

The Friends of Nachusa Grasslands 2017 Scientific Research Project Grant Report

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2017 grant amount: \$860

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

Research Project Topic: Pollination ecology and genetics of downy paintbrush in Illinois

Research Project Purpose:

This study examines the pollination ecology, reproductive success, and genetic diversity of the state-endangered downy paintbrush (*Castilleja sessiliflora*) in Illinois. By comparing a restored population at Nachusa Grasslands with a natural population in northeastern Illinois, this study will shed light on the success of the Nachusa restoration in supporting this endangered species.

Research Project Outcomes to date:

Observed pollinator visitation was low at both sites. 440 minutes of observations were conducted at each population, and no pollinators were recorded visiting *Castilleja sessiliflora* during this time in 2017. Genetic diversity was found to be comparable at both sites: expected heterozygosity, a measure of gene diversity was 0.52 at the Nachusa restoration and 0.555 at Illinois Beach State Park. Inbreeding (Fixation Index), often a concern for small populations of rare species, was low at both sites (-0.031 at Nachusa and -0.049 at Illinois Beach), indicating that excessive inbreeding is not likely to pose a threat to the health and persistence of these populations. Fruit set was found to be fairly low (about 15-20%) at both Illinois Beach and the Nachusa Restoration, while fruit set was found to be more than twice this (about 40%) at the Nachusa Remnant population. Further research is currently being undertaken in 2018-2019 to more thoroughly explore these trends.

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 were critical to supporting my work by covering costs of travel to and from field sites (gas expenses) and accommodations at the second Illinois population (cost of staying at a nearby campsite). These funds also allowed me to purchase critical field equipment (including video cameras, batteries, microSD cards, and an external hard drive to record and store video footage of pollinator visitation). Remaining funds were used to pay for lab supplies and reagents for genetic analysis.

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

This project and additional work that is currently ongoing benefits Nachusa Grasslands by assessing the pollination services to restorations as well as by measuring the genetic diversity captured in restorations, relative to natural populations in the region. This work provides important information about the effectiveness and potential success of the restored prairie at Nachusa Grasslands, specifically for the state endangered species downy paintbrush (*Castilleja sessiliflora*).

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

My findings indicate that the restored population of downy paintbrush contains a similar level of genetic variation as does a natural population of the species in northeastern Illinois, indicating that the restoration has been successful in capturing and maintaining genetic diversity in the restored population. However, results to date suggest that pollinator visitation to downy paintbrush may be low, which could lead to low fruit set in Illinois populations. An ongoing study is currently evaluating whether low pollination and low fruit set are common throughout the region, or a challenge of restored populations, such as that at Nachusa.

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.

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: