



Center for Environmental Sciences and Education

A COMPARISON OF LITERATURE-BASED TO EMPIRICAL-BASED BIRD-HABITAT MODELS: AN EXAMPLE FROM AN ARIZONA SKY ISLAND



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I. INTRODUCTION

Spatially explicit predictive models are an important tool for studying wildlife-habitat relationships. These models have become increasingly important in guiding land management decisions. Because empirical data of habitat requirements is often lacking and costly to collect, literature-based models have been considered a useful alternative.

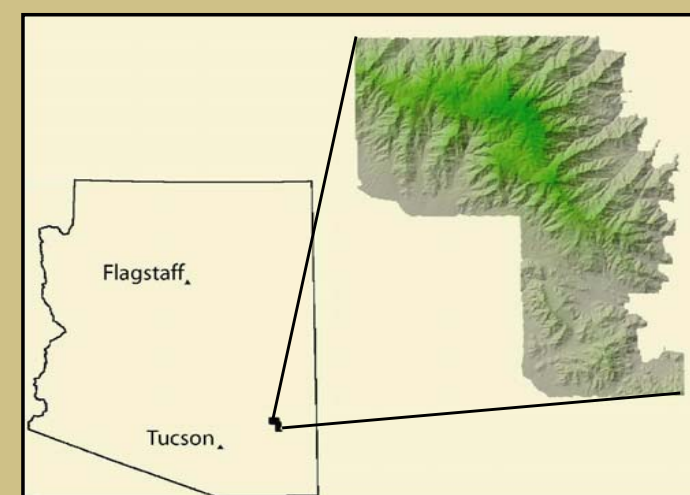
II. OBJECTIVE

Identify the utility of literature-based, landscape-scale predictive bird-habitat models for eight passerines on the Pinafios Mountains, southeastern Arizona.

