

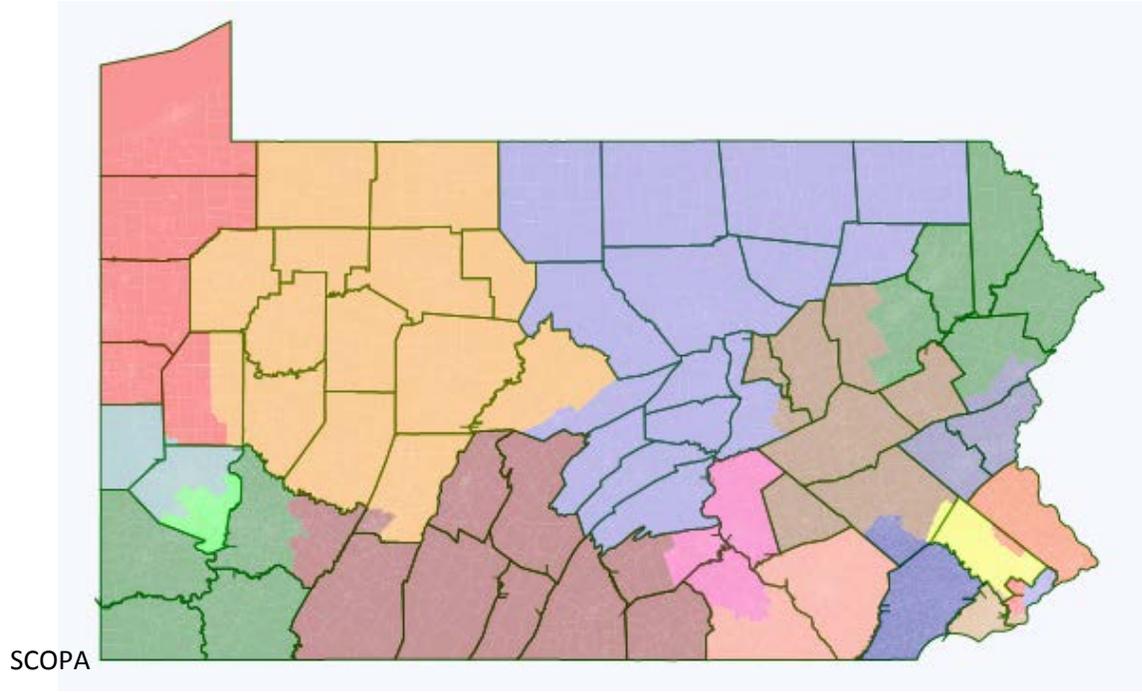
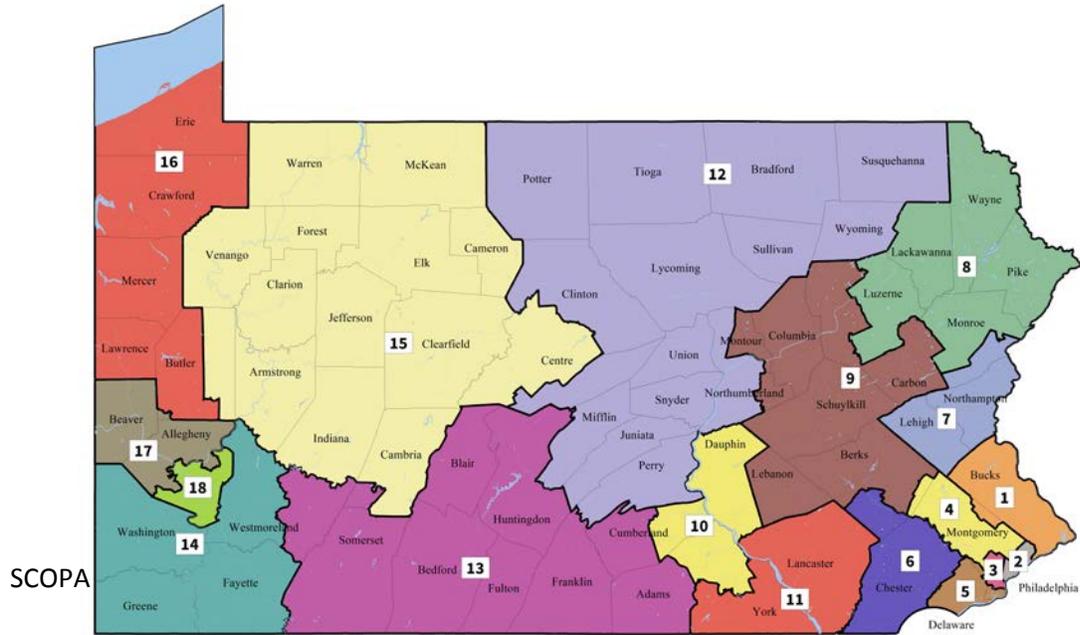
Supplementary Material for

