

Criteria for Pennsylvania congressional redistricting, with links to illustrative maps

Testimony for the PA Senate State Government Committee

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It is important that plans satisfy many criteria. I think a very important one is partisan fairness. Like it or not, it is the parties that count on major issues like climate, abortion, taxation, social programs, and voting procedures, including redistricting itself. I believe that partisan fairness is more important than the traditional criteria in the PA constitution for legislative maps. However, even though the PA constitution does not require the traditional criteria for congressional districts, the PA Supreme Court in its 2018 LWV case extended those criteria to congressional maps and current opinion favors adhering to them. Accordingly, my testimony puts the traditional criteria first and only then considers partisan bias.

Generally, the set of all maps that satisfy the traditional criteria spans a range of partisan bias. If that range includes maps with no partisan bias, one of those maps should be chosen. If, however, the set of maps are all biased toward one party, the least biased map should be chosen, even though that does not achieve partisan fairness. These two cases embody the general principle that I believe should be followed, namely, minimizing partisan bias, subject to the traditional criteria.

To estimate the range of partisan bias for congressional maps in PA, I submit two maps that satisfy the traditional criteria. The first one favors Democrats as much as I could:

<https://davesredistricting.org/join/68d02c04-b223-4529-bbd9-a4bc53e5b25b>

The second one favors the GOP as much as I could:

<https://davesredistricting.org/join/ddb3e855-ac4f-4502-a5c8-803ceccc01da>

Of course, other map drawers may be able to extend the range of partisan bias obtained by these two maps, but these two suffice to show that the range of bias is substantial.

It is interesting to compare the bias of my two maps with the Draw the Lines citizens map. (I might note that I also gave last minute input on that map to keep it from violating the splitting criteria in the LACRA reform bill.) All three maps are biased in favor of the GOP. (That is because Democrats are packed in Philly and Pittsburgh.) My most biased map is biased more than three times as much as my least biased map. The DTL map is also biased, but only about 40% more than my least biased map.

So, how much bias are we talking about? My least biased map would require Democrats to win 51.5% of the vote to obtain half the seats. The DTL map would require 52.1 % of the two party vote. My most biased map would require Dems to win 55% of the two-party vote for half the seats, and 6 D seats for half the vote. My least biased map would have 7.7 D seats for half the vote.

Following are details of my least biased map, starting with a summary

1. One person population deviation
2. Minimal 16 county splits
3. LACRA split counties satisfied
4. Minimal 16 split municipalities/wards
5. Minimal 16 split precincts
6. 2 VRA districts
7. Satisfactory compactness

8. $51.5 \pm 0.3\%$ D vote for half the seats
9. 7.7 ± 0.2 D seats for half the vote
10. 5 competitive districts, responsiveness = 2.8 ± 0.4 .

(Statistical uncertainties were obtained by considering different statewide past elections. Values of bias assume that candidates and their campaigns are equally strong for both parties on average.)

Following is a discussion of these criteria and their implementation for my least biased map.

- 1.) The traditional legal standard for congressional maps is one person population deviation. All the amicus maps in 2018 and the PA maps for previous years conformed to this criterion. It is tedious but quite possible to achieve this criterion by splitting precincts using the block level capability. Any mapper who submits a congressional map should be required to do this to show that they are serious and competent.
- 2.) Given the population deviation criterion, it is overwhelmingly most probable that the minimal number of county splits is 16. Requiring minimal population deviation gives a definite number for determining whether the splits criterion is satisfied, making it much easier for evaluating whether a map satisfies the splits criterion.
- 3.) Another county splitting criteria that was embodied in the LACRA bill is that the maximum splits in any county should be limited to one more than the minimum number of splits required by population deviation. (The 2018 congressional map does not satisfy this criterion.)
- 4.) In order to satisfy minimal population deviation, it is highly probable that 16 precincts must be split with one split occurring at the boundary of each county split. Each split precinct necessarily involves splitting one municipality. In large municipalities each split also splits a ward with high probability.
- 5.) No municipalities were split except when a precinct was split to achieve population equality. A list of split municipalities and precincts is given in Table 1.
- 6.) There are the usual number of two VRA districts in Philadelphia with over 60% minority. African Americans are the most populous group with greater than 42% of the population.
- 7.) Regarding compactness, there are no howlers as bad as the 2011 map. Districts 4,5 and 6 could be made more compact but that would make district CD6 less competitive and make CD4 and CD5 even safer for Democrats. Of course, the shapes of counties limit how compact the overall map can be and winding rivers that separate counties necessarily increase the Polsby-Popper score. Nevertheless, DRA gives this map a 61% rating, closer to good than to OK.
- 8.) Due to the above constraints and despite my efforts described below, this map favors the GOP. The votes bias in the Advanced section of DRA has a statistical uncertainty of 0.3% in the vote required to obtain half the seats; this is the standard deviation obtained using all the past election results in the DRA data base. (Unfortunately, DRA does not automatically do this calculation for users.)
- 9.) The seats bias in the Advanced section of DRA allows one to calculate the estimated number of D seats for half the vote. The number 7.7 ± 0.2 is significantly smaller than 8.5 which is half the seats. While the most probable split would be 8 D and 9 R, it is also quite likely that there would be 7 D and 10 R for half the vote, and less likely that there would be 9 D and 8 R.
- 10.) This map is quite responsive with a value of 2.8. Historic averages have values about 2, and that is what the efficiency gap idealizes. There are basically five competitive districts: 1, 6, 8, 11 and 16.

