

**UNITED STATES DISTRICT COURT  
FOR THE DISTRICT OF SOUTH CAROLINA  
COLUMBIA DIVISION**

THE SOUTH CAROLINA STATE  
CONFERENCE OF THE NAACP, and

TAIWAN SCOTT, on behalf of himself and all  
other similarly situated persons,

Plaintiffs,

v.

THOMAS C. ALEXANDER, in his official  
capacity as President of the Senate; LUKE A.  
RANKIN, in his official capacity as Chairman of  
the Senate Judiciary Committee; JAMES H.  
LUCAS, in his official capacity as Speaker of the  
House of Representatives; CHRIS MURPHY, in  
his official capacity as Chairman of the House of  
Representatives Judiciary Committee;  
WALLACE H. JORDAN, in his official capacity  
as Chairman of the House of Representatives  
Elections Law Subcommittee; HOWARD  
KNAPP, in his official capacity as interim  
Executive Director of the South Carolina State  
Election Commission; JOHN WELLS, Chair,  
JOANNE DAY, CLIFFORD J. EDLER, LINDA  
MCCALL, and SCOTT MOSELEY, in their  
official capacities as members of the South  
Carolina Election Commission,

Defendants.

**Case No. 3-21-cv-03302-MGL-  
TJH-RMG**

**THREE-JUDGE PANEL**

**PLAINTIFFS' OPPOSITION  
TO HOUSE AND SENATE  
DEFENDANTS' *DAUBERT*  
MOTION TO EXCLUDE  
REPORTS, OPINIONS, AND  
TESTIMONY OF  
PLAINTIFFS' EXPERT DR.  
MOON DUCHIN**

## INTRODUCTION

Although House and Senate Defendants’ (“Legislative Defendants”) untimely *Daubert* motion seeks wholesale exclusion of Dr. Moon Duchin’s testimony,<sup>1</sup> their arguments, in fact, only target a single portion of Dr. Duchin’s testimony—her ensemble analyses. Notably, they do not challenge Dr. Duchin’s qualifications, her non-ensemble-related analyses, or the other findings in her three reports. And their criticism of Dr. Duchin’s ensemble-related analyses is premised on an inaccurate description of her purpose for conducting ensemble-related analyses. In doing so, Legislative Defendants selectively quote portions of her report and deposition testimony out-of-context in a misleading manner. But as discussed below, Dr. Duchin’s ensemble analysis, as well as her other analysis and conclusions, are reliable and under Federal Rule of Evidence 702 and *Daubert v. Merrell Dow Pharmaceuticals., Inc.*, 509 U.S. 579 (1993).

Legislative Defendants also seek to exclude Dr. Duchin’s ensemble-related testimony under *Backus v. South Carolina*, a case where the court *permitted* an expert to testify, considered his testimony, and ultimately dismissed the *Daubert* motions as moot. *See*, 857 F. Supp. 2d 553, 561, 570 (D.S.C.), *aff’d*, 568 U.S. 801 (2012). Nevertheless, they ask this Court to adopt an unsupported view of *Backus* that would lead to an insurmountable standard for expert testimony in redistricting cases—one not followed in *Backus*, other courts in the Fourth Circuit, or any other court in the country. And even if this Court agreed with Legislative Defendants’ misinterpretation

<sup>1</sup> Legislative Defendants’ challenge is a *Daubert* motion focused on Dr. Duchin’s methodology in reaching her ensemble-related opinions and seeks wholesale exclusion, rather than an *in limine* motion aimed at limiting the scope of her testimony. Under the Third Amended Scheduling Order, it was required to be filed by August 19, 2022. ECF 210. (“All motions other than (a) those relating to the admissibility of evidence at trial . . . shall be filed no later than August 19, 2022”). Merely using the phrase “*in limine*” twice on the first page of their brief cannot camouflage the Legislative Defendants’ failure to comply with the scheduling order. *See Bryant v. Trexler Trucking, Inc.*, No. 4:11-CV-02254-RBH, 2013 WL 643768, at \*4 (D.S.C. Feb. 21, 2013). Legislative Defendants’ motion should be denied on that basis alone.

of *Backus*, that court still permitted plaintiffs' expert to testify, and the court's observations concerned the weight given to that expert's testimony and not the admissibility of the expert's testimony following trial. *Backus* provides no basis to exclude Dr. Duchin's ensemble-related testimony.

Because none of Legislative Defendants' arguments are a proper basis to exclude any of Dr. Duchin's reports, opinions, and testimony, this Court should deny their motion.

## **ARGUMENT**

### **I. Legal Standard.**

Federal Rule of Evidence 702 permits opinion testimony from a witness who is “an expert by knowledge, skill, experience, training, or education” if it “will help the trier of fact to understand the evidence or to determine a fact in issue,” “the testimony is based on sufficient facts or data,” “the testimony is the product of reliable principles and methods,” and “the expert has reliably applied the principles and methods to the facts of the case.” Fed. R. Evid. 702. In evaluating proposed expert testimony, a court must assess whether it is reliable and relevant. *See Wickersham v. Ford Motor Co.*, No. 9:13-CV-1192-DCN, 2016 WL 5349093, at \*2 (D.S.C. Sept. 26, 2016).

Exclusion of expert testimony “is the exception rather than the rule.” *Id.* at \*2 (citing Fed. R. Evid. 702 Advisory Committee’s Note to 2000 Amendments). While district courts retain a gatekeeping role, “the trial court’s role as gatekeeper is not intended to serve as a replacement for the adversary system.” *Id.* (citing Fed. R. Evid. 702 Advisory Committee’s Note to 2000 Amendments); *See Daubert*, 509 U.S. at 596 (1993) (“Vigorous cross-examination, presentation of contrary evidence, and careful instruction on the burden of proof are the traditional and appropriate means of attacking shaky but admissible evidence.”). Indeed, as long as the expert’s opinion is supported by some facts in the record, any dispute about those facts (or even the presence

of contradictory facts) is not a ground for exclusion. *Sprint Nextel Corp. v. Simple Cell, Inc.*, No. CCB-13-617, 2016 WL 524279, at \*3 n.1 (D. Md. Feb. 10, 2016) (“a dispute of facts is not a reason to exclude expert testimony”). Courts “will exclude evidence on a motion in limine only if the evidence is ‘clearly inadmissible for any purpose.’” *Wickersham*, 2016 WL 5349093, at \*1 (quoting *Hall v. Sterling Park Dist.*, No. 08 C 50116, 2012 WL 1050302, at \*2 (N.D. Ill. Mar. 28, 2012)). Because otherwise, the opposing party must test the expert’s opinion at trial. *See United States v. Crisp*, 324 F.3d 261, 269–70 (4th Cir. 2003).

Further, the Court’s gatekeeping function is “relaxed” in the context of a bench trial. *See United States v. Wood*, 741 F.3d 417, 425 (4th Cir. 2013) (“Finally, because the district court was also the trier of facts, the district court’s evidentiary gatekeeping function was relaxed, and the district court was in the best position to decide the proper weight to give the expert opinions.”); *see also Bishop of Charleston v. Century Indem. Co.*, 225 F. Supp. 3d 554, 567 (D.S.C. 2016) (“[t]he gatekeeper doctrine was designed to protect juries and is largely irrelevant in the context of a bench trial, because [t]here is less need for the gatekeeper to keep the gate when the gatekeeper is keeping the gate only for himself.”) (internal citations and quotations omitted). In such circumstances, “courts will often conditionally admit expert testimony subject to later exclusion if the expert’s testimony does not satisfy Rule 702.” *City of Huntington v. AmerisourceBergen Drug Corp.*, No. CV 3:17-01362, 2021 WL 1596355, at \*2 (S.D.W. Va. Apr. 22, 2021) (collecting cases).<sup>2</sup>

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<sup>2</sup> *See also Jackson v. United States*, No. 16-CV-03219, 2017 WL 11537970, at \*1 (D.S.C. Oct. 26, 2017); *Sunland Const. Co. v. City of Myrtle Beach*, No. 4:05-CV-1227-RBH, 2007 WL 2822509, at \*3 (D.S.C. Sept. 26, 2007); *Wood*, 741 F.3d at 425; *In re Infinity Bus. Grp., Inc.*, No. AP 12-80208-JW, 2018 WL 1234649, at \*1 (Bankr. D.S.C. Feb. 8, 2018).

## II. Legislative Defendants Do Not Challenge Dr. Duchin's Qualifications Nor Most of Her Analyses.

Tellingly, Legislative Defendants do not dispute that Dr. Duchin is qualified. Nor could they. She is a Professor of Mathematics and a Senior Fellow in the Jonathan M. Tisch College of Civic Life at Tufts University. At Tisch College, she leads an interdisciplinary research lab focused on redistricting. Her areas of research and teaching include the structure of census data, the history of the U.S. Census, the design and implementation of randomized algorithms for generating districting plans, and the analysis of redistricting more broadly. Her research is funded by the National Science Foundation, and she has published more than a dozen peer-reviewed articles in publications, including 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*. *See* Duchin Rep. at 2, 40–47 (Ex. A). Dr. Duchin has served as an expert in redistricting litigation in Pennsylvania, North Carolina, Wisconsin, and Alabama. Courts have accepted and credited her testimony in all these cases. *See, e.g., Caster v. Merrill*, No. 2:21-CV-1536-AMM, 2022 WL 264819, at \*22 (N.D. Ala. Jan. 24, 2022), *cert. granted before judgment sub nom. Merrill v. Milligan*, 142 S. Ct. 879 (2022) (“[W]e find Dr. Duchin’s testimony highly credible.”).<sup>3</sup>

Nor do Legislative Defendants specifically challenge most of Dr. Duchin’s analysis, conclusions, or findings. Legislative Defendants, for example, do not challenge Dr. Duchin’s:

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<sup>3</sup> *See also Harper v. Hall*, 385, 868 S.E.2d 499, 548, *cert. granted sub nom. Moore v. Harper*, 142 S. Ct. 2901 (2022); *Carter v. Chapman*, 270 A.3d 444, 469 (Pa. 2022); *Johnson v. Wis. Elections Comm’n*, 971 N.W.2d 402, 417, *cert. granted, opinion rev’d sub nom. Wis. Legislature v. Wis. Elections’ Comm’n*, 142 S. Ct. 1245 (2022).

- demographic and metric comparisons of the various proposed congressional plans, Duchin Rep. at 5–6, 9–13 (Ex. A),
- review of the House and Senate Guidelines, *id.* at 7–8 (Ex. A),
- analysis of the performance of the plans for minority voters’ candidates of choice, *id.* at 25 (Ex. A),
- analysis of whether traditional redistricting principles can explain the boundaries of challenged districts, *id.* at 14–21 (Ex. A),
- criticisms of Mr. Trende’s justifications as both post-hoc and factually inaccurate, Duchin Rebuttal Rep. at 1–5 (Ex. B),
- analysis of the non-public NRRT Jessamine Plan, Duchin Supp. Rep. at 1–6 (Ex. C).<sup>4</sup>

In these analyses, among other findings, Dr. Duchin finds “racial factors predominated over not only traditional principles, but even over partisan ones.” Duchin Rep. at 27 (Ex. A).

### **III. Dr. Duchin’s Ensemble-Related Analysis is Reliable.**

Dr. Duchin presents ensemble analyses to help evaluate whether excessive race-conscious line-drawing may have occurred, particularly when traditional redistricting principles have been undermined in a manner resulting in cracking communities. Duchin Rep. at 2 (Ex. A). Her analysis is a tool that allows one to compare a proposed map to a large volume of algorithm-drawn maps that are typically programmed to adhere to typical traditional redistricting criteria. *Id.* at 22. This ensemble methodology has been the subject of extensive, peer-reviewed academic literature and

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<sup>4</sup> Defendants unsuccessfully moved to strike Dr. Duchin’s supplemental report ECF 335. Their motion was denied the same day that Legislative Defendants filed this motion in limine. *Id.*

can be replicated.<sup>5</sup> And such types of analyses have been widely accepted by federal courts, *see, e.g.*, *Merrill*, No. 2:21-CV-1536-AMM, 2022 WL 264819, at \*22.

#### **IV. Legislative Defendants’ Objections to Dr. Duchin’s Analysis Are Without Merit.**

Legislative Defendants focus their arguments on Dr. Duchin’s ensemble method, ECF 343 (“MIL”) at 2–4, 8–12, which analyzes how proposed plans, including the Senate Bill 865 map (S. 865), compare to a large sample of 100,000 randomly generated race-neutral plans. Legislative Defendants specifically object to Dr. Duchin’s ensemble method for failing to consider *all* traditional districting principles. MIL at 6. In so doing, Defendants misunderstand the purpose of the ensembles, Dr. Duchin’s ensemble process, and misread the law.

As described above, and contrary to Legislative Defendants’ assertion, *id.* at 10–11, the ensemble method stems from numerous peer-reviewed articles detailing its application to redistricting. Additionally, Dr. Duchin explains that the purpose of the ensemble method is not to simulate the legislative process, as Legislative Defendants contend, *id.* at 13, but to provide a comparison for the characteristics of maps drawn without consciousness of race. Duchin Rep. at 22 (Ex. A). Indeed, using 100,000 randomly generated plans, her ensemble analysis holds constant various redistricting principles like compactness, avoidance of subdivision splits, and preserving some communities of interest. *Id.* In so doing, Dr. Duchin shows that S. 865 is an extreme statistical outlier in its dilutive effect on Black voters, far more so than any harm the plan imparts on partisan interests in the state. Duchin Rep. at 27 (Ex. A). Her analysis supports other evidence Plaintiffs will introduce at trial to show that S.865 is the product of racial predomination and intentional

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<sup>5</sup> Amariah Becker, Moon Duchin, Dara Gold & Sam Hirsch, *Computational Redistricting and the Voting Rights Act*, 20 Election L.J. 407 (2021); Daryl DeFord, Moon Duchin & Justin Solomon, *Recombination: A family of Markov chains for redistricting*, Harv. Data Sci. Rev., 3(1) (Winter 2021); Gregory Herschlag et al., *Quantifying Gerrymandering in North Carolina*. Stat. & Pub. Pol’y, 7(1), 30–38 (2020); *see also* Duchin Tr. at 129:1-2 (Ex. D).

discrimination based on relevant legal standards. *Id.* Thus, contrary to Legislative Defendants' contention, Dr. Duchin is not seeking to model or replicate the Legislature's process with her ensemble comparisons. Duchin Rep. at 22 (Ex. A).

Legislative Defendants also misrepresent the inputs that Dr. Duchin's ensembles account for and her reasons for doing so. Legislative Defendants, for example, claim that Dr. Duchin failed to "consider population balance" in accordance with the guidelines by programming an algorithm that permitted population deviations up to one percent. MIL at 8–9. Not so. In her original report and deposition testimony, Dr. Duchin explains that a one-percent deviation is necessary to generate a large comparison ensemble of up to 100,000 potential maps without splitting precincts. Duchin Tr. at 126:2–127:12 (Ex. D); Duchin Rep. at 29 (Ex. A). This is consistent with the goals of ensemble analysis to provide comparison benchmarks for analysis of the enacted plan, not to simulate the legislative process or provide an alternative map for adoption. Duchin Rep. at 22 (Ex. A). As she explains, converting plans with a one-percent deviation to a one-person deviation does not change the measurable features or key characteristics of her ensembles. Duchin Rep. at 29 (Ex. A); DeFord, Duchin & Solomon, *supra*, at 14. In all of her ensembles, she performs tuning experiments, both through an auto-tuning algorithm and by hand, to "boost [her] confidence that one-percent maps can quickly be tuned to one-person without breaking any of their metric properties." Duchin Tr. at 126:2–127:12 (Ex. D). Because the key statistics of the plans are unchanged between the one-percent and one-person level, these ensembles serve their purpose in providing benchmark comparisons even without perfectly equalizing district populations. *Id.*; DeFord, Duchin & Solomon, *supra*, at 33.

Similarly, Legislative Defendants are simply wrong when they assert Dr. Duchin's ensemble method analysis fails to account for compactness and certain communities of interest.

Duchin Tr. (Ex. D) at 129:1-23, 131:24–133:11; Duchin Rep. at 22 (Ex. A). Legislative Defendants also complain that Dr. Duchin use of “three mathematical measures to assess” compactness among congressional plans runs afoul of the House’s guidelines that forbid any “mathematical, statistical, or formula-based calculation or determination.” MIL at 9. But as Legislative Defendants concede, the Senate’s guidelines did not include any such prohibition. Roberts Tr. at 119:25–120:22 (Ex. E). As Dr. Duchin explained, the compactness measurements she relied upon are “routinely used in redistricting analysis and litigation.” Duchin Rep. at 8 (Ex. A). Still, Dr. Duchin also relies on qualitative compactness assessments in her report, including the geography or shape considerations. Duchin Tr. at 61:7–17 (Ex. D); Duchin Rep. at 14–21 (Ex. A). And Legislative Defendants also take issue with how Dr. Duchin incorporated public comments about COIs as not being “subjected to peer review.” MIL at 10–11. Far from Legislative Defendants’ “cherry-picking” allegations, Dr. Duchin reviewed the publicly available data regarding extensive public comments about communities of interest (“COI”). This record includes more than 1,000 pages of comments and transcripts that included more than 20 hearings held by the House and Senate combined. Duchin Rep. at 31–38 (Ex. A); Duchin Tr. at 79:23-89:14 (Ex. D). She identified some key COIs that were repeatedly raised during the proceeding. And she employed her ensemble analysis to account for them (turning them on and off to be able to assess their significance). Duchin Report at 22 (Ex. A).<sup>6</sup>

Legislative Defendants are also wrong when they argue that Dr. Duchin did not include avoidance of VTD splits as a redistricting principle for her ensembles. MIL at 7. As Dr. Duchin

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<sup>6</sup> Dr. Duchin also testifies that there are various other ways to incorporate COIs, and that if South Carolina had adopted a way to quantify COIs systematically into maps, that would be preferable. Duchin Tr. at 83:2-84:14 (Ex. D).

explained at her deposition, the ensemble plans do not split any VTDs. Duchin Tr. at 135:17-21 (Ex. D).

Related to their inaccurate criticisms of Dr. Moon's methodology, the Legislative Defendants also erroneously contend that her ensemble analysis is not relevant. They attempt to support this claim by arguing that Dr. Duchin's ensembled-related analyses purportedly do not account for all facially neutral factors, MIL at 6–8, relying on a misrepresentation of *Backus*. Defendants misconstrue *Backus* as posing a gatekeeping bar on Dr. Duchin's ensemble-related testimony. Same as here, *Backus* defendants moved to exclude an expert for failure “to consider . . . racially neutral factors.” See, e.g., Mot. in Limine at 2, *Backus v. South Carolina*, No. 3:11-cv-03120, Dkt. No. 109-1 (D.S.C. Feb. 13, 2012). At a pretrial conference, the court explained it would not rule on defendants’ motions, indicating it was “more than likely that [Dr. Michael McDonald] [would] testify . . . , and any deficiency will be taken up with cross-examination.” Conf. Tr. at 5, *Backus v. South Carolina*, Dkt. No. 181 (D.S.C. Feb. 28, 2012). During trial, the court reiterated that defendants’ concerns should be addressed via cross-examination and allowed Dr. McDonald to testify. Trial Tr. at 4, 107–08., *Backus v. South Carolina*, Dkt. No. 208 (D.S.C. Mar. 1, 2012). This Court should allow Dr. Duchin to do the same.

Although Defendants seem to argue that *Backus* sets forth a principle that every expert in a redistricting case must cover the waterfront of traditional redistricting criteria or else be excluded, the court in *Backus* did no such thing. In fact, the court never granted the defendants’ applications to exclude Dr. McDonald’s testimony, dismissing the motions instead as moot. *Backus*, 857 F. Supp. 2d at 570 (dismissing all pending motions as moot); see Post-Trial Mem. of Def. Harrell at 12, *Backus v. South Carolina*, Dkt. No. 210 (D.S.C. Mar. 5, 2012) (reminding the court that *Daubert* motion against Dr. McDonald remains pending). The court ultimately considered Dr.

McDonald's testimony but gave it little weight, because his analysis omitted "important" "sources of information," including any consideration the State's guidelines containing "race-neutral principles for redistricting." *Backus*, 857 F. Supp. 2d at 562. Thus, *Backus* does not contain the sweeping exclusionary rule that Defendants advance.

Indeed, *Backus* and other caselaw confirm that Legislative Defendants' objections to Dr. Duchin's testimony go to the weight the Court should assign it, not its admissibility. Fourth Circuit precedent is clear that an "expert's causation conclusion should not be excluded because he or she has failed to rule out every possible alternative cause." *See, e.g., Westberry v. Gislaved Gummi AB*, 178 F.3d 257, 265 (4th Cir. 1999) (holding that "alternative causes suggested by a defendant affect the weight that the jury should give the expert's testimony and not the admissibility of that testimony"). Furthermore, the district court's "gatekeeping function" is "relaxed" in the context of a bench trial. *United States v. Wood*, 741 F.3d 417, 425 (4th Cir. 2013); *see also Ohio Org. Collaborative v. Husted*, No. 2:15-CV-1802, 2016 WL 8201848, at \*4 (S.D. Ohio May 24, 2016) (holding that elections expert's "failure to account for various controls in his case studies . . . implicates the accuracy and credibility of those studies . . . but not their reliability"). Accordingly, the *Backus* court properly considered Dr. McDonald's testimony and weighed it against other evidence, despite concerns that he failed to assess race-neutral factors. *See Backus*, 857 F. Supp. 2d at 562–63.

Even if *Backus* could somehow be construed as adopting an exclusionary rule, Legislative Defendants' motion should be denied because Dr. Duchin's testimony does not suffer from the same flaws that the court saw in Dr. McDonald's. Dr. McDonald's opinion was based on a relatively simple assumption that any change to district maps that increased or maintained the Black voting-age population was attributable to race. *Id.* at 561. Critically, Dr. McDonald admitted

during cross-examination “that he failed to consider the guidelines and criteria that the General Assembly devised for the redistricting process, which . . . contained guiding race-neutral principles.” 857 F. Supp. 2d at 562.

None of that is true of Dr. Duchin’s analysis, which deployed sophisticated statistical methods to provide race-neutral baselines to allow the court to see whether the dilutive effects of the enacted plan were simply a product of geography or of excessive race-consciousness. Duchin Rep. at 27 (Ex. A). As explained repeatedly throughout her report and deposition, Dr. Duchin’s ensembles adhered to criteria obtained directly from the House and Senate guidelines. Duchin Rep. at 7–8 (Ex. A); Duchin Tr. at 40:12–41:1 (Ex. D). Even though Legislative Defendants’ post-hoc partisan and core-retention explanations would not be reflected in the criteria Dr. Duchin reviewed,<sup>7</sup> she still demonstrates that both justifications can be implemented without the dilutive effect of S. 865 has on Black voters. Duchin Rep. at 27 (Ex. A); Duchin Rebuttal Rep. at 2–3 (Ex. B). Dr. Duchin’s analysis is therefore both comprehensive and reliable; it should not be excluded.<sup>8</sup>

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<sup>7</sup> Pending before the Court are several motions in limine by Plaintiffs charging that Defendant should be precluded from asserting partisan affiliation as a justification for its line drawing because it is a post-hoc, non-contemporaneous justification for S. 865. See, “*Plaintiffs’ Motion in Limine to Preclude Defendants from Introducing Evidence or Argument Supporting Rationales for Congressional Map that are not in Legislative Record*,” ECF 348; “*Plaintiffs’ Motion in Limine to Preclude Defendants from Introducing Evidence or Argument Regarding Post Hoc Rationales for Congressional Map*,” ECF 351.

<sup>8</sup> Legislative Defendants’ interpretation of *Backus* is also impossible to implement in practice. As demonstrated by the contradictory testimony from legislators and staff, the redistricting criteria adopted by the House and Senate conflict, have differing relative importance across legislative actors, and, in practice, were subordinated to non-public considerations by mapmakers (at least by the Senate). See, e.g., Roberts Tr. at 201–202 (Ex. E) (identifying multiple non-written private criteria designed to appease members of the Republican congressional delegation, such as minimizing change to CD 7, keeping Fort Jackson in CD 2, and keeping Beaufort County out of CD 2, that explained Senate line-drawing); John Tr. at 50–55 (Ex. F) (disclaiming that Senate map drawing was influenced by requests from the Republican congressional delegation). Requiring experts to use the exact principles and weighting as used by the General Assembly—at the admissibility stage, no less—would exclude any and all expert reports. It would also prevent the Court from analyzing the evidence in concert, contradicting Rule 401’s caution that “no one piece

**V. Dr. Duchin Did Not Base Her Analysis on a False Premise.**

Legislative Defendants incorrectly argue that Dr. Duchin's analysis is based on a false assumption that race must predominate over traditional redistricting principles. MIL at 2, 11–12. As one example, they claim Dr. Duchin understood the “General Assembly was obligated to ‘prioritize electoral opportunity’ [for Black voters] even when the goal ‘conflict[ed]’ with traditional redistricting principles.” MIL at 11. That is impossible to reconcile with Dr. Duchin deposition testimony in which she explicitly rejects that point: “I would shy away from the word ‘maximize’ which has a very specific meaning to me. I don’t think that, again, *to quote*, if there is a conflict, the requirements that include minority electoral opportunity should be given priority.” Duchin Tr. at 211:11–16 (Ex. D).

Dr. Duchin is not a lawyer and makes no legal conclusions in her report. *Id.* at 74:18–23. In Section 3 of her initial report, she summarizes the House and Senate Redistricting Guidelines, reading both sets of guidelines to place particular emphasis on “the safeguarding of minority opportunity to elect candidates of choice” in conjunction with compliance with other aspects of federal law and the constitution. Duchin Rep. at 7-8 (Ex. A). Dr. Duchin recognizes that, based on the Guidelines, compliance with federal law takes priority over other redistricting principles. *Id.*; Duchin Tr. at 69:14–20 (Ex. D). At no point does she opine on the law or whether it requires Legislative Defendants to do anything. She merely provides evidence that support racial predominance and intentional discrimination based on her statistical and visual analysis. Duchin Rep. at 22, 27 (Ex. A); Duchin Tr. 33:8-15 (Ex. D). Her understanding is entirely consistent with Legislative Defendants’ understanding. Campsen Tr. at 135:5–14 (Ex. G); Rankin Tr. at 149:5–13

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of evidence has to prove every element of the plaintiffs’ case.” *Adams v. Ameritech Servs., Inc.*, 231 F.3d 414, 425 (7th Cir. 2000).

(Ex. H); Fiffick Tr. at 119:18–120:11 (Ex. I); Terreni Tr. at 312:11–24 (Ex. J). Any argument by Legislative Defendants’ that Dr. Duchin’s method relies on an improper assumption is erroneous.

## **CONCLUSION**

For the reasons stated above, Legislative Defendants’ motion in limine should be denied.

Dated: September 9, 2022

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**CERTIFICATE OF SERVICE**

I hereby certify that on September 9, 2022, a true and correct copy of the foregoing was served on all counsel of record by electronic mail.

*/s/ Santino Coleman*  
Santino Coleman

**EXHIBIT A**

# Report on South Carolina Congressional Districts

Moon Duchin

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Senior Fellow, Tisch College of Civic Life

April 11, 2022

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# 1 Background and qualifications

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

I am compensated at \$300/hour for my work in this case. I have previously written reports and provided testimony by deposition, a hearing, or at trial in North Carolina, Pennsylvania, Wisconsin, and Alabama, as well as for the challenge in this case to certain South Carolina House of Representatives districts.<sup>1</sup> A full copy of my CV is attached to this report.

## 1.1 Assignment

I have been asked to examine the Congressional districts enacted in South Carolina (Enacted2022), together with the maps from the previous census cycle (Previous2012), alternative maps presented during the legislative process (notably the map submitted with the Harpoonian Amendment, which I have denoted Harpoonian) as well as those by the South Carolina NAACP (SC-NAACP1, SC-NAACP2), the League of Women Voters of South Carolina (LWVSC), and by other members of the public (Foster, Harrison, Muscatel, Sukovich, and Roberts). The eleven maps under consideration are shown on the following two pages.

In comparing these maps, my focus is to assess the state's enacted plan. My analysis will consider the possibility of excessively race-conscious line-drawing, especially noting when traditional districting principles have been undermined in a manner that results in "cracking"—splitting communities and dispersing their voters over multiple districts. I will consider whether this cracking ultimately leads to discernible vote dilution for the Black population of South Carolina.

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

## 1.2 Materials

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

- A major source is Census data, primarily the Decennial Census releases (i.e., the PL 94-171). Other data products from the Census Bureau, including the American Community Survey and the TIGER/Line shapefiles, were also used.
- For priorities and criteria, I consulted the publications by the South Carolina House of Representatives Redistricting Ad Hoc Committee on *2021 Guidelines and Criteria for Congressional and Legislative Redistricting*, and the corresponding publication for the Senate. These are available at [5] [8].
- The state's Congressional plan and numerous publicly submitted alternative plans are available on the state's website [6] [9].
- Community of interest testimony was collected at public meetings and is recorded on the state's website [7] [10].

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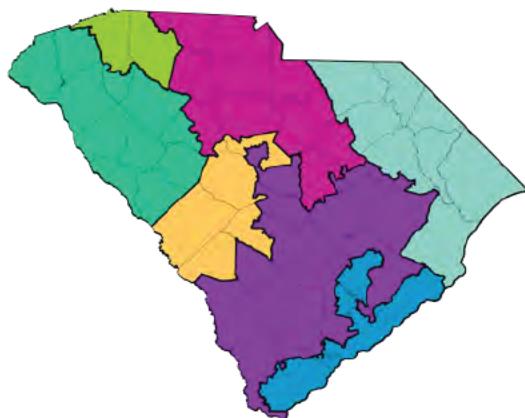
<sup>1</sup>NC League of Conservation Voters, et al. v. Hall, et al. No. 21-cv-500085 (Wake Cnty. Sup. Ct. 2021); Carter v. Chapman, No. 7 MM 2022, 2022 WL 702894 (Pa. Mar. 9, 2022); Johnson v. Wis. Elections Comm'n, No. 2021AP1450-OA, 2022 WL 621082 (Wis. Mar. 3, 2022); Milligan, et al. v. Merrill, et al., Case No. 2:21-cv-01530-AMM and Thomas, et al. v. Merrill, et al., Case No. 2:21-cv-01531-AMM (N.D. Ala. 2021).

## Congressional Maps

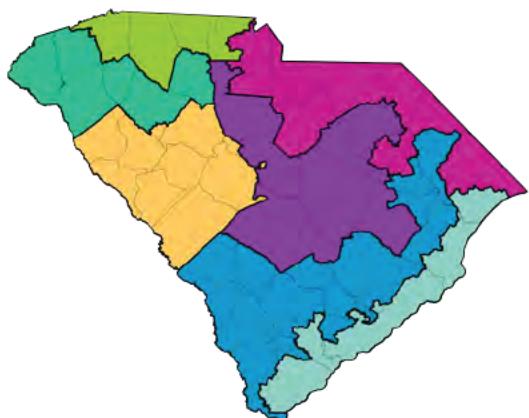
- 1
- 2
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- 5
- 6
- 7



Enacted 2022



Previous 2012



SC-NAACP1



SC-NAACP2



Harpootlian

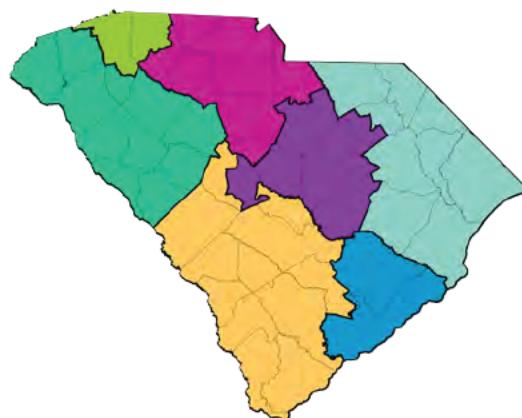


LWVSC

1 2 3 4 5 6 7



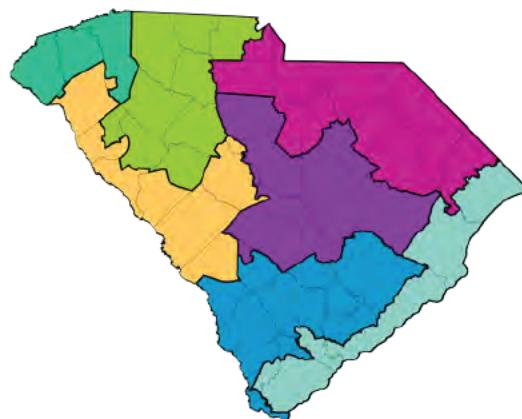
D. Foster  
(Stanford Law)



H. Harrison  
(no affiliation given)



G. Muscatel  
(Stanford Law)



J. Sukovich  
(Newberry County Democrats)



M. Roberts  
(no affiliation given)

## 2 Demographics in South Carolina

In South Carolina, the total population from the 2020 Decennial Census is 5,118,425. Of those, 1,370,542 are identified as Black on their Census forms—this makes up roughly 26.78% of the population. By focusing on those who answered "Yes" to the question of Black racial identity, we use what is sometimes called the *Any Part Black* definition of Black population—this means Black alone or in combination with any other racial or ethnic category. If the most restrictive definition of Black population were used instead, namely non-Hispanic respondents choosing Black and no other race, then the population number would drop to 1,269,031, or 24.79% of population. For the remainder of this report, "Black" refers to the larger definition.

When considering residents of voting age, the Black population is enumerated at 1,014,656 out of 4,014,460, or 25.28%. I will refer to this population share as BVAP, or Black voting age population. Passing to estimates of Black *citizen* voting age population (or BCVAP), the share shifts to 1,007,692 out of 3,877,913, or 25.99%.

