

# Harvest Management Working Group

## *2020 Annual Meeting Report*



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## PREFACE

This report provides a summary of presentations and discussions that occurred at the 32<sup>nd</sup> meeting of the Harvest Management Working Group (HMWG). The 2020 meeting focused on planning for the 2021 regulatory cycle and the revision of the pintail Adaptive Harvest Management decision-making framework. For meeting details please refer to the appended [2020 HMWG Meeting Agenda](#). The HMWG is grateful for the continuing technical support from the waterfowl management community, including many colleagues from Flyway Technical Sections, the United States Geological Survey (USGS), and other invitees from management and research institutions. We acknowledge that information provided by USGS in this report has not received the Director's approval and, as such, is provisional and subject to revision.

**Citation:** U. S. Fish and Wildlife Service. 2020. Harvest management working group meeting report. U. S. Department of Interior, Washington, D. C. 32 pp. Available online at <http://www.fws.gov/birds/management/adaptive-harvest-management/publications-and-reports.php>

## ACKNOWLEDGEMENTS

A working group comprised of representatives from the U. S. Fish and Wildlife Service (USFWS), the U. S. Geological Survey (USGS), the Canadian Wildlife Service (CWS), and the four Flyway Councils ([HMWG Members](#)) was established in 1992 to review the scientific basis for managing waterfowl harvests. The working group, supported by technical experts from the waterfowl management and research communities, subsequently proposed a framework for adaptive harvest management, which was first implemented in 1995.

The 2020 HMWG meeting report was prepared by the USFWS Division of Migratory Bird Management based on contributions from meeting participants. G. Scott Boomer was the principal compiler and serves as the coordinator of the HMWG.

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**Cover Art:** The 2020–2021 Federal Junior Duck Stamp featuring a wood duck (*Aix sponsa*) painted by Madison Grimm of South Dakota.

# 1 Flyway and Partner Reports

## 1.1 Atlantic Flyway (*Min Huang and Greg Balkcom*)

### Multi-stock harvest management

For the 2021–22 regulatory cycle the technical adjustment to the scaling parameter,  $d$ , was implemented. If you recall, we found an oversight in the initial formulation of how and into which model (process or observation) we applied a scaling factor to spatially align our estimates of BPOP and harvest for ring-necks and American green-winged teal. We needed to use this scaling parameter because we are using a measure of absolute harvest for these two species rather than a harvest rate based solely on band returns. We fixed this scaling issue after consultation with this group during the December 2019 meeting. We removed the scaling parameter from the observation model and placed it into the process model. In doing so, we are now scaling down absolute harvest to the scale of what we are “observing” in the BPOP. Thus, the parameters we are estimating (e.g.,  $r$  and  $K$ ) are now correctly scaled. This results in a much lower estimate of  $K$  than previously estimated and a policy that is much more in line with the simulations that we did initially when formulating the decision framework. Most importantly, this is the technically correct way of aligning harvest and BPOP.

We continue to look at ways to band an adequate sample of ring-necks and green-winged teal so that we don’t need to be using an estimate of absolute harvest for these two species. A cursory examination of the number of birds that we would need to annually band ( $n \sim 4,200$  of each species) in order to have reasonable harvest rate estimates (10% CV) indicated that unless a concerted re-distribution of effort is made from current banding objectives, that this is likely unattainable. There is potential to re-distribute effort, but we need to examine what the gain would be for the effort and the trade-off in banding of other species for which we need informed data (mallards, black ducks, wood ducks).

### Mallard Harvest Strategy

We continue to work on development of a mallard harvest strategy that can move us away from the fixed bag of 2 that is currently prescribed by the Prescribed Take Level analysis (PTL) conducted by the DMBM in 2018.

In conjunction with DMBM we are in the process of developing an Integrated Population Model (IPM). The current potential model structures include; a single integrated population model structured similar to the ABDU model, a second model that also considered a fall Lincoln population estimate as well as the composite breeding population survey estimates, and a third model that considers two regions (Northeast US and Eastern Canada) separately and incorporates the Lincoln population estimate. We do want to recognize and recall, however, that despite bias in both the reproductive and survival sub-models, the balance equations in the former Eastern Mallard AHM protocol did a reasonable job of at least, identifying hypotheses that were driving population dynamics. The additive and weakly density dependent model consistently had the most weight associated with it. Our 2 season banding program, which will continue, has allowed us to estimate seasonal survival rates and those estimates are lending credence to the additivity of past harvest policies.

Ultimately, we want to incorporate seasonal survival into whichever model structure we decide to use. All mallard states in the Flyway have committed to continuing with post-season mallard banding. In addition to providing inference on seasonal survival and the effects of harvest, we are also reducing variability in those survival rate estimates.

We continue to search for the elusive environmental co-variates across the scale of eastern mallard breeding range that will help us characterize productivity. Managers have tried to tie environmental co-variates to mallard dynamics on three separate occasions, in the late “80s”, the late “2000s” and now. None of these

efforts have proved fruitful. In the absence of any environmental co-variates, our only response variable is harvest.

The SDM exercise that the AF went through and the subsequent hunter survey we conducted indicated that there was a strong desire to take into account the status of NE US mallards in the development of a harvest strategy. Despite looking at the use of stable isotopes and the incorporation of harvest derivation and transition probabilities into different model structures, we are not confident that the development of reasonable two-population models is possible. Thus, if we are going to take into account the status of NE US mallards, we will likely need to address this desire within the objective function.

We are conducting a final HD survey in early January. The survey has been vetted through HD academicians and the Technical Section and should better force participants to consider trade-offs of various scenarios. This survey will help us inform our harvest packages that we hope to develop by the winter meeting in 2021.

## **Black Duck AHM**

The 2013 International harvest strategy required the updating and technical review of the AHM protocol every five years. The BDAHM working group has identified a number of technical adjustments to be pursued. These include incorporating a new definition of TIP, aligning the spatial scale with Multi-stock AHM (Eastern Survey Area), and removing the mallard competition portion of the model. Further, on the Canadian side, adjustments to the regulatory packages for the liberal alternative. We never thought that we would experience a prolonged period of liberal regulations. Now that we have, we need to better develop liberal regulations that will achieve desired harvest rates. We hope that all these adjustments will be finalized in 2021.

## **Technical Capacity**

The COVID-19 pandemic resulted in no Continental BPOP survey. The technical capacity of the DMBM was able to use existing models and a number of statistical procedures to derive 2020 BPOP estimates and then derive optimal harvest policies for those species covered under an AHM protocol. Our monitoring programs and the technical foundation upon which all of our harvest management is based made this possible. Our robust monitoring programs and their datasets allow for the loss of a year of data. Technical capacity is critical towards supporting and implementing the frameworks we have collectively created. We are pleased that progress within BADS has been made towards fully staffing the branch and we look forward to working with new staff and a new chief when that decision is made.

We want to re-iterate the importance of monitoring and hope that decision makers understand that it is only because we have robust monitoring programs in place that we were able to develop regulations in the absence of current data. The harvest management community needs to insure that complacency over monitoring does not settle in.

## **1.2 Mississippi Flyway (Adam Phelps and John Brunjes)**

Discussions of HMWG-related issues by the Mississippi Flyway Council (MFC) and Technical Section took place at the winter and summer 2020 Flyway meetings. Due to COVID concerns, the winter meeting was the last in-person meeting we have held; our summer meeting was held via Zoom videoconference. At the winter meeting, the Technical Section was updated on the work occurring in the other Flyways. In addition, the Technical Section:

- approved the revised procedure for approval of Working Group priority lists;

- approved the then-current priority list; and
- endorsed the Central Flyway’s evaluation plan for the 2-tier licensing experiment.

The summer 2020 meeting, via Zoom, was much abbreviated compared to a normal summer meeting. The only HMWG-related discussions at that meeting, therefore, were regarding the priority list approval (see below). We would like to address the following specific topics in our update to the Working Group.

