

Harvest Management Working Group

2022 Annual Meeting Report



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PREFACE

This report provides a summary of presentations and discussions that occurred at the 34th meeting of the Harvest Management Working Group (HMWG). The 2022 meeting focused on problem framing and discussions of monitoring required by adaptive harvest management and the revision of the pintail Adaptive Harvest Management framework. For meeting details please refer to the appended [2022 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.

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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 2022 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.

Cover Art: The 2022–2023 Federal Junior Duck Stamp featuring a green-winged teal (*Anas crecca*) painted by Madison Grimm of South Dakota.

1 Flyway and Partner Reports

1.1 Atlantic Flyway (*Min Huang and Josh Stiller*)

Multi-stock adaptive harvest management

We are now into the fifth regulatory cycle using the multi-stock AHM decision framework in the Atlantic Flyway. Due to the fact that we set seasons a year in advance, and our desire to have at least five years of data before we update the framework, we will wait to update the weights on each species until after the 2023–24 season. We are supposed to be doing an initial double loop after this current season, however, we will wait another two years so that we have an appropriate amount of data to change the weights. The weights consist of the individual species harvest importance to each of the three regions of the Flyway (North, Mid-Atlantic, South) and the number of hunter days expended in each region. The intent of incorporating hunter days in each region is as an index of success of the strategy. If we were doing a good job with habitat delivery, hunting opportunity, and maintaining duck populations, hunter days theoretically should increase in those regions where specific species were important to hunters. This is reflected in those individual species weights. One immediate technical tweak to the framework is to update harvest rates with the new reporting rates estimated from the recent reward band studies. These new reporting rates of 0.90, rather than the currently used reporting rates of 0.73, will result in lower estimated harvest rates for those two species for which we directly estimate harvest rates through band recoveries (wood ducks and teal). This shouldn't result in any changes to the optimal policy decision, but will likely result in a downward shift in our estimates of carrying capacity.

Mallard Harvest Strategy

We implemented the Eastern Mallard harvest strategy for the 2023–24 hunting season. The policy strives for a 98% shoulder with no discount factor. The optimal policy for the 2023–24 season calls for a return to a liberal 4-bird bag limit. The change presents a communications challenge as the breeding population, especially in Northeastern US, has not changed significantly since 2019 when the bag limit was restricted. The Flyway has developed an outreach document and now that the SRC has met and approved the recommendation, we will begin disseminating the information. We have some lingering concerns about model performance in year 1 of implementation. The significant lapse in complete breeding population estimates complicated our evaluation of model performance prior to implementation and may explain why the IPM predicts a stable to decreasing EMALL population while the observed BPOP increased by 18%. This is an issue that we had with the old Eastern Mallard AHM framework. Further, we have concerns about the survival sub-model and that finite population growth rate is not correlated with adult female survival or harvest rates or with juvenile female survival or harvest rates. Both seem a bit counter-intuitive or unrealistic. Although the survival sub-model with a declining trend in juvenile survival performed the best, the 16-18% decrease in juvenile survival seems unrealistic without an obvious mechanistic explanation. Similar to the incongruence of the IPM estimate and the BPOP, the stark difference in population trends between eastern Canada (increasing) and Northeast US (decreasing) remains a concern. It is feasible that declines in the Northeast US could continue to be buffered by increases in eastern Canada. Although we did not include any constraints on the policy if Northeast BPOP's continued to slide, if Northeast mallard numbers were to continue to decline and the overall policy remained liberal, it would present a difficult communication hurdle.

Black Duck AHM

The 2013 International harvest strategy required the updating and technical review of the AHM protocol every five years. It has been since that implementation that we have conducted any major technical or policy changes. The BDAHM working group previously identified a number of technical adjustments to be

pursued. These included 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. Recently conducted simulations indicate that changing the spatial scale merely amounts to just that, a scaling change. There doesn't seem to be any change to the underlying optimal policy decision. The change in the definition of TIP also results in a scaling change, with no change in the decision. Similarly, removing the mallard competition from the framework did not affect the decision, but, since there is no underlying mallard model to interact with changing black duck productivity or abundance, the removal of the mallard competition simplifies the framework with no penalty in performance. An annual random effect, that had the same influence on the policy as the mallard competition, was added instead. Removal of the mallard competition, however, may require communications efforts with hunters. The partitioning of the additivity parameter was also simulated. This was a bit problematic and will not be pursued.

A policy decision was made regarding the parity constraint, which was the most contentious issue during the development of the International strategy. This constraint ensures equal harvest, measured through harvest rates, for both countries. The formulation of the parity constraint imposes a penalty on combinations of country-specific harvest rates (i.e., regulatory packages) that are expected to result in one country receiving > 60% of total harvest. A recent trend analysis indicated a strong decreasing trend over time in harvest rates in Canada and in practical terms, it is becoming increasingly evident that there may be a limit in Canada on attainable harvest rates. Due to the decrease in expected harvest rates under each of the four Canadian regulatory alternatives combined with the parity constraint, the U.S. policy became more restrictive. Penalizing U.S. hunters because of declining participation (or at least realized harvest) in Canada, particularly when Canada is in a liberal policy is not what we envisioned nor desired when we collectively agreed to the current parity formulation. Covid and the lack of survey data for two years unfortunately delayed implementation of liberalization changes to Canadian black duck regulations. A number of changes meant to increase harvest rates were tabled due to the lack of survey data. Thus, the current disparity in harvest rates between the two countries will likely continue for the next three years, as Canada is just now entering their new two-year cycle. There was a need for an interim policy decision to address the parity issue when Canada (or any country for that matter) is in a liberal package. The interim decision is to impose the parity constraint only if the optimal policy in Canada is either moderate or restriction. Once Canada is able to institute more liberal harvest regulations and we have experience with those realized harvest rates, this interim parity constraint will be re-visited.

Technical Capacity and Monitoring

As we emerged out of the two-year lack of Continental BPOP survey efforts, the importance of our long-term and robust monitoring programs was once again demonstrated. In the absence of the robust monitoring programs we have, and the data from those programs, it would have been very difficult, if not impossible, to promulgate regulations the past two years. Not only did the monitoring programs allow for regulations to be set, but under the umbrella of AHM, seasons were promulgated in the absence of contemporary data and, importantly, contemporary lawsuits.

We fear that administrative complacency may emerge and there will be a continued erosion of support for monitoring and with that a cost. We feel that as a community we need to determine what level of monitoring is needed to deliver what our constituents demand. It is critical that the harvest management community begin these difficult discussions and chart the path forward to determine what level of monitoring is absolutely necessary to continue to deliver the programs that we currently deliver.

Future of AHM

We continue to have concerns about optimizing across an infinite time series. We briefly explored options such as the discounting of future returns during the formulation of Multi-stock AHM. Our urgency, however, to implement Multi-stock, did not allow us to fully explore and vet this type of approach to harvest management. Perhaps we can look at this in the context of eastern mallard harvest management, or

perhaps the larger harvest management community will have the opportunity to investigate discounting as we collectively re-evaluate our overall approaches to duck harvest management.

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 2022 Flyway meetings, both held in Orange Beach, Alabama. The Winter 2023 meeting will be held 20-24 February in Lafayette, Louisiana.

With the departure of Larry Reynolds from the Mississippi Flyway Council's Game Bird Technical Section, Orrin Jones (IA) and Houston Havens (MS) were named as representatives to the Northern Pintail Harvest Strategy Revision team.

Reconsideration of North American Duck Harvest Management Survey: Mississippi Flyway Summary

Since "Reconsideration of North American Duck Harvest Management" became a priority for the HMWG in December of 2020, several (virtual) meetings have occurred. Between February and July of 2021, a small group (essentially made up of the Communications Committee) worked on soliciting feedback on assumptions, objectives, and questions from the Flyway technical committees regarding how duck harvest management could potentially be revised. During this period, it was decided that this small group would prepare and send a survey to harvest managers (state and federal biologists) to solicit uniform feedback nationwide. This was deemed necessary because the feedback from the Flyway meetings was inconsistent. The set of questions that was derived ensured that feedback across Flyways could be compared usefully. The group also decided that, once the results from that survey were in, the group should be expanded to include more participants for the subsequent technical work, including various committee chairs and species specialists across the Flyways.

The survey went out 8 July 2021. The results were compiled and shared with the state HMWG representatives. The intention was that all four Flyways would see similar presentations at the summer 2021 meetings to ensure that the information going out was the same. Just as importantly, it was intended that feedback from the Flyways be similar in format so that it could be readily compiled and compared. Plans for these presentations were finalized during a call on 5 August.

During a call on 9 November 2021, the drafting of a problem statement was begun. In addition, discussions of how to share the work to date with the HMWG were held. At the 2021 meeting, the HMWG was presented with a summary of findings from the survey. Following that, the draft objectives from the problem statement were presented and discussed at length. It was noted at this time that the objective setting process would necessarily be iterative over at least 2 but probably 3 (or more) iterations, and that a facilitator who could be consistent across the Flyways would be a good resource to help identify the final objectives. Excellent feedback was received from the HMWG during this session.

On 24 January 2022, the group met to discuss HMWG feedback and to refine the presentation to be used at all four winter Flyway meetings. This presentation reviewed the survey results and the draft objectives, but the meat of this presentation was a strengths/weaknesses/opportunities/threats (SWOT) assessment. In the Mississippi Flyway, many state representatives submitted their SWOT lists ahead of the meeting, which was extremely helpful in focusing our discussions.

