

Laboratory Update

(Elmers assigned title)

Arbovirus Surveillance (and related projects) in Georgia 2001-2006

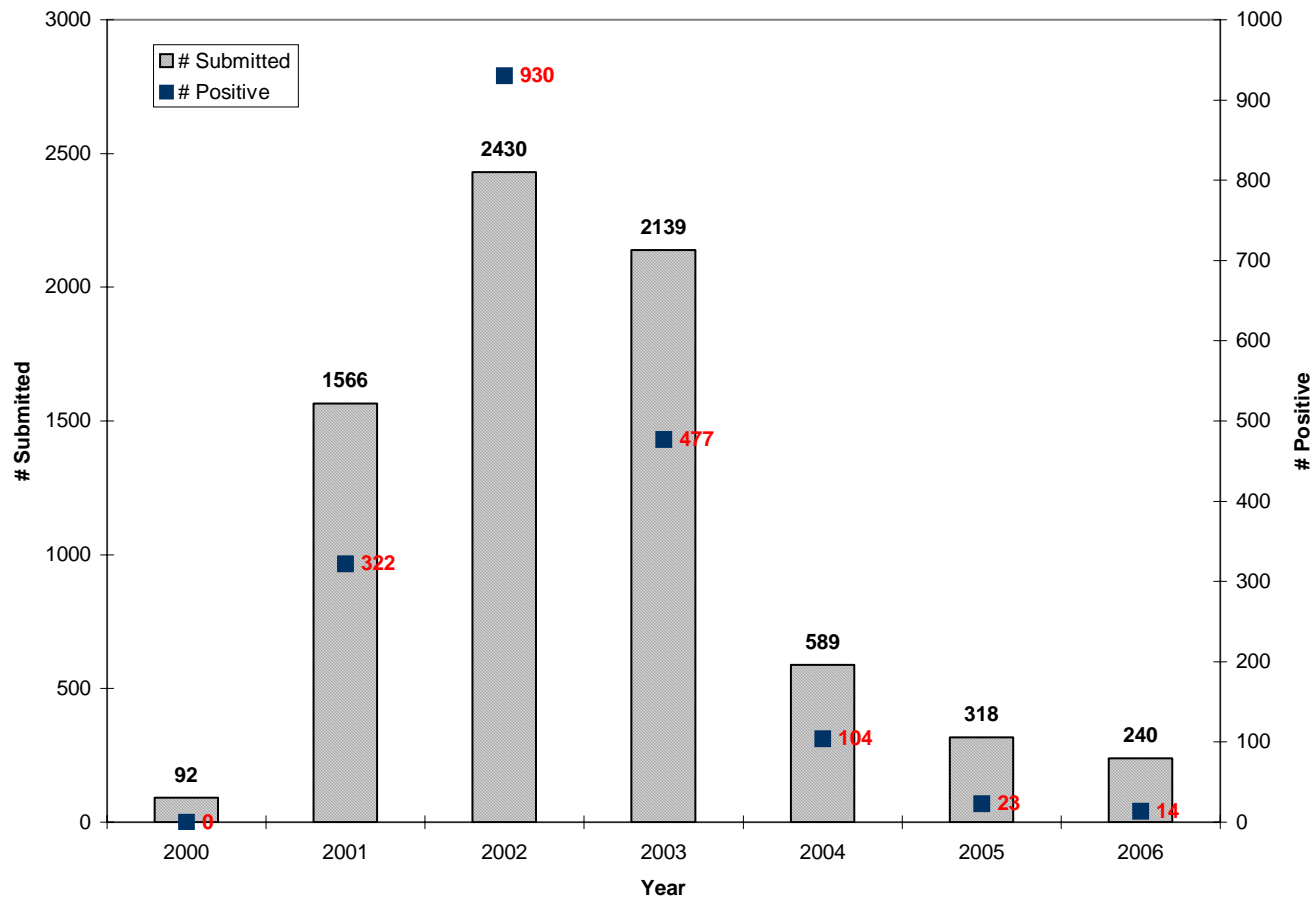
Daniel Mead
Southeastern Cooperative Wildlife Disease Study
UGA

- Dead Bird and Mosquito Surveillance
- Decoy Study
- Serological Studies -- probably won't get to this!
 - Birds
 - White-tailed deer (EEEv)
- What happens next?

