STATE OF NORTH CAROLINA

COUNTY OF WAKE ᴰᴱᶜ 29 A 8: 32

IN THE GENERAL COURT OF JUSTICE
SUPERIOR COURT DIVISION
21 CVS 015426, 21 CVS 500085

NORTH CAROLINA LEAGUE OF
CONSERVATION VOTERS, INC.;
HENRY M. MICHAUX, JR., et al.,

Plaintiffs,

REBECCA HARPER, et al.,

Plaintiffs,

v.

REPRESENTATIVE DESTIN HALL, in
his official capacity as Chair of the House
Standing Committee on Redistricting, et al.,

Defendants.

**NCLCV PLAINTIFFS' MOTION
FOR PROTECTIVE ORDER
QUASHING NOTICE OF
DEPOSITION DIRECTED TO
NCLCV COUNSEL OF RECORD
SAM HIRSCH AND DIRECTING
LEGISLATIVE DEFENDANTS TO
STRIKE SAM HIRSCH FROM
THEIR WITNESS LIST FOR TRIAL**

Pursuant to Rule 26(c), the NCLCV Plaintiffs respectfully move the Court to issue a protective order prohibiting the Legislative Defendants from deposing NCLCV Plaintiffs' litigation counsel of record, Sam Hirsch, and further directing Legislative Defendants to strike Mr. Hirsch from their witness list for trial. Mr. Hirsch is not a fact witness. He has no knowledge whatsoever of "the facts in controversy" with respect to the Enacted Plans. Instead, Legislative Defendants apparently are seeking to depose Mr. Hirsch and call him as a witness at trial because of the role he played with respect to the computerized creation of the NCLCV Plaintiffs' demonstrative maps.

As an initial matter, the Legislative Defendants' notice of deposition is procedurally defective. Mr. Hirsch is not a party to this case and his deposition cannot simply be noticed. In any event, seeking the deposition of opposing litigation counsel is an extraordinary intrusion into the attorney-client and work-product privileges and is not permitted under North Carolina law

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except where the information is critical to the case and cannot possibly be obtained in any other way. That is not the case here.

Even more inappropriate than seeking Mr. Hirsch's deposition is Legislative Defendants' listing of Mr. Hirsch as a potential witness at trial. This raises serious issues under the Rules of Professional Conduct and would cause distraction and disruption to the orderly process that will be necessary to try three consolidated complex cases of significant public interest in just three days, with over a dozen witnesses, beginning just five days from now. *See* Case Management Order at 3-4 (describing the challenges of resolving this litigation in an extremely limited timeframe). Mr. Hirsch is the lawyer who will be putting on NCLCV's expert witness and participating in cross-examining Legislative Defendants' expert witnesses. He should not be required to leave counsel table to sit in the witness box. The NCLCV Plaintiffs respectfully request that this Court issue a protective order prohibiting Legislative Defendants from deposing Mr. Hirsch or attempting to call him as a witness at trial.

BACKGROUND

The issue in this case is whether the Legislative Defendants' Enacted Plans deprive the NCLCV Plaintiffs of the rights guaranteed to them by the North Carolina Constitution. The Legislative Defendants' primary defense to this violation of rights is to assert that the Enacted Plans were not drawn with the intent to dilute the votes of NCLCV Plaintiffs and other Democratic and Black voters. Instead, they argue, the partisan bias and racial vote dilution present in the Enacted Plans is the inevitable result of the Legislative Defendants' adherence to traditional neutral districting principles as applied to the geography and demographics of North Carolina. In their Verified Complaint and Motion for a Preliminary Injunction, the NCLCV Plaintiffs showed that this defense does not hold water. The NCLCV Plaintiffs offered demonstrative congressional and

legislative redistricting plans (which they called the "Optimized Maps") to show that it is possible to draw redistricting plans that adhere to all traditional neutral districting principles without producing an extreme partisan skew and without diluting the voting strength of Black citizens.

In their Motion for Preliminary Injunction, the NCLCV Plaintiffs did not rely on the fact that the plans were produced through computational redistricting (though they did describe the computational redistricting process in their Verified Complaint). Rather, the Tufts University mathematics professor, Dr. Moon Duchin, who offered an affidavit in support of the Motion for Preliminary Injunction, opined only on the objective features of the NCLCV Plaintiffs' demonstrative maps and how those objective features compared with the objective features of the Enacted Plans. Dr. Duchin's testimony was thus fully consistent with Rule 702 as it was provided "to assist the trier of fact to understand the evidence or determine a fact in issue." Dr. Duchin did not consider, and did not opine on, anything related to the method and means of formulating or producing the NCLCV Plaintiffs' demonstrative maps, including the source code, source data, and input parameters. She considered, and opined, on only how the demonstrative maps objectively achieved various traditional redistricting criteria and how they did so without creating the extreme partisan bias of the Enacted Plans. *See* Ex. A, Duchin Report.

Nonetheless, Legislative Defendants repeatedly sought discovery with respect to how the "Optimized Maps" were created. On December 20th, this Court ordered that by 5:00 p.m. on December 23rd, the NCLCV Plaintiffs produce to the Legislative Defendants "the method and means by which the Optimized Maps were formulated and produced, including, but not limited to all source code, source data, input parameters, and all outputted data associated with the Optimized Maps." Order on Legislative Defendants's Motion to Compel at 4 (Dec. 20, 2021). The Court

further ordered the NCLCV Plaintiffs to "identify any and all persons who took part in drawing or participated in the computerized production of the Optimized Maps." *Id.*

The NCLCV Plaintiffs fully complied with that Order (and the Legislative Defendants have not claimed otherwise). The letter accompanying the NCLCV Plaintiffs' voluminous production described the method and means by which the demonstrative maps were formulated and further described all the files being produced, including the maps' source code, source data, input parameters, and all outputted data. The letter also explained (consistent with the NCLCV Plaintiffs' position in moving for a preliminary injunction) that the NCLCV Plaintiffs do not intend to offer any evidence at trial about how the maps were created. Instead, the NCLCV Plaintiffs intend to rely on these demonstrative maps to rebut the Legislative Defendants' argument that the Enacted Plans' extreme partisan bias was inevitable. In other words, although the NCLCV Plaintiffs provided the Legislative Defendants with *all* the information about how their plans were created through a computerized multi-objective optimization process—including all source code, source data, input parameters, and outputted data—the NCLCV Plaintiffs will not offer at trial any evidence or argument about these issues. To avoid needless controversy, the NCLCV Plaintiffs will refrain from calling their plans the "Optimized Maps" and will instead refer to them simply as the "NCLCV demonstrative maps."

As is also described in the letter NCLCV Plaintiffs provided to Legislative Defendants on December 23rd, the person who directed the creation of the NCLCV Plaintiffs' demonstrative maps was NCLCV Plaintiffs' attorney, Sam Hirsch, who is a partner in the Washington, D.C. office of Jenner & Block LLP and one of the lead counsel in this case. The letter explained that Mr. Hirsch was assisted in this process by non-testifying consulting experts. On December 27th, presumably in response to the disclosure that Mr. Hirsch directed the creation of the NCLCV Plaintiffs'

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demonstrative maps, the Legislative Defendants noticed the deposition of Mr. Hirsch for Friday, December 31st, at 9:00 a.m. *See* Ex. B, Deposition Notice of Sam Hirsch (Dec. 27, 2021). Later that same day, the Legislative Defendants provided their witness list for trial, listing Mr. Hirsch as a witness they may call at trial. *See* Ex. C, Legislative Defendants' Witness List (Dec. 27, 2021).

The NCLCV Plaintiffs subsequently informed the Legislative Defendants that their noticed deposition of Mr. Hirsch was improper and requested that they strike Mr. Hirsch from their witness list or the NCLCV Plaintiffs would be forced to seek appropriate relief from the Court. *See* Ex. D, Email from Z. Schauf (Dec. 28, 2021). Legislative Defendants chose not to respond, thus necessitating this motion.

ARGUMENT

Depositions of opposing counsel are not permitted unless (1) no other means exists to obtain the information, (2) the information sought is relevant and nonprivileged, and (3) the information is crucial to the preparation of the case. Here, none of these circumstances is present. The information Legislative Defendants apparently are seeking is not relevant to any issue before the Court. And as to the issues that are before the Court, the Legislative Defendants already have everything they need to analyze the NCLCV Plaintiffs' demonstrative maps and can seek any other information through less intrusive means, such as interrogatories. In any event, the deposition notice is procedurally deficient. Mr. Hirsch is not a party to the case and his testimony can be obtained only by subpoena.

The Legislative Defendants' attempt to call Mr. Hirsch as a witness at trial is likewise impermissible and raises serious issues under the North Carolina Rules of Professional Conduct. Mr. Hirsch is not a necessary witness in this case, and the Legislative Defendants' listing Mr. Hirsch as a potential witness threatens to disrupt the orderly presentation of a case that already

presents tremendous challenges for counsel and the Court to resolve on the compressed timetable ordered by the North Carolina Supreme Court.

I.   The Court Should Issue a Protective Order Prohibiting the Deposition of Mr. Hirsch.

The Court should issue a protective order prohibiting the deposition of Mr. Hirsch for at least two reasons: (1) the notice of deposition is procedurally deficient; and (2) the Legislative Defendants cannot meet their burden to show that a deposition of opposing counsel is necessary.

A. The Notice of Deposition Is Procedurally Improper.

As an initial matter, the notice of deposition is procedurally improper. The Legislative Defendants failed to comply with the basic requirements of Rules 30 and 45 of the North Carolina Rules of Civil Procedure in issuing their notice. As counsel to the NCLCV Plaintiffs, Mr. Hirsch is not a party to the litigation, but is instead a third-party who may be deposed, if at all, only upon proper service of an enforceable subpoena. *See* N.C. R. Civ. P. 30(a) (requiring a subpoena to compel the attendance of a witness at a deposition, "provided that no subpoena need be served on a deponent who is a party"); *Kelley v. Agnoli*, 205 N.C. App. 84, 100, 695 S.E.2d 137, 147 (2010) (Plaintiff "has cited no authority suggesting that a party's law firm is itself a party, and we know of none.") (citing *Bailey v. State*, 353 N.C. 142, 156, 540 S.E.2d 313, 322 (2000)); *Blue Ridge Pediatric & Adolescent Medicine, Inc. v. First Colony Healthcare, LLC*, No. 11 CVS 127, 2012 WL 3249553, at *6 (N.C. Super. Ct. Aug. 9, 2012) (citations omitted). Legislative Defendants have not issued any subpoena to Mr. Hirsch.

B. The Legislative Defendants Have Not Shown that the Deposition of Mr. Hirsch Is Necessary.

In any event, the Legislative Defendants cannot meet their burden to show that a deposition of the NCLCV Plaintiffs' litigation counsel is necessary. The seminal case on this issue is *Shelton v. American Motors Corp.*, 805 F.2d 1323 (8th Cir. 1986), which holds that depositions of

opposing counsel may take place only when the party seeking to take the deposition has met its

burden of demonstrating that "(1) no other means exist to obtain the information than to depose

opposing counsel; (2) the information sought is relevant and nonprivileged; and (3) the information

is crucial to the preparation of the case." *Id.* at 1327 (citation omitted). Although the North

Carolina Supreme Court has not directly adopted *Shelton*, North Carolina state and federal courts,

like courts around the country, have applied *Shelton*'s test. *See, e.g., Blue Ridge Pediatric &

Adolescent Medicine, Inc.*, 2012 WL 3249553, at *10 (holding that the *Shelton* test was appropriate

because it closely parallels the language of Rule 26, which allows a party to limit discovery where

information sought is available from other less-burdensome sources which do not threaten to

invade privileged information); *N.F.A. Corp. v. Riverview Narrow Fabrics, Inc.*, 117 F.R.D. 83,

85 (M.D.N.C. 1987) (applying *Shelton* in granting motion forbidding party from deposing

opponent's counsel and finding that because a "deposition of a party's attorney is usually both

burdensome and disruptive, the mere request to depose a party's attorney constitutes good cause

for obtaining a protective order unless the party seeking the deposition can show both the propriety

and need for the deposition").

