Modeling the Impacts of Climate Change on Birds and Vegetation on Military Lands

Project # 10-465

Background:

Global climate change will affect the landscapes and biological diversity of Department of Defense (DoD) lands. Managing installations to ensure the long-term sustainability of the military mission and the effectiveness of natural-resource management will require an understanding of what changes the future may hold. Models provide an effective way to peer into the future to assess how changes in the environment stemming from climate change and changes in land use may affect the distribution and occurrence of species and where changes in community composition are most likely to occur. Previous work suggests that climate-related shifts in bird distributions on DoD installations in California may be especially great relative to those on other Federal lands in the state, heightening the need to understand future changes.

Objective:

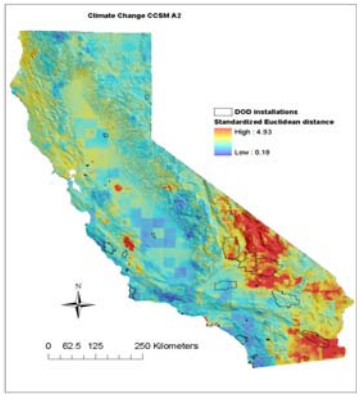
With funding from the DoD Legacy Program, our objective in this project is to extend our analysis of climate-change impacts on bird distributions on DoD lands in California to (1) include a broader array of species, emphasizing threatened, endangered, and at-risk species (TER-S) and species of special concern, and summarize projected distributional changes for these species; (2) assess changes in broad vegetation types; (3) evaluate how changes vary regionally and among installations; (4) determine the effects of changes in land use (housing development) on bird distributions in areas surrounding installations; (5) test the effectiveness of assessments of species vulnerability to climate change; and (6) summarize the findings that may help to inform forward-looking environmental management on DoD installations.

Summary of Approach:

We used a combination of downscaled climate models and species-distribution models to assess potential shifts in the distribution and occurrence of 202 breeding landbird species in California in relation to 39 military installations in the state. Projections of future changes in housing densities in buffer areas surrounding DoD installations were used to assess potential effects of land-use change on species distributions. Multivariate clustering approaches and ecoregional analyses were used to group installations on the basis of similarities in future environmental changes or changes in bird community composition.

Benefit:

Because birds are closely linked with climate and vegetation, their responses can serve as harbingers of change in the environment on military lands, which may affect DoD's capacity to maintain military readiness. Our analyses consider an array of species, some listed under federal or California Endangered Species Acts, others recognized as bird species of special concern. Projections of distribution shifts in relation to DoD installations can provide vital information for conservation efforts by indicating which species may no longer be present and which may persist on DoD lands while diminishing elsewhere. By grouping together installations based on shared environmental or bird-community characteristics, we can identify suites of bases for which similar management actions may be appropriate, pointing out directions for fruitful collaborations.



The figure shows the magnitude of projected climate change, with warmer colors indicating a greater change from the current climate.

Accomplishments:

We have met the six objectives outlined for this project. In addition to modeling distributional shifts associated with climate change and land-use change for a large number of bird species, we have conducted innovative analyses to group installations based on shared environmental or avifaunal characteristics and have highlighted changes at a set of focal installations that may provide guidance for forward-looking environmental management practices.

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