Sea Duck Joint Venture Project # 136

Summary of the 2012 WDFW Winter Sea Duck Aerial Survey Detectability Project - Phase 2

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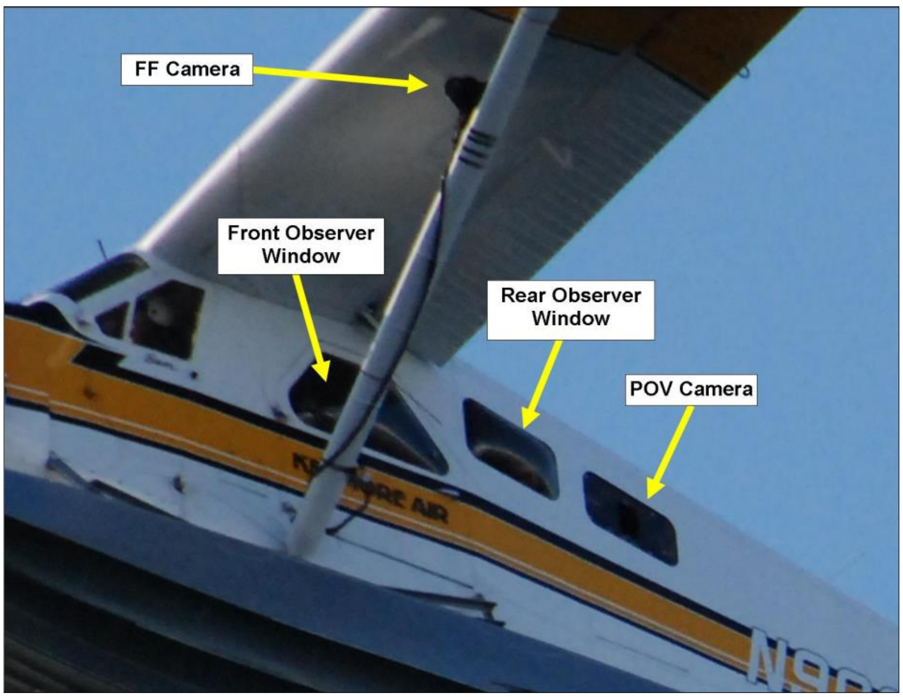
30 August 2012

Washington Department of FISH and WILDLIFE

INTRODUCTION

This effort was implemented to investigate technologies to assist in answering detectability of sea ducks from aerial surveys. Phase 1 was implemented during winter 2011 with the goal of testing various imaging equipment on board the survey aircraft (de Havilland DHC-2) to evaluate effectiveness in being able to document sea ducks along a 50 m transect strip; please see the Proposal submitted to the SDJV at the end of this document for more information related to the goals, objectives, and problem statement. During winter 2012 we implemented phase 2 of the project to fly detectability surveys utilizing what we learned during the 1st phase of the project. This summary report is not intended to be a detailed report, but instead is to be used as a brief summary on the second phase of the project. A more detailed report will be provided as a product from the third and final phase of the project.

METHODS



We utilized a de Havilland DHC-2 "Beaver" aircraft on floats for all surveys. This is the same type of aircraft used for the Washington winter sea duck surveys since 1993-4. The aircraft was equipped with large windows that permitted viewing from the middle row seat (normally used during surveys) as well as from the rear seat, that was used for the double-observer portion of these efforts. The rear window of the aircraft was also large enough to house the POV camera.

Each camera was remotely controlled by remote shutter controls, used during transect flights, and laptop computers to assess camera alignment, adjust focal length and focus.

Software was developed to log the trackline (GPS fix every second), automatically assign transect numbers to transects, track frame count and memory card usage for each camera, and indicate to the camera operator when to turn off and on the POV and FF cameras. This software was run on the POV laptop and viewed on a separate monitor.

Transects were flown directly into the wind to ensure the orientation of the aircraft was true forward. During days with light winds we also flew transects with the wind directly at the tail of the aircraft. Transects were flown at 85 knots at 61m AGL.

We selected areas to fly transects that fit the following criteria:

- Provided area for long and uninterrupted track lines where we could get at least two subsequent transect lines completed before having to initiate a turn;
- Are known to support varying densities of sea ducks;
- Are known to host sea ducks so we would get an adequate sample of all sea duck species encountered during the winter survey efforts;
- Would provide us with a sample of varying Beaufort and glare conditions.