What criteria should be used for redistricting reform? John F. Nagle

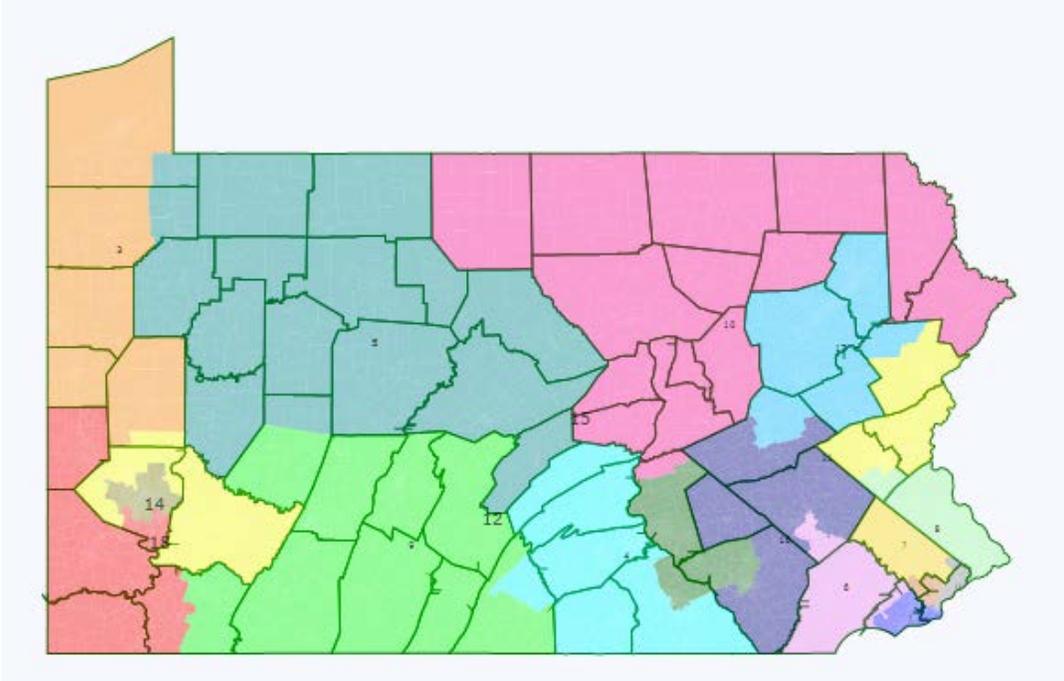
The paper presents analysis of twelve plans for the eighteen congressional districts in Pennsylvania in 2018. The corresponding maps are shown in this supplementary material. The names of the maps are given in Table 1 in the paper which is reproduced here for convenience.

Map	Data	S	V	R	R _D
SCOPA	2016P	7.7	52.7	2.4	4.4
SCOPA	2016S	7.3	52.9	3.2	5.8
SCOPA	2016Row	7.4	52.7	3.3	5.9
SCOPA	PVI	6.7	54.1	2.7	5.0
SCOPA	7s	7.0	53.1	3.4	5.6
D house	7s	7.2	53.0	3.1	5.2
D Senate	7s	7.0	53.6	3.0	4.9
D Lt. Governor	7s	6.8	52.9	4.0	6.7
R leaders	7s	6.0	54.9	2.5	4.0
Petitioners A	7s	7.0	53.2	3.5	6.0
Petitioners B	7s	7.1	53.2	3.2	5.5
Holt	7s	6.6	53.4	3.5	5.8
Author N8	7s	7.6	51.9	4.1	7.0
Author N9	7s	9.1	49.9	5.0	8.6
Author N3	7s	8.6	50.3	4.9	8.3
DBG	7s	8.2	50.8	5.0	8.7

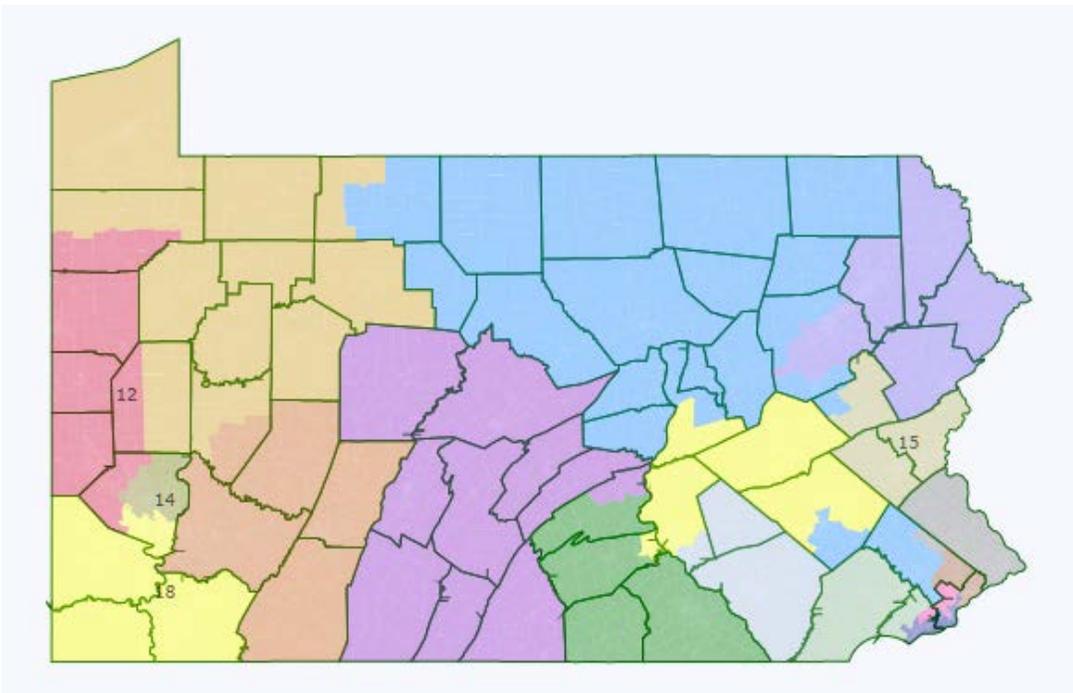
This page shows the SCOPA map, first the official one and then one redrawn for analysis, with results shown on the previous page. Subsequent maps are shown in the same format as the redrawn one without precinct lines, county or municipal names, or CD numbers, all of which obscure the underlying district map.



This page first shows the map submitted by the PA house Democrats followed by the map submitted by the PA senate Democrats. Although neither plan was as favorable to Democrats as the N8 map drawn by the author, the drawers of these plans could have used other data bases to maximize seats, as well as involving other criteria such as incumbency protection.



