

To: Flyway Technical Committees
From: Pintail Working Group
Date: 9 February 2024
Re: Proposed Interim Northern Pintail Harvest Strategy

Executive Summary

Over the past five years, scientists from the U.S. Geological Survey (USGS) and the U.S. Fish and Wildlife Service (USFWS), in consultation with the Flyway Councils, have collaborated on the development of a derived framework for pintail harvest management. The Flyway Councils and USFWS undertook the revision process due to several concerns about the current strategy, including public desires for inclusion of a more liberal regulatory alternative, reliance on outdated modeling techniques and data, and communication challenges associated with the regulatory schedule. In response to these concerns, the USFWS convened a Pintail Working Group (PWG), composed of 2 representatives from each Flyway, the 4 Division of Migratory Bird Management (DMBM) Flyway Representatives, and technical experts from the USFWS and USGS. The PWG has overseen a full evaluation of pintail population and harvest dynamics and has developed and evaluated a large number of alternative harvest strategies. New models for pintail population dynamics and harvest dynamics have been built from scratch, using updated data and modern estimation methods. These models have been embedded in optimization algorithms to generate state-dependent harvest strategies, and the alternative strategies have been evaluated through simulation modeling. Throughout this period, the PWG has provided regular updates to the Flyway Councils and has sought feedback, notably on policy preferences.

In January 2024, after extensive consultation, the PWG identified a new proposed interim harvest strategy for northern pintails. The purpose of this interim harvest strategy is to inform harvest management decisions for northern pintails and to learn about the effects of a 3-bird daily bag limit on management objectives. In consultations with the Flyways, the PWG identified the following set of fundamental objectives: conserve pintail population in perpetuity, provide high-quality hunting opportunities commensurate to population status, minimize regulatory burden on the public, communicate effectively with stakeholders and the public, encourage hunter participation, maintain parity of hunting opportunity across Flyways, and provide other non-consumptive uses. The harvest strategy seeks an appropriate balance of this set of fundamental objectives by (a) seeking to maximize cumulative harvest over the long term, which inherently requires perpetuation of a viable population; (b) providing an open hunting season when the observed breeding population is above 1.2 million birds; (c) allowing a liberal season length with a 3-bird bag under some conditions; and (d) providing a fixed 3-bird bag-limit in the Atlantic Flyway whenever the pintail season is open elsewhere. The derived harvest strategy is state-dependent in that it specifies pintail harvest regulations as a function of breeding population size and latitude. The strategy calls for a closed season whenever the observed breeding population size falls below 1.2 million. Assuming that harvest management adheres to this strategy (and that current model parameters accurately reflect population dynamics), breeding-population size would be expected to average 2.01 million birds with a mean annual observed harvest of 467,000 birds. The expected frequency of closed seasons is 12.6%, the frequency of liberal seasons with a 1-bird bag is 31.4%, and the frequency of liberal seasons with

2- and 3-bird bag limits is 0.8% and 55.2%, respectively. The regulatory alternative is expected to change in 20.9% of years.

The interim pintail harvest strategy is intended to be implemented on an experimental basis until three seasons of the 3-bird daily bag limit have been selected, with an allowance for an additional 2 years to allow for data collection, analysis, review of performance, and evaluation of updated strategies. The results of the evaluation will be provided to the Flyway Technical Committees for consideration, with the expectation that deliberation by the Flyway Councils will follow. It is intended that an operational Northern Pintail Harvest Strategy will be negotiated and implemented based on the results of the interim phase, with the support of the Flyways and the USFWS.

Background

Each year, the Director of the U.S. Fish and Wildlife Service (USFWS), acting on behalf of the Secretary of the Interior under authority granted by the Migratory Bird Treaty Act (MBTA), opens a hunting season for ducks, including northern pintails (*Anas acuta*), if conditions allow. The decisions of the Director, typically made through the Service Regulations Committee (SRC), are informed by input from the four Flyway Councils, which were established based on a 1951 International Association of Fish and Wildlife Agencies recommendation, and which are guided by individual Memoranda of Understanding with the USFWS. The broad framework and process for this set of decisions is described in a Final Supplemental Environmental Impact Statement (FSEIS) that was published in 2013, replacing earlier versions (1975, 1988). One of the significant changes between the 1988 FSEIS and the 2013 FSEIS was that the annual regulations for duck hunting are now set prior to the Breeding Waterfowl Population and Habitat Survey.