The group planned to meet virtually on 23 March to discuss how to combine the SWOT assessment results. However, before that call, the group received a letter from the Pacific Flyway. This letter enumerated several reasons that the Pacific Flyway had not participated in the SWOT assessment or discussions regarding the effort, as well as why they felt that this entire effort was unwarranted and poorly defined. The letter also said that the current effort was inappropriate due to its being beyond the purview of the

HMWG. As a result of this letter, which was received over a year after the effort was identified as a HMWG priority and three months after the detailed discussion held at the 2021 HMWG meeting, most of the call was spent reconsidering the draft problem statement and identifying additional group members to add to make the work more appropriate. Those members, including the second state HMWG representative from each Flyway, all four of the Service's Flyway representatives, and additional regional Service staff, were invited to a call scheduled for 20 April 2022, the purpose of which was to refamiliarize the new members with work thus far and to chart a path forward.

During a contentious call on 20 April, much of this ground was rehashed. Many criticisms of the draft problem statement were enunciated for the first time, despite multiple opportunities to comment over the previous six months. In the end, the Pacific Flyway committed to having comments on the draft problem statement to the group by 20 May. Those comments would be worked into a second draft before the summer Flyway meetings. Those comments were never forthcoming, and the process has languished since the May call.

Duck harvest management at the national or continental scale cannot succeed, or even meaningfully be attempted, without engagement from all four Flyways. The unwillingness of the Pacific Flyway to engage, whether to actively participate or even to provide feedback on documents that would guide the process, is actively hindering what the Mississippi Flyway sees as an important next step in simplifying and streamlining how ducks are harvested in the US. Historically it has been clear that national strategies without engagement across all four Flyways have no traction. The partnerships we build are what makes waterfowl management in North America so strong. Perhaps the upcoming discussions regarding the future of monitoring and how it ties into duck harvest management will provide the necessary impetus for Pacific engagement.

HMWG Priority List

The discussion at the summer meeting centered on the currently proposed Harvest Management Working Group priority list, mostly the proposal to add "Evaluate the implications of changes in monitoring frequency on adaptive harvest management performance" to the list. With the last-minute addition of this priority to the list, there was a great deal of concern regarding the impacts that reductions in monitoring could have. Much of the discussion centered on what form the deliberations and decisions are likely to take and how it might impact other, extant HMWG priorities, particularly reconsideration of duck harvest management and the ongoing pintail strategy revisions. The HMWG has, at recent meetings, discussed proactively examining monitoring with an eye toward having potential cost savings ready in the event that cuts were needed. This new priority item may therefore fit within the overall plan of revising US duck harvest management.

As always, there was some discussion at the summer meeting regarding the lower priority items that have remained on the list for years, and whether they are useful additions to a list that rarely gets addressed beyond the highest priorities. This was especially clear this year, since the newly-added priority regarding monitoring seems likely to hold much of the focus for the coming year.

The Mississippi Flyway would like to thank Pat Devers and BADS staff for again providing the descriptive narrative that accompanies the draft priority list. Having the background and implications of these proposed priorities available at a glance is immensely helpful in our discussions.

Monitoring Concerns

In immediate terms, there is little more concerning in waterfowl management than the potential loss of monitoring data. Maintaining the long-term data sets that waterfowl management has relied on for decades should be a high priority. However, we also recognize that the Service is in a difficult budgetary position. We understand that technology and analytical methods advance, and we should not be afraid to make

changes as warranted. We are hopeful that a number of small efficiencies can be found, the combination of which will be sufficient to forestall larger and more impactful cuts to monitoring programs. We view the inclusion of annual monitoring data in the harvest management process as critical. If the Service sees ways in which the states of the Mississippi Flyway can assist in supporting robust monitoring, we encourage them to bring those suggestions to our attention.

The waterfowl management community relies upon annual monitoring data to inform management decisions. This has been a hallmark of waterfowl management and held as an example of successful adaptive management. Reducing annual monitoring would be a step backwards from the progress that the waterfowl management community has made to integrate science directly into decision making. The Mississippi Flyway has many questions regarding the potential impacts of reduced monitoring. These include concerns that a reduction in monitoring would increase uncertainty regarding population trends and demographics which may require more conservative harvest regulations.

Northern Pintail Harvest Strategy Revision

The Mississippi Flyway is concerned about the current Northern Pintail Harvest Strategy (2010) and the initial results of the harvest strategy revision released in February 2022. The observed settling latitude and population of pintails in 2022 of 1.78 million, is very near the season closure threshold of 1.75 million.

The initial results of the Northern Pintail Harvest Strategy released in February 2022 were also concerning to the Mississippi Flyway. After a period of optimism for additional harvest opportunity, the most recent results from a newly created integrated population model indicate that the current harvest strategy may not be sustainable. The flyway received a brief update in August indicating that further technical work and review of the new IPM would occur during fall 2022 and be presented to the HMWG in December 2022 and to the flyway technical committees in February 2023. We look forward to further updates and engagement regarding a revised pintail harvest strategy.

The Mississippi Flyway is concerned about a potential closed season on pintails and the possibility of future harvest strategies becoming increasingly conservative. Published ecological literature on pintails indicates that harvest rates are relatively low and that the population is limited by poor production (Zhao et al. 2019). This seems contrary to the current harvest strategy and initial results of the revision. While we recognize the pintail population has experienced a long term population decline we question the utility of a closed season and have concerns about the effects of a closed season on waterfowl hunters.

Concerns with SEIS 2013

In the Mississippi Flyway perspectives document for the 2021 HMWG meeting, concerns with SEIS 2013 were raised. The same issue is again raised here as a reminder that it has not been resolved. We suspect that the question of a new SEIS will be raised in multiple contexts this week, so we would like to bring this concern to the attention of the HMWG again as those discussions go forward. Concerns regarding drought conditions on the prairies in 2021, and what many thought were unrealistic predictions of pond counts and breeding populations, caused many biologists in the Mississippi Flyway to raise concerns regarding the appropriateness of a liberal duck season recommendation for 2022-23. Perhaps the primary issue discussed was related to the following paragraph (Alternative 2, page 159):

“The Service proposes that during the implementation period, the Service and Flyway Councils. . . will define what circumstances. . . warrant changing the regulations after they have been established for a given year. A collaborative effort will be made to develop a process that details how these changes would be effected and implemented... The belief of the Service is that such changes should be considered only in extreme situations and such occurrences should not be frequently considered, if at all.”

Exactly what circumstances would be extreme enough to justify or allow changes to the regulations the subsequent summer remains unclear. The process to amend the decision also remains unclear. Clearly no “collaborative effort” to develop that process has ever been initiated, so it remains undefined. Indications from the Service during the summer 2021 meetings were that only a season closure could be considered in these “extreme situations,” rather than season restrictions, though that position has never been formally discussed or codified. We appreciate that the Service altered the language to address concerns the Flyways had about the language on this topic in the Draft SEIS, and that the Flyways should have pushed earlier for clarification on this paragraph. We believe that clarification of “extreme situations” and their potential remedies need to be formally addressed. We would like consultation to begin between the Service and the Flyways regarding what that process would entail.

1.3 Central Flyway (Mike Szymanski and Kevin Kraai)

The Central Flyway is grateful that after two years of disruption and cancellations due to COVID-19, monitoring efforts for migratory game birds and in-person meetings have resumed. Importantly, the May Breeding Ground Habitat and Population Survey resumed, preseason duck banding stations operated, and harvest surveys functioned in full capacity. These three efforts in their full form restore the complete data structure of mid-continent duck AHM, and allowed the implementation of the updated modelling structure of AHM.

Our flyway banding chair worked with the Division of Migratory Bird Management, refuges, and the Mississippi Flyway banding chair to resume preseason duck banding at important areas in the Dakotas and Montana. The Service provided staff to lead banding efforts with support staff provided by the Central Flyway in mallard banding reference area 12, where data has been far below desired numbers. The Mississippi Flyway staffed historically important stations in mallard banding reference area 13. We believe that the pilot year in 2022 was successful and that we can continue to improve this collaborative effort.

We continue to be concerned that DMBM funding levels will negatively impact the three core monitoring programs: the May survey, preseason duck banding, and harvest surveys. Data continuity from these data streams provides the underlying foundation for informed management decisions, communications with the public and the ability to monitor long-term system change (e.g., climate change).

The inadequacy of funding for DMBM continues to jeopardize monitoring programs and the ability to continue to successfully manage waterfowl in North America. Flat budgets over the long-term effectively result in budget cuts, and budgets have been flat for over 10 years. Lack of sufficient funding will not only jeopardize current monitoring efforts, but also stunt, or even preclude the ability to innovate data collection methodologies.

The Central Flyway is still interested in “Reconsidering North American Duck Harvest Management”; however, discussions have stalled because of lack of agreement amongst all four flyways on whether there is a need to move forward. We believe that changes are needed to provide efficiencies to the management paradigm and provide simplicity in decision-making frameworks and regulations delivered to hunters. The pintail harvest management strategy revision plays a role in this discussion; however, we are awaiting completion which has been delayed. We are disappointed that progress has been slow to come.

We appreciate the opportunity for two of our states, South Dakota and Nebraska, to evaluate Two-tier duck hunting regulations. We understand that the SRC has concerns regarding lack of clarity in the measurable attributes and objectives of the evaluation. The two states leading the effort are working to address those concerns. This was the second year of a four-year evaluation. 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)

The Pacific Flyway Council (PFC) and Study Committee (SC) discussed Harvest Management Working Group (HMWG) priorities at the 2022 summer meeting, held as a hybrid (in-person and videoconference) meeting in Juneau, Alaska. The PFC endorsed the draft 2023 priority rankings and project leads without changes but offered comments regarding two high priority technical work items. The PFC expressed deep concern about the potential reduced frequency and intensity of waterfowl monitoring because of shortfalls in the Division of Migratory Bird Management (DMBM) budget. The critical importance of robust monitoring programs to the management and conservation of waterfowl populations is widely recognized. Thus, before any significant decisions are made to cut or modify operational monitoring programs, the PFC supports the need for a thorough evaluation of potential effects of these changes before they are implemented. Accordingly, the PFC agrees with adding the new priority, *'Evaluate the implications of changes in monitoring frequency on adaptive harvest management performance'* but recommends this be the highest priority for the coming year.

