

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

KHADIDAH STONE, et al.,

Plaintiffs,

v.

WES ALLEN, et al.,

Defendants,

Case No. 2:21-cv-1531-AMM

SUPPLEMENTAL EXPERT REPORT OF SEAN P. TRENDE, Ph.D.

**DEFENDANT'S
EXHIBIT
8**

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1 Expert Qualifications

My qualifications were set out in my Expert Report of Sean P. Trende, Ph.D., dated March 29, 2024, (hereinafter “First Trende Report” or “First Report”). They have not changed materially since then. I have not testified in any additional matters, nor have I been deposed in any.

2 Scope of Supplemental Report

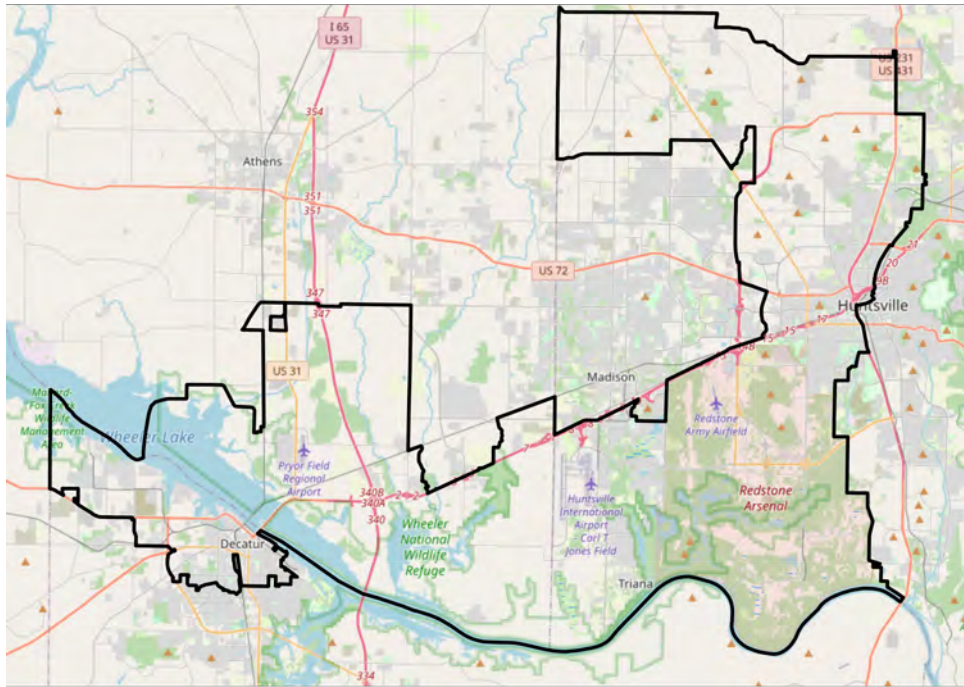
I have been asked to evaluate two new maps submitted by Mr. Anthony Fairfax in his April 19, 2024 Rebuttal Expert Report. These are referred to as “Illustrative Plan 2” or “Fairfax Map 2” and “Illustrative Plan 3” or “Fairfax Map 3.”

This report is intended to be narrowly tailored to those maps, and will not directly address the responses or objections raised against my First Report by Mr. Fairfax or by any other witness for Plaintiffs in their rebuttal reports. Failure to address those responses or objections does not reflect an agreement with those responses or objections. Rather, it simply reflects the intentionally narrow scope of this report.

3 Evaluation of Fairfax Map 2

The new Fairfax Map 2 takes Senate District 7 from the previous Illustrative map and wraps the northern tip around to the northwest of Huntsville, such that the district now resembles nothing so much as a scorpion poised to strike.

Figure 1: Fairfax Map 2, District 7



It is beset by multiple problems. First, as with the previous map, Mr. Fairfax cannot say with a reasonable degree of scientific certainty that District 7 in Illustrative Map 2 has a majority Black CVAP. This is for two reasons. The CVAP sample has inherent error margins that cannot be handwaved away; they are the very real and inevitable product of relying upon samples, and they erode our confidence in the reported estimates. Additionally, the process of trimming block groups and re-allocating the population adds additional, unquantifiable uncertainty to the process. Second, the map does not contain a compact minority population in the Huntsville area. Third, the districts created in this iteration are less compact than the those found in the Enacted Map, and decrease the overall compactness of the map on a regional and statewide basis. Fourth, race almost certainly predominated in the drawing of District 7.

3.1 Mr. Fairfax cannot say with a reasonable degree of scientific certainty that Map 2 has a majority Black BCVAP.

Fairfax Map 2 suffers from many of the same shortcomings as Fairfax Map 1. In particular, because District 7 falls short of 50% + 1 BVAP, he instead relies upon BCVAP. The problem is that CVAP estimates are samples. As with any sample, such as a poll, those estimates are accompanied by inherent uncertainty. We express that uncertainty via error margins or confidence intervals. This uncertainty is an inherent part of the sampling process, and introduces inevitable uncertainty into his estimates of CVAP (as with any sample). It does not make the data worthless or unreliable; it just means that the uncertainty accompanying those estimates should be accounted for, especially if precision is important. Because those error margins/confidence intervals include 50%, Mr. Fairfax cannot say with a reasonable degree of certainty typical of the social sciences that the Black CVAP in Fairfax Map 2 does, in fact, exceed 50%.

If we look at the overall Black CVAP of the block groups wholly or partially within the district, the 95% error margin is 3,627 citizens, while the 90% error margin is 3,044 citizens. The estimate for the overall Black CVAP of the block groups wholly or partially within the district is 44.35%, with a 90% error margin of 2.7% and a 95% error margin of 3.2%.

As Table 1 shows, however, regardless of the method used to estimate the Black CVAP percentage of the district (the various methods are described in my initial report and will not be rehashed here), all of the estimates fall easily within 3.2% of 50%. Even using the more generous 90% confidence level, the district always falls within 2.7% of 50%.

Table 1: Estimated Black CVAP of District 7, Fairfax Map 2

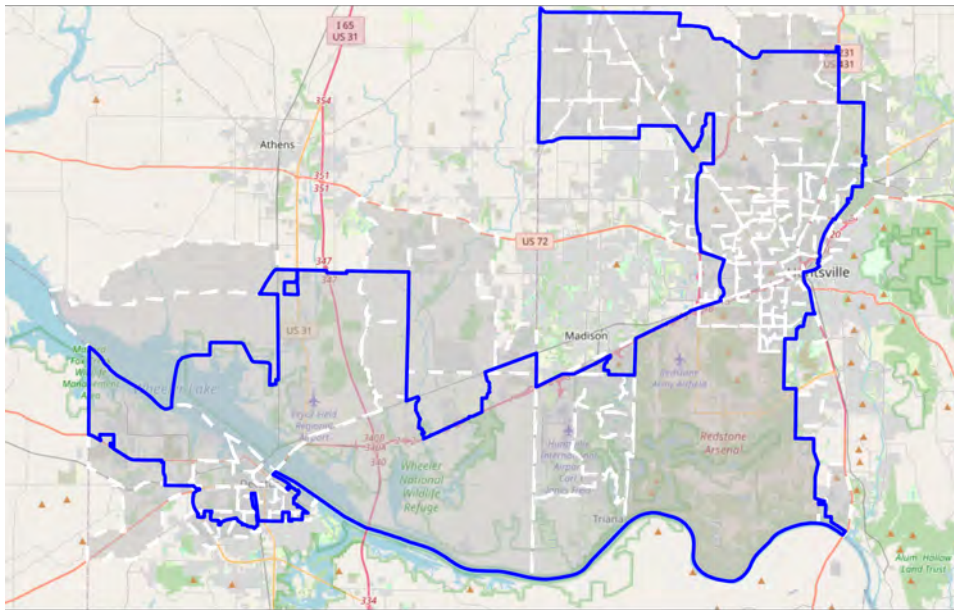
	2020	2021	2022
Full Method 1	51.7%	50.9%	51.1%
Capped Method 1	50.5%	49.8%	50.3%
Method 2, Pop Wt.	51%	50.2%	50.5%
Method 2, Wt. Separate	51.7%	51%	51.1%
EI Expand	51%	50.2%	50.5%
EI Expand, Separate	51.7%	51%	51.1%

Put differently, taking the highest BCVP estimate above of 51.7% (using the 2020 data), our 95% confidence interval is (48.4%, 55%), while our 90% confidence interval is (49%, 54.4%). Using the median estimate of 51%, the 95% confidence interval would be (47.7%, 54.3%), while the 90% confidence interval would be (48.3%, 53.7%).

