

Impact of elephant carcasses on plant diversity in Kruger National Park

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Savanna Science Network Meeting

06 March 2025



Thank you!

Collaborators

- Michelle Budny
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- Tercia Strydom
- Novalee Sweeney
- Aimee Tallian
- Dave Thompson



National
Science
Foundation



National Research
Foundation

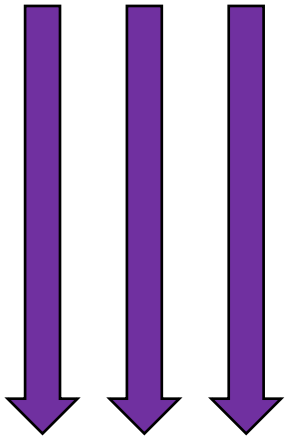
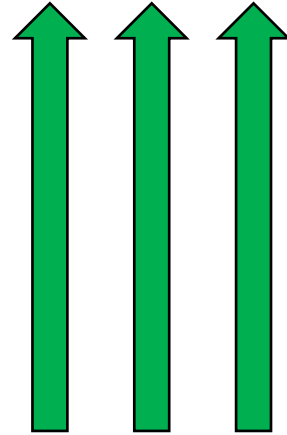
SAEON

South African Environmental
Observation Network



South African
NATIONAL PARKS

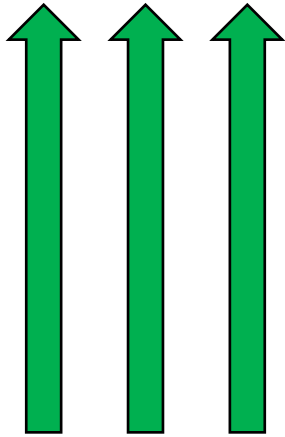
Savanna vegetation structure is determined by a mix of top-down and bottom-up forces.



The relative strengths of top-down and bottom-up forces determine the impacts of elephant carcasses on savanna vegetation structure.

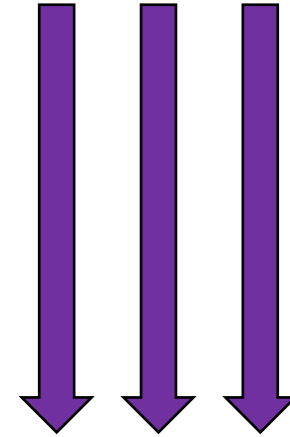


How do top-down and bottom-up forces modulate the impacts of elephant carcasses on savanna vegetation structure?



Alternative Hypothesis 1: Relatively stronger impacts of bottom-up forces

If some species of colonizing grass are better able to tolerate ammonium and/or use nutrients, then they will dominate in the resource-enriched carcass sites, resulting in biodiversity “coldspots” on the savanna.



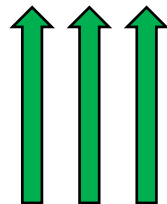
Alternative Hypothesis 2: Relatively stronger impacts of top-down forces

If herbivory is strong enough to disrupt establishment of dominant plants, then greater nutrient availability will enable greater plant species richness, resulting in biodiversity “hotspots” on the savanna.

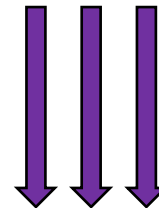
Objectives

1. Quantify the magnitude of nutrient inputs from elephant carcasses into savanna soils and plants.
2. Determine the impacts of elephant carcasses on plant diversity.
3. Test two potential mechanisms driving patterns of plant diversity:

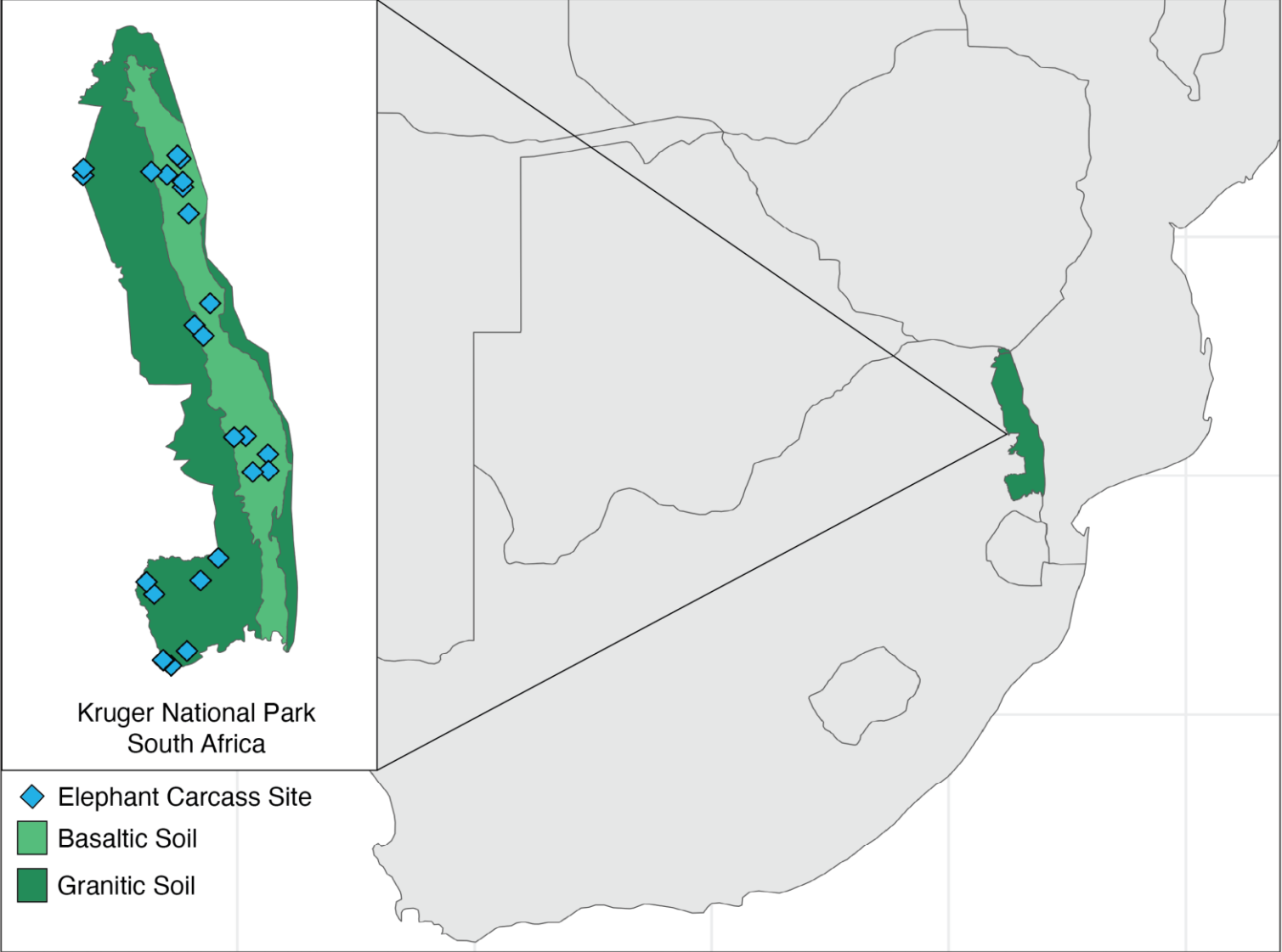
Ammonium tolerance

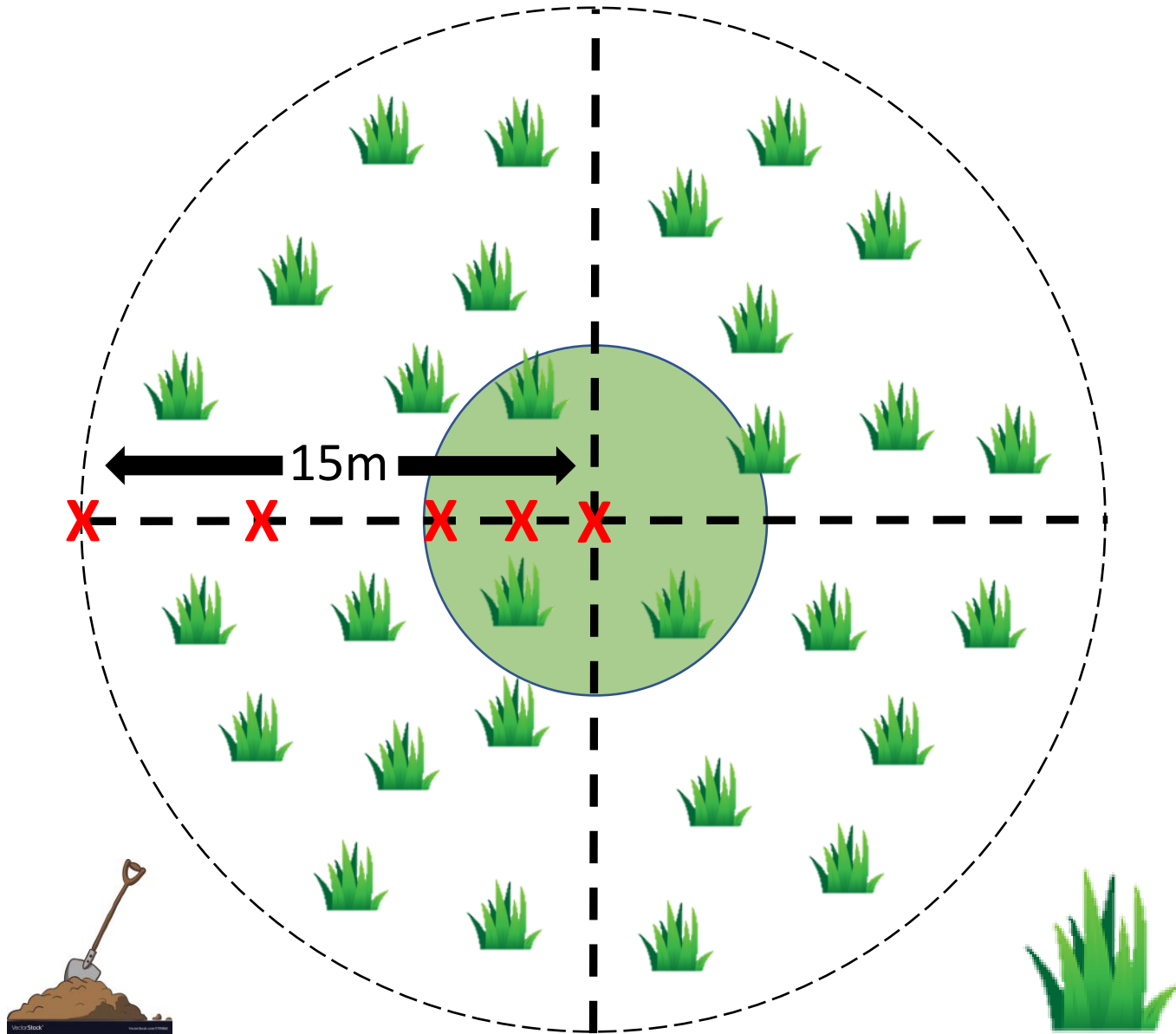


Herbivory



27 elephant carcass sites | 0-7 years postmortem