Under *Shelton*, eliciting testimony from an opponent's *litigation* counsel is especially

disfavored. *Shelton*, 805 F.2d at 1327. Taking the testimony of litigation counsel inevitably risks

invading the attorney-client privilege and opinion work product—both of which are unqualified,

absolute protections. *See Willis v. Duke Power Co.*, 291 N.C. 19, 36, 229 S.E.2d 191, 201 (1976)

(no discovery "whatsoever" may be taken of the mental impressions, conclusions, opinions, or

legal theories of an attorney or other representative of a party concerning the litigation). Thus, if

there is a practical alternative means for obtaining information sought from counsel, a deposition

of counsel should not go forward. *See, e.g., Asbury v. Litton Loan Servicing, LP*, 2009 WL 973095,

at *2 (S.D. W.Va. Apr. 9, 2009) (granting motion to quash subpoena seeking deposition of opposing counsel where other means, including interrogatories, would provide the information sought, and explaining that "courts have required exhaustion of those means before depositions of counsel are allowed"); *Guantanamera Cigar Co. v. Corporacion Habanos, S.A.*, 263 F.R.D. 1, 8 (D.D.C. 2009) ("when seeking to depose opposing counsel, the cards are stacked against the requesting party from the outset and they must prove the deposition's necessity").

The Legislative Defendants fail to demonstrate any one of the three requirements to depose Mr. Hirsch, let alone all three. *First*, there are ample alternative means for obtaining the information that Legislative Defendants apparently are seeking from Mr. Hirsch. In compliance with the Court's December 20th Order, the NCLCV Plaintiffs already produced *all* the data and information that the Legislative Defendants legitimately need to analyze the NCLCV Plaintiffs' demonstrative maps. This included the method and means by which the demonstrative maps were formulated and produced, including, but not limited to, all source code, source data, input parameters, and all outputted data associated with them. To the extent Legislative Defendants believe they need any additional information, they may propound appropriate interrogatories. The Legislative Defendants have adduced no evidence that Mr. Hirsch's deposition is "essential" or that there are no alternative means to obtain what they believe they need. Indeed, they have not even identified to the NCLCV Plaintiffs what it is they want to depose Mr. Hirsch about.

Second, the information Legislative Defendants seek to obtain by deposing litigation counsel is inextricably interwoven with attorney-client communications and opinion work product. The NCLCV Plaintiffs' demonstrative maps were developed specifically for this litigation. All of Mr. Hirsch's work in this matter has been done in anticipation of litigation, and his substantive communications, including with non-testifying consulting experts, are protected by privilege.

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Deposing Mr. Hirsch would invade privileged communications, litigation strategy, and the mental impressions, opinions, and conclusions of trial counsel. In contrast, if the Legislative Defendants were to propound appropriate interrogatories, as the NCLCV Plaintiffs suggested, this would enable the NCLCV Plaintiffs to disaggregate facts from communications and work product, and to provide the factual information sought without invading these privileges and protections.

Third, further information about how the demonstrative maps were created is not even relevant to this case and is certainly not "crucial" to the Legislative Defendants' defense. Although the Legislative Defendants apparently want to depose Mr. Hirsch on the method and means of creating the NCLCV Plaintiff's demonstrative maps, the NCLCV Plaintiffs do not intend to offer at trial any evidence or argument at all about how their demonstrative maps were created. This case—and the two others that will be tried together with it—is about the maps enacted by the General Assembly. The NCLCV Plaintiffs' demonstrative maps will be offered to demonstrate that the Legislative Defendants are wrong to claim that the extreme partisan bias in the Enacted Plans is a necessary byproduct of applying traditional neutral districting principles to North Carolina's geography and demographics. For this limited purpose, what matters—and what the NCLCV Plaintiffs will rely upon at trial—are the objective features of those maps. The Legislative Defendants have not shown, and cannot show, that anything Mr. Hirsch would testify about is "crucial" to their case. Indeed, that is especially true given all the information about the demonstrative maps' creation that the Legislative Defendants have *already* received. In short, the information the Legislative Defendants apparently seek to obtain—an attempt to rebut a rebuttal— does not justify the extraordinary departure from regular order involved in permitting a deposition of opposing trial counsel.

II.   The Court Should Order the Legislative Defendants to Strike Mr. Hirsch from Their Witness List for Trial.

For similar reasons, the Court should order Legislative Defendants to strike Mr. Hirsch from their witness list and prohibit Legislative Defendants from calling Mr. Hirsch as a witness at trial. The North Carolina Supreme Court has adopted a formidable threshold a party must overcome before calling opposing counsel as a witness at trial: "The circumstances under which a court will permit a lawyer for a party, even a prosecuting attorney, to take the witness stand must be such that a compelling reason for action exists." *State v. Simpson*, 314 N.C. 359, 373, 334 S.E.2d 53, 62 (1985); *see also Restatement (Third) of the Law Governing Lawyers* § 108(d) ("A tribunal should not permit a lawyer to call opposing trial counsel as a witness unless there is a compelling need for the lawyer's testimony.").

As explained above, there is no compelling need for Mr. Hirsch's testimony. Moreover, putting Mr. Hirsch on the witness list raises serious issues under Rule 3.7 of the North Carolina Rules of Professional Conduct. Under that Rule, a "lawyer shall not act as advocate at a trial in which the lawyer is likely to be a necessary witness." Mr. Hirsch is the counsel who will be putting on the NCLCV's main witness and participating in the cross-examination of the Legislative Defendants' witnesses. This tactic of listing Mr. Hirsch as a potential trial witness creates the potential for an ethical conflict that would disrupt the trial and generate numerous issues for the Court to resolve during an already extraordinarily compressed timeframe. *Cf. Matter of R.D.*, 376 N.C. 244, 255 (2020) (upholding trial court's refusal to require attorney to testify because of "the existence of the potential for an ethical conflict pursuant to Rule 3.7 of the Rules of Professional Conduct").

To be clear, Mr. Hirsch clearly is not a "necessary" witness under Rule 3.7. Indeed, Mr. Hirsch is not a "witness" to the facts in controversy in this litigation at all. As the Court recently

stated, the "heart of the dispute in this redistricting litigation" is "the information and documentation pertaining to the *Enacted Plans*, including the identification of all persons who took part in the drawing of the *Enacted Plans* in any way, as well as all documents or data relied upon by those involved in the map drawing process [for the *Enacted Plans*]." Order on Harper Plaintiffs' Motion to Compel at 4 (Dec. 27, 2021) (emphasis added).

Mr. Hirsch has no first-hand factual knowledge whatsoever as to any of these issues about how the *Enacted Plans* were created. In fact, if anyone has such factual knowledge, it is Legislative Defendants' counsel. As Legislative Defendants stated in their response to an interrogatory requiring them to identify "any person" who "took part in the drawing of the 2021 Plan," including "providing input, directly or indirectly to any Legislative Defendant": "*Attorneys at Nelson Mullins and Baker Hostetler provided legal advice in connection with the 2021 redistricting.*" *See* Ex. E, Legislative Defendants' Interrogatory Responses at 5 (Dec. 28, 2021) (emphasis added). Yet the NCLCV Plaintiffs have not sought to call these attorneys—the Legislative Defendants' counsel in this litigation—as witnesses at trial.

Because Mr. Hirsch is not a fact witness, he cannot shed any light on the important issues the Court has been tasked with resolving. Mr. Hirsch's knowledge goes only to the process by which the NCLCV Plaintiffs' demonstrative maps were created with the assistance of non-testifying consulting experts, which is not a proper subject of discovery. *See* N.C. R. Civ. P. 26(b)(2) ("[A] party may not, by interrogatories or deposition, discover facts known or opinions held by an expert who has been retained or specially employed by another party in anticipation of litigation or to prepare for trial and who is not expected to be called as a witness at trial."). This

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prohibition would be meaningless if the opposing party could simply examine opposing counsel on the same subjects, as the Legislative Defendants are attempting to do here.

The Legislative Defendants previously have claimed that inquiry into this process is relevant "given that the NCLCV Plaintiffs asked this Court to require North Carolina elections to be conducted under their maps as opposed to the Enacted Plans." Legislative Defendants' Response to Harper Plaintiffs Motion to Compel at 8 (Dec. 27, 2021). But a party's litigation counsel often participates in—and even directs—the creation of a proposed remedy that the party asks the Court to adopt. That does not make counsel a necessary witness at trial. Under that logic, a class-action defendant, for example, could put plaintiff's counsel on their witness list simply because counsel worked with a non-testifying expert on the creation of a damages remedy and then asked the Court to adopt it.

The Court should order the Legislative Defendants to remove Mr. Hirsch from their witness list and prohibit Legislative Defendants from calling Mr. Hirsch as a witness at trial.

CONCLUSION

For the foregoing reasons, the Court should grant the motion for protective order and order that the deposition of Mr. Hirsch cannot take place and that the Legislative Defendants must strike Mr. Hirsch from their witness list and may not call Mr. Hirsch as a witness at trial.

Dated: December 29, 2021

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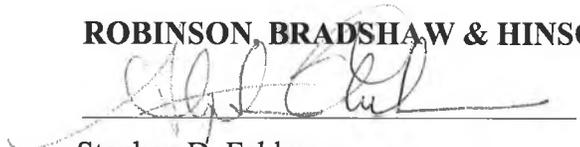
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CERTIFICATE OF SERVICE

I hereby certify that the foregoing document was served upon each of the parties to this action by electronic mail to counsel at the e-mail addresses indicated below, in accordance with North Carolina Rule of Civil Procedure 5(b)(1)(a):

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This 29th day of December, 2021.
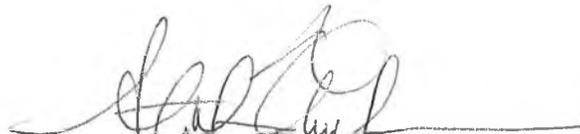
Stephen Feldman

EXHIBIT A

STATE OF NORTH CAROLINA

COUNTY OF WAKE

IN THE GENERAL COURT OF JUSTICE
SUPERIOR COURT DIVISION
___ CVS ____

2021 NOV 16 P 4

NORTH CAROLINA LEAGUE OF CONSERVATION
VOTERS, INC.; HENRY M. MICHAUX, JR.; DANDRIELLE
LEWIS; TIMOTHY CHARTIER; TALIA FERNÓS;
KATHERINE NEWHALL; JASON PARSLEY; EDNA
SCOTT; ROBERTA SCOTT; YVETTE ROBERTS;
JEREANN KING JOHNSON; REVEREND REGINALD
WELLS; YARBROUGH WILLIAMS, JR.; REVEREND
DELORIS L. JERMAN; VIOLA RYALS FIGUEROA; and
COSMOS GEORGE,

        Plaintiffs,

        v.

