

AERIAL SURVEY OF EMPEROR GEESE AND OTHER WATERBIRDS

IN

SOUTHWESTERN ALASKA,

FALL 2008

By

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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, FALL 2008

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**Abstract:** This report presents results of the 30<sup>th</sup> consecutive year of fall aerial emperor goose surveys in southwest Alaska. The survey was flown from 26-29 September 2008 from Jacksmith Bay to Bechevin Bay, along the north side of the Alaska Peninsula and along the south side east to Wide Bay. The USFWS Turbo-Beaver (N754) was used and a left seat pilot/observer and right seat observer made observations along coastlines and over estuaries from 45m (150 feet) ASL and at 200km/hr (110 kts). All bird and marine mammal species were counted with emphasis was on emperor geese, Pacific brant, Canada geese, and Steller's eiders. Population estimates for emperor geese, Canada geese, and Steller's eiders within the entire survey area were 78,201, 41,190 and 28,637, respectively. Three additional replicate surveys of the Izembek NWR area were flown on 28 and 30 September and 1 October to estimate sizes of the Pacific brant and Canada goose populations. Averages counts for the Izembek area, based on these four surveys, were 130,294 Pacific brant and 22,148 Canada geese.

Key words: aerial survey, emperor geese, waterbirds, southwest Alaska. January 2009

## INTRODUCTION

Fall distribution, abundance, and population trends of emperor geese and other waterbirds at migratory staging areas throughout southwest Alaska has been annually monitored since 1979. Data from this survey are used to expand photographic estimates of emperor goose productivity (i.e. percent juveniles) based on the proportional distribution of the population at various fall staging locations. Important data necessary for management of waterbird populations and their habitats are provided by this survey. The survey includes coastline and estuarine habitats from Kuskokwim Bay 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.

## METHODS

The survey was flown using the USFWS Turbine-Beaver (N754) at a ground speed of approximately 200 km/hr (110 kts) and an altitude of 45m (150 feet) ASL. The 2008 survey route was from Jacksmith Bay to the Naknek River, the north side of the Alaska Peninsula south to Bechevin Bay and the south side of the peninsula east to Wide Bay. Observations were made from both sides of the aircraft and voice recorded into two panel-mounted computers using remote microphones. Computers received input from the aircraft Global Positioning System (GPS) saving coordinates for each observation. Computer programs developed by Jack Hodges (USFWS-MBM, Juneau) were used to collect and transcribe these data.

Coastline segments were usually flown 100 meters offshore with deviations to confirm species identification and numbers seaward within 1.6 km (1 mile) of shorelines. In estuaries, a systematic but meandering flight path was followed. Aircraft track was monitored on a computer moving map program to avoid duplication and obtain complete coverage of near shore and estuarine habitats. Whenever possible, flights in key areas were conducted with <20 knots of wind and at or near high

tide.

The greater survey area includes 143 shoreline/estuarine segments (Figures 1-2) which were previously described by Mallek and Dau (2000). In 2008, segments 14-34 were flown on 26 September; segments 35-59 on 27 September; segments 86-137 on 28 September; and segments 60-85 on 29 September. Three additional surveys of Izembek Lagoon and other estuaries adjacent to Izembek NWR were flown on 28 September (Larned/Anderson), 30 September (Mallek/Dau) and 1 October (Mallek/Dau). General observations of habitat and survey conditions including wind speed and direction, temperature, sky condition, visibility, and tide stage were recorded en route during all surveys.

## SURVEY CONDITIONS

26 September: From Jacksmith Bay south to Cape Newenham winds were initially calm becoming east at 15 knots. Sky cover was clear of clouds becoming 5,000 feet broken to overcast. Visibility was unrestricted, tides were mid and air temperature was 35° F.

27 September: Segments 35 (Egegik Bay) to 59 (Moffet Point) were surveyed. Winds were initially north at 15 knots reducing to 8 knots from the north and west. Tides were high (ebbing) south to Cinder River and mid to low south to Port Moller/Nelson Lagoon. Visibility was good and air temperature was 40° F throughout the day. Clear skies persisted throughout the day.

28 September: Segments 86 (Cold Bay) to 137 (Wide Bay) were flown. Winds were light and variable (<5 knots). Sky conditions were 3,000 feet overcast and visibility was good. Temperatures were 43-45° F.

29 September: Segments 60 (Moffet Bay) to 85 (Kinzarof Lagoon) were flown. Winds were 10 knots from the west. Sky conditions were 3,000-6,000 feet broken-overcast and air temperature was 45 ° F. Visibility was good with occasional light rain. Tides were high on the Pacific side of the Alaska Peninsula and low (ebbing) on the Bering Sea side.

30 September: A replicate of segments 60-68, 80-85 was flown. Winds were 10 knots from the west with 1,500 feet overcast ceilings becoming 5,000 feet broken with occasional light precipitation. Visibility was good. Tides were high on the Bering Sea side of the Alaska Peninsula and mid on the Pacific side. Air temperature was 40° F.

1 October: A replicate of segments 60-68, 80-85 was flown. Winds were southeast at 5 knots. Ceilings were broken at 6,000 feet and visibility was fair with occasional glare. Overall visibility was good. Tides were mid on the Pacific and high on the Bering sides of the Alaska Peninsula. Air temperature was 47° F.

## RESULTS/DISCUSSION

The totals for all species observed during the survey are summarized in Table 1. Estimates of emperor goose population sizes (1979-2008) and corresponding 3-year averages are summarized in Table 2. Figure 3 depicts the 30-year population trend for fall staging emperor geese.

## Emperor Goose

Emperor geese were primarily at northern Alaska Peninsula estuarine staging sites where 70,044 were observed (segments 35-59). From northern Bristol Bay to Jacksmith Bay no emperor geese were observed (segments 14-34) and 4,602 were observed along the south side of the Alaska Peninsula (segments 86-137). The remainder of emperor geese observations were in the vicinity of Izembek Lagoon and adjacent estuaries and these totaled 3,555 (segments 60-85). The total estimated fall population was 78,201. The 2008 population estimate is 6% above the 73,531 observed in 2007 and the current 3-year average of 77,604 is 2% above the previous 3-year average of 75,940 (Table 2). The fall emperor goose population trend indicates a 0.4%/year increase (Figure 3).

Numbers and proportions of emperor geese at primary staging sites along the Alaska Peninsula in 2008 were as follows: Egegik Bay 1,780 (2%, segments 36-37); Ugashik Bay 398 (<1%, segment 38); Cinder River Estuary 11,132 (14%, segments 40-42); Port Heiden 7,922 (10%, segments 44-46); Seal Islands 28,274 (36%, segment 47); Nelson Lagoon and adjacent estuaries 19,023 (24%, segments 50-57, 551-552); Izembek Lagoon and adjacent estuaries 3,555 (5%, segments 60-68 and 80-85); Pavlof Bay 2,065 (3%, segments 91-93); Chignik Lagoon 325 (<1% , segment 125) and Wide Bay 1,483 (2%, segments 136-137).

## Pacific Brant

A total of 116,101 Pacific brant was observed during the 26-29 September emperor goose survey of which >99% (115,836) were in Izembek Lagoon and adjacent estuaries. Replicate counts of Izembek Lagoon and adjacent estuaries (28 and 30 September and 1 October) provided counts of 164,779, 119,644 and 120,915, respectively. The average brant count estimated from these four surveys (including Izembek area of the emperor goose survey) was 130,294. The 2008 average count was 6% below the 2007 estimate of 138,476 (n=3 surveys) and 2% below the 33-year average fall count of 133,582 (1975-2007, Izembek NWR files).

## Canada Goose

We observed 41,190 Canada geese during the 26-29 September emperor goose survey. Izembek Lagoon and adjacent estuaries accounted for 61% (25,034) of the total birds observed. The low total count of Canada geese may be attributed to mild weather conditions and resulting delayed migration and exceptionally good crowberry (*Empetrum nigrum*) production which would result in many birds feeding or roosting in adjacent uplands outside the survey area, especially during high tides. Replicate counts of Izembek Lagoon and adjacent estuaries (28 and 30 September and 1 October) provided counts of 24,894, 18,906 and 19,755, respectively. The average Canada goose count estimated from these four surveys (including the Izembek area of the emperor goose survey) was 22,148. The 2008 average count was 26% below the 2007 estimate of 29,964 (n=3 surveys) and 49% below the long-term average fall count of 43,055 (1975-2007, Izembek NWR files).

## Steller's Eider

We observed a total of 28,637 Steller's eiders during the 26-29 September emperor goose survey, 64% below the 2007 count of 80,102 and 55% below the 1979-2007 average of 63,661.

