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End of Summer Report - FURSCA 2025
Evaluating the Environmental Impact of Immigrants in the United States Using Geospatial Analytics
Advised by Dr. Joe Lee-Cullin

This summer I was able to conduct undergraduate research and gain meaningful experience analyzing the environmental impact of immigrants on the states. My main focus for this project was to examine claims from right-wing political ideology that state that an increase in an immigrant population increases degradation to the environment. These claims first piqued my interest after reading the manifesto from the perpetrator of the 2019 Christchurch mass shooting. Environmentalism does not exist only among the left, but is actually very prominent among far-right groups and individuals. It inspired me to question these eco-fascist narratives whose key points are anti-immigrant, nativist, and white supremacist. The sources of these publications, such as FAIR, CIS, and NumbersUSA, are considered non-partisan yet exist solely to help pass restrictive immigration policies and receive funding to continue to promote these ideas. I collected multiple claims from books, journals, articles, and websites to decide which environmental indicators I wanted to use for this project.

My goal was to find data of several environmental indicators then overlay them with immigrant population growth between two time periods, 2000 to 2010 and 2010 and 2020. This data would then be entered into ArcGIS Pro to visualize the environmental impacts in immigrant hotspots and coldspots. Using maps for visual presentation would allow me to recognize patterns that would either support or debunk these claims. Finally, I wanted to improve my skills using Geographic Information Systems software and programming languages using Python on a larger project.

One limitation I experienced was finding data that fit several requirements. The data had to be available at all three time points (2000, 2010, and 2020), had to be georeferenced to Census Tracts, and had to be impacts measured per capita not corporations. Finding datasets that could fulfill these requirements was difficult and also time consuming. I was working on this project using the U.S. Census tracts, which are very small pre-defined geographic boundaries and there are thousands of them. Additionally, some Census tracts change over time so I had to exclude those from my results. The worst was actually waiting for the datasets to be downloaded and cleaned because they were very large datasets that covered the contiguous United States (48 states).

Ultimately, I was able to figure out how to successfully create my maps. However, due to software restrictions on ArcGIS Pro it was a tedious and lengthy process. I created three out of four map outlines which were for my variables of urban growth, pollution, and forest losses. I was unable to work with the data for water quality deterioration as my research session came to an end. Additionally, although I created three map outlines, I was able to make maps for only two of my environmental indicators.

