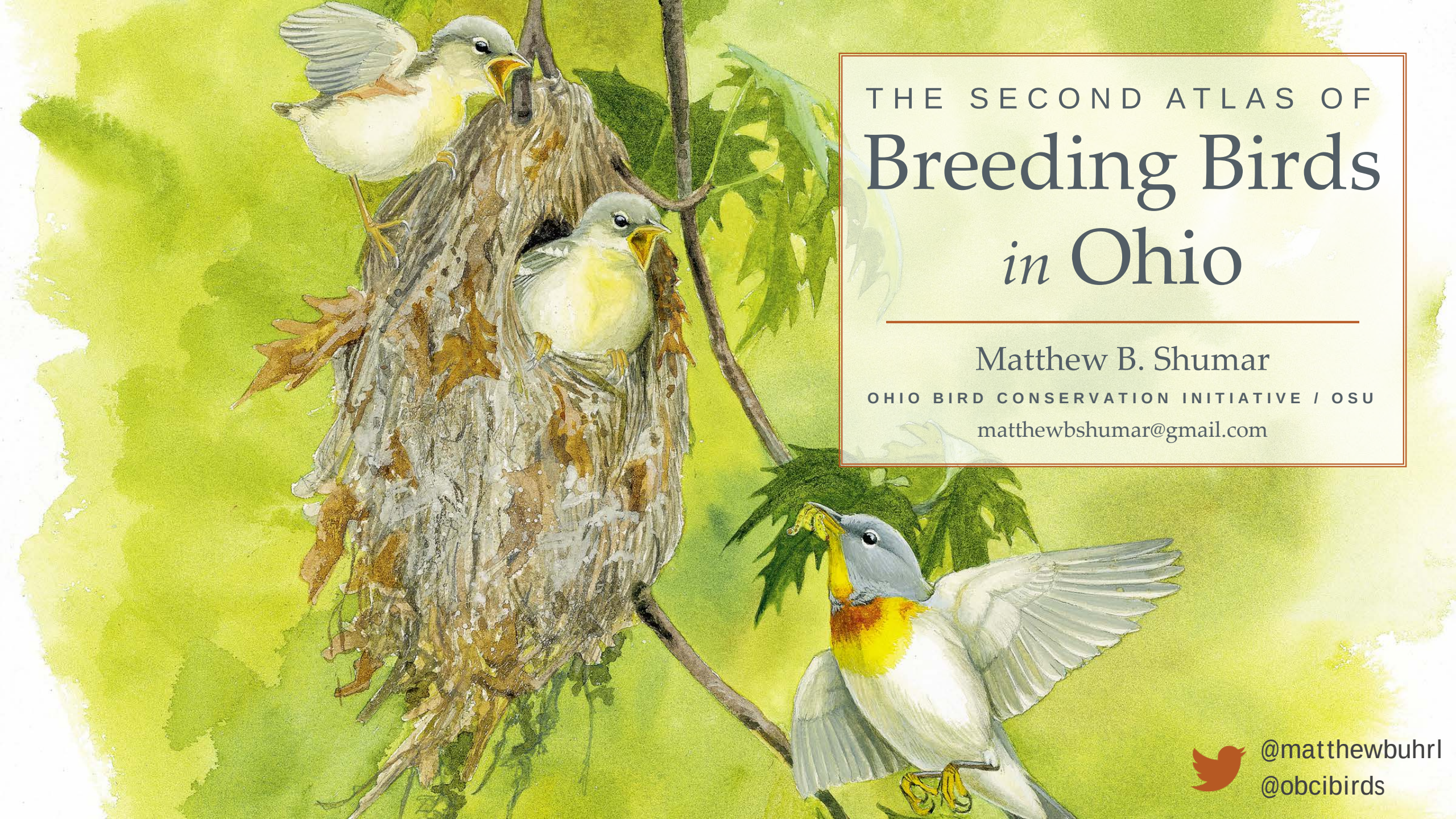

THE SECOND ATLAS OF Breeding Birds *in* Ohio

Matthew B. Shumar

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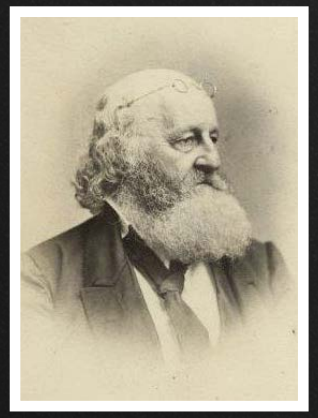
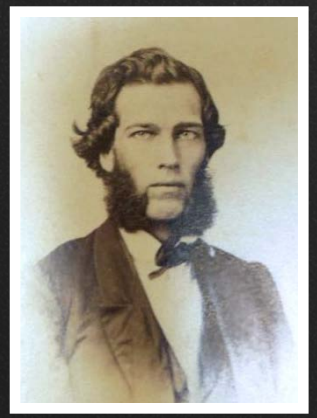
@obcibirds

A Long History of Bird Monitoring in Ohio

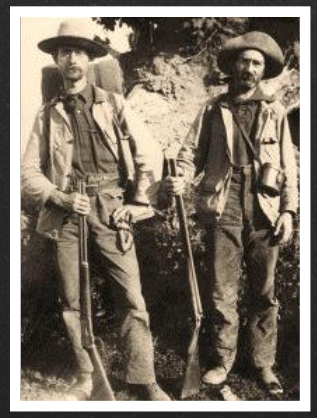
Jared P. Kirtland



John M. Wheaton



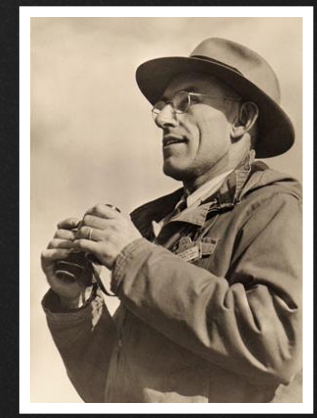
William L. Dawson (I)



Lynds Jones

Lawrence E. Hicks

Milton Trautman



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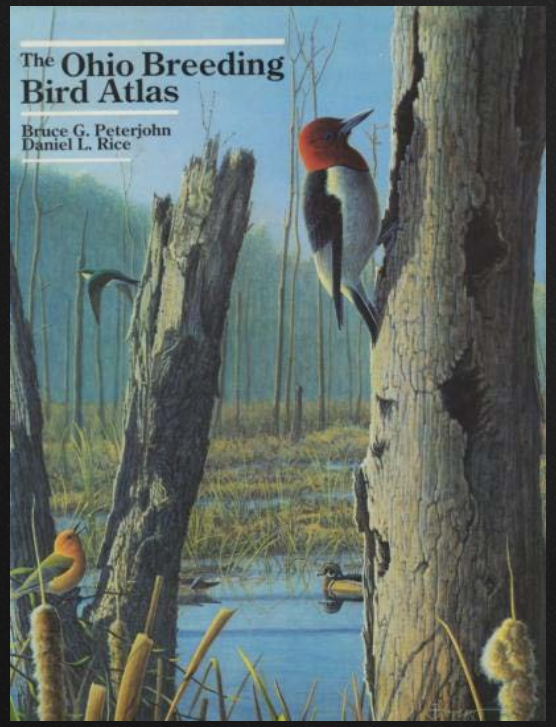
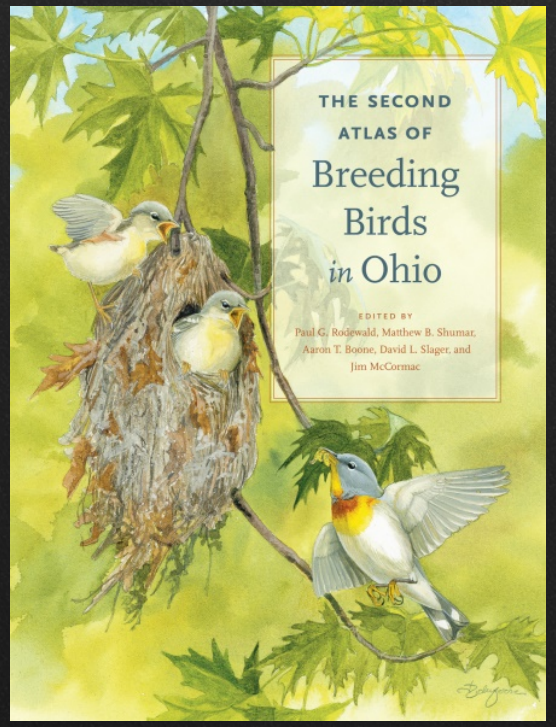
Ohio's Breeding Bird Atlases





- OBBA1 field work from 1982-1987
  - Sampled a subset of blocks (~17%; n=764)
  - Occurrence only (no abundance)
- OBBA2 field work from 2006-2011
  - Complete statewide coverage (n=4,437)
  - Added Abundance sampling
  - Added Marshbird surveys

Note: neither atlas used an eBird daily checklist system

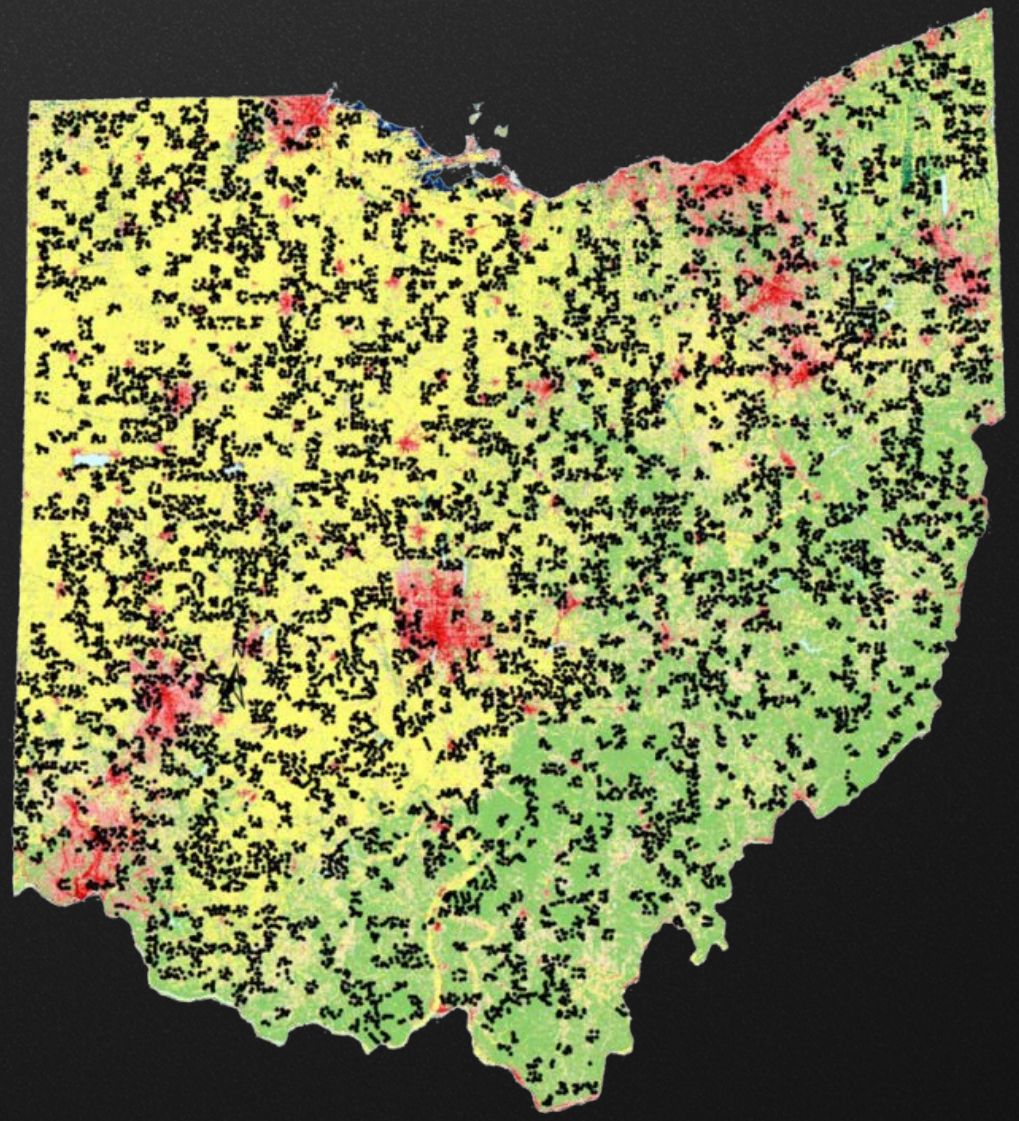
OBBA I (1982-87)

