

Mourning Dove Survival from Band Recoveries in Northern Mississippi

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Abstract: During 2002–2003, we trapped and banded 1870 mourning doves (*Zenaida macroura*) in Hell Creek Wildlife Management Area located in northern Mississippi. Of these, we recovered 152 banded doves and recorded 845 live recaptures. We calculated apparent weekly survival using live recaptures model in Program MARK. Best model yielded adult survival estimates of >0.90 through week 13, then declined to 0.88 by week 15. Juvenile survival estimates followed a similar trend with >0.90 through week 13, then dropping to 0.85 by week 15. Annual survival rate of mourning doves in northern Mississippi was 0.32 (SE 0.07). Recapture probability of AHY doves was 0.014 (SE = 0.01 – 0.13); HY doves exhibited greater recapture probability, ranging from 0.04 (SE = 0.01) to 0.13 (SE = 0.01). We used simulations to examine the influence of number of releases and reporting rates on precision of mean survival estimates. Precision of estimates improved with increased number of releases and reporting rate.

Key words: banding, Mississippi, mourning dove, recoveries, survival

Proc. Annu. Conf. Southeast. Assoc. Fish and Wildl. Agencies 66:102–106

The mourning dove (*Zenaida macroura*) is the most abundant gamebird in North America (Grue et al. 1983, Baskett et al. 1993, Sauer et al. 2010). Mourning doves are habitat generalists found in open habitats of rural and urban landscapes (Otis et al. 2008). Little research has been conducted on mourning doves in Mississippi, particularly population dynamics (Handley and Edwards 1957, Pearce 1981). Elmore et al. (2007) examined long-term (1966–2000) landscape correlates and variability along dove call-count routes and reported localized declines in mourning dove abundance may be related to conversion of agriculture to forestry. During the last decades, approximately 800,000 ha of cropland in Mississippi have been replaced by loblolly pine (*Pinus taeda*) plantations.

A nationwide dove banding program was initiated in 2004 (Tomlinson et al. 1994, USFWS 2005). The justification for this multi-state effort was the need to develop population models representing relationships between survival, reproduction, and harvest rates. Herein, we report mourning dove survival estimates obtained at the onset of the national banding program.

Specifically, we report period and annual survival estimates and recapture probabilities for mourning doves at Hell Creek Wildlife Management Area, located in northern Mississippi. We also present recommendations for mourning dove monitoring in the state.

Study Area

Our study was conducted at Hell Creek Wildlife Management Area (3437N 8903W) and surrounding lands. Hell Creek Wildlife Management Area (hereafter, Hell Creek WMA) is owned and managed by the Mississippi Department of Wildlife, Fisheries, and Parks (MDWFP). Hell Creek WMA is comprised of approximately 948 ha located in northern Union and southwestern Tippah counties. The study site lies within the hills region of northeast Mississippi (Pettry 1977). Hell Creek is managed with an emphasis on small game, namely northern bobwhite (*Colinus virginianus*) and mourning dove. Ambient temperature and precipitation during the study period (2002 and 2003) averaged 25.4 C and 23.3 C and 2.39 cm/month and 4.01 cm/month, respectively (NOAA 2003). Soils are characterized by moderately well-drained and somewhat poorly drained loam and clay, elevations ranged from 115–137m (USDA 1979).

Methods

Trapping and Banding

We identified 12 sites in Hell Creek WMA and adjacent private land for trapping on the basis of exposed bare ground and/or pres-

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ence of doves. We trapped and banded doves during May to August of 2002 and 2003 using modified Kniffin funnel traps baited with seeds of various small grains. Stations were prebaited at least 10 days before trapping began (Reeves et al. 1993). During 2002, we placed 10 sites inside Hell Creek WMA boundary and two sites on adjacent private land. The following year we centralized trapping on five WMA areas and one new private site. Trapping sites represented a mixture of vegetation cover types and allowed for near complete coverage of the study area. Sites were spaced around the study area to capture a representative sample of the dove population at Hell Creek WMA and surrounding private lands.

