

Long-term data and outcomes from the Nachusa Grasslands restoration

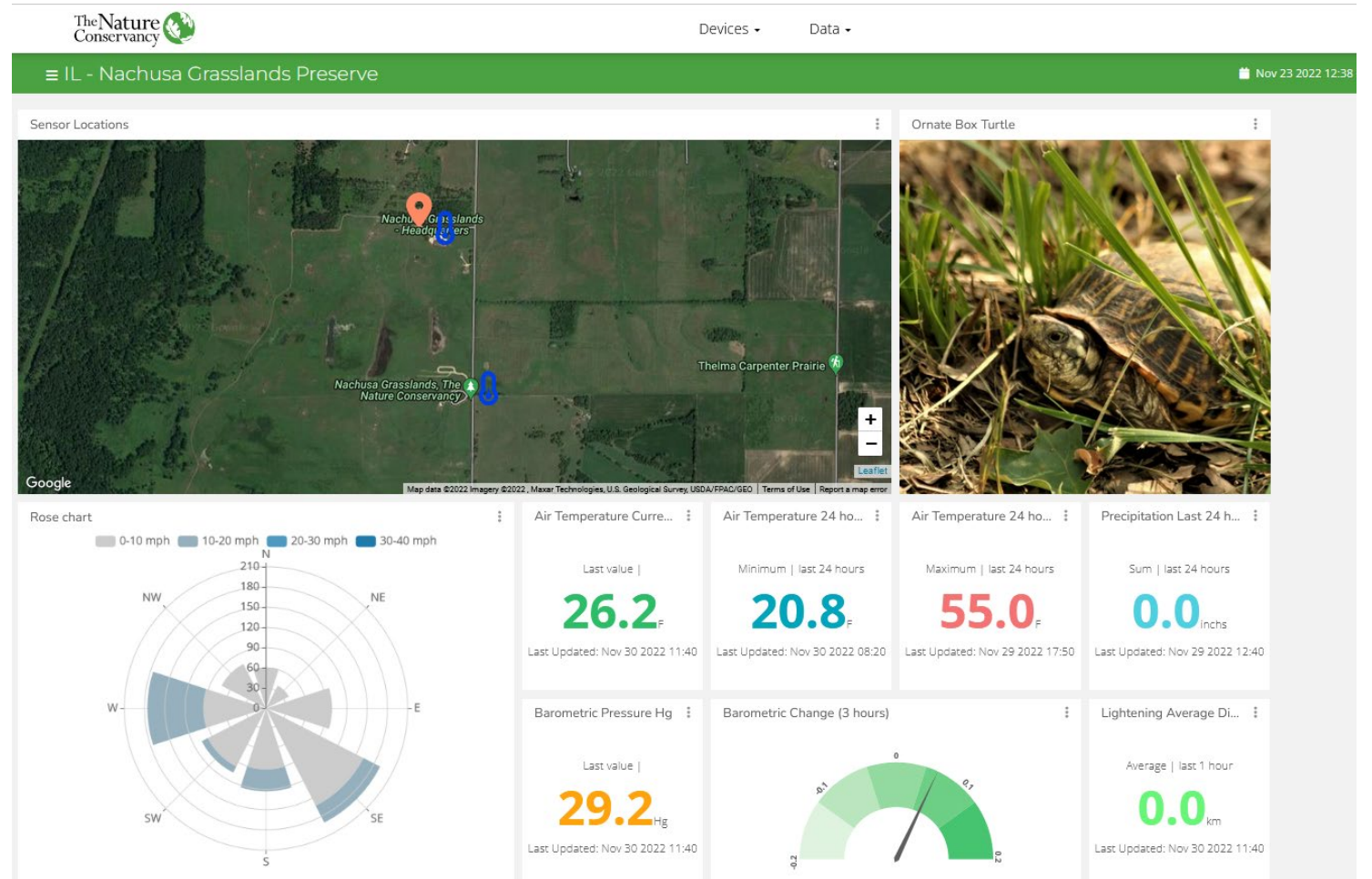
Elizabeth M. Bach

Research Scientist

Nachusa Grasslands

The Nature Conservancy in Illinois

Thank you Wild Ones Rock River Valley!



Acknowledgements

Members, past and present, of the:

Peoria, Meskwaki, Sauk, Myaamia, Kiikaapoi, and Potawatomi Nations

The Nature Conservancy in Illinois

Bill Kleiman

Cody Considine

Dee Hudson

Charles Larry

Pete Guiden

Holly Jones

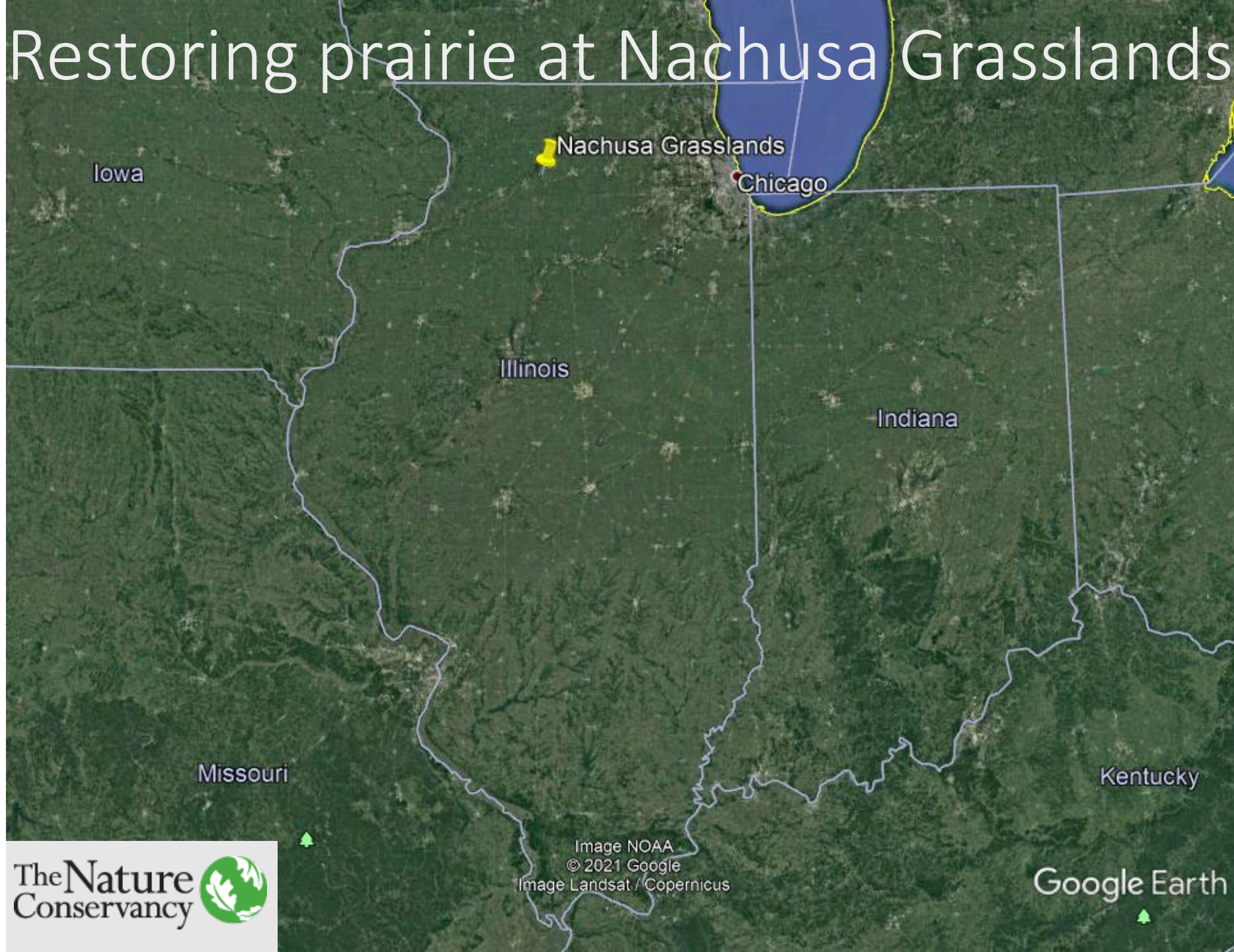
Nick Barber

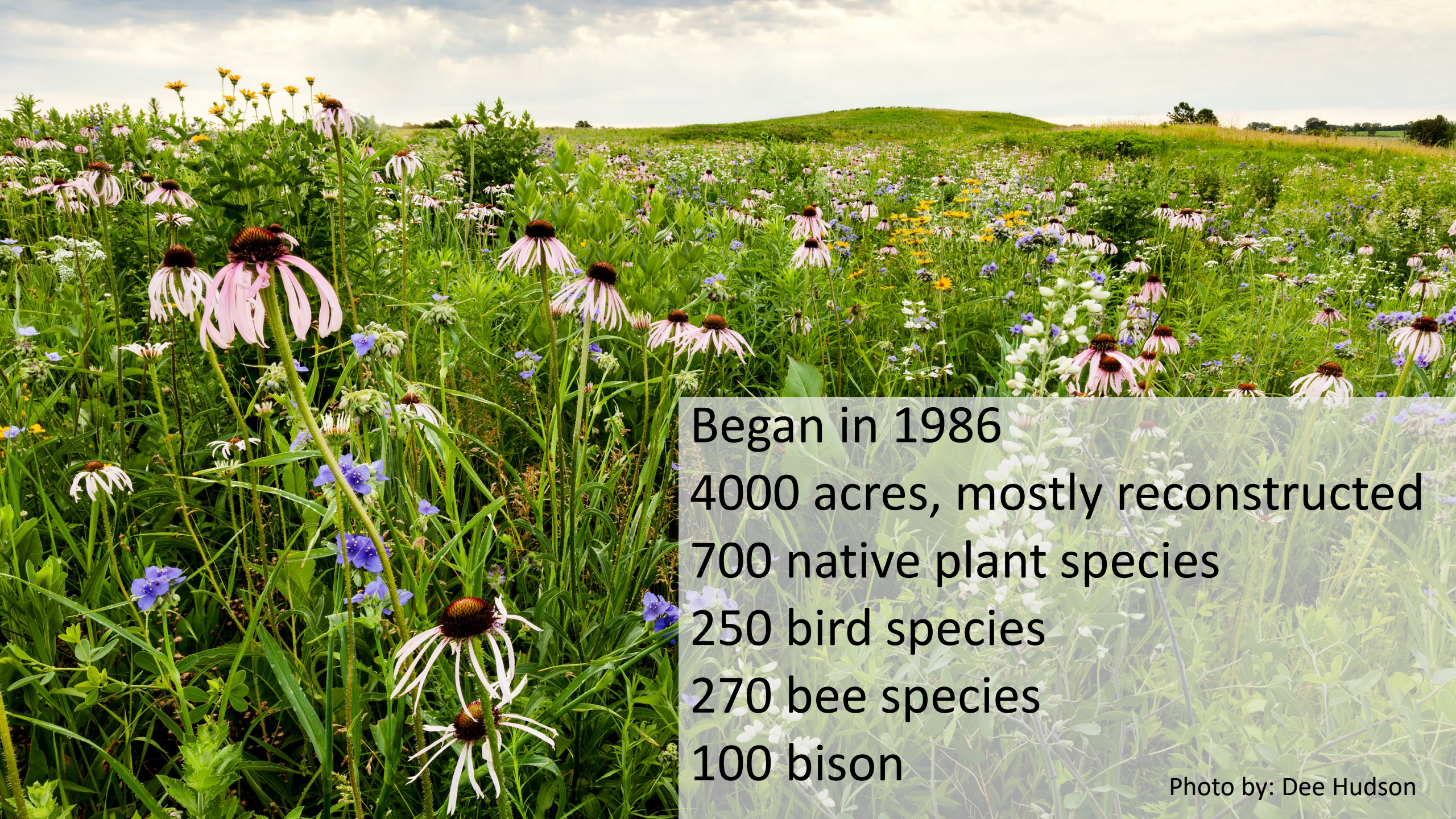
Jenn Chakravorty



Nachusa Grasslands

Restoring prairie at Nachusa Grasslands





Began in 1986
4000 acres, mostly reconstructed
700 native plant species
250 bird species
270 bee species
100 bison

Photo by: Dee Hudson

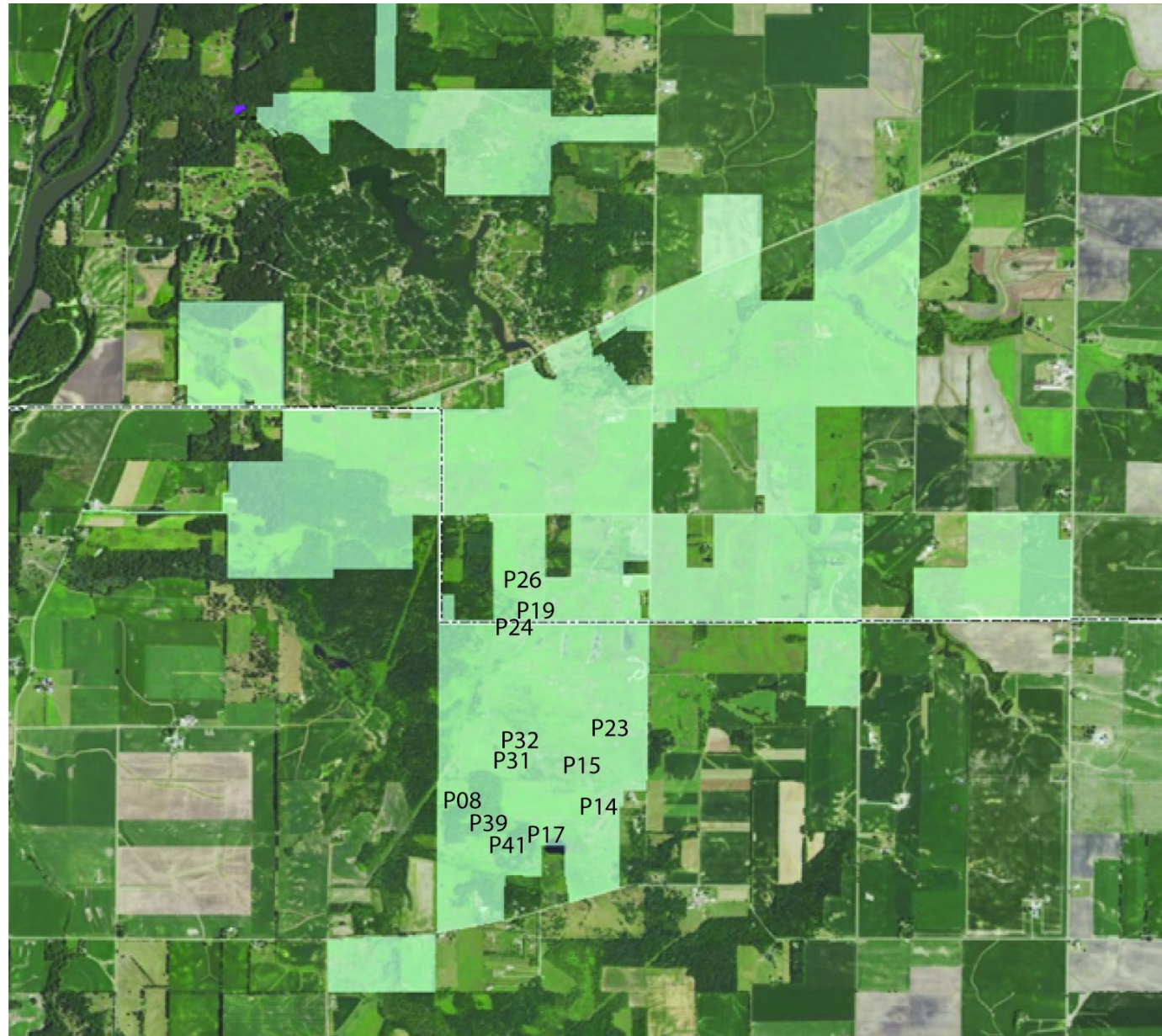
20 years of plant community monitoring

Monitoring impacts of bison reintroduction on
plant communities

Restoring animal communities









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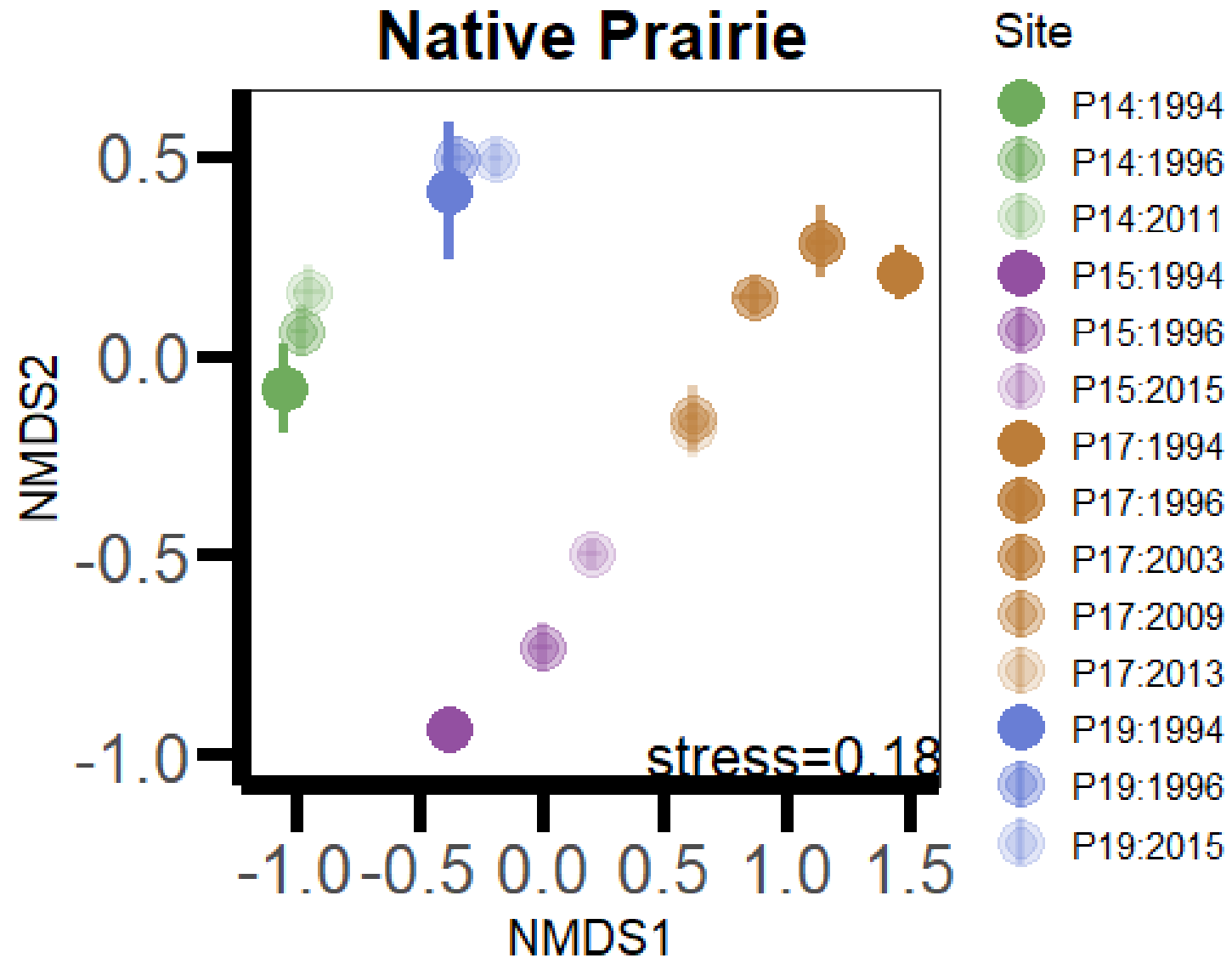


Coefficient of Conservatism

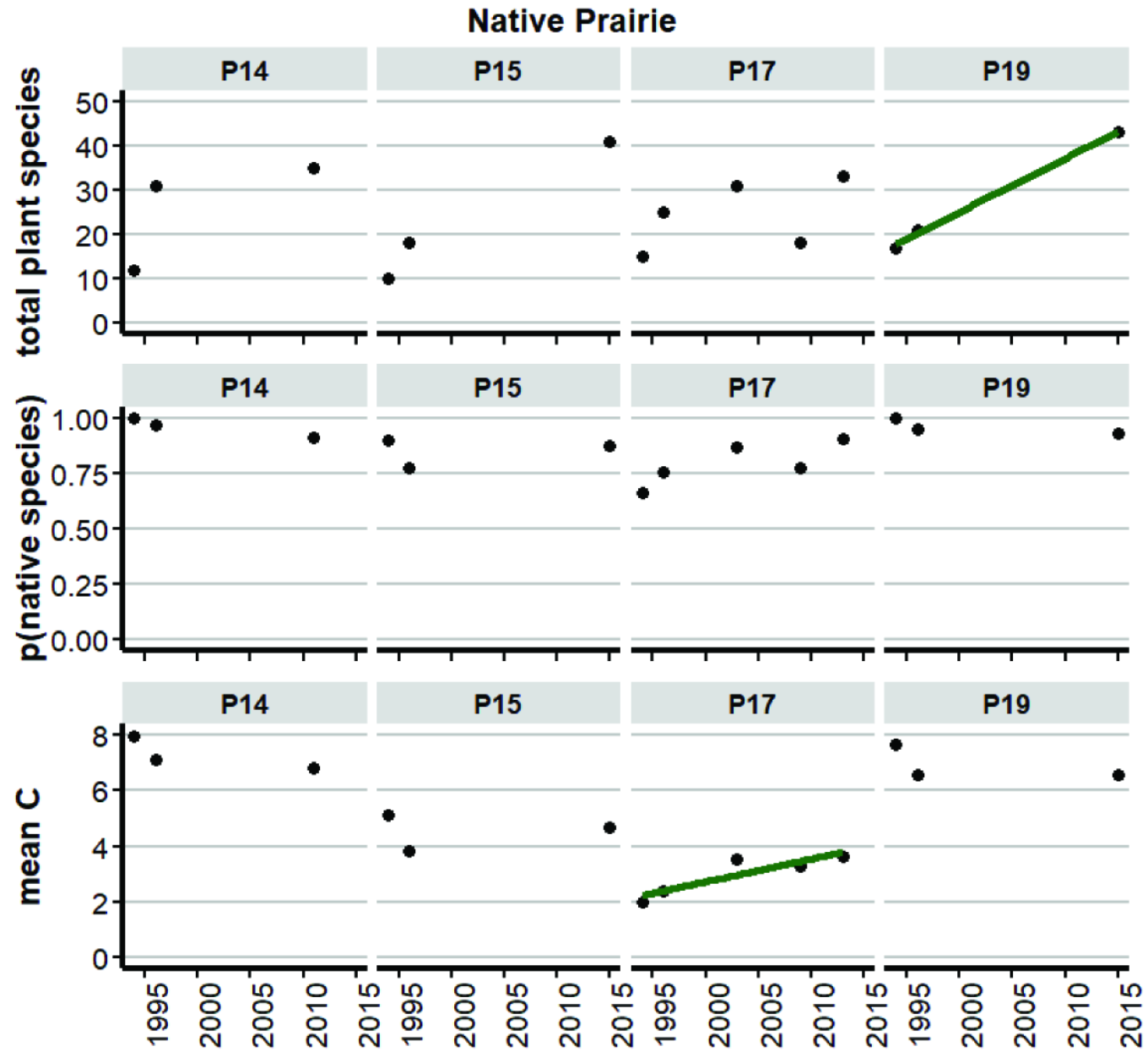
Are management practices sustaining plant diversity, including rare plants, in native prairies and savannas?

Do restored prairies support comparable levels of plant diversity and conservatism to native prairies?

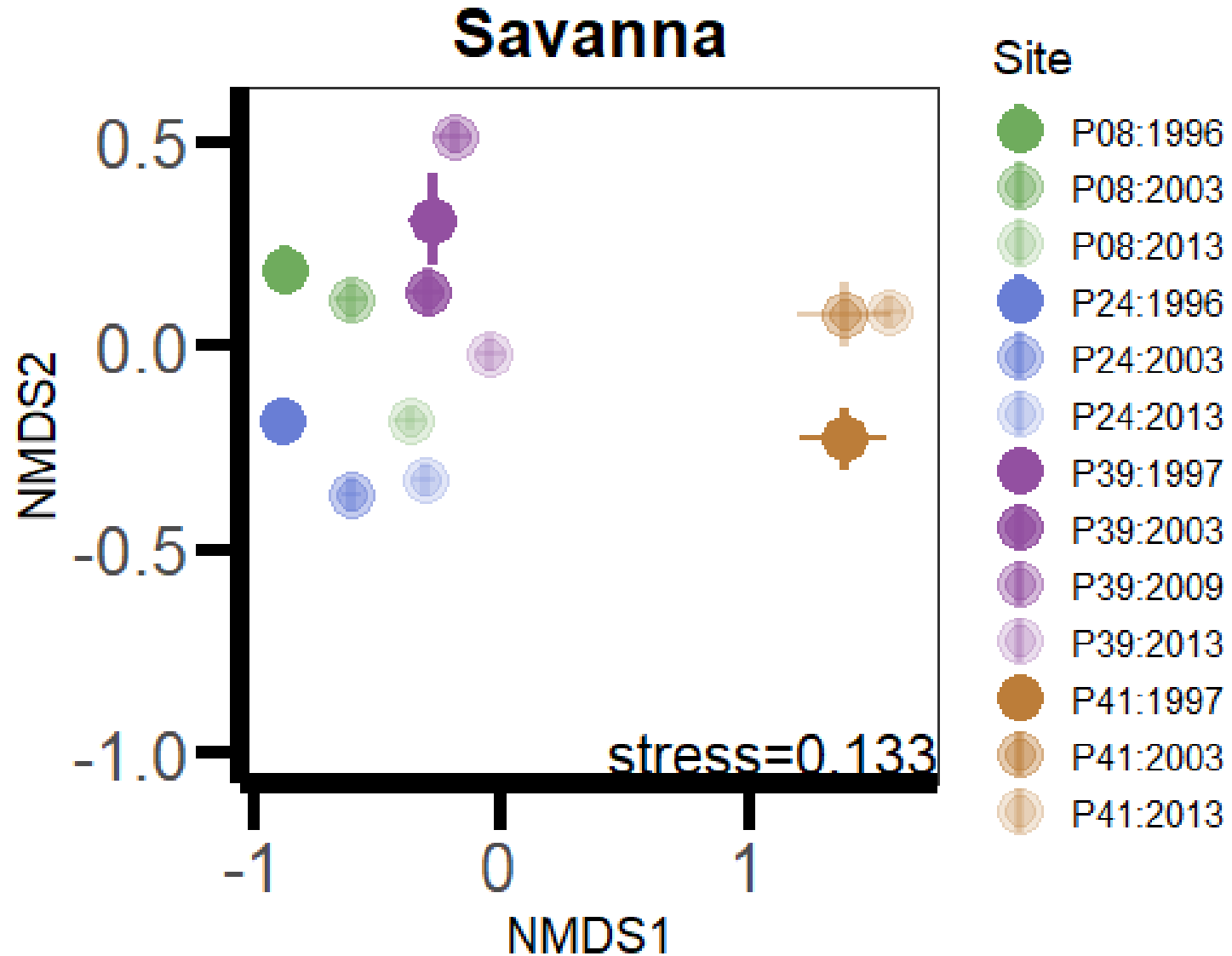
Native prairies distinct, changed over time



