Lec/Lab: Gerrymandering: Maps and political representation

Agenda	• Shuffle seating into lab groups • Mid-semester review • AWR applications • Introduction to gerrymandering: how is it an AWR problem? • Working on Lab workflow
Who would find AWR useful?	• Conservation (bio)geography / landscape ecology: • Political geography:
What is gerrymandering?	Re-districting Racial gerrymander Partisan gerrymander Cracking Packing NYTimes RetroReport: Surprising History of Gerrymandering: https://www.nytimes.com/video/us/100000005921047/gerrymandering-history-future.html
Indicators of Gerrymander	Super-majority Compactness

Geometries of political representation	• Precinct • District • How do these relate to census block, block groups, and tracts?
More resources	Vox video report: The man who rigged America's election maps https://www.vox.com/videos/2019/10/17/20917852/gerrymander-hofeller-election-map Gerrymandering: Documentary Film https://www.documentarystorm.com/gerrymandering/ National Democratic Redistricting Committee: https://democraticredistricting.com/ The Redistricting Majority Project: https://www.redistrictingmajorityproject.com/ Gerrymandering & the "Blue Wave" of 2018 https://nyti.ms/2yWBHvj https://nyti.ms/2STt2nT https://nyti.ms/2T7qouN

Lab 9: Partisan Gerrymandering in North Carolina

Purpose

- The learning goals are to:
  - Practice applying area-weighted re-aggregation techniques.
  - Appreciate how GIS can be applied to political geography problems.
- The practical goals are to:
  - Use an indicator of compactness to evaluate North Carolina's gerrymandered congressional districts.
  - Evaluate the implications of North Carolina's gerrymandered congressional districts in terms of political representation in the U.S. House of Representatives.
  - Estimate the impact that court-ordered redistricting in 2019 would have had on the 2020 elections.
- The overarching research question is: Are the 2019 districts fairer in terms of geographic compactness and political representation than the 2016 districts? Explain why, in terms of gerrymandering (packing and cracking).
- Let's break this question up into two GIS analysis goals:
  1. What is the percentage of Republican voters in each of the 2016 and 2019 districts, based on votes cast in the 2016 presidential election?
  2. How *compact* are each of North Carolina's 2016 and 2019 districts? Please use the following formula to calculate compactness: `400 * pi * area / perimeter^2`

Deliverables

Please create the following deliverables as you complete the lab. The map visualizations do not need to be formal cartographic designs: just have the layers available in your QGIS project to aid in answering Canvas questions.

- Fill in the blanks of the AWR assumptions and planning section
  (i.e. source layer, source fields, target layer, target group field)
- A workflow plan for your analysis for the 2016 districts.
- Summary statistics (minimum, mean and maximum) of:
  - Compactness and Percentage of Republicans in 2016 Districts
  - Compactness and Percentage of Republicans in 2019 Districts
- Map layers visualizing: I suggest using the same classification breaks for each map so that they are directly comparable and a divergent color scheme centered on 50%.
  - percentage of votes for 2016 Republican presidential candidate by voting precinct
  - percentage of votes for 2016 Republican presidential candidate by 2016 Districts
  - percentage of votes for 2016 Republican presidential candidate by 2019 Districts
  - compactness of each 2016 and 2019 district
- Complete a set of questions on Canvas by Thursday (11/11) at 8AM.

Background

North Carolina has been notorious for gerrymandering. Although it is a swing state just slightly favoring Republicans, by 2015, a staggering ten out of thirteen districts had elected Republican representatives. These results have been achieved by suppressing minority votes and drawing district maps favoring the Republican Party. Following the 2010 census, the legislature-updated voting districts were challenged in court and ultimately found by the Supreme Court to be gerrymandered in violation of the Voting Rights Act (*Cooper v. Harris* 2017). The legislature redrew districts in 2016 to resolve the racial gerrymander, but maintaining clear partisan gerrymanders. These districts were used in the 2018 midterm elections, but were again challenged in court. The districts were found to violate North Carolina's state constitution in 2019, causing the legislature to redraw districts again for the 2020 elections. There was very little change in the composition of 2019 districts in terms of race and ethnicity, but are there implications for political party affiliation? The lab will address this question.

