Determining the Spatial Distribution of Grand Rapids' Urban Forest and its Effect on Home Value

Jacob Rumschlag
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GRAND VALLEY STATE UNIVERSITY
www.gvsu.edu

INTRODUCTION:

Incorporating trees into an urban environment can provide an extensive range of environmental benefits to the surrounding areas including the reduction of soil erosion; the creation of habitat for wildlife; local air quality improvements; a decreasing of urban heat island effect; the saving of building energy costs through shading and insulation; the sequestration of carbon; and a reduction of storm water runoff. In addition, an urban tree canopy can also provide cultural benefits and improvements to human quality of life. For example, urban forestry has the capability to improve the scenic quality of a neighborhood, reduce stress, provide privacy, protect residents from the negative effects of undesirable land uses, and contribute to the success of retail areas by creating more attractive environments to consumers. Despite the recognized benefits of urban forestry, urban forests are still generally understudied and underutilized in many cities throughout the United States.

Grand Rapids has recently altered its city's master plan to include the ambitious goal of increasing the tree canopy in the city to 40%. In order to help achieve this commendable task, organizations like the City of Grand Rapids and Friends of Grand Rapids Parks have launched the Urban Forest Project. The Urban Forest Project hopes to encourage citizen engagement with tree planting activities through education, outreach, and volunteer opportunities. This initiative also helps to guide future planting activities through data display and analysis.

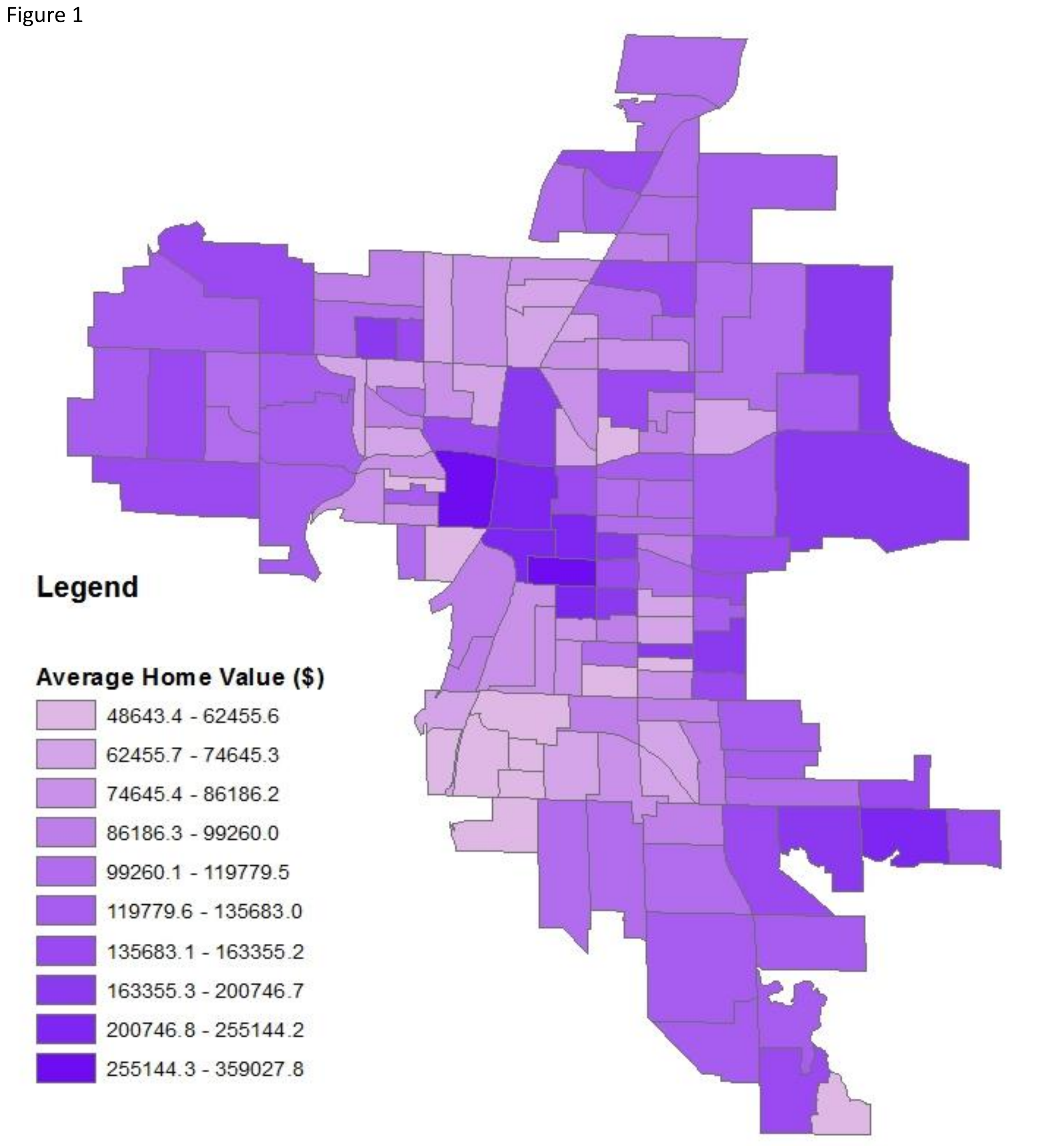
Although many factors must be considered when analyzing the influence of the current tree canopy on the citizens of Grand Rapids, the specific effect of tree frequency on home values must be taken into account. Determining if a correlation exists between tree frequency and the value of one's home may provide further evidence of the positive impact of trees on urban communities, as well as shed light on the degree to which urban trees engender positive externalities. Ultimately, I hope that the analysis will help aid in the planning of future tree planting as Grand Rapids continues to expand their urban forest.

