

# Multi-scale Assessment of Wildlife Sustainability in Switchgrass Biofuel Feedstock Production

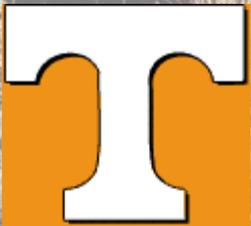


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The University of Tennessee-Knoxville

Tuesday, June 29, 2015



# Opportunities? Threats?



# Background

∞ Grassland and early-successional birds (Peterjohn and Sauer 1999; Brennan and Kuvlesky 2005)

∞ NBCI (Dimmick et al. 2002)

∞ CNGM



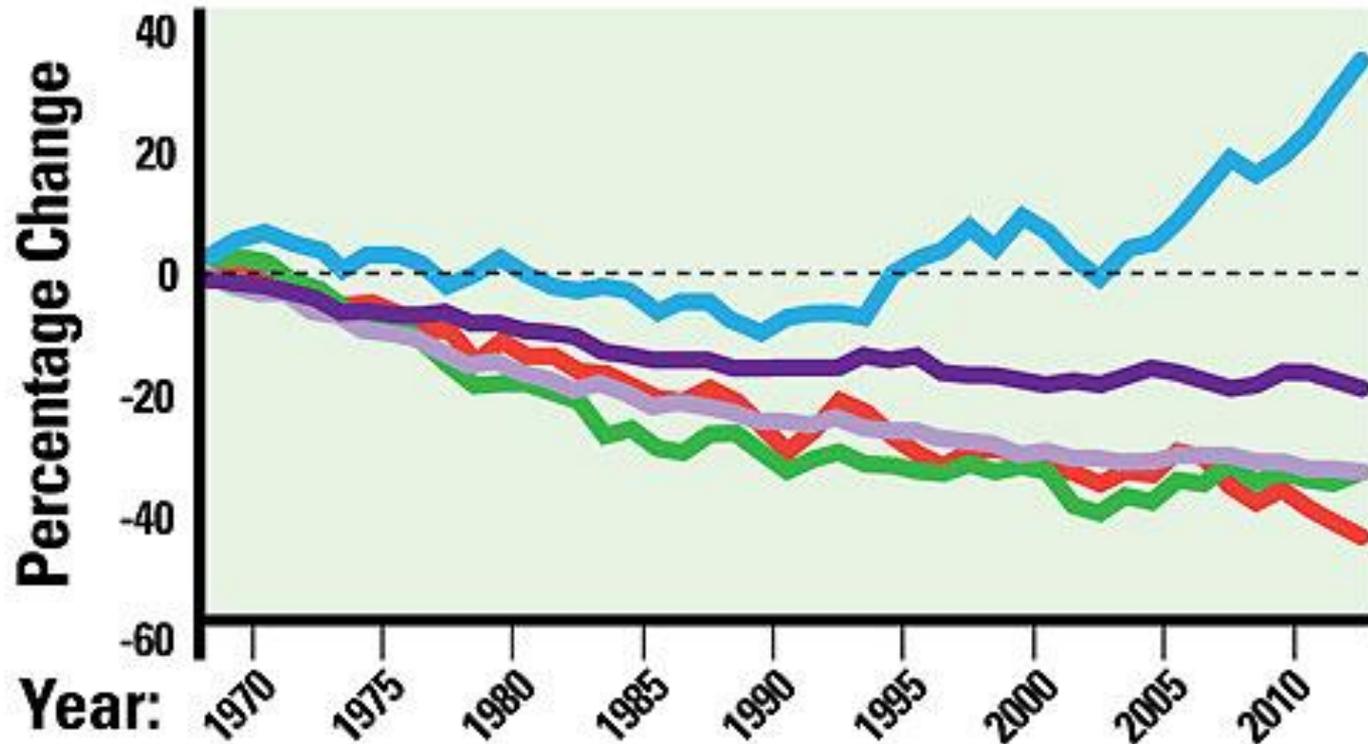
© Arthur Morris/VIREO



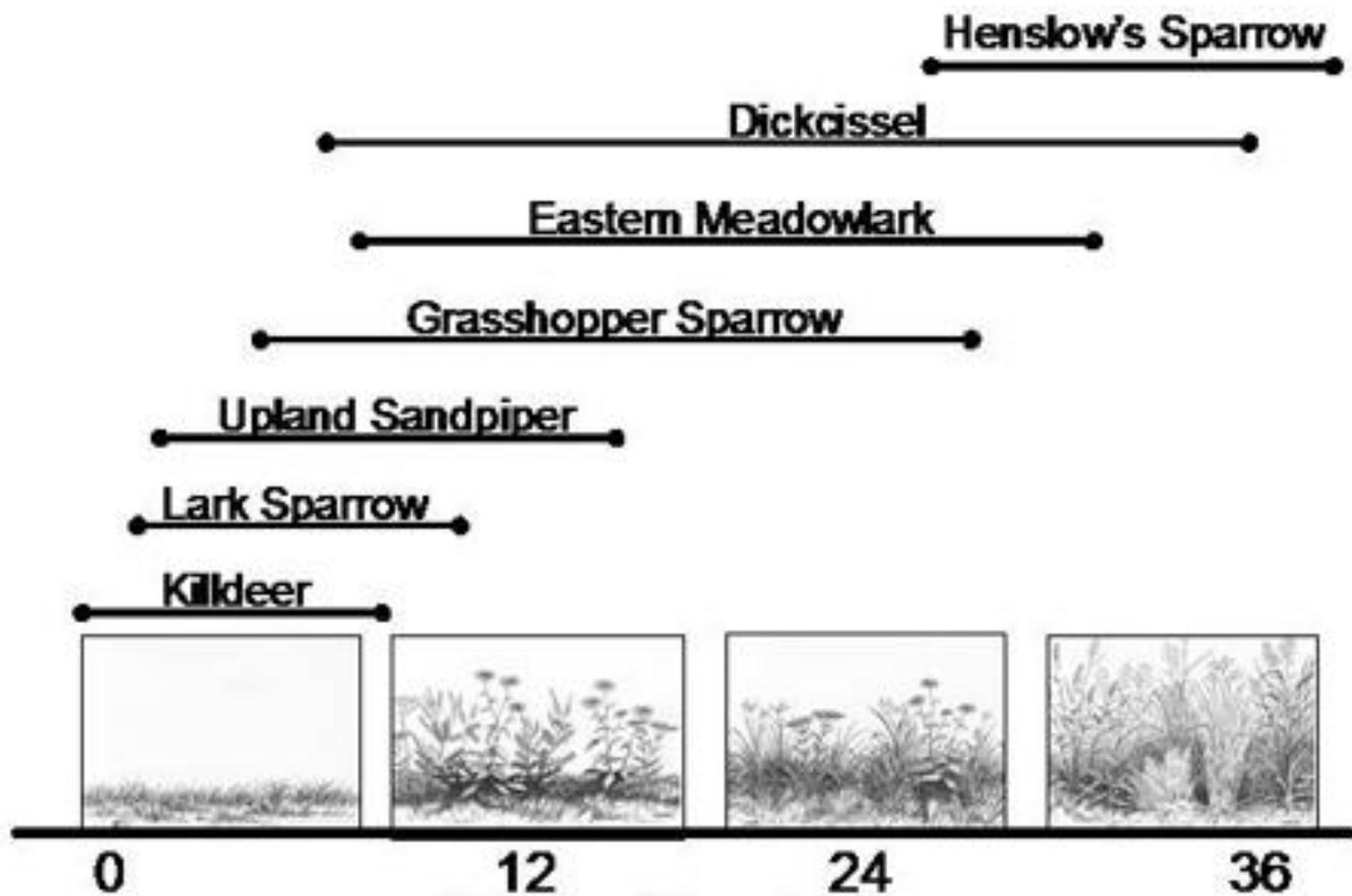
# Grassland birds

## BIRD POPULATION INDICATORS IN FIVE INLAND HABITATS

● Grasslands ● Aridlands ● Eastern Forests ● Western Forests ● Wetlands



See Our Approach for description of bird population indicators.





# U.S. Fish & Wildlife Service Pollinators

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Celebrate National Pollinator Week, June 15 - 21, 2015!



"They Don't Eat Their Pollinators", 2015 Pollinator Poster, Credit: [Teri Nye](#).

## News and Activities:



Photo by Mark Musselman/National Audubon Society.

[Learn more about monarchs:](#)

The [Interior Indian Craft Shop](#) will be highlighting pollinators depicted in American Indian Art from June 15 through 26 in recognition of Pollinator Week.

Find [Pollinator Events](#) being hosted by USFWS (select "pollinator events")

Check out our Spotlight on [Saving the Monarch](#).



