IMPACTS OF RESIDENTIAL GARDENING PRACTICES ON BIRD AND BUTTERFLY COMMUNITIES IN SOUTHEAST KANSAS

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Introduction

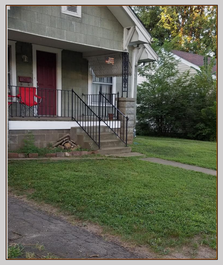
Urban Ecology
The inclusion of humans and cities into ecological research has been fundamental in determining that urban greenspaces are both valuable sources of nearby nature and sites of refugia for many native wildlife species.

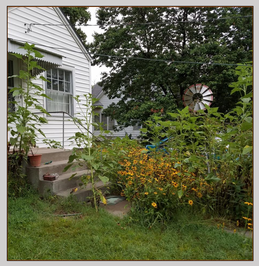
Population Increases: A Shift From Rural to Urban Living
City growth and shifts to urban living result in the fragmentation and removal of habitat. In addition, simplification of vegetation occurs when shrub and sub-canopy layers along with nectar and larval host plants are removed. This loss in vegetation strata limits many native or specialist species.

Humans as Drivers of Landscape Change
Within residential greenspaces, humans are driving landscape change through their perceptions, preferences, management behaviors and city regulations.

Top-Down Drivers
- Landowner decisions
- Preferences/Aesthetics
- Socioeconomic factors

Bottom-Up Drivers
- Nursery trade
- Planning/Zoning
- Homeowners Associations (HOAs)





Research Question:
Which variables of residential gardens best predict bird and butterfly community diversity? How are homeowner decisions impacting diversity trends?

- Management Practices
- Property Ownership
- Canopy Density
- Native vs. Exotic Vegetation
- Plant Diversity
- Sociodemographic Factors

Study Location

Pittsburg, Kansas, USA

Population: 20,394
Urban: 98% Rural: 2%

Total Homes: 7,727
Own: 46% Rent: 54%

Average Annual Income:
Kansas: $53,906 Pittsburg: $33,429

Pittsburg Landscape:
Pittsburg is a micropolitan city located in what was historically a tall grass prairie ecosystem. A variety of agriculture and mining practices fragmented and removed the prairie and grasslands now dominate.

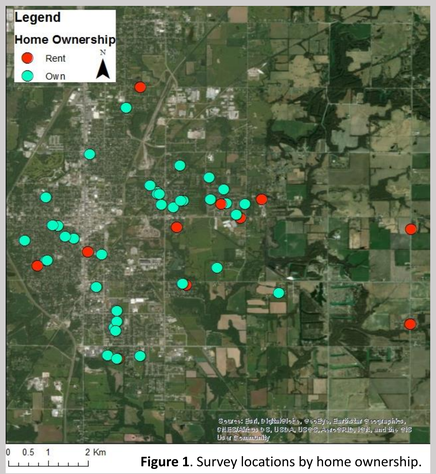


Figure 1. Survey locations by home ownership.

Methods

Site Selection
Informative fliers requesting participation in the study were mailed to 1,732 homes in Pittsburg. I selected 3 postal routes based on both a spatial transect through Pittsburg and the variable of high, medium and low income. Home gardening practices visibly differed from traditional management for manicured lawns to more natural, less landscaped management (Fig. 2).

USPS Route	Number of Homes	Average Household Income ($)
66762-RO04	610	67,810
66762-CO13	571	36,560
66762-CO14	51	Below 25,000

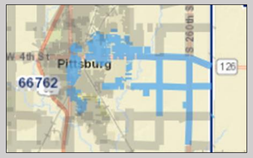


Figure 2. Mail routes for survey fliers throughout Pittsburg, stratified by annual household income. We had approximately the same amount of homes within each visible yard management style.

Bird Point Count Surveys
During the 2017 breeding season (May-July), I surveyed 47 residential properties three times. I used five-minute unlimited radius point counts and recorded all observed bird species along with the variables of time, date, temperature, wind speed and cloud cover.

Butterfly Surveys
I conducted three, ten-minute butterfly surveys (June-August) using the checklist survey method to access the presence/absence of all species. Butterflies were identified to species when possible and categorized as either a generalist or specialist species.