Given the importance of this new priority and considering the potential consequences any changes in monitoring frequency may have on adaptive harvest management performance, the PFC suggests that perhaps the HMWG consider any work planned for the *Reconsideration of North American duck harvest management* priority be shifted to the new priority this next year. The PFC believes it may be premature to reconsider duck harvest management in a decision-making framework until the future level of monitoring and associated effects are known with certainty.

Nonetheless, the SC would like to express appreciation to Scott Boomer for appending the 'Rationale' section to the revised version of the 'duck harvest management reconsideration' problem statement. This section helped clarify some of the confusion expressed by the SC over the priority. The SC has no strong concerns related to duck management in the Pacific Flyway and does not consider this a priority for the flyway. However, the SC anticipates continued engagement and will look for opportunities to provide input as the issue develops further.

Finally, the following are specific updates on long-standing HMWG priorities important to the Pacific Flyway.

Northern Pintails

The revision of the Northern Pintail Harvest Strategy remains a high priority for the Pacific Flyway. The PFC recognizes several factors have impacted recent workloads for many of the DMBM and US Geological Survey staff assisting with the revision. However, the PFC expressed disappointment that work to date will not allow implementation of a revised strategy for the current regulatory cycle. The PFC encourages DMBM and USGS to continue communicating progress with the flyways to ensure timely input and review in the revision process and evaluation of the revised strategy.

Western Mallard

The SC remains supportive of efforts to continue to broaden the geographic scope of the Western Mallard AHM protocol by inclusion of information from other states such as Nevada and Utah. However, we continue to view this work as not critical and non-urgent, as reflected by its lower status in the 2023 HMWG priority list (Additional Priorities).

1.5 Atlantic Flyway Representative (Pat Devers)

Things are pretty quiet in the Atlantic Flyway, but a lot is going on. We have been using the Multi-stock Adaptive Harvest Management (MS-AHM) for about 5 years now and it is working smoothly and as

expected. We (the Atlantic Flyway Technical Section and Service) are starting planned reviews of the technical pieces of this framework. This year we used the new Eastern Mallard AHM framework to recommend the optimal regulations for the 2023–24 season. This framework sets the daily bag limit for mallards with the season length set by the MS-AHM framework. Special thanks to Tony Roberts, Josh Stiller, Jeff Hostetler, and Min Huang for the heavy lifting to get this new framework in place. We continue to use the Black Duck AHM framework to guide regulation in both Canada and the U.S. The Black Duck Adaptive Harvest Management Working Group (BDAHMMWG) has made great progress on several outstanding technical updates thanks to the work of John Yeiser. We expect these technical changes will be incorporated into the 2023 regulatory cycle (for the 2024-2025 season). These updates include: 1) changing the spatial scale of the population abundance from the “core” survey area to the eastern Canada spatial scale; 2) revised the definition of Total Indicated Pairs; and 3) removal of the mallard competition hypothesis. Finally, the Black Duck AHM Working Group is revisiting the purpose, definition, and function form of the harvest parity constraint. This season (2022–2023) is the first year without a Special Sea Duck season in the Atlantic Flyway. The Special Sea Duck season was discontinued over concern about the status and harvest capacity of these species.

Like our partners, we are concerned and frustrated about current funding levels and future budget outlook. Also, we are concerned about long-term vacancies in the Division of Migratory Bird Management and our ability to fill those positions any time soon. Current vacancies include Chief, Branch of Assessment and Decision Support, statistician, assessment biologists(s), Central Flyway Representative Assistant, and pilot-biologist.

Finally, recall the Service is considering ways to streamline the promulgation of annual hunting regulations to ensure we meet our deadlines and support State processes. Several states in the Atlantic Flyway raised concerns with the proposed “periodic rule and policy document” process because they were not sure if the policy document would be enforceable. It also raised the potential for these states to have to go through a rule-making process to ensure their state laws were congruent with the new federal process. At the same time, we have received several questions from the Office of Management and Budget (OMB). Given the concerns of the States and OMB, the Service has decided to slow down the timeline to address these concerns and we are now hoping to be able to implement the new process with the 2024–25 season.

1.6 Canadian Wildlife Service (Jim Leafloor)

The Canadian Wildlife Service (CWS) reported that the modernization of the Migratory Birds Regulations came into force in July of 2022. Some of the most significant changes included full recognition of Indigenous harvesting rights, changes to the definition of possession that simplify requirements for possession, transport, labelling, and use of legally harvested migratory birds, introduction of a free Migratory Game Bird Youth Hunting Permit, and a prohibition on wastage of migratory game birds. All CWS monitoring programs for migratory game birds proceeded in 2022, and there were no programs cancelled due to COVID restrictions this year.

The province of Manitoba introduced new provincial regulations that will put a cap on the number of non-resident licenses sold in the province each year, and will limit most non-resident, non-Canadian licenses to a 7-day period. Some of the available licenses will be allocated to outfitters, and will only be available to clients of licensed outfitters in Manitoba.

CWS also reported on two emerging issues that could have impacts on CWS monitoring programs in the future, including new provincial legislation in Saskatchewan that prohibits access to private land without the owner’s permission, and introduces hefty fines for violators. This new legislation applies to all federal government employees specifically, and could have impacts on the ability to conduct the ground portion of the Waterfowl Breeding Population and Habitat Survey (WBPHS) in Saskatchewan. Another emerging issue is the potential impacts of Highly Pathogenic Avian Influenza (HPAI) on our ability to deliver duck banding programs. There are concerns that baiting could result in increased transmission of HPAI virus among water birds using wetlands where bait trapping occurs in summer.

1.7 Branch of Assessment and Decision Support (Mark Seamans)

There are currently seven staff members in Branch of Assessment and Decision Support (BADS). The BADS Chief position has been vacant for almost two years. In addition, with the US Geological Survey, BADS has a hand in the funding and management of three post docs that are working on issues related to harvest management. Approximately 70% of the work performed by BADS concerns harvest management of migratory birds, with most time committed to duck harvest management followed by goose and webless species harvest management. Other work conducted by BADS mostly relates to species population assessments to inform permitted take management, and assisting in the US Fish and Wildlife Service's effort to recover the loss of 3 billion birds. BADS staff manage the Arctic Goose Joint Venture (AGJV) grant program and the Webless Migratory Game Bird (WMGB) grant program. The call for proposals for the AGJV closed at the end of September 2022, and reviewers are now considering awards. The call for proposals for the WMGB Program opened 13 December 2022.

Most BADS projects related duck harvest management will be discussed at this HMWG meeting. These projects include the pintail AHM revision, mid-continent mallard reporting rate study, changes in duck harvest over space in time, integrating human dimensions in duck harvest management, alternative marking techniques for waterfowl, continued work on black duck AHM, and how to make time dependent in the face of system change. Goose projects are many, and, for example, include examining the use of Lincoln estimators to evaluate harvest, and the use of genetic analyses to identify breeding stocks to inform morphological identification. Webless projects are many and include the revision of the mourning dove harvest strategy. Nongame projects are also many and include survey design development to estimate double-crested cormorant abundance, the effect of increased hurricane frequency and intensity on Caribbean bird populations, and assessing take limits to inform permitted take of swallows and lesser yellow legs.

BADS is regularly being asked to do more while keeping similar staffing levels. Beyond harvest management, there is a growing need to support the process for permitting the planned and incidental take of nongame birds, and to support the US Fish and Wildlife Service's 5 & 1 Strategy to help recover the loss of 3 billion birds. However, harvest management of migratory game birds will continue to be our top priority.

1.8 Branch of Monitoring and Data Management (Kathy Fleming)

2023 Wingbee schedule

All wingbees will be held in person this year. The Atlantic Flyway wingbee will continue to be held last, combined with the late wingbee, at Patuxent during the week of March 20. The woodcock wingbee will be held at Chincoteague NWR the week of April 3.

HIP Stratification Analysis

Last year Emily Silverman and Dave Otis (CSU Emeritus) undertook a webless grant project to explore the reliability and predictiveness of stratification of the harvest estimates based on hunters' answers to HIP questions about their previous year's hunting activity. They found that hunter's HIP answers were generally predictive of their hunting activity the following year. Matching the HIP dataset and harvest diary responses for a subset of hunters provided a comparison of what hunters responded to the HIP questions with what they reported in their diary survey. A substantial proportion of hunters' HIP answers did not match their reported diary responses, suggesting that the HIP stratification may not be reliable. Many hunters that reported not hunting on the diary survey told HIP that they had hunted the previous year and harvested birds. Additional work is ongoing to investigate the effect of reliability on stratification efficiency.

Online harvest survey implementation

The 2022-23 hunting season is the first year of full implementation of the online harvest survey. Advantages of the online survey include: better control of data quality, more time to evaluate and process hunter data, improvements in sampling design (correcting for problems in unequal sampling probability, sample allocation), and reduced printing and postage costs. Some disadvantages are lower response rates, limited capacity for technical support, and lack of budget for ongoing development.

Results of paper/online survey comparison

A 3-year overlap in the paper and online harvest surveys for ducks and doves allows a comparison of response rates, non-response bias, and harvest estimates between the two platforms. Preliminary results from this comparison show that response rates for the online survey are about half that of the paper survey. Harvest estimates from the online survey were slightly lower than those from the paper survey for most states, but followed a similar trend as the paper survey estimates over the 3-year period. A report on the comparison will be finished and released this year.

Integrated waterfowl harvest models

Ben Augustine and Andy Royle (USGS EEEEC) are finishing work on a project funded through the AGJV, SDJV, and DMBM using integrated models to predict species-specific harvest estimates for sea ducks and geese. Preliminary results suggest that models with both time and space- (autoregressive based on adjacent states) dependent structure provide efficient estimates of harvest for most duck and goose species.

