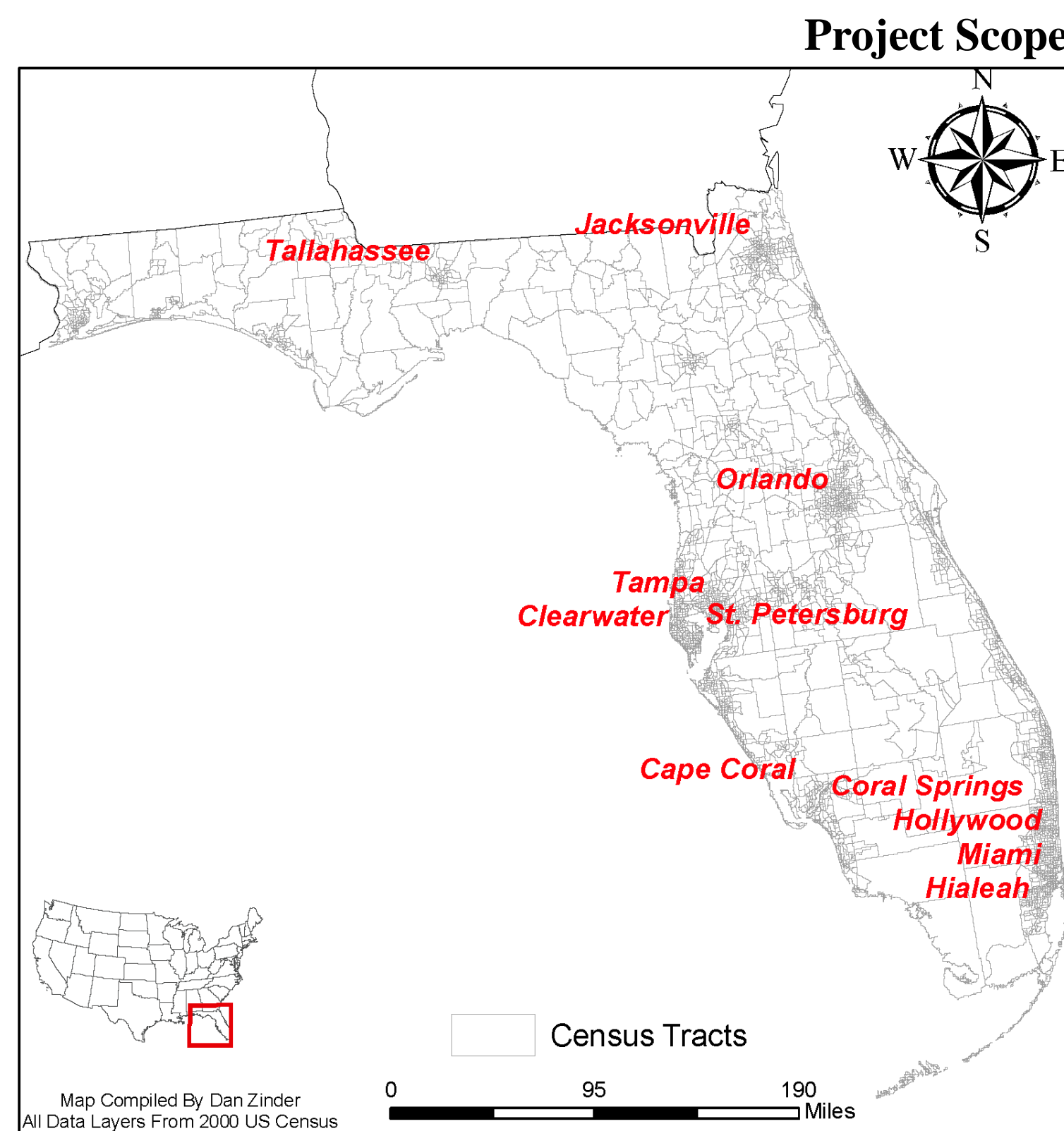# Suburban Sprawl and Foreclosure in Florida

An exploration of factors influencing the 2008 mortgage crisis using GIS technology and STATA statistical software

Project Scope

Census Tracts

Map Compiled By Dan Zinder
All Data Layers From 2000 US Census

0   95   190   Miles

All of the data sources used for this investigation were compiled at the census tract level. Census tracts in Florida are shown above. According to the US Census Bureau website, tract boundaries contain "2,500 and 8,000 persons, and when first delineated, are designed to be homogeneous with respect to population characteristics, economic status, and living conditions". Note that the tracts are smaller near urban centers because people are more densely populated and much larger in rural areas. In reality, neighborhoods frequently overlie tract boundaries. Data on a more individual scale (individual foreclosures or parcel level density data, for example) would have made this investigation more conclusive, however acquiring that level of data on a statewide level was well beyond the scope of this investigation.

