FRIDAY, 5 FEBRUARY 2016		
Capital D **13:20 - 15:20**	**O.2: The Pride of the Salt Marsh: Status and Future Conservation of the American Black Duck** (Organizer: Pat Devers)	
13:20	**O.2.1: Serie**	**Early History of Concern for the American Black Duck and Formation of the Black Duck Joint Venture** (Jerome R. Serie*, Brigitte Collins, Robert J. Blohm, Ken Ross)
13:40	**O.2.2: Sauer**	**Development and Implementation of the Eastern Breeding Waterfowl and Habitat Survey** (John Sauer,*, Daniel Bordage, Mark Koneff, Guthrie Zimmerman)
14:00	**O.2.3: Conroy**	**Development and Implementation of an International Black Duck Harvest Strategy** (Michael J. Conroy*, Eric T. Reed, Paul I. Padding, Mark D. Koneff, Patrick K. Devers)
14:20	**O.2.4: Robinson**	**Integrating Habitat and Population Dynamics: Achieving NAWMP Goals Through the Use of an Annual Life Cycle Model** (Orin Robinson*, Conor McGowan, Patrick K. Devers)
14:40	**O.2.5: Devers**	**Testing the Winter Limitation Hypothesis Using a Two-Season Banding Program** (Patrick K. Devers,*, Guthrie S. Zimmerman, and G. Scott Boomer)
15:00	**O.2.6: Darveau**	**American Black Duck Breeding Habitat: Knowledge and Conservation in a Changing World** (Marcel Darveau*, Daniel Bordage3, Rod Brook, Patricia Edwards, David J. Lieske, Daniel G. McAuley, Nic McLellan, Shawn Meyer, J. Bruce Pollard)
Capital D **15:40 - 17:40**	**P.2: The Pride of the Salt Marsh: Status and Future Conservation of the American Black Duck** (Organizer: Pat Devers)	
15:40	**P.2.1: Coluccy**	**American Black Duck Bioenergetics Model: A Synthesis of Research and Results** (John M. Coluccy*, Paul M. Castelli, Patrick K. Devers, Heath M. Hagy, Gregory J. Soulliere, Christopher K. Williams)
16:00	**P.2.2: Peck**	**Overwinter Survival and Wintering Ground Fidelity of American Black Ducks in Atlantic Canada** (Liam E. Peck*, Randy Milton, J. Bruce Pollard, Garry Gregory, Gregory J. Robertson, Mark L. Mallory)
16:20	**P.2.3: English^**	**Winter Diet and Body Condition of American Black Ducks in Atlantic Canada** (Matthew D. English*, Gregory J. Robertson, Mark L. Mallory)
16:40	**P.2.4: Ringleman**	**A Meta-analysis of American Black Duck Winter Habitat Use along the Atlantic Coast** (Kevin M. Ringelman*, Christopher K. Williams, Patrick Devers, John M. Coluccy, Paul Castelli, Kurt A. Anderson, Jacob L. Bowman, Gary R. Constanzo, Dane M. Cramer, Matt DiBona, Michael Eichholz, Min Huang, Benjamin Lewis, Dawn Plattner, Tina Yerkes)
17:00	**P.2.5: Jones**	**Non-breeding Habitat Planning and Delivery for American Black Ducks** (Malcom Jones*, John Coluccy, Kirsten Luke, Patrick K. Devers)
17:20	**P.2.6: Discussion**	**Discussion** (Patrick Devers)

*Speaker; ^Student

O.2: The Pride of the Salt Marsh: Status and Future Conservation of the American Black Duck
(Organizer: Pat Devers)

O.2.1: Serie

Early History of Concern for the American Black Duck and Formation of the Black Duck Joint Venture

Jerome R. Serie[1]*, Brigitte Collins[2], Robert J. Blohm[3], Ken Ross[4]

[1] Division of Migratory Bird Management, U.S. Fish and Wildlife Service, retired, Easton, MD, 21601, USA, jrserie@goeaston.net
[2] Population Management Unit, Canadian Wildlife Service, Environment Canada, 335 River Road, Ottawa, ON K1A 0H3, Canada
[3] Divison of Migratory Bird Management, U.S. Fish and Wildlife Service, retired, Easton, MD, 21601 USA
[4] Canadian Wildlife Service, Environment Canada (retired), 1732 Dorset Drive, Ottawa, ON KIH 5T8, Canada

