NC General Assembly County Clusterings from the 2020 Census

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In the North Carolina General Assembly districting process, county clusters are used to minimize the overall number of county splits while maintaining population balance in the redistricting process. Determining the county clusters for the NC House and for the NC Senate is the first step in the redistricting process for the NC General Assembly. The county clusters are largely algorithmically determined through an optimization procedure outlined by the NC Supreme Court in Stephenson v. Bartlett. However there are often multiple optimal county clusterings that minimize county splitting (see the Quantifying Gerrymandering blog and the Districks.com explainer for more details). The release of the 2020 census data allows us to determine the possible county clusterings for both the North Carolina State House and State Senate redistricting processes. The one part of Stephenson v. Bartlett which this analysis does not reflect is compliance with the Voting Rights Act. To determine the county clusters, we used the implementation of the court order procedure described in Cater et al.[5]
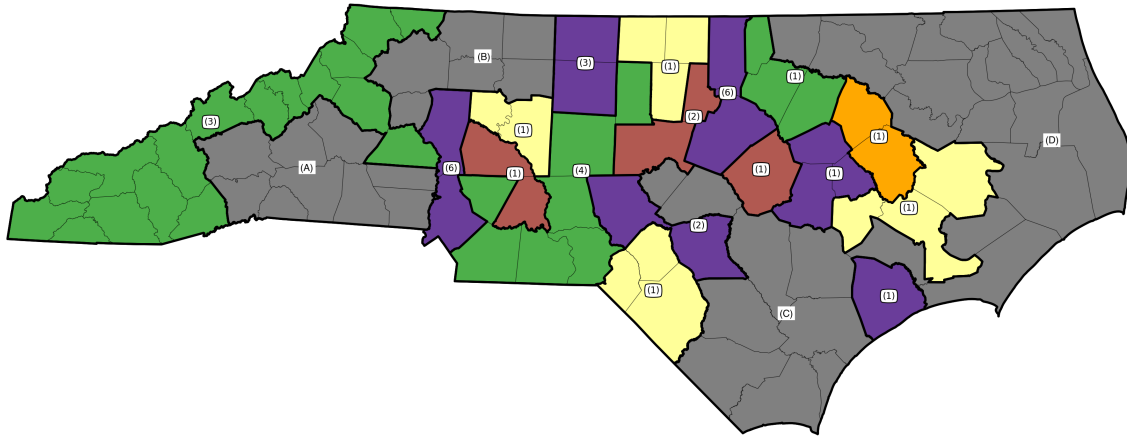

Figure 1: The NC Senate clusters that are fixed shown as colored regions annotated with a number in parentheses giving the number of districts the cluster contains. The four grayed-out regions (labeled A-D) each contain two alternative clusterings. The different options of the grayed-out regions are given in Figure 2. One may mix and match different choices from each of the two options which yields a total of 16 different county clustering maps.

NC State Senate County Clusterings

In the state Senate, there are 17 clusters containing 36 of the 50 districts that are fixed based on determining optimal county clusters. These are represented by the colored county groupings in Figure 1. The white numbers annotating each county clustering give the number of districts that county cluster should contain. Ten of these clusters contain one district, meaning that ten of the 50 senate districts are fixed (i.e. these will be the official districts in the coming cycle). The remaining county clusters must be further subdivided into legislative districts in the coming redistricting process in the General Assembly.
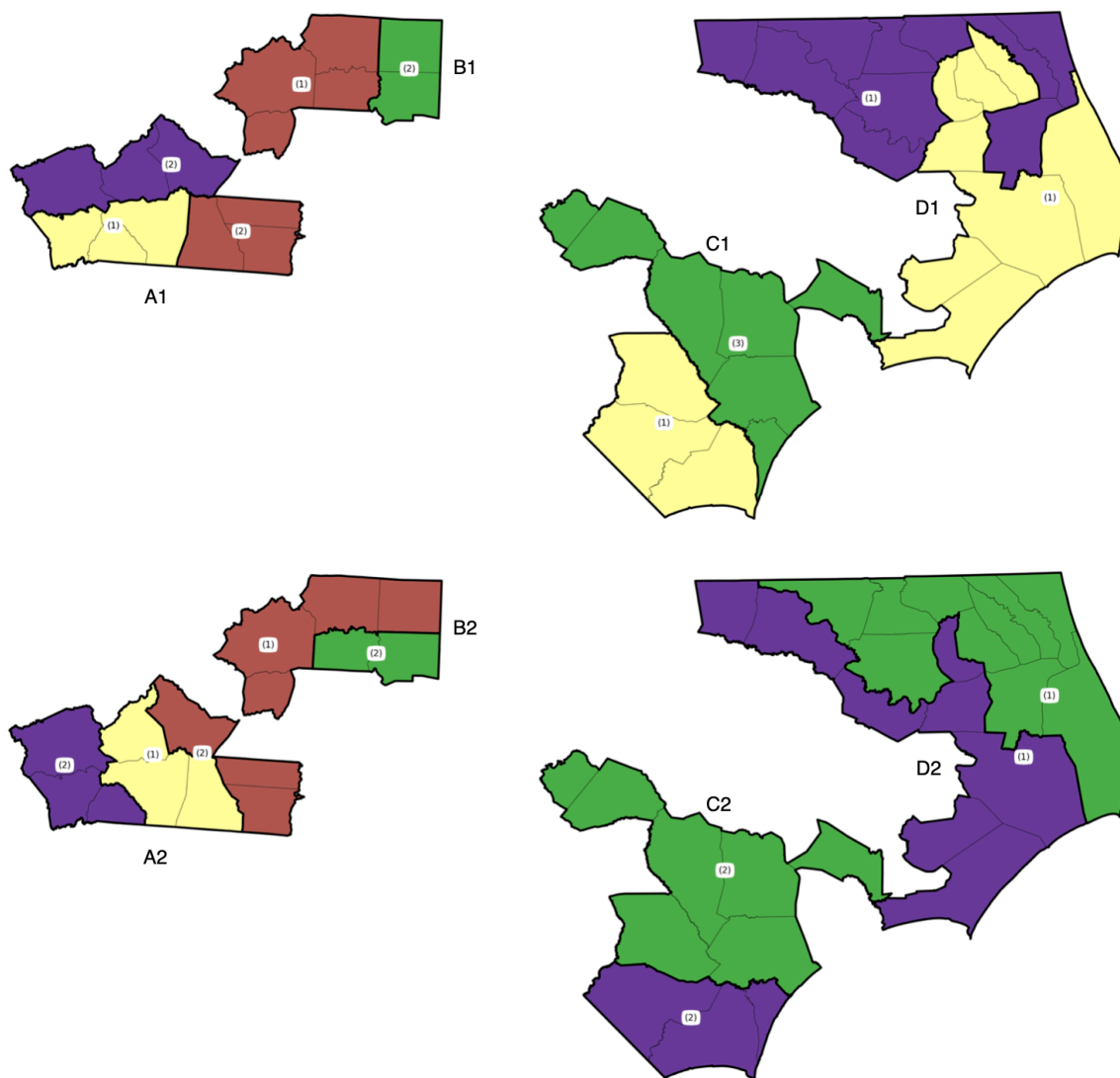
Figure 2: The two possible options in regions A, B, C and D of the NC Senate County Clusterings (top and bottom). The options from the two figures may be mixed. For example, a Senate clustering may be comprised of the fixed clusters from Figure 1, along with options A1, B2, C2, and D1. Again, the numbers in parentheses give the number of districts contained in each cluster.

The remaining clusters (shown in gray) are separated into four groups. Each group has two possible clusterings that minimize county splitting. In combination, there are 16 total possible statewide county clusterings. For simplicity of discussion, we have labeled the different regions where a choice exists as A, B, C, or D and denoted the two choices for each region as 1 or 2. Hence A1 and A2 are the two choices for the A region. No preference is intended by the 1 versus 2 labeling.

The two options in each of the four regions are shown in Figure 2.

In region A to the southwest, Buncombe County may be paired either with McDowell and Burke Counties (A1), or with Henderson and Polk Counties (A2). In both cases, the cluster would be comprised of two districts, however, A2 necessitates that Burke County is paired with Gaston and Lincoln Counties through a very narrow connection which may impede compactness considerations. Furthermore, the Lincoln-Cleveland-Gaston cluster in A1 also exists in the current map. This may mean that the A1 southwestern cluster may be perceived as the more favorable option over A2 since it (i) provides an opportunity to create more compact districts and (ii) may provide an opportunity to draw districts that are nearly identical to the ones that exist in the in Lincoln-Cleveland-Gaston cluster (conditioned on fluctuations in the population).

In region B to the northwest, Forsyth County may either be paired with Stokes (B1) or Yadkin (B2); the remaining county (either Yadkin or Stokes) would then be paired with Surry, Wilkes, and Alexander Counties. In region C to the south, Brunswick and Columbus may be paired either with Bladen to create a one-district cluster (C1) or with New Hanover to create a two-district cluster (C2). Finally, in region D to the east, Carteret, Pamlico, Washington, Chowan, and Hyde Counties may either be paired with Dare, Perquimans and Pasquotank Counties (D1), or with Martin, Halifax and Warren Counties (D2).
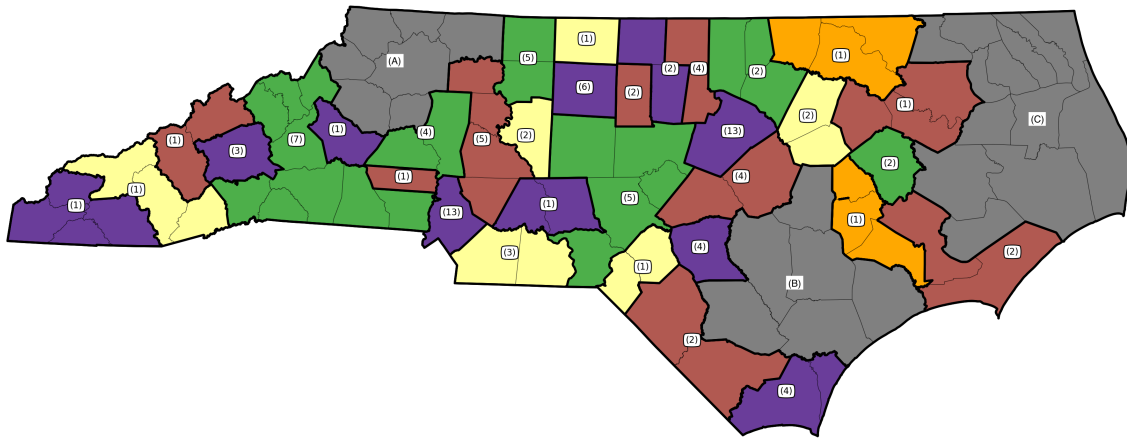

