
Stopover Site Fidelity of Nearctic-Neotropical Migrants to a High-elevation Banding Station Evidenced Through Bird Banding

Craig Marshall*

Department of Wildlife, Fisheries & Aquaculture
P.O. Box 9690

Mississippi State University
Mississippi State, MS 39762

*Corresponding Author:

email: cmarshall.wildlife@outlook.com

David Vogt

5319 Mountain Creek Road

Chattanooga, TN 37415

email: dvogt41@gmail.com

Scott Somershoe

U.S. Fish and Wildlife Service

Division of Migratory Birds, Region 6

P.O. Box 25486

Denver Federal Center

Denver, CO 80225

email: Scott_Somershoe@fws.gov

ABSTRACT

*We examined stopover site fidelity exhibited by Tennessee Warblers (*Oreothlypis peregrina*) and Cape May Warblers (*Setophaga tigrina*) to a high-elevation banding site in the southern Appalachian Mountains. From 1999 - 2014, 6,175 Tennessee Warblers and 198 Cape May Warblers were captured and banded at Whigg Meadow banding station (Monroe County, Tennessee), with 16 Tennessee Warblers and one Cape May Warbler recaptured in subsequent years. The inter-annual recapture, or the recapture of birds banded in prior years, of 16 Tennessee Warblers documents the highest known incidence of fidelity to a single stopover site in a Nearctic-Neotropical migrant passerine species. These results indicate that fidelity to stopover sites by long-distance migrant passerine species occurs, but may be limited to a specific suite of species. We encourage continued reporting of inter-annual site faithful passerines and research regarding stopover site fidelity and the ecology of stopover sites in order to aid in the conservation efforts of long-distance migrant passerines.*

Eric Soehren

Alabama Department of Conservation
& Natural Resources

Wehle Land Conservation Center

4819 Pleasant Hill Road

Midway, AL 36053

email: Eric.Soehren@dcnr.alabama.gov

Scott Rush

Department of Wildlife, Fisheries & Aquaculture

P.O. Box 9690

Mississippi State University

Mississippi State, MS 39762

email: scott.rush@msstate.edu

INTRODUCTION

Fidelity to breeding and overwintering sites has been well documented in many different species of migrant birds (e.g., Greenwood and Harvey 1982, Latta and Faaborg 2001). Fidelity confers specific advantages to the individual, such as previous knowledge of foraging locations, potential nest sites, and predators (Greenwood and Harvey 1982, Latta and Faaborg 2001, Catry et al. 2004, Mehlman et al. 2005). The same selective pressures acting on fidelity to breeding and overwintering sites could result in fidelity to stopover sites along migration routes (Cantos and Telleria 1994, Catry et al. 2004). Stopover site fidelity, as defined by Nesbit (1969), is the return of an individual to a location that is >100 mi (161 km) from breeding and overwintering areas.

Fidelity to stopover sites has been well documented in some migrant birds, such as waterfowl and shorebirds, but only rarely in others, suggesting behavior varies among taxonomic groups (Nisbet 1969, Harrington et al. 1988, Skagen and Knopf 1994, Robertson and Cooke 1999, Fox et al. 2002,

Vogt et al. 2012). Low incidence of fidelity to stopover sites in migrant passerines has been attributed to their ability to use a variety of habitats and still obtain resources needed for migration (Cantos and Telleria 1994, Catry et al. 2004, Somershoe et al. 2009). Also, migrant passerines are highly sensitive to weather conditions; inclement weather (e.g., high winds) along a migration route may dictate use of novel stopover sites rather than habitual use of known, favorable locations (Catry et al. 2004).

Despite assumed limitations to stopover site fidelity by long-distance migrant passerines, we continue to see evidence of this behavior (Nisbet 1969, Winker et al. 1991, Cantos and Telleria 1994, Somershoe et al. 2009, Vogt et al. 2012). Species that establish territories along their migration route, such as the Northern Waterthrush (*Parkesia noveboracensis*), benefit from fidelity to stopover sites as it allows for the location and defense of key resources needed for migration (Rappole and Warner 1976, Somershoe et al. 2009). Stopover site fidelity may also benefit those species that follow narrow migratory pathways and are limited in the availability of adequate stopover sites that support migratory needs.

The inter-annual recapture of 14 Tennessee Warblers (*Oreothlypis peregrina*) at Whigg Meadow, a high-elevation bald in Tennessee, suggests some long-distance migrant passerines are intrinsically tied to specific locations along migratory routes, as noted with waterfowl, shorebirds, and species that maintain territories along migration routes (e.g., Northern Waterthrush; Rappole and Warner 1976, Somershoe et al. 2009, Vogt et al. 2012). The high incidence of inter-annual recapture of Tennessee Warblers at Whigg Meadow also suggests that Tennessee Warblers follow a narrow migratory pathway through the southern Appalachian Mountains (Rush et al. 2014).