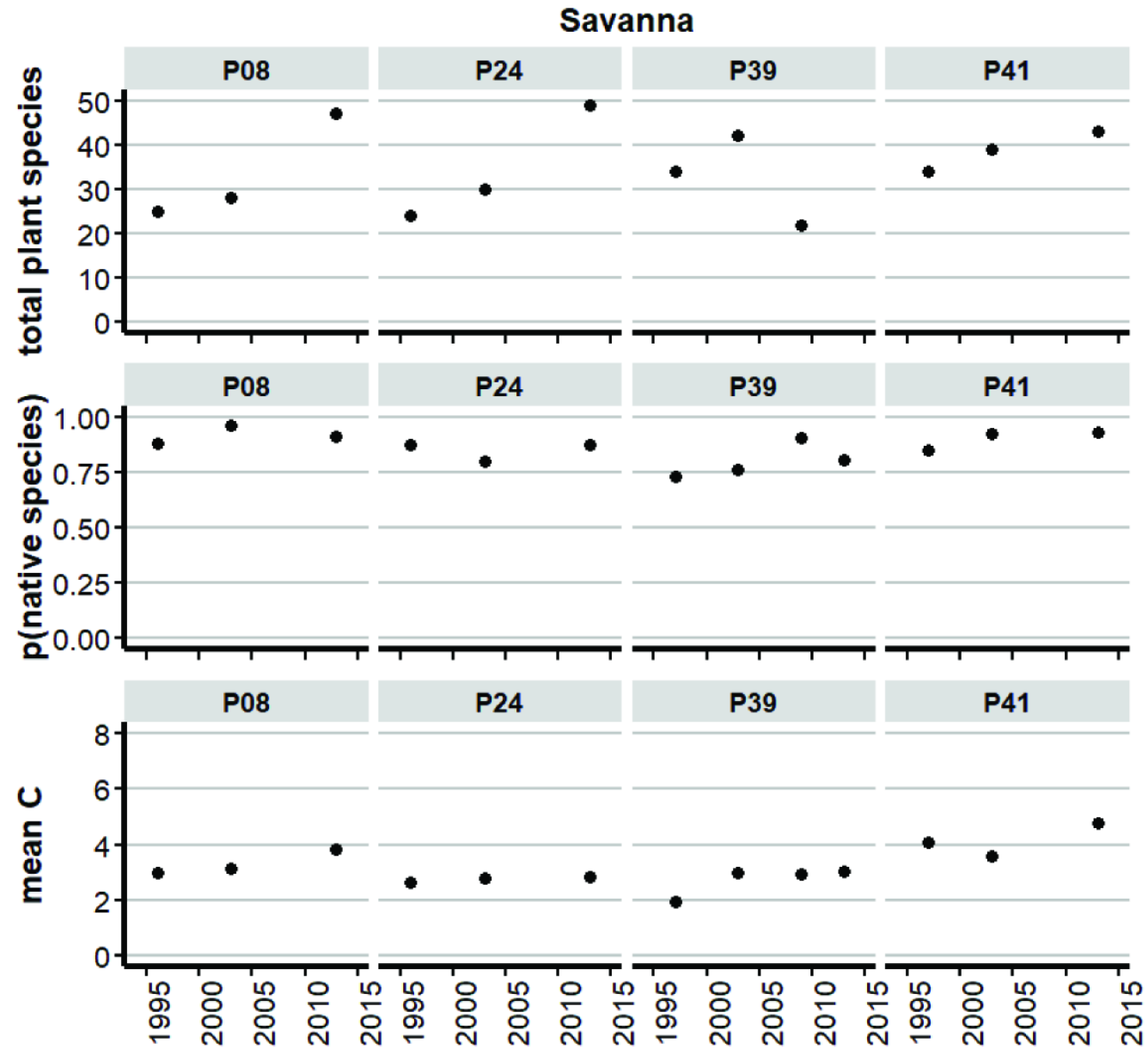
A)



Savannas more similar, changed over time



B)



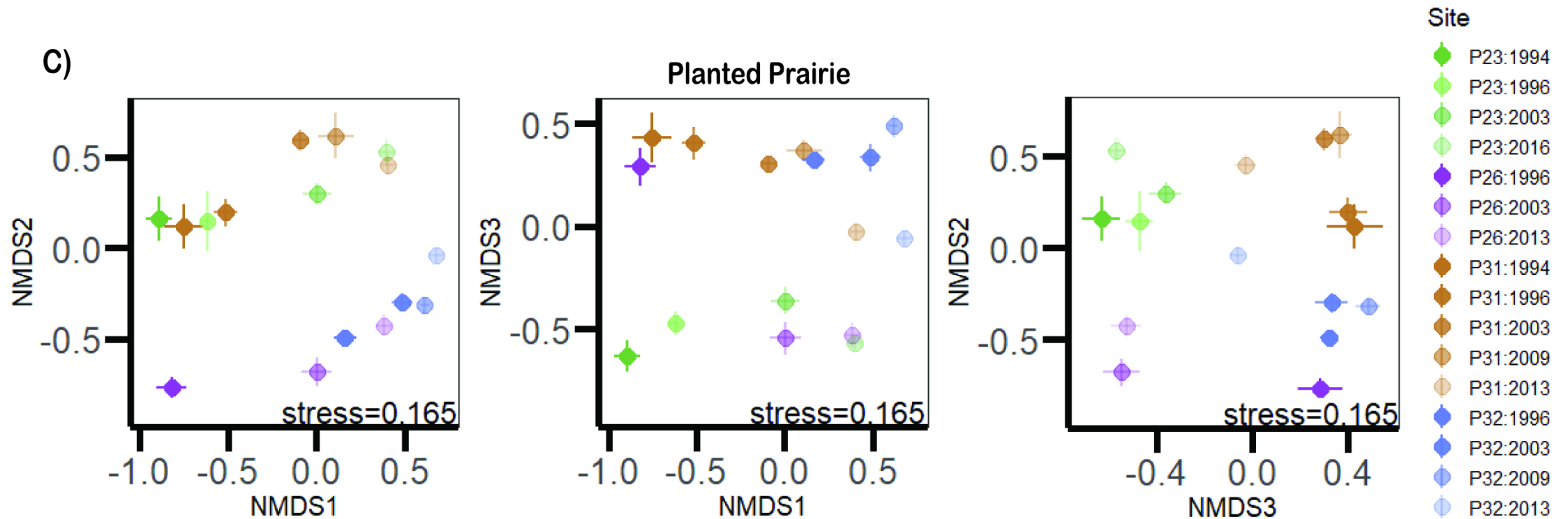


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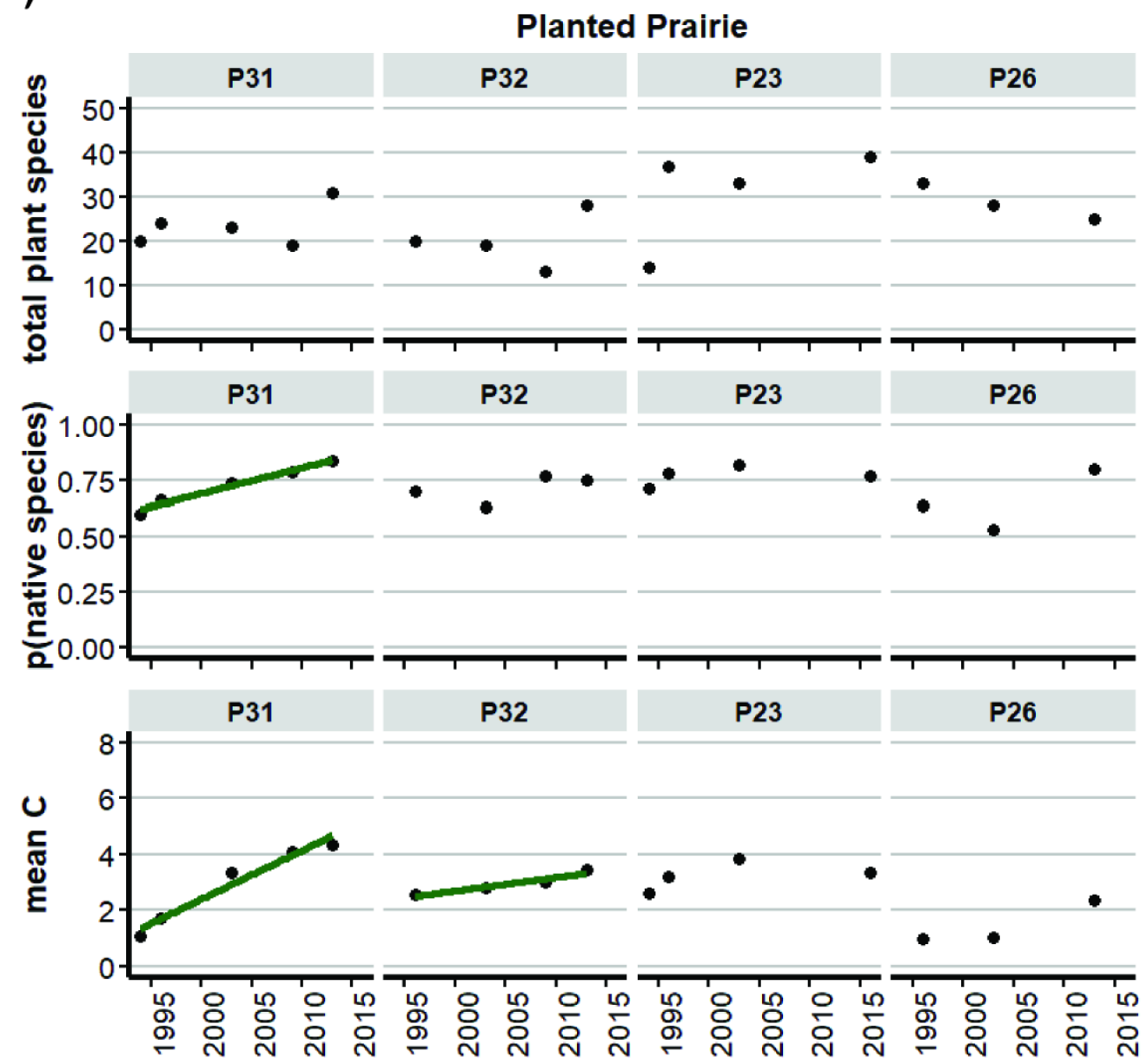


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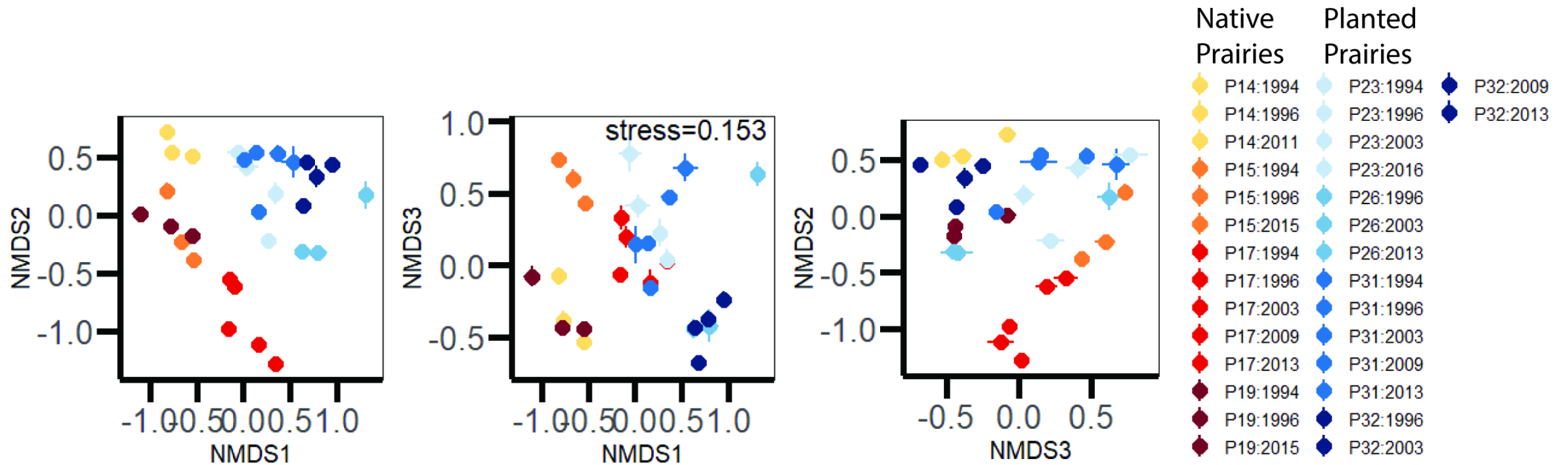
Planted prairies similar, change not consistent