What this means is that social scientists would not reject a claim that the actual BCVP of the population in this district is, in fact, less than 50% Black CVAP. The data produced by the ACS are simply not sufficiently inconsistent with such a hypothesis to form a contrary opinion with sufficient certainty, using standards of reliability typical of the discipline.

This, then, re-raises the second issue with the data. District 7 splits block groups, as the following illustration depicts:

Figure 2: Fairfax Map 2, District 7, with block groups outlined in white



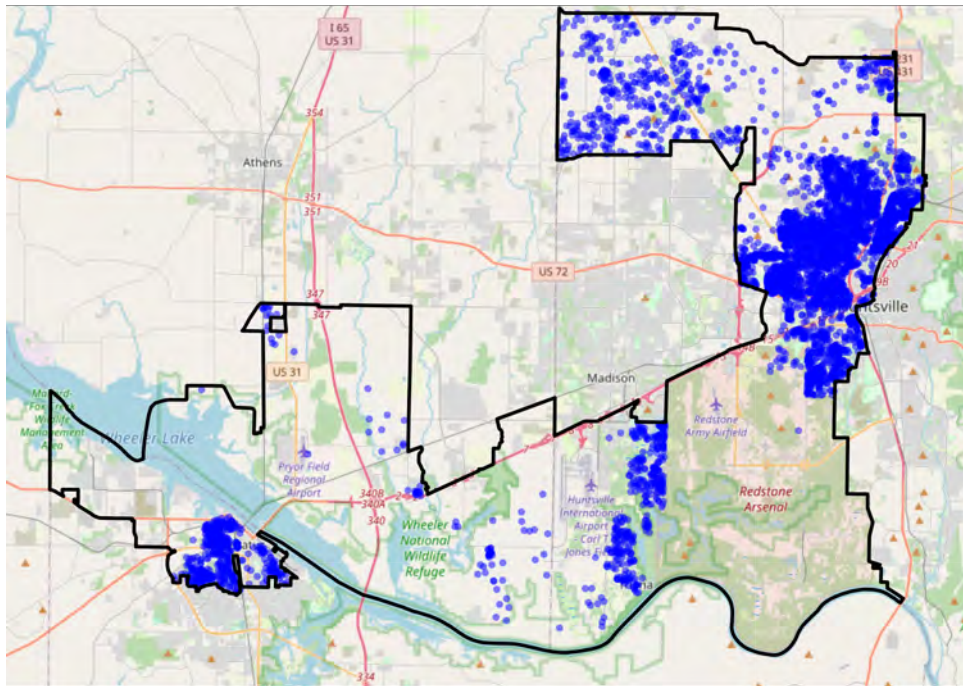
Black citizens of voting age and total citizens of voting age in those split block groups must somehow be separated into those living within the district and those living outside of the district. This is crucial, because we know that the BCVAP of the block groups as a whole is below 50%; that threshold is only crossed (if indeed it is crossed) by allocating citizens within split block groups. While there are multiple techniques for doing so, all of them introduce a degree of error that is unquantifiable. If it is not important to be precise in your estimate, this is typically not a concern. If, however, there is an important threshold that must be surpassed for some reason (such as compliance with the numerosity requirement of *Gingles I*), this uncertainty erodes the confidence we can have in our reported estimates beyond that encapsulated by confidence intervals/error margins.

3.2 Fairfax Map 2, District 7 does not contain a compact minority population

As with its previous iterations, Fairfax Map 2, District 7 does not contain a compact minority population. Rather, it contains multiple clusters of minority populations aggregated together in an attempt to create a 50% +1 BCVAP district.

We can see this by examining the location of Black residents of voting age using the following dotplot:

Figure 3: Fairfax Map 2, District 7. One blue dot = 10 Black residents of voting age

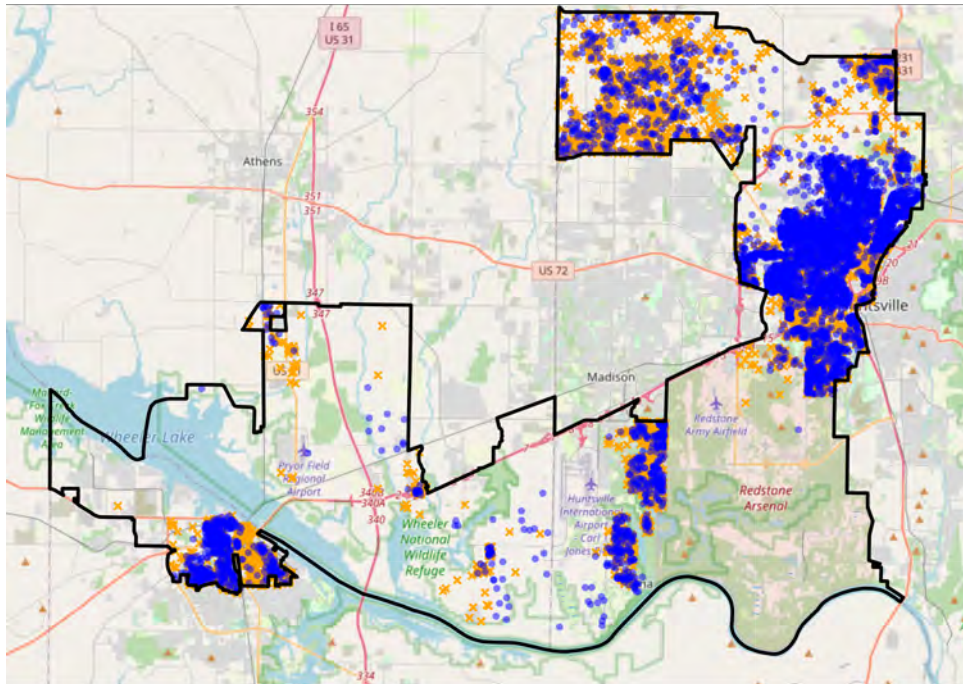


As you can see, there is a cluster of Black residents in the tip of the scorpion's tail, a large cluster in the main portion of the scorpion's tail, a cluster to the west of the Redstone Arsenal, and a final cluster in Decatur.

We can see that the most of the area connecting these clusters is empty by overlaying the White population. As we will see in the choropleth map further below, Mr.

Fairfax needs to utilize these empty precincts to stitch together these clusters of Black residents because otherwise he would have to go through heavily White precincts, dropping his BCVAP below 50% (see Figures 7 and 8).

Figure 4: Fairfax Map 2, District 7. One blue dot = 10 Black residents of voting age. One orange “x” = 10 White residents of voting age



We can further see the isolation of these pockets by looking on a countywide basis.