Population declines in American black ducks (*Anas rubripes*) were evident in the Mid-winter Surveys from the 1950s. These declines continued throughout the 1960s and prompted the first Black Duck Symposium in 1968. This meeting recommended reducing harvests and coordinating management actions with Canada. A series of harvest restrictions were enacted beginning in the 1970s and culminated with restrictions in 1983 and 1984 (in the U.S. and Canada respectively) designed to reduce country specific harvest by 25%. Although several hypotheses were suggested to explain the decline, a lack of information on population trends, productivity, and survival prevented critical assessments of causes and effects. This lack of information was recognized in the 1986 North American Waterfowl Management Plan which identified the black duck as a species of international concern and called for the establishment of the Black Duck Joint Venture (BDJV). The BDJV strategy was (1) to implement a breeding population monitoring program, (2) improve banding to assess harvests and distribution changes, and (3) support research to identify important factors influencing population status, determine habitat requisites, and recommend appropriate management practices. With the help of the newly appointed Management Board in 1989 and the acquisition of new funding in Canada and the U.S., the BDJV was officially established in 1990. A Technical Committee comprised of wildlife biologists and biometricians from both countries, not only helped guide ongoing research and management activities, but oversaw the design and implementation of foundational survey and banding programs. In the 26 years since its inception, the BDJV has succeeded in providing an improved information base to better support management and conservation decisions, yet important questions remain. Since the decline of black duck was not likely caused by a single limiting factor, informed decision-making will require a more comprehensive consideration of multiple variables on a changing landscape.

O.2.2: Sauer

Development and Implementation of the Eastern Breeding Waterfowl and Habitat Survey

John Sauer[1]*, Daniel Bordage[2], Mark Koneff[3], Guthrie Zimmerman[4]

[1] U.S. Geological Survey, Patuxent Wildlife Research Center, 12100 Beech Forest Road, Laurel, MD 20708, USA, jrsauer@usgs.gov

[2] Environment Canada Canadian Wildlife Service, Population Assessment, 801-1550 avenue d´Estimauville, Quebec, QC G1J 0C3, Canada
[3] U.S. Fish and Wildlife Service, Division of Migratory Bird Management, 17 Godfrey Drive, Suite 2, Orono, ME 04473, USA
[4] U.S. Fish and Wildlife Service, Division of Migratory Bird Management, 3020 State University Drive, East, Modoc Hall Suite 2007, Sacramento, CA 95819, USA

Surveying waterfowl in eastern Canada has never been easy. Aircraft provide a means of covering the extensive areas to be surveyed, but variable terrain and remote regions prevented implementation of the fixed-wing transect surveys with associated ground counts that were implemented in the prairie regions of North America. The need for status information to better manage stocks of American black ducks in the 1980s spurred Canadian biologists to implement pilot studies for regional, plot based surveys that employed helicopters. In 1990, a plot-based survey employing a consistent design and protocols was implemented across much of the black duck range. To extend the coverage to the entire black duck range, additional fixed-wing transect-based surveys were implemented in the northern United States and in remote parts of northern Ontario, Northern Quebec, Labrador, and Newfoundland. Fixed-wing surveys were also implemented in a portion of the plot-survey area to provide additional data, permit calibration of survey results, and allow for evaluation of the relative merits of fixed-wing and helicopters as survey platforms for black ducks. Analysis of data produced by these surveys has proven challenging, as established double-sampling procedures employed in other waterfowl surveys could not be implemented without the intensive subsamples obtained from ground-based counts. Instead, estimated population sizes from fixed-wing accounts are scaled to helicopter counts, allowing for estimation of a composite regional population estimate using log-linear hierarchical models. It has proven difficult to reach consensus on a single platform for black duck surveys. However, optimization approaches have been used to modify survey effort to increase efficiency in overlap area, and the dual platforms provide useful redundancy when equipment failures or budget shortfalls caused incomplete results from either the plot or the transect surveys.

O.2.3: Conroy

Development and Implementation of an International Black Duck Harvest Strategy

Michael J. Conroy[1]*, Eric T. Reed[2], Paul I. Padding[3], Mark D. Koneff[4], Patrick K. Devers[2]

[1] Warnell School of Forestry & Natural Resources, University of Georgia, Athens 30602, USA mjconroy52@gmail.com
[2] Canadian Wildlife Service, Environment Canada, 351 St. Joseph Blvd, Gatineau, Quebec K1A OH3, Canada
[3] U.S. Fish and Wildlife Service, Division of Migratory Bird Management, 11510 American Holly Drive, Laurel, MD 20708, USA
[4] U.S. Fish and Wildlife Service, Division of Migratory Bird Management, 17 Godfrey Drive, Suite 2, Orono, ME 04473, USA

American black ducks (Anas rubripes) are highly sought after by hunters in Canada and the United States. Unlike other species of North American dabblers in which >90% of the harvest occurs in the U.S., the proportion of the annual black duck harvest occurring in Canada has ranged between 40% and 60%. In response to the long-term decline of the black duck population between the 1950s and 1990s, the US Fish and Wildlife Service (USFWS) and Canadian Wildlife Service (CWS) implemented harvest restrictions in 1983 and 1984, respectively, resulting in a 25% decline in the country specific harvest. As the population stabilized in the 1990s, the question of liberalization and

allocation between the two countries came under more scrutiny. The Black Duck Adaptive Harvest Management Working Group (BDAHMWG) was established in 1997 to develop an international harvest strategy to establish sustainable levels of continental harvest and acceptable allocation between countries. The BDAHMWG developed an adaptive harvest management framework based on the Eastern Waterfowl Breeding Population and Habitat Survey and four competing hypotheses regarding additive mortality and mallard competition. As technical work on the predictive model developed, harvest managers and policy makers in the USFWS, CWS, and the Atlantic and Mississippi Flyway Councils lacked consensus on the harvest objective and process for allocating harvest between countries. The BDAHMWG used a structured decision making process to resolve these policy issues resulting in an agreement to use an objective of achieving 98% of maximum sustainable yield and a two-part parity constraint that ensures each country receives between 40% and 60% of the allowable continental harvest. The BDAHM framework was implemented in 2012 and is the only international adaptive harvest strategy used in North American waterfowl management. We describe technical elements of the strategy, the process used to resolve debate over policy elements, and future development topics.

O.2.4: Robinson

Integrating Habitat and Population Dynamics: Achieving NAWMP Goals Through the Use of an Annual Life Cycle Model

Orin Robinson[1]*, Conor McGowan[2], Patrick K. Devers[3]

[1] School of Forestry and Wildlife Science, Auburn University, Auburn, AL 36849, USA, Orinjrobinsonjr1@gmail.com
[2] U.S. Geological Survey Cooperative Fish and Wildlife Research Unit, School of Forestry and Wildlife Science, Auburn University, Auburn, AL 36849, USA
[3] U.S. Fish and Wildlife Service, Division of Migratory Bird Management, Laurel, MD 20708, USA

Following the confluence of multiple events including the completion of the first continental assessment of the North American Waterfowl Management Plan, the publication of the Joint Task Group Report, the implementation of the Eastern Waterfowl Breeding Population and Habitat Survey and Black Duck Adaptive Harvest Management strategy, the Black Duck Joint Venture established a new vision for the black duck conservation – the development of a decision framework that integrates habitat delivery and population dynamics to achieve population and harvest objectives. This vision served as the foundation of the BDJV 2015-2019 strategic plan. The goal of this framework is to identify the seasonal vital rate (i.e., survival or productivity) and the region(s) that most influence population growth and determine regional habitat delivery needs to increase continental carrying capacity. We developed a conceptual model consisting of 3 competing hypotheses of density dependent growth that link changes in regional carrying capacity to changes in post-season survival or productivity. Using banding data from 1951-2011 and breeding population survey data from 1990-2014, we developed competing full annual cycle population models for the American black duck that account for density-dependent and density-independent processes. Using a Bayesian model weighting routine, we selected the model(s) that best fit the long-term data. This model uses the seven regions as set by the BDJV, allows movement into and out of each region during each season, and estimates survival and fecundity for each region separately. With this model, we can evaluate the effects of habitat loss or gains on the continental black duck population and develop region specific habitat delivery recommendations for implementation by associated Habitat Joint Ventures. In addition, this framework can be used by the BDJV to allocate limited research money to address assumptions and parameters that most influence our understanding of black duck limiting factors and habitat delivery needs.

