Post-fledging survival and habitat use of Golden-cheeked Warblers on the Balcones Canyonlands Preserve, Austin, Texas

Annual Report

Submitted on December 11, 2018

Jennifer L. Reidy, *Research Specialist, Department of Fisheries and Wildlife Sciences, 302 Anheuser-Busch Natural Resources Building, University of Missouri, Columbia, MO 65211*

Frank R. Thompson, III, *Research Biologist, U.S.D.A. Forest Service Northern Research Station and Department of Fisheries and Wildlife Sciences, 202 Anheuser-Busch Natural Resources Building, University of Missouri, Columbia, MO 65211*

Lisa O'Donnell, *Senior Biologist, City of Austin, 3621 RR 620 South, Austin, TX 78738*

Background

This is the preliminary report for collection agreement #18-CO-11242311-001 between the City of Austin (COA), the U.S. Forest Service, and the University of Missouri (MU). The objectives of this report are to estimate post-fledging survival and habitat use of Golden-cheeked Warblers on Balcones Canyonlands Preserve (BCP), Austin, Texas. We monitored radio-tagged hatch-year (HY) Golden-cheeked Warblers for ~28 days to estimate survival and provide information on habitat use, movement patterns, and behavior on this understudied period.

Objective

The objective of this research is to collect data on HY Golden-cheeked Warblers to determine length of dependence on adults, dispersal distances from the natal area within the season, and potentially to gather critical data about dispersal distances and survival over multiple seasons. This is a continuation of a previous study on HY Golden-cheeked Warblers. This report summarizes activities from the first year of radio-tagging HYs on the BCP.

Methods

Study area-The BCP is a 12,294 ha discontinuous preserve located in western Travis County and includes ~11,250 ha of juniper (*Juniperus ashei*) and oak (*Quercus* spp.) woodland. The dominant canopy species are Ashe juniper (*Juniperus ashei*), Texas red oak (*Quercus buckleyi*), plateau live oak (*Q. fusiformis*), shin oak (*Q. sinuata*), and cedar elm (*Ulmus crassifolia*). We monitored Golden-cheeked Warbler fledglings on 3 study areas (Emma Long, Kent Butler, Forest Ridge), chosen for ease of access (needed for frequent monitoring) and habitat structure as well as accessibility to nests (Fig. 1). The Emma Long study area included the Emma Long (40.5 ha), Emma Long Bike Park (96 ha), and Emma long Expansion (34 ha) monitoring plots. This study area is predominately juniper and the main non-juniper tree species is live oak. The canopy is relatively uniform within monitoring plots and the understory is relatively sparse. The Kent Butler study area included the northern half of Kent Butler monitoring plot (~20 ha) and surrounding upland area (~40 ha). The study area is dominated by juniper and the understory was sparse. The Forest Ridge study area included the north half of the Forest Ridge monitoring plot (~25 ha) and adjacent area to the west (~10 ha). This study area is the most diverse, with red oaks and shin oaks replacing live oaks as the dominant oak species.

There are also other tree species and a rich understory of native shrubs. The canopy was 5-8 m for all territories where we attached bands and radios.

Marking juveniles—COA and MU staff worked collaboratively to search for and monitor nests on the three study areas during April and May 2018. We monitored nests frequently after they hatched to determine the best day to access the nest. On day 8 or 9, we removed 2 or 3 nestlings from the nest. We chose to leave 1 or 2 nestlings in the nest to minimize changes in parental behavior in case one or both adults returned to the nest while handling nestlings. We attached radio-transmitters (Blackburn Transmitters, Nacogdoches, TX, 0.4 g) to 1 nestling per nest. We also banded that individual and 1 or 2 additional nestlings in the nest with 1 USGS aluminum band and 2 or 3 colored bands. After returning all nestlings to the nest, we observed the nest from a distance to assess adult behavior. We monitored the nest daily thereafter until the nest fledged or failed. If a nest was determined to be inaccessible, we monitored it daily around the expected fledge date and hand-captured any accessible fledglings. Only one HY per nest was radio-tagged regardless of capture method (nestling or fledgling). During handling, we assessed HYs for signs of stress or weakness and released any that appeared stressed or if we were unable to attach the radio within ~3 mins. We attached radio-transmitters using the method presented in Streby et al. (2015). Handling time for banded-only HYs was typically <1 min and handling time for HYs receiving radios was <4 min.