Numbers and proportions of Steller's eiders at primary Alaska Peninsula staging sites were as follows: Egegik Bay 0 (0%, segment 36); Port Heiden 170 (<1%, segments 44-46); Seal Islands 8,420 (29%, segment 47); Nelson Lagoon and adjacent estuaries 17,040 (60%, segments 50-57, 551-552); and Izembek Lagoon and adjacent estuaries 2,230 (8%, segments 60-68 and 80-85).

Replicate counts of Izembek Lagoon and adjacent estuaries (28 and 30 September and 1 October) provided counts of 1,678, 10,160 and 13,430, respectively. The average Steller's eider count in the Izembek area, estimated from these four surveys (including the Izembek area of the emperor goose survey), was 6,875. This estimate is 11% below the 2007 estimate of 7,721 (n=3 surveys) and 69% below the 33-year average fall count of 22,332 (1975-2007, Izembek NWR files).

The cause for such low numbers of Steller's eiders in the emperor goose survey area is unknown, but may be due to possible increased nesting effort and production in Russia resulting in delayed migration.

## ACKNOWLEDGMENTS

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Figure 1. Map of emperor goose aerial survey segments 1-36 in southwest Alaska, 1992-2008.

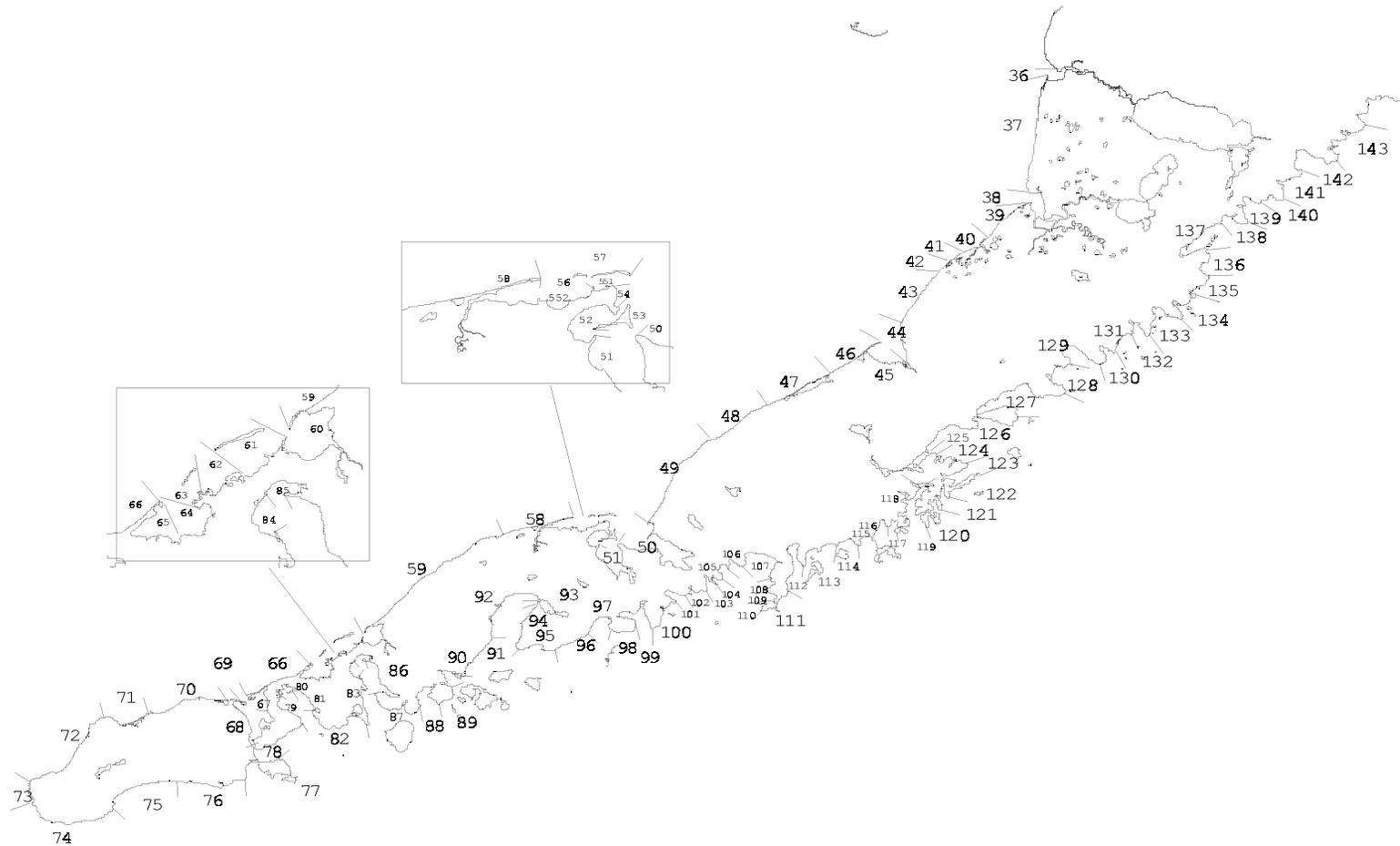


Figure 2. Map of emperor goose aerial survey segments 36-143 in southwest Alaska, 1992-2008.

