

Cirsium pitcheri growth and location on Mt. Baldy at Hoffmaster State Park

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Abstract

Our study investigates the impacts of dune characteristics and variables on the location and growth of *Cirsium pitcheri* in Hoffmaster State Park. We located several areas of concentrated *Cirsium pitcheri* on the dunes, recorded the GPS location of each plant, took measurements and observations of each plant, and recorded the characteristics of the dune the plant was on. We also measured the biodiversity and plant density in each of these concentrated areas using quadrats. We mapped our GPS data and looked for patterns in our measurements using graphs. The data showed that *Cirsium pitcheri* was more likely to be healthy on the crest or a slope of a dune. The results also showed the *Cirsium pitcheri* numbers were higher in areas of lower plant biodiversity and less plant density. From these results we were able to conclude that *Cirsium pitcheri* at Hoffmaster State Park prefers areas that are elevated and open, with less surrounding plants and more exposure to moving sand.

Introduction

Cirsium pitcheri (figure 1) is a threatened species located in sand dunes along the Great Lakes[1]. Due to its small habitat and declining populations, it is important to identify factors that have an effect on the plant's ability to thrive. Factors mentioned in earlier studies included slope angle[3] and effects of animals[2], and these are some of the variables which we investigated.

Our study focused on better understanding how different dune characteristics and variables impact the growth of *Cirsium pitcheri* at Hoffmaster State Park.

Objectives

We had three objectives of our study:

1. Map the location of the *Cirsium pitcheri*
2. Collect data that reveals more about the desired living conditions for *Cirsium pitcheri*
3. Examine our data to find patterns indicating the optimal conditions for the growth of *Cirsium pitcheri*.



Figure 1: A large juvenile *Cirsium pitcheri*

Methods

- This study was conducted at P.J. Hoffmaster State Park.
- We used quadrats to find plant density and diversity (figures 2 and 3).
- We recorded the GPS location of as many *Cirsium pitcheri* plants we were able to record within our study areas.
- For each of the plants recorded by GPS (figure 9), we recorded the status of the plant (alive/dead), number of leaves, maximum leaf length, plant health, slope angle, slope aspect, location on dune and damage from animals.
- Plant health was determined visually using a five-point scale; higher numbers indicated higher levels of health.
- Using the number of leaves and the maximum leaf length, plant age was determined (figure 4).

Sub-area #	Plant density (# plants)			Plant diversity (# species)		
	1	2	3	1	2	3
2	16	56	12	2	1	1
1	8	12	12	1	2	1
3	28	12	12	2	2	2
4	28	24	44	1	2	1

Figure 2: Week 1 Plant Density and Diversity

Sub Area #	Plant density (# plants)			Plant diversity (# species)		
	1	2	3	1	2	3
1	36	76	88	2	2	3
2	16	4	76	1	1	2
3	20	12	32	2	2	2

Figure 3: Week 2 Plant Density and Diversity

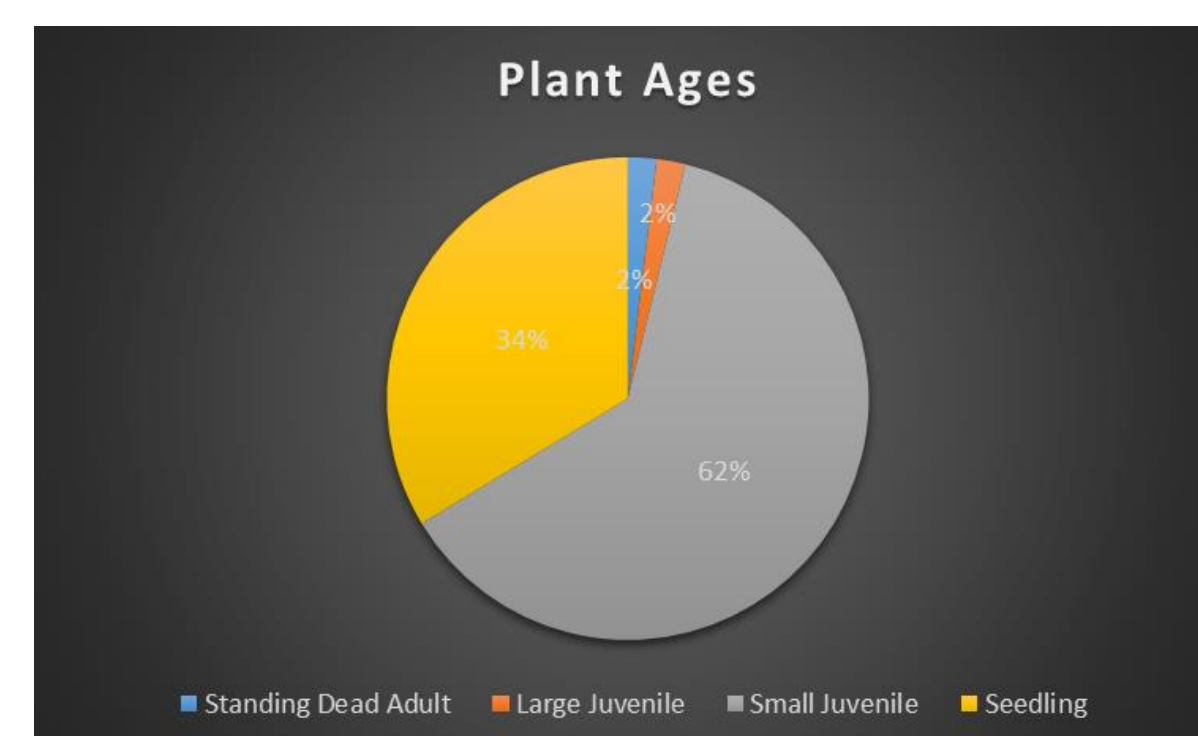


Figure 4: Plant ages for each recorded *Cirsium pitcheri*

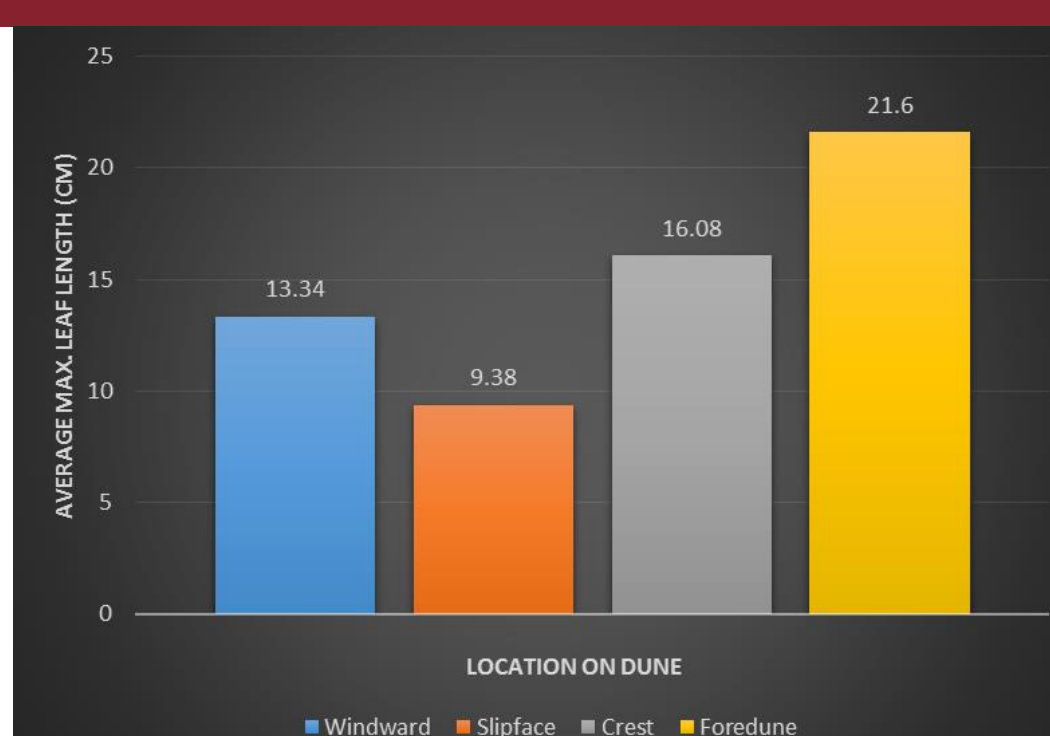


Figure 5: Average Max. Leaf Length Based on Dune Location (Week 1)