PCS photo project

We are working on a pilot project to collect photos taken of harvested waterfowl to supplement the Parts Collection Survey. About 3000 photos were collected during the 2021-22 hunting season. Speciators were able to identify species, sex and age of most birds from photos, despite some issues of poor quality. Double observer identification may be useful for validation models. Future work would include determining feasibility of using image recognition to identify age and sex characteristics, and development of a mobile app to streamline the photo collection process.

1.9 Branch of Migratory Bird Surveys (Mark Koneff)

Mark Koneff presented an update on the Branch of Migratory Bird Surveys staffing and priority activities. The Branch currently consists of 10 pilot-biologists including the Branch Chief. One of these pilot-biologists is in a training status. There are two vacant pilot-biologist positions presently with one anticipated retirement in 2023. Staffing limitations are affecting the Branch's ability to complete large surveys like the Waterfowl Breeding Population and Habitat Survey in its entirety and limiting options to respond to short-term staffing reductions due to illness, injury, or other problems. The Branch also includes a Geospatial Specialist focused on remote sensing and machine learning technologies to improve survey safety, data quality, and efficiency. This integration is occurring in collaboration with the Bureau of Ocean Energy Management and US Geological Survey as well as various academic partners. The intersection of agency mandates and priorities have focused substantial initial development on marine wildlife surveys however other applications to sandhill cranes and waterfowl in more terrestrial habitats is ongoing. Initial phases focused on aircraft modification, image acquisition technology, and solutions for managing very large datasets. Additional emphasis has been on development of tools, processes, and expertise for classification of birds and other wildlife from imagery to develop machine learning training datasets. This initial phase is

largely completed. Present focus is on augmentation of training data, development of machine learning algorithms to detect and classify birds from imagery, and development of estimation methods incorporating machine learning outputs. Other challenges such as the need to develop frameworks that are generalizable to new areas and species suites are also under consideration.

1.10 Division of Bird Conservation, Permits, and Regulations (Greg Fleming)

Greg Fleming, Migratory Bird Hunting Regulations Coordinator, gave an update on the new approach to migratory bird hunting regulations. The update summarized the current process and the new approach to migratory bird hunting regulations. Our current migratory bird hunting regulations process consists of four to five Federal Register documents and is an 18-month process. It is also difficult to get published before Sept 1st with everyone that must review the regulations before publishing.

Our new approach to migratory bird hunting regulations would establish a periodic regulation that would be published in the Federal Register every five years or so, consisting of the things that don't change very often or at all. We would then have an annual Notice of Availability published in the Federal Register to start the process that would reference a policy memo signed by the Assistant Secretary for Fish and Wildlife and Parks. This memo would be placed on the FWS website in January and would include the bulk of the annual Hunting regulations. The Season Selection would also be on the FWS website in May or not at all or just published for the few states that need them. This approach would be approximately nine months and would not require as much review time.

This new approach would not impact the current Flyway system, it's only going to change how the regulation process is made available to the users.

Briefings of the new approach have been held with FWS Director, Assistant Secretary for Fish and Wildlife and Parks, and the Office of Management and Budget.

As of right now the new approach is on hold, until we can resolve some state and Office of Management and Budget concerns. Right now, our focus is on the 2023 migratory bird hunting frameworks and revising the tribal migratory bird hunting rule.

The 2023 proposed migratory bird hunting rule is in the surname system, so hopefully it's published around the start of the year.

2 Partner Updates

2.1 NAWMP Plan Committee Liaison (Todd Sanders)

The North American Waterfowl Management Plan Committee (PC) is an international body that provides leadership and oversight for the activities undertaken in support of the North American Waterfowl Management Plan (i.e., Plan leadership and management). The PC consists of up to 18 members, 6 each from Canada, the United States, and Mexico. In the U.S., each Flyway Council nominates a representative, and the FWS Director appoints up to two federal representatives from the directorate.

The U.S. representatives on the PC include:

Jerome Ford, Co-Chair; U.S. Fish and Wildlife Service
Gray Anderson; Atlantic Flyway Council (VA)
Joe Benedict; Mississippi Flyway Council (TN)
Jeb Williams; Central Flyway Council (ND)
Eric Gardner; Pacific Flyway Council (WA)

The PC typically meets two times per year, generally winter and late summer, and in 2022 met virtually February 9 and 10 and September 7 and 8. The meeting objectives were:

1. To continue to provide leadership and assess progress of reporting JVs and recommend future actions, and
2. To discuss and assess planning and implementation of core aspects of NAWMP programs and strategic priorities.

The PC heard reports from two Joint ventures (species or habitat) at each meeting. The PC also heard reports from the PC's working groups including:

1. North American Waterfowl Management Plan Science Support Team (NSST),
2. Human Dimensions Working Group (HDWG),
3. Communications Committee, and
4. Integration Steering Committee (ISC).

A major work item was identifying NAWMP Performance metrics. Performance metrics may help in accountability for funds received and in fostering support. The metrics are related to the NAWMP objectives for populations, habitat, people, and integration. The primary partner working groups (NSST, HDWG, ISC) have been asked to provide input into potential metrics that are currently available and are applicable internationally or nationally to all Joint Ventures. The PC adopted ANWMP performance metric this fall. The PC co-chairs are in the process of sending a letter to the partners to confirm the performance metrics. These will be provided to the HMWG when available.

Plans are being developed for the 2023 NAWMP plan update. The expectation is that there will be a draft for PC review in April and all three countries would sign the updated in September at the AFWA meeting in Calgary, Alberta.

In November 2022 the UST and NSST completed a report describing the status of Human Dimensions integration by migratory bird Joint Ventures in North America. This is important work to understand where we are currently in regards to HD and Joint Venture work, and where are gaps and potential ways forward. The report is titled "Status of Integrating Human Dimensions Into Joint Venture Bird Conservation Planning and Habitat Delivery."

2.2 NAWMP Integration Coordinator (Diane Eggeman)

Diane Eggeman, NAWMP Integration Coordinator, presented an update on the NAWMP Integration Steering Committee (ISC). The update summarized progress made in 2022 by the ISC, some highlights of integration progress elsewhere under NAWMP, and work related to the North American Waterfowl Professionals Education Plan (NAWPEP). The ISC held virtual meetings throughout the year. Todd Sanders is the HMWG liaison to the Plan Committee. Kevin Kraai continued to serve as the HMWG ex-officio member to the ISC. The ISC continued its webinar series on the societal benefits of NAWMP, with 5 webinars in 2022. An effort is planned to begin soon related to NAWMP objectives—specifically to develop a process for periodic review of the objectives. The NAWMP Science Support Team (NSST) and Unified Science Team completed the report, "Status of Integrating Human Dimensions into Joint Venture Bird Conservation Planning and Habitat Delivery." The NSST also is working on updating the waterfowl species prioritization. The Human Dimensions and Public Engagement Team (HDPET) for NAWMP is working on a white paper, "The State of Conservation Delivery within Migratory Bird Joint Ventures," which addresses landowner outreach and programs across JVs. The paper should be completed soon. NAWPEP steering committee helped university professors communicate the importance of

waterfowl-centered programs and completed an inventory of available waterfowl-related fellowships and scholarships. The committee began addressing concerns about a shortage of well-qualified applicants for waterfowl-specialist positions, starting with a survey of recent graduates from waterfowl graduate programs. The NAWMP Plan Committee approved an initial set of metrics to measure and communicate progress toward NAWMP objectives. The metrics were developed by the Plan Committee's metrics subcommittee and were based on input from the NSST, HDPET, and ISC.

2.3 Human Dimensions Working Group (HMWG Members)

The HMWG revisited the issue pertaining to the lack of a designated working group member who serves as a representative to the Human Dimensions Working Group. In 2022, working group members concluded that updates from the NAWMP Plan Committee Liaison and the NAWMP Integration coordinator were sufficient to maintain a working understanding of the activities of the Human Dimensions working group. However, the working group re-affirmed a willingness to engage with the Human Dimensions Working Group on an *ad hoc* basis to address issues that are relevant to the HMWG and require additional coordination.

2.4 Communication Team (Min Huang)

Communications Team:

No formal update of the Communications Team was delivered at this year's meeting. However, the Communications Team is prepared to provide support for any upcoming communication needs as the working group moves forward with its work. The current membership of this committee includes:

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

2.5 Two-tier license system updates (Rocco Murano and John McKinney)

2022–2023 Duck hunting seasons are ongoing in South Dakota (SD) and Nebraska (NE). Preliminary Tier II results indicate, thus far, that SD has 1,737 Tier II registrants and Nebraska has 2,789. Both states have implemented additional strategies to increase Parts Collection Survey and Harvest Diary response rates. Like last season, a post season survey will be sent to Tier II hunters in both states. Possible measures of success were proposed seeking feedback from members. They are as followed:

- Annual estimated harvest of species with individual regulations not to exceed 10% additional harvest from tier 2 participants (HIP average harvest 1999–2020)
- Duck hunter population lambda rates in SD and NE greater than or equal to .9 by the 2024/25 duck season
- By the 2024/25 duck season demonstrate and identify recruitment, retention, and reactivation of hunters through HIP data (500 per year in combination per state). Similar to average annual loss rate in each state. $N_{t+1} = N_t * (0.9) + R3$
- Compare trends in HIP estimated hunters and demonstrate increased participation rates compared to neighboring states.

- Quantify increases in conservation support through duck stamp sales and other license requirements. This would represent a minimum of 1,000 additional duck stamps sales or \$25,000 increase in conservation dollars between states annually. Attempts will be made to quantify other funding increases i.e., PR etc.
- Quantify motivation, satisfaction, and utility of the simplified option through surveys and interviews.
- Quantify administrative burden to implement and demonstrate that implementation of 2-tier is not onerous to cooperating agencies.

