, in his official capacity as Alabama Secretary of State, Defendant.	Case No. 2:21-CV-1536-AMM

DECLARATION OF WILLIAM S. COOPER

WILLIAM S. COOPER, acting in accordance with 28 U.S.C. § 1746, Federal Rule of Civil Procedure 26(a)(2)(B), and Federal Rules of Evidence 702 and 703, does hereby declare and say:

I. INTRODUCTION

1. My name is William S. Cooper. I have a B.A. in Economics from Davidson College. As a private consultant, I currently serve as a demographic and redistricting expert for the Plaintiffs. I am compensated at a rate of $150 per hour.

(a) Redistricting Experience

2. I have been qualified in federal courts at trial as an expert witness on redistricting and demographics in about 45 voting rights cases in 19 states. My

testimony in these lawsuits almost always included a review of demographics and socioeconomic characteristics for the jurisdictions at issue. Five of these lawsuits resulted in changes to statewide legislative boundaries: *Rural West Tennessee African-American Affairs v. McWherter*, *Old Person v. Cooney*, *Bone Shirt v. Hazeltine*, *Alabama Legislative Black Caucus v Alabama*, and *Thomas v. Reeves.* Approximately 25 of the cases led to changes in local election district plans.[1]

3. In November 2019, I testified in the Northern District of Alabama at trial on behalf of plaintiffs challenging Alabama's 2011 Congressional Plan under Section 2 of the Voting Rights Act – *Chestnut v. Merrill*, Case No. 2:18-cv-00907.

4. In 2019, I prepared a consent decree election plan for the Jefferson County, Alabama Board of Education (*James v. Jefferson County Board of Education*). I served as a redistricting consultant to the City of Decatur, Alabama (*Voketz v. City of Decatur*) between 2015 and 2020. I also served as a redistricting consultant to the plaintiffs in *Alabama State NAACP v. City of Pleasant Grove* in 2018 and 2019. In 2018, I testified on behalf of the plaintiffs in a Section 2 case captioned *Alabama State Conference of the NAACP v. Alabama* involving at-large judicial elections.

[1] I have served as an expert witness on demographics in non-voting trials. For example, in an April 2017 opinion in *Stout v. Jefferson County Board of Education* (Case No.2:65-cv-00396-MHH), a school desegregation case involving the City of Gardendale, Alabama, the court made extensive reference to my testimony.

5. I currently serve as a redistricting consultant to the San Juan County, Utah Commission, with responsibility for developing election plans for the 3-district county commission and the 5-district school board. In October 2021, I briefly served as a consultant to the city council in Wenatchee, Washington and determined that the 2018 redistricting plan I drew is not malapportioned under the 2020 Census.

6. For additional historical information on my testimony as an expert witness and experience preparing and assessing proposed redistricting maps for Section 2 litigation, see a summary of my redistricting work attached as **Exhibit A**.

(b) Purpose of Report

7. The attorneys for the Plaintiffs in this case asked me to determine whether the African American population in Alabama is "sufficiently large and geographically compact"[2] to allow for the creation of two U.S. House majority-Black districts – one more than under the enacted plan (the "2021 Plan").

8. In addition, the attorneys asked me to review historical and current demographics reported in the decennial Census, as well as socioeconomic characteristics reported in the 1-year 2019 American Community Survey ("ACS") for African Americans and non-Hispanic Whites.[3]

[2] *Thornburg v. Gingles*, 478 U.S. 30, 50 (1986).

[3] In this report, "Black" and "African American" are synonymous, as are "Latino" and "Hispanic." Unless otherwise noted, "Black" refers to persons of all ages who are any part Black ("AP Black"), *i.e.*, single-race Black or more than one race and some part Black. "White" or "NH White" means non-Hispanic White. The AP Black classification includes all persons who

9. **Exhibit B** describes the sources and methodology I have employed in the preparation of this report. I also reviewed the "Reapportionment Committee Guidelines for Redistricting," which addresses Alabama's 2021 legislative and congressional redistricting.[4]

(c) Expert Summary Conclusions

10. Based on the 2020 Census, African Americans in Alabama are sufficiently numerous and geographically compact to allow for two majority-Black U.S. House districts in a seven-district plan.

11. As reported in the 1-Year *2019 American Community Survey*, non-Hispanic Whites significantly outpace African Americans across most key indicators of socio-economic well-being. These disparities are found statewide, as well as at the regional level in central and south Alabama.

(d) Organization of Declaration

12. The remainder of this declaration is organized as follows: **Section II** reviews state and regional demographics; **Section III** compares the benchmark 2011 U.S. Congressional Plan and the enacted 2021 U.S. Congressional Plan;

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self-identified in the 2020 Census as single-race Black or some part Black, including Hispanic Black. It is my understanding that following the U.S. Supreme Court decision in *Georgia v. Ashcroft*, 539 U.S. 461 (2003), the "Any Part" definition is the appropriate Census classification to use in most Section 2 cases.

[4] Source: http://www.legislature.state.al.us/aliswww/reapportionment/Reapportionment%20Guidelines%20for%20Redistricting.pdf.

Section IV presents six illustrative plans that feature a second majority-Black congressional district in central and south Alabama; **Section V** reviews socioeconomic disparities by race –statewide and by congressional district – with corresponding charts.

II. DEMOGRAPHIC PROFILE OF ALABAMA

(a) 2010 to 2020 – Population by Race and Ethnicity

13. As shown in **Figure 1**, according to the 2020 Census, Alabama has a total population of 5,024,279. Single-race non-Hispanic Whites ("NH Whites") are a majority of the population (63.12%). Any Part Black Alabamians ("AP Black") comprise 27.16% of the population and are the largest minority population, followed by Latinos (5.26%), who may be of any race.

Figure 1

Alabama – 2010 Census to 2020 Census

Population by Race and Ethnicity[5]

	2010 Number	Percent	2020 Number	Percent	Change 2010 to 2020	% Change 2010-2020
Total Population	4,779,736	100.00%	5,024,279	100.00%	244,543	5.12%
NH White	3,204,402	67.04%	3,171,351	63.12%	-33,051	-1.03%
Total Minority Pop.	1,575,334	32.96%	1,852,928	36.88%	277,594	17.62%
Latino (all races)	185,602	3.88%	264,047	5.26%	78,445	42.27%
NH SR Black	1,244,437	26.04%	1,288,159	25.64%	43,722	3.51%
NH SR Asian	25,907	0.54%	75,918	1.51%	50,011	193.04%
NH SR Hawaiian and Pacific	52,937	1.11%	23,119	0.05%	-29,818	-56.33%
NH SR American Indian and Alaska Native	1,976	0.04%	2,612	0.46%	636	32.19%
NH SR Other	4,030	0.08%	14,455	0.29%	10,425	258.68%
Single-race Black (including Black Hispanics)	1,251,311	26.18%	1,296,162	25.80%	44,851	3.58%
Any Part Black (including Black Hispanics)	1,281,118	26.80%	1,364,736	**27.16%**	83,618	6.53%

14. The population in Alabama grew by 5.12% between 2010 and 2020, from about 4.78 million to 5.02 million. In 2010, minorities represented about one third (32.96%) of the population. By 2020, that figure grew to 36.88% of the statewide population. In fact, all of Alabama's population growth between 2010 and 2020 (244,543) can be attributed to an increase in the minority population (277,594), offsetting a population loss of 33,051 NH White persons.

15. The Any Part Black population grew by 6.53% between 2010 and 2020, from 1.28 million to 1.36 million. African Americans represent 34% of the

[5] **PL94-171 Redistricting File** (Census 2010 and Census 2020)

population increase between 2010 and 2020 in Alabama (83,618 of 244,543 persons).

(b) <u>2020 Census – Spatial Distribution of the Black Population</u>

16. According to the 2020 Census, about half of Alabama's Black population (49.53%) is concentrated in the urban counties of Jefferson (Black pop. 289,515), Mobile (Black pop. 152,471), Montgomery (Black pop. 134,029), and Madison (Black pop. 99,875). The rural Black Belt counties (excluding urban Black Belt Montgomery) account for 8.68% of the statewide Black population.[6] The Counties of Lee and Tuscaloosa – home to the two largest state universities in Alabama – contain 8.34% of the statewide Black population. Taken together, the urban counties, rural Black Belt counties, and university counties encompass two-thirds (66.54%) of the statewide Black population.

17. The map in **Figure 2** displays the state's Black population by county under the 2020 Census, with bold lines demarcating the Black Belt region. The table in **Exhibit C** reports 2020 population by county by race and ethnicity.

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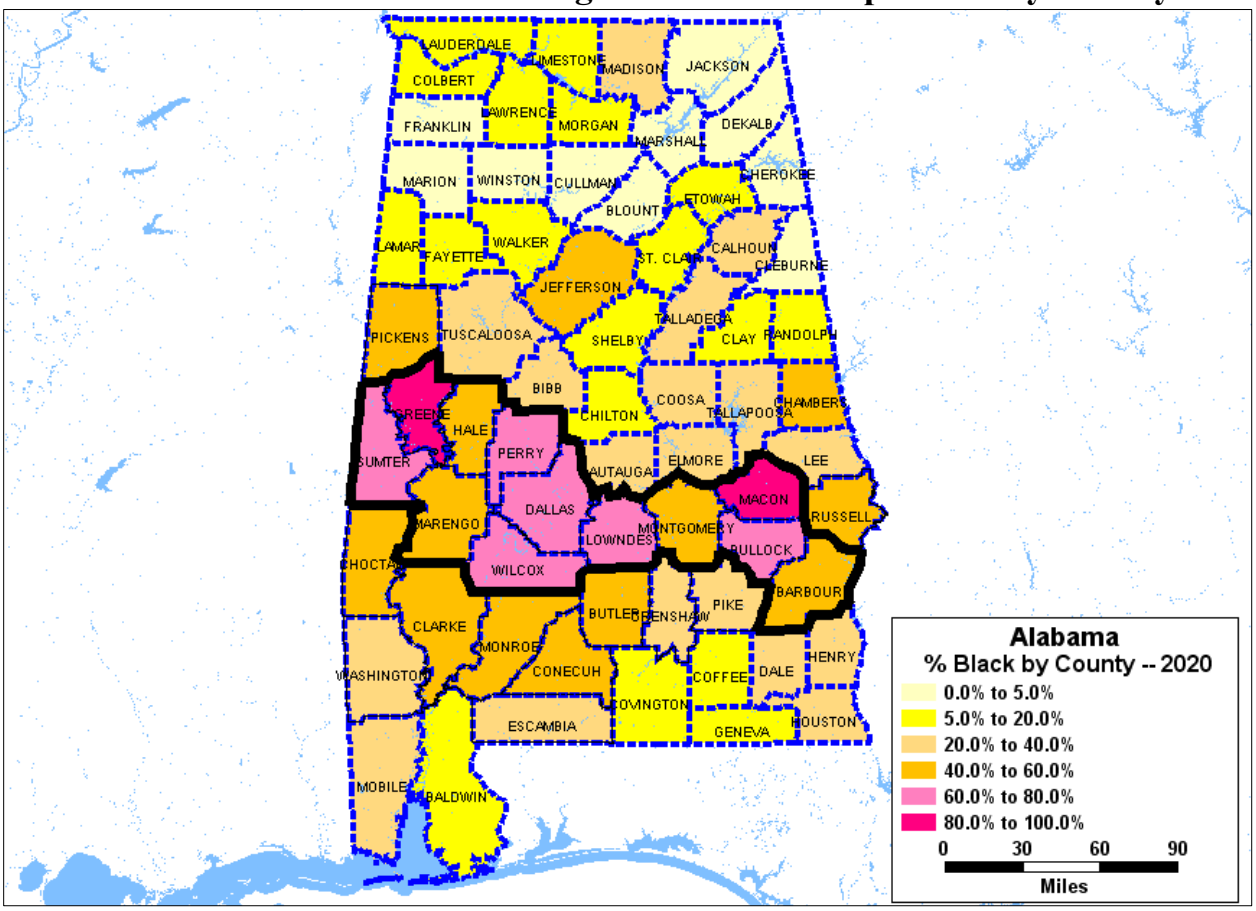
[6] In this declaration, the term "Black Belt" refers to the following counties: Barbour, Bullock, Dallas, Greene, Hale, Lowndes, Macon, Marengo, Montgomery, Perry, Sumter, and Wilcox. This is consistent with my testimony in *Alabama Legislative Black Caucus v Alabama* and *Alabama State Conference of the NAACP v. Alabama.*

For an overview of Alabama's Black Belt, including a listing of Black Belt counties under various definitions, see the article "Black Belt Region in Alabama" by Terance L. Winemiller, Auburn University at Montgomery, in the Encyclopedia of Alabama. http://www.encyclopediaofalabama.org/article/h-2458

Figure 2

2020 Census – Black Belt Region and Black Population by County



(c) Voting Age and Citizen Voting Age

18. As shown in **Figure 3**, African Americans in Alabama constitute a slightly smaller percentage of the voting age population (VAP) than the total population. According to the 2020 Census, Alabama has a total VAP of 3,917,166 – of whom 1,014,372 (25.90%) are AP Black. The NH White VAP is 2,564,544 (65.47%).

Figure 3

Alabama – 2020 Voting Age Population & 2019 Estimated Citizen Voting Age Population By Race and Ethnicity[7]

	2020 VAP	2020 VAP Percent	2019 CVAP Percent
Total	3,917,166	100.00%	100.00%
NH White 18+	2,564,544	65.47%	68.5 %
Total Minority 18+	1,352,622	34.53%	31.5%
Latino 18+	166,856	4.26%	2.2%
Single-race Black (Including Black Hispanics)18+	981,723	25.06%	26.7%
Any Part Black (Including Black Hispanics) 18+	1,014,372	**25.90%**	**27.3%**

19. The rightmost column in **Figure 3** reveals that both the Black and NH White population comprise a higher percentage of the citizen voting age population ("CVAP") than the corresponding voting age population, owing to higher non-citizenship rates among other minority populations.

20. According to estimates from the 1-year 2019 *American Community Survey* ("ACS"), African Americans represent 27.3% of the statewide CVAP – more than a percentage point higher than the 2020 AP Black VAP. The NH White

[7] Sources:
PL94-171 Redistricting File (Census 2020);

Table S2901 -- CITIZEN, VOTING-AGE POPULATION BY SELECTED CHARACTERISTICS (1-year 2019 ACS)
https://data.census.gov/cedsci/table?q=S2901&g=0400000US01&tid=ACSST1Y2019.S2901&hidePreview=true.

2019 ACS 1-Year Estimates 1-Year Estimates-Public Use Microdata Sample
https://data.census.gov/mdat/#/search?ds=ACSPUMS1Y2019&vv=AGEP(18:99)&cv=RACBLK(1)&rv=ucgid,CIT(1,2,3,4)&wt=PWGTP&g=0400000US01

CVAP is 68.5% – 3 percentage points higher than NH White VAP in the 2020 Census.[8]

III. ALABAMA CONGRESSIONAL PLANS – 2021 and 2011

(a) 2021 Enacted Congressional Plan

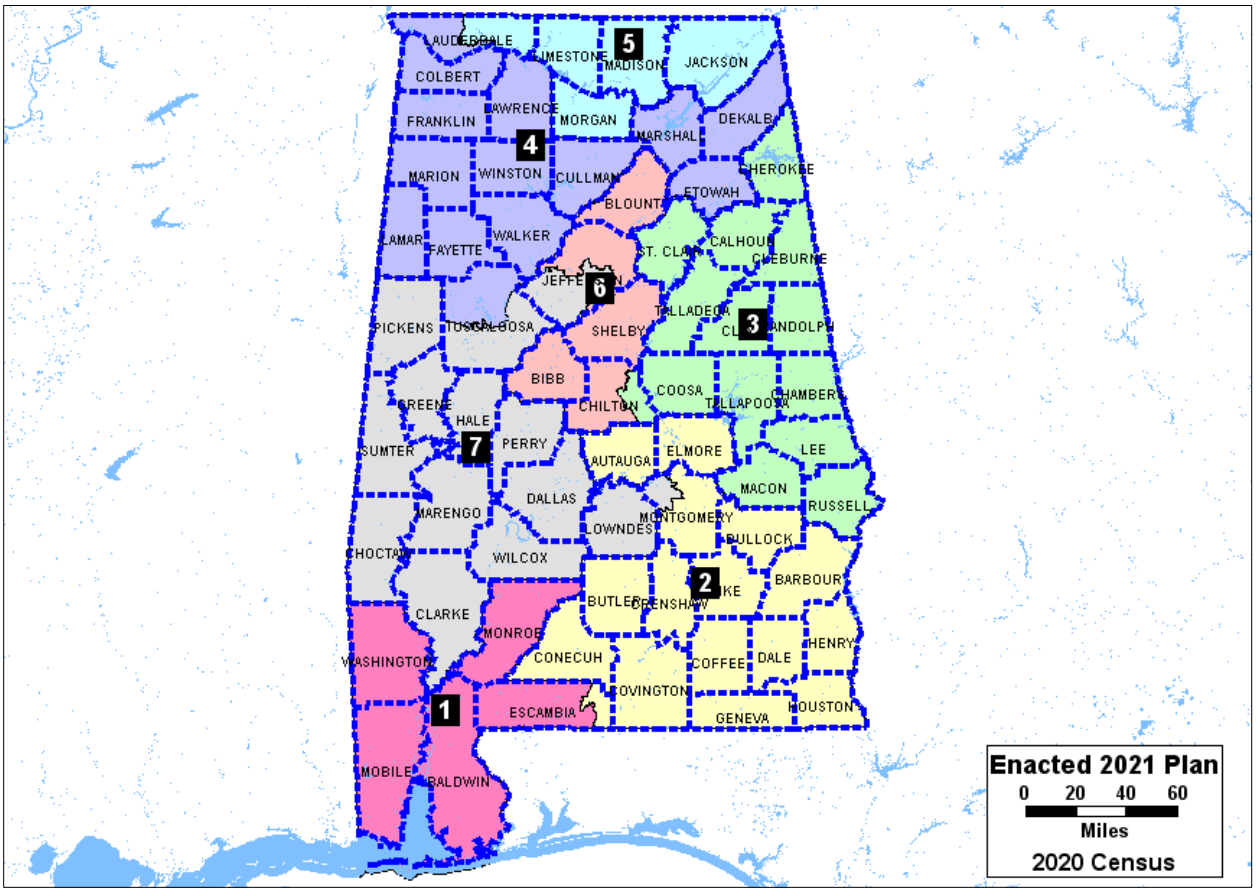
21. On November 4, 2021, Governor Ivey signed into law a new congressional plan (the "2021 Plan") with CD 7 as the only majority-Black district and six county splits.[9] The map in **Figure 4** depicts the 2021 Plan.

[8] Due to the COVID-19 pandemic, the 1-year 2020 ACS results will not be published. Source: https://www.census.gov/newsroom/press-releases/2021/changes-2020-acs-1-year.html

[9] Source for GIS shapefile: https://redistrictingdatahub.org/state/alabama/

Figure 4

Alabama – Enacted 2021 U.S. House Plan



22. Majority-Black CD 7 encompasses part of Jefferson County and extends southwest to include the southern half of Tuscaloosa County and rural Black Belt counties along the Mississippi border, then east through part of the Back Belt to northwest Montgomery County.

23. The table in **Figure 5** shows 2020 summary population statistics for the 2021 Plan. **Exhibit D-1** contains more detailed 2020 population statistics.

Figure 5

2021 U.S. House Plan – 2020 Census

District	Population	18+ Pop	% 18+ AP Black	% 18+ NH White
1	717754	557535	25.61%	66.00%
2	717755	557677	30.12%	62.03%
3	717754	564281	24.99%	67.74%
4	717754	556133	7.70%	82.41%
5	717754	561187	18.06%	70.89%
6	717754	552286	18.93%	71.16%
7	717754	568067	55.26%	38.60%

24. The map in **Exhibit D-2** is a higher resolution version of the **Figure 4** map. **Exhibit D-3** contains maps that focus on CDs 1, 2, and 7 – the general area where a second majority-Black district can be drawn. **Exhibit D-4** identifies county and VTD[10] splits in the 2021 Plan. The 2021 Plan splits six counties and seven populated VTDs.

25. As shown in **Figure 5**, CD 7 in the 2021 Plan is 55.26% BVAP, and the remaining six districts are all 30% BVAP or lower, consistent with the "cracking"[11] that was also evident in the 2011 Plan (discussed further below).

26. The map in **Figure 6** illustrates cracking in the 2011 and 2021 congressional plans. The **Figure 6** map overlays the four 2021 Plan congressional districts in central and south Alabama – CDs 1, 2, 3, and 7 (demarcated by bold

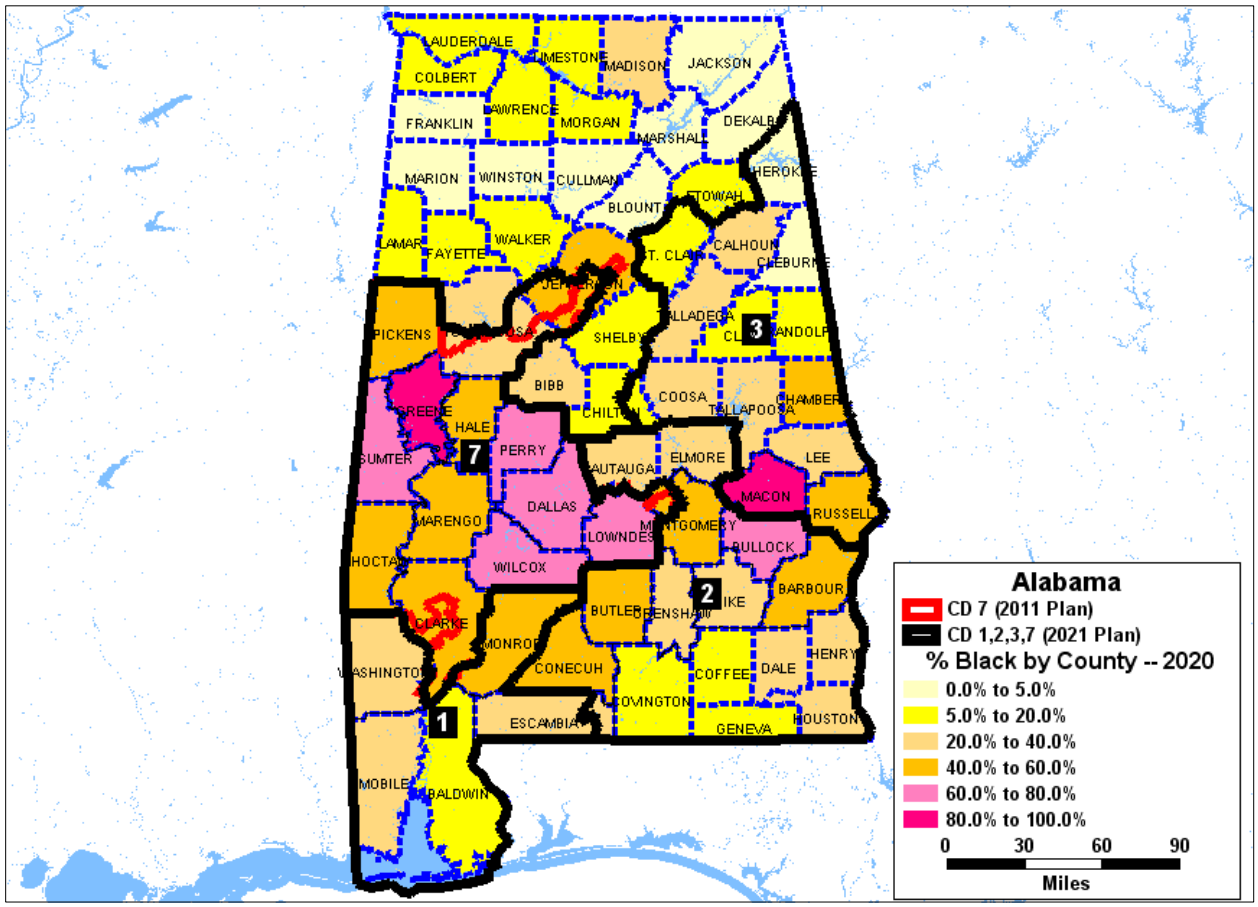
[10] "VTD" is a Census Bureau term meaning "voting tabulation district." VTDs generally correspond to precincts as they existed at the time of the 2020 Census.

[11] "Cracking" is a term which describes redistricting plans characterized with one or more districts that fragment or divide the minority population, resulting in an overall dilution of minority voting strength in the voting plan.

lines) onto a map displaying 2020 Black population by county. Red lines show areas where CD 7 was different under the 2011 Plan. Under both the 2011 and 2021 plans, Black voters who do not live in CD 7 are divided or cracked into neighboring districts, rather than joined into a second majority-Black opportunity district.

Figure 6

Central and South Alabama Under the 2021 Plan and 2011 Plans



27. Under both the 2011 Plan and the 2021 Plan, majority-Black Macon County is in majority-White CD 3, which extends north to encompass Cherokee County in Appalachian Alabama. Majority-Black Bullock County and plurality-

Black Barbour County are joined with southeast Alabama counties in majority-White CD 2. The majority-Black City of Mobile (Black pop. 100,265) is in majority-White CD 1. Most of majority-Black Montgomery County is in majority-White CD 2.

28. According to the 2020 Census, less than one-third (30.02%) of Alabama's Black population lives within majority-Black 2021 CD 7. By contrast, 91.8% of the 2020 NH White population lives in one of the six majority-White districts.

29. As shown in **Figure 5** *supra*, most of the remainder of the Black population outside of CD 7 is distributed relatively evenly into CD 1 (25.61% BVAP), CD 2 (30.12% BVAP), and CD 3 (24.99% BVAP). Taken together, these three districts have a total 2020 Black population of 612,759 (and a BVAP of 451,759), which is nearly enough population to comprise an entire congressional district (85.4% of a full congressional district).

30. For reference, **Exhibit E-1** contains detailed 2020 population statistics by district for the 2011 Plan, which are summarized below in **Figure 7**.

Figure 7

2011 U.S. House Plan – 2020 Census

District	Population	Deviation	% Dev.	18+ Pop	% 18+ AP Black	% 18+ NH White
1	726276	8522	1.19%	564302	25.67%	66.00%
2	693466	-24288	-3.38%	539812	30.60%	61.87%
3	735132	17378	2.42%	576455	25.83%	66.45%
4	702982	-14772	-2.06%	543423	7.18%	82.84%
5	761102	43348	6.04%	595873	17.97%	71.19%
6	740710	22956	3.20%	572838	16.37%	73.88%
7	664611	-53143	-7.40%	524463	60.16%	33.84%

31. **Exhibit E-2** is a state-produced map of the 2011 Plan[12] and **Exhibit E-3** is a state-produced map of the 2021 Plan.[13] As shown in **Exhibit E-4**, there are seven county splits in the 2011 Plan. Under the 2020 Census geography, the 2011 Plan splits populated areas in 47 VTDs.

IV. ILLUSTRATIVE PLANS

A. GEOGRAPHICAL AREA

(a) The Board of Education Plan –1996-2021

32. The area covered by the two majority-Black districts in Alabama's 2021 Board of Education Plan ("BOE Plan") is strikingly similar to the coverage area for the two majority-Black districts in the Plaintiffs' illustrative congressional plans presented in **Section B**.

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[12] Source: http://www.legislature.state.al.us/aliswww/Legislature/2011_Congressional_Districts.pdf

[13] Source: https://www.sos.alabama.gov/alabama-votes/state-district-maps

33. For the past quarter century, more than half of the African Americans in Alabama have lived in one of the two state Board of Education ("BOE") minority opportunity districts in 8-district plans.

34. According to the 2000 Census, under the court-ordered 1996 BOE Plan BOE District 4 was 46.63% SR BVAP and BOE District 5 was 51.75% SR BVAP. Under the 2001 BOE Plan, BOE District 4 was 47.61% SR BVAP and BOE District 5 was 51.97% SR BVAP.[14]

35. According to the 2010 Census, under the 2011 BOE Plan, District 4 and District 5 were both majority-BVAP. BOE District 4 was 51.43% BVAP and BOE District 5 was 57.5% BVAP. According to the 2010 Census, the combined Black population in these two districts was 683,923, which represented more than half (53.38%) of the statewide Black population. **Figure 8** shows the 2011 BOE Plan.

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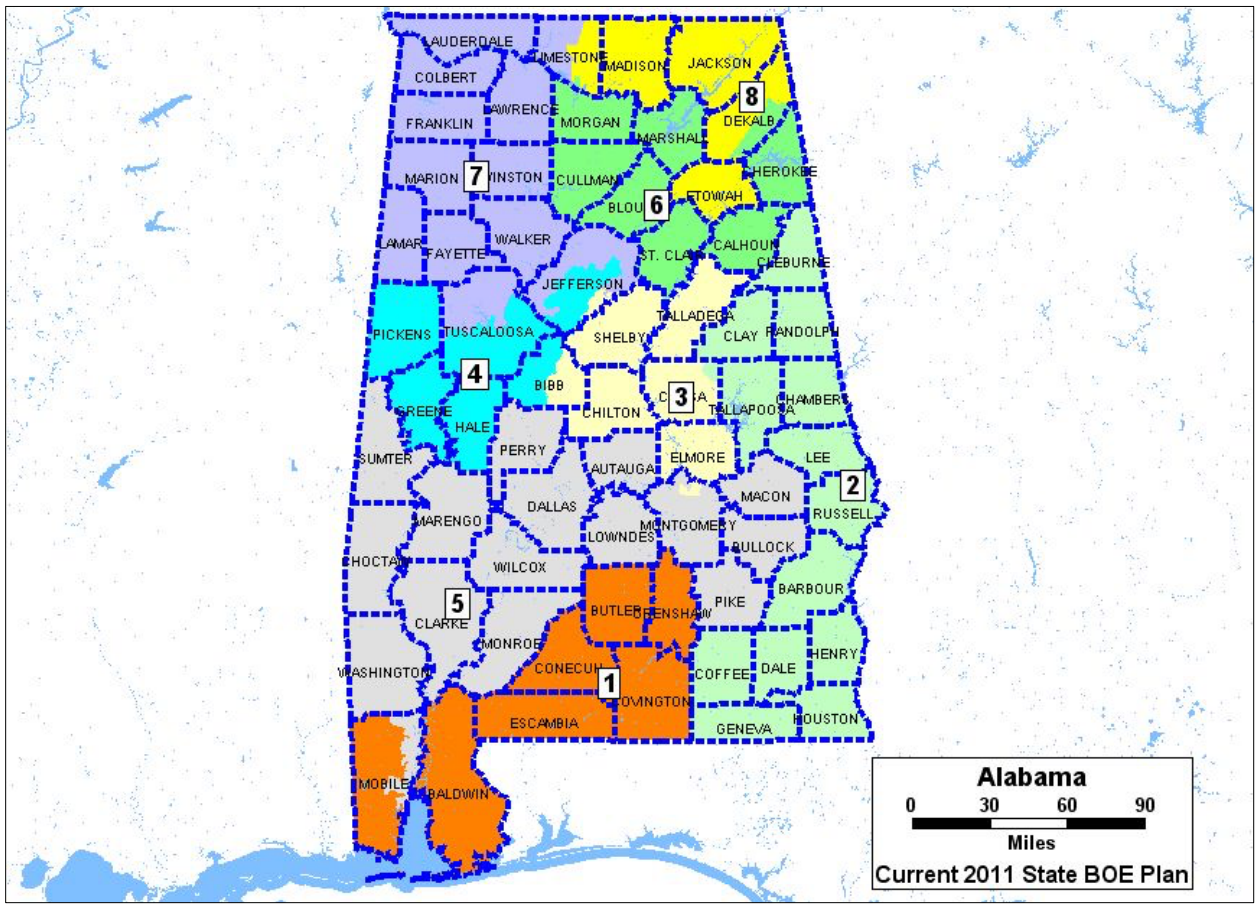
14 Source: February 2, 2002 Section 5 letter from the Alabama Attorney General to the U.S. Department of Justice, available at the Web Archive link below:
https://web.archive.org/web/20141018111338/http://www.legislature.state.al.us/reapportionment/boe/boe.html
The Any Part Black population count was not reported in the Census 2000 PL94-171 file and therefore could not be included here.

Figure 8

Alabama – 2011 Board of Education Plan



36. According to the 2020 Census, under the 2011 BOE Plan, District 4 and District 5 remain majority-BVAP. 2011 BOE District 4 is 51.51% BVAP and 2011 BOE District 5 is 57.72% BVAP.

37. In 2021, the Legislature once again created two majority-Black BOE districts in central and south Alabama. The 2021 BOE Plan was signed into law by Governor Ivey on the same day as the 2021 U.S. House Plan. According to the 2020 Census, the combined SR Black population in 2021 BOE District 4 and BOE

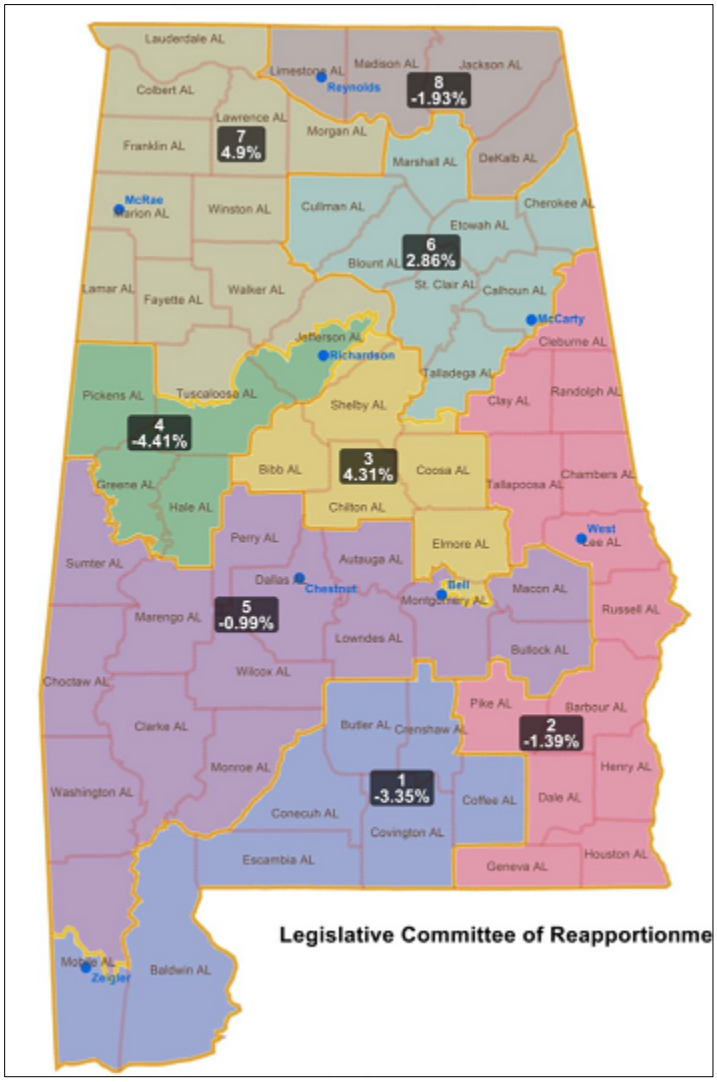
District 5 was 646,759, which represents more than half (51.69%) of the statewide Black population.

38. The 2021 BOE Plan is depicted in **Figure 9**. [15]

Figure 9

Alabama – 2021 Board of Education Plan

15 Source for 2021 BOE Map in **Figure 9** is an October 25, 2021 tweet from Alabama Rep. Chris England
via: https://twitter.com/RepEngland70/status/1452674057640550407.



39. **Exhibit F-1** is a state-produced map of the 2021 BOE Plan.[16]

40. **Exhibit F-2** contains 2020 population statistics by district. District 4 is 51.21% SR BVAP. District 5 is 51.27% SR BVAP.[17]

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16 Source for PDF map of 2021 BOE Plan via https://www.sos.alabama.gov/alabama-votes/state-district-maps https://www.sos.alabama.gov/sites/default/files/State%20Districts/McClendon%20SBOE%20Plan%201_Letter%20size%20map.pdf

41. Similar to the 2021 BOE Plan, the six illustrative plans described below create a second majority-BVAP congressional district in central and south Alabama.

B. ILLUSTRATIVE PLAN FEATURES

(a) Area Encompassed by the Illustrative Majority-Black Districts

42. There are a variety of ways to draw two majority-Black congressional districts in Alabama that adhere to traditional redistricting principles and Alabama's redistricting guidelines, and this has been true since at least the 2010 Census. At the November 2019 *Chestnut v. Merrill* trial and by way of expert reports, I presented four illustrative plans, based on the 2010 Census, all of which contained two majority-Black districts out of seven.

43. Based on the 2020 Census, it is still possible to draw two majority-Black congressional districts, while adhering to traditional redistricting principles.

44. The six illustrative plans described below demonstrate that there are viable remedies in this Section 2 lawsuit. Alternative configurations besides these six illustrative plans featuring two majority-Black congressional districts are

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[17] Source for 2021 BOE Plan population statistics – an October 25, 2021 tweet from Alabama Rep. Chris England via:

https://twitter.com/RepEngland70/status/1452674057640550407

I do not have access to a GIS shapefile of the 2021 BOE Plan, so I am unable to produce detailed statistics that would include Any Part Black VAP percentages.

possible.

(b) Traditional Redistricting Principles

45. The illustrative plans demonstrate that the Black population is sufficiently numerous and geographically compact to allow for the creation of an additional majority-Black district.

46. All six illustrative plans comply with traditional redistricting principles, including population equality, compactness, contiguity, respect for communities of interest, and the non-dilution of minority voting strength.

47. The illustrative plans are drawn to follow, to the extent possible, county boundaries. Where counties are split to comply with one-person one-vote requirements, I have generally used whole 2020 Census VTDs as sub-county components. Where VTDs are split, I have followed census block boundaries that are aligned with roads, natural features, or municipal boundaries.

(c) Common Characteristics of the Illustrative Plans

48. The six illustrative plans share the following features:

- The 2020 Black VAP in the illustrative majority-Black districts is above 50% in all six plans.

- Based on the most current citizenship data available (from the 5-year 2015-2019 ACS Special Tabulation), NH single-race Black CVAP in the illustrative majority-Black districts is above 50% in all six plans.[18]
- The Black VAP to NH White VAP percentage point margins in the illustrative majority-Black districts range from 6.12 percentage points (CD 2, Illustrative 1) to 14.73 percentage points (CD 7, Illustrative 2).
- Four of the six illustrative plans split six counties – the same number of split counties as the 2021 Plan. Illustrative Plan 2 and Illustrative Plan 6 split seven counties – the same number as the 2011 Plan.
- The illustrative plans create a new majority-Black District 2 that includes African American communities in Mobile County, Montgomery County and the central and eastern rural Black Belt counties.
- New majority-Black District 2 under the illustrative plans has a configuration that is similar to District 5 in the 2021 BOE Plan and the 2011 BOE Plan.
- Under the illustrative plans, District 7 includes African American communities in Jefferson County, Tuscaloosa County, and the western rural Black Belt counties, as District 7 does in the 2021 Plan.
- Mobile County is split between majority-White District 1 and majority-Black District 2 in all of the illustrative plans, as it is in the 2021 BOE plan.
- Baldwin County is entirely in District 1 under all of the illustrative plans.
- Under all six of the illustrative plans, one can travel from District 1 in Mobile County to District 1 in Baldwin County without leaving District 1.
- Five of the illustrative plans join the District 1 part of Mobile County to Baldwin County following I-10 and U.S. 98 across Mobile Bay. Under Illustrative Plan 6 (placing all of the City of Mobile into District 1), secondary roads directly connect the District 1 part of Mobile County to District 1 in Baldwin County.
- All Plaintiffs reside in majority-minority districts under the illustrative plans.

[18] https://www.census.gov/programs-surveys/decennial-census/about/voting-rights/cvap.html

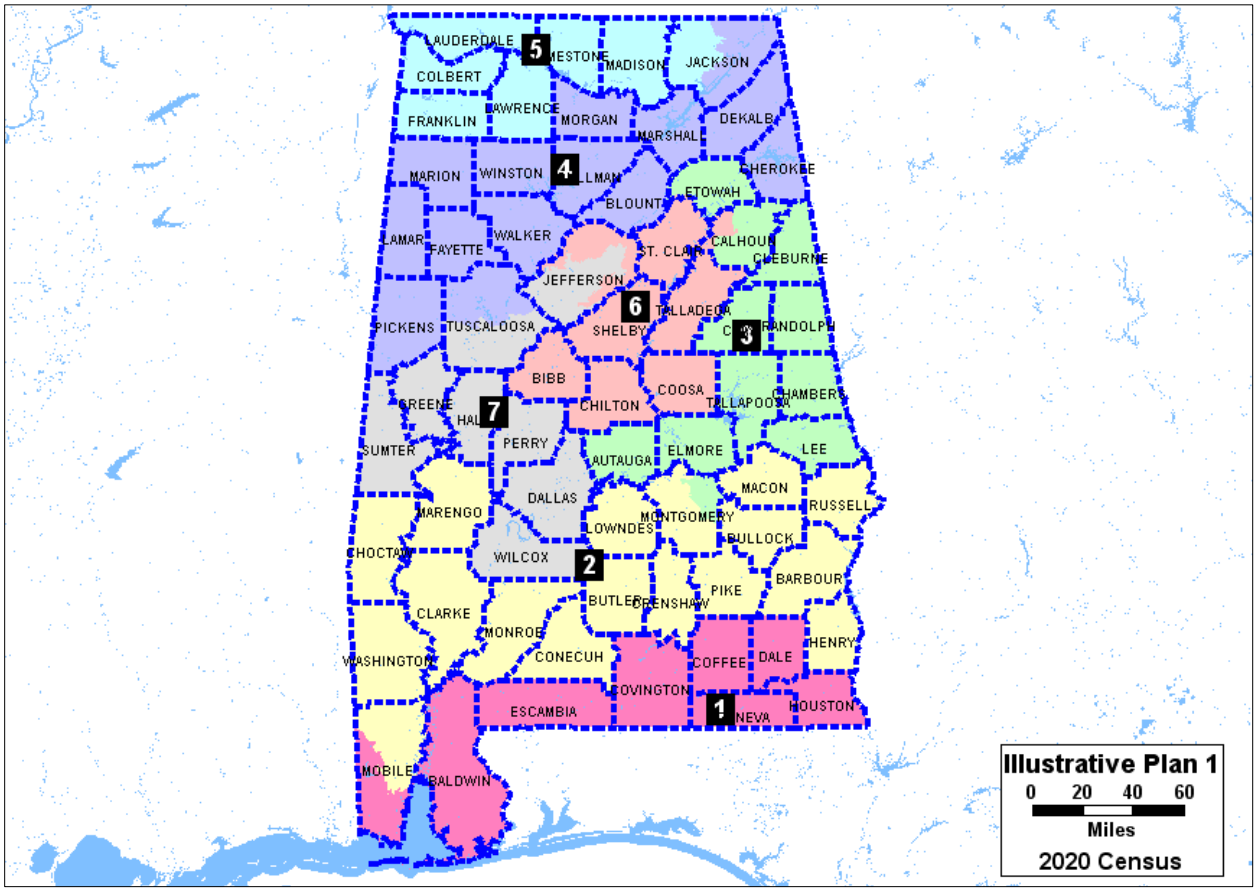
C. SUMMARY DESCRIPTIONS OF ILLUSTRATIVE PLANS

(a) Illustrative Plan 1

49. The map in **Figure 10** depicts Illustrative Plan 1. District 2 is 50.09% BVAP and District 7 is 53.28% BVAP.

Figure 10

Alabama U.S. House – Illustrative Plan 1



50. Majority-Black District 2 encompasses part of Mobile County, extends north to include all of Washington and Choctaw Counties, then east through the Black Belt counties. Henry, Barbour and Russell Counties form the

eastern boundary. The northeast part of Montgomery County is merged into District 3.

51. Majority-Black District 7 encompasses part of Jefferson and Tuscaloosa Counties as well as Sumter County on the Mississippi state line. Dallas and Wilcox Counties form the eastern border of District 7.

52. The table in **Figure 11** shows 2020 summary population statistics for Illustrative Plan 1. **Exhibit G-1** contains detailed 2020 population statistics by district.

