MANAGING SPRUCE-FIR FORESTS, FOR THE BIRDS

A CFRU-funded study conducted in response to concerns regarding declining bird populations in the Atlantic Northern Forest region has hatched new insights on the associations between richness of spruce-fir associated bird species and diverse forest management practices.

Magnolia Warbler
Photo: B Rolek

Declining Bird Populations in the Atlantic Northern Forest

As the extent of coniferous forest cover has decreased in Maine over the past few decades, so too have eastern populations of many North American bird species associated with spruce-fir forests. For example, the U. S. Geological Survey (USGS) Breeding Bird Survey showed a decline in abundance for 11 of 17 bird species that are associated with this forest type.

Forest management practices can have significant impacts on wildlife habitat, and this association between forestry, bird abundance, and bird species richness in the Atlantic Northern Forest region (including parts of the northeastern United States and southeastern Canada) has been explored a bit in the past. However, few studies have considered associations between these bird species and long-term effects from harvest and postharvest treatments on vegetation. This is precisely what Brian Rolek explored for his PhD dissertation at the University of Maine, under the guidance of Dr. Daniel Harrison and Dr. Cynthia Loftin, in collaboration with Dr. Petra Wood from the USGS in West Virginia.

Three Years of Bird Surveys

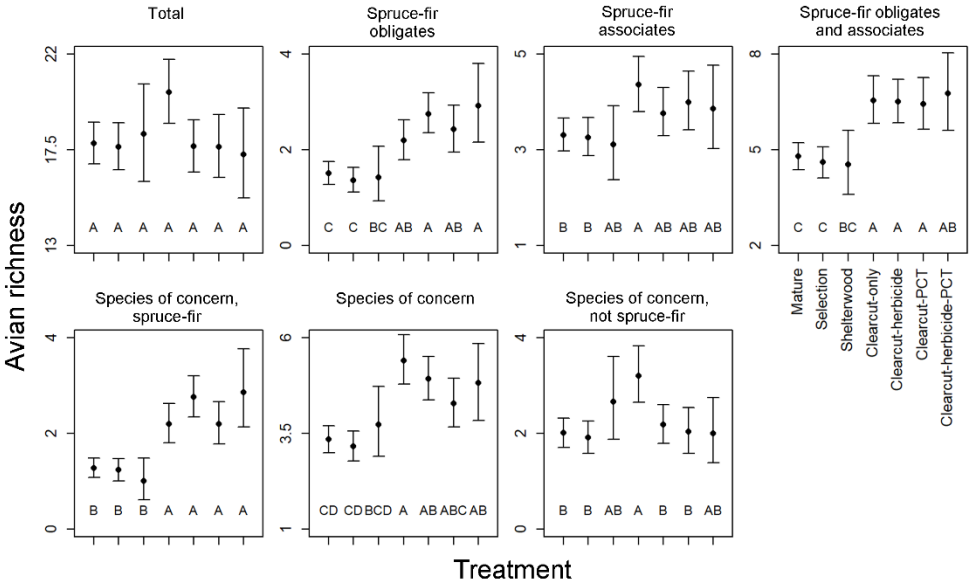
Rolek and his collaborators conducted bird surveys and corresponding vegetation surveys in forests across Maine, New Hampshire, and Vermont that were actively or formerly managed. They surveyed spruce-fir stands with greater than 50% spruce or fir tree composition that represented seven different harvest treatments: mature, selection, shelterwood, clearcut, clearcut with herbicide, clearcut with precommercial thinning (PCT), and clearcut with herbicide and PCT. The locations they selected for their bird surveys were more than 328 feet (100 meters) apart and more than 427 feet (130 meters) from forest edges. In all, they surveyed birds at 425 points in 114 stands. At these bird survey locations, technicians would identify all birds they detected on a given day, during a predetermined time interval.

Bird counts were conducted between June and August of 2013, 2014, and 2015. Survey locations used in this study were typically (71% of sites) visited three times a year during each year of the study. In 2014, the team conducted vegetation surveys at each bird survey location to measure the structure of the forest and to better understand how harvest treatments account for differences in bird abundance and numbers of bird species detected.

Rolek and his collaborators evaluated bird species that they found at 10 or more locations, focusing on 49 species out of a total of 139 species detected. Among these 49 species, they created groups for use in their analyses: spruce-fir obligates, spruce-fir associates, spruce-fir obligates and associates combined, species of concern that are spruce-fir obligates or associates, species of concern, species of concern after omitting spruce-fir species, and total richness. They primarily used these groups to explore relationships between harvest treatments and bird populations.

Where Are Spruce-Fir Obligate Birds Most Abundant?

Spruce-fir obligates, which are bird species that only live in spruce-fir forests, were more abundant in clearcut stands and clearcut stands that had post-harvest treatments, such as herbicide and PCT. This is likely because these treatments promote spruce-fir succession. Many spruce-fir associates, defined as birds that are often found in spruce-fir forests but not exclusively, were also more abundant in these stands with



Brian Rolek holds a spruce grouse

Relationships between the number of bird species (avian richness) and seven harvest treatments (see right). Shared letters (A, B, and C) indicate that harvest treatments are not statistically different. Figure from Rolek *et al.* (2018).

previous clearcut treatments followed by post-harvest treatments.

Several species, including Red breasted Nuthatch and Golden-crowned Kinglet, were most abundant in mature and shelterwood stands. Several spruce-fir obligates did not have clear associations with any of the harvest treatments, suggesting that species within these groups of birds have diverse habitat requirements.

Which Treatments had the Greatest Diversity of Spruce-Fir Obligates?

Species richness (i.e., number of bird species) was similar across treatments. Richness of spruce-fir obligate species, however, was greater in the clearcut stands and clearcut stands with post-harvest treatments. Spruce-fir associate richness was greater in clearcut than in mature and selection stands, but not necessarily greater than in the other treatments.

Using the vegetation survey data, Rolek and his team found that the number of spruce-fir bird species increased with coniferous tree composition and with tree immaturity (e.g., smaller diameter at breast height, tree heights, and quadratic mean diameters). Richness of all bird species, species of concern, and non-spruce-fir species decreased as tree density increased.

Conclusions

- Intensive forest management using postharvest treatments promotes greater spruce-fir composition and may increase abundance and richness of spruce-fir birds.
- Clearcuts with postharvest treatments could be used to mitigate ongoing population declines of spruce-fir birds where the extent of conifer forest is decreasing.

For More Information:

For more details, please refer to the following article:

Rolek, B. W., Harrison, D. J., Loftin, C. S., and Wood, P. B. 2018. Regenerating clearcuts combined with postharvest forestry treatments promote habitat for breeding and post-breeding spruce-fir avian assemblages in the Atlantic Northern Forest. *Forest Ecology and Management 427*: 392-413. https://doi.org/10.1016/j.foreco.2018.05.068

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