Figure 5: Fairfax Map 2, District 7. One blue dot = 10 Black residents of voting age

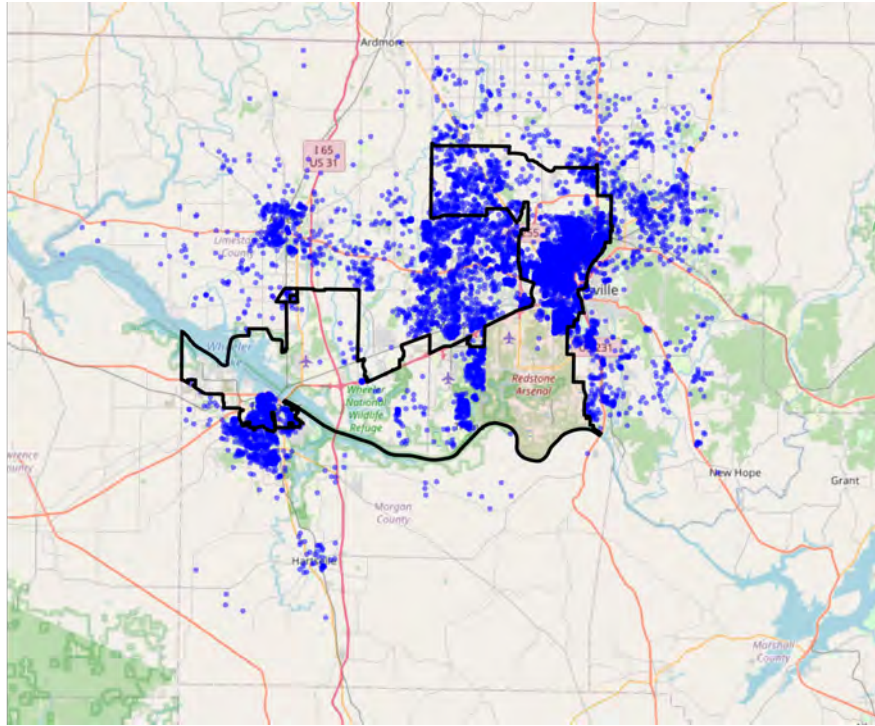


Figure 6: Fairfax Map 2, District 7. One blue dot = 10 Black residents of voting age.
One orange "x" = 10 White residents of voting age

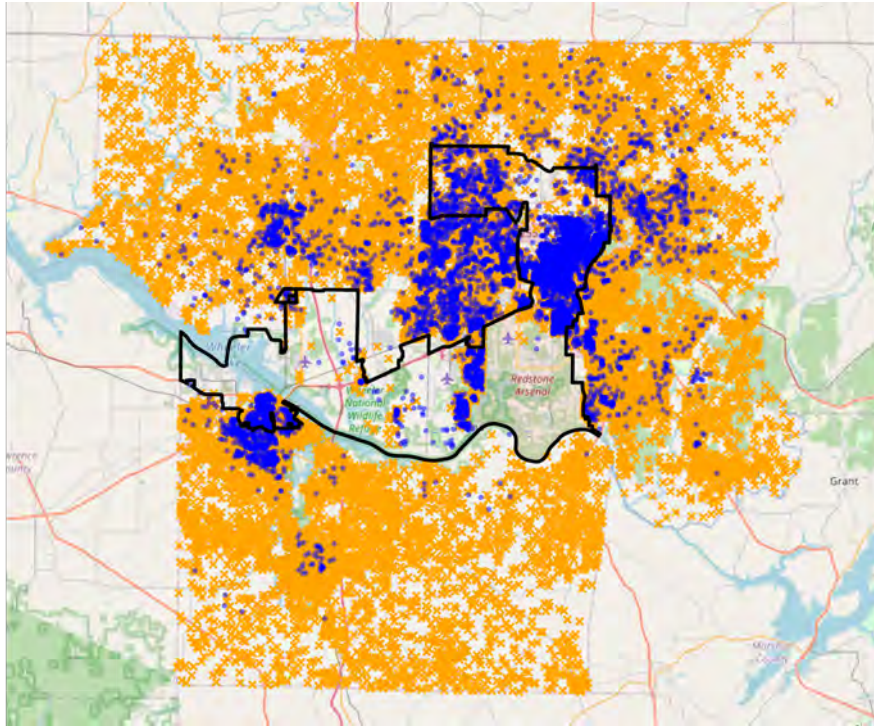
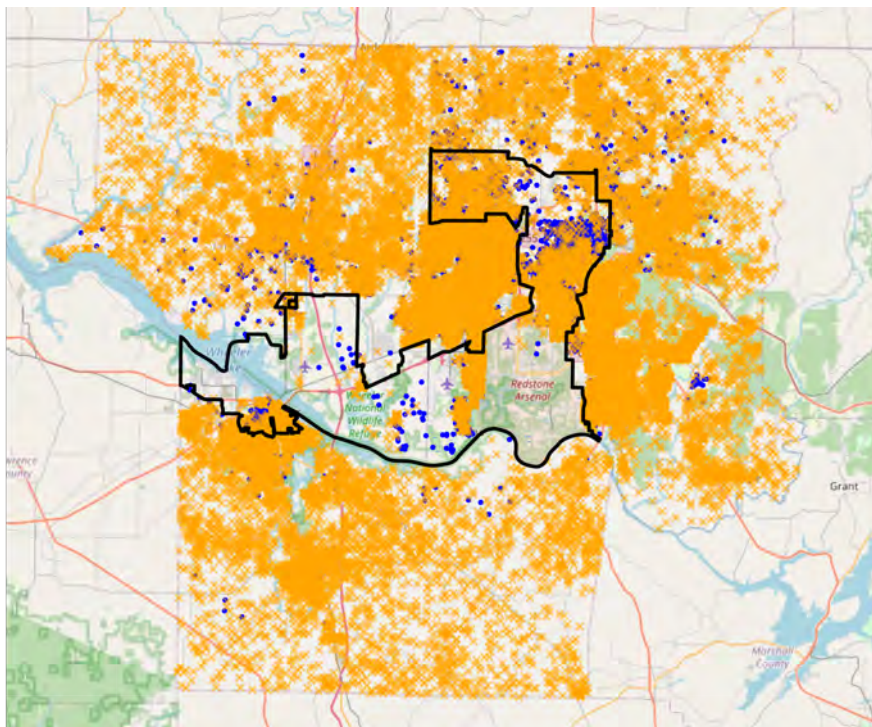


Figure 7: Fairfax Map 2, District 7. One blue dot = 10 Black residents of voting age. One orange “x” = 10 White residents of voting age



(a) In this version, the Black population is printed first, and the White population is overlaid. Note that these should all be read in conjunction with the choropleth maps, which provide a sense of how heavily Black or White a densely populated area is.

3.3 The districts in Fairfax Map 2 are less compact than those in the Enacted Map

Overall, Fairfax Map 2 decreases the compactness of the map relative to the Enacted Map. This can be viewed from a number of perspectives, as compactness is a multifaceted metric. First, we can examine Reock scores. A Reock score asks us to imagine the smallest circle that could encompass a district without cutting it, and then reports the percentage of that circle that the district would fill. As districts become more distended or oval-shaped, the Reock score decreases; as they become more circular, the Reock score increases.

The mean Reock Score of the Enacted Map is 0.395. The mean Reock Score of

Fairfax Map 2 is 0.38 (recall that lower Reock and Polsby-Popper scores mean that a district is less compact). This is even more pronounced when we examine the districts Mr. Fairfax changes in Northern Alabama: 1, 2, 3, 6, 7, 8, 9, 10, and 17. The mean Reock score in the Enacted Map in these districts is 0.422. The mean Reock score in Mr. Fairfax’s Map 2 is 0.354.

Overall District 7 is made 0.03 points more compact under the Reock score, while District 1 is made 0.02 points more compact with this metric. But District 3 goes from a Reock score of 0.59 to 0.23, while District 2 transforms from a district with a Reock score of 0.664 to a district with a Reock score of 0.505.

Figure 8: 10 least compact districts in Enacted and Fairfax Map 2, Using Reock Scores

Fairfax 2 Reock	Fairfax 2 District	Enacted Reock	Enacted District
0.192	12	0.174	1
0.196	1	0.192	12
0.220	4	0.220	4
0.226	3	0.239	18
0.239	18	0.252	21
0.252	21	0.258	7
0.261	27	0.261	27
0.282	29	0.270	25
0.282	22	0.282	29
0.290	7	0.282	22

Polsby-Popper scores measure the degree to which a district is beset by “arms” and “inlets.” It imagines a circle with the same *perimeter* as the district, and asks what

percentage of such a circle the district would fill. The average Polsby-Popper score of the plan declines from 0.257 to 0.245. In Northern Alabama, the average compactness declines from 0.306 to 0.24. District 3 is once again made significantly less compact. District 7 is made less compact under this metric.

