

North American Waterfowl Management Plan Science Support Team
Technical Report No. 2012-1

**Report on Outcomes and Recommendations from the
Demographics Objectives Workshop**

Anne Bartuszevige,
Playa Lakes Joint Venture

Michael G. Brasher, Ducks Unlimited, Inc.
Gulf Coast Joint Venture

Pat Devers, U.S. Fish & Wildlife Service
Black Duck Joint Venture

Dave Howerter, Ducks Unlimited Canada
Prairie Habitat Joint Venture

David Olson, U.S. Fish & Wildlife Service
Region 6 Migratory Birds & State Programs

**A product of the Demographics Objectives Committee
of the NAWMP Science Support Team**

Recommended citation:

Bartuszevige A., M.G. Brasher, P. Devers, D. Howerter, and D. Olson. 2012.
Report on Outcomes and Recommendations from the Demographics Objectives
Workshop. North American Waterfowl Management Plan Science Support Team
Technical Report No. 2012-1. 12pp.

ABSTRACT

In 2009, the NSST Alternative Performance Metrics (APM) Committee identified a limited number of alternative performance metrics to be adopted and implemented by the NAWMP Committee and Joint Ventures (NSST Technical Report 2009-1). The APM Committee developed guidance for advancing beyond financially and area-based objectives and accomplishment metrics to those more meaningful for assessing biological impacts of conservation actions.

Although development of these recommendations represented a significant accomplishment, tangible advancements in measuring biological effectiveness of conservation actions will occur only if the recommendations are adopted by the NAWMP community. The NSST identified as a priority item in its 2012 – 2016 Work Plan the need to continue shepherding these recommendations and to facilitate their implementation. Thus, the NSST Demographic Objectives Committee was established in 2010 with the primary goal of developing methods for setting demographic objectives (i.e., vital rates) at BCR/JV-scales for focal waterfowl species.

The NAWMP Science Support Team's (NSST) Demographic Objectives Committee convened a workshop on 14-15 June 2011 in Corpus Christi, Texas to solicit input from Joint Venture representatives on their efforts to establish regional-scale demographic objectives, logistical and technical challenges to doing so, and opportunities and strategies to expedite the surmounting of those challenges. To catalyze workshop discussions, each attending JV representative was asked to deliver a presentation describing the biological models used to establish waterfowl habitat objectives within their region and the extent to which their models were linked to vital rate objectives. Primary objectives of the workshop were to: 1) provide peer review of current JV biological modeling approaches; 2) establish a commitment from JVs to begin developing demographic objectives within the next 5 years where they do not already exist; and 3) develop a clear understanding of the most appropriate strategies for measuring habitat conservation impacts on key vital rates.

Workshop recommendations for establishing objectives and measuring accomplishment in terms of demographic rates are included in this report and are summarized as follows: promote completion of pintail, scaup, and black duck annual cycle models; develop an annual cycle model for a generic dabbling duck, perhaps based on mallard demographics; and develop strategies to communicate the value and utility of integrated annual cycle models and demographic objectives.

**Report on Outcomes and Recommendations from the
Demographics Objectives Workshop
Corpus Christi, TX, June 14 – 15, 2011**

Objectives for landscape-scale waterfowl habitat conservation and metrics of success are commonly expressed in currencies that depict area impacted by conservation actions (e.g., acres, hectares). Although area-based habitat objectives are derived from scientifically informed species-habitat models that calculate amounts of habitat needed to satisfy resource needs of target populations, rarely do these models estimate incremental impacts of conservation accomplishments on population demographic rates and resultant population growth. Limited resources available for waterfowl habitat conservation requires that resource management practitioners focus on activities and/or regions that produce the greatest biological returns (i.e., greatest impact on target demographic rates) on conservation investments. Quantifying incremental changes in population dynamics attributable to habitat conservation actions, and therefore determination of the most efficient use of limited resources, depends on understanding functional relationships between key demographic rates and habitat features and conditions targeted by conservation programs.