### **Northern Pintail Strategy Revision**

Larry Reynolds is serving as the Mississippi Flyway’s representative and point of contact for the revision of the Northern Pintail Harvest Strategy. In February, he provided the Technical Section with an update on the revision’s progress, starting with the preliminary conclusion that not much has changed in the underlying pintail population dynamics since 2005. However, there are limitations in the current model including: 1) it is not a full balance equation model, and thus cannot accommodate observed changes in vulnerability; 2) it uses total harvest (H), rather than harvest rate (h); 3) H is on a different scale than bpop; and 4) it implicitly adjusts for balance equation bias, but we do not know if bias corrections are correctly allocated to survival and recruitment. Consequently, the revision team feels the need to move to an integrated population model. He also discussed the importance of the 3-bird daily bag limit to the revision process. Because we lack experience with that bag, he outlined two hypotheses for incorporating it into the initial evaluation of alternative strategies: 1) extrapolating a linear estimate of bag limit on total harvest from L1 to L3; or 2) set expected harvest as the same under 2- and 3-bird bags. He reported that 126 alternative strategies have been developed, of which 18 are of primary interest at this point. We are looking forward to reviewing the evaluation of those strategies when they become available.

### **Duck Migration Committee**

The Mississippi Flyway Council Technical Section’s Winter Distribution Working Group has re-established the Duck Migration Committee. This committee was resurrected after six years of inactivity at the winter 2019 Technical Section meeting to address concerns, primarily among southern states, regarding the poor 2018–19 duck season. The purpose of this committee is to examine large-scale spatial and temporal trends in fall migration and wintering duck distribution (see the Mississippi Flyway Perspective in the 2019 HMWG Report for more background). Six presenters at the 2020 winter meeting, and five in the virtual summer meeting, discussed various aspects of their research and how it informs the concerns of this committee. These discussions will continue at future meetings, with the potential of specific outcomes from the committee’s work continuing to be discussed.

### **MCM Double Looping Process**

The Mississippi Flyway considers the double-looping process for mid-continent mallards to be closed. While we understand that there is not consensus between the Mississippi and Central flyways regarding the drake mallard bag limit, and the SRC would like to see the two flyways come together with one recommendation, the Mississippi Flyway does not see a path forward for consensus or even compromise. In a year with very little monitoring, and the 2021 outlook for monitoring uncertain, we feel there is no further discussion to be had at this time regarding mid-continent mallard bag limits. However, we will likely be willing to revisit this topic depending on the outcome of discussions surrounding the latest Working Group priority list, in particular the proposed topic of “Reconsideration of North American Duck Harvest Management” (see below).

## HMWG Priority List

The Mississippi Flyway is pleased with the addition of the topic “Reconsideration of North American Duck Harvest Management” to the Working Group’s Priority List. We believe strongly that an overarching review of how harvest management in North America is conducted is warranted. How other duck species, particularly those with reduced bag limits compared to the overall duck bag limit, fit into harvest management driven by mid-continent mallards is a subject ripe for review. We have several concerns, listed below, that could be included in this discussion.

1. The Mississippi Flyway believes that the hybrid season for scaup under the restrictive package, in which there is a 2-bird bag for 45 days and a 1 bird bag for 15 days, does not make sense. Such a season places a burden of unnecessary regulatory complexity on the hunter while not imparting the benefit of reducing harvest. It sends a message to the public that we believe that we can fine-tune harvest. Revision of scaup harvest management is a high priority for the Mississippi Flyway.
2. We find the current decision rule for canvasbacks difficult to comprehend, rationalize, or explain, insofar as the differences between the population estimates leading to different packages (20k) are smaller than the confidence intervals on the surveys producing those estimates (50k). However, use of this rule has resulted in essentially a set bag of 2 birds since 2015, with no negative impacts to the population. The latter fact is important to remember as we consider how complex we want duck harvest management to be moving forward.
3. The Mississippi Flyway is interested in evaluating how an additional seven days of duck season would impact harvest of those species with harvest restrictions in place. Of particular concern might be pintails, canvasbacks, scaup, and wood ducks. It is not clear that there is overwhelming support for a season extension, but having those days included in any evaluations that occur as part of this process would be important in making those decisions.
4. Overall, there is interest in simplifying duck hunting regulations to the extent practical. We have always operated under the assumption that simplification necessarily comes with loss of harvest opportunity. Since regulatory simplification may be a byproduct of simplification of our processes (such as abandonment of complex derived strategies in favor of simpler prescriptive strategies), that assumption may not hold. Since one of the stated purposes of the MCM AHM double-looping effort was to reduce overhead in the regulatory system, a continent-wide review of duck harvest management, with open minds on the part of all parties, may yield benefits in terms of the cost of the process and regulatory stability.

Finally, we would like to thank Pat Devers and BADS staff for writing the descriptive narrative that accompanied the draft priority list. Having the background and implications of these proposed priorities available at a glance was immensely helpful in our discussions, particularly for newer Technical Section members, non-AHM Committee members, and Council, who are less familiar with the topics at hand. We hope that those brief summaries can be continued in future years.

## COVID-related Monitoring Concerns

In immediate terms, there is little more concerning in waterfowl management than the possibility of missing another breeding population survey season in 2021. We are all in similar circumstances regarding uncertainty of field work in our own states and provinces. We trust that all efforts will be made to perform the 2021 surveys. However, we also need to be prepared in the event that surveys are prevented from occurring. We appreciate the work that was performed by BADS for the 2020 regulatory cycle, and we are glad to see that discussions of this eventuality are on the agenda for this meeting.

### **1.3 Central Flyway (Mike Szymanski and Kevin Kraai)**

The past year has been unlike any other in the modern waterfowl management era. As we were concluding the previous HMWG meeting, we were starting to learn of a strange new virus in Asia. That virus came to be known as COVID-19 and resulted in a world-wide pandemic that had cascading consequences, touching virtually every aspect of humanity. For the first time since its inception in 1955, the May Breeding Population and Habitat Survey was cancelled, along with many other monitoring activities in light of great uncertainty relating to the pandemic. We are thankful that our state and USFWS partners were able to conduct pre-season duck banding activities in the United States as learned precautions were able to be implemented. These data are crucial to annual monitoring and management of North American ducks.

Due to long-term, robust monitoring data available for midcontinent ducks, it was possible to conduct a stop-gap modelling effort this year. Service staff put forth significant effort to determine modelling approaches that were most appropriate to allow the regulatory process to proceed in an objective, science-based manner. Because of these notable and skilled efforts, the Service was able to model outcomes to promulgate regulations for the 2021–22 hunting season.

Over the long-term, the Central Flyway has become increasingly concerned that the collective annual waterfowl monitoring effort is weakening. Without a doubt, the new pandemic created barriers to completing some field work in 2020, but Service staff were successful in completing necessary modeling efforts nonetheless. However, multi-year gaps will create significant uncertainty in the procedures that worked as a one-year stop-gap and waterfowl managers across North America will be left making decisions in the dark. The inability to answer simple, fundamental questions will leave all interested parties guessing about the status and use of waterfowl across the vast geographic expanses that waterfowl inhabit across North America throughout the annual cycle.

Despite current obstacles to sound management, our Flyway remains committed to seeking innovative ways to manage waterfowl. Our goal to reduce unnecessary federal regulatory burden on hunters and testing new regulatory paradigms remains. We fully support the use of sound biological data to inform decisions and strive to eliminate complexity at the federal framework level when simplification is supported by biological inference. However, our three main monitoring efforts (breeding population, pre-season banding, and harvest surveys) must remain intact, and vigorous. These data are the lifeblood of North American waterfowl management and conservation.

We fully support the HMWG's priority to reconsider North American waterfowl management. We believe that this priority will bring together on-going work regarding species-specific bag limits and new, innovative regulatory systems, including the upcoming two-tier evaluation. Obtaining data for a 3-bird pintail bag limit are critical for this endeavor, as we seek regulations that make it easier for people to duck hunt and take people duck hunting. Yet we continue to struggle to maintain recruitment, retention, and reactivation of duck hunters at levels sufficient to keep waterfowl conservation a focus on the landscape. This reconsideration does not have to be limited to delivery of regulations and should also focus on allowing monitoring programs to evolve as well. As our waterfowl populations and hunting community have changed over time, our monitoring systems need to evolve as the world changes around us.