Table 1. Waterbirds and mammal observations by segment, southwest Alaska 26-29 September 2008.

SPECIES	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Amer. Green-winged Teal			1450				45						5			
Amer. Wigeon																
Arctic Tern																
Bald Eagle adult																1
Bald Eagle nest																
Bald Eagle juvenile																
Beluga Whale																
Pacific Brant						227					8					
Black-legged Kittiwake							667	555	751		1					2
Black Oystercatcher																
Black Scoter	100	12	36		7	16		72			64	136	208	86		2759
Brown Bear										1						
Brown Bear cub																
Canada Geese	10	227		300	39		1633		3623		496					
Caribou																
Common Eider		1					4						2			110
Common Loon																
Common Murre																
Common Raven			1		4				1				9			
Cormorant					30	2		31	17	5	5	1	15	3		8
Emperor Goose																
Gadwall																
Greater Scaup		62	160		655		258		455							
Grey Whale																
Harlequin Duck								5			2		8	37	31	25
Harbor Seal			2						250							103
Large Gull	1083	44	79	30	220	12	228	20	360	17	91	124	280	153	54	490
King Eider			23		6	3					1			45		35
Large Shorebird																
Long-tailed Duck			20			15										
Mallard	55	17	155		736		107									
Small Gull	353	65	120		126		27	3	45			80	170			211
Medium Shorebird	405															
Moose																
Northern Harrier																
Northern Pintail	817	47	904	80	523		938		978		50		425			
Northern Shoveler			200													
Pacific Loon																
Pigeon Guillemot								15				15	70			10
Porpose																
Red-breasted Merganser			8		4		55		150							
Red-necked Grebe									12							
Red-throated Loon			3			1										2
Steller's Sealion								50								
Sea Otter																
Small Shorebird			1165													5
Steller's Eider							312				128	45			20	147
Steller's Sealion																
Surf Scoter			7		2											4
Tundra Swan				2												
Walrus																
White-fronted Goose																
White-winged Scoter		7	25	2				20	35	36	127	53	15	9	10	672

Table 1 (cont). Waterbirds and mammal observations by segment, southwest Alaska 26-29 September 2008.

SPECIES	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44
Amer. Green-winged Teal							550		65						
Amer. Wigeon											20				
Arctic Tern															
Bald Eagle adult			2		1						1				
Bald Eagle nest															
Bald Eagle juvenile					2										
Beluga Whale			79				1								
Pacific Brant															
Black-legged Kittiwake										1	1			275	
Black Oystercatcher															
Black Scoter	1	2008	2078			93	814	250	85	1466			10	1120	
Brown Bear															
Brown Bear cub															
Canada Geese	445	3				35	1234	650	1		5240				700
Caribou															
Common Eider															
Common Loon															
Common Murre															
Common Raven															
Cormorant															
Emperor Goose						110	1329	451	398		8002		3130	709	2792
Gadwall															
Greater Scaup		130	407												
Grey Whale															
Harlequin Duck															
Harbor Seal											500				
Large Gull	33	368	1057	5	51	52	1291	30	4457	23	1143	3	218	216	371
King Eider															
Large Shorebird											120				
Long-tailed Duck		1													
Mallard	210	50	40		2		875		2007		1425		500		895
Small Gull	678	610	500	10	13	1251	435	87	290		240		150	51	
Medium Shorebird															
Moose															
Northern Harrier									1						
Northern Pintail	399	137	289	45	5		2113	575	4459		6135		655		1015
Northern Shoveler					2				75						
Pacific Loon															
Pigeon Guillemot															
Porpose															
Red-breasted Merganser							10	9							
Red-necked Grebe								3							
Red-throated Loon								2		2					
Steller's Sealion															
Sea Otter								3			21				
Small Shorebird	50					3000	3760	5	5850		8430		320		1195
Steller's Eider													125		
Steller's Sealion															
Surf Scoter		1				3		200							
Tundra Swan					2		5	2	2		170				
Walrus															
White-fronted Goose															
White-winged Scoter	1	19	20			7		11	73	203				87	

Table 1 (cont). Waterbirds and mammal observations by segment, southwest Alaska 26-29 September 2008.

