Socio-Economic Benefits of Austin's Tree Canopy

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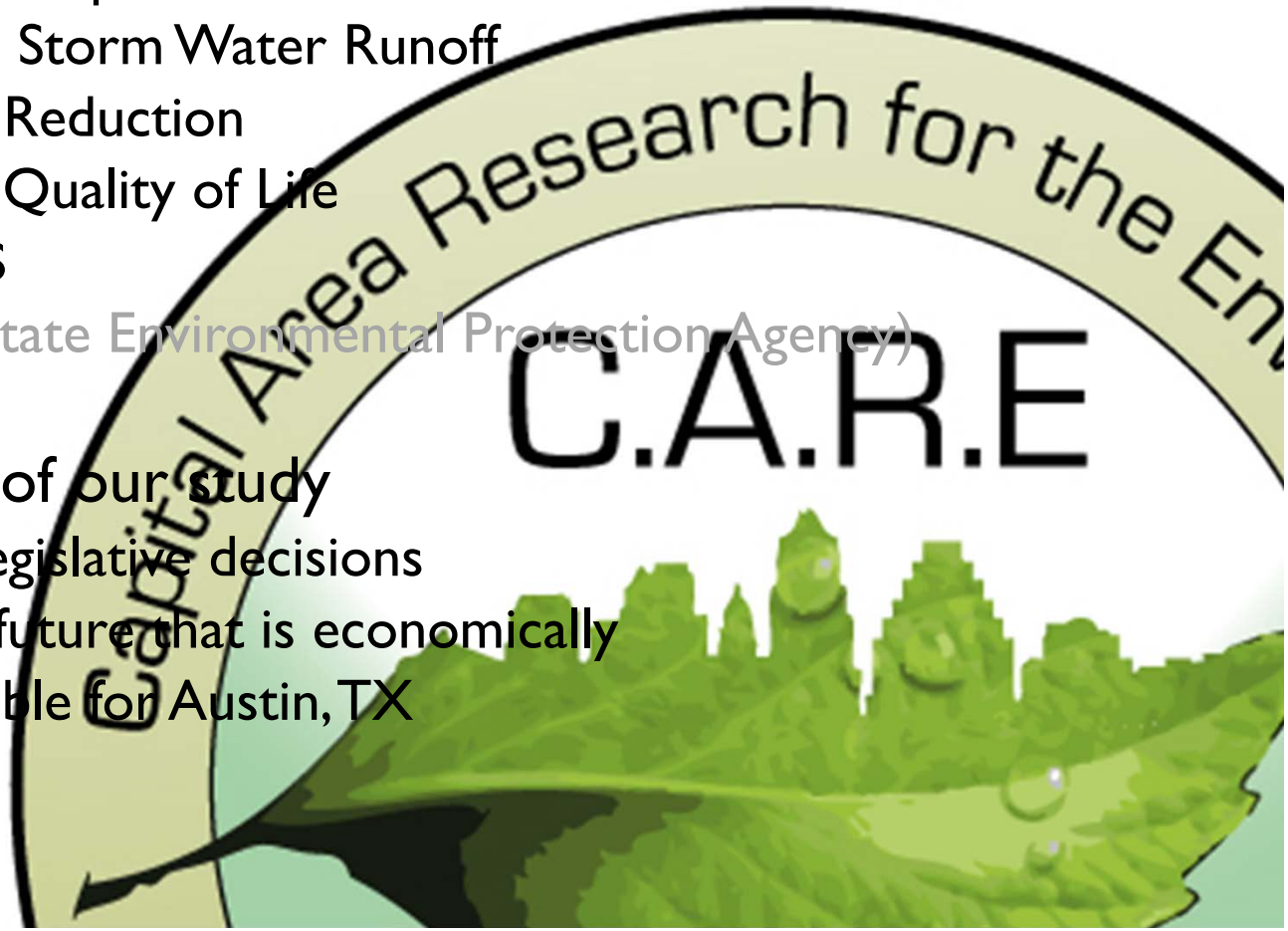
Introduction

- Urban Tree Canopy and Socio-Economic Benefits:
  - Carbon sequestration
  - Reduce Storm Water Runoff
  - Energy Reduction
  - Higher Quality of Life
  - Less $$

  (United State Environmental Protection Agency)

- Benefits of our study
  - COA legislative decisions
  - Green future that is economically feasible for Austin, TX



Primary Areas of Study

- Crime rates
  - Lower crime = less costs and happy citizens
- Property values
  - Higher property value = higher property taxes and affluent citizens

Property Values Research

- Twin Cities
  - Increasing tree cover w/in 250 meters = 60% gain in home sale prices
- Comparison Model
  - How do external factors relate?

(Sander 2010)

3 External variables rather than model

Kyle Fuchshuber, 9/27/2013

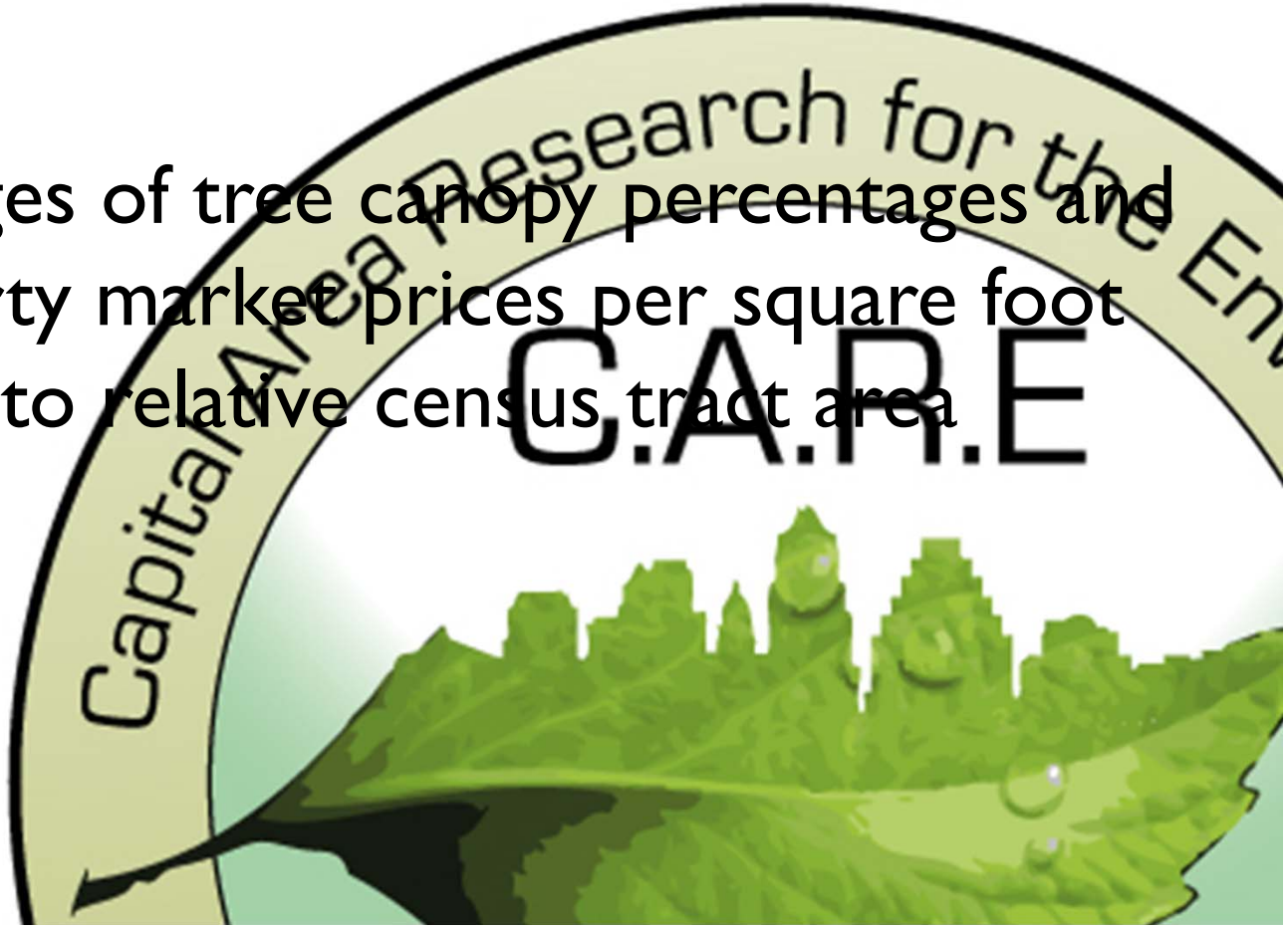
Crime Rates research

- Baltimore
  - Strong negative relationship
- Portland
  - Moderately negative in old growth forests

(Donovan, Prestemon, 2010)

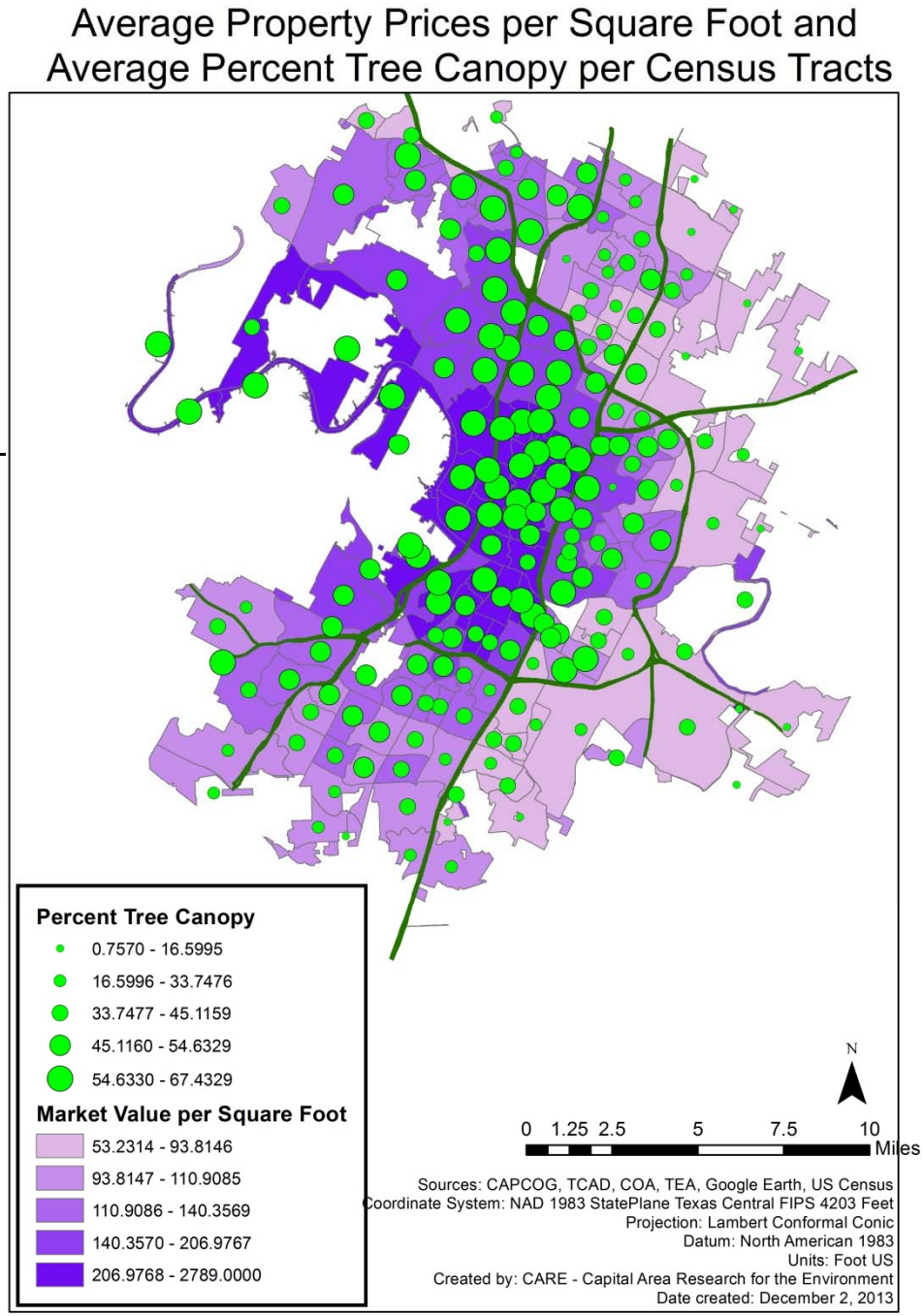
Methodology – Tree Canopy and Property Values

