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Adaptive Regulation of Waterfowl Harvests: Lessons Learned and Prospects for the Future

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Waterfowl managers in North America have been relentless in their pursuit of biological understanding, driven by a conviction that "science" eventually will provide the certitude necessary for effective management policies. Today, the system of waterfowl management in North America is unparalleled among conservation programs in terms of scope, complexity, and cost (Hawkins et al. 1984). The record of accomplishment has been impressive, especially when compared with the more somber accounts of resource exploitation and collapse that tend to characterize much of the history of natural resource development (Ludwig et al. 1993). For all of the success, however, great uncertainty persists about the impacts of harvest and other relevant factors on the biological and social systems of interest. This lack of understanding continues to provoke controversy in the setting of waterfowl hunting regulations, particularly in the U.S. where most of the North American waterfowl harvest occurs.

In response to a rising tide of regulatory frustration, the U.S. Fish and Wildlife Service adopted a formal framework for the adaptive management of waterfowl hunting regulations in 1995. Adaptive harvest management (AHM) is intended to provide effective, or at least more objective, decisions in the face of uncertain regulatory outcomes, and a systematic approach for reducing those uncertainties. Some managers have characterized AHM as revolutionary, while others view it simply as a logical evolution of the previous management approach. After several years of implementation, comprehension and expectations of AHM vary greatly, despite a substantial investment in communication with both internal and external audiences.

In retrospect, AHM was accepted rather readily by waterfowl managers, perhaps reflecting the belief that difficulties in harvest regulation are principally a function of incomplete biological information. After all, this narrow focus has been the driving force throughout much of the history of waterfowl management, and the expectation that science can resolve management problems has become rather pervasive. As a result, AHM occasionally is perceived as a panacea, with expectations that belie the complexity of both biological and socio-political systems. To the surprise of some, AHM has sometimes increased contentiousness in decision making, while (at least so far) failing to reduce key uncertainties regarding regulatory impacts.

The failure of AHM to meet some managers' expectations may be in part because the process is challenging the traditional belief system that provides context for those expectations (Gunderson et al. 1995). Because of the explicit and formal nature of the AHM process, managers are being forced to question long-held beliefs about their ability to understand and influence the managed system, and about the potential of biological science to engender policy consensus. We characterize these traditional beliefs as myths of control, learning, and goal setting.

Myths of control include the belief that there are tight linkages between hunting regulations, hunter behavior, harvest, and waterfowl population response. As we shall explain, managers' ability to control harvest and population size through the manipulation of hunting regulations is limited, especially when compared with the influence of environmental factors beyond the control of managers. A related myth involves the misconception that harvest strategies must or should account for all sources of variability in waterfowl demographics. The incredible proliferation of species and population-specific hunting regulations that occurred during the 1970s and 1980s is testament to this belief (U.S. Fish and Wildlife Service 1988). Perhaps this history is not surprising because most waterfowl managers were trained foremost in biology, where the search for demographic variation and its causes is the foundation of modern biological theory. In natural resource management, however, there is a pressing need to consider not only the benefits, but the direct and indirect costs of managing at progressively finer spatial, temporal, and organizational scales.

Myths of learning include the belief that strong inference is possible in the absence of experimental controls, replication, or randomization. There are severe practical constraints to using rigorous study designs for understanding migratory bird ecology (Nichols and Johnson 1989), and those constraints extend to the ability of AHM to elucidate the influence of harvest and other environmental factors on waterfowl abundance. Another myth of learning involves the unquestioned assumption that systems of interest are stable enough to permit learning. Ecological systems are constantly in flux, and there are serious questions about our collective ability to learn rapidly enough for the knowledge to be applicable to new or unexpected system behaviors.

Perhaps most problematic for the AHM process have been the myths of goal setting, which include the belief that broad, qualitative statements about desirable management outcomes are sufficient to define a unique management strategy. For example, there are many management strategies that could meet the basic goal of sustainable harvests, yet those strategies could all differ in ways that might dramatically affect how they are perceived and accepted by various stakeholders. A key difficulty in defining unambiguous management objectives in AHM continues to be uncertainty and disagreement about how harvest regulations affect behavior and satisfaction of waterfowl hunters.