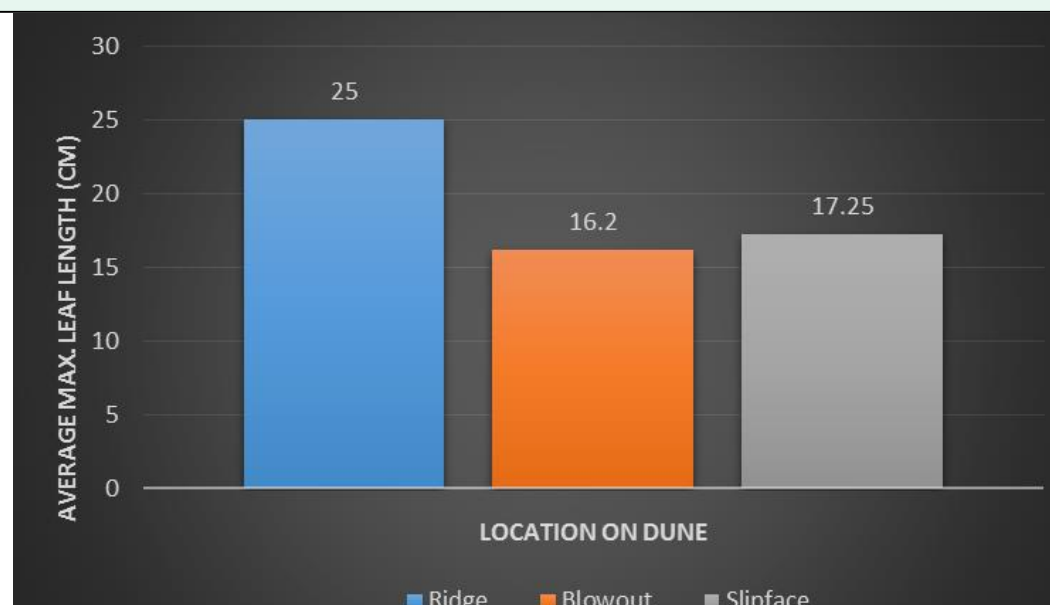


Figure 6: Average Max. Leaf Length Based on Dune Location (Week 2)

Results

- The data had a total of 131 *Cirsium pitcheri*: 64 from area A and 67 from area B.
- 62 percent of the *Cirsium pitcheri* were in the small juvenile stage, 34 percent were seedlings, and large juvenile and standing dead adult were both 2 percent (figure 4).
- The data showed that the longest leaves were on the foredune and on the slipface (figures 5 and 6).
- The data did not show a relationship between slope angle and plant health (figure 8).
- The plants were more likely to grow in less dense areas and to grow by other *Cirsium pitcheri* (figures 2, 3, and 9).



Figure 7: Rachel taking notes on a *Cirsium pitcheri*

Discussion

- Between our two locations of study, there was a trend regarding the relationship between the location of *Cirsium pitcheri* and the length of the longest leaves.
- Between our two locations of study, we were able to find a trend in the relationship between density/diversity of other plant species and the abundance of *Cirsium pitcheri* plants. Lower densities and diversities of other plants were found in areas with higher concentrations of *Cirsium pitcheri* plants.