- Single-family residences extracted from parcel data
- Averages of tree canopy percentages and property market prices per square foot joined to relative census tract area



Apparent patterns…

- Census tracts are assigned average market price of single-family parcels within tract area
- Percent tree canopy is assigned to census tracts in same manner



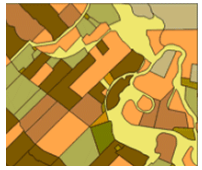
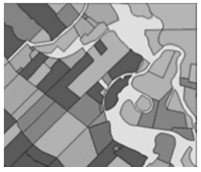
Methodology – Tree Canopy and Property Values

- Geographically Weighted Regression
  - Explanatory variables:
    - Percentage of tree cover
    - Texas Education Agency ranked schools
    - Proximity to parks/natural attractions
    - Proximity to Cultural Attractions
      (Theatres, Shopping, Nightlife)

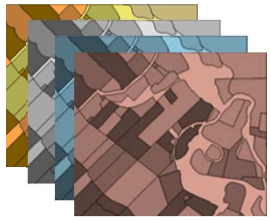
Geographically Weighted Regression




$\beta_1\ Tree\ canopy\ +\ \beta_2\ Schools + \beta_3\ Parks + \beta_4\ Cultural\ Attractions$

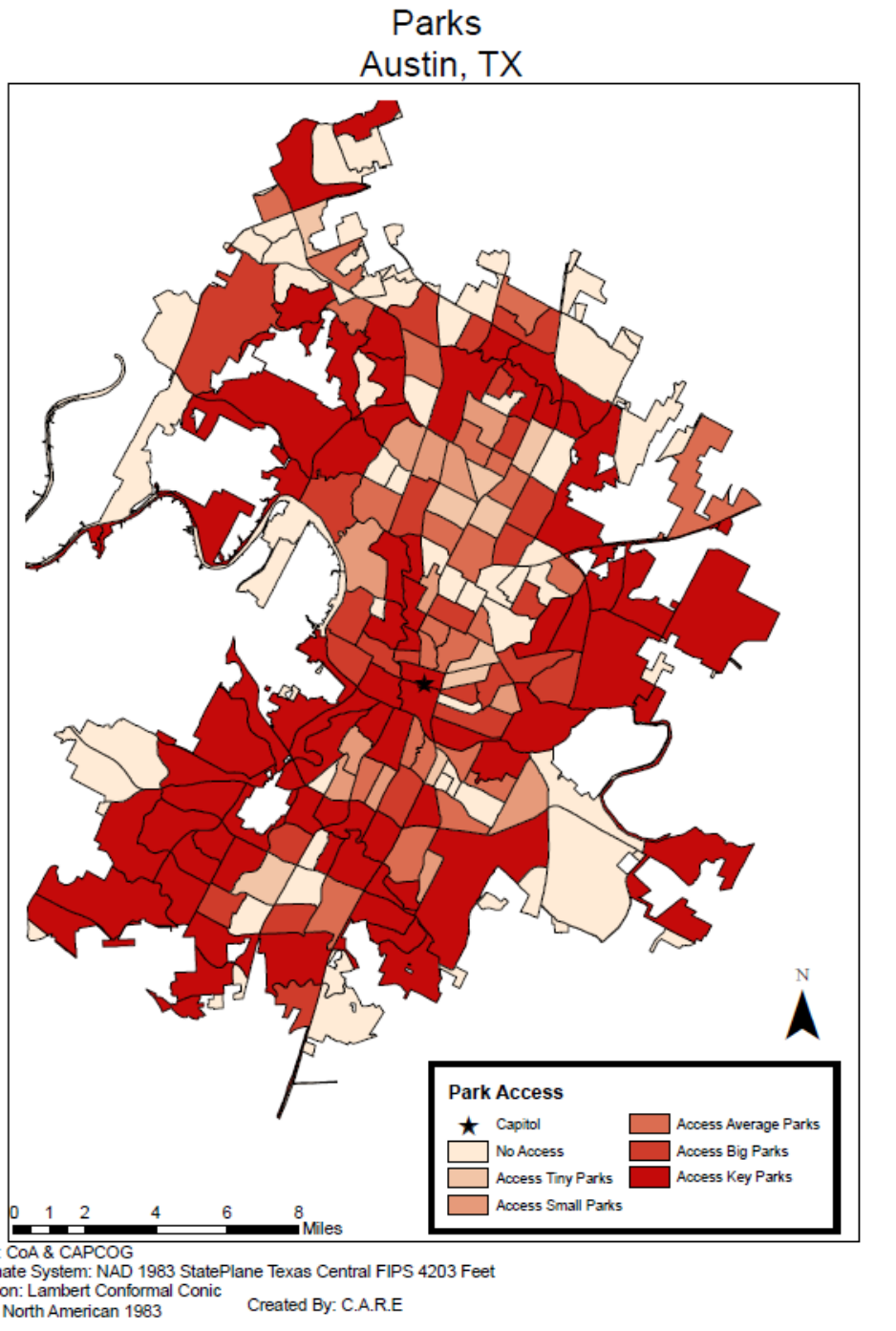




= **Property Value**



Ranking of Parks/Natural Areas

- - Ranking census tracts
  - a. Rank parks by size
  - b. Assign Value by Parks Number Range
  - c. Rank Census Tract by Value of Parks in Individual Tract
- Parks Ranking
  - Hot Spot Isolation
    - a. CoA Data Used
    - b. Buffer
    - c. Clip with Study Area
    - d. Intersect Findings for Final



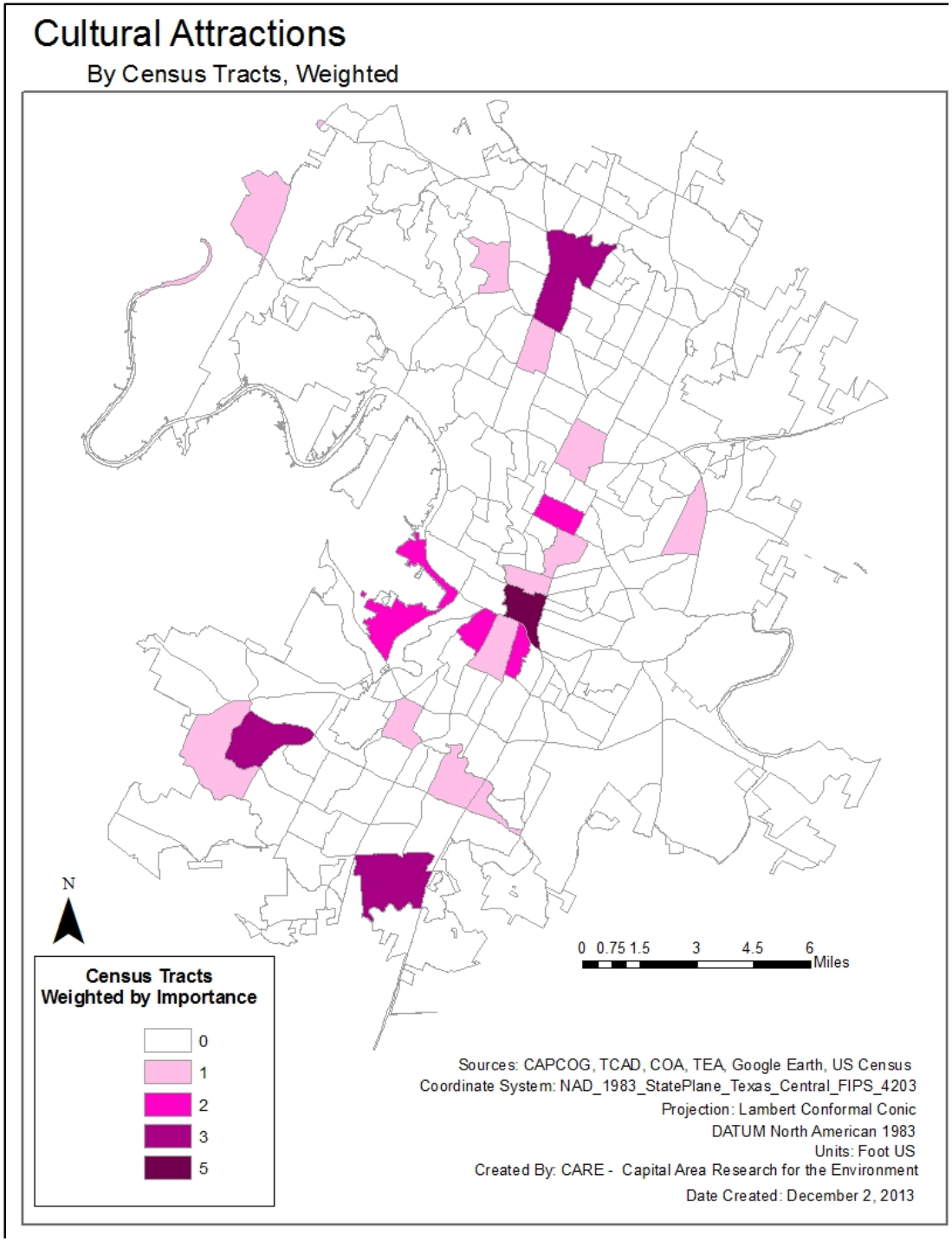
Ranking Cultural Attractions:

Most Important Areas:

- Shopping Centers/Malls
- Cinemas/Theaters
- Nightlife

- Each venue/area was then weighted:
  - No venues = 0
  - Theater, performing arts center, or cinema = 1
  - Nightlife area = 1
  - Regular shopping center =1
  - Major shopping center or mall = 2.

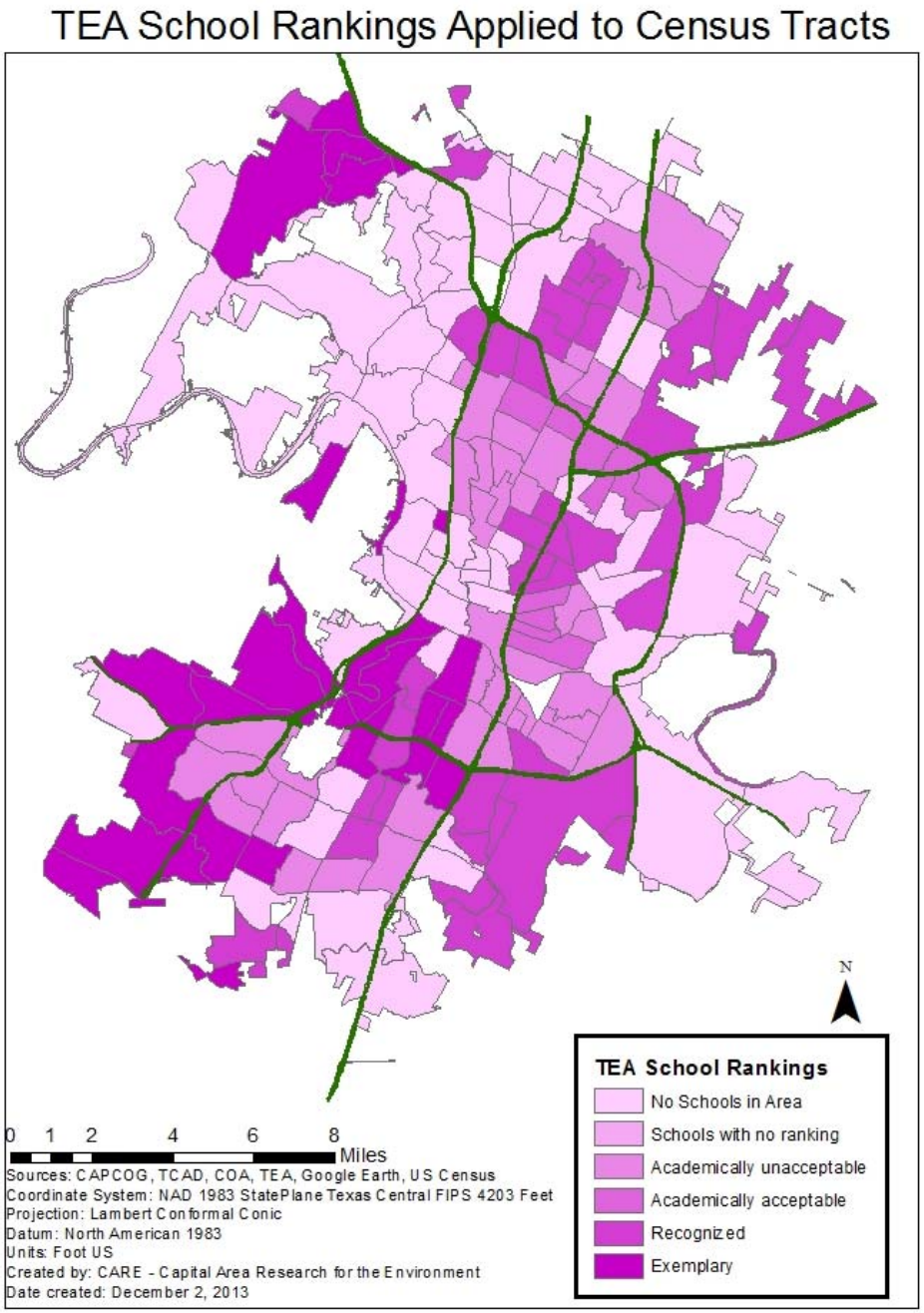
- If more than one venue exists in a census tract, the values are added up, for a total of up to 5. Values ranged from 0 to 5.



Ranking Schools

- Schools located by points
- Each school given Texas Education Agency ranking:
  - No ranking/data: 1
  - Academically unacceptable: 2
  - Academically acceptable: 3
  - Recognized: 4
  - Exemplary: 5

- Schools then joined to census tracts
  - Rank averages calculated
- Census tracts ranked by:
  - Number of schools
  - Average ranking
  - Most reoccurring school ranking within tract

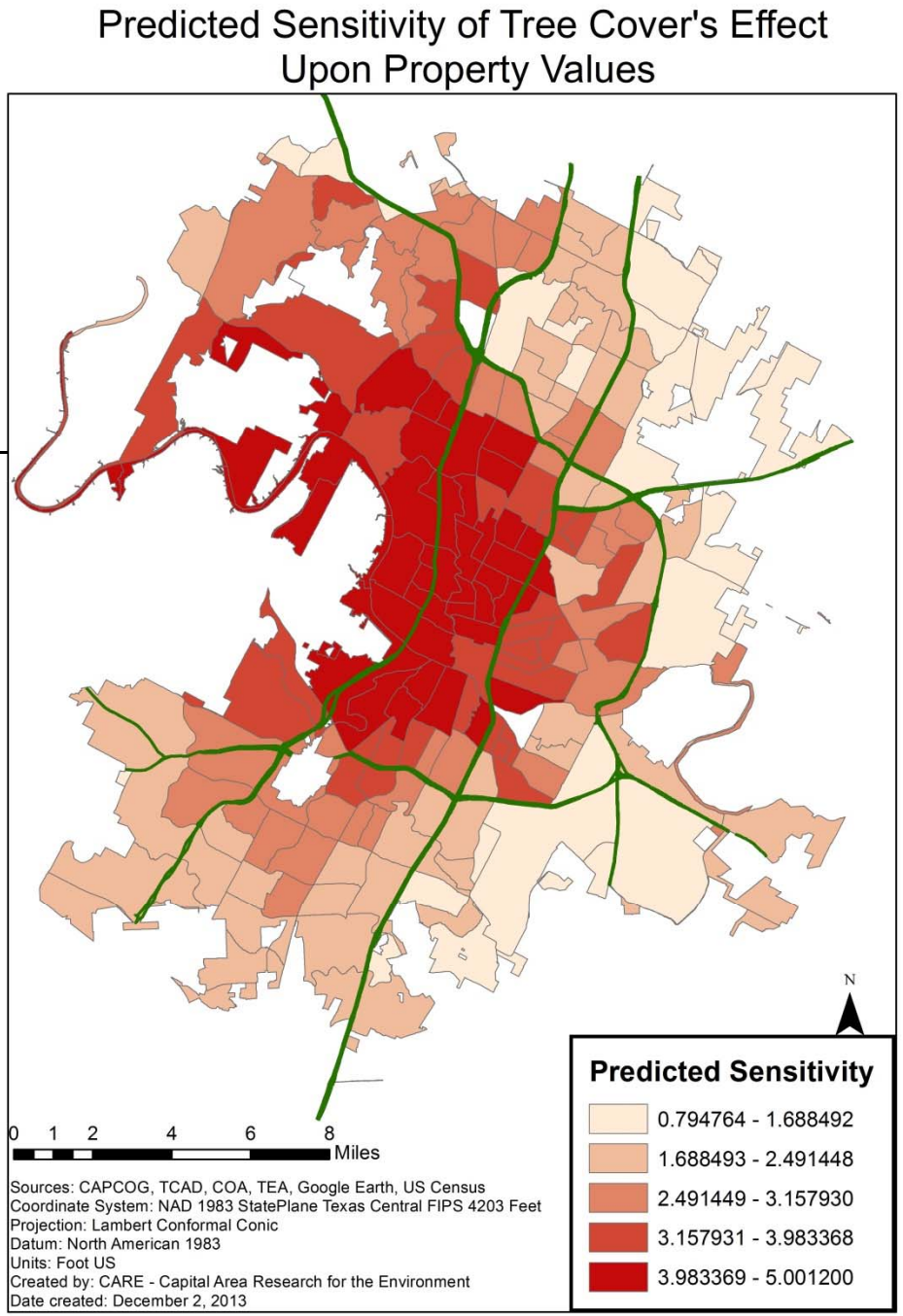


Tree Canopy's Effects upon Property Values:

Results

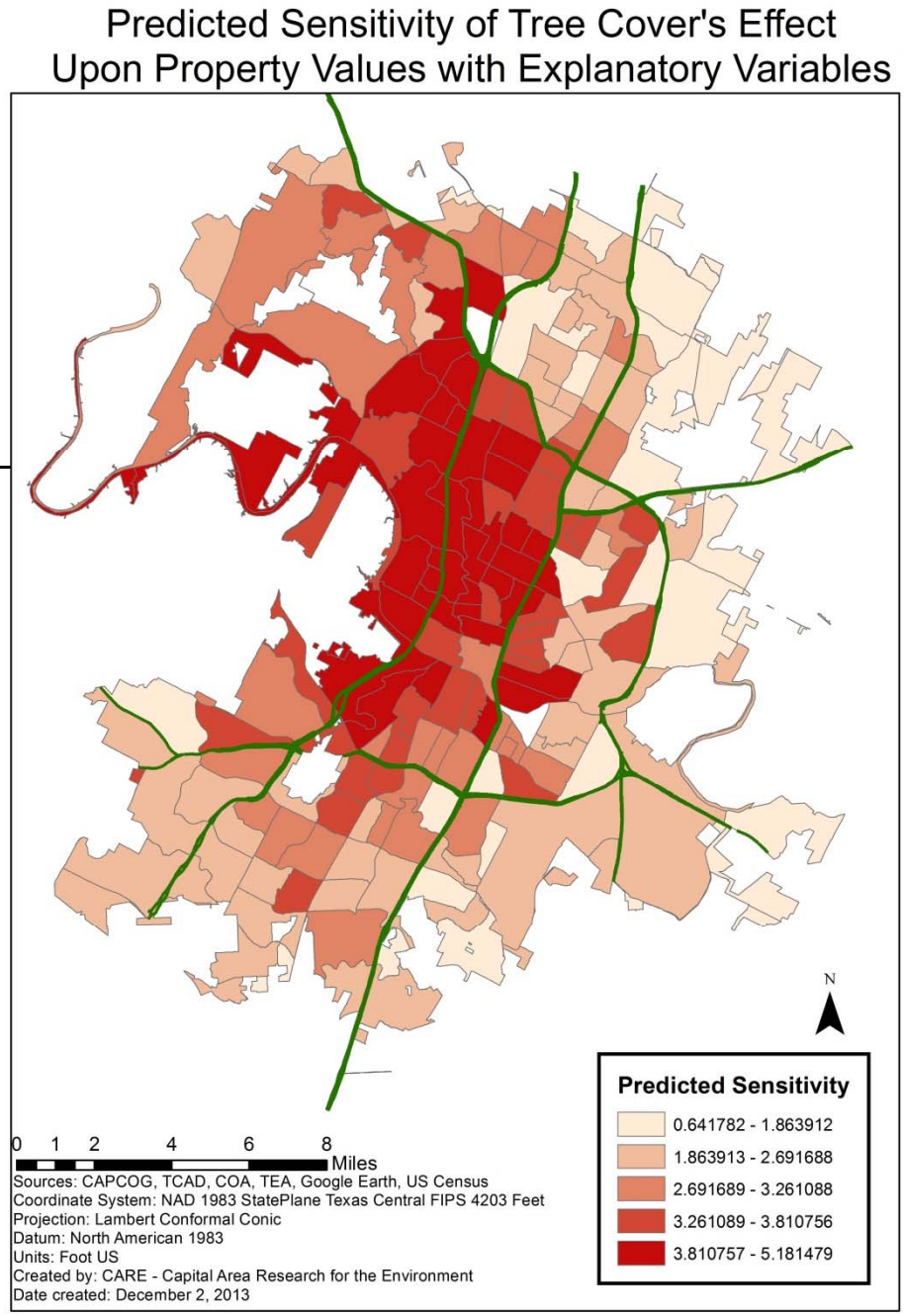
Prediction follows High Value = High Tree Coverage pattern

- Tree Cover and Property Value are directly correlated with no explanatory variables
- Prediction follows hypothesis: higher percentage of tree cover is associated with higher property values



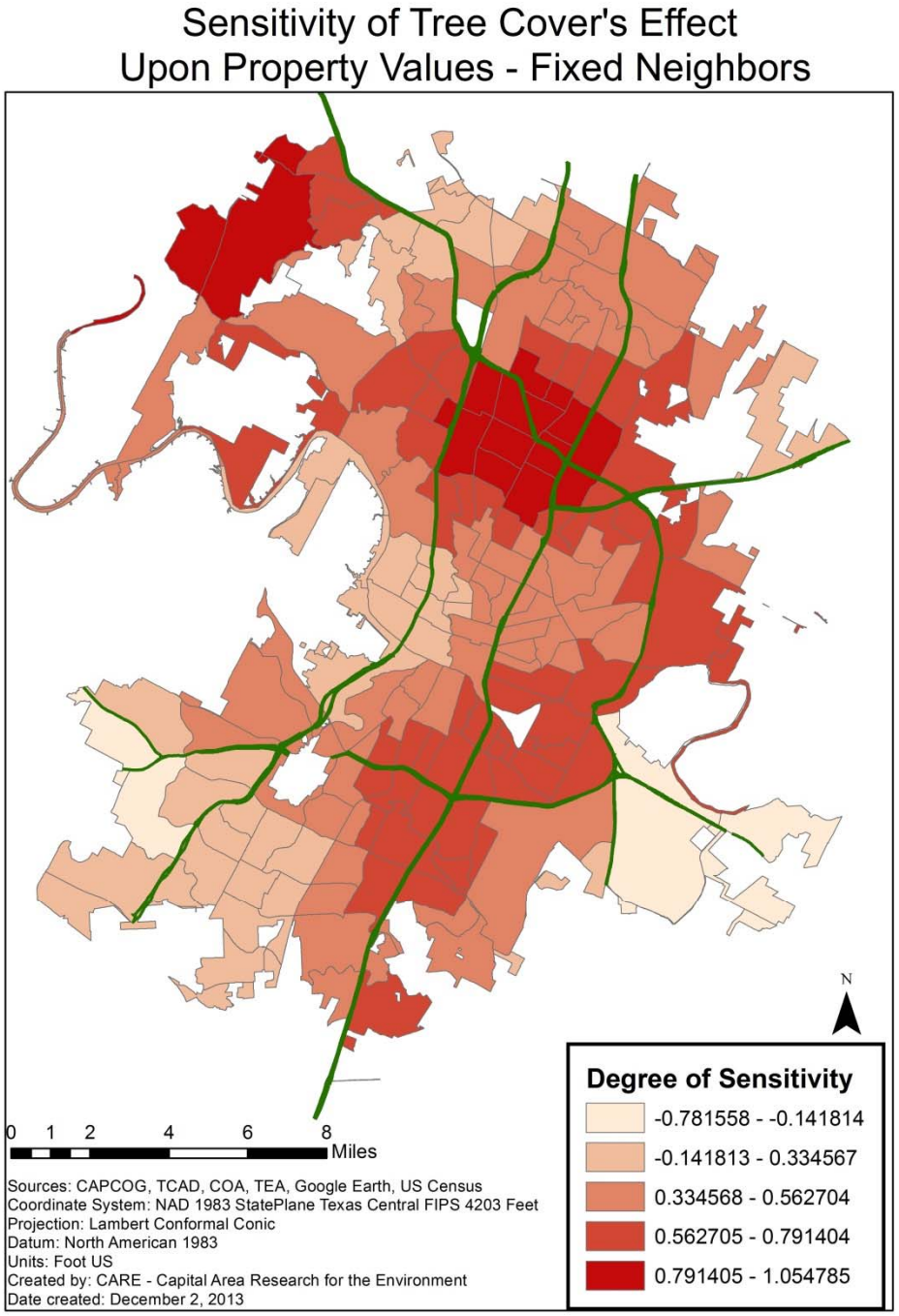
Prediction with considerations

- Property value is correlated to tree cover as well as other explanatory variables
- Areas closer to central business districts and proximity to parks also have an influence on property values



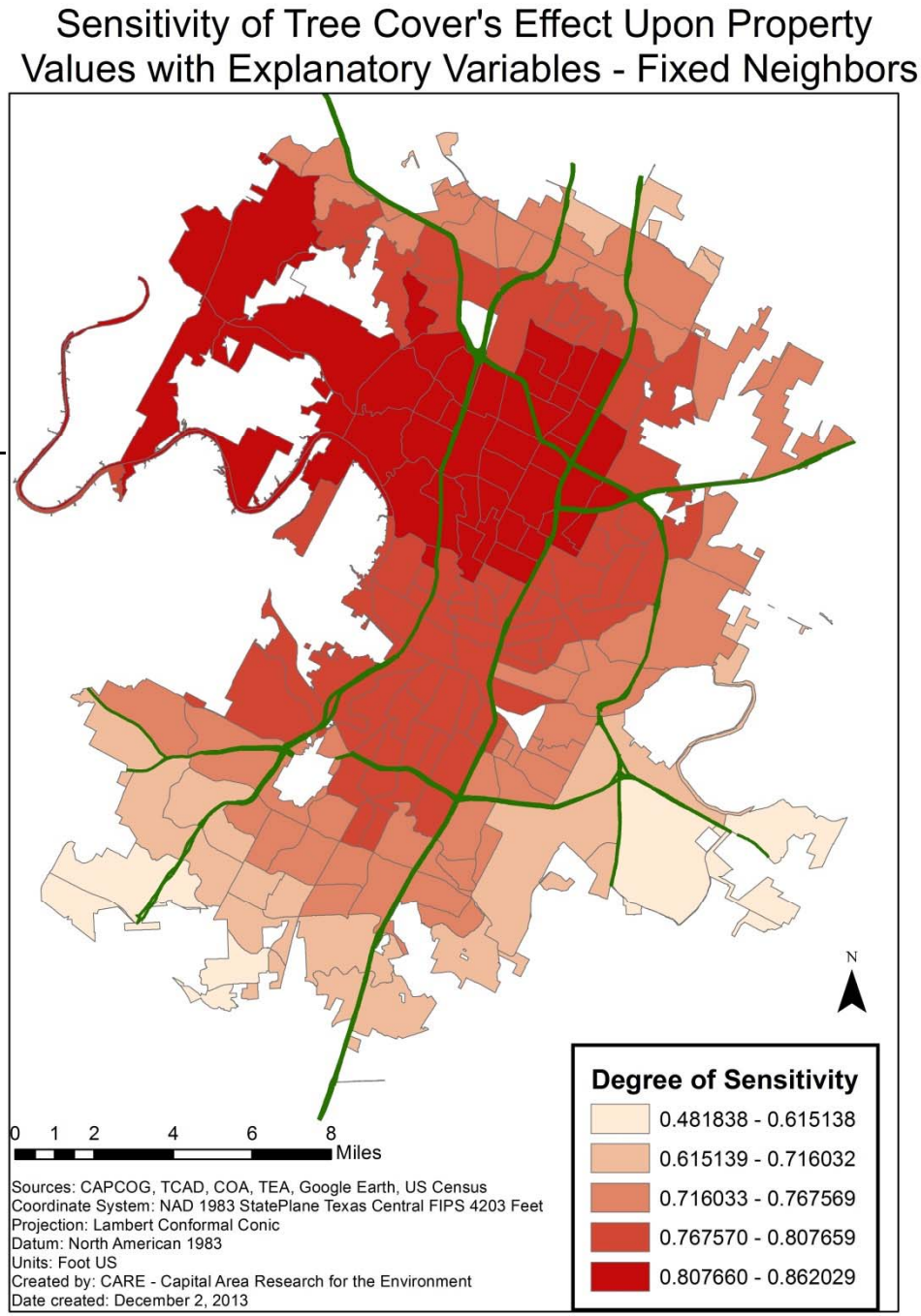
Direct Correlation

- Tree Cover and Property Value are directly correlated with no explanatory variables
- Darker hues of red indicate that the area's property values are more sensitive to tree cover



Explanatory Variables give closer look of reality

- Property value's sensitivity to tree cover is correlated with tree cover as well as other explanatory variables
- Area of highest positive correlation represents 23% of Austin's singe family homes.



Conclusions

- 23% of all single-family parcels will benefit greatly from tree coverage.

