

Natural and Anthropogenic Impacts on *Cirsium pitcheri* at Rosy Mound Natural Area



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Abstract

Cirsium pitcheri (Pitcher's Thistle), a threatened species endemic to Great Lakes dune areas, faces anthropogenic and natural dangers. Using three different study sites, we compared both of these dangers to see which has a more significant impact on *C. pitcheri* population health at Rosy Mound Natural Area. Over a two week period we investigated this question using GPS mapping of individual plants, erosion pins, and nearest-neighbor analysis using the point-quarter method. Weekly wind measurements, soil samples, and pH testing of the soil were also used. Our research showed that the density of *C. pitcheri* in the research areas was inversely related to the amount of anthropogenic activity. However, there are a number of both anthropogenic and natural causes which impede the long-term survival of this species. Having greater knowledge of the relationship between natural and human causes will help scientists determine if the thistle is facing extinction due to anthropogenic or natural factors.

Introduction

Due to many factors including low genetic diversity [1], competition with natural and human introduced invasive species,[2] decrease of available habitat [3], *C. pitcheri* has reached threatened status. Considering all the factors against *C. pitcheri* survival, our team decided to base on our study whether *C. pitcheri* health is negatively impacted primarily due to anthropogenic or natural causes in Rosy Mound. Our hypothesis is that *C. pitcheri* health is primarily negatively impacted by anthropogenic causes. Our **study objectives** were to determine the conditions in which *C. pitcheri* grows, the status of *C. pitcheri* within our research areas, and the impact of anthropogenic factors on *C. pitcheri* health.

Study Area

Our study area was located on Lake Michigan south of Grand Haven, Michigan (Fig. 1). Rosy Mound Natural Area is a shoreline area with an established boardwalk system and a series of unmanaged trails. We selected three sites for investigation.

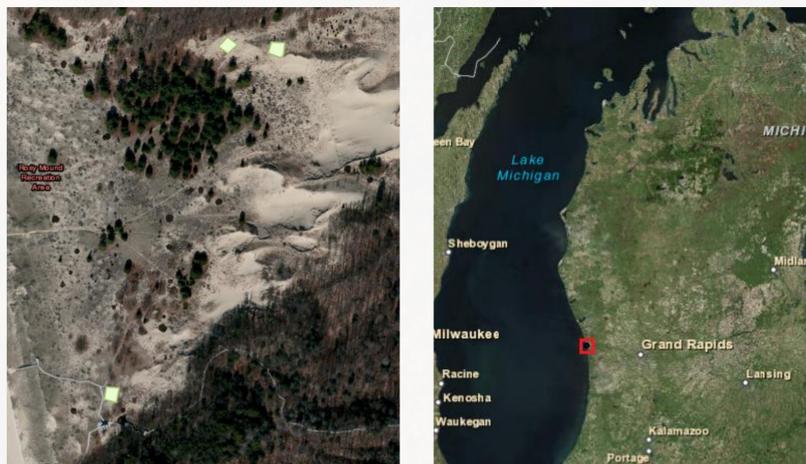


Figure 1: The first study area was located on a boardwalk, the second on an unmanaged trail, and the third away from anthropogenic effects. The research area was located south of Grand Haven, Michigan.

Methods

Our data collection process started with identifying three different areas, mapping the *C. pitcheri* population within each area and measuring each individual leaf length. For randomly selected individuals, we took nearest neighbor analysis with point quarter. We also took a plant survey of the area, placed and measured erosion pins, documented litter, recorded the pH and grain size of soil, and photographed the area around the *C. pitcheri* population (Figure 2).



Figure 2: Researcher collecting the leaf length of *C. pitcheri* (left) and collecting the flags that made up the border of the study site. (right).

