2004

Adaptive Harvest Management Working Group

ADAPTIVE HARVEST MANAGEMENT WORKING GROUP

Annual Meeting
November 30 – December 3, 2004
Orlando, Florida

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Agenda

Tuesday – Nov. 30

8:00-8:30	Welcome (*Eggeman, F. Montalbano*)
8:30-9:00	AHM Task Force report (*Case, MJohnson, FJohnson*)
9:00-10:00	Flyway Council reports (*state & federal representatives*)
10:00-10:30	*break*
10:30-11:30	Flyway Council reports continued (*state & federal representatives*), U.S. Fish & Wildlife Service (*Serie*) and Canadian Wildlife Service (*Reed*) reports
11:30-12:00	Reuniting waterfowl management (*Runge)*
12:00-1:30	*lunch on your own*
1:30-3:30	AHM Task Force assignments #1 and #3: Evaluating the impacts of "standard" and "restrictive" regulatory alternatives on mallards and other species (*FJohnson*)
3:30-4:00	*break*
4:00-5:30	AHM Task Force assignment #2: Modeling mallard harvest rates as a function of Flyway-specific hunting regulations (*Boomer*)
Evening:	Communications Team meets if necessary (*Case et al.*)

Wednesday – Dec. 1

8:00-10:00	AHM Task Force assignment #4: Status of an AHM protocol for western mallards (*FJohnson, Boomer*)
10:00-10:30	*break*
10:30-12:00	AHM Task Force assignment #5: Evaluating the effectiveness of the Hunters' Choice Bag Limit System (*MJohnson, Gammonley*)
12:00-1:30	*lunch on your own*
1:30-3:00	Black duck harvest management: • Black duck population ecology and management challenges (*FJohnson, Conroy*) • Report from the Black Duck AHM Working Group (*Serie, Reed*) • Integrating eastern population surveys (*Koneff*) • Predicting black duck harvest rates from regulations (*Zimpher*)
3:00-3:30	*break*
3:30-5:30	Black duck harvest management (continued)

Thursday – Dec. 2

7:00am-10:00pm	Field trip to Merritt Island NWR and Goodwin WMA (*supper at Goodwin WMA)* (Communications Team meets as necessary)

Friday – Dec. 3

8:00-10:00	Evaluating regulatory strategies for pintails (*Runge, Boomer*)
10:00-10:30	*break*
10:30-12:30	Communications Team report, action items, assignments, timetables, etc
12:30	Adjourn

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This report provides a summary of presentations and discussions that occurred at the 16th meeting of the Adaptive Harvest Management (AHM) Working Group. The goals of this meeting were to compile biological and regulatory assessments necessary to support development of recommendations by the AHM Task Force, to consider implementation protocols for black duck AHM, and to discuss communication issues and needs.

AHM Task Force Update

In June 2004, the AHM Task Force made a set of preliminary recommendations to the International Association of Fish and Wildlife Agencies concerning certain strategic elements of AHM (http://migratorybirds.fws.gov/mgmt/ahm/taskforce/taskforce.htm). In September 2004, the Task Force asked the AHM Working Group to conduct a number of technical assessments to help inform development of final recommendations regarding future application of AHM. The assessment tasks were:

1. Evaluate the implications of a closed season plus only two open-season (i.e., standard and restrictive) regulatory alternatives (Re: AHM Task Force Recommendations # 2, 3, 4, & 5). This task involves:
    a. Specifying a range of possible harvest-rate distributions for standard and restrictive alternatives, and then calculating optimal harvest strategies for mid-continent, eastern, and possibly western, mallards; and
    b. Calculating and evaluating these optimal harvest strategies using both an objective to maximize long-term cumulative harvest and an objective that also includes the NAWMP goal for mid-continent mallards.

2. Construct statistical models that can predict mallard harvest-rate probability distributions as a function of Flyway-specific hunting regulations (Re: AHM Task Force Recommendations # 4 & 5). These models would be used to help determine the specifics of regulatory alternatives (i.e., season length, bag limits, framework dates) once target harvest rates for the standard and restrictive alternatives were agreed upon (based on #1 above).

3. To the extent possible, evaluate the potential need for independent hunting regulations on species other than mallards when the basic duck hunting season is predicated on the status of mallards and two open-season regulatory alternatives (Re: AHM Task Force Recommendations # 7). This task involves application of existing population models developed for pintails, canvasbacks, scaup, several other mid-continent species, and black ducks.

4. Assess progress on incorporating western mallards into the AHM protocol for establishing Flyway framework regulations (Re: AHM Task Force Recommendation # 6). This task involves:
    a. Finalizing a set of models describing the dynamics of western mallards;
    b. Developing efficient procedures for computing optimal harvest strategies; and
    c. Exploring the implications of various joint harvest-management objectives for midcontient and western mallards.

5. Review a preliminary study plan prepared by the Central Flyway Technical Committee to assess the effectiveness of the Hunters' Choice Bag Limit System (Re: AHM Task Force Recommendation # 7).

Results of these assessments are provided throughout the body of this report.

Reports from AHM Partners

Atlantic Flyway.—The primary AHM focus of the Atlantic Flyway in 2004 has continued to look toward maintaining our reliance on eastern mallard AHM and working toward operational status, and to the incorporation of other species. Atlantic Flyway hunting regulations have been based on the status of eastern mallards since 2000, however the provisional nature of this approach continues to be a concern.

The Atlantic Flyway is of the opinion that eastern mallard AHM should be viewed with equal status to the mid-continent model. Mid-continent mallard AHM is considered operational and there are no unique aspects of eastern mallard AHM warranting different (i.e., provisional) status. The argument that the implications of the currently employed AHM models are not fully understood applies to both mid-continent and eastern mallard AHM protocols. Existing mechanisms to prevent over-harvest for other species are in place for both eastern and mid-continent mallard AHM, and therefore concern on this point is not likely warranted. Granting operational status to eastern mallard AHM means that a flyway-specific alternative based solely on the status of eastern mallards can be implemented, at least until a process for integrating other stocks is developed, or it is determined that this approach has undesirable or adverse impacts on duck populations harvested in the Flyway.

The flyway continues to have some concern with respect to stocks of mallards and other species wintering in the southern portion of the flyway. Dialogue on this issue continues with the Mississippi flyway, and the Atlantic Flyway Technical Section will continue to work with that flyway and the AHM Working Group to address any concerns over impacts of Atlantic Flyway regulations on Great Lakes mallard populations. It is felt however that formalizing operational status for eastern mallard AHM may increase the likelihood that significant progress could be made on harvest management issues at the sub-flyway level.

The Atlantic Flyway continues to work closely with the U.S. Fish and Wildlife Service, the Canadian Wildlife Service, and the Mississippi Flyway to develop Black Duck AHM, and strongly supports the implementation of an AHM approach to black duck harvest management. We greatly appreciate the considerable efforts put forth to date by the USWFS and CWS, and the state of New Jersey, and in particular that of Dr. Mike Conroy and his group at the University of Georgia Co-op unit. Although we are not entirely comfortable with the use of a single population model to drive an interim AHM framework, we recognize limitations in current computational techniques. The Atlantic Flyway continues to support the concept that technical limitations should not hold back the development of the most appropriate black duck harvest management regulations.

The Atlantic Flyway is encouraged that the U.S. Fish and Wildlife Service and the Canadian Wildlife Service have explicitly recognized the importance of maintaining data collection activities that support eastern mallard AHM models during the agencies' discussions concerning integrating eastern waterfowl surveys.

The Atlantic Flyway Council recently provided comment on the AHM Task Force report. Principal responses to the Task Force recommendations included the following positions:

1) The Atlantic Flyway requests that the Task Force and USFWS keep in mind the unique perspective of the Atlantic Flyway, where regulations are based solely on eastern mallard AHM,

2) The Atlantic Flyway was not supportive of using NAWMP goals for harvest management purposes. Those goals were intended to guide habitat conservation efforts, not harvest management, and this distinction needs to be clearly expressed by the waterfowl management community,

3) There is support for simplification to two regulatory alternatives for the Atlantic Flyway (i.e., a "standard" and a "restrictive" season), subject to change no more often than every five years. However, the process for selecting the appropriate alternative each year should be more flexible to allow for periodic and timely improvements.

4) The regulatory alternatives should be based on current, rather than traditional, flyway differences, including allowing for flyway-specific differences in regulatory packages and selection of packages annually, and

5) It is premature to specify regulatory packages prior to analysis of various alternatives by the AHM Working Group and the flyways. At this time, we do not support the de facto presumption that the standard season for the Atlantic Flyway should be similar to what was in effect during 1995-1996.

The Atlantic Flyway believes the Central Flyway's "Hunter's Choice Bag Limit" proposal has merit and should be considered in the development of future regulatory alternatives for the Atlantic Flyway. There is general support for the concept of a total bag limit equal to the mallard limit and recognition that the aggregate bag concept may be a desirable alternative to in-season closures for species that need very restrictive harvest limits. Whether it would be as effective as in-season closures was uncertain and would likely depend on the species included for our flyway.

Lastly, in contrast to much of the rest of the continent, the suite of species of particular importance in terms of multi-stock AHM is somewhat different in the Atlantic Flyway. Wood ducks are of particular importance in the Atlantic Flyway, and we would eventually like to see this species, as well as black ducks, as the focus of multi-stock AHM for this flyway. The Atlantic Flyway is committed to working with the U. S. Fish and Wildlife Service and other flyways to facilitate development of a regionally specific multi-stock model as human and computational resources allow.

Mississippi Flyway.— In response to the AHM Task Force's third report (Status Report 3, June 29, 2004), the Mississippi Flyway Council (MFC) made the following comments:

In regards to Task Force Recommendation 1 (i.e., that managers clarify the nature of the NAWMP population objectives) the MFC agreed that it would be good to clarify this issue, but it may be more of a policy issue than a technical one. In regards to Task Force Recommendation 2 (to temporarily de-couple the NAWMP population objective for mallards from AHM) the MFC felt the NAWMP goal should not be decoupled from AHM because:

- it results in a more conservative harvest strategy than a harvest strategy without it,
- it results in a higher average mallard population than a harvest strategy without it,
- there are political and social reasons for keeping the NAWMP goal in the objective function, (e.g., maintaining support for the NAWMP, Joint Ventures, and NAWCA);
- it imposes a constraint that provides a measure of protection for non-mallard ducks and should be retained until some other mechanism is found to restrict harvests of ducks that are unable to sustain the same level of harvest as mallards

Regarding the Task Force's recommendations 3, 4 and 5, all of which deal with the regulatory alternatives, the MFC reiterated its support for the 3-alternative approach. The MFC agreed with the Task Force that the number of regulatory alternatives should be small, that the set of regulatory alternatives should be reviewed no more than once every five years, that the regulatory alternatives should result in distinct ranges of harvest rates, and that the regulatory alternatives should remain in place long enough to measure their effects. Regarding the recommendation that regulatory alternatives should reflect traditional Flyway differences, the MFC believes that these differences should be revisited and evaluated based on current harvest and hunter numbers. Because MFC is unsure about the desires of hunters, it seems that a set of 3 regulatory alternatives, as opposed to 2, would be more intuitive based on hunter's experiences over the past 40 years. Imposing a 1-step constraint when moving between regulatory alternatives would address some of the perceived social concerns about jumping between liberal and restrictive alternatives. The MFC prefers more frequent but smaller changes in regulatory alternatives because this is perceived as being more socially acceptable. Having said that, however, the MFC agreed with the Task Force's recommendation (#5) to have the AHM Working Group investigate the expected performance characteristics of a 2-package system, to use as a basis for developing regulatory specifications for such alternatives if this arrangement appears desirable in the future.