REPRESENTATIVE DESTIN HALL, in his official capacity
as Chair of the House Standing Committee on Redistricting;
SENATOR WARREN DANIEL, in his official capacity as Co-
Chair of the Senate Standing Committee on Redistricting and
Elections; SENATOR RALPH E. HISE, JR., in his official
capacity as Co-Chair of the Senate Standing Committee on
Redistricting and Elections; SENATOR PAUL NEWTON, in
his official capacity as Co-Chair of the Senate Standing
Committee on Redistricting and Elections;
REPRESENTATIVE TIMOTHY K. MOORE, in his official
capacity as Speaker of the North Carolina House of
Representatives; SENATOR PHILIP E. BERGER, in his
official capacity as President Pro Tempore of the North
Carolina Senate; THE STATE OF NORTH CAROLINA; THE
NORTH CAROLINA STATE BOARD OF ELECTIONS;
DAMON CIRCOSTA, in his official capacity as Chairman of
the North Carolina State Board of Elections; STELLA
ANDERSON, in her official capacity as Secretary of the North
Carolina State Board of Elections; JEFF CARMON III, in his
official capacity as Member of the North Carolina State Board
of Elections; STACY EGGERS IV, in his official capacity as
Member of the North Carolina State Board of Elections;
TOMMY TUCKER, in his official capacity as Member of the
North Carolina State Board of Elections; and KAREN
BRINSON BELL, in her official capacity as Executive Director
of the North Carolina State Board of Elections,

        Defendants.

**AFFIDAVIT OF
DR. MOON DUCHIN**

I, Dr. Moon, Duchin, having been duly sworn by an officer authorized to administer oaths, depose and state as follows:

1. I am over 18 years of age, legally competent to give this Affidavit, and have personal knowledge of the facts set forth in this Affidavit.

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

Background and qualifications

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

4. I am a Professor of Mathematics and a Senior Fellow in the Jonathan M. Tisch College of Civic Life at Tufts University.

5. My general research areas are geometry, topology, dynamics, and applications of mathematics and computing to the study of elections and voting. My redistricting-related work has been published in venues such as the Election Law Journal, Political Analysis, Foundations of Data Science, the Notices of the American Mathematical Society, Statistics and Public Policy, the Virginia Policy Review, the Harvard Data Science Review, Foundations of Responsible Computing, and the Yale Law Journal Forum.

6. My research has had continuous grant support from the National Science Foundation since 2009, including a CAREER grant from 2013–2018. I am currently on the editorial board of the journals Advances in Mathematics and the Harvard Data Science Review. I was elected a Fellow of the American Mathematical Society in 2017 and was named a Radcliffe Fellow and a Guggenheim Fellow in 2018.

7. A current copy of my full CV is attached to this report.

8. I am compensated at the rate of $400 per hour.

Analysis of 2021 enacted redistricting plans in North Carolina

Moon Duchin
Professor of Mathematics, Tufts University
Senior Fellow, Tisch College of Civic Life

November 16, 2021

1 Introduction

On November 4, 2021, the North Carolina General Assembly enacted three districting plans: maps of 14 U.S. Congressional districts, 50 state Senate districts, and 120 state House districts. This affidavit contains a brief summary of my evaluation of the properties of these plans. My focus will be on the egregious partisan imbalance in the enacted plans, following a brief review of the traditional districting principles.

Because redistricting inevitably involves complex interactions of rules, which can create intricate tradeoffs, it will be useful to employ a direct comparison to an alternative set of plans. These demonstrative plans illustrate that it is possible to *simultaneously maintain or improve* metrics for all of the most important redistricting principles that are operative in North Carolina's constitution and state and federal law. Crucially, this shows that nothing about the state's political geography compels us to draw a plan with a massive and entrenched partisan skew.

To this end, I will be comparing the following plans: the enacted plans SL-174, SL-173, and SL-175 and a corresponding set of alternative plans labeled NCLCV-Cong, NCLCV-Sen, and NCLCV-House (proposed by plaintiffs who include the North Carolina League of Conservation Voters).
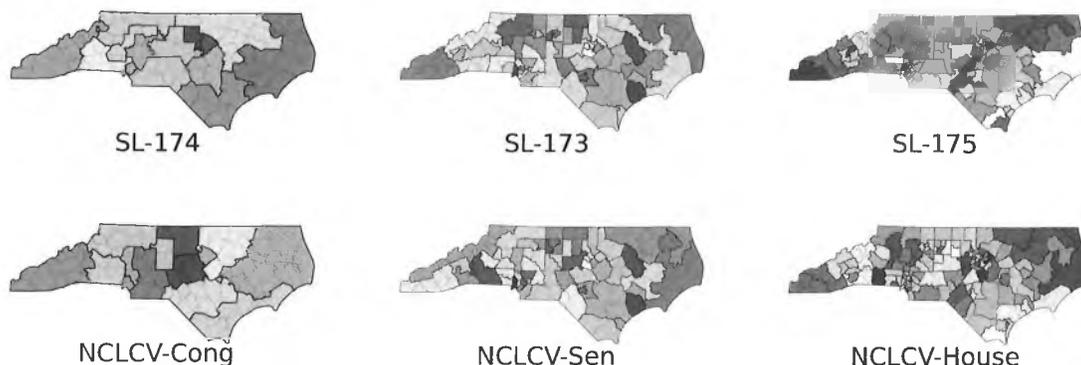

Figure 1: The six plans under discussion in this affidavit.

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2 Traditional districting principles

Principles that are relevant to North Carolina redistricting include the following.

- **Population balance.** The standard interpretation of *One Person, One Vote* for Congressional districts is that districts should be fine-tuned so that their total Census population deviates by no more than one person from any district to any other.

  There is more latitude with legislative districts; they typically vary top-to-bottom by no more than 10% of ideal district size. In North Carolina, the Whole County Provisions make it very explicit that 5% deviation must be tolerated if it means preserving more counties intact.

  All six plans have acceptable population balance.

Population deviation

	Max Positive Deviation	District	Max Negative Deviation	District
SL-174	0	(eight districts)	−1	(six districts)
NCLCV-Cong	0	(eight districts)	−1	(six districts)
SL-173	10,355 (4.960%)	5	−10,434 (4.997%)	13,18
NCLCV-Sen	10,355 (4.960%)	5	−10,427 (4.994%)	15
SL-175	4250 (4.885%)	18	−4189 (4.815%)	112
NCLCV-House	4341 (4.990%)	82	−4323 (4.969%)	87

Table 1: Deviations are calculated with respect to the rounded ideal district populations of 745,671 for Congress, 208,788 for Senate, and 86,995 for House.

- **Minority electoral opportunity.** Minority groups' opportunity to elect candidates of choice is protected by both state and federal law. A detailed assessment of opportunity must hinge not on the demographics of the districts but on electoral history and an assessment of polarization patterns. That is not the focus of the current affidavit. Instead we make the brief note that it is important to avoid the conflation of *majority-minority districts* with *effective districts* for a minority group. An involved analysis of voting patterns—necessarily incorporating both primary and general elections to ensure that candidates of choice can be successfully nominated and elected—will frequently reveal that districts can be effective at demographic levels well below 50% of voting-age population or citizen voting-age population (VAP and CVAP, respectively). For instance, in [3], my co-authors and I drew an illustrative plan for Texas congressional districting in which some parts of the state had districts that were shown to reliably elect Black candidates of choice with BCVAP as low as 28.6%; by contrast, there are other parts of Texas where a 40% BCVAP district is less consistently effective. In a Louisiana case study, we found somewhat different patterns of human and political geography, producing numerous examples of Congressional-sized districts with 55% BCVAP in some parts of the state that are nonetheless marginal in terms of opportunity for Black voters to elect candidates of choice.

  In North Carolina, taking the crossover voting patterns of White, Latino, and Asian voters into account, I note that a district with BCVAP in the low to mid 30s can often be effective for Black voters—but there is no demographic shortcut to a full examination of primary and general election history.

- **Contiguity.** All six plans are contiguous; for each district, it is possible to transit from any part of the district to any other part through a sequence of census blocks that share boundary segments of positive length. As is traditional in North Carolina, contiguity through water is accepted.

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- **Compactness.** The two compactness metrics most commonly appearing in litigation are the *Polsby-Popper score* and the *Reock score*. Polsby-Popper is the name given in redistricting to a metric from ancient mathematics: the isoperimetric ratio comparing a region's area to its perimeter via the formula $4\pi A/P^2$. Higher scores are considered more compact, with circles uniquely achieving the optimum score of 1. Reock is a different measurement of how much a shape differs from a circle: it is computed as the ratio of a region's area to that of its circumcircle, defined as the smallest circle in which the region can be circumscribed. From this definition, it is clear that it too is optimized at a value of 1, which is achieved only by circles.

  These scores depend on the contours of a district and have been criticized as being too dependent on map projections or on cartographic resolution [1, 2]. Recently, some mathematicians have argued for using discrete compactness scores, taking into account the units of Census geography from which the district is built. The most commonly cited discrete score for districts is the *cut edges score*, which counts how many adjacent pairs of geographical units receive different district assignments. In other words, cut edges measures the "scissors complexity" of the districting plan: how much work would have to be done to separate the districts from each other? Plans with a very intricate boundary would require many separations. This score improves on the contour-based scores by better controlling for factors like coastline and other natural boundaries, and by focusing on the units actually available to redistricters rather than treating districts like free-form Rorschach blots.

  The alternative plans are significantly more compact than the enacted plans in all three compactness metrics.

Compactness

	block cut edges (lower is better)	average Polsby-Popper (higher is better)	average Reock (higher is better)
SL-174	5194	0.303	0.381
NCLCV-Cong	4124	0.383	0.444
SL-173	9702	0.342	0.402
NCLCV-Sen	9249	0.369	0.423
SL-175	16,182	0.351	0.419
NCLCV-House	13,963	0.414	0.456

Table 2: Comparing compactness scores via one discrete and two contour-based metrics.

- **Respect for political subdivisions.** For legislative redistricting, North Carolina has one of the strongest requirements for county consideration of any state in the nation. In my understanding, courts have interpreted the Whole County Provisions as follows.

  - First, if any county is divisible into a whole number of districts that will be within ±5% of ideal population, then it must be subdivided accordingly without districts crossing into other counties.
  - Next, seek any contiguous grouping of two counties that is similarly divisible into a whole number of districts.
  - Repeat for groupings of three, and so on, until all counties are accounted for.

A complete set of solutions is described in detail in the white paper of Mattingly et al.— though with the important caveat that the work "does not reflect... compliance with the Voting Rights Act" [4]. Absent a VRA conflict, the 2020 Decennial Census population data dictates that the North Carolina Senate plan must be decomposed into ten single-district fixed clusters and seven multi-district fixed clusters (comprising 2, 2, 3, 3, 4, 6, and 6

districts, respectively). It has four more areas in which there is a choice of groupings. In all, there are sixteen different possible clusterings for Senate, each comprising 26 county clusters. The House likewise has 11 single-district fixed clusters and 22 multi-district fixed clusters (with two to thirteen districts per cluster), together with three more areas with a choice of groupings. In all, the House has only eight acceptable clusterings, each comprising 40 county clusters. Again, it is important to note that VRA compliance may present a compelling reason to select some clusterings and reject others.

Once clusters have been formed, there are more rules about respecting county lines within clusters. The legal language is again explicit: "[T]he resulting interior county lines created by any such groupings may be crossed or traversed in the creation of districts within said multi-county grouping but only to the extent necessary" to meet the ±5% population standard for districts. To address this, I have counted the *county traversals* in each plan, i.e., the number of times a district crosses between adjacent counties within a grouping.

Table 3 reflects the county integrity metric that is most relevant at each level: the enacted congressional plan splits 11 counties into 25 pieces while the alternative plan splits 13, but splits no county three ways. (The enacted plans unnecessarily split three counties into three pieces.) In the legislative plans, the law specifies traversals as the fundamental integrity statistic.

The alternative plans are comparable to the enacted plans, or sometimes far superior, in each of these key metrics regarding preservation of political boundaries.

