

First-Year Research in Earth Sciences: Dunes

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Abstract: Slope stability in coastal dune environments is threatened when surface stabilizers are removed. In North Ottawa Dunes, located in western Michigan, an infectious disease requires the removal of hundreds of oak trees, which have extensive root systems used to maintain slopes. Our study investigated the spatial distribution of oak trees in different dune environments in the park and determined the vulnerability of the slope in areas marked for treatment. Using Trimble GPS devices, we mapped tree cover in different dune environments and imported the data into ArcGIS to create a map extrapolating measured densities to the rest of the park. We analyzed DEM data to predict future slope instabilities based on slope angles, dune environment, and tree density. The western edges of the park contain the highest concentrations of red oaks indicating that these areas will be most affected by the loss of root stabilization. Surprisingly, a flat area may be more vulnerable to erosion following treatment as compared to a steeply sloped area where there are lower concentrations of oak trees. Our analysis also shows that new methods of mitigation are able to decrease tree mortality significantly, minimizing the impact of removal.