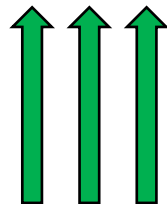




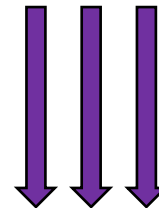
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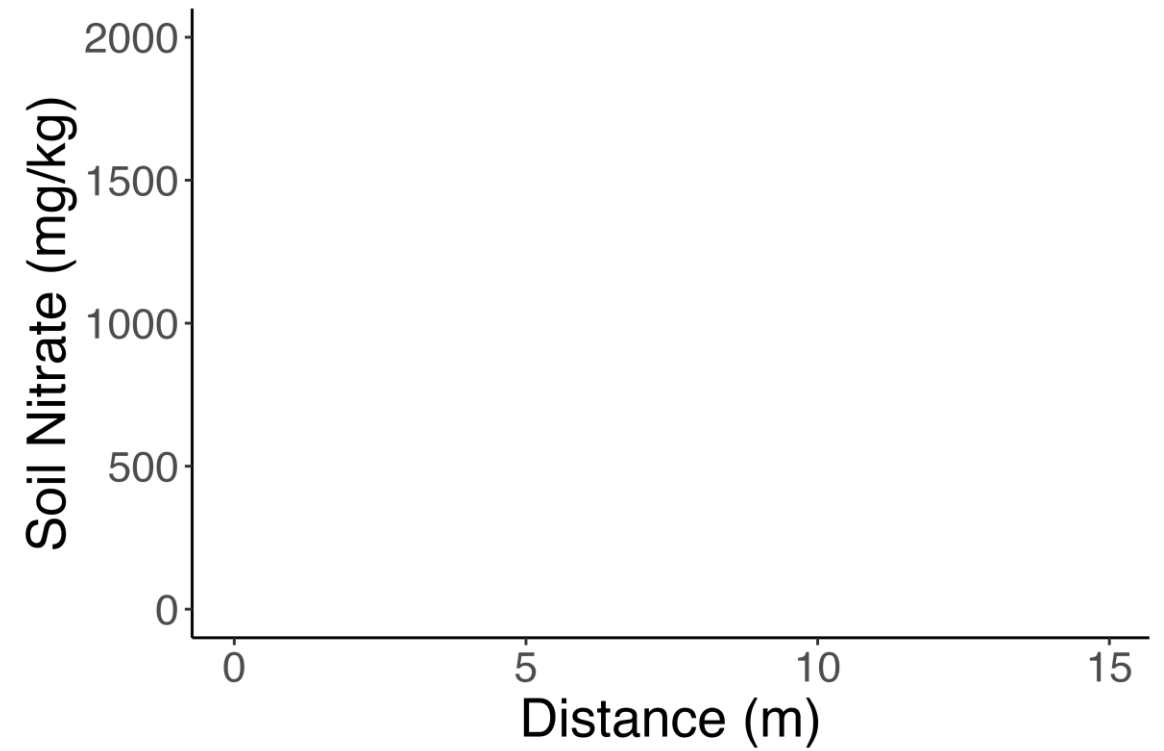
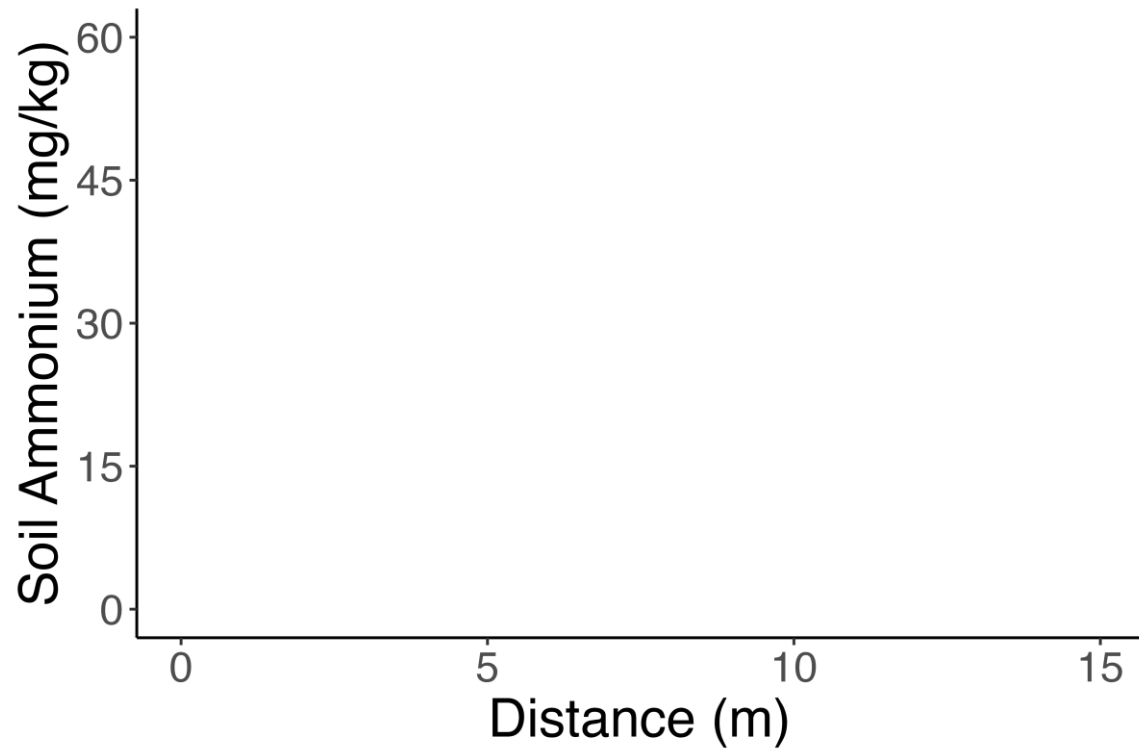
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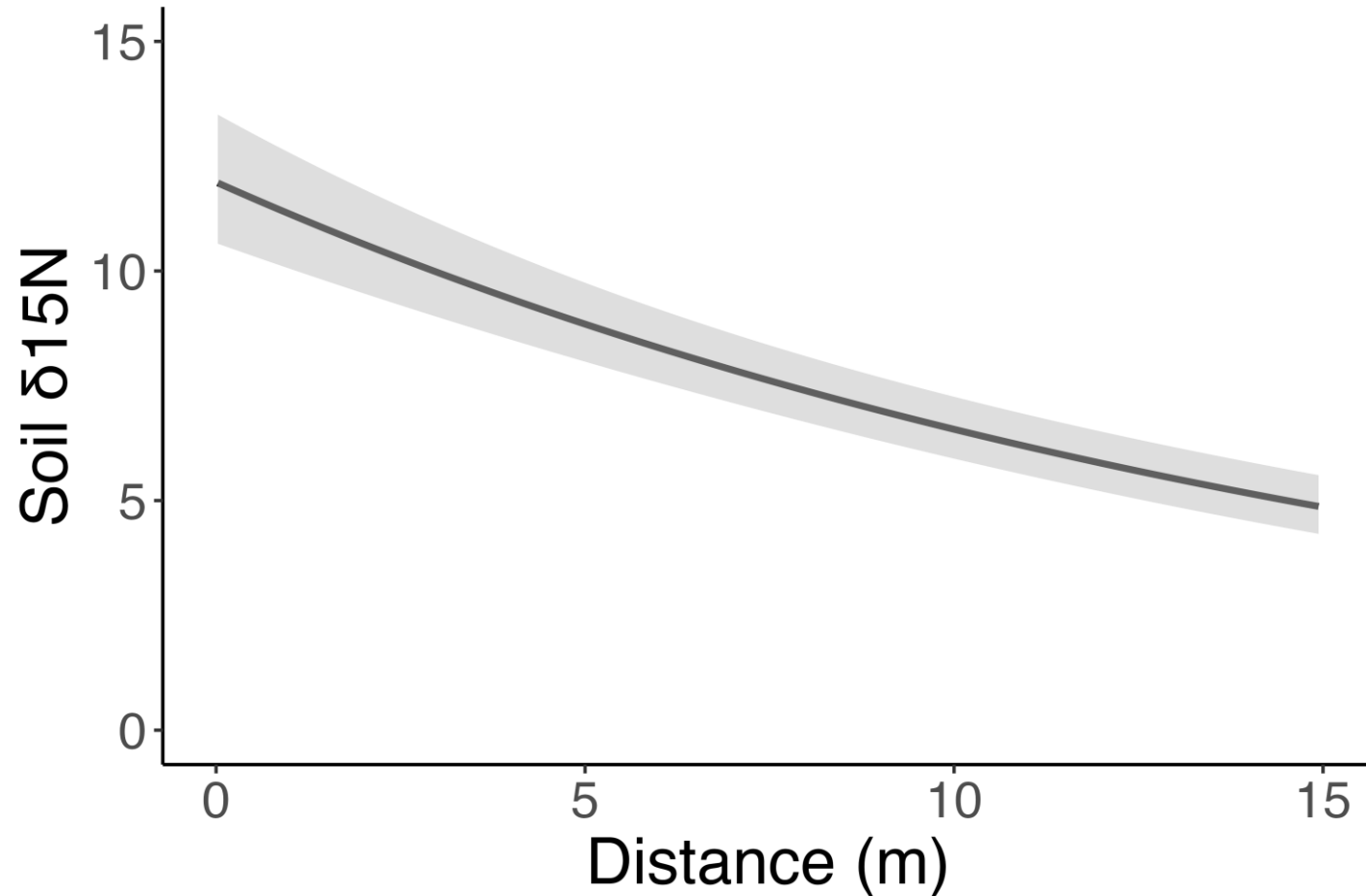


