FRIDAY, 5 FEBRUARY 2016		
Capital Ballroom		
08:20 - 09:40	**M.1: Plenary**	
8:20	**M.1.1: Plenary Michael Anderson** **From Coherence to Integration: Challenges of Multiple Scales, Decision Authorities, and Processes** (Michael G. Anderson*)	
9:00	**M.1.2: Plenary David Fulton** **Values Translated into Objectives: Engaging Waterfowl Stakeholders** (David C. Fulton*, Andrew Raedeke, Jason Spaeth, Michael Kilgore, Howie Harshaw, Gray Anderson, and Dale D. Humburg)	
09:40 - 10:00	*Coffee break*	
Capital Ballroom		
10:00 - 12:00	**N.1: Featured Session: Implementing the 2012 NAWMP Revision: Management Decisions to Integrate Multiple Objectives at Varying Scales** (Organizer: Dale D. Humburg)	
10:00 - 10:05	**N.1.1: Humburg**	**Introduction to the Session** (Dale Humburg*)
10:05 - 10:20	**N.1.2: Runge**	**Modeling and Managing Linkages across Objectives: Beyond the JTG** (Michael C. Runge)
10:20 - 10:35	**N.1.3: Vritska**	**Adaptive Harvest Management: Re-examining Harvest Objectives and Approaches** (Mark P. Vrtiska*, Min Huang, W. Adam Phelps, Paul I. Padding, James R. Kelley, Jr., and James A. Dubovsky)
10:35 - 10:50	**N.1.4: Carter**	**Integrating Human Dimension Considerations into Joint Venture Habitat Delivery** (Michael F. Carter*, Andy Bishop, and Beth Huning)
10:50 - 11:05	**N.1.5: Brasher**	**Focusing Resources on Important Landscapes: A Spatial Framework for Integrating NAWMP Objectives** (Michael G. Brasher*, Mark J. Petrie, David W. Howerter, and Dale D. Humburg)
11:05 - 11:20	**N.1.6: Eadie**	**Integrated Annual Cycle Models of North American Ducks: Progress, Pitfalls and Prospects** (John M. Eadie*, Robert G. Clark, Jane Austin, G. Scott Boomer, Pat Devers, Jim H. Devries, Brady J. Mattsson, Eric E. Osnas, and Michael C. Runge)
11:20 - 11:50	**N.1.7: Johnson**	**Plenary Fred A. Johnson** **Multi-Level Learning in Waterfowl Conservation** (Fred A. Johnson*, Dale D. Humburg, David J. Case)
11:50 - 12:00	**N.1.8: Humburg**	**Closing Comments: A Challenge to the Technical Community**

*Speaker; ^Student

M.1: Plenary

M.1.1: Plenary Michael Anderson

From Coherence to Integration: Challenges of Multiple Scales, Decision Authorities, and Processes

Michael G. Anderson[1]*

[1] Institute for Wetland and Waterfowl Research, Ducks Unlimited Canada, Stonewall, Manitoba, R0C 2Z0, Canada, m_anderson@ducks.ca

Waterfowl conservation has not yet explicitly integrated population, habitat, and user/supporter objectives in management actions. A more coherent system would feature the elements of an informed decision process; namely explicit objectives, system models, monitoring programs, and institutional processes to adapt to new information. Because waterfowl management decisions are made at multiple spatial scales, by multiple decision authorities within and among countries, at various time steps, and with varying degrees of system control, no grand optimization scheme is plausible, and no single entity possesses clear responsibility for such interrelated decisions. We might focus instead on identifying and aligning a few multi-objective management decisions at spatial and temporal scales where integration is most “natural” and co-dependencies most strong. Every decision need not include all three objective classes. A key challenge will be developing the monitoring programs necessary to help inform choices in the pursuit of multiple objectives, but the first step should be to identify the decision problems and associated model predictions and uncertainties of greatest importance. Increasing the adaptive capacity of waterfowl management should address each level in the learning process (so-called “triple-loop” learning). The innermost level focuses on predicting outcomes of routine management actions and monitoring to determine if those actions produce the predicted results. The second level focuses on whether we are doing the right things, including periodic revision of Plan objectives or posing alternative models of system dynamics. The outer most loop is about reviewing organizational structures and processes to enable efficient achievement of management objectives. While it may be useful to think about an overarching conceptual model of how a comprehensive integrated system might work, tangible progress seems more likely with more narrowly defined problems at smaller scales – and Plan partners have begun to explore the pursuit of multiple objectives at regional scales. I hope that we will continue to make progress in developing a coherent system of waterfowl management that is tractable and widely embraced, adaptive, and inclusive of the multiple goals of the 2012 NAWMP. A proximate technical challenge may be to specify the minimum necessary conditions for a coherent management system, given well described multiple objectives, and then engage agency leaders in aligning processes and institutions that will enable the adaptive pursuit of those objectives.

