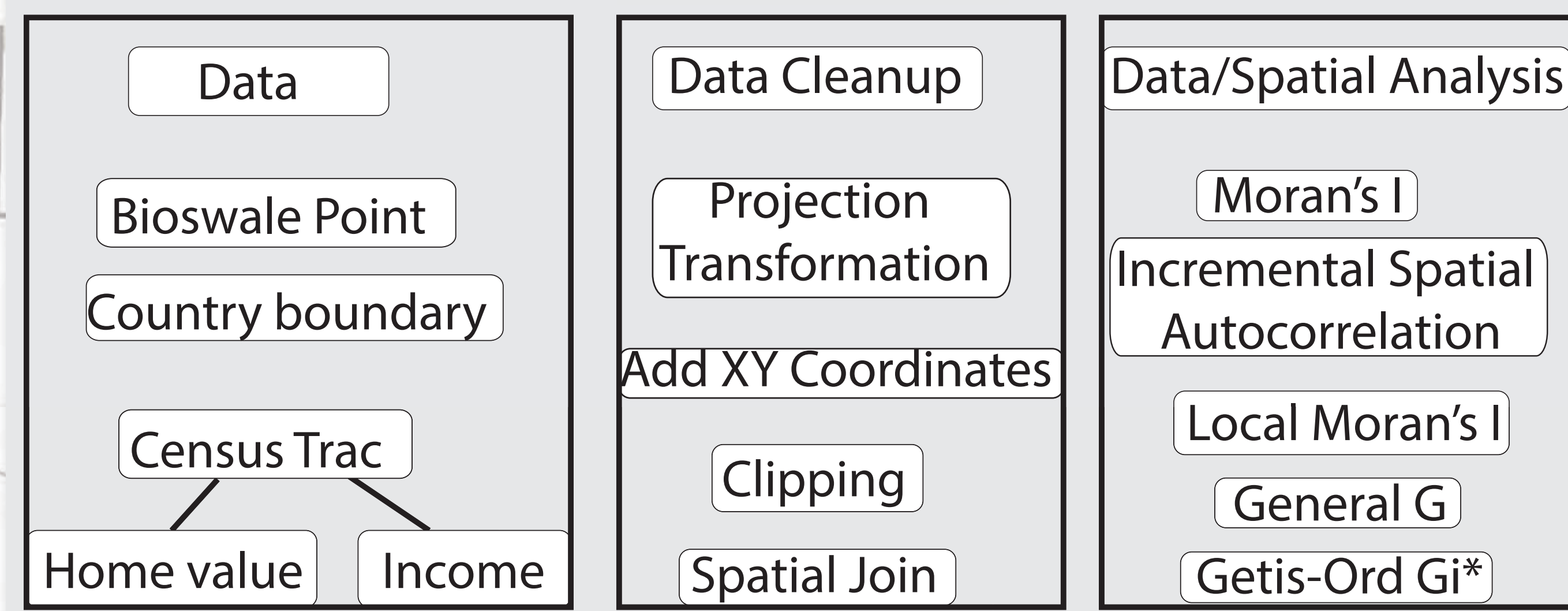


Is there a Bioswale equity issue?

"If you manage stormwater on your property, you can receive up to a 100% discount on your on-site stormwater management charges because your actions help protect rivers, streams and groundwater from the damaging effect of stormwater runoff" (PortlandWaterBureau).



We assumed the bioswales would most likely be clustered in areas of high wealth. So we could easily identify the median home value for Portland using the census.

