

**Investigating the
effects of fire
induced density
on seed predation
in *Liatris aspera***

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Background



Fire and Prairies

Fire can have reproductive benefits for many prairie plants

- Increased resource availability (Brockway et. al. 2002)
- Synchronizes flowering (Wagenius et al. 2020)

Dale G Brockway, Richard G Gatewood, Randi B Paris. Restoring fire as an ecological process in shortgrass prairie ecosystems: initial effects of prescribed burning during the dormant and growing seasons. *Journal of Environmental Management*, Volume 65, Issue 2, 2002, Pages 135-152,

Stuart Wagenius, Jared Beck, and Gretel Kiefer. Fire Synchronizes Flowering and Boosts Reproduction in a widespread but declining prairie species. *PNAS* February 11, 2020 117 (6) 3000-3005



Image Source: Wisconsin Prescribed Burn Fire Council

Fire and *Liatriis*

Reproductive benefits of fire for *Liatriis* (Vickery 2002)

- increases the number of flowering plants
- greater seedling establishment
- higher seed set



Seed Predation

Liatrix is highly susceptible to seed predation from invertebrates

- Negative effects on reproduction (Vickery 2002)

Vickery, Peter. Effects of the Size of a Prescribed Fire on Insect Predation of Northern Blazing Star, a Rare Grassland Perennial. *Conservation Biology* 16(2):413-421



Research Question:

How does fire and the resulting density of flowering liatris plants impact rates of seed predation?

Hypothesis:

I hypothesize that there will be greater density in burned patches, and that these dense burned patches will be more heavily predated than less dense, unburned patches

Methods



Field Data Collection

- Prescribed burns in some of the remnant plots, while some remained unburned
- Recorded nearest neighbor distances for each plant in meters



Liatriis Workflow

Cleaning Liatriis

During the cleaning process, we removed all achenes from the heads, and counted and classified all of the heads from each plant

We created random samples of around 30 achenes for each plant to use for data analysis

Randomizing

Quantifying seed predation

We then quantified seed predation within our random samples as the number of achenes that were predated from each sample.

Finally, we entered our data into CSV files for analysis

Data Entry

Results



Summary Statistics

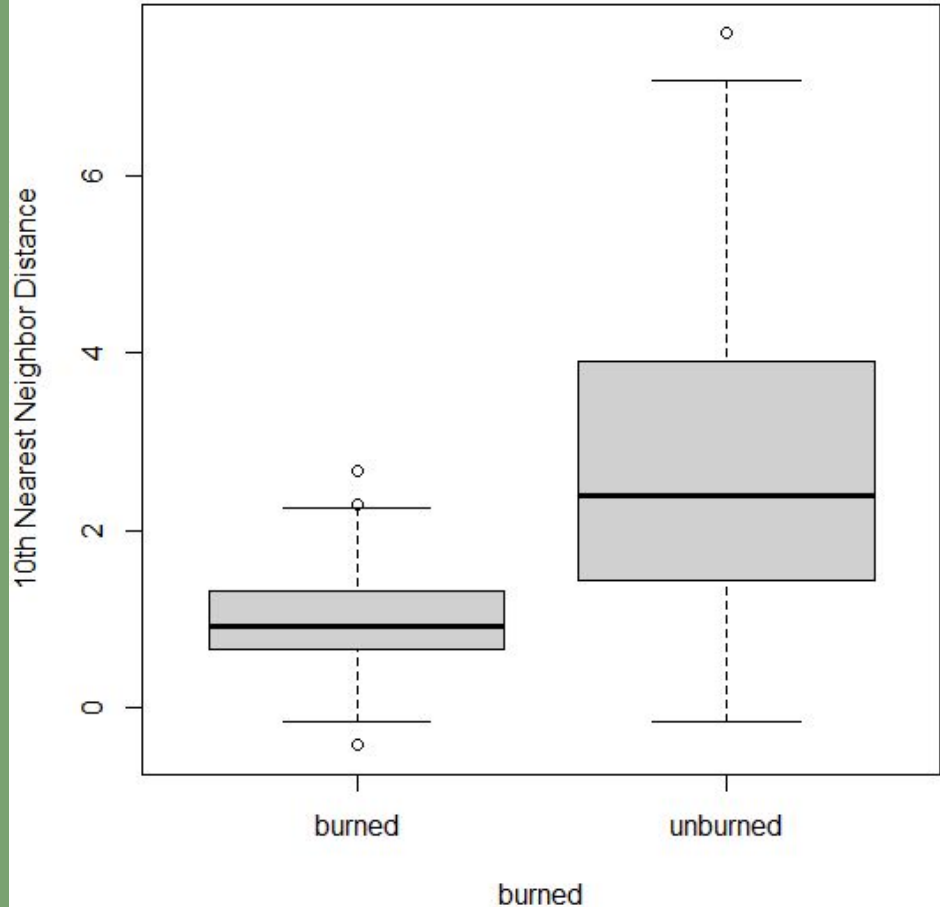
Out of **95** plants, **40** showed no evidence of predation, while **55** showed evidence of predation in some capacity