The North American Waterfowl Management Plan (NAWMP) community is being urged to achieve greater conservation efficiencies through strategic investment of resources and development of capabilities to measure the biological impacts of those investments. Indeed, these have been identified as essential steps for achieving NAWMP goals in an era of limited resources and competing demands for productive waterfowl landscapes. Specifically, the NAWMP Continental Assessment (Assessment Steering Committee 2007) recommended that,

“...partners...strive to develop better performance metrics that reflect the impacts of partner actions on waterfowl populations...,” and

“...every JV should develop explicit, biologically-based planning model(s) that predict how on-the-ground habitat actions will affect vital rates or population responses. Such an approach would, minimally, oblige JVs to articulate key assumptions or uncertainties, develop appropriate evaluation plans and provide a basis for further refinement of planning models.”

Moreover, the Joint Task Group (Anderson et al. 2007) responsible for clarifying the role of NAWMP population objectives in waterfowl harvest management urged that,

“...the waterfowl community focus more scientific efforts on reducing the key ecological uncertainties surrounding current models of population dynamics (e.g., density dependence) and the relationships between waterfowl vital rates, carrying capacity (K), and landscape properties that habitat managers strive to manipulate.”

In response to these recommendations, the NAWMP Science Support Team (NSST) established

in 2008 an Alternative Performance Metrics (APM) Committee for the purpose of identifying a limited number of alternative performance metrics to be adopted and implemented by the NAWMP Committee and Joint Ventures (JVs). The APM Committee developed the following guidance for advancing beyond financially and area-based objectives and accomplishment metrics to those more meaningful for assessing biological impacts of conservation actions:

- i. JVs should frame their accomplishments in terms of changes in demographic parameters (i.e., season-specific vital rates).
- ii. All JVs should adopt the annual life cycle model as the basis of their monitoring program.
- iii. Individual JVs should develop conceptual models or, where data exist, empirical models to explicitly describe how habitat management actions influence vital rate(s).
- iv. At the JV scale this framework should be used to complement traditional metrics including number of acres protected, enhanced, or restored, dollars spent, and dollars leveraged.
- v. At the continental scale, this framework will complement the current metric of comparing continental population size to the population goal.
- vi. In the long-term, JVs should incorporate the influence of both their management actions and population size on vital rates, as this will enable managers and researchers to understand the impact of density-dependence on management actions and vital rates.

Although development of these recommendations represented a significant accomplishment, tangible advancements in measuring biological effectiveness of conservation actions will occur only if the recommendations are adopted by the NAWMP community. The NSST identified as a priority item in its 2012 – 2016 Work Plan the need to continue shepherding these recommendations and to facilitate their implementation. Thus, the Demographic Objectives Committee was established by the NSST in 2010 with the primary goal of developing methods for setting demographic objectives (i.e., vital rates) at BCR/JV-scales for focal waterfowl species.

Several groups within the NAWMP Community have made progress in developing waterfowl annual cycle models that link effects of harvest and habitat management to population dynamics. For example, Mattsson et al. (2012), in collaboration with the NSST's Pintail Action Group, developed an annual cycle metapopulation modeling framework for northern pintails that uses density-dependent relationships between key vital rates and surrogates for habitat quality and quantity to predict the impacts of regional-scale conservation actions on continental population dynamics. Similarly, the Black Duck JV is developing an integrated model that links population dynamics to habitat conditions and will enable objective evaluation of competing hypotheses of how and which habitat features have the greatest impact on black duck vital rates. Additionally, the NSST's Scaup Action Team has made significant strides in modeling the impacts and tradeoffs of resource investments and management decisions on scaup habitats, harvest regulations, and resource users and their integrated effects on scaup population dynamics. Despite these accomplishments, the degree to which individual JVs were

developing regional-scale demographic objectives and their implications for habitat objectives remained unclear.

WORKSHOP DESCRIPTION

As a first step to achieving its objective, the Demographic Objectives Committee convened a workshop on 14 – 15 June 2011 in Corpus Christi, Texas to solicit input from JV representatives on their efforts to establish regional-scale demographic objectives, logistical and technical challenges to doing so, and opportunities and strategies to expedite the surmounting of those challenges. To catalyze workshop discussions, each attending JV representative was asked to deliver a presentation describing the biological models used to establish waterfowl habitat objectives within their region and the extent to which their models were linked to vital rate objectives. Primary objectives of the workshop were to: 1) provide peer review of current JV biological modeling approaches; 2) establish a commitment from JVs to begin developing demographic objectives within the next 5 years where they do not already exist; and 3) develop a clear understanding of the most appropriate strategies for measuring habitat conservation impacts on key vital rates.

