Bird habitat research results from the Bartlett Experimental Forest

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Forest bird habitat management research from the Bartlett Experimental Forest (BEF) in central New Hampshire has focused on the interdisciplinary questions that arise when managing forests for multiple economic and environmental benefits. Forest management of public lands invites considerable discussion of the effects of management on other resources such as forest bird habitat. Those discussions over the years have focused on three general areas: 1) how landscape-level habitat elements affect an integrated management approach; 2) how an integrated approach influences important stand-level habitat characteristics; and 3) within-stand habitat features that are important to an integrated approach. The resulting work on BEF and surrounding White Mountains region illustrates how Forest Service research provides land managers with integrated approaches to managing forest songbird habitats in New England.

Landscape-level habitat

Early questions raised in national forest planning sessions reflected concerns over the potential of forest management to fragment forest habitats which was unknown at the time. Existing research on this topic had been conducted in the Midwest or mid-Atlantic states where forest patches were the minority component of landscapes dominated by agriculture or suburban development (*a review of that literature can be found in King et al. 2011*). DeGraaf (1991, 1992) described the short-lived avian breeding season use of new clearcuts and found that no unique species or assemblages were present on edges of differently-aged forest stands. Edges between even-aged northern hardwood stands, especially abrupt edges, did not function as forest-field edges did in less forested landscapes. King et al. (1996, 1997, 1999) investigated avian nesting success along clearcut edges and found: 1) lower rates for some species along edges than in forest interiors; 2) BEF ovenbird nest survival rates were twice as high as ovenbird nesting survival rates in fragmented forests in the Midwestern US (King and DeGraaf 2002); and 3) that edges created through management had little effect on mature forest birds. DeGraaf (1995) conducted an artificial nest predation experiment on managed and reserved forest blocks in the White Mountains. Higher nest predation rates on both natural and artificial nests have been observed in smaller vs larger forest patches and are influenced by the distance to forest edges on more fragmented landscapes. Using artificial nests with trip cameras that recorded the egg removal event, nest depredation rates were not different between managed and reserved forest blocks for either ground or shrub nests. Even-aged management and the respective size-classes do not fragment forests on these landscapes (DeGraaf and Angelstam 1993).

Many consider significant brown-headed cowbird brood parasitism and nest predation events evidence of fragmented forest systems. Most of the cowbird parasitism work had been conducted on mixed use landscapes. Yamasaki et al. (2000) conducted breeding bird surveys across White Mountain National Forest boundaries (97 percent forested) and surrounding private lands (65 percent forested). 99 percent of cowbird observations were on transect segments outside of the national forest boundary where agricultural and residential land-uses were more prevalent. Work by King et al. (1996, 2002) and Chandler et al. (2009) also reported cowbird parasitism rates < 1 percent, supporting the idea that forest management on forested landscapes does not put forest birds at risk of elevated cowbird parasitism. Forest mammals (black bear, fisher, raccoon, snowshoe hare, and red squirrel) were recognized in half of the identified nest predation events (DeGraaf 1995) and predation rates were not different between managed and reserved extensive northern hardwood forests.

**Bartlett Experimental Forest landscape, facing east.
Photo by Ken Dudzik, U.S. Forest Service**

Welsh and Healy (1993) compared northern hardwoods areas managed for quality sawlogs using even-aged practices with sites reserved from any timber management on the White Mountain National Forest (WMNF). Managed areas were roughly 65 percent sawtimber, 17 percent poles, and 18 percent seedling-sapling stands. Reserved areas were 96 percent sawtimber and 4 percent pole stands. Avian diversity on managed areas

was greater than reserved areas; 20 species were only detected on managed areas; and no species were unique to reserved areas.

These collective results strongly suggest that there are large regional differences in how birds respond to landscape-level habitat arrangements. On the extensively forested landscapes of New England, even-aged management practices do not fragment forest landscapes as they appear to do on more mixed use Midwestern or mid-Atlantic landscapes.

Stand-level habitat

Availability of early successional habitat in New England peaked in the mid-1960s and has since declined steadily (Trani et al. 2001). With the end of the agricultural land abandonment period and wildland fire suppression policies, early successional habitats generally originate from timber harvesting and the occasional severe wind event (Thompson and DeGraaf 2001). By the early 1990s, public concerns over the visual impacts of clearcutting and perceived detrimental effects to wildlife habitat using even-aged management on national forest system lands gave rise to an increased utilization of uneven-aged management practices, such as individual-tree and group selection that would extend a relatively unbroken forest canopy across both the managed and unmanaged forests in New England. Our concerns over the continued decrease in the quantity and quality of early successional bird habitat resulting from the diminished use of even-aged management and clearcutting led to a study examining the avian diversity of clearcuts, group selection cuts and their surrounding mature forest matrix, and uncut mature northern hardwoods on the WMNF (Costello et al. 2000).

