Ecological Impacts of Beach Grooming on Exposed Sandy Beaches

R/CZ-174
J.E. Dugan, H.M. Page and A.M. Wenner
University of California, Santa Barbara

Sandy beaches and associated habitats in southern California support very high levels of recreation. These areas are managed with a wide variety of approaches and techniques ranging from hands-off to intensive. Management programs include public safety, removal of trash, and at many sites the regular removal of marine wrack (mostly kelp). Much of the southern California coast is mechanically groomed (> 100 miles) to remove macrophyte wrack deposits and trash. There are many approaches to grooming (use of heavy equipment to remove cobbles and large woody debris, specialized grooming machines (raking, sifting, smoothing), and to disposal of wrack (burial in the intertidal or supralittoral zone or removal from site). Routine grooming with sifters can remove most objects larger than a few cm in length. In addition to grooming, mechanical approaches are also used in removal of wind-blown sand from pavement and parking areas, breaching of creek mouth impoundments, and for the construction of winter berms to protect structures.

This study was conducted to evaluate serveral hypotheses concerning the impacts of beach grooming on the structure and function of sandy beach ecosystems. We used a combination of quantitative field surveys and manipulative field experiments on sandy beaches in three coastal regions of southern California. We quantified the responses of the species richness, abundance and biomass of wrack-associated macroinvertebrates to beach grooming on several spatial scales to investigate hypotheses that beach grooming alters the community composition and decreases the number of trophic levels and the complexity of the food web. We examined the effects of grooming on the use of beaches by higher trophic levels, specifically shorebirds. We also examined the effects of grooming on the establishment and survival of dune plants and on sediment characteristics and aeolian transport.

Our study found substantial ecological effects of the large-scale disturbance and removal of organic material, food resources, and habitat were associated with beach grooming. Grooming of sandy beaches resulted in significant impacts to every ecological aspect of the intertidal beach and coastal strand and dune communities measured. Results from our field surveys and experiments indicate that grooming activities, specifically removal of wrack subsidies to the intertidal zone and mechanical disturbance, can have negative large scale effects on biodiversity and abundance of sandy beach communities and higher level predators such as shorebirds as well as coastal dune and strand habitats and vegetation.

At one of our study sites on San Buenaventura State Beach, a section of the beach where grooming ceased ~4 years earlier was recovering ecological value as indicated by the development of embryo dunes and hummocks, increased sand stability, a seaward expansion of vegetation, and the significantly higher performance of native plants observed in our experiment. However, invertebrate numbers remained low at that site. This and results from our field experiment at Mission Beach in San Diego suggest that the recovery of beach ecosystems damaged by grooming requires considerable time and must be measured on a scale of years. This result suggests that the ecological costs of grooming extend over a multiyear time scale and environmental impacts associated with any increase in grooming or new grooming activities need to be carefully considered. Our study results can be used to assess the "ecological costs" of current beach management practices and provide a scientific basis for recommendations to improve management of our valuable and heavily utilized sandy beaches.