

**The Friends of Nachusa Grasslands
2023 Scientific Research Project Grant Report
Due June 30, 2024**

Please answer the following questions with clearly written summaries to give Nachusa Friends' science committee members, officers, and board members a good idea of what you accomplished using your grant money. Unless you object to the Friends doing so, your report will be uploaded into the science section of the Friends' website: nachusagrasslands.org.

1. Please save this form to your desktop with a unique file name that includes "Friends 2022 Science Grant Report" and your last name.
2. Complete the form using the headings in bold as your guide.
3. Save the file as a Word document or a PDF.
4. Attach the file to an e-mail, and send it to: nachusafriendsscience@gmail.com no later than June 30, 2024.
5. The subject of the e-mail should be "2023 Scientific Research Grant Report" and your last name.
6. If you have not completed your work, please submit this form anyway by the June 30 deadline and plan to contact Friends after your project is complete so that we may learn from and publicize the outcomes as appropriate.

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2023 grant amount: \$4,900

Research Project Topic: Predation on burrowing crayfish at Nachusa Grasslands

Research Project Purpose:

This project was a follow-up on research conducted in 2022 at Nachusa Grasslands and examined how predation affects the locality and abundance of burrowing crayfish. Additionally, we examined how vegetation height-density may influence our ability to detect burrows and predators over the growth season. We predicted that predation events and the detection of predators would be higher in the early spring when vegetation height-density is low and burrowing crayfish surface level activity is higher compared to the summer months.

This study examined the predation dynamics between burrowing crayfish and other prairie/wetland species commonly found within the Nachusa Grasslands. Cameras were set at the entrance of active crayfish burrows in the six sites identified in our previous study conducted in 2022 with various levels of burrow abundance. Cameras were deployed during two periods (Spring and Summer) for three weeks. Images were reviewed for the presence of known crayfish predators and interactions between predators and crayfish burrows. Predators were determined from species that have been documented in previous literature as predators of crayfish.

Research Project Outcomes to date:

We deployed 11 cameras across 6 sites at Nachusa (Table 1). We captured 36,943 images across an average of 40 deployment nights between deployments 1 and 2, with a total of 154 predator detection events and 489 wildlife detections (Table 2). We documented a total of 33 different species of mammals, birds, and macroinvertebrates. The most common predator species detected were American Robins and Northern Raccoons (Fig 1).

Our results indicate that there is no significant correlation between predator abundance and burrow abundance, $r(23) = 0.20$, $p = 0.345$ (Table 3; Fig. 2). Similarly, there was no significant correlation between vegetation height-density and predator abundance, $r(23) = 0.03$, $p = 0.880$ (Table 3; Fig. 3). However, our results indicate that there is an inverse correlation between height-density of vegetation and predator detection events, though not significantly.

Site	Latitude	Site Description	Vegetation Height-Density (1.27 cm) Min – Max
Site 1	41.88899, -89.35102	Rolling Thunder/Ed's Knob	10.16 –91.7
Site 2	41.88255, -89.35601	Prairie Potholes	7.62 –57.2
Site 3	41.882816, -89.35989	Fen	8.59 – 91.4
Site 4	41.89319, -89.326012	New plot with deer blind, off Stone Barn Rd.	5.72 – 45.7
Site 5	41.9021, -89.342553	Holland Prairie	10.8 –71.1
Site 6	41.89309, -89.37775	Tellabs West	16.2 –71.4

Table 1: Site specific data for the 6 camera deployment locations.

Predator Species Detected	Sites Detected	Total Predator Detection Events
American Mink	Site 4	1
American Robin	Site 2, 3, 5, & 6	56
Barred Owl	Site 3	2
Great Blue Heron	Site 3	1
Killdeer	Site 2	1
Northern Raccoon	Site 2, 3, 4, & 6	68
Sandhill Crane	Site 3	1
Virginia Opossum	Site 4	6
Western Coyote	Site 1, 3, 4, 5 & 6	18

Table 2: Predator species detected at the six sites, where they were detected and how many times.

Variables Tested	t(df)	Pearson Correlation		
		Confidence Interval	P-value (0.05)	Correlation Coefficient (r)
Burrow Abundance Vs. Predator Abundance	0.96(23)	(-0.22, 0.55)	.345	0.20
Predator Abundance Vs. Vegetation	0.15(23)	(-0.37, 0.42)	.880	0.03

Table 3: Pearson Correlation Coefficient results for burrow abundance vs. predator abundance and predator abundance vs. vegetation.

Figure 1: Bar plot of the predator relative abundance by species per camera location.