- Tree canopy has a positive correlation to property values in the City of Austin

Data

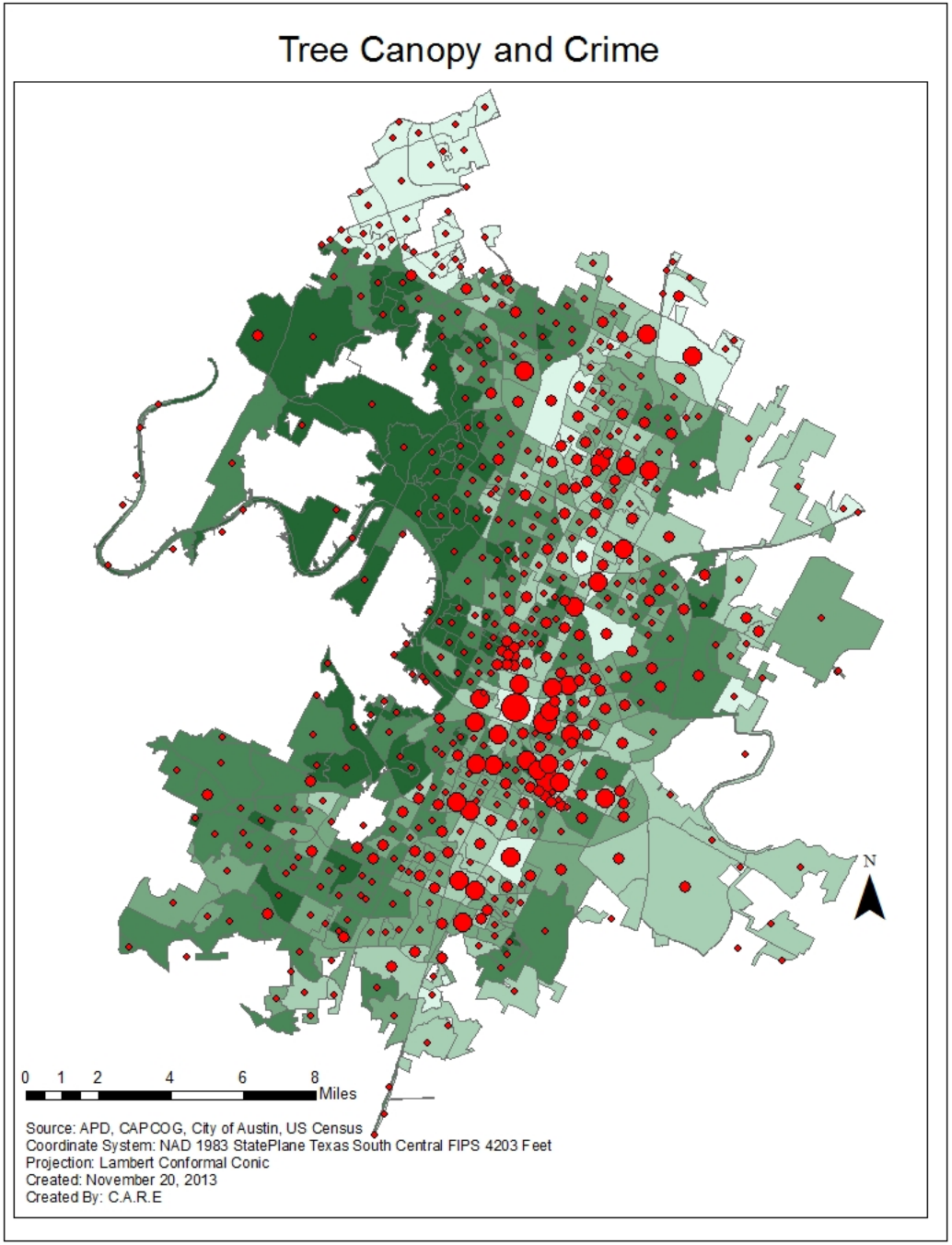
- TCAD Parcels – Percent Tree Canopy and Property Market Prices
- US Census Tracts
- TEA – School Rankings
- CAPCOG – City of Austin Border
- Google Earth – Cultural Attractions
- City of Austin - Parks

Tree Canopy's Effects upon Crime Rates:

Results

Results

- Figure 1A:



4 Suitability model or COA

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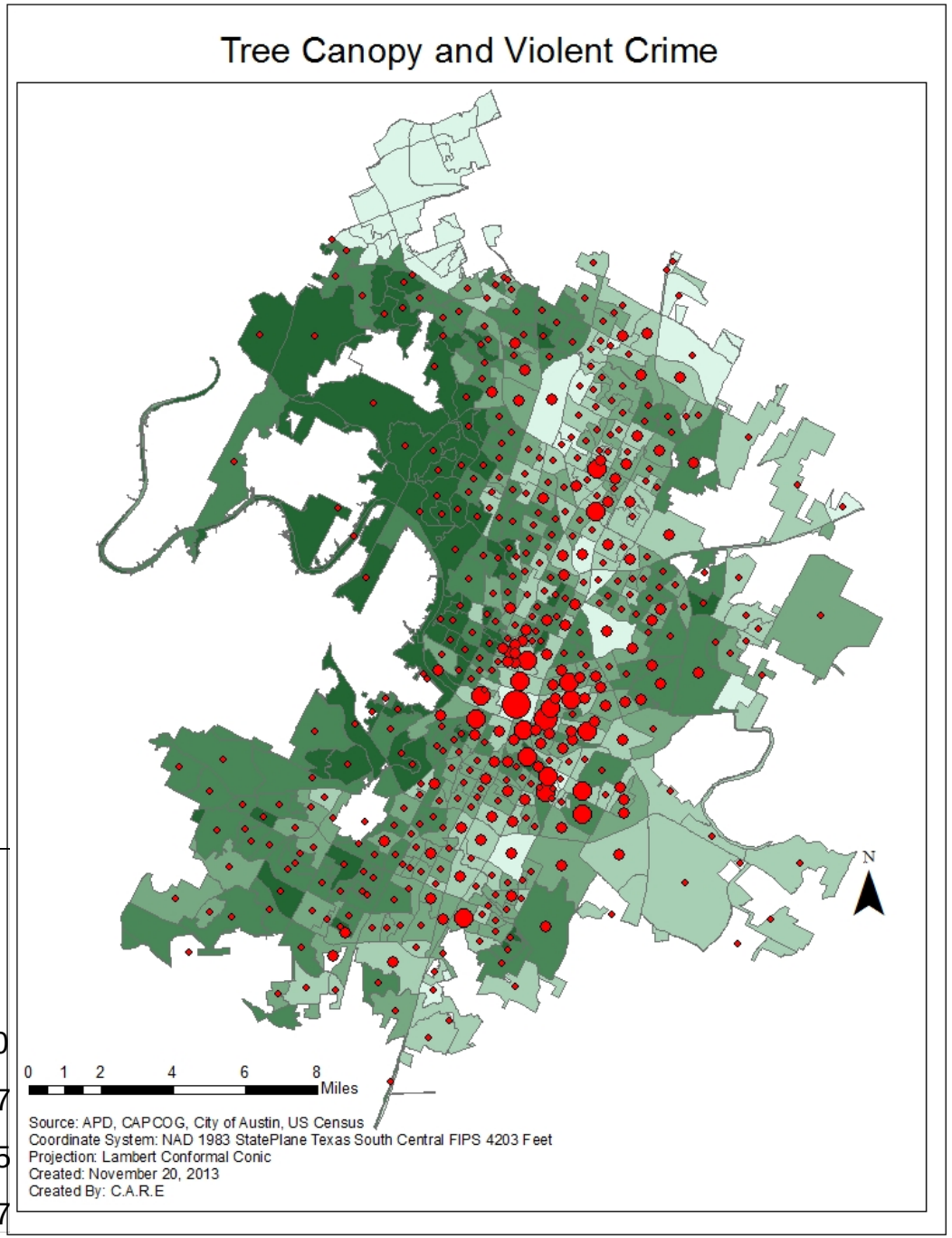
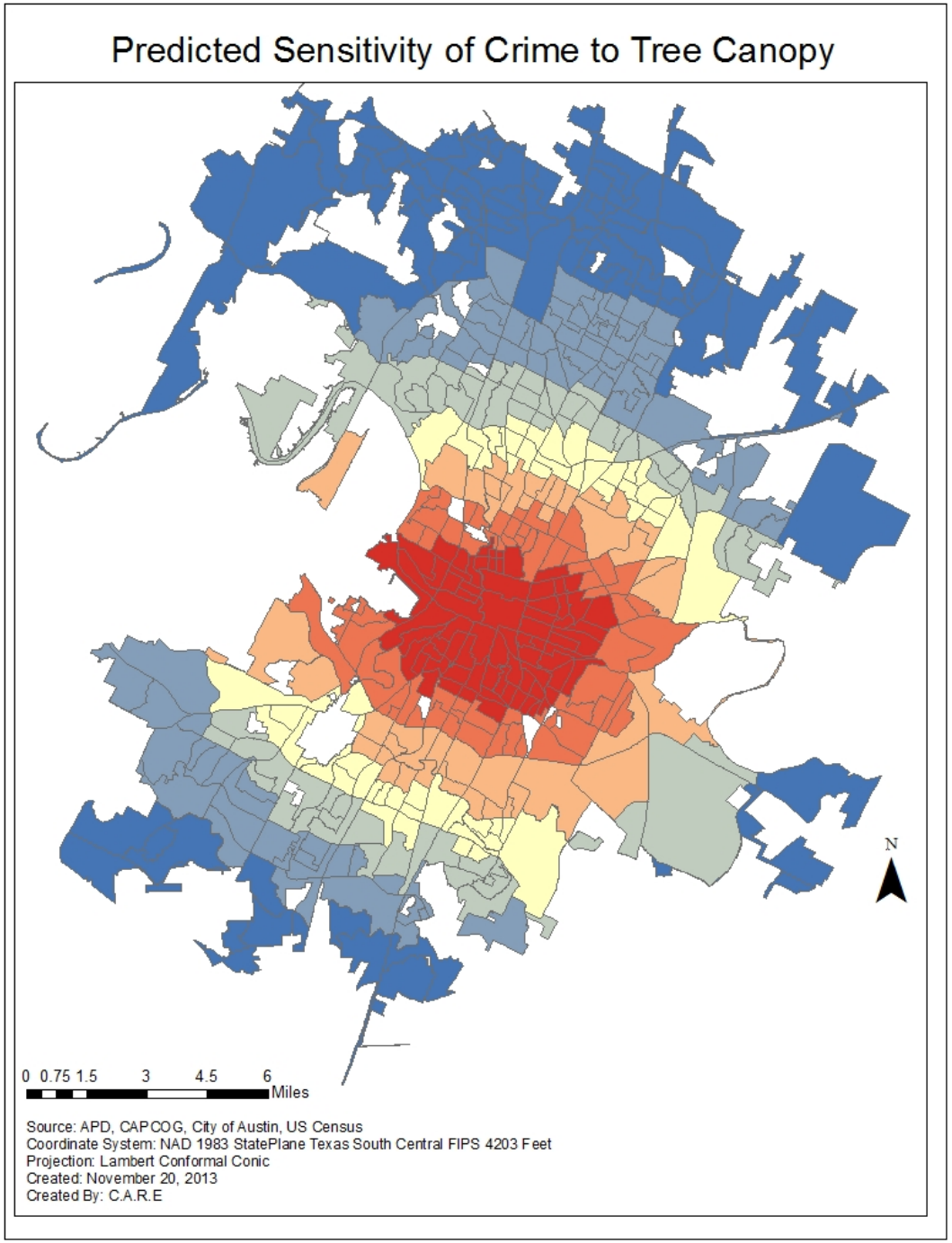
Results