SPECIES	45	46	47	48	49	50	51	52	54	551	552	56	57
Amer. Green-winged Teal													
Amer. Wigeon													
Arctic Tern													
Bald Eagle adult		1						1	1				
Bald Eagle nest													
Bald Eagle juvenile													
Beluga Whale													
Pacific Brant													
Black-legged Kittiwake				1260	5470		50					350	250
Black Oystercatcher													
Black Scoter		1850		162	502	20	683	825					
Brown Bear					2								
Brown Bear cub													
Canada Geese	3	700	431							300			
Caribou													
Common Eider	630											127	2
Common Loon													
Common Murre													
Common Raven							2						
Cormorant						1							
Emperor Goose	4644	486	28274		6	1195	613	76	240	3906	2281	1613	9099
Gadwall													
Greater Scaup			100										
Grey Whale		1											
Harlequin Duck					2								
Harbor Seal	1000	1			8	6						552	300
Large Gull	12312	200	4106	451	725	1795	1875	1305	2501	1370	2705	9655	200
King Eider		130						5					
Large Shorebird													
Long-tailed Duck													
Mallard	855		190							3	50		
Small Gull	2565	30	2700	80	2077	20	850		210		500		
Medium Shorebird	2850		10										
Moose													
Northern Harrier													
Northern Pintail	7870	100	6975							8770	1080		
Northern Shoveler													
Pacific Loon													
Pigeon Guillemot													
Porpose			1		3								
Red-breasted Merganser			10							5			
Red-necked Grebe													
Red-throated Loon					1								
Steller's Sealion													
Sea Otter	303					42	2		3			200	
Small Shorebird	9710		14050						14058	1625	6775	3500	
Steller's Eider	170		8420						1000	400	855	14785	
Steller's Sealion													
Surf Scoter		100											
Tundra Swan													
Walrus				3	1								
White-fronted Goose		90											
White-winged Scoter		570			203		100					1	

Table 1 (cont). Waterbirds and mammal observations by segment, southwest Alaska 26-29 September 2008.

SPECIES	58	59	60	61	62	63	64	65	66	67	68	80	81
Amer. Green-winged Teal													
Amer. Wigeon													
Arctic Tern													
Bald Eagle adult			1		1	1					1		3
Bald Eagle nest													
Bald Eagle juvenile													1
Beluga Whale													
Pacific Brant		30	16117	30502	6395	4397	28215	22187		1003	975	5095	
Black-legged Kittiwake				200					107				100
Black Oystercatcher													
Black Scoter	1758	6							91	260	40	30	144
Brown Bear			1										
Brown Bear cub													
Canada Geese			12795	2125	650	400	4537	3137			1320	70	
Caribou													
Common Eider													
Common Loon													2
Common Murre													
Common Raven	1												
Cormorant							1				3		
Emperor Goose	690		571	8	43		3			10	578	274	605
Gadwall											4		
Greater Scaup													
Grey Whale													
Harlequin Duck		3							22				
Harbor Seal		165	250	60	625		130	50		11			
Large Gull	147	436	978	2438	3201	600	512	1260	447	43	701	821	2222
King Eider													
Large Shorebird													
Long-tailed Duck													
Mallard			309					100			50		
Small Gull			121	140	260			100	59		25	20	6
Medium Shorebird													
Moose													
Northern Harrier													
Northern Pintail			290	1665			577	3145			150	20	
Northern Shoveler													
Pacific Loon													
Pigeon Guillemot													
Porpose													
Red-breasted Merganser											18	480	109
Red-necked Grebe		3							8		1	10	10
Red-throated Loon													
Steller's Sealion													
Sea Otter	3	9	58	110	57	45	28	30	13	190	25		6
Small Shorebird			2330						10			10	20
Steller's Eider			1600	630									
Steller's Sealion													
Surf Scoter											70		
Tundra Swan		4											
Walrus													
White-fronted Goose											1		
White-winged Scoter	310	28							40	70			69

Table 1 (cont). Waterbirds and mammal observations by segment, southwest Alaska 26-29 September 2008.