Resighting—After fledging, we searched for radio-tagged HYs every 1 to 2 days for the first 7-10 days and then ~ twice per week through day 28. During each visit, we searched for HYs for up to 2 hours. We located HYs with a radio-transmitter by honing with a handheld receiver (model R410, ATS) and handheld antenna (3-element folding Yagi, ATS), or occasionally by searching the territory and looking for adults with food and listening for begging

calls. We also searched for banded HYs during each visit. We attempted to resight all banded HYs during each visit. During each survey, we recorded whether the HY was being fed by the male or female or independently foraging. We estimated daily and period survival (cumulative survival across the 28-day monitoring period) of radio-tagged HYs using the logistic exposure method with days since fledging as a continuous fixed effect in the model (Schaffer 2004, Jenkins et al. 2016).

Results

We banded 17 HYs from 8 nests and attached radio-transmitters to 7 HYs. Fifteen of these fledged, including 6 with radio-transmitters, and there were 2 mortalities due to nest predation. Of the 6 HYs we radio tracked, 3 were alive at 25–28 days post-fledging when we stopped tracking them and we concluded 3 died between 5 and 19 days post-fledging (Table 1). Bird WH/RD:DG/SI was observed alive on day 4 but we could not find it on day 5 and it was subsequently never resighted. The female was observed building a new nest a few days later so we concluded this was a mortality on day 5. Bird BK/SI:MV/DG was observed alive on day 3 but the radio was detected at a fixed location from day 5 on and we eventually recovered it with bird remains, so we concluded it was dead on day 5. Bird RD/BL:GR/SI was located alive on day 15 but could not be located on day 17, 18, 19, 23, or 26. Its banded sibling was observed being fed on day 19 and 23, so we concluded this HY was dead on day 19. Daily survival ranged between 0.950–0.999 for days 1–28 post-fledging and resulted in a 28-day cumulative survival of 0.472 (Fig. 2).

In addition to the 6 HYs with radio-transmitters, we resighted the 9 additional banded HYs that fledged. We resighted 8 of the 9 for at least 21 days post-fledge; the remaining HY was

only resighted once on day 10 (Table 1). We cannot conclude what happened to this last HY; however, its cohorts continued to be resighted for >2 weeks after the only resighting of this individual.

Of the 15 HYs that fledged, 5 were attended to primarily by the male and 10 were with the female. Of the 13 HYs resighted beyond day 5 post-fledge, 4 were attended to primarily by the male and 9 were with the female. However, we observed primary care shift from the female to the male for 4 HYs. This occurred between days 5-7, 9-12, 7-10, and on day 10 for these HYs. We found subsequent evidence of building new nests for all females, regardless of switching parental care. However, those that switched began nest building earlier than did females that continued caring for HYs. All HYs were still being fed by adults between days 21 and 30. We observed HYs begin capturing insect prey on day 18 post-fledge. Hatch-year birds were located 3-213 m from the nest, with a trend of being farther from the nest with increasing days post-fledge (Fig. 3). Almost all detections of both radio-tagged and banded-only HYs were within the male's territory (Fig. 1).

Discussion

We attached radio-transmitters to 7 HY Golden-cheeked Warblers. Of these, one HY was depredated in the nest around fledge day and 3 HYs were likely depredated 5–19 days post-fledge. The remaining 3 HYs were resighted through at least 3 weeks post-fledge and were moving well and beginning to forage independently, although all were still being fed by adults as well. Our observed cumulative survival is in the middle of the range reported in post-fledging studies and we also similarly observed an increase in daily survival with age (Cox et al. 2014), although the effect of age was not significant due to wide confidence intervals resulting from our

small sample size. In addition to the radio-tagged HYs, we banded 10 HYs, of which 9 were confirmed to fledge (resighted after fledge day) and 8 were resighted through at least 3 weeks post-fledge. These observations suggest survival of this group of HYs may have been greater than the radio-tagged sample but sample sizes for both groups are limited and do not permit any strong conclusions. Furthermore, our estimate of survival for the radio-tracked sample of HYs is based on assumptions about the mortality of three individuals, and in one of these cases it is possible the HY could have been alive and lost its transmitter, which would negatively bias our survival estimate. We will pursue a formal mark-resighting estimate of survival for the banded HYs in the future.

Our efforts to track HYs and definitively determine their status was hampered by transmitters with limited ranges and by limited available effort to more thoroughly search for individuals and transmitters. Transmitter signals were weak enough that we were often able to locate HYs just as easily without the telemetry equipment as with it. Future studies investigating post-fledging survival should carefully consider the limitations of transmitters available and the level of effort available for locating HYs.

References

Cox, W. A., F. R. Thompson III, A. S. Cox, and J. Faaborg 2014. Post-fledging survival in passerine birds and the value of post-fledging studies to conservation. The Journal of Wildlife Management 78:183–193.

Jenkins, J. M. A., F. R. Thompson III, J. Faaborg. 2016. Contrasting patterns of nest survival and postfledging survival in Ovenbirds and Acadian Flycatchers in Missouri forest fragments. The Condor: Ornithological Applications 118:583–596.

Shaffer, T. L. 2004. A unified approach to analyzing nest success. The Auk 121:526–540.

Streby, H. M., T. L. McAllister, G. R. Kramer, S. M. Peterson, J. A. Lehman, and D. E. Andersen. 2015. Minimizing marker mass and handling time when attaching radio transmitters and geolocators to small songbirds. Condor 117:249–255.

Figure 1. Locations of banded and radio-tagged hatch-year (HY) Golden-cheeked Warblers within Balcones Canyonlands Preserve, Austin, Texas. Red polygons are intensive monitoring plots, yellow polygons represent male territories, white stars are nest locations, and blue circles are HY locations.

