

## Abstract

As the North American population ages, researchers are beginning to ask questions about the accessibility of natural environments. However, no such studies have focused on dune environments. This study investigated the physical accessibility of west Michigan coastal dunes by examining the recreational trails at four Ottawa County Parks. We developed a weighted rating scale to examine different physical trail aspects. We applied the rating scale to recreational trails by collecting data on trail length, location, rest areas, parking lot connections, signs, trail width and slope angle. We also assessed the aesthetic experience of each trail by collecting data on dune environments and scenic views. The rating scale performed well in our field test and was able to distinguish between trails that were marked as accessible on maps and those that were not. The accessible trails scored higher on our rating scale, but they tended not to lead people to dune crests, views of the lake and a variety of dune environments. These results suggest that the aesthetic experience on west Michigan coastal dunes is not equally accessible to all people. Park managers should consider implementing trails that give all visitors equal access to high quality dune experiences.

## Introduction

In the United States 56.7 million people had a disability in 2010, including 30.6 million people who had difficulty walking or climbing stairs [1]. Recent studies have identified the importance of designing accessible trails in parks and forests that allow all people to experience the same scenic experience [2, 3], yet there has been no study on the accessibility of dunes. Our study compares the aesthetic experience of **accessible** and **other** recreational trails for west Michigan dune environments.

**Recreational Trail Classification**  
Accessible trails are trails that are marked as accessible on parks maps or signs along the trail.  
Other trails are any trails that are not specifically designated as accessible.

### Study Objectives:

- Create an accessibility rating scale
- Evaluate the accessibility and scenic experiences of individual trails
- Compare the scenic experiences of accessible trails to other trails

## Study Area

The study took place along the coast of southeast Lake Michigan at four Ottawa County parks. Each park provides unique dune environments with many recreational trails (figure 1).



Figure 1: The four study locations in Ottawa County.

## Methods

- To create an accessibility rating scale, we identified important variables, created or used existing standards to evaluate them, and weighted the variables according to their importance for accessibility (Table 1).
- For data collection we used a variety of tools to examine different variables on each trail (Table 1).
- We also developed and implemented an observation chart to document different scenic experiences specific to dune environments (Figure 2).

Trail Variable	Standard Used	Measurement Tool
Trail length, rest areas, signs, and stairs	Created	GPS units
Trail width	USDA [4]	Tape measure
Trail slope	USDA [4]	Brunton compass
Dune environment	Created	Observation chart

Table 1: Different standards and tools used to evaluate trails.

Observation Chart	
Does the pathway go through a wooded area?	
Is there visible sand along the trail?	
Is there a lookout point?	
Does the trail lead to the top of a dune?	
Is there a view of Lake Michigan?	
Is the beach visible from the trail?	

Figure 2: Scenic observations of each trail.

## Results

- We assessed a total of 18 trails of which 7 were accessible and 11 were other trails. Some trail variables varied greatly depending on whether the trail was accessible or not (Table 2).

Parks	Type of Trail	# of Trails	Maximum slope	Average slope	Surface	# of Stairs	Access from Parking lot	Stairs before/on
Rosy Mound	Accessible	2	12%, 10%	4.2%, 3.45%	Gravel	0, 0	yes, yes	no, no
	Other	3	42%, 43%, 5%	14.25%, 16.30%, 2.25%	Gravel-Wood	116, 43, 0	no, no, no	yes, yes, yes
North Beach	Accessible	1	2%	2%	Wood	0	yes, yes	no
	Other	3	49%, 2%, 25%	23.67%, 60%	Wood-Dirt-Sand	142, 253, 50	yes, no, yes	yes, yes, yes
Kirk Park	Accessible	2	4%, 9%	4%, 3.67%	Asphalt	0, 0	yes, yes	no, no
	Other	2	70%, 8%	26.18%, 5.50%	Dirt-Sand	477, 0	no, yes	yes, no
Tunnel Park	Accessible	2	4%, 0%	2%, 0%	Concrete	0, 0	yes, yes	no, no
	Other	3	0%, 0%, 3%	0%, 0%, 1.5%	Wood-Sand	66, 0, 75	yes, no, no	yes, yes, yes

Table 2: Some trail characteristics collected at each park's accessible and other trails.