WORKSHOP PRESENTATIONS

Fourteen habitat JVs and 3 species JVs and/or Action Groups were represented at the workshop (Table A.1). Presentations from JV representatives revealed that few possessed empirical data and analytical capabilities to develop quantitative models relating habitat features and conditions to changes in waterfowl vital rates. The Prairie Habitat JV reported having an empirical model that enabled predictions of the impacts of habitat gains or losses on incremental changes in waterfowl vital rates and subsequent population growth. Similarly, the Prairie Pothole JV described empirical models that predict duck recruitment based on landscape-scale habitat conditions, as well as models that enable targeting of conservation efforts based on relationships between breeding pair density and landscape features (i.e., thunderstorm map). However, these models have not yet been used to forecast demographic impacts of habitat gains or losses, nor have they have been used to establish habitat objectives based on target demographic rates. As a positive development, most JVs have now identified the key vital rates they expect to affect through conservation actions within their regions, and many have made the conceptual relationships between vital rates and conservation accomplishments explicit (e.g., non-breeding season survival and availability of dietary energy on landscape). Only a few JVs had not yet explicitly identified vital rates to be impacted through priority conservation actions in their region.

To continue building toward a system where all JVs are able to tie conservation actions to waterfowl demography, the following steps are recommended:

- i. If not already completed, JVs should specify the vital rates targeted by conservation actions within their planning region.
- ii. JVs should complete conceptual models linking conservation actions to population demographics. JVs with fewer waterfowl responsibilities (or with a dearth of data

- available to parameterize models) should collaborate with neighboring JVs to apply generalized models developed for similar habitats.
- iii. Consider whether local objectives are consistent with habitat quantity and quality objectives for other JVs within a given flyway.
 - iv. Demonstrate that habitat objectives incorporate appropriate levels of resource redundancy and articulate how this was determined.
 - v. Partner with JVs sharing relevant resources to develop options for rolling-up population outcomes from JV to Flyway scales.
 - vi. If data are currently unavailable for developing demographic objectives, identify specific variables to monitor and the data required to validate models. This should be considered in light of the need for common currencies at cross-JV scales to facilitate aggregation of data for subsequent roll-up.
 - vii. Develop models with the capacity to establish demographic objectives. If data are currently lacking, rapid prototype models should be created using data from neighboring JVs or published literature. These models should explicitly incorporate hypotheses about if/how density dependence affects demographic responses.

Presentations were also delivered by representatives of the Scaup Action Team, Pintail Action Group, and Black Duck JV to update attendees on the progress and details of annual cycle models being developed by each of these groups. This series of presentations proved valuable for revealing similarities among the modeling efforts as well as the extent to which they differed in their structure, degree of sophistication, progress towards completion, and utility for informing waterfowl habitat and harvest management decision making. Some were viewed as stronger in their linkage to an adaptive decision making framework, while others were more advanced in their ability to forecast impacts of regional-scale conservation actions on continental population dynamics. Nevertheless, all were viewed as informative for helping attendees better understand the variety of annual life cycle modeling frameworks that could be used to help JVs link habitat features to demographic rates. Additionally, these modeling efforts addressed 3 duck species that vary in habitat affinities, geographic distribution, and life history strategies; thus enabling workshop participants to contemplate adaptability of these modeling frameworks for other species as well as consider potential focal species around which models could be based. Representatives from these groups expressed interest in greater synergies and collaborations, as their collective expertise and shared experiences would likely accelerate model developments. Some opined that perhaps the Demographic Objectives Committee could facilitate further interactions among these groups through a structured workshop in the near future.

WORKSHOP BREAKOUT SESSION

A breakout session was organized as a mechanism to facilitate discussions about: 1) how interactions among JV representatives could facilitate identification of common currencies and accelerate refinements to extant biological models; 2) which vital rates are likely most important to target with conservation actions in different regions and time periods; 3) the functional form of relationships between vital rates and conservation actions (or habitat features affected by conservation actions); 4) how these relationships might be incorporated

into annual cycle models; 5) the value of annual cycle models and measures of demographic change in addressing accountability obligations at JV and international scales; and 6) how to identify attributes of a focal species amenable to annual cycle model development.

Representatives from each of the three breakout groups delivered brief presentations to summarize discussions and conclusions of their group.

Workshop participants recognized the value of using empirical models to predict impacts of conservation actions on demographic objectives and as a key component of integrated models that enable objective resource allocation decisions. Although it was widely recognized that improvements to conservation efficiency theoretically could be gained through a refined understanding of relationships between vital rates and habitat conditions, some workshop participants questioned whether the gains in efficiency would be worth the costs required to develop and populate sophisticated annual life cycle models. Rather than increasingly sophisticated models, it was opined that targeted efforts to refine assumptions and parameter estimates of simpler models may be sufficient to establish habitat objectives that prevent selected vital rates from becoming a limiting factor for population growth. The use of bioenergetics models to establish habitat objectives for non-breeding regions and time periods was offered as an example in which sufficient foraging resources could prevent natural mortality during non-breeding periods from becoming a limitation to population growth.

While these models may be sufficient to plan conservation programs within a given JV, workshop participants were unanimous in the recognition that annual cycle models are indeed the most relevant framework for translating regional-scale conservation actions into incremental changes in continental population growth.

Regardless of whether JVs formally establish demographic objectives, all workshop participants agreed that integrated annual cycle models remain valuable and worth pursuing for the following reasons:

1. They provide a formal framework within which to link habitat conservation actions, harvest management decisions, and landscape conditions to a common demographic currency (i.e., incremental population change).
2. They provide a mechanism for objectively weighing trade-offs (costs and benefits) among different and potentially competing conservation actions, which enables more informed resource allocation decisions.
3. They enable predictions of the consequences of landscape change (or manipulations) on demographic rates and population size, which may be used to inform risk analyses and conservation priorities.
4. Their development requires careful articulation of hypotheses of functional relationships between habitat and demographic parameters and the potential role that density dependence plays in those relationships.
5. Sensitivity analyses performed on annual cycle model parameters provide opportunities to identify those demographic rates and conservation actions having greatest impact on

waterfowl populations, and likewise, those that do not merit serious attention from waterfowl habitat and harvest managers.

Discussions in breakout sessions also led groups to suggest it would be advantageous to select a subset of species (i.e., focal species) whose range and resource requirements encompass a significant portion of all waterfowl habitats across the continent, as opposed to developing unique models for every species. Ultimately, JVs will be asked to report accomplishments for only those species for which their JV region is of significant value.

WORKSHOP RECOMMENDATIONS

Workshop participants were asked, in closing, for their input on how this committee and the entire NSST should proceed towards adoption of recommendations for establishing objectives and measuring accomplishment in terms of demographic rates. Suggestions from workshop participants can be summarized into three general areas: promote completion of pintail, scaup, and black duck annual cycle models; develop an annual cycle model for a generic dabbling duck, perhaps based on mallard demographics; and develop strategies to communicate the value and utility of integrated annual cycle models and demographic objectives. Specific strategies and insights associated with these suggestions were as follows:

1. Promote completion of pintail, scaup, and black duck annual cycle models
 - a. Encourage NSST members to engage with groups developing integrated annual cycle models
 - b. Have NSST provide technical review of annual cycle and regional models currently under development, to include examination and refinement of functional relationships among habitat features and key vital rates
 - c. Use existing data to validate model outcomes and test model assumptions, and/or help design studies or programs to collect data necessary for testing model assumptions
 - d. Advocate for funding in support of these efforts and promote the use of postdocs as an efficient approach for advancing model development
 - e. Host a structured workshop among participants of annual cycle modeling efforts to explore commonalities, identify potential synergies, and consider the appropriate involvement of NSST in developing integrated life cycle models
2. Develop annual cycle model for a generic dabbling duck, perhaps based on understanding of mallard demographics
 - a. Use this model as a tool to demonstrate the value of annual cycle models and as a framework for building an annual cycle model with limited data (i.e., as a template for less studied species)
 - b. Eventually develop as a fully functional annual cycle model for mid-continent, eastern, and/or western mallard populations
 - c. Consider potential use of a generic model in facilitating the extension of waterfowl models to other waterbird groups

3. Develop strategies to communicate the value and utility of annual cycle models and demographic objectives
 - a. Look for opportunities to provide leadership in advocating for use of annual cycle models and vital rate objectives across JVs sharing target resources
 - b. Develop communications plan for disseminating the findings and products of the pintail, scaup, and black duck modeling efforts (e.g., peer-reviewed articles, workshops at appropriate venues)
 - c. Seek opportunities to deliver presentations and products that demonstrate value of annual cycle models to JV Management Boards, Flyway technical committees, other relevant audiences as a way to achieve buy-in and additional support
 - d. Generate a report that depicts rapid prototype models with key demographic parameters and functional relationships linking management actions to demographic parameters and population growth