In regards to the Task Force's recommendations 6 and 7, which deal with how other stocks of ducks should be addressed within AHM, the MFC agreed with the Task Force's support for the first of the AHM Working Group conceptual approaches to managing multiple stocks of duck, but disagreed with the Task Force's objection to using the NAWMP population objective for mallards as a constraint in this process. The MFC also agreed that independent season lengths, bag limits, and framework dates should be considered for stocks of ducks with relatively low harvest potential (e.g., canvasbacks) or for stocks with small or declining population sizes (e.g., pintails), but that independent season lengths should be used as a last resort because they complicate regulations and result in inadvertent violations. The MFC believes the aggregate bag limit proposal from the Central Flyway is worth exploring and that the AHM Working Group or the Central Flyway should further examine the potential effectiveness of this regulation.

The MFC agreed with the Task Force that "closed seasons" should not be excluded from the AHM process because this is a fundamental regulatory alternative and removing it appears to arbitrarily eliminate an alternative for responsible management.

Finally, the MFC felt that the statement that "maximizing the sustainable waterfowl harvest is not the most important objective of harvest management" was not a completely accurate statement. It may be the most important harvest objective given that we currently are unable to measure other objectives such as satisfying hunters and maintaining participation. The MFC recognizes that they know very little, at least quantitatively, about hunter satisfaction and therefore believes that maximizing the sustainable waterfowl harvest should remain an important objective of harvest management, at least until we acquire more information on hunter satisfaction issues, which needs to be done in a coordinated fashion within and among Flyways.

Central Flyway.— The Central Flyway continues to support AHM as the best approach for managing mid-continent mallards. We stress, however, that much work still needs to be done on improving harvest management of mallards, and this remains a priority interest of the Central Flyway. We encourage continued efforts to improve technical aspects of the mid-continent mallard AHM protocol. We consider improvements in recruitment model issues within AHM to be a high priority. The Central Flyway would also like to understand the impacts of possible changes in differential vulnerability of female mallards on subsequent population dynamics, equilibrium population sizes, and on resulting regulatory strategies. We

will be resurrection our interest in looking at hen mallard harvest issues and mallard sex ratio issues during our upcoming technical committee meetings.

While we support development of AHM for western mallards, we are concerned about how and where mallards are split between Western and Mid-Continent stocks.

The Central Flyway, as did the other flyways, expended considerable effort during the past year in evaluating FWS budget issues. The Central Flyway remains concerned about budget and personnel allocations for work on AHM and other waterfowl management issues.

We again emphasize the importance of effective, targeted communication efforts, not only relating directly to AHM, but also all waterfowl management programs. In the past several years we have seen increased reports of dissatisfaction by hunters across the country coupled with concerns about mismanagement of waterfowl harvest and governmental misrepresentation of waterfowl harvest and population data. Much of this has been fueled by internet facilitated communications, such as chat rooms, websites and emails. We believe that continued unchecked or without appropriate response, these types of efforts could mushroom to the point of disrupting our ability to managed duck harvest through an AHM approach.

The Central Flyway is strongly opposed to the use of Seasons-within-a Season for restricting the harvest of individual duck stocks. In its place we have proposed a Hunter's Choice or Aggregate Bag system for reducing the harvest when needed. We are currently developing a proposal for an experimental evaluation of an Aggregate Bag in the Central Flyway. The proposed experiment would include evaluation of human dimensions information relative to this approach to harvest management. We will be discussing this proposed work this week and look forward to the guidance and assistance of the AHM Working Group in developing a sound study proposal. See the comments on this work that we provided in our response to the AHM Task Force

The Central Flyway is pleased that AHM has reduced the amount of time needed to address hunting regulation issues at their summer meetings. Because of this, the Central Flyway Council was able to devote most of a day to a facilitated joint Council/Technical Committee session on AHM issues. This was a very productive session in that it allowed Council and Technical Committee members the opportunity to share concerns and ideas and better inform all members of AHM issues. As a result of this meeting, the Central Flyway Council provided the following in response to the AHM Task Force Report Number 3 in a letter from Chair Vernon Bevill dated July 23, 2004:

"The Central Flyway Council (CFC) appreciates the opportunity to provide input and feedback on the Adaptive Harvest Management (AHM) Task Force's Status Report Number 3, dated June 29, 2004. The following responses were developed during several hours of thoughtful and productive discussion during our summer meeting and we trust the Task Force will give them serious consideration. We appreciate the Task Force's continuing acknowledgement of the role of the flyway councils and the U.S. Fish and Wildlife Service (Service) in the establishment of migratory bird hunting regulations.

AHM Task Force Proposed Timetable: The CFC is concerned that the timetable proposed by the Task Force will not provide adequate opportunity for resolution of these important issues by the Flyway Councils and the Service Regulations Committee (SRC). In particular, it will be difficult for the Flyway Councils to adequately review and respond to the "more final set" of Task Force recommendations in January, prior to the SRC meeting. We would prefer to have the opportunity for full review by each flyway Technical Committee and Council, and opportunity for interaction among the flyways, before

these recommendations are made to the SRC. This interaction could take place at the March 2005 flyway council and National Flyway Council meetings.

Even if there was unanimous agreement with all of the recommendations in the Task Force report, the details of developing new regulatory alternatives and analyses associated with these recommendations will likely take considerable time and effort. The CFC has proposed some alternative recommendations (as we expect other flyways will) that will need some time to develop and implement. Specifically, we would like to maintain the current liberal and restrictive package season lengths in any new alternatives, as well as develop and implement Hunter's Choice Bag Limit (see attachment) regulatory options on an experimental basis in the Central Flyway. Unless this experimental approach is incorporated as an option into the final Task Force recommendations, we are concerned that the Task Force's efforts to finalize their work according to the proposed schedule will be at odds with the Central Flyway's efforts to implement and evaluate the effectiveness of the Hunter's Choice Bag Limit regulatory options. We see no pressing need to quickly impose major changes to AHM regulatory options for the 2005-2006 seasons except for the de-coupling of harvest and population objectives. Moreover, we note that the schedule to reconsider zones and splits will begin in 2005, with implementation of revised zones and splits beginning with the 2006-2007 seasons. Given that zones/splits configurations can be influenced in part by the regulatory alternatives that are available, it may be useful to have the schedules for possible revisions to zones/splits and AHM regulatory alternatives follow the same schedule.

Finally, the CFC suggests that the Task Force make some recommendations on how policy issues related to AHM will be handled in the future. Although the Task Force has made an admirable effort to resolve the issues addressed in the report, policy-level issues and disagreements about duck harvest management will undoubtedly continue to arise. Will the Task Force remain a standing group? If so, are any future changes anticipated in the relationships between the Task Force (and the International Association of Fish and Wildlife Agencies), the Flyway Councils, and the SRC? If not, how does the Task Force recommend that future policy issues be addressed?

CFC response to Recommendations #1 and #2: The CFC agrees with the AHM Task Force's recommendations. A review and clarification of North American Waterfowl Management Plan (NAWMP) population objectives is warranted. We note that an update of the NAWMP was recently completed, and it will take considerable time and effort to conduct further review of NAWMP objectives. The National Science Support Team and AHM Working Group may be able to collaborate on this effort to clarify how NAWMP objectives relate to harvest management programs.

Until the relationships between habitat and harvest programs for North American ducks are clarified, the CFC is not convinced that NAWMP population objectives are appropriate for constraining overall mallard harvest or harvest of other stocks of ducks. Therefore, the CFC supports a temporary decoupling from the goals of the NAWMP and use in its place an objective of maximizing long-term cumulative harvest of mid-continent mallards in order minimize the time spent in closed season prescriptions and maximize hunting opportunity. We also believe that the time to decouple is now, while enjoying the recreational opportunity afforded by liberal duck hunting seasons. Decoupling AHM from NAWMP when a restrictive season is the recommended alternative will likely result in a general misunderstanding of the motives for this action.

Should NAWMP goals be re-coupled with AHM objectives in the future, we recommend that action be preceded with a comprehensive analysis of the consequences and an opportunity for full discussion and input from the flyway Councils.

CFC Response to Recommendations #3, 4 and 5: The CFC offers qualified support for the Task Force recommendation to simplify the regulatory packages. We agree in concept that the packages should be designed to result in distinct rates of harvest. We concur that the alternatives should reflect flyway differences but also believe that changes in the regulatory relationships among flyways should be considered when biological justification for modification is developed. The CFC believes that regulatory frameworks for a flyway should be based on harvest rates within the flyway and the biological capabilities of the waterfowl populations to support harvest. We do not concur with the Task Force premise that waterfowl hunters will support a reduction in opportunity to gain simplicity/consistency in regulations, particularly as it relates to the liberal package. We offer the following modifications and or requested clarifications as they relate to these recommendations.

We strongly endorse the use of a 74-day liberal season length and a 39-day restrictive season length in the Central Flyway. Experience since 1995 indicates that we have not been able to achieve the desired harvest rate of 13% under the liberal package and typically have observed rates in the range of 11 – 12% most years. We believe that it would be desirable to maintain harvest rates in this range rather than adopting a more conservative approach for any revised Liberal package. Furthermore, we argue that maintaining hunter interest and participation is a crucial aspect in management decisions and would support efforts to more quantitatively assess hunter preferences as outlined in the Think Tank Report on Waterfowl Hunter Satisfaction.

In addition, we would like to see an analysis of the difference in days of hunting opportunity simulated over a 10-year period between the existing 3-package system versus a more conservative 2-package system. Does the use of the 2-package system reduce potential hunter opportunity?
The CFC reiterates its support for the use of the Hunter Choice Bag Limit option as part of any package as a means of dealing with the management of multiple stock issues.

CFC Response to Recommendation #6: The CFC supports continuing efforts to define three breeding populations of mallards, with regulations governed by derivations of those birds. We do have some concerns with how potential boundaries for derivation of harvest will be described and how that might affect the optimization routines for those populations.

CFC Response to Recommendation #7: The CFC provided the Task Force with recommendations for use of an aggregate bag limit system (Hunter's Choice Bag Limit) to account for species with lower harvest potential (response to Task Force Status Report #2). As mentioned earlier, the CFC is concerned that the Central Flyway's recommendations regarding an experimental trial and evaluation of the Hunter's Choice Bag Limit option in the Central Flyway is not reflected in the Task Force's Status Report #3. We urge the Task Force to incorporate the Hunter's Choice Bag Limit proposal in the Task Force's next draft report.

The CFC continues to recognize that setting seasons based on the status of mallards may result in harvests of some duck species, in some years, which exceed objective harvest levels. Closed seasons, independent season lengths (seasons-within-seasons), bag limits, and framework dates are all potential harvest management tools that could be considered in managing harvests of those stocks with relatively low harvest potential (e.g., canvasbacks) or for those stocks with declining population sizes (e.g., pintails). Closed seasons and seasons-within-seasons have been used separately and together in recent years to limit harvest of canvasbacks and pintails, resulting in increased regulation complexity. The CFC believes that closed seasons and seasons-within-seasons are generally burdensome to duck hunters, compared to other potential harvest management approaches, particularly as these season adjustment approaches are used for more species. In addition, the CFC does not want to compromise mallard hunting opportunity (season length) in order to limit harvest on stocks with lower harvest potential.

Thus, the CFC has a strong interest in developing regulatory alternatives for the Central Flyway that (1) limit harvest on species with relatively low harvest potential, (2) maintain maximum harvest opportunity on drake mallards, but (3) avoid closed seasons, seasons-within-seasons and/or reductions in overall season lengths. Specifically, we believe that the use of Hunter's Choice Bag Limit may be as effective at reducing harvest of target species as seasons-within-seasons, while maintaining drake mallard hunting opportunity. The Council also believes that the Hunter's Choice Bag Limit is as practical and effective relative to extant monitoring programs as are season-within-seasons, requires similar levels of administration, results in less regulatory complexity compared to season-within-seasons, better accommodates the range of hunter's abilities to shoot selectively, encourages hunters to shoot selectively, and will result in fewer regulations violations due to species seasons closures.

