Sea Duck Joint Venture
Annual Project Summary
FY2022 (October 1, 2021 – September 30, 2022)

Project Title: Evaluating Sea Duck Detectability in the Puget Sound Winter Ambient Monitoring Program SDJV #136

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Project Description: Monitoring the abundance and density of wintering sea ducks in the U.S. portion of the Salish Sea is achieved annually through aerial surveys conducted by the Washington Department of Fish and Wildlife (WDFD). These surveys provide information regarding the wintering population status and trends of several sea duck species, information which is necessary for population and habitat management. The Sea Duck Joint Venture recognizes the Salish Sea as a Key Habitat Site, and accurate sea duck abundance estimates are essential to understand how threats both inside and outside the Salish Sea are impacting sea duck populations. However, raw counts from WDFW aerial surveys tend to underestimate the number of individuals due to imperfect detection (Samuel and Pollock 1981, Pollock and Kendall 1987) and movement away from the aircraft.

Model-based approaches for correcting for imperfect detection are widely applied but are most useful when specifically developed for the study area, species, environmental conditions, and set of observers, as these variables can affect detection (Pearse et al. 2008). As raw counts from the WDFW aerial surveys do not provide any information regarding the detection process, we seek to develop a correction factor for aerial survey counts of sea ducks by species. Comparing detected animals to known numbers of animals can serve as a useful method for developing a correction factor that can be used to account for imperfect detection and adjust estimates for

better accuracy of abundances (Caughley et al. 1976, Bayliss and Yeomans 1990, Pearse et al. 2008). Photographs can capture all animals available for detection along a transect with no time limit to identify and count species. However, long-term collection and analysis of photographs tends to be more costly and time-intensive (Bayliss and Yeomans 1990). Therefore, using photographs to calculate a correction factor for imperfect observer detection can serve as a cost-effective and accurate approach for sea duck survey estimates. The correction factor can be retroactively applied to previous surveys and will be a useful component for analyses of future sea duck surveys in the Salish Sea.

We are using aerial survey data collected by WDFW to compare sea duck detection rates from two observers with known numbers of sea ducks available for detection, as recorded by plane-mounted cameras. Data collection occurred during March 2012 in the Salish Sea. The aircraft flew along transect lines, and rear-seated observers counted all sea ducks observed along the transect while the forward-facing camera photographed sea ducks ahead of the plane, and a point-of-view camera photographed sea ducks available to the observers. We are developing a set of models that will result in species-specific correction factors for aerial surveys of sea ducks.

Project Objectives: 1) Evaluate whether there is a need for further digital image processing of the 2012 data, 2) Complete data analyses based on imagery to estimate correction factors that will provide quantitative information on availability and detection of sea ducks by the Puget Sound Ambient Monitoring Program (PSAMP) observers, 3) Incorporate species-specific correction factors into winter estimates of sea duck species monitored through PSAMP.

Project Status: A postdoctoral scientist, Jamie Brusa, has been working on the project through July of 2022, with assistance from another postdoctoral scientist, Matthew Farr. Objective 1 – All necessary image processing has been completed. Objective 2 – We have developed a final model for the data and all analyses are complete. The model includes an observation model for the forward-facing camera and an observation model for the observers. We recognized while developing the model that the point-of-view camera cannot be used directly because the field-of-view is different between this camera and the observers. However, the model does account for movement, non-detection, and misidentification, though these processes cannot be fully decomposed. Objective 3 – With funding from Washington Department of Fish and Wildlife, we are currently working on a large project focused on modeling all past PSAMP data from 1994-present. We will be integrating observation processes from this project into that modeling effort. That modeling effort is well underway under the leadership of postdoctoral scientist Matthew Farr and will seek to estimate both population growth and distribution of wintering seaducks in the US portion of the Salish Sea.

A final paper describing the observation model has been drafted, and once final, this will be developed into a final report for SDJV. Thus, we expect to be able to complete a final report on this project well before the May 31, 2023 final report due date.

Project Funding Sources (US$).
NA – not funded by SDJV in FY2022

Total Expenditures by Category (SDJV plus all partner contributions; US$).
NA – not funded by SDJV in FY2022