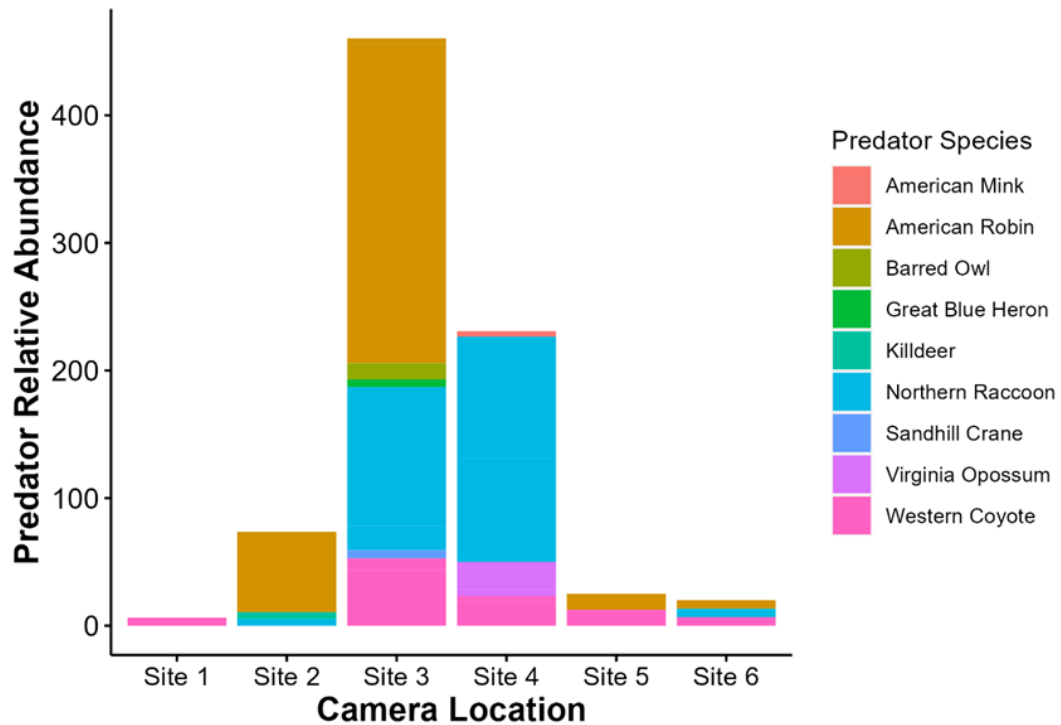


Figure 2: Burrow abundance and predator relative abundance correlation.

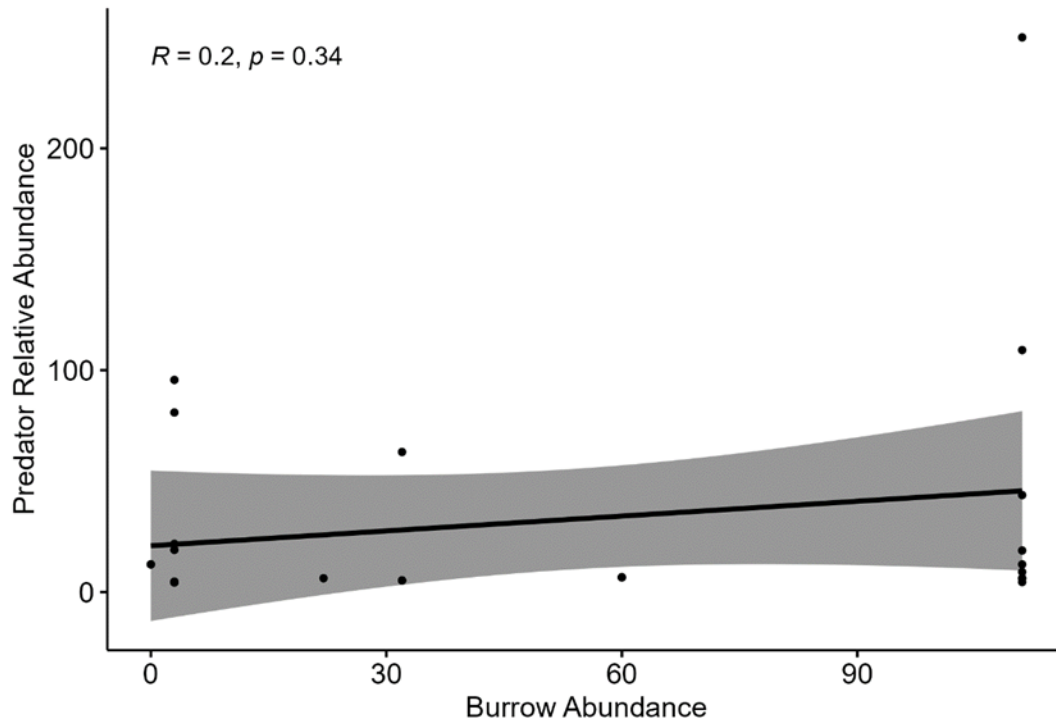
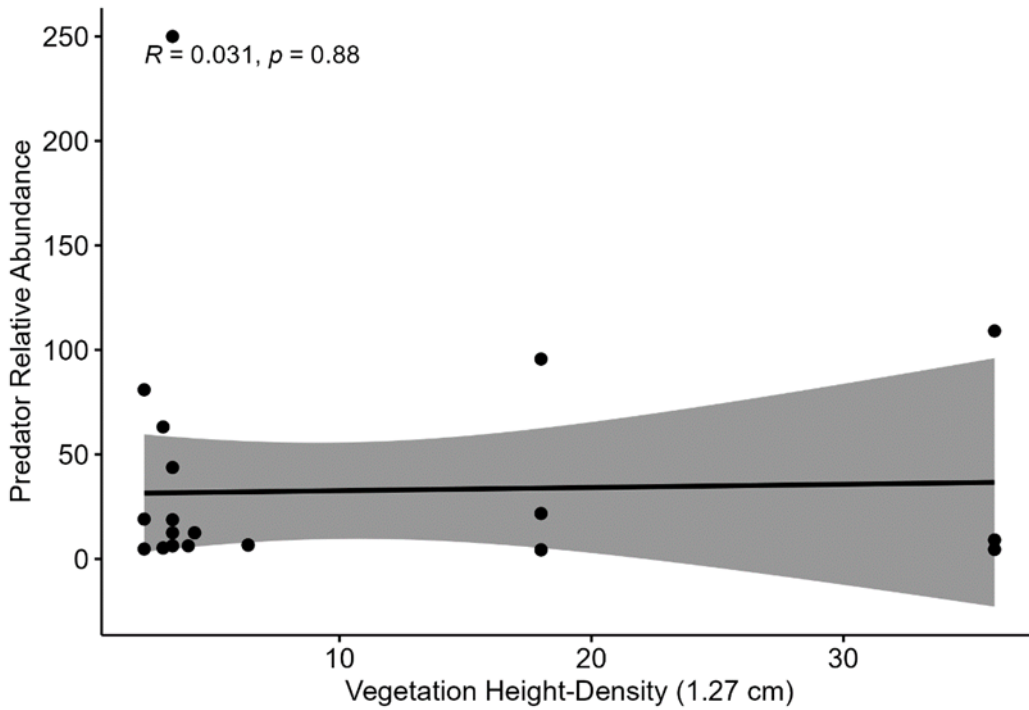


