AVIAN USE OF URBAN GREENSPACES VARIES ACROSS THE FULL ANNUAL CYCLE

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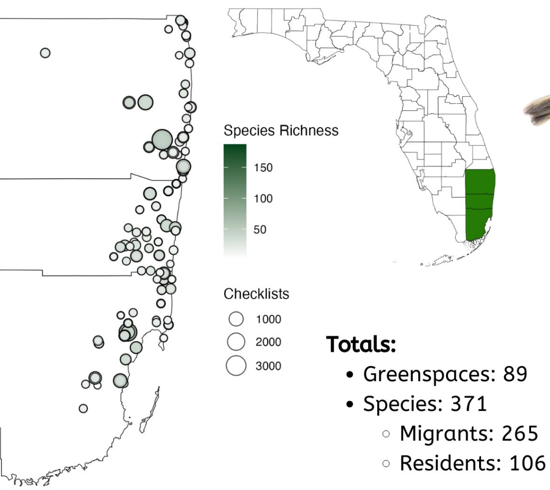
Introduction

- **Urbanization and greenspace importance:** Cities fragment habitats and reduce resources, but urban greenspaces (parks, reserves) can partially support biodiversity, though their conservation value varies by size, connectivity, and habitat complexity.
- **Seasonal and functional gaps in knowledge:** Most studies focus on breeding season or single taxa, overlooking how species use greenspaces differently across the full-annual cycle and how functional diversity responds to urban landscapes.



gure 1. Map showing the study area and sample size.

Objectives

Question 1 - Species-Area Relationship

- Determine how species–area relationships in urban greenspaces change seasonally and across urban gradients.

Question 2 - Patch Connectivity & Isolation

- Determine how the spatial isolation of greenspaces affects species occupancy across different phases of the annual cycle.

Methods

- **Study system and bird data:** Examined 89 urban greenspaces (5.6–364.6 ha) across South Florida (Broward, Miami-Dade, Palm Beach; **Figure 1**). Bird observations came from complete eBird checklists (2010–2024), with species classified as migratory or residental (from the AVONET database).
- **Greenspace attributes:** Measured area, isolation (distance to nearest greenspace), urbanization intensity (Global Human Modification Index), and vegetation type (Dynamic World dataset) to capture habitat heterogeneity.
- **Statistical analysis:** Modeled species richness (migratory, residental, total) using negative binomial GLMMs in glmmTMB, accounting for seasonal variation and checklist effort; effects of size, isolation, and habitat heterogeneity visualized with partial dependence plots.

Results

01 Dominant habitat significantly influences species richness, with the largest declines in crop lands **(Fi gure 2)**. Note the significant difference in built area bet ween migration statuses.

02 Species richness significantly increases with site size an sampling effort, but significantly declines with human modification (GHMI) in migratory species, and shows an increasing trend for residential species **(Figure 3)**.

03 Isolation has a significant negative effect: its impact does not depend on season or analysis **(Figure 4)**. The interactions between isolation, season, and migration status were not significant, meaning this negative effec is consistent across all seasons and species status.

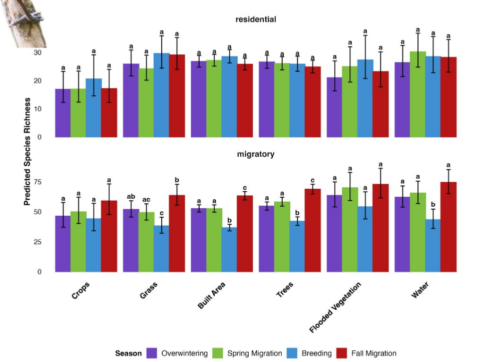


Figure 2. Dominant habitat type influence on species richness during parts of the full-annual cycle.

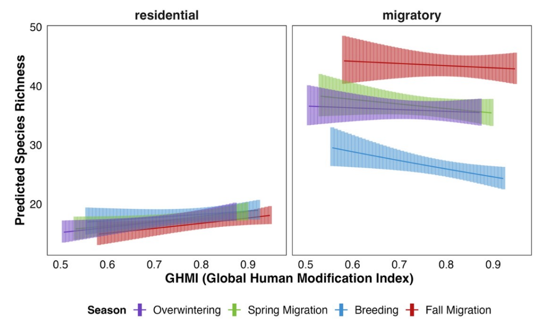


Figure 3. Global human modification influence on species richness during parts of the full-annual cycle.

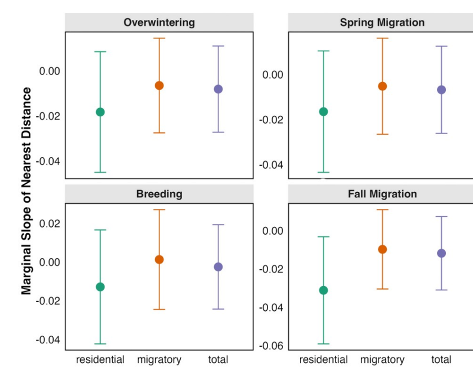


Figure 4. Season-specific effects of nearest greenspace distance on bird species richnes for migratory and residential species.

Discussion and Management Practices

- **Enhance connectivity:** Even modest reductions in isolation can help maintain species richness; consider creating habitat corridors or stepping-stone greenspaces between urban patches.
- **Prioritize habitat diversity:** Cropland-dominated sites support fewer species; managers should promote a mix of natural and semi-natural habitats to support a wider range of birds.
- **Mitigate human modification impacts:** Reduce anthropogenic disturbance in key greenspaces through controlled access, buffer zones, and urban planning that limits impervious surfaces.
- **Adaptive management:** Use predictive models to identify high-risk sites and implement interventions (e.g., connectivity improvements) to test effectiveness over time.