WHITE HOUSE  
BLOGS

# Biofuel Production

- Provide scientific information about biofuel fields
- >30 Million Acres
- Make information available to **land managers and producers**
  - a) Training
  - b) Publications
  - c) Workshops
  - d) Field Days



[nativegrasses.utk.edu](http://nativegrasses.utk.edu)



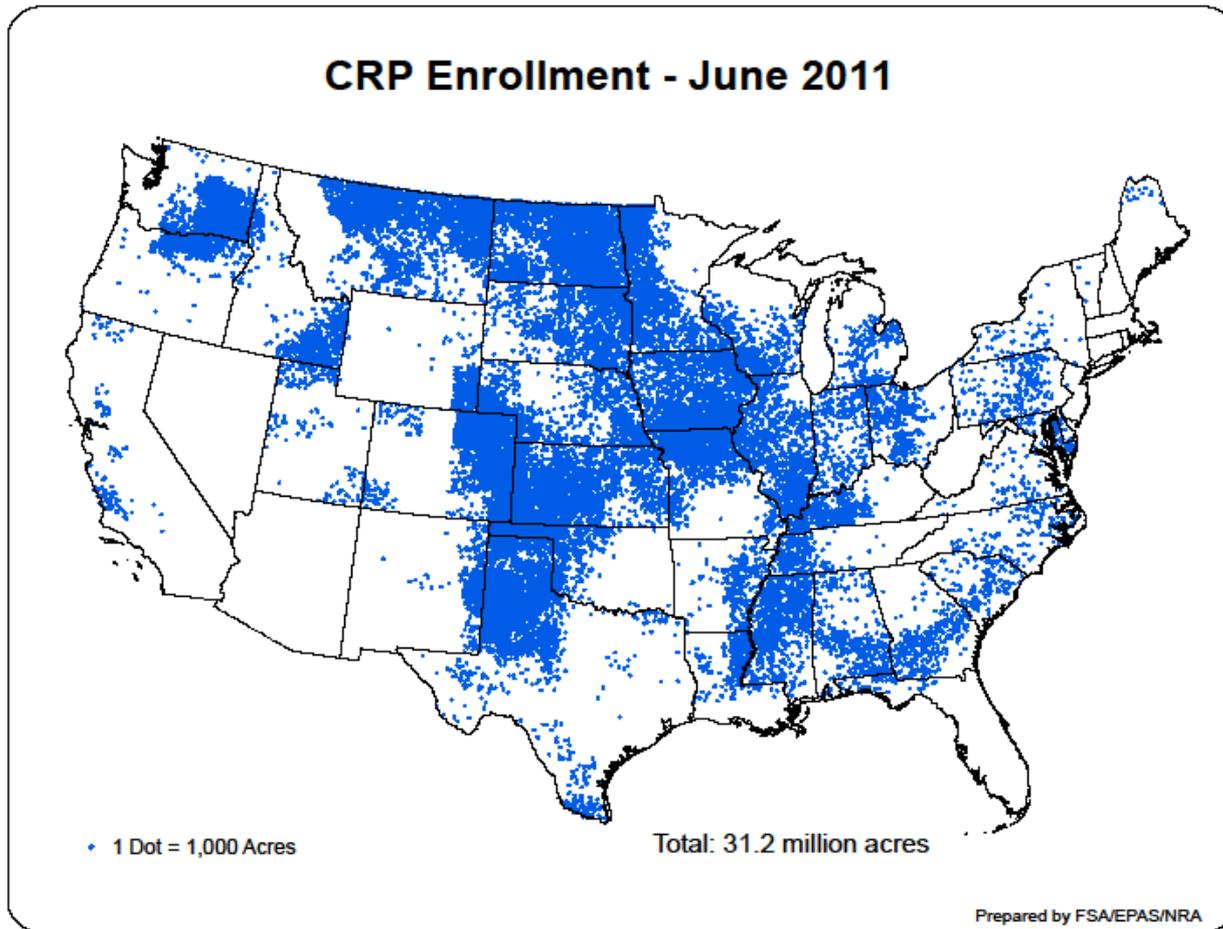
# Center for Native Grasslands Management



- ❧ What are the opportunities for wildlife?
- ❧ What is the role of switchgrass biofuel?
- ❧ How will biofuels affect grassland bird and pollinator species?