M.1.2: Plenary David Fulton

Values Translated into Objectives: Engaging Waterfowl Stakeholders

David C. Fulton[1]*, Andrew Raedeke[2], Jason Spaeth[3], Michael Kilgore[3], Howie Harshaw[4], Gray Anderson[5], Dale Humburg[6]

[1] U.S. Geological Survey, Minnesota Cooperative Fish & Wildlife Research Unit, University of Minnesota, Saint Paul, MN, 55108, USA, dcfulton@umn.edu
[2] Missouri Department of Conservation, Columbia, MO, 65201, USA

[3] University of Minnesota, Saint Paul, MN, 55108, USA
[4] University of Alberta, Edmonton Alberta, T6G2J9, Canada
[5] Tennessee Wildlife Resources Agency, Nashville, TN 37220, USA
[6] Ducks Unlimited, Inc., One Waterfowl Way, Memphis, TN 38120, USA

A critical aspect of the North American Waterfowl Management Plan (NAWMP) is the identification of goals and fundamental objectives for managing waterfowl and related resources. Such fundamental goals and objectives represent a statement of human values for desired future conditions of the resource and the social welfare or benefits provided by those conditions. In the Adaptive Management framework such fundamental objectives are defined by stakeholders through participatory and collaborative processes, but the specific processes and techniques that can be used for defining such fundamental objectives are not necessarily clear. We describe a process through the application of discrete choice methods that can provide a key source of data that can be used to inform and define fundamental objectives within an adaptive management framework. This approach is founded on Random Utility Theory originally developed by Thurstone in his method of paired comparisons and famously extended to multiple comparison choices by McFadden in his Nobel-winning work on discrete choice theory and methods. We are using this approach to quantify stakeholders' (waterfowl hunters and viewers) preferences (values) related to waterfowl-based recreational experiences to facilitate revisions of NAWMP objectives. The approach identifies the relative importance of different attributes of a waterfowl-related recreation experience, the utility curves of different levels within an attribute and the interactions and trade-offs among different attributes when making a choice about preferred experiences. Expected outcomes of the study include: 1) quantified measures of stakeholder preferences; 2) NAWMP objectives and management actions that are informed by the values and preferences of waterfowl and wetland stakeholders; 3) a focus on harvest management actions that will provide the greatest benefits in terms of stakeholder preferences within the context of what is biologically feasible. This science-based rigorous approach to developing fundamental objectives can make substantive contributions to the NAWMP adaptive management process.

N.1: Featured Session: Implementing the 2012 NAWMP Revision: Management Decisions to Integrate Multiple Objectives at Varying Scales (Organizer: Dale D. Humburg)

N.1.1: Humburg

Introduction to the Session

N.1.2: Runge

Modeling and Managing Linkages across Objectives: Beyond the JTG

Michael C. Runge[1]*

[1] U.S. Geological Survey, Patuxent Wildlife Research Center, Laurel, MD 20708 USA, mrunge@usgs.gov

In 2007, the Joint Task Group (JTG) described a framework for linking waterfowl harvest and habitat management by recognizing the shared dynamics that underlie both decision contexts. Although this was not meant to be an all-encompassing integrated framework for waterfowl management, the tantalizing concept of integration opened up discussions of the broad linkages among waterfowl