SPECIES	82	83	84	85	86	88	90	91	92	93	97	99	101	102	103	104
Amer. Green-winged Teal																
Amer. Wigeon		10														
Arctic Tern				2												
Bald Eagle adult	4	1			1		2	5	1	3		1	2	1		
Bald Eagle nest							1									
Bald Eagle juvenile						2		3	1							
Beluga Whale																
Pacific Brant				950												
Black-legged Kittiwake	126								50		750		2			
Black Oystercatcher																
Black Scoter		128	75	10	2	30	7	29	397	10			17			
Brown Bear							3									
Brown Bear cub							2									
Canada Geese									40	25						
Caribou																
Common Eider																
Common Loon		4			1	2	3	4	14	1	2	2	5			2
Common Murre																
Common Raven	1							1								
Cormorant	1	4	2					38	86					5	6	1
Emperor Goose	27	1121		315	15		50	22	708	1335						
Gadwall																
Greater Scaup																
Grey Whale																
Harlequin Duck	17	42	4	99	24	15	207	69	134	196	25	123	54	37		
Harbor Seal		1		20	1		66		20	10		10				
Large Gull	2461	596	4	156	504	1364	3179	311	783	614	102	719	207	64	322	285
King Eider																
Large Shorebird																
Long-tailed Duck																
Mallard		80					10				35					
Small Gull	51				3	22		11		161	610	6				30
Medium Shorebird																
Moose																
Northern Harrier																
Northern Pintail							20			45						
Northern Shoveler																
Pacific Loon	13					2	2									
Pigeon Guillemot																
Porpose																
Red-breasted Merganser		682		20		52	135		1103	572		135				
Red-necked Grebe		19				8		49	43	2	3	164	3			1
Red-throated Loon																
Steller's Sealion																
Sea Otter	3	2	2	20	5				51	5						
Small Shorebird		236		5					50							
Steller's Eider																
Steller's Sealion																
Surf Scoter			2					2	11	5						
Tundra Swan											2					
Walrus																
White-fronted Goose																
White-winged Scoter		95	30		13	31	10	26	620	28		12	40			

Table 1 (cont). Waterbirds and mammal observations by segment, southwest Alaska 26-29 September 2008.

SPECIES	105	106	107	112	113	114	115	116	117	118	125	126	127	128	129	130	131
Amer. Green-winged Teal																	
Amer. Wigeon											4						
Arctic Tern																	
Bald Eagle adult			5	2	2	2		1		2	4	7	3	1	1		1
Bald Eagle nest																	
Bald Eagle juvenile			4	1						1							
Beluga Whale																	
Pacific Brant																	
Black-legged Kittiwake								200				255	1	282	3	400	32
Black Oystercatcher																75	
Black Scoter			503			1						62	21				
Brown Bear			1							1		1	4	3	1	1	
Brown Bear cub			2											3	2		
Canada Geese															1		
Caribou														1			
Common Eider																	
Common Loon	2		4				1					10	3	3	4		
Common Murre	8																
Common Raven			1											2	2	2	
Cormorant	1		62	5	44	57	18	7		26		15	43	6	18	38	42
Emperor Goose				60							325	5	120	80	149		32
Gadwall																	
Greater Scaup											500						
Grey Whale																	
Harlequin Duck			22	39	15					14	121	75	10	22	16		
Harbor Seal			60									2	1			1	
Large Gull	457	190	257	390	650	38	102	10	27	13	284	492	495	30	121	84	15
King Eider																	
Large Shorebird																	
Long-tailed Duck																	
Mallard																	
Small Gull	220	20	295	235	315	242	330	355	23	187	893	563	103	516	343	190	676
Medium Shorebird																	
Moose								1									
Northern Harrier																	
Northern Pintail											650						
Northern Shoveler																	
Pacific Loon																	
Pigeon Guillemot																	
Porpose																	
Red-breasted Merganser	8		225	25			2					10	398		30		
Red-necked Grebe	12		23	13	1		10					54	25	32	11		1
Red-throated Loon												1					
Steller's Sealion																	
Sea Otter											12	34	36	5	33	21	
Small Shorebird													10				
Steller's Eider																	
Steller's Sealion														2			
Surf Scoter			250									215	93	163	10	30	80
Tundra Swan				3							8						
Walrus																	
White-fronted Goose																	
White-winged Scoter	20		2	10	258	2	5				10	139	204	157	7		31

Table 1 (cont). Waterbirds and mammal observations by segment, southwest Alaska 26-29 September 2008.

