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

G. Hofmann

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. = <u>spp. richness</u>

2. Patch – single species

    •   State var. = <u>occupancy</u>

3. Population – single species

    •   State var. = <u>abundance</u>

E(C) = Np

E(C) = expected count
N = true abundance
p = detectability

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

Logistically feasible, unbiased estimator??

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Occupancy rate = proportion of sites a spp. occupies

Occupancy Rate Estimation

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- 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

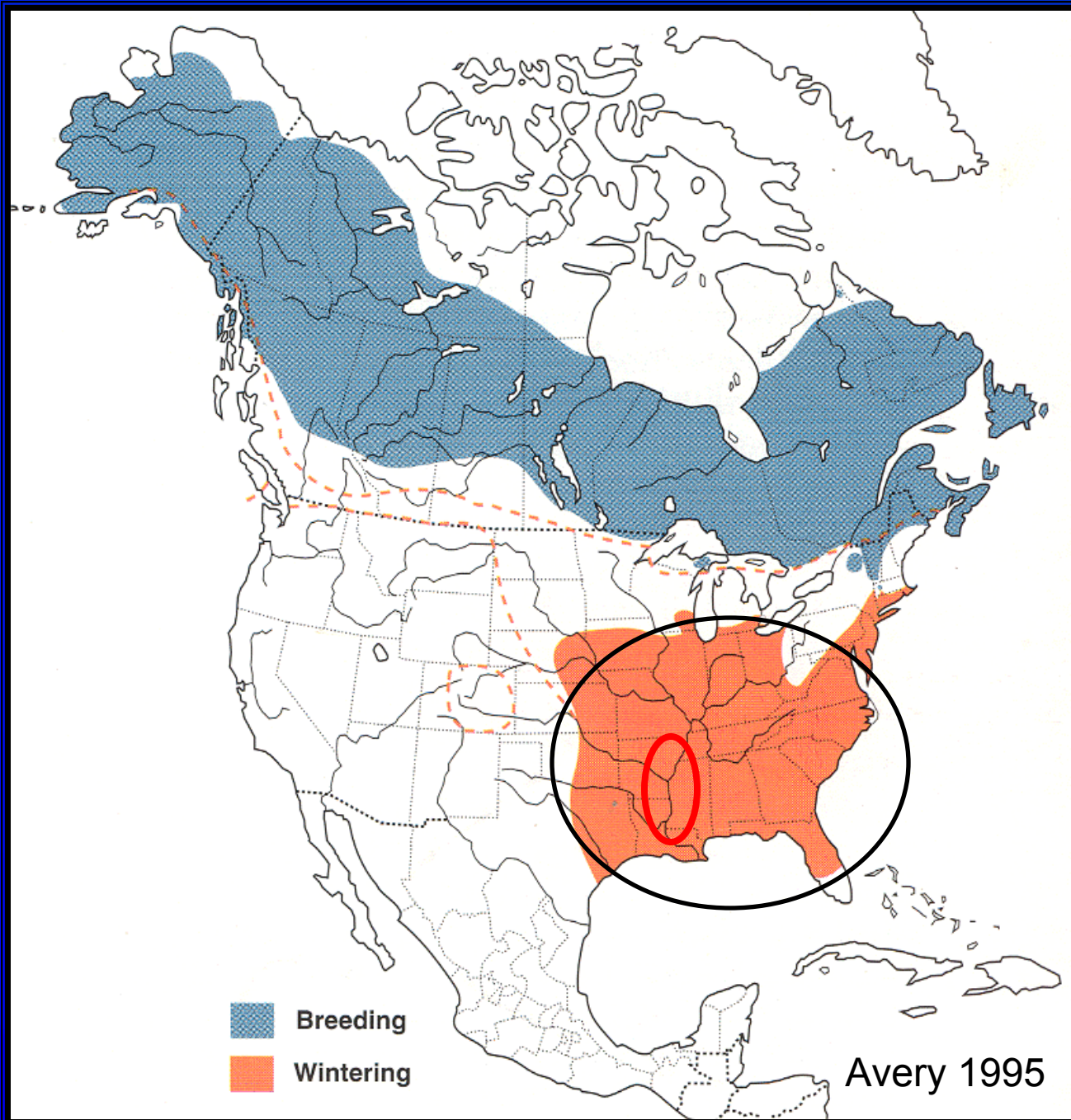$\hat{x} =$ Estimate of occupied sites

$s =$ 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

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

Breeding

Wintering

Avery 1995

Sampling Design

Randomly selected sites surveyed during 2 seasons: January and February

<u>Recorded</u>:

1. Presence/absence and #'s
2. Other spp.
   - Co-occurrence?
3. Habitat measurements (local and landscape level)
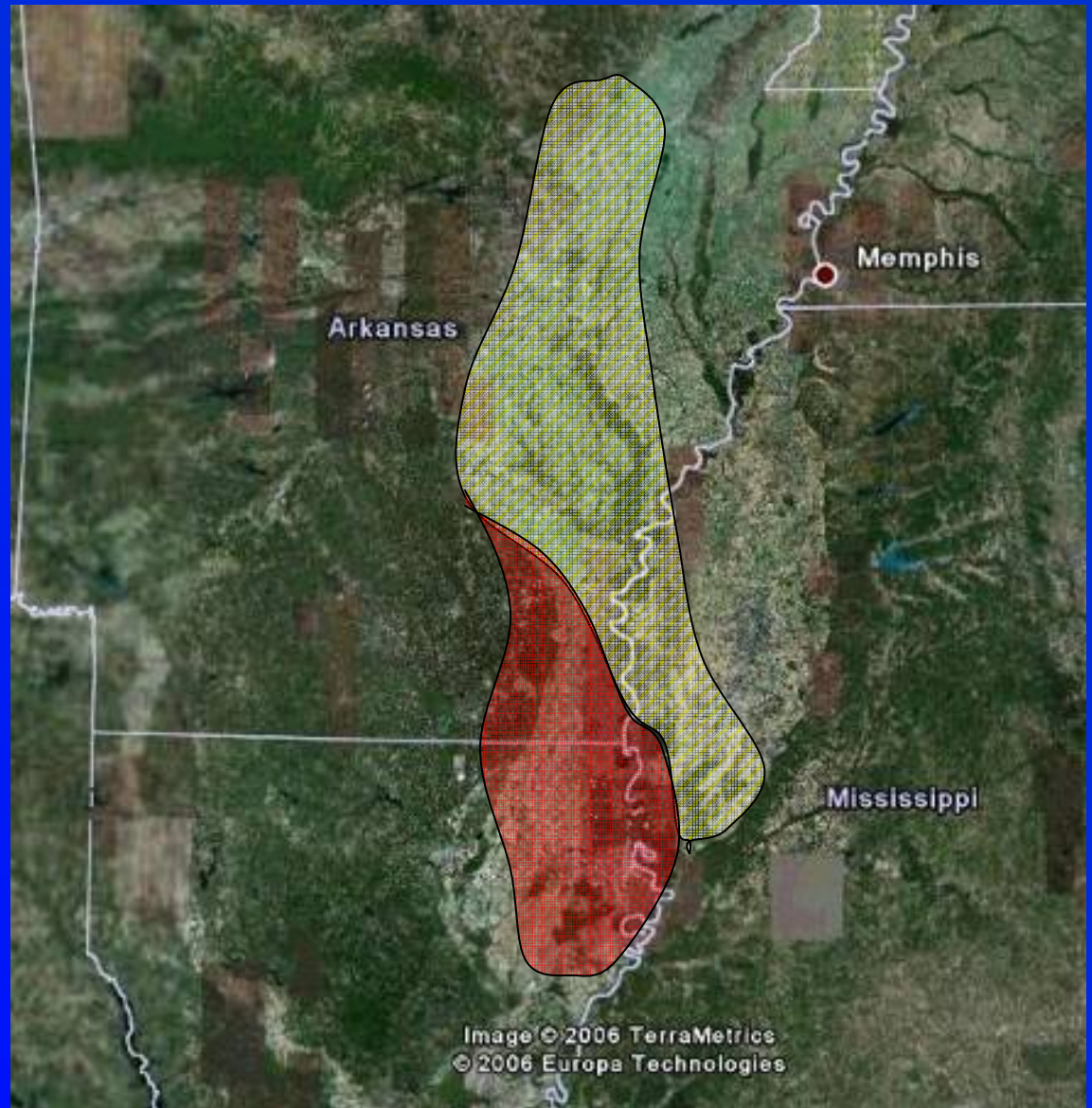4. Weather
   - May dictate diet

2006 & 2007 Field Seasons

2006: ≥ 4 surveys per season at 79 sites
- 52 in forests
- 17 in fields

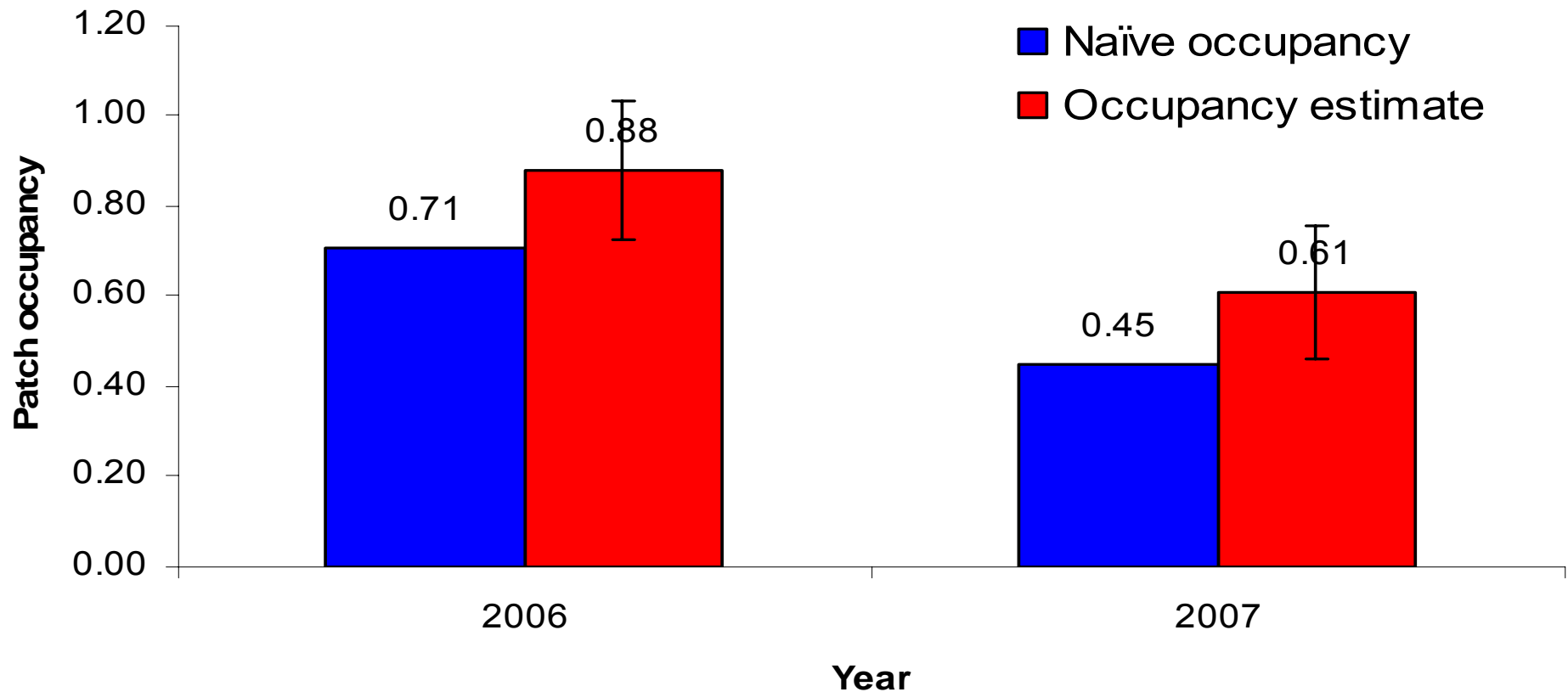**2007:** ≥ 5 surveys per season at 115 sites
- 68 sites in forests
- 47 sites in fields

Arkansas

Memphis

Mississippi

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Preliminary Results

- Program PRESENCE (MacKenzie et al. 2002)

- Still working on a candidate set of models incorporating habitat and landscape variables

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Changes from year-to-year:
– **Water levels**
– **Climatic differences**

Evaluate long-term temporal patterns!!

Sampling in the Southeast (SE)

- **300 sites on DOD and NWR lands in southeast**
  - *A region* **thought** **to have fewer Rusties**
- **2 visits per site during 2007**

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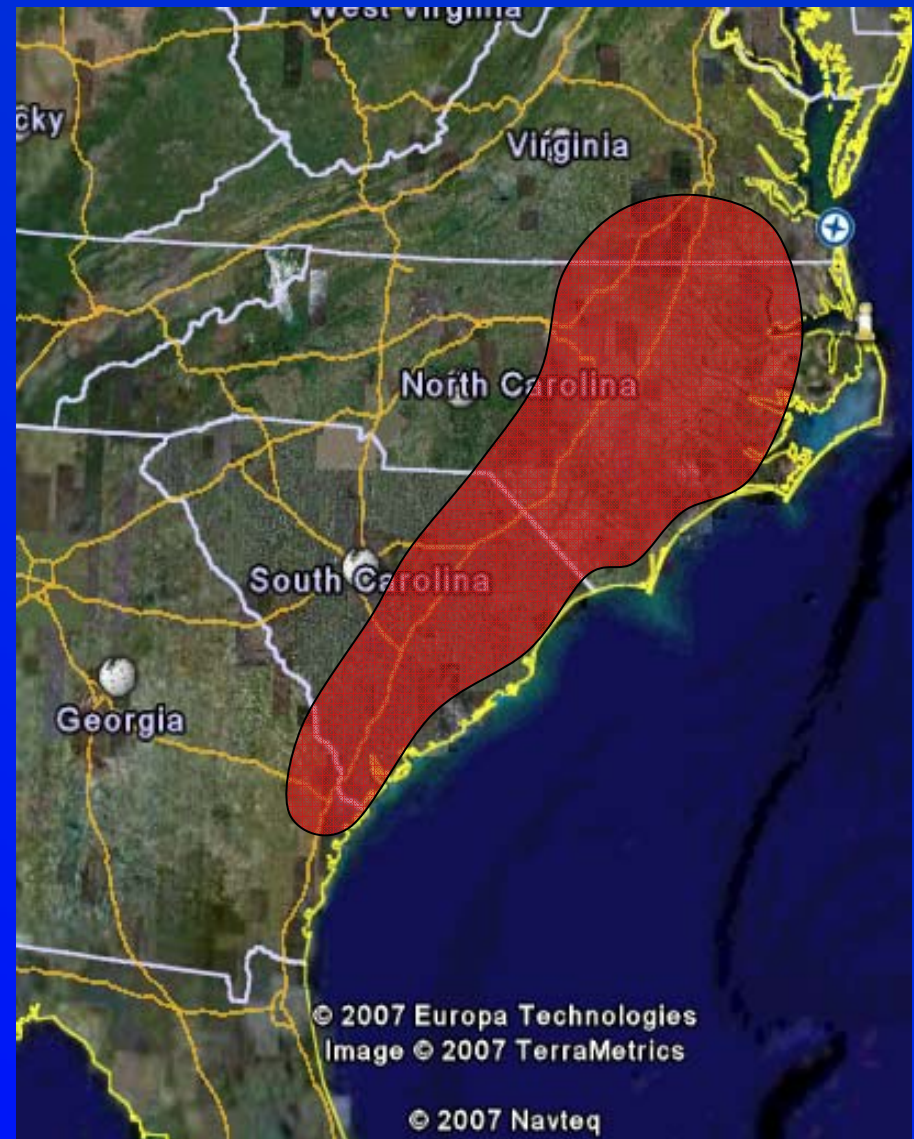
SE vs. LMAV

LMAV: on average **~12%** of sites had detections during 2 surveys, but **~42%** of sites had detections in 10 surveys

SE: only **~5%** (14 of 300) sites had detections during 2 surveys

- More than 2 surveys
- Call backs
- Cluster sampling (?)

Conclusion

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

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DOD Legacy

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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 Technicians:

D. Konkoly, T. Johnston, J. Armiger

G. Hofmann