OBBA II (2006-11)

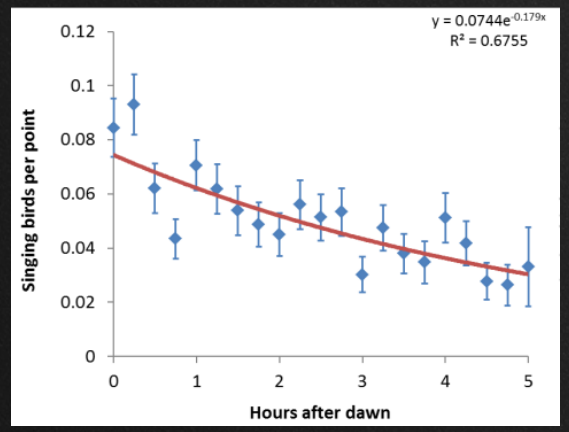
Abundance Surveys

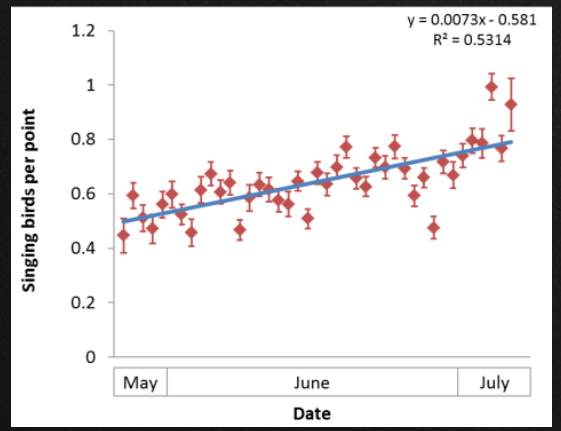
- 8 point-counts in ~½ total blocks
- Trained surveyors collect data
- All singing birds tracked through discrete time & distance bands
- Estimating detectability

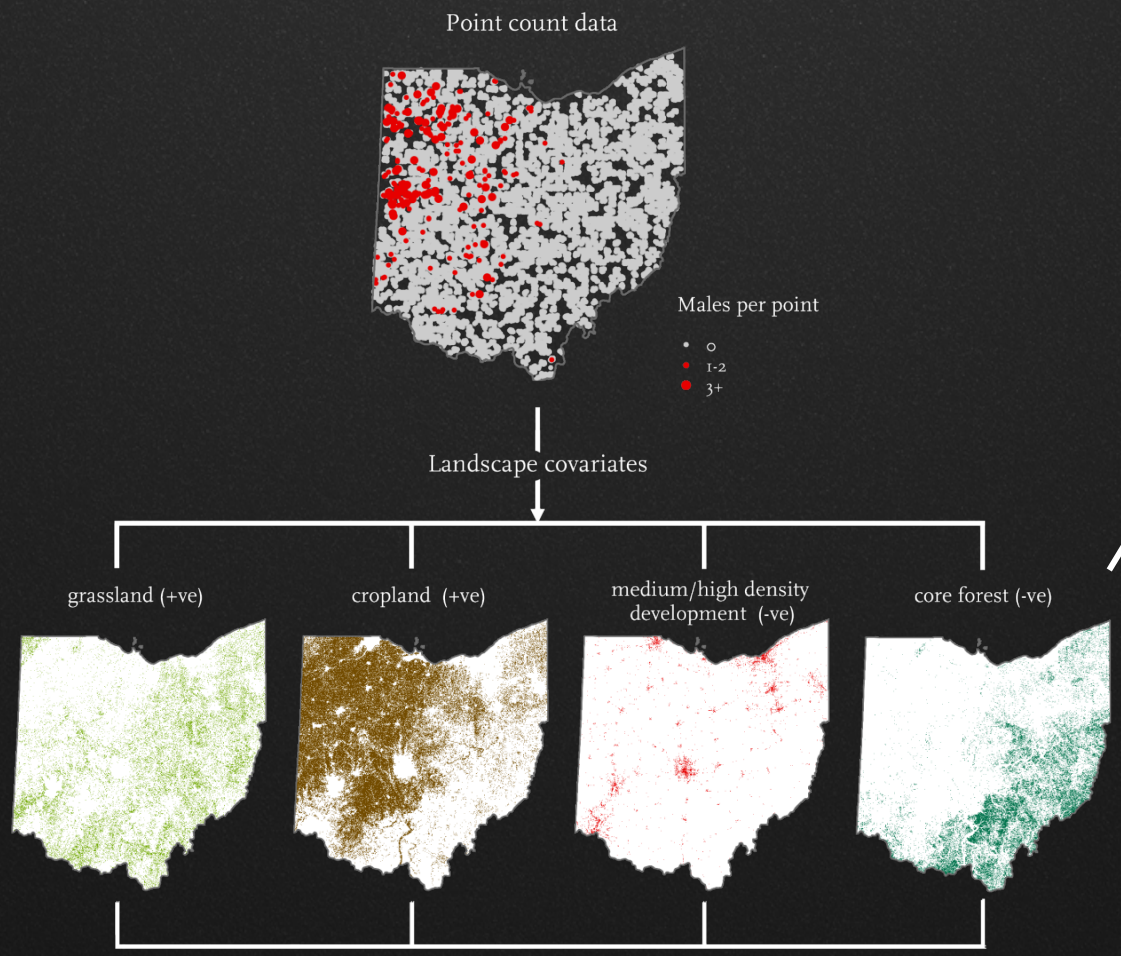
Farnsworth et al. 2002

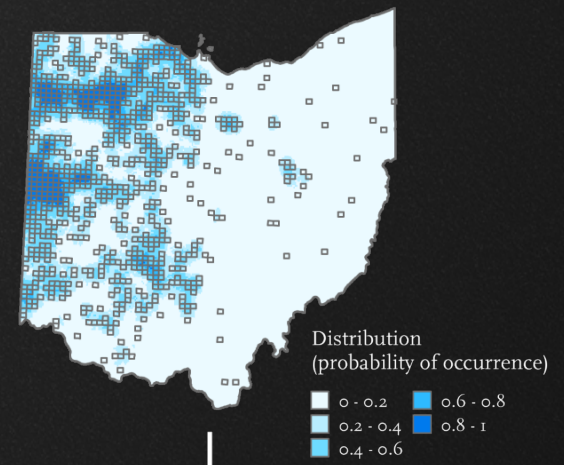


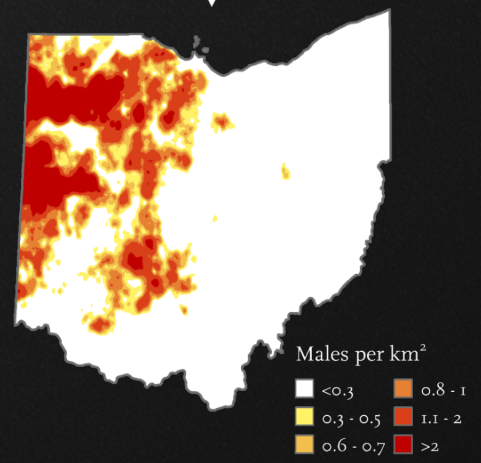
Abundance Analyses









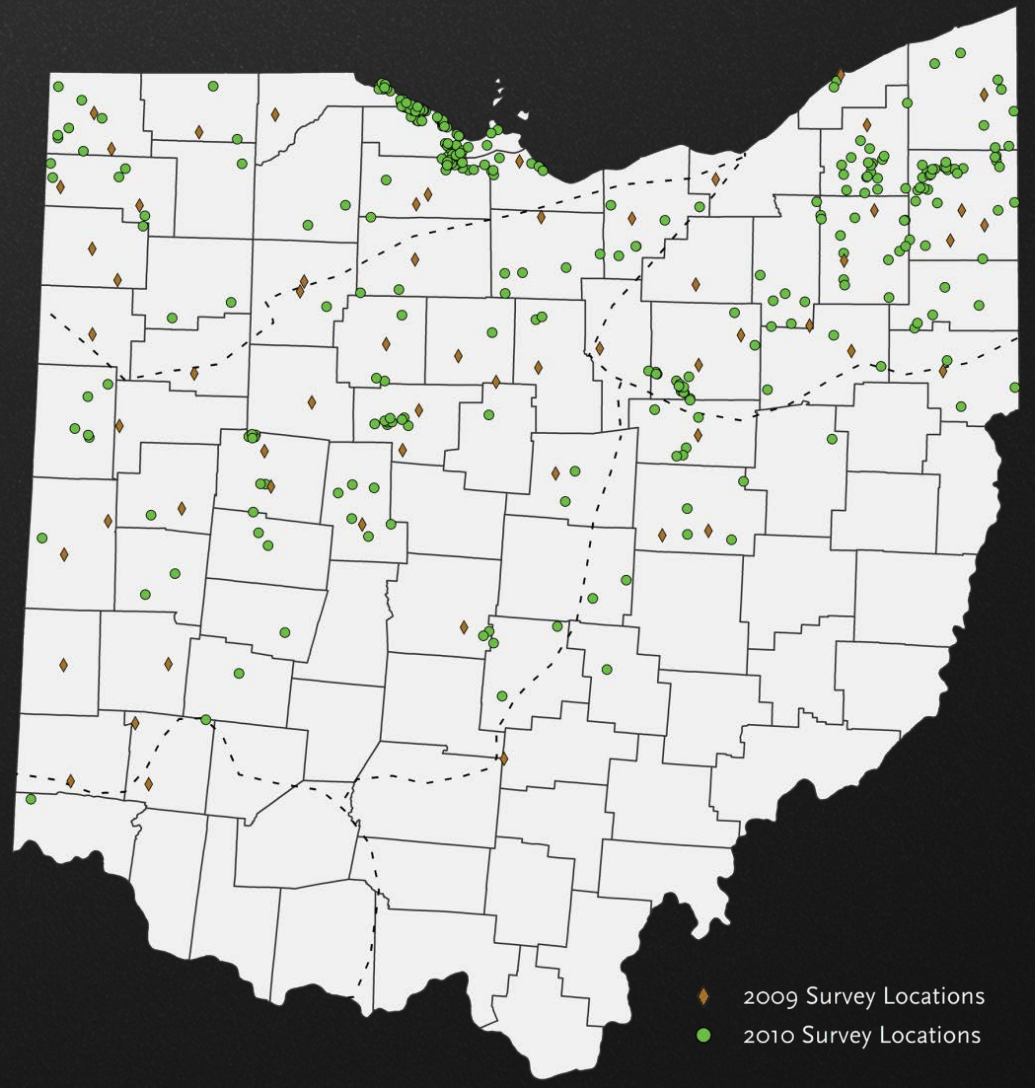


Marshbird Surveys

- 571 points surveyed
- Trained surveyors collect data
- Broadcast playback
- Generate population estimates

  Willard 2011
  Kahler 2013

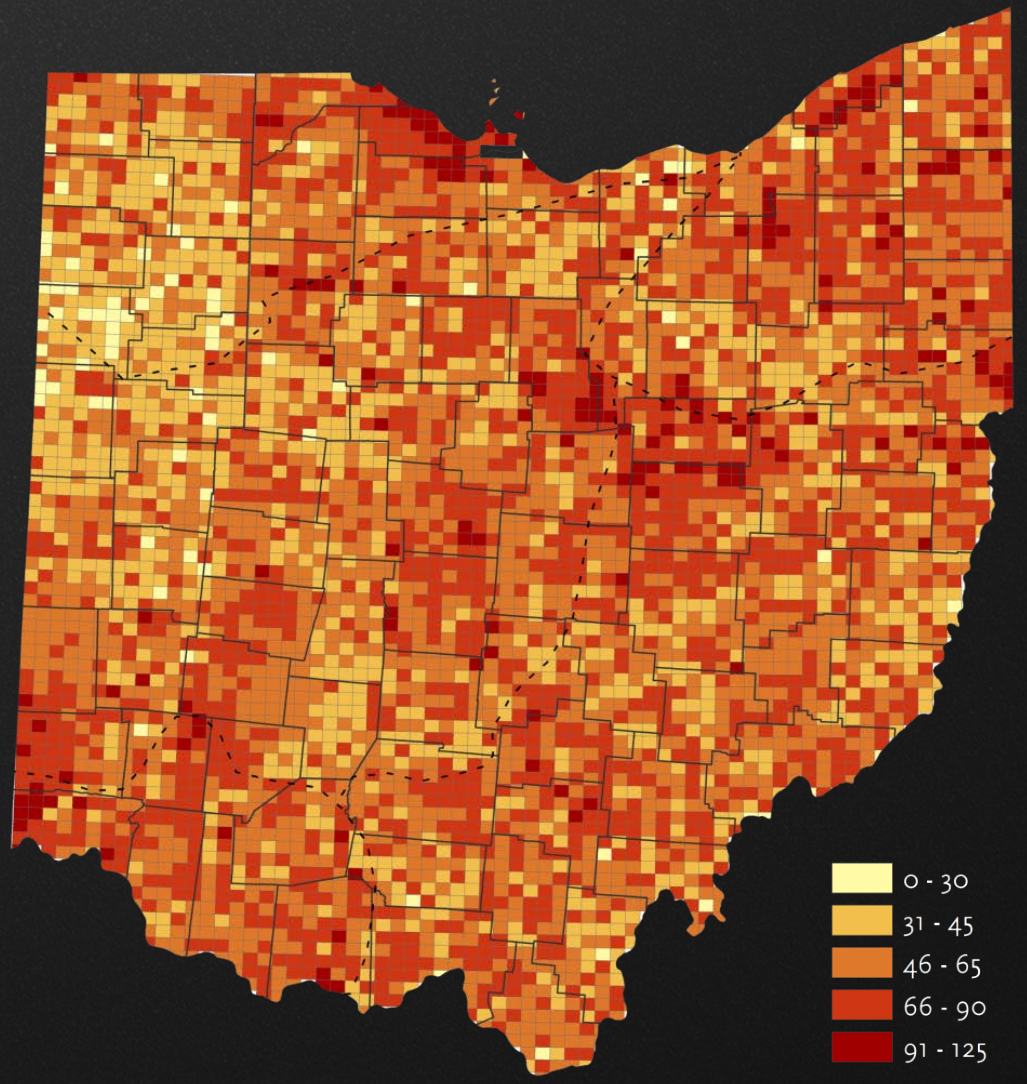
photo by Robin Arnold



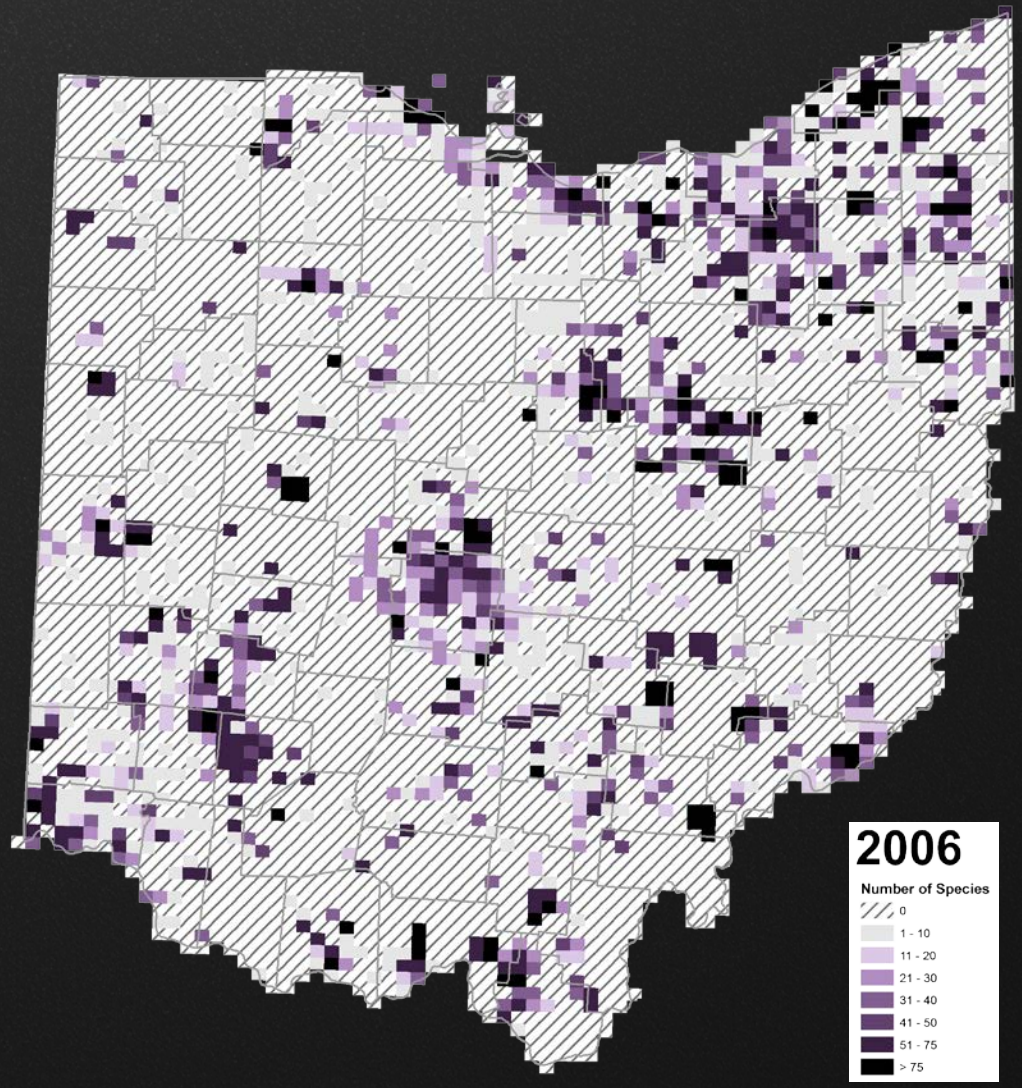
Second Atlas Coverage

- 4,437 blocks have data (100%)
- 205 observed breeding species
- 194 confirmed breeders
- >1,000,000 observations
- ~14,400 abundance surveys

photo courtesy of The Columbus Dispatch



Every Atlaser Makes a Difference!



Species Composition

OBBA I (1982-87) | **OBBA II (2006-11)**

174

*Yellow-crowned Night-Heron**
Laughing Gull
*Black Tern**
*Long-eared Owl**
*Loggerhead Shrike**
Bewick's Wren
*Golden-winged Warbler**
*Yellow-headed Blackbird**

*** Species observed in OBBA2 Non-priority Block**

166

182

*Mute Swan***
Trumpeter Swan
*American Wigeon***
Common Merganser
*Double-crested Cormorant***
*Great Egret***
*Black-crowned Night-Heron***
*Osprey***
Purple Gallinule
*Sandhill Crane***
Eurasian Collared-Dove
*Northern Saw-whet Owl***
Peregrine Falcon
Golden-crowned Kinglet
Blackburnian Warbler
Clay-colored Sparrow

**** Species observed in OBBA1 Special Area**

Probable and Confirmed species observed within Priority Blocks

Mississippi Kite

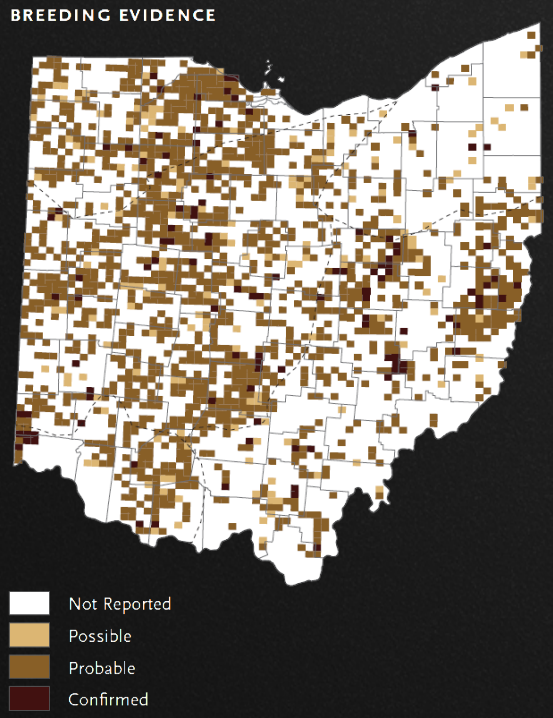
photo by Aaron Boone

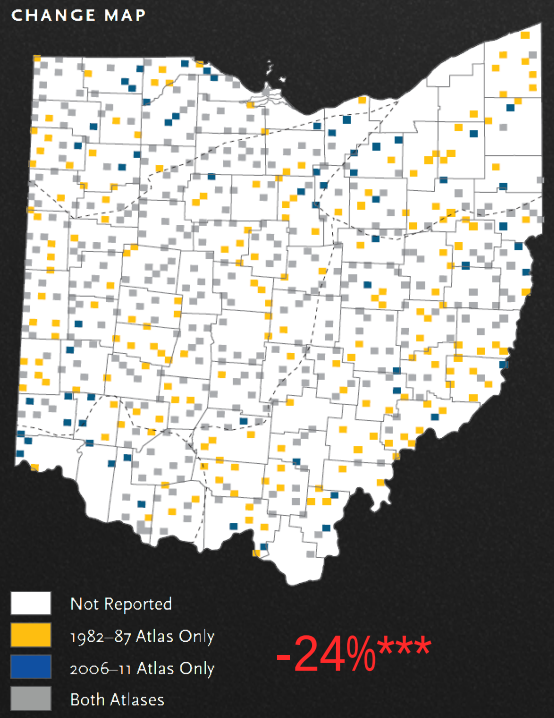
Black-necked Stilt

photo by Dave Slager

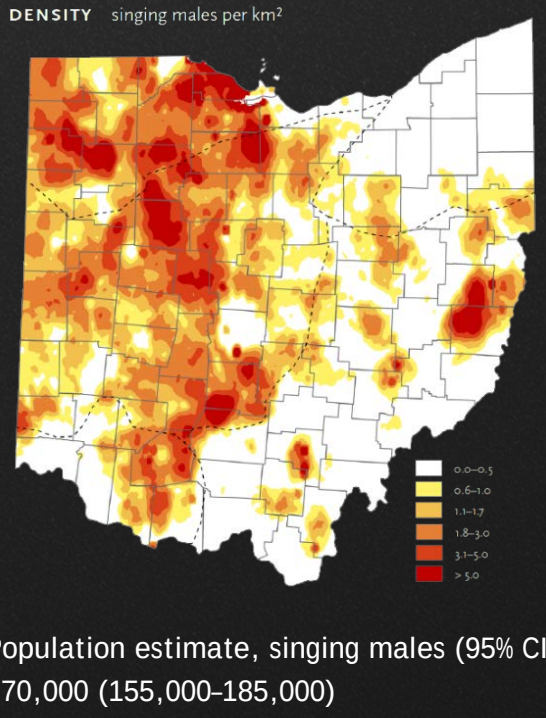
Species Results

Grasshopper Sparrow (*Ammodramus savannarum*)



