



Branching out Austin

Increasing the Urban Tree Canopy of Low Income Communities in Austin, TX

Background

The urban tree canopy (UTC) provides a variety of benefits for residents. Aside from cleaning the air, reducing carbon dioxide, providing wildlife habitat and mitigating a city's heat-island effect at large, close proximity to trees has been proven to reduce stress, increase property value, and even decrease community crime rates.¹ Unfortunately, the environmental, health and social benefits high UTC density provide are not shared by all. A study by Florida international University measured the distribution of urban tree canopy cover in relation to race/ethnicity and income across seven cities in 2015 showed that there was a positive and significant correlation between UTC cover and median household income.²

The Austin Parks and Recreation Department (APRD) has recently received a grant for \$1,000,000 to increase the city's UTC cover. With this grant, they plan to increase urban forestry in low-income communities in an effort to mitigate economic, social, and environmental disparities. On average, trees cost between

\$12-\$68 dollars each and require \$11/year for maintenance. With this grant, APRD estimates they can plant 1,300 trees with 3 years of provided care.³

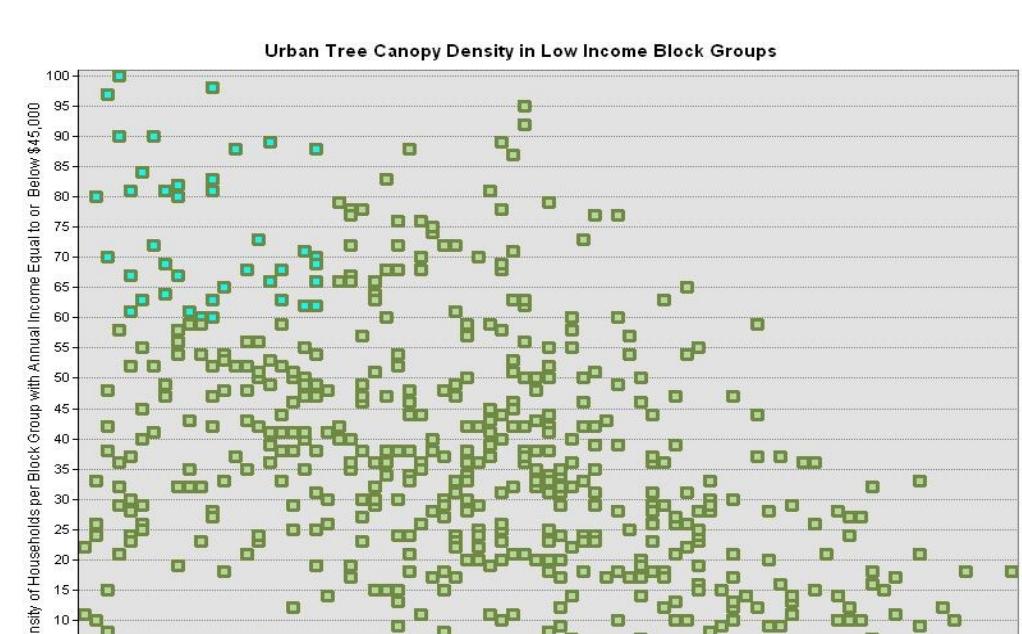


Fig. 2: This scatterplot is comparing the mean UTC per census block group to the density of households with a median annual income of \$45,000 or less. Note the highlighted points denoting block groups with a high number of low income households and low UTC.

income block groups, having inadequate UTC density, and a high population density so the urban forestry efforts could impact the most people.

The American Community Survey data on Median Household income in the Past 12-Months was used to determine low-

Methodology

The first step for APRD was to identify high priority block groups. These block groups were defined by having a high density of low income households, having inadequate UTC density, and a high population density so the urban forestry efforts could impact the most people.

