Understanding differences in community composition of in-field prairie plantings in Iowa, USA

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Outline

- The backdrop
- My thesis research
  - Methods
  - Results
  - Discussion & Summary

The backdrop:

We grow A LOT of corn and soybeans in Iowa.

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This two-year annual cropping system is inherently “leaky”

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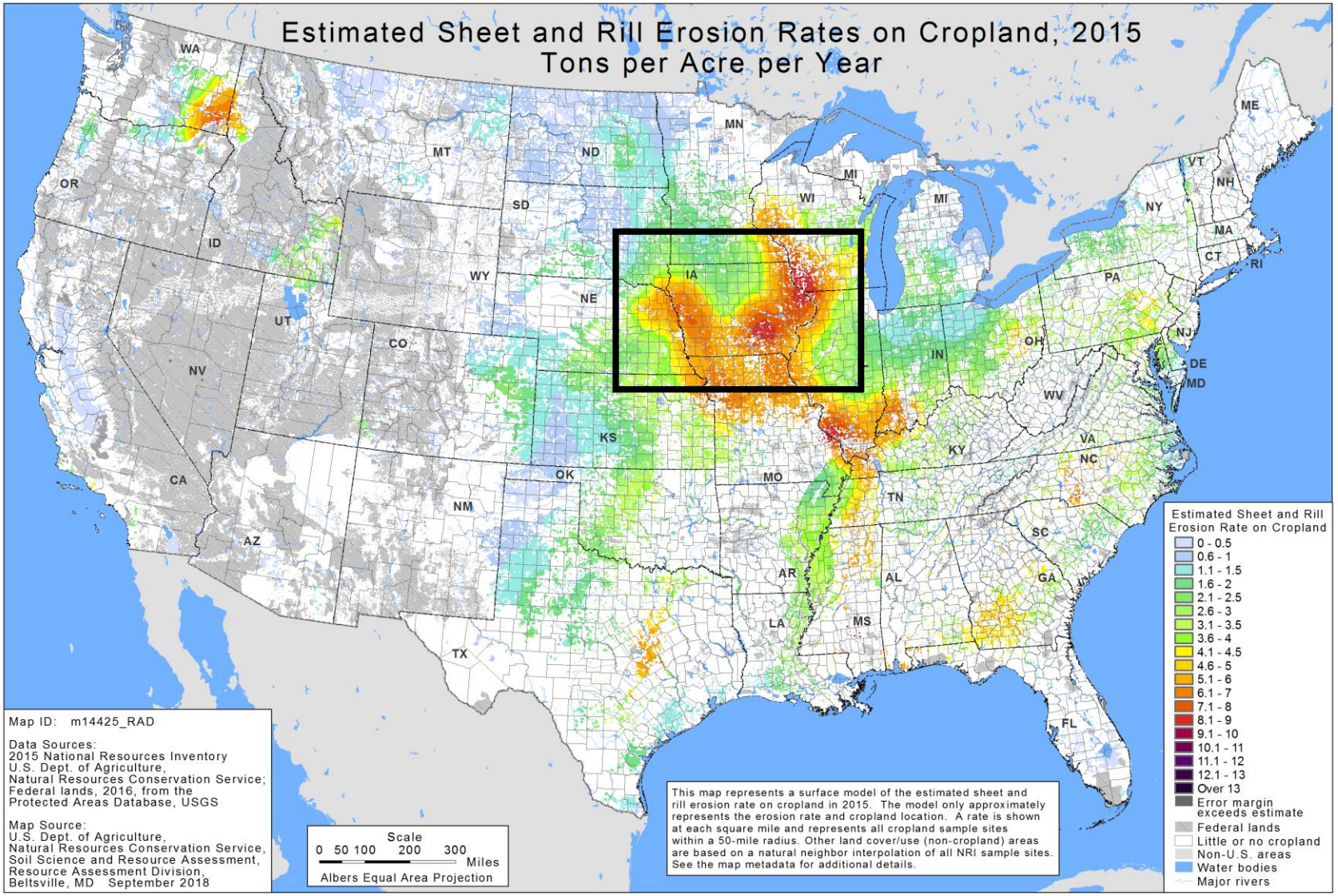