There are bountiful opportunities for incorporating electronic surveys into the harvest surveys program and using remotely sensed habitat metrics to help inform regulatory decisions. However, finding and incorporating new innovations in monitoring systems does not mean that we can just stop conducting business as we have for many decades. We simply cannot just break from long-term datasets or reduce data availability as we seek new solutions. Significant investments by the Service and management partners need to be made to perform evaluations to ensure sound implementation of any new methodologies. However, we find ourselves deeply troubled at this position in time. The Central Flyway has been concerned about the ability of the Division of Migratory Birds to sustain current monitoring efforts, let alone have the resources available to innovate. As previously mentioned, we are deeply concerned that critical monitoring data will not be collected at necessary levels; doing less is not an acceptable solution for North America's waterfowl managers and conservationists, including hunters.

These are the opinions and perceptions of the Central Flyway’s HMWG representatives, both long-term members of the Central Flyway; this statement has not been reviewed or approved by the entire Central Flyway membership.

#### **1.4 Pacific Flyway (Brandon Reishus and Jason Schamber)**

##### **Northern Pintails**

Revision of the Northern Pintail Harvest Strategy remains a top priority for the Flyway. In February 2020, we discussed the work completed to date by the Pintail Working Group (PWG). At that time, the Study Committee was concerned that the revision might not be far enough along by the late-summer meetings to allow adequate review by the technical committees, in advance of possible implementation in 2021. In March, Council sent a letter to Ken Richkus, Chief, Division of Migratory Bird Management (DMBM), that outlined the PFC’s expectations for review and feedback concerning the strategy.

While we appreciate the work done by the PWG and the DMBM and look forward to implementation of the revised strategy in the future, we are disappointed it is unlikely to be completed in time to inform the 2022 regulations cycle.

##### **Western Mallard**

We appreciate the work done by the HMWG and DMBM in recent years to revisit the Western Mallard AHM protocol, developed in 2008, and include other breeding and harvest areas important to the Pacific Flyway (British Columbia and Washington, and banding data from Idaho). We remain supportive of efforts to continue to broaden the geographic scope of the protocol by inclusion of information from other states such as Nevada and Utah. However, we do not view this work as critical, as reflected by its 2021 HMWG priority status (Long-Range).

#### **1.5 USFWS Flyway Representatives (Pat Devers)**

I’d like to recognize Tony Roberts, the Atlantic Flyway Representative assistant for his efforts to support the Atlantic Flyway since the retirement of Paul Padding. Tony has been critical to maintaining effective communication with the Flyway, providing technical support to the Flyway, and supporting the Acting Flyway Representative.

In addition to the issues raised by the Atlantic Flyway members, I want to provide an update on sea duck harvest management. The Atlantic Flyway Technical Section is considering restrictions to sea duck harvest to reduce harvest pressure on these populations. The Atlantic Flyway Council and Service implemented harvest restrictions in 2015 designed to reduce harvest by 25%. These restrictions failed to reduce harvest forcing the Flyway and Service to consider additional changes. The Flyway is considering several alternative approaches and will continue the discussion at the winter 2021 meeting.

#### **1.6 USFWS Flyway Representatives (Jim Dubovsky)**

Jim Dubovsky conveyed what he viewed as two looming threats to the regulations-setting process, and thus the work of the HMWG. The first was threats to monitoring activities. Leadership at both federal and state levels continues to question the need for current levels and frequency of monitoring for migratory game birds, particularly waterfowl. The recent three billion birds publication (Rosenberg et al. 2019) indicated that of all the guilds of bird species, only waterfowl and waterbirds have improved since the 1970’s. Grassland birds showed the largest declines, but other guilds also had large decreases in abundance. Agency

leaders continue to search for ways to fund research and management activities for these other species to halt or reverse those declines, and question whether a better use of resources currently expended for migratory game birds (which generally are doing well) would be to divert those resources to guilds of species experiencing declines. Further, the fact that hunting regulations continued to be promulgated despite the cancellation of and/or negative impacts to a number of game bird monitoring activities in 2020 could be used by leaders as additional justification that current levels of monitoring are not critical to establishing hunting seasons. Indeed, several DMBM staff were presented with this issue and asked to defend annual monitoring efforts. The second issue was the potential for additional political intervention into the regulations-setting process. With the recent successes of entities taking a political route to achieve desired regulations changes (e.g., January 31 closing framework date; implementation of a 2-tier regulations pilot study), additional groups may see this as a viable route to change regulations. Recent requests from organizations requesting representation on the HMWG indicate such a desire. Although not political interventions per se, such requests suggest a desire to engage in influencing the regulations-setting process. To avoid potential violations of the Federal Advisory Committee Act, the management community needs to be vigilant about these efforts, and to the extent possible direct such efforts through the flyways as the appropriate venue (by virtue of the MOUs the Service has with the flyways) to discuss and address regulations concerns.

## **1.7 Canadian Wildlife Service (Chris Roy)**

### **Regulations for the 2020–2021 and 2021–2022 Hunting Seasons**

The hunting regulations for migratory game birds are reviewed and amended biennially by Environment and Climate Change Canada (ECCC), with input from provinces and territories, as well as from various other stakeholders. The hunting regulations for the [2020–2021 and 2021–2022 Hunting Seasons](#) were published in July 2020. The regulations cycle for the 2022–2023 and 2023–2024 seasons has already started and over the next year, the CWS will evaluate the validity of the requests that were made by stakeholders.

### **Modernization**

The proposed revised [Migratory Birds Regulations](#) have been published in the Canada Gazette, Part I, and a public comment period took place from June 1, 2019 to September 30, 2019. All comments received are being carefully considered by ECCC in the development of the final regulations. We anticipate that the revised regulations will be published in spring 2021, and will come into force in July 2021, in time for the fall 2021 hunting season.

### **Field work**

Spring fieldwork was cancelled due to the pandemic. Some field activities were conducted in the fall, such as pre-season and winter banding, but the overall scope of these activities was limited. CWS continues to monitor the situation for the 2021 spring season. Decisions might be taken at a regional level and some large surveys might be only partially completed.

### **Regional Initiatives**

Prairie Region is developing a Mallard harvest management strategy. The strategy is a cooperative effort between CWS, Manitoba, Saskatchewan, and Alberta. The strategy defines the monitoring programs required for mallard harvest management decisions in the Prairies and establishes prescriptive thresholds for regulatory changes in the region. The strategy will improve provincial engagement in harvest management and monitoring programs while also providing clarity about future management actions.

The Ontario and Quebec Regions have deployed transmitters on Sandhill crane during the fall of 2018 and 2020. The goal of the project is to document the expanding distributions of the crane population in eastern Canada, inform mitigation strategies related to agricultural conflicts with Sandhill crane, and explore the harvest potential of the Eastern population. The project is a partnership with the University of Waterloo (B. Fedy lab).

The Atlantic Region will start a study to evaluate the rate of breeding across the breeding range of American Common Eiders in the Atlantic through a large-scale telemetry study. The Atlantic region also started a project to examine the relationship between ocean warming in the Gulf of Maine and changes in winter distributions of Common Eiders. This work will be conducted in partnership with Ducks Unlimited Canada, Acadia University, Université du Québec à Montréal, University of Winsor and Dept. of Inland Fisheries, Maine.

CWS is developing species distribution models for waterfowl and American Woodcock in Eastern Canada. These models will rely on data collected from the helicopter component of the Eastern Waterfowl and American woodcock Singing Ground Surveys. The output of those analyses will inform the work of the Eastern Habitat Joint Venture and used to evaluate the coverage of the American woodcock Singing Ground Survey in Canada.

CWS continues to work with the USFWS on the development of surveys for boreal and low Arctic breeding waterfowl. The survey focuses on scoters and scaups utilizing information from both helicopter and fixed-wing platforms. The ultimate goal is to develop methodology to combine information from the two platforms and produce species-specific sea ducks abundance estimates for large regions that are not currently covered by the BPOP and EWS surveys.

## **1.8 Branch of Assessment and Decision Support (Pat Devers)**

The Branch of Assessment and Decision Support (BADS) is in the process of hiring a new quantitative ecologist. Interviews will be completed by mid-December and an offer should be extended prior to the end of the year. The incumbent will be responsible for implementing and maintaining 1-2 adaptive harvest strategies, providing analytical support for Harvest Management Working Group priorities, and providing analytical support for non-game issues. I anticipate the incumbent will start in late winter or early spring 2021.