Figure 11

Illustrative Plan 1 – 2020 Census

District	Population	18+ Pop	% 18+ AP Black	% 18+ NH White
1	717755	557084	16.03%	74.88%
2	717754	559442	50.09%	43.97%
3	717753	563119	22.53%	68.99%
4	717753	555541	6.31%	83.20%
5	717755	561688	18.66%	70.63%
6	717754	556122	13.95%	77.62%
7	717755	564170	53.28%	39.41%

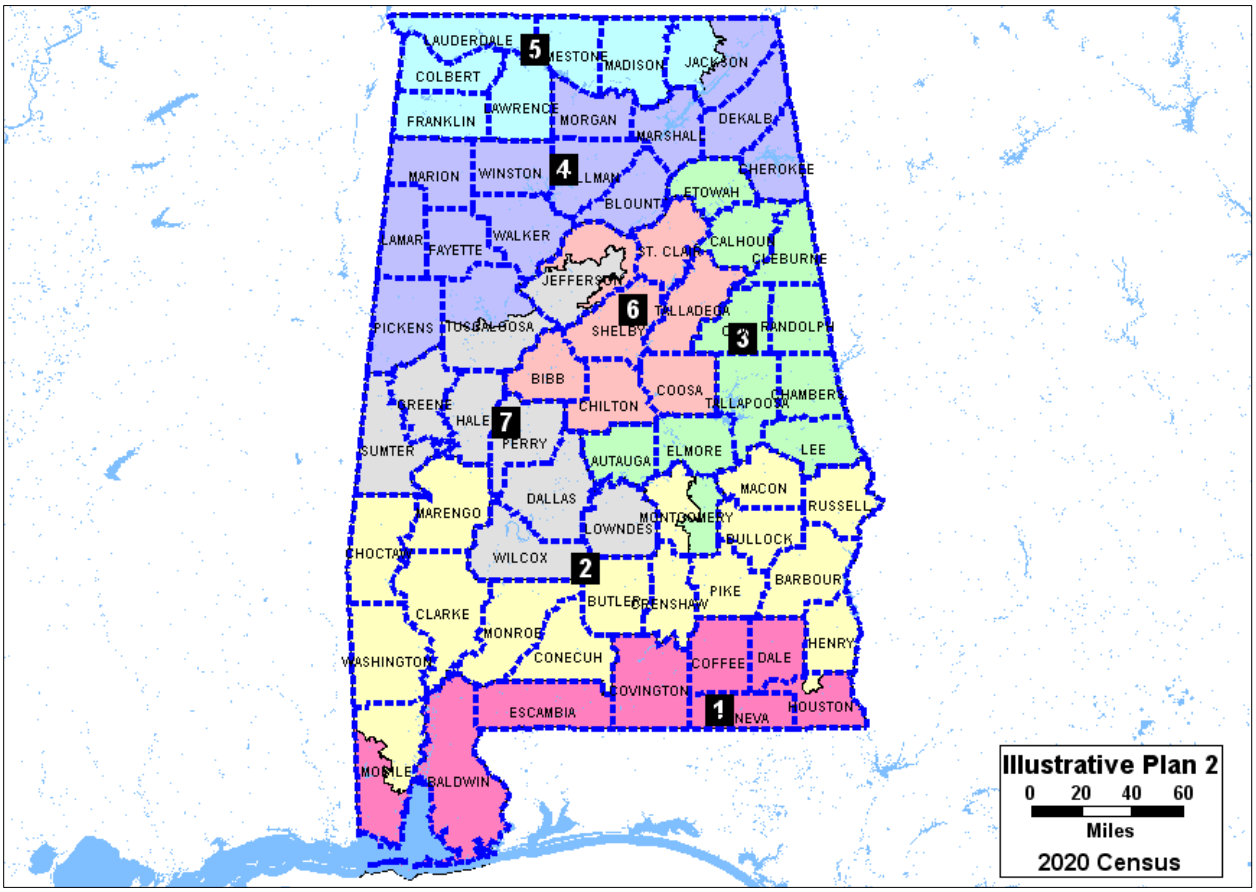
53. The map in **Exhibit G-2** is a higher resolution version of the **Figure 10** map. **Exhibit G-3** contains maps focusing on District 2 and District 7 and adjacent areas. As shown in **Exhibit G-4**, Illustrative Plan 1 splits six counties and populated areas in 16 VTDs.

(b) <u>Illustrative Plan 2</u>

54. The map in **Figure 12** depicts Illustrative Plan 2. District 2 is 50.88% BVAP and District 7 is 53.79% BVAP.

Figure 12

Alabama U.S. House – Illustrative Plan 2



55. Under Illustrative Plan 2, District 2 is similar in geographic extent to Illustrative Plan 1. Additional areas of Montgomery County are merged into District 3, allowing parts of Dothan to be joined with District 2.

56. District 7 is geographically similar to District 7 under the 2021 enacted Plan. The eastern border of District 7 is Lowndes County, whereas District 7 in

the 2021 Plan crosses into Montgomery County to pick up some neighborhoods in the City of Montgomery.

57. The table in **Figure 13** shows 2020 summary population statistics for Illustrative Plan 2. **Exhibit H-1** contains detailed 2020 population statistics by district.

Figure 13

Illustrative Plan 2 – 2020 Census

District	Population	18+ Pop	% 18+ AP Black	% 18+ NH White
1	717754	558142	14.92%	75.87%
2	717754	558446	50.88%	43.29%
3	717755	562845	21.97%	69.52%
4	717753	555526	6.31%	83.20%
5	717755	561688	18.66%	70.63%
6	717754	555856	14.34%	77.09%
7	717754	564663	53.79%	39.06%

58. The Illustrative Plan 2 maps in the **Exhibit H** series are identical in format to the maps in the Exhibit G series (Illustrative Plan 1). As shown in **Exhibit H-4** Illustrative Plan 2 splits seven counties – the same number as the 2011 Plan and one more than the 2021 Plan. Populated areas in 13 VTDs are split.

59. To reach zero deviation, 15 persons in Calhoun County are assigned to District 6, with the remainder in District 3. Arguably, this 15-person de minimis

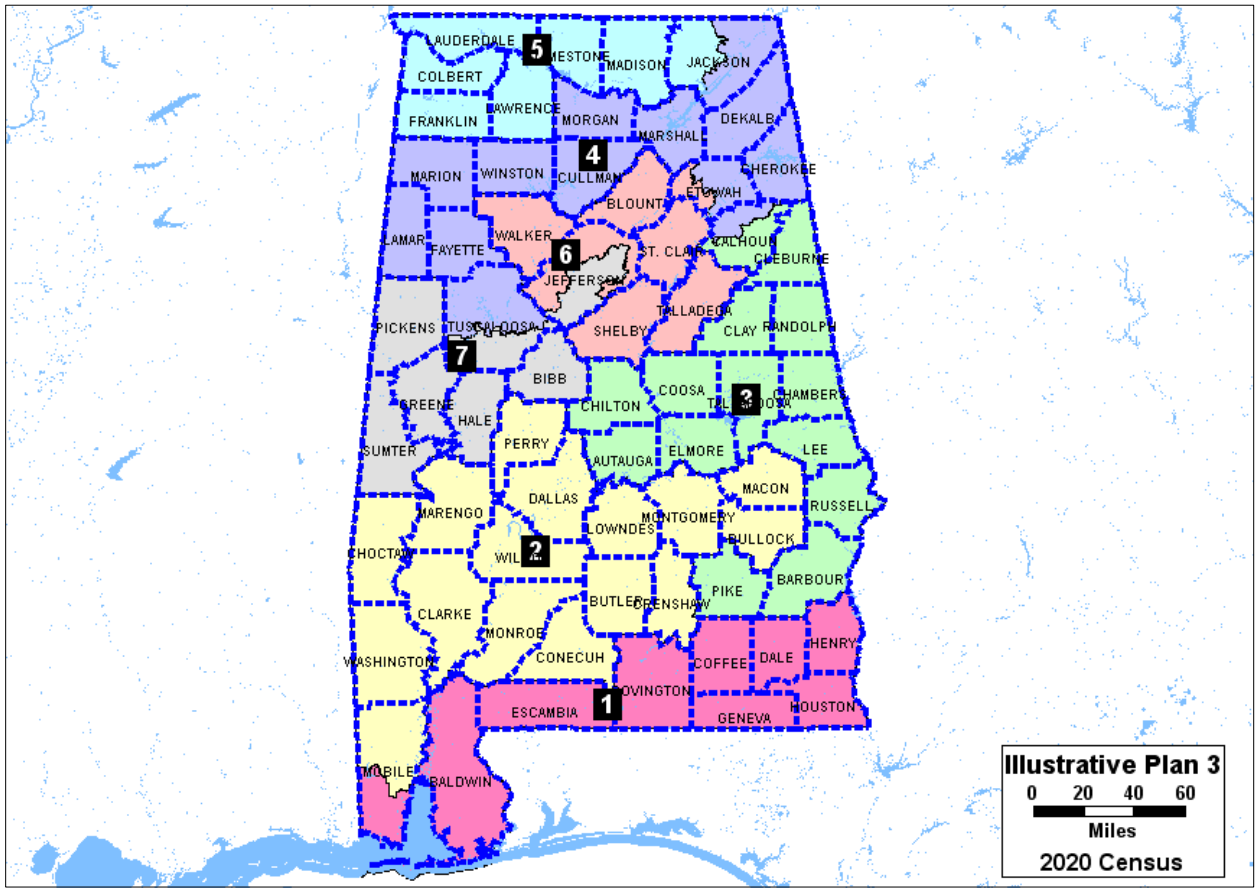
split in Calhoun County could be eliminated by assigning all of Calhoun County to District 3, resulting in just six county splits.[19]

(c) Illustrative Plan 3

60. The map in **Figure 12** depicts Illustrative Plan 3. District 2 is 50.27% BVAP and District 7 is 50.09% BVAP.

Figure 14

Alabama U.S. House – Illustrative Plan 3



61. Majority-Black District 2 encompasses part of Mobile County and extends east to encompass Macon and Bullock Counties.

[19] *Tennant v. Jefferson Cnty. Comm'n*, 567 U.S. 758 (2012).

62. Majority-Black District 7 encompasses part of Jefferson County and extends south to Tuscaloosa County and west to Sumter and Pickens Counties.

63. The table in **Figure 15** shows 2020 summary population statistics for Illustrative Plan 3. **Exhibit I-1** contains detailed 2020 population statistics by district.

Figure 15

Illustrative Plan 3– 2020 Census

District	Population	18+ Pop	% 18+ AP Black	% 18+ NH White
1	717753	557048	17.23%	73.86%
2	717752	559299	50.27%	43.53%
3	717755	562300	25.49%	66.43%
4	717755	559374	7.30%	82.21%
5	717755	561688	18.66%	70.63%
6	717755	554093	11.93%	79.81%
7	717754	563364	50.09%	42.12%

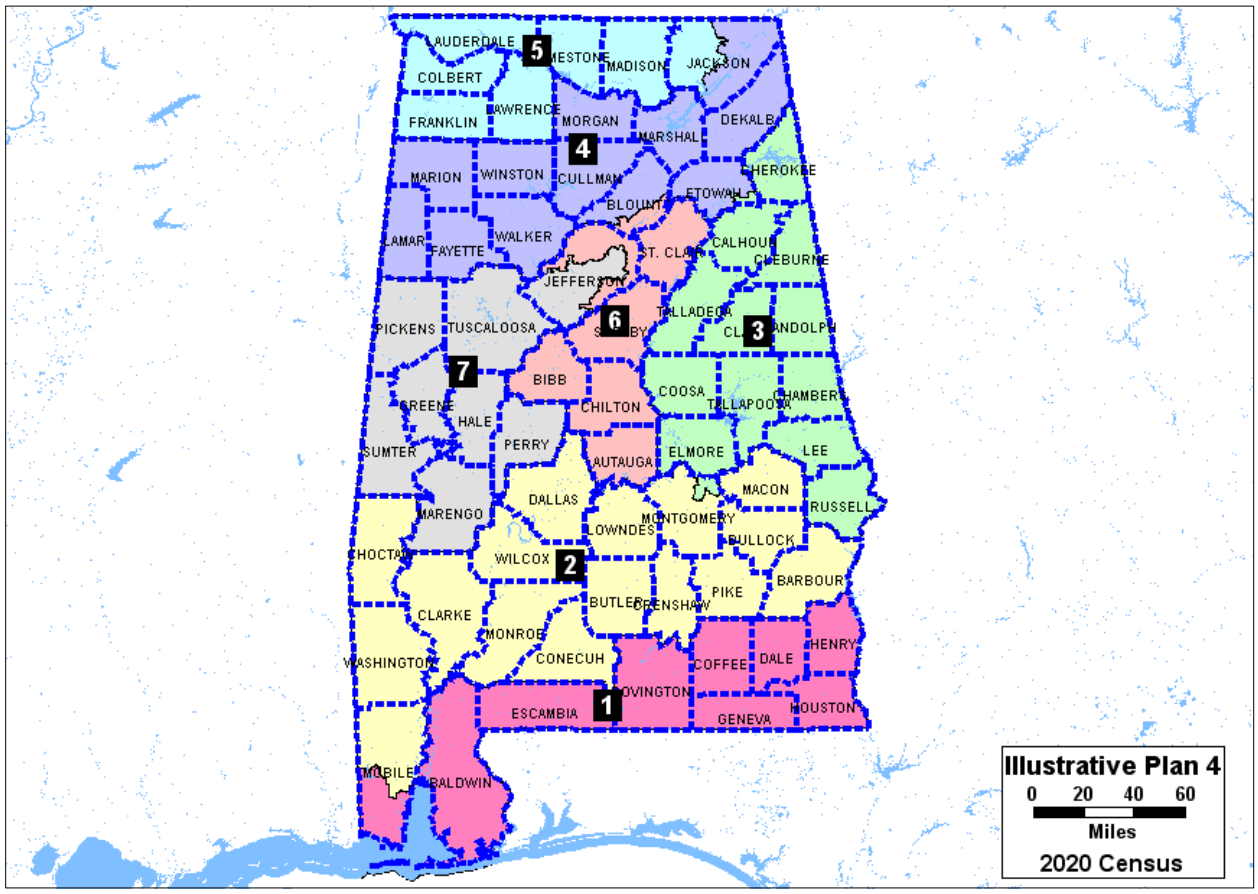
64. The Illustrative Plan 3 maps in the **Exhibit I** series are identical in format to the Exhibit G and H series. As shown in **Exhibit I-4**, Illustrative Plan 3 splits six counties and populated areas in 10 VTDs.

(d) <u>Illustrative Plan 4</u>

65. The map in **Figure 16** depicts Illustrative Plan 4. District 2 is 50.07% BVAP and District 7 is 50.09% BVAP.

Figure 16

Alabama U.S. House – Illustrative Plan 4



66. Majority-Black District 2 encompasses part of Mobile County, extends north to include all of Choctaw County, then east to the Georgia state line to include all of Barbour County – part of the historical Black Belt.

67. Majority-Black District 7 encompasses part of Jefferson County and all of Tuscaloosa County and stretches west to the Mississippi state line, with Perry and Marengo Counties forming the eastern border.

68. The table in **Figure 17** shows 2020 summary population statistics for Illustrative Plan 4. **Exhibit J-1** contains detailed 2020 population statistics by district.

Figure 17

Illustrative Plan 4 – 2020 Census

District	Population	18+ Pop	% 18+ AP Black	% 18+ NH White
1	717753	557046	17.23%	73.87%
2	717752	561374	50.07%	43.92%
3	717755	564004	25.10%	67.19%
4	717755	556215	6.73%	82.75%
5	717755	561685	18.66%	70.63%
6	717755	554035	12.93%	77.83%
7	717754	562807	50.09%	42.53%

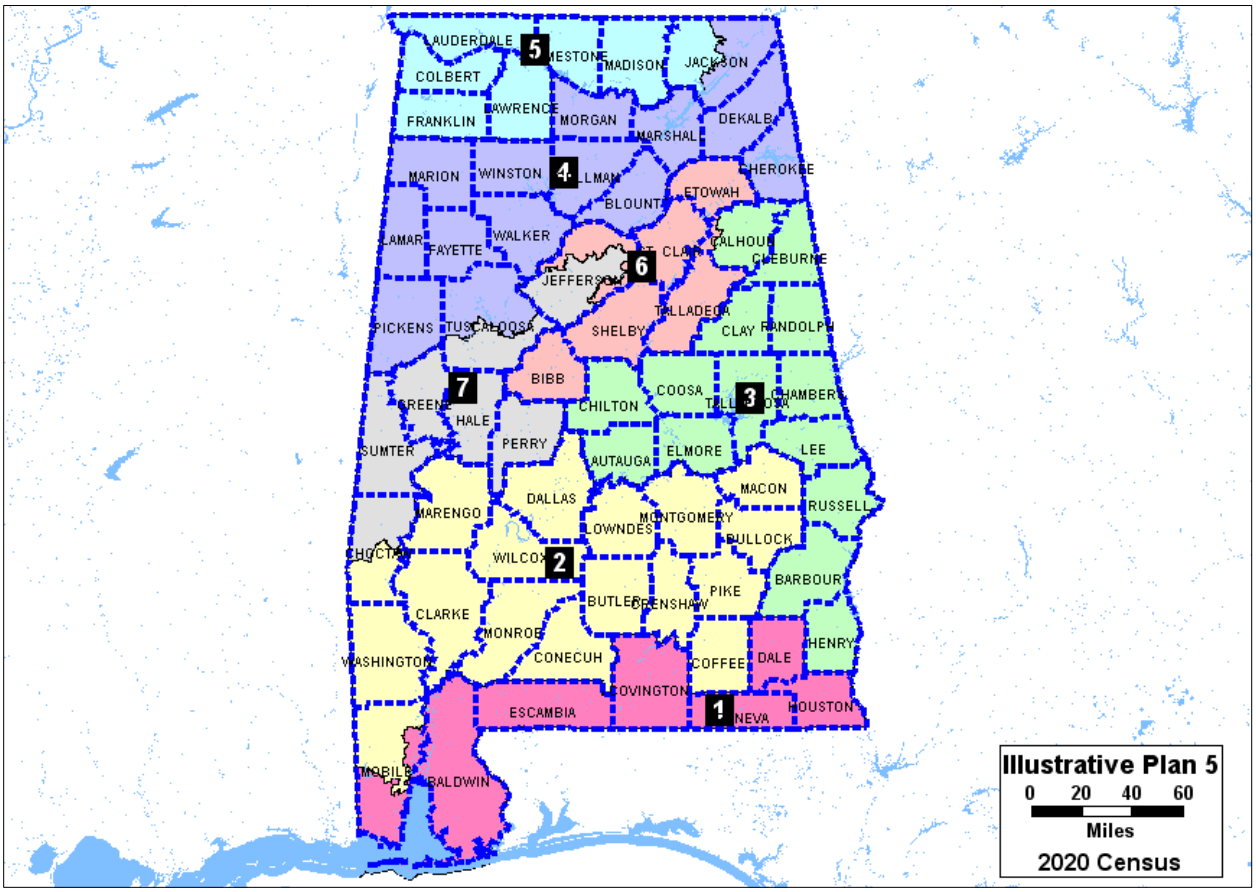
69. The Illustrative Plan 4 maps in the **Exhibit J** series are identical in format to the maps in the Exhibit G, H, and I series. As shown in **Exhibit J-4** Illustrative Plan 4 splits six counties and populated areas in 12 VTDs.

(e) Illustrative Plan 5

70. The map in **Figure 18** depicts Illustrative Plan 5. District 2 is 50.24% BVAP and District 7 is 50.09% BVAP.

Figure 18

Alabama U.S. House – Illustrative Plan 5



71. Majority-Black District 2 encompasses part of Mobile County, extends north to include all of Washington County and part of Choctaw County, then east though the Black Belt counties. Macon, Bullock, and Pike Counties form the eastern boundary, along with Coffee County, where the current District 2 incumbent resides.

72. Majority-Black District 7 encompasses part of the Counties of Jefferson and Tuscaloosa, extends west to the Mississippi state line, then south to share Choctaw County with District 2 and east to Perry County.

73. The table in **Figure 19** shows 2020 summary population statistics for Illustrative Plan 5. **Exhibit K-1** contains detailed 2020 population statistics by district.

Figure 19

Illustrative Plan 5 – 2020 Census

District	Population	18+ Pop	% 18+ AP Black	% 18+ NH White
1	717754	557535	17.12%	74.18%
2	717755	557677	50.24%	43.20%
3	717754	564281	24.52%	67.49%
4	717754	556133	6.10%	83.50%
5	717754	561187	18.66%	70.63%
6	717754	552286	14.16%	77.64%
7	717754	568067	50.09%	42.02%

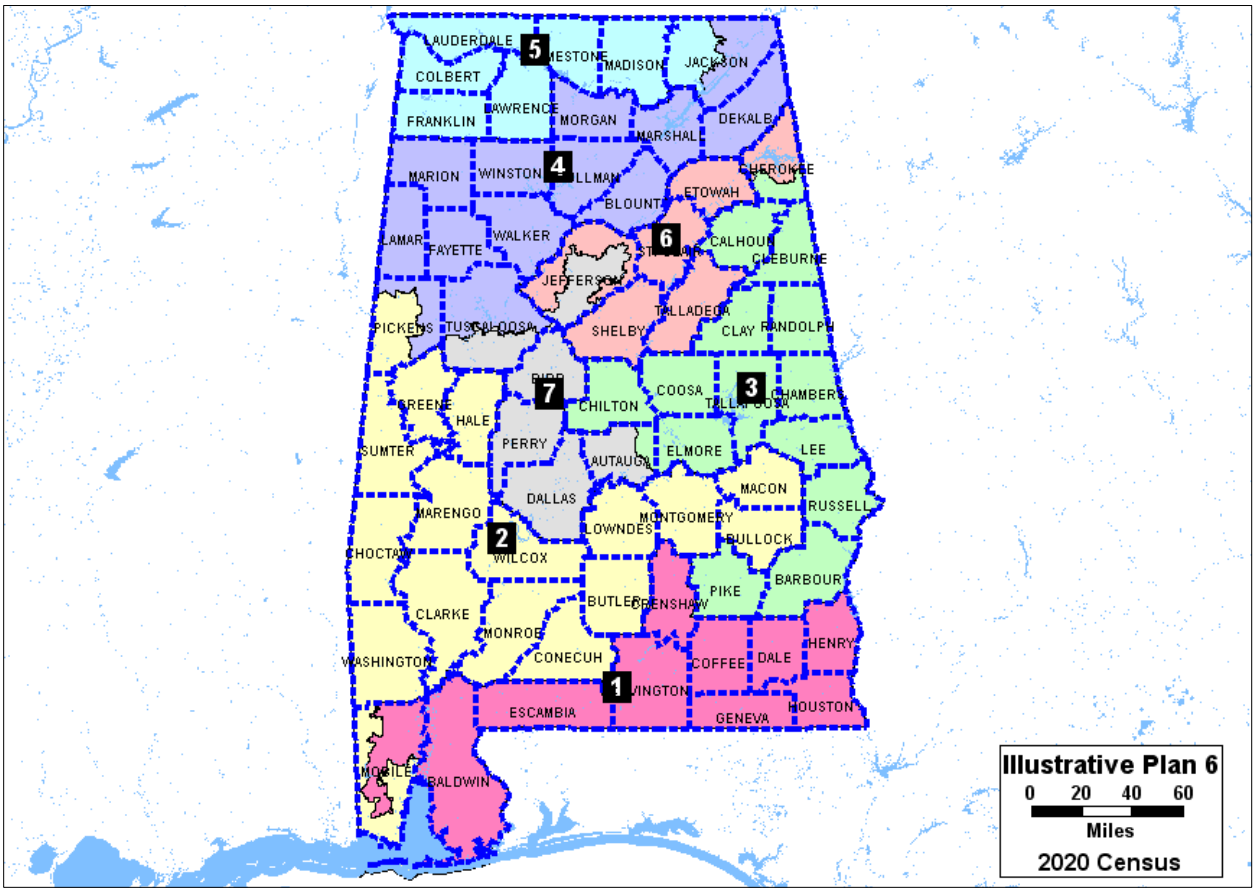
74. The Illustrative Plan 5 maps in the **Exhibit K** series are identical in format to the maps in the Exhibit G, H, I, and J series. As shown in **Exhibit K-4**, Illustrative Plan 5 splits six counties and populated areas in 20 VTDs.

(f) Illustrative Plan 6

75. The map in **Figure 20** depicts Illustrative Plan 6. District 2 is 51.28% BVAP and District 7 is 51.09% BVAP.

Figure 20

Alabama U.S. House – Illustrative Plan 6



76. Illustrative Plan 6 demonstrates that it is possible to create a second-majority-Black district while keeping all of the population in the Cities of Mobile and Montgomery, as well as Montgomery County, whole in the new district. The enacted 2011 Plan and the enacted 2021 Plan split the City of Montgomery.

77. Majority-Black District 2 encompasses part of Mobile County, including all of the City of Mobile, before extending north to include the Black Belt counties on the Mississippi state line. Part of Pickens County is shared with District 4.

78. At the Washington County line, District 2 extends as far east as Macon and Bullock Counties, including all of Montgomery County.

79. Majority-Black District 7 encompasses part of the Counties of Jefferson and Tuscaloosa, extending south to Dallas County. To the east District 7 shares Autauga County with District 3.

80. The table in **Figure 21** shows 2020 summary population statistics for Illustrative Plan 6. **Exhibit L-1** contains detailed 2020 population statistics by district.

Figure 21

Illustrative Plan 6 – 2020 Census

District	Population	18+ Pop	% 18+ AP Black	% 18+ NH White
1	717753	557535	15.83%	75.27%
2	717755	557677	51.28%	42.36%
3	717753	564281	24.77%	67.22%
4	717754	556133	5.63%	83.83%
5	717755	561187	18.66%	70.63%
6	717755	552286	13.58%	78.31%
7	717754	568067	51.09%	41.08%

81. The Illustrative Plan 6 maps in the **Exhibit L** series are identical in format to the maps in the Exhibit G, H, I, J, and K series. As shown in **Exhibit L-4**, Illustrative Plan 6 splits seven counties and populated areas in 27 VTDs. However, fifteen of the 27 VTD splits are created because the plan generally follows the city limits of the City of Mobile (rather than VTDs) to define the

boundary between District 1 and District 2.

(g) Compactness Measures

82. The districts in the illustrative plans are reasonably shaped and compact – and clearly within the normal range for compactness as compared to congressional plans nationwide.[20]

83. **Figure 22** reports compactness scores generated by Maptitude for the 2011 U.S. Congressional Plan, the 2011 BOE Plan, the 2021 U.S. Congressional Plan, and the Illustrative Plans. The table summarizes the Reock[21] and Polsby-Popper[22] scores – the two most widely-referenced measures of compactness. Higher scores indicate higher compactness.

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[20] See, for example, *Redrawing the Map 2012 Addendum* by geospatial firm Azavea – examining the compactness scores for post-2010 congressional plans in all states: https://2rct3i2488gxf9jvb1lqhek9-wpengine.netdna-ssl.com/wp-content/uploads/2019/08/Azavea_Redistricting-White-Paper-Addendum-2012_sm.pdf

[21] "The Reock test is an area-based measure that compares each district to a circle, which is considered to be the most compact shape possible. For each district, the Reock test computes the ratio of the area of the district to the area of the minimum enclosing circle for the district. The measure is always between 0 and 1, with 1 being the most compact. The Reock test computes one number for each district and the minimum, maximum, mean and standard deviation for the plan." *Maptitude For Redistricting* software documentation (authored by the Caliper Corporation).

[22] The Polsby-Popper test computes the ratio of the district area to the area of a circle with the same perimeter: 4pArea/ (Perimeter2). The measure is always between 0 and 1, with 1 being the most compact. The Polsby-Popper test computes one number for each district and the minimum, maximum, mean and standard deviation for the plan. *Maptitude For Redistricting* software documentation (authored by the Caliper Corporation).

Figure 22

Compactness Scores – Illustrative Plans vs 2011 Plans and 2021 Plan

	Reock				Polsby-Popper		
		Low	High			Low	High
2011 U.S. Congressional Plan							
All Districts (mean avg.)	.38	.22	.49		.19	.13	.29
CD 2	.49				.22		
CD 7	.38				.13		
2011 BOE Plan							
All Districts (mean avg.)	.40	.24	.52		.19	.15	.22
BOE District 4	.40				.15		
BOE District 5	.37				.15		
2021 U.S. Congressional Plan							
All Districts (mean avg.)	.38	.30	.50		.22	.15	.32
CD 2	.50				.26		
CD 7	.43				.19		
Illustrative Plan 1							
All Districts (mean avg.)	.34	.21	.47		.18	.13	.33
District 2	.36				.18		
District 7	.37				.13		
Illustrative Plan 2							
All Districts (mean avg.)	.34	.21	.52		.18	.12	.33
District 2	.31				.12		
District 7	.40				.13		
Illustrative Plan 3							
All Districts (mean avg.)	.34	.20	.47		.18	.12	.33
District 2	.33				.14		
District 7	.37				.13		
Illustrative Plan 4							
All Districts (mean avg.)	.33	.20	.41		.22	.13	.34
District 2	.33				.24		
District 7	.41				.24		
Illustrative Plan 5							
All Districts (mean avg.)	.29	.19	.39		.18	.11	.33
District 2	.39				.19		
District 7	.23				.11		
Illustrative Plan 6							
All Districts (mean avg.)	.31	.24	.35		.16	.10	.34
District 2	.29				.11		
District 7	.34				.11		

84. Compared to the 2021 Plan, the Illustrative Plans are generally in the same range of compactness.[23]

V. SOCIOECONOMIC PROFILE OF ALABAMA

85. Non-Hispanic Whites in Alabama significantly outpace African Americans across a broad range of socioeconomic measures, as reported in the 1-year 2019 ACS. [24] This disparity is summarized below and depicted with further detail in charts found in **Exhibit M-1** and the table in **Exhibit M-2**.

86. For additional socioeconomic data by congressional district in the general region where the illustrative plans create two majority-Black districts, see **Exhibits N** (CD 1), **Exhibits O** (CD 2), **Exhibits P** (CD 3), **Exhibits Q** (CD 6), and **Exhibits R** (CD 7).[25]

(a) Income

- African Americans in Alabama experience a poverty rate (23.4%) that is more than twice that of Whites (11.5%). (**Exhibit M-1 at p. 22 and Exhibit M-2 at p. 8**)

---

23 As noted in footnote 13 (*supra*), I do not have a GIS shapefile for the 2021 BOE Plan, so I am unable to run compactness scores on that plan.

24 In this section, as elsewhere in this report, "White" refers to NH White. Black or African American refers to Any Part Black.

25 Source: https://data.census.gov/cedsci/table?text=s0201&t=-0A%20-%20All%20available%20non-Hispanic%20Origin%3A005%20-%20Black%20or%20African%20American%20alone%20or%20in%20combination%20with%20one%20or%20more%20other%20races&g=0400000US01,01%245000000&y=2019&tid=ACSSPP1Y2019.S0201&hidePreview=true

- The child poverty rate for African Americans is 34.1%, compared to 13.2% of White children. (**Exhibit M-1 at p. 22 and Exhibit M-2 at p. 8**)

- Black median household income is $35,900, which is just 59.9% of White median household income is $59,966. (**Exhibit M-1 at p. 14 and Exhibit M-2 at p.7**)

- Per capita income disparities in Alabama track the disparities seen in median household income. Black per capita income is $20,402, compared to White per capita income of $32,939. (**Exhibit M-1 at p. 17 and Exhibit M-2 at p. 8**)

- Over a quarter (25.4%) of Black households rely on food stamps, compared to 8.2% of White households. (**Exhibit M-1 at p. 15 and Exhibit M-2 at p. 7**)

(b) Education

- Of persons 25 years of age and over, 14.9% of African Americans have not finished high school, compared to 10.9% of their White counterparts. (**Exhibit M-1 at p. 5 and Exhibit M-2 at p. 3**)

- At the other end of the educational scale, for ages 25 and over, 19.4% of African Americans have a bachelor's degree or higher, compared to 28.8% of Whites. (**Exhibit M-1 at p. 5 and Exhibit M-2 at p. 3**)

(c) Employment

- The Black unemployment rate (for the population over 16, expressed as a percent of the civilian labor force) is 7.7%, compared to a 3.8% White unemployment rate. (**Exhibit M-1 at p. 11 and Exhibit M-2 at p. 5**)

- Of employed African Americans, 25.8% are in management or professional occupations, compared to 40.3% of Whites. (**Exhibit M-1 at p. 13 and Exhibit M-2 at p. 6**)

(d) Housing

- In Alabama, about half of Black householders (50.5%) are homeowners, while over three-quarters of White households (77.1%) are

owner-occupied. (**Exhibit M-1 at p. 21 and Exhibit M-2 at p. 9**)

- About one in eight of Black households (11.7%) lack access to a vehicle, while just 3.8% of White households are without a vehicle. (**Exhibit M-1 at p. 23 and Exhibit M-2 at p. 9**)

- Median home value for Black homeowners is $101,800, which is just 61.4% of the median home value for Whites ($165,800). (**Exhibit M-1 at p. 25** and **Exhibit M-2 at p.10**)

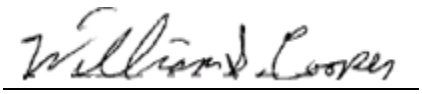
87. For comparison, I have prepared similar charts depicting socioeconomic characteristics for the state, all Alabama counties, and places with significant Black population according to the 5-year 2015-2019 ACS.[26] These charts are available for download at: http://www.fairdata2000.com/ACS_2015_19/Alabama/

# # #

I reserve the right to continue to supplement my reports in light of additional facts, testimony and/or materials that may come to light.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on: December 10, 2021



WILLIAM S. COOPER

[26] The 2019 1-year ACS is not available for counties and places with populations under 20,000. The 5-year 2015-2019 ACS reports SR Black socioeconomic estimates only. AP Black estimates are not published in the 5-year ACS.

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U.S. DISTRICT COURT
N.D. OF ALABAMA

EXPERT REPORT OF MAXWELL PALMER, PH.D.

I, Dr. Maxwell Palmer, declare as follows:

1. My name is Maxwell Palmer. I am currently an Associate Professor of Political Science at Boston University. I joined the faculty at Boston University in 2014, after completing my Ph.D. in Political Science at Harvard University. I was promoted to Associate Professor, with tenure, in 2021. I teach and conduct research on American politics and political methodology.

2. I have published academic work in leading peer-reviewed academic journals, including the *American Political Science Review*, *Journal of Politics*, *Perspectives on Politics*, *British Journal of Political Science*, *Journal of Empirical Legal Studies*, and *Political Science Research and Methods*. My book, *Neighborhood Defenders: Participatory Politics and America's Housing Crisis* was published by Cambridge University Press in 2019. I have also published academic work in the *Ohio State University Law Review*. My published research uses a variety of analytical approaches, including statistics, geographic analysis, and simulations, and data sources including academic surveys, precinct-level election results, voter registration and vote history files, and census data. My curriculum vitae is attached to this report.

3. I have served as an expert witness or litigation consultant on numerous cases involving voting restrictions. I testified at trial or by deposition in *Bethune Hill v. Virginia* before the U.S. District Court for the Eastern District of Virginia (No. 3:14-cv-00852-REP-AWA-BMK); *Thomas v. Bryant* before the U.S. District Court for the Southern District of Mississippi (No. 3:18-CV-00441-CWR-FKB); *Chestnut v. Merrill* before the U.S. District Court for the Northern District of Alabama (No. 2:18-cv-00907-KOB); *Dwight v. Raffensperger* before the U.S. District Court for the Northern District of Georgia (No. 1:18-cv-2869-RWS); *Bruni v. Hughs* before the U.S. District Court for the Southern District of Texas (No. 5:20-cv-35); and *Texas Alliance for Retired Americans v. Hughs* before the U.S. District Court for the Southern District of Texas (No. 5:20-cv-128). I also served as the independent racially polarized voting analyst for the Virginia Redistricting Commission in 2021. I worked as a data analyst assisting testifying experts in *Perez v. Perry* before the U.S. District Court for the Western District of Texas (No. 5:11-cv-00360-OLG); in *LULAC v. Edwards Aquifer Authority* before the U.S. District Court for the Western District of Texas (No. 5:12-cv-00620-OLG); in *Harris v. McCrory* before the U. S. District Court for the Middle District of North Carolina (No. 1:13-cv-00949-WO-JEP); in *Guy v. Miller* before the U.S. District Court for the District of Nevada (No. 11-OC-00042-1B); in *In re Senate Joint Resolution of Legislative Apportionment* before the Florida Supreme Court (Nos. 2012-CA-412, 2012-CA-490); and in *Romo v. Detzner* before the Circuit Court of the Second Judicial

Circuit in Florida (No. 2012 CA 412).

4. I am being compensated at a rate of $350/hour for my work in this case. No part of my compensation is dependent upon the conclusions that I reach or the opinions that I offer.

5. I was retained by the plaintiffs in this litigation to offer an expert opinion on the extent to which voting is racially polarized in parts of Alabama. I was also asked to evaluate the performance of the majority-minority districts in the plaintiffs' illustrative maps.

6. I find strong evidence of racially polarized voting across the focus area, which is comprised of the 1st, 2nd, 3rd, 6th, and 7th Congressional Districts under the 2021 redistricting map. Black and White voters consistently support different candidates. I also find strong evidence of racially polarized voting in each of the five individual congressional districts.

7. Black-preferred candidates are largely unable to win elections in the focus area. Across an analysis of 12 statewide elections, the Black-preferred candidate was able to win in the focus area only once. When taken on a district-by-district basis, the Black-preferred candidate was defeated in every one of the 12 elections analyzed in the 1st, 2nd, 3rd, and 6th Congressional Districts. The Black-preferred candidate won a majority of the vote in District 7 in all 12 elections.

8. Under all six of the illustrative maps, I find that Black-preferred candidates are able to win elections in both majority-minority districts.

Data Sources and Elections Analyzed

9. For the purpose of my analysis, I examined elections in the 1st, 2nd, 3rd, 6th, and 7th Congressional Districts, under the plan adopted by the state legislature in 2021. Collectively, I refer to this area as the "focus area." Figure 1 maps the focus area.

10. To analyze racially polarized voting, I examined election results from the 2012, 2014, 2016, 2018, and 2020 general elections, and the 2017 special election for U.S. Senate. I included statewide elections for U.S President, U.S. Senate, Governor, Lieutenant Governor, Secretary of State, Attorney General, State Auditor, Treasurer, Commissioner of Agriculture and Industries, Chief Justice of the State Supreme Court, and Associate Justice of the State Supreme Court. I excluded all offices that were only contested by one of the major parties.

11. I analyzed racially polarized voting using two different data sources:

- Precinct-level election results and data on Citizen Voting Age Population (CVAP) by race for the 2016, 2018, and 2020 general elections and the 2017 special election for U.S. Senate. The precinct level data was assembled by the Voting and Election Science Team, an academic group that provides precinct-level data for U.S. Elections, based on data from the Secretary of State. This data was then updated to use 2020 Voting Tabulation

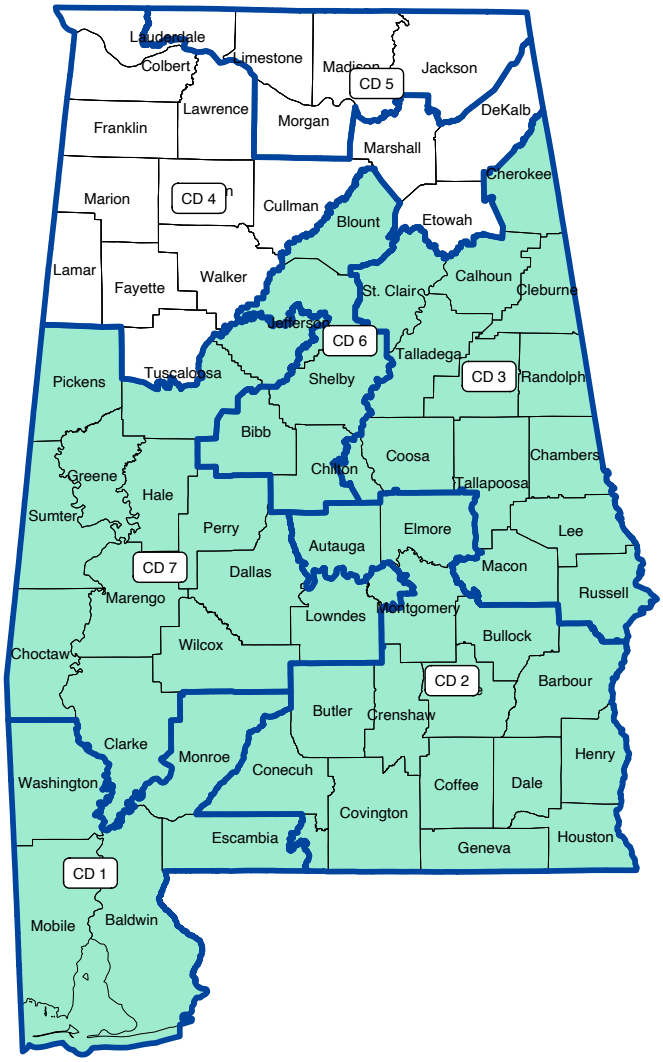

Figure 1: Map of the Focus Area

Districts (VTDs), and distributed on the Redistricting Data Hub.[1] I merged this with Citizen Voting Age Population data from the U.S. Census' American Community Survey (ACS).[2] I used CVAP data at the census block group level, and allocated populations to 2020 VTDs. When census blocks or VTDs were split, I weighted the population data using 2010 census block populations.[3]

- Precinct-level election results and data on actual voter turnout by race for the 2020

[1]https://redistrictingdatahub.org/dataset/2016-al-election-data-projected-to-2020-vtds/; https://redistrictingdatahub.org/dataset/2018-al-election-data-projected-to-2020-vtds/; https://redistrictingdatahub.org/dataset/2020-al-election-data-projected-to-2020-vtds/. For 2017, I used 2017 election results and shape files provided by VEST at https://doi.org/10.7910/DVN/VNJAB1 and updated the results to use 2020 VTDs.

[2]https://www.census.gov/programs-surveys/decennial-census/about/voting-rights/cvap.html

[3]I used the ACS 2014-2018 5-year averages for the 2016 election, and ACS 2015-2019 5-year averages for the 2017, 2018, and 2020 elections.

general elections. The precinct level data was assembled by the Voting and Election Science Team and updated to use 2020 Voting Tabulation Districts (VTDs), and distributed on the Redistricting Data Hub.[4] Actual turnout by race was calculated by the Redistricting Data Hub using a commercial voter file provided by the data vendor L2.[5] This data provides a close estimate of the actual number of voters who cast a ballot in each VTD in the 2020 general election.[6]

- County-level election results and data on voter registration by race for the 2012 and 2014 general elections. This data was downloaded from the website of the Alabama Secretary of State.[7] I use this data to estimate racially polarized voting at the county level for the focus area in 2012 and 2014, where precinct-level data is not available.

Racially Polarized Voting Analysis

13. In analyzing racially polarized voting in each election, I used a statistical procedure, ecological inference (EI), that estimates group-level preferences based on aggregate data. I analyzed the results for three racial demographic groups: Non-Hispanic Black, non-Hispanic White, and Other, based on the voters' self-identified race in the voter registration database or American Community Survey Citizen Voting Age Population ("CVAP") data. I excluded third party and write-in candidates, and analyzed votes for the two major-party candidates in each election. The results of this analysis are estimates of the percentage of each group that voted for the candidate from each party in each election. The results include both a mean estimate (the most likely vote share), and a 95% confidence interval.[8]

14. Interpreting the results of the ecological inference models proceeds in two general stages. First, I examined the support for each candidate by each demographic group to determine if members of the group vote cohesively in support of a single candidate in each election. When a significant majority of the group supports a single candidate, I can then identify that candidate as the group's candidate of choice. If the group's support is roughly evenly divided between the two candidates, then the group does not cohesively support a single candidate and does not have a clear preference. Second,

[4] https://redistrictingdatahub.org/dataset/2020-al-election-data-projected-to-2020-vtds/

[5] https://redistrictingdatahub.org/dataset/2020-alabama-elections-turnout-by-race-ethnicity-aggregated-to-2020-census-vtds/

[6] The estimates provided in this data source are inexact because the voter file used for the calculation is dated August 22, 2021. It is missing any voters removed from the voter file between election day and this date, and may also locate voters who changed addresses since the election in the wrong precinct. I validated this data by comparing county totals by race to actual turnout by race data from the Secretary of State.

[7] https://www.sos.alabama.gov/alabama-votes/voter/election-data

[8] The 95% confidence interval is a measure of uncertainty in the estimates from the model. For example, the model might estimate that 94% of the members of a group voted for a particular candidate, with a 95% confidence interval of 91-96%. This means that based on the data and the model assumptions, 95% of the simulated estimates for this group fall in the range of 91-96%, with 94% being the average value. Larger confidence intervals reflect a higher degree of uncertainty in the estimates, while smaller confidence intervals reflect less uncertainty. For the analyses using Citizen Voting Age Population data and voter registration data, I estimated models that allow for different voter turnout levels by race.

after identifying the preferred candidate for each group (or the lack of such a candidate), I then compared the preferences of White voters to the preferences of Black voters. Evidence of racially polarized voting is found when Black voters and White voters support different candidates.

15. Figure 2 presents the estimates of support for the Black-Preferred candidate for Black and White voters for all 12 electoral contests from 2016 to 2020 using precinct-level election data and Citizen Voting Age Population data. Here, I present only the estimates and confidence intervals, and exclude individual election labels. Full results for each election are presented in Figure 3 and Table 2. In each panel, the solid dots correspond to an estimate in a particular election, and the gray vertical lines behind each dot are the 95% confidence intervals for the estimate.[9]

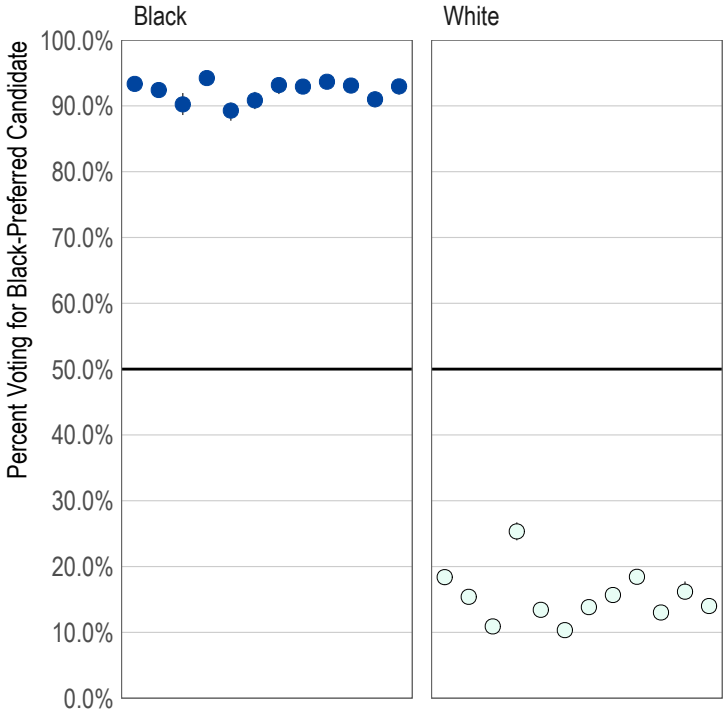

Figure 2: Racially Polarized Voting Estimates by Race — Focus Area

16. Examining Figure 2, the estimates for support for Black-Preferred candidates by Black voters are all significantly above 50%. Black voters are extremely cohesive, with a clear candidate of choice in all 12 elections. On average, Black voters supported their candidates of choice with 92.3% of the vote.

17. In contrast to the Black voters, Figure 2 shows that White voters are highly cohesive in voting in opposition to the Black candidate of choice in every election. On average, White voters supported Black-preferred candidates with 15.4% of the vote, and in no election did this estimate exceed 26%.

[9] In some cases the lines for the confidence intervals are not visible behind the dots because they are relatively small.

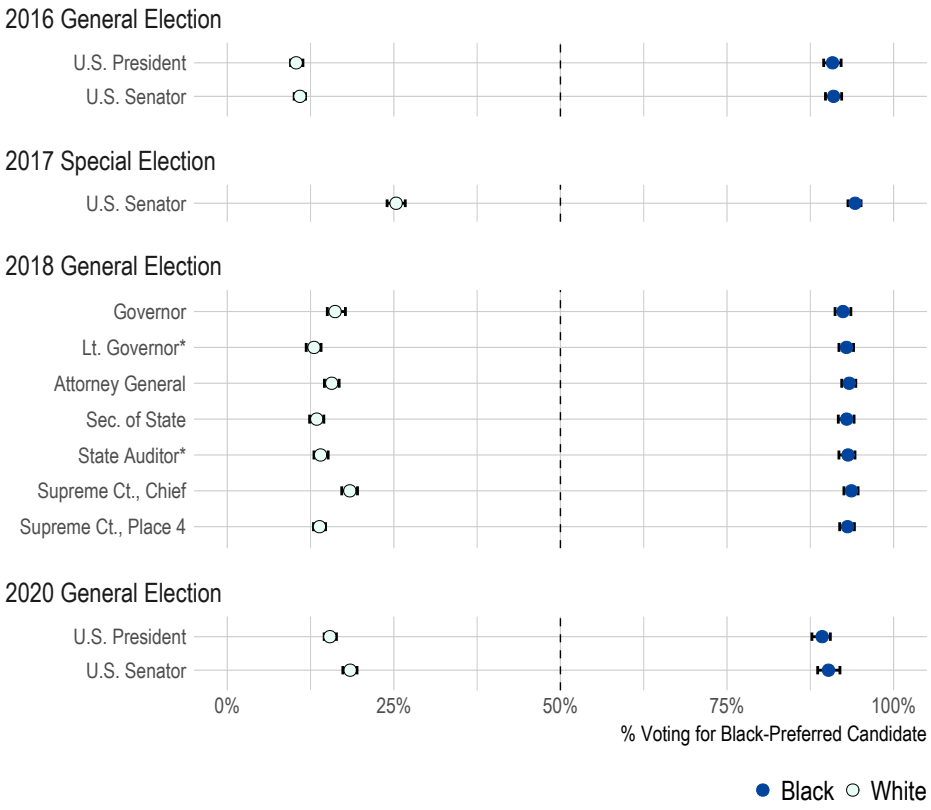

Figure 3: Racially Polarized Voting Estimates by Election — Focus Area

18. Figure 3 presents the same results as Figure 2, separated by each electoral contest. The estimated levels of support for the Black-Preferred candidate in each election for each group are represented by the colored points, and the horizontal lines indicate the range of the 95% confidence intervals. In every election, Black voters have a clear candidate of choice, and White voters are strongly opposed to this candidate.

19. Table 9 presents the ecological inference results for the precinct-level data with actual voter turnout by race for 2020. These results support the findings discussed above. Black voters are highly cohesive and have a clear candidate of choice in each election, and White voters cohesively oppose the Black candidates of choice.

20. While the precinct data is limited to 2016 to 2020, county-level election results provide similar evidence of racially polarized voting in 2012 and 2014. Figure 4 and Table 3 present county-level ecological inference results for these elections, using county-level voter registration by race to estimate the voting population. The results are consistent across these seven elections; Black voters have a clear candidate of choice in each election, and White voters strongly opposed the Black-preferred candidates.

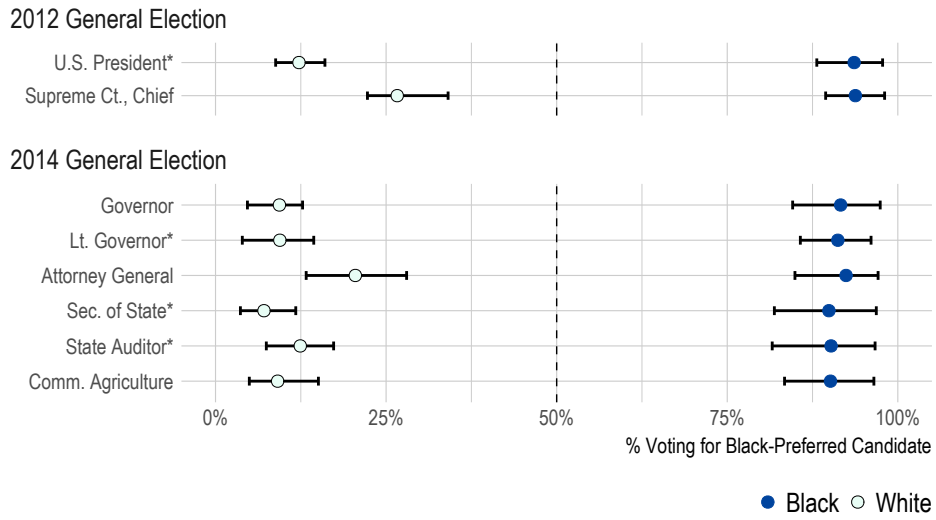

Figure 4: Racially Polarized Voting Estimates by Election Using County-Level Data — Focus Area

21. There is also strong evidence of racially polarized voting in each of the five congressional districts that comprise the focus area. Figure 5 plots the results, and Tables 4–8 present the full results, using precinct-level election results and Citizen Voting Age Population Data.[10] Black voters are extremely cohesive, with a clear candidate of choice in all 12 elections in each district. On average, Black voters supported their candidates of choice with 92.7% of the vote in CD 1, 88.8% in CD 2, 90.0% in CD 3, 92.2% in CD 6, and 94.4% in CD 7.[11]

22. In contrast to the Black voters, Figure 5 shows that White voters are highly cohesive in voting in opposition to the Black candidate of choice in every election in each district. On average, White voters supported Black-preferred candidates with 16.2% of the vote in CD 1, 9.2% in CD 2, 11.9% in CD 3, 22.8% in CD 6, and 25.0% in CD 7.

Performance of Black-Preferred Candidates in the Focus Area

23. Having identified the Black candidate of choice in each election, I now turn to their ability to win elections in these districts. Table 1 presents the results of each election in the focus area and each congressional district for the 2016 to 2020 elections. For each election, I present the vote share obtained by the Black-preferred candidate.

24. Across the 12 statewide contests analyzed, the Black-preferred candidate won only once in the focus area. In all other cases, the White-preferred candidate won the

[10]Table 9 presents the ecological inference results for the precinct-level data with actual voter turnout by race for 2020.

[11]I restrict this analysis to the 2016–2020 elections because the necessary precinct-level data is not available for 2012 and 2014.

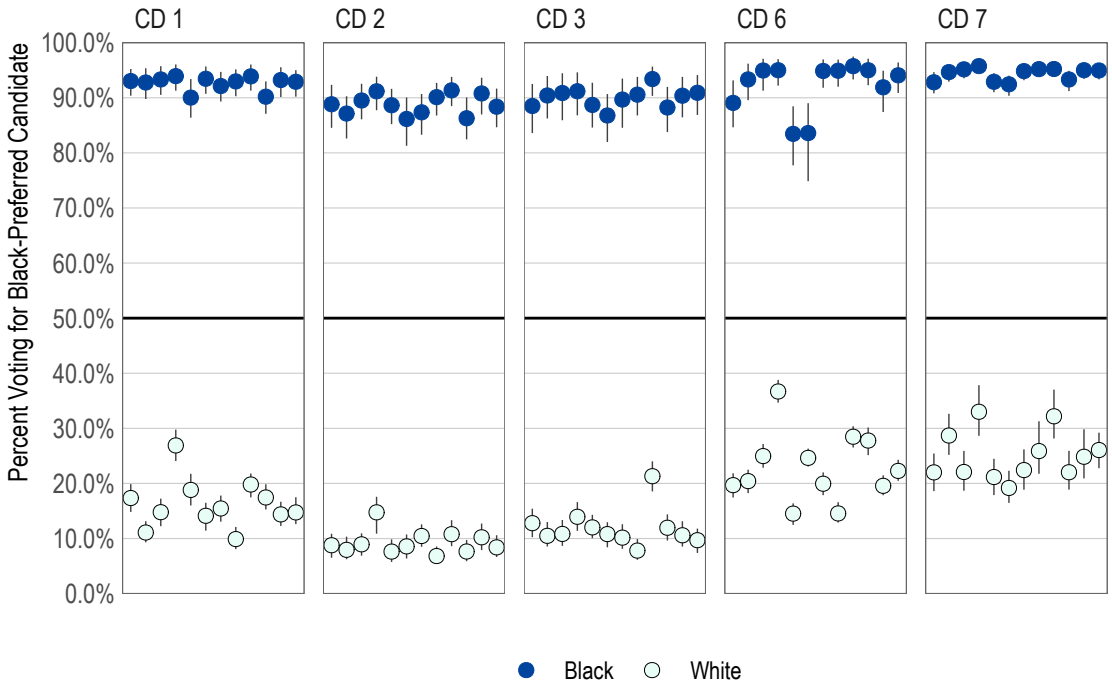

Figure 5: Racially Polarized Voting Estimates by Race — Congressional Districts

majority of the vote. In the 1st, 2nd, 3rd, and 6th Congressional Districts, the White-preferred candidate defeated the Black-preferred candidate in all 12 elections. In the 7th Congressional District, the Black-preferred candidate won all 12 elections.[12]

25. The Black-preferred candidate won the majority of the vote in the focus area in only one contest, the 2017 special election for U.S. Senate. In this election the White-preferred candidate was Roy Moore, a former Chief Justice of the Alabama Supreme Court.[13] Moore is a uniquely controversial figure in Alabama politics, having been removed from his position on the Supreme Court in 2003, and later suspended from his position on the Supreme Court in 2016 following his 2012 election. In the 2017 U.S. Senate election, Moore was also accused of sexual assault and misconduct by several women.[14] Moore's unique unpopularity is highlighted by a statement of the National Republican Senate Committee on the 2020 Senate race: " 'The NRSC's official stance is ABRM: anyone but Roy Moore,' said Kevin McLaughlin, the committee's executive director. 'The only thing Doug Jones and I agree on is that his only prayer for electoral success in

[12]I restrict this analysis to the 2016–2020 elections where I have precinct-level data in order to analyze performance in each Congressional District. However, the results are similar when I include the 2012 and 2014 elections at the county-level for the focus area; Black-preferred candidates win only one of the eight statewide elections analyzed in 2012 and 2014.

[13]When the 2012 and 2014 elections are included for the focus area, the Black-preferred candidate wins one additional election, the 2012 election for Chief Justice of the Supreme Court. In this election, the White-preferred candidate was Roy Moore as well.

[14]Notwithstanding these potentially distinguishing features of Mr. Moore's candidacy, more than 74% of White voters voted for Moore in 2012 and 2017. See Table 2.

2020 is a rematch with Roy Moore.' "[15] However, the Black-preferred candidate, Doug Jones, won this election in the focus area only because of his large margin of victory in the 7th Congressional District; Moore won the majority of the vote in the other four congressional districts in the focus area.

Performance of the Majority-Minority Districts in the Illustrative Maps

26. I also analyzed the performance of Black-preferred candidates for the versions of CD 2 and CD 7 in the plaintiffs' six illustrative maps by calculating the percentage of the vote won by the Black-preferred candidates across the twelve statewide races from 2016 through 2020 analyzed above.

27. Figure 6 presents the results of this analysis. In the two majority-minority districts in each illustrative map, CD 2 and CD 7, the Black-preferred candidate won all twelve statewide elections, with an average of at least 57% of the vote in all maps for CD 2, and an average of at least 65% of the vote for CD 7. Figure 7 plots the vote shares in each election of the Black-preferred candidates for districts 2 and 7 for each illustrative map. In Districts 1, 3, and 6 the White-preferred candidate defeated the Black-preferred candidate in all 12 elections. Tables 10-15 provide the full results in all districts for each map.

I reserve the right to continue to supplement my reports in light of additional facts, testimony and/or materials that may come to light.

I declare under penalty of perjury that the foregoing is true and correct.

Maxwell Pal

Executed on: December 10, 2021

[15] https://www.politico.com/newsletters/playbook-pm/2019/02/28/netanyahu-indicted-pelosi-attempts-to-wrangle-dems-and-says-noko-won-the-summit-401605

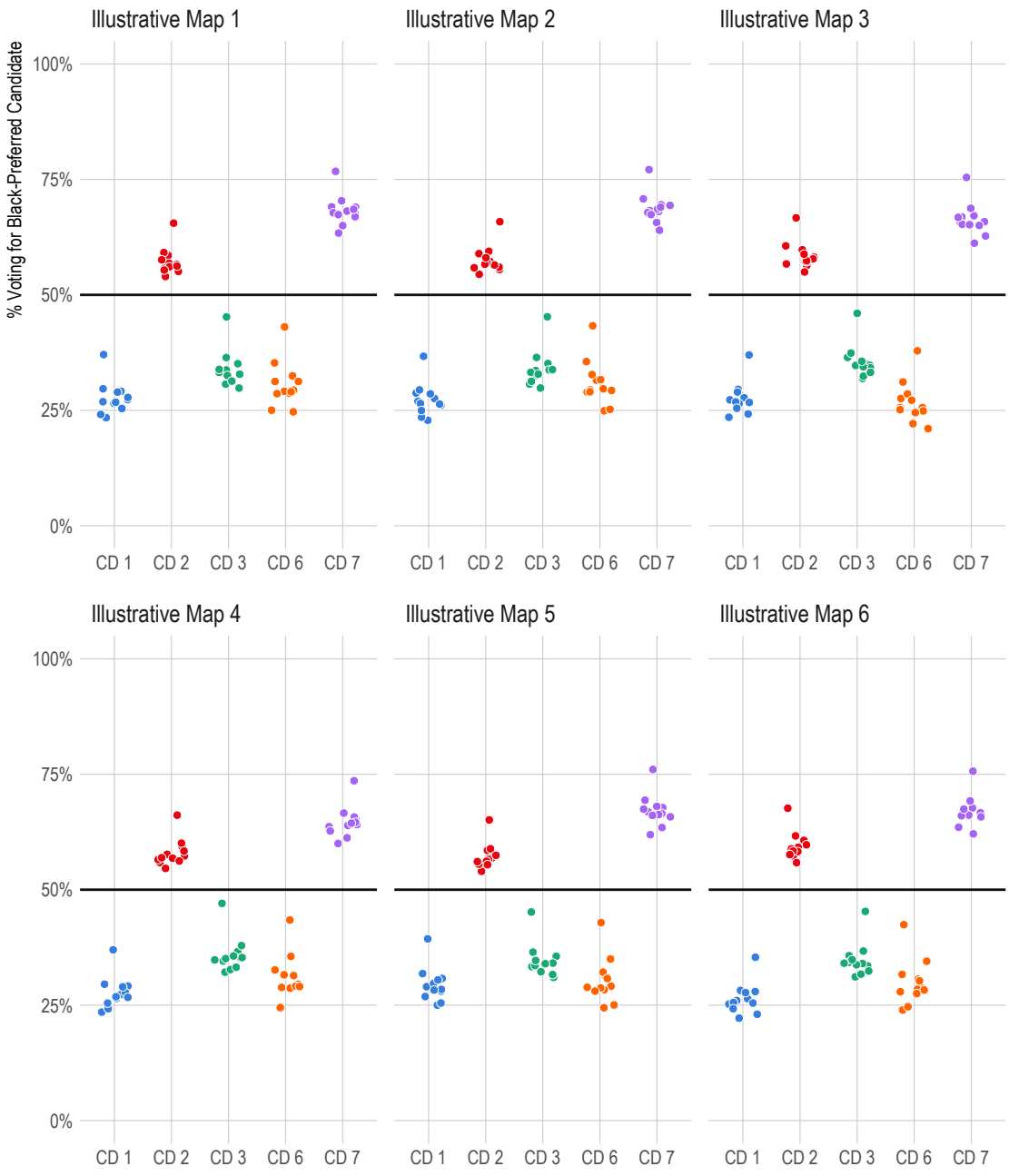

Figure 6: Vote Shares of Black-Preferred Candidates Under the Illustrative Maps

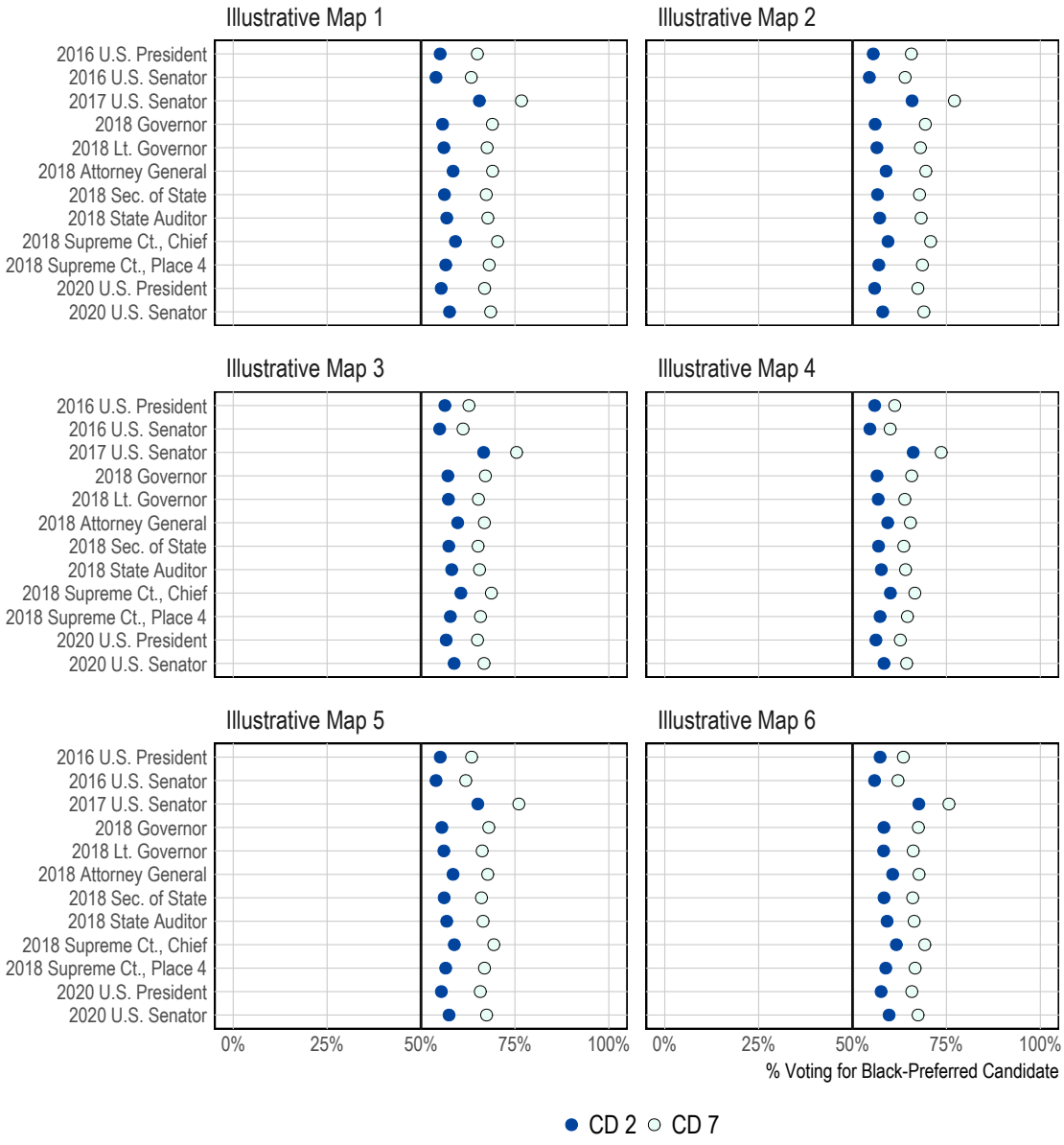

Figure 7: Vote Shares of Black-Preferred Candidates Under the Illustrative Maps, Districts 2 and 7

Table 1: Election Results in the Focus Area — Vote Share of Black-Preferred Candidates

		Focus Area	CD 1	CD 2	CD 3	CD 6	CD 7
2016	U.S. President	39.5%	35.0%	33.3%	32.1%	29.7%	65.7%
	U.S. Senator	39.3%	34.6%	33.7%	33.0%	29.7%	64.1%
2017	U.S. Senator	54.3%	49.1%	45.7%	47.0%	48.6%	76.2%
2018	Governor	43.8%	39.4%	35.8%	35.4%	37.9%	68.0%
	Lt. Governor	42.3%	37.7%	35.7%	34.6%	34.3%	67.1%
	Attorney General	44.6%	40.3%	38.8%	36.4%	36.7%	68.6%
	Sec. of State	42.4%	37.9%	35.8%	34.8%	34.5%	67.0%
	State Auditor	42.9%	38.6%	36.8%	35.1%	35.0%	67.4%
	Supreme Ct., Chief	46.2%	41.9%	38.5%	37.8%	40.8%	69.6%
	Supreme Ct., Place 4	42.7%	38.1%	36.1%	35.1%	34.7%	67.7%
2020	U.S. President	40.9%	35.7%	35.2%	32.8%	34.6%	66.2%
	U.S. Senator	43.4%	39.1%	37.8%	35.2%	37.2%	67.8%

Table 2: Ecological Inference Results — Estimated Vote Share of Black-Preferred Candidates — Precinct-Level Election Data with Citizen Voting Age Population — Focus Area

		Black	White	Other
2016	U.S. President	90.8% (89.5, 92.1)	10.3% (9.5, 11.4)	68.8% (63.9, 74.0)
	U.S. Senator	91.0% (89.8, 92.2)	10.9% (10.0, 11.7)	70.7% (64.8, 77.0)
2017	U.S. Senator	94.2% (93.2, 95.1)	25.3% (24.0, 26.7)	79.9% (70.3, 86.8)
2018	Governor	92.4% (91.2, 93.6)	16.2% (15.0, 17.7)	78.1% (69.1, 84.3)
	Lt. Governor*	92.9% (91.8, 94.0)	13.0% (11.8, 14.1)	79.9% (73.2, 85.2)
	Attorney General	93.3% (92.2, 94.3)	15.7% (14.6, 16.8)	83.6% (78.2, 88.1)
	Sec. of State	93.0% (91.7, 94.1)	13.4% (12.4, 14.5)	81.3% (74.6, 87.2)
	State Auditor*	93.2% (91.8, 94.2)	14.0% (13.0, 15.1)	81.5% (76.2, 86.3)
	Supreme Ct., Chief	93.7% (92.5, 94.7)	18.4% (17.2, 19.5)	82.0% (75.4, 87.9)
	Supreme Ct., Place 4	93.1% (91.9, 94.1)	13.8% (12.9, 14.7)	80.9% (73.6, 87.6)
2020	U.S. President	89.3% (87.7, 90.5)	15.4% (14.5, 16.4)	66.1% (60.9, 72.2)
	U.S. Senator	90.2% (88.6, 91.9)	18.4% (17.4, 19.5)	71.9% (66.7, 76.6)

* Indicates that the Black candidate of choice was Black.

Table 3: Ecological Inference Results — Estimated Vote Share of Black-Preferred Candidates — County-Level Election Data with Voter Registration by Race — Focus Area

		Black	White	Other
2012	U.S. President*	93.6% (88.1, 97.8)	12.2% (8.8, 16.0)	52.6% (16.7, 84.5)
	Supreme Ct., Chief	93.8% (89.4, 98.1)	26.6% (22.3, 34.1)	56.1% (19.2, 86.4)
2014	Governor	91.6% (84.6, 97.4)	9.4% (4.7, 12.8)	50.9% (20.6, 82.3)
	Lt. Governor*	91.2% (85.7, 96.1)	9.4% (3.9, 14.4)	51.9% (16.0, 82.9)
	Attorney General	92.4% (84.9, 97.1)	20.5% (13.3, 28.0)	62.7% (28.1, 93.0)
	Sec. of State*	89.9% (81.9, 96.8)	7.1% (3.6, 11.8)	55.4% (22.6, 85.4)
	State Auditor*	90.2% (81.6, 96.7)	12.4% (7.4, 17.3)	54.5% (22.5, 84.1)
	Comm. Agriculture	90.1% (83.4, 96.5)	9.1% (5.0, 15.1)	54.2% (23.3, 82.2)

* Indicates that the Black candidate of choice was Black.

Table 4: Ecological Inference Results — Estimated Vote Share of Black-Preferred Candidates — Precinct-Level Election Data with Citizen Voting Age Population — CD 1

		Black	White	Other
2016	U.S. President	93.0% (90.3, 95.2)	9.9% (8.1, 12.1)	66.8% (50.3, 79.8)
	U.S. Senator	92.1% (89.3, 94.7)	11.1% (9.3, 13.1)	63.3% (37.1, 80.6)
2017	U.S. Senator	93.9% (91.3, 96.0)	26.9% (24.1, 29.8)	63.1% (41.4, 80.7)
2018	Governor	92.9% (90.2, 95.0)	17.5% (15.3, 19.8)	65.0% (41.1, 83.0)
	Lt. Governor*	92.8% (89.8, 95.4)	14.1% (11.4, 16.5)	69.3% (50.7, 83.8)
	Attorney General	93.9% (91.3, 96.1)	17.3% (14.8, 19.9)	73.3% (45.8, 86.4)
	Sec. of State	93.0% (90.4, 95.2)	14.7% (12.6, 17.5)	71.0% (50.3, 86.9)
	State Auditor*	93.2% (90.1, 95.6)	15.5% (13.1, 17.8)	72.4% (51.1, 85.4)
	Supreme Ct., Chief	93.5% (90.7, 95.7)	19.8% (17.5, 21.8)	73.9% (57.9, 86.1)
	Supreme Ct., Place 4	93.3% (90.5, 95.7)	14.8% (12.2, 17.2)	70.7% (49.3, 84.6)
2020	U.S. President	90.0% (86.4, 93.4)	14.4% (12.3, 16.7)	55.4% (42.0, 71.0)
	U.S. Senator	90.2% (87.1, 93.0)	18.8% (16.0, 21.7)	64.6% (46.7, 78.7)

* Indicates that the Black candidate of choice was Black.

Table 5: Ecological Inference Results — Estimated Vote Share of Black-Preferred Candidates — Precinct-Level Election Data with Citizen Voting Age Population — CD 2

		Black	White	Other
2016	U.S. President	86.2% (81.3, 90.1)	6.8% (5.5, 8.6)	60.9% (42.5, 75.8)
	U.S. Senator	87.4% (83.3, 90.7)	7.6% (5.7, 9.9)	70.3% (48.7, 84.3)
2017	U.S. Senator	91.3% (88.5, 93.8)	14.8% (10.9, 17.6)	70.9% (50.5, 86.1)
2018	Governor	88.8% (84.5, 92.4)	8.6% (6.4, 10.7)	64.8% (37.9, 82.4)
	Lt. Governor*	88.6% (85.2, 91.6)	7.9% (6.2, 10.3)	71.3% (50.5, 85.5)
	Attorney General	90.8% (87.0, 93.6)	10.5% (8.5, 12.6)	66.1% (48.4, 80.2)
	Sec. of State	88.4% (84.6, 91.7)	8.4% (6.7, 10.6)	68.8% (47.1, 84.1)
	State Auditor*	89.5% (86.1, 92.5)	8.8% (6.5, 10.9)	68.9% (45.7, 85.4)
	Supreme Ct., Chief	91.2% (87.7, 93.8)	10.2% (7.9, 12.7)	72.3% (54.0, 86.7)
	Supreme Ct., Place 4	90.1% (86.8, 92.7)	7.6% (5.9, 9.7)	73.7% (55.7, 87.4)
2020	U.S. President	87.1% (82.6, 90.3)	8.9% (6.9, 10.9)	60.0% (46.3, 76.2)
	U.S. Senator	86.3% (82.5, 90.1)	10.8% (8.6, 13.3)	71.0% (50.8, 83.4)

* Indicates that the Black candidate of choice was Black.

Table 6: Ecological Inference Results — Estimated Vote Share of Black-Preferred Candidates — Precinct-Level Election Data with Citizen Voting Age Population — CD 3

		Black	White	Other
2016	U.S. President	88.7% (84.6, 92.7)	7.8% (6.1, 9.9)	77.4% (63.1, 91.0)
	U.S. Senator	88.5% (83.6, 92.5)	10.5% (8.6, 13.0)	71.8% (54.9, 84.1)
2017	U.S. Senator	93.4% (90.3, 95.7)	21.3% (18.6, 24.0)	82.4% (70.0, 91.1)
2018	Governor	89.7% (84.6, 93.5)	12.0% (10.1, 14.3)	72.6% (58.1, 84.9)
	Lt. Governor*	90.6% (86.8, 93.8)	10.2% (8.1, 12.6)	76.7% (60.9, 88.5)
	Attorney General	90.4% (86.5, 93.8)	12.8% (10.2, 15.4)	76.0% (59.8, 88.5)
	Sec. of State	90.9% (86.9, 94.1)	10.8% (8.7, 13.4)	72.6% (47.8, 87.8)
	State Auditor*	90.4% (86.2, 94.0)	10.6% (8.5, 13.1)	76.3% (63.3, 86.1)
	Supreme Ct., Chief	90.9% (85.9, 94.5)	13.9% (11.4, 16.6)	79.7% (63.7, 91.1)
	Supreme Ct., Place 4	91.2% (86.8, 94.6)	10.8% (8.4, 13.0)	73.5% (56.1, 85.9)
2020	U.S. President	86.8% (82.0, 90.7)	9.7% (7.4, 11.8)	67.7% (56.3, 79.8)
	U.S. Senator	88.2% (83.8, 92.0)	12.0% (9.6, 14.4)	73.5% (59.1, 86.0)

* Indicates that the Black candidate of choice was Black.

Table 7: Ecological Inference Results — Estimated Vote Share of Black-Preferred Candidates — Precinct-Level Election Data with Citizen Voting Age Population — CD 6

		Black	White	Other
2016	U.S. President	91.9% (87.4, 94.9)	14.5% (12.5, 16.4)	48.4% (34.5, 68.6)
	U.S. Senator	89.1% (84.6, 93.2)	14.6% (12.9, 16.6)	57.8% (45.6, 69.7)
2017	U.S. Senator	93.3% (89.6, 96.2)	36.7% (34.7, 38.8)	46.9% (25.3, 72.6)
2018	Governor	94.1% (90.9, 96.4)	25.0% (22.8, 27.2)	48.9% (27.6, 76.4)
	Lt. Governor*	95.0% (92.3, 97.1)	19.6% (17.9, 21.5)	52.6% (29.2, 80.3)
	Attorney General	94.9% (91.8, 97.0)	22.3% (20.5, 24.3)	61.8% (39.5, 81.8)
	Sec. of State	95.0% (92.2, 97.0)	19.9% (17.9, 22.0)	53.6% (24.5, 77.9)
	State Auditor*	94.9% (92.0, 96.9)	20.4% (18.2, 22.5)	53.3% (26.6, 81.7)
	Supreme Ct., Chief	95.0% (91.3, 97.1)	28.5% (26.5, 30.4)	52.9% (26.9, 80.4)
	Supreme Ct., Place 4	95.7% (93.3, 97.5)	19.7% (17.4, 21.8)	57.3% (34.1, 79.0)
2020	U.S. President	83.5% (77.7, 88.4)	24.6% (23.1, 26.3)	35.2% (20.2, 59.0)
	U.S. Senator	83.6% (74.9, 89.0)	27.8% (25.1, 30.1)	38.5% (23.6, 54.8)

* Indicates that the Black candidate of choice was Black.

Table 8: Ecological Inference Results — Estimated Vote Share of Black-Preferred Candidates — Precinct-Level Election Data with Citizen Voting Age Population — CD 7

		Black	White	Other
2016	U.S. President	93.3% (91.2, 94.9)	21.2% (17.9, 24.5)	82.1% (71.9, 89.3)
	U.S. Senator	92.9% (91.0, 94.5)	19.2% (16.5, 22.3)	80.4% (69.7, 90.1)
2017	U.S. Senator	95.8% (94.6, 96.9)	32.2% (28.2, 37.0)	88.1% (79.4, 93.9)
2018	Governor	94.7% (92.9, 96.0)	24.8% (20.9, 29.8)	83.0% (72.6, 91.4)
	Lt. Governor*	94.8% (93.2, 96.1)	22.1% (18.7, 25.9)	84.0% (67.6, 92.0)
	Attorney General	95.0% (93.4, 96.4)	25.9% (21.8, 31.3)	87.5% (80.1, 93.4)
	Sec. of State	95.0% (93.3, 96.2)	22.0% (18.6, 25.4)	88.5% (80.7, 93.9)
	State Auditor*	95.2% (93.9, 96.3)	22.4% (18.9, 26.2)	85.5% (73.2, 92.9)
	Supreme Ct., Chief	95.2% (93.8, 96.5)	26.1% (22.8, 29.2)	89.3% (81.5, 94.1)
	Supreme Ct., Place 4	95.2% (93.5, 96.5)	22.0% (18.9, 25.9)	89.3% (82.1, 94.6)
2020	U.S. President	92.4% (90.4, 94.0)	28.7% (25.2, 32.6)	77.3% (69.1, 86.1)
	U.S. Senator	92.8% (90.8, 94.7)	33.0% (28.6, 37.8)	84.4% (74.2, 92.6)

* Indicates that the Black candidate of choice was Black.

Table 9: Ecological Inference Results — Estimated Vote Share of Black-Preferred Candidates — Precinct-Level Election Data with Voter Turnout by Race — 2020 Elections

		Black	White	Other
Focus Area	U.S. President	97.3% (96.8, 97.6)	9.1% (8.7, 9.5)	82.0% (78.6, 84.9)
	U.S. Senator	97.6% (97.2, 98.0)	12.1% (11.8, 12.5)	88.9% (85.6, 91.6)
CD 1	U.S. President	96.5% (95.2, 97.6)	8.6% (7.5, 9.8)	75.9% (66.3, 83.1)
	U.S. Senator	97.0% (95.5, 98.1)	12.7% (11.7, 14.0)	82.1% (72.7, 89.7)
CD 2	U.S. President	96.9% (95.7, 97.8)	5.6% (4.7, 6.8)	68.6% (58.2, 77.2)
	U.S. Senator	97.1% (96.0, 98.0)	6.9% (6.4, 7.6)	92.8% (88.3, 96.0)
CD 3	U.S. President	96.7% (95.3, 97.8)	7.4% (6.8, 8.2)	83.1% (75.9, 88.7)
	U.S. Senator	97.0% (95.5, 98.1)	10.7% (9.9, 11.7)	83.9% (74.8, 91.1)
CD 6	U.S. President	97.0% (95.5, 98.1)	11.8% (11.2, 12.6)	91.6% (86.0, 95.3)
	U.S. Senator	96.8% (94.8, 98.1)	15.2% (14.6, 16.0)	93.0% (88.4, 96.2)
CD 7	U.S. President	97.5% (97.0, 98.0)	16.6% (15.0, 19.3)	66.4% (39.8, 80.6)
	U.S. Senator	98.0% (97.4, 98.4)	19.7% (18.4, 21.2)	71.5% (58.3, 82.4)

Table 10: Vote Share of Black-Preferred Candidates — Illustrative Map 1

		CD 1	CD 2	CD 3	CD 4	CD 5	CD 6	CD 7
2016	U.S. President	23.4%	55.1%	29.8%	16.1%	33.9%	24.7%	65.0%
	U.S. Senator	24.1%	54.0%	30.7%	19.0%	34.4%	25.0%	63.4%
2017	U.S. Senator	37.1%	65.5%	45.2%	27.8%	51.4%	43.1%	76.8%
2018	Attorney General	29.1%	58.5%	35.1%	21.6%	41.2%	31.2%	69.1%
	State Auditor	27.3%	56.9%	33.6%	19.7%	39.8%	29.4%	67.8%
	Governor	27.8%	55.7%	33.7%	21.9%	40.1%	32.5%	69.0%
	Lt. Governor	26.5%	56.1%	32.5%	18.7%	38.5%	28.7%	67.6%
	Supreme Ct., Place 4	26.9%	56.6%	33.2%	20.1%	39.8%	29.1%	68.1%
	Supreme Ct., Chief	29.7%	59.2%	36.4%	22.6%	41.9%	35.3%	70.4%
	Sec. of State	26.7%	56.2%	32.8%	19.0%	39.1%	29.0%	67.4%
2020	U.S. President	25.4%	55.4%	31.3%	16.5%	37.2%	28.6%	66.9%
	U.S. Senator	28.9%	57.6%	33.9%	19.6%	40.5%	31.2%	68.5%

Table 11: Vote Share of Black-Preferred Candidates — Illustrative Map 2

		CD 1	CD 2	CD 3	CD 4	CD 5	CD 6	CD 7
2016	U.S. President	22.8%	55.5%	29.8%	16.1%	33.9%	24.9%	65.7%
	U.S. Senator	23.5%	54.5%	30.7%	19.0%	34.4%	25.2%	64.0%
2017	U.S. Senator	36.7%	65.8%	45.3%	27.8%	51.4%	43.3%	77.1%
2018	Attorney General	28.7%	58.9%	35.1%	21.6%	41.2%	31.5%	69.5%
	State Auditor	27.0%	57.2%	33.6%	19.7%	39.8%	29.6%	68.3%
	Governor	27.5%	56.0%	33.7%	21.9%	40.1%	32.7%	69.4%
	Lt. Governor	26.1%	56.5%	32.5%	18.7%	38.5%	29.0%	68.1%
	Supreme Ct., Place 4	26.5%	57.0%	33.2%	20.1%	39.8%	29.4%	68.6%
	Supreme Ct., Chief	29.4%	59.4%	36.4%	22.6%	41.9%	35.6%	70.8%
	Sec. of State	26.4%	56.6%	32.8%	19.0%	39.1%	29.3%	67.8%
2020	U.S. President	24.9%	55.9%	31.3%	16.5%	37.2%	29.0%	67.4%
	U.S. Senator	28.6%	58.0%	33.8%	19.6%	40.5%	31.6%	69.0%

Table 12: Vote Share of Black-Preferred Candidates — Illustrative Map 3

		CD 1	CD 2	CD 3	CD 4	CD 5	CD 6	CD 7
2016	U.S. President	23.5%	56.4%	31.9%	17.7%	33.9%	21.0%	62.8%
	U.S. Senator	24.2%	55.0%	32.4%	20.4%	34.4%	22.1%	61.2%
2017	U.S. Senator	37.0%	66.7%	46.0%	31.3%	51.4%	37.9%	75.4%
2018	Attorney General	29.1%	59.8%	36.5%	23.4%	41.2%	27.6%	66.9%
	State Auditor	27.3%	58.2%	35.0%	21.6%	39.8%	25.6%	65.6%
	Governor	27.7%	57.2%	34.7%	23.9%	40.1%	28.5%	67.1%
	Lt. Governor	26.5%	57.3%	34.2%	20.5%	38.5%	24.9%	65.3%
	Supreme Ct., Place 4	26.8%	57.8%	34.7%	21.8%	39.8%	25.6%	65.8%
	Supreme Ct., Chief	29.5%	60.6%	37.4%	24.6%	41.9%	31.1%	68.7%
	Sec. of State	26.7%	57.4%	34.4%	20.8%	39.1%	25.1%	65.2%
2020	U.S. President	25.4%	56.7%	33.2%	18.1%	37.2%	24.5%	65.0%
	U.S. Senator	29.0%	58.8%	35.6%	21.2%	40.5%	27.2%	66.8%

Table 13: Vote Share of Black-Preferred Candidates — Illustrative Map 4

		CD 1	CD 2	CD 3	CD 4	CD 5	CD 6	CD 7
2016	U.S. President	23.5%	55.9%	32.1%	16.6%	33.9%	24.3%	61.2%
	U.S. Senator	24.2%	54.6%	32.7%	19.7%	34.4%	24.5%	60.0%
2017	U.S. Senator	37.0%	66.1%	47.0%	28.6%	51.4%	43.4%	73.6%
2018	Attorney General	29.1%	59.4%	36.6%	22.2%	41.2%	31.4%	65.4%
	State Auditor	27.3%	57.7%	35.2%	20.3%	39.8%	29.5%	64.1%
	Governor	27.7%	56.5%	35.3%	22.1%	40.1%	32.6%	65.7%
	Lt. Governor	26.5%	56.8%	34.6%	19.2%	38.5%	28.7%	63.9%
	Supreme Ct., Place 4	26.8%	57.3%	35.1%	20.6%	39.8%	29.1%	64.6%
	Supreme Ct., Chief	29.5%	60.1%	37.9%	23.3%	41.9%	35.6%	66.6%
	Sec. of State	26.7%	56.9%	34.8%	19.6%	39.1%	29.0%	63.6%
2020	U.S. President	25.4%	56.2%	33.2%	16.9%	37.2%	28.8%	62.7%
	U.S. Senator	29.0%	58.4%	35.7%	20.0%	40.5%	31.6%	64.4%

Table 14: Vote Share of Black-Preferred Candidates — Illustrative Map 5

		CD 1	CD 2	CD 3	CD 4	CD 5	CD 6	CD 7
2016	U.S. President	25.0%	55.1%	31.0%	15.9%	33.9%	24.4%	63.5%
	U.S. Senator	25.5%	54.0%	31.6%	18.8%	34.4%	25.0%	61.9%
2017	U.S. Senator	39.4%	65.1%	45.2%	27.6%	51.4%	42.9%	76.0%
2018	Attorney General	30.8%	58.5%	35.6%	21.4%	41.2%	31.1%	67.8%
	State Auditor	29.0%	56.8%	34.1%	19.5%	39.8%	29.1%	66.5%
	Governor	29.7%	55.5%	34.0%	21.7%	40.1%	32.1%	68.0%
	Lt. Governor	28.0%	56.1%	33.3%	18.5%	38.5%	28.3%	66.3%
	Supreme Ct., Place 4	28.4%	56.6%	33.8%	19.9%	39.8%	28.9%	66.9%
	Supreme Ct., Chief	31.8%	58.9%	36.5%	22.4%	41.9%	35.0%	69.4%
	Sec. of State	28.3%	56.2%	33.6%	18.8%	39.1%	28.7%	66.1%
2020	U.S. President	26.9%	55.4%	32.2%	16.3%	37.2%	28.0%	65.8%
	U.S. Senator	30.5%	57.5%	34.7%	19.4%	40.5%	30.8%	67.5%

Table 15: Vote Share of Black-Preferred Candidates — Illustrative Map 6

		CD 1	CD 2	CD 3	CD 4	CD 5	CD 6	CD 7
2016	U.S. President	22.2%	57.3%	31.1%	15.7%	33.9%	23.9%	63.5%
	U.S. Senator	23.0%	55.9%	31.7%	18.4%	34.4%	24.6%	62.1%
2017	U.S. Senator	35.4%	67.6%	45.3%	27.8%	51.4%	42.4%	75.7%
2018	Attorney General	27.9%	60.7%	35.7%	21.3%	41.2%	30.6%	67.7%
	State Auditor	26.0%	59.2%	34.3%	19.4%	39.8%	28.7%	66.4%
	Governor	26.4%	58.3%	34.1%	21.9%	40.1%	31.7%	67.5%
	Lt. Governor	25.2%	58.3%	33.5%	18.4%	38.5%	27.9%	66.2%
	Supreme Ct., Place 4	25.6%	58.8%	34.0%	19.8%	39.8%	28.4%	66.7%
	Supreme Ct., Chief	28.2%	61.7%	36.7%	22.5%	41.9%	34.5%	69.2%
	Sec. of State	25.5%	58.4%	33.7%	18.7%	39.1%	28.3%	66.0%
2020	U.S. President	24.2%	57.6%	32.4%	16.2%	37.2%	27.5%	65.8%
	U.S. Senator	27.7%	59.7%	34.8%	19.3%	40.5%	30.3%	67.4%

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U.S. DISTRICT COURT
N.D. OF ALABAMA

UNITED STATES DISTRICT COURT
NORTHERN DISTRICT OF ALABAMA
SOUTHERN DIVISION

MARCUS CASTER, et al., Plaintiffs, v. JOHN H. MERRILL, in his official capacity as Alabama Secretary of State, Defendant.	Case No.: 2:21-cv-1536-AMM

SECOND DECLARATION OF DR. BRIDGETT KING

Pursuant to 28 U.S.C. § 1746, I, Bridgett King, make the following declaration:

1. This second declaration responds to assertions made in two reports submitted by the Defendant in this case. Section I addresses Tom Bryan's assertion of how "Black" should be defined for purposes of measuring the Black population of a political subdivision. Section II addresses Dr. M.V. Hood III's assertion that white support of minority Republican candidates suggests racial considerations do not influence their voting behavior, as well as his discussion of a recent Alabama State House race.

