ADAPTIVE HARVEST MANAGEMENT WORKING GROUP

Annual Meeting
Jackson, Mississippi
April 8-11, 2003

This report provides a summary of presentations and discussions that occurred at the 15th meeting of the Adaptive Harvest Management (AHM) Working Group. The primary purposes of this meeting were to consider further modifications to the AHM protocol for midcontinent mallards, to discuss possible multiple-stock strategies, and to consider communication needs.

Reports From Partners

Atlantic Flyway.--The primary AHM focus of the Atlantic Flyway in 2003 is maintaining the reliance on eastern mallard AHM and working toward its evolution to incorporate other species. To that end, the Atlantic Flyway has worked in partnership with the U.S. Fish and Wildlife Service, Canadian Wildlife Service, and the Mississippi Flyway to develop AHM for black ducks, and we are anxious to participate in its implementation, including possible integration with eastern mallard AHM. Black duck AHM requires buy-in and partnership of Canadian waterfowl managers. The Atlantic Flyway strongly supports an AHM approach to black duck harvest management; however, managers agree that technical limitations of AHM should not preclude the development of the most appropriate black duck harvest management regulations. The technical section believes it is critical that the door be left open for spatial stratification below the flyway level for sound, biologically justified black duck harvest regulations. We view the U.S. Fish and Wildlife Service's wood duck population modeling work as a good starting point for describing this species' population dynamics in response to harvest. Wood ducks are extremely important in the Atlantic Flyway, and we see them as a major component of multi-stock AHM for this flyway. Also, we would like for black ducks and wood ducks to be incorporated at the outset into an Atlantic Flyway multi-stock AHM, rather than after a long process of developing multi-stock AHM based on the nine mid-continent species identified in the multi-stock conceptual document.

Some southern states in the Atlantic Flyway have been concerned about the potential effects of liberal harvest regulations on stocks of mallards that winter in the southern portion of the flyway. There are also concerns about early season extensions that are a possibility for states in the Great Lakes Region and the effects of such extensions on birds produced in that area. The mallard committee has reviewed some of the past work on these stocks of birds by Dr. Dave Otis of the Iowa Coop Research Unit. Efforts thus far have not been able to identify any major concerns. The Atlantic Flyway Technical Section intends to continue coordinating with the Mississippi Flyway and the AHM Working Group to address any concerns over impacts of Atlantic Flyway regulations on Great Lakes mallard populations.

The Atlantic Flyway, by way of the Council-approved recommendation, supports regulatory constraints similar to those proposed by the Mississippi Flyway (i.e., eliminate the very restrictive package, and limit changes in regulations to one step each year) being applied to the Atlantic Flyway.

The technical section agreed that we were not opposed to these constraints being applied to the other flyways but chose not to make any recommendation to that effect. The technical section considered, but did not endorse, a recommendation to reduce the total duck bag limit in the Moderate and Liberal packages from six to four if most Prairie duck populations were below NAWMP goals.

We are pleased to see progress on incorporating other species into AHM, and we support this effort. According to the recent issue paper on multi-stock AHM, within-flyway spatial stratification would not be considered at this point. The Atlantic Flyway Technical Section took issue with this premise. Our highest priority message on this topic is that we need to be working toward spatial stratification below the flyway level sooner, rather than later. Precedents already exist in the form of management units for the Columbia Basin in the Pacific Flyway and for the High Plains in the Central Flyway. Recent analysis of population and harvest data for Atlantic Flyway mallards, black ducks, wood ducks, and various mid-continent duck stocks (e.g., pintail) have all revealed important differences between northern and southern areas of the flyway. Trends in hunter numbers and managers' perceptions of hunter preferences also differ on a north-south gradient within the flyway. We believe that the possibility of establishing a distinct management unit in the Atlantic Flyway should not be ruled out as we explore ways to develop a sound, biologically based approach to management of multiple stocks. The technical section generally agreed that seasons-within-a-season and complete species closures were acceptable when necessary, but definitely not a preferred approach. However, it would be difficult to identify the species for which seasons-within-a-season would be acceptable, since there is a trade-off between complexity and opportunity. Seasons-within-a-season are most acceptable for species that are easily distinguished and/or spatially segregated from other stocks, but the total number of such seasons occurring at one time would have to be considered. Alternative A appears to be the closest to a viable option, but needs further development or modification to understand the implications. There was not general support for Alternative B, or any other approach that would simply aggregate and optimize harvest of multiple stocks. Similarly, Alternative C was rejected because it would unnecessarily forego recreational opportunity for the sake of simplicity.

Mississippi Flyway.--The use of framework date extensions in 2002 and 2003 was discussed at the Mississippi Flyway Council's Technical Section (MFCTS) meeting in February, 2003. In regards to using framework extensions for the 2003-04 season if the liberal regulatory alternative was implemented, most states indicated that they would likely use framework extensions in the same manner as they did last fall. MN and WI, however, are unsure at this time if they would use the opening framework extension in 2003, although WI indicated they might use it in their north zone. OH is contemplating using the closing framework date extension in future years. The responses were the same if the moderate regulatory alternative were offered. No states conducted any formal or informal evaluations of the framework date extensions this past season and no evaluations are planned for this year.

The MFCTS continues to support integrating the 3 constraints or modifications that they have recommended in the past to the AHM regulations packages and process. The majority of Tech Section reps in the Flyway would rank these constraints in the following order of importance:

1) No closed seasons at population and pond numbers where we have had seasons in the past.
2) No very restrictive regulations package.
3) Restricting regulatory changes to 1 step each year when either liberalizing or restricting.

It is worth noting that there is not an overwhelming consensus on the ranking of these constraints among the Tech Section reps. It should also be noted that both the Mississippi Flyway Council Regulations Committees recommended that the AHM packages for the 2002-03 be used in 2003-04 with the following modifications, that regulation package changes be limited to one step, that any closed cells falling within the range of mallard population and pond levels where previous hunting seasons have been conducted, should not be designated as closed, that the very restrictive package should be removed from the regulatory alternatives. The Council purposely avoided numbering the constraints in priority order in their recommendation, but they listed them in a different order than the Tech Section.

Most states do not believe that it is necessary to assess the impacts of applying the 1-step constraint only when restricting harvests (as opposed to both restricting and liberalizing regulations), although this opinion was certainly not unanimous either. Some states don't want to see the 1-step constraint introduced to the process while others think that if it is introduced into the process, it should be applied when either restricting or liberalizing regulations as they see this as a more responsible way to handle this issue.

The vast majority of the Tech Section reps do not believe that the NAWMP objective for mallards should an integral part of the objective function and those few that think the goal should be retained in the objective function believe that it should be allowed to vary depending upon habitat conditions in the prairies. Most state reps were curious as to how the models would perform without the NAWMP in the objective function. Some state reps would even like to see how the original packages would perform with all 3 of the above constraints implemented and the NAWMP removed from the objective function.

With regards to Fred Johnson's draft paper on "Population Dynamics of Ducks Other Than Mallards in Midcontinent North America," the consensus was that this appeared to be a good start for dealing with other stocks of ducks, although the paper was challenging. The conclusions of the report, (i.e., that the models examined suggested that the current AHM protocol, with its explicit recognition of the NAWMP goal for midcontinent mallards, should not prevent several other sympatric duck species from maintaining average population sizes above their respective NAWMP goals, the exceptions being scaup, wigeon, and pintails, which rarely exceed their respective NAWMP goals under the AHM protocol for mallards), seemed to suggest Tech Section reps that we could continue to duck harvests using AHM for mallards and still maintain reasonable populations of other species. Perhaps we should consider accepting slightly lower equilibrium populations of some other species to optimize mallard harvest. There were several concerns expressed about how we should deal with species like pintails, wigeon and scaup given that this analysis suggested that their populations would not reach their respective NAWMP goals. Generally speaking, most Tech Section reps felt that we need to continue to closely monitor harvests rates and population growth of some of these "other"

species as we implement more restrictive harvest regulations. Theoretically, if the 60-day seasons had helped to suppress these populations, we may see some positive population growth with moderate or restrictive seasons.

In regards to the report titled "The Problem of Scale in Adaptive Harvest Management: Alternatives for Recognizing Stock-Specific Variation in Harvest Potential," the questions posed ultimately elicited many comments from Tech Section reps, most of which were all over the board.

Regarding which species (or group of species), if any, would independent season lengths (and possibly bag limits and framework dates) be acceptable, the responses ranged from no seasons within in seasons, to possibly 1 or 2 but as few as possible, to the idea that we are too concerned about seasons within seasons and complex regulations and we should use seasons within seasons for any species that need protection beyond that provided by daily bag limits. There seems to be no general consensus except that we don't really know what hunters will find acceptable. There was some consensus that we should not add more species to the list for which there are bag limit restrictions. If we thought we needed to add more species to the list, then we should lower total daily bag limits to reduce the number of species-specific limits.

Regarding species (or group of species) for which independent bag limits (fixed or varying annually) would be acceptable, the overwhelming consensus was that we should stick with the species that we currently have independent bag limits for.

Regarding the species (or group of species), for which periodic closed seasons be acceptable, the general consensus was that we did not want to stray too far from where we have been in the past, for example, canvasbacks and maybe redheads. Pintails were discussed regarding closed seasons, but the consensus was that we would not want to close this season if at all possible (compliance problems, identification problems).

There was general agreement with the basic premises used to develop the alternatives (e.g., limiting spatial stratification to a Flyway level) in the report, but most reps felt that we should not try to manage at too fine a spatial scale.

With regards to which conceptual approach the AHM Working group should explore first, the vast majority of the Tech Section reps felt we should work on Alternative A first; Alternative C was the lowest priority. It was noted by several Tech Section reps that alternative population goals, something other than the NAWMP goals, should be considered for some species, particularly pintails and scaup.

One of the themes that was noted in almost all responses to the question about what the communications challenges would be for this coming year was that we need to convey our commitment to the AHM process, that the process is working, that it is a good decision-making tool, and that the decline in duck numbers was inevitable and a factor of cyclic habitat changes on the prairies, not over-harvest due to the AHM process. We need to illustrate that the resource is being

protected. If the AHM process indicates the optimum choice is a restrictive regulatory package, then we will need to show how and why such a substantial change in regulations could come about, that toggling between liberal and restrictive may be fairly common and that this strategy is not detrimental to duck populations. We need to convey a positive message about the benefits of dry cycles to maintaining high productivity of prairie wetlands.

Most Tech Section reps felt the key audience for the above messages would be the hunters themselves. Hunters in the Mississippi Flyway have become particularly skeptical of state and federal agencies in recent years due to perception of poor duck seasons. Nearly equally important, however, were wildlife administrators, politicians, outdoor writers, enforcement staff and, of course, our own Federal and state wildlife personnel.

In addition to the usual tools, more effort may be needed to get accurate information in popular hunting magazines, as well as on the Internet. Video's may not be all that useful for the general public because it is hard to get enough of them to view them, but they are good for delivering a clear, consistent and concise message to agency staff and administrators. It should probably be a separate video from the status report. The Service should designate someone to monitor some of the major discussion forums on the Internet and respond to some of the questions and misinformation that is being circulated through these channels.

Central Flyway.--The Central Flyway continues to support the AHM approach used for midcontinent mallards. We support current efforts to improve the technical aspects of the midcontinent mallard AHM protocol. We also support current efforts to evaluate and improve AHM objectives and regulatory alternatives/constraints. Most of the focus during the past year has been on how other duck species are faring under a mallard-based AHM approach, and how other species can be explicitly incorporated in current AHM approaches. We commend the Service, USGS, and others who have worked on these issues. To help provide useful input, our report is structured as responses to a set of questions related to these and other issues, as recently posed by the Service:

Would your state likely use extensions the way you did this past hunting season if a liberal season were offered again in the 2003-04 season? What if the 2003-04 season were moderate?

State	Liberal	Moderate
Montana	Would use extensions	Would use extensions
Wyoming	Would use extensions	Would use extensions
Colorado	Would likely not use extensions	Won't use extensions
New Mexico	Would use early & late extensions	Would use early & late extensions
North Dakota	Yes	Yes
South Dakota	Yes	No
Nebraska	Won't use extensions	Won't use extensions
Kansas	Yes	No
Oklahoma	Yes	Might use extensions
Texas	No information	

Did your state conduct any formal or informal evaluation of the extensions this past season? North Dakota sampled hunters to look at participation: ~ 10,000 participants during first week (extension) of the season. This week was only open to resident hunters.

Do you favor any of the 3 constraints recommended by the Mississippi Flyway? Which ones? Why? The Central Flyway is in favor of eliminating the Very Restrictive package, because as structured this package does little to achieve its intended purpose – spending less time in "closed-season" prescriptions.

We are also in favor of providing a prohibition on "closed-season" prescriptions for mallard populations for which seasons were open historically (approximately 5.5 million in the traditional survey area, Michigan, Minnesota, and Wisconsin). We further emphasize that, even if mallard populations decline below this level, we would want to provide some level of duck hunting opportunity (particularly for mallards). The Service and Flyways should begin to develop guidelines for what sort of "sub-optimal" regulations might be developed in these circumstances.
Finally, the Central Flyway is opposed to a limitation on changes in regulations to one regulatory step each year. In our view, this constraint attempts to address what is primarily a communications issue – explaining why there would sometimes be (about 20-30% of the time) relatively large changes in regulations from one year to the next. While this is certainly an important and challenging issue, the proposed constraint results in a dramatic reduction in the expected time spent in the Liberal package, with a corresponding increase in time spent in the Restrictive package. This would present a new communications challenge, because we would be voluntarily sacrificing long-term hunting opportunity with little or no biological justification. We believe a more valid alternative would be to increase and improve efforts to communicate how optimal regulatory decisions are made in AHM, and how some substantial variation in regulations should be expected, given the environmental variation that occurs on the prairie breeding grounds (something about

which many duck hunters are already aware). We also believe that a more appropriate way to address the "knife-edge" nature of the annual regulations matrix might be to reconfigure the regulatory alternatives so that there are greater differences in expected harvest rates among the Liberal, Moderate, and Restrictive packages.

For the 1-step constraint, should the limitation on regulatory change occur both during times of restriction and liberalization, or just during restrictions? We are opposed to this limitation in either case.

Are there additional analyses you would like to see to help you form an opinion about these 3 constraints? We appreciate the extensive analyses that have been conducted, including the most recent report (F. A. Johnson, 28 February 2003) which attempts to examine the potential effects on population status of duck species other than mallards in relation to some of these proposed constraints. We are interested in some analyses to examine how changing the expected harvest rates under different packages (and in particular, expanding the differences among packages in expected harvest rates) might affect the resulting regulatory strategy, and the expected time spent in each package. Possible approaches include: (1) eliminating the Very Restrictive package and developing a new Restrictive package with a slightly lower expected harvest rate, and a Moderate package with an expected harvest rate at approximately the mid-point between the Liberal and revised Restrictive package; (2) eliminating the Very Restrictive package and changing the Liberal package to have a higher expected harvest rate; or (3) eliminating both the Very Restrictive and Moderate packages (i.e., use only 2 packages. Ideally, changes in packages should be also informed by additional information on the season lengths and bag limits desired by duck hunters.

Are there any comments / suggestions for the technical report? We appreciate the work that went into the original technical report by Johnson, Runge, and Serie ("The problem of scale in adaptive harvest management: alternatives for recognizing stock-specific variation in harvest potential," 16 December 2002), as well as the additional reports prepared by F. A. Johnson ("Population dynamics of ducks other than mallards in midcontinent North America," 4 February 2003; and "Adaptive harvest management (AHM) of midcontinent mallards: an assessment of certain regulatory constraints & modified management objectives," 28 February 2003). These reports have done a good job of defining many of the issues surrounding adaptive management of duck species beyond mallards.

What do you see as the management implications of the results? An obvious implication of the results is that whatever approach is followed will be technically challenging. Moreover, any effort to incorporate other duck species into AHM will involve many subjective decisions. We believe that harvest management objectives for other species should receive careful consideration, and more information should be collected on hunter attitudes toward regulations for other species. More recent analyses indicate that the population status of many duck species likely is adequately addressed using the current mallard-based AHM protocol. Collectively, these results suggest that developing more sophisticated approaches to harvest management of other duck species will take considerable time and effort, but in the interim the current *ad hoc* approaches may be sufficient to protect the resource.

For which species (or group of species), if any, would independent season lengths (and possibly bag limits and framework dates) be acceptable? There is some limited support in the Central Flyway for a "mallard season" and a separate "duck season," which may often be of different length (i.e., shorter) and impose bag limits restrictions for some species. This is similar to "Alternative B" in the 16 December 2002 technical report. However, any approach involving independent seasons imposes closed seasons for some species at some times, and closed seasons are a major cause for concern (primarily in terms of hunter satisfaction) in the Central Flyway.

For which species (or group of species), if any, would only independent bag limits (fixed or varying annually) be acceptable (assuming that season length for these species were specified based on some unrelated group of birds)? There is considerable support in the Central Flyway for using bag limit restrictions as the primary tool for managing harvest of duck species, within a common season length and framework dates.

For which species (or group of species), if any, would periodic closed seasons be acceptable (assuming that season length and bag limits for these species were specified based on some unrelated group of birds)? The Central Flyway does not support closed seasons under most conditions for any duck species. From a biological perspective, the minimum justification for a closed season would be evidence of a dramatic decline in population size, with substantial evidence that over-harvest (even with restrictions imposed) was an important cause of the decline, and the population was unlikely to recover to desired levels without a hunting closure. Closed seasons would also be justified if a species was federally listed as threatened or endangered. Closed seasons are easier to implement when managers and hunters have had previous experience with closures. The canvasback is the only species which meets this criterion in recent years, and we believe that some limited harvest opportunity could still be provided for canvasbacks without long-term detrimental impacts on population status, even during many years when season closures have been imposed. Recognizing that season closures may be warranted under some limited circumstances, we believe that a major objective of duck harvest management should be to avoid closed seasons, and perhaps to limit any closures to the minimum spatial and temporal resolution needed.

