

**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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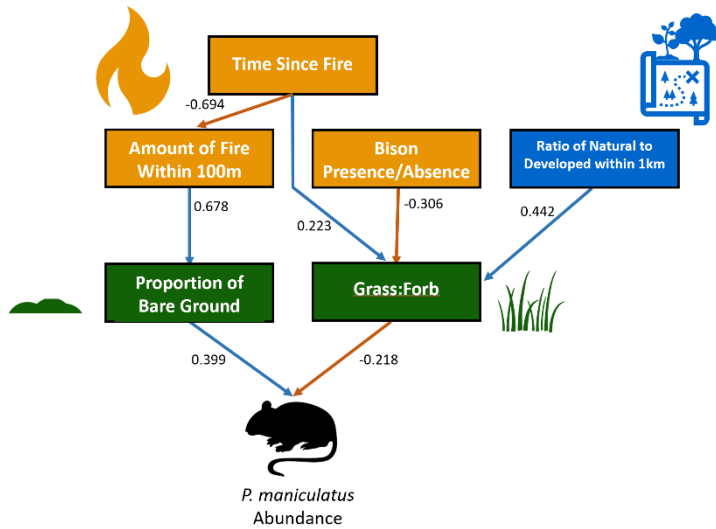
Current E-mail: erin.schaefer@mtsu.edu

2023 grant amount: \$3,000

Research Project Topic: Understanding complex direct and indirect drivers of tallgrass prairie small mammals across scales

Research Project Purpose: This project aimed to investigate the complex interactions between tallgrass prairie management, large-scale landscape context, vegetation, and small mammal communities. We sought to identify the extent to which management practices like prescribed fire and the reintroduction of bison impacted small mammal communities directly, as well as indirectly through their impacts on the plant community. Through this work, we hope to provide a greater understanding of the far-reaching impacts of management, as well as more knowledge about the community ecology of tallgrass prairie small mammals.

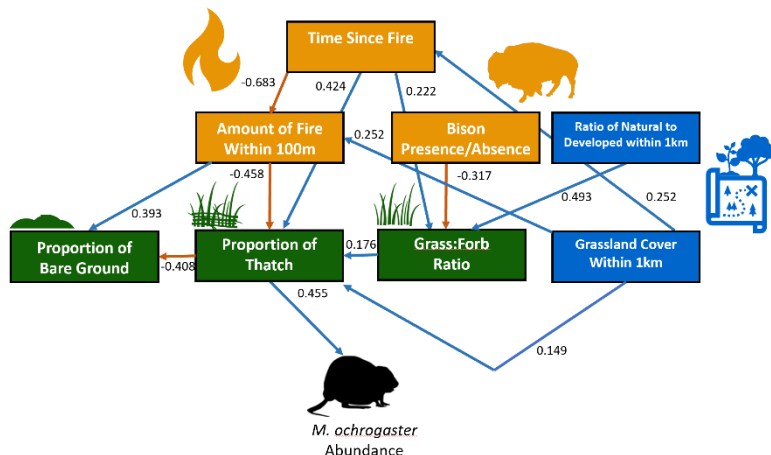
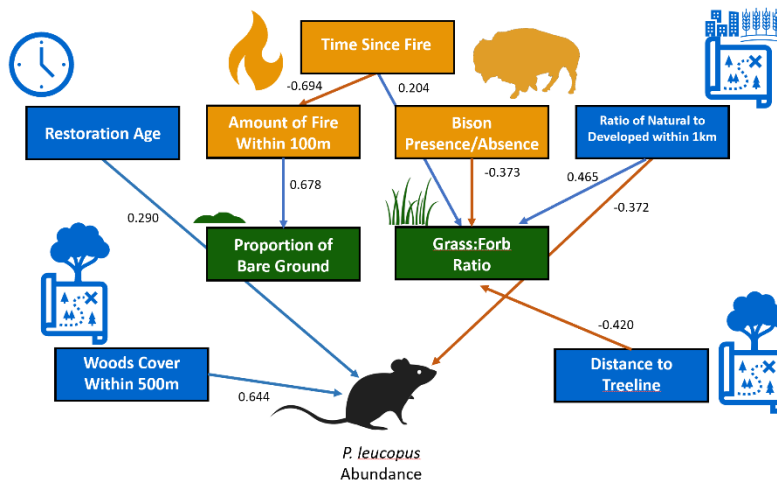
Research Project Outcomes to date: We have identified several complex and species-specific relationships between small mammals, management, and landscape context. In all figures below, blue arrows indicated positive relationships while red arrows indicate



negative relationships. First, we identified that the deer mouse (*Peromyscus maniculatus*) has a positive association with prescribed fire, but that this relationship is indirect through the impacts of fire on vegetation. Deer mice are more common in areas with more bare ground and more forbs, and fire increases the cover of bare ground. However, burned areas tend to be grassier, so fire is not only benefiting this species. Bison also reduce the cover of grasses, which lead to increased deer mice. It is possible that the interaction between bison

