

CONFIRMATION OF SUCCESSFUL CHESTNUT-SIDED WARBLER BREEDING IN SOUTH-CENTRAL INDIANA

Patrick J. Ruhl¹ and **John B. Dunning Jr.:** Department of Forestry and Natural Resources, Purdue University, West Lafayette, IN 47907 USA

Jeffrey K. Riegel: 437 Erie Church Road, Bedford, IN 47421 USA

ABSTRACT. Reported here is the first documented successful chestnut-sided warbler (*Setophaga pensylvanica*) breeding attempt in south-central Indiana in 20 years. Although small breeding populations have historically utilized available habitat in the southern half of the state, Indiana birders have only recorded 22 chestnut-sided warbler sightings in this region during the breeding season (June–July) over the last 35 years. Constant-effort mist-netting was used to monitor six, 7-year-old clearcuts in the Morgan Monroe and Yellowwood State Forests (Morgan and Brown counties, IN) during the summer of 2015. Over the course of the breeding season, 16 chestnut-sided warblers: seven males, five females (four with a brood patch indicating breeding attempts), and four hatch-year birds (indicating successful breeding) were banded. In addition to one other report of confirmed breeding in northern Indiana (Miami County), this is the only confirmed chestnut-sided warbler breeding population in the state within the last decade. Breeding of chestnut-sided warblers in 2015 demonstrates the value of maintaining some early successional habitat in southern Indiana landscapes.

Keywords: banding, breeding, chestnut-sided warbler, early successional, Indiana, *Setophaga pensylvanica*

INTRODUCTION

Chestnut-sided warblers (*Setophaga pensylvanica*) breed in early successional deciduous forests in the northeastern United States (Byers et al. 2013). Thus, they respond positively to the creation of early successional habitat by modern silvicultural management and timber harvesting. Regenerating clearcuts (timber harvests ≥ 4 ha) serve as ideal pockets of habitat for the species, which uses the dense tangle of regrowth to hide open-cup nests from predators and to feed by gleaning small invertebrates from the underside of leaves (Greenberg 1983; Whitehead et al. 1995; Byers et al. 2013).

Although birds are sometimes reported during the summer months, all but the northernmost tier of Indiana counties fall outside of chestnut-sided warbler breeding range (Mumford & Keller 1984; Castrale et al. 1998). However, this does not necessarily mean chestnut-sided warblers have never bred within the state. In fact, the species was an uncommon but regular breeder in south-central Indiana during the late 1980s and early 1990s (Whitehead et al. 1995), and although they have not been detected within the region in

the last 20 years, the historical breeding presence is still represented on the Birds of North America range map (Byers et al. 2013). Over the last 20 years, Indiana birders have reported an average of 14.8 birds/year during the breeding season (Ken Brock, pers. comm.). Of these reports, the majority are concentrated in the northern tier of counties, with only 22 reported June–July sightings in the southern half of the state in the past 35 years (Ken Brock, pers. comm.).

From 1985–1990 there were four confirmed chestnut-sided warbler breeding attempts in Indiana: three in northern counties (LaPorte, St. Joseph, LaGrange), and one in a south-central county (Brown) (Castrale et al. 1998). However, the most recent Breeding Bird Atlas (2005–2011) shows a decline in statewide breeding attempts, reporting only one confirmed successful breeding attempt in a northern county (Miami) and none in the south-central or southern regions (U.S. Geological Survey 2015). Historically, there have been reports of extra-limital breeding in south-central Indiana (Whitehead et al. 1995), but due to inadequate habitat renewal in the region (e.g., logging suppression and fire suppression), known breeding populations have gone undetected in this part of the state for the past 20 years (Forest Inventory 2015).

¹ Corresponding author: Patrick J. Ruhl, pruhl@purdue.edu.

Historically, logging has been strongly correlated with chestnut-sided warbler range expansion and breeding success. Prior to the Industrial Revolution and an increased national demand for timber, chestnut-sided warblers were a rare bird in the eastern United States (Askins 2002; Byers et al. 2013). Due to the low occurrence of naturally occurring early successional habitat creation, chestnut-sided warbler habitat, and thus population expansion, was limited. However, since the 1800s, chestnut-sided warbler populations have expanded in response to the increased provision of essential breeding habitat via forest logging (Askins 2002; Byers et al. 2013). Now a widespread spring (and fall) migrant across most of the eastern United States, chestnut-sided warblers can effectively find and colonize the ephemeral pockets of early successional habitat resulting from recently logged sites.

In Indiana, there was a noticeable peak in timber harvest (i.e., early successional habitat creation) in the late 1980s, corresponding with subsequent peaks in chestnut-sided warbler breeding activity within the state (Whitehead et al. 1995; Castrale et al. 1998; Forest Inventory 2015). However, a lull in logging activity in the 1990s and 2000s has limited the availability of adequate chestnut-sided warbler breeding habitat over the last twenty years. In this study, we documented successful chestnut-sided warbler breeding attempts in south-central Indiana clearcut sites that were harvested in 2008. This study highlights the potential conservation benefits of active management for early successional species in Indiana.