Recognizing that there is no historical experience with the actual effectiveness (harvest impacts, hunter preference) of the Hunter's Choice Bag Limit, the CFC is committed to working with the Service to develop a plan to evaluate the approach during an experimental period. Preliminary discussions with technical staff indicate an evaluation of the Hunter's Choice Bag Limit option could be accomplished relatively inexpensively and by using existing tools. The attached summary of the Hunter's Choice Bag Limit provides further clarification of this option to assist the Task Force in considering this strongly supported recommendation of the CFC.

We understand the challenges faced by the members of the Task Force and appreciate their efforts in the continued refinement of the AHM approach used to establish duck hunting regulations.

Pacific Flyway.— The Pacific Flyway Study Committee and Council have had extensive discussions regarding AHM during the past year, starting with the AHM workshop in Denver and continuing in the March and July meetings. Council philosophies on AHM are represented in several actions taken over the past year.

A. AHM Task Force interactions

Comments were provided to the AHM Task Force in two recommendations regarding Pacific Flyway policy and direction. Significant points contained in these recommendations include:

1. Reconfiguration of AHM packages

The Pacific Flyway Council believes that AHM needs to more clearly distinguish between data driven objectives related to maximizing harvest annually and the relatively subjective issues involved in hunter opportunity and satisfaction. A clear and reasonable basis is needed for trading off biologically supported harvest potential and associated hunting opportunity for tangible AHM program benefits. An example is reducing the season length under the Liberal option. If reducing the maximum season length from 107 days to 93 days resulted in benefits of reducing harvest pressure on duck stocks below population objectives and eliminated the need for seasons within seasons for pintail and canvasbacks in most years, it would be worth considering that level of reduction in maximum hunting opportunity.

In general, the Council supported the idea of simplifying the set of regulatory alternatives. The Council could not reach consensus on the number of regulatory alternatives to consider, without obtaining additional background information defining the alternatives. As indicated previously, the Council supported the concept of minimizing partial seasons on pintails and canvasbacks. However, the Council asked for evaluation of more alternatives sets than the 2 alternative proposal advanced by

the Task Force, and proposed several options. The Council supported developing the details for these additional sets of alternatives for further review, including how often partial seasons would likely be triggered for each package. The Council recommended that potential changes occur after the evaluation and further analyses are completed, which would provide the basis for additional flyway council review and input on "costs/benefits". The Council also supported reviewing the alternatives for potential changes every 5 years, along with zones and splits.

2. Use of the North American Plan population objectives

Rather than temporarily "de-couple" the NAWMP population goal for mallards from AHM, the Council recommended that the AHM Task Force, flyways, and the Service cooperate to develop a shared vision of the role of population objectives (targets) in NAWMP, and their specific relationships with harvest management mechanisms in the AHM process. The Council recommended that the Task Force work with the AHM Working Group and the Service to consider options involving changes in the existing objective function to improve overall AHM system performance.

3. Accounting for sources of variation in waterfowl demographics

The Pacific Flyway Council supports incorporating appropriate models for western mallards and pintails into the AHM process as soon as possible. This has been a consistent and longstanding Council position with continental implications. Combined with other refinements, this modification would help address some of the most important issues related to harvest management now relying primarily on performance of mid-Continent models. Investing in expanded efforts for these two important species could result in cost-effective improvements to the process. The Council recognized the need to set priorities for the limited staff and financial resources available now and in the future. However, these are currently the most important species level needs for the Pacific Flyway.

B. Western Mallard Model Development

Toward developing models for western mallards, the Pacific Flyway Council contracted with University of Nevada - Reno (UNR) in 2003. A preliminary report was produced by UNR in April, which was subsequently reviewed by USFWS in June. A final report was developed by UNR in August that provided significantly more detail than the first draft, and incorporated major changes proposed by USFWS. Jim Nichols of USGS also reviewed the report and proposed additional technical edits.

All agencies have recognized the strengths and weaknesses of extant datasets available for western mallards as identified in our initial contract with Cornell University (Sheaffer and Malecki) in 1999. Pacific Flyway states and provinces stepped up efforts since 1990 to improve data for our flyway. We believe that future modeling efforts and other management programs would benefit from additional banding and monitoring support from USFWS, needs that we have recognized since the creation of our flyway. The work by UNR presents evidence that western mallard data are no worse than those available for the other two continental stocks. Similar to other stocks, the current effort considers the strengths and weaknesses of available information.

We continue to seek a collaborative approach in finalizing and incorporating these models as part of the AHM program. Although our contract with UNR is complete, the contractors are committed to produce necessary products for future joint optimization tasks. Likewise, the Council has requested

to be involved in further refinement of the models, as well as joint optimization tasks in the months ahead. Additional details of western mallard modeling will be discussed later in the meeting.

C. Pintails

Northern pintail continue to be of importance to the Pacific Flyway. In July, we requested assistance from the Division of Migratory Bird Management (DMBM) and others to provide technical assistance to work with the Pacific Flyway Study Committee (PFSC) and the other flyways to address potential changes to the interim harvest strategy. Subsequent to that request, the Service amended the strategy to: 1) set partial seasons (restrictive alternative) when the BPOP or Fall Flight exceeds the closure level but the BPOP is less than 2.5 million and projections in the strategy predict a decline in the following year's BPOP (not including a 6% growth factor); 2) adopt full seasons, minimum 1-bird daily bag when the BPOP exceeds 2.5 million, regardless of the following year's BPOP projection; and 3) retain all other existing provisions of the strategy. The Service requested a cooperative review of the strategy as amended.

To begin that review, a conference call was conducted in October among representatives of the flyways and federal agencies. The outcomes of that call were that

1) Mike Runge, Scott Boomer, and Fred Johnson would address: a) an update of survival and recovery rates estimates; b) an update of the basic population model including addressing the bias; c) a way to deal with overflight bias in BPOP estimates; and d) improvements to the harvest prediction models.

2) Simulations to illustrate the likely effects of implementing these updates using the existing general strategy would be conducted.

3) A report of those actions would occur at this meeting and a draft report would be available for consideration at the January SRC meeting.

We anticipate that any further revisions to the strategy in this coming year would be coordinated during the early season regulation cycle and the Pacific Flyway looks forward to close coordination with the other flyways over the next few months on this issue. We presume the same flyway contacts that were involved in the conference call in October will be our primary point of contact for that coordinated review.

Additional issues that the group felt warranted exploration in the future included: 1) the potential role of an aggregate bag limit; 2) sex and/or stock specific regulations; 3) state-specific season length options; and 4) the recognition of winter distribution and abundance in developing harvest strategies.

U.S. Fish & Wildlife Service.— In 2004 the Flyway Councils were asked by the Task Force to provide input to a questionnaire developed following their January 9, Denver, CO, AHM Conference. In April 2004, the Service's representative on the Task Force, Ralph Morgenweck, asked key migratory bird personnel in all Regions and the Division of Migratory Bird Management (DMBM) to respond to the same questionnaire. This input was specifically requested to help him understand the staff's perspectives and provide insight into the range of opinions within the Service. The feedback received was remarkably consistent among all Regions and DMBM, and Ralph shared these comments with the Service's Directorate and with other Task Force members.

Similarly, Service personnel have developed responses to the Task Force Recommendations forwarded to the Flyway Councils last summer. Although these responses should not be considered as part of any official Service position, I think it is appropriate to share them on behalf of the staff of the Service's migratory bird program.

First, service staff agree with the Task Force's assertion that the population objectives in the NAWMP should be better clarified, periodically reviewed, and updated by the conservation community at large. But, Service staff would also argue that waterfowl populations, harvest and habitat management are linked and should be a part of the NAWMP. However, as we all know, the population goals laid out in the 1986 Plan and other updates that followed do not explicitly provide this linkage. Therefore, we have a problem in interpreting the NAWMP goals. But, also, everyone in the NAWMP community has accepted that the present objectives have limitations as performance measures without understanding how environmental conditions and harvest policies affect the ability to attain population objectives through habitat conservation. Presently, the AHM objective function, utilizing the NAWMP objectives, is just a number that injects conservatism into the harvest strategy and provides some linkage between harvest and habitat management. However, understanding better what the NAWMP goals represent could change how these numbers are implemented in an objective function. A better understanding of what these goals represent and what that means for their use in AHM can only strengthen the linkage between harvest and habitat management.

Secondly, Service staff believe that until these possible linkages can be fully explored that the NAWMP population goals should remain coupled in the AHM objective function. Further, staff strongly feel the NAWMP goals and objectives should set the agenda for waterfowl management – including both habitat and harvest policy. Harvest management in the United States should not dictate population levels exclusively, without other considerations. Pitting harvest management and habitat management against each other would have disastrous consequences. By uncoupling these components, the very foundation of the NAWMP would be undermined and would unnecessarily jeopardize decades of waterfowl conservation planning efforts endorsed by its international partners. Service staff are also concerned with public perception and the huge communication challenge this would create.

Thirdly, Service staff agree with the Task Force's efforts to simplify the regulatory alternatives, continue to reflect Flyway differences, and to maintain them long-term unless there are compelling reasons to do otherwise.

Fourth, Service staff strongly believe that we should return to the packages used during 1995-96. We have much more accumulated experience over several decades and it would reduce the risk to species with relatively low status and /or harvest potential, and yet, still provide reasonable hunting opportunity. Whether we should use 2 or 3 regulatory packages is unclear; however, we should consider what is likely to be more acceptable to the hunting public.

Fifth, Service staff support the technical evaluation of any proposed regulatory alternative, but we believe that such decisions are value-based on societal or policy considerations, which is the primary role of the AHM Task Force.

Sixth, Service staff would prefer to incorporate the status of a broader suite of species in the AHM process, but, in the short-term don't see how that is possible. Until a better alternative is available, we should continue to make our choices based on the status of mallards.

Seventh, Service staff agree that continued use of independent seasons on some species may be necessary in the future, but recognize that more risk-aversive regulatory packages such as those prior to 1997 have proven to be an effective approach to preventing over-harvest of other duck stocks.

Since the inception of the AHM Task Force by the IAFWA in December 2002, the Service has maintained a keen interest in the development of useful harvest policy guidelines. In reality, this need has been with us since in inception AHM in the early 1990's. We all recognized early on that in order to implement a successful harvest management strategy, there were two important ingredients or arenas: (1) biological - based on our current scientific knowledge of waterfowl population dynamics and their limiting factors, and our ability to objectively compile, analyze, and interpret these data and, (2) political - involving subjective, value-based judgments about the goals and objectives of management, i.e. which alternative models to include, which regulatory alternatives to consider, and at what management scale. And, most importantly, the analytical structure and policy-based decision making processes must be linked.

We have all heard Fred Johnson talk about integrating Science and Policy, and that too much emphasis on the Scientific enterprise, while too little attention on the more subjective or policy-based aspects, can be problematic. In many respects, we have struggle with the policy issues from the very beginning of AHM. The current assignment given to the AHM Task Force to provide policy guidance is a good case-in-point. Now, after a 2-year effort, it is time to cut-to-the-chase and make the "hard decisions," the value-based decisions, that will lead us into the next phases of future harvest management and set the long-term strategic direction of AHM.

Canadian Wildlife Service.—The Canadian Wildlife Service recognizes the need for international harvest strategies for species in which there is a significant harvest in Canada. We believe that Adaptive Harvest Management (AHM) approaches can provide, in some cases, the scientific rigour and formal process needed for implementation of such international harvest strategies. Throughout the process of developing international AHM approaches, biological and societal considerations will be of utmost importance.