D house

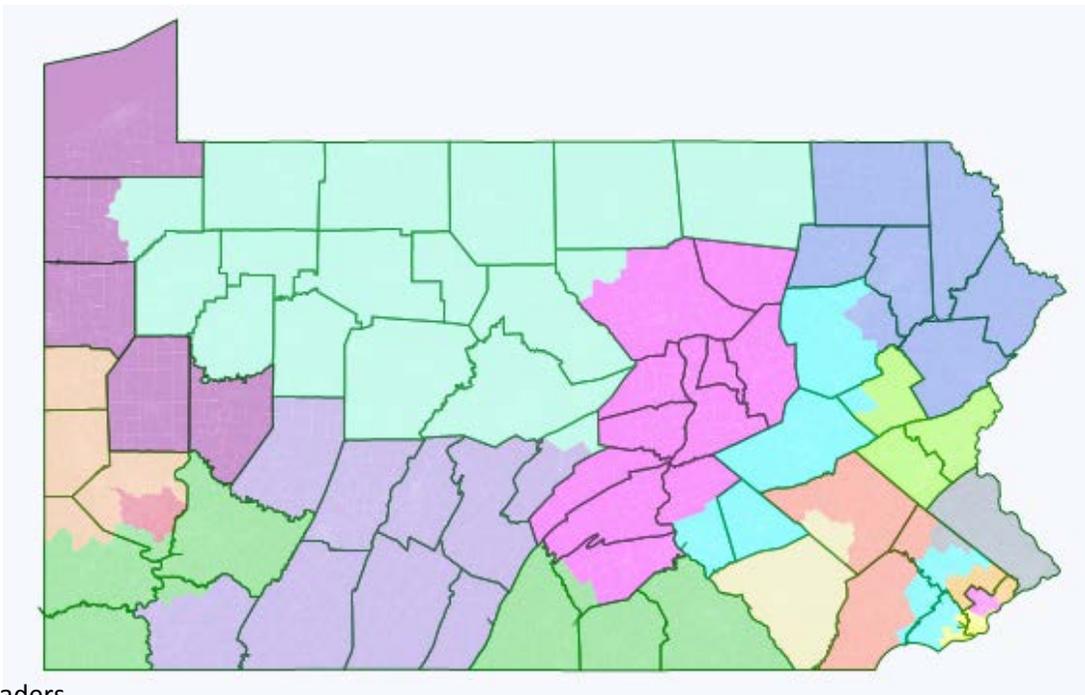


D senate

This page shows the author's rendition of the Joint Submission Plan presented by the Republican legislative leaders on 2/9/18. Because of the low resolution of the presented map, it is certain that a few precincts were misplaced, but the overall analysis will be insignificantly different.

The submitted map was rejected by the governor. This agrees with an excellent site posted by Mike Johnson <http://www.politicspa.com/heres-how-every-district-would-change-under-the-scarnati-turzai-map/86396/> who gives much more detailed comparison to the 2011 map. My analysis confirms that this is what is commonly called a stealth gerrymander because it conforms to the traditional criteria but is clearly drawn for partisan advantage. The analysis used all statewide data aggregated from 2012 and 2014. Similar results were obtained by Michael Waxenberg (private communication) using the PVI 2012 and 2016 presidential data from a map similarly drawn. Mike Johnson's website above similarly used even more statewide data.

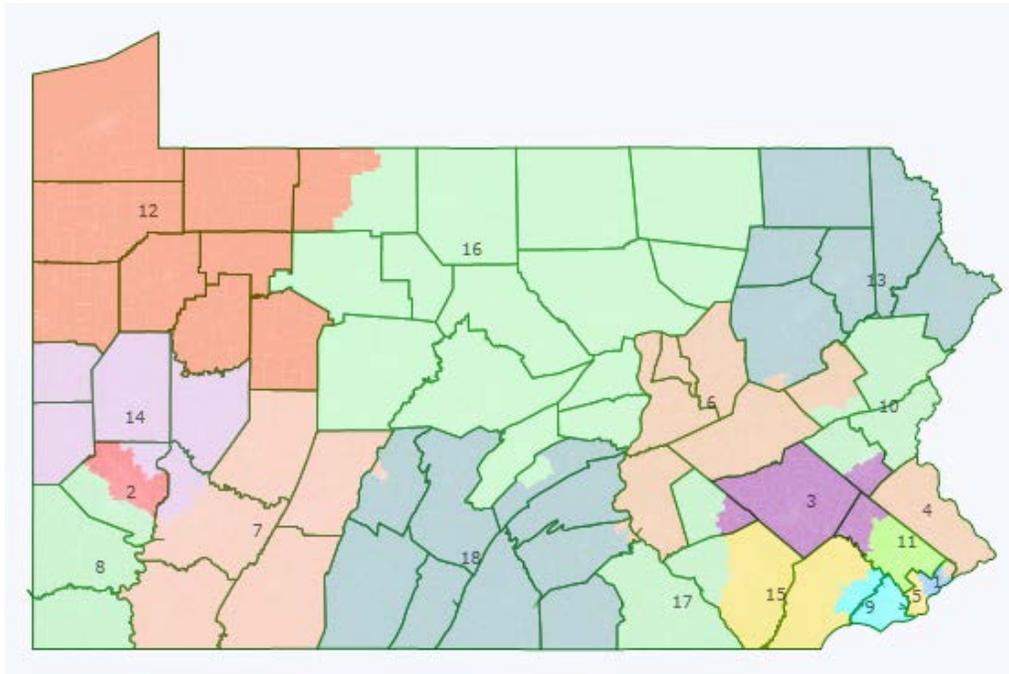
There is obvious evidence of intentional gerrymandering in the submitted map which can easily be seen by zooming the image with precinct lines, but which can barely be seen in a statewide non-zoomed view. One egregious example is packing Swarthmore and other D voting precincts in Delaware county into CD1. Another is packing heavily D voting precincts along the Ohio river valley into CD14. These might have put in as negotiating gambits. However, the plan is unfair at its core. Making a few tweaks to fix these obvious faults would not increase fairness and responsiveness substantially.