- Figure 1B:



Results

- Figure 2A:



5 External variables rather than model

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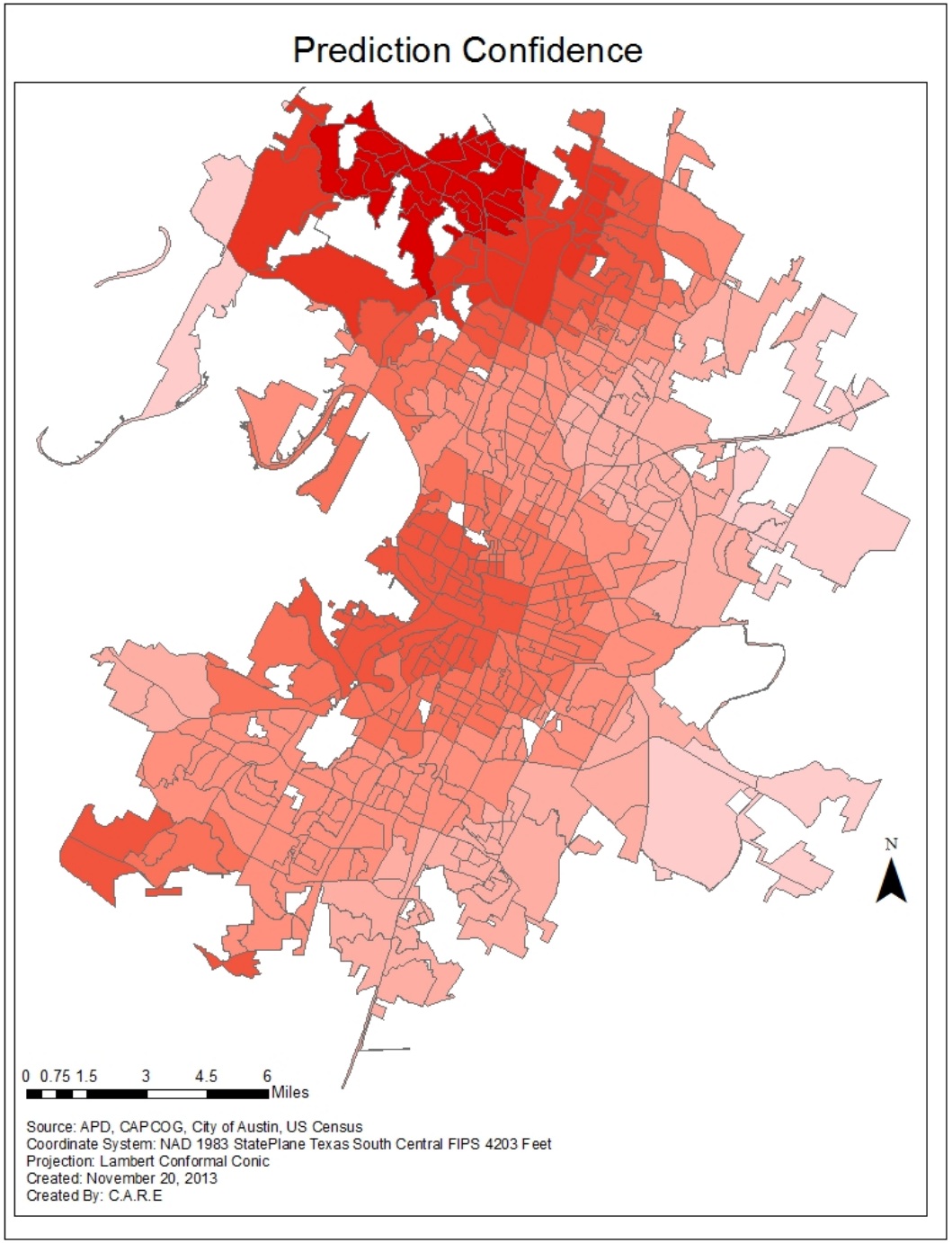
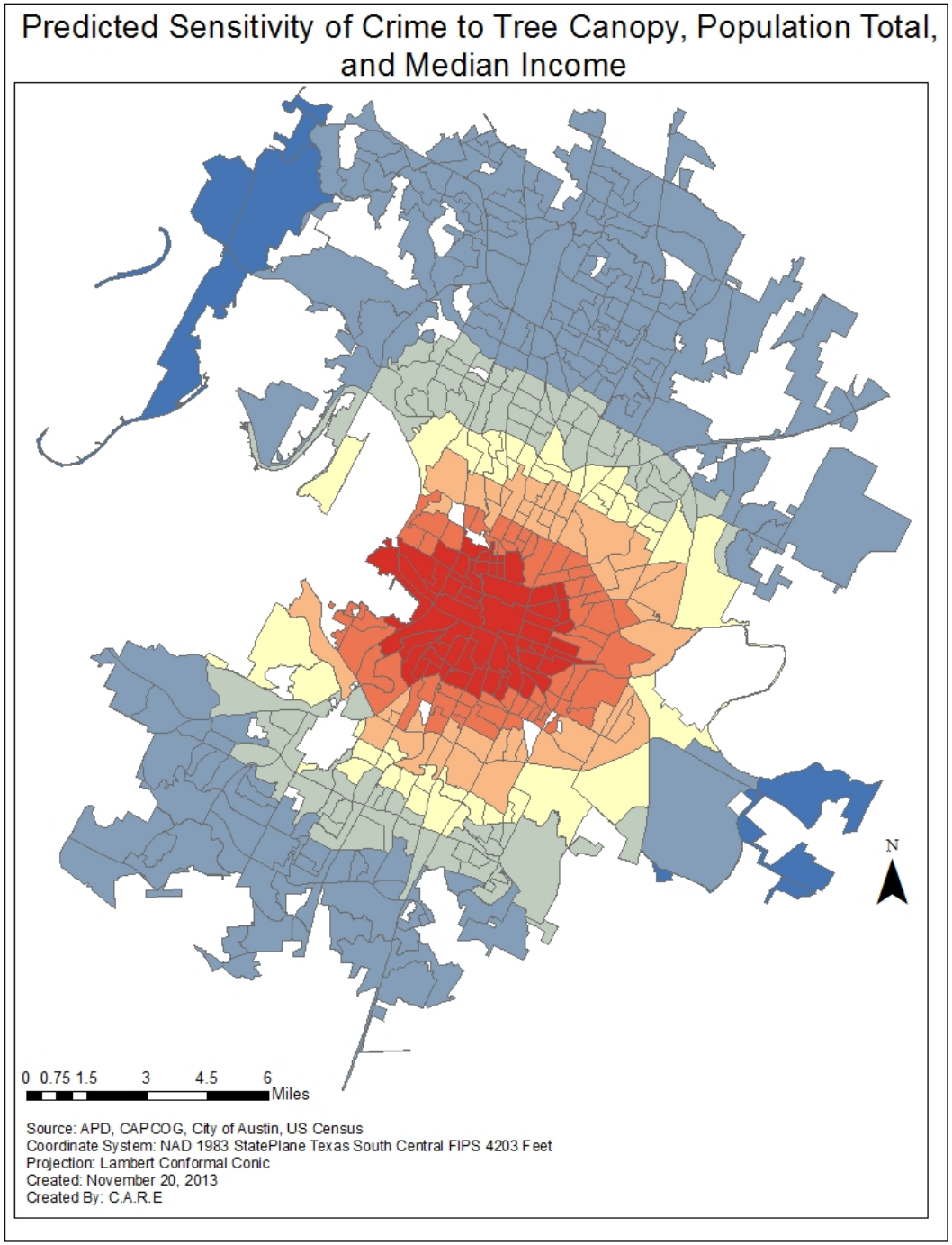
Results

- Figure 2B:



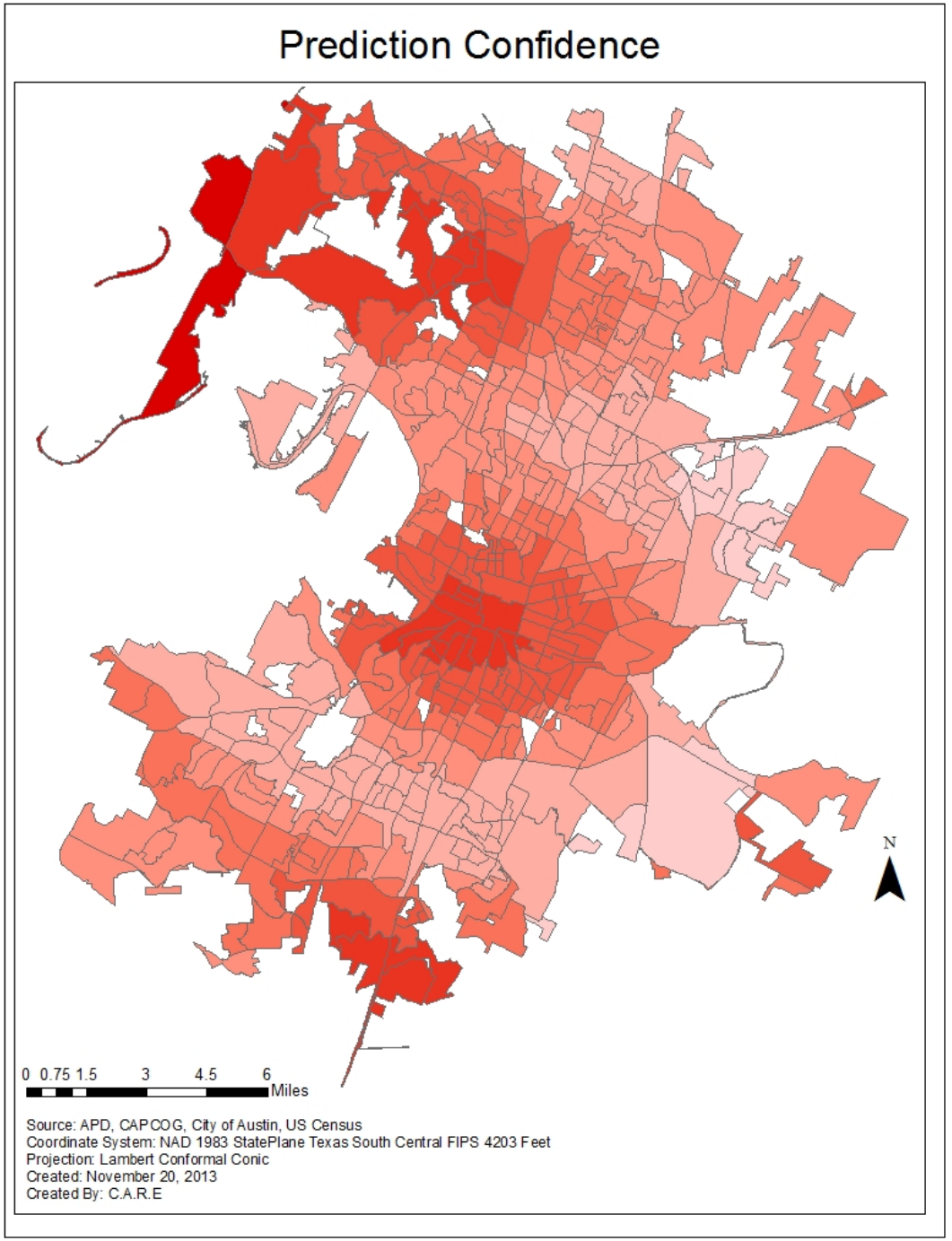
Results

- Figure 3A:



