Potential Kiwikiu Habitat on Leeward Haleakala

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GES 180 – Ecosystem Management

Introduction

The threats to native forest birds in the state of Hawaii are numerous and relentless. Hawaii has seen over two-thirds of its endemic bird species go extinct since human contact, many being after Western contact. This is a large part of how Hawaii has earned the notorious moniker of “the extinction capital of the world.” The introduction of invasive species, the introduction of avian disease, and habitat degradation have been major driving forces in the decimation of the endemic forest bird population, and it is expected that climate change will amplify this pressure in the coming years. It has been predicted that with the warming climate, the most lethal disease to the birds – avian malaria – will be present at higher elevations than it is currently. Avian malaria is limited by the cold temperatures that exist at higher elevation, but with warmer temperatures, the disease could spread much higher than at present. This can drastically shrink the available habitat remaining for the native Hawaiian forest birds. The upper limits of their habitat is well defined, and not likely to grow into much higher elevations given a warmer climate due to the limitations of converting sub-alpine shal-l land into wet forest.

Maui Forest Bird Recovery Project (MFBRP) has a plan to help ensure the survival of Maui’s most endangered forest bird, the Kiwikiu, by restoring forest in Nakula Natural Area Reserve on Leeward Haleakala and reintroducing the bird in this location to create a second population with a much smaller chance of having such a large impact from avian malaria. I worked for MFBRP as a technician in 2014 in TNC’s Waikamoi Preserve to aid in their studies of existing Kiwikiu habitat and home ranges. I wanted to continue to support their cause and coordinated with them on this project to help fulfill one of their GIS analysis needs.

Methodology

I have obtained eight band satellite imagery of the land parcels in question from the WorldView 2 satellite, which has allowed me to estimate the approximate area of ground cover, canopy cover which is deemed as preferred Kiwikiu habitat, and grass which are prime areas for re-firstation efforts. The satellite imagery is from 2011 which is prior to any re-firstation efforts so I was able to determine both existing forest canopy as well as an estimation of how much and what will become forest canopy as a result of re-firstation efforts as of April 2015. I then clipped this data to the specific areas in question and subsequently combined the bands to create raster images that highlight the different levels of chlorophyll absorption in false color. Each cover type was highlighted best in different wavelength bands, so I had to identify each cover type in a separate raster. After identifying the unique color ranges for ground cover, canopy cover, and grass, I was able to recolor the pixel cells of the satellite imagery with these identifiers and merge them into a single raster file. I then was able to calculate the area for each cover type on both post restoration and calculate the area of the re-firstation efforts by using the “calculate geometry” function for each of the polygons. I merged the re-firstation polygons with the existing cover, canopy cover, grass and bare ground without any human intervention. The current estimates for having such a large impact from avian malaria. I worked for MFBRP as a technician in 2014 in TNC’s Waikamoi Preserve to aid in their studies of existing Kiwikiu habitat and home ranges. I wanted to continue to support their cause and coordinated with them on this project to help fulfill one of their GIS analysis needs.

Problem Statement

Kiwikiu core habitat is forested land. How much preferred Kiwikiu habitat currently exists in the land zones as restoration areas on Leeward Haleakala, and how much potential habitat has been created by the recent re-firstation efforts of Maui Forest Bird Recovery Project and the Department of Land and Natural Resources in Nakula Natural Area Reserve?

Results, Discussion, & Conclusions

The three low elevation restoration areas consisting of Department of Hawaiian Homelands (DHH), Nakula Natural Area Reserve, and Kahikinui Natural Area Reserve totaled 4207.52 acres of land. Forest canopy was determined as being 494.18 acres of land (11.6%), grass was determined as being 1334.72 acres of land (31.3%), and ground cover was determined as being 2528.72 acres of land (59.1%). Within the lower fenced section of Nakula Natural Area Reserve where MFBRP is focusing on re-firstation efforts and plans on reintroducing a second population of Kiwikiu, there is a total of 422.61 acres of land. Forest canopy was determined as being 69.31 acres of land (16.6%), grass was determined as being 218.49 acres of land (51.7%), and ground cover was determined as being 134.89 acres of land (31.6%). The combined efforts of the Department of Land and Natural Resources and Maui Forest Bird Recovery Project have potentially converted up to 66.5 acres of grass and ground cover to forest canopy, or 13.0% of the total area as of April 2013. From this effort, approximately 27.5% of the lower fenced section of Nakula will be forest canopy, and more re-firstation effort is currently underway and planned for the future.

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