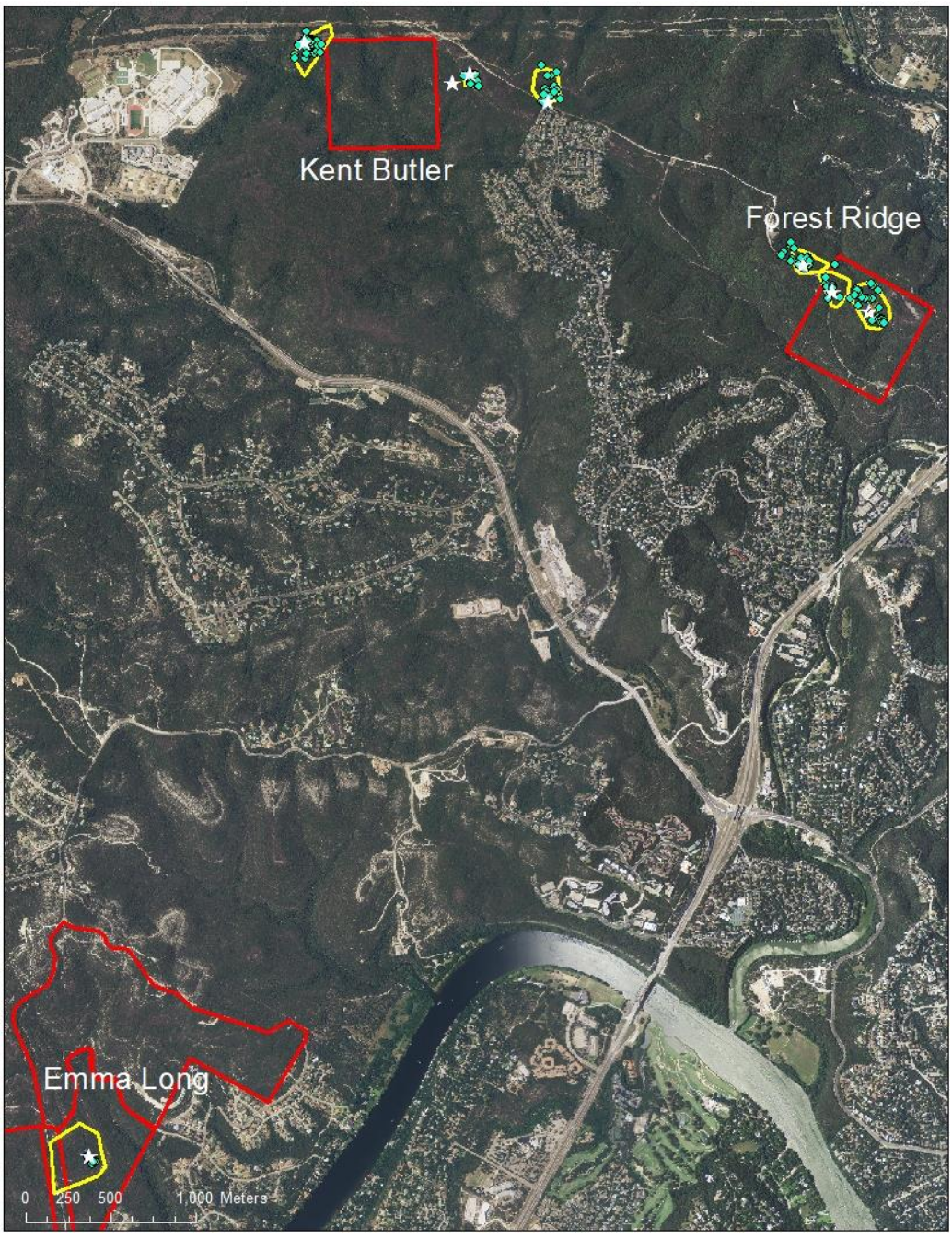

Figure 2. Period survival and 95% confidence limits based on 6 radio-tagged hatch-year (HY) Golden-cheeked Warblers from 0-28 days post-fledging on Balcones Canyonlands Preserve, Austin, Texas.

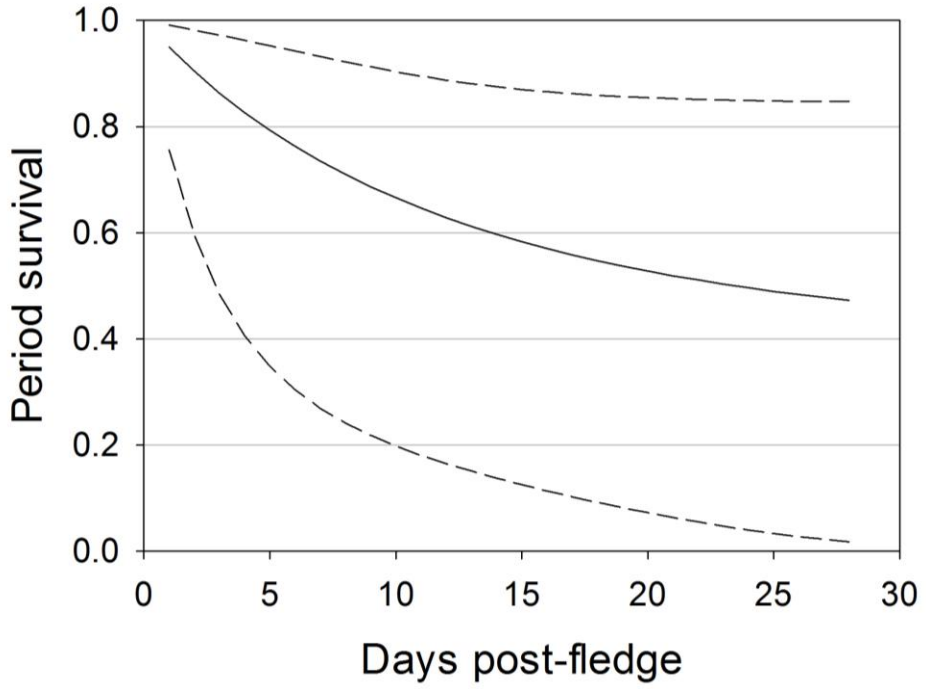

Figure 3. Distances (meters) moved by hatch-year (HY) Golden-cheeked Warblers (n=15 individuals) 0-30 days post-fledging on Balcones Canyonlands Preserve, Austin, Texas.