The priorities for the BADS include: 1) revisions to the northern pintail adaptive harvest management strategy, 2) development of a new harvest strategy for eastern mallard management in the Atlantic Flyway, 3) Reconsidering North American duck harvest management in the U.S., and 4) contingency planning in case the 2021 Waterfowl Breeding Population and Habitat Survey is cancelled. In addition to these efforts the BADS continues to provide analytical support for a variety of non-harvest management issues including conflict species management (e.g., double crested cormorant and common ravens), grasslands bird conservation, and shorebird conservation.

In Fiscal Year 2020 the BADS funded three post-doctoral projects through U.S.G.S. Patuxent Wildlife Research Center. The purpose of the first project is to develop generalizable methods for integrating Breeding Bird Survey and eBird data to estimate population abundance over time and space. This project is focused on non-waterfowl species, particularly those with limited or sparse data, but may have applications to waterfowl. The second project is designed to evaluate the trade-offs among alternative sampling designs using marked individuals. This project will evaluate 1 waterfowl case study and 1 non-game case study. This project will investigate alternative marking technologies (e.g., GPS units, nano-tags) and overall costs relative to information gained. We expect to hire a post-doctoral research associate in early 2021. The goal of the third project is to complete an initial evaluation of the feasibility of formally incorporating social objectives and hunter dynamics in Adaptive Harvest Management frameworks. We do not expect this project to result in immediate changes to Adaptive Harvest Management. We expect to hire a post-doctoral researcher in 2021.

## **1.9 Branch of Monitoring and Data Management (Kathy Fleming)**

The Branch of Monitoring and Data Management (BMDM) added 3 new employees this past year: Meghan Eycler (data manager), Abby Walter (data analyst), and Kyle Point (CF speciator), as well as 2 contractors (Paul Padding, Andrew Coupe) to assist with validation of harvest estimates and building a new SQL data architecture for MB data assets. BMDM is continuing the modernization of Harvest Surveys, with the second year of a 3-year transition to an online diary survey application, an ongoing analysis of stratification efficiency in harvest estimates, and a collaboration with DJ Case to explore hunter attitudes about HIP and harvest surveys, to increase participation and improve data quality for the survey. In 2021, we will be collaborating with Andy Royle (USGS) to develop model-based estimates of species-specific harvest, as a possible alternative to the design-based harvest estimates currently used in harvest management.

## **1.10 Reward banding update (Pam Garrettson, Scott Boomer, and Nathan Zimpfer)**

We presented preliminary data describing the first 4 years of a 5-year reward banding project for mallards, and a completed 3-year project for black ducks. For mid-continent mallards, target banding levels were approached in 2017 and 2018 with lower banding numbers observed in 2019 and 2020. In 2020, relatively few reward bands were placed in Canada due to Covid-19 restrictions. A preliminary analysis of direct recoveries of mallards released with \$65 and \$100 bands suggest similar harvest rates of birds banded with these dollar amounts, which suggests that we can pool these bandings when updating mid-continent mallard harvest rate estimates for use in annual AHM protocols. Preliminary, median reporting rate estimates of 0.93 (95% CI: 0.80, 0.99), 0.85 (95% CI: 0.68, 0.97), and 0.92 (95% CI: 0.79, 0.99) were observed in 2017, 2018, and 2019 respectively. These results suggest that band reporting rates have increased compared to estimates from previous reward banding investigations (Boomer et al. 2013). For American black ducks, reporting rates were 0.65 (95% CI: 0.49, 0.82) for Canada, 1.00 (95% CI: 0.98, 1.01) for the US, and 0.80 (95%CI: 0.66, 0.95) for both countries combined. Reporting rates in both the US and Canada have increased since they were last investigated (Garrettson et al. 2014), but a substantial gap between the two countries remained.

## **2 Partner Updates**

### **2.1 NAWMP Plan Committee Liaison (Jim Dubovsky)**

Jim Dubovsky provided an update on the activities of the North American Waterfowl Management Plan Committee (PC) during the last calendar year. The PC was convened three times, once in February, once in September, and for a conference call in October. During the February meeting the PC viewed presentations regarding activities being conducted by the Intermountain West, Prairie Habitat, and Prairie Pothole joint ventures. In their review of the joint ventures' progress, the PC mentioned three major themes that should be addressed: (1) broadening the tent of partners to maintain relevancy, (2) emphasizing the need for more human dimensions work, and (3) ensuring that grassland bird species receive needed attention. At the meeting the PC also finalized the PC Roles, Responsibilities, and Functions document, and agreed on strategic priorities and actions for the 2019-21 period. Jim briefly reviewed the document and priorities, and discussed specific actions and responsible individuals under each priority. The September meeting of the PC was held virtually due to the COVID-19 restrictions on travel. Thus, the PC did not entertain reviews by any joint venture. Presentations were provided on impacts of the pandemic on joint venture activities and migratory bird monitoring activities. The largest impact to joint ventures has been face-to-face interactions among employees and with the public, which are necessary to build relationships and develop habitat management plans; science and grant activities largely progressed without interruptions. The pandemic impacted a number of bird monitoring activities in 2020, most notably the

Waterfowl Breeding Population and Habitat Survey, which was not conducted for the first time since 1955. Pre-season waterfowl banding was conducted, but the geographic extent of field activities was limited largely to northern areas of the contiguous 48 United States, and areas around Winnipeg and Saskatoon in Canada. During this meeting the PC also approved the Integrated Steering Committee (ISC) Work Plan and the Communication Plan for the North American Waterfowl Management Plan (NAWMP), reviewed a paper drafted by members of the PC regarding the importance of monitoring (“Waterfowl Population Monitoring and NAWMP Conservation Success”) and the North American Waterfowl Professional Educational Plan (NAWPEP), and discussed progress on the strategic priorities. The PC did not endorse the monitoring paper, but rather agreed to provide edits and comments to the writing team with instructions to develop a revised draft for the PC to consider. The NAWPEP was provided to the PC for information only; no action was needed. The PC met by conference call in October to discuss the revised monitoring paper and suggested additional edits to the document, with a commitment to revisit action on the new revision at a later date. The next meeting of the PC will occur on February 17–18, 2021, and will be held virtually. As in the past, three joint ventures will be asked to provide updates of their activities, and these may be provided outside of the February meeting dates. There also will be the usual progress updates regarding the strategic priorities, ISC, and other routine business. Finally, Jorge Coppen, the NAWMP Coordinator for the last 15 years, retired at the end of November. Jim offered to provide documents mentioned above to members of the Working Group that may be interested.

## **2.2 NAWMP Integration Coordinator (Diane Eggeman)**

The NAWMP Integration Coordinator presented an update on the NAWMP Integration Steering Committee (ISC). The update summarized the ISC’s work plan, progress made in 2020 by the ISC and under the North American Waterfowl Professionals Education Plan (NAWPEP), and a review of results from the 2017 Waterfowl Professionals Survey related to harvest management.

The ISC met face-to-face in February 2020 and held online meetings approximately monthly throughout the year. Jim Dubovsky served on the ISC as the HMWG liaison to the Plan Committee, and Kevin Kraai served as the HMWG ex-officio member. The ISC developed its work plan by first reviewing the accomplishments and unfinished business of the 2012 NAWMP Action Plan, and then identified appropriate actions that fit under the eight recommendations of the 2018 NAWMP Update. One action in the work plan is designated for the HMWG and flyways: “develop and incorporate social science and people objectives into harvest management using adaptive frameworks where feasible, focusing on flyway-level efforts.” The work plan was approved by the Plan Committee in September 2020.

The ISC addressed three high-priority actions in 2020, (1) developing a regional priority landscapes decision support tool, (2) assembling and communicating societal benefits of NAWMP work, and (3) providing guidance on interpreting waterfowl population objectives of NAWMP. The committee also developed two communications documents, “Priority Landscapes Fact Sheet” and “Waterfowl Population Monitoring and NAWMP Conservation Success.”

NAWPEP is an effort to advance Recommendation 7 of the 2018 NAWMP Update, to “bolster training programs for future waterfowl management professionals.” The NAWPEP steering committee completed a final draft strategic plan following review by flyways and others. Completed actions included summarizing credentials deemed important for successful waterfowl professionals and estimating the annual rate of graduate students who acquired waterfowl-wetland employment upon graduation.