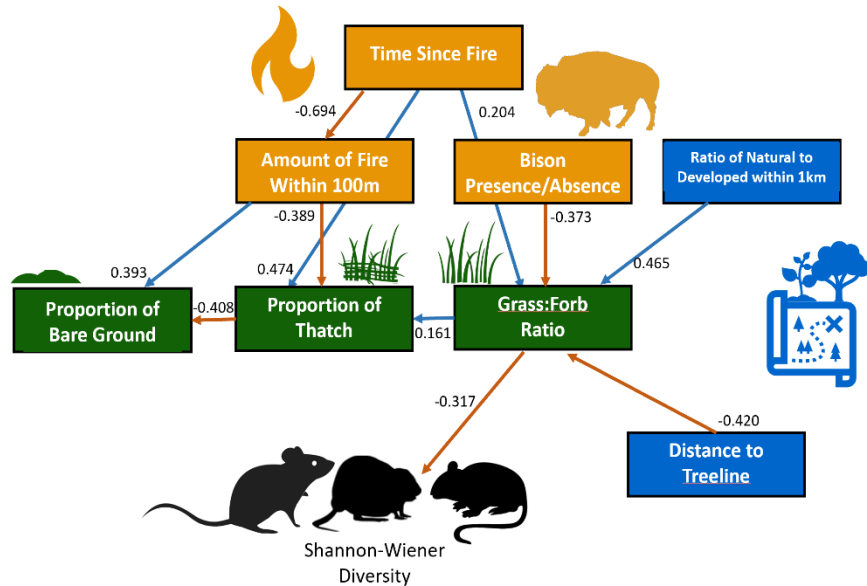
and prescribed fire leads to increased populations of deer mice.

White-footed mice (*Peromyscus leucopus*) were positively associated with the amount of woods cover in proximity of the trapping site, which is expected because they often nest in trees. White-footed mice were also associated with older sites at the preserve, which may be because older sites at Nachusa tend to be closer to woody areas. This species was overall indifferent to management, with no direct impacts or indirect impacts through vegetation.



Prairie voles (*Microtus ochrogaster*) were only strongly associated with increased cover of thatch. This was also an anticipated result, as the voles make runways under the thatch to travel. Thatch was heavily impacted by management, with prescribed fire reducing thatch cover significantly.

Finally, small mammal diversity was most closely associated with the ratio of grasses to forbs. Diversity was highest at sites with more forbs, and the ratio of grasses to forbs was driven by prescribed fire and the presence of bison. However, small mammal diversity is very similar across the preserve, with two or three dominant species and a few rare species that appear occasionally.



Describe how the grant funds you have received from the Friends of Nachusa Grasslands have been used in regard to the above topic, purpose, and/or outcomes: Grant funds were used to acquire materials to conduct small mammal trapping, including several hundred new PIT tags and needles, new calipers to measure small mammals, new scales for weighing mammals, and new safety equipment including new gloves. The funds were also used to help provide my salary over the summer so I can dedicate that time fully to my research.

Describe how your project has benefited the work and goals of Nachusa Grasslands: This work has provided new insight into the impacts of management on the whole prairie. With a greater understanding of the drivers of small mammal communities, Nachusa can better predict increases and decreases in small mammals, which can in turn predict increased populations of predators or increased seed consumption.

Describe how your findings can be applied to challenges in management practices for restoration effectiveness and species of concern: A greater understanding of the whole prairie community can provide more information and greater context in predicting management outcomes. If small mammal populations can be predicted to increase in the wake of prescribed fire, managers can predict that seed consumption may also increase, which could inform where they choose to overseed or plant sensitive species. Increases in small mammal populations can also provide more food for predators, including the state endangered Northern Harrier. Finally, this study lays the groundwork for future investigations that examine the indirect impacts of restoration and management practices as mediated through the plant community.

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

2024 | Rowland-Schaefer, E.G., Jones, H.P. “Managing to thrive: the direct and indirect impacts of tallgrass prairie management and land cover on small mammals”. Nachusa Science Symposium. Franklin Grove, IL.

2023 | Rowland-Schaefer, E.G., Jones, H.P. “The view from above: an assessment of the impacts of interactions between prescribed fire and bison on vegetation using drone imagery.” Nachusa Science Symposium. Franklin Grove, IL.

Have you submitted manuscripts to scientific journals? If so, which ones? If not, do you anticipate doing so?

Rowland-Schaefer, E.G., O. Koehn, and H.P. Jones. 2023. Small mammal associations with landscape composition, configuration, and management in tallgrass prairies: a review. *Mammal Review*: 54(2): 178-192

Additionally, my dissertation was published and is now available on ProQuest. I am also in the process of revising the final chapter of my dissertation for submission to a journal within the next month.

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

Our long-term small mammal trapping work is ongoing, with plans to continue trapping as long as is possible. Future directions include investigating other potential impacts of management, including impacts on small mammal diet. Future work could also investigate other vegetation variables such as height or density.

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