



Effects of Management Techniques on Castle Park Dune

Cassandra Miceli, Josh Nieuwsma, Eleighna Prather

Abstract

Castle Park Dune, located south of Holland, Michigan, contains a large parabolic blowout. The Land Conservancy of West Michigan has implemented several management techniques to minimize the amount of sand movement on the dune. This study aims to identify the effectiveness of these techniques by monitoring changes in sand accumulation and movement using erosion pins and sand traps. Our results show the sand fences are preventing sand transport but they are having a limited effect. The information in this study will be used by the Land Conservancy to determine future management on the dune.

Study Area

This study took place on Castle Park Dune located south of Holland, Michigan. It is owned by the Land Conservancy of West Michigan. The dune has a large blowout on the windward face surrounded by grassy vegetation.

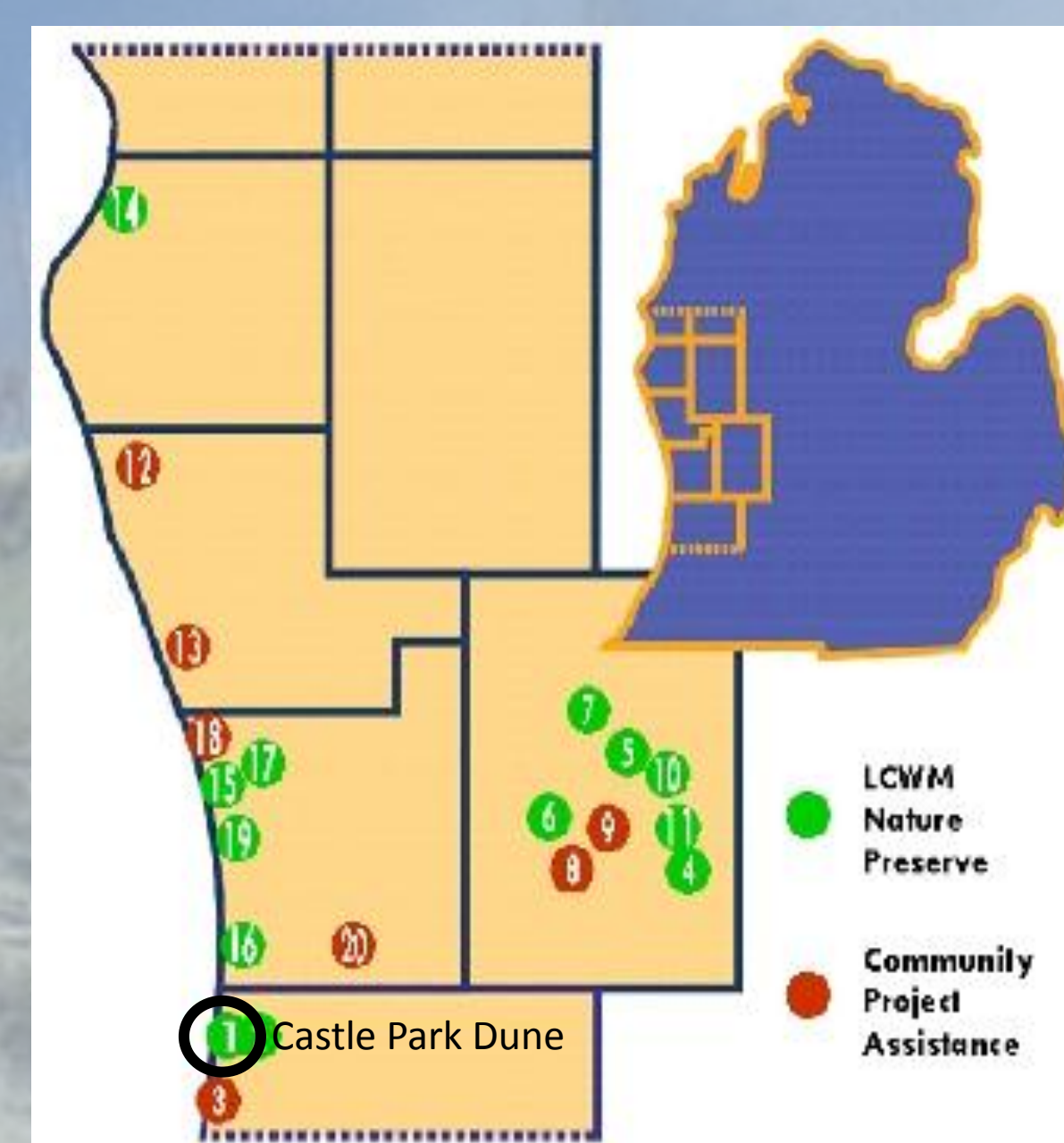


Fig. 1. Map of properties owned by the Land Conservancy. Photo: Land Conservancy of West Michigan www.naturenearby.org/NaturePreserves.tab.aspx

