

# HOW URBANIZATION AFFECTS ECOSYSTEMS

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**INTRODUCTION & MAIN QUESTIONS** — Urbanization is booming around Wisconsin as well as the rest of the country. Land use for urban development is growing faster than land use for parks or conservation areas. We studied the diversity of bird, tree, and macro-invertebrate species at gradients varying from rural to urban. We wanted to answer how urbanization affects diversity, and the native to exotic ratio amongst those species.

## METHODS

**I. Study Sites** - Seven sites were chosen and are organized in a urban to rural gradient:

UW-Milwaukee Campus — (Urban) Bird and tree data were collected in an area of high human disturbance.

Residential Neighborhood Near UW-Milwaukee — (Urban) Bird and tree data were collected in an area of high human disturbance.

Lake Park Golf Course — (Urban) Bird and tree data were collected.

Urban Ecology Center — (Suburban) Bird and tree data were collected in a riparian forest ecosystem that had minimal city noise and human disturbance.

Hubbard Park — (Suburban) Macro-invertebrates were collected from the Milwaukee River.

Rivers Edge Park — (Rural) Tree and bird data were collected in a riparian forest ecosystem. Macro-invertebrate data was collected from the Milwaukee River.

UW-Milwaukee Field Station — (Rural) Bird and tree data were collected in a forest ecosystem.

## II. Data Collection

### Birds

Species and quantities recorded  
Observed birds within a 50 meter radius for 10 minutes

### Trees

Random plots of 10 meters by 10 meters chosen  
Circumference at breast height was recorded for trees with a circumference greater than 4 cm