The American Community Survey data on Median Household income in the Past 12-Months was used to determine low-

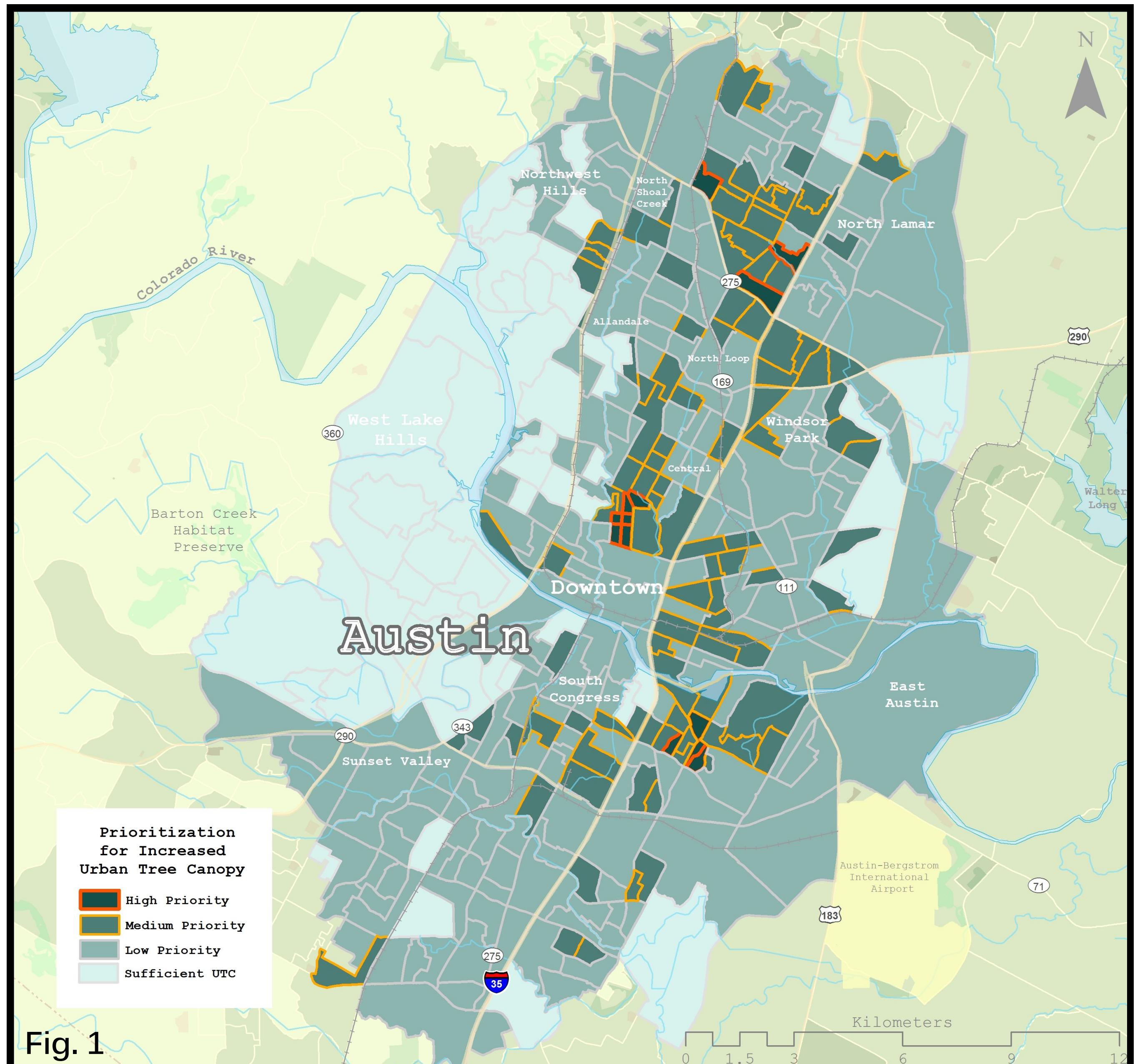


Fig. 1

income block groups. An annual income of or less than \$45,000/year was set as the socioeconomic benchmark status of low income based on percentages and reports from the U.S. Census Bureau.⁴ Columns with numbers of households under the \$45k mark were aggregated in a new field, divided by the total number of households and then normalized by hectares. The UTC canopy raster data from the National Land Cover Database was overlaid on top of the block groups. Mean tree canopy per block group was calculated using a zonal statistics function within ArcGIS. While the main targets were block groups with high numbers of low income households that also had low UTC canopy, it was important to categorize block groups by overall population density for the best allocation of these urban forestry efforts. Each variable was broken into