Forest losses were measured by pixels per tract and then calculated into acres. I created four bivariate maps in total for this variable which were:
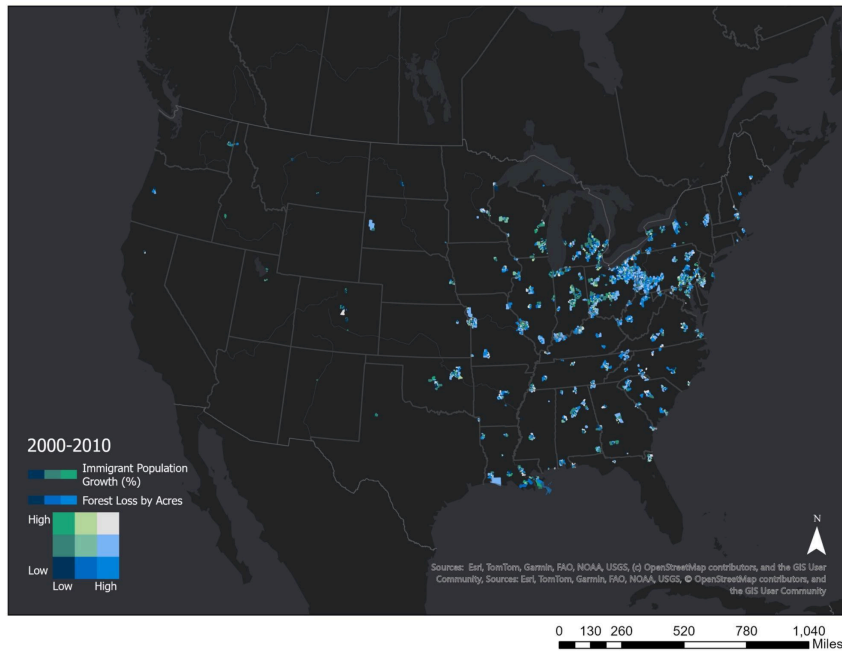
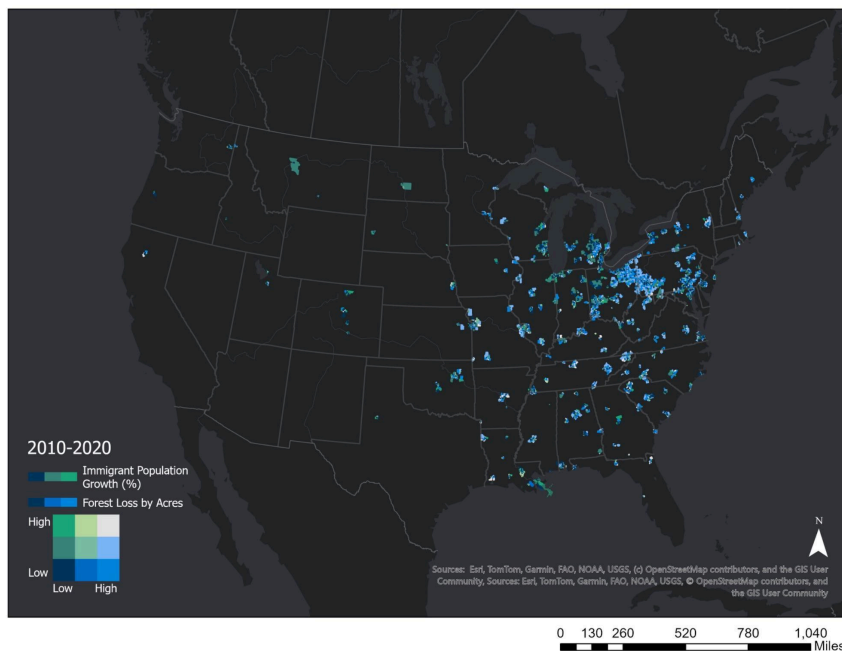1. Forest Loss by Acres in 2000-2010 in Hotspots (High Immigrant Population Growth)
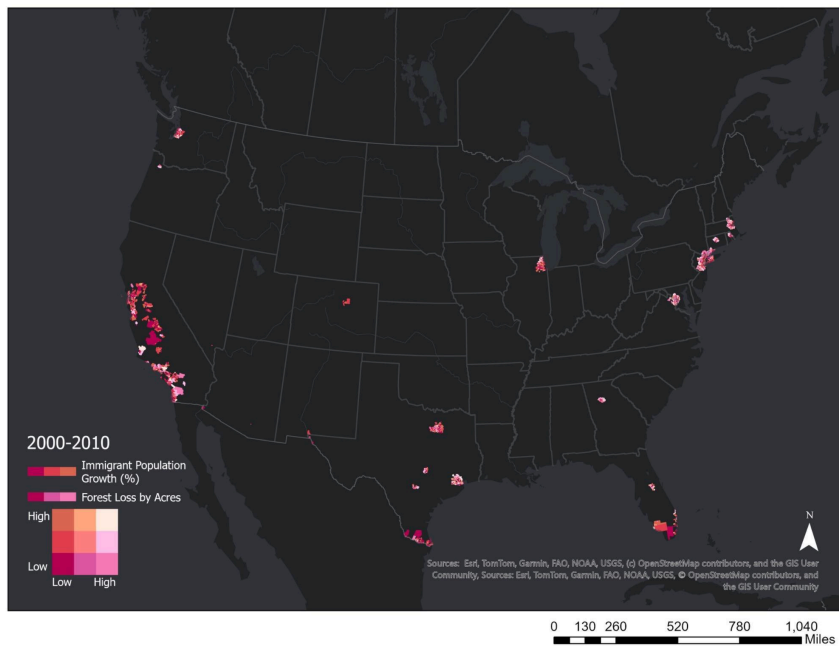