Herbivory





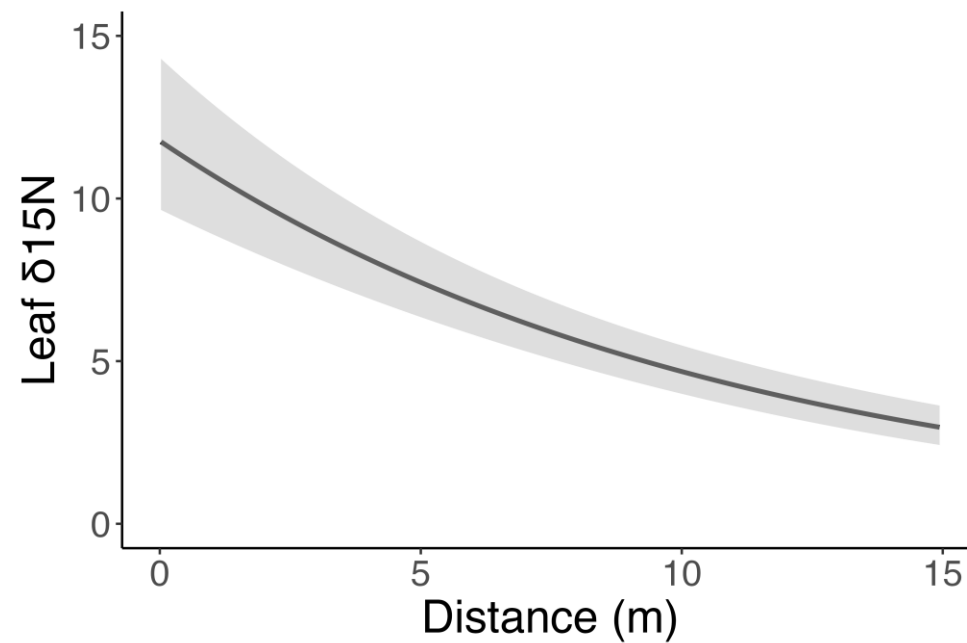
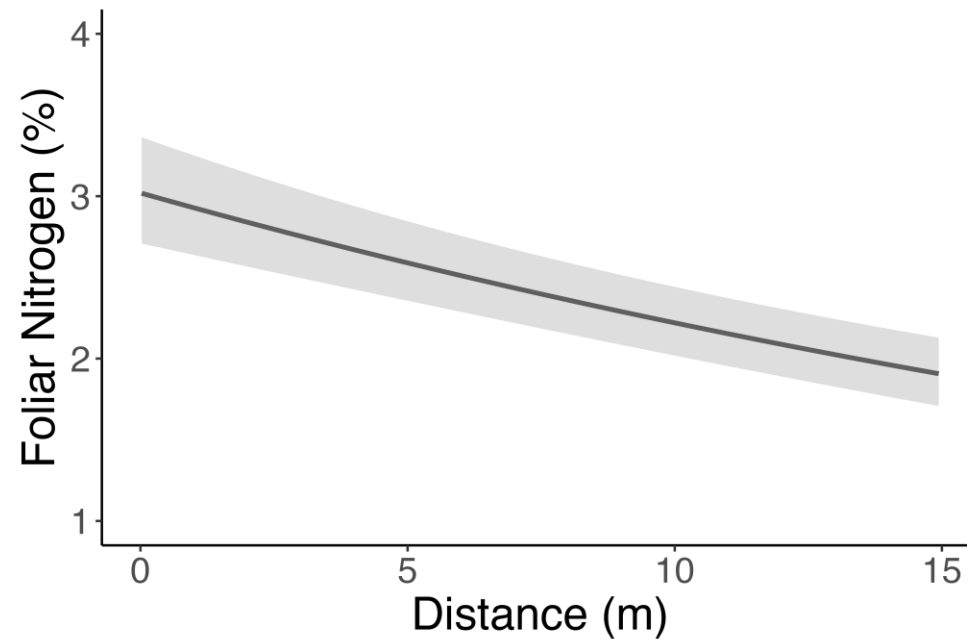
High soil nitrogen concentrations were sourced from the elephant carcasses.



Foliar nitrogen was elevated
at carcass sites.



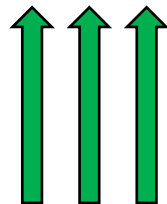
Urochloa mosambicensis



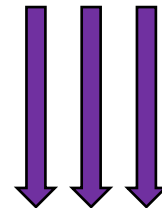
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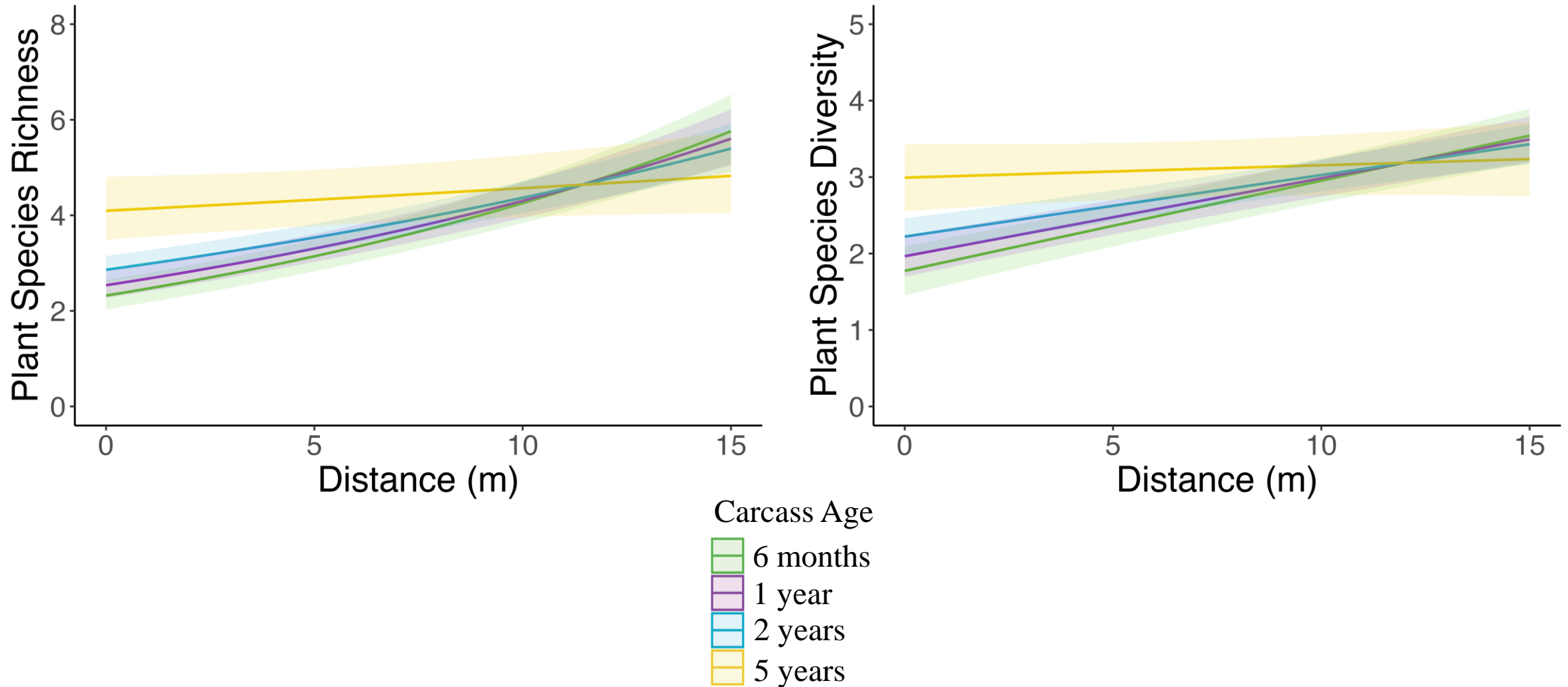
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Herbivory



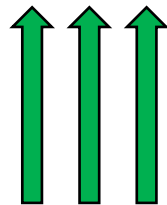
Plant richness and diversity were initially low on carcass sites but recovered over time.



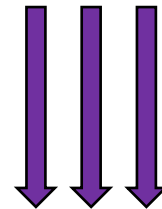
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Herbivory





