Evaluation of wind and wave processes critical in sustaining beach backshore environments - R/6840-0004

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Research Summary

Beach nourishment is routinely used in New Jersey and many locations throughout the world to protect coastal facilities and enhance recreation. Despite these benefits, the true restoration potential of nourished beaches is rarely achieved because most beaches are raked to remove wrack (litter) and are maintained as "slabs of sand." Landforms and habitats on the backshore are rarely allowed to evolve by natural processes, preventing topographical and biological diversity, threatening endangered species and reducing seed sources, thereby decreasing resilience of plant communities and sustainability of coastal resources. The backshore is a source of sediment for dune formation and a zone that can generate habitats not found elsewhere. The few dunes that are allowed to form naturally on unraked beaches reveal great diversity of topography and vegetation (Figure 1). There is a need to identify the types, persistence and scale of landforms and habitats that can evolve on the backshores of nourished beaches, the way they interact with wave and wind processes and the most appropriate strategies for managing them.

Figure 1. A naturally evolving dune at Ocean City that formed after beach raking was stopped.

The purpose of this study is to determine differences between raked and unraked beaches and use this information to make informed decisions about the significance of raking to evolution of habitats and provision of sediment to the dunes that protect human infrastructure from erosion and flooding. Data on surface sediments, topography and vegetation will be gathered on six pairs of unraked and raked beach sites in Avalon and Ocean City, NJ to identify landform and habitat types. The effect of storm wave runup and aeolian transport on changes in surface sediments and topography will be evaluated during an entire winter storm season using photogrammetric imagery of one of these sites. Wind flows and rates of sediment transport within and through characteristic raked and unraked beach environments will be monitored during two one-month instrumented field studies conducted during the winter storm season to quantify the processes causing change. Results from the field studies will be synthesized and used to evaluate the long-term benefits of alternative management strategies and develop guidelines for managing backshore environments.

Knowledge of the transport potential across the backshore and the spectrum of ecological niches that are capable of emerging over time is important for determining adaptive measures to increase both human and biologica values. The results will thus be valuable for planning, construction and regulatory branches of the state and federal governments and for municipal managers deciding why, when and how to remove litter and whether or where to place sand fences to build dunes or control inundation of human infrastructure.