Southern Fire Exchange Webinar July 25, 2013

"Fire and Fauna in the Southeast: Lessons Learned from Recent Research"

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Fire and Fauna in the Southeast: Lessons Learned from Recent Research

Chris Moorman, PhD
NCSU Dept. of Forestry and Env. Resources
Fisheries, Wildlife, and Conservation Biology

Outline

- **Effects on leaf-litter obligates**
  - **Woodland salamanders and shrews**
- **Effects on ground-nesting birds**
  - **Wild turkey nest survival**
- **Effects on acorns and other wildlife food**
  - **Forage, soft mast, acorn availability**
- **Summary of consistent themes**

Long-term Response of Salamanders and Shrews to Fire & Fuel Reduction Treatments

Charlotte Matthews' MS Thesis
Collaborators: Katie Greenberg and Tom Waldrop

Relevant Environmental Change

- **Reduction in leaf litter cover and depth**
- **Canopy reduction and greater ground temps**
- **Increase in herbaceous layer**

What We Know

- **Salamanders not affected by:**
  - **single prescribed fires (Ford et al. 1999, Floyd et al. 2001, Mosely et al. 2003, Greenberg and Waldrop 2008)**
  - **two low-intensity fires (Ford et al. 2010)**

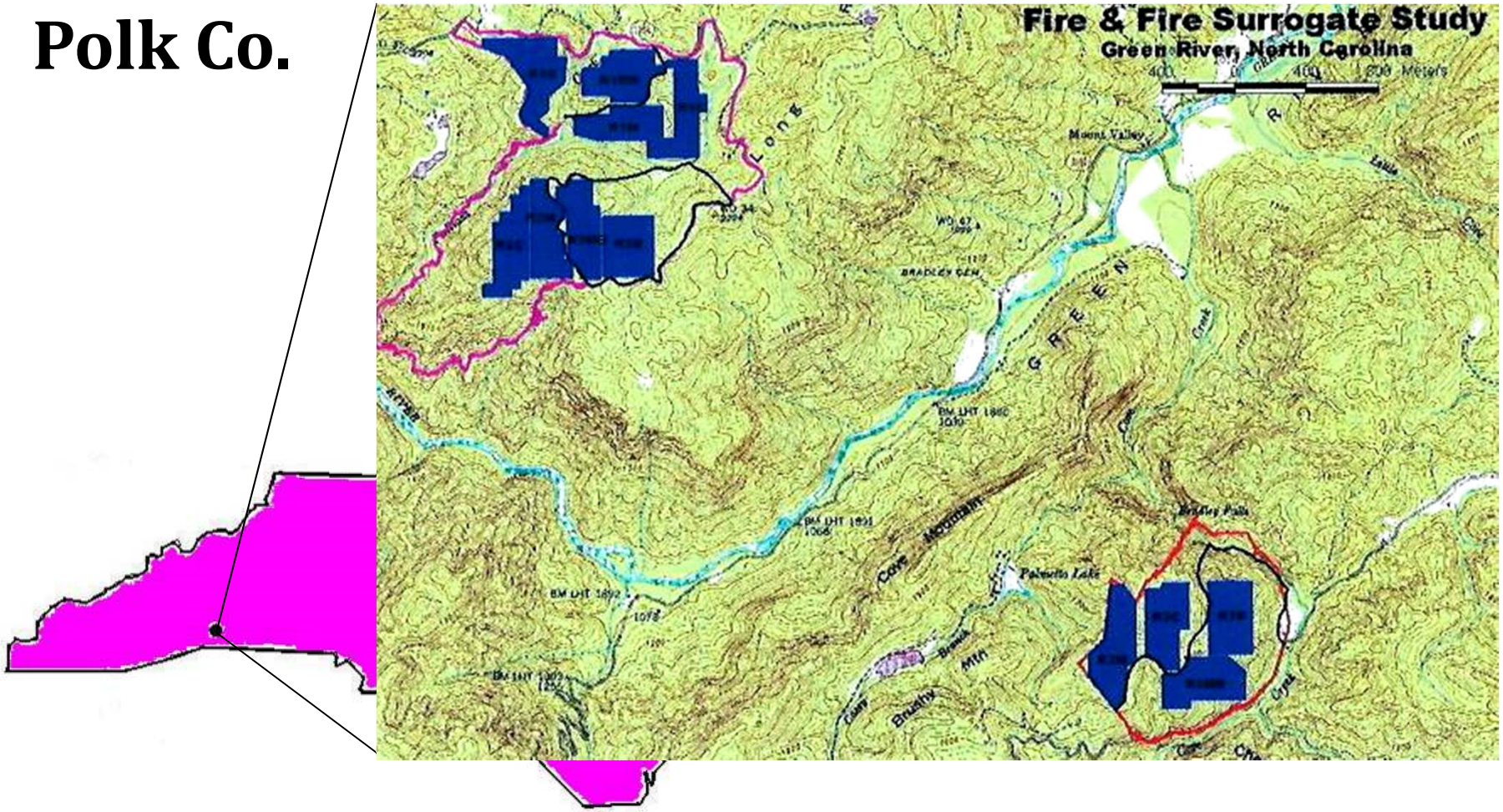
- **Shrews not affected by:**
  - **Single, low-intensity fires (Ford et al. 1999)**
  - **But, declined after single high intensity fire (Greenberg et al. 2007)**

Green River Game Land

- **5,841 ha**
- **Elevation: 366 - 793 m**
- **Oak-hickory overstory with pine on ridges**
- **Understory: rhododendron & mt. laurel**
- **Not thinned or burned >50 years**

Green River Game Lands

Polk Co.



Fuel Reduction Treatments

- 3 replicates
- 3 treatments (10 ha) + control:
  - Twice-burned (2003, 2006)
  - Mechanical understory cut (2002)
  - Mechanical understory cut + 2 burns
- National Fire & Fire Surrogate Study

Control

Mechanical (2002)

Twice-burned (2003, 2006)

Mechanical + 2 Burns

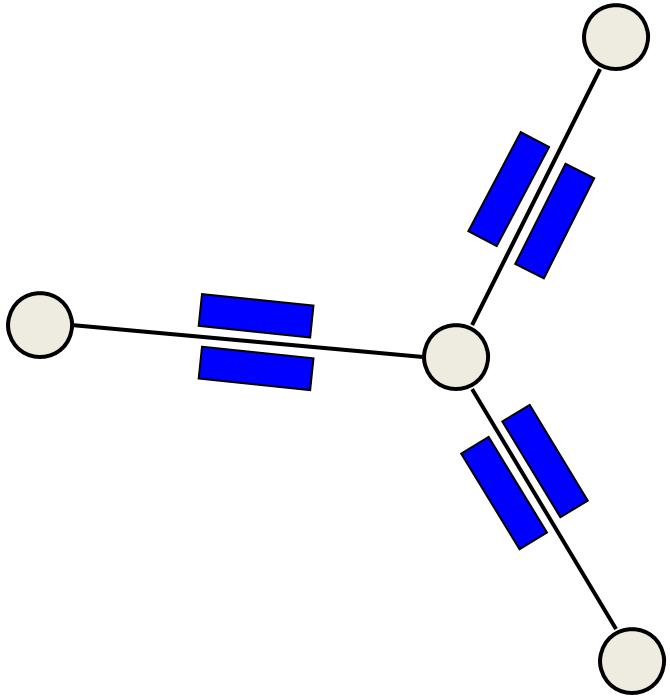
Fire Temperatures

- **1st burn (2003)**
  - **B : 180° C**
  - **M+B : 370° C**
    - **→ Overstory mortality**

- **2nd burn (2006)**
  - **2B : 155° C**
  - **M+2B : 222° C**
    - **→ Overstory mortality**

Herpetofauna/Shrew sampling

- May – August 2006 & 2007
- 3 drift fence arrays/unit = 36 arrays
  - 4 pitfall traps & 6 funnel traps



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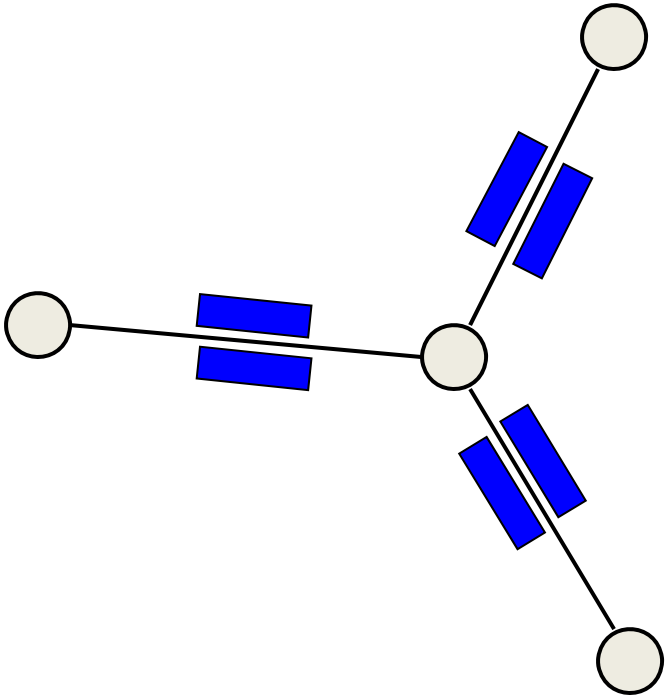