Dead Birds

2000 – present (Oct 15th)

- **7,374 submitted**
 - **1,870 WNV positive**



Jan 01- Dec 05

- 6,964 dead birds submitted for testing
 - 1,859 – WNV positive
- For analysis, data was “cleaned” to only include birds submitted during the “transmission season”
 - Varied annually
 - June to late November or early December

“Cleaned Data”

(June – ~ Dec. depending on year)

- 4,795 birds submitted
 - Overall prevalence = 38%
 - » (1,821 WNV positive birds)
 - Corvids (n = 2,498)
 - Submitted by 129 of 159 GA counties
 - 67% WNV positive
 - All other birds (n=2,297) – 8% WNV positive

“All other birds”

- Carolina chickadee
 - 80% of submissions WNV positive



- House Finch
 - 22.8 % positive



- American Goldfinch
 - 28.6% positive



- Northern Cardinal
 - 28% positive

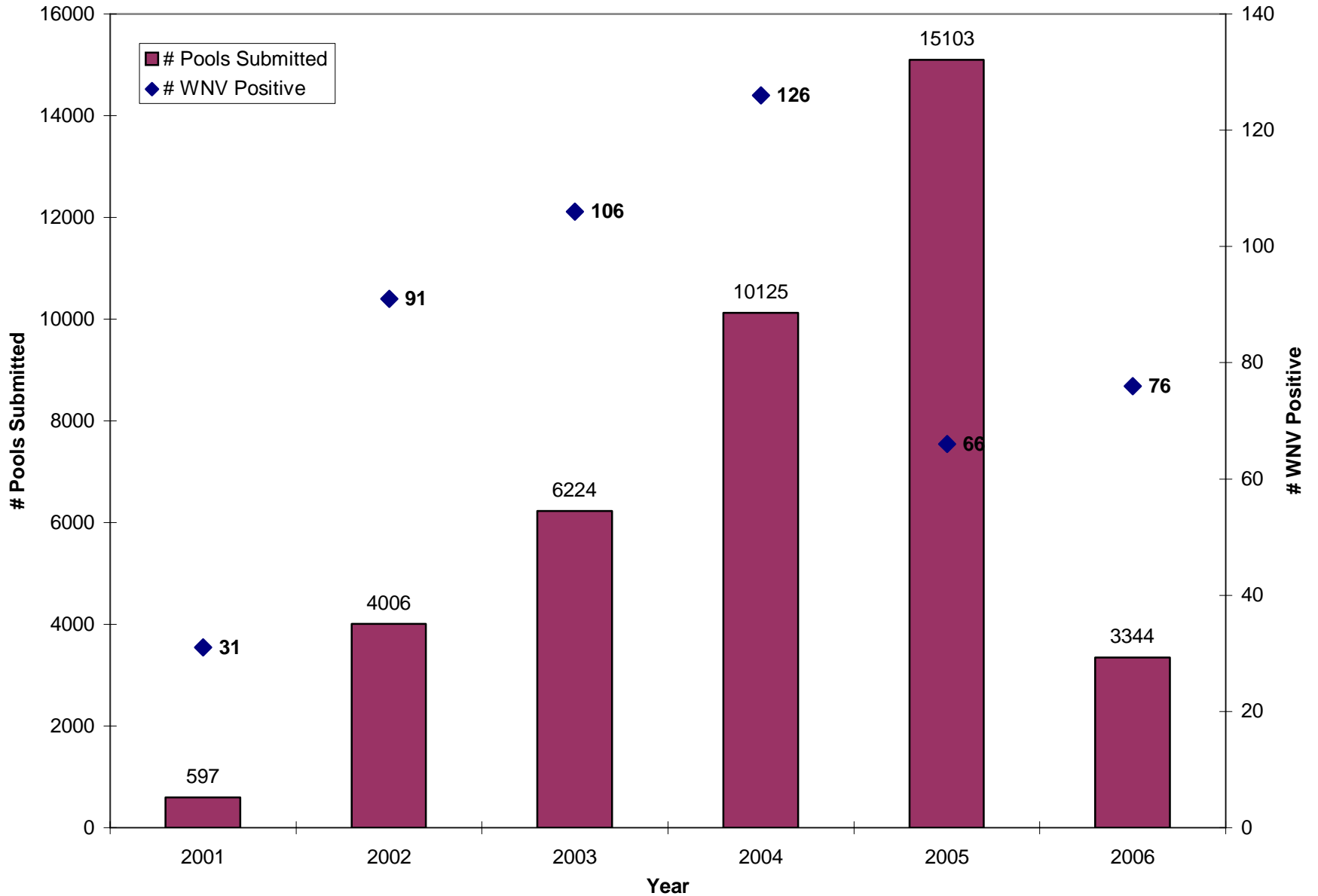


Dead Birds and Mosquitoes

2000 – present (Oct 15th)

