MOURNING DOVE HARVEST STRATEGY 2015

Preface

The process of setting migratory upland gamebird hunting regulations is conducted annually in the United States (USFWS 2013a). This process involves a number of meetings where the status of migratory upland gamebirds is reviewed by agencies responsible for setting hunting regulations. In addition, the U.S. Fish and Wildlife Service (USFWS) publishes proposed regulations in the *Federal Register* to allow public comment. This document is part of a series of reports intended to support development of harvest regulations. Specifically, this report is intended to provide migratory upland gamebird managers and the public with information about the strategy for setting mourning dove hunting regulations in the United States.

Acknowledgments

This report was prepared by the USFWS Division of Migratory Bird Management. The principal authors were M. E. Seamans and T. A. Sanders. M. E. Seamans, T. A. Sanders, and D. L. Otis developed the technical framework to support the strategy. Much of this strategy was borrowed from the work done by G.S. Boomer and F. Johnson for waterfowl harvest management. This strategy is a result of the strategy proposed in 2003 and developed by the Mourning Dove Task Force: T. Bidrowski (Kansas Department of Wildlife and Parks), John Brunjes (Commonwealth of Kentucky), B. Dukes (South Carolina Department of Natural Resources), Bill Harvey (Maryland Department of Natural Resources), Corey Mason (Texas Parks and Wildlife Department), Shaun Oldenburger (Texas Parks and Wildlife Department), M. Rabe (Arizona Game and Fish Department), John Schulz (Missouri Department of Conservation), Rich Schultheis (Kansas Department of Wildlife and Parks), Nathan Stricker (Ohio Department of Natural Resources), Mike Szymanski (North Dakota Game and Fish Department), and D. Yparraguirre (California Department of Fish and Game). The following individuals also contributed at various stages of strategy development: D. Otis (Iowa State University), D. Miller (Pennsylvania State University), D. Dolton (USFWS), K. Richkus (USFWS), K. Wilkins (USFWS), J. Dubovsky (USFWS), P. Padding (USFWS), and D. Sharp (USFWS).

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http://www.fws.gov/birds/surveys-and-data/reports-and-publications.php

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Executive Summary

Over the past 10 years a harvest strategy for mourning doves in the United States has been in development. The first challenge was to put in place national banding and parts collection programs in order to collect data to estimate dove population vital rates. Second, development of models to predict the outcome of various harvest scenarios was needed. These tasks have been accomplished and a formal harvest strategy was adopted by the Flyway Councils and USFWS in 2013 for implementation in the 2014-15 hunting season.

The purpose of this strategy is to inform annual mourning dove harvest management decision in the three Management Units (Eastern, Central, and Western). The objectives of the strategy are to: conserve mourning dove populations in the three Management Units; and to minimize annual regulatory change. Regulatory alternatives (packages) are prescribed for each Management Unit based on critical abundance thresholds. These thresholds represent a percentage of the population size expected when at maximum productivity (one half of carrying capacity or maximum sustained yield or MSY). A discrete logistic model is used to estimate abundance from the previous year (there is a one year lag in data availability). Abundance estimates from all years are used in the discrete logistic model to estimate maximum population growth rate and carrying capacity, from which the critical thresholds are derived. This document will be updated to reflect future changes in the harvest strategy and will be available on our web site (http://www.fws.gov/birds/surveys-and-data/webless-migratory-game-birds/doves-and-pigeons.php).

Background

The mourning dove (*Zenaida macroura*) is the most abundant and most harvested migratory game bird in the U.S. In 2011, population size in the U.S. was about 310 million at the start of the hunting season, and approximately 16.5 million mourning doves were harvested by 955,000 hunters (Seamans et al. 2012). There is a long and rich tradition of mourning dove sport harvest in the U.S.

In 2003 a National Strategic Harvest Management Plan (henceforth "The Plan") was developed and approved by the four Flyway Councils (Anonymous 2005). The Plan calls for development and continuous improvement of an objective framework for making informed harvest management decisions for mourning doves. Paramount is (1) the establishment of monitoring programs for the collection of mourning dove vital rate information and (2) development of demographic models that use these data to predict effects of harvest management actions and environmental conditions on population abundance.

In 2008, the Flyway Councils and U.S. Fish and Wildlife Service adopted interim harvest strategies for the Central, Eastern, and Western Management Units until such time that elements of the more comprehensive national approach could be developed. The intent was to replace these interim strategies within 5 years. Harvest management decisions in the interim strategies are prescribed based on a composite trend in mourning dove relative abundance determined primarily from roadside surveys. Roadside surveys include the Mourning Dove Call-count Survey (doves heard and doves seen) and the North American Breeding Bird Survey. Prior to the interim strategies, harvest management decisions were based loosely on trends in mourning dove relative abundance from roadside surveys. The reliability of roadside surveys to index abundance of doves is unknown and opposing trends in doves heard and doves seen in the Eastern Management Unit has caused doubt in their veracity. Furthermore, trends in relative abundance cannot be used reliably to evaluate and predict the effects of harvest on dove demographics (Runge et al. 2004).

The Mourning Dove Task Force developed the following harvest strategy using the best available information. The proposed strategy is true to the intent of The Plan. This strategy was formally accepted by the Service in 2013 (USFWS 2013b) and will be used for the first time during the 2014-15 hunting season. The harvest strategy does not use roadside surveys, but instead relies on mourning dove absolute abundance estimated from band-recovery and harvest data and a demographic model that predicts harvest and resulting subsequent year abundance (Lincoln 1930, Geis 1972, Otis 2006).

Purpose and Objectives

The purpose of this strategy is to inform harvest management decisions for mourning doves in each of Mourning Dove Management Units in the United States. The objectives of the proposed mourning dove harvest strategy are to ensure the long-term conservation of mourning dove populations and to minimize the frequency of regulatory changes.

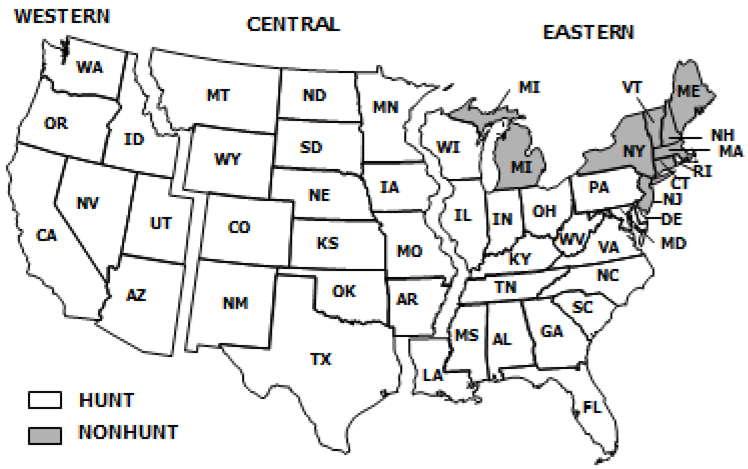

Figure 1. Mourning dove harvest management units: Central, Eastern, and Western. States in gray did not have a mourning dove hunting season in 2013.

Regulatory Options and Harvest

Framework dates for all management units (MUs) are 1 September to 15 January. The regulatory options for mourning dove harvest were prescribed and based on input from the Mourning Dove Task Force, Flyway Technical Committees, and Flyways Councils. Each Management Unit (Figure 1) has similar daily bag limits for each of 3 regulatory alternatives: standard, restrictive, and closed season options (Table 1). Season length varies among Management Units and was decided upon by individual Flyways. Existing regulations concerning zones and splits for mourning dove harvest management, and the rules concerning the timing of when recommendations can be made to zones and splits (USFWS 2006), will remain unchanged. Regulations concerning aggregate bag limits and opening and closing dates (e.g., south Texas zone) will also remain unchanged.

Table 1. Mourning dove daily bag limit and days associated with each regulatory alternative in the Eastern (EMU), Central (CMU), and Western (WMU) Management Units.