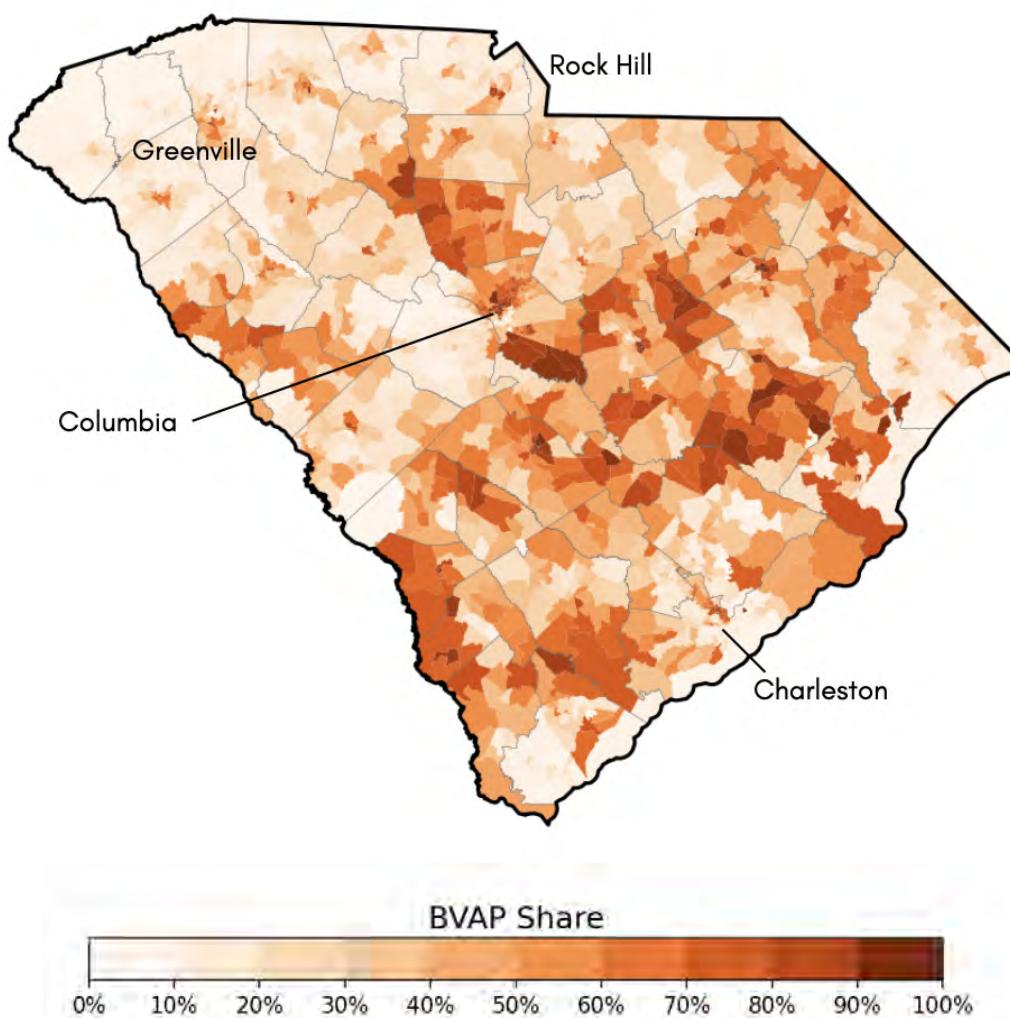


Figure 1: This choropleth map shows the share of Black voting age population shaded by VTD (i.e., by voting precinct) across South Carolina, overlaid with the boundaries of the 46 counties.

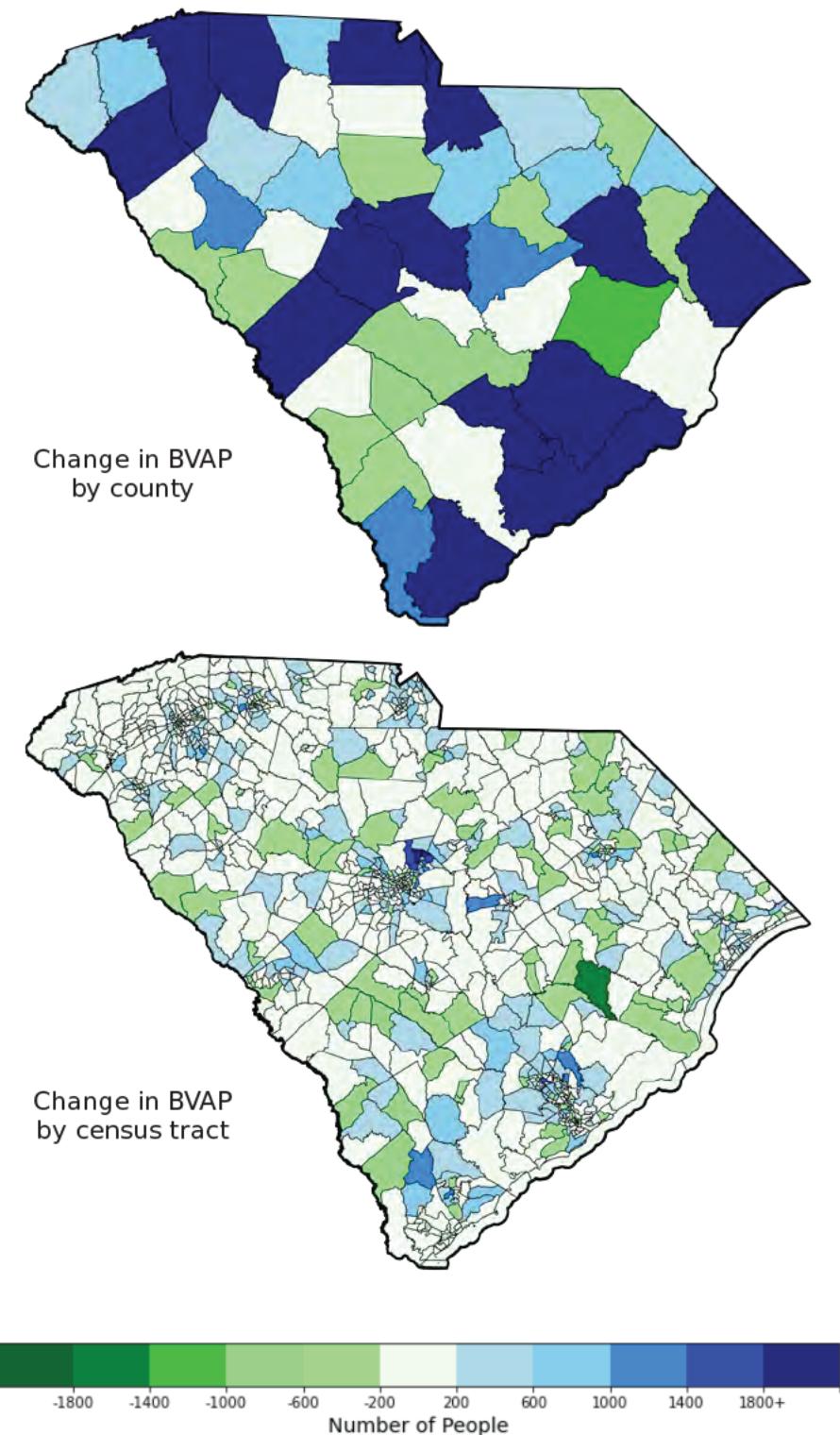


Figure 2: These maps show the shifts in Black population in South Carolina, according to American Community Survey estimates comparing 2010 and 2019. Black population has grown in the Columbia area and parts of greater Charleston, particularly, creating the demographic conditions for increased electoral influence.

### 3 Redistricting criteria

The Guidelines issued by the House and Senate are substantially similar; I will focus below on the House Guidelines and make notes as to where the Senate Guidelines agree or differ.

#### 3.1 First-tier requirements

**Minority opportunity.** The first specific districting criterion discussed in the House Guidelines is the safeguarding of minority opportunity to elect candidates of choice, referencing the Voting Rights Act of 1965 and more generally federal and state law. The House Guidelines affirm that "Any proposed redistricting plan that is demonstrated to have the intent or effect of dispersing or concentrating minority population in a manner that prevents minorities from electing their candidates of choice will neither be accepted nor approved."<sup>2</sup>

I note that both sets of Guidelines clearly contemplate the use of race data in ensuring compliance with the VRA: "race may be a factor considered in the creation of redistricting plans, but it shall not be the predominant factor motivating the legislature's decisions concerning the redistricting plan and shall not unconstitutionally predominate over other criteria set forth in these guidelines."<sup>3</sup>

**Population balance.** The standard interpretation of *One Person, One Vote* is that districts, especially Congressional districts, should be balanced to near mathematical equality of population, using total population from the Decennial Census.

For population balancing, the House Guidelines cite the Congressional ideal of 731,204 people per district derived from the PL94-171 and, by referencing "strict equality," imply that we should seek to have four districts at 731,204 and three at 731,203. The Senate Guidelines explicitly call for one-person top-to-bottom deviation for Congressional districts.

#### 3.2 Second-tier requirements

The previous criteria (covered in I-IV of the House Guidelines) are rooted in the Constitution and in federal and state law. Next, the Guidelines delineate four traditional principles that should be considered in South Carolina redistricting, though their role is clearly meant to be subordinate to the requirements of I-IV, and therefore they may need to give way in case of conflict.<sup>4</sup>

**Contiguity.** A district is regarded as contiguous when it is one connected piece. More precisely, a district formed from census blocks is called contiguous by the standard definition 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 from one to the next. In South Carolina, in accordance with the guidance in Section V of the House Guidelines, contiguity by water is acceptable; however, areas that only intersect at a single point or "points of adjoining corners" are not considered contiguous. Interestingly, point contiguity is allowed in the Senate Guidelines, as long as pairs of districts do not cross over each other at such a point.

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<sup>2</sup>The Senate Guidelines are nearly identical, noting that Congressional plans "must not have either the purpose or the effect of diluting minority voting strength".

<sup>3</sup>The Senate language is similar: "consideration of race is permissible," but any predominance of race-neutral considerations must be narrowly tailored.

<sup>4</sup>Similarly, the Senate Guidelines cover population balance and minority opportunity in Section I, then contiguity in Section II, putting communities of interest, district cores, the integrity of political subdivisions (counties, cities, towns, and VTDs), and compactness into Section III, entitled "Additional Considerations."

**Compactness.** The criterion of district compactness is the principle that districts should be reasonably shaped, not eccentric or irregular. The House Guidelines note that districts that are not visually compact can sometimes be justified by the shape of census block boundaries or natural geography and by the creation of districts to comply with the VRA.<sup>5</sup>

The House Guidelines remark that compactness "should be judged in part by the configuration of prior plans... [but] should not be judged based upon any mathematical, statistical, or formula-based calculation or determination." Despite this expressed preference, metrics are routinely used in redistricting analysis and litigation, so I will report them here.

The two most common compactness metrics are the Polsby-Popper score and the Reock score. These are both *contour-based* scores that rely on the outline of the district on a map. *Polsby-Popper* is a ratio formed by comparing the district's area to its perimeter. *Reock* considers how much of the smallest bounding circle is filled out by the district's area. Recently, mathematicians have argued for the use of discrete compactness metrics that de-emphasize the outline and instead consider how the districts are formed from units of census geography. *Block cut edges* is a metric that counts the number of census blocks that are adjacent to each other in the state, but are assigned to different districts. This assesses the "scissors complexity" of a plan, giving a measure of how many blocks would have to be separated from one another to divide up all the districts. An advantage of the contour scores is that they are familiar and in wide use. An advantage of discrete scores is that they do not excessively penalize districts for having winding boundaries when those boundaries come from physical geography, like coastlines or rivers.

**Communities of interest (COIs) and political boundaries.** Communities of interest are geographical areas where residents have shared interests relevant to their representational needs. The Senate Guidelines spell this out as "geographical, demographic, historic, or other characteristics that cause people to identify with one another, including economic, social, cultural, language, political, and recreational activity interests." (This is condensed but similar to the language in the House Guidelines.)

In numerous states, the legislature or other government offices launched an effort to collect COI testimony accompanied by digital mapping from members of the public, coordinated with the new Decennial Census data. I have reviewed the public testimony collected by the state and published online on the redistricting sites for the Senate and House [10 7]. The oral testimony was not accompanied by mapping submissions, but I have made a serious effort to screen it comprehensively and take it into account in this report wherever possible.

Many submitted comments were broad or theoretical, such as the general importance of communities; preserving county and municipal boundaries; concerns about partisan and racial gerrymandering; competitiveness; transparency and public participation; and deprioritizing incumbency protections. But notably, speakers also named particular counties, regions, or metropolitan areas with specific representational concerns. For instance, commenters spoke to Dorchester County, the Lowcountry, North Charleston, Orangeburg, Columbia, and Sumter communities of interest, which will be discussed below in the detailed district review (§5).

In line with some of the public commenters, the House Guidelines fold what is usually a separate principle into the category of COIs. Namely, it is very common in redistricting to require respect for political boundaries, especially for the boundaries of counties, cities, and towns. In South Carolina, counties, municipalities, and precinct/VTD lines are explicitly classified as a part of the COI principle, "but will be given no greater weight, as a matter of state policy, than other identifiable communities of interest." The Senate Guidelines split out respect for counties (III.C), cities and towns (III.D), and VTDs/precincts (III.E) under separate headings.

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<sup>5</sup>Compactness is also sometimes used to describe population distributions rather than districts; in that usage, compact populations are those that are clustered rather than dispersed. Notably, the Senate Guidelines shy away from shape considerations entirely, referencing what is sometimes called *functional compactness*: "the extent to which points of the district are joined by roads, media outlets, or other means for constituents to communicate effectively with each other and with their representative."

## 4 Review of metrics for Congressional maps

This section reports metrics for all of the Congressional maps discussed in this report. These include measurements of traditional redistricting criteria such as compactness and geographic splits, as well as demographic data.

### 4.1 Racial demographics

The plans submitted to the legislature for consideration differ greatly in their distribution of Black population over the districts. The following tables present the BVAP by district for each of the plans, and then identify the number of districts surpassing thresholds of 50, 40, and 30% BVAP. Recall that, as described above, BVAP measurements in this report are with respect to so-called Any Part Black categories (i.e., Black alone or in combination).

	<b>CD 1</b>	<b>CD 2</b>	<b>CD 3</b>	<b>CD 4</b>	<b>CD 5</b>	<b>CD 6</b>	<b>CD 7</b>
Previous2012	0.173	0.239	0.174	0.183	0.257	0.525	0.254
Enacted2022	0.174	0.254	0.176	0.19	0.247	0.469	0.254
SC-NAACP1	0.349	0.205	0.16	0.172	0.244	0.528	0.117
SC-NAACP2	0.24	0.202	0.18	0.185	0.202	0.503	0.254
Harpootlian	0.212	0.219	0.156	0.162	0.337	0.497	0.184
LWVSC	0.233	0.197	0.169	0.191	0.244	0.488	0.245
Foster	0.244	0.208	0.143	0.153	0.202	0.323	0.496
Muscatel	0.167	0.248	0.178	0.184	0.247	0.488	0.254
Harrison	0.233	0.276	0.185	0.177	0.277	0.352	0.267
Sukovich	0.293	0.184	0.143	0.211	0.319	0.493	0.129
Roberts	0.233	0.315	0.197	0.386	0.321	0.167	0.151

	<b>#districts with &gt;50% BVAP</b>	<b># districts with &gt;40% BVAP</b>	<b>#districts with &gt;30% BVAP</b>
Previous2012	1	1	1
Enacted2022	0	1	1
SC-NAACP1	1	1	2
SC-NAACP2	1	1	1
Harpootlian	0	1	2
LWVSC	0	1	1
Foster	0	1	2
Muscatel	0	1	1
Harrison	0	0	1
Sukovich	0	1	2
Roberts	0	0	3

Table 1: The first table gives Black voting age population share by district for the plans under consideration. The second table shows the number of districts that have BVAP over 50%, 40%, and 30%, respectively.

## 4.2 Population deviation

One Person, One Vote calls for plans to have nearly equal population across their districts. Over the ten years between Decennial Census releases, districts grow quite malapportioned due to natural population shifts between and within the states. In South Carolina, the deviation grew to over 170,000 from top to bottom.

All of the new plans reduce the deviation significantly, with Enacted2022, SC-NAACP1, SC-NAACP2, Harpootlian, LWVSC, Foster, and Muscatel all achieving top-to-bottom deviation in the single digits.

	<b>Maximum positive deviation</b>	<b>Maximum negative deviation</b>	<b>Top-to-bottom deviation</b>
Previous2012	87,689	-84,741	172,430
Enacted2022	0	-1	1
SC-NAACP1	1	-1	2
SC-NAACP2	1	-3	4
Harpootlian	1	-3	4
LWVSC	3	-2	5
Foster	0	-1	1
Muscatel	0	-1	1
Harrison	630	-668	1298
Sukovich	746	-944	1690
Roberts	1790	-724	2514

Table 2: Population deviation in each plan.

### 4.3 Compactness

In terms of district shape, the state's enacted plan, like the state's plan from the previous cycle, is only moderately compact compared to some of the other proposals submitted to the legislature. For example, LWVSC and SC-NAACP2 plans are more compact than both state maps—Previous2012 and Enacted2022—by all three featured metrics of compactness. The Harpootlian plan beats the state's maps on the Polsby-Popper and cut edges scores, though not on the Reock score.

	<b>avg Polsby-Popper</b> (higher is better)	<b>avg Reock</b> (higher is better)	<b>Block cut edges</b> (lower is better)
Previous2012	0.202	0.369	3217
Enacted2022	0.210	0.361	2843
Harpootlian	0.235	0.327	2227
LWVSC	0.224	0.379	2392
SC-NAACP1	0.165	0.270	3578
SC-NAACP2	0.240	0.371	2343
Foster	0.273	0.376	2313
Muscatel	0.216	0.371	2955
Harrison	0.289	0.443	2074
Sukovich	0.208	0.324	2636
Roberts	0.177	0.308	3091

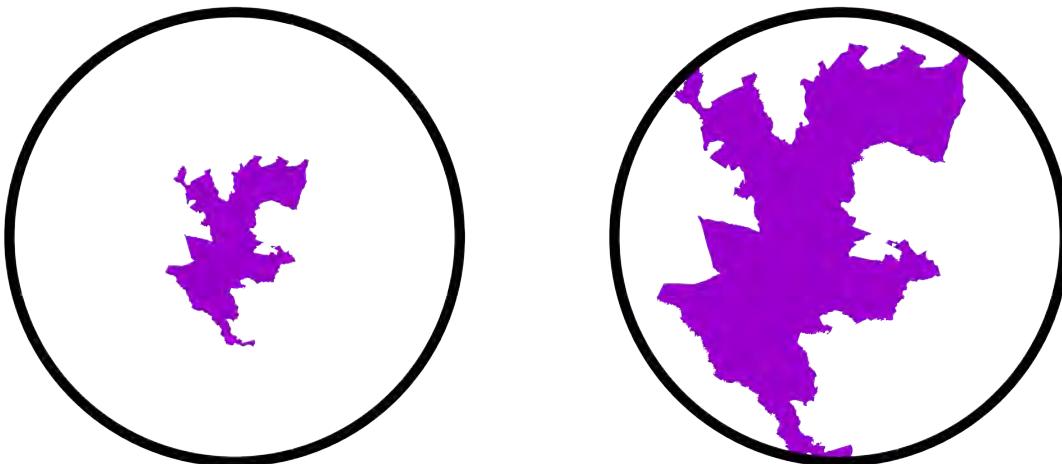


Table 3: Comparing compactness scores via one discrete and two contour-based metrics. The Polsby-Popper score compares a district's area to the area of the circle with the same perimeter (left). The Reock score compares a district's area to the area of the smallest circle that contains the district (right). These are illustrated using CD 6 from the state's plan Enacted2022, which has an extremely low Polsby-Popper score of 0.0754 (left) and a more moderate Reock score of 0.3569 (right).

#### 4.4 Political subdivisions

Respect for the integrity of political subdivisions—units such as counties and cities—is a traditional principle in its own right. In South Carolina, it is also named as a communities of interest consideration in the legislative Guidelines.

In the tables below, each "splits" score counts the number of units that are assigned to multiple districts, while each "pieces" score adds up, over the divided units, how many districts they touch. For example, if one county is split two ways and another is split three ways, this would count as a total of two split counties and five county pieces.

In Table 4, we see the splits/pieces counts for counties and county subdivisions. County subdivisions are a census data product; subdivisions nest inside counties and respect municipalities, tending to have more regular boundary lines than municipalities themselves.

	<b>County Splits</b> (out of 46)	<b>County Pieces</b>	<b>Subdivision Splits</b> (out of 271)	<b>Subdivision Pieces</b>
Previous2012	12	24	39	78
Enacted2022	10	20	29	58
SC-NAACP1	19	39	49	99
SC-NAACP2	14	30	30	61
Harpootlian	7	14	12	24
LWVSC	6	12	24	48
Foster	9	19	26	53
Muscatel	12	24	31	62
Harrison	6	12	15	30
Sukovich	13	26	23	46
Roberts	7	15	22	46

Table 4: This table presents the number of county and county subdivision splits and pieces in each plan.

In the cities and towns analysis, I will distinguish the splits and pieces that merely impact the *territory* from the splits that actually divide *population*. Note that the population splits are often smaller, because boundaries of cities can be quite complicated and sometimes only an unpopulated outlying area is divided from the rest of the city—this would count as a territory split, but not as a population split. Table 5 shows the counts.

	<b>City Splits</b> (out of 69)	<b>City Pieces</b>	<b>Town Splits</b> (out of 202)	<b>Town Pieces</b>
Previous2012	13 / 13	26 / 26	6 / 5	12 / 10
Enacted2022	10 / 10	20 / 20	12 / 10	24 / 20
SC-NAACP1	15 / 13	30 / 26	11 / 10	22 / 20
SC-NAACP2	9 / 7	18 / 14	13 / 10	27 / 21
Harpootlian	9 / 7	18 / 14	7 / 6	14 / 12
LWVSC	6 / 5	12 / 10	5 / 4	10 / 8
Foster	11 / 10	22 / 20	8 / 5	16 / 10
Muscatel	16 / 16	32 / 32	7 / 6	14 / 12
Harrison	11 / 11	22 / 22	6 / 6	13 / 12
Sukovich	14 / 13	28 / 26	8 / 7	16 / 14
Roberts	14 / 11	30 / 24	8 / 8	16 / 16

Table 5: This table presents city and town splits for each plan, with both territory splits and population splits shown. For example, the Harpootlian plan city splits are shown as 9 / 7, meaning that the plan splits the territory of nine cities across multiple districts, but only seven of those splits involve populated blocks.

## 4.5 Incumbency

The plans under consideration vary in their treatment of incumbents, from zero to three pairings.

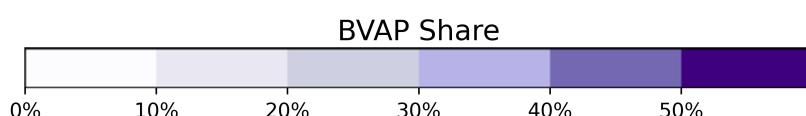
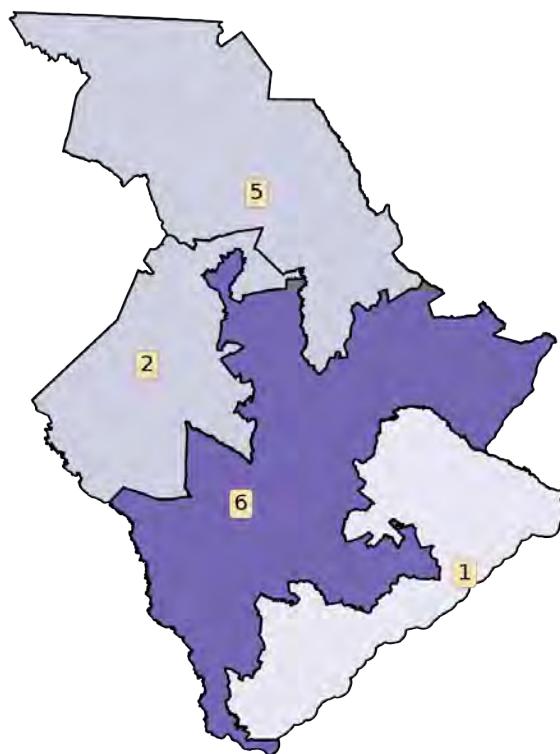
- Previous2012: none
- Enacted2022: none
- SC-NAACP1: none
- SC-NAACP2: none
- Harpootlian: none
- LWVSC: one pair
  - CD 3: Duncan (R) / Timmons (R)
- Foster: one pair
  - CD 4: Rice (R) / Mace (R)
- Muscatel: none
- Harrison: one pair
  - CD 6: Clyburn (D) / Wilson (R)
- Sukovich: one pair
  - CD 4: Rice (R) / Norman (R)
- Roberts: three pairs
  - CD 2: Wilson (R) / Mace (R)
  - CD 3: Rice (R) / Norman (R)
  - CD 5: Duncan (R) / Clyburn (D)

## 5 Detailed district review

The complaint filed by the SC-NAACP cites Congressional districts 1, 2, and 5 from the newly-proposed plan Enacted2022 as having been drawn to dilute Black voting power. Since these districts surround district 6—the only district in the state’s plan that presents electoral opportunity to Black voters—we will discuss CD 1, CD 2, and CD 5 in relation to CD 6.

First, we recall the levels of Black voting age population and the compactness scores for each district. Note: only Polsby-Popper is cited here because it is by far the most commonly used compactness score. Cut edges, in particular, is only defined for whole plans and not for individual districts.

Enacted2022	1	2	5	6
BVAP	.174	.254	.247	.469
Polsby-Popper	.146	.171	.229	.077



In the reconfiguration between Previous2012 and Enacted2022, the movement of terrain between key districts is shown below in Figure 3

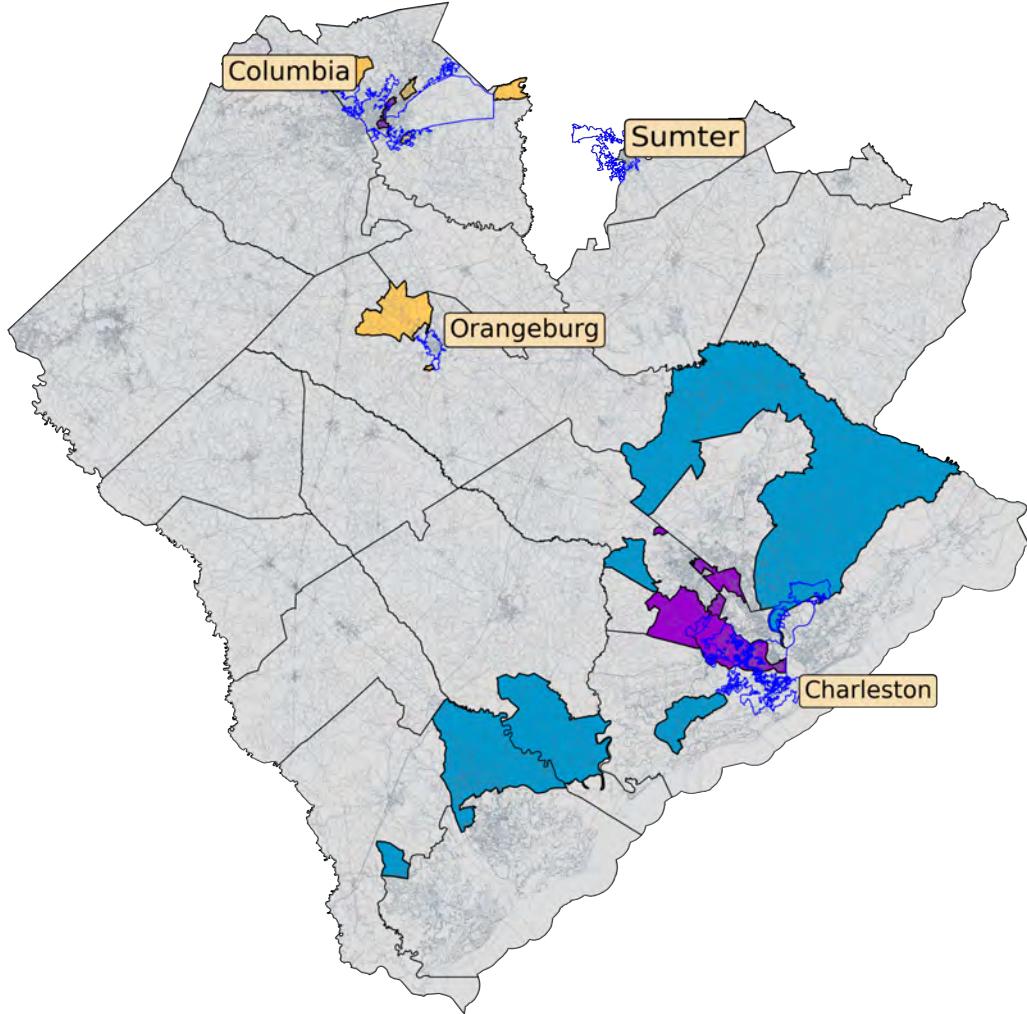


Figure 3: Terrain moved in and out of CD 6. Areas are colored in terms of their district reassignment. Yellow areas were moved from CD 6 to CD 2; blue was moved from CD 6 to CD 1, and purple areas were moved into CD 6 from the neighboring districts.

As the figure makes clear, the reassignment is happening in scattered chunks and shards, and is not aimed at healing key splits of cities and communities that were frequently cited in the public testimony, including Columbia, Sumter, Orangeburg, and Charleston. This produces a map that cuts those areas in a way that neither respects traditional redistricting principles nor publicly identified community needs, as I will detail in the remainder of this section.

## 5.1 CD 1

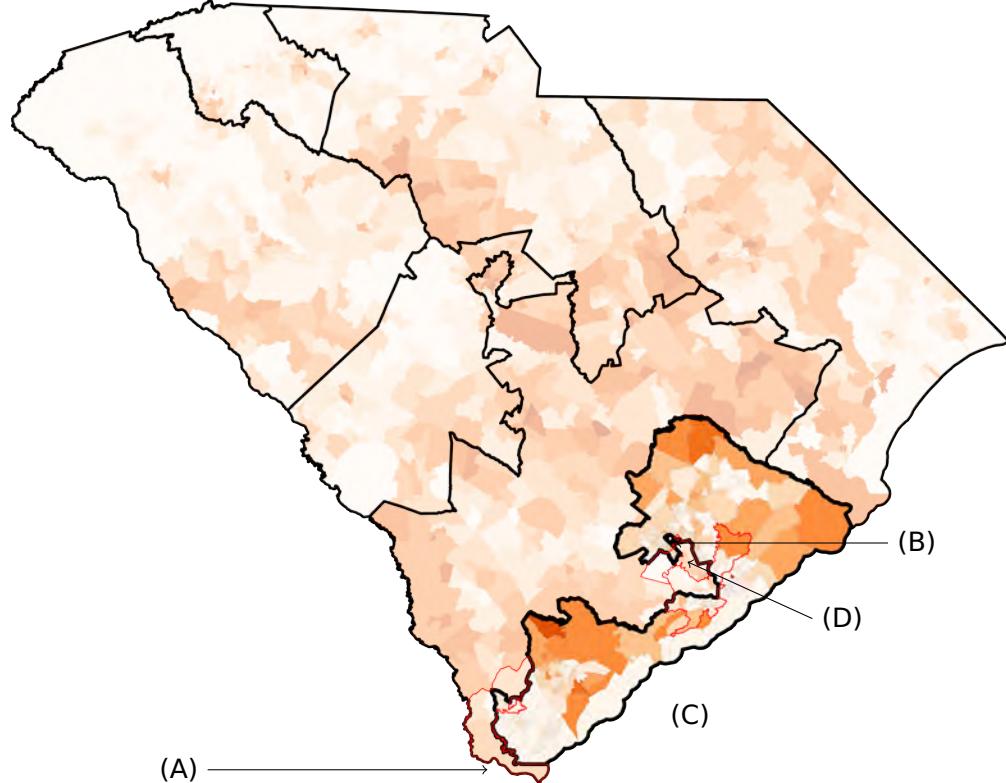


Figure 4: CD 1 is highlighted, with the Black voting age population as in Figure 1 and split cities outlined in red.

The first Congressional district in the Enacted 2022 map comprises all of Berkeley and Beaufort Counties and pieces of Jasper, Colleton, Charleston, and Dorchester Counties. Within Charleston County, the CD 1 and CD 6 boundary follows natural geography, but only until reaching Berkeley County.

- (A) **Jasper County split.** Jasper County, which was previously intact in the enacted 2012 map, is split. Only two of its precincts are included in the new CD 1.
- (B) **Dorchester County split illogically.** The district makes an unnecessary detour from Berkeley County into Dorchester County, involving six precinct splits that do not follow any major roadways or bodies of water. The reasons for splitting precincts are not clear, but they result in two separate pieces of Dorchester County being found in CD 6. The split precinct pieces show a noticeable racial skew—five out of six split precincts have a significant BVAP differential between the piece in CD 1 and the piece in CD 6, with higher Black population share on the CD 6 side, consistent with a strategy of cracking in CD 1.
- (C) **Coastal and Lowcountry COIs disregarded.** COI testimony asks to keep together the coastal communities and "Lowcountry" counties—principally Jasper, Charleston, Colleton, and Beaufort—but these are split in the state's map. By contrast, the Harpoorian proposal is highly cognizant of these COIs.