STUDY AREA AND DATA:

The area in question is Grand Rapids, Michigan. Grand Rapids was founded in 1826 as a trading post, given its great location on the Grand River in West Michigan. The city is home to over 190,000 citizens, making it the second largest city in Michigan. Grand Rapids is known for its furniture production, as well as for being the boyhood home of President Gerald Ford.

Grand Rapids tree distribution data was collected and provided by the City of Grand Rapids Forestry Department. Data depicting home values throughout the city was found through the U.S. Census. Geographic data displaying block group locations throughout Grand Rapids was provided by the Johnson Center's Community Research Institute. The study area includes the block groups within the city of Grand Rapids, Michigan. However, I was unable to find sufficient data for some of the block groups and excluded them from the study area.

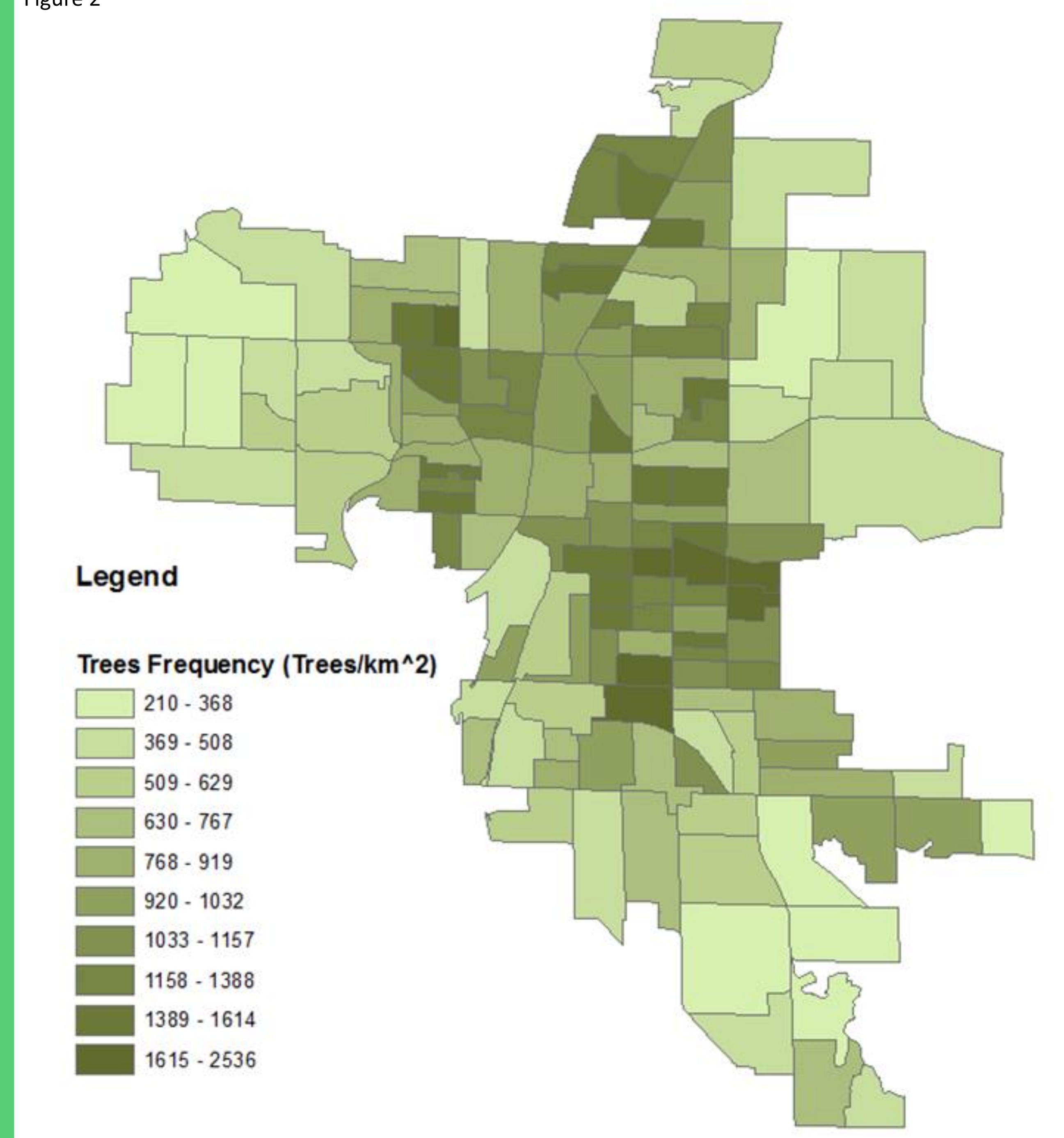
Figure 1



METHODS:

- Average home values was created by joining average home values table to the block group shape file based of off their common field. The symbology was changed in order to display the results (Figure 1).
- A spatial join was conducted to determine the amount of trees that fall within each block group. The number of trees within each block group was then divided by the area of the block group using the field calculator. The symbology was changed in order to display the results (Figure 2).
- The Euclidean Distance tool was used in order to determine the linear distance to the nearest tree throughout the city of Grand Rapids. Using the clip tool and the block groups shapefile, this raster shapefile was clipped to the area of interest (Figure 3).
- A statistical analysis was then implemented in order to determine if a relationship between tree frequency and the Grand Rapids average home value exists. Using Microsoft Excel, data was displayed in a scatterplot format with a trend line in order to comprehend the general pattern of relationship amongst urban tree frequency and home value (Figure 4).
- Using the Average Nearest Neighbor tool I was able to create an Average Nearest Neighbor Summary (Figure 5).

Figure 2



RESULTS AND CONCLUSION:

- The Grand Rapids urban forest is spatially clumped and therefore not evenly dispersed throughout the city.
- There are pockets within Grand Rapids 2500+ feet away from the nearest tree.
    - Nevertheless, the majority of the areas in the city are located reasonably close to a tree.
- A positive correlation does indeed exist between tree frequency and home value in Grand Rapids.
    - However, this positive correlation is both slight and very weak meaning future tree planting should not expect to drastically increase the value of nearby homes and therefore should not be a major consideration in choosing areas to expand the Grand Rapids urban forest.

