Presence/absence surveys for estimating occupancy as a system state variable for wintering Rusty Blackbirds (*Euphagus carolinus*)

Jason D. Luscier
Dept. of Biol. Sci., Univ. of Arkansas
Fayetteville, AR

What exactly do we want to achieve?

- Monitoring program to estimate system state and related variables
  - Status will dictate how to direct conservation
  - Compare with model-based predictions to understand dynamics

3 State-level Variables . . .

1. Community – multiple species
   - State var. = spp. richness

2. Patch – single species
   - State var. = occupancy

3. Population – single species
   - State var. = abundance

$$E(C) = Np$$

E(C) = expected count

N = true abundance

p = detectability

$$\hat{N} = C / \hat{p}$$

Logistically feasible, unbiased estimator??

Occupancy rate = proportion of sites a spp. occupies

Occupancy Rate Estimation

- Presence/absence surveys
  - Detection/Non-detection
  - Reduced effort
- Does not require large sample sizes
    - Most other techniques are data hungry
    - Ideal for rare/elusive spp. (lots of 0's)

Occupancy Rate Estimation

$$\hat{\Psi} = \frac{\hat{x}}{S}$$

$\hat{\Psi}$ = Estimate of occupancy

$\hat{x}$ = Estimate of occupied sites

S = Total number of sites

Probability of detection

(i.e., not all absences are "true" absences)

Objectives

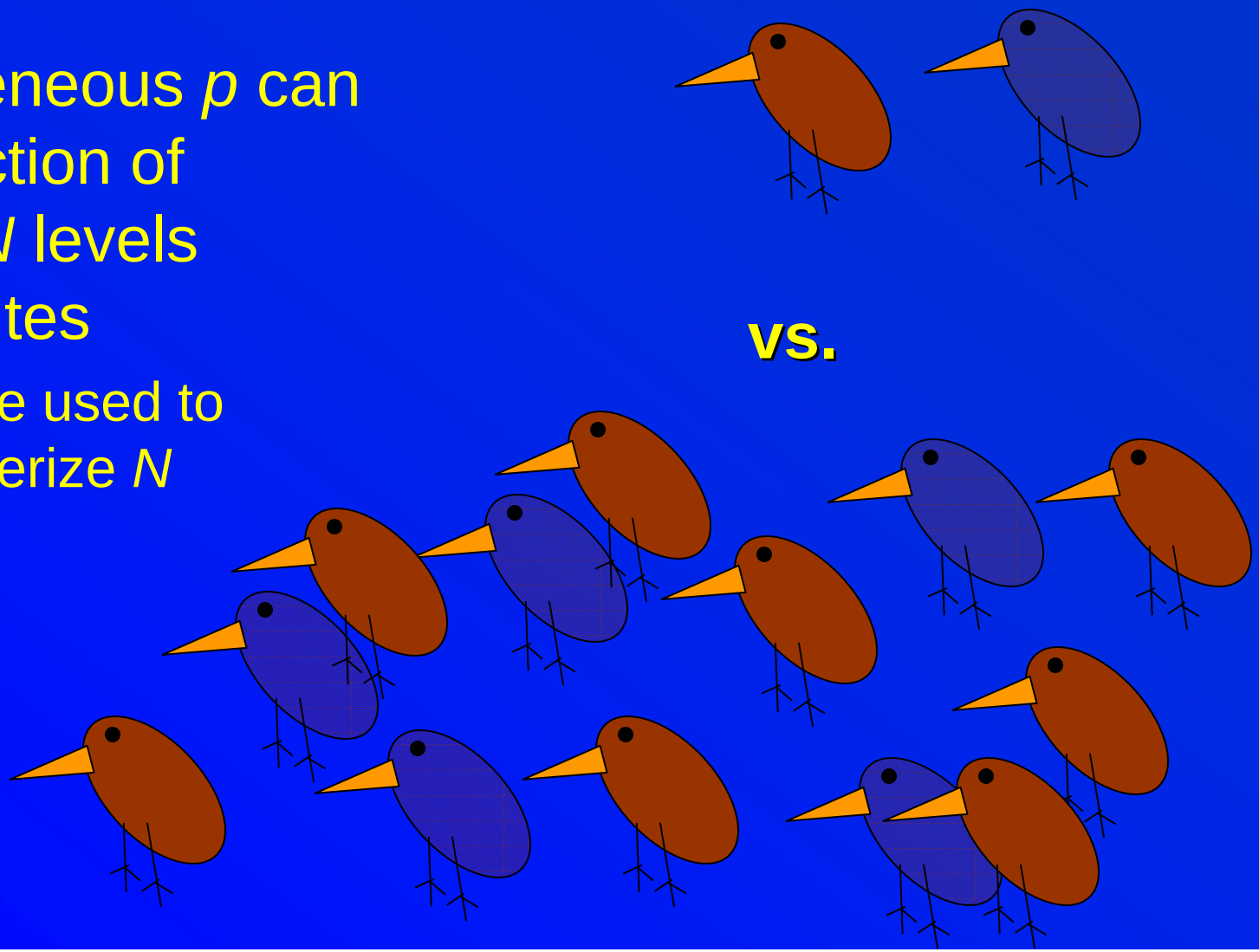
- Spp. occurrence and distributions
- Habitat use
- Heterogeneous detection probabilities

Objectives (cont'd)

- Rates of co-occurrence with other spp.
- Current abundance levels (Royle and Nichols 2003)
- Recommendations for long-term monitoring

Abundance Models (Royle and Nichols 2003)

- Heterogeneous *p* can be a function of varying *N* levels among sites
  - *p* can be used to characterize *N*

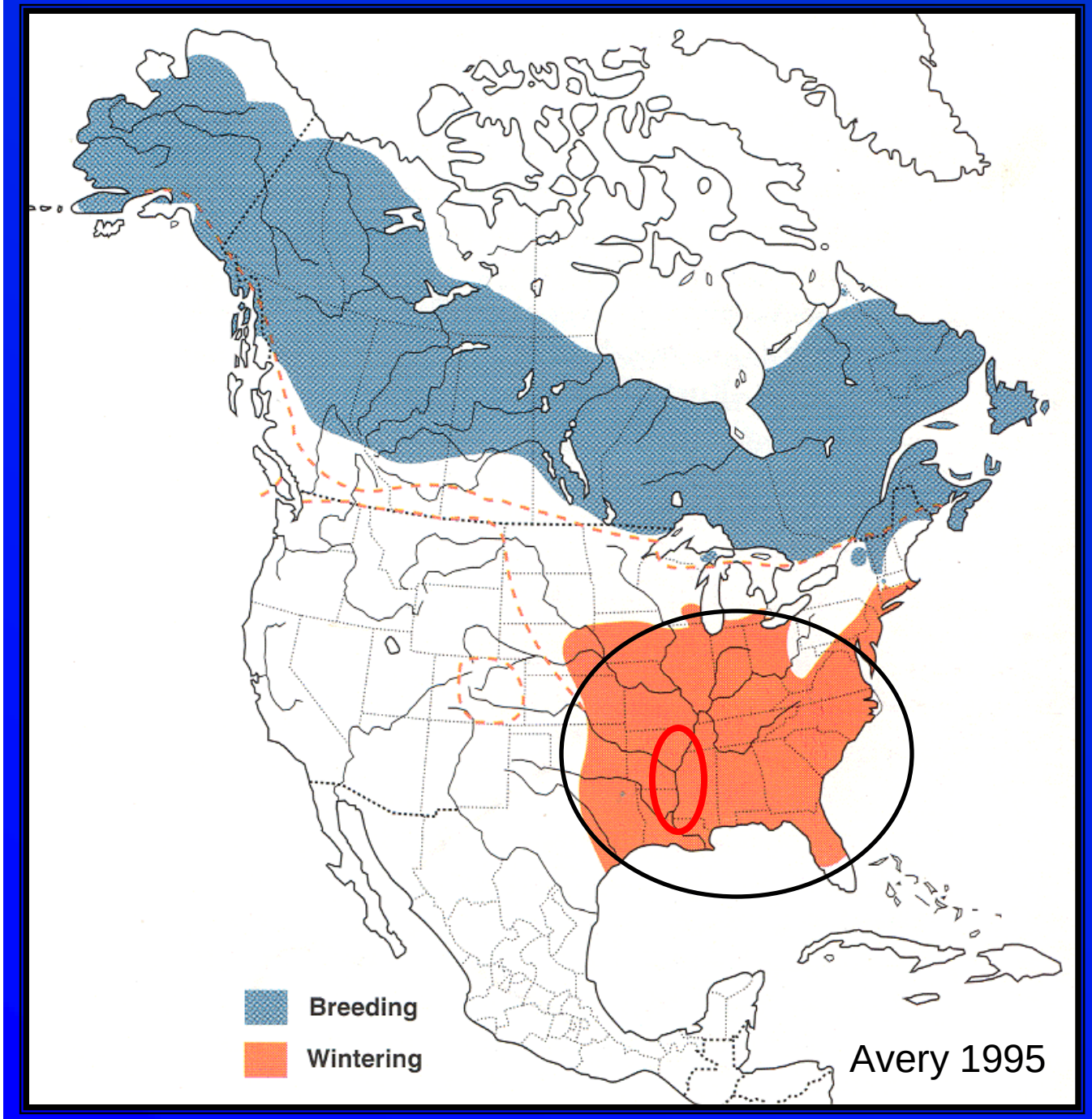


Abundance Models (Royle and Nichols 2003)

Assumptions:

- site-specific N has a Poisson distribution with mean λ
  - *i.e., bird distibutions in space follow Poisson*
- detection of individuals is independent

If assumptions are met, λ = density



Birds spread out on breeding grounds but flock on wintering grounds – thus, estimation of wintering populations

Sampling Design

Randomly selected sites surveyed during 2 seasons: January and February

<u>Recorded</u>:

1. Presence/absence and #'s
2. Other spp.
3. Habitat measurements (local and landscape level)
4. Weather

Habitat Measurements

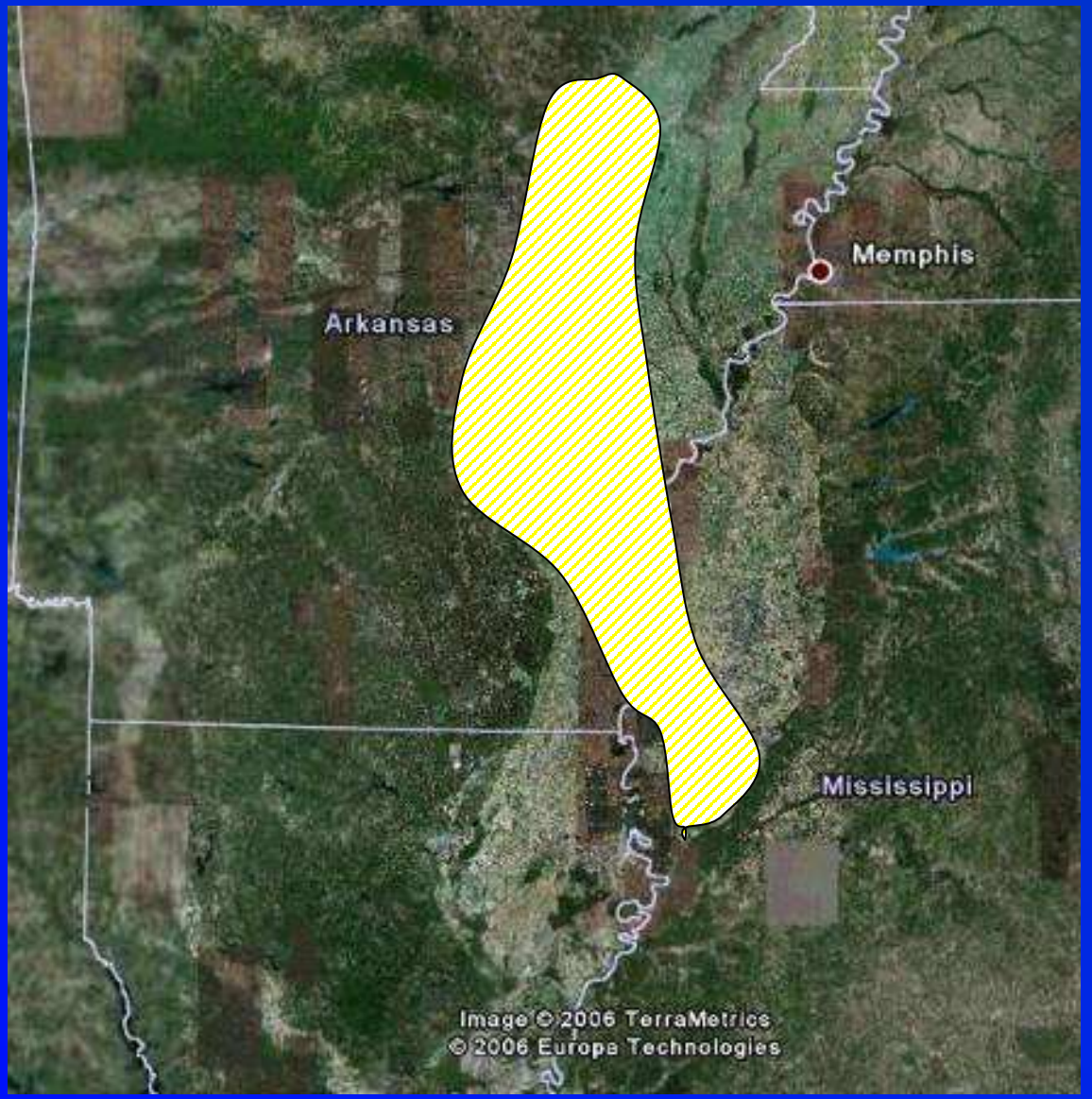
- Local
  - Tree density, canopy cover, ground cover
- Landscape
  - Forest age, forest type, % urbanization, distance to nearest body of water

Other variables . . .

- Air temp
  - May dictate diet
- Presence/absence of other birds (i.e., Icterids, startlings, robins)
  - To estimate co-occurance rates