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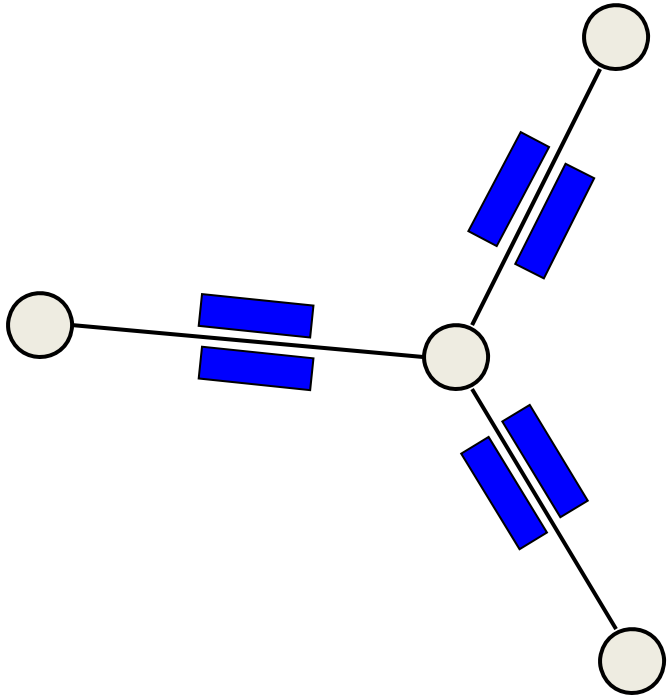
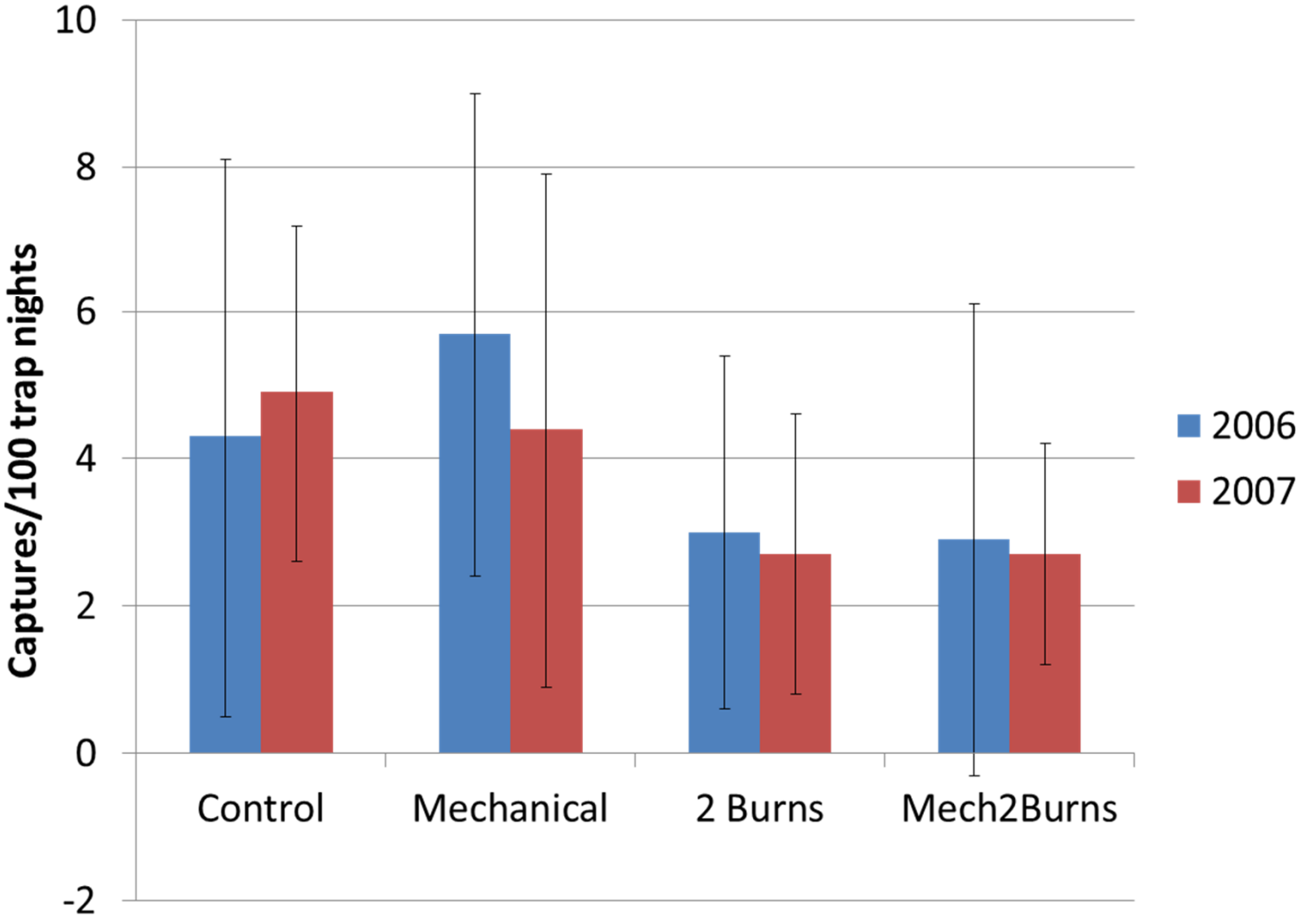
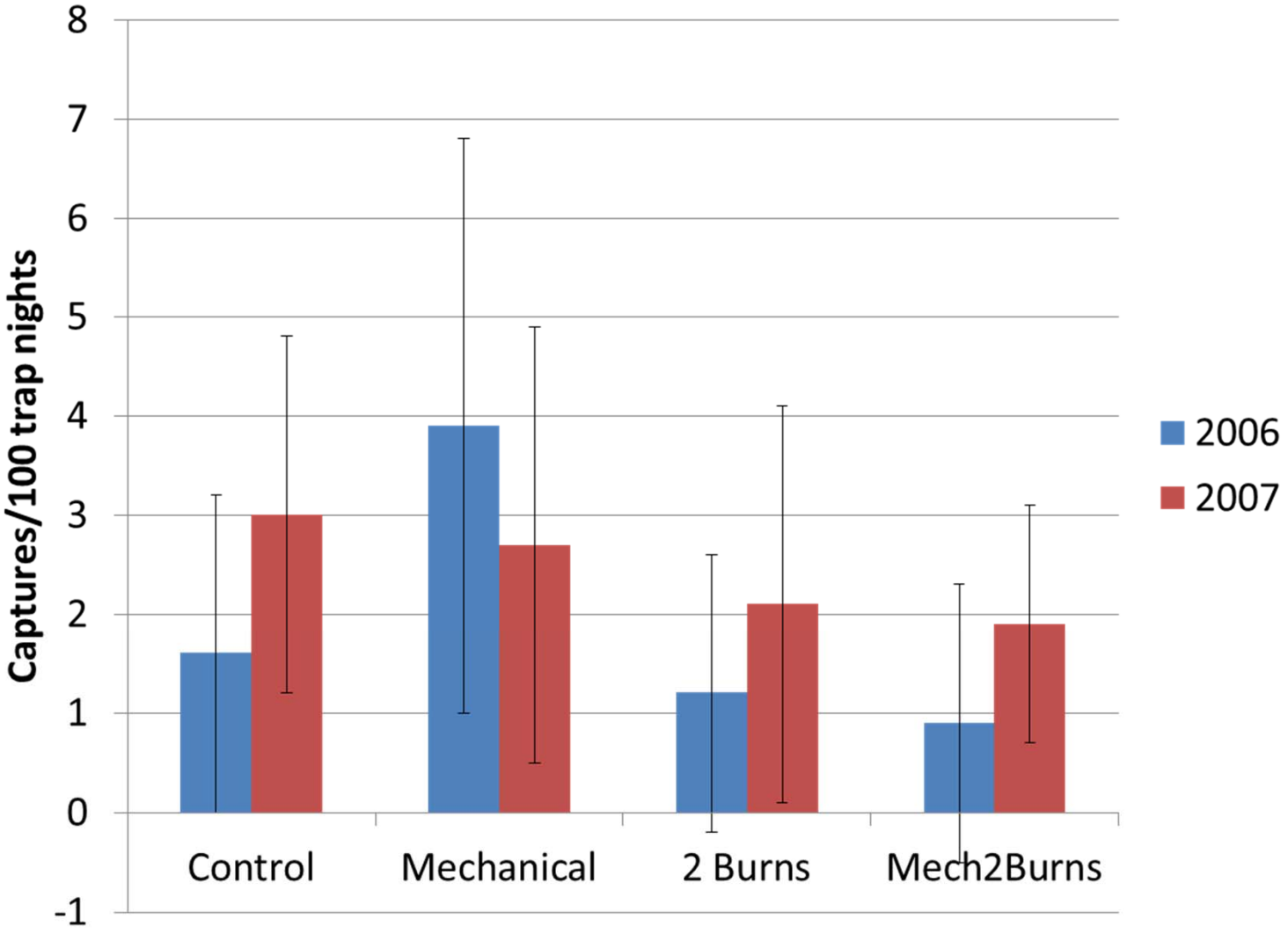


All Shrew Response



Southeastern Shrew Response



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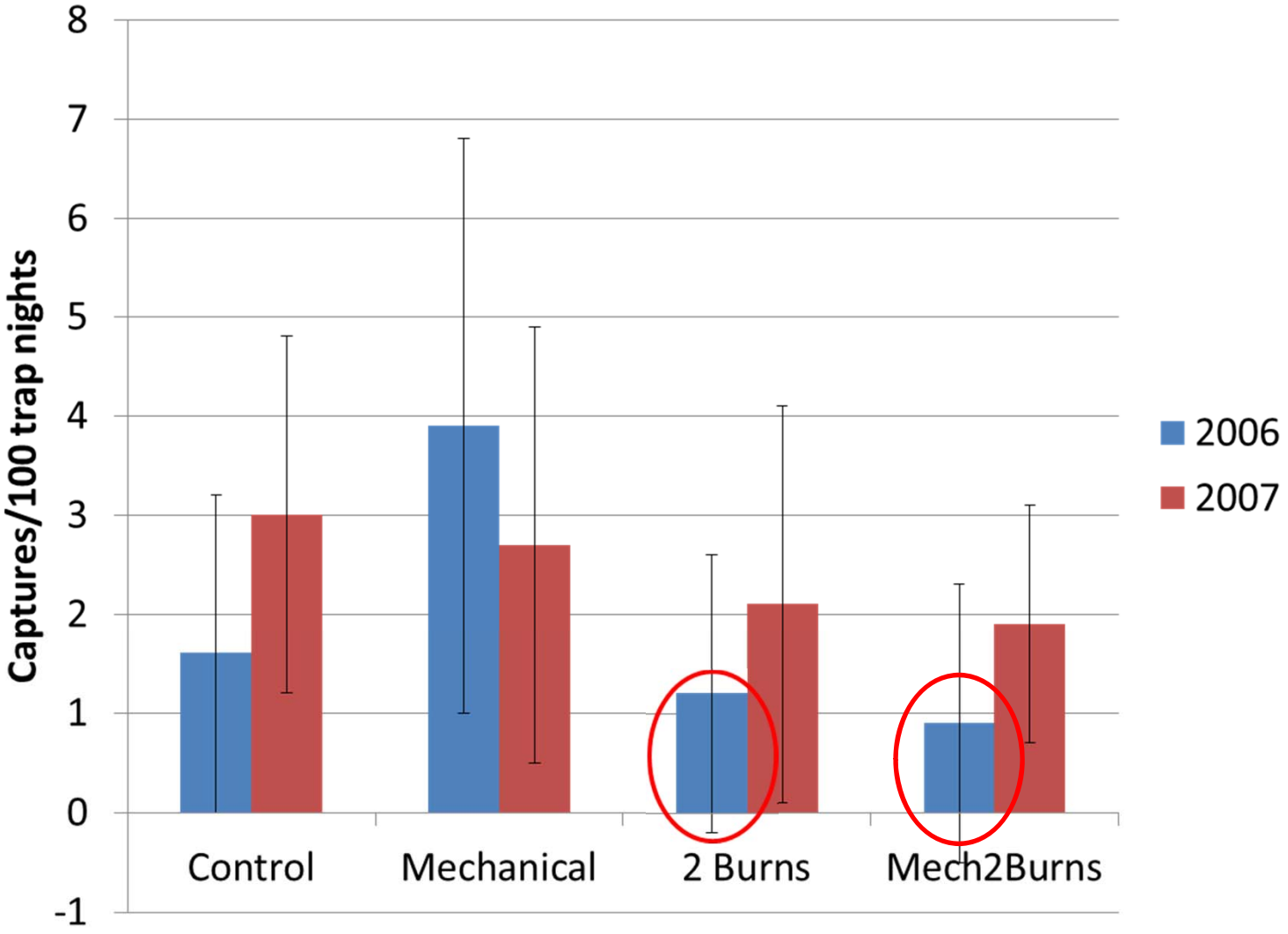
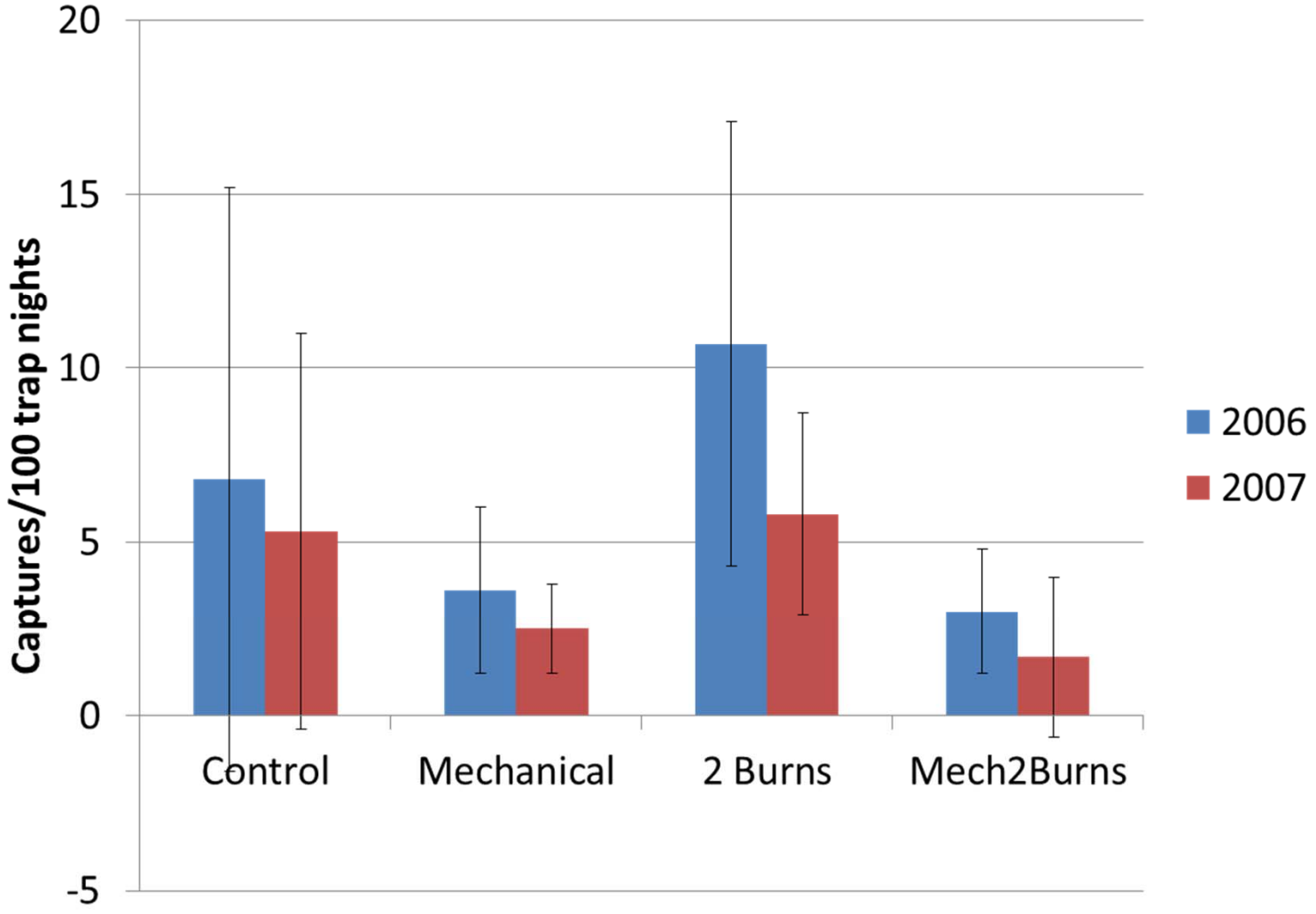
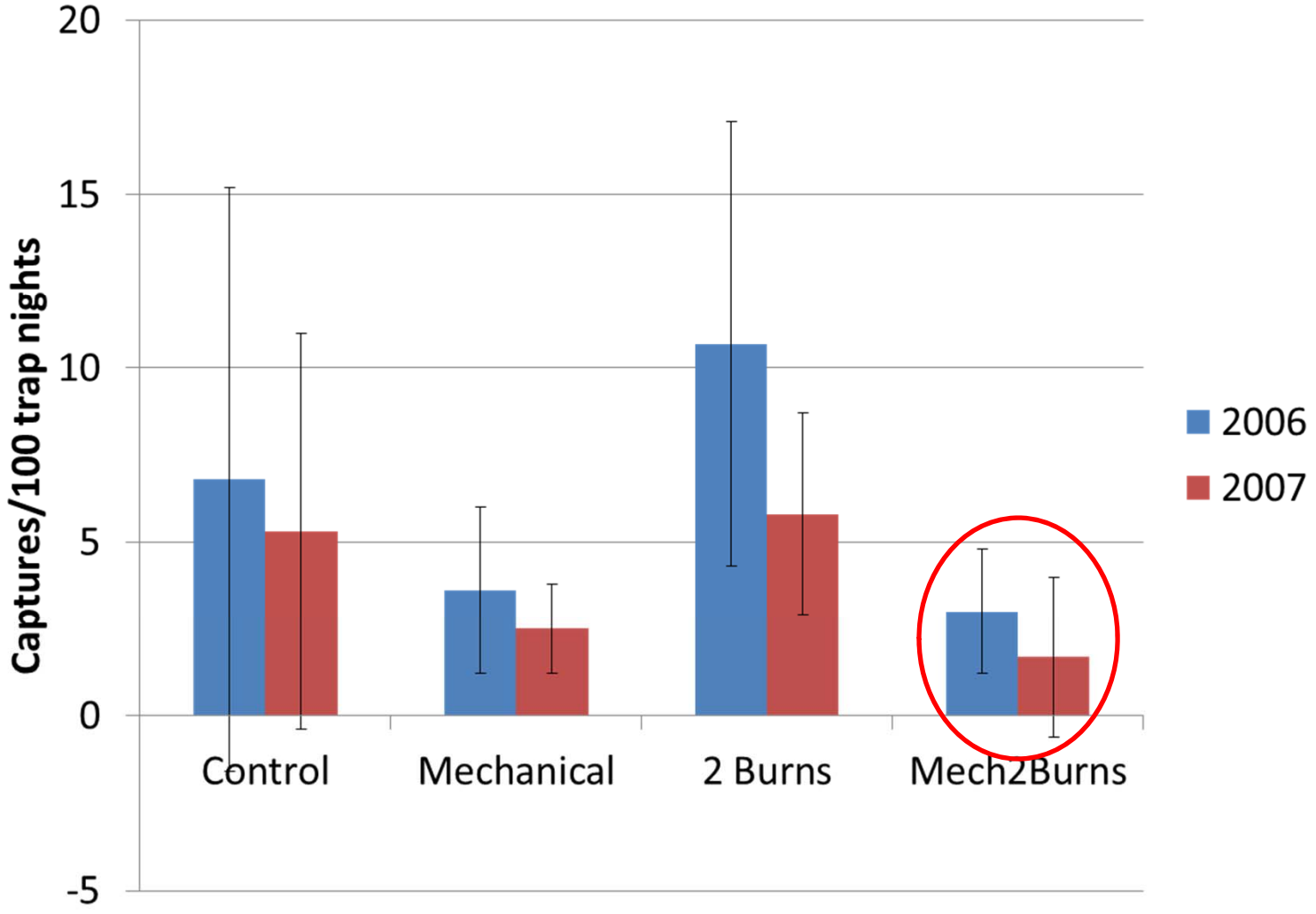


