Ecological and social factors predicting avian diversity in urban parks.

P. S. Warren and A. Kinzig

Abstract

Urban parks are the primary form of green space occurring in residential areas of a city. As such, neighborhood parks may provide refugia for wildlife as well as the nearest interface with nature available to people. We hypothesize that in neighborhood parks, the interaction of ecological factors with social factors determines the number of species and their abundances. To address this question, we have begun a study of avian species diversity in neighborhood parks in Phoenix. Both ecological and social factors will be measured and a model fitted to determine what factors best predict avian diversity. We are conducting a census of birds in 18 neighborhood parks in Phoenix using a standard 15 minute point count protocol used in other studies at CAP-LTER. We classify the parks as falling in high, middle or low socioeconomic neighborhoods using market cluster data. Both on its own and in combination with a larger, ongoing study of park ecology, this study will help elucidate the complex array of forces generating patterns of biodiversity in urban landscapes.

Question

How does species richness vary in relation to the socioeconomic status of neighborhoods surrounding urban parks?

Introduction

A growing literature (e.g.[1-3]) addresses landscape factors predicting urban patterns of avian diversity. No study, however, has examined how cultural values and cultural practices interact with biogeochemical processes to generate these patterns. For example, species richness appears to be negatively correlated with housing density and landscaping using exotic plants.[1] Both of these landscape factors, however, are determined by an array of economic, cultural and historical forces. To develop a comprehensive understanding of patterns of biodiversity in urban areas, we must incorporate these socioeconomic factors into our ecological models.[3]

Neighborhood parks are often the primary open space in residential areas and may act as reservoirs of species diversity or as refugia for sensitive species.[2] In addition, the value of parks to humans is likely to vary culturally and therefore the design and use of parks will vary culturally. These factors make neighborhood parks a useful model system for ecologists to examine the interactions between social and ecological processes.

References

[1]Germaine, S. S., S. S. Rosenstock, R. E. Schweinsburg, and W. S. Richardson. 1998. Relationships among breeding birds, habitat, and residential development in greater Tucson, Arizona. Ecological Applications 8:680-691.

[2]Hermy, M., and J. Cornelis. 2000. Towards a monitoring method and a number of multifaceted and hierarchical biodiversity indicators for urban and suburban parks. Landscape and Urban Planning 49:149-162.

[3]Savard, J.-P. L., P. Clergeau, and G. Mennechez. 2000. Biodiversity concepts and urban ecosystems. Landscape and Urban Planning 48:131-142.
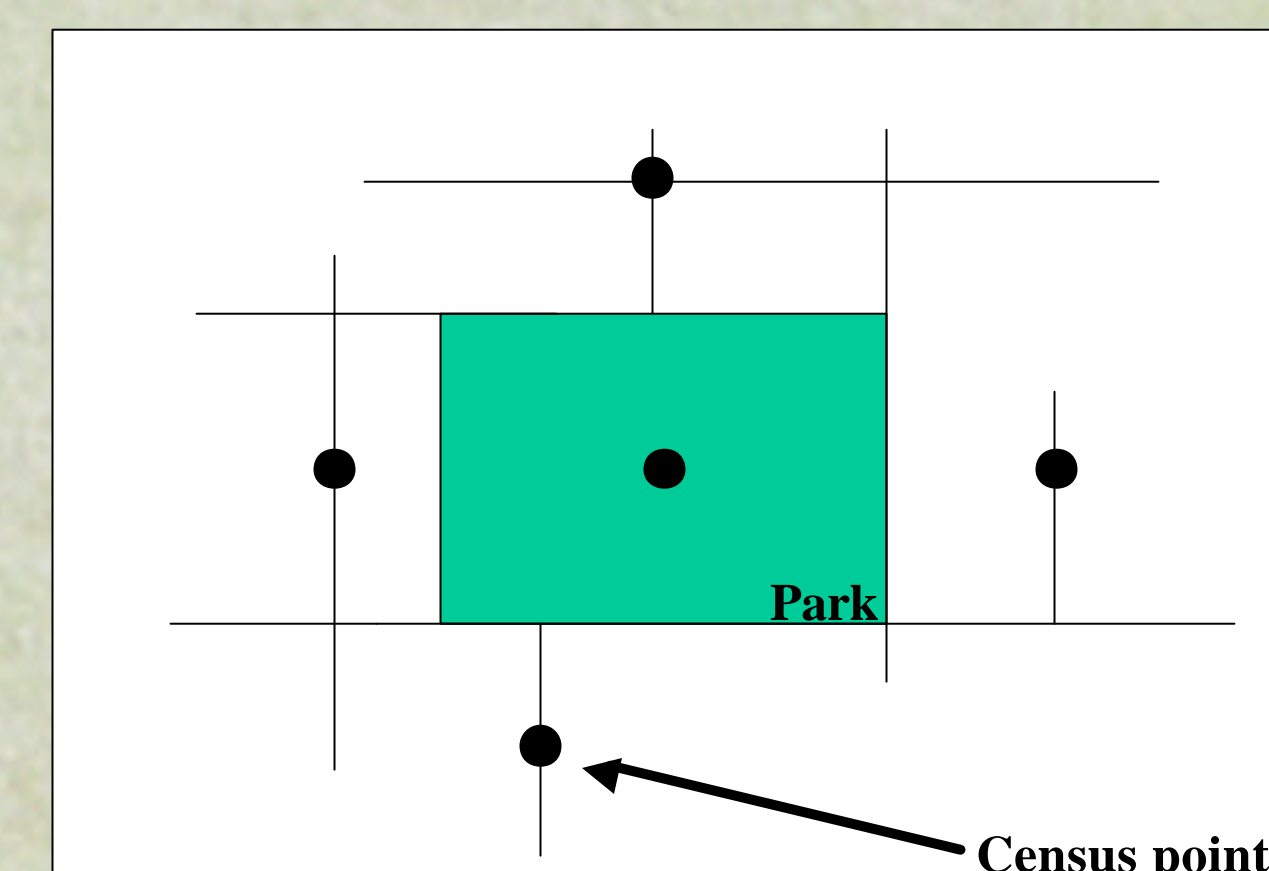
Methods