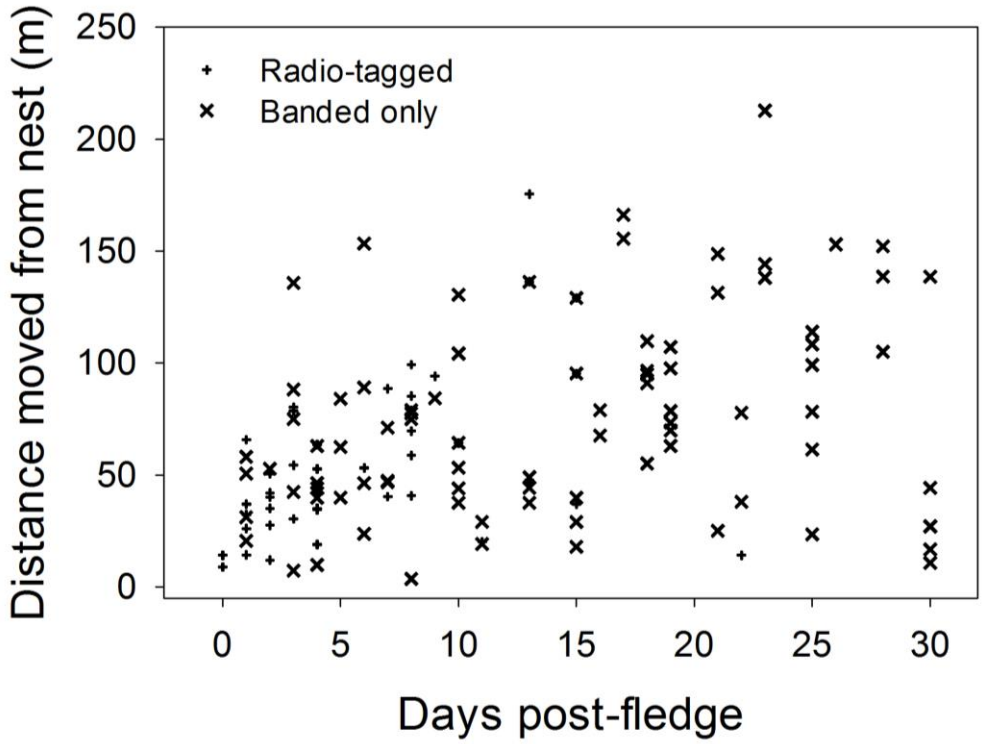

Table 1. Descriptive information for hatch-year (HY) Golden-cheeked Warblers banded and radio-tagged on Balcones Canyonlands Preserve, Austin, Texas, during April and May 2018.

Nest ID	Study area[1]	HY ID	Date banded	Date fledged	Banding Location (east)	Banding Location (north)	Radio freq.[2]	No. of days resighted	Final fate
02JS18	FR	BK/SI:OR/DB	4/20/2018	4/23/2018	616948	3362166	165.024	25	Alive
04JS18	KB	GR/PI:MV/SI	4/22/2018	4/22/2018	613625	3363750	165.092	25	Alive
08JR18	EL	WH/RD:DG/SI	4/22/2018	4/22/2018	612359	3357209	165.157	4	Assumed dead day 4
09JR18	KB	RD/BL:GR/SI	4/23/2018	4/23/2018	615057	3363402	165.124	15	Assumed dead day 19
17JS18	FR	BK/YE:OR/SI	4/24/2018	4/25/2018	616557	3362443	164.790	28	Alive
01JR18	KB	BK/SI:MV/DG	4/30/2018	5/2/2018	614600	3363564	165.289	3	Assumed dead day 5
02WR18	KB	YE/SI:GR/WH	5/1/2018	NA[3]	614499	3363511	164.824	0	Nest depredated
02JS18	FR	BL/SI:BK/PI	4/20/2018	4/23/2018	616948	3362166	NA	25	Alive
02JS18	FR	PI/SI:DG/YE	4/20/2018	4/23/2018	616948	3362166	NA	10	Unknown
04JS18	KB	GR/SI:RD/BK	4/22/2018	4/22/2018	613625	3363750	NA	25	Alive
04JS18	KB	MV/BL:GR/SI	4/22/2018	4/22/2018	613625	3363750	NA	25	Alive
09JR18	KB	RD/DG:PI/SI	4/23/2018	4/23/2018	615057	3363402	NA	28	Alive
17JS18	FR	BK/DB:DG/SI	4/24/2018	4/25/2018	616557	3362443	NA	28	Alive
05JS18	FR	BK/SI:BL/DG	4/27/2018	4/27/2018	616731	3362287	NA	21	Alive
05JS18	FR	DG/SI:OR/MV	4/27/2018	4/27/2018	616731	3362287	NA	30	Alive
01JR18	KB	YE/OR:OR/SI	4/30/2018	5/2/2018	614600	3363564	NA	30	Alive
02WR18	KB	RD/OR:RD/SI	5/1/2018	NA[3]	614499	3363511	NA	0	Nest depredated

[1] EL = Emma Long study area; FR = Forest Ridge study area; KB = Kent Butler study area
[2] NA = juvenile was banded only
[3] Did not fledge