Figure 9: 10 least compact districts in Enacted and Fairfax Map 2, Using Polsby-Popper Scores

Polsby-Popper, FF2	Fairfax 2 District	Polsby=Popper, Enacted	Enacted District
0.123	22	0.121	11
0.133	11	0.123	22
0.134	7	0.135	17
0.154	3	0.138	25
0.156	17	0.142	7
0.159	12	0.159	12
0.166	15	0.164	15
0.173	21	0.173	21
0.177	20	0.177	20
0.181	9	0.178	26

Finally, we can examine “cut edges.” Cut edges compactness was employed by plaintiffs in *Allen v. Milligan*, and is related to Polsby-Popper. It measures the number of blocks or precincts that are separated in order to create districts. As districts become more sprawling, more and more adjacent blocks are separated to create the district. Thus, higher scores are less compact for purposes of this metric. The Enacted Map removes 8,862 edges. Fairfax Map 2, on the other hand, removes 9,059 edges. If we examine Northern Alabama alone, the Enacted Map removes 1,652 edges. Fairfax Map 2 removes 1,974.

If we look at the precinct level, rather than the block level, the Enacted Map removes 995 edges, while Fairfax Map 2 removes 1,011. If we constrain our analysis to Northern Alabama alone, the Enacted Map removes 161 edges, while Fairfax Map 2 removes 182.

3.4 Race almost certainly predominated in the drawing of Fairfax Map 2, District 7

That race predominated in the drawing of this district is almost definitional; the sole reason for varying from Fairfax Map 1, District 7 is to increase the BCVAP.¹ However, in this instance, the role that race played is even more obvious. We can recreate the choropleth maps that were utilized to examine Fairfax Map 1, District 7 at both the VTD and block level:

¹The fact that these districts may score well based upon other sociological factors does nothing to change my opinion here; after all, race correlates with various sociological factors, so this would likely be the case even in the most egregious of racial gerrymanders. But those sociological factors are often reported only at the block group or even census tract level, so they are not as precisely delineated as racial data are for districts. Moreover, there's nothing in these maps that suggests that these factors correlate more strongly with precinct/block group selection more strongly than racial data; indeed given how carefully these maps select high-BVAP precincts, it is difficult to see how they possibly could do so.

Figure 10: Fairfax Map 2, District 7, with VTDs shaded by BVAP

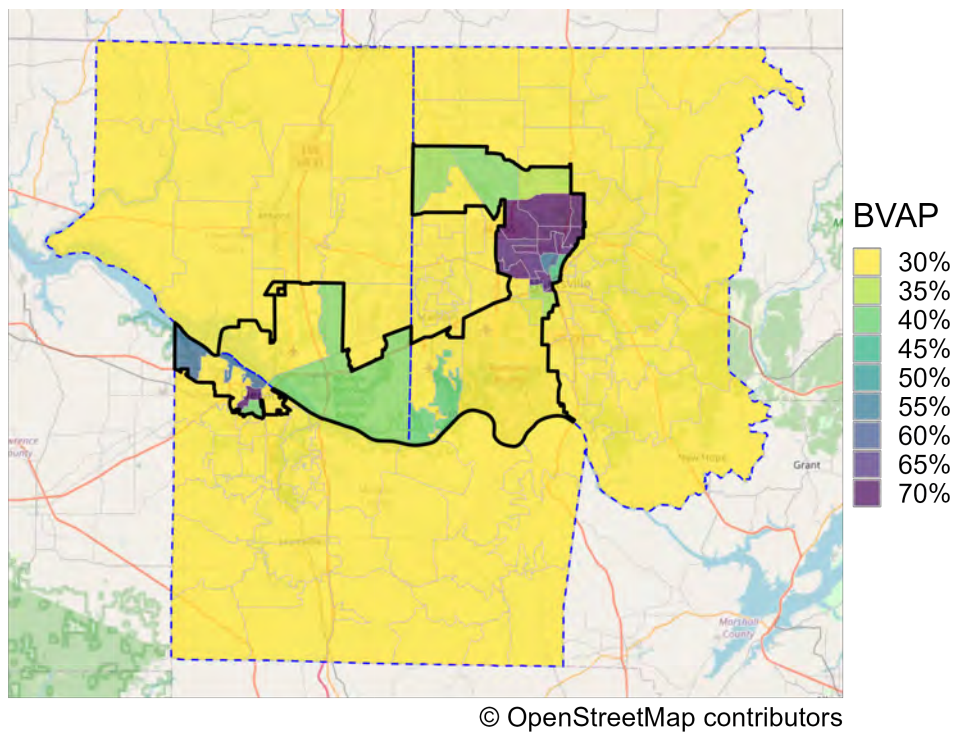
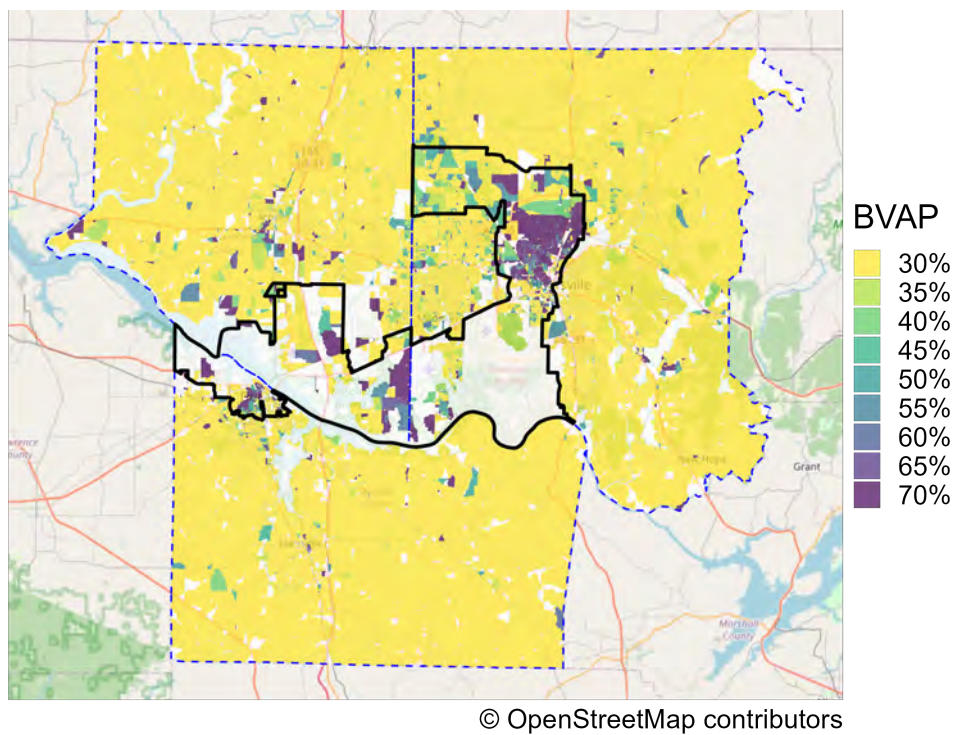