County and municipality preservation

	# county pieces			# traversals
SL-174	25		SL-173	97
NCLCV-Cong	26		NCLCV-Sen	89
			SL-175	69
			NCLCV-House	66

	# municipal pieces
SL-174	90
NCLCV-Cong	58
SL-173	152
NCLCV-Sen	125
SL-175	292
NCLCV-House	201

Table 3: Comparing the plans' conformance to political boundaries.

I will briefly mention several additional redistricting principles.

- **Communities of interest.** In North Carolina, there was no sustained effort by the state or by community groups to formally collect community of interest (COI) maps, to my knowledge. Without this, it is difficult to produce a suitable metric.

- **Cores of prior districts.** In some states, there is statutory guidance to seek districting plans that preserve the cores of prior districts. In North Carolina, this is not a factor in the constitution, in statute, or in case law. In addition, attention to core preservation would be prohibitively difficult in the Senate and House because of the primacy of the Whole County Provisions, which forces major changes to the districts simply as a consequence of fresh population numbers.

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- **Incumbent pairing.** In 2017, the North Carolina legislative redistricting committee listed "incumbency protection" as a goal in their itemization of principles. In 2021, this was softened to the statement that "Member residence may be considered" in the drawing of districts. I have counted the districts in each plan that contain more than one incumbent address; these are sometimes colorfully called "double-bunked" districts. For this statistic, it is not entirely clear whether a high or low number is preferable. When a plan remediates a gerrymandered predecessor, we should not be surprised if it ends up pairing numerous incumbents.

Double-bunking

	# districts pairing incumbents
SL-174	3
NCLCV-Cong	1
SL-173	6
NCLCV-Sen	9
SL-175	7
NCLCV-House	15

Table 4: For Congress and Senate, the enacted and alternative plans are comparable; at the House level, the alternative plan has more double-bunking. *Note: These numbers were calculated using the most accurate incumbent addresses that have been provided to me.*

3 Partisan fairness

3.1 Abstract partisan fairness

There are many notions of partisan fairness that can be found in the scholarly literature and in redistricting practitioner guides and software. Most of them are numerical, in the sense that they address *how a certain share of the vote should be translated to a share of the seats* in a state legislature or Congressional delegation.

The numerical notions of partisan fairness all tend to agree on one central point: an electoral climate with a 50-50 split in partisan preference should produce a roughly 50-50 representational split. North Carolina voting has displayed a partisan split staying consistently close to even between the two major parties over the last ten years, but the plans released by the General Assembly after the 2010 census were very far from realizing the ideal of converting even voting to even representation. This time, with a 14th seat added to North Carolina's apportionment, an exactly even seat outcome is possible. But the new enacted plans, like the plans from ten years ago, are not conducive to even representation.

3.2 Geography and fairness

However, some scholars have argued that this ideal (that even vote preferences should translate to even representation) ignores the crucial *political geography*—the location of votes for each party, and not just the aggregate preferences, has a major impact on redistricting outcomes. In [5], my co-authors and I gave a vivid demonstration of the impacts of political geography in Massachusetts: we showed that for a ten-year span of observed voting patterns, even though Republicans tended to get over one-third of the statewide vote, it was impossible to draw a single Congressional district with a Republican majority. That is, the geography of Massachusetts Republicans locked them out of Congressional representation. It is therefore not reasonable to charge the Massachusetts legislature with gerrymandering for having produced maps which yielded all-Democratic delegations; they could not have done otherwise.

In North Carolina, this is not the case. The alternative plans demonstrate that it is possible to produce maps that give the two major parties a roughly equal opportunity to elect their candidates. These plans are just examples among many thousands of plausible maps that convert voter preferences to far more even representation by party. In Congressional redistricting, the geography is easily conducive to a seat share squarely in line with the vote share. In Senate and House plans, even following the strict detail of the Whole County Provisions, there are likewise many alternatives giving a seat share for each party that falls, in aggregate, within a few percentage points of the vote share across a large set of elections.

The clear conclusion is that the political geography of North Carolina today does not obstruct the selection of a map that treats the parties equally and fairly.

3.3 Translating votes to seats

The enacted plans behave as though they are built to resiliently safeguard electoral advantage for Republican candidates. We can examine this effect without invoking assumptions like "uniform partisan swing" that impose counterfactual voting conditions; instead, we will use the rich observed dataset of 52 statewide party-ID general elections in North Carolina in the last ten years. 29 of these are elections for Council of State (ten offices elected three times, with the Attorney General race uncontested in 2012), three presidential races, three for U.S. Senate, and 17 judicial races since mid-decade, when those became partisan contests. See Table 6 for more detail on the election dataset.

I will sometimes focus on the smaller set of better-known "up-ballot" races: in order, the first five to appear on the ballot are the contests for President, U.S. Senator, Governor, Lieutenant Governor, and Attorney General. Together these occurred 14 times in the last Census cycle.

|	Up-ballot generals (14)		All generals (52)	
	D vote share	D seat share	D vote share	D seat share
SL-174	.4883	.2908	.4911	.3118
NCLCV-Cong		.4796		.4931
SL-173	.4883	.3957	.4911	.4065
NCLCV-Sen		.4557		.4592
SL-175	.4883	.3994	.4911	.4080
NCLCV-House		.4649		.4684

Table 5: Comparing overall fidelity of representation to the voting preferences of the electorate. Vote shares are reported with respect to the major-party vote total.

To understand how the enacted plans create major shortfalls for Democratic representation, we will overlay the plans with voting patterns from individual elections in the past Census cycle. As we will see, the enacted Congressional plan (SL-174) shows a remarkable lack of responsiveness, giving 10–4 partisan outcomes across a wide range of recent electoral conditions, meaning that 10 Republicans and only 4 Democrats would represent North Carolina in Congress. The alternative plan (NCLCV-Cong) is far more faithful to the vote share, far more responsive, and tends to award more seats to the party with more votes.

The top of Figure 2 shows this dynamic in the three Presidential contests in the last Census cycle, with a Democratic vote share (pink box) between 48% and 50% of the major-party total each time. For a contest that is so evenly divided, we would expect a fair map to have 6, 7, or 8 out of 14 districts favoring each party. The alternative Congressional map NCLCV-Cong does just that, while the enacted plan SL-174 has just 4 out of 14 Democratic-majority districts each time (green and maroon circles). The alternative plan is far more successful at reflecting the even split of voter preferences. Below the initial explainer, simplified versions of the same type of graphic are presented for all five up-ballot races. Figure 3 compares legislative maps in the same fashion. Next, Figure 4 returns to the full 52-election dataset to give the big picture of entrenched partisan advantage in the enacted plans.

Congressional plan comparison in Presidential elections

Does even voting translate to even representation?
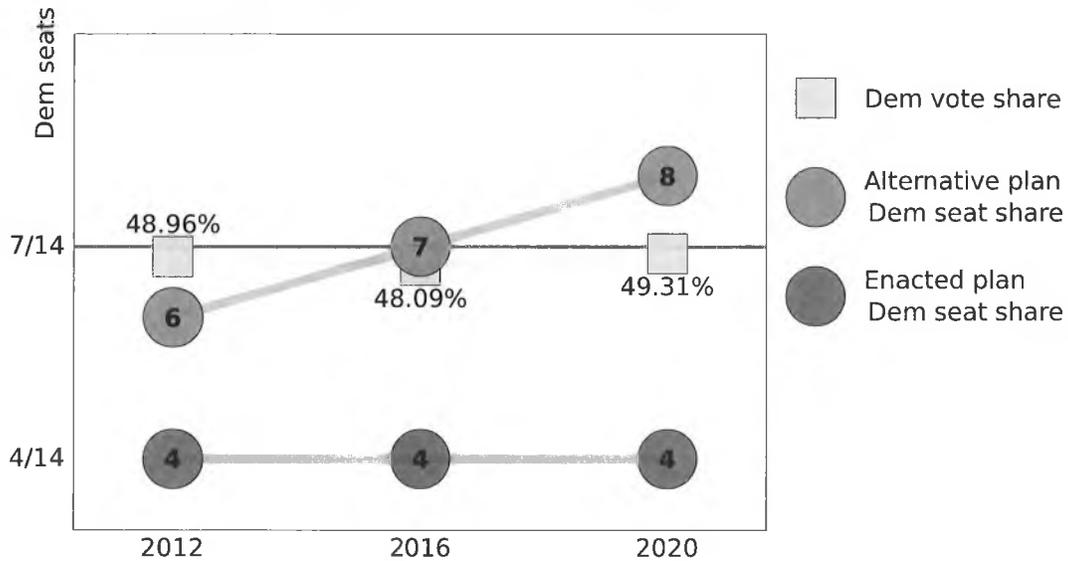
**Congressional plan comparison across up-ballot races**
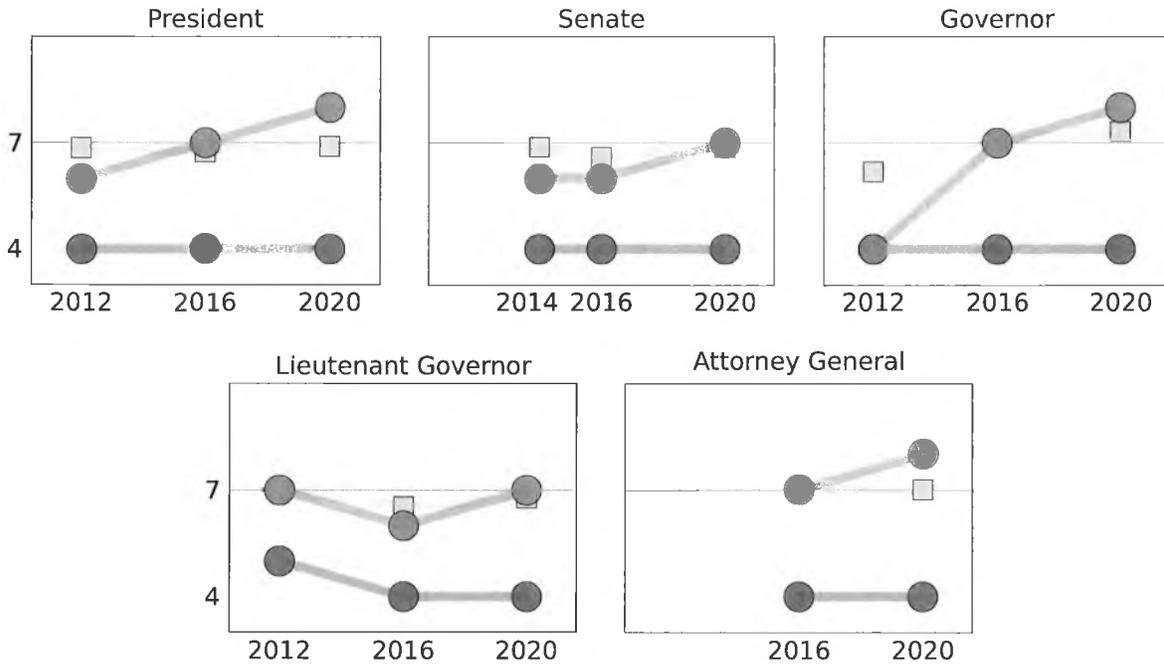
Figure 2: For up-ballot general election contests across the previous Census cycle, we can compare the seat share under the enacted Congressional plan SL-174 (maroon) and the seat share under the alternative Congressional plan NCLCV-Cong (green) to the vote share ( ) for Democratic candidates. At top is a detailed look at the presidential contests; this is repeated below, alongside the other four up-ballot offices. The 50% line is marked each time.