Figure 3: Predator relative abundance and vegetation height-density correlation.



The goal of this study was to determine if predator dynamics influence the burrow abundance and if the height-density of the vegetation would influence predator detection. We found that the abundance of predators at Nachusa may not be influencing the abundance of burrowing crayfish across the sites. Additionally, we found that vegetation height-density may not influence our ability to detect predator events though does decrease as vegetation height-density increases over the growing season. This does not mean that predation events on crayfish are decreasing over the growing season, as we may not have been able to accurately detect the predators as the vegetation around the burrows grew.

This project is the first long term video documentation of predation events on burrowing crayfish in a prairie or wetland ecosystem. No images were captured of predators digging up or consuming crayfish, and predator abundance did not significantly influence burrowing crayfish abundance. However, predator species presence in the area may influence the population of burrowing crayfish at Nachusa. These results will support conservation managers in making choices on predator population control and vegetation management when supporting burrowing crayfish populations.

Describe how the grant funds you have received from the Friends of Nachusa Grasslands have been used regarding the above topic, purpose, and/or outcomes:

Grant funds were used for study materials and to facilitate several trips to Nachusa for field sampling. In addition, funding was used to provide one month of graduate student stipend to conduct this study.

Describe how your project has benefited the work and goals of Nachusa Grasslands:

Burrowing crayfish species are linked to prairie and wetland habitats. However, little is known about their habitat associations which can help to inform conservation on these organisms. Understanding more about the biogeography of these prairie/wetland organisms helps to preserve, protect, and spur research collaborations to conserve species diversity found within the Nachusa Grasslands and similar endangered ecosystems.

Describe how your findings can be applied to challenges in management practices for restoration effectiveness and species of concern:

While no burrowing crayfish species are listed as species of concern, they are an essential part of the prairie and wetland ecosystem, providing habitat for species of dragonflies and amphibians. They also provide ecosystem functions such as soil mixing. The continuation of research into the habitat associations of burrowing crayfish can be applied to several non-crayfish species across the Nachusa landscape and inform management for future seeding, hydrological manipulations, and mowing.

Please list presentations/posters you have given on your research:

A crayfish's tale: The habitat associations for the Great Plains Mudbug (*Lacunicambarus nebrascensis*) at the Nachusa Grasslands. The Nachusa Science Symposium. 04-20-2024.

Getting CRAY with burrowing crayfish. Illini Wildlife and Conservation Club Meeting. 02-20-2024

Have you submitted manuscripts to scientific journals? If so, which ones? If not, do you anticipate doing so? (Please send digital copies of published articles to the Friends so that we can learn from your work.)

No publication has been submitted to date. However, a working manuscript is being revised and will be sent for journal review within the year.

What follow-up research work related to this project do you anticipate (if any)?

No follow-up research work is planned to date.

Optional: Suggestions for improving the application and award process for future Friends of Nachusa Grasslands Scientific Research Grants: