The Relationships Between Oriental Bittersweet and Castle Park Dune

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Hypothesis: The removal of Oriental bittersweet will destabilize the leeward slope of the dune.

Abstract

This study was done on a large dune at Castle Park in Holland, MI. Oriental bittersweet has taken over much of the leeward slope of the dune. The study sought to determine the relationships between bittersweet and the dune and to gather general information for further studies. Various methods were used to map topography, measure activity, and determine dune characteristics. This study will give information that will guide future management efforts, including removal of Oriental bittersweet and restoration of native vegetation.

Introduction

Oriental bittersweet competes with native vegetation on the Castle Park dune located just south of Holland, Michigan. Ultimately, Oriental bittersweet (Fig. 1) kills areas of native vegetation, including trees [1]. This study sought to investigate dune topography, activity and surface conditions and to determine the relationships between Oriental bittersweet and the dune.

Figure 1. Oriental bittersweet.

Study Area

This study took place on a coastal dune within Castle Park, located on the east coast of Lake Michigan near Holland, Michigan (Fig. 2).

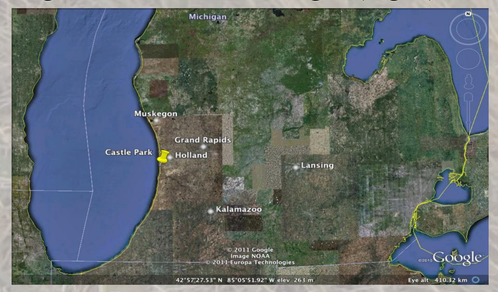

Figure 2. A satellite view showing the location of Castle Park.

Methods

- A SOKKIA Total Station (Fig. 3) was used to determine the dune's topography.
- A Dune Features Inventory (DFI) was used to record characteristics and assess dune activity [2].
- Sand traps were placed at the crest to determine if sand was traveling over the crest.
- Erosion pins were placed on a transect line along the windward and leeward slopes in order to measure erosion and deposition.
- GPS Trimbles were used to identify and map the location of Oriental bittersweet on the dune.
- A soil sample was taken to establish if soil development was present to determine stability of the dune.

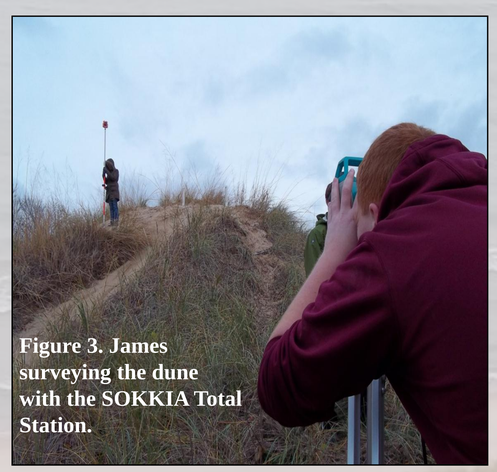

Figure 3. James surveying the dune with the SOKKIA Total Station.

Results

Topographical Analysis: The dune is 49.5 meters tall and has a steep windward slope. There are two crests with a blowout extending between the crests (Fig. 4).

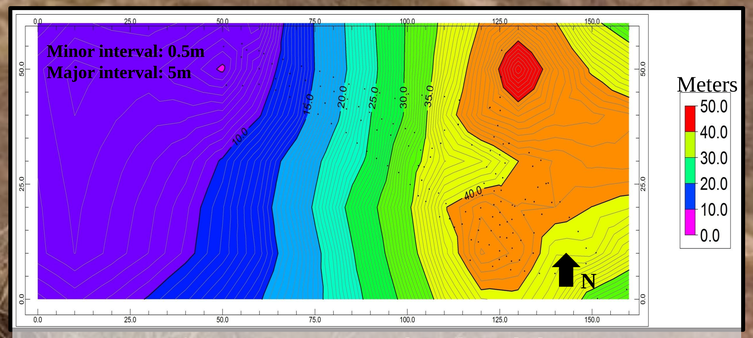

Figure 4. Contour map of Castle Park dune.