State Senate plan comparison across up-ballot races
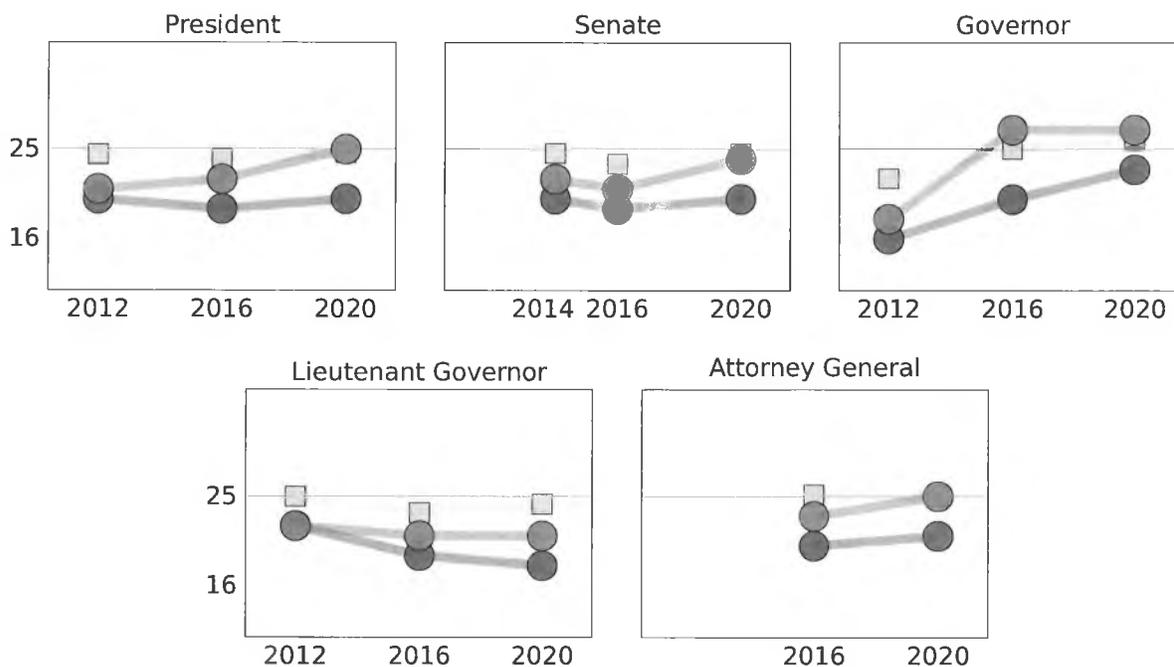
## State House plan comparison across up-ballot races
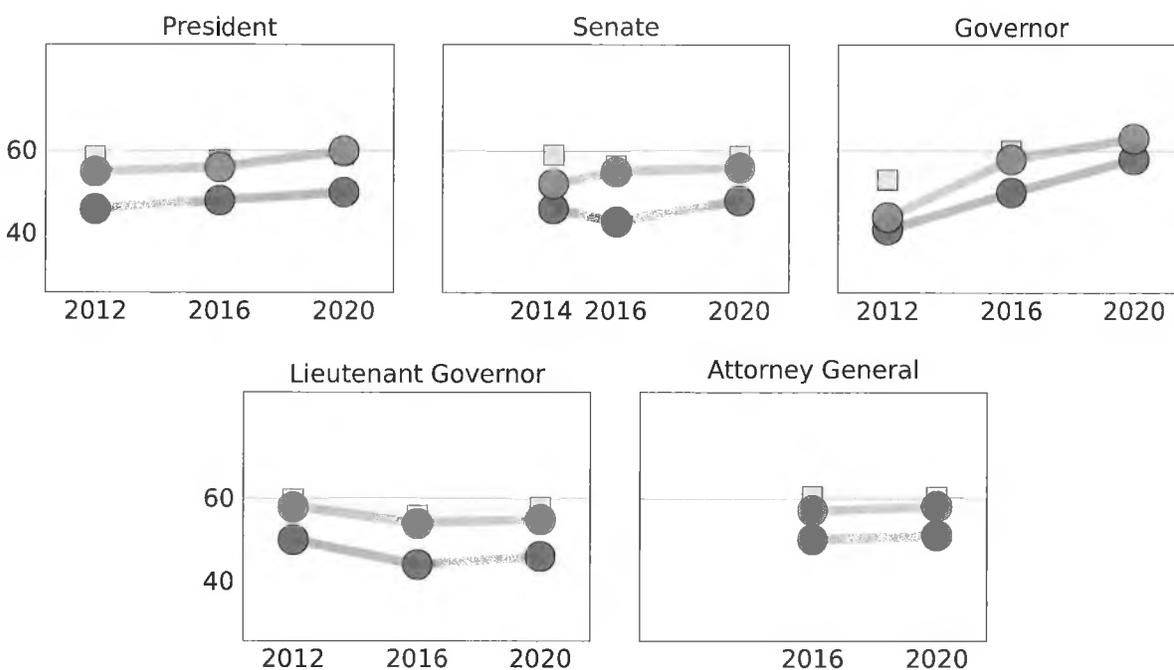
Figure 3: Legislative plans tested against voting patterns from up-ballot elections. The enacted plans SL-173 and SL-175 are shown in maroon. The alternative plans NCLCV-Sen and NCLCV-House, in green, have seat shares tracking much closer to the nearly even voting preferences.

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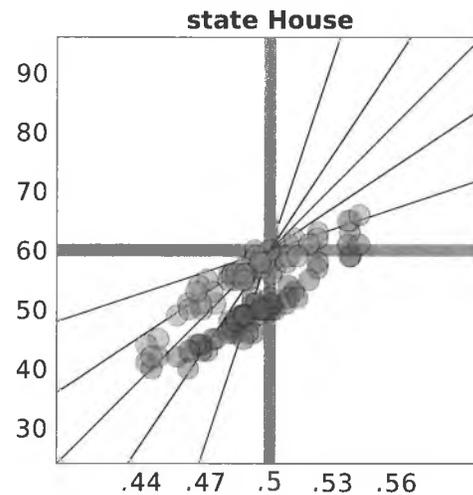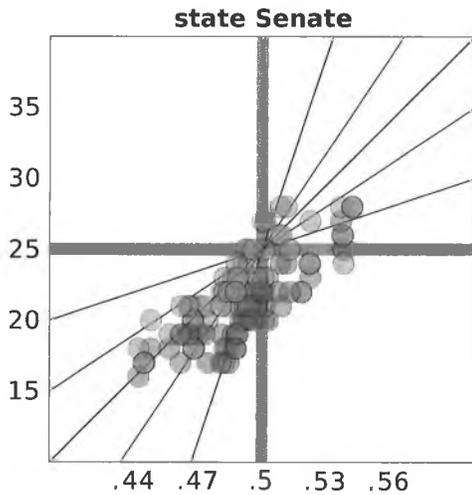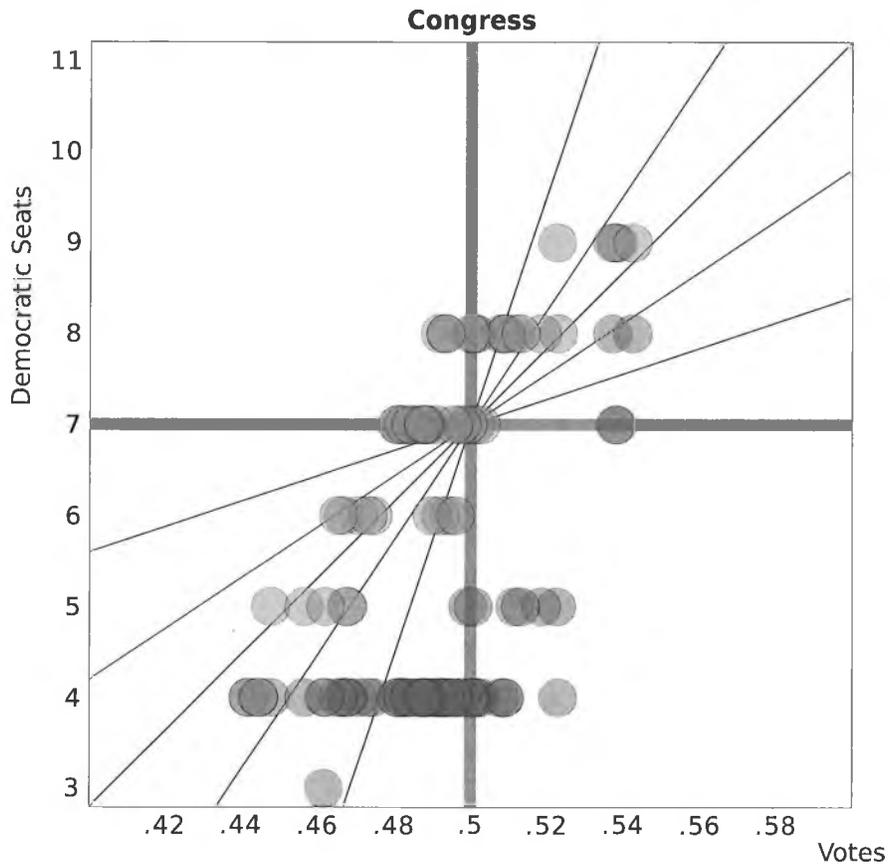
Figure 4: On a seats-vs.-votes plot, the election results for the six maps are shown for 52 general election contests in the last decade; each colored dot is plotted as the coordinate pair (vote share, seat share). The diagonals show various lines of *responsiveness* that pivot around the central point of fairness: half of the votes securing half of the seats. The Congressional comparison is at top, followed by Senate and House. The enacted plans are shown in maroon and the alternative plans in green.

