

FILED

02-08-2024

CLERK OF WISCONSIN  
SUPREME COURT**IN THE SUPREME COURT OF WISCONSIN**

No. 2023AP1399

Rebecca Clarke, Ruben Anthony, Terry Dawson, Dana Glasstein, Ann Groves-Lloyd, Carl Hujet, Jerry Iverson, Tia Johnson, Angie Kirst, Selika Lawton, Fabian Maldonado, Annemarie McClellan, James Mcnett, Brittany Muriello, Ela Joosten (Pari) Schils, Nathaniel Slack, Mary Smith-Johnson, Denise Sweet and Gabrielle Young,

*Petitioners,*

Governor Tony Evers In His Official Capacity, Nathan Atkinson, Stephen Joseph Wright, Gary Krenz, Sarah J. Hamilton, Jean-Luc Thiffeault, Somesh Jha, Joanne Kane and Leah Dudley,

*Intervenors-Petitioners,*

v.

Wisconsin Elections Commission, Don Millis, Robert F. Spindell, Jr., Mark L. Thomsen, Ann S. Jacobs, Marge Bostelmann, Carrie Riepl, in their Official Capacities as Members of the Wisconsin Elections Commission; Meagan Wolfe In Her Official Capacity as the Administrator of the Wisconsin Elections Commission; Andre Jacque, Tim Carpenter, Rob Hutton, Chris Larson, Devin Lemahieu, Stephen L. Nass, John Jagler, Mark Spreitzer, Howard Marklein, Rachael Cabral-Guevara, Van H. Wanggaard, Jesse L. James, Romaine Robert Quinn, Dianne H. Hesselbein, Cory Tomczyk, Jeff Smith and Chris Kapenga in Their Official Capacities as Members of the Wisconsin Senate,

*Respondents,*

Wisconsin Legislature, Billie Johnson, Chris Goebel, Ed Perkins, Eric O'Keefe, Joe Sanfelippo, Terry Moulton, Robert Jensen, Ron Zahn, Ruth Elmer and Ruth Streck,

*Intervenors-Respondents.*

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**BRIEF OF AMICUS MATTHEW PETERING, PhD  
REGARDING CONSULTANTS' REPORT**

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### **INTEREST OF AMICUS CURIAE**

Matthew Petering, PhD is an Associate Professor of Industrial and Manufacturing Engineering at UW-Milwaukee and owner of District Solutions LLC, a Milwaukee-based redistricting consulting company. He earned a PhD and master's degree, both in Industrial and Operations Engineering, from the University of Michigan. He has more than 20 years of experience developing algorithms to optimize the productivity of seaports, warehouses, universities, and high-speed railway, car-sharing, and healthcare systems. In 2019, Petering began developing a redistricting algorithm, named *FastMap*, which produces fair maps based upon objective criteria. He has been involved as an *amicus curiae* in this case since November 8, 2023.

### **BACKGROUND**

On November 8, 2023, Petering submitted an *amicus curiae* brief to the Court which highlighted the immense mapmaking challenge presented by this case; argued that a powerful computer algorithm was needed to tackle this challenge; and presented several Wisconsin legislative district plans—some that his algorithm made in 2021 and one new plan—illustrating why this was the case.

On December 22, 2023, the Court held that the current state legislative district maps are unconstitutional and asked the six parties to submit proposals for new maps. They did so on January 12, 2024. At the same time, Petering submitted a district plan (173#008) created by his *FastMap* redistricting algorithm and petitioned the Court to include it in the group of proposals to be evaluated. The Court denied the request on January 17, 2024.

On January 22, 2024 the six parties, and several *amici* including Petering, submitted briefs commenting on the six map proposals before the Court. Shortly thereafter, on February 1, Dr. Bernard Grofman and Dr. Jonathan Cervas, the Court-appointed consultants, submitted to the Court a report comparing the performance of the six map proposals before the Court.

The purpose of this *amicus curiae* brief is to respond to the report submitted by Drs. Grofman and Cervas (i.e., “the consultants”). Petering acknowledges the Court declined his request to submit his *FastMap* district plan 173#008, but he includes the analytics from that plan to enable him to fully respond to the consultants’ report.

### **ARGUMENT**

The conclusions reached by Dr. Grofman and Dr. Cervas regarding the six map proposals before the Court are strikingly similar to those reached by Petering in his January 22 *amicus curiae* brief. The methodological approach taken by the consultants is also similar to that taken by Petering in his two previous *amicus curiae* briefs.

The consultants’ methodological approach and conclusions are similar Petering’s in many ways. First, both groups have advocated using the Dave’s Redistricting App (DavesRedistricting.org) from the beginning. Second, the consultants and Petering have independently concluded that none of the six map proposals before the Court achieves political neutrality. Third, the consultants and Petering have given special consideration to Native Americans while passing over other less meritorious and less-well-defined communities of interest. Fourth, the consultants and Petering have independently acknowledged that better map proposals are possible. Both groups have observed that

another map proposal could be created which “improves performance on most or all of the Court mandated criteria” (consultant’s report page 25). We elaborate on these points below.

**I. The Consultants And Petering Have Advocated Using Dave’s Redistricting From The Beginning.**

Both the consultants and Petering have advocated using DavesRedistricting.org (DRA) for analyzing, sharing, and visualizing maps from the beginning of their involvement in this case. Use of DRA is critical as it places map analyses on a common footing so everyone—the Court, parties, consultants, *amici*, and public—can clearly see the advantages and disadvantages of each proposal via an apples-to-apples comparison. DRA is also exceptionally speedy at rendering analyses. Within half an hour, it is possible to upload into DRA the twelve .csv files for the six parties’ assembly and senate maps and obtain detailed analytics that provide a solid picture of each proposal’s strengths and weaknesses. To Petering’s knowledge, no other tool can perform such a detailed analysis of a map proposal so quickly.

The consultants advocated for DRA since the beginning of their involvement in this case. The fourth paragraph of their December 26 letter to the Court reads as follows. *“A link to the plan hosted on Dave’s Redistricting App (DRA) is also encouraged. Dave’s Redistricting App <https://davesredistricting.org/> is a free mapping software program that is easy to use and has been made use of by some other state courts. Posting a map on DRA strongly facilitates public access to any proposed map.”*

Meanwhile, Petering's November 8, 2023 *amicus curiae* brief made ten references to DRA on pages 11, 17, 20, 21, 24, 25, and 26. That brief used DRA to measure performance for nearly all redistricting criteria that were considered.

**II. The Consultants And Petering Independently Concluded That None Of The Six Map Proposals Before The Court Achieves Political Neutrality. All Proposals Are Tilted Toward Republicans.**

The consultants clearly stated that none of the six map proposals before the Court achieves political neutrality. They stated that the proposals submitted by the Wisconsin Legislature and the Johnson intervenors “can clearly be labeled partisan gerrymanders” (page 23). They also stated that, “On average, each plan, including those submitted by Governor Evers, the Democratic Senators, the Clarke Petitioners, and Wright [Intervenors-Petitioners] ... remain[s] tilted toward the Republicans on all three of our metrics [for political neutrality]” (page 23). Meanwhile, Petering's *amicus curiae* brief stated that: “A detailed analysis of the six map proposals...shows that none achieves political neutrality” (heading II on page 7).

The details of the consultants' analysis of political neutrality, which considered 13 recent statewide elections, are shown in Tables 5-10 and 12 of their report. Table 12, which summarizes the information in Tables 5-10, is reproduced in Table 1 below. The negative values in the columns labeled “average mean-median bias” and “average partisan bias” show that, according to their analysis, all proposals favor Republicans.

The details of Petering's analysis of political neutrality are shown in Figures 3-5 and Tables 3, 4, and 6



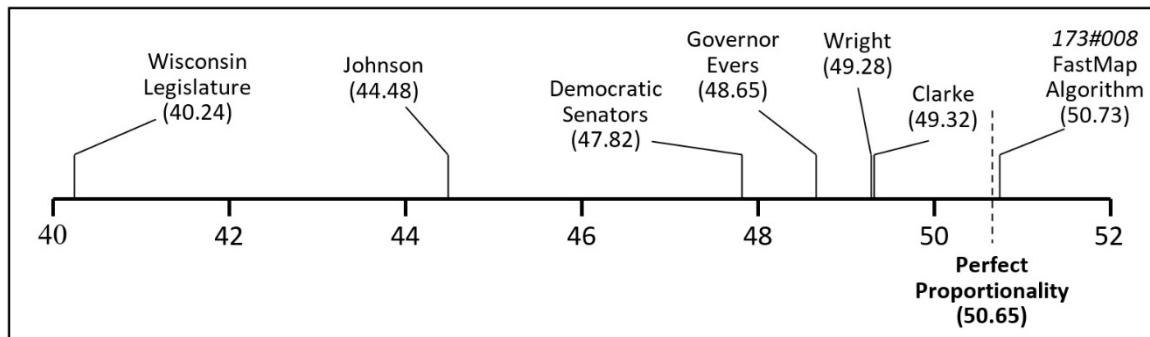
of his January 22 brief. These items are reproduced in Figures 1-3 and Tables 2-4 below. (His analysis regarding the number of competitive districts appears in a later section.)

**Table 1. Overall analysis of the political neutrality of the proposals (from consultants' February 1 report). Results are averages of each proposal's assembly and senate plan across 13 elections.**

Plan	Average mean-median bias	No. elections with majoritarian result	Average partisan bias
SB621 (current)	-6.3%	10 of 26	-15.5%
Clarke	-1.7%	20 of 26	-2.0%
Democratic Senators	-1.3%	19 of 26	-0.4%
Governor Evers	-1.8%	20 of 26	-2.5%
Johnson	-4.4%	10 of 26	-10.5%
WI Legislature	-6.3%	10 of 26	-15.6%
Wright	-1.5%	17 of 26	-2.0%

\* Lower absolute values for mean-median and partisan bias are more politically neutral. The more elections with a majoritarian result, the more politically neutral. Negative values in this table favor Republicans.

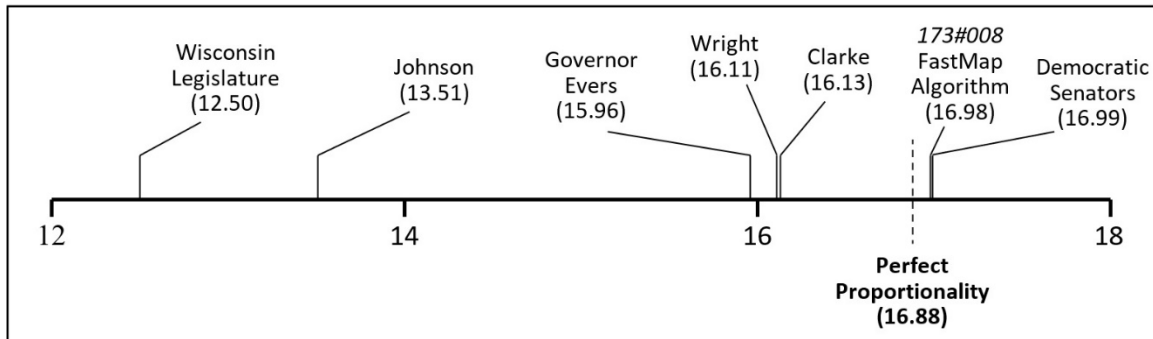
Figure 1 shows that the most assembly seats predicted to be won by Democrats for any of the six proposals before the Court is 49.32 seats, whereas 50.65 seats is a perfectly proportional (i.e., neutral) result. Thus, all proposals' assembly maps favor Republicans.



**Figure 1. Predicted number of assembly seats won by Democrats for the map proposals before the Court (from Petering's January 22 Amicus Brief). Results for district plan 173#008 (which is not before the Court) are included for comparison.**

Figure 2 shows that only one proposal before the Court achieves political neutrality in the senate: the Democratic Senators' proposal in which Democrats are

predicted to win 16.99 seats. All other proposals favor Republicans. The Democratic Senators' proposal favors Republicans in the assembly by much more ( $= 2.83 \text{ seats} = 50.65 - 47.82$ ) than it favors Democrats in the senate ( $= 0.11 \text{ seats} = 16.99 - 16.88$ ), so it favors Republicans overall.

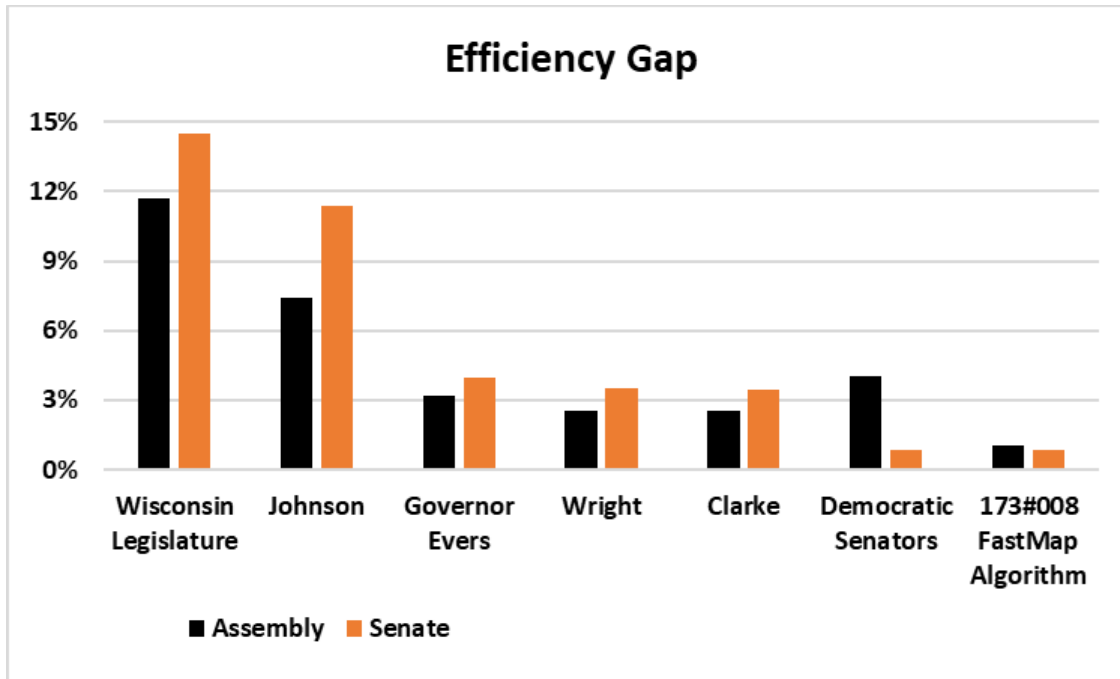


**Figure 2.** Predicted number of senate seats won by Democrats for the map proposals before the Court (from Petering's January 22 Amicus Brief). District plan 173#008 is included for comparison.

Table 2 shows the efficiency gap of each proposal, computed by DRA using the fractional seats approach, for the assembly and senate. The total efficiency gap for the assembly + senate is also shown. Smaller values are better, and the proposals before the Court are ordered from worst to best for total efficiency gap. Figure 3 is a visualization of the same information, which is also reported in the Clarke (page 23) and Democratic Senators' (page 11) briefs dated January 22. In Table 2 and Figure 3, positive values favor Republicans. These items again show that all map proposals before the Court favor Republicans.

**Table 2.** Efficiency gaps for the map proposals before the Court (from Petering's January 22 Amicus Brief). District plan 173#008 is included for comparison.

	Wisconsin Legislature	Johnson	Governor Evers	Wright	Clarke	Democratic Senators	173#008 FastMap Algorithm
Assembly	11.67%	7.39%	3.18%	2.55%	2.51%	4.02%	1.07%
Senate	14.46%	11.38%	3.95%	3.51%	3.46%	0.82%	0.85%
Sum	26.13%	18.77%	7.13%	6.06%	5.97%	4.84%	1.92%



**Figure 3. Efficiency gaps for the map proposals before the Court (from Petering's January 22 Amicus Brief). District plan 173#008 is included for comparison.**

Table 3 shows an estimation of each party's chances of winning at least a proportional share of seats in each chamber. According to DRA composite data for six elections from 2016 to 2022, a proportional share of assembly (senate) seats for Democrats is 51 (17) and for Republicans is 48 (16), rounded to the nearest integer. In Table 3, the six proposals before the Court are ordered from least to most politically neutral. Note that no such proposal gives Democrats more than a 30% chance of winning at least a proportional share of seats in the assembly. Meanwhile, all such proposals give Republicans at least an 85% chance of winning at least a proportional share of seats in the assembly. In the senate, only the Democratic Senators' proposal gives both parties at least a 50% chance of winning at least a proportional share of seats. All other proposals give Republicans a significantly higher chance of winning at least a proportional share of seats than Democrats. According to this table, all proposals before the Court favor Republicans.

**Table 3. Chance of each party winning at least a proportional share of seats in the assembly and senate (from Petering's January 22 Amicus Brief). District plan 173#008 is included for comparison.**

<b>Proposal</b>	<b>Democrats' Chances of Proportional Seat Share in the Assembly</b>	<b>Republicans' Chances of Proportional Seat Share in the Assembly</b>	<b>Democrats' Chances of Proportional Seat Share in the Senate</b>	<b>Republicans' Chances of Proportional Seat Share in the Senate</b>
Wisconsin Legislature	0 in a million	100.0000%	0.3%	99.95%
Johnson	0.4%	99.9%	2.4%	99.6%
Governor Evers	16.7%	93.0%	34.3%	87.4%
Clarke	26.4%	87.4%	38.2%	86.1%
Wright	27.9%	85.1%	38.5%	85.1%
Democratic Senators	8.4%	97.0%	64.2%	64.1%
173#008 FastMap Algorithm	52.3%	63.5%	64.4%	65.4%

Finally, Table 4 shows the majoritarian concordance of the map proposals according to eleven recent statewide elections, all of which are among the 13 elections considered by the consultants. For each of these eleven elections, the table shows whether the candidate who won the popular vote also carried a majority of assembly and senate districts in each proposal. Note that the best performing proposals before the Court—Governor Evers and Clarke—only achieved majority rule in 16 of 22 cases, although better performance is clearly possible. This table shows that no proposal before the Court strongly embodies the principle of majority rule.

Overall, the consultants and Petering independently concluded that all six map proposals before the Court favor Republicans. The Democratic Senators did as well, stating that “Republicans can win the majority of seats without winning the majority of votes under every proposed map” (footnote 5 on page 14, Jan. 22 brief). So did the Clarke petitioners: “All parties except the Legislature and Johnson intervenors submitted maps exhibiting political neutrality, with a modest advantage for the Republican Party” (page 23, Jan. 22 brief). And the metrics provided by Governor Evers (page 14, January 22 brief) show the same. If all parties’ proposals give the Republican Party an advantage, no proposal is politically neutral.

**Table 4. Proposals' adherence to majority rule in eleven recent statewide elections (from Petering's January 22 Amicus Brief). Majority rule is achieved (Y) if a majority of districts in the proposal are carried by the candidate who won the popular vote. If majority rule is not achieved, the cell is blank. District plan 173#008 is included for comparison.**

<b>Assembly Election</b>	<b>Wisconsin Legislature</b>	<b>Johnson</b>	<b>Democratic Senators</b>	<b>Wright</b>	<b>Governor Evers</b>	<b>Clarke</b>	<b>173#008 FastMap Algorithm</b>
2022 Gov			Y	Y	Y	Y	Y
2022 Sen	Y	Y	Y		Y	Y	Y
2022 AG				Y	Y	Y	Y
2022 SOS				Y		Y	Y
2022 Tres	Y	Y	Y		Y	Y	
2020 Pres				Y		Y	Y
2018 Gov							Y
2018 Sen	Y	Y	Y	Y	Y	Y	Y
2018 AG							Y
2016 Pres	Y	Y	Y	Y	Y	Y	Y
2016 Sen	Y	Y	Y	Y	Y	Y	Y
<b># Assembly Elections w/ Majority Rule</b>	5	5	6	7	7	9	10
<b>Senate Election</b>	<b>Wisconsin Legislature</b>	<b>Johnson</b>	<b>Democratic Senators</b>	<b>Wright</b>	<b>Governor Evers</b>	<b>Clarke</b>	<b>173#008 FastMap Algorithm</b>
2022 Gov			Y	Y	Y	Y	Y
2022 Sen	Y	Y			Y	Y	
2022 AG			Y	Y	Y		Y
2022 SOS			Y	Y	Y		Y
2022 Tres	Y	Y		Y	Y	Y	
2020 Pres			Y	Y	Y	Y	Y
2018 Gov			Y				Y
2018 Sen	Y	Y	Y	Y	Y	Y	Y
2018 AG			Y				Y
2016 Pres	Y	Y	Y	Y	Y	Y	Y
2016 Sen	Y	Y	Y	Y	Y	Y	Y
<b># Senate Elections w/ Majority Rule</b>	5	5	9	8	9	7	9
<b>Total # Majoritarian Asm. + Sen. Elections</b>	10	10	15	15	16	16	19

### **III. The Consultants And Petering Each Gave Special Consideration To Native Americans While Passing Over Other Less Meritorious And Less-Well-Defined Communities Of Interest**

Unlike most of the parties, the consultants and Petering each gave special consideration to Native American communities while passing over other less meritorious and less-well-defined communities of interest. Page 9 of the consultants' report states that most of the

parties' analyses of communities of interest "deal with claims that particular counties should be kept together because of various sorts of social, cultural, or economic ties. These types of claims are hard to evaluate and may be disguised ways of justifying plan elements that have a partisan or incumbent protection motive. Also ... we found it hard to clearly differentiate among plans on grounds such as maintenance of television media markets ... or consistency of plan borders with those of school catchment areas." On the other hand, a few sentences later, the report states that "Native Americans represent a distinct, cognizable, and geographically definable community of interest" (page 10).

Meanwhile, Petering's brief states that, "Among several communities of interest, one group stands out for its merits and well-defined boundaries: Native American communities" (page 35). Also, the brief *amici curiae* for the Midwest Alliance of Sovereign Tribes and Lac Du Flambeau Tribe also calls attention to the importance of Native American communities.

Two parties' briefs—those by the Wright intervenors-petitioners and the Legislature—discuss Native American communities as well as other types of communities, but the consultants, Petering, and the *amici curiae* Midwest Alliance of Sovereign Tribes and Lac Du Flambeau Tribe are the only groups to focus exclusively on Native Americans when discussing communities of interest.

**IV. The Consultants And Petering Are The Only Groups To Acknowledge That Better Map Proposals Exist. Both Agree That Better Proposals Are Readily Available.**

Unlike the parties and other *amici* in this case, the consultants and Petering independently acknowledge that better map proposals exist. Moreover, they agree that better map proposals are readily available.

The final paragraph of the consultants' report reads as follows:

The Court can instruct us to take one or more of the plans and improve it with respect to one or more of the court-mandated criteria. Or the Court can instruct us to draw on more than one of the proposed maps and offer the Court a map intended to improve performance on most or all of the Court mandated criteria. In the process of reviewing plans, we have done extensive explorations of the geography of Wisconsin, and we are confident that we can do so. If the Court were to instruct us to create such a map, we are poised to produce it quickly.

Consultants' Report, p. 25 (emphasis in original).

Meanwhile, hints are sprinkled throughout Petering's January 22 brief pointing to this same conclusion. That brief demonstrates that a better map proposal is readily available: district plan *173#008* that Petering submitted to the Court on January 12 but was not accepted by the Court on January 17. The conclusion of Petering's January 22 brief is repeated below. Clearly, the final sentence refers to district plan *173#008*.

In Petering's analysis, no proposal before the Court reaches partisan neutrality as required by the Court, and none has districts that are "as compact as practicable." Also, no proposal has a decent number of competitive districts. Petering recommends that none of the [six proposals before the Court] be accepted. Instead, the consultants should make maps for the Court that are politically neutral, highly compact, and competitive. According to this analysis, they already have an exceptional starting point for such maps."

*1/22/24 Brief of Amicus Matthew Petering, PhD Regarding Proposed Remedial Maps, p. 46.*

In contrast, no party or other *amicus curiae* has argued that better map proposals exist. The Legislature, Clarke petitioners, Democratic Senators, and Wright intervenors-petitioners each argue that their respective proposals are the best. The Johnson intervenors-respondents argue that the Legislature's and Johnson proposals are the two best, and Governor Evers argues that they are the two worst. Meanwhile, the brief *amici curiae* for the Midwest Alliance of Sovereign Tribes and Lac Du Flambeau Tribe argues that the Wright proposal is the best; the brief *amicus curiae* submitted by Forever Wisconsin argues that the Clarke proposal is the best; and the brief of *amici curiae* Wisconsin Justice Initiative, Inc. & Wisconsin Fair Maps Coalition argues that that the Legislature's and Johnson proposals are the two worst.

It is interesting to see the divide between what the consultants and Petering claim is possible and what others say. This begs the question: Would the consultants succeed



in quickly crafting another map proposal—a seventh proposal—which improves upon the six map proposals if the court were to instruct them to do so? Petering believes the answer to this question is yes.

**V. The Consultants Will Quickly Be Able To Craft Another Map Proposal—A Seventh Proposal—That Improves Upon The Six Map Proposals If The Court Instructs Them To Do So.**

The consultants will be able to quickly craft a seventh map proposal that performs better than any of the six map proposals before the Court because examples of better plans exist. For example, district plan *173#008* mentioned in Petering's January 22 *amicus curiae* brief has better overall performance than any of the six proposals before the Court. The .csv files for this plan are available at [DistrictSolutions.net/Wisconsin-Maps.html](http://DistrictSolutions.net/Wisconsin-Maps.html).

This section provides a detailed analysis showing that plan *173#008* meets strict legal requirements while outperforming all six proposals before the Court for the redistricting criteria listed in the Court's Dec. 22 decision. In particular, Petering will show that plan *173#008* has by far the best performance for political neutrality, greatest number of competitive districts, most compact district shapes, and best performance for Native American communities when compared to the six proposals before the Court. Petering will also show that it has nearly the best performance for county splitting, narrowly coming in second and placing well ahead of third place. The only major category where plan *173#008* is not among the top two performers is municipality splitting where it is in fifth place, better than two proposals before the Court. All in all, none of the map proposals before the court comes close to

plan 173#008's performance. Since it is possible to make a better plan, the consultants should also be able to craft one.

Petering now analyzes plan 173#008 one criterion at a time in support of the previous paragraph's conclusions with the criteria sequenced as in Petering's previous two *amicus curiae* briefs.

Table 5 shows the criteria listed in the Court's December 22, 2023 decision. There are 11 criteria, each identified by a number from 1 to 11. Most criteria consist of two subcriteria, one for assembly (A) and one for senate (S) districts. In Table 5, subcriteria are indicated by a number followed by the letter A or S. Criteria 1-4 relate to strict legal requirements, and Criteria 5-11 are used to compare maps that satisfy strict legal requirements.

**Table 5. Redistricting criteria included in the Court's December 22, 2023 decision**

<b>Criterion</b>	<b>Description</b>		
1	Nesting of assembly districts within senate districts		
<b>Assembly Subcriterion</b>	<b>Description</b>	<b>Senate Subcriterion</b>	<b>Description</b>
2A	Population deviation (legal requirmnt)	2S	Population deviation (legal requirmnt)
3A	EPC and VRA compliance	3S	EPC and VRA compliance
4A	Contiguity (strict)	4S	Contiguity (strict)
5A	Political neutrality	5S	Political neutrality
6A	Compactness	6S	Compactness
7A	Keeping counties intact	7S	Keeping counties intact
8A	Keeping municipalities intact	8S	Keeping municipalities intact
9A	Keeping communities of interest intact	9S	Keeping communities of interest intact
10A	Population deviation (beyond leg req)	10S	Population deviation (beyond leg req)
11A	Keeping wards intact	11S	Keeping wards intact

All metrics are computed by DavesRedistricting.org (DRA) unless otherwise noted.

### **A. Criteria 1-4: Strict Legal Requirements**

Table 6 shows the consultants' analysis of Criteria 1-4 which is nearly identical to the analysis in Petering's Jan. 22 *amicus curiae* brief. Regarding Criterion 1, all proposals nest three consecutively numbered assembly districts in a

senate district. Regarding Criterion 2, all proposals have a population deviation below 2% in the assembly and senate. Regarding Criterion 3, all proposals appear to comply with the Equal Protection Clause (EPC) and Voting Rights Act (VRA). Regarding Criterion 4, the consultants found that all proposals except that of the Democratic Senators satisfy the strict contiguity requirements. John D. Johnson, Marquette Law School Lubar Center Research Fellow, found that plan 173#008 also satisfies these requirements (<https://law.marquette.edu/facultyblog/2024/01/analysis-of-proposed-legislative-redistricting-plans-submitted-to-the-wisconsin-supreme-court/>).

**Table 6. Adherence to strict legal requirements for plan 173#008 and the six proposals before the Court.**

<b>Proposal</b>	<b>District Nesting and Numbering Requirements Met?</b>	<b>Overall Range in Population Deviation in Assembly and Senate &lt; 2%?</b>	<b>Complies with Voting Rights Act?</b>	<b>All Assembly and Senate Districts Strictly Contiguous?</b>
Democratic Senators	Y	Y	Y	
Wisconsin Legislature	Y	Y	Y	Y
Johnson	Y	Y	Y	Y
Governor Evers	Y	Y	Y	Y
Clarke	Y	Y	Y	Y
Wright	Y	Y	Y	Y
173#008 FastMap Algorithm	Y	Y	Y	Y

## **B. Criterion 5.1: Political Neutrality**

Tables A1-A10 and Figures A1-A10 in the appendix show the performance of district plan 173#008 and the six proposals before the Court according to ten metrics of political bias that are computed by DavesRedistricting.org: *disproportionality*, *efficiency gap*, *gamma bias*, *seats bias*, *partisan bias*, *declination*, *votes bias*, *global asymmetry*, *lopsided outcomes bias*, and *mean-median bias*. In all these tables and figures, positive (negative) values favor Republicans (Democrats). All computations are based on DRA 2016-2022 composite election data.

As mentioned in Petering's two previous *amicus curiae* briefs, in a swing state like Wisconsin, most measures of political neutrality are consistent. John F. Nagle & Alec Ramsay, *On Measuring Two-Party Partisan Bias in Unbalanced States*, 20 Election Law Journal 116 (2021). Thus, it is not surprising to see in Tables A1-A10 and Figures A1-A10 that the seven district plans have the same relative ranking for most metrics of political bias. Indeed, for the first six metrics of political bias listed in the preceding paragraph, the district plans have the exact same ranking from least to most politically neutral: *Legislature, Johnson, Governor Evers, Wright, Clarke, Democratic Senators, and 173#008*. For the next three metrics of political bias, the district plans have the same ranking except that the Wright and Clarke proposals are swapped.

The only metric of political bias for which the proposals have a substantially different ranking is mean-median bias. For this metric the plans have the following ranking from least to most politically neutral: *Legislature, Johnson, Clarke, Governor Evers, Democratic Senators, 173#008, and Wright*. Overall, *173#008* is by far the most politically neutral plan of the seven according to the appendix.

We can also evaluate political neutrality according to a new metric introduced by Petering in his January 22 brief: *chances of winning a proportional seat share*. As the brief explains, it is possible to use DRA 2016-2022 composite election data and Monte Carlo simulation to estimate, for any district plan, the likelihood that each party will win at least its proportional share of seats in the assembly and senate in a future election.

According to DRA 2016-2022 composite election data, Democrats have 51.16% of the statewide, two-party vote in

Wisconsin. In a perfectly proportional election this translates to  $(.5116)*(99) = 50.65$  assembly and  $(.5116)*(33) = 16.88$  senate seats for Democrats. Meanwhile, Republicans have received 48.84% of the two-party vote which translates to  $(.4884)*(99) = 48.35$  assembly and  $(.4884)*(33) = 16.12$  senate seats. Rounded to the nearest integer, a proportional share of assembly (senate) seats for Democrats is 51 (17) and for Republicans is 48 (16). A politically neutral proposal should give each party at least a 50% chance of obtaining at least a proportional share of seats in both the assembly and senate.

Table 7 shows Petering's estimates for the likelihood that each party will win at least its proportional share of seats in the assembly and senate in a future election for each of the seven district plans. The plans are ordered from least to most politically neutral in the table. Note that plan *173#008* is the only one that gives both political parties at least a 50% chance of obtaining at least a proportional share of seats in both chambers. All other plans give Democrats less than a 30% chance of winning a proportional share of seats in the assembly and Republicans more than an 85% chance of winning a proportional share of seats in the assembly. In the senate, the Democratic Senators' proposal is the only other plan that gives both parties at least a 50% chance of winning a proportional share of seats. According to Table 7, *173#008* is by far the most politically neutral of the seven plans.

**Table 7. Chance of each political party winning at least its proportional share of seats in the assembly and senate.**

<b>Proposal</b>	<b>Democrats' Chances of Proportional Seat Share in the Assembly</b>	<b>Republicans' Chances of Proportional Seat Share in the Assembly</b>	<b>Democrats' Chances of Proportional Seat Share in the Senate</b>	<b>Republicans' Chances of Proportional Seat Share in the Senate</b>
Wisconsin Legislature	0 in a million	100.0000%	0.3%	99.95%
Johnson	0.4%	99.9%	2.4%	99.6%
Governor Evers	16.7%	93.0%	34.3%	87.4%
Clarke	26.4%	87.4%	38.2%	86.1%
Wright	27.9%	85.1%	38.5%	85.1%
Democratic Senators	8.4%	97.0%	64.2%	64.1%
<b>173#008 FastMap Algorithm</b>	<b>52.3%</b>	<b>63.5%</b>	<b>64.4%</b>	<b>65.4%</b>

The final metric of political neutrality that we consider is one that appears prominently in the consultants' report: *majoritarian concordance*. Table 8 shows the exact same information in Tables 7-8 of the consultants' report except that plan 173#008 is included. This table shows, for 13 recent statewide elections, the number of such elections in which a majority of assembly and senate districts in each district plan are carried by the candidate who won the election. According to this table, plan 173#008 is the most politically neutral, resulting in majoritarian concordance in 23 of 26 cases. Two proposals before the Court—Governor Evers and Clarke—tie for second place with majoritarian concordance in 20 of 26 cases. Once again, plan 173#008 has the best performance.

*Overall, plan 173#008 has significantly better performance for political neutrality than any of the six proposals before the Court.*

**Table 8. Plans' adherence to majority rule in thirteen recent statewide elections. Majority rule is achieved (Y) if a majority of districts in the proposal are carried by the candidate who won the popular vote. If majority rule is not achieved, the cell is blank.**

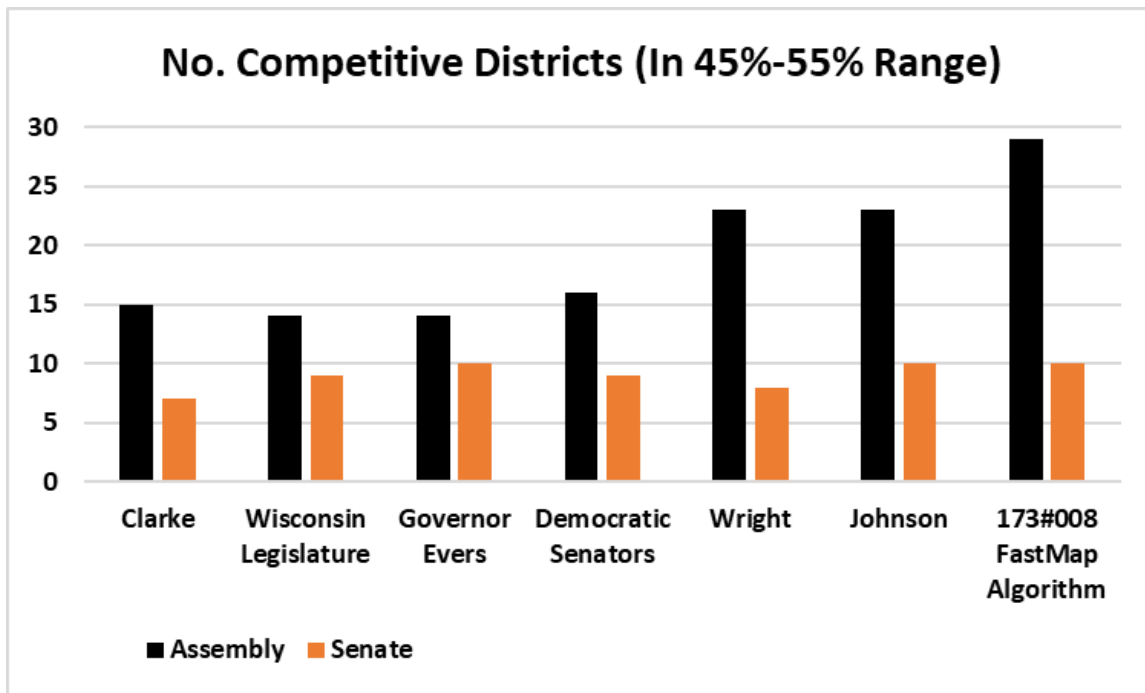
<b>Assembly Election</b>	<b>Wisconsin Legislature</b>	<b>Johnson</b>	<b>Wright</b>	<b>Democratic Senators</b>	<b>Governor Evers</b>	<b>Clarke</b>	<b>173#008 FastMap Algorithm</b>
2016 Sen	Y	Y	Y	Y	Y	Y	Y
2022 Tres	Y	Y		Y	Y	Y	
2022 Sen	Y	Y		Y	Y	Y	Y
2016 Pres	Y	Y		Y	Y	Y	Y
2022 SOS			Y			Y	Y
2020 Pres			Y			Y	Y
2018 AG							Y
2018 Gov							Y
2022 AG			Y		Y	Y	Y
2022 Gov			Y	Y	Y	Y	Y
2018 Tres			Y	Y	Y	Y	Y
2018 SOS			Y	Y	Y	Y	Y
2018 Sen	Y	Y	Y	Y	Y	Y	Y
<b># Assembly Elections w/ Majority Rule</b>	5	5	9	8	9	11	12
<b>Senate Election</b>	<b>Wisconsin Legislature</b>	<b>Johnson</b>	<b>Wright</b>	<b>Democratic Senators</b>	<b>Governor Evers</b>	<b>Clarke</b>	<b>173#008 FastMap Algorithm</b>
2016 Sen	Y	Y	Y	Y	Y	Y	Y
2022 Tres	Y	Y	Y		Y	Y	
2022 Sen	Y	Y			Y	Y	
2016 Pres	Y	Y	Y	Y	Y	Y	Y
2022 SOS			Y	Y	Y		Y
2020 Pres			Y	Y	Y	Y	Y
2018 AG				Y			Y
2018 Gov				Y			Y
2022 AG			Y	Y	Y		Y
2022 Gov			Y	Y	Y	Y	Y
2018 Tres				Y	Y	Y	Y
2018 SOS				Y	Y	Y	Y
2018 Sen	Y	Y	Y	Y	Y	Y	Y
<b># Senate Elections w/ Majority Rule</b>	5	5	8	11	11	9	11
<b>Total # Majoritarian Asm. + Sen. Elections</b>	10	10	17	19	20	20	23

### C. Criterion 5.2: Number Of Competitive Districts

Petering computed the number of competitive assembly and senate districts in the district plans. A competitive district is one in which each party's share of the two-party vote is in the 45%-55% range according to DRA 2016-2022 composite election data. The results are shown in Table 9 and Figure 4. Higher values are better, and the proposals are ordered from least to greatest number of competitive districts in the assembly + senate. Once again, plan 173#008 has significantly better performance than the six proposals before the Court.

