

AERIAL SURVEY OF EMPEROR GEESE AND OTHER WATERBIRDS
IN
SOUTHWESTERN ALASKA,
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By
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AERIAL SURVEY OF EMPEROR GEESE AND OTHER WATERBIRDS IN SOUTHWESTERN ALASKA, FALL 2014

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Abstract: This report presents results of the annual fall emperor goose population survey in southwest Alaska (1979-2014). The 2014 fall emperor goose population index was 90,954 birds. The survey was flown on 29-30 September along the north side of the Alaska Peninsula (Naknek River to Bechevin Bay), with replicate surveys of the Izembek area flown on 1 and 5 October. All species of waterbirds and marine mammals were counted, but emphasis was placed on emperor geese, Pacific brant, Canada geese, and Steller's eiders. Consistent with previous reporting, the most recent 3-year average of emperor geese on the south side of the Alaska Peninsula was included in our current index. Total population indices for Pacific brant, Canada geese, and Steller's eiders were 171,704, 47,070, and 43,066, respectively. Average counts for emperor geese, Pacific brant, Canada geese, and Steller's eiders in the Izembek Complex (n = 3 surveys) were 3,226, 171,635, 46,236, and 7,300, respectively.

Key words: aerial survey, emperor geese, waterbirds, southwest Alaska. January 2017

INTRODUCTION

The primary objective of the emperor goose fall survey is to provide annual population indices and proportional distributions of emperor geese at primary fall staging locations in southwest Alaska. The main uses of this information are to provide weighting factors for photographic estimates of emperor goose productivity (i.e., percent juveniles; Stehn and Wilson 2014) and provide a fall measure of emperor goose population trend relative to other emperor goose population indices (Dooley et al. 2016).

Secondarily, the survey provides annual fall population indices for Pacific brant, Canada geese, and Steller's eiders along the entire Alaska Peninsula, as well as within the Izembek area. Brant have been counted on the Alaska Peninsula, during fall staging since 1975 (USFWS, unpubl. data), with more standardized surveying beginning in 1981. However, the majority of brant on the Alaska Peninsula (>99%) are found at Izembek Lagoon and surrounding estuaries (hereafter Izembek Complex). To help account for sampling variation in indices of dense Izembek Complex aggregations of geese, replicate surveys of the area are conducted there each year.

Because the fall index of Pacific brant in the Izembek Complex encompasses nearly the entire world population of Pacific brant (Reed et al. 1998, Ward et al. 2005) and provides a comparative population measure to the Pacific-wide mid-winter survey (Pacific Flyway Council 2002, Olsen 2015), it has been a consistent fall metric included the Pacific Flyway Databook (Olsen 2016). Together, the Fall Izembek survey and Mid-winter survey are ranked as the highest priorities for population assessment of Pacific Black Brant (Pacific Flyway Council 2002, Stehn et al. 2010).

METHODS

The 2014 survey was flown using a USFWS Cessna 206 (N9623R) equipped with amphibious floats, at a ground speed of 167-200 km/hr (90-110 kts) and an altitude of 45-77 m (150-250 feet) above sea level (ASL). The survey route included the north side of the Alaska Peninsula

from Naknek to Bechevin Bay (Segments 34-85, Figs. 1-2). Observations were made from both sides of the aircraft and voice recorded into two laptop computers. GPS coordinates were automatically recorded and linked to the position of the aircraft track and individual aerial observations using custom computer programs (Jack Hodges, USFWS-MBM, Juneau). Although emperor geese, Steller's eiders, Pacific brant, and Canada geese are the primary species of interest, other waterbirds species are also recorded during the survey (Appendices 1 and 2).

Coastline segments of the survey were flown ~200 meters offshore, with deviations only to confirm species identification and flock size. Estuaries were flown in their entirety by following historical survey tracks and monitoring real-time aircraft locations to ensure adequate coverage of the survey area. Flights were primarily conducted with <20 knots of wind.