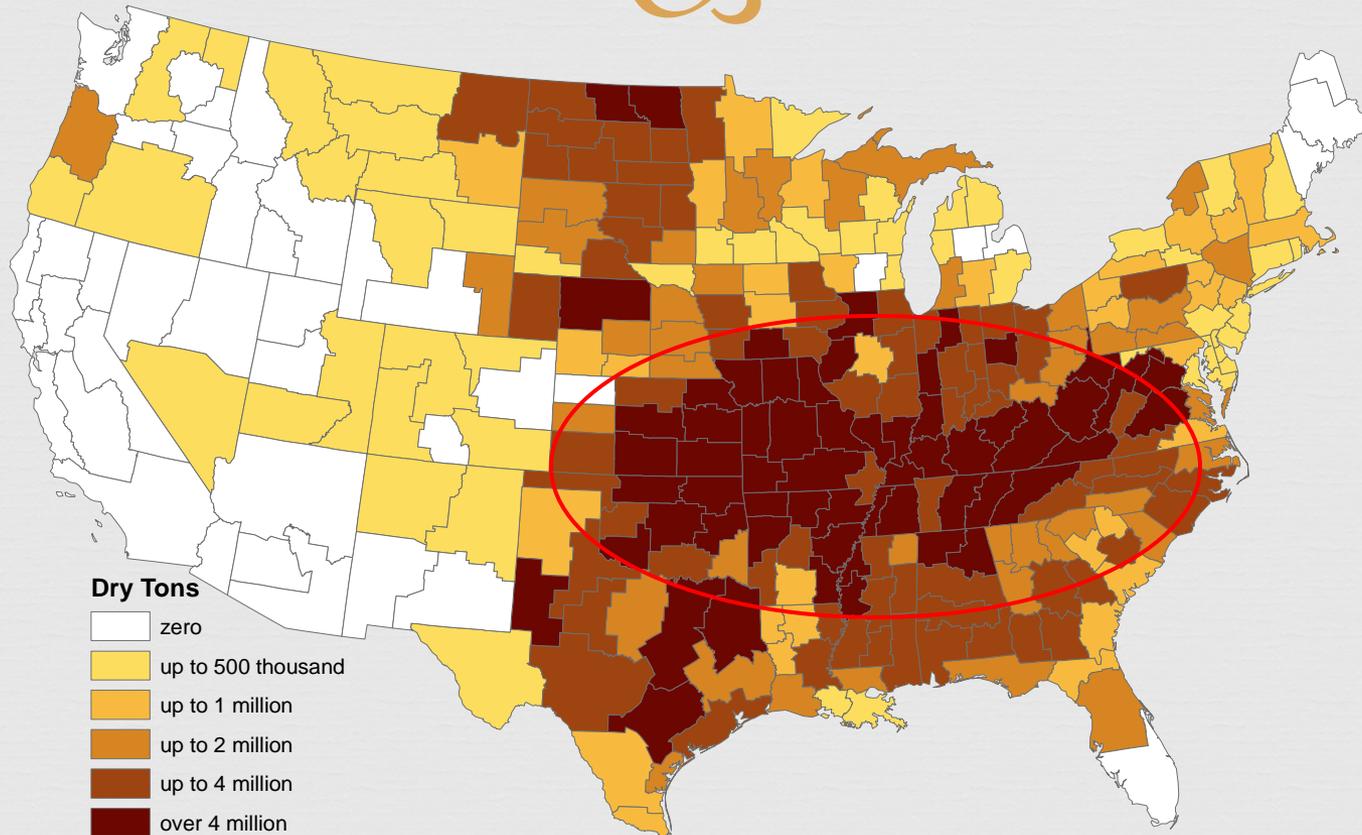


# Status quo for Grassland Conservation



**CRP- 31 MM Ac Footprint**

# Conservation in a Production Setting



➤ 35 - 55 MM ac by 2025

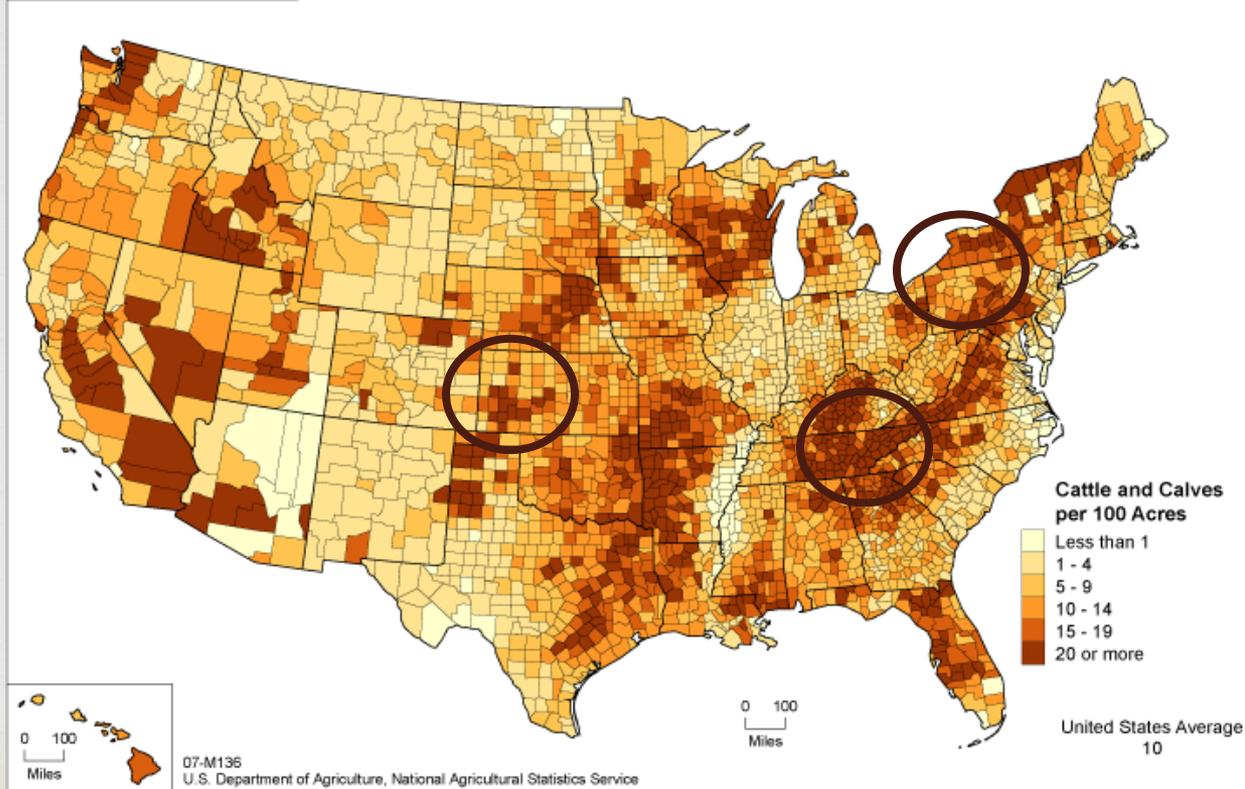
# Where to conserve grassland birds?



- Conserve grassland birds in grass-dominated landscapes
- Production landscape



Average Number of Cattle and Calves per 100 Acres of All Land in Farms: 2007



# Switchgrass production fields

11 May



5 June



18 April



late-June

# Consider the Alternatives...

☞ Corn – Gulf hypoxia, replacing native prairie, poor net energy and carbon balances

☞ Exotics:

☞ Miscanthus

☞ Napiergrass

☞ Others?



(Courtesy of the University of Illinois)

☞ What do we know about their impact on wildlife?

☞ What about other biota?

☞ What about spread?

# Biofuels



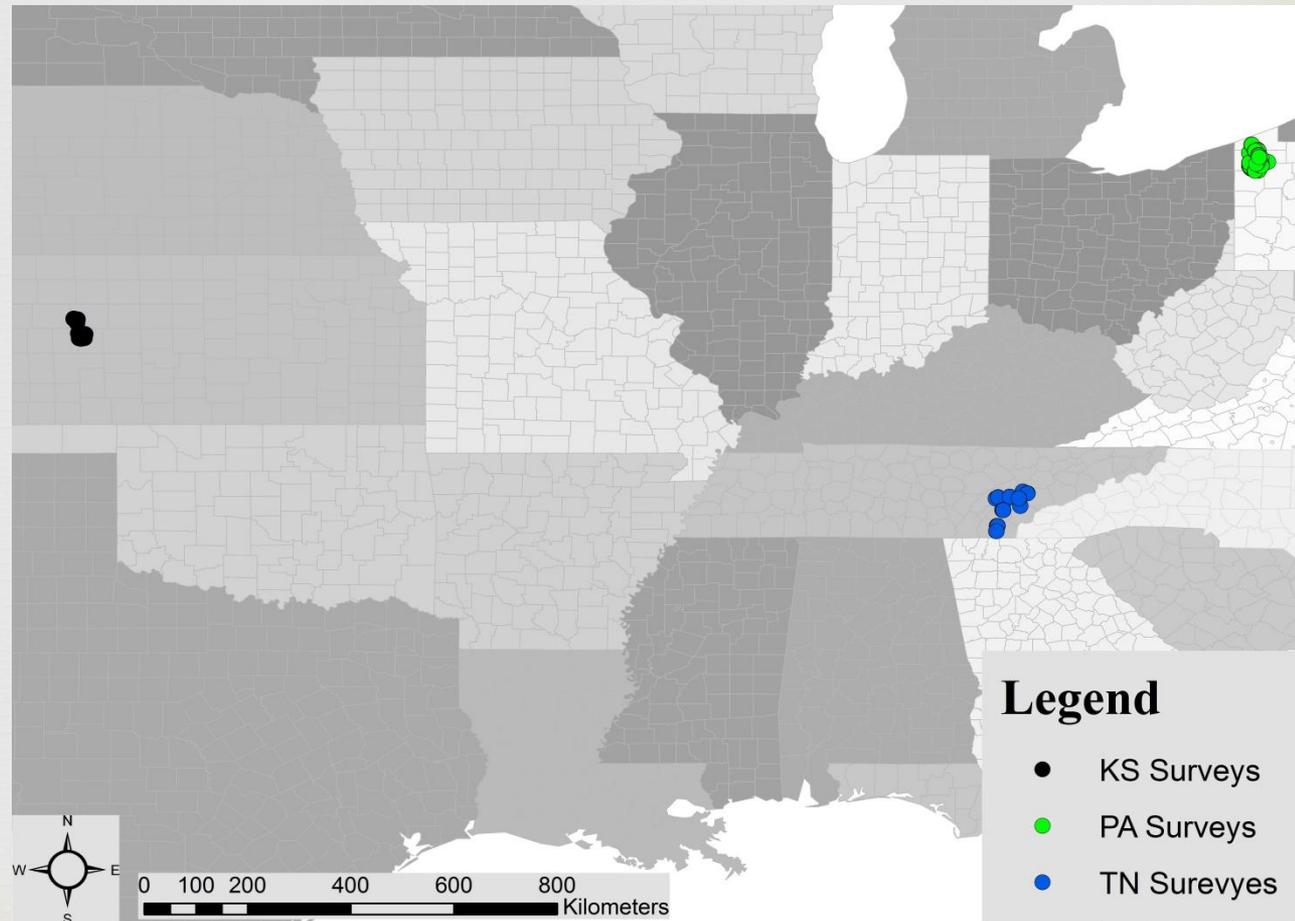
- ❧ Switchgrass Monoculture Biofuel Fields
- ❧ Matrix Fields
  - ❧ KS-CRP
  - ❧ PA-Orchard Grass Pastures
  - ❧ TN-Tall Fescue Pastures
- ❧ Avian occupancy and abundance
- ❧ Avian nest success
- ❧ Pollinator richness and abundance



# Study Areas



- KS-Sharp Seed, 15 Fields
- PA-Ernst Seed, 20 Fields
- TN-Private Landowners, 20 Fields



# Methods

- Fixed Radius Point Counts
- 3 Visits per year
- 3 min, removal
- Distance Bands
- Nest Searching



# Methods (cntd)



- ❧ Vegetation Sampling
- ❧ Pollinator Sampling



# Bird Analyses



## Maximum Likelihood (AIC)

- ❧ Occupancy Models:  
Program MARK
- ❧ Abundance Models:  
Program R package  
unmarked
- ❧ Nest Survival Models:  
Program MARK
- ❧ Covariates
  - ❧ Temporal
  - ❧ Landscape
  - ❧ Field Level Vegetation