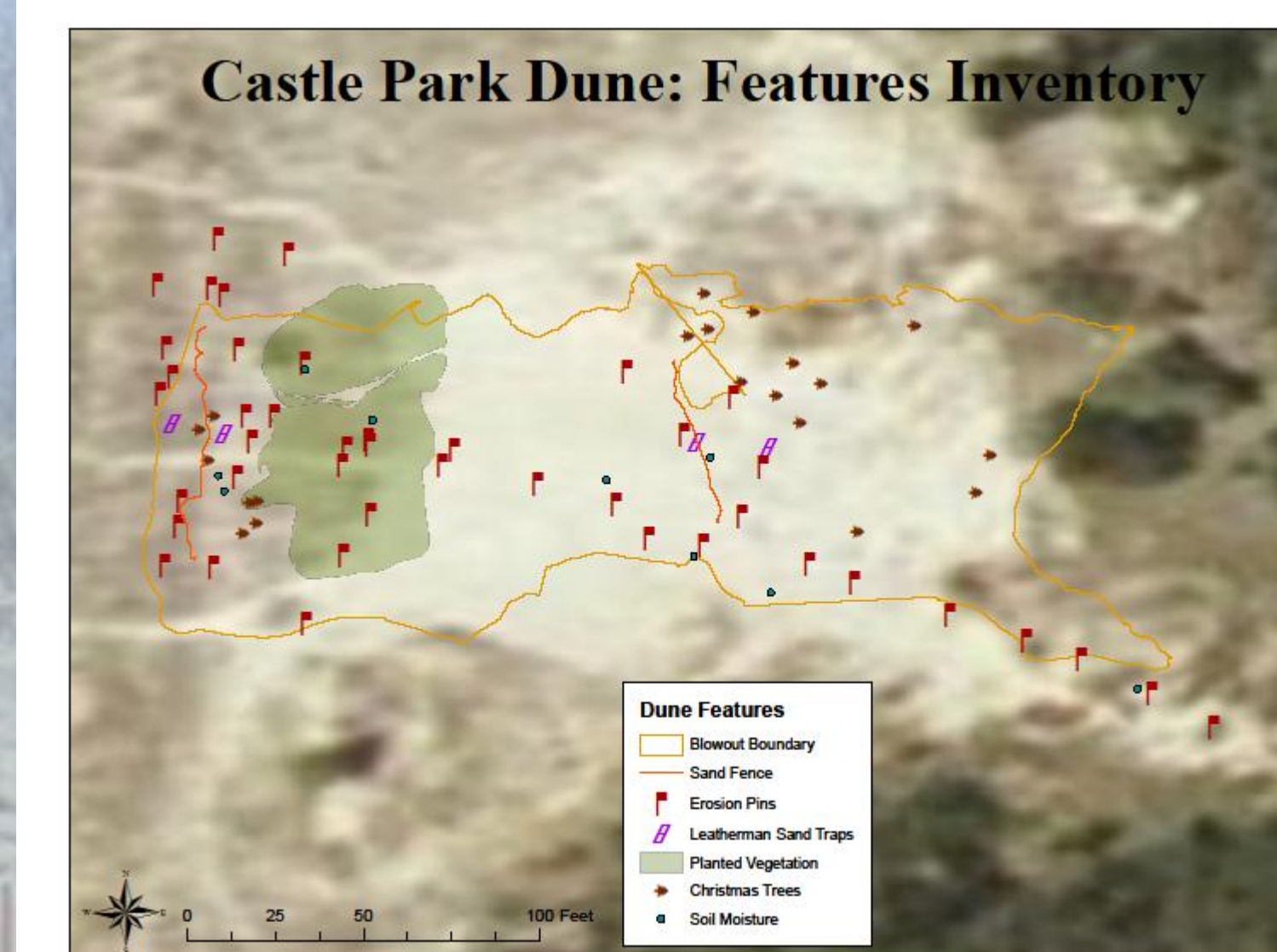


Fig. 2. Aerial photo with GPS mapping

Discussion

Although the sand fences appear to be decreasing the amount of sand being moved in the air, they seem to be having little effect on erosion and deposition rates. The results show sand movement is being slowed by the sand fences especially nearing the crest on the windward slope. The base of the dune also has minimal sand activity possibly because of substantial vegetation cover. Our data doesn't show a substantial difference in sand deposition and erosion in front the fences and behind them

Conclusions

The fences currently on the dune are made of a flimsy, plastic material, therefore, once they stop the sand movement through the air the sand can still easily travel through the fences. Since sand fences have the potential to reduce sand movement, as well as restrict access to the dune (van Dijk and Vink 2005, 59), we suggest that Dune Management invests in more durable fences in order to stabilize the blowout.