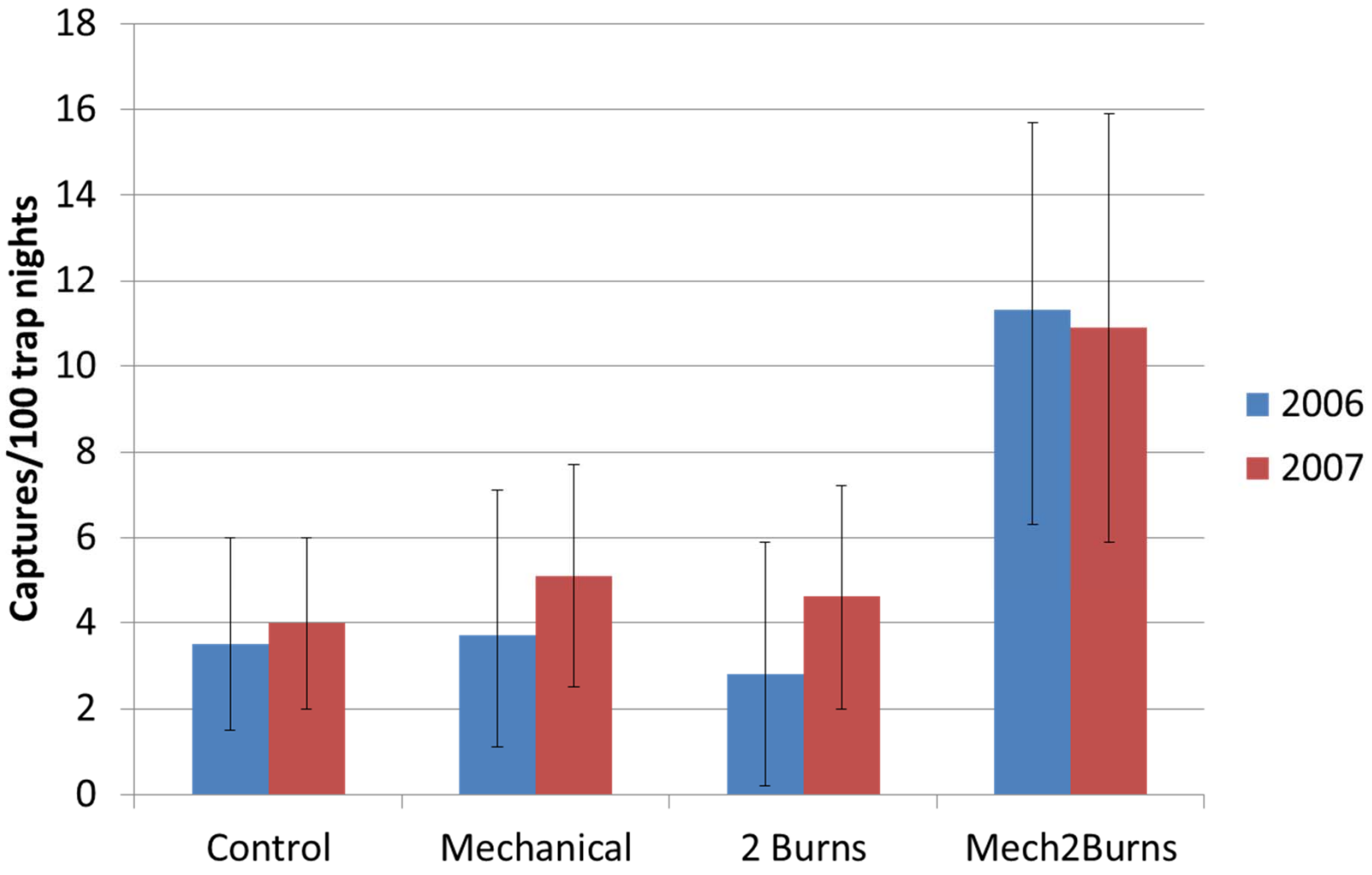
Salamander Response



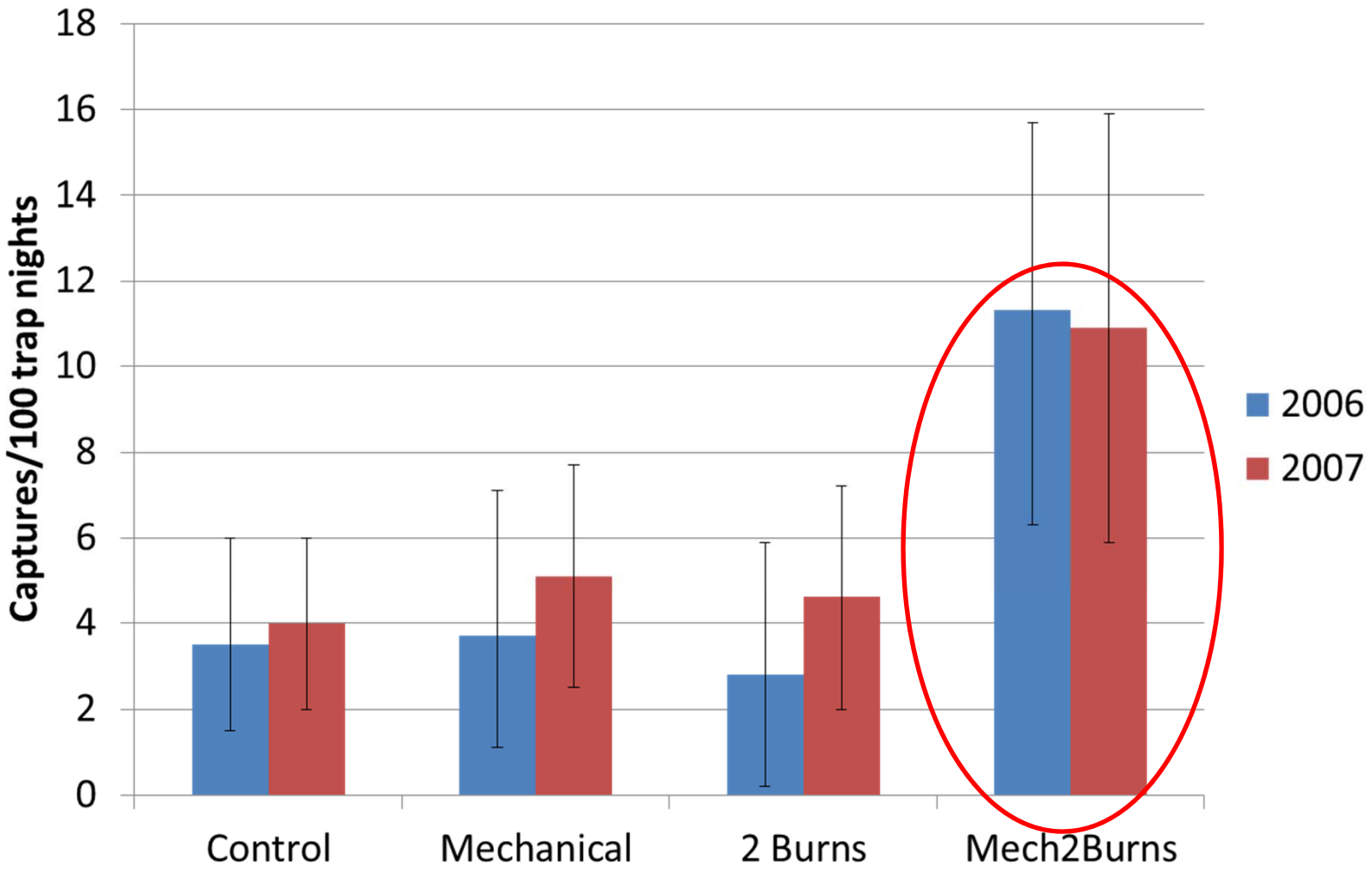
Salamander Response



Lizard Response



Lizard Response



Change in Habitat (2006)

- **Leaf litter depth lower in 2B & M+2B**
- **Duff depth lower in M+2B**
- **Canopy cover lower in M+2B**
- **Down woody debris not different**
- **Arthropods not different**

Conservation Implications

- **Fires that reduce overstory likely to:**
  - **negatively affect salamanders**
  - **benefit lizards and other reptiles**
- **Effects of low intensity fires limited and short term**
  - **negatively affect some shrews, temporarily**
  - **indications of salamander increase after fires related to detectability?**
- **Longer-term studies needed**

Effects of Growing-season Fire on Wild Turkey Nest Survival

Eric Kilburg's MS Thesis
Collaborators: Chris DePerno, Craig Harper, David Cobb

Growing-season Fire and Turkeys

Potential Benefits

- Greater visibility
- Spring/summer forage
- Brood cover

Potential Disadvantages

- Nest destruction
- Nesting cover reduction
- Poult mortality
- Temporary forage reduction

Growing-season Fire and Turkeys

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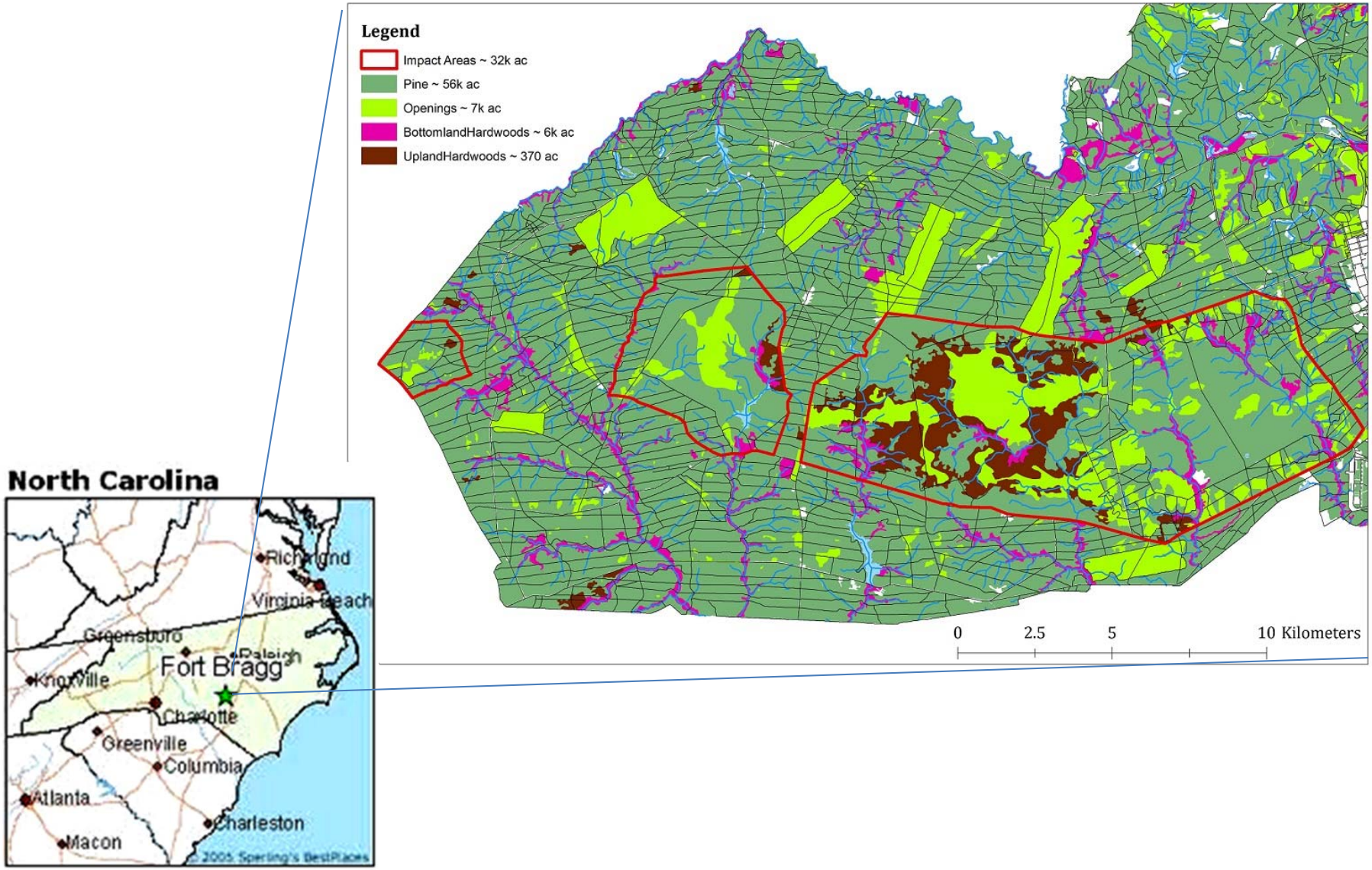
Fort Bragg


Legend
Impact Areas ~ 32k ac
Pine ~ 56k ac
Openings ~ 7k ac
BottomlandHardwoods ~ 6k ac
UplandHardwoods ~ 370 ac
0
2.5
5
10 Kilometers
North Carolina
Richmond
Virginia Beach
Greensboro
Raleigh
Fort Bragg
Knoxville
Charlotte
Greenville
Columbia
Atlanta
Charleston
Macon
© 2005 Sperling's BestPlaces

Captured Hens (2011-2012)

GPS data logger

VHF transmitter

Nest Monitoring

- Located hens > 3x weekly
- Flagged stationary hens
- Determined fate from eggshells/ incubation duration

Nest Search Results

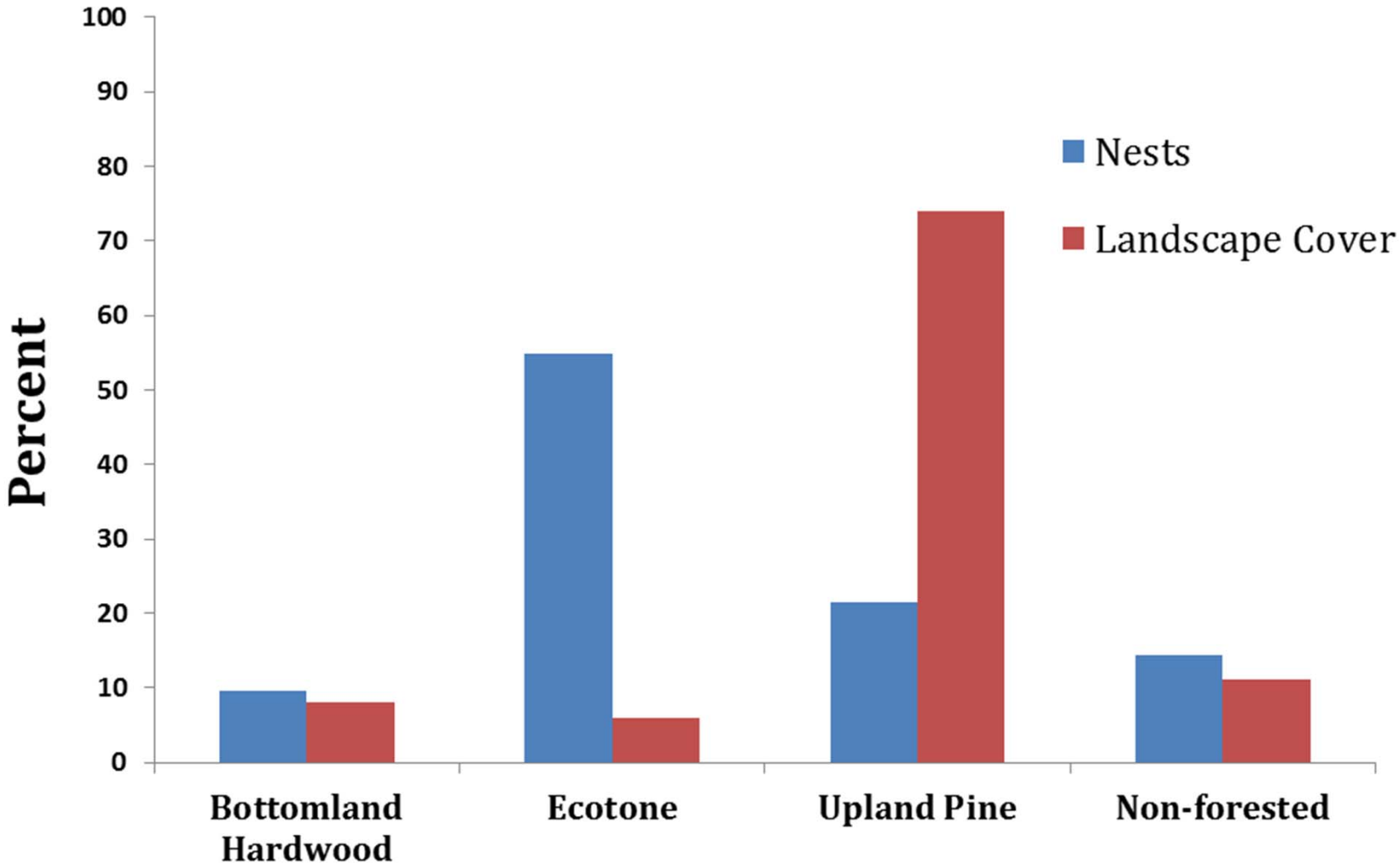
Radio-tagged 65 hens

Located 42 nests on base

Monitored 30 nests for survival

- 1 nest destroyed by fire
- 1 nest abandoned (military activity)
- 16 nests depredated
- 12 nests hatched

Nest-site Selection (n=42)



