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Tallgrass Prairie Center: Factors Affecting *Cirsium arvense* Density in Eastern Iowa Conservation Reserve Program Fields

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Factors Affecting *Cirsium arvense* Density in Eastern Iowa Conservation Reserve Program Fields

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Background

- An estimated 230,000 acres of Conservation Reserve Program (CRP) fields were planted since 2011 across Iowa to restore habitats suitable for monarchs and pollinators.
- The CRP Pollinator initiative requires the planting of three species of native flowering forbs per blooming season.
- *Cirsium arvense* (Canada thistle) is a major competitor because it is perennial, spreads clonally, and its seeds are wind-dispersed.
- Typically land managers will eliminate a prairie planting when thistle becomes too abundant.

Research Questions-

- How does thistle density vary with the density of other species in the plant community?
- Is thistle density in a CRP field affected by proximity to other thistle populations?

Methods

- We surveyed vegetation in 12 sites in eastern Iowa during summer 2017.
- For each site, we selected random points using QGIS to establish five to ten, 100m transects
- 75 - 0.5 m x 2.0 m quadrats were placed at 7 m intervals along the transects.
- We identified sown forbs and then counted how many stems per plant.
- Using a series of nested sub-quadrats, we recorded the area of the smallest sub-quadrat in which a perennial grass first appeared (frequency).
- We recorded the presence or absence of *C. arvense* in neighboring ditches and land
- Perennial grass frequency was converted to density using: $d = [\ln(1-f)] / -a$
- We calculated mean grass, forb and thistle density for each site.
- We plotted the relationship between thistle density and competing vegetation at the level of individual quadrats (n= 975) and sites (n=13).

Results

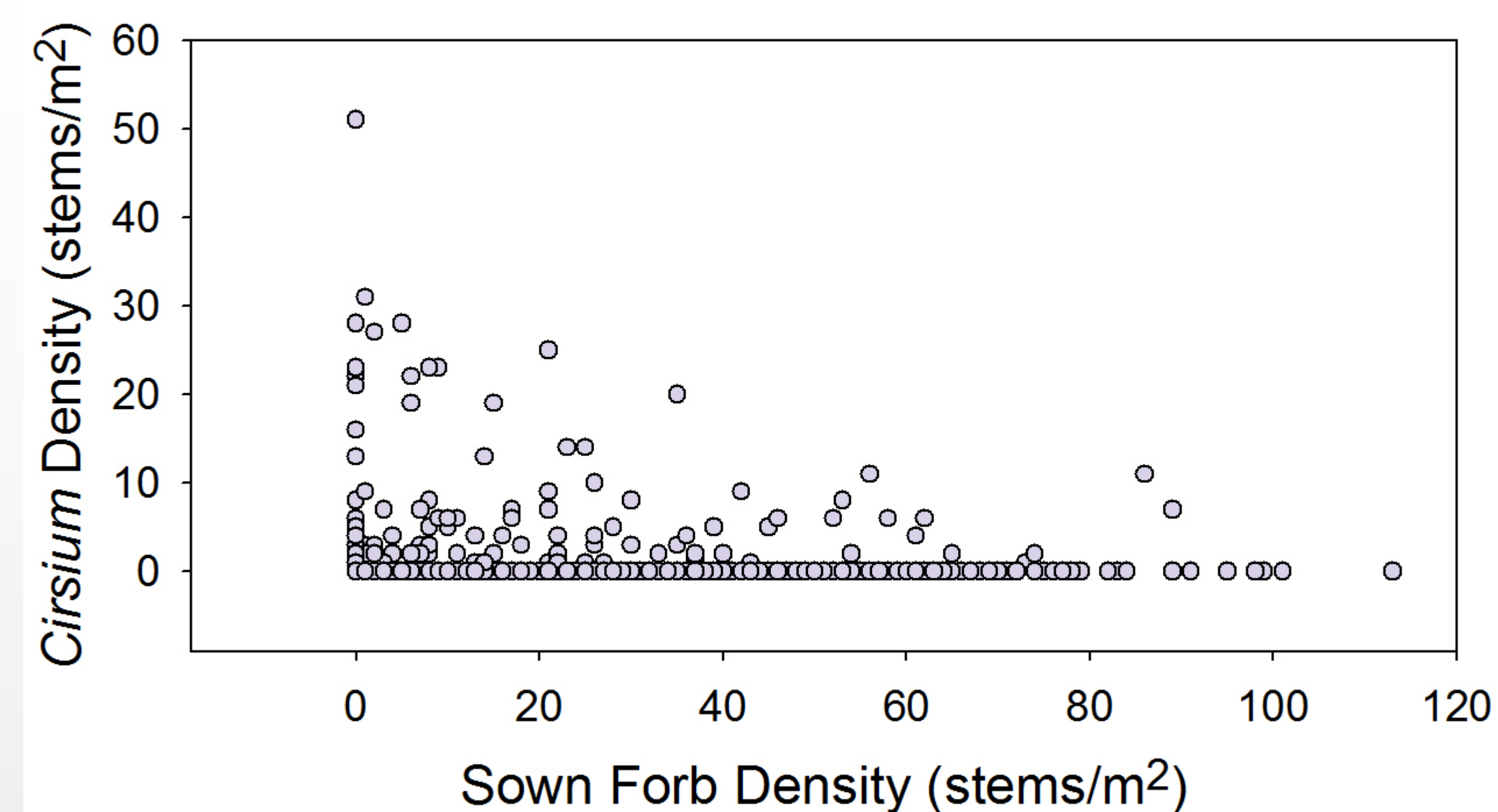


Figure 1: Density of *Cirsium* vs. all planted forb stems across 900 quadrats over 12 sites.

