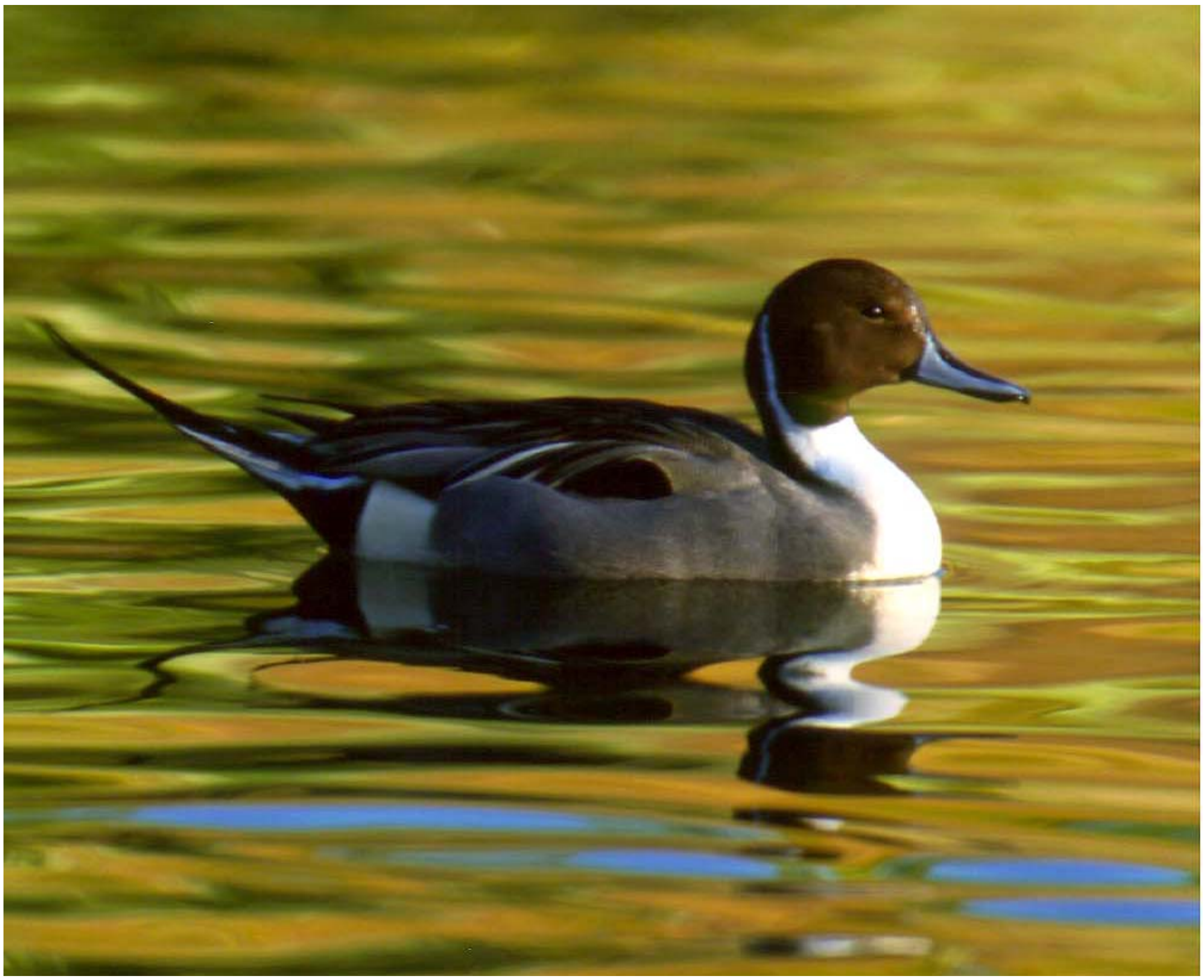
U. S. Fish and Wildlife Service

Northern Pintail
Harvest Strategy



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PREFACE

The process of setting waterfowl hunting regulations is conducted annually in the United States (Blohm 1989). This process involves a number of meetings where the status of waterfowl is reviewed by the 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 waterfowl managers and the public with information about the strategy for setting northern pintail-hunting regulations in the United States.

ACKNOWLEDGMENTS

This report was prepared by the USFWS Division of Migratory Bird Management. The principal authors were T. A. Sanders, M. C. Runge (U.S. Geological Survey), R. E. Trost, and G. S. Boomer. M. C. Runge and G. S. Boomer developed the technical framework to support the current strategy. Significant contributions in developing the strategy were made by D. Yparraguirre (California Department of Fish and Game), S. E. Sheaffer (Cornell University), R. A. Malecki (Cornell University), R. E. Trost , K. Wilkins (USFWS), J. Dubovsky (USFWS), C. Moore (USFWS), D. Caithamer (USFWS), F. A. Johnson, T. A. Sanders, and flyway biologists. Other individuals that provided essential information were K. Richkus (USFWS) and D. Caswell (Canadian Wildlife Servive). Comments regarding this document should be sent to the Chief, Division of Migratory Bird Management, U.S. Fish and Wildlife Service, 4401 North Fairfax Drive, MS MSP-4107, Arlington, VA 22203.

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Available on the web at: http://www.fws.gov/migratorybirds/reports/reports.html

TABLE OF CONTENTS

EXECUTIVE SUMMARY

In 1995 the U.S. Fish and Wildlife Service (USFWS) implemented the Adaptive Harvest Management (AHM) program for setting duck hunting regulations in the United States (Walters 1986, USFWS 2006). The AHM approach provides a framework for making objective decisions in the context of incomplete knowledge concerning waterfowl population dynamics and regulatory impacts.

Since at least 1995, the Flyway Councils have identified the northern pintail as a high-priority species for inclusion in the AHM process. The Pacific Flyway Council is credited with developing the initial harvest strategy, but many have contributed to the strategy's initial and subsequent development including biologists from State wildlife agencies, Flyway Councils, U.S. Fish and Wildlife Service, U.S. Geological Survey, and the New York Cooperative Fish and Wildlife Research Unit at Cornell University.

The USFWS adopted the cooperatively-developed northern pintail (*Anas acuta*) harvest strategy in 1997. The strategy is a prescribed, objective process for arriving at a state-dependent regulatory choice each year. Also, the strategy is adaptive in that it is a goal-oriented decision-making process where management performance can be improved as the effects of management actions and other events become better understood (USFWS 2006, Williams et al. 2007).

The goal of the strategy is to maintain harvest opportunity consistent with current population status while reducing acrimony about annual regulation setting by basing them on objective biological criteria. The population models require knowing the breeding population size and the mean latitude of the breeding population. This is determined annually in the Waterfowl Breeding Population and Habitat Survey conducted in May in the traditional survey areas (USFWS 1987). Based on a desired population growth of 6%, a harvestable surplus is determined and allocated among the Flyways according to historic distribution of harvest. Several constraints are placed on the process to allow for limited harvest even if little or no

population growth is expected. But, a bag limit greater than 1 requires projected population growth to be at least 6% with the increased bag.

Since adoption, the strategy has had a number of policy and technical modifications as additional data and insights have become available. Flyway-specific predicted harvest models were updated in 2002; a partial season (restrictive season within a liberal or moderate general duck season) option was added in 2004; and in 2006, flyway-specific harvest models and the age-ratio model were updated, and a model was added to adjust the size of the breeding population by removing bias associated with the population's latitude. In 2007, a compensatory harvest-mortality model was added to the Strategy that otherwise assumed harvest mortality to be additive to natural forms of mortality.

The compensatory model assumes that pintail survival during the period following the hunting season is density-dependent, and represents an alternative hypothesis about the effect of hunting mortality on pintail population change. The compensatory model is a competing model in the analytical framework used to prescribe harvest regulations under the current Strategy.

Predictions of pintail population size derived from the additive and compensatory models are compared to the results of past population surveys to determine the predictive reliability of each alternative model. These comparisons are then used to weight each model in a manner that reflects past predictive ability. The weighted average of the two models is then used to predict the subsequent year population size as a function of harvest. Model weights are updated annually by comparing model predictions with survey results. By iteratively updating model weights, the process should eventually identify which model is the best overall predictor of changes in population abundance. The model with the greatest predictive ability exerts greater influence in regulatory decisions over time. Current model weights favor the hypothesis that harvest mortality is additive (60%).

BACKGROUND

In 1995, the USFWS adopted the concept of adaptive resource management (Walters 1986) for regulating duck harvests in the United States (USFWS 2006). This approach explicitly recognizes that the consequences of hunting regulations cannot be predicted with certainty, and provides a framework for making objective decisions in the context of that uncertainty (Williams and Johnson 1995). Inherent in the adaptive approach is an awareness that management performance can be maximized only if regulatory effects can be predicted reliably. Thus, adaptive management relies on an iterative cycle of monitoring, assessment, and decision-making to clarify the relationships among hunting regulations, harvests, and waterfowl abundance for the purpose of improving management over time.

Since at least 1995, the Flyway Councils have identified the northern pintail as a high-priority species for inclusion in the AHM process. The Pacific Flyway, which takes about 55% of the pintail harvest, has been especially supportive of this effort. In 1996, the Pacific and Central Flyway Councils independently proposed prescribed harvest strategies for the 1996 season, but neither strategy was adopted by the USFWS (61 FR 38001, see Appendix A for publication details of pertinent Federal Register documents).

In July 1996, the Flyway Councils endorsed a resolution at the joint flyway meeting in Kansas City, Missouri (Joint Flyway Recommendation No. 13) that resulted in funding commitments from States and organizations in the Pacific and Central Flyways totaling $90,000 for incorporation of pintails into AHM. In 1997, the Pacific Flyway Council proposed a revised prescriptive harvest strategy and the Central Flyway Council proposed strategy remained unchanged for the 1997 season. The USFWS proposed to adopt a revised version of the Pacific Flyway Council harvest strategy (62 FR 31303). This revised pintail harvest strategy was adopted in 1997 (62 FR 39721 and 50662).

