

**AERIAL SURVEY OF EMPEROR GEESE AND OTHER WATERBIRDS  
IN SOUTHWESTERN ALASKA, SPRING 2003**

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

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# AERIAL SURVEY OF EMPEROR GEESE AND OTHER WATERBIRDS IN SOUTHWESTERN ALASKA, SPRING 2003

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**Abstract:** The 23<sup>rd</sup> consecutive spring aerial emperor goose survey was conducted from 29 April-3 May 2003. 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 71,160 emperor geese (up 21% from 2002) were observed in coastline and estuarine habitats from Kokechik Bay to Unimak Island, including north and south sides of the Alaska Peninsula. The current 3-year average of consecutive spring surveys is now 71,433 birds (up 4% from previous 3-yr average). Other species of emphasis included Pacific brant and Steller's eider with counts of 88,174 and 14,841, respectively.

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## INTRODUCTION

Distribution, abundance and population trends of emperor geese and other waterbirds have been monitored in spring by this survey since 1981 at migratory staging areas throughout southwestern Alaska. The survey includes coastline and estuarine habitats from the Yukon-Kuskokwim 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. Survey coverage along the south side of the Alaska Peninsula emphasizes known emperor goose staging and use areas. Population data on emperor geese, collected in accordance with the Pacific Flyway Emperor Goose Management Plan, are used as the index for harvest management. The 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 study area.

## METHODS

The spring 2003 survey was flown from 29 April-3 May. Survey timing was determined by observations of the phenology of ice break-up in coastal estuaries and coastlines within the survey area and local observations of migrating and staging emperor geese. 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.

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. Route of flight was from Kokechik Bay, along the central Yukon-Kuskokwim Delta coast, south to Bechevin Bay on Unimak Island along the north side of the Alaska Peninsula and then eastward along the south side of the Alaska Peninsula to Wide Bay. Observations were made from both sides of the aircraft and voice recorded into two laptop computers using remote microphones. The computers received input from the aircraft global

positioning system (GPS) which saved coordinates for each observation using a program designed by Jack Hodges (USFWS-MBM, Juneau).

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 flown to ensure complete coverage. Whenever possible, flights were not conducted when winds exceeded 20 knots and primary staging areas were flown at or near high tide as this was when geese were concentrated near shorelines.

The survey area includes 143 shoreline/estuarine segments identified on 1:500,000 scale aeronautical maps (Figure 1) and 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 at the start of a days flight and whenever changes occurred en route. Navigation and the notification of segment start and stop times were responsibilities of the pilot/observer.

## **SURVEY CONDITIONS**

April 29: Yukon-Kuskokwim Delta (Segments 2-10). Northeasterly winds (15 kts), high scattered ceiling and a temperature of 35°F. Visibility and survey conditions were good. Snow conditions were: Bethel to Aropuk Lake 0-10%, Aropuk Lake to Kokechik Bay 10-40% with much of the coastal wet meadows covered by melt water from eroding snow cover. There were considerable amounts of exposed meadow habitat available along the coast. Kokechik and Hooper bays were approximately 50% covered with deteriorating ice. Angyoyaravak and Hazen bays were ice free. Kangirlvar Bay had 10-15% ice cover and Kinia Bay was ice free. Kuskokwim Bay had some broken, grounded shore-fast ice and was open off-shore. Very little broken, grounded shore-fast ice was present throughout these segments and the only off-shore ice was approximately 500m of brash from Panowat Spit to Hooper Bay.

April 30: Bethel to King Salmon (Segments 11-34). Light northerly winds (5 kts), high scattered ceilings and temperatures of 40-50°F. Visibility and survey conditions were good. No snow was present in coastal lowlands and sea ice was absent.

May 1: Naknek River to Izembek Lagoon (Segments 35-65, 84-85). From King Salmon to Port Heiden, winds were southerly at 5 kts with a high scattered ceiling and temperature of 50°F. From Port Heiden to Port Moller, skies became high overcast and southerly winds increased to 12 kts. From Port Moller south, winds increased to 20kts from the southwest and the temperature decreased to 40°F. Visibility and survey conditions were good. Tides were at mid to low levels along the entire north side of the Alaska Peninsula.

May 3: Cape Glazenap to Bechevin Bay (Segments 66-68, 80) during the morning; Pavlof Bay to Wide Bay (Segments 92-137) during the afternoon. Winds were southwesterly at 25kts with a temperature of 40°F during the morning. Visibility was good in the segments flown but low ceilings prevented surveying along the south side of the Alaska Peninsula from False Pass to Cold Bay. The tides were low in Bechevin and Morzhovoi bays. During the afternoon, the winds were initially the same as in the morning, but decreased from Pavlof Bay east. Visibility was good.

