Project Proposal

This project proposal focuses on the relationship between Puerto Rico's human population and potential tree canopy loss between 2011 and 2021. Through the use of NLCD tree canopy cover datasets and municipal population data, this project will analyze whether municipalities population density correlates with higher rates of forest degradation. This study is motivated by Puerto Rico's fluctuating demographics due to natural disasters, economic factors, and tourism. While the island is no stranger to hurricanes, climate change has repeatedly shown an increase in occurrence and severity in recent years (Bueno, 2017). The successional destruction has forced many residents to move inward on the island, or leave it entirely (Acosta et. al., 2020). With each disaster racking up the common wealth's debt, the need for economic prosperity has only surged. Tourism has become a key factor in Puerto Rico's economic development despite the increasingly negative environmental impact (Hernandez-Delgado et. al., 2012). Despite the decline in population, the hope of enticing tourists to immigrate is a driving factor in harmful urban development, often near the island's protected forests (Castro-Prieto et. al., 2017). Understanding the resulting population and land use patterns and their effect on forest change is crucial for informing potential land management policies and sustainable economic development.

Through the utilization of R-based analysis, this project will be able to systematically analyze the relationship between population and environmental change through automated statistical analysis. While standard GIS software packages are helpful tools in spatial analysis, an R-based method as proposed in this project would allow for enhanced statistical testing and custom metrics not easily available with other methods. R-packages easily allow for the creation of multiple regression models or spatial autocorrelation tests, as well as the ability to combine multiple variables such as population and forest variables. Alongside this, an R-based approach allows for clear workflow documentation in comparison to GIS software packages. This clear documentation allows for clear replication and potential applications with similar data.

The success of this project will be defined through the creation of maps depicting the spatial patterns of canopy loss and population change, statistical tests determining in municipalities with increased population show significant forest lass, and a resulting R script that can be reproduced readily. The data being utilized will include the NLCD Tree Canopy Cover

datasets (PRUSVI) from 2011 and 2021, the USGS National Boundary Dataset of Puerto Rico, and annual population estimates for 2011 and 2021 from the U.S. Census Bureau. Planned statistical analysis will include calculating the percent change in population and forest loss for each municipality, a correlation analysis to measure the strength of the relationship, and a linear regression model to predict forest loss based on population. If possible, annual precipitation data and/or elevation data may be added if available, allowing for a multiple regression analysis in order to better account for climate variables in regards to forest loss.

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