

Memorandum

To: Todd Sanders, Pacific Flyway Representative, USFWS DMBM

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Subject: 2014 breeding ground survey for dusky Canada Geese, Copper River Delta, AK

INTRODUCTION AND METHODS

The principal population management index for dusky Canada geese is based on an aerial breeding ground survey on the Copper River Delta (CRD) and ground counts on Middleton Island, Alaska (Pacific Flyway Council 2008). The aerial breeding ground survey on the CRD has been completed every year since 1986 with the exception of 2013. The 2014 aerial survey was conducted on 12-13 May by the U.S. Fish and Wildlife Service (USFWS), Region 7 Migratory Bird Management (R7 MBM). The crew was comprised of biologist-pilot Heather Wilson and right seat observer William Larned (R7 MBM). Heather Wilson participated in the survey for the first time in 2014; William Larned has participated in the survey since 1994.

Standard aerial breeding pair survey techniques were used (USFWS and CWS 1967). An amphibious Cessna 206 was used in 2014, similar to most prior surveys. Standard east-west transects were flown (Fig. 1) at an altitude of approximately 45 m and an airspeed of 150 km/hr. Pilot and right-seat observer counted target species to a distance of 200 m from the transect centerline. Observations were recorded directly into a GPS-connected computer (John Hodges, USFWS R7, MBM, Juneau). The same flight lines have been used since 1997 but minor changes to several transects were made in 2014 to increase the safety near mountains. Three strata (West Delta, East Delta and Egg Island; Fig. 1) were used for population estimates. Transects were spaced at intervals of 0.93 km (West Delta), 1.85 km (East Delta), and 0.78 km (Egg Island). All observed species of geese, swans, moose and bears were recorded. Population indices for dusky Canada geese, trumpeter swans, as well as swan nests are presented in this report

Dusky Canada GeeseAerial breeding ground indices

The population indices presented in Tables 1 and 2 are defined as follows:

$$\begin{aligned} \text{Indicated Total Birds} &= 2 \times (\text{singles} + \text{pairs}) + \text{birds in flocks} \\ \text{Indicated Breeding Birds} &= 2 \times (\text{singles} + \text{pairs}) \end{aligned}$$

These indices are based on the assumption that a single observed goose represents a pair, with the unseen mate on a nest; thus, single observations are doubled to account for the pair. Geese seen on nests were not counted.

The analysis was performed using a Visual Basic program (John Hodges, USFWS, Migratory Bird Management, Juneau). The weighted average densities (ratio of means) of each index were calculated from all transects within each of the 3 strata (West Delta, East Delta and Egg Island). A ratio estimation procedure was used to estimate the variance of the average densities (Caughley 1977). Average density was multiplied by total stratum area to calculate the population index for each of the three strata, which were summed for the total index. We assumed that all flight lines were flown as designed. Bird locations determined from the voice/GPS location were assigned to the nearest transect.

Management Index

Aerial breeding ground indices are adjusted to account for breeding birds missed by aerial survey crews using methods described in the Dusky Canada Goose Management Plan (Pacific Flyway Council 2008). The adjustment is made using the ratio of nests (counted by ground crews) to indicated pairs (counted by aerial crews; Hodges and Eldridge 2007). The ratio incorporates nest detection rate and renesting rate (Fondell et al. 2006). Together, this results in an adjusted breeding bird index of 3.3954 (Pacific Flyway Council 2008). The calculation is as follows:

$$0.5 * 3.39 * (1 / 0.832) * (1 / 1.2) * 2 = \mathbf{3.3954}$$

Where:

0.5 = pairs per indicated breeding birds index

3.39 = ratio of nests detected by ground crews per indicated pairs detected by aerial survey crews

0.832 = nest detection rate for ground crews

1.2 = renesting rate prior to the aerial survey (1.2 nests/pair)

2 = birds per pair

To derive the Management Index, the adjusted breeding bird index for the CRD is added to the CRD aerial count of flocked birds plus the count of adult birds on Middleton Island. Counts on Middleton are derived from a biennial ground survey conducted by the Alaska Department of Fish and Game (Petrula et al. 2012).