O.2.5: Devers

Testing the Winter Limitation Hypothesis Using a Two-Season Banding Program

Patrick K. Devers[1],*, Guthrie S. Zimmerman[2], G. Scott Boomer[1]

[1] U.S. Fish and Wildlife Service, Division of Migratory Bird Management, 11510 American Holly Drive, Laurel, MD 20708, USA. Patrick_devers@fws.gov
[2] U.S. Fish and Wildlife Service, Division of Migratory Bird Management, 3020 State University Drive, East, Modoc Hall Suite 2007, Sacramento, CA 95819, USA

To meet population and habitat objectives, managers and researchers require reliable information describing the abundance and distribution of populations and their vital rates (i.e., survival, recruitment, and harvest rates). Based on the winter limitation hypothesis (WLH), habitat planners within the Atlantic Coast Joint Venture, State and Provincial Agencies, and the National Wildlife Refuge System assume black ducks are limited by energetic demands during the non-breeding season. One prediction from the WLH suggests that black duck post-hunting season survival is negatively affected by winter severity and non-breeding season habitat quality. We designed and implemented a pilot two-season banding program in collaboration with the Atlantic and Mississippi Flyway Councils, Canadian Wildlife Service, and National Wildlife Refuge System to test the black duck WLH and investigate how seasonal survival rates vary in relation to winter habitat and weather conditions. Our objectives were to 1) use historical black duck band recovery information to develop a statistically valid sampling design, 2) estimate annual and seasonal survival and recovery rates, and 3) evaluate the precision and usefulness of seasonal survival rates to improve black duck non-breeding habitat management. Using historical band recovery data we estimated a post-season banding quota of 3,000 black ducks and allocated the quota across regions using transition probabilities. Between 2010 and 2015, partners banded 21,718 black ducks during post-season operations, with an annual average of 3,619. Estimates of annual survival rates based on two-season (e.g., 0.47-0.71 for adult males) and pre-season (0.51-0.77) recovery data were similar, but estimates based on two-season data were more precise. Seasonal survival was higher during summer-fall compared to winter-spring. Recovery rates were lower for post-season banded birds compared to pre-season banded birds. Annual and seasonal survival rates were similar between black ducks and mallards and there is some evidence that post-season survival is influenced by extreme weather conditions.

O.2.6: Darveau

American Black Duck Breeding Habitat: Knowledge and Conservation in a Changing World

Marcel Darveau[1,2]*, Daniel Bordage[3], Rod Brook[4], Patricia Edwards[5], David J. Lieske[6], Daniel G. McAuley[7], Nic McLellan[8], Shawn Meyer[9], J. Bruce Pollard[5]

[1] Ducks Unlimited Canada, Quebec, QC, G1V 0A6, Canada, m_darveau@ducks.ca
[2] Universite Laval, Quebec, QC, G1V 0A6, Canada
[3] Canadian Wildlife Service, Quebec Region, QC, G1J 0C3, Canada
[4] Ontario Ministry of Natural Resources and Forestry, Peterborough, ON, K9J 7B8, Canada
[5] Canadian Wildlife Service, Atlantic Region, Sackville, NB E4L 1G6, Canada
[6] Mount Allison University, Sackville, NB, E4L 1E4, Canada
[7] USGS Patuxent Research Center, Orono, ME, 04473, U.S.A.; 8 Ducks Unlimited Canada, Amherst, NS, B4H 3Z5, Canada; 9 Canadian Wildlife Service, Ontario Region, Ottawa, ON, K1A 0H3, Canada

One goal of the Black Duck Joint Venture (BDJV) is to support research aimed at identifying and understanding the factors affecting the breeding population of the American black duck (Anas rubripes, hereafter black duck) in North America. BDJV has funded research on breeding habitat studies from remote northern Canadian boreal areas, the Atlantic Canada and Maine, to southern Chesapeake Bay. Data from breeding pair and brood surveys has shown that black ducks tend to use smaller wetlands and streams during nesting and move to larger waterbodies during summer. Little is known however about reproductive success in most of its breeding range. Anthropogenic effects such as the long-range transport of acid precipitation have been shown to potentially influence duckling survival through changes in aquatic food webs though at the landscape scale, black ducks appear to be resilient to industrial forestry as currently practiced in the Canadian boreal forest. The species also utilize more southern landscapes partly converted to agriculture. Considering the immense size and remoteness of the boreal forest used by breeding black ducks and that the population seems to be doing well in its core breeding range, it is not surprising that conservation efforts to date have been limited. Currently, <10% of the black duck breeding range is protected (IUCN categories I-VI), conferring proportional protection to black ducks that nest at low and uniform densities (<1 pair/km²) across much of the boreal landscape. Presently, protection focuses on governmental guidelines for sustainable land use, allied with voluntary best management practices and certification programs. These appear very promising in maintaining quality breeding habitat for black ducks, as they target, at a fine scale, key habitats such as riparian zones and wetlands. However, with rapid human development and encroachment into the boreal forest, further efforts will be needed to ensure conservation of black duck populations in North America.