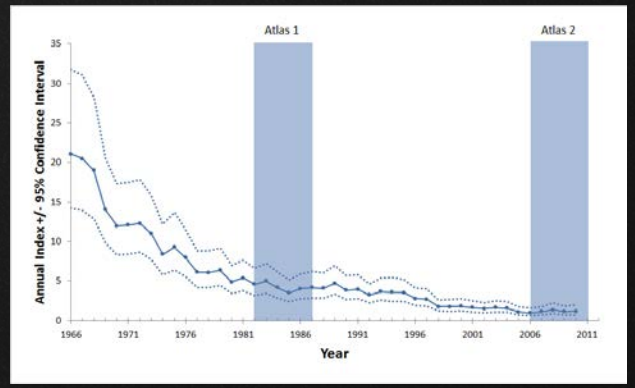


-24%***



Population estimate, singing males (95% CI)
170,000 (155,000–185,000)

photo by Joshua Clark



Occupancy Changes

- 32 species with significant increases in block occupancy
- 56 species with significant declines in block occupancy

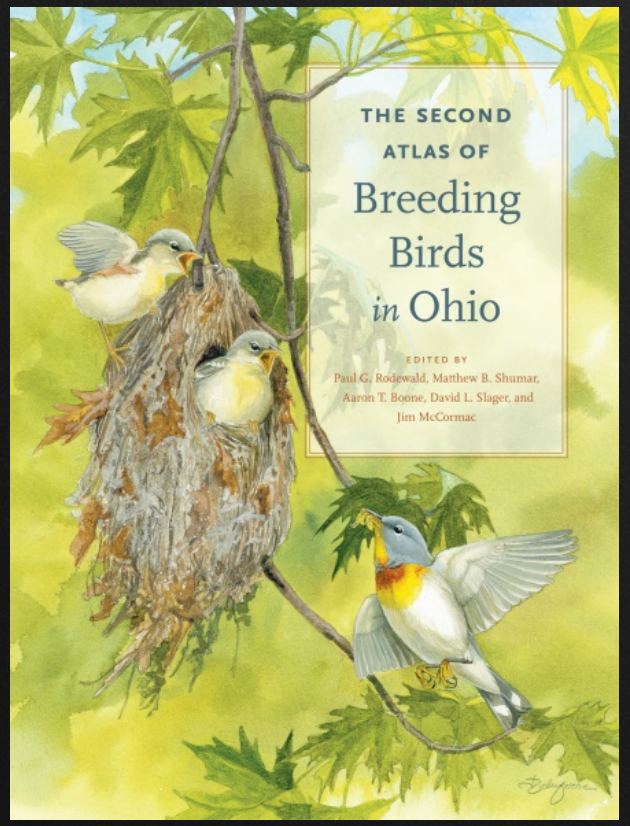
Species	OBBA1 p-blocks	OBBA2 p-blocks	Change	
Bald Eagle	5	120	+2300%	***
Peregrine Falcon	1	13	+1200%	**
Yellow-bellied Sapsucker	2	19	+850%	***
Black Vulture	23	112	+387%	***
Northern Parula	40	192	+380%	***
Ruffed Grouse	245	57	-77%	***
Common Nighthawk	228	75	-67%	***
Northern Bobwhite	402	142	-65%	***
Eastern Whip-poor-will	187	78	-58%	***
Least Flycatcher	77	38	-51%	***

*Significance codes: * = p < 0.05, ** = p < 0.01, *** = p < 0.001*

photo by Daniel Behm

photo by Darlene Friedman

The Second Atlas of Breeding Birds in Ohio



Introduction + a foreward by Bruce Peterjohn

- Chapter 1: Introduction
- Chapter 2: Habitat and Environmental Features
- Chapter 3: Survey Design and Analytical Methods
- Chapter 4: Summary of Avifaunal Changes Between Atlases
- Chapter 5: Guide to Interpreting Species Accounts
- Chapter 6: Species Accounts
- Chapter 7: Implications for Bird Conservation in Ohio

+ 7 appendices (unconfirmed species, phenology, field cards, etc.)

The Second Atlas of Breeding Birds in Ohio

FIGURE 3.4.1 Example of a block showing random roadside point-count locations. Field technicians were instructed to survey points 1 through 8, to minimize habitat biases. An additional 8 points were generated in the event that any of the initial 8 points could not be surveyed.

remaining 4,205 blocks, 50 percent were randomly selected for abundance surveys, and from those a subset was randomly selected to be sampled each year from 2007 to 2011.

Within each block, a road-based randomized sampling design was implemented to accommodate complete coverage of such a large number of blocks (O'Connell et al. 2004). Using a geographic information system (GIS), it was determined that nearly 100 percent of the sampling blocks had enough roads to facilitate counts of at least 8 randomly selected points that were at least 400 m (~1,300 ft) apart. For safety and noise interference concerns, interstate and major highways were removed from the potential sampling area. Within each block, 16 point-count locations were randomly selected and moved to the closest road using an ArcView 3.2 (ESRI 1999) extension designed by the Penn State Institutes for the Environment (figure 3.4.1). Point counts were conducted at the first 8 of the 16 locations. The remaining points were used as alternate locations in case any of the initial 8 were inaccessible or there were other issues (e.g., safety concerns, excessive noise disturbance).

Counts were conducted from 28 May through 7 July each year, beginning at 30 minutes before sunrise and continuing for approximately 5 hours each morning. To reduce the variability caused by environmental conditions, counts were not conducted in inclement weather (e.g., excessive wind, precipitation, extreme temperatures). Prior to the start of each field season, staff were tested for aural and visual identification skills and given approximately 2 weeks to adapt to the rigorous field protocols.

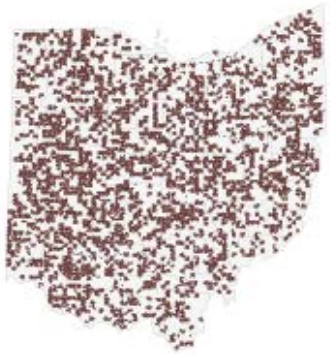


FIGURE 3.4.2 Completed second Atlas abundance survey locations

FIGURE 3.4.3 Breeding Bird Survey routes that were run at least once during the second Atlas

Field staff navigated as close as possible to each assigned count location using a global positioning system (GPS) vehicle receiver (Garmin Nüvi), and they recorded the date, time, specific latitude and longitude and whether or not there was any minor noise interference present (see appendix F for data collection form). Counts were conducted during a 6-minute, 15-second time period, divided into five 75-second time bands. Importantly, singing birds were recorded during each time period that they were detected, not just the period of initial detection. During each time band, singing birds were also recorded in one of three radial distance bands from the observer: within 25 m, 25–75 m, and beyond 75 m (0–82 ft, 82–246 ft, and beyond 246 ft). All birds detected were recorded at each count location, but only singing males were tracked between time and distance bands. This survey method allows for the use of a "removal model" (Farnsworth et al. 2002) to account for biases associated with observer and seasonal effects (see section 3.8). Nonsinging birds were tallied but not placed into discrete time or distance bands, so that field staff could focus on tracking singing individuals. Flyovers and birds detected prior to and subsequent to the count period were also tallied separately.

In addition to recording the location, time, date, and noise information, ancillary weather and habitat information were recorded after the completion of the timed survey. Collected weather data included temperature (in degrees Celsius) and categorical data on precipitation, wind speed, and cloud cover. Habitat data were also categorical and included the dominant habitat type, conifer cover, presence of siticaceous understory, signs of deer browse, evidence of recent/active land-use change, presence of livestock and/or working farms, presence of natural cavities and nest boxes, and road type.

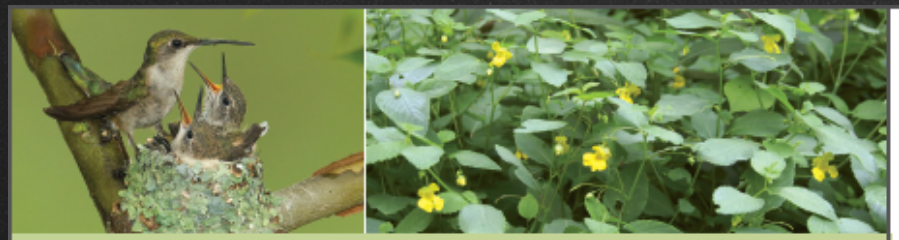
From 2007 to 2011, a total of 14,351 point counts were conducted statewide, covering 1,904 blocks (46%; figure 3.4.2). By contrast, Breeding Bird Survey routes within Ohio contain approximately 3,450 points across just 654 atlas blocks (figure 3.4.3; Pardieck et al. 2014). This extra resolution of data allowed for more sophisticated statistical analyses to be conducted during the second Atlas.

3.5 Integration of External Data

In addition to the database of observations submitted by volunteers, efforts were made to incorporate observations from several supplemental data sets. These additional sources added new records and in some cases upgraded breeding evidence codes for species within atlas blocks. Significant effort was taken to ensure that supplemental records were compatible with second Atlas block data in terms of spatial accuracy and associated metadata (e.g., observer, effort hours).

Data from second Atlas abundance surveys were converted to block records and added to the general atlas database. The large majority of detections on these point counts were singing, territorial birds and coded as T; detections of species that have an inconspicuous song or no song (e.g., woodpeckers, corvids, Common Grackle, House Sparrow) were typically coded as OS. As time permitted, field staff recorded breeding codes for individual detections, which allowed for a small proportion

The Second Atlas of Breeding Birds in Ohio



RUBY-THROATED HUMMINGBIRD *Archilochus colubris*

The Ruby-throated Hummingbird, the only breeding hummingbird in eastern North America, is among our most recognizable and popular birds. Indeed, red hummingbird feeders with sugary water are readily seen during summertime in backyards ranging from rural homesteads to urban patios. Though diminutive in size, the species is aggressive and highly territorial. Males fiercely defend feeding areas and often perform a U-shaped flight display for mates. Although Ruby-throated Hummingbirds are typically observed foraging at nectar feeders, a significant proportion of their summer diet comes from arthropods (Weidensaul et al. 2015). Nests sites are located in woodlots or even treed parks and backyards. The female alone builds the nest, a tiny cup of lichen and spiderwebs located on a branch in the midcanopy.

DISTRIBUTION The breeding distribution of the Ruby-throated Hummingbird covers most of eastern North America, from central Canada south to the Gulf of Mexico. The western boundary extends into the Midwest and corresponds with the distribution of eastern hardwood forests (Bertin 1982). Jones (1903) described the species as common across Ohio. Hicks (1935a) reported breeding for all counties statewide and considered the species fairly common to abundant, yet rather localized in many counties. After 1940, the species declined because of habitat loss, especially within western Ohio (Peterjohn 2001). Despite localized losses, the overall statewide distribution likely remained consistent in subsequent decades.

The species was widely distributed through both atlas projects; however, priority block occupancy significantly declined by 5 percent between atlas periods. During the second Atlas, hummingbirds were sparser in the wide agricultural expanses of western counties. The decline in block occupancy between atlas periods was likely driven by blocks within southern counties, where forest maturation has been extensive. While the species' occurrence is highly linked to forest cover, lower densities of Ruby-throated Hummingbirds occur where blocks are dominated by large tracts of dense closed-canopy contiguous forest. Preferred foraging plants such as jewelweed, columbine, and bee balm (Weidensaul et al. 2015) are likely less common in heavily wooded areas with fewer canopy openings.

Without atlasers' monitoring feeders, it can prove difficult for them to document Ruby-throated Hummingbirds. Increased block turnover in the Prairie Peninsula could be related to changes in habitat, although issues with effort and detectability were probably contributing factors. Additionally, the majority of observations (71%) were submitted using the OS code (indicating "possible"), with the remainder of observations primarily consisting of territorial or displaying males. The species was confirmed in 6 percent of all blocks, a relatively low percentage but similar to atlases in nearby states (e.g., Pennsylvania; Wilson et al. 2012). Male Ruby-throated Hummingbirds are polygamous and conspicuously defend food sources, including feeders, throughout the summer and provide no care for young; females regurgitate food to their young, are rarely seen carrying food or fecal sacs, and only remain with fledged young for 4–7 days (Weidensaul et al. 2015). These behaviors likely account for the paucity of confirmed breeding records. Second Atlas observers noted nest construction as early as 30 April, with dependent young observed as late as 5 September.