2. In responding to these assertions, I draw on my research and writing as a political/social scientist and my in-depth understanding of voting rights in a historical and contemporary context, along with understanding gained from academic and applied experience.

I. Definition of "Black"

3. In Mr. Bryan's report, he discusses the need to "define and document the true 'Black' population" of congressional districts.[1] Mr. Bryan notes that in the last two Censuses,

[1] Bryan Rep. at 9.

respondents had the option of selecting more than one race.[2] He states: "A 'Black' in Alabama therefore can be Black alone, or perhaps in combination with other races or possibly even also Hispanic.[3] He goes on to assert that "[i]n this matter precise definitions matter," and claims that counting only those Alabamians who identify as Black and no other race ("Black alone," "single race Black," or "SR Black") as Black when analyzing the Black population of a congressional district "has been most defensible from a political science / Gingles 2 voting behavior perspective," as opposed to counting all Alabamians who identify as Black, regardless of whether they also identify with another race ("any part Black" or "AP Black").[4]

4. Mr. Bryan is not a political scientist, and Mr. Bryan does not offer any explanation, evidence, or citation to support his assertion that counting only those who identify as "Black alone" as Black for purposes of measuring population has been "most defensible" from a "political science" perspective.

5. Drawing on my own scholarship and those of other political scientists and historians, it is my opinion that Mr. Bryan's assertion has it exactly backwards. From a political science and historical perspective, the more defensible position is that, when determining the Black population of a political subdivision, *all* individuals who identify as Black—whether in combination with other races (and/or Hispanic heritage) or not—should be counted as Black.

6. The AP Black definition is superior to the Black alone definition from a political science and historical perspective because it better comports with how individuals racially self-identify. Racial self-identification is the result of historical, cultural, and social environments.

7. From the historical perspective, how individuals racially self-identify must take

[2] *Id.*
[3] *Id.*
[4] *Id.* at 10.

account of how society and the State of Alabama has defined the Black race. In Alabama, that understanding must begin with the "one drop rule." For centuries, states in the American South, including Alabama, defined Black by using the one drop rule, also known as the "one black ancestor rule," or in anthropology as "the hypo-descent rule." Stated simply, the rule asserts that a single drop of Black blood makes a person Black. Racially mixed persons were thus considered Black and assigned the status of the subordinate group.[5] As one scholar explains: "Any person who has some 'negro blood' has been or still is regarded as 'colored,' or 'African,' or 'Negro,' or 'Black,' or 'Afro American,' or 'African American.'"[6]

8. The rule did not apply to people whose heritage was some combination of Caucasian, Hispanic, Asian, or Native. In both the historical and contemporary contextual understanding, the one drop rule applied only to Americans of African descent—in other words it only applies to Black Americans.[7]

9. The one drop rule became entrenched across the American South in the 1910s and 1920s, but it first appeared in legal codes in the 1800s. The rule evolved out of racist notions of white racial purity.[8] While state statutes often explicitly defined who was considered Black, social customs also played a large role in defining the racial line, which used the one drop rule to suppress political, economic, and social access and mobility. As early as the 1700s, those who were mixed race Black and white ("mulattos," "quadroons," "octoroons," etc.) were subject to the same legal disabilities as Blacks and thus were enslaved. Keeping "mulattos" and other part-Black persons

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[5] Davis, F. J. (1991). Who is Black? One nation's definition. Penn State University Press: University Park, Pennsylvania; Hickman, C. B. (1997). The Devil and the One Drop Rule: Racial Categories, African Americans, and the U.S. Census. *Michigan Law Review*, *95*(5), 1161–1265.
[6] Jordan, W. D. (2014). Historical Origins of the One-Drop Racial Rule in the United States. *Journal of Critical Mixed Race Studies*, 1(1), 98-132.
[7] Davis, *supra* n.5; Jordan, *supra* n.6.
[8] Hickman, *supra* n.5.

enslaved served an economic purpose: the offspring of children with Black mothers and white fathers increased a plantation's inventory.

10. Though the citizenship status of Black Americans changed after the Civil War, Black people with significant white ancestry continued to be considered Black if they also had a Black ancestor.

11. An understanding of Blackness that is inclusive of all Black individuals, both SR Black and AP black, was also adopted by the US Bureau of the Census.

12. By the Fourteenth Census in 1920, when the color line had hardened, the Census Bureau stopped counting "mulattoes" and formally adopted the one drop rule:

> The term "white" as used in the census report refers to persons understood to be pure-blooded whites. A person of mixed blood is classified according to the nonwhite racial strain. . . . [t]hus a person of mixed white . . . and Negro . . . is classified as . . . a Negro . . . regardless of the amount of white blood . . . .[9]

13. This formal adoption of the one drop rule appeared in legislative definitions as well. For example, in 1924, a Virginia Act for "Preservation of Racial Integrity" defined a White person as someone with "no trace whatsoever of any blood other than Caucasian."[10] By 1930, Virginia defined as colored anyone "in whom there is ascertainable any negro blood."[11]

14. As time has progressed, our understanding of who is Black, and who is not, has not deviated; to the contrary, it has been further entrenched in our society. Historian Paul Spickard argues:

> The "one drop" rule is so ingrained in the American psyche that Blacks and Whites do not think twice about it. For example, part-Black people of all hues joined Blacks

[9] Bureau of the Census, U.S. Dept. of Commerce, Fourteenth Census of the United States: 1920, at 10 (1923); Hickman, *supra* n.5.
[10] 1924 VA. Acts ch. 371, § 5.
[11] 1930 VA. Acts ch. 85, § 67.

> in embracing the "Black is Beautiful" slogan advanced in the late 1960s, finally taking pride in their skin color, their hair and other aspects of their black ancestry.[12]

15. For all persons with Black lineage, barriers to full opportunity and participation are formidable, and a person who is fractionally Black cannot escape these obstacles.[13] Asserting one's racial identity is thus a political exercise, a conscious decision to connect to the heritage of that racial identity.[14] It is a choice to connect to the politics and organized interests of that racial identity, but one also accepts the socio-political and anthropological struggles of that group.

16. Individuals who assert their identity as Black, in total or in part, are making a conscious decision to identify with the history and legacy of Black identity in the United States, an identity that includes the trans-Atlantic slave trade, the legacy of Jim Crow, segregation, the relief brought by the 1964 Civil Rights Act and 1965 Voting Right Act, and the contemporary political, economic, and social realities experienced by Black Americans. Excluding such individuals from the definition of Black cannot be supported from a political science perspective.

II. Republican Voting Patterns

A. Support for Black Candidates Among White Republican Voters

17. I respond to two assertions made in Dr. Hood's report. First, Dr. Hood asserts that "ideology trumps race in the case of white Republicans and their support for GOP minority candidates," citing specifically an article Dr. Hood published with Seth C. McKee.[15]

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[12] Spickard, P.R. (1992). The Illogic of American Racial Categories in *Racially mixed people in America*, (in Root, M P.P. Root ed.), p. 12-23. Sage Publishing: Thousand Oaks, California. This observation is cited in Hickman, *supra* n.5.
[13] Davis, *supra* n.5.
[14] Martin, B. L. (1991). From Negro to Black to African American: The Power of Names and Naming. *Political Science Quarterly*, *106*(1), 83–107.
[15] Hood Rep. at 15 (citing Hood, M. V., & Mckee, S. C. (2015). True Colors: White Conservative Support for Minority Republican Candidates. *The Public Opinion Quarterly*, *79*(1), 28–52).

18. In the cited article, while the authors conclude that conservative whites will vote for conservative minority candidates, they provide no explicit discussion of white Republican willingness to vote for Black candidates, the heart of the issue. Nor does the study consider any elections conducted in the state of Alabama.

19. In the analysis, Hood and McKee collapse all the non-white candidates who ran for Congress or Governor in the elections studied—elections in Delaware, Florida, Hawaii, Maryland, Nevada, New Mexico, Ohio, Pennsylvania, South Carolina, Texas, and Vermont into the category of "minority" candidate. This category includes 4 African Americans, 3 Asians, and 4 Hispanics. The level of support among conservative voters for these minority candidates was compared against conservative voters' support for white candidates using the 2006, 2010, and 2012 Cooperative Election Study (formerly known as the Cooperative Congressional Election Study). They provide no discussion of the conditions under which support for a minority candidate will occur.

20. Perhaps more importantly, the mere fact that white Republicans support a minority candidate tells us quite little about whether any of those voters are motivated by racial considerations. As political scientists Hakeem Jefferson and Michael Tesler recently explained, white Republican voters who harbor prejudiced views will still support a Black candidate so long as that candidate takes particular positions on issues relating specifically to race.[16] Specifically, racially prejudiced white voters will support a Black candidate so long as the candidate's positions "don't threaten the racial hierarchy" and give no reason to "worry that the[] candidate[] will

[16] Jefferson, H. & Tesler, M. (2021). Why White Voters With Racist Views Often Still Support Black Republicans, *FiveThirtyEight*, https://fivethirtyeight.com/features/why-racist-white-voters-often-favor-black-republicans/.

represent the interest of Black Americans."[17] In other words, white voters who harbor racial prejudice will support a Black candidate who successfully demonstrates he or she is "not in the business of carrying water for their own racial group."[18] By contrast, they will oppose any Black candidate whom they believe "will fight for 'those people [Black Americans]' and not 'people like us [white Americans].'"[19] Put simply, racially prejudiced white voters "are not hostile to Blackness, per se. They are hostile to a particular manifestation of Blackness – one that reflects a commitment to racial justice and the advancement of [Black Americans'] collective goals."[20]

21. Moreover, Jefferson and Tesler also explain that voting for Black Republicans may be appealing to racially prejudiced whites because "it assuages concerns of being seen as racist by enabling them to say, 'I can't be racist! I voted for the Black candidate!'"[21]

22. The 2016 Republican primary provides a helpful example. During that race, support for candidate Ben Carson, a Black man, was "positively correlated with the belief that Black Americans have too much influence on U.S. politics."[22] Carson also received much more favorable evaluations among Republicans harboring the "overtly prejudiced [view] that 'most African Americans are more violent than most whites'" as compared to white candidate Jeb Bush.[23]

23. When considering partisanship, we know that Democrats and Republicans differ greatly across a wide range of issues. While some of these issues do not pertain to race, many of them do. For example, recent surveys have found the following:

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[17] *Id.*
[18] *Id.*
[19] *Id.*
[20] *Id.*
[21] *Id.*
[22] *Id.*
[23] *Id.*

a. 49 percent of Democrats/Democratic Leaners believe that white people benefit a great deal from advantages in society that Black people do not have, compared to 7 percent of Republicans/Republican Leaners, a 42 percent difference.[24]

b. 67 percent of Democrats/Democrat Leaners believe that when it comes to giving Black people rights the country has not gone far enough, compared to 15 percent of Republicans/Republican Leaners, a 52 difference.[25]

c. 71 percent of Republicans/Republican Leaners believe that a lot of progress has been made when it comes to ensuring equal rights for all Americans regardless of their race/ethnicity, compared to 29 percent of Democrats/Democratic Leaners, a 42 percent difference.[26]

d. 85 percent of Democrats/Democrat Leaners support the Black Lives Matter movement, whereas 78% of Republicans/Republican Leaners say they oppose it.[27]

e. 81 percent of Democrats support removing confederate monuments from public spaces, compared to 17 percent of Republicans, a 62 percent difference.[28]

---

[24] In a Politically Polarized Era, Sharp Divides in Both Partisan Coalitions. *Pew Research Center*. https://www.pewresearch.org/politics/2019/12/17/in-a-politically-polarized-era-sharp-divides-in-both-partisan-coalitions/.

[25] *Id.*

[26] Deep Division in Americans' View of Nation's Racial History – and How to Address It, *Pew Research Center*, https://www.pewresearch.org/politics/2021/08/12/deep-divisions-in-americans-views-of-nations-racial-history-and-how-to-address-it/.

[27] Menasce Horowitz, J. (2021, Sept. 27). Support for Black Lives Matter Declined After George Floyd Protests, but Has Remained Unchanged Since, *Pew Research Center*, https://www.pewresearch.org/fact-tank/2021/09/27/support-for-black-lives-matter-declined-after-george-floyd-protests-but-has-remained-unchanged-since/.

[28] Kelley, A. (2020, July 17). A Majority of Americans Support Removal of Confederate Monuments: Poll. *Washington Post*, https://thehill.com/changing-america/respect/diversity-inclusion/507788-a-majority-of-americans-support-removal-of.

24. These results demonstrate the deep divisions among the two major political parties on issues of race.

B. The 2021 Alabama House District 73 Election

25. The second of Dr. Hood's assertions to which I respond is his identification of the election of Kenneth Paschal, a Black Republican, to the Alabama House of Representatives in 2021, as evidence that ideology is more important than race in determining white Republican voting behavior.

26. For the reasons just explained, Mr. Paschal's election tells us very little about whether his supporters harbor racially prejudiced views. And for purposes of political science methodology, when put into context, this single election in one Alabama State House District with less than 4,000 total votes cast provides almost no insight into anything about white voters in Alabama.

27. Additionally, Paschal's election tells us nothing about polarization between Black and white voters.

28. Paschal is the first Black Republican elected to the Alabama Legislature in 140 years, since the end of Reconstruction. This speaks to the significant historical and contemporary challenges that Black Alabamians, including Black Republicans, face when endeavoring to engage in Alabama politics.

29. Moreover, Paschal's win is an outlier in the field of Black Republicans who have recently run for office but lost in the primary election.[29] Below I list Black Republicans who

[29] *See* Cason, M. (2018, Sept. 9). Alabama Republican Chair Terry Lathan Says Party Can Do More to Recruit African-Americans, *AL.com*, https://www.al.com/news/2018/09/alabama_republican_chair_terry.html.

recently ran in contested Republican primary elections.[30] Candidates in bold advanced to the general election.[31]

Candidate Name	Election Year	Election Type	Office	Votes Received	% of Vote Received
Pamela Blackmore Jenkins	2014	Republican Primary	AL House Seat 46	389	4.90
Philip Brown	2014	Republican Primary	Public Service Commission Position 2	43,097	12.58
Sam Rowlin	2014	Republican Primary	Autauga County Sheriff	1,610	18.74
William McCollum	2014	Republican Primary	Fayette County Sheriff	841	34.58
B.J. Major	2014	Republican Primary	Cherokee County Board of Education Seat 5	466	18.64
Tijuanna Adetunji	2014	Republican Primary	Montgomery City Council District 2	1410	13.79
Ron Wilson	2014	Republican Primary	House District 85	555	34.22
Sharica S. Long	2018	Republican Primary	Colbert County Circuit Clerk	1,097	19.9
Phillip	**2018**	**Republican Primary**	**Jefferson County Executive Committee, Dis 1 Pt. 2**	**797**	**46.2**

[30] There are other candidates who are listed by the Republican party as qualifying for elections in 2014 and 2018. The results of some of these primary elections, however, are not provided in the official certification on the Alabama Secretary of State website. Although most counties do not have election websites that provide archived results, where possible, I checked county election websites. I also used the website Ballotpedia to verify the returns in primary and general elections for Black Republicans who ran in 2014 and 2018, but I did not use that website as a primary source of information. This list represents the most comprehensive set of information available in light of these data limitations.

[31] I obtained the certified elections results from the Alabama Secretary of State's public website.

Brown[32]					
Derrick Williams	2016	Republican Primary	District Judge Mobile County P. 4	4371	12.3
John H. Moore	2018	Republican Primary	Morgan County Sheriff	319	1.8
Lewis Brooks[33]	**2018**	**Republican Primary**	**Shelby County School Superintendent**	**12626**	**50.7**
Randy Turner	2018	Republican Primary	Morgan County Commissioner	4907	31.9
Allen Hendrickson	2018	Republican Primary	Houston County Commission Seat 2	700	19.2
Jayla McElrath	2018	Republican Primary	Cherokee County Board of Elections Place 4	1217	25.9

30. Finally, if we consider the vote returns from Paschal's performance in both the Republican Primary and Republican Primary runoff as a proxy for white Republican Party support of his candidacy, it is not overwhelming by any means. In the March 30, 2021 House District 73 Special Republican Primary, Paschal received just 27% of votes cast, and the remaining votes went to other candidates. Leigh Hulsey, a white candidate whom Paschal faced in the runoff, received 30.7% of votes cast in the initial primary election.[34] In the April 27 primary runoff election, Husley received 1,414 votes (48.91% of votes cast) and Paschal received 1,477 votes (51.09 % of votes

[32] There is no record of a runoff for this seat in the 2018 returns on the SOS website. 2018 election results are not archived on the Jefferson County Elections website (https://www.jccal.org/Default.asp?ID=1480&pg=Elections+Results). Brown, however, proceeded to the 2018 General Election, and is in bold for this reason.

[33] This election is not in the 2018 returns on the SOS website and the Shelby County Probate Office does not have an election results archive. There was no Democratic Party challenger in the general election. The information about the race is from Dawkins, S. (2018, June 5). Brooks Wins Tightly Contested Race for Superintendent of Shelby County Schools. *Shelby County Reporter*. https://www.shelbycountyreporter.com/2018/06/05/brooks-wins-tightly-contested-race-for-superintendent-of-shelby-county-schools/.

[34] Alabama Secretary of State: https://www.sos.alabama.gov/sites/default/files/election-2021/Certification%20of%20Primary%20Results.pdf).

cast), a difference of just 63 votes.[35] Both the overall number of ballots cast in these elections and the margins between Paschal and Hulsey are small. Using this example to extrapolate any conclusion about white voting behavior in Alabama would be scientifically unsound.

# # #

I declare under penalty of perjury that the foregoing is true and correct. I reserve the right to supplement my report in light of additional facts, testimony, and/or materials that may come to light.

Executed on: December 20, 2021

Bridgett King

[35] Alabama Secretary of State: https://www.sos.alabama.gov/sites/default/files/election-2021/HD73_Republican_Party-Certification_of_Results-Special_Primary_Runoff_Election.pdf.

FILED
2021 Dec-21 AM 10:10
U.S. DISTRICT COURT
N.D. OF ALABAMA

IN THE UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF ALABAMA
SOUTHERN DIVISION

MARCUS CASTER, LAKEISHA CHESTNUT, BOBBY LEE DUBOSE, BENJAMIN JONES, RODNEY ALLEN LOVE, MANASSEH POWELL, RONALD SMITH, and WENDELL THOMAS, Plaintiffs, v. JOHN H. MERRILL, in his official capacity as Alabama Secretary of State, Defendant.	Case No. 2:21-CV-1536-AMM

SECOND DECLARATION OF WILLIAM S. COOPER

WILLIAM S. COOPER, acting in accordance with 28 U.S.C. § 1746, Federal Rule of Civil Procedure 26(a)(2)(B), and Federal Rules of Evidence 702 and 703, does hereby declare and say:

1. My name is William S. Cooper. I serve as a demographic and redistricting expert for the Plaintiffs. I filed a declaration in this lawsuit on December 10, 2021.

2. I file this second declaration to respond to assertions made in Thomas Bryan's December 10, 2021 report as it pertains to the *Gingles* 1 analysis in my December 10, 2021 declaration ("December 10 Declaration").

I. Illustrative Plan 7

3. First, Mr. Bryan criticizes an illustrative plan that "scores worse" than the 2021 Plan in his opinion on compactness. *See* Bryan Milligan and Caster Report at 31.

4. To be clear, there is no bright line rule as to what constitutes a sufficiently compact redistricting plan or district. There are many factors that the map drawer must take into account, such as odd-shaped precincts and jurisdictional lines, that can impact compactness.

5. While Illustrative Plans 1-6 offer multiple ways to draw an additional majority-Black district consistent with traditional districting principles, they are by no means the sole way to do so. Specific to Mr. Bryan's concern, it is certainly possible to draw another such district while prioritizing compactness.

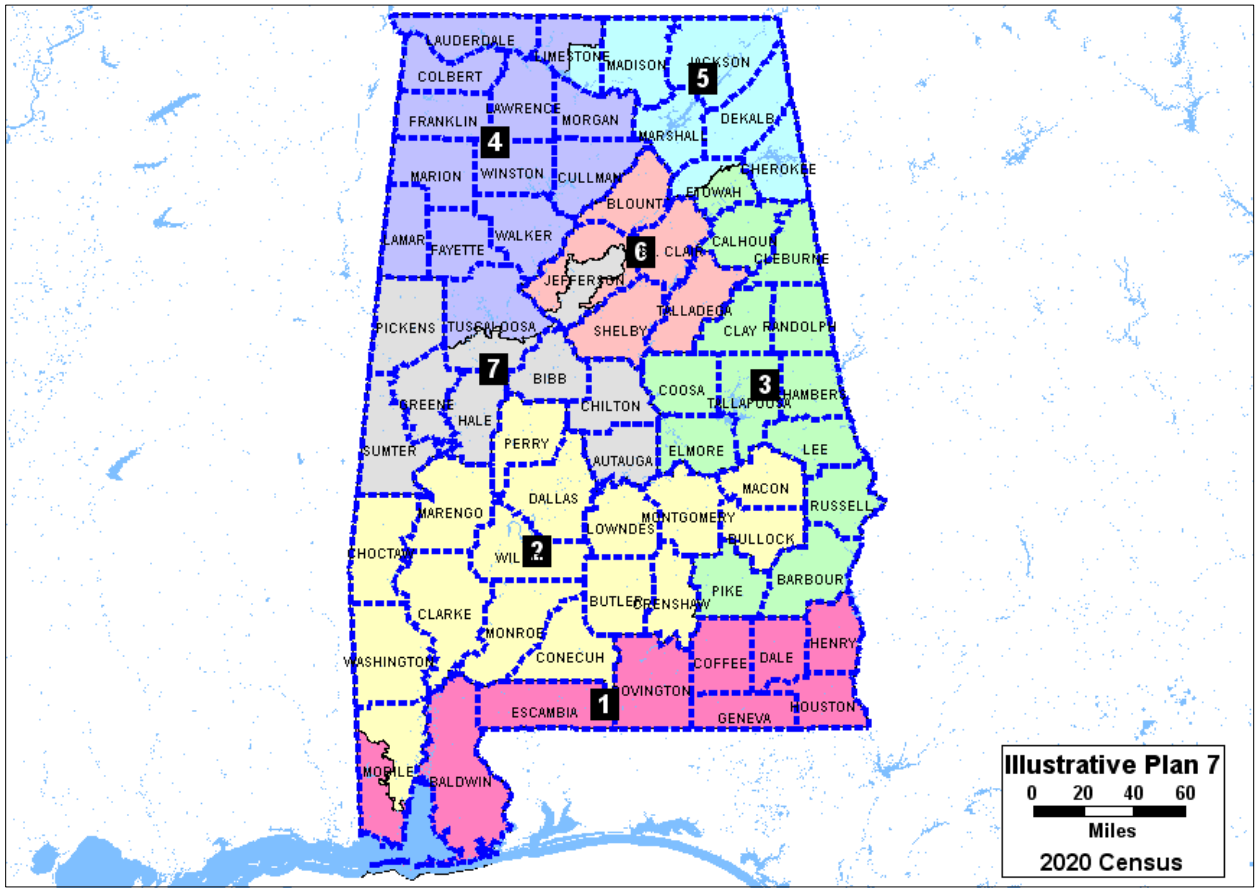
6. In response to Mr. Bryan's criticism, I present an additional plan – Illustrative Plan 7 – to add to the six illustrative plans presented in my December 10 Declaration. Illustrative Plan 7 achieves higher compactness scores than the compactness scores I documented for Illustrative Plans 1 through 6. Compactness scores for Illustrative Plan 7 are on par with, or superior to, the 2021 Enacted Plan. Illustrative Plan 7 splits just five counties – one less than the 2021 Enacted Plan.

7. The map in **Figure 1** depicts Illustrative Plan 7. District 2 is 51.88% BVAP and District 7 is 50.31% BVAP.

8. As in Illustrative Plan 6, majority-Black District 2 is drawn so that both the City of Mobile and the City of Montgomery (and Montgomery County) are entirely in District 2.

Figure 1

Alabama U.S. House – Illustrative Plan 7



9. Majority-Black District 2 extends north to Choctaw County and then east through the Black Belt, encompassing whole counties. Macon and Bullock Counties form the easternmost border.

10. As is the case under the enacted 2021 BOE Plan, from District 1 it is necessary to drive for a short distance through District 2 (BOE District 5) in order

to get to the Baldwin County portion of District 1 (BOE District 1).[1] The enacted 2021 Senate Plan also contains this feature. There are no roads directly connecting the Washington County and Mobile County portions of SD 22 with the Baldwin County portion of SD 22 without driving outside of the district to reach I-10 or I-65 into Baldwin County.

11. Majority-Black District 7 in Illustrative Plan 7 encompasses part of the Counties of Jefferson and Tuscaloosa, extending west to Hale, Green, Sumter, and Pickens Counties. To the southeast, District 7 encompasses all of Bibb, Autauga, and Chilton Counties.

12. The table in **Figure 2** shows 2020 summary population statistics for Illustrative Plan 7. **Exhibit A-1** contains detailed 2020 population statistics by district.

[1] In Illustrative Plans 1 through 6, there is a direct route from District 1 in Mobile County to District 1 in Baldwin County.

Figure 2

2021 Illustrative Plan 7 – 2020 Census

District	Population	18+ Pop	% 18+ AP Black	% 18+ NH White
1	717753	556689	15.58%	75.40%
2	717752	559658	51.88%	42.02%
3	717755	564958	25.51%	66.69%
4	717755	564081	8.63%	82.48%
5	717755	557105	16.11%	71.57%
6	717755	555983	13.25%	78.02%
7	717754	558692	50.31%	42.08%

13. The map in **Exhibit A-2** is a higher resolution version of the **Figure 1** map. **Exhibit A-3** contains maps focusing on District 2 and District 7 and adjacent areas.

14. As shown in **Exhibit A-4**, Illustrative Plan 7 splits five counties and populated areas in 28 VTDs. However, ten of the 28 VTD splits are created because the plan generally follows the city limits of the City of Mobile (rather than VTDs) to define the boundary between District 1 and District 2.

15. In addition to being majority-BVAP, Districts 2 and 7 are majority-non-Hispanic AP BVAP—50.97% and 50.83%, respectively—a feature Illustrative Plan 7 shares with Illustrative Plan 6.[2]

16. I have therefore provided the Court with seven illustrative congressional plans that adhere to traditional redistricting principles and the state's redistricting

[2] Under Illustrative Plan 6, District 2 and District 7 are also majority SR BVAP – 50.19% and 50.05%, respectively.

guidelines, which include population equality, compactness, contiguity, respect for communities of interest, and the non-dilution of minority voting strength.

II. Compactness Scores -- Illustrative Plans and 2021 Enacted Statewide Plans

17. I present expanded district-by-district compactness scores (including Convex Hull and Schwartzberg analyses) for each of my seven illustrative plans, as well as the four statewide plans signed into law in 2021 by Governor Ivey – the 2021 U.S. House Plan ("2021 Plan"), the Board of Education Plan ("2021 BOE Plan"), the 2021 Senate Plan ("2021 Senate Plan"), and the 2021 State House Plan ("2021 House Plan").[3] Mr. Bryan presents these scores for various enacted and hypothetical district plans. Bryan Milligan and Caster Report at 29-30.

18. **Figure 3** reports compactness scores generated by Maptitude for Illustrative Plan 7, the 2021 U.S. Congressional Plan, the 2021 BOE Plan, the 2021 State Senate Plan, and the 2021 State House Plan. The Figure 3 table summarizes the Reock and Polsby-Popper scores – the two most widely-referenced measures of compactness. Higher scores indicate higher compactness.[4]

[3] I was unable to provide this information in my December 10 Declaration because I did not have the GIS shapefile of the plans. The GIS shapefiles for the three statewide plans were obtained by the attorneys for the plaintiffs during the post-December 10 discovery process.

[4] See my December 10 Declaration at ¶¶ 82-84 for a similar table with compactness scores for Illustrative Plans 1 through 6 and the 2011 BOE and 2011 U.S. House plans.

Figure 3

Compactness Scores – Illustrative Plan 7 vs 2021 Plans

	Reock				Polsby-Popper		
		Low	High			Low	High
Illustrative Plan 7							
All Districts (mean avg.)	.41	.20	.56		.21	.13	.39
District 2	.39				.19		
District 7	.37				.13		
2021 U.S. Congressional Plan							
All Districts (mean avg.)	.38	.30	.50		.22	.15	.32
CD 2	.50				.26		
CD 7	.43				.19		
2021 BOE Plan							
All Districts (mean avg.)	.39	.24	.52		.24	.18	.38
District 4	.35				.18		
District 5	.36				.19		
2021 Senate Plan							
All Districts (mean avg.)	.41	.19.	.63		.26	.12	.54
2021 House Plan							
All Districts (mean avg.)	.39	.11	.62		.24	.07	.60

19. **Exhibit B-1** through **B-7** contains district-by-district compactness scores for the seven illustrative plans. In addition to Reock and Polsby-Popper, there are Maptitude generated scores under the Convex/Hull[5] measure (higher is better) and the Schwartzberg measure[6] (lower is better).

[5] "The Area/Convex Hull test computes the ratio the district area to the area of the convex hull of the district (minimum convex polygon which completely contains the district). The measure is always between 0 and 1, with 1 being the most compact. The Minimum Convex Polygon test computes one number for each district and the minimum, maximum, mean and standard deviation for the plan." *Maptitude For Redistricting* software documentation (authored by the Caliper Corporation).

[6] "The Schwartzberg test is a perimeter-based measure that compares a simplified version of each district to a circle, which is considered to be the most compact shape possible. This test requires the base layer that was used to create the districts. The base layer is used to simplify each district to exclude complicated coastlines. . . . This measure is usually greater than or equal

20. The four compactness measures in the Exhibit B series are the ones that Mr. Bryan purports to use in his analysis of the Hatcher Plan and the 2021 Plan. Mr. Bryan's report of the Schwartzberg scores is plainly erroneous, because those scores cannot fall below 1. Lower (not higher) scores are better and 1.0 is both the lowest and the most compact score possible.

21. Also, with respect to compactness scores, it was methodologically flawed for Mr. Bryan to sum the compactness scores across measures to compare and contrast scores with a single consolidated data point.

22. The **Exhibit C** series contains district-by-district compactness scores for the 2021 Plan, the 2021 BOE Plan, the 2021 State Senate, and 2021 State House in the same format as the Exhibit B series.

III. Comparative Compactness Scores – A Texas Case Study

23. In my December 10 Declaration, I referenced a 2012 study conducted by Azavea with compactness score comparisons for congressional plans in the 2010 Census redistricting cycle.[7] Based on the Azavea report, in my opinion, compactness scores for the Illustrative Plans fall within a normal range when compared with plans in other states.

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to 1, with 1 being the most compact." *Maptitude For Redistricting* software documentation (authored by the Caliper Corporation).

[7] https://2rct3i2488gxf9jvb1lqhek9-wpengine.netdna-ssl.com/wp-content/uploads/2019/08/Azavea_Redistricting-White-Paper-Addendum-2012_sm.pdf

24. **Exhibit D-1** contains Reock and Polsby Popper scores for the 2021 congressional plan recently enacted in Texas, where Mr. Bryan serves as a consultant to the Republican House Redistricting Committee. Bryan Milligan and Caster Report at 3.

25. As shown in **Exhibit D-1**, the mean average Reock and Polsby-Popper scores for the 2021 Texas congressional plan is about the same as those of the Illustrative Plans. Several Texas congressional districts score significantly worse than the Illustrative Plan districts.

26. Eight Texas congressional districts have Reock scores below .29, which is the lowest score for the Illustrative Plans. The lowest Reock scores are TX CD 14 (.19), TX CD 15 (.12), and TX CD 35 (.08).

27. Nine Texas districts have Polsby-Popper scores below .11 – the lowest score for the Illustrative Plans. The lowest Polsby-Popper score is registered by TX CD 33 at .04.

28. **Exhibit D-2** (Texas Senate) and **Exhibit D-3** (Texas House) are in a similar format as Exhibit D-1. Both exhibits reveal a number of compactness scores lower than the Illustrative Plans.

IV. Proper BVAP Metric

29. In my December 10 Declaration, I discuss how AP Black, as opposed to SR Black, is the appropriate metric for determining the Black population of a given district. Initial Declaration at 3 n.3. Mr. Bryan claims SR Black has been "most consistently used historically in VRA cases." *See* Bryan Milligan and Caster Report at 10. In my experience, this is wrong and courts have consistently accepted AP Black as the correct measure in Section 2 cases.

30. As explained in *Georgia v. Ashcroft*, 539 U.S. 461, 473 n.1 (2003), the appropriate *Gingles* 1 metric in this case is AP BVAP due to the relatively small population percentage of single-race minority voters in Alabama who are some race other than Black.

31. Throughout the 2010s, I have consistently reported AP BVAP in litigation and non-litigation settings.

32. Courts in Section 2 cases in which I served as an expert in the 2010s have accepted the Any Part classification for the *Gingles* 1 analysis. *See Ga. State Conf. of NAACP v. Fayette Cnty. Bd. of Comm'rs*, 118 F. Supp. 3d 1338 (N.D. Ga. 2015); *Missouri State Conference NAACP et al. v. Ferguson-Florissant School District*, 201 F. Supp. 3d 1006 (E.D. Mo. 2016).[8]

[8] I have also used AP BVAP in other cases where the court relied on my testimony without making a specific finding as to the appropriateness of using the figure.

33. To my recollection, the first time I reported Any Part VAP statistics was in the 2006 remedial phase of *Bone Shirt v. Hazeltine*, No. 01-cv-3032 (D.S.D.). In that lawsuit, an illustrative plan that I developed became the court-ordered remedial plan.[9]

V. Voter Registration by Race by District– Illustrative Plans and 2021 Plan

34. Regardless, my Illustrative Plans demonstrate the ability to draw two majority-Black congressional districts using either AP BVAP or SR BVAP. *See supra* n.2.

35. Voter registration data further demonstrates that the majority of eligible voters in these district are Black. Though he is incorrect, Mr. Bryan claims Black alone is the "most defensible" definition to use when measuring the Black population. Bryan Milligan and Caster Report at 10. Because Alabama's voter registration form allows voters to choose only one race, those statistics demonstrate that the majority of registered voters in Districts 2 and 7 in all seven Illustrative Plans self-identified as Black.

36. Below, I provide 2021 voter registration statistics for active voters who self-identified as Black in areas encompassed by District 2 and District 7 in the

[9] In Footnote 14 in my December 10 Declaration, I mistakenly stated that the Any Part classification was not available from the 2000 PL94-171 redistricting file. While Any Part Black counts were not available in the 1990 Census PL 94-171 file, they were available in the 2000 PL94-171 file.

Illustrative Plans.

37. I used *Maptitude for Redistricting* to geocode a statewide list of 3.16 million active registered voters obtained by the plaintiffs' attorneys through discovery.

38. As shown in **Figure 4**, under all seven illustrative plans, Black registered voters are a majority in District 2 and District 7.

Figure 4

Black Registered Voters in District 2 and District 7 by Illustrative Plan

Plan Number	District 2	District 7
Plan 1	51.8%	57.7%
Plan 2	52.3%	58.3%
Plan 3	52.0%	52.7%
Plan 4	51.7%	54.2%
Plan 5	52.3%	53.8%
Plan 6	53.3%	54.6%
Plan 7	53.6%	53.5%

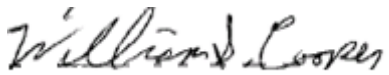
39. Current Black registered voter percentages are higher than the CVAP estimates I reported in my December 10 Declaration. There are at least two reasons for this difference: (1) the CVAP estimates count only persons who are non-Hispanic single-race Black; and (2) the 2015-2019 ACS is historical, with a survey midpoint of July 1, 2017.

# # #

I reserve the right to continue to supplement my reports in light of additional facts, testimony and/or materials that may come to light.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on: December 20, 2021



WILLIAM S. COOPER

FILED
2021 Dec-23 PM 06:21
U.S. DISTRICT COURT
N.D. OF ALABAMA

My name is Thomas Bryan[1]. I am a professional demographer and political redistricting expert witness. I have been retained by the State of Alabama to provide analysis and support in the case of *Milligan v. Merrill* and *Caster v. Merrill*.[2] A copy of my CV was attached to earlier reports, and my earlier reports addressed my qualifications and compensation.

I am over 18 years of age and I have personal knowledge of the facts stated herein.

In this supplemental report, I provide:

1) An analysis of plans presented by plaintiff experts Mr. Bill Cooper and Dr. Moon Duchin;
2) A summary and interpretation of traditional redistricting principles;
3) A discussion and analysis of the census and DOJ definitions of "Black" population and a summary of demographic characteristics of the Duchin and Cooper Plans.
4) An analysis and evaluation of the Duchin and Cooper plans, including a:
   A. core retention analysis (CRA)
   B. incumbency; and
   C. compactness analysis.
5) Appendices
   1. Alabama Census 2020 Total and Black Population
   2. Alabama Census 2020 Total and Black Voting Age Population
   3. Demographic Statistics
   4. Core Retention Analysis; and
   5. Compactness Measures and Statistics

1) An Analysis of Dr. Duchin and Mr. Bill Cooper Plans

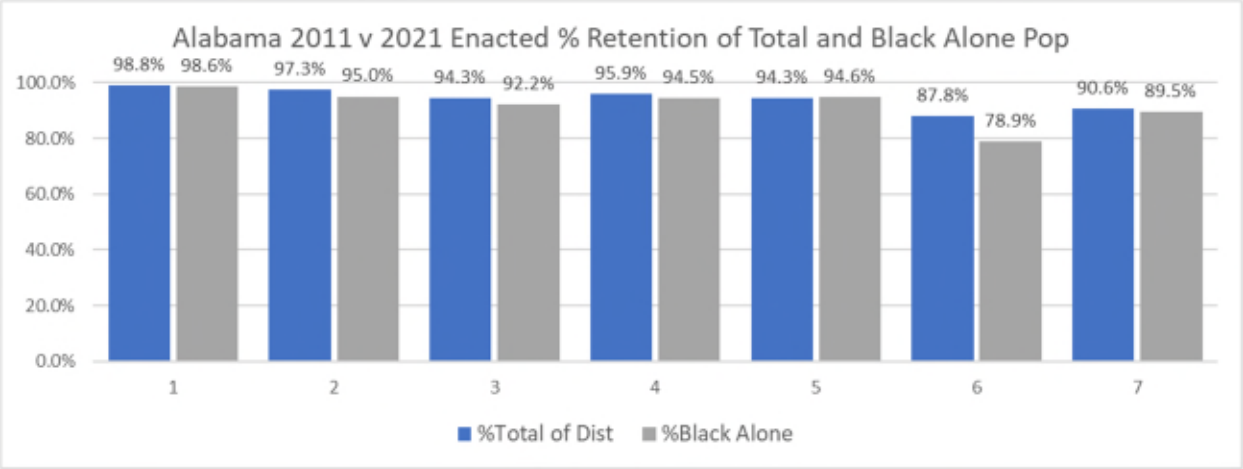
This report is submitted as a supplemental report in *Milligan v. Merrill* and *Caster v. Merrill*. Plaintiffs in both cases allege that Section 2 of the Voting Rights Act requires Alabama to draw two majority-black districts (the Milligan Plaintiffs also assert claims of racial gerrymandering and intentional gerrymandering). The *Milligan* plaintiffs present a plan in their complaint ("the Hatcher plan") that significantly changes the representational landscape of the state and deviates far from a "least change" approach. Plaintiffs submitted, among other experts, the reports of Dr. Moon Duchin and Mr. Bill Cooper who present various demonstrative plans, each of which has a structure similar to the Hatcher plan. Dr. Duchin and Mr. Cooper have testified in numerous cases about redistricting and are known to me.

[1] https://www.linkedin.com/in/thomas-bryan-424a6912/

[2] https://redistricting.lls.edu/case/milligan-v-merrill/ and https://redistricting.lls.edu/case/caster-v-merrill/

In Figure 2, it can be seen that core retention of the total population and the Black population by the State of Alabama 2021 enacted plan compared to the 2011 existing Alabama plan is significant, consistent and comparable, which should have been expected given the least change approach of the 2021 plan.

Core Retention Figure 2 Total and Black Population: 2011 Existing v 2021 Enacted Plans



I refer here to Duchin Core Retention Analyses Appendix, CRA Figures 1-8. The first of each pair of figures compares core retention of the total population (in blue) against core retention of the Black alone population (in grey) for the plan. The second of each pair of figures compares core retention of the Black alone population from the enacted Alabama plan (in grey) with the core retention of the Black alone population from the Duchin plan. Across each of the charts, two themes prevail. First – by comparing the core retention of the Duchin plans with the core retention of the enacted Alabama plan (above) – the total core retention of the Alabama plan is higher (often significantly) than all of the districts in all of the Duchin plans. Second, comparing the core retention of the Black alone population specifically – the core retention of Alabama's enacted plan is significantly higher than the Duchin plans. In comparing to total retention of the Alabama Plan with the Duchin plans in Figures 3-6 below, the Alabama Plan performs substantially better.

Core Retention Figure 3: Duchin Plan A

Duchin A	Total Population	Black Alone Population
Number Retained	2,933,247	812,954
Percent Retained	58.4%	63.1%
Number Displaced	2,091,032	475,205
Grand Total	5,024,279	1,288,159

In Table 2 below the results pass the "eyeball test" that is: you can just look at District 2 and see that it has simple geometry. It has numerous straight segments and is compact in the sense it fits nicely in its circumscribing circle. But some details in the table are not intuitive. The districts with significant lengths of riparian boundaries tend to score poorly (and are hard to see from a statewide map). Smaller river segments have greater sinuosity, thus greater lengths. Districts 1, 4, 6, and 7 have long lengths of river boundaries. District 5 has numerous straight line segments but suffers from being elongated (that is, it fits poorly in a circle).

Compactness Table 2 Alabama 2021 Enacted Plan Compactness Scores

District	Polsby-Popper	Schwartzberg	Reock	Convex_Hull	Total
1	0.20	0.44	0.40	0.71	1.75
2	0.26	0.51	0.50	0.76	2.02
3	0.25	0.50	0.36	0.77	1.88
4	0.19	0.44	0.36	0.61	1.60
5	0.32	0.56	0.30	0.80	1.98
6	0.15	0.39	0.31	0.68	1.55
7	0.19	0.44	0.43	0.68	1.74
Sum	1.55	3.28	2.67	5.01	
Average	0.22	0.47	0.38	0.72	

In Compactness Table 2 (above), we first note that by looking at the "Sum" and "Average" rows at the bottom - compactness scores are higher in each measure than the 2011 congressional plan. Next I look at individual districts. Each method ranks each district differently. Polsby-Popper and Schwartzberg and Convex-Hull ranks D5 as being the best, while Reock ranks D2 highest. In looking at the last column "Total" we see that D2 actually prevails as the most compact district. My interpretation is that the highest ranking districts are comparable, but that D4, D6 and D7 are least compact – due in part to a significant amount of border being waterways at the Bankhead Lake intersection.

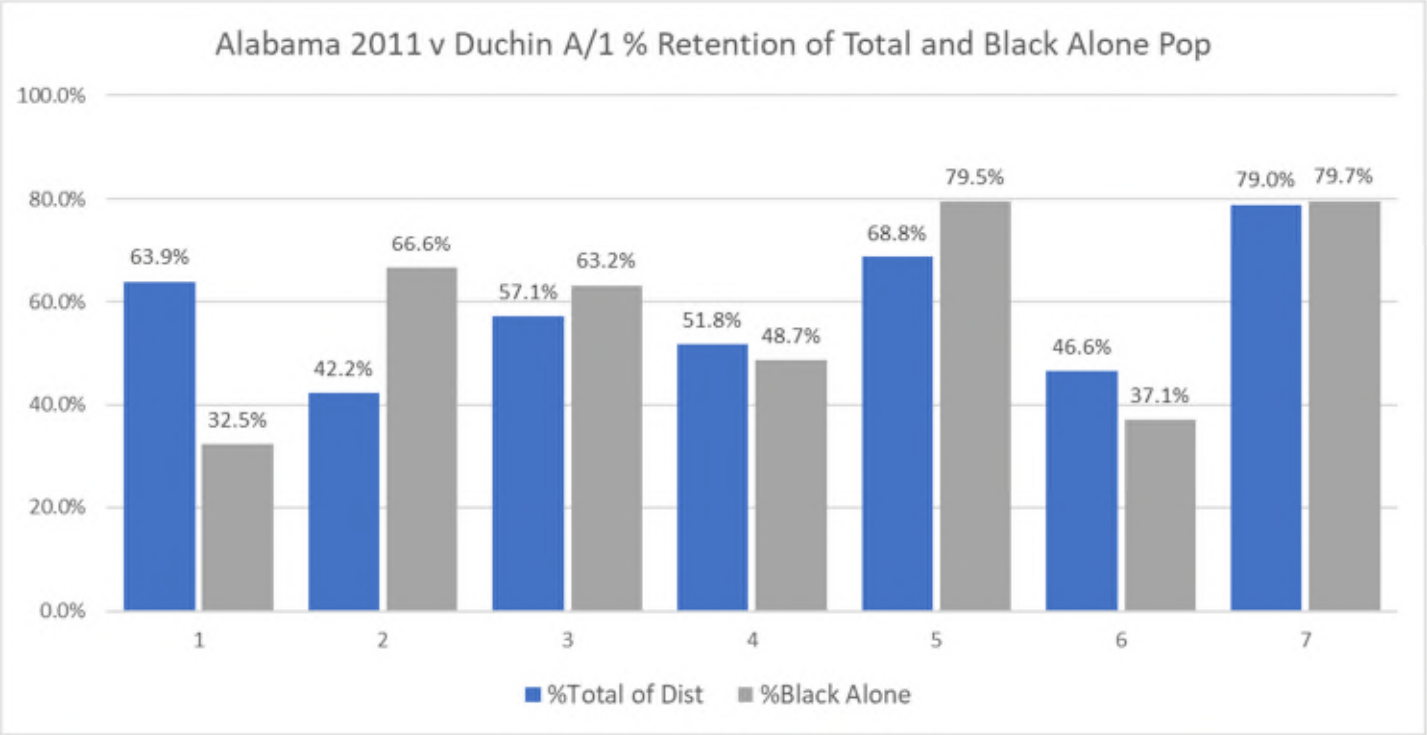
In Compactness Table 3 (below), we see the average compactness scores for the 2011 Existing Plan, the 2021 Enacted Plan, Duchin Plans A-D and Cooper Plans 1-6. Outside of Cooper Plan 4, the remaining Cooper Plans all have inferior compactness scores to the Duchin Plans, the 2011 Existing Plan and the 2021 Enacted Plan. Only Cooper Plan 4 has comparable scores to the other plans. Consistent with her direction and commitment to deliver plans with improved compactness scores, Dr. Duchin's Plans A-D almost always show higher compactness scores than the enacted Alabama plan on average. However, I note that in all four of Dr. Duchin's plans, Districts 1 and 2 (one of her purported majority-BVAP districts) were made far less compact. Details of compactness scores by plan and by district are presented in Appendix 5.

Appendix 4

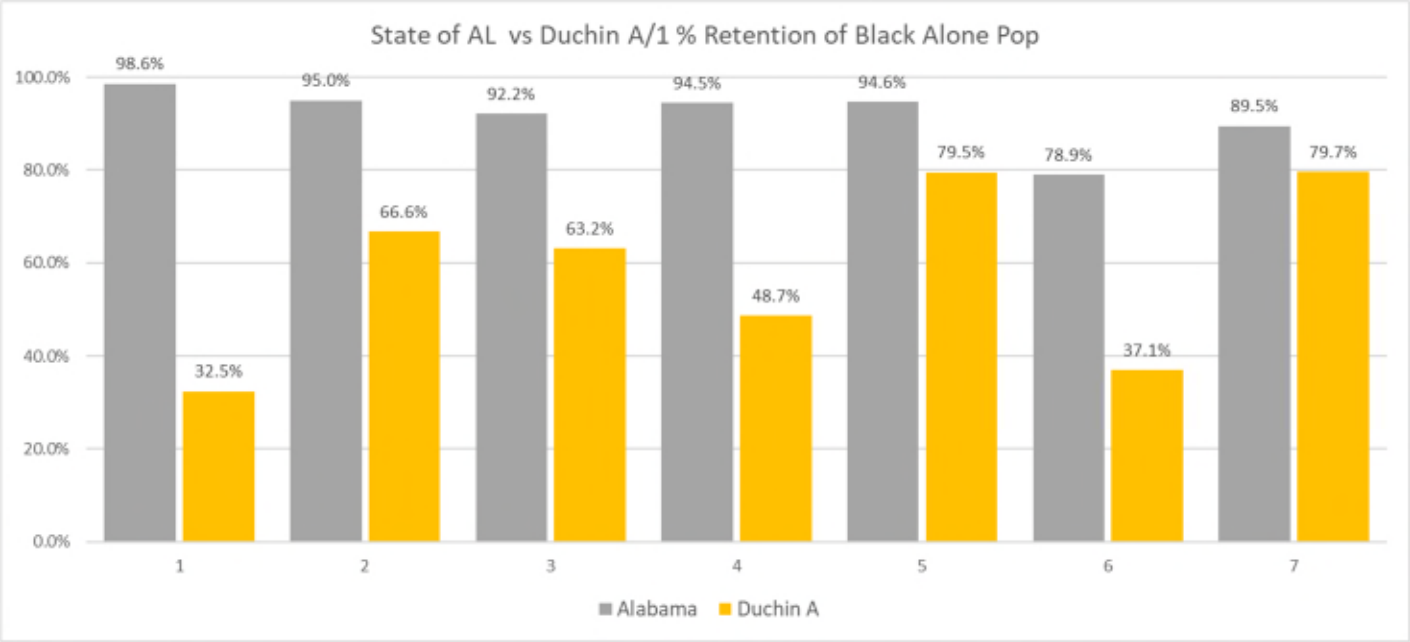
Core Retention Analysis

Duchin CRA Charts Appendix

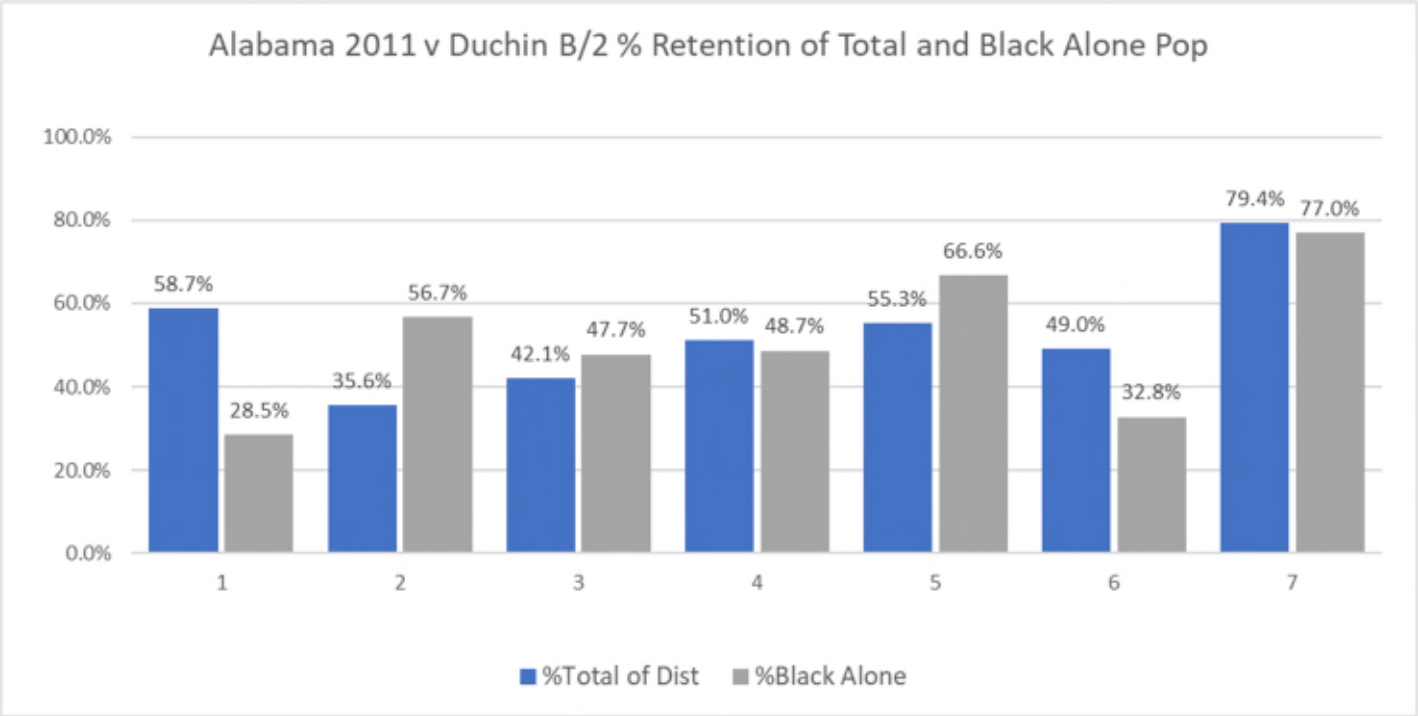
CRA Figure 4.1 Core Retention of Total and Black Population: 2011 Existing v Duchin A



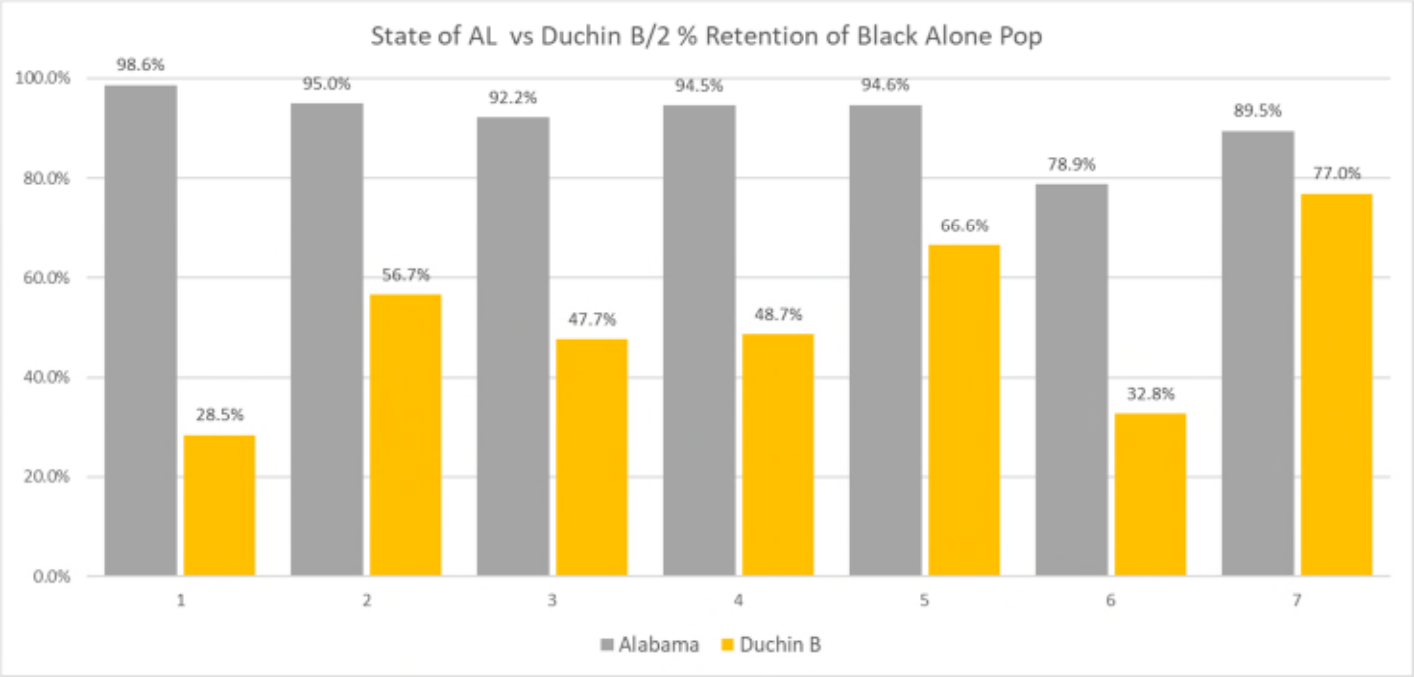
CRA Figure 4.2 Core Retention of Black Alone Population: 2021 Enacted v Duchin A



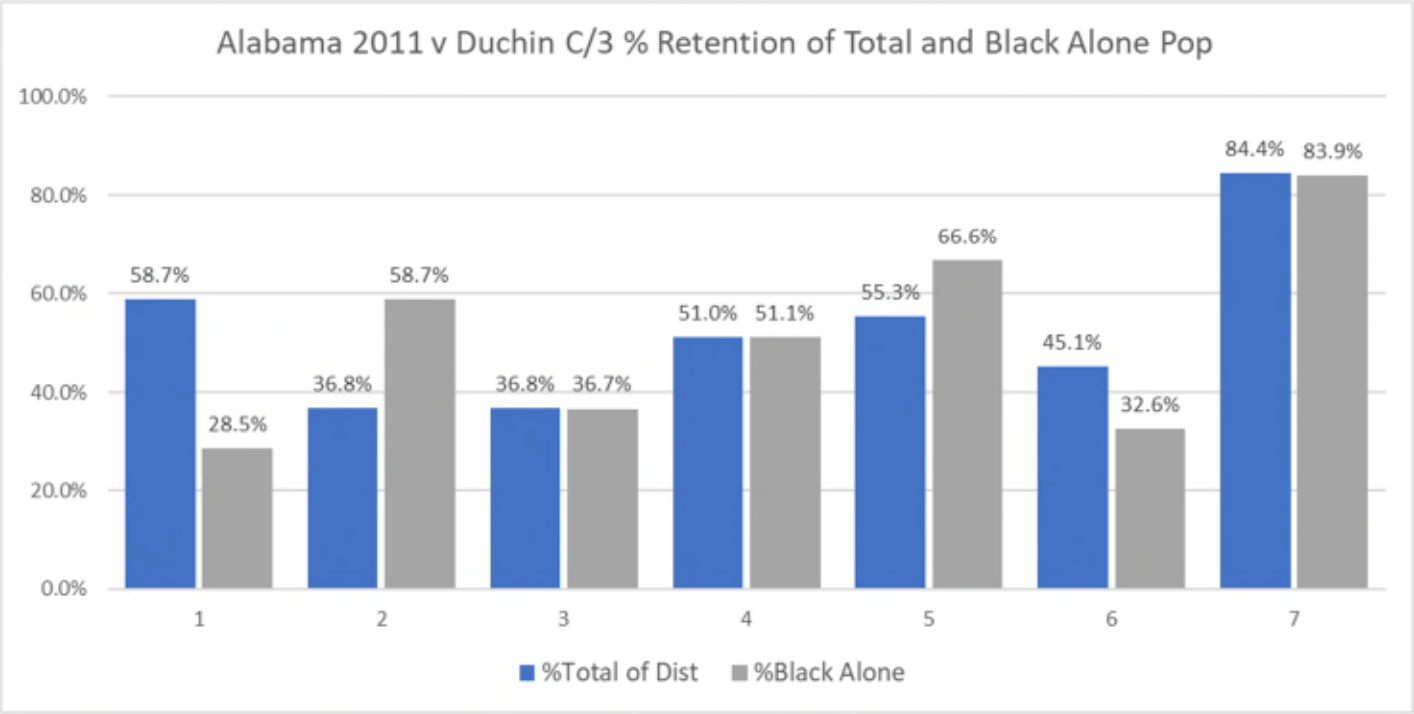
CRA Figure 4.3 Core Retention of Total and Black Population: 2011 Existing v Duchin B



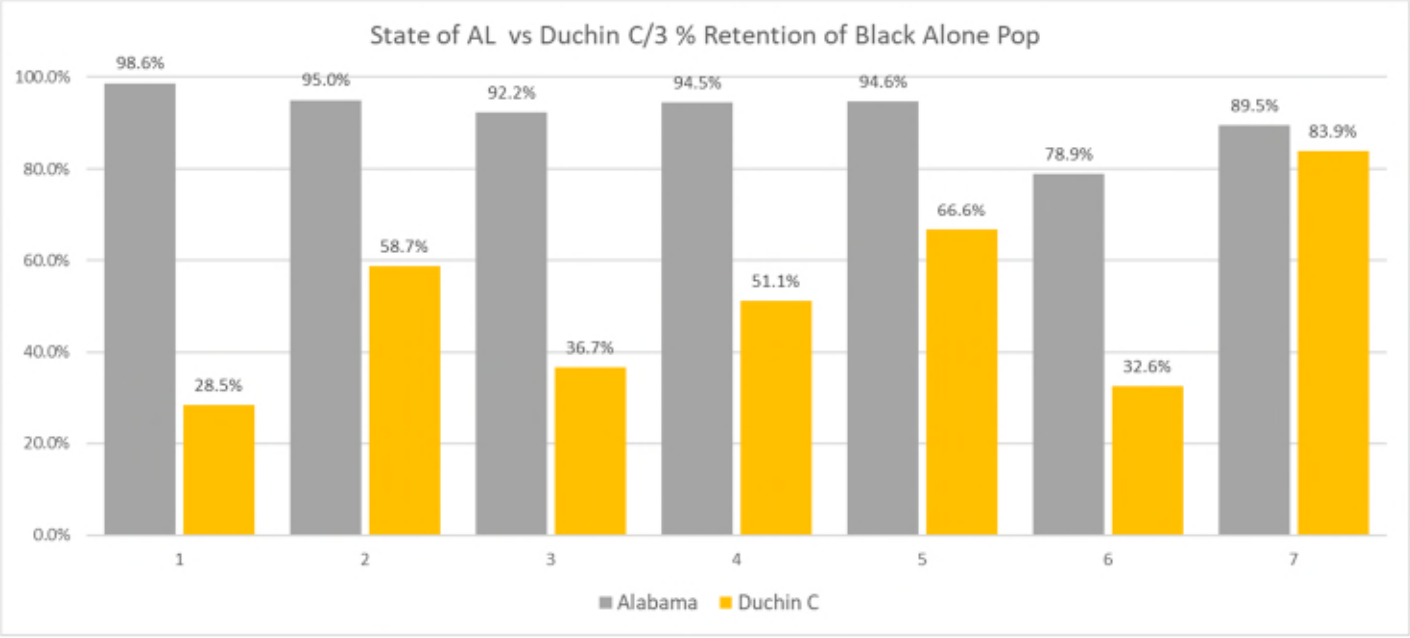
CRA Figure 4.4 Core Retention of Black Alone Population: 2021 Enacted v Duchin B



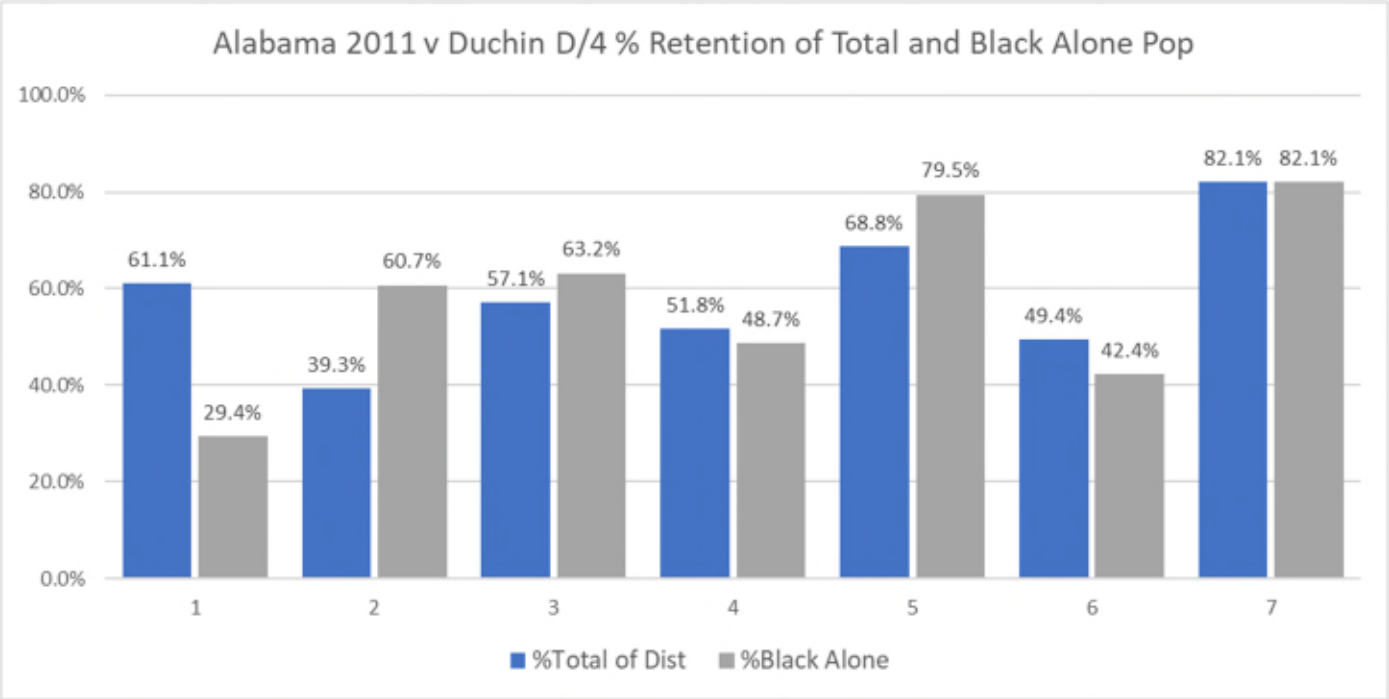
CRA Figure 4.5 Core Retention of Total and Black Population: 2011 Existing v Duchin C



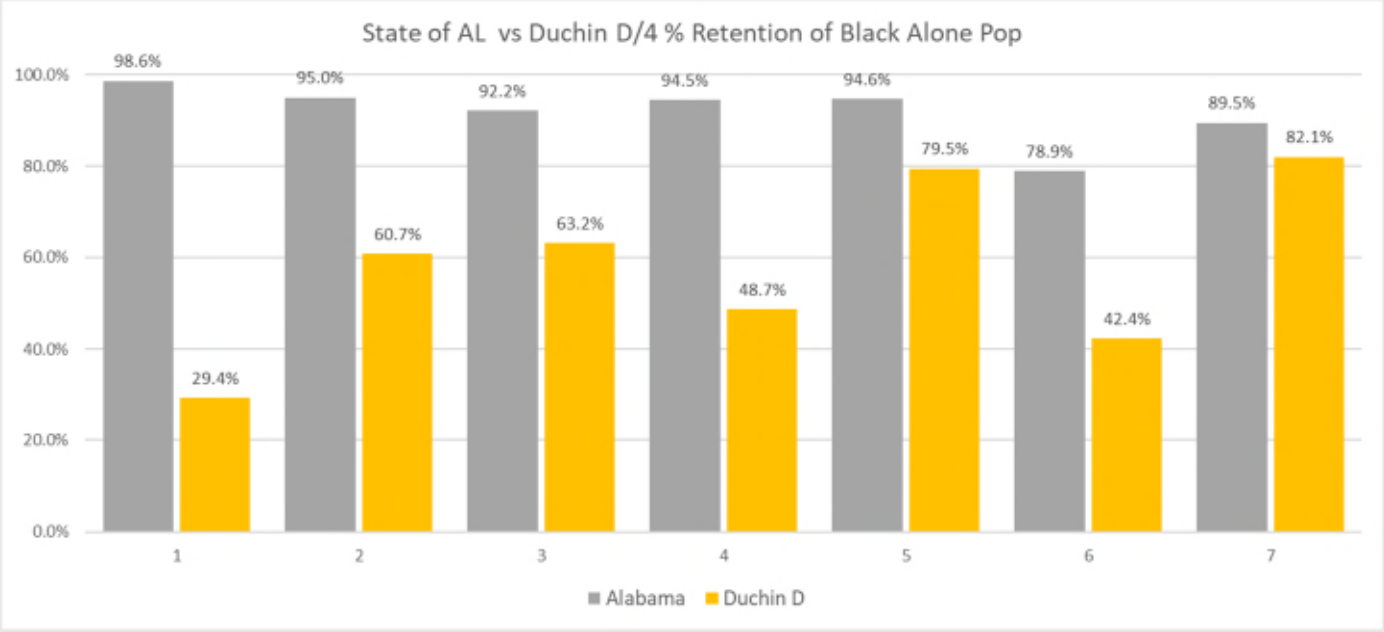
CRA Figure 4.6 Core Retention of Black Alone Population: 2021 Enacted v Duchin C



CRA Figure 4.7 Core Retention of Total and Black Population: 2011 Existing v Duchin D

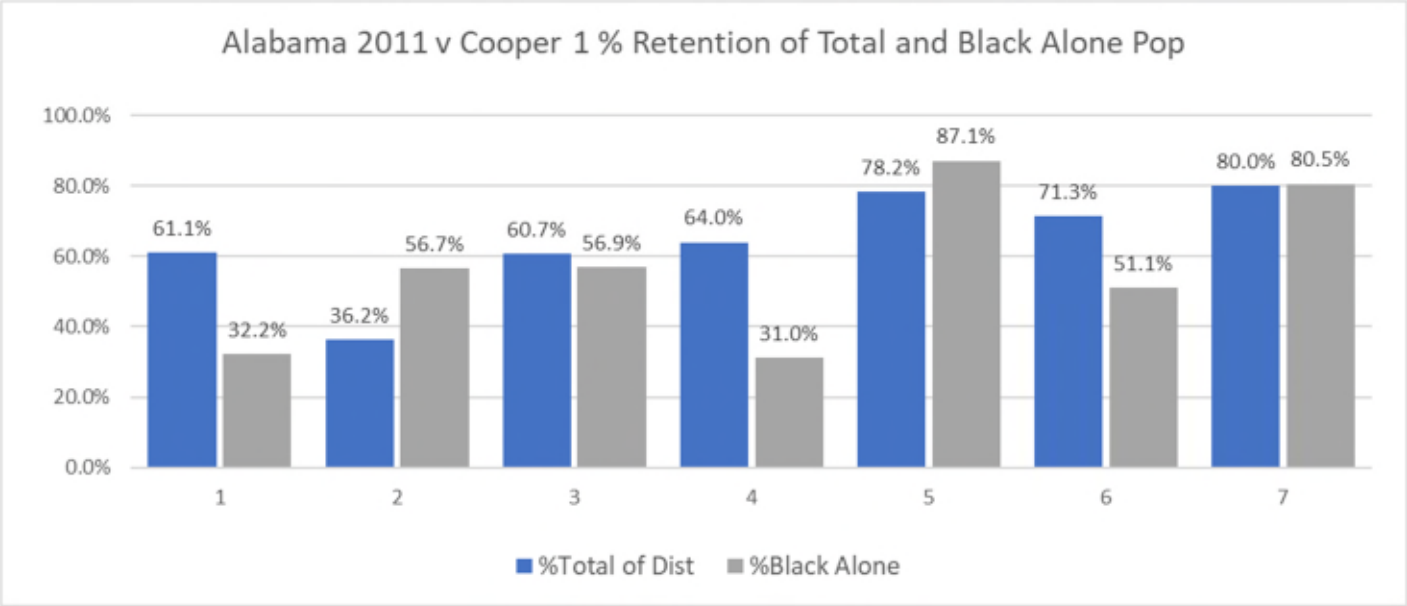


CRA Figure 4.8 Core Retention of Black Alone Population: 2021 Enacted v Duchin D

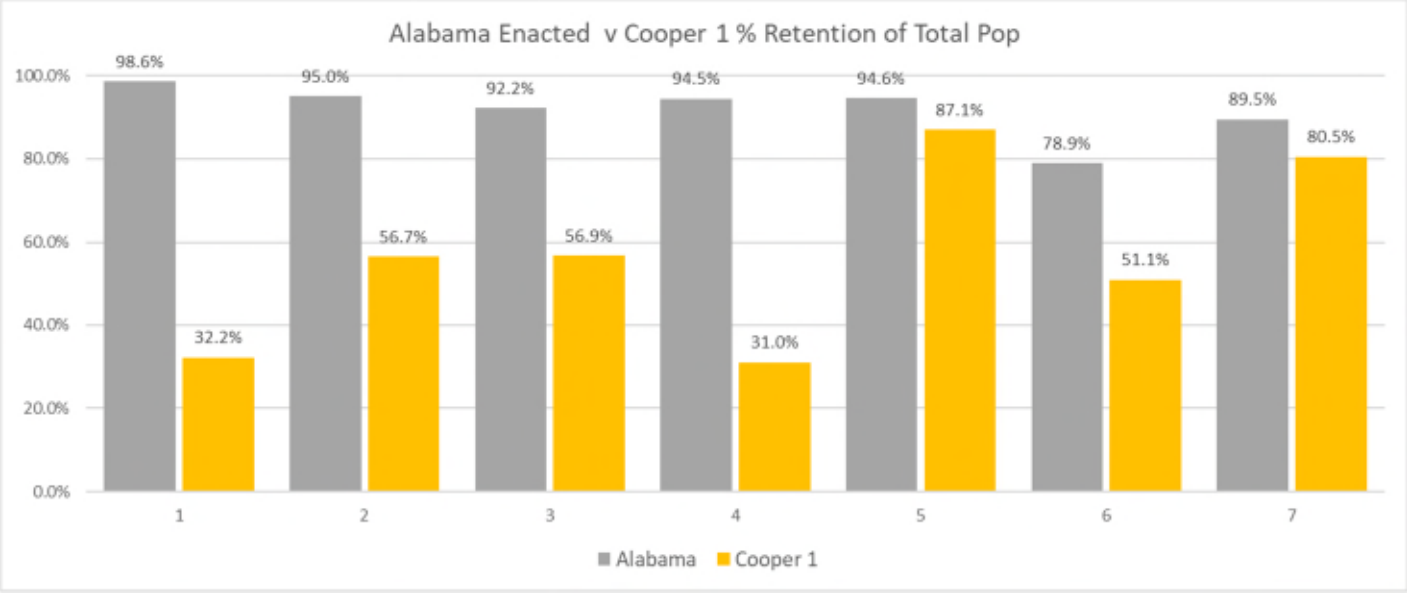


Cooper CRA Charts Appendix

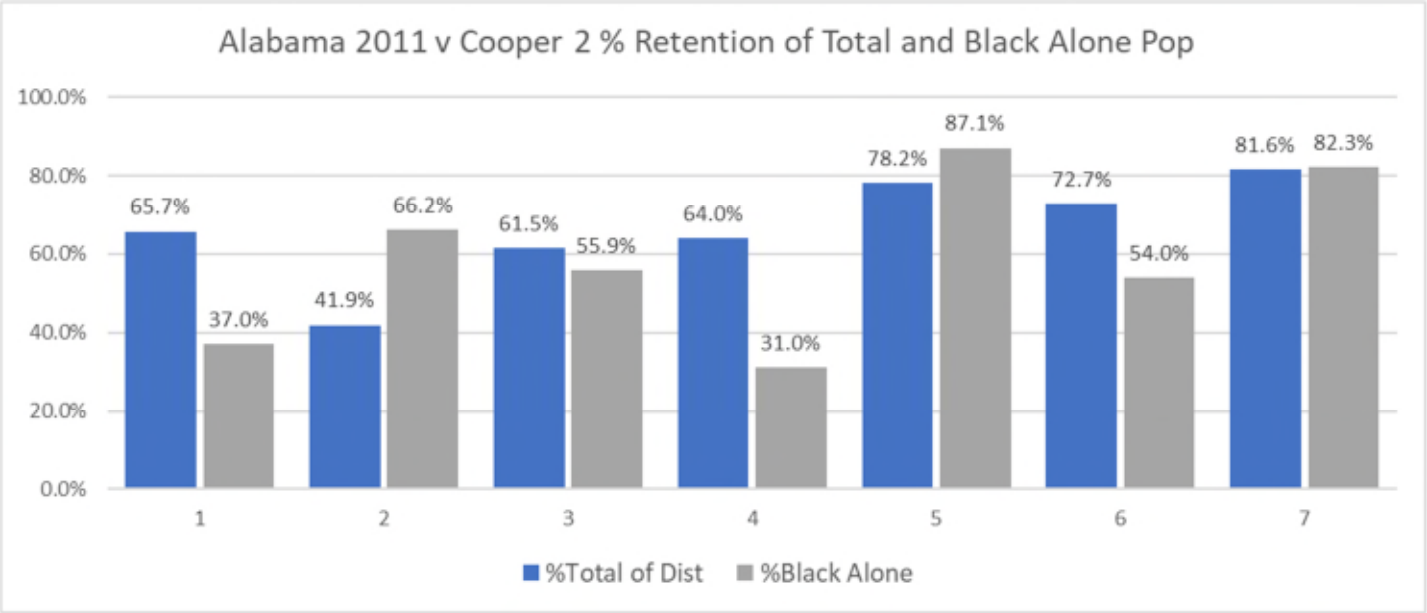
CRA Figure 4.9 Core Retention of Total and Black Population: 2011 Existing v Cooper 1



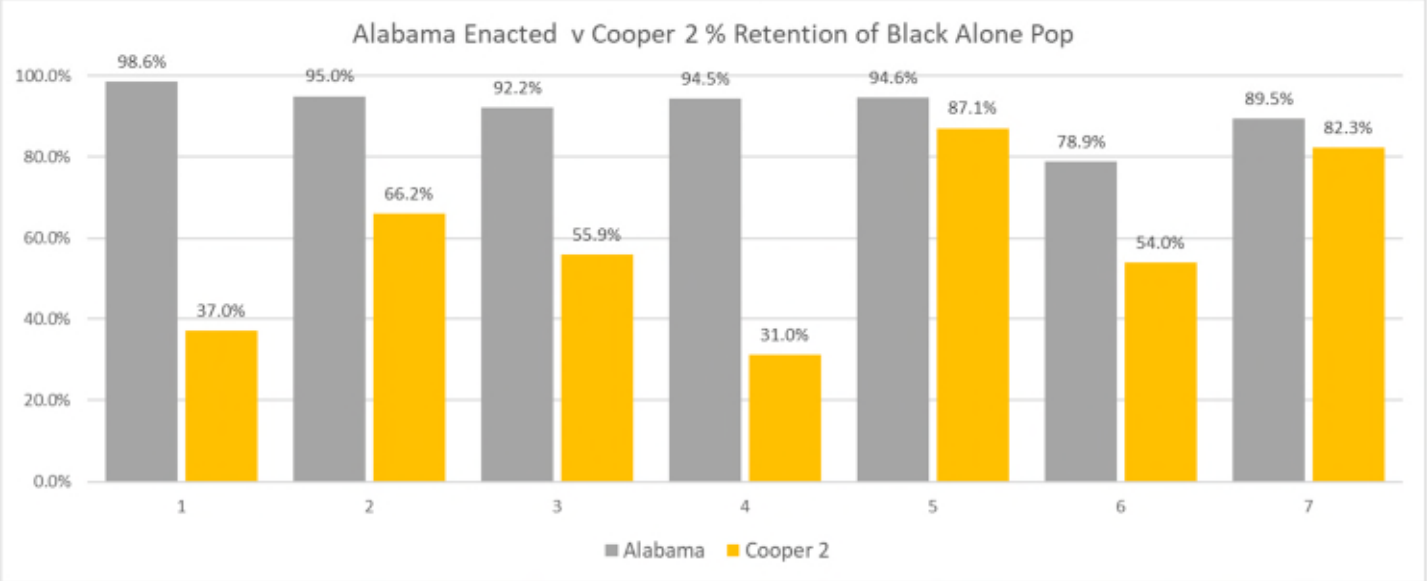
CRA Figure 4.10 Core Retention of Black Alone Population: 2021 Enacted v Cooper 1



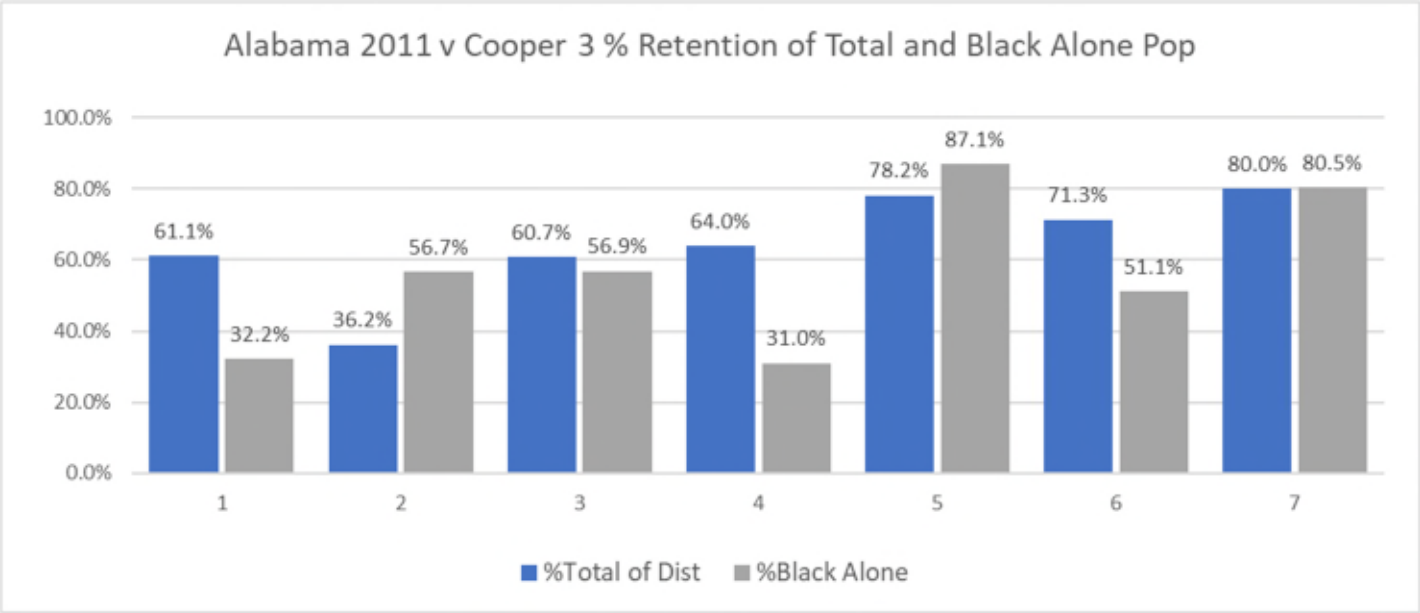
CRA Figure 4.11 Core Retention of Total and Black Population: 2011 Existing v Cooper 2



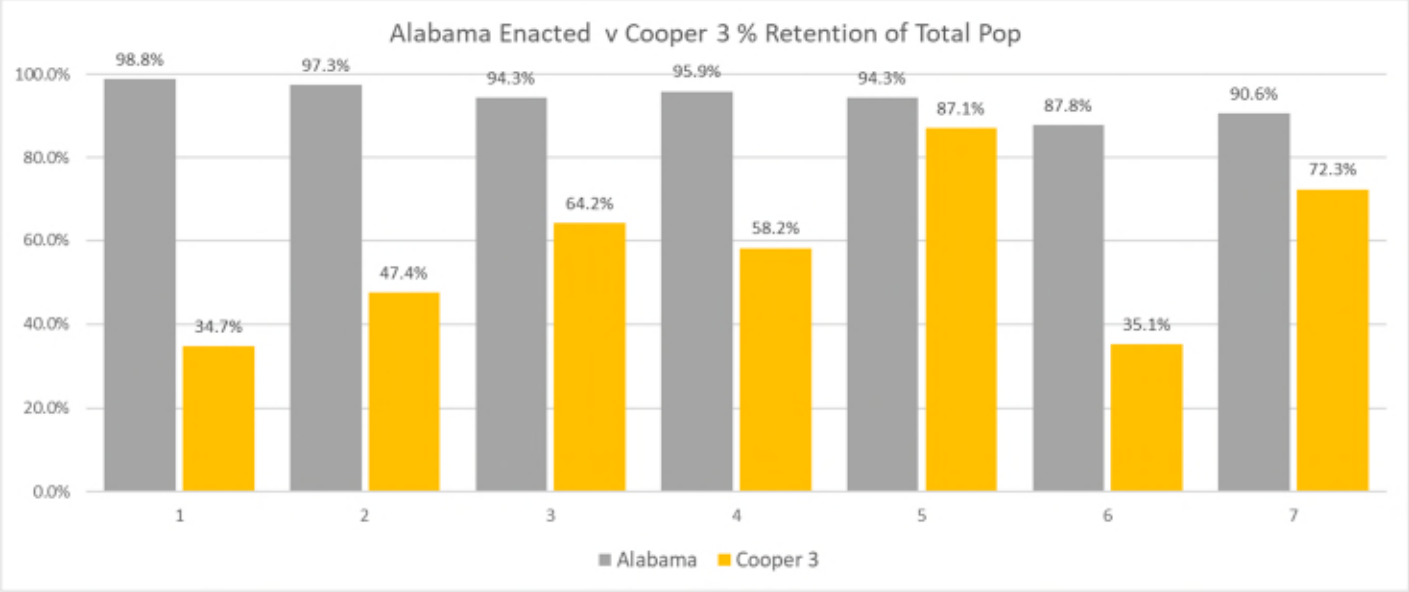
CRA Figure 4.12 Core Retention of Black Alone Population: 2021 Enacted v Cooper 2



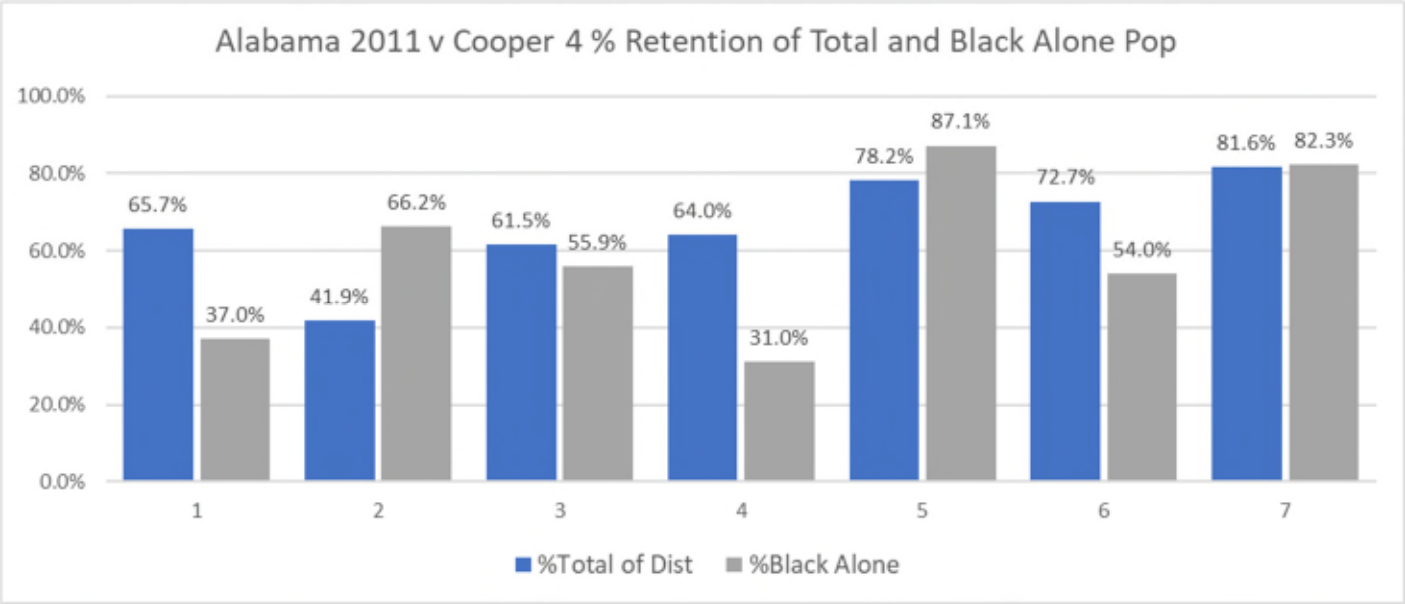
CRA Figure 4.13 Core Retention of Total and Black Population: 2011 Existing v Cooper 3



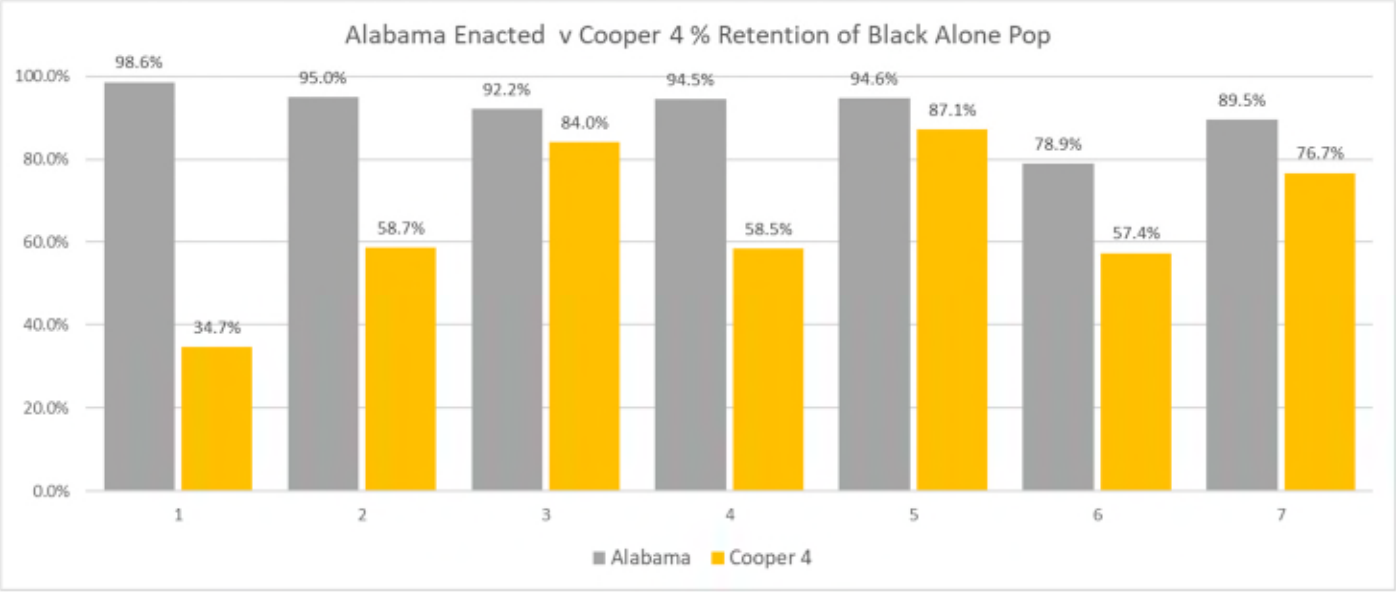
CRA Figure 4.14 Core Retention of Black Alone Population: 2021 Enacted v Cooper 3



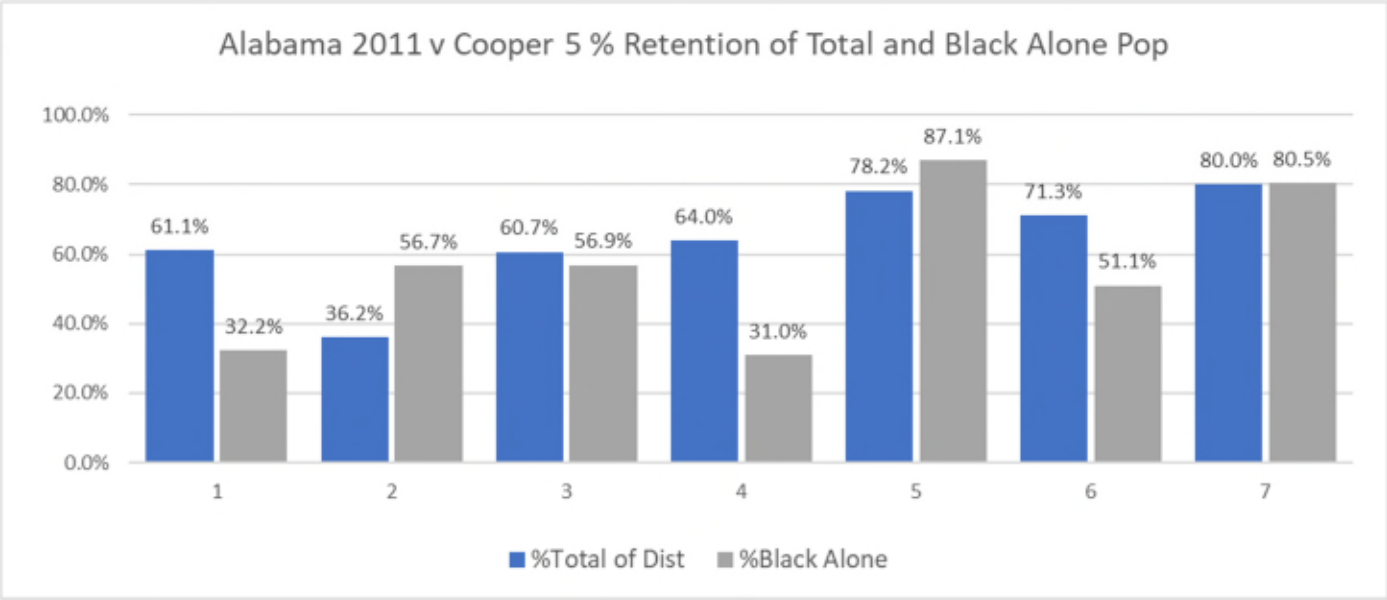
CRA Figure 4.15 Core Retention of Total and Black Population: 2011 Existing v Cooper 4



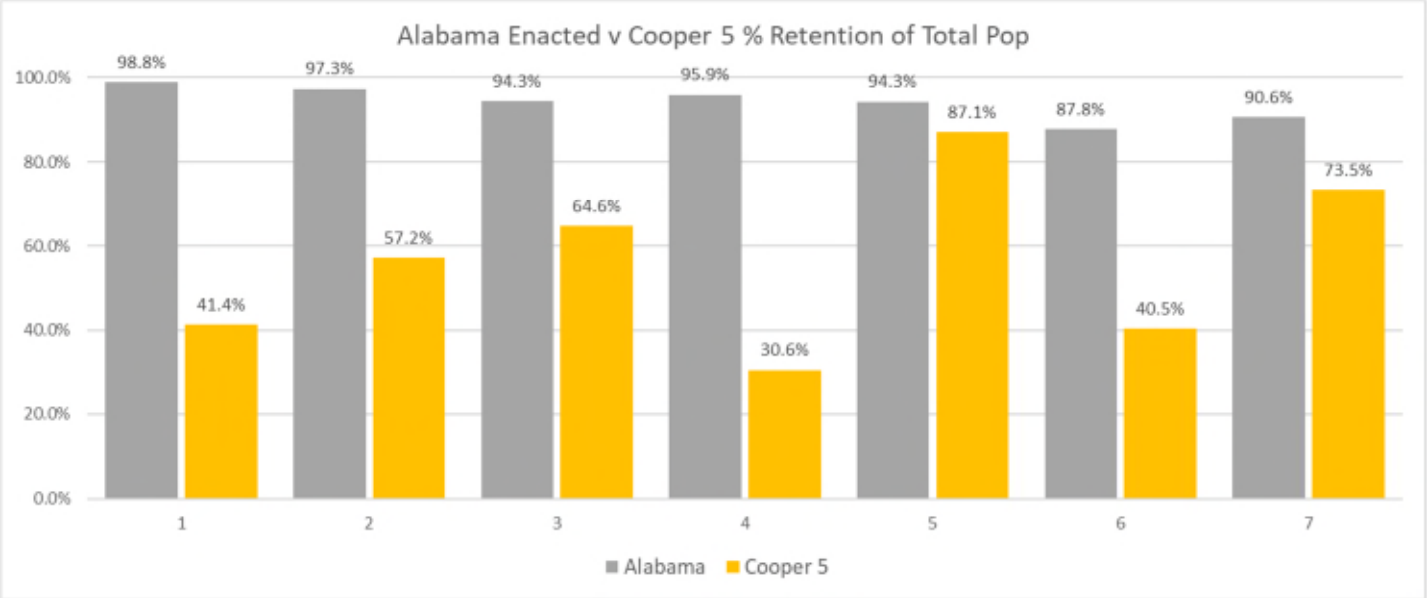
CRA Figure 4.16 Core Retention of Black Alone Population: 2021 Enacted v Cooper 4



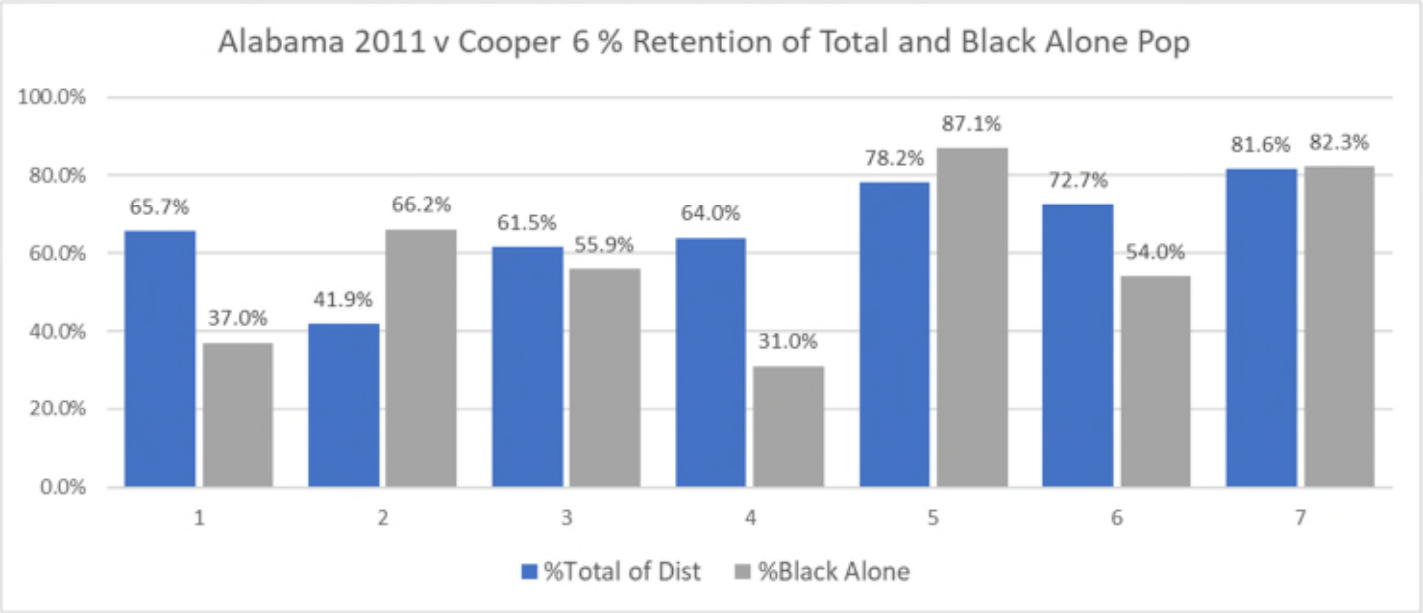
CRA Figure 4.17 Core Retention of Total and Black Population: 2011 Existing v Cooper 5



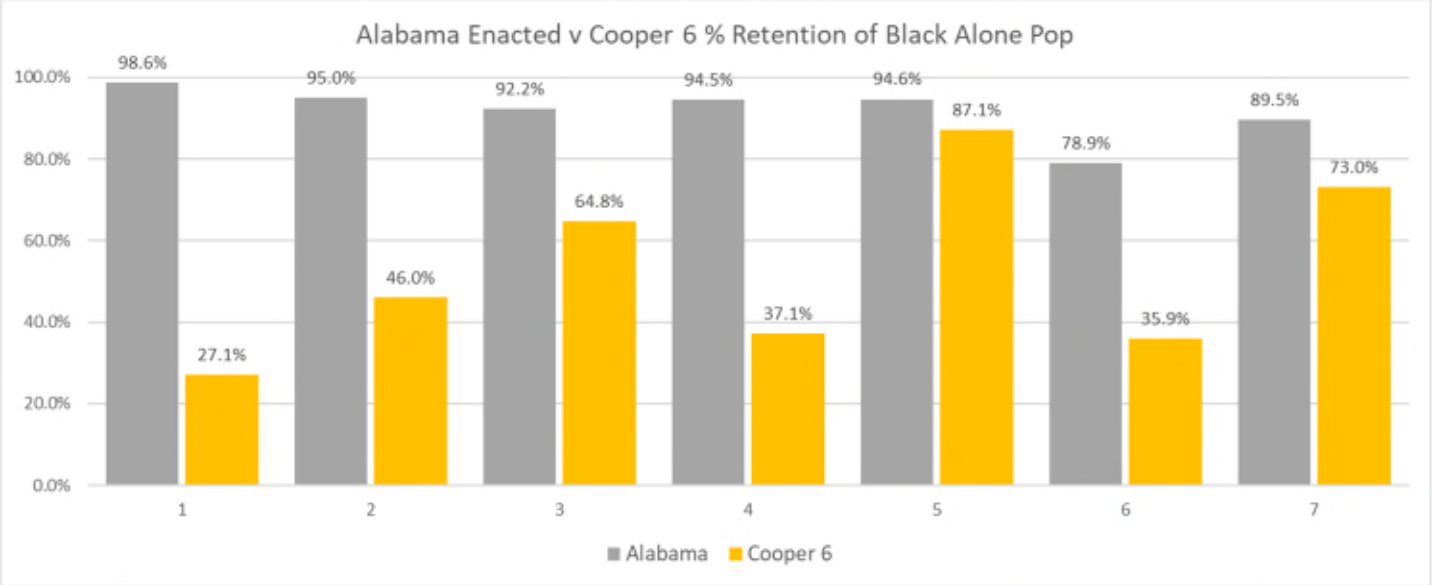
CRA Figure 4.18 Core Retention of Black Alone Population: 2021 Enacted v Cooper 5



CRA Figure 4.19 Core Retention of Total and Black Population: 2011 Existing v Cooper 6



CRA Figure 4.20 Core Retention of Black Alone Population: 2021 Enacted v Cooper 6



Duchin Compactness Appendix

Appendix 5.1 Duchin Compactness Plan A

District	Polsby-Popper	Schwartzberg	Reock	Convex_Hull	Total
1	0.13	0.36	0.22	0.57	1.28
2	0.16	0.40	0.34	0.64	1.54
3	0.26	0.51	0.49	0.78	2.04
4	0.37	0.61	0.61	0.90	2.48
5	0.38	0.62	0.39	0.87	2.26
6	0.22	0.47	0.32	0.70	1.71
7	0.28	0.53	0.39	0.83	2.02
Sum	1.80	3.49	2.76	5.29	
Average	0.26	0.50	0.39	0.76	

Appendix 4.2 Duchin Compactness Plan B

District	Polsby-Popper	Schwartzberg	Reock	Convex_Hull	Total
1	0.16	0.39	0.20	0.58	1.33
2	0.19	0.43	0.34	0.67	1.63
3	0.23	0.48	0.35	0.67	1.73
4	0.40	0.63	0.42	0.87	2.32
5	0.53	0.73	0.50	0.93	2.69
6	0.25	0.50	0.50	0.80	2.06
7	0.23	0.48	0.31	0.77	1.80
Sum	1.98	3.64	2.64	5.30	
Average	0.28	0.52	0.38	0.76	

Appendix 4.3 Duchin Compactness Plan C

District	Polsby-Popper	Schwartzberg	Reock	Convex_Hull	Total
1	0.16	0.39	0.20	0.58	1.33
2	0.15	0.39	0.23	0.67	1.44
3	0.28	0.53	0.38	0.76	1.94
4	0.32	0.57	0.44	0.85	2.18
5	0.53	0.73	0.50	0.93	2.69
6	0.18	0.42	0.40	0.73	1.73
7	0.18	0.43	0.28	0.75	1.64
Sum	1.80	3.46	2.43	5.27	
Average	0.26	0.49	0.35	0.75	

Appendix 4.4 Duchin Compactness Plan D

District	Polsby-Popper	Schwartzberg	Reock	Convex_Hull	Total
1	0.13	0.36	0.21	0.57	1.27
2	0.15	0.39	0.34	0.62	1.50
3	0.26	0.51	0.49	0.78	2.05
4	0.36	0.60	0.60	0.89	2.46
5	0.38	0.62	0.39	0.87	2.26
6	0.19	0.44	0.33	0.67	1.62
7	0.27	0.52	0.51	0.81	2.10
Sum	1.75	3.45	2.88	5.19	
Average	0.25	0.49	0.41	0.74	

Cooper Compactness Appendix

Appendix 4.5 Cooper Compactness Plan 1

District	Polsby-Popper	Schwartzberg	Reock	Convex_Hull	Total
1	0.15	0.38	0.21	0.56	1.30
2	0.14	0.37	0.33	0.61	1.45
3	0.14	0.38	0.37	0.57	1.46
4	0.21	0.46	0.28	0.69	1.64
5	0.33	0.58	0.33	0.85	2.09
6	0.16	0.39	0.47	0.73	1.75
7	0.13	0.37	0.37	0.64	1.50
Sum	1.26	2.93	2.35	4.65	
Average	0.18	0.42	0.34	0.66	

Appendix 4.6 Cooper Compactness Plan 2

District	Polsby-Popper	Schwartzberg	Reock	Convex_Hull	Total
1	0.14	0.37	0.21	0.56	1.28
2	0.12	0.34	0.31	0.56	1.33
3	0.14	0.38	0.34	0.56	1.42
4	0.21	0.46	0.28	0.69	1.64
5	0.33	0.58	0.33	0.85	2.09
6	0.17	0.41	0.52	0.73	1.83
7	0.13	0.36	0.40	0.61	1.48
Sum	1.23	2.88	2.39	4.56	
Average	0.18	0.41	0.34	0.65	

Appendix 4.7 Cooper Compactness Plan 3

District	Polsby-Popper	Schwartzberg	Reock	Convex_Hull	Total
1	0.16	0.40	0.20	0.58	1.35
2	0.22	0.47	0.39	0.74	1.81
3	0.16	0.40	0.41	0.65	1.63
4	0.12	0.35	0.31	0.58	1.36
5	0.33	0.58	0.33	0.85	2.09
6	0.13	0.36	0.47	0.72	1.68
7	0.15	0.39	0.30	0.66	1.49
Sum	1.28	2.95	2.40	4.78	
Average	0.18	0.42	0.34	0.68	

Appendix 4.8 Cooper Compactness Plan 4

District	Polsby-Popper	Schwartzberg	Reock	Convex_Hull	Total
1	0.16	0.40	0.20	0.58	1.34
2	0.18	0.42	0.36	0.70	1.67
3	0.24	0.49	0.33	0.79	1.85
4	0.22	0.47	0.30	0.72	1.71
5	0.34	0.58	0.33	0.85	2.09
6	0.13	0.36	0.35	0.65	1.49
7	0.24	0.49	0.41	0.78	1.91
Sum	1.50	3.21	2.29	5.07	
Average	0.21	0.46	0.33	0.72	

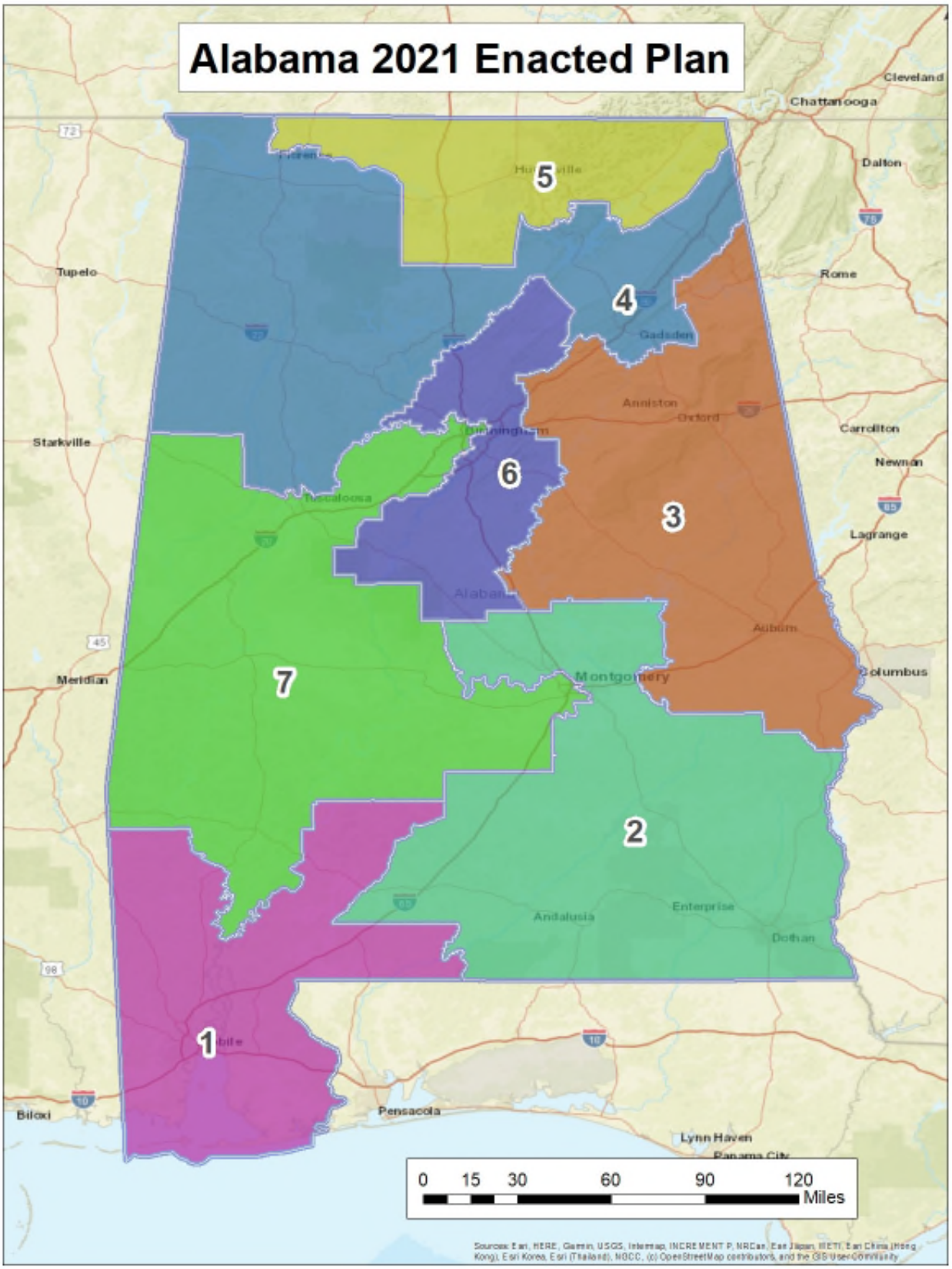
Appendix 4.9 Cooper Compactness Plan 5

District	Polsby-Popper	Schwartzberg	Reock	Convex_Hull	Total
1	0.13	0.36	0.19	0.53	1.20
2	0.19	0.44	0.39	0.70	1.72
3	0.18	0.43	0.33	0.62	1.56
4	0.20	0.45	0.29	0.68	1.61
5	0.33	0.58	0.33	0.85	2.09
6	0.13	0.36	0.30	0.66	1.46
7	0.11	0.34	0.23	0.65	1.33
Sum	1.28	2.95	2.05	4.69	
Average	0.18	0.42	0.29	0.67	

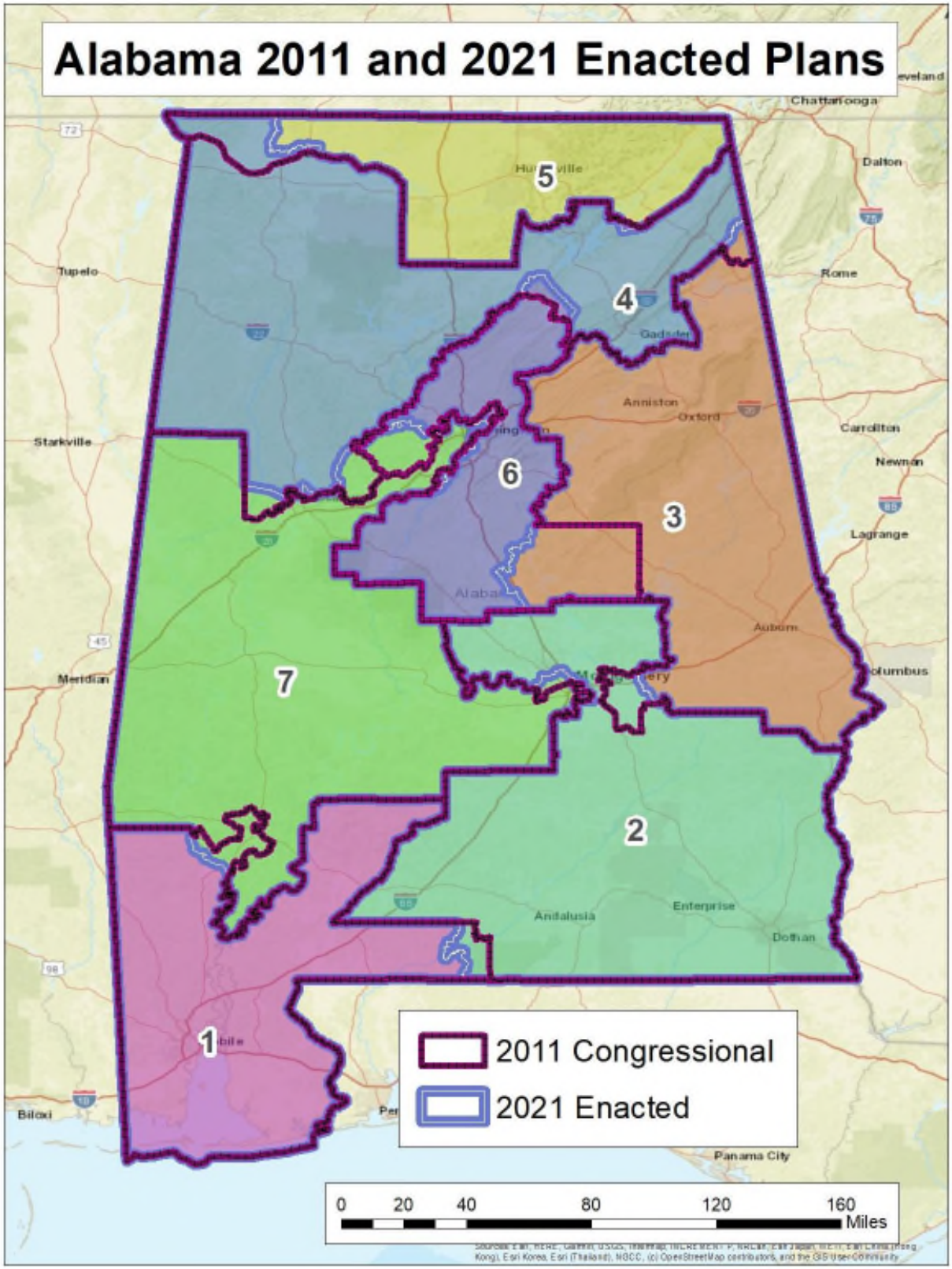
Appendix 4.10 Cooper Compactness Plan 6

District	Polsby-Popper	Schwartzberg	Reock	Convex_Hull	Total
1	0.12	0.34	0.24	0.51	1.21
2	0.11	0.33	0.29	0.57	1.31
3	0.16	0.40	0.35	0.63	1.54
4	0.18	0.43	0.30	0.70	1.62
5	0.34	0.58	0.33	0.85	2.09
6	0.10	0.31	0.29	0.65	1.34
7	0.11	0.32	0.34	0.56	1.33
Sum	1.11	2.72	2.13	4.46	
Average	0.16	0.39	0.30	0.64	

Map Appendix 1 (State of Alabama 2021 Enacted Plan)

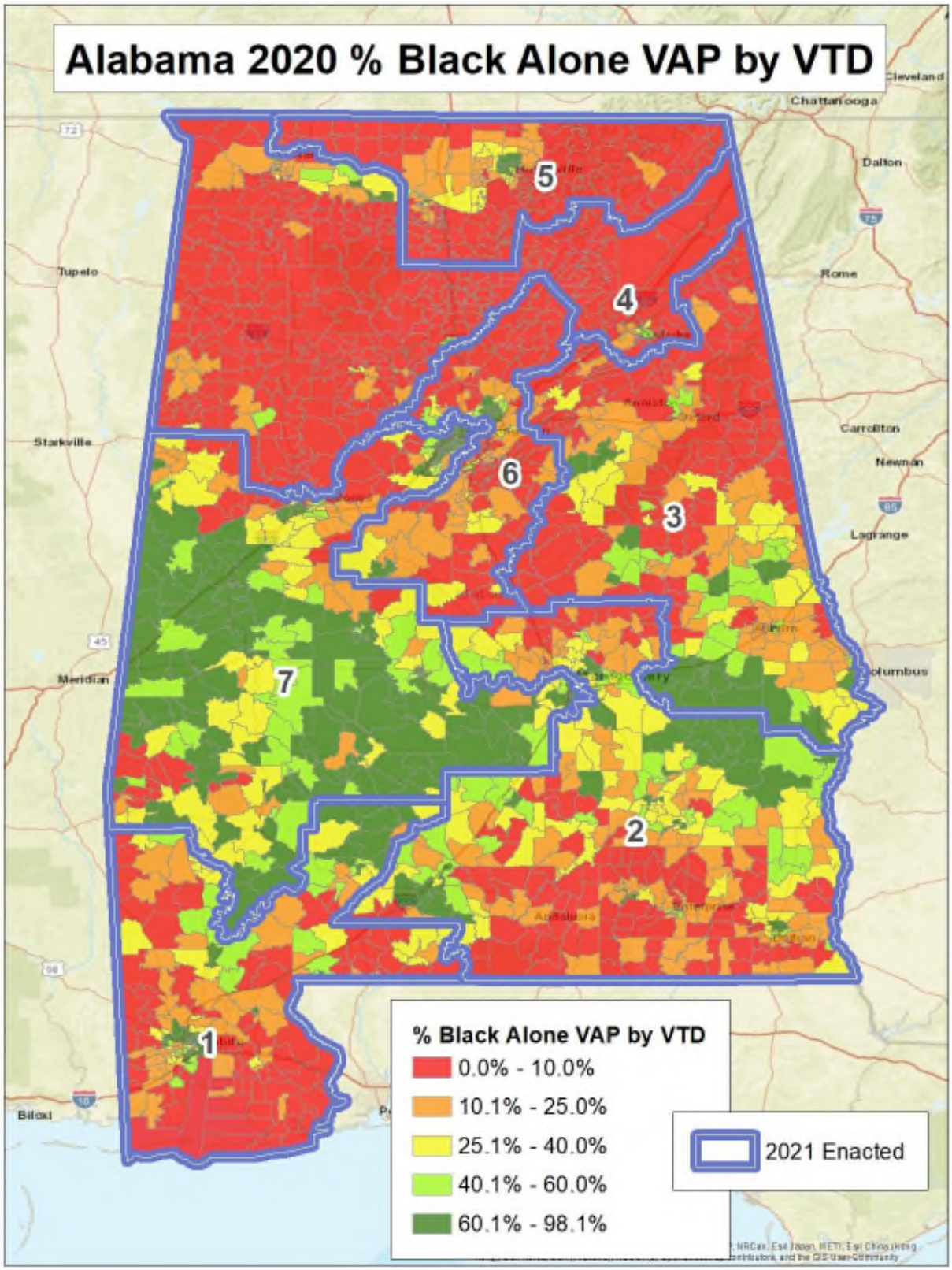


Map Appendix 2 (State of Alabama 2011 and 2021 Enacted Plans)

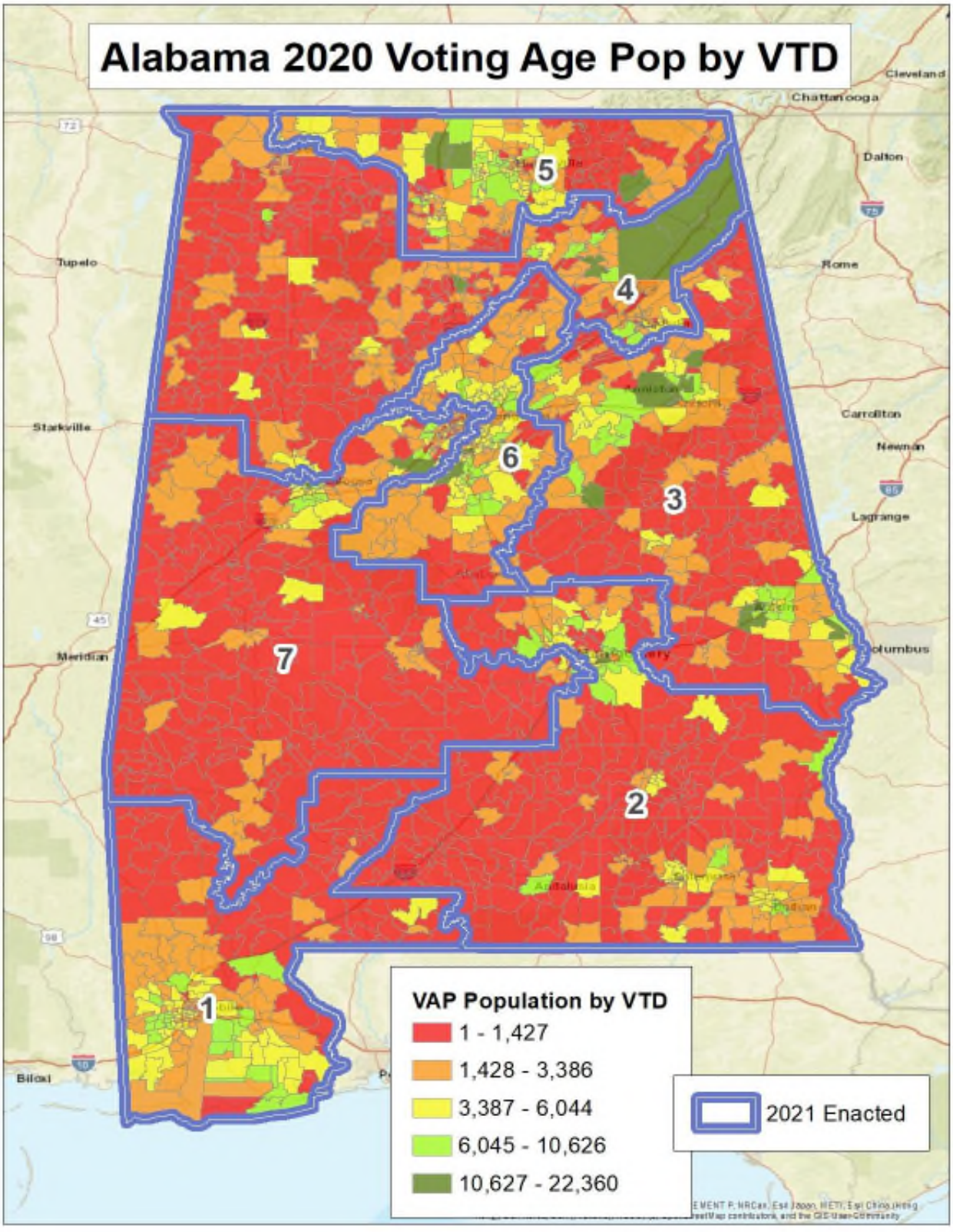


Alabama Enacted Plan
Map Appendices
% Black Alone and VAP
By County and VTD

Map Appendix 3 (State of Alabama Enacted Plan Percent Black Alone VAP by VTD)

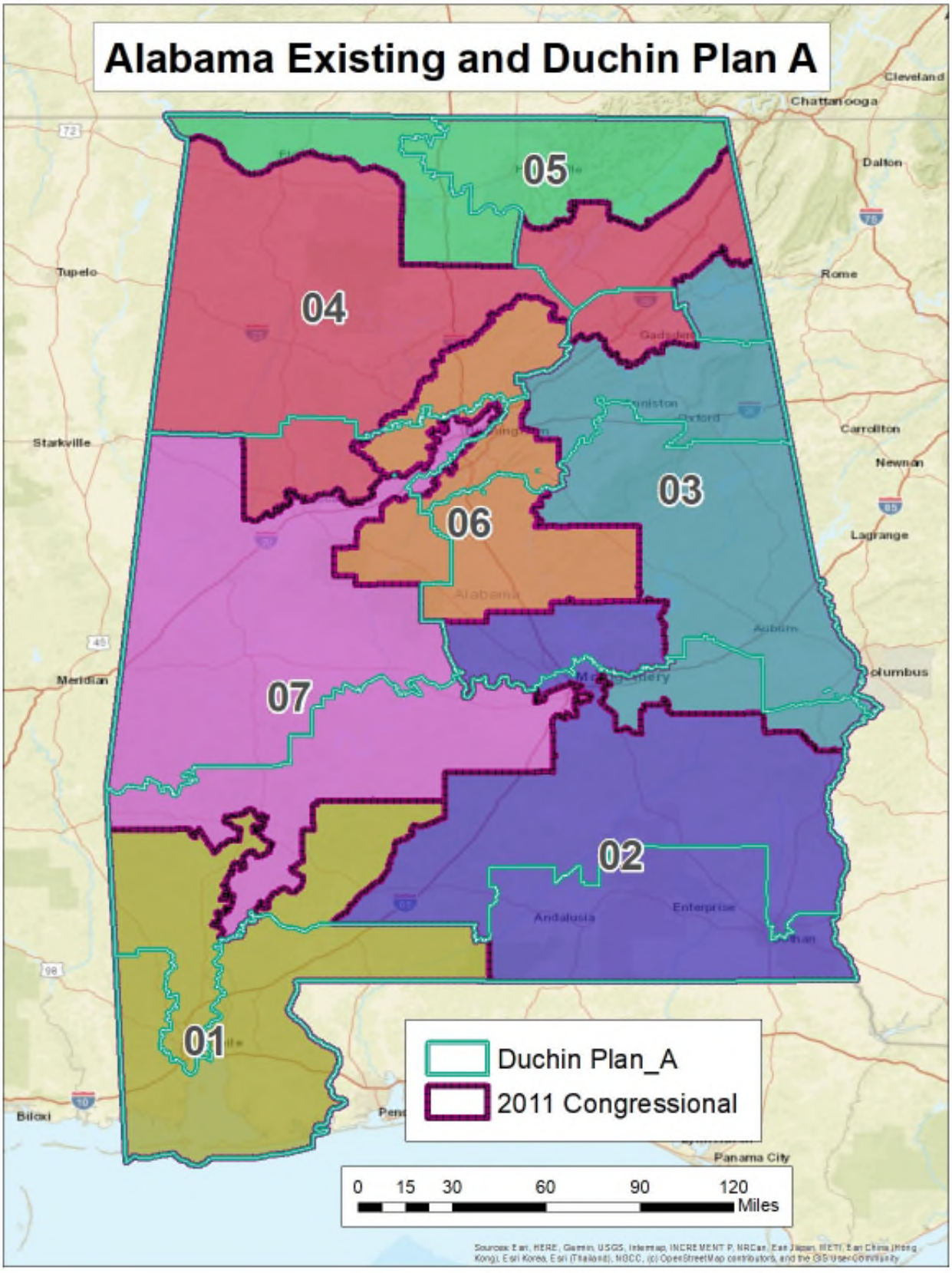


Map Appendix 4 (State of Alabama Voting Age Population by VTD)

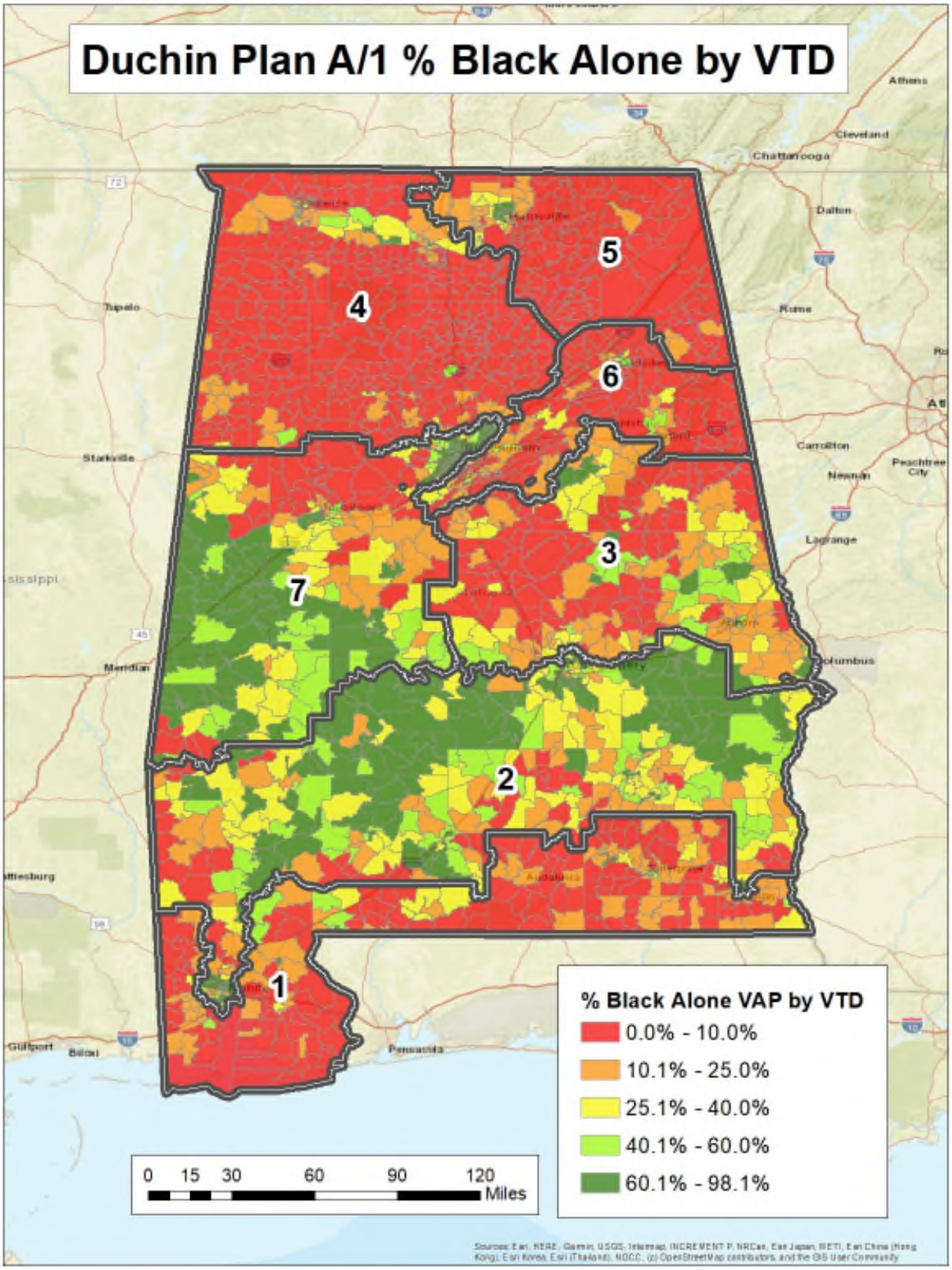


Duchin Plans
Map Appendices
Base Map and
% Black Alone and VAP
By Census VTD

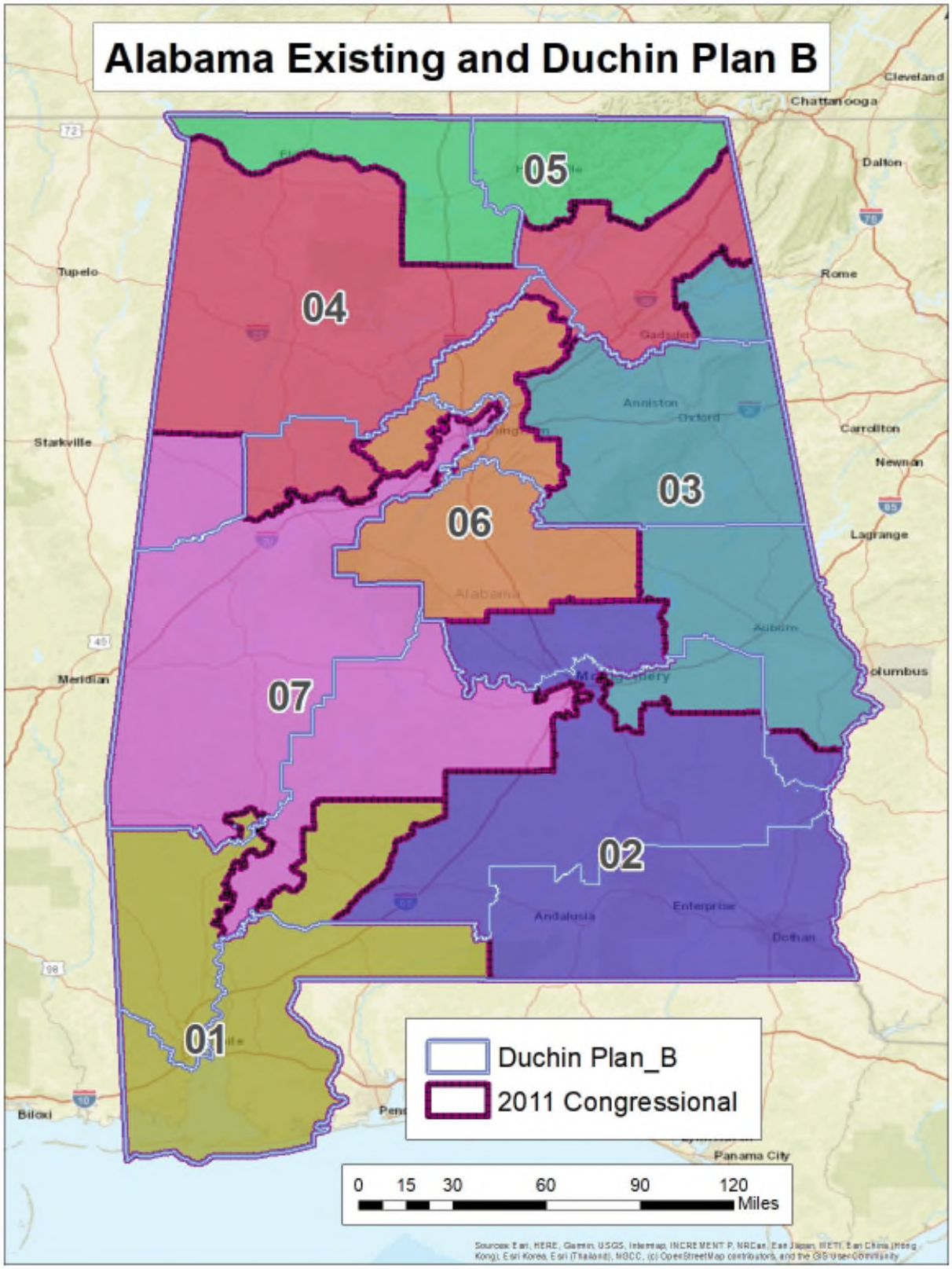
Map Appendix 5 (Duchin Plan A/1 and Alabama Existing Districts)