Since 2010, harvest management of pintails has been guided by a strategy that was developed cooperatively by the USFWS and the four Flyway Councils, under the framework of the 1988 FSEIS. Fourteen seasons of implementation of the current pintail strategy, including eight hunting seasons under the 2013 FSEIS, have provided valuable data and experience about both the performance of the harvest strategy and its communication.

Several concerns about the current pintail strategy have arisen. First, the FSEIS has created a difficult communication challenge, in that regulations set in advance of the breeding season are sometimes contraindicated by breeding population survey results in May. Second, there is a vocal segment of the hunting community that would like the opportunity, or at least option, for a 3-bird daily bag limit, when conditions allow. Third, none of the parameters in the population models underlying the pintail strategy have been updated since 2010 (most have not been updated since 2005, despite some changes in monitoring efforts), and there are questions about whether the model predictions are tracking observed results from monitoring programs. Fourth, there remain differences of opinion across Flyways about the relative importance of the various objectives of pintail harvest management, for example, with some Flyways asking whether increased hunting opportunity is possible and others asking whether regulations can be simpler. Fifth, resolution of critical uncertainty has been slow, because the current pintail strategy does not actively seek to reduce uncertainty; some stakeholders believe resolution of uncertainty could lead to better achievement of the objectives. Sixth, the Flyways, states, and hunting public desire

a better intuitive understanding of current pintail population dynamics, the models used to describe them, and the relationship to the harvest strategy.

In November 2018, in response to these concerns, the USFWS convened a Pintail Working Group (PWG), composed of 2 representatives from each Flyway, the 4 Division of Migratory Bird Management (DMBM) Flyway Representatives, and technical experts from the USFWS and USGS. Over the past five years, the PWG has overseen a full evaluation of pintail population and harvest dynamics and has developed and evaluated a large number of alternative harvest strategies. New models for pintail population dynamics and harvest dynamics have been built from scratch, using updated data and modern estimation methods. These models have been embedded in optimization algorithms to generate state-dependent harvest strategies, and the alternative strategies have been evaluated through simulation modeling. Throughout this period, the PWG has provided regular updates to the Flyways and has sought feedback, notably on policy preferences. In January 2024, after extensive consultation, the PWG identified a new proposed interim harvest strategy for northern pintails.

This document describes the proposed harvest strategy for northern pintails, for consideration by the Flyways and the USFWS. In order to be implemented, a proposed strategy needs to be endorsed by the four Flyway Councils, approved by the SRC, then adopted by the USFWS through rulemaking. If a proposal is endorsed by the Councils in March 2024 and the SRC in April 2024, it is anticipated that it could be implemented for the 2025-2026 hunting season.

Purpose and Objectives

The purpose of this harvest strategy is to inform harvest management decisions for northern pintails. The strategy identifies annually an optimal, state-dependent, regulatory alternative to best achieve the harvest management objectives based on a set of regulatory alternatives and models of system dynamics.

In consultations with the Flyways, the PWG identified the following set of fundamental objectives for consideration in the development of the pintail harvest strategy:

- A. Conserve pintail populations in perpetuity
 - 1. Maintain the average pintail population at or above its maximum net productivity level (the population size at maximum sustained yield), taking into account long-term habitat conditions. That is, the harvest strategy should maintain the average population at the peak of or on the “right shoulder” of the yield curve indefinitely.
- B. Provide high-quality harvest opportunities commensurate to population status
 - 2. Maximize¹ sustained annual harvest
 - 3. Minimize the frequency of closed seasons
 - 4. Minimize the frequency of restrictive seasons

¹ The terms “maximize” and “minimize” express the desired direction for each objective and should be understood to be preceded by the phrase “All other things equal...”. When evaluating alternative strategies, all other things are rarely equal, that is, the strategy that has the highest sustained annual harvest may not be the one that minimizes the frequency of closed seasons. Thus, in practice, a balance is sought in which few individual objectives are maximized or minimized.

5. Maximize the frequency of liberal seasons
- C. Minimize regulatory burden on the public
6. No partial seasons
 7. Minimize the frequency of regulatory changes
 8. Minimize the complexity of the regulations
- D. Communicate effectively with stakeholders and the public
9. Maximize understanding of the process by which hunting regulations are set
 10. Minimize counter-intuitive regulations (regulations at odds with current conditions, resulting from the timing of decisions under the FSEIS)
- E. Encourage hunter participation
11. via (B) and (C) above
- F. Maintain parity of hunting opportunity across Flyways
12. Maintain equitable distribution of harvest across flyways
- G. Provide other non-consumptive uses (e.g., wildlife viewing)
13. Maximize sustained population size

The harvest strategy seeks an appropriate balance of this set of fundamental objectives by (a) seeking to maximize cumulative harvest over the long term, which inherently requires perpetuation of a viable population; (b) providing an open hunting season when the observed breeding population is above 1.2 million birds; (c) allowing a liberal season length with a 3-bird bag under some conditions; and (d) providing a fixed 3-bird bag-limit in the Atlantic Flyway whenever the pintail season is open elsewhere.