Background: Over the past year, a number of anecdotal news reports have surfaced depicting once thriving suburban communities as some of the areas hardest hit by the 2008 mortgage crisis. This investigation sought to find a method to determine whether concrete evidence exists to support those claims. It looked at Florida, in particular because it is as state that is notorious both for its long standing high rate of growth and more recently for its high foreclosure rate.

The terms "suburban" and "sprawl" themselves have no agreed upon formula for determining their parameters. These terms are often defined anecdotally based upon characteristics such as high population growth rates, low to medium density, new development, single lot detached development, long commutes, and middle to upper class residents. This investigation combined the six criteria listed above to identify regions whose growth could be characterized as residential suburban sprawl and then sought to determine whether these regions' foreclosure rate was significantly different than the rate within the state at large.

The 2000 US Census provides data sets that quantify these criteria through their SF1 and SF3 data sets on a census tract level scale. Foreclosure data through June 2008 is available through the Department of Housing and Urban Development (HUD). Last, HUD also provided housing data that is consistent in date to their foreclosure data via their "USPS Vacancies" data compiled by the United States Postal Service.

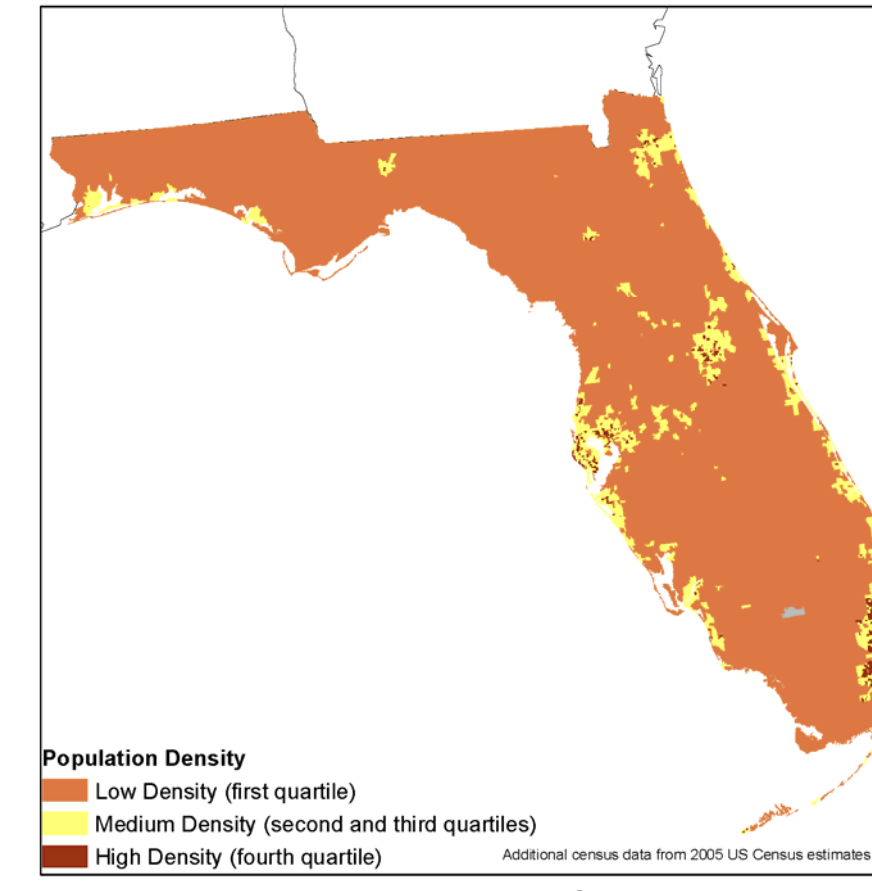## Criteria 1: Growth Rate

Growth Rate between 2000 and 2005
Below the Median
Above the Median
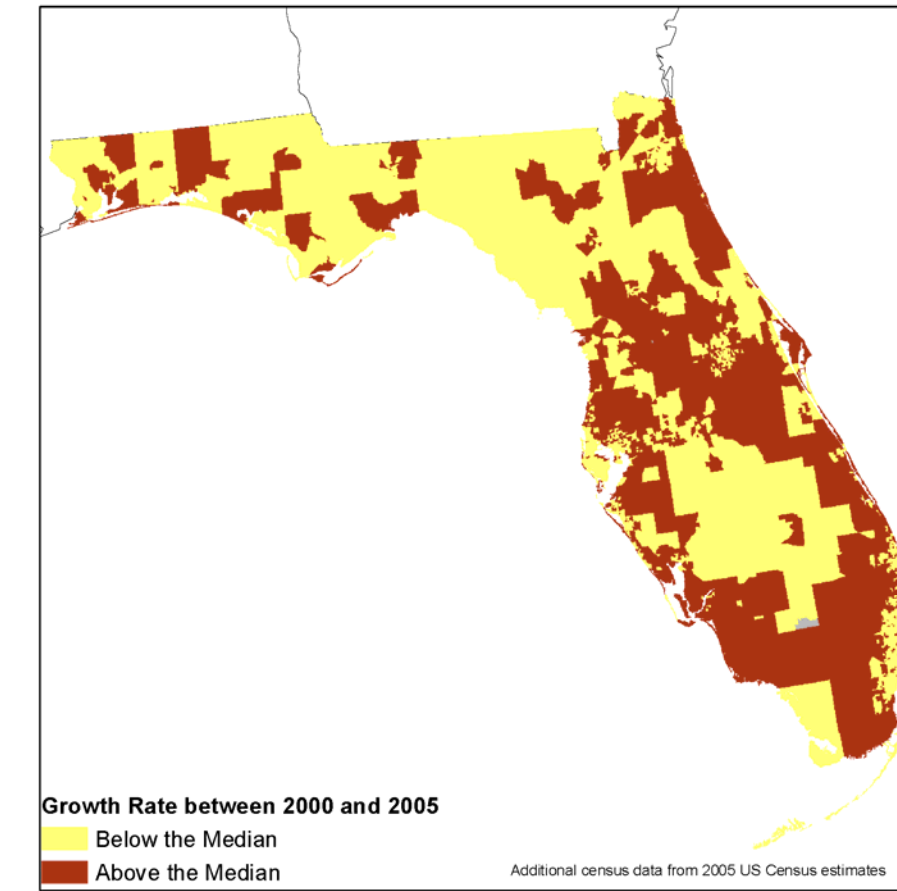
Growth rate was positively correlated with foreclosure rate with a correlation coefficient of 0.158. This study calculated growth rate between population totals counted in 2000 and 2005 respectively. Any tract with a growth rate above the state median growth rate was considered in the final mapping analysis.

The median growth rate within Florida census tracts was calculated at 11.6%.

Criteria 2: Density

Population Density
Low Density (first quartile)
Medium Density (second and third quartiles)
High Density (fourth quartile)

Density was correlated with foreclosures in Florida with a correlation coefficient of 0.264. Population density numbers were based on the 2005 Census population/square mile field. To avoid counting rural and urban areas this investigation specified the middle two density quartiles; between 966.8 and 4800.6 people/square mile for the final mapping analysis.

Note: Since the foreclosure rate data did not have a normal distribution, the foreclosure rate was normalized using the natural log (ln) for each criteria. The density variable was also normalized.