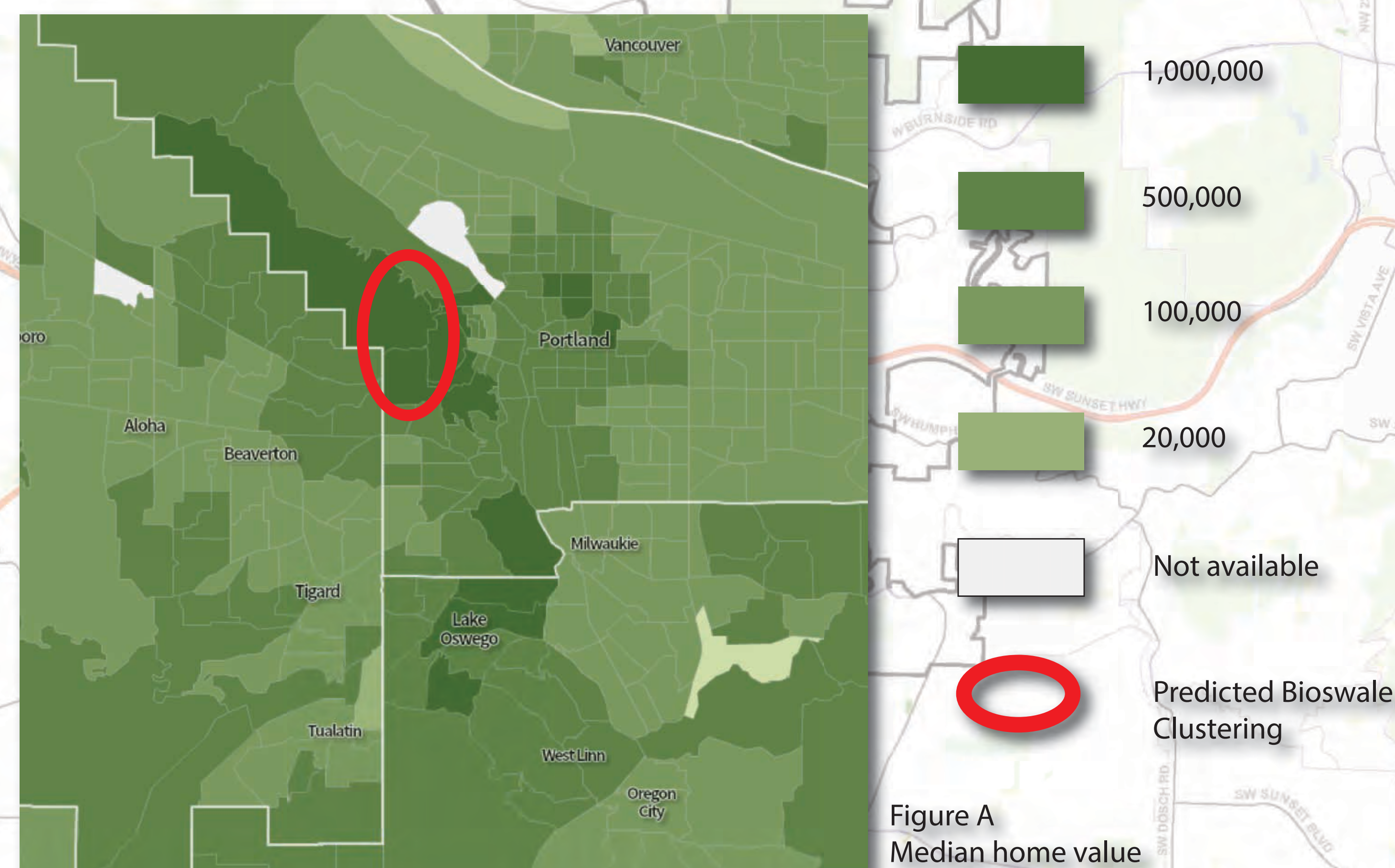


Figure A  
Median home value

To determine if the mean housing value impacts the number of bioswales in a given census tract we needed to collect and organize our data before analyzing it. Our data came from the Bureau of Environmental Services and the 2010 United States Census. We also utilized other applications like SocialExplorer and CivicApps. We have established mean housing costs per tract within Multnomah County, joined this information to the average income and then used the Bureau of Environmental Services Sewer Collection System 2015 to establish polygons of common housing values and show the bioswale location points.



Once all of our data was loaded into Arcmap analysis began. In order to establish clustering of points and establish spatial autocorrelation we first ran the local Anselins Moran's  $i$  or tool from the spatial statistics tool box. To run Anselins we used the "TRACT" and "COUNT" as the input and field with the conceptualization of distance as inverse distance with a band limit of 3000. The index value, the p-value 0.07 and z-score 1.78 all reflect that of clustered data. This is a choropleth map with the lmiZscore with a hot and cold diverging color map with 7 natural breaks. As the map shows, the high clustered areas fall in tracts with higher mean housing values.



Incremental Spatial Autocorrelation (Figure C) measured the autocorrelation of our data points and created this line graph of the z-scores. The peaks show statistically significant clustering is most pronounced. This analysis allowed for us to use Hot Spot Analysis (Getis-Ord  $G_i^*$ ).