METHODS

During the summer of 2015, territoriality and productivity of breeding birds was monitored in six south-central Indiana clearcuts. These clearcuts, approximately 4 ha in size, were harvested in 2008–2009 as part of the ongoing Hardwood Ecosystem Experiment (HEE), a long-term, landscape-level study monitoring the social and ecological impacts of forest management within the Morgan-Monroe and Yellowwood state forests (MMYSF) in southern Indiana (Kalb & Mycroft 2013). The HEE was initiated in 2006 by the Indiana Department of Natural Resources, Division of Forestry, as a multidisciplinary 100 year collaborative study between scientists at Purdue University and other regional universities. Location maps of HEE clearcut sites (even-aged

management treatments) are available in the Northern Forest Experiment Station General Technical Report (Kalb & Mycroft 2013). Harvested seven years ago, clearcuts now consist of a densely vegetated understory and a developing sapling overstory, ideal for chestnut-sided warblers (Byers et al. 2013). In addition, these sites represent some of the only appropriate chestnut-sided warbler habitat created in the region in the last two decades (Forest Inventory 2015).

Constant-effort mist-netting, following the Monitoring Avian Productivity and Survivorship (MAPS) protocol (DeSante et al. 2000), was used to monitor breeding activity in harvest-created gaps from May–August 2015. We banded all birds with a federal leg band, and recorded wing-chord length, tail length, culmen length, mass, presence of migratory fat, age, sex, and breeding status (presence of cloacal protuberance in males or brood patch in females). All birds were captured and handled in accordance with Federal Banding Permit #21781 and Purdue Animal Care and Use Committee guidelines (protocol # 110000078C002).

In clearcut sites, five 1.5 m wide net lanes were cleared, just large enough for 12 m long, 30 mm mesh, four-tier, black, tethered, nylon mist-nets. Nets were not positioned in a standardized grid, but rather in an attempt to maximize productivity and efficiency (DeSante et al. 2000). All nets were at least 50 m apart, as well as ≥ 25 m into the study site from the clearcut edge. This spacing allowed for adequate sampling of the clearcut habitat and efficient net checks to minimize injury and mortality. Nets were operated at each site for one day (6 net-hours) during each of nine consecutive 10-day sampling periods. Taking into account daily variation in net-hours caused by extenuating circumstances (e.g., weather conditions), nets were opened for a total of 1,562 net hours during the 2015 summer banding season.

In addition to banding data collected in summer 2015, 15 point counts were performed in and around the clearcuts between 20 May and 20 June, 2006–2015 (with the exception of 2013 when no point counts were done). During these point counts, observations on chestnut-sided warbler behavior and territorial defense were recorded. Point counts consisted of an unlimited-radius ten-minute count where all detected birds were recorded. Each point was surveyed twice during the 30-day period with a minimum of 7 days between repeated counts at any given

point. Items recorded included the time of first detection (for each individual), species, detection method (song, call, sight, etc.), sex (if possible), and approximate distance of bird from observer (10 m increments). Beginning in 2010 (two years post-harvest), it was also noted whether birds were in a harvest area, on the edge of a harvest area, or in the forest matrix. In 2015, digital recordings were taken at each point count.

RESULTS

During the 2015 banding season, 16 chestnut-sided warblers were caught at two of the six clearcuts, which we labeled the Northern and Southern sites. These two clearcuts (~ 0.5 km apart) were located in Yellowwood State Forest, Brown County, Indiana. Although these clearcuts were approximately the same size, age, and location, and the habitat differences between the two were indistinguishable, all but one individual was banded in the Southern site. Correspondingly, breeding activity was only observed in the Southern clearcut.

Observations.—Prior to the 2015 breeding season, 15 chestnut-sided warblers were detected in HEE point counts over a nine-year period. Of these 15 detections, nine chestnut-sided warblers (most likely migrants) were detected in May, during the first three days of the survey period (three, two, and four birds were detected in 2006, 2007, and 2014 respectively). However, in 2010, 2011, and 2014, six birds were detected during the month of June (two, three, and one bird(s) in 2010, 2011, and 2014 respectively). These June detections could be indicative of breeding attempts, although breeding success was unconfirmed.

Beginning in May 2015, potential breeding activity was observed in the Southern site. We observed males singing from exposed snags from 15 May–1 July (indicative of breeding territory establishment and defense). On 17 May, we observed a male chestnut-sided warbler defend its territory from a male prairie warbler (*Setophaga discolor*), and on 2 June during a point count we observed agonistic behavior between an unbanded male chestnut-sided warbler and a banded chestnut-sided warbler (sex unknown).

All seven banded males had an enlarged cloacal protuberance (indicative of active breeding status). Throughout the study, four females developed brood patches (indicative of breeding

attempts). The first was banded on 3 June, the next two were banded on 11 June, and the final female with a brood patch (caught in the same net as a hatch-year bird) was banded on 1 July (see cover photo of this issue [124(1)]).