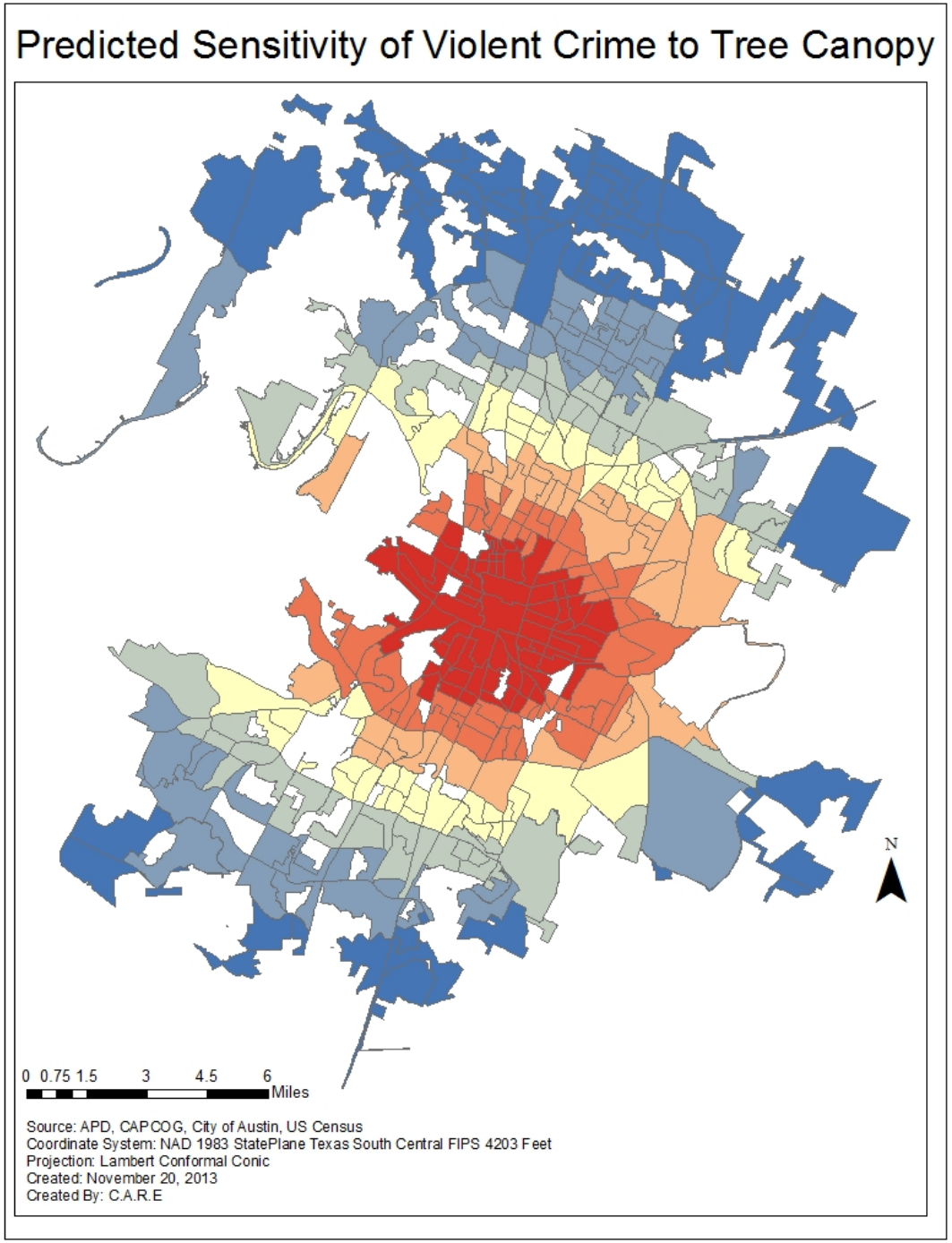
Results

- Figure 3B:



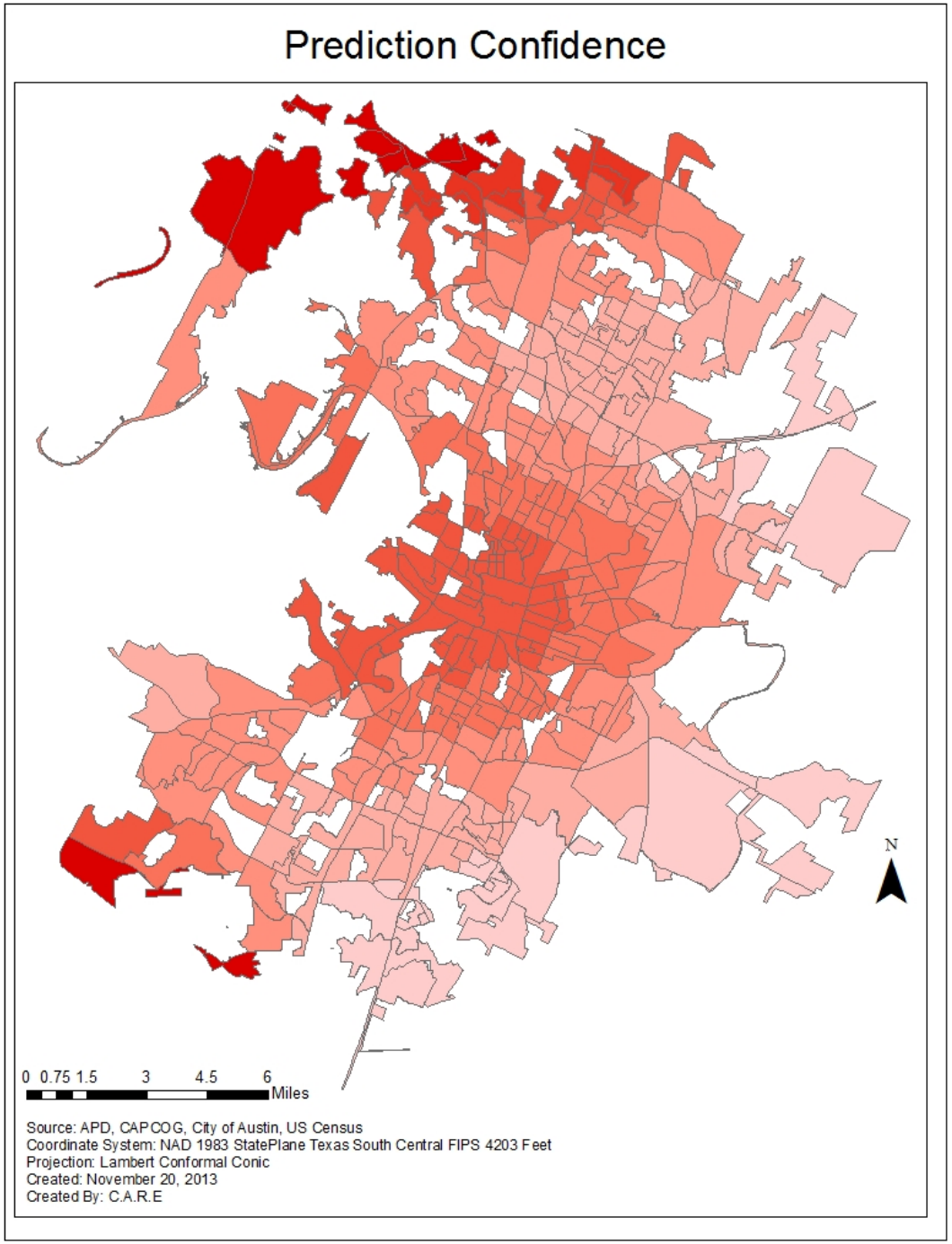
Results

- Figure 4A:



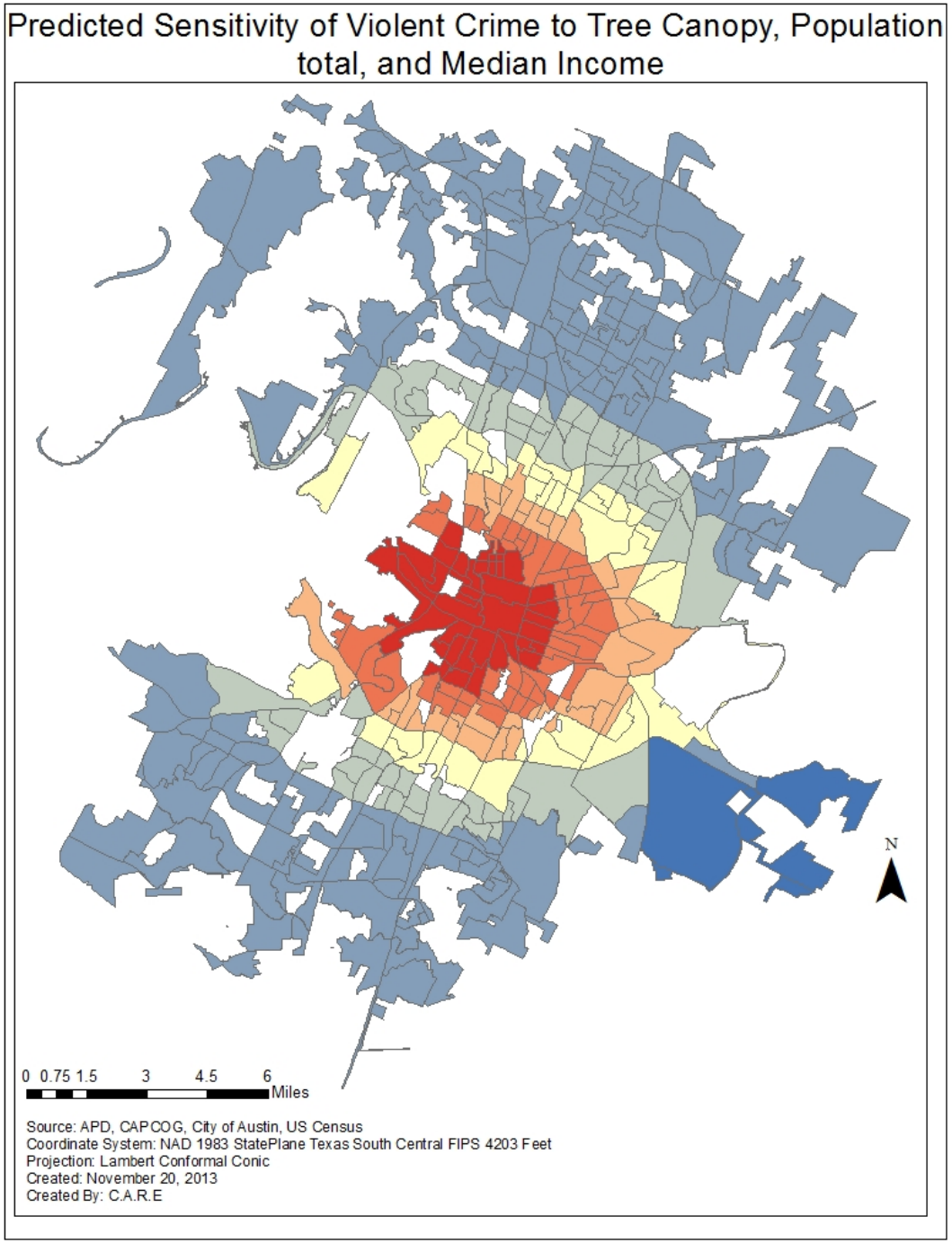
Results

- Figure 4B



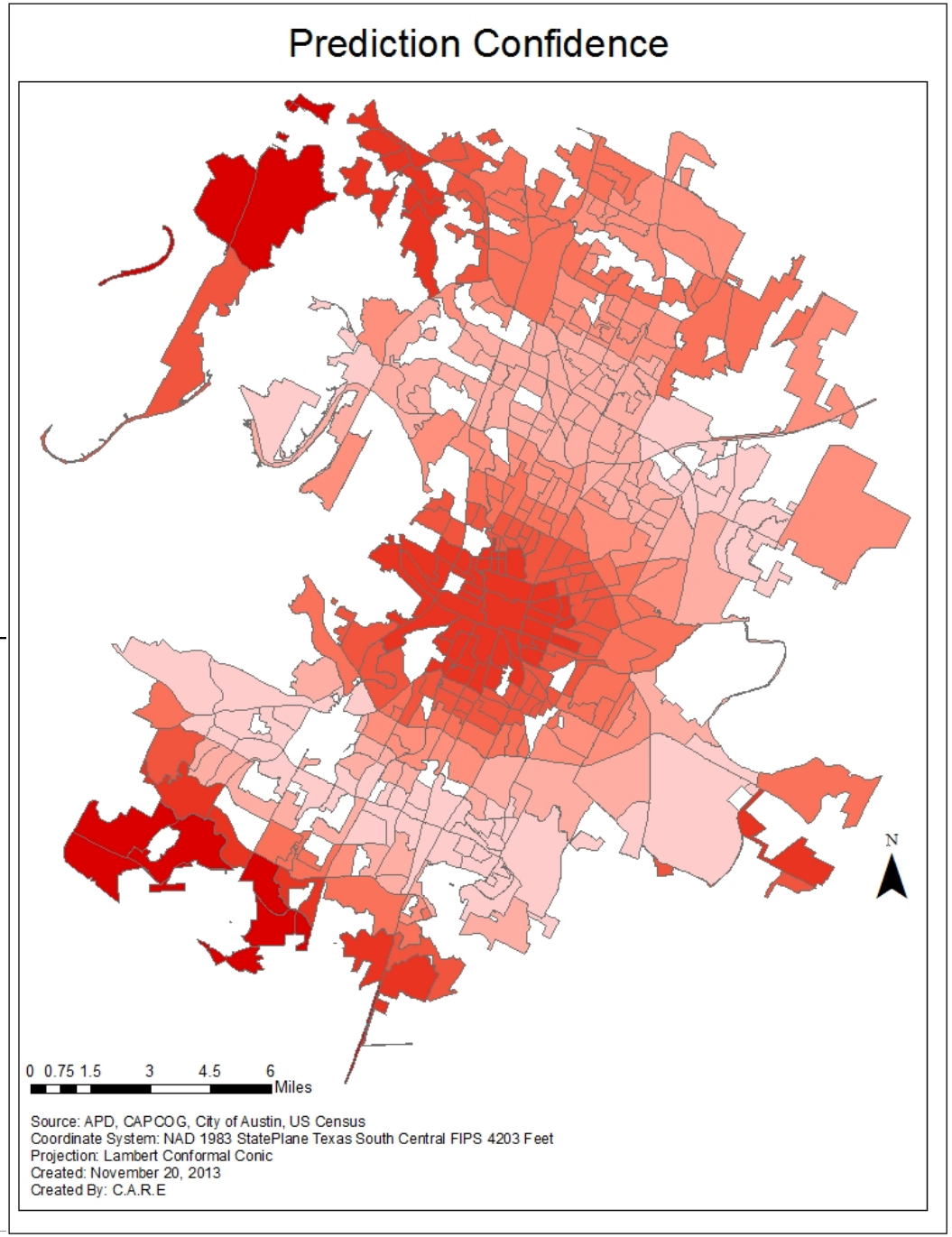
Results

- Figure 5A



Results

- Figure 5B



Discussion

- Correlation is not particularly significant.
- More variables need to be considered.
- Model could have been more confident in its prediction.

Conclusion

- Increase in tree canopy decreases crime.
- Greater relationship near downtown.

Data

- TCAD Parcels – Percent Tree Canopy and Property Market Prices
- US Census Tracts
- TEA – School Rankings
- CAPCOG – City of Austin Border
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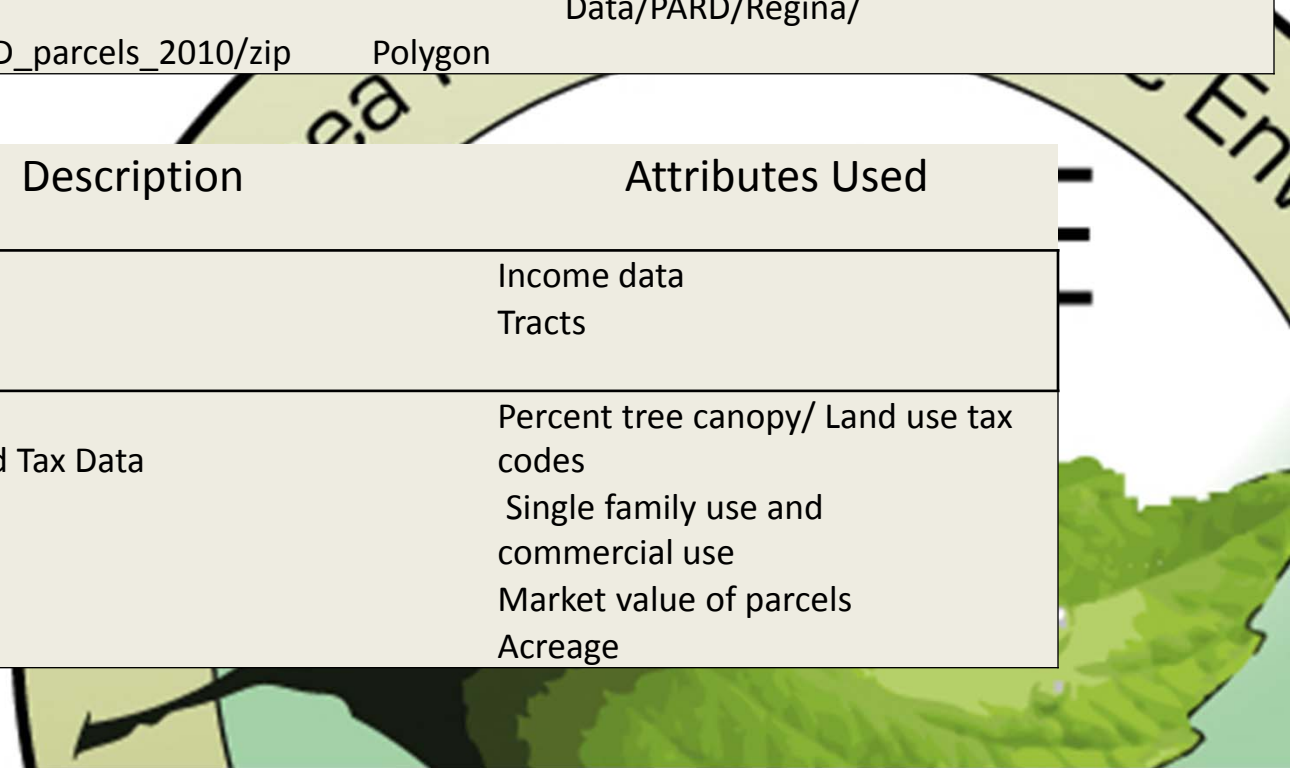
GIS DATA

Description	File_Name	Feature Type	Source
Street Centerlines	STREETS.zip	Line	ftp://ftp.ci.austin.tx.us/GIS-Data/Regional/coa_gis.html
City of Austin Parks	coa_parks.zip	Polygon	ftp://ftp.ci.austin.tx.us/GIS-Data/Regional/coa_gis.html
2010 Census	census2010_blocks_uscensus.zip	Polygon	http://txsdc.utsa.edu/
City Limit Boundary	capcog_city_limits.zip	Polygon	CAPCOG
Crime	Incident_Extract.csv	Point	Austin Police Department
Austin Tree and Tax Data	TCAD_parcels_2010/zip	Polygon	ftp://ftp.ci.austin.tx.us/GIS-Data/PARD/Regina/

Description	Attributes Used
2010 Census	Income data Tracts
Austin Tree and Tax Data	Percent tree canopy/ Land use tax codes Single family use and commercial use Market value of parcels Acreage



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*(2010), 1646-1656. http://www.nrs.fs.fed.us/ pubs/jrnl/2010/nrs_2010_sander_001.pdf

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