

# POTENTIAL IMPACTS OF CLIMATE CHANGE ON BIRD AND TREE HABITATS WITHIN THE APPALACHIAN MOUNTAINS

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The habitats associated with the distributions of bird and tree species vary with the resolution of investigation and regional context, and especially within high-elevation forests. Our understanding of how bird distributions may shift with climate change was advanced by our understanding of how climate shapes the boundaries of a species' range. As our knowledge about how tree habitats may respond to climate change improves, we can begin to consider how birds, in turn, might respond to the changes in climate and vegetation. To accomplish this, we modeled the impact of climate change on the importance values of 134 tree species based on climate, elevation, soil, and landscape features. We then developed models of bird species distributions in the eastern United States, using climate, elevation and the previously modeled tree habitat importance values. We selected 147 representative bird species and generated predictive maps of their contemporary habitat associations. As with the tree species models, the bird models were then projected onto three models of climate change under high and low emissions scenarios. The resulting bird models indicate that potential suitable habitat will decrease by at least 25 percent for 60 (high emissions) to 43 (low emissions) species and increase for 43 (high) to 18 (low) within the eastern United States. The importance that the Appalachian Mountains play in shaping future distributions of birds and trees, as they have done for millennia, will likely continue. The changes in habitat for birds and trees are characterized by a northeastern directional shift, which is greatly influenced by the Appalachian Mountains. In addition, for many bird species currently occupying this region, we see the habitat suitability decline but not disappear, possibly due to the birds' associations with both climate and tree species. The climate conditions may become less suitable or even unique, but the bird may still be able to occupy parts of the region because of suitable tree habitat, creating refugia for birds within the region. It is important to note that these results represent potential changes in habitat, and consideration of species specific life histories, landscape characteristics, and regional context are important components of model interpretation. Managers may be faced with unique combinations of bird habitat, making it necessary to consider objectives that include maintaining habitat for species vulnerable to projected changes and, in some cases, providing suitable habitat for species that may establish into new regions.

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