Both states will continue to manage the regulatory Two-Tier system and pursue feedback regarding possible measures of success.

2.6 Time-dependent optimal solutions to address system change (Jamie Ashander)

A big challenge for harvest management is anticipating system change in our management strategies. When and how is early action needed to achieve our objectives in a changing system?

We review theoretical results for this question (Tucker and Runge 2021), derived by assuming known future change (in the form of changes to underlying demographic parameters) and then applying finite-time dynamic programming to find time-dependent optimal policies that account for, and indeed, anticipate, these changes. These results showed that optimal policies can anticipate future change and that failing to account for system change has very different effects, depending on the nature of the change: failing to account for declines in carrying capacity (K) results in under-harvest; failing to account for declines in intrinsic growth rate (r) leads to over-harvest.

We then present ongoing work applying these techniques to the question of setting hunting regulations for mid-continent Mallard (MCM), given potential future climate change by using a simplified implementation of the AHM model coupled to a climate-based pond model. We describe a model that predicts May pond counts in the Prairie region of the USA and Canada (a key predictor of mallard reproduction) as a function of climate variables (precipitation and temperature) and estimate parameters for two scenarios for May pond sensitivity to climate. By combining this pond model with downscaled projections of future climate from CMIP5 (ensemble projections based on 29 general circulation models for two emissions scenarios, RCPs 4.5 and 8.5), we develop projected trajectories of May pond counts in the Prairies under four climate futures. We then use dynamic programming and a simplified version of the AHM model to derive a time-dependent optimal policy for each climate future. We show how time-dependent optimal policies differ between these futures, with more liberal harvest policies being required to maintain harvest goals under futures where May ponds are more sensitive to climate. We also assess the expected value of perfect information (EVPI) about future climate change for the objectives of mallard harvest management. We conclude by emphasizing that the frequency of policy updates and monitoring provide important context for interpreting these results.

Finally, we describe future plans. First, we are working to expand the treatment of uncertainty in the analysis. Second, we plan to apply these ideas to Atlantic Population Canada geese.

2.7 Integrating human dimensions (Richard Berl, Pat Devers, Scott Boomer, and Mike Runge)

The goal of this project is to explore and evaluate an integrated framework for the consideration of waterfowl population dynamics, waterfowl hunter dynamics, and hunter behavior to inform the annual process of setting harvest regulations for North American waterfowl. Our process draws from established theory and practice in human dimensions and adaptive harvest management, and is based in a causal

inference approach that allows for predictions, with uncertainty, of the potential outcomes of future changes to the waterfowl-hunter-harvest system.

A number of hypotheses have been proposed to relate aspects of hunter perceptions, behavior, and experiences to harvest management decisions and to harvest rates; for instance, that hunter recruitment, retention, and reactivation (R3) is dependent to some extent on both regulatory decisions and waterfowl populations, that participation rates are affected by regulatory limits as well as perceptions of the intent of those regulations, and that both hunter R3 and participation would be negatively impacted by a shift to a more restrictive regulatory package. We developed a set of models to describe the dynamics that might result from one set of hypothesized relationships between waterfowl populations, hunter populations, and harvest numbers. We use the mid-continent mallard hunter-harvest system as an example, but the models could feasibly be extended to any harvest context with appropriate changes to hypothesized relationships.

Results from observing the dynamics of the system described by these models suggest that, under each regulatory package, there exists a stable equilibrium state for waterfowl populations and hunter populations, and that changes in the system over time can be described as movement toward this equilibrium. We find that relatively small effects on hunter R3 and participation (reduction of 2% – 5%) can lead to significant changes in equilibrium population values, all else held constant.

We led an expert elicitation session amongst working group members to estimate the potential effects of a shift from a liberal package to a moderate package on the number of active hunters and hunter-days spent afield, at equilibrium. Analyses of these data are ongoing and will aid future efforts to estimate parameter values for these models.

Given constructive feedback on model structure and implementation, we will continue to refine our models, correct for potential biases in observed data, and incorporate a social component to the density dependence term limiting hunter numbers to allow for exogenous causes of hunter decline. This work provides a foundation for understanding the linked socio-ecological components of the waterfowl-hunter-harvest system, reduces key uncertainties surrounding the role of human behavior in the harvest process, aids in crafting targeted questions for future research, and contributes to integration across biological and social NAWMP objectives.

3 Pintail AHM

3.1 Pintail AHM revision updates (Mike Runge and Scott Boomer)

We provided an overview of the progress that has been made to date in the development of the modeling and decision analysis part of the pintail AHM revision. This update focused on some additional work evaluating the starting- and ending-year data sources (e.g., pintail band-recovery and harvest data) that is evaluated by the integrated population model. We describe how shortening the time series by omitting the earlier years of data (e.g., 1960–1980) tends to increase the variance of the resulting parameter estimates, but in general, does not result in any trend or meaningful differences in the point estimates (i.e., the mean or median). However, the shortened data series did result in an increase in the estimate of process error. Overall, these results do not provide strong evidence to support not including any of the available pintail monitoring information in our assessment.

We then reviewed the harvest management implications of the updated assessment of pintail population and harvest dynamics by describing the results of an equilibrium analysis. The equilibrium analysis suggests that the harvest potential of pintails is highly sensitive to the latitude where pintails settle each spring (weighted mean latitude). When pintails settle farther north, their reproductive output is reduced, which results in a lower maximum sustainable yield and carrying capacity. Unfortunately, these results suggest that the expected harvest of pintails with the selection of harvest regulations that included a full season and 1, 2, and 3 bird bag limit would result in unsustainable harvest levels when the pintail

population settled in more northern latitudes. Optimal harvest policies derived with the updated pintail population parameters recommend closed seasons when observed population estimates reach equilibrium population sizes at maximum sustained yield. Simulations of these policies result in unsatisfactory properties of a harvest strategy that includes the toggling back and forth between closed and open seasons. Because the results are inconsistent with our recent history of pintail harvest management, we revisited the models that are used to predict changes in pintail harvest with changes in regulations. Total pintail harvest is predicted for each Flyway (along with a constant take from Canada and Alaska) with Flyway specific, linear models that predict harvest as a function of season length and bag limits. We realized that these models predicted the same level of harvest as a function of regulations regardless of the magnitude of the fall flight. Because we can calculate a fall flight with the pintail IPM, we decided to use fall flight as a predictor in a new set of Flyway-specific harvest models. The resulting models now compensate for changes in the fall flight predicting lower harvest levels when the May population and subsequent fall flight is lower. More importantly, the predicted harvest levels expected with the implementation of a full season length and a 1, 2, and 3 bird bag limits are now sustainable. We are optimistic that when these updated harvest models are included in the optimization, the resulting optimal policies will be more consistent with our recent experience and may offer some additional opportunity to explore other strategy options including: shoulder points, different closed season constraints, and Flyway specific options such as flat bags (AF) or increased season lengths (CF and MF). Based on these technical updates, the next steps in the revision of the pintail AHM strategy include:

- IPM
 - Document and peer review
- Harvest analysis
 - Double-check
 - especially, check whether the new models predict the last 5 years well
 - Document and review
- Optimization
 - Put the new harvest models into the optimization and see if the strategy adjusts in the way we think
- Strategy development
 - Talk to the PWG to see what’s next
 - Reports to Flyway technical committees (Feb)
 - Draft proposal for new harvest strategy
 - Vet proposal with Flyways (Aug), HMWG (Dec)

4 Reconsideration of North American Duck Harvest Management

4.1 *Adaptive cycles of socio-ecological systems (Scott Boomer and Fred Johnson)*

We described historical changes of the Adaptive Harvest Management program within the theoretical framework of adaptive cycles (Holling 2001). Soon after a political controversy in 1994, waterfowl sport harvest regulatory decision protocols were significantly revamped with the implementation of mid-continent mallard AHM. Based on the success of this decision protocol, the AHM program then experienced rapid growth as multiple decision frameworks were developed in response to an increase in technical capacity,

institutional buy-in, and administrative support (Figure 1). We argue that as an institution, AHM has reached its carrying capacity (K), resulting in a rigid and less resilient decision process. As a result, AHM as currently implemented is increasingly vulnerable to external shocks (e.g., COVID 19 or budgetary shortfalls), heightening concerns about AHM effectiveness or more importantly, potential breakdowns in the decision-making process. We suggest that the HMWG should begin exploring options for navigating the “Omega” phase of the adaptive cycle in order to minimize the negative consequences associated with the destructive potential of this part of the adaptive cycle, while taking full advantage of any corresponding emerging opportunities for meaningful changes in AHM.

