

CPLN503 - Final Project Option 1.1

GIS for Redistricting

Tianyu Zhang (Neve), December 20, 2023

Prompt 1:

Population Share of Each Race/Ethnic Group by Old and New Congressional Districts

Population Share of Race/Ethnicity Group by the Old Districts

District	Share_White	Share_Black	Share_Asian	Share_Hisp_Latx	Share_Other
1	40.0%	33.9%	7.1%	16.7%	0.2%
2	29.0%	57.1%	5.0%	6.0%	0.3%
3	90.5%	4.4%	1.0%	2.1%	0.1%
4	81.6%	7.2%	2.2%	6.8%	0.1%
5	92.4%	2.3%	1.7%	2.0%	0.1%
6	83.4%	4.1%	4.5%	6.1%	0.1%
7	84.5%	5.6%	4.7%	3.4%	0.1%
8	85.1%	3.7%	4.7%	4.8%	0.2%
9	92.9%	2.7%	0.6%	2.1%	0.1%
10	90.1%	3.4%	1.0%	4.0%	0.1%
11	85.7%	5.1%	1.6%	6.0%	0.1%
12	92.1%	3.1%	1.8%	1.4%	0.1%
13	58.2%	18.6%	8.7%	11.9%	0.3%
14	70.3%	21.2%	3.1%	2.2%	0.2%
15	76.3%	4.0%	2.6%	15.2%	0.2%
16	73.1%	5.5%	1.8%	17.8%	0.1%
17	82.7%	5.4%	1.8%	8.3%	0.1%
18	92.8%	2.2%	1.9%	1.3%	0.1%

Population Share of Race/Ethnicity Group by the New Districts

District	Share_White	Share_Black	Share_Asian	Share_Hisp_Latx	Share_Other
1	83.8%	3.9%	5.5%	4.9%	0.2%
2	40.2%	26.0%	7.2%	24.3%	0.4%
3	30.0%	57.0%	5.6%	4.5%	0.3%
4	78.2%	8.9%	6.1%	4.6%	0.2%
5	63.4%	24.0%	6.5%	3.9%	0.2%
6	74.4%	5.6%	3.7%	14.2%	0.1%
7	72.5%	5.4%	3.0%	16.9%	0.3%
8	82.1%	5.1%	1.5%	9.7%	0.1%
9	89.7%	2.3%	1.0%	5.8%	0.1%
10	76.5%	10.4%	3.2%	7.5%	0.1%
11	85.7%	3.1%	1.7%	7.9%	0.1%
12	92.6%	2.1%	1.6%	2.2%	0.1%
13	92.2%	2.5%	0.7%	3.0%	0.1%
14	93.2%	3.0%	0.8%	1.2%	0.1%
15	94.7%	2.0%	0.7%	1.5%	0.1%
16	90.0%	4.5%	1.0%	2.3%	0.1%
17	88.3%	5.6%	2.6%	1.5%	0.2%
18	73.2%	18.2%	3.5%	2.2%	0.2%