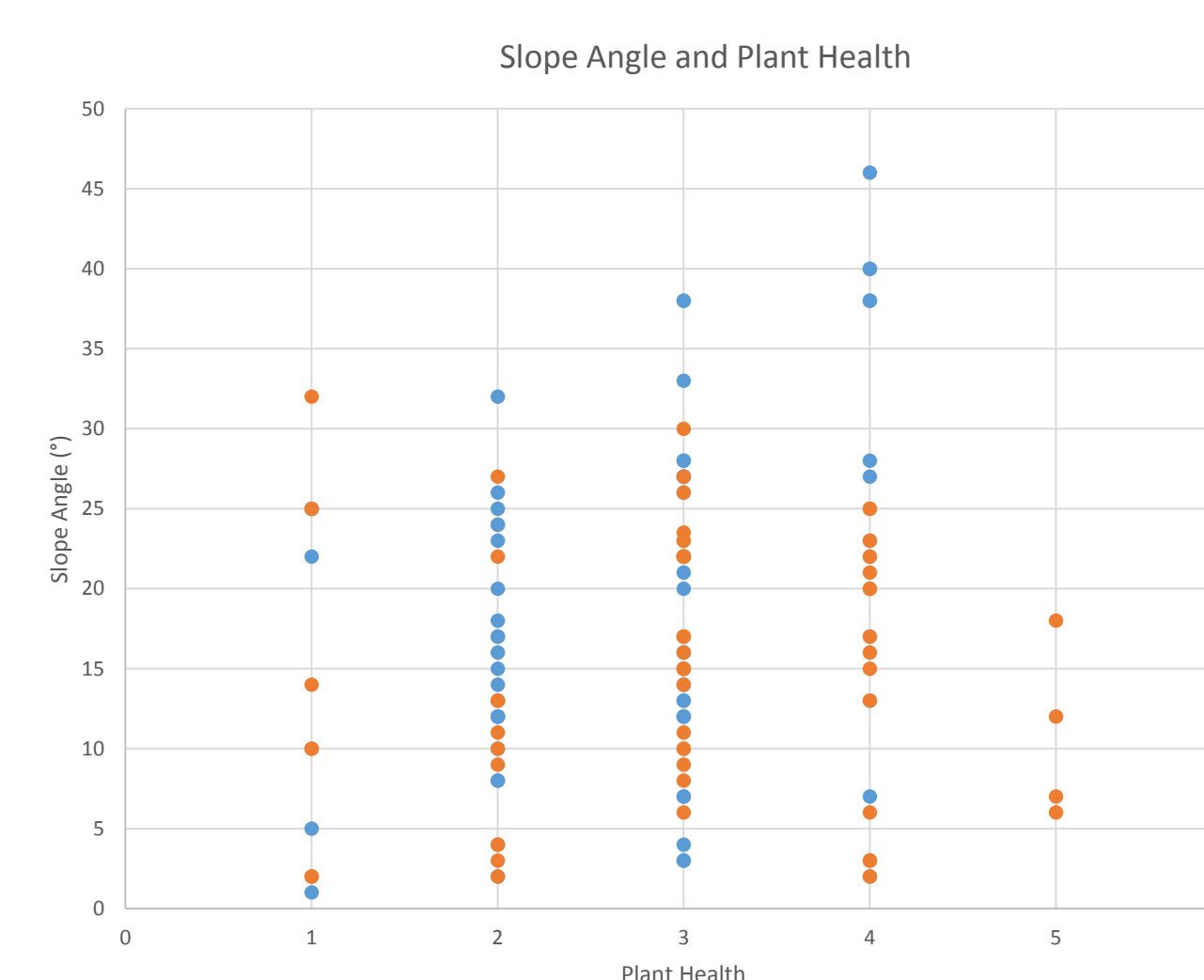


Figure 8: Plant health in relation to slope angle

Study Area

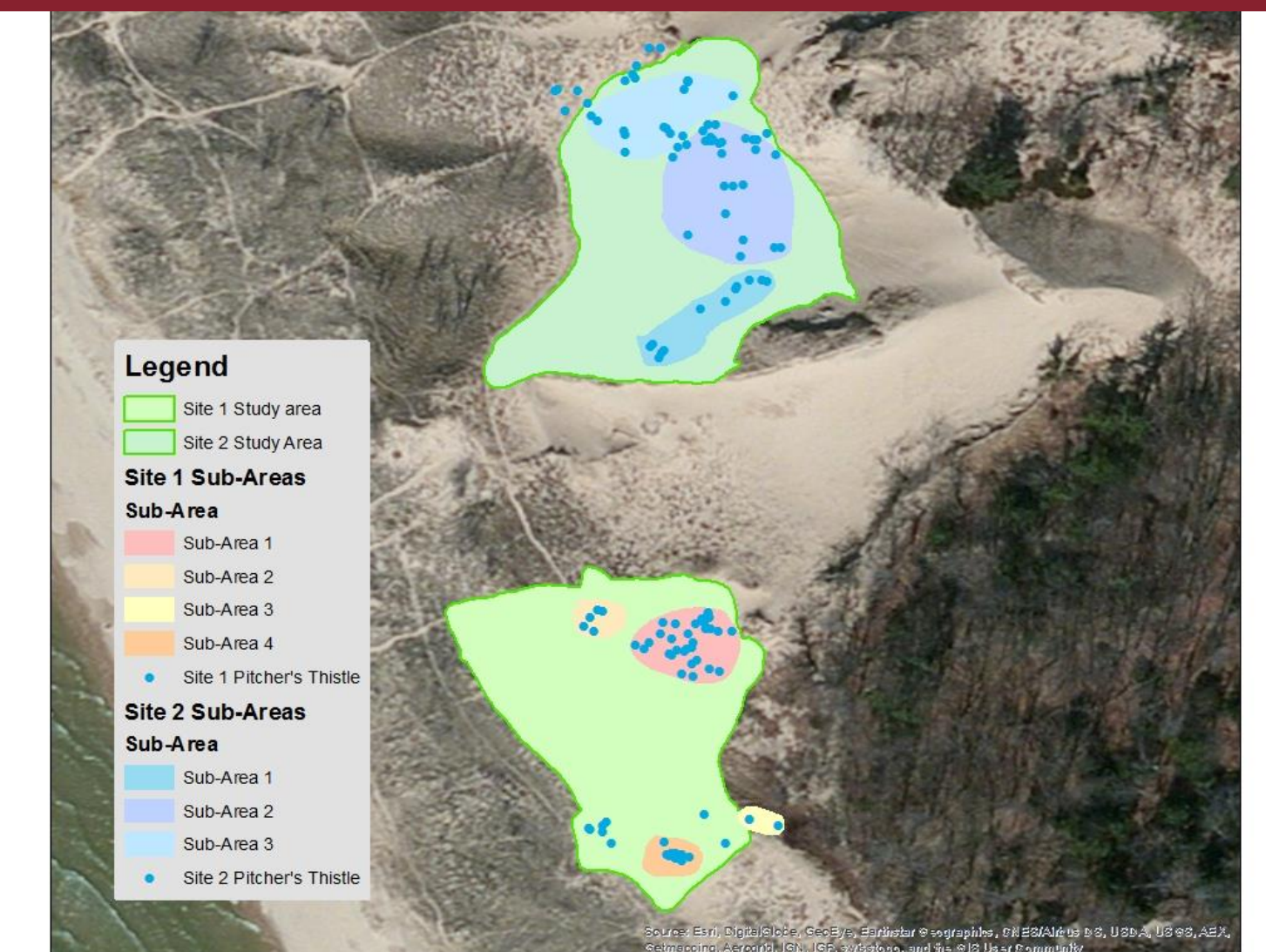


Figure 9: The two locations of study along with the corresponding sub-areas and individual *Cirsium pitcheri*

Conclusions

During this study, we found *Cirsium pitcheri* in two areas within P.J. Hoffmaster State Park, and we recorded various characteristics for each of the plants. We were able to record the locations of the *Cirsium pitcheri* for this dune. There was correlations between dune locations and plant