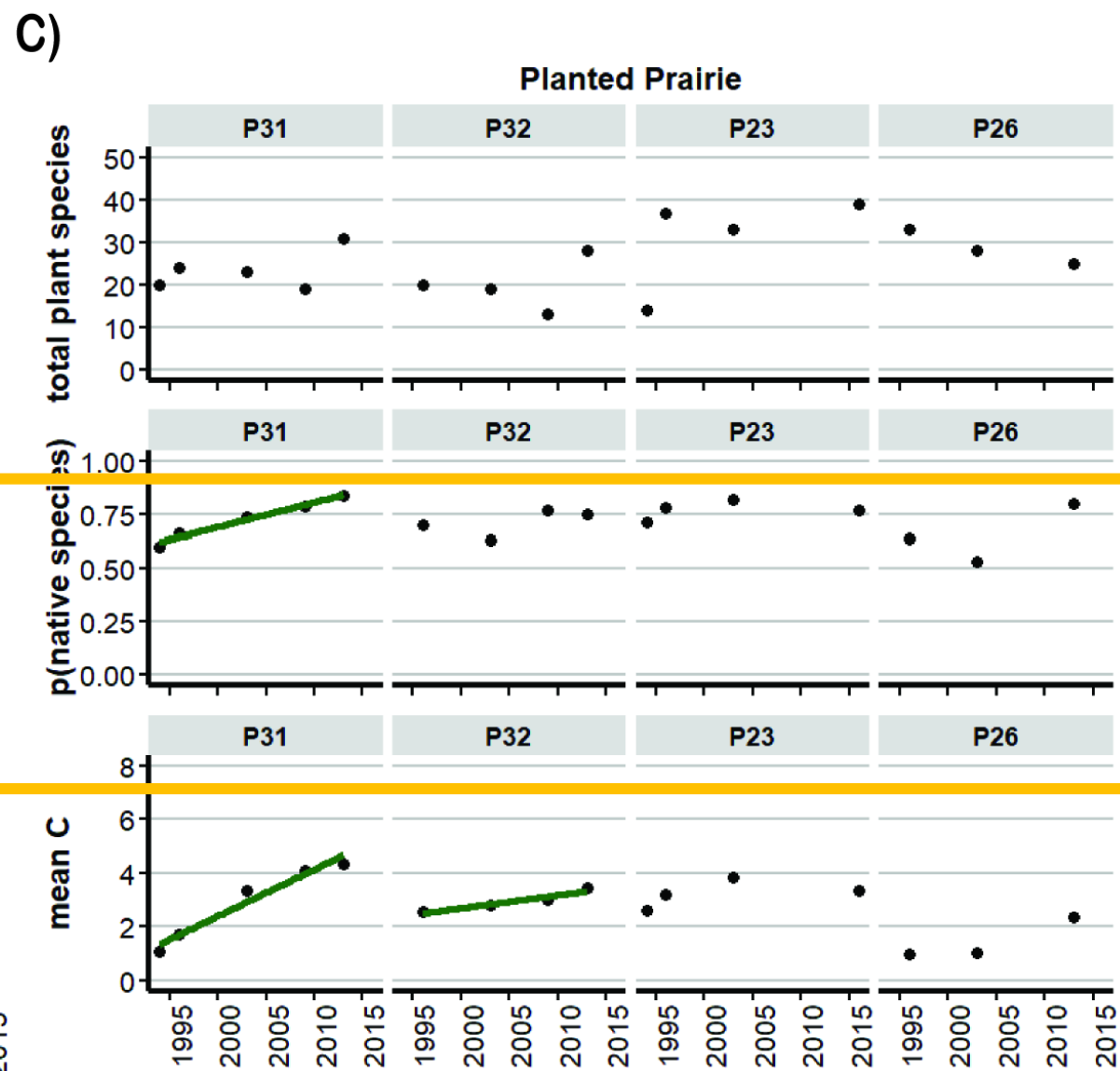
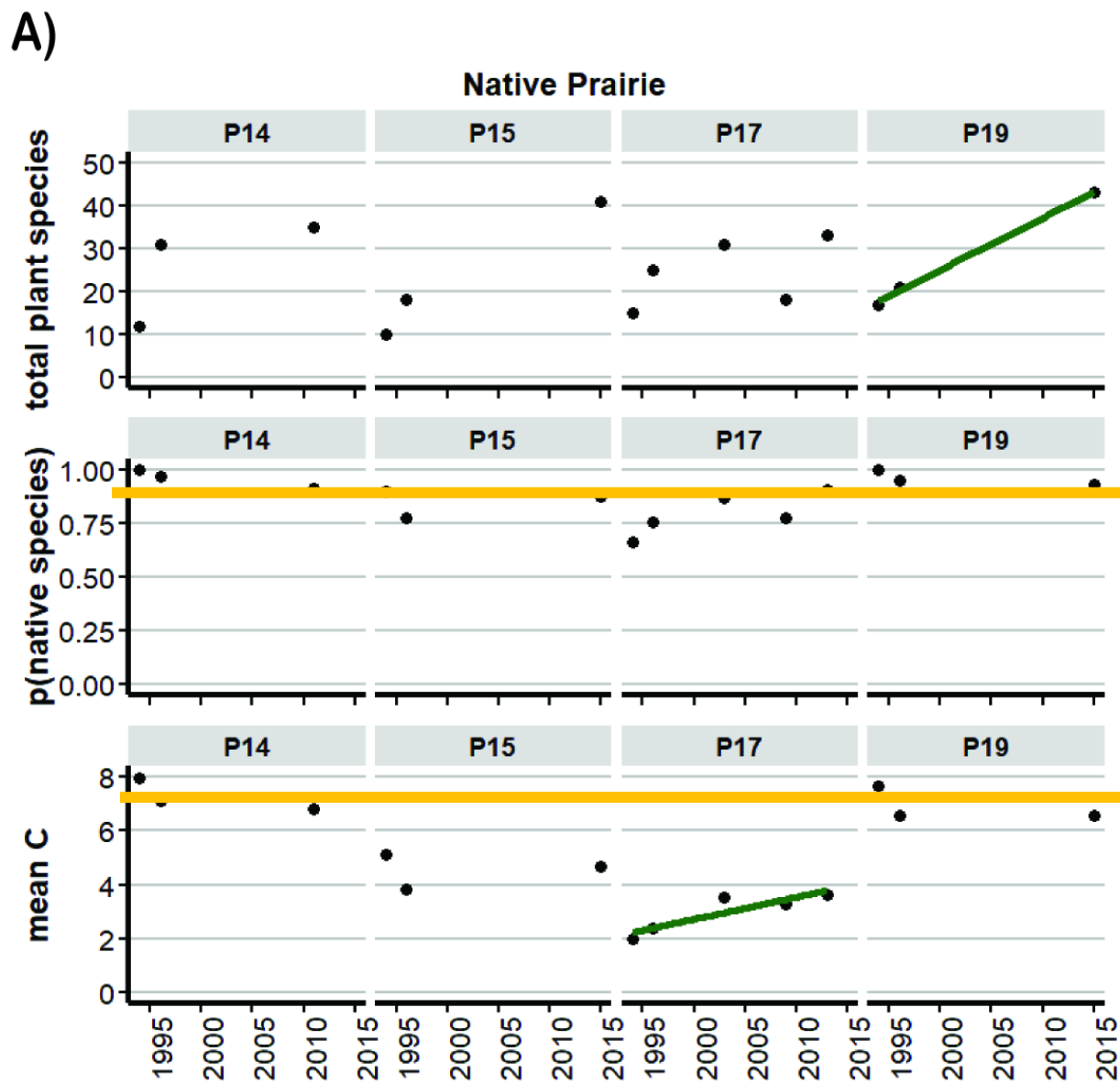


C)



Native prairies distinct from planted prairies





Are management practices sustaining plant diversity, including rare plants, in native prairies and savannas?

Yes

Do restored prairies support comparable levels of plant diversity and conservatism to native prairies?

Not quite

20 years of plant community monitoring

**Monitoring impacts of bison reintroduction on
plant communities**

Restoring animal communities



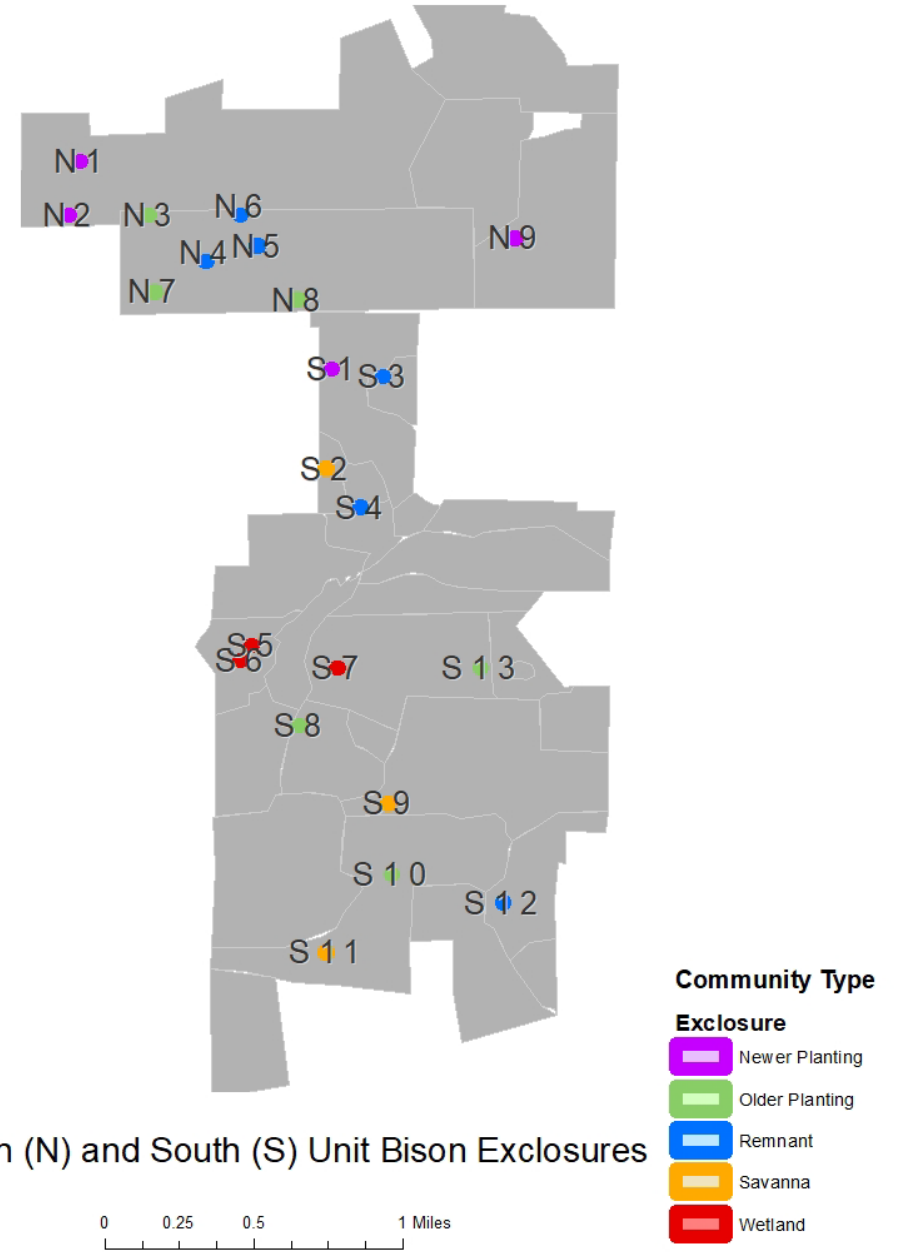
How will bison grazing impact plant community?