Activity: The DFI classified the dune as active. The sand collected from sand traps showed that erosion was occurring and sand was traveling over the crest (Fig. 5). Erosion pin measurements showed that the windward slope is most active and that the leeward slope is mostly stable despite receiving inputs of sand (Fig. 7).

Sand Trap	Time Period (Week)*	Weight of Dry Sand Collected (g)
South	1	21.38
	2	507.56
Middle	1	0.87
	2	130.26
North	1	18.75
	2	54.36

Figure 5. Amount of sand collected at each sand trap over two weeks.

Characteristics: We plotted 279 individual Oriental bittersweet plants, which were most prevalent on the leeward slope of the dune (Fig. 6). Soil, an indicator of stability, is beginning to form on the leeward slope.

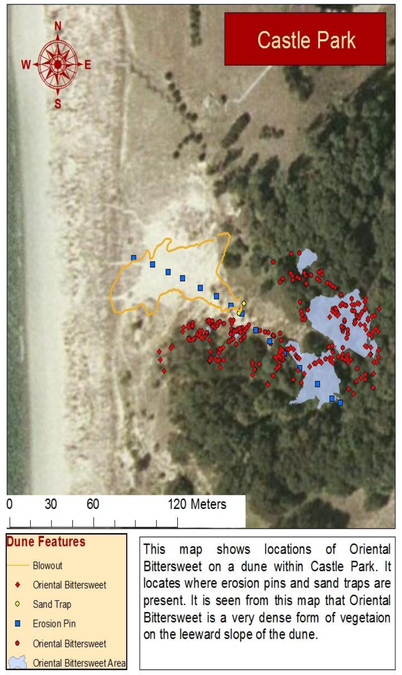

Figure 6. A GIS map of the study site.

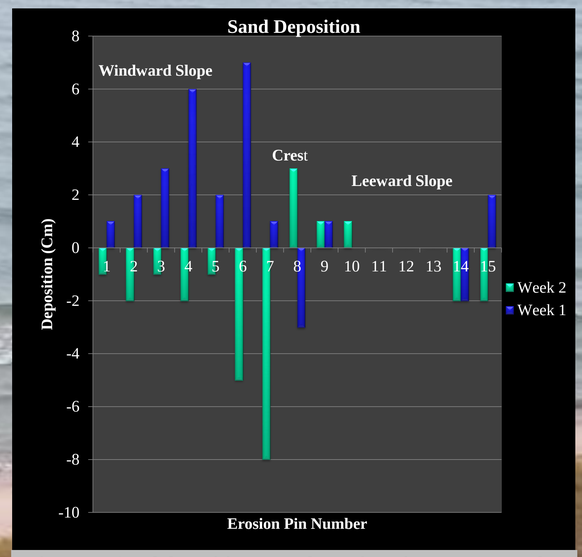

Figure 7. Sand deposition at each erosion pin over two weeks.

Conclusions

The dune at Castle Park is an active blowout, and it is evident that sand is traveling beyond the crest of the dune. The lack of erosion and the presence of soil on the leeward slope indicate that the slope is stable. Because Oriental bittersweet is the only vegetative species on portions of the leeward slope, it can be concluded that Oriental bittersweet helps stabilize the leeward slope. Thus, soon after removing the bittersweet, park managers should plant a native species capable of withstanding small amounts of sand deposition. This will ensure that the leeward slope is protected from erosion.

Acknowledgements

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References

[1] Albright, Thomas P., Anderson, Dean P., Keuler, Nicholas S., Pearson, Scott M., and Turner, Monica G. "The Spatial Legacy of Introduction: *Celastrus orbiculatus* in the Southern Appalachians, USA." *Journal of Applied Ecology* 46 (2009): 1229-1238.

[2] Beauchamp, J., F. Van Baak and D. van Dijk (2009). "Creating a Dune Features Inventory (DFI) for Michigan Coastal Dunes." Annual meeting of the Association of American Geographers (Las Vegas, NV), 22-27 March 2009.