Environmental Factors Affecting *Cirsium pitcheri* at Rosy Mound Natural Area

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Abstract

This study investigates the environmental factors affecting the population of *Cirsium pitcheri* located in Rosy Mound Natural Area's coastal dune system. We measured plant characteristics through observation, used GPS mapping to provide a spatial analysis of plant density and dune characteristics, and measured surrounding plant communities using random 0.5m by 0.5m quadrat surveys. The results of this study show that *C. pitcheri* grows best in areas of higher erosion rates and low vegetation density. With this research, strategies can be developed to help restore *C. pitcheri* populations throughout the Great Lakes coastal dune systems.

Introduction

Cirsium pitcheri (figure 1, 2) is a federally threatened species endemic to the coastal dunes of the Great Lakes area. This species is dependent on natural disturbances [1]; however, its decline is due largely to habitat loss, human impacts, and other unnatural disturbances [2]. Our research attempts to identify the environmental factors that influence the growth of *C. pitcheri* at Rosy Mound Natural Area.

Figure 1. An immature *C. pitcheri*

Figure 2. A mature *C. pitcheri.*

Study Objectives

1. Measure the characteristics of as many individual *C. pitcheri* plants as we can.
2. Measure the surface characteristics around the *C. pitcheri*.
3. Collect data on the plant community surrounding the *C. pitcheri*.
4. Identify natural conditions of Rosy Mound Natural Area that are beneficial to the growth of *C. pitcheri.*

Study Site

Our study area was Rosy Mound Natural Area (figure 3). It is located along the eastern shore of Lake Michigan, just south from Grand Haven.

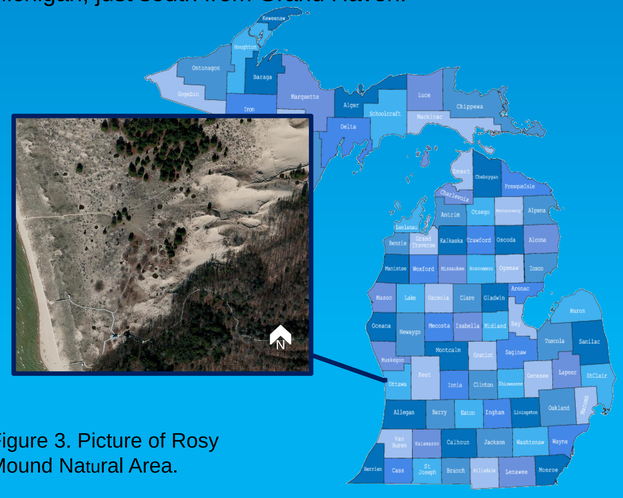


Figure 3. Picture of Rosy Mound Natural Area.

Methods

We measured the individual *C. pitcheri* plants' characteristics. We also measured surface characteristics and surrounding vegetation. We used a Juno Trimble GPS to map these characteristics, as well (table 1).

Types of Data Collected		
Plant Characteristics	Surrounding Vegetation	Surface Characteristics
Dead or Alive	Quadrat Samples	Sand Samples
Longest Leaf Length	Plant Density	Moisture Content
Number of Living Leaves	Plant Types	Erosion/Deposition Rates
Height	Vegetation Areas (GPS)	Dune Landscape Features (GPS)
Health Rating		Boardwalks (GPS)
Ground Cover		
Surrounding Community		
General Description of Plant		
Locations of Individual Plants (GPS)		

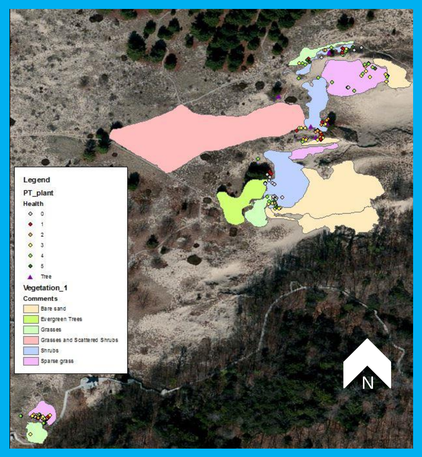
Table 1. Variables measured in study.

Results

140 specimens of *C. pitcheri* were mapped in the study. The most favorable conditions, where *C. pitcheri* plants had maximum leaf lengths of over 30 cm, were areas with low levels of ground cover (figure 4). Populations of over 20 individual *C. pitcheri* plants grew in locations with an erosion rate of 1 cm over the three weeks of the study, and were present on blowouts, slipfaces, and interdunal areas (figure 5) with varying vegetation levels from bare sand to shrubs with nearby trees (figure 4). No significant pattern was shown relating *C. pitcheri* populations and sand moisture content (figure 6).

Map of Vegetation Areas

Figure 4. Figure shows vegetation areas for the surrounding landscapes around the *Cirsium pitcheri* specimens, as well as health levels. Health level 0 indicates a lack of data on those plants.

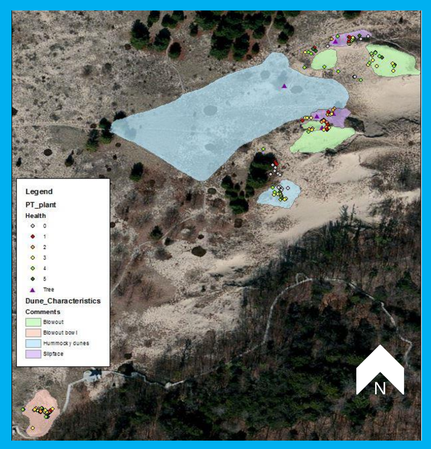


Map of Sand Moisture Content

Figure 6. Figure shows where the sand samples were taken in relationship to the location of *Cirsium pitcheri*. The moisture content percentages are shown next to the sample sites.

Map of Landscape Areas

Figure 5. Figure shows the overall dune areas in our study area, as well as *Cirsium pitcheri* health levels.



Discussion

Our study indicates that *C. pitcheri* — those that are large and healthy or dead but succeeded in growing seed pods — grow best in places with low ground cover [2] and in places with moderate sand transport [3]. The results of our studies are consistent with the findings of earlier studies [2, 3]. However, we found a population of *C. pitcheri* growing in a shrubby area near a stand of evergreens, which is not a typical location for *C. pitcheri* growth based on other studies (figure 7).

Figure 7. *C. pitcheri* among the shrubs and grasses.

Conclusions

Our results indicate that *C. pitcheri* grows well in places with low vegetation levels and moderate levels of sand transport. However, results also show that *C. pitcheri* can grow in more stable areas of the dune with shrubs and trees present.

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References

[1] Maun, M. A. 1997. "Restoration Ecology of a Threatened Endemic: *Cirsium pitcheri* Along the Great Lakes." *Coenoses* 12, no. 2/3: 109-117.

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