Do you agree with the premises used to develop the alternatives for the immediate future (e.g., limiting spatial stratification to a Flyway level)? Why or why not? We are not comfortable with the stated objective to "optimize long-term harvest returns" of all duck species, "whereby no species in question is either 'over-harvested' or 'under-harvested.'" For most species other than mallards, an objective of "getting the biggest pile of dead ducks" is not a major concern. Further, it appears from recent analyses that for some species of concern (e.g., pintails), populations are not predicted to approach objective levels even with total season closures. In this case, it seems that any allowable harvest should be based on some objective other than "maximize sustainable harvest while achieving population objectives." In addition, we suggest that differential regulations within flyways should be considered. Such an approach may be particularly useful when managing harvests of species that have relatively limited distributions. Regulations designed to limit harvest of these species are applicable where the ducks occur, but add unnecessary complexity to regulations in areas where the species is uncommon and the regulations would have little impact on resulting harvests. For

example, current Central Flyway restrictions on canvasbacks (closed season) and pintails (partially closed season) likely could be relaxed to a 1-bird daily bag limit throughout the season in Montana, Wyoming, and New Mexico, without any significant change in total flyway harvest of these species (collectively, annual harvest in these states averaged 395 canvasbacks and 2,832 pintails during the 1990s).

Are there alternatives not considered in the report that should be? The main alternative we would like to see given more consideration would involve imposing a constraint of a common season length for all species and using some form of a point system or aggregate bags (e.g., a 6-bird daily bag limit, with no more than 1 pintail or canvasback or scaup) to direct harvest pressure away from species with lower harvest potential. It may be difficult to predict harvests resulting from this type of approach, but we believe it is preferable to season closures (or "partial" closures).

Any other comments / suggestions on how to proceed? Development of biologically sound and socio-politically viable approaches to AHM for multiple duck species will require much effort, and we caution against the implementation of a "quick fix" to address current criticisms of AHM. Because specific management objectives, regulatory options, and alternative models of population dynamics (with associated weights) are all inextricably linked in AHM, progress must keep pace in all 3 of these areas. There is currently work being done on harvest management objectives and population modeling, and we have suggested here that additional attention to regulatory alternatives could be useful in addressing many AHM-related issues. These efforts should proceed in a coordinated fashion, and may take some time. In the interim, effective communication with waterfowl managers and the broader public may be the top priority.

In the arena of management objectives, there is currently much discussion about the role of the NAWMP objectives in AHM. The current emphasis on the NAWMP objective for midcontinent mallards results in more conservative regulatory options than if this constraint is not included in the harvest management objective. While the prospect of greater frequency of liberal regulations for mallards is appealing, we believe that removing the NAWMP mallard objective from the current AHM objective function would pose significant communications challenges. A communications strategy should be developed on this issue. Furthermore, there is some indication that the current NAWMP constraint may provide a "buffer" that helps maintain populations of other prairie-nesting ducks. We believe that more discussion, and possibly technical work, is needed before any decisions are made on changing the role of the NAWMP mallard objective in AHM.

Most importantly, is there any sense of agreement (details notwithstanding) on a conceptual approach so that technical work can go forward? The Central Flyway strongly supports efforts to understand the population dynamics of duck species, and the possible impacts of harvest on these dynamics. We encourage these efforts to continue, particularly given the current high profile of managing harvest of other duck species within the framework of AHM for mallards. Making the best management use possible of the limited information on the dynamics of other species should always be a priority.

Within the Central Flyway, there is general agreement that providing maximum hunting opportunity for mallards (particularly drake mallards) is a top priority. Thus, we believe that duck hunting regulations should be based primarily on the status of mallards. We are unwilling to forego hunting opportunity for mallards in order to optimize harvest management of other species. At the same time, we would like to avoid season closures (or "partial" closures) on other species. We recognize that this leaves bag limit regulations as the only real tool for addressing species with harvest potential that substantially differs from mallards, which poses problems for regulatory control in achieving harvest management objectives. We believe, however, that more innovative use of bag limit regulations (e.g., greater use of aggregate bags) should be explored before more drastic measures (e.g., multiple independent seasons) are taken. We further believe that regulation-setting at finer spatial scales (within a Flyway) may be desirable. As always, discussion and resolution of these issues would be greatly enhanced by an improved understanding of hunter desires, attitudes, and behaviors in relation to hunting regulations.

We stress, however, that much work still needs to be done on improving harvest management of mallards, and this is still the top priority for the Central Flyway. In the recent report by Runge et al. ("A revised protocol for the adaptive harvest management of midcontinent mallards"), 5 topics were identified for future work: (1) improving recruitment sub-models, (2) improving survival sub-models, (3) understanding the cause of the balance equation bias, (4) improving the model updating procedure, and (5) improving estimates of harvest rates. While work is progressing in all these areas, they remain immediate priorities. 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.

Pacific Flyway.--The Pacific Flyway has increased its efforts over the past year to finalize technical analyses of western mallard information for inclusion into AHM. The PFSC has contracted with University of Nevada – Reno and Wildlife Management Institute to produce (by January 2004) a model set for western mallards that can be incorporated in to the AHM framework. Mark Herzog will be reporting on this effort later in the meeting.

At its March 22 meeting in North Carolina, the Pacific Flyway Council considered several recent issues related to AHM. The Council endorsed a recommendation that responded to several topics presented by USFWS at the March technical committee meetings:

Selection of framework extensions is contingent on approval by state wildlife regulatory organizations. At this time, it is anticipated that no changes to 2002-03 state selections would occur under liberal and moderate packages in 2003-04. No state in the Pacific Flyway conducted evaluations of extensions this past season.

The Pacific Flyway Council reiterates its support provided last year for two of the three constraints on AHM packages recommended by the Mississippi Flyway. At the April 2002 AHM Working Group meeting, revisions to model weights and the balance equation were developed, and subsequently applied to simulate the frequency of regulation packages under various scenarios.

Results are similar to past analyses regarding proposed revisions to closed and very restrictive packages. Changing closed season cells > 5.5 million to "restrictive" and very restrictive cells to "restrictive" have relatively little impact on the frequency of moderate and liberal packages. However, adding the option of limiting package shifts to no more than one step at a time has a much greater impact, resulting in more conservative regulations. Therefore, we continue to support our earlier recommendation for changes to the closed season and very restrictive packages, but we do not support limiting package shifts to more than one step at a time. Recent efforts to determine hunter preferences through the AHM Task Force will be valuable in determining optimal package configurations.

The Council does not support the three alternatives as presented in the December 16, 2002 USFWS paper, "The Problem of Scale in AHM: Alternatives for Recognizing Stock-Specific Variation in Harvest Potential". We view these alternatives as too complex for effective implementation in regulating Pacific Flyway duck harvest. In addition, existing population, survival, and recruitment data are for most duck species are not comparable to those available for mallards, and should not be used to constrain mallard harvest potential. We would prefer refinement of the existing system compared to the alternatives presented. However, the alternatives serve as points for further discussion on a topic that has been debated for many years. We continue to support the inclusion of western mallard models in alternatives developed.

For mid-continent mallards it is important to maximize long-term sustainable harvest while maintaining healthy populations of other species. From the recent paper, "Population Dynamics of Ducks Other Than Mallards in Mid-continent North America", it does not appear that allowing mallards to drive duck harvest management will significantly impact attainment of NAWMP goals for most other species. Where mallard harvest management does appear to negatively impact trends of other species, the Council favors independent harvest strategies for those species.

With regard to specific questions raised from the "multi-stock" paper, from our perspective it appears that independent harvest strategies are warranted for pintails, scaup, and canvasbacks. Independent species harvest strategies should focus on independent bag limits, and independent season lengths and closed seasons as last resorts. Objective (and hopefully standardized) criteria need to be developed to determine which species warrant separate harvest strategies. We support development of harvest regulations at the flyway level, but continuation of traditional harvest management provided in the High Plains and Columbia Basin units.

Hunter abilities and opinions, as well as regulation simplification, need to be factored into regulatory decisions where mutually acceptable biological alternatives exist. As noted in the above papers, the ability of hunters to distinguish species is a major concern in developing effective harvest regulations. Effectiveness of the recent reduced pintail season length in regulating harvest should be considered in developing future seasons for species with independent harvest strategies. Enforcement officers should be consulted in evaluating regulation efficacy.

To account for hunter abilities / preferences and complexity, we need to be creative in designing

annual regulation packages for species with independent harvest strategies. For example, one alternative might be to annually combine restrictive regulations for a small group of species where independent harvest strategies prescribe similar restrictive season lengths in that year.

The Council believes that the recently formed AHM Task Force and associated meetings on hunter preferences should help in addressing many of the above issues, particularly hunter abilities / preferences and complexity issues. We agree that most of these should be resolved in the near-term (over the next 2-3 years) and look forward to additional opportunities for input.

AHM Task Force.--The AHM Task Force was established in December 2002 by Brent Manning, president of the International Association of Fish and Wildlife Agencies. The mission of the AHM Task Force is to foster understanding and support for continued strategic development and implementation of AHM. The Task Force will focus primarily on policy issues, recognizing of course that strategic direction must be consistent with capabilities for science-based monitoring and assessment of the waterfowl resource. Any strategic guidance for AHM also will acknowledge the dependency of waterfowl population abundance on both harvest and habitat availability, the need for direct involvement of the Flyway Councils, and the need for comprehensive, integrated approaches to migratory bird conservation.

The AHM Task Force will focus on the following policy topics:

1. Harvest-management objectives
2. The set of regulatory alternatives
3. The specification of management scales
4. Communications

Individuals have been appointed to the Task Force based on their ability to contribute to the group's mission. Experience with the history and institutional mechanisms of waterfowl management were prerequisites. The Task Force is relatively small, open-minded, and able to embrace a nationwide perspective. The Task Force will look for strategic approaches that can be embraced across Flyways.

Task Force members include:

- *Wayne MacCallum*, Atlantic Flyway (MA Division of Fish & Wildlife)
- *Roy Grimes, Mississippi Flyway (KY Dept. Fish & Wildlife Resources)*
- *John Cooper, Central Flyway (SD Game, Fish & Parks Department)*
- *Don Childress, Pacific Flyway (MT Fish, Wildlife & Parks)*
- *Ken Babcock (Ducks Unlimited)*
- *Rollie Sparrowe (Wildlife Management Institute)*
- *Ken Williams (USGS Cooperative Research Units)*
- *Ralph Morgenweck (U.S. Fish and Wildlife Service)*
- *Dave Case, facilitator (D. J. Case & Associates)*

Fred Johnson (U.S. Fish and Wildlife Service) and Mike Johnson (North Dakota Game and Fish Department) represent the AHM Working Group on the Task Force.

The AHM Task Force is analogous to the AHM technical Working Group, in that it is an advisory body without decision-making powers. Like the AHM Working Group, the Task Force will assemble information, review and discuss alternative approaches, and make non-binding recommendations to the IAFWA and Flyway Councils. The Task Force will rely heavily on the AHM Working Group and technical/study committees of the Flyway Councils for help in assessing the biological and regulatory implications of alternative policy choices. The Task Force also will work closely with the IAFWA and Flyway Councils to establish priorities and timetables for deliverables.

To date, the Task Force has held one, 1-day meeting and four conference calls. The next meeting is scheduled for June 2. Guidelines by which the Task Force operates and summaries of its meetings and conference calls can be found at http://migratorybirds.fws.gov/mgmt/ahm/taskforce/taskforce.htm.

U.S. Fish & Wildlife Service.–There is a new report on framework-date extensions that describes how harvest rates under the liberal alternative (for both midcontinent and eastern mallards) were originally specified, and how those harvest-rate predictions (with & without framework-date extensions) are being updated using band-recovery data. That updating resulted in a decrease in the expected harvest rate of midcontinent mallards from about 14% to 12%, based on the 1998-2001 experience with the liberal alternative. There is still evidence of a lot of annual variability in harvest rates under the same regulatory alternative (CV = 18%). With regard to framework-date extensions, we won't have any data for a few weeks yet. Jim Dubovsky has determined that the increase in harvest rates of midcontinent mallards may be less than expected this past season (8% vs. 15%) because of less-than-expected use of the extensions. Obviously, however, we'll need several years of framework extensions to understand the full range of variability in their application.

We distributed a report in February describing the dynamics of ducks in the midcontinent region other than mallards. Using readily available data and standard regression techniques, we were able to successfully produce statistical models that describe one-year changes in population size relative to NAWMP goals. Taken at face value, the models suggest that the current AHM protocol, with its explicit recognition of the NAWMP goal for midcontinent mallards, should not prevent several other sympatric duck species from maintaining average population sizes above their respective NAWMP goals. The exceptions are scaup, wigeon, and pintails, whose population sizes rarely exceeded their respective NAWMP goals under the simulated AHM protocol for mallards. The models described in this report have a number of limitations and should be used with caution. The data and model structure described herein are amenable to more formal time-series analysis, and this work is on-going.

Most people are aware of the Service's inability to get waivers for aircraft-weight restrictions for the May survey. Four crew areas would be affected: N. Alb. & NW Terr., N. Man. & Sas., W. Ont., and

Quebec. We currently are assessing what strata would be done partially or not at all. We expect that approximately 20% of survey transects would not be flown.

From an analytical standpoint, a partial MAS has obvious ramifications, particularly in year we are expecting a big over-flight. Three alternatives are being explored: (a) standard data augmentation (using historic relationship of counts in surveyed and what-will-be unsurveyed areas); (b) data augmentation in combination with population model based projections via Bayesian updating or Kalman filtering; and (3) retooling of the AHM models for mallards to correspond to a reduced survey area. We currently exploring the pros and cons of each, including the durability of the fix.

These "band-aids" may not be necessary, however, as we have just received word that the Office of Aircraft Services has agreed on a program that will allow extension of the 206 waivers for the migratory bird survey program this summer. It involves specialized inspections of the wing spars on all 206's over the next month, contracting with TGS engineering to instrument our aircraft providing long term monitoring of mission g loads , and reconfiguring 206's with Sierra tanks and Wip 3450 floats. Completion of the specialized wing spar inspections without discrepencies is key to extending the waiver in short term. Reconfiguring the aircraft and installing monitoring instruments will be completed as soon as practical.

Last summer we initiated a major reward-band study in we banded more than 6,000 black ducks and 24,000 mallards (half the sample are reward bands, half are control bands), both in excess of our goals. Original plans were to move ahead with the addition of wood ducks and Canada geese this year. However, severe budget constraints, as well as emerging questions about the most effective study design, are causing us to delay full-scale implementation of those plans. We believe we need to take more time to think critically about the sources and magnitude of variation in band-reporting rates expected on spatial, temporal, and taxonomic scales. Pilot work could help in that regard and may proceed this summer. Also, we clearly have multiple objectives (band-reporting rate, harvest rate, survival rate) and it turns out that all of these objectives cannot be simultaneously maximized by a single study design (i.e., there are tradeoffs). We are interested in more dialogue about strategic objectives, as well as appropriate study designs and analytical protocols for now and in the future. We need time to do that.

Also, we have some preliminary results of reward banding last year. Adult males in Alb, Sas, and Man were banded with $10, 20, 30, 50 rewards in addition to the $100 rewards. The $30 reward achieved a reporting rate of 1. Reporting rate of standard bands was 69%, which is similar but slightly lower than what we've seen in previous years (75%). The preliminary estimate of harvest rate was about 10%, which is similar to or slightly lower than we've seen in recent years.

A pilot study in 2000 and 2001 found large discrepancies in age determination based on internal examination and based on wing plummage. Errors were not random in that more adults from internal aging were classified as young by wings. We thought maybe we had found the "smoking gun" in terms of the apparent positive bias in estimates of survival and reproductive rates. However, there was some question about whether in fact the internal aging was accurate. During this past

season, researchers used a sample of a hunter-killed banded birds and surreptitiously submitted these to the Central and Mississippi Flyway wing bees. The sample consisted of know-age adults (indirect recoveries) and indicated (at time of banding) adults and young (direct recoveries). Correct-classification rates in the wing bees were 95-98% for adults and 91-95% for young, and errors appeared to be random (n=98, but 2 wings/bird). The study will continue next year.

Mike Runge et al. applied for and received a grant under the USGS State Partnership Program to advance AHM for goose populations in general and for AP Canada geese in particular. Combined with a $29k contribution from the AF, the total project budget is $75k (over 18 months). In addition, Evan Cooch at Cornell has found $50k (over 2 years) to support the effort. Project partners are in the process of deciding how to manage the effort. They have advertised a post-doc position, but have not yet determined whether to proceed with hiring someone.

Canadian Wildlife Service.--The Canadian Wildlife Service (National Office) is pleased to be part of the AHM Working Group and is looking forward to increased participation in AHM for species in which there is a significant harvest in Canada. To date, CWS has funded a preliminary technical assessment of the feasibility of AHM for Atlantic Population Canada Geese and is hoping for continued participation in the efforts to develop an AHM protocol for this population. CWS is also supportive and strongly involved in Black Duck AHM and is hoping to use this approach to set Black Duck harvest regulations in the future. CWS sees the Black Duck AHM as a good opportunity for an international coordinated approach to waterfowl harvest management.

In order to make implementation of AHM easier in Canada, regulatory changes are underway 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. In addition to these regulatory changes, Steve Wendt (CWS National Office, Acting Director Wildlife Conservation Branch) will be the Canadian contact on the AHM Task Force.

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.

WMI Hunter-Satisfaction Study *(Dave Case)*

The goal of this project is to develop an overall framework and specific recommendations for addressing:

1. How to gain a more thorough and rigorous understanding of the relationship between waterfowl hunting regulations and hunter satisfaction, recruitment, retention, and involvement in habitat conservation; and
2. How to systematically incorporate this understanding into management and conservation programs.

The project has 4 specific objectives to help achieve this goal:

- Compile the previous research and literature addressing this issue.
- Assemble a "Think Tank" of technical and administrative representatives from Flyway Councils and U.S. Fish and Wildlife Service, and experts in the fields of hunter recruitment/retention and human dimensions research.
- Through two meetings of the Think Tank, create a sense of direction and internal agreement regarding this issue.
- Develop specific recommendations for improving/enhancing management programs.