# Occupancy ( $\psi$ )



## Covariates

Grass Cover

Forb Cover

Litter Cover

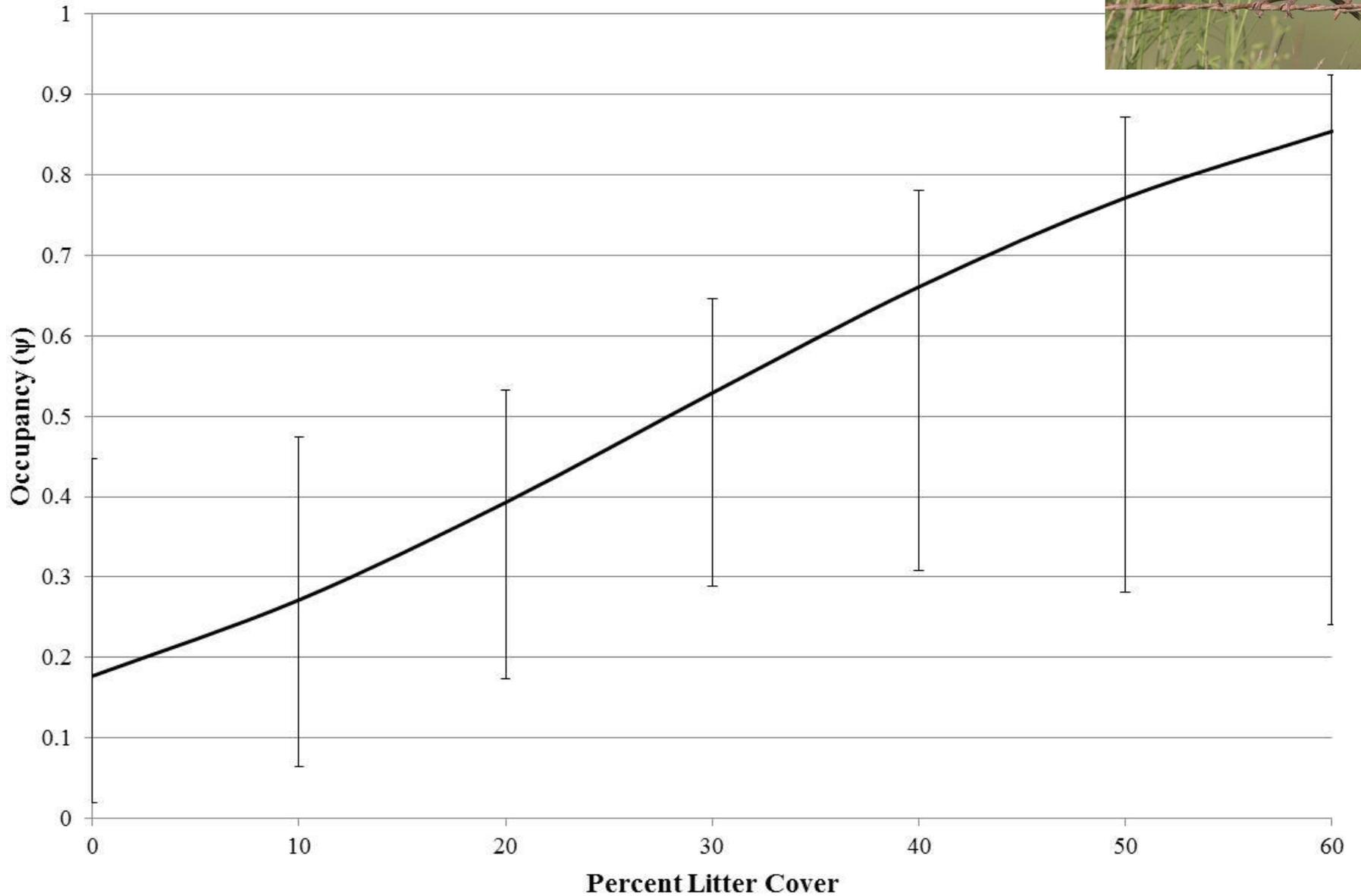
Bare Ground Cover

Vegetation Height

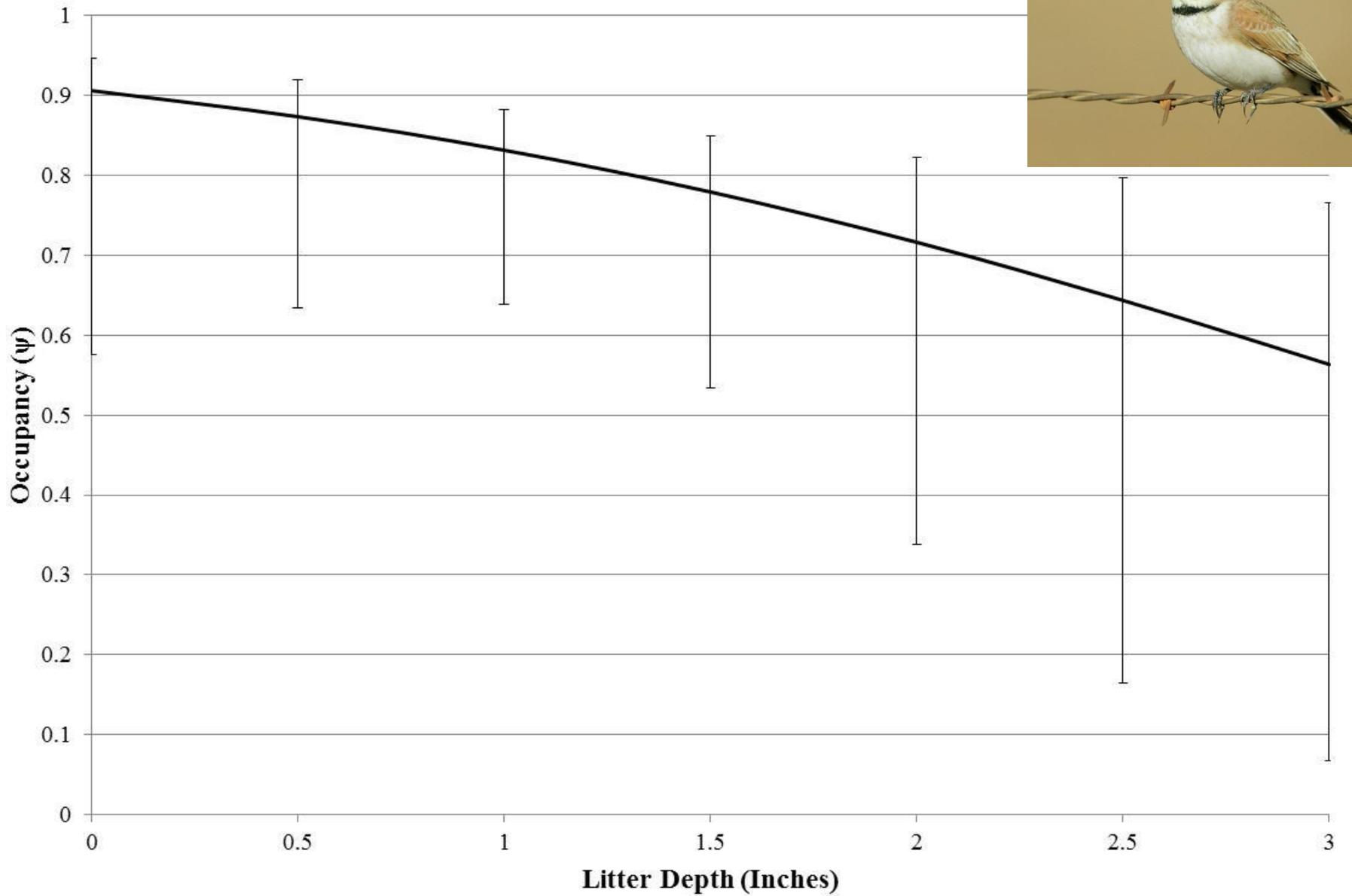
Litter Depth

Species (KS)	Matrix	SE	Mono	SE
Cassin's Sparrow	0.32	0.16	0	0
Grasshopper Sparrow	1	0	0	0
Red-winged Blackbird	0.18	0.07	1	0
Dickcissel	0.60	0.11	1	0
Horned Lark	0.83	0.07	1	0
Western Meadowlark	1	0	1	0