SPECIES	132	133	134	135	136	137	Grand Total
Amer. Green-winged Teal							2115
Amer. Wigeon							34
Arctic Tern							2
Bald Eagle adult	4			3		3	77
Bald Eagle nest							1
Bald Eagle juvenile						1	16
Beluga Whale							80
Pacific Brant							116101
Black-legged Kittiwake	41	871	44	215	10	1212	14534
Black Oystercatcher							75
Black Scoter		30				103	19217
Brown Bear		6		1	2	13	41
Brown Bear cub		3		1		2	15
Canada Geese					20		41190
Caribou						2	3
Common Eider							876
Common Loon	2						71
Common Murre							8
Common Raven		1			2		30
Cormorant	35	126	143	27	25	38	1041
Emperor Goose		40	80	98	470	1013	78201
Gadwall							4
Greater Scaup							2727
Grey Whale							1
Harlequin Duck	3	4		4	20	29	1575
Harbor Seal						1	4206
Large Gull	24	200	63	82	386	314	82004
King Eider							248
Large Shorebird							120
Long-tailed Duck							36
Mallard		12		2		120	8890
Small Gull	328	874	20	13	370	515	23798
Medium Shorebird							3265
Moose							1
Northern Harrier							1
Northern Pintail				40		360	52346
Northern Shoveler							277
Pacific Loon							17
Pigeon Guillemot							110
Porpose					1		5
Red-breasted Merganser		68		15	125	806	5269
Red-necked Grebe	3						524
Red-throated Loon							12
Steller's Sealion							50
Sea Otter	2	5	1	2			1387
Small Shorebird							76169
Steller's Eider							28637
Steller's Sealion							2
Surf Scoter	5	40	2		38	63	1396
Tundra Swan							200
Walrus							4
White-fronted Goose							91
White-winged Scoter	18	2		40	75	270	4978

Table 2. Emperor goose fall survey data, southwest Alaska, 1979-2008.

YEAR	TOTAL	3YR. AVG.	DATES	OBSERVERS	SURVEY AREA
1979	59,808	NA	10/1-10/4	B.Conant/R.E.Gill, Jr.	North Alaska Peninsula only
1980	65971	NA	10/4-10/8	R.J. King/R.E. Gill, Jr.	North Alaska Peninsula only
1981	63156	62978	10/3-10/8	R.J. King/R.E. Gill, Jr./D.V. Derksen	Kuskokwim Bay south
1982	80608	69912	10/6-10/10	R.J. King/K.S. Bollinger	Kuskokwim Bay south
1983	72551	72105	10/10-10/16	R.J. King/D.V. Derksen	Kuskokwim Bay south
1984	82842	78667	10/3-10/8	"	Kuskokwim Bay south
1985	59790	71728	10/10-10/14	R.J.King/W.D. Eldridge	Kuskokwim Bay south
1986	68051	70228	10/5-10/11	"	Kuskokwim Bay south
1987	65663	64501	10/2-10/5	"	Kuskokwim Bay south
1988	76165	69960	10/7-10/12	"	Kuskokwim Bay south
1989	70729	70852	10/7-10/12	R.J. King/L. Denlinger	Kuskokwim Bay south
1990	109531	85475	10/17-10/19	R.J. King/A.W. Brackney	Kuskokwim Bay south
1991	75295	85185	10/3-10/8	"	Kuskokwim Bay south
1992	82295	89040	10/10-10/17	"	Kuskokwim Bay south
1993	71051	76214	10/23-10/26	R.J. King/D.A. Dewhurst	Alaska Peninsula only
1994	87086	80144	10/8-10/14	R.J. King/K. Laing	Kuskokwim Bay south
1995	91009	83049	10/14-10/20	R.J. King/K.S. Bollinger	Kuskokwim Bay south
1996	87018	88371	9/28-9/29	R.J. King/W.D. Eldridge	North Alaska Peninsula only <sup>1</sup>
1997	86669	88232	10/3-10/5	R.J. King/C.P. Dau	North Alaska Peninsula only <sup>1</sup>
1998	67744	80477	10/7-10/9	R.J. King/E.J. Mallek	Alaska Peninsula only
1999	60226	71546	10/1-10/5	E.J. Mallek/C.P. Dau	North Alaska Peninsula only <sup>1</sup>
2000	61626	63199	9/26-28,10/2	"	Kuskokwim Bay south
2001	59987	60613	9/26-28,10/1	"	Kuskokwim Bay south
2002	78692	66768	9/29-10/2	"	Kuskokwim Bay south
2003	77290	71990	9/27-10/2	"	Kuskokwim Bay south
2004	93544	83175	9/30-10/3	"	Kuskokwim Bay south
2005	73212	81349	10/4-10/8	"	Alaska Peninsula only
2006	81078	82611	9/26-9/28	"	Alaska Peninsula only
2007	73531	75940	9/26-10/3	"	North Alaska Peninsula only <sup>1</sup>
2008	78201	77604	9/26-9/29	"	Kuskokwim Bay south

<sup>1</sup> Average count of south side of the Alaska Peninsula used in estimate.

