

Project Year-End Summary Report 2020

Title of Project:

Begin your answers in the box right beside each question and the space will expand to accommodate. Limit your report to two pages if possible. More detailed presentations, articles or posters are welcome separately.*

1. Organization or Individual who Received the Grant: Auburn University

2. Amount of Grant: \$ 1230.74

3. Was additional outside funding obtained? (check box that applies) Yes No
Source(s) if you checked "yes."

4. Briefly, how was the grant money from the Carter Conservation Fund used? We purchased micropipets to extract onion nectar; however, we did not spend remaining funds to analyze nectar as we could not collect nectar this year. Our field technician contracted COVID-19, and we halted nectar studies until next summer.

5. Write an abstract or summary of the activities performed and the progress that was made this year on your project. Save any conclusions, lessons learned, and benefits achieved for the final section 6. Since our field technician contracted COVID-19, we were not able to collect nectar this year. Nectar collection requires a team of researchers, and we would compromise data by collecting nectar with one researcher. Consequently, we focused on identifying new field sites, collecting additional data on phenology and floral insect visitors, and modeling environmental factors that influence nectar and other floral traits to attract pollinators. This data will clarify relationships we observe between nectar composition and local pollinator communities.

6. State any conclusions. Include any lessons learned that would assist others. What benefit to you, the community or the environment has resulted or do you hope will result from your use of our funding? While we were unable to complete our work this field season, we learned the following from field data and environmental models:

Variation in precipitation availability may influence nectar content: while New Mexico's mountains are expected to have smaller snowpacks over the next decade, the likelihood that montane plants will receive their water by rainfall is increasing, and plant populations may not be adapted to use summer rainfall. Plants, like *Allium cernuum*, rely on the slow release of water from snow, not necessarily the sudden deluge of water made possible by summer rains. Models show some areas will experience no significant change in total annual precipitation, but the proportion of total precipitation due to summer rainfall is greater than in past years. Certain onion populations in clay to loamy soils will be able to use summer rains better than onions in shallow rocky soils. This data can be expanded to include rare widespread species that reside

in a variety of climate and soil regimes. This could guide ex situ propagation of rare plants from dry areas to ensure their genetic diversity is preserved.

Populations of widespread native plants likely do not share effective pollinators: we identified new field sites across much of the state of New Mexico and observed floral visitors at all sites. Most onion populations did not share communities of floral visitors, suggesting that onion nectar is likely attractive to a wide diversity of insects. Using this data, we will search for common components in onion nectar next season and examine how microhabitat differences change nectar, impacting which pollinators visit onions and how effective these pollinators move pollen between flowers. This data also applies to other widespread native plants and invites other researchers for rare widespread plants to examine how microhabitat differences impact pollination within their study populations.

The number of female-only plants varied significantly between sites: *Allium cernuum* produces two types of inflorescences: a set of flowers that are hermaphroditic and a set of female-only flowers. Traditionally, female-only flowers are found in marginal habitats, which defined by models may be habitats with clay and loamy soils. Field data show few insects visit female-only flowers, and these populations appear pollinator limited. However, female-only flowers may reproduce clonally, which shifts the nature of genetic and demographic parameters within populations. Next year, we plan to assess how clonal growth impacts *Allium cernuum* populations and pollination delivery. Several of New Mexico's rare montane plants also grow clonally, and data from clonal studies in *Allium cernuum* can inform conservation of these threatened populations.

We ask the Native Plant Society of New Mexico to extend our funds through 2021 to allow us to complete our nectar collection and analyses in *Allium cernuum*. While we were unable to complete this work over the calendar year, insights from 2020 field and model data have enriched our experimental framework to allow our data and conclusions to inform conservation of rare and threatened plants in New Mexico, particularly ex situ collections for New Mexico's newest botanical garden at NMSU. We would like to share our climate and soil models for *Allium cernuum* at the 2021 state conference and provide conclusions from our complete work in an article for the quarterly newsletter at the end of 2021.

Please send your completed form as an email attachment to cartergrantapps@gmail.com.

* To remain in good standing for any future funding from the Native Plant Society of New Mexico, plan to write an article (600-1000 words) for our quarterly newsletter, or create and present a poster at our annual statewide conference, or send us a copy of a published article connected with the past year's work, or work with a local chapter of NPSNM to make an illustrated, educational presentation.

Our next state conference is scheduled for August 20-22 in Alamogordo. Contact our Otero chapter for additional information. Find information about our regional chapters on our website www.npsnm.org. Write to cartergrantapps@gmail.com at any time with questions.