Figure 11: Fairfax Map 2, District 7, with blocks shaded by BVAP

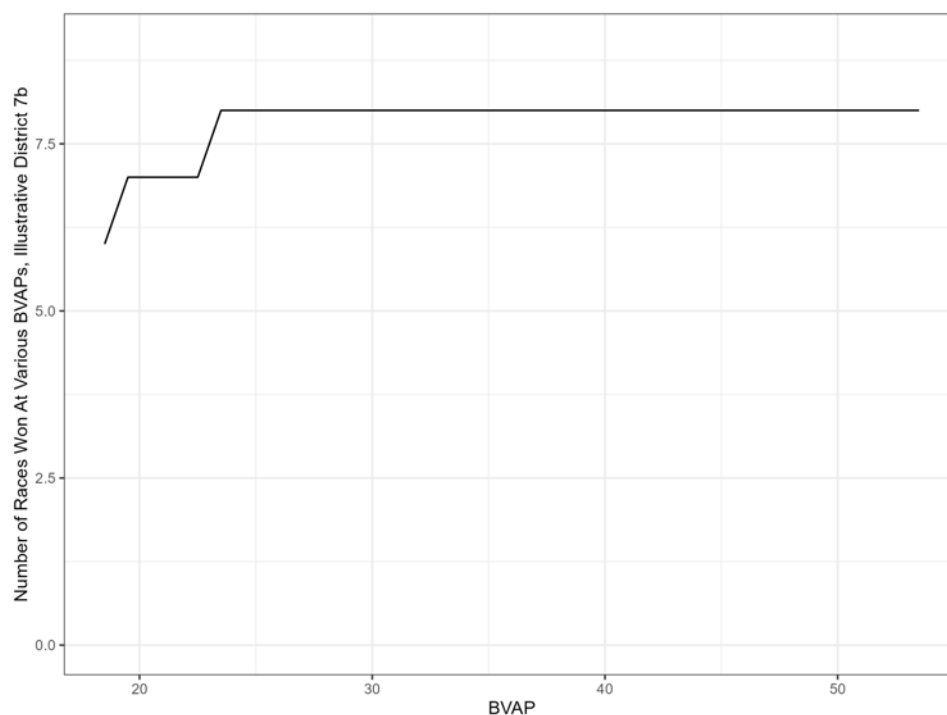


As you can see, Fairfax Map 2, District 7 now includes every VTD in the three counties it traverses with a BVAP in excess of 30%, including an arm (or tail) to grab the relatively high BVAP precincts northwest of Huntsville and the high BVAP precincts in Decatur. Moreover, the low BVAP precincts utilized, as shown in the dotplots above, are largely empty. Otherwise, the heavily White precincts are carefully avoided, even if including these precincts would result in a more compact map district (such as the precincts in Huntsville) or one that split fewer counties (by withdrawing from Decatur). Breaking the map down to census blocks shows the same phenomenon.

3.5 Effectiveness Analysis

Finally, I was asked to recreate the performance analysis from my original report. After updating my code from the First Report to account for the new maps, new EI estimates were generated and utilized. This area of the state reflects very low levels of racially polarized voting. As you can see below, the district would perform at well below 50% BVAP. Of the 8 races examined (detailed in the First Report), the Black candidate of choice almost always wins. This is because Whites in this area only express a modest preference for Republicans over Democrats, and do not vote sufficiently as a bloc to defeat the Black-preferred candidates, even at sub-50% thresholds.

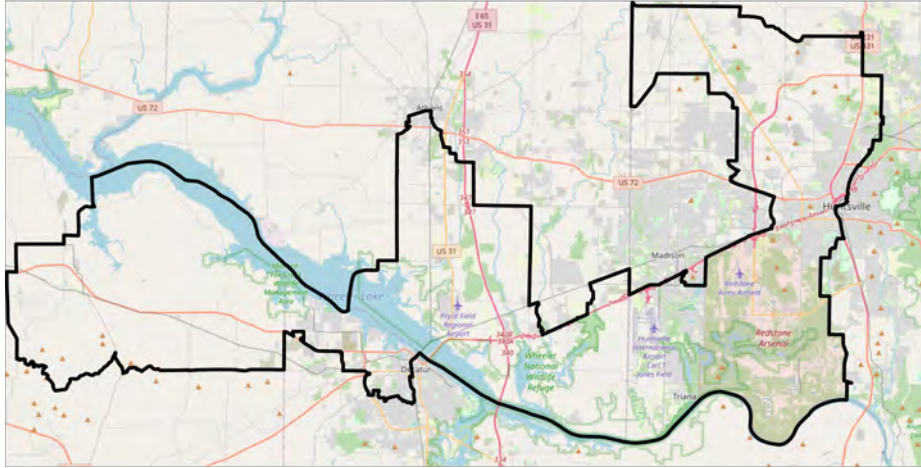
Figure 12: Number of Races won at different BVAPs, Illustrative District 7



4 Evaluation of Fairfax Map 3

The new Fairfax Map 3 takes District 7 and extends it into neighboring Lawrence County, giving a shape that resembles a baby dragon with an overbite in flight.

Figure 13: Fairfax Map 3, District 7



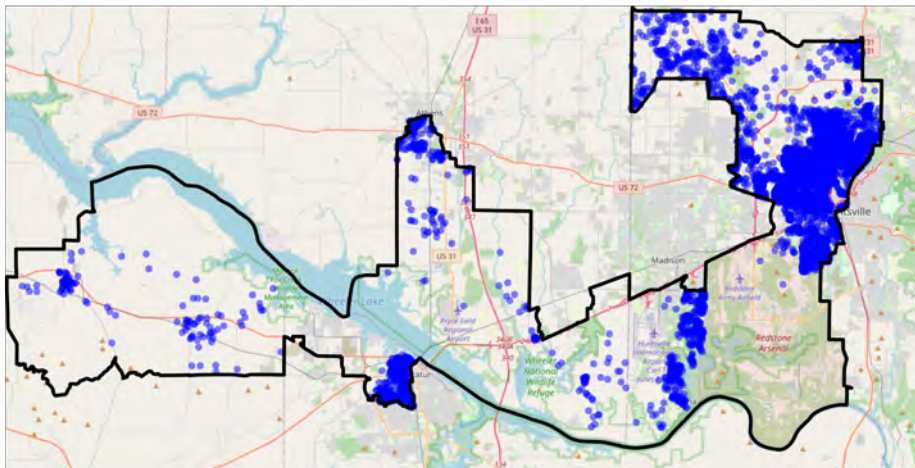
It, too, suffers from multiple problems. This map does avoid the problem of CVAP estimation by creating a district that is 50.04% BVAP. But as with the other districts, the map does not contain a compact minority population. The districts created in this iteration are likewise less compact than those found in the Enacted Map, and decrease the overall compactness of the map on a regional and statewide basis. Race almost certainly predominated in the drawing of the map. Finally, the map introduced additional county splits.

4.1 Fairfax Map 3, District 7 does not contain a compact minority population

Once again, Fairfax Map 3, District 7 is not based on a compact minority population, something we can see by examining dotplots. The district once again includes a cluster of Black residents in the tail around Huntsville, a cluster in Decatur, and a cluster

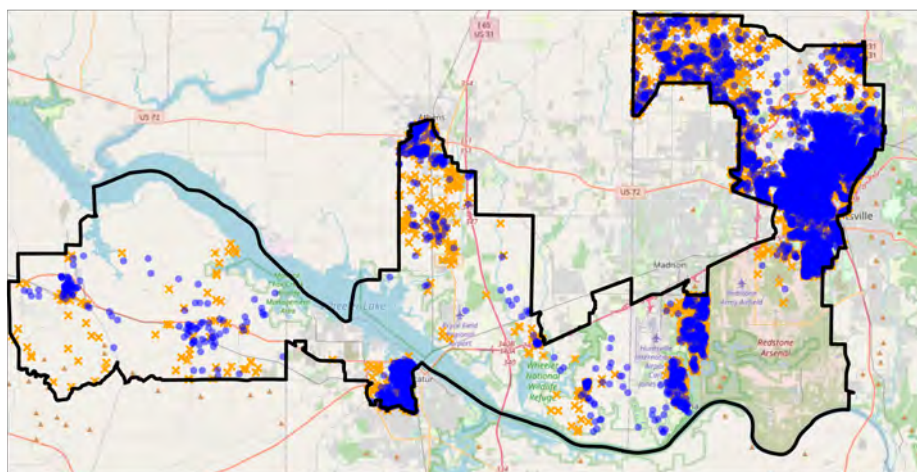
west of the Redstone Armory. It adds a cluster in Athens, and then a cluster of rural Black population West of Decatur.

Figure 14: Fairfax Map 3, District 7. One blue dot = 10 Black residents of voting age



As with Fairfax Map 2, adding in the White population allows us to see the empty swatches of land that characterize much of the space between the Black clusters in the district.

Figure 15: Fairfax Map 3, District 7. One blue dot = 10 Black residents of voting age.
One orange "x" = 10 White residents of voting age



We can further see the isolation of these pockets by looking on a countywide basis.

