Using Ebird to Categorize Avian Geographic Distribution in the Rio Grande Valley by Ecoregion

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1 Abstract

Sponsored by the Cornell Lab of Ornithology and National Audubon Society, eBird is a web-based application that compiles Citizen Science bird observations. Since 2002, eBird has provided a rich data source for basic information on bird abundance and distribution throughout the world. There is a substantial amount of recorded observations in the Rio Grande Valley(RGV) on eBird. Hotspots can be found all over the RGV. These hotspots are model ecosystems that represent the various ecoregions of South Texas. In this report I aim to delineate ecoregions of the RGV using elevation, soil types, and vegetation type with Python. The type of ecoregion each hotspot falls into will tell what type of family will likely be seen. Using this, we can make predictions about what type of birds can be seen based on ecoregion.

2 Background

The Rio Grande Valley of South Texas consists of Cameron, Hidalgo, Willacy, and Starr county. It is a major migratory stopover site for birds of the Central and Mississippi flyover. In the RGV, Species at or near their northern limits of their breeding ranges in the include Plain Chachalaca, Red-billed Pigeon, and Altamira Oriole, while species at or near their southern range limits include Swainson's Hawk, Chimney Swift, and Western Kingbird (Brush 2008). In Addition, the RGV boasts Year-round native species like the endangered Red-Crowned Parrot. The Valley, often considered the number two birding site in North America, has recorded almost 500 bird species, drawing thousands of people and millions of dollars into the region (Mathis 2004). This demonstrates a need for knowledge on the habitat and species distribution of birds for conservation and recreational purposes.

3 Significance

A characterization of bird family groups and their corresponding habitat based on ecological factors like elevation and soil types facilitates habitat prediction. This method, in conjunction with actually sampling sites in the future, will allow for habitat zones to be designated based on bird family.

4 Hypothesis

Certain bird families will be present in accordance with ecoregions. For example, a shorebird is more likely to be correlated with the low elevation levels that are distinctive of resaca and coastal environments.

5 Proposed Methods

Create ecoregions for the RGV:

Currently there are only two major ecoregions delineated for South Texas: Gulf Coast . They can be seen in Figure 4 and 5. These are over generalizations, and not useful when trying to understand habitat distribution for the area.

I will be using Palo Alto as an example because it has well defined ecoregions based on elevation and soil types. A recent survey of the park found that despite the general low relief of the entire park (9.7-20.9 feet), slight changes in elevation resulted in variation of the vegetation (Cooper 2004). These variations were then classified into three distinct habitat zones: Brushland, Salt Prairie, and Wetlands (Cooper 2004).

Brushland habitat is observed on the area adjacent to the meandering Resacas, is slightly higher in elevation, has better drainage, and allows soils to have a lower salinity than the neighboring salt prairie; therefore, it supports a different plant community (Cooper 2004). When viewing a digital elevation map of the park, Brushland areas have the highest elevation with points ranging from 5-7m shown as the dark green parts of Figure 1. Levee soils include Laredo Silty Clay Loam (Cooper 2004). These elevated areas are dominated by honey mesquite, spiny hackberry, Texas ebony, common anaqua, lotebush, colima lime pricklyash, and Lindheirmer's prickly pear (Cooper 2004).

Salt prairie habitat exists in areas of low elevation where there is increased salt build-up due to poor drainage. When it rains, water collects salt as it drains to the prairie. Due to high evaporation rates, the salt gets left behind and the soil becomes too saline to support large trees. The elevation in this area ranges from 3-5m and is seen as the beige areas in Figure 1. Salt prairie soils include Lomalta Clay, Benito Clay, Latina Sandy Clay, Sejita Silty Clay Loam (Cooper 2004). Gulf cord grass (S. spartinae)-covers most of the salt prairie. Patches of slightly lower elevation with more concentrated salt levels create what is known as Borrichia or salt flats, which support primarily sea oxeye (B. frutescens) and succulents among the bare patches of soil (Cooper 2004).

Wetlands known as Resacas cover 2 percent of the park (Cooper 2004). As old distributaries of the Rio Grande, Resacas provided conveyance routes moving floodwater to the Laguna Madre (Buford 2016). If these systems are not artificially maintained, they dry out because of high evaporation and sedimentation rates. At Palo Alto, the old Resaca acts as an ephemeral pond because it only retains water after heavy storms. In figure 1, the wetlands appear as snake like, light green meanders with elevations between 3-4m. During dry periods, invasive species and thorny underbrush grow in the channel. Transition soils include Chargo Silty Clay, Laredo Silty Clay Loam, Saline (Cooper 2004).

Top 3 families found in each hotspot:

I will need to create a pandas data frame for each hotspot in the four counties that make up the RGV. Based on Scientific name, I will categorize by number of sightings per family. I will create a variable for each hotspot and define it as the top three families sighted. This will tell you where to go based on the type of bird you want to see.

Top 3 families found in each ecoregion:

Once the ecoregions are designated, I will assign the hotspots that correspond to them. Then, I will average the top 3 families seen within those hotspots and assign that as the top 3 families likely to be seen per ecoregion.

6 Impacts

The Lower Rio Grande Valley hosts many endangered and threatened bird species. A model that is capable of accurately predicting bird habitats by family would make it easy to find new bird habitats with potential endangered species within them. This facilitates conservation practices once territories are known. In addition, birds provide economic value to the Rio Grande Valley, and the successful preservation of their habitat ensures that they return. Due to this, it is an economic incentive to properly characterize bird habitat and distribution.

7 Timeline

Schedule by Week:

Week 1: The top five families per hotspot will be extracted using the E-bird API. Vegetation, soils, and elevation data will be manipulated in Python in preparation to designate ecoregions.

Week 2: Ecoregions will be designated.

Week 3: Spatial Analysis - Average the top three families based on the hotspots of each ecoregion.

Week 4: Spatial Analysis - Add a temporal aspect to the top three families based on the hotspots of each ecoregion.

Figure 1: This is a digital elevation Map of Palo Alto National Historic Park. The red point represents Tamaulipan Thornscrub, the yellow point represents the Resaca wetlands, and the blue point represents the Coastal Prairie.

Figure 2: This is a satelite image of Palo Alto National Historic Park.

prairies.png

Figure 3: The Gulf Prairies and Marshes are a Major Eco-region of East Texas.

Texas Plains.png

Figure 4: The South Texas Plains are a Major Eco-region of South West Texas.

[3] [1] [2]

References

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