2. Forest Loss by Acres in 2010-2010 in Hotspots (High Immigrant Population Growth)
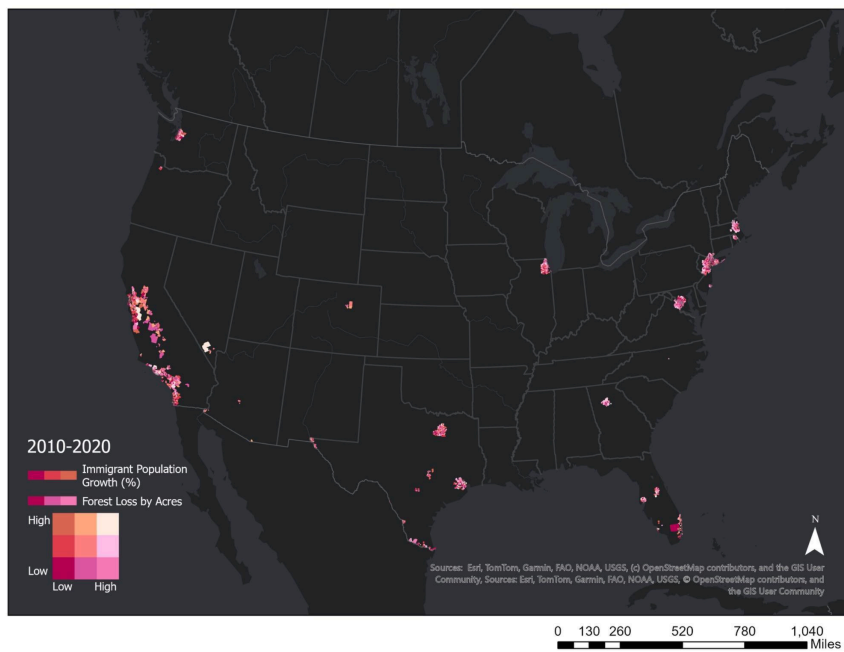
3. Forest Loss by Acres in 2000-2010 in Coldspots (Low Immigrant Population Growth)
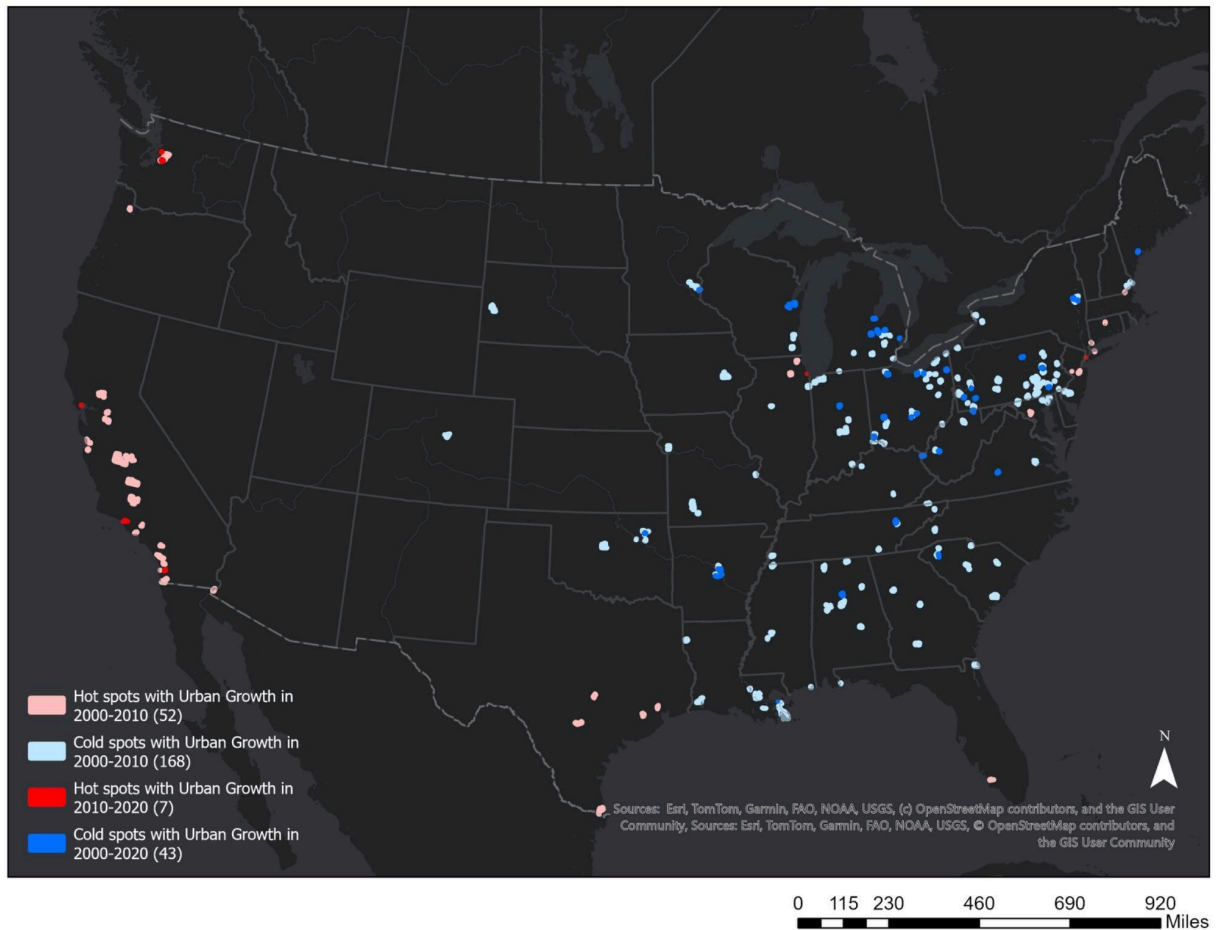
4. Forest Loss by Acres in 2010-2020 in Coldspots (Low Immigrant Population Growth)