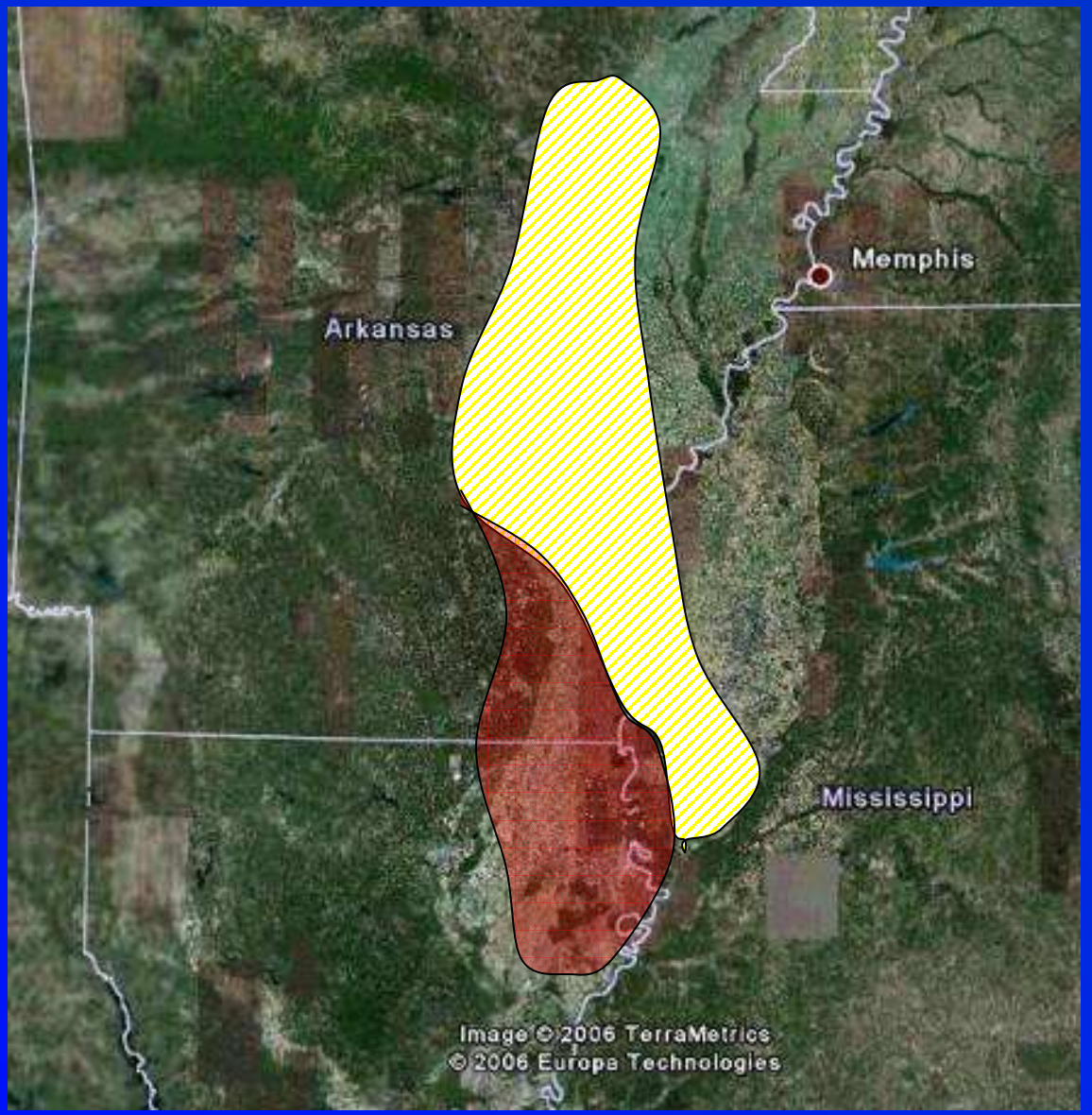
2006 Field Season (Pilot Year)