# Cassin's Sparrow (KS)



# Horned Lark (KS)



# Occupancy ( $\psi$ )



## Covariates

Grass Cover

Forb Cover

Litter Cover

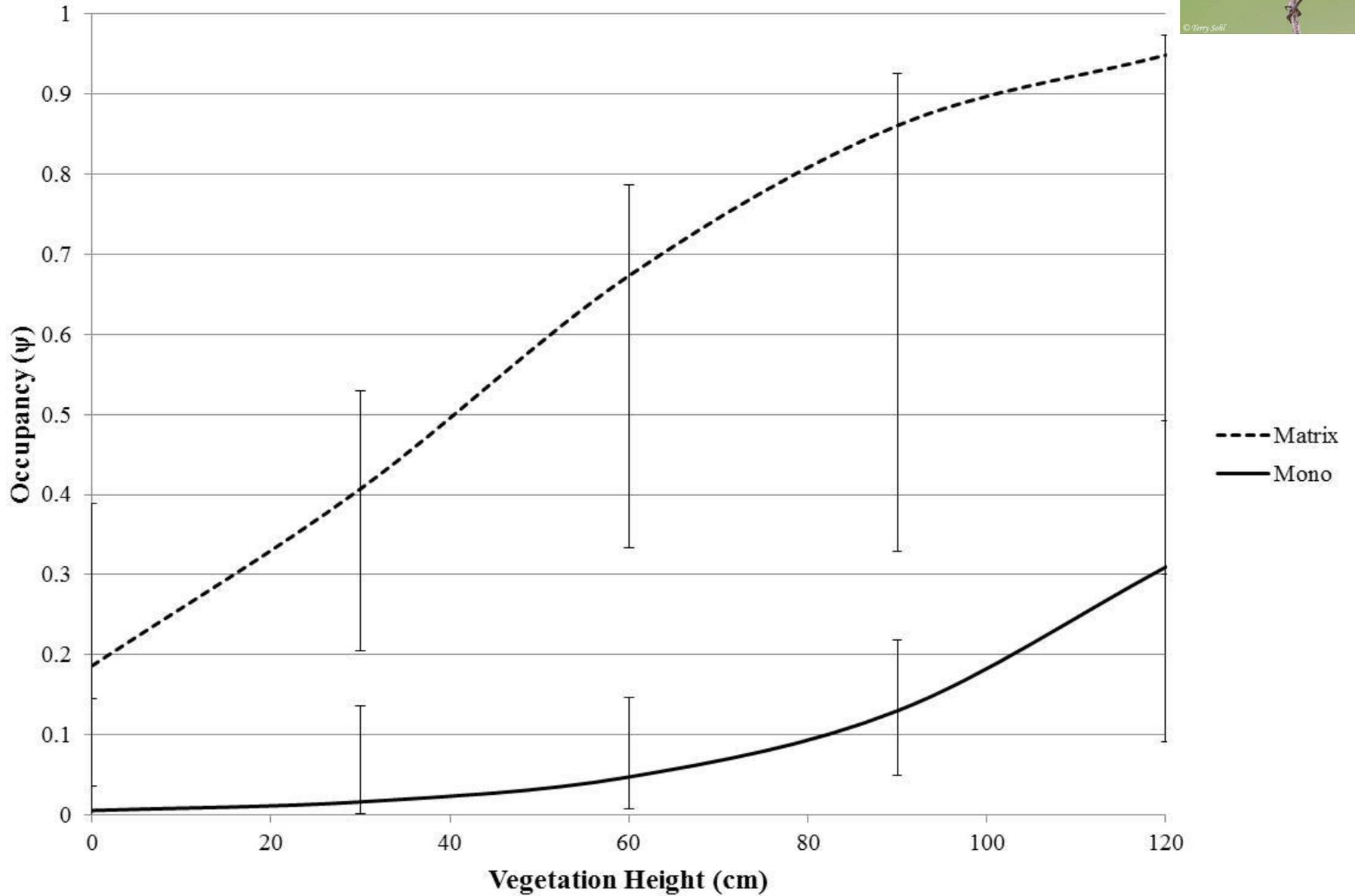
Bare Ground Cover

Vegetation Height

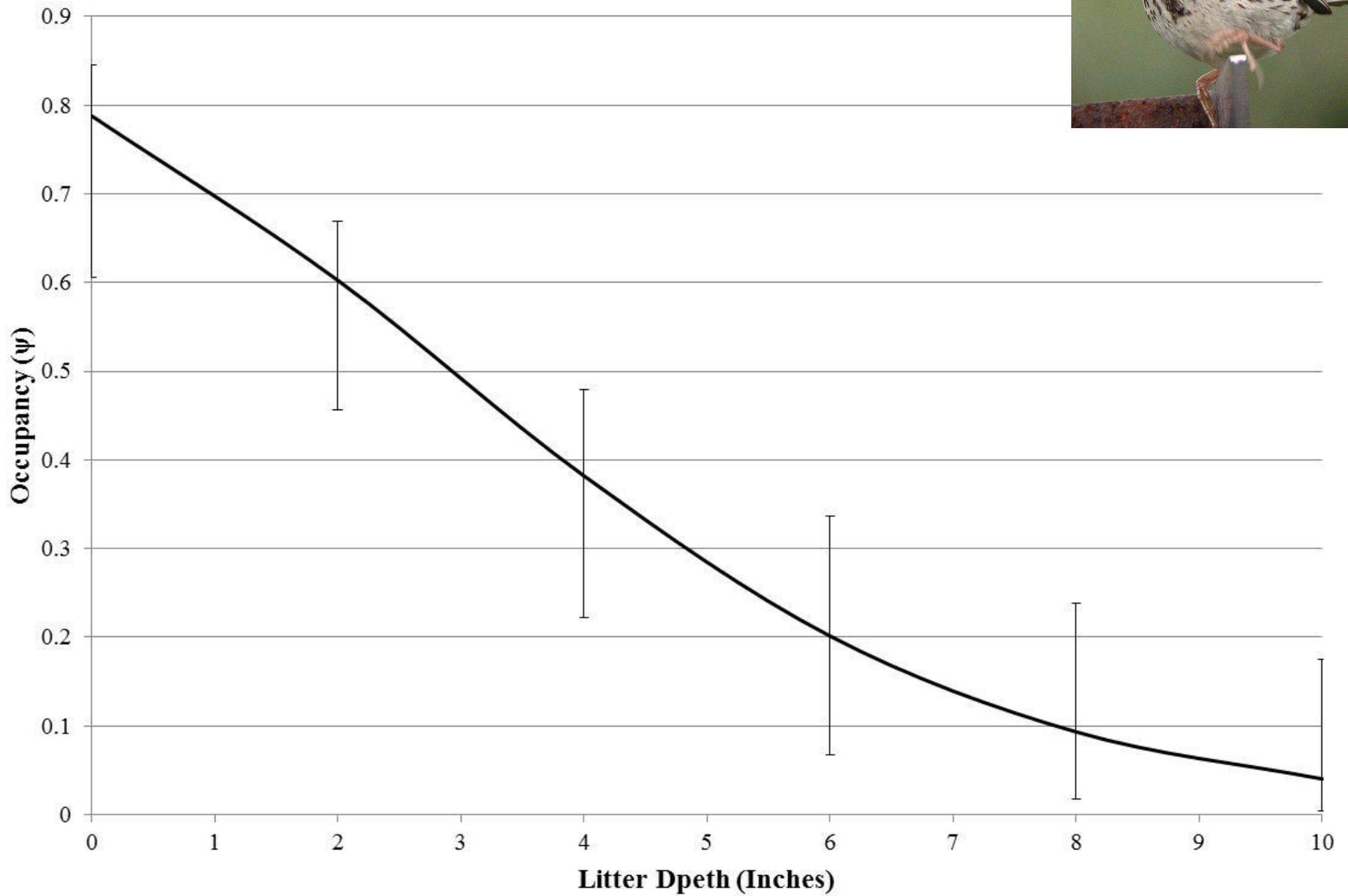
Litter Depth

Species (PA)	Matrix	SE	Mono	SE
Eastern Meadowlark	0.96	0.07	0	0
Bobolink	0.75	0.17	0.07	0.05
Savannah Sparrow	0.57	0.07	0.57	0.07
Indigo Bunting	0.31	0.16	0.76	0.20
Common Yellowthroat	0.23	0.12	1	0
Red-winged Blackbird	1	0	1	0

