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

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Abstract: We conducted the 32nd annual spring aerial emperor goose survey (1981-2012, 2014) from 23 to 29 April 2014. The survey included coastline and estuarine habitats from Jacksmith Bay to Wide Bay, including the north and south sides of the Alaska Peninsula. We counted a total of 79,883 emperor geese, 18.2% above the 2012 count of 67,588, and 22% above the long-term average (65,486, 1981-2012). The current management index (most recent 3-year average, 2011-12, 2014) is 73,879 (7.4% above the previous 3-yr average of 68,772). Other species of emphasis included Pacific brant and Steller's eider with counts of 64,588 and 15,212, respectively.

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INTRODUCTION

Since 1981 we have conducted an annual spring emperor goose survey to monitor spring distribution, abundance, and population trends of emperor geese and other waterbirds at migratory staging areas in southwestern Alaska. The aerial survey was cancelled in 2013 due to aircraft mechanical issues. The survey focuses on coastline and estuarine habitats from southern Kuskokwim Bay south and west along the north side of the Alaska Peninsula to Bechevin Bay and includes the south side of the Alaska Peninsula east to Wide Bay. Survey coverage along the south side of the Alaska Peninsula focuses on known emperor goose use areas and omits habitats where birds have not traditionally been observed staging, based on more inclusive historical surveys. A 3-year moving average of survey totals is used as the population index for management in accordance with the Pacific Flyway Emperor Goose Management Plan (2006). These data provide long-term population trends, distribution, and habitat use for emperor geese and associated species.

METHODS

We flew the 2014 survey between 23-29 April within the core portion of 143 shoreline/estuarine segments (Mallek and Dau 2000; Figure 1). We conducted the survey in an amphibious Cessna 206 (N9623R) flown at 45m (150 feet) above sea level and at 175km/hour (95 knots). Aircraft map displays along with 1:500,000 aeronautical and 1:63,360 topographical maps were used for navigation. Observations of habitat and survey conditions including wind, temperature, sky condition, visibility, sea and fresh-water ice conditions, and tide stage were recorded during the survey.

Survey timing targets spring staging emperor geese on the Alaska Peninsula prior to arrival on the Yukon-Kuskokwim Delta and following their departures from the eastern Aleutian Islands and Kodiak Island. Less than 100% of all emperor geese are within the survey area at the time the survey is conducted, but it is expected that the proportion present is consistent among years. Because not all emperor geese are present within the survey area, the total count is considered a population *index*, rather than a *total population estimate*.

The 2014 survey began on 23 April at Jacksmith Bay (Segment 14) and continued to Nanvak Bay (Segment 22). The portion of the survey from Egegik Bay to Moffet Point (Segments 36-59) was flown on 24 April. Moffet Bay, Izembek Lagoon and Kinzarof Lagoon (Segments 60-65, 84-85) were flown on 25 April. Segments west of Cold Bay (66-68, 80-83) were completed on 28 April along with a replicate survey of Moffet Bay and Izembek Lagoon. The south side of the Alaska Peninsula, east to Wide Bay (within Segments 88-137), was flown on 29 April. We used laptop computers and the aircraft Global Positioning System (GPS) to associate geographic coordinates with each voice-recorded observation. Record and Transcribe programs were used to collect and process data (J. Hodges, MBM-Juneau).

SURVEY CONDITIONS

Ice and snow conditions in 2014 were indicative of the mild 2013-14 winter conditions and an early spring break-up, in comparison to the cold, delayed spring of 2012. Sea ice was absent offshore and in estuaries throughout the survey area in 2014. Only the largest lakes in northern Bristol and Kuskokwim bays (Segments 14-22) had remnant ice. Snow cover was approximately 5% from Nanvak Bay (Seg. 22) north, and was otherwise absent in coastal lowlands throughout the survey area.

April 23: Jacksmith Bay to Dillingham (Segments 14-22): Conditions were good with minimal sun glare seaward of the survey route. Winds were light and variable ($\leq$10 knots) and ceilings were scattered to overcast at 2,000-3,000 feet. Air temperatures ranged from 35^{o} to 40^{o}F.

April 24: Dillingham to Cold Bay (segments 36-59): Survey conditions were good. Light southwest winds ($\leq$5 knots) increased to southeast at 15 knots with ceilings of 2,500 to $\geq$5,000 feet scattered to overcast. Air temperatures increased from 30^{o} to 40^{o}F during the day.

April 25: Cold Bay and Izembek Lagoon (Segments 84-85, 60-65): Survey conditions were good with mid-level tide in Izembek Lagoon and high tide in Cold Bay. Ceiling was 2,000 feet overcast with southeast wind at 8 knots and air temperature was 40^{o}F.