R leaders

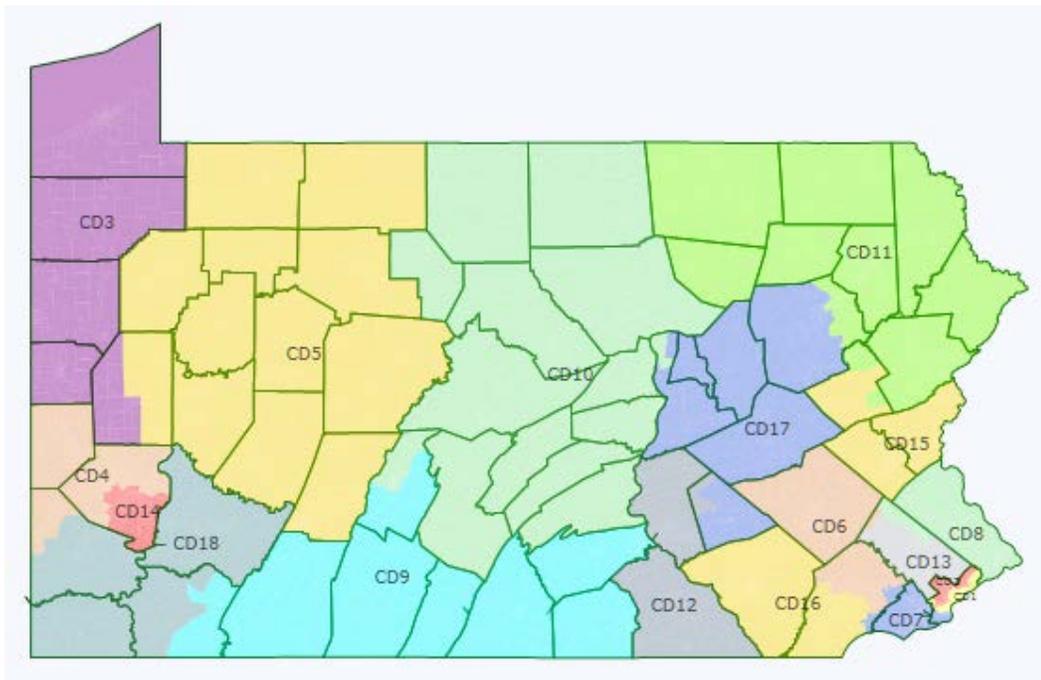
Actually, this map could have been rejected as not satisfying the traditional criteria because it has 18 county splits instead of the minimum 17. The number of county splits is the number of splits in all the counties, not the number of split counties, which doesn't take into account multiply split counties. See <http://lipid.phys.cmu.edu/nagle/Technical/splits.docx> for why this is the best measure of splits.

This page first shows the map that appears on p. 10 of Jowei Chen’s expert witness report in the court case; it was further tweaked for the submission of the lieutenant governor.