Chestnut-sided warbler, a typical early successional forest bird. Photo by Dave King, U.S. Forest Service

Young clearcuts (0-10 years old) around 20 acres in size provide habitat for a more diverse group of early successional bird species (e.g., chestnut -sided warbler, common yellowthroat, and mourning warbler) than group selection openings averaging 0.5 acres (Costello et al. 2000); 11 species were observed only within clearcut stands. Group selection retains much of the mature northern hardwood bird community while offering habitat for a limited number of early successional bird species. Typical forest bird species (e.g., red-eyed vireo, ovenbird, black-throated green warbler, American redstart) were found in both mature stands and the mature, matrix stands surrounding group cuts; no species was exclusive to group selection stands. Gradual replacement of clearcutting with small group selection treatments could result in reduced avian diversity across extensively forested landscapes.

Comparisons of avian diversity in unmanaged mature, clearcut, and shelterwood conditions in northern hardwoods by King and DeGraaf (2000) were not surprisingly the result of differences in habitat structure among treatments. Avian diversity was greater in shelterwood conditions than either unmanaged mature stands or young clearcuts. Additionally, a nine-year survey of breeding birds in a new clearcut, patch cuts, and low-density shelterwood in northern hardwoods demonstrated that early successional, generalist, and mid-/later successional species were present in all three treatment areas although the clearcut and patches had higher proportions and more observations of early successional bird species (Yamasaki et al. 2014). Avian composition and richness in patch-cut opening sizes of at least 3-5 acres were similar to the 15-acre clearcut, though abundance was higher in the clearcut. These findings provide a starting point to address the minimum opening size needed for early successional species question raised by Costello et al. (2000).

DeGraaf and Yamasaki (2003) describe options for managing early successional habitat involving the silvicultural system being used, size of regeneration cuts, time between regeneration cuts and rotation age. Larger regeneration openings create conditions for dense reproduction of intolerant, intermediate, and tolerant tree species (Leak et al. 2014); smaller gaps (< 0.5 ac) create conditions weighted towards tolerant tree species. Access to full sunlight encourages the production of soft mast (e.g., strawberry, *Rubus*, and pin cherry), all important foods for frugivorous birds and mammals. Schlossberg and King (2008) conducted a meta-analysis of early successional bird use of clearcut edges and interiors, and found that these species avoided edges and were not edge specialists as had been widely thought. Larger cuts minimize edge and create quality habitat for these species and with time, forest-interior birds as well.

The short-lived response of early successional breeding birds to young clearcuts, patches, and large groups lasts around 10 years or so by which time the regeneration has grown beyond the stage these early successional species can use (DeGraaf 1991; DeGraaf and Yamasaki 2003; Schlossberg and King 2009). Re-entry periods in managed areas that exceed 20 years probably reduce the potential value to early successional bird species due to the aging out of quality habitat and lack of new cuts to replace what had grown up (DeGraaf and Yamasaki 2003). Considering a shorter re-entry period in these situations may be warranted.

(Story continues on next page)

Bird Habitat Research Results, continued

Some of the most interesting findings in young clearcuts comes from work by Chandler et al. (2012) examining the post-fledging and pre-migration values of young clearcuts to birds in the White Mountains region. Mistnetting captures during the mid- through late summer period compared occurrence and abundance of birds using young clearcuts and mature northern hardwoods. Seven of the nine mature forest-nesting species with sufficient captures to evaluate (e.g., blackburnian warbler, black-throated blue and black-throated green warblers, red-eyed vireo, and Swainson's thrush) were more abundant in clearcuts than mature forest habitat. Reasons for these habitat selections could be: 1) to complete feather development in structurally complex habitats that minimize predation risks and 2) more available food resources (i.e., soft mast and insects) in young clearcuts.

In northwestern Pennsylvania, Stoleson (2013) also examined avian postbreeding use of regenerating clearcuts and mature Allegheny hardwoods and found that habitat choice (clearcut vs mature forest) by both adults and newly fledged young was correlated to a better physiological condition and more advanced molt for a subset of forest birds.