Data Sources

- **`Tracts_acs2018_nc`** are census tracts with 2014-2018 American Community Survey 5-year population estimates.
  - CRS: 32119 NAD 1983 North Carolina (a state plane projection)
  - Metadata for the demographic variables is found in metadata.csv
  - Tracts are not necessary for the required question, but you may use them to investigate whether any of the districts are also *racial* gerrymanders. These also provide an opportunity to practice specifying and implementing your own question, e.g. by assessing the racial gerrymandering in the 2011 districts.
- **`Rucho_Lewis_Congress_3`** North Carolina Legislature's 2011 version of U.S. Congressional Districts, drawn after the 2010 census.
  - CRS: 32119 NAD 1983 North Carolina (a state plane projection)
  - `District`: unique district number
  - You are not asked to do any analysis with this layer. It is here for you to see how extremely gerrymandered North Carolina was prior to the Supreme Court's finding of an illegal *racial gerrymander*.
- **`2016_Contingent_Congressional_Plan_Corrected`** North Carolina Legislature's 2016 version of U.S. Congressional Districts, drawn after their 2011 districts were found to be racial gerrymanders.
  - CRS: 32119 NAD 1983 North Carolina (a state plane projection)
  - `District`: unique district number
- **`C-Goodwin-A-1-TC`** North Carolina Legislature's 2019 version of U.S. Congressional Districts, drawn after their 2016 districts were found to be partisan gerrymanders
  - CRS: 32119 NAD 1983 North Carolina (a state plane projection)
  - `DISTRICT`: unique district number
- **`precincts`** North Carolina voting precincts as of 2016
  - CRS: 4269 North American Datum 1983
  - `PREC_ID`: text, precinct ID, which may be duplicated in different counties
  - `COUNTY_NAM`: *text*, county name
  - `dem`: *integer*, votes for Democratic Party candidate in 2016 presidential election
  - `rep`: *integer*, votes for Democratic Party candidate in 2016 presidential election
  - `cntyprec`: *text*, concatenation of the county name and precinct ID, forming a unique ID for each precinct
  - *CAUTION*: there is at least one geometry error in this data provided by North Carolina. You can repair this using the Fix Geometries tool.
- Data References:
  - The census tract demographic data was downloaded with the tidycensus package for R.
  - The congressional districts are all provided by the North Carolina General Assembly: https://www.ncleg.gov/Redistricting
  - The 2016 presidential voting results were downloaded from the North Carolina State Board of Elections with precinct shapefiles available from: https://www.ncsbe.gov/results-data/voting-mapsredistricting and tabular voting results available from: https://er.ncsbe.gov/downloads.html

Hints and Advice

- We are simplifying voting results as votes cast at a polling station for the Democratic (dem) or Republican (rep) candidate for president in 2016.
- We are assuming that voters are evenly distributed throughout voting precincts.
- We cannot assume that voting precincts are nested neatly within redrawn districts.
- Use the guide to `Area-Weighted Re-Aggregation (assumptions and planning)` to start planning your workflow for estimating election results at the district level. You can copy the relevant sections of the conceptual workflow.
- When you save tables without geometries, use the `.xlsx` format (MS Office Open XML Spreadsheet) to preserve information about data types. This applies to:
  - Saving output of GROUP BY if you don't dissolve geometries
  - Exporting `.csv` loaded without geometries
- UNION can take a couple of minutes to run…
- UNION may result in many features with seemingly `0` area, and if you select and zoom to these, you'll find that they are *splinter polygons*: infinitesimally small features created by errors between two boundaries. These *splinters* take themselves out of the equation by having an area-weight ratio of `0` or near `0`, so you don't have to worry about them. Splinters *may* cause a small drop in your estimated totals, however.
- UNION may also result in features with `NULL` data wherever voting precincts did not overlap with the more general boundaries of congressional districts. This isn't a problem.
- I suggest using the same classification breaks for each map so that they are directly comparable. Use a divergent color scheme centered on `50%` for mapping voting results.

Area-Weighted Re-Aggregation Planning and Checking Assumptions

- Before you start area-weighted re-aggregation, fill in the blanks below:

  1. What is the polygon layer containing the attribute data that I need?
     source layer:

  2. What are the source attributes that I need?
     source fields:

  3. What polygon layer of geographic units do I need my final results in?
     target layer:

  4. Which attribute field *uniquely identifies* the target features?
     target group field:

  5. Are the source features and target features stored in the same projected coordinate system, and is the CRS reasonable for calculating areas?

  6. Do the *source fields* represent **totals** (as opposed to rates, percentages, or densities)?

  7. Can you assume that the source data totals are evenly distributed within the source feature polygons?

- Reminder: calculate all ratios and estimates with **decimal numbers**.
  The area-weight ratio may need precision as high as 6 decimal places, or the number of significant figures in any of the source fields.

Self-check your work

- Please consider ways in which you may check the accuracy of your workflow and write in those approaches for checking work here.
  - In particular, where do you have opportunities to check the accuracy of your estimation of voting results by district?

Results

Please check your work against the summary statistics below, rounded to two decimal places.

	Compactness		Percent Republican	
	2016	2019	2016	2019
Minimum	15.374	18.696	28.924	30.002
Mean	24.886	29.276	55.032	55.272
Maximum	37.100	42.366	67.610	71.382

Please consider answers to the following interpretive questions and complete answers on Canvas:

1. Which set of districts is more compact? 2016 or 2019?

2. What was the *least compact* district in 2016?

3. Based on the 2016 presidential election, how many seats were Republicans likely to win in 2018, using districts created in 2016?

4. Based on the 2016 presidential election, how many seats are Republicans likely to win in 2020, using districts created in 2019?

5. Which districts are Democrats likely to flip in 2020? To flip means to defeat the candidate of the incumbent's party.

6. Look at the NYTimes reporting of U.S. House of representative race in 2020 and scroll to the "House" results. https://www.nytimes.com/interactive/2020/11/03/us/elections/results-north-carolina.html
   Did your predictions come true?

7. Which set of districts seems more democratic, if we expect the number of North Carolinian representatives in the U.S. House of Representatives to reflect the overall support of each party in North Carolina? 2016 or 2019?

8. Why are the election results still so skewed in favor of Republicans after 2019?