The project was delayed from the original schedule so that efforts could be coordinated with the AHM Task Force.

The Think Tank met in Jackson, Mississippi just prior to the AHM Working Group meeting. The 2-day workshop was a success, although it was clear that addressing this complex issue is no small task.

The five human dimensions specialists who are participating on the Think Tank will convene in early June to discuss and articulate potential approaches. The full Think Tank will conduct a second workshop in August. The report and recommendations resulting from the project will be completed and distributed in December 2003.

Regulatory Constraints for Midcontinent Mallards *(Guy Zenner)*

I presented a report prepared by Jeff Lawrence, MN DNR and Dale Humburg, MO DOC on the effects of applying 3 constraints to the AHM process:

1) no closed seasons at population and pond numbers where seasons have been open in the past;
2) removing the very restrictive regulations package from the suite of regulations packages; and
3) restricting regulatory changes to 1 step each year when either liberalizing or restricting.

The Mississippi Flyway has identified these as high priority items for AHM and formally

recommended the AHM regulation packages incorporate these changes in 2002 and 2003.

The authors examined how eliminating or restricting the closed season regulations package, eliminating the very restrictive package from the suite of regulations packages, and constraining regulations changes to one-step between years influenced optimal regulations decisions, simulated breeding populations and harvests. They used Adaptive Stochastic Dynamic Programming, the 2002 mid-continent mallard model set (corrected for bias) and the 2002 model weights. All simulations included adjustments for framework date extensions in the moderate and liberal packages. They compared mean, minimum, and maximum breeding population size, harvest, frequency of regulations use, and frequency of regulations changes between consecutive years.

Eliminating closed seasons at mallard populations above 5.5, 4.5, and 3.5 million, as well as eliminating the closed season completely, resulted in declining average breeding populations as the population criteria were lowered from 5.5 to 3.5 million. Maximum size of the breeding population did not change, but minimum size declined nearly 1 million mallards, from 3.75 to 2.77, as the population criteria declined. Average harvests were similar among the 4 test cases. Even with the constraint of no closed seasons above 4.5 million mallards, closed seasons were still the optimal choice in 7% of the years. The constraint of having no closed at mallard populations above 3.5 million and having no closed season at any level resulted in nearly identical average breeding populations, harvests and frequency of optimal regulatory choices.

Eliminating the Very Restrictive (VR) package resulted in increases of both closed (increased from 32.6 to 34.3%) and Restrictive (R) seasons (increased from 11.4 to 14.8%). The one-step constraint caused the frequency of R and Moderate hunting seasons to increase with little effect on average breeding population size or harvest. Applying the one-step constraint only when restricting harvests yielded little difference in average breeding populations or harvests but increased the number of years when closed seasons might be expected. Combining the one-step with the no closed season > 5.5 million mallards yielded results similar to the one-step constraint alone. Combining all 3 constraints resulted in results similar to the closed season > 5.5 million and no VR option, with more years of moderate seasons.

Waterfowl managers must decide which harvest management objective is most appropriate: maximum harvest, no closed seasons, maintaining a large breeding population, having maximum years of liberal seasons, or some other objective. Minimum breeding populations also should be considered because there could be a substantial change in the minimum population under different scenarios. The Mississippi Flyway has stated that hunting should be open at levels where mallards have been hunted in the past (i.e. ~ 5.5 million), however, a lower level may be appropriate. This report suggests some objectives may best be achieved through use of constraints rather than modification of the stated harvest management objective.

The NAWMP Goal in AHM for Midcontinent Mallards *(Fred Johnson)*

I reviewed how the NAWMP goal is used in the objective function for midcontinent mallards, why

it acts as a constraint on hunting opportunity, and a couple of potential alternatives for lessening its impact. The current objective function devalues harvest associated with regulations and resource conditions expected to produce a subsequent breeding population size ≤8.8 million, which is the NAWMP goal for the traditional survey area and the three Great Lakes States. The addition of the NAWMP goal to the objective function makes the regulatory strategy more conservative than it would be under an objective to simply maximize long-term cumulative harvest. The NAWMP goal acts as a constraint on hunting opportunity because in three of the four mallard models, the optimal population size for maximizing harvest is considerably less than the goal. Only the model with additive hunting mortality and weakly density-dependent recruitment suggests that maximum harvests could be attained with a breeding population near the NAWMP goal. The current model weights suggest that population size in the absence of harvest (carrying capacity, K) would be about 11 million, and that the optimal population size for maximizing harvest would be about 6 million. The NAWMP goal would not act as a constraint on hunting opportunity only if K were expected to be roughly twice the goal (i.e., about 18 million). To help ascertain whether K might have changed over time, I examined residuals from models that explained variation in survival, recruitment rates, and population size as a function of ponds and harvest rates. There were no strong time dependencies in any of the model residuals. Finally, I examined optimal regulatory strategies in which the nature of the harvest devaluation were changed to make the NAWMP goal less of a constraint on hunting opportunity. In one case, I devalued harvest less severely when the population was expected to fall below the NAWMP goal. This alternative produced a slightly more liberal regulatory strategy, with the expectation of a slightly higher average harvest and slightly lower population size. I also examined an alternative in which the NAWMP goal was "scaled" by pond numbers based on the pre-1980 relationship between mallard and pond numbers. In this case, harvest devaluation would occur as it is done currently, but the goal would be year-specific and depend on water conditions. However, this alternative did not appear to measurably affect the regulatory strategy or expected performance characterisitics.

Alternative Models of Recruitment for Midcontinent Mallards *(Scott Boomer)*

A series of analyses were performed to evaluate the consequences of using alternative recruitment models in the current mid-continent mallard (MCM) AHM model set. Alternative models of recruitment derived from various combinations of Canadian and US pond information and BPOP estimates were examined. An evaluation of each alternative model included the following analyses based on data from 1974 - 95: the derivation of alternative recruitment hypotheses, the calculation of equilibrium conditions, prediction error estimation, the derivation of pond state dynamic relationships, balance equation bias corrections, model weight updating, and the calculation of optimal decision strategies and corresponding simulations. Alternative recruitment hypotheses derived from parameterizations based on the 80% confidence ellipsoid for models using Canadian ponds resulted in equilibrium conditions that were biologically unrealistic. These results were attributed to increases in error resulting from regression analyses based on a shorter time series of information. When US pond information was included, either in the form of total ponds or in conjunction with Canadian ponds, the equilibrium conditions resulting from the 80% confidence parameterization were more realistic and comparable to the equilibrium conditions calculated for the

current recruitment model parameterization. Recruitment models using total ponds or Canadian and US ponds resulted in larger prediction errors compared to the recruitment model currently being implemented in the MCM AHM protocol. However, these models provided weighted predictions that were more similar to the observed breeding population than the current mid-continent mallard model set. Updated model weights for recruitment parameterizations, based on total ponds or Canadian ponds in conjunction with US ponds, did not change as much as the current model set, indicating less support for the weakly density dependent recruitment hypothesis. The set of optimal decisions resulting from the recruitment model using total ponds would not have differed from the historical set of optimal decisions based on the current recruitment model using only Canadian pond information. However, the conditions simulated under these optimal strategies were more variable in comparison to the simulated conditions calculated with the current recruitment models. These results suggest that including US pond information, either in the form of total ponds or in conjunction with Canadian Pond information, provides some improvement in predicting the breeding population, but also results in larger prediction variances which directly affects how model weights change. As a result, the ability to differentiate between alternative models that include US pond information will be reduced. Future analyses will continue to explore the ramifications of using alternative recruitment models in the MCM AHM protocol. Specifically, we will evaluate if using the weighted latitude of the breeding population as a predictor variable results in better predictions. Because the weighted latitude of the breeding population includes a longer time series than total ponds or US ponds, we would expect a reduction in the prediction variance.

Population Dynamics of Western Mallards *(Mark Herzog)*

The western-mallard model set is being revisited, with the goal of providing models by January 2004 that can be integrated into the AHM protocol. The first priority is the delineation of the population (i.e., what is a western mallard?). This was discussed at much length so as to meet the goals of the Pacific Flyway, but also keep the amount of change to the midcontinent models to a minimum. Of particular interest was the possible inclusion of Alberta in the western mallard population. It was concluded that geographic assignment of Alberta birds did not matter, as long as a joint optimization approach for midcontinent and western mallards was used. Thus, Alberta will remain as part of the midcontinent population. It also was decided that because Alaska, Yukon, and BC contribute considerable numbers of mallards to the Pacific Flyway, and very little contribution to midcontinent harvests or the midcontinent models, that these birds likely could be removed from the midcontinent population and included in the western population. Therefore, the western population has been defined as those mallards breeding within reference areas 1, 9, 10, and 11 (specifically all Pacific Flyway states, Yukon, and British Columbia).

During the review of population delineation it was noted that important discussions will be needed within and among flyways as to the role of the Pacific Flyway in achieving NAWMP or other broad-scale management goals. While we are not yet at a point where we can implement a joint objective function for midcontinent and mallards, these are issues that would benefit from early conversations so that implementation can move quickly when the other AHM components are ready.

Work is currently proceeding on two fronts: (1) gathering and compiling complete breeding population (BPOP) data, and (2) estimating the recruitment rates of western mallards.

In general, a complete data set for all western mallards, that is comparable and can be combined to estimate a total BPOP, is available from 1994 – present, with the exception of one year (2001). However, since 1990 a set of BPOP data is available which contains more than 90% of the total BPOP. Also, not only is the missing 10% a small proportion of the total BPOP, it has also been shown (during years where the data is available) that, it is highly correlated with the total western mallard population. Thus the variation lost by including data from 1990 to present is minimal.

British Columbia is an important source of western mallards. Current estimates suggest 1/3 of all western mallards are produced within BC. However, mallard surveys are not performed using the standard operating procedures used for the Waterfowl Breeding Ground Population and Habitat Surveys (May aerial surveys - MAS). Therefore, it is important to determine if the current BC survey protocol is comparable to the other survey method, and then determine a method that can produce from the BC survey a number that can be combined with the rest of the Pacific Flyway's BPOP estimates. For the past 3 years certain regions of BC have surveyed using both the MAS method as well as the BC density-estimation method. Initial examination shows that indeed these methods are highly correlated, and therefore it should be possible to include BC BPOP estimates into the total PF BPOP estimate. There is also a need to account for any double-counting that occurs in northern BC where both surveys are flown. Consultation with Andre' Breault in the next month should help to resolve all the BC issues quickly.

We are estimating western mallard recruitment rates. Because 44% of all birds harvested in Pacific Flyway are midcontinent mallards, it is necessary to remove the contribution of midcontinent mallards to the Pacific Flyway parts-survey to correctly estimate western mallard recruitment. Bob Trost and Marty Drut have developed a method of weighted averages based on harvest derivation, the known midcontinent age ratio, and the observed Pacific Flyway age ratio (which includes midcontinent birds) to estimate an age ratio of western mallards.

It is important to determine the best way to account for differential vulnerability in the age ratio estimates. At issue is the amount of spatial and temporal variability in differential vulnerability, and the need and ability to account for that variation.

Finally, the ability of estimates of annual survival and age ratio estimates (under various vulnerability estimates) to predict observed changes in BPOP was examined using a population balance equation. While correlations between predicted BPOP and observed BPOP were fairly high (~0.6 – 0.8), this was primarily due to the high amount of variation in BPOP that is accounted for by the previous year's BPOP. When predicted and observed growth rates were compared, correlation was much lower (0.17), suggesting there is still much work to be done in developing informative estimates of recruitment and survival.

Current survival data is only available through 1997; therefore all of these analyses include averaged

annual survival rates from 1998 to present. It is also important to note that the estimates of juvenile female survival rate are higher than those for juvenile males. Not only does this affect predicted recruitment rates, but also predicts a population (at equilibrium) that contains more females (53%) than males. During the next couple of months we will derive more recent estimates of survival. The goal is to compile and present this information at the July 2003 Pacific Flyway study committee meeting in Vail, CO.

Development of a Strategy for Adaptive Harvest Management of American Black Ducks *(Mike Conroy)*

I reviewed the origin, organization, and timetable for Black Duck AHM, which began as a working group in 2000. Technical work is scheduled for completion during 2003 and potentially will lead to implementation of AHM in 2004. The working group developed out of the international harvest committee's mandate to develop a continental strategy for managing black duck harvest. AHM was viewed as a means of dealing with (not resolving) issues of uncertainty in black duck dynamics, which revolved around the extent to which black duck populations have declined principally because of competition from mallard, or due primarily to harvest. A 1-population model has been developed that encapsulated 4 alternative biological models (presence or absence of a mallard effect on recruitment; additive or compensatory survival) and 2 adjustment factors (on recruitment or survival rates) that are needed because of model over-prediction. I described optimal harvest policies, and how these are influenced by relative belief in the alternative models and constraints on the harvest decision. Constraints currently incorporated included 1) population objectives, 2) parity of US and Canada harvest, and 3) exclusion of closed seasons from consideration. I briefly describe extension to multiple breeding stocks (3 production areas) and harvest areas (3 in Canada, the Mississippi Flyway, and northern and southern portions of the Atlantic Flyway), and the technical challenges posed by this complexity. Finally, I discuss how black duck AHM fits within the general context of multi-stock AHM, particularly with respect to the definition and constraints upon objective functions.
To see the complete presentation visit
http://coopunit.forestry.uga.edu:8080/blackduck_ahm/meetings/ahm_jackson/. For more information about black duck AHM see http://fisher.forestry.uga.edu/blackduck/.

AHM & Framework Extensions: Lessons Learned *(Bruce Leopold)*

The issues of framework extension and AHM have been controversial over the past few years. A review of primary issues and associated actions provides an excellent opportunity to develop a proactive understanding to deal with these issues in the future in a more constructive manner. There is never a single way to analyse nor interpret data, but there always is a need for biologists to objectively examine data and ensure that it represents biological reality. This applies to framework extension where biologists must base management decisions on the biological facts rather than emotional or politicial issues. Biologists must also temper their decisions with biological rather than statistical reasoning, and to understand and accept data limitations. Concerning framework extension, clarification was made concerning Mississippi's position regarding framework extension

which included: 1) it was responding to needs of its stakeholders; 2) with its first request for framework extension, there was a commitment to secure funding to evaluate impacts, to ensure science-based results, 3) MS only resorted to "politics" when politics were resorted to; 4) MS always was concerned for the biological impacts; 5) MS desired a decision solely based on biological evidence; 6) was concerned about using worse case scenarios; and 7) was concerned about using an "untested" model (AHM). Regarding AHM, it is a tremendously useful tool that will allow biologists to objectively examine management alternatives. But we must always remember that nothing can replace the collective knowledge of biologists, and that AHM should be used as a tool to aid biologists in decision making, not dictate to biologists what the decisions should be. When using and discussing AHM, we must: 1) be honest about variability and temper our decisions in the context of that variability; 2) always remember that it is an abstraction of really and therefore has limitations; 3) keep an open mind; 4) have doubt, and to question results relative to your knowledge, 5) cut the jargon, cut the complex math: convey concepts in everyday language to ensure understandability; 6) avoid developing an "attachment to" the model, and 7) always remember that biologists should rule the model, rather than the model ruling the biologists. The final advice provided was that we must be cognizant of the fact that we are dealing with the dynamics of a continental duck population that is extremely complex and is affected by numerous abiotic, biotic, and social variables. Lastly, biologists were asked to set aside any regional, personal differences, and to work for the good of the resource.

Pintail AHM *(Mike Runge)*

The development of an AHM strategy for northern pintails (*Anas acuta*) has been challenging on both technical and political levels. In this way, it exemplifies the challenge of multi-species AHM. As we move beyond mid-continent mallards to develop formal quantitative harvest strategies for other species, we face two fundamental difficulties: greater uncertainty about the biology, because the monitoring data are sparser; and the political challenge of identifying management objectives for multiple stocks.

For pintails, there are three technical issues that are impeding development of an AHM strategy. (1) There is evidence of a temporal trend in recruitment, presumably due to habitat change in the southern Canadian prairies. In the past, recruitment was strongly influenced by the latitude of the breeding population—in years when the prairies were wet and pintails settled in the southern part of their breeding range, recruitment was high; in years when pintails overflew the prairies, recruitment was low. This effect appears to have disappeared; now, even when the prairies are wet and pintails settle in the south, recruitment is not very high. The problem is that in order to find a stable, optimal harvest strategy, the dynamics cannot be changing over time. What should we assume about the long-term trajectory of this trend in recruitment? Essentially, the carrying capacity, as determined by quality of the breeding grounds, is changing—is there a way to measure this and capture it in our models? (2) There are several biases in our monitoring programs for pintails, but we do not yet know their cause or how to compensate for them. When combined into a “balance equation,” the survival rates (from band-recovery data) and age-ratios (from parts collection data) overpredict the growth rate of the population (as measured by the aerial surveys). Worse, this

overprediction is related to where the birds settle. That is, when pintail overfly the prairies, we appear to undercount them. The first type of bias (balance equation bias) is also seen in mid-continent mallards, and we have a method to deal with it. But we do not yet have a technical method to correct for the overflight bias. (3) It will be difficult to develop a predictive model for harvest rate as a function of regulations. This is the central relationship in an AHM model because it is the link between the management action and the effect on the population. Estimates for pintail harvest rates have wide confidence intervals because of the small sample size of bands that are recovered each year. Since harvest rates are measured with so much error, it will be difficult to discern the effects that regulations have on them.

While the development of the components of an AHM model for pintails has progressed steadily, albeit slowly, over the past few years, the assembly of these components into a management strategy has not proceeded at all. There are three impediments, each of which is a human dimensions question that needs to be answered in the political arena. (1) How will decisions about pintail harvest interact with decisions about mallard harvest? What regulatory structure is desired: independent regulations for each species, common season length but separate bag limits, or the same regulations? If a common season length is desired, should the season be set by mallard status and the pintail bag set conditionally, or should the regulations for the two species be jointly optimized? (2) What are the objectives for pintail management? There are many possible objectives, among them: to maximize harvest, provide incentive for winter habitat conservation, provide consistent opportunity, and avoid closed seasons. How are these objectives to be balanced against one another, and how are they to be balanced against the management objectives for mallards and other species? (3) How much do we want to forego harvest opportunity in order to allow the pintail population to recover? There is a wide consensus that the decline in the pintail population is due to habitat degradation, not overharvest. Nevertheless, harvest could potentially delay recovery. Should that be a consideration in setting harvest regulations?

