Sample Maps that Illustrate the Issues in Redistricting Pennsylvania

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Introduction

The purpose of this document is to illustrate the consequences of meeting the letter of the law on the various criteria for a map. We show that there are tradeoffs among criteria: being too compact leads to many split counties. The same is true of a very tight population constraint. The maps here should be considered a mix of reasonable maps and cautionary tales on the strictness of the criteria.

Compact map

The following maps illustrate the necessary tradeoffs in constructing districts. We begin with a map that should be rejected because of its extreme enforcement of compactness.
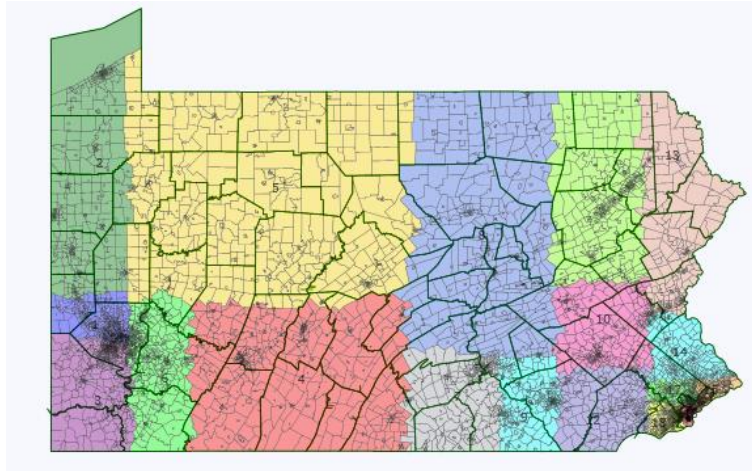

Figure 1: A map that takes compactness to the extreme but does badly on many other criteria[1]

This map makes no concession to the geography of the state and it splits many political boundaries such as county lines, thereby violating one of the traditional districting criteria. This illustrates the conflict between the traditional criterion of compactness with that of not splitting subdivisions.

Note also how jagged the edges of the district are. This is due to keeping precincts intact and the precincts have irregular shapes. Consequently, it is possible to have an even more compact map by splitting precincts. This is true when using compactness measures that use the lengths of the perimeters of each district.

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[1] This map was drawn to illustrate the problems with compactness by John F Nagle, www.lipid.phys.cmu.edu/nagle

The first group of the following maps focuses on the traditional criterion of not splitting political boundaries. The second group focuses on responsiveness and fairness.

A Map with a Low Number of Splits

This map keeps the number of splits low while being reasonably compact. There are multiple possible definitions for split counties. If a county has a population larger than a congressional district, it has to be covered by more than one district, and we do not consider that to be a split county. If the remainder of the county after whole districts have been carved out (two carved out in Philadelphia and one in both Montgomery and Allegheny Counties) is put into one district, we do not count the county as split. That is, our definition of a split county is one that can be entirely placed in a single district but is not, or the remainder in Philadelphia, Montgomery, or Allegheny Counties is divided into two or more districts.
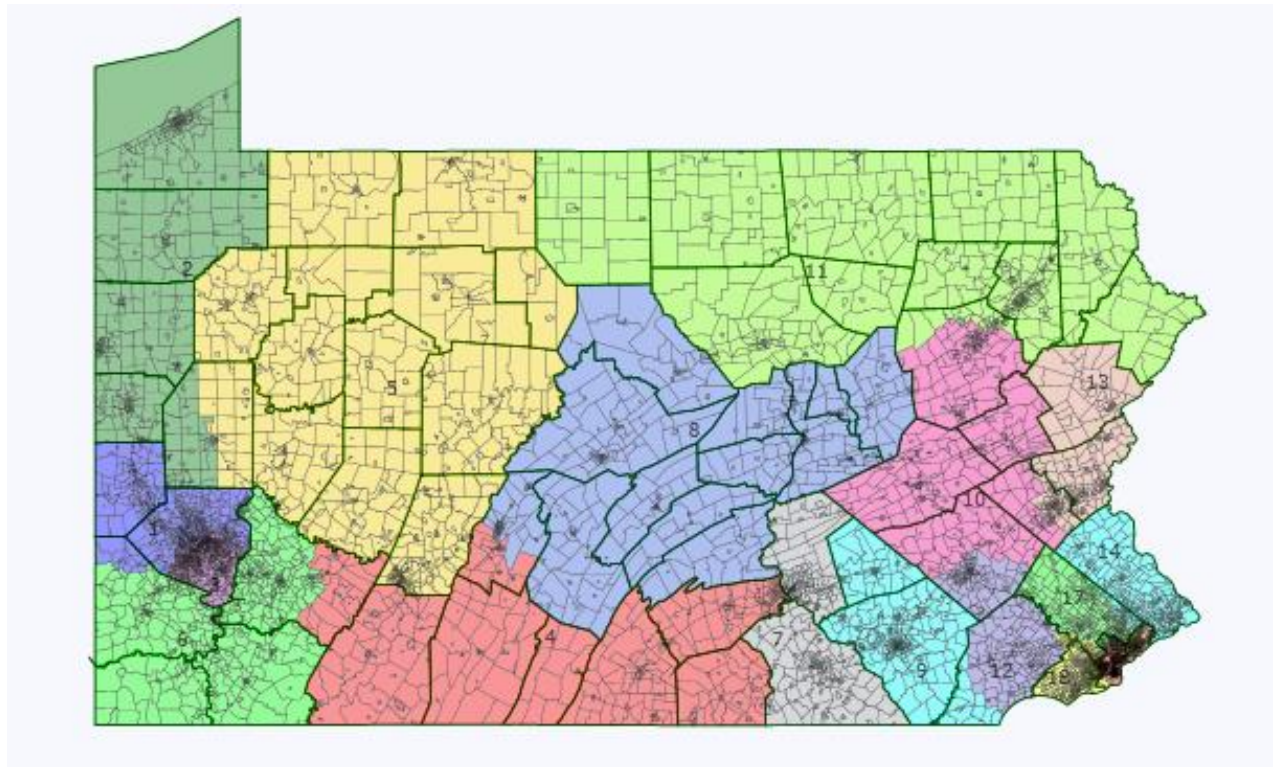

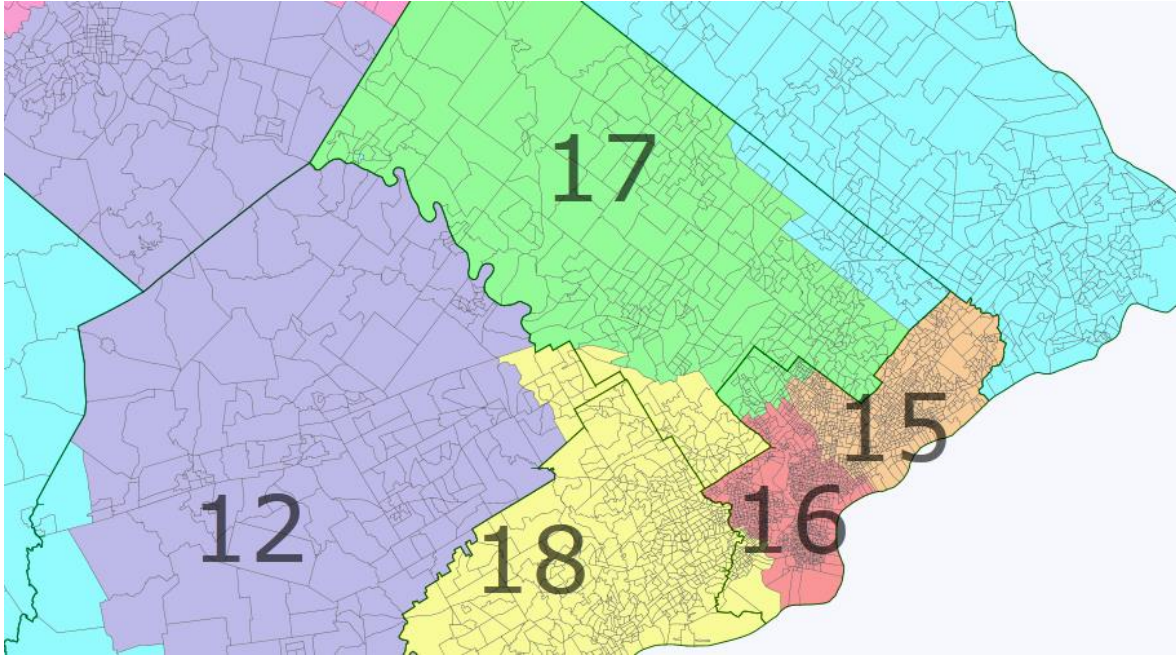Figure 2a: Murphy 1, entire state
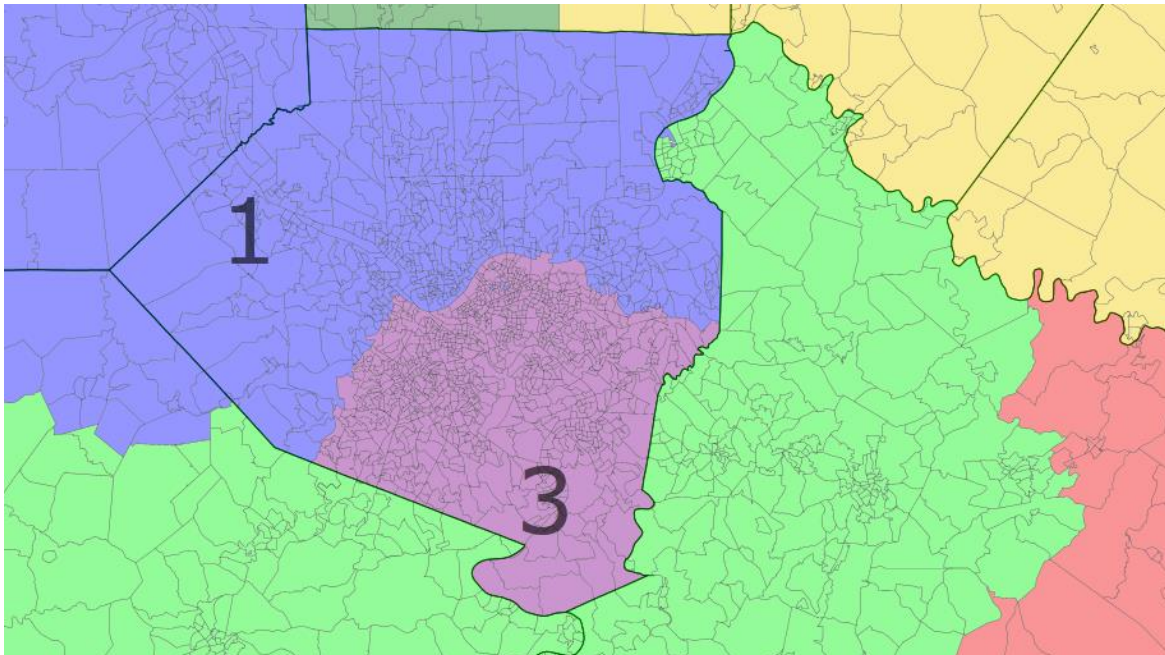
Figure 2b: Murphy 1 Southeastern Pennsylvania

Figure 2c: Murphy 1 Southwestern Pennsylvania

Properties:

1. Split counties: 10
2. Chester county split twice
3. Maximum population deviation: 3078
4. Average population deviation 1514
5. Majority minority districts: 2

Note that the residual portions of Montgomery and Philadelphia Counties are split into two districts.

This map generally respects the county boundaries, is reasonably compact, and meets the requirements of the Voting Rights Act. The population deviation is less than .5%, which is a reasonable implementation of the equal-population criterion.

The Effect of Tighter Population-Equality Restrictions on Split Counties and Compactness

In a court case the judge ruled that population should not deviate by more than one person. We illustrate in Murphy 2 the effect of tightening the population deviation, starting with Murphy 1. The software we used does not allow us to map districts within one person since it has precinct level data. Any of the maps presented here can be adjusted by hand to meet this criterion, but this generally requires splitting more counties and other political subdivisions.
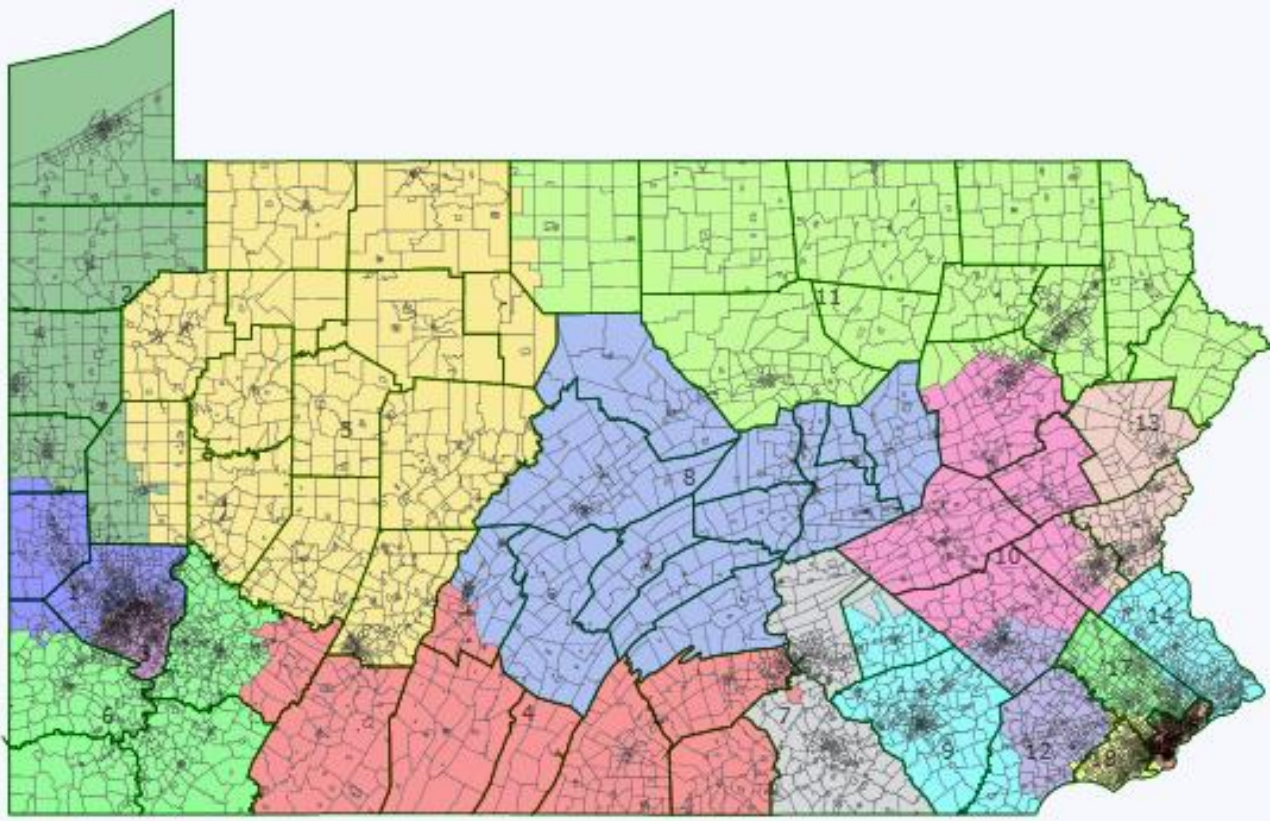

