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:
$1000

Research Project Topic:
Notes on the Natural History of *Nomada banksi* and other Inquilines of *Andrena asteris*

Research Project Purpose:

In 2023, my goal was to record and describe the behaviors associated with cleptoparasitic interactions between *Nomada banksi* and *Andrena asteris.* I also had the goal of locating the nectar source (floral preference), "sleeping" habitat, and mating sites of *Nomada bansksi* to gain a more thorough understanding of the habitat requirements of this rare species of cleptoparasitic bee.

In addition to this, I searched for other rare species of bees thought to be in flight at the time of the study. This work was completed to supplement the on-going research recording the bee fauna of Nachusa.

Research Project Outcomes to date:

I was able to document and record video footage of 4 noteworthy behaviors associated with cleptoparasitism displayed by *Nomada banksi* at nesting aggregations of *Andrena asteris* (their hypothesized host). These behaviors were described in detail in my 2023 annual TNC report.

I was also able to document the nectar source (floral preference), "sleeping" habitat, and mating sites of *Nomada bansksi* during the study. Copied below is summary of these observations.

- **Nectar plant (floral preference)** – male and female *N. banksi* were primarily recorded from *Solidago altissima* (one male was collected from *Euthamnia graminifolia)* within 15 meters of the nest sites of *Andrena asteris.* This is the first-time this species was recorded from a plant on preserve, as well as the first-time male *N. banksi* were recorded from the preserve. The distance between the nest sites of *A. asteris* and the host plant *Solidago altissima* (or other short-rayed fall Asteraceae) may be of importance as a habitat requirement for *N. banksi*. As *Solidago altissima* is a common plant throughout the preserve, no management seems to be required for this species at this time. The seeding of portions of wallow edges with *Solidago altissima* could serve as a meaningful management objective if *N. banksi* becomes less abundant on site in the future.

- **"Sleeping Habitat" and behavior –** Because *N. banksi* is a cleptoparasitic bee that does not build and provision its own nest, they need to find a place to "rest" overnight or during inclement weather. For consecutive days, independent of cloud cover, between 1600 – 1700 hr, I observed female *N. banksi* synchronously move from high activity around their host's nests to their "resting" sites on the leaves of *Solidago altissima* and *Coreopsis tripteris* immediately surrounding the nesting aggregation. They attach themselves by the mandible to the edges of leaves of these plants and frequently cluster on the leaves of an individual plant.

- **Mating behavior –** N. banksi males and females were documented in-copula on the flowers of *Solidago altissima*. It appears the males patrol and hold territory on the flowers of *Solidago altissima*. Throughout the day females occasionally visit the *Solidago altissima* flowers adjacent to the host nesting aggregation for nectar, and males attempt to mate with receptive females on these visits. During the 1600 – 1700 hr time period males shift their patrolling from inflorescence height (on *Solidago altissima*) to about the height of where females are clipping to the leaves to rest. I was able to watch multiple males attempt to mate with "resting" females with none of them being successful.

In addition to the work completed towards the understanding of Nomada banksi and Andrena asteris other exciting discoveries were made while attempting to document the bee fauna of Nachusa. (Information copied from L. Rericha's 2023 Nachusa annual report)

- *Nomada adducta* - A Great Plains special and unknown from Illinois until the Klostermann and Rericha vouchers, this bee is at the eastern edge of its geographic range.

On 10 September, Klostermann observed females entering and exiting a communal soil nest of Andrena accepta at the No Name Knob wallow complex. This is the first time that any observations have been made of a nest host for this nomad. (Footage was recorded)

- *Nomada tiftonensis* - Unknown from Illinois until the collection at Nachusa Grasslands, this bee was vouchered from the No Name Knob wallow complex by J. Klostermann on 15 September. This species is regionally rare and occurs in mesic to dry sand-prairie remnants.