On 21 June, successful breeding of chestnut-sided warblers was confirmed in the Southern clearcut by netting and banding a fledgling. The tail length, degree of feather molt, presence of yellow lining around gape, and limited flight capacity all indicate that the bird was recently fledged from a nearby nest. The fledgling was released back at the net where it was caught, because it was most likely still dependent on parental care. All together, four hatch-year chestnut-sided warblers were banded during the 2015 breeding season (months of June and July). Hatch-year birds were banded on 21 June, 1 July, 24 July, and 31 July.

DISCUSSION

Prior to this study, the most recent breeding confirmation of chestnut-sided warblers in south-central Indiana was documented by Whitehead et al. (1995). This south-central region (including Brown, Jackson, and Lawrence counties, Indiana) has historically been known as an extra-limital breeding pocket outside of the main chestnut-sided warbler breeding range (Whitehead et al. 1995; Byers et al. 2013). This study confirms continued breeding in this region following a 20 year period in which chestnut-sided warbler breeding presence went unnoticed.

In this study, chestnut-sided warbler breeding success was documented in one of two clearcut sites in the Yellowwood State Forest. Both clearcuts were harvested at the same time, and no discernible difference in vegetation was observed between Northern and Southern sites that would explain the discrepancy in breeding preference. In contrast, Whitehead et al. (1995) observed chestnut-sided warblers in nearly every clearcut in the Yellowwood sites (Donald R. Whitehead, pers. comm.). One potential reason for the perceived differences in site use between our study and Whitehead et al. (1995) could be the size of the harvest openings. In our study, clearcuts were approximately 4 ha (Kalb & Mycroft 2013). Upon further review, it appears that the Yellowwood clearcuts described in Whitehead et al. (1995) might be better described as a series of small patch cuts (0.3–1.5 ha) in close proximity to one another (Michael Spalding, pers.

comm.). However, while increasing forest opening size within a forest-dominated matrix is positively correlated with breeding bird species richness (Taylor & Taylor 1979; Costello et al. 2000), chestnut-sided warblers are known to colonize both small selection cuts as well as larger clearcut stands (Costello et al. 2000; Tozer et al. 2010). Thus, the difference in clearcut size between the present study and Whitehead et al. (1995) may not explain the discrepancy in site use.

In the present study there was a 7-year time lag between habitat creation and confirmation of chestnut-sided warbler breeding. This is three years longer than the lag previously reported for chestnut-sided warblers in south-central Indiana (Whitehead et al. 1995), and five years longer than the minimum colonization period reported in DeGraff & Yamasaki (2003). Although the summer of 2015 was the first season mist-netting was used to confirm chestnut-sided warbler breeding in clearcuts, point count data were collected at these sites during the previous nine summers (including two years of pre-harvest data collection). Two and three chestnut-sided warblers were detected during point counts in June 2010 and 2011, respectively. Thus, it is a distinct possibility that breeding chestnut-sided warblers, present in low numbers, could have colonized HEE clearcuts two and three years post-harvest. However, based on the available data, 2015 is the first summer in which chestnut-sided warbler breeding was confirmed in HEE clearcuts.

Early successional habitat management within a forest-dominated matrix can benefit a wide variety of birds (Pagan et al. 2000; DeGraff & Yamasaki 2003; Porneluzi et al. 2014). Many avian species require early successional habitat for several components of their life history (e.g., yellow-breasted chat [*Icteria virens*], prairie warbler, and northern bobwhite [*Colinus virginianus*]). In addition, several birds that require mature forest habitat for breeding (e.g., scarlet tanager [*Piranga olivacea*], ovenbird [*Seiurus aurocapilla*], wood thrush [*Hylocichla mustelina*], and worm-eating warbler [*Helmitheros vermivorum*]), depend on the availability of nearby early successional habitat during the post-fledging period (Pagen et al. 2000; Vitz & Rodewald 2006; Streby et al. 2011). In Indiana, ruffed grouse (*Bonasa umbellus*; another species that occupies early successional habitat) populations have been in decline for the past 25 years (Backs & Castrale 2014). In fact, the 2015

ruffed grouse hunting season was suspended in Indiana due to statewide declines.

Given the ephemeral nature of early successional habitat, continuous regeneration is needed within the landscape to maintain adequate availability of suitable breeding habitat (DeGraff & Yamasaki 2003). The present study documented breeding seven years post-harvest, but in light of existing data on habitat viability, management plans have been developed that recommend new patch generation every 10–15 years (DeGraff & Yamasaki 2003). Although active forest management (i.e., timber harvesting) is sometimes opposed by the general public, clearcutting can be one of the most effective methods of early successional habitat creation (Askins 2002). Based on this study and others (Askins 2002; DeGraff & Yamasaki 2003), we suggest implementation of regular timber harvest rotation in Indiana to maximize benefits to early successional species while maintaining mature forest structure and species composition.

In summary, chestnut-sided warbler breeding success in HEE clearcuts illustrates one potential ecological benefit of active forest management in the state of Indiana. The benefits of early successional habitat management, however, extend beyond providing breeding habitat for chestnut-sided warblers. Forest openings (e.g., clearcuts) create breeding habitat for many early successional specialists as well as mature forest species (Askins 2002; Pagen et al. 2000; Byers et al. 2013). A balance of both early successional and mature forest habitat conservation is essential for maximizing species richness and biodiversity within the state.

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