Nest survival of White-winged doves in south Texas

Final Report

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Abstract

Harvest management of migratory game birds requires that managers derive relationships between population demographic parameters and use these estimates in a predictive framework to evaluate annual change in population size. We estimated daily nest survival for white-winged doves (*Zenaida asiatica*) for use in development of models for predicting annual recruitment for formal harvest management planning and evaluation. We used fates from 7,864 white-winged doves nests monitored between 1966 and 2002 and found that daily nest survival varied between the early breeding months (May–June) and late breeding months (July–Sept) and exhibited variation over 5-year intervals. Daily survival estimates ranged from 0.94 (0.937–0.947) to 0.99 (0.998–0.999) giving overall nest success estimates between 0.19 and 0.96. Our nests, which were in native habitats, had a considerably higher median nest survival than estimates from urban populations. For white-winged doves, the influence of environmental factors on natality and mortality is critical to understanding population dynamics and for future management planning and monitoring. Our results provide a foundation from which development of initial strategies for monitoring white-winged dove reproductive parameters across their range.

Introduction

In the United States, dove research and management has received considerable attention recently, with large-scale banding and wing collection programs implemented to evaluate population demography and harvest (Tomlinson et al. 1994; Otis 2002, 2003; Otis and White 2002). These studies primarily addressed development of management plans for mourning doves (*Zenaida macroura*), while demographic monitoring programs for white-winged doves (*Zenaida asiatica*) have not yet been developed. However, white-winged doves are quite important to hunters. For example, in 2006, white-winged doves in Texas provided approximately 1.4 million hunter days, with a resulting harvest of about 1.8 million birds (J. Purvis, Texas Parks and Wildlife Department, unpublished data).

Texas represents the primary United States range of 3 white-winged dove populations (Eastern, Mexican Highland, and Upper Big Bend) (George et al. 1994). Prior to the 1980s, white-winged doves were confined to the Lower Rio Grande Valley of south Texas (Cottam and Trefethen 1968) and the Big Bend Region of west Texas (Schwertner et al 2002). Since then, white-winged doves experienced considerable range expansion, with simultaneous shifts in habitat use and behavior (Schwertner and Johnson 2005). Currently, only 16% of white-winged doves breeding in Texas occurs in the Lower Rio Grande Valley, with 84% of breeding occurring in all other physiographic regions of Texas with the exception of the Pineywoods region of east Texas (Gould 1962, Roberson et al. 2004, T. W. Schwertner, TPWD, unpublished data). Outside historic range, white-winged doves are confined almost exclusively to urban environments and preliminary evidence from Texas suggests most birds breed in the residential core of cities (Schwertner and Johnson 2005). Population level impacts of urban adaptation on reproduction, survival, and harvest are unclear.

The relationship between white-winged dove call-count survey indices and population status is unknown (George et al. 1994). Thus, management plans based on annual estimates of population size or index trends are inappropriate, especially at scales smaller than a management unit (Baskett 1993, Anderson 2001, 2003). Until the relationship between call-count surveys and population status is clarified, management of white-winged doves must rely on the ability of regulatory agencies to determine how harvest influences population status, and use this information to assist with sustainable harvest management planning (Otis 2002, 2003).

George et al. (1994), Tomlinson et al. (1994), Schwertner et al. (2002), and Otis (2003) all maintained that estimates of dove productivity were necessary for population monitoring and harvest management planning in the Central Management Unit. For example, George et al. (1994:48) recommended research on "productivity and recruitment to compare with survival estimates using nest studies, radiotelemetry, and wing collection programs." Few data are available on the nesting ecology of white-winged doves and available data are descriptive (e.g., clutch size, fledgling number, nest density; Saunders 1940, Alamia 1970, Blankinship 1970, Swanson and Rappole 1993, Hayslette et al. 1996). Nest survival estimates are rare and typically confined to urban environments (West et al. 1993, Hayslette and Hayslette 1999, Small et al. 2005), while few address historic breeding environments (Martinez et al. 2005). Our objective was to estimate daily nest survival for white-winged doves in native breeding environments so that models for predicting annual recruitment can be developed for use in formal harvest management planning and evaluation.

Methods

Texas Parks and Wildlife Department personnel sampled white-winged dove nests along transects in 4 counties in south Texas (Cameron, Hidalgo, Starr, and San Patricio) between May and September—with nest checks occurring at various intervals (usually weekly)—from 1966 through 2002 (no data were collected in 1979; Hayslette et al. 1996). When biologists located a nest, they recorded its location and contents (no. eggs, no. young) and subsequently monitored the nest until success ($\geq$ 1 fledgling) or failure (no young fledged). Biologists conducted checks at irregular intervals, so we excluded nests from our analyses where > 10 days elapsed between checks.

We estimated daily survival of white-winged dove nests using logistic-exposure (Shaffer 2004a, b) with an information-theoretic approach to model selection (Burnham and Anderson 2002). We used SAS (v.9.1.3; SAS 2000) for all analyses. Unfortunately, inconsistently collected nest-specific individual covariates over the 35 years of data collection precluded development of mechanistic predictive models for nest survival using individual covariates (e.g., nest age or stage, habitat type, or nest height) as fixed data is a requirement for model selection procedures (Burnham and Anderson 2002). For this reason, we focused model development on more general models describing temporal variation in nest survival both within and between breeding seasons (Table 1) (Geissler et al. 1984, Sayre and Silvy 1993). Our focus on temporal models rather than mechanistic models answers George et al. (1994) and Tomlinson et al.'s (1994) call for estimates of white-winged dove productivity and recruitment among various segments of the breeding period.

Results

We used fates from 7,864 white-winged doves nests monitored between 1966 and 2002 (excluding 1979) for our analysis, with monitored nests providing an effective sample size of 104,925 (Shaffer 2004b). Nest checks occurred at irregular intervals, with a median of 6 days between checks. Nest activity during the early breeding months peaked between 26 May and 2 June (Julian days 147–154) while activity during the later breeding months peaked between 9 July and 6 August (Julian days 191–219) (Figure 1). There was evidence of inter-period variation for breeding activity as shown by the median differences (Chambers et al. 1983).

The best fitting model was one where estimates of daily nest survival varied between the early breeding months (May–June) and late breeding months (July–Sept) but were constant within 5-year intervals (Table 2). We could not fit more complex models to represent the within year data (e.g., a month by year model) as there were some month–year combinations where zero nests were located along the study transects. Daily survival estimates ranged from 0.94 (0.937–0.947) to 0.99 (0.998–0.999) (Figure 2). We found no support for models which evaluated more general temporal frames or differences attributable to spatial location (e.g., county).

Discussion

Most reproductive ecology studies of white-winged doves have focused on general estimates of nesting ecology parameters (Blankinship 1970, Swanson and Rappole 1993, Hayslette et al. 1996, Otis 2003). Assuming a 15-day incubation period and a 13-day fledgling period (Schwertner et al. 2002, Small et al. 2005), our estimates of nest survival for white-winged doves in Texas ranged from 17 to 96% over the period of data collection, with a median of 89%. Median estimates from our study were 30% higher than estimates found for urban doves; however, the range from our estimates encompasses estimates made by West et al. (1993), Hayslette and Hayslette (1999) and Small et al. (2005) using the Mayfield method (51, 57, and 45% respectively). However, these estimates were for white-winged doves in urban environments so it is likely they are not representative of the nesting doves we evaluated in historic habitat (Hayslette et al. 1996).

Based on our results, white-winged doves in the LRGV seemed to undergo 2 distinct breeding pulses rather than a continuous breeding cycle, thus answering one of the white-winged dove research questions suggested by George et al. (1994). However, as our data were not collected over the entirety of the breeding season in the LRGV, we could have missed an initial pulse in early spring (March–April). Because we did not find evidence for general models over longer time frames (decadal), it is likely that white-winged dove nest survival is related to conditions which vary annually (e.g., precipitation, temperature, nesting cover availability;

Cottam and Trefethen 1968, Schwertner et al. 2002) or inter-annually (nesting attempt, nest height, nest density). We could not include these variables because data collection was inconsistent over time and space. We also acknowledge that our nest survival results are representative of transects surveyed, which could further constrain the applicability of our results. While our results are likely representative of general trends in white-winged doves nesting in historic south Texas range, researchers should expand future studies of white-winged doves to include nests in both rural and urban habitat types.

Based on our analysis, it seems that over time, breeding season initiation peaks have advanced about 4 days. This peak could affect current breeding population estimates, as calling intensity survey methods currently in use (Rappole and Waggerman 1986) are tied to reproductive phenology rather than population density. In addition, we note that our daily survival estimates appear to be lower in those 5-year intervals following severe freezes in the Lower Rio Grande Valley (1962, 1983, 1989, J. Roberson, Texas Parks and Wildlife, unpublished data). Thus, although we did not specifically evaluate this phenomenon, the potential impacts of freezes on white-winged dove production have been discussed in other works (Cottam and Trefethen 1968, George et al. 1994).

Understanding nest survival is critical to long-term management of avian populations (Dinsmore et al. 2002, Grant et al. 2005, Shaffer and Thompson 2007). As there is a paucity of data on dove reproduction in the United States (Otis 2003), research and validation of population recruitment parameters, and how these parameters are impacted by various environmental and human-induced factors, are vital to sustaining dove populations at biologically and socially acceptable levels. Informed harvest management of mourning and white-winged doves requires that managers derive relationships between population demographic parameters and use these estimates in predictive framework to evaluate annual change in population size (Otis 2002, Otis 2003). Our results provide a foundation from which development of initial strategies for monitoring white-winged dove reproductive parameters across their range.

Management Implications

Because Texas is the primary stronghold for white-winged doves in the Unite States, our nest survival results provide a foundation of productivity information for use in population models and adaptive management for white-winged doves. Our nests in native habitats had a considerably higher median nest survival than estimates from urban populations. Additionally, our results suggest changes in breeding chronology, which also impacts designs for population estimation. As white-winged doves are increasingly found in urban environments, future work should focus on evaluating differences in population parameters between native and urban habitats and the impact changing breeding chronology have on populations. In addition, we suggest standardized data collection regarding reproductive effort for all white-winged dove research programs in Texas. Standardized collection of reproductive information, combined with increased effort towards estimating adult survival and harvest using bandings, should allow for more informed population management of white-winged doves in the United States.

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Table 1. Notation and description of models used to estimate nest survival white-winged doves nesting in Texas, 1996–2002 (excluding 1979).

Model	Model notation	Model description
1	$DSR_{Constant}$	Constant model
2	DSR_{Month}	Daily survival differs between months, constant over time
3	DSR_{Decade}	Daily survival differs between decades, constant within each decade-month combination
4	$DSR_{MonthEL}$	Daily survival differs between early (May-June) breeding season and late (July-August) breeding season, constant within each decade-month combination
5	$DSR_{HalfDecade}$	Daily survival differs between each 5-year interval, constant within each 5-year interval-month combination
6	$DSR_{MonthEL*Decade}$	Daily survival differs between early (May-June) breeding season and late (July-August) breeding season and differs between each decade-month combination
7	$DSR_{MonthEL*HalfDecade}$	Daily survival differs between early (May-June) breeding season and late (July-August) breeding season and differs between each 5-year interval -month combination

8	$DSR_{Month*HalfDecade}$	Daily survival differs between months and differs between each 5-year interval -month combination
9	$DSR_{MonthEL*County}$	Daily survival differs between early (May-June) breeding season and late (July-August) breeding season and differs between each county-month combination
10	$DSR_{Month*County}$	Daily survival differs between months and differs between each county-month combination
11	DSR_{County}	Daily survival differs between county, constant over time

Table 2. Candidate models[a] used to estimate daily nest survival of white-winged doves in south Texas between 1966 and 2002 (excluding 1979).

Model notation	No. of parameters	ΔAIC_c	w_i
$DSR_{MonthEL*HalfDecade}$	16	0	0.99
$DSR_{HalfDecade}$	8	26.86	<0.01
$DSR_{MonthEL*Decade}$	10	60.97	<0.01
$DSR_{Month*Decade}$	25	61.62	<0.01
DSR_{Decade}	5	87.36	<0.01
$DSR_{Month*County}$	18	2257.89	<0.01
$DSR_{MonthEL*County}$	8	2259.36	<0.01
DSR_{County}	4	2286.93	<0.01
$DSR_{MonthEL}$	2	2292.45	<0.01
DSR_{Month}	5	2295.37	<0.01
$DSR_{Constant}$	1	2232.11	<0.01