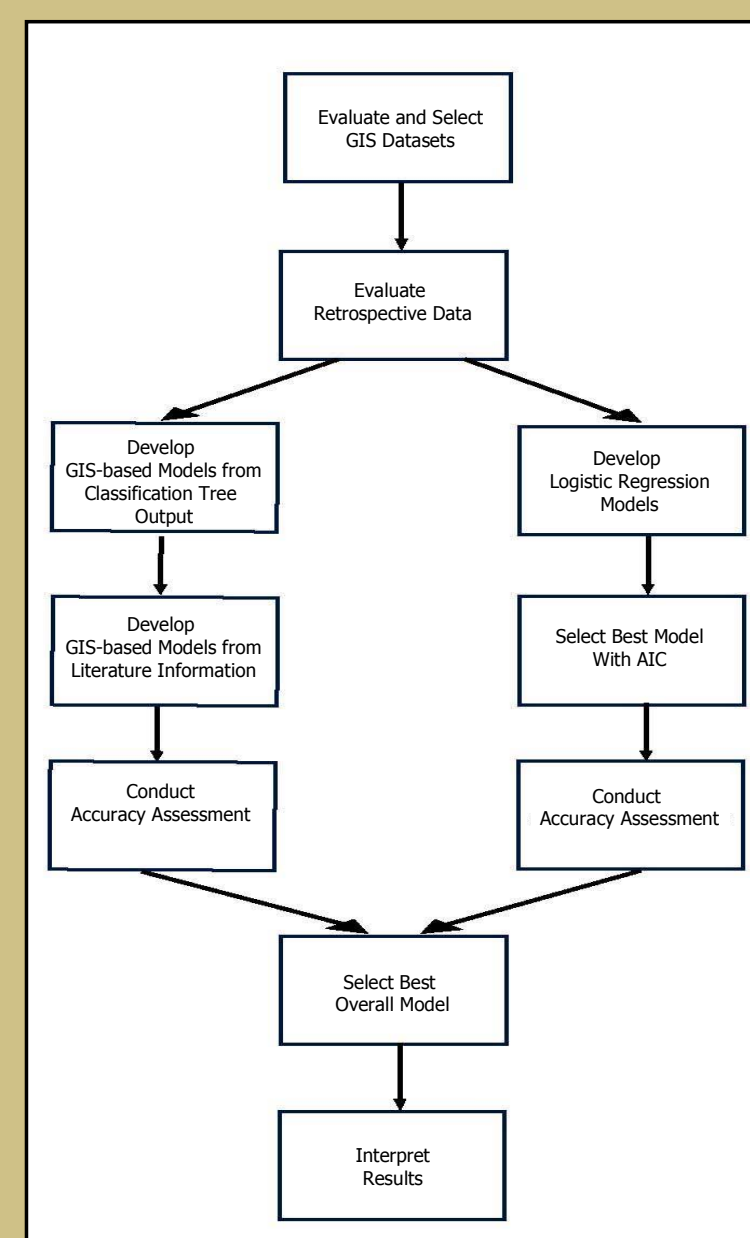
III. METHODS

We developed four models per species using available literature, a three-year (1993-1995) dataset of bird point count data, classification trees and GIS-based distribution maps, and multiple logistic regression. We used habitat variables identified from the available literature to develop a GIS-based habitat distribution model (model 1) and a forced regression model (model 2). Empirical data were used to build model 3 (classification tree with the resultant selected habitat correlates used to develop a GIS distribution model), and model 4 (a backward stepwise logistic regression model).

We accuracy assessed models using bird point data collected during the 2002 breeding season. A competing models/ multi-criteria model selection approach was used to compare literature-based to empirical-based models. We selected the "best" model based upon highest overall model accuracy, highest model specificity and sensitivity, and lowest commission and omission errors.



Locator map of the Pinafios Mountains



Schematic diagram of modeling process

IV. RESULTS

Three of the eight species rendered literature-based models, which performed better than models based on empirical data. These models were the literature-based GIS-based distribution model for the bridled titmouse and the forced logistic models for the Bewick's wren and spotted towhee.

Selection of Best Models

	Overall Accuracy	Sensitivity	Specificity	Commission	Omission
<i>Backward Stepwise Regression</i>					
Bewick's wren	70.5	94.5	53.9	0.023	0.272
^a red-faced warbler	68.9	64.7	72.5	0.162	0.147
^a yellow-rumped warbler	68.9	88.4	41.9	0.116	0.581
<i>Forced Regression- Literature Derived</i>					
spotted towhee	66	61.3	68.1	0.117	0.223
<i>Classification Tree</i>					
broad-tailed hummingbird	57.3	87.5	38.1	0.049	0.379
Mexican jay	72.7	75	71.4	0.091	0.182
<i>GIS-based - Literature derived</i>					
bridled titmouse	61.4	100	46.9	0.386	0

^aGIS-based models nonsignificant, backward stepwise regression selected by default

V. CONCLUSIONS

- Landscape-scale habitat models based upon empirical data performed better (3/32 models or ~91%) than literature based models.
- Accuracy assessments are required to test the working hypotheses (i.e., predictive habitat models).
- Models and model output should be viewed as "work in progress." As better data and techniques become available, these models can be revised and improved.



Bridled titmouse (*Baeolophus wollweberi*)



Yellow-rumped warbler (*Dendroica coronata*)



Spotted Towhee (*Pipilo maculatus*)



Red-faced warbler (*Cardellina rubrifrons*)

VI. MANAGEMENT IMPLICATIONS

For models to be most useful to land managers, they should be site-specific, based upon empirical data, and accuracy assessed. Although their use is often limited, literature-based models should be viewed as "baseline" habitat models, which can be modified as our understanding of a species' habitat is improved. Additionally, information collated during an exhaustive literature review can be used to (1) identify research needs concerning species' habitat requirements, and (2) assist in developing the appropriate study design for collecting habitat measurements, which best reflects our understanding of the species' habitat.



Warbling vireo (*Vireo gilvus*)



Mexican jay (*Aphelocoma ultramarina*)



Bewick's wren (*Thryomanes bewickii*)



Broad-tailed hummingbird (*Selasphorus platycercus*)