Regulatory Options and Harvest

The harvest strategy considers a range of regulatory alternatives that includes a closed season, and 1-bird, 2-bird, and 3-bird bag limits. The maximum pintail season length depends on the general duck season framework (characterized as liberal, moderate, or restrictive), as specified by Flyway-specific Adaptive Harvest Management (AHM) protocols.

Notably, the strategy allows for a 3-bird bag limit when the population size and expected fall flight are large enough to support the corresponding harvest. This is a significant change from the 2010 strategy, which only allows a maximum 2-bird bag limit.

For the Atlantic Flyway, the strategy calls for a fixed 3-bird bag limit, provided that the pintail season is open in the other Flyways. If the pintail strategy calls for a closed season, then the season is also closed in the Atlantic Flyway. This option was requested by the Atlantic Flyway in order to simplify regulations. In the period 2010–2018, harvest in the Atlantic Flyway constituted an average of 3.3% of the continental pintail harvest. Given this low contribution to the harvest, allowing the fixed 3-bird bag limit has very little effect on the harvest opportunity in the other flyways.

The optimal state-dependent pintail regulation is calculated under the assumption of a liberal season length in all Flyways. If the season length of the general duck season determined by Flyway-specific AHM is less than liberal in any of the Flyways, then the season length for pintails matches that of the general duck framework, and the pintail bag-limit is as called for under this strategy. (Note that this aspect of the harvest strategy differs from the 2010 pintail harvest strategy, which contained substitution rules that allowed increased bag limits when the season was shorter.)

The models that predict continental pintail harvest as a function of regulations now include an estimate of the fall flight as a predictor (Fig. 1). Such models were not possible in the 2010 strategy because reliable estimates of fall flight were not available; now the integrated population model for continental pintail dynamics can estimate fall flight. This change in the modeling has an important effect on the harvest strategies because if the population size declines, so does the fall flight, and so does the harvest under a given regulatory package; this feedback effect allows sustainable harvest under conditions that were not previously thought to be sustainable.

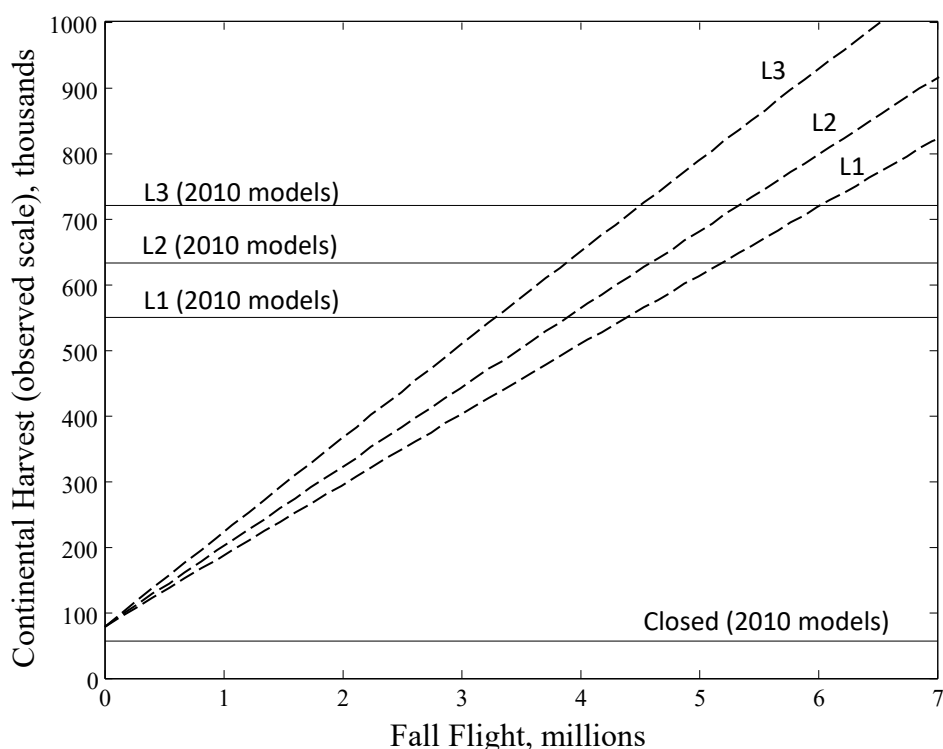


Figure 1. Predicted continental northern pintail harvest (including all four Flyways, Alaska, and Canada) as a function of the continental fall flight. The models used in the 2010 pintail harvest strategy are shown with solid lines, the new models with dashed lines. The mean fall flight over the period 1985–2018 was 4.47 million birds. Note that the predicted harvest is on the observed scale (as reported in the Harvest Survey), not the corrected scale internal to the pintail population model.

Models and Optimization

The harvest strategy relies on models for two state variables: the size and mean latitude of the continental breeding population of northern pintails, as determined from the Waterfowl Breeding Population and Habitat Survey in May in the traditional survey areas. The observed breeding population size is adjusted to account for relative bias as a function of the mean latitude of the population. Pintail breeding population size (BPOP) and mean latitude are used to predict pintail recruitment. The subsequent year's pintail breeding population size is predicted using a full balance-equation model, which accounts for summer survival, predicted recruitment, predicted kill (comprising predicted harvest and crippling loss), and winter survival. Harvest mortality is partially compensatory with natural mortality for females, and fully additive for males. The parameters for the population model are estimated from an Integrated Population Model (IPM) using Bayesian Markov-chain Monte Carlo methods (Boomer et al., *in prep.*). As noted above, the IPM can produce an estimate of fall flight as an intermediate variable.

The mean latitude of the breeding population is predicted from a first-order auto-regressive time series model. It is expected that the population model, the latitude model, and the harvest model will be updated with incoming data on a regular basis in the future.

Stochastic dynamic programming is used to find the state-dependent solution that best achieves the objectives for northern pintail harvest management (Lubow 1995, Johnson and Williams 1999). This optimization process is based on: (1) the regulatory alternatives; (2) current population, latitude, and harvest models for northern pintails; and (3) the objective of maximizing long-term cumulative harvest including the closed-season constraint.

Harvest Strategy

The derived harvest strategy is state-dependent in that it specifies pintail harvest regulations as a function of breeding population size and latitude (Fig. 2). The strategy calls for a closed season whenever the observed breeding population size falls below 1.2 million. There is a band of population size above 1.2 million and below 2.0 million where a liberal season with a 1-bird bag limit is called for; the width of this band varies with the mean latitude of the BPOP. Above this band, the strategy largely calls for liberal seasons with a 3-bird bag limit; the 2-bird bag limit is called for only in a narrow sliver of the strategy.

The proposed strategy was derived with the inclusion of a threshold at an observed breeding population size 1.2 million, above which the season was constrained to be open. "Closure thresholds" between 1.0 million and 1.75 million were explored and were shown to have a strong effect on the relative frequencies of closed, 1-bird, and 3-bird seasons. The highest threshold (1.75 million) produces the highest frequencies of 3-bird seasons but also the highest frequencies of closed seasons. The lowest threshold explored (1.0 million) produces the lowest frequency of closed seasons, but at the expense of a lower frequency of 3-bird seasons. The threshold of 1.2 million balances these effects so that closed seasons occur fairly seldom and yet the opportunity for 3-bird seasons is fairly frequent.

Use of this regulatory strategy has been simulated to determine expected performance characteristics. Assuming that harvest management adheres to this strategy (and that current model parameters accurately reflect population dynamics), breeding-population size would be

expected to average 2.01 million birds with a mean annual harvest of 467,000 birds. The expected frequency of closed seasons is 12.6%, the frequency of liberal seasons with a 1-bird bag is 31.4%, and the frequency of liberal seasons with 2- and 3-bird bag limits is 0.8% and 55.2%, respectively. The regulatory alternative is expected to change in 20.9% of years.

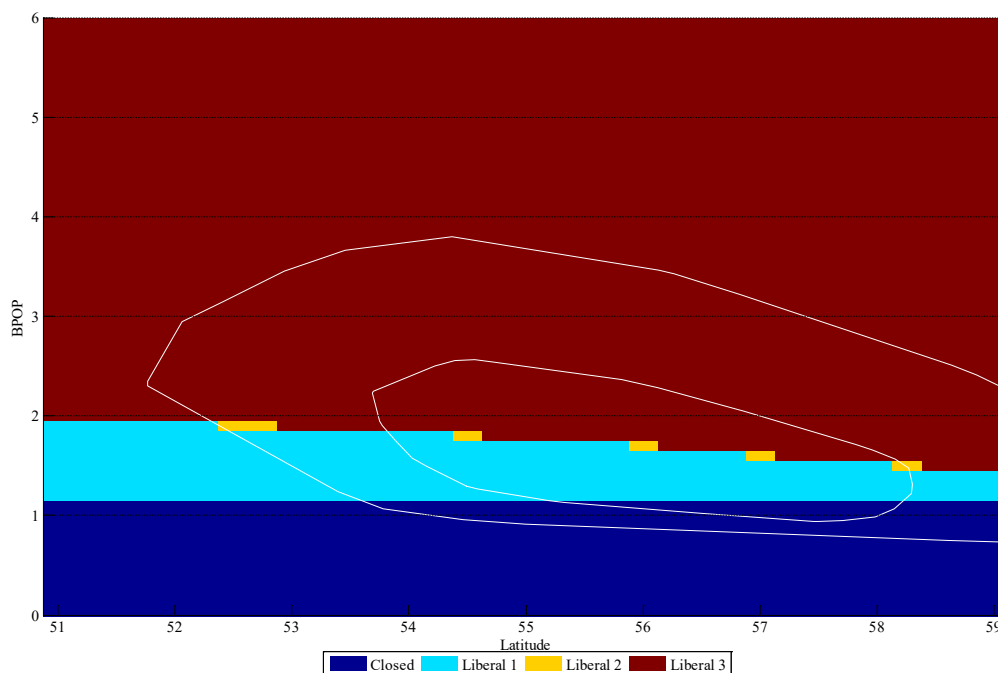


Figure 2. State-dependent harvest strategy for northern pintails as a function of the breeding population size (BPOP, in millions) and the mean latitude of the breeding population (Latitude, in degrees N). The strategy assumes that the general duck season is liberal in season length. Regulatory options are closed, liberal 1-bird, liberal 2-bird, or liberal 3-bird bag. The white contours show the 90-percent (outer) and 50-percent (inner) prediction intervals of BPOP and Latitude from a simulation of the strategy.

Implementation under FSEIS 2013

The harvest strategy was derived, using stochastic dynamic programming, under the assumption that the state variables observed in the May breeding population survey are used to set the regulations for the following autumn (in the same calendar year), as was done prior to 2013. Since the establishment of the 2013 FSEIS, state variables in year t are used to set the regulations for year $t+1$.

In practice, however, a pintail strategy will have to work under the framework of the FSEIS. To investigate the impact of this, the pintail harvest strategy (as derived) was simulated under the delayed conditions of the FSEIS framework. That is, to set the regulations for a given year in the simulation, the state variables from the year *before* were used. This can produce changes in regulations that are one-year late, although other more complicated patterns are possible. The effects on the performance metrics of the strategy are small (Table 1).

Table 1. Comparison of the performance of the pintail harvest strategy, with and without a one-year delay in the availability of state variable estimates.

	Pre-FSEIS conditions	Post-FSEIS conditions
mean BPOP (obs)	2.01 M	2.02 M
mean Harvest (obs)	467 K	466 K
Freq. Closed	12.6 %	13.3 %
Freq. L1	31.4 %	29.8 %
Freq. L2	0.8 %	0.9 %
Freq. L3	55.2 %	56.0 %
Frequency of change	20.9 %	19.0 %

This analysis suggests that using a strategy that is derived under pre-2013 assumptions but implemented under post-2013 conditions will not greatly undermine the performance of the strategy. There's a more technical alternative—to derive the strategies under the post-2013 conditions, as is done for mid-continent mallards and as has been done for the current pintail strategy. For the sake of simplicity and ease of presentation, the harvest strategy omits this complexity.

Interim Implementation

For several reasons, pintail harvest management has been cautious for the last two decades. There is evidence that the continental carrying capacity for pintails declined by about 50% in the early 1980s. Pintail populations have hovered near historical lows in the last decade. When the 2010 harvest strategy was being negotiated, several flyways were concerned that allowing a 3-bird bag limit option would raise the frequency of closed seasons to intolerable levels. Many of these same concerns remain, even with the updated population and harvest models. Since 1988, a liberal 3-bird season for pintail has only occurred once (in 1997), thus the estimate of the effect of a 3-bird bag on harvest is uncertain. A power analysis suggests that three additional years of experience with a 3-bird bag would be needed to clearly discern the difference between the effect of 2-bird and 3-bird regulations on the harvest in the Pacific Flyway and at the continental level, with longer periods needed to discern the same difference in the other three flyways.

For these reasons, this strategy is intended to be implemented on an experimental basis. The interim phase will last until three 3-bird seasons have been experienced. This could happen in as few as three years, but it could take longer—based on the expected frequencies of the regulatory packages (Table 1), five to six years might be expected. Implementation of the interim strategy will also continue until harvest under the third 3-bird season can be analyzed, which will include two additional years of the strategy (Tables 2 and 3), meaning the strategy will last a minimum of five hunting seasons.

Table 2. Timing of Interim Strategy: Scenario 1. In this scenario, the strategy happens to call for 3-bird bag limits in the first three years of implementation (marked by an asterisk). The data from those three seasons becomes available in August of 2028, is analyzed, and provides information to the Flyways for deliberation in early 2029, with adoption of an operational strategy in March-April 2029. But by this point, the regulations for the 2029-30 season (the fifth under the interim strategy) have already been proposed.

Year	March-April	August	September
2024	SRC recommends interim strategy	FWS proposes 2025-26 regulations	
2025		FWS proposes 2026-27 regulations	Interim Season 1 *
2026		FWS proposes 2027-28 regulations	Interim Season 2 *
2027		FWS proposes 2028-29 regulations	Interim Season 3 *
2028		FWS proposes 2029-30 regulations; <i>Data available from first 3 seasons</i>	Interim Season 4
2029	SRC recommends operational strategy		Interim Season 5
2030	...		Operational Season 1

Table 3. Timing of Interim Strategy: Scenario 2. In this scenario, the third 3-bird season is not called for until the 2030-31 hunting season. The interim strategy is evaluated in the winter of 2031-32, and an operational pintail strategy is in place for the 2033-34 season.

Year	March-April	August	September
2024	SRC recommends interim strategy	FWS proposes 2025-26 regulations	
2025		FWS proposes 2026-27 regulations	Interim Season 1
2026		FWS proposes 2027-28 regulations	Interim Season 2
2027		FWS proposes 2028-29 regulations	Interim Season 3 *
2028		FWS proposes 2029-30 regulations	Interim Season 4
2029		FWS proposes 2030-31 regulations	Interim Season 5 *
2030		FWS proposes 2031-32 regulations	Interim Season 6 *
2031		FWS proposes 2032-33 regulations; <i>Data available from three 3-bird seasons</i>	Interim Season 7
2032	SRC recommends operational strategy		Interim Season 8
2033	...		Operational Season 1

The evaluation of the interim phase will include the following analyses: (1) evaluation of the integrated population model, notably whether the parameters have remained stable; (2) evaluation of the harvest models, especially whether the effect of the 3-bird bag limit is greater than estimated in the current models; and (3) evaluation of updated performance metrics for the harvest strategy, after the population and harvest models have been updated. Other analyses may also be called for.

The results of the evaluations will be provided to the Flyway Technical committees for consideration, with the expectation that deliberation by the Flyway Councils will follow. It is

intended that an operational Northern Pintail Strategy will be negotiated (e.g., inclusion or exclusion of a 3-bird daily bag limit) and implemented based on the results of the interim phase with the support of the Flyways and the USFWS.

Acknowledgments

Significant contributions in developing this strategy were made by the members (past and present) of the Pintail Working Group: Brandon Reishus (Oregon Department of Fish and Wildlife); Melanie Weaver (California Department of Fish and Wildlife); Kevin Kraai (Texas Parks and Wildlife Department); Mike Szymanski (North Dakota Game and Fish); Larry Reynolds (Louisiana Department of Wildlife and Fisheries); Houston Havens (Mississippi Department of Wildlife, Fisheries, and Parks); Orrin Jones (Iowa Department of Natural Resources); Greg Balkcom (Georgia Department of Natural Resources); Josh Homyack (Maryland Department of Natural Resources); Doug Howell (North Carolina Wildlife Resources Commission); Todd Sanders, Jim Dubovsky, David Scott, Tom Cooper, Paul Padding, and Pat Devers (USFWS Flyway Representatives); G. Scott Boomer, Erik Osnas, Mark Seamans, Guthrie Zimmerman, Jeff Hostetler, and John Yeiser (USFWS); and Michael Runge (USGS).

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