Lab 5: Choropleth

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GEOG 323 B02

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1.

The the upper class limits, the number of observations in each class, and the GVF values for each of the classifications for the 2016 Vancouver population data can be found in the preceding table.

Table 1: 2016 Population per Square Kilometre in Vancouver, BC, Canada observations, class bounds and GVF values using equal interval, natural breaks, quantile and standard deviation classifications.

Classification	Number of Classes	Observations	Class 1 Upper Bound	Class 2 Upper Bound	Class 3 Upper Bound	Class 4 Upper Bound	Class 5 Upper Bound	GVF Value
Equal Interval	5	118	8640.19	16492.2	24344.22	32196.23	40048.24	0.91
Natural Breaks (Jenks)	5	118	3858.66	7097.01	13348.8	24136.09	40048.24	0.93
Quantile	5	118	3784.6	5314.21	7408.04	10276.12	40048.24	0.75
Standard Deviation	5	118	4855.3	11817.79	18780.28	25742.77	40048.24	0.94

2.

Figure 1, a histogram of the 2016 population data shows that the data is not normally distributed and is positively skewed. Figure 2, a qq plot confirms this as the samples do not follow a linear pattern. Due to this, a standard deviation classification would not be a suitable choice as the data is not normally distributed. Furthermore, do to the dispersion shown in the histogram, a natural breaks classification would create classes with great variance in class size, particularly in the higher density samples. Other then quantile, all the classifications have near optimal GVF values and the difference between them is very minor. The equal interval classification provides the easiest interpretation for the reader as it shows a linear progression through classes. This makes it the best classification to use in this particular circumstance.

