HABITAT SUITABILITY FOR AN ENDEmic BUTTERFLY, BARTRAM’S SCRUB HAIRSTREAK, AND IMPLICATIONS FOR MANAGEMENT

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INTRODUCTION

Bartram’s Scrub Hairstreak, Strymon acis bartramii (Bartram’s) is a small but strikingly beautiful butterfly (Figure 1) that lives exclusively in the pine rocklands of Miami-Dade and Monroe Counties. It is closely associated with its larval plant, pinedale croton (Croton lineolatus), and rarely seen more than 5 meters from the plant.

With less than 2% of pine rocklands remaining today, Bartram’s populations, as well as all species that live in that ecosystem, have been declining. The pine rocklands is a fire-dependent ecosystem that relies on periodic prescribed burns to prevent succession to rockland hammock. Bartram’s was listed as a federally endangered species by the U.S. Fish and Wildlife Service (USFWS) on September 11, 2014. With this new designation, resource managers must consider their prescribed burning regime. If not implemented properly, these imperiled species could be negatively impacted.

STUDY OBJECTIVES

1. Determine what patch-scale factors affect the suitability of habitat for Bartram’s populations.
2. Determine what landscape-scale factors affect the suitability of habitat for Bartram’s populations.
3. Determine if the current pine rocklands management affects habitat suitability for Bartram’s populations and how the landscape can be managed to facilitate Bartram’s colonization.

STUDY SITE SELECTION

The Richmond Complex in North Miami and Navy Wells in Florida City are the largest areas of pine rocklands outside of Everglades National Park. A total of 40 plots will be selected with 20 at each site. To determine the ratio of herbaceous to shrub vegetation, high resolution Digital Orthophoto Quarter-Quadrangles (DOQQs) and LiDAR data will be fused and segmented in eCognition. In ArcMap, a supervised classification will be conducted to classify areas as bare ground, herbaceous vegetation, shrubbery and canopy. Once classified, percent cover for each management unit will be calculated. Sites will be selected based on the ratio of herbaceous to shrub vegetation, croton abundance, and presence of Bartram’s (see Preliminary Data Collection below).

In early 2013, Fairchild Tropical Gardens conducted a study funded by the U.S. Fish & Wildlife Service, to assess and map croton distributions in the pine rocklands of Miami-Dade County (Maschinski, Hodges, Magagnoli, & Possley, 2013). KB-Scan was used to map rockland edges, using mostly fire breaks and paths to collect the data. To supplement their data, I collected data along interior transects throughout the properties at both Navy Wells and the Richmond Complex (Zoo Miami, Larry and Penny Thompson Park and Martinez Pinelands). I followed Fairchild’s data collection methodologies where transects were walked. When a croton was encountered, a 2.5 meter radius was surveyed.

In order to quantify habitat suitability at the patch-scale, it is necessary to survey the plant density and the plant resources upon which the butterflies depend. These plants would include not only the host and nectar plants at a site but could also include those used by adult butterflies for roosting, mate-location and oviposition. Monthly butterfly surveys will be conducted per Kadlec et al. (2012). A total of 40 circular quadrats (diameter 10 m) will be placed at Navy Wells (20) and within the Richmond Complex properties (20). When Bartram’s are encountered, their behaviors will be observed and the extreme points of their observed flight will be geolocated. Table 2 below lists all parameters that will be assessed in these surveys.

OBJECTIVE 1 – DETERMINE WHAT PATCH-Scale FACTORS AFFECT THE SUITABILITY OF HABITAT FOR BARTRAM'S POPULATIONS

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OBJECTIVE 2 – DETERMINE WHAT LANDSCAPE-SCALE FACTORS AFFECT THE SUITABILITY OF HABITAT FOR BARTRAM’S POPULATIONS

While studying Bartram’s at the patch scale may be necessary for understanding their specific habitat needs, it is important to consider the dynamics of a species’ environment at a larger scale. To accomplish this objective, data analysis of the fused and segmented ortho-image/LiDAR data will follow a multi-step process which will iterate through data extraction from the remotely sensed data and statistical analysis until the best fitting model is determined.

The optimized kernel size of the best model will be used as the moving window size for calculating continuous HSI values, based on the regression equation and model coefficients, across the pine rockland landscape covered by the DOQQ and LiDAR imagery. The result of this process will be a continuous landscape-scale probability map showing the extent of suitable habitat for Bartram’s. The minimum habitat suitability threshold will be determined based on the qualitative scale in Table 3 and the correspondence of these scores with actual observations of habitat use within the study plots. Because a HSI score of 60 is the lowest value associated with Bartram’s reproduction, the minimum area of suitable habitat will be determined based on the smallest suitable habitat patch with HSI scores 60 or greater.

OBJECTIVE 3 – DETERMINE IF CURRENT MANAGEMENT AFFECTS HABITAT SUITABILITY AND HOW THE LANDSCAPE CAN BE MANAGED

Fire management regimes in the various management units on these sites will be examined. Fire is vital for Bartram’s survival. Fire and exotic plant management may affect butterfly populations (Dai, Leng, & Kadlec, 1996). Areas with large patches of herbaceous vegetation that include C. linearis are expected to improve chances of encountering Bartram’s populations. The percentage of suitable HSI values with and without comparing the patch and landscape scales are anticipated. The results of these models are expected to predict other suitable habitat for Bartram’s populations that have not been found previously.

RESEARCH IMPLICATIONS

With the recent federal listing of the Bartram’s (Endangered Status for the Florida Leafling and Bartram’s Scrub-Hairstreak Butterflies, 2014), there is now increasing urgency to understand the management needs of this butterfly. Current management decisions are made in the process of planning for and implementing an aggressive prescribed burn regime over the next several years for these properties as a result of funding received from USFWS. The results of this study will inform land managers and helpful managers with useful information, such as the minimum threshold for suitable habitat required for Bartram’s populations. This new information could guide their efforts in developing management plans that promote suitable BSH habitat in the pine rocklands of Miami-Dade County.

REFERENCES


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Table 1. Parameters for Assessing Patch-Scale Habitat Suitability for Bartram’s

Table 2. Criteria for determining habitat suitability scores and threshold.

Figure 2. Croton distribution at Navy Wells (left) and the Richmond Complex (right).

Figure 3. Bartram’s Croton distribution in bare ground and small areas of leaves of croton.

Figure 4. Ratio of interior to edge croton density per square meter.