## **RESULTS/DISCUSSION**

Observed ice conditions and coastal snow cover in estuaries and along coastlines of the Yukon-Kuskokwim Delta indicated that 2003 was the earliest documented ice-out during the 23 years the survey has been flown (Appendix 2). The first sightings of emperor geese on the Yukon-Kuskokwim Delta were reported at Hooper Bay and Tutakoke River on 26 April 2003 (Paul Flint, USGS-ASC/Brian Pearson, UAF, pers. comm.) and were comparable to the first sighting in 2002 (Dau and Mallek 2002). Only 14 emperor geese were seen on the Yukon-Kuskokwim Delta on 29 April 2003, suggesting that few birds had arrived in the interim and that migration timing was comparable to other early years. This was confirmed by the low number of emperor geese observed from Kuskokwim Bay to Nanvak Bay/Cape Newenham. Based on the first arrival of substantial numbers of emperor geese at the Tutakoke River field camp, migration was eight days earlier in 2003 than in 2002 (Appendix 3).

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

### **Emperor Goose**

Response by emperor geese to the early spring conditions appeared negligible, and most birds were distributed primarily along the northside of the Alaska Peninsula as in previous years. The emperor goose population estimate for 2003 was 71,160 (Table 1). Proportions of emperor geese at primary staging sites were similar to long-term patterns (Table 2). Figures 2 and 3 indicate non-significant growth rates for the 10-year and 23-year trends. The 2003 population estimate was 21% above the 2002 estimate of 58,743 (Appendix 1). The current 3-year average management index of 71,433 increased 4% from the previous average (2000-2002) of 68,568 geese (Appendix 1).

### **Pacific brant**

We observed a total of 88,174 brant during the emperor goose survey (Table 1), 43,038 (49%) 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, most notably in Chagvan and Nanvak bays where 42,576 were observed. The sightings of small numbers of brant flying south from Port Moller/Nelson Lagoon towards Izembek Lagoon and the normal distribution of small numbers along the southside of the Alaska Peninsula suggested later migrants were following a migratory pattern comparable to previous years.

### **Steller's Eider**

We observed a total of 14,841 Steller's eiders during the emperor goose survey (Table 1) of which 486 (3%) were in Izembek Lagoon and adjacent areas. Steller's eiders were seen in lower numbers than in previous years suggesting they may have responded to the early spring conditions by migrating sooner. Because this species shows high fidelity for staging habitats within the survey area, we believe some birds may have passed the Yukon-Kuskokwim Delta prior to our flights. As during previous years, most flocks observed off the Yukon-Kuskokwim Delta and south to Cape

Newenham were of equal sex ratio (98%, n=98 flocks). However, in Bristol Bay estuaries flocks were predominately brown plumaged birds (65%, n= 20 flocks with only 5 flocks, 25%, of equal sex ratio) which is more typical of composition observed in mid to late May in those areas. Subjectively, it appears the Steller's eider migration may have been advanced by 10 days or more.

## **CONCLUSIONS**

The spring 2003 emperor goose population estimate of 71,160 was 21% above the 2002 estimate of 58,743. The 3-year average population of 71,433 (2001-2003) increased 4% from the previous 3-year average of 68,568 (2000-2002) and remains below the management threshold of 80,000 required for consideration of legalized harvest.

The increase in population size is partially attributable to increased, but still below average, productivity of juveniles in 2002 (17.8 % juveniles in the fall population, Anderson et. al. 2002). The fall productivity estimate in 2002 marked the seventh consecutive year of below average production (avg. 19.2%, n=18 years).

Recovery of the emperor goose population continues to be prevented by annual mortality factors which combine to exceed recruitment of breeding age geese into the population. Continued illegal spring and fall hunting is concentrated on adult geese and in conjunction with low survival of juveniles during pre-fledging and winter are primary factors limiting recovery of the population. Increasing hatching success and gosling survival on the Yukon-Kuskokwim 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, illegal 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 importance.

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Figure 1. Map of emperor goose aerial survey segments 1-36 in southwest Alaska, 1992-2003.