Table of municipalities and precincts that were split to achieve zero population deviation. Of course, different choices could have been made, but there would still be a list of 16 split precincts and split munis. The first column gives the pair of districts where a county split occurs. The second column names the county. The third column names the split municipality and the last column identifies the split precinct.

Districts	Split County	Split Muni	Split Precinct/Ward
16-17	Allegheny	Pittsburgh	Ward 04
14-16	Westmoreland	Penn	Ward 01
12-14	Cambria	Summerhill Township	Summerhill District South
12-15	Butler	Donegal Township	Donegal
9-12	Centre	Miles	Miles District East
9-10	Cumberland	Middlesex	Middlesex 01
12-13	Bradford	Wells Township	Wells
11-13	Luzerne	Butler Towhship	05
8-11	Monroe	Chestnuthill	02
7-13	Dauphin	Lower Paxton	27
6-13	Berks	Maidencreek	03
4-6	Montgomery	Skipjack	03
1-6	Montgomery	Upper Moreland	03
5-6	Chester	East Bradford	02
1-2	Philadelphia	Philadelphia	Ward 63 precinct 05
2-3	Philadelphia	Philadelphia	Ward 38 precinct 16

This paragraph describes my best efforts to make a fairer and more responsive map while adhering to the traditional criteria. Starting in the west, Allegheny county requires splitting one municipality. I chose to split Pittsburgh and no others. This enabled drawing CD16 as a competitive district by reducing the packing of Democrats in CD17. There is essentially no other place in the west where one could draw a competitive district. In the southeast, Philadelphia could be split an additional time and still satisfy the LACRA criterion, but that runs into VRA issues. There is no advantage for reducing the statewide bias by combining a partial Philly district with any of the surrounding counties except for Bucks. Further combining Bucks county with part of Montgomery county manages to make CD 1 competitive. The remainder of Montgomery and Delaware are strongly Democratic. I have combined those with Chester and part of Berks to form a competitive CD6 along with D leaning CD4 and CD5. One can draw more compact districts in this region, but that would decrease competitiveness. I have kept the Lehigh valley together in competitive and compact CD8 and the northwest region together in competitive and compact CD11. The remainder of the state is divided into GOP districts. The most competitive of these is CD7. It could be made more competitive by including the city of York, but that would entail having more splits.

The basic problem for fairness in PA is the packing of Democrats in excess of 80% in Philly. I see no way to unpack those districts while conforming to the traditional criteria. And I see no way to draw GOP districts with a similar degree of packing. However, the second map linked above favors the GOP three times more than my first least biased map. (I haven't bothered to obtain 0 population deviation as that makes an insignificant difference to the bias.)

It is important to know how to evaluate the partisan bias in a map. The DRA composite data base would give Dems 10 seats for this map, but that data base gives Dems 52.80% of the vote. Giving Dems more seats when using a data base that gave Dems more than 50% of the vote just doesn't qualify as a way to estimate partisan bias. The seats-votes curve gives the true picture of bias via the vote bias and seat bias metrics. The Declination, Global Symmetry and Gamma metrics are also reliable. The other metrics listed in DRA Advanced and the 100% proportionality shown in DRA Analysis are inferior for reasons published in <https://lipid.phys.cmu.edu/nagle/2021NagleRamsayELJwithAppendices.pdf>. A flaw in the often used median minus mean measure is revealed by the DRA Rank-Votes graph which shows only one competitive GOP district versus 4 competitive Dem districts. (However, median minus mean often performs well when there is symmetry in the votes of competitive districts.) The values of the other metrics are not durable over the different past election results - they vary rapidly as the overall vote changes as can be seen by choosing other elections provided by DRA.

In conclusion, PA currently seems to be "naturally" biased favoring the GOP because Democratic voters are packed in Philadelphia and Pittsburgh. This political geography dilutes their voting power. The traditional criteria and the political geography of PA appear to prevent complete mitigation of this dilution at this time. However, as voting patterns shift, the political geography might favor Democrats in future redistricting cycles. The altruistic course for whatever party is favored would be to agree to minimize this bias while still enjoying the remaining bias that traditional districting imposes. If such agreement is not forthcoming when the favored party has a legislative majority, that adds to the argument in favor of an independent commission for districting.