Figure 16: Fairfax Map 3, District 7. One blue dot = 10 Black residents of voting age

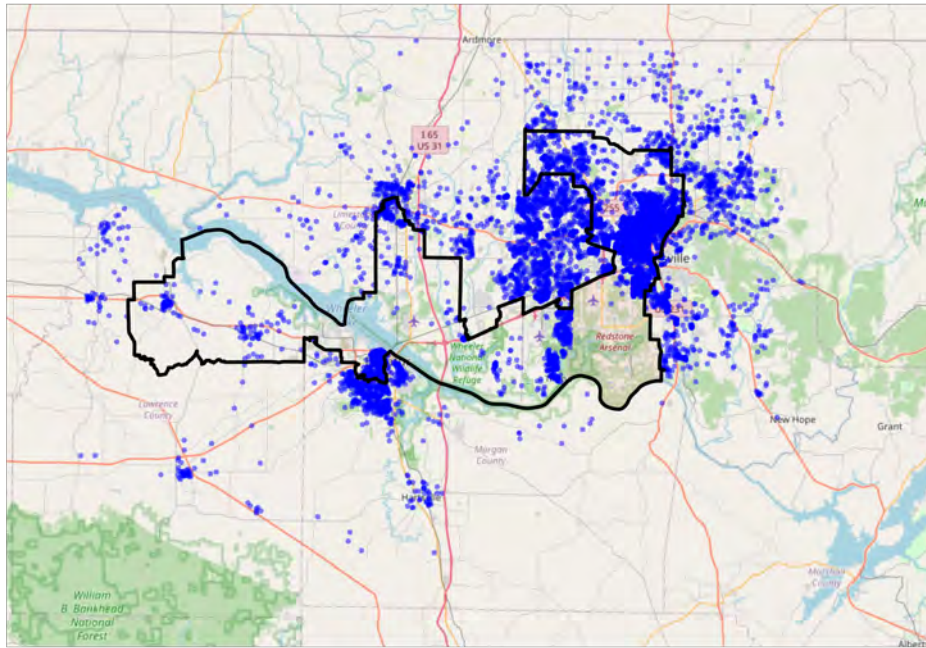


Figure 17: Fairfax Map 3, District 7. One blue dot = 10 Black residents of voting age.
One orange "x" = 10 White residents of voting age

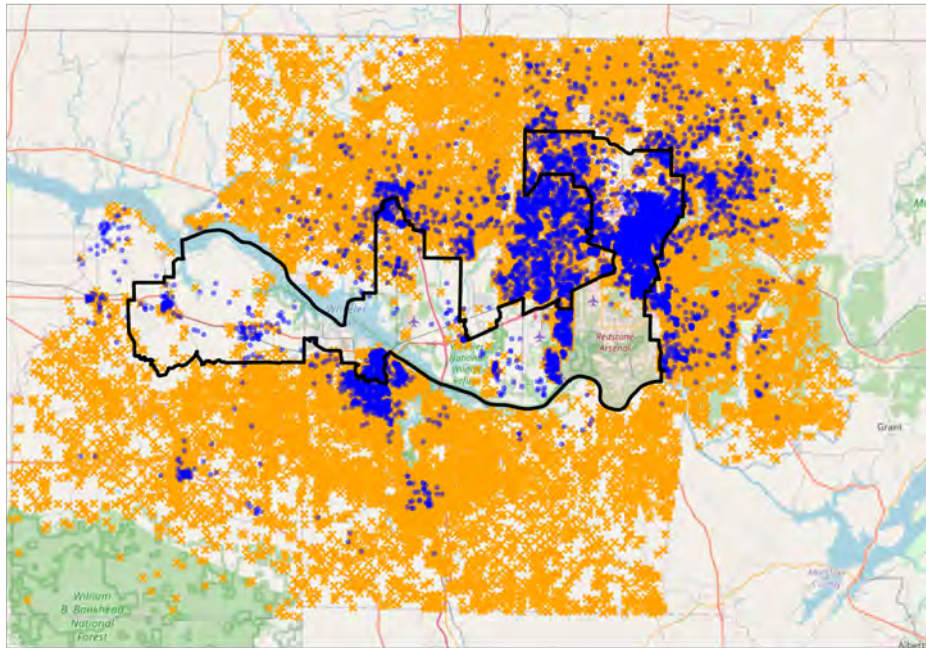
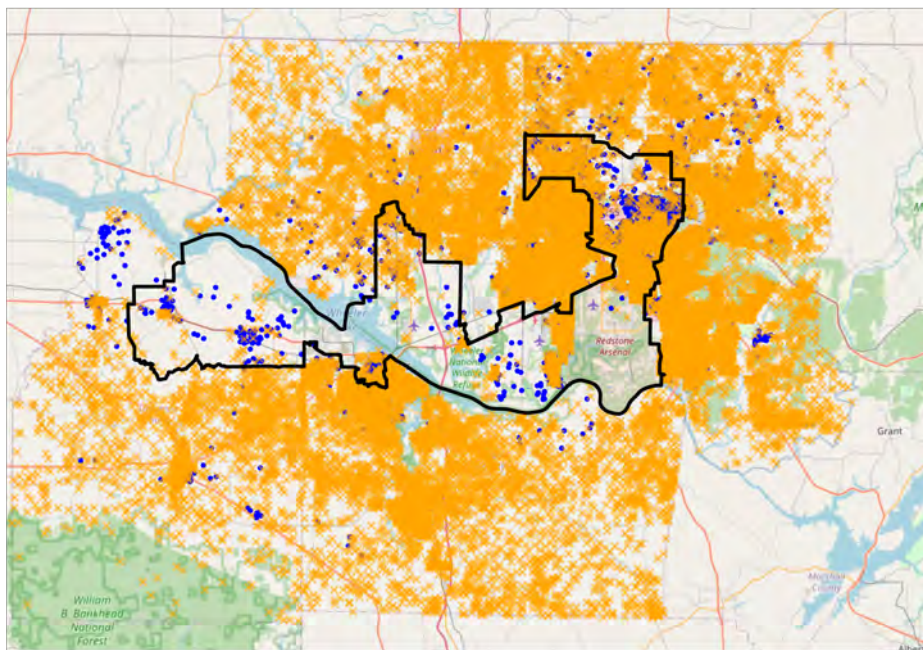


Figure 18: Fairfax Map 3, District 7. One blue dot = 10 Black residents of voting age. One orange “x” = 10 White residents of voting age



(a) In this version, the Black population is printed first, and the White population is overlaid. Note that these should all be read in conjunction with the choropleth maps, which provide a sense of how heavily Black or White a densely populated area is.

4.2 The districts in Fairfax Map 3 generally and District 7 specifically are less compact than the districts in the Enacted Map

Fairfax Map 3 also decreases the compactness of the districts relative to those in the Enacted Map. The mean Reock Score of the Enacted Map is 0.395. The mean Reock Score of Fairfax Map 3 is 0.377. The mean Reock score in the Enacted Map in Northern Alabama is 0.422. The mean Reock score in Mr. Fairfax’s Map 3 in Northern Alabama is 0.345.

Overall District 7 is made 0.045 points less compact under the Reock score, and is now the 3rd-least compact district on the map. District 1 is made less compact, and is

now less compact than any district drawn under the Enacted Map. District 3 once again sees a substantial drop in its Reock score, from 0.59 to 0.276.

Figure 19: 10 least compact districts in Enacted and Fairfax Map 3, Using Reock Scores

Polsby-Popper, FF3	Fairfax 3 District	Polsby=Popper, Enacted	Enacted District
0.136	1	0.174	1
0.192	12	0.192	12
0.213	7	0.220	4
0.220	4	0.239	18
0.239	18	0.252	21
0.252	21	0.258	7
0.258	3	0.261	27
0.261	27	0.270	25
0.282	29	0.282	29
0.282	22	0.282	22

The average Polsby-Popper score of the map declines from 0.257 to 0.249. In Northern Alabama, the compactness declines from 0.306 to 0.259. District 3 is once again made significantly less compact. District 7 is also made less compact, and is now the second-least compact district on the map, trailing only District 22 (which, again, is located in a geographically restrictive area).