The technical challenges can be addressed by additional research, and the USFWS Division of Migratory Bird Management and USGS Patuxent Wildlife Research Center are committed to moving forward with that research. The human dimensions challenges are more difficult. Not only don't we know the answers to the questions posed above, it isn't even clear how to seek such answers. In what forum and by what methods should answers be sought? While there will be plenty of technical issues to resolve, I believe that the fundamental challenges of multi-species AHM will be political: agreement about the relationships among regulations for different species, and the explicit articulation multiple, competing objectives.

Multi-Stock AHM Workshop

Workshop participants were divided up by Flyway and asked to answer the following questions:

(1) With regard to regulatory strategies:

(a) For which species (or group of species), if any, would independent season lengths (and

possibly bag limits and framework dates) be acceptable?

(b) For which species (or group of species), if any, would only independent bag limits (fixed or varying annually) be acceptable (assuming that season length for these species is specified based on some unrelated group of birds)?

(c) For which species (or group of species), if any, would periodic closed seasons be acceptable (assuming that season length and bag limits for these species were specified based on some unrelated group of birds)?

(2) Describe how Alternative A (in Johnson et al., 2003, Alternatives for recognizing stock-specific variation in harvest potential) might work for your Flyway. What species would be used as a constraint on the optimization of mallard harvest? From what survey areas are these species derived? What species, if any, might have independent seasons? From what survey areas are these species derived?

(3) Describe how Alternative B might work for your Flyway. How many guilds do you envision, and what species would be assigned to these guilds? From what survey areas are these species derived? Considering there would be two independent duck seasons, how many regulatory alternatives do you envision, and would they be the same for each guild?

(4) If you could further sub-divide your Flyway into harvest units, would you and where would the boundaries be? Describe the breeding-ground derivations for these harvest units. Provide supporting rationale for the boundaries.

Atlantic Flyway.--Independent season lengths would be acceptable for certain species (black ducks, canvasbacks, and pintails) when necessary, but definitely not a preferred approach. Employing independent bag limits or periodic closed seasons would be acceptable for any and all species if deemed necessary. Black ducks, wood ducks, and, for the southern portion of the flyway, the mid-continent group could be used as constraints on the optimization of mallard harvest for Alternative A. Black ducks, mallards, and the mid-continent species are derived from the eastern, Atlantic Flyway plot, and traditional surveys' areas. Wood ducks are derived mainly from the BBS and Atlantic Flyway plot survey. Under Alternative A, independent seasons for certain species would be acceptable as described above. These species are derived from the eastern, Atlantic Flyway plot, and traditional surveys' areas. Atlantic Flyway managers did not believe that Alternative B was workable for our flyway. There is strong interest and justification for subdividing the Atlantic Flyway into northern and southern harvest units. The northern unit might include CT, DE, ME, MA, NH, NJ, NY, PA, RI, and VT. The southern unit might include FL, GA, MD, NC, SC, VA, and WV. These boundaries represent a compromise, in the interest of simplicity, between the distribution/derivation of black ducks and mallards. However, these boundaries are not inconsistent with a north-south division based on distribution/derivation of the "Big 3" species in the flyway (mallards, wood ducks, and black ducks). Recent analysis of population and harvest data for Atlantic Flyway mallards, black ducks, wood ducks, and various mid-continent duck stocks (e.g., pintail)

have all revealed important differences between northern and southern areas of the flyway. Trends in hunter numbers and managers' perceptions of hunter preferences also differ on a north-south gradient within the flyway. We believe that the possibility of establishing a distinct management unit in the Atlantic Flyway should be seriously considered as we explore ways to develop a sound, biologically based approach to management of multiple stocks.

Mississippi Flyway.--*Question 1(a):* We would prefer only one season within a season. This season, however, could include more than one species (for example a 30-day season for both pintails and canvasbacks). The species considered for inclusion in such a season should be those for which we have concern for over-harvest (for example canvasbacks and pintails in recent years). These species could change depending upon changes in population status.

Why? Because more than one season within a season creates too much regulatory complexity, it creates enforcement problems and it implies a finer level of management capability than we presently have.

In regards to individual bag limits, there is generally agreement that we should not add more species to the list for which we currently have individual bag limits. If we thought we needed to add more species to that list, then we should consider lowering total daily bag limit and thus reduce the number of species-specific limits.

Question 1(b): We should not have independent bag limits for too many more species than we currently have on the list (i.e., 4 mallards (of which no more than 1 may be female), 2 wood ducks, 2 redheads, 1 black duck, 1 pintail, and 3 scaup (sometime 1 canvasback). If we think we need to restrict the bag limit some species, say ring-necks or wigeon or gadwall, to 4 birds/day when we have a 6-bird total limit, we should seriously consider lowering the total bag limit to 4 and thereby reduce the number of species-specific independent limits.

Why? Because bag limit regulations become too complex for the average duck hunter (we assume) and duck hunters, as a whole, don't appear to have very good duck identification skills.

Question 1(c): The general consensus in the Mississippi Flyway was that we do not want to close seasons on any species unless absolutely necessary and we don't want to consider too many other species than we have in the past (e.g., canvasbacks, redheads, maybe pintails as a last resort).

Why? The reasons are similar to those cited for item B, including the increasing complexity of regulations, unintentional violations, and the limited duck identification skills of most hunters.

Question 2: One suggestion would be to base the optimization process on mallards, but constrain the process by the status of the top 4 duck species (wood ducks, green-wings, gadwalls and ring-neck ducks) that are harvested in the Mississippi Flyway. We would continue to have independent bag limits for species of concern with special strategies (season within season or closed seasons) for species like pintails and canvasbacks.

Question 3: Alternative B proposes the idea of species guilds and placing duck species into 2 (or possibly more) groups depending upon their relative harvest potential, information we lack for most ducks other than mallards. By harvest potential, the authors meant to convey the idea that some stocks of ducks can support higher rates of harvests than others, which is a function of their life history/biology.

One possibility would be to place ducks in 2 groups: dabblers and divers. The dabbler group would be optimized on mallards whereas the divers might be optimized on ring-necks. This grouping, however, results in ducks being put into both groups that have very different harvest sustainability.

Another possibility for grouping the ducks would be by the species ability to sustain high harvest. High harvested species that apparently can sustain such harvest rates as well as those species that are very lightly harvested even during long seasons with liberal bag limits (e.g., mallards, gadwalls, blue-wings, green-wings, shovelers, mergansers, goldeneyes, ruddy ducks, etc.) would be put in one group and mallards could be used to determine the regulations. The other group of ducks would contain species that apparently cannot sustain high harvest rates (or at least we think they can't) and for which we traditionally have had independent bag limits (e.g., pintails, wood ducks, black ducks, redheads, canvasbacks, scaup, possibly wigeon or ring-necks). These species would have a shorter season and, possibly, independent bag limits.

We suggest only 2 groupings because we only want to have one season within a season, reduce regulations complexity (I guess), etc.

Question 4: Generally, the Mississippi Flyway Tech Section reps were agreeable to managing on a Flyway level. If we were to consider sub-Flyway regions for harvest management, the logical social choice would be to split the Flyway into northern and southern regions, similar to the existing Upper and Lower Region Regulations Committees. If we were most interested in mallard biology and harvest management, we could split a few states (or parts of state) off the eastern side of the Flyway (MI, OH, eastern KY and TN) and manage harvest in that region in a manner similar to the Atlantic Flyway since many of the birds in these areas originate in the Great Lakes/Ontario region.

Central Flyway.--The Central Flyway recommends that, before alternatives for harvest management of multiple duck species can be evaluated and implemented, managers and administrators must carefully review their specific management objectives.

The Central Flyway strongly believes that duck harvest management should be based on a common duck season for all species. Differences among duck stocks in harvest potential should be handled primarily through bag limit restrictions within the common season. As they have been traditionally used, bag limit restrictions have limited capability of reducing harvest on target species (reductions in both season length and bag limit are often used to achieve large reductions in harvest). However, we believe that greater use of aggregate bags may be effective in reducing harvest of target species to desirable levels, within a common duck season (based on the status of midcontinent mallards). For example, within a 6-bird daily bag limit, a restriction could be imposed that a daily bag could

include only 1 hen mallard or pintail or canvasback or mottled duck. Such a regulation is more restrictive than a 1-bird daily limit for each of these species, and should result in comparatively lower species-specific harvests.