Trumpeter Swans

Population Indices

The population indices for swans are as follows:

$$\text{Indicated Total Birds} = (2 \times \text{pairs}) + \text{single birds} + \text{birds in flocks}$$

Indicated Breeding Birds = (2 x pairs) + single birds
Swan Nests = number of active swan nests (swans on or adjacent to nests)

The same population analysis program described above for dusky Canada geese was used to calculate the population indices for trumpeter swans (Table 2).

RESULTS AND DISCUSSION

Dusky Canada Geese

Dusky Canada goose aerial population indices and management indices are presented in Table 1 and Figure 2. The 2014 aerial indicated breeding bird index (3,649), aerial indicated total birds index (5,054), and total population estimate (15,574) were among the highest recorded in 20 years. Population increases could be due in part to high production on CRD from 2008-2011 (Petrula 2011).

The Pacific Flyway Management Plan for the Dusky Canada Goose specifies the population is to be sustained within a range of 10,000 to 20,000 geese. The plan identifies three action levels, based on 3-year averages of the management index (Pacific Flyway Management Council 2008). In 2009, the three-year population average dropped below 10,000 birds triggering Action Level 2. These actions, in conjunction with good production, may have contributed to the recent higher population indices. The 3-year (2011, 2012, 2014) population average of 13,678 is 37% above the 10,000 population level and 9% above the 12,500 population threshold required return to Action Level 1 (Pacific Flyway Management Plan 2008).

Trumpeter Swans

The three population indices for trumpeter swans are presented in Table 2 and Figure 3. Data for swans are variable but generally show increasing trends between 1986-2014. These data could be used to track long term changes in swan singles and pairs but further analyses are required to determine growth rates. Swan results from the spring Copper River dusky survey may provide an alternative partial measure of the regional trumpeter swan breeding population (Groves et al. 2009).

Snow, Ice and Survey Conditions

Snow and ice conditions vary between years on the Copper River Delta. In 2014, southcentral Alaska experienced a warm spring. Based on communications with the National Forest Service in Cordova, the timing of data collection was moved four days earlier relative to the mean (1986-2012) initiation date (16 May, range 9-22 May) to ensure the survey was completed before vegetation leaf-out reduced detection of geese. No snow was observed in the study area, somewhat unusual as some snow and ice is usually observed (Eldridge pers. comm.). Survey conditions (e.g., wind, glare, visibility) were not a factor for goose observations in 2014.

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Table 1. Aerial population indices for dusky Canada geese for the Copper River Delta aerial dusky Canada goose survey, 1986-2014.

	Aerial Indicated total birds index	SE	Aerial Indicated breeding birds index	SE	Adjusted aerial breeding bird index ¹	Birds in flocks	Breeding and Flocked	Middleton Island adults	Management Index	3-year running average
1986	5,469	356	4,811	389	16,335	658	16,993	80	17,073	
1987	5,408	504	4,294	409	14,580	1,114	15,694	84	15,778	
1988	5,296	364	4,412	325	14,981	884	15,865	90	15,955	16,269
1989	6,582	565	4,463	369	15,154	2,119	17,273	75	17,348	16,360
1990	5,442	669	4,482	457	15,218	960	16,178	93	16,271	16,525
1991	3,773	437	2,861	356	9,714	912	10,626	249	10,875	14,831
1992	6,648	835	4,472	284	15,184	2,176	17,360	473	17,833	14,993
1993	6,334	495	4,096	265	13,908	2,238	16,146	473	16,619	15,109
1994	5,810	432	4,226	253	14,349	1,584	15,933	473	16,406	16,953
1995	3,685	323	3,357	250	11,398	328	11,726	473	12,199	15,075
1996	3,509	267	2,936	190	9,969	573	10,542	1,456	11,998	13,534
1997	4,208	271	3,379	176	11,473	829	12,302	1,168	13,470	12,556
1998	4,814	350	3,571	203	12,125	1,243	13,368	1,168	14,536	13,335
1999	3,068	224	2,599	174	8,825	469	9,294	1,168	10,462	12,823
2000	3,009	184	2,477	128	8,410	532	8,942	1,309	10,251	11,750
2001	3,157	202	2,788	181	9,466	369	9,835	1,309	11,144	10,619
2002	3,836	294	2,966	173	10,071	870	10,941	1,416	12,357	11,251
2003	3,083	222	2,215	129	7,521	868	8,389	1,416	9,805	11,102
2004	3,198	235	2,712	190	9,208	486	9,694	1,499	11,193	11,118
2005	5,050	614	3,986	418	13,534	1,064	14,598	1,499	16,097	12,365
2006	3,412	326	3,006	301	10,207	406	10,613	1,453	12,066	13,119
2007	2,848	188	2,456	157	8,339	392	8,731	1,453	10,184	12,782
2008	2,512	192	2,222	167	7,545	290	7,835	1,317	9,152	10,467
2009	1,768	165	1,513	103	5,137	255	5,392	1,317	6,709	8,682
2010	2,714	193	2,324	131	7,891	390	8,281	1,249	9,530	8,464
2011	3,736	326	2,845	202	9,660	891	10,551	1,249	11,800	9,346
2012	4,093	365	3,498	270	11,877	595	12,472	1,188	13,660	11,683
2013 ²	-	-	-	-	-	-	-	-	-	-
2014	5,054	435	3,649	256	12,390	1,404	13,794	1,780	15,574	13,678