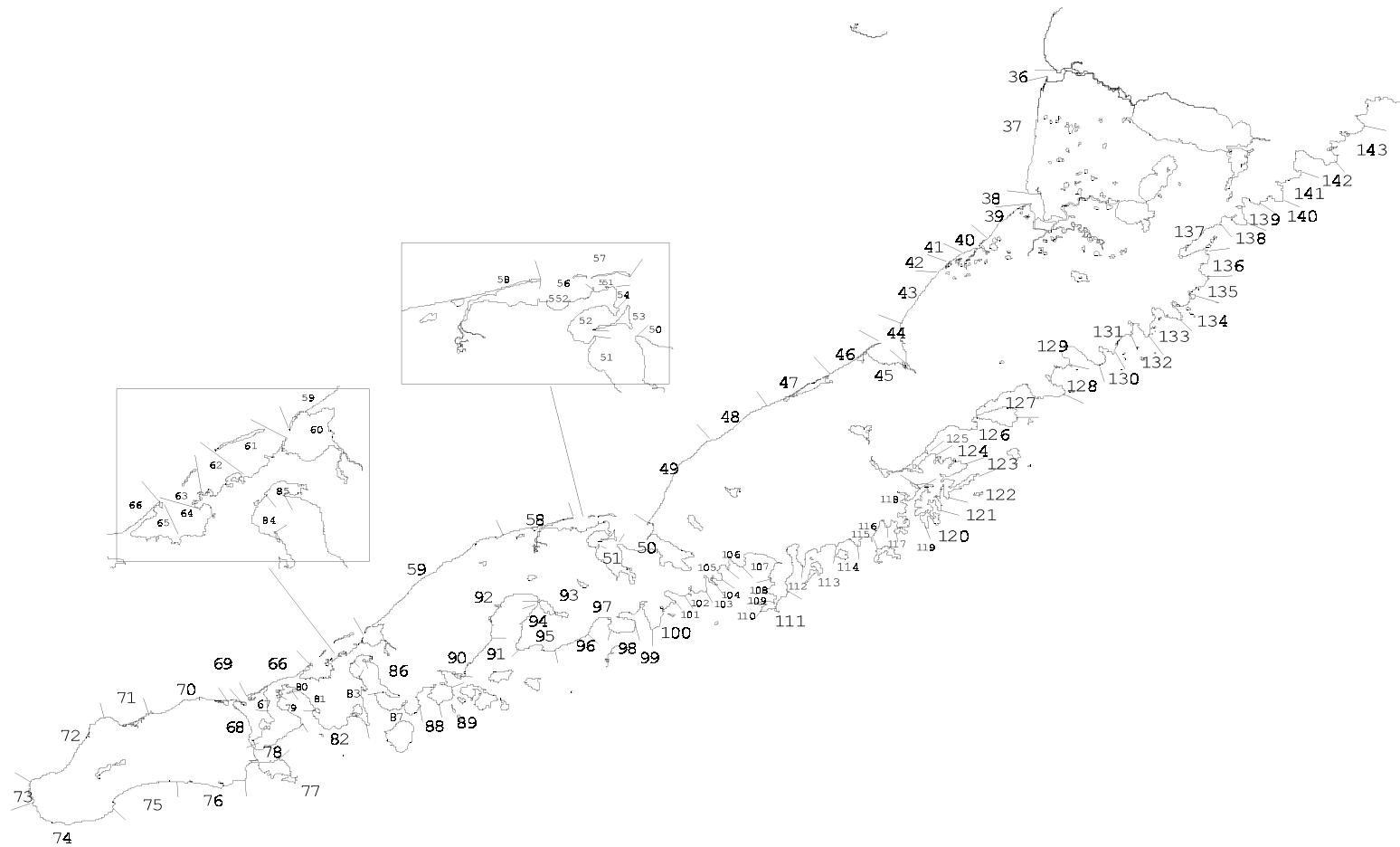


Figure 1 (continued). Map of emperor goose aerial survey segments 36-143 in southwest Alaska, 1992-2003.

Table 1. Waterbird and mammal observations by segment from southwest Alaska, 29 April - 3 May 2003.

SPECIES	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
American Green-winged Teal																	
American Wigeon																	
Arctic Tern												2					
Bald Eagle (adult)																	
Bald Eagle Nest																	
Bald Eagle (juvenile)																1	
Black-bellied Plover											5						
Brown Bear																	
Beluga Whate																	
Pacific Brant					19			13	3	22	50				20		
Black-legged Kittiwake																	
Black Scoter		3		11	2	8	4		35		15	2		5	7	7	24
Bonaparte's Gull																	
Bufflehead											2						
Canada Goose	2			9	8					104	420	2					
Common Eider	3	658	44	259	76	309	34	26									250
Goldeneye																	
Common Loon																	
Common Murre																	
Common Raven	1			2					1	1							1
Cormorant						6											54
Emperor Goose			2		4			8									
Greater Scaup				55		390	690	803	80	25	776	639	8	8	5	23	703
Grey Whale																	
Harlequin Duck																	
Harbor Seal				3						1			1			1	2
Horned Grebe																	
Jaeger											1						1
King Eider		1	2	1	63		12	3							25	5	
Large Gull	487	34	41	27	39	34	361	907	71	5	236	30	42	71	56	64	567
Long-tailed Duck	133	996	4	5	10	153	52	6			4						57
Mallard				2													19
Northern Pintail	66	5	98	4		13		42		2	2						4
Pacific Loon	1	3		5			3				1					5	3
Pigeon Guillemot																	
Red-breasted Merganser		5		3	18		275	703	62	71	8		1			15	17
Red Fox																	
River Otter																	
Rough-legged Hawk																	
Red-necked Grebe																	
Red-throated Loon		6		8		1		4			4	2	6		6	5	2
Sandhill Crane																	
Sabine's Gull																	
Sea Otter																	
Small Gull	430		2	13	13	22	25	43	46	4	31	42	15	13	22	56	84
Small Shorebird				21			4945	780			1		10		40		
Spectacled Eider				7	20		7	293									
Steller's Eider						524	329	3084		4				3	15	30	2745
Steller's Sealion																	
Surf Scoter																	
Tundra Swan	10																
Walrus				13													3
White-fronted Goose	5		1	3						66	40						
White-winged Scoter																1	
Yellow-billed Loon																	



Table 1 (continued). Waterbird and mammal observations by segment from southwest Alaska, 29 April - 3 May 2003.

