Breeding Bird Response to Shortleaf Pine Restoration and Potential Brown-headed Nuthatch Reintroduction in the Ozarks-Ouachita Interior Highlands

Sarah Kendrick
State Ornithologist, Missouri Department of Conservation
Shortleaf Pine Initiative Meeting, October 3, 2019

CFLRP

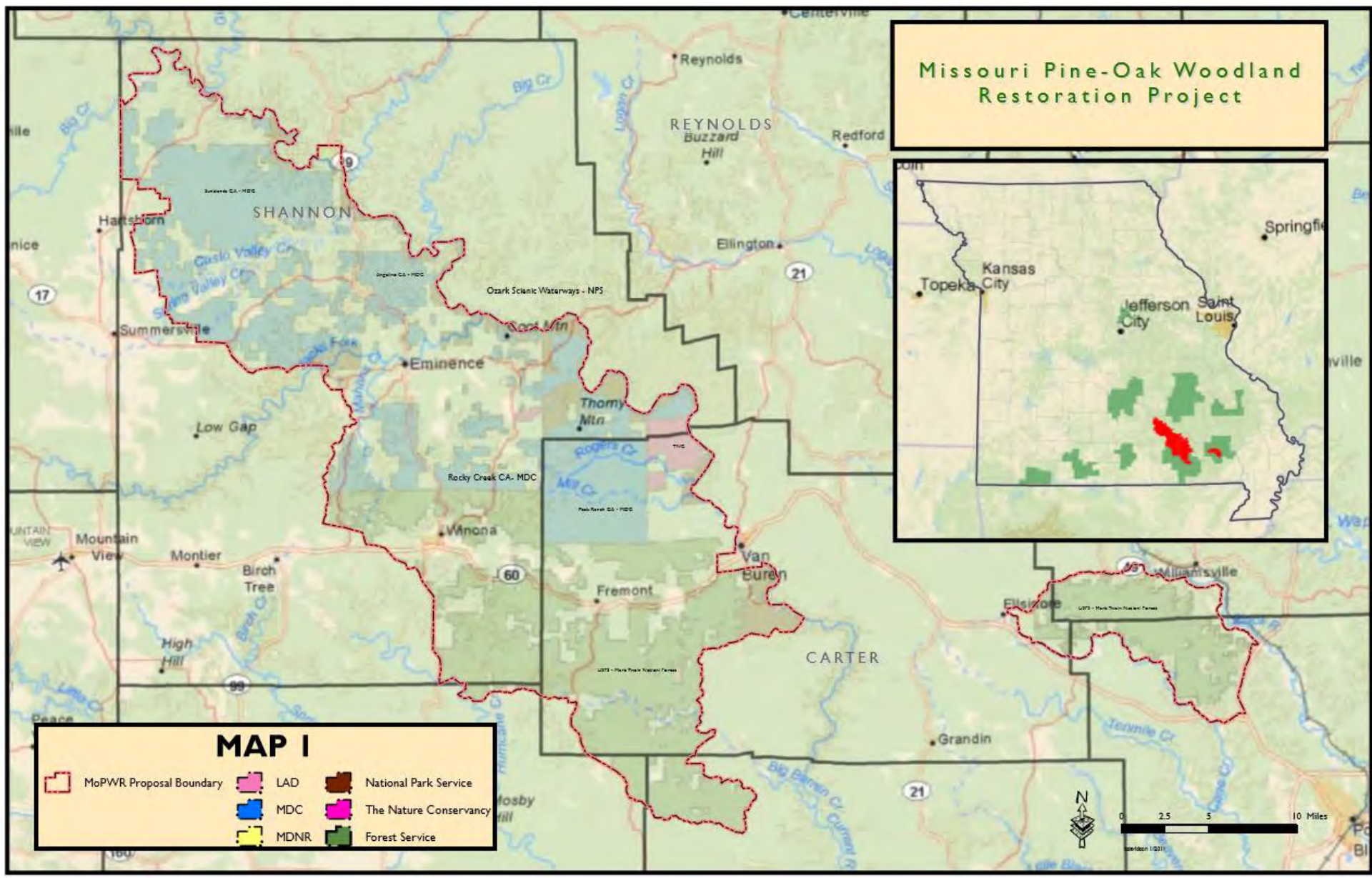
Collaborative Forest Landscape Restoration Project

The purpose of the Collaborative Forest Landscape Restoration Program (CFLRP) is to encourage the collaborative, science-based ecosystem restoration of priority forest landscapes.

Missouri Pine-Oak Woodlands Restoration Project

Study Area: 345,710 acres

Acres to receive treatment: 115,860



Breeding bird response to pine-savanna and woodland restoration in the Ozark-Ouachita Interior Highlands

Melissa Roach, University of Missouri
Frank R Thompson, USDA Forest Service Northern Research Station
Todd Jones-Farrand, U.S. Fish and Wildlife Service

Brian Davidson, Mark Twain National Forest
Mary Lane, Ouachita National Forest

Why do we care about savannas and woodlands in the Midwest?

- Their distribution is a fraction of what it was historically
- Resilience to climate change
- High plant and animal diversity
- Important habitat for TES, species of concern, and habitat specialists

Savanna


Open oak-woodland


Closed pine-woodland


Pine forest


Oak forest

Collaborative Forest Landscape Restoration Program = “CFLRP”

Arkansas and Oklahoma Shortleaf-Bluestem Community, Ouachita NF

348,482 acre landscape

Missouri Pine-Oak Woodlands Restoration Project, Mark Twain NF

345,710 acre landscape

Conservation implications

- Active management to restore larger tracts of pine savanna and woodland underway
- Foster floristic and biological diversity
- Impact on breeding bird community unknown
- Some controversy over increased use of fire and changes in forest composition and structure.

Research Objectives

1. Estimate species densities across a savanna-woodland-forest gradient and in response to management activities.
2. Estimate reproductive success of select species across the vegetation gradient and in response to management activities.
3. Estimate densities of Eastern Whip-poor-will and Chuck-will's-widow across the vegetation gradient and in response to management activities.

Species: ground/shrub-nesting; positive

Prairie Warbler**

Kentucky Warbler**

Blue-winged Warbler**

Yellow-breasted Chat*

Bachman's Sparrow**

White-eyed Vireo*

Eastern Towhee*

Northern Bobwhite*

Species: canopy-nesting; positive

Brown-headed Nuthatch**

Eastern Wood-pewee*

Pine Warbler

Red-cockaded Woodpecker**

Red-headed Woodpecker**

Summer Tanager

Species: forest-nesting; negative

Acadian Flycatcher

Black-and-white Warbler

Worm-eating Warbler**

Ovenbird

Wood Thrush**

Methods

- Conducted 10-minute avian point counts following distance sampling protocols
- Measured vegetation at all points 2013

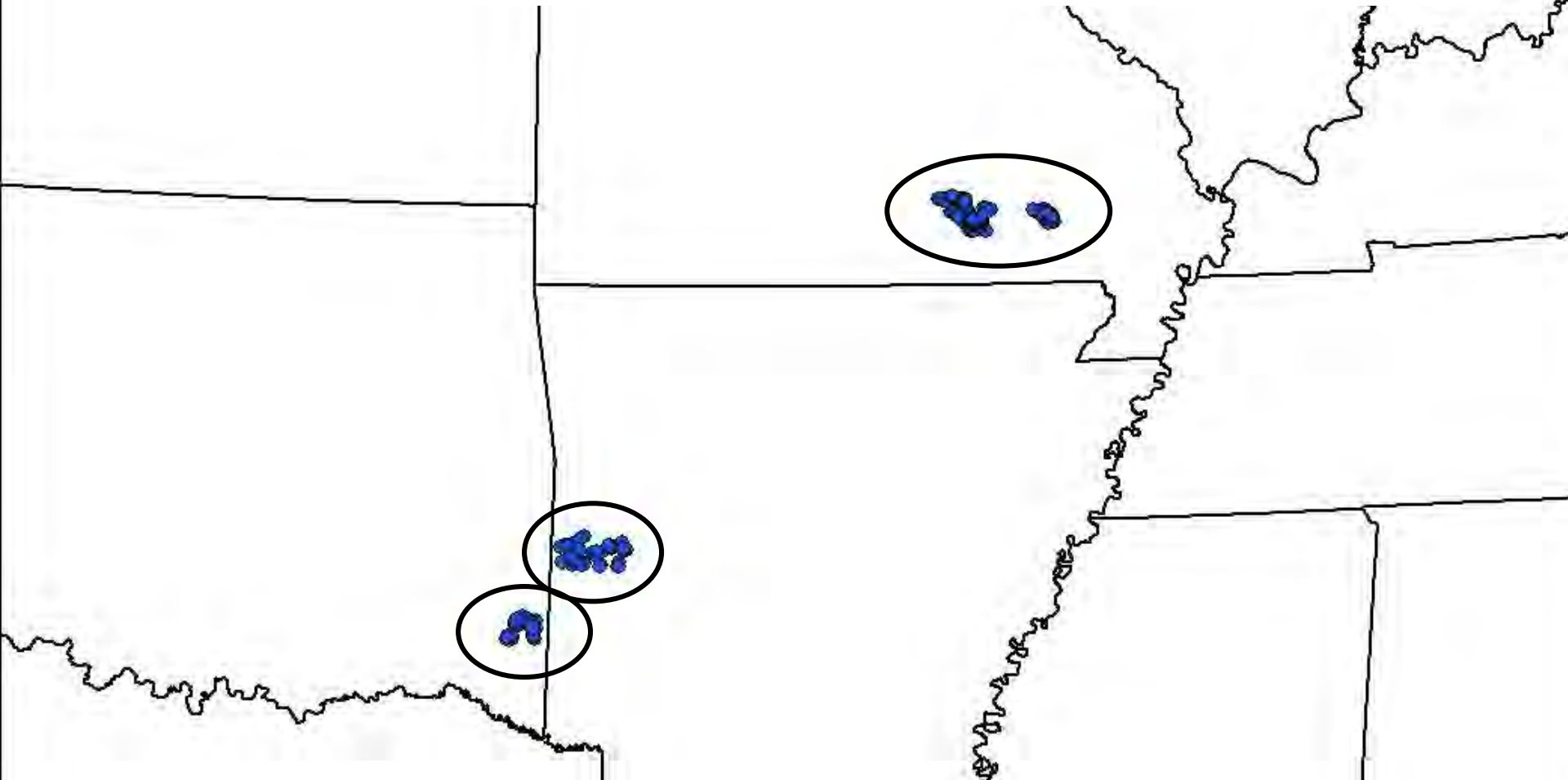
Modeling approach

Two-stage hierarchical distance-based models estimating both detection probability and density

- Control for factors affecting species detectability
- Estimate the effect of habitat covariates on species density

This results in robust density estimates and provides knowledge on habitat relationships and management effects.

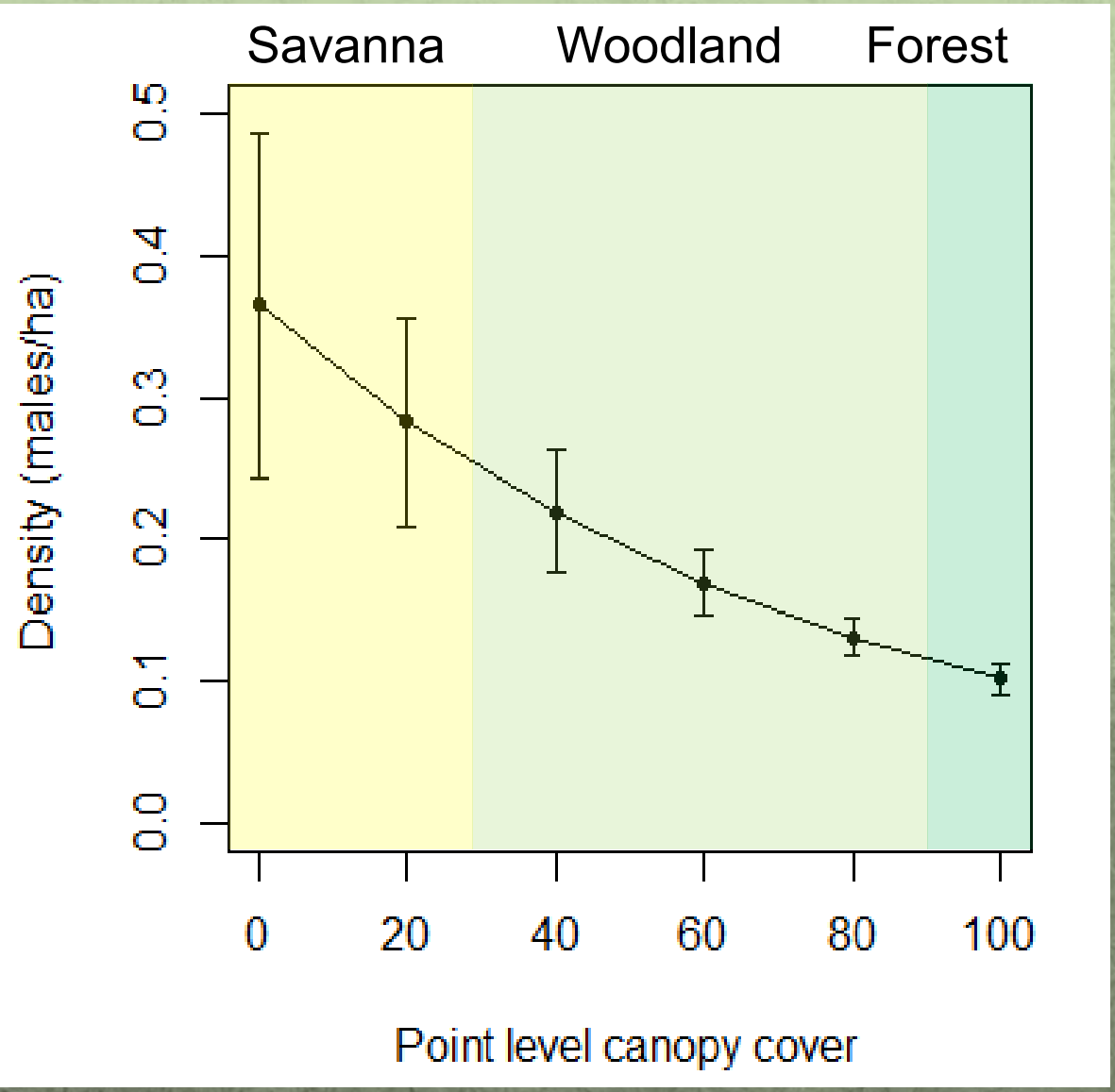
We completed point counts at 251 point in Missouri and 101 points in Arkansas and Oklahoma in 2013, 2014, and 2015



Results: We were able to fit models for 16 of our 19 focal species

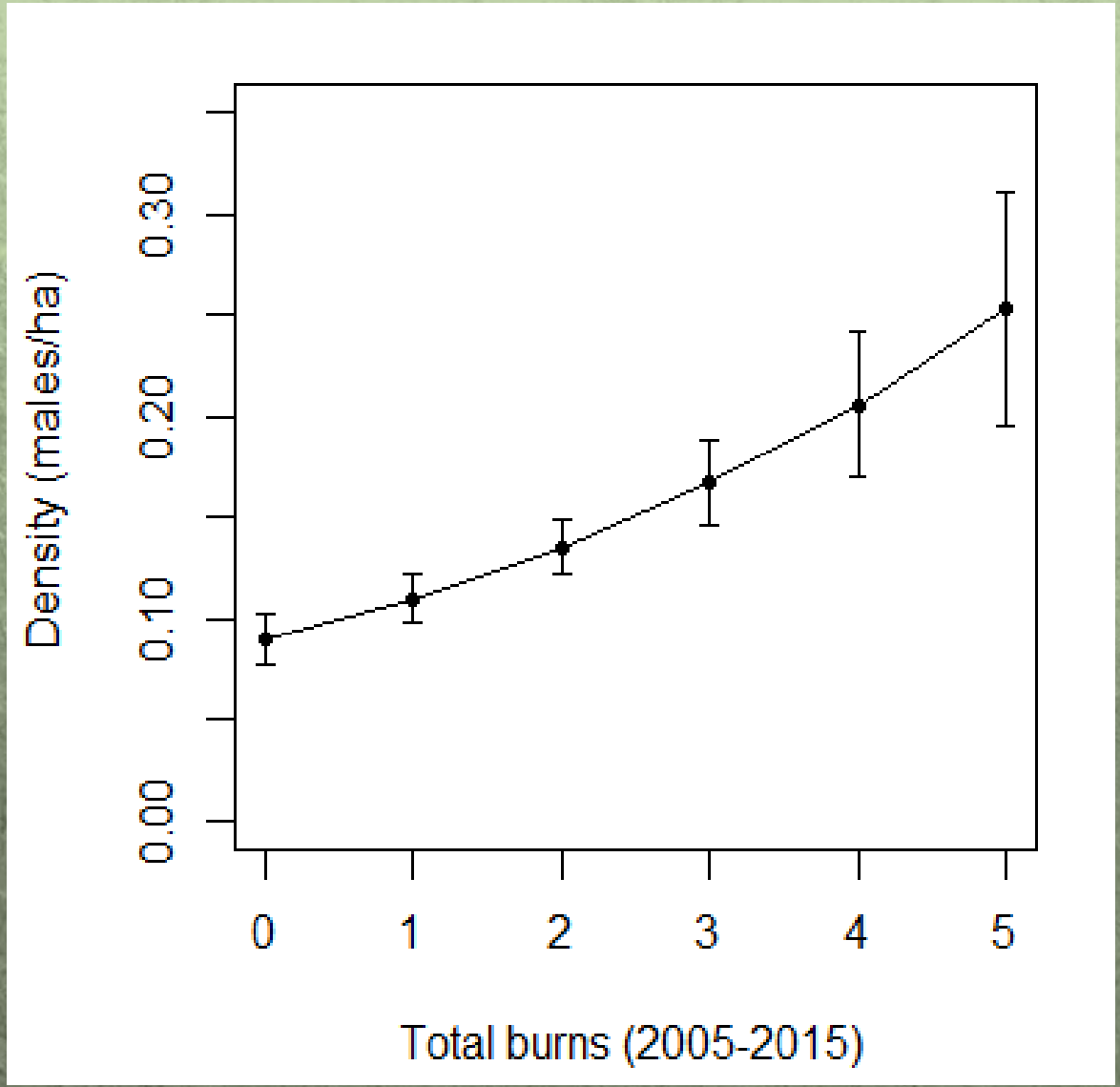
Species	Top model
Acadian Flycatcher	λ(year+canopy+basal+reg+burns+canopy1k+tree1k+ act1k) σ(min+obs)
Black-and-white Warbler	λ(canopy+shrub+basal+reg+burns+canopy1k+tree150) σ(doy+obs)
Brown-headed Nuthatch	λ(burns) σ(doy)
Blue-winged Warbler	λ(year+canopy+tree size+act1k) σ(doy)
Eastern Towhee	λ(basal+reg+canopy150+tree1k+act1k) σ(doy+obs)
Eastern Wood-pewee	λ(tree size+reg+act150) σ(doy+obs)
Kentucky Warbler	λ(year+canopy+reg+thin+tree150) σ(doy)
Ovenbird	λ(year+canopy+shrub+tree size+reg+burns+thin+ canopy150+tree150+act1k) σ(obs)

Effect of canopy cover



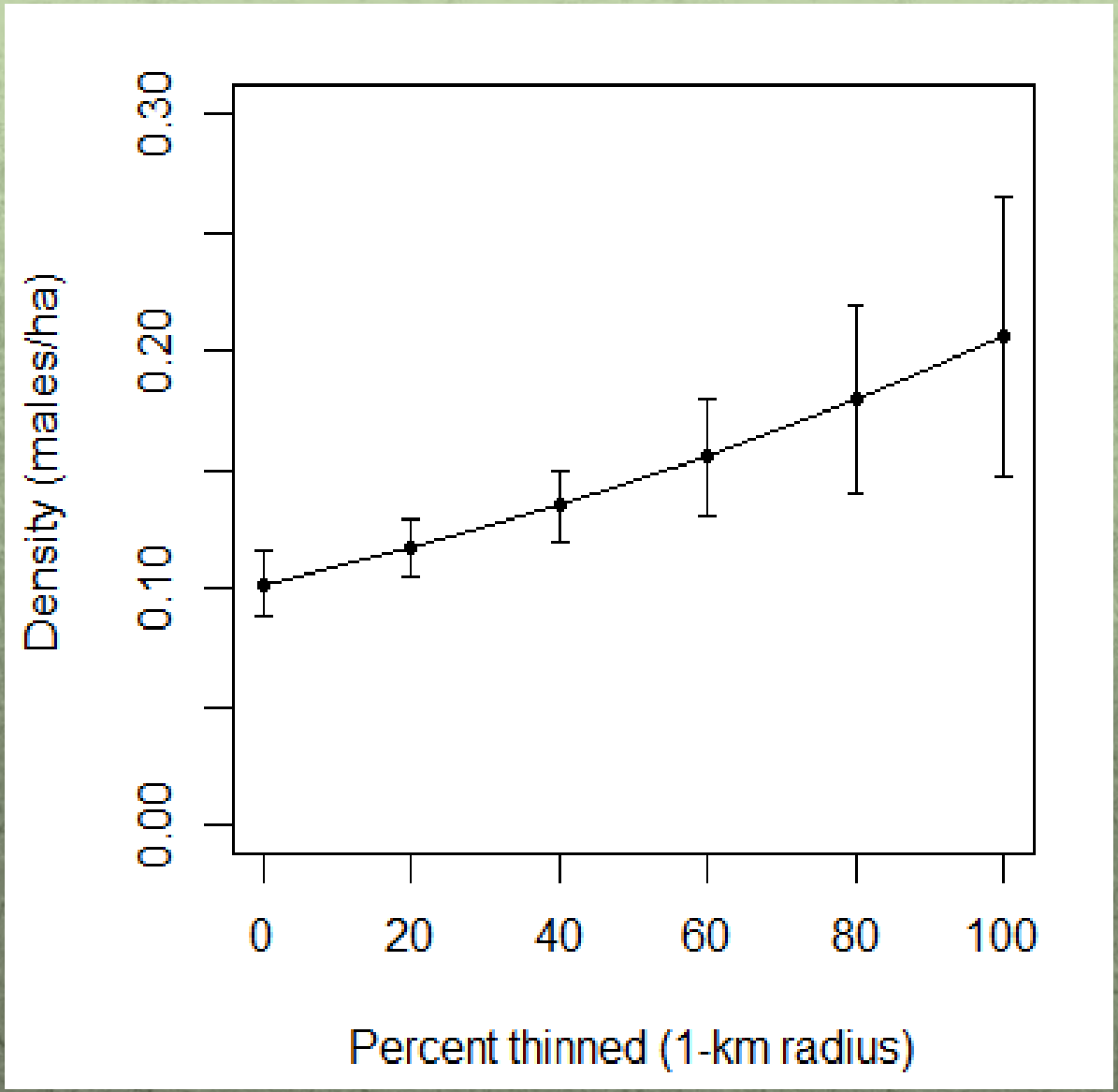
Prairie Warbler

Effect of fire frequency



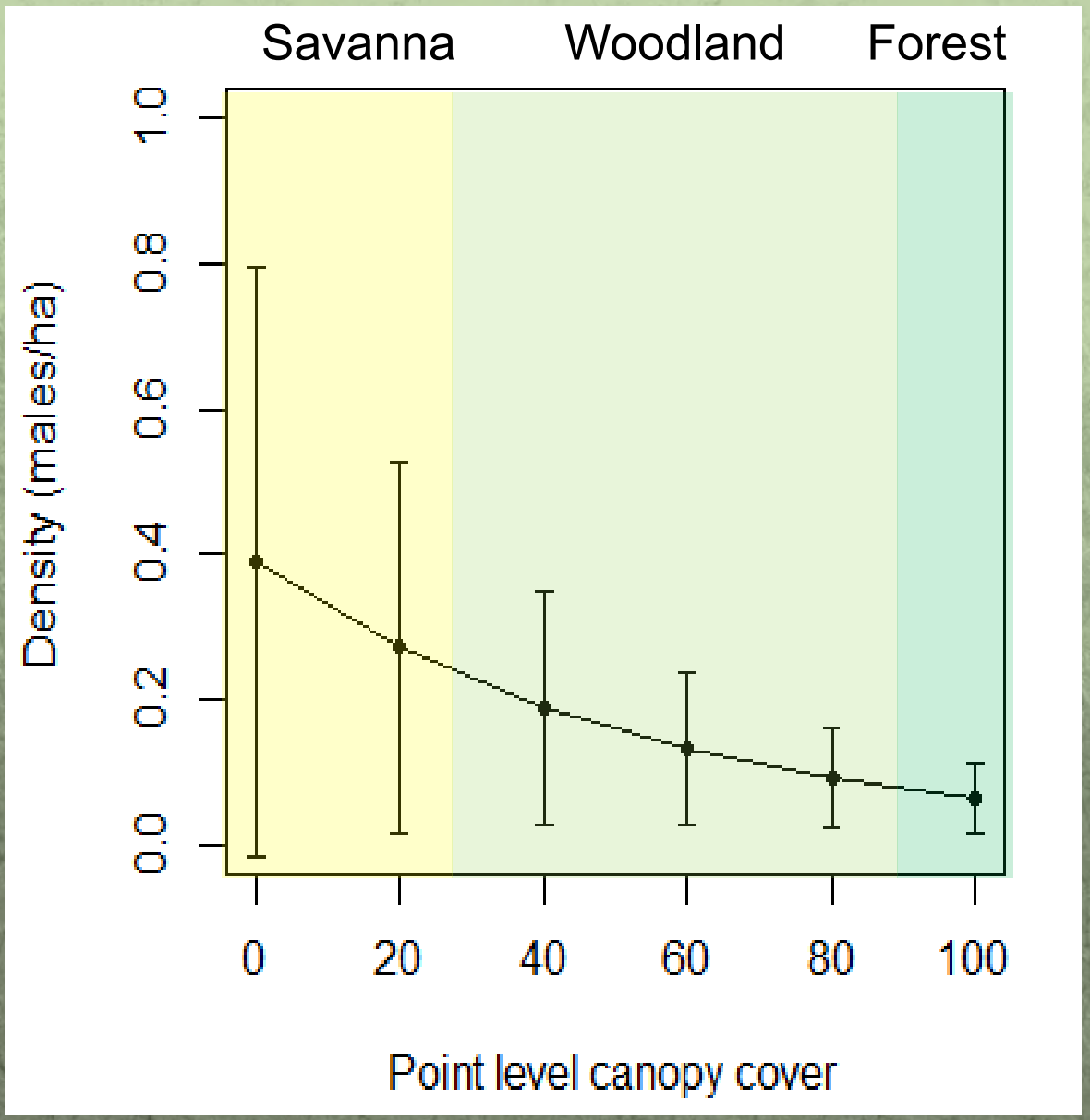
Prairie Warbler

Effect of thinning



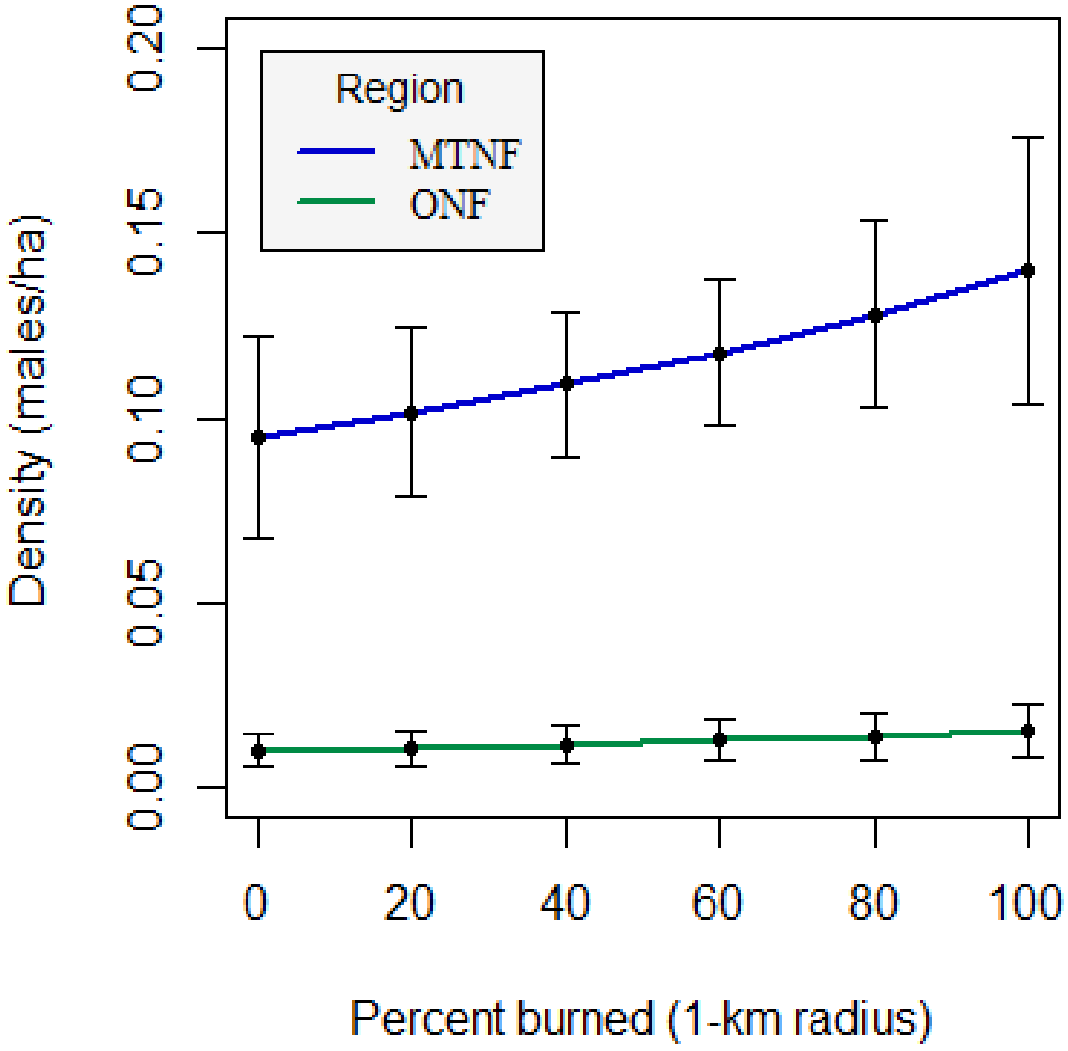
Prairie Warbler

Effect of canopy cover



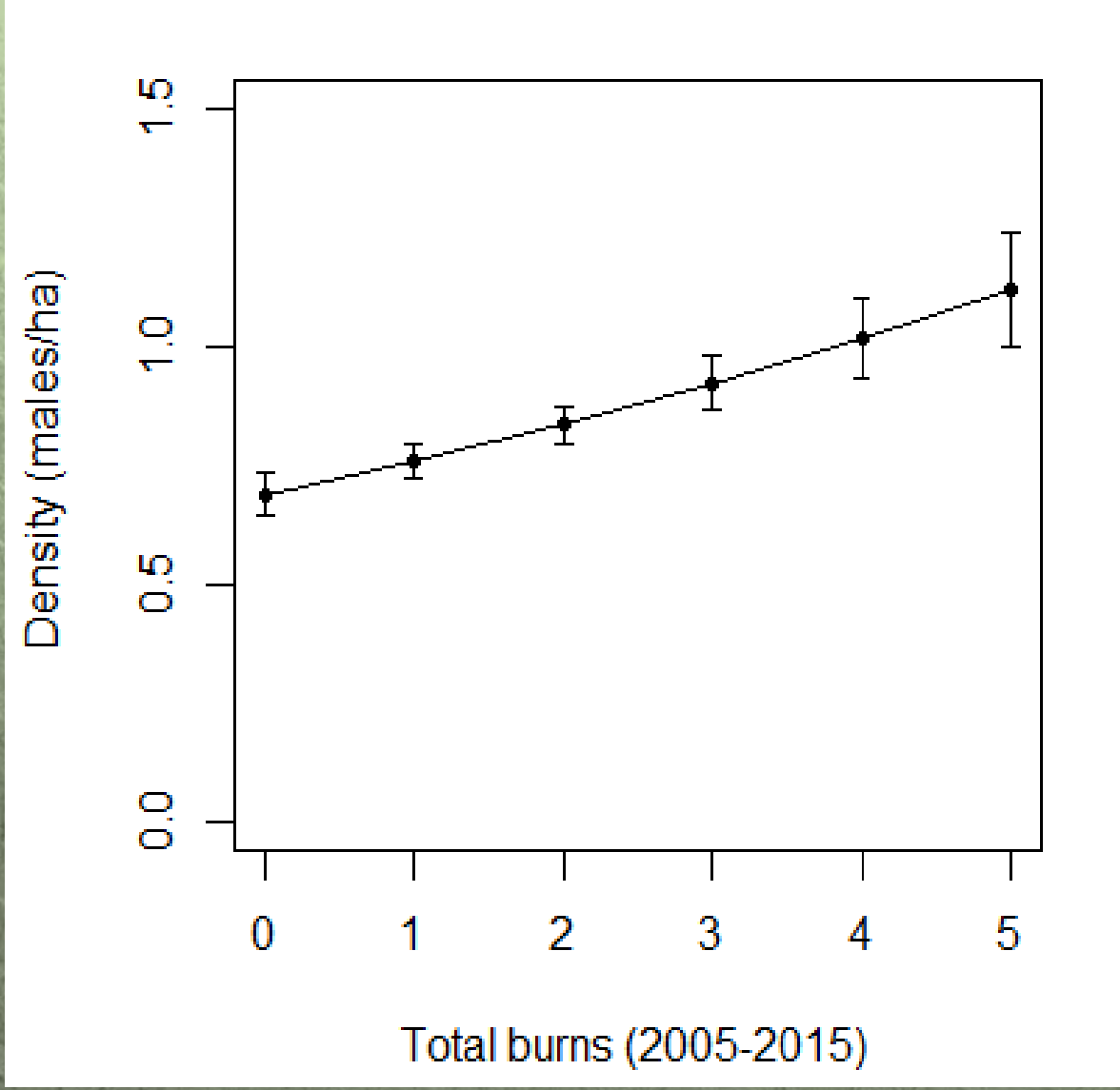
Blue-winged Warbler

Effect of area burned



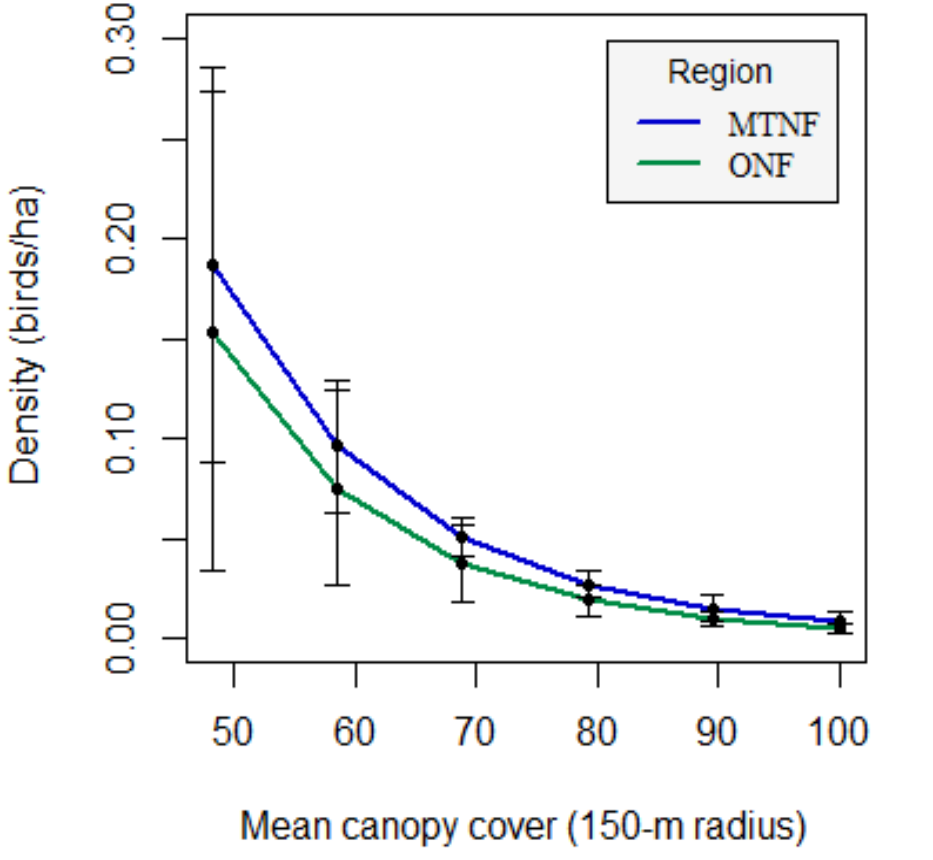
Eastern Towhee

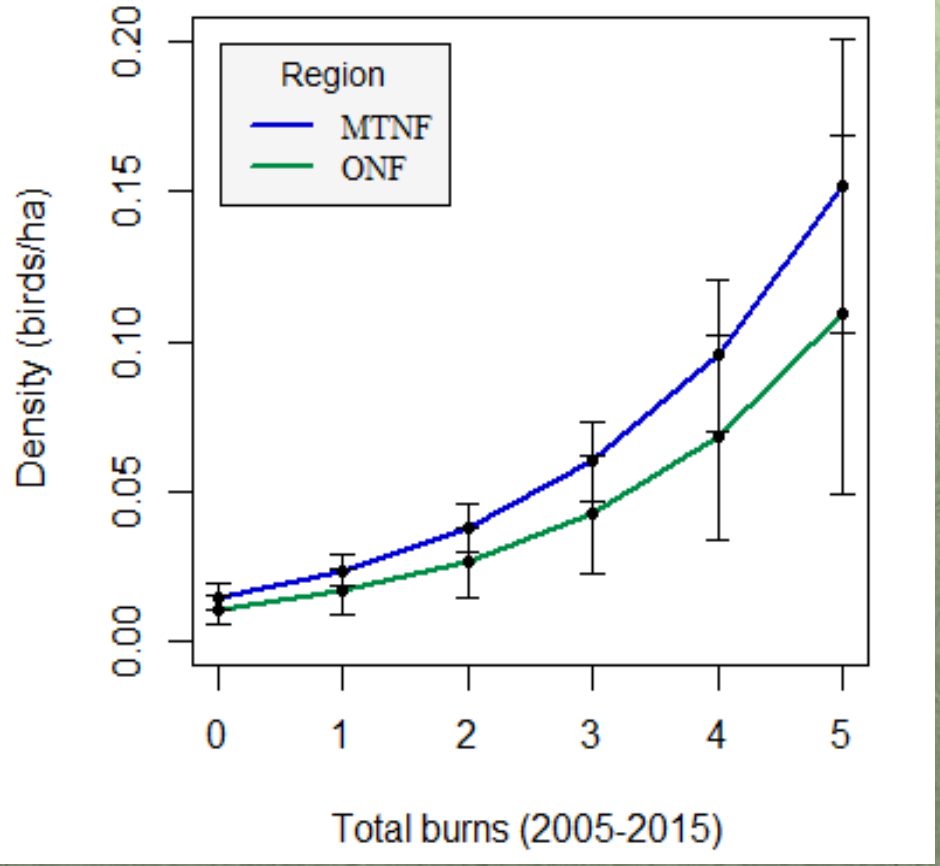
Effect of fire frequency



Pine Warbler

Red-headed Woodpecker





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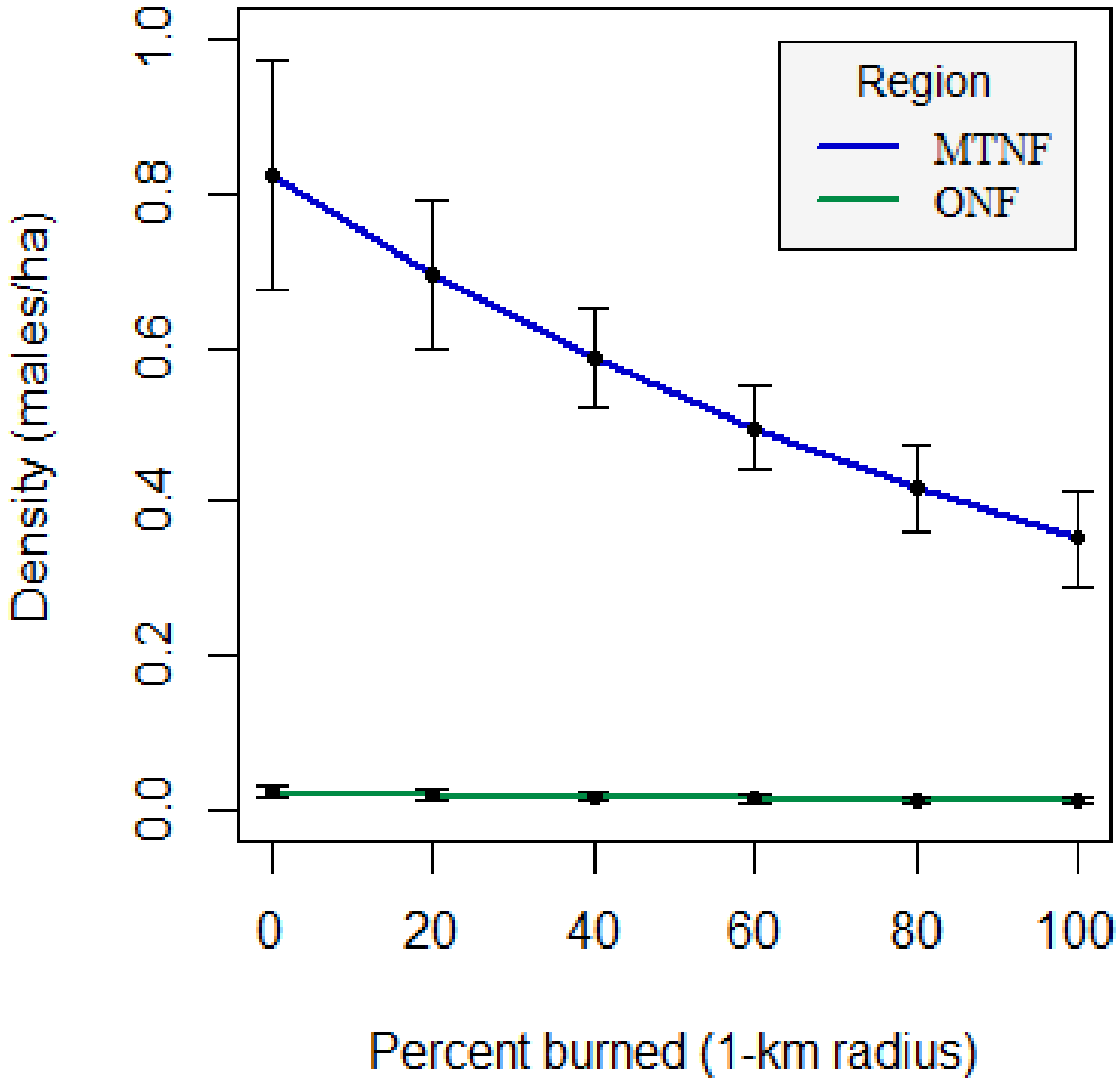


Ovenbird

Summary

- Management activities are restoring pine-woodland
- Eleven of 16 species responded **positively**, 9 of which are species of concern
- Four species responded **negatively**, 2 of which are species of concern

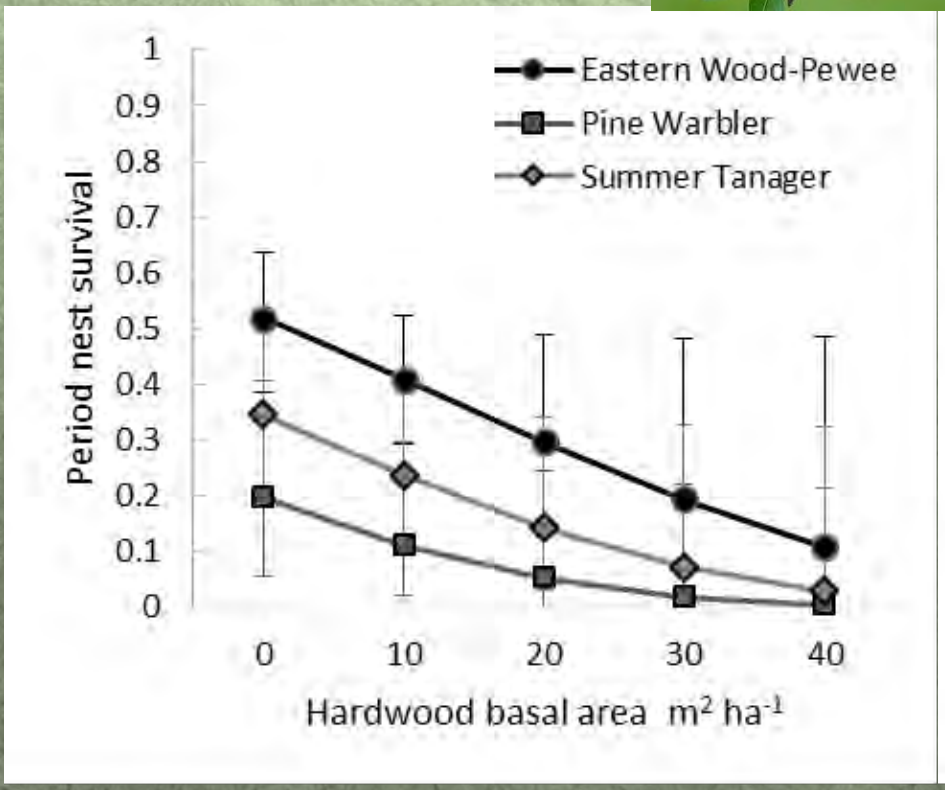
What about nest success?

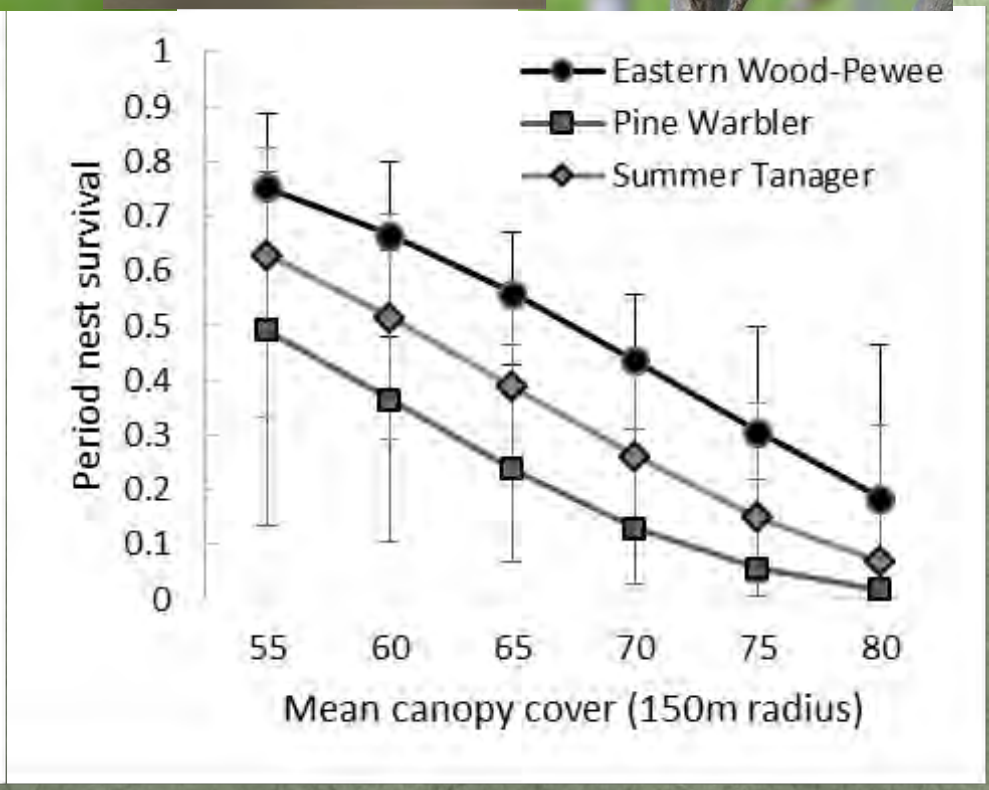
Period nest survival for the shrub nesters



Period nest survival for the shrub nesters

Period nest survival for canopy nesters





Summary

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Brown-headed Nuthatch Reintroduction

Shortleaf Pine Initiative
October 3, 2019

Sarah Kendrick – MDC State Ornithologist

Frank Thompson III – Research Wild Biol, NRS-USFS

Thomas Bonnot – Research Prof, Univ of MO

David Hollie

Outline

Background – What's happened so far?

BHNU Ecology and Natural History

Supporting Analyses

- Arkansas Source Population
- Missouri Habitat

Background

Not a new idea

Lit review, researched species' natural history (CHJV) – 2016

Asked lots of what-if questions. Communication was key.

- Gary Slater (FL reintroduction) – Nov 2017
- Jim Cox, Tall Timbers (12+ years of BHNU experience, reintros)
- Larry Harrison, USFWS Region 3 Permits Supervisor
- Arkansas Game and Fish – Dec 2017
- WebEx call: US Forest Service, MDC, Arkansas Game and Fish, Central Hardwoods JV – Mar 2018
- Co-op meeting of US Forest Service and Arkansas Game and Fish – May 2018
- Follow-up surveys in Ouachita NF – Mar 2019
- Analyses by Tom Bonnot – Spring 2019
- Co-op meeting of USFS and AGFC (video presentation) – June 2019
- Partner meeting with Arkansas to decide yay or nay – Aug 2019

Natural History

Brown-headed Nuthatch (*Sitta pusilla*)

Rich Stanton Master's work (2011-12)

Non-migratory cooperative breeder (15-30%;
18 of 22 tagged Ouachita groups were cooperative breeders (82%))