USDA, National Resources Inventory

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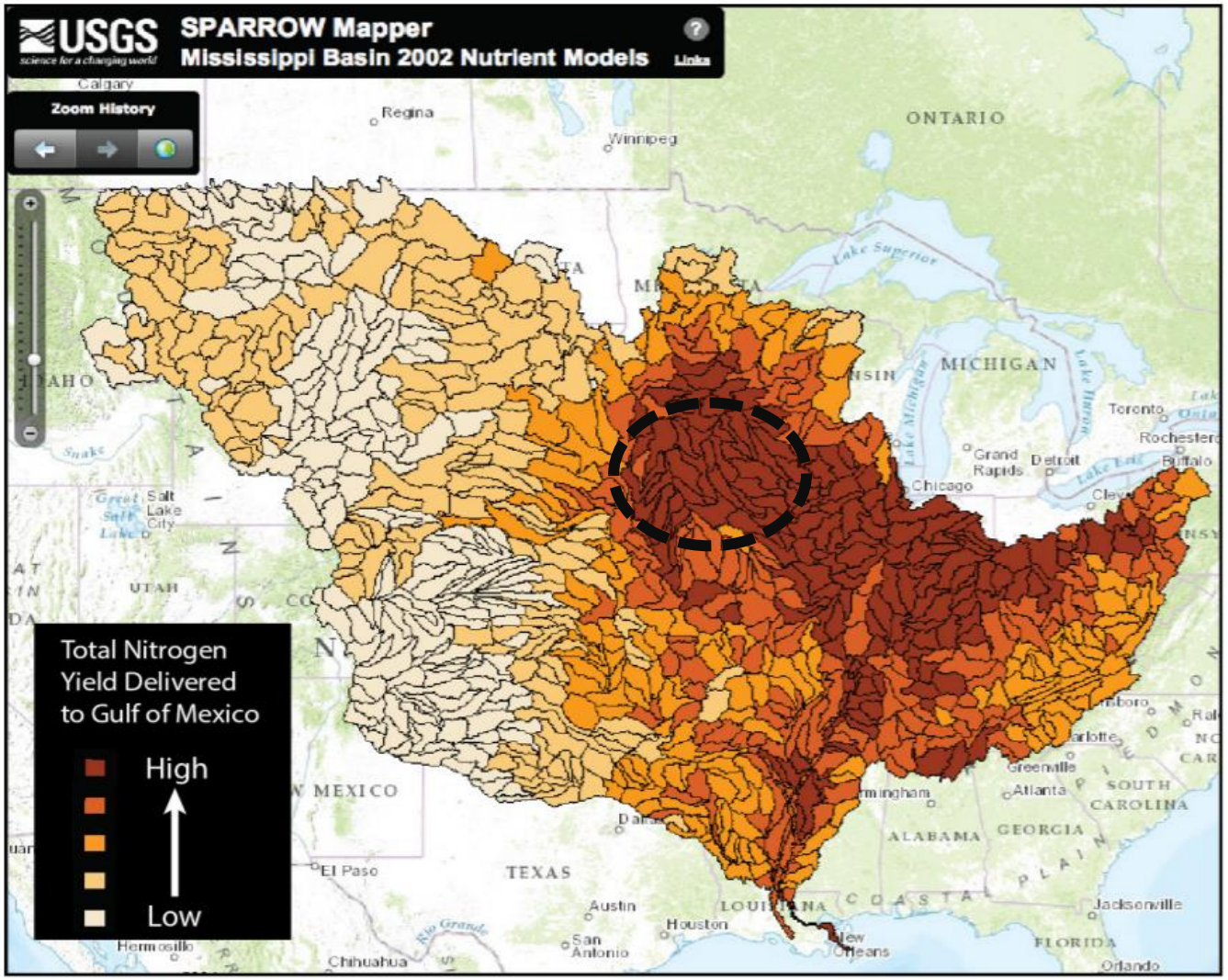
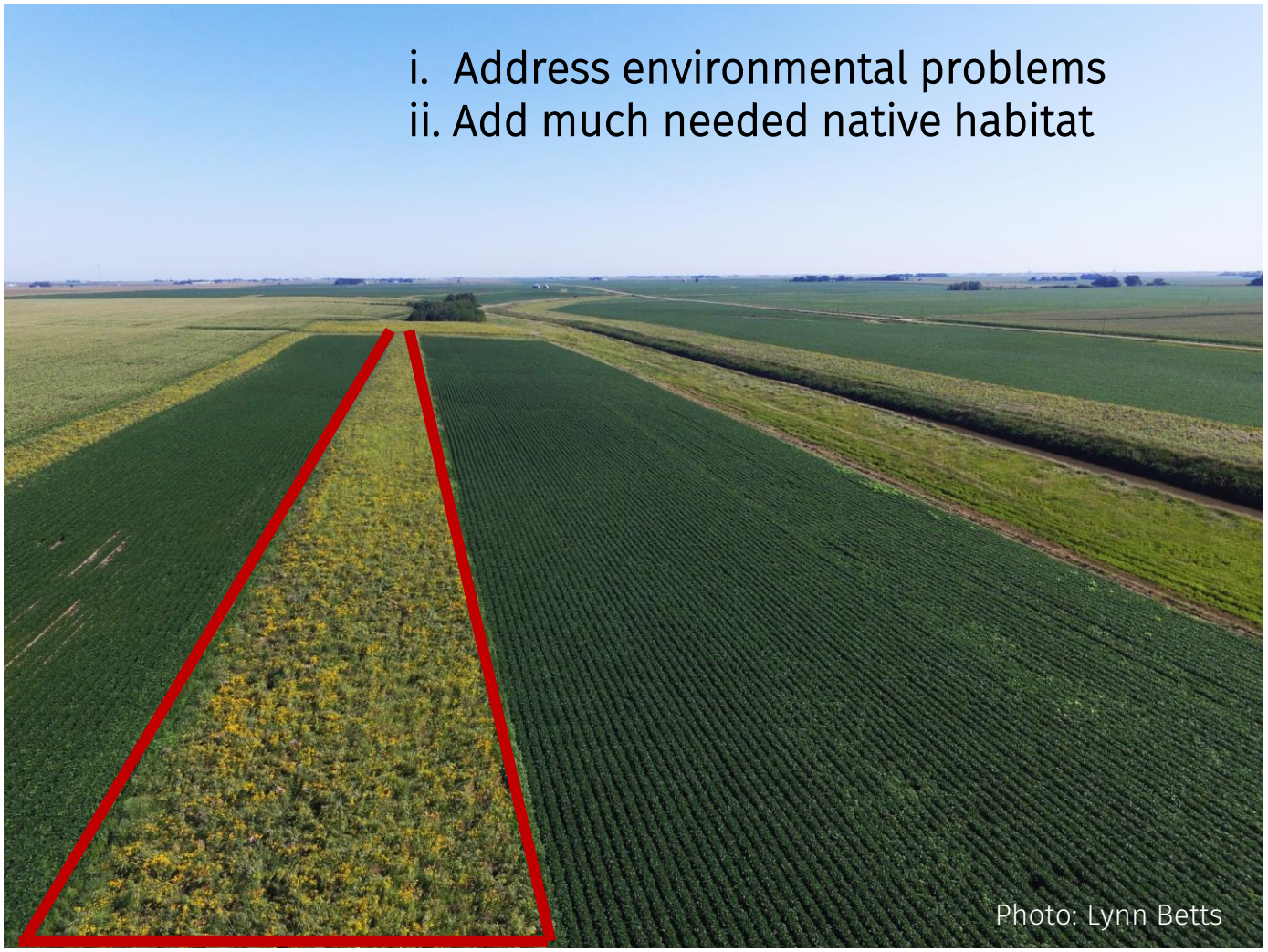