**Table 9. Number of competitive districts in plan 173#008 and the six proposals before the Court (DavesRedistricting.org).**

Chamber	Clarke	Wisconsin Legislature	Governor Evers	Democratic Senators	Wright	Johnson	173#008 FastMap Algorithm
Assembly	15	14	14	16	23	23	29
Senate	7	9	10	9	8	10	10
Sum	22	23	24	25	31	33	39



**Figure 4. Number of competitive districts in plan 173#008 and the six proposals before the Court (DavesRedistricting.org).**

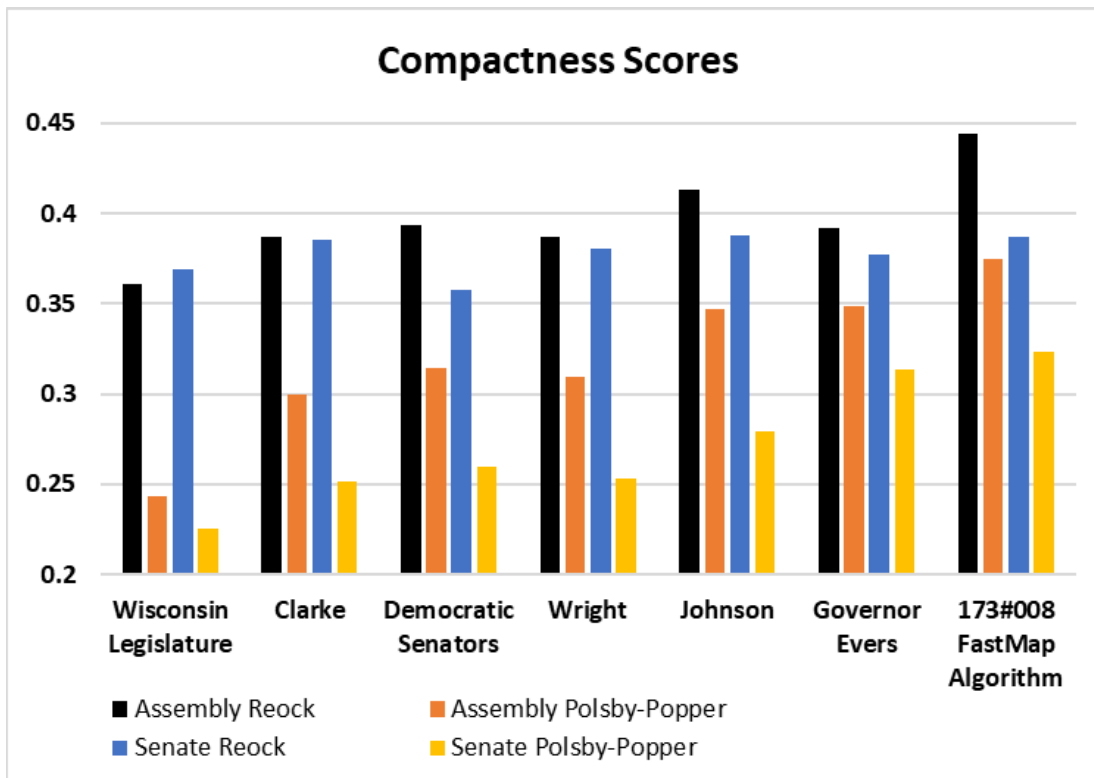


### D. Criterion 6: Compactness

Table 10 and Figure 5 show the average Reock and Polsby-Popper compactness scores (higher is better) of the districts in plan 173#008 and the six proposals before the Court. The plans are sequenced from lowest to highest sum of the two scores for the assembly + senate (i.e., from worst to best). Once again, plan 173#008 has significantly better performance than the six proposals before the Court.

**Table 10. Compactness scores (higher is better) for plan 173#008 and the six proposals before the Court (DavesRedistricting.org).**

Proposal	Assembly Reock Score	Assembly Polsby-Popper Score	Senate Reock Score	Senate Polsby-Popper Score	Sum
Wisconsin Legislature	0.3612	0.2437	0.3687	0.2257	1.199
Clarke	0.3867	0.2995	0.3852	0.2516	1.323
Democratic Senators	0.3932	0.3145	0.3577	0.2596	1.325
Wright	0.3869	0.3098	0.3805	0.2533	1.331
Johnson	0.4128	0.3472	0.3877	0.2793	1.427
Governor Evers	0.3919	0.3488	0.3769	0.3133	1.431
173#008 FastMap Algorithm	0.4443	0.3747	0.3867	0.3233	1.529



**Figure 5. Compactness scores (higher is better) for plan 173#008 and the six proposals before the Court (DavesRedistricting.org).**

Figures 6-19 show the assembly/senate districts in the seven plans. A significant number of districts in most of the proposals appear contorted and strained, reflecting the challenge to make districts that must simultaneously meet multiple mapping criteria. On the other hand, the districts in plan 173#008 are, by far, the gentlest on the eye.

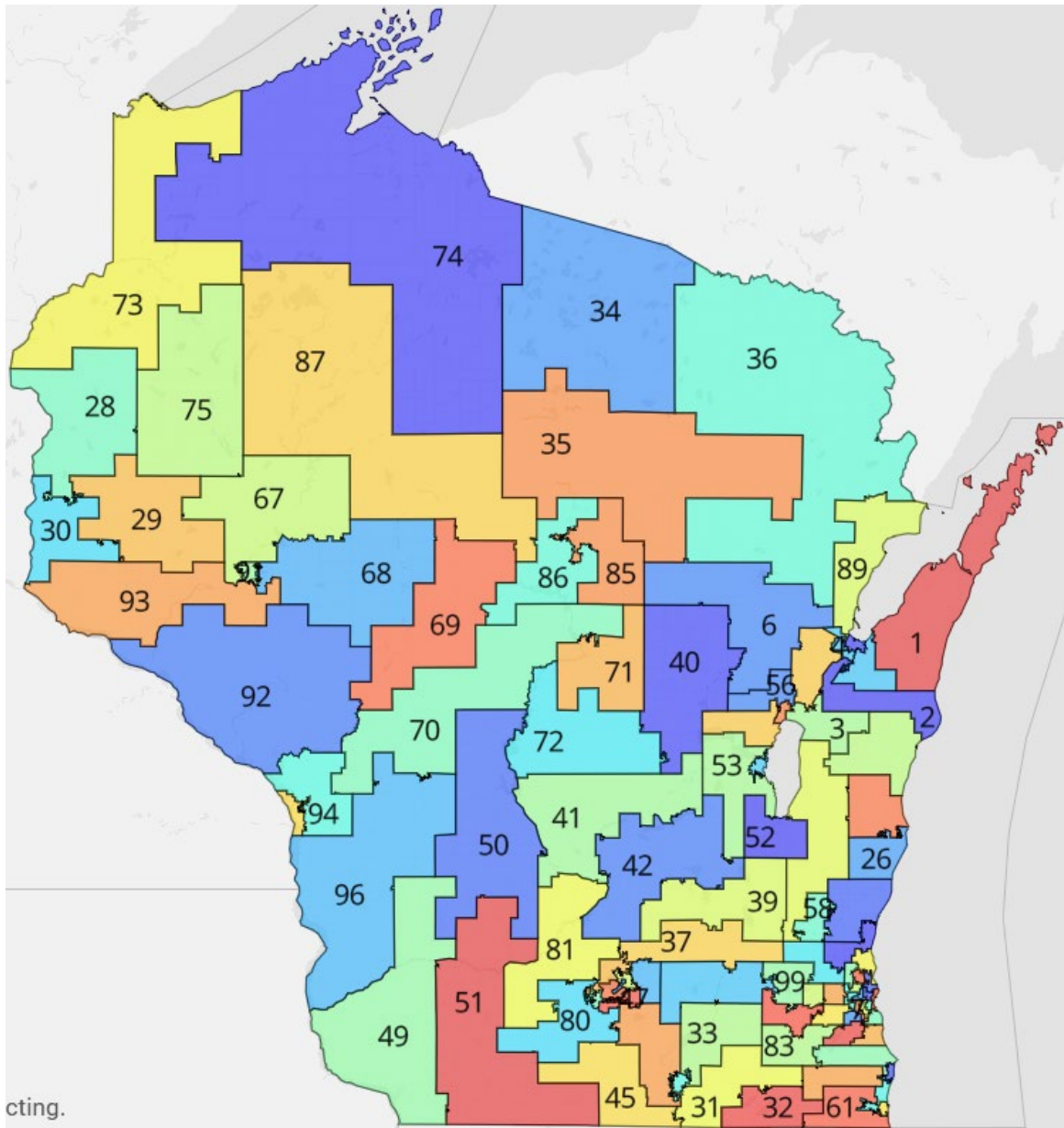


Figure 6. Wisconsin Legislature assembly districts (Reock = 0.3612, Polsby-Popper = 0.2437).

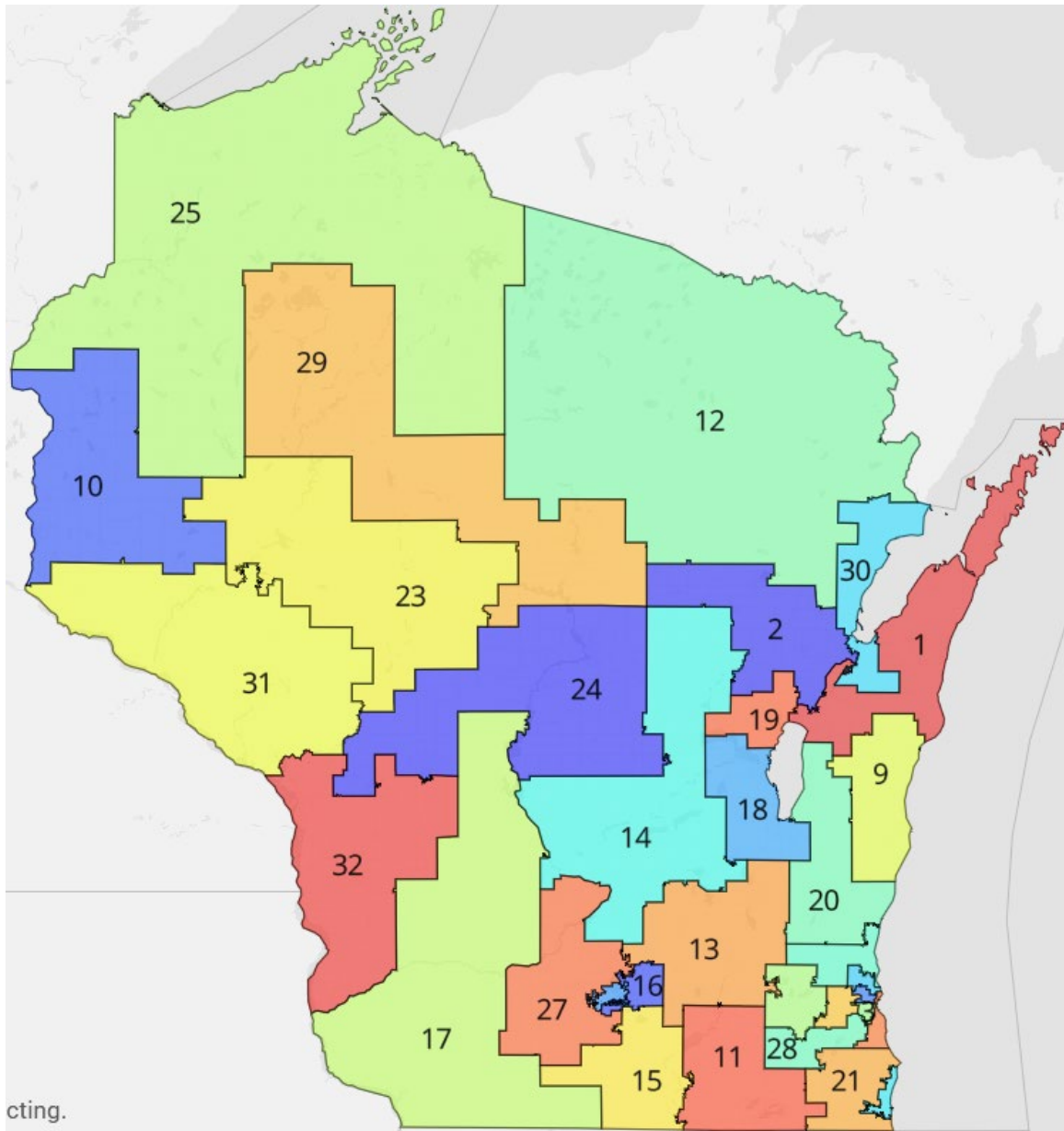
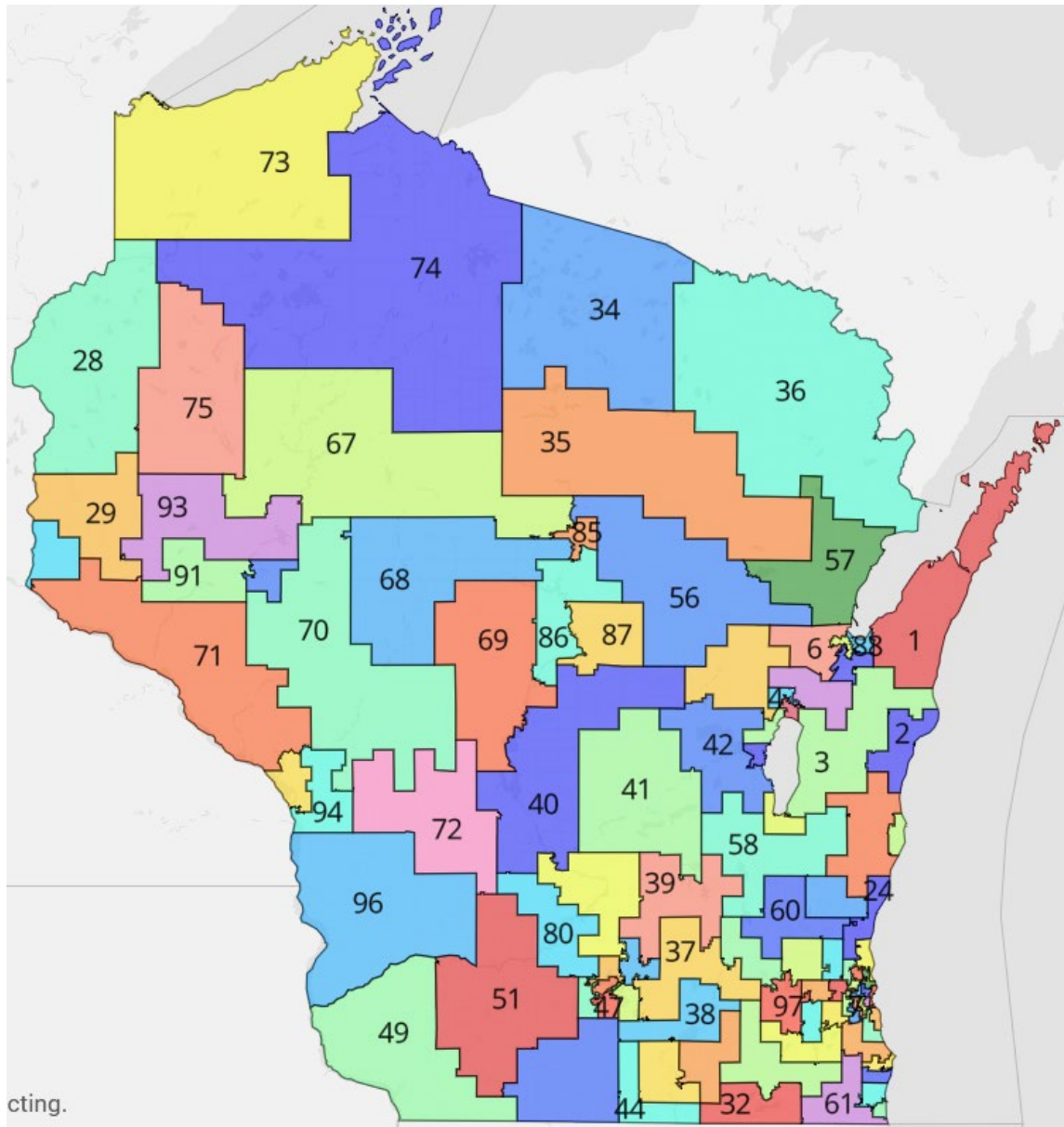


Figure 7. Wisconsin Legislature senate districts (Reock = 0.3687, Polsby-Popper = 0.2257).



**Figure 8. Clarke assembly districts (Reock = 0.3867, Polsby-Popper = 0.2995).**

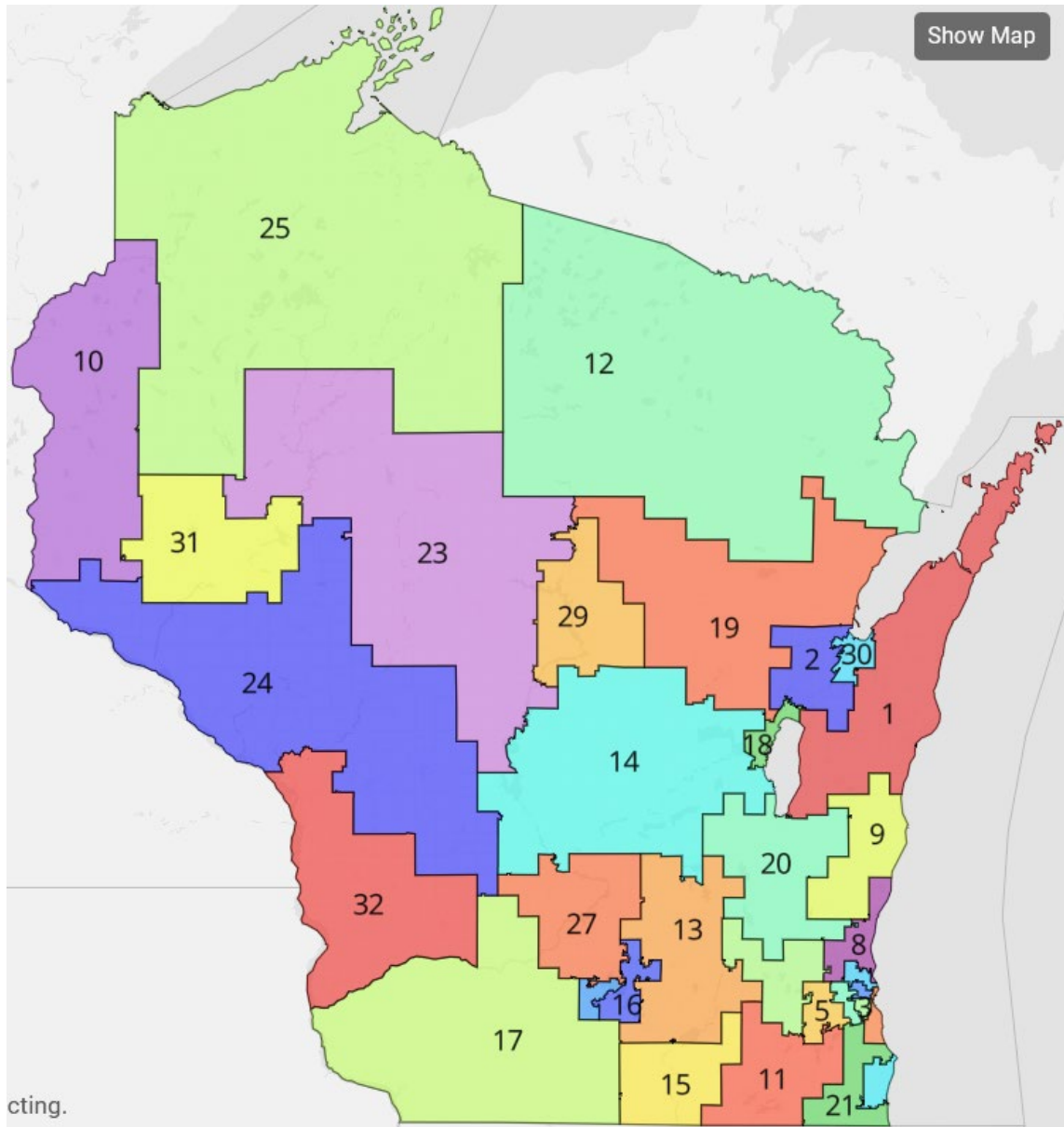


Figure 9. Clarke senate districts (Reock = 0.3852, Polsby-Popper = 0.2516).





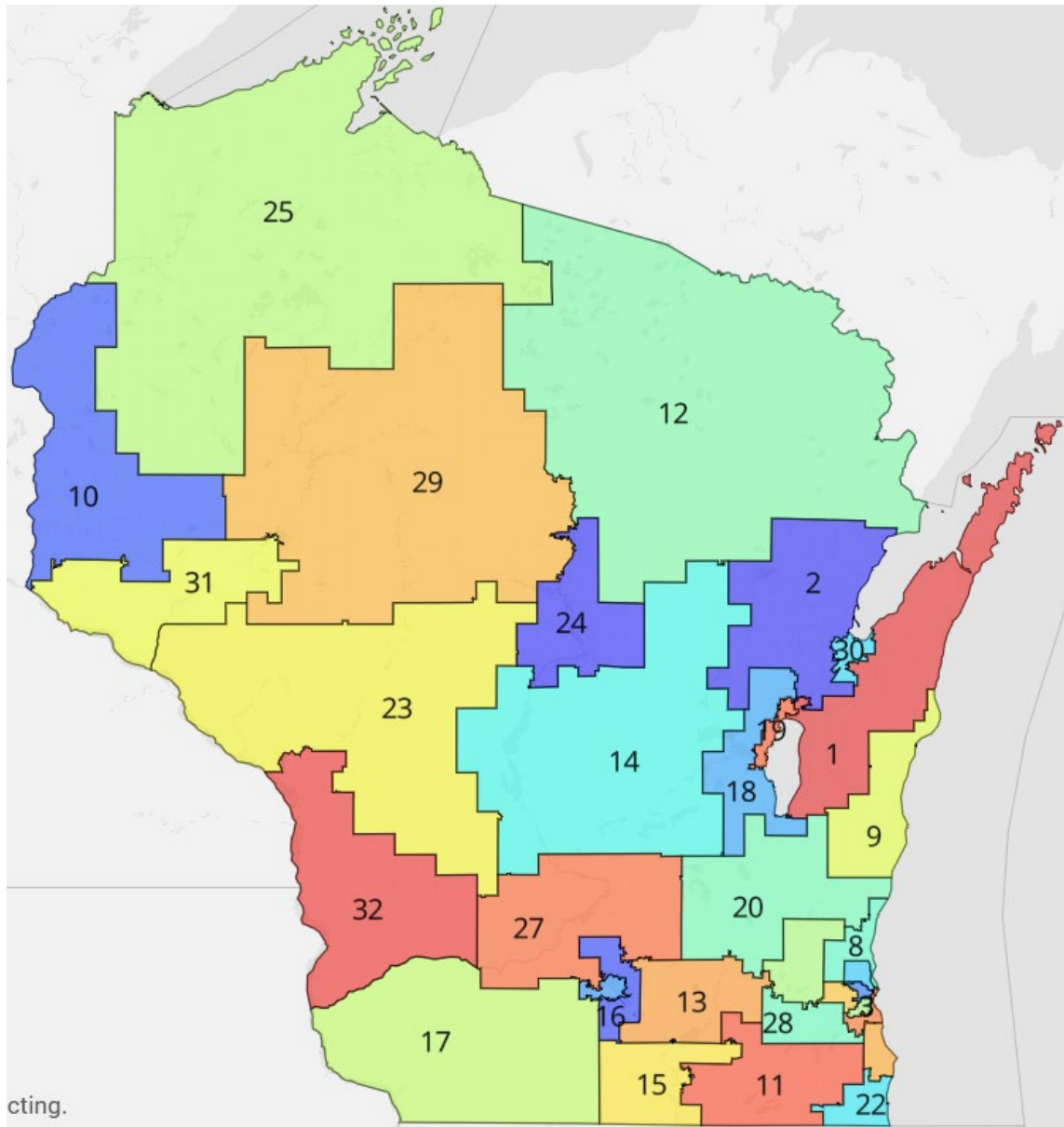


Figure 11. Democratic senators' senate districts (Reock = 0.3577, Polsby-Popper = 0.2596).

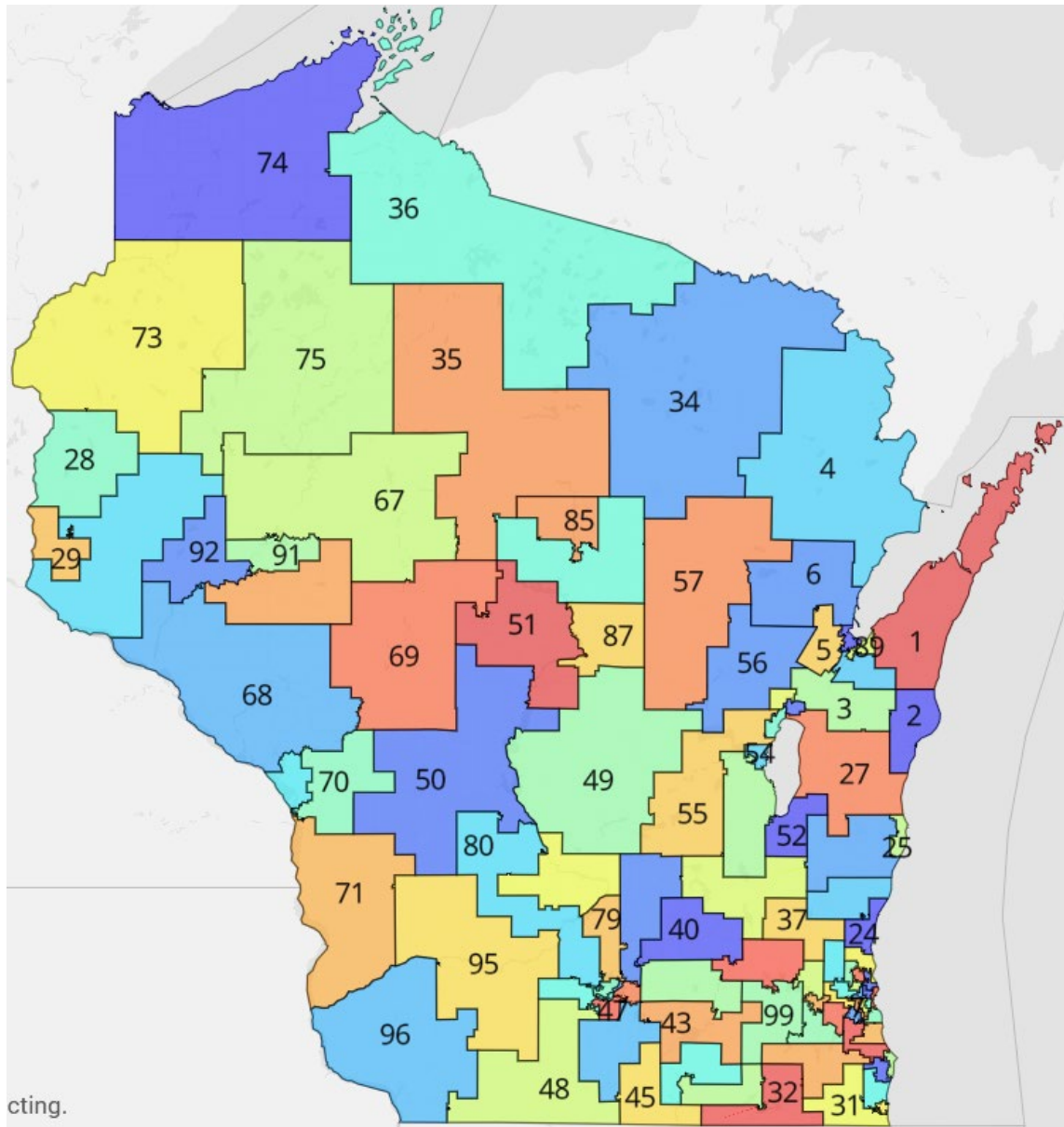


Figure 12. Wright assembly districts (Reock = 0.3869, Polsby-Popper = 0.3098).



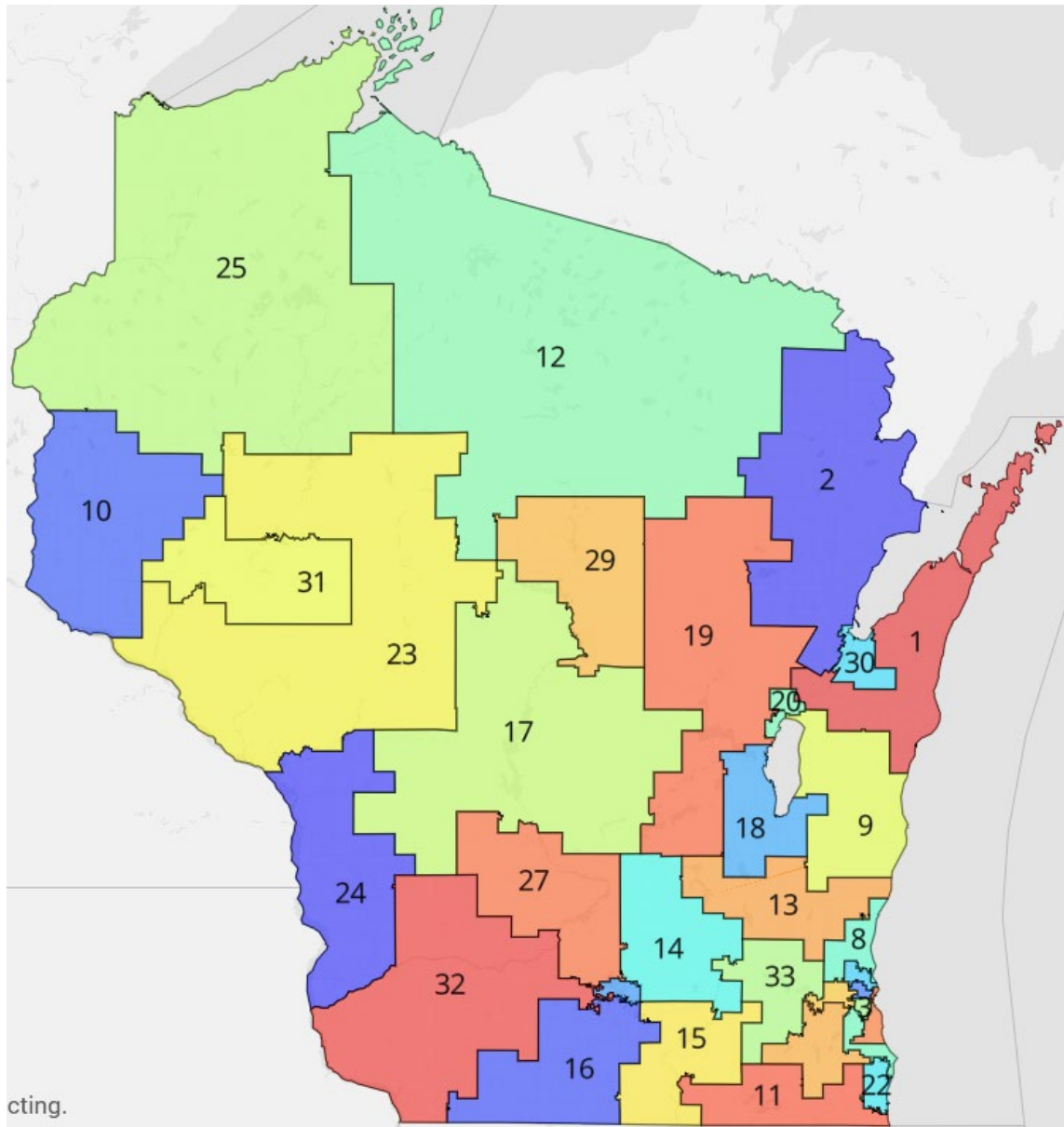


Figure 13. Wright senate districts (Reock = 0.3805, Polsby-Popper = 0.2533).

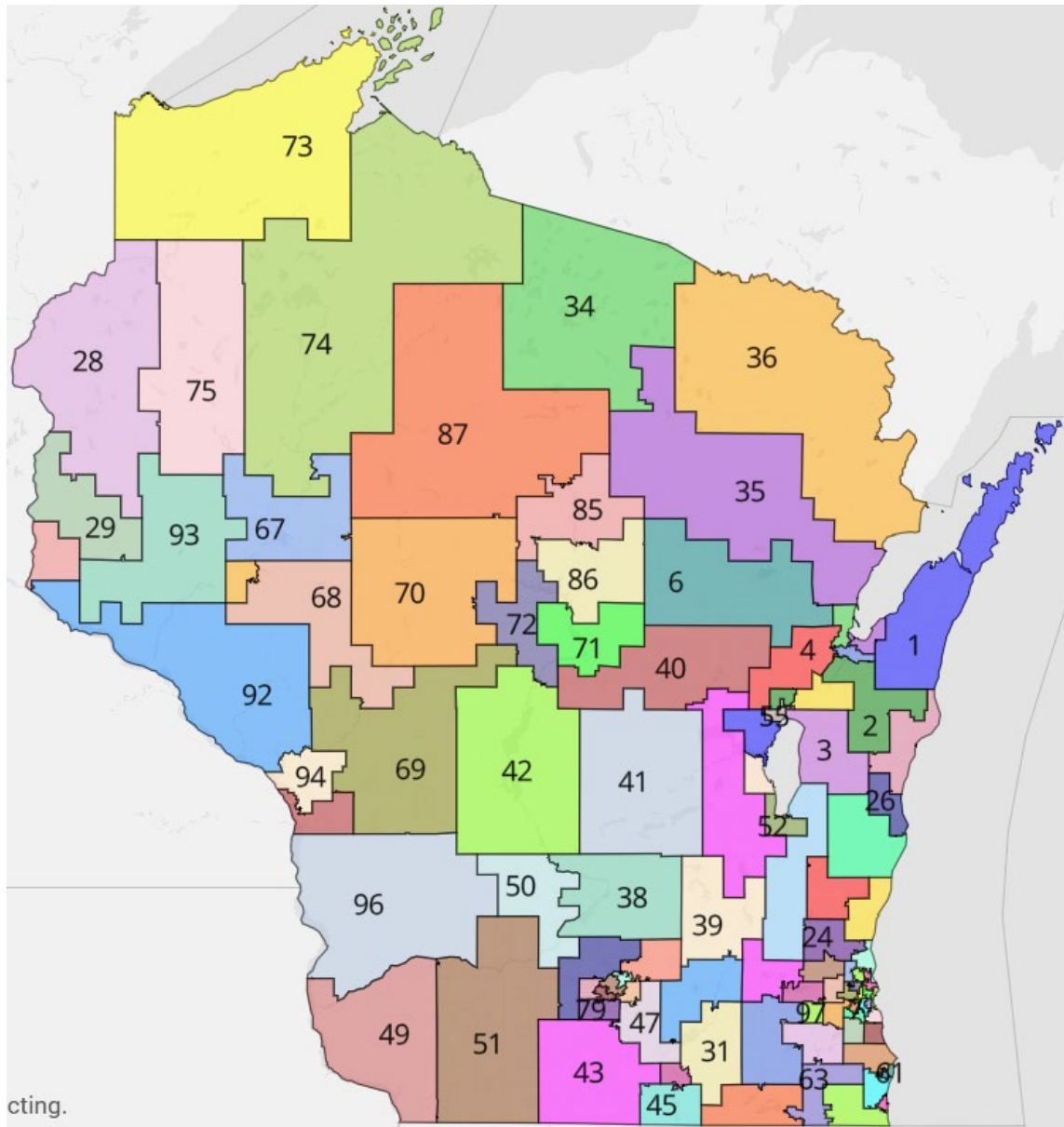


Figure 14. Johnson assembly districts (Reock = 0.4128, Polsby-Popper = 0.3472).

