

# Above-ground trap efficacy and carcass competition ecology in the American burying beetle (*Nicrophorus americanus*)

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USF&WS ABB SCIENCE MEETING, 23 OCT 2014

Above-ground trap efficacy and carcass competition ecology in the American burying beetle  
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Abstract

During 2014 field surveys to monitor American burying beetle (ABB) abundance and distribution at The Nature Conservancy's Tallgrass Prairie Preserve (TPP) in Osage County, and the Muddy Boggy ABB Conservation Bank (MBCB) in Pontotoc County, Oklahoma, we addressed two questions of applied importance in the management of this endangered species: 1) Do ABB above-ground traps (used since 2012) exhibit the same trapping performance as in-ground techniques? And 2) Is the strength of competition for carcass resources similar across habitats (forest vs. grasslands)? We posed the first question due to declining ABB capture records at the TPP, and observations of ABBs laying quiescent outside above-ground traps. We addressed the second question to understand the strength and structure of carcass competition that ABBs encounter in the field, and because visibility and evidence of vertebrate and invertebrate competitors have been seemingly reduced by the adoption of above-ground traps. To address question #1, we fitted above-ground traps with in-ground pitfall bases beneath the traps to assess how many ABBs and other burying beetles were attracted to the bait, but did not end up in the above-ground bucket trap. We also tested the influence of trap cover size on trap-rates by comparing the effectiveness of traps with standard 16"x 24" trap tops to those with larger 24"x24" trap covers. We found that above-ground traps slightly underestimated ABB and burying beetle abundances by 3-4% overall; we only observed false negatives in 2.5% of trapping efforts, however. We did find a significant difference in trapping rates between the two trap types, with the traps constructed with a larger cover trapping higher numbers of beetles. In addressing question #2, we recorded invertebrate competitors collected in ABB traps, and documented vertebrate trap visitation using motion-activated camera traps positioned at each ABB trap. We used presence at the trap as a proxy for direct competition, and compared competition between a grassland site (TPP) and forested site (MBCB). We found comparable rates of Nicrophorine competition for carcasses between the two habitats, but significantly higher competition in grasslands when examining non-Nicrophorine carrion beetle abundances. We found no difference in vertebrate scavenger visitation to traps between habitats, with similar observed abundance values but different scavenger assemblages. The most common competitor for carcasses in both habitats were turkey and black buzzards.

# ABB Research Agenda

Conduct annual surveys at TNC properties

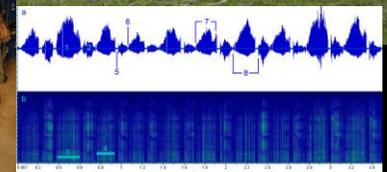
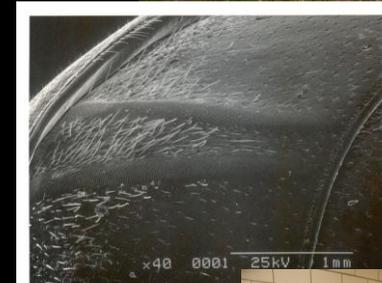
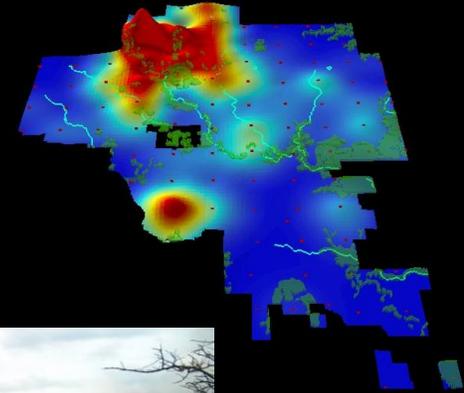
- Tallgrass Prairie Preserve (Osage County)
- Pontotoc Ridge (Johnson & Atoka Counties)
- Cucumber Creek (LeFlore County)
- Nichols Preserve (Cherokee County)

Muddy Boggy Conservation Bank (Pontotoc, Hughes, Coal Counties)

Partnerships with Cherokee and Osage Nations

Field and laboratory investigations

Integrated studies of behavioral ecology, natural disturbance ecology, community ecology, environmental ecology, HIREC



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Conduct annual surveys at TNC properties

