The Friends of Nachusa Grasslands
2019 Scientific Research Project Grant Report
Due April 30, 2020

1. Please save this form to your desktop with a unique file name that includes "Friends 2019 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 April 30, 2020.
5. The subject of the e-mail should be "2019 Scientific Research Grant Report" and your last name.
6. After your research project is complete, please contact Friends so that we may learn from and publicize the outcomes as appropriate.

Name: Nicholas A. Barber
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2019 grant amount: $2,520

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

Research Project Topic: Community monitoring of ground beetles and dung beetles in restored and remnant prairie varying in age, fire history, and bison presence.

Research Project Purpose: Continue ongoing monitoring of two ecologically important insect groups, ground beetles and dung beetles to determine how community diversity and composition continue to change as restorations age, and how bison and fire management shape this succession.

Research Project Outcomes to date: All 2019 sampling was completed successfully, and dung beetle and ground beetle specimens were sorted from trap catches. Dung beetle identifications (by Sheryl Hosler, PhD student at University of Illinois-Chicago) are ongoing, but ground beetle identifications at San Diego State University have been paused because campus is closed during the COVID-19 crisis. Identifications might resume in fall 2020, but at this time campus reopening plans are not set.

A publication based on 2018 sampling has been accepted at *Ecological Applications* (see below), and a presentation using 2013-2018 data is planned for the 2020 Ecological Society of America virtual meeting in August.

This project also contributed to student training. Sheryl Hosler, MS, continued sampling protocols from her thesis work and will co-own the data so that our collaboration will continue with future publications anticipated. Three undergraduate students at San Diego State University were also able to gain experience pinning and identifying beetle specimens before campus was closed.

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: Of the $2,520 in funds provided, $520 went to facilities & administration costs; $1,668 to personnel; $315 to insect pinning, curation, and storage supplies, and $17 to shipping specimens from Illinois to California. The personnel funds were particularly helpful and appreciated because it allowed me to employ a graduate student as a part-time research assistant rather than relying on unpaid volunteer work, which is a significant barrier to participation for many aspiring young scientists who cannot afford to forgo paid work. Given the low stipends for graduate students, such supplemental income is especially important.

Describe how your project has benefited the work and goals of Nachusa Grasslands: Understanding how prairie restoration and management affects biodiversity will require long-term data. “Long-term” in ecology is often surprisingly short: most datasets are 1-3 years in length. The opportunity to extend a six-year dataset by a seventh year strengthens the conclusions we can draw and the insights to management outcomes. This dataset has particular value because it was initiated prior to bison introduction, so beetle diversity data have been collected in a Before-After/Control-Impact design across multiple sites. Rather than just a snapshot of prairie biodiversity, these data can give indicate how successional changes that occur with restoration age are redirected by bison activities.

Describe how your findings can be applied to challenges in management practices for restoration effectiveness and species of concern: One important question of current analyses is whether sites without bison access represent ecosystems that are unique from sites with bison and provide habitat for species absent within the bison unit. If so, this supporting these species would require some portions of Nachusa to remain bison-free. On the other hand, if non-bison sites contain just a subset of species already present in the bison unit, those sites would be less unique and potentially less valuable for total biodiversity, at least regarding beetle diversity. Assuming San Diego State opens in the coming months so specimen identifications can resume, I anticipate being able to answer this question by the end of 2021.

Please list presentations/posters you have given on your research: In 2019-2020, I presented data and results from previous years of Nachusa beetle monitoring in invited seminars at the University of Wyoming, the University of Würzburg in Germany, and the Grassland Research Institute at Northeast Normal University in Changchun, China.

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

Nelson M*, SC Hosler*, FA Bötzl*, HP Jones, and NA Barber. In press. Reintroduced grazers and prescribed fire effects on beetle assemblage structure and function in restored grasslands. *Ecological Applications.*

(This publication was recently accepted, and I will pass a copy on to Friends and Nachusa staff once it is publicly available)

Jones HP, K Savage*, AM Burke*, J Fliginger*, SC Hosler*, E Rowland*, N Steijn*, and NA Barber. In prep. Functional consequences of changes in animal communities in managed grasslands: an application of the CAFE approach. (anticipated submission August 2020, target journal *Oikos*)

Guiden PW, HP Jones, NA Barber, R Blackburn*, AK Farrell*, SC Hosler*, RB King, M Nelson*, E Rowland*, K Savage*, N Steijn*, and J Vanek*. In prep. An ecosystem-wide analysis finds little support for the Field of Dreams hypothesis in restored tallgrass prairies. (anticipated submission July 2020, target journal *PNAS*)
(* indicates student author)

What follow-up research work related to this project do you anticipate (if any)?
<u>Optional</u>: Suggestions for improving the application and award process for future Friends of Nachusa Grasslands Scientific Research Grants: The research grants are an outstanding program, and I appreciate the recent efforts to continue fundraising. Supporting student researchers, and giving more senior researchers the ability to pay field assistants, is an enormous benefit to these early-career scientists. Additionally, Friends' willingness to include facilities and administrative support ("overhead") in grants is also important. My institution generally will not recognize or provide any support for awarded grants that do include F&A funds.