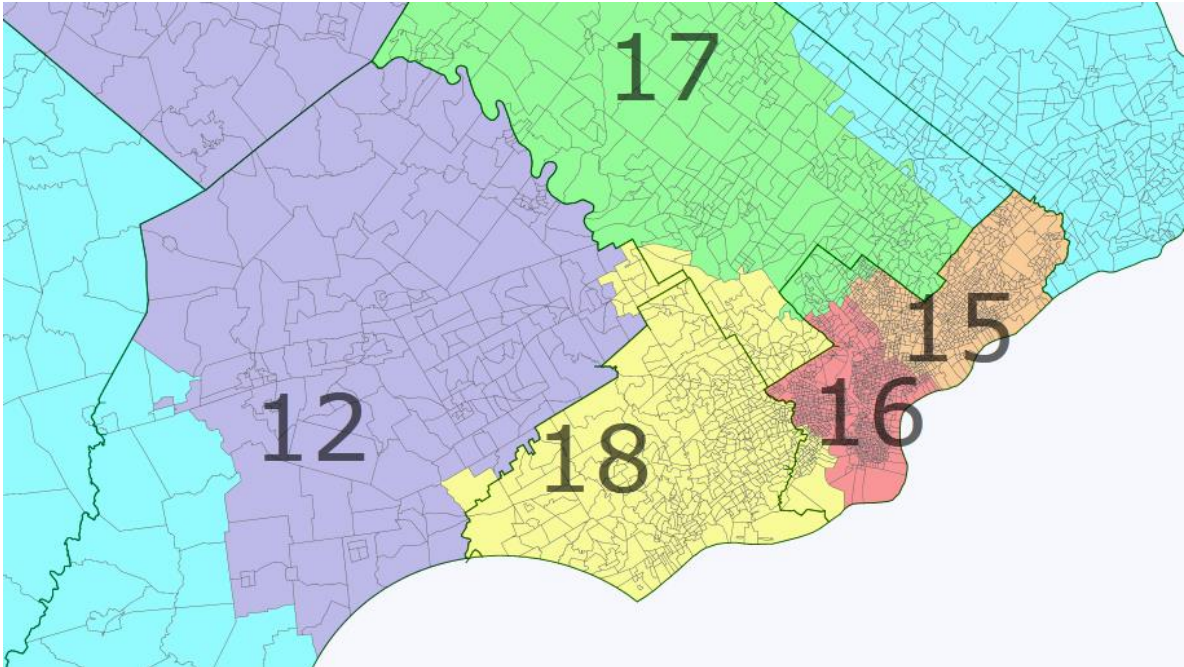Figure 3a: Murphy 2 all of Pennsylvania

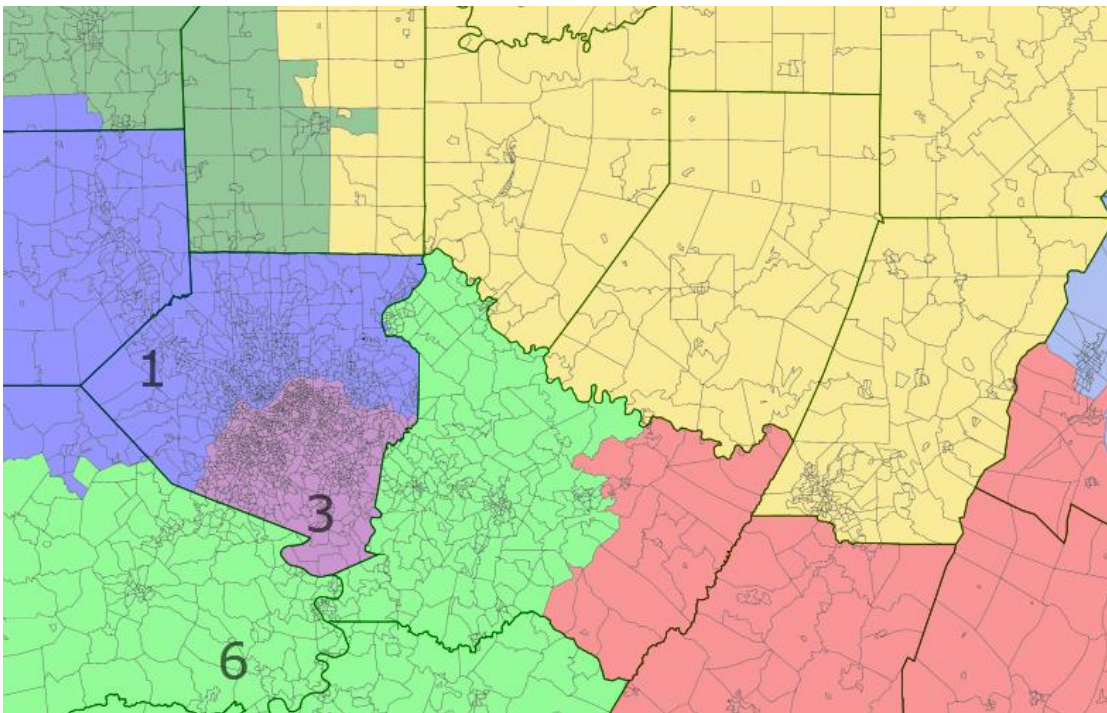Figure 3b: Murphy 2 Southeast Pennsylvania

Figure 3c: Southwest Pennsylvania

Properties:

1. Split counties: 14
2. Total number of splits: 16 (Chester county split twice the remainders of Montgomery and Philadelphia Counties split once)

3. Maximum population deviation: 421
4. Average population deviation 230
5. Majority minority districts: 2

The population deviation has been reduced 5 fold with this map. However, 4 more counties are split. Note that the increased splits involves moving very small portions of counties out of the districts that encompass most of the county, which means less responsiveness to county issues from the legislators who wind up with the tiny pieces of counties. Another feature is that the edges of the districts are more jagged. For example, District 4 intrudes into District 7 around Harrisburg. District 7 extends into Lebanon county whereas it consists of exactly two counties in Murphy 1. Furthermore, the boundary between Districts 2 and 5 in the southwest corner is more jagged. The increased splits and decreased compactness over Murphy1illustrates that no criterion should be taken to an extreme.

Removing the Split Remainders in Montgomery and Philadelphia Counties

This map illustrates how the boundaries can be adjusted to eliminate the splits of the remainders in Montgomery and Philadelphia Counties. In the case of Philadelphia, the population that cannot fit into the two districts contained entirely in the city is allocated to Bucks County. The portion of Montgomery County placed in a different district is moved to the northwestern boundary. Note how the boundaries of the districts in the Southeast region shift relative to Murphy 1 to maintain the populations of the districts within .5%. This map illustrates that meeting the goal of having a district entirely within Montgomery County causes alterations in all of the nearby districts. Essentially, the population constraint means districts act like a balloon—you squeeze a district in one area and it has to expand in another.
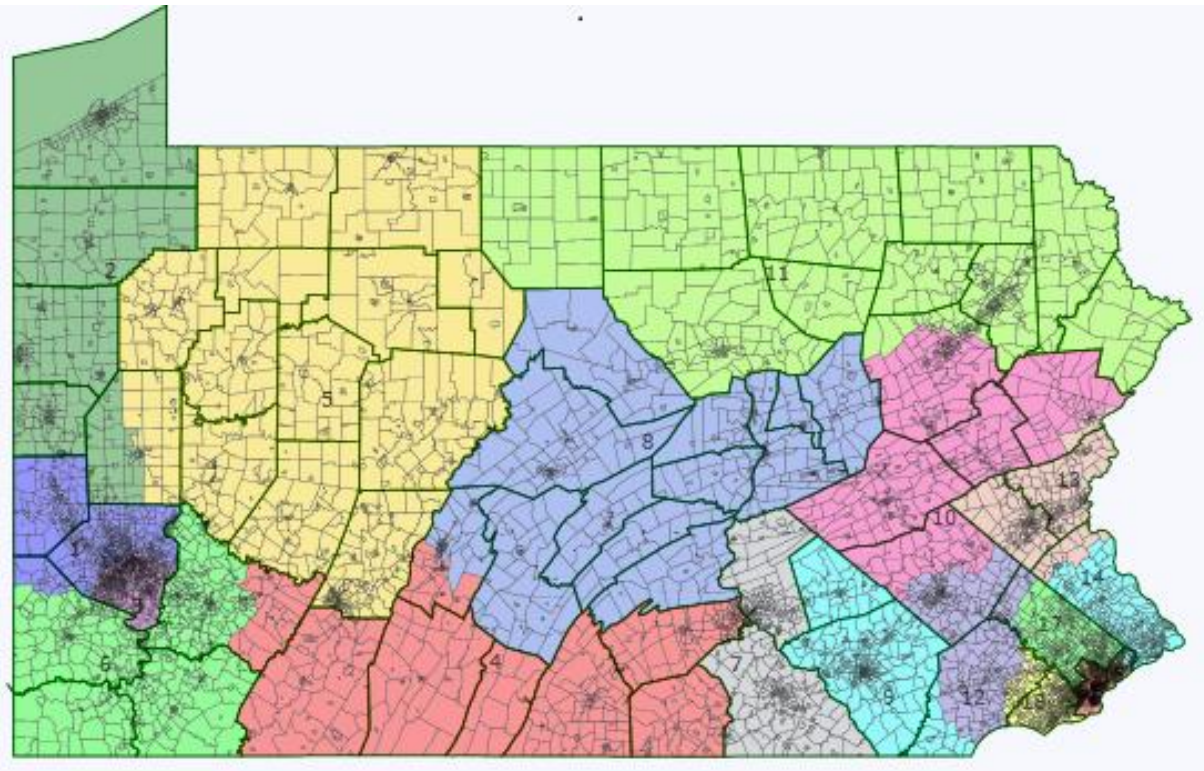