• Select parks that are similar in size and facilities.

• Classify parks as high, middle or low socioeconomic status using market cluster data from PRIZM.

e.g. a high socioeconomic status park (below)

Cluster code: 05
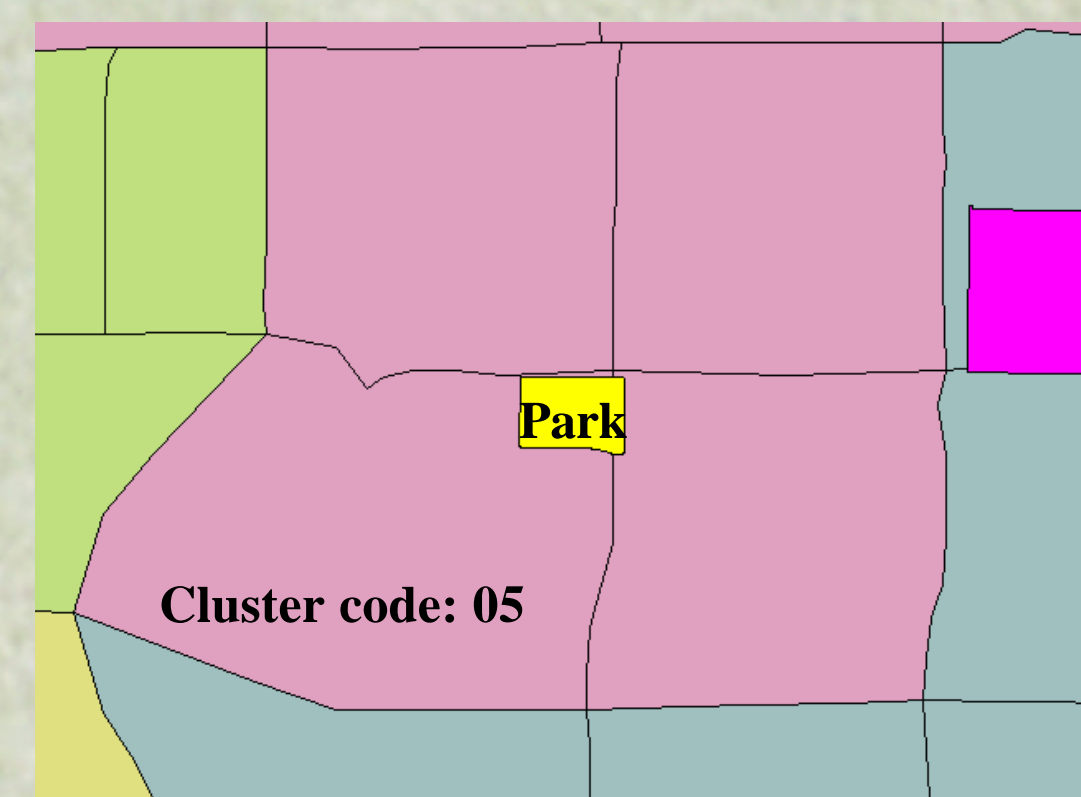
• Conduct censuses of bird species (15 minute point counts, 3 observers, 4 times per year)
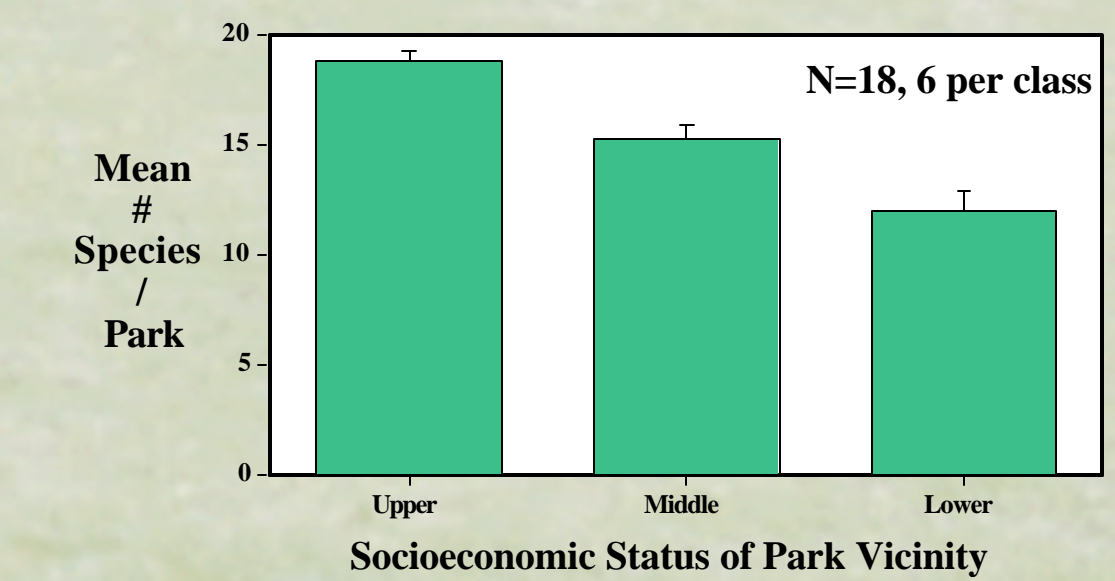
Park

Census point

Conclusion and Future Work

Avian diversity in neighborhood parks (as measured by species richness) varies significantly with socioeconomic status of the surrounding communities. Although speciosity appears to increase with socioeconomic status, lower class parks are more variable than the others and support some unique species not seen in the other two classes. Future analyses will use social surveys and measures of habitat to refine these results and to determine exactly which social and ecological factors predict variation in species diversity.

Preliminary Results*

1. Species richness varies significantly among the three groups, increasing with increasing socioeconomic status. (ANOVA, $F=22.272$, $p<0.001$)

N=18, 6 per class

Mean # Species / Park — Socioeconomic Status of Park Vicinity (Upper, Middle, Lower)