[a] Minimum AICc=12844.597

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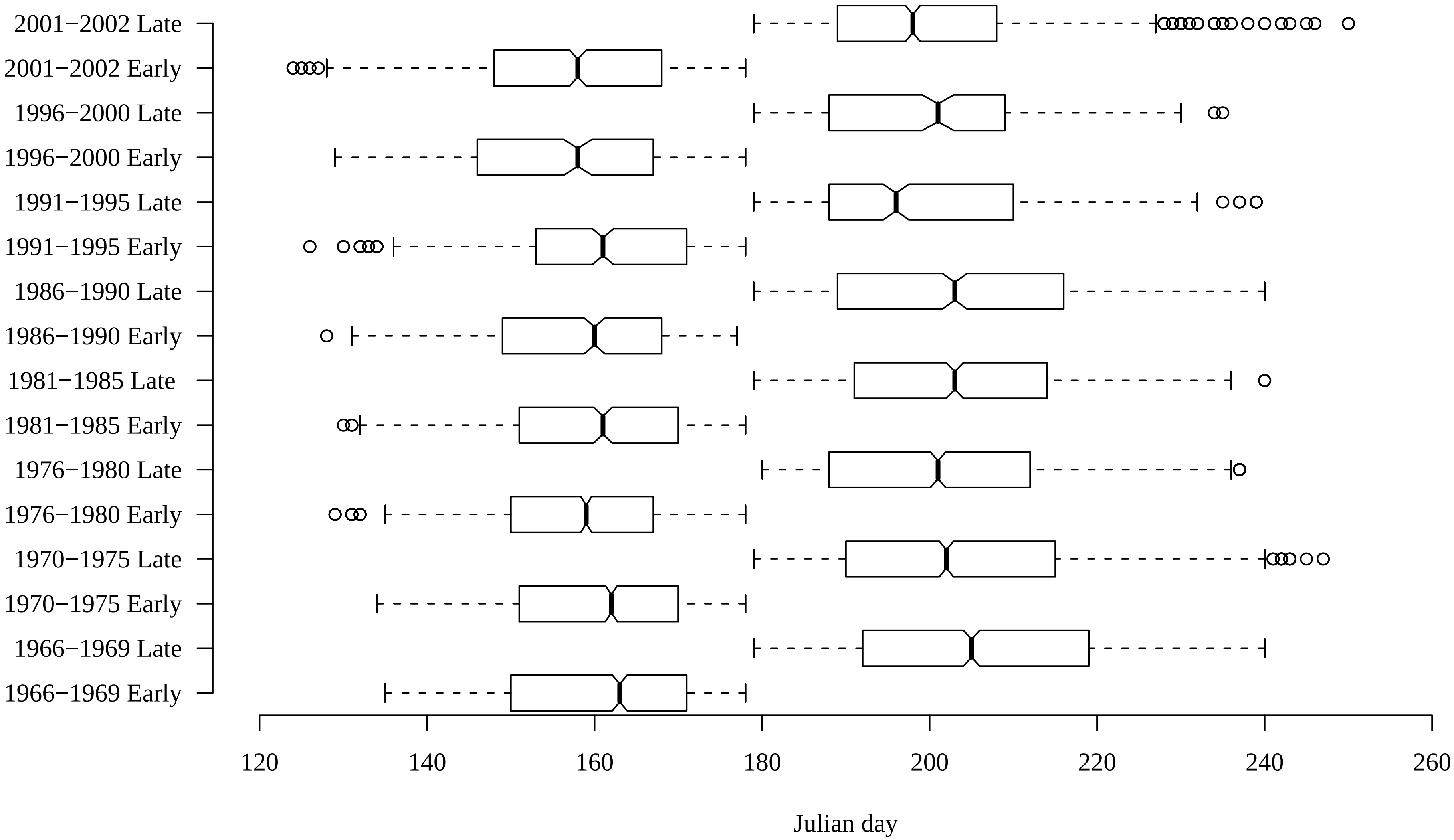
Figure 1. Median breeding activity time for white-winged doves during the early breeding period (May–June) or the late breeding period (July–Sept) in Texas USA between 1966 and 2002 (excluding 1979).