- Our newly-created rating scale (Figure 3) allowed us to calculate an accessibility score for each trail. The scores let us quickly evaluate the trail's level of accessibility and compare results between different trails and parks.
- Scores for accessible trails averaged 14.5 more points compared to scores for other trails (Figure 4). Out of the 34 total points possible no accessible trail scored below 31 and only one other trail scored over 23.
- Highly accessible trails often led to poor aesthetic environments; however other trails led to aesthetically pleasing views. This was most evident for the aesthetic elements of dune crests and beach visibility (Figure 5).

Trail Characteristic	Points
Trail Width (3 pts possible) Average of measurements taken every 50 meters: _____ cm □ >48 in (122 cm) = 3 pts □ 36-48 in (91-122 cm) = 2 pts □ < 36 (91 cm) = 0 pts	
Trail Length (3 pts possible) As measured by GPS: _____ km □ 0-1 km = 3 pts □ 1-1.5 km = 2 pts □ 1.5-2 km = 1 pt □ > 2 km = 0 pts	
Maximum slope (3 pts possible) Measured with compass/level at steepest slope: _____ % grade □ ≤10% = 3 pts □ 11-14% = 2 pts □ 15-20% = 1 pt □ >20% = 0 pts	
Average slope (3 pts possible) Averaged from slope measurements every 50 meters: _____ % grade □ ≤5% = 3 pts □ 6-8% = 2 pts □ 9-12% = 1 pt □ >12% = 0 pts	
Is there a rest area or bench present? (2 pts possible) □ At least 1 = 2 pts □ None = 0 pts	
Type of Trail Surface (4 pts possible) □ Hard = 4 pts □ Moderate = 3 pts □ Soft = 2 pts □ Very Soft = 0 pts	
Are Signs Present? (1 pt possible) □ Yes = 1 pt □ No = 0 pts	
Trail is accessible from parking lot? □ Yes = 5 pts □ No = 0 pts	
Ramps or stairs present? (5 pts possible) □ Ramp(s) present or no stairs = 5 pts □ < 50 stairs = 3 pts □ > 50 stairs = 0 pts	
Trail is located before any steps? □ Yes = 5 pts □ No = 0 pts	
Total Points (34 total possible points)	

Figure 3: Rating scale used to assess each trail's recorded data.

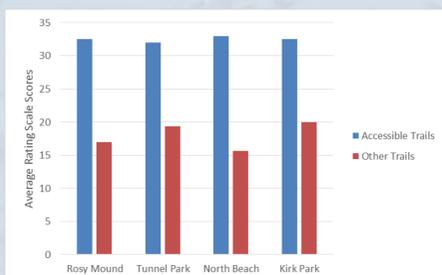


Figure 4: Average accessibility scores for each park.

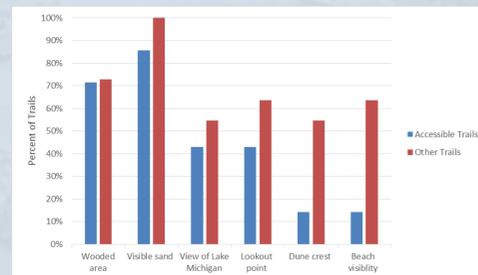


Figure 5: Percent of trails where each different scenic experience was found.

## Discussion

- Our results agree with studies that indicate trails with aesthetically pleasing views are often inaccessible to those with disabilities and health conditions [5] (Figure 6).
- Our rating scale can be used to accurately assess the accessibility of trails. The data suggests that anything that scores over 25 should be considered accessible.
- Accuracy might be improved by testing the rating scale in different locations and also by adding more points of data collection per trail.
- Future studies might consider surveying people with physical limitations to determine what dune environments they find most aesthetically pleasing.



Figure 6: View from a trail at Rosy Mound that had a low accessibility score but had a high scenic observation rating.

## Conclusions

We created a rating scale that is effective at evaluating the level of accessibility for trails in dune environments. Accessible trails did score high on the rating scale but generally offer a lower percentage of aesthetically pleasing environments when compared to other trails.

## Acknowledgements

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## References

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