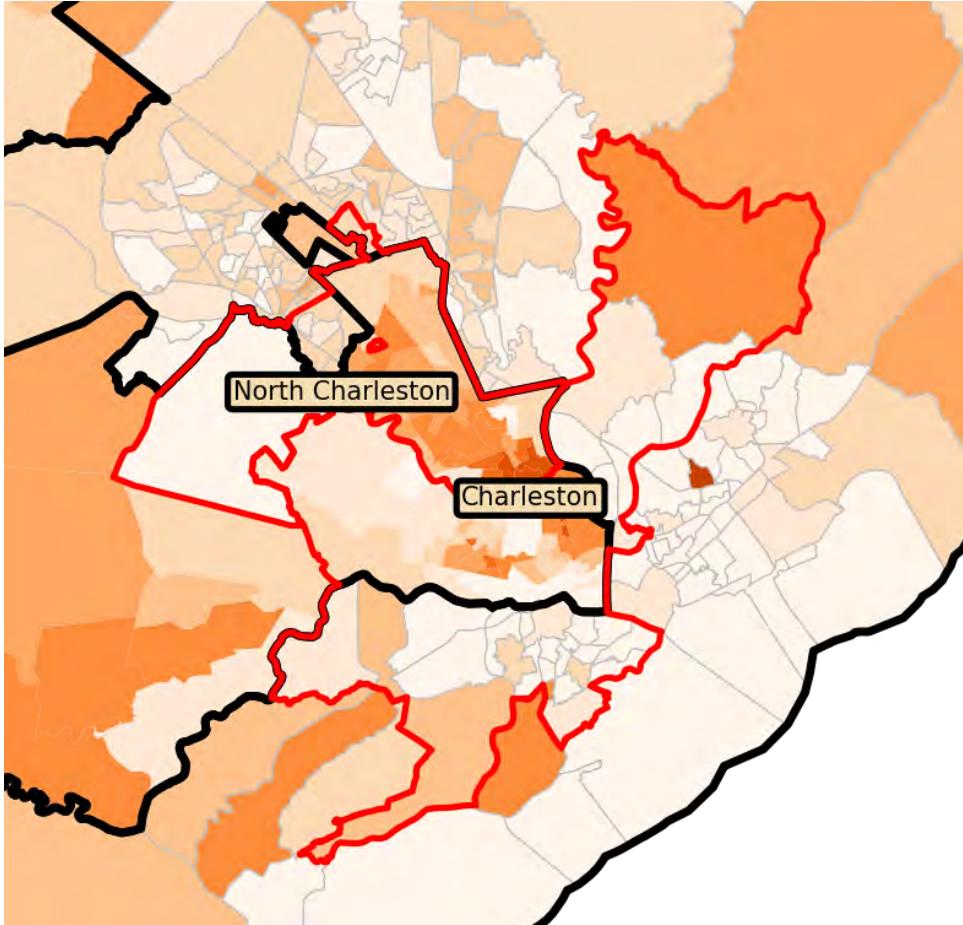


Figure 5: North Charleston is split between CD 1 and CD 6 as the district line winds between counties, in and out of the city, and through neighborhoods with significant Black population.

- (D) **Charleston County split erratically.** Charleston County boundaries appear to be selectively followed, ignoring communities cited in public testimony, which notably highlights "Charleston and surrounding towns." The cities of Summerville and Ladson are part of both Berkeley and Dorchester Counties, while North Charleston spans these two counties as well as Charleston County. The state has split all three cities: for Summerville and Ladson, the district boundary follows the county line, but for North Charleston the district winds around to grab a small piece of the city. (See Figure 5) All of these important communities could have been kept whole. Public comment is particularly vocal on North Charleston, saying that the city has more in common with Charleston than with Columbia, and more in common with the Lowlands than the Midlands.

## 5.2 CD 2

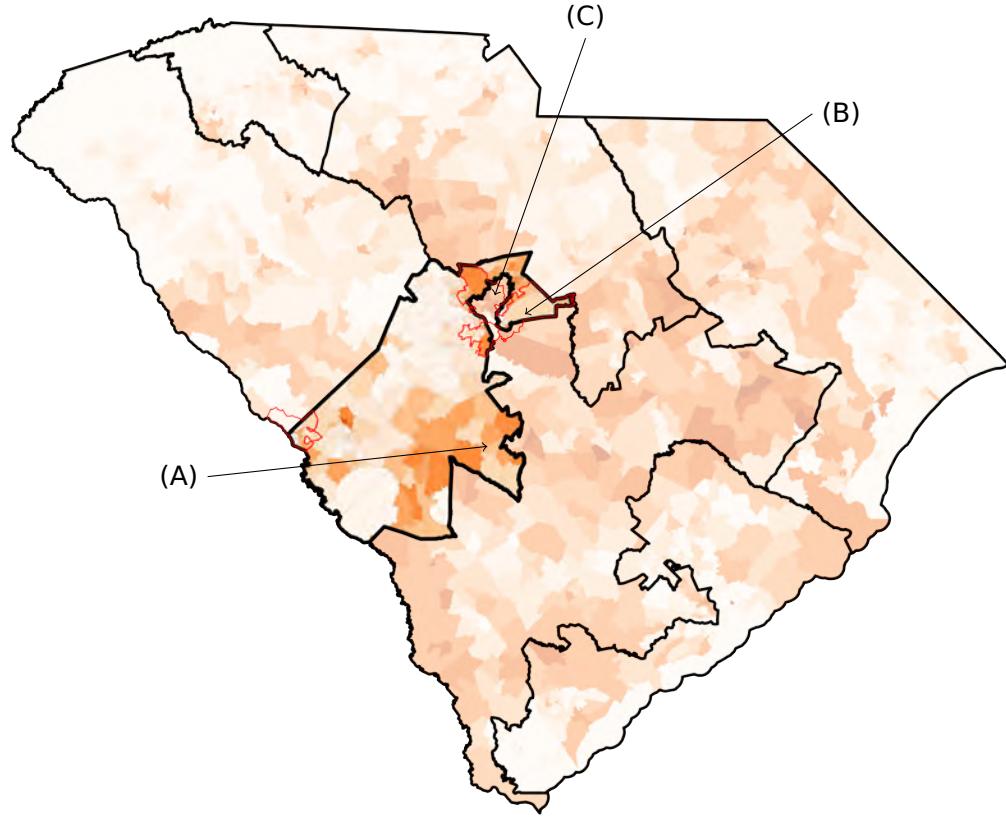


Figure 6: CD 2 is highlighted, with the Black voting age population as in Figure 1 and split cities outlined in red.

The second district is made up of the entirety of Aiken, Barnwell, and Lexington Counties and pieces of Orangeburg and Richland Counties.

- (A) **Orangeburg separated from CD 2.** The CD 2 boundary forms a ring around the western Orangeburg suburbs, keeping the city of Orangeburg in CD 6. The public comment indicates, by contrast, that Orangeburg has more in common with the adjoining areas of CD 2.
- (B) **Hook into Columbia.** In Richland County, CD 2 wraps circuitously around the greater Columbia area in a non-compact hook shape in the prior plan Previous2012—and though the details are different, that hook shape is preserved in the new plan Enacted2022. It appears to crack voters by drawing district boundaries through an area in northern Richland with high BVAP. (See Figure 7)

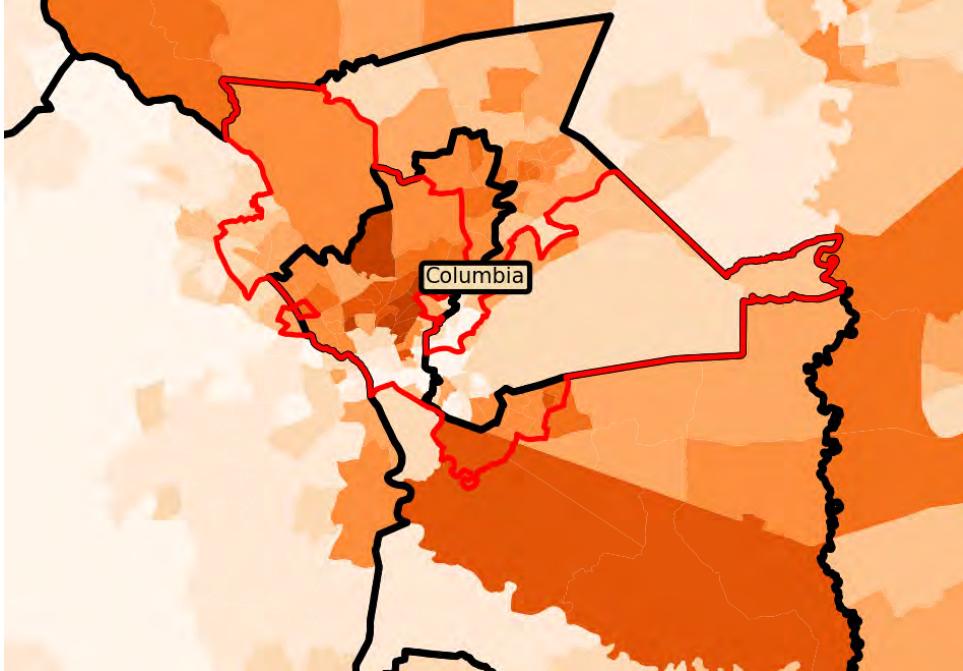


Figure 7: District lines wrap around and divide the city of Columbia. This splits both the city and the county in a manner that cracks Black population.

(C) **Splitting in and around Columbia.** In Richland County, the cities of Cayce, Columbia, and Forest Acres are all split, along with two precincts that are split in a manner that does not appear to follow major roads. If the district line traced along the Richland County boundary, or at least divided the county in a less winding manner, it would avoid needless splitting and confusion. Some public comment suggests that the Columbia area contains communities that are linked, but that these linked communities were divided by the CD 6 "bulb" in Columbia. As William Maxie testified: "Do people in downtown Columbia not have that much in common with people from Forest Acres or people right across the [Congaree] river? No, they do. That's where a lot of people live and a lot of those people work." (Appendix B)

### 5.3 CD 5

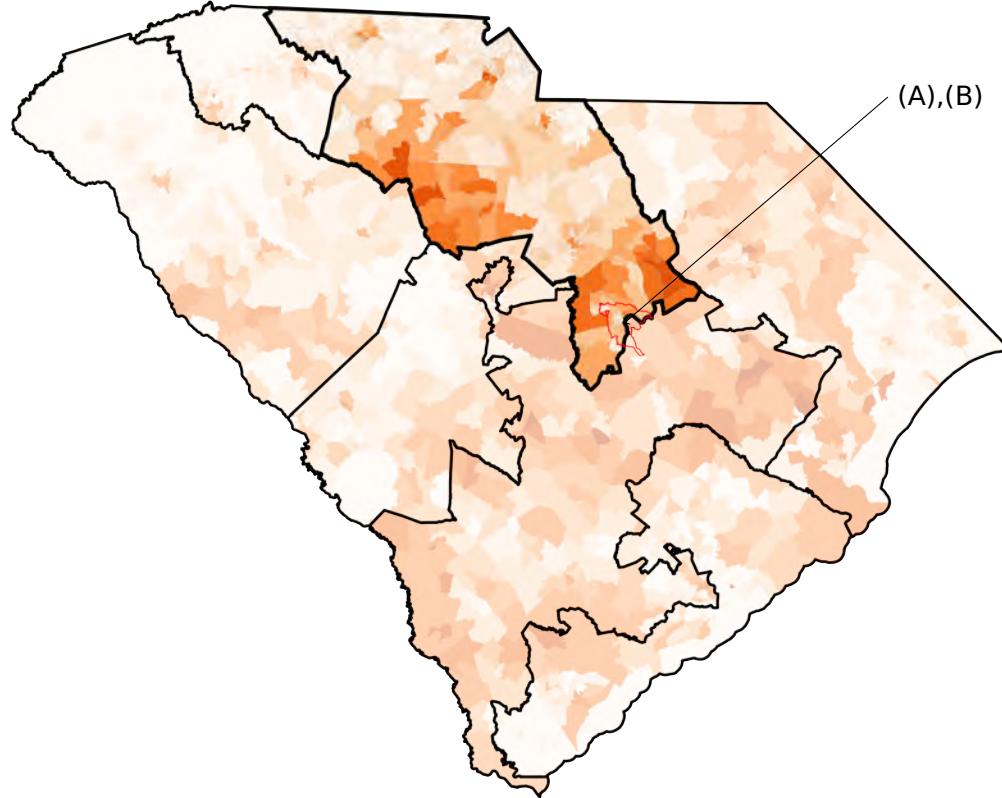


Figure 8: CD 5 is highlighted, with the Black voting age population shown as in Figure 1 and the split city of Sumter (pop. 43,463) outlined in red.

The fifth district covers all of Cherokee, York, Union, Chester, Lancaster, Fairfield, Kershaw, and Lee Counties and pieces of Spartanburg County along the CD 5 and CD 4 boundary and Sumter County along the CD 5 and CD 6 boundary.

- (A) **Sumter COI not respected.** The city of Sumter and the neighborhoods of East Sumter and Mulberry are three majority-Black communities split by the enacted map.<sup>6</sup> The public testimony suggests that the city of Sumter and Sumter County are each important communities—these are referenced by at least four commenters. For instance, Archie Parnell testified that "I think there is a community of interest here in Sumter and I would urge you to continue with your criteria that you've adopted 10 years ago and, hopefully, keep counties together."
- (B) **Sumter split is illogical.** In Sumter County, one precinct is split along several low-density residential roads (W Oakland Ave, Cemetery Road, Carver Street, Green Swamp Road, Bradford Street, and Council Street). This portion of W Oakland Ave and all of Cemetery Road appear to be in the middle of a cemetery.

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<sup>6</sup>Sumter in particular is roughly 51% Black by population.

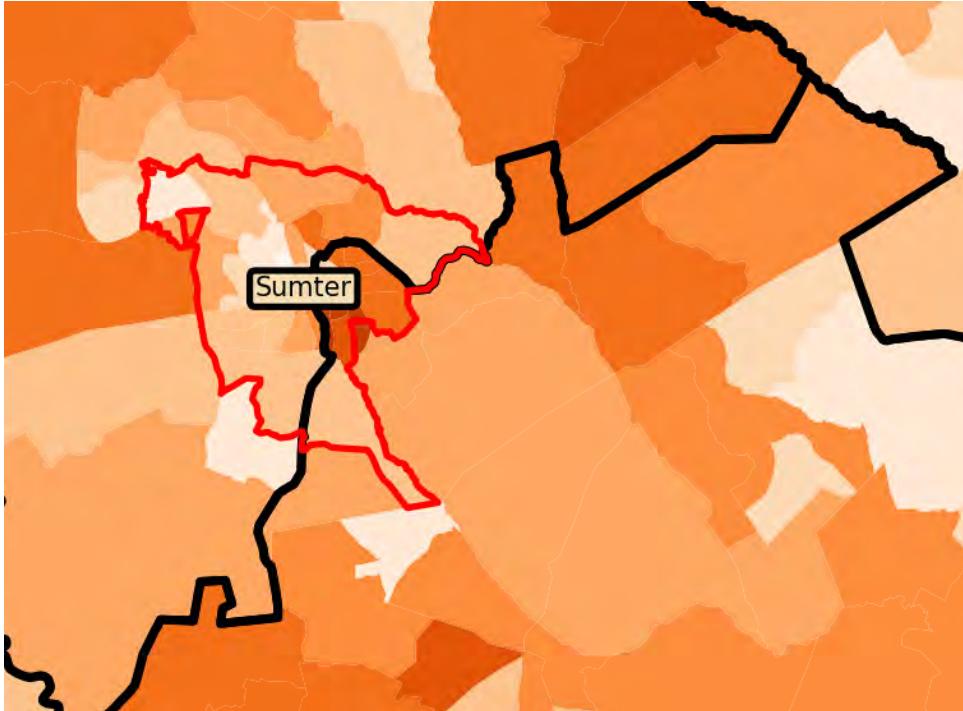


Figure 9: Sumter, a small majority-Black city cited in public testimony as an important community, is split in the state's map as the CD 5/CD 6 dividing line wends through a heavily Black region.

See Appendix B for a large selection of public testimony supporting the points raised in this section.

## 6 Vote dilution compared to the neutral baseline

In order to illustrate the universe of possibilities when some or all districts are redrawn, I have used a method that is increasingly popular in the peer-reviewed scientific literature as well as courts of law.<sup>7</sup> This is called the *ensemble method* for redistricting, where randomized algorithms are used to construct large numbers of sample plans that vary district lines while holding the rules and geography constant. This is a popular method for determining whether some property of districting plans is an inevitable consequence of the rules and geography, or whether neutrally drawn alternatives show evidence that the unusual property is intentional. In this section, I will investigate evidence of whether the state's plan has *cracked* the Black population across districts 1, 2, 5, and 7, which show sharply less Black population than the level in CD 6. To do this I will focus on the demographic statistics of *the district with second-highest BVAP* in the state's plans, compared to alternatives.

I have used the Python package *GerryChain*, developed in my Lab and openly available to the public since 2018, to generate several ensembles of 100,000 alternative plans each. Population balance and contiguity are enforced throughout the algorithm, and it is implemented with a preference for compactness and for the preservation of counties and municipalities. I performed runs which attempt to prioritize the preservation of certain communities of interest identified in public testimony, and also runs that did not operationalize the COI concept. (For details, see Supplement A.) Ensemble generation made no use of race data and are *neutral* with respect to all other properties except those listed here.

### 6.1 Statewide

Using neutral ensembles of districting maps, we can compare the properties of a plan to alternative statewide plans that were made under traditional criteria. A histogram showing the distribution of Black population in the *second-highest district* is given in Figure 10. Cracking would tend to show up as unusually low BVAP in the second-highest district. This is exactly what we observe in Figure 10.

Comparing to the neutral ensemble—which was constructed with the same natural and physical geography that faced the legislature, and with the traditional districting principles enforced—illustrates that the cracking that was qualitatively described in the last section does indeed amount to dilution of Black population with respect to a neutral baseline. And we note that the contrast with the SC-NAACP1 and Harpoonian maps, which draw CD 6 with higher BVAP than Enacted2022 (see Table 1), makes it clear that the BVAP dropoff is not merely a function of maintaining CD 6 at near-majority levels.

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<sup>7</sup>In this cycle, ensemble evidence has been accepted by courts in North Carolina, Pennsylvania, and Ohio. In the previous cycle, it formed a key component of the evidence in North Carolina and Pennsylvania that resulted in the invalidation of enacted plans in each state. Peer-reviewed publications include [2] [3] [1] and many more.

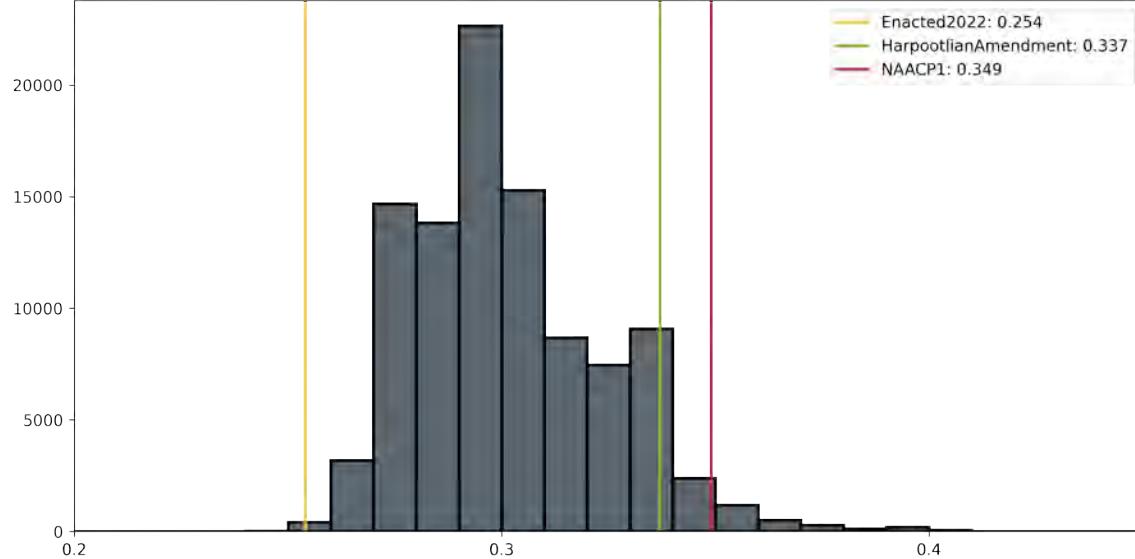


Figure 10: This histogram compares the district with *second-highest* BVAP in three current plans to those from 100,000 alternative plans. Most neutral plans are at or near 30% BVAP in their second highest district, while the state’s plan is especially low. The SC-NAACP1 and Harpootlian plans are not cracked compared to the ensemble, even though they maintain CD 6 with BVAP levels above those in the state’s plan.

## 6.2 Focused area

The complaint filed by the SC-NAACP specifically seeks relief for the dilution of Black voters in CD 1, CD 2, and CD 5. These districts cannot be adequately analyzed without the inclusion of CD 6 to the cluster. In order to show how these districts can be re-drawn, I have generated a new ensemble of 100,000 maps that only scrambles these four, preserving the state’s CD 2, CD 3, and CD 7 exactly as drawn. In addition, I have identified an example of an alternative map (shown in Figure 11) that maintains CD 6 in nearly its exact configuration while un-cracking CD 5. Importantly, the alternative plan does not create an additional majority-Black district; rather, its CD 5 has just over 30% BVAP—a strengthened additional district, like CD 1 in the SC-NAACP1 alternative plan.<sup>8</sup>

Thus, whether we use a whole-state redraw or a targeted redraw, we find the state’s plan to crack the Black population of South Carolina. As this section makes clear, many other possibilities were available to the state.

<sup>8</sup>In the following section, I will explain a metric of the “effectiveness” of a district for Black voters, using four probative elections provided by counsel. In this alternative map, CD 5 does not always have a win for the Black candidate of choice—but that candidate receives at least 47.5% of the vote in each of the four elections, winning outright in one of the four. That performance corroborates the claim that this is a strengthened district for Black voters, and one in which a candidate would likely have to campaign in a way that led to some Black support in order to prevail.

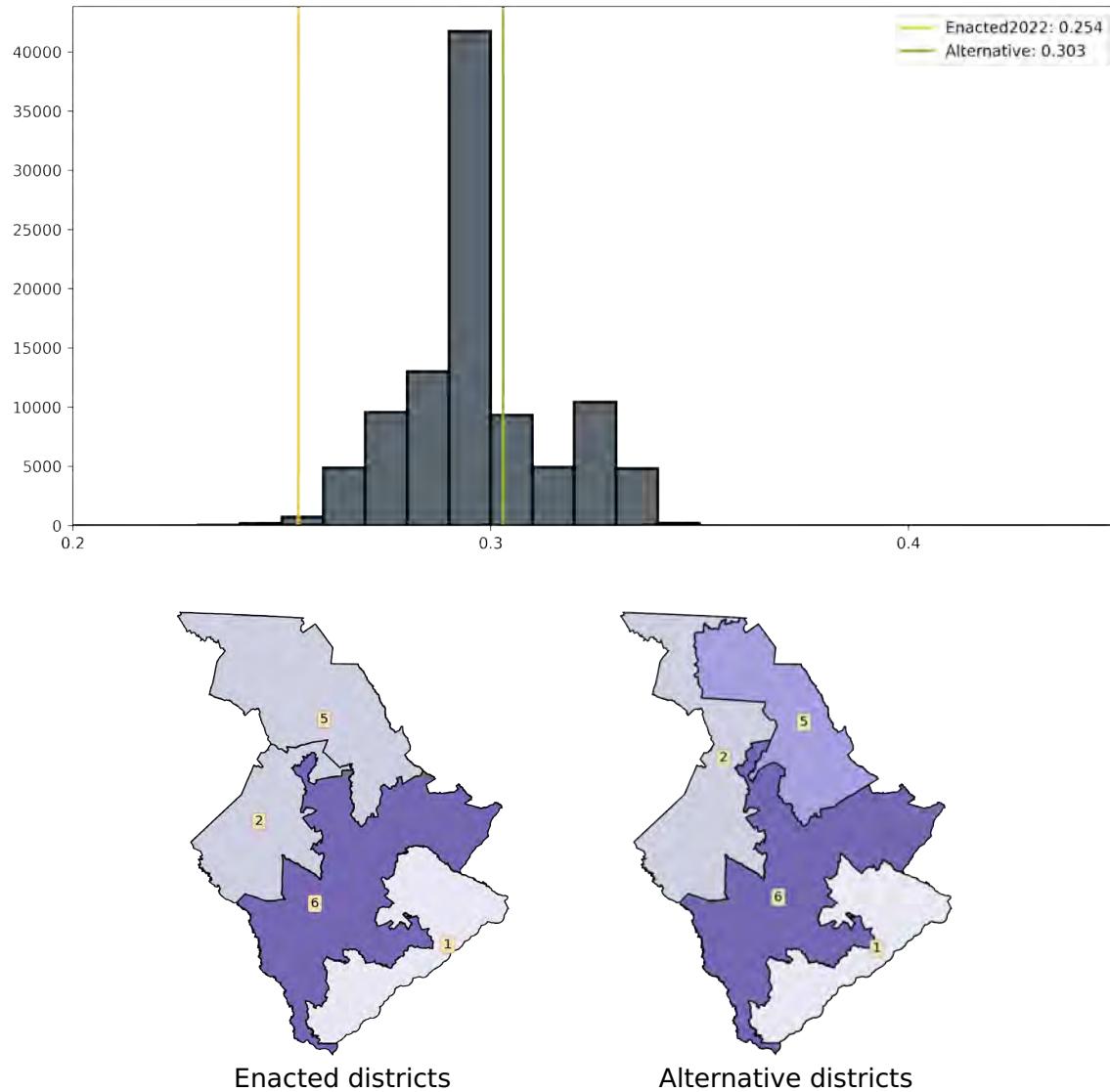


Figure 11: Histogram of BVAP in the second-highest district, comparing the low BVAP observed in the proposed plan to an ensemble of 100,000 sample plans that redraw only districts 1, 2, 5, and 6. An alternative plan is also shown—it leaves CD 6 and therefore CD 1 nearly unchanged, and unpacks this focus area mostly by changing a single (CD 2 / CD 5) boundary line.

## 7 Electoral opportunity for Black voters

Minority electoral opportunity is ultimately best gauged not by racial proportions in the population, but by an electoral history that shows that candidates of choice can be both nominated and elected. To measure that, we have used four recent statewide elections that were identified by counsel as particularly probative for Black electoral opportunity. These are the Secretary of State and Treasurer elections from 2018 and the U.S. Senator and President elections from 2020. In each case, a Black-identified candidate was on the ballot (including Kamala Harris on the Biden ticket). These elections have also been confirmed by counsel to display racially polarized voting, in which Black voters cohesively support the candidate of choice, while White voters form enough of a bloc to defeat these candidates in each election.

If the Black candidate of choice won in each of the 4 elections in a district, we can label the district as highly *effective* from the point of view of Black electoral opportunity. The overall effectiveness of a 7-district plan is the sum of these 0-4 scores over each district, giving an overall score on a scale of 0-28.

<b>Black candidates of choice</b>	
Secretary of State 2018	Melvin Whittenburg
Treasurer 2018	Rosalyn Glenn
U.S. Senator 2020	Jaime Harrison
President 2020	Joe Biden / Kamala Harris

Table 6: Black candidates of choice were identified in a racially polarized voting analysis provided by counsel.

	<b>Effectiveness</b> (out of 28)	<b>By District</b>						
		1	2	3	4	5	6	7
Previous2012	4	-	-	-	-	-	4	-
Enacted2022	4	-	-	-	-	-	4	-
Harpootlian	6	2	-	-	-	-	4	-
LWVSC	6	2	-	-	-	-	4	-
SC-NAACP1	8	4	-	-	-	-	4	-
SC-NAACP2	8	4	-	-	-	-	4	-
Foster	10	4	-	-	-	-	2	4
Muscotel	4	-	-	-	-	-	4	-
Harrison	6	2	-	-	-	-	4	-
Sukovich	8	4	-	-	-	-	4	-
Roberts	11	2	3	-	4	2	-	-

Table 7: Effectiveness score across each proposed congressional plan in the four elections identified as probative for Black electoral opportunity. The state's plans from 2012 and 2022 confine Black electoral opportunity to a single district, where all four Black candidates of choice would have won the district, while none of them would have won in the other six districts. Only one other map under consideration (Muscotel) limits Black opportunities as starkly. Other plans extend effectiveness to more districts. SC-NAACP1 and SC-NAACP2 are reliably effective in both CD 1 and CD 6, while Harpootlian, for instance, would keep CD 1 within reach.

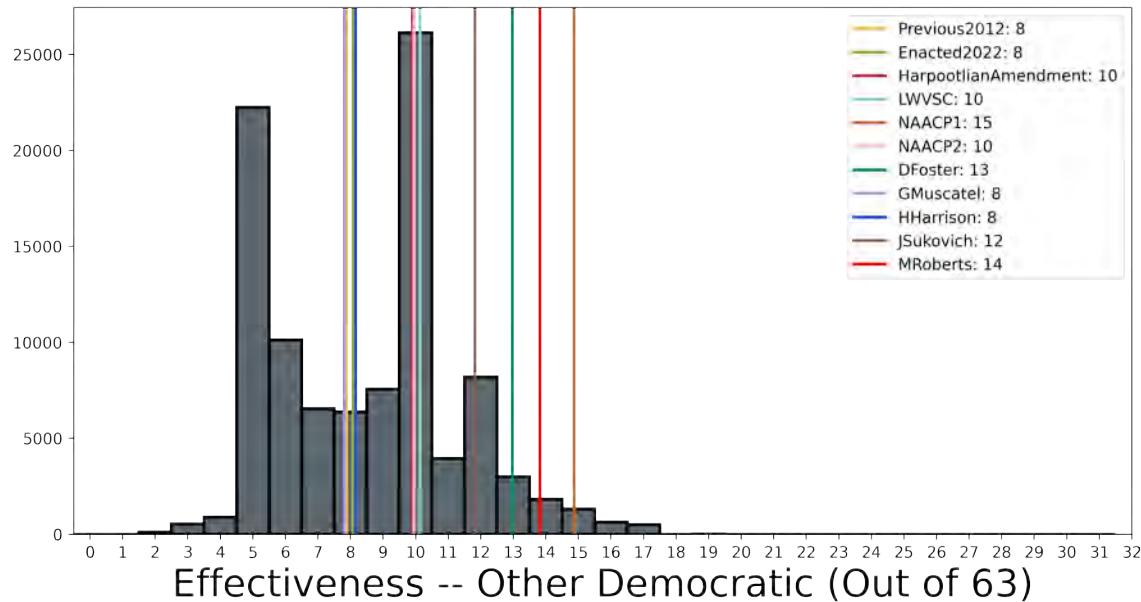
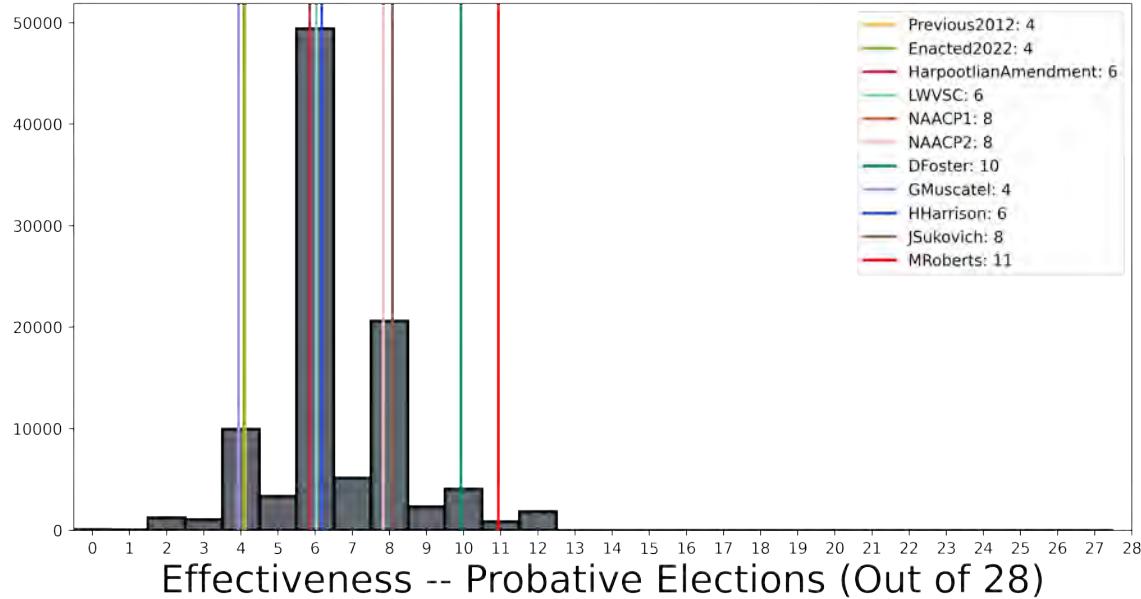


Figure 12: The comparison to 100,000 neutral plans shows that maps with such low levels of opportunity for Black voters are rarely found by chance (top), while the generic Democratic performance is much more typical (bottom). In particular, Previous2012 and Enacted2022 are both in the 12.4th percentile of effectiveness when it comes to the four probative elections for Black voters, but are right near the middle of the distribution (46.9th percentile) in the other seven contests evaluated here.

We can make use of the neutral ensembles presented earlier to consider whether it is possible that such concentration of Black opportunity is merely a function of political geography. We find that it is not. Only 12.4% of maps drawn in a race-neutral fashion (top of Figure 12) have as low an effectiveness score as the state's plan when considering the probative elections. By far the most common outcome for these blindly drawn maps is 6 wins for the Black candidate of choice, with another significant spike at 8. This shows that many alternatives that were available to the legislature—from the SC-NAACP options to the LWV map to the compromise plan represented by the Harpoortlian amendment—will tend to allow Black voters an opportunity to elect candidates of choice at a level in keeping with the human and political geography of the state. The state's maps from ten years ago and again from this year are the ones that are demonstrably dilutive, and as we've seen, they submerge traditional principles in order to secure this outcome.

This finding is even much strengthened by considering the wider dataset of all recent statewide general elections (bottom of Figure 12). This time, seven more general elections are evaluated: Attorney General 2018, Governor 2014, Governor 2018, Lt. Governor 2014, President 2016, Secretary of State 2014, Superintendent of Education 2014, U.S. Senator 2014, and U.S. Senator 2016. If we compare the four that are considered probative for Black electoral opportunity against the nine that are not designated in this way, the picture becomes extremely clear.

The state's plans Previous2012 and Enacted2022 are not outliers in their performance in generic partisan races, where they sit very near the middle of the pack; rather, they only stand out in the races with a Black candidate on the ballot, where the preferences of Black voters most diverge from those of White voters. Thus, it is not plausible that the concentration of Black voters in the state's plan was merely a side effect of partisan concerns. The state's plan is quite ordinary (46.9th percentile) in its effectiveness for the generic Democratic voter, but only shows up as unusually ineffective (dropping to the 12.4th percentile) when the races most probative for Black voters are separately considered.

## 8 Conclusion

By comparing various plans for South Carolina Congressional districting, I find that the state's plan Enacted2022 expressly contravenes the legislature's own Guidelines, which clearly state that "Any proposed redistricting plan that is demonstrated to have the intent or effect of dispersing or concentrating minority population in a manner that prevents minorities from electing their candidates of choice will neither be accepted nor approved." Considering this strong guidance, and the increased Black population in the Columbia and Charleston areas (see Figure 2), we would expect increased electoral opportunities for Black voters to be reflected in the Congressional plan. By each kind of analysis provided above, we see that this is not the case; instead, Black population is cracked across Congressional districts 1, 2, and 5 in a way that demonstrably diminishes Black voters' ability to elect candidates of choice.

The state's plan draws its boundaries with a series of steps that (a) sacrifice traditional districting principles, and (b) harm Black voters by clear dilution of their voting power. These are shown in Section 4.5 and Sections 6-7 respectively. And I do not find these harms to be incidental. Each time I examined a decision with both racial and partisan elements in the design of the state's plan, I found that racial factors predominated over not only traditional principles, but even over partisan ones.

In this report, I have identified indicators of dilution of the Black vote both by showing the comparison to neutral plans and, crucially, by comparison to other plans that were available to the legislature at the time of plan adoption. The alternative provided in the Harpoortlian Amendment, particularly, is far more respectful of communities of interest and goes a long way to remediate the vote dilution of the state's plan. The presence of that option—and the state's selection, instead, of a plan with less Black electoral opportunity and generally inferior metrics across the traditional principles—is strong evidence of dilutive intent.

## References

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- [10] South Carolina Senate Judiciary Committee Redistricting Subcommittee, *Meeting Information*. [redistricting.scSenate.gov/meetinginfo](http://redistricting.scSenate.gov/meetinginfo)

## A Generation of ensembles of districting plans

Ensembles of alternative districting plans were made with the open-source Python package *GerryChain*, which has been publicly available since 2018 [4].

The basic step begins with a graph representing the geographical units of South Carolina, then fuses two districts chosen at random. We draw a random tree (graph with no cycles) that spans the double-district; next, the tree is cut at an edge that creates two complementary balanced pieces, which become the new districts replacing the ones that were fused. The district generation process enforces that every district has population within 1% of ideal district size; if the tree has no cut edge leaving sufficiently balanced pieces, then a new tree is drawn. Contiguity is required throughout, as a consequence of the fact that deleting an edge from a tree always leaves two connected components. Compactness is highly favored throughout this process, because compact districts have far more spanning trees [2].

To choose the random tree, a method called *minimum spanning trees* is employed, using weights that encourage county and subdivision integrity. Within-county edges are given a random weight in  $[0, 1]$  while those between counties or county subdivisions receive a weight with a +1 "surcharge." This surcharge is additive, so an edge between different counties and between different divisions have a +2, effectively drawing from  $[2, 3]$ . I also ran a variant that added a "surcharge" for splitting certain COIs frequently mentioned in the public hearing testimony, as shown below in Figure 13. Supporting selections from the COI testimony have been included in the supplementary sections below.

The random tree is chosen by drawing weights from these intervals and then finding the (typically unique) spanning tree of minimum weight. In addition, when that tree is cut to separate new districts, the algorithm first seeks for a between-county edge as the cut, if it is possible within balance constraints. This promotes the selection of spanning trees that restrict to counties and municipalities in a single connected piece, which will tend to keep counties and municipalities un-split in the districts.

Convergence diagnostics for this kind of process are performed by varying the starting point and the random number seed, as well as by comparing outputs after 10,000 steps to those after 100,000; comparing outputs with and without filters like county/subdivision/COI preservation; and comparing runs with population deviation thresholded at 1% to alternative runs with 2% or 0.5% leeway. Together, these provided me with high confidence that 100,000 steps is enough in this particular districting setting (Congressional districts in South Carolina) to produce stable and reliable statistics. The recombination procedure targets the *spanning tree distribution* on plans. For more information on recombination and convergence heuristics, see especially [2].

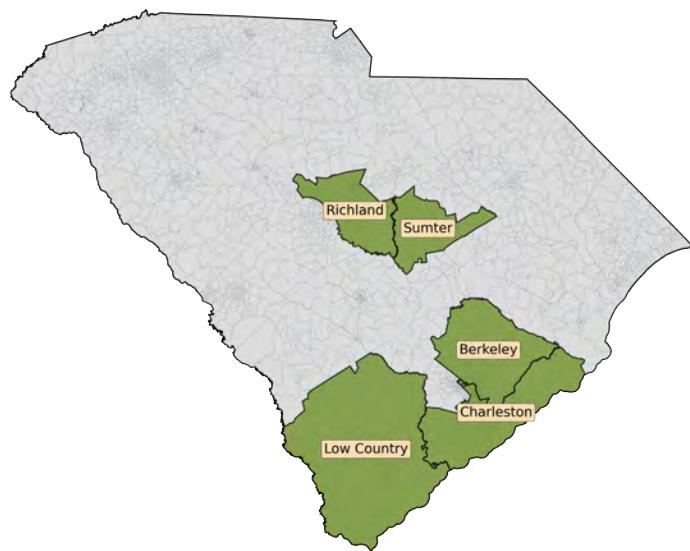


Figure 13: A selection of COIs identified in public testimony. For this report, ensembles were generated both *with* and *without* an emphasis on maintaining these COIs whole. The differences in BVAP and other measurable properties were minimal.

## B Selections from public testimony

Below, I have included selections from the public testimony conducted by the South Carolina legislature and available in full at [7] [10]. The Senate public hearings took place July 27-August 12, 2021. The House public hearings were held from September 8-October 4, 2021.

I have organized these by their relevance to the features of CD 1, CD 2, and CD 5 discussed above in Section [5]. I have included the speakers' stated affiliations where available.

### Jasper County split

**Mary Ann Bromley.** "The economic importance of the Jasper Port Project is an excellent example of a shared community of interest for residents of both counties in that area."

### Dorchester County split illogically

**Tim Lewis, Chair of Dorchester County Democratic Party.** "So I'd like to look at Dorchester County specifically, because that is our community of interest... Dorchester County I like to call a donor county... We share five senate representatives. And if you look at that map right there, actually, one of those – two of those areas, just little slivers. So what happens is that we donate our voters to other senate districts so they can get their votes. Well, the challenge with that, of course, is that those small slivers do not really truly have true representation. Those senators and so forth live in other districts. They truly are not represented by those folks... But, I mean, we have two senators that represent us well and I think have the interest of the county and our uniqueness of our county, the uniqueness of Summerville, the uniqueness of St. George in their mind, Senator Stephens and Senator Bennett. Those other areas are donors."

### Coastal and Lowcountry COIs disregarded.

**Blaine Lotz.** "In some ways, the formation of today's First Congressional District was a step in the right direction; that is, having Lowcountry counties, such as Charleston and Beaufort, in single district. Unfortunately, your predecessor republicans played politics by carving out the northwestern quadrant of Beaufort County, largely rural, largely African-American, and largely democratic, and moved it into the single majority/minority congressional district, the Sixth, Jim Clyburn's district. The goal was to [dilute] Beaufort County in the First Congressional District keeping it in republican control. The same thing was done in other First District counties, keeping million-dollar beach homes on the coast in the district, but moving their inland working-class neighbors into the Sixth District."

**Scott Anderson, Beaufort Federation of Republican Men.** "We also currently have representatives that both understand and act on the values that make the Lowcountry special... Our growth, tourism, coastal – the coastal environment, just to name a few. Just as those in the midlands and the upstate have unique needs, I implore the committee to maintain districts that are representative of our diverse state."

**Mayor Bill T. Young, Jr. Mayor of Walterboro.** "Colleton County is very divided. We have four senators and four representatives, and none of these elected officials are dependent on Colleton County for their elections, so they do what elected officials do, they pay attention to the areas that elect them. We believe that it's Colleton's turn to have a larger portion of its districts, and I would ask you, on behalf of the people of Walterboro and Colleton County, that you keep Colleton County together as much as possible as a community of interest."

**Mayor Steve Murray, Mayor of Beaufort.** "I see Beaufort County as a community of interest in terms of our educational challenges, our infrastructure challenges, social and cultural, our historic assets and how we're trying to link those together... [W]hen you look at our challenges around beach erosion, around offshore testing and seismic drilling – seismic testing off of drilling, nesting shorebirds and conservation issues, again, infrastructure around bridges, it is a community of interest as well. So I hope as you're considering drawing those maps, that you would think about Beaufort County as a community of interest and you would think about that coastal district – continue to think about that as a community of interest."

**Mayor Tim Goodwin, Mayor of Folly Beach.** "South Carolina's beach communities are relatively few in number and small in population, yet we all face unique challenges that is applicable only to beach communities, and they can be quite large."

**Council Member Dickie Schweers, Charleston County Council.** "What I would like to do is specifically address communities of interest, but specifically coastal communities of interest. ... And what I would ask you is to please continue allowing those districts to properly represent those coastal communities. The commonalities I see, because they're coastal districts, include tourism; housing, and especially housing cost; outdoor recreation; port and shipping activity; boating; hunting; fisheries."

**Jerry Ashmore, Port Royal Town Council.** "We're a community of interest along the coast. We need to keep coastal communities in a district that share natural resources, beaches, estuaries, and tourism. We're in this together and we all share similar concerns all for the good of the Lowcountry."

**Mayor Jane Darby, Mayor of Edisto Beach.** "I want to address a little bit further, the community of interest. We know our community has an odd shape... So what I would like to bring is a few more things in the community of interests for our district. The most important factor to consider, and is vastly more important for the welfare of us, is that we all share the same problems, and it's all related [to] a maritime environment."

**Jodie Strutek.** "Here in Beaufort County, we are at a disadvantage because legislators have used our voters as a political football in the drawing of congressional districts and senate districts. It prevents us from being adequately heard by our representation. We've heard the testimony of my peers tonight. Our communities, specifically subcommunities of color, are split into different districts despite being a part of Beaufort County."

**Mayra Rivera-Vazquez, Chair of the Beaufort County Democratic Party.** "The Latino community is one of the fastest growing communities in America this decade, and Beaufort County is not an exception. Beaufort County is one of the top five counties with the highest Latino population in the state, with 11.1 percent. Three cities in the county have the largest Latino population in South Carolina, Bluffto with 16.84 percent, Port Royal with 12.55 percent, and Hilton Head with 11.81 percent. The Lowcountry 1st Congressional District has the largest number of Latino voters in South Carolina with 4 percent. As the Senate Subcommittee on Redistricting examines communities of interest as essential criteria to preserving and enhancing the political strength of those communities, the expansion of the Latino population in Beaufort County must be addressed... As South Carolina, we draw lines for electoral district this year. The Latino community in Beaufort County, as a community of interest, cannot afford to sit on the sidelines."

**Council Member Steve Murdaugh, Colleton County County Council.** "I am here speaking on behalf of the citizens of Colleton County... Well, if you want to talk about communities of interest, you already have communities of interest. You have councils of government. We have Lowcountry councils of government. Look at your counties that are there. We're members of the Southern Carolina Economic Development Lines. Look at the counties that are there. We don't have any community ventures with Dorchester or that district. I think that would be a starting point to try to get more of Colleton into a – some of these other districts."

**Christine DeVries.** "But I actually wanted to speak directly to the issues with Beaufort County. We've had several people before, spoke very well to how we're a vibrant place and full of active citizens and that we all believe that Beaufort County should be a community of interest, and I certainly concur with that. I think it's critical that in our redistricting process, that Beaufort County is preserved and enhanced and ensure we do have strong representation, in both the US Congress and the South Carolina Legislature, and that our representation is not diluted by unnecessarily dividing parts of the county between legislative districts."

**Queen Quet (Marquette L. Goodwine).** "I am very pleased to have this opportunity to speak on behalf of the Gullah/Geechees that reside on the Sea Islands, in particular as a community of interest. I'm a native of St. Helena Island, also with family roots on Polawana Island and Datha Island; and that's here in Beaufort County, South Carolina. But we also have a kinship with Edisto Island... And it's important for us who are natives here to sustain this very environment, because we are inextricably tied to it. I always tell everyone that the land is our family and the waterways are our bloodline. So we're working on a resiliency project with the EPA for St. Helena Island. And we'd love to see that duplicated throughout these sea islands because of sea level rise; we have intense heat; and, of course, as already mentioned, we're in a hurricane zone as it is. So we need to sustain this coastline, and we thank you-all for doing the work that you're doing as coastal representatives that are there, because I see one of my good buddies there that helped stop the offshore drilling. And I want you-all to make sure that you drill down on these communities of interest and don't leave (speaking Gullah) out there, because we be Gullah/Geechee anointed people and we're so glad if I have a chance to be a part of the process and make sure that you're aware of us and that our cultural community is sustained environmentally and culturally."

**Mark Hartley.** "I represent the 1st District on the board, and the 1st District is – congressional district is largely coastal. It runs along South Carolina coast from Calibogue Sounds in Jasper County through the coastal portions of Beaufort, Colleton, and Charleston Counties up to the Santee River. As the 1st Congressional District Representative on DNR board, I can attest to the 1st Congressional District is a community of interest. The district's geography and coastal natural resources are unique and some of the most magnificent in the – in the nation... Their community interest arise from their unique geographic and coastal natural resources. They border the Atlantic Ocean with a chain of barrier isles. They have extensive saltwater river – river-run estuaries extending far inland. Virtually all coastal tidelands of South Carolina, which are extremely important for water fowl and other endangered species, are in these two senate districts. They have over 70 miles of protected coastline and over a half million protected acres in the ACE Basin, Cape Romain Wildlife Refuge, Santee Delta, and Winyah Bay."

**Meade Dillon.** "I am blessed by God to live in what I call the Lowcountry. Yes, I am in Mt. Pleasant; but I can be at the beach in about 15 or 20 minutes, I can be downtown in historic Charleston in about 15 or 20 minutes, or I can be heading up to Moncks Corner or Lake Marion to visit friends on the lake up there, all in a relatively short period of time. And so many of the previous speakers have focused on, oh, Mt. Pleasant, it's a community. Well, guess what? It is not a bubble and I don't stay in it and I think most of those others speakers don't stay in

Mt. Pleasant as well. And so my point is very simple. Senators who have a little piece of Mt. Pleasant and a little piece of the barrier islands and a little piece of the inland, they're going to reflect my community and my interests because they're going to get the whole picture. We have a great variety here in Charleston and in Berkeley and Dorchester County, and so having representatives which have a little piece of all those will help make sure that they really understand the value of living here in the Lowcountry."

**William Walker.** "What I'm very worried about is a major part of our life blood here in South Carolina and the Lowcountry is the Gullah-Geechee community, and we must be sure that we take care of those communities and that we make sure that the candidates have a shot at nominating and voting for candidates that are going to support interest of the Gullah-Geechee community as well as the African-American community."

**Timothy Wyld.** "I live in Sun City, which should be in the dictionary as the definition of a community of interest. Unfortunately, I live on the north side of Sun City, and even the map that your wonderful cartographer has drawn over there does not recognize our little section of Sun City that is in James Clyburn's district. We are not contiguous with any county other than Beaufort. We are totally surrounded by Beaufort County. We can't have conversations with our neighbors, our friends, our gym partners, our tennis partners, our golf partners because they all vote in CD1 and we're stuck voting in CD6. It makes absolutely no sense. You can go by any of the criteria you're using, we're a community of interest. We have been set apart because Pulte annexed us to the City of Hardeeville to get lower development costs, and we got stuck in Jasper County as a result. I'm begging you to fix this oversight. It just doesn't make sense."

**Representative Jermaine Johnson.** "It absolutely makes no sense whatsoever that, you know, we have somebody representing up here that's, you know, down in Charleston or somebody that's in Charleston is representing somebody in Columbia or somebody way down in Edgefield and Aiken and you've got to come down here. This makes no sense."

**Michael Sawiki.** "I would like to speak to the Committee about the natural geography sometimes connected by water, sometimes connected by land that we along the shore of South Carolina Coast. There is no question that this is one of the most beautiful and pristine environments in the nation. It is a special place because of the many rivers that flow through the marshlands into the sea. These rivers and marshes are alive with hundreds of varieties of fish, shellfish, shrimp, animals and birds of all kind. Many of the creatures that live in the deeper oceans began their lives in the South Carolina marshes and rivers. Some of [] us who live in this beautiful part of the state were fortunate enough to be born here. And many of us came here because of the natural beauty. I think that I speak for most of us who know the importance of protecting the preserve – and preserving what we have here... because elected officials who live and work along the Coast share a common love and understanding for the area and those of us who live here, we would like to see the Low Country be treated as a community of interest when the redistricting takes place."

**Willie Terrell, Young Republicans of Beaufort County.** "But in a way, I feel like I represent many young people throughout the Low Country. Because up and down the South Carolina coast, our needs, our wants, our aspirations are much of the same. Many of us, like myself, were born and raised in the Low Country. We love it. We like to make it our home and raise our family here. In order to do so we need two things: One, quality education, and, two, opportunities."

**Council Member Logan Cunningham, Beaufort County Council and Vice President of the Republican Club.** "But I will tell you that the representatives that we've had for this time, or our new representatives, the policies that are put in place here for Beaufort County and the Low Country have made it a desirable and successful place for people to continue to come to... It's about the fact that the values and the conservative policies that we've had here in the Low Country, that have made it successful... We stand here in Beaufort County with our Low Country values. And we're prepared to continue to defend them, because they have been successful here and in the state."

### **Charleston County split erratically**

**A.J. Davis.** "I live in the southern end of North Charleston right outside of the old Naval base. I consider my community of interest not only that geographic area, but the marginalized African-American populations, both native and adopted, or in local terms, the benyas and the comeyas. I've called Charleston home for the last 20 years... I live in the Chicora Community but share a kindred spirit with most of the southern end of North Charleston south of Park Circle. Like many of the folks who have come before me, I express concern that this process will afford marginalized communities such as mine legitimate, effective political representation. As Ms. Singleton so eloquently put it, it's about more than votes, but the impact to human lives. Due to population changes, communities like mine were havens for members of the African-American populations that have been displaced due to [gentrification], specifically from areas like downtown and West Ashley."

**Kelly Gorby.** "I'm glad the one gentleman bought up the maps of Charleston County, because as far as the U.S. Congressional District is concerned, that shape is crazy. Charleston County deserved to be in one U.S. Congressional District. North Charleston problems, North Charleston interests should be considered with the rest of Charleston County and not with Columbia. That's where our airport is. That's where our tourists are coming into town. They're sleeping in those hotels. They're shopping at Tanger Outlets. There's really no reason that they shouldn't be considered in our same U.S. Congressional District. So I would also advocate for that."

**Emily Mayer.** "First, I would like to start with our congressional district lines. Beaufort County is currently split among two different congressional districts... As the population of Beaufort County is well within the limits of what a congressional district can hold, I implore you to find out why this section of Beaufort County has been cut out of being represented by the same congressperson as the rest of their county members, as we are a part of the same community with interests regarding our public educational system. Additionally, Congressional District 1 extends up the shores through Charleston County. But, as you can see on the map, it cuts out North Charleston and then goes in again to Berkeley County. Again, noting that that North Charleston demographic is overwhelming[ly] less white compared to the areas of Charleston and Berkeley Counties that are included in Congressional District 1 all the way to Monks Corner, all the way up in that Berkeley County area, which is 68 percent white. I ask again why this cutout is necessary? If we're talking about continual lines, the shapes of our district, why not make it more continuous to allow communities of the same counties to stay together? These lines don't feel as if they meet the requirements needed... I add to the sentiments that were made earlier that Beaufort County is a community of interest within itself."

**Brady Quirk-Garvan.** "Charleston and the broader tri-county have seen tremendous growth in the last decade and, despite the global pandemic, it shows no signs of slowing down... Keeping neighborhoods [and] geographic zones together are important not only because it

allows constituents to know their representatives, but because it allows for greater economic progress. When Senators and House members draw elongated districts and stretch districts across rivers, oceans, and county lines, it creates problems when it comes to advocacy for district. It is difficult to be the best advocate for your constituents when a district involves multiple counties and widely different geographic areas. The needs of a dense suburb like Mt. Pleasant and Charleston County are very different from rural Berkeley County, and sometimes their needs are antithetical to one another; and yet we have districts where senators are asked to provide the same level of advocacy to both, and that just doesn't happen. Another example of this is my congressional district, District 6, which runs from here in North Charleston up to Columbia. And I can assure you, living here, that North Charleston is much more intertwined with Charleston and the Lowcountry than it is with the Midlands."

**David Quick.** "So the slicing and dicing, it ultimately comes down to this gerrymandering stuff... We need our – our congressional district not to stretch all the way down. We've got three hubs on the coast and, let's face it, the coast is one of our big drivers of South Carolina's economy. You've got – you've got the Grand Strand, you've got Charleston, and you've got Hilton Head and Beaufort. These are very distinct hubs. Let's try to think along those hub lines, you know, and those natural boundaries. And, really, let's make – let's make these lines make sense and not confuse voters anymore... And just like so many people said, people in North Charleston have more in common with people in Charleston than they do in Columbia."

**Zachary Kronsberg.** "I agree with what Mr. Quirk-Garvan said earlier about North Charleston and, frankly, half of downtown having more in common with the rest of Charleston County than they do with Columbia. So I think that it would make sense for them to be in the U.S. Congressional 1st District instead of the 6th District."

**Shayna Howell.** "I urge you to consider [Charleston] county a community of interest and not split it so many ways...While I appreciate the idea of the coast as a group of residents with shared interests, I believe we would be better served by districts that don't split so many county lines – residents of these coastal counties typically all care about our coastal resources – so their voice will not be diluted."

**Emmett Robert Murray Jr.** "Where did the input for this ridiculous change come from? Was a blindfold and dart board involved? I have read a [] good deal about gerrymandering, but this is my first time at seeing it up close and personal. I'm sure that this map that I am looking at showing this oddball projection protruding into district 1 must be a misdirected key punch. It is beyond belief that state bean counters have decided that the interest of the West Ashley residents of Charleston Co. and the people of the rural counties of Clarendon, Orangeburg and Darlington are anywhere close to similar. This political anomaly needs to be corrected before it is set in stone."

**Lynn Schuler Teague, League of Women Voters South Carolina.** "The League plan accurately reflects the diverse population is what is increasingly a network of closely tied satellite communities around a center in urban Charleston. The League proposal shows that much of this important community of interest could easily be kept together in CD 1. The Senate's [draft] map, on the other hand, produces what in our measure is a 14-percentage point partisan gap by slicing and dicing this clear community of interest in unreasonable ways. Charleston itself is split. Adjacent North Charleston would continue to be put into a district with Columbia, more than a hundred miles away, although it is very much a part of the social and economic networks associated with Charleston. James Island and Johns Island would be split. What would the people of South Carolina sacrifice so that the General Assembly can achieve this gerrymander?"

**Gloria Aslanidis.** "My home is in the City of Charleston and the County of Charleston.... I'm sure Dorchester County is a lovely place to live, but I see no community of interest."

## **Orangeburg separated from CD 2**

**Chester Palmer.** "[Orangeburg County has] much more in common with Columbia and Richland and Lexington than we do with Charleston. And that's something that you need to consider when you redraw the district lines."

**Larry Wagner.** "Now, what do those folks down in the tail of Georgia have to do – a commonality with Orangeburg-Calhoun County where we live in St. Matthews?"

**State Representative Jerry Govan.** "The redistricting process should incorporate more of the City of Orangeburg and more of the nearby suburbs, considering the history of this district... The City of Orangeburg and surrounding areas in Central Orangeburg County should continue to have a voice in their respective areas."

## **Hook around Columbia**

**William Maxie.** "And so when you go to redistrict this time – and there's been a lot of growth in South Carolina, and y'all have to make a lot of changes – I would urge you to make sure that these districts are fair, obviously, and equitable, but make sure that they make sense geometrically... I mean, you know, the 2nd District is a good example where Representative Wilson is. I mean, it reaches around the City of Columbia, and to what end is that? I mean, do people in downtown Columbia not have that much in common with people from Forest Acres or people right across the river? No, they do. That's where a lot of those people live and a lot of those people work, so, you know, the shape of these districts is important, and y'all really need to make sure that towns and counties stay whole to make sure that our communities of interest are represented. That's not just a legal term. That's just the people that we live with and work with, that we worship with and that we spend all of our time with."

## **Splitting in and around Columbia**

**Jonneika Farr, Co-chair of Columbia Branch of NAACP Political Action Committee and Chair Richland County Democratic Women's Council.** "I live in the Northeast Columbia area...I would like for the redistricting committee to ensure that redistricting is not done in such a way that arbitrary lines are drawn splitting neighborhoods"

**Lynn Schuler Teague.** "CD 2 should not have a finger projecting through Columbia. In Richland County, the effort to get CD 2 to Fort Jackson drives CD 2 through the Black communities of northwest Richland, separating them from neighboring communities to allow the incumbent to "keep" Fort Jackson within "his" district. Why must a legislator have a specific base within his district to protect it in deliberations of the House Armed Services Committee? Also, how does an incumbent's interest constitute a community of interest-especially where it requires violating a clear and very real community of interest of minority voters?"

## **Sumter COI is not respected**

**Archie Parnell.** "And here we are in Sumter and Sumter is split down the middle. The historic district where I live, three blocks down is a different congressional district. Two blocks up is a different congressional district... And I think there is a community of interest here in

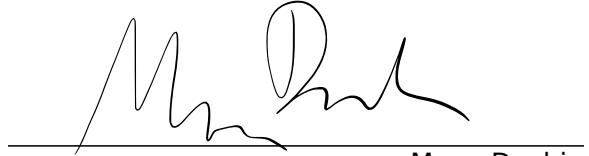
Sumter and I would urge you to continue with your criteria that you've adopted 10 years ago and, hopefully, keep counties together. Now, I realize that these various criteria are not all in one direction. Sometimes they conflict with each other and so you cannot just always have a win/win on everything. But I would urge you that the lines that are drawn in Sumter be redrawn in order to make it more of a unit, more of a community of interest."

**John Reilly.** "I'm not in a big populated area, but everything else I do is in Sumter. And everything that people in my neighborhood do is in Sumter. We're attached to Shaw, so that's kind of how we – everything is Sumter oriented, but our representation, if I have anything to say to anybody, is in Richland. Which really doesn't make any sense for us."

**Anthony Nysor.** "So like I was saying, I've only been a resident of South Carolina, namely Sumter, for a couple of years. The first two years I lived in town was normal. And then when I bought a home at the beginning of this year, I'm wanting to say it's about a three mile difference between the old home and the new home, but I have a completely different representation at all levels. And that's something that was really concerning to me because I still shop at the same Piggly Wiggly. Everyone is Sumter still goes to the same one Starbucks. We all have very, very aligned interests, lifestyles. There's some obvious socioeconomic differences in town, but it's still one town, one community."

I reserve the right to continue to supplement my report in light of additional facts, testimony and/or materials that may come to light. Pursuant to 28 U.S.C. 1746, I declare under penalty of perjury of the laws of the United States that the foregoing is true and correct according to the best of my knowledge, information, and belief.

Executed this 11th day of April, 2022.



Moon Duchin

A handwritten signature in black ink, appearing to read "MD". It is written in a cursive style with a prominent initial 'M' and a circular 'D'.

# Moon Duchin

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 Mathematics · STS · Tisch College of Civic Life | Tufts University

## Education

<b>University of Chicago</b>	MS 1999, PhD 2005
Mathematics	
Advisor: Alex Eskin	Dissertation: <i>Geodesics track random walks in Teichmüller space</i>
<b>Harvard University</b>	BA 1998
Mathematics and Women's Studies	

## Appointments

<b>Tufts University</b>	
Professor of Mathematics	2021–
Assistant Professor, Associate Professor	2011–2021
<i>Principal Investigator</i>   MGGG Redistricting Lab	2017–
<i>Senior Fellow</i>   Jonathan M. Tisch College of Civic Life	2017–
<i>Director</i>   Program in Science, Technology, & Society	2015–2021
<b>University of Michigan</b>	
Assistant Professor (postdoctoral)	2008–2011
<b>University of California, Davis</b>	
NSF VIGRE Postdoctoral Fellow	2005–2008

## Research Interests

Data science for civil rights, computation and governance, elections, geometry and redistricting.  
 Science, technology, and society, science policy, census data, technology and law, algorithmic fairness.  
 Random walks and Markov chains, random groups, random constructions in geometry.  
 Large-scale geometry, metric geometry, isoperimetric inequalities.  
 Geometric group theory, growth of groups, nilpotent groups, dynamics of group actions.  
 Geometric topology, hyperbolicity, Teichmüller theory.

## Selected Awards & Distinctions

<b>Research Professor</b> - MSRI Program in Analysis and Geometry of Random Spaces	Spring 2022
<b>Guggenheim Fellow</b>	2018
<b>Radcliffe Fellow</b> - Evelyn Green Davis Fellowship	2018–2019
<b>Fellow of the American Mathematical Society</b>	elected 2017
<b>NSF C-ACCEL</b> (PI) - Harnessing the Data Revolution: Network science of Census data	2019–2020
<b>NSF grants</b> (PI) - CAREER grant and three standard Topology grants	2009–2022
<b>Professor of the Year</b> , Tufts Math Society	2012–2013
<b>AAUW Dissertation Fellowship</b>	2004–2005
<b>NSF Graduate Fellowship</b>	1998–2002
<b>Lawrence and Josephine Graves Prize for Excellence in Teaching</b> (U Chicago)	2002
<b>Robert Fletcher Rogers Prize</b> (Harvard Mathematics)	1995–1996

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Applied and Interdisciplinary Publications & Preprints

***Political Geometry: Rethinking Redistricting in the U.S. with Math, Law, and Everything In Between***

25 chapters, 475 pages. Preprint online. Birkhäuser Books, to appear 2022. (eds. Moon Duchin, Olivia Walch) see: Introduction, Compactness, Communities of Interest, Clustering, Random Walks, Ranked Choice Voting.

***Private numbers in public policy: Census, differential privacy, and redistricting***

Harvard Data Science Review, to appear 2022. (with Aloni Cohen, JN Matthews, and Bhushan Suwal)

***The (homological) persistence of gerrymandering***

Foundations of Data Science, to appear 2022. Online first. (with Thomas Needham and Thomas Weighill)

***Implementing partisan symmetry: Problems and paradoxes***

Political Analysis, to appear 2022. arXiv:2008:06930  
(with Daryl DeFord, Natasha Dhamankar, Mackenzie McPike, Gabe Schoenbach, and Ki-Wan Sim)

***Measuring segregation via analysis on graphs***

Preprint. arXiv:2212.10708 (with James Murphy and Thomas Weighill)

***A reversible recombination chain for graph partitions***

Preprint. (with Sarah Cannon, Dana Randall, and Parker Rule)

***Ranked choice voting and minority representation***

Preprint. Online. (with Gerdus Benade, Ruth Buck, Dara Gold, and Thomas Weighill)

***Clustering propensity: A mathematical framework for measuring segregation***

Preprint. (with Emilia Alvarez, Everett Meike, and Marshall Mueller; appendix by Tyler Piazza)

***Discrete geometry for electoral geography***

Preprint. (with Bridget Eileen Tenner) arXiv:1808.05860

***Recombination: A family of Markov chains for redistricting***

Harvard Data Science Review. Issue 3.1, Winter 2021. Online. (with Daryl DeFord and Justin Solomon)

***Census TopDown: The impact of differential privacy on redistricting***

2nd Symposium on Foundations of Responsible Computing (FORC 2021), 5:1–5:22. Available online.  
(with Aloni Cohen, JN Matthews, and Bhushan Suwal)

***Models, Race, and the Law***

Yale Law Journal Forum, Vol. 130 (March 2021). Available online. (with Doug Spencer)

***Computational Redistricting and the Voting Rights Act***

Election Law Journal, Volume 20, Number 4 (2021), 407–441. Available online.  
(with Amariah Becker, Dara Gold, and Sam Hirsch)

***Mathematics of nested districts: The case of Alaska***

Statistics and Public Policy. Vol 7, No 1 (2020), 39–51. (w/ Sophia Caldera, Daryl DeFord, Sam Gutekunst, & Cara Nix)

***A computational approach to measuring vote elasticity and competitiveness***

Statistics and Public Policy. Vol 7, No 1 (2020), 69–86. (with Daryl DeFord and Justin Solomon)

***Locating the representational baseline: Republicans in Massachusetts***

Election Law Journal, Volume 18, Number 4, 2019, 388–401.  
(with Taissa Gladkova, Eugene Henninger-Voss, Ben Klingensmith, Heather Newman, and Hannah Wheelen)

***Redistricting reform in Virginia: Districting criteria in context***

Virginia Policy Review, Volume XII, Issue II, Spring 2019, 120–146. (with Daryl DeFord)

***Geometry v. Gerrymandering***

*The Best Writing on Mathematics 2019*, ed. Mircea Pitici. Princeton University Press.  
reprinted from Scientific American, November 2018, 48–53.

***Gerrymandering metrics: How to measure? What's the baseline?***

Bulletin of the American Academy for Arts and Sciences, Vol. LXII, No. 2 (Winter 2018), 54–58.

***Rebooting the mathematics of gerrymandering: How can geometry track with our political values?***

The Conversation (online magazine), October 2017. (with Peter Levine)

***A formula goes to court: Partisan gerrymandering and the efficiency gap***Notices of the American Mathematical Society **64** No. 9 (2017), 1020–1024. (with Mira Bernstein)***International mobility and U.S. mathematics***Notices of the American Mathematical Society **64**, No. 7 (2017), 682–683.

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Pure Mathematics Publications & Preprints***Conjugation curvature for Cayley graphs***

Journal of Topology and Analysis, to appear 2022. Online first. (with Assaf Bar-Natan and Robert Kropholler)

***You can hear the shape of a billiard table: Symbolic dynamics and rigidity for flat surfaces***Commentarii Mathematici Helvetici, Vol 96, Issue 3 (2021), 421–463. Available online.  
(with Viveka Erlandsson, Christopher Leininger, and Chandrika Sadanand)***Stars at infinity in Teichmüller space***

Geometriae Dedicata, Volume 213, 531–545 (2021). (with Nate Fisher) arXiv:2004.04321

***The Heisenberg group is pan-rational***Advances in Mathematics **346** (2019), 219–263. (with Michael Shapiro)***Random nilpotent groups I***International Mathematics Research Notices, Vol. 2018, Issue 7 (2018), 1921–1953.  
(with Matthew Cordes, Yen Duong, Meng-Che Ho, and Ayla Sánchez)***Hyperbolic groups***chapter in *Office Hours with a Geometric Group Theorist*, eds. M.Clay,D.Margalit, Princeton U Press (2017), 177–203.***Counting in groups: Fine asymptotic geometry***Notices of the American Mathematical Society **63**, No. 8 (2016), 871–874.***A sharper threshold for random groups at density one-half***Groups, Geometry, and Dynamics **10**, No. 3 (2016), 985–1005.  
(with Katarzyna Jankiewicz, Shelby Kilmer, Samuel Lelièvre, John M. Mackay, and Ayla Sánchez)***Equations in nilpotent groups***Proceedings of the American Mathematical Society **143** (2015), 4723–4731. (with Hao Liang and Michael Shapiro)***Statistical hyperbolicity in Teichmüller space***

Geometric and Functional Analysis, Volume 24, Issue 3 (2014), 748–795. (with Howard Masur and Spencer Dowdall)

***Fine asymptotic geometry of the Heisenberg group***

Indiana University Mathematics Journal 63 No. 3 (2014), 885–916. (with Christopher Mooney)

***Pushing fillings in right-angled Artin groups***

Journal of the LMS, Vol 87, Issue 3 (2013), 663–688. (with Aaron Abrams, Noel Brady, Pallavi Dani, and Robert Young)

***Spheres in the curve complex***In the Tradition of Ahlfors and Bers VI, Contemp. Math. **590** (2013), 1–8. (with Howard Masur and Spencer Dowdall)***The sprawl conjecture for convex bodies***

Experimental Mathematics, Volume 22, Issue 2 (2013), 113–122. (with Samuel Lelièvre and Christopher Mooney)

***Filling loops at infinity in the mapping class group***

Michigan Math. J., Vol 61, Issue 4 (2012), 867–874. (with Aaron Abrams, Noel Brady, Pallavi Dani, and Robert Young)

***The geometry of spheres in free abelian groups***

Geometriae Dedicata, Volume 161, Issue 1 (2012), 169–187. (with Samuel Lelièvre and Christopher Mooney)

***Statistical hyperbolicity in groups***Algebraic and Geometric Topology **12** (2012) 1–18. (with Samuel Lelièvre and Christopher Mooney)

***Length spectra and degeneration of flat metrics***

Inventiones Mathematicae, Volume 182, Issue 2 (2010), 231–277. (with Christopher Leininger and Kasra Rafi)

***Divergence of geodesics in Teichmüller space and the mapping class group***

Geometric and Functional Analysis, Volume 19, Issue 3 (2009), 722–742. (with Kasra Rafi)

***Curvature, stretchiness, and dynamics***

In the Tradition of Ahlfors and Bers IV, Contemp. Math. **432** (2007), 19–30.

***Geodesics track random walks in Teichmüller space***

PhD Dissertation, University of Chicago 2005.

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**Teaching****Courses Developed or Customized****Mathematics of Social Choice** | [sites.tufts.edu/socialchoice](http://sites.tufts.edu/socialchoice)

Voting theory, impossibility theorems, redistricting, theory of representative democracy, metrics of fairness.

*Have designed and taught variants at entry level and at math-major level.*

**History of Mathematics** | [sites.tufts.edu/histmath](http://sites.tufts.edu/histmath)

Social history of mathematics, organized around episodes from antiquity to present. Themes include materials and technologies of creation and dissemination, axioms, authority, credibility, and professionalization. In-depth treatment of mathematical content from numeration to cardinal arithmetic to Galois theory.

**Reading Lab: Mathematical Models in Social Context** | [sites.tufts.edu/models](http://sites.tufts.edu/models)

One hr/wk discussion seminar of short but close reading on topics in mathematical modeling, including history of psychometrics; algorithmic bias; philosophy of statistics; problems of model explanation and interpretation.

**Reading Lab: Classification** | [sites.tufts.edu/classification](http://sites.tufts.edu/classification)

One hr/wk discussion seminar of short but close reading on topics in classifications and taxonomies, including censuses; race and ethnicity; academic disciplines, mathematical and legal definition; chemical elements; species and model organisms; sex and gender.

**Geometric Literacy**

Module-based graduate topics course. Modules have included:  $p$ -adic numbers, hyperbolic geometry, nilpotent geometry, Lie groups, convex geometry and analysis, the complex of curves, ergodic theory, the Gauss circle problem.

**Markov Chains** (graduate topics course)**Teichmüller Theory** (graduate topics course)**Fuchsian Groups** (graduate topics course)**Continued Fractions and Geometric Coding** (undergraduate topics course)**Mathematics for Elementary School Teachers** (inquiry-based course for pre-service teachers)**Standard Courses**

Mathematical Modeling and Computation (with Python), Discrete Mathematics, Calculus I-II-III, Intro to Proofs, Linear Algebra, Complex Analysis, Differential Geometry, Abstract Algebra, Graduate Real Analysis

**Weekly Seminars Organized**

- Geometric Group Theory and Topology
- Science, Technology, and Society Lunch Seminar

## Selected Talks and Lectures

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<b>AMS Einstein Public Lecture in Mathematics</b>	October 2023
Central Sectional Meeting of the AMS, Omaha, NE	
<b>Distinguished Plenary Lecture</b>	June 2021
75th Anniversary Meeting of Canadian Mathematical Society, Ottawa, Ontario	<i>online (COVID)</i>
<b>BMC/BAMC Public Lecture</b>	April 2021
Joint British Mathematics/Applied Mathematics Colloquium, Glasgow, Scotland	<i>online (COVID)</i>
<b>Radcliffe Fellow Lecture</b>	November 2018
Radcliffe Institute for Advanced Study, Cambridge, MA	
<b>Gerald and Judith Porter Public Lecture</b>	January 2018
AMS-MAA-SIAM, Joint Mathematics Meetings, San Diego, CA	
<b>Mathematical Association of America Distinguished Lecture</b>	October 2016
MAA Carriage House, Washington, DC	
<b>American Mathematical Society Invited Address</b>	September 2016
AMS Eastern Sectional Meeting, Brunswick, ME	

## Named University Lectures

- Loeb Lectures in Mathematics   Washington University in St. Louis	April 2022
- Mathematics and Natural Sciences Divisional Lecture   Reed College	March 2022
- Parsons Lecture   UNC Asheville	October 2020
- Math, Stats, CS, and Society   Macalester College	October 2019
- MRC Public Lecture   Stanford University	May 2019
- Freedman Memorial Colloquium   Boston University	March 2019
- Julian Clancy Frazier Colloquium Lecture   U.S. Naval Academy	January 2019
- Barnett Lecture   University of Cincinnati	October 2018
- School of Science Colloquium Series   The College of New Jersey	March 2018
- Kieval Lecture   Cornell University	February 2018
- G. Milton Wing Lectures   University of Rochester	October 2017
- Norman Johnson Lecture   Wheaton College	September 2017
- Dan E. Christie Lecture   Bowdoin College	September 2017

## Math/Computer Science Department Colloquia

- Reed College	Dec 2020	- Université de Neuchâtel	Jun 2016
- Georgetown (CS)	Sept 2020	- Brandeis University	Mar 2016
- Santa Fe Institute	July 2020	- Swarthmore College	Oct 2015
- UC Berkeley	Sept 2018	- Bowling Green	May 2015
- Brandeis-Harvard-MIT-NEU	Mar 2018	- City College of New York	Feb 2015
- Northwestern University	Oct 2017	- Indiana University	Nov 2014
- University of Illinois	Sept 2017	- the Technion	Oct 2014
- University of Utah	Aug 2017	- Wisconsin-Madison	Sept 2014
- Wesleyan	Dec 2016	- Stony Brook	March 2013
- Worcester Polytechnic Inst.	Dec 2016		

## Minicourses

- Integer programming and combinatorial optimization (two talks) | Georgia Tech May 2021
- Workshop in geometric topology (main speaker, three talks) | Provo, UT June 2017
- Growth in groups (two talks) | MSRI, Berkeley, CA August 2016
- Hyperbolicity in Teichmüller space (three talks) | Université de Grenoble May 2016
- Counting and growth (four talks) | IAS Women's Program, Princeton May 2016

## Visiting Lectures

- Election Law | Yale Law School Spring 2022
- Election Law | Harvard Law School Spring 2022
- Privacy, Policy, and the U.S. Census | University of Chicago (CS) Spring 2022
- Optimized Democracy | Harvard (CS) Spring 2021

## Science, Technology, and Society

- The Mathematics of Accountability | Sawyer Seminar, Anthropology, Johns Hopkins February 2020
- STS Circle | Harvard Kennedy School of Government September 2019
- Data, Classification, and Everyday Life Symposium | Rutgers Center for Cultural Analysis January 2019
- Science Studies Colloquium | UC San Diego January 2019
- Arthur Miller Lecture on Science and Ethics | MIT Program in Science, Tech, and Society November 2018

## Data Science, Computer Science, Quantitative Social Science

- Can Algorithms Bend the Arc Towards Fairness? | Algorithmic Justice Project, UNM/SFI March 2022
- Data Linkage Seminar | Massive Data Institute, McCourt School of Public Policy August 2021
- Mechanism Design for Social Good (MD4SG) Colloquium | MD4SG Initiative November 2020
- Data Science for Social Good (DS4SG) Workshop | Georgia Tech November 2020
- Privacy Tools Project Retreat | Harvard May 2020
- Women in Data Science Conference | Microsoft Research New England March 2020
- Quantitative Research Methods Workshop | Yale Center for the Study of American Politics February 2020
- Societal Concerns in Algorithms and Data Analysis | Weizmann Institute December 2018
- Quantitative Collaborative | University of Virginia March 2018
- Quantitative Social Science | Dartmouth College September 2017
- Data for Black Lives Conference | MIT November 2017

## Political Science, Geography, Law, Democracy, Fairness

- The Long 19th Amendment: Women, Voting, and American Democracy | Radcliffe Institute Nov-Dec 2020
- "The New Math" for Civil Rights | Social Justice Speaker Series, Davidson College November 2020
- Math, Law, and Racial Fairness | Justice Speaker Series, University of South Carolina November 2020
- Voting Rights Conference | Northeastern Public Interest Law Program September 2020
- Political Analysis Workshop | Indiana University November 2019
- Program in Public Law Panel | Duke Law School October 2019
- Redistricting 2021 Seminar | University of Chicago Institute of Politics May 2019
- Geography of Redistricting Conference Keynote | Harvard Center for Geographic Analysis May 2019
- Political Analytics Conference | Harvard University November 2018
- Cyber Security, Law, and Society Alliance | Boston University September 2018
- Clough Center for the Study of Constitutional Democracy | Boston College November 2017
- Tech/Law Colloquium Series | Cornell Tech November 2017
- Constitution Day Lecture | Rockefeller Center for Public Policy, Dartmouth College September 2017

## Program Development

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**Principal Investigator** MGGG Redistricting Lab mggg.org

Multidisciplinary research lab with postdocs, research staff, and undergraduate researchers drawn from mathematics, computer science, software development, geography, policy. Hosts law student externs. Provided public mapping support for roughly 100 localities after 2020 Census data released.

Support includes NSF Convergence Accelerator, Sloan Foundation, Thornburg Foundation, Arnold Foundation.

**Co-Founder, Program Director** Science, Technology, and Society Program sts.tufts.edu

Interdisciplinary program offering a major and minor, with ~40 affiliated faculty. Runs popular weekly lunch seminar, Reading Labs on topics from Automation to Representation to Life to Energy.

**Organizer** Semester Program in *Algorithms, Fairness, and Equity*, Fall 2023

Mathematical Sciences Research Institute, Berkeley CA

Program will host ~50 research members on topics connected to mechanism design, fair partitioning, and fair ML.

**Designer** Short workshops and training programs

- GeoData Bootcamp 2020 (20 students from around the country)
- Mapping Training 2020 (30 students from around the country)
- Graphs and Networks Workshop 2020 (500 live participants)
- Data for Election Administration online 2021, in-person 2019 (dozens of administrators and scholars)

**Program builder** Research and mentorship programs

- Voting Rights Data Institute 2018, 2019

Six-week summer research programs hosting 52 and 33 undergraduate and graduate students, respectively, with dozens of visitors from math, CS, law, political science, geography, urban planning, and more.

- Polygonal Billiards Research Cluster 2017, Random Groups Research Cluster 2014

Five-week intensive summer research programs for vertically integrated groups of 12-14 undergraduate, graduate, postdoctoral, and junior faculty researchers, combining experimental and theoretical work.

- Directed Reading Program and DRP Network sites.google.com/view/drp-network/

Co-founded highly successful near-peer mentoring program in 2003 at UChicago. Now exists at >40 math departments as grad-student-run reading program with excellent outcomes for broadening participation in mathematics. Secured NSF grant to expand the program to more campuses and to fund social science research on outcomes.

## Graduate Advising in Mathematics

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Nate Fisher (PhD 2021), Sunrose Shrestha (PhD 2020), Ayla Sánchez (PhD 2017),  
Kevin Buckles (PhD 2015), Mai Mansouri (MS 2014)

Outside committee member for Chris Coscia (PhD 2020), Dartmouth College

## Postdoctoral Advising in Mathematics

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**Principal supervisor** Thomas Weighill (2019–2020)

**Co-supervisor** Daryl DeFord (MIT 2018–2020), Rob Kropholler (2017–2020), Hao Liang (2013–2016)

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## Selected Professional Service and Public-Facing Work

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**Program committees and editorial boards**

ACM Conference on Fairness, Accountability, and Computing (FAccT)	2022
Symposium on Foundations of Responsible Computing (FORC)	2021
Harvard Data Science Review	since 2019
Advances in Mathematics	since 2018

**Committee on Science Policy**

American Mathematical Society	2020–2022
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**Amicus Brief of Mathematicians, Law Professors, and Students**

<i>principal co-authors: Guy-Uriel Charles and Moon Duchin</i>	2019
Supreme Court of the United States, in <i>Rucho v. Common Cause</i> - cited in dissent	

**Expert work for redistricting litigation**

<i>reports, deposition, and/or trial testimony</i>	2018–
Pennsylvania, North Carolina, Wisconsin, South Carolina, Alabama	

**Presenter on Public Mapping, Statistical Modeling**

National Conference of State Legislatures	2019, 2020
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**Committee on The Future of Voting: Accessible, Reliable, Verifiable Technology**

National Academies of Science, Engineering, and Medicine	2017–2018
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**Committee on the Human Rights of Mathematicians**

American Mathematical Society	2016–2019
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## Selected Visiting Positions and Residential Fellowships

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<b>Research Professor</b> Analysis and Geometry of Random Spaces program Mathematical Sciences Research Institute   Berkeley, CA	Spring 2022
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<b>Visiting Professor</b> Department of Mathematics Boston College   Chestnut Hill, MA	Fall 2021
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<b>Fellow</b> Radcliffe Institute for Advanced Study Harvard University   Cambridge, MA	2018–19
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<b>Member</b> Center of Mathematical Sciences and Applications Harvard University   Cambridge, MA	2018–19
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<b>Visitor</b> Microsoft Research MSR New England   Cambridge, MA	2018–19
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<b>Research Member</b> Geometric Group Theory program Mathematical Sciences Research Institute   Berkeley, CA	Fall 2016
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<b>Research Member</b> Random Walks and Asymptotic Geometry of Groups program Institut Henri Poincaré   Paris, France	Spring 2014
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## **EXHIBIT B**

# Report on South Carolina Congressional Districts

Moon Duchin

Professor of Mathematics, Tufts University

Collaborating Faculty in Race, Colonialism, and Diaspora Studies

Senior Fellow, Tisch College of Civic Life

May 4, 2022

## 1 Assignment

I am a professor of Mathematics and a Senior Fellow in the Jonathan M. Tisch College of Civic Life at Tufts University. My previous report in this case is dated April 11, 2022, and it contains a full account of my relevant background and qualifications.

In the current report, I have been asked to provide a brief response to the Expert Report of Sean P. Trende, dated April 18, 2022.

## 2 Summary

- The state's plan is described by Mr. Trende as placing top priority on core retention, as measured by the very high percentage of the population whose district assignment in Enacted2022 is identical to their district assignment in the "benchmark" Previous2012. But South Carolina's demographics and electoral dynamics, as well as the national legal framework, have all shifted in the last ten years. Thus a map with very high core retention can be dilutive of Black voting power while its predecessor was acceptable under a different set of facts and rules. That is the case with the current South Carolina Congressional maps.
- Even if core retention is elevated to the top echelon of districting priorities, my report confirms that this does not lock in the dilutive effects found in the state's plan. The alternative plan shown in my previous report (Section 6.2, incl. Figure 11) is just one example—92% of the population is assigned to districts exactly as in Enacted2022, and indeed the alternative plan mainly differs in a single boundary between two districts, but this plan nonetheless outperforms the Enacted2022 plan in terms of the ability of Black voters to elect their candidates of choice.
- The state's plan is described by Mr. Trende as placing a high priority on "repairing" split counties and precincts. But the number of split counties is similar to that in the benchmark plan, as is the number of split precincts (though the count is described misleadingly in the Trende Report). By contrast, as detailed in the previous report and below, there was another Congressional plan proposed during the legislative process—the Harpoonian map—with substantially fewer political subdivision splits. This map is comparable or superior to the state's plan Enacted2022 in all traditional districting principles (Section 4 of previous report), and provides measurably greater minority opportunity to elect. This plan was considered and rejected by the legislature.

- Compared to the benchmark from ten years ago, the state's plan repairs splits selectively; it conspicuously fails to heal cities and other areas of particular salience for Black communities (such as the city of Sumter), as they were highlighted in the legislature's own public hearings. This is discussed in Section 5 of my previous report and is expanded on in the present report.
- The Trende Report makes no mention at all of several issues that are discussed in my previous report and are clearly salient to the evaluation of South Carolina Congressional districts.
  - Respect for the boundaries of cities and towns, not just for counties and precincts.
  - Respect for communities of interest, as described in many hours of public testimony for the South Carolina House and Senate.
  - Comparison to nine alternative plans available in the public record that collectively establish a baseline for minority opportunity-to-elect against the current demographic backdrop.
  - Evidence that the state's plan Enacted2022 is more extreme in the elections most probative for Black electoral opportunity than in the performance of generic Democratic candidates.

### **3 Core retention**

In the Trende Report, a brief history of the district shapes is presented before reporting the core retention percentages for each district in his Table 3, from the lowest value of 82.84% population retention in CD 1 to a highest value of 99.96% retention in CD 7. By contrast, the core preservation numbers for the Harpoottlian plan, for example, run from roughly 54-73% percent, with 60-65% retention in CD 1 and CD 6.

The retention of prior districts is a commonly articulated principle in redistricting. It can be described in terms with a positive or a negative valence. When positively described, core preservation promotes "continuity of representation." When more skeptically described, it is the most direct form of incumbent favoritism available to line-drawers, maintaining current representatives in districts with maximum name recognition and a history of success. In this case, the appeal to core preservation is used to keep minority population dispersed across multiple districts, whereas the shifting population and the reduction in BVAP in CD 6 would likely have led to the creation of new opportunities in a neutral process. I am not aware of any principle in law or in published redistricting guidelines that allows for a threshold level of high core preservation to justify excessively race-conscious decisions with a known dilutive effect.

The hook into Charleston is defended by Mr. Trende as having been introduced in past redistricting cycles, and merely retained in the current map. This is an excellent example to show that the "repairing" and "smoothing out" of boundaries was carried out in a highly selective manner by the state, as I will further detail below in §4. When existing configurations harm Black communities through cracking, such as the hook configuration in Charleston or the split of Sumter—both clearly and explicitly identified in public testimony collected by the legislature and discussed in Section 5 of my previous report—these were not altered in the new enacted plans, with preservation of district cores serving as a shield.

#### **3.1 Reconciling district cores with non-dilution**

The alternative plan shown in my previous report (Section 6.2, incl. Figure 11) illustrates that it is possible, if desired, to maintain extremely high core retention in a manner that does not dilute minority voters' opportunity to elect. That alternative plan has nearly 100% agreement with Enacted2022 in five districts (CD 1,3,4,6,7). It essentially revises the state's plan in a

single boundary line: the division of CD 2 from CD 5. This means it has an average core retention score of nearly 92%, when compared to the state's plan Enacted2022. However, this modest change is enough to secure markedly better electoral opportunity for Black voters. As noted in the earlier report (footnote 8, page 23), the alternative plan sees an electoral performance of at least 47.5% of the two-way vote for the Black voters' candidate of choice in all four highly probative elections.

## 4 Respect for boundaries, Communities of interest

In Mr. Trende's report, he writes that "The Enacted Plan also reduces the number of split precincts to 13, from 65." However, this is misleading. Precincts are administrative units that are locally defined and maintained; they can and do change regularly for any of a diverse set of reasons. Every ten years, prior to the release of the new population data in the PL94-171, the Census Bureau releases a geography file called *voting tabulation districts*, or VTDs. These are developed in collaboration with a designated partner from the state in order to best reflect current precincts, aligned to census geography. By comparing the Previous2012 plan to both sets of units, I have confirmed that the benchmark splits 65 2020 VTDs, but only splits 13 2010 VTDs.

That is, in contrast to Mr. Trende's representation, the new plan Enacted2022 is not far more respectful of precinct boundaries than its predecessor, but comparable. By contrast, the legislatively proposed Harpootlian plan has superior performance on county, subdivision, and city splits to the state's plan Enacted2022. The alternative plan splits 7 counties instead of 10; 12 county subdivisions instead of 29; and 7 cities instead of 10.<sup>1</sup>

Notably, the superior performance of the Harpootlian plan is not merely mechanical; rather, as the legislative record shows, the plan was drawn by State Senator Richard Harpootlian after careful review of the public testimony about important communities of interest for redistricting.

The splits clearly identified as being most harmful to Black voters—such as Sumter (40% White) and key neighborhoods of Charleston—are not addressed in the state's new plan. Instead, more heavily White cities (Beaufort – 65% White, Goose Creek – 58% White, Hanahan – 65% White) are made whole.<sup>2</sup>

The selective treatment of political boundaries demonstrates a race-conscious line-drawing process.

### 4.1 Other traditional principles

As noted in Section 4 of my previous report, the state's plan Enacted2022 is also generally inferior to alternatives such as the Harpootlian plan on metrics of compactness. The Harpootlian plan is better on the average Polsby-Popper score and on the cut edge count; in addition, it is superior on another metric cited by Mr. Trende—the so-called "inverse Schwartzberg" score, discussed by him on p19-20—as well as on the convex hull score, another common compactness metric.<sup>3</sup>

The only compactness metric on which the state's plan looks better is the Reock score (see Table 3 of my initial report), which rewards districts for fitting snugly in a circle. The hooking shape of CD 2 in the state's plan and the erratic boundary of CD 6 are therefore not heavily penalized by this score, even though the districts are visibly non-compact.

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<sup>1</sup>As noted in my earlier report, this counts splits of *populated* municipal territory. All comparisons can be found in Section 4 of that report..

<sup>2</sup>All percentages in this comparison are non-Hispanic single-race White percentages of population.

<sup>3</sup>The "inverse Schwartzberg" score of a district is just the square root of its Polsby-Popper score, so if a district is superior on one of these scores then it must be superior on the other. The average convex hull score of a district in Enacted2022 is .767 while for Harpootlian it is .773. This score measures how much each district deviates from a simpler polygon called its *convex hull*, and scores closer to 1 are better.

## 5 Conclusion

In the large, indications of racial gerrymandering are easy to detect in the Enacted2022 plan. In the changes made against the map from from ten years prior, Jim Clyburn's CD 6 saw its Black voting age population share markedly diminished, dropping from 52.5% BVAP to 46.9%, a difference of 5-6 percentage points. However, though the adjacent districts CD 5 and CD 7 were next in line in BVAP proportion, each having over 25% BVAP, neither of these received an increase in their BVAP share—instead, CD 7 remained essentially untouched while CD 5 actually lost a percentage point.<sup>4</sup>

	<b>CD 1</b>	<b>CD 2</b>	<b>CD 3</b>	<b>CD 4</b>	<b>CD 5</b>	<b>CD 6</b>	<b>CD 7</b>
Previous2012	0.173	0.239	0.174	0.183	0.257	0.525	0.254
Enacted2022	0.174	0.254	0.176	0.190	0.247	0.469	0.254
Harpootlian	0.212	0.219	0.156	0.162	0.337	0.497	0.184

Table 1: **BVAP shares by district.** (Repeated from previous report, Table 1.)

Rather than being assigned to CD 5 or CD 7, the Black population was cracked over multiple districts in a manner that ensured that the opportunity to elect candidates of choice would remain out of reach. This was not done merely by chance, but through selective decisions to smooth and heal splits in areas more heavily populated with White voters, while leaving areas with greater Black population shares illogically split.

Indeed, the randomized districting analysis performed in Section 7 of my prior report, which was not discussed by Mr. Trende, shows that the state's plan is far more of an outlier in its performance on the elections most probative for Black voters than it is in a generic general election. (See especially previous Figure 12.)

Finally, the Trende Report is completely silent on comparing the state's chosen plan to the other options that were before the legislature at the time of adoption, especially the Harpootlian plan. That alternative plan is generally superior to the state's plan on traditional principles (particularly splits and compactness, shown in Section 4 of earlier report and Section 4.1 above) while showing deference to communities of interest identified in the public record (quoted in Appendix B) and affording measurably greater opportunity for Black voters to elect candidates of choice (previous Section 7).

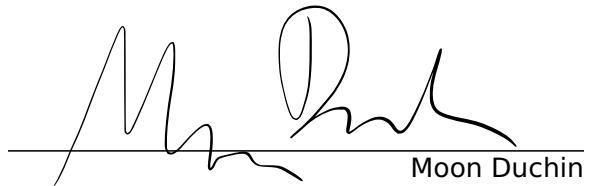
I also presented an alternative plan (previous Section 6.2), which bears over 92% resemblance to the state's plan while demonstrably reducing its fence-out effect for Black voters' candidate preferences. This shows that even the elevation of core preservation to the highest echelon of districting priorities does not need to lock in the racially dilutive impact of the state's plan. Instead, the strict confinement of Black electoral opportunity to a single district—CD 6—emerges as the leading hypothesis for the design principles that drove the construction of the Enacted2022 plan.

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<sup>4</sup>Meanwhile, South Carolina has been growing less White overall, with the WVAP share dropping from 66.7% in 2010 to 64.9% in 2020. Greater Charleston and the Lowcountry region have seen some of the greatest increases in BVAP overall. Demographics and trends are discussed in Section 2 of my prior report.

I reserve the right to continue to supplement my report in light of additional facts, testimony and/or materials that may come to light. Pursuant to 28 U.S.C. 1746, I declare under penalty of perjury of the laws of the United States that the foregoing is true and correct according to the best of my knowledge, information, and belief.

Executed this 4th day of May, 2022.



Moon Duchin

A handwritten signature consisting of three distinct strokes: a vertical line with a small loop at the top, a large circular loop, and another vertical line with a small loop at the bottom. The signature is written above a horizontal line, with the name "Moon Duchin" printed in a standard font below it.

# Supplemental Information on South Carolina Congressional Districts

Moon Duchin

Professor of Mathematics, Tufts University

Collaborating Faculty in Race, Colonialism, and Diaspora Studies

Senior Fellow, Tisch College of Civic Life

August 9, 2022

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 disclosed several reports in this case, and my full credentials and CV are available in prior disclosures. Drawing in part on questions that were posed in my deposition of July 14, 2022, this supplemental report provides further context for the material in the earlier reports. Section 4 contains two minor corrections.

In addition, this report contains data and metrics relating to the so-called "Jessamine" map that was provided to me by counsel. In my understanding, this is a Congressional plan created by the National Republican Redistricting Trust and conveyed to South Carolina officials for their consideration.

## 1 Distribution of BVAP

First, to help clarify the relationship between race-conscious line-drawing and electoral outcomes, I will illustrate the distribution of race over the districts in Figure 1. The plot shows the Black voting age population (BVAP) in each district, where the conventional numbering of the districts is ignored and we instead order them from lowest BVAP to highest BVAP. Note that this means that the district in column 6 is the one with the second-highest BVAP in each plan, and may be geographically located anywhere in the state. Column 6 therefore shows the same data that is depicted in Figure 10 from my April 11 report, but in fuller statewide context.

We see that the state's plans (benchmark Previous2012 and enacted Enacted2022) not only have unusually low BVAP in column 6, but indeed have unusually low BVAP in all districts except the highest and lowest.

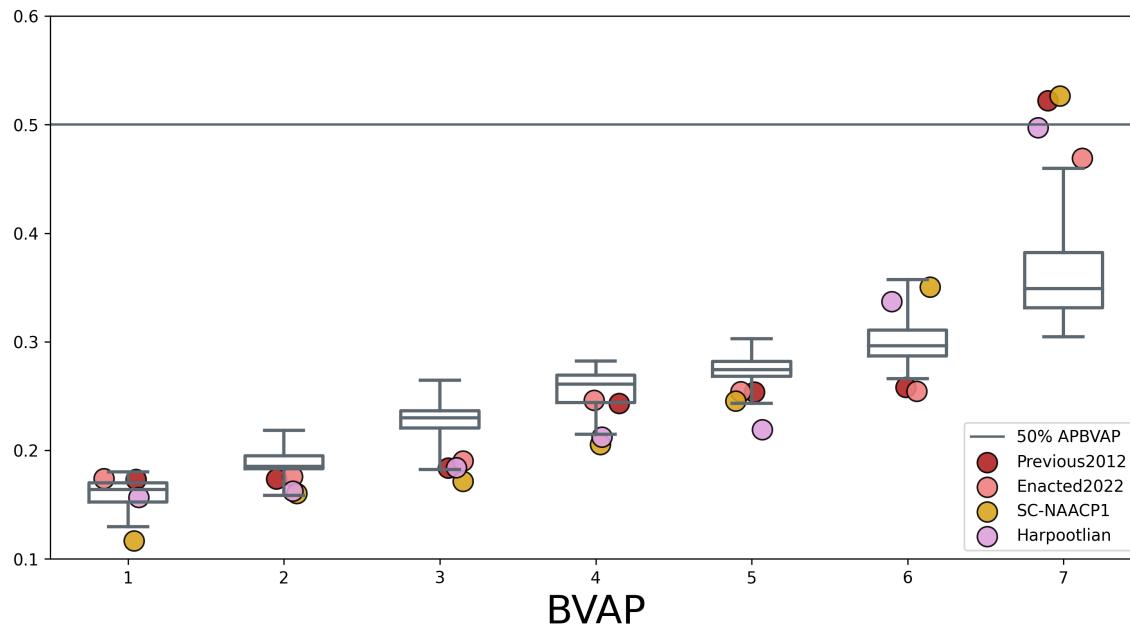


Figure 1: The box-and-whiskers plot shows the comparison of the four highlighted plans against an ensemble of 100,000 neutrally drawn plans (i.e., plans that consider population balance, contiguity, compactness, and the preservation of counties, but do not take racial or partisan data into account).

## 2 Performance by Black voters' candidates of choice

To allow us to draw out further relationships between patterns of elevated or depressed BVAP and electoral performance, I now turn to the four general elections identified by counsel as "particularly probative for Black electoral opportunity," as discussed in Section 7 of my April 11 report.<sup>1</sup> The following tables show the electoral outcomes for each of the Black voters' candidates of choice (henceforth, "Black candidate(s) of choice" or simply "candidate(s) of choice") in these probative elections. By giving detailed vote shares, and not just counting the number of outcomes over 50%, this section provides additional detail for the effectiveness analysis presented in Section 7 of the April 11 report.

The values shown in the tables below report the share of the major-party vote for the identified candidate, rounded to the third decimal place. I have shaded **gray** the cells in which the candidate of choice had more votes than their opponent, so that they would have won the district outright (i.e., vote share greater than 50%). In order to highlight patterns in the tables, I've shaded **amber** the outcomes between 46% and 47.5% and have shaded **pink** the outcomes between 47.5% and 50%.

The tables are presented below for one probative election at a time. These four elections have statewide shares for the candidate of choice of .441, .448, .429, and .432, respectively, averaging .4372, or nearly 44%. The other nine statewide elections in my dataset, which were regarded as less probative, have a statewide vote share sometimes as low as 37% for these

<sup>1</sup>From April 11 report, page 25: "four recent statewide elections that were identified by counsel as particularly probative for Black electoral opportunity. These are the Secretary of State and Treasurer elections from 2018 and the U.S. Senator and President elections from 2020. In each case, a Black-identified candidate was on the ballot (including Kamala Harris on the Biden ticket). These elections have also been confirmed by counsel to display racially polarized voting, in which Black voters cohesively support the candidate of choice, while White voters form enough of a bloc to defeat these candidates in each election."

candidates, averaging .4199. These nine are still the candidates of choice for Black voters, but were referred to as "Other Democratic" candidates in Figure 12 on page 26 of the April 11 report. That figure illustrated that the state's enacted plan provides a far starker disadvantage in the probative elections than in other general election contests, leading me to conclude that race was predominating over even partisan advantage in the enacted map.<sup>2</sup> See Appendix A for the vote share tables across the nine other general elections.

## 2.1 Pres20 - Biden/Harris - statewide share .441

	CD 1	CD 2	CD 3	CD 4	CD 5	CD 6	CD 7
Previous2012	0.470	0.442	0.310	0.396	0.416	0.678	0.406
Enacted2022	0.456	0.446	0.310	0.406	0.408	0.663	0.406
Jessamine	0.440	0.440	0.310	0.406	0.407	0.693	0.406
SC-NAACP1	0.526	0.379	0.331	0.360	0.405	0.655	0.435
SC-NAACP2	0.525	0.408	0.310	0.397	0.379	0.663	0.406
Harpootlian	0.518	0.365	0.347	0.342	0.469	0.656	0.387
LWVSC	0.517	0.399	0.308	0.404	0.400	0.649	0.408
Foster	0.529	0.335	0.365	0.378	0.376	0.521	0.578
Muscatel	0.478	0.443	0.313	0.399	0.409	0.647	0.406
Harrison	0.520	0.444	0.317	0.394	0.449	0.543	0.416
Sukovich	0.521	0.340	0.364	0.349	0.448	0.662	0.414
Roberts	0.522	0.512	0.396	0.503	0.510	0.329	0.315

Table 1: Performance by the candidate of choice (Biden/Harris) in the 2020 Presidential election, by district in each proposed plan. Colors show 46-47.5%; 47.5-50%; 50% and beyond.

## 2.2 Sen20 - Harrison - statewide share .448

	CD 1	CD 2	CD 3	CD 4	CD 5	CD 6	CD 7
Previous2012	0.470	0.446	0.319	0.402	0.428	0.687	0.416
Enacted2022	0.457	0.450	0.319	0.412	0.421	0.669	0.416
Jessamine	0.440	0.444	0.319	0.412	0.420	0.700	0.416
SC-NAACP1	0.536	0.384	0.339	0.369	0.417	0.663	0.433
SC-NAACP2	0.526	0.414	0.319	0.404	0.391	0.668	0.415
Harpootlian	0.516	0.373	0.354	0.352	0.481	0.660	0.397
LWVSC	0.518	0.404	0.317	0.411	0.413	0.653	0.417
Foster	0.529	0.344	0.370	0.385	0.388	0.526	0.588
Muscatel	0.476	0.447	0.322	0.406	0.421	0.657	0.416
Harrison	0.521	0.449	0.327	0.400	0.461	0.548	0.426
Sukovich	0.529	0.347	0.369	0.362	0.460	0.666	0.415
Roberts	0.521	0.520	0.408	0.512	0.517	0.336	0.324

Table 2: Performance by the candidate of choice (Harrison) in the 2020 U.S. Senate election, by district in each proposed plan. Colors show 46-47.5%; 47.5-50%; 50% and beyond.

<sup>2</sup>In the phrasing of the prior report, "The state's plans Previous2012 and Enacted2022 are not outliers in their performance in generic partisan races, where they sit very near the middle of the pack; rather, they only stand out in the races with a Black candidate on the ballot, where the preferences of Black voters most diverge from those of White voters."

### 2.3 SOS18 - Whittenburg - statewide share .429

	<b>CD 1</b>	<b>CD 2</b>	<b>CD 3</b>	<b>CD 4</b>	<b>CD 5</b>	<b>CD 6</b>	<b>CD 7</b>
Previous2012	0.443	0.408	0.305	0.371	0.408	0.681	0.410
Enacted2022	0.433	0.413	0.305	0.380	0.401	0.658	0.409
Jessamine	0.414	0.407	0.305	0.380	0.400	0.691	0.409
SC-NAACP1	0.526	0.351	0.322	0.340	0.396	0.647	0.414
SC-NAACP2	0.505	0.385	0.305	0.375	0.365	0.646	0.409
Harpootlian	0.494	0.343	0.333	0.324	0.464	0.639	0.382
LWVSC	0.496	0.376	0.302	0.380	0.396	0.631	0.406
Foster	0.507	0.323	0.345	0.368	0.363	0.495	0.579
Muscotel	0.450	0.410	0.308	0.375	0.401	0.653	0.409
Harrison	0.499	0.433	0.313	0.369	0.440	0.518	0.421
Sukovich	0.513	0.320	0.344	0.337	0.443	0.642	0.399
Roberts	0.499	0.498	0.390	0.500	0.492	0.312	0.300

Table 3: Performance by the candidate of choice (Whittenburg) in the 2018 Secretary of State election, by district in each proposed plan. Colors show **46-47.5%**; **47.5-50%**; **50% and beyond**.

### 2.4 Tres18 - Glenn - statewide share .432

	<b>CD 1</b>	<b>CD 2</b>	<b>CD 3</b>	<b>CD 4</b>	<b>CD 5</b>	<b>CD 6</b>	<b>CD 7</b>
Previous2012	0.442	0.409	0.306	0.371	0.417	0.687	0.416
Enacted2022	0.433	0.415	0.306	0.379	0.410	0.661	0.415
Jessamine	0.414	0.408	0.306	0.379	0.409	0.695	0.415
SC-NAACP1	0.532	0.353	0.320	0.343	0.405	0.650	0.411
SC-NAACP2	0.503	0.390	0.307	0.373	0.374	0.648	0.415
Harpootlian	0.492	0.347	0.330	0.328	0.474	0.642	0.386
LWVSC	0.493	0.381	0.303	0.379	0.407	0.632	0.411
Foster	0.508	0.327	0.340	0.370	0.371	0.498	0.586
Muscotel	0.448	0.411	0.309	0.374	0.410	0.659	0.415
Harrison	0.495	0.441	0.315	0.368	0.449	0.519	0.427
Sukovich	0.515	0.323	0.339	0.346	0.454	0.644	0.399
Roberts	0.499	0.500	0.399	0.506	0.491	0.314	0.303

Table 4: Performance by the candidate of choice (Glenn) in the 2018 Treasurer election, by district in each proposed plan. Colors show **46-47.5%**; **47.5-50%**; **50% and beyond**.

### 2.5 Summary

We can see across all four of these probative contests that the Jessamine plan is more extreme in securing Republican advantage in CD 1. However, the enacted plan stays far enough from competitive in all districts that there is no meaningful difference in minority opportunity to elect candidates of choice.

### 3 Assessing the Jessamine Plan

The Jessamine plan, which I understand was prepared by the National Republican Redistricting Trust as a draft plan for South Carolina, is shown here.

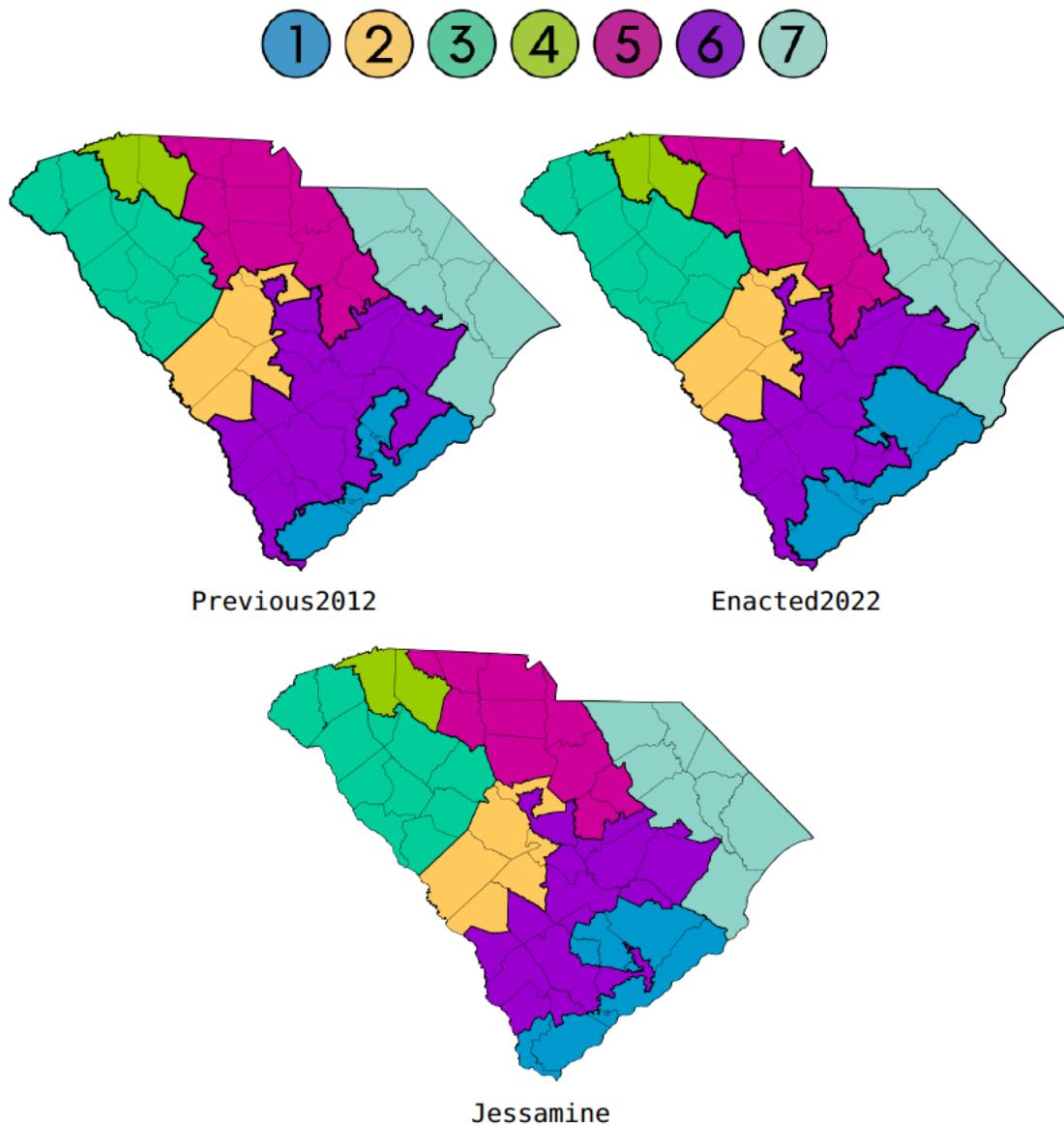


Figure 2: The benchmark and enacted plan (top left/right) and the "Jessamine" plan (bottom). There are minor differences between the enacted plan and the Jessamine plan along several borders, but the major difference is in the interface of CD 1 and CD 6. In particular, the Jessamine plan has a novel T shape at the interface of Charleston, Berkeley, and Dorchester counties.

Next, I will present the redistricting metrics for the Jessamine plan, in the same order and with the same scoring system as in Section 4 (p9-13) of my April 11 report.

In terms of racial demographics, the plan has 49.3% BVAP in its CD 6, then dropping off to 25.4% in CD 7.

	<b>CD 1</b>	<b>CD 2</b>	<b>CD 3</b>	<b>CD 4</b>	<b>CD 5</b>	<b>CD 6</b>	<b>CD 7</b>
Enacted2022	0.174	0.254	0.176	0.190	0.247	0.469	0.254
Jessamine	0.163	0.242	0.176	0.190	0.246	0.493	0.254

Table 5: The Jessamine plan has one district in the 40-50% BVAP range and no other districts over 30% BVAP.

The Jessamine plan has *de minimis* top to bottom deviation of one person.

For compactness, the Jessamine plan has an average Polsby-Popper score of 0.212, which is roughly the same as the enacted plan Enacted2022 (0.210) and is worse, for instance, than the Harpoonian plan (0.235). In the Reock metric, the Jessamine plan scores 0.368, comparable to the enacted plan Enacted2022 (0.361) and behind the LWVSC plan (0.379). Its block cut edges score—here, recall that a lower score is better—is 3484 edges that have been cut, which makes it less compact than the enacted plan Enacted2022 (2843), the benchmark plan Previous2012 (3217), and the Harpoonian plan (2227), among others.

The Jessamine plan splits 13 counties, each two ways (so there are 26 pieces). It splits 43 county subdivisions two ways (so there are 86 pieces). And it splits 13 cities (26 pieces) and 13 towns (16 pieces). These numbers are the same whether we consider all splits of territory or whether we restrict to splits of populated territory. Overall, in terms of preserving political subdivisions, the Jessamine plan is generally somewhat worse than the enacted plan Enacted2022, the benchmark plan Previous2012, and than many of the public proposals, including the Harpoonian plan. No incumbents are paired in the Jessamine plan.

## 4 Minor corrections to earlier report

Finally, I record two minor corrections to my earlier report of April 11, 2022, offering clarifications in the process. These corrections have no effect on my quantitative or qualitative conclusions from earlier reports.

First, Figure 2 on page 6 of the April 11 report shows a pair of choropleth plots depicting the changes to each county and census tract in South Carolina between 2010 and 2019. They are erroneously labeled "BVAP" (Black voting age population) when they should be labeled "**BCVAP**" (Black citizen voting age population). The reason for using the American Community Survey rather than the Decennial Census data is to make it possible to see intercensal changes, which can show us whether change is gradual or sudden. To illustrate, I am now including several timestamps over the ten-year span in Figure 3 below.<sup>3</sup> The 2020 ACS was recently released, allowing me to update the timeline to 2020.

Second, my April 11 report includes the following paragraph:

This finding is even much strengthened by considering the wider dataset of all recent statewide general elections (bottom of Figure 12). This time, **seven** more general elections are evaluated: Attorney General 2018, Governor 2014, Governor 2018, Lt. Governor 2014, President 2016, Secretary of State 2014, Superintendent of Education 2014, U.S. Senator 2014, and U.S. Senator 2016. If we compare the four that are considered probative for Black electoral opportunity against the nine that are not designated in this way, the picture becomes extremely clear. (emph. added)

Here, the reference to "seven more general elections" should have read "nine more general elections." (The list contains nine elections and the rest of the paragraph also references nine.)

<sup>3</sup>Again drawing from ACS 5-year estimates ending in each successive year, the Richland County statistics are as follows. BCVAP10: 122,702; BCVAP11: 125,562; BCVAP12: 128,260; BCVAP13: 130,944; BCVAP14: 133,049; BCVAP15: 135,385; BCVAP16: 137,985; BCVAP17: 140,623; BCVAP18: 142,633; BCVAP19: 144,660; BCVAP20: 152,782. Over the decade, BCVAP has risen by over 30,000 people, or nearly 25%, well outpacing the overall rate of population growth in the county (8%) and in the state (10.7%).

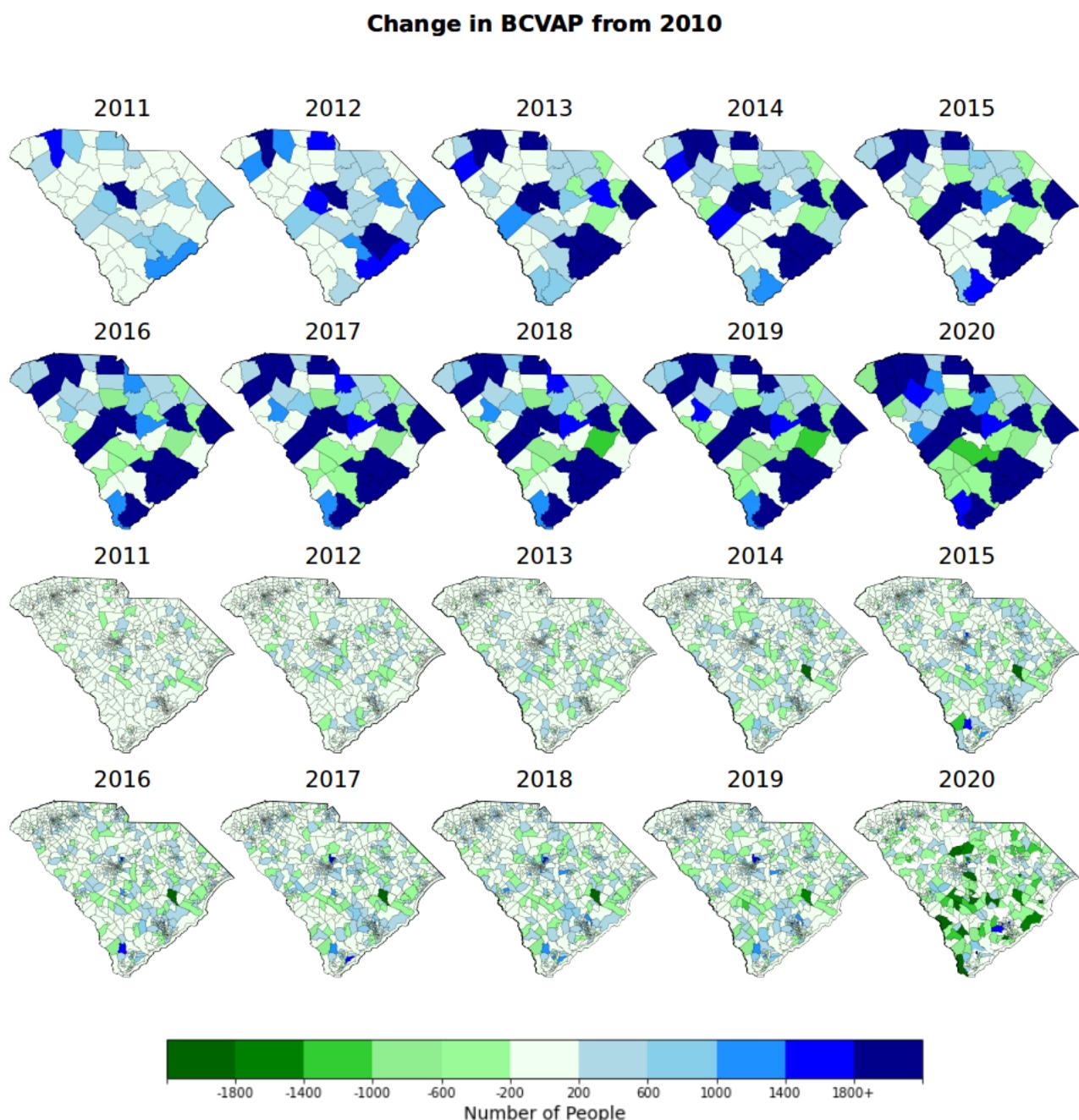


Figure 3: These plots compare the Black citizen voting age population (BCVAP) from the 5-year ACS estimate ending in 2010 to the corresponding estimates from each successive year up to 2019, giving further background for Figure 2 from my April 11 report. We see that Richland County immediately saw its BCVAP count rise by over 1800 people, and indeed the count rose steadily over the decade, outpacing population growth in the state overall. Charleston and Berkeley counties see pronounced BCVAP growth as well. In the bottom plots, which show differences at the tract level, we see that for the most part the growth pattern is not concentrated in a small number of tracts, but is distributed over the counties.

## A Performance tables for remaining elections

Recall that the 13 general elections in the dataset have been separated into 4 elections that were identified by counsel as more probative for Black electoral opportunity, and 9 other general elections. In each of the 13, I understand that the Democratic candidate is the Black candidate of choice.

For completeness of the record, this appendix presents the shares for these other Democratic candidates in each district in each plan.

	<b>CD 1</b>	<b>CD 2</b>	<b>CD 3</b>	<b>CD 4</b>	<b>CD 5</b>	<b>CD 6</b>	<b>CD 7</b>
Previous2012	0.479	0.458	0.334	0.411	0.431	0.700	0.427
Enacted2022	0.468	0.461	0.335	0.420	0.423	0.683	0.427
Jessamine	0.449	0.457	0.335	0.420	0.422	0.713	0.427
SC-NAACP1	0.548	0.398	0.355	0.376	0.417	0.670	0.448
SC-NAACP2	0.539	0.423	0.333	0.413	0.393	0.678	0.427
Harpootlian	0.528	0.383	0.369	0.355	0.484	0.672	0.405
LWVSC	0.531	0.413	0.332	0.420	0.417	0.665	0.426
Foster	0.539	0.353	0.382	0.394	0.388	0.543	0.596
Muscatel	0.486	0.459	0.338	0.415	0.424	0.675	0.427
Harrison	0.533	0.461	0.342	0.410	0.465	0.562	0.438
Sukovich	0.541	0.359	0.382	0.367	0.464	0.676	0.429
Roberts	0.533	0.536	0.409	0.521	0.530	0.348	0.334

Table 6: Governor 2018

	<b>CD 1</b>	<b>CD 2</b>	<b>CD 3</b>	<b>CD 4</b>	<b>CD 5</b>	<b>CD 6</b>	<b>CD 7</b>
Previous2012	0.473	0.439	0.319	0.390	0.424	0.698	0.425
Enacted2022	0.460	0.443	0.320	0.398	0.417	0.681	0.425
Jessamine	0.441	0.438	0.320	0.398	0.416	0.712	0.425
SC-NAACP1	0.547	0.380	0.336	0.359	0.411	0.664	0.440
SC-NAACP2	0.536	0.409	0.319	0.391	0.384	0.669	0.424
Harpootlian	0.522	0.368	0.348	0.341	0.479	0.661	0.403
LWVSC	0.530	0.396	0.317	0.398	0.411	0.654	0.423
Foster	0.533	0.340	0.359	0.391	0.380	0.525	0.594
Muscatel	0.480	0.440	0.322	0.393	0.417	0.671	0.425
Harrison	0.532	0.449	0.327	0.387	0.456	0.548	0.436
Sukovich	0.540	0.341	0.358	0.357	0.458	0.666	0.420
Roberts	0.526	0.529	0.405	0.517	0.512	0.331	0.317

Table 7: Attorney General 2018

	<b>CD 1</b>	<b>CD 2</b>	<b>CD 3</b>	<b>CD 4</b>	<b>CD 5</b>	<b>CD 6</b>	<b>CD 7</b>
Previous2012	0.431	0.406	0.302	0.364	0.404	0.688	0.403
Enacted2022	0.422	0.41	0.303	0.374	0.394	0.664	0.403
Jessamine	0.403	0.405	0.303	0.374	0.393	0.693	0.403
SC-NAACP1	0.517	0.357	0.312	0.334	0.389	0.650	0.404
SC-NAACP2	0.501	0.381	0.304	0.364	0.36	0.656	0.402
Harpootlian	0.498	0.347	0.322	0.316	0.465	0.648	0.359
LWVSC	0.491	0.374	0.300	0.373	0.392	0.641	0.396
Foster	0.508	0.323	0.331	0.347	0.355	0.505	0.581
Muscatel	0.440	0.408	0.306	0.368	0.395	0.660	0.402
Harrison	0.491	0.437	0.312	0.361	0.433	0.525	0.415
Sukovich	0.502	0.315	0.331	0.341	0.442	0.654	0.390
Roberts	0.506	0.495	0.380	0.496	0.497	0.308	0.293

Table 8: President 2016

	<b>CD 1</b>	<b>CD 2</b>	<b>CD 3</b>	<b>CD 4</b>	<b>CD 5</b>	<b>CD 6</b>	<b>CD 7</b>
Previous2012	0.334	0.352	0.274	0.310	0.390	0.646	0.374
Enacted2022	0.333	0.359	0.275	0.318	0.381	0.604	0.374
Jessamine	0.315	0.353	0.275	0.318	0.380	0.633	0.374
SC-NAACP1	0.459	0.315	0.272	0.296	0.369	0.608	0.321
SC-NAACP2	0.404	0.329	0.278	0.311	0.341	0.603	0.374
Harpootlian	0.401	0.314	0.277	0.284	0.443	0.596	0.314
LWVSC	0.391	0.329	0.271	0.317	0.381	0.587	0.360
Foster	0.420	0.299	0.279	0.293	0.331	0.451	0.553
Muscatel	0.339	0.356	0.277	0.314	0.380	0.614	0.374
Harrison	0.390	0.398	0.284	0.306	0.408	0.472	0.386
Sukovich	0.424	0.282	0.279	0.317	0.422	0.600	0.322
Roberts	0.415	0.431	0.361	0.464	0.441	0.275	0.259

Table 9: U.S. Senate 2016

	<b>CD 1</b>	<b>CD 2</b>	<b>CD 3</b>	<b>CD 4</b>	<b>CD 5</b>	<b>CD 6</b>	<b>CD 7</b>
Previous2012	0.372	0.377	0.296	0.318	0.409	0.711	0.419
Enacted2022	0.372	0.385	0.296	0.326	0.401	0.673	0.419
Jessamine	0.353	0.379	0.296	0.326	0.400	0.705	0.419
SC-NAACP1	0.544	0.331	0.288	0.305	0.386	0.655	0.342
SC-NAACP2	0.464	0.356	0.297	0.321	0.346	0.646	0.418
Harpootlian	0.437	0.332	0.289	0.293	0.476	0.641	0.367
LWVSC	0.454	0.344	0.293	0.325	0.400	0.631	0.411
Foster	0.463	0.318	0.284	0.335	0.340	0.480	0.611
Muscatel	0.375	0.383	0.299	0.321	0.400	0.685	0.418
Harrison	0.453	0.438	0.306	0.312	0.435	0.511	0.433
Sukovich	0.504	0.304	0.284	0.334	0.454	0.641	0.343
Roberts	0.453	0.507	0.370	0.513	0.472	0.289	0.275

Table 10: U.S. Senate 2014

	<b>CD 1</b>	<b>CD 2</b>	<b>CD 3</b>	<b>CD 4</b>	<b>CD 5</b>	<b>CD 6</b>	<b>CD 7</b>
Previous2012	0.387	0.414	0.303	0.320	0.422	0.711	0.419
Enacted2022	0.382	0.418	0.306	0.327	0.413	0.681	0.419
Jessamine	0.363	0.414	0.306	0.327	0.411	0.710	0.419
SC-NAACP1	0.533	0.362	0.297	0.305	0.403	0.669	0.357
SC-NAACP2	0.478	0.368	0.305	0.319	0.365	0.670	0.418
Harpootlian	0.455	0.351	0.301	0.290	0.494	0.662	0.356
LWVSC	0.466	0.357	0.303	0.327	0.414	0.655	0.407
Foster	0.474	0.324	0.293	0.330	0.335	0.536	0.612
Muscotel	0.391	0.417	0.309	0.322	0.412	0.686	0.418
Harrison	0.465	0.431	0.316	0.315	0.441	0.556	0.433
Sukovich	0.500	0.318	0.292	0.335	0.473	0.668	0.351
Roberts	0.467	0.520	0.371	0.527	0.487	0.306	0.272

Table 11: Governor 2014

	<b>CD 1</b>	<b>CD 2</b>	<b>CD 3</b>	<b>CD 4</b>	<b>CD 5</b>	<b>CD 6</b>	<b>CD 7</b>
Previous2012	0.383	0.378	0.295	0.312	0.397	0.701	0.417
Enacted2022	0.380	0.384	0.297	0.319	0.387	0.668	0.417
Jessamine	0.361	0.379	0.297	0.319	0.386	0.700	0.417
SC-NAACP1	0.528	0.332	0.290	0.295	0.379	0.651	0.358
SC-NAACP2	0.472	0.349	0.296	0.313	0.336	0.646	0.417
Harpootlian	0.449	0.327	0.293	0.280	0.468	0.639	0.364
LWVSC	0.462	0.337	0.293	0.318	0.387	0.631	0.409
Foster	0.468	0.311	0.286	0.338	0.323	0.487	0.601
Muscotel	0.388	0.382	0.299	0.314	0.387	0.675	0.417
Harrison	0.461	0.423	0.305	0.307	0.421	0.514	0.432
Sukovich	0.496	0.299	0.286	0.321	0.447	0.641	0.355
Roberts	0.460	0.499	0.364	0.510	0.468	0.290	0.264

Table 12: Lt. Governor 2014

	<b>CD 1</b>	<b>CD 2</b>	<b>CD 3</b>	<b>CD 4</b>	<b>CD 5</b>	<b>CD 6</b>	<b>CD 7</b>
Previous2012	0.393	0.365	0.286	0.295	0.391	0.695	0.408
Enacted2022	0.389	0.371	0.287	0.302	0.381	0.665	0.408
Jessamine	0.371	0.366	0.297	0.303	0.380	0.695	0.408
SC-NAACP1	0.524	0.320	0.279	0.278	0.371	0.642	0.368
SC-NAACP2	0.481	0.344	0.287	0.298	0.325	0.638	0.407
Harpootlian	0.461	0.315	0.283	0.264	0.460	0.631	0.355
LWVSC	0.468	0.333	0.283	0.301	0.380	0.622	0.399
Foster	0.478	0.302	0.275	0.332	0.310	0.472	0.594
Muscotel	0.399	0.369	0.289	0.298	0.380	0.670	0.407
Harrison	0.468	0.423	0.295	0.291	0.412	0.502	0.423
Sukovich	0.496	0.287	0.275	0.306	0.439	0.633	0.360
Roberts	0.472	0.491	0.358	0.500	0.457	0.279	0.247

Table 13: Secretary of State 2014

	<b>CD 1</b>	<b>CD 2</b>	<b>CD 3</b>	<b>CD 4</b>	<b>CD 5</b>	<b>CD 6</b>	<b>CD 7</b>
Previous2012	0.363	0.343	0.292	0.317	0.399	0.699	0.419
Enacted2022	0.363	0.352	0.291	0.325	0.392	0.661	0.419
Jessamine	0.344	0.344	0.291	0.325	0.391	0.694	0.419
SC-NAACP1	0.529	0.298	0.291	0.303	0.383	0.643	0.337
SC-NAACP2	0.455	0.330	0.292	0.319	0.335	0.629	0.419
Harpootlian	0.433	0.304	0.291	0.288	0.475	0.622	0.354
LWVSC	0.442	0.319	0.289	0.324	0.395	0.612	0.407
Foster	0.456	0.300	0.287	0.325	0.330	0.458	0.603
Muscatel	0.366	0.349	0.294	0.320	0.391	0.673	0.418
Harrison	0.442	0.418	0.301	0.311	0.424	0.485	0.435
Sukovich	0.489	0.280	0.287	0.323	0.453	0.623	0.340
Roberts	0.447	0.480	0.369	0.506	0.458	0.275	0.272

Table 14: Superintendent of Education 2014

I reserve the right to continue to supplement my report in light of additional facts, testimony and/or materials that may come to light. Pursuant to 28 U.S.C. 1746, I declare under penalty of perjury of the laws of the United States that the foregoing is true and correct according to the best of my knowledge, information, and belief.

Executed this 9th day of August, 2022.



Moon Duchin

Moon Duchin , PhD  
The South Carolina State Confvs.McMaster/Alexander

July 14, 2022

Page 1

1                   IN THE UNITED STATES DISTRICT COURT  
2                   FOR THE DISTRICT OF SOUTH CAROLINA  
3                   COLUMBIA DIVISION  
4  
5     THE SOUTH CAROLINA STATE  
6     CONFERENCE OF THE NAACP

and

6 TAIWAN SCOTT, ON BEHALF OF HIMSELF  
AND ALL OTHER SIMILARLY SITUATED  
PERSONS.

Plaintiffs,

vs. Case No. 3:21-CV-03302-JMC-TJH-RMG

10 THOMAS C. ALEXANDER, IN HIS OFFICIAL  
CAPACITY AS PRESIDENT OF THE SENATE;  
11 LUKE A. RANKIN, IN HIS OFFICIAL CAPACITY  
AS CHAIRMAN OF THE SENATE JUDICIARY  
12 COMMITTEE; MURRELL SMITH, IN HIS OFFICIAL  
CAPACITY AS SPEAKER OF THE HOUSE OF  
REPRESENTATIVES; CHRIS MURPHY, IN HIS  
13 OFFICIAL CAPACITY AS CHAIRMAN OF THE HOUSE  
OF REPRESENTATIVES JUDICIARY COMMITTEE;  
14 WALLACE H. JORDAN, IN HIS OFFICIAL CAPACITY  
AS CHAIRMAN OF THE HOUSE OF REPRESENTATIVES  
ELECTIONS LAW SUBCOMMITTEE; HOWARD KNAPP,  
15 IN HIS OFFICIAL CAPACITY AS INTERIM  
EXECUTIVE DIRECTOR OF THE SOUTH CAROLINA  
16 STATE ELECTION COMMISSION; JOHN WELLS,  
17 JOANNE DAY, CLIFFORD J. EDLER, LINDA MCCALL,  
18 AND SCOTT MOSELEY, IN THEIR OFFICIAL  
CAPACITIES AS MEMBERS OF THE SOUTH CAROLINA  
STATE ELECTION COMMISSION.

Defendants.

22 DEPOSITION OF: MOON DUCHIN, PHD  
(Via Videoconference)

DATE: Wednesday, June 22, 2022

TIME: 10:13 a.m.

Moon Duchin , PhD  
The South Carolina State Confvs.McMaster/Alexander

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1 the opinion that the enacted plan intentionally  
2 discriminates on the basis of race?

3 A. I hold the opinion that there is  
4 compelling evidence to support that conclusion.

5 Q. And do either of your reports conclude  
6 that race predominated over traditional district  
7 principles in the enacted plan?

8 A. Let me stipulate that -- so that I don't  
9 speak very repetitively, that we can maybe shorthand  
10 the phrase "evidence in support of," but let me just  
11 stipulate that I always intend to provide evidence  
12 in support of various legal conclusions and not to  
13 provide legal conclusions myself. Having said that,  
14 I do offer evidence of the predominance of racial  
15 concerns over various kinds of other principles.

16 Q. And as you sit here today do you hold an  
17 opinion that race predominated over the -- over  
18 traditional districting criteria in the enacted  
19 plan?

20 A. Let's say I do hold the opinion that  
21 other principles were subordinated to concerns that  
22 are -- that involve race.

23 Q. And what are those concerns that involve  
24 race?

25 A. If we could look at my report, we can

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1 look at section 7 on page 25 of my initial report.

2 So in this section I look at what I call:

3 "Electoral opportunity for Black voters." And I do  
4 think that there is evidence that electoral  
5 opportunity for Black voters has been a concern in  
6 the creation of the map. And, in particular, I  
7 offer evidence that it predominates over other  
8 partisan considerations.

9 Q. Are there any other concerns that  
10 involve race that you believe predominate over  
11 traditional districting criteria?

12 A. Could I ask you to rephrase the  
13 question?

14 Q. Sure. I think what you said a couple  
15 answers ago was that you believe that concerns that  
16 involve race predominated over traditional criteria,  
17 and I asked you what those are.

18 You said electoral opportunity for Black  
19 voters. I'm just curious if there are any other  
20 concerns or issues that touch on race or involve  
21 race, to use your phrase, that are addressed in your  
22 report or form part of your opinions.

23 It's not meant to be a trick question.  
24 I'm just trying to understand what you meant by  
25 concerns that involve race.

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1           A.    Sure. I understand. I think we could  
2       look at my response report of May 4th on page 2 and  
3       look at the first bullet of that.

4           Q.    Okay. We can get to that.

5           A.    Okay. But just to say, there I do  
6       discuss the idea that the so-called repair of  
7       counties and precincts in the State's plan is  
8       selective and fails to address areas of particular  
9       salients for Black communities. That would be  
10      another example.

11          Q.    And we will walk through all this in a  
12      little bit more detail.

13          A.    Sure.

14          Q.    All right. I want to turn to page 5 of  
15      your opening report --

16          A.    Yes.

17          Q.    -- which I have up on the screen. I  
18      encountered a new word in your report that I had  
19      never seen before, at least in my memory. Under  
20      Figure 1 you use this word "choropleth." Did I say  
21      that correctly?

22          A.    You did. It's choropleth.

23          Q.    Okay. Can you explain to me what a  
24      choropleth is?

25          A.    Gladly. A choropleth is a kind of map

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1 visualization that is shaded and where the intensity  
2 of the shading reflects some numerical quantity.

3 And that's what we see here.

4 Q. And what is being depicted in Figure 1?

5 A. This is the share of Black voting age  
6 population in every VTD. Those are often informally  
7 called precincts, so in every precinct in South  
8 Carolina.

9 Q. And which data did you use to determine  
10 the BVAP in precincts for Figure 1?

11 A. This is decennial census data from the  
12 PL94-171.

13 Q. And on page 6 you have -- are these also  
14 choropleths?

15 A. Yes, it's fair to call these  
16 choropleths.

17 Q. Figure 2. And here is this depicting  
18 changes in BVAP by county over a period of time? Is  
19 that right?

20 A. That's correct.

21 Q. And that's according to the American  
22 Community Survey estimates. Is that right?

23 A. Yes. So this is, on top, by county; on  
24 the bottom, by tract. This is showing the change  
25 between the ACS estimates of 2010 and 2019.

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1 Q. And Figure 1 was depicting a percentage?

2 A. That's right.

3 Q. And Figure 2 appears to depict the total  
4 number of people. Is that right?

5 A. That's right. As I would phrase it,  
6 it's a share in Figure 1 and a count in Figure 2.

7 Q. And in Figure 2 is this only voting age  
8 population or is this total population?

9 A. It says that it's voting age population,  
10 and so I hope that's correct.

11 Q. Is there a reason you used the ACS data  
12 rather than the decennial census data to generate  
13 Figure 2?

14 A. The pause is me trying to remember the  
15 circumstances of the creation of this figure. I'm  
16 not completely sure why that choice was made -- why  
17 I made that choice, but I will say, as you know,  
18 that census data was delayed this year.

19 The ACS, or American Community Survey,  
20 had particular difficulty with its 2020 data, so  
21 2019 -- in fact, the Census Bureau has released  
22 communications indicating that the 2020 ACS was  
23 compromised by COVID and other factors. And so  
24 although I don't, as we sit here, remember the exact  
25 thought process, I suspect that I was trying to make

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1       an apples-to-apples comparison between ACS releases  
2       that were done with similar methodology in 2010 and  
3       2019.

4           Q.     Was the decennial census data available  
5       when you drafted this report?

6           A.     Definitely.

7           Q.     And could you have generated Figure 2  
8       using the decennial census data?

9           A.     Yes. And I have every reason to believe  
10      it would be similar.

11          Q.     But you did not, at least, include that  
12      in your report.

13          A.     That's right.

14          Q.     And do you recall whether you actually  
15      did, in fact, generate a version of Figure 2 with  
16      the decennial census data?

17          A.     I do not recall, but I can assure you  
18      that this is not cherry-picked to give a different  
19      impression. I always try to do the best and most  
20      forthcoming data practice as possible. So it is  
21      assuredly not the case that a decennial image would  
22      show a substantially different result and this was  
23      chosen to give a different impression.

24          Q.     But as you sit here today, you don't  
25      know how Figure 2 would look if you had used

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1 decennial census data instead. Is that right?

2 A. Well, the only thing I can assure you is  
3 that it's not the case that I compared them, they  
4 looked different and I chose this one to give a  
5 different impression. I can assure you that's not  
6 the case.

7 Q. Okay. But you can't -- you don't know,  
8 one way or the other, what Figure 2 would look like  
9 with decennial census data, as you sit here today?

10 A. I don't -- I don't have it in my mind.  
11 I will tell you some reasons that ACS data might be  
12 of interest, as opposed to decennial census data.  
13 So ACS data -- for example, this figure says it's  
14 BVAP, as in Black voting age population. It doesn't  
15 say that it's BCVAP, as in Black citizen voting age  
16 population.

17 But one reason to use ACS data sometimes  
18 is to look at citizen voting age share. That  
19 doesn't appear to be what I have done here, but I'm  
20 describing reasons that one might choose the ACS as  
21 a data product rather than the decennial census.  
22 Other than that, I am not able, as I sit here, to  
23 account for why this is done with ACS, except to  
24 repeat that I assure you it's not cherry-picked.

25 Q. I appreciate where you're coming from.

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I just would like to get an answer to this question for the record. You don't know, as you sit here today, what Figure 2 would look like with decennial census data. Is that correct?

A. I have every reason to believe it would look similar.

Q. But you don't know that. Correct?

A. I wouldn't want to assert that with certainty.

Q. So the answer is you don't know.

A. I have answered you as best I can.

Q. Let's go to page 7 of your report where you discuss redistricting criteria. And is it correct that this section, or part 3, is a review of the redistricting criteria in the Guidelines issued by the House and Senate?

A. Yes, that's correct. And I also attempt to contextualize that sometimes by appealing to sources beyond the State's Guidelines. But it is correct to say that the focus is the State's Guidelines.

Q. And you divided the criteria here into first-tier and second-tier requirements. Is that right?

A. Yes, following the Guidelines

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1 themselves.

2 Q. Okay. Did either the House or the  
3 Senate Guidelines divide the criteria into first and  
4 second tiers?

5 A. Yes. And I describe that here. Let me  
6 try to remember whether it was House or Senate, but  
7 one of the two -- and we can pull them up and  
8 verify -- clearly indicates that the second set may  
9 not compromise the first. So that does follow the  
10 Guidelines. Would you like us to find that in the  
11 Guidelines?

12 Q. Yeah. And I'm going to pull those up if  
13 I can figure out how to do that real quick. Bear  
14 with me for one second, if you don't mind.

15 A. It's the House Guidelines, just to say.

16 Q. Okay. Can you see the House  
17 Redistricting Guidelines on your screen?

18 A. Yes. And I have a local copy.

19 Q. And are these the House Redistricting  
20 Guidelines we have been discussing and that you  
21 reference in your report?

22 A. Yes.

23 (Exhibit No. 3, 2021 Guidelines and Criteria for  
24 Congressional and Legislative Redistricting, was  
25 marked)

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1 Q. Anything.

2 A. No. No, not to my knowledge.

3 Q. And is a map drawer obligated to use any  
4 mathematical measures of compactness?

5 A. Well, there have been instances where a  
6 court order specifies measures, in fact. That was  
7 the case in Pennsylvania litigation in 2018 that I  
8 was involved in. So in that instance I think you  
9 would be obligated to use particular metrics to  
10 comply with the court order. But absent some  
11 directive of that kind, it's a matter of discretion.

12 Q. Was the General Assembly in South  
13 Carolina under a directive of that kind when it drew  
14 the enacted plan?

15 A. Not to my knowledge.

16 Q. I want to scroll back to page 8. Isn't  
17 it true that the House Guidelines eschewed, for lack  
18 of a better term, the use of mathematical  
19 calculations or determination for compactness?

20 A. That's right. They say, and I quoted it  
21 here, that compactness should not be judged based  
22 upon any mathematical, statistical or formula-based  
23 calculation or determination.

24 Q. And I believe in the footnote you also  
25 quote the Senate Guidelines.

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1 A. Right.

2 Q. And I believe your phrase is that they  
3 shy away from shape consideration entirely,  
4 referencing what is sometimes called functional  
5 compactness. Is that right?

6 A. That is right.

7 Q. So in your review of these plans, on  
8 page 11 did you conduct any analysis of compactness  
9 other than use of these three metrics?

10 A. There is other discussion of compactness  
11 in my report, namely in the qualitative descriptions  
12 in section 5. I frequently reference erratic  
13 shapes, a hook and so on. Those are compactness  
14 considerations that are more holistic in the manner  
15 that I think is actually preferred by the  
16 Guidelines. So both quantity and qualitative  
17 compactness are discussed in my report.

18 Q. And we will certainly get to section 5  
19 in a preview of coming attractions, but here, in  
20 section 4.3, the only compactness analysis you have  
21 done here is the mathematical measures. Is that  
22 right?

23 A. That's correct. This section is  
24 entitled: Review of metrics.

25 Q. Thank you. Let's move down to 4.4,

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1 Political subdivisions.

2                   Actually, let me ask you one quick  
3 question back on compactness, if I might. So even  
4 under these metrics the enacted plan, it looks like,  
5 performs better than SC-NAACP1 on all three of these  
6 metrics. Is that right?

7                   A. That's right.

8                   Q. And it performs better than the  
9 Harpoonian plan on a Reock. Is that right?

10                  A. That's right. It performs worse on  
11 Polsby-Popper, substantially worse on block cut  
12 edges and better on Reock. Correct.

13                  Q. Thank you. And that's because each of  
14 these metrics measures a different thing. Is that  
15 right?

16                  A. Yes. And that's what those  
17 illustrations -- those gorgeous illustrations on  
18 your screen are attempting to illustrate.

19                  Q. Thank you. All right. Let's move to  
20 4.4, Political subdivisions.

21                  A. Yes.

22                  Q. And this, again, is just based on  
23 metrics. You didn't include in this section any  
24 analysis of other communities of interest. Is that  
25 right?

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1           A. That's right. The divisions that are  
2 discussed here are counties, county subdivisions,  
3 cities and towns.

4           Q. I'm going to scroll back to page 8.  
5 Now, is it true that the House Guidelines said that  
6 counties, municipalities or other political  
7 subdivisions would be given no greater weight as a  
8 matter of state policy than other identifiable  
9 communities of interest?

10          A. Yes. That's a direct quote.

11          Q. It's right there on page 8. Correct?  
12 And if we come back here to 4.4, Political  
13 subdivisions, I believe this is Table 4?

14          A. Yes.

15          Q. It appears the enacted plan performs  
16 better than both SC-NAACP plans on county splits,  
17 County pieces of subdivision splits and subdivision  
18 pieces. Is that right?

19          A. That's right. Although I would say,  
20 particularly on subdivision splits, it's virtually  
21 the same as the second NAACP, 29 versus 30.

22          Q. And then you also looked at city splits.  
23 Is that right?

24          A. That's right. Cities and towns are in  
25 Table 5.

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1 Q. And if I understand correctly, the  
2 number listed on the left of the slash is total  
3 splits, and the number on the right is splits  
4 affecting population. Is that right?

5 A. That's exactly right.

6 Q. And in your experience as a map drawer,  
7 why might a map drawer split something that does not  
8 affect population?

9 A. One of the learning experiences for me,  
10 when I started drawing maps, was just how wild  
11 municipal boundaries can be. So what frequently  
12 happens, more in some parts of the country than  
13 others, that municipalities, as they are officially  
14 defined, may have spurs with no population.  
15 Sometimes just almost an individual line that runs  
16 out of the city and into -- for historical reasons  
17 and may run for many miles. So sometimes splits to  
18 municipalities divide these zero population spurs.  
19 And in this report I'm not offering an opinion on  
20 whether that's important or not. I'm reporting it  
21 both ways so that readers of the report can draw  
22 their own conclusions.

23 Q. And on city splits here, we will just  
24 take column one, it looks like the enacted plan  
25 performs better than SC-NAACP1 Muscatel, Harrison

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1 Sukovich and Roberts. Is that right?

2 A. Yes. And worse than SC-NAACP2

3 Harpoonian and the League.

4 Q. One more question about splits that  
5 don't affect population.

6 A. Yes.

7 Q. In your experience, or to your knowledge  
8 are there census blocks that do not contain any  
9 population?

10 A. In the 2010 census, 40 percent of the  
11 census blocks in the country had no population.

12 Q. And how about in the 2020 census, do you  
13 know one way or the other?

14 A. I actually don't know that number. I do  
15 know that one of the efforts the Census Bureau made  
16 in 2020 was to reduce the number of census blocks  
17 nationally. So I suspect that the number 40 percent  
18 has dropped. Irrespective of that, it is  
19 unquestionably the case that many blocks have no  
20 population.

21 Q. And does a map drawer have to put those  
22 blocks in a district somewhere?

23 A. That's an interesting question. It  
24 really depends.

25 One thing that stood out to me, in some

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1 of the litigation that I have been involved in, is  
2 that sometimes maps that are presented differ in how  
3 they handle which blocks have to be assigned. So I  
4 would say that there is not complete consensus on  
5 the question of which blocks have to be assigned but  
6 that, in my view, it's best practice to assign all  
7 of the blocks in the state.

8 Q. And can assigning census blocks without  
9 population help make a district to be contiguous of  
10 a particular shape or something like that?

11 A. Definitely.

12 Q. Section 4.5 addresses Incumbency. And  
13 you have listed here incumbent pairings in various  
14 plans. Is that right?

15 A. I have.

16 Q. Where did you get the incumbent  
17 residency information from?

18 A. This is from the shapefile that I  
19 mentioned with electoral data that was provided by  
20 counsel.

21 Q. And so it was preloaded in that file?  
22 You didn't get it from somewhere else or merge two  
23 files together or anything like that?

24 A. So shapefiles -- even though we say a  
25 shapefile, a shapefile is actually a collection of

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1 files. And so it's a little bit insubstantial to  
2 talk about whether things were in separate files or  
3 the same one, but it was all in the same data  
4 package. It was all in the same delivery.

5 Q. And before I go to section 5 I want to  
6 go back and just round out a few questions on this  
7 section 4.

8 A. Yes.

9 Q. Did you omit from section 4 any  
10 traditional criteria contained in the General  
11 Assembly's Guidelines?

12 A. I made an effort to address all the ones  
13 that had high billing. There isn't a numerical  
14 discussion of core retention. But again, as we  
15 reviewed when we looked at the Guidelines before,  
16 core retention is kind of packaged with other  
17 considerations in the Guidelines, and it wasn't a  
18 clear heading, in particular, in the House  
19 Guidelines. So I do not give core retention  
20 statistics across the plans but I do give core  
21 retention statistics in places where I think they  
22 are relevant in the report.

23 Q. And what about VTD splits, did you give  
24 statistics on VTD splits here?

25 A. It does not look like I did give

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1 statistics on VTD splits. I certainly could if that  
2 would be helpful.

3 Q. And did you give any statistics on  
4 partisan performance?

5 A. Not in this section because, indeed,  
6 partisan performance is not listed among the  
7 criteria in the Guidelines. But I certainly do  
8 discuss partisan performance later in my report.

9 Q. You said that you focused on the  
10 criteria that had, quote -- "high billing" I think  
11 was your phrase. Is that a phrase you used a moment  
12 ago?

13 A. I believe you.

14 Q. If I'm wrong you can correct me on the  
15 transcript. But how did you determine which  
16 criteria do or do not have high billing or otherwise  
17 merited inclusion here in section 4?

18 A. I'm referring, sort of generally, to  
19 things like being the heading of a section or being  
20 in boldface, things like that. So that, for  
21 example, if you review the House Guidelines you will  
22 see that core retention is nowhere a section header  
23 or in boldface. That is an informal  
24 characterization of the billing in the Guidelines.

25 Q. And was the General Assembly prevented

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1 from considering factors that were not in bold  
2 headings in the Guidelines?

3 A. I know of no attempt to restrain them  
4 from other considerations.

5 Q. So could the General Assembly consider  
6 criteria that were not in bold headings in the  
7 Guidelines?

8 A. Well, my view of my reading here is that  
9 they can consider anything that they want, but not  
10 at the expense of the criteria that I listed here.

11 Q. Where, in the Guidelines, does it say  
12 that they can't consider core preservation at the  
13 expense of these other criteria?

14 A. Well, let's see. Well, in particular,  
15 it says that all criteria -- I'm here reading from  
16 the House Guidelines, from the last page in Priority  
17 of Criteria. It says: If there is a conflict among  
18 the requirements of these guidelines, the  
19 requirements addressed in the first section should  
20 be given priority.

21 Let's see if I can find anything that  
22 refers to considerations outside the Guidelines.  
23 I'm not sure if that's addressed, but I will try to  
24 find out. I suppose that it is implicit in  
25 statements such as Incumbency consideration, which

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1       is listed here; therefore, it's a named principle.  
2       It shall not influence the redistricting plan to  
3       such an extent as to overtake other redistricting  
4       principles.

5                   So though it's not made explicit, I  
6       would say that a reasonable reader would conclude,  
7       quite strongly, even, that unnamed criteria also  
8       cannot overtake the redistricting principles that  
9       are here named. But I concede to you that that is  
10      just an attempt to make sense of what's written here  
11      and not explicit text.

12                  Q. And are you looking currently at the  
13       House Guidelines?

14                  A. I was just reading from the House  
15       Guidelines. Correct.

16                  Q. And can you see those on the screen now?

17                  A. Yes.

18                  Q. It takes me a moment to catch up with  
19       you, so I appreciate your patience. And the House  
20       Guidelines here, in part VII, mention Communities of  
21       Interest?

22                  A. Uh-huh.

23                  Q. Are you aware of any authority or any  
24       decisions treating existing districts and cores of  
25       districts as a community of interest?

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1 tell me what you mean by that?

2 A. Sure. The colored areas, which are the  
3 areas that were reassigned, are not one connected  
4 component or two connected components, but it looks  
5 like maybe up to ten if -- I'm informally trying to  
6 count. Some of them are large and some are so small  
7 that you have to zoom in quite far to see them. So  
8 that's what merits the colorful phrase "scattered  
9 chunks and shards."

10 Q. And when you talk about areas being  
11 large or small are you talking about geography or  
12 population?

13 A. Both.

14 Q. And these changes involved more than two  
15 districts. Is that right?

16 A. Correct. What you see here is 6 to 2, 6  
17 to 1. And what does it say here, and into 6 from  
18 the neighbors.

19 Q. And can you show here that any areas  
20 moved in or out of -- in between 6 and 5?

21 A. Unclear. That may be covered in -- let  
22 me think about that for a moment. Yeah. That's  
23 unclear because there is purple both on the south  
24 side of the map. And if you zoom in you can also  
25 see purple near Columbia. And so I'm not entirely

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1       sure whether that -- some of that may well be  
2       involving District 5. It's not identified in  
3       this -- in this plot.

4           Q. All right. And you also say that the  
5       reassignment is not aimed at healing key splits of  
6       cities and communities that were frequently cited in  
7       the public testimony, including Columbia, Sumter  
8       Orangeburg and Charleston. Is that right?

9           A. Yes, that is an accurate quote.

10          Q. Do either the House or the Senate  
11       Guidelines say anything about these particular  
12       communities and whether they should be split or  
13       reunified?

14          A. These communities are not named in the  
15       Guidelines.

16          Q. Were any of these communities split in  
17       the benchmark plan from 2010?

18          A. I think it's implied here, by the word  
19       "healing," that they were split. And when I say  
20       that they are not aimed at healing, I mean those  
21       splits were not addressed or lessened in the move  
22       from the benchmark to the enacted plan.

23          Q. How did you identify these four  
24       communities of interest for this portion of your  
25       report?

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1           A. I read all of the public testimony and  
2 made a good-faith effort to summarize and synthesize  
3 it.

4           Q. So it's fair to say you read the public  
5 hearing transcripts and then drew conclusions based  
6 on that reading. Is that right?

7           A. That's right.

8           Q. And have you ever used that method  
9 before in any of your prior expert reports?

10          A. Let's see. I'm trying to think those  
11 through. I certainly have used selections from  
12 public hearing testimony before, but I will say that  
13 in many of my prior expert reports the state  
14 collected not only oral testimony, narrative  
15 testimony, but also collected maps. And when the  
16 state collects maps it's possible to synthesize  
17 those as a matter of data science. When the state  
18 collects only narratives, it is much more difficult  
19 to synthesize precisely.

20          Q. So in any of your prior expert reports  
21 have you done what you did here, which was to read  
22 all the public hearing testimony and then identify  
23 certain communities within that testimony?

24          A. Yes, and particular in Wisconsin.

25          Q. And so --

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1           A. Sorry. Excuse me. It's also addressing  
2         the South Carolina State House districts also in  
3         that report.

4           Q. Got it. And do you have -- is there any  
5         support or discussion of this particular method in  
6         any academic literature that you're aware of?

7           A. That is, is there any discussion of the  
8         method of using public testimony to identify  
9         communities of interest?

10          Q. To identify a subset of communities of  
11         interest.

12          A. I'm sorry. Could you rephrase?

13          Q. Sure. Let me ask you this: Were these  
14         the only four communities of interest identified in  
15         the public testimony?

16          A. I see. No, certainly not. Thank you  
17         for rephrasing.

18          Q. Yeah. Sorry.

19           Okay. So I want to understand how you  
20         identified these four out of the various communities  
21         of interest that were identified in the public  
22         hearing testimony. So can you tell me why you  
23         identified these four, as opposed to other  
24         communities of interest?

25          A. Sure. And incidentally, if you look at

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1       Figure 13 in my report, which is on page 30, you  
2       will see one, two, three, four -- five areas  
3       highlighted, which I call "A selection of COIs  
4       identified in public testimony." So this is page  
5       30.

6           Q. Right. I think I'm there. I'm sorry.  
7       These are different than what you have got in the  
8       form we were just talking about. Correct?

9           A. To be clear, this is labeled "A  
10       selection." But yeah, let me try to restate and  
11       clarify the broader point that I'm making.

12           The testimony in South Carolina, which I  
13       made a significant effort to contend with in its  
14       entirety, was exclusively narrative. And that makes  
15       it quite challenging to do what a data scientist  
16       would call operationalizing the testimony into  
17       chunks that you might consider individual COIs.  
18       However, I have made a good-faith effort to do that  
19       by looking for themes in the public testimony and  
20       trying to do so in an even-handed way.

21           Q. How did you determine which communities  
22       of interest discussed in the public hearing  
23       testimony to include in your report?

24           A. I attempted to find the ones most  
25       frequently discussed and most explicitly delineated.

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1 It is a good-faith effort to do just that.

2 Q. And as part of that good-faith effort  
3 did you count the number of comments or the number  
4 of commenters? I'm just trying to understand how  
5 you determined what was getting more or less  
6 emphasis than something else.

7 A. To be clear, I would have greatly  
8 preferred a more data-intensive record. But from  
9 the narrative record I made a complete but  
10 qualitative review.

11 Q. And are you aware of any academic  
12 literature that discusses, supports or endorses the  
13 kind of qualitative review you undertook here?

14 A. Well, I have a book chapter that  
15 discusses the use of public testimony. I have a  
16 paper under review that discusses the quantification  
17 methods you can use when that testimony is  
18 accompanied with maps. I'm trying to think of other  
19 examples.

20 Generally, I would say there is a  
21 shortage of peer-reviewed work on communities of  
22 interest, generally; something I hope to address in  
23 the coming months and years.

24 Q. And to the extent that that literature  
25 exists, I think I heard you say that it was a

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1 quantification or quantitative analysis in  
2 communities of interest. Is that right?

3 A. I think maybe a good way to answer your  
4 question would be to say what academic domain this  
5 falls in. So this falls in an area that has a huge  
6 literature called "participatory mapping" that's  
7 part of the academic geography literature. I would  
8 say there are hundreds of papers on participatory  
9 mapping and the idea of taking seriously public  
10 input, grass-roots input. So I don't know that any  
11 of those papers focuses specifically on applications  
12 to redistricting, but there is really no shortage of  
13 both qualitative and quantitative support for the idea  
14 of community mapping.

15 Q. And here I'm just looking for a simple  
16 yes or no answer to this next question.

17 A. Sure.

18 Q. Is there any academic literature that  
19 discusses the method you used here, in this report,  
20 this specific method?

21 A. I'm trying to give you the yes or no  
22 answer. I would say the detailed method used here,  
23 no.

24 Q. Okay. Thank you. And how about are you  
25 aware of any court decisions or opinions discussing

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1 the detailed method that you employed here in this  
2 report?

3 A. All right. I do think -- and please  
4 tell me if this is responsive to your question  
5 because I'm sincerely trying to be, I do think there  
6 are cases where courts have taken, quite seriously,  
7 informal communities of interest, as reflected in  
8 the public record. For instance, in Texas.

9 Q. And I'm looking for just a yes or no  
10 answer to the next question.

11 A. Sure.

12 Q. Are you aware, one way or the other,  
13 whether any court has discussed the specific method  
14 you used in this report?

15 A. While I would love to give you a simple  
16 yes or no, I think too much hinges on what's meant  
17 by "the specific method." I'm sorry. But I would  
18 say that I'm trying to follow what I take to be the  
19 way courts have used communities of interest. I am  
20 trying to follow that here to the best of my ability  
21 with the public record available.

22 Q. Is public testimony in a redistricting  
23 record statistically random?

24 A. I don't understand the question.

25 Q. Is public testimony -- who can provide

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1 public testimony?

2 A. Okay. In many states anyone can. For  
3 instance, the cycle in Michigan, the commission  
4 debated whether only residents could provide  
5 testimony and decided that it would be open to  
6 anyone.

7 Q. And among the people who show up to  
8 testify, for example, are they a statistically  
9 random sample of the statewide population?

10 A. I'm not sure I understand what that  
11 would mean, but I think the spirit is are they --  
12 are there any statistics gathered on commenters. Am  
13 I understanding right?

14 Q. Well, what I really want to understand  
15 is, are commenters, whoever shows up to comment in a  
16 public -- in public hearing, can we extrapolate from  
17 that that their views represent the views of the  
18 entire state or the populous at large from which  
19 they are drawn?

20 A. Well, certainly not. With any public  
21 anticipatory effort there is always going to be a  
22 kind of small sample. And it's hard to say exactly  
23 what that might represent in terms of the overall  
24 views of all residents, all adults, all voters or  
25 some other universe.

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1           Q. So if I can just briefly summarize, the  
2 public testimony does not necessarily represent the  
3 views of all voters or all residents of the state.  
4 Is that correct?

5           A. It certainly does not represent the  
6 views of all voters. It could not.

7           Q. And I think you said that you were  
8 looking for communities of interest that got  
9 particular focus or emphasis in the public hearing  
10 testimony. Is that right?

11          A. That's right. I looked for themes, is  
12 the phrase that I used.

13          Q. And so would those communities of  
14 interest necessarily be a point of focus or emphasis  
15 for all voters or all individuals in the state?

16          A. Again, I clearly concede that there is  
17 no way testimony could possibly capture everything.  
18 That's certain.

19          Q. But would the weight of that testimony  
20 be representative of the weight of the views among  
21 all residents or all voters in the state?

22          A. Well, I believe that it's the best we  
23 have, that, in fact, considerable effort was  
24 expended by the State to collect it. And it strikes  
25 me that it would be misuse of that time and those

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1 resources not to take it seriously as the best  
2 record we have of residents characterizing their own  
3 communities.

4 Q. And regardless of whether it is the best  
5 we have or is something that the General Assembly  
6 should have, could have or did, in fact, take  
7 account of, I'm asking a slightly different  
8 question, which is, do the points of emphasis -- can  
9 you say, one way or the other, whether the points of  
10 emphasis in the public testimony accurately  
11 represent the views of the points of emphasis of the  
12 populous generally in South Carolina?

13 A. I think it's reasonable to assume a  
14 correlation. Is that what you mean? It's not going  
15 to be the entirety, necessarily, but I think it's  
16 reasonable to assume correlation.

17 Q. And have you conducted any analysis,  
18 either survey analysis or anything like that to try  
19 to capture the views of individuals who did not  
20 provide public hearing testimony with respect to  
21 communities of interest?

22 A. In South Carolina, certainly not.

23 Q. And did plaintiff's counsel ever  
24 instruct you to focus, back on page 15, on these  
25 four communities, Columbia, Sumter, Orangeburg and

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1           Charleston?

2           A.     No. These were my own choices.

3           Q.     And I think you have already testified  
4               that there were other communities of interest  
5               identified in the public hearing testimony. Is that  
6               right?

7           A.     Yes. I would estimate that the public  
8               testimony probably runs to over 1,000 pages. So it  
9               certainly discusses many other areas.

10          Q.     That sounds low to me, even, 1,000  
11          pages.

12          A.     I'm trying to be conservative with my  
13          numbers.

14          Q.     That makes sense. Okay.

15           So let's move on to 5.1, District One.  
16           And you again -- is this a choropleth. Am I saying  
17           that right, choropleth here, Figure 4?

18          A.     It is, highlighting District 1.

19          Q.     All right. So you mention here, under A  
20          is the Jasper County split. And you note that two  
21          Jasper County precincts are included in the new  
22          District 1. Is that right?

23          A.     That's right.

24          Q.     Are you aware of any public testimony  
25          that supported splitting these two precincts from

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1 the rest of Jasper County?

2 A. Off the top of my head, no. If I go to  
3 selections from public testimony, I see that I have  
4 included, on page 31, one selection, which is Mary  
5 Ann Bromley who says: "The economic importance of  
6 the Jasper Port Project is an excellent example of a  
7 shared community of interest for residents of both  
8 counties in that area." So if anything, Bromley's  
9 quote goes to the idea that this area should be kept  
10 together.

11 Q. And are you aware of any other testimony  
12 in the public record or do you recall any today that  
13 might actually support this split of Jasper County?

14 A. No. It's entirely possible that there  
15 is some.

16 Q. And the next, under B you mention  
17 Dorchester County.

18 A. Yes.

19 Q. And was Dorchester split in the  
20 benchmark plan?

21 A. Let's see. I don't mention that here  
22 and so I don't have materials in front of me to make  
23 that determination.

24 Q. And are you aware of any public  
25 testimony that supported splitting Dorchester

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1 alternative districting plans that operationalize  
2 the rules as I understand them.

3 Q. Has the ensemble method been accepted by  
4 any court in a racial gerrymandering case?

5 A. I could not answer authoritatively  
6 whether any court has accepted ensembles in a racial  
7 gerrymandering context, but I have been involved, as  
8 I mentioned before, in numerous cases in the cycle  
9 in which ensemble evidence was used, including in a  
10 racial fairness context.

11 Q. So as I understand the ensemble method,  
12 you program an algorithm to consider certain rules,  
13 and then the algorithm generates plans based upon  
14 those rules. Is that right?

15 A. Yes, that's right, broadly.

16 Q. Okay. I would like to understand a  
17 little bit better what you program the algorithm to  
18 do.

19 A. Yes.

20 Q. So I think we are on page 22 here.

21 A. Sure.

22 Q. First you say: "Population balance and  
23 contiguity are enforced throughout the algorithm?"

24 A. Yes.

25 Q. What standard of population balance did

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1 you use?

2 A. This is described in a bit more detail  
3 on page 29 where I explain that I compared runs with  
4 a population deviation of 2 percent, 1 percent and  
5 half a percent. There is a supplementary kind of  
6 analysis that helps to increase my confidence that  
7 the population balance enforced by the algorithm is  
8 appropriate to the problem at hand, and that is to  
9 experiment with tuning those plans from the ensemble  
10 to one-person deviation. So should I describe that?

11 Q. Please.

12 A. I don't want to give any more details  
13 than you want, because I know I can get away into  
14 the weeds on this.

15 Q. Please go ahead.

16 A. Sure. Okay. So I have two kinds of  
17 tuning protocols that I use to convince myself that  
18 in a particular redistricting setting a 1 percent,  
19 say, deviation is adequate to understand  
20 Congressional redistricting in which, as we have  
21 already discussed, the usual standard for adoption  
22 is a one-person deviation.

23 So I have done -- I routinely do two  
24 kinds of analysis, and did try them here in South  
25 Carolina, and those are to run an auto-tuning

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1       algorithm that swaps blocks at a small level until  
2       the population is tuned to one person, and to have a  
3       human, in this case me, hand-tune the maps to a  
4       one-person deviation. And the purpose of those  
5       tuning experiments is to boost my confidence that  
6       1 percent maps can quickly be tuned to one person  
7       without breaking any of their metric properties.  
8       That is the kind of justification that is properly  
9       done, in my view, to build ensembles at something  
10      like 1 percent deviation and to have a high  
11      confidence that they will be relevant to one-person  
12      redistricting requirements.

13           Q. I would like to turn back now to page 22  
14       and then carry it over -- you mention several  
15       ensembles of 100,000 alternative plans each.

16           A. Yes.

17           Q. Were any of those plans drawn to a  
18       one-person, top-to-bottom deviation?

19           A. I can't say whether that occurred in the  
20       1 percent ensembles, but I can say that I  
21       experimented with tuning selected plans from the  
22       ensembles and always found it to be quickly tunable  
23       to one person without breaking the other relevant  
24       properties.

25           Q. And with respect to -- just so I

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1 understand, these 100,000 alternative plans each, or  
2 however many the total number was, were drawn with a  
3 population deviation as great as 2 percent. Is that  
4 right?

5 A. The ones that appear in the figures are  
6 drawn with 1 percent. That's right.

7 Q. And by "the figures," do you mean, for  
8 example, Figure 10 here on page 23?

9 A. There are exactly three figures that use  
10 ensembles, and those are Figures 10, 11 and 12.

11 Q. All right. Now back to page 22, I think  
12 you said the ensemble method is implemented with a  
13 presence for compactness --

14 A. That's right.

15 Q. -- for the preservation of counties and  
16 municipalities.

17 A. That's right.

18 Q. Can you tell me what you did to program  
19 these preferences in the algorithm?

20 A. I certainly can. And here you should  
21 give me guidance as to the detail level that you  
22 like because, to me, this is a really fascinating  
23 research area. So I will try first with a high  
24 level of generality, and then just tell me how  
25 specific you would like to get.

