Effects of Spatial Patterning within Working Pine Forests on Priority Avian Species in Mississippi

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Abstract

Within dynamic ecosystems, research into how land use change and pattern affects species diversity has led to a suite of ecological hypotheses to assess species-landscape associations. The Habitat Amount Hypothesis suggests that it is the total amount of habitat, regardless of configuration, whereas the Multi-dimensional Hypothesis suggests it is the suite of local, landscape, and landform characteristics that have the greatest influence on species diversity within its local landscape. Working forests may serve as interesting systems to test these hypotheses of amount and configuration due to the dynamic mosaic of forest stages produced via silvicultural practices. These systems may represent shifting steady-states, whereby at large enough scales, total amount of a given forest age class may not vary despite changes in stand configurations over time across a landscape of multiple stands. To examine these competing hypotheses, we assessed avian species associations with total amount vs. configuration of habitat in working loblolly pine (Pinus taeda) forests in Mississippi during 2019-2020. We estimated abundance and assessed species associations with local, landform, and landscape characteristics using a Bayesian n-mixture model that estimated detection dependent on availability and perceptibility of birds. We found that habitat amount alone did not exhibit consistent positive associations with avian abundance for both early-successional and mature forest associated species guilds. Most target species exhibited positive associations with patch proximity, measured by Euclidean distance, and proximity-area index. Given the extensive coverage of working forests and growing demand for forest products, sustainable forestry guidelines that consider proximity of stands in similar age classes and stages could enhance landscape suitability for some target species guilds. Further research is needed to assess potential effects of stand proximity to species diversity across scales. By combining ecological theory with forest management, we can better inform conservation measures and land use objectives in working forested landscapes.

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