health and leaf lengths. Optimal conditions were areas that are elevated and mostly open or bare sand (figure 10).

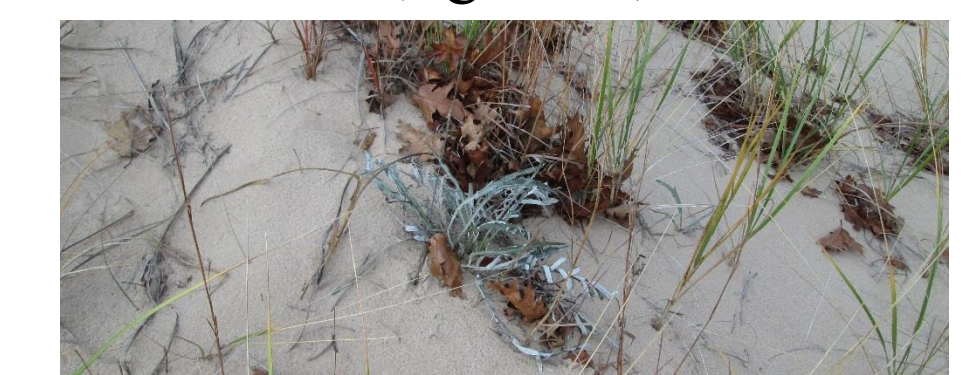


Figure 10: Ideal conditions for *Cirsium pitcheri*

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References

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2. D'Ulisse, Angelo, M.A., Maun. 1996. "Population ecology of *Cirsium pitcheri* on Lake Huron sand dunes: II. Survivorship of plants." *Canadian Journal of Botany*. 74. 1701-1707
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