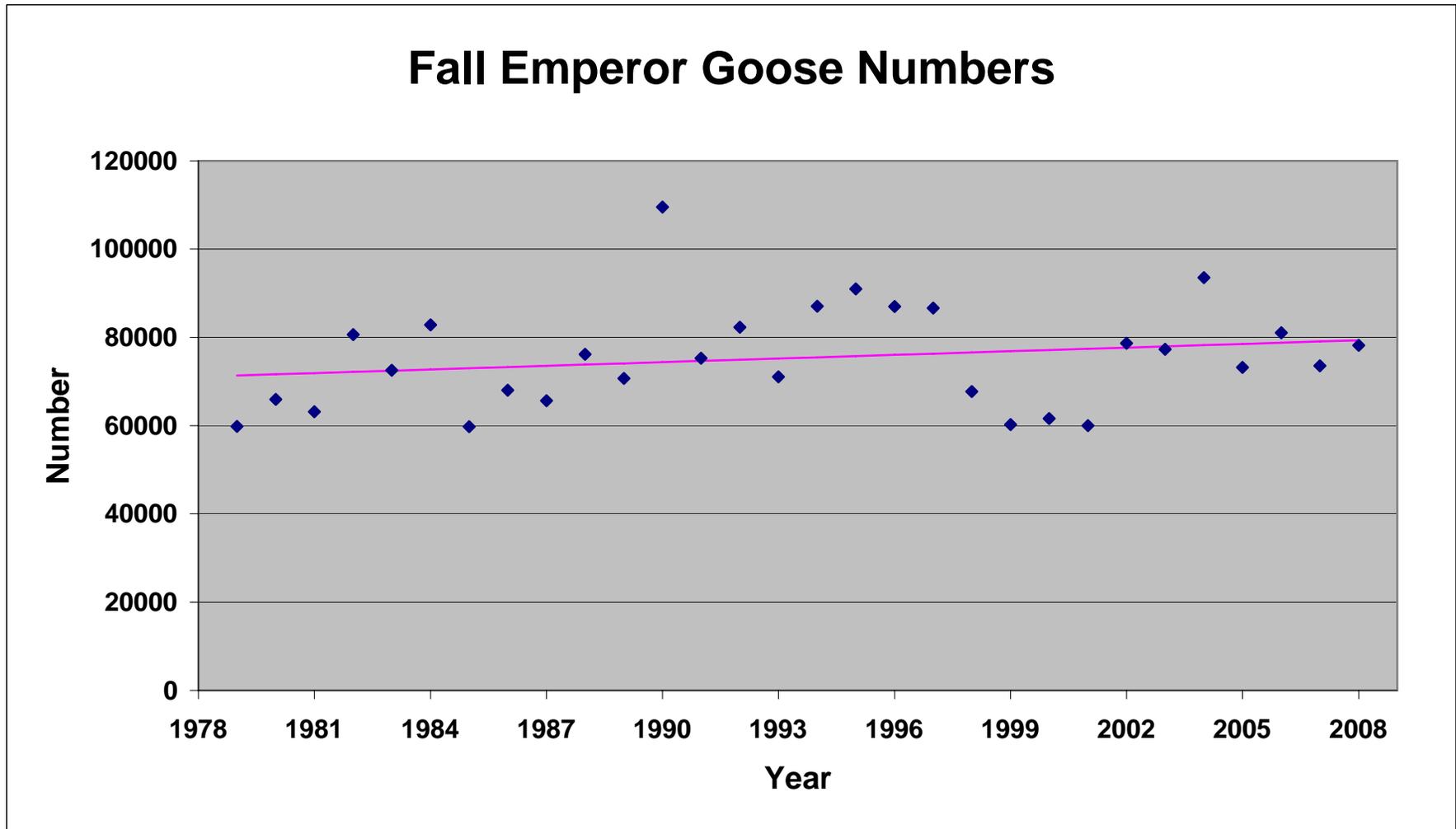


Figure 3. Thirty year trend of fall staging emperor geese in southwest Alaska: mean = 75,348, slope = 275,  $p = 0.27$ , R square = 0.04, mean annual growth rate = 0.36%.