Urochloa mosambicensis

Early colonizer that establishes and dominates in center of carcass sites

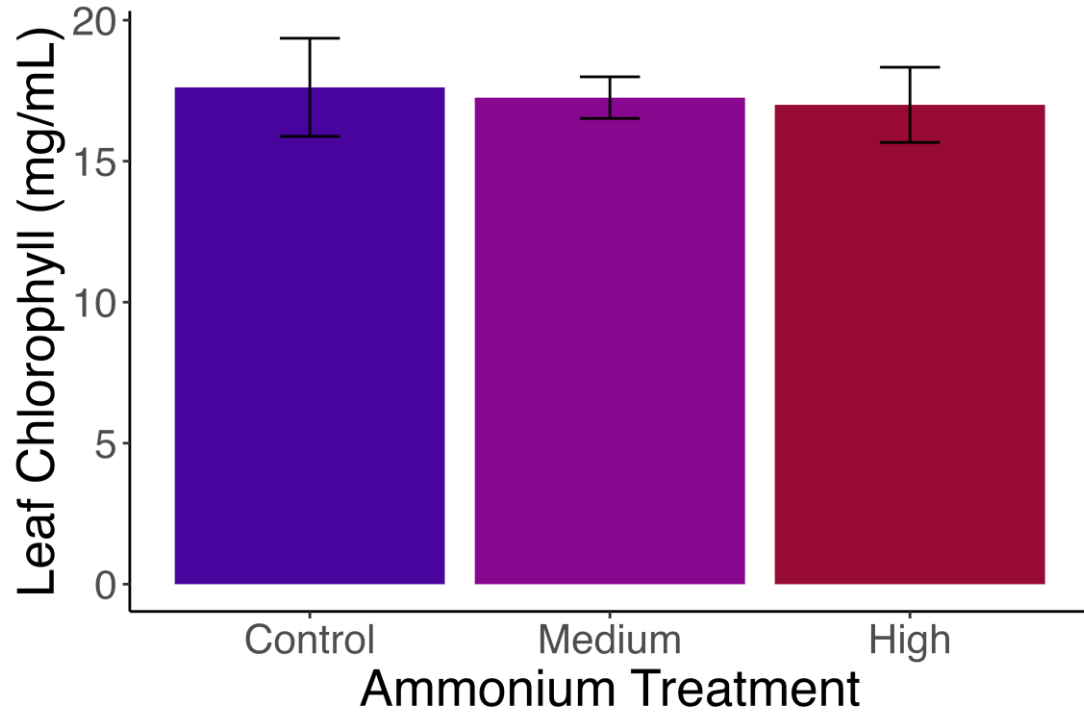


Panicum maximum

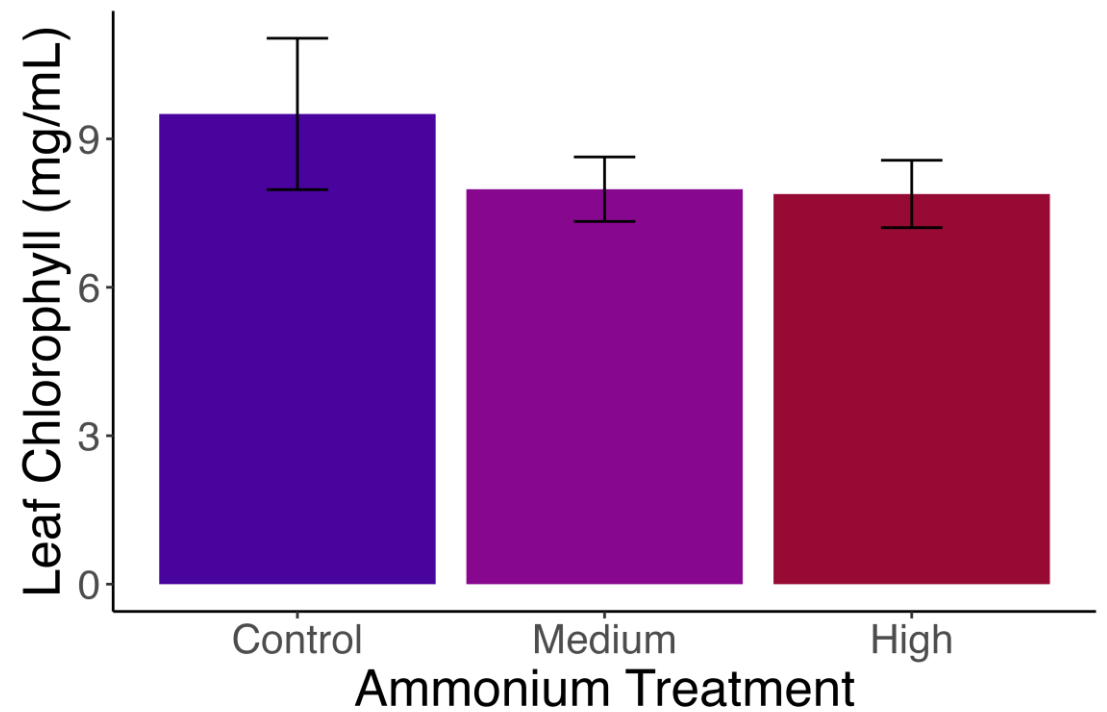
Abundant species off of carcass sites

Bottom-up mechanism: Grass species colonizing carcass sites had greater ammonium tolerance than dominant species off the carcass sites.

