Sea Duck Joint Venture
Annual Project Summary for Endorsed Projects
FY 2010 – (Oct 1, 2009 to Sept 30, 2010)

Survey Title: SDJV PR96: Pacific Black Scoter Breeding Survey

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Project Description: We conducted the seventh year of aerial survey observations to monitor Alaska's breeding population of Black Scoters. A left-seat pilot observer (PDA) and a rear-seat observer (SS, TLM) flew the survey in a Cessna 206 aircraft on amphibious floats. They recorded all Black, White-winged, and Surf scoters (*Melanitta nigra, M. perspicillata, M. fusca*), and Greater or Lesser scaup (*Aythya marila, A. affinis)* within a 200m strip on each side of the aircraft using standard aerial survey protocol. On approximately every fourth transect, both the pilot and the rear-seat observer viewed the left side of the transect making independent double-count observations for a mark-resight estimate of detection rate. The timing of the survey, about 2 weeks after the standard North American Waterfowl Breeding Pair and Habitat Survey, was appropriate for these late-nesting diving duck species. The delineation of strata was based on the distribution of scoters observed on extensive surveys flown throughout Alaskan wetlands in various years from 1989 to 1997. From 2004 to 2007, we flew systematic transects sampling 154,645 km^2 of tundra wetlands divided into 12 strata of high and low scoter density in various geographic regions. Using these 4-years of results, we redesigned the survey in 2008, to be more efficient and practical by excluding some areas of low density and increasing sampling where variance was high. Transects flown 2008-10 sampled 113,732 km^2 of wetlands in 6 strata covering 74% of the original area and 84% of the 2004-07 average scoter population. We decided it was not time or cost effective to survey some regions of low density or the small area of high-density black scoter nesting habitat near Nelson and Izembek Lagoons on the Alaska Peninsula. These areas can perhaps be surveyed periodically in combination with other studies. For Scoters, the aerial index measure used was indicated total birds (= 2* n singles + 2* n pairs + birds in flocks), assuming a single male often indicated an undetected nesting female. Singles are not doubled for Scaup due to the excess sex ratio of males in the population.

Objectives: Our objectives were to estimate the breeding population size, determine population trend, and identify important scoter habitat. We collected data using an **a**nnual aerial transect survey that sampled a majority of Black Scoter nesting habitat and corrected for possible variation in detection rate. The survey precision was intended to provide a reasonable ability to detect rapid population change within a 5-year period. The survey from 2004 to 2006 was part of SDJV Project #38 Black Scoter Integrated Study and it continues to complement goals of that project as more data on population delineation, seasonal movement, and estimated harvest are compiled.

Preliminary Results: The 2010 aerial survey transects were flown on 8 days from 13 June to 24 June. We sampled the same area of 113,732 km^2 as in the previous two years. Reanalysis of data in the same area from all years indicated the area observed and number of birds recorded (Table 1). We observed a slightly larger area this year (Table 1) by successfully reaching nearly all the designed transects even though data from one observer were lost on 7 transects due to computer recording problems.

Table 1. Total area and count of birds observed on aerial surveys for scoters and scaup.

Year	2004	2005	2006	2007	2008	2009	2010
Observed (km^2)	1113.1	1012.6	1253.9	1293.1	1342.9	1350.2	1379.3
BLSC	740	1104	1223	1751	742	1144	1331
SUSC	4	12	18	28	3	7	19
WWSC	19	32	10	5	6		1
SCAU	1204	1472	1910	2078	1145	1667	1890

The combined observer data estimated a total population index of 102,687 Black Scoter (SE = 9,368, CV = 9.1%) and 133,855 Scaup (SE = 14,078, CV = 10.5%) in 2010 (Table 2). We also tabulated population indices from previous years reanalyzed using the same area and stratification (Table 2). The 2009 and 2010 population indices were larger and the sampling errors were smaller in comparison with previous years.

Table 2. Aerial population indices of scoters and scaup on western Alaska tundra wetlands reanalyzed using the 2008 redesign with 6 strata to sample a total area of 113,732 km^2. Long-tailed ducks were not counted on all transects after 2007 because we concluded that the survey was not appropriately timed for this species.

Year	Scoter species	Black Scoter	Scaup	Long-tailed Duck	Tundra Swan	Jaeger species
1989-1997	121,158		147,026	27,503	78,453	3,752
2004	67,563	65,418	99,932	10,026		
2005	61,393	60,821	107,345	9,658		
2006	77,901	76,034	116,076	12,645		
2007	83,620	81,506	113,562	9,852		
2008	62,606	62,048	88,284		75,498	1,427
2009	92,772	92,366	117,399			
2010	105,274	102,687	133,855			

The trend of the 2004-2010 Black Scoter aerial index data (Table 2, combined observers, no adjustment for detection) indicated an average annual population growth rate of 1.074 (90% confidence interval = 1.026 - 1.123). The Scaup aerial index also indicated an increasing trend averaging 1.028 (90% c.i. = 0.988 - 1.070) annual growth.

From the independent front- and rear-seat observations recorded on transects where both observers searched the left side, we matched sightings based on time (location), species, group size, and notes recorded on the bird's behavior (sitting, swimming, flying) and distance from the aircraft (near, mid, far, off transect). The 7-year average detection rates for the front- and rear-seat observers, respectively, were 55% and 64% for black scoter and 52% and 57% for Scaup. This compares with detection rates of 86% (VCF = 1.15) for scoters and 52% (VCF = 1.933) for scaup determined by the ratio of helicopter to fixed-wing aircraft counts recorded on the Yukon Delta, 1989-1991 (Smith 1995). Estimated detection rate varied to some degree with each of the factors we examined such as species, year, and observer seat (Fig. 1) and also with group size, individual observer, and region. In spite of complexity and limitations from small sample size, because the double count data were collected systematically representing all days, regions, conditions, group sizes, and observers, the combined data should result in a relatively unbiased estimate of the average detection rate. The method for the mark-resight analysis still requires the assumption that heterogeneity of detection rates among the individual observations was not extreme.

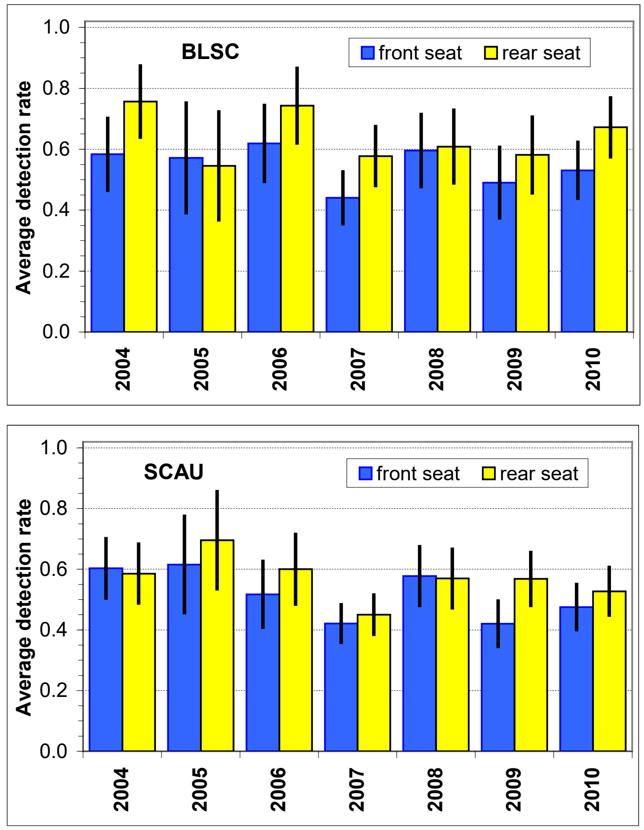

Figure 1. Average detection rate of Black Scoter and Scaup of front and reat-seat observers in each survey years based on matching of independent double count observations. Data for each species and year are analyzed separately while region, crew, day, and group sizes are pooled.

We used the aerial population index divided by the detection rate calculated for each species, observer-seat, and year to estimate the actual population size. For 2004 to 2010, the average of the front and rear-seat corrected population estimates was 133,146 Black Scoters (Table 3) compared to the average aerial index of 77,690 indicated total birds. The 7-year average corrected population was 208,939 Scaup (Table 3) compared to an aerial index of 111,220 total birds. Population trends from 2004 to 2010 differed between the aerial indices and the corrected population estimates. For the Black Scoters, aerial indices increased (average annual growth rate, GR = 1.074), detection rate declined (GR = 0.981), and estimated populations increased (GR = 1.096, 90% c.i. 1.035 – 1.160) (Fig. 2). Black scoters and combined species of scoters show the same trends. Black scoters were 98% of the total scoters with an average population of 2,486 White-winged and Surf scoters in western Alaska tundra. For Scaup, aerial indices increased (GR = 1.029), detection rate declined (GR = 0.963), and estimated populations increased (GR = 1.068, 90% c.i. 1.005 – 1.135) (Fig. 3).

Table 3. Estimated population sizes, standard errors, and coefficients of variation (CV) for combined scoter species, Black scoter, and Scaup species on western Alaska tundra wetlands based on the average of front- and rear-seat aerial indices divided by estimated detection for each seat, species, and year. Standard errors and CVs include variance from both aerial indices and detection rates.

	Scoter species			Black Scoter			Scaup species		
Year	Population	Std.err.	CV	Population	Std.err.	CV	Population	Std.err.	CV
2004	100,356	14,342	0.143	97,272	13,923	0.143	168,554	27,213	0.161
2005	111,341	23,034	0.207	110,025	22,715	0.206	164,921	31,311	0.190
2006	115,508	15,295	0.132	112,894	14,946	0.132	206,866	29,295	0.142
2007	165,758	22,739	0.137	161,696	22,335	0.138	260,326	34,375	0.132
2008	103,732	17,313	0.167	102,609	17,190	0.168	156,013	28,469	0.182
2009	174,465	31,161	0.179	173,727	31,052	0.179	238,098	33,106	0.139
2010	178,265	25,858	0.145	173,798	25,523	0.147	267,794	41,564	0.155
Avg	135,632	21,392	0.158	133,146	21,098	0.158	208,939	32,191	0.154

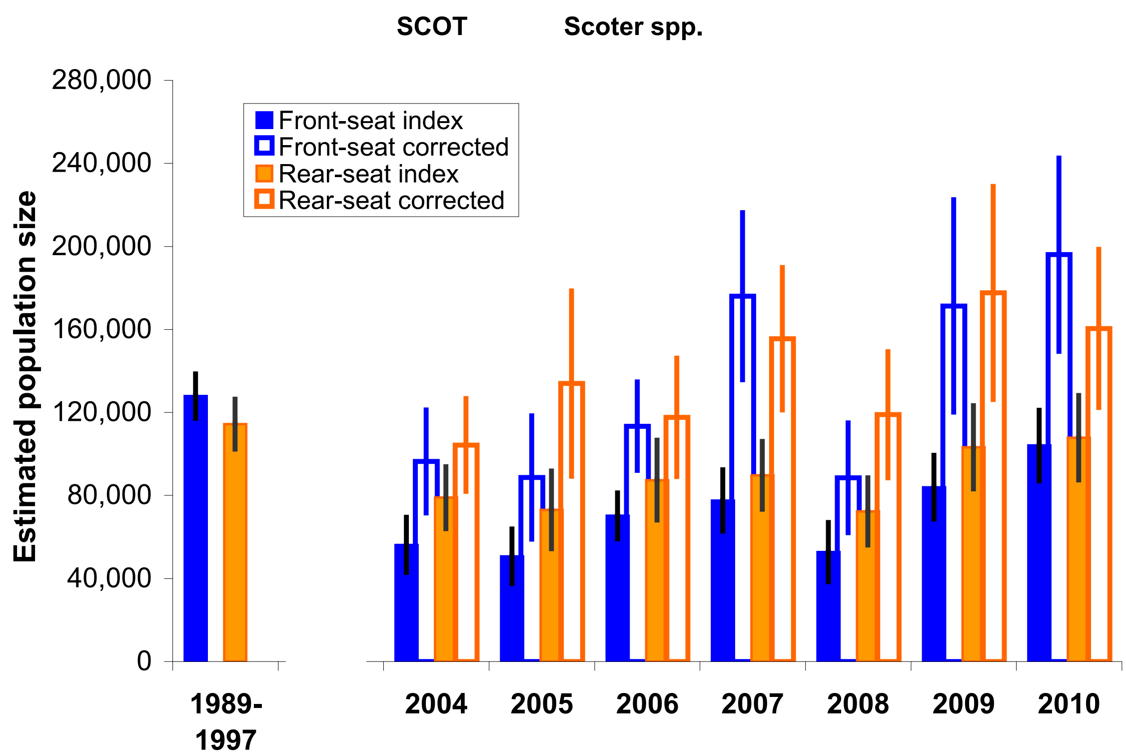

Figure 2. Aerial index (shaded columns) and estimated population size following correction for detection rate (open columns) for front and rear seat observers for Scoter species.

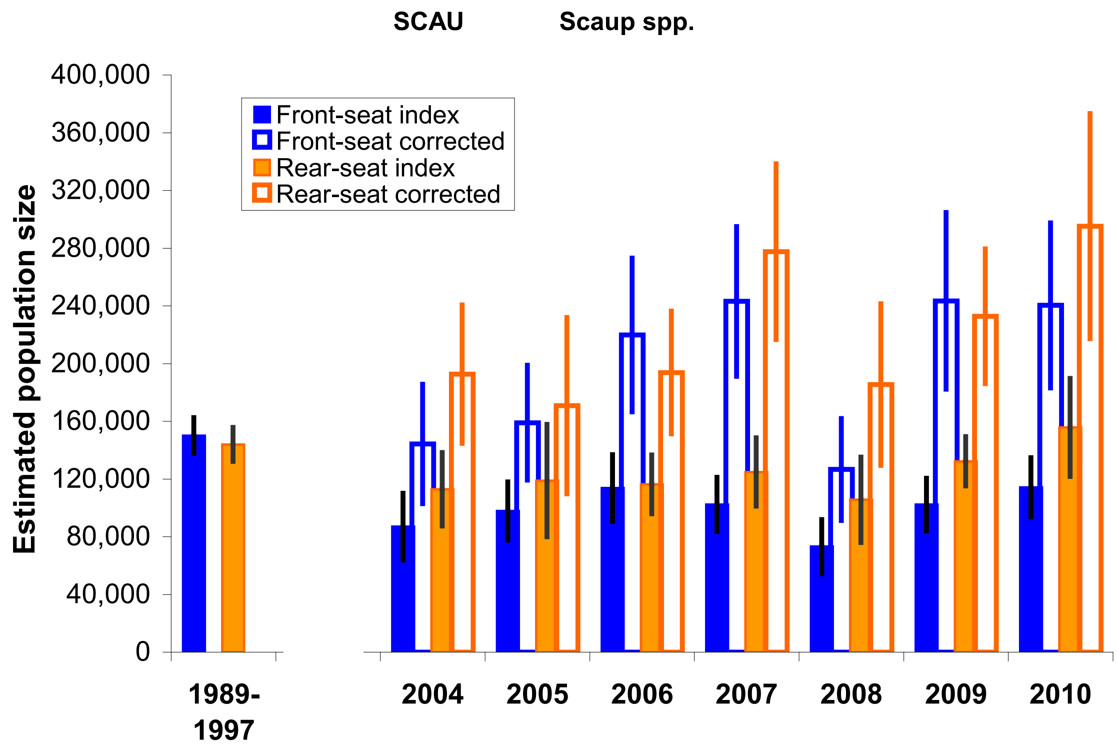

Figure 3. Aerial index (shaded columns) and estimated population size following correction for detection rate (open columns) for front and rear seat observers for Scaup species.

Project Status: The survey successfully monitors the size, distribution, and trend of the black scoter nesting population. Aerial indices and corrected population estimates both show increasing trends. Estimated average detection rate seems to be declining slightly which makes more recent corrected populations even larger. Improved data collection and more consistent notes on bird behavior and locations in recent years make the double count observation process more reliable by reducing potential bias in matching. Analysis procedures for the detection rates could still be improved.

The increasing trend for both scoter and scaup populations in western Alaska tundra nesting areas reduces the earlier concern about declining populations. At least since 2004, possible overharvest by subsistence hunters, or a decline in quality of foods in near-shore marine staging or wintering areas, seems less likely than previously thought. In spite of variation in observation conditions and new rear-seat observers, relatively consistent estimates among years suggests that less frequent monitoring (biennial or triennial) may suffice. With increasing aerial survey cost due to new aircraft, the priority of conducting this survey on an annual basis is being reconsidered.

SDJV (USFWS) Contribution	Other U. S. Federal Contributions	U. S. non-federal contributions	Canadian federal contributions	Canadian non-federal contributions	Sources of funding
10,000					
	5500				USFWS R7
	10,522				Yukon Delta NWR
	3,674				Selawik NWR
	1100				Togiak NWR
	400				AK Peninsula NWR