To measure urban sprawl, I measured tracts that changed from rural to urban and then counted those for both time periods and hot spots. For this variable, I created one map that shows the changes in both decades and for both high- and low- immigrant population growth areas.

5. Urban Growth in 2000-2010 and 2010-2020 based on Immigrant Population Growth

Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, (c) OpenStreetMap contributors, and the GIS User Community, Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community

Legend:
- Hot spots with Urban Growth in 2000-2010 (52)
- Cold spots with Urban Growth in 2000-2010 (168)
- Hot spots with Urban Growth in 2010-2020 (7)
- Cold spots with Urban Growth in 2000-2020 (43)

There were no recognizable patterns in these maps so I was unable to draw concrete conclusions. Therefore, I decided to conduct tests to see if there was any significant difference between high- and low-immigrant population groups. Both Mann-Whitney U test and Chi-square tests were employed to evaluate statistical relationships between the variables. A Mann–Whitney U test showed no significant difference in forest loss between high- and low-immigrant population growth for either 2000-2010 ($U = 18,348,268$, $p = 0.997$) or 2010-2020 ($U = 23,387,838$, $p = 0.868$). A Chi-square test showed that from 2000-2010, there was no significant difference in rural to urban area changes by tract between high- and low-immigrant population growth. From 2010-2020, rural to urban changes became significantly more common with low-immigrant population growth ($X^2 = 54.80$, $p < 0.001$). These findings challenge prevailing narratives that link immigration directly to environmental degradation.

My research remains incomplete as I need to create maps and test statistics for the two variables of water quality and pollution. Through my results so far, there is nothing concrete that states that higher immigration leads to higher environmental degradation. l will continue my research this upcoming fall as part of a directed study with my advisor, Dr. Joe Lee-Cullin. I have recently submitted an abstract of this project to be considered to present at the SACNAS NDiSTEM 2025 conference. Furthermore, I will make sure my research is complete to present at the Elkin R. Isaac Student Research Symposium.

My project is important due to the recent political climate. There is constant debate over immigration legislation. I would like to enter this debate with my own research and facts as many false claims and skewed research are constantly brought forward. My FURSCA experience has allowed me to complete my requirement for the GIS minor and I will be able to use this for my graduate school application as well. This is an opportunity that I believe everyone should have. As a daughter of two immigrants, I hope my findings are able to contribute to the advancement of society.