ABUNDANCE AND POPULATION STATUS Second Atlas abundance data yielded a statewide population estimate of 300,000 individuals, with the highest densities occurring in the northern half of the Ohio Hills. Lower densities within the Prairie Peninsula were likely linked to the availability of forest habitat for nesting and food resources. Breeding Bird Survey results for Ohio indicated a consistent increase of 2 percent per year since the mid-1960s, which is consistent with the survey-wide increase of 1.8 percent per year (Sauer et al. 2014).

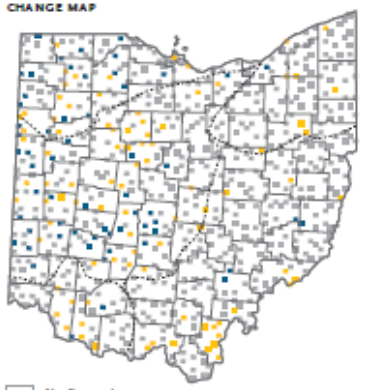
CONSERVATION AND MANAGEMENT Although suburbanization and forest fragmentation are detrimental to many bird species, Ruby-throated Hummingbirds may benefit from low levels of disturbance and housing development within forested regions. With hummingbird feeders and flower gardens, food sources are widely available throughout the breeding season within Ohio. The reliance on bird feeders may increase window collisions or predation by cats (Weidensaul et al. 2015), but current impacts seem negligible. The Ruby-throated Hummingbird is not listed as a species of concern for Ohio or adjacent states, and given current land-use trends within Ohio, the outlook for the species seems positive.

MATTHEW B. SHUMAR
In memory of Margaret E. Marks

BREEDING EVIDENCE

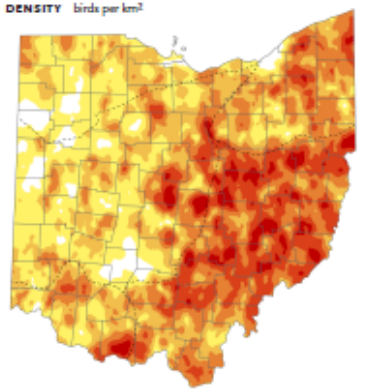
Not Reported
Possible
Probable
Confirmed

CHANGE MAP



Not Reported
1983–87 Atlas Only
2006–11 Atlas Only
Both Atlases

DENSITY birds per km²



0.0–0.5
0.6–1.5
1.6–2.5
2.6–4.0
4.1–6.0
> 6.0

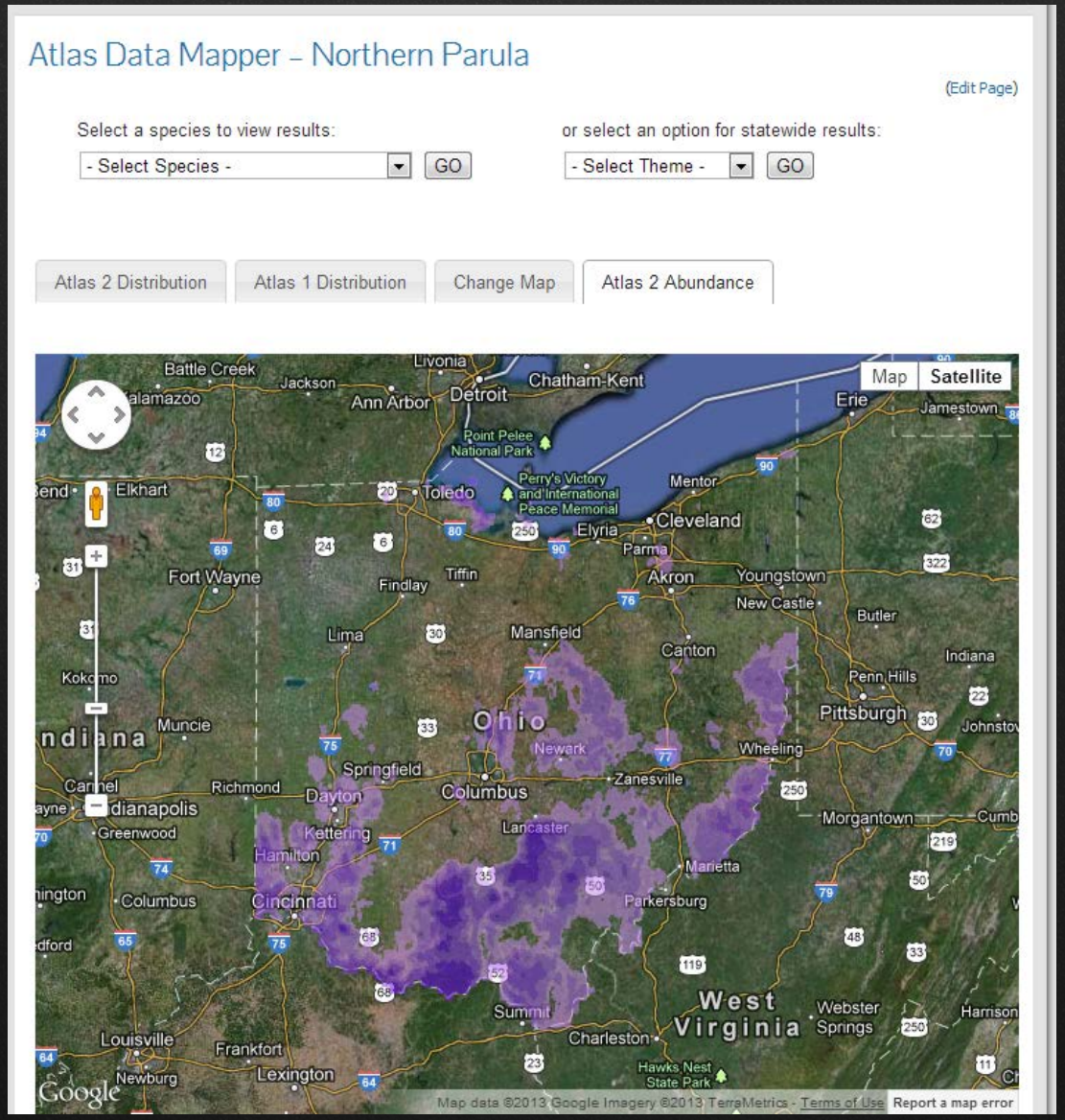
NUMBER OF BLOCKS DETECTED

	2006–11				1983–87	
	All Blocks		Priority Blocks		Priority Blocks	
	No.	%	No.	%	No.	%
Possible	1442	32.5%	357	46.7%	255	33.4%
Probable	839	18.9%	225	29.5%	340	44.5%
Confirmed	271	6.1%	72	9.4%	90	11.8%
Total	2552	57.5%	654	85.6%	685	89.7%

Population estimate, birds (95% CI)
300,000 (280,000–320,000)

BREEDING BIRD SURVEY TREND

Future Products: Web-based Mapping Tools



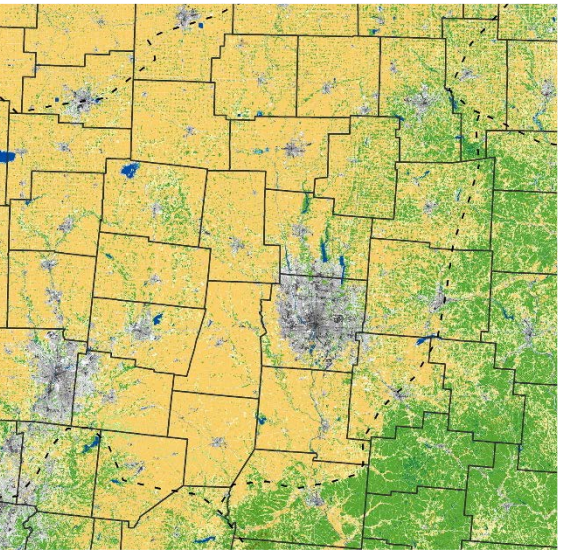
Changes in Conservation Status

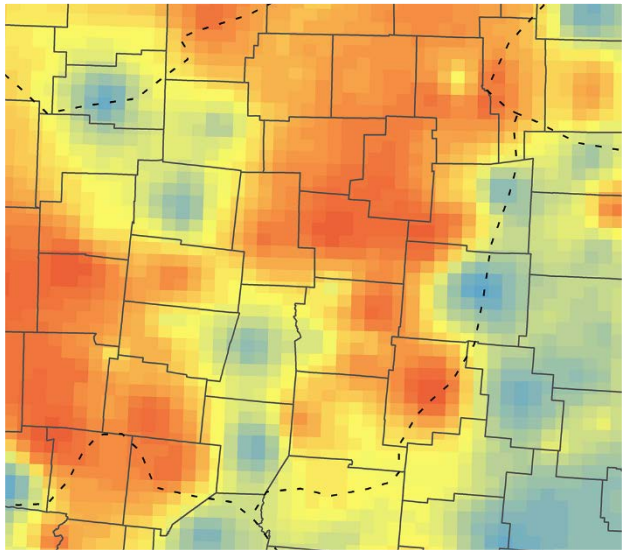
- Downgrade conservation status
  - Sandhill Crane (*Endangered to Threatened*)

- Newly listed species
  - Ruffed Grouse (*Species of Concern*)
  - American Coot (*Species of Concern*)
  - Black-billed Cuckoo (*Species of Concern*)
  - Common Nighthawk (*Species of Concern*)
  - Eastern Whip-poor-will (*Species of Concern*)
  - Red-headed Woodpecker (*Species of Concern*)
  - Vesper Sparrow (*Species of Concern*)
  - Grasshopper Sparrow (*Species of Concern*)
  - Common Merganser (*Special Interest*)
  - Yellow-bellied Sapsucker (*Special Interest*)
  - Blue-headed Vireo (*Special Interest*)
  - Veery (*Special Interest*)
  - Golden-winged Warbler (*Special Interest*)
  - Nashville Warbler (*Special Interest*)

Beyond the Book: A Rich Ecological Dataset

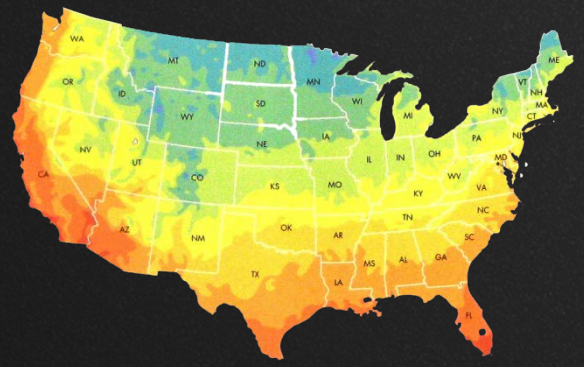
Regional changes in breeding bird distributions:
a strong proximate signal of landcover in the face of growing climate pressure