Endemic to pine woodlands in SE US

Common and widespread in their range

- 2-3 ha breeding territories average, median 7 ha in AR (Stanton)
- Northernmost latitude – VA, MD.
  Western edge of range - east TX, northern AR.

Not included on any regional or national conservation lists, IUCN: Least Concern


Shelley Rutkin

Extirpated from Missouri

Historically native (records from E. Seymour Woodruff 1907)

Shortleaf pine-oak woodland systems once covered >6 million acres in MO Ozarks

Open structure dominated by old-growth shortleaf pine and dense herbaceous groundcover

Most likely extirpated in 40s when last swaths of SLPI removed

- Non-migratory, fairly sedentary, weak flyers
- *Natural recolonization of restored pine woodlands is unlikely*

First Florida Reintroduction (1997)

42 nuthatches were translocated from Big Cypress National Preserve to Long Pine Key in Everglades National Park (40 km from source population)

- Positive growth rate maintained, ~100 individuals (2009) with distribution across reintro area (Slater et al. 2013)

Other Florida Reintroductions (2017, 2019)

TALL TIMBERS **FIREBIRD**

Updates from the Stoddard Lab of Ornithology — Summer | Fall 2017

A Feathery Field of View

The south Florida landscape where our nuthatch reintroduction will take place is not the only place where songbirds are struggling. Hammocks and forested wetlands in the Red Hills region have also lost some musical magic in recent years. Annual breding bird surveys conducted on Tall Timbers, for example, have not detected a Wood Thrush in over a decade. Numbers of Kentucky Warbler and Louisiana Waterthrush also are much lower.

Unlike the nuthatch declines in south Florida, songbird declines on Tall Timbers are not linked to timber harvests and a loss of habitat. A big hammock on the property has just as many ancient beech trees and magnolias as it had in the 1980s when the thrush was more common there. Instead, Wood Thrush declines are linked to pernicious, broad-scale changes that include loss of wintering habitat, increases in nest parasites, neighborhood cats, and even changes in the amount of calcium found in woodland soils. The phrase "acid rain" doesn't appear in the news much these days, but

George M. Sutton's watercolor of a Wood Thrush painted in 1952 as a color plate for Georgia Birds by Thomas Burleigh. The painting is part of the Stoddard Collection at Tall Timbers.

