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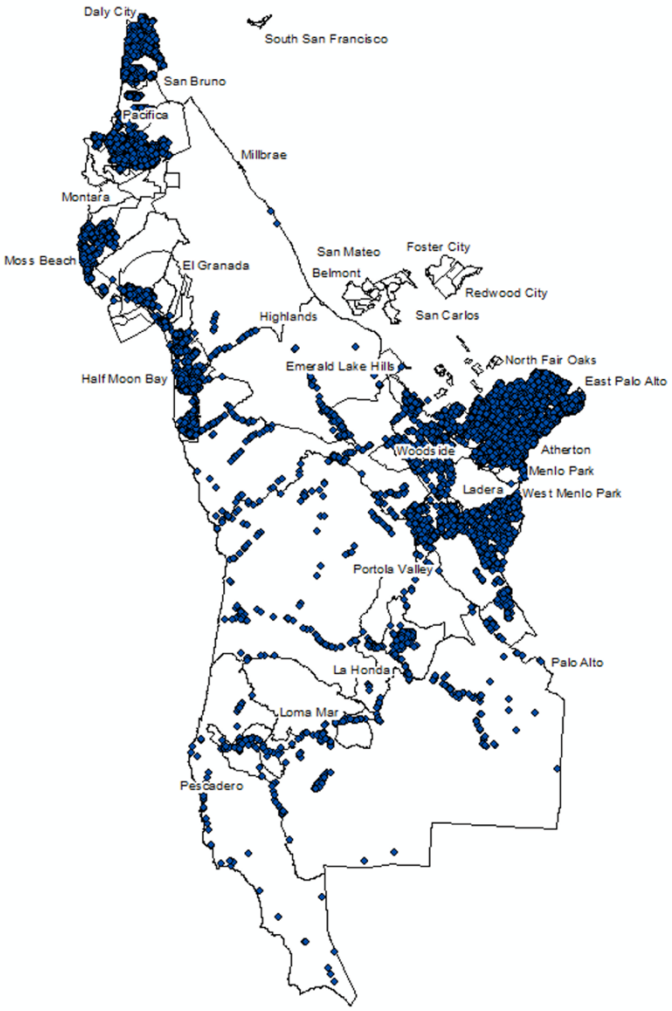
SWRK 730

Density and 3D maps in Application of Registered Voters in Congressional District 16, San Mateo, CA

Introduction

The data used in this analysis are from ACS 5-year estimate census data and voter database requested from San Mateo City Council. With around 83,000 entries, the voter dataset recorded detailed voting characteristics and anonymous personal information including addresses. I geocoded those 83,000 addresses in ArcGIS with 94% match and the points shown in the first map are the geocoded address locations of those 83,000 registered voters on map.



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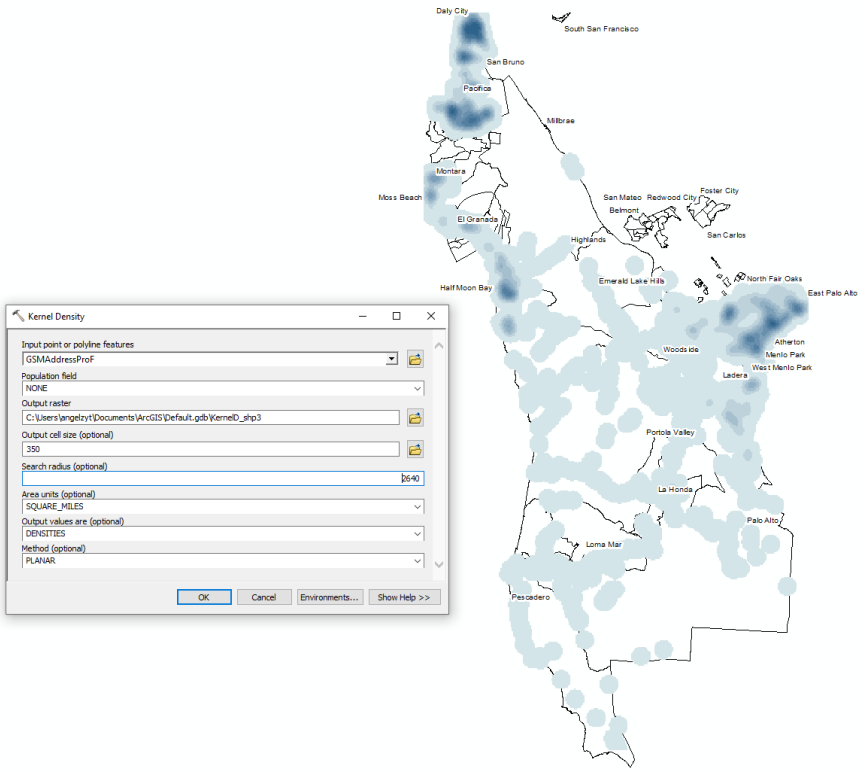
Density Map