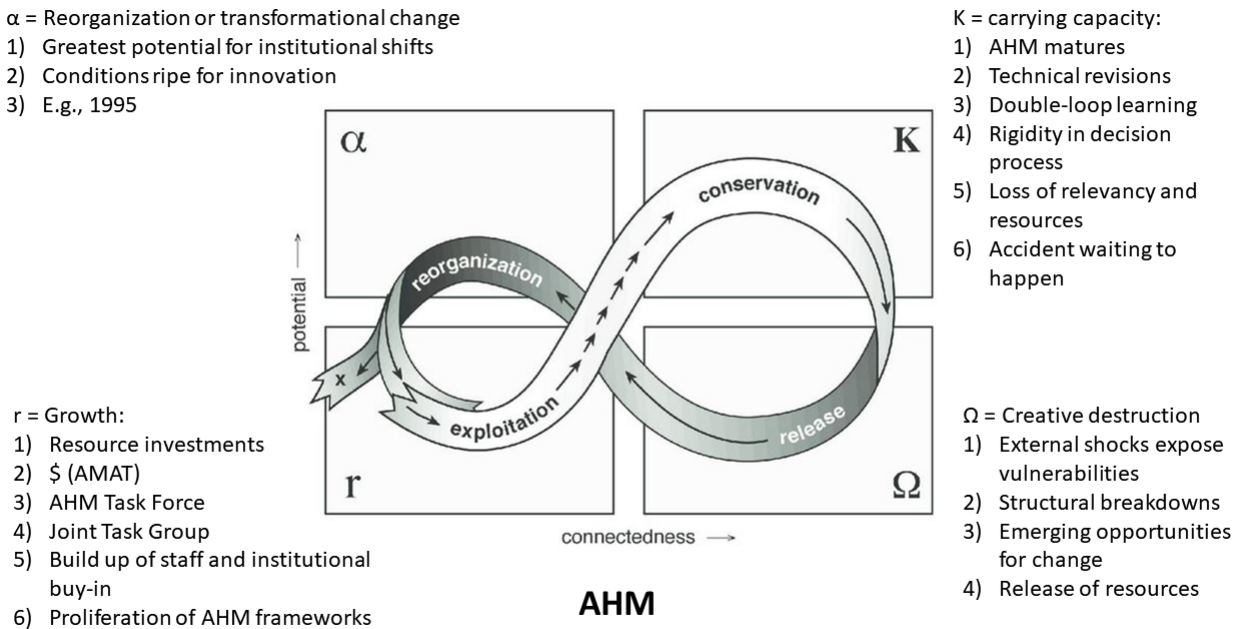


Figure from: Holling 2001

Figure 1 – Institutional changes in the Adaptive Harvest Management program depicted within the 4 distinct phases of the adaptive cycle of socio-economic systems. The figure was adapted from a graphic in [Holling \(2001\)](#).

4.2 About that problem statement - where we left off... (Pat Devers)

Discussions concerning the long-term resiliency and institutional support for waterfowl harvest management, and in particular, adaptive harvest management have been occurring since at least 2016. Common concerns and issues raised in these discussions include continued decline of personnel capacity in the US Fish and Wildlife Service Division of Migratory Bird Management, long-term financial support for waterfowl monitoring, sustainability of multiple single species harvest strategies, long-term decline in waterfowl hunters, and social support or interest in waterfowl hunting and wetland conservation. These concerns have resulted in the development of several communication products designed to educate Federal and State Agency administrators about the history of waterfowl conservation and the components and success of adaptive harvest management (AHM). Many of these concerns and values figured prominently in the revision of the mid-continent mallard and pintail AHM frameworks. In the process of identifying technical priorities for the Harvest Management Working Group (HMWG) for Fiscal Year 2022 a proposal was made to revise the Scaup AHM strategy. This led to a robust discussion about contradictions between stated concerns regarding the long-term resiliency and sustainability of waterfowl harvest management and the almost instinctive response of managers to try to maximize hunting opportunity through the development of new analytical techniques and single species harvest strategies. Following from this

discussion, the HMWG proposed to not pursue the revision of the Scaup AHM strategy, but instead take a more holistic view of waterfowl harvest management and how it is implemented relative to the long-term concerns over resiliency, relevancy, and funding. The “Reconsidering duck harvest management in the U.S.” was adopted as a HMWG priority in Fiscal Year 2021.

An ad-hoc committee consisting mostly of members of the HMWG Communication Team led the initial work on this priority. This ad-hoc team developed an on-line survey to elicit input from Flyway and Federal waterfowl biologists and used the input to draft an initial problem statement which was presented to the HMWG in December 2021. The working group was expanded in 2022 and a second draft of the problem statement was written with input from the Flyways. Next steps for Fiscal Year 2023 include finalizing the problem statement and identifying appropriate work tasks and products that should result from this priority.

4.3 Genesis of new HMWG priority

Over the last decade, the USFWS Migratory Bird Program has experienced repeated flat budgets and limited funding increases which has generated concern about the long-term feasibility of maintaining annual monitoring efforts required by adaptive harvest management decision protocols. The Migratory Bird Program would like the Harvest Management Working Group to evaluate the possible impacts that reduced monitoring budgets would have on AHM decision-making to prepare for the possibility of future budget shortfalls. For practical purposes, the HMWG should consider the likely impacts to existing AHM frameworks based on a 50% reduction in waterfowl monitoring budgets. Any potential changes to monitoring may involve reductions in the frequency and intensity of effort along with modifications to monitor designs or sampling frames associated with the May BPOP surveys, Harvest Surveys, and the preseason Cooperative Banding Program. The USFWS Migratory Bird Program would like the Harvest Management Working Group to consider this request as a high priority issue.

4.4 Decoupling of an indicator species, are mallards still the bellwether of the mid-continent (Mike Szymanski)

Mid-continent mallards play the important role of guiding the process used to promulgate duck harvest regulations in the Central and Mississippi Flyways. The use of their breeding population and habitat status, band recoveries, and harvest information inform models to describe population dynamics in relation to regulatory paradigms. Mallards are also highly desired by hunters as a charismatic species that lends itself well to hunting, can sustain relatively high levels of harvest, and is ubiquitously abundant. Their data are unparalleled and allow the use of a structured decision-making process formally known as Adaptive Harvest Management.

However, mallards are a highly plastic species, and the question is occasionally raised whether they are the appropriate species to drive harvest management decisions for all duck species in the mid-continent region. Moreover, their general success and abundance often precludes them from inclusion from State Wildlife Action Plans. There are some indications that their demographics may not be representative of other duck species. [Finger et al. \(2016\)](#) showed differences in timing of migration and peak abundance for mallards and scaup in relation to breeding population and habitat survey protocol. North Dakota Game and Fish duck brood surveys over a 58-yr period in North Dakota show a wide range (6 – 42%) of contributions by mallards to total duck brood numbers in the state. Importantly, do mallard harvests represent the consequences of harvest management delivery?

Based on a 2-yr study of 137 GPS telemetered juvenile mallards in North and South Dakota in 2018 and 2019, there are findings that could be concerning in light of a shifting climate. Essentially, migration strategy differed substantially between two consecutive years. In fall/winter 2018-19, birds tended to winter farther north and west in regions with lower harvest pressure. During fall/winter 2019-20, birds were

distributed in more traditional harvest areas to the southeast. During both winters, northerly movements began to dominate migration movements in mid-January. As a result, harvest rates on the sample were 20 and 130 percent higher for juvenile male and female mallards, respectively, during fall/winter 2019-20. This begs the question of whether other duck species will experience higher harvest rates if mallard abundance is lower than normal in high harvest regions?

A look into USFWS harvest data from 1999-2019 shows a strong declining trend in the contribution of mallards to the total duck harvest in most mid-continent states. Over this time frame, mallards formerly comprised roughly 50% of the duck harvest in the Dakotas, declining to roughly 30% in recent years. Strong trends are also noted for southern states, with mallards now only comprising roughly 7 and 5 percent of the total duck harvest for Texas and Louisiana, respectively. The overall trend for the Central and Mississippi Flyways shows a decline of mallards formerly contributing roughly 40% of total duck harvest to 30% in recent years.

These changes, in light of a shifting climate, beg the question of whether or not mallards will continue to be the appropriate indicator species for determining harvest management actions directed at all ducks in the mid-continent.

4.5 Correlations in waterfowl harvest: exploring spatial and temporal trends (John Yeiser)

The goal of adaptive harvest management for waterfowl is to maximize cumulative long-term harvest of focal stocks. We assume that these focal stocks are useful proxies for other waterfowl when establishing harvest policies. There is currently no systematic approach for setting regulations for non-focal stocks that have no harvest strategy, and implementing stock-specific strategies would quickly become infeasible, both in terms of technical capacity and regulatory complexity. However, understanding how non-focal stocks respond to harvest management would be informative to current harvest management strategies, and may facilitate innovation for future strategies.

We established a framework to analyze correlations in harvest among waterfowl species over time and spatial boundaries. We developed a multivariate normal model that estimated the trajectory of harvest of any one stock, as well as how that stock covaries with other stocks. We fit this model to state- and species-specific harvest estimates derived from HIP and parts collection surveys. Initial simulations indicated that the model estimated correlations among harvest accurately. The precision of estimates increased as correlation strength increased.

We fit this model to three different data sets: pooled harvest of 10 species in the Atlantic Flyway from 1965-2021; state-specific mallard harvest in the mid-continent over three time periods roughly representing different stages of waterfowl harvest management: 1965–1995 (pre-AHM), 1995–2011 (post-AHM), and 2012–2021 (recent); and harvest of 10 species in the southern mid-continent over those same three time periods.

In the Atlantic Flyway, we estimated relatively weak correlations among mallard harvest and the other species considered. Taken together, harvest of species that constitute the multi-stock (American green-winged teal, ring-necked ducks, goldeneyes, and wood duck) correlated to harvest of nearly every other species that we considered. There were many correlations among mallard harvest in different states in the mid-continent, and most were in among states that are in close proximity. These correlations remained largely unchanged over the three time periods.

Many of the species we considered in the southern mid-continent showed correlations to other stocks. For example, mallard, northern pintail, and northern shoveler harvest were all correlated to harvest of several other stocks during at least one of the three time periods. Overall, correlations increased over time, which suggests that AHM increased cohesion in waterfowl harvest.

This work demonstrated a method to estimate correlations in harvest among waterfowl, however our models were phenomenological in nature. Implementing a predictive model within this analytical framework may allow for the assessment of specific risks to non-focal stocks resulting from AHM alternatives.

4.6 Waterfowl Breeding Population and Habitat Survey review (Emily Silverman)

The Waterfowl Breeding Population & Habitat Survey (WBPHS) began as a series of coordinated regional aerial breeding surveys in the late 1940s. Modern analyses and curated datasets use data beginning in 1955. There were many changes to coverage and protocols in the first 20 years of the survey, and the current strata were imposed post hoc over transects established within earlier strata. Until 1977 the Bush and Prairie regions operated under different SOPs, while survey effort in the eastern region began in the 1990s (1987 for Canadian helicopter surveys). Operational and methodological differences between these three survey regions remain.