Management Unit	Regulatory alternative	Daily bag limit	Days
EMU	Standard	15	90
	Restrictive	10	70
	Closed	0	0
CMU	Standard	15	90
	Restrictive	10	70
	Closed	0	0
WMU	Standard	15	60
	Restrictive	10	60
	Closed	0	0

Models and Data

The variable representing the state of the resource is preseason (1 September) mourning dove population size (abundance). This will be predicted for the year subsequent to the year with the most currently available observed population size estimate. For example, in February and March 2014 when Management Unit and Flyway technical committees convene to review monitoring data and deliberate on proposed regulations for the 2014-15 season, abundance estimates would be available through 2012 and the model would predict abundance for 2013, one year behind the current regulatory year. A regulatory alternative would then be prescribed based on the level of confidence that the predicted abundance estimate exceeds critical abundance threshold values.

Abundance is predicted using a logistic growth model (Schaefer 1954) in a Bayesian analytical framework (Meyer and Millar 1999, Johnson et al. 2007, Boomer et al. 2012). Johnson et al. (2007) provide a description of the predictive model (see *Technical Details* below). Three monitoring programs provide data for estimating abundance: The National Mourning Dove Banding Program, Dove Parts Collection Program, and the Harvest Information Program. The latter two programs are administered by the Branch of Harvest Surveys in the Division of Migratory Bird Management, USFWS. The National Banding Program is a collective effort among states with some federal support.

Harvest Strategy

Critical abundance thresholds were calculated based on an approximation of carrying capacity and the theoretical maximum sustained yield (MSY) curve associated with the logistic growth model (Sanders and Seamans 2012) and are presented in Table 2.

The abundance values represent a percentage of the population size expected when at maximum productivity (one half of carrying capacity or MSY). Population sizes less than 100% MSY are inherently more risky in regard to population conservation and maximizing harvest opportunity because of decreasing total population productivity and ability to rebound from low population levels. Abundance at 50% and 30% MSY were adopted as critical thresholds so that if abundance dropped below these values it would result in a restrictive or closed season regulatory prescription, respectively.

Table 2. Critical mourning dove abundance thresholds (in millions) in the Eastern, Central, and Western Management Units based on the percentage of the population size expected when at maximum productivity (MSY; one half of carrying capacity). The proposed harvest strategy stipulates that the restrictive regulatory alternative would be implemented at 50% MSY and a closed season at 30% MSY.

Percentage MSY	EMU	CMU	WMU
100	71.1	118.7	38.6
90	64.0	106.8	34.8
80	56.9	94.9	30.9
75	53.3	89.0	29.0
70	49.8	83.1	27.0
60	42.7	71.2	23.2
50	**35.6**	**59.3**	**19.3**
40	28.4	47.5	15.5
30	**21.3**	**35.6**	**11.6**
25	17.8	29.7	9.7

The Bayesian model used in predicting mourning dove abundance involves repeated sampling and results in a distribution of predicted abundance estimates (posterior probability distribution), a natural and intuitive way to portray uncertainty in the parameter estimate. The distribution is broad when there is more uncertainty and narrow when there is less uncertainty. The posterior probability distribution is used in a decision analysis framework for harvest regulation change relative to threshold abundance values. The harvest strategy requires that 85% of the distribution (confidence in the parameter estimate) must be above the critical abundance threshold (i.e., 50% or 30% MSY) to prescribe that regulatory alternative (i.e., standard or restrictive). This corresponds to a credible interval (CI) of 70% for the parameter estimate (i.e., central 70% of the posterior probability distribution plus one half of the remaining distribution [the upper half]). Thus, if the lower 70% CI for the predicted abundance dips below the critical abundance threshold value then the more restrictive regulatory alternative is prescribed. Using the lower credible interval provides incentive to reduce uncertainty in parameter estimation (spread in the posterior probability distribution) by maintaining and improving monitoring programs. The greater the uncertainty in the parameter estimate the sooner a restrictive regulatory alternative may be prescribed because one is less confident that the parameter is above the threshold value to maintain the standard regulatory alternative as the population approaches the restrictive level.

Technical Details

The Mourning Dove harvest strategy relies on estimates of abundance using the most recent monitoring data and a logistic model for prediction. Johnson et al. (2007) provide a description of the predictive model; we repeat the description here so that the reader has immediate reference to all model details. The logistic model combines reproduction and natural mortality into a single parameter r, the intrinsic rate of population growth. The model assumes density-dependent growth, which is regulated by the ratio of population size, N, to the carrying capacity of the environment, K (i.e., population size in the absence of harvest). In the traditional formulation, harvest mortality is additive to other sources of mortality, but compensation for hunting losses can occur through subsequent increases in production. However, the model is parameterized in a way that also allows for compensation of harvest mortality between the hunting and breeding seasons. It is important to note that compensation modeled in this way is purely phenomenological, in the sense that there is no explicit ecological mechanism for compensation (e.g., density-dependent mortality after the hunting season).

The basic model for all three management unit stocks has the form:

$$N_{t+1} = \left[N_t + N_t r \left(1 - \frac{N_t}{K}\right)\right](1 - h_t^A d))$$

where t is an index to year, h^A is the harvest rate of adults, and d is a scaling factor. The scaling factor is used to account for a combination of unobservable effects, including un-retrieved harvest (i.e., crippling loss), differential harvest mortality of the immature cohorts, and for the possibility that some harvest mortality may not affect subsequent breeding-population size (i.e., the compensatory mortality hypothesis).

Bayesian estimation methods are used in combination with a state-space model that accounts explicitly for both process and observation error in breeding population size. This combination of methods is becoming widely used in natural resource modeling, in part because it facilitates the fitting of non-linear models that may have non-normal errors (Meyer and Millar 1999). The Bayesian approach also provides a natural and intuitive way to portray uncertainty, allows one to incorporate prior information about model parameters, and permits the updating of parameter estimates as additional information becomes available.

Most of the procedures used to estimate preseason population size (N_t) were taken from Otis (2006). A simple modified form of the "Lincoln estimator" (Lincoln 1930, Geis 1972) was used to derive N_t:

$$N_t = H_t/h_t,$$

where H_t is estimated annual harvest and h_t is estimated annual harvest rate. Annual harvest rates, h_t, were estimated from direct recoveries (*for an example of methods see* Sanders and Otis 2012). Estimates of H_t are taken from the annual Harvest Information Program harvest estimates for mourning doves (available from http://www.fws.gov/birds/surveys-and-data/reports-and-publications/hunting-activity-and-harvest.php).

Annual estimates of age ratio from the Parts Collection Program are used to estimate annual recruitment rates (R_t; Miller and Otis 2010). Annual estimates of recruitment are then used to account for variation in availability for harvest of adults (A) and juveniles (J):

$$H_{t,A} = H_t\left(\frac{1}{1+R_{t-1}}\right)$$

$$H_{t,J} = H_t\left(\frac{R_{t-1}}{1+R_{t-1}}\right)$$

Such that:

$$N_t = \frac{H_{t,A}}{h_{t,A}} + \frac{H_{t,J}}{h_{t,J}}.$$

Literature Cited

Anonymous. 2005. Mourning dove national strategic harvest management plan. U.S. Fish and Wildlife Service. Laurel, MD, USA.

Boomer, G. S., T. A. Sanders, and G. S. Zimmerman. 2012. Adaptive Harvest Management: 2012 hunting season. U.S. Department of the Interior, Fish and Wildlife Service, Division of Migratory Bird Management, Washington, D.C.

Geis, A. D. 1972. Use of banding data in migratory game bird research and management. U.S. Department of the Interior, Fish and Wildlife Service, Special Scientific Report---Wildlife 154, Washington, D.C.

Johnson, F. A., G. S. Boomer, and T. A. Sanders. 2007. A proposed protocol for the Adaptive Harvest Management of mallards breeding in western North America. Unpublished report, 7 March 2007. U.S. Department of the Interior, Fish and Wildlife Service, Division of Migratory Bird Management, Washington, D.C.