Next, I used the point data to draw a series of density maps using Kernel Density function. Combinations of cell size 350 feet and search radii of 2640, cell size 600 feet and search radii of 5280, and cell size 100 feet and search radii of 1320 were visualized in three maps respectively. The first combination of cell size 350 feet and search radii of 2640 works best to reflect the voter density to a fit extent. Because compared to other parameters, these sets of parameters just display the overall picture of voter populated areas with highlighted yet not over-mixed colors. The differential nuance is just right for readers to capture the trend that registered voters cluster mainly in the north and east.



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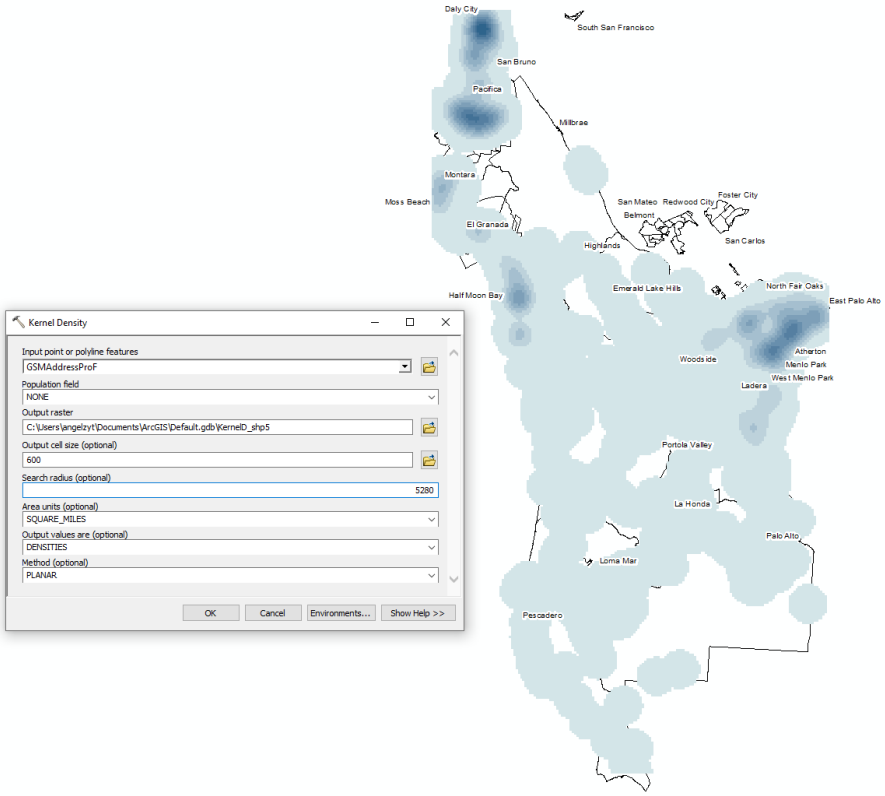

