Spatial Distribution of Pitcher's Thistle on a Rosy Mound Natural Area Blowout

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Abstract

Cirsium pitcheri (Pitcher's thistle) is a threatened plant species endemic to the Great Lakes region. Our study investigated the spatial distribution of *C. pitcheri* and its relationship to sand erosion and vegetation density on a blowout in Rosy Mound Natural Area. Methods used in the study included using erosion pins to measure changes in elevation within the blowout, GPS mapping of plant locations, and observing vegetation density areas. Vegetation quadrats were used to take randomized sample plots of vegetation density. Results show that *C. pitcheri* was largely found in areas of mild erosion and previously established vegetation areas. This study will aid park managers in better managing populations of *C. pitcheri* in the future.

Introduction

Pitcher's thistle, *Cirsium pitcheri* (Figure 1), is a threatened plant endemic to the Great Lakes which faces various threats [1-3]. Our project seeks to understand the spatial distribution of *C. pitcheri* through the example of a population on a blowout in Rosy Mound Natural Area.

Study Objectives

- Map locations and characteristics of *C. pitcheri*
- Record changes in elevation: erosion and deposition
- Analyze vegetation density

Figure 1. A flowering example of Pitcher's thistle on the blowout.

Study Area

Our study area is a blowout in Ottawa County Parks' Rosy Mound Natural Area, located approximately 3 km south of Grand Haven, Michigan (Figures 2 and 3). The blowout is part of a system of blowouts and parabolic dunes along the western edge of the park.

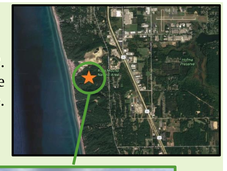

Figure 2. Location of the study site.

Figure 3. Eastward facing view of the study location.

Methods

We took data on *C. pitcheri* at various stages of development (Figure 4), surrounding vegetation, and sand movement; methods used are explained in Table 1.

Objectives	Variables	Methods
Mapping and classifying *C. pitcheri*	*C. pitcheri* locations and stages of development	Use handheld Trimble systems to record the locations of *C. pitcheri*; classify according to different stages of development (seedling, juvenile, flowering, dead)
Analyzing vegetation	Vegetation diversity (number of species) and density	Wooden quadrats thrown randomly to observe vegetation, specifically in areas with *C. pitcheri*
Recording erosion and deposition	Changes in elevation due to erosion and deposition	Recorded data taken at designated erosion pins once a week for a duration of 2 weeks in total

Table 1.
The methods used within the study.

Figure 4. Clockwise from top left: seedling, juvenile, flowering, and dead *C. pitcheri*.

Results

We mapped the locations of 444 *C. pitcheri* plants within our study location (Figure 5). *C. pitcheri* was found in many parts of the blowout, in areas ranging from sparse to dense vegetation. Ages of *C. pitcheri* ranged from seedlings to dead plants. Erosion pins were used to determine changes in erosion, and the data was graphed (Figures 6-7). We also analyzed and graphed vegetation density and area coverage (Tables 2-3).

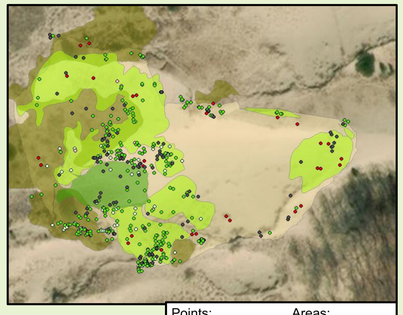

Figure 5. A map of all *C. pitcheri* recorded.

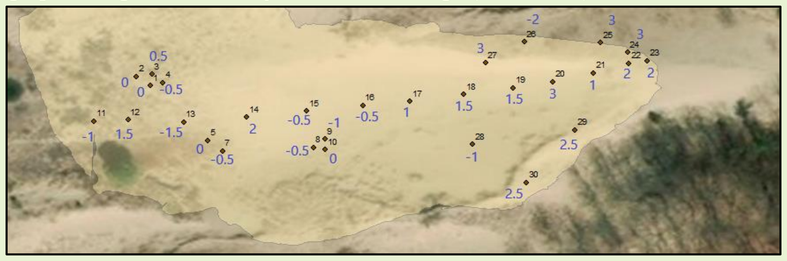

Figure 6 (above). Numbered points show erosion pins. Total changes in elevation at each point (in cm) from day 0 (setup) to day 14 (final measurements) are shown in purple. Positive numbers indicate deposition; negative numbers indicate erosion.

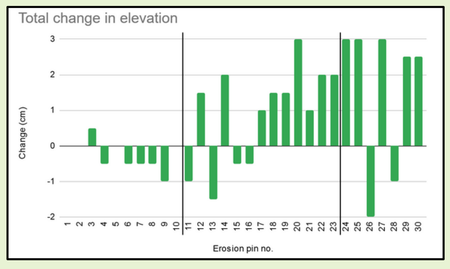

Figure 7 (left). Total change in elevation on each erosion pin to the nearest 0.5 cm.

Location	*C. pitcheri* population (#)	Area (m^2)	Density (#/m^2)
Sparse	228	3205	0.071
Dense	30	549	0.055
Shrub	125	3377	0.037

Table 2 (left). Each area of vegetation, its total number of *C. pitcheri*, and the density of *C. pitcheri* obtained by dividing the number of plants by area.

Vegetation category	Average vegetative cover	Average number of species
Sparse (light green)	20%	1.9
Shrub (dark green)	30%	2.7

Table 3 (right). The percent of vegetation within the quadrats with the areas averaged together and the average number of species.

Discussion

As seen in our research, sparse vegetation is most conducive for *C. pitcheri* growth. With this in mind, protection of sparsely vegetated areas on and around blowouts is an excellent management method.

Another method of management is boardwalks; however, these are already in place and seem fairly effective in allowing people with the opportunity to enjoy their surroundings while keeping off fragile dune areas (Figure 8).

Figure 8. A sign asking people to stay off the dunes, explaining why humans should stay out of the area.

Conclusions

The blowout contained 444 recorded *C. pitcheri* plants which were distributed largely in areas with less erosion. We found that Pitcher's thistle thrives in areas with less erosion and medium vegetation density.

Acknowledgements

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Works Cited

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