Figure 3: The NC House clusters that are fixed; there are three grayed-out regions (labeled A-C) that each contain two alternative clusterings. The different options of the grayed-out regions are given in Figure 4. One is free to mix and match different choices from the two options which yields a total of eight different county clustering maps.

NC State House County Clusterings

In the state House, there are 33 clusters containing 107 of the 120 districts that are fixed based on determining optimal county clusters. These are represented by the colored county groupings in Figure 2. Again, the white numbers annotating each county clustering give the number of districts that county cluster should contain. Eleven of these clusters contain one district, meaning that eleven of the 120 house districts are fixed (i.e., these will be the official districts in the coming cycle).

The remaining clusters (shown in gray) are separated into three groups. Each group has two possible clusterings that minimize county splitting. In combination, there are eight total possible statewide county clusterings in the house. The two options in each of the three regions are shown in Figure 4.
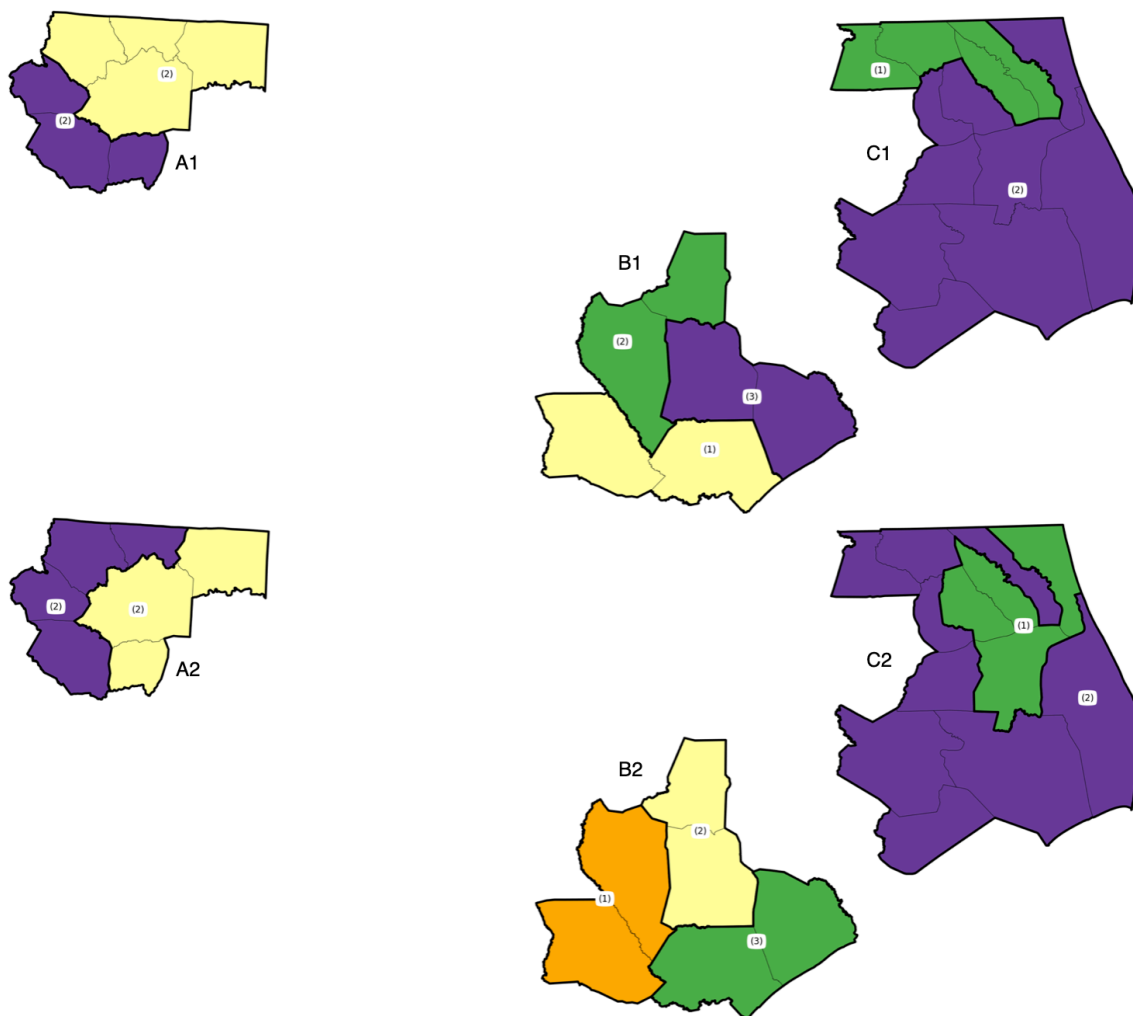

Figure 4: The two possible options in regions A, B, and C of the NC House County Clusterings (top and bottom). The options from the two figures may be mixed. For example, a House clustering may be comprised of the fixed clusters from Figure 3, along with options A2, B1, C2.