April 28: Izembek Lagoon to Bechevin Bay and the southside to Cold Bay (Segments 60-65 [Izembek replicate], 66-68, 80-85): Survey conditions were good with mid-level tide in Izembek Lagoon high tide along the Pacific side of the Alaska Peninsula. Winds were north westerly at 15-20 knots with a ceiling of 900 feet overcast and an air temperature of

45°F.

April 29: Belkofski Bay to Wide Bay (Segments within 88-137). Ceilings were greater than 1,000 feet with thin scattered to clear skies and winds were calm to southerly at ≤10 knots. Very little sun glare was encountered and the far east portion of Wide Bay had fog. Air temperature was 45°F.

RESULTS/DISCUSSION

Totals counts in 2014 are presented by survey segment (Table 2). Most emperor geese were found in their traditional estuaries along the Bering Sea coast of the central and western Alaska Peninsula, with slightly lower than average counts (1981-2012) from Cape Newenham north (1 versus 1.9% of the total count), west of Izembek Lagoon (0 versus 0.3%), and along the south side of the Alaska Peninsula (2.6 versus 3.6%). The largest aggregations of emperor geese in 2014 were observed near Port Heiden and Nelson Lagoon. Observations at Unalaska, west of the survey area in the eastern Aleutian Islands, suggested that most emperor geese had departed by 18 April with late stragglers on 20 April (2 adults with 18 juveniles; S. Golodoff, pers. comm**.).** Near the town of Kodiak, departure of up to 85% of the wintering population was indicated from 13-23 April, with few remnant birds reported on 28 April (R. MacIntosh/S. Berns, pers. comm.).

Emperor Goose

The 2014 emperor goose spring count (79,883) was 18.2% above the 2012 estimate of 67,588 (Dau and Mallek 2013 and Table 2, this report) and 22.0% above the long term average of 65,487 (1981-2012). The current management index (i.e., 3-year average, 2011-12, 2014) of 73,879 birds is 7.4% above the previous average of 68,772 (2010-2012; Table 3). Primary staging sites along the north side Alaska Peninsula held 96.3% of birds observed in 2014, versus the long-term average of 91.4% (1981-2012). Below average counts of emperor geese were made from Jacksmith Bay to Cape Pierce (Segments 14-22; n=814 birds; 1981-2012 average 1,302). No emperor geese were seen in the westernmost areas of Bechevin Bay/Morzhovoi Bay (Segments 67-68/80-81) versus the 1981-2012 average of 157. In 2014, a total of 2,058 (2.6%) were observed along the south side of the Alaska Peninsula (Segments 88-137) versus the 1981-2012 average of 2,846 (3.6%). Observations of the early departures of emperor geese from Unalaska confirm that most migrants from the eastern Aleutian Islands were likely in the survey area. Likewise, observations of migrants from Kodiak Island suggest that most emperor geese from that wintering population were likely in the survey area.

Pacific Brant

We observed a total of 64,588 brant during the 2014 survey (Table 2) which is 9.7% below the long-term average for this spring survey (71,495, 1981-2012). We observed 40,135 brant, 62.1% of the total, in Izembek Lagoon and adjacent areas (Segments 60-68, 80-85). The long-term average for that area is 78.4% (1981-2012). Also, we observed

20,972 brant in Chagvan and Nanvak bays (Segments 20, 22), which is well above the long-term average of 12,349 brant for those segments. Based on these observations, we believe our brant count may have been low due to an accelerated, yet geographically spread migration, in response to the mild, early spring conditions. The first brant were arriving at the Tutakoke River (Yukon-Kuskokwim Delta) on approximately 23 April, as we were beginning the survey (J. Sedinger, pers. comm.), while observations from British Columbia to Oregon, and at Izembek lagoon, indicated some were still enroute from southern wintering and staging areas.

We flew a replicate survey of Izembek (Segments 60-65) and Kinzarof (Segment 85) lagoons on 28 April, during which 50,967 brant were observed. Three days earlier (25 April) our initial count of the area revealed 33,265 brant. Ground-based observations suggested brant were actively arriving to the Izembek area during this period (C. Dau, H. Wilson, and Izembek NWR staff pers. obs.).

Steller's Eider

We observed only 15,212 Steller's eiders during the survey (Table 2). This low count may have also been due to an accelerated migration in response to the mild, early spring conditions, as we indicated with brant. However, only 209 Steller's eiders were observed from Jacksmith Bay to Nanvak Bay (Segments 14-22), indicating that most of the population had likely migrated north of the survey area prior to 23 April. The 2014 count is 68.6% below the long-term average of 48,652 (1981-2012). Distribution was similar to previous years with most Steller's eiders observed from Port Heiden to Izembek Lagoon (11,459 birds, 75.3%). Steller's eider flock composition, recorded by the right seat observer, showed that 90.2% of 41 total observations were of equal ratios (i.e., adult males versus brown-plumaged birds).