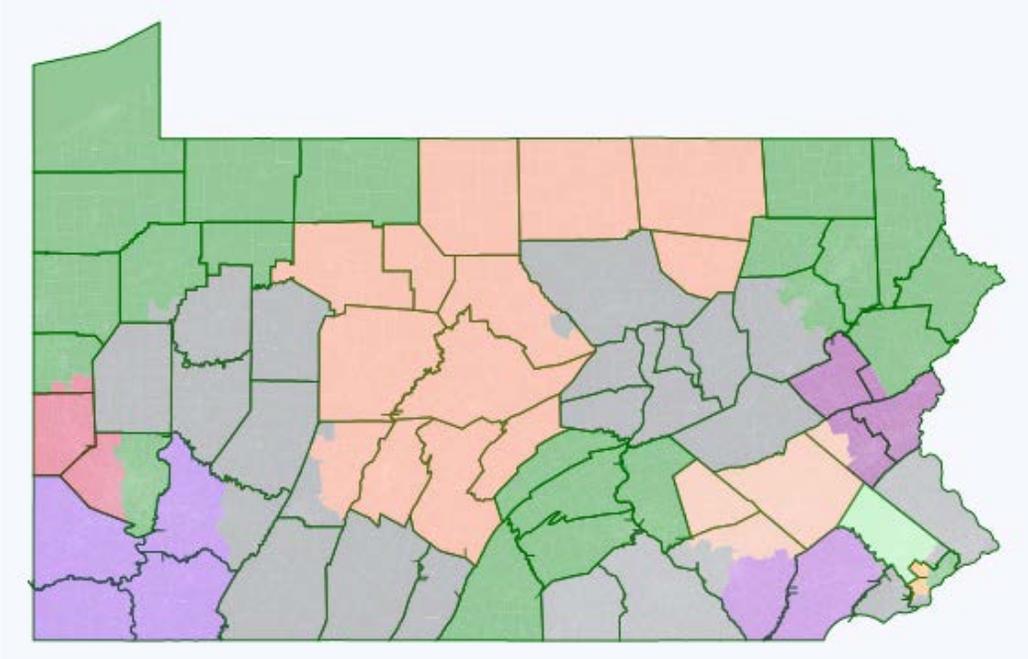
D Lt. Governor

Next is shown one of the many maps drawn by the renowned PA map drawer Amanda Holt, who kindly sent me the DRA file for this and several other maps.

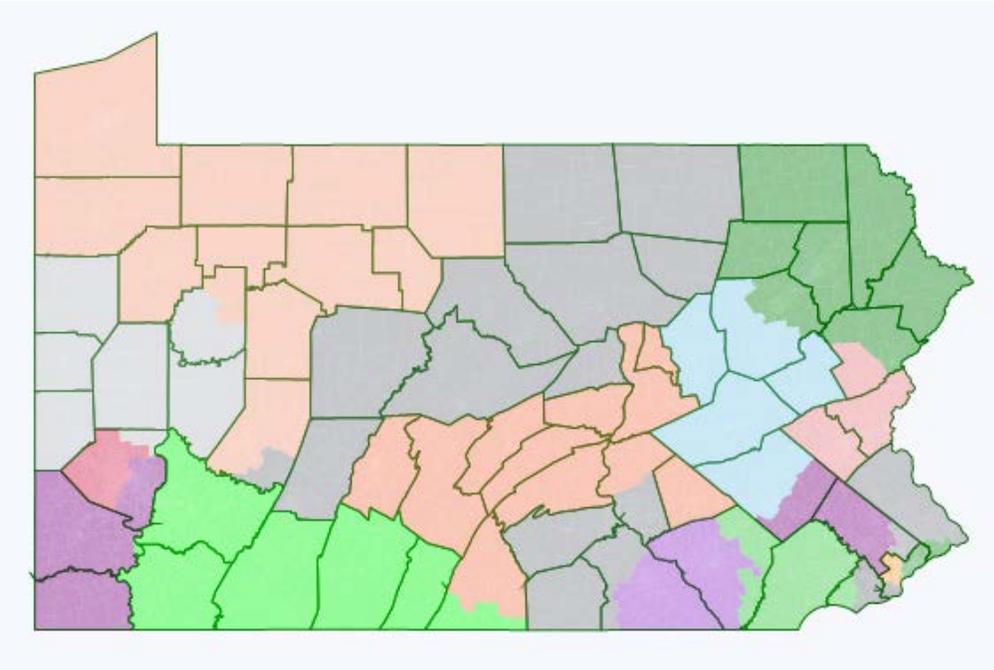


Holt

This page shows two maps submitted by the petitioners in the LWV court case.