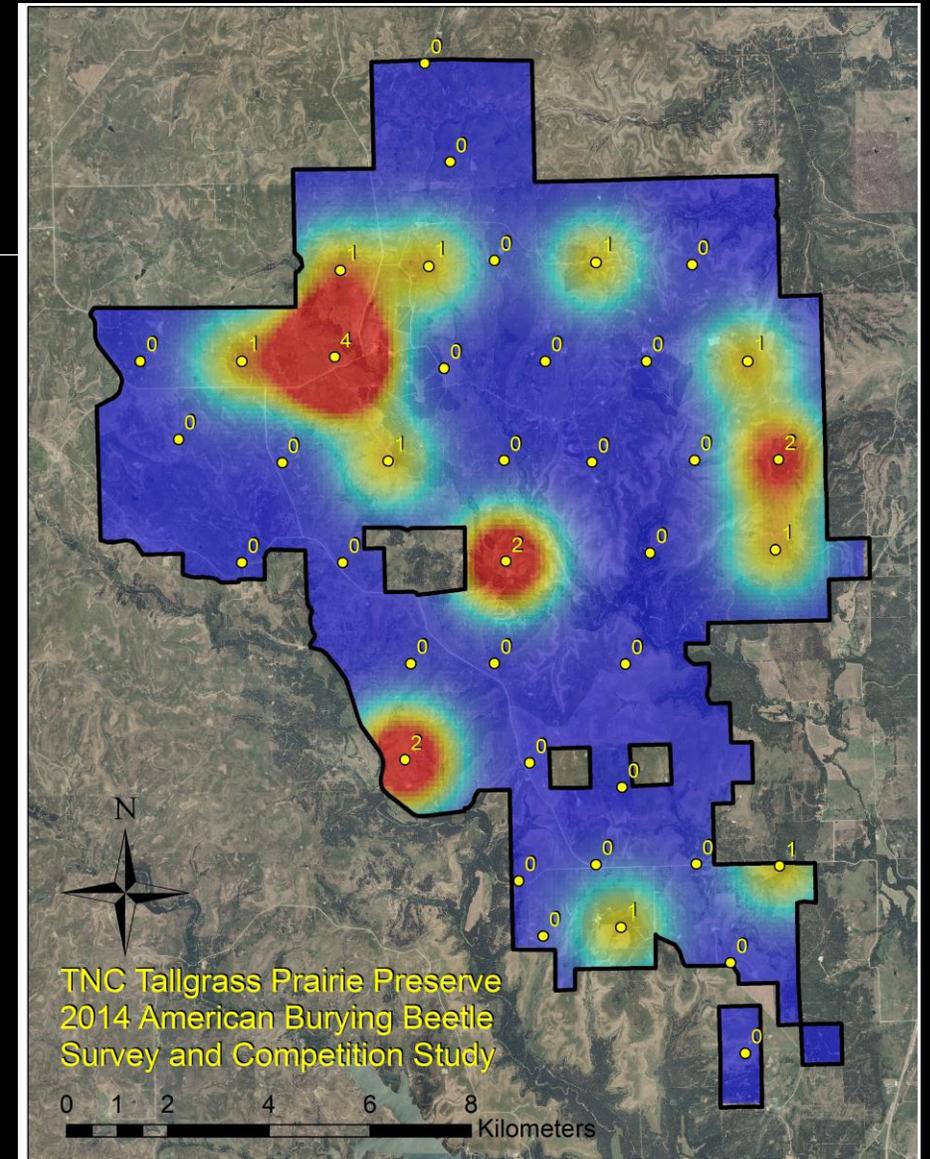
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# 2014 Field Study Questions

1. Do ABB above-ground traps (used since 2012) exhibit the same trapping performance as in-ground techniques?

- Declining abundance records at TPP
- ABBs quiescent outside traps on checking

2. Is the strength of competition for carcass resources similar across habitats (forest vs. grasslands)?

- Documentation of vertebrate and invertebrate competitors reduced by use of above-ground traps