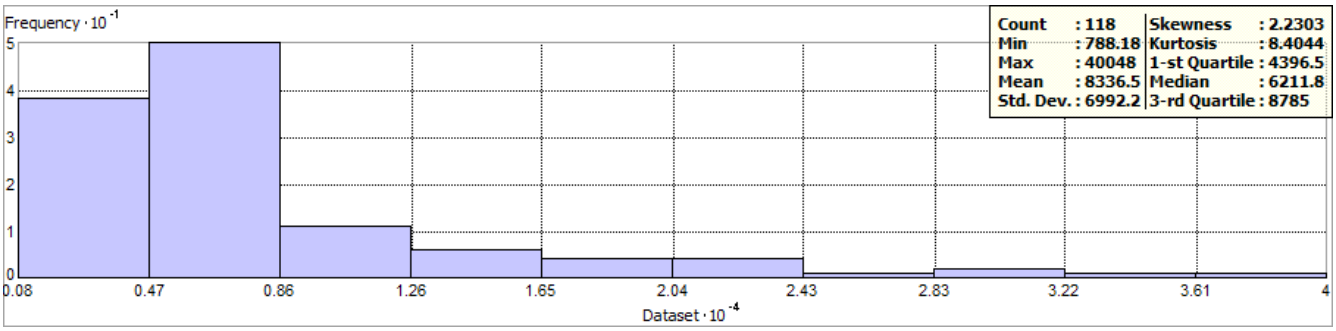


Figure 1: Histogram of 2016 Population Density, 10 Bins

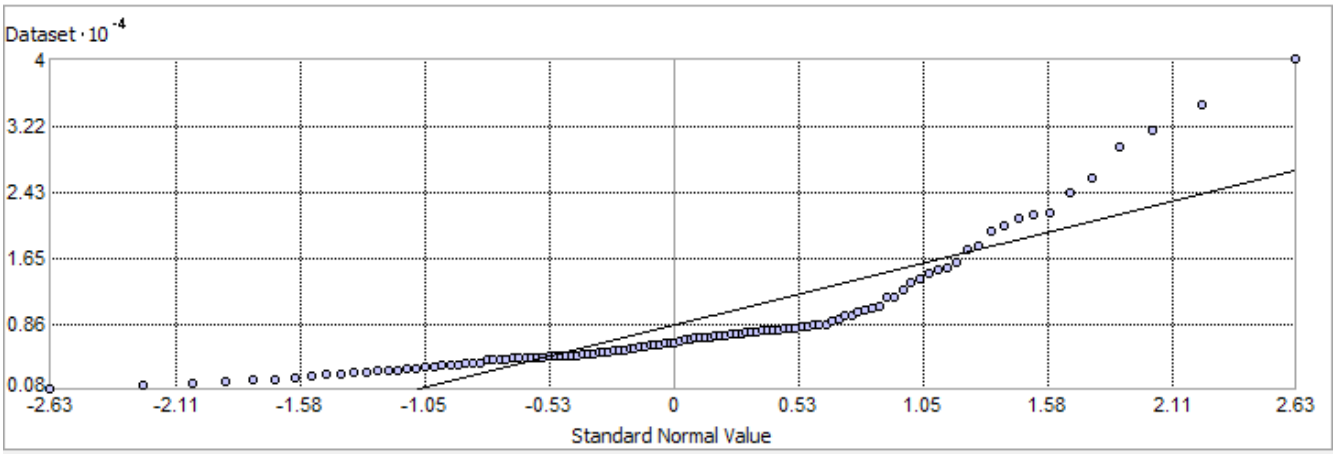


Figure 2: QQ Plot of 2016 Population Density

3.

The method selected to map the population per square kilometre attribute from the combined 2011 and 2016 Vancouver population data set was an equal interval classification with 5 distinct classes. Although other methods of classification using the same number of classes such as natural breaks and standard deviation had higher GVF values of 0.93 and 0.94 respectively, they were not suitable to map the population density variable.

The equal interval classification provides a linear growth rate through classes which is typically expected from the average reader and makes the map easier to read. The natural breaks classification creates class sizes that vary greatly, which makes the map more difficult to interpret. The higher GVF value of 0.93 is expected as the Jenks algorithm is designed to maximize variation between classes, however the GVF value from the combined 2011-2016 population data shown in Table 2 of 0.91 is still acceptable.

The distribution of the combined data is still positively skewed and not normally distributed as shown by Figure 3, a histogram and QQ plot of the combined data, making standard deviation classification a poor choice. In addition, standard deviation classification is not suitable for time series comparisons.

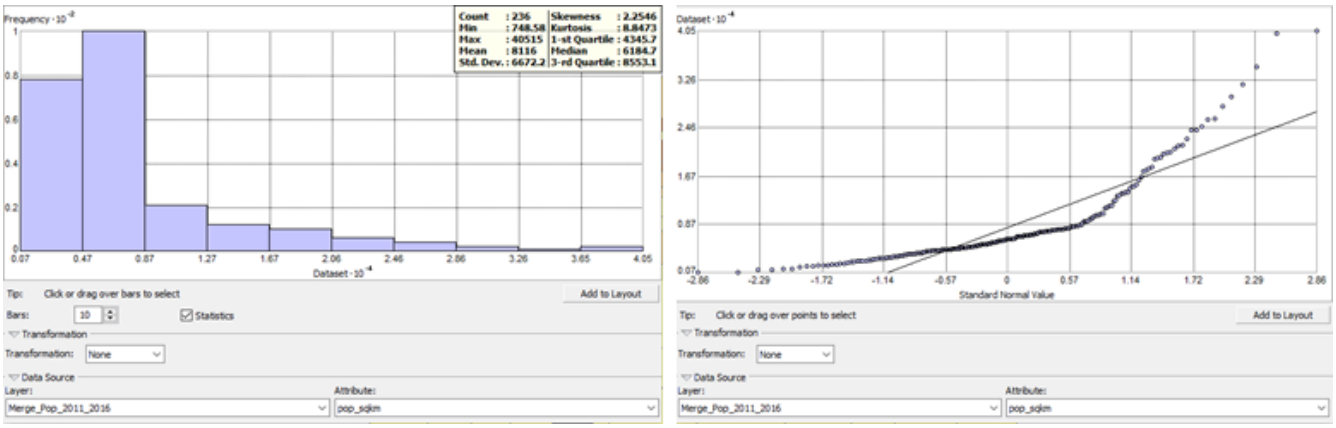


Figure3: Histogram and QQ Plot of Combined 2011 and 2016 Population Density

Table 2: Combined 2011-2016 Population per Square Kilometre in Vancouver, BC, Canada observations, class bounds and GVF value

Classification	Number of Classes	Observations	Class 1 Upper Bound	Class 2 Upper Bound	Class 3 Upper Bound	Class 4 Upper Bound	Class 5 Upper Bound	GVF Value
Equal Interval	5	236	8701.89	16655.21	24608.53	32561.84	40515.16	0.91

4.