The purpose of this paper is to expand upon work conducted by Vogt et al. (2012), who documented the highest incidence of stopover site fidelity in a Nearctic-Neotropical migratory passerine to a

migratory stopover site. We also hope to shed light on the importance of stopover sites, such as Whigg Meadow, while addressing the lack of research regarding the role and impact of stopover sites on migrant passerines.

METHODS

Study Site. Migrating passerines were captured at Whigg Meadow Banding Station (bald) in Monroe County, Tennessee (35° 18.6' N, 84° 02.1' W, elevation: 1490 m) within the Tellico Ranger District of Cherokee National Forest (Fig. 1). The habitat of Whigg Meadow is comprised of a forest-grassland ecotone that transitions between an open grassland (an approximate 3-ha high-elevation banding site) and northern hardwood forest. The high-elevation herbaceous bald is surrounded by a shrub-dominated plant assemblage with dense thickets of smooth blackberry (*Rubus canadensis*) and highbush blackberry (*Vaccinium corymbosum*) encroaching upon the open herbaceous area. The forest north of the bald consists of second growth or stunted American beech (*Fagus grandifolia*) and yellow birch (*Betula alleghaniensis*), with the forest south of the bald being dominated by sugar maple (*Acer saccharum*), northern red oak (*Quercus rubra*), and cockspur hawthorn (*Crataegus crus-galli*).

Using mist nets, migrating birds were captured and banded following the guidelines of Ralph et al. (1993) from late August through early October 1999 - 2014. Nine 12-m mist nets were used from 1999 - 2013 with an additional five nets being used in 2014 for a total of 14 nets. The placement of the five additional nets created a continuous extension of the original nine. Nets were placed along the bald margin, covering only a small percentage of the bald. Mist nets were open from sunrise until early afternoon (approximately eight hours). Nets were not operated during inclement weather (e.g., rain or high winds) and conditional to adequate technical support. Given varied schedules, annual effort varied from 523 total net-hours to 2739 net-hours. All captured birds were measured, aged, sexed following Pyle (1997), and banded with USGS aluminum bands.

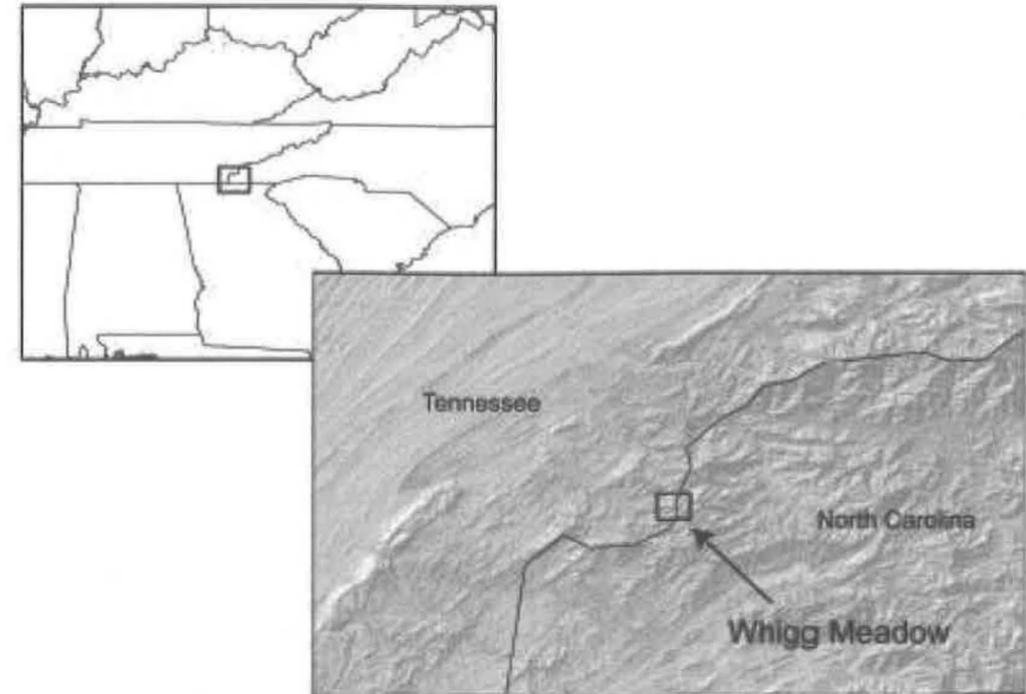


Figure 1. Whigg Meadow, a high-elevation banding station, located along the southern Appalachian mountains in eastern Tennessee.