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In region A to the northwest, Watauga and Caldwell may either be paired with Alexander (A1; purple) or with Ashe and Alleghany (A2; purple).

In region B to the south, Onslow may either be paired with Duplin (B1; purple) or with Pender (B2; green). The Duplin-Onslow cluster currently forms a three-district cluster and thus there may be an opportunity to minimally alter the three existing districts in this cluster (perhaps needing to adjust district boundaries based on population fluctuations). Because of this, B2 may end up as the selected clustering.

Finally, in region C to the east, either Currituck, Tyrell, Perquimans and Pasquotank will form a single district (C1), or Hertford, Gates, Camden and Pasquotank will form a single district (C2). In both cases, the remaining counties will form a cluster of two districts.

Population Deviations

All the county clusterings are required to have populations such that the resulting districts are within 5% of the ideal district population, hence all the possible county clusters we have listed have population deviations less than 5%. In the Senate clusters, all possible choices of clusterings contain at least one district with a population deviation of more than 4.9%. In the House clusters, all possible choices of clusterings contain at least one district with a population deviation of 4.71%. Averaged across all the districts, all of the county clusterings have a mean deviation between 3.1% and 3.5% in the NC Senate and 1.2% and 1.5% in the NC House.

Tables 1 through Table 4 list each of the different county clusters contained in the different county clusterings. For each cluster, the relative average population deviation per district is given. Negative values indicate that the average district may be less populated than the ideal population size while positive values indicate that the average district will be more populated than the ideal population size.

The ideal population size is calculated by first taking the population of each cluster and dividing it by the number of districts in the cluster to obtain the average population per district for the cluster. The ideal district population is obtained by dividing the state population by the total number of districts (120 districts in the House and 50 districts in the Senate). The ideal population is then subtracted from the average population of a district in a cluster to obtain the deviation of the average cluster population from the ideal cluster population. This is then converted to a relative population deviation by dividing by the ideal population. It is this relative error, expressed as a percentage, which is reported in the table.

Tables 1 and 2 give the data for the different options for the NC Senate and NC House respectively. The clusters are grouped by the region label (A, B, C or D in the Senate and A, B, or C in the House). The labeling corresponds to that in the Figures in the preceding sections. Tables 3 and 4 give the data for the clusterings which are fixed in the Senate and House, respectively.

NC Senate Clusters Which Vary Across Clusterings	Number of Districts	Option	2020 Census Population	Average Population Deviation
Buncombe-Burke-McDowell	2	A1	401,600	-3.83%
Cleveland-Gaston-Lincoln	2	A1	414,272	-0.79%
Henderson-Polk-Rutherford	1	A1	200,053	-4.18%
Buncombe-Henderson-Polk	2	A2	405,061	-3.00%
Cleveland-McDowell-Rutherford	1	A2	208,541	-0.12%
Burke-Gaston-Lincoln	2	A2	402,323	-3.65%
Forsyth-Stokes	2	B1	427,110	2.28%
Alexander-Surry-Wilkes-Yadkin	1	B1	210,986	1.05%
Forsyth-Yadkin	2	B2	419,804	0.53%
Alexander-Stokes-Surry-Wilkes	1	B2	218,292	4.55%
Bladen-Brunswick-Columbus	1	C1	216,922	3.90%
Duplin-Harnett-Jones-Lee-New Hanover-Pender-Sampson	3	C1	599,681	-4.26%
Bladen-Duplin-Harnett-Jones-Lee-Pender-Sampson	2	C2	403,585	-3.35%
Brunswick-Columbus-New Hanover	2	C2	413,018	-1.09%
Carteret-Chowan-Dare-Hyde-Pamlico-Pasquotank-Perquimans-Washington	1	D1	199,750	-4.33%
Bertie-Camden-Currituck-Gates-Halifax-Hertford-Martin-Northampton-Tyrrell-Warren	1	D1	198,430	-4.96%
Carteret-Chowan-Halifax-Hyde-Martin-Pamlico-Warren-Washington	1	D2	198,557	-4.90%
Bertie-Camden-Currituck-Dare-Gates-Hertford-Northampton-Pasquotank-Perquimans-Tyrrell	1	D2	199,623	-4.39%

Table 1: This table gives the NC Senate Clusters which vary across the 16 different possible clusterings of the entire state. The different clusterings are formed by choosing either option 1 or 2 from the four different regions (A, B, C, and D).