As such, CWS sees the Black Duck AHM as a good opportunity for an international coordinated approach to waterfowl harvest management. Following the publication of the final Black Duck AHM report by Dr. Mike Conroy and colleagues and recent developments through the black duck AHM working group, we are looking at the possibility of implementing a single population AHM approach based on breeding ground surveys in the near future. This approach would allow sufficient flexibility to implement, in the future, a fully stratified AHM approach that would recognize biological differences between the recognized harvest areas. In the meantime, we envision being able to accommodate differences among Canadian harvest areas by allowing regulations to vary by area (based on historical trends of the source populations for each area), while aiming to attain specified overall harvest rates at the Canadian level.

CWS is also involved in the development of an AHM for Atlantic Population Canada Geese. This involvement has been in the form of funding a preliminary technical assessment of the feasibility of the approach as well as current involvement in modeling efforts. We intend to continue supporting the work that is underway to develop an AHM framework for this population.

In order to make implementation of AHM easier in Canada, we are looking at the possibility to make regulatory changes that would alleviate the need to determine harvest regulations for the upcoming waterfowl hunting seasons before the current year's information from breeding areas is available. This

system would have three or more levels (e.g. red - yellow - green light system) for which season lengths and bag limits would be pre-defined. Information from the breeding areas would then be used to determine what level of harvest could be allowed. There are still some technical difficulties to overcome (regulatory decisions have to be determined before the spring surveys are completed) but hope to be able to resolve these in the near future.

On the topic of the inclusion of NAWMP population goals as constraints to harvest in AHM, CWS believes that these should not be dissociated from the AHM process at this point because these population goals have been negotiated and agreed to at the highest level of government of our countries. A clarification of the meaning of these goals as they pertain to harvest or habitat management would be nonetheless appropriate at this point.

There are important differences in spatial distribution and derivation of waterfowl harvest between the continental US and Canada. Particularly there is a strong East - West stratification in derivation of harvest, where Canadian hunters mainly harvest local birds or birds coming from areas directly to the north. These differences between the 2 countries have implications for multi-stock AHM. In particular, mid-continent birds are not harvested in significant numbers on the Pacific coast or in eastern Canada (Ontario, Quebec and Atlantic Provinces). It is therefore evident that CWS would not support a continent-wide harvest strategy where regulatory packages would be determined primarily by the status of mid-continent waterfowl. Rather, ways of integrating these differences between in multi-stock AHM should be sought.

In a memo on Black Duck AHM circulated by the USFWS, they described the difficulty of assigning resources to further development of the models, and ultimately, to the implementation of Black Duck AHM. We recognize that AMH implementation would require a substantial input of resources, and it is not immediately obvious how CWS would be able to manage. Right now, we do not propose a solution, but caution that that there is no clear answer.

Reuniting Waterfowl Management

Two of the most significant management programs designed to affect duck populations in North America are the North American Waterfowl Management Plan (the Plan) and the U.S. program of Adaptive Harvest Management (AHM). Both the Plan and AHM are continental in their scope, involve an extensive group of stakeholders, and rely on an adaptive process of biological planning, implementation, and evaluation. The development of these two programs has occurred independently, however. Consequently, there has been little explicit recognition that both harvest and habitat effects have to be considered for coherent management planning and evaluation. For example, harvest policy can affect whether population objectives of the Plan are met, irrespective of the success of the Plan's habitat conservation efforts. Conversely, habitat conservation activities under the Plan can influence harvest potential and therefore the amount of hunting opportunity provided. It seems increasingly clear that the Plan's duck population objectives can only be useful for conservation planning and evaluation if they are accompanied by an explicit specification of the harvest policy and environmental conditions under which they are to be achieved. This clarification also is necessary to ensure that Plan population objectives are not attained solely through the reduction of hunting opportunity in AHM. We believe then that it is imperative that these two key waterfowl-management programs work to harmonize their objectives, at least for the species of ducks important in harvest management. AHM and the Plan ought to be working toward the same ends, but that is not possible so long as the mutually reinforcing relationship of these programs is obscured by ambiguities in their respective management objectives.

AHM Task Force Assignments

1. Evaluate the implications of a closed season plus only two open-season (i.e., standard and restrictive) regulatory alternatives.

We focused on two questions concerning this task: (a) how does selection of target (or mean) harvest rates for "standard" and "restrictive" regulatory alternatives affect expected management characteristics for mid-continent mallards; and (b) how important is this selection relative to management objectives and model weights. We examined three possible mean harvest rates for adult males under a "standard" regulatory alternative: 0.13, which is the mean under the current liberal alternative; 0.11, which is the mean under the current moderate alternative; and 0.09, which is intermediate between the means for the current restrictive and moderate alternatives. For the "restrictive" alternative, we examined two possible rates: 0.06, which is the mean under the current restrictive alternative; and 0.04, which is similar to the mean under the very-restrictive alternative (last considered in 2002). Thus, there were six possible combinations of mean harvest rates to be examined for the "standard" and "restrictive" alternatives. For each of these combinations, we computed an optimal regulatory strategy under two management objectives (i.e., objective functions), with five mallard population models (60 optimal strategies in all). The two alternative management objectives were: (a) maximize long-term cumulative harvest; and (b) maximize long-term cumulative harvest, subject to a proportional devaluation of harvest whenever the mallard population falls below the goal of the North American Waterfowl Management Plan (NAWMP). The five population models included the four extant models of population dynamics, plus an "average" model based on the 2004 model weights (U.S. Fish and Wildlife Service. 2004. Adaptive harvest management: 2004 hunting season. U.S. Dept. Interior, Washington, D.C. 39pp. http://migratorybirds.fws.gov). We then simulated application of these optimal strategies and computed mean size of the breeding population, harvest, and fall flight, the frequency of closed, "restrictive," and "standard" seasons, and the frequency of annual regulatory changes.

Generally, differences in management performance and regulatory patterns attributable to the six possible combinations of harvest rates for the "standard" and "restrictive" alternatives were minor compared to the variability due to the choice of management objective and model describing mallard population dynamics. Given a management objective and model, the choice of mean harvest rate for the "restrictive" alternative made almost no difference in any measure of management performance. The expected frequency of "restrictive" seasons was low in almost all scenarios, and in some cases was associated with a high frequency of annual changes from a "standard" to a closed season (and vice-versa). The expected frequency of "standard" and closed seasons was more sensitive to the choice of mean harvest rate under the "standard" alternative, but under current model weights, the choice of management objective had as much or more effect on expected management characteristics than the choice of harvest rate for the "standard" alternative. Results suggest that the desirable consequences of eliminating the NAWMP goal from the management objective (e.g., more regulatory stability, higher frequency of "standard" seasons; Fig. 1) would be accompanied by undesirable consequences (e.g., lower breeding-population size, smaller fall flight; Fig. 2) that could not be offset even with what would be perceived as an extremely conservative "standard" alternative.

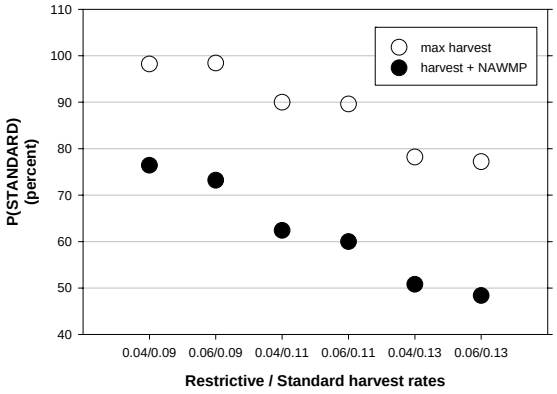

Fig. 1. Average mallard breeding populations projected under six different combinations of mean harvest rates.

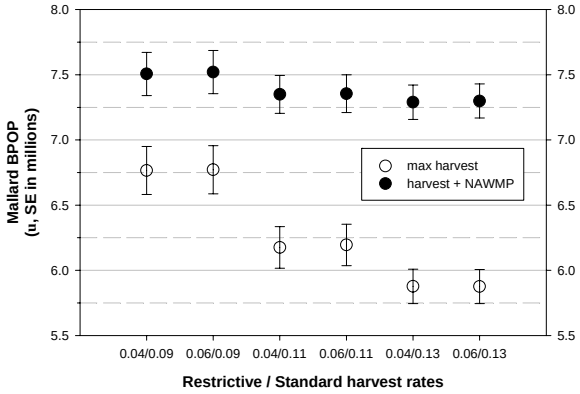

Fig. 2. Expected frequency of the "standard" regulatory alternative under six different combinations of mean harvest rate.

2. Construct statistical models that can predict mallard harvest-rate probability distributions as a function of Flyway-specific hunting regulations.

We developed methods to model population-specific harvest rates for mallards as a function of Flyway-specific hunting regulations. Our preliminary analysis was based on a modeling framework developed for black duck AHM by Conroy et al. (2005. Modeling of regional harvest rates in relation to harvest regulations using band–recovery data and Markov Chain - Monte Carlo methods. J. Wildl. Manage. 69:*In press*). Under this framework, the harvest process is modeled as a function of harvest-area specific recovery and band-reporting rates, and the movement rates of birds from discrete source (breeding) populations to harvest areas. The geographical scale of our initial assessment focused on the current delineations of the three mallard breeding populations (Eastern, Midcontinent, Western) and five harvest areas (four Flyways and Canada). We used Bayesian methods to fit a range of initial models with different parameterizations, which differed in how movement or recovery rates were allowed to vary over time. For the purposes of this exploratory work, we did not incorporate covariate information (e.g., season length, bag limits, etc.) that we believe may be informative in explaining the observed variation in mallard harvest rates.

Our preliminary results suggest that the analytical framework can provide the desired parameter estimates and the initial estimates seem reasonable given some simplistic assumptions regarding the use of fixed reporting rates. However, there is substantial technical work that must be accomplished before we are able to model and predict harvest rates for the three mallard populations as a function of flyway-specific hunting regulations and population-specific population dynamics. Much of this work will focus on methods to model temporal and spatial variation in reporting rates, determining a reliable set of predictors (e.g., season length), and evaluating the scale for post-stratification of band recoveries in relation to extant population models and optimization protocols.

3. To the extent possible, evaluate the potential need for independent hunting regulations on species other than mallards when the basic duck hunting season is predicated on the status of mallards and two open-season regulatory alternatives.

We examined the effects of “restrictive” and “standard” regulatory alternatives, whose use was optimized for mid-continent mallards, on nine species of ducks. The nine species were gadwall, American wigeon,

green-winged teal, blue-winged teal, northern shoveler, northern pintail, redhead, canvasback, and scaup (lesser and greater combined). The abundance of these species was indexed by their respective breeding-population estimates from the traditional mid-continent survey area. For this assessment, we relied on a population model that predicts growth rate as a function of duck abundance, the number of May ponds in Canada, and the harvest rates of mid-continent mallards (Johnson, F. A. 2003. Population dynamics of ducks other than mallards in mid-continent North America. U.S. Fish and Wildl. Serv., unpub. rep., 15pp.). We believe harvest rates of mallards serve as a useful predictor of harvest pressure on other species because harvest rates of mallards and of other species are highly correlated over the period of record. We predicted abundance of the nine duck species relative to their respective NAWMP goals under each of the six combinations of mean harvest rates for the "restrictive" and "standard" regulatory alternatives, under each of the two mallard management objectives described previously, and using the optimal strategy associated with the current model weights for mid-continent mallards (108 scenarios).

