

Grant Recipient: Adair McNear (she/her)

Project Title: Did the pollinator cross the road?: Plant-pollinator ecology and wildflower population connectivity in roadside verges of the Piedmont region of North Carolina, USA.

Updated Research Summary: In central North Carolina, rural roadside verges can harbor diverse communities of Piedmont savanna wildflower species. Many of these wildflowers rely on insect pollinators for gene flow (via pollen transfer), but vehicle traffic and disturbances within roadside habitat can be hazardous to insects. Adair McNear is studying the functional ecology of roadside environments and hopes to find evidence of successful insect-driven pollen transfer among roadside populations of two Piedmont savanna wildflower species: wild quinine (*Parthenium integrifolium*) and purple false foxglove (*Agalinis purpurea*). Adair is collecting voucher specimens of insect visitors to roadside populations of *P. integrifolium* and *A. purpurea*. To understand how insects forage within roadside habitat, she will test insect-driven transport of a UV pollen analog among experimental roadside wildflower populations. Adair has also expanded her research to include a landscape genetic analysis of population connectivity among roadside populations of her two focal wildflower species. Lastly, Adair will explore the role of road bed age and nearby land use history in the present day distribution of roadside *P. integrifolium* and *A. purpurea* populations. Using observational, experimental, historical and genetic data, Adair's research is an interdisciplinary look at the ecological function of roadside habitat for two Piedmont savanna wildflower species, and will give insight into the conservation potential of roadside habitats for insect-pollinated wildflowers.



Progress Report: Adair McNear is continuing the field work she began in 2021 on the ecology of roadside populations of Piedmont savanna wildflowers, and expects to have field work completed by the fall of 2023, and findings written for publication by early 2024. She decided to narrow her research focus from 3 wildflower species to 2 in order to facilitate logistics and research expenses. Research now focuses on 2 wildflower species: wild quinine (*Parthenium integrifolium*) and purple false foxglove (*Agalinis purpurea*). Data collection is ongoing and results have

not yet been analyzed.

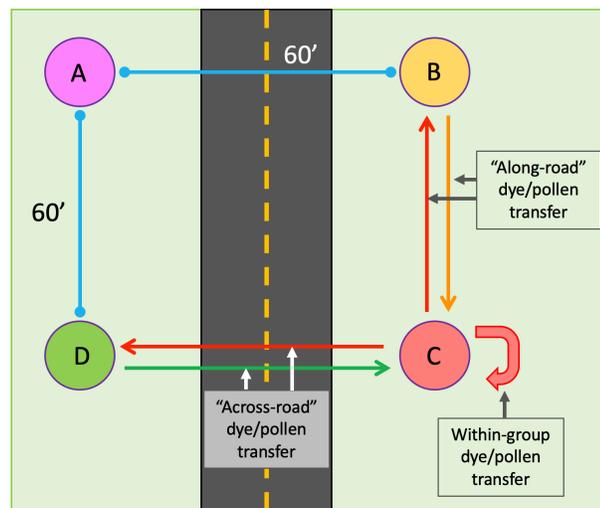
- **Observations of insects:** Adair has collected insect visitors to *P. integrifolium* at 9 roadside sites since May/June 2022, and is still collecting insects (*P. integrifolium* has a very long bloom period). Collected insects will form a voucher collection and allow identification of insects to lowest taxa possible. Insect collections for roadside *A. purpurea* (a species with a much shorter bloom time) will begin in August/September

2023, and Adair will aim to make collections at 9 roadside sites for this species. Adair is preserving and labeling insects, and is photographing each specimen to aid in identification. All of Adair's voucher specimens will be uploaded to the iNaturalist community science platform at:



<https://www.inaturalist.org/projects/insect-visitors-to-roadside-parthenium-integrifolium-flowers>

- **Experimental test of insect behavior in roadsides:** Adair developed an experiment to test how insects forage along roadside habitats. Her experimental assay will allow insects to choose to forage alongside a road (ie. foraging in the verge without crossing the road) or choose to cross the road to forage. Experimentally placed clusters of blooming wildflowers will provide the forage for insects, and a UV dye pollen analog will be applied to flowers which will allow Adair to detect how insects are navigating the experimental array. A diagram of the experimental design is below:



Adair originally planned to use experimental populations of seed-grown *A. purpurea* for her experiment. Sadly, *A. purpurea* seed did not germinate in the needed numbers and the experiment was postponed from 2022 to 2023. Currently, Adair is sowing species of native wildflowers that have more established horticultural methodology, and she will conduct her experiment using Downy lobelia (*Lobelia puberula*) and Eastern Beardtongue (*Pensetmon laevigatus*) in 2023 during those species' respective bloom periods.

- **Landscape population genetics of roadside plants:** Adair was able to secure additional funding needed to conduct landscape-scale population genetics, likely using genome-scale ddRADseq methodology. This analysis will work in concert with the portions of Adair's research funded by the 2021 Shinn Grant, and will provide additional robust data to the research project. Adair is currently conducting DNA extractions to prepare for analysis.
- **Historical Land Use and Road Bed Age:** Adair has used historical maps for her study area and USDA aerial imagery to allow her to coarsely age road beds in the study area (Orange Co., NC, USA). Additionally, the USDA aerial imagery will allow Adair to characterize adjacent land use of her sampling sites (within 0.5 km of the roadside sampling site). Adair will conduct this analysis using GIS software and has consulted with UNC Chapel Hill's Geography Department in order to facilitate this analysis.