Stephen N. Matthews, Matthew B. Shumar, Paul G. Rodewald, Katharine E. Batdorf

Understanding Species Distributions



Climate

Landcover

Topography

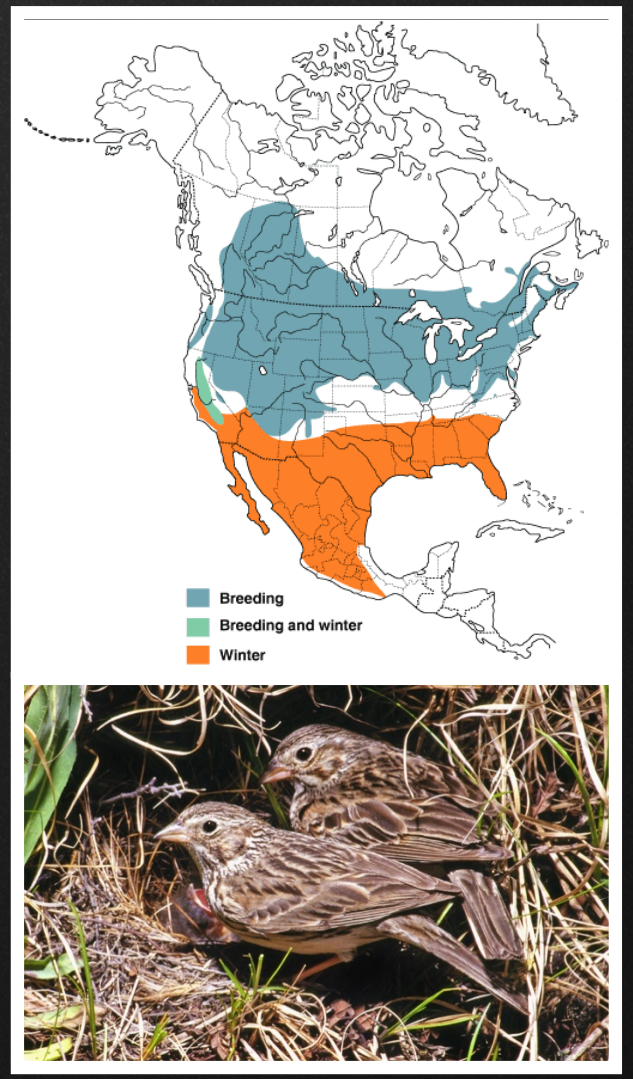
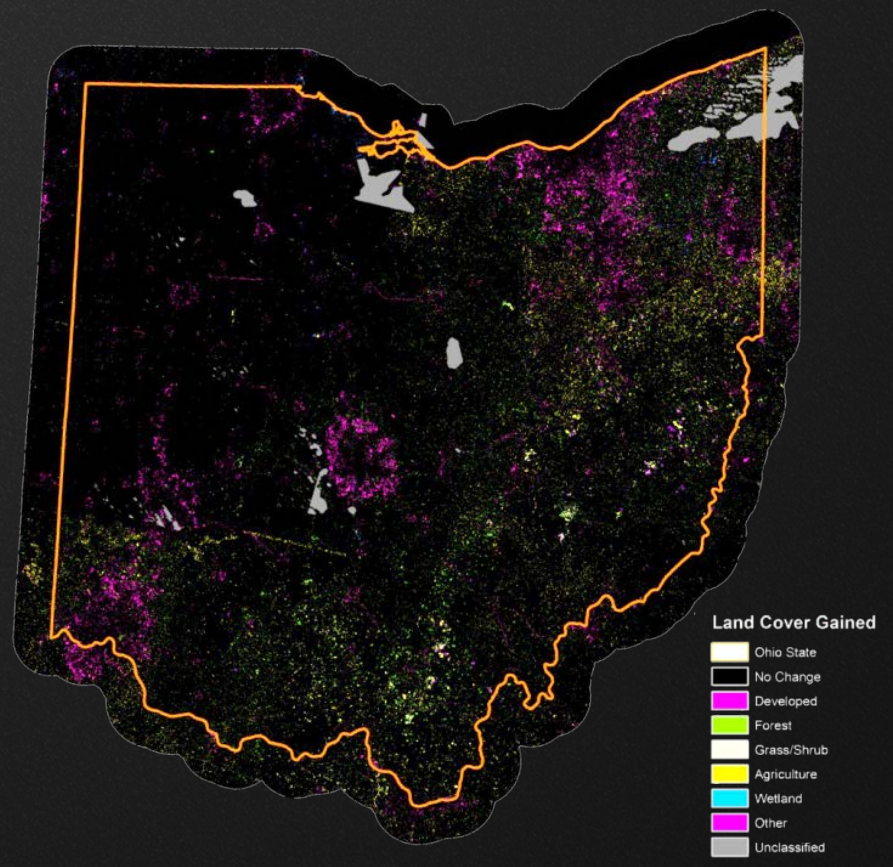


photo by John Watts

Changes in land cover and use

- NLCD 1992 – 2011
  - 90% increase in development
  - Regional shift in forest cover
  - Regional shift / intensification of agriculture

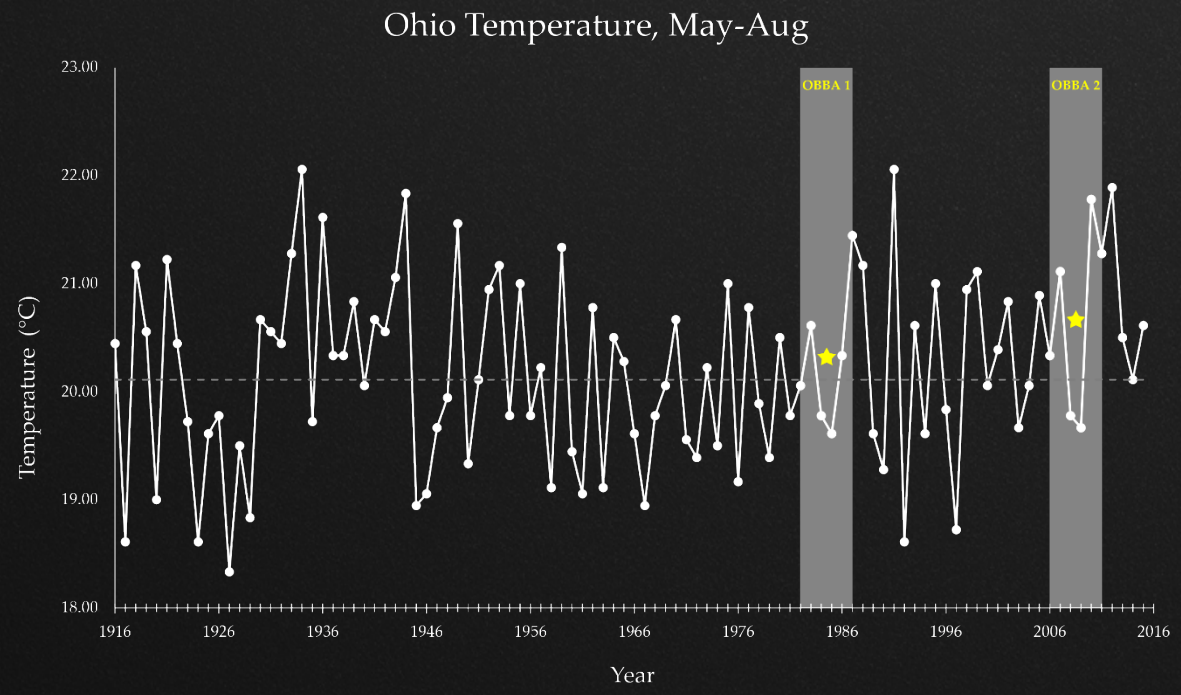
photo by Jim McCormac

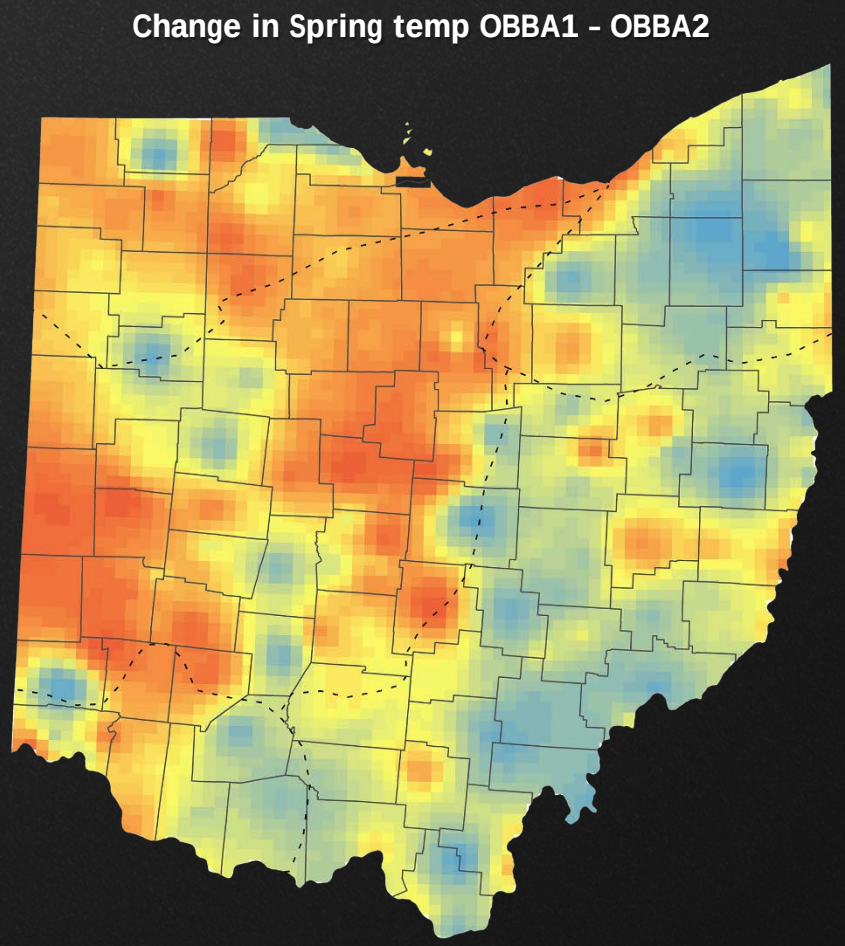


Changes in climate

National Climate Assessment: Midwestern USA

- Avg. annual increase for 1980-2010 = 3x 1900-2010
- Increase in extreme precipitation events over century





Species distribution changes

- Assessed 30 species with boundaries intersecting Ohio
- Change in median value of all blocks along leading/trailing edge
- 14 species with substantial northward shifts

  e.g., Northern Parula 93 km ↑
- 9 species with substantial southward shifts

  e.g., Prairie Warbler 76 km ↓

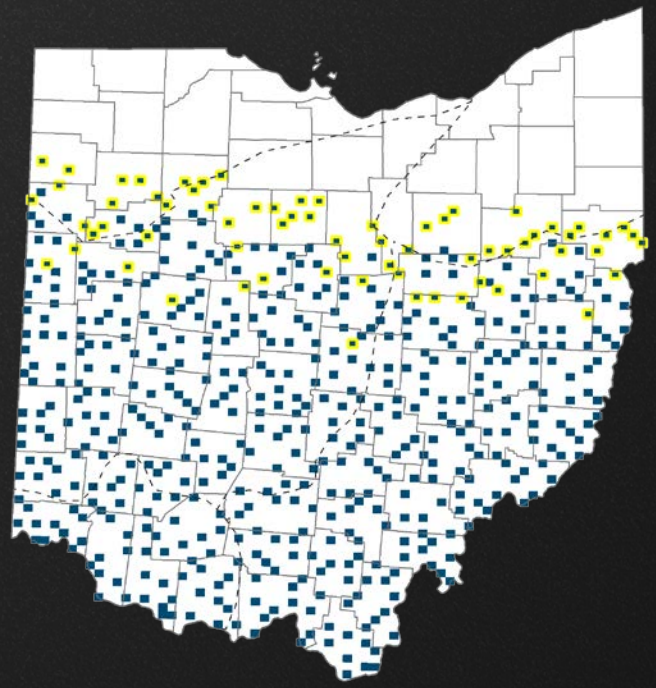
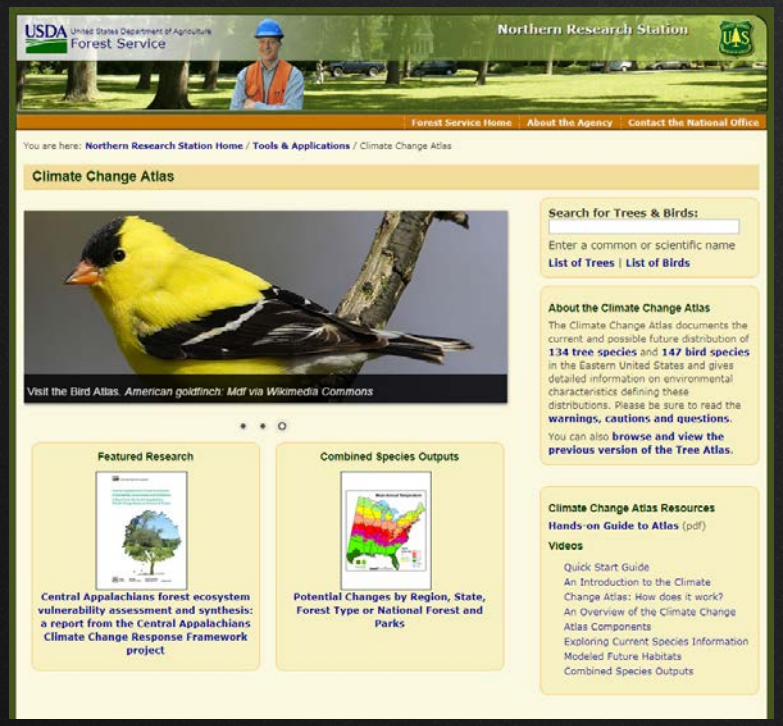


photo by Donald Althoff

What is driving these changes?