Given a harvest-management objective for mallards, it was generally not possible to discern any meaningful effect of varying the mean harvest rates for the "restrictive" and "standard" regulatory alternatives on the abundance of other duck species. The choice of management objective for mallards (i.e., whether to include the NAWMP goal) was a much more important determinant of duck population size, especially with higher harvest rates associated with the "restrictive" and "standard" regulatory alternatives. The 90th percentiles for the abundance of northern pintails and scaup never included their respective NAWMP goals under any combination of mean harvest rates or management objectives. The abundance of American wigeon only rarely exceeded its NAWMP goal, and only under a harvest-management objective that included the mallard NAWMP goal. The median abundance of blue-winged teal, redhead, and canvasback tended to be close to their respective NAWMP goals under all scenarios. The median abundance of green-winged teal, northern shoveler, and gadwall were above their respective NAWMP goals under all scenarios.

Conditioned on our particular choice of harvest rates for the "restrictive" and "standard" regulatory alternatives, and on current model weights for mid-continent mallards, our results suggest that independent regulatory strategies may be useful for northern pintails, scaup, and possibly American wigeon *if* attainment of their respective NAWMP goals is to be accomplished at least in part through harvest management. It is worth noting, however, that our results suggest the abundance of pintails would still fall far short of the NAWMP goal (-33%) even in the absence of harvest.

We also examined possible regulatory strategies for black ducks based on recent population models developed by Conroy et al. (2002. Identification and synthetic modeling of factors affecting American black duck populations. Wildlife Monographs 150. 64pp.). Over the period of record, independent harvest regulations for black ducks have produced harvest rates that are near optimal given the objectives of maximizing harvest and attaining the NAWMP population goal for black ducks. However, elimination of the NAWMP goal as part of the harvest management objective for black ducks would apparently allow for higher harvest rates, thereby reducing to some (unknown) extent the necessity for a regulatory strategy independent of mallards.

4. Assess progress on incorporating western mallards into the AHM protocol for establishing Flyway framework regulations.

The U.S. Fish & Wildlife Service and the AHM Working Group continue to place a high priority on this effort, and believe it is an essential element of a more comprehensive and effective AHM framework. Most recently, efforts have focused on defining the geographic bounds of a western mallard population and on understanding how the abundance of these mallards varies over time. Drs. Mark Herzog and Jim

Sedinger recently addressed these issues through a cooperative agreement among the Pacific Flyway, the State of Oregon, the Service, and the University of Nevada – Reno.

The development of AHM for western mallards continues to present technical challenges that make implementation much more difficult than with either mid-continent or eastern mallards. Specifically, we remain concerned about our ability to reliably determine changes in the population size of western mallards based on a collection of surveys conducted independently by Pacific Flyway States and the Province of British Columbia. These surveys tend to vary in design and intensity, and in some cases lack measures of precision (i.e., sampling error). We still consider the methods for estimating mallard abundance in British Columbia to be in the development and evaluation phase, and there are as yet unanswered questions about how mallard abundance will be determined there on an operational basis. Another technical challenge is how to estimate a reliable, annual measure of reproductive success. Submission of mallard wings by hunters typically provides a good measure of reproductive success, but application of this approach for western mallards is complicated by the mixing of mid-continent and western mallards in the Pacific Flyway harvest.

Extensive reviews of the research by Drs. Herzog and Sedinger suggest that further technical work is required on these monitoring issues. In light of these challenges, we believe that it will not be possible to hold to the original timeline, in which implementation of AHM for western mallards was tentatively scheduled for the 2005 hunting season.

5. Review a preliminary study plan prepared by the Central Flyway Technical Committee to assess the effectiveness of the Hunters' Choice Bag Limit System.

Central Flyway representatives on the AHM Working Group presented an outline of the approach the flyway plans to use to evaluate a Hunters' Choice Bag Limit System. The evaluation will focus on comparing proposed Hunters' Choice (HC) regulations to Season-Within-A-Season (SWAS) regulations currently being used to manage harvests of pintails and canvasbacks. The hypotheses of primary interest are: (1) annual harvests of pintails and canvasbacks in the Central Flyway are no greater under HC regulations than under SWAS regulations, and (2) duck hunters in the Central Flyway will prefer HC regulations over SWAS regulations. The Central Flyway proposed a Before-After-Control-Impact study design. Under this design, all Central Flyway states will use SWAS regulations for pintails and canvasbacks during the 2005-2006 hunting seasons (provided open seasons on these species are permitted), in order to gain additional experience with SWAS regulations. An experimental period would begin with the 2006-2007 season, in which half of Central Flyway states will be randomly assigned to HC regulations and the other half retain SWAS regulations to provide a control group. The experiment will continue for at least three hunting seasons. Annual harvest estimates derived from federal harvest and parts collection surveys will be used to compare harvests between HC and SWAS regulations. To examine hunter preferences between HC and SWAS regulations, mail surveys will be conducted using a standardized format and sampling approach throughout the flyway. The Central Flyway will work with Human Dimensions experts to design and analyze these surveys. An effective internal and external communications strategy will be essential to the success of this experimental evaluation, and the flyway will also work with experts to develop and implement a flyway-wide communications strategy. Annual updates will be provided to the Service, flyway councils, and the AHM Working Group. An evaluation report will be prepared following the end of the experimental period.

The AHM Working Group gave conceptual support for conducting an evaluation of HC regulations in the Central Flyway. Numerous technical issues on study design and analysis must still be resolved, and the Working Group provided guidance on these issues. A more detailed study plan will be completed by the Central Flyway Waterfowl Technical Committee at their working meeting, December 9-14, 2004. A sub-

group of the AHM Working Group and several other scientists were identified to provide peer review for the draft study plan. After review, the revised plan will be provided to the entire Working Group and the chairs of each flyway technical committee for additional review. A final study proposal will be forwarded by the Central Flyway Council to the Service Regulations Committee after the March Central Flyway Council meeting. A brief update on the status of the study proposal will be provided to the Task Force at its meeting in January.

Black Duck Harvest Management

Black Duck Population Ecology and Management Challenges

Management of American black ducks (*Anas rubripes*) has long been hampered by a lack of understanding regarding the factors affecting annual abundance. This has resulted in disagreements among stakeholders about whether to use hunting regulations to arrest the large-scale decline of black ducks, and ultimately how to provide sustainable hunting opportunities. In 1999 a technical working group (BDAHMWG) was formed to investigate how the U.S. and Canada might cooperate in an adaptive approach to the management of black duck harvests. Adaptive harvest management (AHM) for black ducks is viewed as a means of dealing with (rather than resolving) uncertainties in population dynamics, particularly those concerning the role of mallard competition and sport harvest in the long-term decline in black duck abundance. The BDAHMWG was formed by, and provides technical advice to, the Black Duck International Harvest Strategy Committee (HSC). The HSC is comprised of seven representatives from the U.S. Fish and Wildlife Service, the Canadian Wildlife Service, and the Atlantic and Mississippi Flyway Councils. The BDAHMWG includes the seven members of the HSC along with other government representatives who are involved in the technical aspects of the effort.

Working under contract, the U.S.G.S. Cooperative Fish and Wildlife Research Unit in Georgia (GA Coop. Unit) has been leading the technical effort to develop an international AHM framework for black ducks. The effort has successfully produced models of the continental black duck population that recognize four alternative biological hypotheses (presence or absence of a mallard effect on reproduction, additive or compensatory hunting mortality) and that explicitly account for an apparent bias in estimates of survival or reproductive rates (*Conroy, M. J., M. W. Miller, and J. E. Hines. 2002. Identification and synthetic modeling of factors affecting American black duck populations. Wildlife Monograph No. 150. 64pp.*). Development of an AHM framework also has included an investigation of the implications of: (a) breeding-population goals; (b) parity in U.S. and Canadian harvests; and (c) possible regulatory alternatives and constraints. An extension of this framework to three breeding stocks and six harvest areas (three in eastern Canada, two in the Atlantic Flyway, and one in the Mississippi Flyway) also has been explored. The GA Coop. Unit recently provided a draft final report (hereafter referred to as the "BDAHM Report") to the BDAHMWG for review. For more information about the effort to develop an AHM approach to black ducks visit http://coopunit.forestry.uga.edu/blackduck/.

In 2003 the USFWS Division of Migratory Bird Management (DMBM) began working with the Atlantic Flyway Council and others to develop assessment procedures that could be used to better inform black duck harvest management in the United States. These procedures are intended to help the USFWS assess the biological implications of any proposed changes to hunting regulations in the U.S. in the short term, as well as complement the ongoing effort to develop an international program for the adaptive management of black duck harvests.

The DMBM developed an assessment framework in cooperation with the GA Coop. Unit, and after consultation the Atlantic Flyway Technical Section. The framework uses published models of black duck

population dynamics to examine the potential effects of varying harvest (Conroy et al. 2002). These models describe a single continental population of black ducks, and were parameterized using midwinter inventories to index population size. Based on this assessment framework, historical harvest rates of black ducks generally have been consistent with the dual management objectives of maximizing sustainable harvest and attaining the North American Waterfowl Management Plan (NAWMP) population goal for black ducks. Since 1995, however, overall harvest rates of black ducks have been higher than what seems to be optimal for meeting these management objectives. Therefore, the USFWS believes that any proposed changes to black duck hunting regulations must consider the appropriateness of departing from these traditional management objectives. The findings were described in the USFWS 2004 AHM report, which is available at http://migratorybirds.fws.gov/reports/ahm04/ahm2004.pdf.

Informed black duck harvest management depends on methods for predicting changes in black duck harvest rates that are associated with proposed changes in hunting regulations in the Atlantic and Mississippi Flyways. Representatives of the Atlantic Flyway Technical Section, working in cooperation with the DMBM and the GA Coop. Unit, have made considerable progress in developing these methods. Unfortunately, however, progress was not sufficient to assist with the development of U.S. regulatory proposals during 2004. Cooperative efforts are continuing and we anticipate having the capability to evaluate U.S. regulatory changes in the near future.

Based on meetings of the BDAHMWG, and after review of the BDAHM Report, the DMBM has identified several issues concerning continued development and application of an international AHM strategy for black ducks:

1) *What are appropriate objectives and constraints of black duck harvest management?*

   The BDAHMWG supports a basic objective of maximizing long-term cumulative (i.e., sustainable) harvest, subject to appropriate constraints. First, a harvest strategy that helps maintain population size above some numeric goal has appeal, although there is not yet consensus on the magnitude of the goal, nor on the appropriate tradeoff between harvest and the goal as the population falls below goal. If a *continental* population goal is to be used, the original NAWMP goal of 385 thousand black ducks in the MWI (or its rough equivalent of 640 thousand in the CWS breeding-population surveys) seems an appropriate choice. If this goal were used as a constraint on harvest policy, then DMBM believes it should be implemented in the same fashion as that for midcontinent mallards, which provides approximately equal emphasis on population and harvest objectives (http://migratorybirds.fws.gov/reports/ahm04/ahm2004.pdf). It is worth noting, however, that the AHM Task Force recently has recommended that NAWMP population goals should not be used in AHM processes until those goals can be interpreted within the context of "average" environmental conditions and a specified harvest policy. The DMBM has not yet formulated a response to this recommendation from the AHM Task Force.

   A second issue involving population goals involves their spatial stratification associated with managing multiple breeding populations of black ducks. The BDAHM Report used a continental population goal of 496 thousand black ducks that was distributed among three breeding populations (Western – 175k; Central – 115k; Eastern – 206k). These population goals represent average black duck abundances derived from the CWS helicopter surveys during 1996-99. These population goals have not been vetted by the larger management community, and the DMBM is concerned that they could be interpreted as representing a retreat from efforts to rebuild black duck numbers. Additionally, the BDAHM Report suggests that application of spatially stratified population goals is only effective in the *absence* of other spatial constraints on harvests. Unfortunately, the absence of

spatial harvest constraints leads to non-unique optimal harvest policies (BDAHM Report, pages 87, 218, 222-223).

A final issue concerning harvest-management objectives involves the spatial distribution of the harvest. Fortunately, there appears to be broad agreement that any harvest strategy should not disrupt the tradition of approximate parity in harvests between the U.S. and Canada. The DMBM supports this position.

2) *Are extant monitoring, assessment, and optimization capabilities sufficient to support a high degree of spatial stratification in an AHM process for black ducks and, if so, does this approach convey significant advantages over an approach that relies on less spatial stratification?*

The BDAHM Report concludes (pages 222-223) that: "Spatial AHM is appealing as an approach for integrating biological knowledge about different stocks of black ducks into a model for setting regional harvest regulations for black ducks. The reality is that much of this touted ability is presently elusive, for at least 2 reasons. First, as elaborated above, our ability to build spatial AHM models for black ducks may have gotten ahead of our ability to parameterize them. Thus, one may very well be able to construct optimal harvest models with specified functional and parameter values, but currently some components of these models do not behave in a biologically reasonable manner. Unless critical parameters of these models can be updated as new information is available, it is a dubious proposition to base long-term harvest strategies on these models, unless it can be revealed that the strategies are insensitive to these parameter values or functional relationships. Second, even if computational challenges of these highly-dimensioned problems can be overcome, our analysis makes clear that some types of spatial harvest strategies, and some combination of constraints, are not helpful to resolving the question of "what is the optimal harvest strategy over space and through time?" While attractive, and apparently globally optimal, spatially unconstrained harvest strategies are non-unique. That is, there are many different strategies that achieve the same maximum objective value, including the one selected by ASDP."

The BDAHM Report further concludes (page 8): "Although an ultimate goal of this project is to develop and evaluate spatially-stratified models, most of the modeling to date has been for a single, continental population. This work, notably the models summarized in the monograph by Conroy et al. 2002, is thus a natural first step for further, possibly more complex models. In addition, a number of technical challenges exist to the parameterization and use of spatially-stratified AHM models. These include, at a minimum: (1) absence of data to suitably parameterize and update such models, (2) complexity and difficulty in deriving optimal harvest strategies, and (3) difficulties in displaying, explaining and interpreting highly-dimensioned model results. In addition, spatial stratification is but one relevant "layer" of complexity to be considered, in that issues of integration of AHM across species (particularly relevant for black ducks and mallards in the East), and connection of harvest and habitat management decisions and objectives, remain elusive. While not necessarily an endpoint in the development of an AHM process for black ducks, a single-population approach is a critically important and necessary foundation."

Finally, the BDAHM Report observes that (page 216): "Results from the single-population models (Chapter 2) have already begun to contribute to AHM for black ducks. First, an examination of historical harvest rates in relation to harvest rates that "would have been optimal" if AHM had been in place, has placed historical and recent harvest regulations in perspective. Generally speaking, these analyses have suggested that harvest of black ducks has not been overly exploitive, and has, on average, come close to what would have been recommended, had AHM been in place. Second, the existing AHM models provide guidance for interim harvest strategies that are based on adaptive

principles. Third, although AHM for black ducks probably will be based on surveys of breeding populations in the long term, the MWS [i.e., midwinter inventory] continues as an alternative means of monitoring overall population status. Therefore, continental AHM for black ducks could proceed based on these models, until such time as models based on breeding populations (including spatial stratification) are available and fully developed."

Based on these findings, the DMBM concludes that much more work is needed to understand and develop the capabilities to develop and implement a highly stratified AHM process for black ducks. The DMBM could at this time, however, support a single-population approach for black ducks, with the designation of Canada and U.S. as separate harvest areas for the purposes of coordinated management.

3) *Who will be responsible for the development of models that predict black duck harvest rates as a function of hunting regulations?*

The Atlantic Flyway Council Technical Section, in cooperation with the DMBM and the GA Coop. Unit, has been developing procedures to predict country-specific harvest rates as a function of regulations and hunter numbers in the Atlantic and Mississippi Flyways and eastern Provinces of Canada. These procedures rely on recent advances in Bayesian hierarchical modeling and application of Markov Chain Monte Carlo methods. To date, however, this effort has been only partially successful, and preliminary results suggest great uncertainty in predicting harvest rates realized under any particular regulatory scenario. DMBM does not currently have sufficient resources to dedicate to this effort, and will have to continue to rely on the Atlantic Flyway Council Technical Section or others to complete this work.

4) *How will black duck AHM be integrated with existing AHM for eastern mallards?*

Informed harvest management of black ducks requires an understanding of the dynamics of sympatric mallards, due to circumstantial evidence that black duck reproductive rates decrease with increasing numbers of mallards. In the work conducted by the GA Coop. Unit, the dynamics of sympatric mallards were modeled as a random walk, which was independent of harvest or environmental effects. Annual growth rates of mallards were predicted as random draws from the empirical distribution of mallard growth rates during 1971-94. This mallard model serves as a placeholder for more sophisticated mallard models, whose development was beyond the purview of the GA Coop. Unit contract.

More sophisticated models for eastern mallards exist as part of the current AHM protocol in the U.S (http://migratorybirds.fws.gov/reports/ahm02/emal-ahm-2002.pdf), but these models are parameterized using abundance surveys that do not correspond with any of the geographic bounds of the mallard models used by the GA Coop. Unit. Development of mallard models that are compatible with the developing black duck AHM framework would require a considerable investment to reconcile these differences in geographic bounds and to appropriately re-parameterize population models of both mallards and black ducks.

In addition, there has been no decision as to whether black duck and mallard harvests should be managed jointly, which would be optimal because of the evidence of competition between the species. This joint optimization would add considerably to the dimensionality of the decision problem, whose solution is already taxing available computational abilities. A more feasible alternative would be to develop an optimal harvest strategy for black ducks after conditioning on an optimal mallard strategy, or vice-versa. Until the implications of these approaches can be explored, it

will be difficult to make an informed policy decision about how black duck and mallard harvest management should interact.

5) *How will black duck AHM reduce uncertainty about population dynamics and lead to improved harvest management?*

The BDAHM Report did not address the issue of adaptive learning. We quote from page 217: "We believe that our single-population models and the empirical work to date have established a reasonable range of process uncertainty under which AHM can proceed. We have shown how AHM can occur, given established model weights; but we have not shown how these weights can be updated given new monitoring data, nor have we pursued an actively-adaptive approach to management."

The DMBM believes that in the short term the passively adaptive approach for updating model weights currently used for midcontinent and eastern mallards would be acceptable (i.e., based on a comparison of predicted and observed population sizes). However, we are interested in the more rigorous approach suggested in the BDAHM Report (page 224), in which multiple data sources could be integrated, and in which process error and observation error could be accounted for separately. This approach would allow simultaneous updating of model weights and revision of the sampling distributions of model parameters. This approach is still in the exploratory phase, but appears to hold great promise.

An actively adaptive approach, in which both learning and traditional management objectives are used to drive harvest policy and improve long-term management performance, is superior to a passive approach. In active adaptive management, the optimal policy prescribes management actions that are informative of population dynamics when uncertainty is high (so that future decisions can be improved). Conversely, when uncertainty is low, the optimal policy prescribes actions that produce the highest long-term management benefits. However, an optimal, actively adaptive approach to harvest management remains beyond our grasp for problems of even moderate dimensionality (i.e., those with many alternative models, random effects, alternative management actions, and spatial strata). An alternative, but sub-optimal, approach to active adaptive management is experimentation. An experimental approach was suggested by many notable scientists in the 1980s (e.g., Drs. D. Anderson, J. Nichols, M. Conroy). The recommendation has been ignored, however, not because the reduction of uncertainty is considered unimportant, but because of the short-term risks to harvest opportunity that experimentation might entail. In effect, implementation of a regulatory experiment means temporarily replacing traditional harvest objectives with an objective to learn (i.e., to discriminate among alternative hypotheses of system dynamics). As a consequence, there is a potential loss of harvest opportunity with experimentally based regulations.

6) *How will potential variability or changes in survey programs affect our ability to implement and maintain an international AHM approach?*

The GA Coop. Unit used various survey data to parameterize population models for black ducks. For the continental population, population abundance was derived from the MWI in the Atlantic and Mississippi Flyways (Conroy et al. 2002). However, there has been a long-standing desire to forgo reliance on the MWI for black duck management because the survey lacks any statistical sampling design. The BDAHM Report used CWS helicopter surveys to parameterize models of spatially stratified breeding populations.

Unfortunately, the CWS helicopter surveys used to parameterize spatially stratified models of black

ducks also have some shortcomings: (a) they only cover the portion of the black-duck breeding range contained within Canada; (b) they do not presently account for variation in visual detection of black ducks (although this is also a problem with the MWI); and (c) there are concerns that current-year data can be analyzed in time for the regulations-setting process in the U.S. Moreover, the relatively short-time series of these data, combined with the need to estimate a large number of spatially-explicit model parameters, resulted in imprecise parameter estimates and biologically unrealistic behaviour of some population models (BDAHM Report, page 217).

For several years there has been a vigorous debate about how to use CWS helicopter and USFWS fixed-wing aerial surveys to estimate range-wide abundance of breeding black ducks to help meet a variety of management needs (including AHM). The USFWS and CWS are working to identify ways to integrate the 2 surveys so as to provide reliable, cost-effective information on breeding duck abundance in eastern Canada and the northeast U.S. (see the later section entitled *Integrating Eastern Population Surveys*).

7) *What are the next steps in BDAHM and who is responsible for continued technical support?"*

The contract with the GA Coop. Unit has been concluded with production of the BDAHM Report. The effort has produced a wide array of useful tools for exploring the applicability of AHM to black ducks, and has articulated well both the technical and sociological challenges to the development of an international harvest strategy. Sustaining the development, and eventual implementation and maintenance, of the effort will require substantial institutional support from federal, state, and provincial partners. The DMBM believes that the AHM Working Group, which oversees technical development of regulations-setting processes for the USFWS, would be an appropriate venue for further technical development of an international AHM protocol for black ducks. Representatives of CWS participate in the AHM Working Group, and membership could be extended to Canadian provinces as well (provinces already participate in the BDAHM Working Group). Technical staff from the DMBM (assisted by USGS) has been responsible for most of the technical development and application of AHM concepts to date in the U.S. Unfortunately, the DMBM has been assigned many other AHM priorities beyond black ducks, and presently does not have sufficient resources to resolve many of the outstanding technical issues associated with black duck AHM. This is particularly so for those issues relating to spatial stratification of the breeding population.

Nonetheless, the DMBM believes that it may be feasible to devote sufficient staff resources to begin limited implementation of a single-population AHM protocol for black ducks as early as next year, provided that:

a) adequate models can be developed to predict black duck harvest rates resulting from a particular configuration of hunting regulations (as described under issue #3);
b) the U.S. and Canada can agree on harvest-management objectives, including the issues of population goals, harvest distribution, and synchronicity among harvest areas when annual changes in regulations are necessary; and
c) black duck AHM is operated (at least in the short term) independently of the AHM protocol for eastern mallards in the Atlantic Flyway; this means that appropriate adjustments to black duck regulations within the regulatory framework prescribed by mallards may be necessary to achieve the appropriate harvest rates for black ducks (e.g., a shorter season for black ducks than mallards).

Report from the Black Duck AHM Working Group

A meeting of the Black Duck Adaptive Harvest Management Working Group was held in conjunction with the Black Duck Joint Venture technical and board meetings in November 2004. The intent of this meeting was to summarize and discuss important findings and main conclusions of the final AHM report by Conroy et al. entitled: Development of an Integrated, Adaptive Management Protocol for American Black Ducks. Important topics covered in this meeting also included perspectives of the Federal agencies (USFWS and CWS) responsible for setting migratory game birds harvest regulations as well as from the two Flyways in which Black Ducks are harvested (AF and MF). Finally, there was an open discussion among the working group members as to how we could move ahead and start making use of some of the results from the Conroy et al. AHM report. Following is a very brief bullet-form summary of the perspectives from the USFWS, CWS, AF, and MF, as well as a summary of the discussion on what are the steps needed to move forward with Black Duck AHM.