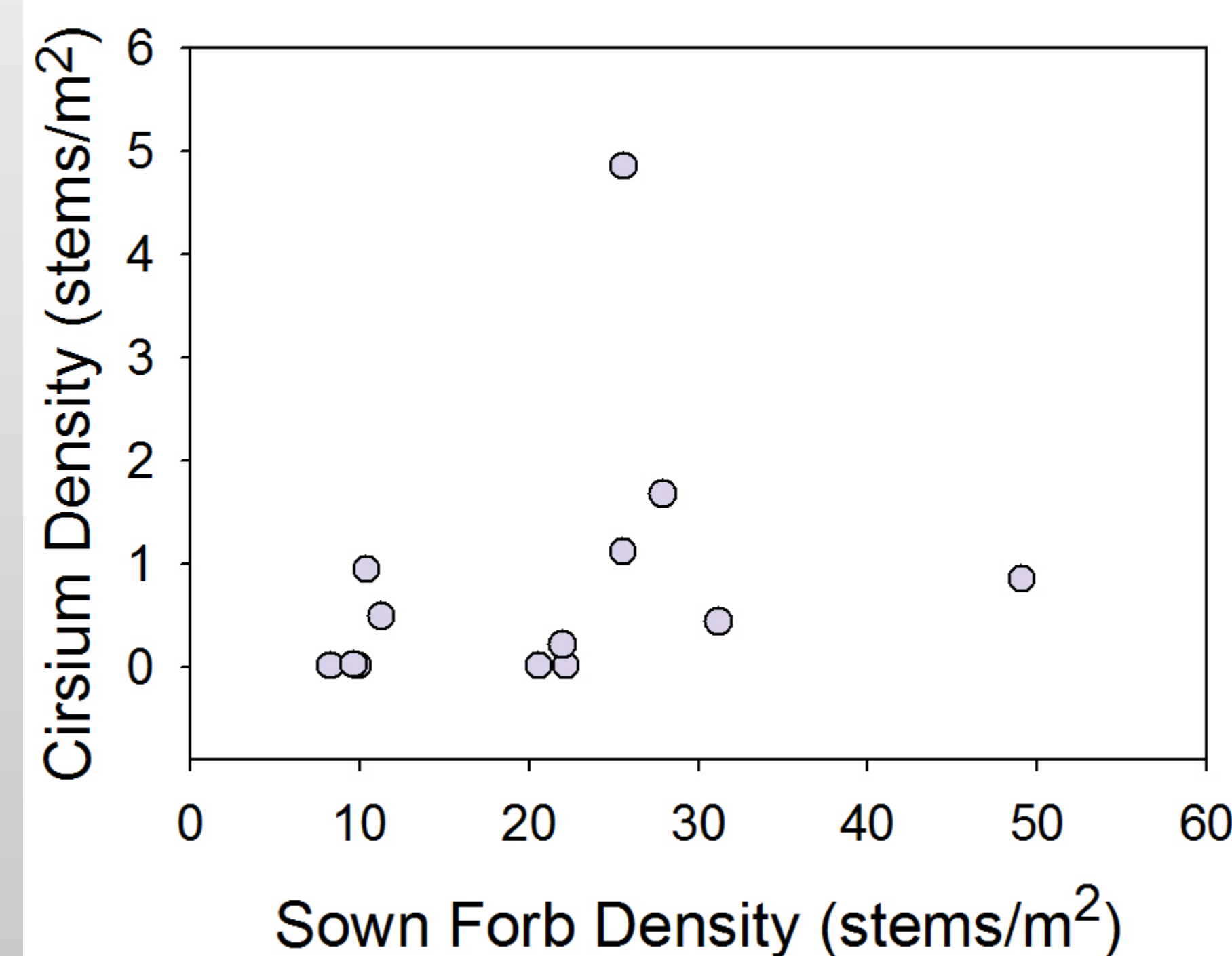


Figure 2: Mean sown forb density compared to *Cirsium* density (stems/m²) per site.

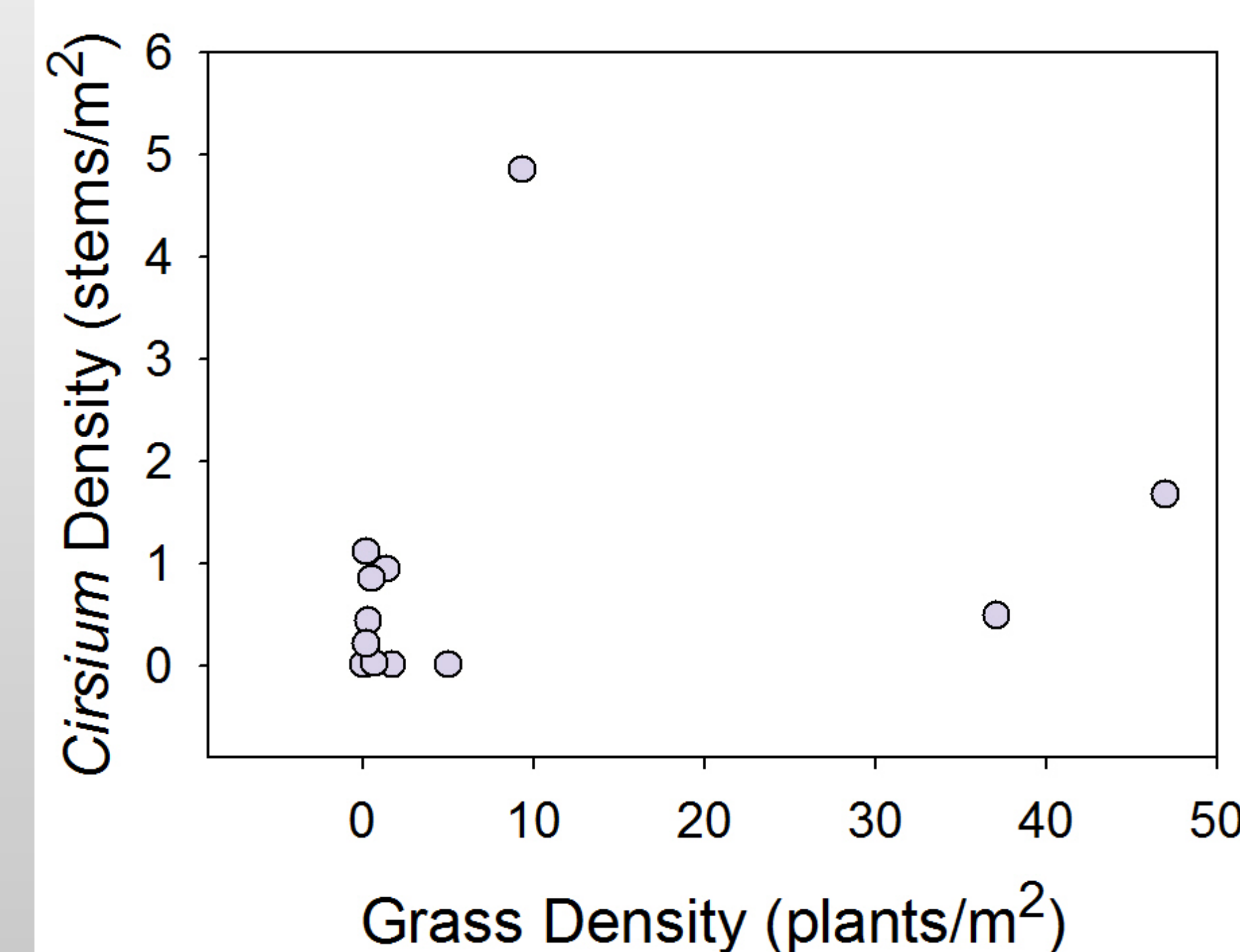


Figure 3: Mean estimated grass density compared to *Cirsium* density (stems/m²) per site.