–Feathery Field continued on page 2

Bringing Back the Squeak to South Florida

The pine forests of south Florida aren't quite as noisy as pine forests in the Red Hills. Loud songsters such as Indigo Bunting and Orchard Oriole simply don't breed in south Florida, while other birds were eliminated by timber harvests that took place decades ago.

One of the birds affected dramatically by south Florida timber harvests was the Brown-headed Nuthatch. The squeaky notes of this pineland endemic could once be heard from Orlando to Miami, but the nuthatch has disappeared from large swaths of the region, blinking out in some places even before the endangered Red-cockaded Woodpecker disappeared from those same areas.

While pines have grown back on many public lands in the region, today's managed forests are isolated by expanding residential and agricultural development as well as natural swamps and marshes (see map on page 2). As a result, the nuthatch, woodpecker, and other missing species may need a bit of help to re-occupy some former haunts.

A thunderstorm approaches the pine flatwoods on Jonathan Dickinson State Park. Nuthatches have not been seen on the park in over 60 years.

The *Stoddard Bird Lab* is working with the Florida Park Service to return the Brown-headed Nuthatch to Jonathan Dickinson State Park near Hobe Sound, Florida. The park contains over 10,000 acres dominated by pine-woods that once supported both the nuthatch and the

–Bringing Back continued on page 2

Jim Cox, Tall Timbers Research Station

- Studied BHNUs for 12+ years
- Great resource

Summer 2018, juveniles only

Summer 2019, adults and juveniles

- ~80-90% in resighting of translocated 2018 birds and pairing/nesting

Habitat Requirements

OPENESS OF THE UNDERSTORY and SNAGS

Suitable habitat is best characterized as mature pine forest, and limiting features appear to include openness of the understory and density of snags. Human influences on these features may include logging and changes in fire regime. – BNA Account (Slater et al. 2013)

Stanton, Thompson, and Kesler. 2015, Site occupancy in NW AR, JWM:79:917–926

Stanton, Kesler, and Thompson. 2015, Space and resource use, Auk 131: 407–420


Hugh Whelan

Snags Snags Snags

Require snags for nesting, mature pines nearby for foraging

"Snags should be a primary target of habitat management for nuthatches. Nuthatch abundance is associated with snag abundance (Wilson and Watts 1999). Snag density, particularly of large snags, is also associated with increased productivity (Lloyd and Slater 2007) and nesting success (Sullivan 2011)."

Workhorse: excavates cavities annually

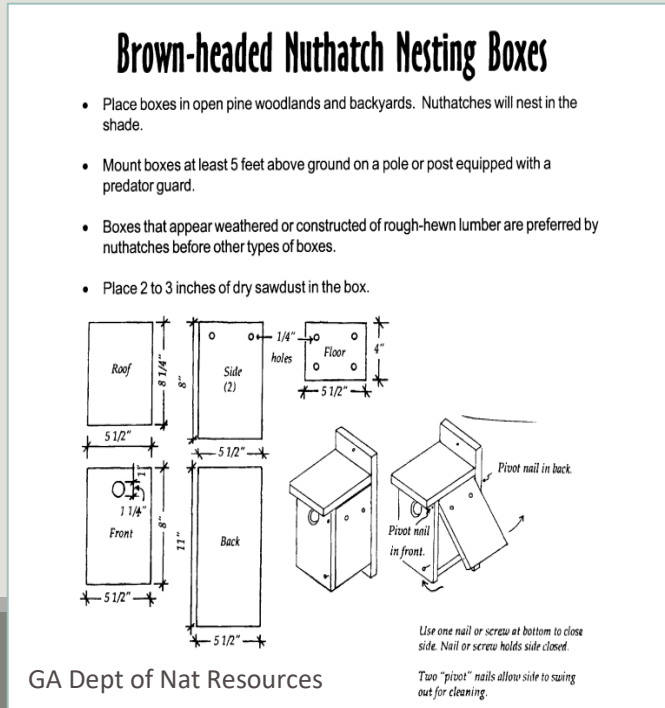
Relevant Natural History

Usually excavates a cavity, sometimes uses existing cavity and nest boxes – supplement habitat if necessary

Outreach:

Draw birders to the region

Educate about and experience pine woodland



Brown-headed Nuthatch Nesting Boxes

- Place boxes in open pine woodlands and backyards. Nuthatches will nest in the shade.
- Mount boxes at least 5 feet above ground on a pole or post equipped with a predator guard.
- Boxes that appear weathered or constructed of rough-hewn lumber are preferred by nuthatches before other types of boxes.
- Place 2 to 3 inches of dry sawdust in the box.

GA Dept of Nat Resources

Management Recs

USFS and MDC will continue emphasis on pine woodland restoration and management as part of the CFLRP, but also an MDC focus

"Slater (1997) recommended conservation of old-growth pine, restoration of natural fire regimes, retention of large trees and snags (including small snags that will not be sought by larger cavity competitors), and **reintroduction programs in areas that lost populations because of habitat destruction but now have suitable regrowth**."

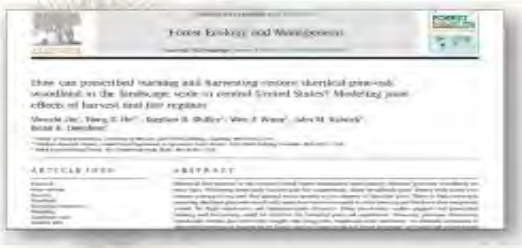
Two main questions:

1. Are Arkansas source populations stable enough to support removal of birds for a host population?

2. Does Missouri have suitable pine woodland habitat to support a population?

Supporting Work

Missouri CFLRP Habitat Assessment



USFS NRS and MU conducted a LANDIS assessment of pine woodland management approaches in CFLRP area

Apply habitat models to the outputs to assess how much habitat there will be over next 50 years

Identify and assess source population

- AR Bird Monitoring Analysis
  - R8 Landbird Modeling
  - Trends
- Assessment of Source Population Size
  - Follow-up Sampling
  - Abundance

Missouri CFLRP Habitat Assessment

The Southern National Forest's

Migratory and Resident Landbird

Conservation Strategy

Includes Program Guidance for Most Neotropical

Migratory, Temporate Migratory, and Resident Birds

June, 1996

Glen D. Gaines - USDA Forest Service, Southern Region,
Fisheries, Wildlife, and Range Staff,
Atlanta, Georgia

Eddie Morris - USDA Forest Service,
Chattahoochee-Oconee National Forests,
Gainesville, Georgia

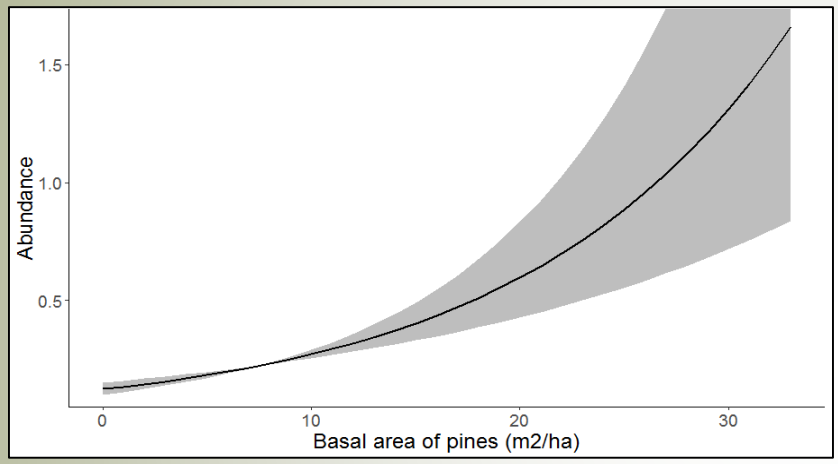
Trends in Abundance and Habitat Associations of Forest Birds on Southern National Forests 1992-2017

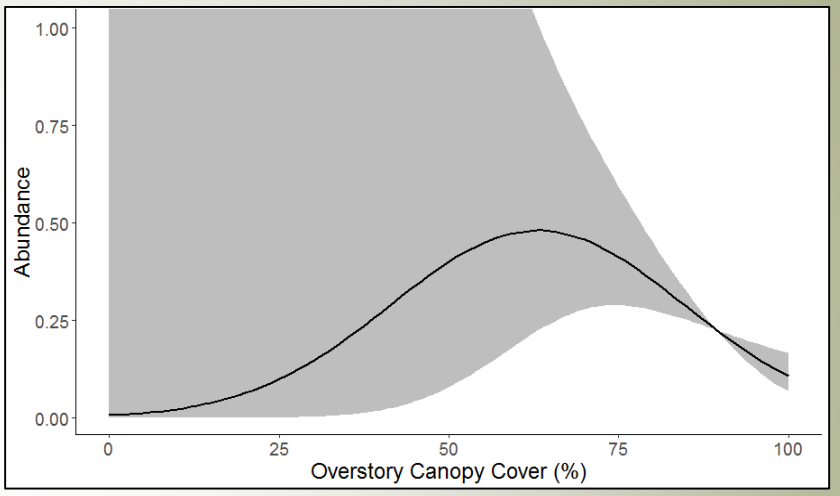
Elizabeth Matseur, Research Specialist, University of Missouri-Columbia

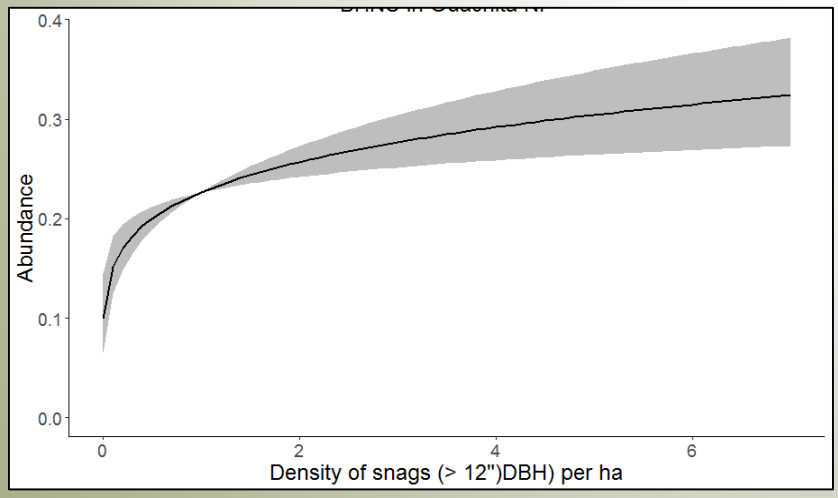
Thomas W. Bonnot, Research Assistant Professor, University of Missouri-Columbia

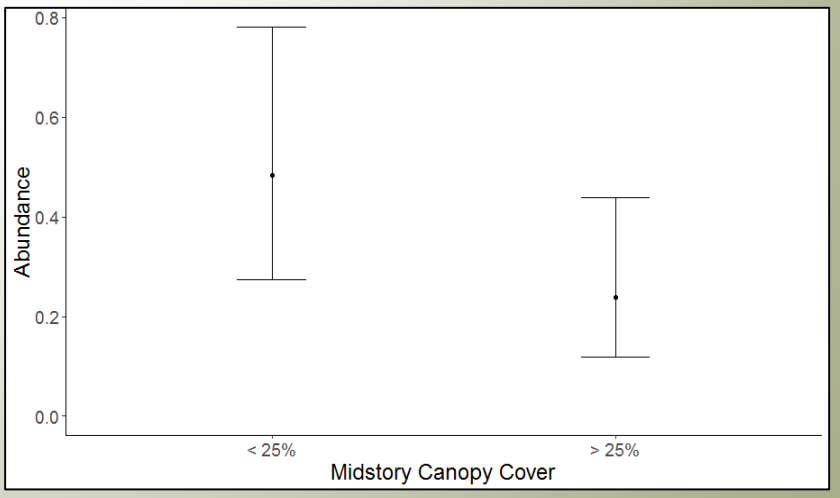
Frank R Thompson III, Research Wildlife Biologist, USDA Forest Service Northern Research Station

MO Habitat Analysis – Arkansas variables related to abundance



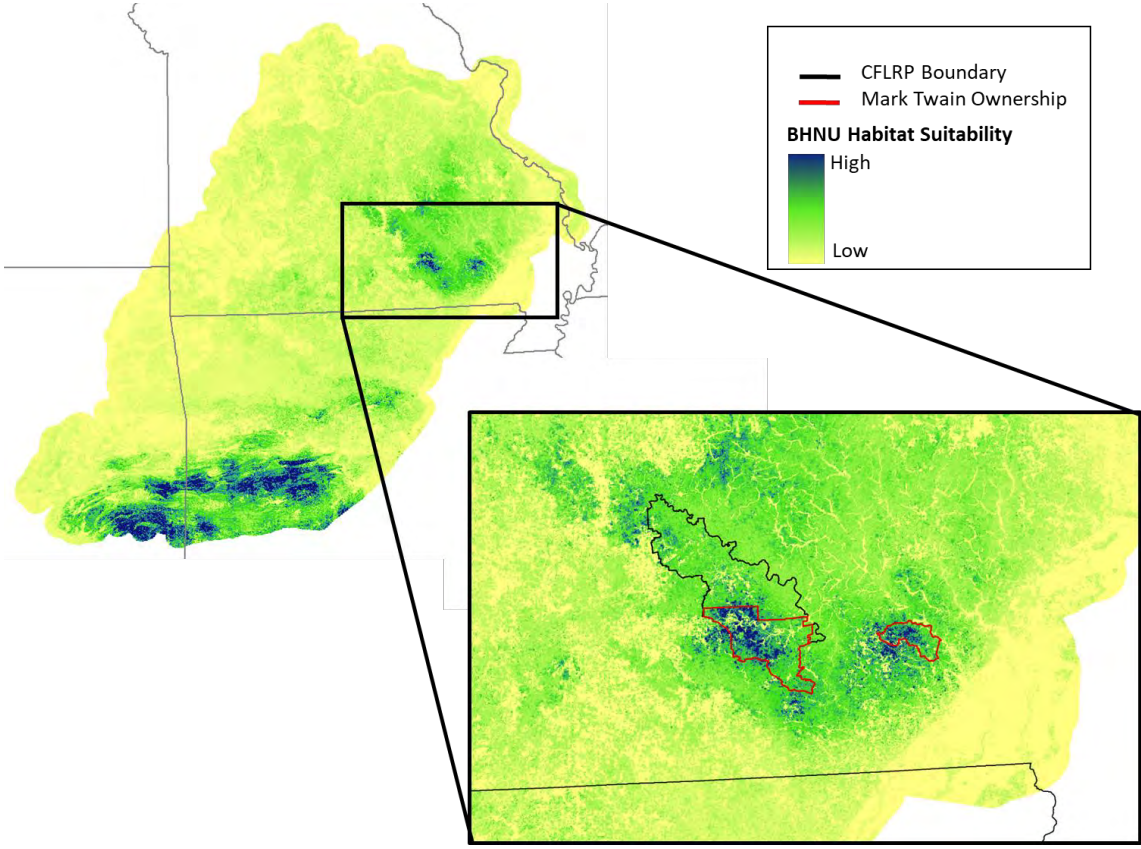




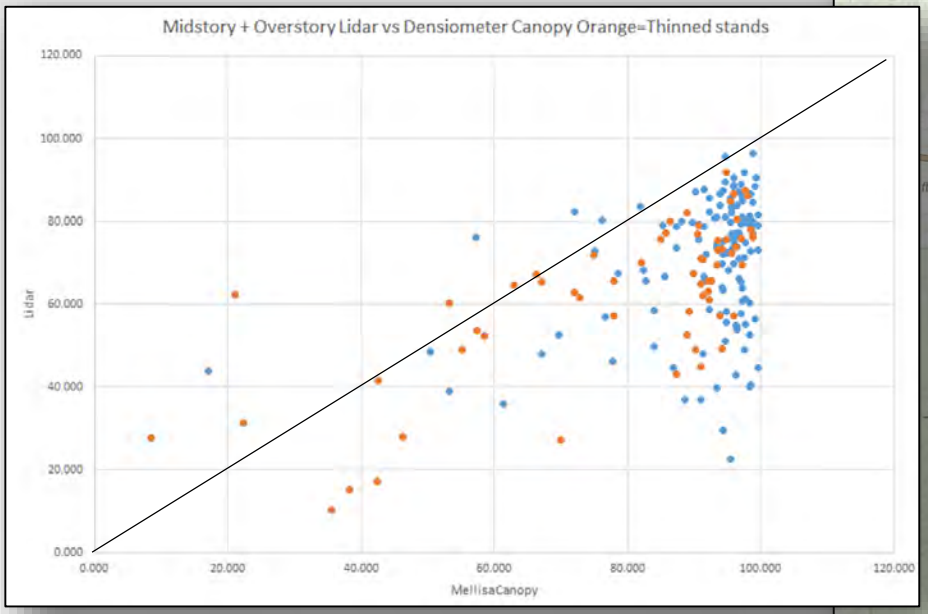


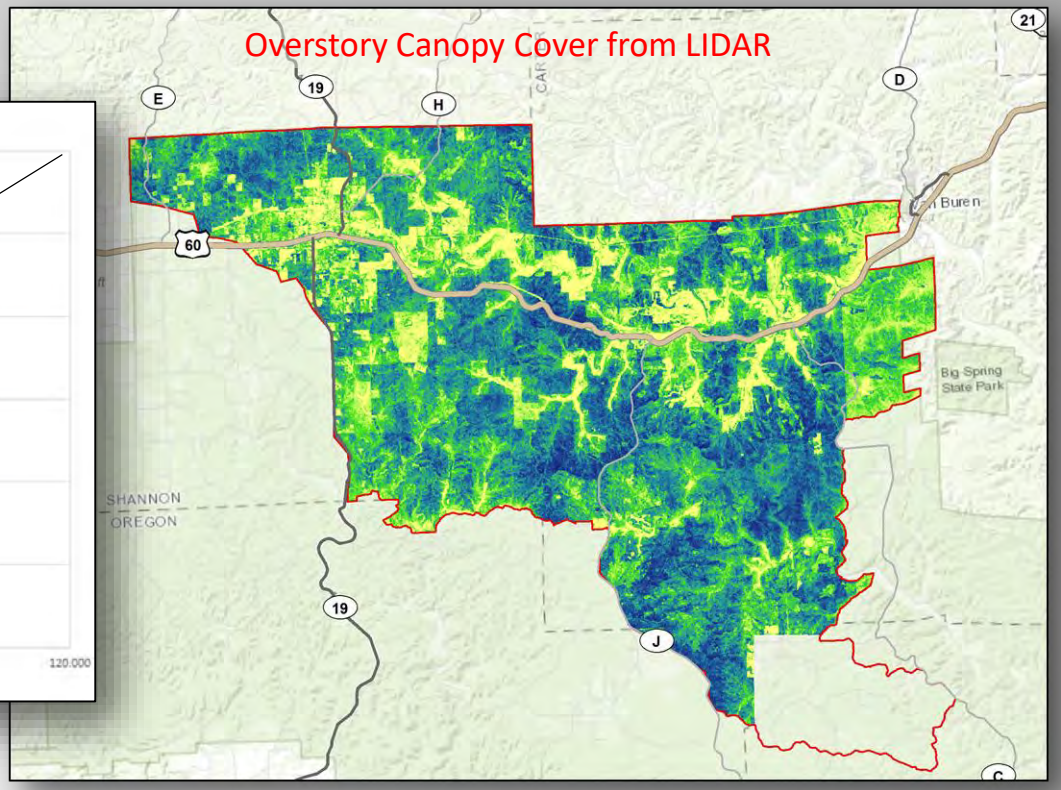
MO Habitat Analysis – Habitat suitability