Biologists in the Pacific Flyway are credited with developing the initial prescribed harvest strategy, but many have contributed to the strategy's initial and subsequent development, including biologists from State wildlife agencies, Flyway Councils, U.S. Fish and Wildlife Service, U.S. Geological Survey, and the New York Cooperative Fish and Wildlife Research Unit at Cornell University. Since adoption, the strategy has undergone review (USFWS 2002, Runge and Boomer 2005) and received technical modifications as additional data and insights became available.

The harvest strategy was revised in 2002 when Flyway-specific harvest models were updated (67 FR 40131). In 2002 and 2003, the Service set pintail regulations that deviated from the strict prescriptions of the harvest strategy (i.e., partial season), but remained true to the intent of the strategy (67 FR 53694 and 59111; 68 FR 50019 and 55786). In 2004, the harvest strategy was modified to include a partial season option (69 FR 43696 and 52971). In adopting those changes, the USFWS and others called for review of the pintail strategy (69 FR 57142) and consideration of technical modifications that could be made to improve it (see Runge and Boomer 2005). As a result of this review, the strategy was revised in 2006 to include updated flyway-specific harvest models, an updated recruitment rate model, and the addition of a procedure for removing bias in the breeding population size estimate based on its mean latitude (71 FR 50227 and 55656). Pursuant to requests from flyways and other stakeholders, a compensatory model was added to the strategy in 2007 (72 FR 18334) as an alternative to the existing additive harvest model. The harvest strategy did not become adaptive on an annual basis until 2007 when the compensatory model was added. In the future, it is expected that the current prescribed strategy will be replaced with a derived strategy that is based on specific management objectives.

GOAL AND PURPOSE

The goal of the northern pintail harvest strategy is to maintain harvest opportunity consistent with current population status while reducing acrimony about annual regulation setting by basing regulations on objective biological criteria. The purpose is to identify the allowable daily bag limit between 1 and 3 that is consistent with the prescriptions of the strategy. Note that the current strategy is prescribed, not derived; the formal objectives have not been articulated. Rather, the state-dependent strategy is calculated using a number of rules:

1) The strategy relies on two state variables—the size and mean latitude of the northern pintail breeding population determined from the Waterfowl Breeding Population and Habitat Survey in May in the traditional survey areas,

2) The observed breeding population size is adjusted to account for relative bias as a function of the mean latitude of the population (described in the Technical Details section),
3) Predicted subsequent year northern pintail breeding population size is determined from the weighted average of the additive and compensatory models (described in the Technical Details section) accounting for:
   a) summer survival,
   b) predicted recruitment,
   c) predicted kill (comprising predicted harvest and crippling loss), and
   d) winter survival,
4) There is a desire to maintain a distribution of harvest among flyways consistent with "contemporary" levels (Pacific Flyway = 0.55, Central Flyway = 0.20, Mississippi Flyway = 0.20, and Atlantic Flyway = 0.05), and
5) There is a desire to achieve a population growth rate of at least 6%.

The strategy stipulates the regulations using the following considerations:

1) Except in certain circumstances (partial season), the pintail season length is determined by the general duck season length; and the pintail strategy is used to determine the bag limit.
2) The pintail season is closed when the observed breeding population (oBPOP) is less than 1.5 million and the predicted fall flight is less than 2.0 million.
3) A partial season (restrictive season length) is warranted when the oBPOP or predicted fall flight exceeds the closure level but the oBPOP is less than 2.5 million and the population model predicts a decline in the population size with a 1 bird bag under the full season length (liberal or moderate general duck season).
4) A full season, minimum 1-bird daily bag limit is called for when the oBPOP exceeds 2.5 million, regardless of the following year's projection.
5) A full season with a 2- or 3-bird bag limit is called for when the model predicts population growth of at least 6% under the corresponding bag limit.

Thus, if the conditions for a season closure are not met, then the bag limit is at least 1 regardless of expected population growth in the subsequent year. If expected population growth of 6% in the subsequent year can be achieved with 2 or 3 in the bag then allow the larger bag limit. However, if the population is less then 2.5 million and a 1 bird bag in the otherwise moderate or liberal alternative is expected to result in negative population growth in the subsequent year then the season is restrictive (partial season within the general duck season).

HARVEST STRATEGY

The prescribed harvest strategy described above is state-dependent in that it specifies pintail harvest regulations as a function of breeding population size and latitude. Graphical depiction of the strategy allows visual comparison of alternative additive, compensatory, and weighted additive-compensatory models (Figures 1 and 2). At moderate population size and latitude, the compensatory model allows for greater harvest (Figure 1b) than does the additive model (note especially that the size of the restrictive region [season-within-a-season] is smaller and is invoked when the latitude is higher). Also, 2- and 3-bird bags are called for under more circumstances. But, at high population sizes, the higher bag limits are called for less often, because the compensatory model predicts that growth of the population will be slower (density-dependence). The 2006 average model calls for a strategy that is intermediate between the additive and compensatory models (Figure 1c).

The harvest strategy does depend on the duck season framework specified by AHM for the general duck season in that the options available for pintail management depend on the overall framework. Thus, if the AHM general duck season length is liberal or moderate, the pintail regulations include 1-, 2-, and 3-bird bags, and a restrictive season length option (season-within-a-season) (Figure 2a and 2b). When the AHM season length is restrictive, the options for the pintail regulations include 1-, 2-, and 3-bird bags (Figure 2c).

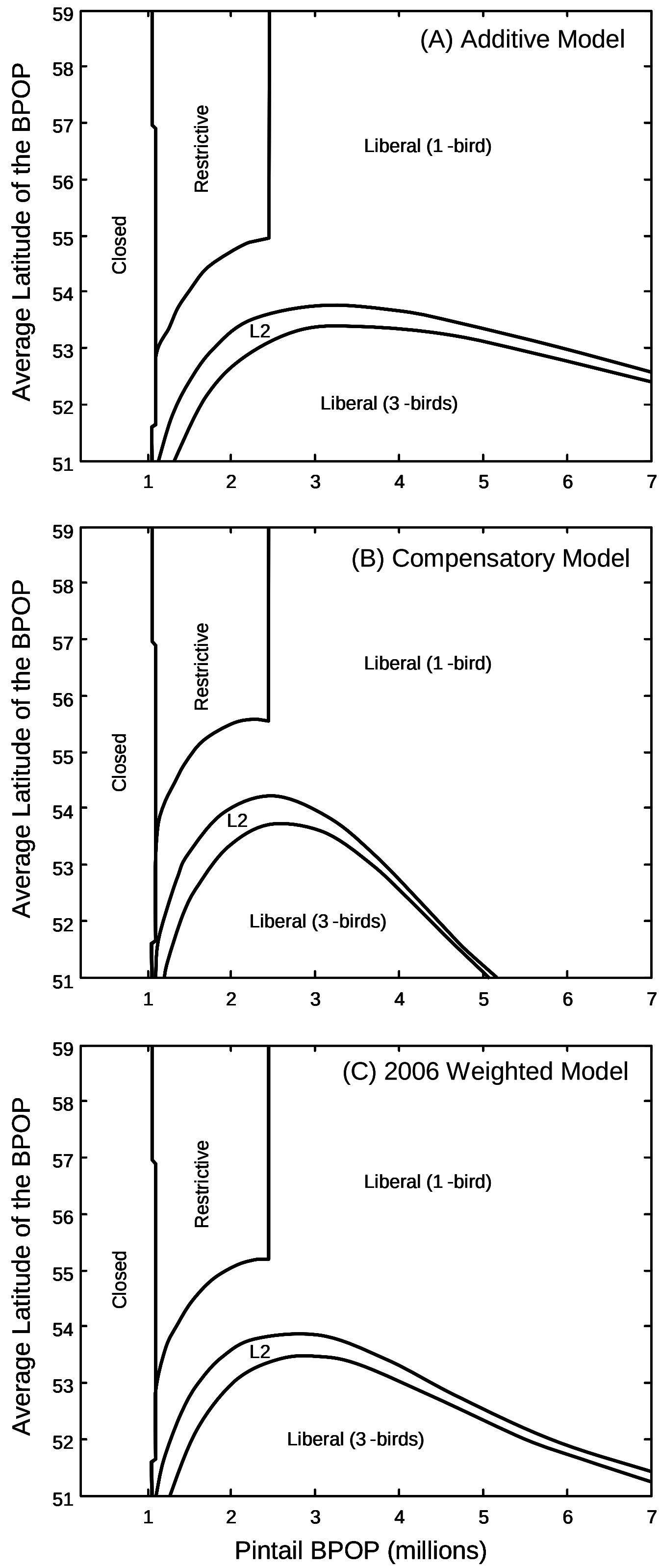

Figure 1. State-dependent harvest strategy with (A) additive, (B) compensatory, and (C) 2006 weighted models. In each case, the strategy assumes that the duck season package is Liberal.

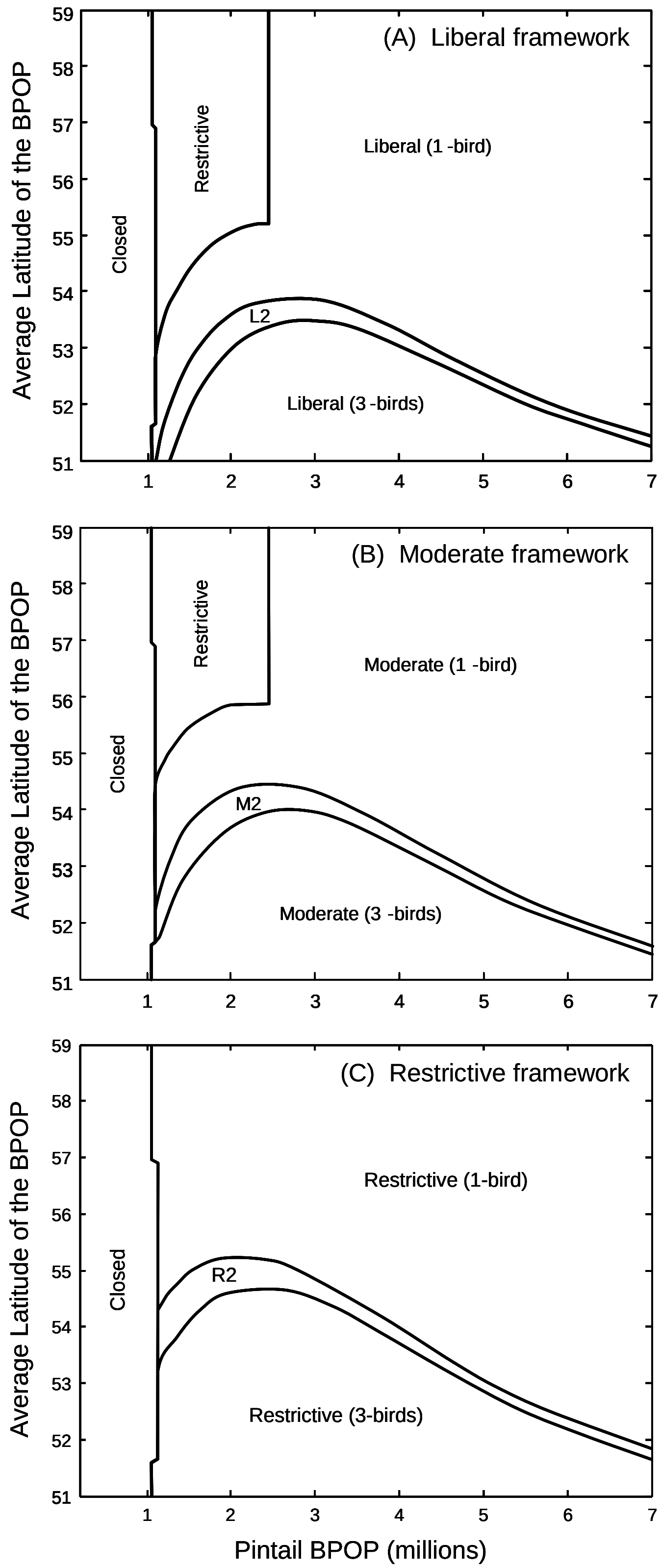

Figure 2. State-dependent harvest strategy with the 2006 weighted model, under (A) Liberal, (B) Moderate, and (C) Restrictive duck season packages.

TECHNICAL DETAILS

The northern pintail harvest strategy depends on two current-year input variables determined from the Waterfowl Breeding Population and Habitat Survey in May in the traditional survey areas; breeding population size and mean latitude of the breeding population. Given these input variables, the procedure of identifying the maximum daily bag limit and season length for the upcoming hunting season involves the following calculations developed by Runge and Boomer (2005) and Runge (2007).

Latitude Bias Correction Model

Northern pintails tend to settle on breeding territories farther north during years when the prairies are dry and farther south during wet years. When pintails settle farther north, a smaller proportion are counted during the Waterfowl Breeding Population and Habitat Survey, thus the population estimate is biased low in comparison to years when the birds settle farther south. This phenomenon may be a result of decreased detectability of pintails during surveys in northern latitudes compared to southern latitudes or because birds settle in regions not covered by the survey. The degree of overall bias appears to depend on the distribution of the pintail population among northern and southern strata, a distribution that is captured to a large degree by the mean latitude of the breeding population.

The latitude-adjusted breeding population size in year *t* ($cBPOP_t$) is calculated as

$$cBPOP_t = e^{\ln oBPOP_t + 0.0741(mLAT_t - 51.68)} \qquad (1)$$

where $oBPOP_t$ is the observed breeding population size in year *t* and $mLAT_t$ is the mean latitude of the observed breeding population in year *t*.

The mean latitude of the northern pintail breeding population is the distribution centroid or balance point for the traditional strata (1-50, 75-77) of the Waterfowl Breeding Population and Habitat Survey, and is the average latitude of survey strata weighted by abundance of the species in each survey strata. Mean latitude of the observed breeding population in year *t* is calculated as

$$mLat_t = \sum_j [l_j (oBPOP_{tj} / oBPOP_t)] \qquad (2)$$

where l_j is the latitude of survey stratum *j*.

Population Models

Two population models are considered: one in which harvest is additive to natural mortality, and another in which harvest is compensatory to natural mortality. The models differ in how they handle the winter survival rate. In the additive model, winter survival rate is a constant, whereas winter survival is density-dependent in the compensatory model.

The predicted $cBPOPt$ in year *t* + 1 ($cBPOP_{t+1}$) for the additive harvest mortality model is calculated as

$$cBPOP_{t+1} = \left\{cBPOP_t s_s (1+\gamma_R \hat{R}_t) - \hat{H}_t / (1-c)\right\} s_w \quad (3)$$

where $cBPOP_t$ is the latitude-adjusted breeding population size in year *t*, s_s and s_w are the summer and winter survival rates, respectively, γ_R is a bias-correction constant for the age-ratio, *c* is the crippling loss rate, $\hat{R}_t$ is the predicted age-ratio, and $\hat{H}_t$ is the predicted continental harvest. Discussion of $\hat{R}_t$ and $\hat{H}_t$ submodels are found in the following sections. The model uses the following constants: s_s = 0.07, s_w = 0.93, γ_R = 0.8, and *c* = 0.20.

The compensatory harvest mortality model serves as a hypothesis that stands in contrast to the additive harvest mortality model, positing a strong but realistic degree of compensation. The compensatory model assumes that the mechanism for compensation is density-dependent post-harvest (winter) survival. The form is a logistic relationship between winter survival and post-harvest population size, with the relationship anchored around the historic mean values for each variable. For the compensatory model then, predicted winter survival rate in year *t* (s_t) is calculated as

$$s_t = s_0 + (s_1 - s_0)\left[1 + e^{-(a+b(P_t - \bar{P}))}\right]^{-1} \quad (4)$$

where s_1 (upper asymptote) is 1.0, s_0 (lower asymptote) is 0.7, *b* (slope term) is -1.0, P_t is the post-harvest population size in year *t* (expressed in millions), $\bar{P}$ is the mean post-harvest population size (4.295 million from 1974 through 2005), and

$$a = \text{logit}\left(\frac{\bar{s} - s_0}{s_1 - s_0}\right)$$

or

$$a = \log\left(\frac{\bar{s} - s_0}{s_1 - s_0}\right) - \log\left\{1 - \left(\frac{\bar{s} - s_0}{s_1 - s_0}\right)\right\} \quad (5)$$

where $\bar{s}$ is 0.93 (mean winter survival rate).

Age Ratio Submodel

Recruitment in year *t* (R_t) is measured by the vulnerability-adjusted, female age-ratio in the fall population and is calculated as

$$R_t = \exp(7.6048 - 0.13183 mLAT_t - 0.09212 cBPOP_t) \quad (6)$$

where $mLAT_t$ is the mean latitude of the observed breeding population in year *t* and $cBPOPt$ is the latitude-adjusted breeding population in year *t* (expressed in millions).

Harvest Submodel

Predicted continental harvest in year *t* ($\hat{H}_t$) is calculated as

$$\hat{H}_t = H_{pf} + H_{cf} + H_{mf} + H_{af} + H_{akcan} \quad (7)$$

where H_{pf} is predicted harvest in the Pacific Flyway, H_{cf} is predicted harvest in the Central Flyway, H_{mf} is predicted harvest in the Mississippi Flyway, H_{af} is predicted harvest in the Atlantic Flyway, and H_{akcan} is predicted harvest in Alaska and Canada and is a fixed value equal to 67,000 birds (the average harvest in Alaska and Canada from 1996 through 2003 was 65,910). Flyway specific harvest is calculated as

$$H_{pf} = -12051.41 + 1160.960 Days + 73911.49 Bag \quad (8)$$

$$H_{cf} = -95245.20 + 2946.285 Days + 15228.03 Bag + 23136.04 Sis \quad (9)$$

$$H_{mf} = -59083.66 + 3413.49 Days + 7911.95 Bag + 59510.10 Sis \quad (10)$$

$$H_{af} = -2403.06 + 360.950 Days + 5494.00 Bag \quad (11)$$

where *Days* is the season length, *Bag* is the daily bag limit, and *Sis* is an indicator variable with a value equal to 0 (full season equal to the regulatory alternative season length liberal, moderate, or restrictive for general duck season AHM) or 1 (restrictive season within the liberal or moderate regulatory alternative for general duck season AHM, i.e., partial season).

Model Weights

The fit to historic data is used to compare the alternative additive and compensatory harvest models. From the $cBPOP_t$, $mLAT_t$, and observed harvest (H_t) for the period 1974–through year *t*, the subsequent year's breeding population size (on the latitude-adjusted scale) is predicted with both the additive and compensatory model, and compared to the observed breeding population size (on the latitude-adjusted scale). The mean-squared error of the predictions from the additive model (MSE_{add}) is calculated as

$$MSE_{add} = \frac{1}{(t-1975)+1} \sum_{t=1975}^{t} (cBPOP_t - cBPOP_t^{add})^2 \quad (12)$$

and mean-squared error of the predictions from the compensatory model is calculated in a similar manner.

The model weights for the additive and compensatory model are calculated from their relative mean-squared errors. The model weight for the additive model (W_{add}) is calculated as

$$W_{add} = \frac{\frac{1}{MSE_{add}}}{\frac{1}{MSE_{add}} + \frac{1}{MSE_{comp}}} \tag{13}$$

The model weight for the compensatory model is found in a corresponding manner, or by subtracting the additive model weight from 1.0.

As of 2006, the compensatory model did not fit the historic data as well as the additive model (Figure 3). The mean-squared errors were 0.3995 for the additive model and 0.5912 for the compensatory model. Thus, the model weights, based on 2006 data, were 0.597 for the additive model, and 0.403 for the compensatory model.

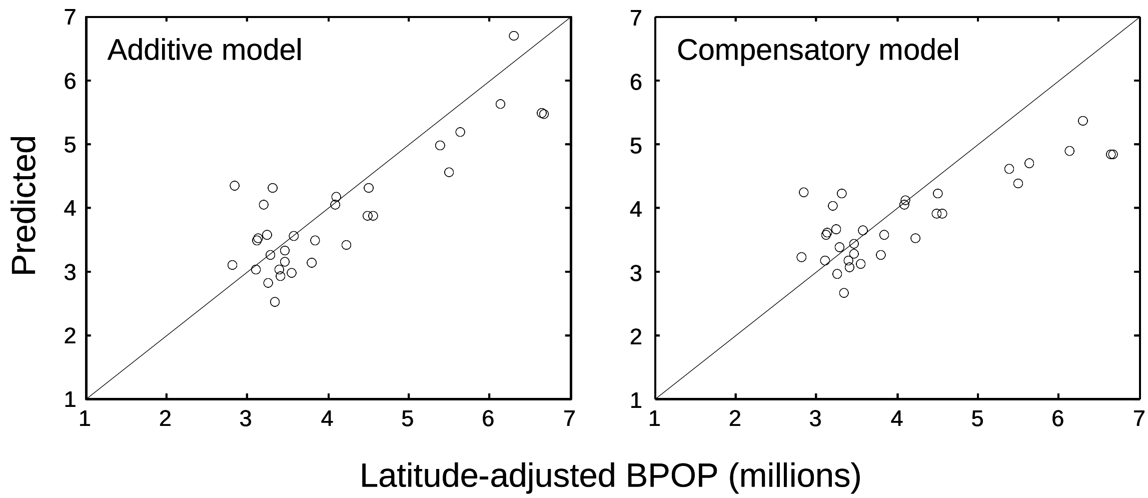

Figure 3. Predicted vs. observed breeding population size (latitude-adjusted), 1975-2006, for the additive and compensatory models.

The weighted average of the additive and compensatory models is then used to predict the size of the breeding population in the subsequent year a function of harvest. Model weights are updated annually by comparing model predictions with survey results. By iteratively updating model weights, the process should eventually identify which model is the best overall predictor of changes in population abundance. The model with the greatest predictive ability exerts greater influence in regulatory decisions over time.

Other Calculations

Based on equations 2 and 3, predicted production in year t (r_t) may be calculated as

$$r_t = cBPOP_t s_s(\gamma_R R_t), \tag{14}$$

predicted fall flight in year t (F_t) may be calculated as

$$F_t = cBPOP_t s_s(1 + \gamma_R R_t), \tag{15}$$

and post-harvest population size in year t (P_t) may be calculated as

$$P_t = cBPOP_t s_s (1 + \gamma_R R_t) - H_t /(1 - c) \qquad (16)$$

Yield Curves

The yield curve for the additive model suggests a carrying capacity of 7.32 million (on the latitude-adjusted scale), maximum sustained kill of 444,000 at an equilibrium population size of 3.34 million, and an optimal harvest rate of 10.7% (Runge and Boomer 2005).

The yield curve for the compensatory model is significantly skewed compared to the additive model (Figure 4). On the right shoulder, as the harvest rate increases, the yield increases quickly with very little decrease in the equilibrium population size; thus, to some extent, the harvest is very nearly "free". The maximum sustainable yield is higher for the compensatory model (560 thousand), but the implied carrying capacity is lower (4.67 million) and the optimal equilibrium population size is also lower (3.00 million). The optimal harvest rate (the harvest rate that produces the maximum sustainable yield) is 14.8%.

The average model, weighted using 2006 data, produces a yield curve that is intermediate between the additive and compensatory models. On the right shoulder, the effect of harvest is less pronounced than in the additive model, but not as dramatically as in the compensatory model. The implied carrying capacity is intermediate between the additive and compensatory models (5.50 million), the maximum sustainable yield is 488 thousand at an equilibrium population size of 3.09 million, and the optimal harvest rate is 12.6%.

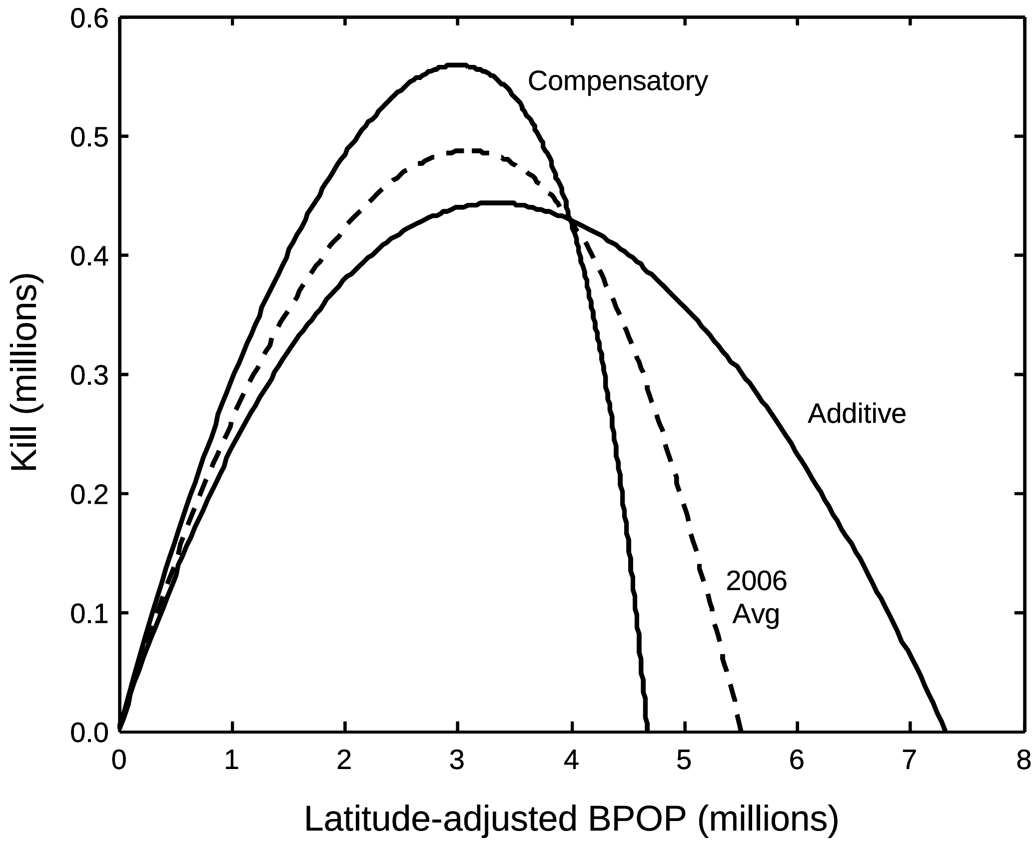

Figure 4. Equilibrium yield curves for three models: additive, compensatory, and 2006 average.

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APPENDICIES

APPENDIX A. List of Federal Register documents pertinent to the northern pintail harvest strategy.

Publication Date	Volume	Number	Page
22 July 1996	61	141	38001
6 June 1997	62	109	31303
23 July 1997	62	141	39721
26 September 1997	62	187	50662
11 June 2002	67	112	40131
16 August 2002	67	159	53694
19 September 2002	67	182	59111
19 August 2003	68	160	50019
26 September 2003	68	187	55786
21 July 2004	69	139	43696
24 August 2004	69	163	52131
24 August 2004	69	167	52971
23 September 2004	69	184	57141
24 August 2006	71	164	50227
22 August 2006	71	184	55656
11 April 2007	72	69	18334

APPENDIX B. Observed breeding population size (*oBPOP*), average latitude of the breeding population (*mLAT*), latitude-bias corrected breeding population size (*cBPOP*), observed vulnerability-adjusted female fall age-ratio (*R*), observed continental harvest (*H*), and calculated post-harvest population size (*P*), for northern pintails, 1974-2006.

Year	*oBPOP*	*mLAT*	*cBPOP*	*R*	*H*	*P*
1974	6,598,180	53.062	7,307,800	1.20909	1,413,293	8,296,885
1975	5,900,370	52.584	6,307,600	1.09643	1,798,365	6,040,235
1976	5,475,650	53.231	6,141,000	0.93177	1,545,202	5,571,517
1977	3,926,090	58.857	6,680,700	0.57118	1,203,693	5,308,768
1978	5,108,180	52.689	5,503,400	1.41496	1,491,598	6,348,653
1979	5,376,130	52.327	5,638,800	1.14504	1,482,262	5,710,057
1980	4,508,080	56.936	6,653,300	0.49626	1,233,913	4,963,908
1981	3,479,480	57.590	5,390,200	0.61967	919,750	4,493,934
1982	3,708,760	53.060	4,107,100	1.58871	908,331	5,393,551
1983	3,510,640	55.054	4,506,700	0.84399	925,176	4,128,241
1984	2,964,800	56.029	4,091,100	0.89692	786,518	3,935,481
1985	2,515,490	55.139	3,249,600	0.63552	627,678	2,646,627
1986	2,739,750	54.852	3,464,900	1.1057	529,462	3,909,041
1987	2,628,340	55.832	3,574,300	0.75154	615,711	3,236,660
1988	2,005,520	59.064	3,465,400	0.73144	279,230	3,496,193
1989	2,111,900	56.880	3,103,900	1.53817	336,787	4,425,369
1990	2,256,630	57.807	3,552,500	1.28416	318,263	4,643,629
1991	1,803,380	59.805	3,292,000	0.61751	251,356	3,128,597
1992	2,098,140	57.659	3,266,800	0.58066	260,287	3,023,665
1993	2,053,420	55.946	2,816,100	1.03192	290,367	3,235,666
1994	2,972,270	53.563	3,416,500	1.33246	360,447	4,490,307
1995	2,757,860	53.729	3,209,300	0.96957	575,694	3,269,411
1996	2,734,490	53.509	3,130,600	0.96575	585,367	3,152,802
1997	3,557,993	52.707	3,838,500	1.35352	766,781	4,637,946
1998	2,520,648	55.392	3,318,000	0.63723	645,455	2,699,806
1999	3,057,886	54.610	3,798,500	0.94808	594,612	3,932,403
2000	2,907,561	57.739	4,554,200	0.61138	553,807	4,054,915
2001	3,295,994	55.854	4,489,500	0.62459	473,528	4,121,034
2002	1,789,710	57.910	2,838,900	0.66425	380,437	2,567,698
2003	2,558,229	55.286	3,340,900	1.14554	389,063	3,995,497
2004	2,184,602	56.498	3,121,100		372,038	
2005	2,560,531	55.481	3,392,764		455,844	
2006	3,386,425	54.676	4,227,175			