

Northern Research Station

Rooted in Research

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A Bird's Eye View: Anticipating Avian Outcomes of Forest Management

Forest management decisions can have both positive and negative impacts on biodiversity, including bird species. Silvicultural treatments such as thinning, single-tree selection, and other methods can influence bird abundance and diversity because different species have different habitat, diet, breeding, and migration needs.

To better understand how forest management activities affect bird populations, researchers conducted a meta-analysis that focused on two types of species in eastern North America during the breeding season: mature-forest species and shrubland species. The research team was led by David King, a research wildlife biologist with the Northern Research Station of the U.S. Department of Agriculture Forest Service.

Previous studies have shown both positive and negative relationships between forest management and species abundance, depending on factors such as taxa, geographic location, and forestry practices used. This study moved beyond species abundance to analyze the conservation implications of silviculture treatments and provide generalizable, overarching findings about the effects of canopy reduction on the entire bird community. These findings can help guide land management decisions related to bird conservation.

KEY MANAGEMENT CONSIDERATIONS

- In general, low-retention stands (0–10 percent tree retention) support high densities of shrubland bird species, and partially harvested stands (40–70 percent tree retention) support a diversity of mature-forest and shrubland bird species in eastern North America.
- Although lightly thinned and unharvested stands resulted in bird communities of lower conservation value, several mature-forest bird species rely on these habitats.
- For land managers interested in using postharvest retention of canopy trees to meet ecological objectives, this synthesis can assist in assessing species-specific and community-wide avian responses to harvest levels along the entire gradient of canopy treatments.

Finding a Balance

Many bird species are in decline. Mature-forest bird species such as wood thrush (*Hylocichla mustelina*) and cerulean warbler (*Setophaga cerulea*) have experienced steep declines in eastern North America in recent decades. Similarly, many shrubland bird species that rely more on open canopies such as the prairie warbler (*Setophaga discolor*), field sparrow (*Spizella pusilla*), and eastern towhee (*Pipilo erythrophthalmus*) have declined across their ranges. Balancing the needs of mature-forest and shrubland birds is challenging because these species occupy different ecological niches.

The research team used conservation values for each bird species determined by Partners in Flight (PIF), a network of organizations dedicated to bird conservation across North and South America that has developed an Avian Conservation Assessment Database to assess conservation vulnerability and status of all bird taxa. Drawing on PIF's conservation values, the team developed objective, community-wide conservation indices associated with different silvicultural treatments calculated by weighing the standardized density of each species (number of



The wood thrush is equally abundant in mature forests and shelterwood cuts. Silviculture that creates intermediate levels of canopy openness can support both priority species as well as declining shrubland birds that require an open forest canopy. Licensed photo by Julio/Adobe Stock.

birds per unit area) against the density of the tree retention (low, moderate, and high) silvicultural treatments. The scores convey the conservation status of the bird communities; higher values indicated greater conservation value (e.g., higher densities of more threatened species).

“This is the first study to use a meta-analysis to assess the effects of silviculture on bird communities, to consider both shrubland and mature-forest species, and to supplement abundance values with bird conservation values,” says King, “which enables us to assign an objective bird conservation value for any management scenario.”

The research team had to be selective when choosing studies for the meta-analysis. According to King, studies had to address the effects of silviculture, occur in eastern forests, and use some form of survey methodology that could be standardized by unit area. “We reviewed hundreds of studies, but only 33 were suitable for inclusion in our analysis,” says King.

Benefits and Future Inquiries

Low retention stands with 0–10 percent tree retention (e.g., clearcuts) and partially harvested stands with 40–70 percent tree retention (e.g., shelterwoods) typically had the highest conservation values. Low retention stands had high densities of shrubland bird species, and partial-harvest stands had a mix of both shrubland and mature-forest species. These species may be responding to enhanced understory structure produced from these treatments, which they need for nesting or foraging.

Unharvested and lightly thinned stands, which the researchers defined as those with 70–100 percent tree retention, typically had the lowest conservation values. King attributes this result to the homogeneity of many eastern forests due to historical land use and disruption of natural disturbance regimes. While mature-forest birds prefer closed canopies—and these species tended to decline with decreased canopy tree retention and basal area—several priority species had similar or even greater abundances in partially harvested stands and unharvested stands.

Even though low retention stands had higher community conservation values and high retention stands had lower values, the researchers advise against using these findings as blanket recommendations to increase harvest intensity. Instead, they recommend using the information as one consideration among many in land management decisions. For example, the researchers note that unharvested stands provide important habitat for certain species that depend on old-growth forests. As King explains, “The youngest and oldest age classes of forest are underrepresented in eastern forests, and efforts to increase both of these age classes are necessary for biodiversity conservation.”



Regeneration following a shelterwood cut on the Chippewa National Forest. USDA Forest Service photo by Andrea Brandon

Noting the benefit of intensively harvesting in certain areas to increase habitat for shrubland birds while preserving forest cover in others to support certain mature-forest species, King says, “The homogeneity of our eastern forests is a well-documented artifact of human land use and suppression of natural disturbances. Increasing diversity through silviculture can help managers meet ecological objectives.”

This study highlights the tradeoffs involved in balancing the needs of nesting mature-forest and shrubland birds. Understanding the effects of tree retention on different bird species and community-wide conservation scores can help land managers develop comprehensive conservation strategies for managed forests.

PROJECT LEAD

[David King](#) is a research wildlife biologist in the Northern Forest Science and Applications research work unit with the USDA Forest Service Northern Research Station.

FURTHER READING

Akresh, Michael E.; King, David I.; McInvale, Savannah L.; Larkin, Jeffery L.; D'Amato, Anthony W. 2023. [Effects of forest management on the conservation of bird communities in eastern North America: A meta analysis](#). *Ecosphere*. 14(1): e4315. 14(1): e4315. <https://doi.org/10.1002/ecs2.4315>.

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