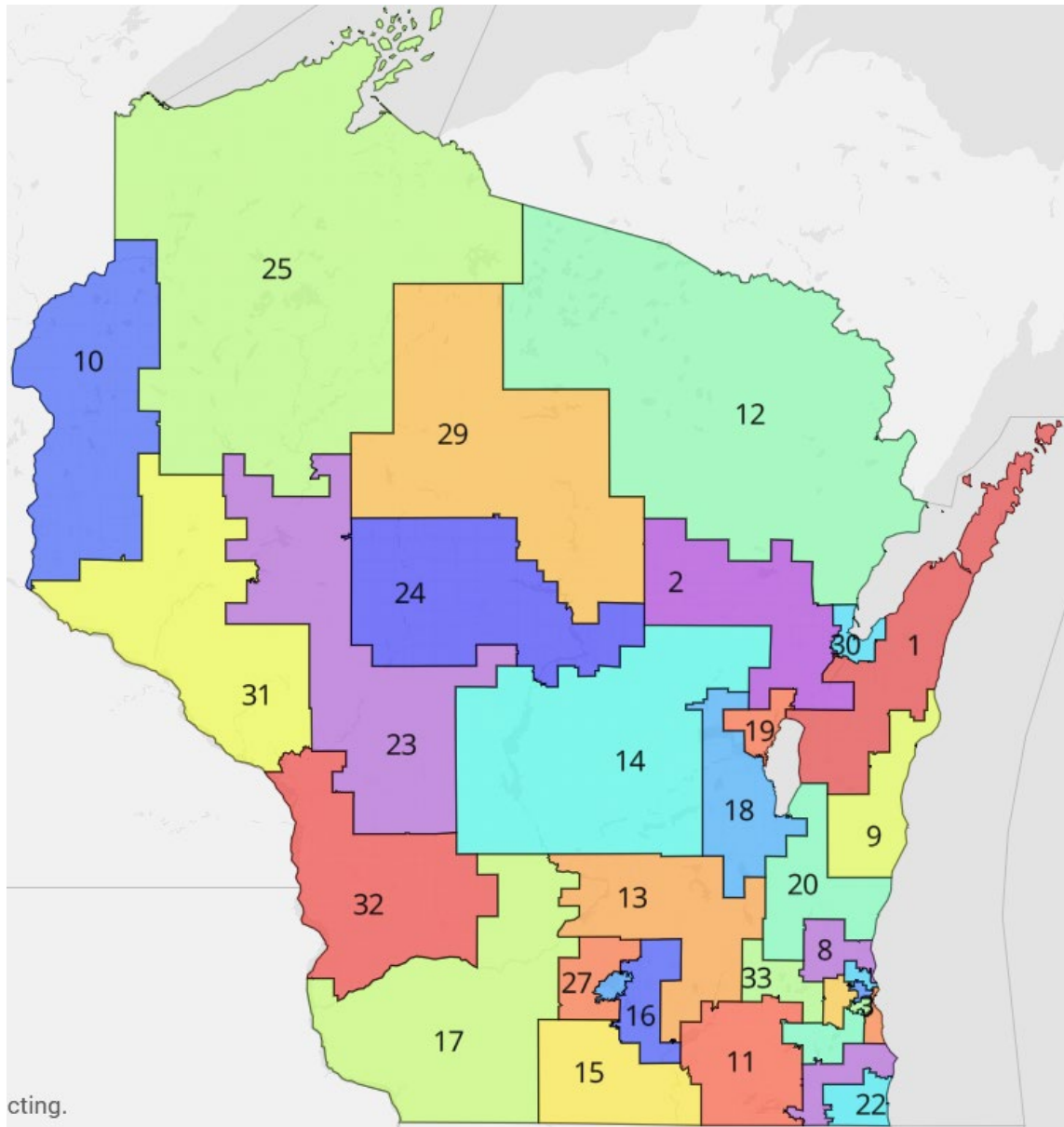


Figure 15. Johnson senate districts (Reock = 0.3877, Polsby-Popper = 0.2793).

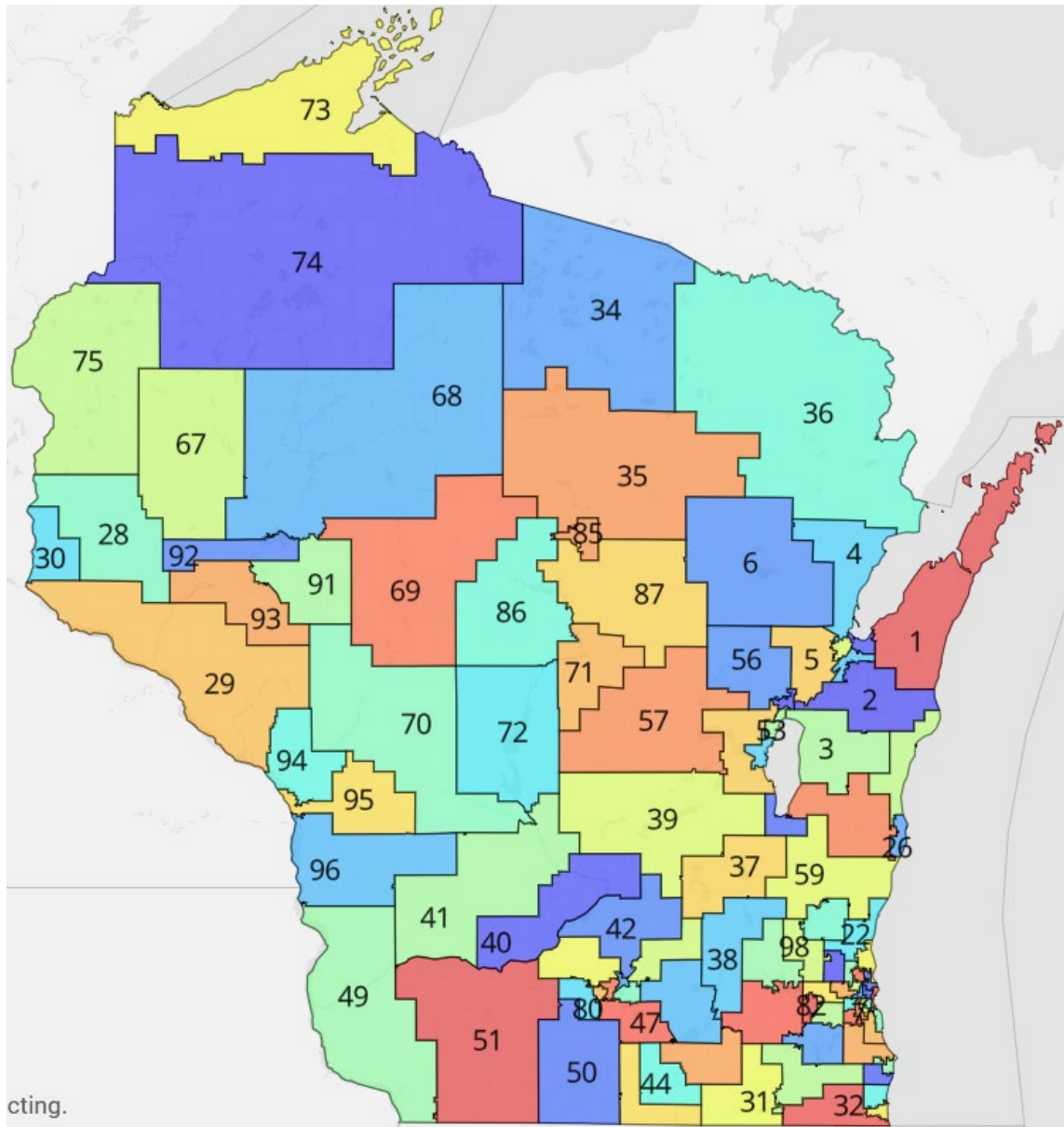


Figure 16. Governor Evers assembly districts (Reock = 0.3919, Polsby-Popper = 0.3488).

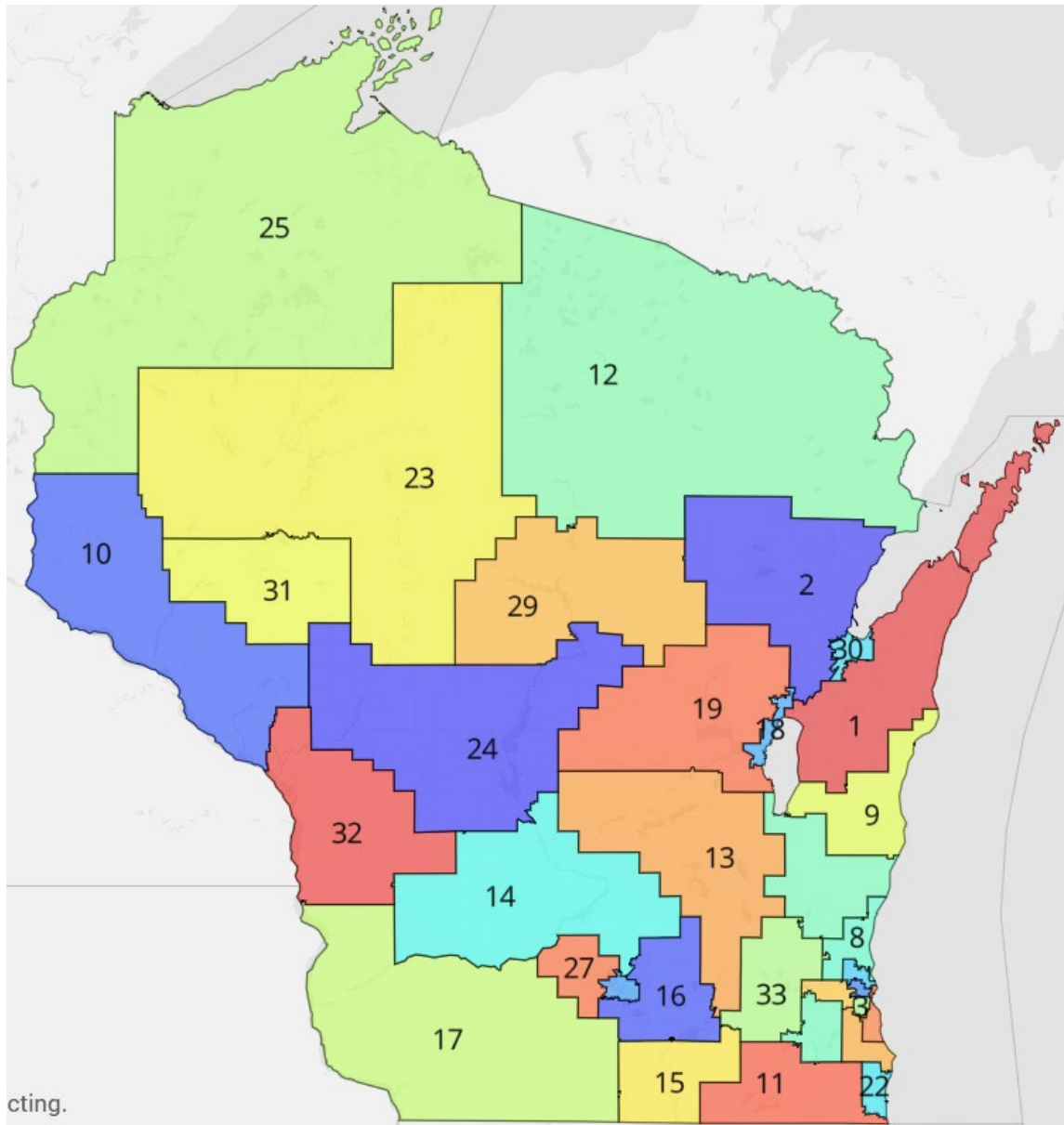


Figure 17. Governor Evers senate districts (Reock = 0.3769, Polsby-Popper = 0.3133).



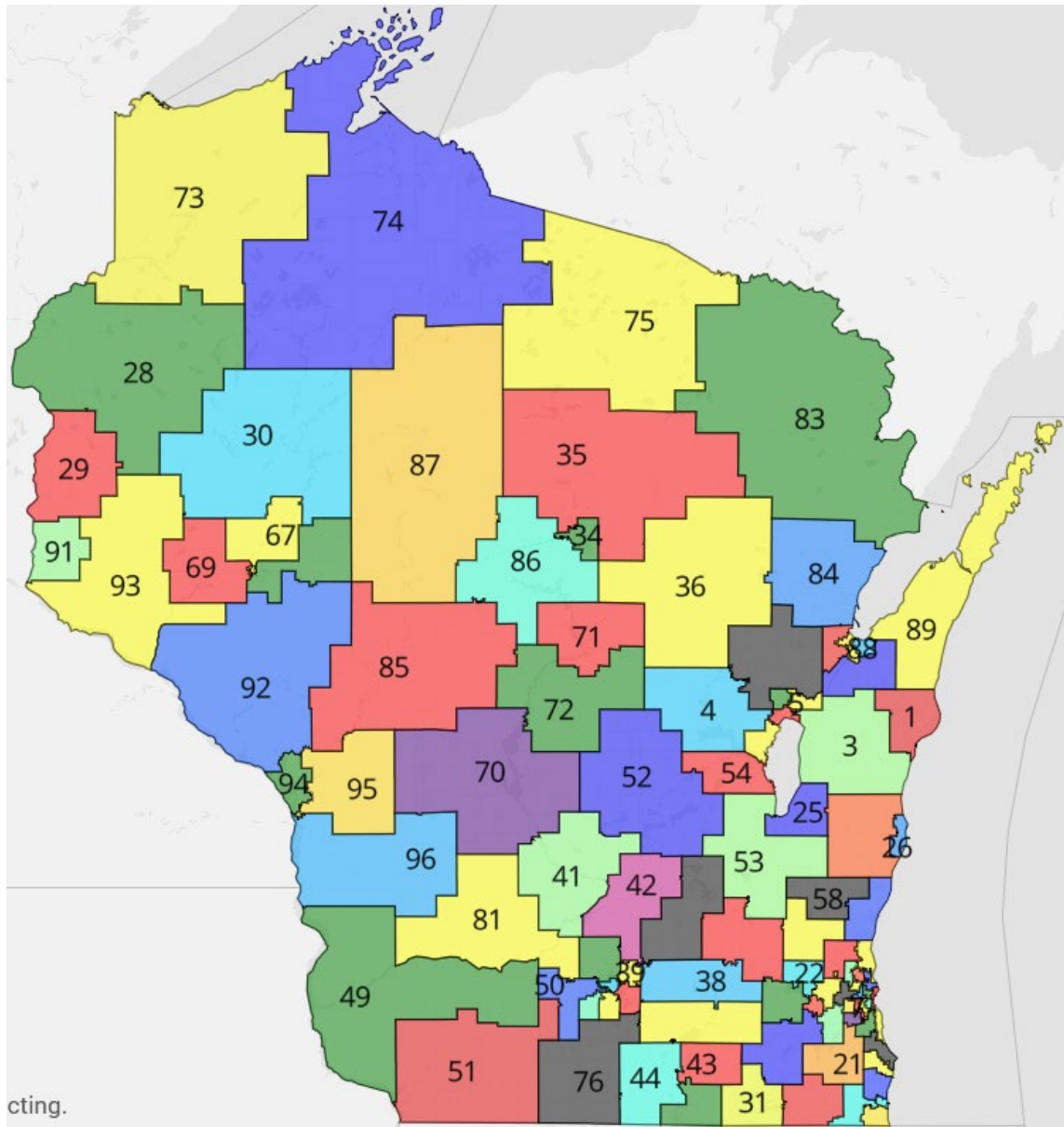


Figure 18. FastMap algorithm assembly districts (Reock = 0.4443, Polsby-Popper = 0.3747).

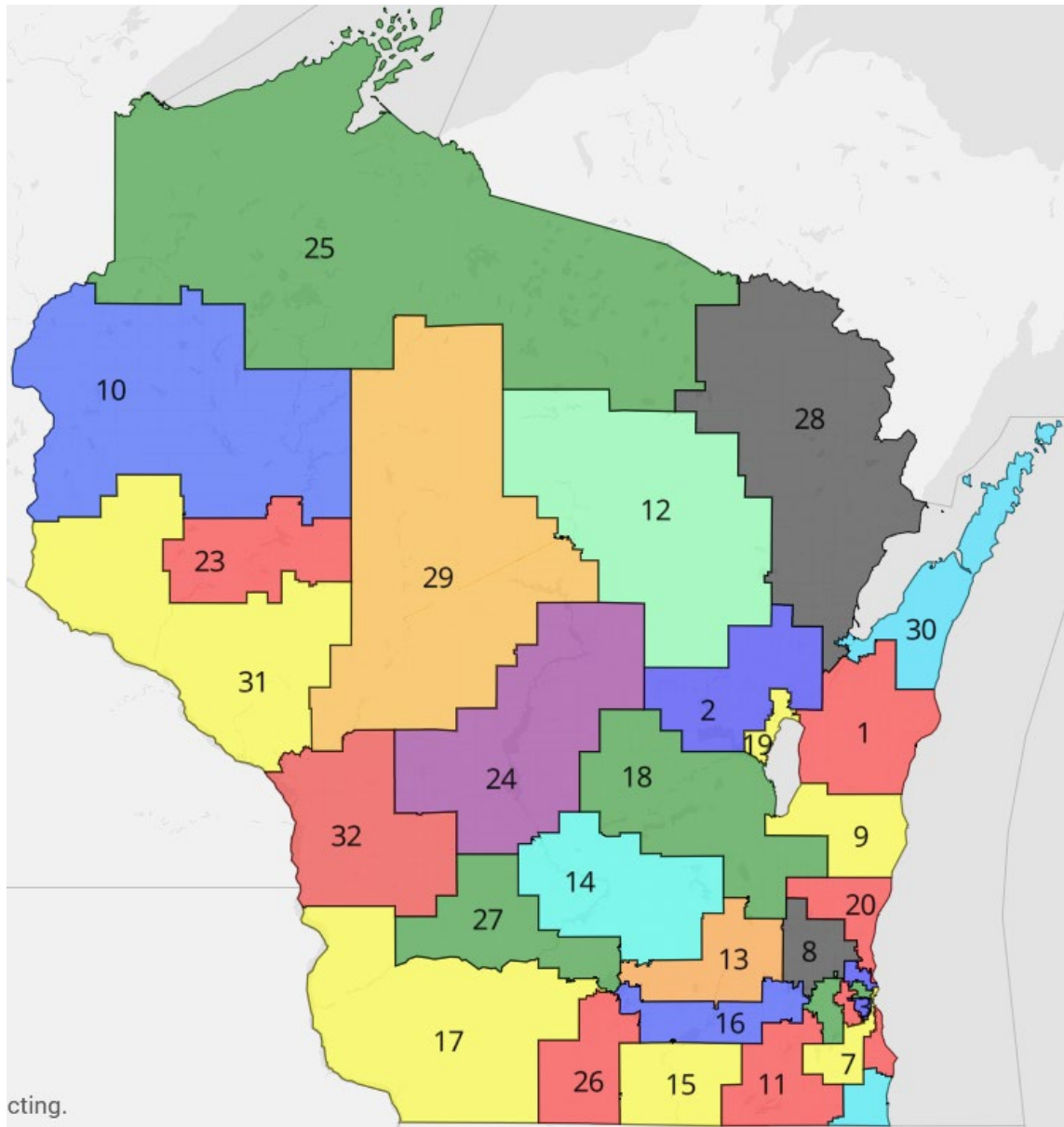


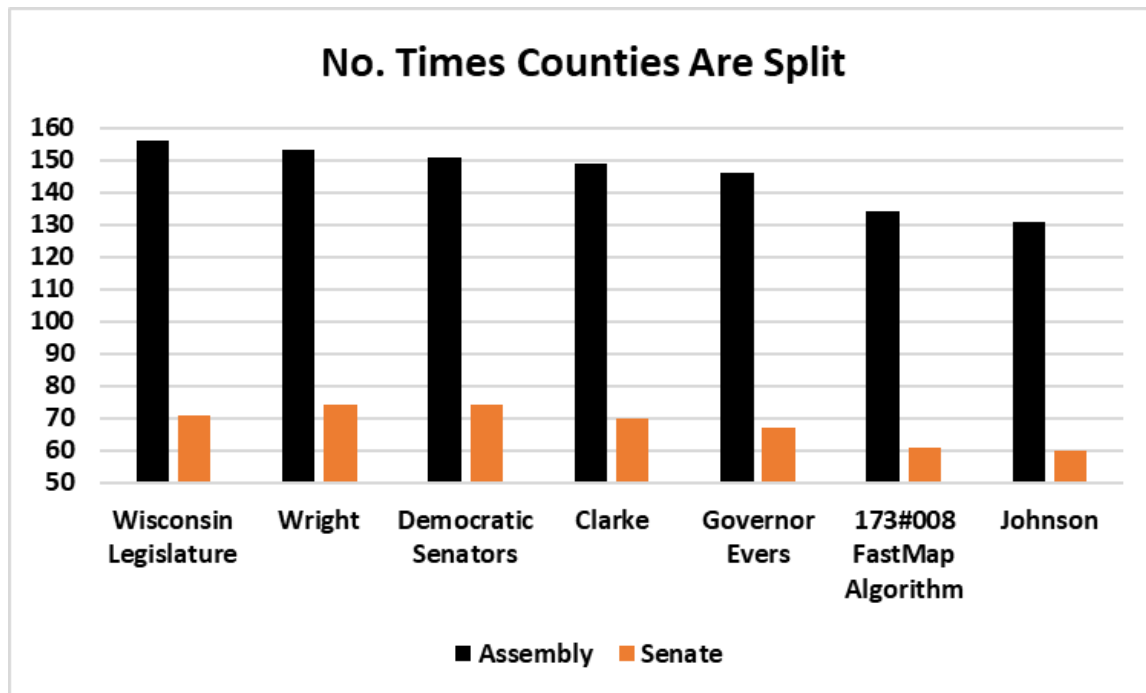
Figure 19. FastMap algorithm senate districts (Reock = 0.3867, Polsby-Popper = 0.3233).