POV (OBSERVER POINT OF VIEW) CAMERA

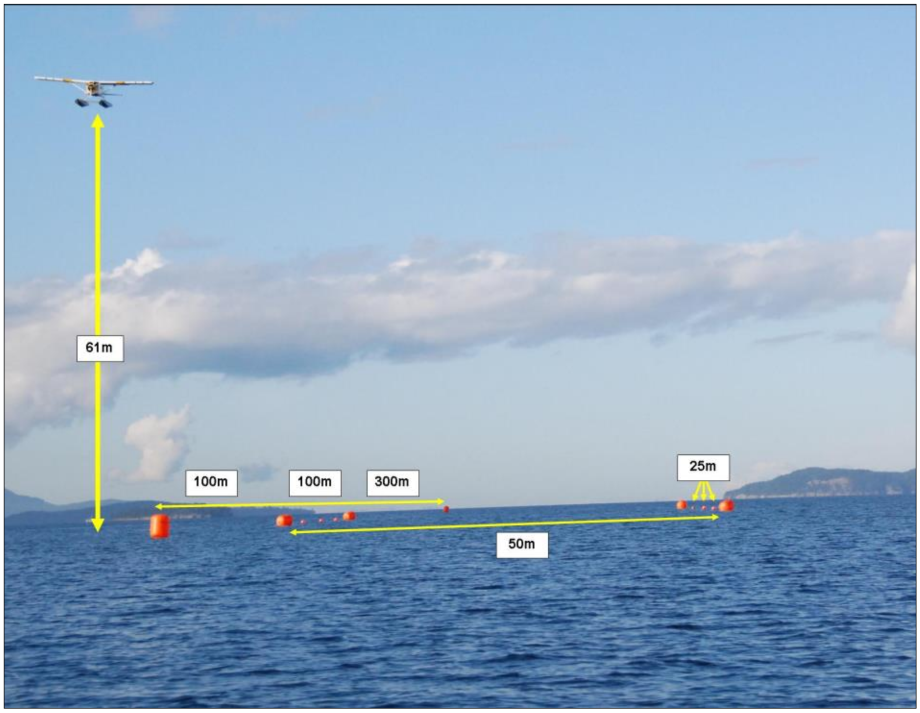
We used a Canon EOS 5D Mark II equipped with a Canon EF 24-105mm f/4L IS USM lens mounted to the rear window on the left side of the aircraft. This camera was aligned and focal length was set to image roughly 5 meters beyond the 50 meter transect strip adjacent to the aircraft, and was directions slightly forward, with a vertical (portrait) orientation.

After our initial test flight in November 2011 we were not able to obtain the image clarity and shutter speed that we had expected from the previous year's (phase 1) results. We discovered that the aircraft had windows that were slightly tinted, which resulted in a slower shutter speed and created some image blur. The project was delayed to have a window built and installed that would allow the camera lens to protrude past the window through a hole, eliminating any visual obstruction.

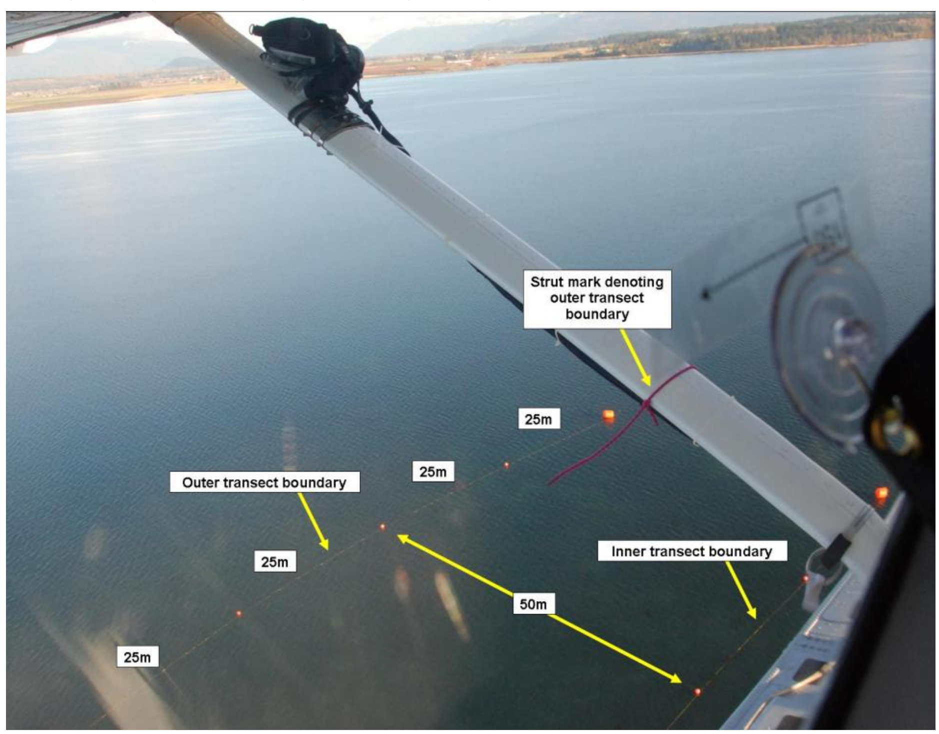
FF (FORWARD FACING) CAMERA

We used a Canon EOS 5D Mark II equipped with a Canon EF 70-200mm f/2.8L IS USM lens mounted to the left wing strut of the aircraft. This camera was aligned and focal length was set to image the 50 meter transect strip 250-300 meters ahead of the aircraft. The camera was also aligned to image a horizontal (landscape) orientation. This camera was mounted high on the wing strut close to the point of attachment to the wing to reduce vibration from the strut cowling. Attachment high on the wing-strut also put the camera away from turbulence from the aircraft propeller, as well as potential water spray during take-off and landings. In addition, we found that this high placement reduced the amount of rainfall coming in contact with the protective lens filter when rain was present.