SOURCES:

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- Sander, H., Polasky, S., & Haight, R. G. (2010). The value of urban tree cover: A hedonic property price model in Ramsey and Dakota counties, Minnesota, USA. Ecological Economics, 69(8), 1646-1656.
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Figure 3

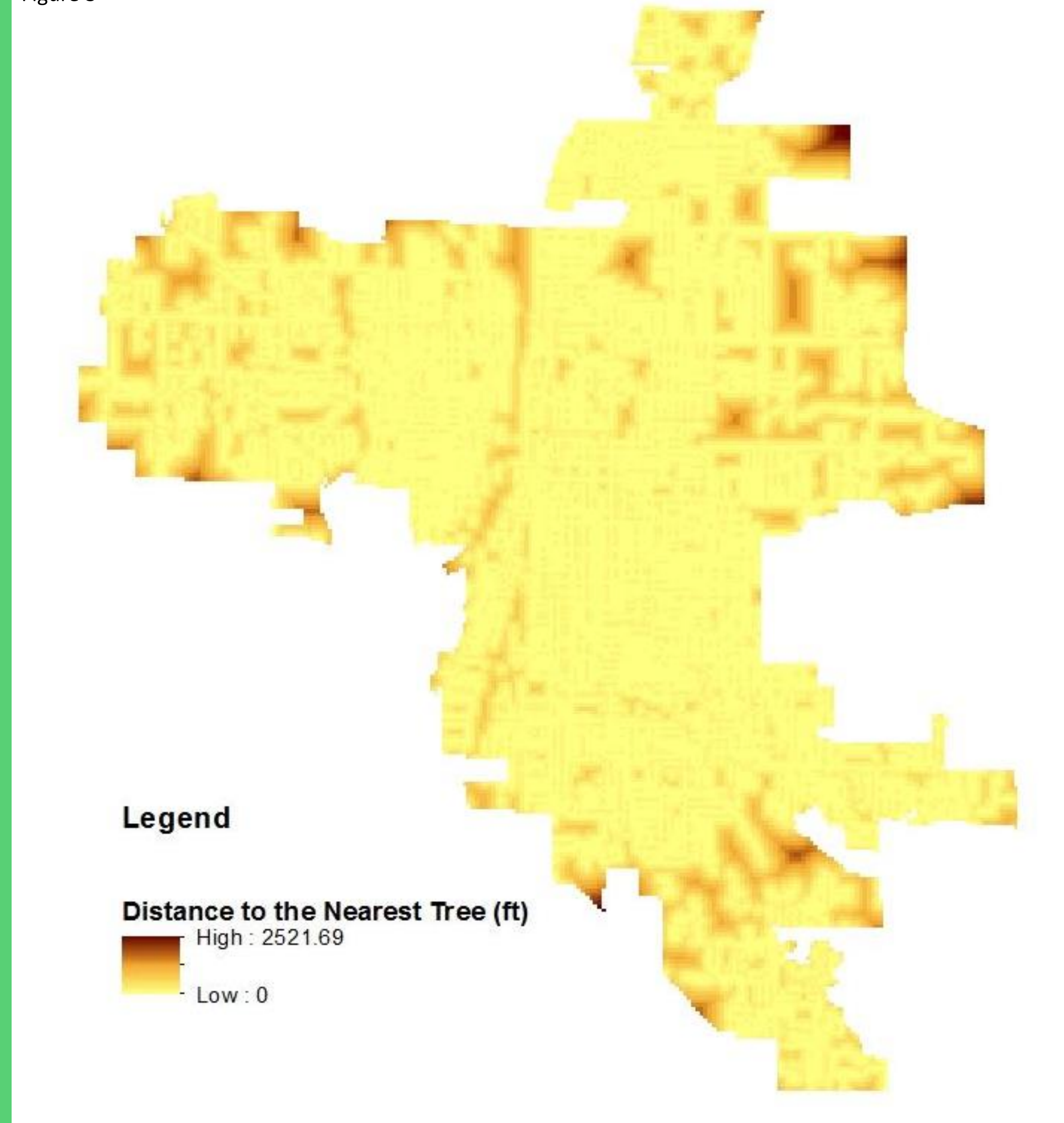

Figure 4

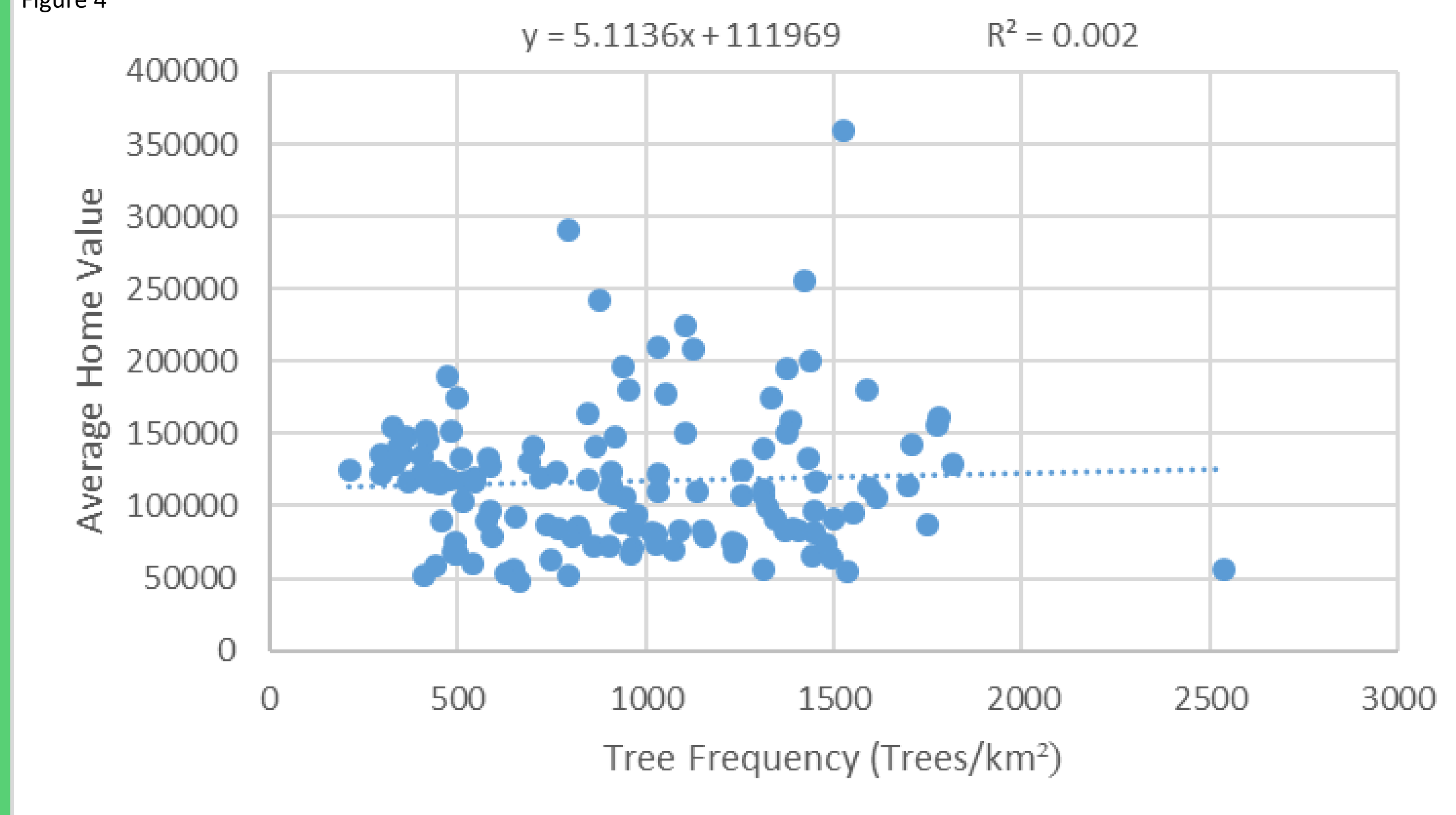

Figure 5