Dissertations

Piping Plover (Charadrius Melodius) Conservation on the Barrier Islands of New York: Habitat Quality and Implications in a Changing Climate

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Abstract
Habitat loss is the leading cause of species extinction. Protecting and managing habitat quality is vital to an organism's persistence, and essential to endangered species recovery. We conducted an investigation of habitat quality and potential impacts from climate change to piping plovers (Charadrius melodius) breeding on the barrier island ecosystem of New York, during 2003-2005. Our first step in this analysis was to examined the relationship between two common measures of habitat quality: density and productivity (Chapter 1). We used both central and limiting tendency data analysis to find that density significantly limited productivity across many spatial scales, especially broader scales. Our analysis of plover habitat quality (Chapter 2) focused on 1) identifying the spatial scaling of plovers to their environment; 2) determining the relative importance of four aspects of the environment (land cover, predation,

management, and disturbance); and 3) determining the key environmental variables that influence productivity. We found that plover habitat selection occurred within a narrow range of spatial scales that was unique to each environmental variable. Further, we found that management and predation variables influenced population-level productivity relatively more than land cover and disturbance. Environmental variables with a significant positive influence on habitat quality were land management units, plover conservation educational signs, and symbolic string fencing erected around plover nesting areas. We found a significant negative relationship among density of people on ocean beaches, herring gull density, and land cover degradation. To quantify possible impact to plover habitat from future climate change (Chapter 3), we examined the extent of habitat change resulting from different estimates of sea-level rise (SLR) and storminess over the next 100 years. We found that the particular SLR estimate, habitat response, and storm type used to model climate changes influenced the amount of potential habitat available. Importantly, we observed synergy between SLR and storms resulting in the increasing impact of SLR and storms on plover habitat over the next 100 years. Finally, we found that coastal development contributed considerably to habitat loss when combined with climate changes. Our findings raise concerns regarding current plover recovery goals and management strategies. Density-dependent productivity may threaten the goal of a joint increase in both plover population and productivity. We advocate density monitoring and allocation of alternative nesting areas to provide the relief of possible high-density limitations. Based on our analysis of habitat selection and climate change threats, we call for a shift in management focus away from known breeding areas, towards ecosystem processes. Long-term conservation of piping plover habitat quality is more likely through protecting and promoting natural barrier island dynamics (i.e. overwash and migration) and minimizing human development on the barrier islands of New York State.