## E. Criterion 7: County Splitting

Table 11 and Figure 20 show the number of times that counties are split by assembly/senate districts in plan 173#008 and the six proposals before the Court. Smaller numbers are better, and the plans are sequenced from worst to best. Note that the consultants prefer measuring splitting in this manner instead of counting the number of counties that are split at least once (page 5 of consultants' report). The numbers in the table, which are from DRA, nearly match those in the consultants' report. Plan 173#008 is almost the best for county splitting, narrowly coming in second and placing well ahead of third place.

**Table 11. Number of times that counties are split in plan 173#008 and the six proposals before the Court (DavesRedistricting.org).**

Chamber	Wisconsin Legislature	Wright	Democratic Senators	Clarke	Governor Evers	173#008 FastMap Algorithm	Johnson
Assembly	156	153	151	149	146	134	131
Senate	71	74	74	70	67	61	60
Sum	227	227	225	219	213	195	191



**Figure 20. Number of times that counties are split in plan 173#008 and the six proposals before the Court (DavesRedistricting.org).**

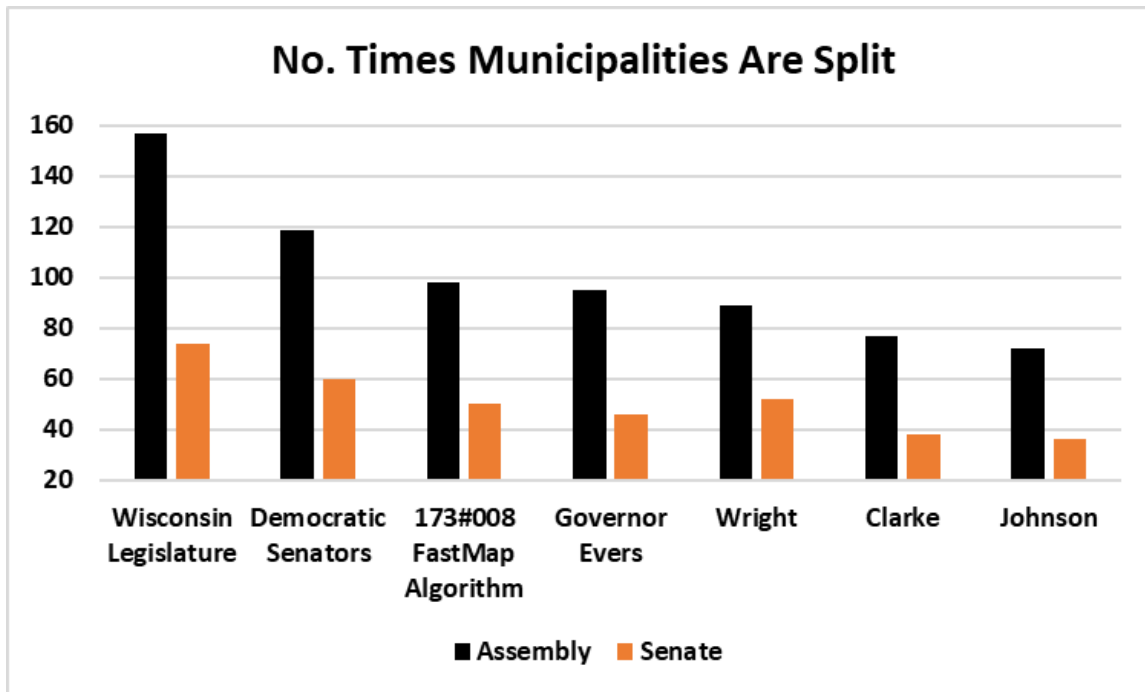


## F. Criterion 8: Municipality Splitting

Table 12 and Figure 21 show the number of times that municipalities are split by districts in plan 173#008 and the six proposals before the Court. Smaller numbers are better, and the plans are sequenced from worst to best. (The consultants prefer counting the number of splits instead of the number of municipalities that are split at least once.) The numbers for the proposals before the Court are from the consultants' report; those for 173#008 are from Petering's January 12 expert report. For this criterion, plan 173#008 is in fifth place, better than two proposals before the Court.

**Table 12. Number of times that municipalities are split in plan 173#008 and the six proposals before the Court (DavesRedistricting.org).**

Chamber	Wisconsin Legislature	Democratic Senators	173#008 FastMap Algorithm	Governor Evers	Wright	Clarke	Johnson
Assembly	157	119	98	95	89	77	72
Senate	74	60	50	46	52	38	36
Sum	231	179	148	141	141	115	108



**Figure 21. Number of times that municipalities are split in plan 173#008 and the six proposals before the Court (DavesRedistricting.org).**

### G. Criterion 9: Communities of Interest

Among several communities of interest, the consultants and Petering both identified one group that stands out for its merits and well-defined boundaries: Native American communities. Hence, plan 173#008 and the six proposals before the Court were analyzed in terms of how well they keep Native American persons together in the same district.

Table 13 shows the two assembly and two senate districts with the highest Native American voting age population (VAP) percentages in each plan. The plans are sequenced from lowest to highest sum of the VAP percentages for the two districts in the assembly + senate (i.e., from worst to best). For example, the worst performer in Table 13 is the Clarke proposal with VAP percentages summing to  $9.66\% + 7.35\% + 6.09\% + 5.13\% = 28.23\%$ . Note that no proposal before the Court has two assembly districts with at least 10% Native American VAP, whereas plan 173#008 has two assembly districts with at least 12% Native American VAP. Overall, plan 173#008 does a much better job of keeping Native American persons together in the same district than any proposal before the Court.

**Table 13. The two assembly and two senate districts with the highest Native American VAP percentages in plan 173#008 and the six the proposals before the Court.**

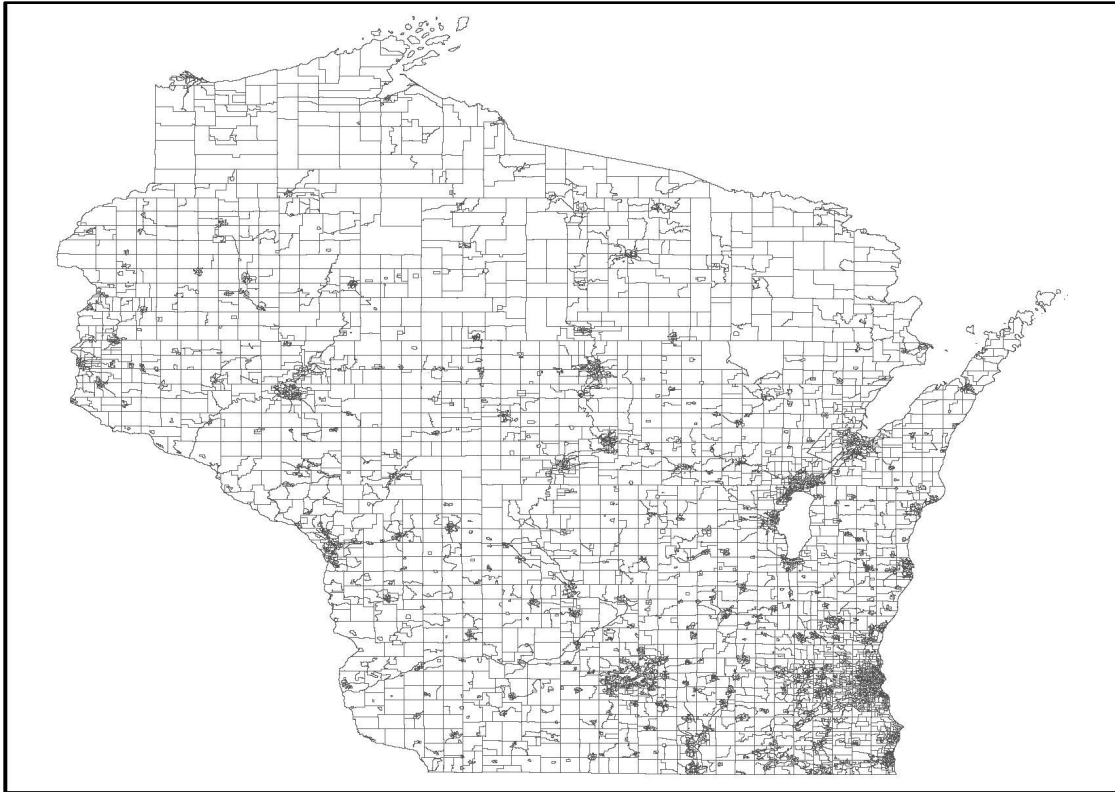
Proposal	Two Asm. Dists. With Highest Native American VAP %		Two Sen. Dists. With Highest Native American VAP %		Sum of Four Native American VAP % Values
	Assembly Districts	Senate Districts	Assembly Districts	Senate Districts	
Clarke	74, 6	9.66%, 7.35%	25, 12	6.09%, 5.13%	28.23%
Johnson	74, 6	9.53%, 7.52%	25, 2	6.07%, 5.54%	28.66%
Wisconsin Legislature	36, 74	10.45%, 7.75%	2, 12	5.84%, 5.72%	29.76%
Wright	57, 5	9.67%, 9.64%	25, 2	5.41%, 5.40%	30.12%
Democratic Senators	74, 35	12.77%, 9.21%	25, 12	7.38%, 4.92%	34.28%
Governor Evers	6, 73	12.55%, 9.18%	2, 25	7.52%, 6.42%	35.67%
173#008 FastMap Algorithm	74, 36	14.88%, 12.01%	25, 12	7.08%, 5.23%	39.20%

## **H. Criterion 10: Population Deviation (Beyond Legal Requirements)**

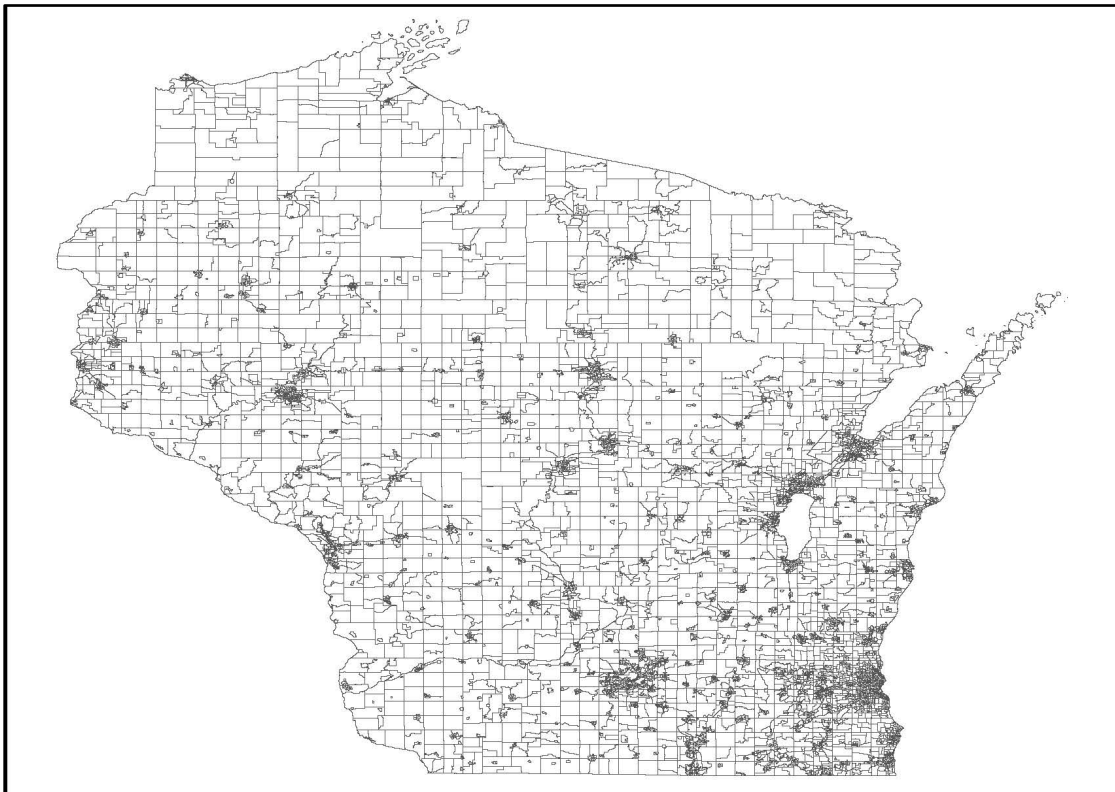
Plan 173#008 clearly meets Wisconsin's 2% population deviation standard with a total population deviation of 1.98% in the assembly and 1.35% in the senate.

## **I. Criterion 11: Ward Splitting**

According to paragraphs 3-8 in the January 2, 2024 joint stipulation, the parties agreed to use out-of-date August 2021 ward shapes to construct their remedial map proposals. However, all municipalities in Wisconsin have done once-a-decade local redistricting—changing the shapes of their wards—since the August 2021 redistricting dataset was created. Thus, Wisconsin's wards are now vastly different than the wards the parties agreed to use. Thus, all computations of ward splits are meaningless because *plan 173#008 and the six proposals before the Court each split scores, if not hundreds, of today's wards, and no one has computed how many*. Figure 22 shows the wards used by the parties to make maps, and Figure 23 shows Wisconsin's wards as of July 2023. More information is provided on pages 36-42 of Petering's January 22 brief.



**Figure 22. The 7136 wards used by the parties to make maps (August 2021 redistricting dataset).**



**Figure 23. Wisconsin's 7013 wards as of July 2023 (the latest date for which data is available).**

## J. Overall Comparison of Plan 173#008 To The Six Proposals Before The Court

It is possible to give each district plan a single numerical score using the method described in Petering's previous two *amicus curiae* briefs. This involves using well-defined *penalty metrics* for each redistricting criterion and a *weighting scheme* that specifies how penalty metrics for individual criteria are aggregated into a single number that is the *total penalty score* of a proposal. The proposal with the lowest total penalty score is the best.

Table 14 shows the criteria that Petering decided to use to assign a single numerical score to each plan and the metrics used to measure each.

**Table 14. Criteria involved in assigning a single numerical score to plan 173#008 and the six proposals before the Court.**

Criterion	Chamber	Category	Penalty Metric
5A-1	Assembly	Political Neutrality	No. fractional seats away from perfect proportionality
5A-2	Assembly	Competitiveness	No. noncompetitive districts outside the 45%-55% range
6A	Assembly	Compactness	1 – (average district Reock score)
7A	Assembly	County Splitting	No. splits of counties
8A	Assembly	Municipality Splitting	No. municipalities whose population is <i>not</i> kept in 1 district
5S-1	Senate	Political Neutrality	No. fractional seats away from perfect proportionality
5S-2	Senate	Competitiveness	No. noncompetitive districts outside the 45%-55% range
6S	Senate	Compactness	1 – (average district Reock score)
7S	Senate	County Splitting	No. splits of counties
8S	Senate	Municipality Splitting	No. municipalities whose population is <i>not</i> kept in 1 district

Table 15 shows the total (penalty) score that Petering computed for plan 173#008 and the six proposals before the Court. The weighting scheme that was used to trade off the ten criteria that went into each plan's total score is shown in the second column. Figure 24 shows the total penalty scores of the plans arranged along a number scale.