Introduction

Sand fences are often used to stabilize dunes (Grafals-Soto 2012, 46). The intention of this study is to determine the effectiveness of management techniques put in place on Castle Park Dune to slow sand movement in the dune blowout. In April 2012 sand fences were installed and in October dune grass was planted on the leeward side of the fences. The objectives are to measure and record sand movement in several areas of the blowout.

Results

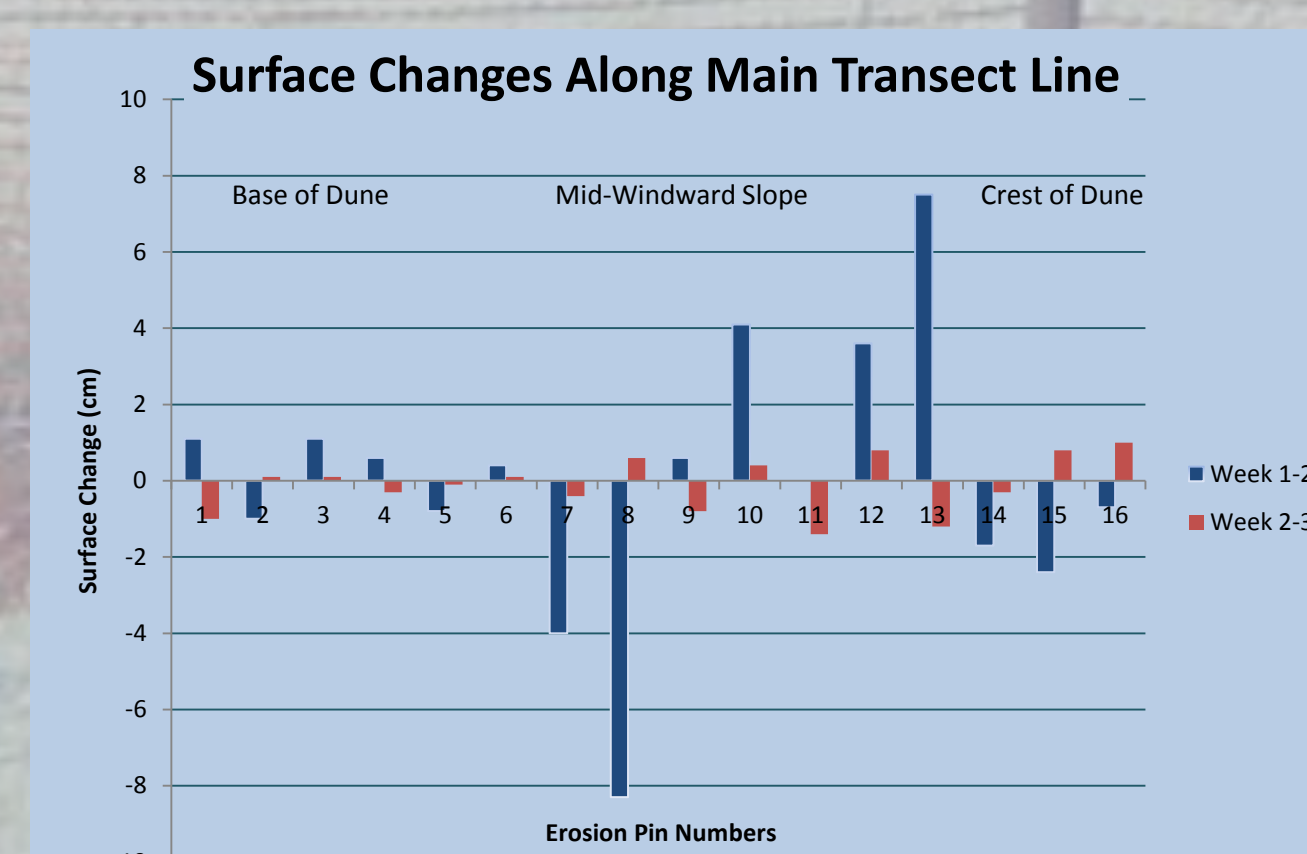


Fig. 3 shows data from erosion pins along transect line

Figure 3 represents erosion pins along the transect show small amounts of deposition near the base of the dune. Further up the windward slope there was an increased range in erosion and deposition changes. Near the middle of the dune there was increased erosion followed closely with similar amounts of deposition. Then, nearing the crest, there was a lesser amount of erosion. Fig. 4A shows the average changes in sand accumulation around the upper sand fence. There was increased erosion during the first week due to high winds. The results from the second week show the effects of more normal weather conditions. The results in Fig. 4B, from erosion pins around the lower fence, were similarly affected by wind.