Results from the 2017 waterfowl professionals survey included findings related to harvest management. Survey questions addressed the performance of AHM regulations, whether any changes were needed, whether harvest management had made progress to support NAWMP objectives, and the importance of including AHM strategies in supporting NAWMP objectives. From a NAWMP perspective, the current challenge in harvest management is to formally integrate people objectives into the work of harvest management and remain accountable to those objectives.

### **2.3 Human Dimensions Working Group (Cindy Longmire)**

In July 2020, the Human Dimensions Working Group made the decision to switch from an annual meeting to quarterly virtual meetings. The first quarterly meeting was held in October and the next meeting is scheduled for January 29th. National reports for the US Waterfowl Hunter and the US Birdwatcher surveys have been drafted and final edits are being addressed. A document highlighting insights and implications from the national surveys has been drafted and will be presented to the HDWG at their January meeting for review and further discussion. The working group is also working on metrics for evaluating NAWMP social objectives and the draft metrics will be further discussed and refined at the January meeting.

### **2.4 NAWMP Science Support Team (Kevin Kraai)**

#### **UST & NSST Committee Membership**

- Jorge Coppen has retired as NAWMP coordinator as of 11/25/20.
- We need to review the committee membership of NSST Executive Committee – typically this includes chair, vice chair, incoming chair, past chair, NAWMP Coordinator, and national representatives from Canada and Mexico. Some of these positions are vacant.
- As far as UST, we need to find a replacement chair and re-evaluate executive committee membership. Brad Andres has graciously served for a long time in this role.

Action – Review committee memberships and solicit new members as appropriate.

#### **UST & NSST Committee Membership**

##### *Theme Team 1: Cross-regional planning efforts*

- This team has developed a prospectus with anticipated outcomes regarding what the Theme Team should try to accomplish.
- Most of the current work of the Team has been doing is focused on waterfowl migration chronology and exploring the use of eBird data to build migration chronology curves.
- The team developed a proposal for postdoc funding that has been shared with various groups. The proposal is essentially a formal analysis of eBird data to create regional scale migration curves and comparing these results to independent data sets. However, does this proposal remain high priority? We should gather to evaluate what else TT1 can do.
- We need to have a discussion with JVC's about how this Team and UST can be relevant and value added to current efforts such as JV8, 3 Billion Bird Loss, and other efforts.

##### *Theme Team 2: Taxa integration planning efforts & Theme Team 3: Human dimensions planning*

- Mark Petrie had sent out an initial email to JV Coordinators about the interviews and will follow up with another email to update
- Team 2 is done with the interview questions (vetted through the team) and has interviewers identified
- Team 3 is in the final stages of completing their questions and are vetting one last review through the team. Team 3 will have a set of online pre-questions that will be sent to JVCs in advance of a scheduled interview, in an effort to make the interview more efficient.

- The JVC and interviewer(s) from Team 2 and 3 will determine what is the best way to handle interviews – all at once or two separate interviews.
- We will conduct a couple of test interviews in January 2021 to fine tune the remainder of the interviews. We should anticipate a February 2021 rollout for the remainder of the interview scheduling.

Action – Request time on JVC monthly call (perhaps Feb/Mar call) to update on Team 1 progress and discuss how UST can assist with cross-regional planning efforts

Action – Mark Petrie will email JVCs regarding interview updates

### **NAWMP Metrics of Success**

- NAWMP has asked NSST to consider appropriate metrics of success for population and habitat objectives; how do we measure progress on a meaningful scale?
- We briefly discussed what mechanisms we already have in place – coordinated population objectives through Fleming et al. effort; BPOP surveys on breeding grounds; and energetic modeling on the wintering grounds.
- We decided that we needed a little more clarity on the ask

Action – Mike Brasher and Dave Gordon will try to talk with Jim Dubovsky about the request; once we have better clarity, we will gather a small group to discuss and respond

## **2.5 Communication Team (Min Huang)**

The Communications Team met on Monday afternoon with all state and federal members attending. The committee discussed three topics:

- Two documents that were put together since the last formal meeting in 2019 and how to make the best use of these,
- The role of the committee in the pintail harvest strategy revision,
- How best to address the rift with academia that has been at the forefront of conversation for the past two years.

Discussions were had at the 2019 meeting concerning the current timing of the regulatory process, the general lack of understanding of the process by practitioners and hunters alike, and the disconnect at times of the current BPOP and subsequent regulations. The committee developed a document that outlines the reasons for and the tradeoffs associated with that new process.

The committee also developed a document outlining the importance of monitoring to support AHM. This document sprung out of the circumstances surrounding the pandemic and the fact that regulations were promulgated in the absence of a survey. It is feared that decision makers will take this fact and start diverting resources away from monitoring.

Ultimately keeping administrators (state and federal) supportive of the AHM process and fully understanding the entire process continues to be critical. A current examination of published comments against proposed hunting regulations before and after the implementation of AHM has been initiated by DMBM. This analysis will serve to demonstrate to the SRC membership how AHM has reduced conflict and freed up time that was available towards other critical issues. A quick discussion ensued pertaining to

engaging old members of the SRC who were present before the implementation of AHM who could relate to the current and future SRC membership what used to happen and how we never want to go back to an era of discord. This analysis and its results should be followed up with the discussion of how monitoring, in all of its forms, enables and supports AHM. In the absence of monitoring, lawsuits follow. The recent lawsuits over cormorant take are prime examples.

The committee spent some time discussing the best way to disseminate materials in general, including these two documents. It is one thing to develop materials, but in order for them to be effective, there needs to be a good process for that information to get to its intended audience. Certainly the method for distributing materials from this group to colleagues is through the Flyway technical representatives back to the Flyway states. Similarly, the USFWS Flyway Representatives should be disseminating information to the Regions and others involved in migratory birds. Most of the developed documents have been fairly detailed. Rather than have each partner distill this detail to more usable form, the committee felt it might be beneficial to have a communications specialist condense and simplify these for broader distribution. This would insure a uniform message across all partners. We will look into a state partner or Federal communications specialist to assist us. The committee also discussed how to get information to a broader audience (i.e., hunters). We have opportunity to work with our national NGO partners to get materials into their magazine or newsletters. At a more local scale, there are certainly opportunities, although they vary by state, for getting distilled information out to a broader audience. From the Federal perspective, in order to get some of this done, some processes will have to occur, but these are not insurmountable.

The committee verified that development of communications associated with the pintail harvest strategy revision is a current charge. The committee is ready to take this on once it the revision is completed.

The widening rift with academia has been ongoing for some time now. This disconnect and at times, mistrust between academia and managers, involves, among other things, a general misunderstanding by the academic community about the entire process of duck harvest management. Differing opinions on hypotheses governing dynamics are a healthy thing, but in the current climate have not led to collaboration and science that has furthered our understanding of processes and subsequent management. Outside of a few labs across the country there has also been a general lack of inclusion of academicians. The general consensus continues to be that this issue is clearly “our responsibility.” But how much and where that inclusion occurs continues to be a difficult thing to define. The ultimate goal here is to build cooperative relationships with professors and their students that can supplement our capacity and spur collaboration and partnerships in a positive direction. The Atlantic Flyway invited several professors to their winter 2020 meeting to give presentations on various issues surrounding mallards (stable isotope analysis, genetics, cross-seasonal models and harvest management). This session was met with a tepid response from the AF; however, it was a first step in the right direction.

This committee felt that the first step towards a unified community was to set up a workshop with two or three of the prominent university labs in the country, the USFWS, USGS, and some of the members from the Councils. This workshop would be the precursor to a larger, more encompassing event at the next duck symposium. This first event will be organized by the members of the HMWG with the subsequent meeting at the Symposium being organized by the academicians who participated in the first workshop. This would help with messaging and provide a good context for wider participation and openness by others in the academic world.

Communications Team Min Huang (AF, chair)  
Adam Phelps (MF)  
Mike Szymanski (CF)  
Brandon Reishus (PF)  
Pat Devers (FWS)  
Dave Case (DJ Case and Associates)

## **2.6 Evaluating harvest management conflicts pre and post AHM (Pam Garrettson)**

I examined 21 years (1980–2000) of Federal Register (FR) documents concerning the early and late seasons for waterfowl harvest in the United States (US), specifically the sections addressing duck sport harvest regulations and recorded the number and nature of comments that represented conflicts. These documents included comments submitted in writing, verbal comments recorded during public hearings submitted by the public in response to regulations proposed by the US Fish and Wildlife Service (FWS), as well as Flyway council recommendations, and the US Fish and Wildlife Service (FWS) responses to comments. I recorded a total of 9,997 comments characterized as conflicts for the 21-year (1980–2000) period, 555 from Flyways, 9,902 from individuals, and 350 from NGOs. Conflicts occurred in all years ( $n = 21$ , mean = 476, median = 57). Too conservative was the most frequent type of comment ( $n = 21$ , mean = 490, median = 39, sum = 9,250), followed by too liberal ( $n = 21$ , mean = 64, median = 11, sum = 707), inadequate science ( $n = 8$ , mean = 2.6, median = 2, sum = 18), harvest equity ( $n = 3$ , mean = 4.3, median = 3, sum = 13), length of comment period ( $n = 6$ , median = 1, sum = 9). Season length was the subject of the most comments (2,297), followed by bag limits (1,945), shooting hours (1,591), general harvest strategy (1,331), and regulations process (1,196). The number of comments varied considerably by year, and the majority of comments occurred in 1988 and 1994. I plan to continue the process for 2001–2019, and more thoroughly test the hypothesis that the implementation of AHM was associated with fewer conflicts.

## **2.7 Adjusting AHM frameworks for non-stationarity (Scott Boomer)**

The HMWG has long been concerned about the potential effects of system changes on AHM decision frameworks (Nichols et al. 2011), explicitly recognizing this issue as a long range HMWG priority in 2011. Scott provided some background around the development of the HMWG's exploration of potential factors that need to be considered when linking environmental changes to the key demographic relationships codified in AHM models. Substantial work has been accomplished linking recruitment and survival models to regional scale changes in precipitation and temperature, which now sets the stage for exploring the temporal aspect of these changes (time dependency) in our optimization frameworks, which will allow us to account for climate uncertainty in our adaptive harvest management programs.

## **2.8 Time-dependent harvest policies to inform management under climate change (Mike Runge and Anna Tucker)**

Dr. Tucker, a postdoctoral scientist at USGS Patuxent, is leading several projects to examine the effects of system change on management of migratory birds. One of those projects is looking specifically at the effect of system change (e.g., climate change) on optimal harvest strategies for waterfowl. The first analysis along these lines uses a logistic population model, tuned to approximate mallard dynamics, to examine the consequences of time-dependent changes in the carrying capacity ( $K$ ) or the intrinsic rate of growth ( $r$ ). A time-dependent optimal policy (derived through finite-time stochastic dynamic programming) can account for known changes in future dynamics. Importantly, failing to account for system change has very different effects, depending on the nature of the change: failing to account for declines in  $K$  leads to under-harvest of the population in the short-term; failing to account for declines in  $r$  leads to over-harvest of the population in the short-term. These results have implications for all waterfowl harvest management policies. This paper is currently in review at the *Journal of Wildlife Management*. Future work will examine the role of uncertainty in future dynamics and the sensitivity to discount rates. Regular engagement with the Harvest Management Working Group over the course of the next several years will occur as this work unfolds.

Two related projects are also underway. First, Drs. Tucker and Runge are leading a USGS Powell Center working group on time-dependent decision making, with a focus on migratory bird management. Sixteen scientists from around the world, with expertise in migratory bird management, decision analysis, optimal control theory, and behavioral economics, have joined this working group. In addition to a synthesis of time-dependent decision analysis, the group will also examine three case studies: waterfowl harvest

management; waterfowl habitat acquisition; and management of eagle incidental take. Second, funding from the Northeast and Southeast Climate Adaptation Science Centers was received to analyze and develop specific applications of time-dependent optimal strategies for mid-continent mallards and Atlantic Population Canada geese. This work will be undertaken in close cooperation with FWS and the Flyways over the next two years.

## **3 Pintail AHM Revision**

### ***3.1 Pintail AHM revision: history and overview (Mike Runge)***

The Pintail Working Group, convened by the Service with representatives from all four flyways and facilitated by Mike Runge, has been methodically working through a full examination of the pintail harvest strategy, with the intent to develop and propose a revised strategy. The impetus for this effort has roots in the development of the current strategy, which was developed in 2010. During the negotiations among the flyways and FWS in 2010, two strategies (called “39” and “39b” at the time) were compared; those two strategies were identical in derivation, except 39b included the possibility of 3-bird bag limits. In part because of concerns that 39b would lead to unacceptable frequency of closed seasons, strategy 39 (the current strategy) was adopted. In the 10 years since its implementation, several concerns have arisen. First, some of the analyses on which the strategy was based have not been revisited since 2005. Second, the 2013 SEIS implementation has created challenges in communicating the logic of the pintail strategy. Third, some states, especially in the Pacific Flyway, remained concerned that there is untapped harvest potential. The charge to the Pintail Working Group was to evaluate and revise the pintail population models; to explore alternative harvest strategies; and to consider experimental or active adaptive management to resolve key uncertainties.

Dr. Runge presented a summary of the group’s work to date, including some detailed analyses of pintail demography and dynamics. Preliminary analyses suggest that there has not been much change in the underlying dynamics of pintails since 2005 (the last time a complete analysis of population and harvest dynamics was undertaken). There are, however, some important critiques of the existing set of population models: the current model is not a full balance equation model, so cannot accommodate observed changes in vulnerability; the current model uses total harvest ( $H$ ), rather than harvest rate ( $h$ ), and we do not know if  $H$  is scaled correctly relative to the population size estimated from the breeding survey; the current model implicitly adjusts for balance equation bias, but we do not know if the bias corrections are correctly allocated to survival and recruitment; and relevant uncertainty is not captured in the current model. The Pintail Working Group has been supporting development of an Integrated Population Model (IPM) that can represent the full balance equation and integrate important estimation methods.

### ***3.2 Pintail IPM (Scott Boomer)***

We described the development of an integrated population modeling (IPM) estimation framework to represent continental-scale pintail dynamics. We used age ratio, band recovery, total harvest, and breeding population information with a state-space formulation to model the true, latent pintail population dynamics assuming multiplicative process error. We continue to scale the observed BPOP with a linear model as a function of the weighted average (BPOP) latitude of the breeding population, modeling the observation process assuming additive errors and the survey-design based variance is fixed and known. Our preliminary results suggest that the recruitment and survival rates from the IPM are consistent with estimates from independent analyses conducted with the raw data. In addition, estimates of bias correction from the IPM are consistent with ad-hoc bias corrections calculated from the time series of recruitment and survival rates estimated from the raw data. We then describe some prior checks and sensitivity analyses that will be conducted prior to finalizing the IPM parameterization that will serve as a basis for deriving pintail harvest policies for the pintail AHM revision process.

### **3.3 Compensatory mortality model: heterogeneity hypothesis (Erik Osnas)**

Erik presented a model of the relationship between annual survival ( $S$ ) and kill rate ( $K$ ) based on heterogeneity in hunting and non-hunting mortalities. A continuous-time model was developed to: represent a range of variation in natural and harvest mortalities, allow for non-hunting mortality to occur during the hunting season under “competing risks”, and an explicit correlation between mortality sources (“individual frailty”). The motivation was to determine if a linear or stepwise-linear model of survival and harvest (*sensu*,  $S = S0(1 - BK)$ , Anderson and Burnham 1976) could approximate deviations from the additive mortality model (i.e.,  $S = S0(1 - K)$ ) over reasonable mortality rates for waterfowl. Results showed that for low to moderate non-hunting mortality rates and low correlation between mortality rates, small deviations from the additive model were produced due to a “competing risks” mechanism due to non-hunting mortality occurring during the hunting season. Under high and strong correlations between mortality rates, large deviations occurred from the additive model with a simple linear relationship between survival and harvest. Only under very extreme harvest rates and correlation did a non-linear relationship between survival and harvest occur. These results show that a simple linear (phenomenological) model can approximate the patterns expected from harvest compensation due to heterogeneity under reasonable mortality rates for waterfowl.

### **3.4 Pintail AHM revision: harvest strategy evaluation (Mike Runge)**

For several reasons, the COVID-19 pandemic delayed progress on the pintail revision. Dr. Runge was pulled off to work on COVID-related impacts to other species, and the FWS Branch of Assessment and Decision Support had to focus on adjusting all harvest strategies to account for the missing May survey data. Pintail assessment work resumed in the fall of 2020 and we anticipate substantial progress can be made in 2021, but the timeline for implementation is now a year later than we had anticipated last year.

Regarding critical uncertainty, in addition to the hypotheses discussed by Dr. Osnas earlier, the Pintail Working Group has identified key uncertainty in the effects of an “L3” package (liberal season length with a 3-bird bag limit). Since 1985, there has been little experience with an L3 package. We are considering two hypotheses: one in which there is a linear effect of bag limit on total harvest from L1 to L3; and one in which the expected harvest is the same under 2- and 3-bird bags.

The Pintail Working Group has sketched the outlines of a series of 126 alternative harvest strategies, but thinks that 18 of those are of immediate interest for investigation. The idea is to examine these strategies against the fundamental objectives, in a manner similar to the analysis of 2009. Of particular interest is whether the choice of a preferred strategy is impeded by the critical uncertainty in the harvest models. If it is, then a short-term experimental strategy could be investigated to resolve that uncertainty. If it is not, then an experimental strategy would not be needed.

At the HMWG meeting, substantial discussion focused on the emerging results from the IPM, notably the scaling parameter between total harvest ( $H$ ) and harvest rate ( $h$ ). This result suggests that the current harvest strategy may overstate the effect of harvest regulations on the population dynamics. While we have not yet analyzed the effect of this parameter on harvest strategies, it is possible that the trade-off in objectives that led to the choice of strategy 39 over 39b in 2010 might be reduced. If this is the case, then could there be a short-cut to a revised strategy that does not involve a full analysis of many alternatives? Although sooner implementation was attractive to some members of the HMWG, there was considerable concern expressed about rushing an analysis. After long discussion, the consensus of the HMWG, affirmed without dissent, was to stay the course for a deliberate and thorough analysis of harvest strategies, knowing this would delay implementation of a revised or experimental strategy until fall of 2023.

On this timeline, development of the IPM would be completed in early 2021 by the PWG, DMBM, and USGS; alternative harvest strategies would be analyzed in Mar-May 2021; any substantive deliberation needed from the Flyway technical committees would be requested as part of the August 2021 meetings; and a full strategy would be proposed at the December 2021 HMWG meeting. That proposal could then be

taken to the Flyway Technical Committees in February 2022 for review, leading to review and endorsement by the Councils in March 2022. After working through all the regulatory steps, the aim would be to either implement a new strategy or begin an experimental phase in September 2023.

With so many moving parts and with the long time still remaining before implementation, members of the HMWG noted the challenges they face in communicating with their constituents. They suggested that the PWG develop a communications plan and materials that could be used over the next two years to keep the Flyways, states, and public updated on continuing progress.

## **4 Flyway Updates**

### ***4.1 Two-tier regulations(Central Flyway)***

The Central Flyway provided a brief update on the status of the two-tier regulations pilot study that is ready for implementation. A Memorandum of Agreement (MOA) between the Service and the states of Nebraska and South Dakota is being reviewed and will be finalized before implementation.

### ***4.2 Eastern mallard IPM and assessment (Tony Roberts)***

The Atlantic Flyway started using multi-stock harvest management to set general duck seasons in the 2019–20 season. Multi-stock management is based on the population dynamics and abundance of four species: wood ducks, ring-necks, green-wings, and goldeneye. Mallards are still important to managers and hunters in the flyway, but previous iterations of eastern mallard models did not perform well. We are developing a new eastern mallard harvest strategy based on objectives to sustain eastern mallard populations that meet legal mandates for consumptive and non-consumptive uses and maximize harvest opportunities in accordance with hunter desires.

The first steps we have been taking are to finalize model form and test model fit. We have tried three variations of model form, and all have been tested for model fit, with varying results. All models include annual survival related to a measure of additivity and production a function of mallard density and time. Population abundance is stepped through time using demographic rates and linked to estimated abundance from surveys. We are using 2-season banding data to improve survival estimates.

Based on model fit results we have started to move forward with model development and test the performance of different models based on model selection. Model selection methods include WAIC (Watanabe Akaike or “Widely Applicable” Information Criterion) and PSIS-LOO (Leave One Out cross-validation computed with Pareto-Smoothed Importance Sampling).

## **5 Adjusting adaptive management protocols in the absence of 2021 BPOP information**

### ***5.1 2020 adjustments to AHM protocols (Scott Boomer and Josh Dooley)***

We provided an overview of the adjustments to AHM decision protocols and analytical procedures conducted in 2020 to assist with informing harvest regulations in the absence of missing waterfowl breeding population and habitat survey (WBPHS) observations. When applicable, most AHM frameworks relied on population models and data from 2019 to predict 2020 breeding population sizes. For frameworks that required observations of state variables for which population models do not exist, we relied on formal time

series analyses to forecast 2020 population sizes and habitat indices (e.g., Canadian ponds). The full details of the technical issues were documented in [U.S. Fish and Wildlife Service \(2020\)](#). In addition, the Branch of Assessment and Decision Support of the USFWS provided a memo that included general model predictions of 2020 abundances for most goose and swan populations. Other modeling efforts have been developed for Atlantic brant, Atlantic Population Canada geese, and emperor geese, and results of these analyses were also presented. We then discussed how an additional year without breeding population data would impact waterfowl and goose decision making frameworks (AHM and prescribed). In general, we would have to continue to project population changes with existing models and information with the expectation that 2021 predictions would be highly variable.

## **5.2 Performance of dead recovery models with missing banding years (Josh Dooley)**

I presented information related to missing a year of banding data, highlighting how this can affect model parameter confounding and outlining various approaches that could be used to potentially evaluate and minimize bias in model estimates. Missing (or partial) banding data will be a larger issue to deal with analytically for 2021 assessments/analyses since many banding operations were canceled or modified during summer 2020 (and likely will be again during summer 2021). This is particularly an issue for arctic-nesting geese, where banding data compose a majority of the information used to monitor some populations and establish harvest regulations (e.g., threshold harvest strategies that use Lincoln estimates or harvest rates). I and Rod Brook (Ontario Ministry of Natural Resources and Forestry) used simulated data to evaluate the performance of simple, constrained maximum likelihood estimation (MLE) models and random-effect Markov chain Monte Carlo (RE MCMC) models when there was a missing year of banding and also fit these models to real, collected data of Southern Hudson Bay Population Canada geese. RE MCMC models generally performed better than the simple, constrained MLE models that were considered, and other approaches to improve or evaluate performance were briefly described (i.e., fix certain parameters, use covariates, include general time-series models [e.g., auto-regressive models], and incorporate additional data [e.g., Integrated Population Models]).

## **6 HMWG Priority Actions and Work Plan**

The HMWG opened up a discussion to review the annual process for identifying and finalizing HMWG priorities. Because of the changes in meeting schedules associated with the SEIS ([U.S. Department of the Interior 2013](#)), the revised timeline was developed ([Figure 1](#)) and allows for more discussion of work progress between Technical Sections, Councils, and SRC members and admits a process for which new priorities can be proposed throughout the year.

The HMWG then reviewed progress on the following FY2021 priority action items ([see attached Priorities](#)), focusing on the following high priority issues:

1. Reconsideration of North American duck harvest management in the United States: The desire to reduce the complexity of waterfowl management in the United States is a common theme across several HMWG efforts including the Pintail and Mid-Continent Mallard AHM revisions, and the experimental two-tier regulations system. There is recognition among all members of the HMWG that the maintenance of multiple, single species harvest strategies is probably not sustainable or desirable in the long-term. The HMWG is proposing to re-evaluate and re-consider the objectives of duck harvest management in the United States and the policies and procedures that govern the promulgation of waterfowl regulations in a more holistic manner. This includes, but not limited, to consideration and evaluation of splash limits, season lengths, bag limits, multi-stock approaches, and temporal time step for setting regulations. The HMWG proposes removing “Revision of MCM-AHM and other species management”, “Revision of Scaup AHM”, and “Development of a Canvasback

Harvest Strategy” from the priority list due to similarities and overlap with a more holistic re-evaluation of promulgating waterfowl regulations in the United States.