H_1 : Increase plant diversity by suppressing dominant grasses

H_{1A} : Decrease plant diversity through grazing and disturbance

H_0 : No change in plant diversity

- 22 bison exclosures
- Experimental design: Dr. John Taft & Dr. Sara Baer
- Synthesis of 2015-2020 data: Jenn Chakravorty



Fenced grazing exclosures

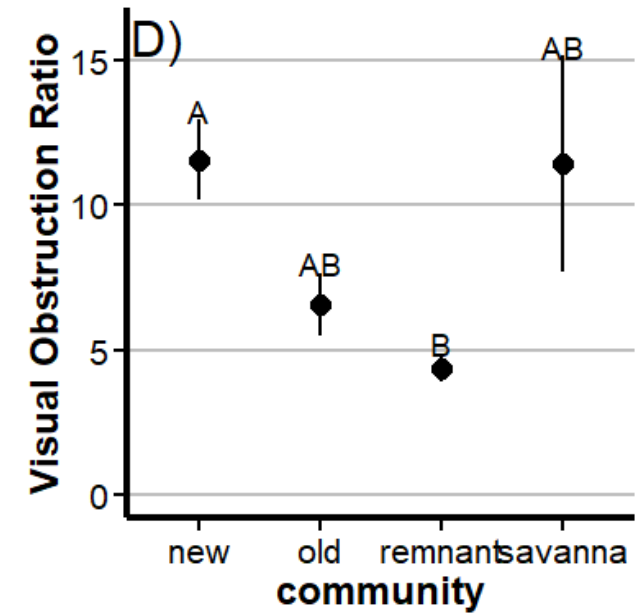
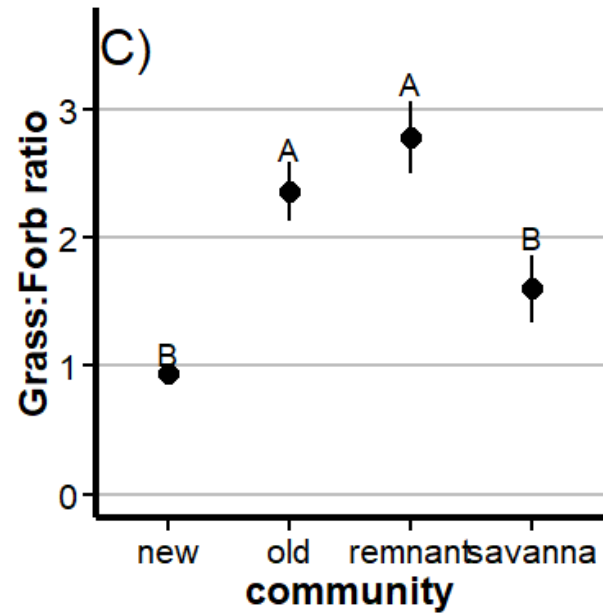
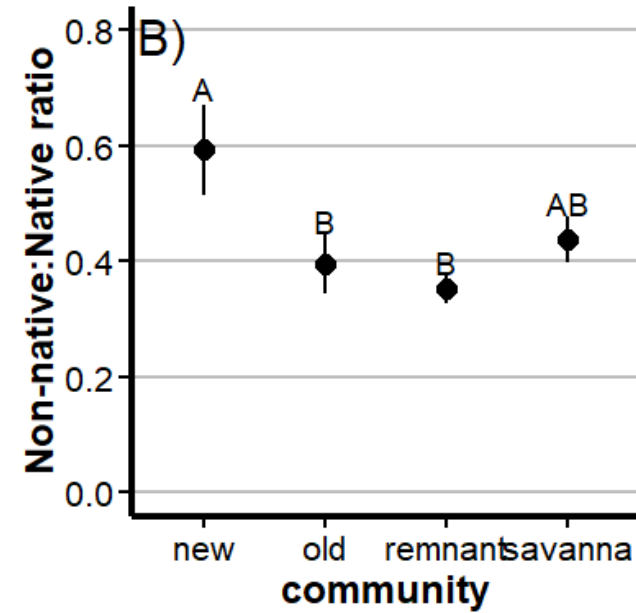
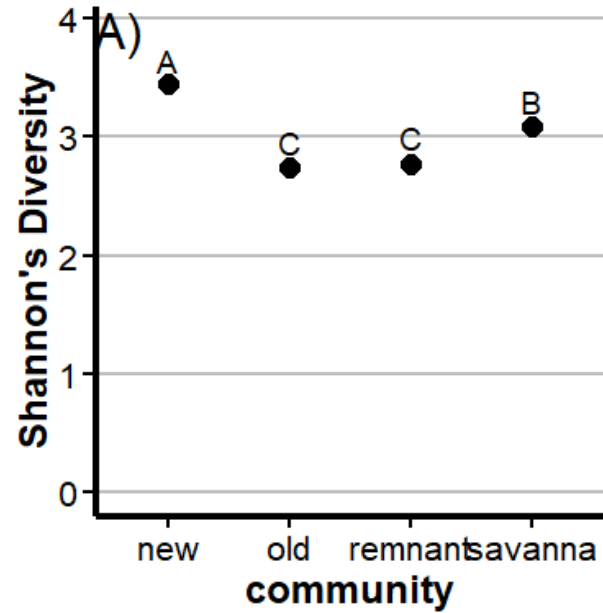
3 parallel transects inside
& outside fence

Species composition &
cover in 0.5m² quadrats

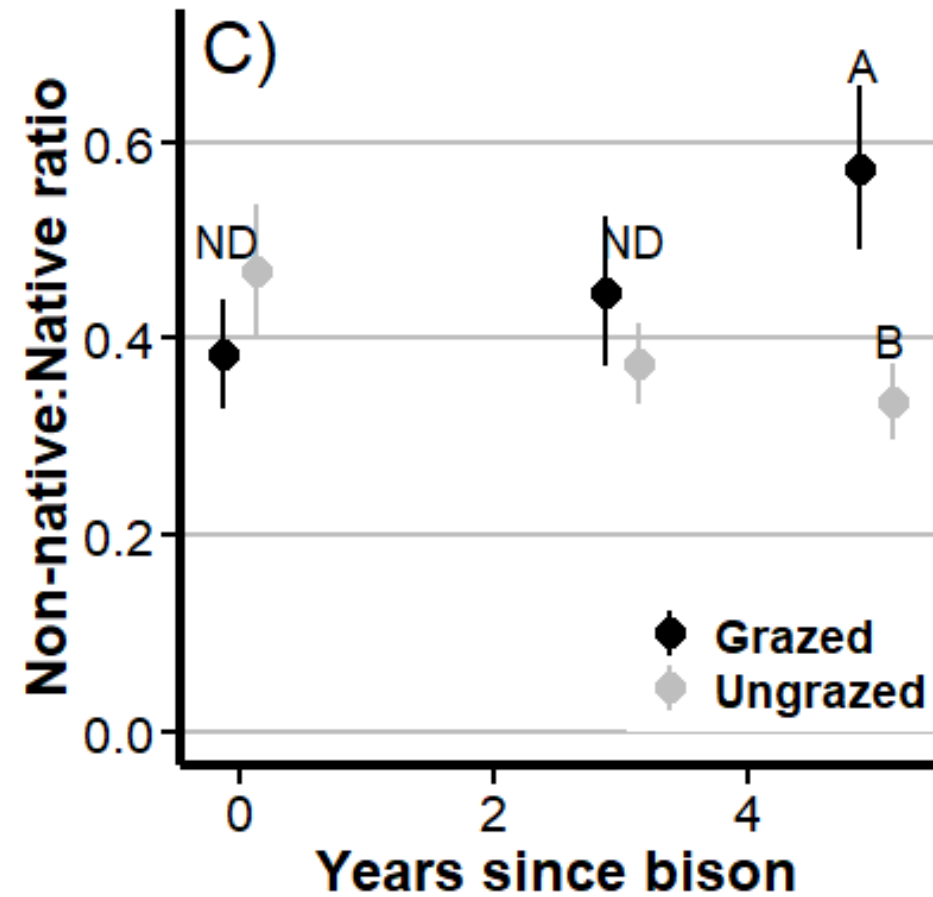
Data from:
pre-bison, 3yr, 5yr



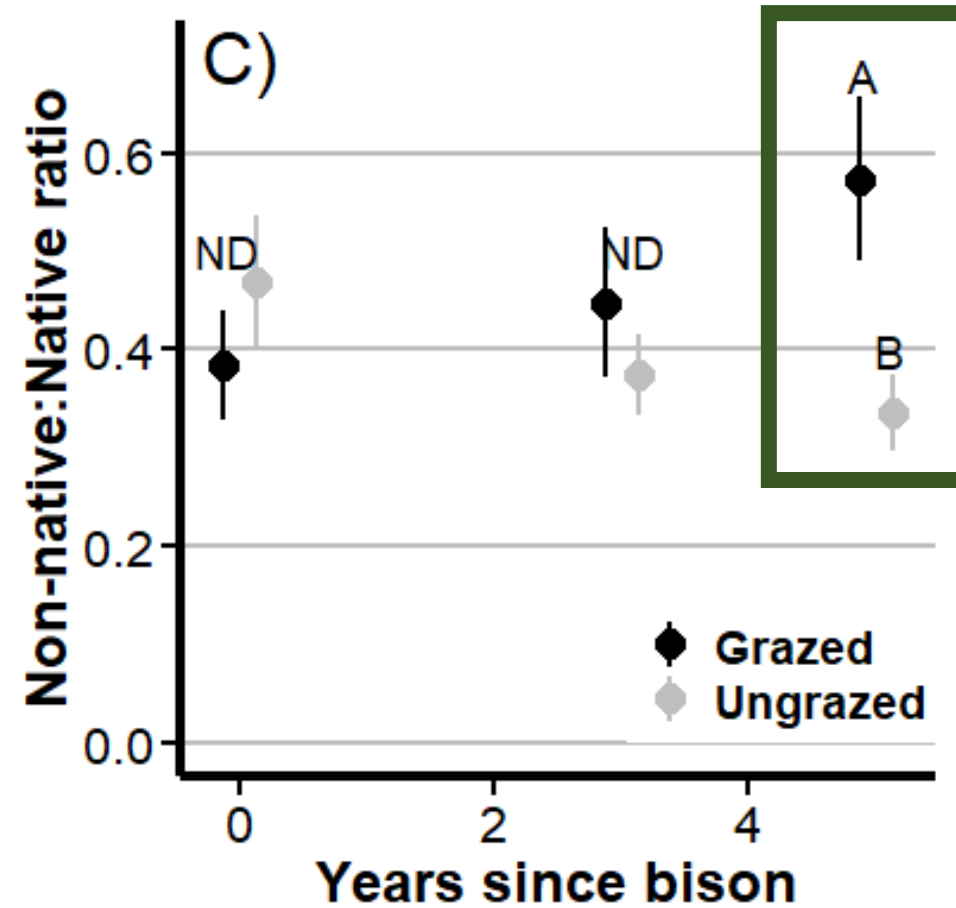
No grazing affect on plant diversity



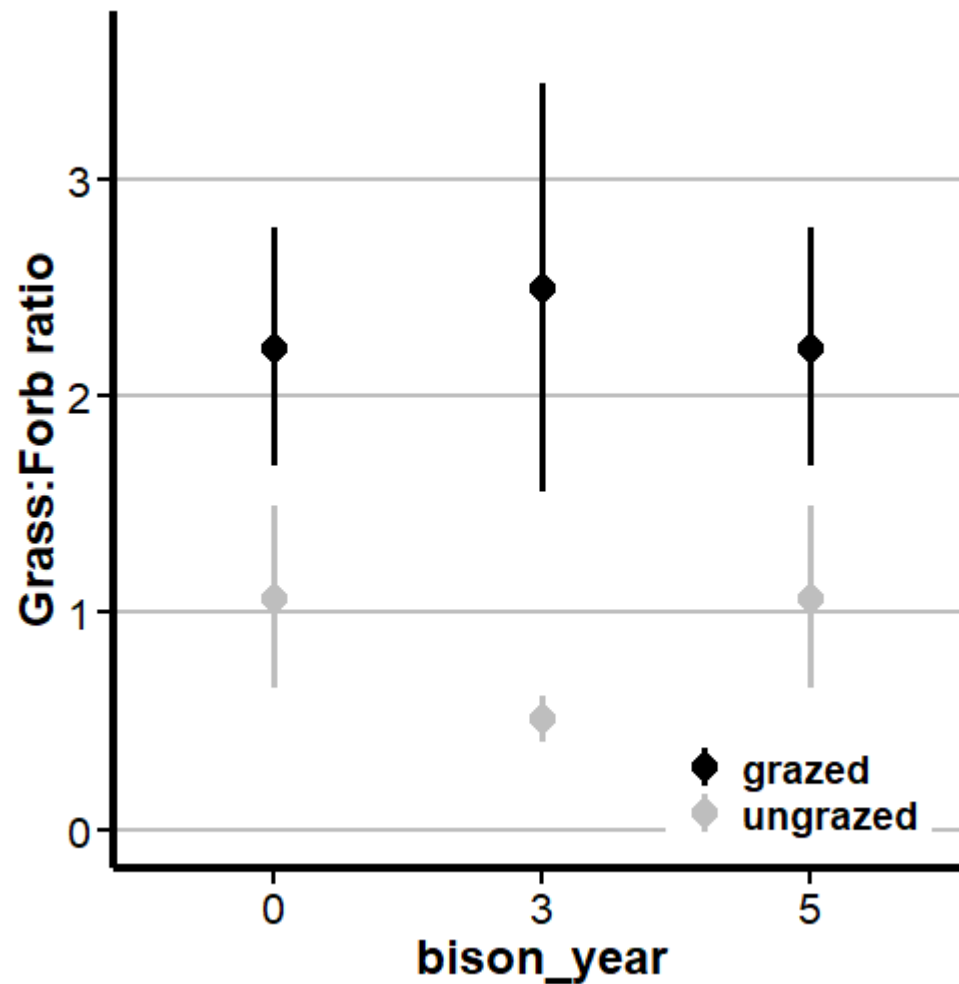
Trend in non-native:native species ratio



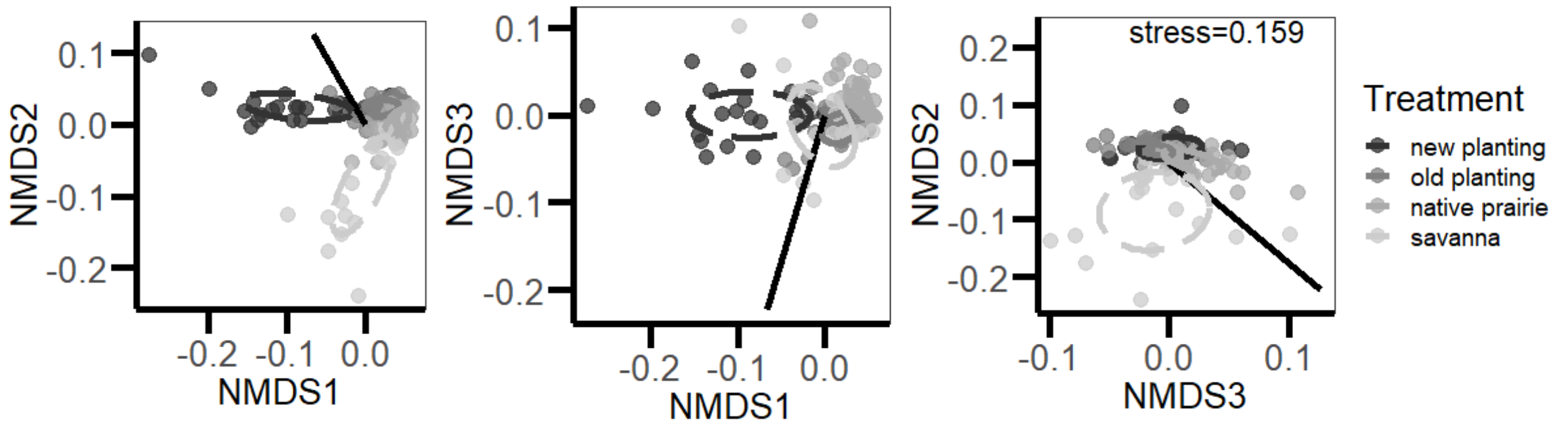
Trend in non-native:native species ratio