The map showing population per square kilometre using the classes defined by the combined 2011-2016 population data is shown on the next page.

5.

There were 5 regions that increased in population density from 2011 to 2016. All of these regions were located in the north-western area of Vancouver in the downtown district. This is expected as this region is the metropolitan centre of the city and is expected to have the highest density and to see the most growth over time. These regions are highlighted in Figure 3. The rest of the city saw no discernible change in density and there were no regions that showed a decrease in density.

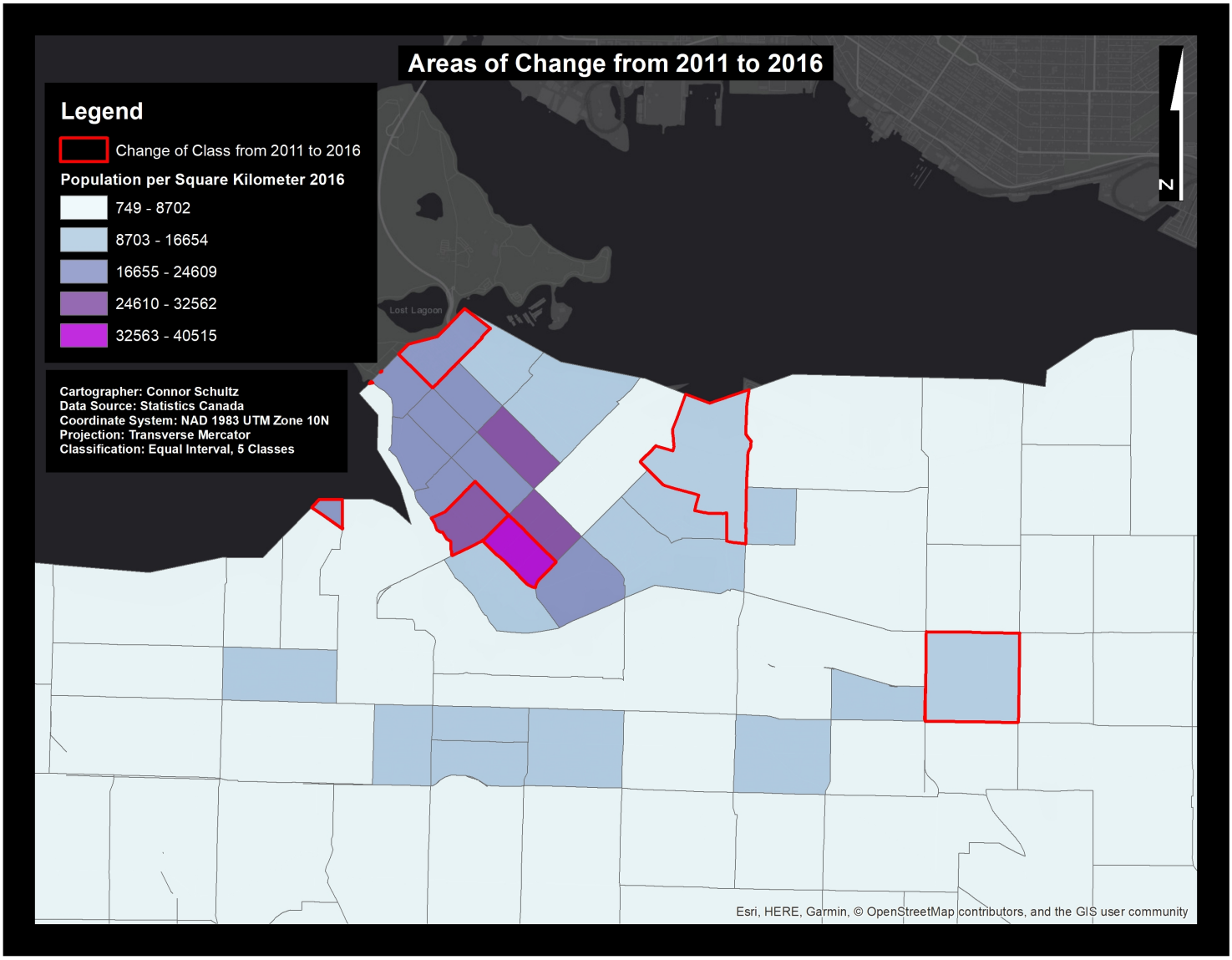
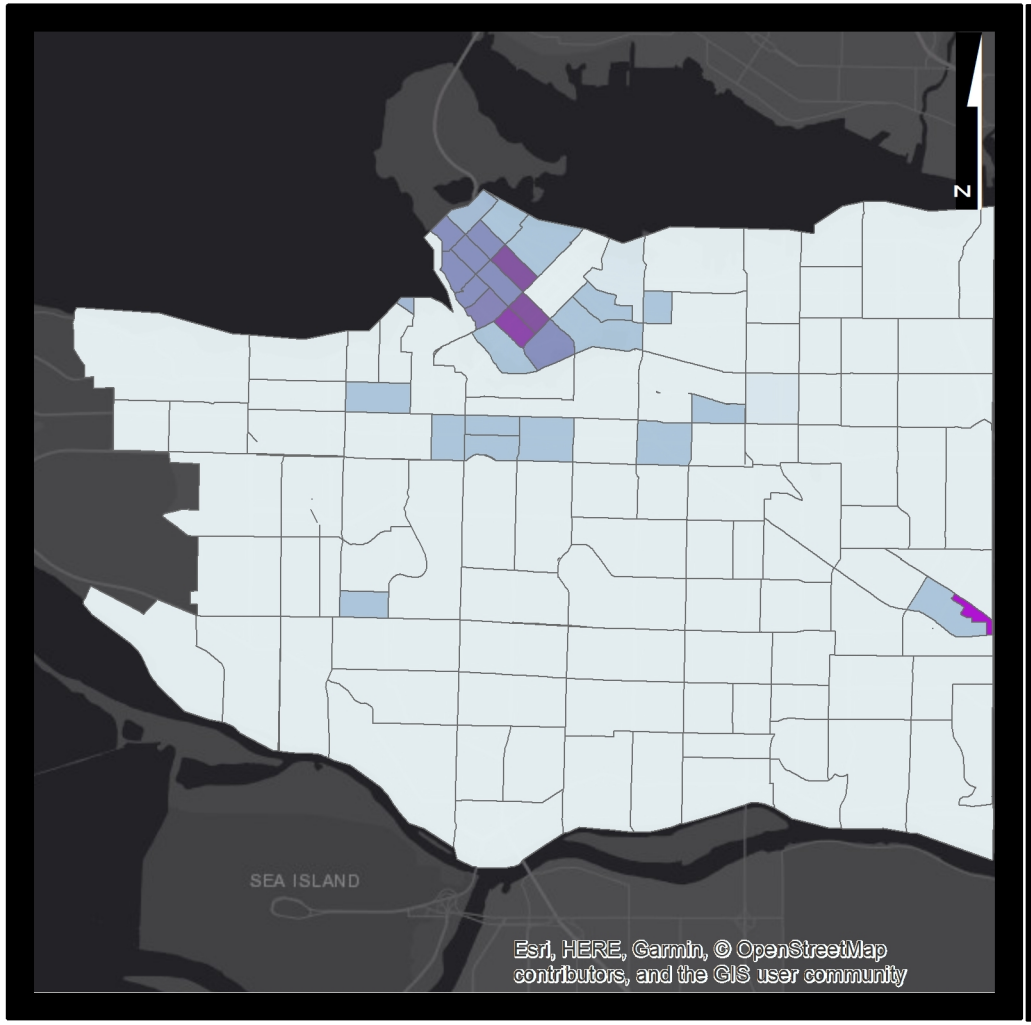
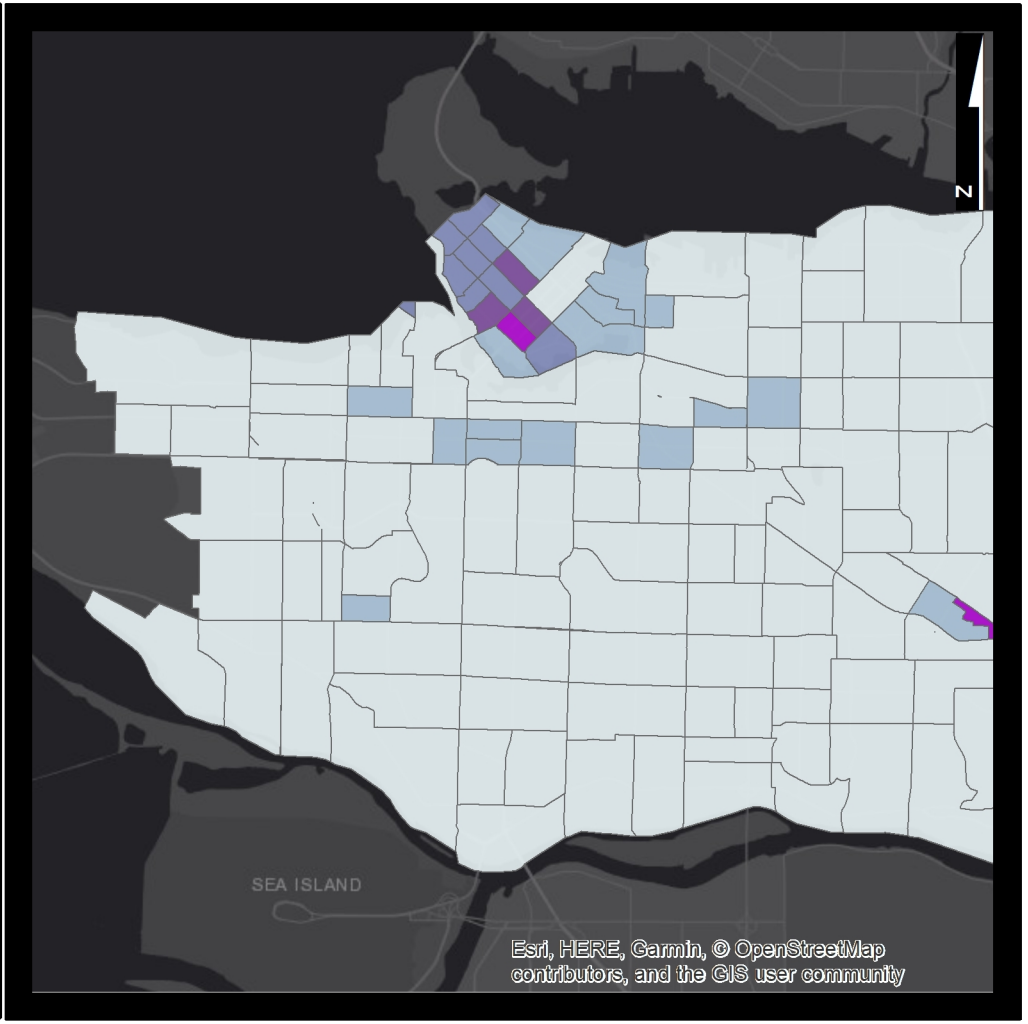


Figure 3: Areas of change in population density from 2011-2016 using classes defined by the combined 2011-2016 data set

2011 Population Density Map of Vancouver, BC



2016 Population Density Map of Vancouver, BC



Legend

Population per Square Kilometer

- 749 - 8702
- 8703 - 16654
- 16655 - 24609
- 24610 - 32562
- 32563 - 40515

Scale: **1:120,000**

Cartographer: Connor Schultz
Data Source: Statistics Canada
Coordinate System: NAD 1983 UTM Zone 10N
Projection: Transverse Mercator
Classification: Equal Interval, 5 Classes