Perspectives:

USFWS:

- Interest in having a new harvest strategy for Black Ducks
- Concerned with spatial stratification and associated technical difficulties with spatial models
- Supportive of a single population AHM based on MWI, in the short term if necessary to move more rapidly toward implementation

CWS:

- Spatial stratification a high priority
- Recognize technical difficulties with spatial models
- Would agree with single population approach in the short-term, as long as it is based on breeding ground surveys
- Allows sufficient flexibility for future implementation of a fully stratified approach.

Atlantic Flyway:

- Hunter dissatisfaction with current Black Duck hunting regulations
- Recognize regional differences in Black Duck demography and harvest potential
- Understand technical difficulties associated with spatial models
- Interested in moving ahead with what is ready (single population approach based on MWI) but aim for spatial stratification in long term.

Mississippi Flyway:

- Black Ducks are not a high priority in the Flyway, except for eastern States
- Spatial stratification is important

A road map to Black Duck AHM implementation:

The perspectives on BDAHM expressed by the main stakeholders provided a good basis for agreement on a path to move forward with BDAHM implementation. The working group members agreed to move ahead with a single continental population AHM approach that would be based on breeding grounds surveys. This single population approach would use a collapsed version of the spatially-stratified AHM models (as described in pp 80-88 of Conroy et al.'s final report), thus retaining the spatial structure needed for future implementation of a stratified AHM approach. Some work will be required to adjust and update these AHM models. Mike Conroy will provide an estimate of the amount of time and resources

necessary for completion of the work (Paul Castelli, NJ DFW, has committed Nathan Zimpfer's time to help Dr. Conroy with this work).

The input data for this model would be indicated pairs X 2 for both Black Ducks and Mallards, as measured from the helicopter plot segment of the current Eastern Waterfowl Survey. It will be critical for the success of AHM that survey data collected by CWS biologists be ready in time to accommodate both the U.S. and Canadian regulatory processes (see discussion about timing of regulatory decisions below). Initially, data from fixed-wing aircraft and ground plots will be ignored but the models should be able to accommodate results from an integrated Eastern Waterfowl Survey at some time in the future. Also, there will be no attempt to integrate Black Duck and Eastern Mallard approaches in the short-term.

The AHM models for Black Ducks would initially recognize 2 harvest areas (Canada and U.S.) and the output of these models would be expressed in terms of optimal harvest rates for each harvest area. Federal agencies (USFWS and CWS) would ultimately be responsible for allocating harvest within their respective countries in such a way as to achieve targeted country-specific harvest rates. It was recognized that approximate parity in the harvest between Canada and the U.S should govern allocation of the harvest at the continental scale. It has been agreed that allocation of the harvest should result in 40-60% of the harvest of black ducks occurring in either country.

An important aspect of this international AHM approach is that the timing of the regulatory decisions should be the same in both countries since decisions are linked. At present the regulatory process in Canada and the U.S differ in such a way that regulatory decisions are not based on the same year of survey data (U.S regulations are based on the current year's survey data whereas Canadian regulations are based on the previous year's data).

- In the short-term, it was the impression of USFWS representatives that U.S. regulatory packages for Black Ducks could be based on the previous year's survey results, with the option of changing regulations in the face of new information from the current year's survey.
- CWS could make last minute adjustments in regulations if major changes in population size are observed. Legislation exists in Canada that allows emergency orders to be applied in exceptional cases.
- CWS will also look at ways of overcoming technical problems related to using the most up to date survey information for setting Canadian regulations.

The working group members recognized that reliance on an AHM approach for setting harvest regulations underscores the need for appropriate banding data that will allow a robust estimation of Black Duck and Mallard harvest rates in Canada and the U.S.

Finally, the desirability and nature of population objectives will need to be discussed among the larger management community. The working group members had agreed on a constraint to harvest that helps prevent the population from going below a minimum level. Federal agencies will need to determine whether this constraint is consistent with other harvest and habitat management objectives, including the NAWMP population goal for black ducks.

Representatives from the USFWS expressed the desire to be able to implement BDAHM as soon as possible. If the technical work is completed in a timely manner, they were suggesting that BDAHM could be implemented in the U.S. in time for the 2005 regulatory cycle. The fall-back position for the USFWS, in case AHM could not be used in the 2005 regulatory cycle, was to use information from the single population models based on MWI and additional work from Nathan Zimpfer and Fred Johnson, to inform

Black Duck regulatory decisions. It would not be possible to implement BDAHM in Canada prior to the 2006 regulatory cycle, as regulations for 2005 need to be proposed no later than December 2004.

Integrating Eastern Population Surveys

As a result of differing agency goals and management needs, large-scale waterfowl abundance surveys in eastern North America were developed independently by the U. S. Fish and Wildlife Service and the Canadian Wildlife Service in the late 1980s and early 1990s. The 2 independent surveys have been conducted in portions of eastern North America since 1990. The presence of 2 independent surveys has lead to increasing concerns about redundancy and inefficient use of resources, lack of a consistent estimation framework, and poorly tracking time series. In October 2004 representatives of the FWS Division of Migratory Bird Management met with CWS administrators in Ottawa, Ontario to discuss options to incorporate the efforts of the FWS and CWS into a single, integrated survey. While much technical work and logistical planning remains, this meeting resulted in several key agreements among the FWS and CWS:

- Combine efforts to develop comprehensively survey all waterfowl breeding range in eastern Canada (south of the Canadian archipelago) and the northeast U.S. within practical and fiscal limits.
- Survey timing would be optimized for black ducks, mallards, or Canada geese depending on relative breeding densities of each species.
- Geographic overlap in FWS and CWS survey effort will be reduced over time. Helicopter counts will be conducted where logistically feasible in boreal regions and will be supplemented by counts conducted by fixed-wing aircraft and ground crews in other regions. In the short-term, significant geographic overlap will continue until models currently used in decision-making can be re-parameterized (e.g., eastern mallards).
- CWS and FWS will investigate and incorporate methods for estimation of detection rate from all survey platforms so that corrected counts from different platforms can be combined.
- The timing of data availability must be sufficient to meet the regulatory needs of both nations.
- An estimation framework will be developed jointly for the integrated survey and only one agreed upon set of estimates will be developed and presented from the annually (i.e., the FWS and CWS will no longer present independent estimates).
- Target implementation date for an integrated survey is 2007.

In order to facilitate progress, 2 technical working groups were formed consisting of FWS, CWS, and USGS scientists. An Integration Working Group is investigating methods to combine survey data in a common estimation framework, and a Detection Probability Working Group is investigating methods for estimation of detection probability in aerial surveys. It is anticipated that joint analysis and reporting of survey data will begin in 2005 and that experimental methods to estimation detection will continue during the 2005 surveys.

Predicting Harvest Rates of Black Ducks

The purpose of this modeling effort was to determine the expected change in continental harvest rates of black ducks, given a change in the bag limit, season length, or combination thereof, within the Atlantic Flyway for American black ducks. The models were derived from the larger work of Conroy et al. (Jan 2005, JWM), modeling regional waterfowl harvest rates using Markov Chain Monte Carlo.

The models using banding and recovery data of juvenile males from 1971-1994 to fit linear logistic models using a Bayesian framework in the program WinBugs. Once models were fit, population data and regulations from 1990-2001 were used to generate posterior predictive distributions of harvest rates under a variety of scenarios of where regulations changes might occur. I examined a model that included effects for season length and bag limit, and a second model, which included an additional covariate for changes in hunter numbers over time. For each model, I allowed regulations to change within the entire Atlantic Flyway or only in the northern portion of the flyway, based on multiple population AHM harvest area definitions. I examined regulations packages (Season Length/ Bag limit) of 30/2, 42/2, 60/2, and the current regulations package of 60/1 for comparison to reward banding results, and empirically derived harvest rates estimates from F. Johnson.

Currently the two models currently under investigation imply that harvest rates are relatively insensitive to changes in regulations. Under current regulations, the models predict continental harvest rates to be around 0.17. Even given a doubling of the bag limit to 2 birds in the Atlantic Flyway there is little change to the overall harvest rate. However, after further discussion there is some question of whether this represents actuality, or whether this insensitivity represents the poor of regulations to influence harvest rates unless changes to regulations are great. In addition the group would like to see a model with only a covariate for hunter numbers, to see if the results are similar to other models. A final report should be distributed to the Atlantic and Mississippi Flyway Councils sometime in January.

Evaluating Regulatory Strategies For Pintails

Pursuant to a request from the Pacific Flyway Council, a small group of people was convened to assess the 2004 pintail harvest strategy and consider several technical modifications to the modeling framework currently in use to manage pintails. That group consists of: Michael Runge (USGS Patuxent), Scott Boomer (USFWS/DMB/PHAS), Bob Trost (USFWS/DMB), Fred Johnson (USFWS/DMB/PHAS), Diane Eggeman (Florida FWCC, representing the Atlantic Flyway), Kevin Kraai (Texas PWD, representing the Central Flyway), Dan Yparraguirre (California DFG, representing the Pacific Flyway), Robert Helm (Louisiana DWF, representing the Mississippi Flyway), and Greg Balkcom (Georgia DNR). This report provides some brief results describing the progress of this group that we believe may be important to consider when developing pintail harvest regulations. In addition, this memo serves to notify you of the intended direction of this work as we move forward with our evaluation. A more detailed report will be provided to each Flyway's technical working group in February.*Breeding Population Survey Corrections.* One of the major concerns with the current pintail harvest policy is that it relies on population size estimates from the May aerial survey that are biased. In dry years on the prairie when pintails settle farther north, the BPOP tends to drop at a rate that cannot be explained by population dynamics alone. We developed a way to apply an empirical correction to the BPOP estimates, by making use of the average latitude of the breeding population. These corrected BPOP estimates (Fig. 1) smooth out the temporary sharp drops caused by "overflights," and in recent years, suggest there are 30-60% more pintails in the breeding population than the May surveys indicate. Use of these corrected BPOPs in a pintail population model significantly improves our ability to predict changes in the population size.

Recruitment model. The recruitment model currently used in the pintail harvest strategy is not explicitly density-dependent, but is implicitly so because one of the predictors in the model is strongly correlated with pintail BPOP. We developed a revised recruitment model that includes the BPOP (corrected as above) as a direct predictor. In any given year, the predictions from these two models are very similar, but the new model has a clear mechanistic explanation and is more amenable to the types of analyses we commonly employ with duck population models.

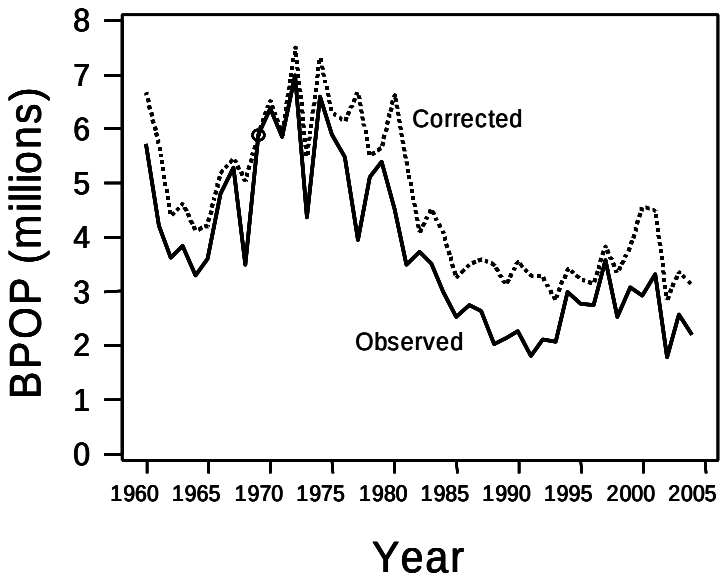

Fig. 1. Observed and corrected pintail breeding population sizes, 1960-2004. The correction is based on the average latitude of the breeding population, and is calibrated so the two curves coincide in 1969 (the year with the most southern observed latitude).