NC House Clusters Which Vary Across Clusterings	Number of Districts	Option	2020 Census Population	Average Population Deviation
Alexander-Surry-Wilkes	2	A1	173,772	-0.13%
Alleghany-Ashe-Caldwell-Watauga	2	A1	172,203	-1.03%
Alexander-Caldwell-Watauga	2	A2	171,182	-1.61%
Alleghany-Ashe-Surry-Wilkes	2	A2	174,793	0.46%
Bladen-Pender	1	B1	89,809	3.23%
Duplin-Onslow	3	B1	253,291	-2.95%
Sampson-Wayne	2	B1	176,369	1.37%
Bladen-Sampson	1	B2	88,642	1.89%
Duplin-Wayne	2	B2	166,048	-4.56%
Onslow-Pender	3	B2	264,779	1.45%
Beaufort-Chowan-Currituck-Dare-Hyde-Pamlico-Perquimans-Tyrrell-Washington	2	C1	167,493	-3.73%
Camden-Gates-Hertford-Pasquotank	1	C1	82,953	-4.65%
Beaufort-Camden-Chowan-Dare-Gates-Hertford-Hyde-Pamlico-Washington	2	C2	165,528	-4.86%
Currituck-Pasquotank-Perquimans-Tyrrell	1	C2	84,918	-2.39%

Table 2: This table gives the NC House Clusters which vary across the eight different possible clusterings of the entire state. The different clusterings are formed by choosing option 1 or 2 from the 3 different regions (A, B, or C).

NC Senate Clusters Which Are Fixed Across Clusterings	Number of Districts	2020 Census Population	Average Population Deviation
Iredell-Mecklenburg	6	1,302,175	3.95%
Granville-Wake	6	1,190,402	-4.98%
Alamance-Anson-Cabarrus-Montgomery-Randolph-Richmond-Union	4	870,409	4.22%
Guilford-Rockingham	3	632,395	0.96%
Alleghany-Ashe-Avery-Caldwell-Catawba-Cherokee-Clay-Graham-Haywood-Jackson-Macon-Madison-Mitchell-Swain-Transylvania-Watauga-Yancey	3	642,393	2.56%
Chatham-Durham	2	401,118	-3.94%
Cumberland-Moore	2	434,455	4.04%
Caswell-Orange-Person	1	210,529	0.83%
Franklin-Nash-Vance	1	206,121	-1.28%
Johnston	1	215,999	3.45%
Rowan-Stanly	1	209,379	0.28%
Beaufort-Craven-Lenoir	1	200,494	-3.97%
Hoke-Robeson-Scotland	1	202,786	-2.87%
Edgecombe-Pitt	1	219,143	4.96%
Davidson-Davie	1	211,642	1.37%
Onslow	1	204,576	-2.02%
Greene-Wayne-Wilson	1	216,568	3.73%

Table 3: This table gives the NC Senate clusters which are fixed across all 16 of the possible clustering maps.

NC House Cluster Which Are Fixed Across Clusterings	Number of Districts	2020 Census Population	Average Population Deviation
Mecklenburg	13	1,115,482	-1.37%
Wake	13	1,129,410	-0.13%
Avery-Cleveland-Gaston-Henderson-McDowell-Mitchell-Polk-Rutherford-Yancey	7	623,272	2.35%
Guilford	6	541,299	3.70%
Forsyth-Stokes	5	427,110	-1.81%
Chatham-Lee-Moore-Randolph-Richmond	5	426,414	-1.97%
Cabarrus-Davie-Rowan-Yadkin	5	452,605	4.05%
Brunswick-New Hanover	4	362,395	4.14%
Cumberland	4	334,728	-3.81%
Harnett-Johnston	4	349,567	0.46%
Catawba-Iredell	4	347,303	-0.19%
Durham-Person	4	363,930	4.58%
Anson-Union	3	260,322	-0.25%
Buncombe	3	269,452	3.24%
Columbus-Robeson	2	167,153	-3.93%
Nash-Wilson	2	173,754	-0.14%
Carteret-Craven	2	168,406	-3.21%
Davidson	2	168,930	-2.91%
Franklin-Granville-Vance	2	172,143	-1.06%
Pitt	2	170,243	-2.15%
Alamance	2	171,415	-1.48%
Caswell-Orange	2	171,432	-1.47%
Rockingham	1	91,096	4.71%
Bertie-Edgecombe-Martin	1	88,865	2.15%
Lincoln	1	86,810	-0.21%
Hoke-Scotland	1	86,256	-0.85%

NC House Cluster Which Are Fixed Across Clusterings	Number of Districts	2020 Census Population	Average Population Deviation
Haywood-Madison	1	83,282	-4.27%
Greene-Jones-Lenoir	1	84,745	-2.59%
Jackson-Swain-Transylvania	1	90,212	3.70%
Halifax-Northampton-Warren	1	84,735	-2.60%
Burke	1	87,570	0.66%
Montgomery-Stanly	1	88,255	1.45%
Cherokee-Clay-Graham-Macon	1	84,907	-2.40%

Table 4: This table gives the NC House clusters which are fixed across all 8 of the possible clustering maps.