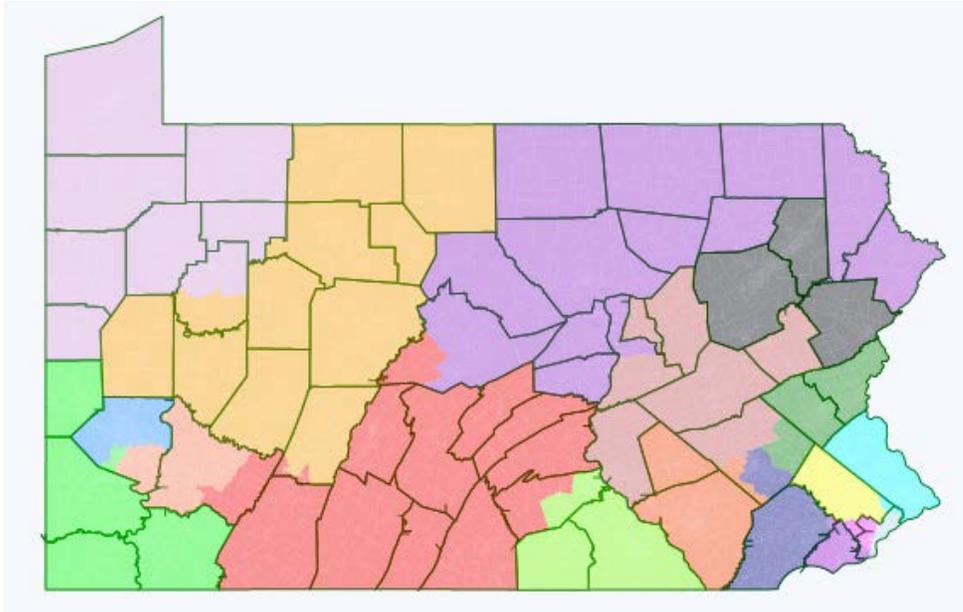
Petitioners A



Petitioners B

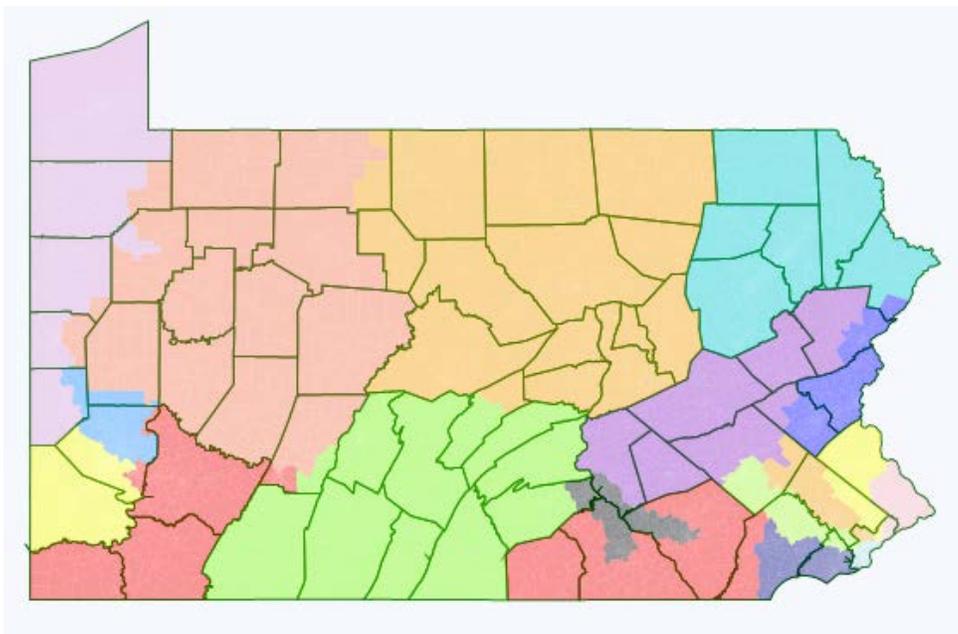
This page first shows the author's N8 map which was designed to favor Democrats while still satisfying the traditional criteria. As such it could be described as a stealth Democratic gerrymander except that it is still biased in favor of Republicans. I drew it to minimize the number of split counties (only 10) by having a few counties multiply split. It still has 17 county splits.