SPECIES	19	20	21	22	23	24	25	26	27	28	29	32	33
American Green-winged Teal													240
American Wigeon													
Arctic Tern											56		
Bald Eagle (adult)							1	1	1				
Bald Eagle Nest													
Bald Eagle (juvenile)								1					
Black-bellied Plover													2
Brown Bear											16		
Beluga Whate												8	
Pacific Brant		27976		14600	10			1					
Black-legged Kittiwake	100		10	185	621		44		7	24	10		
Black Scoter		20		10	35	46	48		15		158	1431	29
Bonaparte's Gull													
Bufflehead													
Canada Goose												5	
Common Eider					70				8		101		
Goldeneye						40		2	2				
Common Loon													
Common Murre					1		4				2		
Common Raven				2			3	3	1				
Cormorant	2		9	10	71		265	11	10	12	42	5	
Emperor Goose	350	20	4	2		55							
Greater Scaup		520				400		374		40	10	1134	43
Grey Whale											1		
Harlequin Duck		90				8	9	224	160	50	50		
Harbor Seal				800		3					13		
Horned Grebe							2						
Jaeger							1	5					
King Eider	20			30	3							166	
Large Gull	6768	12745	1061	221	207	1314	157	2264	2690	2275	2324	203	194
Long-tailed Duck						16	10		10		169	460	
Mallard								2			6		
Northern Pintail				520		2		210		110	12	154	
Pacific Loon						2	1	1					
Pigeon Guillemot													
Red-breasted Merganser	1	26	2	20	23	513	40	231	8	24	145	57	
Red Fox													
River Otter													
Rough-legged Hawk													
Red-necked Grebe					34	15	114	27					
Red-throated Loon	2					1	3	2	2		34	2	1
Sandhill Crane				2									
Sabine's Gull												1	
Sea Otter													
Small Gull	10	1430	105	293	332	559	303	847	528	1921	1433	326	382
Small Shorebird											15		
Spectacled Eider													
Steller's Eider	14	2478		13	20			5					
Steller's Sealion	3	2	13			7			84	7			
Surf Scoter												2	
Tundra Swan													
Walrus													
White-fronted Goose													
White-winged Scoter			5								15	8	
Yellow-billed Loon													

Table 1 (continued). Waterbird and mammal observations by segment from southwest Alaska, 29 April - 3 May 2003.

SPECIES	34	35	36	37	38	39	40	41	42	43	44	45	46	47
American Green-winged Teal														
American Wigeon														
Arctic Tern		1		3										
Bald Eagle (adult)										2	2			
Bald Eagle Nest														
Bald Eagle (juvenile)							1							
Black-bellied Plover														
Brown Bear										1				
Beluga Whate														
Pacific Brant					25							15		
Black-legged Kittiwake														
Black Scoter		1007	2283	334	10645	404	40	2	5	106	4953	252	190	20
Bonaparte's Gull														
Bufflehead				2										
Canada Goose														
Common Eider		1	1	6	35				150	1		150	7	
Goldeneye													10	
Common Loon													1	
Common Murre														
Common Raven						4	1					2		
Cormorant	1			2										
Emperor Goose			1060	2	1629		7373		25		2060	31127	23	10954
Greater Scaup		75	432	88	525	10	20		5	6	38	510	106	50
Grey Whale				2								5	1	
Harlequin Duck				2		10			20	5				
Harbor Seal		259		7	2	1	2				4	1025	5	80
Horned Grebe														
Jaeger				1	1						1			
King Eider		2					150							
Large Gull	492	227	29	129	334	35	175	7	171	11	592	5140	530	384
Long-tailed Duck		395		75	30	20	50			3			2	
Mallard	2	30	28				45						40	
Northern Pintail	86		91		542	20	160		212	2	10	1323		135
Pacific Loon				1		1								
Pigeon Guillemot														
Red-breasted Merganser	85	26	95	52	47		4		40	10			81	
Red Fox				1	1								1	
River Otter														
Rough-legged Hawk														
Red-necked Grebe				1										
Red-throated Loon		17		77	13	7	1	5		1	4		9	
Sandhill Crane							2							
Sabine's Gull														
Sea Otter							20					20		
Small Gull	593	96	486	788	340	53	44	10		44		50	451	32
Small Shorebird		166	82		100		300		125			300	185	
Spectacled Eider														
Steller's Eider			130								1350	2000		200
Steller's Sealion													10	
Surf Scoter														
Tundra Swan	28	2					2							
Walrus										1				
White-fronted Goose	10													
White-winged Scoter				12	11					242	13			
Yellow-billed Loon														

Table 1 (continued). Waterbird and mammal observations by segment from southwest Alaska, 29 April - 3 May 2003.