Criteria 3: New Growth

Median Year Structures Built
Built Within the Past 25 Years
Built Over 25 Years Ago
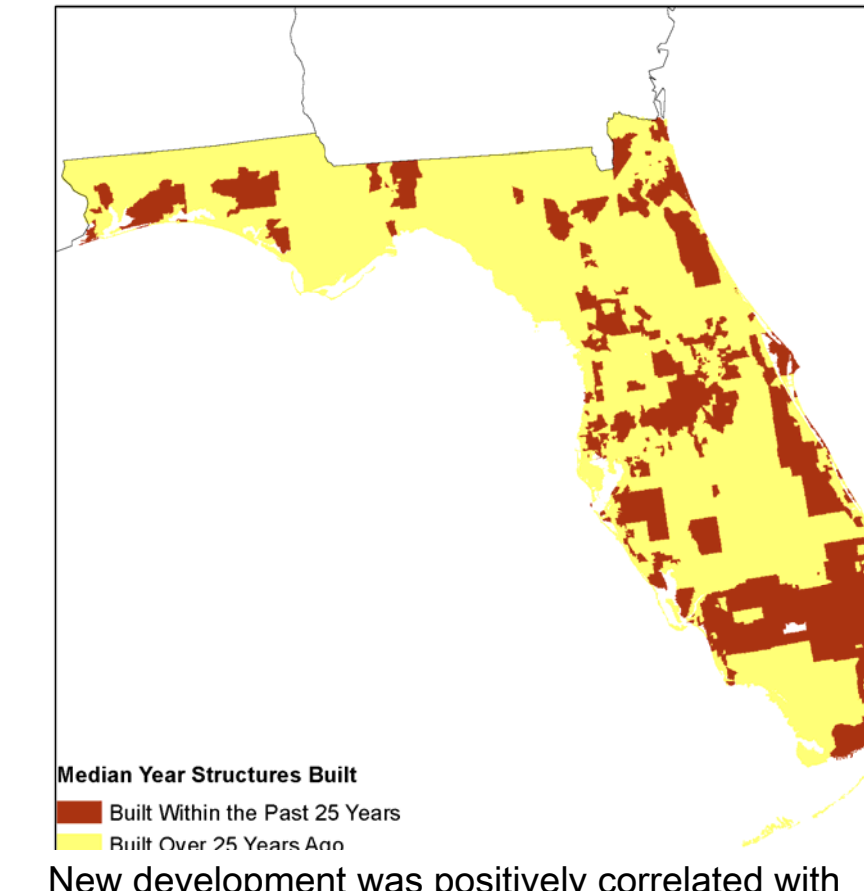
New development was positively correlated with foreclosure rate with a correlation coefficient of 0.177. New growth was determined by using the "median year structure built" field from the 2000 census. The investigation was unable to determine any concrete way of determining "new" and made the cutoff point at 25 years ago. Any tract where the median year was less than 25 years ago was considered in the final mapping analysis.

Criteria 4: Single Lots

Percent Single Family Detached units
Below the Median
Above the Median
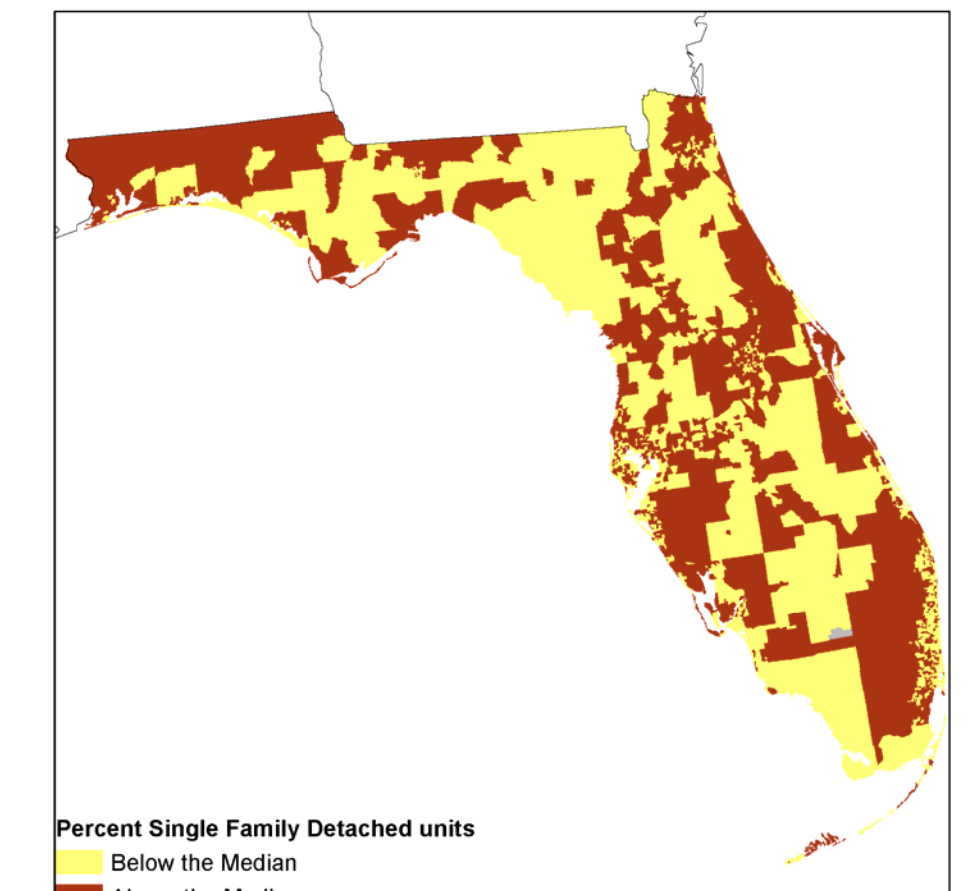
The percentage of residences that are single lot detached properties was positively correlated with foreclosure rate with a correlation coefficient of 0.298. This field was based upon the quotient of the Census 2000 fields of "single lot detached units" and "total housing units". The median rate was 55.7%. Any tract with a rate above the state median rate was considered in the final mapping analysis.

