Echinacea Project

Research Project Proposal Summer 2011

Amber Zahler

21 June 2011

**Goals**:

1. Investigate flowering phenology of *Echinacea angustifolia* among fragmented prairie landscapes.

2. End the summer with a data set to be analyzed and turned into either a poster to present at the Steven Galovich Memorial Student Symposium at Lake Forest College or to be written up as the topic of a Senior Thesis.

3. I do not have a preference on whether my research project is independent or in conjunction with another member of Team Echinacea.

**Background**:

The North American tall grass prairie, which once covered an expansive area, has become increasingly fragmented and isolated, now consisting of less than 1% of its original population. These fragmented habitats, or remnants, have been found to have loss of genetic diversity (Wagenius et al. 2007). This fragmentation and loss of diversity may be the cause of variation or changes in flowering phenology in *Echinacea angustifolia*.

Wagenius and Lyon, 2010, found that, *Echinacea angustifolia* in fragmented habitats were not pollinator-limited, but pollen-limited. The exact causes of pollen limitation are as of yet still unknown. A plant’s flowering phenology has been suggested to affect the reproductive fitness of the plant, which could be a cause of pollen limitation. If flowering time of a plant deviates too much from what has been naturally constructed as the populations’ peak time, that plant may not receive as much pollen or the appropriate type of pollen as its better-timed constituents. Or, in larger populations, flowering at peak time could create more competition among other *Echinacea* plants and would therefore be more beneficial for the plants to have staggered flowering times among its population. Based off these hypotheses, the questions I would like to address this summer are as follows:

Does flowering time of *Echinacea angustifolia* vary between remnants?

Does flowering time vary within remnants? How synchronous/asynchronous are they? Does population density and/or remnant size correlate with flowering time?

**Methods**:

To determine flowing phenology, the number of, as well as which remnants, must be chosen (5 or 6?). A method to randomly sample Echinacea plants to use must be determined so that plats that flower earlier are not favored (plants chosen along transect?). Determine the number of plants in each remnant and frequency of visits to each remnant to ensure appropriate data collection (every other day? every two days?).

After determining the number of plants in each remnant I will observe the timing of floret production. The following will be recorded: flowering start date, flowering end date, and duration of flowering.

Flowering synchrony will be evaluated comparing duration of flowering both within a remnant as well as between remnants. The percentage of plants flowering will also be compared within remnants in addition to between remnants (other ways to evaluate results/data?). Determine a possible correlation between remnant size and/or population density of Echinacea on flowering time (more plants, more competition for pollen: staggered flowering times?).

**References**:

Wagenius, S., E. Lonsdorf, and C. Neuhauser. 2007. Patch aging and the S-Allee effect: breeding system effects on the demographic response of plants to habitat fragmentation. In press, The American Naturalist

Wagenius, S., and S. P. Lyon. 2010. Reproduction of Echinacea angustifolia in fragmented prairie is pollen-limited but not pollinator-limited. Ecology 91:733-742.