

**Sea Duck Joint Venture
Annual Project Summary
FY2021 (October 1, 2020 – September 30, 2021)**

Project Title (*including SDJV Project #*): Improving US Sea Duck Harvest Estimates through Improved Sampling Design and Model Development – SDJV project #163

Principal Investigators (*name, affiliation, email address*): Andy Royle, USGS Eastern Ecological Science Center, 12100 Beech Forest Rd, Laurel MD 20708

Partners (*anyone else providing support*):

Kathy Fleming, USFWS DMBM Branch of Monitoring and Data Management, Laurel, MD;

Anthony Roberts, USFWS DMBM Atlantic Flyway Office, Laurel, MD

Adam Smith, Environment and Climate Change Canada, Ottawa, ON

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

Our proposal directly addresses the following SDJV priority science need: to improve harvest estimates for North American sea ducks by increasing the amount and quality of information from hunters and applying analytical techniques to reliably estimate the size and composition of harvests. The level and composition of the harvest, derivation and distribution of the harvest and an assessment of the values and concerns of stakeholders are all necessary elements of effective harvest strategies and regulatory framework that ensure sustainable harvests. Estimating harvest of American Common Eiders is a top priority.

Project Objectives:

This project involves three primary objectives:

1. Develop Bayesian hierarchical models to estimate species' harvests by integrating data from the Waterfowl Harvest Survey and the PCS.
2. Evaluate model structures to identify critical factors affecting harvest estimation and determine streamlined design elements that capture main sources of uncertainty for performance. Model components to evaluate include: (1) the general model structure, including likelihood and prior distributions (e.g., including total harvest data only vs. also the number of hunters, hunting days, etc.), (2) incorporating underlying trends or auto-regressive structure, and (3) individuals as repeated measures or random effects to evaluate bias on resulting estimates.

3. Based on the above results and new survey methodology, design a sampling scheme that most accurately estimates sea duck harvest on an annual basis. Provide BMDM recommendations for future survey/sampling modifications based on results from the study (e.g., updated sample size targets and/or sampling frames for stratification based on model variances, guidelines for repeat sampling of the same individuals).

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

We hired a post-doc for this project (Ben Augustine) who was on-boarded with USGS EESC on August 30. We had initial meetings with partners on that day, discussing aspects of the data structure and the transfer of PCS and harvest data to the post-doc. Due to the recent start date of the post-doc, very little meaningful work has been done.

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

The project is being actively developed but the objectives have not yet been accomplished.