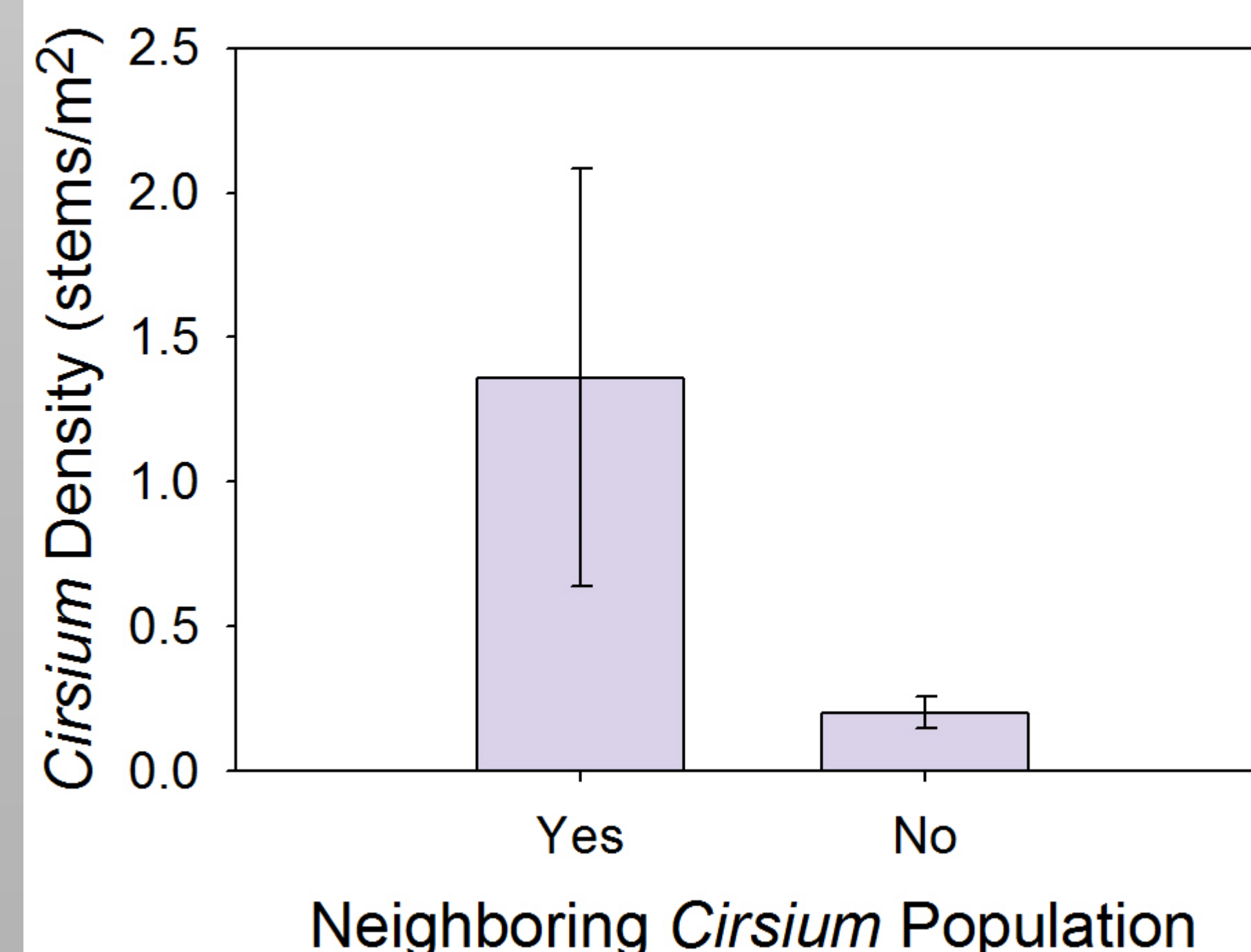
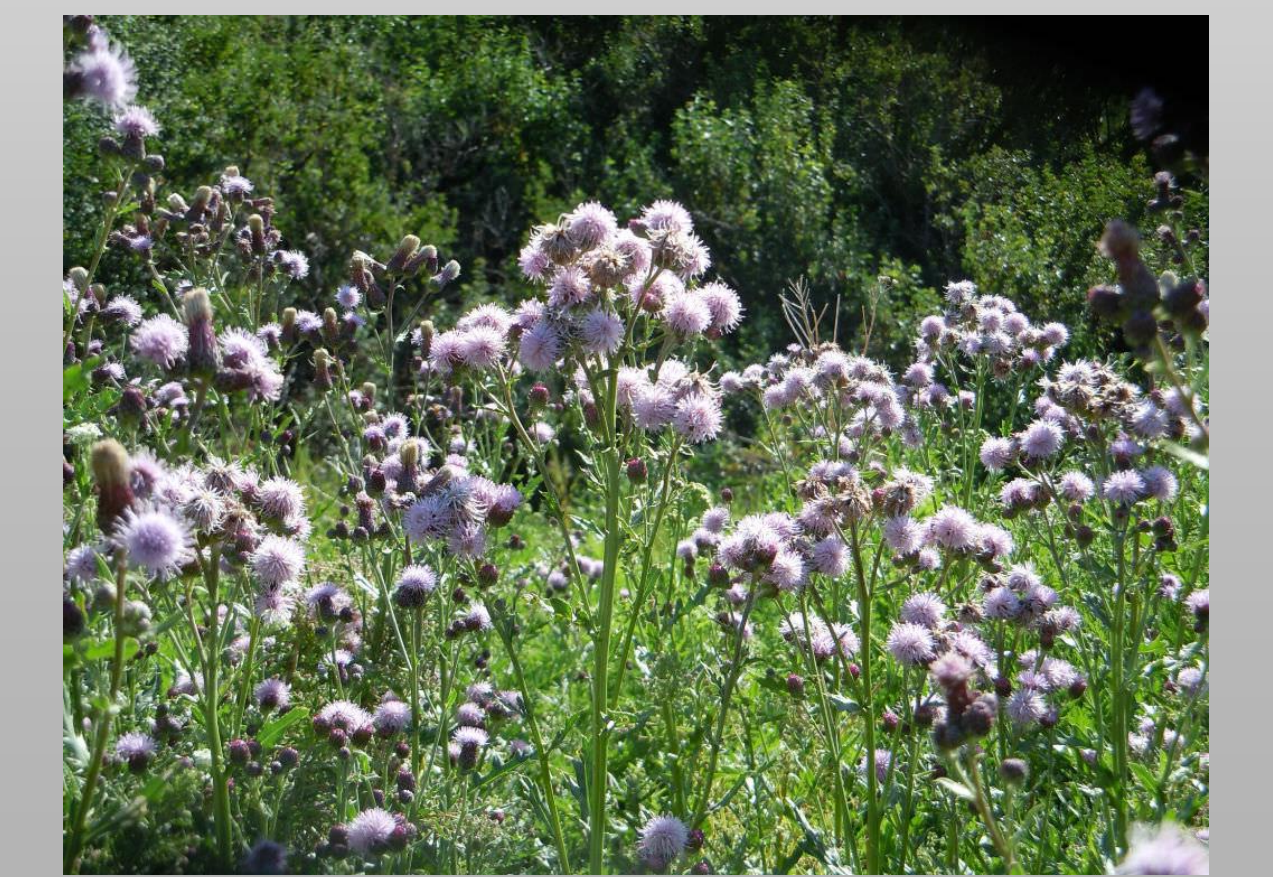


Figure 4: Affect of the proximity of *Cirsium* populations on mean *Cirsium* density at each site (n=6 for each category).

Conclusions

- Preliminary observation suggests that at the quadrat level, *Cirsium* density is lower at extremely high sown forb densities (Fig.1)
- Sites varied from a mean of zero to 5 stems/m² but neither forb nor grass stem density appeared to influence *Cirsium* density at the site level (Figs. 2 & 3)
 - The difference between quadrat and site results may be related to *Cirsium*'s dense clonal growth form
- *Cirsium* in CRP fields had higher density when close to neighboring populations (Fig.4)



Future Goals

- In the summer of 2018, more sites will be surveyed and we will begin statistical tests
 - The role of neighboring populations needs to be further studied

Acknowledgements

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WoFP -. "Cirsium Arvense." World of Flowering Plants. World of Flowering Plants, 01 July 2017. Web. 26 July 2017.