

**Title:** Pollination ecology and local adaptation of *Echinacea laevigata* (Asteraceae) in woodland and open microhabitats at Picture Creek Diabase Barrens.

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*E. laevigata* is a charismatic denizen of the Northern Prairie Barren plant community, a rare plant community in North Carolina. The largest population of *E. laevigata* in the world is found in Granville County, North Carolina at Picture Creek Diabase Barrens where populations exist in similar, proximal microhabitats as those described by Collins & Foré (2009): a powerline



right-of-way and adjacent woodlands. Current management practices adhere to the understanding that open conditions are ideal for the success of this species. However, the genetic differentiation between woodland and open habitat (Collins & Foré, 2009) raises a question about how populations from microhabitats interact, and whether genotypes in specific microhabitats warrant specific management for the maintenance of their genetic diversity. *E. laevigata* is self-incompatible (Stucky et al., 2012), and does not reproduce clonally. Therefore, it relies on the services of pollinators to facilitate pollen transfer and successful reproduction.

In the summer of 2019, with crucial support of the North Carolina Native Plant Society Shinn Grant, we began field research to accomplish three main objectives: (1) Identify the primary floral visitors to *E. laevigata* in the two microhabitats to determine if there is



a difference in the suites of pollinators. (2) Investigate pollen transfer dynamics between plants in the woodland microhabitat with shaded conditions, and open microhabitat in the powerline right-of-way exposed to full sunlight. (3) Test for local adaptation at the germination and establishment stages in woodland and open microhabitats to help us understand the best habitat

management strategies for maintaining genetic differentiation in *E. laevigata* as this species continues its recovery.

#### Objective 1

From May to July we delineated ten plots, five in each microhabitat and conducted two pollinator samplings per week (a morning and an afternoon sampling) in each plot. Bees, skippers, duskywings, and other insects collected were pinned and labeled for identification. Other lepidopterans that were easily identified on the wing were marked and released.

#### Objective 2

To study pollen transfer dynamics between the microhabitats, we used 4 different colored fluorescent dyes as a pollen analog on the discs of a given number of flowers in each of our established plots. We applied the dye in the morning to 4 plots and checked all of our plots that same evening under UV light after a full day of pollinator activity. With limited time and fluorescent dye and a lack of rain to wash away our pollen analog, we were only able to complete one round of dyeing in which we encountered several obstacles including dye colors that looked too similar to distinguish. However frustrating, those obstacles proved to be instructive for future efforts to evaluate pollen flow of *E. laevigata* between microhabitats at Picture Creek.

#### Objective 3

At the beginning of the flowering period for *E. laevigata* we bagged approximately 15 flowers per plot, labeling 5 pollen donors and 10 pollen receivers, to exclude pollinating organisms so that we could conduct controlled crosses for maternal and paternal genetics from each microhabitat. Throughout the season we collected pollen from our donor plants and pollinated our receiver plants in the opposite microhabitat, collecting seeds from all of our plants, and placing them in storage to be planted within our plots in a future field season.

This project is ongoing and will hopefully provide additional insight into the ecology of a species that is beloved by so many North Carolina plant enthusiasts. I would like to express my sincere gratitude to the North Carolina Native Plant Society for providing us with the funds to hire a field technician to support the research effort for this project. Without that support, this project would not be possible.

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