# Bobolink (PA)



# Savannah Sparrow (PA)



# Occupancy ( $\psi$ )



## Covariates

Grass Cover

Forb Cover

Litter Cover

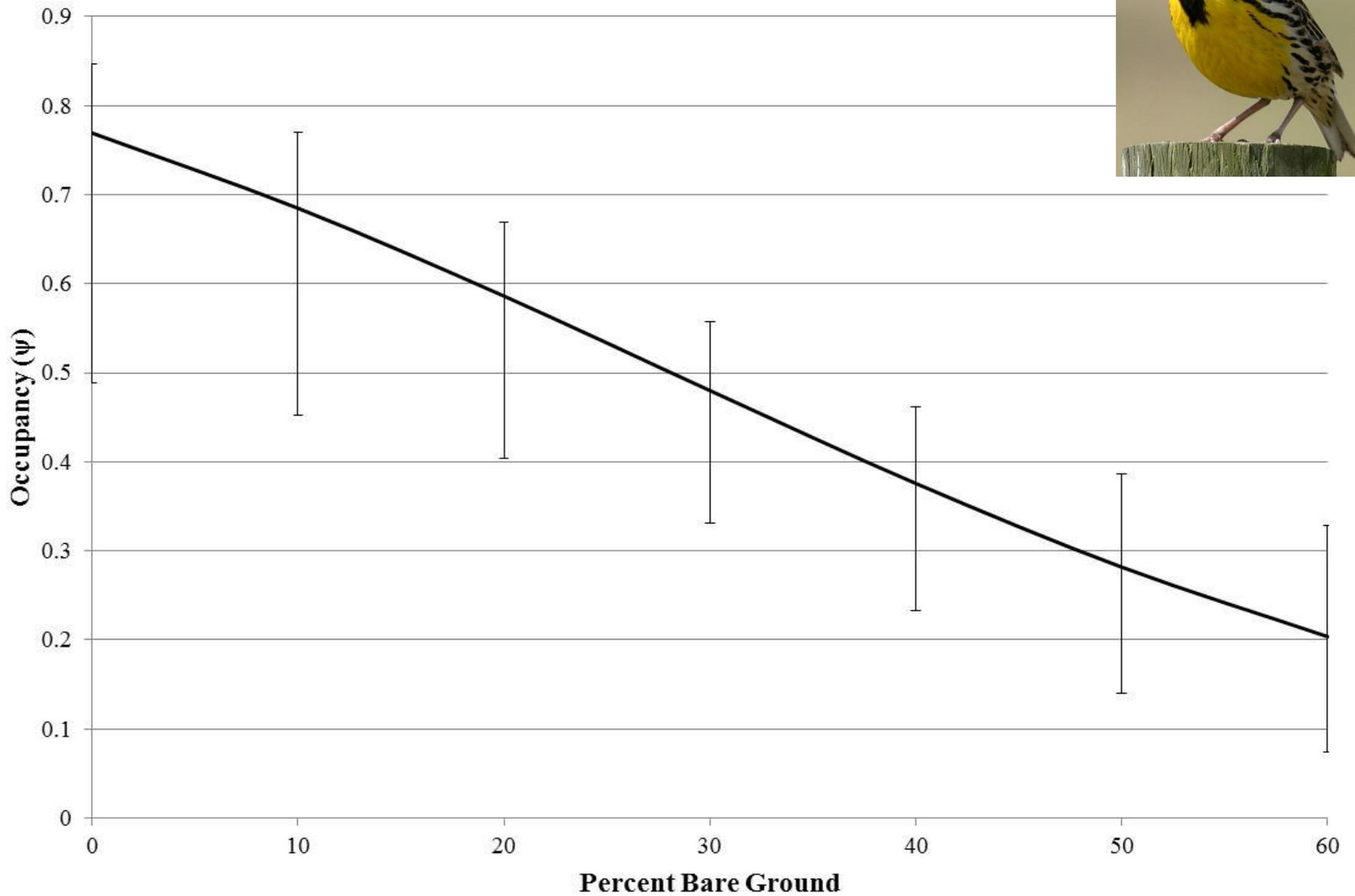
Bare Ground Cover

Vegetation Height

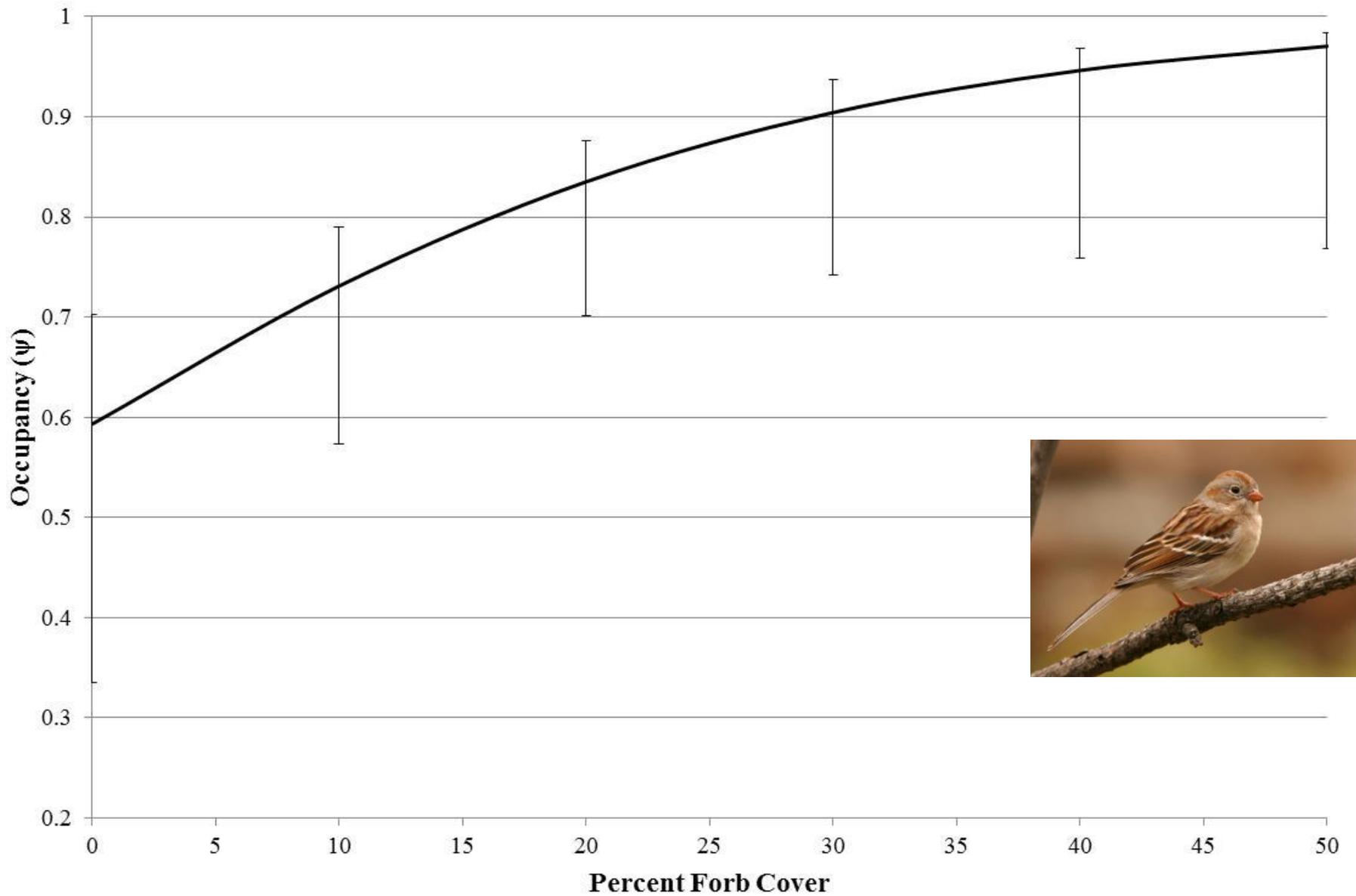
Litter Depth

Species (TN)	Matrix	SE	Mono	SE
Dickcissel	0	0	0.29	0.12
Grasshopper Sparrow	0.19	0.10	0.56	0.14
Eastern Meadowlark	0.47	0.08	0.47	0.08
Northern Bobwhite	0.61	0.20	0.61	0.20
Red-winged Blackbird	0.66	0.10	0.66	0.10
Field Sparrow	0.85	0.05	0.85	0.05
Indigo Bunting	0.96	0.04	0.96	0.04

# Eastern Meadowlark (TN)



## Field Sparrow (TN)



# Nests



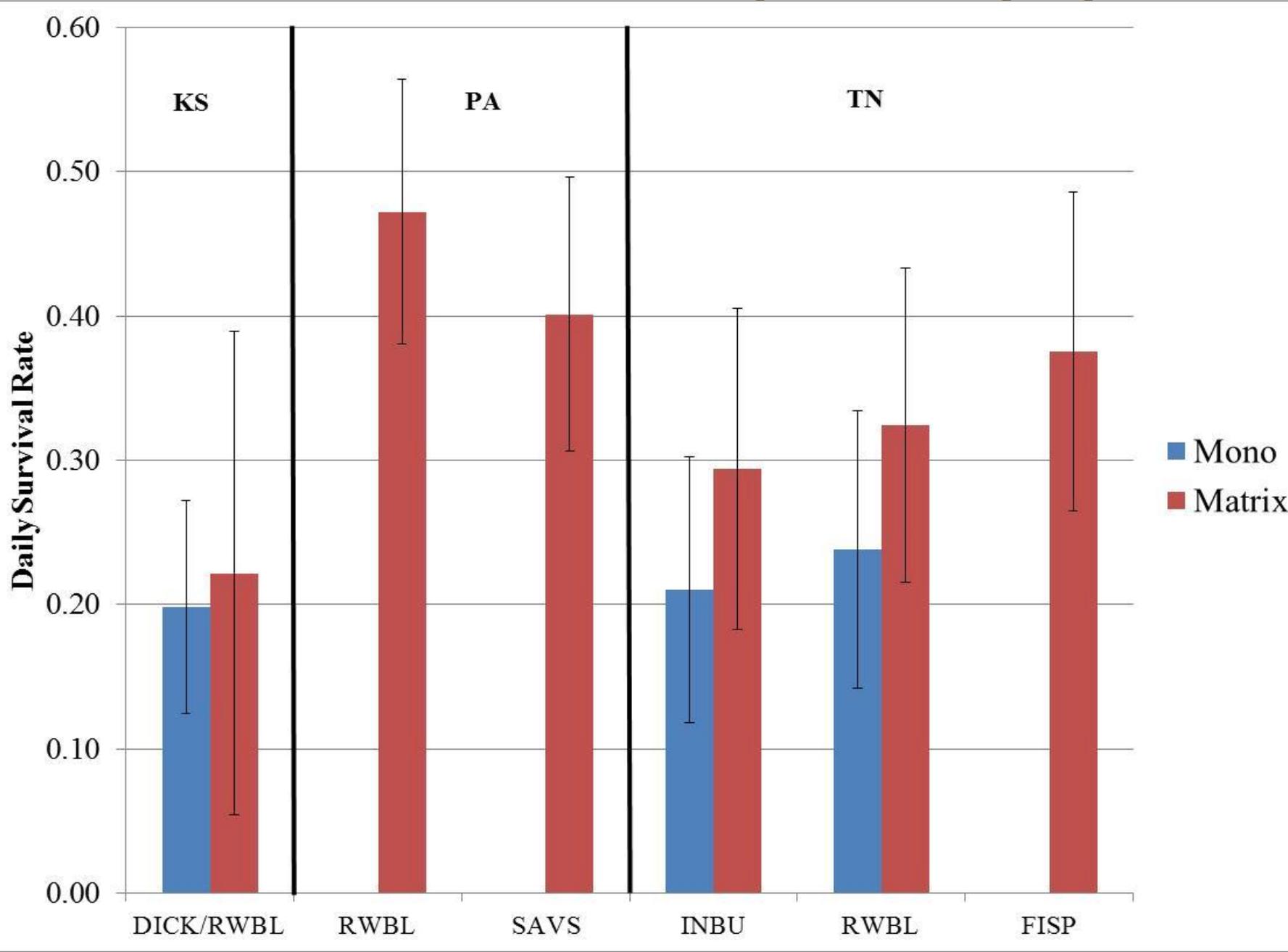
∞ 107 Nests from 12 species

∞ Mono;  $n = 45$

∞ Matrix;  $n = 62$



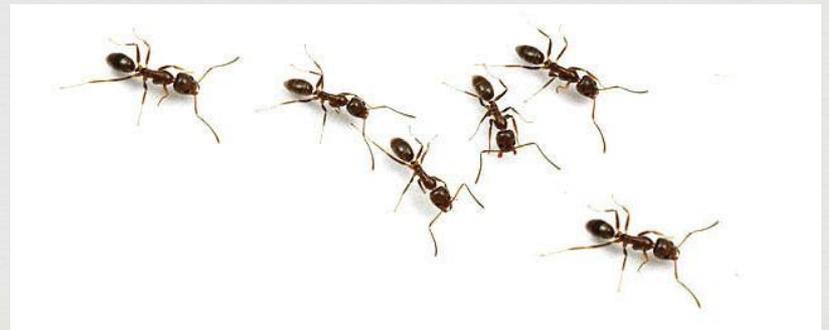
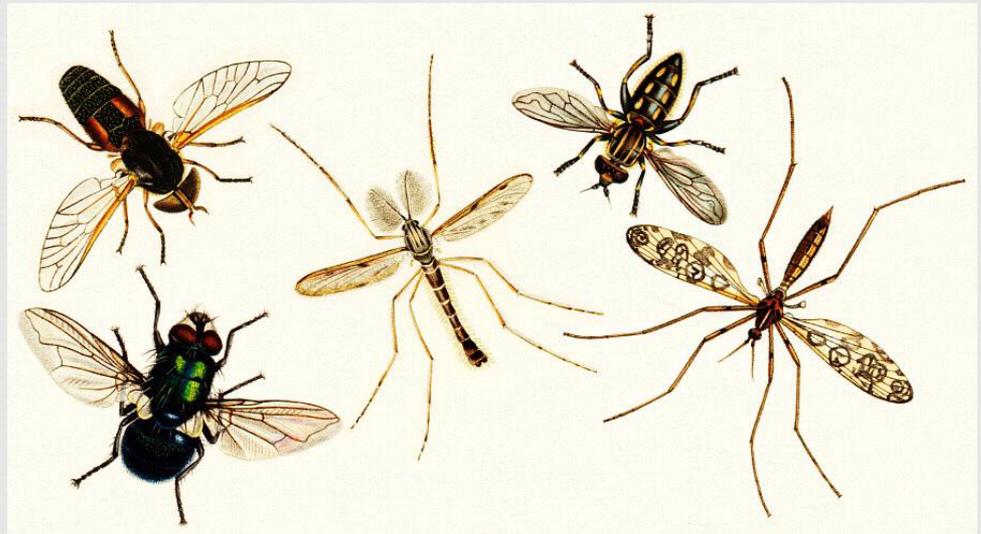
Species	KS	PA	TN	Total
RWBL	18	31	12	61
INBU	0	0	12	12
FISP	0	0	10	10
DICK	7	0	1	8
SAVS	0	6	0	6
HOLA	2	0	0	2
GRSP	1	0	1	2
COYE	0	0	2	2
WEME	1	0	0	1
EAME	0	1	0	1
BLGR	0	0	1	1
CHSP	0	0	1	1
Total	29	38	40	107



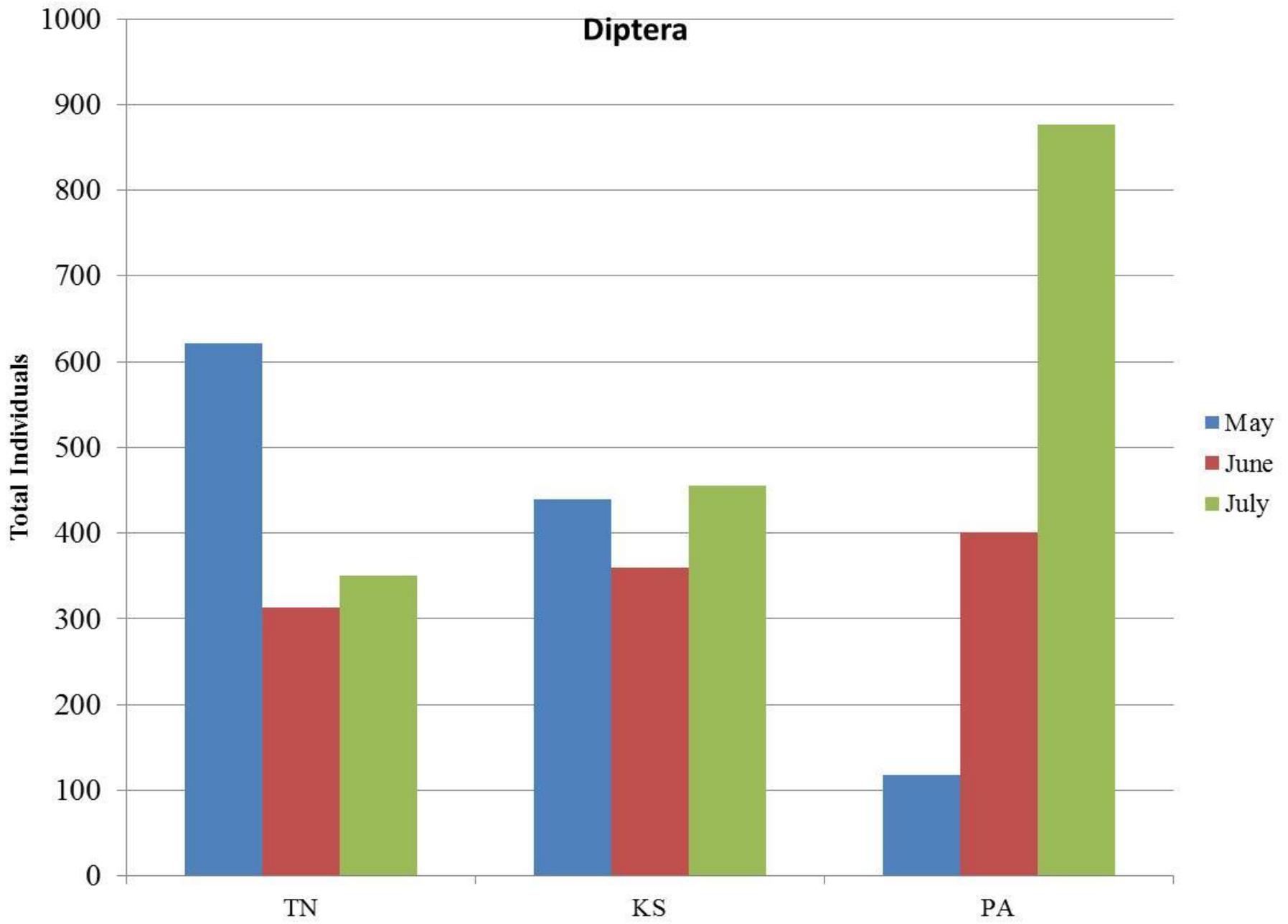
# Pollinators?