- *Sphecodes autumnalis* - This regionally rare species flies in late summer and is a cleptoparasite of the genus Perdita. Vouchered by J. Klostermann on 10 September, a female was taken from the wallow complex at No Name Knob. On 15 September, another female was collected by Rericha in remnant dry sand prairie at the apex of the same knob where it searched for host nests; this area was where Perdita swenki was vouchered. This cleptoparasite is also known from remnant sand prairie at Illinois Beach State Park in Lake County. However, the Lake County vouchers were taken more than one hundred years ago by S. Graenicher.

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 completely, to partially cover the cost of camera equipment (Nikon Z7 Camera body) used in this study. The camera was specifically bought to record footage of behavioral interactions between *Nomada banksi* and *Andrena asteris.* But more generally, this equipment was also used to broadly document biodiversity found at Nachusa Grasslands. Over the past 4 years working at Nachusa I have been documenting the biodiversity found on site through photography. Currently, I have over 30,000 photos documenting at least 1,000 different species in habitat. The camera gear purchased using this grant, contributed to close to 5,000 of those photos and hours of video footage. A comprehensive catalog of my arthropod photography can be located below (please note this catalog is only of arthropod diversity; I have many photos of organisms outside of Arthropoda). With proper credit/acknowledgment Nachusa Grasslands and The Nature Conservancy have my permission to use these photos for media and publications.

Inaturalist Arthropod Photo Catalog:

https://www.inaturalist.org/observations?place_id=any&project_id=arthropods-of-nachusa-grasslands&user_id=joshklostermann&verifiable=any

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

Our project has benefited the work and goals of Nachusa Grasslands by using basic observational data to gain an understanding of the previously unknown biology of a rare cleptoparasitic bee species (*Nomada banski)* and its newly discovered host (*Andrena asteris*). This work broadly identified and described behaviors associated with *Nomada ~ Andrena* cleptoparasitism and in doing so provided insight into many different aspects/outstanding questions in bee biology. Information on the habitat utilized by *Nomada banksi* was also recorded and may be utilized to inform management practices. Through the course of this work, I was also able to record two bees on the preserve that were previously unknown to Illinois (*Nomada adducta, Nomada tiftonensis*) and one bee that had not been recorded in over 100 years (*Sphecodes autumnalis*). In addition to its record, I was also able to document the host of the cleptoparasitic *Nomada adducta.* I recorded this species demonstrating cleptoparasitic behavior towards the communal nests of *Andrena accepta,* a previously undocumented relationship.

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

Our findings are useful to the challenges of management and habitat restoration. Bank's Nomad bee (*Nomada banksi)* is a rare and seldom collected cleptoparasitic bee known from the Midwestern and Eastern United States. Since this species is cleptoparasitic it relies on nests provisioned by a host to complete its life cycle. The host of *Nomada banksi* was previously undocumented until it was discovered to be *Andrena asteris* through the course of this work. The occurrence of *Nomada banksi* on site is therefore intimately tied to the presence of *Andrena asteris. Andrena asteris* is known to be a pollen specialist on short-rayed fall Asteraceae such as *Solidago,* and *Symphyotrichum* and forms nesting aggregations in areas of bare-ground and deep sand. Many nesting aggregations of *Andrena asteris* were documented on the preserve and detailed information of each are included in my ongoing work investigating the nesting wasp fauna of Nachusa's bison wallows. This work also documented the previously unknown the nectar source (floral preference), "sleeping" habitat, and mating sites of *Nomada bansksi.* This information may be valuable if *Nomada banksi* populations decline without an associated decline of its host species.

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

2024 Nachusa Science Symposium, Video Presentation. "Notes on the Natural History of *Nomada banksi"*

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, but I plan on doing so.

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

I anticipate work in further documenting the biology of the state record *Nomada adducta* on site, such recording and documenting its cleptoparasitic behavior towards *Andrena accepta* in greater detail, and documenting its nectar plants (floral preferences), mating sites, and "sleeping" sites.

I also anticipate future visits to continue to document the biodiversity of Nachusa Grasslands through photography and search for other rare species of bees to supplement the on-going research documenting the bee fauna of Nachusa.