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1               Okay. The ensemble method here is  
2 conducted with what's called a "Markov chain." And  
3 Markov chains are sequences of random  
4 transformations. In this case, an innovation that  
5 my research group has introduced into the field of  
6 computational redistricting is the use of what are  
7 called "spanning trees." Spanning trees. And the  
8 process of moving from plan to plan is to fuse two  
9 districts, select a random spanning tree, cut that  
10 tree and that produces two new districts. That  
11 process has been analyzed in multiple peer-reviewed  
12 papers as one that promotes compactness. And the  
13 way that it does that is to up-weight -- so all of  
14 these Markov chain methods employ randomness. And  
15 that means they are probabilistic. These methods  
16 put a much higher probability on selecting a plan  
17 that is more compact in a metric that relates  
18 closely to the block cut edges metric that was  
19 discussed earlier. So it is not certain that you  
20 will choose a compact plan, but it is far more  
21 likely that you will choose a more compact plan.  
22 And, in fact, how much more likely it is is in  
23 proportion to that compactness. That's how  
24 compactness is promoted. Is that the right level of  
25 detail?

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1 Q. That's fine.

2 How about preservation of counties and  
3 municipalities?

4 A. That's done differently. And this is  
5 also something that I think is quite conceptually  
6 powerful. Here is how that's done. So it mentions  
7 that when you fuse two districts you then draw, at  
8 random, an object called a "spanning tree." Now,  
9 there are several randomized algorithms for choosing  
10 spanning trees. You could choose them uniformly,  
11 but an even faster and more efficient thing to do is  
12 to put random weights on the edges and then choose a  
13 minimum-weight spanning tree. Sorry to be a math  
14 professor, but that's how -- for a moment I will  
15 need to do that to explain this properly. So there  
16 is a classic algorithm to do that called "Kruskal's  
17 algorithm," which is what we use.

18 What we do to promote the integrity of  
19 counties and cities is to put different weights on  
20 edges within a county and edges between counties.  
21 By putting a higher weight on edges within counties,  
22 we tend to probabilistically prioritize trees that  
23 stay within the county. And that means when you cut  
24 an edge of the tree it becomes far more likely that  
25 counties will be kept together.

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1                  One thing I will add is that our method  
2 has a feature that I think is very helpful for  
3 problems for applications to redistricting, which is  
4 because this is done with a random weight, the  
5 importance placed on county preservation can be  
6 interpolated between zero and 100 percent. So if  
7 you find that full weight on county preservation  
8 goes too far and produces maps that cut way fewer  
9 counties than the ones made by people, you can dial  
10 down the weight on county preservation in order to  
11 be producing maps that are similar to the ones that  
12 were made by the decision-makers.

13                In this case of South Carolina, we found  
14 that the number of county splits in our ensemble was  
15 comparable to some of the better maps made by  
16 people. And that's a way of telling that you  
17 haven't overshot the mark.

18                Q. And that particular conclusion about  
19 county splits being comparable to other plans, is  
20 that anywhere in your report?

21                A. That sentence, no. That's a standard  
22 element of the methodology which I described in  
23 peer-reviewed articles also.

24                Q. Just so I understand, when you talk  
25 about a preference for compactness and preservation,

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1       that's a preference with respect to other plans  
2       drawn in the ensemble plans. Is that right?

3           A. That's right. You should imagine that  
4       there are trillions of possible plans, and each of  
5       them is being selected by the algorithm with some  
6       probability. So "preference" means a higher  
7       probability weight on plans that are more compact  
8       and split fewer counties.

9           Q. Your next sentence says: "I performed  
10      runs which attempt to prioritize the preservation of  
11      certain communities of interest identified in public  
12      testimony and runs that did not operationalize the  
13      COI concept." Which communities of interest did you  
14      attempt to prioritize?

15           A. That's precisely the ones shown in  
16      Figure 13 on page 30, exactly those.

17           Q. How did you choose those communities of  
18      interest to prioritize?

19           A. I believe we discussed that at some  
20      length before lunch.

21           Q. Is it the same method?

22           A. Oh, absolutely. This is -- the idea  
23      here was to make a good-faith effort to complete a  
24      thorough review of public testimony, find places  
25      frequently mentioned, try to understand the reasons

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1 people gave for citing these communities, make sure  
2 they were in line with reasons named by the State as  
3 legitimate, and recognizing this as selective to  
4 operationalize this as a working concept. Let me  
5 emphasize, when I say this, I certainly do not  
6 represent this as the only way of taking COIs into  
7 account. This is part of a robustness check that I  
8 like to perform whenever I do ensemble analysis to  
9 show that at least some effort to keep COIs whole  
10 wasn't having a wholesale distorting effect on the  
11 other measurable properties of the plans. And I can  
12 confirm that it was not.

13 So the idea here is to have this toggle,  
14 COI toggle. Turn it on and there is one particular  
15 way. Turn it off, see if that changes the  
16 measurable properties and the plans that are  
17 relevant in Figures 10, 11 and 12. I find that it  
18 does not.

19 Q. And when you say, "did not  
20 operationalize the COI concept," for a layperson  
21 like me does that mean turning off COI toggle, to  
22 borrow your analogy?

23 A. That's exactly what I mean.

24 Q. The next sentence says that: "Ensemble  
25 generation made no use of race data." Does that

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1 mean that you turned off race data in the ensemble  
2 plans or something else?

3 A. That means that the algorithm does not  
4 use the race field.

5 I want to say something that I think is  
6 very important for reasoning about ensembles and  
7 race, which is, I think that everything else that's  
8 in the ensemble has racial factors subtly proxied.  
9 For example, the boundaries of counties and  
10 municipalities can well have an important racial  
11 history. And I don't mean to deny that at all, only  
12 to say that in this collection of ensemble runs the  
13 race field and the data was simply not used by the  
14 algorithm.

15 Q. And the rest of that sentence says that  
16 the plans are neutral with respect to all other  
17 properties except those listed here. Does that mean  
18 the ensemble plans don't consider data on other  
19 traditional districting principles or those  
20 principles at all?

21 A. It does mean that. And it also means  
22 something stronger, which is that the -- those of us  
23 who study computational redistricting, we think  
24 about, as I was referring to earlier, the  
25 probability distribution from which we are sampling.

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1       So I'm not only saying that we didn't use a field in  
2       the data that has to do with other features, I'm  
3       also saying that I can characterize the limiting  
4       distribution and it depends only on the named  
5       features, the limiting distribution does, which is  
6       to say -- well, let me rephrase that in a way that I  
7       think is maybe clearer. If you take two plans and  
8       you ask how much more likely is it to see this than  
9       this, I can answer that quantitatively. And I know  
10      that it depends only on the things that are  
11      described here.

12           Q. So when the algorithm is drawing the  
13       plans in the ensemble approach or in the ensemble  
14       plans does it consider preservation of cores?

15           A. I have done that in some studies. I did  
16       not do that here.

17           Q. Okay. And focusing again on what you  
18       did here for South Carolina on the Congressional  
19       plan, does the algorithm consider VTD splits?

20           A. Yes. Because it only builds from whole  
21       VTDs. It does not split any VTDs.

22           Q. And does it consider partisan  
23       performance in any districts?

24           A. Certainly not.

25           Q. How about incumbency pairing?

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1           A.    Can I do that here? I did look at  
2       inc incumbency in the South Carolina House, but I think  
3       for Congress I did not. Let me look again at the  
4       description in appendix A. I don't see incumbency  
5       described. And that means in this report I did not  
6       look at incumbencies.

7           Q.    Section 6.1 is a statewide analysis --  
8       or at least it's headed as a statewide analysis.  
9       And you say -- and I don't mean to suggest it's not.  
10      I'm just trying to be as accurate as you are, which  
11      you're setting a high standard. The first sentence  
12      says: "Using neutral ensembles of districting maps,  
13      we can compare the properties of a plan to  
14      alternative statewide plans that were made under  
15      traditional criteria." Are these alternative  
16      statewide plans that were made under traditional  
17      criteria the ensemble plans made with the parameters  
18      we have been discussing?

19           A.    Yes, that's right.

20           Q.    Or art they different? There are not  
21      any different set of plans?

22           A.    No. We just described the comparative.

23           Q.    Okay. And as I understand what you have  
24      shown here, we will move here to District -- maybe  
25      to Figure 10, but I think it's also on page 22, what

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1 minority opportunity as opposed to higher core  
2 retention, yes. I think that is directed, but I  
3 wouldn't say required.

4 Q. So let me rephrase and see if I  
5 understand your point. Is it your reading that the  
6 Guidelines direct the General Assembly not to trade  
7 off compliance with some other principle at the  
8 expense of minority voting opportunity?

9 A. So sorry, but I think my entering got  
10 cut out in the middle of your sentence. Can you  
11 repeat that?

12 Q. It was such a good sentence, I don't  
13 know, but I will try. Is it your reading of the  
14 Guidelines that the Guidelines direct the General  
15 Assembly not to trade off less minority voting  
16 opportunity for better compliance with the other  
17 principles in the Guidelines or considerations in  
18 the Guidelines?

19 A. Well, an exception might be population  
20 balance, which is in the first tier here. But  
21 specifically as to core retention, my reading is  
22 that they are directed to prioritize minority  
23 electoral opportunity over core retention. That's  
24 correct.

25 Q. And what about over other principles

Moon Duchin , PhD  
The South Carolina State Confvs.McMaster/Alexander

July 14, 2022

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1 that you have placed in the second tier?

2 A. Okay. Let's review. Yes. I think it  
3 says the requirements addressed in sections 1, 2, 3  
4 and 4 should be given priority if there is a  
5 conflict.

6 Q. So on your reading, the Guidelines  
7 direct the General Assembly to maximize voting --  
8 minority voting strength to the extent it can do so  
9 while trading off compliance with the second-tier  
10 considerations?

11 A. I would shy away from the word  
12 "maximize" which has a very specific meaning for me.  
13 I don't think there is maximization here. But I do  
14 think that, again, to quote, if there is a conflict,  
15 the requirements that include minority electoral  
16 opportunity should be given priority. So they are  
17 directed, in case of conflict, to prioritize  
18 minority electoral opportunity over compactness over  
19 district cores and so on.

20 Q. So this is helpful, but let me ask it  
21 another way, if that's okay. We talked earlier that  
22 redistricting involves tradeoffs. Right? That the  
23 criteria may cut in different directions or that a  
24 map drawer may prioritize one criterion or  
25 consideration over another and that tradeoffs are

Moon Duchin , PhD  
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1 part and parcel of redistricting. Is that right?

2 A. Yes.

3 Q. Is it your reading that the Guidelines  
4 direct the General Assembly, when faced with such  
5 tradeoff between minority voting strength on the one  
6 hand and a second-tier consideration on the other  
7 hand, to choose the option that prioritizes minority  
8 voting strength?

9 A. I think that's the plain language here.  
10 And let me stipulate that I might not have written  
11 it exactly this way. But reading the way they wrote  
12 it, I do think that's what they say.

13 Q. Okay. And have you discussed the  
14 Guidelines with whoever wrote them?

15 A. I certainly haven't. And I have no idea  
16 who wrote them.

17 Q. And do you know one way or another  
18 whether the standard in the Guidelines was simply  
19 meant to be an articulation of what Section 2 of the  
20 Voting Rights Act requires?

21 A. Not simply. It says that it goes beyond  
22 the Voting Rights Act. And both sets of the  
23 Guidelines reference other principles such as equal  
24 protection. So it's not simply a recording of  
25 Section 2.

Page 1

1                   UNITED STATES DISTRICT COURT  
2                   DISTRICT OF SOUTH CAROLINA  
3                   COLUMBIA DIVISION  
4                   THE SOUTH CAROLINA  
5                   STATE CONFERENCE OF  
6                   THE NAACP, et al,  
7                   Plaintiffs,  
8                   vs.                   CASE NO.  
9                   3:21-CV-03302-MBS-TJH-RMG

10                  THOMAS C. ALEXANDER,  
11                  et al,

12                  Defendants.

13                  VIDEOCONFERENCE  
14                  DEPOSITION OF: WILLIAM ROBERTS  
15                  DATE:               July 7, 2022  
16                  TIME:              9:35 a.m.  
17                  LOCATION:         1310 Gadsden Street  
18                                   Mahogany Conference Room  
19                                   Columbia, SC  
20                  TAKEN BY:         Counsel for the Plaintiffs  
21                  REPORTED BY:     ERIC GLAZIER, Court Reporter  
22  
23  
24  
25

1       boundaries is there, as well as minimizing  
2       divisions of voting precinct boundaries.

3           Q.     But you'd agree that ease of election  
4       administration is not something that is within  
5       these guidelines?

6           DEFENSE COUNSEL: Objection.

7       Mischaracterizes testimony.

8           A.     When you minimize divisions of county  
9       boundaries and you minimize divisions of voting  
10      precincts, you in fact make the election  
11      administration easier.

12          Q.     How would somebody from a member of the  
13      public know that in reading these three criteria?

14          A.     If they worked in elections, they would  
15      understand that.

16          Q.     So only people who worked in elections  
17      would understand that point?

18          A.     Not necessarily, but they would get the  
19      gist of how this plays into the ease of election  
20      administration.

21          Q.     Did you at all disclose in any of your  
22      testimony to the public that ease of election  
23      administration was a consideration?

24          A.     Not that I can recall.

25          Q.     For district compactness, in F, who was

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1 responsible at all for assessing compactness of  
2 proposed districts or plans?

3 A. That would have been something that we  
4 used the eye test on. And that would have been the  
5 core redistricting staff would look at the plans.

6 Q. What's the eye test?

7 A. Looking at a district and seeing how  
8 compact it is, seeing if there's any bizarre  
9 outlier shapes or anything to the district.

10 Q. Are you aware that there are techniques  
11 for measuring compactness?

12 A. Yes.

13 Q. Do you rely on any of those techniques  
14 in your redistricting work outside of the  
15 congressional redistricting process?

16 A. No.

17 Q. You use the eye test for all the maps  
18 that you've worked on for compactness?

19 A. That's correct. We did run one report,  
20 getting the different algorithms that were  
21 available in the software, but no one knew exactly  
22 what we were looking at, so we used the eye test.

23 Q. After each map was drawn, was there  
24 anything provided to members, the redistricting  
25 subcommittee, on compactness assessment or

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1 it might be. I might have mislabeled this one.

2 Do you want to just take a minute to  
3 review this, what's on the screen, if helpful?

4 DEFENSE COUNSEL: Is this on the  
5 website, John?

6 MR. CUSICK: Yeah, this is pulled  
7 directly from the senate -- it's a press release  
8 from the senate redistricting subcommittee.

9 DEFENSE COUNSEL: I'm handing Will my  
10 computer. I just pulled it up --

11 MR. CUSICK: Perfect.

12 DEFENSE COUNSEL: -- so he can see it  
13 on the screen as well.

14 BY MR. CUSICK:

15 Q. And so here, it states in the first  
16 sentence, the senate redistricting subcommittee has  
17 posted two proposed congressional plans to be  
18 considered, one of which was referred to generally  
19 as the senate amendment one plan and the other was  
20 by Senator Harpoortlian.

21 Do you recall that?

22 A. I'd have to go back and look at what's  
23 posted online. I don't -- I couldn't tell you what  
24 these were referring to in this, which two plans.

25 Q. After the initial staff plan, did you

Page 201

1 work on a second map that was publicly posted and  
2 shared?

3 A. Yes. That would have been the senate  
4 amendment one plan.

5 Q. Yeah.

6 And can you walk me -- who was involved  
7 in the senate amendment one plan's creation?

8 A. That would have been the core  
9 redistricting group of Andy Fiffick, Charlie  
10 Terreni, myself, Breeden John, and Paula Benson.

11 Q. Anyone else?

12 A. Possibly Maura Baker or Madison Faulk.  
13 They were in and out of the room.

14 Q. And were there any differences in the  
15 data you had available to you for the creation  
16 of -- or the creation of that map versus the senate  
17 staff plan?

18 A. Not that I can recall. I think we used  
19 the same data throughout the redistricting process.

20 Q. Did you rely on the same priority  
21 criteria in drawing that map?

22 A. The map that was released as senate  
23 amendment one was -- had the same criteria,  
24 especially the don't touch the Seventh, Congressman  
25 Clyburn wants a minimal change, Joe Wilson wants

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1           Fort Jackson, and don't go to Beaufort.

2                   And then we took -- and that created  
3                   the original staff plan, and then we took the  
4                   public input that we received on the original staff  
5                   plan and made some modifications to the staff plan  
6                   to create this one.

7                   Q.     Got it.

8                   Did any members -- any senate  
9                   redistricting subcommittee members have input in  
10                  this -- in senate amendment one?

11                  A.     Senator Campsen -- this is the one --  
12                  this is -- Senator Campsen possibly could have had  
13                  some input on this, this being the vehicle that was  
14                  moving forward.

15                  Q.     Anyone else outside of Senator Campsen  
16                  that's part of the redistricting subcommittee?

17                  A.     Not that I can recall.

18                  Q.     And this is mainly just to make sure I  
19                  know if there are any differences, but were there  
20                  any changes in who was responsible for providing  
21                  legal advice on this proposal based on the initial  
22                  staff plan?

23                  A.     Can you repeat that one more time?

24                  Q.     Any differences in the make-up of  
25                  people who might have provided legal advice on this

Page 50

1                   JOHN

2        office had created?

3           A. No. I wasn't sure who  
4        created it. Like I said, I got  
5        there a little bit late so I didn't  
6        know if they had talked about that  
7        before I got there or not, but I  
8        didn't ask who created it.

9           Q. Did you understand any of  
10      the -- Mr. Tresvant? Is that right?

11       A. Yes, Tresvant.

12       Q. Did you understand any of  
13      the suggestions to be requests on  
14      behalf of Congressman Clyburn or  
15      more informal discussions about the  
16      district?

17       A. It was more informal  
18      discussions less so not requests  
19      just kind of maybe a statement of  
20      preferences, you know, it would be  
21      nice if X area was included but it  
22      wasn't a specific request.

23       Q. Were you involved at all in  
24      any follow-up with anyone else from  
25      Representative Clyburn's office

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1                   JOHN

2       after this meeting?

3       A.     No.

4       Q.     Did you have any other  
5     conversations or become aware of  
6     conversations about any other  
7     suggestions or thoughts from  
8     Representative Clyburn's office?

9       A.     No, not that I recall.

10      Q.     Were you involved in any  
11     discussions with anyone from  
12     Congressman Wilson's office?

13      A.     I was in the room while  
14     Charlie Terreni spoke with, I think  
15     it was directly with Congressman  
16     Wilson or it could have been a  
17     staffer. So I guess I overheard a  
18     conversation but I wasn't really  
19     involved.

20      Q.     Was that in -- I assume it  
21     was -- was that in Senator Rankin's  
22     office too?

23      A.     Yes, it was.

24      Q.     Do you recall how long that  
25     meeting was?

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1                           JOHN

2                           A. That phone conversation was  
3                           fairly short. Five minutes at the  
4                           most I would think.

5                           Q. You mentioned you weren't  
6                           part of the conversation. Did you  
7                           and Mr. Terreni have any  
8                           conversation after it with any  
9                           feedback or debrief?

10                          A. We just kind of talked  
11                          about what they discussed on the  
12                          phone and it was -- again it was  
13                          Mr. Terreni, Fiffick, Will Roberts,  
14                          myself. We were working -- we were  
15                          just working on maps and I don't  
16                          remember what spurred the  
17                          conversation but he called the  
18                          Congressman. He called whoever it  
19                          was he spoke with, whether it was  
20                          the Congressman or a staffer I don't  
21                          recall exactly but they just talked  
22                          about -- about the districts. I  
23                          don't recall -- I don't think that  
24                          -- I know it was prior to the Senate  
25                          releasing their staff congressional

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1                           JOHN

2       plan and I don't think that the  
3       House had put anything out yet. So  
4       I don't exactly remember what the  
5       impetus was for the conversation.

6       Q.     Do you recall any feedback  
7       from either Congressman Wilson or  
8       his office on how CD 2 should be  
9       drawn?

10      A.     Yes. I remember their  
11       express interest in Fort Jackson  
12       being included in the 2nd. That was  
13       really the only specific area I  
14       recall.

15      Q.     Were you involved in any  
16       follow-up after that initial  
17       meeting?

18      A.     No.

19      Q.     Did you at all become aware  
20       of any additional feedback from  
21       Congressman Wilson's office on any  
22       proposed maps by the Senate  
23       subcommittee?

24      A.     No, not that I recall.

25      Q.     Were you at all involved in

Page 54

1                   JOHN

2       any discussions with Congresswoman  
3       Mace's office about CD 1?

4       A.     No.

5       Q.     Do you recall receiving any  
6       feedback from other members of the  
7       Senate staff regarding input from  
8       Congresswoman Mace's office?

9       A.     No, I don't.

10      Q.     What about any feedback or  
11     conversations with Congressman  
12     Rice's office?

13      A.     No.

14      Q.     Outside of these members  
15     any other members of Congress or  
16     former members of Congress that you  
17     recall speaking to during the  
18     congressional redistricting process?

19      A.     None that I spoke to.

20      Q.     Who else were you aware of  
21     that was -- had conversations?

22      A.     Andy Fiffick spoke with  
23     Congressman Timmons at one point.

24      Q.     Anyone else?

25      A.     That's all I remember.

Page 55

1                   JOHN

2                 Q. Did you receive any  
3                 instructions for how you should  
4                 assess or evaluate any of the  
5                 feedback you received from members  
6                 of Congress in drawing maps?

7                 A. Not particularly.

8                 Q. Would you consider  
9                 suggestions they had of equal weight  
10                to members of the public?

11                A. Yes, for the most part.

12               The feedback that we got from them I  
13               would say yes for the most part.

14               Q. Were there any political  
15               organizations that you had  
16               conversations with?

17               A. No.

18               Q. Anyone obvious working on  
19               behalf of any organizations?

20               A. No.

21               Q. Any consultants?

22               A. No.

23               Q. Lobbyists?

24               A. I did speak with Dr. John  
25               Ruoff, R-U-O-F-F. He was working

Page 1

1                   **UNITED STATES DISTRICT COURT**  
2                   FOR THE DISTRICT OF SOUTH CAROLINA  
3                   COLUMBIA DIVISION

4                   THE SOUTH CAROLINA                   )  
5                   STATE CONFERENCE OF                )  
6                   THE NAACP, et al.,                )  
7                   )                                  )  
8                   Plaintiffs,                        )                                  Case No. 3:21-CV-03302-MGL-  
9                   )                                  )                                  TJH-RMG  
10                  vs.                                 )  
11                  )                                  )  
12                  )                                  )  
13                  THOMAS C.                            )  
14                  ALEXANDER, et al.,                )  
15                  )                                  )  
16                  )                                  )  
17                  Defendants.                        )  
18                  )                                  )

19  
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23  
24                  Videotaped Remote Deposition of  
25                  SENATOR GEORGE EARLE CAMPSEN, III  
26                  (Taken by Plaintiffs)  
27                  Isle of Palms, South Carolina  
28                  Friday, August 5, 2022

29  
30  
31  
32  
33  
34                  Reported in Stenotype by  
35                  Lauren M. McIntee, RPR, CRR  
36                  Transcript produced by computer-aided transcription

<p style="text-align: right;">Page 134</p> <p>1 A. No. They're the ones who rendered those 2 opinions.</p> <p>3 Q. Based on your work as a subcommittee member, 4 did you have any understanding of what test might be 5 needed to assess concerns about racial gerrymandering?</p> <p>6 A. Yes, I did. Yeah.</p> <p>7 Q. And what's your understanding --</p> <p>8 A. I wasn't relying on my -- I wasn't relying on 9 my legal opinion because this is not an area of the law 10 that I deal with regularly, so I relied upon them.</p> <p>11 Q. I feel like I could -- I can close out maybe; 12 maybe this question closes out this. It would be fair 13 to say that for any compliance with federal law or the 14 US Constitution, that would have been a question for 15 Mr. Gore or Mr. Terreni?</p> <p>16 A. Yes, ultimately. I mean, you could have a 17 contingent opinion or view or something, but ultimately 18 you -- you go to them and say, what do you -- what do 19 you think? What do we need -- should we do this? 20 Should we not do it? So just a -- it's an ongoing 21 process.</p> <p>22 Q. I now want to move on to Roman Numeral 23 Number 3 entitled Additional Considerations. Do you see 24 that?</p> <p>25 A. Yes.</p>	<p style="text-align: right;">Page 136</p> <p>1 as a subcommittee member to mean that the additional 2 considerations were not -- were not a mandatory 3 criteria?</p> <p>4 A. Yes, because sometimes they -- some of these 5 just couldn't be applied, so. For practical reasons. 6 And that's correct, yes.</p> <p>7 Q. And also the -- the subportions of Roman 8 Numeral 3, A through F, they're also not ranked in any 9 particular order, right?</p> <p>10 A. Yes.</p> <p>11 Q. For communities of interest in A, do you 12 recall if anybody on the subcommittee or staff compiled 13 a list of identifiable communities of interest?</p> <p>14 A. Well, there's a list in the guide, in the 15 guidelines there. But in addition to that?</p> <p>16 Q. That's right. If there were any actual maps 17 of communities of interest that people identified.</p> <p>18 A. Maps, no. Not that I'm aware of.</p> <p>19 Q. Do you recall at all any public testimony 20 about digital mapping of communities of interest?</p> <p>21 A. I don't recall that. That may have happened. 22 Had a lot of testimony we digested, but I don't recall 23 that.</p> <p>24 Q. And so one of the factors in looking at 25 communities of interest, you see demographic here?</p>
<p style="text-align: right;">Page 135</p> <p>1 Q. It says, "Other criteria that should be given 2 where practical and appropriate in no particular order 3 of preference." Did I read that correctly?</p> <p>4 A. Yes.</p> <p>5 Q. Did you understand the additional 6 considerations to be of a lower priority than compliance 7 with federal law or the US Constitution?</p> <p>8 A. I don't know that I'd characterize it that 9 way, but you certainly have to comply with -- certainly 10 have to comply with the Constitution and federal voting 11 rights law. That's probably more, I would say maybe 12 more -- some of these other principles are perhaps a 13 little bit more inchoate than the law. I mean, all of 14 us as lawyers know law is a bit inchoate too.</p> <p>15 But these communities of interest, a lot of 16 times that's in maybe the eye of the holder, how far it 17 minimized division of VTDs, but what's -- what's really 18 minimize mean? So it's a little less clear. You can't 19 go research Lexus and find cases where this -- you know, 20 case law basically adds fullness to these provisions. 21 So they're a little bit more obtuse, I would say.</p> <p>22 Q. And do you see the language in that line 23 where it says "where practical and appropriate"?</p> <p>24 A. Yes.</p> <p>25 Q. Do you understand -- did you understand that</p>	<p style="text-align: right;">Page 137</p> <p>1 A. Yes.</p> <p>2 Q. Does that include racial demographic?</p> <p>3 A. Yes.</p> <p>4 Q. And I think you testified earlier that for 5 the Gullah-Geechee community, that certain traditions 6 that impacted them were relevant to your considerations 7 of how they were considered a community of interest to 8 you?</p> <p>9 A. Yes.</p> <p>10 Q. Do you recall testimony from black community 11 members saying they wanted to keep North Charleston and 12 Charleston together in the same congressional district 13 as a community of interest?</p> <p>14 A. I'm certain I -- I recall some testimony to 15 that effect in North Charleston, yes.</p> <p>16 Q. And keeping West Ashley in CD1?</p> <p>17 A. I -- yes, I heard some testimony to that 18 effect, yes.</p> <p>19 Q. For the amendment you offered, did any 20 historic characteristics for community of interest play 21 into your proposed CD1?</p> <p>22 A. Did -- can you state that again?</p> <p>23 Q. Yeah, that was a bad question. You see 24 historic or other characteristics as a subcategory for 25 community of interest?</p>

35 (Pages 134 - 137)

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Page 1

UNITED STATES DISTRICT COURT  
FOR THE DISTRICT OF SOUTH CAROLINA  
COLUMBIA DIVISION

THE SOUTH CAROLINA STATE CONFERENCE OF THE NAACP,  
*et al.*,

Plaintiffs,

vs. CASE NO.: 3:21-CV-03302-MGL-TJH-RMG

THOMAS C. ALEXANDER, *et al.*,

Defendants.

DEPOSITION OF: SENATOR LUKE A. RANKIN  
(APPEARING VIA VIRTUAL ZOOM)

DATE: August 2, 2022

TIME: 10:52 AM

LOCATION OF

THE DEPONENT: Rankin & Rankin Law Firm  
201 Beaty Street  
Conway, SC

TAKEN BY: Counsel for the Plaintiffs

REPORTED BY: TERRI L. BRUSSEAU  
(APPEARING VIA VIRTUAL ZOOM)

Page 148

1 maybe.

2 Q. Right, but I need some of those boxes.

3 So, Madam Court Reporter, can we pause  
4 for a second? And, John, can you try to work with  
5 Senator Rankin to see if Exhibit Share can work?  
6 Because I've only got one screen here and it's  
7 going to take a lot longer to turn off Screen  
8 Share, check documents, check an outline, come  
9 back?

10 (Off-the-record conference.)

11 BY MR. TRIVEDI:

12 Q. Okay. Sorry about that,  
13 Senator Rankin. So are you now seeing the --  
14 Mr. Gore's share screen, the document we were just  
15 talking about, the guidelines?

16 MR. GORE: It's going to take me a  
17 second to pull it up. Bear with me one second.

18 BY MR. TRIVEDI:

19 Q. Now are you seeing the screen?

20 A. Yep. Yep.

21 Q. Okay. So we're on the second page.  
22 Okay. We can stop there where it says additional  
23 considerations. Do you see that?

24 A. I do.

25 Q. And do you see where it says other

Page 149

1       criteria should be given consideration, where  
2       practical and appropriate, and in no particular  
3       order of preference?

4           A.     Right.

5           Q.     Okay. First of all, for everything  
6       under Roman Numeral III, did you understand -- do  
7       you understand all of those considerations to be  
8       subordinate to compliance with the law?

9           A.     That's a legal question. I can't  
10      answer that. I don't think that you can violate  
11      the federal law, but I don't know that these are  
12      disregarded. And, again, that's -- I'm not an  
13      expert in this field, but I couldn't answer that.

14           Q.     I think you said it. I think you said  
15      it. I'll just rephrase. You wouldn't consider a  
16      map viable if it met every single one of the  
17      considerations under Roman Numeral III but was also  
18      a racial gerrymandering? That would be a no-go for  
19      you, is that right?

20           A.     Well, that's a great paraphrase, I wish  
21      I was smart enough to say something like that, but  
22      that's not what I said. And so, no, I would  
23      disagree with that. Again, these are -- should be  
24      hand-in-hand. These should not trump the law, but  
25      I -- again, it's a question of beyond my scope to

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1 answer what you're asking me to answer.

2 Q. Okay. So you can't say with confidence  
3 that if a map -- if you were told that a map was a  
4 racial gerrymander but it complied with all those  
5 other considerations, you can't say with confidence  
6 that you'd say that you would reject that map?

7 A. Again, I -- you're saying that if it is  
8 violative and found by court to be racial  
9 gerrymandering, would I say, but, judge, look,  
10 we've abided by these? I don't know that I can  
11 answer that question.

12 Q. Okay. But these guidelines were  
13 adopted well before a court would ever see it and  
14 you all decided rightly that compliance with the  
15 law should be a guideline. So all I'm asking is if  
16 you ever saw a map that you felt based on your own  
17 analysis or anybody else's did violate the law,  
18 would you still allow that map to be passed into  
19 law later on because, well, it complied with those  
20 other considerations?

21 A. Well, the question in a vacuum would be  
22 no, but the question that this is not in a vacuum,  
23 you've got a 20 can plan that largely the same,  
24 largely the same, that a court has told us that we  
25 had not gerrymandered based on race. And so

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1       there was that water contiguity is acceptable. I  
2       don't remember where that comes from, but that was  
3       another thing that we referred to outside counsel  
4       and they found acceptable.

5           Q.     Looking to the next category, Roman  
6       Numeral III, Additional Considerations. It's on  
7       the next page. Do you mind --

8           A.     Sure.

9           Q.     Well, I guess I'll look at it myself.  
10       Is it fair to -- under Roman Numeral III,  
11       Additional Consideration, it reads, Other criteria  
12       that should be given consideration, where practical  
13       and appropriate, in no particular order of  
14       preference.

15           Am I reading accurately what follows  
16       that category?

17           A.     Yes, ma'am.

18           Q.     Okay. Did you understand the things  
19       that follow in this part of the Senate guidelines  
20       to be of lower priority to compliance with federal  
21       law and the categories that preceded this section?

22           A.     That wasn't my understanding, but  
23       that's -- well, yeah, based on outside counsel's  
24       advice, yes, these were things that could not, you  
25       know, or should not be considered over the

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1       federal --

2           Q.     But --

3           A.     -- guidelines.

4           Q.     I'm sorry. I cut you off.

5           A.     I'm sorry. My understanding from  
6 outside counsel is that this stuff in No. III are  
7 additional considerations that were not as  
8 paramount as the federal -- requirements of federal  
9 law, and then additional considerations, I think in  
10 here it tells you in this document the difference  
11 between the two.

12          Q.     And the words that I read, other  
13 criteria that should be given consideration, where  
14 practical and appropriate, in no particular order  
15 of preference, does that also give support for the  
16 idea that these are of lower priority than the  
17 federal requirements that precede it?

18          A.     I mean, that could be construed that  
19 way, yes, ma'am. It's up to members of the Senate  
20 to consider whatever they want to consider when  
21 they're making decisions. And when those decisions  
22 were made and turned into maps based on those  
23 decisions how they wanted the map drawn, we then  
24 submitted them to outside counsel to review.

25          Q.     Looking at subcategory III(A), what is

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1                   TERRENI

2                   Q. Does it say anything about  
3                   nondilution of minority voting  
4                   strength?

5                   A. It does not.

6                   Q. Does it say anything about  
7                   compliance with Section 2 or  
8                   nonracial gerrymandering?

9                   A. No. I think those are  
10                  presupposed as we discussed earlier.

11                  Q. But it has elevated core  
12                  constituencies which was an  
13                  additional consideration in the  
14                  criteria to one of the top two goals  
15                  of the map alongside one person one  
16                  vote. Is that fair to say?

17                  A. Not over avoidance of  
18                  racial gerrymandering Section 2.  
19                  Will would have known that. I mean  
20                  those are nonnegotiable, right? So  
21                  he would have -- he said our goals,  
22                  I mean I think he assumed everybody  
23                  understood them, not trying to  
24                  violate federal law. So our goal  
25                  was to bring congressional districts