Incumbents

We now perform a simple analysis of the effect of the new county clustering on the ability to preserve incumbencies. We do this, not to endorse or critique incumbency preservation, but because the NC General Assembly has identified it as one of its redistricting criteria. The new county clustering is only one way in which the new 2020 Census data influences the incumbency protection efforts. A more complete understanding of the effect on incumbency protection will require an analysis how geopolitical geography of the new Census data interacts with the redistricting process. We hope to investigate this more completely in the coming months.

For the moment, we simply note the number of incumbents in each county cluster (based on their official county of residence as obtained from the Redistricting Data Hub) and compare it to the number of districts each county clustering dictates. The following figures are repeats of the previous figures with an additional number added to the annotating white circles. The first number still gives the number of districts for each county cluster and the second number gives the number of incumbents currently residing in county cluster. When the first number is larger than the second, we outline the label in green to denote there is an opportunity to elect a new representative, assuming a current incumbent from another cluster does not relocate, even if all of the incumbents are re-elected.[6] When the second number is larger than the first, we outline the label in red to denote that at least one of the incumbents cannot be re-elected from this county cluster.

Figure 5: For the fixed clusters in the NC Senate, we display the number of districts followed by the number of incumbents within the cluster. Cluster labels highlighted in red must double bunk at least two incumbents. Cluster labels highlighted in green will elect at least one representative who is not currently serving in office.

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[6] Candidates for the General Assembly must reside in their district at least once year prior to the general election.

Figure 5 highlights impacts in the NC Senate. The fixed clusterings in Johnston County, Wake-Granville, and Moore-Hoke will each elect at least one representative not currently serving in office. The following three fixed clusters will double bunk at least two incumbents:

- Alamance-Anson-Cabarrus-Montgomery-Randolph-Richmond-Union

- Alleghany-Ashe-Avery-Caldwell-Catawba-Cherokee-Clay-Graham-Haywood-Jackson-Macon-Madison-Mitchell-Swain-Transylvania-Watauga-Yancey
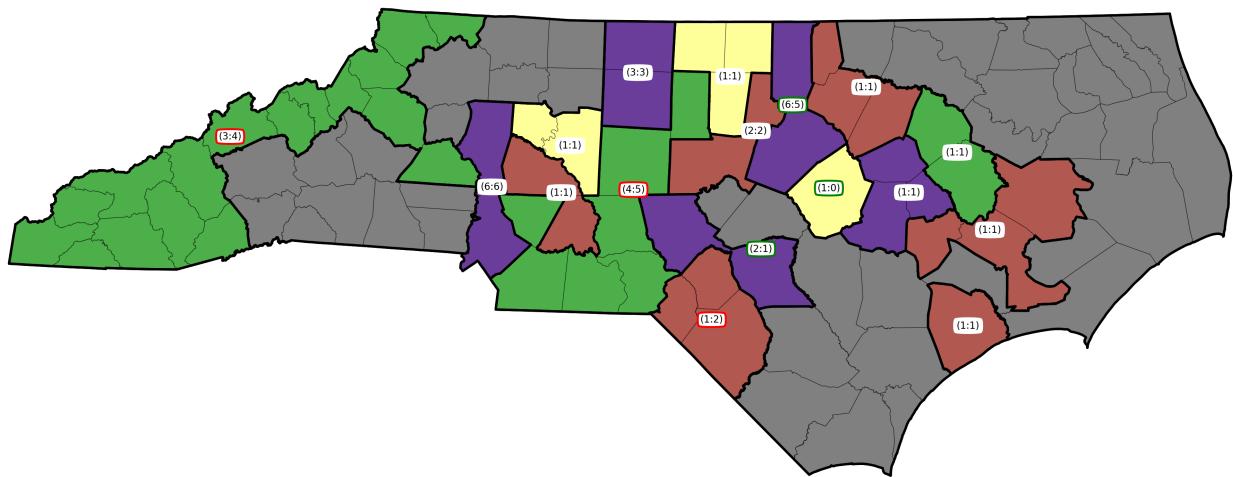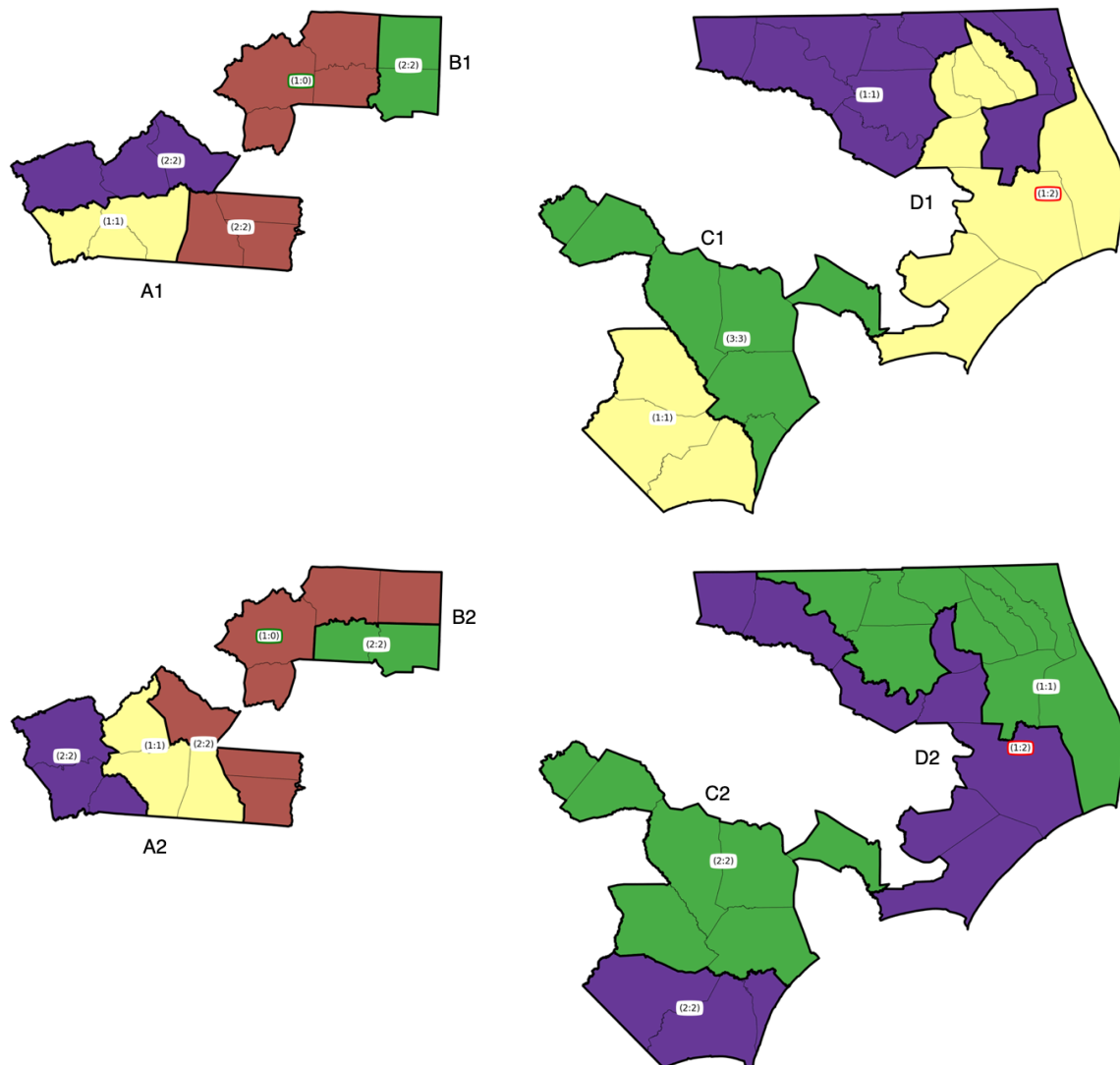
- Hoke-Robeson-Scotland