Criteria 5: Long Commutes

Commuting to work
Percent of 30+ minute commutes by tract
Below the Median
Above the Median
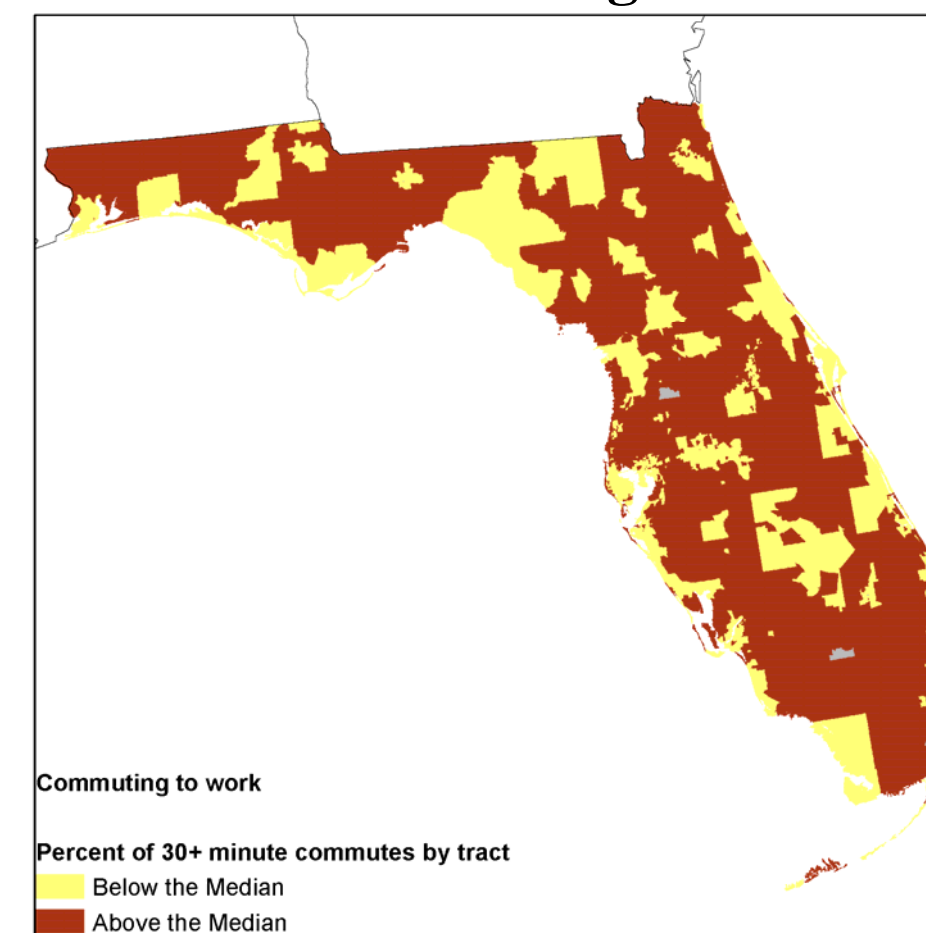
Commute time was positively correlated with foreclosure rate with a correlation coefficient of 0.378. Census 2000 had a number of fields that listed commute time. All fields where the commute was over 30 minutes were divided by the total workforce that did not work at home. The median rate was 35.8%. Any tract with a growth rate above the state median long commute rate was considered in the final mapping analysis.

Criteria 6: Income

Average Income
Below the Median
Above the Median
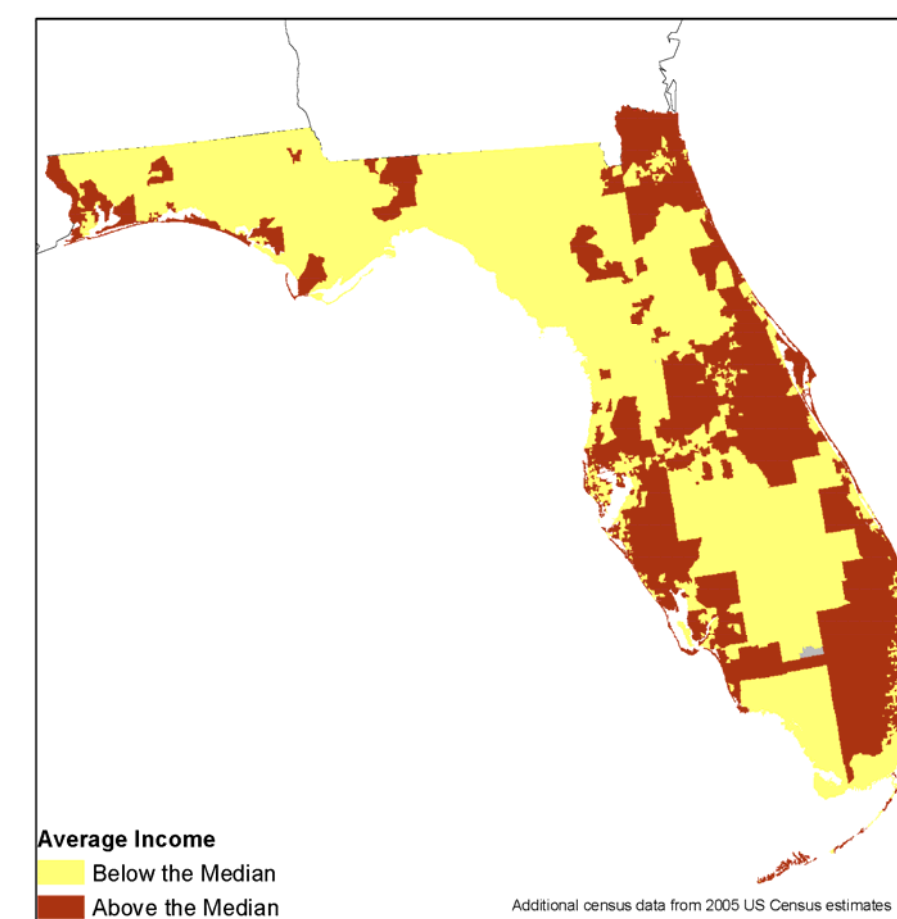
Median income was positively correlated with foreclosure rate with a correlation coefficient of 0.170. This field was based upon the 2000 census