Figure 4a: A map that removes the splits in Montgomery and Philadelphia Counties
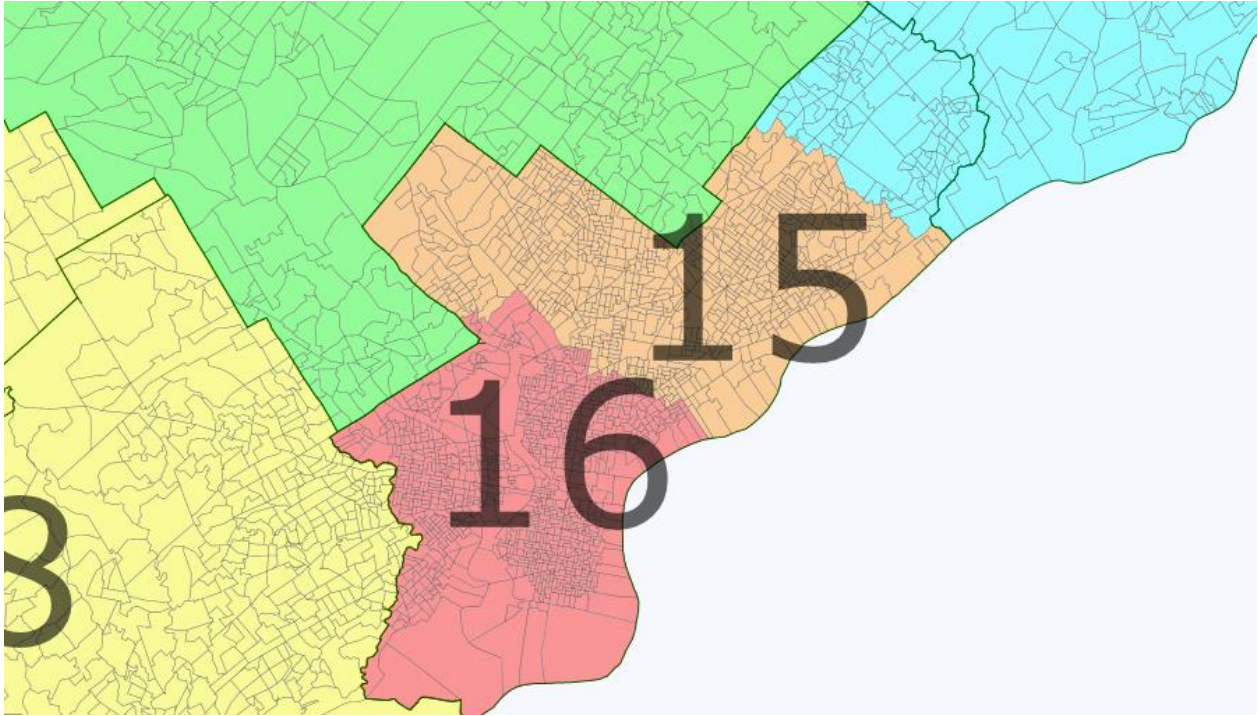
Figure 4b: The Southeast with the remainders of Montgomery and Philadelphia Counties contained in one district
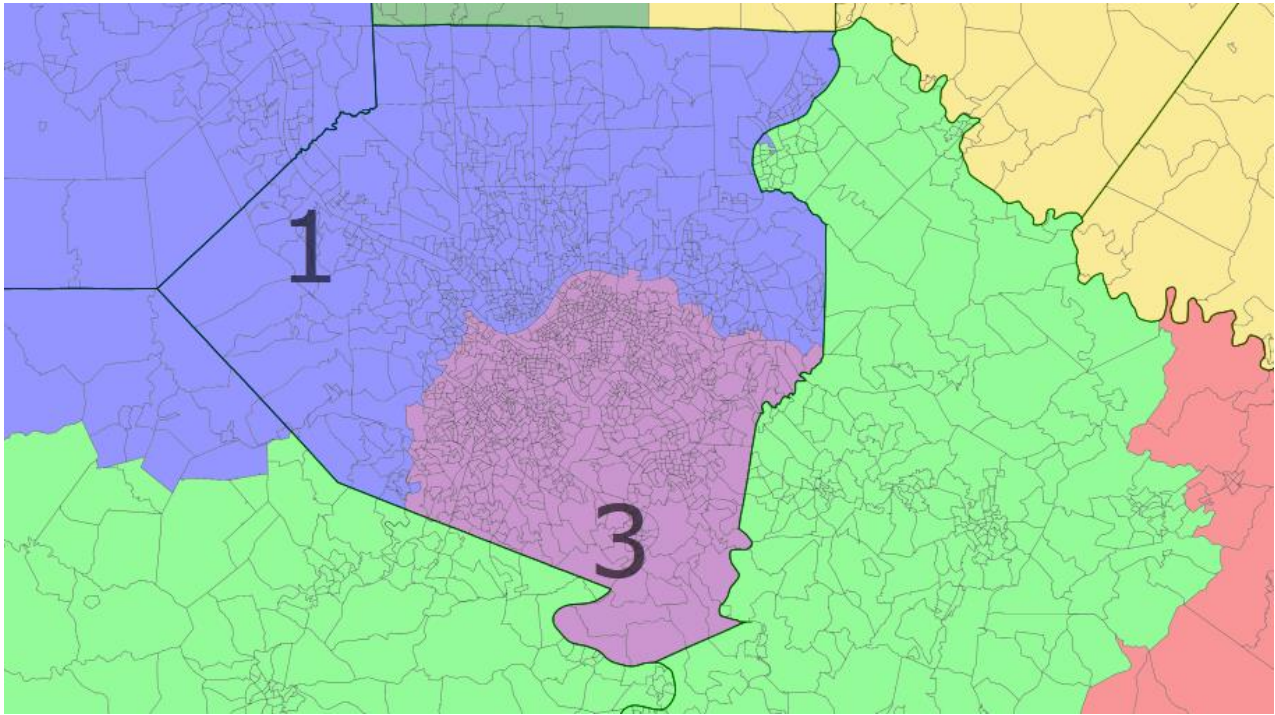

Figure 4c: Allegheny County

Properties:

1. Split counties: 9
2. Chester county is split twice
3. Maximum population deviation: 3296
4. Average population deviation: 1592
5. Majority minority districts: 2

Another Plan Minimizing the Number of Splits

The following map was drawn to minimize the number of split counties. Nine counties were split once each: Butler, Washington, Westmorland, Blair, Luzern, Lehigh, Chester, Montgomery and Philadelphia. No other cities, townships nor wards were split.

Political registration, voting history and population demographics were not considered in the preparation of this plan.

This comes at a price. Maximum population deviation is 12,819 or 1.7%. Absolute population equality makes little sense. It changes day by day; the Census Bureau estimated that between 2010 and 2114. PA County populations had increased as much as +3.5% (Cumberland County) or decreased as much as -5.5% (Cameron County).
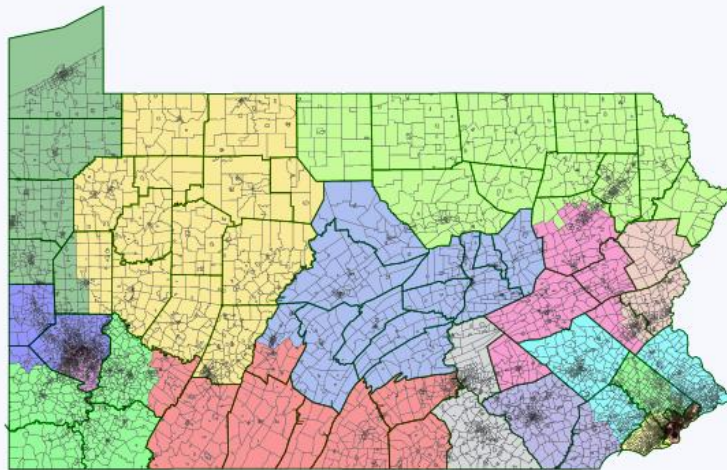