We recognize that it would be difficult to predict expected harvests of different duck stocks under an aggregate bag approach as described above. We believe, however, that it would be preferable to gain experience with this approach before imposing other types of restrictions (e.g., seasons within seasons), particularly since harvest is not considered to be a major cause for declines of most duck stocks, and the Central Flyway contribution to total harvest of most duck stocks of concern is relatively small. After gaining experience with aggregate bags, it may be determined that harvest levels of some duck stocks are still higher than desired. In such a case, season closures may be warranted. The Central Flyway believes that closed seasons (or seasons-within-seasons) are extremely undesirable, because they create law enforcement problems and cause concerns for hunters. Therefore, we believe that season closures and independent seasons should be imposed only after all other options have been exhausted.

Because season length has a strong influence on harvest levels, consideration of species other than mallards may be important in designing regulatory alternatives in AHM. For example, the expected harvest rate index of pintails under different season lengths (and a 1-bird daily bag) could be used to help design season lengths for all ducks under different AHM packages.

Although there is no consensus on specific approaches, the Central Flyway is willing to consider differential duck regulations within the flyway. There are already differences in season length between the High Plains Mallard Management Unit and the remainder of the Central Flyway. Another possible approach is to develop separate AHM regulations packages for the northern states (based mainly on changes in bag limits among packages) and southern states (based mainly on season length changes). Finally, stock-specific restrictions could be imposed only in those states where such restrictions would have a meaningful impact on harvest. For example, annual federal estimates of canvasback harvest in Montana have never exceeded 677 birds, so it seems (biologically) unnecessary to close the canvasback season in Montana.

Pacific Flyway.--The Pacific Flyway (PF) does not support the three alternatives as presented in the December 16, 2002 USFWS paper, "The Problem of Scale in AHM: Alternatives for recognizing stock-Specific Variation in Harvest Potential." (Johnson et al 2002). We view these alternatives as too complex for effective implementation in regulating PF duck harvest. We would prefer refinement of the existing system compared to the alternatives presented. We continue to support the inclusion of western mallard models in alternatives developed.

In general, the PF believes that closed seasons should be avoided. Complex regulations, through species-specific limits and/or seasons, should be implemented only as a means to avoid closed seasons or when otherwise biologically justified. The PF would support needed species-specific limits for all species, but cautions that "look-alike" species may need consideration in some cases.

As described in the Johnson et al (2002) report, Alternative A is considered to be problematic. The nine other principle species assessed by the traditional survey do not distribute themselves equally across all 4 flyways. For example, blue-winged teal are rarely encountered in the PF. Additionally, we believe that other stocks of birds not currently assessed by the traditional survey (e.g. western mallards, gadwall) comprise important parts of the PF harvest and our harvest should not necessarily be constrained should those stocks, as measured by the traditional survey, be below the North American goal.

Independent harvest strategies are warranted for pintails, scaup, and canvasbacks. These harvest strategies should focus on independent bag limits, and independent season lengths and closed seasons as last resorts. Objective (and hopefully standardized) criteria need to be developed to determine which species warrant separate harvest strategies. We support development of harvest regulations at the flyway level, but continuation of traditional harvest management provided in the High Plains and Columbia Basin units.

The PF recognizes significant differences within the Flyway in duck harvest potential. Discussion and further consideration of establishing stable regulations in low harvest areas and continuing fluctuating regulations consistent with resource status and understanding of the role of harvest dynamics in high harvest areas seems worthwhile.

Concluding remarks.–The Working Group agreed that a strategic approach to multi-stock AHM depends heavily on harvest management goals and objectives, which remain ambiguous. The hunter-satisfaction study being conducted by WMI could provide useful guidance in this regard. Nonetheless, most Working Group members agreed that there should be a common duck season (apparently based on mallards), with whatever provisions necessary to limit the possibility of a closed seasons on any other species. The three western Flyways also agreed that there are no species for which independent season lengths are acceptable. Independent bag limits appear to be acceptable for all or many species, and aggregate bags might be considered to further limit the possibility of closed seasons. All agreed that bag limit changes should be based on sound biological rationale and be limited to those that produce meaningful changes in harvest rate. There was strong agreement that we should simplify regulations wherever possible. There was widespread uneasiness with Alternative B, in which there would be at least two independent duck seasons based on duck guilds of different harvest potentials. Notably, the Atlantic Flyway differed from the other Flyways in many of their responses, suggesting that the a single, nationwide approach to multi-stock AHM may not be feasible.

The group agreed to the following timeline for continuing work on the multi-stock issue:

- April - June
  - AHMWG prepares summary of April 10th workshop
  - Task Force briefing (June 2)
  - Hunter-satisfaction develops draft framework

•July
- Flyway meetings - briefings and discussion of hunter-satisfaction draft framework and multi-stock workshop summary

•September
- 2nd hunter-satisfaction workshop

•October
- based on Flyway and hunter-satisfaction discussions, the AHM Working Group will prepare a means for Flyways to provide structured input on the multi-stock issue

•December
- Hunter-satisfaction final report

•February - March
- Flyways meet and discuss multi-stock issue and provide feedback to AHM Working Group

•April
- AHM Working Group meeting - develop draft strategic approach for multi-stock AHM

Communications Strategy

The Communication Team met during the week and updated the 2002 AHM Communications Strategy. A summary of the draft Strategy was reviewed on Friday and is provided below. It was clear from the discussions during the week and from the meeting of the Communications Team that communications remains a vitally important element of AHM.

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: All target audiences should:

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

•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.

Strategy ("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

Strategic Considerations:

•Build (reinforce) internal support/agreement for AHM process.
•AHM WG members are critical to effective communications and must plan an aggressive, active role.
•Be cautious about communicating ("speculating") on potential habitat, population, and regulatory package interactions. Separate what we DO know about habitat and populations from what we DON'T know about resulting regulations.
•Create popular "summaries" for all technical reports.
•Limited communications funding.
•Reframe "closed season" cells in AHM matrix.

Target Audiences:

•AHM Technical
•Biologists/Managers/Law enforcement
•Administrators
•Communicators
•Hunters

Key Messages (all audiences):

•Results/successes of AHM implementation to date—we've learned things and it's reduced contentiousness.
•Prairies are dynamic ecosystems, wet and dry cycles are part of normal (and beneficial) processes AHM is a dynamic process—continuous improvement

Actions and Timetable:

•April 11 each Flyway has preliminary "Top 10" identified
•May 1 spring breeding and pond surveys begin

•May 2	draft communications strategy distributed to AHM Working Group for review by DJCA (Train the trainer—Version 1.0 is framed); Strategy for "Top 10" is developed and AHM WG members begin F2F (at least 1to1) communications with tech peers, key administrators, and Top 10 stakeholders
•June 2	AHM Task Force meeting
•June 5	Hunter satisfaction Think Tank
•June 14-18	Migratory Bird (AHM) session at OWAA
•June 18	preliminary May survey results are available
•June 18-19	SRC meeting
•June 22	New release and media package on May survey results are produced and distributed to media directly by USFWS and through states and NGOs
•July	brood and pond surveys conducted—communicated via status report and video
•July 17	"Considerations for AHM 2002-03" publication is completed; PowerPoint completed
•July 21-25	Technical committees and flyway Councils meet—mini-workshops conducted by AHM tech reps with help from Fred Johnson, Mike Runge, and others as needed; proposal for "Train the Trainer" version 2.0 is presented
•July 30-31	late-season SRC meeting (proposed regulation for 2002-03 season)
•August 18	USFWS proposed regulation
•August 20	Hunter satisfaction Think Tank workshop
•August 30	updated communications strategy completed
•December 19	Hunter Satisfaction Think Tank report completed

AHM Working Group - Annual Meeting
April 8-11, 2003
Jackson, Mississippi

Agenda

Sunday-Monday – April 6 & 7 WMI-sponsored hunter-satisfaction workshop (*by invitation only*)

Tuesday – April 8

8:00-8:30	Welcome / introductions / meeting objectives (*Baker, FJohnson*)
8:30-10:00	Flyway Council reports (*state & federal representatives*)
10:00-10:30	*break*
10:30-12:00	AHM Task Force report (*Case, MJohnson, FJohnson*)
	U.S. Fish & Wildlife Service report (*FJohnson*)
	Canadian Wildlife Service report (*Reed*)
12:00-1:30	*lunch*
1:30-2:15	WMI hunter-satisfaction study (*Case et al.*)
2:15-3:15	Regulatory constraints for midcontinent mallards (*Zenner*)
3:15-3:45	*break*
3:45-4:30	The NAWMP goal in AHM for mid-continent mallards (*FJohnson*)
4:30-5:30	Communications planning (*Case et al.*)

Wednesday – April 9 Mississippi Delta field trip; Communications Team meets

Thursday – April 10

8:00-9:00	Models of recruitment for midcontinent mallards (*Boomer*)
9:00-10:00	Population dynamics of western mallards (*Herzog*)
10:00-10:30	*break*
10:30-11:20	Black duck AHM (*Conroy*)
11:20-12:00	AHM & framework extensions: lessons learned (*Leopold*)
12:00-12:30	Pintail AHM (*Runge*)
12:30-2:00	*lunch*
2:00-5:30	Multi-stock AHM workshop

Friday – April 11

8:00-9:00	Multi-stock AHM workshop wrap-up
9:00-10:00	Communication strategy (*Case et al.*)
10:00-10:30	*break*
10:30-12:00	Action items, assignments, timetables
12:00	Adjourn