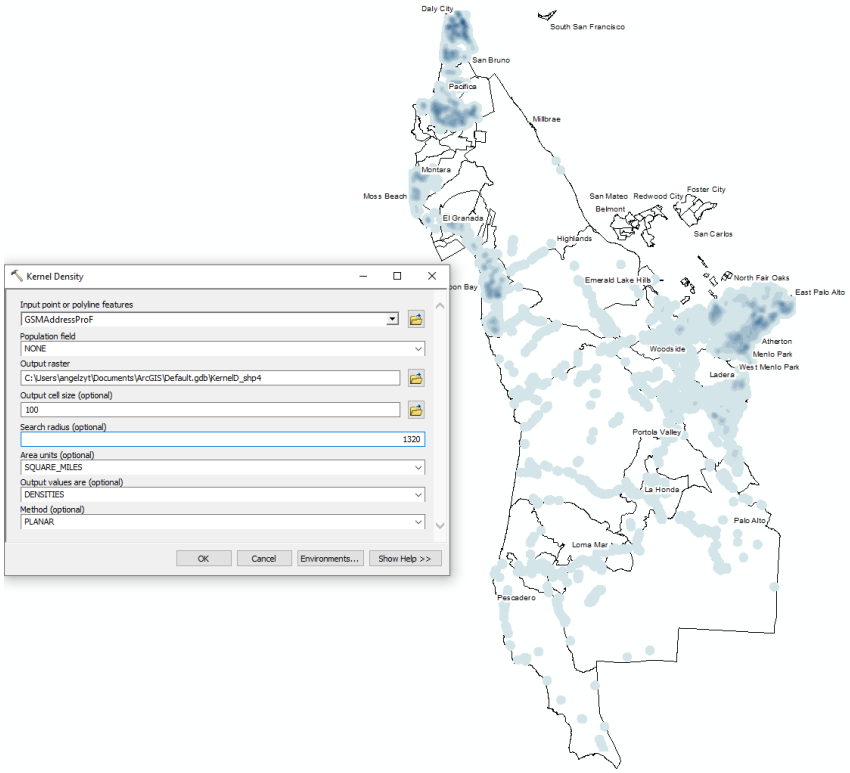

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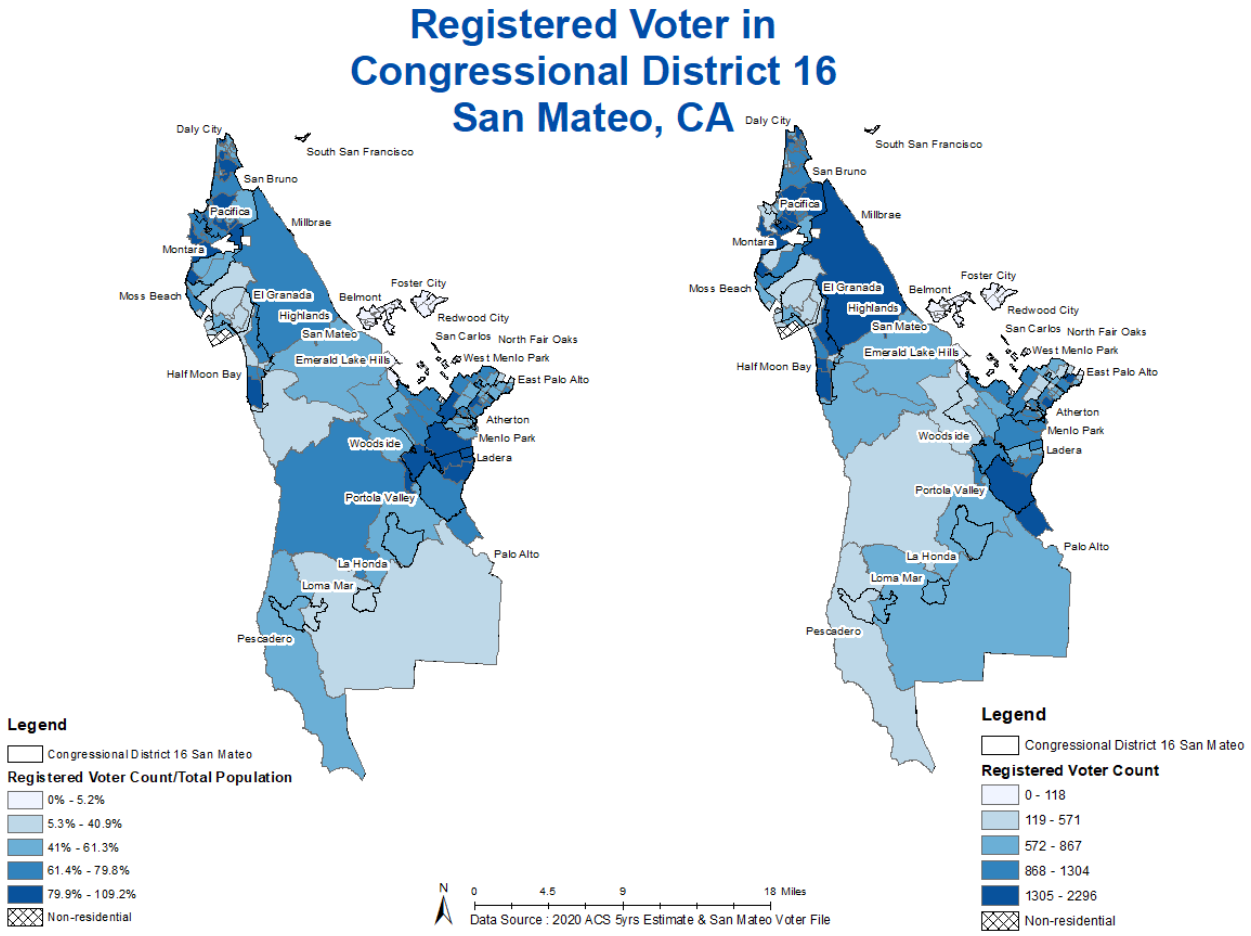
Vector Map