Results

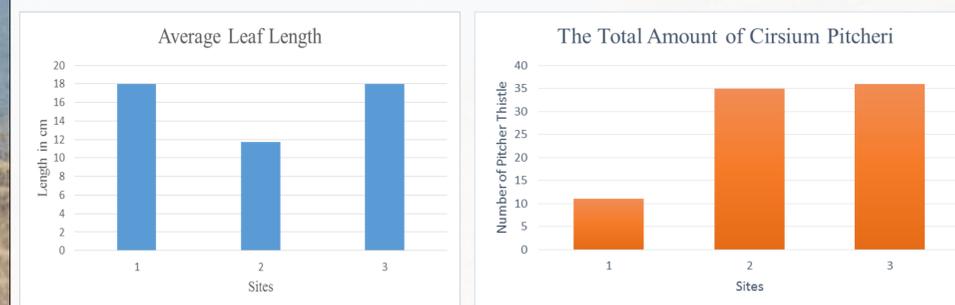


Figure 3: The graph shows the average leaf length of *C. pitcheri*. The leaf length of *C. pitcheri* expresses the health of survival: the longer the leaf the older it is. *C. pitcheri* was found to be the healthiest at sites one and three. Figure 4: This graph shows the amount of *C. pitcheri* found by the researchers. The number of *C. pitcheri* is another property of the health of a location. As shown on the graph site two and three seem to be the healthiest.

Sites	Sand Type	Sand movement	pH of soil
1	medium sub-rounded	1.27 cm	6.37
2	medium sub-rounded	1.44 cm	6.5
3	medium sub-rounded	.83 cm	6.6

Table 1: The table expresses grain type, sand movement, and pH of soil.

The most common nearest neighbor in all three sites was *Calamovilfa longifolia*. Each study area had practically identical plant types recorded with the exception of the third site, which had *Leymus arenarius*, an invasive species. Site 1 was the nearest to the boardwalk and had the least amount of total *C. pitcheri*, but also had the least amount of noticeable human impact. Site 2 had the greatest amount of *C. pitcheri* and the greatest amount of sand movement. Site 3 had the highest average pH level and also the longest average leaf length but was the only site containing an invasive species and contained the most litter, regardless of the fact that it was the farthest study site from the boardwalk.

Discussion

Anthropogenic factors do not have a substantial impact on *C. pitcheri* health. Site 1, the most managed of the three sites, had the least *C. pitcheri*. Site 2 was on an unmanaged trail and contained litter, and had a shorter leaf length than Site 3. Site 3 had the most *C. pitcheri* and the longest average leaf length, but was largely identical to Site 2.

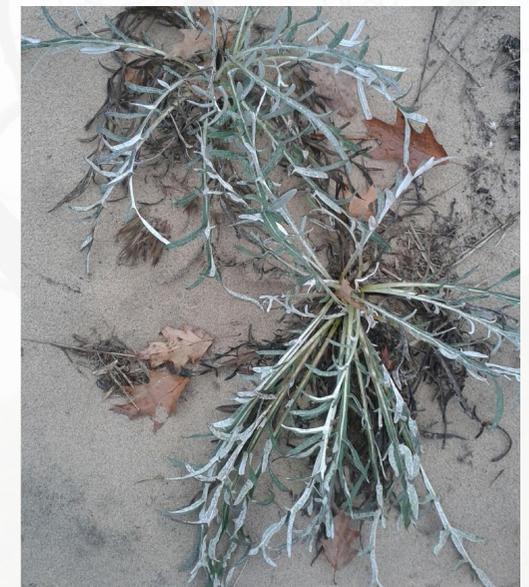


Figure 5: *Cirsium pitcheri*

Conclusions

Anthropogenic impacts do not necessarily correlate with poor *C. pitcheri* health, at least at Rosy Mound, which does not have a threatened *C. pitcheri* population.

Acknowledgements

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References

- [1] Gauthier, M. Crowe, E. Hawke, L. Emery, N. Wilson, P. and Freeland, J. March 2010. "Conservation genetics of Pitcher's thistle (*Cirsium pitcheri*), an endangered Great Lake endemic" NRC 88 (3): 250-257.
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