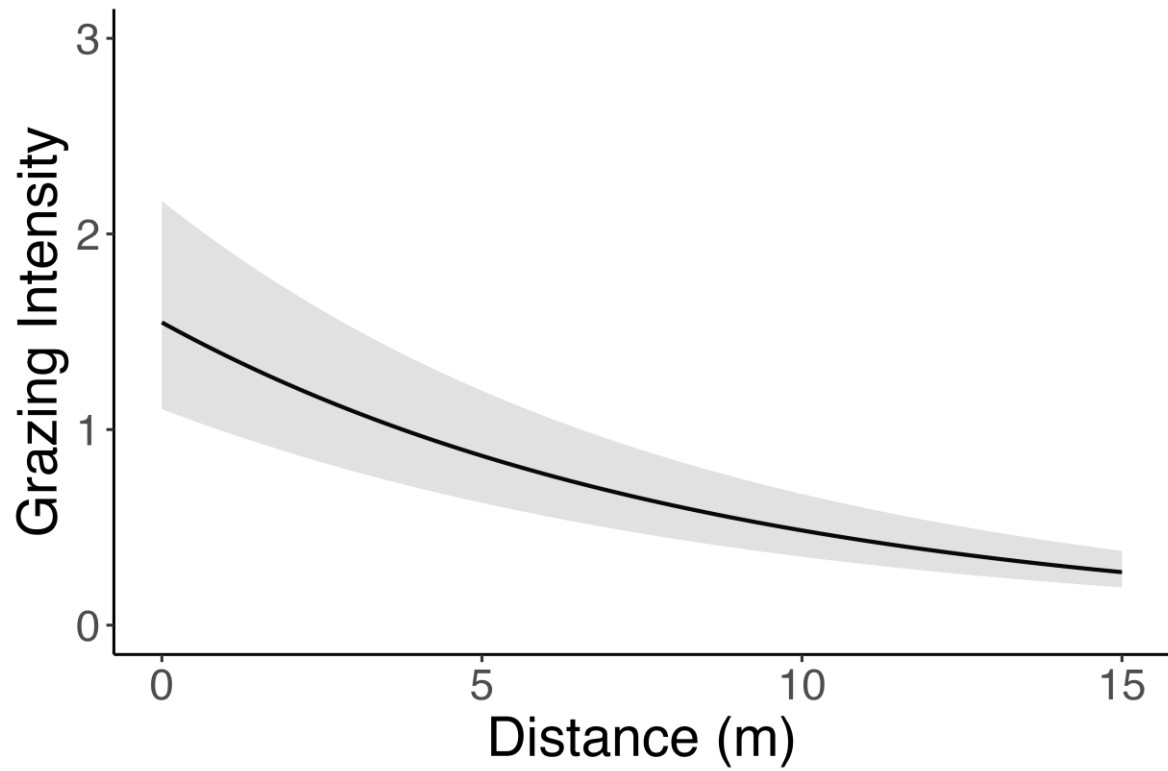
Urochloa mosambicensis



Panicum maximum



Top-down mechanism: Herbivore grazing intensity was greater at carcass sites.

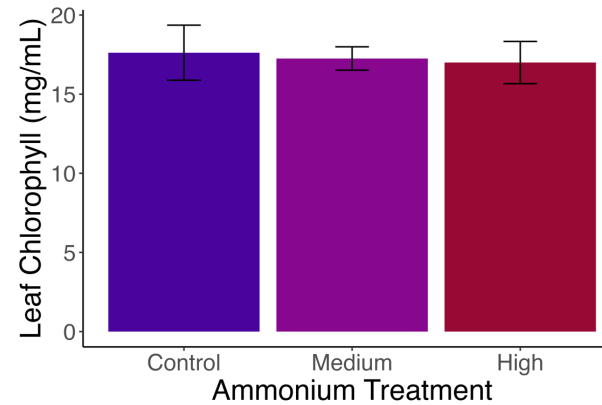


Recap

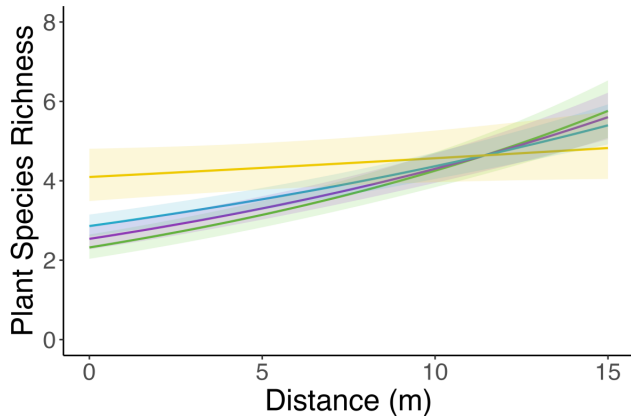
We examined the role of top-down and bottom-up forces in determining the impacts of elephant carcasses on savanna plant diversity.



Elephant carcasses release huge pulses of nitrogen into savanna soil, which are taken up by plants.



Early colonizing grasses have higher ammonium tolerance than dominant grasses off of carcass sites.



Plant diversity initially decreases at elephant carcass sites but recovers over time.



Herbivores are attracted to nutritious browse and forage more intensively at carcass sites, promoting plant diversity.