harvest, habitat, and human management. When broadening this focus, it is useful to recognize that the pursuit of multiple objectives is often complicated by tradeoffs among them, and multi-criteria decision analysis provides a set of useful tools for understanding and navigating these tradeoffs. There is a four-fold challenge in making decisions that affect the wide array of waterfowl objectives. First, all of the separate fundamental objectives need to be clearly articulated. This has proven to be difficult, but the methods described in Dr. Fulton's plenary provide some new promise. Second, the linkages among the objectives, as driven by various decision contexts, need to be understood. It might be useful to think about sets of objectives that need to be actively integrated, because there are decisions that directly affect them all, and sets of objectives that only need to be passively integrated, in the sense that achievement of one might be conditional on achievement of another, but they do not directly compete. Third, models need to be developed that predict the performance of the management alternatives against the multiple objectives, recognizing the linkages among the decision contexts and objectives. Fourth, for those objectives for which there are tradeoffs, a process of weighing the objectives is needed. A daunting set of challenges, but one made easier, perhaps, by recognizing two things: (1) not all of the decisions and objectives are linked, so several smaller models, rather than a comprehensive, fully integrated model, may suffice; and (2) the central role of predictive modeling provides a way to think about these linkages by thinking about how we could predict the effects of decisions on waterfowl, their habitats, and the humans who enjoy them.

N.1.3: Vritska

Adaptive Harvest Management: Re-examining Harvest Objectives and Approaches

Mark P. Vrtiska[1]*, Min Huang[2], W. Adam Phelps[3], Paul I. Padding[4], James R. Kelley, Jr.[5], James A. Dubovsky[6]

[1] Nebraska Game and Parks Commission, Lincoln, Nebraska, USA, mark.vrtiska@nebraska.gov
[2] Connecticut Department of Energy and Environmental Protection, North Franklin, Connecticut, USA
[3] Indiana Department of Natural Resources, Bloomington, Indiana, USA
[4] U.S. Fish and Wildlife Service, Laurel, Maryland, USA
[5] U.S. Fish and Wildlife Service, Bloomington, Minnesota, USA
[6] U.S. Fish and Wildlife Service, Lakewood, Colorado, USA

Adaptive harvest management (AHM) was implemented in 1995 as a process to set annual duck harvest regulations in the U.S., based on the population dynamics and status of Mid-continent mallards (*Anas platyrhynchos*). Given an agreed-upon management objective(s), this process provides a framework for making optimal decisions in the face of uncertainty about waterfowl demographics, responses to changes in the environment and harvest regulations. Since then, the AHM protocol has evolved to consider three separate stocks (Eastern, Mid-continent, and Western) of mallards. Periodically, stakeholders need to revisit the objectives of management to assess whether they have changed, determine whether changes to the model set are appropriate, and whether the regulatory alternatives should be revised. Both the Atlantic (Eastern ducks) and Mississippi/Central (Mid-continent ducks) Flyways are re-examining harvest management objectives, underlying population models, and potential approaches to duck harvest management. The harvest management objective initially developed in 1995 of maximizing cumulative harvest over the long term may not accurately reflect contemporary harvest management goals. Stakeholders are recognizing the need for an explicit consideration of hunter participation in the process, as recommended in the revised North American Waterfowl Management Plan (NAWMP). In the Atlantic Flyway, the formulation of a multi-stock decision framework explicitly acknowledges hunter demographics as a fundamental objective. The multi-stock framework also accounts for

habitat goals in conjunction with harvest management objectives to provide the necessary shared context for both sets of objectives. For the Mid-continent, all facets of AHM are being considered, including hunter participation. For example, stakeholders are reconsidering whether the NAWMP population goal should be retained in the objective function, and whether a multi-stock approach to duck harvest management is preferable and feasible. Because the key to implementation of a successful management program is identification of clear and unambiguous objectives, resolution of these issues is a necessary first step in the process.

N.1.4: Carter

Integrating Human Dimension Considerations into Joint Venture Habitat Delivery

Michael F. Carter[1]*, Andy Bishop[2], Beth Huning[3]

[1] Playa Lakes Joint Venture, 2575 Park Lane, Lafayette, CO 80027 USA, mike.carter@pljv.org
[2] Rainwater Basin Joint Venture, 2550 N. Diers Ave., Ste Grand Island, NE 68803 USA
[3] San Francisco Bay Joint Venture, 735 B Center Blvd. Fairfax, CA 94930 USA

