



Matching the scale of conservation with the scale of climate change

Understanding how climate change may affect wildlife and habitats is a key to the future success of conservation. Computer models project how the distributions of plants, birds, and other organisms may respond to changes in temperature, precipitation, growing season, or sea level stemming from global climate change. These modeling studies are complicated by *scale*. Different species respond to the environment at different scales -- a beetle, a bird, and a bison use the same grassland habitat at vastly different scales, and habitat management that is appropriate for one species may not be suitable for the others.

The scales on which climate models forecast change also vary. Global climate models provide coarse projections at scales of hundreds of kilometers. Regional climate models “downscale” projections to a scale of tens of kilometers, and additional modeling can increase the scale of resolution to a few hundred meters.

So both climate and the distribution of species can be expressed at multiple scales. Writing in the journal *Conservation Biology*, John Wiens and Dominique Bachelet (now with the Conservation Biology Institute) assess how these multiple scales of resolution may affect conservation practices.

Conservation aimed at regional, national, or global scales is usually about establishing priorities and influencing policy. At these scales, the coarseness of global and regional climate models may be less important than what they reveal about possible future changes. At the finer scale of ecoregions defined by broad environmental characteristics (central valley grasslands, for example), downscaled climate models may be more useful, but they also carry greater uncertainty. At a local

scale, variations in topography and land cover influence climate, often overriding the projections of the global and regional climate models and further increasing uncertainty.

To be most effective, the scales of conservation should be closely aligned with the scales of climate model projections. Most on-the-ground conservation planning and action occurs at local and ecoregional scales. Conservationists and resource managers should not disregard model projections at these scales because of their uncertainty, but should consider the sources of uncertainty and be prepared to change priorities and actions if the future is not playing out as predicted.

Management Implications

- Species differ in the scales on which they respond to the environment, and climate models differ in their resolution and uncertainty of their predictions at different scales.
- The scales of conservation planning and action should be matched with the scale of climate model projections; mismatches can produce misleading results.
- Managers should pay attention to the uncertainty of model projections, but not ignore the future projections because they are uncertain.

Paper citation

Wiens, J.A., and D. Bachelet. 2009. Matching the multiple scales of conservation with the multiple scales of climate change. *Conservation Biology* 24:51-62.