First-Year Research in Earth Sciences: Dunes

Conference Presentation: Gustafson, A., A. Dykstra, B. Price, C. Yang, and M. Zhang. 2023. "The Optimal Biogeomorphic Environment for a Rare Dune Thistle." North-Central Section Meeting of the Geological Society of America. Grand Valley State University, Grand Rapids, Michigan, 4-5 May 2023; poster.

Abstract: *Cirsium pitcheri,* a thistle endemic to Great Lakes dunes, requires a narrow range of sand movement to survive. Because these specific geologic habitats are declining, *C. pitcheri* is designated a threatened species. This project investigates the micro- and meso- ecosystems of *C. pitcheri* to identify the optimal biogeomorphic environment for this rare plant. Our objectives were to investigate the biophysical characteristics of two blowouts, measure the abundance and characteristics of *C. pitcheri* at each site, and analyze the data to identify the optimal conditions for *C. pitcheri* to thrive. We investigated blowout characteristics using GPS and drone mapping, straight-line surveys, and surface change measurements with erosion pins. We recorded all *C. pitcheri* plants within the sites and conducted quadrat surveys for plant density and nearest neighbors. The mid-sized blowouts had heights of 2-4 meters and similar low levels of erosion and deposition. The two blowouts had large differences in total number of *C. pitcheri* plants, but all living age categories occurred in both blowouts. *Ammophilia breviligulata,* a dune grass abundant in Michigan, frequently grew near *C. pitcheri*. On average, the nearest neighbor of *C. pitcheri* grew less than 0.5 meters away. Despite the proximity of the nearest neighbor plants, percent vegetation cover around *C. pitcheri* was less than 40% on average. We concluded that *C. pitcheri* grows well in nearly-bare sandy soil among scattered plants. This study may provide dune managers with information needed to recognize and preserve biogeomorphic dune environments suited for *C. pitcheri*.