

Environmental and Socioeconomic Influences on the Phoenix Avifauna

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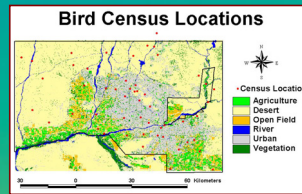
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Bird communities in urban areas are strongly influenced by habitat changes resulting from human activities. Previous studies of urban bird communities have focused largely on habitat measurements. Yet the human behavioral and socioeconomic drivers of habitat change are seldom directly addressed. We examine the combined effects of human socioeconomic structure and habitat structure on the avifauna of the Phoenix metro area using a common multivariate analytical framework. We address two specific questions:

- Are traditional measures of habitat structure and productivity (e.g., floristics, foliage structure and volume) sufficient to predict bird species richness and abundance in urban areas?
- Do measures of human socioeconomic structure and behavior (e.g., income, population density, age of development) have measurable effects on bird species richness and abundance? Can such measures improve statistical models to predict bird species richness and abundance?

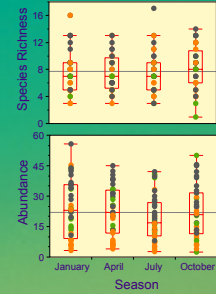
Methods

- Three observers count birds 4 times a year at 40 sites in the Phoenix metro area.
- Here we present results from censuses conducted during the first year of this long-term monitoring program, 2000-2001.
- We used stepwise multiple regression to model bird species richness and abundance as a function of 17 variables including habitat measurements from the 200-survey, socioeconomic indices from US Census data, NDVI from remote-sensed data, and spatial measurements from a GIS. The best-fit model results are presented below.



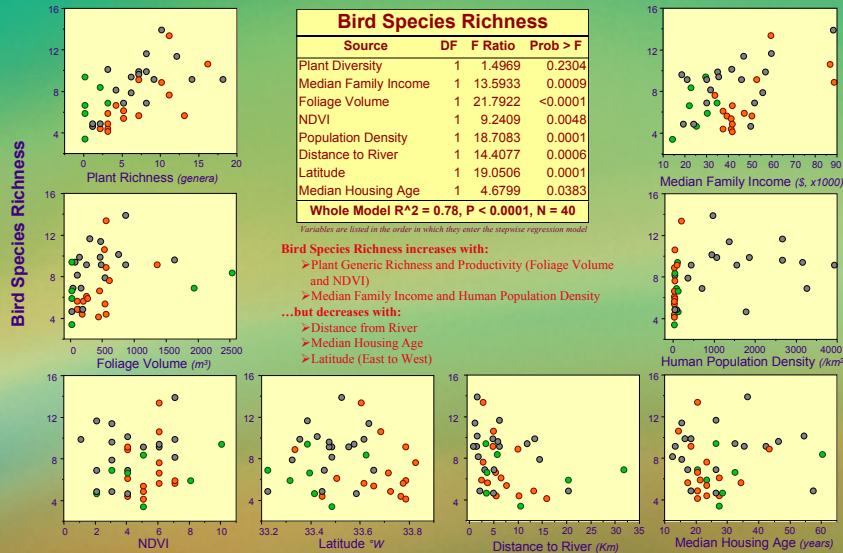
Do Seasons Count?

- We found no seasonal variation in bird species richness and abundance.
- We therefore used average species richness and abundance as the dependent variables in our multiple regression models.
- Species composition does vary between seasons, but we do not address it here.



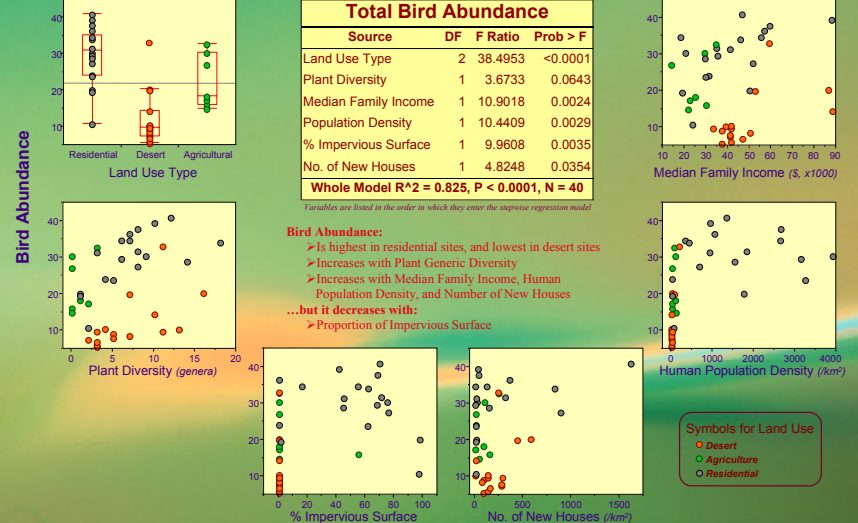
Eight Predictors of Bird Species Richness

$$\text{Bird Species Richness} = 254.96 + 0.0826 * \text{Plant Div} + 0.000055 * \text{MFI} + 0.0024 * \text{Foliage Vol} + 0.39 * \text{NDVI} + 0.001 * \text{HPD} - 0.0002 * \text{Dist to River} - 7.48 * \text{Lat} + 0.055 * \text{MHA}$$



Five Predictors of Bird Abundance

$$\text{Bird Abundance} = 11.24 + \text{Match}(\text{Habitat}, \text{"res"}, 6.97, \text{"des"}, -13.26, \text{"agr"}, 6.29) + 0.49 * \text{Plant Div} + 0.0002 * \text{MFI} + 0.0039 * \text{Pop Den} - 0.13 * \% \text{Imperv Surf.} + 0.0071 * \text{No. New Houses}$$



Human socioeconomic structure does matter

- Measures of habitat structure are important predictors of bird community characteristics, but they do not fully explain patterns observed in urban areas.
- In Phoenix, Median Family Income is a significant predictor of both bird species richness and abundance.
- Likewise, Human Population Density is also a significant predictor, but its positive effect on richness is non-intuitive.
- We need to examine the pathways through which human behavior and social structure affect habitat structure to fully understand our impact on biodiversity.
- Understanding the mechanisms whereby humans affect the habitats they live in is critical in understanding and managing biodiversity in human-dominated landscapes.