3.4 Swing districts and competitive contests

Another way to understand the electoral properties of districting plans is to investigate how many districts always give the same partisan result over a suite of observed electoral conditions, and how many districts can "swing" between the parties. Figure 5 compares the six plans across the up-ballot elections. The enacted plans lock in large numbers of always-Republican seats. In the Senate and House, nearly half the seats are locked down for Republicans. In the Congressional plan, it's well *over* half. This provides another view from which the NCLCV plans provide attractive alternatives.
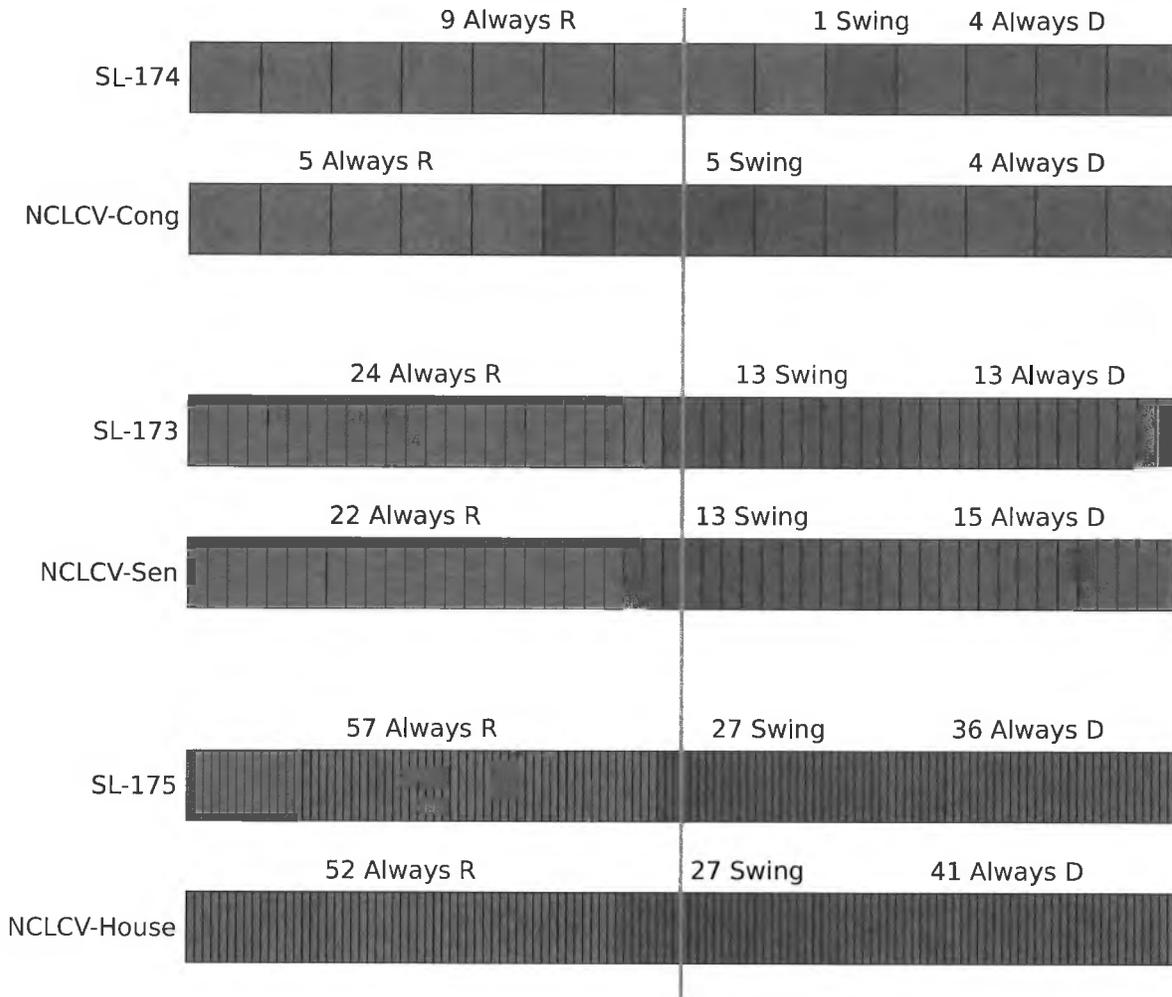

Figure 5: These visuals show the breakdown of seats that always have a Republican winner, always have a Democratic winner, or are sometimes led by each party across the 14 up-ballot elections over the previous Census cycle. The 50-50 split is marked.

One more measure of partisan fairness, frequently referenced in the public discourse, is the tendency of a districting plan to promote close or competitive contests. We close with a comparison of the enacted and alternative plans that displays the number of times across the full dataset of 52 elections that a contest had a partisan margin of closer than 10 points, 6 points, or 2 points, respectively. This can occur up to $14 \cdot 52 = 728$ times in Congressional maps, $50 \cdot 52 = 2600$ times in state Senate maps, and $120 \cdot 52 = 6240$ times in state House

maps. The figures below show horizontal rules at every 10% interval of the total number of possible competitive contests; we can see, for instance, that the alternative Congressional plan has contests within a 10-point margin more than 40% of the time.

Competitive contests in the Congressional plans


Senate plans

House plans
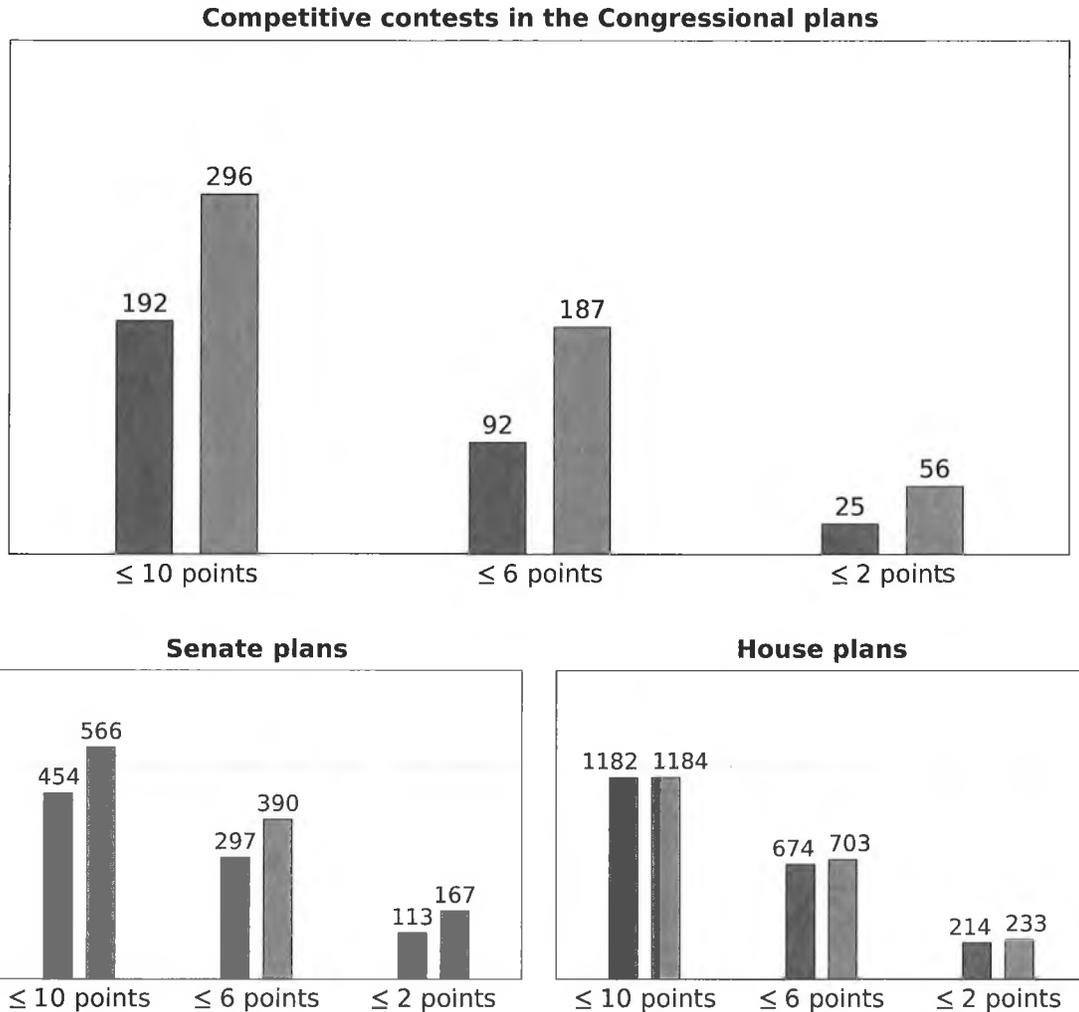
Figure 6: These bar graphs show the number of competitive contests for the enacted plans (maroon) and the alternative plans (green). In each plot, we consider increasingly restrictive definitions of "competitive" from left to right, counting districts in which the major-party vote split is closer than 45-55, 47-53, and 49-51, respectively.

4 Conclusion

North Carolina is a very "purple" state. In 38 out of the 52 contests in our dataset, the statewide partisan outcome is within a 6-point margin: 47-53 or closer. We can make a striking observation by laying our six plans over the vote patterns.

	D Vote Share	SL-174	NCLCV-Cong	SL-173	NCLCV-Sen	SL-175	NCLCV-House
GOV12	0.4418	4	4	16	18	41	44
AGC16	0.4444	4	4	17	17	40	42
LAC16	0.4475	4	5	18	20	42	45
JHU16	0.4563	4	5	18	19	42	49
AGC20	0.4615	3	4	17	19	40	51
JZA16	0.4619	4	5	19	21	43	50
JDI16	0.4653	4	6	19	21	44	53
LTG16	0.4665	4	6	19	21	44	54
LAC12	0.4674	4	5	20	20	44	51
AGC12	0.4678	4	5	18	18	43	50
SEN16	0.4705	4	6	19	21	43	55
TRS16	0.4730	4	6	19	21	45	53
TRS20	0.4743	4	6	17	20	45	51
JA620	0.4806	4	7	17	21	46	55
PRS16	0.4809	4	7	19	22	48	56
JA420	0.4822	4	7	17	22	47	56
INC20	0.4823	4	7	18	23	47	56
LTG20	0.4836	4	7	18	21	46	55
JA720	0.4842	4	7	17	22	48	56
SUP20	0.4862	4	7	19	23	49	56
JA520	0.4874	4	7	18	22	49	57
JA218	0.4876	4	7	18	22	45	55
JS420	0.4879	4	7	19	24	49	56
J1320	0.4885	4	7	19	23	49	56
PRS12	0.4897	4	6	20	21	46	55
SEN20	0.4910	4	7	20	24	48	56
LAC20	0.4918	4	8	21	25	51	58
SEN14	0.4919	4	6	20	22	46	52
PRS20	0.4932	4	8	20	25	50	60
JS220	0.4934	4	8	21	24	51	59
SUP16	0.4941	4	6	22	23	49	57
JS118	0.4955	4	7	20	25	50	58
INC16	0.4960	4	6	22	22	50	57
JST16	0.4976	4	7	21	23	50	58
LTG12	0.4992	5	7	22	22	50	58
JS120	0.5000	4	8	22	27	52	60
AUD16	0.5007	5	8	22	23	51	56
GOV16	0.5011	4	7	20	27	50	58
ATG20	0.5013	4	8	21	25	51	58
ATG16	0.5027	4	7	20	23	50	57
JA118	0.5078	4	8	22	26	51	58
AUD20	0.5088	4	8	24	28	54	61
JA318	0.5091	4	8	21	26	52	59
SOS20	0.5116	5	8	24	28	53	62
JGE16	0.5131	5	8	22	25	52	59
INC12	0.5186	5	8	22	22	55	61
SOS16	0.5226	5	9	24	24	57	62
GOV20	0.5229	4	8	23	27	58	63
AUD12	0.5371	8	9	27	28	61	65
SOS12	0.5379	7	9	26	26	59	63
TRS12	0.5383	7	9	25	24	59	65
SUP12	0.5424	8	9	28	28	61	66

Table 6: 52 general elections, sorted from lowest to highest Democratic share. Election codes have a three-character prefix and a two-digit suffix designating the office and the election year, respectively. AGC = Agriculture Commissioner; ATG = Attorney General; AUD = Auditor; GOV = Governor; INC = Insurance Commissioner; LAC = Labor Commissioner; PRS = President; SEN = Senator; SOS = Secretary of State; SUP = Superintendent of Schools; TRS -=Treasurer. The prefix JA* refers to judicial elections to the Court of Appeals (so that, for instance, JA118 is the election to the Seat 1 on the Court of Appeals in 2018), those beginning with JS* refer to elections to the state Supreme Court. All other J* prefixes refer to an election to replace a specific judge on the Court of Appeals.

The three enacted plans combine with those 38 relatively even vote patterns to produce 114 outcomes. Every single pairing of an enacted plan with a close statewide contest—a complete sweep of 114 opportunities—gives an *outright Republican majority* of seats. All three enacted plans will lock in an extreme, resilient, and unnecessary advantage for one party.

By every measure considered above that corresponds to a clear legal or good-government redistricting goal or value, the alternative plans meet or exceed the performance of the enacted plans. It is therefore demonstrated to be possible, without any cost to the redistricting principles in play, to select maps that are far fairer to the voters of North Carolina.