SPECIES	48	49	50	51	52	53	54	551	552	56	57	58	59	60
American Green-winged Teal														
American Wigeon									50					
Arctic Tern										5				
Bald Eagle (adult)	2		9	2	1				1	1	5	2	7	
Bald Eagle Nest														
Bald Eagle (juvenile)		1	4						2		3	4	1	
Black-bellied Plover														
Brown Bear														
Beluga Whate														
Pacific Brant					450			395	55				143	250
Black-legged Kittiwake	700	8350										211	220	
Black Scoter	219	1444		2911	4417	258				2513		30	1620	
Bonaparte's Gull													5	
Bufflehead	8													
Canada Goose					350									
Common Eider		3							300	300	1			
Goldeneye														
Common Loon	4												2	
Common Murre														
Common Raven	3												17	
Cormorant	364	123							25				2	
Emperor Goose			700					21	10465	1935	25	40		
Greater Scaup					50			290	34					
Grey Whale		3								1	1		9	
Harlequin Duck	72	102	2										26	
Harbor Seal	8	4	624			125							1	1
Horned Grebe														
Jaeger														
King Eider													10	
Large Gull	1294	2486	389	2	67	54	21	20	6195	52	235	268	4369	99
Long-tailed Duck											10	35	50	
Mallard														
Northern Pintail								145	128	30				
Pacific Loon	1													
Pigeon Guillemot														
Red-breasted Merganser	52	68			120			20		55			32	3
Red Fox														
River Otter														
Rough-legged Hawk						1								
Red-necked Grebe		13										3	91	
Red-throated Loon	14	2										5	9	
Sandhill Crane					9									
Sabine's Gull														
Sea Otter			703		60	139				58	13		47	129
Small Gull	339	542	333	20	25	130	1	55	50	35	30	630	195	215
Small Shorebird					150								1190	
Spectacled Eider														
Steller's Eider	300	1							1050					330
Steller's Sealion		12	16								1		21	
Surf Scoter														
Tundra Swan														
Walrus		606												
White-fronted Goose														
White-winged Scoter	5	58							20				58	
Yellow-billed Loon														

Table 1 (continued). Waterbird and mammal observations by segment from southwest Alaska, 29 April - 3 May 2003.

SPECIES	61	62	63	64	65	66	67	68	80	84	85	92	93	97	99
American Green-winged Teal															
American Wigeon													7		
Arctic Tern															
Bald Eagle (adult)	1	1	2	1				1	2	3	1	2	1		
Bald Eagle Nest															
Bald Eagle (juvenile)			1					1	2						
Black-bellied Plover															
Brown Bear															
Beluga Whate															
Pacific Brant	25688	12	2779	7300	4000		3003				6	60			
Black-legged Kittiwake			250					150				70			10
Black Scoter	334		11		170	407	3	3		49	25	10	82	8	153
Bonaparte's Gull															
Bufflehead															
Canada Goose															
Common Eider															
Goldeneye															
Common Loon														2	3
Common Murre															
Common Raven														1	
Cormorant						19						5	5		
Emperor Goose												390			
Greater Scaup		30		4	20								32		6
Grey Whale															
Harlequin Duck	20			30	10	5	10			10	101	3	98	10	96
Harbor Seal	75		350	2	50		250	1	20		230		13		
Horned Grebe															
Jaeger															
King Eider															
Large Gull	435	186	1645	570	748	466	657	560	30	115	30	91	165	7	7
Long-tailed Duck															
Mallard					4										2
Northern Pintail				10	410							150			
Pacific Loon															
Pigeon Guillemot															
Red-breasted Merganser	17	10	37		27		14		255	7	11	24	187		16
Red Fox															
River Otter													1		
Rough-legged Hawk															
Red-necked Grebe															
Red-throated Loon													2		
Sandhill Crane															
Sabine's Gull															
Sea Otter	25	2	651	3	49		90				21	3	36	1	
Small Gull	5				310	15	3	54	5		135	52	45		35
Small Shorebird	2							150							
Spectacled Eider															
Steller's Eider	80	20	40		2	10	4					60			
Steller's Sealion	2														
Surf Scoter															
Tundra Swan															
Walrus															
White-fronted Goose															
White-winged Scoter						1401								3	20
Yellow-billed Loon															

Table 1 (continued). Waterbird and mammal observations by segment from southwest Alaska, 29 April - 3 May 2003.