- We know that distributions are dynamic (especially at range margins)
- Well documented changes in distribution and abundance linked to landcover and climate shifts
  - Declines of early successional habitat, increases urbanization
  - Climate shifting phenology and distributions
- Our goal was to explore relative influence of climate and landcover
  - Developed statewide models using Breeding Bird Atlas occurrence data
  - Compare to nationwide models using Breeding Bird Survey count data

NABBS models



http://www.nrs.fs.fed.us/atlas

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Anantha M. Prasad, Matthew P. Peters

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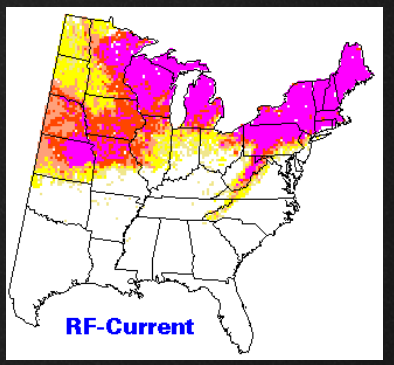
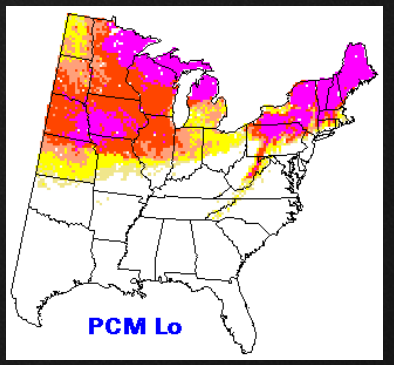
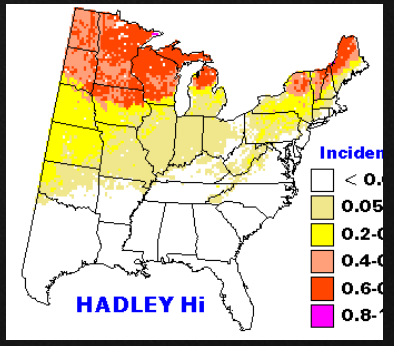
Current

Increasing Climate Change

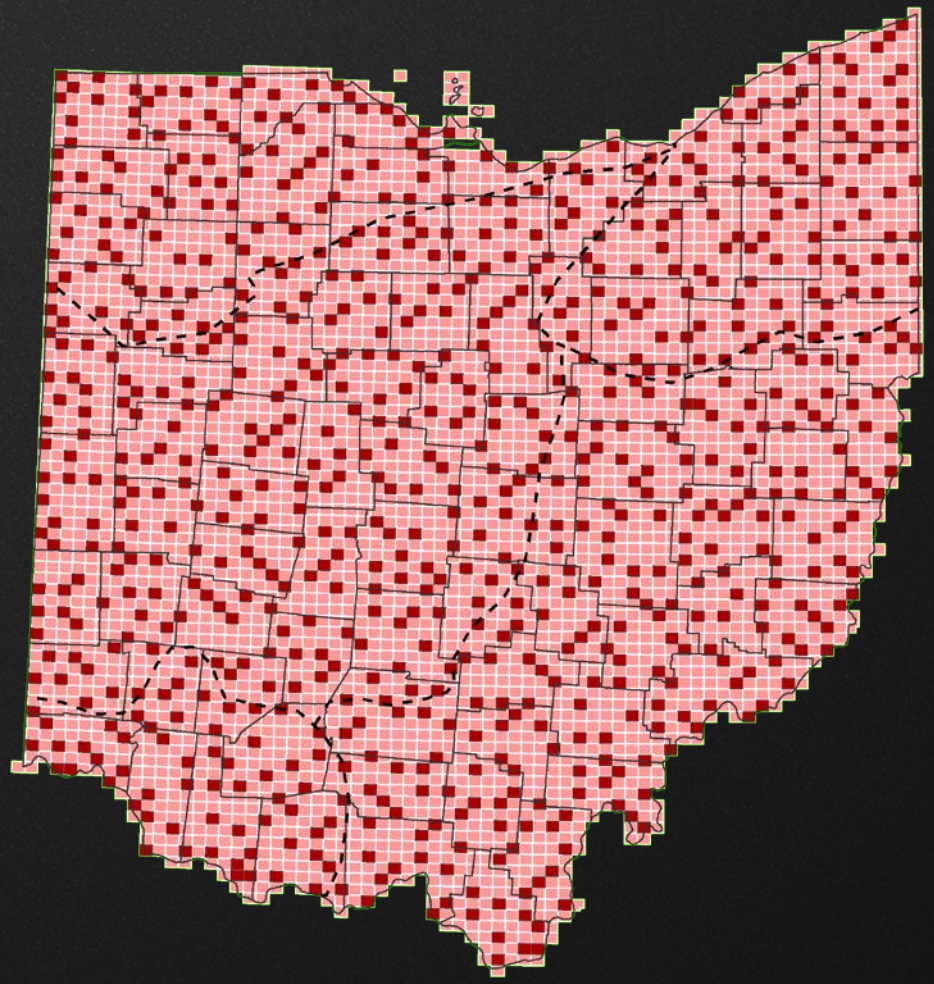






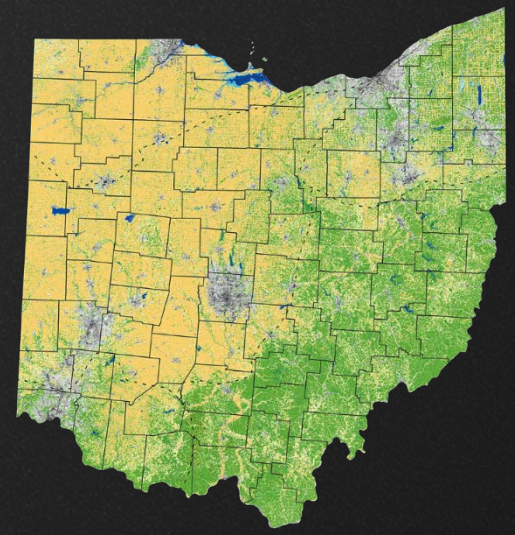
Atlas models: Species data

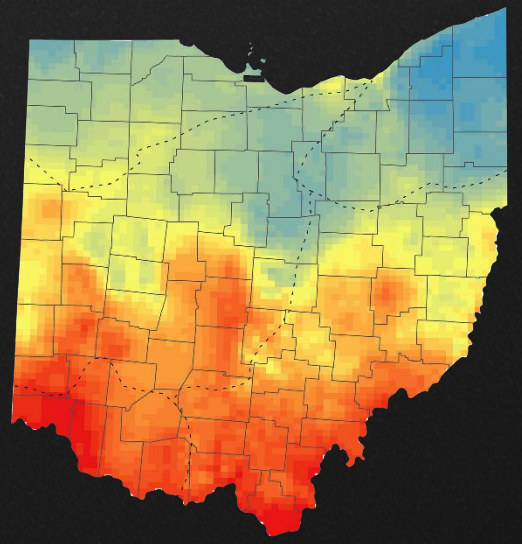
- Ohio Breeding Bird Atlas
  - First Atlas (*OBBA1*): 1982-87
  - Second Atlas (*OBBA2*): 2006-11
- 764 Priority Blocks
  - ~20 hours of survey effort
  - ~77 species per block
- 4,437 Second Atlas Blocks
  - 113 species modeled



Atlas models: Environmental data

- Landcover
  - NLCD (1992 & 2011)
  - % Deciduous-Mixed Forest, % Coniferous Forest, % Edge Forest (Deciduous-Mixed), Maximum Deciduous-Mixed Forest Patch , % Open habitat
- Climate
  - PRISM (1982-87, 2006-11)
  - Mean Spring Temp, Mean Annual Temp, Min Annual Temp, Total Annual Precip, Total Breeding Season Precip
- Other
  - Mean Elevation, Max Elevation, Hemlock presence, Stream Length





Atlas models

- RandomForests
  - Models built using OBBA2 bird data for 113 species
  - Suite of climate + landcover + *other*
  - Predicted into OBBA2 and OBBA1 priority blocks

- Model evaluation
  - Model performance (*e.g.*, out-of-bag error rates)
  - Predictive ability (*e.g.*, true skill statistic)
    - Model all block OBBA2
    - Predict to OBBA1
    - Ask how does model carputer change

Variable importance

- Which variables are influencing the model
- Are species associated with many different variables