Figure 2. Daily survival rate (DSR) estimates for white-winged doves in Texas, USA between 1966 and 2002. We specified time frame as either early breeding period (May–June; black) or late breeding period (July–Sept; gray), paired at the 5-year interval level (1966–1969, 1970–1975, 1976–1980 (excluding 1979), 1981–1985, 1986–1990, 1991–1995, 1996–2000, 2001–2002) as shown by the character styles in each plot.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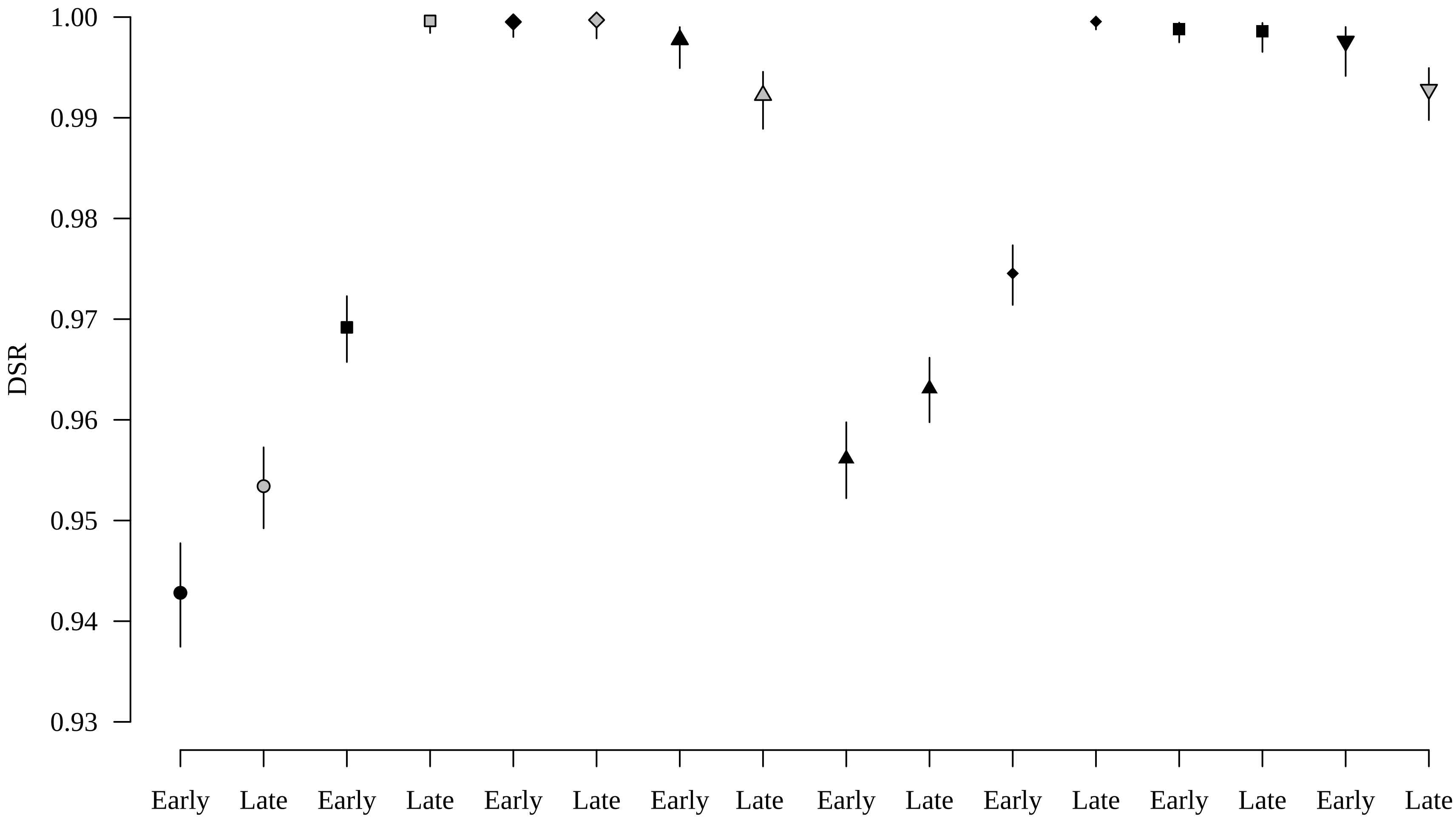
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