Impacts of White-Tailed Deer on a Lake Michigan Parabolic Dune System

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Abstract

White-tailed deer, *Odocoileus virginianus*, have a significant impact on environments in North America with many populations over the carry capacity of the area. This is the case in PJ Hoffmaster State Park, Michigan, where we investigated a large parabolic dune system to determine where deer have the most impact. We mapped individual tracks, scat and trails with Trimble GPS units, and areas were visually assessed for the impacts of deer. In areas with deer evidence, vegetation quality was noted within quadrats. The foredune had the most presence of deer as shown by scat and tracks going to and from Lake Michigan. Deer tracks on human unmanaged trails suggest that deer use these trails as well as creating their own trails. Vegetation results show deer have not significantly impacted the quality of American beach grass. With the low level of vegetation damage, sand movement has not increased beyond what is characteristic for this type of dune system. While the significant presence of deer is noticed—especially on the foredune—at the moment there is no concern for destabilization of the dune system.

Introduction

White-tailed deer, *Odocoileus virginianus*, have grown in population over the last century across the eastern United States and have had a big impact on different environments [1]. Deer are labeled a keystone herbivore because they keep the growth of plants in check and also provide a food source for predators and humans [2]. But overpopulation causes damage when deer consume too many plants [1]. We investigated how the presence of deer affect the stability of a parabolic dune system.

Study Objectives

1. Document and map deer impacts in the study area.
2. Assess quality of vegetation related to deer impacts.
3. Assess relationship between active deer trails and areas of dune.

Study Area

Our study location was at P.J. Hoffmaster State Park in Ottawa County, Michigan (Fig. 1). The Park Naturalist has estimated the carrying capacity of deer to be 65, yet there is an estimated 3-4 times that many deer throughout the park [3].

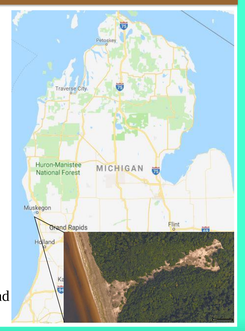


Fig. 1: Location of study area in Michigan and aerial view of the parabolic dune system

Methods

We recorded and mapped variables related to the presence of deer in the study area (Table 1). We developed a scale to visually measure the impact of deer on the vegetation (Table 2).

Variable	Method	Definition	Picture examples
Singular tracks	GPS mapping	One or two hoof prints with no other prints nearby	
Scat	GPS mapping	Observed deer scat	
Deer trails	GPS mapping	Multiple tracks forming a noticeable trail	
Unmanaged trails	GPS mapping	Trails that are used by humans as well as animals	
Deer impact	Assess against visual scale	Damage to vegetation and/or dune appearance from deer	See Table 2

Table 1: Variables investigated, with the methods and examples

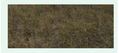
Category	Damage level	Description	Picture examples
1	No damage	Lush vegetation with no noticeable damage. No evidence of deer presence is observed.	
2	Little damage	Vegetation has some bare spots or noticeable damage. Some evidence of deer presence is observed.	
3	Moderate damage	Vegetation is sparser, with distinct bare spots and/or noticeably damaged plants. More evidence of deer presence is observed.	
4	High damage	Damage to vegetation is common, but vegetation also includes healthy stems growing. Frequent evidence of deer presence is observed.	
5	Severe damage	Few or no healthy stems of plants are observed; remnant stems are visible. A lot of evidence of deer presence is observed.	Not seen at study area

Table 2: Deer impact scale

Results

Area of Dune	Scat	Tracks
Foredune	23	6
Arm	0	3
First ridge	0	0
First trough	1	2
Main trough	1	12
Forest	0	0

Table 3: Number of deer scat and deer tracks observed and mapped in different dune areas.

Area of Dune	Visit 1	Visit 2	Visit 3
Foredune #1	3	3.5	2
Foredune #2	3	3	2
North Arm	1	1	1
First Crest	4	2	2.5
Second Crest	1.5		
Blowout behind 2nd Crest	1		
Slipface of 2nd Crest	1.5		

Table 4: Levels of deer impact observed for various dune areas across 3 site visits

Evidence of deer presence on the dune included 25 samples of scat, with 23 samples found on the foredune (Table 3). Singular deer tracks were found in all dune environments with 23 tracks mapped (Table 3).

Damage levels assessed against the Deer Impact Scale ranged from no damage (1) to high damage (4) (Table 4). Visually, the arms of the dune had very little damage except for some trees missing bark.

Both deer trails and unmanaged trails were found in many dune environments (Fig. 2). Some of the unmanaged trails also had deer tracks on them. Trails identified as deer trails, as well as deer evidence, are found both on the forested arms and the open areas of the dune (Fig. 3).

Fig. 2: Unmanaged trails and deer trails in open dune areas at the site.

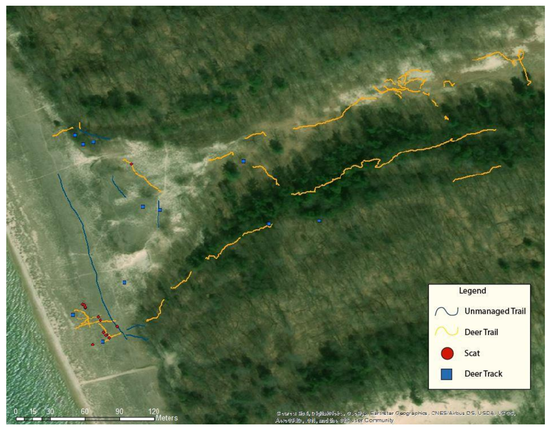


Fig. 3: Mapped deer evidence and trails

Discussion

The quantity of deer evidence and vegetation damage found on the foredune suggest that deer spend significant time in this dune environment and they are grazing on the American beach grass (*Ammophila breviligulata*).

Vegetation on the dune has had some impact by the deer grazing. Nevertheless, vegetation is still growing and doing well, as demonstrated by the vegetated foredune.

With unmanaged trails found over the entire dune, it is hard to distinguish which trails are used only by deer. Deer tracks on unmanaged trails suggest that deer are using these trails as well as humans. From the direction of the tracks, deer use the trails to get water from Lake Michigan, forage on the foredune—as well as in the forest—and shelter in various areas of the forest (Fig. 4).

With healthy vegetation on the various areas of the dune, erosion of the dune has not increased beyond what is typical for this type of dune.

Fig. 4: Deer tracks on the beach

Conclusions

Deer presence is seen over the entire dune, but most evidence was found on the foredune. Vegetation has had some impact from the deer, but is still doing well. Trails made by people and deer have been found on the dune, with most of the unmanaged trails found in the open areas of the dune. Hoffmaster State Park is overpopulated by deer but at the moment there is no concern for destabilization of this specific dune system.

Acknowledgments

We would like to thank P.J. Hoffmaster State Park for allowing us to conduct our research in the Park. We would also like to thank Department of Geology, Geography and Environmental Studies at Calvin College and Michigan Space Grant Consortium.

Works Cited

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