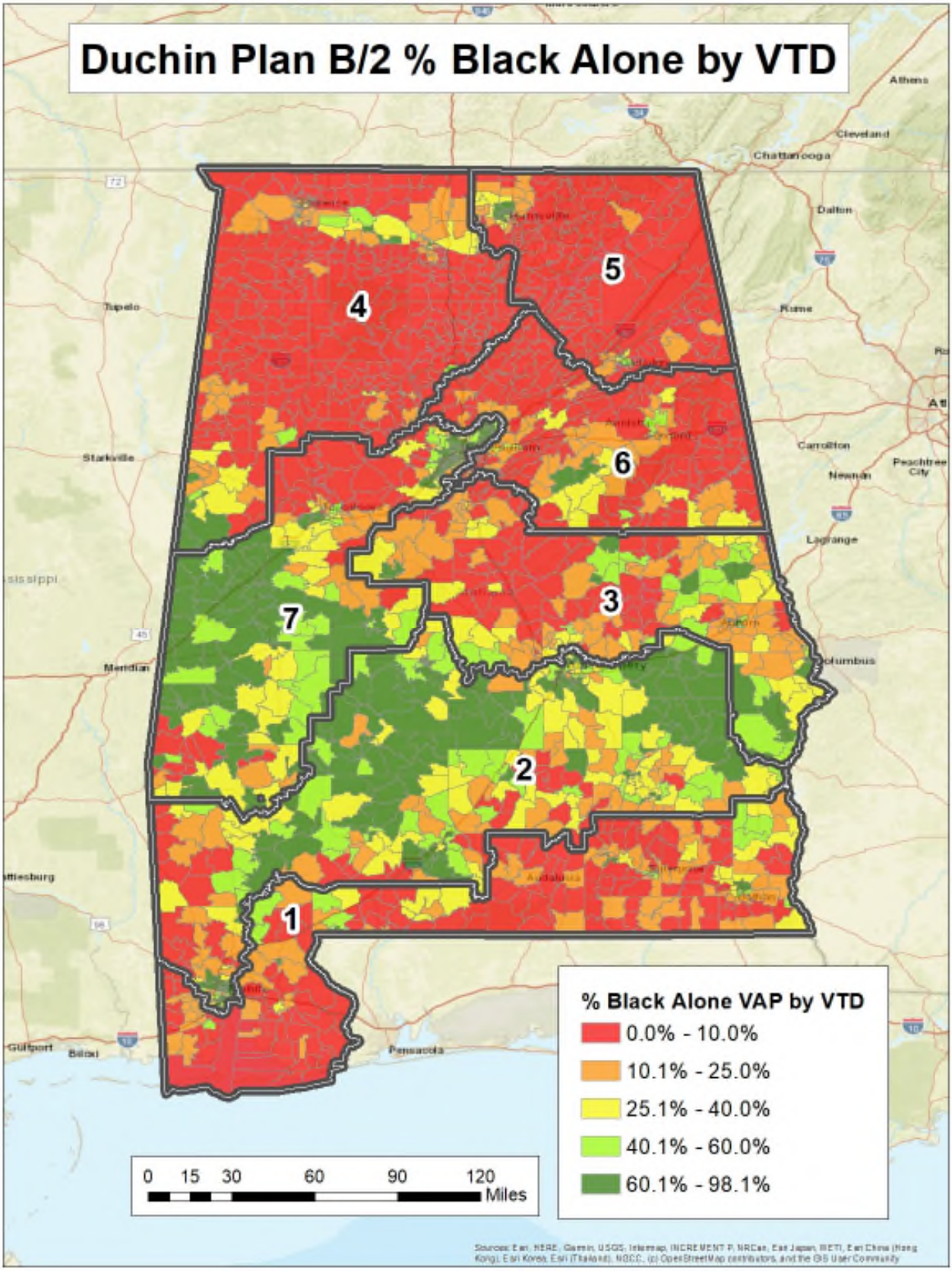
Map Appendix 5A (Duchin Plan A/1 Plan Percent Black Alone VAP by VTD)



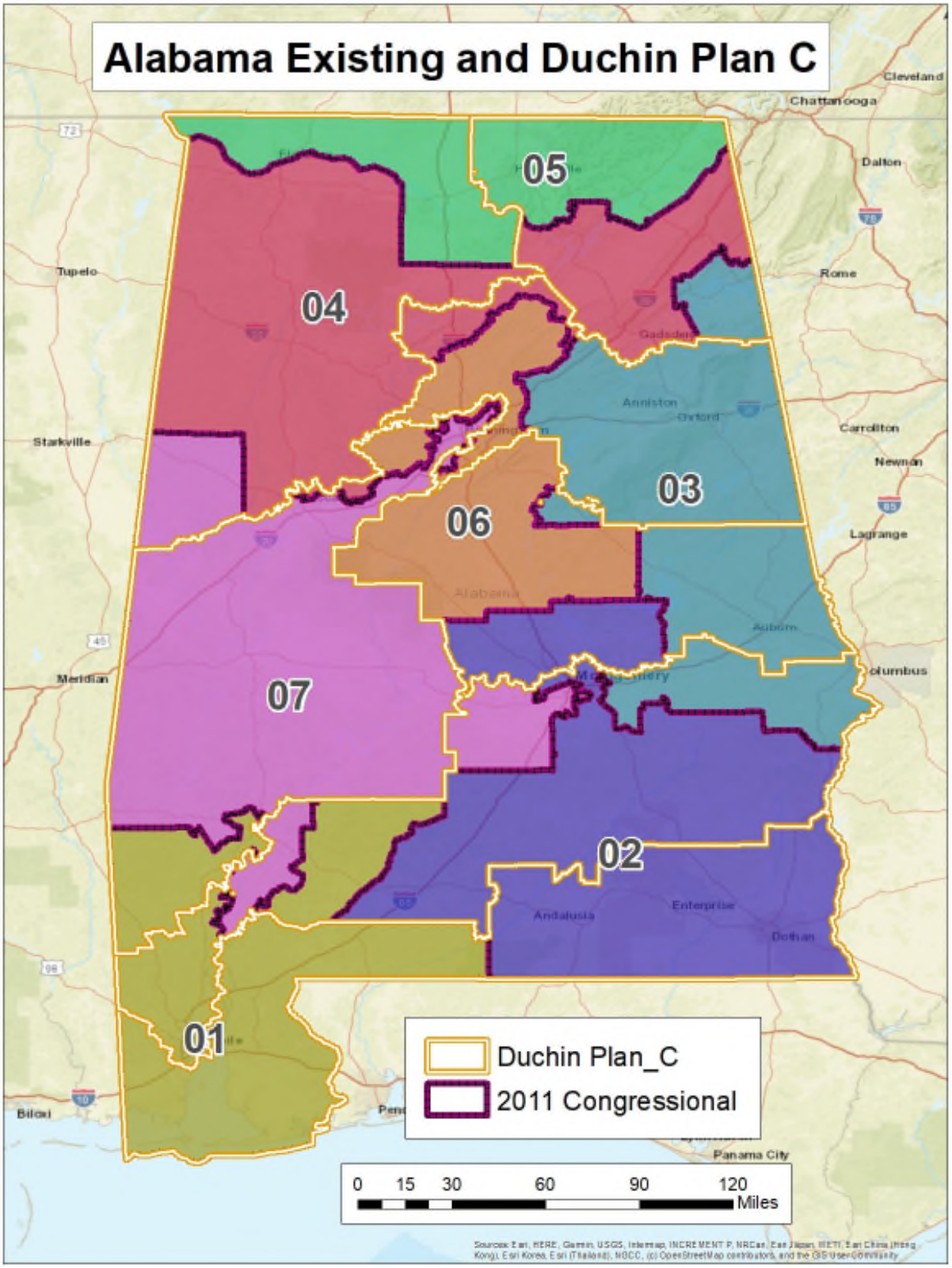
Map Appendix 6 (Duchin Plan B/2 and Alabama Existing Districts)



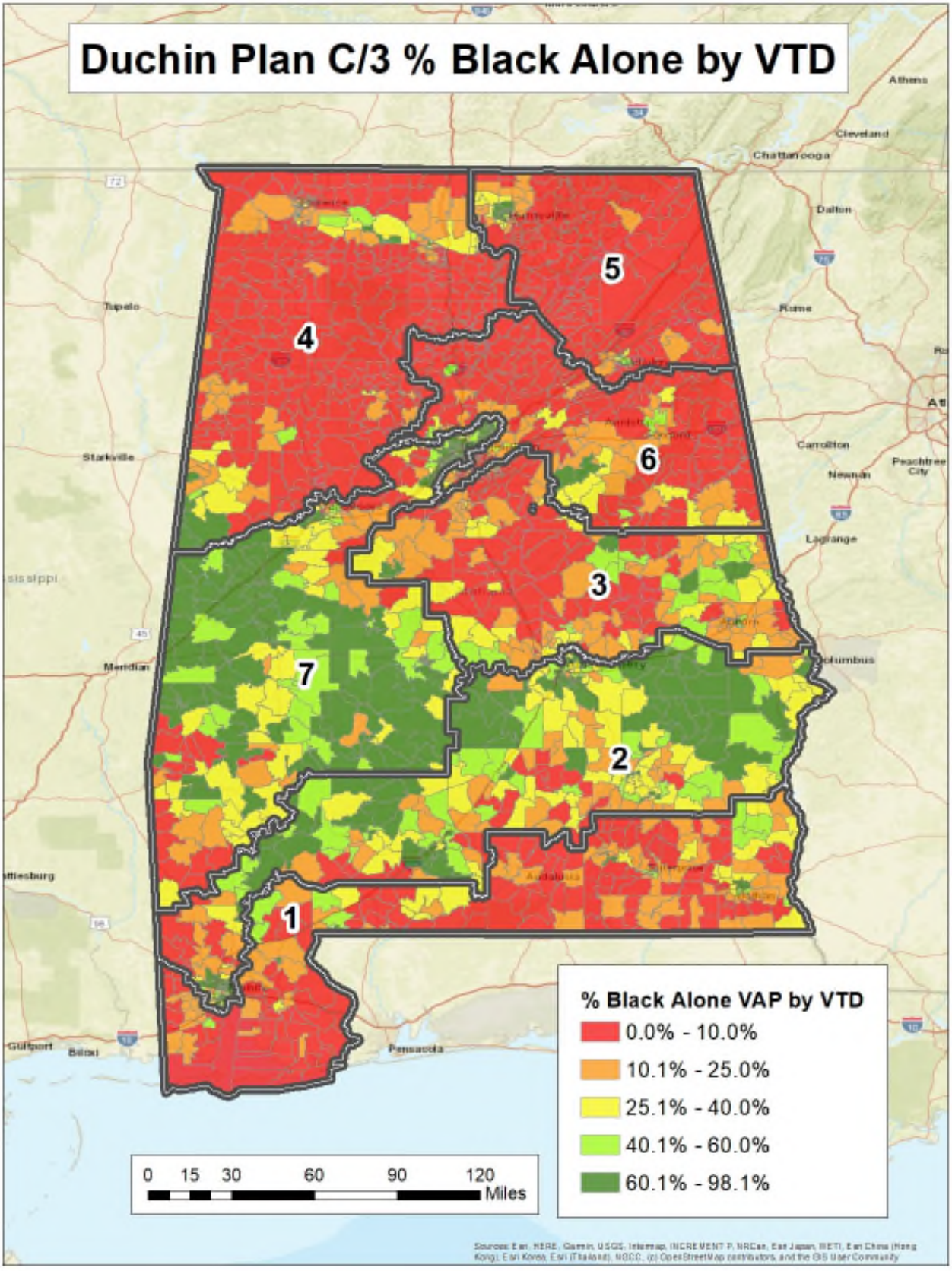
Map Appendix 6A (Duchin Plan B/2 Plan Percent Black Alone VAP by VTD)



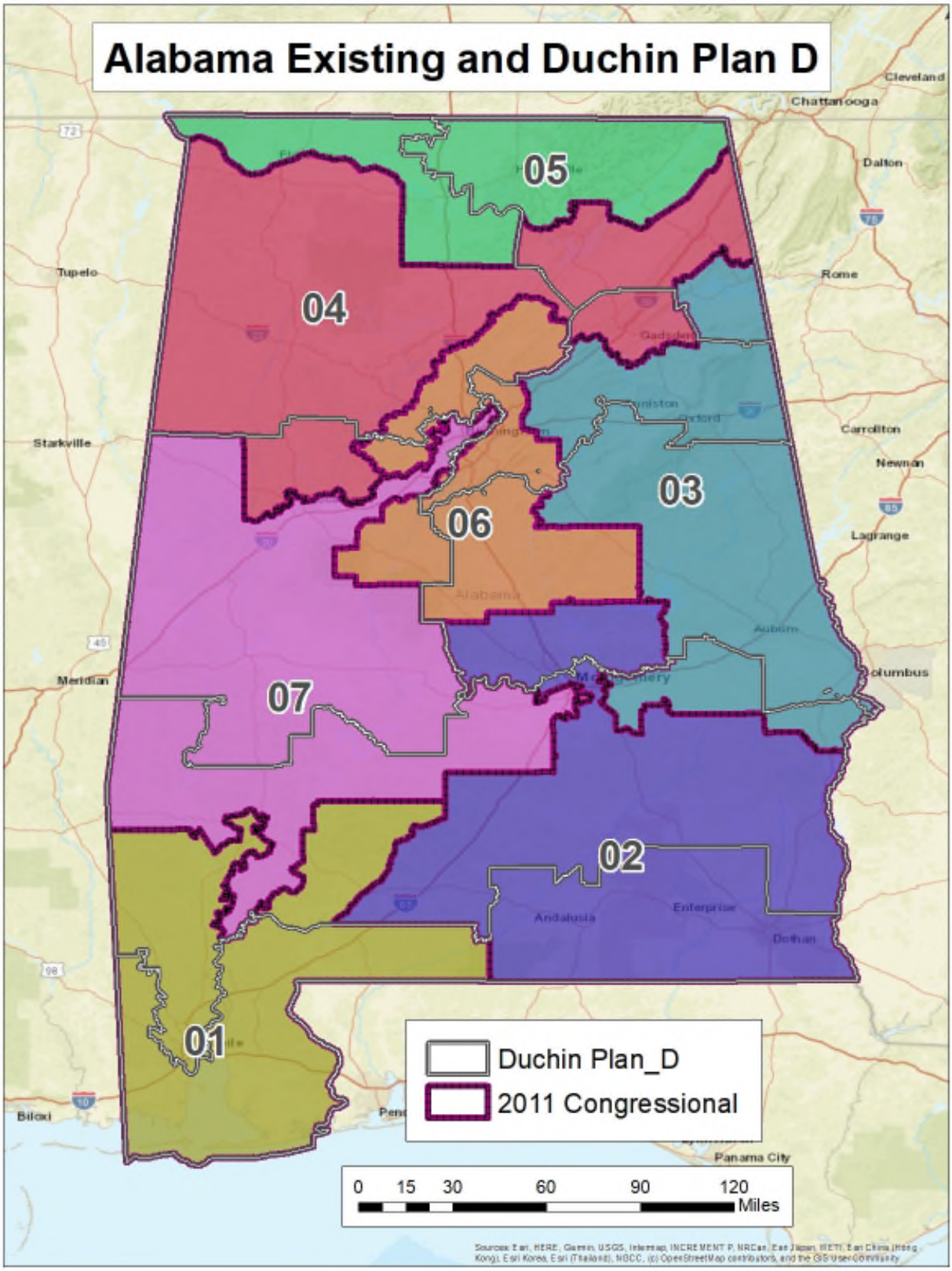
Map Appendix 7 (Duchin Plan C/3 and Alabama Existing Districts)



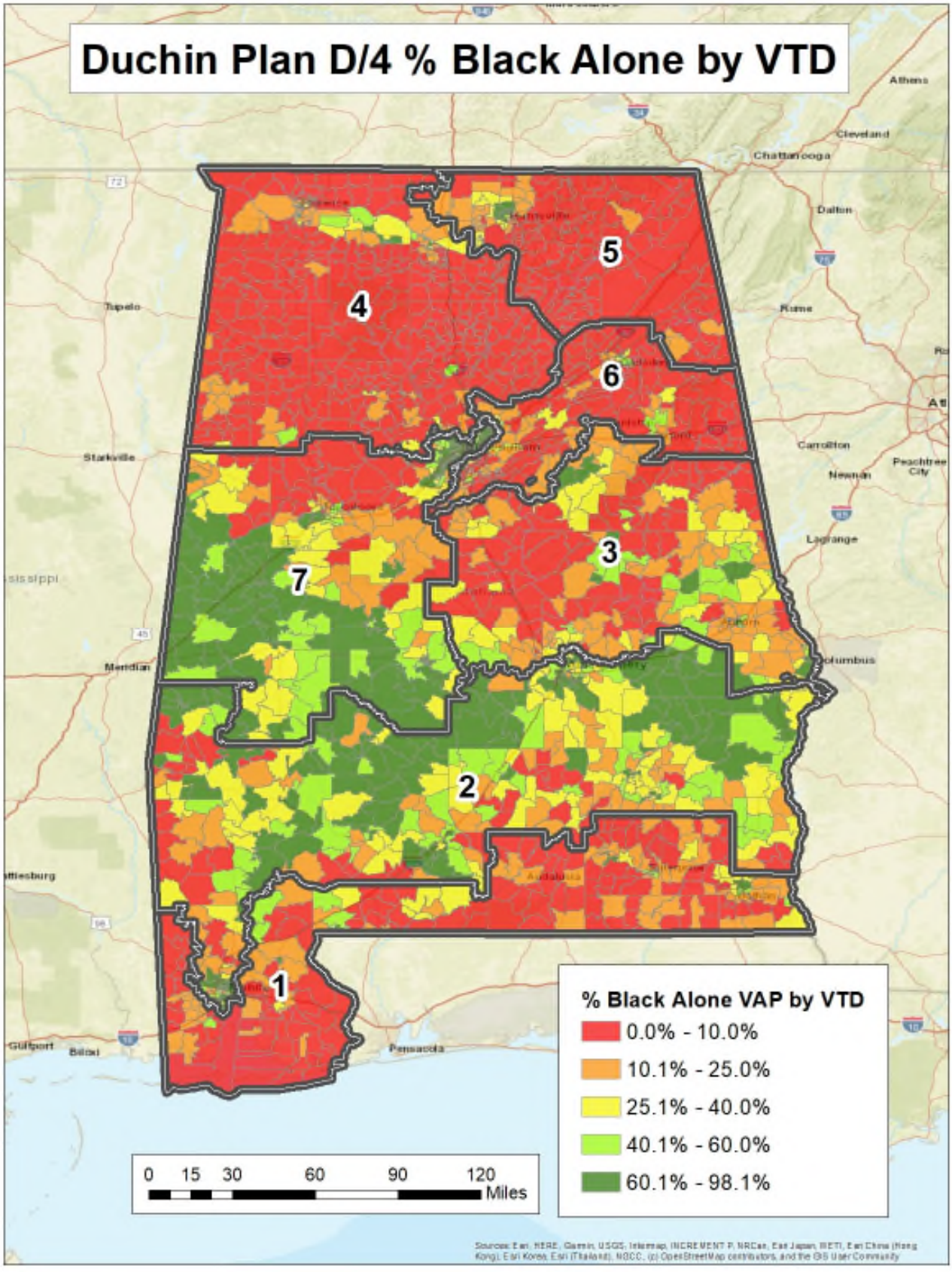
Map Appendix 7A (Duchin Plan C/3 Plan Percent Black Alone VAP by VTD)



Map Appendix 8 (Duchin Plan D/4and Alabama Existing Districts)

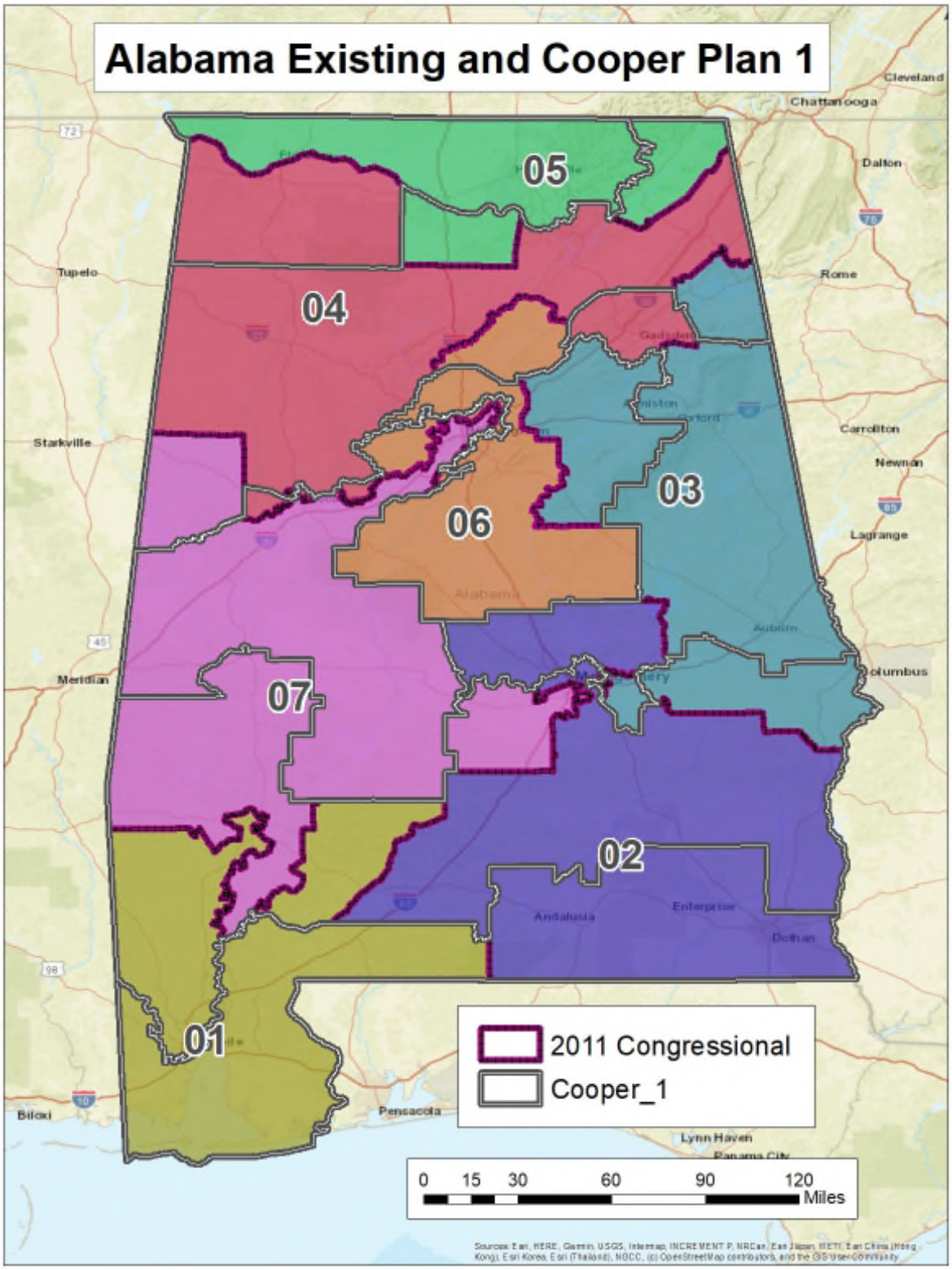


Map Appendix 8A (Duchin Plan D/4 Plan Percent Black Alone VAP by VTD)

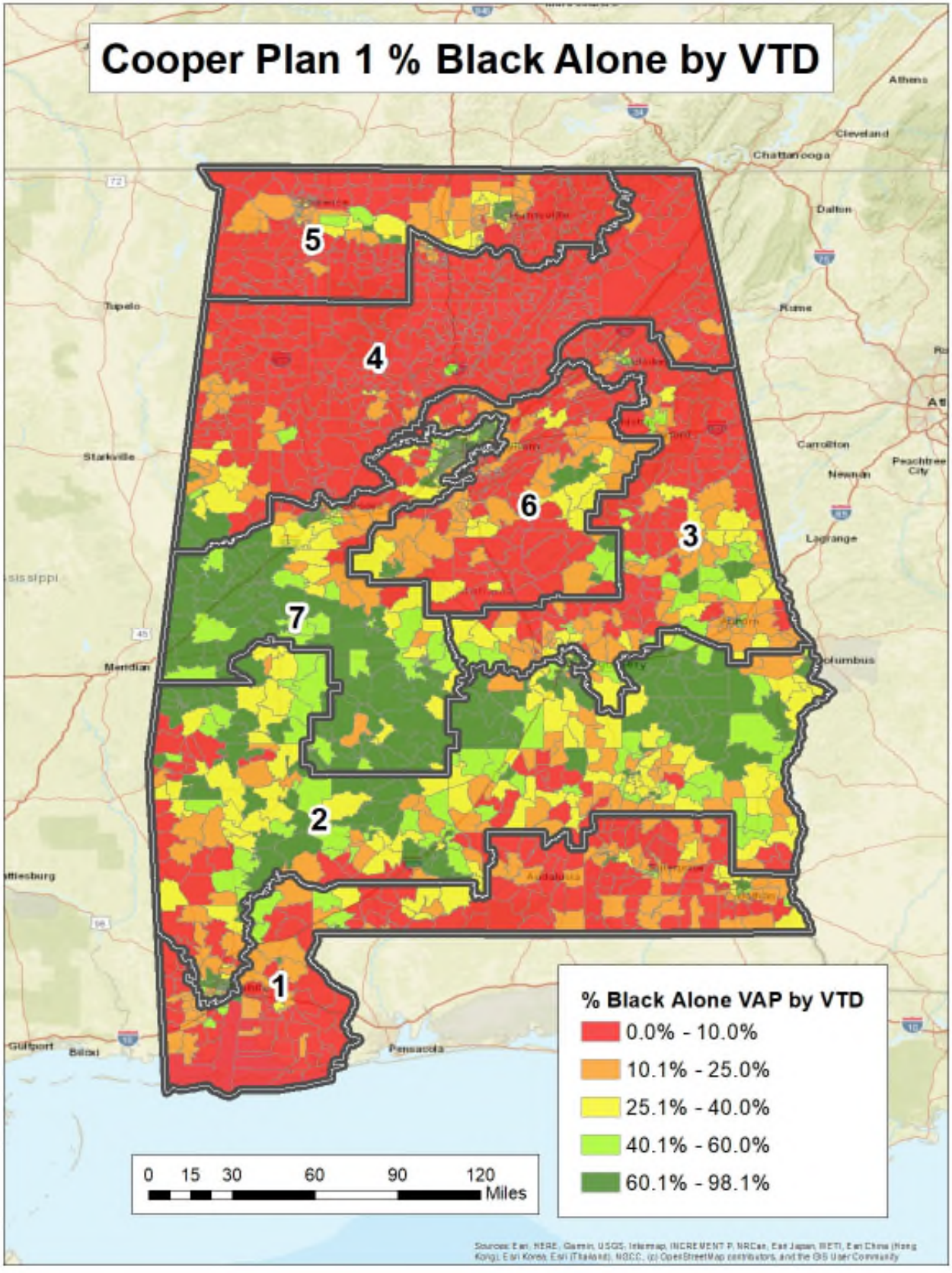


Cooper Plans
Map Appendices
% Black Alone and VAP
By Census VTD

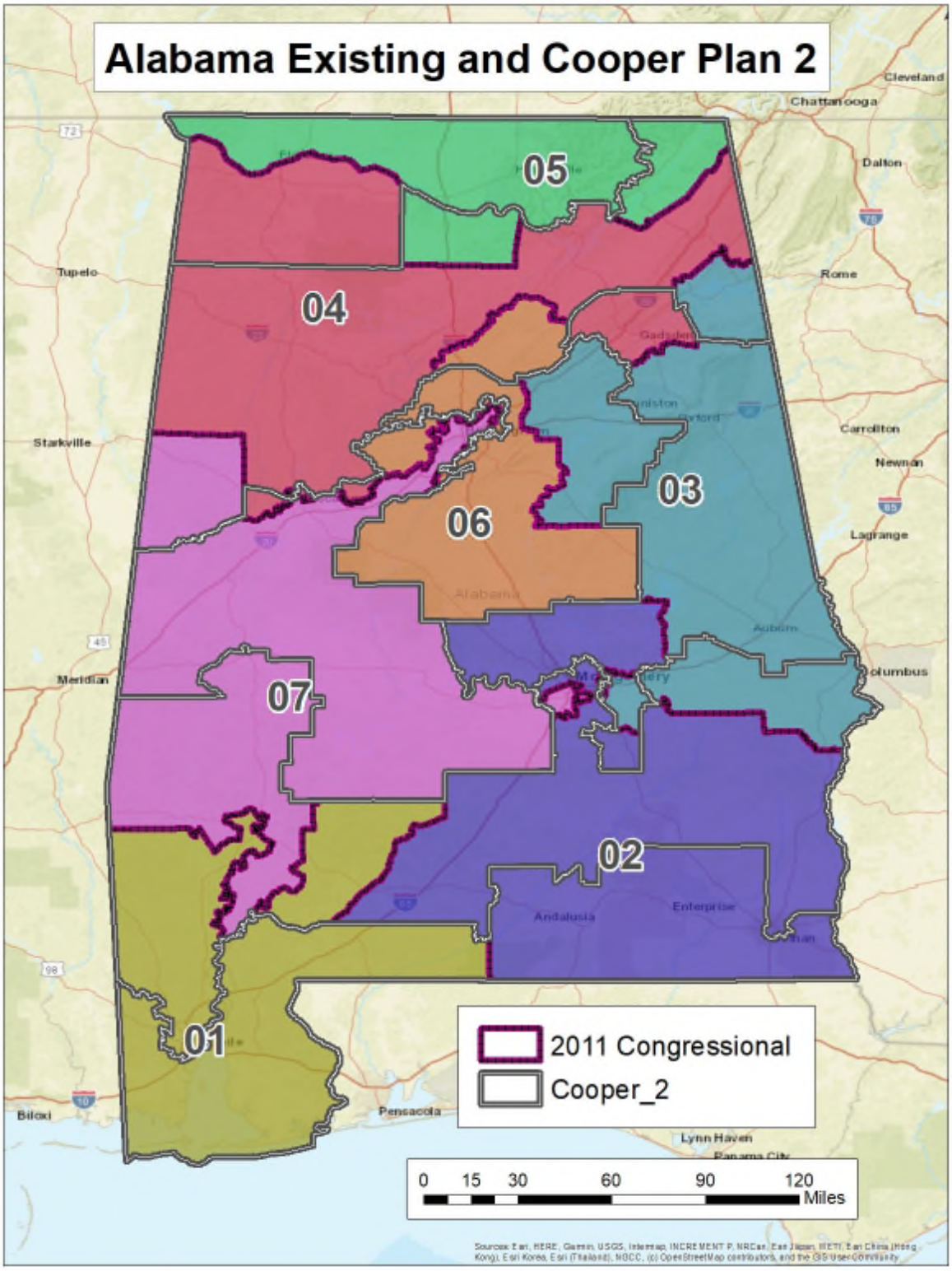
Map Appendix 9 (Cooper Plan 1 and Alabama Existing Districts)



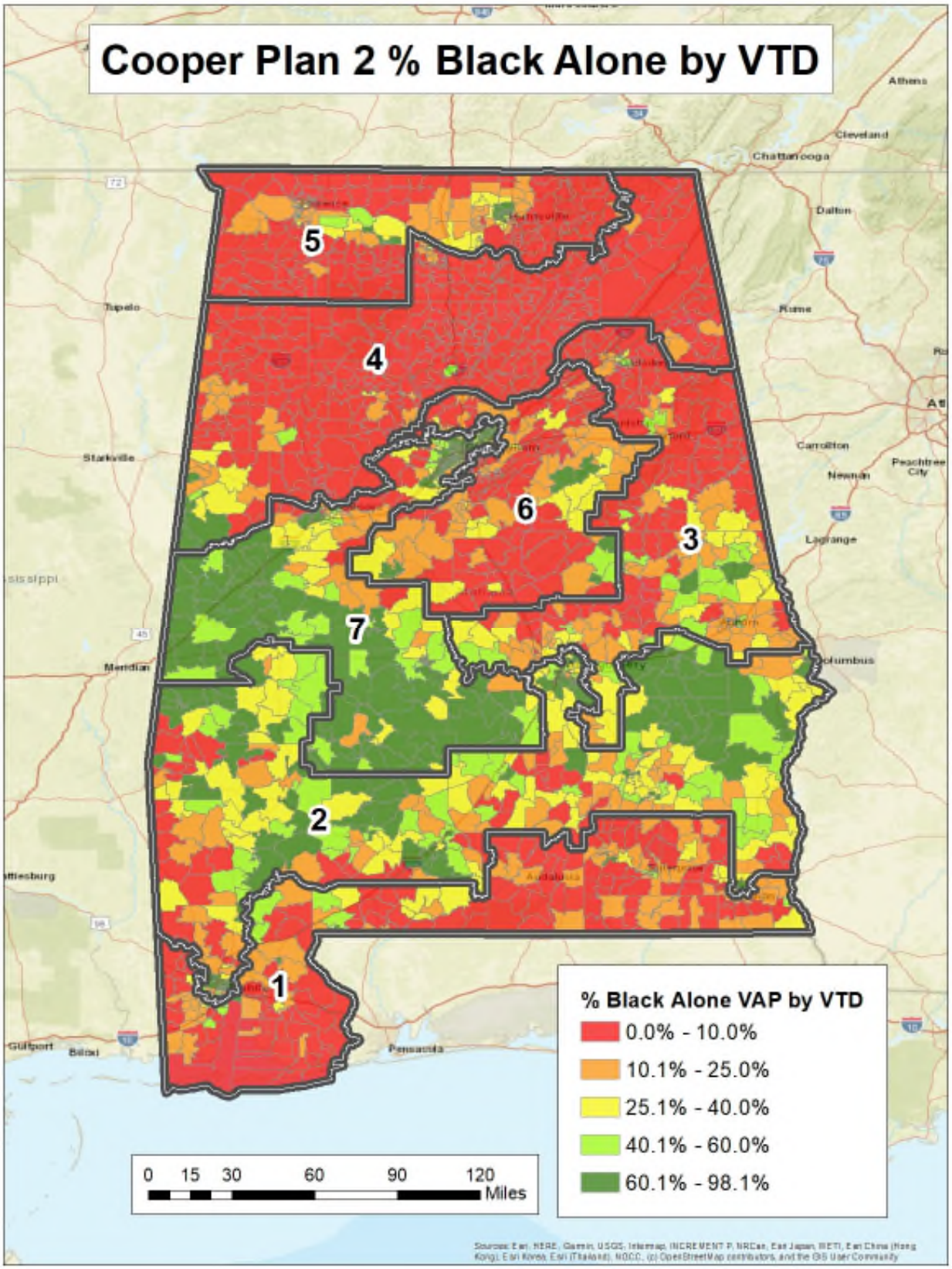
Map Appendix 9A (Cooper Plan 1 Plan Percent Black Alone VAP by VTD)



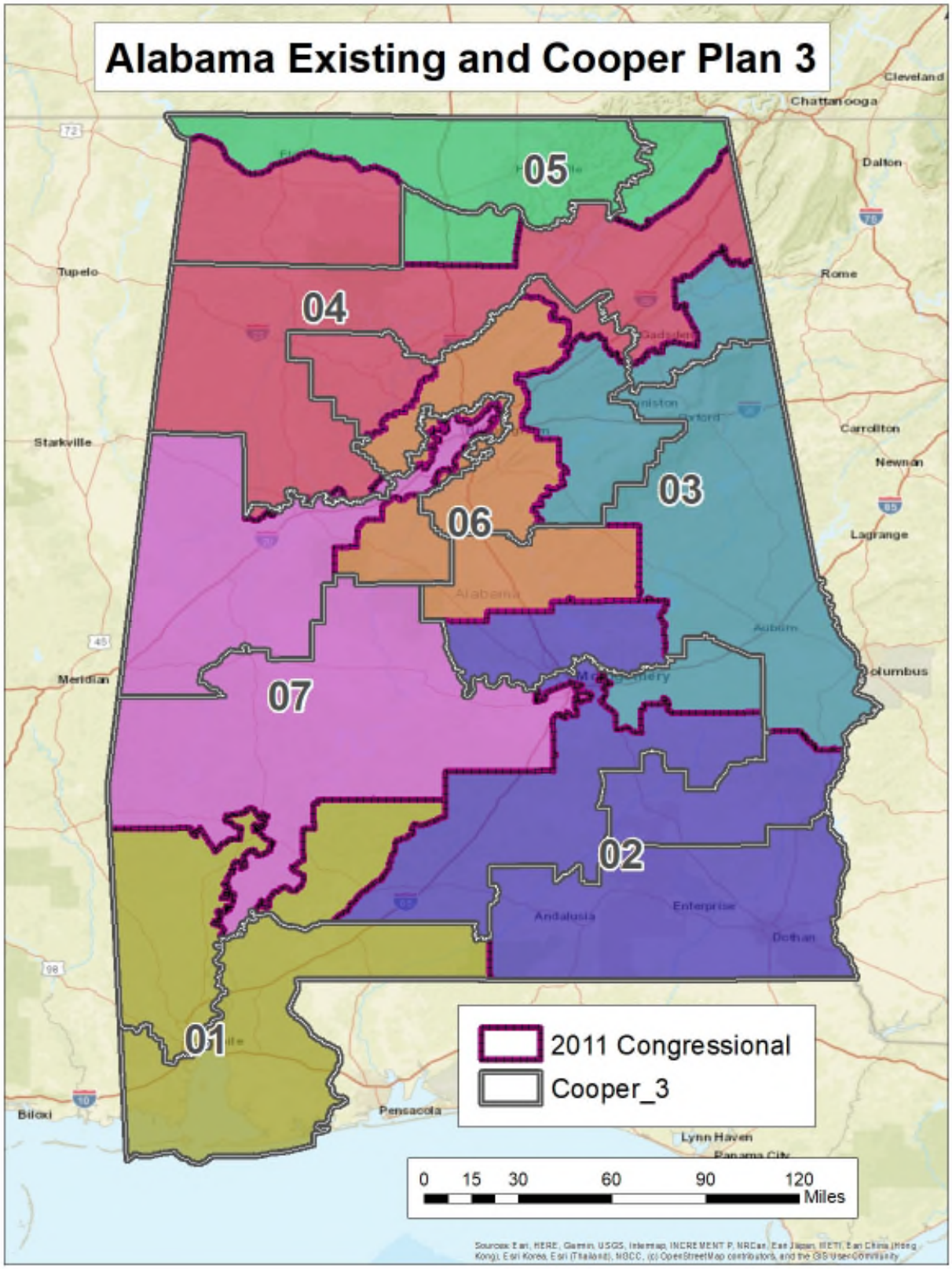
Map Appendix 10 (Cooper Plan 2 and Alabama Existing Districts)



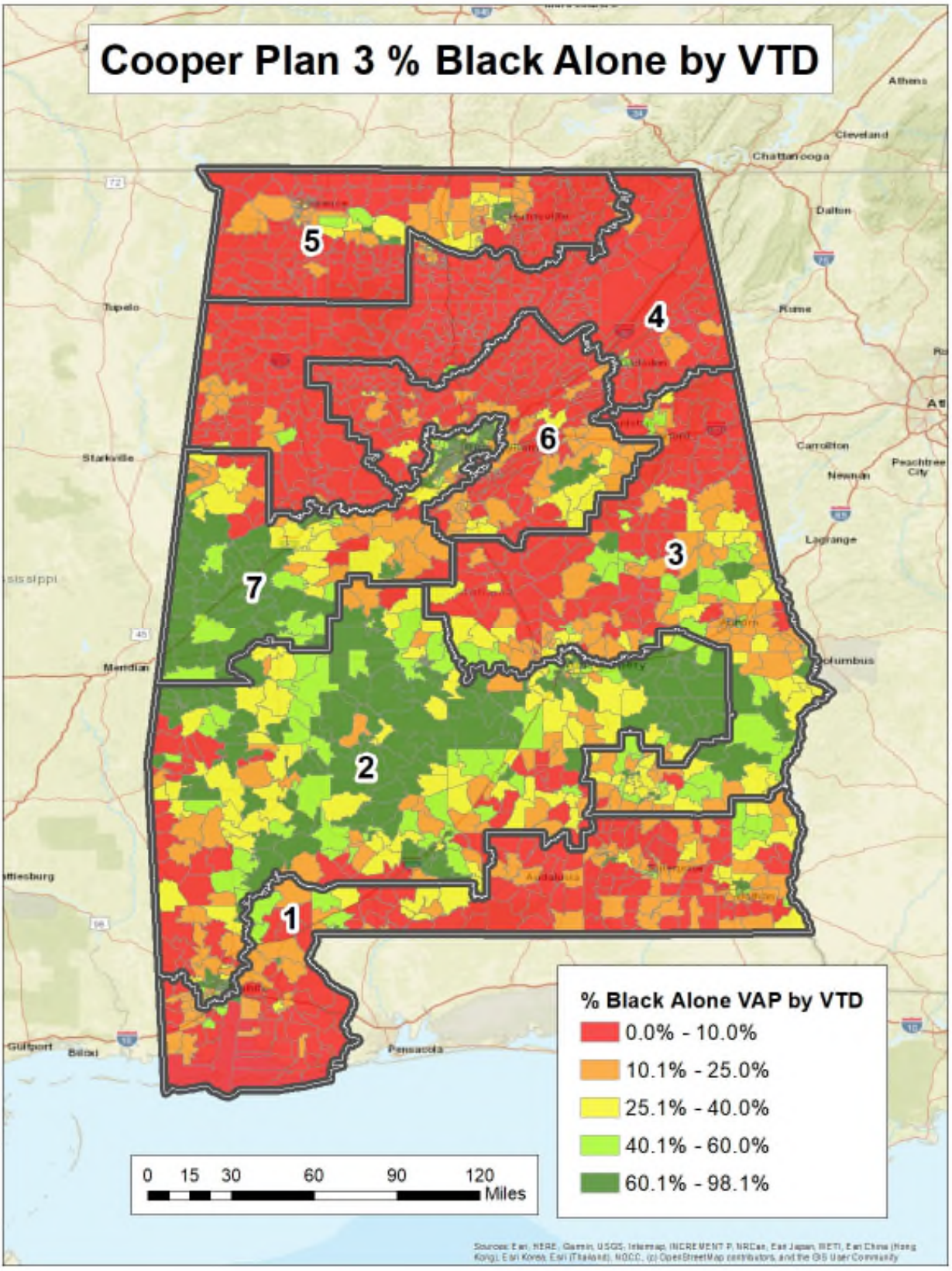
Map Appendix 10A (Cooper Plan 2 Plan Percent Black Alone VAP by VTD)



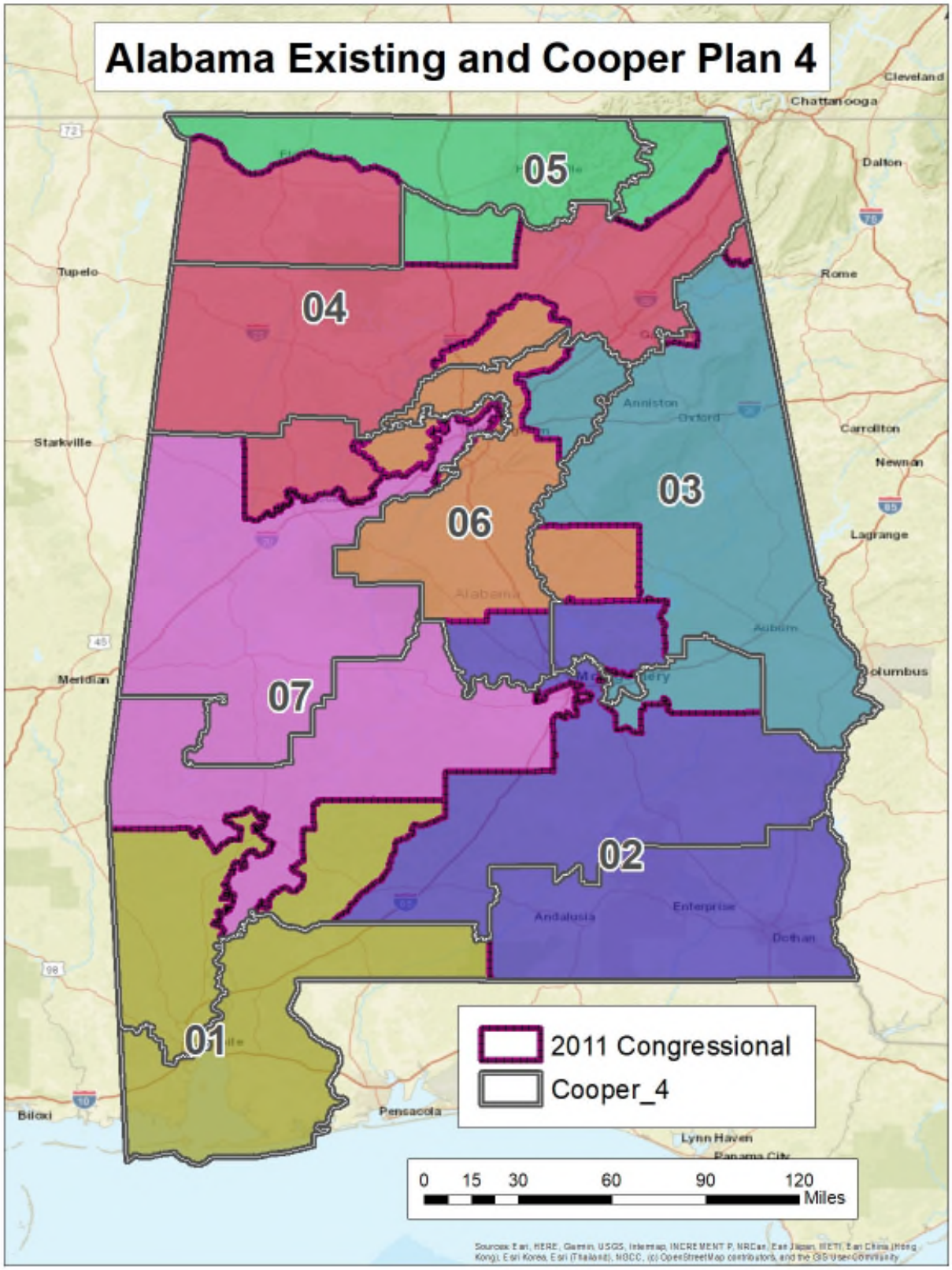
Map Appendix 11 (Cooper Plan 3 and Alabama Existing Districts)