Traps were set early in the morning and checked before 0800 hrs, then re-checked at 2 hr intervals until sunset. Captured doves were fitted with size 3A USGS Bird Banding Laboratory (BBL) numbered leg bands and classified to age (HY and AHY) and sex via external plumage characteristics then released at the capture site (Cannell 1984, Mirarchi 1993). Weight and molt of captured doves was recorded. Gender was assigned to AHY doves only because of the inherent difficulties associated with determination of HY individuals (Schulz et al. 1995). Doves for which we were unable to determine sex were classified as undetermined (U). During May through August of 2002 and 2003, we continuously operated 256 traps for a total effort of 1792 trap-hours. We checked doves harvested at Hell Creek WMA and surrounding private lands for bands during September and October of the 2002 and 2003 hunting seasons. Band recoveries were also obtained from reports to MDWFP and the BBL.

Analysis

We used the live recaptures model in Program MARK to estimate survival and recapture probabilities, and test sex, age (HY and AHY), and year effects (White and Burnham 1999). We developed a set of candidate models, representing the specific factors of interest (i.e., age, sex, and year) and used Akaike's Information Criterion adjusted for small sample size (AICc) and goodness-of-fit tests to select the most parsimonious model (Lebreton et al. 1992). We estimated apparent survival (ϕ) and recapture probability (p) during the summer trapping periods as a function of total weekly rainfall and effort as total traps set per interval (7-day) divided by 1000. We tested for overdispersion using Program Release (Burnham and Anderson 1998).

We used the dead recoveries model in Program MARK to estimate survival rate ($S(i)$) and band reporting rate ($r(i)$). Estimates generated reflect actual survival probabilities from one season to the next (Brownie et al. 1985, White and Burnham 1999). Reporting rate is the probability of a band being reported (assuming the bird died), not the probability of a hunter reporting the band. To

increase the precision of the estimates, we pooled males and females into one AHY group, as harvest bag checks showed no sex bias. Previous banding studies reported little if any difference in survival between sexes (Martin and Sauer 1993).

We simulated the effect that the number of doves released and reporting rate (r) may have had on the standard error (SE) and survival (S) estimates in Program MARK using the best model constructed from the band recovery data (White and Burnham 1999). We manipulated the number of releases (500, 1000, 1500, 2000, and 2500) and reporting rates (0.05, 0.10, 0.15, 0.20, and 0.25) as recommended by White and Burnham (1999) by changing the slope of the parameter estimate (i.e., beta). We used five capture periods and 500 iterations for the simulations. We held beta values from the best model (recoveries only option) constant and manipulated number of releases to examine change in precision of the estimate. We computed mean SE for all simulations to determine effect on precision of the survival estimates.

Results

We captured and banded 1870 doves at Hell Creek WMA and surrounding lands during our study. Approximately 41% of doves banded in 2002 were AHY, 56% were HY, and the remaining 3% were undetermined. Of the AHY doves, 41% were female and 59% were male. During 2003, the age ratio of captured doves was somewhat skewed towards AHY (>63%). We recaptured banded doves during 2002 (422) and 2003 (423), and received notification of 152 recovered doves reported to MDWFP and the BBL. Notifications of mourning dove recoveries from Hell Creek WMA and surrounding lands encompassed a six-state region including Mississippi, Alabama, Arkansas, Florida, Georgia, and Tennessee. However, the majority (88%) of recoveries was reported within Mississippi.

The live recaptures model exhibited a good fit ($X^2_{151}=0.77$, $P=0.982$) and there was no evidence of overdispersion (Table 1). Model $\{\phi(\cdot) p(\text{effort})\}$ was the best model for varying survival and evidence supported a quadratic time trend in apparent survival. The best apparent survival model $\{\phi(\text{age}+TT) p(\text{effort})\}$ contained 88% of the total weight where survival varied by age with a quadratic trend, and effort influenced recapture probability. Apparent weekly survival rate was slightly higher for AHY doves than for HY doves (Table 2). Annual apparent survival rate for doves in our study was 0.316. Mourning dove survival at Hell Creek WMA decreased in late summer and recapture probability also decreased over time (Table 2). Apparent survival remained high ($\phi > 0.90$) through week 13, then declined slightly (0.88) during week 15. Hatch-year doves apparent survival followed a similar trend, with estimates > 0.90 through week 13 then declined

Table 1. Summary of models (live recaptures) for mourning doves banded on Hell Creek Wildlife Management Area, 2002–2003. Model notation indicates apparent survival and recapture probability. Model variables include age, effort and weekly precipitation.

Model	k ^a	AIC _c ^b	ΔAIC _c ^c	Weight ^d	Deviance
{phi(age+TT) p(effort)}	6	3981.27	0.00	0.88	1031.75
{phi(TT) p(effort)}	5	3985.55	4.28	0.10	1038.04
{phi(age+T) p(effort)}	5	3989.73	8.46	0.01	1042.22
{phi(T) p(effort)}	4	3992.96	11.69	0.01	1047.46
{phi(age) p(effort)}	4	4006.68	25.41	0.00	1061.18
{phi(.) p(effort)}	3	4012.87	31.60	0.00	1069.38
{phi(.) p(.)}	2	4138.61	157.34	0.00	1197.12
{phi(.) p(precip)}	3	4139.36	158.09	0.00	1195.87

- a. Number of parameters in the model
- b. AIC_c = corrected quasi-Akaike Information Criterion
- c. Difference between model AIC_c and minimum AIC_c for model set
- d. Total weight of model in relation to the model set

Table 2. Beta estimates from the best apparent survival model for mourning doves banded on Hell Creek Wildlife Management Area, 2002–2003.

Parameter	Beta	Standard error	95% Confidence interval	
			Lower	Upper
1:int phi	3.13	0.32	2.51	3.75
2:HY	-0.27	0.11	-0.48	-0.06
3:T	0.22	0.09	0.05	0.39
4:TT	-0.02	0.01	-0.03	-0.01
5:int p	-4.25	0.37	-4.98	-3.53
6:effort	1.29	0.21	0.87	1.71

Table 3. Summary of models (dead recoveries) for mourning doves banded on Hell Creek Wildlife Management Area, 2002–2003. Model notation indicates survival and reporting rate.

Model ^a	k ^b	AIC _c ^c	ΔAIC _c ^d	AIC _c weight ^e	Deviance
{S(.) r(.)}	2	0.00	1122.05	0.41	0.57
{S(year) r(.)}	3	0.65	1122.70	0.30	0.00
{S(.) r(year)}	3	0.65	1122.69	0.30	0.00

- a. Models ranked in ascending ΔAIC_c
- b. Number of parameters in the model
- c. Corrected quasi-Akaike Information Criterion
- d. Difference between AIC_c for the model and the minimum AIC_c for the model set
- e. Total weight of model in relation to model set