Figure 6: For the optional clusters in the NC Senate, we display the number of districts followed by the number of incumbents within the cluster. Cluster labels highlighted in red must double bunk at least two incumbents. Cluster labels highlighted in green will elect at least one representative who is not currently serving in office.

Figure 6 indicates that the clusters in region D produce a cluster that will double bunk two incumbents.

Figure 7: For the fixed clusters in the NC House, we display the number of districts followed by the number of incumbents within the cluster. Cluster labels highlighted in red must double bunk at least two incumbents. Cluster labels highlighted in green will elect at least one representative who is not currently serving in office.

Figure 7 highlights impacts of redistricting in the NC House. The fixed clusterings of Mecklenburg, Wake, and Harnett-Johnston will each elect at least one representative not currently serving in office. The following two fixed clusters will double bunk at least two incumbents:

- Avery-Cleveland-Gaston-Henderson-McDowell-Mitchell-Polk-Rutherford-Yancey

- Chatham-Lee-Moore-Randolph-Richmond

Figure 8 indicates that all options of potential clusters (A, B, and C) for the NC House will cause double bunking of at least two incumbents in two districts.

In addition to the above analysis, we also analyze the clusters with respect to minimizing county traversals. A county traversal occurs when a district extends over the boundary of two counties. Even though the number of incumbents may match the number of districts, it could still be impossible to draw districts that minimize county splitting and county traversals.