# Above-ground trap efficacy

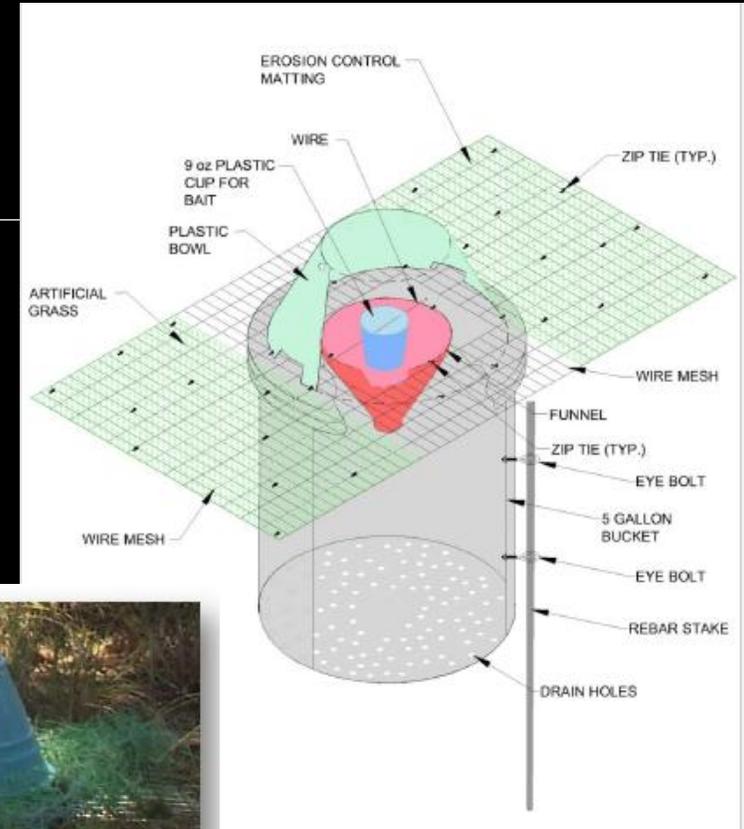
Above ground bucket traps tested by Doug Leasure (Leasure et al 2012) and adopted by the USFWS.

Field study indicated comparable trapping rates to in-ground techniques

- 8 cup transects

Increased sampling efficiency

Adopted extensively by permittees



Appendix C  
Instructions for Building Above  
Ground Bucket Traps for American  
Burying Beetles (*Nicrophorus  
americanus*) Doug Leasure, David  
Rupe, Beth Phillips, Dustin Opine, &  
Gary Huxel

# Above-ground trap efficacy

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Integrated into sampling design at the Tallgrass Prairie Preserve annual ABB survey in 2012

Questions:

1. Do above-ground bucket traps underestimate ABB abundance?
2. Do above-ground bucket traps contribute to false negatives during ABB surveys?
3. Is cover size related to trapping performance?



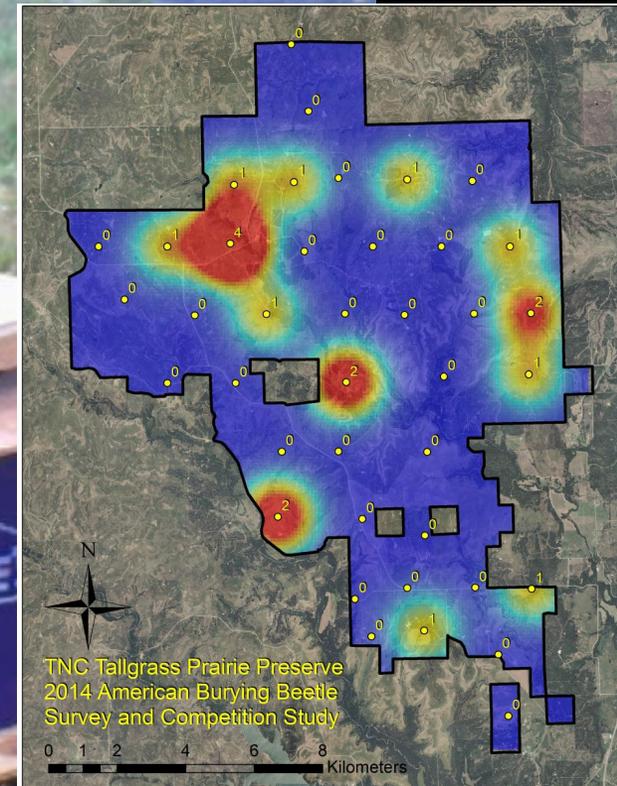
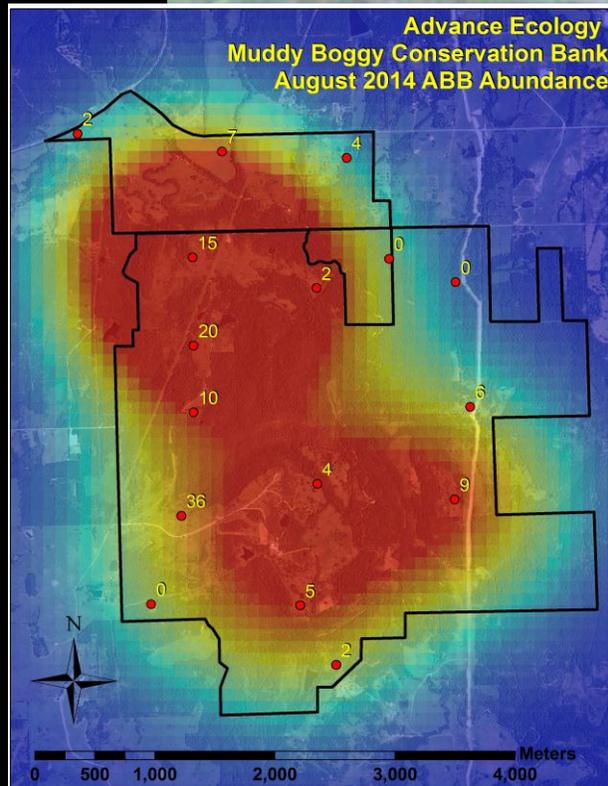
# Above-ground trap efficacy

## Methods:

1. Design and deploy above-ground traps with in-ground pitfall capture mechanism.
  - Observe underestimates; split captures
  - False negatives; ABBs trapped in-ground but none in bucket
2. Compare trapping rates between traps with standard size (24"x16") and larger (24"x24") trap covers (randomized site placement).

## Study sites:

1. Tallgrass Prairie Preserve, Osage County, OK (40 sites)
2. Muddy Boggy Conservation Bank, Pontotoc County, OK (16 sites)



# Above-ground trap efficacy

1. Do above-ground bucket traps underestimate ABB abundance?

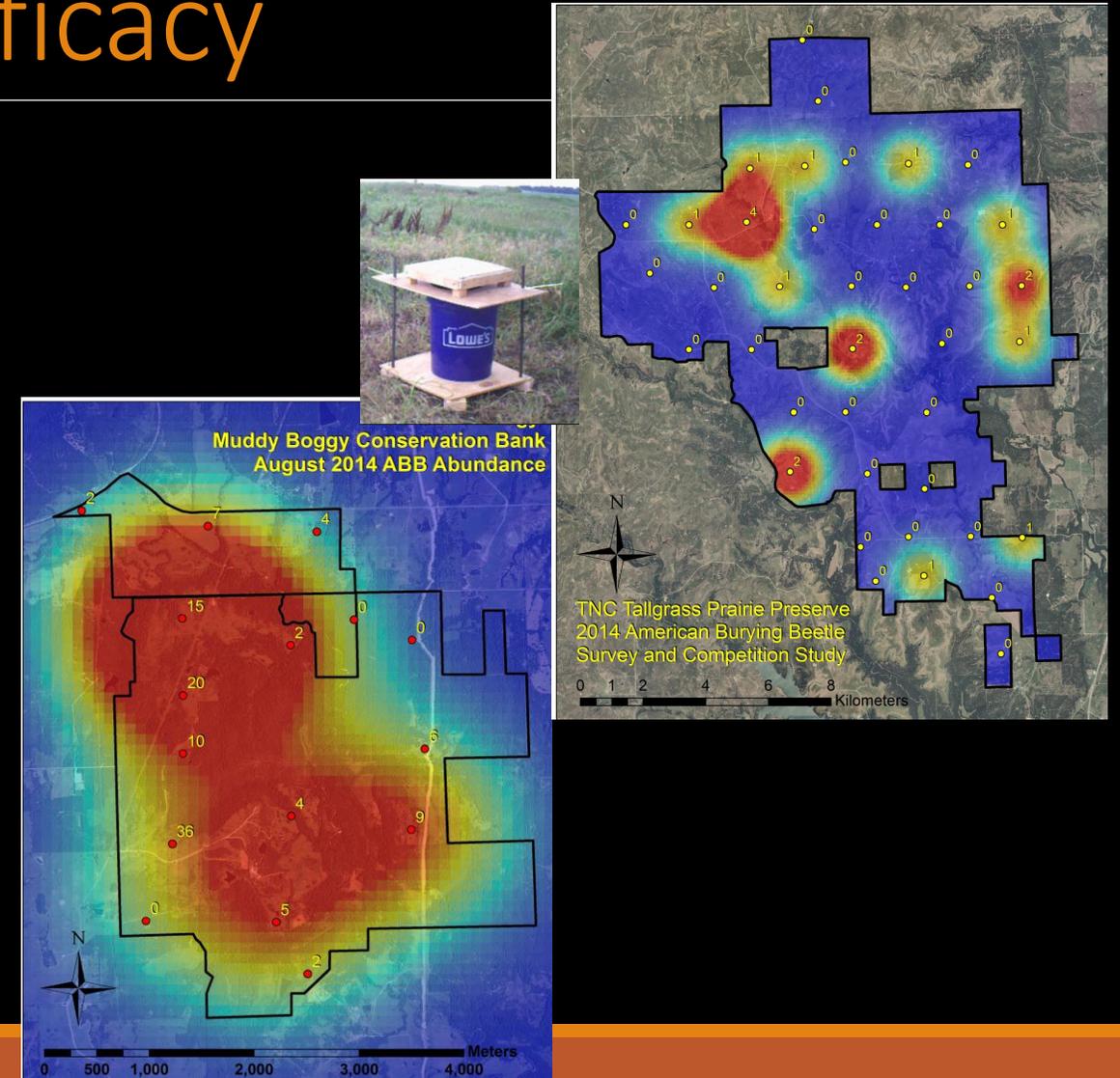
Examined by site over 5 nights of survey:

-1 of 40 of sites (2.5%) underestimated ABB abundance at TPP, where only 18 of 40 sites had presence (45%; low density site)

-4% underestimation of abundance

-3 of 16 sites (19%) of sites underestimated ABB numbers at MBCB, where 13 of 16 sites had presence (81%; high density site)

-3% underestimation of abundance

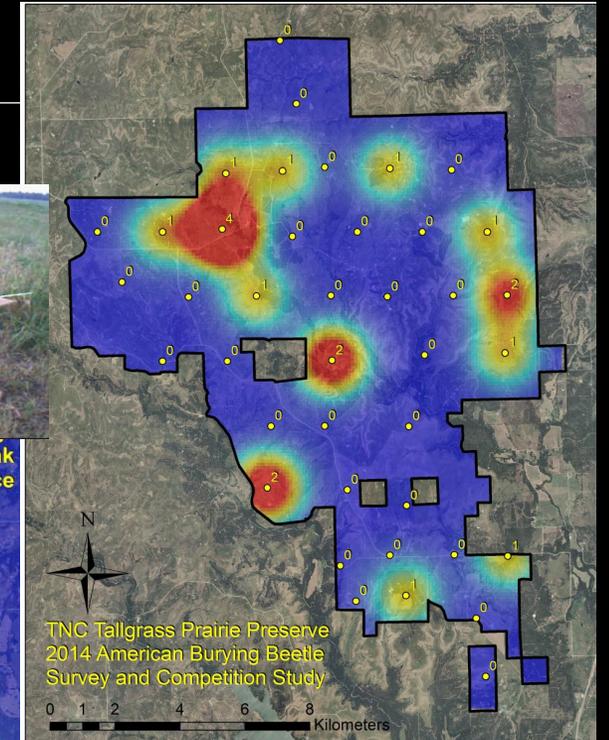
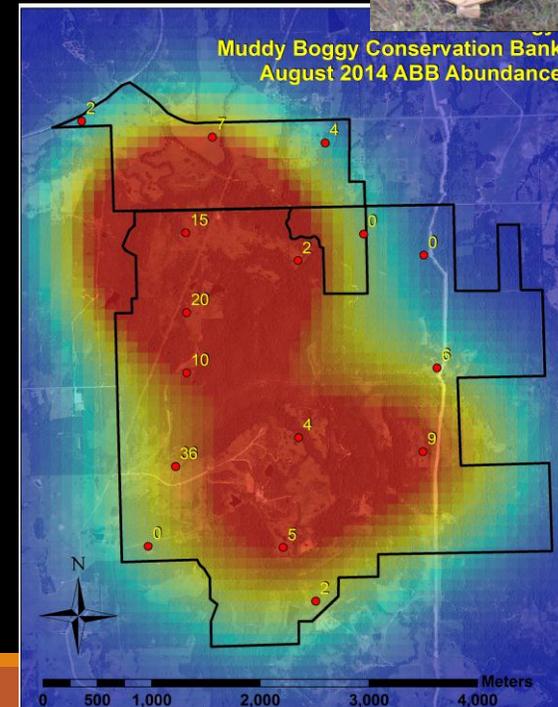


# Above-ground trap efficacy

2. Do above-ground bucket traps contribute to false negatives during ABB surveys?

-1 of 40 of sites (2.5%) exhibited a false negative at the TPP (low density site)

-no sites at MBCB exhibited false negatives (high density site)



# Above-ground trap efficacy

3. Is cover size related to trapping performance?

-examined trap performance between traps with standard (384 in.<sup>2</sup>) and large (576 in.<sup>2</sup>;+192 in.<sup>2</sup>) covers using two sample rank test .

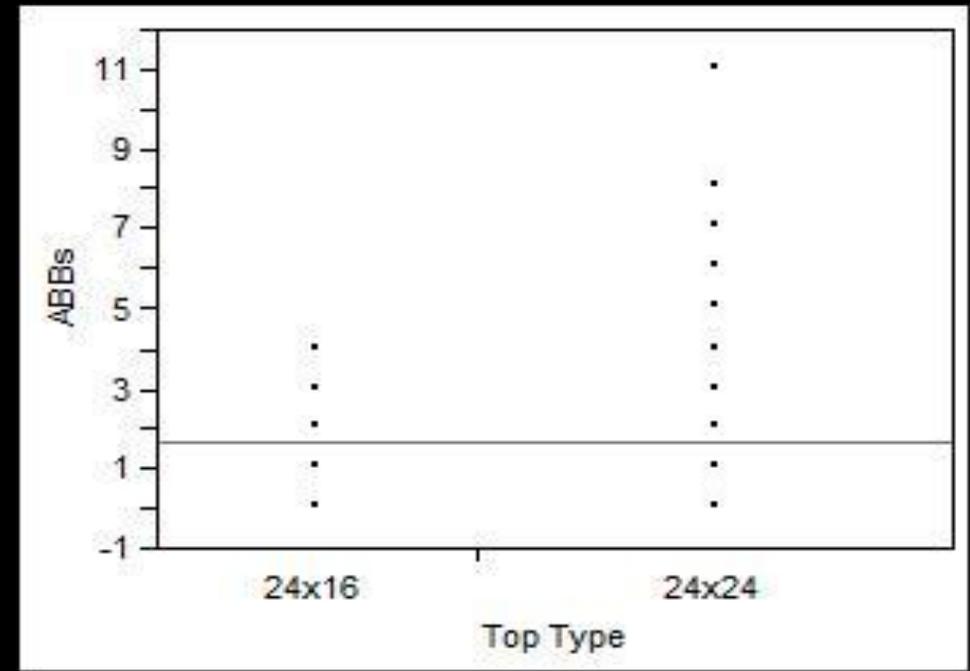
-Each trap night an independent event.

-Significant difference in trap performance.

-Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

1-way Test, ChiSquare Approximation

Chi Square	DF	Prob>ChiSq
5.3296	1	0.0210



# Competition for carrion resources

Competition for resources likely driving factor in the selection for most life history traits in ABBs and other Nicrophorine beetles (Darwin 1871)

With use of above-ground trap, reduction in competition visibility

- Vertebrates (scavenger-proof)
- Invertebrates (trap sampling bias)

Question: Is the strength of competition for carcass resources similar across habitats (forest vs. grasslands)?



# Competition for carrion resources

Question: Is the strength of competition for carcass resources similar across habitats (forest vs. grasslands)?

Methods:

- Record invertebrate competitors collected in ABB traps

- Record vertebrate trap visitation using camera traps positioned at each ABB trap

Use presence at trap as proxy for direct competition

Compare competition between grassland site (TPP) and forested site (MBCB)



# Competition for carrion resources

Invertebrate competition, grassland vs forest

-Microphorine competition – NS

Wilcoxon Rank Sum Test

1-way Test, ChiSquare Approximation

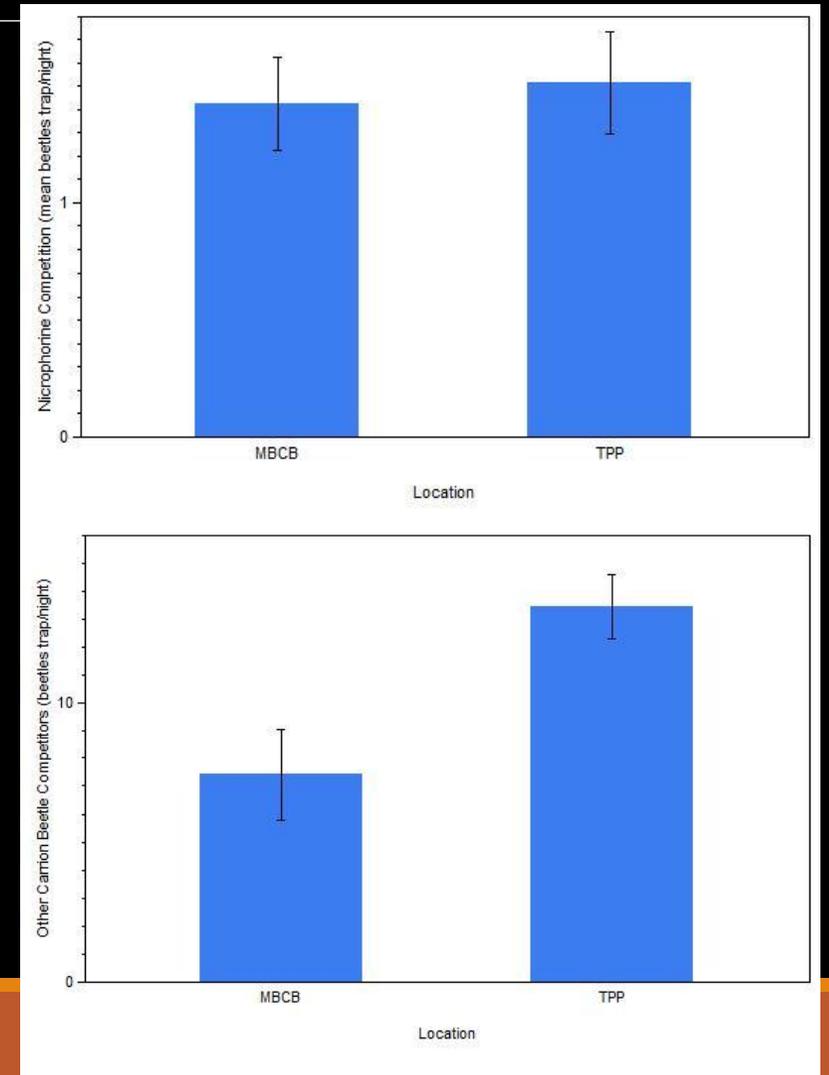
ChiSquare	DF	Prob>ChiSq
2.9379	1	0.0865

-Other carrion beetle fauna

Wilcoxon Rank Sum Test

1-way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
47.5335	1	<.0001



# Competition for carrion resources

Vertebrate competition - NS

Test	ChiSquare	Prob>ChiSq
Likelihood Ratio	1.562	0.2114
N	DF	
311	1	

No statistical difference in incidence of vertebrate visitation to traps similar between grasslands and forest

Most common competitor in both habitats:

- Black and Turkey Buzzards
- Opossum, raccoon, armadillo, coyote, feral dogs, shrews, bobcat

Similar abundance; different assemblages



# 2014 Field Study Questions

1. Do ABB above-ground traps (used since 2012) exhibit the same trapping performance as in-ground techniques?

- Minimal effect of false negatives and underestimation of abundance
- Significant performance effect of trap cover size

2. Is the strength of competition for carcass resources similar across habitats (forest vs. grasslands)?

- Invertebrate competition stronger in grasslands
- Similar vertebrate competition between grassland and forested habitats
- Different competitive assemblages



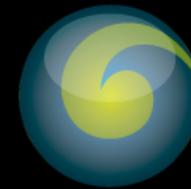
# Acknowledgements



The Nature  
Conservancy



Protecting nature. Preserving life.™



**ADVANCED  
ECOLOGY**

est. 1997

enhancing natural resource value