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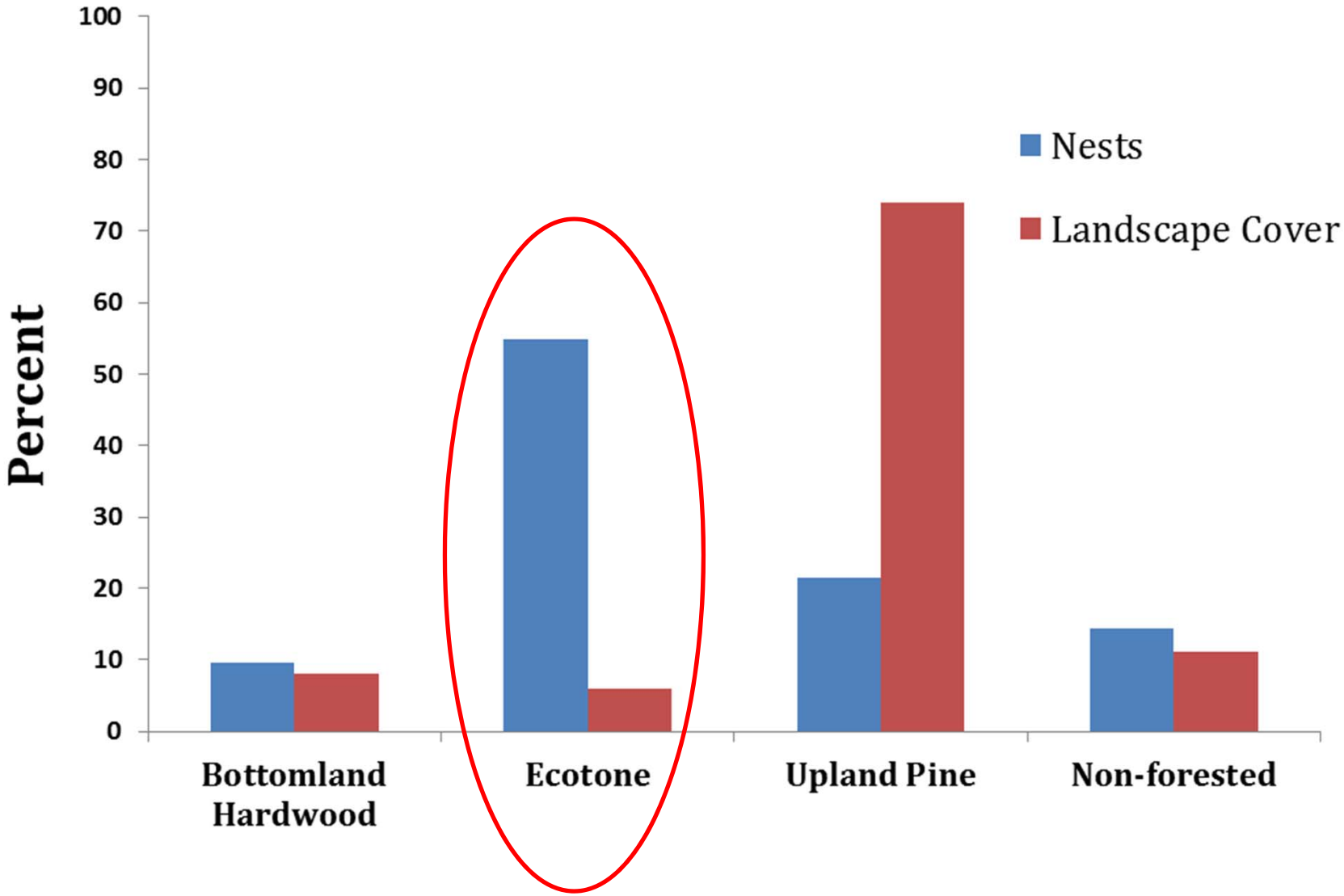

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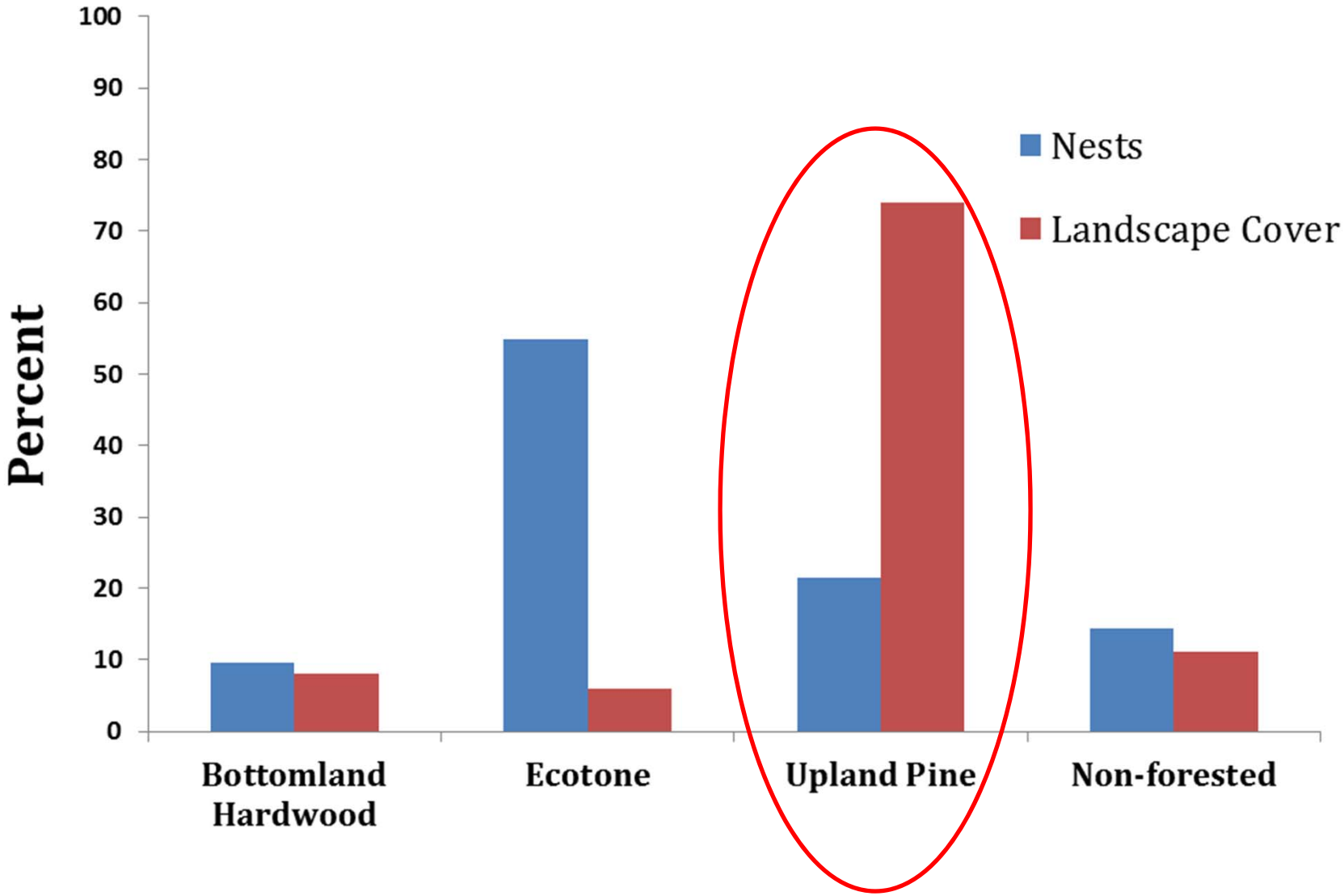
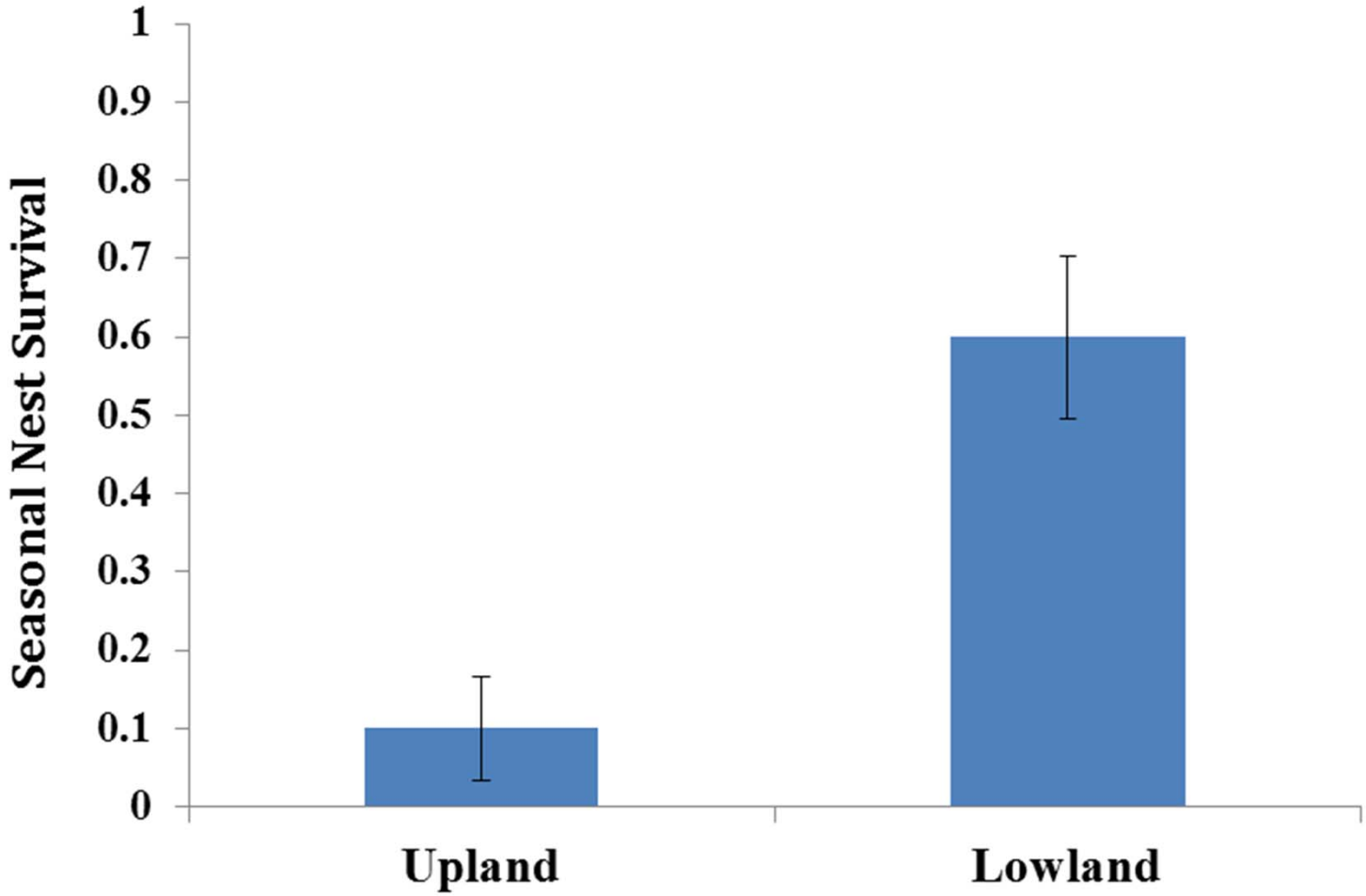
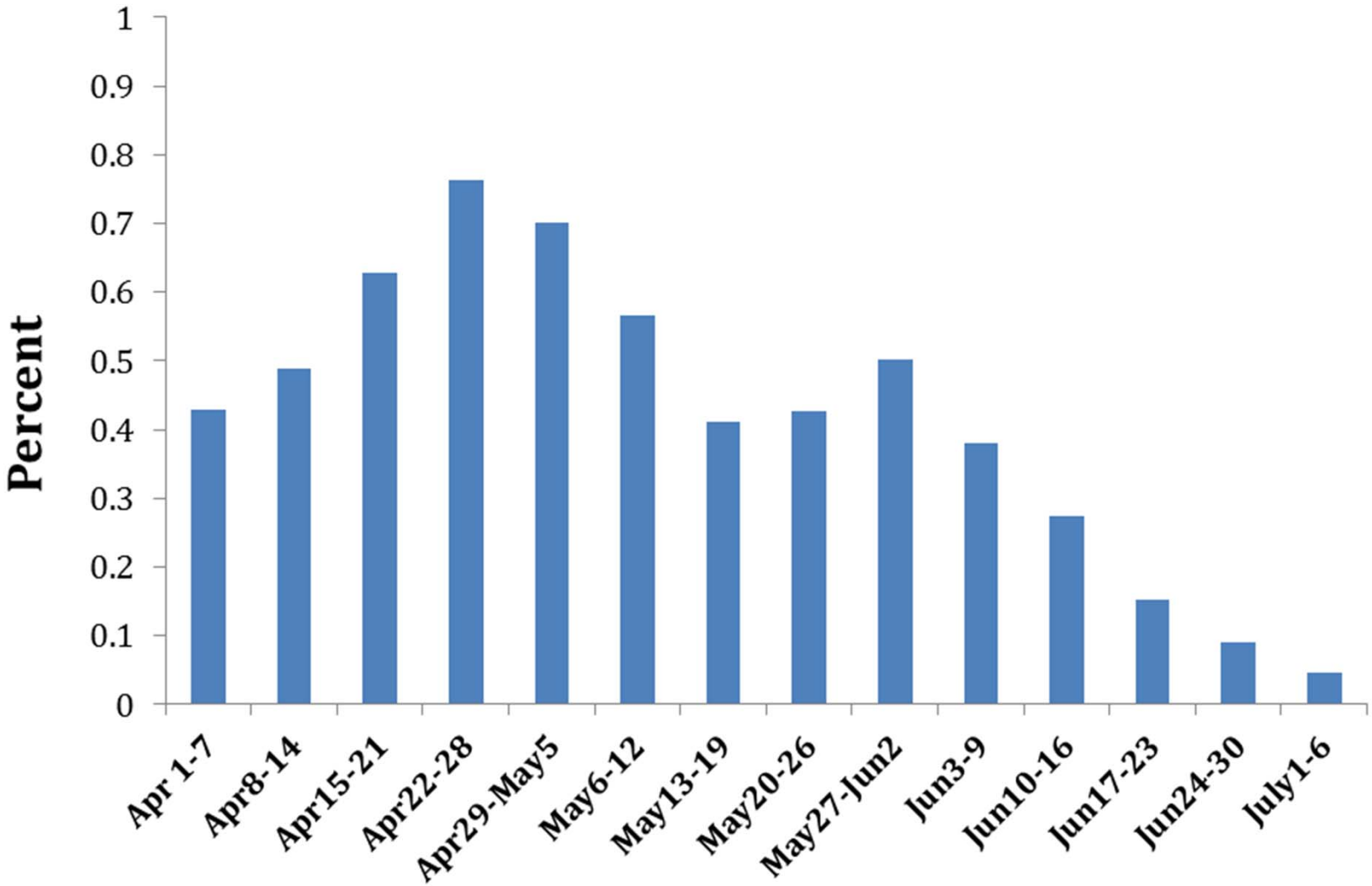