- Dead Birds
 - 7,374 submitted
 - 1,870 WNV positive
- Mosquitoes
 - 39,399 pools submitted (430,475 mosquitoes)
 - 496 WNV positive pools

Mosquito Pool Submissions



Other Viruses Detected

- EEEv
- Highlands J virus
- Flanders virus
- South River virus
- LaCrosse virus
- Potosi virus
- Keystone virus
- Cache Valley virus
- Newcastle Disease virus

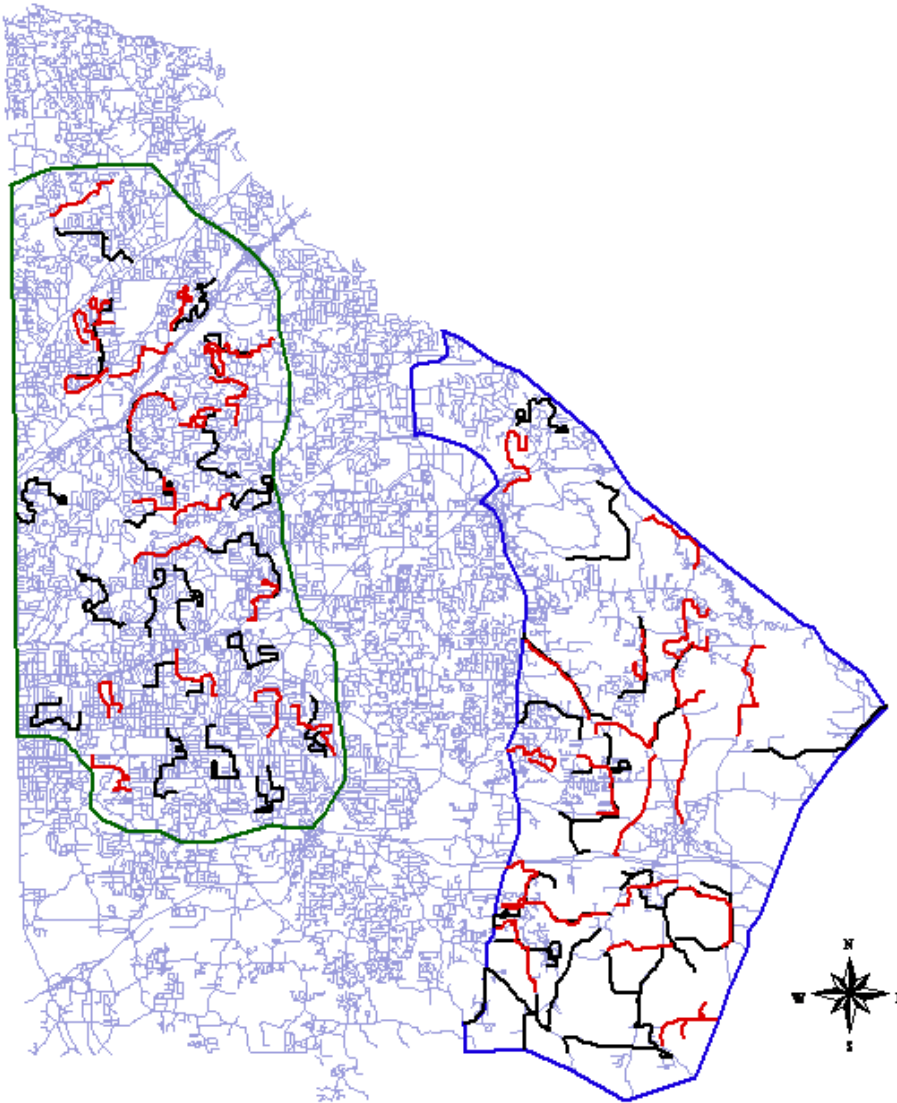
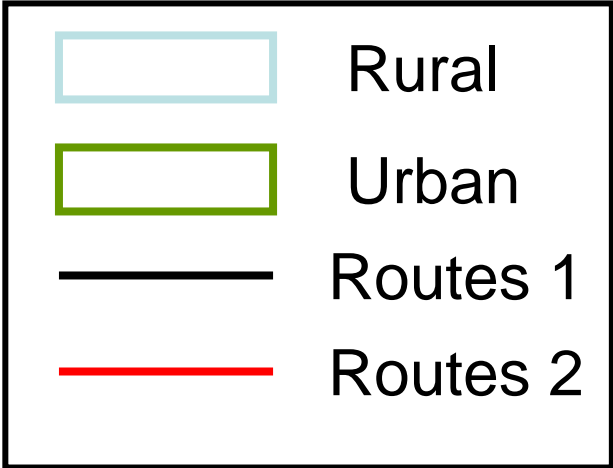
Detection, reporting, and carcass disappearance related to dead bird surveillance for WNV

- Assess detection and reporting of dead crows using decoy surrogates in urban and rural environments in a location with an intensive and organized dead bird surveillance system
- Assess the temporal persistence and fate of crow and sparrow carcasses in similar urban and rural environments



- Evaluated in DeKalb County, GA
- Two trials: July & September 2003
- DeKalb partitioned: Urban, Rural, Buffer
- Each trial, 200 decoys placed in both urban & rural areas = 400 decoys/trial = 800 total
- Decoys placed along randomly selected routes (10/route); 1 every 0.5 km; alternating between left and right sides

DECOY ROUTES JULY AND SEPTEMBER 2003



Methods

- Decoys labeled with reporting instructions to DeKalb County Board of Health
- Decoys placed relatively close (2-20m) to roads
- Monitored at 7 days and categorized as:
 - Reported
 - Still present but unreported
 - Or Missing but unreported





Data Analysis



- Constructed 5 candidate models relating decoy finding and reporting to area (urban or rural) and time (July or September)
 - “Finding” = reported + missing categories
- Akaike Information Criteria (AIC) values calculated to select best approximating model
- Akaike weights (w_i) calculated to determine weight of evidence in favor of each model
- Analysis conducted using program SURVIV



Candidate Models



1. Decoy finding (F) and reporting (R) vary by area (a), either urban or rural, and by time (t), either July or September.

$$F(a*t) R(a*t)$$

2. Decoy finding and reporting vary by area only, time has no effect.

$$F(a) R(a)$$

3. Decoy finding varies by area only, reporting is unaffected by area or time.

$$F(a) R(.)$$

4. Decoy finding was unaffected by area or time, reporting varies by area only.

$$F(.) R(a)$$

5. Decoy finding and reporting are unaffected by either area or time.

$$F(.) R(.)$$



Results



Decoys Placed	Reported	Still Present	Missing/Unreported
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Trial 1

Urban	200	34 (17%)	74 (37%)	92 (46%)
Rural	200	5 (3%)	146 (73%)	49 (25%)

Trial 2

Urban	200	32 (16%)	84 (42%)	84 (42%)
Rural	200	7 (4%)	137 (69%)	56 (28%)

Total

Urban	400	66 (17%)	158 (40%)	176 (44%)
Rural	400	12 (3%)	283 (71%)	105 (26%)

Passive surveillance underestimates extent of total mortality



-- 43% of “dead crows” found & only 10% reported

■ For every decoy reported in:

Urban - 4 go unreported

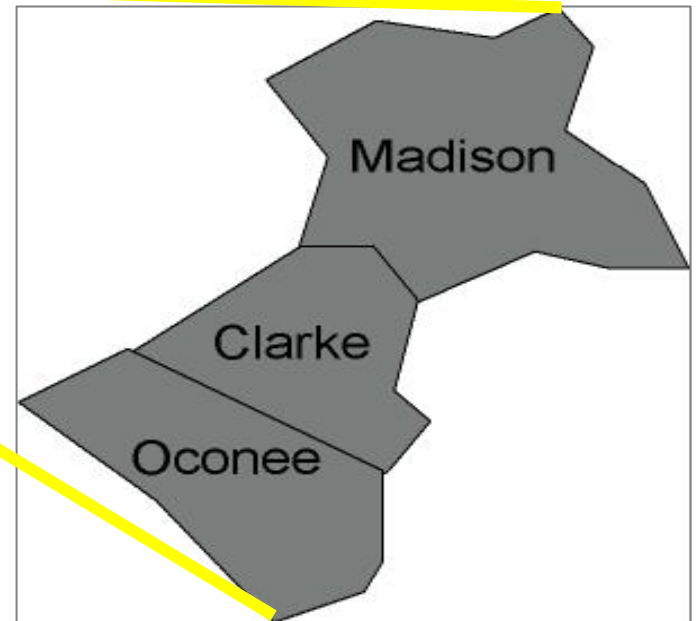
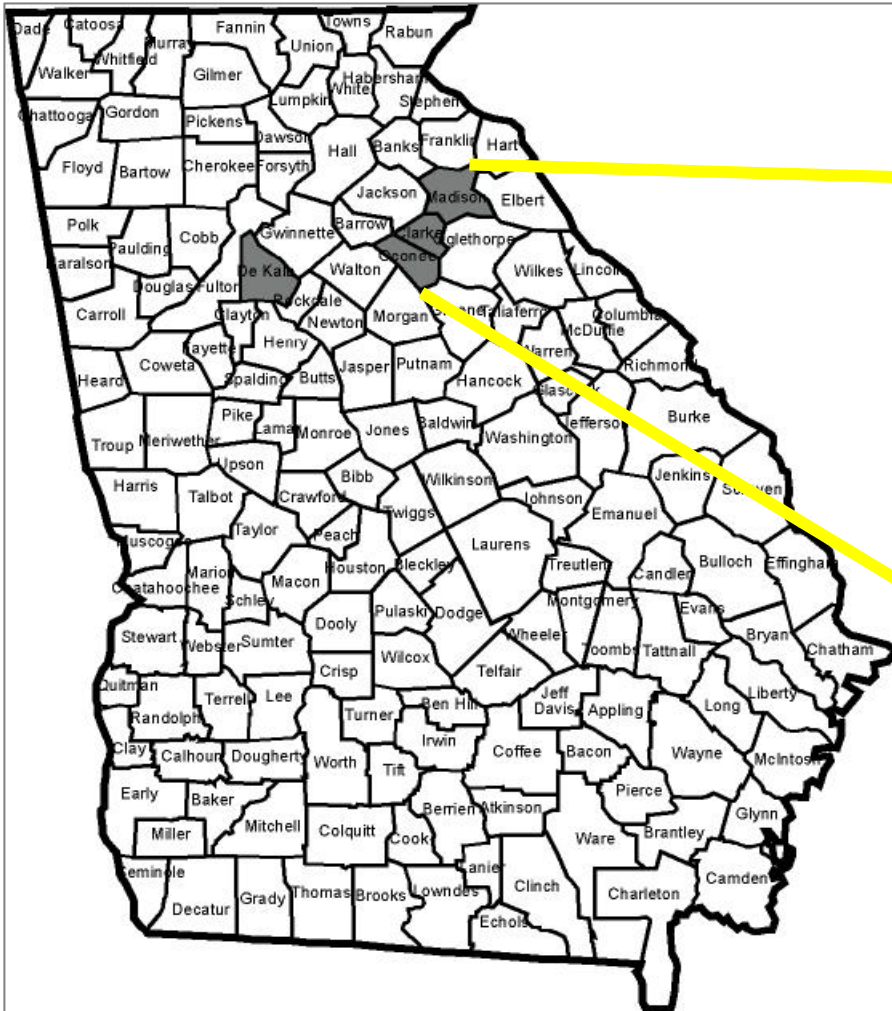
Rural - 30 go unreported

Carcass Persistence and Fate



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Study Areas



Methods

- Counties partitioned: Urban and Rural based on land uses from LANDSAT data
- Two trials: July & September 2004
- Each trial, 48 carcasses of each species placed in both urban and rural areas = 96 carcasses/trial = 192 total
- Each trial 3 sessions of 16 crow and 16 house sparrow carcasses



- Carcass placement not random, dependent on permission
- Included locations such as neighborhood residential lots, parks, rural farms, forest
- Carcasses placed in pairs
 - 1 pair for smaller sites
 - 2 pairs for larger (>16 ha) sites
 - Carcasses and pairs separated
- Monitored daily for 6 days



- 16 trail cameras used to monitor portion of carcasses
- Fate “known” if:
 - Scavenger removing or scavenging
 - Scavenger last known species before missing
- “Scavenging pressure” based on visits of scavenging species per camera night





Data Analysis



- Analysis conducted using known fate model in program MARK
- Constructed 8 candidate models estimating carcass persistence rate
- AIC_c values for small sample size calculated to select best approximating model
- Akaike weights (w_i) calculated to determine weight of evidence in favor of each model
- Model averaging used to incorporate model selection uncertainty directly into parameter estimates using w_i

Candidate Models

1. Carcass persistence rates (S) vary by species (spp), crow or sparrow, area (a), urban or rural, time (t), July or September, and days of exposure (0-6) (e).