The 2012 NAWMP Plan revision recommends integration among traditional waterfowl management institutions but also suggests integration among disciplines. One such discipline is human dimensions (HD). We are finding, especially among habitat managers, that occasionally using a technique (e.g. do a survey) to understand an aspect of HD relative to a decision by clients is not a challenging practice or particularly new. However, institutionalizing human dimensions work to the point of routinely and correctly using it and incorporating results into adaptive management loops is completely new. With this Plan revision, the joint venture community began regional experiments designed to better understand and demonstrate how HD work could be integrated into habitat management decisions. We present three case studies demonstrating this integration by three joint ventures using habitat delivery to serve viewers, hunters and the general public. The first case study will focus on the ecological goods and services (EG&S) work done by Playa Lakes Joint Venture to tie playa conservation efforts to Aquifer recharge which will benefit the general public. Landowner surveys and focus groups have informed playa conservation messages and strategies, resulting in the development of a replicable, prioritized, targeted playa restoration process in the Texas Panhandle, working within small focal areas. The second case study, from Rainwater Basin Joint Venture, demonstrates how hunter satisfaction surveys guided habitat restoration decisions. And the third will show how the SFBJV used human dimensions methods to understand how to improve habitat delivery to benefit viewers in an urban setting. Each of these local experiments uses data driven processes to inform adaptive management decisions. We end with a general survey of all joint ventures and their progress in implementing the 2012 revision through use of human dimensions work.

N.1.5: Brasher

Focusing Resources on Important Landscapes: A Spatial Framework for Integrating NAWMP Objectives

Michael G. Brasher[1]*, Mark J. Petrie[2], David W. Howerter[3], Dale D. Humburg[4]

[1] Ducks Unlimited, Inc., Gulf Coast Joint Venture, Lafayette, LA 70506, USA, mbrasher@ducks.org
[2] Ducks Unlimited, Inc., Pacific Northwest Office, Vancouver, WA 98683, USA
[3] Institute for Wetland and Waterfowl Research, Ducks Unlimited Canada, Stonewall, MB R0C 2Z0,

Canada
[4] Ducks Unlimited, Inc., One Waterfowl Way, Memphis, TN 38120, USA

The 1986 NAWMP and subsequent updates emphasized the need to focus conservation resources in areas most important to waterfowl demography. Indeed, advancements in geospatial technology and databases have enabled more thoughtful identification of priority areas for habitat conservation to achieve NAWMP population objectives. Examples include continental scale efforts like the NAWMP map of areas considered most important to waterfowl populations and various regional scale, conservation targeting tools. Thus far, such efforts have not considered the social elements which are critical components of the integrated goals of the 2012 NAWMP, particularly the goal of growing populations of resource users and conservation supporters. Spatial targeting of waterfowl habitat conservation has clear linkages to providing or enhancing ecological goods and services as a means of growing conservation support, but it is increasingly postulated that strategically targeted habitat delivery may also contribute to growing numbers of hunters and other resource users by providing effectively located access opportunities. As such, spatially-explicit decision support systems are envisioned as useful frameworks for integrating and optimizing habitat conservation delivery to benefit NAWMP waterfowl population and social goals. Waterfowl demographics and social dynamics associated with habitat conservation are inherently complex and vary at ecological and political scales. Consequently, such tools will likely have greater impact at regional scales where knowledge of system dynamics is most detailed and decision bodies for allocating resources are well established. We will discuss ongoing efforts to develop prototype tools for targeting habitat conservation to achieve multiple NAWMP goals, at both regional and continental scales. This will include presentation of hypothesized relationships among spatial variables and waterfowl population and user-supporter objectives, as well as consideration of tradeoffs and valuations (i.e., weightings) among objectives. Limitations of existing knowledge and spatial datasets, as well as adaptive implementation and refinement of resulting tools will also be discussed.

N.1.6: Eadie

Integrated Annual Cycle Models of North American Ducks: Progress, Pitfalls and Prospects

John M. Eadie[1]*, Robert G. Clark[2], Jane Austin[3], G. Scott Boomer[4], Pat Devers[4], Jim H. Devries[5], Brady J. Mattsson[6], Eric E. Osnas[7], Michael C. Runge[7]