**Table 15. Holistic scoring of plan 173#008 and the six proposals before the Court according to the methodology in Petering's previous amicus briefs. Proposals are ordered from worst to best. Plan 173#008 has the lowest total penalty score by far: 2173.**

		Wisconsin Legislature		Johnson		Governor Evers	
Criterion	Weight	Penalty Score	Weighted Penalty Score	Penalty Score	Weighted Penalty Score	Penalty Score	Weighted Penalty Score
5A-1	50	10.41	520.5	6.17	308.5	2.00	100
5A-2	5	85	425	76	380	85	425
6A	1000	0.6388	638.8	0.5872	587.2	0.6081	608.1
7A	1	156	156	131	131	146	146
8A	1	81	81	35	35	55	55
5S-1	150	4.38	657	3.37	505.5	0.92	138
5S-2	15	24	360	23	345	23	345
6S	1000	0.6313	631.3	0.6123	612.3	0.6231	623.1
7S	1	71	71	60	60	67	67
8S	1	44	44	23	23	33	33
		Total Penalty = 3584.6		Total Penalty = 2987.5		Total Penalty = 2540.2	
		Democratic Senators		Clarke		Wright	
Criterion	Weight	Penalty Score	Weighted Penalty Score	Penalty Score	Weighted Penalty Score	Penalty Score	Weighted Penalty Score
5A-1	50	2.83	141.5	1.33	66.5	1.37	68.5
5A-2	5	83	415	84	420	76	380
6A	1000	0.6068	606.8	0.6133	613.3	0.6131	613.1
7A	1	151	151	149	149	153	153
8A	1	69	69	44	44	52	52
5S-1	150	0.11	16.5	0.75	112.5	0.77	115.5
5S-2	15	24	360	26	390	25	375
6S	1000	0.6423	642.3	0.6148	614.8	0.6195	619.5
7S	1	74	74	70	70	74	74
8S	1	47	47	29	29	34	34
		Total Penalty = 2523.1		Total Penalty = 2509.1		Total Penalty = 2484.6	
		173#008 FastMap Algorithm					
Criterion	Weight	Penalty Score	Weighted Penalty Score				
5A-1	50	0.08	4				
5A-2	5	70	350				
6A	1000	0.5557	555.7				
7A	1	134	134				
8A	1	56	56				
5S-1	150	0.10	15				
5S-2	15	23	345				
6S	1000	0.6133	613.3				
7S	1	61	61				
8S	1	39	39				
		Total Penalty = 2173					

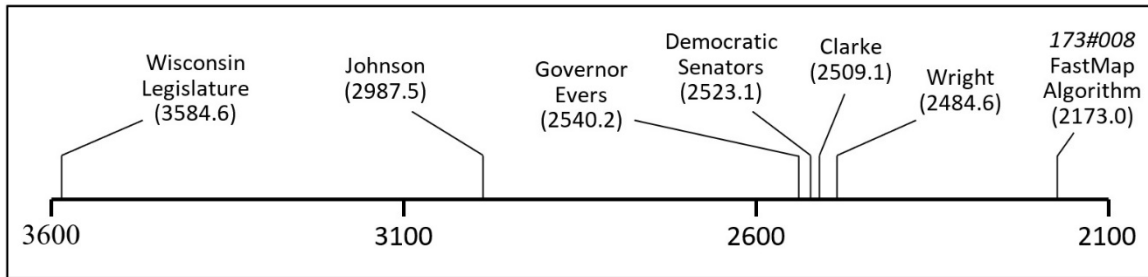


Figure 24. Plan 173#008 has a significantly lower total penalty score—2173—than any proposal before the Court.

According to Table 15 and Figure 24, plan 173#008 significantly outperforms all six proposals before the Court. This should come as no surprise given that plan 173#008 has the best performance for political neutrality, greatest number of competitive districts, and most compact district shapes by far. Plan 173#008 also has nearly the best performance for county splitting, narrowly coming in second and placing well ahead of third place.

Note that the scoring in Table 15 does not include Criterion 9: Communities of Interest. Had the scoring included this criterion, plan 173#008 would have performed even better relative to the six proposals before the Court (see Table 13).

Overall, plan 173#008 is proof that, if the Court instructs them to do so, the consultants will likely succeed in quickly crafting another map proposal—a seventh proposal—which improves upon the six map proposals before the Court.

## CONCLUSION

Wisconsin's future hangs in the balance. The Court-appointed consultants and Petering have independently concluded that none of the six map proposals before the Court achieves political neutrality because they all favor Republicans. The Clarke petitioners and Democratic

Senators have also stated that all proposals before the Court favor Republicans, and the metrics produced by Governor Evers show the same (see page 12).

Yet there exists at least one example of a strictly contiguous legislative district plan for Wisconsin that *is* politically neutral. This plan outperforms all proposals before the Court for eleven of the twelve metrics of political neutrality that are considered in this brief, and it outperforms five of the six proposals for the twelfth metric. The plan also has a significantly greater number of competitive districts, much better district shapes, and does a much better job of keeping Native American persons in the same district than any proposal before the Court. Moreover, it has significantly better county splitting performance than five of the six proposals before the Court. This plan, named *173#008*, can be downloaded at [DistrictSolutions.net/Wisconsin-Maps.html](http://DistrictSolutions.net/Wisconsin-Maps.html).

Given the consultants' clear willingness to do so, the Court should instruct the consultants to craft a seventh map proposal that improves upon the six proposals before the Court without delay. This will help ensure that the Court has the best possible options to draw upon when it selects the remedial map.

Dated: February 8, 2024

**FOX, O'NEILL & SHANNON, S.C.**

*Electronically signed by Matthew W. O'Neill*

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**FORM AND LENGTH CERTIFICATION**

I certify that the foregoing brief conforms to the rules contained in Wis. Stat. § (Rule) 809.19(8)(b) and (c)3 (as modified by the Court's December 22, 2023 Order) for a brief produced with a proportional serif font. The length of the brief, exclusive of the caption, Table of Contents, Table of Authorities, and Interest of Amicus, is 4,918 words.

Dated: January 22, 2024

**FOX, O'NEILL & SHANNON, S.C.**

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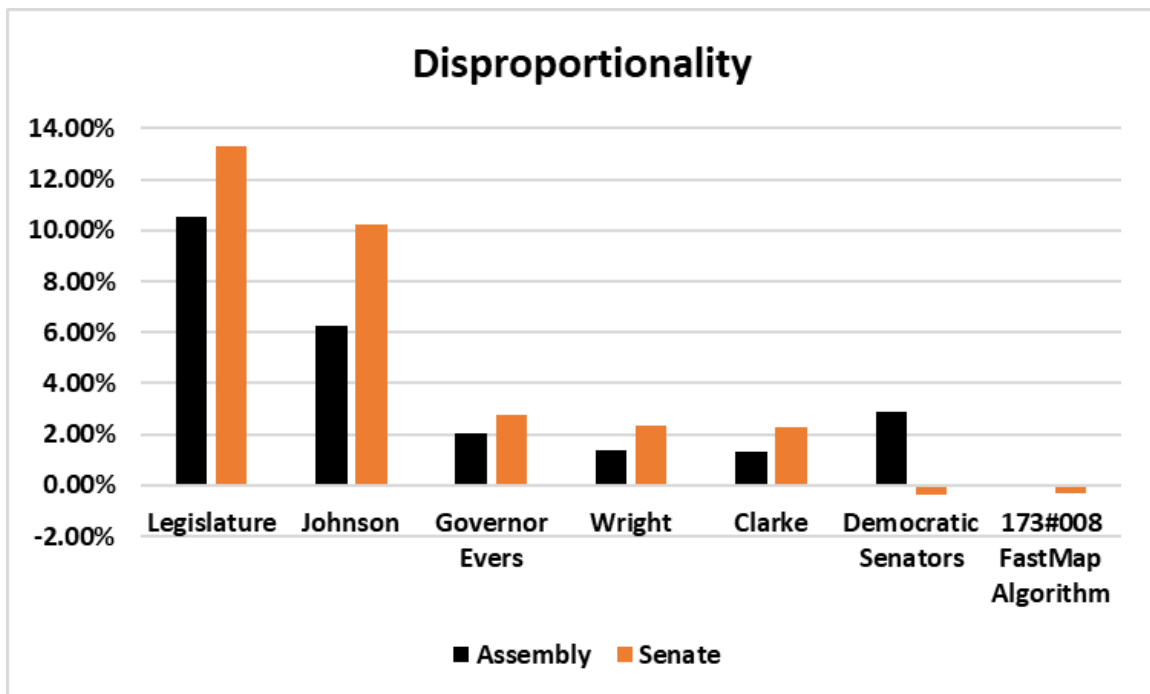
***Counsel for Matthew Petering***

## APPENDIX

Table A1 shows the disproportionality of each plan, computed using the fractional seats approach, for the assembly and senate. The total disproportionality for the assembly + senate is also shown. Smaller values are better, and the plans are ordered from worst to best for total disproportionality. Figure A1 is a visualization of the same information.

**Table A1. Disproportionality of plan 173#008 and the six proposals before the Court (DavesRedistricting.org).**

	Legislature	Johnson	Governor Evers	Wright	Clarke	Democratic Senators	173#008 FastMap Algorithm
Assembly	10.51%	6.23%	2.02%	1.39%	1.34%	2.86%	-0.09%
Senate	13.30%	10.22%	2.79%	2.35%	2.30%	-0.34%	-0.31%
Total	23.81%	16.45%	4.81%	3.74%	3.64%	3.20%	0.40%

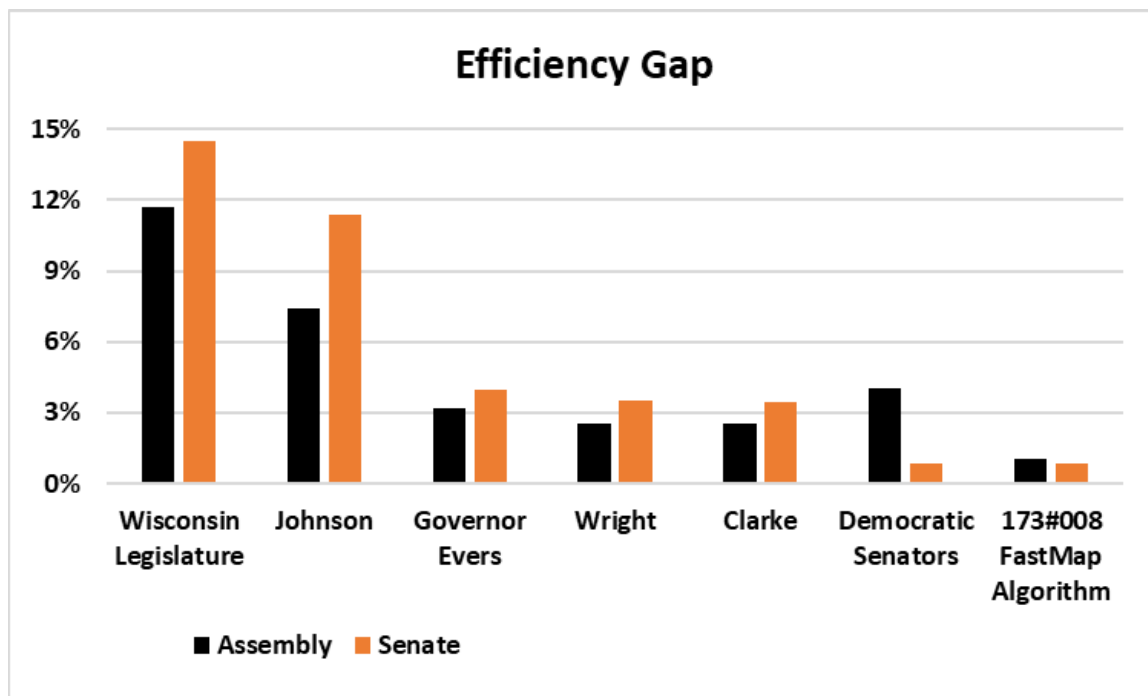


**Figure A1. Disproportionality of plan 173#008 and the six proposals before the Court (DavesRedistricting.org).**

Table A2 shows the efficiency gap of each plan, computed using the fractional seats approach, for the assembly and senate. The total efficiency gap for the assembly + senate is also shown. Smaller values are better, and the plans before the Court are ordered from worst to best for total efficiency gap. Figure A2 is a visualization of the same information.

**Table A2. Efficiency gap of plan 173#008 and the six proposals before the Court (DavesRedistricting.org).**

	Legislature	Johnson	Governor Evers	Wright	Clarke	Democratic Senators	173#008 FastMap Algorithm
Assembly	11.67%	7.39%	3.18%	2.55%	2.51%	4.02%	1.07%
Senate	14.46%	11.38%	3.95%	3.51%	3.46%	0.82%	0.85%
Sum	26.13%	18.77%	7.13%	6.06%	5.97%	4.84%	1.92%

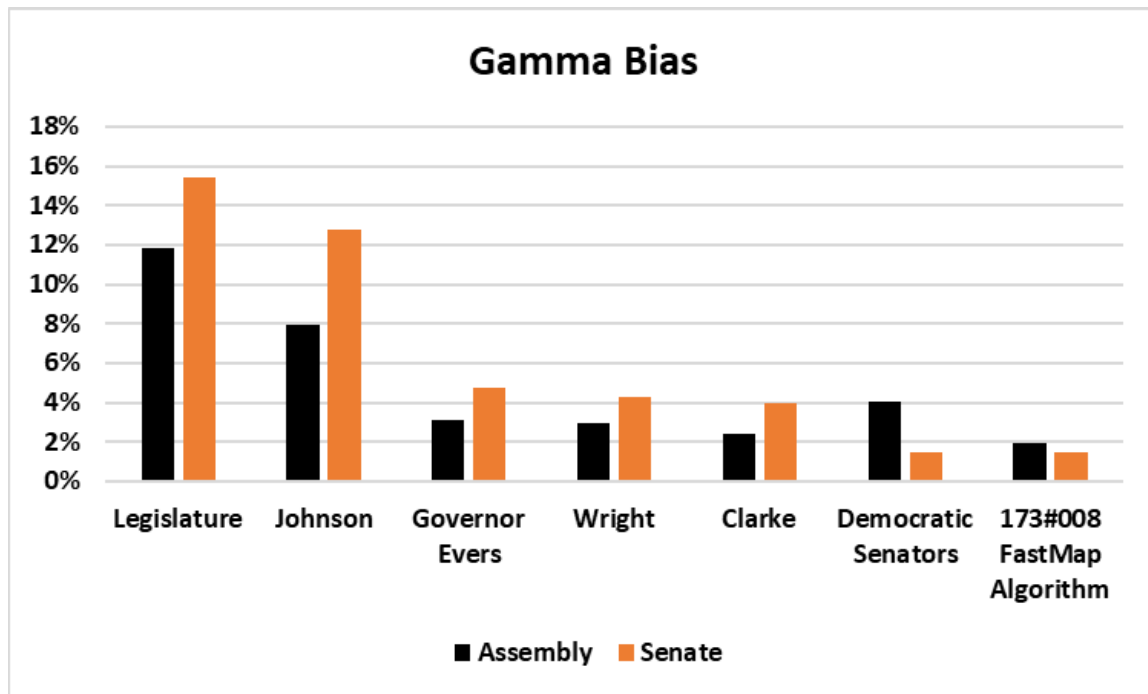


**Figure A2. Efficiency gap of plan 173#008 and the six proposals before the Court (DavesRedistricting.org).**

Table A3 shows the gamma bias of each plan, computed using the fractional seats approach, for the assembly and senate. The total gamma bias for the assembly + senate is also shown. Smaller values are better, and the plans are ordered from worst to best for total gamma bias. Figure A3 is a visualization of the same information.

**Table A3. Gamma bias of plan 173#008 and the six proposals before the Court (DavesRedistricting.org).**

	Legislature	Johnson	Governor Evers	Wright	Clarke	Democratic Senators	173#008 FastMap Algorithm
Assembly	11.80%	7.92%	3.12%	2.96%	2.44%	4.01%	1.97%
Senate	15.39%	12.79%	4.77%	4.27%	3.99%	1.49%	1.47%
Sum	27.19%	20.71%	7.89%	7.23%	6.43%	5.50%	3.44%

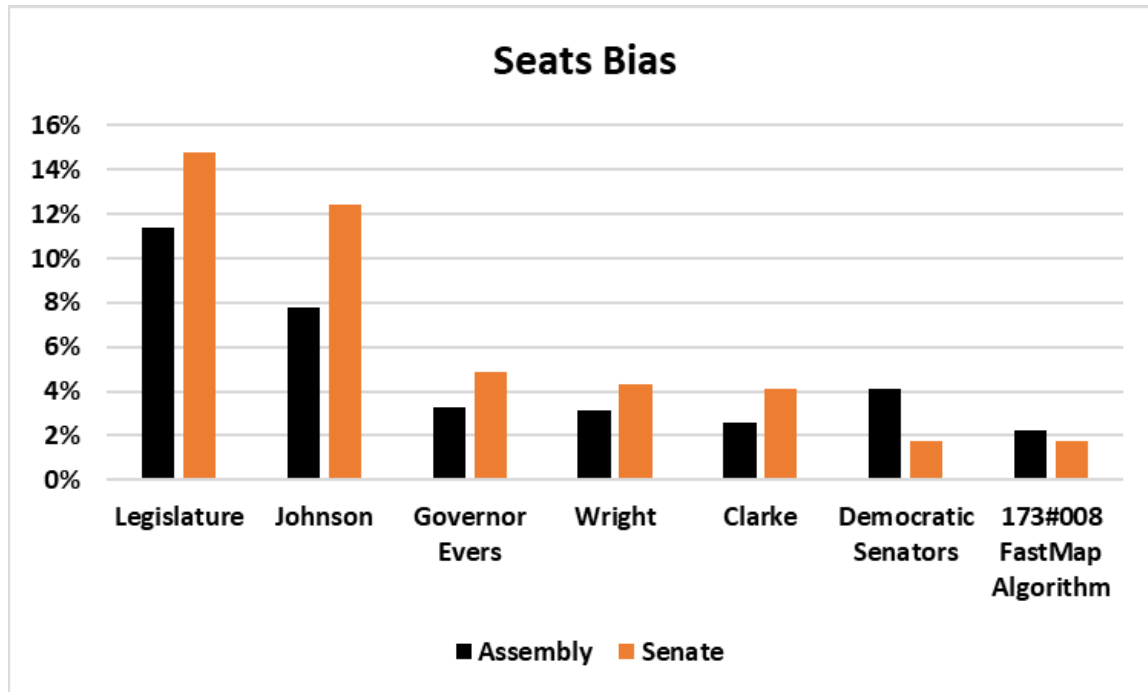


**Figure A3. Gamma bias of plan 173#008 and the six proposals before the Court (DavesRedistricting.org).**

Table A4 shows the seats bias of each plan, computed using the fractional seats approach, for the assembly and senate. The total seats bias for the assembly + senate is also shown. Smaller values are better, and the plans are ordered from worst to best for total seats bias. Figure A4 is a visualization of the same information.

**Table A4. Seats bias of plan 173#008 and the six proposals before the Court (DavesRedistricting.org).**

	Legislature	Johnson	Governor Evers	Wright	Clarke	Democratic Senators	173#008 FastMap Algorithm
Assembly	11.42%	7.78%	3.27%	3.15%	2.62%	4.09%	2.26%
Senate	14.75%	12.43%	4.89%	4.31%	4.10%	1.78%	1.73%
Sum	26.17%	20.21%	8.16%	7.46%	6.72%	5.87%	3.99%

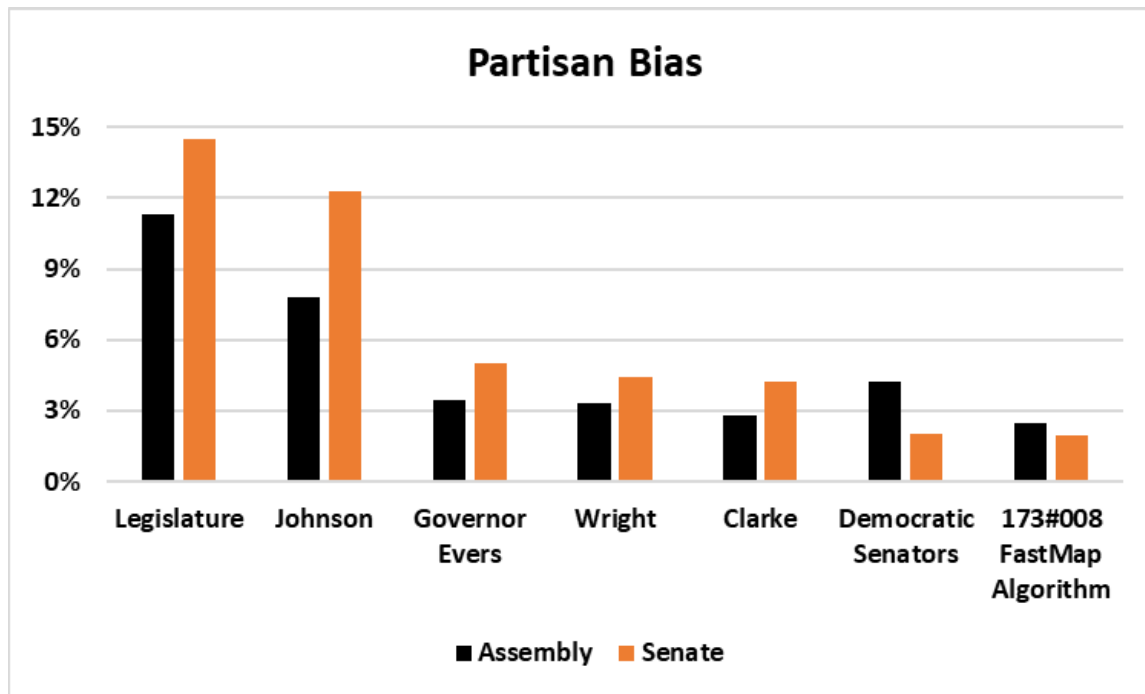


**Figure A4. Seats bias of plan 173#008 and the six proposals before the Court (DavesRedistricting.org).**

Table A5 shows the partisan bias of each plan, computed using the fractional seats approach, for the assembly and senate. The total partisan bias for the assembly + senate is also shown. Smaller values are better, and the plans are ordered from worst to best for total partisan bias. Figure A5 is a visualization of the same information.

