

**Friends of Nachusa Grasslands
2020 Scientific Research Project Grant Report
Due June 30, 2021**

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2020 grant amount: \$10,000

Please answer the following questions with 1- to 2- sentence summaries:

Research Project Topic: Monitoring Nachusa's Wild Bees

Research Project Purpose:

Wild bees are declining around the world, and while protected areas such as Nachusa Grasslands provide important refuge habitat for bees, we still have little understanding of how management of such protected areas, or climate change impacts within them, will alter wild bee populations and community composition. In 2020, we continued our existing bee monitoring program while also expanding our proposed methods to specifically target bees of high conservation interest: habitat and dietary specialist bees, and bumble bees.

Research Project Outcomes to date:

In 2020, we had two full-time technicians, Chan Dolan and Josh Klostermann, working at Nachusa from early June through September 30. Chan surveyed bumble bees throughout the preserve, recording over 7,000 foraging bumble bees belonging to 11 species. Notably, she recorded 19 observations of the federally-endangered Rusty Patched Bumble Bee (*Bombus affinis*), as well as hundreds of observations of two other declining species, *Bombus rufocinctus* and *Bombus pennsylvanicus*, and a handful of observations of *Bombus fraternus*, a species at the northernmost limit of its range at Nachusa.

Josh surveyed widely for rare bees and also designed a new project assessing bee and wasp use of bison wallows for nesting. He recorded a total of 269 actively nesting insects in wallows, including 54 brood parasites. In addition, Josh conducted a full season of sampling for our long-term bee monitoring project. He used passive traps to collect bees at 16 sites around Nachusa during 6 sampling rounds, leading to ~2,000 specimens added to our long-term data set. These bees are still being processed.

Both Chan and Josh presented their preliminary results at the 2020 Entomological Society of America meeting in November 2020. Chan is currently analyzing her data in order to prepare a scientific paper. Josh is collecting an additional year of data in 2021 with the intent of publishing his two-year project as the first chapter of his PhD dissertation. Josh's conference talk is available on Youtube: https://www.youtube.com/watch?v=ID_iwEE0okc&t=0s He also maintains an active

iNaturalist page documenting hundreds of observations from Nachusa:
<https://www.inaturalist.org/projects/arthropods-of-nachusa-grasslands>

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:

All of the funds from the 2020 Science Grant were used to pay Chan and Josh for their four months of work last year.

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

Our project is increasing understanding of endangered and declining bee species at Nachusa. Chan's ongoing analysis of her 2020 data will tell us more about which habitats and plant species are best supporting these sensitive species. Josh's work surveying for rare bees, in collaboration with Laura Rericha-Anchor, added several new bee species to the Nachusa species list in 2020. In addition, his work on insect nesting in bison wallows increases our understanding of the relationship between bison and insects, and may result in actionable management recommendations for how to manage wallows and/or create artificial wallows to promote insect nesting in prairie without bison.

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

Please see above.

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

Presentations given since November 2020:

Dolan C, Klostermann J, Griffin S, Bruninga-Socular B. Flower and habitat preferences of the critically endangered Rusty Patched Bumble Bee (*Bombus affinis*) on a 4,000 acre tallgrass prairie preserve. Entomological Society of America conference, November 2020

Klostermann J, Dolan C, Griffin S, Bruninga-Socular B. A look into the diversity and behaviors of nesting bees and wasps found in bison wallows. Entomological Society of America conference, November 2020

Bruninga-Socular B, Griffin S, Gibbs J. Bees in restored tallgrass prairie: Lessons learned from 8 years of fieldwork in Illinois. University of Minnesota, Entomology Department seminar. February 16, 2021 (**Note:** this talk is publicly available on Youtube: <https://www.youtube.com/watch?v=Hm0J2T01zoU>)

Griffin S, Bruninga-Socular B, Gibbs J. Wild bee communities at the Nachusa Grasslands are structured by landscape and management rather than local flower communities. Nachusa Grasslands Virtual Science Symposium. April 24, 2021

Bruninga-Socolar B, Griffin S, Gibbs J. Little bees on the prairie: restoring a native pollinator community. Invited talk, Hobart & William Smith Colleges. May 13, 2021

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.)

Planned scientific papers:

Klostermann J, et al. Quantifying soil-nesting bee and wasp use of bison wallows at Nachusa (pending 2nd year of data in 2021)

Dolan C, et al. Predicting site occupancy of common bumble bee species at Nachusa (pending 2nd year of data in 2021)

Dolan C, et al. Bumble bee diet and habitat preferences at Nachusa – analysis in progress

Bruninga-Socolar B, et al. Habitat associations of common solitary bee species at Nachusa – analysis in progress

Bruninga-Socolar B, et al. Network analysis of plant-bee species associations at Nachusa – analysis in progress

Published or in review manuscripts:

Bruninga-Socolar B, Griffin S, Portman Z, Gibbs J. Variation in prescribed fire and bison grazing supports multiple bee nesting groups in tallgrass prairie. Currently in 2nd round of review at *Restoration Ecology*

Griffin S, Bruninga-Socolar B, Gibbs J. (2021) Bee communities in restored prairies are structured by landscape and management, not local floral resources. *Basic & Applied Ecology* 50: 144-154.

Griffin S, Bruninga-Socolar B, Kerr MA, Gibbs J, Winfree R. (2017) Wild bee community change over a 26-year chronosequence of restored tallgrass prairie. *Restoration Ecology* 25: 650-660.

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

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