Nest Survival (n=30)



Fire Exposure (~6% of nests per year)



Summary and Implications

- 1 out of 30 nests destroyed by fire over 2 years
- Fire-maintained ecotones were important nest sites
- Less than 6% of nests exposed to fire each year

- Growing-season fire:
  - Has limited influence on nest survival
  - May increase nesting cover in lowlands/ecotones
  - May reduce nesting cover in uplands, especially on low productivity sites

- Dormant season fires may increase nesting cover in uplands

Effects of Fire Season and Frequency on Food Availability

Marcus Lashley PhD Research
Collaborators: Chris DePerno, Craig Harper

What We Wanted to Know

- Effects of fire season on deer forage availability
- Effects of fire season on fruit abundance
- Effects of time since fire on understory fruit abundance
- Long-term effects of fire application on distribution of acorn availability

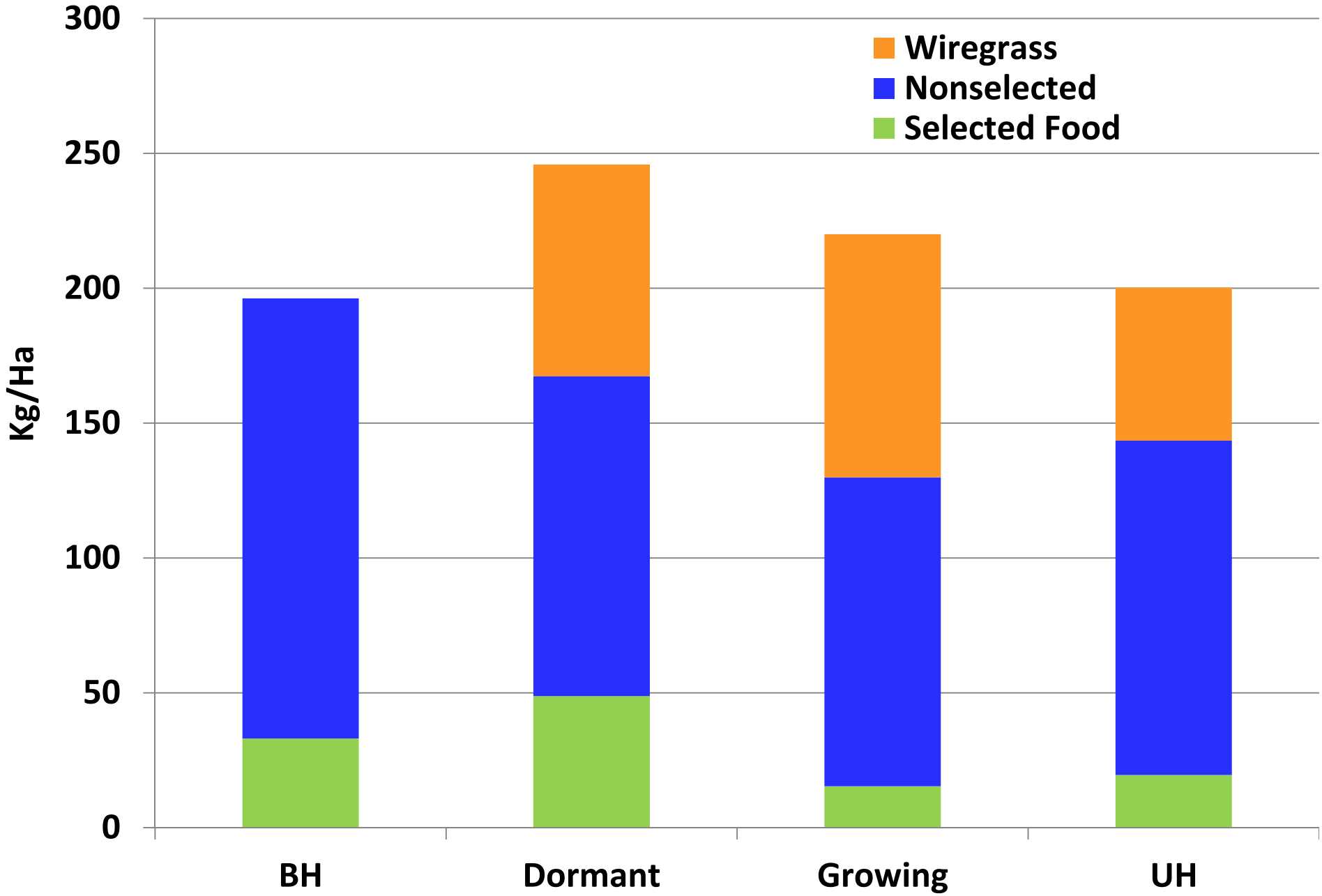
Study Design

- Upland Hardwood
- Bottomland Hardwood
- Upland Pine
  - Following >2 dormant-season fires
  - Following >2 growing-season fires (April-August)
    - Same year as fire
    - 1 year since fire
    - 2 years since fire

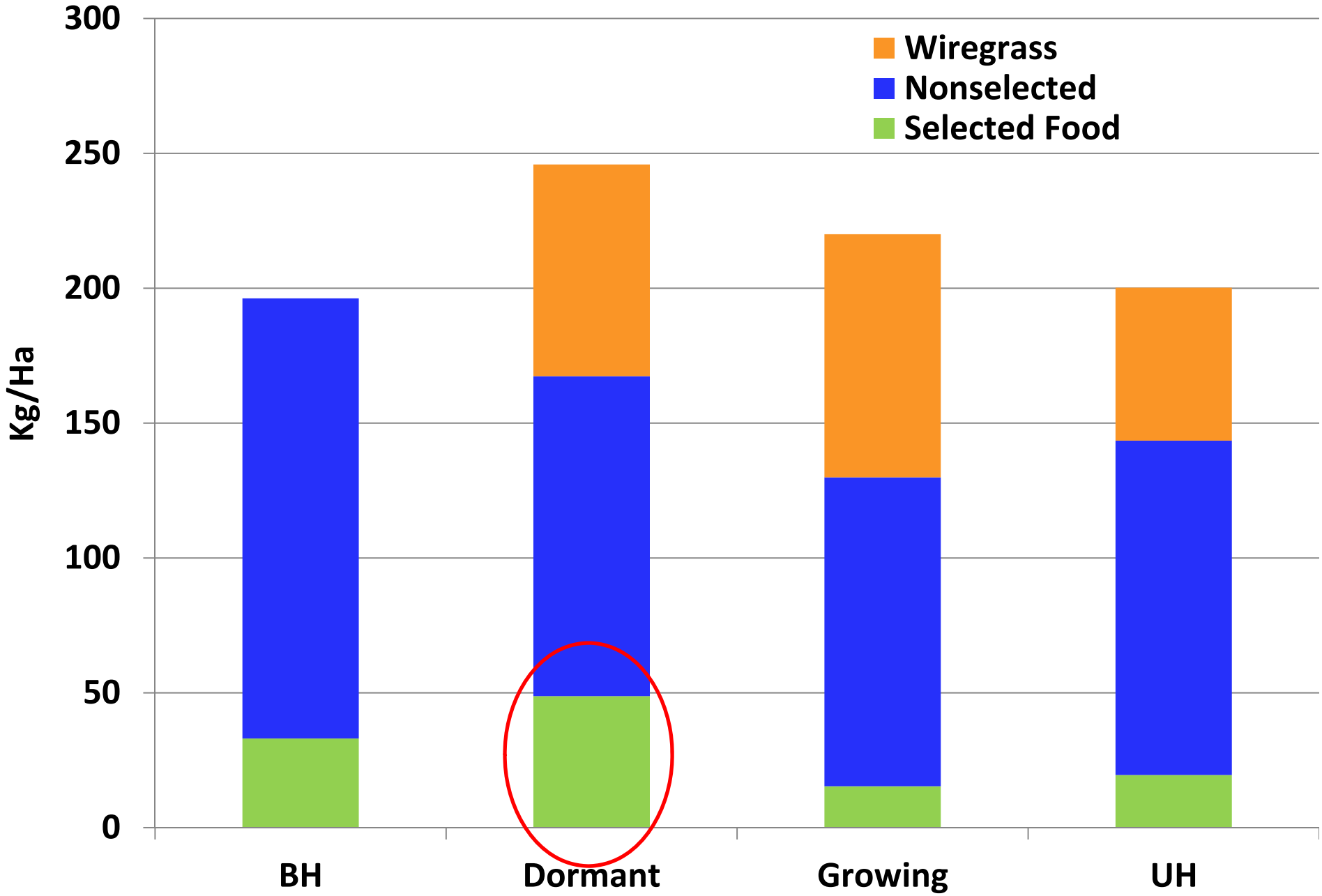
How We Measured Food

- **Biomass of deer forage in exclusion cages**
- **Understory fruits measured along transects**
- **Acorn (and persimmon) transects**

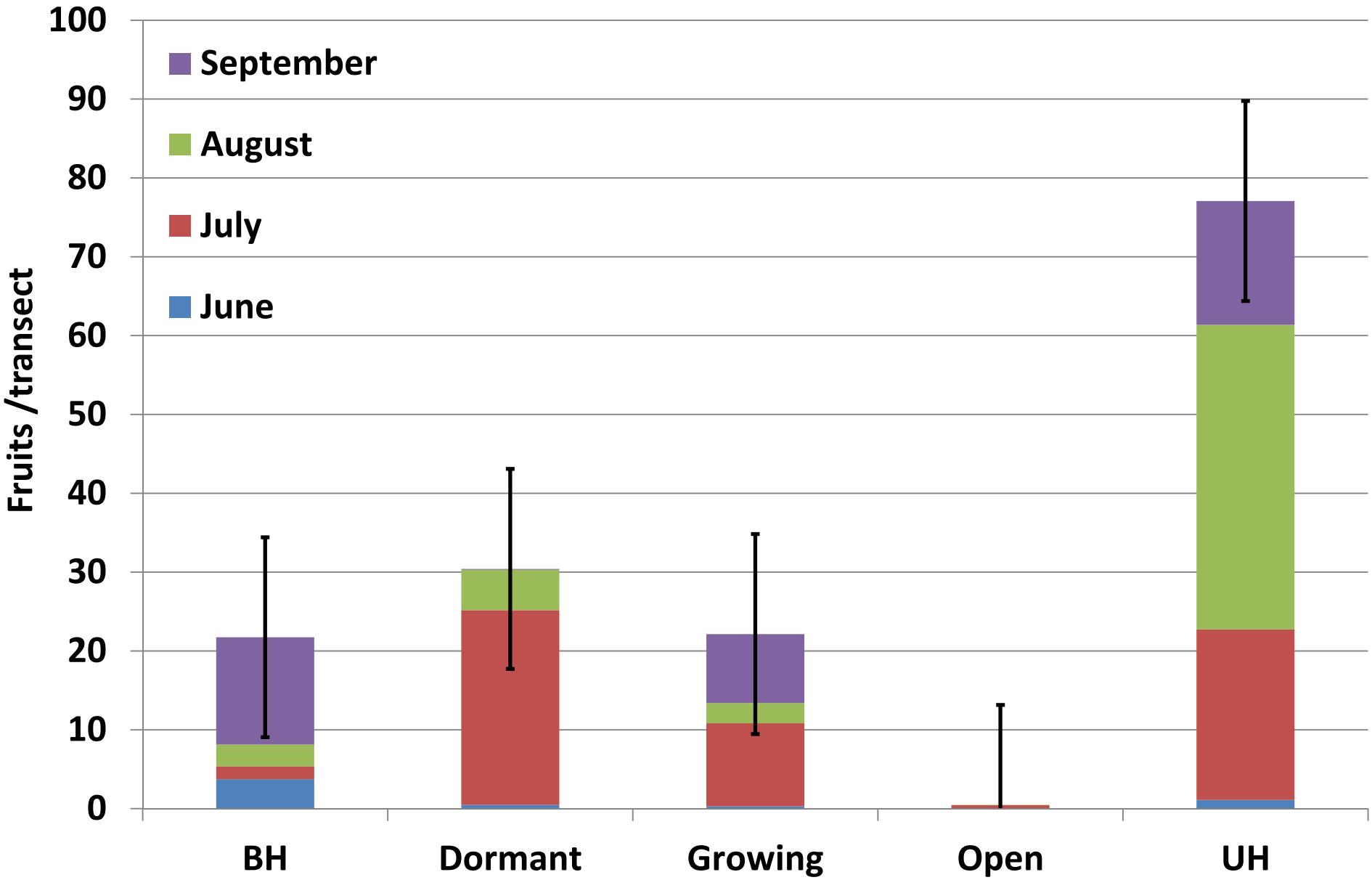
Deer Forage Available



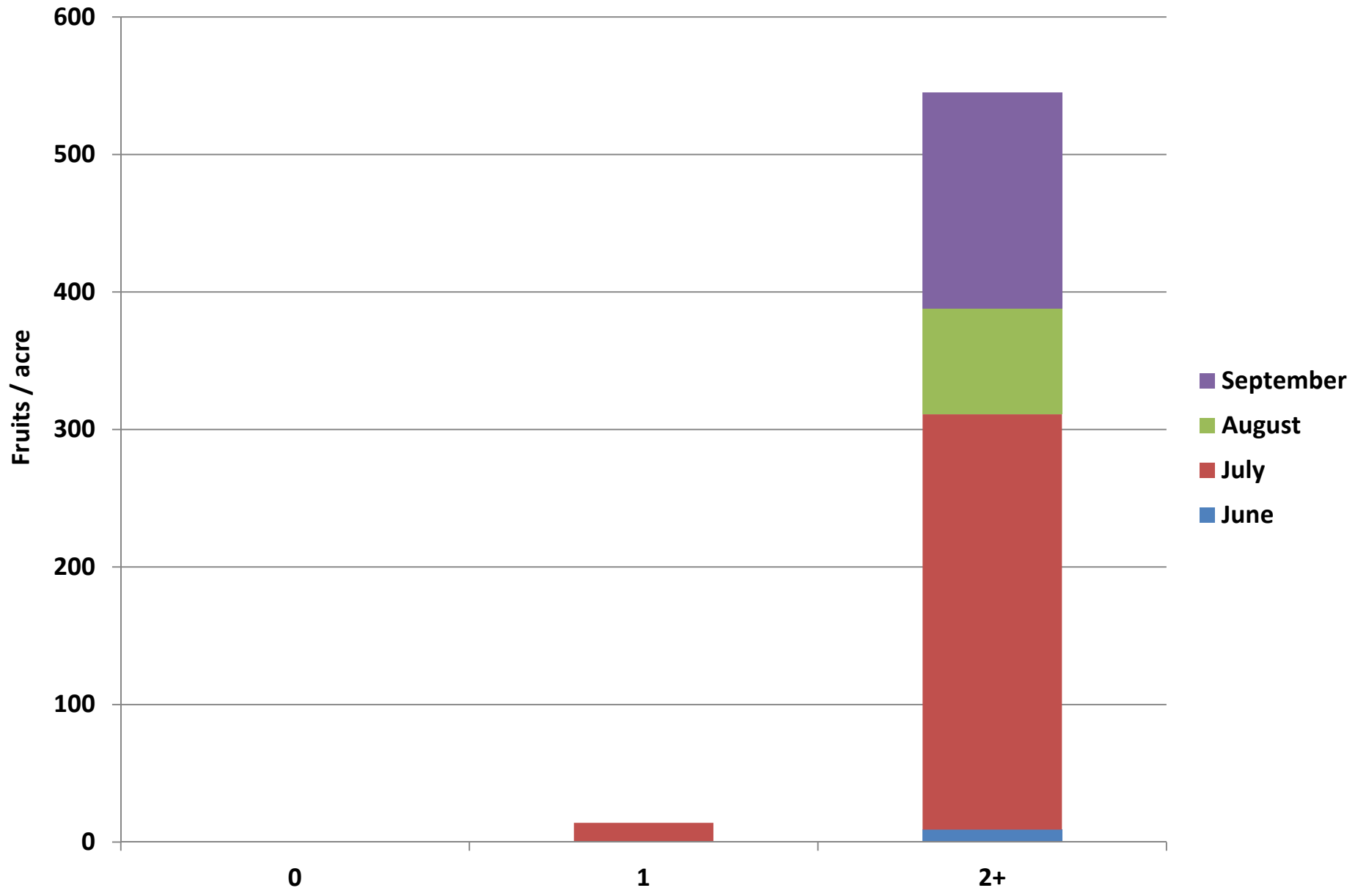
Deer Forage Available

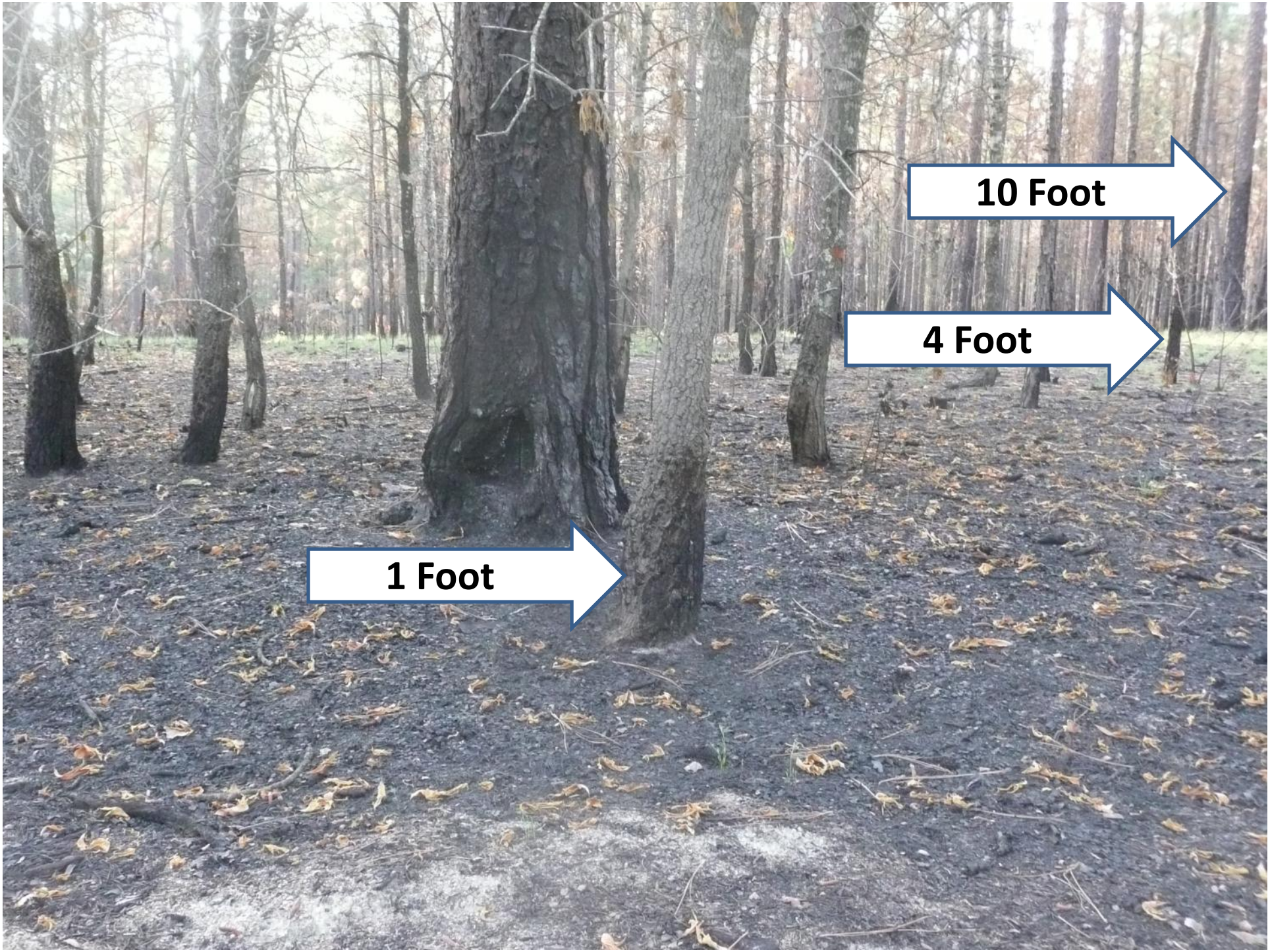


Soft Mast (By Cover Type)

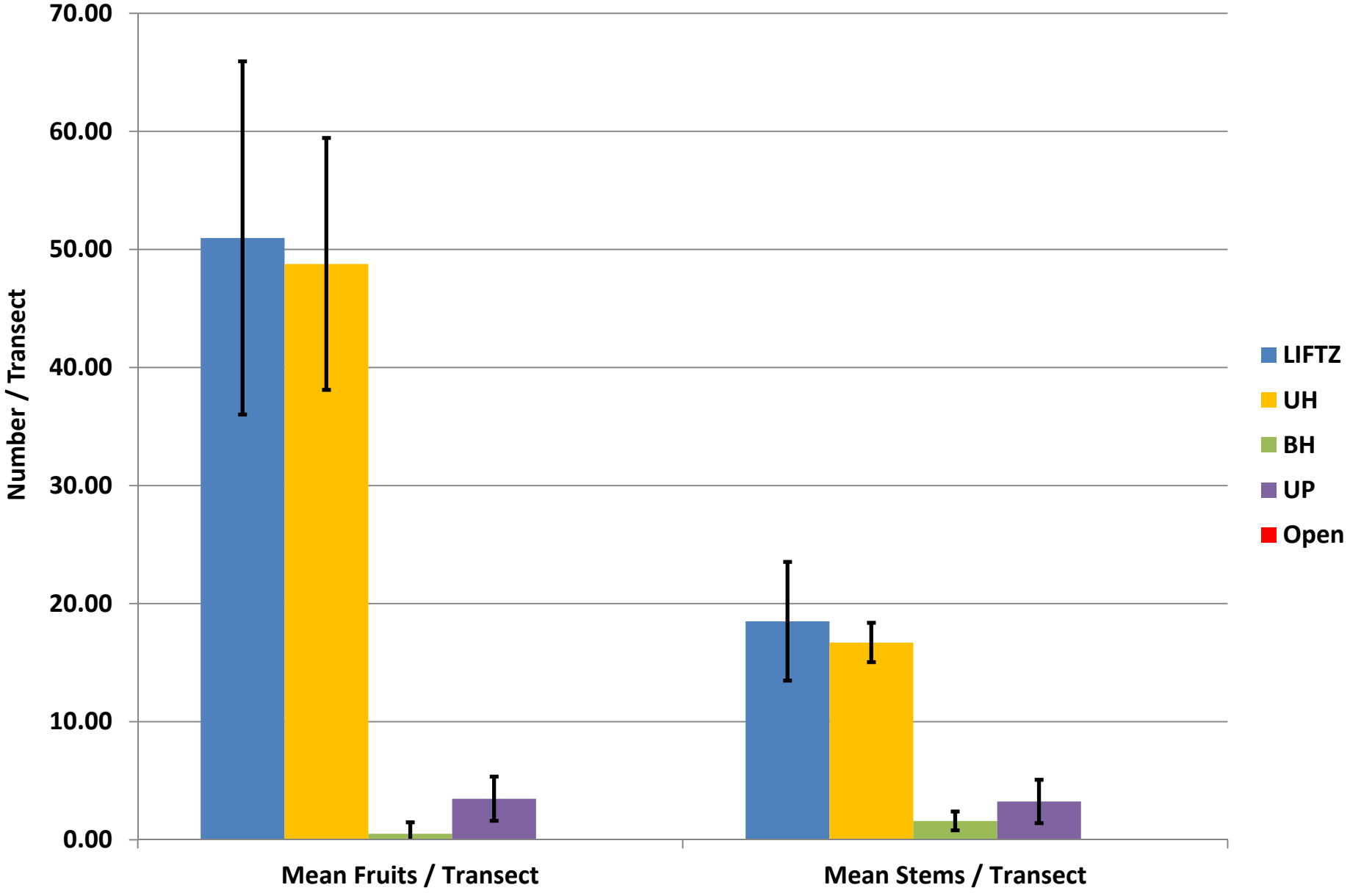


Soft Mast in Pines (Years Since Burned)

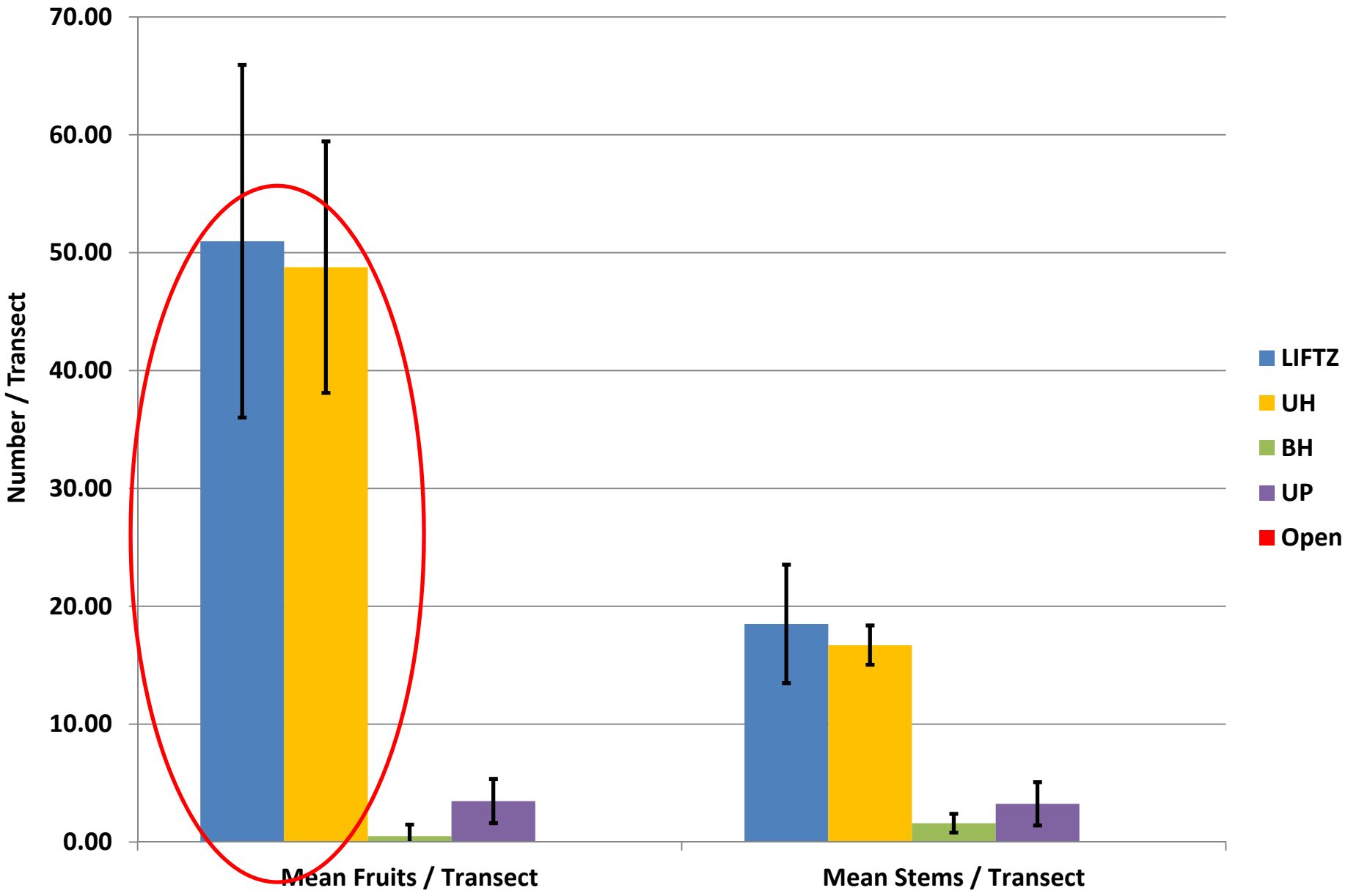



10 Foot
4 Foot
1 Foot

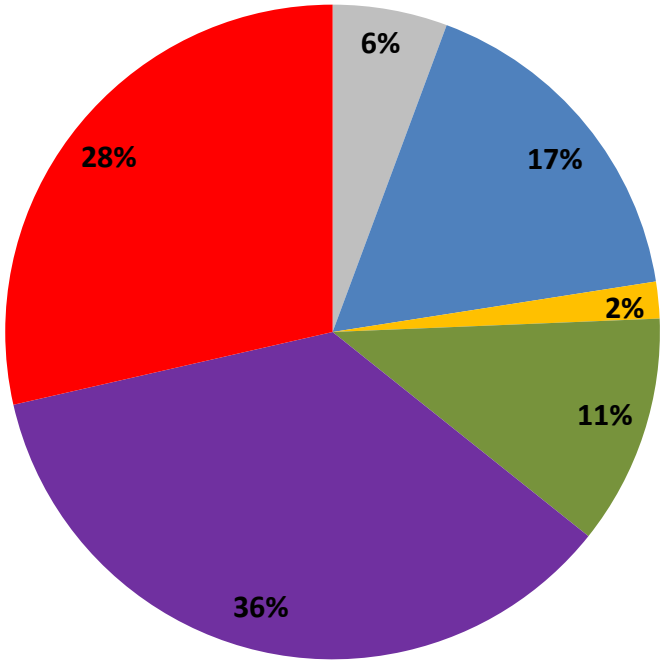
Acorns and Persimmons



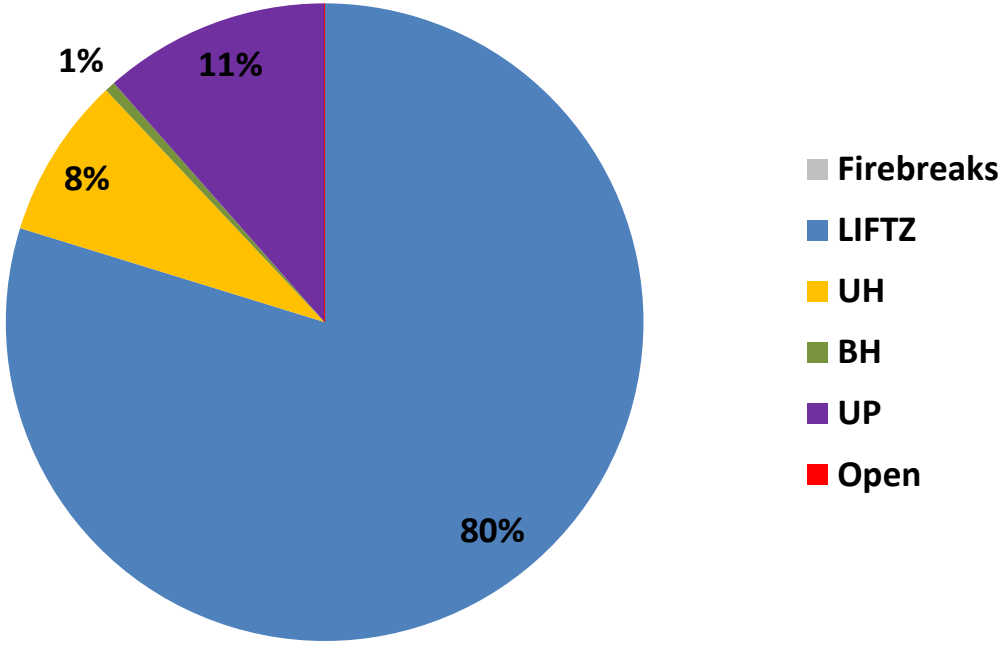
Acorns and Persimmons



Relative Land Area



Acorn/Persimmon Abundance



Conservation Implications

- **Include dormant-season fires to maintain:**
  - **Forage and cover for deer**
  - **Wider diversity of soft mast**
- **Longer return intervals (>2 years) needed to maintain soft mast production**
- **Include strategies to protect oaks/hardwoods**

Summary Themes

- Define target species when predicting fire effects
- Effects of prescribed burning vary with time
  - After a single fire
  - After additive effects of repeated fires
- Behavioral adaptations allow coexistence with fire
- Consider historical fire occurrence
- Heterogeneous fire application is encouraged
  - Variable fire seasons
  - Variable return intervals within and among stands

Acknowledgments

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DEPARTMENT OF AGRICULTURE

NORTH CAROLINA
Wildlife
RESOURCES COMMISSION

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