2. Northern Pintail Adaptive Harvest Management revision process: The Pintail Working Group (PWG) has made limited technical progress since the HMWG meeting in December 2019 due to other priorities (e.g., development of two-tier implementation plan) and changes in priority assignments in response to the Coronavirus pandemic. The PWG is developing a more detailed work plan and intends to provide updates to the Flyway Councils relative to the development of an integrated population model and any preliminary results. The PWG established an ambitious time line to complete the revision process in time for implementation for the 2021–2022 hunting season, but cautions the HMWG and the Flyway Councils that this target implementation date may not be achieved.
3. Experimental two-tier regulations system: The Central Flyway (CF) and the Division of Migratory Bird Management (DMBM) developed an implementation plan and shared it with the four Flyways for review and comment. The implementation plan was adopted by the Service Regulations Committee (SRC) during the April 2020 meeting. Nebraska and South Dakota have conducted pre-implementation surveys and will provide a summary report detailing the purpose, methods, and results of the survey prior to the summer Flyway meetings. The CF and DMBM anticipate changes to the implementation plan will be made based on the experience and knowledge gained after the 2021–2022 hunting season. Additionally, the CF and DMBM note the Flyway Council, DMBM and SRC will need to address and resolve several outstanding policy issues, including: what is success relative to the two-state pilot program; how will the Councils and SRC decide if, when, and how to expand the pilot program to additional states and flyways; and how will the Councils and SRC decide if, when, and how to implement a national-wide two-tier regulations system?
4. Development of Eastern Mallard Harvest Strategy: The Atlantic Flyway Council Mallard Committee and the Atlantic Flyway Office, with assistance from the Branch of Assessment and Decision Support, is working on a new harvest strategy for eastern mallards. To date they have identified objectives of the strategy and are currently working towards the development of an integrated population model to support the harvest strategy.
5. Time-dependent optimal solutions to address system change: Mike Runge and Jim Lyons of the USGS Patuxent Research Center and the Branch of Assessment and Decision Support have secured funding to support a Postdoctoral Research Associate to develop preliminary analyses and frameworks to account for system change in the setting of annual waterfowl hunting regulations. Dr. Anna Tucker started as the postdoctoral research associate in spring 2020.
6. Waterfowl Banding Needs Assessments: Pam Garrettson of the Branch of Assessment and Decision Support is working on updating wood duck banding guidance using methods detailed by Jim Kelley and using current data. The Branch of Assessment and Decision Support is funding a post-doctoral research project with USGS Patuxent to design and evaluate alternative monitoring programs based on marked individuals (i.e., standard bands plus other auxiliary markers) to support harvest and habitat management. The purpose of this project is to determine if new technologies can increase the amount and quality of data obtained per marked bird while also decreasing overall costs of annual waterfowl monitoring. This project will start late summer or early fall 2020.
7. Additional HMWG priorities: No specific updates at this time.

The HMWG noted that additional work items that the Service or the Flyways would like to see addressed that are not included in these actions would necessarily delay completion of the highest priority tasks.

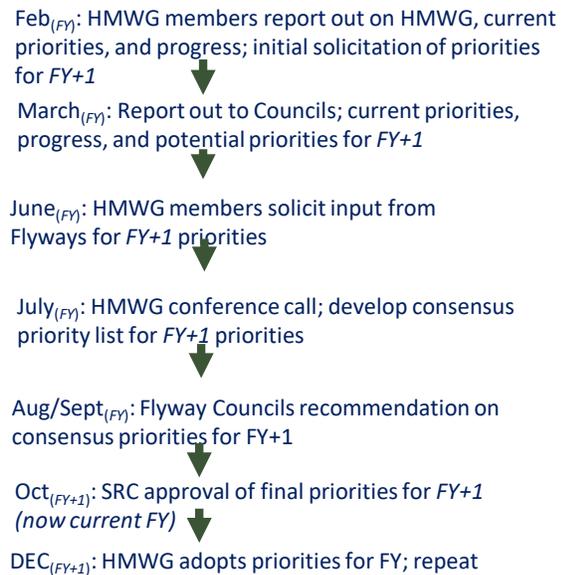
## **6.1 2021 HMWG meeting**

The next HMWG meeting will be hosted by the Central Flyway in Austin, TX, from 6–10 December 2021.

Previous Schedule



Adopted Schedule



**Figure 1** – A revised timeline for updating the Harvest Management Working Group Priorities.

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# 2020 Harvest Management Working Group Meeting Virtual (Eastern Standard Time) Agenda

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## Tuesday 8 December 2020

- 1100 Welcome, introductions, logistics, agenda (Boomer, Kraai)
- 1115 Flyway reports  
Atlantic, Mississippi, Central, Pacific (State Technical Representatives)  
US Fish and Wildlife Service (Flyway Representatives)  
Canadian Wildlife Service (Roy)  
US Fish and Wildlife Service DMBM/BADS (Devers)  
US Fish and Wildlife Service DMBM/BMDM (Fleming)  
Reward banding update (Garrettson)
- 1330 BREAK
- 1400 Partner updates  
NAWMP Plan Committee update (Dubovsky)  
NAWMP Integration (Eggeman)  
Human Dimensions Working Group (Longmire)  
National Science Support Team (Kraai)  
HMWG Communication team (Huang)  
Evaluating harvest management conflicts pre and post AHM (Garrettson)  
Adjusting AHM frameworks for non-stationarity (Boomer)  
Time-dependent optimal solutions to address system change (Runge)
- 1630 Adjourn

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## Wednesday 9 December 2020

- 1100 Pintail AHM revision  
Recap (Runge)  
IPM (Boomer)  
Compensatory mortality model: heterogeneity hypothesis (Osnas)  
Decision analyses (Runge)
- 1330 BREAK
- 1400 Two-tier license system updates (CF)  
Mid-continent mallard AHM revisions: decision framing for other stocks(HMWG)  
Multi-stock AHM updates (Huang and Balkcom)  
Eastern mallard IPM and assessment (Roberts)
- 1630 Adjourn

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## Thursday 10 December 2020

- 1100 Meeting recap (Boomer)
- 1115 Adjusting adaptive management protocols in the absence of 2021 BPOP information  
Performance of dead recovery models with missing banding years (Dooley)  
Forecasting (ARIMA, IPM state space projections) (Boomer and Dooley)  
Communication needs (HMWG)
- 1330 Break
- 1400 HMWG Priorities (Devers)
- 1400 HMWG Terms of Reference: updates and finalization

Plans for 2021

Action items

Next meeting: location (Central Flyway: Austin, TX), date

1530 Meeting summary and parting thoughts (HMWG)

1600 Meeting Adjourned

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## Finalized Harvest Management Working Group Priorities, FY2021

**Table 1** – Priority rankings and project leads identified for the technical work proposed at the 2019 Harvest Management Working Group meeting and finalized during the summer of 2020.

Priority Level	Status	Participants
<b>Highest Priorities (Urgent and Important)</b>		
Reconsideration of North American duck harvest management	On-going	DMBM, Flyway Councils
Northern pintail AHM revision	On-going	DMBM, Flyway Councils, USGS
Evaluation of experimental two-tier regulations system	On-going	Central Flyway, DMBM
Development of an eastern mallard harvest strategy	On-going	Atlantic Flyway Council, DMBM
Re-invigorating institutional support for AHM	On-going	DMBM, HMWG communications team
<b>Long-range Priorities (Non-urgent, but Very Important)</b>		
Time-dependent optimal solutions to address system change (e.g., habitat change; hunter dynamics; climate change).	On-going	USGS, BADS
Western mallard AHM revision	On-going	Pacific Flyway, BADS
<b>Additional Priorities</b>		
Waterfowl banding needs assessment	On-going	BADS, USGS, Flyway Councils
Waterfowl harvest potential assessment methods case study development	On-going	Atlantic Flyway Office, DMBM

## Harvest Management Working Group Members

This list includes only permanent members of the Harvest Management Working Group. Not listed here are numerous persons from federal and state agencies that assist the Working Group on an ad-hoc basis.

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