In order to establish clusters of Hot (high) and Cold (low) cluster values we ran the Getis-Ord  $G_i^*$  tool also found in the Spatial Statistic Toolbox in Arcmap. Based on the p-value of 0.03 and z-score of 2.16 our confidence level suggests that we have statistically significant spatial clusters of high values in the tracts with a higher mean housing value and low clusters found in the tracts with the lower mean housing cost

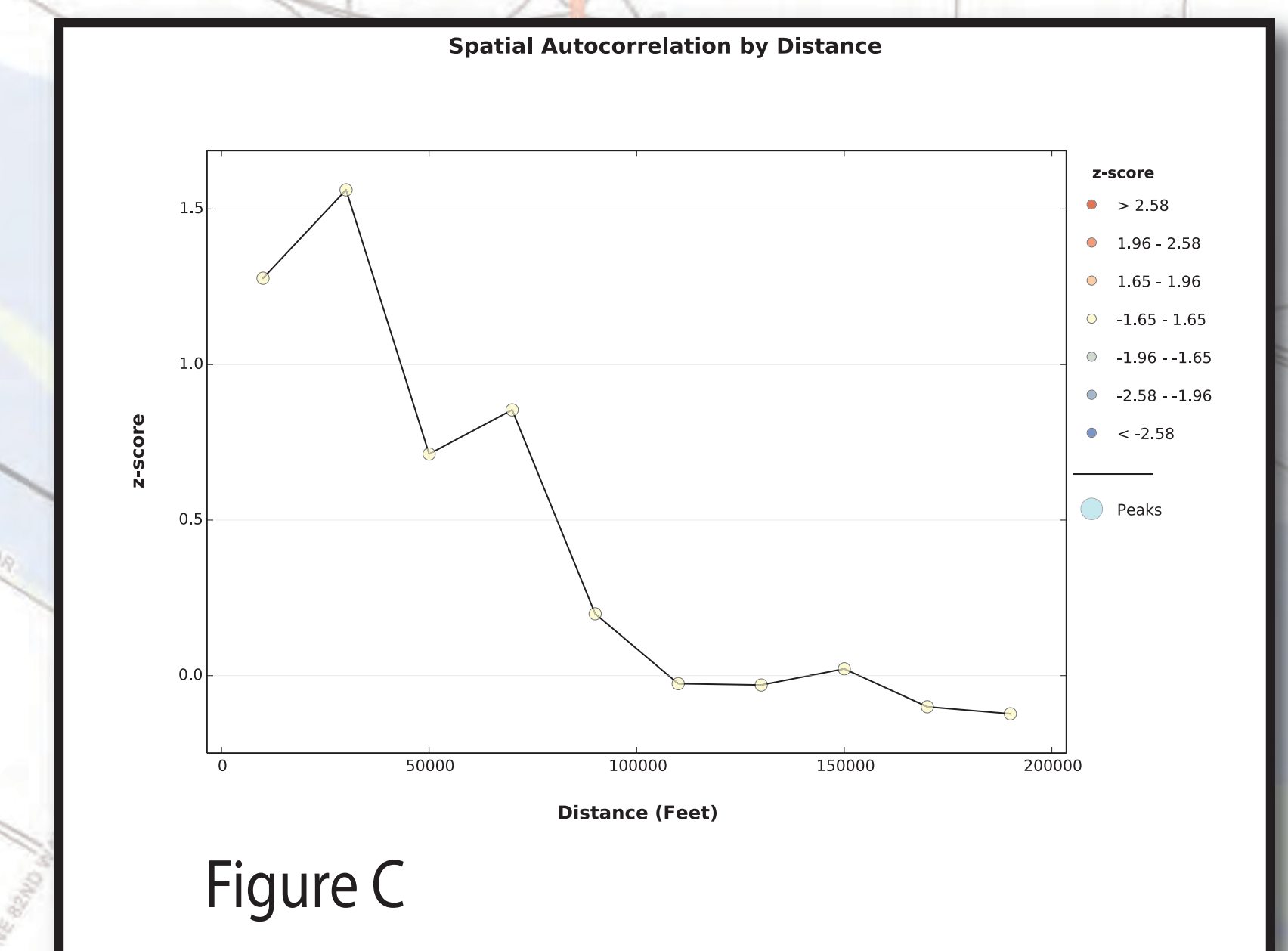
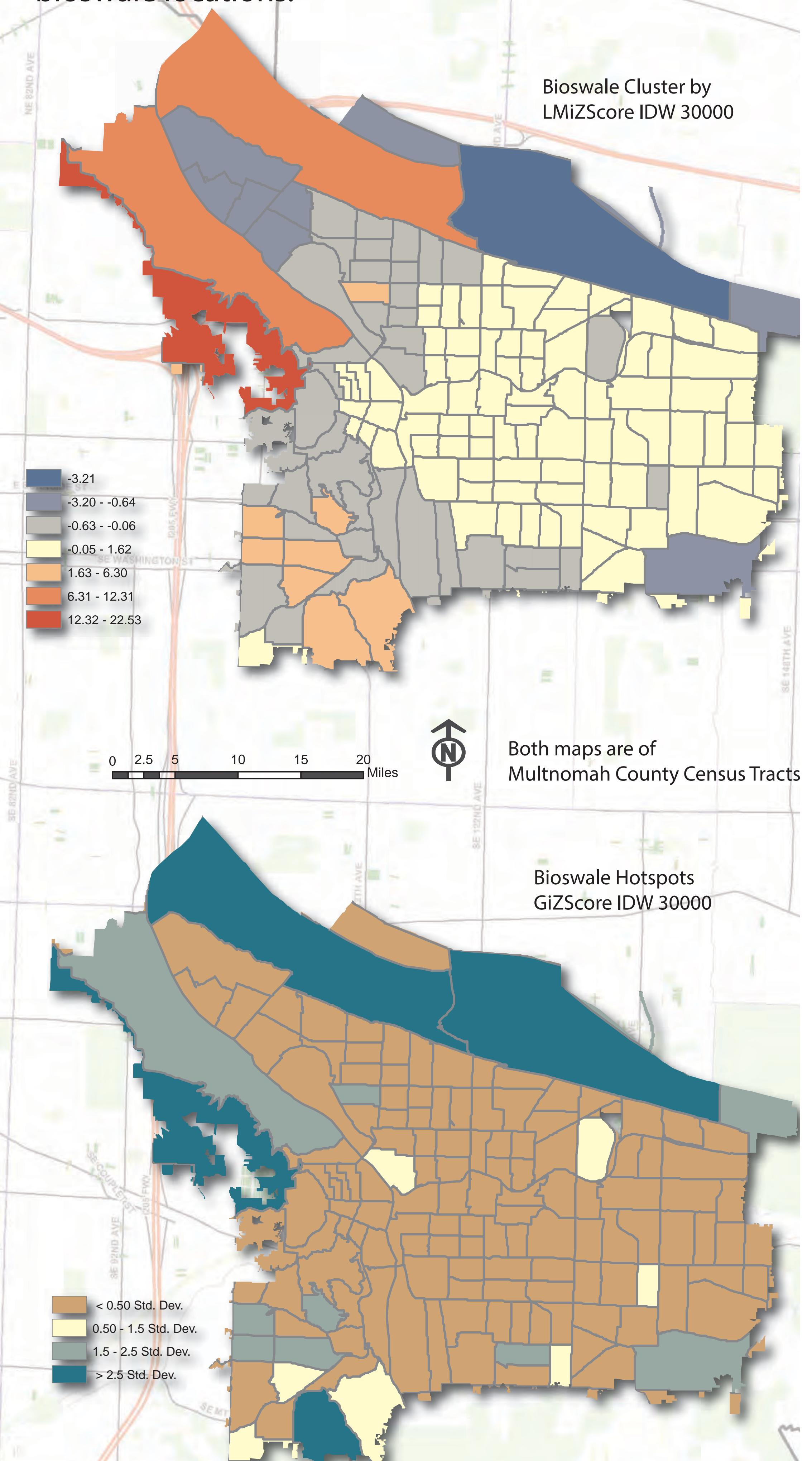


Figure C

Bioswales have many environmental benefits and having one on your property can lower your monthly water bill. After statistical analysis we have concluded that the higher mean home values for a given tract, the more bioswales are found there. Conversely, the lower the mean home value the less bioswales are located in that given tract. Statistically significant clusters as well as hot and cold spots support our original hypothesis and suggest there is in fact an equity issue in terms of bioswale locations.



Bioswale Cluster by  
LMiZScore IDW 30000

Both maps are of  
Multnomah County Census Tracts

Bioswale Hotspots  
GiZScore IDW 30000