Calibrating Cameras to the Transect Strip



We utilized an on-water grid that could be adjusted to line up with the orientation of the wind. The on-water grid was setup using orange sailing race marks (2m high X 1.5m wide) connected together with yellow floating polypropylene line to delineate transect boundaries. We used a series of race marks to delineate the inner-edge of the transect strip, spanning 500 meters. One race mark was used to mark the beginning of the transect edge, and a second race mark was positioned 300 meters further along the span marking the beginning of the 100m x 50m transect grid. Three smaller floats were positioned 25 meters apart along the inner transect edge followed by another race mark 25m further along the span. The inner edge of the transect strip was marked with a final race mark positioned 100m past the previous race mark.



The outer edge of the transect strip was marked with race marks at either end of a 100m span, with three smaller markers positioned 25 meters apart. These marks were positioned perpendicular from the same marks from the inner transect strip markers, and ran parallel to them, denoting the outer edge of the 100m x 50m grid.

Before each survey day the grid was setup and the aircraft was flown over the grid to align the FF and POV cameras to the transect strip, and to delineate within the frames of each respective camera view the transect boundaries.

The issue we encountered with this method was the time it took to set up and disassemble the on-water grid reduced the survey time per day. On the second survey day, after the grid was set up, we flew (at varying altitudes) over straight highways and railway lines that were oriented along the direction of the wind to test if we could use these other features to delineate the inner and outer transect boundaries. We reviewed the images from these tests with the images from the grid flights from the same day and found no difference between them. After the second survey day we utilized highways and railway lines oriented with the wind to delineate transect boundaries on the FF and POV image frames, thus doubling the survey effort each day.

IMAGE COLLECTION AND OBSERVER METHODS DURING TRANSECTS

The time (to the second) was synchronized on both cameras as well as observer watches. Image file naming was set to <date> + <"POV" or "FF", respectively> + <time (to the second)>+<sequential number (beginning with 1 for each day)>. By using this naming structure the POV and FF images could be calibrated, and they could be matched up with the recorded times of the observer observations and the GPS log.

Each camera was equipped with a wired remote control. The camera operator would activate continuous shooting (3.9 frames/sec) on the FF camera, and then after 5 seconds begin continuous shooting on the POV camera (the POV was delayed as it takes 6-8 seconds for the area captured on the FF camera to reach perpendicular to the aircraft). Each camera would be shut off for 5 seconds, after 45 seconds of continuous shooting each. After this 5 second pause, imaging would be restarted, beginning the next transect. This pause was necessary to clear the internal camera buffer.

Observers were seated on the left side of the aircraft in the middle "front" seat (normally used during aerial surveys), and the rear seat. There observers were isolated both audibly and visually.

Each camera was equipped with two 128GB and one 32GB SanDisk Extreme 60MB/sec UDMA memory cards. We would fly transects and image the transect strip until a card was nearly filled. We would then land to replace full memory cards with empty cards per camera, and to swap observer positions (front observer to the rear position, and rear observer to the front position). Observers recorded all observations within the transect strip to the second.

TRANSECTS FLOWN

A total of one test flight day and seven survey days were flown (31.1 flight hours):

1. 11-Nov-2011 Test Flight 5,799 Images
2. 15-Nov-2011 Survey Flight 3,816 Images

3. 07-Mar-2012 Survey Flight 9311 Images
4. 08-Mar-2012 Survey Flight 36,906 Images
5. 09-Mar-2012 Survey Flight 28,682 Images
6. 18-Mar-2012 Survey Flight 41,451 Images
7. 25-Mar-2012 Survey Flight 27,772 Images
8. 26-Mar-2012 Survey Flight 40,869 Images

NEXT STEPS – PHASE 3

The third and final phase of the project is to process all survey images (185,000 images) to classify species and counts during transects, then analyze the data to estimate detectability rates of sea ducks. The final results of these efforts will provide correction factors to apply to past WDFW winter aerial survey data of sea ducks, and will also be applied to future surveys. With financial support, we would like to begin this phase in November, 2012, hiring a temporary staff member to assist in these efforts. Without continued financial support, completion of this phase would be delayed until time of permanent project staff can be dedicated to these efforts, and/or other funding sources can be found to implement this work.

Project Funding Sources (US$). Complete only if funded by SDJV in FY12; 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)
$20,675					SDJV
		22,000			Washington Dept Fish and Wildlife

Total Expenditures by Category (SDJV plus all partner contributions; US$). Complete only if project was funded by SDJV in FY12; 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				$42,675	$42,675