Within predated plants, predation rates ranged from **~2%-58%**

Of **95** samples, **28** came from burned sites, while **67** unburned sites

Effect of burning on density

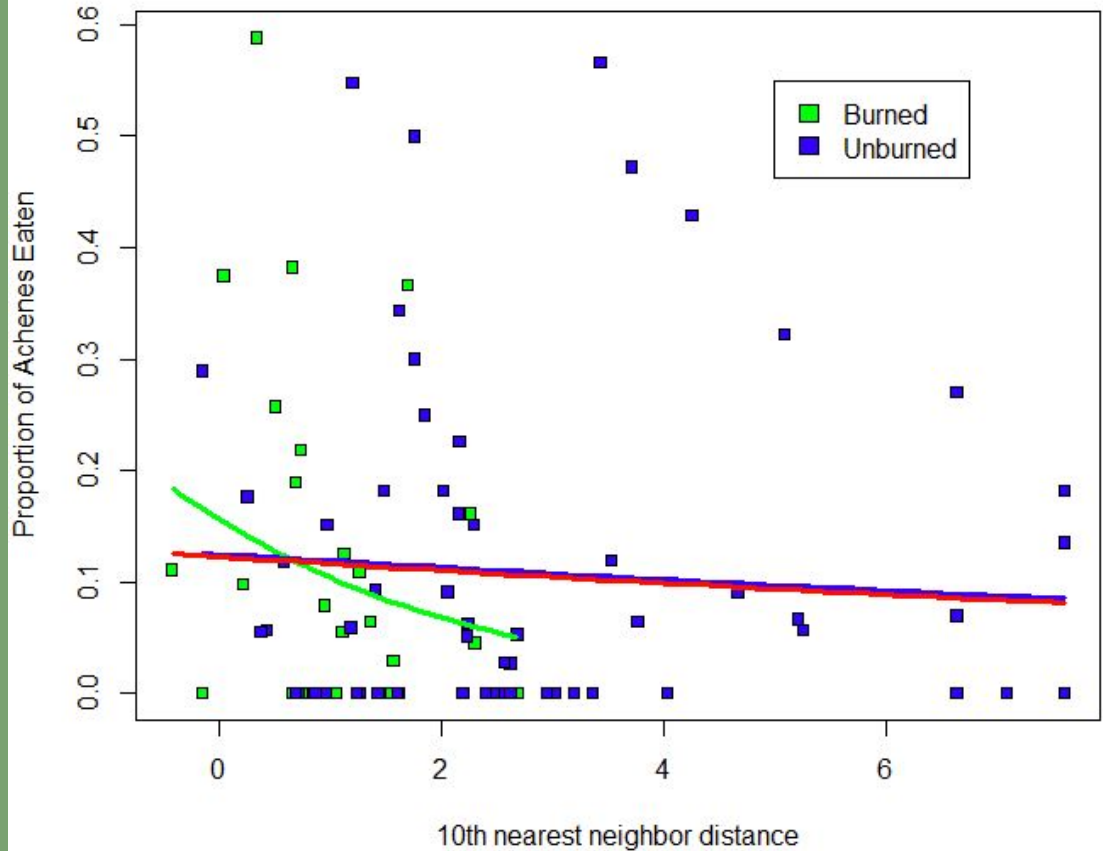
Burned patches had significantly smaller nearest neighbor distances than those in unburned patches (p-value = .0007079)



Effects of Density on Predation

Slight negative relationship

- Slope: -0.06066
- Steeper negative relationship for just burned plots



Conclusions



Contributions to Science

- More evidence to support the idea that fire is beneficial for certain prairie plants and their reproduction
- Understanding the relationship between density and seed predators

Conservation Implications

- Good news for the continuation of burning as a tool for reproductive success!
- Knowing that burning increases the density of *Liatris*
- Burning-induced density does not seem to attract seed predators

Further Research

- Possible areas of further research:
 - quantifying how predation affects reproductive success
 - Why burned plots have a stronger relationship between density and predation than unburned plots