Trend in grass:forb ratio in savanna



Distinct plant communities in each habitat



PERMANOVA

community type: ($p < 0.01$, $R^2=0.36$)

Bison grazing has little/no impact on plant community in the first 5 years



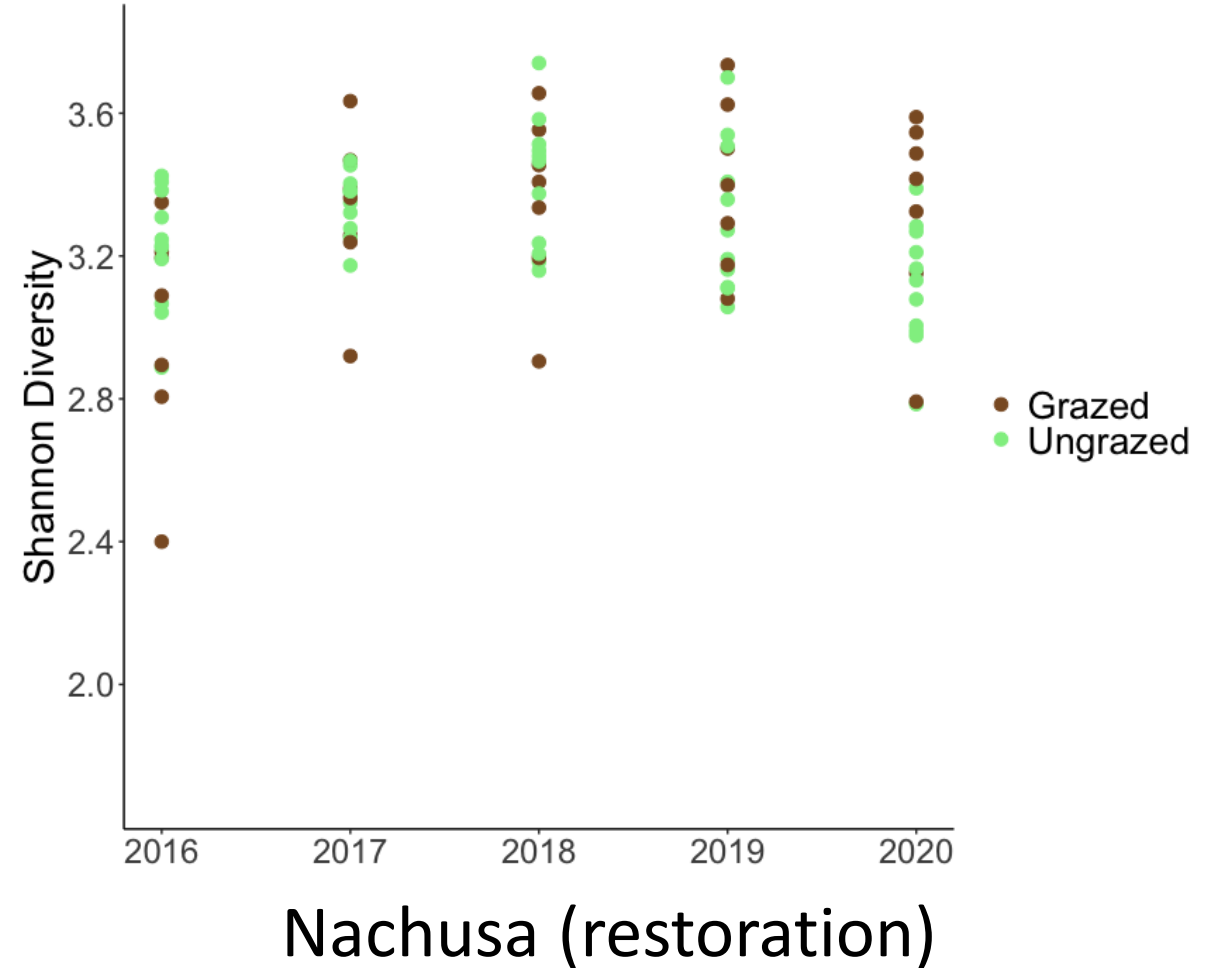
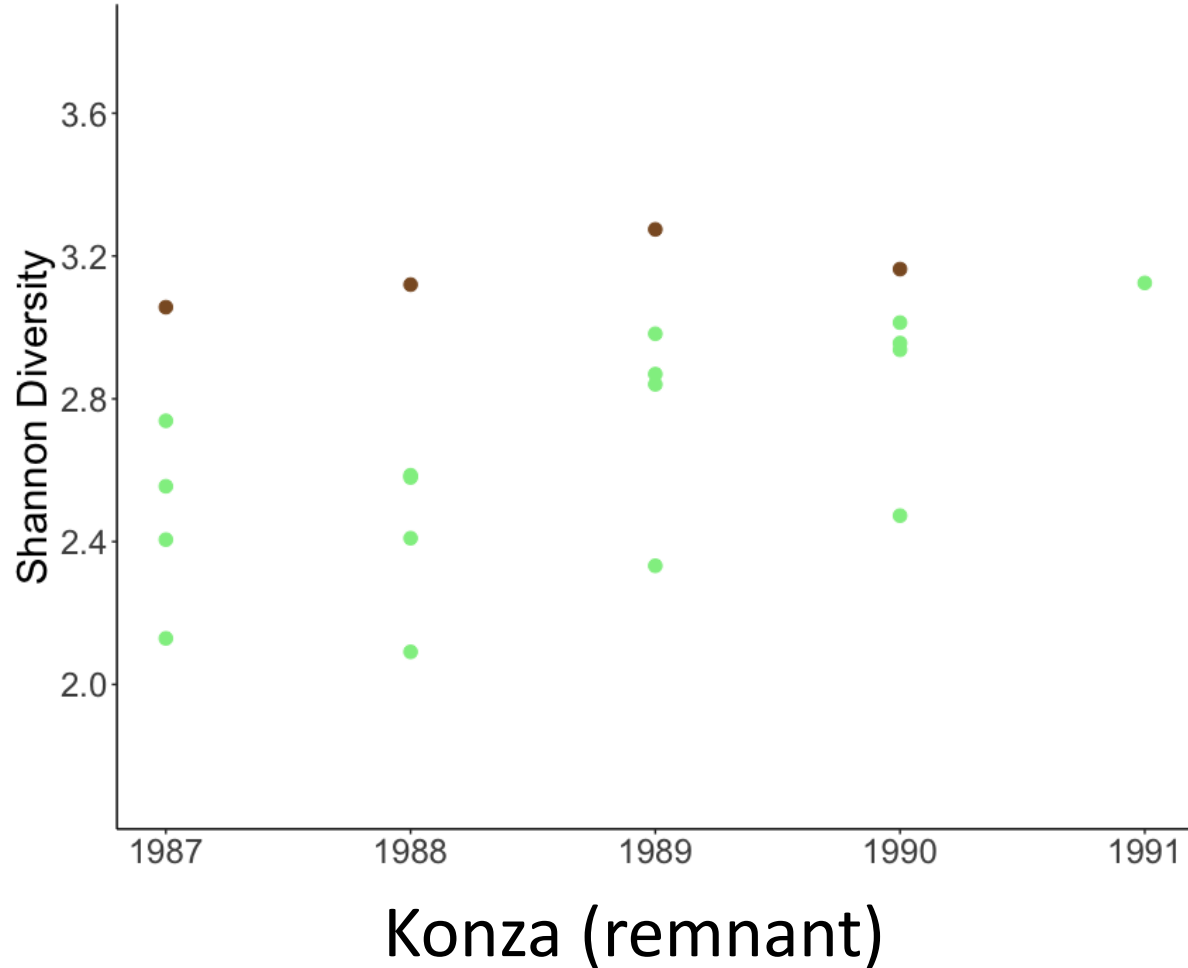
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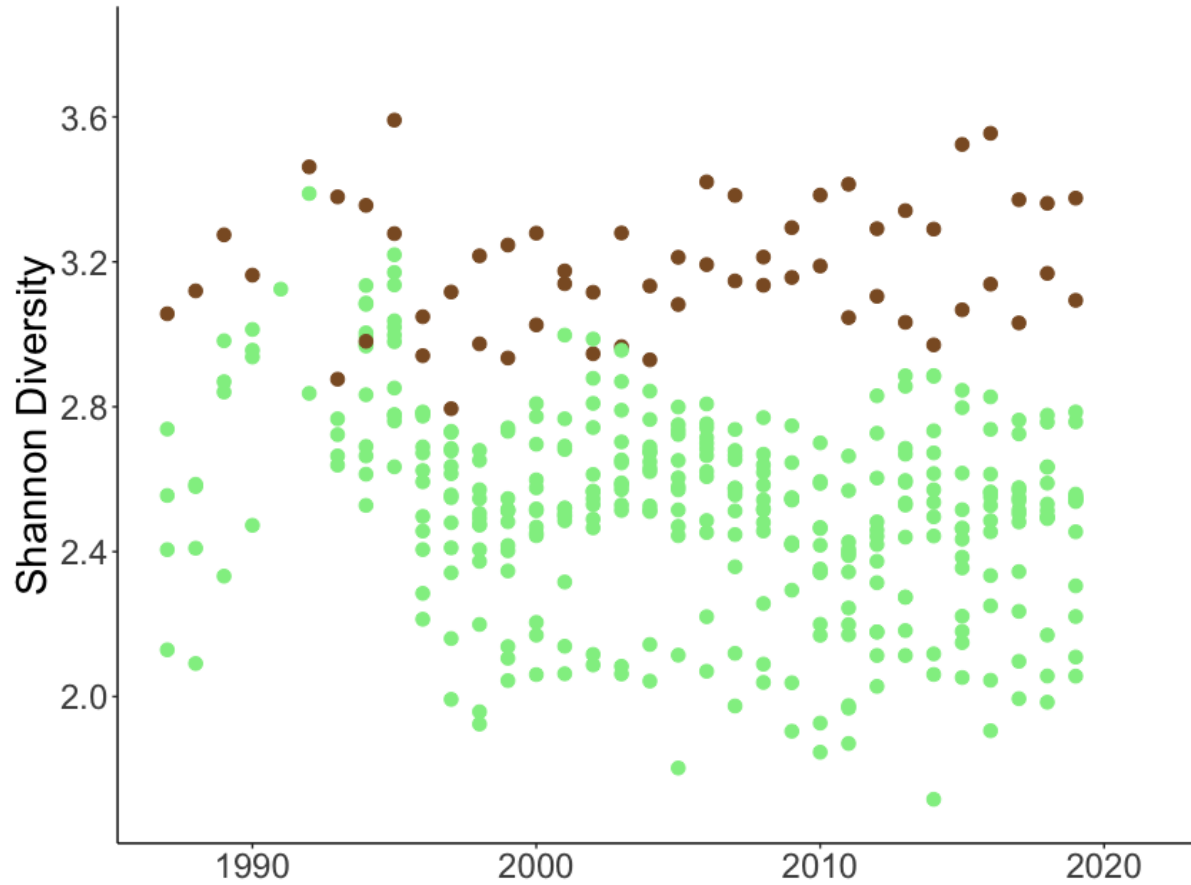
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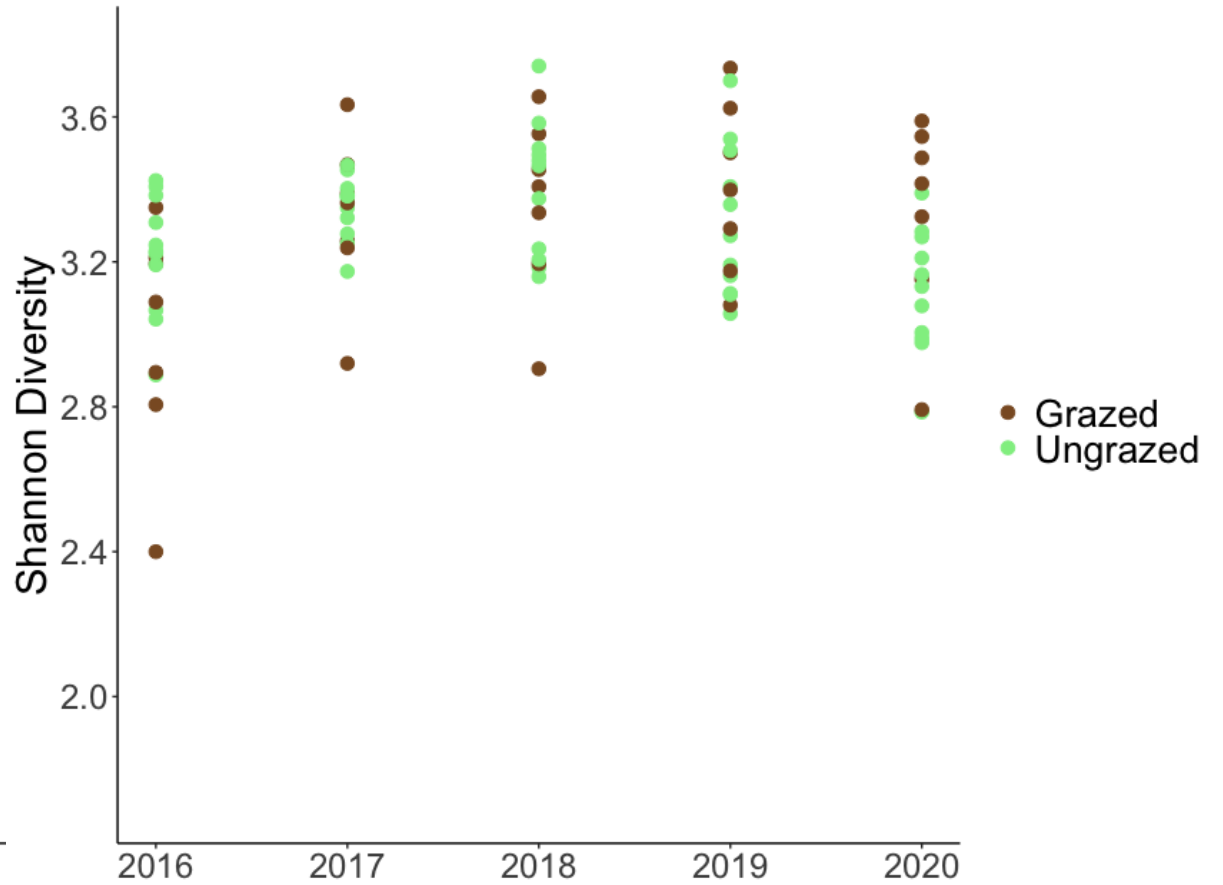
Response at Nachusa differs from Konza