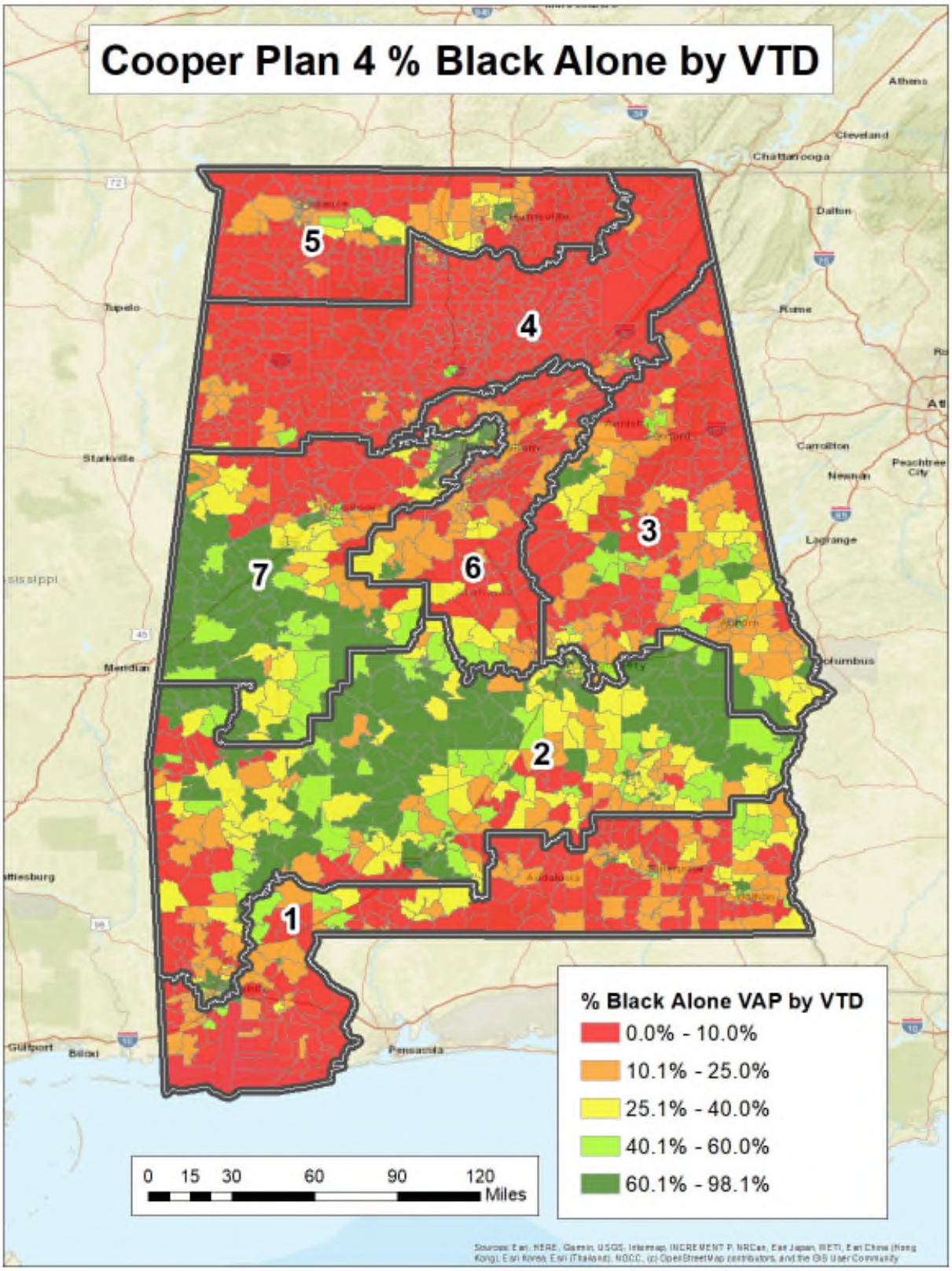
Map Appendix 11A (Cooper Plan 3 Plan Percent Black Alone VAP by VTD)



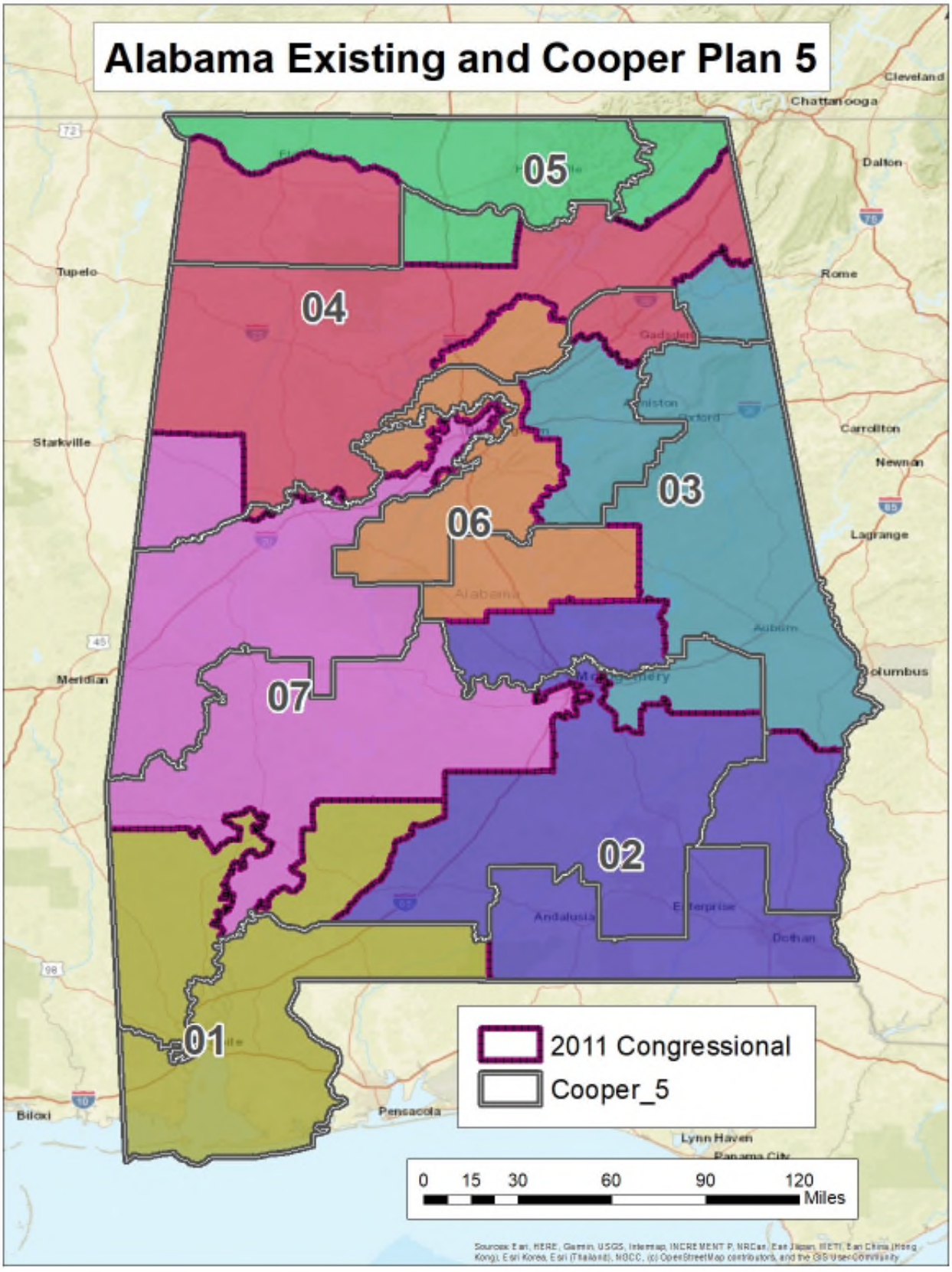
Map Appendix 12 (Cooper Plan 4 and Alabama Existing Districts)



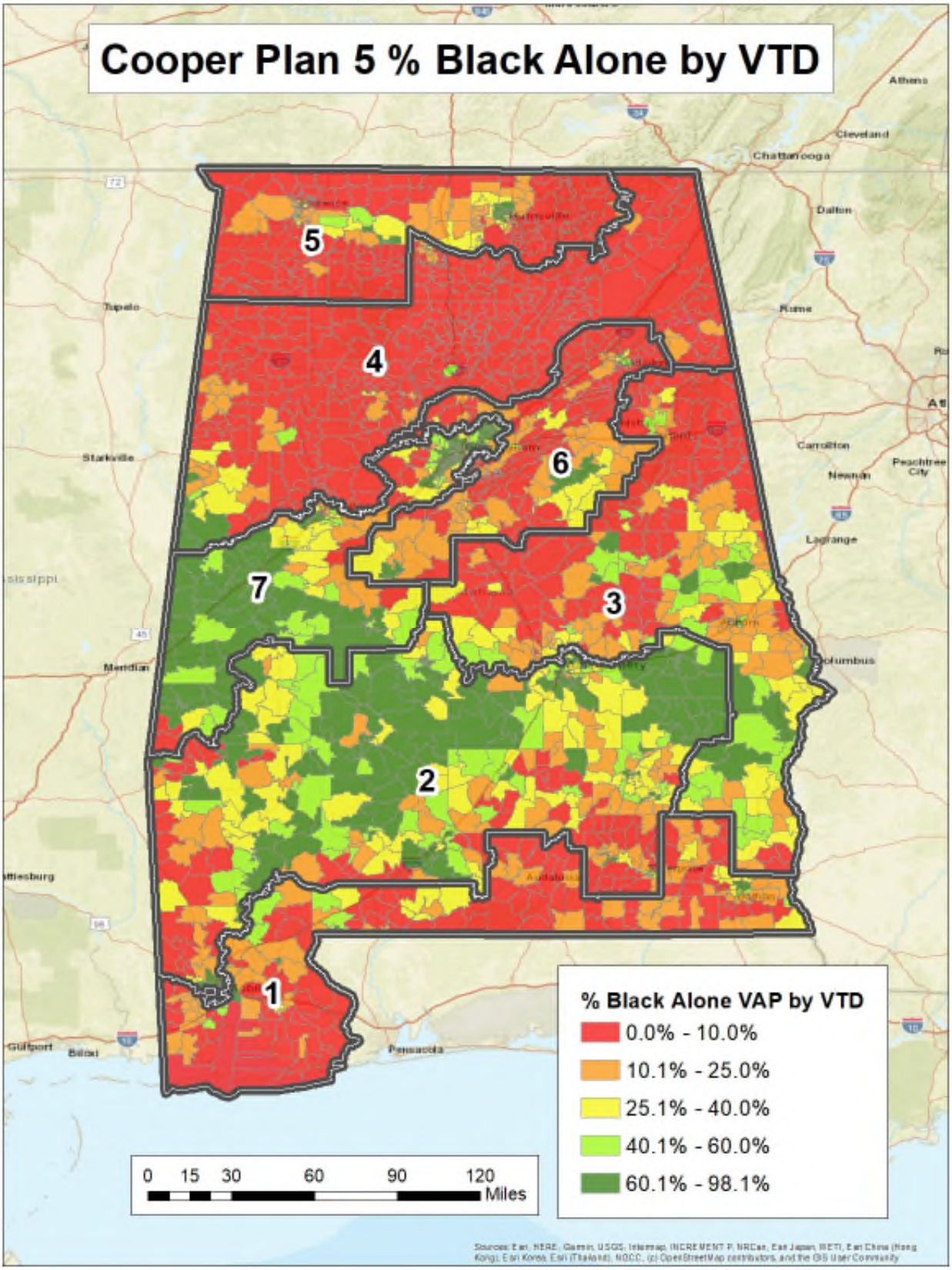
Map Appendix 12A (Cooper Plan 4 Plan Percent Black Alone VAP by VTD)



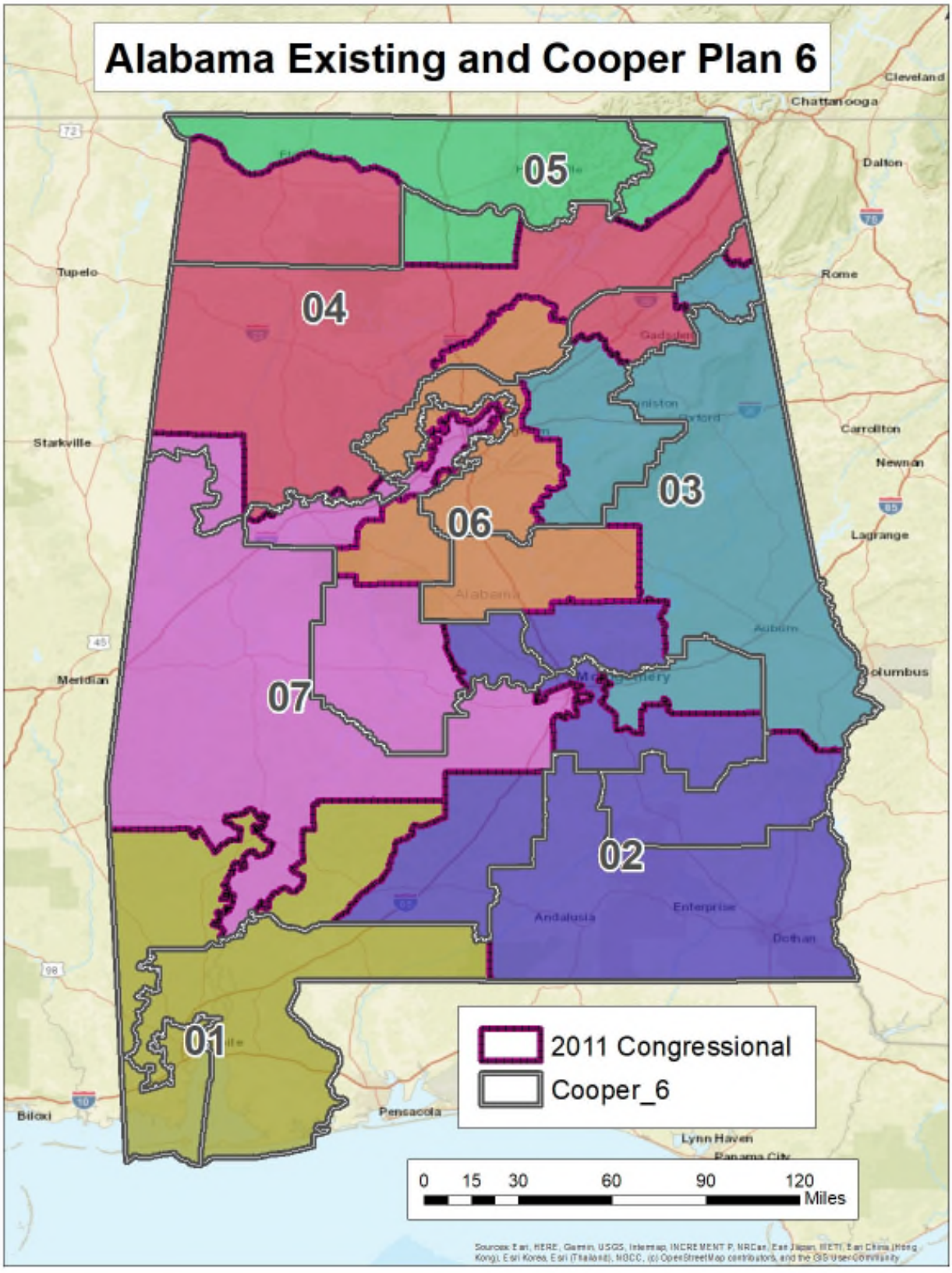
Map Appendix 13 (Cooper Plan 5 and Alabama Existing Districts)



Map Appendix 13A (Cooper Plan 5 Plan Percent Black Alone VAP by VTD)



Map Appendix 14 (Cooper Plan 6 and Alabama Existing Districts)



Map Appendix 14A (Cooper Plan 6 Plan Percent Black Alone VAP by VTD)

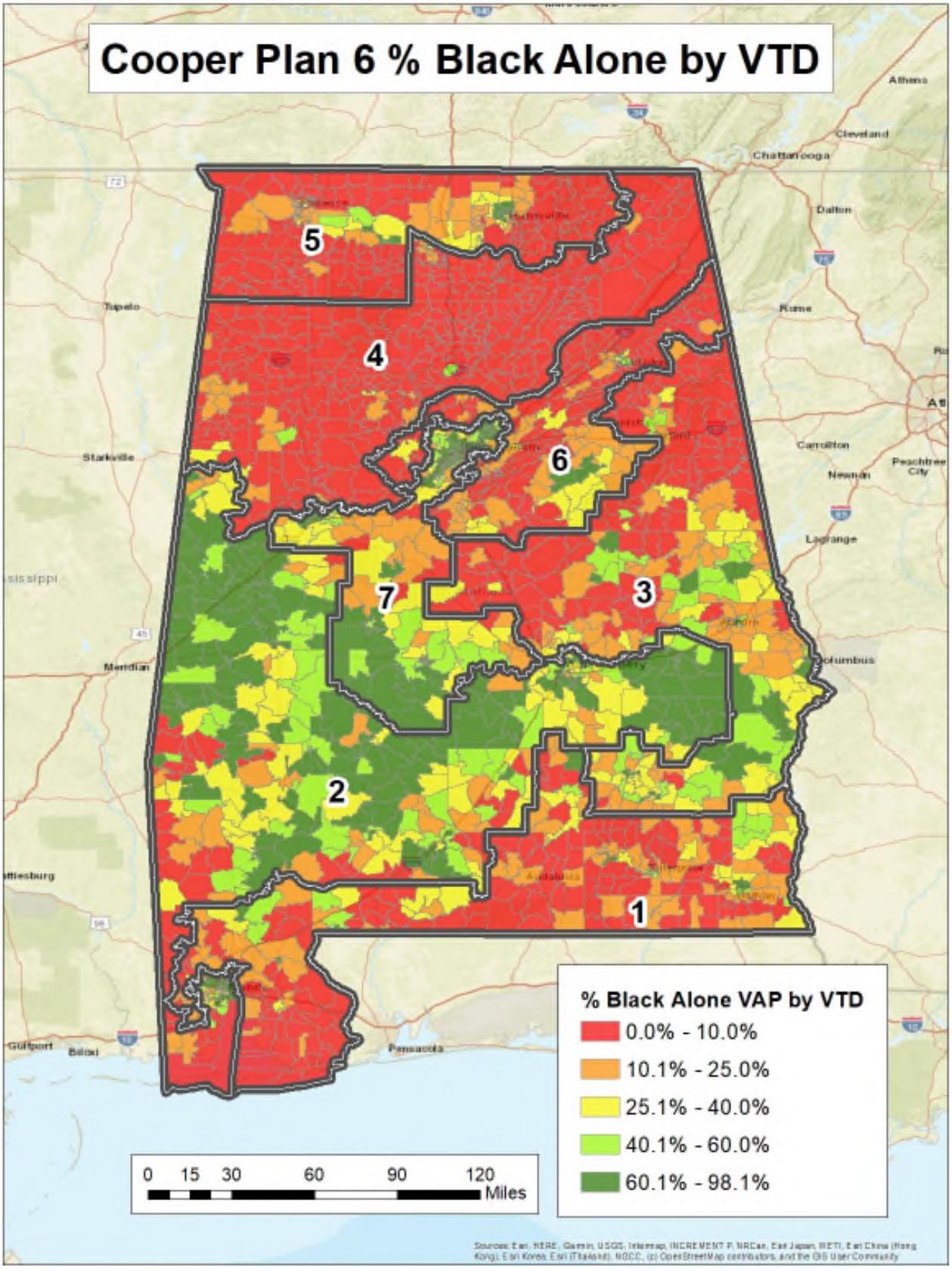
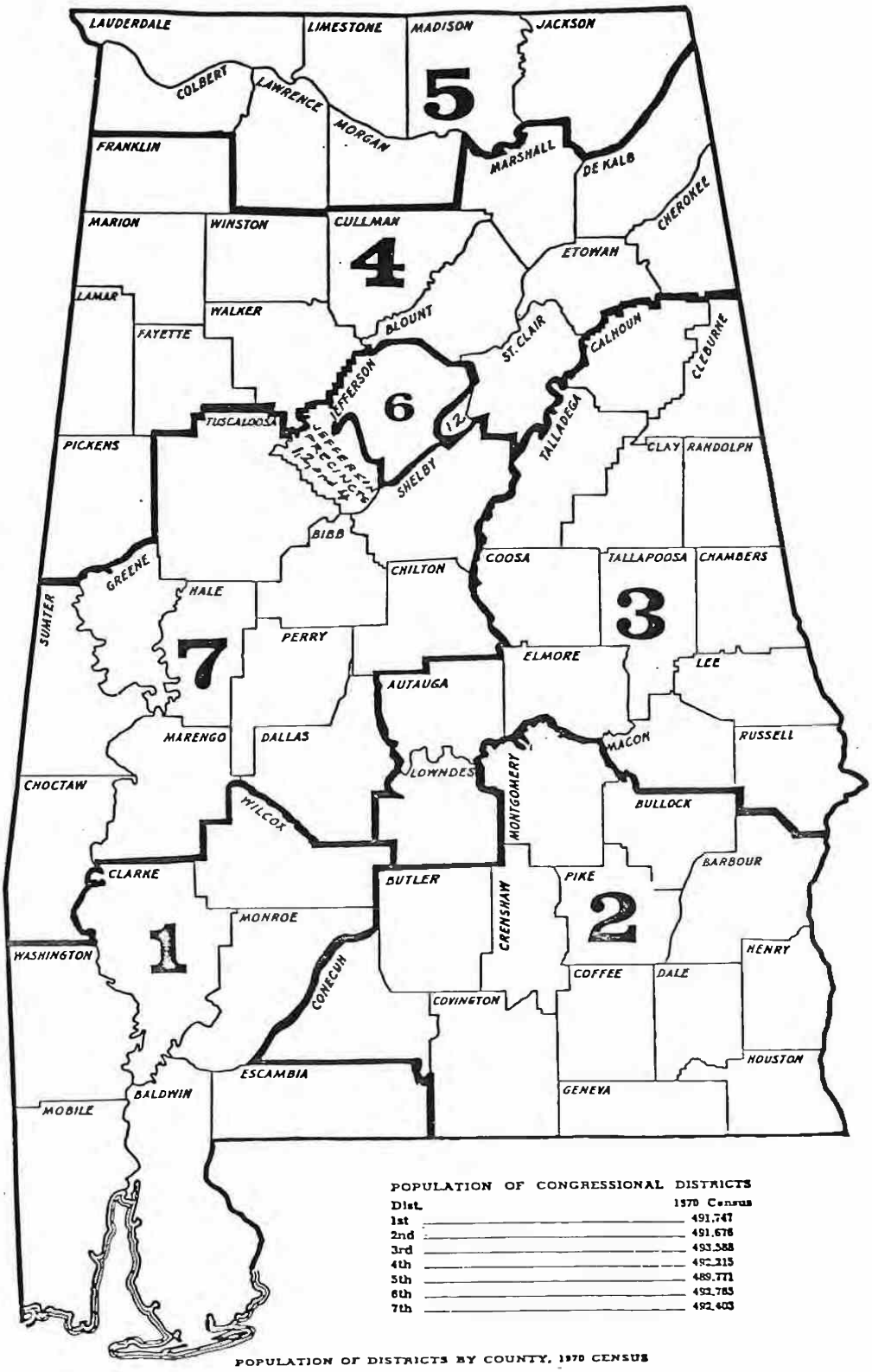


Exhibit 7

Alabama's Congressional Districts

Act No. 120 Third Special Session 1971 Approved January 19, 1972



POPULATION OF CONGRESSIONAL DISTRICTS

Dist.	1970 Census
1st	491,747
2nd	491,676
3rd	493,588
4th	492,215
5th	489,771
6th	493,785
7th	492,403

POPULATION OF DISTRICTS BY COUNTY, 1970 CENSUS

Act No. 120, Third Special Session, 1971. Approved Jan. 19, 1972

1ST DISTRICT

Baldwin	59,382
Clarke	26,724
Escambia	34,907
Mobile	317,308
Monroe	20,883
Washington	16,241
Wilcox	16,303
Total	491,747

(R) Jack Edwards, Congressman, Mobile

2ND DISTRICT

Barbour	22,543
Bullock	11,824
Butler	22,007
Coffee	34,872
Conecuh	15,645
Covington	34,079
Crenshaw	13,188
Dale	52,938
Geneva	21,924
Henry	13,254
Houston	56,574
Montgomery	167,790
Pike	25,038
Total	491,676

(R) Wm. L. "Bill" Dickinson, Congressman, Montgomery

3RD DISTRICT

Autauga	24,460
Calhoun	103,092
Chambers	36,356
Clay	12,536
Cleburne	10,998
Coosa	10,662
Elmore	33,535
Lee	61,268
Lowndes	12,896
Macon	24,841
Randolph	18,331
Russell	45,394
Talladega	65,280
Tallapoosa	33,840
Total	493,588

(D) Bill Nichols, Congressman, Sylacauga

4TH DISTRICT

Blount	26,853
Cherokee	15,608
Cullman	52,445
DeKalb	41,981
Etowah	94,144
Fayette	16,252
Franklin	23,933
Lamar	14,333
Marion	23,788
Marshall	54,211
Pickens	20,326
St. Clair	37,958
Walker	56,248
Winston	18,654
Jefferson Prec. 12 (Leeds)	7,483
Total	492,218

(D) Tom Bevill, Congressman, Jasper

5TH DISTRICT

Colbert	49,832
Jackson	39,303
Lauderdale	68,111
Lawrence	27,281
Limestone	41,699
Madison	186,540
Morgan	77,306
Total	489,771

Ronnie Flippo, Congressman, Florence

6TH DISTRICT

Jefferson	493,785

(R) Albert Lee Smith Congressman, Birmingham

7TH DISTRICT

Bibb	13,812
Chilton	25,180
Choctaw	16,589
Dallas	55,296
Greene	10,650
Hale	15,888
Marengo	23,819
Perry	15,388
Shelby	38,037
Sumter	16,974
Tuscaloosa	116,029
Jefferson Precincts 1, 2 & 4	144,741
Total	492,403

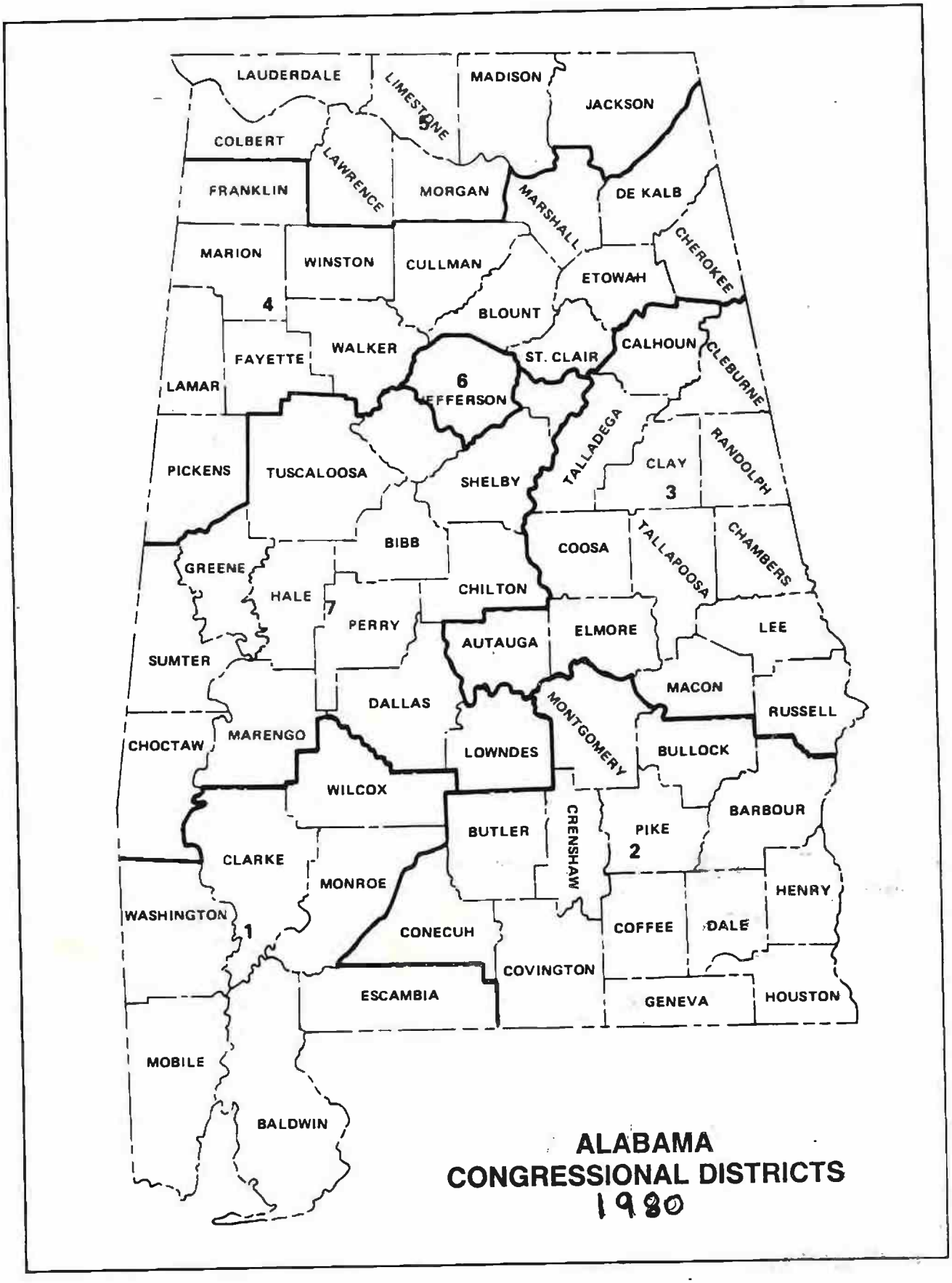
(D) Richard C. Shelby, Congressman, Tuscaloosa

STATE OF ALABAMA
CONGRESSIONAL DISTRICTS 1980

Reapportionment Office
Alabama State House
11 South Union, Room 811
Montgomery, Alabama 36130
(205)242-7941

Act. 81-929

3


LAUDERDALE
LIMESTONE
MADISON
JACKSON
COLBERT
LAWRENCE
FRANKLIN
MORGAN
MARSHALL
DE KALB
CHEROKEE
MARION
WINSTON
CULLMAN
ETOWAH
4
BLOUNT
FAYETTE
WALKER
ST. CLAIR
CALHOUN
CLEBURNE
LAMAR
6
JEFFERSON
PICKENS
TUSCALOOSA
SHELBY
TALLADEGA
CLAY
3
RANDOLPH
BIBB
COOSA
TALLAPOOSA
CHAMBERS
GREENE
HALE
7
CHILTON
PERRY
AUTAUGA
ELMORE
LEE
SUMTER
MACON
DALLAS
MONTGOMERY
RUSSELL
CHOCTAW
MARENGO
LOWNDES
BULLOCK
WILCOX
BARBOUR
BUTLER
CRENSHAW
PIKE
2
CLARKE
MONROE
HENRY
WASHINGTON
1
CONECUH
COFFEE
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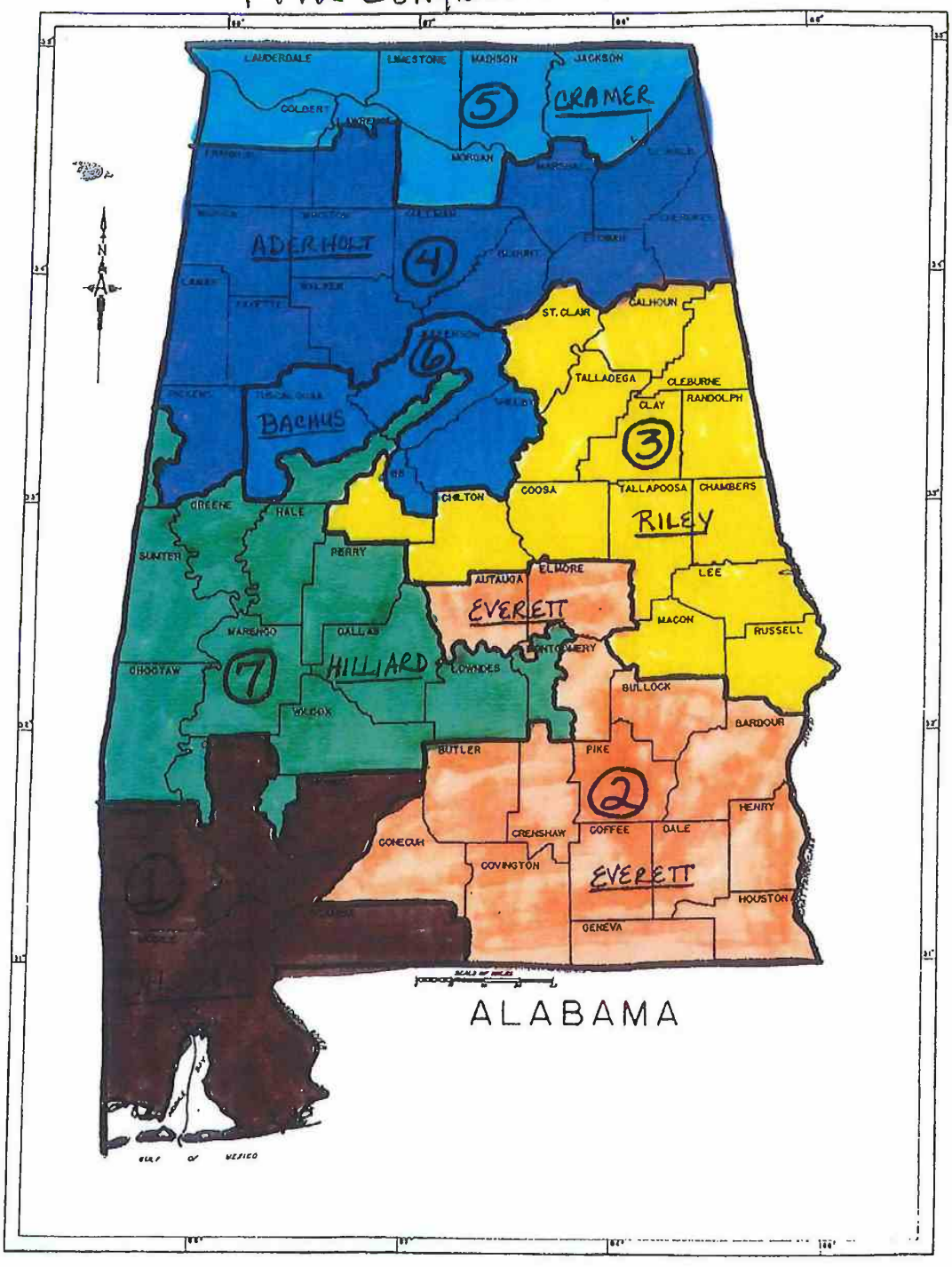
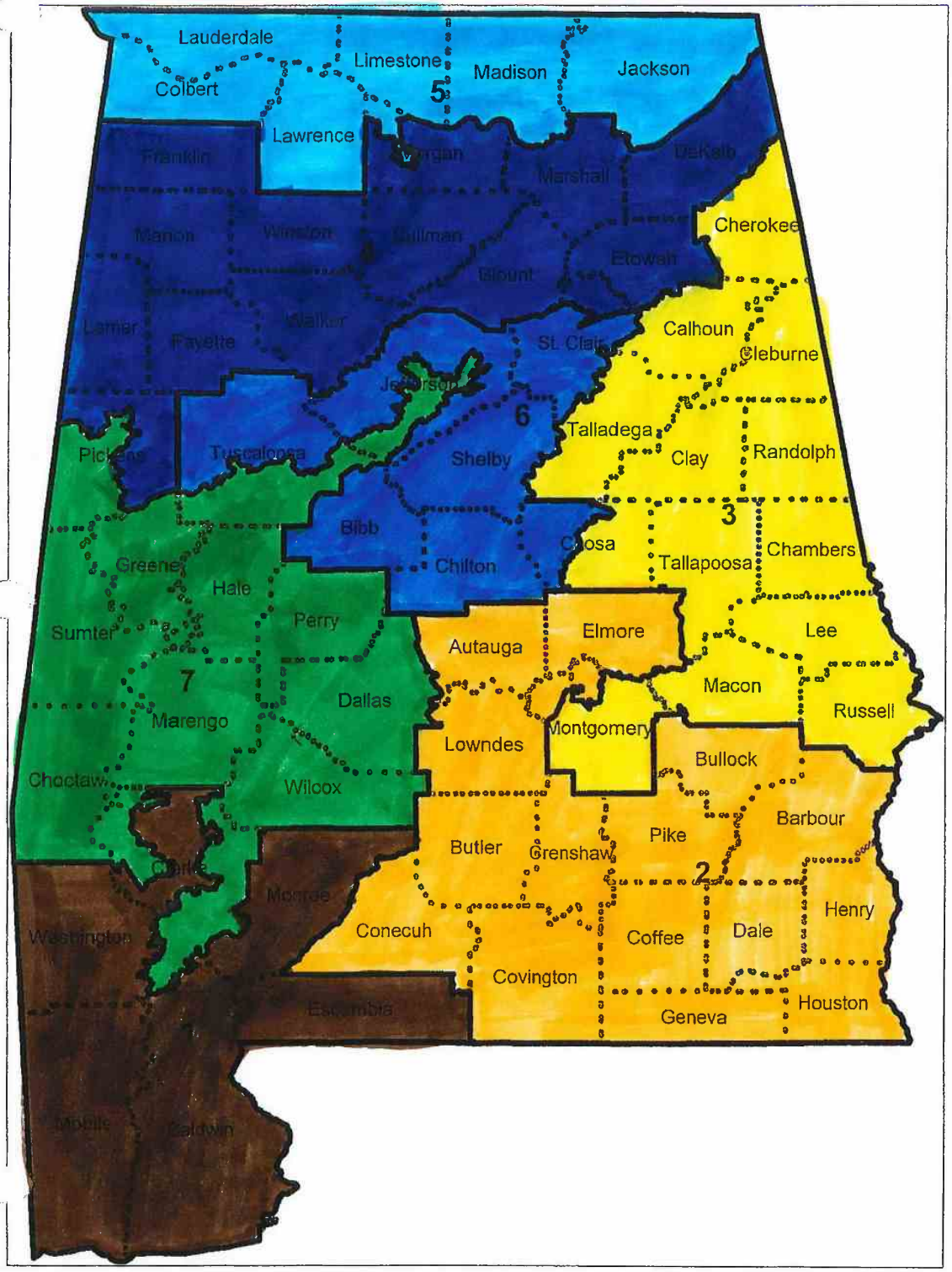
MOBILE
BALDWIN
ALABAMA
CONGRESSIONAL DISTRICTS
1980

1992 Congressional

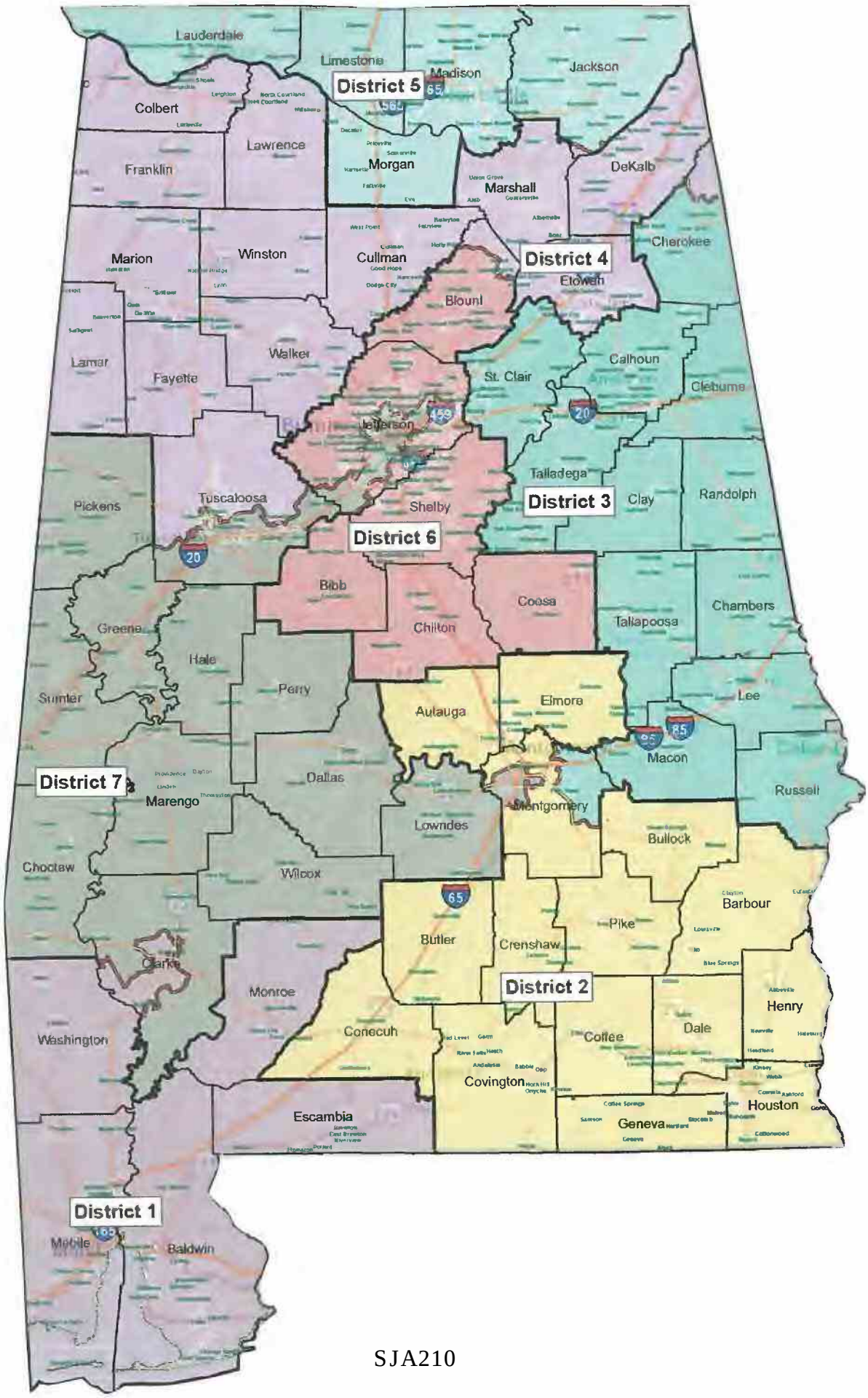


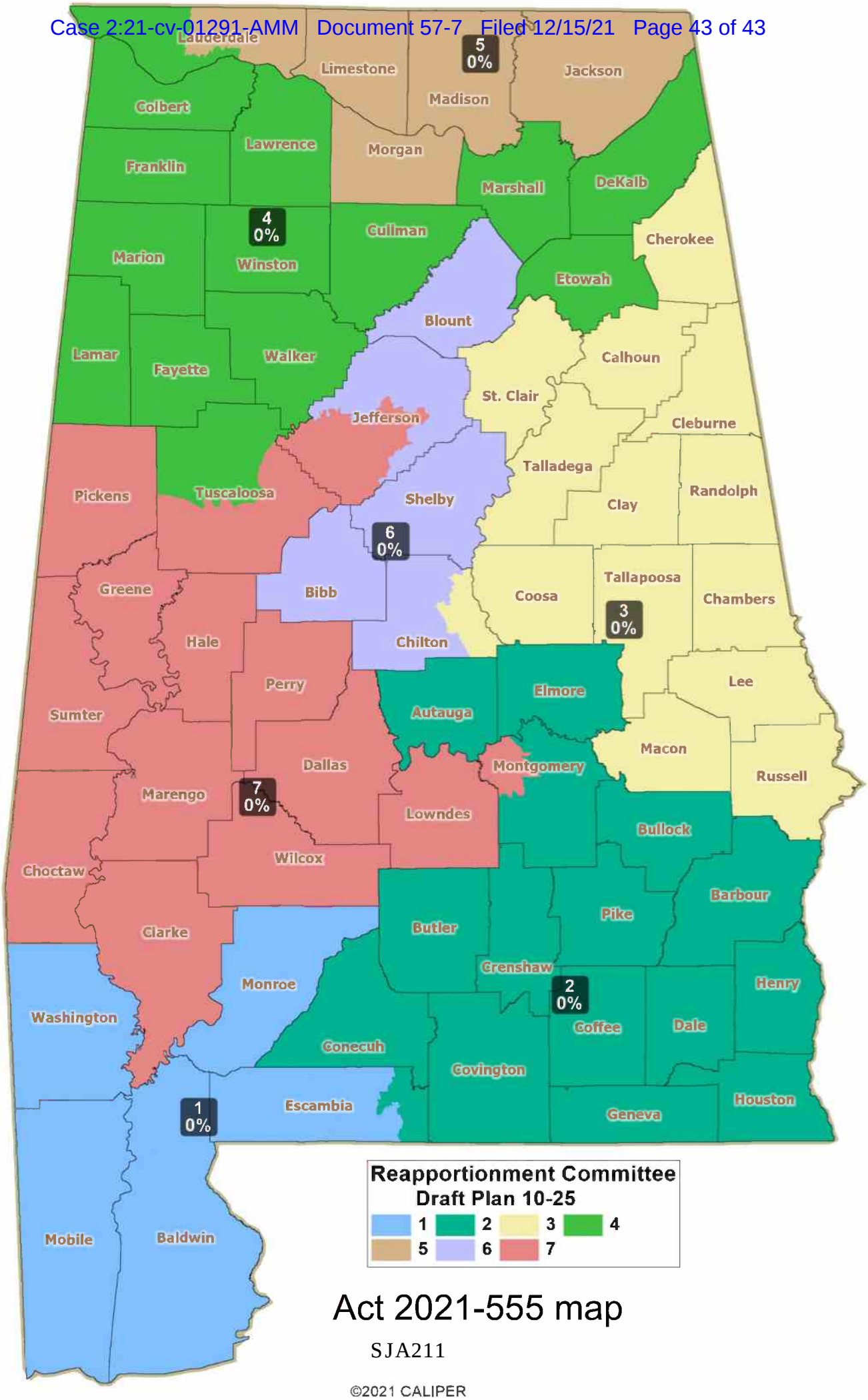
2002 Congressional Districts



2002 Congressional Districts 1-30-02
1/31/02 11:32 AM

2011 Congressional Districts





Act 2021-555 map

SJA211