We have only discovered one cluster in which it is not possible to draw district boundaries while simultaneously minimizing traversals and preventing two incumbents being placed in the same newly formed district. This instance is in Cabarrus-Davie-Rowan-Yadkin House cluster in which Davie and Yadkin each hold an incumbent, however, the two counties do not have enough joint population to make up a single house district. Because of the geometry of the cluster, these two
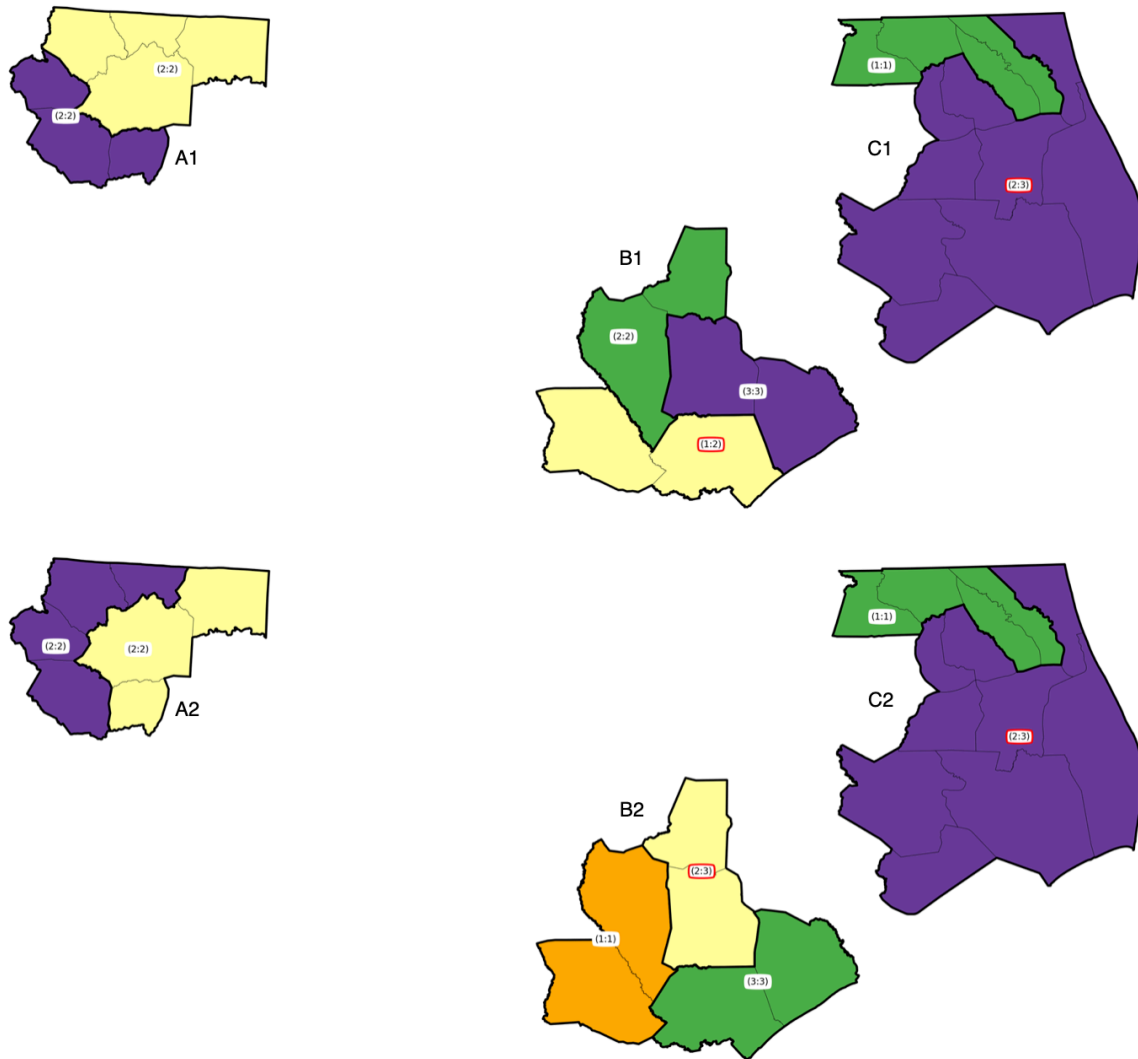
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Figure 8: For the optional clusters in the NC House, we display the number of districts followed by the number of incumbents within the cluster. Cluster labels highlighted in red must double bunk at least two incumbents. Cluster labels highlighted in green will elect at least one representative who is not currently serving in office.

counties must then be combined as part of a single district ensuring the one of the two incumbents is not re-elected (see Figure 8 and the northern two counties within the 4-county 5:5 green cluster in the center of the state).

In aggregate, the NC Senate will contain four double bunked districts (regardless of the clustering options used), and the NC House will contain five double bunked districts (regardless of the clustering options used).

Conclusion

Based on the 2020 Census, we have provided all of the possible county clusterings for the NC House and Senate obtain by the procedure outlined in *Stephenson v. Bartlett*. The consultants

associated with <u>The Differentiators</u> have announced that they have obtained the same groupings we have found using the software we released.

Although many of the clusters are now fixed, the General Assembly will be left to choose between various clustering options in some parts of the state. Certainly, compliance with the Voting Rights Act will be a key consideration in choosing between potential clusters. Preservation of communities of interest might also drive the decision to select one option over another. One could also consider choosing clusters to reduce the population deviations. For example, the B2 options in both the House and Senate clusterings have one district with a relative population deviation above 4.5%. As this necessitates that at least one of the districts in this cluster has a similarly large population deviation, it provides a reasonable rationale (if all other consideration are equal) to select the other clustering. There are clusterings with equally large deviations which might suggest choosing the alternative clustering option. One might also consider compactness, thought a less compact clustering, does not necessitate that the resulting districts are not compact. Hence this would need to be considered in each case.

We intend to follow this initial analysis with more in-depth looks at the clusterings and their implications.