$$\{S(\text{spp}*\text{a}*\text{t}*e)\}$$

2. Carcass persistence rates vary by species, area, and time only.

$$\{S(\text{spp}*\text{a}*\text{t})\}$$

3. Carcass persistence rates vary by species (spp) and days of exposure.

$$\{S(\text{spp}*e)\}$$

4. Carcass persistence rates vary by area (a) and days of exposure.

$$\{S(\text{a}*e)\}$$

5. Carcass persistence rates vary by days of exposure only.

$$\{S(e)\}$$

6. Carcass persistence rates vary by species only.

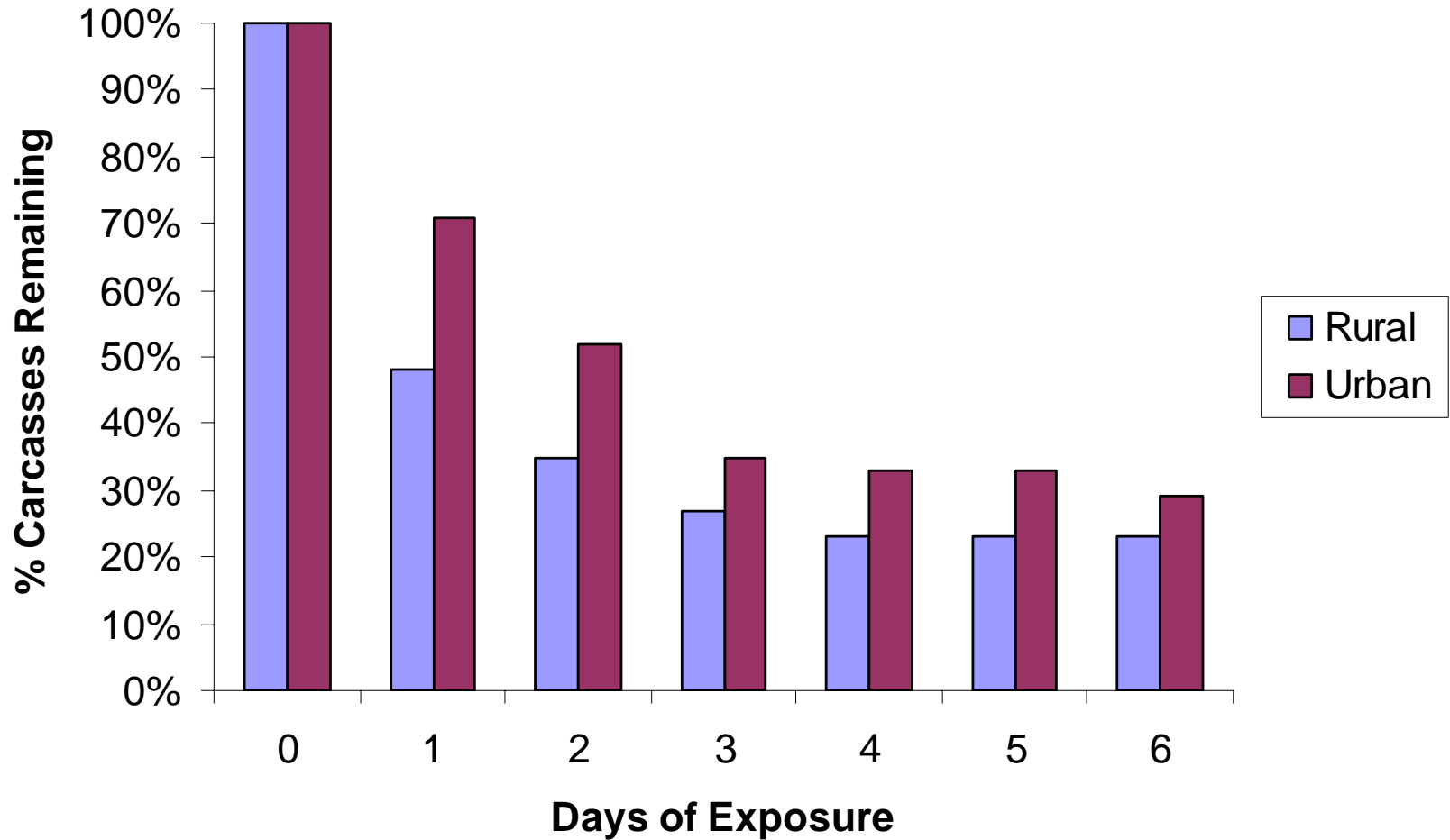
$$\{S(\text{spp})\}$$

7. Carcass persistence rates vary by area only.

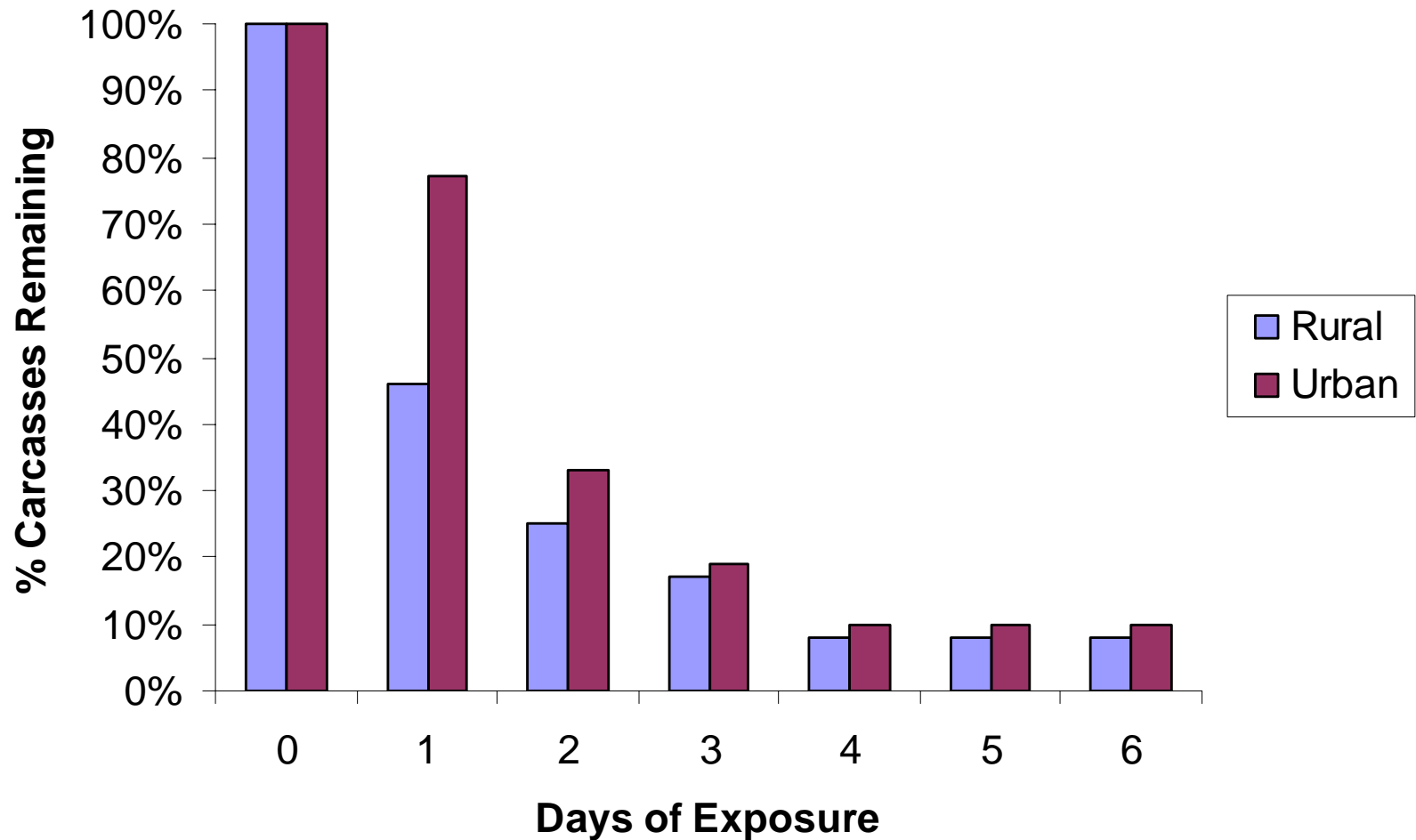
$$\{S(\text{a})\}$$

8. Carcass persistence rates are unaffected by species, area, time, or days of exposure. $\{S(.)\}$

Results – Crow Carcasses



Results – Sparrow Carcasses



Results

- 64% scavenger visits did not result in removal of carcass
- Incidental visits:
 - 1 American Robin
 - 1 Ovenbird
 - 1 Armadillo
 - 2 Eastern chipmunks
 - 2 Eastern cottontail rabbits
 - 11 Eastern gray squirrels
 - 33 White-tailed deer
 - 2 Unknowns (blurry photos)



- Most (82%) carcasses disappeared within 6 days
- Supports conclusions of previous studies that carcasses are quickly assimilated into environment
 - Rural carcasses persisted 1.6 days
 - Urban carcasses persisted 2.1 days

- Models indicated that carcass persistence rates affected by species, area, and days of exposure
- Sparrow carcass persistence lower than crow
 - More potential scavengers, more susceptible to insects
- Rural areas lower persistence than urban
 - “scavenging pressure” higher in rural areas
- High carcass losses during first day may be due to scavenger foraging habits