field "median income". The median income in Florida was $37455. Any tract with a growth rate above the state median income was considered in the analysis.
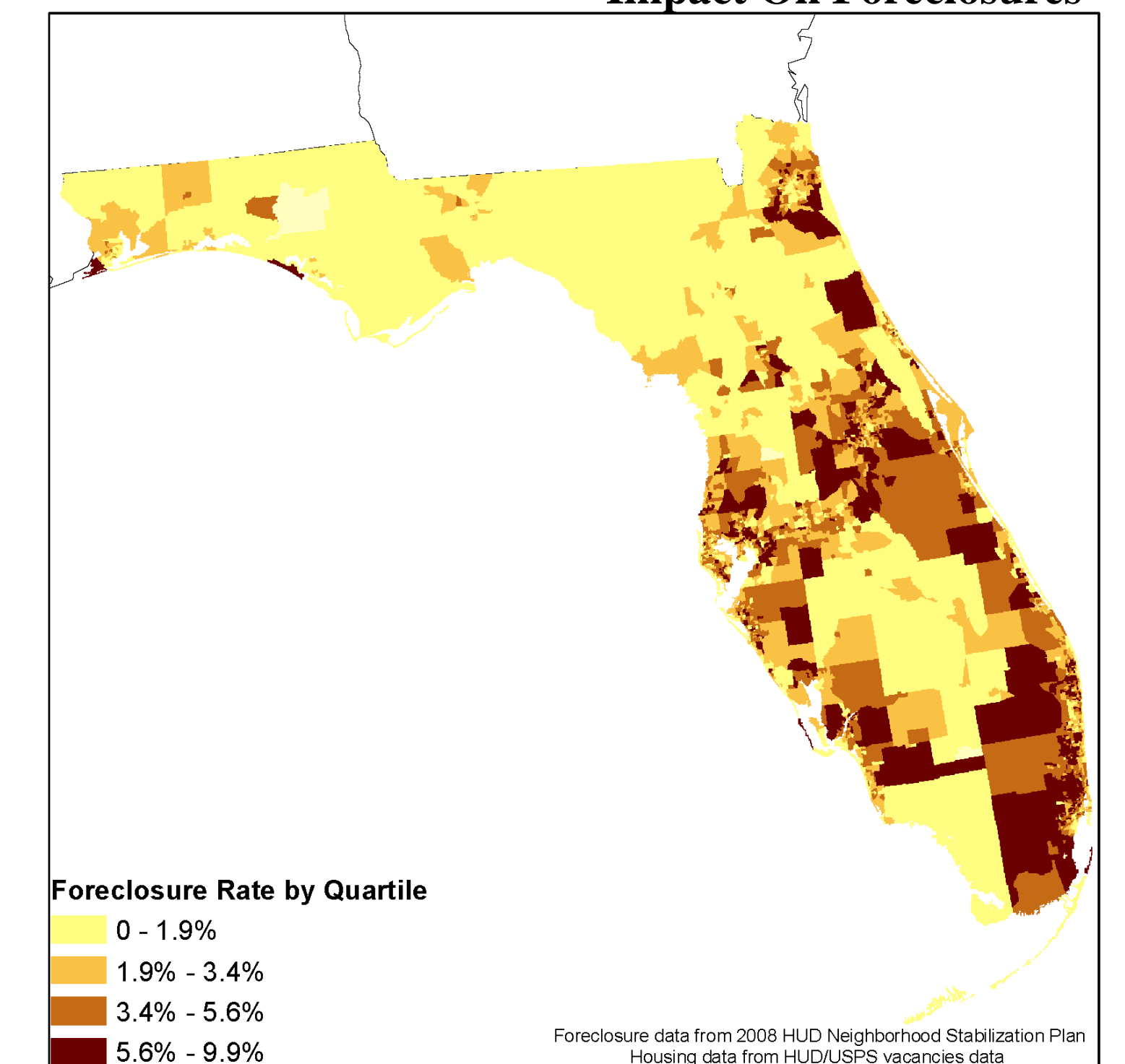
Median income was normalized using the natural log.