- Applied AR habitat model to MO remote sensing data
- Mapped the suitability of habitat across the region
- Mark Twain CFLRP sites compared well with Ouachita and Ozark-St. Francis NF landscapes



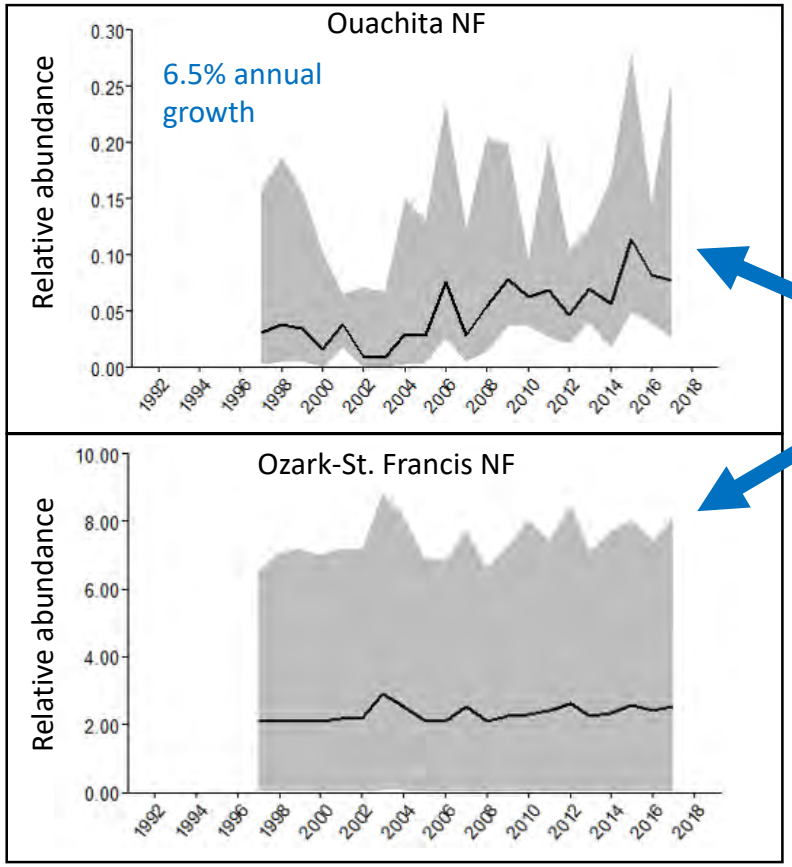
LIDAR data for MTNF

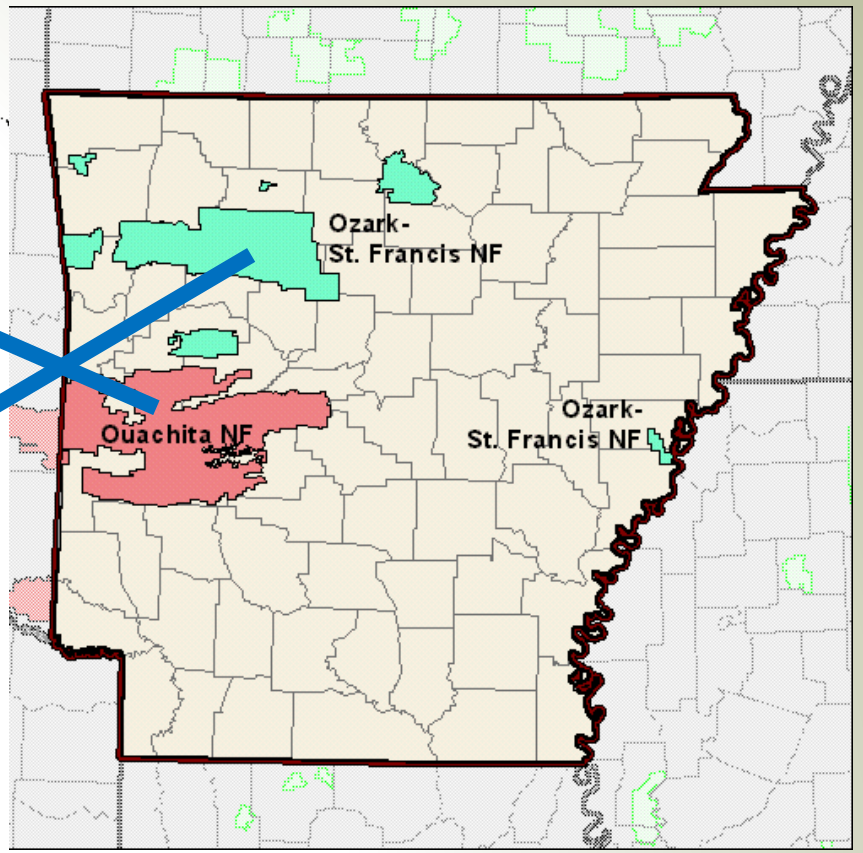




- Melissa Roach bird surveys densiometer readings, CFLRP
- LIDAR overstory canopy cover

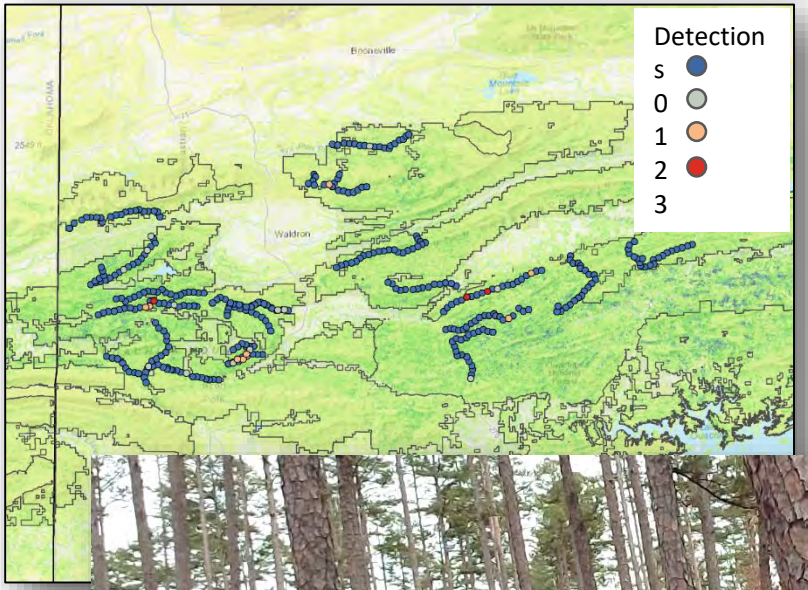
Assessment of Source Populations – NF trends





Assessment of Source Populations – Estimate density

- Sampled birds mid-March 2019 to obtain densities across Ouachita NF
  - 3 days
  - 6 observers
  - 12 routes
  - 362 points
- Poor weather conditions for sampling
- But, still recorded detections



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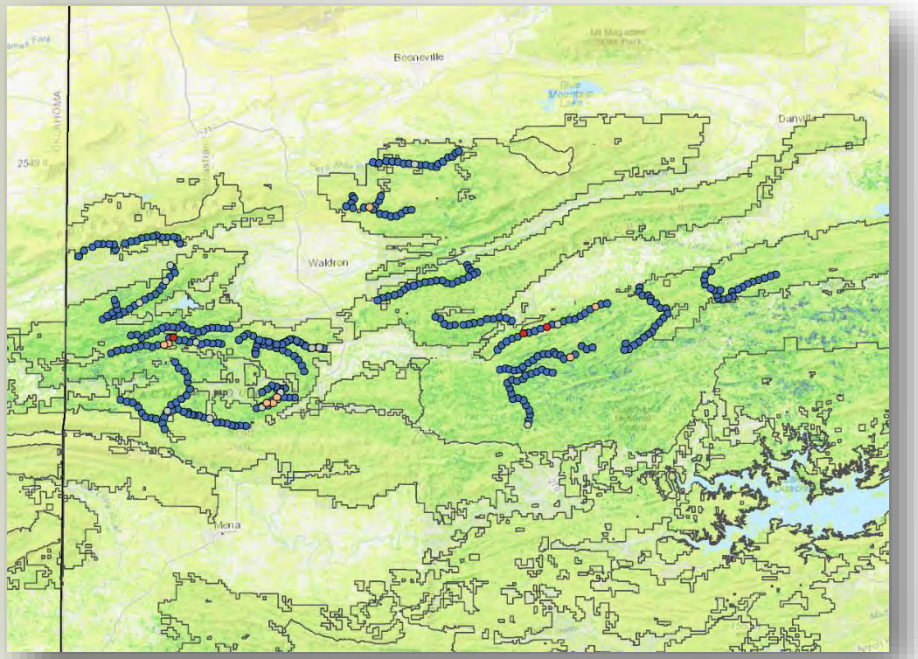
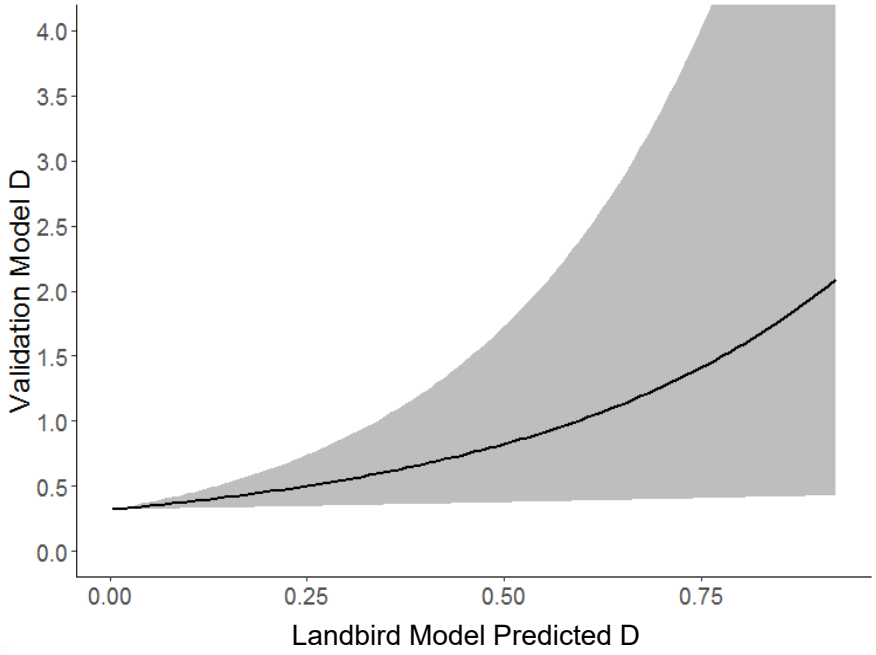
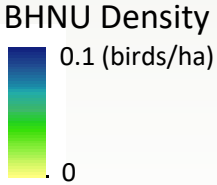


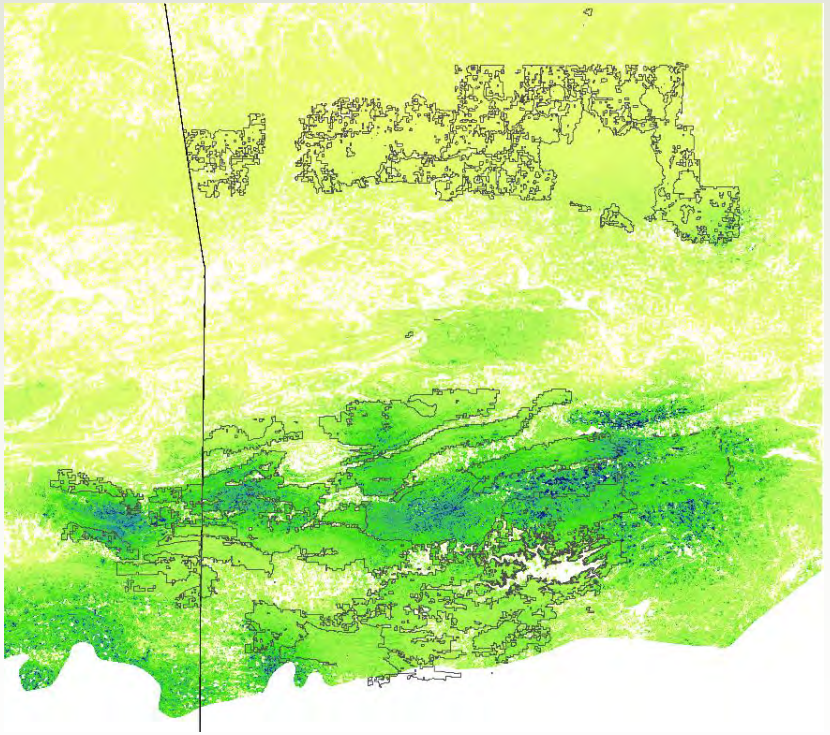


Assessment of Source Populations – Estimate density

Landbird Model

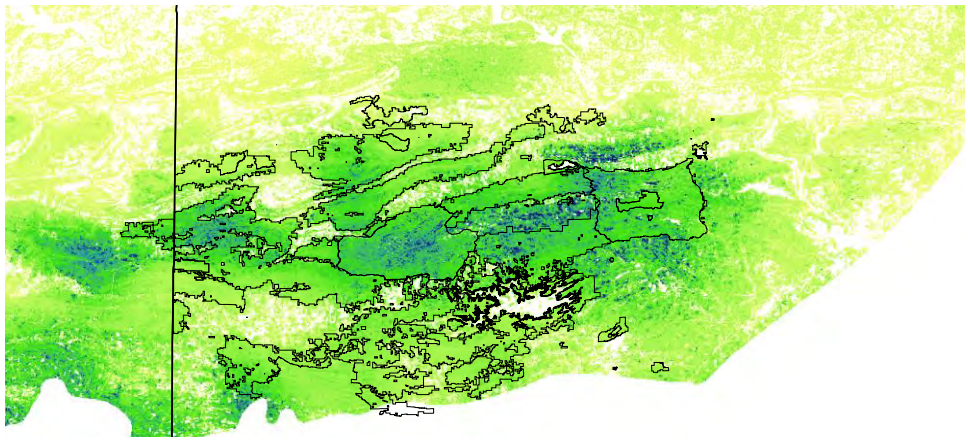


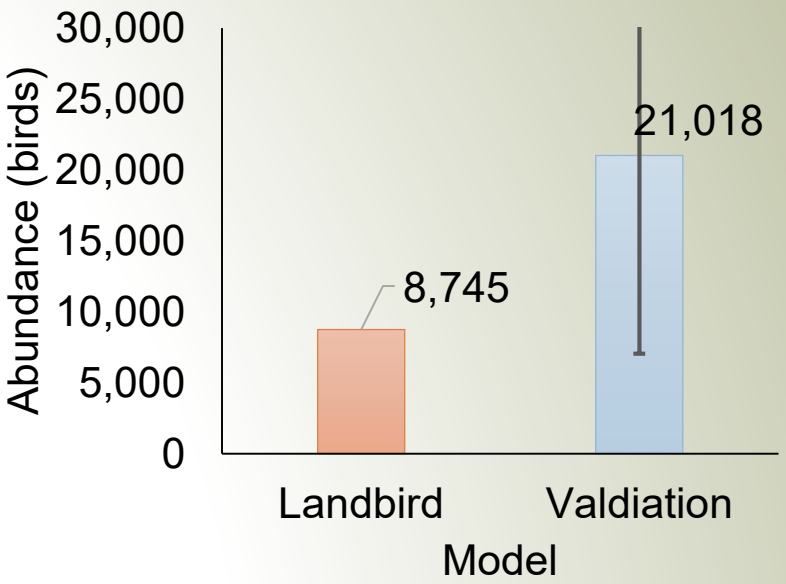
Validation Model



Assessment of Source Populations – Population size

- Estimated abundance of Brown-headed Nuthatch in the Ouachita NF
- Likely more than 10,000 birds





MO Habitat Analysis – Estimated Carrying Capacity

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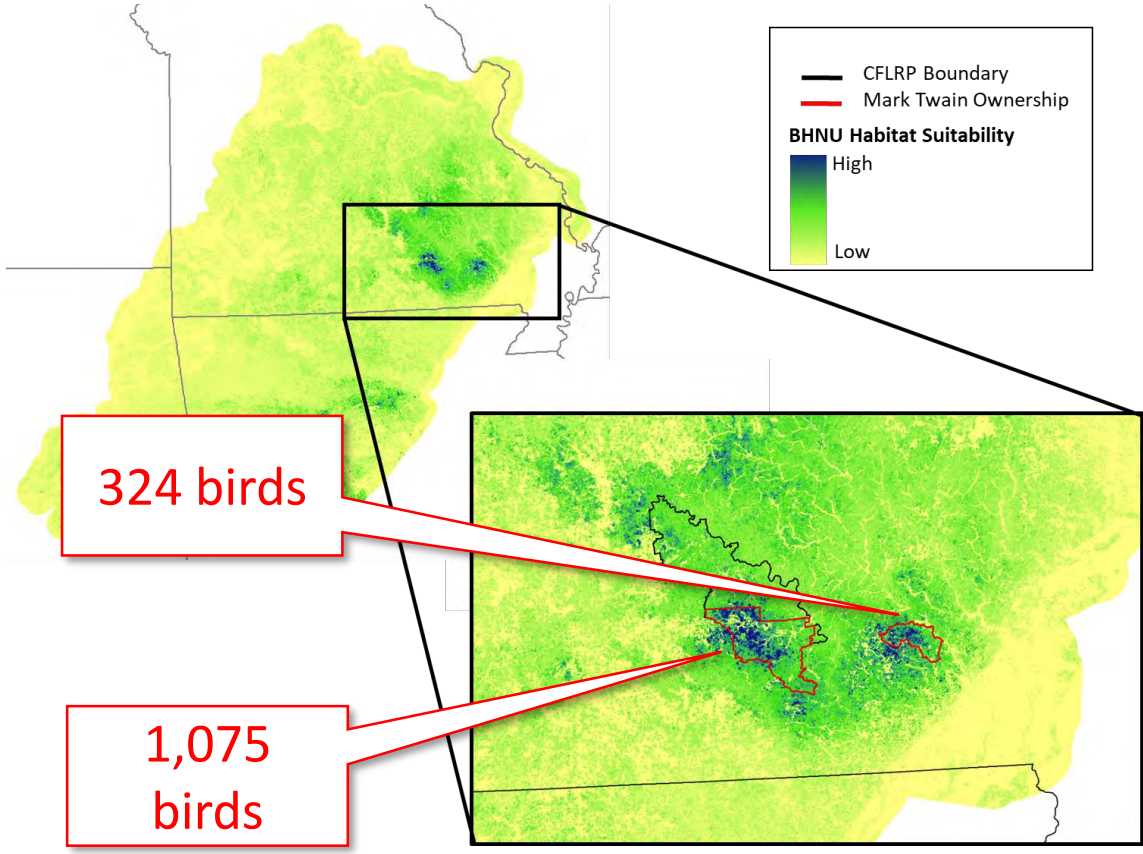
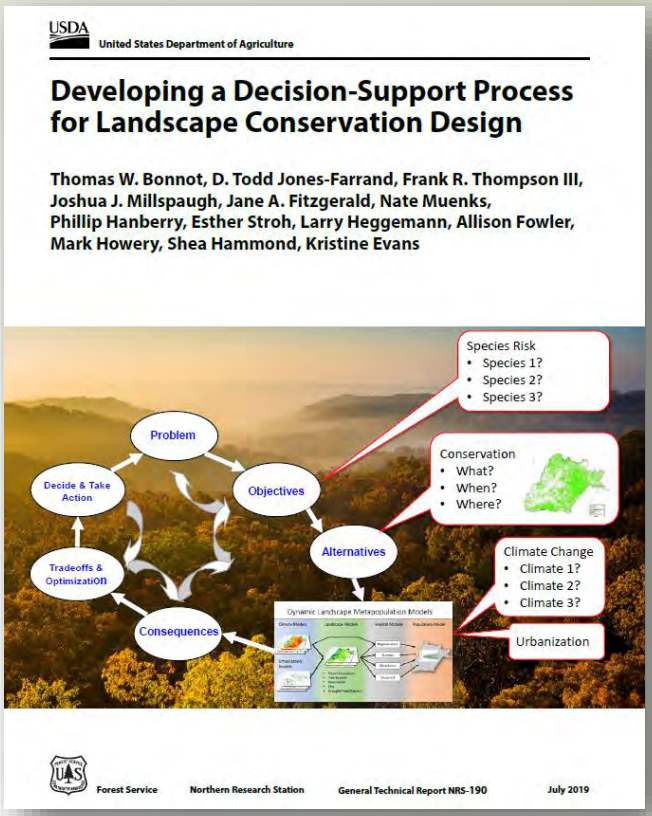
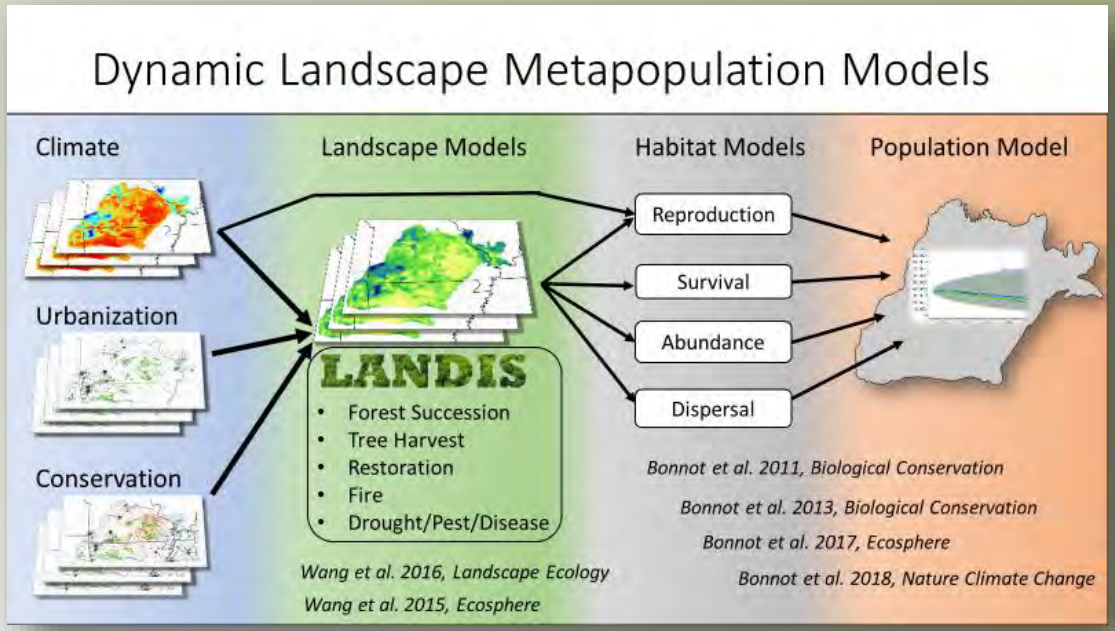


Example from Ozark Highlands Modeling





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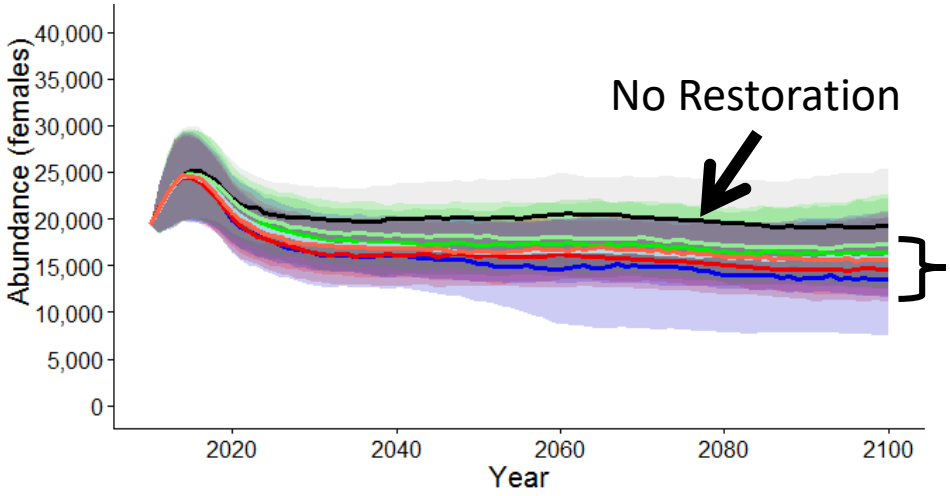

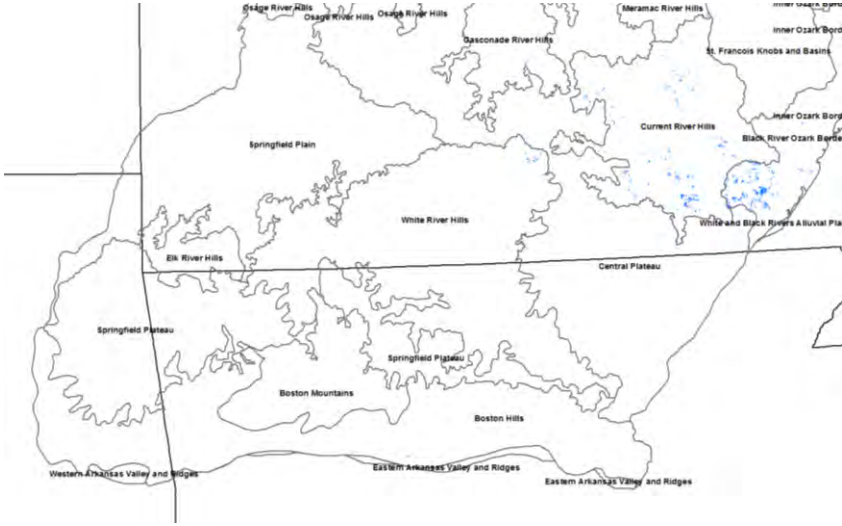

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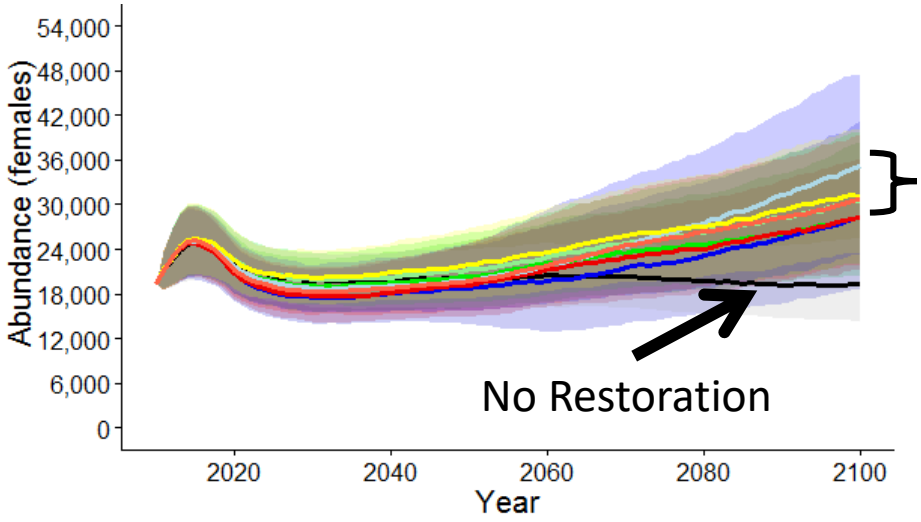
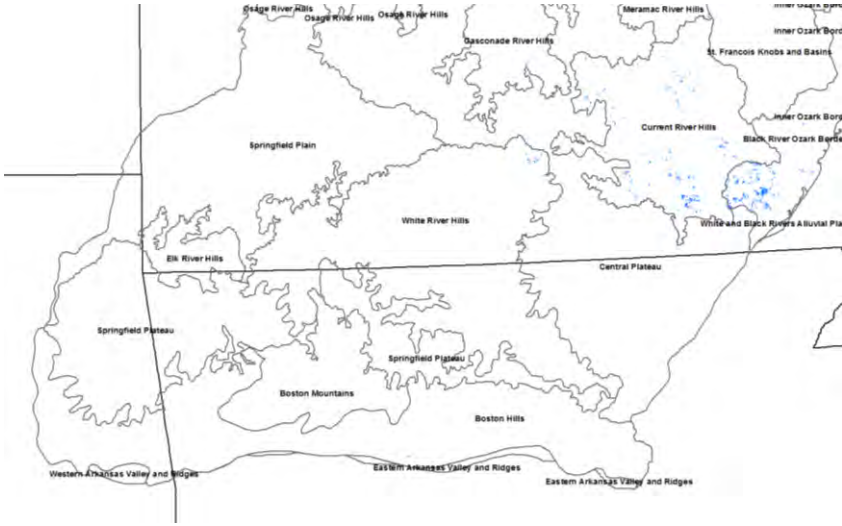


Went back and simulated Restoration with Translocation of 100 individuals in the 1st 3 years to Current River Hills

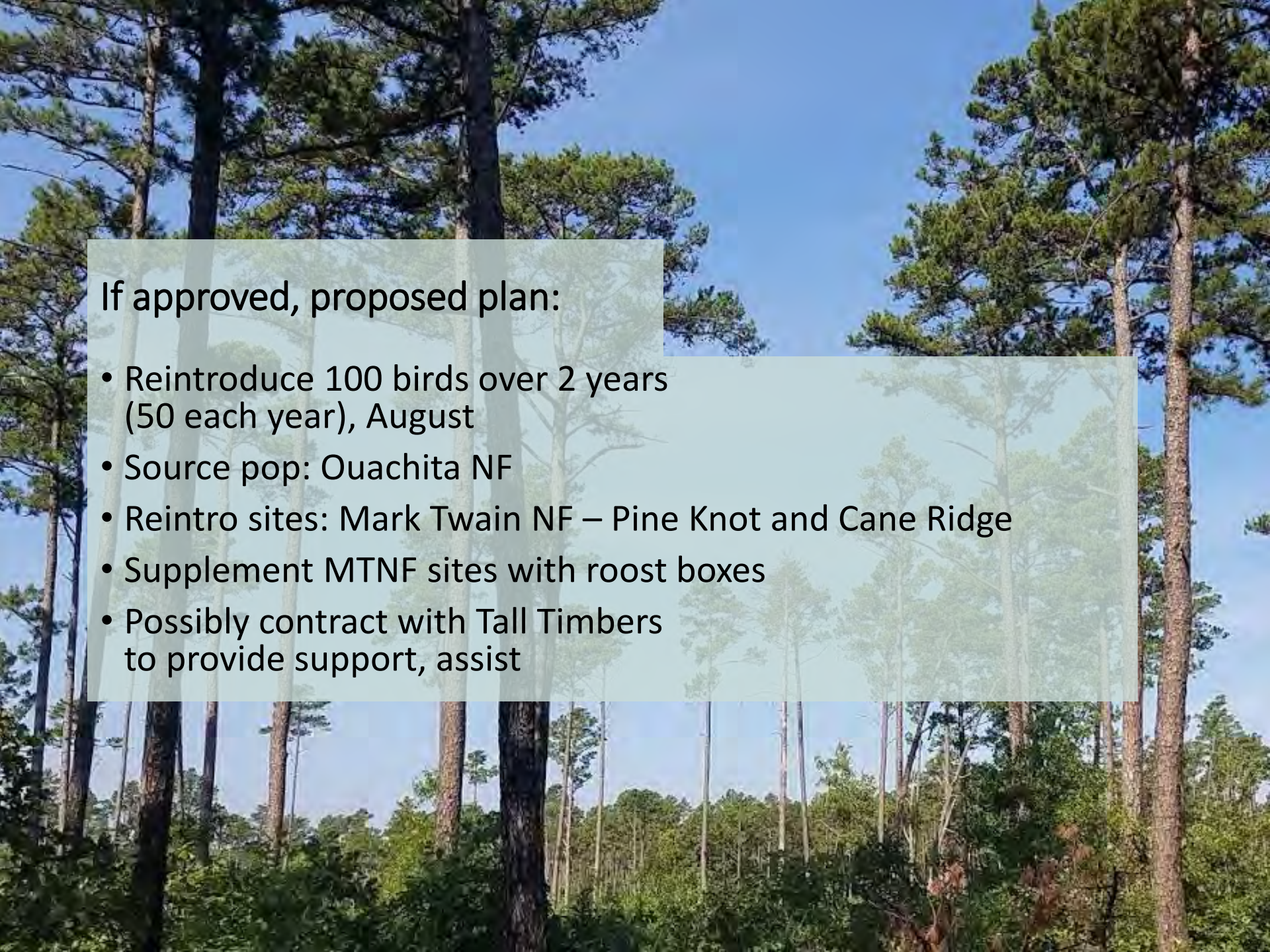


Arkansas partners support reintroduction

Aug 14, 2019 Meeting

Next Steps

- Missouri habitat analysis – more thorough estimates of future habitat
  - Apply abundance models to LANDIS outputs and estimate carrying capacity under management
  - Look at snag data from Roach's CFLRP point counts on release sites
- Reintroduction population modeling
  - Compare scenarios
- Further research and contacts
  - Translocation logistics – many questions remain
  - Resources: Jim Cox, *hab and abundance analyses*
  - Funding possibilities: MDC, USFS Mark Twain NF



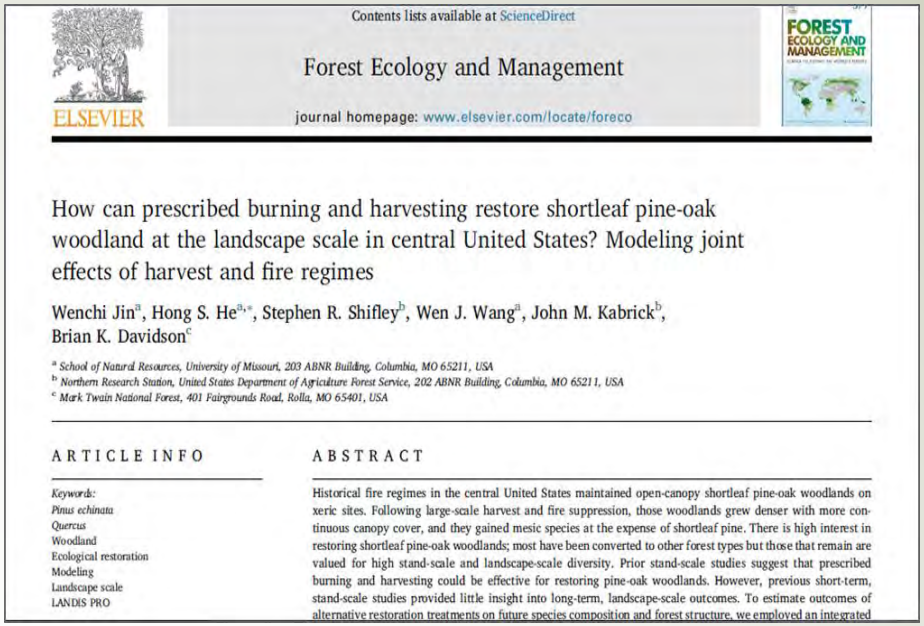
If approved, proposed plan:

- Reintroduce 100 birds over 2 years (50 each year), August
- Source pop: Ouachita NF
- Reintro sites: Mark Twain NF – Pine Knot and Cane Ridge
- Supplement MTNF sites with roost boxes
- Possibly contract with Tall Timbers to provide support, assist

Thank you! Questions?

