

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

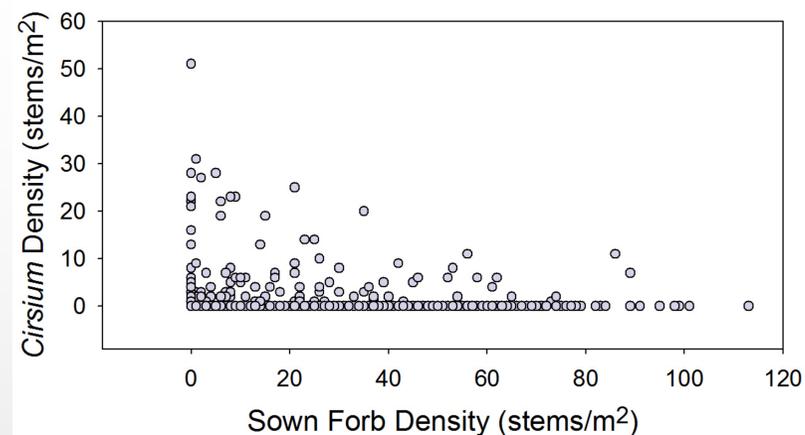


Figure 1: Density of *Cirsium* vs. all planted forb stems across 900 quadrats over 12 sites.

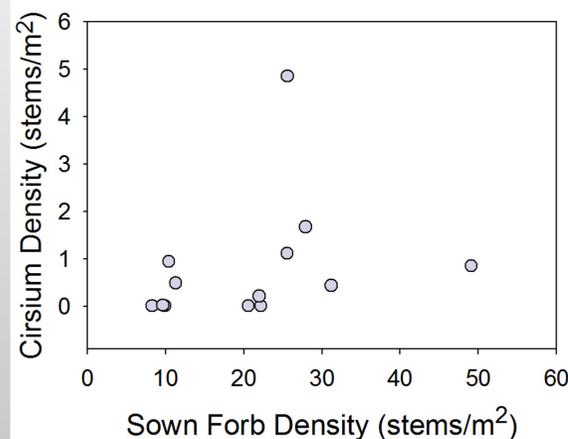


Figure 2: Mean sown forb density compared to *Cirsium* density (stems/m²) per site.

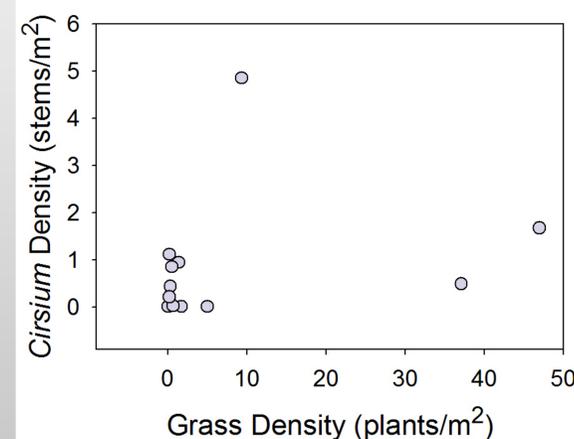


Figure 3: Mean estimated grass density compared to *Cirsium* density (stems/m²) per site.

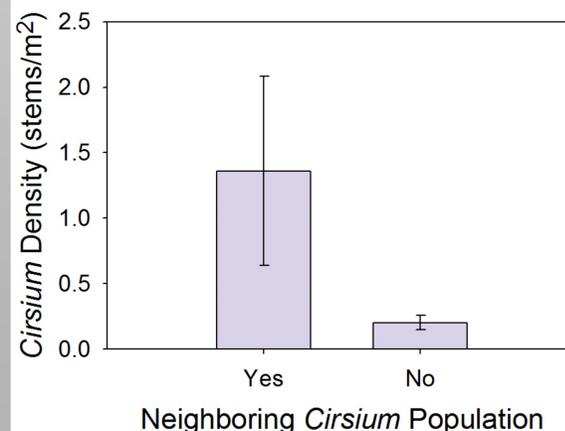


Figure 4: Affect of the proximity of *Cirsium* populations on mean *Cirsium* density at each site (n=6 for each category).

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

Thanks go out to everyone that worked so hard in the SURP program. Gabrielle Brown, Jennifer Pauley, Michael Lashbrook, Chandler Dolan, Molly Langhenry, Kylie Jonas, Alec Glidden, Kathleen Madsen, Dr. Laura Jackson, Dr. Mark Myers, Dr. Ai Wen and Dr. Mark Sherrard. Our program was supported by the UNI Conservation Corps, and the UNI Biology SURP.

Cited

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