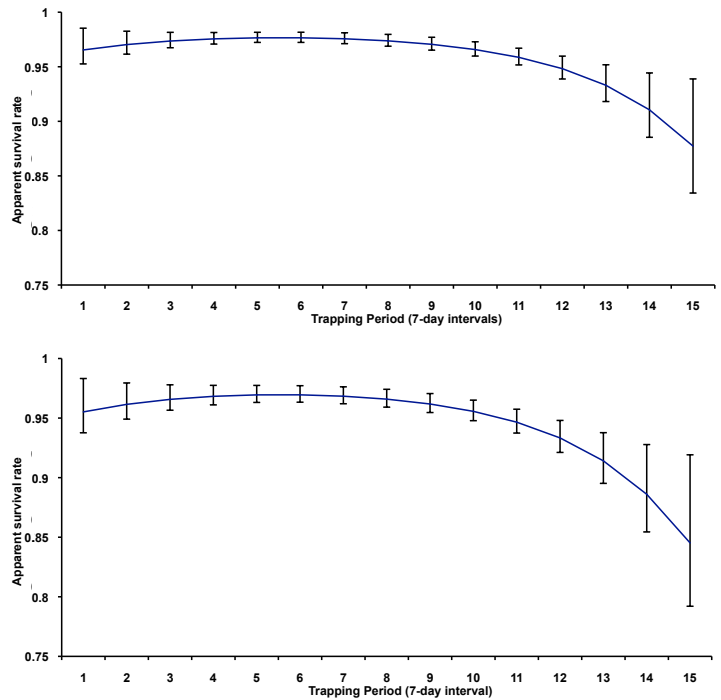


Figure 1. Weekly apparent survival rates ($\pm 95\%$ CI) for AHY doves (top) and HY doves (bottom) at Hell Creek WMA, 2002–2003.

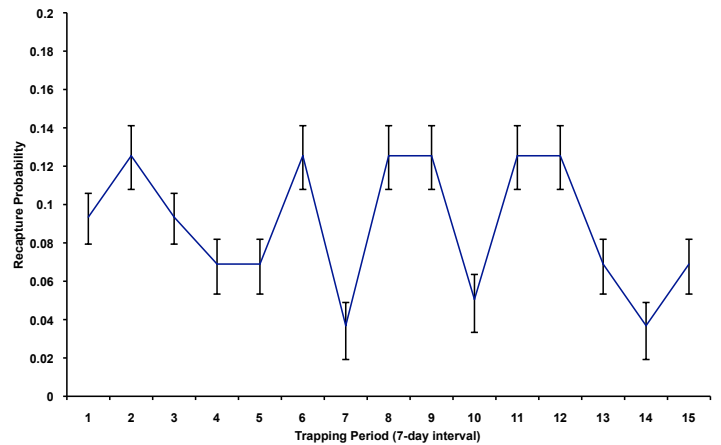


Figure 2. Weekly recapture probability ($\pm 95\%$ CI) for immature (HY) mourning doves at Hell Creek WMA, 2002–2003.

(0.85) during week 15 (Figure 1). Recapture probability of AHY doves was 0.014 (SE 0.01 – 0.13). Immature doves exhibited greater overall recapture probability, ranging from 0.04 (SE = 0.01) to 0.13 (SE = 0.01), though this varied widely during capture periods (Figure 2). Conversely, AHY recaptures were fewer during the initial weeks of trapping, peaked during late June and early July before gradually decreasing toward the end of August.

The dead recoveries model indicated three candidate models

had nearly identical AIC_c values (Table 3). As our study consisted of two capture periods (2002 and 2003), we selected the model with the fewest number of parameters {S(.) r(.)} for the most parsimonious description of the data. Annual survival rate of doves was 0.32 (SE = 0.07) and estimated reporting rate was 0.098 (Table 4). Simulations indicated the number of releases as well as reporting rate influenced the precision of the survival estimates (i.e., S_i standard error). The mean S_i standard error was 0.0042 with 500 releases per year;

Table 4. Survival and recovery estimates from model $\{S(\cdot)r(\cdot)\}$ from the dead recoveries model in program MARK for mourning doves banded at Hell Creek WMA, 2002–2003.

Parameter	Estimate	Standard error	95% Confidence interval	
			Lower	Upper
1:S	0.32	0.07	0.19	0.47
2:S	0.32	0.07	0.19	0.47
3:S	0.32	0.07	0.19	0.47
4:S	0.32	0.07	0.19	0.47
5:r	0.10	0.01	0.08	0.12
6:r	0.10	0.01	0.08	0.12
7:r	0.10	0.01	0.08	0.12
8:r	0.10	0.01	0.08	0.12

with 2500 releases per year greatly improved precision ($SE = 0.0005$). Similarly, precision of survival estimates improved with increasing reporting rate. Mean standard error of S_i (0.03) for recovery rate of 0.05 decreased (0.01) as recovery rate increased to 0.20. Moreover, our models suggested greater precision was achieved when simulated capture periods approached five, compared to the two periods of our study.