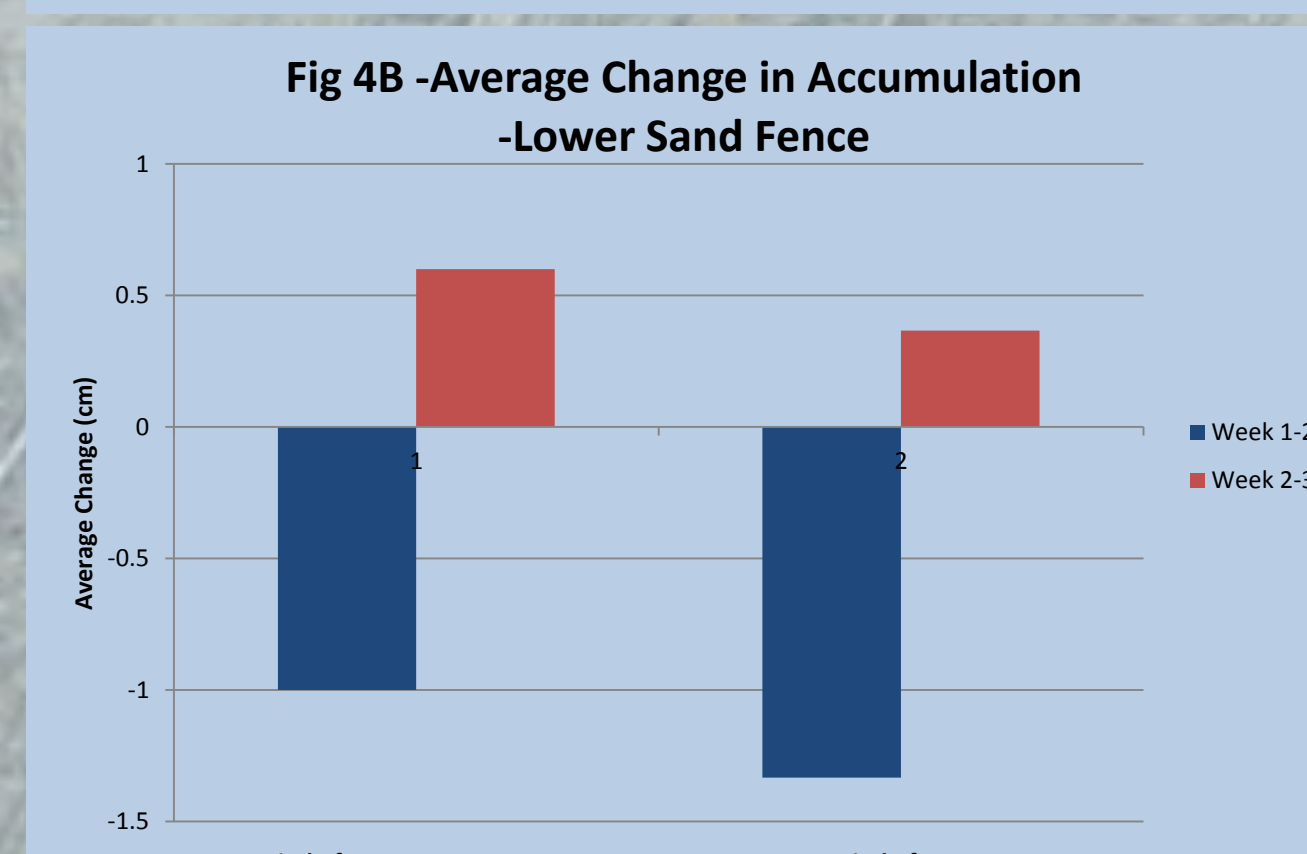
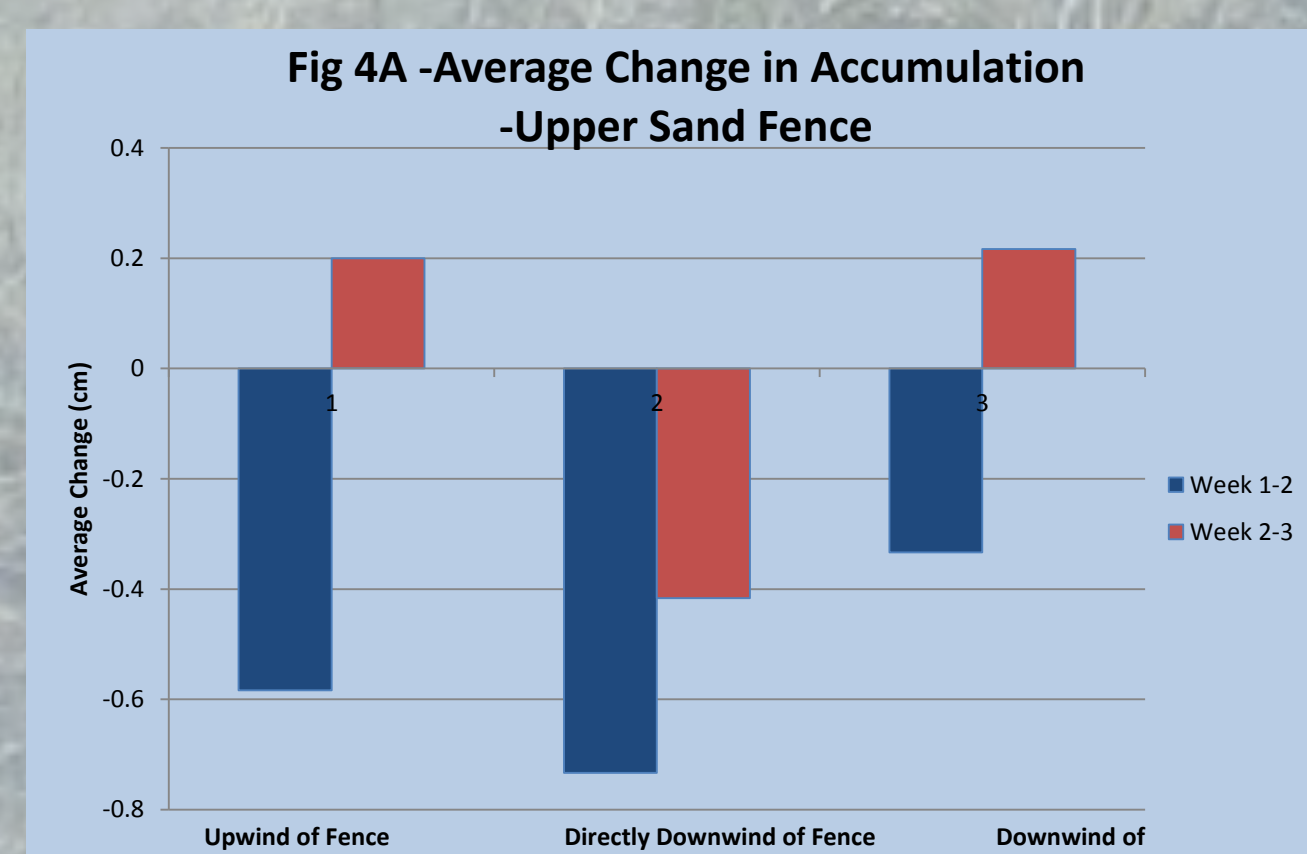


Fig. 4 A,B Changes in surface height around sand fences

Methods

- Erosion pins used to determine the amount of sand movement along the axis of the dune and around the sand fences
 - Sand traps placed in front of and behind the fences to determine amount of sand movement in relation to the fence
 - GPS mapping to show features and provide a visual representation of the study area on the dune
- Refer to Fig. 2 for placement of methods during the study period.



Fig. 5A Measuring Erosion Pins

Fig. 5B Installing Erosion Pins

Acknowledgements

We would like to thank the Land Conservancy of West Michigan for allowing us access to this dune and providing information about the dune. The Calvin College Geography Department for allowing use of their equipment and lab rooms. And lastly, a special thanks to Dr. Deanna van Dijk and Tyler Bleeker who gave their support and guidance along the way.

References

- Grafals-Soto, Rosana. 2012. "Effects of sand fences on coastal dune vegetation distribution." *Geomorphology* 145-146: 45-55.
- Van Dijk, Deanna and Vink, Robert D. 2005. "Visiting A Great Lakes Sand Dune: The Example of Mt. Pisgah in Holland, Michigan." *The Great Lakes Geographer* 12 (2): 45-63.