P.2: The Pride of the Salt Marsh: Status and Future Conservation of the American Black Duck
(Organizer: Pat Devers)

P.2.1: Coluccy

American Black Duck Bioenergetics Model: A Synthesis of Research and Results

John M. Coluccy[1]*, Paul M. Castelli[2], Patrick K. Devers[3], Heath M. Hagy[4], Gregory J. Soulliere[5], Christopher K. Williams[6]

[1] Ducks Unlimited Inc., 1220 Eisenhower Place,, Ann Arbor, MI 48108, USA, jcoluccy@ducks.org
[2] U.S. Fish & Wildlife Service, Edwin B. Forsythe National Wildlife Refuge, 800 Great Creek Road, Oceanville, NJ 08231, USA
[3] U.S. Fish and Wildlife Service, 11510 American Holly Drive, Laurel, MD 20708, USA
[4] Illinois Natural History Survey, Forbes Biological Station – Bellrose Waterfowl Research Center, University of Illinois at Urbana-Champaign, Havana, IL 62644, USA
[5] U.S. Fish & Wildlife Service, Upper Mississippi River and Great Lakes Region Joint Venture Science Office, 2651 Coolidge Road, Suite 101, East Lansing, MI 48823, USA
[6] Department of Entomology and Wildlife Ecology, University of Delaware, Newark, DE 19716, USA

Bioenergetic models are increasingly used by bird conservation Joint Ventures to estimate habitat requirements for non-breeding waterfowl. Models translating population objectives to habitat objectives require four basic data inputs: 1) daily bird energy requirements (DER) and 2) time-specific population objectives (e.g., duck use days) are needed to calculate energy demand, while 3) amounts of various habitats available and the 4) energetic value of forage accessible within those

habitats are used to calculate energy supply. The difference between energy supply and energy demand can then be used to direct conservation planning and implementation, answering key questions of "what, where, and how much" habitat is needed to achieve a target carrying capacity. Information for conducting bioenergetics modeling for American black ducks was largely lacking. In response, the Black Duck and Atlantic Coast Joint Ventures in partnership with Ducks Unlimited, academic institutions, state and federal agencies, and others initiated a suite of studies to fill information gaps and facilitate more effective conservation planning for American black ducks across their winter range. Beginning in 2004, several replicated field studies commenced on primary black duck wintering areas in multiple states and one province (NY, NJ, CT, VA, TN and NS) to evaluate food resource availability, habitat use and behavior, and food habits. A follow up captive-bird study was undertaken in 2009 to evaluate the true metabolizable energy and nutritional value of black duck foods. During this time frame, research was also initiated to estimate DER based on black duck behavior across the 24-hour time period. This effort lead to the most recently initiated study to evaluate activity multipliers (e.g., relative time spent swimming, preening, etc.) to resting metabolic rate to refine estimates of DER. The culmination of these works will be a decision support tool to help guide habitat conservation for black ducks across their non-breeding range. We summarize methods and results from these studies and discuss implications for ongoing black duck conservation planning.

P.2.2: Peck

Overwinter Survival and Wintering Ground Fidelity of American Black Ducks in Atlantic Canada

Liam E. Peck[1]*, Randy Milton[2], J. Bruce Pollard[3], Garry Gregory[4], Gregory J. Robertson[5], Mark L. Mallory[1]

[1] Department of Biology, Acadia University, Wolfville, NS, B4P 2R6, Canada, liampeck@acadiau.ca
[2] Wildlife Conservation Division, Nova Scotia Department of Lands and Forests, Kentville, NS, B4N 3X3, Canada
[3] Canadian Wildlife Service, Environmental Stewardship Branch, Environment Canada, Sackville, NB, E4L 4A7, Canada
[4] Forests, Fish, and Wildlife Division, Prince Edward Island Department of Agriculture and Forestry, Charlottetown, PE, C1A 7N8, Canada
[5] Wildlife Research Division, Environment Canada, Mount Pearl, NL A1N 4T3, Canada

The American Black Duck (*Anas rubripes*) is a migrant species of waterfowl native to the northeastern United States and Atlantic Canadian provinces. More than 100 years of studying the species has presented a concerning trend: black duck populations have been declining, and remain below desired levels. In recent years, however, winter population survey data and anecdotal observations suggest that the number of black ducks wintering in Atlantic Canada have increased, making Nova Scotia in particular one of the few regions to see an increase of black ducks. How these Eastern Canadian ducks fit in to current models of black duck population structure and the hunting pressures they face is still uncertain. We conducted and expanded banding operations to capture/recapture black ducks in Nova Scotia, and acquired additional overwinter banding data from a number of other sites in eastern Canada in Prince Edward Island, New Brunswick, and Newfoundland (the latter an urban control site approximately 1000 kilometers northeast of Nova Scotia, where birds are known to rely on anthropogenic food sources for survival). Mark-recapture analyses using banding data were used to model survival estimates in MARK while also being used to observe movement among sites in the Maritimes, allowing us to observe fidelity, survival, and the effects of harvest on the American black duck. The American black duck is an important game bird

in the Atlantic Flyway where the species makes up a large proportion of ducks harvested; however, excessive harvest is arguably the most significant annual mortality factor for black ducks. With an increased knowledge on the overwintering of black ducks in Nova Scotia and surrounding provinces, it will be possible to implement better harvest strategies to ensure black ducks can achieve population goals, while also shedding light onto why their populations are increasing in Nova Scotia and surrounding areas.

P.2.3: English^

Winter Diet and Body Condition of American Black Ducks in Atlantic Canada

Matthew D. English[1]*^, Gregory J. Robertson[2], Mark L. Mallory[1]

[1] Biology Department, Acadia University, Wolfville NS, Canada. B4P 2R6, matthew.english@acadiau.ca
[2] Wildlife Research Division, Environment Canada, Mount Pearl NL, Canada. A1N 4T3

American Black Ducks (*Anas rubripes*) remain a species of international concern in North America as the population size has decreased by ~50% since the 1950s. Atlantic Canada is the northern limit of black duck wintering range, and in contrast to overall population trends in eastern North America, recent surveys suggest that numbers of black ducks overwintering in Atlantic Canada are increasing. In order to identify factors allowing black ducks to survive at the northern limit of their wintering range, we examined winter diet using isotopic data, gut analyses, and energetic measurements from 53 adult black ducks collected during the winter of 2014. Duck health was measured through a variety of physiological parameters, and the body condition of ducks in Atlantic Canada was compared to that of black ducks wintering farther south in the United States of America. Black duck movements through the winter and subsequent linkages to previously unknown breeding areas were monitored by deploying 11 satellite transmitters attached to black ducks in 2014. Black ducks wintering in rural areas fed on molluscs and seeds through the winter, while ducks wintering in an urban area relied almost entirely on human food. Despite these differences in diet, black duck body condition in rural and urban areas did not differ through the winter. From looking at previously published data, black ducks wintering in Atlantic Canada are significantly structurally smaller and lighter than those wintering in Maine and Virginia, but still maintain similar fat reserves. This suggests that black ducks wintering in Atlantic Canada must maintain proportionally higher fat reserves to survive the longer and harsher winters than black ducks wintering further south.

P.2.4: Ringleman

A Meta-analysis of American Black Duck Winter Habitat Use along the Atlantic Coast

Kevin M. Ringelman[1]*, Christopher K. Williams[2], Patrick Devers[3], John M. Coluccy[4], Paul Castelli[5], Kurt A. Anderson[2], Jacob L. Bowman[2], Gary R. Constanzo[6], Dane M. Cramer[2], Matt DiBona[7], Michael Eichholz[8], Min Huang[9], Benjamin Lewis[2], Dawn Plattner[8], Tina Yerkes[4]

[1] School of Renewable Natural Resources, Louisiana State University Ag Center, Baton Rouge, LA, 70805, USA, kringelman@agcenter.lsu.edu
[2] Department of Entomology and Wildlife Ecology, University of Delaware, Newark, DE, 19716, USA
[3] U.S. Fish and Wildlife Service, Laurel, MD, 20708, USA
[4] Ducks Unlimited Inc., Ann Arbor, MI, 48108, USA
[5] U.S. Fish and Wildlife Service, Oceanville, NJ, 08231, USA

*Speaker; ^Student

[6] Virginia Deparment of Game and Inland Fisheries, Charles City, VA, 23230, USA
[7] Delaware Department of Natural Resources and Environmental Control, Smyrna, DE 19977, USA
[8] Department of Zoology, Southern Illinois University, Carbondale, IL, 62901, USA
[9] Connecticut Department of Energy and Environmental Protection, North Franklin, CT, 06254, USA

American black ducks (*Anas rubripes*) have generally been well studied throughout the annual cycle, but surprisingly, we lack a synthetic, quantitative understanding of their space-use during the winter. This in turn limits our ability to prioritize habitat acquisition and restoration efforts. Here, we used >17,000 telemetry locations from 235 black ducks ranging from Connecticut to Virginia to study home range composition and space-use in relation to habitat quality, severe weather, and urbanization. Despite substantial environmental variation, home range sizes were similar among regions and years. Smaller home and core ranges contained a greater proportion of salt marsh habitat, and ducks experiencing more 4-day freeze events had larger home and core ranges. Ducks exposed to prolonged periods of cold weather had smaller core ranges when those areas were comprised of more energy-rich freshwater habitats. When we examined individual telemetry locations, we found that ducks used irregularly inundated "high marsh" more at night, presumably for foraging, and urban habitats more during the day and evening crepuscular periods. We found that black ducks used regularly inundated "low" marsh less on days where the temperature never rose above freezing, and instead used subtidal areas and forested wetlands more. Finally, we found ducks were marginally more likely to use freshwater habitats during high tides. Our study confirms that black ducks depend on salt marsh for wintering habitat, and points to an unexpectedly important role for forested wetlands during periods of cold weather. We found no evidence that black ducks avoided urban areas or roads, which supports the inclusion of all available habitats in carrying capacity modeling. We emphasize that new hypothesis-driven, local telemetry studies are needed to further elucidate the relationships between black duck movements and environmental variation, especially cold weather.

P.2.5: Jones

Non-breeding Habitat Planning and Delivery for American Black Ducks

Malcom Jones[1]*, John Coluccy[2], Kirsten Luke[3], Patrick K. Devers[1]

[1] U.S. Fish and Wildlife Service, Division of Migratory Bird Management, 11510 American Holly Drive, Laurel, MD 20708, USA, tim_jones@fws.gov
[2] Ducks Unlimited, Great Lakes and Atlantic Region, 331 Metty Drive, Suite 4, Ann Arbor, MI 48103, USA
[3] American Bird Conservancy, 1601 Balboa Avenue, Panama City, FL 32405, USA

The 2015-2019 Black Duck Joint Venture Strategic Plan established a vision of achieving the North American Waterfowl Management Plan (NAWMP) population goal by increasing carrying capacity in region(s) determined to be most influential to continental population growth. During the non-breeding season, habitat researchers and managers assume the primary limiting factor is energy in the form of food resources. Representatives from the Black Duck, Atlantic Coast, and the Upper Mississippi River and Great Lakes Joint Venture(s) are developing a decision framework to guide habitat acquisition, enhancement and restoration throughout black duck non-breeding range based on bio-energetics theory. The current version of the decision framework was developed at the county-level scale and can be scaled up to identify areas that have excess, adequate, or deficient energetic supply to support stepped-down population goals for black ducks. Estimates of energetic supply were derived using results from replicated field studies and laboratory studies that provide empirical estimates of kcal/ha/wetland type and National Wetland Inventory data. Estimates of

energetic demand were derived by stepping down the NAWMP population goal and applying estimates of daily energetic requirements and migration chronology to calculate population level energetic demand for the non-breeding period. Estimates of energetic supply and demand were incorporated into a geographic information system (GIS) and used to identify areas with excessive, adequate, or deficient energy. Initial results indicate the northeast United States (i.e., Long Island Sound) may be deficient in terms of energy supply, whereas New Jersey and Delaware have adequate energetic capacity, and the Chesapeake Bay region has excess energetic capacity. On-going work seeks to improve the usefulness of this decision framework by incorporating estimates of competition from other waterfowl species, and risks to existing habitat from urban growth and sea level rise. When completed this decision framework will aid in identifying priority areas for habitat acquisition, enhancement or restoration and the selection of proposed projects that maximize the overall quality of black duck habitat on the landscape.

P.2.6: Discussion

Discussion

Patrick Devers