Figure 20: 10 least compact districts in Enacted and Fairfax Map 3, Using Polsby-Popper Scores

Polsby-Popper, FF3	Fairfax 3 District	Polsby=Popper, Enacted	Enacted District
0.123	22	0.121	11
0.133	7	0.123	22
0.133	11	0.135	17
0.156	17	0.138	25
0.159	12	0.142	7
0.166	15	0.159	12
0.173	21	0.164	15
0.177	20	0.173	21
0.191	26	0.177	20
0.192	1	0.178	26

Finally, we can again examine “cut edges.” The Enacted Map removes 8,862 edges. Fairfax 3 removes 8,978. If we examine Northern Alabama alone, the Enacted Map removes 1652 edges. Fairfax Map 3 removes 1893.

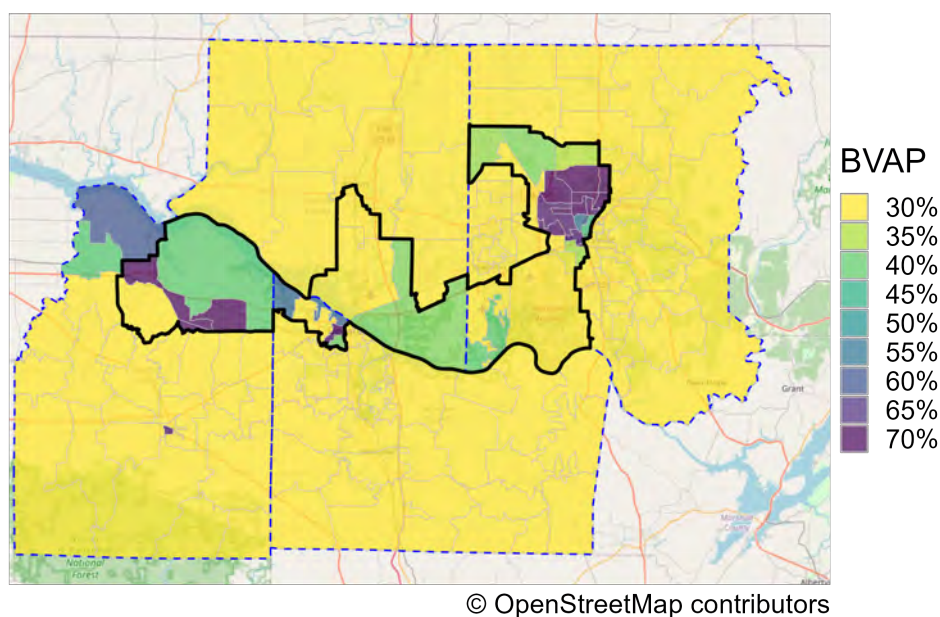
If we look at the precinct level, the Enacted Map removes 995 edges, while the Fairfax Map removes 1026 edges. If we constrain our analysis to Northern Alabama alone, the Enacted Map removes 161 edges, while Fairfax Map 3 removes 197.

4.3 Race almost certainly predominated in the drawing of Fairfax Map 3, District 7

As with Map 2, race almost certainly predominated in the drawing of Fairfax Map 3, District 7 by definition; the map exists to improve the BVAP of maps in the area relative to maps Mr. Fairfax had already drawn. Indeed, it isn’t clear that there are any other choices that could have been made; this is one of only a handful of configurations

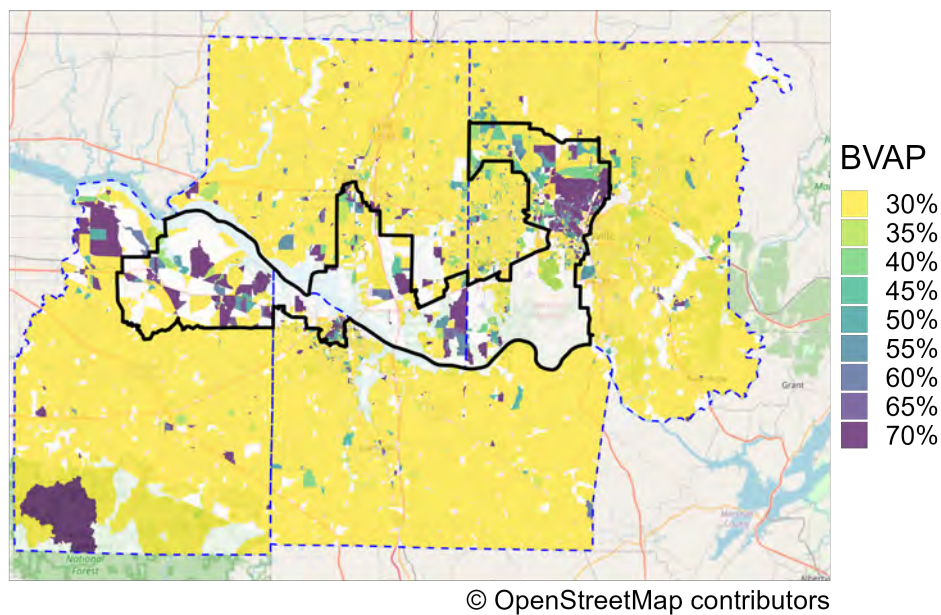
in the area that will get a mapdrawer to 50% + 1 BVAP. As the choropleth map below illustrates, Fairfax Map 3, District 7 once again takes in every precinct² with a BVAP above 30% in the "traditional" three counties used in this configuration, and almost every precinct with a BVAP above 30% in Lawrence County.

Figure 21: Fairfax Map 3, District 7, with VTDs shaded by BVAP



²Mr. Fairfax splits four precincts within this district. For simplicity's sake, I will treat a split precinct as two separate precincts. Perhaps notably, making any of these precincts whole would drop the BVAP below 50%.

Figure 22: Fairfax Map 3, District 7, with blocks shaded by BVAP



Indeed, if we were to take the precincts in the four counties and rank them by BVAP percent, District 7 would include all of the 40 precincts with the highest BVAPs, with the exception of the 9th, 17th, 22nd, 36th, 38th, 39th, and 40th precincts. It includes all but two majority Black precincts across the four counties.

Figure 23: Precincts in Map 3, District 7, BVAP %s and area-wide rankings by BVAP %

BVAP %	Rank	BVAP %	Rank
91.9%	1	42.7%	21
84.3%	2	40.6%	23
81.1%	3	40.2%	24
79.2%	4	38.9%	25
78.6%	5	37.9%	26
76.7%	6	37.8%	27
76.5%	7	36.3%	28
76.0%	8	35.6%	29
71.8%	10	34.7%	30
71.5%	11	33.4%	31
71.2%	12	32.1%	32
69.3%	13	31.7%	33
68.1%	14	28.8%	34
67.8%	15	28.5%	35
66.9%	16	27.1%	37
57.5%	18	24.4%	43
56.2%	19	21.0%	49
42.8%	20	12.7%	69