In spite of these difficulties, however, AHM remains one of the few large-scale, successful efforts to apply the principals of adaptive resource management. Thus, our goal here is to critically examine what has been learned from the process since its implementation in 1995. We focus principally on the functional elements of the process, and the technical difficulties inherent in making informed management decisions for complex natural resource systems. However, much of what has been learned has more to do with the nature and functioning of institutions than with biology and the impact of regulations, and so we discuss those social aspects as well. We first briefly describe the AHM process to provide a framework for organizing and describing important lessons for the future of this effort. We conclude with comments about the success of AHM and the difficult challenges that remain.

The AHM Process

AHM is framed in terms of sequential decision-making under uncertainty, more formally in terms of a stochastic control process (Puterman 1994). In this process, the manager periodically observes the state of the system (e.g., population size and relevant environmental features) and takes some management action (i.e., hunting regulations). Based on this action, the manager receives immediate benefits (e.g., harvest) and incurs costs that are relevant to the stated objectives of management. The resource system subsequently evolves to a new state, with the change influenced by the management action and other uncontrolled factors. The manager then observes the new system state, and makes a new decision. The goal of management is to make a sequence of such decisions, each based on information about current system status, so as to maximize net benefits over an extended time frame. A prescription of optimal management actions for each state of the system at each time constitutes a management strategy (or policy). These strategies can account explicitly for several sources of management uncertainty, including uncontrolled environmental variation, imperfect control over management effects, and incomplete knowledge of system dynamics (Johnson et al. 1997).

There are three fundamental components of AHM (or of any decision-making process):

(1) objectives that describe the preferred outcome of decision making, and that provide the metrics by which alternative decisions can be evaluated;

(2) a set of alternative actions, which in this case are represented by different sets of hunting regulations; and

(3) models that predict the consequences or outcomes of the alternative actions, in terms relevant to the stated management objectives.

A key feature of the AHM process is an explicit accounting for uncertainty about the impacts of regulations and uncontrolled environmental factors on waterfowl demographics. This uncertainty is expressed by a set of alternative system models, with each model empirically weighted in proportion to its predictive ability. The optimal regulatory decision in a given year is conditioned on both system state and the weights assigned to the alternative system models. Operational monitoring programs provide the basis for current regulatory decisions, as well as the means to compare predicted and observed management outcomes. Thus, AHM involves a 3-step process:

(1) each year, an optimal regulatory action is identified based on system state (i.e., population size and relevant environmental conditions) and on the weights associated with the alternative models of system dynamics;

(2) conditioned on the optimal regulatory action, model-specific predictions for the subsequent year's population size are determined; and

(3) when monitoring data from the subsequent year are available, model weights are updated to reflect the relative ability of each alternative model to predict the change in population size that actually occurred.

This process eventually will identify the model that most reliably predicts the population dynamics as a function of regulatory actions and other environmental factors. The current AHM approach is passively adaptive, in the sense that learning is an unplanned by-product of the regulatory process (Johnson et al. 1997). Actively adaptive strategies, in which there is a higher premium on learning, are currently under investigation.

Predicting Management Outcomes

Quantifiable predictions, which provide the basis for regulatory decisions and for future learning, depend on the availability of models describing system behaviors. In the case of AHM, these models must specify the differential effect of various hunting regulations, as well as uncontrolled environmental factors, on harvests and subsequent population size. Key system uncertainties are expressed by a set of alternative models, which represent competing hypotheses of system dynamics. Key considerations in this modeling process involve the breadth of system features to be considered, and the depth of the analysis. There are no manifest boundaries for defining natural systems or the limits of management responsibility and influence (Walters 1986, Levin 1992); therefore, the range and scale of system features to be considered must be guided closely by management goals and objectives. Morevover, modeling necessarily involves a process of synthesis, in which the fine-level detail of biological, physical, and social systems must be abstracted to predict relevant behaviors with a minimum of model complexity.

The modeling of waterfowl population dynamics has a long and rich history (Williams and Nichols 1990), but useful models for harvest management purposes remain somewhat illusive. Some of the limitations in model availability and their utility have been self-imposed. For example, managers have been preoccupied with the effects of duck harvest on annual survival for almost 50 years, in spite of the fact that changes in duck population size may be more sensitive to variation in reproductive success than in survivorship (Martin et al. 1979). Moreover, the investigation of harvest effects on survivorship has been dominated by a focus on statistical correlations, at the expense of mechanistic models of the mortality process (Johnson et al. 1993). In this respect, there has been too little attention on the nature of density-dependence in mortality and reproductive processes in waterfowl, even though density-dependence provides the theoretical foundation for sustainable harvesting (Hilborn et al. 1995). In cases where AHM has stimulated these investigations, researchers have been stymied by questions concerning the most likely environmental limiting factors, or by a paucity of demographic and environmental data at the necessary spatial and temporal scales. Clearly, the construction of useful models for harvest management depends on asking the right questions, and on the availability of data to stimulate the formation of useful hypotheses.