- Little variation in scavenging species or their visits between areas
- Opossums and raccoons responsible for most crow carcass removals
- Domestic cats and insects most sparrow carcass removals
- Camera flash/noise may have startled scavengers
 - High % of visits w/ no removal
 - Multiple scavengers to individual carcasses
- 6 mammalian and 1 avian species scavenging
 - Potential WNV oral exposure



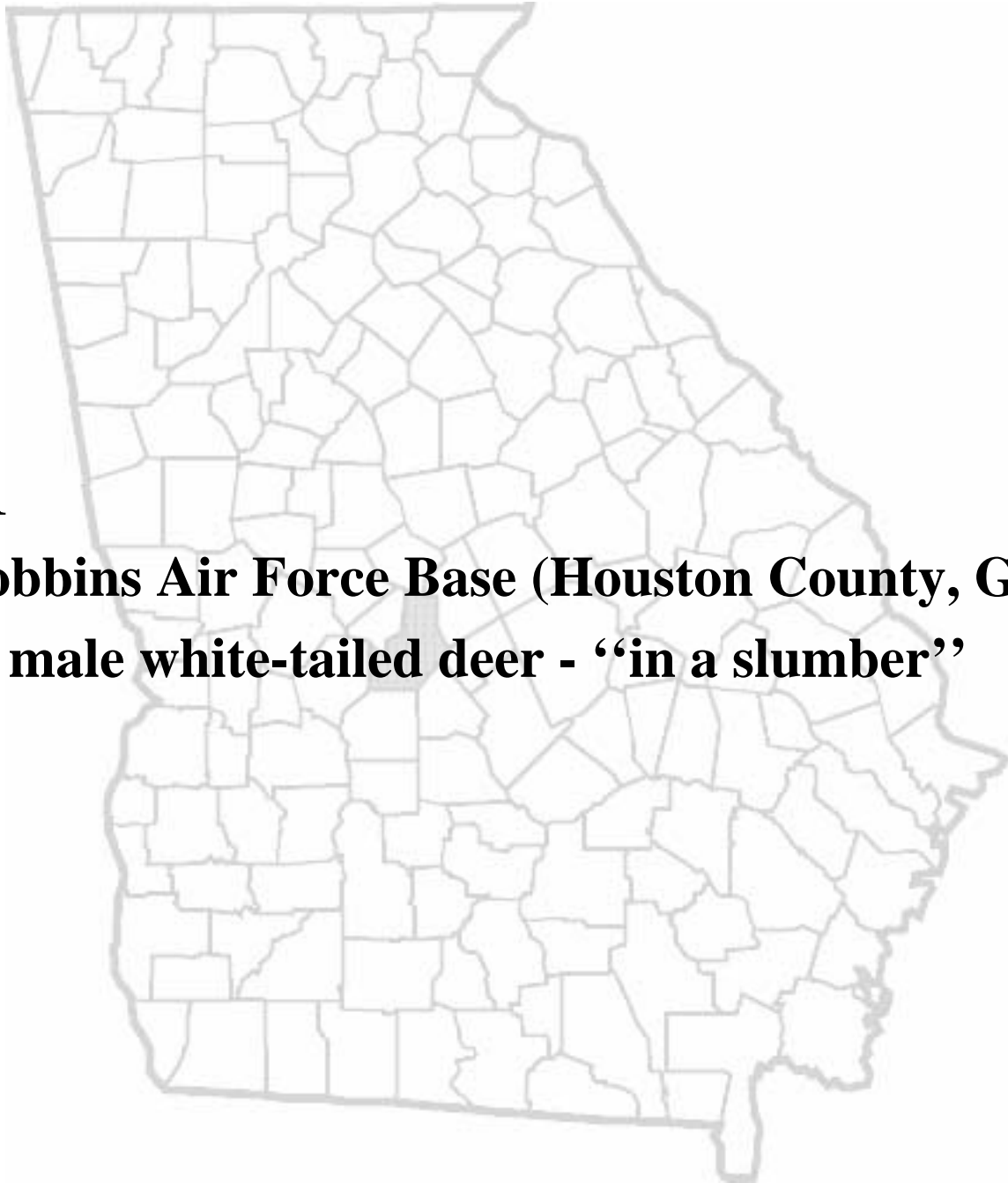


Serological Studies

1 July 2001

Warner Robbins Air Force Base (Houston County, GA)

12-mo-old, male white-tailed deer - “in a slumber”



Histopathology – tissues from major organs (everything!)

IHC - prion protein

FA - rabies virus and *Listeria monocytogenes*

VI

lung and spleen - CPAE and BHK 21 cells

lung, heart, spleen, brain, and kidney - Vero cells



EEEV