- ≥ 4 surveys per season at 79 sites
  - 52 in forests
  - 17 in fields



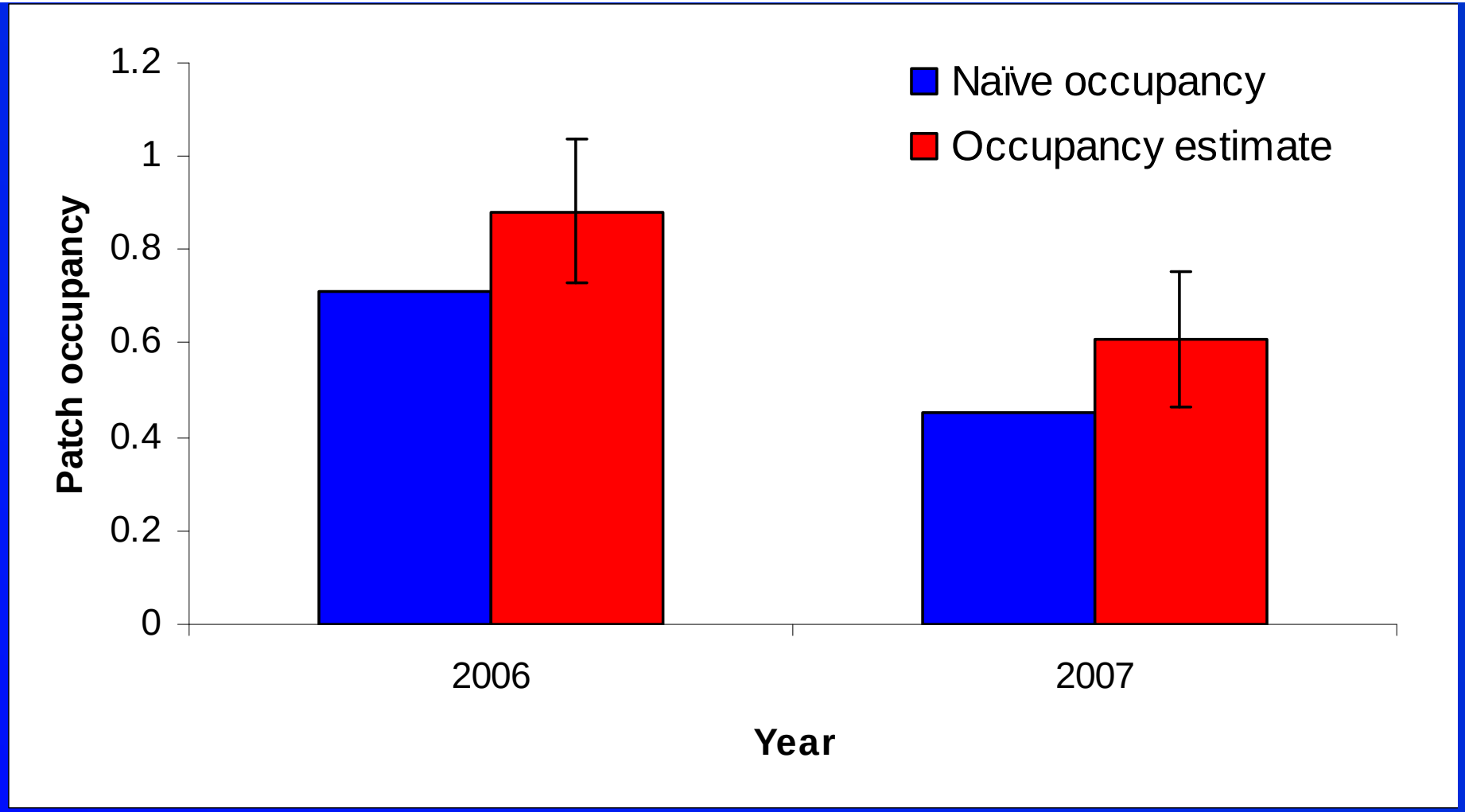
2007 Field Season

- ≥ 5 surveys per season at 115 sites
  - 68 sites in forests
  - 47 sites in fields



Preliminary Results

- Program PRESENCE (MacKenzie et al. 2002)
- Still working on a candidate set of models incorporating habitat and landscape variables



Changes from year-to-year:

- **Water levels**
- **Climatic differences**

Evaluate long-term temporal patterns!!

- 300 sites on DOD and NWR lands in southeast
  - A region thought to have fewer Rusties
- 2 visits per site

Conclusion

Logistically feasible state variable for monitoring Rusty Blackbird populations temporally and/or spatially!

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NWRs and state lands across eastern AR, western MS, and northeastern LA

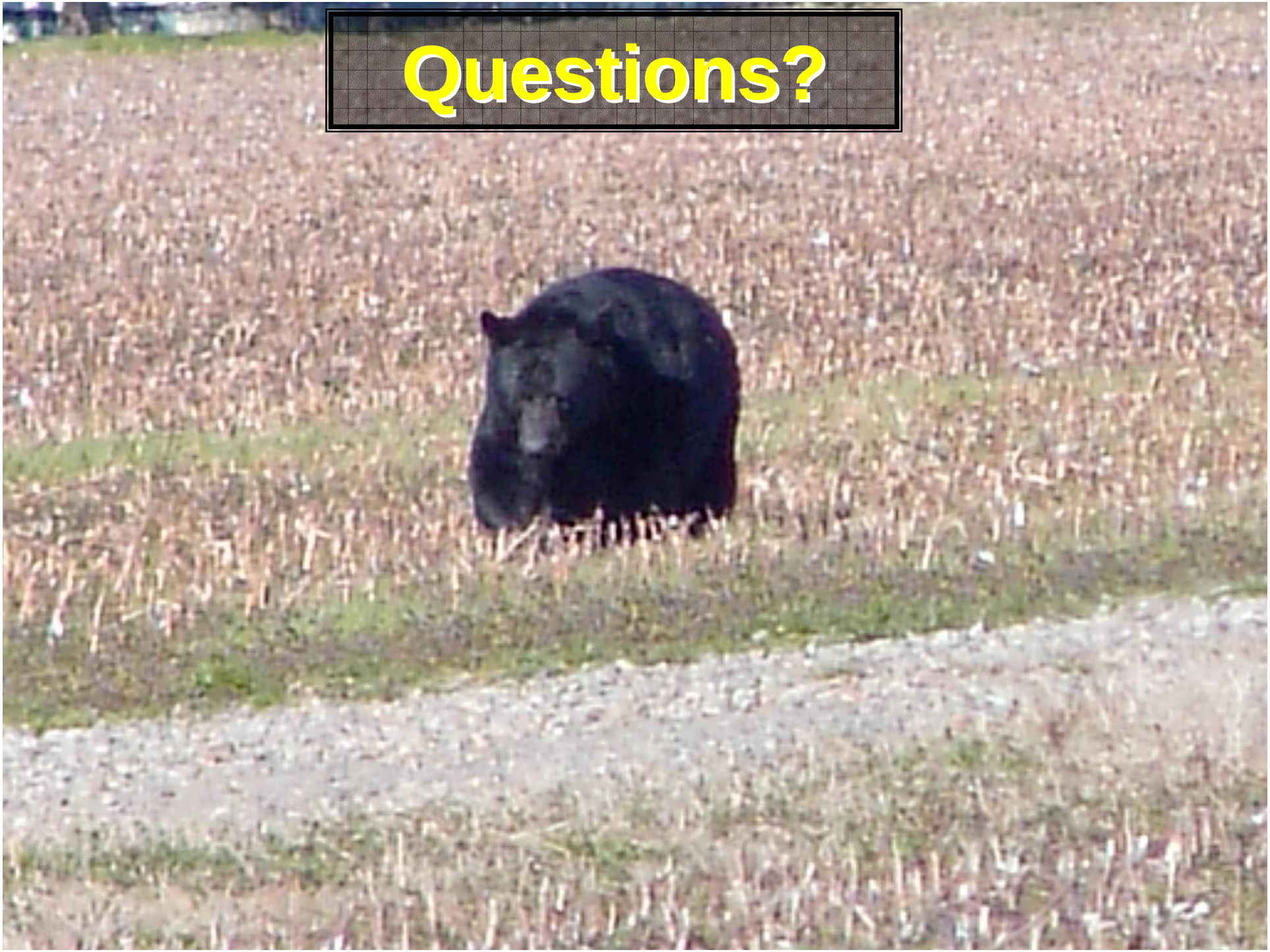
Graduate Committee:

K. Smith
D. Krementz
G. Petris
R. Greenberg
G. Huxel

Field Technician:

D. Konkoly

G. Hofmann


Questions?