¹Aerial indicated breeding bird index x 3.3954

²Survey not completed due to aircraft problems and weather delays

Table 2. Population indices for trumpeter swan singles and pairs (singles + 2 x pairs), total swans (singles + 2 x pairs + flocked birds), and active nests for the Copper River Delta aerial dusky Canada goose survey 1986-2014.

Survey Year	Swan Singles and Pairs	Total Swans	Swan Nests
1986	435	467	95
1987	191	199	32
1988	342	667	85
1989	360	425	75
1990	245	381	65
1991	342	361	66
1992	222	353	47
1993	245	382	43
1994	300	372	45
1995	424	457	41
1996	399	475	68
1997	230	248	65
1998	508	588	96
1999	410	435	79
2000	447	592	65
2001	499	576	96
2002	592	756	107
2003	519	671	129
2004	416	549	57
2005	469	670	75
2006	788	888	147
2007	403	412	65
2009	337	346	89
2010	448	463	77
2011	449	511	74
2012	501	582	108
2013 ¹	-	-	-
2014	367	397	192

¹Survey not completed due to aircraft problems and weather delays

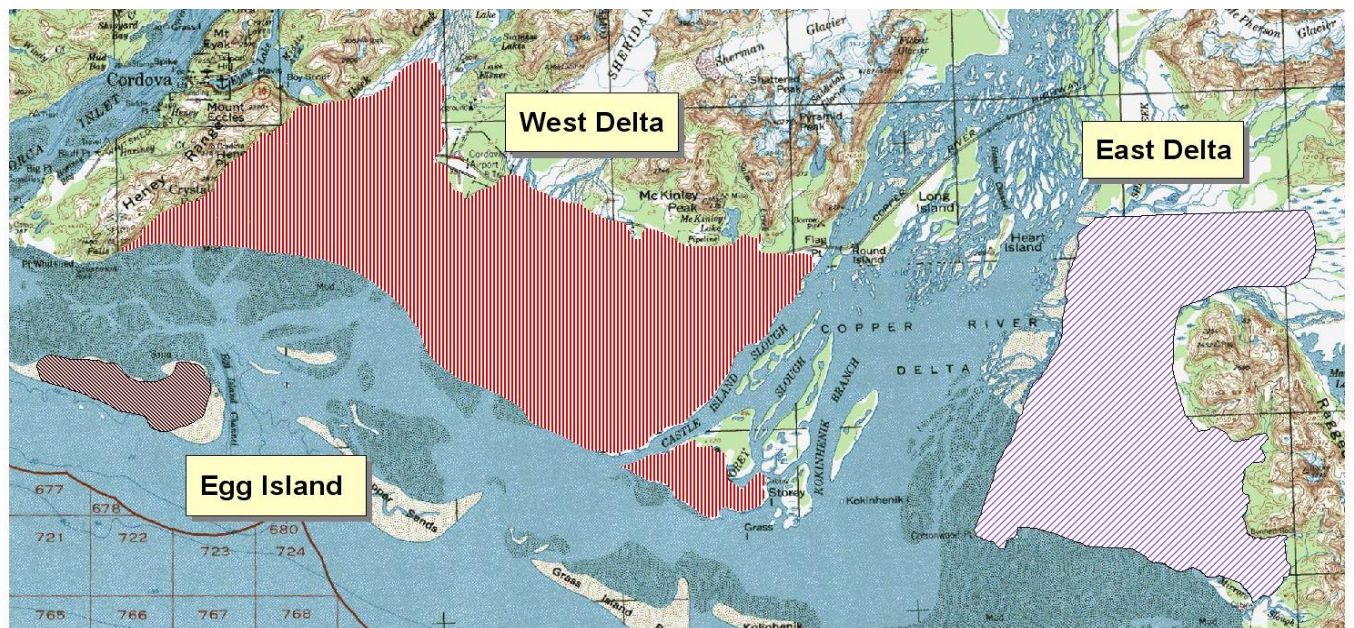


Figure 1. 2014 flight lines and stratified survey units for the Copper River Delta aerial dusky Canada goose survey.

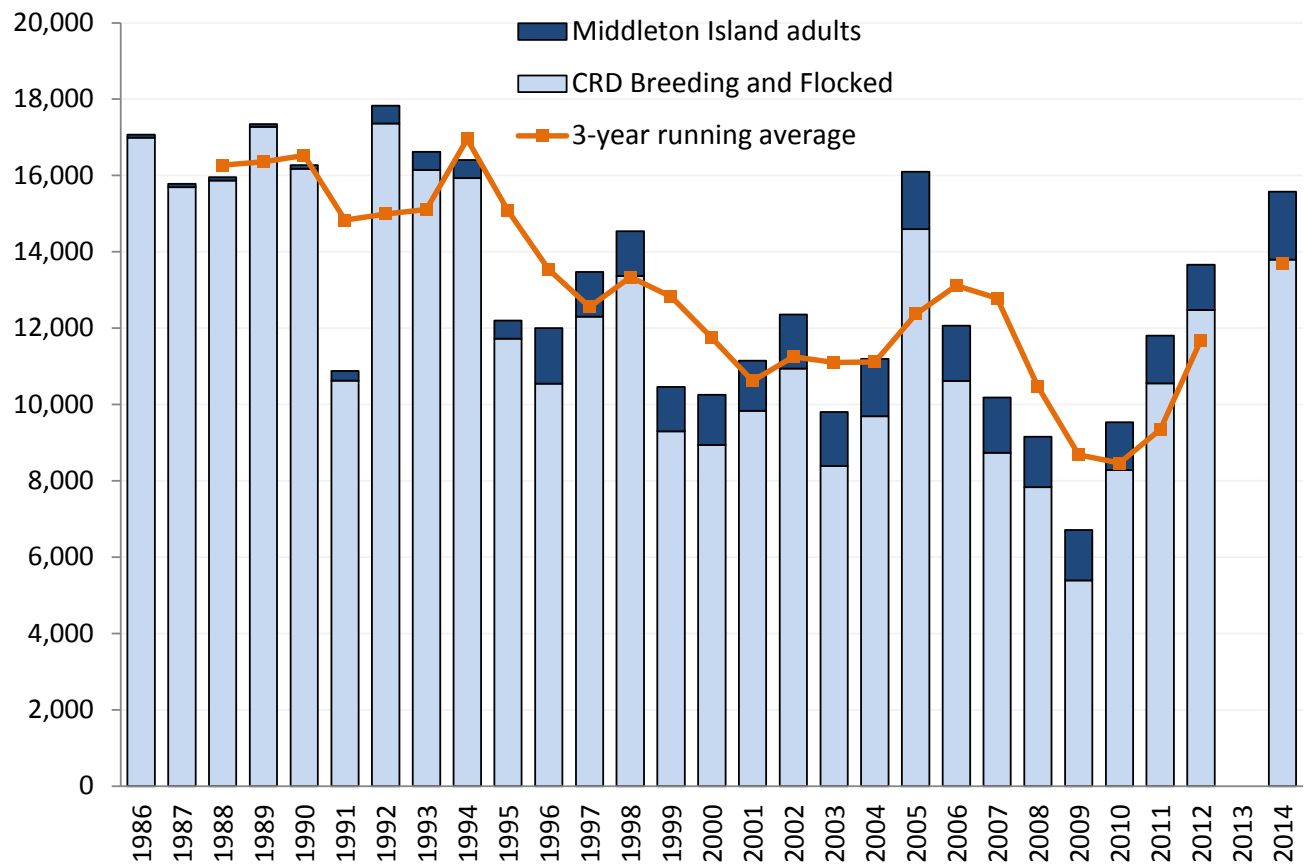


Figure 2. Management index for dusky Canada geese, Copper River Delta and Middleton I., Alaska, 1986-2014.

