Long-Term Changes in Urban Riparian Bird Communities

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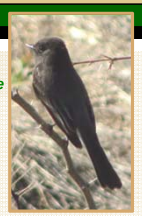
GRRO: Greater Road Runner

Introduction



BLPH: Black Phoebe

- Riparian zones are biodiversity hotspots, particularly in arid landscapes where they provide resources for wildlife, including migratory bird species.
- Urbanization affects site-level and landscape-level environment. Environmental changes may lead to riparian zones that foster altered biotic communities.
- Shifts in bird communities may take place over long temporal scales. However, such shifts have rarely been documented in urban areas.

Water Specialists

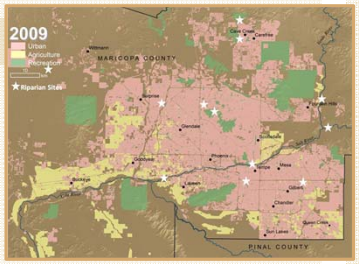
SOSP: Song Sparrow

Questions:

1. Are there seasonal differences in bird species composition?
2. Has bird community composition changed over time?
3. How does bird species composition differ among various riparian sites, and which environmental variables explain variation of the sites and bird communities?

Methods: Study Sites

- Central Arizona–Phoenix Long-Term Ecological Research (CAP LTER) project has been monitoring bird populations since 2002 at 12 riparian long-term monitoring sites.
- Site water features are ephemeral or perennial, lotic or lentic.



Examples of Riparian Study Sites

Salt River, perennial reach in an urban landscape

Retention Basin, perennial drain in an urban landscape

Cave Creek, ephemeral wash in the Sonoran Desert

New River, ephemeral wash in an urban landscape

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Methods: Data and Analyses

Riparian Bird Community

- For 11 years, 3 different observers visited each site once per season (spring and winter).
- All birds seen and heard were recorded during 15-minute open-radius point count surveys. However, only landbirds were considered in our analysis.
- Seasonal bird abundance was the seasonal maximum # of individuals per species within 40m of the point. When combining years, we averaged abundance across years.
- We used Nonmetric Multidimensional Scaling (NMDS) to evaluate bird communities compositional differences.

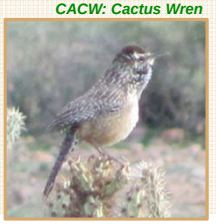
Environmental Variables

BTSP: Black-throated Sparrow

- In 2013, site variables were quantified within 40m of bird points.
- Using ArcGIS and remote sensing images (1m resolution) from 2010, landscape variables were quantified within a 2km buffer around bird points.
- Significant environmental variables ($p<0.05$) were determined based on 1,000 permutations of fitting the variables onto the NMDS ordination for spring and winter seasons.

Desert Specialists

CACW: Cactus Wren

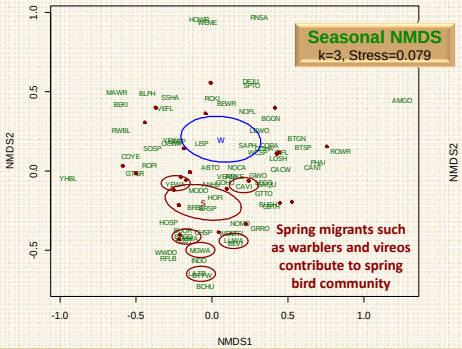


Results: Riparian Bird Community

Time Frames:
(a) 2002 & 2004, (b) 2007 & 2008, (c) 2011 & 2012

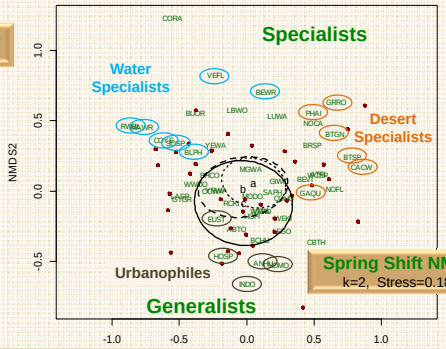
Seasonal Differences

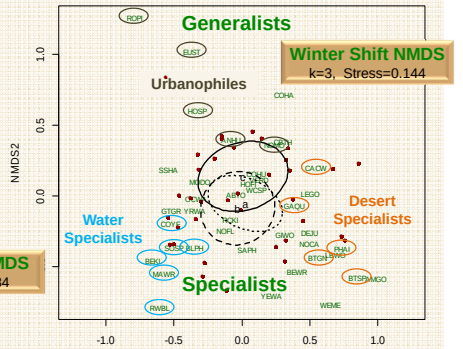
- Winter (W) and Spring (S) bird communities have different species composition.



Temporal Shift

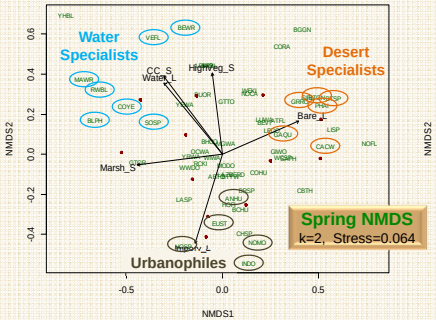
- Temporal NMDS ordinations indicate a compositional shift to more urban tolerant species such as generalists for both seasons.

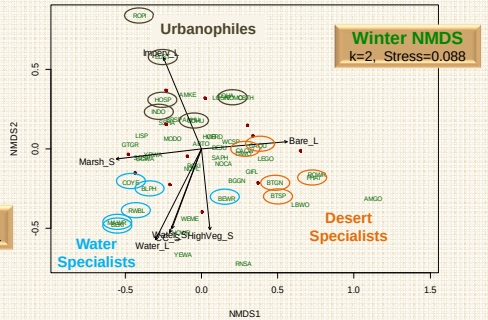




Results: Environmental Variables

- Spring and Winter NMDS show how bird communities differ at various riparian sites.
- Six (Spring NMDS) and seven (Winter NMDS) site and landscape environmental variables are significant in explaining environmental variation of riparian sites.





ANHU: Anna's Hummingbird

NOMO: Northern Mockingbird

Urbanophiles

Significant Environmental Variables

Variables (Site-level)	Graph Name	NMDS
% Marsh	Marsh_S	W
% Water	Water_S	S + W
% High Vegetation (>1.5m)	HighVeg_S	S + W
% Canopy Cover	CC_S	S + W
Variables (Landscape-level)	**Graph name**	**NMDS**
% Impervious Surface	Imperv_L	S + W
% Bare Ground	Bare_L	S + W
% Water	Water_L	S + W