

## NPSNM Grant Report 2016

**Grant Recipient:** Benjamin Cooper

**Grant Duration:** 1 year

**Project Title:** Evolution and Systematics of *Oenothera* sect. *Calylophus* (Onagraceae)

**Project Description:** Within the evening primrose family (Onagraceae), *Oenothera* Sect. *Calylophus* currently includes 7 species (13 taxa) of predominantly suffrutescent perennials with a center of diversity in New Mexico and the Trans-Pecos region of Texas. In *Oenothera* sect. *Calylophus*, there have likely been two independent shifts in pollination syndrome from sphingophily (hawkmoth pollination) to melittophily (bee pollination), which were accompanied by transitions from vespertine to diurnal flowering. Sect. *Calylophus* has also experienced convergent evolution of gypsum endemism (edaphic specialization to gypsum soils). Finally, *Oenothera* sect. *Calylophus* is thought to have radiated recently as a result of climate fluctuations during the Pleistocene, and there is evidence of continued gene flow between many taxa. Together, these attributes make *Oenothera* sect. *Calylophus* an ideal study system for investigating speciation and diversification in plants. Unfortunately, the current systematics of *Oenothera* sect. *Calylophus* are almost 40 years old, based only on morphology, and poorly understood. Modern molecular techniques, that utilize molecular data in addition to morphological data, will allow me to create a more robust phylogeny that can be used to address these important evolutionary questions. My project aims to resolve the systematics of sect. *Calylophus* using cutting edge targeted Next Generation Sequencing (NGS) techniques. It is the focus of my Master's research through the Plant Biology and Conservation Program at Northwestern University/Chicago Botanic Garden.

**Grant Amount:** \$790.00

**How Grant Funds Were Used:** The \$790.00 that I received from the NPSNM grant in 2016 were used to purchase a MiSeq Reagent Kit v2 (Illumina, San Diego, California, USA). With this kit I was able to sequence the remaining 96 of my 195 total individual plant DNA samples that I included in a phylogenetic analysis of *Oenothera* sect. *Calylophus*.

**Evaluation and Future Directions:** My Master's Thesis from Northwestern University/The Chicago Botanic Garden, which is based on the results of this project, was presented, defended and passed in September, 2016. I also presented preliminary findings from this project at the 2016 Botanical Society of America meeting in Savannah, GA. In December of this year, with help from my Advisor (Dr. Krissa Skogen) and Las Cruces native Dr. Warren Wagner of the Smithsonian Institution, I travelled to the Smithsonian Institution in Washington, DC to collect morphological measurements from vouchers of all samples that were included in my molecular phylogeny. These data will be used to revise the taxonomy and taxonomic keys for sect. *Calylophus*, which will likely be included in the currently-in-progress Flora of North America. Finally, I will be submitting two publications based on this research: 1) A taxonomic revision using molecular and morphological data, and 2) A molecular phylogeny. Both publications will be submitted to peer-reviewed scientific journals (TBD) in 2017. I will notify NPSNM with updates on the status of these publications. Upon publication of the taxonomic revision, I plan to travel to several herbaria with large *Oenothera* sect. *Calylophus* collections including the University of Texas at Austin, the Smithsonian Institution (Washington, DC), the Missouri Botanic Garden, and the University of New Mexico, to annotate their collections.