Harvest models. We have developed updated models to predict total harvest of pintails in each Flyway. These models are all quite similar to the ones currently used in the pintail harvest strategy, but include a term for a "season-within-a-season." For the Central and Mississippi Flyways, we found that the expected harvest of pintails is higher for a restrictive pintail season within an otherwise liberal duck season than it is for a season that is restrictive for all ducks.

Long-term changes in habitat and the effect on sustainable harvest. Using the new recruitment model and the BPOP correction, but otherwise keeping the population model from the current pintail harvest strategy unchanged, we can analyze the equilibrium harvest dynamics (Fig. 2). The top curve in Fig. 2 shows the sustainable annual harvest as a function of the corresponding equilibrium population size, when the average latitude of the BPOP is 53.6°N (the average prior to 1975): the carrying capacity (equilibrium population size in the absence of harvest) was about 9 million (on the corrected scale), the maximum yield occurred when the population was held around 4 million, and the maximum sustainable annual harvest was more than what we would expect to achieve with a liberal season and three-bird bag in all Flyways. There is evidence, however, that the average latitude of the BPOP shifted significantly north between 1975 and 1985 to 56.0°N, where it has remained since. This shift may perhaps be due to changes in habitat and agricultural practices in the prairies. Whatever the reason, the recruitment model predicts greatly reduced production with this higher latitude, and hence a much lower harvestable surplus (lower curve in Fig. 2). The carrying capacity has been reduced to about 5 million (on the corrected scale), the maximum yield occurs when the population is held a bit over 2 million, and the maximum sustainable harvest is approximately what we expect under a restrictive pintail season within a liberal duck season. This graph shows the central tendencies under average environmental conditions; in wet years, of course, the harvest potential could allow for a liberal season. We think this graphical depiction of the change in harvest potential as a result of a long-term change in pintail dynamics has immediate harvest management implications and is important to keep in mind as we continue to evaluate pintail harvest policies.

Modified harvest policy. The pintail harvest strategy was modified in July 2004 as follows: "Season closed when the breeding population estimate (BPOP) is less than 1.5 million and the projected Fall Flight is less than 2.0 million. Partial season (restrictive alternative) when the BPOP or Fall Flight exceeds the closure level but the BPOP is less than 2.5 million and projections in the strategy predict a decline in the following year's BPOP (not including a 6% growth factor). Full season, minimum 1-bird daily bag limit when the BPOP exceeds 2.5 million, regardless of the following year's BPOP projection. All other existing provisions of the strategy continue to apply" (69 FR 52131). Incorporating the three technical improvements described above into the population model, we can calculate and depict this harvest strategy as in Fig. 3. The season would be closed when the *observed* BPOP is less than ~1 million (which is roughly equivalent to a corrected fall flight of 2 million), restrictive when the observed BPOP is less than 2.5 million with a high latitude of the BPOP, and liberal otherwise (this graph assumes the AHM package is liberal). More than one bird in the bag is allowed when the population growth is expected to be greater than 6%.

Next steps. We have not yet explored the implications of the strategy shown in Fig. 3, but intend to do so very soon. Specifically, we intend to (1) look at the average population size and harvest expected under this strategy, for several levels of long-term average latitude; (2) develop figures similar to Fig. 3 for the cases where the AHM strategy is Moderate or Restrictive; and (3) look at the frequency of various regulations under this strategy. Our intent is to prepare a detailed report by mid-February, for review by the Flyway technical committees. We hope that this report provides enough information to engender useful discussion over the next several months, so that the SRC can receive valuable feedback from the Flyways prior to its June and July meetings.

The working group identified several additional harvest management issues that could potentially be addressed in the pintail harvest strategy. These issues include sex-specific harvest regulations, stock-specific harvest regulations, state-specific season length options (e.g., reduced overall opportunity to avoid closed or partially-closed seasons), and harvest strategies based on winter distribution and abundance. We would welcome guidance from the Service Regulations Committee and the Flyways regarding the priority and timing for work to address these topics.

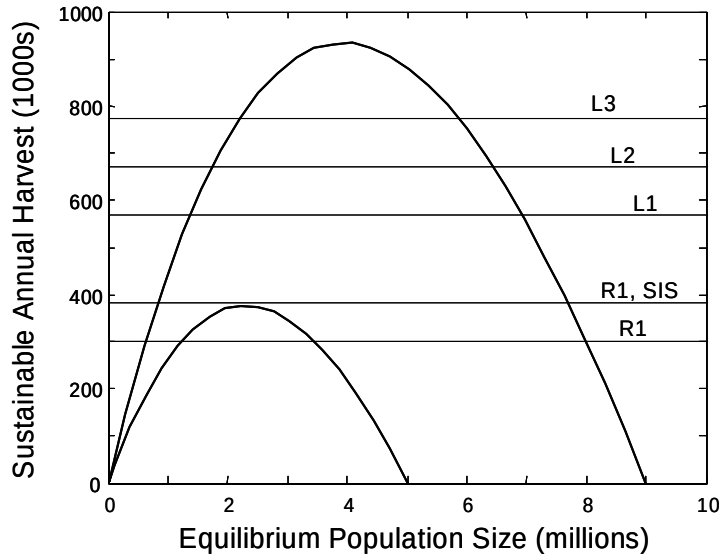

Fig. 2. Sustainable annual harvest of pintails as a function of equilibrium population size (on the corrected scale). The top curve is under environmental conditions that produce an average latitude of 53.6; the bottom curve assumes an average latitude of 56.0. The five horizontal lines show the expected continental harvest under a series of harvest packages, including a restrictive pintail season within a liberal duck season ("R1, SIS").

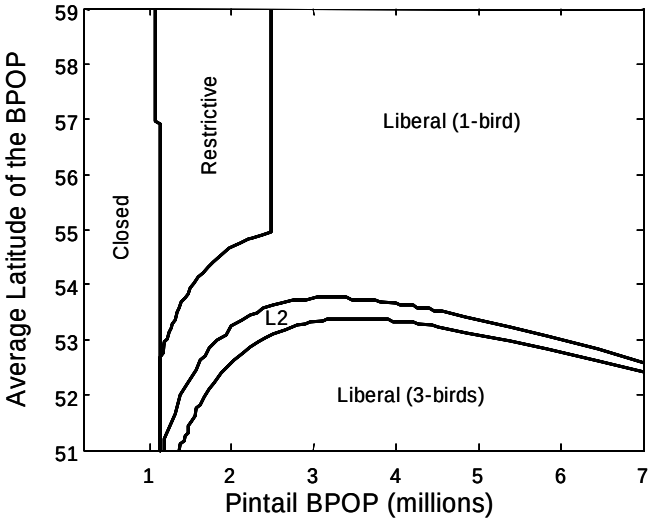

Fig. 3. Pintail harvest strategy, based on the July 2004 modifications and three technical improvements (overflight bias correction, new recruitment model, updated harvest models). For a given value of the *observed* (not corrected) pintail BPOP and average latitude of the BPOP, the resulting regulatory decision is shown. Note that this graph assumes the AHM package is "liberal", thus the "restrictive" regulation implies a season-within-a-season.

Communications Team Report

The Communication Team met during the week and discussed the importance and role of communications to AHM. The Communications Team includes:

Diane Eggeman, Atlantic Flyway
Guy Zenner, Mississippi Flyway
Mike Johnson, Central Flyway
Dan Yparraguirre, Pacific Flyway
Dave Sharp, U.S. Fish and Wildlife Service
Fred Johnson, U.S. Fish and Wildlife Service
Dave Case, D.J. Case & Associates

Dave Case made a presentation to the AHM Working Group on behalf of the Communications Team. Dave first reviewed the goal, target audiences, and objectives that have been used to guide AHM communications efforts over the last few years. Those included:

Goal

- All interests involved in the waterfowl regulations-setting process support AHM as an integral part of the process by which duck hunting regulations are set

Objectives

Know

- What AHM is, why it was needed, and how it improves on the regulations-setting process used prior to the 1995-96 seasons.

Feel

- Comfortable that the regulations setting process uses the best science available and carefully balances hunting opportunity with long-term waterfowl conservation; and
- Excited about the positive results for waterfowl conservation from AHM.

Do

- Participate constructively in the regulations setting process; and
- Support AHM as an integral part of that process, even when the regulatory choice may seem inappropriate.

He then reviewed the communications strategy that was developed at the April 2003 AHM Working Group meeting:

"High-Tech, High Touch"

- High Tech
    - Web-based products
    - Proactive (and reactive) web updating and monitoring
    - Train the trainer video/cd/dvd
        - popular options
        - Version 1.0 in 2003, Version 2.0 in 2004

- High Touch
    - Identify Top 10 stakeholders in each flyway—develop "face-to-face" strategy for each (2-Way!)
        - Phone calls
        - Meetings
        - Small group sessions—Fred and Mike available to help

The Communication Team felt that communication efforts over the past few years, particularly in 2003 and 2004, had been far short of what is needed to maintain support for AHM. In fact, it is clear that support for AHM may erode considerably without a more effective, comprehensive outreach effort.

The Communications Team discussed and recommended consideration of a comprehensive, adaptive outreach effort to:

- Understand waterfowl hunters/constituents;
- Build credibility and support for waterfowl management processes;
- Retain and recruit waterfowl hunters;
- As a continued force for conservation.

The Communications Team suggested the effort be:

- Adaptive—designed to manage, communicate and learn
- Contextual/Strategic—solve management problems
- Data-mining heavy—uses existing literature, point-of-sale data, etc.
- Multi-scale—national, flyway, state, local
- Multi-disciplinary—waterfowl, human dimensions, communications etc.
- AHM Task Force to play initial leadership role
- Synergistic with other efforts such as:
    - Hunter's Choice/Central Flyway
    - Future of Hunting—WMI
    - Waterfowl Hunter Satisfaction Think Tank
    - USFWS Migratory Bird SEIS
    - USFWS Migratory Bird Outreach effort

This comprehensive approach obviously goes well beyond the purview of the AHM Working Group. The complexity and funding of such an effort are additional obstacles. In spite of these challenges, the Communications Team felt it was important that this approach be considered.

The AHM Working Group agreed with the Communication Teams concerns and indorsed the idea of presenting this approach to the AHM Task Force at their meeting in January 2005 and encouraging the Task Force to take a leadership role.

Development of an Integrated, Adaptive Management Protocol for American Black Ducks

La version française

This web page describes progress and ongoing work on a study to evaluate possible use of Adaptive Harvest Management in the development of an international harvest strategy for American black ducks (*Anas rubripes*). This work is proceeding under the auspices of the Black Duck Adaptive Harvest Management Working Group (BDAHM), which is providing technical support to the Black Duck International Harvest Strategy Committee, a collection of managers in the Canadian Wildlife Service (CWS) and U.S. Fish and Wildlife (USFWS) charged with the development of an international harvest strategy. This work is supported on contract to the University of Georgia, Cooperative Fish and Wildlife Research Unit from the Black Duck Joint Venture, with funding from the Biological Resources Division, USGS, FWS and CWS. Periodic reports, updates, and modeling tools will be provided on this website and may be freely used, so long as the BDAHM is acknowledged.

Project overview...

Principal Investigator

Dr. Michael J. Conroy, Georgia Cooperative Fish & Wildlife Research Unit, D. B. Warnell School of Forest Resources, University of Georgia

Graduate Students

Christopher Fonnesbeck, Ph.D. Candidate, University of Georgia

Nathan Zimpfer, M.S. Candidate, University of Georgia

Site Map

Last updated 11 August 2004