

Assessing Long-Term Dynamics of Bird Distributions in Relation to Climate Change: From Early-1900s to Present

January 2011

Fact Sheet

The Issue

Climate change is expected to have severe impacts on floral (plant) and faunal (animal) species' habitat ranges. This impact can already be seen in the upslope retreat and contraction of the Sierra Nevada conifer forest since the 1930s, which is consistent with warmer winter nights, an upward migration of the freezeline, earlier spring snow melt, and earlier summer drought conditions. This upslope retreat of conifers is a clear biological signal that climate conditions are warming in this region.

Understanding how climate change will affect species' habitat ranges is important because these changes, in turn, will affect future land-use decisions pertaining to resource use, conservation, recreation, and development. Models are a useful tool for predicting future habitat range shifts due to climate change.

Recent model-based predictions of how faunal ranges will respond to future climate change are both alarming and highly uncertain. The most direct way to test model prediction accuracy is to apply the model to predict responses to climate change from the recent past, and then test the model using independent survey data from the present.



The Wilson's Warbler (*Wilsonia pusilla*).
Photo credit: PRBO Conservation Science

Project Description

Between 1904 and 1940, Joseph Grinnell and his colleagues documented the diversity and distribution of terrestrial vertebrates at more than 700 locations throughout California. This project takes advantage of this unusually detailed work and unique historical record to examine changes in patterns of avian diversity. This rich historic record enables precise along elevational gradients in the Sierra Nevada mountain range, the proposed identification of both species and sampling sites.

Building upon the Grinnell survey, this project involves resurveying breeding birds over a two-year period at 60-70 sites throughout California's coastal counties. Researchers are

monitoring latitudinal range shifts, as well as local extinctions and colonizations, which have taken place over the past century in response to climate change. While past Grinnell resurveys examined changes in bird and small mammal ranges in relatively intact landscapes, resurveys will be conducted at natural and semi-rural sites that have experienced varying levels of climate and land use change.

The project's goals are to:

- Produce a dataset of bird occupancy through resurveys of avian diversity at sites with variable climate change histories that were sampled by Grinnell and colleagues.
- Produce estimations of occupancy for 70-100 bird species to be incorporated as GIS layers, and then used to test climate change models' ability to predict changes in species ranges.
- Rank the ability of various climate change and land use factors to explain changes in California bird distributions over the past century.

PIER Program Objectives and Anticipated Benefits for California

This work will provide critical information on bird habitat over the past 100 years in relation to climate change, which, in combination with recent and ongoing Grinnell project resurveys elsewhere in California, will generate important information for the testing and evaluation of models on species' response to climate change. This project will help California in its efforts to predict habitat changes under future climate scenarios.

Understanding how these habitats may change in the future is important for the development of realistic climate projections for California.

These climate projections are needed to understand potential changes in energy demand and generation, and to ensure that stable, secure, and reliable sources of energy can continue to be provided to California's residents.

Project Specifics

Contract Number: PIR-08-001

Contractor: University of California, Berkeley

Amount: \$199,999

Term: February 2009 to February 2011

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