EPA. Mississippi River/Gulf of Mexico Watershed Nutrient Task Force 2017 Report to Congress

The backdrop:

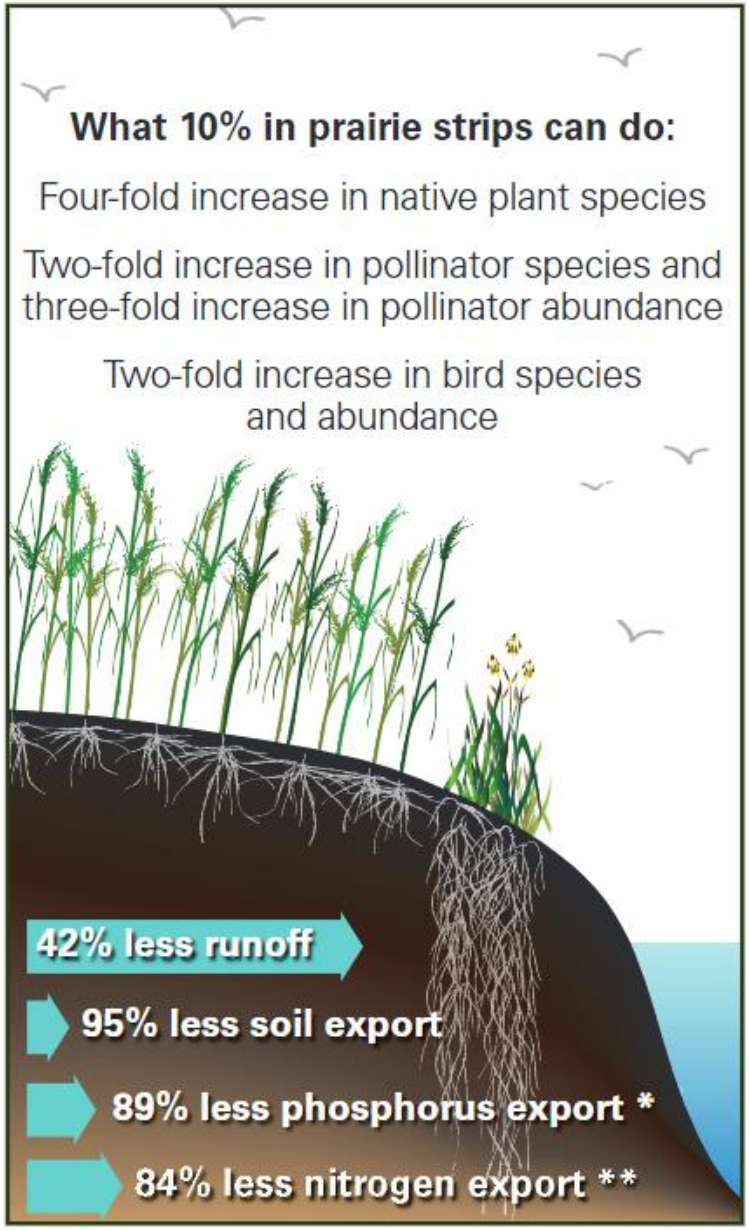
Prairie strips = one solution

Strategically planted restorations



Prairie strips = one solution

Scientific trials of prairie strips began in 2007 at the Neal Smith Wildlife Refuge (Prairie City, Iowa)



Prairie strips can now be found on over 60 farms and are an official Conservation Reserve Program practice (CP-43)

My Masters research

Comprehensive survey of vegetation in established prairie strips sites.

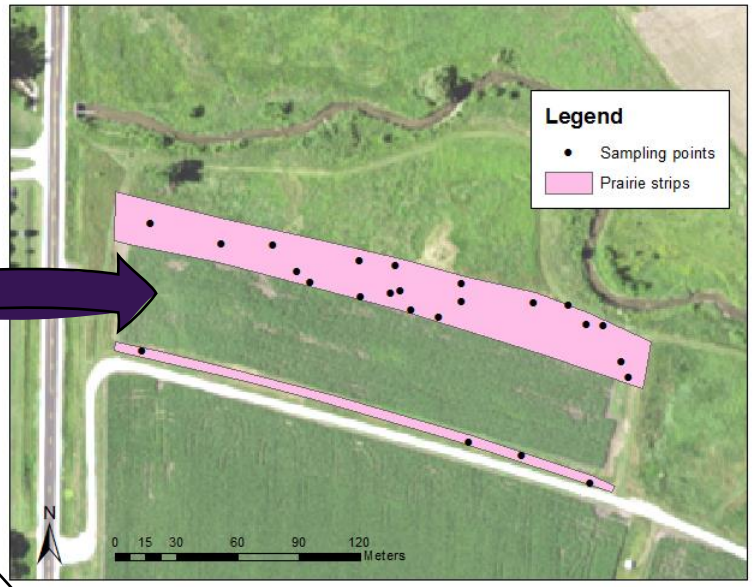
Restoration goals:

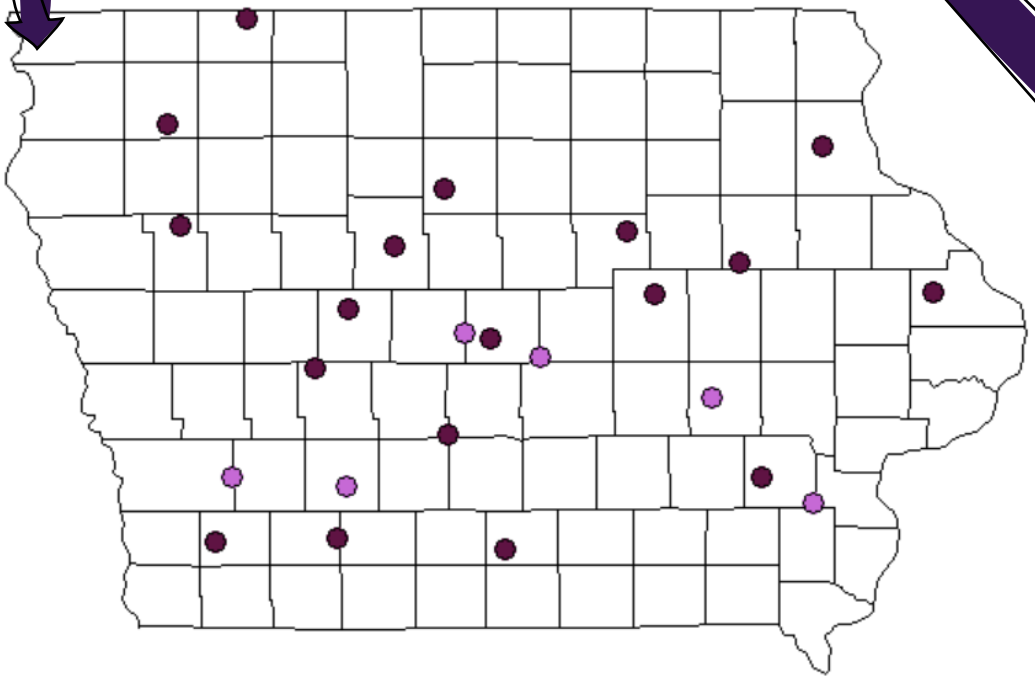
- Diversity
- Target species cover

Factors that explain variation

Methods: Field

- Two field seasons (2018 and 2019)
- 25 sites visited once between July and August
- Random sampling locations chosen in ArcGIS and staked with a GPS in the field
- Percent cover estimates of each species





The light purple sites were all seeded with the same seed mix.

Methods: Stats

- Linear mixed effects models
  - Explanatory variables:
    - Sampling year
    - Seed mix richness
    - Site age
    - Site size
    - Avg. perimeter-to-area ratio of the site
    - Planting season
  - Response variables: Diversity (α-,β-,γ-), richness, and relative cover of different functional groups (logit transformed)
- Data: https://doi.org/10.25380/iastate.12287951.v1
- Code: https://github.com/lydiaPenglish/STRIPS2vegAnalysis

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Focused on seed mix richness as the seed mix is the largest economic investment a landowner makes in this type of restoration

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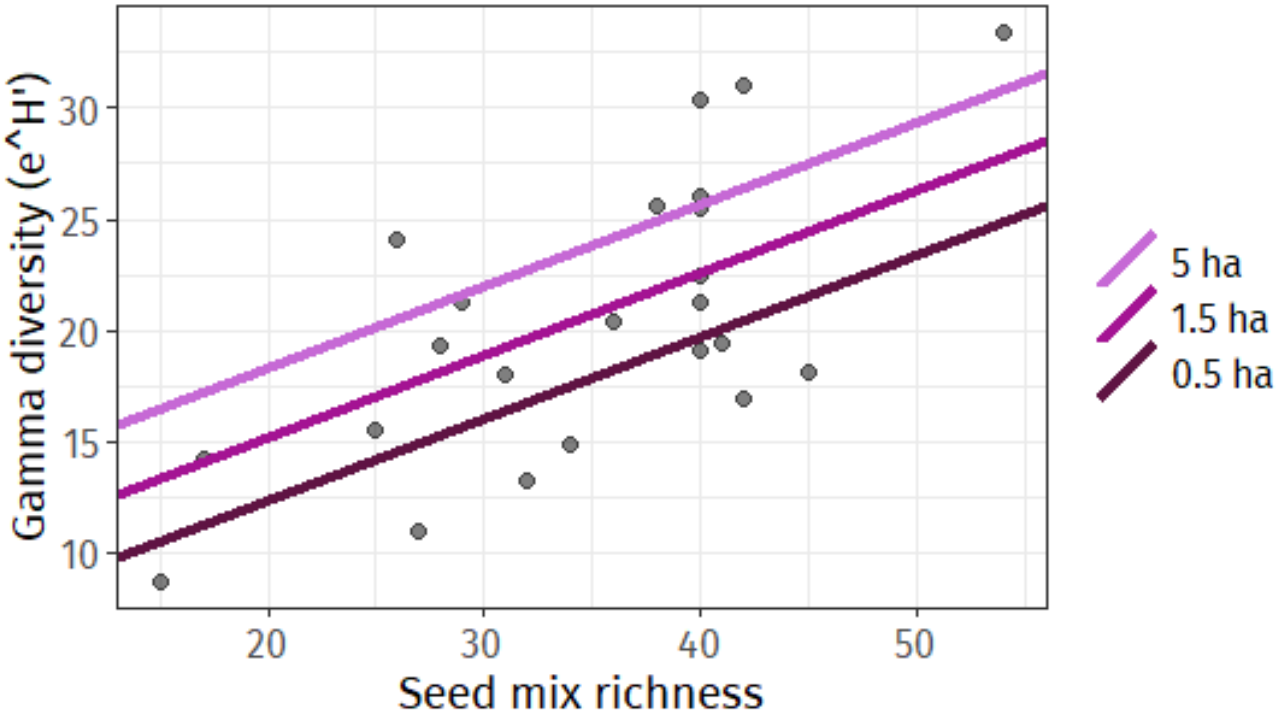
Results: γ-diversity

	Est.	95% CI	P
FIXED EFFECTS			
Sampling year	1.38	-0.03, 2.85	0.07
Seed mix richness	0.37	0.19, 0.55	**<0.001**
Site age	—	—	—
Site size (ha) - log	2.59	0.94, 4.23	**0.007**
P:A ratio	—	—	—
Season planted	—	—	—



Results: Target species cover

- Didn't find that many factors explained variation in the relative cover of prairie species, weedy species, or different functional groups

	Legume cover (logit)			Annual weed cover (logit)		
	Est.	95% CI	P	Est.	95% CI	P
FIXED EFFECTS						
Sampling year	-0.71	-1.61, 0.135	0.11	0.09	-0.40, 0.62	0.72
Seed mix richness	0.01	-0.07, 0.09	0.73	0.04	-0.01, 0.08	0.13
Site age	**-1.05**	-1.65, -0.44	**0.006**	**-0.36**	-0.67, -0.05	**0.04**
Site size (ha)	0.65	0.02, 1.28	0.07	—	—	—
Avg P:A ratio	—	—	—	—	—	—
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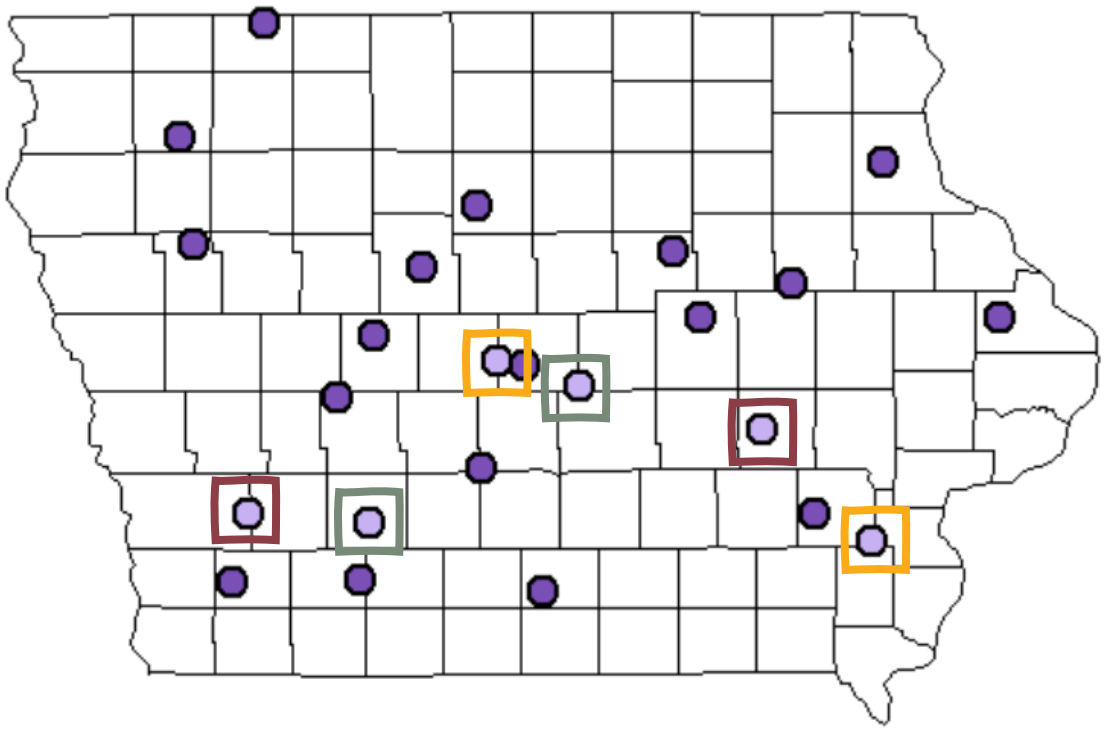
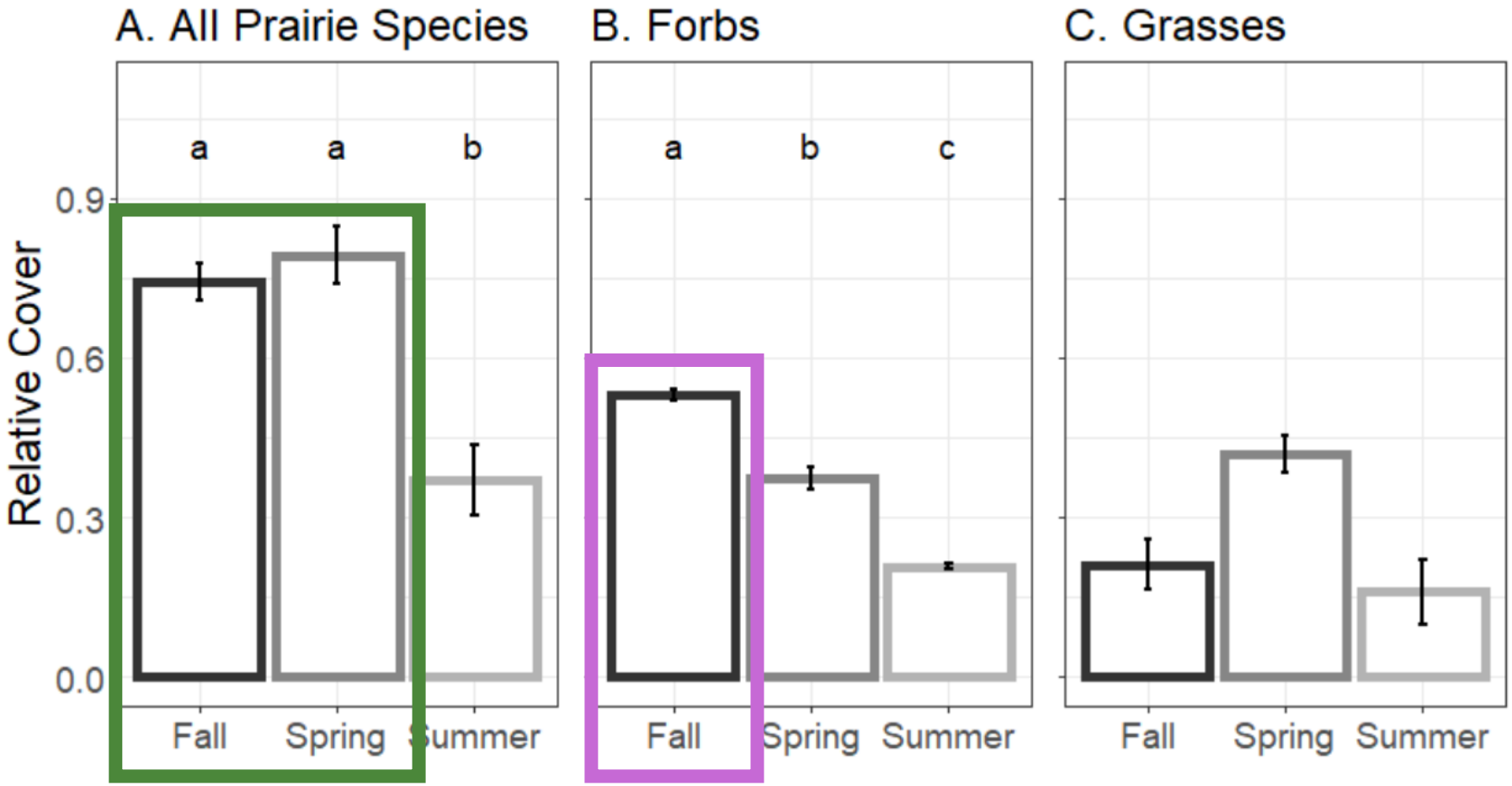
Avg P:A ratio	—	—	—	—	—	—
Season planted	—	—	—	—	—	—

Site age was negatively associated with annual weedy cover (a common pattern) and the cover of legumes (likely an artifact of the seed mixes used).