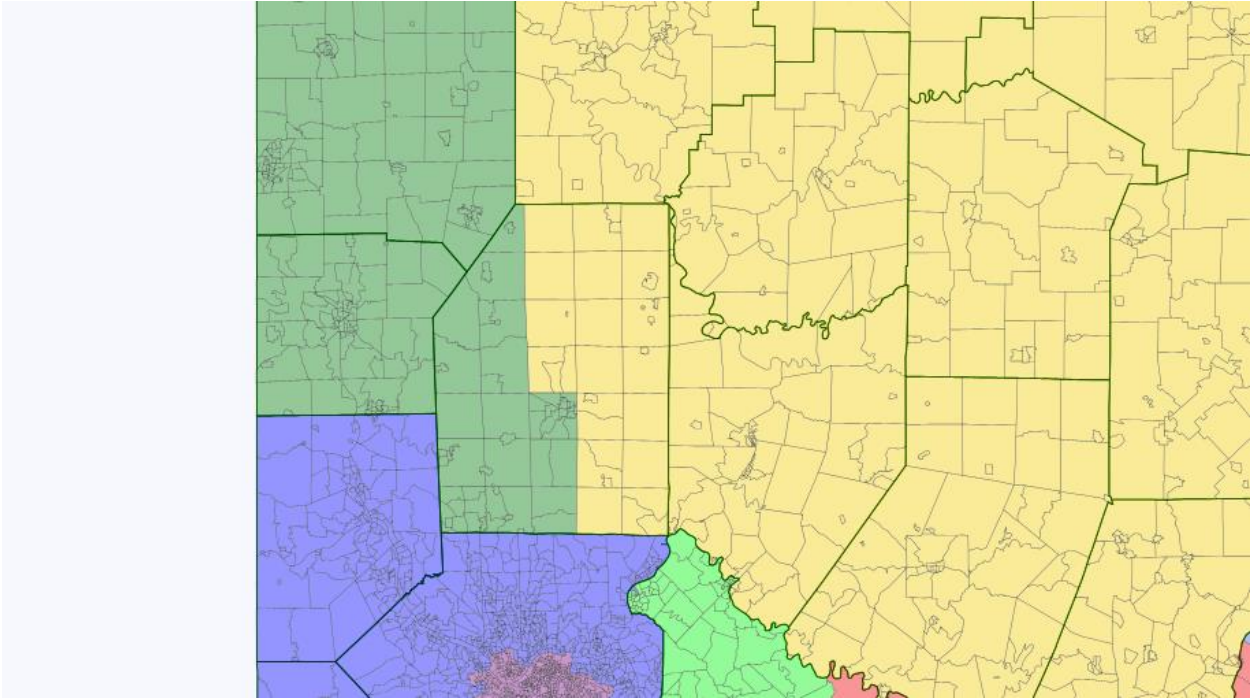Figure 5a: Hess 2 Plan to Minimize Split Counties
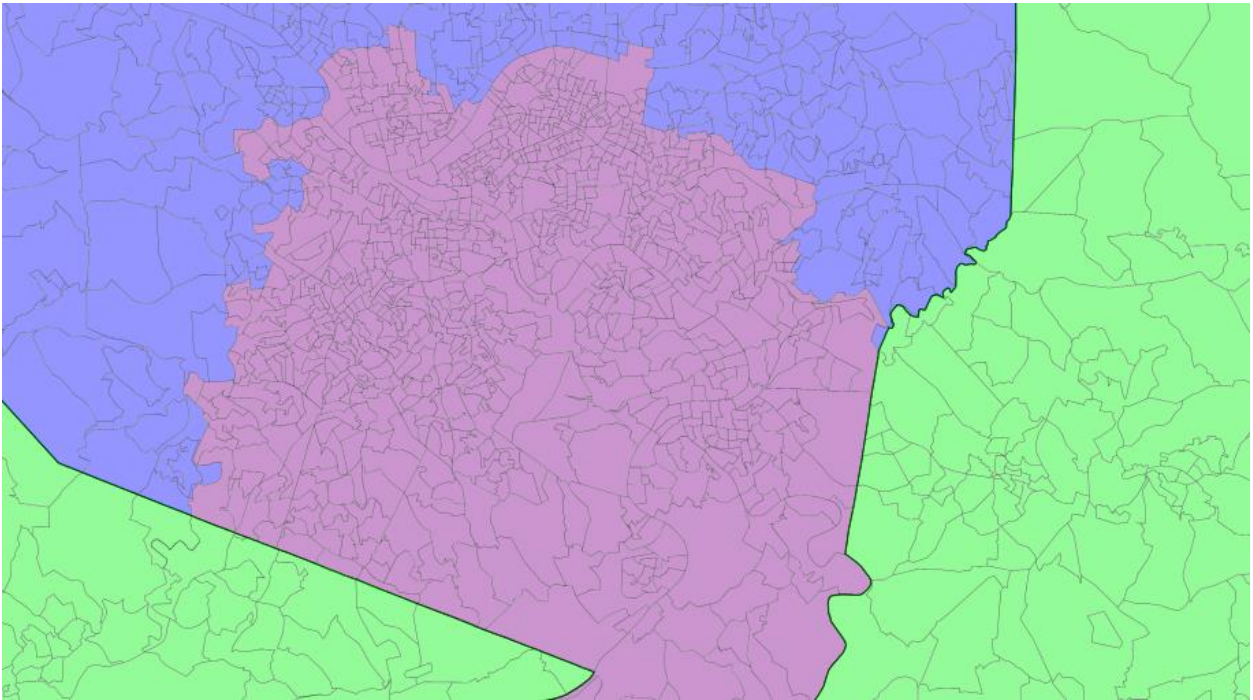
Figure 5b: Detail of Blair County Split

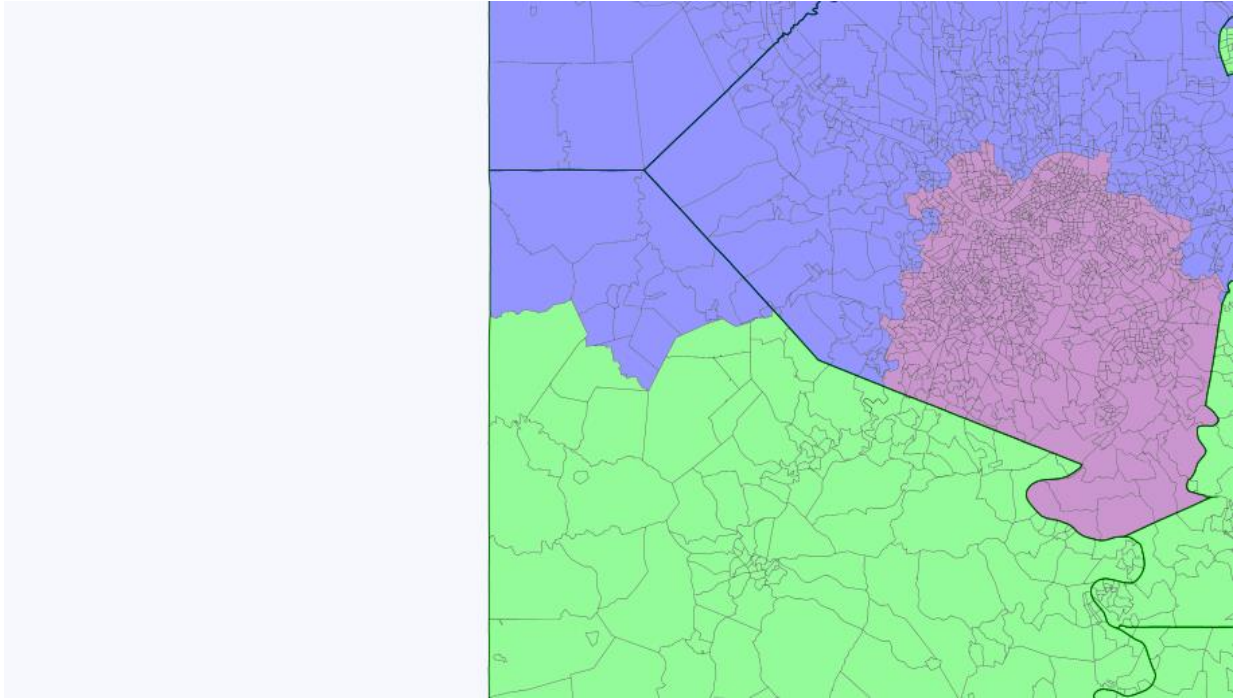Figure 5c: Detail of Pittsburgh in Allegheny County

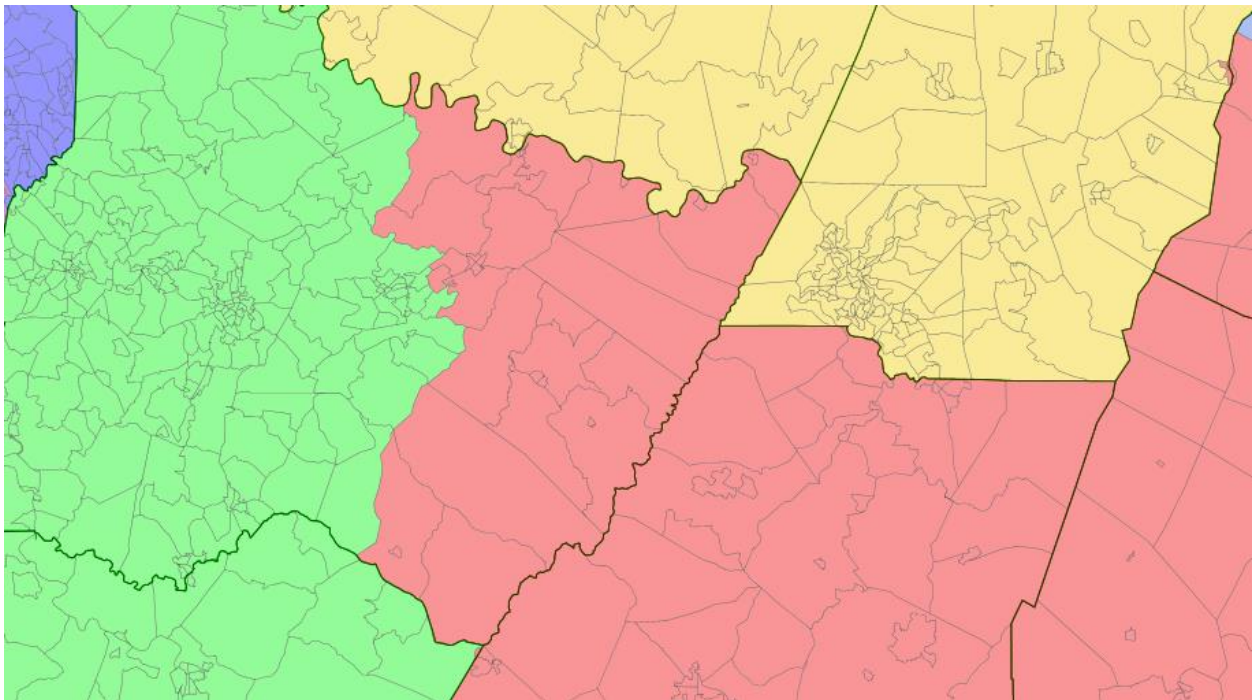Figure 5d: Detail of Split in Northwest of Washington County