[1] Department of Wildlife, Fish & Conservation Biology, University of California, Davis, One Shields Avenue 95616, USA, jmeadie@ucdavis.edu
[2] Environment Canada and Department of Biology, University of Saskatchewan, 115 Perimeter Road, Saskatoon, Saskatchewan S7N0X4, Canada
[3] US Geological Survey, Northern Prairie Wildlife Research Center, 8711 37th Street SE, Jamestown, ND 58401, USA
[4] U.S. Fish & Wildlife Service, 115 Merriam Lab, 11510 American Holly Drive Laurel, MD 20708-4016, USA
[5] Ducks Unlimited Canada, P.O. Box 1160, Stonewall, MB R0C2Z0, Canada
[6] Department of Integrative Biology and Biodiversity Research, University of Natural Resources and Life Sciences, Vienna, Austria
[7] U.S. Geological Survey, Patuxent Wildlife Research Center, Laurel, MD 20708 USA

The North American waterfowl management community is working to better integrate harvest management, habitat conservation and the interests of people (human dimensions). A significant challenge has been to articulate the linkages among these components and to develop decision support frameworks to guide management actions in light of alternative and often conflicting

management objectives. Annual cycle models have been developed for several duck species of conservation concern and all share a common purpose in defining the linkages between habitat management actions at regional levels (e.g., Joint Ventures), and population and harvest dynamics at a continental scale. Here, we explore recent progress, identify challenges that have emerged, and suggest directions for future progress. These efforts have demonstrated, first, that it is fully possible to link habitat and harvest management across scales and second, that an integrated approach can inform conservation allocation decisions. Furthermore, a broad stakeholder community has been engaged to develop model components and motivate a deeper understanding of the complex processes that link dynamics across scales. Effectively capturing spatial and temporal dynamics and modeling integration across scales remains a challenge for all annual cycle models. Developing parameterized functional relationships will also be an ongoing task in the face of limited data, uncertainties about key vital rates, and the form and strength of density-dependence. Finally, our understanding of the dynamics of human dimensions is in its infancy. Efforts are underway to better define the functional relationships between waterfowl populations, harvest regulations, and the desires and contributions of end-users. Existing models should be developed to completion, as these will inform all future efforts at integrated management. Similar approaches should be considered for other species and perhaps guilds of ducks that share similar life-histories. Perhaps the greatest utility of such efforts will be the engagement of managers and stakeholders in the process of identifying objectives, specifying underlying assumptions, and posing hypotheses about the linkages that connect regional processes to continental dynamics. Finally, these models will be useful for evaluating alternative management scenarios and providing insights about trade-offs and consequences inherent in multi-objective decision-making.

N.1.7: Johnson

Plenary Fred A. Johnson
Multi-Level Learning in Waterfowl Conservation

Fred A. Johnson[1]*, Dale D. Humburg[2], David J. Case[3]

[1] Wetland and Aquatic Research Center, U.S. Geological Survey, 7920 NW 71 Street, Gainesville, FL 32038 USA, fjohnson@usgs.gov
[2] Ducks Unlimited, Inc., One Waterfowl Way, Memphis, TN 38120 USA
[3] D.J. Case & Associates, 317 E. Jefferson Blvd., Mishawaka, IN 46545, USA

The 2012 revision of the North American Waterfowl Management Plan is part of a growing trend in conservation in which social and ecological systems are seen to be linked, with each affecting the behaviors of the other. The approach has less to do with regulating a steady stream of ecological goods and services and more to do with expanding the capacity of socio-ecological systems to cope with uncertainty and adapt to change. This “resilience” perspective emphasizes the need for continual learning at multiple scales, with careful attention to cross-scale effects and feedbacks. Adaptive management can play a critical role in building a culture of learning, in which the focus is on planned, iterative learning for problems that are well bounded and conservation objectives and actions are tightly linked. But adaptive management can also foster social learning about the objectives and actions used to frame and determine (adaptive) management policies, and the forms of resource governance that are conducive to healthy, resilient socio-ecological systems. Social learning will necessarily be less structured than adaptive management and will be more discontinuous in time and space. We discuss these ideas about learning in the context of waterfowl harvest and habitat management, and the desire to make waterfowl conservation relevant to broader societal interests. Going forward, we suggest that the waterfowl management community must embrace an effort to better understand the relationship between waterfowl and people, and how that

relationship can change over time. Critical to this effort will be mechanisms for monitoring and analyzing the values of diverse stakeholders within the context of a changing socio-ecological system, and for understanding the extent to which those values are shaped by what managers do.

N.1.8: Humburg

Closing Comments: A Challenge to the Technical Community