2. Species richness is more variable in parks classified as low socioeconomic status.

N=18, 6 per class

CV of # Species / Park — Socioeconomic Status of Park Vicinity (Upper, Middle, Lower)
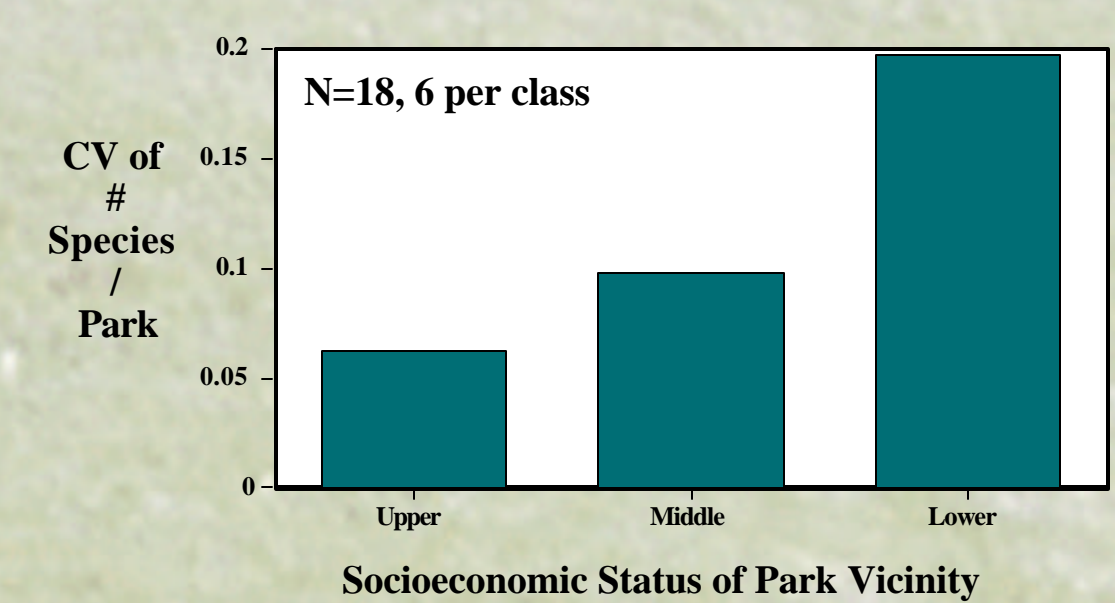
3. The number of rarely sighted birds does not differ significantly among the three groups. (ANOVA, $F=1.00$, $p=0.391$)

N=18, 6 per class

Mean # Species / Park — Socioeconomic Status of Park Vicinity (Upper, Middle, Lower)
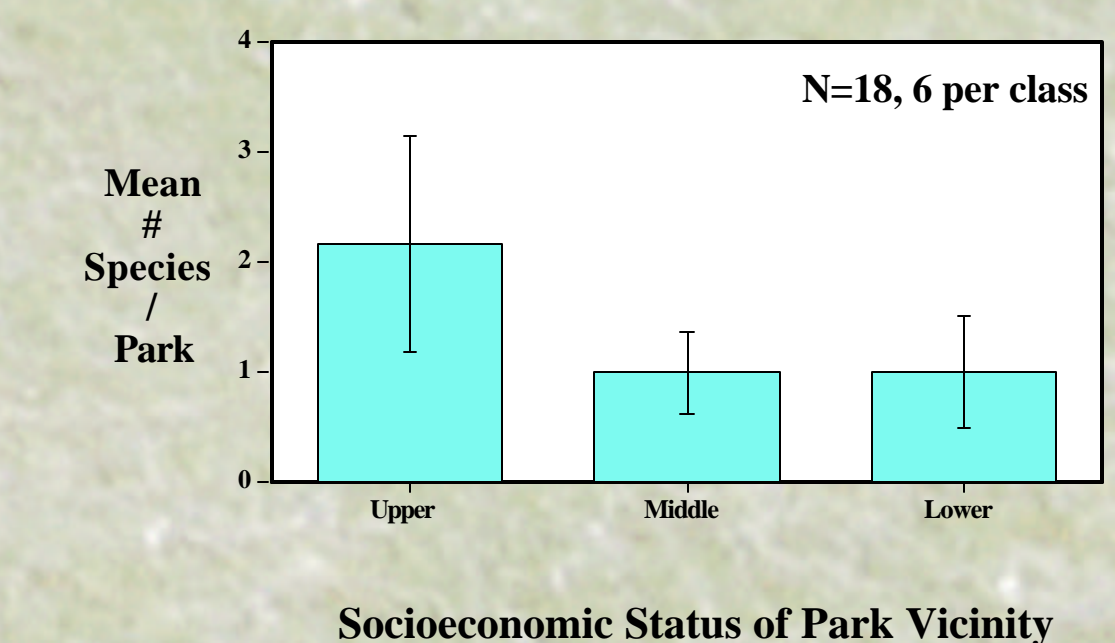
*Results include only data from the winter 2000 survey and from the center census point for each park.