SPECIES	101	102	103	104	105	106	107	112	113	114	115	116	117	118	126	127
American Green-winged Teal																
American Wigeon																
Arctic Tern																
Bald Eagle (adult)							1		1						3	9
Bald Eagle Nest															1	3
Bald Eagle (juvenile)							1								1	1
Black-bellied Plover																
Brown Bear															2	3
Beluga Whate																
Pacific Brant																140
Black-legged Kittiwake	40						5	51	175	5	10			8		
Black Scoter	415	75						45	3					65	65	93
Bonaparte's Gull																
Bufflehead								4				10				
Canada Goose																
Common Eider																
Goldeneye								6								
Common Loon	2								3						3	2
Common Murre									1	1		5				
Common Raven																
Cormorant						5			34		1	8	1	14	8	2
Emperor Goose								350							40	57
Greater Scaup																
Grey Whale										3						
Harlequin Duck	15	53	3				2	8	10		5	2		37	46	78
Harbor Seal									18	4					6	4
Horned Grebe																
Jaeger																
King Eider																
Large Gull	31	18	1	4			99	425	125	12	58	113	5	80	235	61
Long-tailed Duck																
Mallard																
Northern Pintail												15				127
Pacific Loon																
Pigeon Guillemot	1							1		1						
Red-breasted Merganser	21	15					6	101						5	45	
Red Fox																
River Otter																
Rough-legged Hawk								1								
Red-necked Grebe															3	
Red-throated Loon							3									
Sandhill Crane																
Sabine's Gull																
Sea Otter															30	35
Small Gull		5					6		50	4	300	357	2		3	303
Small Shorebird																
Spectacled Eider																
Steller's Eider																
Steller's Sealion																
Surf Scoter							5				20			10	10	8
Tundra Swan	1															
Walrus																
White-fronted Goose																
White-winged Scoter	22						3		3						35	
Yellow-billed Loon																

Table 1 (continued). Waterbird and mammal observations by segment from southwest Alaska, 29 April - 3 May 2003.

SPECIES	128	129	130	131	132	133	134	135	136	137	Grand Total
American Green-winged Teal											240
American Wigeon		8								4	69
Arctic Tern											67
Bald Eagle (adult)	3	6	1	1	3	5		4	6	10	105
Bald Eagle Nest	1									1	6
Bald Eagle (juvenile)		1				3	1			1	31
Black-bellied Plover											7
Brown Bear			2			1				4	29
Beluga Whate											8
Pacific Brant	47		15							322	88174
Black-legged Kittiwake										10	11266
Black Scoter	78	30		33	49	15			98	1075	39254
Bonaparte's Gull											5
Bufflehead											26
Canada Goose											900
Common Eider											2793
Goldeneye											60
Common Loon	2	3			1					10	38
Common Murre											14
Common Raven		3		15		1					62
Cormorant	35	17	13			4	32		176	35	1434
Emperor Goose	25	135		18					460	1801	71160
Greater Scaup		55									9165
Grey Whale											26
Harlequin Duck	51	130	3		6	12		15	15	63	3493
Harbor Seal			2							17	4014
Horned Grebe										3	5
Jaeger											11
King Eider											493
Large Gull	47	61	2	73	31	21	25	7	342	297	67743
Long-tailed Duck											2757
Mallard											180
Northern Pintail										50	4957
Pacific Loon											28
Pigeon Guillemot							1				4
Red-breasted Merganser	156	39	2		5				35	147	4285
Red Fox						1					4
River Otter											1
Rough-legged Hawk											2
Red-necked Grebe	12				2	1				10	326
Red-throated Loon					1						261
Sandhill Crane											13
Sabine's Gull											1
Sea Otter	63	52	14		1				1	72	2338
Small Gull	3						8	25		37	16851
Small Shorebird											8562
Spectacled Eider											327
Steller's Eider											14841
Steller's Sealion											178
Surf Scoter	351				2	25		15	45	7	500
Tundra Swan										2	45
Walrus											623
White-fronted Goose											125
White-winged Scoter	5			4	3				5	192	2144
Yellow-billed Loon										3	3

Table 2. Primary staging sites and proportions of emperor geese from the 2003 spring aerial survey of southwest Alaska in comparison to long-term averages.

Location (Segment/s)	2003	1981-2003
	Number (% of Total)	Avg. Number (Avg. % of Total)
Chagvan Bay/Nanvak Bay (19-22)	376 (0.5)	1470 (2.1)
Egegik Bay (36)	1,060 (1.5)	778 (1.1)
Ugashik Bay (38)	1,629 (2.3)	1556 (2.3)
Cinder River Estuary (40)	7,373 (10.4)	6562 (10.1)
Port Heiden (44-45)	33,187 (46.6)	19611 (31.3)
Seal Islands Lagoon (47)	10,954 (15.4)	7841 (11.6)
Port Moller/Nelson Lagoon (50-54, 56-57, 551-552)	13,146 (18.5)	19782 (28.8)
Izembek Lagoon (60-65)	0 (0)	3561 (5.0)
Pavlof Bay (91-92)	390 (0.5)	269 (0.5)
Ivanof Bay (112)	350 (0.5)	497 (0.8)
Chignik Bay (125-126)	40 (0.1)	266 (0.3)
Wide Bay (136-137)	2261 (3.2)	1141 (1.5)

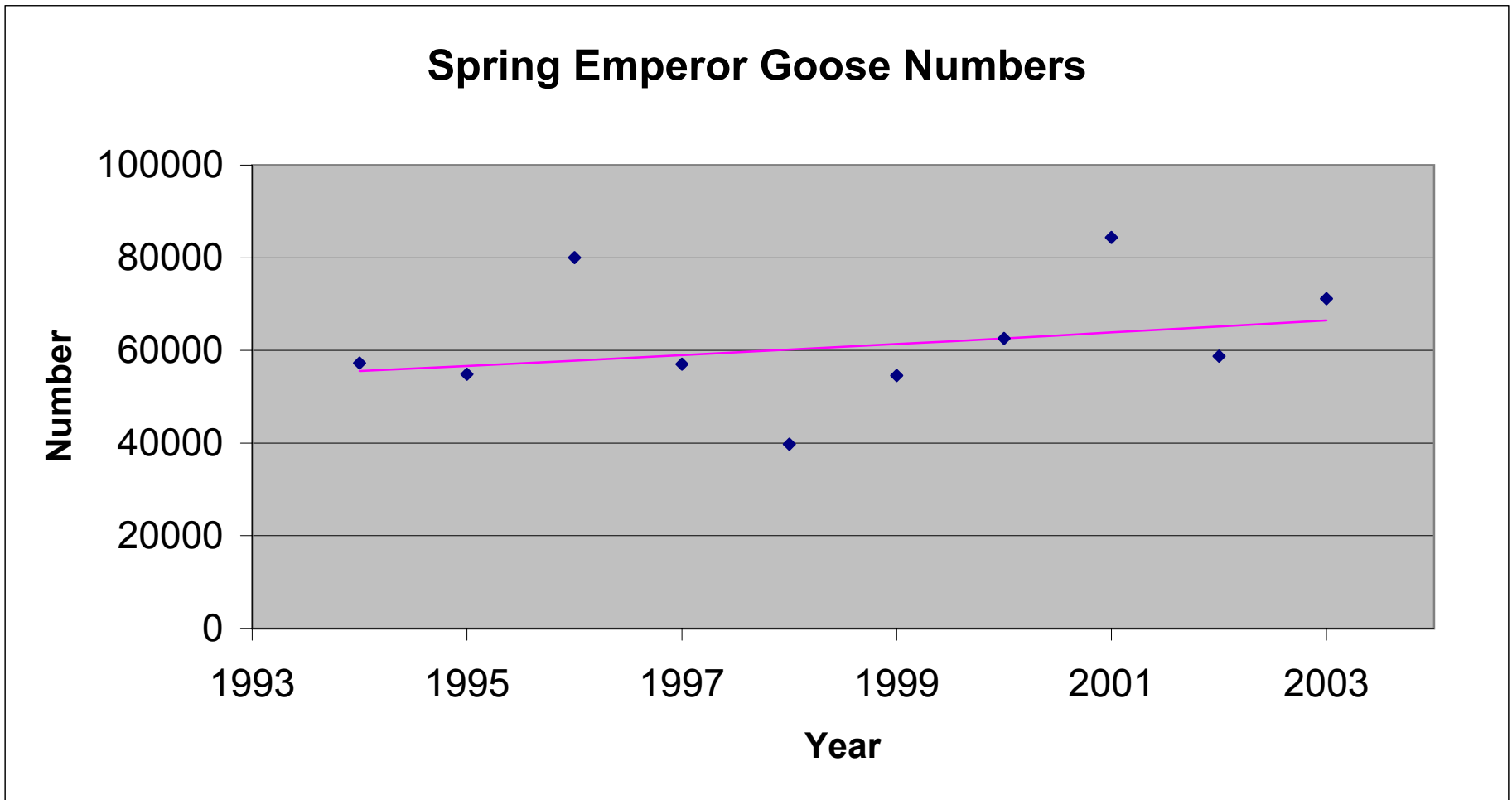


Figure 2. Ten year trend of staging emperor geese in southwest Alaska. Average annual growth rate = 1.020, Prob>Ttest = 0.434, 95% confidence interval = 0.965 to 1.079, mean = 62,043.



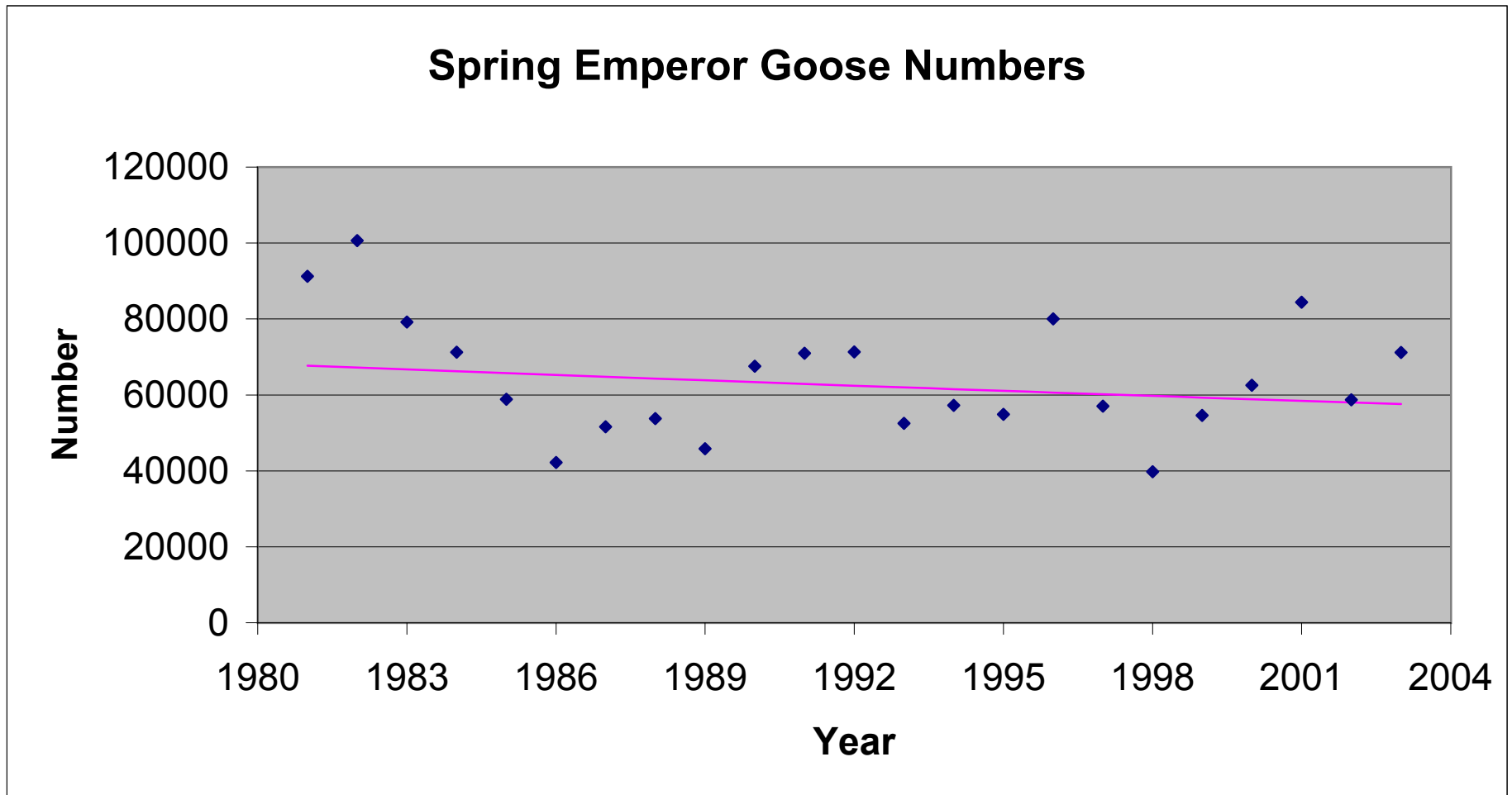


Figure 3. Twenty-three year trend of staging emperor geese in southwest Alaska. Average annual growth rate = 0.993, Prob>Ttest = 0.337, 95% confidence interval = 0.977 to 1.008, mean = 64,235.

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

YEAR	SURVEY DATES	POPULATION SIZE		3 YEAR AVERAGE		OBSERVERS
		Number	% Change <sup>1</sup>	Number	% Change <sup>1</sup>	
1981	4/23-27	91,267				R.King/C.Dau
1982	5/2-4	100,643	10			“
1983	4/25-29	79,155	-21	90355		“
1984	4/26-5/4	71,217	-10	83672	-7	“
1985	5/12-16	58,833	-17	69735	-17	“
1986	5/4-7	42,231	-28	57427	-18	“
1987	4/30-5/4	51,633	22	50899	-11	“
1988	5/2-6	53,784	4	49216	-3	“
1989	5/3-6	45,800	-15	50406	2	“
1990	4/28-5/4	67,581	48	55722	11	“
1991	5/2-7	70,972	5	61451	10	“
1992	4/30-5/5	71,319	0	69957	14	“
1993	4/30-5/5	52,546	-26	64946	-7	“
1994	4/29, 5/2-6	57,267	9	60377	-7	“
1995	5/3-6	54,852	-4	54888	-9	“
1996	4/27-30	80,034	46	64051	17	“
1997	4/25-28	57,059	-29	63982	0	“
1998	5/4-7	39,749	-30	58947	-8	“
1999	4/27-5/1	54,600	37	50469	-14	“
2000	4/28-5/3	62,565	15	52305	4	C.Dau/E.Mallek
2001	4/29-5/4	84,396	35	67187	28	“
2002	5/3-5/6	58,743	-30	68568	2	“
2003	4/29-5/3	71,160	21	71433	4	“

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

Appendix 2. Snow and ice conditions during the spring emperor goose survey in southwest Alaska, 29-30 April 2003.

AREA	SNOW COVER <sup>1</sup>	MARINE ICE COVER <sup>2</sup>
Kokechik Bay	10-20	≤50 in Kokechik B./Brash along beach.
Hooper Bay	30-40	≤50
Hazen Bay	30-40	0
Carter Bay	0	0
Goodnews Bay	0	0
Chagvan Bay	0	0
Nanvak Bay	0	0
<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 UAF