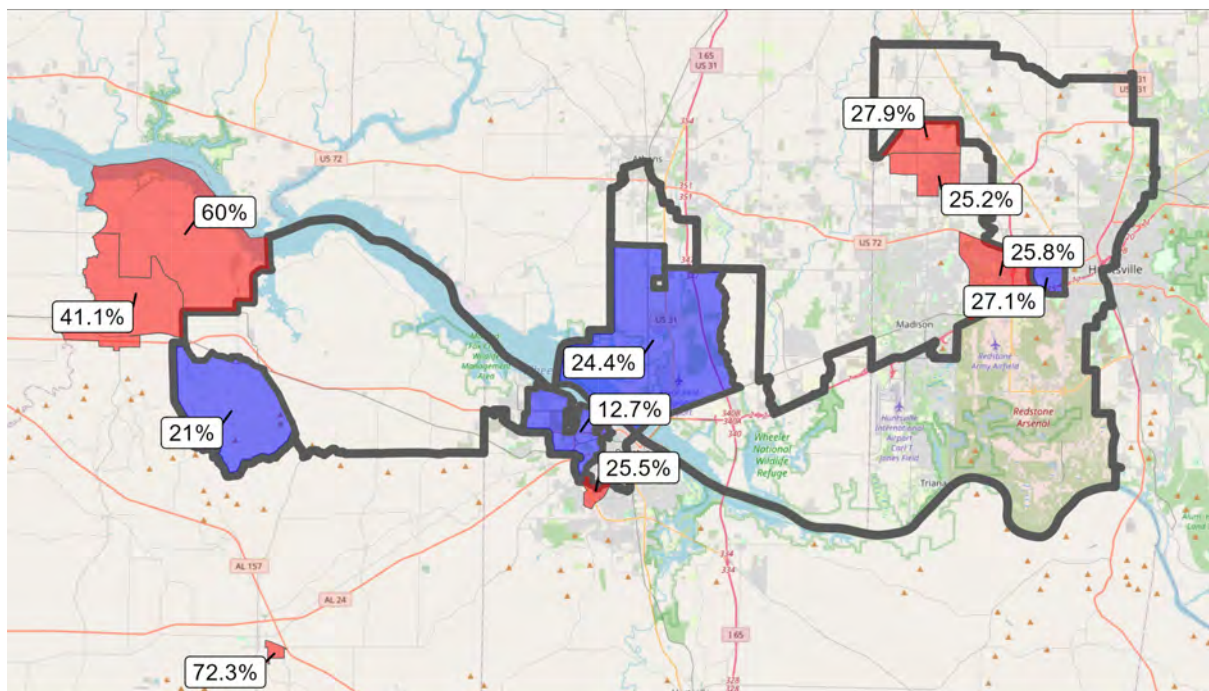
(a) These are precincts in District 7 arranged by BVAP. The ranks correspond to the ranked BVAP %s in the four counties in Map 3, District 7: Lawrence, Limestone, Madison and Morgan. In other words, the District includes the 1st-8th highest BVAP precincts in the counties, the 10th through 16th highest, and so forth.

In other words, this map carefully carves out the most heavily Black precincts in

these counties, bypassing the remainder of the precincts, and using unpopulated areas to bind them together.

Moreover, this appears to be one of just a handful of precinct combinations that achieve a 50%+1 BVAP. The following figure shades the six precincts with BVAPs above 25% that were not included in District 7 red. It shades the four precincts with BVAPs below 25% that are included in District 7 blue.

Figure 24: Fairfax Map 3, District 7



(a) Precincts with BVAPs above 25% not included in District 7 are shaded red. Precincts with BVAPs below 25% included in District 7 are shaded blue

A few things become apparent. Examining first the precincts with BVAPs above 25% not included in District 7, the 72.3% BVAP precinct in Lawrence County is not

contiguous to the district and cannot be added without including a sizeable White population. The three precincts in Madison County cannot be added on their own without dropping the BVAP of the district below 50%, nor can the 25.5% BVAP precinct in Morgan County. You can add the 41.1% BVAP and 60% BVAP precincts in Lawrence County without dropping the District BVAP below 50%, but at that point the district is already 50% + 1 BVAP.

Moreover, the 24.4% BVAP precinct and 12.7% BVAP precincts included in the map are necessary for contiguity and cannot be removed without substantially reconfiguring the district. The 21% precinct can be removed, but is lightly populated; removing it and adding any of the higher-populated precincts to the East drops the BVAP below 50%.

The 27.1% BVAP precinct in the district has a population of 5,237, meaning that transferring it to District 2 creates one-person-one-vote problems; remedying them by moving the two red precincts to the North out of 2 and into 7 solves that problem, but drops the BVAP in District 7 below 50%.

There are a near-infinite number of possible maps that can be drawn, so it's difficult to declare this the *only* way to achieve a 50% + 1 BVAP in the area. But it appears to be close. I could identify only a handful of variations (described above) on the basic theme that Mr. Fairfax identifies that would satisfy *Gingles*' 50% + 1 threshold. These precincts appear to be painstakingly selected in order to raise the District BVAP above 50%.

4.4 Fairfax Map 3, District 7 increases the number of county splits beyond those found in the Enacted Map

Finally, Fairfax Map 3 increases the number of county splits beyond those found in the Enacted Map. The Enacted Map splits 19 counties. Map 3, on the other hand, splits 21.

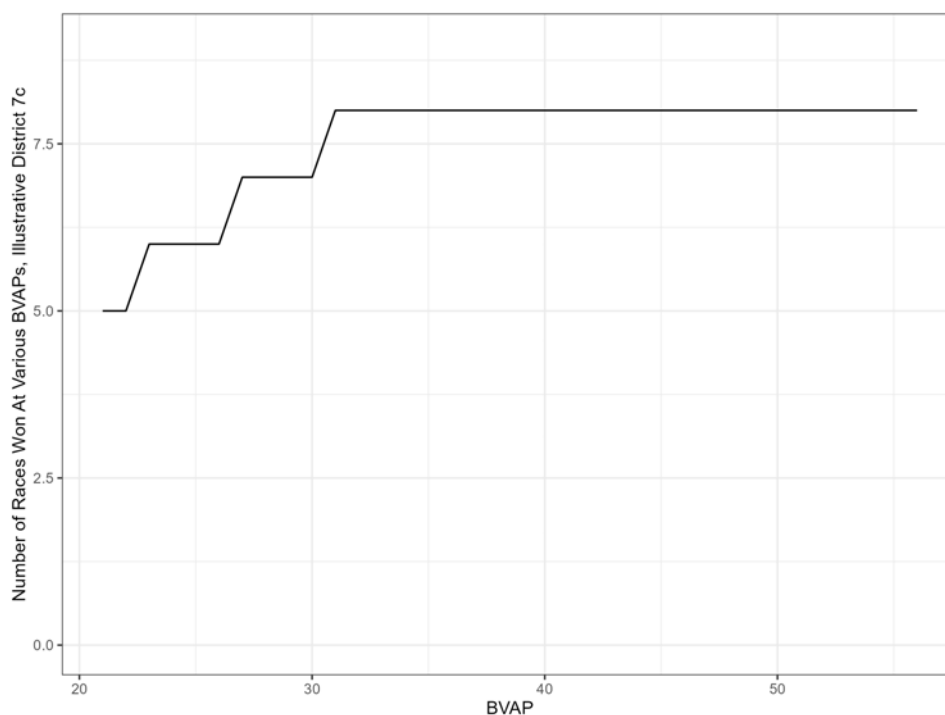
Moreover, District 7 is now composed of portions of four counties. No district in the Enacted Map splits four counties.

In addition, this fourth county split is clearly driven by race. If we take the precincts in Morgan, Madison and Limestone Counties alone and sort them by BVAP, and then take cumulative totals of population, voting age population, and Black voting age population, we can readily see that selecting the highest BVAP percent precincts, even without respect for contiguity, will yield at best a 48.1% BVAP district within the constraints imposed by one-person-one-vote. While it's possible a 50% + 1 BVAP district can be drawn in these three counties by aggressively splitting precincts, I am skeptical that it can be accomplished without overwhelming reliance on race.

4.5 Effectiveness Analysis

Finally, I was asked to recreate the performance analysis from my original report for the new District 7. As you can see below, the district would perform at well below 50% BVAP.

Figure 25: Number of Races won at different BVAPs, Illustrative District 7



5 Conclusion

District 7 in Mr. Fairfax's Illustrative Maps 2 and 3 do not change any of my conclusions from my First Report. Illustrative Map 2 suffers from the same defects with respect to CVAP as Map 1, while making the map less compact and continuing to rely overwhelmingly on race in the drawing. Map 3 does address the CVAP issue, but it sacrifices traditional redistricting principles even further in pursuit of a 50% + 1 BVAP percent.

I declare under penalty of perjury under the laws of the State of Ohio that the foregoing is true and correct to the best of my knowledge and belief. Executed on 26 April, 2024 in Delaware, Ohio.

Sean Trende

Sean P. Trende