CONCLUSIONS

Since an indicated population decline in 1981-82, the trend in the annual population index for emperor geese has remained essentially flat to slightly increasing; with an overall annual growth rate of 0.2% (1981-2012, 2014, Figure 3, Table 3). However, the growth rate since harvest closure in 1987 (1.2%) has been substantially more favorable. This slow, but steadily increasing trend, suggests that the closure to hunting in 1987 may have positively influenced conservation of the species. Overall, continued mortality pressures (anthropogenic and natural) and subdued productivity (relatively low proportion of juveniles counted in the fall) are likely precluding population growth, as indicated by the spring survey index.

Fall age ratios (% hatching-year birds) have declined at approximately 1%/year, with annual estimates around the long-term mean of 0.19 (SD: 0.06) representing a range of poor (0.1-.12) to good (0.23-0.26) years from 1985-2013 (Stehn and Wilson 2014). Six of the past 10 years (60%) and 14 of the overall 29 years (48%) have been below the long-term average juvenile age ratio (Stehn and Wilson 2014); indicating production has been less than ideal. Declining numbers of juveniles lowers potential recruitment of

breeding age adults (3^+ yrs). The likelihood that birds harvested in spring are breeding-age adults rather than young, is higher in years following a summer of poor production. Mortality of breeding-age adults is especially harmful to the overall emperor goose population because it lowers both current population size and potential production of future goslings. We believe low annual productivity (as indexed by fall age ratios) and a failure to increase adult survival, are the primary factors limiting recovery of the population. A better understanding of additive losses from continued hunting (intentional and unintentional take and crippling) would help quantify this impact on the population. However, this effort will first require more reliable documentation (Wolfe and Paige 2002, Naves 2011).

We believe that two realistic management options for increasing population size are 1) reducing human harvest year-round and 2) increasing nest success and lower gosling predation rates on the Yukon-Kuskokwim Delta. Gosling survival is estimated to be low due to high predation rates, primarily by gulls (Bowman et al. 1997). Gosling growth and survival rates also appear to be negatively influenced by grazing pressure and competition for preferred habitats (Schmutz and Laing 2002). Additional, uncontrollable, negative factors during nesting and brood rearing include storm surge flooding, increased pond salinity and sedimentation, and erosion of nesting habitat. However, emperor geese exhibit high rates of egg production and nest success through late incubation in most years (Fischer and Stehn 2012), which indicates good potential for gosling production.

The following are our views of problems limiting recovery of the emperor goose population and potential management options to address them:

1) ***Problem:*** Illegal hunting in spring, summer, fall and winter. Comprehensive harvest surveys are needed in Alaska and Russia to assess temporal and spatial distribution and age composition within the harvest.
Management option: Increase compliance with regulations through outreach and enforcement to reduce take. Expand and provide analytical support for harvest surveys to better assess take.

2) ***Problem:*** Predation on goslings is high (Bowman et al. 1997), productivity is relatively low, and survival of juveniles is chronically low from pre-fledging through winter (Schmutz et al. 1997).
Management option: Predator management options on the YKD should be evaluated for local and area-wide effectiveness in increasing productivity and gosling survival (Bowman et al.1997). Monitoring of age and season specific survival rates should be continued. Increase monitoring of climate-change impacts on quantity and quality of nesting and brood rearing habitats.

3) ***Problem:*** Wintering ecology and survival of emperor geese is poorly understood and very low juvenile survival is indicated.
Management option: Quantify mortality factors during winter and

determine if management options exist to reduce them. Marking and satellite tracking studies of emperor geese have helped locate possible study sites (Hupp et al. 2007, 2008a,b).

The spring emperor goose survey continues to provide an index to population size and trend as required by the Pacific Flyway management plan (Pacific Flyway Council 2006 and Alaska Migratory Bird Co-management Council (AMBCC) Technical Subcommittee - Emperor Goose). We believe this survey would benefit from complete or partial replicate counts at high density staging sites (e.g. Port Heiden, Nelson Lagoon, and Izembek). Replicate counts could 1) help qualify the accuracy of the population index and 2) provide useful measures of timing and duration of use of most important sites.

The findings and conclusions in this article 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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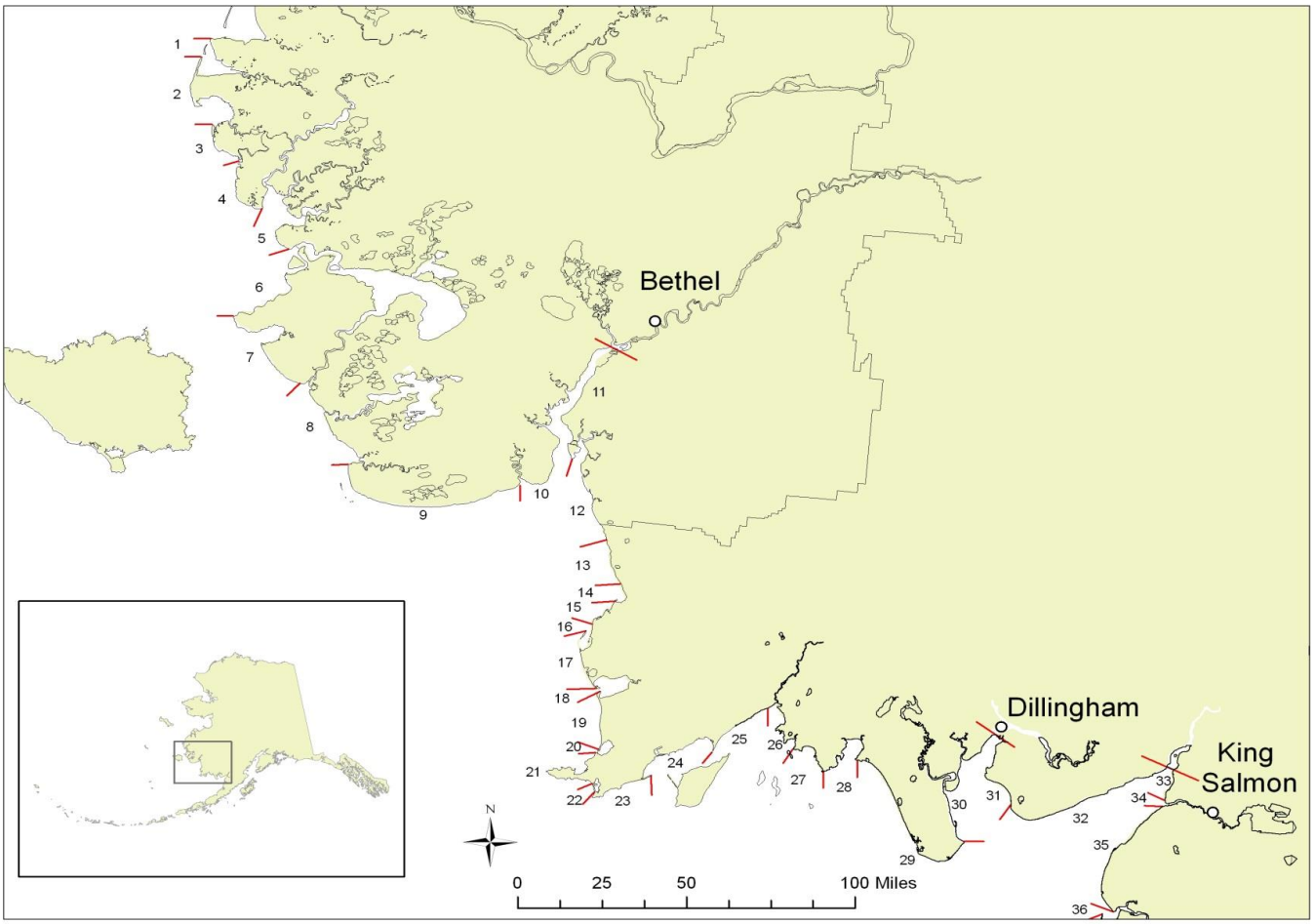

Figure 1. Emperor goose aerial survey segments 1-35, southwest Alaska.

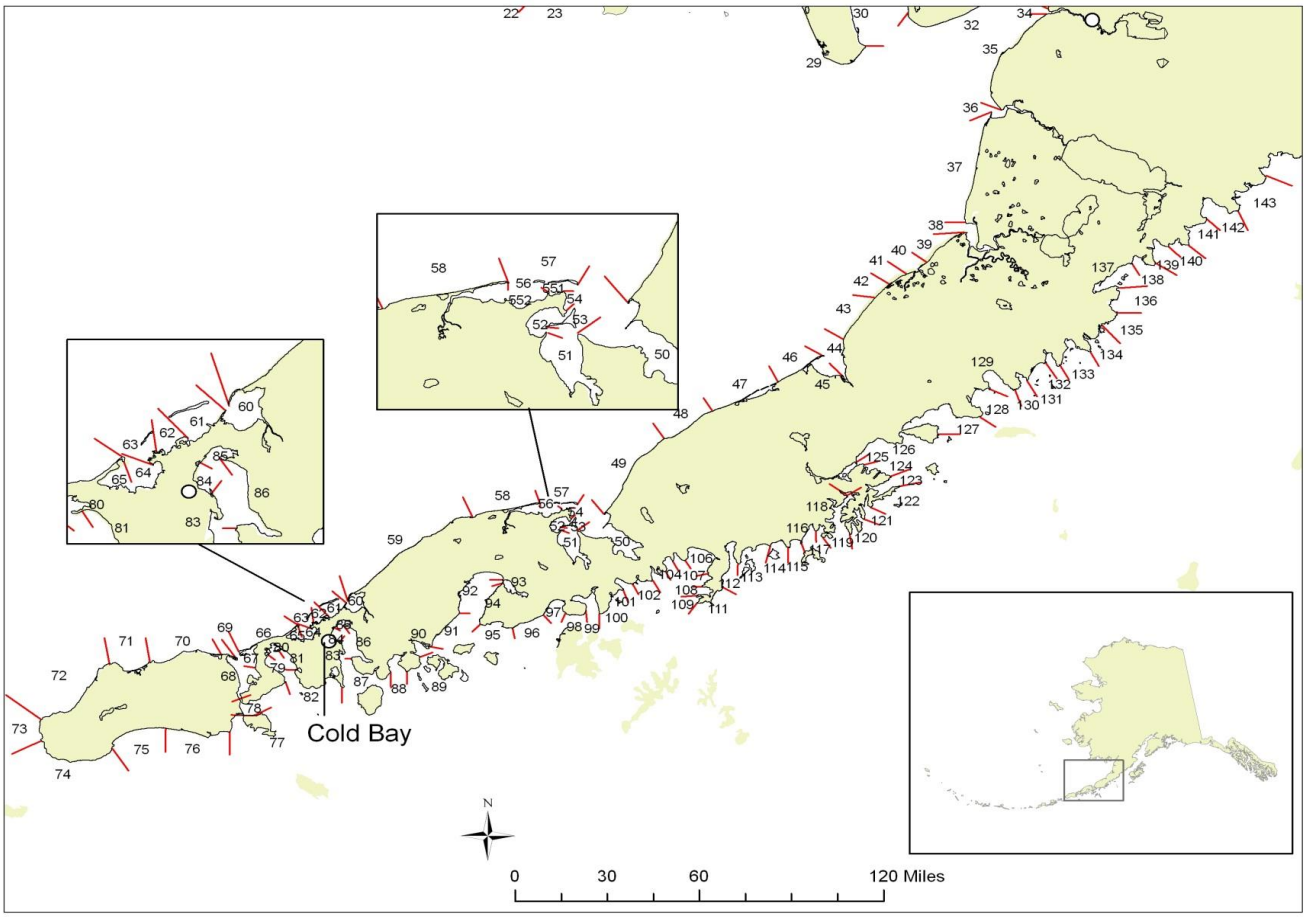

Figure 2. Emperor goose aerial survey segments 35-143, southwest Alaska.

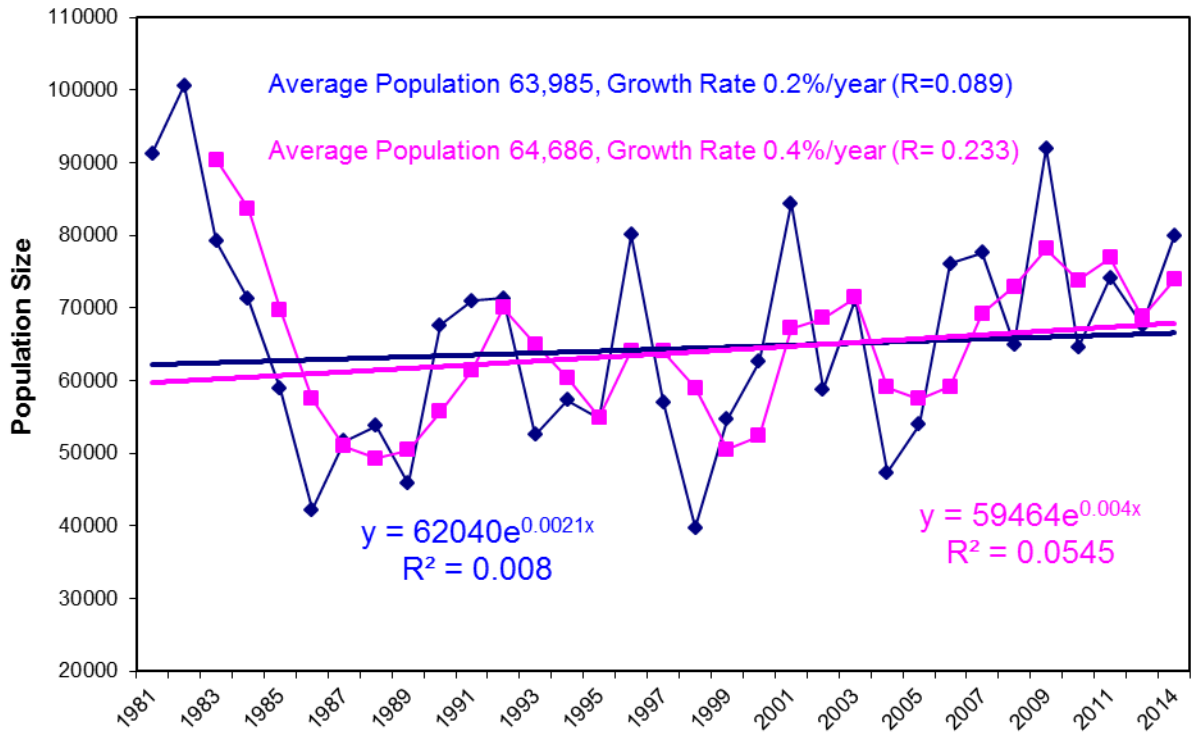

Figure 3. Spring emperor goose annual and 3-year average population indices, 1981-2012, 2014.

Table 1. Snow and ice conditions during spring emperor goose survey in southwest Alaska, 23 April 2014.

AREA	SNOW COVER[1]	MARINE ICE COVER[2]
Kokechik Bay	NS	NS
Hooper Bay	NS	NS
Hazen Bay	NS	NS
Carter Bay	<5	0
Goodnews Bay	<5	0
Chagvan Bay	<5	0
Nanvak Bay	<5	0
Relative Phenology[3]	**Very Early**	**Very Early**

[1] Percent snow cover on near-shore freshwater marshes. NS= Not Surveyed.

[2] Percent of marine ice cover in estuary.

[3] Subjective habitat conditions (early, average, late) based on ice and snow cover.

Table 2. Waterbird and mammal observations by segment, southwest Alaska, 23-29 April 2014.

Species	14	15	16	17	18	19	20	22	36	37	38	39	40	41	42	43
Bald Eagle (Ad)									2		1					
Beluga																
Black Brant							18422	2550			50					
Black-legged Kittiwake							2									
Black Scoter		2				20	8		53	332	12	289				
Canada Goose							250									
Common Eider											11					
Common Merganser		4														
Emperor Goose		20		6			778	10	2767	1	4966					
Greater Scaup	3	3	5		27		10	30	240	22	18					
Gray Whale										1		1				
Harlequin Duck												10				
King Eider						4			2	8						
Large Gull	132	32	268	42	181	76	692	633	436	340	850	32				
Long-tailed Duck	2	2	361	1		33	35			192		50				
Mallard									4	2	21					
Mew Gull	6	2	7	2	1	2			306	97	182	180				
Northern Pintail		10							26		20					
Pacific Loon										2						
Pelagic Cormorant					23											
Pigeon Guillemot																
Red-breasted Merganser			74	29	86	7	121	74	2	38	70	8				
Red- throated Loon				2		2			4	44	6					
Sea Otter									3	1	2					
Small Shorebird									500		1200					
Steller's Eider		79	80	50	316		3173	10								
Surf Scoter												2				
White-fronted Goose												10				
White-winged Scoter				1		128			17	112	2	21				

Table 2 (continued). Waterbird and mammal observations by segment, southwest Alaska, 23-29 April 2014.

Species	44	45	46	47	48	49	50	51	52	53	551	552	56	57	58	59
Arctic Tern												1	1			
Bald Eagle (Ad)	1					1	2	2			1		1			
Bald Eagle (Juv)			1							1	1		4			
Black Brant				50												
Black Scoter	214	1	637	190	15	2075			1			65	7001	2592	2804	239
Common Eider	10	350	6	2								3	90			
Common Raven				1	1											
Common Goldeneye													1			
Emperor Goose	4427	29851	8	14090						20	1739	4491	1175	1410		
Greater Scaup	115					10		15								
Gray Whale					2	5									1	
Harbor Seal		930		480		121							280	1	60	
King Eider	80					61										
Large Gull	440	196	237	2152	777	651	274	4	431	312	496	900	45	344	993	37
Long-tailed Duck				2		400							1500		240	
Mew Gull	453	70	176	700	1270	670	500	1040		6	700				40	30
Northern Pintail	600	460		530					75							
Red-breasted Merganser	6		5			15						110		6	1	
Red- throated Loon			1													
Sea Otter		75					6	28		1			418	130	1	
Small Shorebird	500			1030			220				2000	40				
Steller's Eider	5			1600									810	125		
Steller's Sealion						2										
Walrus						1										
White-winged Scoter						559						34	815	1	47	

Table 2 (continued). Waterbird and mammal observations by segment, southwest Alaska, 23-29 April 2014.

Species	60	61	62	63	64	65	66	67	68	80	81	82	83	84	85
Bald Eagle (Ad)			1								1				
Bald Eagle (Juv)				1											
Black Brant	2207	3777	3225	311	17750	5995	304	2700	967	3152	1	30	50		
Black-legged Kittiwake								7							
Black Scoter	236		10				124	2	10	10	53	40	4		
Brown Bear								1	1						
Common Eider									19					3	
Common Loon											1	2			
Common Raven													2		
Emperor Goose	1317			45									10		
Greater Scaup	1459		8							15					
Harlequin Duck					5		51	8	30		2		5	7	65
Harbor Seal		60		5					2		2				4
Large Gull	205	78	54	46	3	1000	181	234	366	668	7	113	38	6	223
Long-tailed Duck									1						
Mallard	20	1	104							17					
Mew Gull		43	2			500		9	75	52			5	1	63
Northern Pintail		122	2												
Pelagic Cormorant							1						1		
Red-breasted Merganser	47	27							2	141					75
Sea Otter	194	137	70	11		40	2	88	228		20		1		6
Small Shorebird	2615		225										90		
Steller's Eider	3271	5528	65	60						6					
Tundra Swan			3												
White-winged Scoter	3						25		3				1	2	

Table 2 (continued). Waterbird and mammal observations by segment, southwest Alaska, 23-29 April 2014.

Species	88	90	91	92	93	97	99	101	102	103	104	105	106	107	112	113	114	115
Bald Eagle (Ad)	3		1	1		1	4		1			1	1			1		
Bald Eagle (Juv)								1								3	1	
Black Brant	4	733	20	66				30										
Black Scoter	18	2		7	28	6	13				65		12	10	35	26	23	30
Bufflehead	12	20					14								45			
Common Loon	3	1	3			5	20	1		1	5	1	8	9		4		
Common Raven					1													
Doublr-crested Cormorant					1			1				1	2			1		
Emperor Goose		15	10	149	15							15			190			
Common Goldeneye					2			2										
Greater Scaup							20							1				
Gray Whale															1			
Harlequin Duck	4	33		80	248	33	199	34	42		9	98	32	19	32		30	
Harbor Seal					21	2	6	60			2					2	1	
Large Gull	33	618	16	739	394	41	3	8	41	1	2	3	5	6	65	7	10	8
Long-tailed Duck						2	1	1										
Mallard					55		2											
Mew Gull	5	2		111	56	14	14	13	4				40	27	260	42	2	14
Pelagic Cormorant			3												1	23	6	2
Pigeon Guillemot														1		3	1	
Red-breasted Merganser	80	10	32		25		148	2	4		1			8	179	16		
Lesser Sandhill Crane		2																
Sea Otter	2		13	10														
Small Shorebird				6700	400								30					
Steller's Eider		6			2		20	2										
Steller's Sealion							1								1			
Surf Scoter						20												3
White-winged Scoter	22		2				4					3	4		15			

Table 2 (continued). Waterbird and mammal observations by segment, southwest Alaska, 23-29 April 2014.

Species	116	117	118	125	126	127	128	129	130	131	132	133	134	135	136	137	**Survey Total**
Arctic Tern																	**2**
Bald Eagle (A)		1	1	1	1	3			2	1		7	1	1	3	1	**53**
Bald Eagle (J)				1	1	1						1				1	**18**
Bald Eagle (N)																	**Note**
Black Brant				1700	3		80	26	39			21				325	**64588**
Black-legged Kittiwake												200					**209**
Black Scoter				275	157	65	5	45				33				92	**19400**
Brown Bear		1						1						1			**5**
Bufflehead												20	2				**91**
Canada Goose																	**250**
Common Eider																2	**496**
Common Loon			4	2	5	1	1	3				5	2	1		4	**94**
Common Merganser																	**4**
Common Murre	2		2														**4**
Common Raven					2		1	21			1					1	**33**
Double-crested Cormorant					5		2	1	2				1				**17**
Emperor Goose					185	75	369	311		270	45	25	80		1160	498	**79883**
Common Goldeneye				8		4		7									**5**
Greater Scaup				4			2					30				1	**2279**
Gray Whale					1	1					2				1		**17**
Harlequin Duck				77	6	77		26	55	3		135		29	30	74	**1588**
Harbor Seal		30	2	7		3	100	4				25				3	**3170**
Humpback Whale																	**1**
King Eider					25												**186**
Large Gull	15	45	74	3203	145	531	90	48	61	3	17	355	68	83	125	393	**24264**
Long-tailed Duck																	**3405**
Mallard				1													**269**
Mew Gull	300		2	368	8	206	1	125	12	50		294				26	**11408**
Northern Pintail																	**2141**
Pacific Loon																	**2**
Pelagic Cormorant			3	2								2				1	**68**
Pigeon Guillemot																	**5**
Red-breasted Merganser				195	17	4	11	26	2	2				1		39	**2199**
Red-throated Loon																	**61**
Lesser Sandhill Crane																	**2**
Sea Otter					16	13		6				1				3	**1526**
Small shorebird (spp)						10		1							8		**18259**
Steller's Eider								1	3								**15212**
Steller's Sealion																	**5**
Surf Scoter					8	40									8	21	**108**
Tundra Swan												2					**7**
Walrus																	**1**
White-fronted Goose																	**10**
White-winged Scoter			1	1	20	64	10	5			1					21	**1985**

Table 3. Spring emperor goose survey data, southwest Alaska, 1981-2012, 2014.

YEAR	TOTAL	% CHANGE	3-YR AVG.	% CHANGE	DATES	OBSERVERS	SURVEY AREA
1981	91267				4/23-4/27	R.King/R.Gill/J.Sarvis/C. Dau	Y-K Delta to Wide Bay
1982	100643	0.093			5/2-5/4	R.King/C.Dau/M.Reardon/ B. Reiswig	Kuskokwim Bay to Wide Bay
1983	79155	-0.271	90355		4/25-4/29	R.King/C.Dau/V.Berns/ J.Solberg	Kuskokwim Bay to Wide Bay
1984	71217	-0.111	83672	-0.074	4/26-5/4	R.King/C.Dau/V.Berns/ R.Arment	Kuskokwim Bay to Cape Douglas
1985	58833	-0.210	69735	-0.167	5/12-5/16	R.King/C.Dau	Kuskokwim Bay to Cape Chiniak
1986	42231	-0.393	57427	-0.176	5/4-5/7	"	Nelson Island to Cape Atushagvik
1987	51633	0.182	50899	-0.114	4/30-5/4	"	Hooper Bay to Puale Bay
1988	53784	0.040	49216	-0.033	5/2-5/6	"	Hooper Bay to Cape Chiniak
1989	45800	-0.174	50406	0.024	5/3-5/6	"	Hooper Bay to Portage Bay
1990	67581	0.322	55722	0.105	4/28-5/4	"	Hooper Bay to Portage Bay
1991	70972	0.048	61451	0.103	5/2-5/7	"	Hooper Bay to Puale Bay
1992	71319	0.005	69957	0.138	4/30-5/5	"	Hooper Bay to Cape Kubugakli
1993	52546	-0.357	64946	-0.072	4/30-5/5	"	Hooper Bay to Wide Bay
1994	57267	0.082	60377	-0.070	4/29, 5/2-6	"	Hooper Bay to Wide Bay
1995	54852	-0.044	54888	-0.091	5/3-5/6	"	Hooper Bay to Chignik Lagoon
1996	*80034*	*0.315*	*64051*	*0.167*	*4/27-4/30*	"	*Hooper Bay to Puale Bay*
1997	57059	-0.403	63982	-0.001	4/25-4/28	"	Hooper Bay to Wide Bay
1998	39749	-0.435	58947	-0.079	5/4-5/7	"	Hooper Bay to Wide Bay
1999	54600	0.272	50469	-0.144	4/27-5/1	"	Hooper Bay to Wide Bay
2000	62565	0.127	52305	0.036	4/28-5/3	E.Mallek/C.Dau	Hooper Bay to Chignik Lagoon
2001	84396	0.259	67187	0.285	4/29-5/4	"	Hooper Bay to Puale Bay
2002	58743	-0.437	68568	0.021	5/3-5/6	"	Kuskokwim Bay to Wide Bay
2003	71160	0.174	71433	0.042	4/29-5/3	"	Hooper Bay to Wide Bay
2004	47352	-0.503	59085	-0.173	4/30-5/3	"	Hooper Bay to Wide Bay
2005	53965	0.123	57492	-0.027	4/20-4/23	"	Kuskokwim Bay to Wide Bay
2006	76108	0.291	59142	0.029	4/27-5/2	"	Kuskokwim Bay to Wide Bay
2007	77541	0.018	69205	0.170	4/24-4/29	"	Kuskokwim Bay to Kuiukta Bay
2008	64944	-0.194	72864	0.053	4/29-4/30	"	Naknek to Bechevin Bay
2009	91948	0.294	78144	0.072	5/1-5/3	"	Kuskokwim Bay to Wide Bay
2010	64562	-0.424	73818	-0.055	4/27,5/1-5/2	"	Kuskokwim Bay to Canoe Bay
2011	74166	0.129	76892	0.042	4/27, 4/29-5/1	"	Kuskokwim Bay to Canoe Bay
2012	67588	-0.097	68772	-0.106	4/25-4/27	"	Kuskokwim Bay to Wide Bay
2013						No Survey	
2014	79883	0.182	73879	0.074	4/23-25,4/29	H.Wilson/C.Dau	Kuskokwim Bay to Wide Bay