References

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

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https://sites.duke.edu/quantifyinggerrymandering/files/2021/08/countyClusters2020.pdf

[5] Moon Duchin, Taissa Gladkova, Eugene Henninger-Voss, Heather Newman, and Hannah Wheelen, *Locating the Representational Baseline: Republicans in Massachusetts.* Election Law Journal, Volume 18, Number 4, 2019, 388–401.

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

Executed this 16th day of November, 2021.

_____
                                    Moon Duchin

Sworn and subscribed before me

this the 16 of November, 2021.

_____
Notary Public

Name: _____

My Commission Expires: _____

GREGORY J. AGNEW
Notary Public
COMMONWEALTH OF MASSACHUSETTS
My Commission Expires
June 28, 2024

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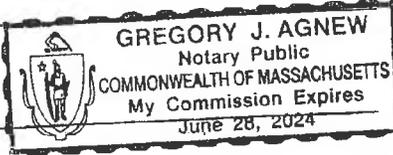
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Education

University of Chicago   MS 1999, PhD 2005
Mathematics
Advisor: Alex Eskin   Dissertation: *Geodesics track random walks in Teichmüller space*

Harvard University   BA 1998
Mathematics and Women's Studies

Appointments

Tufts University
Professor of Mathematics   2021—
Assistant Professor, Associate Professor   2011–2021

Director | Program in Science, Technology, & Society   2015–2021
(on leave 2018–2019)

Principal Investigator | MGGG Redistricting Lab   2017—

Senior Fellow | Tisch College of Civic Life   2017—

University of Michigan
Assistant Professor (postdoctoral)   2008–2011

University of California, Davis
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, technology and law.
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.

Awards & Distinctions

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

The (homological) persistence of gerrymandering
Foundations of Data Science, online first. (with Thomas Needham and Thomas Weighill)

You can hear the shape of a billiard table: Symbolic dynamics and rigidity for flat surfaces
Commentarii Mathematici Helvetici, to appear. arXiv:1804.05690
(with Viveka Erlandsson, Christopher Leininger, and Chandrika Sadanand)

Conjugation curvature for Cayley graphs
Journal of Topology and Analysis, online first. (with Assaf Bar-Natan and Robert Kropholler)

A reversible recombination chain for graph partitions
Preprint. (with Sarah Cannon, Dana Randall, and Parker Rule)

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. online.
(with Aloni Cohen, JN Matthews, and Bhushan Suwal)

Stars at infinity in Teichmüller space
Geometriae Dedicata, Volume 213, 531–545 (2021). (with Nate Fisher)   arXiv:2004.04321

Random walks and redistricting: New applications of Markov chain Monte Carlo
(with Daryl DeFord) For edited volume, Political Geometry. Under contract with Birkhäuser.

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)

The Heisenberg group is pan-rational
Advances in Mathematics **346** (2019), 219–263. (with Michael Shapiro)

Random nilpotent groups I
IMRN, 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.

Science, Technology, Law, and Policy Publications & Preprints

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, Available online. (with Amariah Becker, Dara Gold, and Sam Hirsch)

Discrete geometry for electoral geography
Preprint. (with Bridget Eileen Tenner) arXiv:1808.05860

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

Clustering propensity: A mathematical framework for measuring segregation
Preprint. (with Emilia Alvarez, Everett Meike, and Marshall Mueller; appendix by Tyler Piazza)

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.

Graduate Advising in Mathematics

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

Principal supervisor Thomas Weighill (2019–2020)

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

Teaching

Courses Developed or Customized

Mathematics of Social Choice | sites.tufts.edu/socialchoice
Voting theory, impossibility theorems, redistricting, theory of representative democracy, metrics of fairness.

History of Mathematics | 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
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.

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

Standard Courses

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

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

Selected Talks and Lectures

Distinguished Plenary Lecture
75th Anniversary Meeting of Canadian Mathematical Society, Ottawa, Ontario

June 2021
online (COVID)

BMC/BAMC Public Lecture
Joint British Mathematics/Applied Mathematics Colloquium, Glasgow, Scotland

April 2021
online (COVID)

AMS Einstein Public Lecture in Mathematics
Southeastern Sectional Meeting of the AMS, Charlottesville, VA

[March 2020]
postponed

Gerald and Judith Porter Public Lecture
AMS-MAA-SIAM, Joint Mathematics Meetings, San Diego, CA

January 2018

Mathematical Association of America Distinguished Lecture
MAA Carriage House, Washington, DC

October 2016

American Mathematical Society Invited Address
AMS Eastern Sectional Meeting, Brunswick, ME

September 2016

Named University Lectures

- Parsons Lecture | UNC Asheville	October 2020
- Loeb Lectures in Mathematics | Washington University in St. Louis	[March 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
- Nilpotent groups (three talks) | Seoul National University   October 2014
- Sub-Finsler geometry of nilpotent groups (five talks) | Galatasaray Univ., Istanbul   April 2014

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

- Data Science for Social Good Workshop (DS4SG) | Georgia Tech (virtual)   November 2020
- Privacy Tools Project Retreat | Harvard (virtual)   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

Editorial Boards

Harvard Data Science Review
Associate Editor   since 2019

Advances in Mathematics
Member, Editorial Board   since 2018

Selected Professional and Public Service

Amicus Brief of Mathematicians, Law Professors, and Students	2019
principal co-authors: Guy-Uriel Charles and Moon Duchin	
Supreme Court of the United States, in Rucho v. Common Cause - cited in dissent	
Committee on Science Policy	2020–2023
American Mathematical Society	
Program Committee	2020–2021
Symposium on Foundations of Responsible Computing	
Presenter on Public Mapping, Statistical Modeling	2019, 2020
National Conference of State Legislatures	
Committee on the Human Rights of Mathematicians	2016–2019
American Mathematical Society	
Committee on The Future of Voting: Accessible, Reliable, Verifiable Technology	2017–2018
National Academies of Science, Engineering, and Medicine	

Visiting Positions and Residential Fellowships

Visiting Professor Department of Mathematics	Fall 2021
Boston College | Chestnut Hill, MA	
Fellow Radcliffe Institute for Advanced Study	2018–19
Harvard University | Cambridge, MA	
Member Center of Mathematical Sciences and Applications	2018–19
Harvard University | Cambridge, MA	
Visitor Microsoft Research Lab	2018–19
MSR New England | Cambridge, MA	
Research Member Geometric Group Theory program	Fall 2016
Mathematical Sciences Research Institute | Berkeley, CA	
Research Member Random Walks and Asymptotic Geometry of Groups program	Spring 2014
Institut Henri Poincaré | Paris, France	
Research Member Low-dimensional Topology, Geometry, and Dynamics program	Fall 2013
Institute for Computational and Experimental Research in Mathematics | Providence, RI	
Research Member Geometric and Analytic Aspects of Group Theory program	May 2012
Institut Mittag-Leffler | Stockholm, Sweden	
Research Member Quantitative Geometry program	Fall 2011
Mathematical Sciences Research Institute | Berkeley, CA	
Postdoctoral Fellow Teichmüller "project blanc"	Spring 2009
Agence Nationale de la Recherche (Collège de France) | Paris, France	

EXHIBIT B

STATE OF NORTH CAROLINA

COUNTY OF WAKE

IN THE GENERAL COURT OF JUSTICE
SUPERIOR COURT DIVISION
21 CVS 015426
21 CVS 500085

NORTH CAROLINA LEAGUE OF
CONSERVATION VOTERS, et al.,

Plaintiffs,

vs.

REPRESENTATIVE DESTIN HALL, in his
official capacity as Chair of the House
Standing Committee on Redistricting, et al.,

Defendants.

**LEGISLATIVE DEFENDANTS'
NOTICE OF DEPOSITION OF
SAM HIRSCH**

REBECCA HARPER, et al.,

Plaintiffs,

vs.

REPRESENTATIVE DESTIN HALL, in his
official capacity as Chair of the House
Standing Committee on Redistricting, et al.,

Defendants.

PLEASE TAKE NOTICE that on December 31, 2021, beginning at 9:00 a.m., Legislative

Defendants in the above-captioned matter will take the deposition of Sam Hirsch via an online

videoconference, pursuant to Rules 26 and 30 of the North Carolina Rules of Civil Procedure. The

testimony will be recorded by video recording and stenographic means and will be taken remotely

before a Notary Public or some other person duly authorized by law to take depositions. The

deponent, court reporter, and counsel will each remotely join the videoconference via phone and/or

an email invitation that will be sent by the court reporter. The examination shall continue from day to day until completed. All counsel are invited to attend and cross-examine as provided by law.

This the 27th day of December, 2021.

/s/ Phillip J. Strach

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* Admitted Pro Hac Vice

CERTIFICATE OF SERVICE

It is hereby certified that on this the 27th day of December, 2021, the foregoing was served on the individuals below by email:

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Counsel for Intervenor Common Cause

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/s/ Phillip J. Strach

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EXHIBIT C

STATE OF NORTH CAROLINA

COUNTY OF WAKE

IN THE GENERAL COURT OF JUSTICE
SUPERIOR COURT DIVISION
21 CVS 015426
21 CVS 500085

NORTH CAROLINA LEAGUE OF
CONSERVATION VOTERS, et al.,

Plaintiffs,

vs.

REPRESENTATIVE DESTIN HALL, in his
official capacity as Chair of the House
Standing Committee on Redistricting, et al.,

Defendants.

REBECCA HARPER, et al.,

Plaintiffs,

vs.

REPRESENTATIVE DESTIN HALL, in his
official capacity as Chair of the House
Standing Committee on Redistricting, et al.,

Defendants.

LEGISLATIVE DEFENDANTS' TRIAL WITNESS LIST

Pursuant to the Court's December 13, 2021 Scheduling Order, Legislative Defendants identify

the following witnesses who they may call to testify live at the trial in this matter:

1. Senator Ralph Hise

2. Representative Destin Hall

3. Dr. Michael Barber

4. Dr. Andrew Taylor

5. Dr. Jeffrey Lewis

6. Mr. Sam Hirsch

7. Mr. Sean Trende

8. All witnesses listed by *Harper* Plaintiffs or *NCLCV* Plaintiffs

9. All witnesses listed by Plaintiff-Intervenors.

Legislative Defendants reserve the right, to the fullest extent permitted under the North Carolina Rules of Civil Procedure, the Local Rules for the Civil Superior Court for the Tenth Judicial District, the General Rules of Practice for the Superior and District Courts, and the orders of this Court to supplement this list.

This the 27th day of December, 2021.

/s/ Phillip J. Strach

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* Admitted Pro Hac Vice

CERTIFICATE OF SERVICE

It is hereby certified that on this the 27th day of December, 2021, the foregoing was served on the individuals below by email:

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EXHIBIT D

From:	Schauf, Zachary C.
Sent:	Tuesday, December 28, 2021 8:10 AM
To:	Alyssa Riggins; McKnight, Katherine L.; Jones, Stanton; Theodore, Elisabeth; Steed, Terence; Callahan, Sam; akhanna@elias.law; lmadduri@elias.law; jshelly@elias.law; gwhite@elias.law; Hilary Harris Klein; allison@southerncoalition.org; Mitchell D. Brown; Katelin Kaiser; Jeff Loperfido; Adam Doerr; Narendra Ghosh; Brennan, Stephanie; Burton Craige; Erik R. Zimmerman; Majmundar, Amar; Paul Smith; Phil Strach; Stephen Feldman; Tom Farr; Babb, Mary Carla (Hollis); Braden, E. Mark; Raile, Richard; Lewis, Patrick T.; John Branch; Hirsch, Sam; Amunson, Jessica Ring; Bracey, Kali N.; Mittal, Urja R.; Molodanof, Olivia; Boer, Tom; Martin Warf; Greg McGuire; Nate Pencook; Cella, John
Subject:	RE: NCLCV v. Hall; Notice of Deposition

Counsel,

We have reviewed the Legislative Defendants' Notice of Deposition of Sam Hirsch, which is improper for at least two reasons. First, it is procedurally deficient. Mr. Hirsch is not a party, but is instead a third party; hence, in no event may the Legislative Defendants proceed by notice of deposition. *E.g., Blue Ridge Pediatric & Adolescent Medicine, Inc. v. First Colony Healthcare, LLC*, No. 11 CVS 127, 2012 WL 3249553, at *7 (N.C. Super. Ct. Aug. 9, 2012); *Kelley v. Agnoli*, 695 S.E.2d 137, 147 (N.C. Ct. App. 2010).