**Table A5. Partisan bias of plan 173#008 and the six proposals before the Court (DavesRedistricting.org).**

	Legislature	Johnson	Governor Evers	Wright	Clarke	Democratic Senators	173#008 FastMap Algorithm
Assembly	11.30%	7.77%	3.45%	3.33%	2.83%	4.23%	2.49%
Senate	14.51%	12.30%	5.02%	4.40%	4.25%	2.00%	1.98%
Sum	25.81%	20.07%	8.47%	7.73%	7.08%	6.23%	4.47%

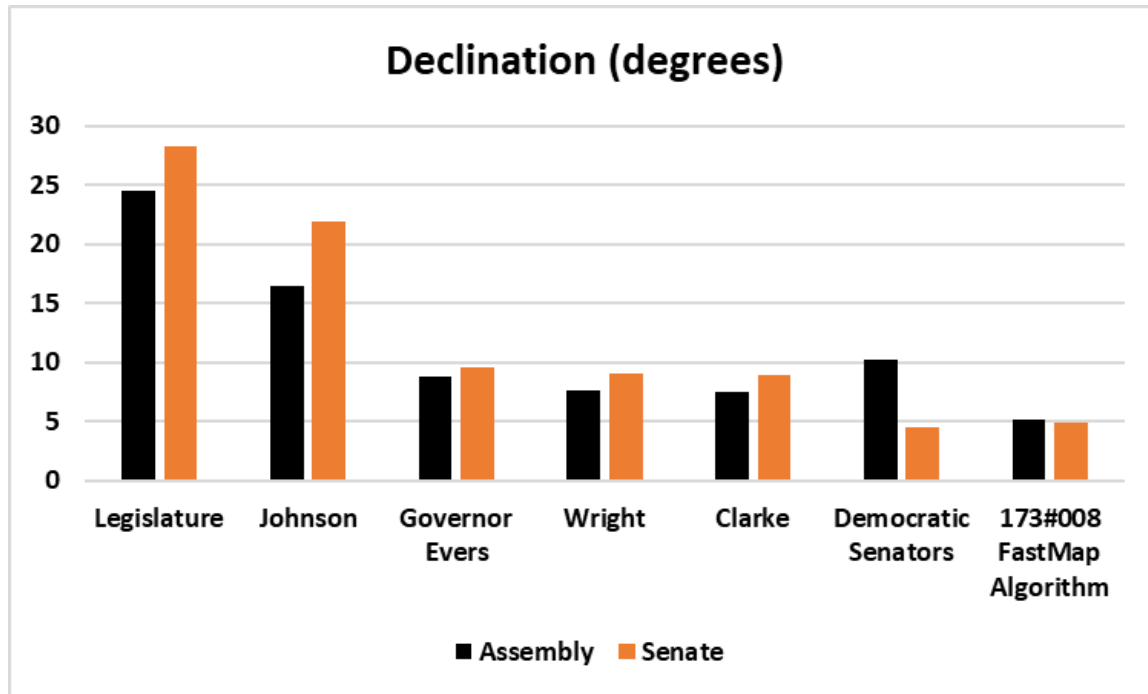


**Figure A5. Partisan bias of plan 173#008 and the six proposals before the Court (DavesRedistricting.org).**

Table A6 shows the declination of each plan, computed using the fractional seats approach, for the assembly and senate. The total declination for the assembly + senate is also shown. Smaller values are better, and the plans are ordered from worst to best for total declination. Figure A6 is a visualization of the same information.

**Table A6. Declination of plan 173#008 and the six proposals before the Court (DavesRedistricting.org).**

	Legislature	Johnson	Governor Evers	Wright	Clarke	Democratic Senators	173#008 FastMap Algorithm
Assembly	24.46°	16.40°	8.74°	7.59°	7.54°	10.19°	5.12°
Senate	28.26°	21.89°	9.59°	9.02°	8.87°	4.50°	4.92°
Sum	52.72°	38.29°	18.33°	16.61°	16.41°	14.69°	10.04°



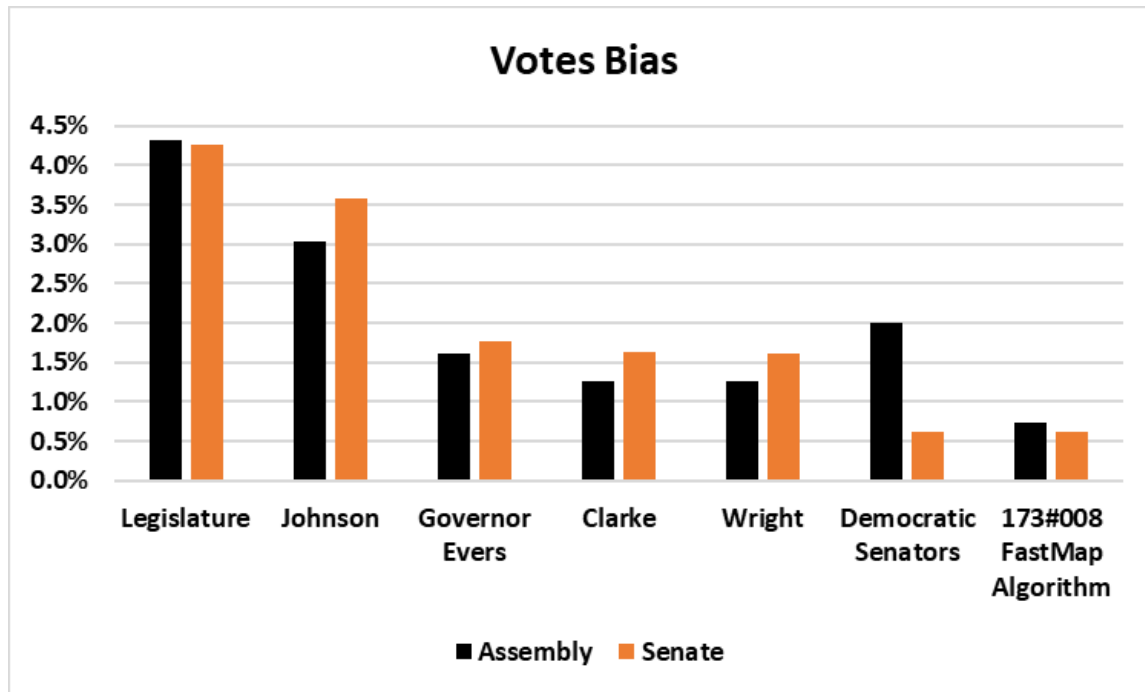
**Figure A6. Declination of plan 173#008 and the six proposals before the Court (DavesRedistricting.org).**



Table A7 shows the votes bias of each plan, computed using the fractional seats approach, for the assembly and senate. The total votes bias for the assembly + senate is also shown. Smaller values are better, and the plans are ordered from worst to best for total votes bias. Figure A7 is a visualization of the same information.

**Table A7. Votes bias of plan 173#008 and the six proposals before the Court (DavesRedistricting.org).**

	Legislature	Johnson	Governor Evers	Clarke	Wright	Democratic Senators	173#008 FastMap Algorithm
Assembly	4.32%	3.04%	1.60%	1.26%	1.26%	2.00%	0.73%
Senate	4.25%	3.58%	1.76%	1.62%	1.60%	0.61%	0.61%
Sum	8.57%	6.62%	3.36%	2.88%	2.86%	2.61%	1.34%

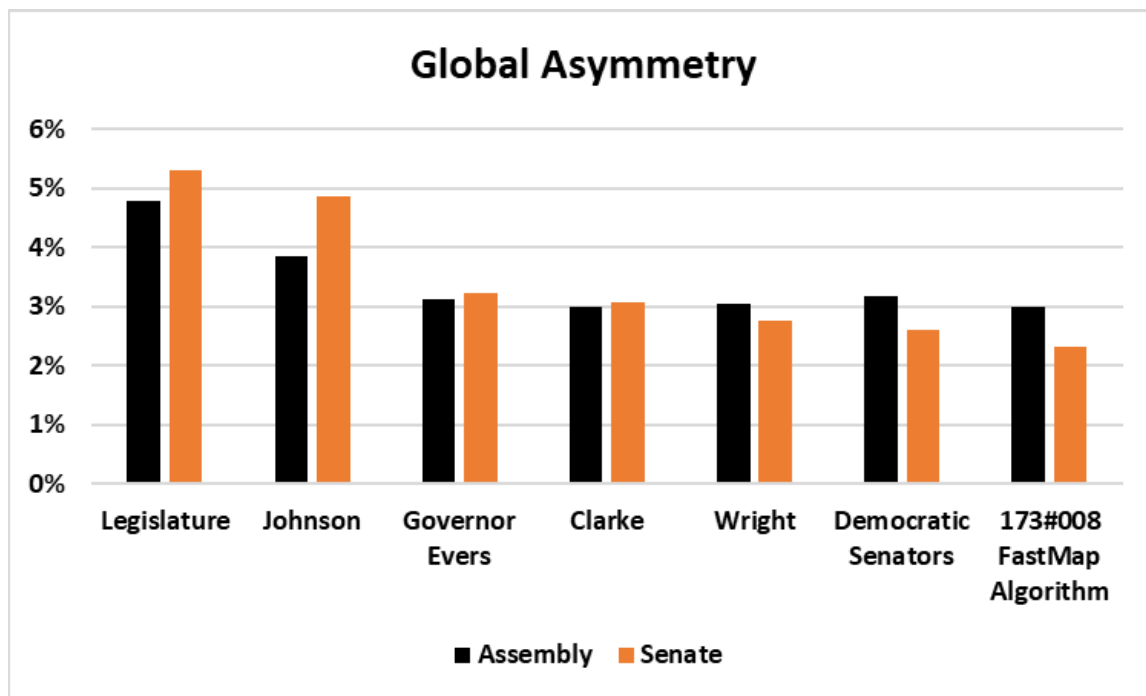


**Figure A7. Votes bias of plan 173#008 and the six proposals before the Court (DavesRedistricting.org).**

Table A8 shows the global asymmetry of each plan, computed using the fractional seats approach, for the assembly and senate. The total global asymmetry for the assembly + senate is also shown. Smaller values are better, and the plans are ordered from worst to best for total global asymmetry. Figure A8 is a visualization of the same information.

**Table A8. Global asymmetry of plan 173#008 and the six proposals before the Court (DavesRedistricting.org).**

	Legislature	Johnson	Governor Evers	Clarke	Wright	Democratic Senators	173#008 FastMap Algorithm
Assembly	4.77%	3.86%	3.13%	3.00%	3.04%	3.18%	2.99%
Senate	5.30%	4.86%	3.22%	3.06%	2.75%	2.61%	2.32%
Sum	10.07%	8.72%	6.35%	6.06%	5.79%	5.79%	5.31%

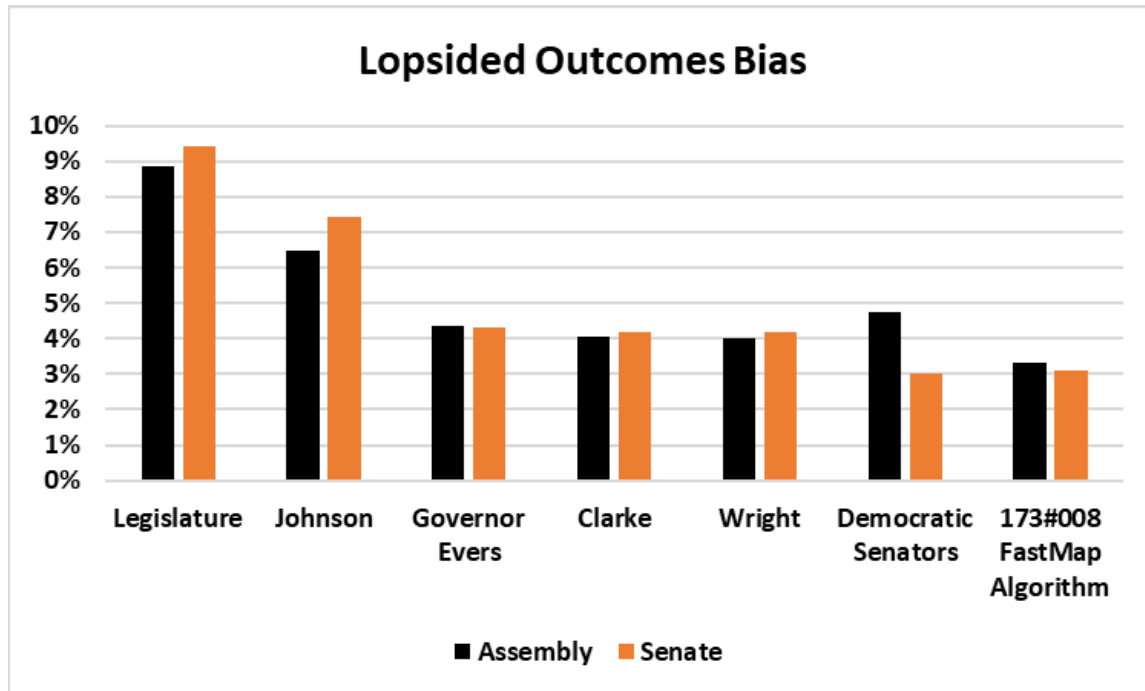


**Figure A8. Global asymmetry of plan 173#008 and the six proposals before the Court (DavesRedistricting.org).**

Table A9 shows the lopsided outcomes bias of each plan for the assembly and senate. The total lopsided outcomes bias for the assembly + senate is also shown. Smaller values are better, and the plans are ordered from worst to best for total lopsided outcomes bias. Figure A9 is a visualization of the same information.

**Table A9. Lopsided outcomes bias of plan 173#008 and the six proposals before the Court (DavesRedistricting.org).**

	Legislature	Johnson	Governor Evers	Clarke	Wright	Democratic Senators	173#008 FastMap Algorithm
Assembly	8.86%	6.49%	4.37%	4.04%	3.99%	4.76%	3.32%
Senate	9.44%	7.45%	4.33%	4.19%	4.20%	3.03%	3.10%
Sum	18.30%	13.94%	8.70%	8.23%	8.19%	7.79%	6.42%

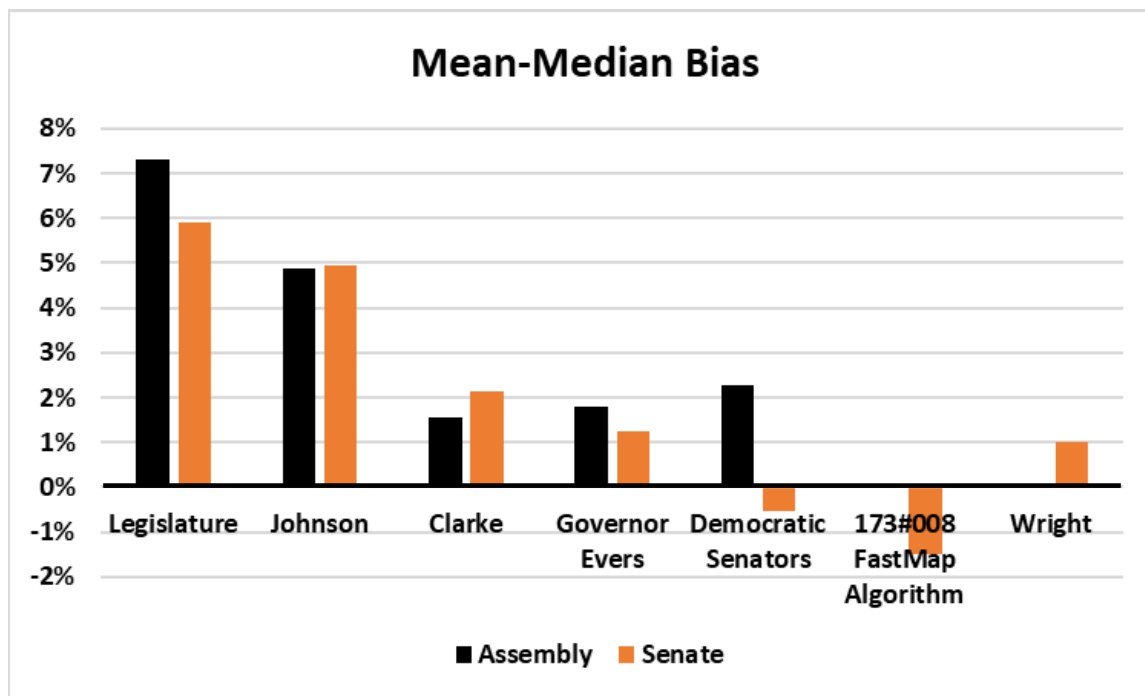


**Figure A9. Lopsided outcomes bias of plan 173#008 and the six proposals before the Court (DavesRedistricting.org).**

Table A10 and Figure A10 show the mean-median bias of each plan for the assembly and senate. The total mean-median bias for the assembly + senate is also shown in Table A10. Smaller values are better, and the plans are ordered from worst to best for total mean-median bias.

**Table A10. Mean-median bias of plan 173#008 and the six proposals before the Court (DavesRedistricting.org).**

	Legislature	Johnson	Clarke	Governor Evers	Democratic Senators	173#008 FastMap Algorithm	Wright
Assembly	7.32%	4.89%	1.54%	1.79%	2.28%	-0.03%	0.03%
Senate	5.91%	4.95%	2.12%	1.26%	-0.52%	-1.51%	1.01%
Total	13.23%	9.84%	3.66%	3.05%	2.80%	1.54%	1.04%



**Figure A10. Mean-median bias of plan 173#008 and the six proposals before the Court (DavesRedistricting.org).**