

Sea Duck Joint Venture
Annual Project Report
FY25 (Oct 1, 2024 – Sept 30, 2025)

Project Title (*including SDJV Project #*): SDJV 176: An integrated model of scoter populations in eastern North America with a focus on estimating survival

Principal Investigators (*name, affiliation, email address*):

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Partners (*anyone else providing support*):

NA

Project Description (*issue being addressed, location, general methodology*):

Sea duck demographic parameters are difficult for researchers to estimate at a range-wide scale because their breeding and wintering areas are challenging to access and/or work in. Recent population modeling (Koneff et al. 2017) has provided insight into which demographic parameters are most important for better understanding the harvest potential of these species, hence improving management and providing a sustainable recreational opportunity. There were concerns with the previous approach and a stated need for updated models of sea duck population dynamics. Though data sources are limited, we believe there is sufficient data from small-scale studies and larger monitoring programs that can provide a more complete view of changing sea duck populations.

We propose to use integrated population models to improve estimates of annual survival, estimate the effect of changing harvest regulations on survival, and provide insight into what data needs are most useful for improving demographic rate estimates. Target species are black scoter (*Melanitta americana*), surf scoter (*M. perspicillata*), and white-winged scoter (*M. deglandi*) in eastern North America. Our goal is to integrate Christmas Bird Count trend data with demographic parameter estimates obtained from on-going fecundity surveys and prior knowledge of scoter survival. We propose a one-year project that will utilize the skills of quantitative biologists to integrate the various sources of data and analyze population demographics of scoters in eastern North America, and determine the sensitivity of the model to uncertainty in fecundity and survival rates.

Project Objectives:

The primary goal of this project is to obtain a better understanding of scoter abundance trends and survival rates using existing data. We propose to achieve our goal through the following objectives:

- 1) Build a hierarchical model that links observed population trend data with available demographic data to estimate accurate and precise survival rates.

2) Assess model performance using simulations to determine which parameters the survival estimate is most sensitive to and where managers should collect more data to most improve survival estimates.

3) Incorporate historic changes in harvest regulations as variables to estimate the effects of management actions.

Preliminary Results *(include maps, photos, figures/tables as appropriate):*

The integrated data model was been developed, after adjusting the structure to work with the available information we have for sea ducks. We have also incorporated the adult fecundity estimates from Parts Collection data and the Atlantic Flyway's photographic survey to work with the Leslie matrix used for the population model. Preliminary results based on simulated data indicate that the model struggles to differentiate between survival and fecundity, meaning that an increase in the estimate for survival can be offset by a decrease in fecundity. Consequently, the model will be sensitive to the knowledge used to inform the priors for these parameters. In addition, the original CBC analysis, which was performed by Meehan et al., was primarily focused on population trend estimation, which meant that there was no annual variation in population growth. When we added a term for annual variation in the growth rate, we had indications that the model was not converging. After discussions with Tim Meehan, we pursued an alternative analysis of the CBC data that was intended to capture annual variation in relative abundance, as opposed to trend estimation.

Project Status *(e.g., did you accomplish objectives, encounter any obstacles, what are your future plans):*

The original proposed integrated data model, based off work by Davis et al., needed significant changes given the differences in available data, which is very limited in our case. In addition, the CBC derived relative abundances from Meehan et al. did not include annual variation in the population growth rate, which is critical to this analysis as annual variation in the relative abundances is one of the stronger sources of data. We had some concerns about the convergence of this model when including the additional term for annual variation in the trend parameter. We contacted Tim Meehan and he provided us with an alternative set of derived abundances from a previous analysis that does allow for annual variation in the population trajectory. These results are at a larger scale than the grid cells we were originally considering and therefore we needed to alter how we were matching the spatial resolution of the CBC data with the species-specific modeled wintering habitat calculated by Lamb et al. (2020). These changes have required that we rethink the model structure several times to allow the estimates to inform each other.

Project Funding Sources (US\$). Complete only if funded by SDJV in FY25. This is used to document: 1) how SDJV-appropriated funds are matched, and 2) how much partner resources are going into sea duck work. You may include approximate dollar value of in-kind contributions in costs. Add rows as needed for additional partners.

SDJV (USFWS) Contribution	Other U.S. federal contributions	U.S. non-federal contributions	Canadian federal contributions	Canadian non- federal contributions	Source of funding (name of agency or organization)
43,850					SDJV

Total Expenditures by Category (SDJV plus all partner contributions; US\$). Complete only if project was funded by SDJV in FY25; total dollar amounts should match those in previous table.

ACTIVITY	BREEDING	MOLTING	MIGRATION	WINTERING	TOTAL
Banding (include only if this was a major element of study)					
Surveys (include only if this was a major element of study)					
Research					43,850