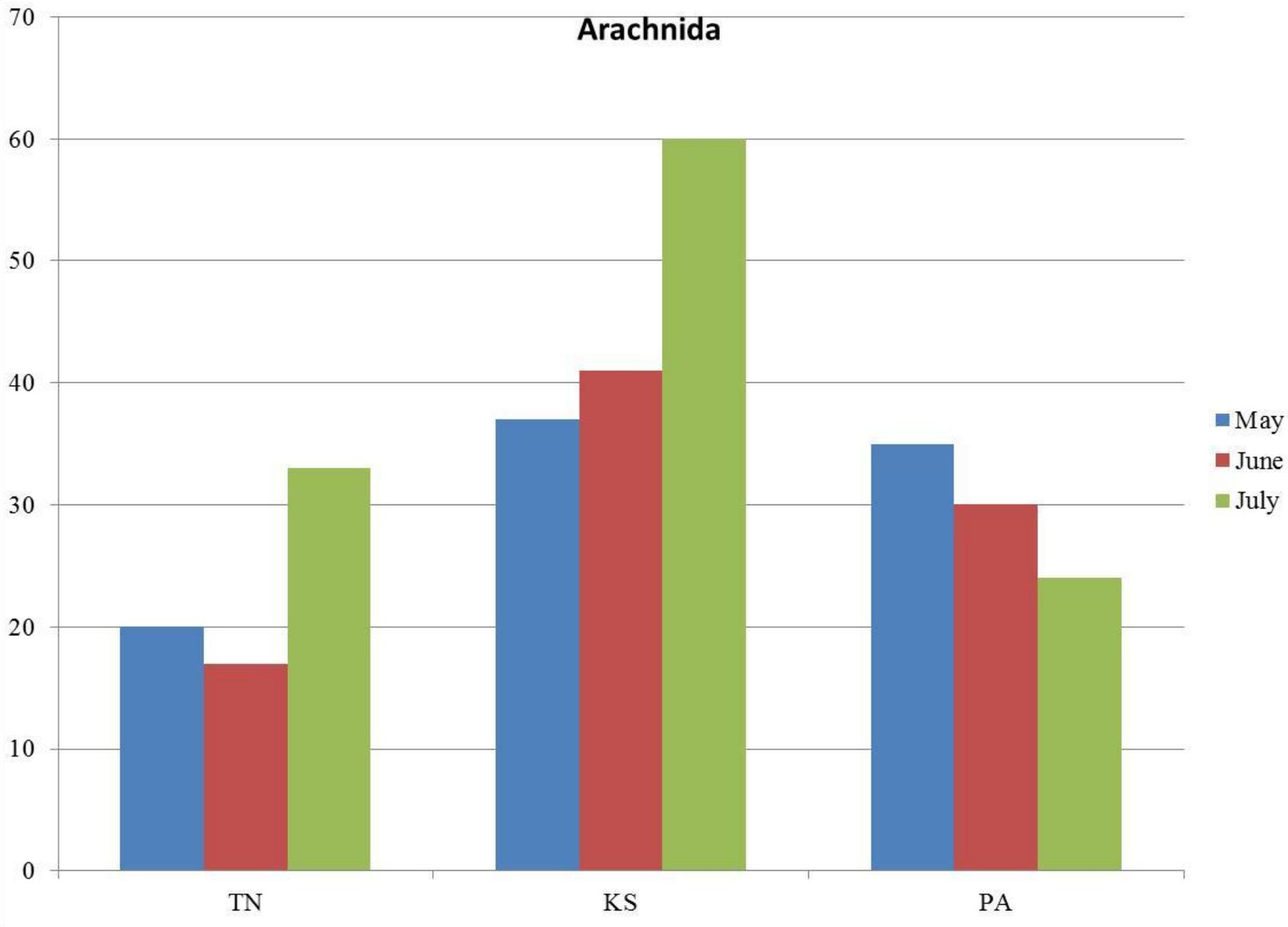
- ☞ May, June, July
- ☞ Bees sent for ID
- ☞ Species Richness and Abundance among biofuel and reference fields



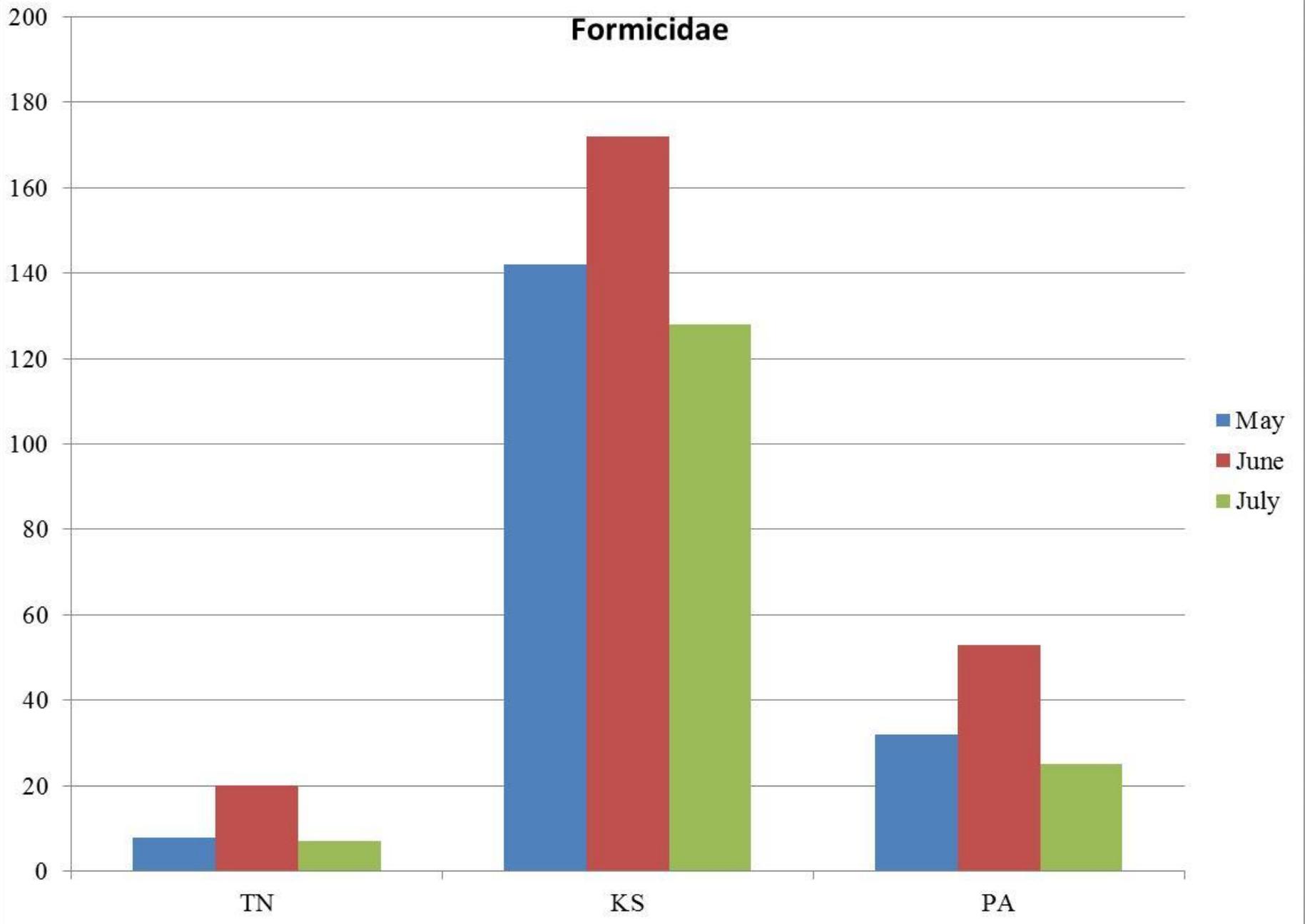
# Diptera



# Arachnida



# Formicidae



# Discussion



- ❧ One Year (2014)
- ❧ Occupancy differs greatest between KS field types, and least between TN field types
- ❧ Species and Site Specific differences between field types
- ❧ Continued research in 2015
- ❧ Daily Survival Rate greater on matrix fields
- ❧ Did not check for differences among species



# Project Support

## Thanks to the following!

- ❧ Patrick D. Keyser, Charles Kwit, Joseph D. Clark, Craig Harper, and Elizabeth D. Holcomb
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- ❧ Sharp Bros. Seed Company
- ❧ Ernst Conservation Seeds
- ❧ Private Landowners in TN
- ❧ Ken Goddard
- ❧ Dairy Research and Education Center-Hugh Moorehead
- ❧ University of Tennessee



# Questions?