PROPOSED NEXT STEPS FOR THE DEMOGRAPHIC OBJECTIVES COMMITTEE

Identification of priority next steps for the Demographic Objectives Committee was deemed important to ensure we continue to build of the momentum and interest that currently exists in this effort. To that end, we propose the following as near-term priority action items for our Demographic Objectives Committee:

1. Conduct a joint workshop for the groups currently developing waterfowl annual cycle models to promote modeling consistencies, enable collaboration, and explore the potential for developing a generic annual cycle model. ***(Summer or Fall 2013)***
2. Identify waterfowl species that should be the focus of additional annual cycle models. ***(Summer or Fall 2013 at the workshop)***
3. Develop a white paper to clearly describe how annual cycle models for multiple species and demographic objectives for multiple JVs may be simultaneously used to inform and improve resource management decisions to benefit waterfowl and other migratory birds and especially to effectuate a roll-up of JV contributions to the achievement of NAWMP goals. ***(Fall 2013 or Spring 2014)***
4. Work with JV science staffs to hypothesize functional relationships between habitat features and waterfowl vital rates to form the basis for parameterization of a generic annual cycle model. ***(Fall or Winter 2013 after the workshop)***
5. Identify critical data needs for advancing the development of annual cycle models and demographic objectives. ***(Summer or Fall 2013 at the workshop)***

LITERATURE CITED

- Anderson, M. G., D. E Caswell, J. M. Eadie, J. T. Herbert, M. Huang, D. D. Humburg, F. A. Johnson, M. D. Koneff, S. E. Mott, T. D. Nudds, E. T. Reed, J. K. Ringelman, M. C. Runge, and B. C. Wilson. 2007. Report from the Joint Task Group for Clarifying North American Waterfowl Management Plan Population Objectives and Their Use in Harvest Management.
- Assessment Steering Committee. 2007. North American Waterfowl Management Plan Continental Progress Assessment. Canadian Wildlife Service, U.S. Fish and Wildlife Service, Secretaria de Medio Ambiente y Recursos Naturales.
- Mattsson, B. J., M. C. Runge, J. H. Devries, G. S. Boomer, J. M. Eadie, D. A. Haukos, J. P. Fleskes, D. N. Koons, W. E. Thogmartin, and R. G. Clark. 2012. A modeling framework for integrated harvest and habitat management of North American waterfowl: Case-study of northern pintail metapopulation dynamics. *Ecological Modelling* 225:146-158.

Appendix

Table A.1. Attendee list for Demographic Objectives Workshop, 14-15 June 2011, Corpus Christi, TX.

Name	Affiliation
Anne Bartuszevige	Playa Lakes Joint Venture
Carol Beardmore	USFWS, Sonoran Joint Venture
Mike Brasher	Ducks Unlimited, Inc., Gulf Coast Joint Venture
Steve Brock	USFWS, Lower Mississippi Valley Joint Venture
Bob Clark	Canadian Wildlife Service
Jorge L. Coppen	USFWS, Division of Bird Habitat Conservation
Steve Cordts	MN Department of Natural Resources, Miss Flyway Rep
Steve DeMaso	USFWS, Gulf Coast Joint Venture
Patrick Devers	USFWS, Black Duck Joint Venture (remote)
Kevin Doherty	USFWS, Prairie Pothole Joint Venture
John Eadie	University of California - Davis
Dave Gordon	USFWS, Division of Bird Habitat Conservation
Dave Howerter	Ducks Unlimited Canada, Prairie Habitat Joint Venture
Todd Jones-Farrand	USFWS, Central Hardwoods Joint Venture
Rex Johnson	USFWS, Habitat and Population Evaluation Team
Tim Jones	USFWS, Atlantic Coast Joint Venture
Luke Naylor	AR Game & Fish, Lower Miss Valley Joint Venture
Mark Petrie	Ducks Unlimited, Inc.; Pacific Coast, Central Valley, and Intermountain West Joint Ventures (remote)
Stuart Slattery	Ducks Unlimited Canada, Prairie Habitat Joint Venture
Christina Sloop	San Francisco Bay Joint Venture
Greg Soulliere	USFWS, Upper Mississippi River and Great Lakes JV