On-going long-term data collection



Konza (remnant)



Nachusa (restoration)

20 years of plant community monitoring

Monitoring impacts of bison reintroduction on
plant communities

Restoring animal communities

Effects of management outweigh effects of plant diversity on restored animal communities in tallgrass prairies

Peter W. Guiden^{a,1} , Nicholas A. Barber^b , Ryan Blackburn^c, Anna Farrell^a, Jessica Fliginger^a , Sheryl C. Hosler^d , Richard B. King^{a,e} , Melissa Nelson^a, Erin G. Rowland^a , Kirstie Savage^a, John P. Vanek^a , and Holly P. Jones^{a,e} 





Age of planting



Prescribed fire



Bison grazing

How does prairie restoration affect animal biodiversity?

Is animal biodiversity shaped by management or plant communities?



Small mammals



Snakes



Dung beetles



Ground beetles

Animal biodiversity

Taxonomic diversity
Phylogenetic diversity

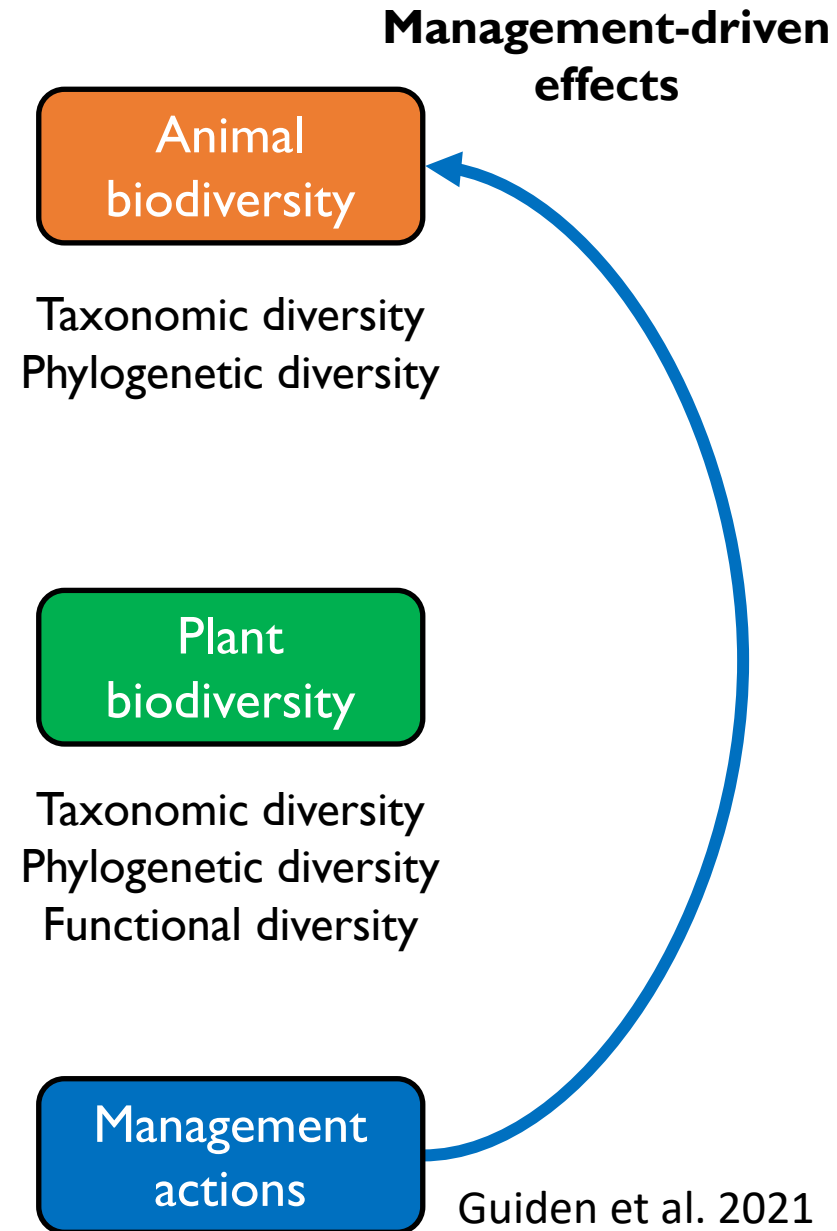
Plant biodiversity

Taxonomic diversity
Phylogenetic diversity
Functional diversity

Management actions

How does prairie restoration affect animal biodiversity?

Is animal biodiversity shaped by management, or plant communities?



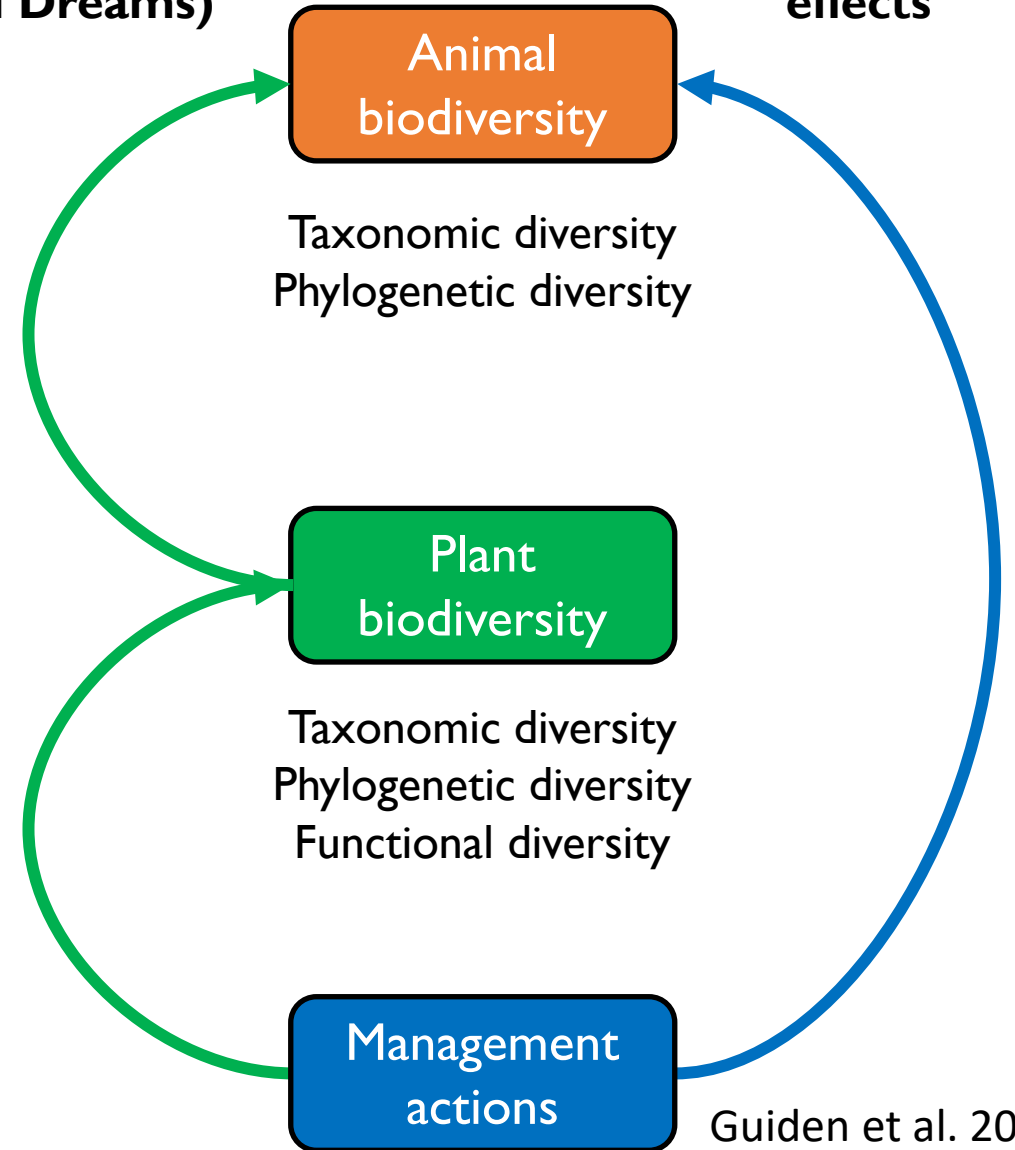
How does prairie restoration affect animal biodiversity?

Is animal biodiversity shaped by management, or plant communities?



**Plant-driven effects
(Field of Dreams)**

Management-driven effects



Guiden et al. 2021



Plant community surveys (4 years)



Small-mammal live trapping (4 years)



Snake cover-board trapping (1 year)

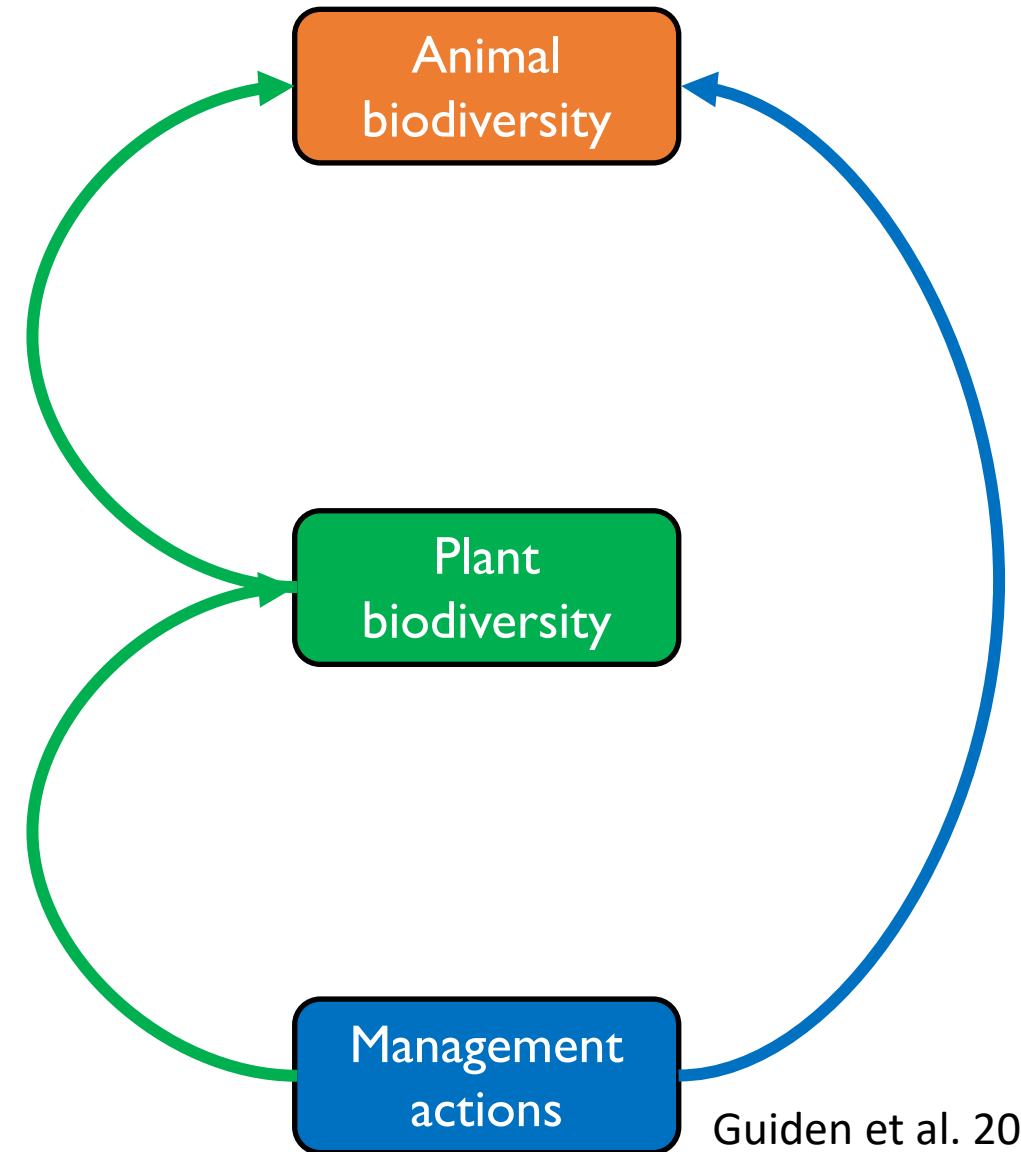


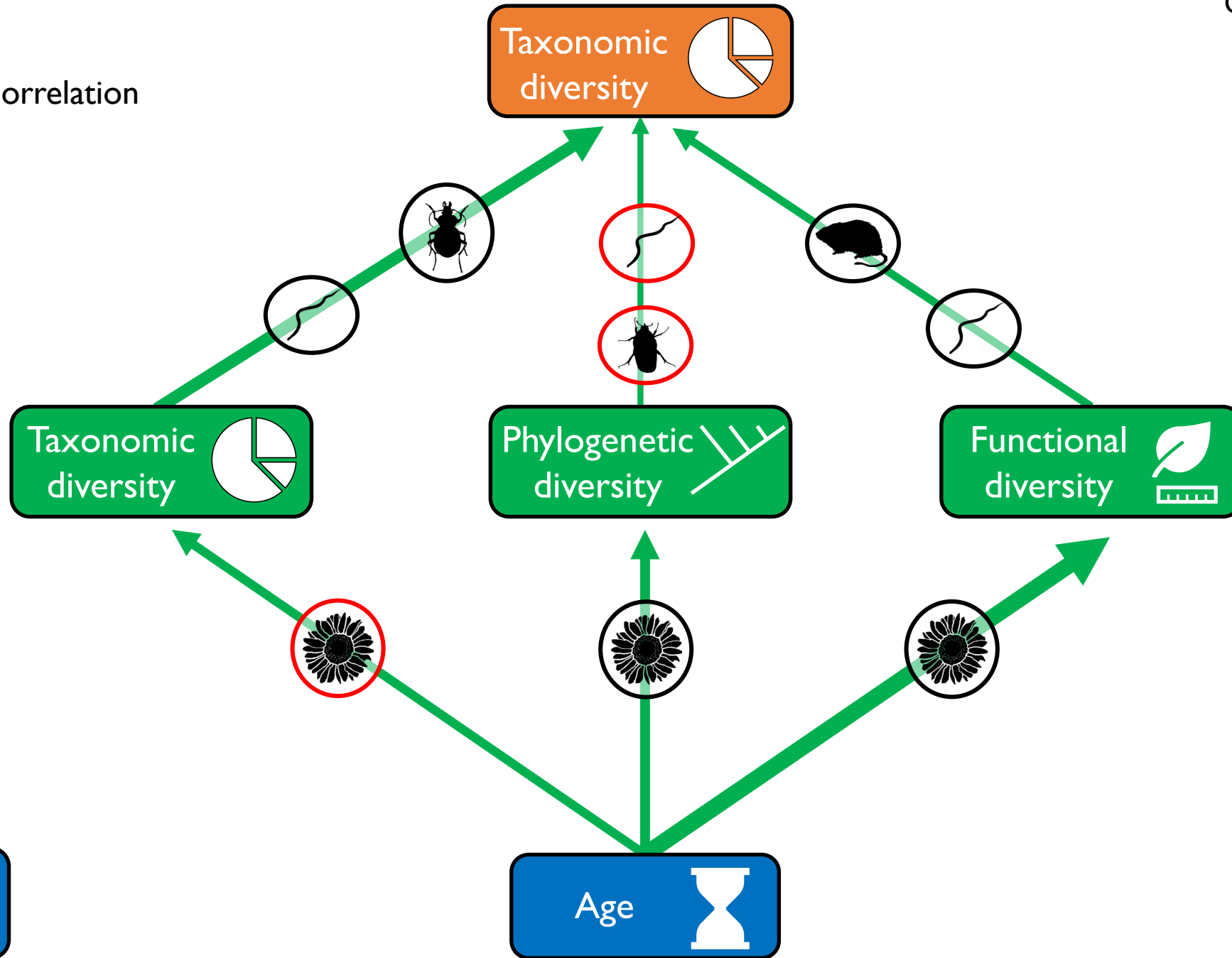
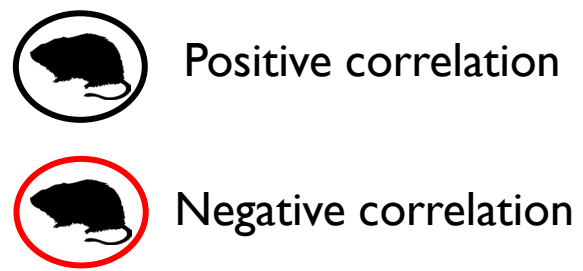
Invertebrate pitfall traps (2 years)

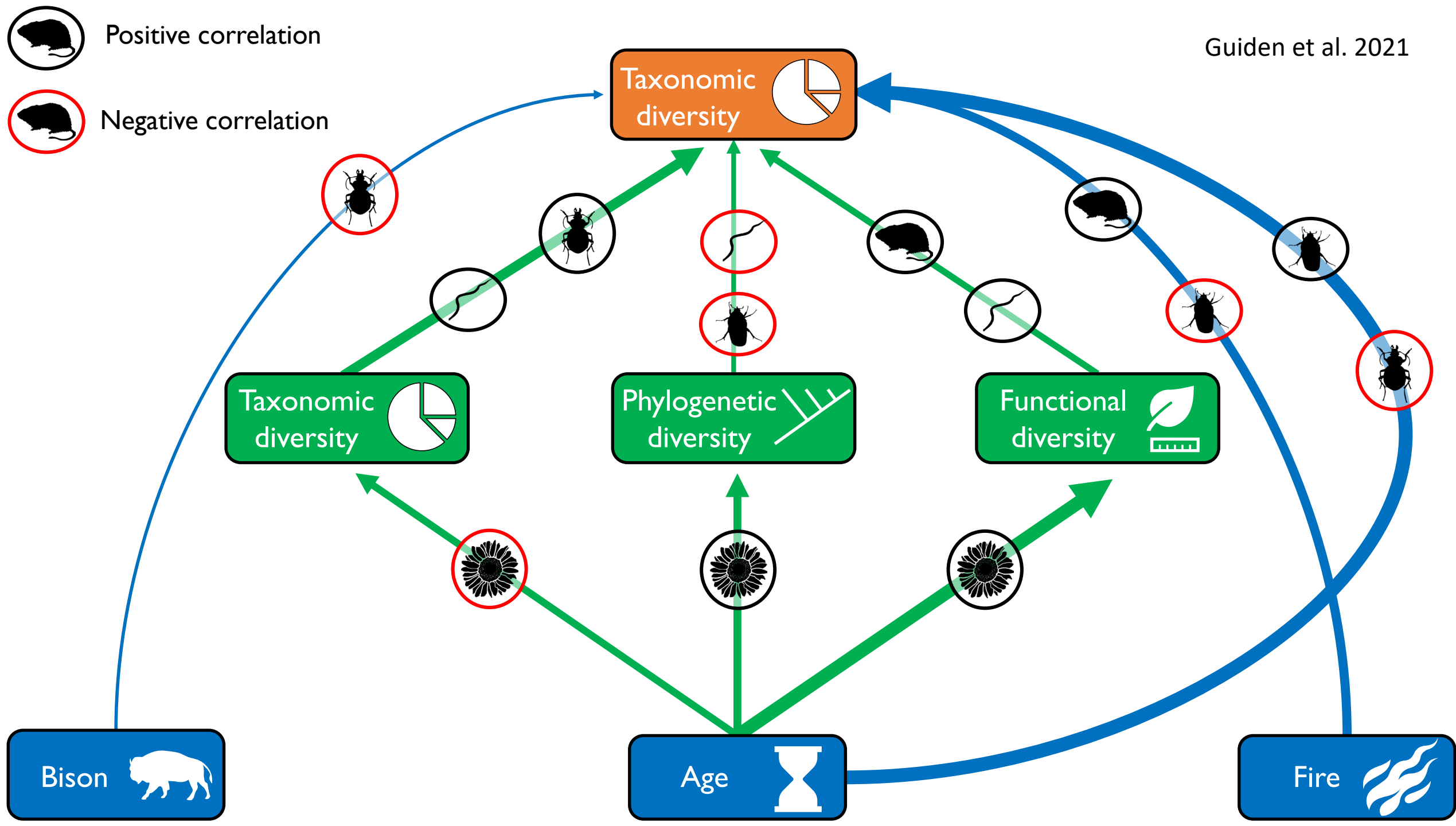
Total: 278 species
5 distinct communities

Putting it all together: structural equation models

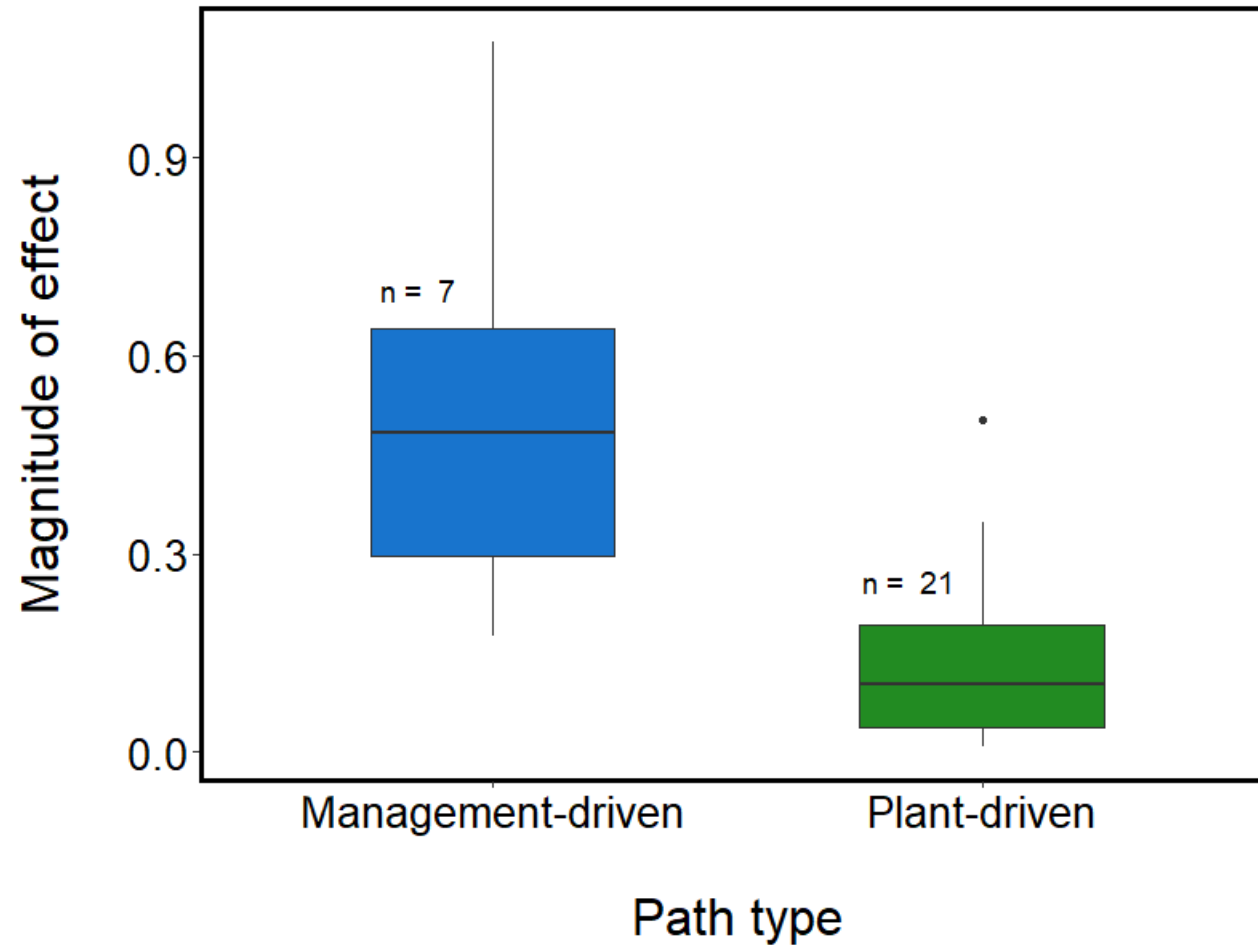
- Model Field of Dreams prediction: plant-driven effects
- Test for missing paths: management-driven effects
- Compare the strength of different pathways







Management-driven effects were six times stronger than plant-driven effects



How does prairie restoration affect animal biodiversity?

Management had positive *and* negative effects

Is animal biodiversity shaped by management or plant communities?

Management practices *and* plant biodiversity important





Nachusa: The work continues

Long-term plant monitoring, including younger plantings

Bison responses: Beyond 5 years

On-going restoration work & new plantings

Science at Nachusa

40 researchers from 16 different institutions

80 peer-reviewed publications

Annual Science Symposium
(April 20, 2024)

For 2024: Friends of Nachusa
awarded >\$70,000 among 12
researchers



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Questions?

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