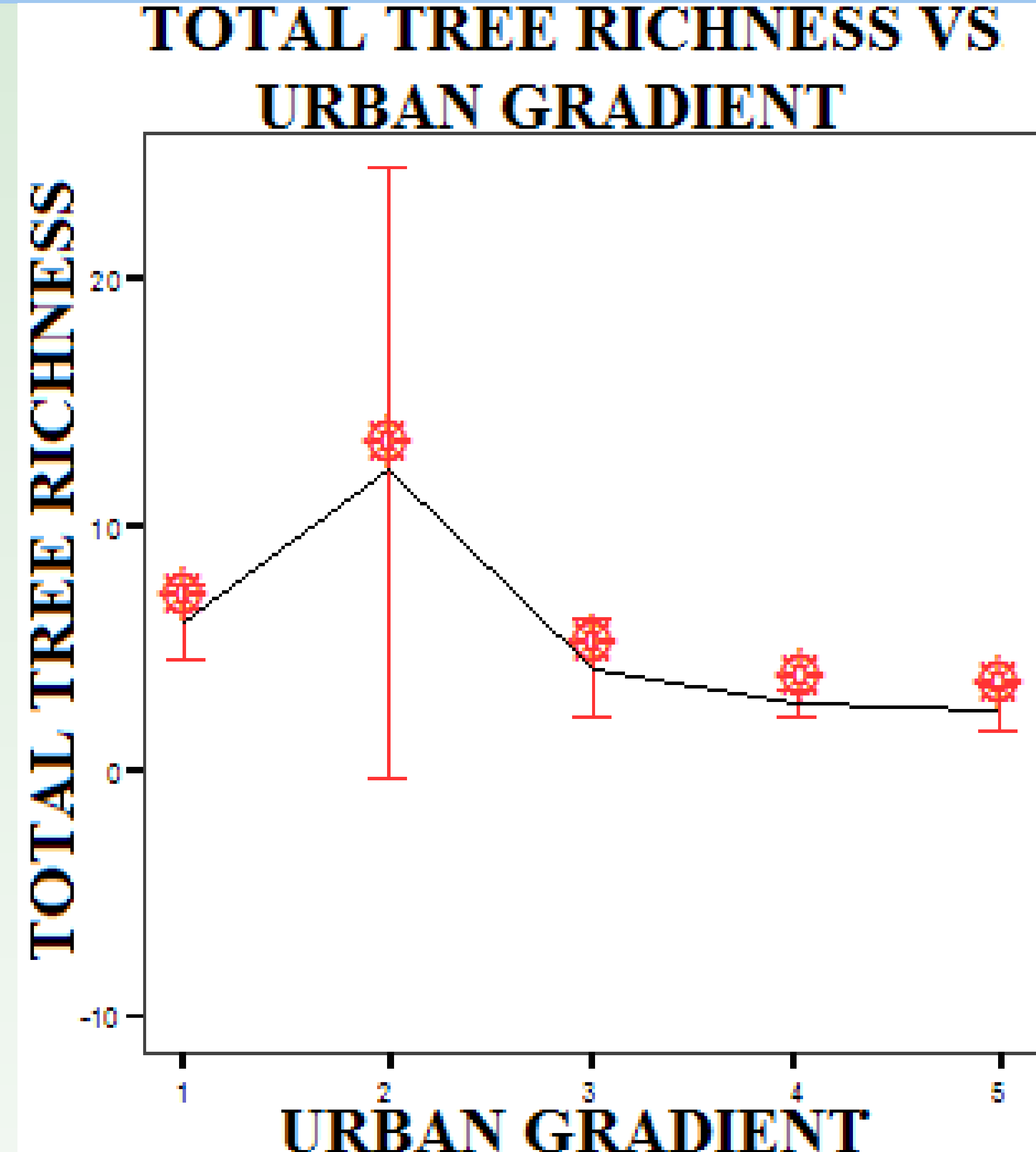
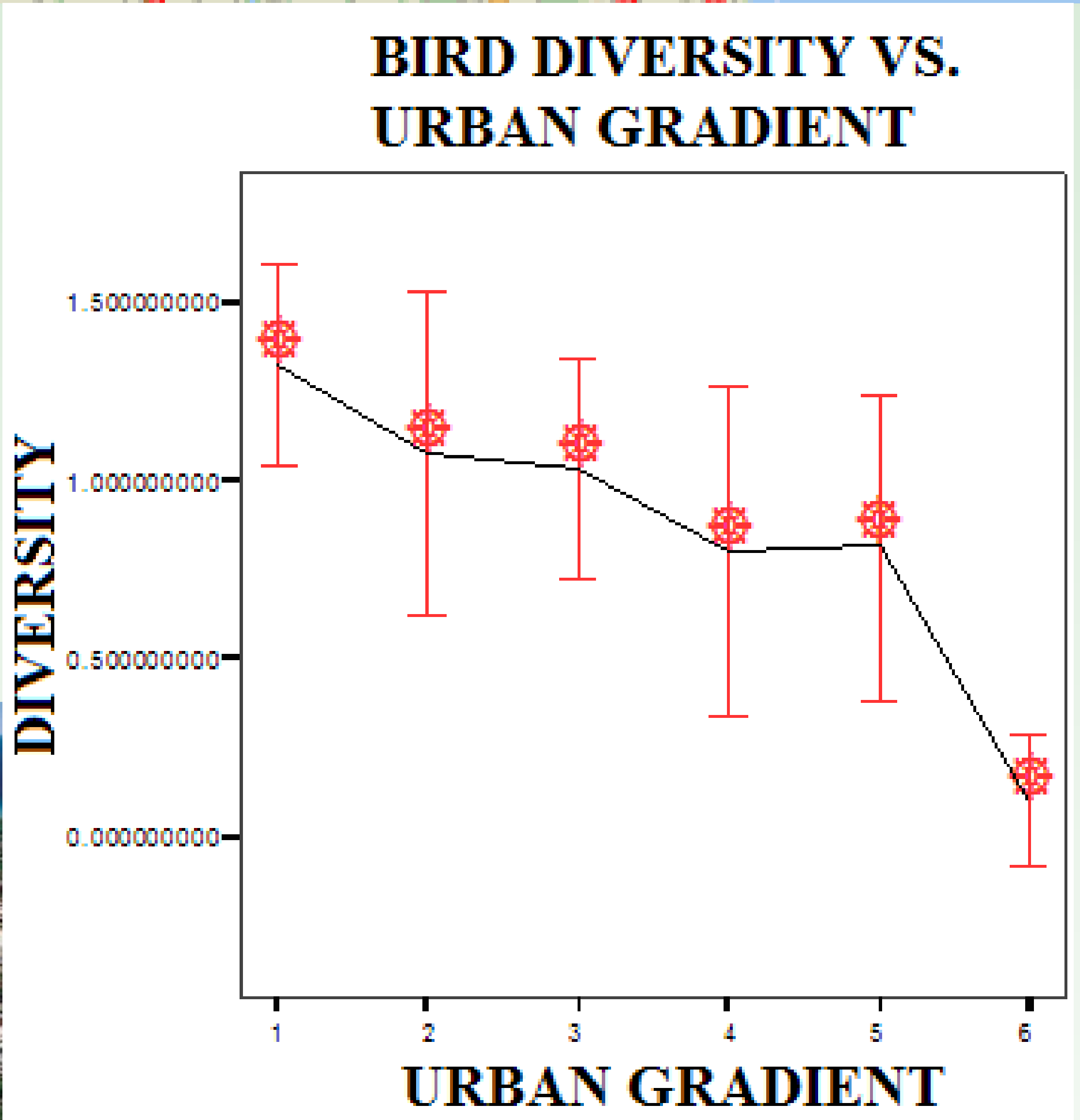
### Macro-invertebrates

Collected within a transect along the river  
Collected by kick netting for two minutes

## III. Calculations

- All data was entered into Microsoft Excel. The following were calculated:

DBH (diameter at breast height)  
Native, exotic, and total biomass  
Native, exotic, and total richness  
Diversity  
Evenness



These graphs represent a significant relationship of how urbanization affects ecosystems.

## RESULTS AND CONCLUSIONS

Our results indicate that the bird diversity, evenness, and richness decrease with urbanization while exotic richness increases with urbanization. This coincides with the moderate development theory which states that moderate development will increase ornamental vegetation. In turn this will increase bird abundance (Blair, 1996). Some bird species will thrive in a moderately developed environment and others will thrive in their natural habitats, hence the increase in exotic richness and the decrease in native richness with urbanization.

We also analyzed how trees responded to urbanization. We found that the natural and total richness decreased, while exotic biomass increased with urbanization. The increase in importation of nonnative species by humans increases the exotic biomass. (Mackin-Rogalska et al. 1988, Kowarik 1995) The decrease in native tree biomass and richness is due to anthropogenic disturbance.

Last we analyzed aquatic macro-invertebrates. We found that the results were not significant due to minimal changes in species richness, evenness and diversity.