Lincoln, F . A. 1930. Calculating waterfowl abundance on the basis of banding returns. U.S. Department of Agriculture Circular 18, Washington, D.C.

Meyer, R., and R. B. Millar. 1999. BUGS in Bayesian stock assessments. Canadian Journal of Fisheries and Aquatic Sciences 56:1078–1086.

Miller, D.A., and D.L. Otis. 2010. Calibrating recruitment estimates for mourning doves from harvest age ratios. Journal of Wildlife Management 74:1070-1079.

Otis, D.L. 2002. Survival models for harvest management of mourning dove populations. Journal Wildlife Management 66:1052-1063.

Otis, D.L. 2006. A mourning dove hunting regulation strategy based on annual harvest statistics and banding data. Journal of Wildlife Management 70:1302-1307.

Runge, M. C., W. L. Kendall, and J. D. Nichols. 2004. Exploitation. Pages 303-328 *in* W. J. Sutherland, I. Newton, and R. E. Green, editors. Bird Ecology and Conservation: A Handbook of Techniques. Oxford University Press, Oxford, UK.

Sanders, T.A., and D.L. Otis. 2012. Mourning dove reporting probabilities for web-address versus toll-free bands. Journal Wildlife Management 76:480-488.

Sanders, T. A., and M. E. Seamans. 2012. Predictive models for use in mourning dove harvest management. Unpublished report, 30 October 2012. U.S. Department of the Interior, Fish and Wildlife Service, Division of Migratory Bird Management, Washington, D.C.

Schaefer, M. B. 1954. Some aspects of the dynamics of populations important to the management of commercial marine fisheries. Bulletin of the Inter-American Tropical Tuna Commission 1:25–56.

Seamans, M.E., R. Rau, and T.A. Sanders. 2012. Mourning dove population status 2012. U.S. Department of the Interior, Fish and Wildlife Service, Division of Migratory Bird Management Washington, D.C., USA.

USFWS. 2013a. Issuance of annual regulations permitting the hunting of migratory birds; final supplemental environmental impact statement. U.S. Department of the Interior, USFWS.

USFWS. 2013b. Migratory bird hunting; proposed frameworks for early-season migratory bird hunting regulations; notice of meetings. Federal Register 78(144):45376-45404.

Appendix. Estimates of mourning dove population size in each Management Unit, 2003-2014.

	Management Unit							
	Eastern		Central		Western		Total (United States)	
Year	N	SE	N	SE	N	SE	N	SE
2003	95,185,770	5,928,485	113,160,426	8,793,019	130,689,722	23,709,255	339,035,919	25,972,926
2004	83,727,068	3,682,688	211,882,352	14,364,455	85,252,984	10,800,723	380,862,403	18,345,445
2005	132,684,439	5,519,978	191,487,791	14,014,384	38,424,695	3,863,246	362,596,925	15,549,848
2006	89,701,708	3,601,794	198,713,688	13,114,280	49,961,993	4,600,355	338,377,388	14,356,898
2007	102,380,934	4,595,082	158,182,346	10,146,315	59,860,570	4,387,999	320,423,850	11,971,509
2008	98,054,573	4,040,673	169,328,484	10,710,906	52,516,245	4,289,543	319,899,303	12,225,004
2009	103,089,071	4,237,048	148,487,151	8,868,563	50,903,066	3,438,976	302,479,288	10,412,999
2010	89,879,549	4,158,696	149,107,614	9,485,894	54,699,102	3,825,339	293,686,264	11,041,293
2011	85,742,115	4,454,969	125,454,975	6,963,865	51,056,398	3,866,139	262,253,488	9,126,291
2012	86,822,493	4,426,412	148,465,032	12,040,150	69,355,734	5,485,348	304,643,259	13,951,609
2013	85,761,468	5,417,106	123,976,908	8,230,999	48,016,677	3,620,680	257,755,053	10,497,796
2014	68,270,783	3,483,106	161,674,016	9,607,487	43,697,391	3,252,203	273,642,189	10,724,395