CLIMATE CHANGE CONNOTATIONS OF A SUITABILITY MAP FOR MIMOSA PIGRA IN PUERTO RICO

M. Julio Barragán-Arce1, Wilfredo Robles2, and Yetsabel Auccaille-Quispe3
1Department of Agricultural Economics and Rural Sociology, University of Puerto Rico, Mayagüez, 2Department of Crop and Environmental Sciences, University of Puerto Rico, Mayagüez, 3Department of Mathematical Sciences, University of Puerto Rico, Mayagüez

Environmental conditions are important determinants of the survival of species. Because the environment changes over space, one would expect a corresponding spatial gradient in the presence/absence of an invasive species. This correspondence is important when evaluating the susceptibility of certain regions to the invasion of foreign pests or when predicting the impact of environmental change on existing living organisms. In the present study we estimate a suitability map for Mimosa pigra in Puerto Rico. To do this we use spatially indexed data on presence/absence, minimum and maximum temperatures, and precipitation. A logistic regression was estimated in R with presence/absence as the dependent variable and minimum and maximum temperatures and precipitation as the independent variables. All estimated coefficients, except for that of minimum temperature, were statistically significant. The estimated equation was then used to predict the suitability index level of each point in space given its minimum and maximum temperatures and precipitation levels. These data points were then exported back to ArcGIS for visualization purposes. This map was used by Barragán and Henríquez (2011) as an input in a mathematical model of the spread of this invasive species over Puerto Rico. Finally, elasticies defined as the percent change in the predicted suitability index over the percent change in each variable were computed for both the values of the independent variables at each pixel and for the average value of the independent variables. Three elasticity maps were generated in ArcGIS using the former data. When using average data, the elasticity was highest and negative for precipitation. Maximum temperature had a low but positive elasticity. These results have important applications in predicting the impact of climate change on the suitability of the new environments created.

Key words: suitability map, logistic regression, climate change, GIS, invasive species, Mimosa pigra