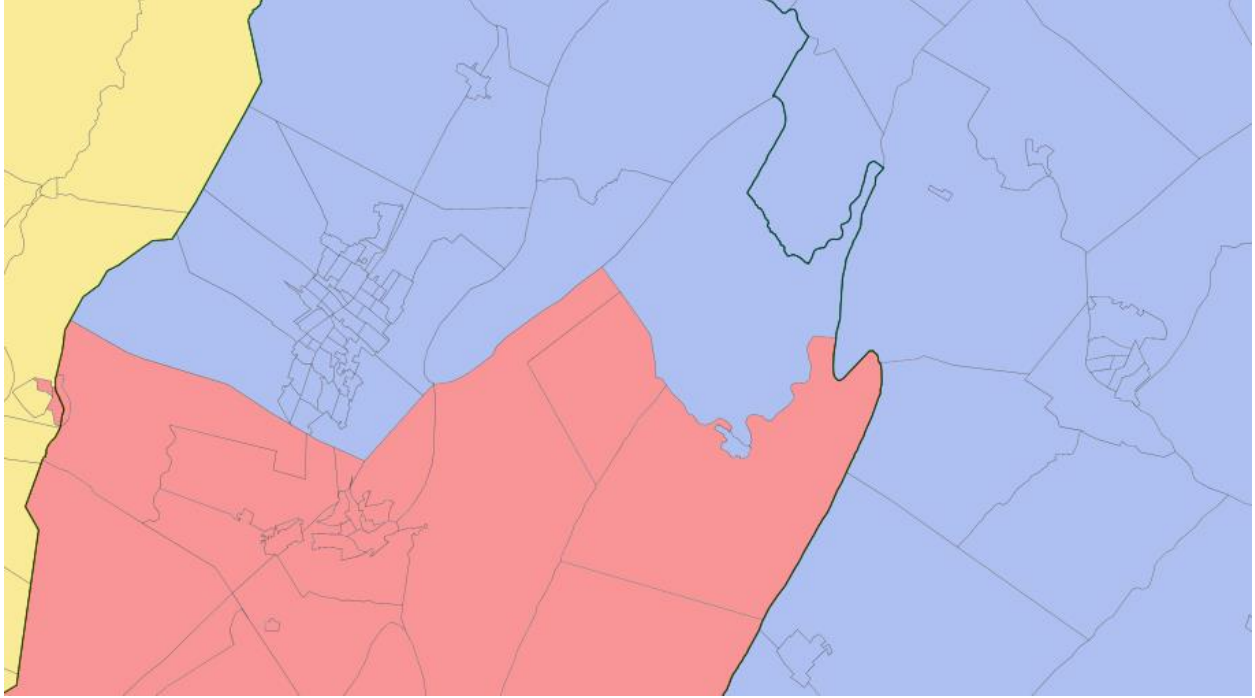Figure 5e: Detail of Split in Northeast of Westmoreland County

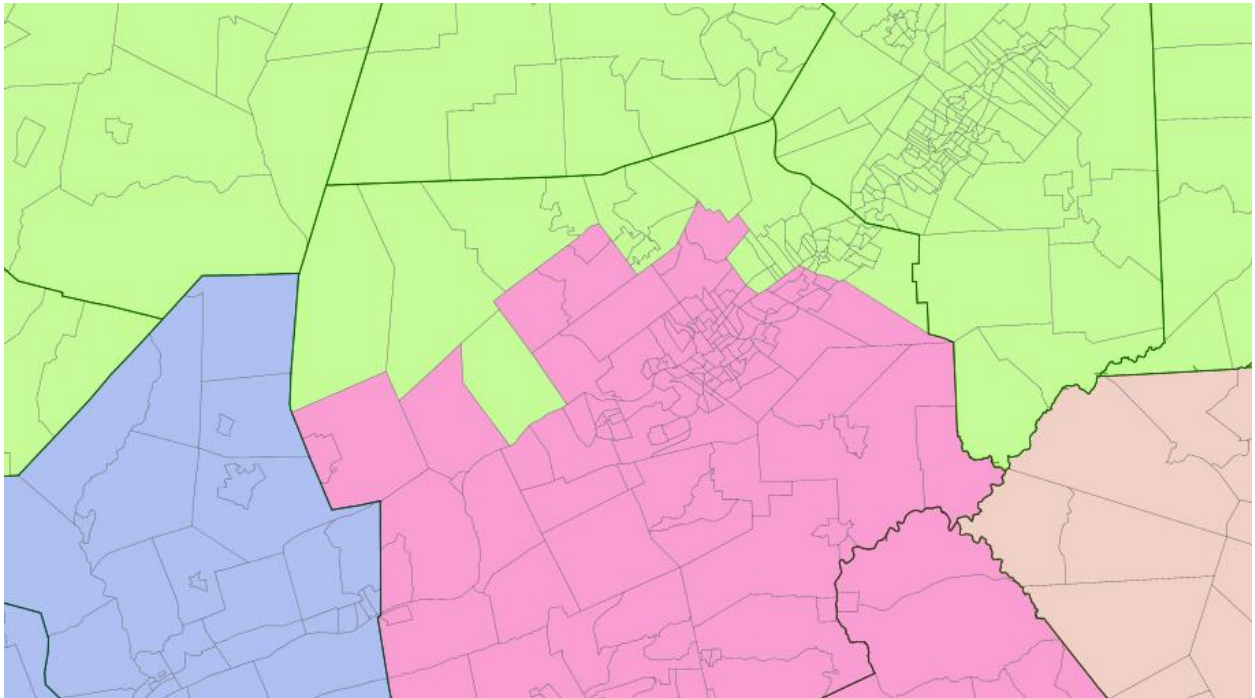Figure 5f: Detail of Split in Northern Blair County

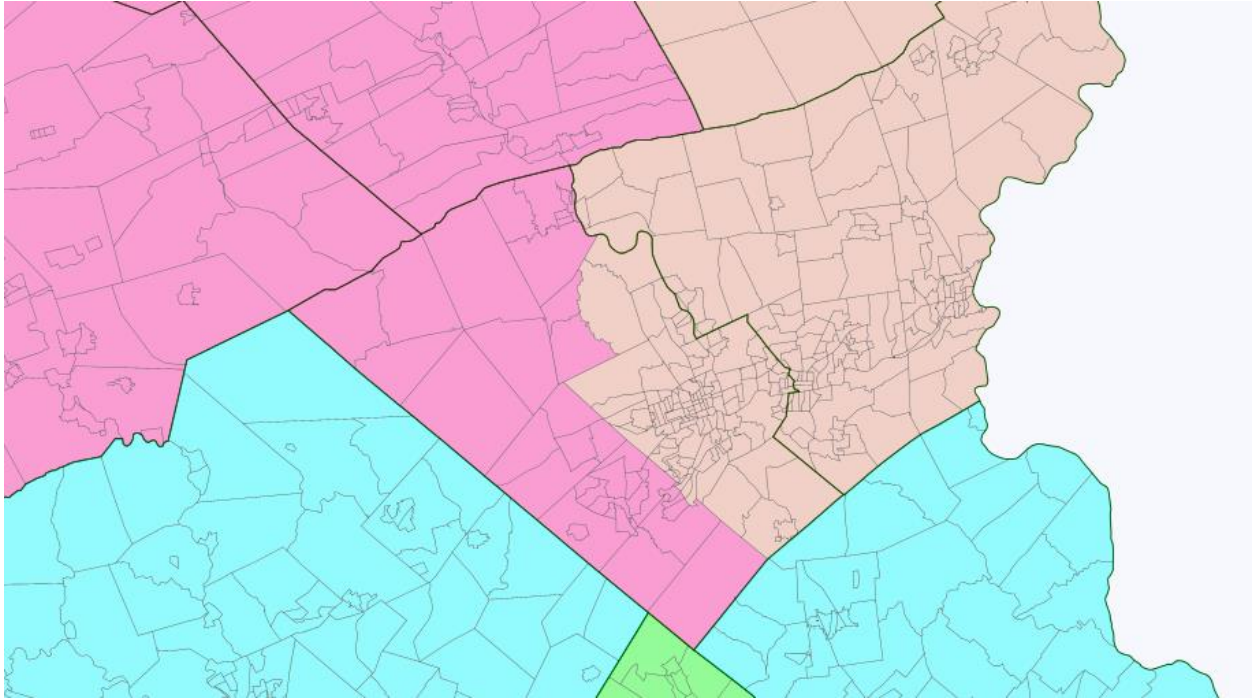Figure 5g: Detail of Split in Northern Luzerne County

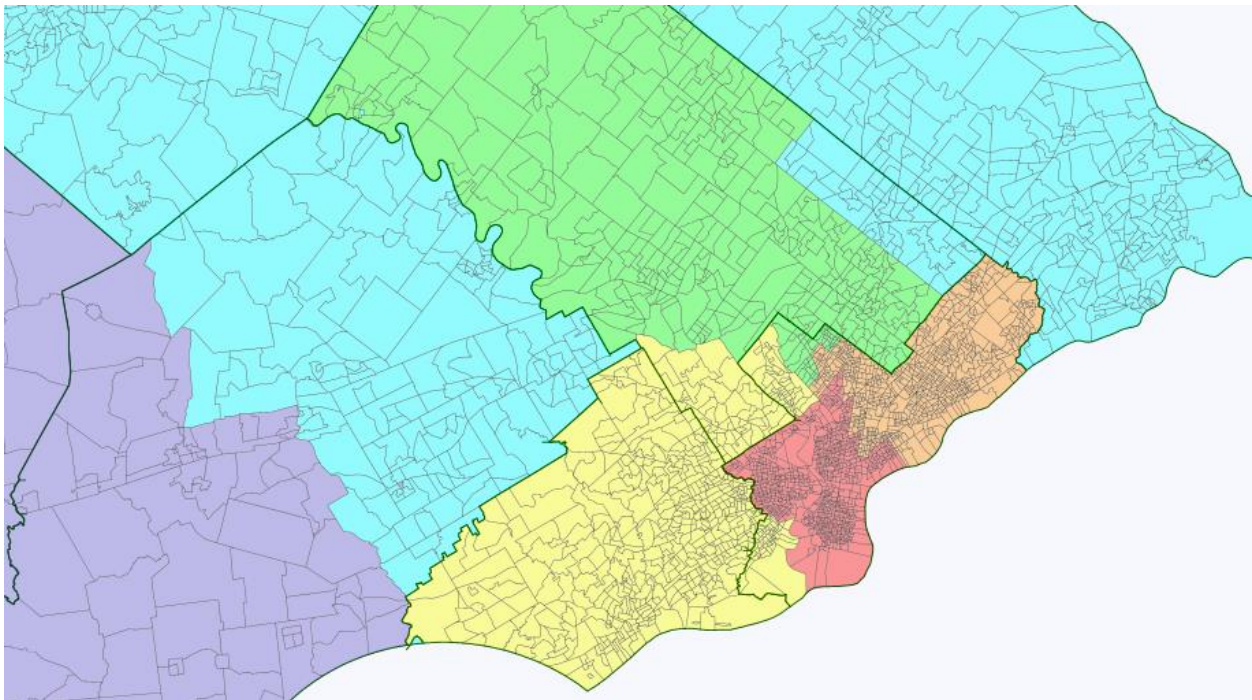Figure 5h: Detail of Split in West Lehigh County

Figure 5i: Detail of Splits in Chester, Montgomery and Philadelphia Counties

Properties:

1. Split counties: 9
2. No county split more than once (the remainders of Montgomery County and Philadelphia are split once)

3. Other than Philadelphia no city or township is split.
4. No wards are split anywhere including Philadelphia
5. Maximum population deviation: 12,819 or 1.8%
6. Average population deviation :4777 or 0.7%

Minimizing Townships Split and the Montgomery County district contains the remainder of Philadelphia

In this map we started with the map that has the remainder of Philadelphia in Bucks County and made every attempt to not split townships. Thus, Pittsburgh is in one district. We also adjusted the borders around every township we could see to keep them whole. We do not guarantee we found all split townships, as there are hundreds in the state. The other feature of this map is that, instead of the Bucks County District containing Northeast Philadelphia, we move northwest Philadelphia into the district that covers most of Montgomery County. To balance the populations, keep townships together and minimize split counties we had to adjust boundaries throughout the southeastern portion of the state.
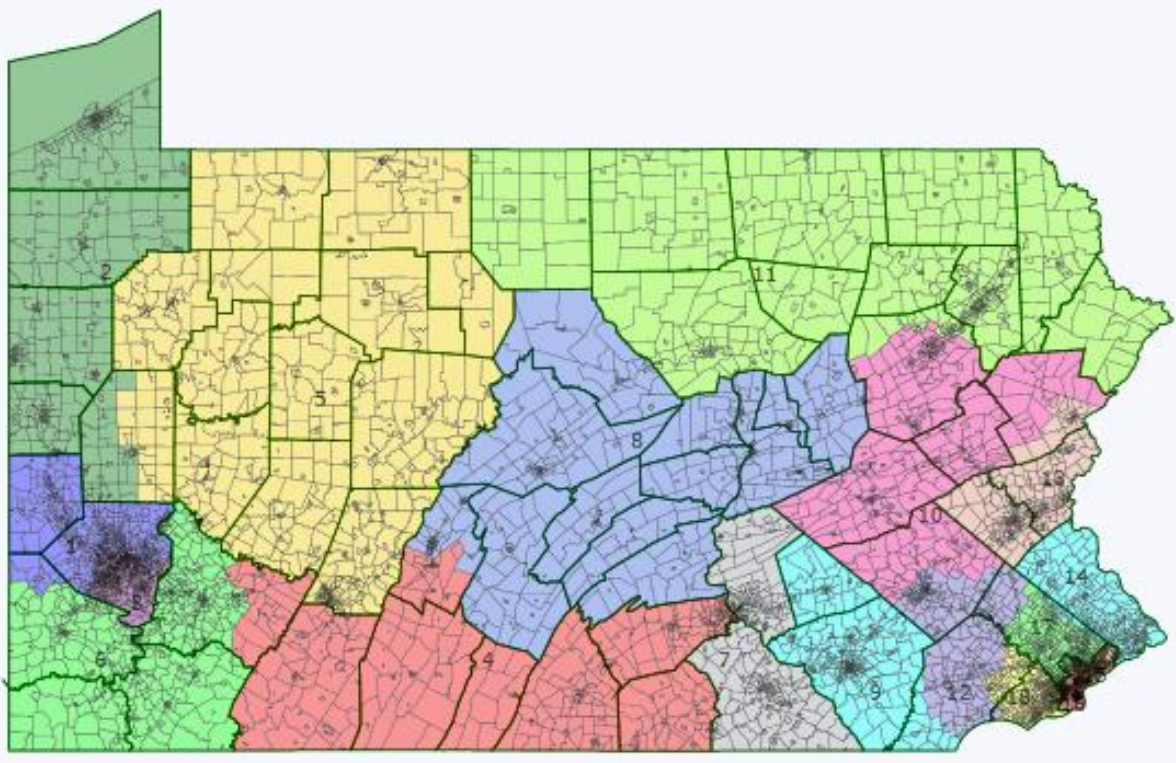

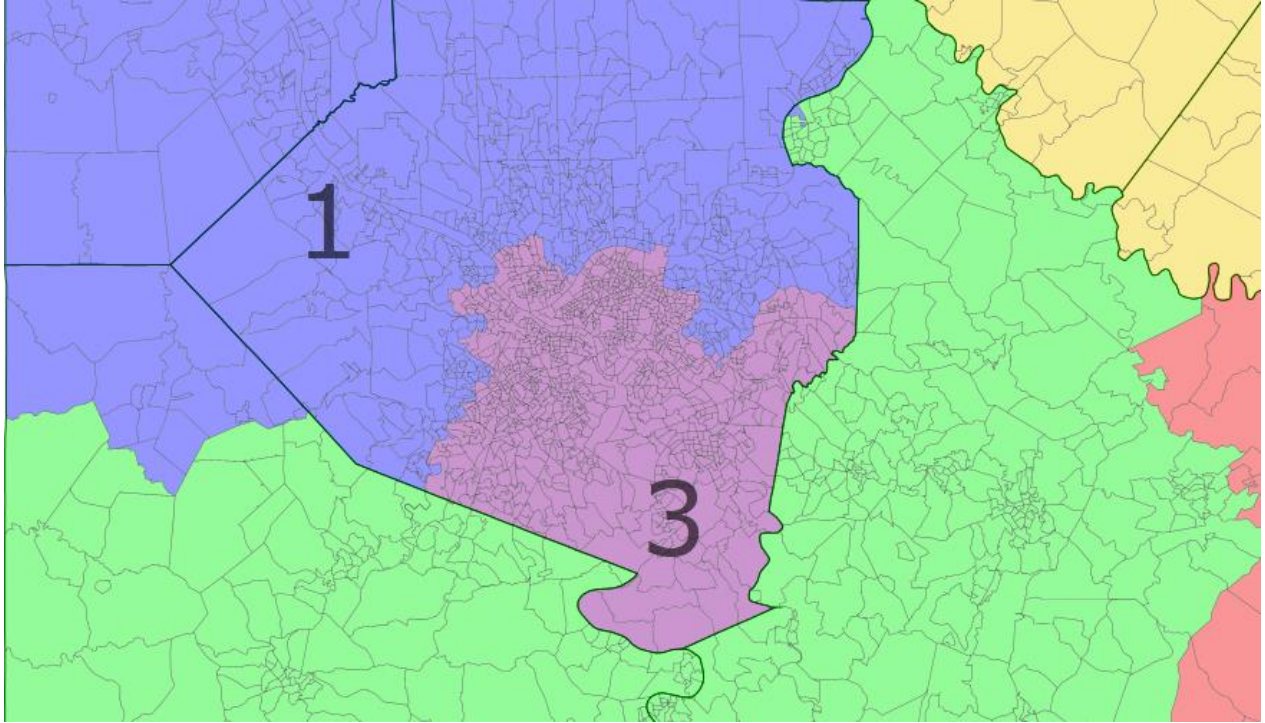Figure 6a: The Montgomery County district includes Northwest Philadelphia

Figure 6b: Southwest Pennsylvania with Pittsburgh in one district and no split neighboring townships
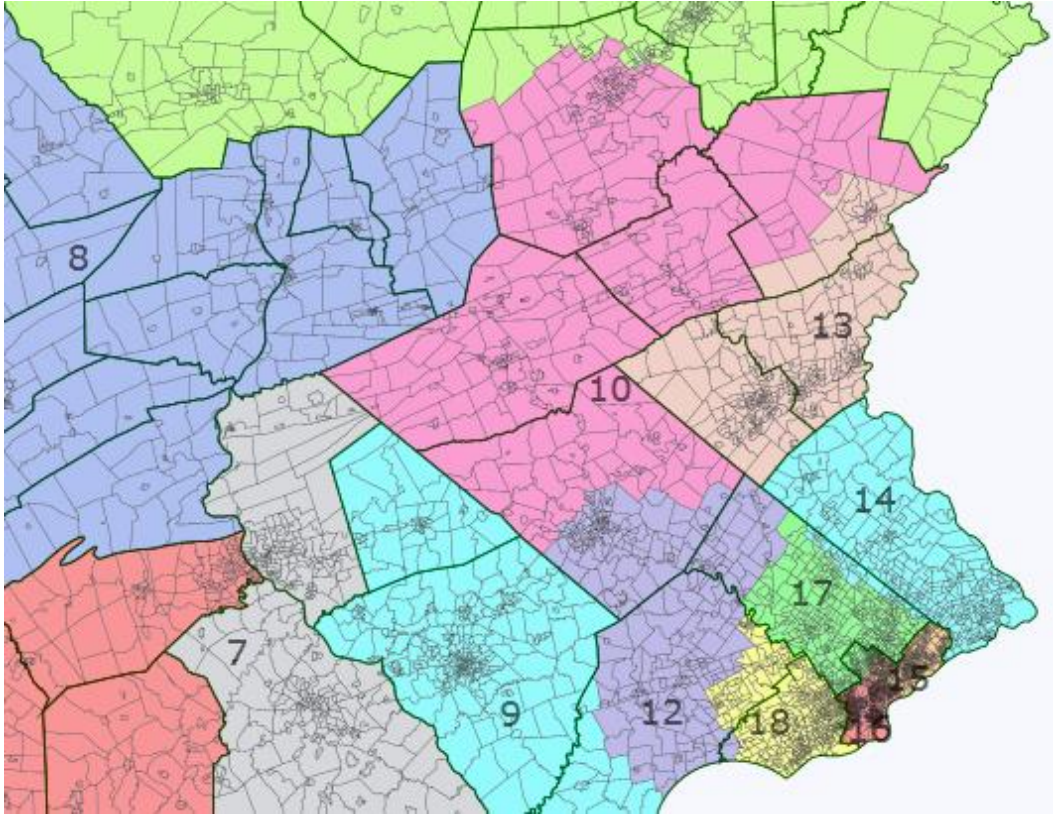

Figure 6c: Greater Southeast Pennsylvania with the Montgomery County district including the Northwest portion of Philadelphia
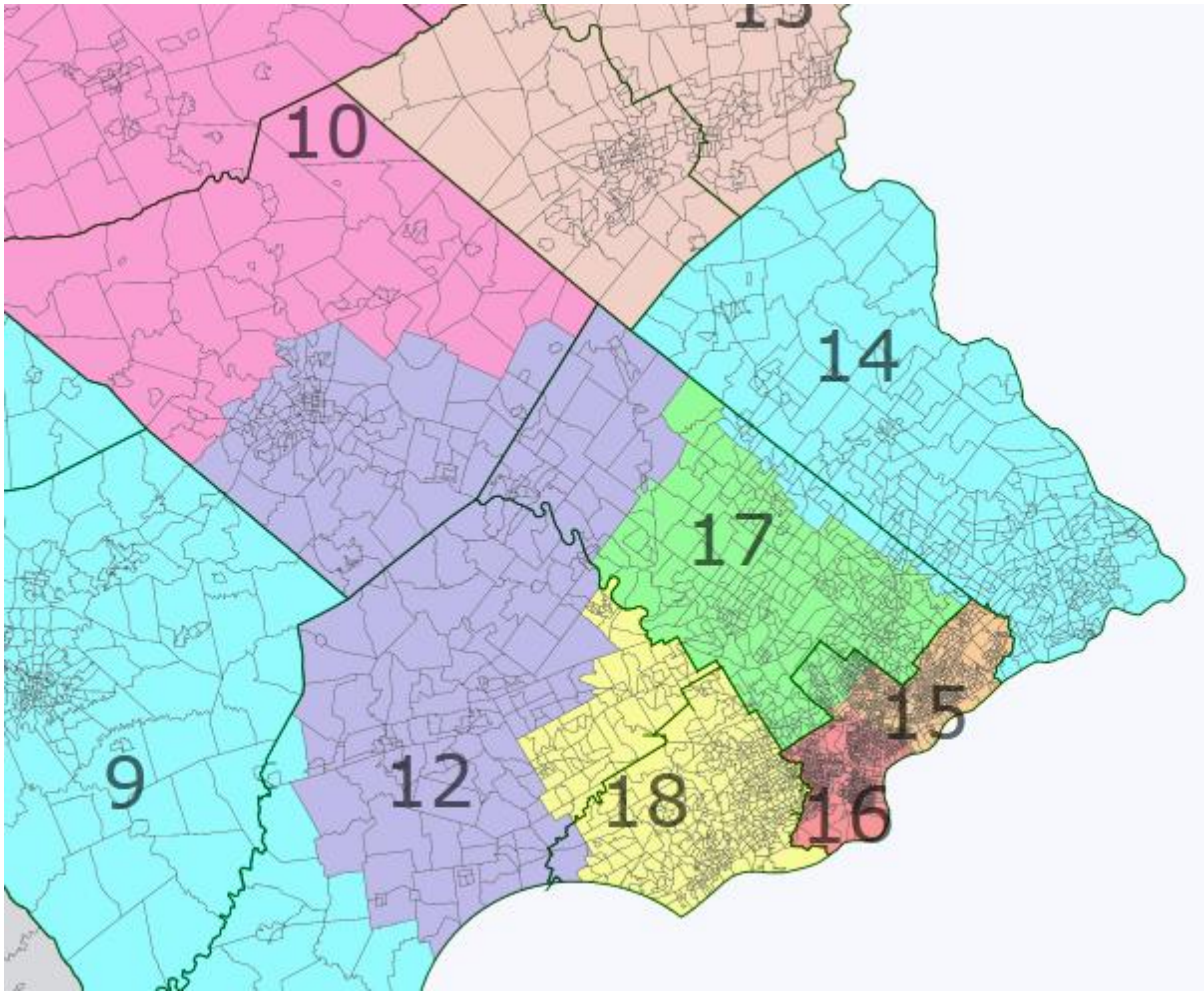
Figure 6d: Southeast Pennsylvania with the Montgomery County district including the Northwest portion of Philadelphia

Properties:

1. Split counties: 9
2. Chester county is split twice
3. Maximum population deviation: 3296
4. Average population deviation: 1707
5. Majority minority districts: 2

Note that the Montgomery County district moves southeast, the Bucks County district includes part of Montgomery County, the Allentown/Bethlehem district extends further into Monroe County, the district labeled 10 extends further south, and the Delaware County district goes further into Montgomery County. This is essentially a rotation of population around the districts surrounding southeast Pennsylvania.

The Takeaways from the Maps Presented Here

We purposely do not provide a single map because even while leaving out the political aspects of designing districts, map making requires judgement calls. Here is what we have learned:

1. Rigid rules, like a maximum population deviation of one, restrict the ability to achieve other mapping goals such as minimizing the number of split counties.
2. Compactness is really a device for restricting gerrymandering, not a useful goal when taken to extremes. Like population deviation, a tight constraint on compactness, using any of the measures of compactness in the literature, means other more meaningful goals, such as minimizing the number of split counties are hard to achieve.
3. Because voting proclivities follow geographic patterns, to the extent the mapping process precludes partisan fairness as a criterion, not splitting counties does have the effect of leading to districts that are not competitive and a substantial wastage of votes.
4. An open question is the extent to which splits harm or help counties. If a county constitutes a significant share of voters in two districts, it has greater representation than a county in just one district. Yet, dividing a county among several districts means that county has no meaningful representation.

The overarching theme of this piece is that coming up with good maps is a judgment call, balancing multiple goals, and controlling gerrymandering through rigid rules would lead to worse maps than a process that has built-in flexibility.

This flexibility can be abused when one party controls the whole process. Thus, the State Supreme Court ruling is a win but not victory for democracy in Pennsylvania. A victory would be the state empowering a nonpartisan commission of citizens to draw the districts.

Acknowledgement

These maps were made using Dave's Redistricting App by David Bradlee, http://gardow.com/davebradlee/redistricting/launchapp.html. His work building a free software tool is invaluable for citizens to participate in drawing political districts.