Another concern with the development of AHM models involves multiple sources of variation in waterfowl demographics (e.g., differences among species in rates of natural mortality), and the degree to which harvest strategies can or should account for those sources of variation. All ecological systems exhibit variability on a broad range of temporal, spatial, and organizational scales, ultimately as a function of how individual animals respond to their environment (Levin 1992). The manner in which individuals are aggregated (e.g., by spatially segregated populations of conspecifics) for management purposes is an arbitrary decision, but one that can strongly influence both the benefits and costs of management. Management approaches that account for important sources of ecological variation are expected to yield the highest benefits, but also are characterized by relatively high monitoring and assessment costs (Babcock and Sparrowe 1989, Sparrowe 1990). There also may be social costs, as regulatory complexity increases to account for differences in the capability of various stocks to provide sustainable harvests. Determining the optimal level of aggregation for harvest management depends critically on the availability of explicit performance criteria (i.e., costs and benefits), and on understanding patterns of ecological variation. Description of these ecological patterns, in turn, depends on sufficient data to investigate potential sources of variation and to suggest underlying causal mechanisms.

Although the history of waterfowl management has been characterized by efforts to account for increasingly more sources of variation in waterfowl demographics, we believe there is reason to question the efficacy of this approach (Sparrowe and Patterson 1987, Johnson and Williams 1999). As the spatial, temporal, and organizational scales at which harvest management is delivered become progressively smaller, we expect the marginal gain in management benefit to shrink (i.e., there is a point of diminishing return). At the same time, we believe management costs would continue to increase at a constant or even accelerating rate. Therefore, beyond some point, net benefit will decrease and may eventually become negative. Moreover, it seems that the limited resources typically available for waterfowl monitoring and assessment will constrain waterfowl managers to a fairly course grain approach to hunting regulations. At least this should be the case if managers are committed to ensuring that the resolution of harvest management is consistent with the monitoring and assessment programs designed to support that management. It remains to be seen what level of resolution ultimately will be most appropriate in the AHM process, but we are increasingly concerned about what we see as unrealistic expectations for accommodating small-scale variation in waterfowl population dynamics.

Finally, the productivity of the modeling enterprise has been limited by a lack of attention to the social components of the harvest-management process. After all, managers do not control harvests directly, but rather must rely on the manipulation of hunting regulations. It seems obvious that understanding the relationship between hunting regulations and harvests is critical to sound harvest management, yet little is understood about how regulations and other factors affect hunter activity and success. Unfortunately, past experience is of limited utility. In most cases, the complexity of historic hunting regulations, combined with inadequate replication and experimental controls, has prevented managers from drawing strong inference about the relationship between regulations and harvests (Nichols and Johnson 1989). Managers know even less about how human demographics and economic factors affect waterfowl hunting activity. There have been profound long-term changes in the number of waterfowl hunters in the United States that cannot be explained by changes in regulations. Clearly, reliable harvest predictions depend in part on a better understanding of factors other than hunting regulations that influence waterfowl hunter activity and success.

Regulatory Controls

In AHM, regulatory controls have direct and indirect effects, and both are important to effective harvest management (Williams and Johnson 1995). Direct effects are manifested as the size of the harvest and the size of the waterfowl population (during at least part of the annual cycle). Regulations also have indirect effects by influencing the understanding of how populations respond to harvest. The design of regulatory alternatives, therefore, is not a trivial task, and involves several key considerations. First, the number of regulatory alternatives must be small to facilitate their assessment, although the set of alternatives can be expanded or limited as the need and desirability to do so is recognized. Second, the alternatives should vary enough so that differences in resulting harvest levels and impacts on population dynamics can be detected by extant monitoring programs. Finally, the needs of law enforcement and the desires and abilities of hunters should be considered in the formulation of regulatory alternatives.

