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Do Female Prothonotary Warblers Exhibit Site Fidelity after a Major Flood?

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ABSTRACT

In 2007, a 20-year flood event in south-central Oklahoma provided an opportunity to study the impact of a major flood on Prothonotary Warbler (Protonotaria citrea) *site fidelity and nest success in 2008. We re-established a network of nest boxes to recapture previously banded female Prothonotary Warblers to determine if site fidelity or dispersal occurred one year post-flood. Seven banded female Prothonotary Warblers returned to the study area for an annual recapture rate of 8%. The 2008 recapture rate was approximately 30 - 50% lower than 2004 (48%), 2005 (58%), and 2006 (41%). Recaptured females avoided nest sites submerged during the 2007 flood by dispersing an average distance of 697 m (range = 99 - 2773 m, n = 7) in 2008. Recaptured females exhibited nest success comparable to previous years. Prothonotary Warblers demonstrated a negative post-flood response; however, some females did return to the study area and nest successfully.*

INTRODUCTION

Prothonotary Warblers *(Protonotaria citrea)* are Nearctic-Neotropical migrants that inhabit bottomland hardwood forest, riparian forest, and other wetland habitats (Walkinshaw 1941, Flaspohler 1996, Petit 1999). Prothonotary Warblers choose nest sites in bottomland hardwood and riparian forests that are prone to long-term shallow inundation, but occasionally major flooding events occur (Blem and Blem1991). There is a paucity of data regarding how Prothonotary Warblers respond to a major flood event the following year. As part of broader research on Prothonotary Warbler site fidelity and nest success (Wood 2004, Wood and Reasor 2006), we had the opportunity to study the impact of a major flood event on Prothonotary Warblers in south-central Oklahoma (Diggs 2009). Our primary research objective was to determine whether female Prothonotary Warblers demonstrated site fidelity or dispersal after a major flood event. We also examined inter-seasonal movements of recaptured female Prothonotary Warblers and documented their post-flood nest success.

METHODS

Study Area. The Tishomingo National Wildlife Refuge (TNWR) is 6700 ha of primarily bottomland hardwood and upland hardwood forests in south-central Oklahoma (about 34° 11' N, 96°38' W). Within TNWR, Prothonotary Warbler habitat surrounds the Cumberland Pool, which is an 1821-ha flood control area (Chappell and Fisher 2005). From 5 May to July 2007, total precipitation of 96 cm raised the Cumberland Pool water level from a starting elevation of 188 m to 195 m. The 7 m of floodwaters inundated our arrays of Prothonotary Warbler nest boxes and no nest was successful in 2007 (Diggs and Wood 2009). No female Prothonotary Warblers were banded or recaptured in 2007 due to logistical constraints caused by flooding. All nest boxes were submerged for the duration of the nesting season.

Nest Box Placement. From 2003 to 2007, 40 nest boxes had been placed around the Cumberland Pool and monitored for nest success and site fidelity (Wood and Reasor 2006). In 2008, we re-established the 40 nest boxes in areas that had been inundated by the flood to determine if female Prothonotary Warblers demonstrated site fidelity. In some cases, nest boxes could not be replaced in the same locations as in previous years due to large

piles of woody debris left by the flood. In these cases, nest boxes were placed as close to the original locations as possible. We also added 37 new nest boxes in similar habitat not included in the 2003 - 2006 study area to detect whether female Prothonotary Warbler post-flood dispersal occurred.

Nest Box Checks. Starting 1 Apr 2008, nest box checks were conducted every 3 - 7 d to determine nesting activity (Martin and Geupel 1993). When egg laying began, we checked the box every 1 - 3 d until clutch completion and recorded clutch size. Ten days after the final egg was laid, the box was checked daily to determine the number of eggs hatched. Boxes were checked every 1 - 3 d until fledging 11 days post-hatching. We report mean ± standard deviation for nest success parameters.

Banding. Adult females were target captured from nest boxes while incubating (Wood and Reasor 2006). We captured 41 of 44 possible females during incubation for a successful capture rate of 93% (Diggs 2009). We recorded band numbers of recaptured female Prothonotary Warblers to determine site fidelity or if dispersal occurred. A recapture was defined as a female that was banded at the study site in any previous year. We georeferenced nest box locations with a Garmin etrex GPS unit. We used ArcMap Version 9.3 (ESRI, Redlands, CA) to map female Prothonotary Warbler inter-seasonal movement patterns.

RESULTS

In 2008, we recaptured seven female Prothonotary Warblers of the 84 adult females originally banded at TNWR from 2003 to 2006 for an 8% annual recapture rate. No recaptured female returned to the same nest box used during pre-flood years. The average distance recaptured females moved between nest boxes inter-seasonally between pre- and post-flood years was 697 m (range = 99 - 2773 m, $n = 7$). Four of the recaptured females nested in newly located nest boxes, whereas the remaining three used nest boxes within the 2003 - 2007 study area. Six of seven recaptured females had successful first nests and averaged 4.1 ± 2.0 young fledged; however, the other recaptured female lost her nestlings due to early seasonal flooding. Three recaptured females made second nest attempts in the same nest box as their first nest attempt in 2008. Two of the females successfully fledged four young each; however, the third female lost her clutch to raccoon *(Procyon lotor)* predation. The other four females either did not re-nest or dispersed away from our study area.