These studies highlight: 1) the complex nature of Neotropical migratory bird habitat; 2) the range of habitats used by forest birds while on their breeding grounds in New England is not necessarily represented solely by nesting habitat conditions and 3) forest as well as early successional birds utilize early successional habitats for both post-fledging and pre-migration activities.

Within-stand habitat features

At this fine-grain scale, snags and live cavity trees used by primary excavators (i.e., woodpeckers) and secondary cavity-users (i.e., wood duck, red- and white-breasted nuthatches, as well as many mammal species) in managed forests provide both secure nesting and foraging sites as well as the potential recruitment of coarse woody debris when the trees eventually fall to the forest floor (DeGraaf and Shigo 1985; Tubbs et al. 1987; DeGraaf and Yamasaki 2001). Understanding the dynamics of snag longevity was important to developing workable snag and live cavity tree guidelines for northern hardwoods by re-examining the mortality component on a long-term hardwood growth study (Solomon 1977) at Bartlett (Yamasaki and Leak 2006). 25-year results found that one-third of the oldest, dense hardwood (beech, yellow birch, sugar maple, and white ash) sawtimber snags were still standing 20-25 years after death and 17 percent were still visible on the ground while the oldest, moderately dense hardwood (red maple and paper birch) sawtimber snags were all on the ground 20-25 years after death. Sawtimber and large sawtimber snags stand longer than pole-sized snags. The opportunities to maintain snags and live cavity trees across working forest landscapes utilize riparian areas, retention patches in larger clearcuts, retention groups/patches in group selection stands, and individual trees in uneven-age stands.

The collection of three University Press of New England publications (DeGraaf and Yamasaki 2001 and DeGraaf et al. 2005, 2006) as well as the latest northern hardwoods silvicultural guide (Leak et al. 2014) provide foresters and biologists with tools and information to better integrate efficient, effective forest and wildlife habitat management efforts across the New England landscape.

Lessons learned so far

- Even-aged management remains an integral tool in the management of forest habitats for a variety of birds that call New England home.
- Bird habitats are both structurally complex vertically and horizontally across forested landscapes. Forest as well as early successional birds utilize early successional habitats for both post-fledging and pre-migration activities.
- No one set of silvicultural techniques meets all species' habitat requirements in one place at the same time. We recommend using a variety of silvicultural techniques to maintain avian species diversity across forested landscapes in New England.

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Special points of interest:

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- *Annual Winter Meeting in Bangor Maine! page 12*
- *Nominate a colleague for a NESAF Award page 16*

Inside this issue:

Québec Multi-Aged Silviculture Tour – Tony D'Amato

NESAF members headed North of the border August 24-26 to spend several days on a field tour hosted by the Québec Ministry of Forests, Wildlife, and Parks (MFFP) examining different silvicultural systems for managing northern hardwood and temperate mixedwood forests in southern Québec. The tour was organized by **Patricia Raymond**, Research Forester with the MFFP, **Tony D'Amato,** Co-Chair of the Forestry Program at the University of Vermont, **Nancy Patch,** County Forester for the Vermont Department of Forests, Parks and Recreation, and **Bennet Leon**, Chair of the NESAF Silviculture Working Group. The tour included 24 foresters and other natural resource professionals from the US and 12 scientists and research staff from the Québec MFFP allowing for rich discussions over the three days regarding differences and similarities in management approach between northern hardwood and mixedwood forests on either side of the border.

There were many highlights of the multi-day meeting, and it goes without saying that the hospitality and rich exposure and discussions of forest management experienced throughout the tour left many looking forward to the next opportunity to visit the great work being accomplished by Québec MFFP on northern hardwood and mixedwood silviculture. The proceedings for the field tour can be downloaded from the welcome page on the NESAF website for those of you that missed the tour, but are interested in the great work happening in this region.

Forest Wildlife Research in New England

News Quarterly Science Theme– Dr. Anthony D'Amato, Theme Editor

The forests of New England are valued for many reasons with wildlife habitat often one of the first things on a landowner's list. We are fortunate to work in a region where a large body of long-term research and practical experience on forest wildlife habitat relationships exists to guide management designed to meet wildlife-related objectives.

This theme highlights the body of work that has been conducted examining the impacts of different silvicultural systems on forest birds by the USDA Forest Service Northern Research Station at the Bartlett Experimental Forest, NH and the growing body of knowledge being generated by scientists at the University of New Hampshire on the factors affecting moose population dynamics in northern New England.