categories and given a prioritization score where categories reflecting the highest priority were assigned a 3 and those with the lowest assigned a 0. These methods can be seen in figures 3-5

	Low Income Density	UTC Density	Population Density
High Priority (3)	76-100%	0-10%	41-185k ppl/hectare
Medium Priority (2)	51-75%	11-30%	21-40k ppl/hectare
Low Priority (1)	26-50%	31-60%	11-20k ppl/hectare
No Priority (0)	0-25%	59-80%	0-10k ppl/hectare

(Low Income Density Score + UTC Density Score + Population Density Score)/3= Prioritization Score

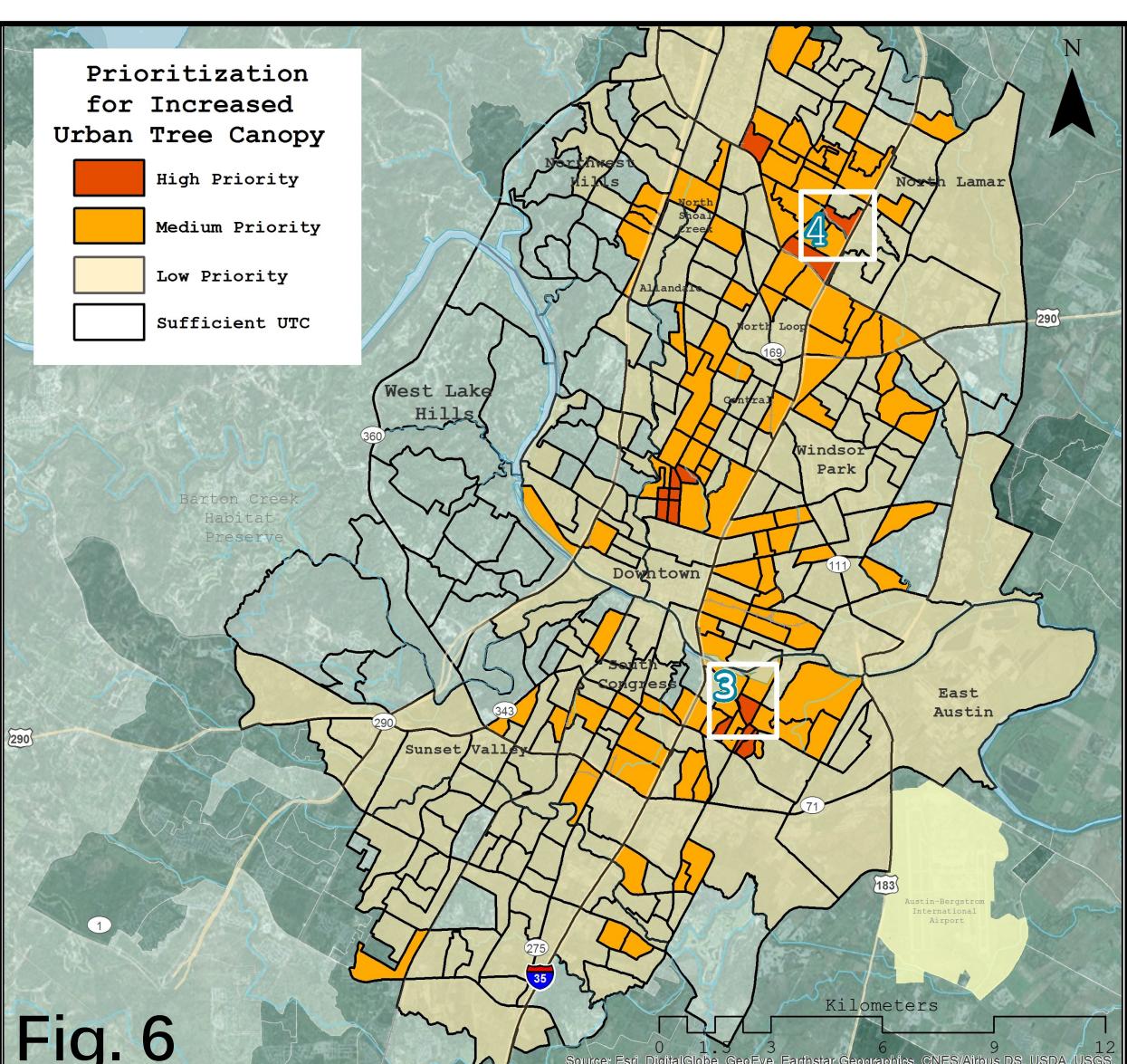
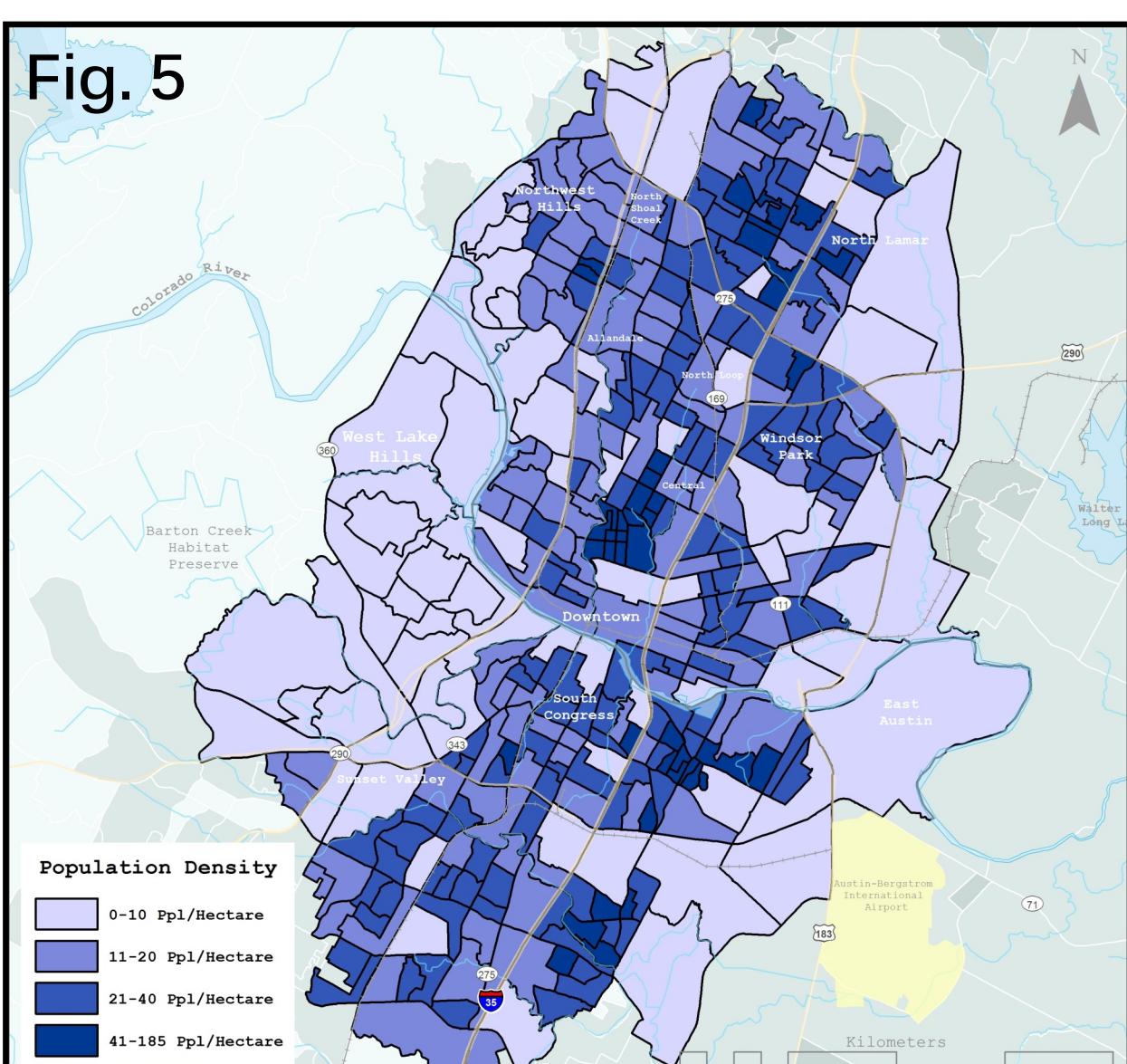
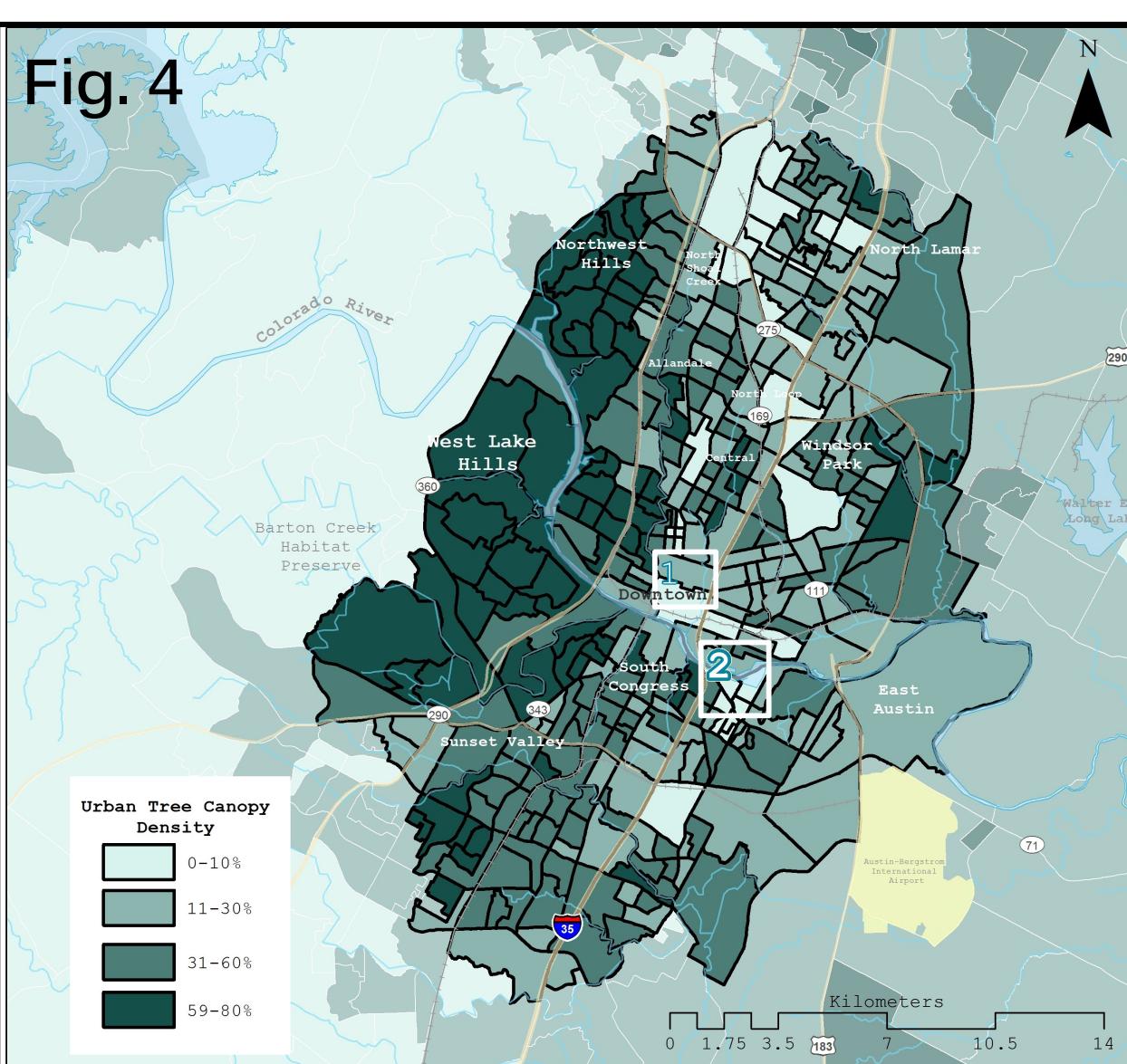
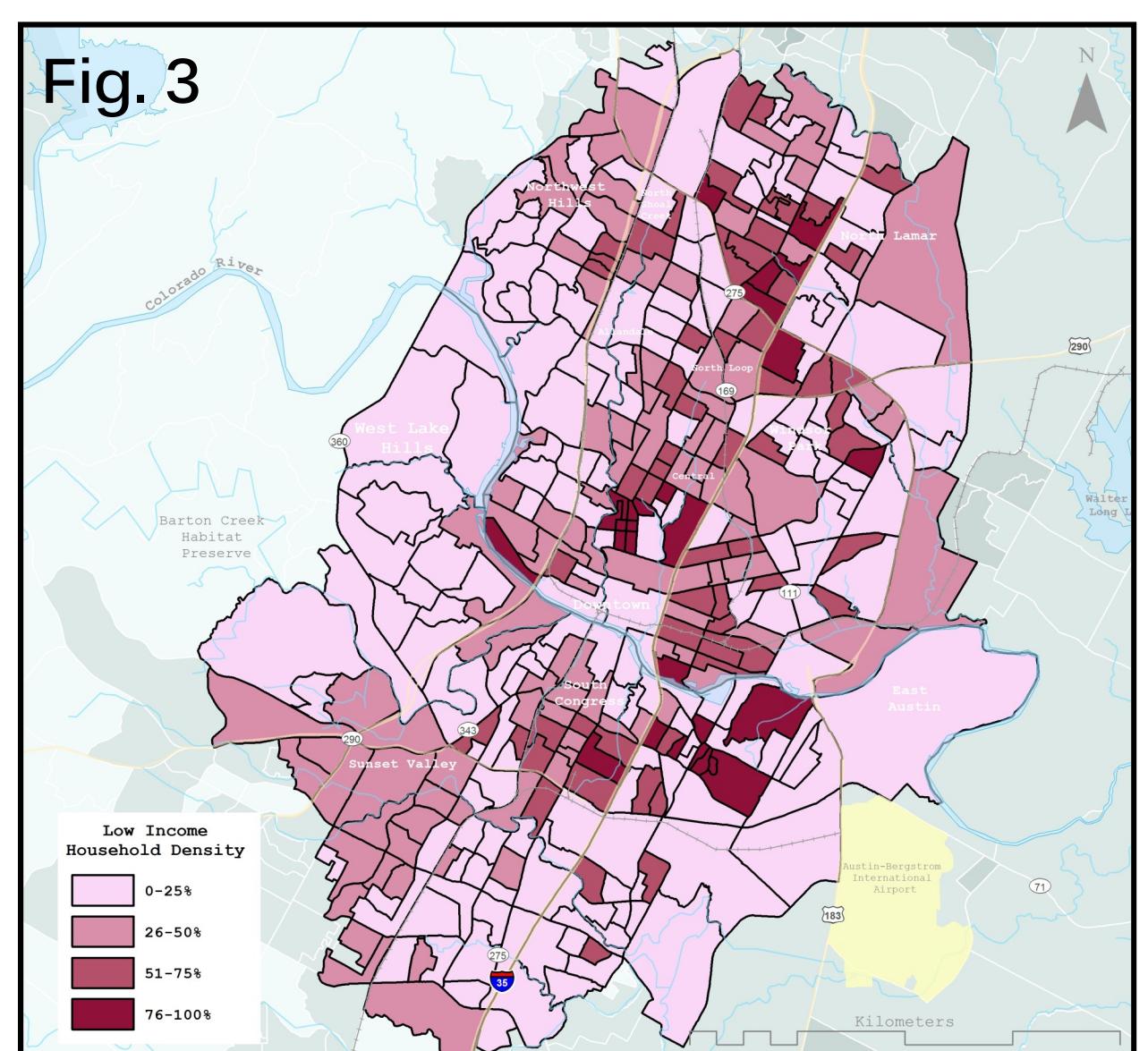
Results

