

AERIAL SURVEY OF EMPEROR GEESE AND OTHER WATERBIRDS  
IN SOUTHWESTERN ALASKA, SPRING 2004

By

Christian P. Dau<sup>1</sup>  
and  
Edward J. Mallek<sup>2</sup>

Key Words: aerial survey, emperor geese, waterbirds, southwest Alaska.

October 2004

<sup>1</sup>U. S. Fish and Wildlife Service  
Migratory Bird Management  
1011 E. Tudor Road  
Anchorage, Alaska 99503

<sup>2</sup>U. S. Fish and Wildlife Service  
Migratory Bird Management  
1412 Airport Way  
Fairbanks, Alaska 99701

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*Christian P. Dau, U.S. Fish and Wildlife Service, Migratory Bird Management, 1011 E. Tudor Rd, Anchorage, AK, 99503*

*Edward J. Mallek, U.S. Fish and Wildlife Service, Migratory Bird Management, 1412 Airport Way, Fairbanks, AK, 99701*

**Abstract:** The 24th consecutive spring aerial emperor goose survey was conducted from 30 April-3 May. An amphibious Cessna 206 (N234JB) flown at 45m (150 feet) ASL and 200km/hr (110 kts) was used to perform the survey. A total of 47,352 (down 33.5% from 2003) emperor geese were observed in coastline and estuarine habitats from Kokechik Bay to Unimak Island, including north and south sides of the Alaska Peninsula east to Wide Bay. Satellite tracking data suggest some emperor geese may have gone undetected while in transit across Bristol Bay which could explain the lower than expected count. The 3-year average of consecutive spring surveys is now 59,085 birds (down 17.3% from previous 3-yr average). Other species of emphasis included Pacific brant and Steller's eider with estimated populations of 81,666 and 10,393, respectively.

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## INTRODUCTION

This survey has annually monitored spring distribution, abundance and population trends of emperor geese and other waterbirds at migratory staging areas throughout southwestern Alaska since 1981. Coastline and estuarine habitats from the Yukon-Kuskokwim Delta (Y-K Delta) south and west along the north side of the Alaska Peninsula to Unimak Island, and the south side of the Alaska Peninsula east to Wide Bay were surveyed. Coverage along the south side of the Alaska Peninsula emphasizes known emperor goose staging and use areas. These population data, collected in accordance with the Pacific Flyway Emperor Goose Management Plan, are used as the index relative to established harvest thresholds. These data also assess annual and long-term variation in seasonal migratory phenology and determine the distribution trends and habitat use for emperor geese throughout the survey area.

## METHODS

The spring 2004 survey was flown from 30 April-3 May. Survey timing has been determined by observations of the phenology of ice break-up in coastal estuaries and coastlines within the survey area, local observations of migrating and staging emperor geese, and in recent years by the movement of birds implanted with satellite transmitters. The former observations consisted of a combination of satellite imagery, ice charts from the National Weather Service and observations from refuges within the survey area. Jerry Hupp (USGS-BRD Alaska Science Center) provided periodic locations of 18 satellite monitored birds marked in 2003 and tracked through spring 2004.

The survey was flown in an amphibious Cessna 206 (N234JB) at a ground speed of approximately 200 km/hr (110 kts) and an altitude of 45m (150 feet) ASL. The survey route followed the coast from

Kokechik Bay (north of the village of Hooper Bay) to the lower Naknek River (near the village of King Salmon) to the tip of the Alaska Peninsula (along the north side of the peninsula) to Wide Bay (along the south side of the Alaska Peninsula). Observations were made from both sides of the aircraft and voice recorded into two laptop computers using remote microphones. Computers received input from the aircraft Global Positioning System (GPS) saving coordinates for each observation. Special “record” and “transcribe” computer programs developed by Jack Hodges (USFWS-MBM, Juneau) were used to collect and process these data.

The coastal flight path was usually 100 meters offshore with deviations to confirm species identification and numbers, normally within 1 mile of exposed shorelines. In estuaries, a systematic but meandering flight path was followed to ensure complete coverage. Whenever possible, flights were conducted with <20 knots of wind and primary staging areas were flown at or near high tide as this concentrated geese near shorelines.

The survey area includes 143 shoreline/estuarine segments identified on 1:500,000 scale aeronautical maps (Figure 1) which were previously described by Mallek and Dau (2000). General observations of habitat and survey conditions including wind speed and direction, temperature, sky condition, visibility, and tide stage were recorded en route.

## SURVEY CONDITIONS

Spring 2004 was climatically the earliest observed since the annual survey began in 1981. The springs of 2003 and 2004 have been the earliest on record. In 2004, there was essentially no snow on coastal lowlands of the Y-K Delta and no sea ice was present in the nearshore Bering Sea.

April 30: Y-K Delta (Segments 2-10). Northeast winds (15-20 kts), high scattered ceiling and a temperature of 38°F. Visibility and survey conditions were good. Snow conditions were: Bethel to Aropuk Lake 0-2%, Aropuk Lake to Kokechik Bay 0-2% with all coastal wet meadows snow free and no signs of flooding. All meadow habitats along the coast were available to spring migrating birds as were coastal tide flats. Kokechik and Hooper bays were ice free with a small amount of deteriorating ice grounded on adjacent mud flats. Angyoyaravak, Hazen, Kangirlvar and Kinia bays were also ice free. Kuskokwim Bay had some broken, grounded shore-fast ice one to two miles offshore from Kongiginak east. Survey conditions were mostly favorable with moderate glare in some locations.

May 1: Bethel to King Salmon (Segments 11-34). Northeast winds (15-18 kts), high scattered ceilings and temperatures of 45°F. Survey conditions were mostly favorable with moderate glare in some locations. No snow was present in coastal lowlands and sea ice was absent.

May 2: Naknek River to Moffet Bay (Segments 35-60). From King Salmon to Cold Bay, winds were northwest at 5 kts with a 3000 foot scattered ceiling and a temperature of 52°F. Survey conditions were mostly favorable with moderate glare in some locations. Tides were high and ebbing at Egegik and Ugashik Bays and Cinder River Lagoon, mid at Port Heiden and Seal Islands and very low in Herendeen Bay and Nelson Lagoon. Tide was mid/flooding at Moffet Bay. Survey conditions were mostly favorable with moderate glare in some locations.

May 3: Izembek Lagoon to Cold Bay (Segments 66-68, 80-83) during the morning; Kinzarof lagoon to Wide Bay (Segments 84-137) during the afternoon. Winds were west to northwest at 5-15kts with temperatures of 42-45°F. Survey conditions were good. Tide level was mid on the Bering Sea side and low on the Pacific side.

## RESULTS/DISCUSSION

Lack of Bering Sea ice and coastal snow cover in 2004 surpassed the record early conditions in 2003 making spring 2004 climatically the earliest documented survey (Appendix 2). The first emperor geese sightings on the Y-K Delta were ours on 30 April, identical to the arrival of the first satellite tracked bird (Jerry Hupp, USGS, BRD, ASC, pers. comm.). The 160 emperor geese seen on the Y-K Delta on 30 April was below the long-term average of 603 birds (14 were observed in 2003). Comparatively low numbers of emperor geese were observed from Kuskokwim Bay to Nanvak Bay/Cape Newenham with the majority in estuaries along the north side of the Alaska Peninsula. This suggests migration may be more closely correlated with conditions at staging rather than breeding areas and that the majority of birds were distributed normally and migrating at a rate comparable to other years. Field camps on the Y-K Delta were not established until 3 May and one camp (Tutakoke River) reported a flock of 1,000 emperor geese on 7 May and what they felt was a peak influx on 17 May (Appendix 3).

Emperor goose and other waterbird numbers are summarized by segment in Table 1.

### Emperor Goose

The 2004 emperor goose count was 47,352, 33.5% below the 2003 estimate of 71,160 (Appendix 1), and 25.5% below the 24 year average of 63,532±15,580. The current 3-year average management index of 59,085 decreased 17.3% from the previous average of 71,433 (2001-2003) geese. Tracking data for emperor geese equipped with satellite and VHF transmitters suggests some migrants may have gone undetected while in transit across Bristol Bay which could explain the lower than expected count. Tracking data indicated that by 1 May two emperor geese (1 VHF and 1 satellite equipped bird of 28 transmitted birds) had reached the Y-K Delta. By 2 May, the day we surveyed the north side of the Alaska Peninsula, up to 25% of the transmitted birds had reached the Y-K Delta. This suggests nearly 20% of the population may have been missed in transit. Proportions of emperor geese at primary staging sites were similar to long-term patterns (Table 2). The long-term emperor goose population trend is not significant and is illustrated in Figure 2.

### Pacific brant

We observed a total of 81,666 brant during the emperor goose survey (Table 1), 50,146 (61.4%) of which were in Izembek Lagoon and adjacent areas. Brant responded to the early spring conditions by distributing farther north in the survey area in larger numbers. A total of 73 were observed on the Y-K Delta which was 204% above a 22 year average of 24±50 birds. Totals of 19,640 and 9,577 brant were observed at Chagvan and Nanvak bays, respectively. Small numbers of brant along the south side of the Alaska Peninsula were characteristic of the migratory pattern observed in previous years.

## Steller's Eider

We observed a total of 10,393 Steller's eiders during the emperor goose survey (Table 1), 80.8% below the long-term average of  $54,102 \pm 28,782$ . Early spring climatic conditions have coincided with lower than average counts of Steller's eiders in recent years (i.e. 2002 = 15,260, 2003 = 14,841). As in 2003, Steller's eiders were largely absent from southerly estuaries within the survey area suggesting earlier than normal departures to breeding areas. Only 1,215 birds (11.7% of total) were observed from Port Moller/Nelson Lagoon to Izembek Lagoon and none were observed along the south side of the Alaska Peninsula. We believe the climatically early conditions in 2002, 2003, and 2004 resulted in low counts of Steller's eiders and that the bulk of the migration passed the Y-K Delta prior to the survey (4/29 in 2003 and 4/30 in 2004). Subjectively, it appears the Steller's eider migration may have been advanced by 10 days or more in both 2003 and 2004. Equal sex ratio of adult plumaged birds (96.2%) in 53 flocks recorded by the right seat observer suggested paired birds predominated. In previous surveys, Steller's eider flocks in southern Bristol Bay estuaries have been predominately brown plumaged birds (females and/or subadults). In 2004 only one such flock was observed which may be indicative of low productivity in 2003.

Five Steller's eiders were captured during winter 2003 at Kodiak Island and implanted with satellite transmitters. Three of the five were near Cape Avinof (southern Y-K Delta) during the survey and all five remained off the Y-K Delta through mid May (Dan Rosenberg, Alaska Dept. Fish and Game, pers. comm.). Kodiak Island is geographically a peripheral wintering site and it appears that these satellite equipped birds migrated later than the bulk of the population based on the low number of birds seen on this 30 April-3 May survey.

## CONCLUSIONS

The spring 2004 emperor goose population estimate of 47,352 was 25.5% below the long-term average (1981-2004) of 63,532. The current 3-year average population of 59,085 (2002-2004) is 17.3% and 8.2% below the previous 3-year average (71,433, 2001-03) and the long-term average of 3-year indices (64,331, n= 24). The Pacific Flyway Emperor Goose Management Plan establishes a management threshold of 80,000 geese in spring for consideration of legalized harvest.

The decrease in emperor goose population size in 2004 is partially attributable to the record low number of juveniles detected in fall 2003 (9.3%, Bob Stehn, USFWS-MBM, pers. comm.). Productivity in 2003 was 50.3% below the long-term average ( $18.7 \pm 5.6\%$ , 1985-2003) and was the eighth consecutive year below average as measured by observations of fall age ratios in estuaries along the Alaska Peninsula. Additionally, tracking of transmitting birds indicates that nearly 20% of migrants possibly escaped detection while in transit from the Alaska Peninsula estuaries to Y-K Delta breeding sites.

Recovery of the emperor goose population continues to be prevented by a combination of mortality factors which apparently exceed recruitment of breeding age geese into the population. Primary factors limiting recovery of the population appear to be illegal spring and fall hunting and predation during nesting and brood rearing. These factors have been amplified by low productivity in recent years and chronic low survival of juveniles from pre-fledging through winter (Schmutz et al. 1997).

Realistic management options are reduction of harvest and decreasing predation on nests and young. Increasing hatching success and gosling survival on the Y-K Delta by reducing predator populations should be investigated as a means to increase recruitment of breeding birds into the population (Bowman et al.1997). Although management options to reduce winter mortality of emperor geese may be limited, it is still important to investigate and determine the severity of factors such as climate, predation, hunting, and pollution/contaminants so that appropriate beneficial actions can be undertaken. Annual monitoring of population size and trend as well as distribution, habitat use, and productivity is of continuing management importance.

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Figure 1. Map of emperor goose aerial survey segments 1-36 in southwest Alaska, 1992-2004.

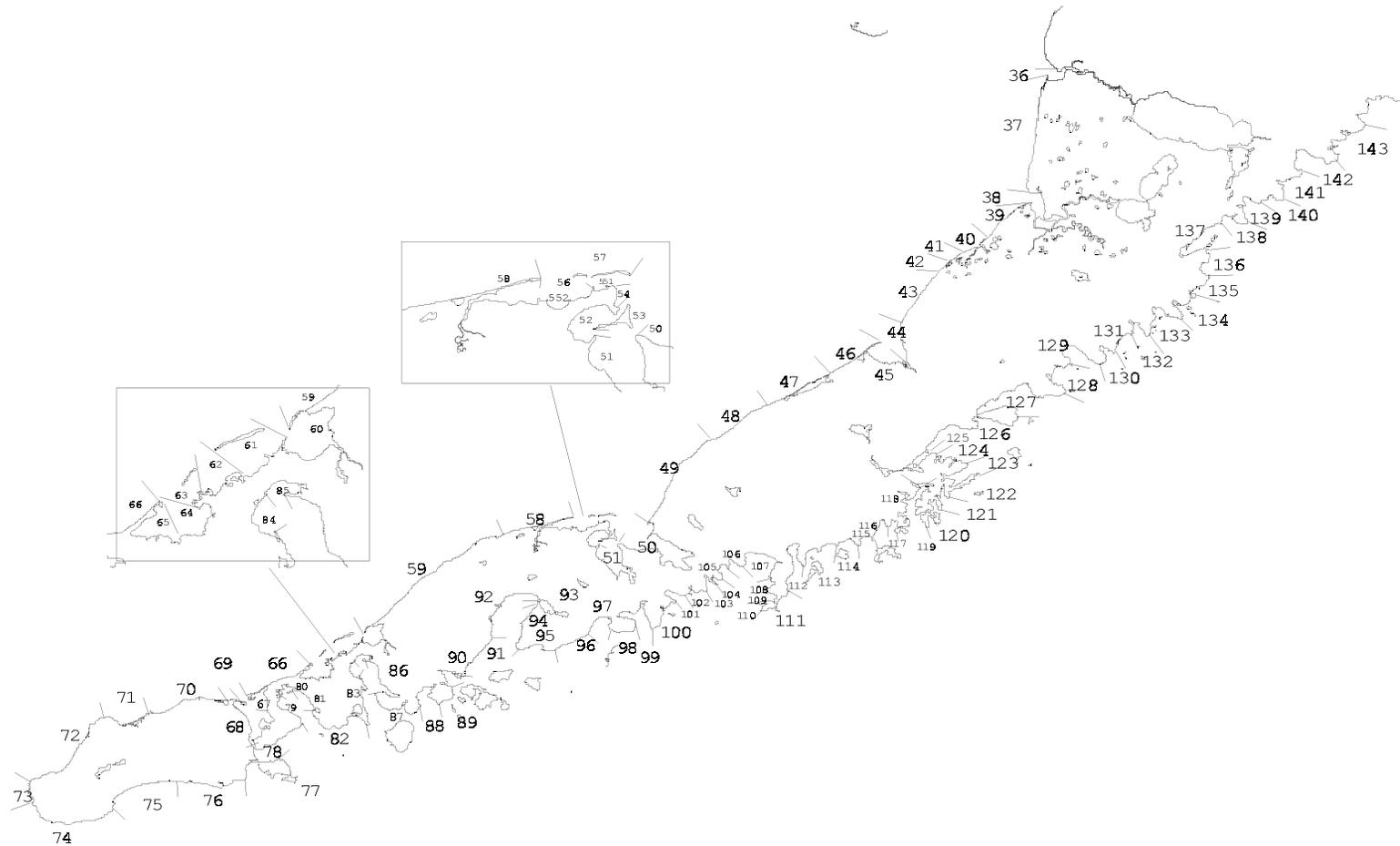


Figure 1 (continued). Map of emperor goose aerial survey segments 36-143 in southwest Alaska, 1992-2004.

Table 1. Waterbird and mammal observations by segment from southwest Alaska, 30 April - 5 May 2004.

SPECIES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Amer. Green-winged Teal																		
American Wigeon																		
Arctic Tern			2						29									
Bald Eagle														1				
Black-bellied Plover											4							
Brown Bear																		
Beluga Whale																		
Pacific Brant					14		54		5							320	58	104
Black Oystercatcher																		
Black Scoter		3	1						20									
Bufflehead																		
Canada Goose			1	19	22	42	360	161	55	31	816	29						
Common Eider	3	63	678	97	17	10	150		104									1
Common Goldeneye																		
Common Loon																		
Common Merganser																		
Murre																		
Common Raven																		
Cormorant			1			2	3											12
Emperor Goose			2	7	19		55		77									
Greater Scaup									561	40	46	10			6	145		361
Gray Whale																		
Harlequin Duck																		
Harbor Seal									1									
Jaeger												1	1					
King Eider		13	6			51	211		73							57		
Large Gull	8	81	129	86	101	145	200	31	716	128	70	17	120	3	77	137	82	1362
Large Shorebird																		
Long-tailed Duck		6	55			29	21		308						1	2	1	
Marbled Godwit																		
Mallard									20									
Northern Pintail			6	45	5		40	33	17	3	5	14			10			
Northern Shoveler									10									
Orca																		
Pacific Loon		2	1						2	1								
Pigeon Guillemot																		
Red-breasted Merganser	2		3		8				93	10	81					2	61	10
Red Fox																		
Red-necked Grebe																		
Red-throated Loon			5	1	1		2		5		5				6	3	18	4
Sandhill Crane						1												
Sea Otter																		
Mew Gull		1			7	23	57	5	30		10	7	2	5	14	10	110	14
Small Shorebird		6		5			10		130				800			138		2057
Spectacled Eider				4			8		12									
Steller's Eider						40	475		3987						130	8	2	58
Steller's Sealion																		
Surf Scoter																		
Tundra Swan				8	17	4	41	12										
Walrus																		
White-fronted Goose		3	1	1	26	10	224	568	46	71	348	11	22		1			
Willow Ptarmigan								1										
White-winged Scoter		1							174							4		4

Table 1 (continued). Waterbird and mammal observations by segment from southwest Alaska, 30 April - 5 May 2004.

SPECIES	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
Amer. Green-winged Teal								75								
American Wigeon												2				30
Arctic Tern						1					112	8	10			30
Bald Eagle		1									3			1		
Black-bellied Plover																
Brown Bear																
Beluga Whale														1		
Pacific Brant	3	19640		9577												
Black Oystercatcher																
Black Scoter	8			10	24	53	16	13		5	227	93	265	2770	53	
Bufflehead																
Canada Goose							1	8								
Common Eider		2									105	4				
Common Goldeneye																
Common Loon																
Common Merganser																12
Murre							78			1						
Common Raven				2	2	4				1						
Cormorant	1			1	26	11	15	10	4		23					
Emperor Goose		73														
Greater Scaup		234		22	2	614	12	413		276	60	186	1852	2154	274	8
Gray Whale																
Harlequin Duck				8	8	6	127			266		10				2
Harbor Seal											275				1	
Jaeger							2									1
King Eider				1						1	1			2		
Large Gull	1723	5267		237	870	1062	128	1680	250	4531	389	2	238	120	15	390
Large Shorebird																
Long-tailed Duck	1			3	2						197	2		3	13	
Marbled Godwit																
Mallard												1				10
Northern Pintail				145				30				2			8	115
Northern Shoveler								20								
Orca											1					
Pacific Loon				5				1	1	1	14	1				
Pigeon Guillemot																
Red-breasted Merganser				11	27	10	177	452		192	499	15	89	22	1	384
Red Fox																
Red-necked Grebe					10	1					2					
Red-throated Loon					2	5	2				290	3	1	4	2	
Sandhill Crane																
Sea Otter																
Mew Gull	31	5		35	155	622	3808			3092	552	249	303	187	128	432
Small Shorebird					40	50	66				5		10	35		
Spectacled Eider																
Steller's Eider	359	3430		2												
Steller's Sealion				2	5											
Surf Scoter																
Tundra Swan																79
Walrus																
White-fronted Goose					2										2	5
Willow Ptarmigan																
White-winged Scoter				4							17	14				

Table 1 (continued). Waterbird and mammal observations by segment from southwest Alaska, 30 April - 5 May 2004.

SPECIES	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49
Amer. Green-winged Teal		45													
American Wigeon															
Arctic Tern	175	1	130	588	20	320					125		200		
Bald Eagle	1					4	2				5	1	4		5
Black-bellied Plover															
Brown Bear			1												
Beluga Whale															
Pacific Brant			5								50	65			
Black Oystercatcher															
Black Scoter	239	238	5508	701	17	85	1	75	184	811	245	61	183	4	560
Bufflehead	2	2	8												
Canada Goose															
Common Eider			1	25			6				16				
Common Goldeneye															
Common Loon			2												
Common Merganser															
Murre															
Common Raven					1				1			1	1		2
Cormorant	1		1						1					72	3
Emperor Goose		1400		1488		5732				2340	10285		10589		
Greater Scaup	575	646	37	443		12		13		212	95				
Gray Whale			13	4	13	2			3		2	6	1	3	16
Harlequin Duck															29
Harbor Seal	53	1		22		351					2355		650		
Jaeger				6							3				
King Eider		27													
Large Gull	544	687	397	1499	164	2048	68	610	551	215	1147	198	969	318	493
Large Shorebird				5											
Long-tailed Duck	8		572		2			2		595					130
Marbled Godwit						100									
Mallard				27		50						20	5		
Northern Pintail	40	327	3	78		13		101			575		575		
Northern Shoveler		4													
Orca															
Pacific Loon	1		7	2											
Pigeon Guillemot															
Red-breasted Merganser	218	432	532	6	40	28		5		63		2	1		
Red Fox												2			
Red-necked Grebe			5												10
Red-throated Loon	40		47	6	1							2			4
Sandhill Crane		3													
Sea Otter					1								45	1	
Mew Gull	153	25	74	301	36		125		2		264		340	654	471
Small Shorebird	3000			58	682	550		53			5600		200		
Spectacled Eider															
Steller's Eider	4										683				
Steller's Sealion									1						
Surf Scoter															
Tundra Swan															
Walrus														350	2
White-fronted Goose	3														
Willow Ptarmigan															
White-winged Scoter	18		3007	3	51										

Table 1 (continued). Waterbird and mammal observations by segment from southwest Alaska, 30 April - 5 May 2004.

SPECIES	50	51	52	53	54	551	552	56	57	58	59	60	61	62	63
Amer. Green-winged Teal															
American Wigeon															
Arctic Tern							5						10		
Bald Eagle	7	9	4				1		12		8	1		4	2
Black-bellied Plover															
Brown Bear															
Beluga Whale															
Pacific Brant			50			30	55					3137	14615		5285
Black Oystercatcher															
Black Scoter	109	2286	2285	500	10	20	654	231	1	15	863	30	134		77
Bufflehead												2			
Canada Goose															
Common Eider								408							
Common Goldeneye															
Common Loon															
Common Merganser															
Murre															
Common Raven	1								3	1	10		5		
Cormorant							22	40							
Emperor Goose	775					2405	8499	1881	285			123			
Greater Scaup	18	25					365						3		4
Gray Whale										3	56				
Harlequin Duck											31		4		
Harbor Seal	883						640	339			50		5	3	375
Jaeger												1			
King Eider															
Large Gull	1462	1137	303	495	1236	1480	7095	1706	424	676	1441	2394	423	1439	218
Large Shorebird															
Long-tailed Duck	21										5				
Marbled Godwit															
Mallard							5								
Northern Pintail						2	40			2		51	100	140	
Northern Shoveler							10								
Orca															
Pacific Loon	1														
Pigeon Guillemot															
Red-breasted Merganser	2		7	20			7	10	2		5	17	78	2	66
Red Fox											1				
Red-necked Grebe											3				
Red-throated Loon															
Sandhill Crane															
Sea Otter	140			3	1	1		125				5	139	13	23
Mew Gull	345		45			5		200	90		42	743	125	585	50
Small Shorebird							2000	30				125			
Spectacled Eider															
Steller's Eider	8						800				110		96		150
Steller's Sealion	3										1				
Surf Scoter															
Tundra Swan															
Walrus															
White-fronted Goose															
Willow Ptarmigan															
White-winged Scoter	8	5		1400											

Table 1 (continued). Waterbird and mammal observations by segment from southwest Alaska, 30 April - 5 May 2004.

SPECIES	64	65	66	67	68	80	81	82	83	84	85	86	88	90	91	92	93	97	99
Amer. Green-winged Teal																			
American Wigeon																			
Arctic Tern																			
Bald Eagle	1		7	1	1	2	3	3	1	2	2	1		1			1		
Black-bellied Plover																			
Brown Bear								1										1	
Beluga Whale																			
Pacific Brant	19438	6215	10	1385		35		10	16					300		25			
Black Oystercatcher																			
Black Scoter		2	795		4	63	247	19	41		3	8		252		450	40	10	
Bufflehead																			
Canada Goose																			
Common Eider								1				30							
Common Goldeneye														25					
Common Loon						1	1	3				1			1	1			
Common Merganser																			
Murre			1																
Common Raven									2										
Cormorant			1	1			9	21	1								13	1	
Emperor Goose																50			12
Greater Scaup	10																		
Gray Whale			1																
Harlequin Duck			165	37		2	5	146	133	2	35	16		49	21	71	92		8
Harbor Seal	22	15		145	40	4			2					28					
Jaeger																			
King Eider																			
Large Gull	155	249	1642	546	816	300	29	27	219	9	106	5		4	58	24	764	48	75
Large Shorebird																			
Long-tailed Duck	15		20		6				10							5			
Marbled Godwit																			
Mallard		2					1							10					
Northern Pintail	58	400			86										8				
Northern Shoveler		10																	
Orca																			
Pacific Loon																			
Pigeon Guillemot																			3
Red-breasted Merganser	64	23		63	31	42	25	9	24	19		39		151		124	38		
Red Fox																			
Red-necked Grebe			150									2				5			
Red-throated Loon			2												2				
Sandhill Crane																			
Sea Otter	39	46	6	132	3	2	2	2	13		28	37			1	9	132		
Mew Gull			20		392	108		6	2		8			42	48	29	72	47	15
Small Shorebird	450																		
Spectacled Eider																			
Steller's Eider	22	5	19									5							
Steller's Sealion			3																
Surf Scoter			5													3			
Tundra Swan																			
Walrus																			
White-fronted Goose																			
Willow Ptarmigan																			
White-winged Scoter			389				8			4					2	8	3		

Table 1 (continued). Waterbird and mammal observations by segment from southwest Alaska, 30 April - 5 May 2004.

SPECIES	101	102	103	104	105	106	107	112	113	114	115	116	117	118	125	126	127	128	129
Amer. Green-winged Teal																			
American Wigeon																			
Arctic Tern																			
Bald Eagle							1	1				1					3		1
Black-bellied Plover																			
Brown Bear																			
Beluga Whale																			
Pacific Brant							12								943		90	90	
Black Oystercatcher																		30	
Black Scoter							1	55						7	17	122	156	853	60
Bufflehead								10								15			
Canada Goose																			
Common Eider																			
Common Goldeneye																			2
Common Loon							3									1	8		
Common Merganser																			
Murre														4		2			
Common Raven										1							1		
Cormorant		1					3					1	2	18	3	1			
Emperor Goose																		145	
Greater Scaup								81	45					10	505		20	105	182
Gray Whale												1			1				
Harlequin Duck							9	40					15		12	72	21	12	5
Harbor Seal							8					3							
Jaeger																			
King Eider									4										
Large Gull	15	4				7	12	96	125	3	33	79	1	95	367	481	793	320	103
Large Shorebird																			
Long-tailed Duck														5					10
Marbled Godwit																			
Mallard																			
Northern Pintail															44		50	58	
Northern Shoveler																		10	
Orca																			
Pacific Loon																			
Pigeon Guillemot																			
Red-breasted Merganser							10	44			7		3		876	5	20	12	4
Red Fox																			
Red-necked Grebe							1	15				2	1						
Red-throated Loon																			
Sandhill Crane																			
Sea Otter															65	89	4	4	2
Mew Gull						940	45	355	3	164	19	538	12	38	374	5	216	10	37
Small Shorebird																	60		5
Spectacled Eider																			
Steller's Eider																			
Steller's Sealion																			
Surf Scoter																		24	
Tundra Swan																			
Walrus																			
White-fronted Goose																			
Willow Ptarmigan																			
White-winged Scoter																	6		

Table 1 (continued). Waterbird and mammal observations by segment from southwest Alaska, 30 April - 5 May 2004.

SPECIES	130	131	132	133	134	135	136	137	Grand Total
Amer. Green-winged Teal									120
American Wigeon									32
Arctic Tern									1766
Bald Eagle	1		2	3		1	2	3	121
Black-bellied Plover									4
Brown Bear									3
Beluga Whale									1
Pacific Brant	20			2				8	81666
Black Oystercatcher									30
Black Scoter		45	6				43	2	22989
Bufflehead				2					41
Canada Goose									1545
Common Eider									1721
Common Goldeneye									27
Common Loon			4		1		1		28
Common Merganser									12
Murre			7	3	2		3		101
Common Raven									39
Cormorant	3		2	49	53	1	5	15	453
Emperor Goose		102		95			169	744	47352
Greater Scaup	20	8						19	10729
Gray Whale					1		1		127
Harlequin Duck	12	47	44	34		28	5	71	1700
Harbor Seal	2		2					40	6315
Jaeger									15
King Eider									447
Large Gull	34	46	39	96	35	20	134	354	60600
Large Shorebird									5
Long-tailed Duck									2050
Marbled Godwit									100
Mallard									151
Northern Pintail	2							12	3243
Northern Shoveler									64
Orca									1
Pacific Loon								1	41
Pigeon Guillemot									3
Red-breasted Merganser		2	3	4			60	32	5426
Red Fox									3
Red-necked Grebe							1	4	212
Red-throated Loon								1	464
Sandhill Crane									4
Sea Otter	6	1		1	1	2		65	1189
Mew Gull	66	77	1	535	51	9		28	18881
Small Shorebird	10							88	16263
Spectacled Eider									24
Steller's Eider									10393
Steller's Sealion									15
Surf Scoter				20					52
Tundra Swan								2	163
Walrus									352
White-fronted Goose									1344
Willow Ptarmigan									1
White-winged Scoter						20	4		5154

Table 2. Primary staging sites and proportions of emperor geese from the 2004 spring aerial survey of southwest Alaska in comparison to long-term averages.

Location (Segment/s)	2004	1981-2003
	Number (% of Total)	Avg. Number (Avg. % of Total)
Chagvan Bay/Nanvak Bay (19-22)	73 (0.2)	1470 (2.1)
Egegik Bay (36)	1,400 (3.0)	778 (1.1)
Ugashik Bay (38)	1,488 (3.1)	1556 (2.3)
Cinder River Estuary (40)	5,732 (12.1)	6562 (10.1)
Port Heiden (44-45)	12,625 (26.7)	19611 (31.3)
Seal Islands Lagoon (47)	10,589 (22.4)	7841 (11.6)
Port Moller/Herendeen B/Nelson Lagoon (50-54, 551-552, 56-57)	13,845 (29.2)	19782 (28.8)
Izembek Lagoon (60-65)	123 (0.3)	3561 (5.0)
Pavlof Bay (91-92)	50 (0.1)	269 (0.5)
Ivanof Bay (112)	0 (0.0)	497 (0.8)
Chignik Lagoon/Chignik Bay (125-126)	0 (0.0)	266 (0.3)
Wide Bay (136-137)	913 (1.9)	1141 (1.5)

## Spring Emperor Goose Numbers

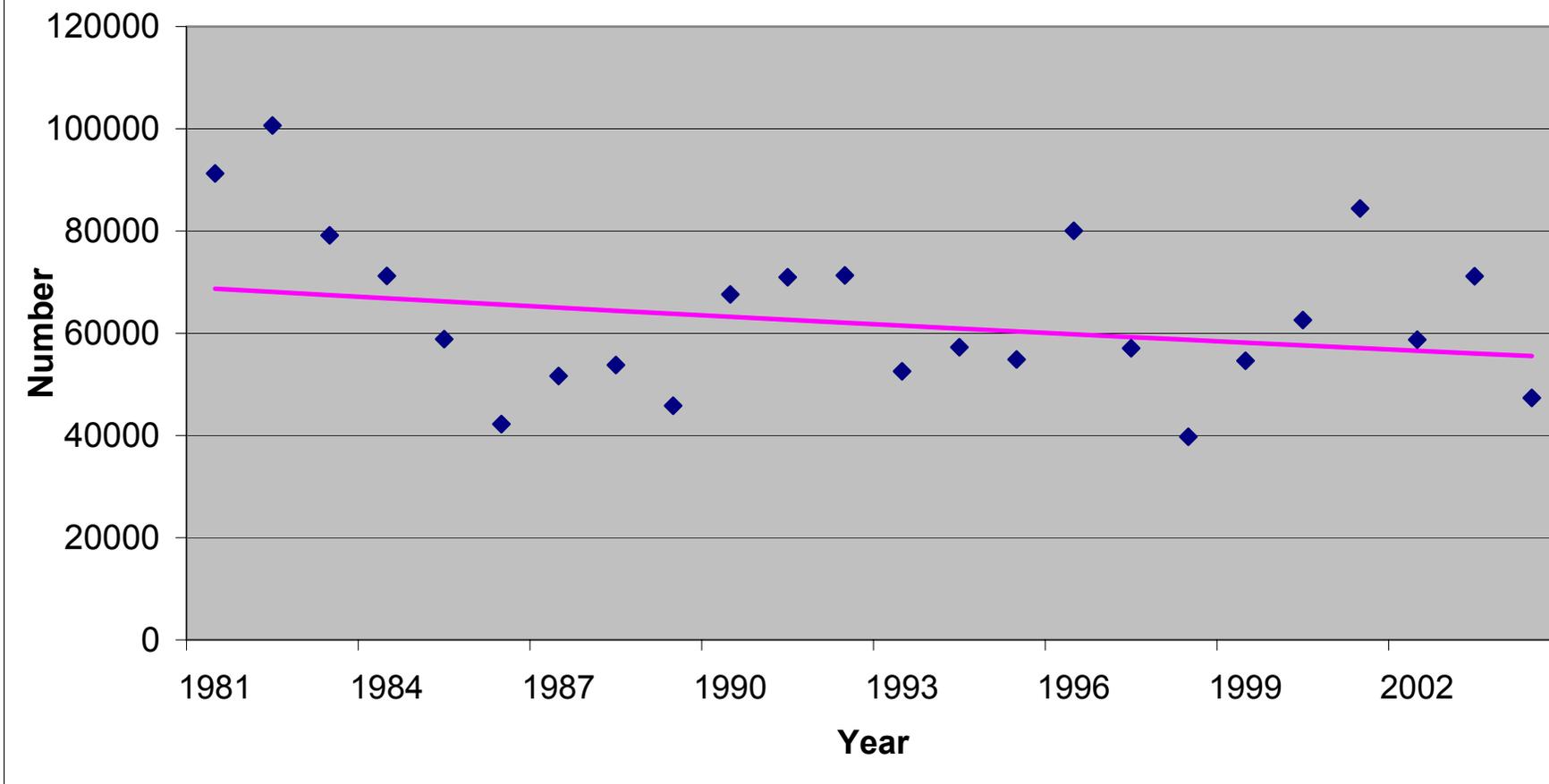


Figure 2. Twenty-four year trend of staging emperor geese in southwest Alaska (1981 - 2004). Average annual growth rate = 0.991, Prob>Ttest = 0.197, 95% confidence interval = 0.976 to 1.005, mean = 63,532.

Appendix 1. Spring emperor goose survey timing and totals, southwest Alaska, 1981 - 2003.

YEAR	DATES	POPULATION SIZE		3 YEAR AVERAGE		OBSERVERS
		Number	% Change <sup>1</sup>	Number	% Change <sup>1</sup>	
1981	4/23 - 4/27	91,267				R.King/C.Dau
1982	5/2 - 5/4	100,643	0.103			“
1983	4/25 - 4/29	79,155	-0.214	90,355		“
1984	4/26 - 5/4	71,217	-0.1	83,672	-0.074	“
1985	5/12 - 5/16	58,833	-0.174	69,735	-0.167	“
1986	5/4 - 5/7	42,231	-0.282	57,427	-0.176	“
1987	4/30 - 5/4	51,633	0.223	50,899	-0.114	“
1988	5/2 - 5/6	53,784	0.042	49,216	-0.033	“
1989	5/3 - 5/6	45,800	-0.148	50,406	0.024	“
1990	4/28 - 5/4	67,581	0.476	55,722	0.105	“
1991	5/2 - 5/7	70,972	0.05	61,451	0.103	“
1992	4/30 - 5/5	71,319	0.005	69,957	0.138	“
1993	4/30 - 5/5	52,546	-0.263	64,946	-0.072	“
1994	4/29, 5/2-6	57,267	0.09	60,377	-0.07	“
1995	5/3 - 5/6	54,852	-0.047	54,888	-0.091	“
1996	4/27 - 4/30	80,034	0.459	64,051	0.167	“
1997	4/25 - 4/28	57,059	-0.287	63,982	-0.001	“
1998	5/4 - 5/7	39,749	-0.303	58,947	-0.079	“
1999	4/27 - 5/1	54,600	0.374	50,469	-0.144	“
2000	4/28 - 5/3	62,565	0.146	52,305	0.036	E.Mallek/C.Dau
2001	4/29 - 5/4	84,396	0.349	67,187	0.285	“
2002	5/3 - 5/6	58,743	-0.304	68,568	0.021	“
2003	4/29 - 5/3	71,160	0.211	71,433	0.042	“
2004	4/30 - 5/3	47,352	-0.335	59,085	-0.173	”

<sup>1</sup> Percent change from previous year.

Appendix 2. Snow and ice conditions during spring emperor goose survey in southwest Alaska, 30 April-1 May 2004.

AREA	SNOW COVER <sup>1</sup>	MARINE ICE COVER <sup>2</sup>
Kokechik Bay	<2	0 with some grounded ice on tideflats.
Hooper Bay	<5	0
Hazen Bay	0	0
Carter Bay	0	0
Goodnews Bay	0	0
Chagvan Bay	0	0
Nanvak Bay	0	10
<b>Relative Phenology<sup>3</sup></b>	<b>Very early</b>	<b>Very early</b>

<sup>1</sup> Percent snow cover on near-shore freshwater marshes.

<sup>2</sup> Percent of marine ice cover in estuary.

<sup>3</sup> Subjective habitat conditions (early, average, late).

Appendix. 3. Migratory phenology of emperor geese at Y-K Delta field camps.

YEAR	EMS Date	LOCATION	ARRIVAL		OBSERVER
			FIRST	PEAK	
1981	4/23	No Data	-	-	-
1982	5/3	Tutakoke R./Kokechik B.	10/16 May	23-25 May	V.Byrd
1983	4/25	Kokechik Bay	7 May	23 May	M. Petersen
1984	4/28	“	8 May	13 May	“
1985	5/12	Lower Kashunuk River	12 May	19 May	C. Ely
1986	5/4	“	3 May	5-7 May	“
1987	4/30	“	8 May	17 May	“
1988	5/2	“	3 May	9 May	“
1989	5/3	“	6 May	20 May	“
1990	4/28	“	6 May	8 May	“
1991	5/2	“	1 May	14 May	“
1992	4/30	“	13 May	24 May	“
1993	4/30	“	5 May	13 May	“
1994	4/29	“	1 May	12 May	“
1995	5/3	“	6 May	11 May	“
1996	4/27	“	5 May	10 May	“
1997	4/25	“	29 April	7 May	“
1998	5/4	“	23 April	7 May	“
1999	4/27	Kigigak Is./Big Slough	9/14 May	17/20 May	M. Wege
2000	4/28	Aknerkochik River	6 May	13-15 May	“
2001	4/29	Tutakoke R./Kigigak Is./Big Slough	?/7/14 May	4/11-16 May	M. Wege/C. Nicolai
2002	-	Old Chevak-Tutakoke R.	3 May	-	C. Nicolai
2003	4/29	Tutakoke R.	26 April	2 May	B. Pearson
2004	4/30	Hooper Bay-Angyoyarvak Bay	30 April	7, 17 May	B. Pearson