Second, in all events, taking Mr. Hirsch's deposition is neither necessary nor appropriate. Depositions of a party's litigation counsel are granted only in extraordinary circumstances, which this is not. Your notice, at bottom, seeks to depose Mr. Hirsch because he worked with non-testifying experts to craft the NCLCV Plaintiffs' proposed remedy for the constitutional violation they have alleged in their Verified Complaint. It would never be appropriate to depose litigation counsel on that ground, and your request is particularly inappropriate here, given how clearly it aims to harass one of the NCLCV Plaintiffs' lead counsel on the eve of trial.

If there is information that the Legislative Defendants legitimately believe they need, in addition to the voluminous and comprehensive information that the NCLCV Plaintiffs have produced five days ago in compliance with the Court's December 20 Order, the Legislative Defendants should propound appropriate interrogatories seeking additional factual information in lieu of seeking testimony from trial counsel.

Please let us know by 5:00 p.m. today whether you will withdraw your deposition notice. Please also confirm that you will strike Mr. Hirsch from your witness list for trial, which is highly inappropriate and threatens to deprive the NCLCV Plaintiffs of their choice of trial counsel. Otherwise, we will seek appropriate relief from the Court. The NCLCV Plaintiffs reserve all rights.

Regards,

Zach

From: Alyssa Riggins <alyssa.riggins@nelsonmullins.com>
Sent: Monday, December 27, 2021 9:24 AM
To: McKnight, Katherine L. <kmcknight@bakerlaw.com>; Jones, Stanton <Stanton.Jones@arnoldporter.com>; Schauf, Zachary C. <ZSchauf@jenner.com>; Theodore, Elisabeth <Elisabeth.Theodore@arnoldporter.com>; Steed, Terence <Tsteed@ncdoj.gov>; Callahan, Sam <Sam.Callahan@arnoldporter.com>; akhanna@elias.law; lmadduri@elias.law; jshelly@elias.law; gwhite@elias.law; Hilary Harris Klein <hilaryhklein@scsj.org>; allison@southerncoalition.org; Mitchell D. Brown <mitchellbrown@scsj.org>; Katelin Kaiser <katelin@scsj.org>; Jeff Loperfido <jeffloperfido@scsj.org>; Adam

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Subject: NCLCV v. Hall; Notice of Deposition

External Email – Exercise Caution
Counsel,

Please find the attached notice of deposition.

Best,
Alyssa

ALYSSA RIGGINS ASSOCIATE
alyssa.riggins@nelsonmullins.com

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Confidentiality Notice

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EXHIBIT E

STATE OF NORTH CAROLINA

COUNTY OF WAKE

IN THE GENERAL COURT OF JUSTICE
SUPERIOR COURT DIVISION
21 CVS 015426
21 CVS 500085

NORTH CAROLINA LEAGUE OF
CONSERVATION VOTERS, et al.,

Plaintiffs,

vs.

REPRESENTATIVE DESTIN HALL, in his
official capacity as Chair of the House
Standing Committee on Redistricting, et al.,

Defendants.

REBECCA HARPER, et al.,

Plaintiffs,

vs.

REPRESENTATIVE DESTIN HALL, in his
official capacity as Chair of the House
Standing Committee on Redistricting, et al.,

Defendants.

**LEGISLATIVE DEFENDANTS' OBJECTIONS AND RESPONSES TO PLAINTIFFS'
SECOND SET OF INTERROGATORIES**

Defendants Representative Destin Hall, Senator Ralph E. Hise, Jr., Speaker of the North

Carolina House Timothy R. Moore, and President Pro Tem of the North Carolina Senate, Philip

E. Berger, Senator Warren Daniel, and Senator Paul Newton ("Defendants"), by and through

undersigned counsel, serve their objections and responses to Plaintiffs' Second Set of

Interrogatories as follows:

GENERAL OBJECTIONS

Defendants make the following answers, responses, and objections to Plaintiffs' Second Set of Interrogatories ("Interrogatories"). Each of the following responses is made subject to any and all objections as to competence, relevance, or other grounds that would require exclusion of such statement if made by a witness present and testifying in court. Any and all such objections and grounds are expressly reserved and may be interposed at the time of trial.

The responses are based on Defendants' present knowledge, information, and belief, as derived from (a) the knowledge and information of present employees or agents of Defendants gained in their capacity as such and (b) a review of the documents and materials maintained by Defendants that would be likely to contain the information called for by the Interrogatories. These responses are subject to amendment and supplementation as Defendants acquire additional information and complete their review and analysis and made without prejudice to Defendants' right to use subsequently discovered or developed information. Defendants state that their responses to the Interrogatories were prepared in consultation with their attorneys and may not exactly match the words or phrases that may be used by individuals in the course of this litigation to describe events, policies, and practices discussed herein.

No incidental or implied admissions are intended by these responses. The fact that Defendants respond or object to any Interrogatory should not be taken as an admission that Defendants accept or admit the existence of any facts assumed by such Interrogatory or that such Response or objection constitutes admissible evidence as to any such assumed facts. The fact that Defendants respond to part of or all of any Interrogatory is not intended to be, and shall not be, construed as, a waiver by Defendants of any part of any objection to any Interrogatory.

Defendants will respond to Plaintiffs' Document requests in accordance with Rules 26 and 33 of the North Carolina Rules of Civil Procedure and will not provide responses or documents to the extent such responses or production would exceed the requirements of those Rules. Defendants only respond to these discovery requests with information or documents in their possession, custody or control.

Since the North Carolina Rules of Civil Procedure prohibit discovery of privileged matters, Defendants have attempted to interpret each Document Request to call for discoverable matter only. To the extent any response or produced document contains or refers to matters otherwise protected from discovery by the work product doctrine, the attorney-client privilege, or the legislative privilege, no waiver is intended; nor is any waiver intended as to any other matters that are or may be subject to such protection or otherwise privileged.

These responses are provided solely for the purpose of and in relation to this action

Responses and Objections to Specific Interrogatories

1.   Identify by 5 p.m. on December 23, 2021, each person who, to your knowledge took part in the drawing of the 2021 Plans, including each person who had any involvement in (a) the development, formulation, discussion, consideration, review, drawing, revision, negotiation, and/or adoption of the 2021 Plans and/or the 2021 Plans Criteria; (b) assisting Legislative Defendants, directly or indirectly, in conducting any of the activates described in subsection (a); or (c) providing input, directly or indirectly to any Legislative Defendant, to their staff, or to employees of the General Assembly on the 2021 Plans and/or the 2021 Plans Criteria. This request covers individuals including, but not limited to, legislative staff members and contractors, legal counsel, members of political organizations, and outside consultants of any kind, including outside political consultants or outside mapmakers:

RESPONSE: Defendants object to this interrogatory to the extent it calls for the production of information protected by the attorney-client privilege, legislative privilege, or the work-product doctrine.[1] Defendants further object on the grounds that this request seeks information beyond Defendants' knowledge. Legislators could have spoken to staff members, other legislators, or members of the public without the knowledge of Defendants. Subject to and without waiving these objections, Legislative Defendants identify:

Rep. Destin Hall	Rep. William Richardson	Rep. Jason Saine
Rep. John Torbett	Rep. Jay Adams	Rep. Cecil Brockmam
Rep. Becky Carney	Rep. Linda Cooper-Suggs	Rep. Jimmy Dixon
Rep. Jon Hardister	Rep. Pricey Harrison	Rep. Kelly Hastings
Rep. Zack Hawkins	Rep. Brenden Jones	Rep. Grey Mills
Rep. Robert Reives	Rep. David Rogers	Rep. John Szoka
Rep. Harry Warren	Rep. Lee Zachary	Sen. Ralph Hise
Sen. Warren Daniel	Sen. Paul Newton	Sen. Dan Blue
Sen. Jay Chaudhuri	Sen. Ben Clark	Sen. Don Davis
Sen. Chuck Edwards	Sen. Carl Ford	Sen. Kathy Harrington
Sen. Brent Jackson	Sen. Joyce Krawiec	Sen. Paul Lowe
Sen. Natasha Marcus	Sen. Natalie Murdock	Sen. Wiley Nickel
Sen. Jim Perry	Sen. Bill Rabon	Sen. Gladys Robinson

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[1] Defendants have not withheld any information in response to this Interrogatory on the basis of these objections.

Legislative Defendants further identify all members of the General Assembly who voted on the Redistricting bills. The roll calls are publicly available on the General Assembly Website.

Legislative Defendants further identify the following staff members and third parties:

- **All individuals who spoke at public hearings**
- **Neal Inman**
- **Brian Fork**
- **Joshua Yost**
- **Sam Hayes**
- **Brent Woodcox**
- **Dylan Reel**
- **Nathan Babcock**
- **Jonathan Mattingly**
- **Attorneys at Nelson Mullins and Baker Hostetler provided legal advice in connection with the 2021 redistricting.**
- **Non-Partisan Central Staff Members**

2.   Identify, by 5 p.m. pm December 23, 2021, all documents or data relied upon or otherwise considered by any Legislative Defendant or by any person identified in response to Interrogatory No. 1 above in connection with the creation of the 2021 Plans, including but not limited to draft redistricting plans (whether partial or complete), analysis of or relating to the 2021 Plans or drafts thereof, election or other partisan data, racial data, or any other data.

RESPONSE: Defendants object to this interrogatory to the extent it calls for the production of information protected by the attorney-client privilege, legislative privilege, or the work-product doctrine.[2] Defendants further object that this request is duplicative of Request for Production of Document No. 1. Subject to and without waiving these objections, Defendants state that no partisan or racial data was used or relied upon by Defendants. Defendants cannot speak for Dr. Mattingly, or the other third parties identified above. Defendants further state that they relied upon Dr. Mattingly's county groupings, which are publicly available, the 2020 census data (excluding any racial or political data), and incumbent addresses (which have already been produced to Counsel). Defendants also consulted publicly available remedial maps, and court opinions, including the special master reports of Nathan Persily drafted in *Covington v. North Carolina*. As a further response, Defendants refer Plaintiffs to Defendants' Objections and Responses to Request for Production of Document No. 1.

Defendant Hall states that during the truncated map-drawing period he relied on a staff member, Mr. Dylan Reel, to help prepare draft concept maps to develop options for a limited number of districts in a limited number of county groupings while complying with redistricting criteria. Defendant Hall would sometimes review these concept maps while drawing plans but the concept maps did not dictate map drawing and often Defendant Hall ignored them altogether. Defendant Hall and Mr. Reel did not use any racial or political data in preparing these concept maps. Neither Defendant Hall nor the

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[2] Given the broad sweep of this Interrogatory it could conceivably cover documents created or prepared by attorneys containing legal analysis or documents otherwise covered by legislative privilege. However, Defendants have not to their knowledge withheld any documents or data based on these objections.

other Legislative Defendants have copies of these concept maps or any information or data related to such maps.

Submitted, this the 28th day of December, 2021.

/s/ Phillip J. Strach

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