Putting The Criteria Together

foreclosure_info
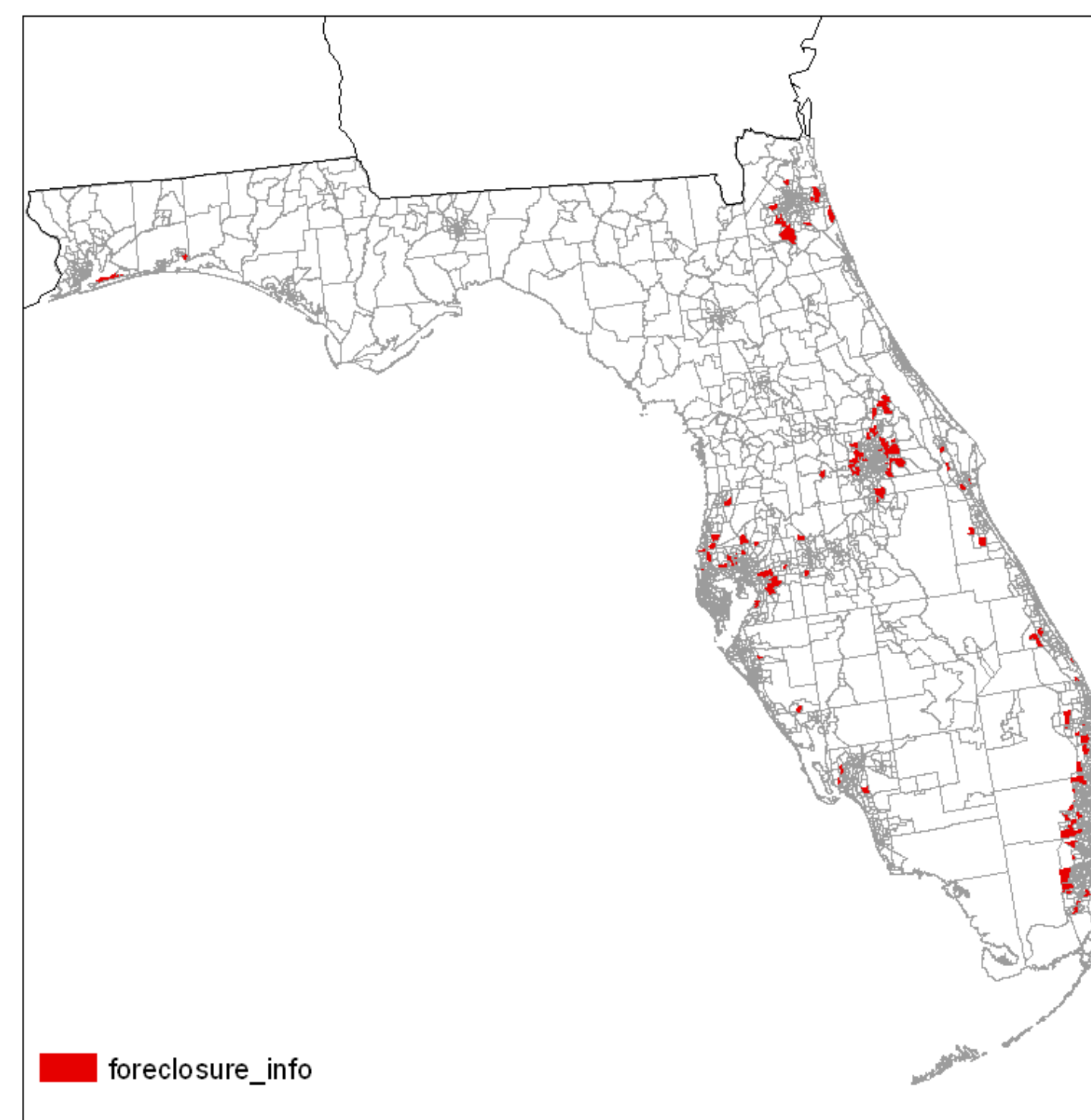
Spatial results: Using the "select by attribute" function, tracts that met ALL of the specified characteristics for each criteria were identified and mapped. The resultant tracts were almost exclusively on the margins of some of Florida's largest cities with near rings around the Miami, Tampa, and Orlando metropolitan areas. The six criteria, based on anecdotally supplied definitions for "suburban sprawl" were thus able to identify tracts in a concrete manner that can be described as sprawling suburbs.

A comparison between this maps and the foreclosure rate map to the immediate right suggests that there a Many of the tracts most highly impacted by foreclosures in the state seem to align well with the tracts identified as residential suburban sprawl here.

Impact On Foreclosures

Foreclosure Rate by Quartile
0 - 1.9%
1.9% - 3.4%
3.4% - 5.6%
5.6% - 9.9%

Foreclosure data from 2008 HUD Neighborhood Stabilization Plan
Housing data from HUD/USPS vacancies data

Statistical Results: Each of the six specified criteria were plugged into a regression analysis with the (ln of) foreclosure rate as the dependant variable. Each criteria had a statistically significant effect on the model at the alpha level of 0.01. The resultant r-squared value of 0.434 suggests that while these criteria are not a perfect fit for describing Florida's foreclosure problems, they certainly indicate that something about these areas made them more prone to foreclosures than the state at large. This is consistent with the presence of other high impact foreclosure areas in the above map and the anecdotal reports about concurrent trends in some rural and metropolitan areas.

Nonetheless, the suburban areas identified in this investigation have been hit particularly hard. The mean foreclosure rate statewide was near 4.5% as compared with a 7.8% rate within the identified tracts. The difference between these means is statistically significant well above the 99% confidence rate (t-value = 6.842).

This investigation provides a means for defining and analyzing suburban sprawl in a concrete manner on a macro level. Although it is not predictive of how foreclosures will impact Florida's sprawling suburban areas in the future it provides strong evidence that these formerly thriving areas were particularly vulnerable to the impacts of a downturned economy.

A Poster By Dan Zinder