RESULTS

From 1999 - 2014 there were 6,175 Tennessee Warblers and 198 Cape May Warblers (*Setophaga tigrina*) captured and banded at Whigg Meadow. As reported in Vogt et al. (2012), from 1999 - 2008, 4,324 Tennessee Warblers were captured and banded at Whigg Meadow. Fourteen of these banded Tennessee Warblers were recaptured at the Whigg Meadow site during a year subsequent to their initial capture. These inter-annual recaptures of Tennessee Warblers comprise the highest incidence of inter-annual recapture of a Nearctic-Neotropical long-distance migrant at any one location. Expanding on the work conducted by Vogt et al. (2012), 257 Tennessee Warblers and six Cape May Warblers were captured and banded during 2014. From all the individuals captured in 2014, two Tennessee Warblers and one Cape May Warbler were inter-annual recaptures. The recaptured Cape May Warbler is the first documented inter-annual recapture of this species at Whigg Meadow. The ages of all inter-annual recaptures (Tennessee and Cape May warblers), including

those from Vogt et al. (2012), ranged from hatch year (SY) to after third year (ATY). There were no inter-annual recaptures of Tennessee Warblers or Cape May Warblers from 2009 - 2013.

DISCUSSION

The propensity for long-distance migrant passerines to exhibit fidelity to stopover sites is rare due to the physical and environmental factors thought to limit this behavior (Catry et al. 2004). Although viewed as uncommon, unparalleled evidence of site fidelity to migratory stopover sites has been documented with the inter-annual recapture of 16 Tennessee Warblers and one Cape May Warbler at Whigg Meadow, a high-elevation bald in the southern Appalachian Mountains. This study supports the view that a limited number of long-distance migrant passerine species exhibit fidelity to stopover sites, while also highlighting the importance of inland migratory stopover sites. Although high elevation balds are regularly used by migrating passerines, they have received minimal attention (Vogt et al. 2012, Rush et al. 2014). Research addressing the role of high-elevation

balds and adjacent early successional/scrub habitat in supporting migrating passerines and other avian taxa, is needed.

The inter-annual recapture of 16 Tennessee Warblers and one Cape May Warbler at Whigg Meadow provides evidence that at least some long-distance migrant passerine species exhibit fidelity to stopover sites. Fidelity to stopover sites may be selected for in long-distance migrant passerines with strict habitat requirements (Cantos and Telleria 1994, Merom et al. 2000). This behavior would be akin to that of migrant waterfowl and shorebird species, which are tied to wetland and mudflat stopover sites along migratory routes.

The proportion of inter-annual recaptures from the total captured in the period 1999 - 2014 is relatively similar for both Cape May Warblers (0.505%) and Tennessee Warblers (0.259%). However, there is a drastic difference in the total number of individuals captured (198 Cape May vs. 6,175 Tennessee Warblers) at Whigg Meadow. These two species exhibit no apparent difference in habitat use and available forage requirements along their migration routes (Baltz and Latta 1998, Rimmer and McFarland 2012). Although requirements appear similar for these two species, differences in total captures bring to question potential causal mechanisms. One possible explanation is that Cape May Warblers may follow a more coastal migration route than Tennessee Warblers, thus a lower incidence of captures of Cape May Warblers at Whigg Meadow.

In 2014, four additional nets were added to the original nine used from 1999 - 2013, increasing capture rates and net hours for 2014 as compared to the previous years. However, even with the increase in capture rates and net hours, no inter-annual recaptures were caught in these nets. The added nets were placed as a continuous extension of the original nine and were in the same habitat. The lack of any inter-annual recaptures in these nets could be attributed to chance, but could also be due to differences in the habitat at a smaller scale than what was examined. Given that only a small portion

of the bald margin was sampled, we may be concluding that both Tennessee and Cape May warblers use the entire bald as a preferred stopover site when, in fact, these species may be using a smaller, more specific portion of the bald.

Migration pathways continue to be delineated with greater precision. The continued banding of migrating birds coupled with the use of emerging technologies, such as GPS tracking technology, ecological tracers, and genetic markers, will continue to refine the boundaries of these distributions, enlightening our understanding of the proximate and ultimate causes leading to migratory behavior and stopover ecology. Obtaining greater depth of understanding regarding the role and importance of stopover sites, such as Whigg Meadow, is vital in aiding conservation efforts of long-distance migrant passerines.

ACKNOWLEDGMENTS

This research was made possible through the tireless efforts of numerous volunteers, specifically J. Carter, J. Dedeker, N. Edwards, L. Lewis, M. Miller, C. Muise, J. Trent and H. Wilson. Funding and logistical support was provided by the USDA Forest Service, Cherokee National Forest, and the College of Forest Resources, Mississippi State University.

LITERATURE CITED

Baltz, M.E. and S.C. Latta. 1998. Cape May Warbler (*Setophaga tigrina*), *The birds of North America online* (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; retrieved from Birds of North America Online: <http://bna.birds.cornell.edu/bna/species/332> (accessed 7 Apr 2015).