Sarah.Kendrick@mdc.mo.gov, ext 3262

Missouri CFLRP Habitat Assessment



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How can prescribed burning and harvesting restore shortleaf pine-oak woodland at the landscape scale in central United States? Modeling joint effects of harvest and fire regimes

Wenchi Jin[a], Hong S. He[a,*], Stephen R. Shifley[b], Wen J. Wang[a], John M. Kabrick[b], Brian K. Davidson[c]

[a] School of Natural Resources, University of Missouri, 203 ABNR Building, Columbia, MO 65211, USA
[b] Northern Research Station, United States Department of Agriculture Forest Service, 202 ABNR Building, Columbia, MO 65211, USA
[c] Mark Twain National Forest, 401 Fairgrounds Road, Rolla, MO 65401, USA

ARTICLE INFO

Keywords:
Pinus echinata
Quercus
Woodland
Ecological restoration
Modeling
Landscape scale
LANDIS PRO

ABSTRACT

Historical fire regimes in the central United States maintained open-canopy shortleaf pine-oak woodlands on xeric sites. Following large-scale harvest and fire suppression, those woodlands grew denser with more continuous canopy cover, and they gained mesic species at the expense of shortleaf pine. There is high interest in restoring shortleaf pine-oak woodlands; most have been converted to other forest types but those that remain are valued for high stand-scale and landscape-scale diversity. Prior stand-scale studies suggest that prescribed burning and harvesting could be effective for restoring pine-oak woodlands. However, previous short-term, stand-scale studies provided little insight into long-term, landscape-scale outcomes. To estimate outcomes of alternative restoration treatments on future species composition and forest structure, we employed an integrated

USFS NRS and MU conducted a LANDIS assessment of pine woodland management approaches in CFLRP area

With support from MTNF, Frank and Tom Bonnot are modifying this model to include snags

Then apply HSI and abundance models to the outputs to assess how much habitat there will be over next 50 years

Missouri CFLRP Habitat Assessment

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USFS NRS and MU conducted a LANDIS assessment of pine woodland management approaches in CFLRP area

Apply habitat models to the outputs to assess how much habitat there will be over next 50 years


Bob Epperson

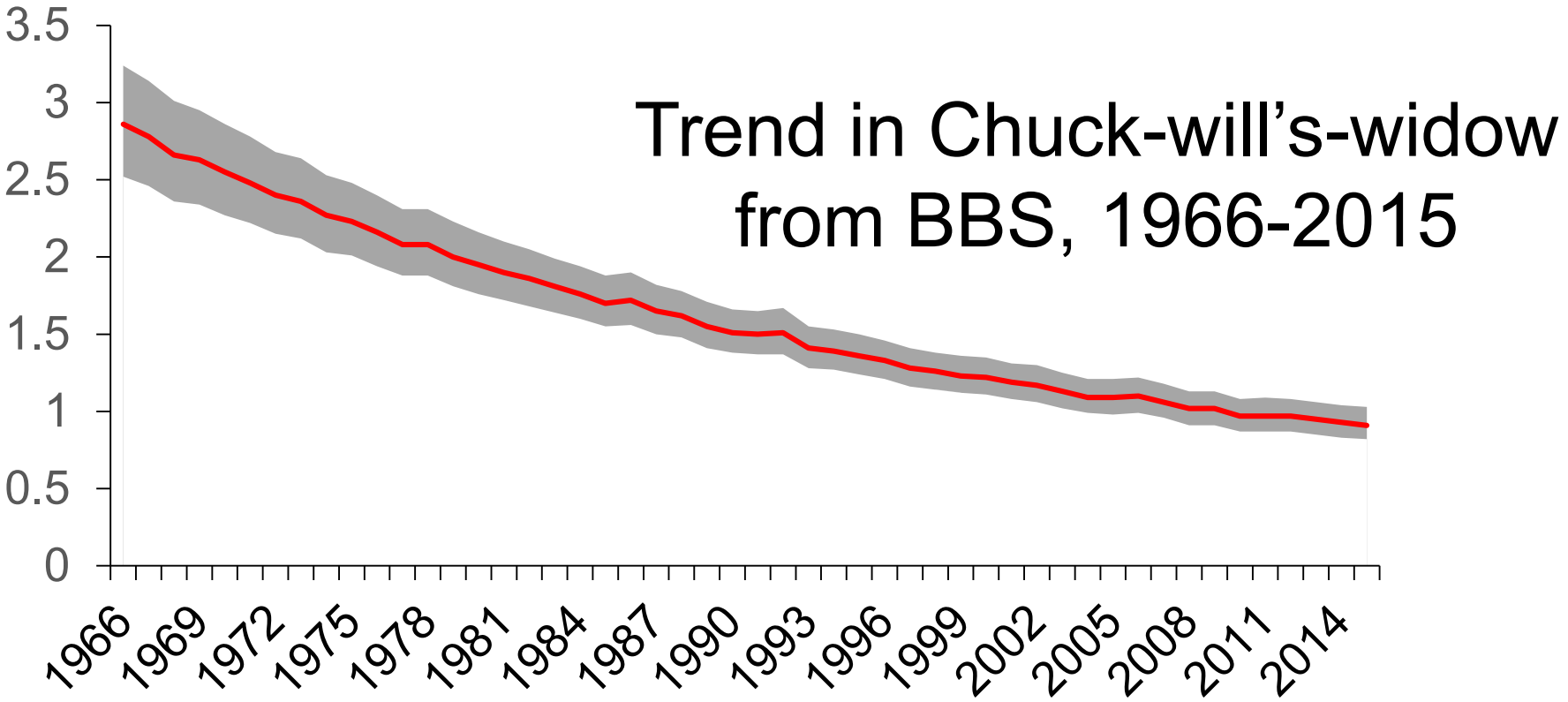
Identify and assess source population

- AR Bird Monitoring Analysis
  - R8 Landbird Modeling
  - Trends
- Assessment of Source Population Size
  - Follow-up Sampling
  - Abundance

Relationships of Chuck-will's-widow and Eastern Whip-poor-will abundance with landscape composition and management

Filling Critical Knowledge Gaps In The Eastern Whip-poor-will Annual Cycle

Why are we concerned about Nightjars?



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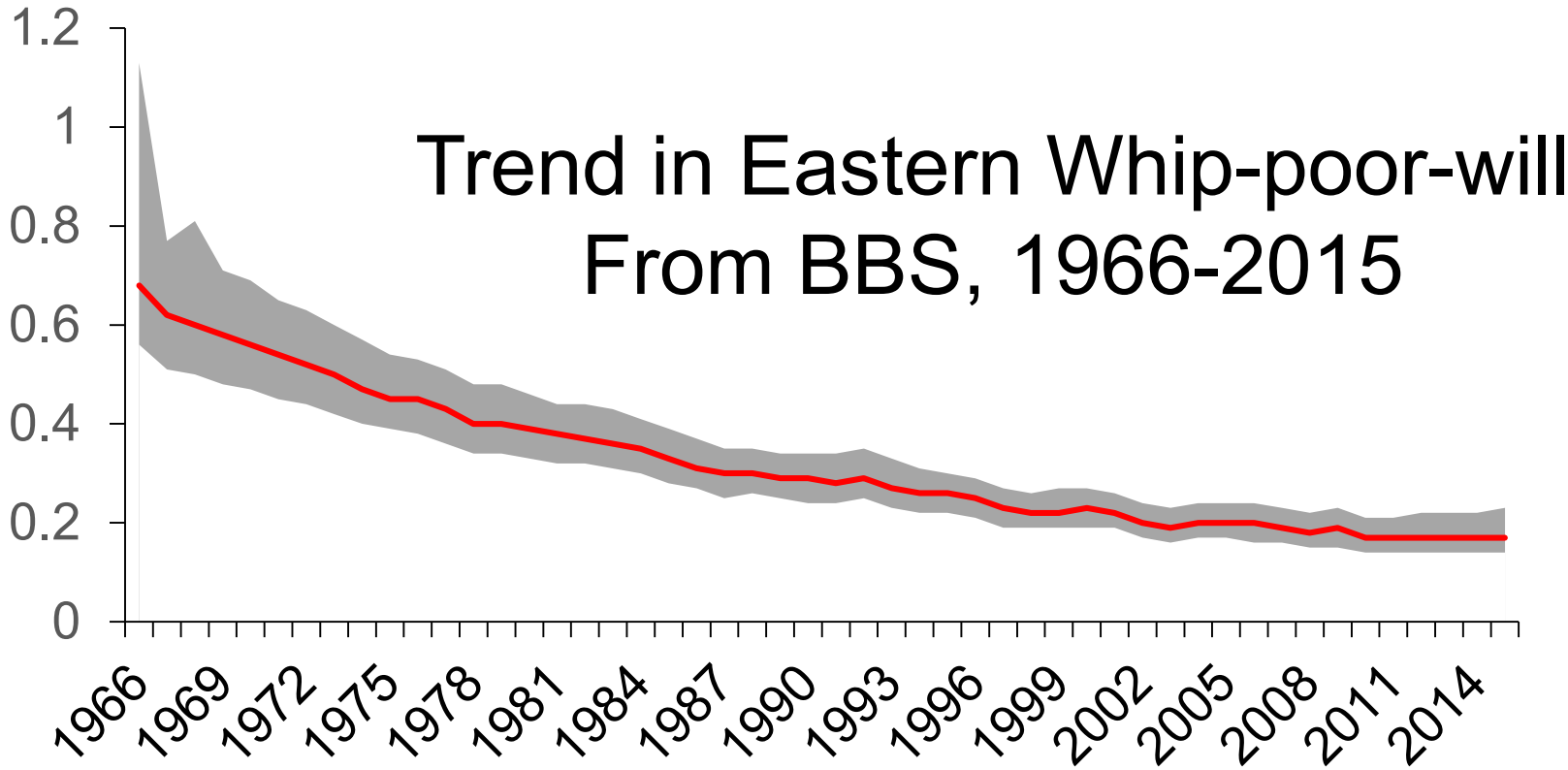


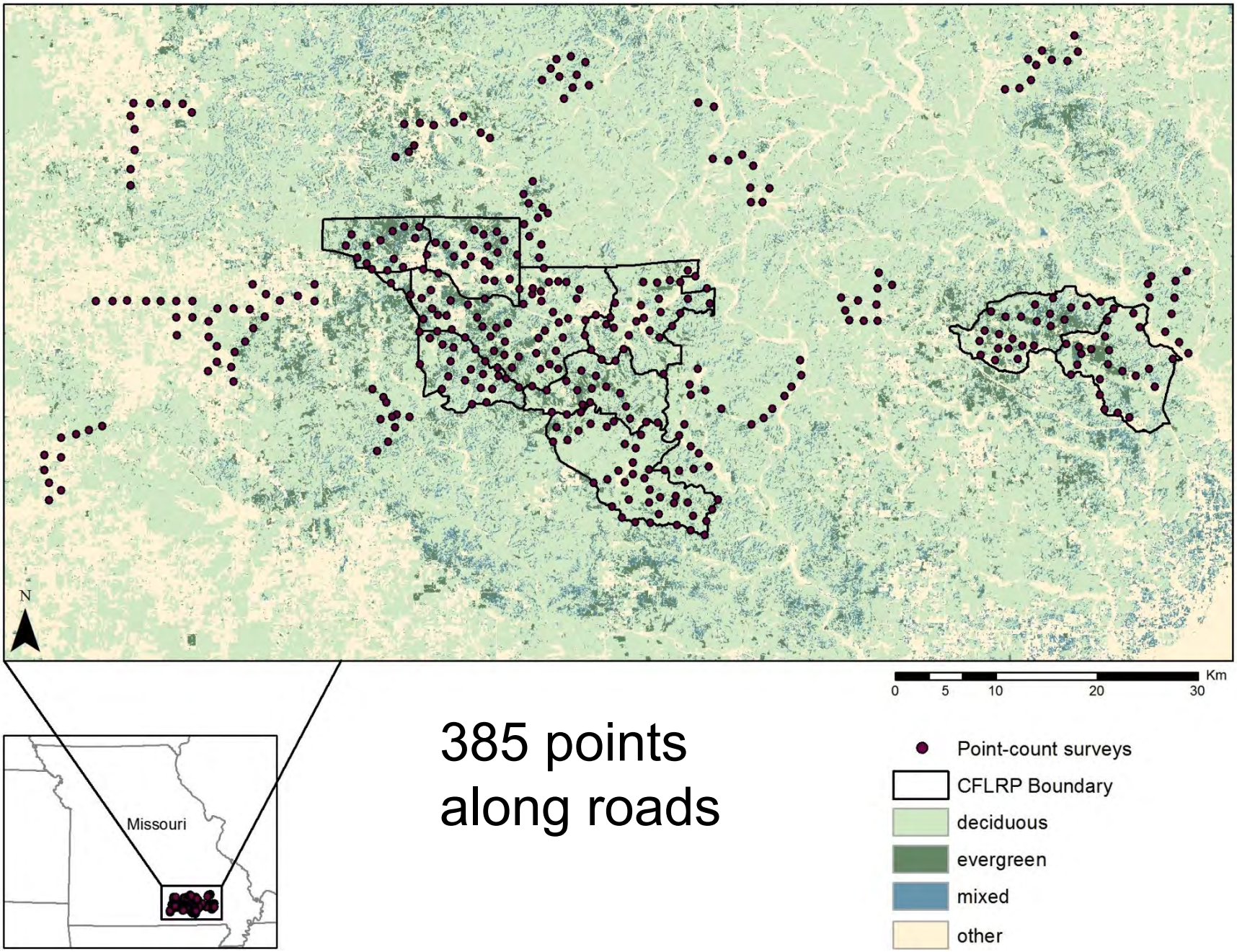
Relationships of Chuck-will's-widow and Eastern Whip-poor-will abundance with landscape composition and management

Melissa C. Roach
University of Missouri, Columbia, Missouri
Frank R. Thompson III
USDA Forest Service Northern Research Station, Columbia, Missouri
Tom Bonnot
University of Missouri, Columbia, Missouri

Acknowledgments: Funding and support provided by USDA Forest Service Northern Research Station, Mark Twain National Forest, Missouri Department of Conservation, and University of Missouri

Question:

How will pine-woodland restoration affect abundance of Chuck-will's-widow and Eastern Whip-poor-will?


N
Km
0
5
10
20
30
Missouri
385 points
along roads
Point-count surveys
CFLRP Boundary
deciduous
evergreen
mixed
other

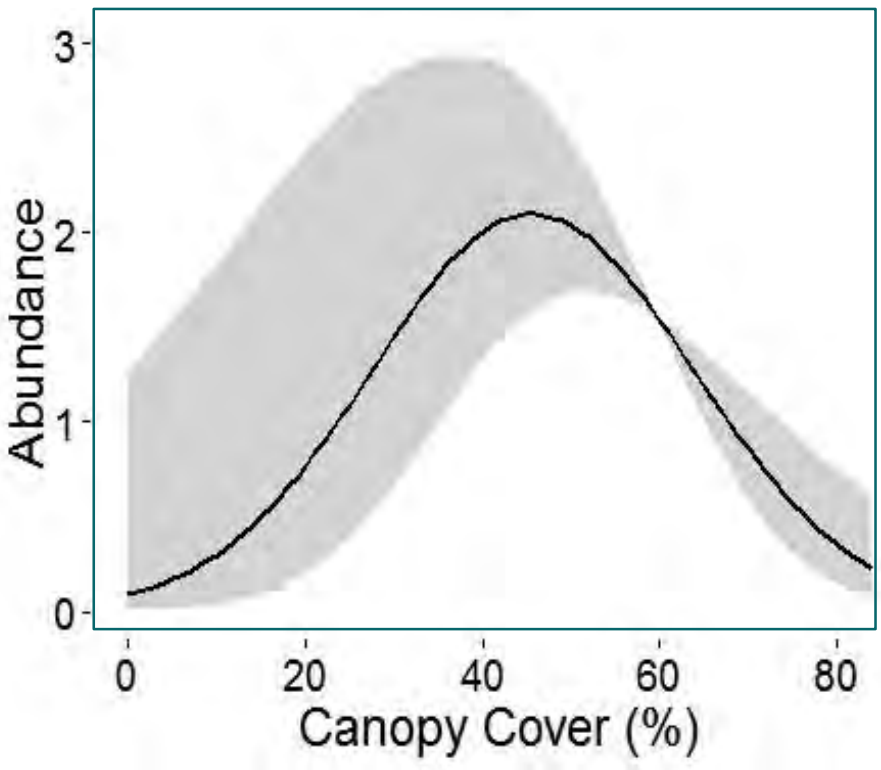
Methods

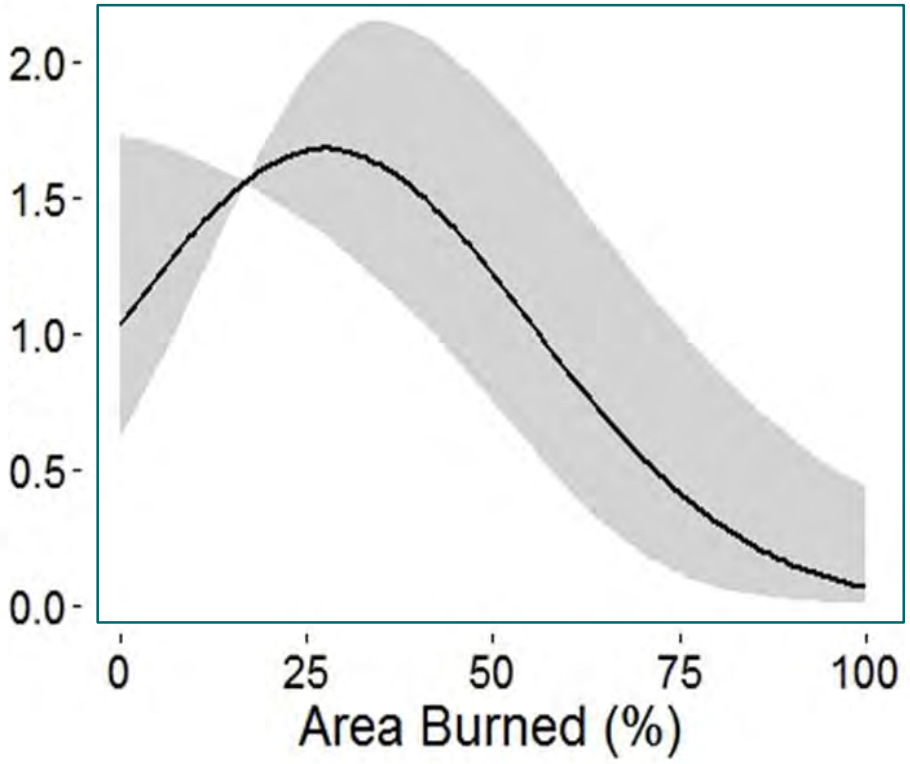
- Conducted 6-min nocturnal, roadside surveys (n=385) during peak moon cycles April – July, 2014 & 2015
- Assessed mean canopy cover, % evergreen forest cover, evergreen basal area, total basal area, % area burned, and % area thinned within a 500m radius of each point.
- Fit Bayesian time-removal models to relate abundance to the above habitat factors while accounting for effects of observer and day-of-year on detectability

Results

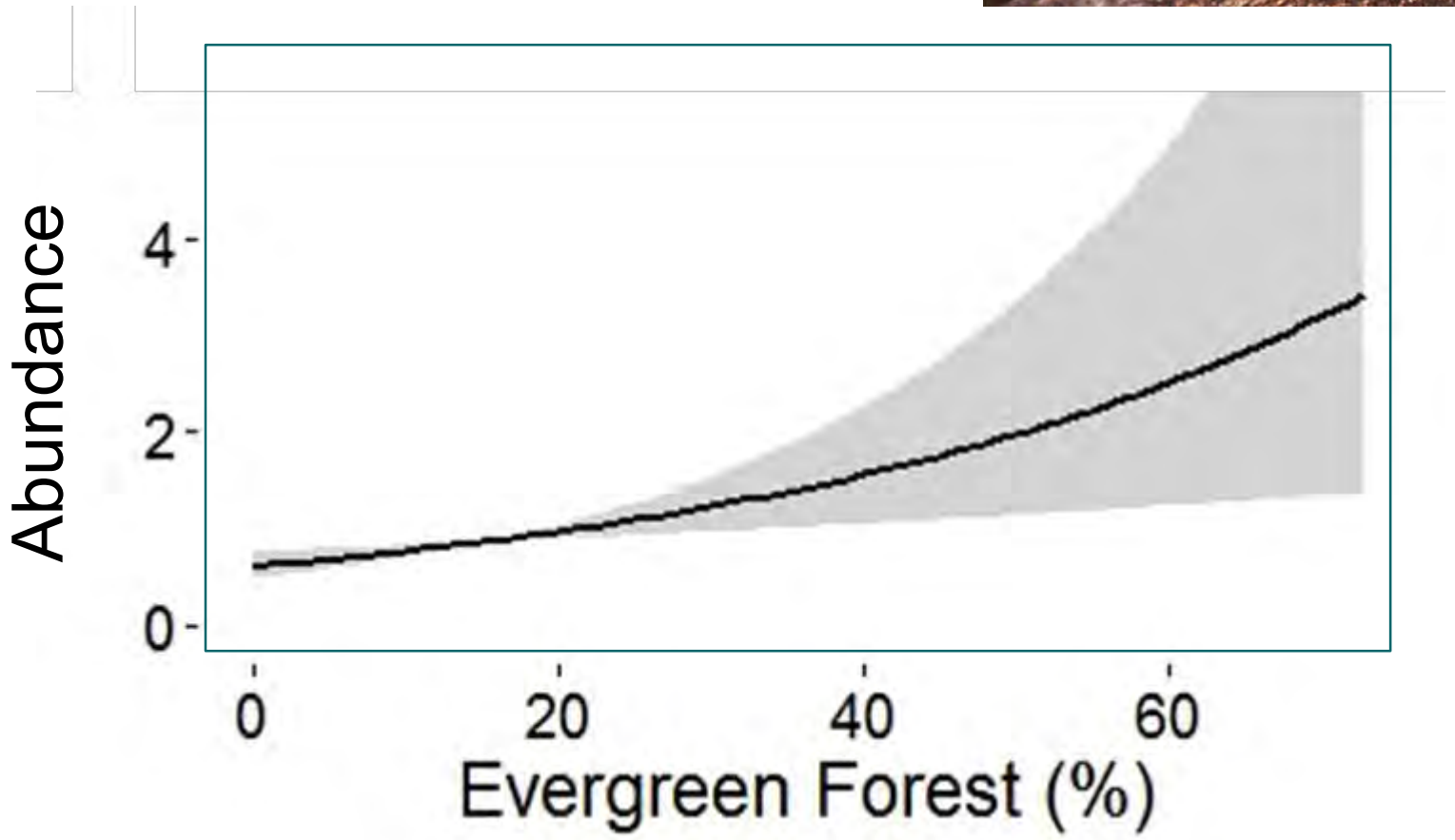
- We detected at least one nightjar at 266 of 385 points
- We detected 186 CWWIs and 534 EWPWs

Results: Chuck-will's-widow

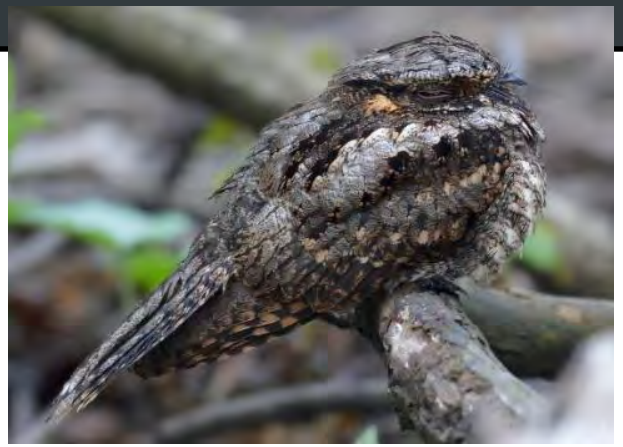


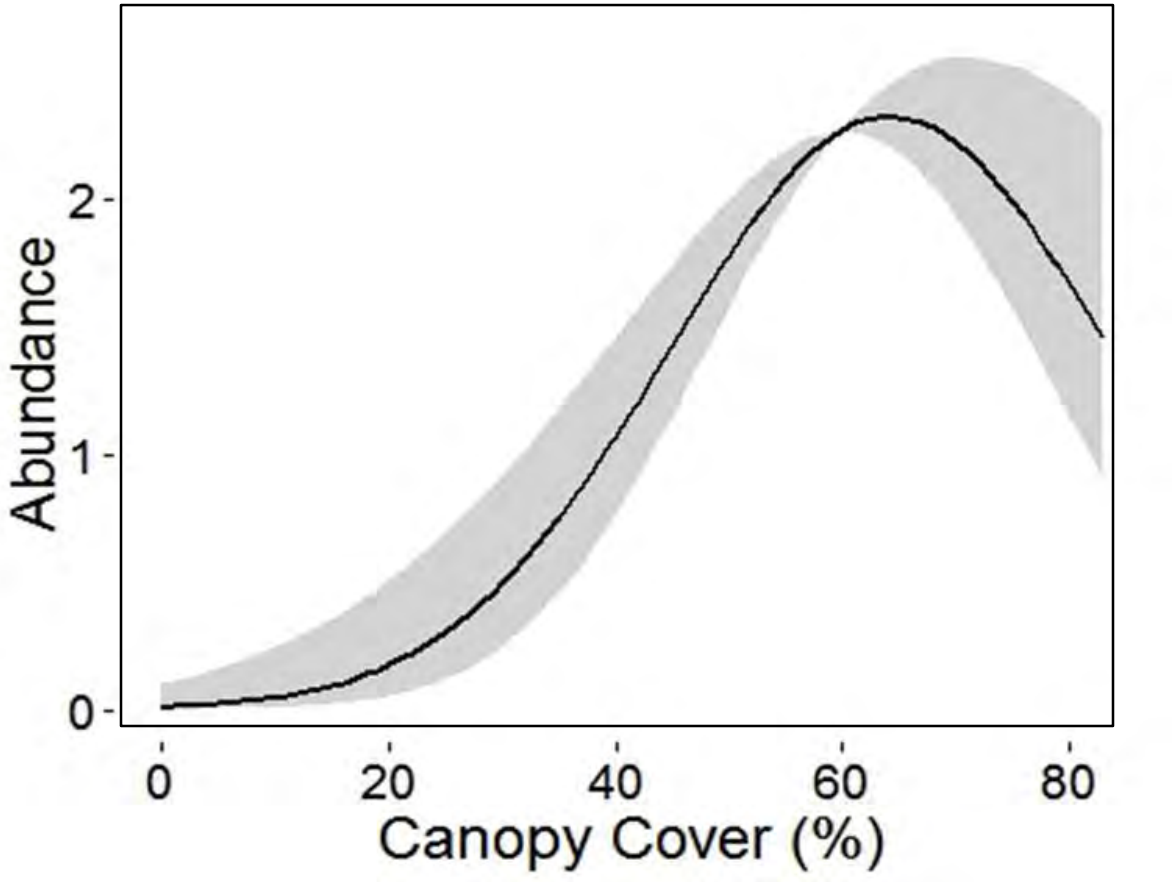


Results: Chuck-will's-widow



Results: Eastern Whip-poor-will





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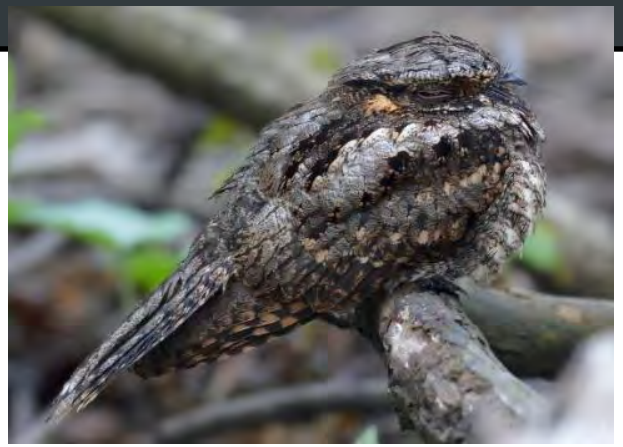

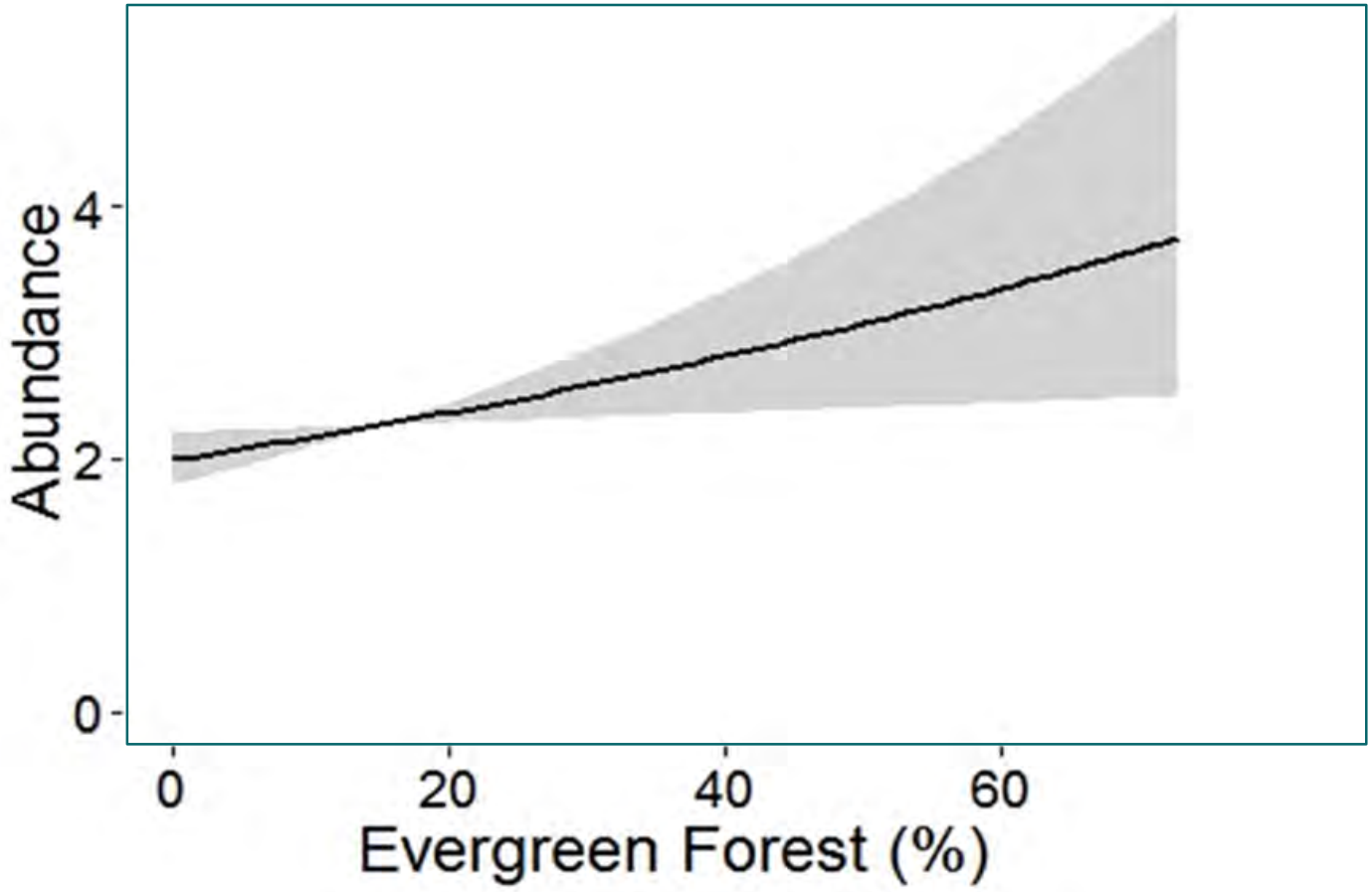

Discussion & future work

- Our hypothesis that pine woodland restoration provides breeding habitat for CWWI and EWPW was supported; both species were more abundant at intermediate canopy cover and areas with increased pine.
- Analysis will be improved by using updated land cover data (i.e. 2016 NLCD) and local LIDAR data.