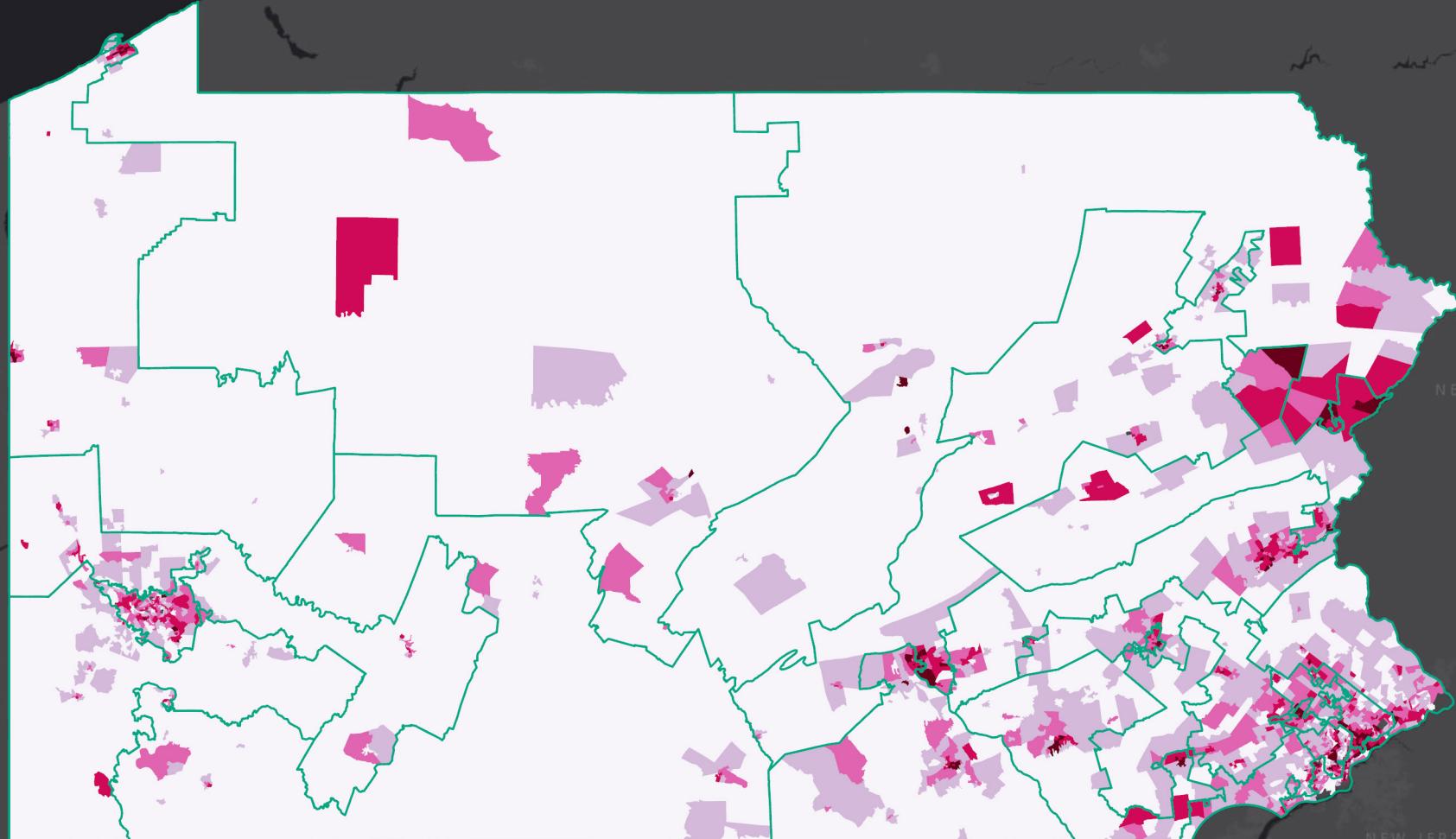
Data source:

- 2016 ACS 5-Year Estimates, Table “B01001”and “B03002.”
- Old and New PA Congressional District Boundaries provided in class.

Prompt 2.1:

Diversity Index by Census Tracts, Pennsylvania

with reference to Old Congressional District Boundaries



Legend

District Boundaries



Diversity Index by Census Tract

- 0.0 - 0.16
- 0.17 - 0.31
- 0.32 - 0.47
- 0.48 - 0.63
- 0.64 - 0.78



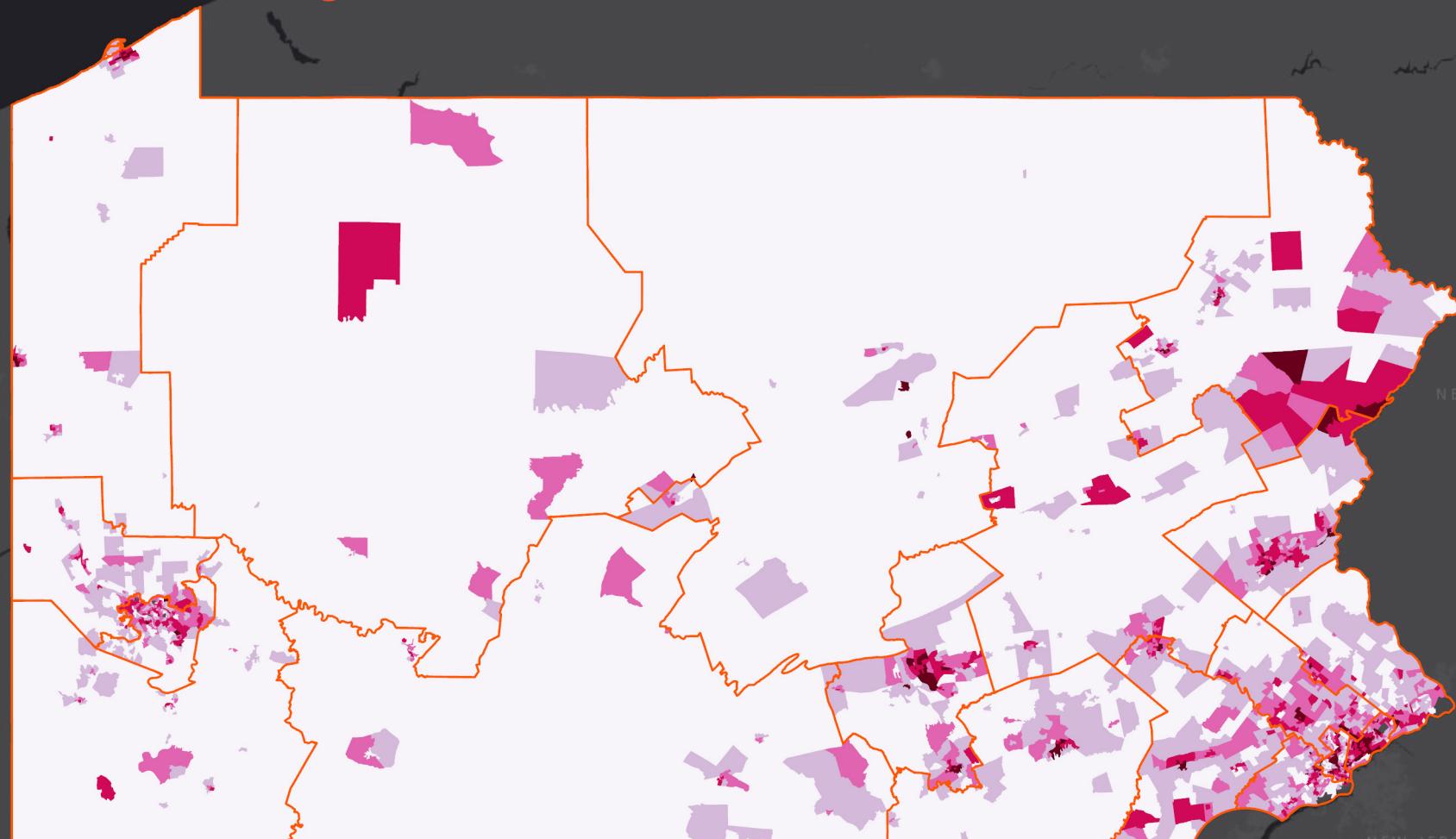
0 20 40 80 Miles

Data source:
2016 ACS 5-Year Estimates, Old/New PA Congressional District Boundaries (Class Material)
Esri, HERE, Garmin, USGS, EPA, NPS

Prompt 2.2:

Diversity Index by Census Tracts, Pennsylvania

with reference to New Congressional District Boundaries



Legend

District Boundaries



Diversity Index by Census Tract

- 0.0 - 0.16
- 0.17 - 0.31
- 0.32 - 0.47
- 0.48 - 0.63
- 0.64 - 0.78

0 20 40 80 Miles

Data source:
2016 ACS 5-Year Estimates, Old/New PA Congressional District Boundaries (Class Material)
Esri, HERE, Garmin, USGS, EPA, NPS



WEST VIRGINIA

MARYLAND

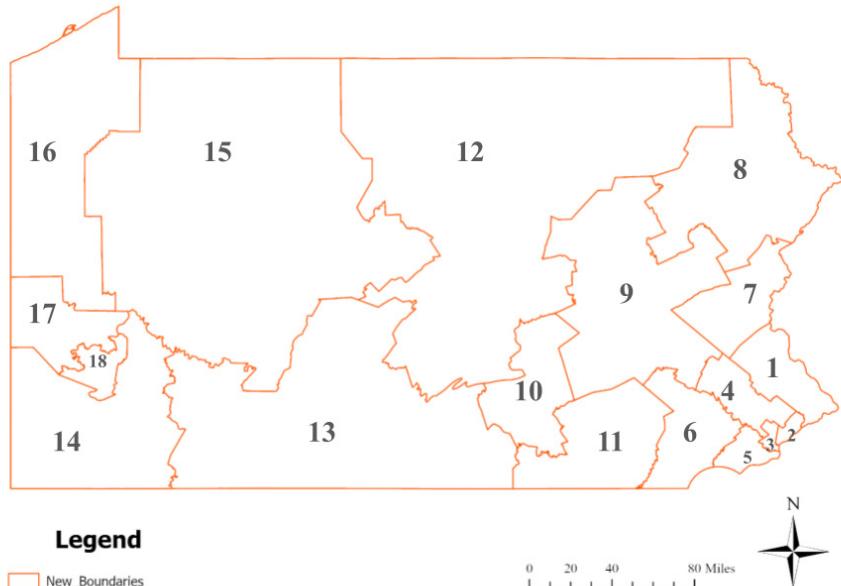
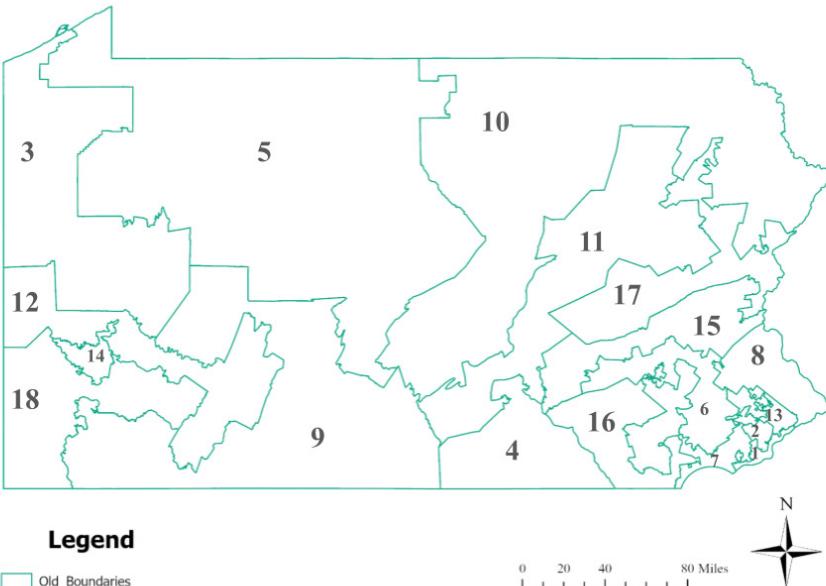
ARE

Delaware

Bay

NEW JERSEY

N



Old vs. New Boundaries Compactness

Old_District	Old_PP_score	New_District	New_PP_score
8	0.364	1	0.452
13	0.076	2	0.458
2	0.393	3	0.361
6	0.083	4	0.314
1	0.080	5	0.389
7	0.041	6	0.298
15	0.144	7	0.424
17	0.083	9	0.249
11	0.137	10	0.296
9	0.136	13	0.261
18	0.172	14	0.337
5	0.266	15	0.417
3	0.222	16	0.341
12	0.099	17	0.285
14	0.114	18	0.182
4	0.402		
16	0.131	11	0.372
10	0.146	8	0.281
		12	0.277

Prompt 3: Comparing Compactness of Old vs. New Boundaries

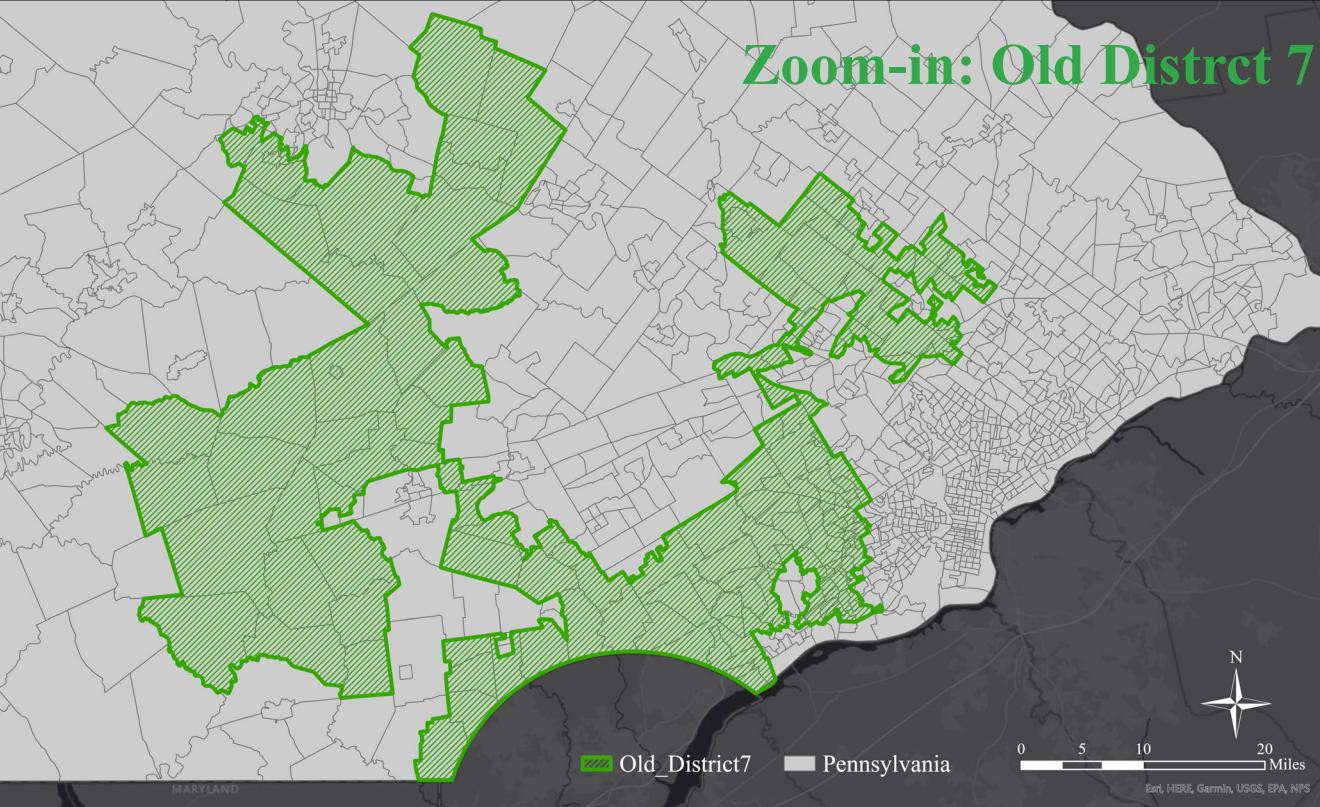
Acknowledging differences between old and new congressional districts, the study has attempted to manually identify matching districts with similar location and size, as shown in charts on the left. Note that some old districts appear to have been merged or split.

The general observation is that the majority of districts have become more compact, indicated by higher Polsby-Popper test scores (PP_score). For the only “pair” with a compactness drop - Old District 2 vs. New District 3 - the change is marginal (~0.03). Therefore, the redistricting has most likely corrected trends of former gerrymandering.

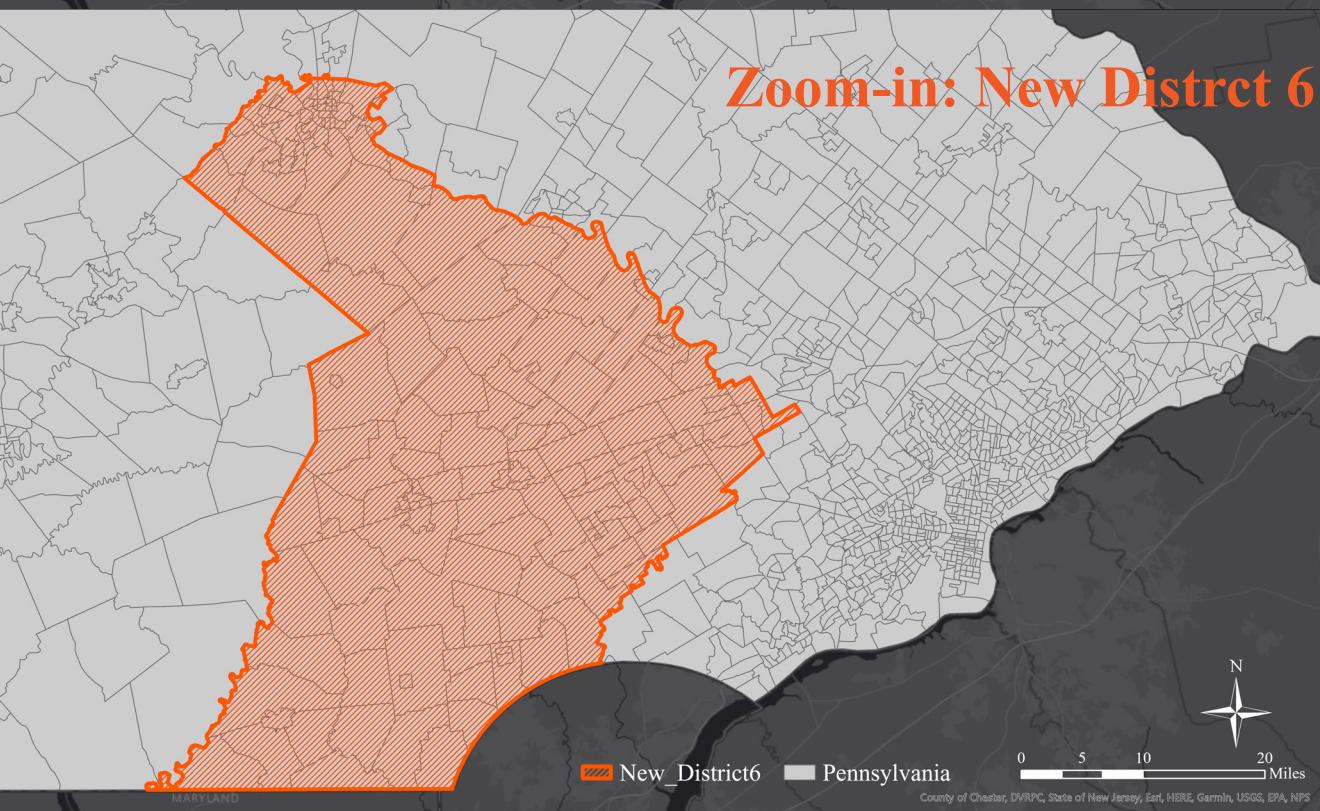
Data source:

- Old and New PA Congressional District Boundaries provided in class.

Zoom-in: Old District 7



Zoom-in: New District 6



The Old District 7 has an especially problematic, irregular shape. With reference to new district boundaries, it matches best with New District 6, which evidently has a better consolidated, compact shape. As a result, while Old District 7 has a compactness score of 0.041, New District 6 has a compactness score of 0.298, reflecting a total increase of 0.257.

Data source:

- Old and New PA Congressional District Boundaries provided in class.

Prompt 4: Redrawing Congressional Districts in East PA

Three districts selected for this prompt are intended to satisfy the following criteria:

- Contains a relatively balanced combination of less-diverse and more-diverse census tracts.
- Since Pennsylvania's total population in 2016 is 12783977, the redrawn district should contain around 700000~720000 total population.
- The redrawn district should be of a relatively compact shape.
- The districts are joined continuously to one another, leaving no uncovered census tracts in between.

Redrawn District 2

Redrawn District 1

Redrawn District 3

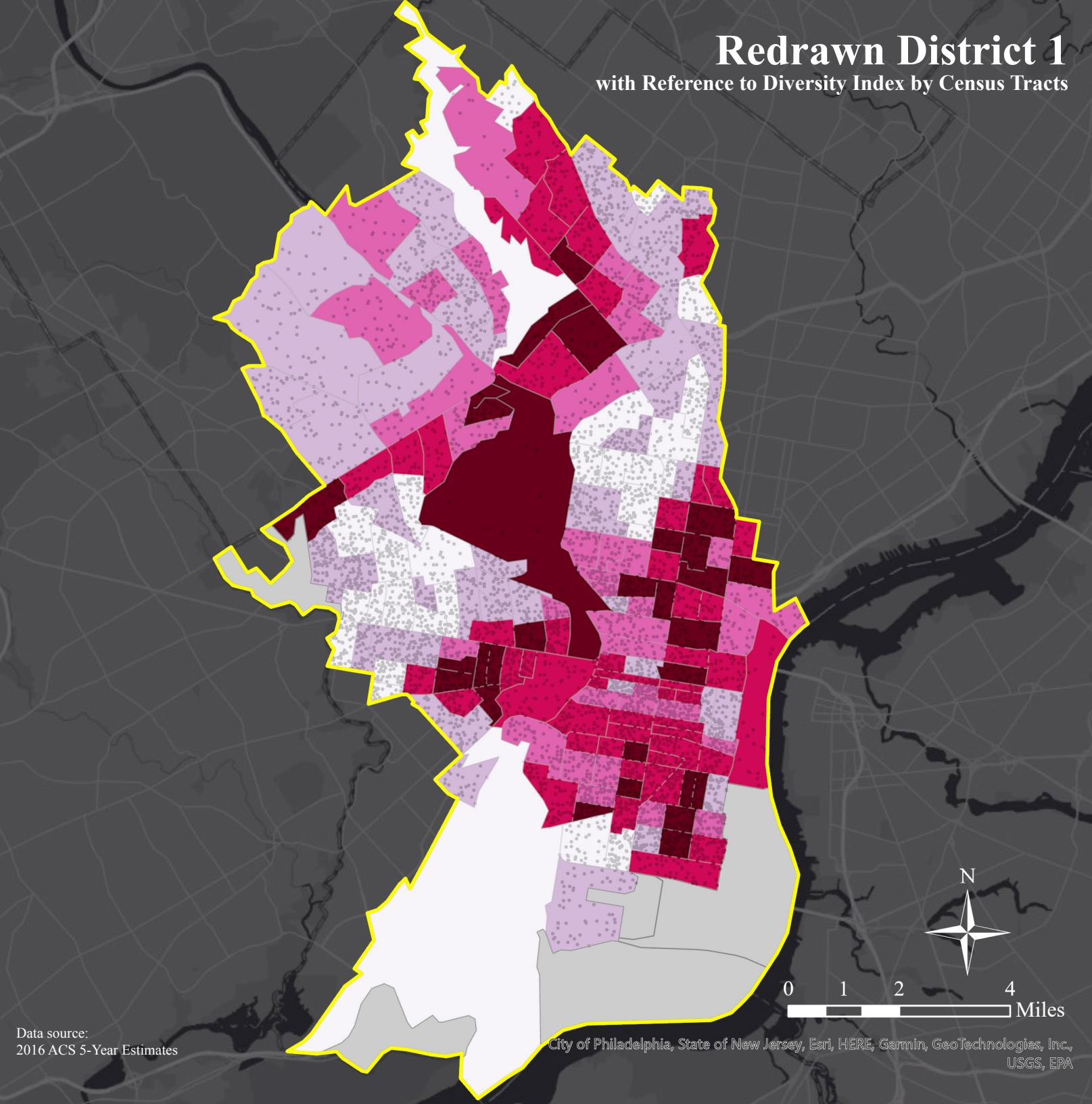


0 2.5 5 10 Miles

Data source:
2016 ACS 5-Year Estimates
Esri, HERE, Garmin, USGS, EPA, NPS

Redrawn District 1

with Reference to Diversity Index by Census Tracts



KEY STATS

Total Population:

727578

Compactness Score (PP Score):

0.314

Overall Diversity Index:

0.63

Legend

1 Dot = 100 people

Diversity Index by Census Tract

0.0 - 0.16

0.17 - 0.31

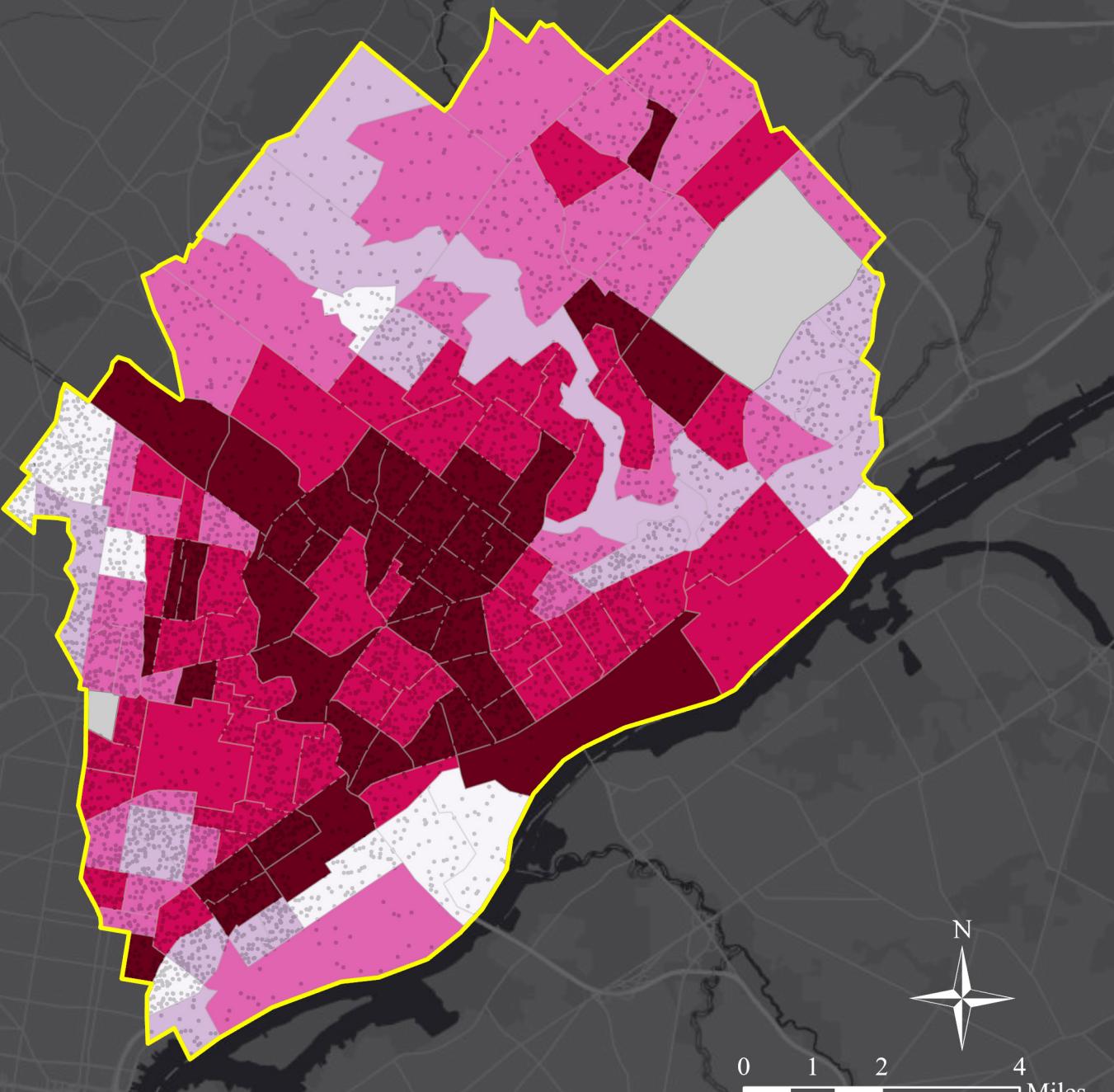
0.32 - 0.47

0.48 - 0.63

0.64 - 0.78

Redrawn District 2

with Reference to Diversity Index by Census Tracts



KEY STATS

Total Population:

720505

Compactness Score (PP Score):

0.553

Overall Diversity Index:

0.71

Legend

1 Dot = 100 people

Diversity Index by Census Tract

0.0 - 0.16

0.17 - 0.31

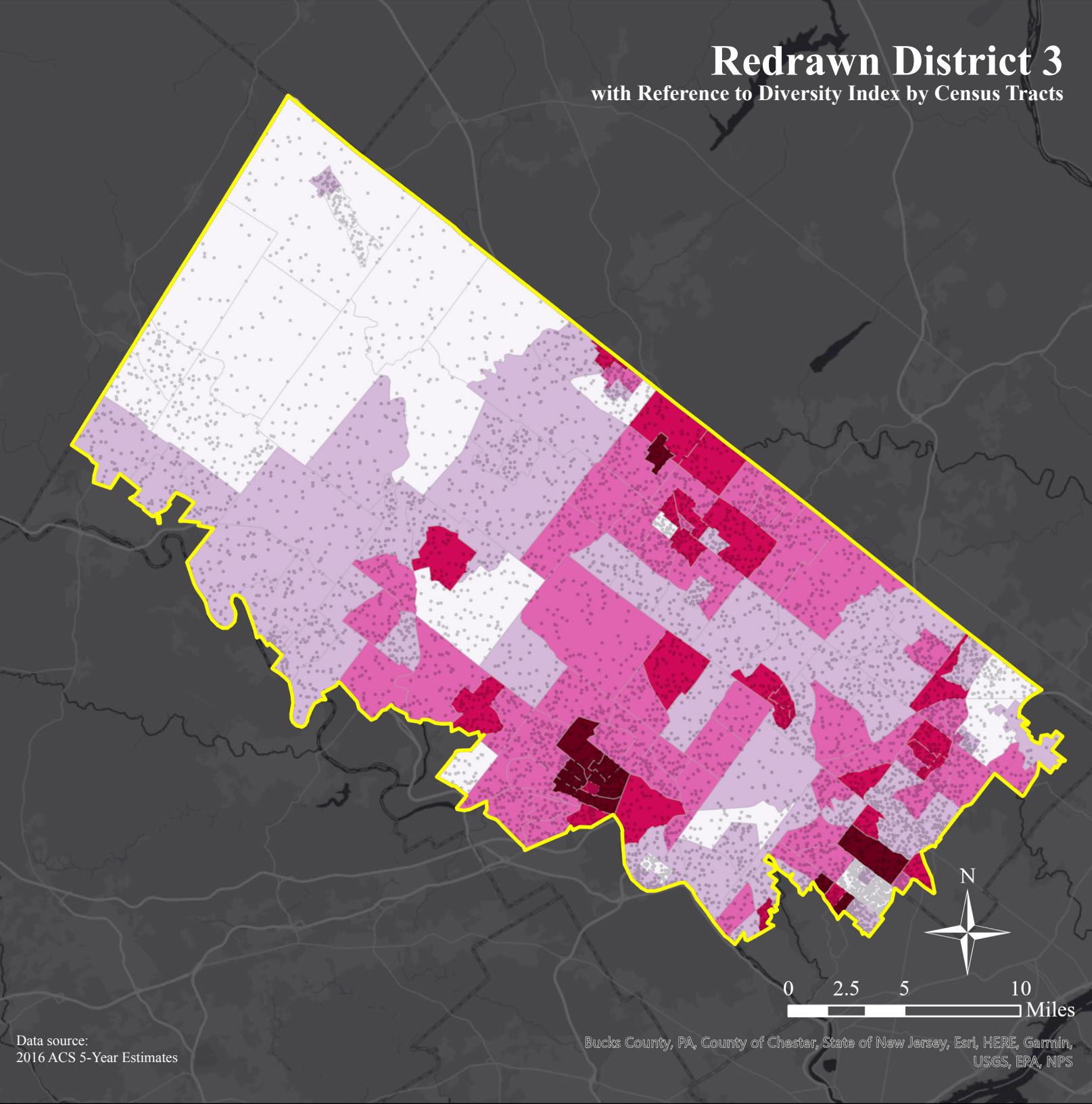
0.32 - 0.47

0.48 - 0.63

0.64 - 0.78

Redrawn District 3

with Reference to Diversity Index by Census Tracts



KEY STATS

Total Population:

702358

Compactness Score (PP Score):

0.356

Overall Diversity Index:

0.44

Legend

1 Dot = 100 people

Diversity Index by Census Tract

0.0 - 0.16

0.17 - 0.31

0.32 - 0.47

0.48 - 0.63

0.64 - 0.78