Since the establishment of the survey in its present-day form in the mid-1970s (mid-1990s for the eastern region) and the comprehensive survey review by (Smith 1995), many biological and analytical changes have taken place. These include changes in habitats and breeding distributions, declines of several species (northern pintail *Anas acuta*, scaup spp. *Aythya affinis/marila* and scoter spp. *Melanitta americana/perspicillata/deglandi*), the development of Adaptive Harvest Management frameworks, new data sources, and advances in analytical methods and data management.

The current review effort is considering the spatial design of the survey with a focus on determining the appropriate geographic coverage, a new stratification, and an optimal allocation of effort. The goal is to provide high quality, efficient estimates of abundance from a survey that is logistically flexible (i.e., easy to adjust effort) with consistent methods across the survey extent. Priority species and/or stocks considered in this effort are northern pintail, scaup spp., canvasback *Aythya valisineria*, blue-winged teal *Anas/Spatula discors*, scoter spp., American black duck *Anas rubripes*, western and mid-continent mallard *Anas platyrhynchos*, and eastern green-winged teal *Anas crecca*, ring-necked duck *Aythya collaris* and goldeneye spp. *Bucephala clangula/islandica*. These priority species were chosen because they are included in quantitative harvest strategies or are species of concern. Priority species were also restricted to waterfowl species for which that the current survey extent and methods provides good coverage of breeding populations.

We used modeled abundance surfaces from (Adde et al. 2020) and eBird (predicted breeding season abundance, 2018) to estimate the proportion of priority populations and stocks covered by the WBPHS and other complementary operational breeding surveys. We assessed the validity of these model abundance surfaces using WBPHS and other aerial waterfowl survey observations. This analysis provides the first ever estimation of survey coverage and highlights areas for possible survey expansion based on coverage of the priority species. We are now using the modeled species abundance surfaces to explore alternative stratifications based on current strata boundaries, historical boundaries, Bird Conservation Regions, and administrative boundaries (states and provinces). We are also reviewing the historical time series of estimates to understand the quality of our existing methods of population estimation and the possible impact of survey modifications.

4.7 Alternative marking methods for monitoring migratory birds (Kylee Dunham, J. Andrew Royle, James E. Lyons, Patrick K. Devers, Mark Koneff, Scott Boomer, and Mark Seamans)

Much of our current understanding of migratory bird ecology and successful management is based on capturing and releasing birds with bands (i.e., rings) and subsequent re-encounters with the marked individuals through live recaptures, resights, or dead recoveries. Banding, or ringing, has been a critical component of waterfowl conservation and management in North America. However, the amount of data

collected per marked bird can be low in space and time due to low encounter rates resulting in poor parameter estimation and potentially inefficient monitoring efforts. Recent advancements in wildlife marking technology, crowdsourcing, citizen science platforms, and analytical methods offer new opportunities to advance migratory bird conservation and management. We reviewed the current waterfowl banding programs used to inform the adaptive harvest management plan and explored alternative marking technologies (i.e., Motus tags) and their potential for supplementing the current monitoring programs. We measured the utility of alternative marking technologies and analytical methods using structured decision-making principles considering the financial costs, logistical challenges, and the number of additional parameters (i.e., migration phenology) that could be estimated for combinations of marking technologies, study design, and analytical method. The status quo current banding effort was the cheapest option financially but offered no increase in the number of estimable parameters. Alternatively, remote transmitting satellite tags offered the most data and subsequently the highest number of estimable parameters but came at considerable financial cost. We identified two alternatives that balanced financial costs with a considerable gain in the number of estimable parameters. Both alternatives included a single season capture-mark-recapture-recovery (CMRR) banding framework, constructing an extensive network of Motus towers across North America, and developing an integrated CMRR model that accommodated traditional CMRR banding data combined with continental wide recaptures through the Motus network.

4.8 Monitoring Discussion (Pat Devers and Scott Boomer)

The HMWG initiated a problem framing exercise in response to the new HMWG priority focused on an evaluation of the impacts that changes in monitoring may have on the performance of adaptive harvest management decision-making frameworks. The HMWG concluded that the trigger for investing HMWG resources into solving this problem was funding limitations associated with a flat migratory bird management budget and the increasing costs of maintaining current monitoring efforts. After deliberations, the HMWG decided to set the following bounds on this problem:

- The decision maker is the Chief of the Division of Migratory Bird management who has funding discretion as it pertains to large scale monitoring programs conducted by the USFWS. These surveys include the Waterfowl and Breeding Habitat Survey (WBPHS), The Harvest Survey, and the pre-season banding program.
- The overall objective of this exercise is to determine the impacts of how a 50% reduction in the monitoring budget will impact the waterfowl management enterprise, including the sport and subsistence harvest management programs, the Habitat and Joint Venture programs, along with the multitude of other institutions and partners involved with the conservation and management of the North American waterfowl resource.
- For this exercise, we will consider changes in the intensity or frequency of monitoring effort and/or changes in the design of existing monitoring programs that will result in a decrease in net monitoring costs approaching the target rate of 50%.
- For this problem, it is expected that there will be a one-time budget decision constrained to the funding of the WBPHS, national Harvest Survey, and the pre-season Cooperative Banding Program.

The HMWG participated in a facilitated brainstorming session to identify and list the key features and outcomes of the monitoring program that are most important to the waterfowl management enterprise. Based on this exercise, a [draft list](#), of monitoring objectives was developed to identify the key outcomes and features that participants valued most from operational monitoring programs. The bulk of the items on this list can be classified as “means” objectives as they reveal expected outcomes that would result in the achievement of the fundamental objectives of the monitoring program. These overarching goals included:

1. To support waterfowl conservation as mandated by the Migratory Bird Treaty Act.

2. To provide the basis for recreational sport hunting opportunity.
3. To provide subsistence hunting opportunity while fulfilling treaty obligations to indigenous peoples.

In addition to this classification, the HMWG also highlighted several procedural constraints associated with operational readiness, annual logistics, and safety protocols associated with each monitoring program. We evaluated the list of monitoring objectives and developed an influence diagram (Figure 2) to identify the primary connections between monitoring objectives (means and fundamental) and the key actors from waterfowl conservation and management institutions. The resulting diagram highlights the importance of annual monitoring information to the waterfowl management enterprise.

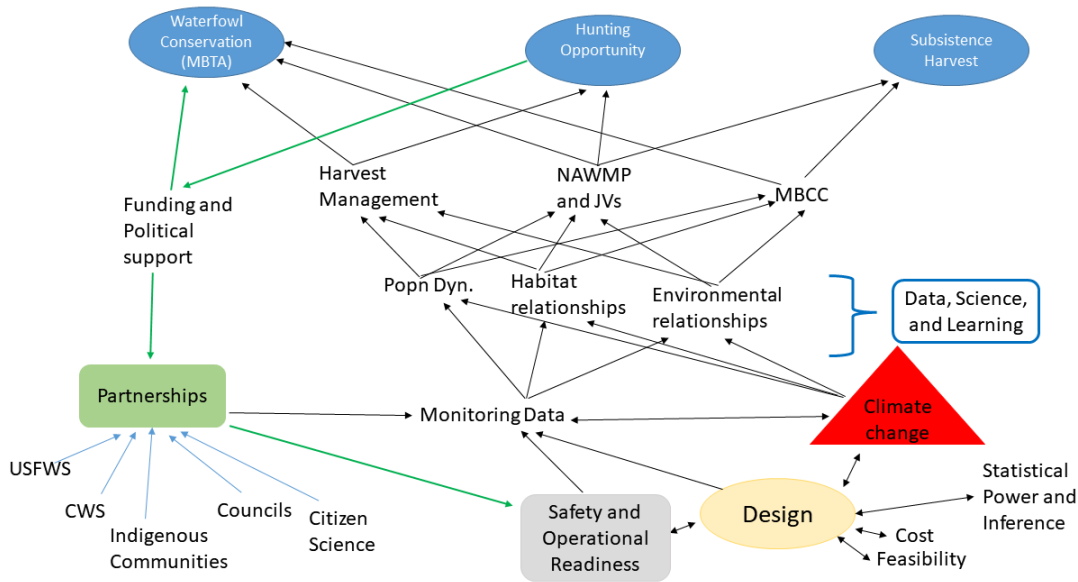


Figure 2 – An influence diagram that depicts the key relationships between monitoring objectives and the primary components of the waterfowl management enterprise. Monitoring data provides the necessary information for informing waterfowl conservation and management decisions.

The preliminary evaluation of the objectives list served as a frame of reference for the next stage of the problem-framing exercise that involved identifying potential actions that could be taken to reduce the monitoring budget. The HMWG focused on the 3 primary monitoring programs and drafted a set of possible actions that may be considered to reduce monitoring costs. These draft actions, include reduced effort sampling frames as well as changes to monitoring frequency. The HMWG tentatively concluded that a type of portfolio analysis may be used to identify potential suites of actions that would result in the desired budget decreases.

Next Steps The HMWG will begin to organize a subset of alternatives to consider when evaluating potential impacts to AHM decision frameworks. In addition, a set of performance metrics associated with each monitoring result must be identified in order to serve as a basis of comparison when discriminating amongst different actions. We believe that a qualitative assessment should be conducted to properly frame how we anticipate any changes to current monitoring protocols will impact our ability to achieve the three fundamental objectives highlighted in Figure 2. The next steps for making progress on this priority include:

1. The Flyway Representatives will highlight the results of this discussion in their winter Flyway meeting updates.

2. The raw tables and an initial summary of these results will be included in the 2022 Harvest Management Working Group meeting report.
3. A qualitative assessment in narrative form will be developed in preparation for continued discussion at the 2023 summer Flyway meetings and submission to Flyway councils, the Service Regulations Committee, and Migratory Bird Management leadership.
4. These efforts will be coordinated through the Harvest Management Working Group.