After creating the density map, I also created vector maps to aggregate the point data to the census demographic data using spatial join. The map below in the right is the raw count of registered voter in each block group. The map in the left is the normalized number of registered voter by total population in each block group. There is minus difference after normalization. Some deep blue areas of raw count switch to light blue after normalization. It can be inferred that block groups with higher the number of registered voters do not necessary to be political active zones overall.



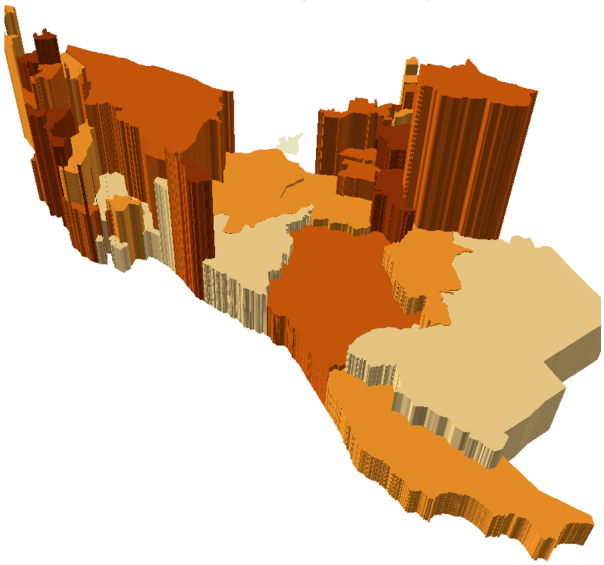
3D Map

Aggregated data

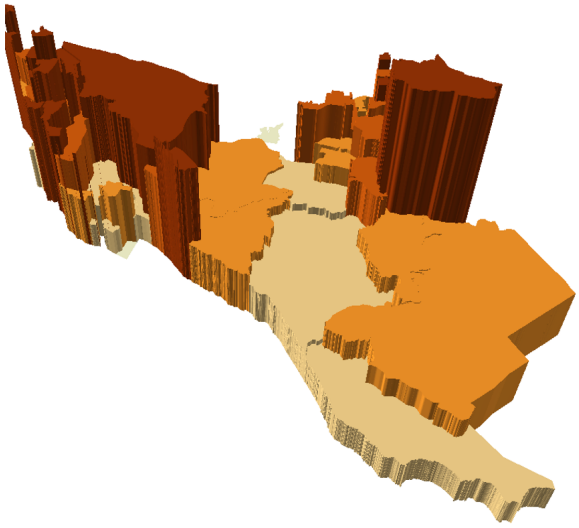
Then I applied both the density and vector maps to 3D maps in ArcScene. The first series of maps are 3D maps for aggregated data. They share the same pattens reflected from the 2D vector maps yet seem to erase the nuance referred from vector maps that higher

raw counts not necessarily equals to high registered voter percentage. In order words, these series of 3D maps do not tell the best story compared to the 2D vector maps.

Normalization by Total Population



Voter raw count



Point data

The series of maps below are the 3D density maps for the combination of cell size 350 feet and search radii of 2640, which is the best visualization reflecting the features just right. The 3D density maps in red tell a better story than just density maps in that they show trends and distinctions in different block groups where register voters cluster. The green maps in the right are weighted by voter propensity score – the voting probability of a voter. We can see from that the weighted 3D density maps are smoother compared to unweighted maps. That means the probability of voting for registered voters in high voter density areas does not necessarily higher than areas with less voter density among high voter-populated block groups.

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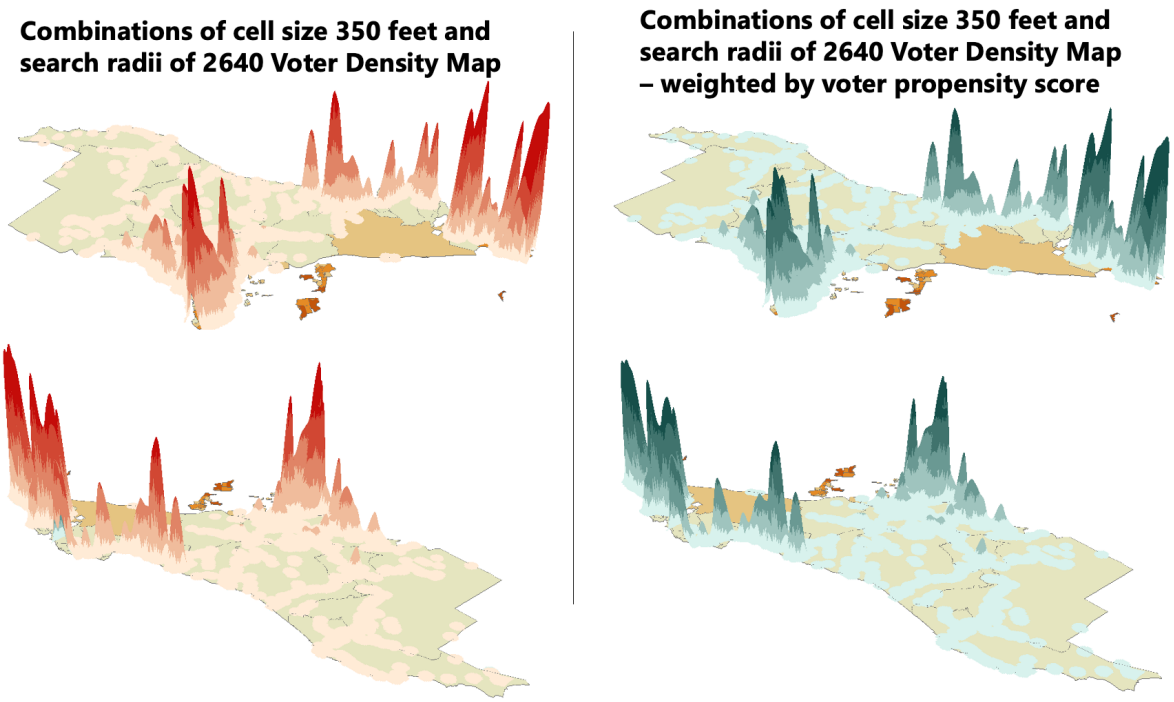

Conclusion

In this analysis, the vector maps show us a better demonstration of voters density in detail while 3D density maps of point data are a good means to compare in a macroscope. It is also insightful to get the nuance of similar trends from the 3D density maps, especially added with features of concerns weighted.