Throughout the process of defining regulatory alternatives, managers must be mindful that the link between hunting regulations and resulting harvest rates is imperfect, and that the associated uncertainty in the relationship between regulations and harvest has important consequences for the AHM process. Even repeated experience with particular regulatory alternatives has failed to eliminate the high degree of uncertainty regarding the extent to which realized harvest rates are commensurate with expectations. Variation in weather and habitat conditions, timing of migration, hunter success, and countless other uncontrolled factors result in regulation-specific harvest rates that can vary by as much as ±50 percent of the mean (Johnson et al. 1997). Additional uncertainty is introduced when there is little or no prior experience with particular regulatory alternatives, such as some of those in use since 1997. Moreover, most empirical assessments have raised doubts about managers' capability to manipulate harvest pressure independently on multiple waterfowl stocks using conventional regulatory tools (Hochbaum and Walters 1984, Rexstad and Anderson 1988, Rexstad et al. 1991, Johnson and Moore 1995). The implications of these sources of uncertainty can be profound. Generally, less precision in the prediction of harvest rates leads to more conservative and more "knife-edge" harvest strategies. We characterize strategies as "knife-edge" when only small changes in system state (e.g., population size) are required to precipitate very large changes in the optimal regulatory choice. Conservative harvest strategies, with frequent annual changes in hunting regulations, are not likely to win favor among waterfowl hunters. It is not yet clear, however, that the waterfowl management community is prepared to acknowledge the inherent limitations in the ability to control and predict harvests, and to develop regulatory alternatives that help avoid the most undesirable consequences of those limits.

Ultimately, the design of regulatory alternatives involves subjective decisions. The AHM process cannot define an acceptable set of regulatory alternatives any more than it can define a useful set of population models. In practice, the design of regulatory alternatives for AHM has been heavily influenced by tradition, where the historic motivations and rationale for regulatory choices often are unknown or outdated. Therefore, there is a strong temptation among managers to promote non-traditional regulatory alternatives that influence the amount and distribution of hunting opportunity in ways that currently are deemed desirable. And there's the rub: the design of regulatory alternatives inherently involves value judgements, for which empirical data regarding harvest and population impacts are of limited utility (other than to constrain regulatory alternatives within biological and legal limits). In the end, managers from various parts of the country must understand how hunter satisfaction is influenced by the nature of regulatory alternatives and seek solutions that meet the needs of diverse interests.

Management Objectives

Natural resource management is a process of using biological information to predict the outcomes of alternative management actions, and then using sociological information to assign value to those outcomes (Lee 1993). AHM can produce optimal regulatory decisions (i.e., those with the highest expected value) in the face of uncertainty or disagreement about the outcomes of harvest management, but if and only if there is agreement about management goals and objectives. The basic objective of the AHM process since 1995 has been to maximize long-term cumulative waterfowl harvest, recognizing of course that long-term population viability is essential to attaining that objective. Against the backdrop of this basic objective, constraints are used to reflect social, economic, administrative, political, ecological, or other considerations. Constraints limit achievement of the harvest objective by restricting allowable options and, thus, tend to reduce overall harvest opportunity.

Perhaps not surprisingly, the magnitude of the annual waterfowl harvest may not be the most appropriate metric for the objective of the AHM process. Most waterfowl managers seem more interested in maximizing hunter satisfaction, recognizing that this is affected only in part by harvesting success. This view is supported by recent human-dimensions studies that indicate hunter participation and satisfaction are not increased substantially by regulations that provide for the maximum allowable harvest (Enck et al. 1993, Ringelman 1997). Of concern, however, is evidence that managers continue to overestimate the importance of achievement-oriented factors in setting hunting regulations, ignoring evidence that waterfowl hunters are motivated to a large extent by the social and aesthetic aspects of the hunting experience (Ringelman 1997).

As early as 1993, there were discussions among those of us involved in AHM about framing objectives in terms that relate to hunter satisfaction rather than harvest (Johnson et al. 1993). We continue to see no theoretical problems in pursuing an objective defined in these terms, but clearly there are major challenges in application. In particular, what is the most appropriate metric of hunter satisfaction? How is it related to regulations and to attributes of the biological system (e.g., harvest and population size)? And what is the mechanism by which it would be monitored? The management community currently is ill-equipped to answer these questions. Certainly, a first step must involve a more systematic acquisition of information on hunter satisfaction, and how it is influenced by hunting regulations. In our experience, however, there seems to be a good bit of institutional resistance to human-dimension studies, perhaps due to privacy concerns, costs, and a general feeling of discomfort among wildlife managers who naturally would rather focus on biological systems. We also recognize that human-dimension information could make management even more difficult, by exposing the extent of demographic and geographic variation in hunter's opinions. We cannot help but believe, however, that empirical data about that which motivates waterfowl hunters will be useful for improving waterfowl management in a variety of ways, some of which may not be directly related to the AHM process.

Whether the basic currency of management performance is expressed in terms of harvest or hunter satisfaction, constraints on the regulatory process will continue to be an important aspect of AHM.

As we've discussed, current harvesting strategies and their associated performance are constrained by the inherent uncertainty associated with regulatory outcomes, but also by limitations purposely imposed by managers. An example of the latter is the population goal for midcontinent mallards from the North American Waterfowl Management Plan. Under conditions of poor population status and/or poor reproductive potential, the value of mallard harvest is devalued to help encourage population growth (Johnson et al. 1997). This constraint results in a regulatory strategy that is considerably more conservative than it would be in the absence of this constraint.

Other constraints are less obvious, particularly those involving the set of regulatory alternatives. For example, recent mallard population levels probably can sustain greater harvest pressure than that achieved even under the most liberal regulatory alternative currently available. Another example involves the constraining effect of regulatory alternatives on the frequency of regulatory changes. Frequent regulatory changes typically are deemed undesirable, and this can be addressed in part by specifying regulatory alternatives that produce large differences in expected harvests. However, to date there has been little effort within the AHM process to explore the relationship between regulatory alternatives and the expected frequency and magnitude of annual changes in regulations.

A difficult issue in the setting of harvest-management objectives involves the desired distribution or allocation of hunting opportunity among various parts of the country. In fact, a well-known scientist remarked in 1993 that failure to deal effectively with the issue of harvest allocation ultimately could lead to the "death" of AHM. For most of the history of AHM, however, there has been little attempt to address the issue in either an explicit or formal way. Recently, certain changes in the set of regulatory alternatives, as well as a growing awareness of long-term changes in harvest distribution, have elevated the issue to the forefront of management problems. The matter of "dividing up the pie" has become increasingly controversial, and now threatens to undo much of the progress that has been made since 1995. Unfortunately, the lack of an effective process or protocol for organizing debate, as well as a paucity of information on hunter satisfaction, continue to be formidable obstacles to resolving the issue. As a first step, the management community must attempt to agree on criteria that characterize "fairness" in harvest distribution (Brams and Taylor 1996), so that appropriate computing procedures can be developed for the AHM process. In the end, however, managers must recognize that the distribution of hunting opportunity and associated harvests are influenced heavily by uncontrolled variation in habitat and weather conditions. Therefore, in spite of what managers do with regulations, the notion that "someone else, somewhere else is getting all the ducks" may remain a common perception among waterfowlers.

Learning

The ability to gain knowledge of population dynamics through the manipulation of hunting regulations is well known. In fact, waterfowl researchers often have advocated experimenting with regulations to help resolve uncertainty about the effect of harvest on annual survivorship (e.g., Anderson et al. 1987). Generally, managers have resisted such "probing" (Walters 1986) actions, mostly because of the short-term risks to hunting opportunity that such experimentation entails. It is important to understand, however, that the focus of AHM is on neither short-term harvest nor on learning, but instead on regulations that provide an optimal balance of short- and long-term harvest benefits. Of course, the realization of long-term benefits ultimately depends on an ability to learn more about the nature of regulatory impacts. Therefore, we have begun to explore how various management-system features influence learning rates and expectations for long-term management performance. This much is already clear, however: the degree of regulatory control over harvests has a marked influence on the efficacy of probing actions and, thus, on the learning required to improve management over time (Johnson and

Williams 1999). This realization argues for regulatory alternatives that are sufficiently stable to provide the experience necessary for reliable and precise predictions of associated harvest rates.