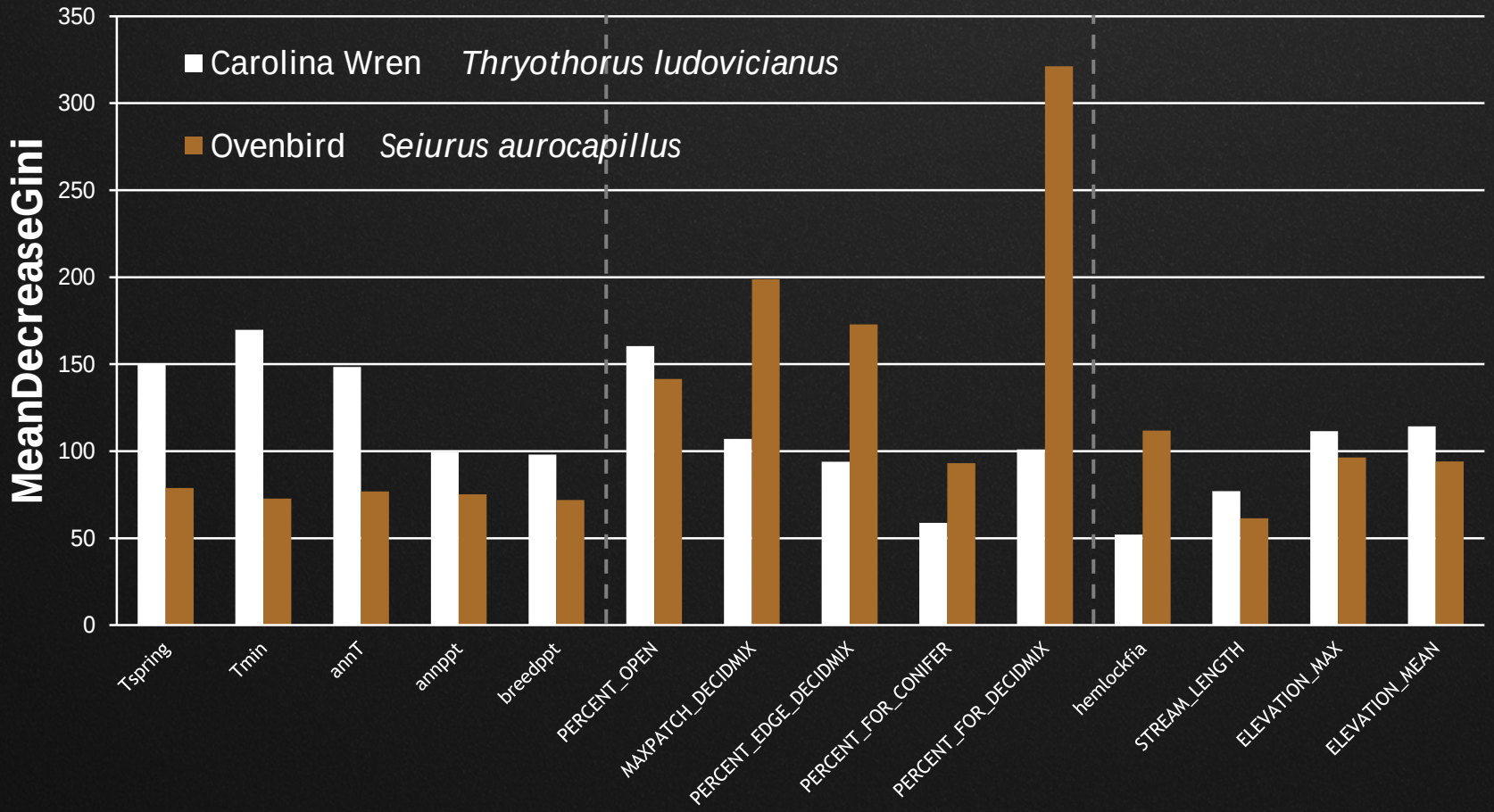


photo by Steve Jones

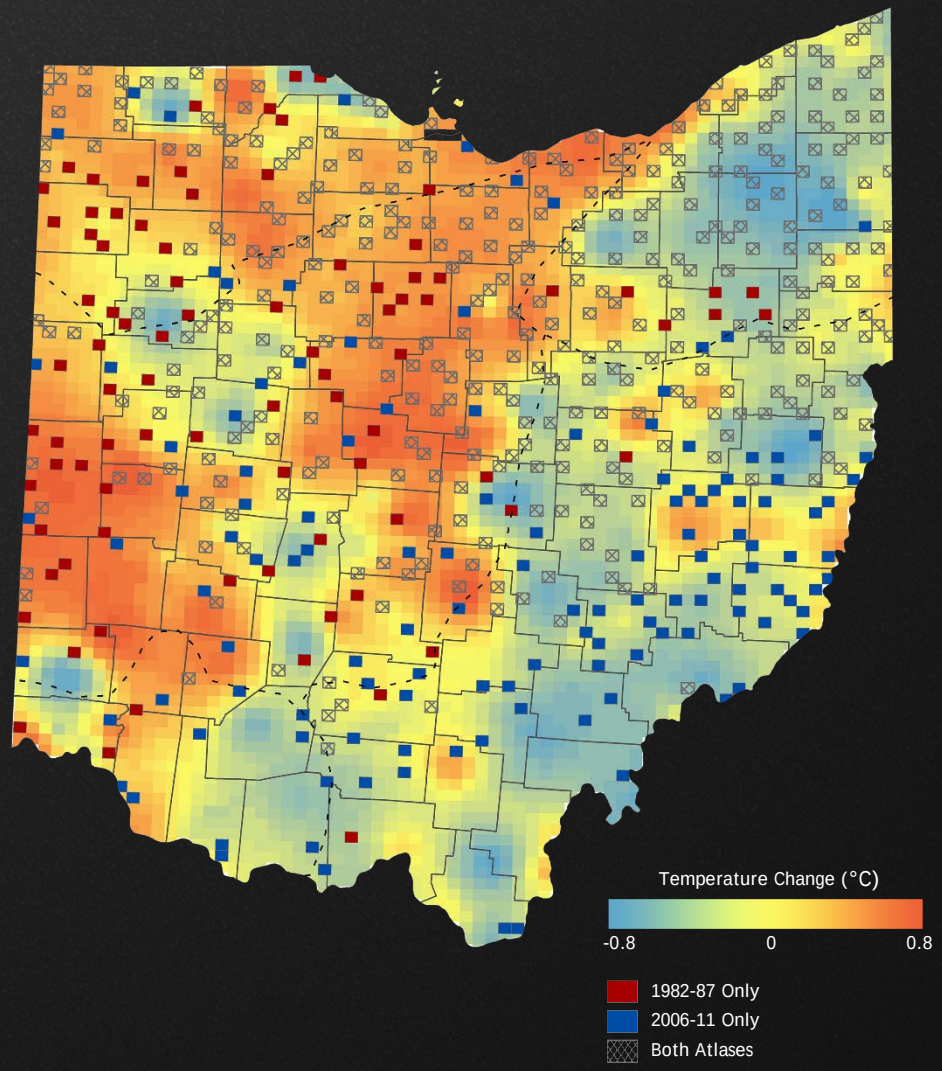
photo by Daniel Behm

Effects of climate

photo by Bruce Miller

Rose-breasted Grosbeak (*Pheucticus ludovicianus*)

- 39 km southern shift
- Higher importance of climate variables
- Increased Spring Temp (-)



Effects of climate

photo by Laura Keene

Blue Grosbeak
(*Passerina caerulea*)

61 km northern shift (*expansion*)
Increased Spring temp (+)

Southern species

photo by Brian Graybill

Carolina Wren
(*Thryothorus ludovicianus*)

76 km northern shift (*expansion*)
Increased minimum temp (+)

Southern species
Severe winter impacts well documented

photo by Daniel Behm

Veery
(*Catharus fuscescens*)

20 km northern shift (*contraction*)
Increased Spring temp (-)

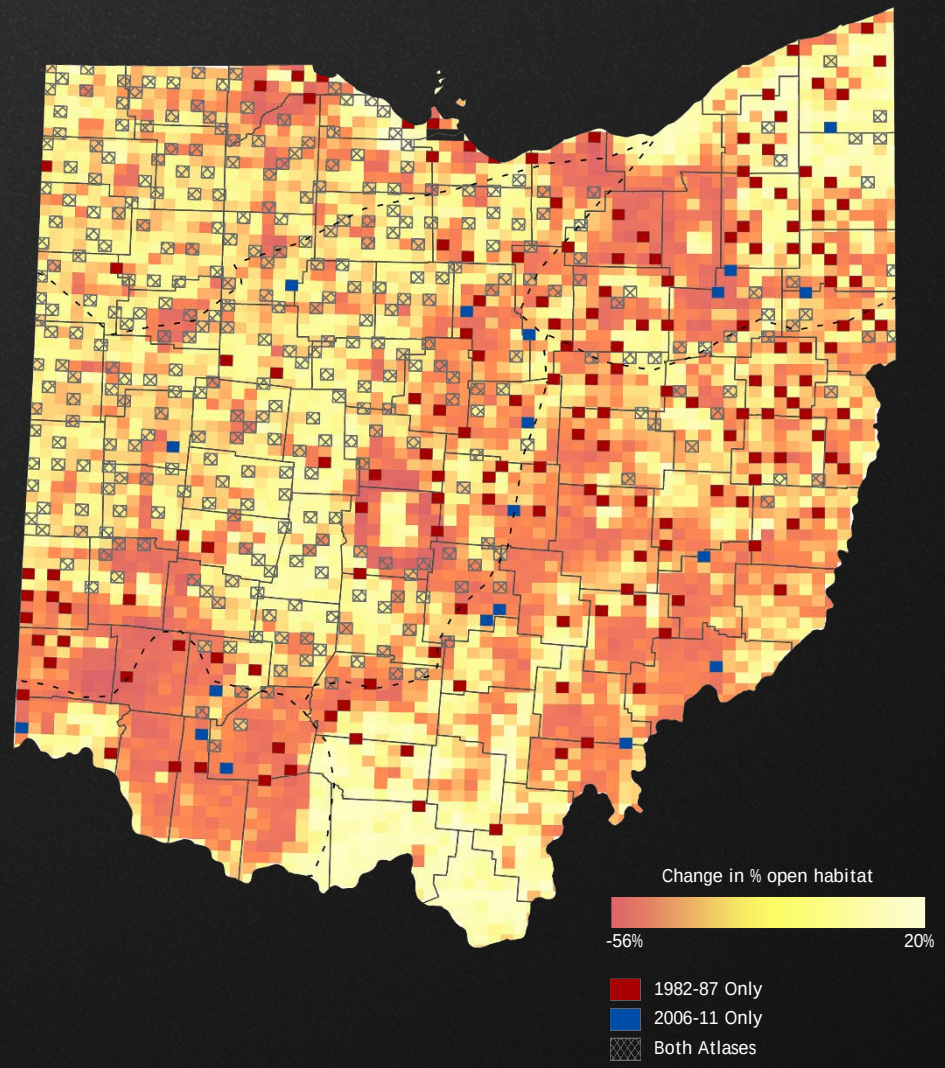
Northern species

Effects of landcover

photo by John Watts

Vesper Sparrow (*Pooecetes gramineus*)

- 26 km northern shift
- Higher importance of landcover
- Decrease in open area (-)



Effects of landcover

photo by Laura Keene

Worm-eating Warbler (*Helmitheros vermivorus*)

19 km southern shift (*contraction/loss*)
Decreased % decid-mix forest (-)

Southern/Appalachian species

photo by Darlene Friedman

Northern Parula (*Setophaga americana*)

93 km northern shift (*expansion*)
Increased max forest patch (+)

Southern species
Stream length & climate also important

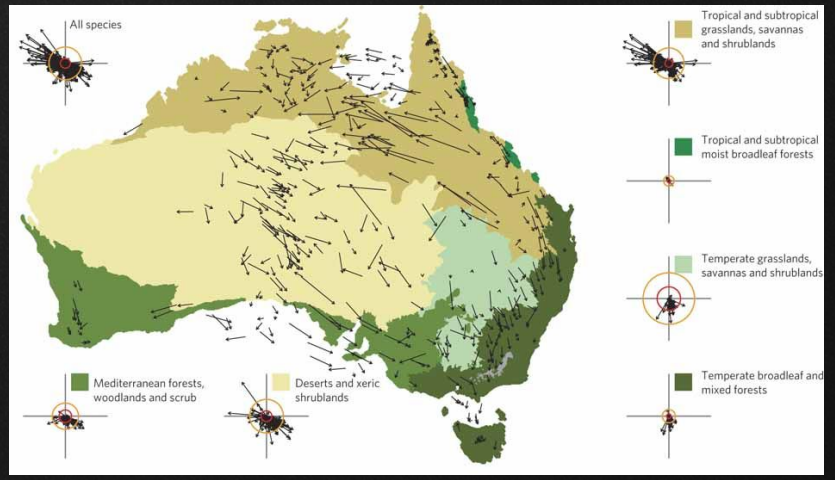
photo by Daniel Behm

Blue-winged Warbler (*Vermivora cyanoptera*)

No latitudinal change
Decreased % decid-mix forest (-)

Conclusions

- Climate & landcover were both important and need to be considered for future management
- Proximate changes show strong land use influence but climate signal is strong
  - NABBS models produced strange maps when landcover omitted
- Latitudinal shifts may not be related to climate
- Tracing trajectories reveals shifts can be in multiple directions
- Landcover changes and landscape shapes playing field



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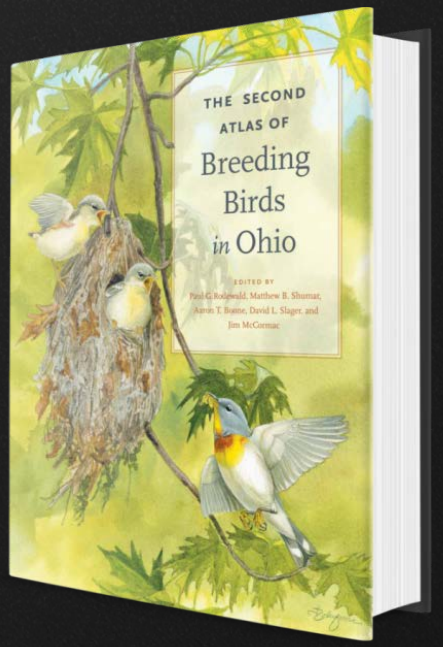

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