In 2008, two of the recaptured females demonstrated population recruitment after the 2007 flood. One female was originally banded as a nestling in 2005 at TNWR, but was not recaptured in 2006 or 2007. She was recaptured in 2008 and fledged five young from one nest attempt. The other female was originally banded as a nestling in 2004 at TNWR and was recaptured in 2005 and 2006, but not in 2007. In 2008, she fledged a total of nine young from two different nest attempts.

DISCUSSION

Recapture Rate. Seven female Prothonotary Warblers returned to the study area for an annual recapture rate of 8% based on the total number of female Prothonotary Warblers banded from 2003 - 2006. The 2008 recapture rate was approximately 30 - 50% lower than adult female Prothonotary Warbler cumulative recapture rates from 2004 (48%), 2005 (58%), and 2006 (41%). Due to the lack of banding in 2007, we also compared the 2008 recapture rate to annual recapture rates for adult female Prothonotary Warblers from 2003 - 2004 [55%], 2004 - 2005 [47%], 2005 - 2006 [44%] and 2006 - 2008 [26%], where we treated the number of adult females as zero in the previous year. This demonstrated a 53% drop in recapture rate for adult females when we took into account the lack of new females banded in 2007. This reflected a strong aversion response to the 2007 flood. We speculate the lower recapture rate was due to post-flood dispersal and avoidance of areas flooded in 2007. Other banded Prothonotary Warblers may have returned to the general area, but were not captured because they nested outside the study area. We

acknowledge that the lack of banding in 2007 due to the flood could also result in a lower recapture rate in 2008 (Diggs 2009).

Inter-seasonal Movement Patterns. Floodwaters in 2007 inundated previous Prothonotary Warbler nest box arrays at TNWR. In 2008, some females returned to their pre-flood sites, but not as precisely as in previous years. From 2003 to 2006, female Prothonotary Warblers moved an average of 300 m between seasons (Wood and Reasor 2006), which is greater than the 203 m distance moved by Prothonotary Warblers in Tennessee (Petit 1999). Post-flood, seven female Prothonotary Warblers moved an average of 697 m (range 99 - 2773 m) at TNWR to nest post-flood. This distance was two times greater between pre- and post-flood years, which indicated an aversion response by female Prothonotary Warblers to areas flooded in 2007. This result indicated that some females returned relatively close to pre-flood nest sites; however, other females dispersed far from previous years' nest sites. The longest inter-seasonal move at TNWR pre-flood was 1000 m (Wood and Reasor 2006). In 2008, one female dispersed 2773 m from her pre-flood nest site, which indicated a strong negative post-flood response by this female. We acknowledge that the addition of nest boxes to surrounding areas increased our ability to detect greater inter-seasonal movements; however, some females remained in the vicinity of the original nest box arrays while others dispersed.

Nest Box Fidelity. In 2008, no female Prothonotary Warblers re-nested in the same nest box as previous years; whereas from 2003 to 2006, 35% of female Prothonotary Warblers returned to the same nest box between years (Wood and Reasor 2006). Because no female Prothonotary Warblers returned to the same nest box in 2008 at TNWR, this showed a negative post-flood response by Prothonotary Warblers. The flood deposited large amounts of woody debris around nest boxes, which may have caused female warblers to avoid those sites.

Nest Success and Population Recruitment. Recaptured female Prothonotary Warblers demonstrated high nest attempt rates and fledged approximately four young per nest attempt. Although the 2007 flood altered Prothonotary Warbler nesting habitat, recaptured females had comparable nest success to previous years at TNWR (Wood and Reasor 2006). Two recaptured female Prothonotary Warblers demonstrated population recruitment post-flood including one female who had not been recaptured since her original banding as a nestling 2005. Prothonotary Warblers may have avoided areas affected by the flood, but some females still returned and nested successfully.

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News, Notes, Comments

History of Hummingbird Banding in the United States

ABSTRACT

Personal account and recollection of hummingbird banding and research over the past 30 years. The author's involvement in the development of hummingbird bands, tools, traps, and the establishment of Hummingbird Research Group is discussed.

INTRODUCTION

Protocols for banding hummingbirds are unique. Hummingbird banders must obtain a special permit, cut and shape individual bands from printed sheets, and construct their own traps. A perceived problem with hummingbird bands led me to establish a newsletter, *Hummingbird Hotline*, where banders could collaborate to resolve specific issues and share research. This effort at communication among hummingbird banders transformed a few independent researchers in the early 1980s into the cohesive Hummingbird Research Group that exists today.

BACKGROUND

The earliest located account of hummingbird banding is that of Walter Deane, Shelburne, Coos County, NH (Deane 1925). On 1 Aug 1923, Deane trimmed the smallest sized band and thought it still too large when placed on a female Ruby-throated Hummingbird (*Archilochus colubris*) hand-captured in a neighbor's shed. Deane banded two more female hummingbirds on 19 and 31 Aug 1923. In 1925, he banded a female on 10 Jul and a male on 21 Jul.

Eleanor S. Morgan, Asticou, Northeast Harbor, ME, also used a cut-down band on a Ruby-throated Hummingbird hand-captured at her home on 3 Aug 1924 (Morgan 1925). Morgan banded six more hummingbirds in 1924 and four in 1925.

Hummingbird recapture data from the US Bird Banding Laboratory (BBL) reveals two early same-site encounters: O. L. Austin, Sr., banded a Ruby-throated Hummingbird on 24 May 1932 in Massachusetts, which he recaptured exactly one year later, and Mrs. A. McAlister banded a Ruby-throated Hummingbird on 13 Jun 1938 in New Hampshire, which she recaptured on 22 May 1939.