6 sites sampled in 2019 were sown with the same seed mix

Results: Subset of sites



Dormant season plantings result in higher cover of prairie species

Fall plantings result in higher cover of forbs

There are no significant differences in grass cover between planting seasons

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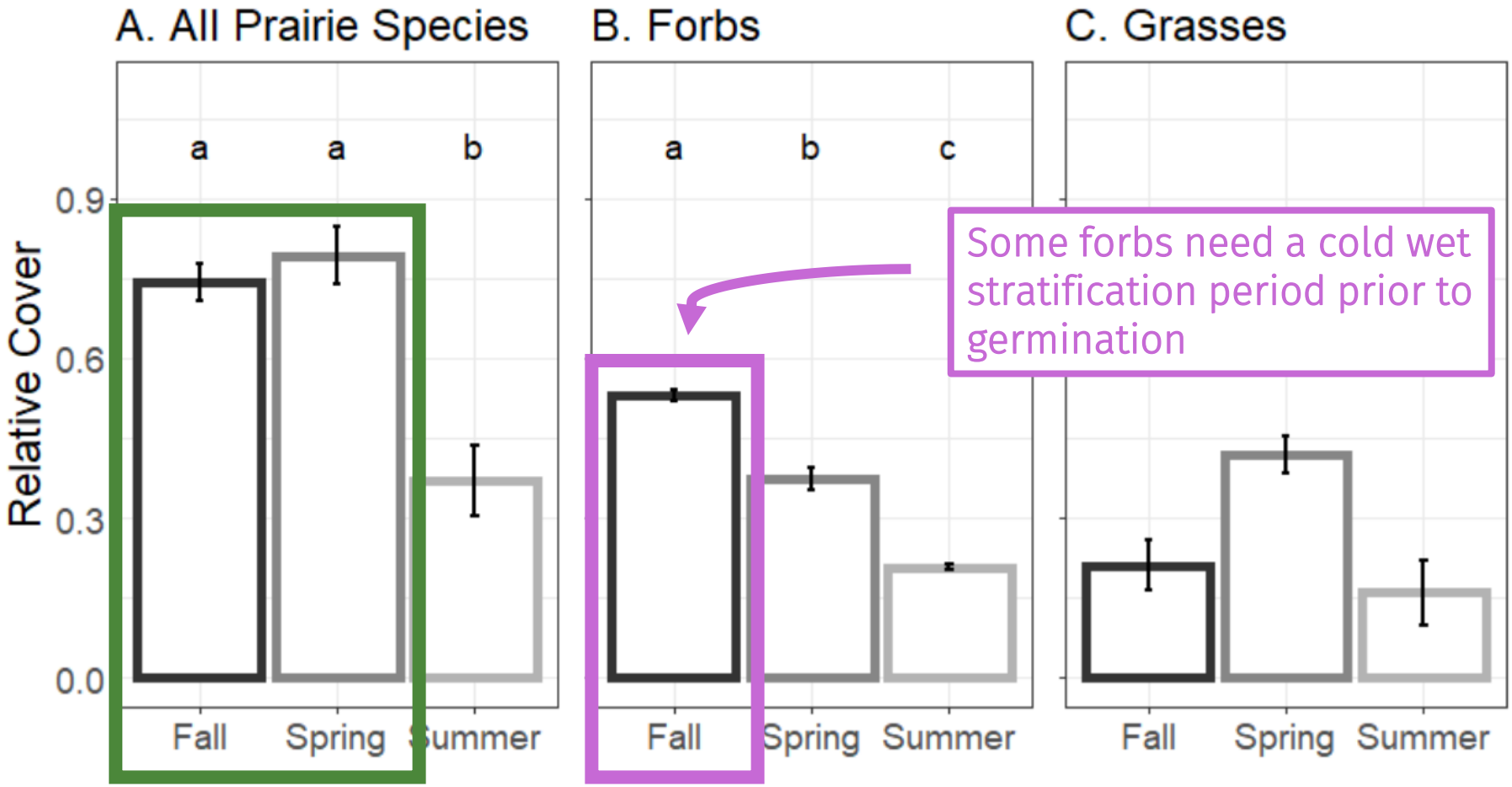

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Discussion and summary

- The seed mix richness is positively associated with diversity and target species richness.
  - Oftentimes more speciose seed mixes are more expensive ($$$) but in this case, higher investment pays off.

- Few of our explanatory factors explain variation in weedy or prairie species cover.
  - Other, recent work has shown the importance of stochastic factors like planting year weather, in determining non-target cover (Groves et al. 2020. *Scientific Reports).* This should be investigated.

- Season planted does explain the relative cover of prairie species, forbs especially, but this is only evident after we control for seed mix richness in a subset of sites.

Thanks for viewing!

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Department of Agronomy

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Get in touch!

I currently work for Practical Farmers of Iowa, a non-profit centered around farmer-to-farmer education. Learn more here!

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