Vegetation Surveys
I used a Daubenmire frame to take 5 random samples of ground cover. Within 11.3m of the point count location, I measured canopy density, canopy height and diameter at breast height (DBH) of all trees. I estimated the percent of artificial ground cover, bare soil, flowering plants, trees, shrubs and grass (James and Shugart, 1970; Fig. 3).



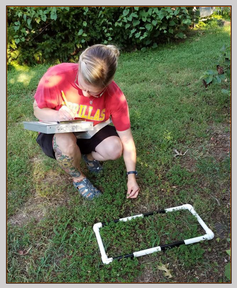


Figure 3. Vegetation surveys conducted at 47 residential properties in June 2017.

Participant Surveys
Participants in the study were asked to complete an online survey using the New Ecological paradigm (NEP) questions to gauge environmental attitude. Additional questions were used to determine personal preferences and management behaviors regarding their properties. I will use Qualtrics programmimg to analyze participants responses. These surveys will be available to residents next month.

Data Analysis
Preliminary data analysis included simple linear regression to determine the relationship between bird or butterfly community data with yard vegetation variables. An analysis of variance (ANOVA) was used to determine differences in the average number of bird and butterfly species across management intensities. Future analyses include bird and butterfly abundance modeling (Program R, Package unmarked).

Results

Bird and Butterfly Communities
We recorded 47 bird species from 1,845 total observations over the 2017 breeding season. The 6 most common species accounted for 73% of the total observations (Fig. 4).


European Starling (*Sternus vulgaris*)

American Robin (*Turdus migratorious*)

Northern Cardinal (*Cardinalis cardinalis*)

House Sparrow (*Passer domesticus*)

Mourning Dove (*Zenaida macroura*)

House Wren (*Troglodytes aedon*)

Figure 4. Six most abundant bird species observed during the 2017 breeding season.

We recorded 27 butterfly species from 434 total observations. The five most common species accounted for 57% of the total observations (Fig. 5).


Eastern tailed-blue (*Cupido comyntas*)

Painted lady (*Vanessa virginiensis*)

Fiery skipper (*Hylephila phyleus*)

Red-banded hairstreak (*Calycopis cecrops*)

Monarch (*Danaus plexipp*)

Figure 5. Five most abundant butterfly species observed during the 2017 survey.

Management Style and Vegetation Associations

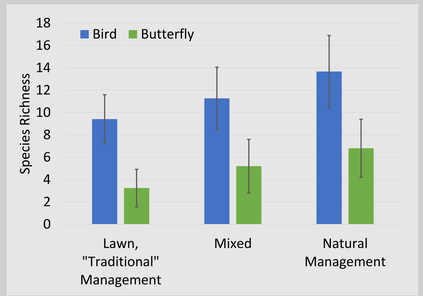


Figure 6. Average bird (ANOVA: F = 9.6, $P < 0.001$) and butterfly species (F = 10.2, $P < 0.001$) differed across the three lawn management styles. The largest differences in richness occurred across lawn and natural management styles (Tukey HSD; Bird, $P = 0.001$; Butterfly, $P = 0.001$). There was also a difference between lawn and mixed styles for butterfly richness (Tukey HSD: $P = 0.044$).

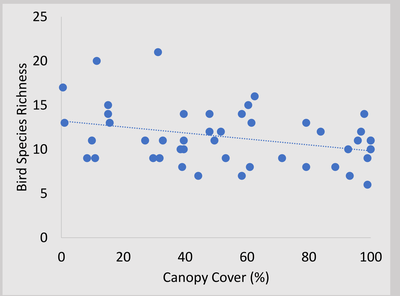


Figure 7. Canopy cover was negatively related to bird species richness (Linear regression: $\beta = -0.03$, $R^2 = 0.11$, P = 0.021). Canopy cover did not predict butterfly species richness ($R^2 = 0.07$, $P = 0.063$).

Conclusions

- Initial estimates for bird and butterfly diversity were greater than expected. Species richness for both birds and butterflies increased with vegetation complexity and more natural management styles by homeowners (Fig. 6 and 7).
- The butterfly community responded to small management efforts, with more species found in mixed and natural management styles over the traditional lawn (Fig. 6).
- Data collection and analyses are still underway, particularly for homeowner surveys. We expect to perform additional field sampling in Summer 2018.

Acknowledgements & References

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