Discussion

Mourning doves banded at Hell Creek WMA and surrounding lands were generally recovered within the state of Mississippi. Both AHY and HY doves were recovered approximately equal distances from the banding sites, suggesting doves harvested at Hell Creek WMA were largely derived from the local breeding population. A seven-year banding study encompassing a six-county region in South Carolina reported nearly 80% of releases were recovered within the state (Haas 1978). Furthermore, a large-scale banding study (1966–1971) in the Eastern Management Unit (EMU) states concluded 85% of the doves harvested were locally produced (Hayne and Geissler 1977). McGowan and Otis (1998) reported doves recovered <6 km from a South Carolina banding site two years after initial capture.

Recaptures during our study varied between HY and AHY doves and may be related to the dynamics of the local breeding population. Mourning doves are capable of 5–6 nesting attempts in most Southeastern states (Sayre and Silvy 1993). As such, immature doves were available for recapture throughout our trapping period. Conversely, AHY recaptures may reflect nesting activity patterns and post-breeding dispersal of local breeding adults.

Annual apparent survival rate for doves in our study was 0.316, similar to estimates reported throughout EMU states with dove hunting seasons. The reporting rate (0.098) in our study was greater than estimates for other species of migratory birds (Giudice

2003). Reporting rates for mourning doves banded and harvested during 1967–1977 averaged 0.015 for AHY and 0.020 for HY birds (Dunks et al 1982). Mourning dove survival rates may vary widely across the United States. Survival rates within hunting states range from 0.35–0.45 for AHY and 0.20–0.30 for HY doves (Martin and Sauer 1993). More recent estimates from South Carolina yielded similar results (McGowan and Otis 1998). Many studies on dove survival derived annual estimates from radio telemetry data or band recoveries (Schulz et al. 1996); however, few studies have estimated survival using live recaptures within the summer trapping season. Our survival estimates during the summer trapping period yielded weekly estimates between 0.925–0.959 for AHY and 0.925–0.959 for HY doves and may reflect relatively low nest predation rates during the summer months (Gottfried and Thompson 1978, Westmoreland and Best 1985). However, this may also reflect the absence of hunting pressure during the dove nesting season.

Variances for the estimates were relatively small considering the study was limited to two years. Similarly, the number of releases, as well as the reporting rate, may have influenced precision of survival estimates. Our simulations provided insight into the level of effort required (i.e., five capture periods) to achieve improved estimates of survival. Simulations have been used to assess the effects of management decisions (i.e., increased bag limits) on the relationship between harvest and annual survival rates (Otis 2002). The national dove banding program was initiated just as our study ended. Since then, approximately 700 doves per year have been banded by MDWFP biologists. These efforts have contributed to development of harvest models and been instrumental for implementation of the national mourning dove harvest management plan (USFWS 2005, Otis et al. 2008).

Acknowledgments

Funding was provided by the Mississippi Department of Wildlife, Fisheries, and Parks through project W-48-49, Study 56 of the Federal Aid in Wildlife Restoration Program. We are grateful to S. Coleman, Hell Creek WMA area manager, and his staff for assistance with dove trapping and banding as well as collection of dove harvest data. B. Holder, M. Szypinski, D. Collins, and C. Lott provided field assistance during the study. The manuscript was greatly improved by comments from two anonymous reviewers. Animal capture and handling procedures were conducted under the auspices of Master Station Permit 22456 of the USGS Bird Banding Laboratory and protocol 01-086 of the Mississippi State University Institutional Animal Care and Use Committee. The use of trade names or products does not constitute endorsement by the U.S. Government.

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