Historically, the emperor goose fall survey included 143 coastline and estuarine habitats from the Yukon Kuskokwim Delta, Bristol Bay, the north side of the Alaska Peninsula and Unimak Island, to the south side of the Alaska Peninsula northeast to Wide Bay (Figures 1-2, Mallek and Dau 2000-2013). However, over time, the north side of the Alaska Peninsula (Segments 34-65 from Naknek through Izembek) was identified as the primary fall staging area used by emperor geese in southwest Alaska (96% [SE: 0.004] of total index 1981-2014), with a relatively small proportion occurring on the south side of the Alaska Peninsula (Segments 86-137), and an even fewer observations in the "far northern" segments (i.e., Yukon-Delta and northern Bristol Bay; Segments 1-35).

To improve efficiency of data collection, segments along the Yukon-Delta/northern Bristol Bay were omitted from surveying and analysis beginning in 2005. Similarly, surveys of the south side of the Alaska Peninsula (an area with relatively low numbers of birds and consistently poor flight/weather conditions) were also flown less frequently beginning in 2005, and the last fall survey of that area was flown in 2009. Recent surveys, including 2014, have included only segments on the north side of the Alaska Peninsula (Segments 34-85, Naknek through Izembek; Fig. 2) corresponding to areas where photographs for emperor goose age ratios are collected (Shults and Larned 2016, Stehn and Wilson 2014), and where Pacific brant, Canada geese, and Steller's eiders are most abundant. To maintain consistency with historical emperor goose indices, we include the most recent 3-year average from the south side of the Alaska Peninsula (2004, 2008, 2009) in the total 2014 emperor goose index.

In 2014, segments 34 to 59 (North side of the Alaska Peninsula: Naknek to the start of Izembek) were flown on 29 September, while segments 60-68, 80-85 (Izembek Complex) were flown on 30 September. In the Izembek Region, replicate surveys of segments 60-65 and 84-85 (i.e., Izembek Lagoon) were flown on 1 and 5 October. However, the remaining Izembek Complex segments (i.e., 66-69, 80-83; Bechevin, Morzhovoi, and Little/Big Lagoons, and the south side of Frosty) were flown only on September 30. Thus, I calculated the 2014 emperor goose survey indices as the sum of four parts: 1) the northern Alaska Peninsula (Segments 34-59); 2) the average of the three Izembek Lagoon surveys from 30 Sept., 1, and 5 Oct.; 3) a single survey of the remaining Izembek Complex segments (30 Sept.); and for emperor geese only, 4) the most recent 3-year average from the south side of the Alaska Peninsula (2004, 2008, 2009; Segments 86-139).

Survey conditions including wind speed and direction, temperature, sky and water conditions, visibility, and tide stage were recorded during surveys and are provided below, consistent with historical reporting.

SURVEY CONDITIONS

29 September: Survey conditions were good with north winds at 6 kts, broken ceilings to 4,000 feet, and 20-30 mile visibility. Tides were low from Naknek (Seg. 35) to Cinder River (Segs. 40-41) and mid-level south to Port Moller (Seg. 50). The tide was mid to high in the Nelson Lagoon complex (Segs. 52-57, 551-552). Air temperatures increased from 45 to 50° F throughout the day.

30 September: Survey conditions were fair to good, with clear skies, considerable glare, light east winds at 4 kts, and temperatures of approximately 45° F. Tides were low throughout the Izembek Complex.

1 October: Survey conditions were fair to good, with broken overcast skies, moderate east winds at 15 kts, and temperatures of 45° F. Tides were low in the Izembek area throughout the survey.

5 October: Survey conditions were excellent, with clear skies, light northwest winds at 5 kts, and temperatures of approximately 45-50° F. A mid-rising tide predominated throughout the Izembek Lagoon area survey.

RESULTS/DISCUSSION

Population indices for the four primary species of interest (emperor geese, Pacific brant, Canada geese, and Steller's eiders) are summarized in the text below, as well as in Tables 1 and 2. Historical estimates of emperor goose fall population indices (1979-2014) and corresponding 3-year averages are summarized in Table 1, while segment-specific totals for all species observed during the survey are summarized in Appendices 1 and 2.

Emperor Goose

The 2014 fall population index of emperor geese was 90,954, resulting in a new 3-yr running average (2012-2014) of 75,912. The 2014 index was calculated as the sum of birds observed on the northern Alaska Peninsula (83,507), the Izembek Lagoon average (1,011, CV: 78%, $n = 3$: 1,909, 431, and 693), the single count of the remaining Izembek Complex segments (2,215), and the most recent 3-yr average from the south side of the Alaska Peninsula (4,221).

The 2014 emperor goose population index represented a 22.5% increase from the long-term average (74,267, 1979-2013, Table 1). The long-term (1979-2014; MBM R7 files) fall population trajectory of emperor geese indicated no significant growth using simple logistic regression (growth rate: 1.0, SE: <0.01, R^2 : <0.01).

Numbers and proportions of emperor geese at primary staging sites along the Alaska Peninsula from this survey are used to weight lagoon-specific photographic estimates of emperor goose productivity (i.e., percent juveniles) via a count-weighted estimate (Stehn and Wilson 2014,

Shults and Larned 2016). Herein, we report the distribution of emperor geese among major lagoons along the north side of the Alaska Peninsula in 2014: Egegik Bay 532 (<1% of total 2014 index, Segments 36-37); Ugashik Bay 458 (<1%, Segment 38); Cinder River Estuary 15,983 (18%, Segments 39-43); Port Heiden 11,819 (13%, Segments 44-45); Seal Islands 34,300 (38%, Segment 46-47); Nelson Lagoon and adjacent estuaries 20,314 (23%, Segments 50-58, 551-552); average of Izembek Lagoon and adjacent estuaries (i.e., Izembek Complex) 3,226 (4%, Segments 60-68 and 80-85); and the south side of Alaska Peninsula, Cold Bay to Wide Bay most recent 3-year average, 4,221 (2%; Segments 86-139). Approximately 5% of the total emperor geese were observed outside of these major estuaries.

Pacific Brant

A total of 171,704 Pacific brant were observed during the emperor goose survey, of which >99% (average: 171,635) were observed in the Izembek Complex and <1% (69) were observed on the northern Alaska Peninsula. The Izembek Complex average (171,635) was calculated from 3 surveys of Izembek Lagoon (149,835, 137,481, 194,765, average: 160,694, CV: 19%, Table 2) and the addition of a single count of the remaining Izembek Complex segments at Morzhovi and Bechevin Bays (10,941). Consistent with historic fall brant indices, no previous counts of brant on the south side of the Alaska Peninsula were included in the 2016 index.

The 2014 Izembek Complex index (171,635) represented an 8.8% increase from the previous year (2013: 157,781; $n = 2$ surveys), and a 29% increase from the long-term average of 133,151 (1976-2013, MBM R7 files). The long-term (1976-2014; MBM R7 files) fall population trend of Pacific brant indicated no significant growth using simple logistic regression (growth rate: 1.0, SE: <0.01, R^2 : <0.01).

Canada Goose

A total of 47,040 Canada geese were observed during the emperor goose survey, with most (98%; average: 46,236), occurring in the Izembek Complex. The 2014 emperor goose survey index of Canada geese included observations from the northern Alaska Peninsula (804), Izembek Lagoon replicates (average: 36,509; CV: 30%, $n = 3$ surveys: 38,339, 24,725, and 46,462), and a single survey of the remaining Izembek Complex segments (9,727).

The 2014 Canada goose fall index represented a near tripling of the 2013 (16,644) index and an 86% increase from the previous 3-year average (25,254, 2011-2013). However, it marked only a 5% decrease from the historical long-term average (49,397, 1979-2013, MBM R7 files). The long-term (1979-2014; MBM R7 files) fall population trend of Canada geese indicates a slight decline (<1% per year) using simple logistic regression (growth rate: 0.99, SE: <0.01, R^2 : 0.08).

Steller's Eider

Our 2014 fall population index of Steller's eiders was 43,066, with a little over half (24,731; 57%) occurring in the Nelson Lagoon area (Segments 50-58, 551-552). The 2014 index included 35,766 birds from the northern Alaska Peninsula and an average of 7,300 birds observed at Izembek Lagoon (CV: 14%, $n = 3$: 7,013, 8,466, 6,421). No Steller's eiders were observed in the

remaining Izembek Complex segments in 2014 and no Steller's eiders have been observed in any of the most recent counts of the south side of the Alaska Peninsula.

In 2014, Steller's eiders decreased 9% from the previous year (47,321), and increased by 6% from the most recent 3-year average (37,722). Overall, Steller's eiders were 27% below their long-term average (59,343, 1979-2013, MBM R7 files). The current long-term fall population trend of Steller's eiders (1979-2014; MBM R7 files) indicated no significant growth (growth rate: 1.0, SE: <0.01, R^2 : <0.01) using simple logistic regression.

Numbers and proportions of Steller's eiders at primary southwest Alaska estuarine staging sites in 2014 were as follows: Egegik Bay 0 (Segments 36-37); Ugashik Bay 0 (Segment 38); Cinder River Estuary 2,895 (6.7%, Segments 40-42); Port Heiden 0 (Segments 44-46); Seal Islands 8,105 (19.0%, Segment 46-47); Nelson Lagoon and adjacent estuaries 24,731 (57.8%, Segments 50-58, 551-552); and Izembek Lagoon and adjacent estuaries 7,300 (17%, Segments 60-69 and 80-85).

Steller's eiders have been monitored at Izembek National Wildlife Refuge since the refuge was established, with formal annual surveys beginning in 1979. The long-term trend at Izembek Complex (1979-2014) indicated a stable to slightly decreasing population (growth rate: 0.99, SE: <0.01, R^2 : 0.39) using simple logistic regression, while fall survey data for the Nelson Lagoon region indicated no significant trend (growth rate: 1.0, SE: <0.01, R^2 : 0.04) over the same time period. The most recent 10 year trends in both locations provided similar results.

The findings and conclusions in this report are those of the author(s) and do not necessarily represent the views of the U.S. Fish and Wildlife Service.

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Figure 1. Map of emperor goose fall aerial survey segments 1-36 in southwest Alaska.

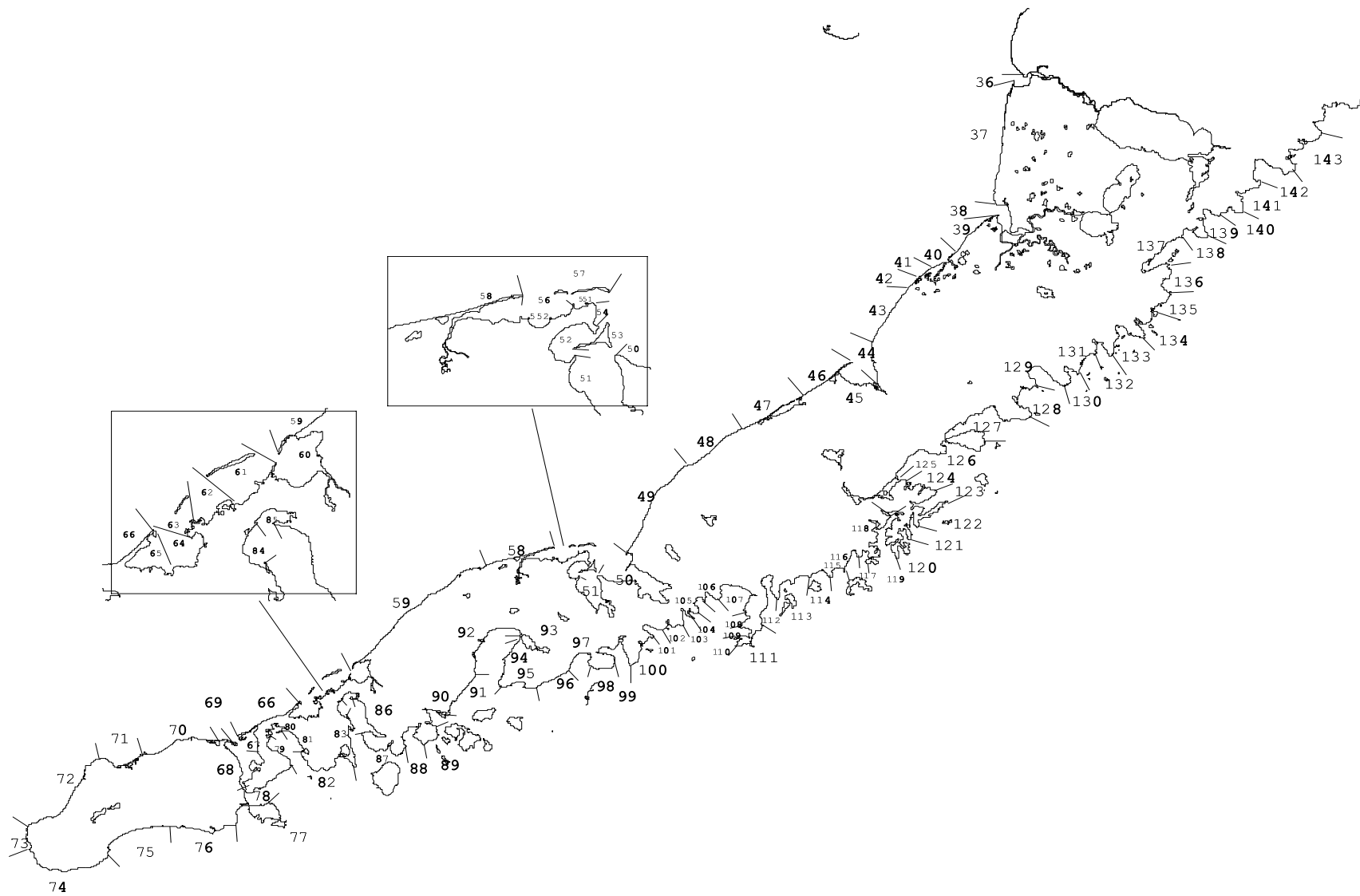


Figure 2. Map of emperor goose fall aerial survey segments 36-143 in southwest Alaska.

Table 1. Fall emperor goose survey data, southwest Alaska, 1979-2014.

YEAR	DATES	POPULATION INDEX	3YR. AVG.	PILOT/OBSERVER(S)	SURVEY AREA	SEGMENTS RANGE (TOTAL # SURVEYED)
1979	10/1-10/4	59808	NA	Conant/Gill	North Alaska Peninsula only	11-79 (54)
1980	10/4-10/8	65971	NA	King/Gill	North Alaska Peninsula only	11-79 (54)
1981	10/3-10/8	63156	62978	King/Gill/Derksen	Kuskokwim Bay south	11-90 (79)
1982	10/6-10/10	80608	69912	King/Bollinger	Kuskokwim Bay south	11-92 (81)
1983	10/10-10/16	72551	72105	King/Derksen	Kuskokwim Bay south	11-92 (81)
1984	10/3-10/8	82842	78667	"	Kuskokwim Bay south	11-92 (81)
1985	10/10-10/14	59790	71728	King/Eldridge	Kuskokwim Bay south	11-92 (81)
1986	10/5-10/11	68051	70228	"	Kuskokwim Bay south	11-92 (81)
1987	10/2-10/5	65663	64501	"	Kuskokwim Bay south	11-92 (81)
1988	10/7-10/12	76165	69960	"	Kuskokwim Bay south	11-92 (81)
1989	10/7-10/12	70729	70852	King/Denlinger	Kuskokwim Bay south	11-92 (81)
1990	10/17-10/19	109531	85475	King/Brackney	Kuskokwim Bay south	35-92 (81)
1991	10/3-10/8	75295	85185	"	Kuskokwim Bay south	11-92 (81)
1992	10/10-10/17	82295	89040	"	Kuskokwim Bay south	11-139 (105)
1993	10/23-10/26	71051	76214	King/Dewhurst	Alaska Peninsula only	35-137 (86)
1994	10/8-10/14	87086	80144	King/Laing	Kuskokwim Bay south	12-127 (83)
1995	10/14-10/20	91009	83049	King/Bollinger	Kuskokwim Bay south	20-139 (97)
1996	9/28-9/29	87018	88371	King/Eldridge	North Alaska Peninsula only ¹	35-65 (32)
1997	10/3-10/5	86669	88232	King/Dau	North Alaska Peninsula only ¹	35-85 (52)
1998	10/7-10/9	67744	80477	King/Mallek	Alaska Peninsula only	34-138 (85)
1999	10/1-10/5	60226	71546	Mallek/Dau	North Alaska Peninsula only ¹	35-85 (41)
2000	9/26-28,10/2	61626	63199	"	Kuskokwim Bay south	14-137 (96)
2001	9/26-28,10/1	59987	60613	"	Kuskokwim Bay south	14-137 (98)
2002	9/29-10/2	78692	66768	"	Kuskokwim Bay south	14-137 (100)
2003	9/27-10/2	77290	71990	"	Kuskokwim Bay south	14-137 (96)
2004	9/30-10/3	93544	83175	"	Kuskokwim Bay south	14-137 (88)
2005	10/4-10/8	73212	81349	"	Alaska Peninsula only	34-137 (58)
2006	9/26-9/28	81078	82611	"	Alaska Peninsula only	34-125 (48)
2007	9/26-10/3	73531	75940	"	North Alaska Peninsula only ¹	34-85 (42)
2008	9/26-9/28	78201	77604	"	Kuskokwim Bay south	14-137 (96)
2009	9/29-10/5	79647	77127	"	Kuskokwim Bay south	20-137 (76)
2010	9/30, 10/4	59924	72591	"	North Alaska Peninsula only ¹	34-85 (42)
2011	9/27-9/30	62561	67377	"	North Alaska Peninsula only ¹	34-85 (44)
2012	9/28-9/30	58683	60389	"	North Alaska Peninsula only ¹	35-85 (41)
2013	9/30, 10/19	78100	66448	Wilson/Dau	North Alaska Peninsula only ¹	35-85 (39)
2014	9/29-10/5	90954	75912	Wilson/Larned	North Alaska Peninsula only ¹	34-85 (43)

¹ Most recent 3-yr average count of south side of the Alaska Peninsula used in estimate

Table 2. Summary of Fall 2014 counts used to calculate totals for the Izembek Complex and Emperor Goose Survey. The 2014 Fall Emperor Goose Survey totals were the sum of three parts, highlighted in grey below: 1) the Northern Alaska Peninsula (Segments 34-59, flown on 29 Sept.); 2) the Izembek Complex Average (Segments 60-85, flown on 30 Sept., and 1 and 5 Oct.); and for emperor geese only, 3) the most recent 3-year average from the south side of the Alaska Peninsula (2004, 2008, 2009; Segments 86-139).

Area	Species			
	Emperor Goose	Pacific Brant	Canada Goose	Steller's Eider
Northern Alaska Peninsula	83,507	69	804	35,766
<i>Izembek Lagoon Replicates</i>				
<i>Rep 1: Sept 30</i>	1,909	149,835	38,339	7,013
<i>Rep 2: Oct 1</i>	431	137,481	24,725	8,466
<i>Rep 3: Oct 5</i>	693	194,765	46,462	6,421
Average of Replicates	1,011	160,694	36,509	7,300
Additional Izembek Segments (Bechevin & Morzhovi Bays: *Surveyed only on Sept 30)	2,215	10,941	9,727	0
Izembek Complex Average¹	3,226	171,635	46,236	7,300
South side Alaska Peninsula ²	4,221			
TOTAL	90,954	171,704	47,040	43,066

¹The Izembek Complex Average was calculated as the sum of two parts: 1) the average of the three Izembek Lagoon surveys from 30 Sept., 1, and 5 Oct.; and 2) a single survey of the remaining Izembek Complex segments in Bechevin and Morzhovi Bays (30 Sept.).

²The most recent 3-year average of the South side of the Alaska Peninsula was included only for emperor geese, in an effort to maintain consistency with previous years' calculations. For the other primary species, South side averages were never included in report totals, as historically, < 20 birds of these species were observed on the South side in any given year.