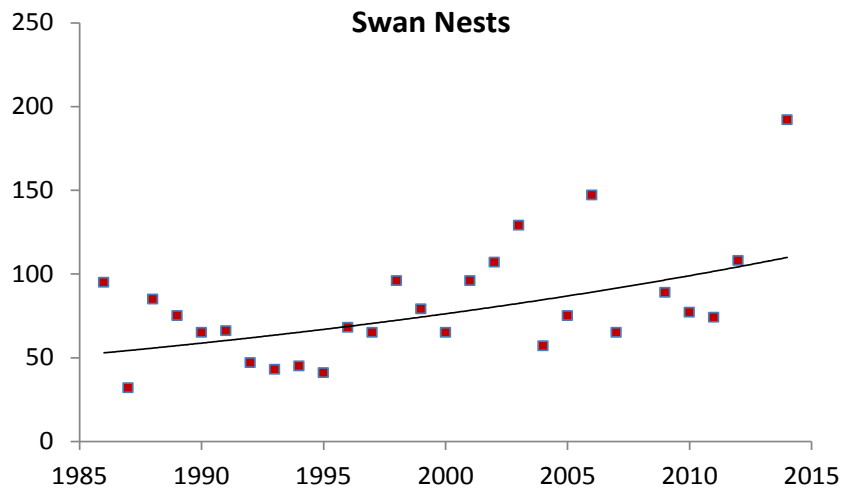
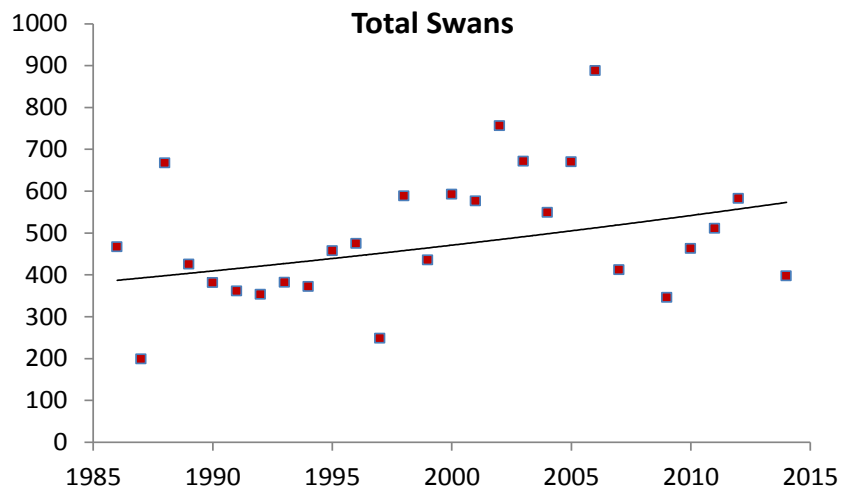
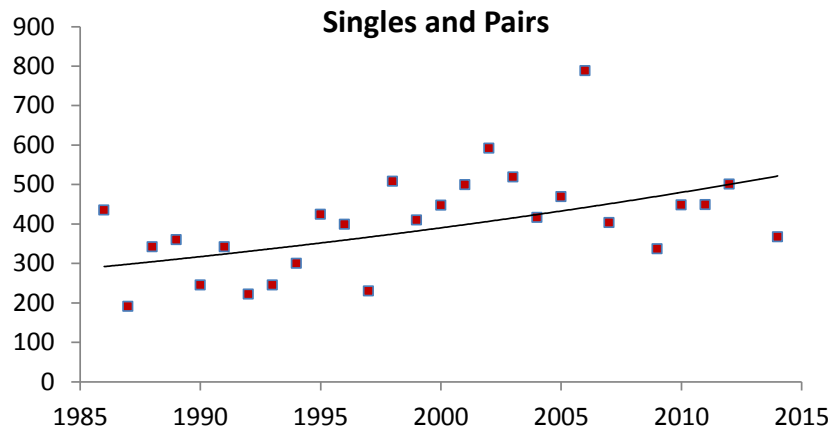


Figure 3. Population indices for trumpeter swan singles + pairs, total swans, and active nests for the 2014 Copper River Delta, Alaska, 1986-2014.