We also see two other fundamental limitations on the ability to learn about regulatory impacts through the AHM process. The first involves the issue of replication and randomization of regulatory "treatments," and the associated impact on inferential strength (Nichols and Johnson 1989). In AHM, application of different regulatory alternatives occurs non-randomly because of the dependency of regulations on system state. Therefore, years with different regulations are characterized by systematic differences other than that associated with the regulatory treatment. This "statistical confounding" limits the confidence one can have that any observed effect was a consequence of differences in regulations. The ability to replicate regulatory treatments also is constrained because migratory birds do not form discrete populations that are spatially isolated. In the case of most waterfowl species, this means that replication of regulatory treatments occurs solely over time, thus limiting the strength of inferences about treatment effects and about the mechanisms underlying population dynamics.

The other limitation on learning involves the issue of system stability. It is at least conceivable that the model providing the most accurate description of population dynamics could change over time. For example, the mortality process in midcontinent mallards currently is characterized by two alternative forms, one assuming additive hunting mortality and one assuming a compensatory mortality process (Johnson et al. 1997). If the degree to which hunting mortality is additive to other sources of mortality depends on a density-dependent process (as virtually all scientists agree that it must), then changes in density (i.e., the number of birds per limiting resource) would result in changes in the most appropriate model. The ability of the AHM process to track these changes depends on both the magnitude and frequency of such changes (Johnson et al. 1993). If the changes in underlying population dynamics are too large or frequent, learning becomes essentially impossible because of limitations imposed by the precision of extant monitoring programs, and because of the role of past experience in the updating of model weights (Williams et al. 1996). We believe that the current AHM process for midcontinent mallards could suffer from this problem because there is evidence that the degree of additivity in hunting mortality has changed over time (W. L. Kendall, U.S.G.S. Patuxent Wildlife Research Center, unpubl. data).

Conclusions

Despite all of the limitations of the AHM process, it has proven to be incredibly valuable for providing structure and focus to the debate over appropriate hunting regulations. In the AHM process very little is left implicit, and managers are increasingly aware that disagreements over management objectives and possible outcomes cannot be "swept under the rug." Of course, AHM did not create these disagreements. They have been there all along, often manifesting themselves as contentious and bitter arguments over annual regulations. The great advantage of AHM is that it provides a means to agree on appropriate hunting regulations in the face of professional disagreement about the effects of hunting and other factors on waterfowl abundance. As we indicated earlier, however, AHM is not a process for resolving disputes over management objectives. Nonetheless, AHM can help inform and structure that debate by enabling managers to predict (probabilistically) in explicit and quantifiable terms the outcomes associated with alternative management objectives and constraints. For these reasons, we believe it may be the AHM process itself that is the most enduring benefit of the collective efforts to improve waterfowl harvest management.

Certainly, there is much more we could say about our experiences with AHM. Many of the lessons have been immediate and obvious (at least in retrospect), particularly those relating to the more technical aspects of the process. We believe the ultimate success of AHM, however, will depend much more on how the management community reacts to the limits to management performance that are being exposed by the process. Therefore, we conclude our discussion by restating what we believe to be three key institutional issues that pose the greatest challenges to the long-term success of AHM:

(1) goal setting - Effective management planning and evaluation depends on agreement among stakeholders about how to value harvest benefits, and how those benefits should be shared. Unresolved value judgements, and the lack of effective procedures for organizing debate, pose a serious threat to the viability of AHM (or to any other informed approach to management). Moreover, the lack of information on the attitudes and preferences of the nation's waterfowl hunters is a continuing problem in the effort to determine appropriate management objectives.

(2) limits to system control - There are rather severe practical limits to the ability to predict, control, and measure harvests and, therefore, significant constraints on short-term harvest yields and the learning needed to increase long-term performance. These limits cannot be overcome completely, and the management community must somehow balance expectations with reality in formulating regulatory strategies (Babcock and Sparrowe 1989).

(3) accounting for sources of variation in waterfowl demographics - The history of waterfowl management has been characterized by efforts to account for increasingly more spatial, temporal, and organizational variability in waterfowl biology. We question the wisdom of this approach, particularly given that resources for monitoring and assessment are always limited. In addition to the limits imposed by management costs, managers must recognize that the ability to optimize harvests of various waterfowl stocks depends on the capabilities to harvest selectively, some understanding of each stock's dynamics, and knowledge of interdependence in stock sizes. Managers currently face considerable uncertainty in meeting any of these criteria.

Coping with these institutional issues will require innovative mechanisms for producing effective dialogue, and for handling disputes within a process that all parties regard as fair. Ultimately, we will consider AHM an unqualified success if it motivates and guides this process of institutional self-examination and renewal.

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