Cantos, F.J. and J.L. Telleria. 1994. Stopover site fidelity of four migrant warblers in the Iberian Peninsula. *Journal of Avian Biology* 25:131-134.

Catry, P., A. Encarnacao, A. Araujo, P. Fearon, A. Fearon, M. Armelin and P. Delaloye. 2004. Are long-distance migrant passerines faithful to their stopover sites? *Journal of Avian Biology* 35:170-181.

Fox, A.D., J.O. Hilmarrsson, O. Einarsson, A.J. Walsh, H. Boyd and J.N. Kristiansen. 2002. Staging site fidelity of Greenland White-fronted Geese *Anser albifrons flavirostris* in Iceland. *Bird Study* 49:42-49.

Greenwood P.J. and P.H. Harvey. 1982. The natal breeding dispersal of birds. *Annual Review of Ecology and Systematics* 13:1-21.

Harrington, B.A., J.M. Hagan and L.E. Leddy. 1988. Site fidelity and survival differences between two groups of New World Red Knots (*Calidris canutus*). *Auk* 105:439-445.

Latta, S.C. and J. Faaborg. 2001. Winter site fidelity of Prairie Warblers in the Dominican Republic. *Condor* 103:455-468.

Mehlman, D.W., S.E. Mabey, D.N. Ewert, C. Duncan, B. Abel, D. Cimprich, R.D. Sutter and M. Woodrey. 2005. Conserving stopover sites for forest-dwelling migratory landbirds. *Auk* 122:1281-1290.

Merom, K., Y. Yom-Tov and R. McClery. 2000. Philopatry to stopover site and body condition of transient Reed Warblers during autumn migration through Israel. *Condor* 102:441-444.

Nisbet, I.C.T. 1969. Returns of transients: Results of an inquiry. *Eastern Bird Banding Association News* 32:269-274.

Pyle, P. 1997. *Identification guide to North American birds. Part 1*. Slate Creek Press, Bolinas, CA.

Ralph, C.J., G.R. Geupel, P. Pyle, T.E. Martin and D.F. DeSante. 1993. *Handbook of field methods for monitoring landbirds*. USDA, Forest Service, General Technical Report PSW-GTR-144. Pacific Southwest Research Station, Albany, CA.

Rappole, J.H. and D.W. Warner. 1976. Relationships between behavior, physiology and weather in avian transients at a migration stopover site. *Oecologia* 26:193-212.

Rimmer, C. C. and K. P. McFarland. 2012. Tennessee Warbler (*Oreothlypis peregrina*), *The Birds of North America Online* (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; retrieved from Birds of North America Online: <http://bna.birds.cornell.edu/bna/species/350> (accessed 7 Apr 2015).

Robertson, G.J. and F. Cooke. 1999. Winter philopatry in migratory waterfowl. *Auk* 116:20-34.

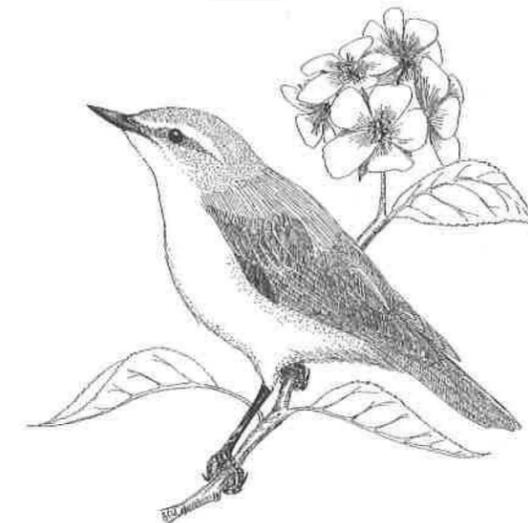
Rush, S.A., E.C. Soehren and M. Miller. 2014. Stopover duration and habitat use by Tennessee Warblers (*Oreothlypis peregrina*) at a high-elevation bald. *Southeastern Naturalist* 13:92-100.

Skagen, S.K. and F.L. Knopf. 1994. Migrating shorebirds and habitat dynamics at a prairie wetland complex. *Wilson Bulletin* 106:91-105.

Somershoe, S.G., D.G. Cohrs and D.A. Cohrs. 2009. Stopover-site fidelity at a near-coastal banding site in Georgia. *Southeastern Naturalist* 8:537-546.

Vogt, D.F., M.E. Hopey, G.R. Mayfield III, E.C. Soehren, L.M. Lewis, J.A. Trent and S.A. Rush. 2012. Stopover site fidelity by Tennessee Warblers at a southern Appalachian high-elevation site. *Wilson Journal of Ornithology* 124:366-370.

Winker, K., D.W. Warner and A.R. Weisbrod. 1991. Unprecedented stopover-site fidelity in a Tennessee Warbler. *Wilson Bulletin* 103:511-512.



Tennessee Warbler
by George West