Out of the 918 block groups studied, APRD identified 11 block groups as high priority areas and over 70 block groups as medium priority areas. The high priority areas represent communities that have a high density of low income households, high population density, and low UTC cover. The results can be seen in figure 5 with high priority areas in red and medium priority areas in yellow.



Conclusions

Identifying possible block groups is the first step in APRD's efforts. Like all models, users must be skeptical of data available. Images 1&2 above are close examinations of the UTC data from 2011. Image 1 shows a block group identified as having 0-10% tree cover and seems to be fairly accurate. Image 2 depicts the same coverage, but with more visible vegetation. The data is from 2011, so trees might have grown. Images 3 & 4 offer a closer inspection of high priority areas labeled in figure 6. Image 3 shows an area that seems to have a decent amount of tree coverage, but is labeled as 'high priority' due to the low income and population density of the block group. This block group may not be the best for APRD's urban forestry efforts. Image 4 shows another high priority area that could be an industrial zone. While trees would be nice to have there as well, planting trees there will not benefit as many residents in this block group. APRD now needs to use a land use layer to identify areas where people would get the most exposure to trees on an everyday basis such



Kristin Sukys

Fundamentals of GIS 231
December 22, 2016
Projection: NAD 1983 UTM Zone 14

References:

- Danford, Rachel (2014) *What does it take for Equitable Urban Tree Canopy Distribution? A Boston Case Study*. University of Massachusetts, Amherst. <http://digitalcommons.umass.edu/cgi/viewcontent.cgi?article=1123&context=cate> Accessed 12/1/16
- Schwartz,Kirsten (2015) *Trees Grow on Money: Urban Tree Canopy Cover and Environmental Justice*. Florida International University. http://digitalcommons.fiu.edu/cgi/viewcontent.cgi?article=1002&context=gss_fac Accessed 11/29/2016
- Seitz J, Escobedo F (2015) *The Cost of Managing an Urban Forest*. University of Florida IFAS Extension. <http://edis.ifas.ufl.edu/fr279> Accessed 11/30/2016
- Devavans, Carmen (2015) *Income and Poverty in the United States: 2014 Current Population Reports*. U.S. Department of Commerce Economics and Statistics Administration. U.S. Census Bureau. <https://www.census.gov/content/dam/Census/library/publications/2015/demo/p60-252.pdf> Accessed 12/22/16

Data & Image Sources:

- Median Household Income in the Past 12 Months, Texas, U.S. Census Bureau American Community Survey (2014)
- Total Population , Texas, U.S. Census Bureau American Community Survey (2014)
- NLCD 2011 USFS Tree Canopy Carographic, National Land Cover Database (2011)
- Tree Clipart: <http://clipsart.co/stencil-of-a-tree-outline>