N8



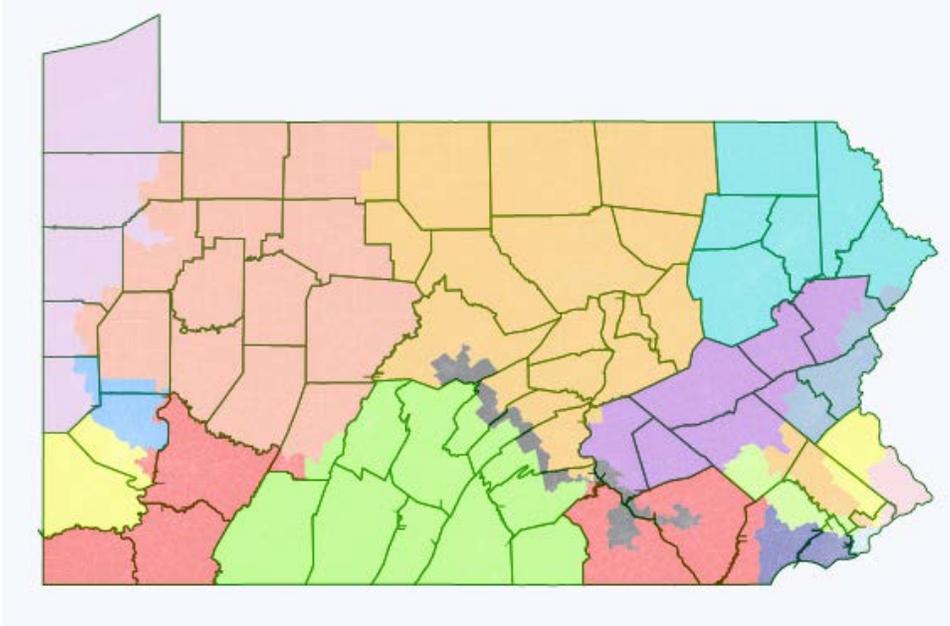
Following is the author's N3 map that was drawn to have only a small bias in favor of Republicans by departing from the traditional criteria by having 30 county splits instead of the minimal 17 splits. For comparison, the rejected 2011 map had 35 county splits.

N3 map



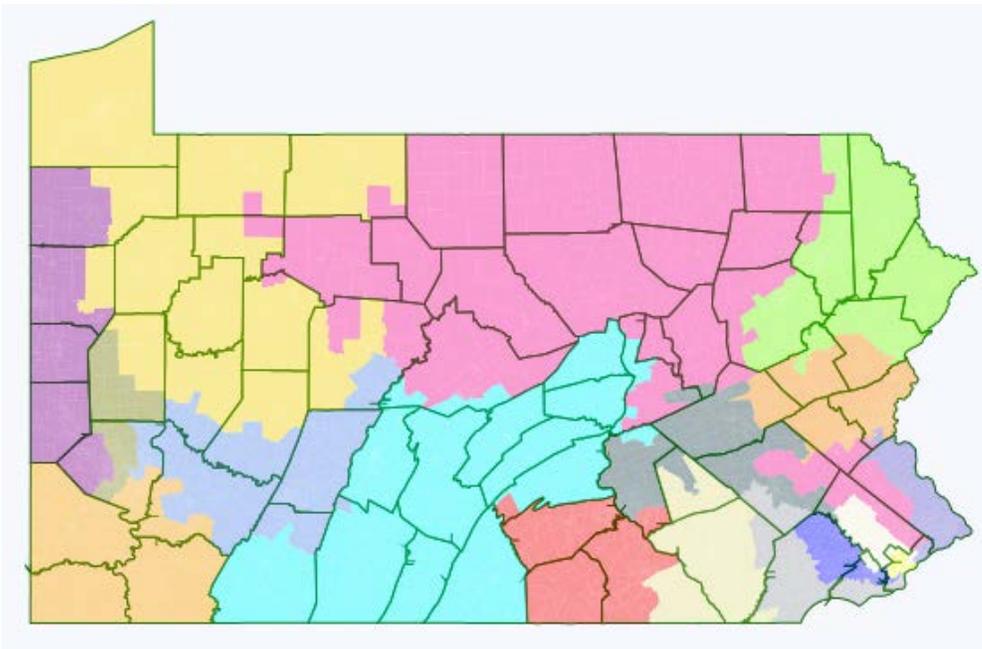
The first map is the color version of the N9 map that is shown in grayscale as Fig. 4 in the paper. It has 39 county splits. It is like N3 except for the only skinny district with one end in the center of the state.

N9



What the text calls the best democratic gerrymander (DBG) map is shown below. However, when using the 7s voter preference data base, it is still slightly biased in favor of Republicans and less favorable to Democrats than the N9 map above. It has 52 county splits.

DBG



Additional maps not mentioned in the paper can be found at <http://lipid.phys.cmu.edu/nagle>.