5 HMWG Priority Actions and Work Plan

The HMWG opened up a discussion to review the annual process for identifying and finalizing HMWG priorities. Progress reports on many of the FY2022 priority action items associated with [HMWG Priorities](#), were presented at this year's meeting. 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.

5.1 2023 HMWG meeting

The next HMWG meeting will be hosted by the Pacific Flyway from 5–7 December 2023.

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Table 1 – Objectives of monitoring programs in support of waterfowl harvest management discussed at the Harvest Management Working Group meeting.

- 1 Provide hunting opportunity
- 2 minimize risk to biological resource
- 3 maximize hunting opportunity
- 4 minimize legal risk and costs
- 5 maximize monitoring innovation/capacity
- 6 maintain partnerships
- 7 minimize fear of making wrong decisions
- 8 maintain NAWMP programs that require this data
- 9 minimize communication challenges to constituents
- 10 minimize reduction of collaboration among partnerships (e.g, NAWMP)
- 11 maintain current decision processes and AHM protocols
- 12 avoid closed seasons, max open seasons
- 13 minimize impacts to other surveys (capabilities)
- 14 minimize risk to lost revenue from waterfowl harvest enterprise (hunter loss, lost license revenue, duck stamps, state programs)
- 15 minimize risk of lost credibility
- 16 minimize congressional interventions
- 17 maintain scientific integrity and monitoring datasets
- 18 maintain public trust, minimize loss of public trust in these institutions
- 19 maximize ability to detect system change (extreme climate events)
- 20 maintain the integrity of a long term dataset, and data quality
- 21 minimize bridge-burning. . .
- 22 minimize negative impacts on hunting population (bad decision negatively impacting hunters; connect people to nature)
- 23 minimize uncertainty that impacts regulatory decisions
- 24 minimize number of negative public comments
- 25 minimize the cost of future declines
- 26 minimize the probability that waterfowl population status declines (in relation to the 3 Billion birds report)
- 27 maintain trust responsibilities of MBTA
- 28 maximize our ability to assess and predict future dynamics and ability to manage in the face of uncertainty
- 29 maximize our ability to manage subsistence harvest (co-management)
- 30 maximize resilience of monitoring programs and crew safety (personell and equipment, resilience to disease impacts, private land access)
- 31 to inform state regulations (zones and splits)
- 32 minimize cost of re-tooling existing decision frameworks and protocols
- 33 minimize the reduction in learning about waterfowl (demographic) while maximizing ability to
- 34 minimize risk to fleet and pilot assets
- 35 maximize crew safety (all programs)
- 36 minimize the erosion of our qualified observers
- 37 maintaining data sets for non-regulatory uses (research, conservation programs. . .)
- 38 maximize/optimize information gathering for mgmt dec and legal mandates
- 39 minimize disagreements about harvest management decisions
- 40 maintain the integrity of AHM as currently practiced and codified in the SEIS

- 41 maximize the ability to develop new methods/technologies/innovations (that might offer cost savings in the future)
- 42 minimize economic loss
- 43 minimize permanent losses (e.g., people)
- 44 maximize the reliability of the information (maintain minimum standards for data quality)
- 45 maximize ability to innovate
- 46 maximize staff morale
- 47 minimize impact to species specific harvest strategies to guard against risky strategies

Table 2 – Possible changes to current waterfowl monitoring programs to reduce the annual monitoring budget by 50% discussed at the Harvest Management Working Group meeting.

WBPHS (\$630 K, TSA + ESA) (\$60 K in Alaska)

- 1 status quo
- 2 alternate TSA and ESA annually
- 3 fly every other line
- 4 core survey area drop the rest
- 5 drop Alaska
- 6 reduce (eliminate) ground crew effort
- 7 remotely sense water
- 8 eliminate surveys use ebird
- 9 reduce effort in dense strata
- 10 fly every other year
- 11 adaptive survey design
- 12 re-design/optimally sample
- 13 lincoln estimates
- 14 Technological advancements using imagery
- 15 4 sq mile survey for US coverage
- 16 Drop BMBS and contract out
- 17 Go back to 185's
- 18 Eye in the sky DOD capabilities
- 19 Go fund me
- 20 Evaluate water conditions and adjust survey coverage
- 21 Cancel AP goose survey

Pre-season Banding (\$320 K)

- 1 status quo
- 2 run half of the stations
- 3 target only mallards
- 4 reduce cost per duck banded through operational shifts (band in US)
- 5 adaptive survey design
- 6 re-design/optimally sample
- 7 optimize spatially... look for hotspots that are representative
- 8 reduce preseason and rely on partners to post season band
- 9 reduce crew costs (housing, transportation costs)
- 10 band every other year
- 11 Cut the entire program and hope partners pick up the slack
- 12 Reduce banding and use known fate info from satellite markers
- 13 Leverage new analytical methodologies to reduce marking effort
- 14 Leverage new marking technologies (satellite, MOTUS...)
- 15 Have the states bail out the Federal program (state crews run the stations)

Harvest Surveys (\$)

- 1 status quo
- 2 reduce survey costs by 0.50
- 3 cut the parts collection survey and use pictures instead (online)

- 4 crowd source wing bees (do it remotely)
- 5 Use AI/ML technology to speciate/age/sex instead of parts collection
- 6 Analytical methods to streamline survey and reduce costs
- 7 Have the states use check stations to collect harvest info
- 8 Mixed mode (electronic and other) in place of diary
- 9 Cut diary survey
- 10 Do diary survey every other year
- 11 Optimally sample hunters with re-designed survey based on historical info
- 12 cut the parts collection survey and use a bood survey to get age ratios
- 13 Use recoveries of marking program to monitor age and sex in harvest

Harvest Management Working Group 2022 Meeting Agenda Port Aransas, Texas

Monday 12 December 2022

- 08:00 Welcome, introductions, logistics, agenda (Boomer, Kraai)
08:15 Flyway reports
Atlantic, Mississippi, Central, Pacific (State Technical Representatives)
US Fish and Wildlife Service (Flyway Representatives)
Canadian Wildlife Service (Roy and Leafloor)
US Fish and Wildlife Service DMBM/BADS (Seamans)
US Fish and Wildlife Service DMBM/BMDM (Fleming)
US Fish and Wildlife Service DMBM/BMBS (Koneff)
US Fish and Wildlife Service DBPR/BPR (Fleming)
10:00 Break
10:30 Partner updates
NAWMP Committee update (Sanders)
NAWMP Integration (Eggeman)
Human Dimensions Working Group ()
National Science Support Team (Roberts)
12:00 Lunch
13:00 Communication team (Huang)
Two-tier license system update (Murano and McKinney)
Time-dependent optimal solutions to address system change (Ashander)
15:00 Break
15:30 Integrating human dimensions (Berl)
Expert elicitation (Berl et al.)
17:00 Adjourn
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Tuesday 13 December 2022

- 08:00 Pintail AHM revision
Recap (Runge)
IPM update (Boomer and Runge)
Equilibrium analyses/optimization
10:00 Break
10:30 Decision analyses
Next steps
12:00 Lunch
13:00 Reconsideration of North American duck harvest management
Adaptive cycles of socio-ecological systems (Boomer et al.)
About that problem statement - where we left off... (Devers et al.)
Genesis of new HMWG priority (Richkus)
Partners' response (facilitated round-robin)
15:00 Break
15:30 Decoupling of an indicator species, are mallards still the bellwether of the midcontinent? (Szymanski et al.)
Spatio-temporal changes in waterfowl harvest distributions (Yeiser et al.)

Preparations for tomorrow's discussion (HMWG)

17:00 Adjourn

Wednesday 14 December 2022

08:00 Meeting recap (Boomer)
WBPHS review (Silverman et al.)
Alternative marking methods for monitoring migratory birds (Dunham et al.)

10:00 Break

10:30 Monitoring frequency discussion
Problem framing (tbd)
Mocking up a trade-off analysis (tbd)

12:00 Lunch

13:00 Assessment Updates
Reward banding update (Garrettson)
Black duck AHM updates (Yeiser)
Finalize HMWG Terms of Reference (HMWG)

15:00 Break

15:30 HMWG Priorities (HMWG)
Plans for 2023: action items and task assignment (HMWG)
Next meeting: location (Pacific Flyway:), date, topics...

16:30 Meeting summary and parting thoughts (HMWG)

17:00 Adjourn

FY2023 Harvest Management Working Group Priorities

Table 4 – Priority rankings and project leads identified for the technical work reviewed at the 2022 Harvest Management Working Group.

Priority Level	Status	Participants
Highest Priorities (Urgent and Important)		
Evaluation of the implications of changes in monitoring frequency on adaptive harvest management performance	Proposed	Flyway Councils, DMBM, USGS
Northern Pintail AHM revision	On-going	Flyway Councils, DMBM, USGS
Reconsideration of North American duck harvest management	On-going	Flyway Councils, DMBM
Evaluation of Experimental two-tier license system	On-going	Central Flyway, DMBM
Long-range Priorities (Non-urgent, but Very Important)		
Time-dependent optimal solutions to address system change (e.g., habitat change; hunter dynamics; climate change).	On-going	USGS, BADS
Additional Priorities		
Assessment of diving duck harvest capacity	Proposed	Flyway Councils, DMBM
Western mallard AHM revision	On-going	Pacific Flyway, BADS
Waterfowl Banding Needs Assessment	On-going	BADS, USGS, Flyway Councils

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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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Figure 3 – The participants of the 2022 Harvest Management Working Group meeting in Port Aransas, Tx.