Ecological Impacts From the Interactions of Climate Change, Land Use Change, and Invasive Species

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The five objectives of this research project are to: (1) work with environmental managers and stakeholders to explore different scenarios for land use planning, development of coastal areas, habitat restoration, or other management issues in the context of climate change and invasive species; (2) conduct mesocosm experiments testing links between climate change and land use in altering the ability of invasive species to affect native communities; (3) conduct field experiments to assess temporal and/or spatial scales of potential efforts needed to effectively manage invasive species; (4) conduct field experiments examining the survival of key predators of invasive species in areas of different land use; and (5) develop predictive models to assess alternative management strategies. Focus will be placed on integrating management needs with ecological predictions that allow managers to evaluate multiple stressors at different temporal and spatial scales in different types of coastal systems.

Workshops with managers and stakeholders will discuss multi-stressor management needs and establish the most useful management scenarios for coastal zone planning in a context of climate change and invasive species and information dissemination methods. Mesocosm experiments will simulate predicted temperature changes, and the population and community responses of native and recently introduced species will be compared. Field experiments will determine the spatial and temporal scales for the effective management of invasive species in the context of differences in coastal land use and climate change. An existing population/community model will be modified to present easily understood scenarios to managers and planners.

This study will directly examine climate change on shallow-water marine communities that are most likely to suffer from the poleward spread of species as coastal waters warm. The adaptation of an existing model will couple climate and land use changes to assess their combined effects on the susceptibility of habitats to species invasion and subsequent ecosystem changes in a manner that can be used by managers and planners. Because the invaders are easily recognized and their damage to native communities can be readily quantified, they can be used by managers as highly visible indicators of stress, as well as to assess the success of various types of implemented management plans.

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