

**The Friends of Nachusa Grasslands
2018 Scientific Research Project Grant Report
Due June 30, 2019**

1. Please save this form to your desktop with a unique file name that includes “Friends 2018 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, 2019.
5. The subject of the e-mail should be “2018 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.

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2018 grant amount: \$1440

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

Research Project Topic: Pollinator visitation rates and fruit set of the state-endangered downy paintbrush (*Castilleja sessiliflora*) in Illinois and the surrounding region

Research Project Purpose:

To investigate whether the state-endangered plant *Castilleja sessiliflora* is experiencing low reproductive success due to low pollinator visitation, I examined pollinator visitation rates and fruit set of *C. sessiliflora* in Illinois and the surrounding region. By doing so, I explore whether pollinator visitation and fruit set differ at restored and remnant populations at Nachusa Grasslands in Illinois, as well as whether pollinator visitation and fruit set differ at populations in Illinois and in the surrounding region.

Research Project Outcomes to date:

Early results are presented in the table below. Overall, pollinator visitation rate (the number of pollinator visits relative to the number of open flowers observed) was variable within Illinois and more moderate at populations elsewhere in the Upper Midwest. Visitation rate was highest at the Nachusa Remnant population, but this did not translate to correspondingly high fruit set (this may be due to low effectiveness of local pollinators at transferring pollen or other reasons). Fruit set was lower in Illinois compared to other populations in the region, but was higher at the remnant population at Nachusa than either of the other populations in Illinois.

Population	State	Pollinator visitation rate (average over 2 years)	Fruit to flower ratio (average over 1-3 years)
Nachusa Remnant	IL	1.385	0.35
Nachusa Restoration	IL	0	0.2
Illinois Beach State Park	IL	0.0285	0.25
Spring Creek Prairie	MN	0.655	0.54
Felton Prairie	MN	0.355	0.72

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:

The grant funds I received from the Friends of Nachusa Grasslands provided valuable support by covering costs of travel to and from field sites in Illinois and Minnesota (gas expenses) and accommodations at sampling locations including Zion, IL, Red Wing, MN, and Moorehead, MN, over two field seasons (2018-2019). These funds also allowed me to purchase field equipment necessary to record and store pollinator observation videos (including video camera accessories and an external hard drive) and to assess the relative contribution to seed set from different groups of pollinators at Nachusa (wire cages and mesh netting to conduct a pollinator exclusion experiment).

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

This project benefits the work of Nachusa Grasslands by assessing the pollination services to and reproductive success of a state-endangered plant species, at both a restoration and remnant prairie at Nachusa, as well as in the surrounding region. By identifying that fruit set is lower but pollinator visitation is comparable (but variable) in Illinois relative to elsewhere in the region, this work suggests other factors may be at play in driving relatively low reproductive output. This provides new information to scientists and land managers regarding the health of *C. sessiliflora* Illinois and possible avenues for future management of this species.

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

By shedding light on one piece of the puzzle of the health and persistence of *C. sessiliflora* in Illinois, this project can inform management practices for this Illinois species of concern. While these findings indicate fruit set is lower in Illinois, data show that pollinating insects do visit *C. sessiliflora* in Illinois, though observed visitation was low at the Nachusa restoration. (One possible explanation for this is that it may be outcompeted for pollinators by other more rewarding flowers in the species-rich restoration.) With this information, future management may focus on monitoring these populations to stay abreast of any declines in mature plants, beyond the observed relatively low seed set. Given that *C. sessiliflora* is a long-lived perennial, healthy populations may persist even with lower seed set, but monitoring of population size and recruitment could help ensure

intervention (supplemental seeding of restorations, supplemental hand pollinations, etc) could be provided in the future if deemed necessary.

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

1. Wenzell, K., J. Fant, and K. Skogen. Range-wide variation in floral traits and local pollinators in downy paintbrush (*Castilleja sessiliflora*, Orobanchaceae), and implications for restoration at the range edge. Poster: Nachusa Grasslands Science Symposium, Franklin Grove, IL, October 21, 2017.

2. Wenzell, K., J. Fant, and K. Skogen. Range-wide variation in floral traits and local pollinator assemblages in a widespread species *Castilleja sessiliflora* (Orobanchaceae). Poster: Ecological Society of America Annual Meeting, Portland, OR, August 10, 2017.

3. Mentored student presentation: Jasmine Uruchima, 2017. Chicago Botanic Garden College First Program for low income high school students. Resulting research: "Genetics of *Castilleja sessiliflora* at a restored and remnant population in Illinois." Presented at College First Symposium, Chicago Botanic Garden, August 24, 2017.

4. Wenzell, K., J. Fant, and K. Skogen. "Do pollinators drive floral divergence? Investigating geographic floral variation in *Castilleja* (Orobanchaceae)." Oral presentation: Botanical Society of America, Botany Conference, Rochester, MN, July 24, 2018

Have you submitted manuscripts to scientific journals? If so, which ones? If not, do you anticipate doing so? (Please keep us informed on publications.)

Results have not yet been submitted for publication but I intend to do so, as part of my dissertation research.

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