

AERIAL SURVEY OF EMPEROR GEESE AND OTHER WATERBIRDS  
IN SOUTHWESTERN ALASKA, SPRING 2008

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

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**Abstract:** The 28th consecutive spring aerial emperor goose survey was conducted from 29-30 April. Adverse weather precluded surveying the south side of the Alaska Peninsula (segments 86-137) so we expanded our count by using the most recent count for those areas (i.e. 2006 4,309). Additionally, we expanded or estimate by seven birds observed in northern Bristol Bay on 26 April. A total of 64,944 emperor geese were estimated (down 16% from 2007 and up 1% from the previous 27 year average) in coastline and estuarine habitats from Goodnews Bay to central Izembek Lagoon, including all the north side of the Alaska Peninsula and the south side east to Kuiu Bay. The 3-year average of consecutive spring surveys is now 72,864 birds (up 5% from the previous 3-yr average of 69,205). Other species of emphasis (not expanded to unsurveyed areas) included Pacific brant and Steller's eider with observed populations of 50,591 and 58,841, respectively. An amphibious Cessna 206 (N9798Z) was used, flown at 45m (150 feet) ASL and 200km/hr (110 kts).

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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. The traditional survey route included 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. Coverage along the south side of the Alaska Peninsula emphasizes known emperor goose staging and use areas and omits areas of marginal habitat where birds have not been seen during previous surveys. A 3-year moving average of these population data, collected in accordance with the Pacific Flyway Emperor Goose Management Plan, is used as the index to established harvest thresholds. The data also assess annual and long-term variation in seasonal migratory phenology and determine trends in distribution and habitat use for emperor geese.

### METHODS

The survey was flown from 29-30 April. A second aircrew provided counts from Jacksmith Bay to the Naknek River on 26 April (segments 14-33). Generally, survey timing during recent years has been adjusted earlier in response to climatic conditions within the survey area, including earlier break-up of sea ice. Satellite tracking of

migrating emperor geese has also prompted earlier survey starts. However, climatic conditions were several days later in 2008 than in 2007 and the survey start was delayed in response.

The survey area includes a maximum of 143 shoreline/estuarine segments identified on 1:500,000 scale aeronautical and 1:63,360 topographical maps (Figures 1 and 2) and was previously described by Mallek and Dau (2000). Segments along the south side of the Alaska Peninsula with marginal habitat, where no emperor geese were observed during previous surveys, have been omitted. General observations of habitat and survey conditions including wind speed and direction, temperature, sky condition, visibility and tide stage were recorded en route.

An amphibious Cessna 206 (N9798Z) flown at a ground speed of approximately 200 km/hr (110 kts) and an altitude of 45m (150 feet) ASL was used. The planned route of flight was Jacksmith Bay, in the southern portion of Kuskokwim Bay 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. The coastal flight path was approximately 100 meters offshore with deviations, normally within 1.6 km (1 mile) of exposed shorelines, to confirm species identification and estimate numbers. 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. 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. Specialized record and transcribe programs were used to process these data (J. Hodges, MBM-Juneau).

## SURVEY CONDITIONS

Climatic conditions this spring were delayed in comparison to recent trends (through 2007) towards earlier, mild springs. However, most emperor geese were congregated in Alaska Peninsula estuaries as in previous years. Offshore sea ice was extensive in 2008 probably due to several days of persistent northerly winds which congealed drifting ice along the north shore of the upper Alaska Peninsula. Estuaries north of Cape Newenham (i.e. Carter, Goodnews, Chagvan and Nanvak bays) had extensive ice cover (B. Larned pers comm., Table 1). North Alaska Peninsula estuaries had variable amounts of floating ice (Egegik Bay 5%, Ugashik Bay 5-10%, Cinder River Lagoon 50-98%, Port Heiden 5-10%) and all had 50-70% of tidal flats covered by grounded ice. Estuaries from Seal Islands Lagoon south were ice free. Adverse winds produced turbulence that prevented us from surveying the south side of the Alaska Peninsula east from Cold Bay (Segments 86-137).

April 26: Jacksmith Bay to Naknek (Segments 14-33, observations provided by W. W. Larned, MBM, Soldotna). Extensive ice cover was reported in all estuaries in northern Bristol Bay and offshore areas had moderate amounts of ice. Estuary ice cover was as

follows: Jacksmith and Carter bays 100%, Goodnews Bay 75 %, Chagvan Bay 90% and Nanvak Bay 99%. Most lowland areas were snow free and freshwater ponds were ice covered.

April 29: King Salmon to Cold Bay (Segments 34-59). Survey conditions were favorable. Northerly winds of 8-15 kts, 2500 foot overcast to clear ceilings and temperatures increasing from 32-35°F were encountered. Tide conditions were high in Egegik and Ugashik bays, lowering to mid-low from Port Heiden south to the Port Moller/Nelson Lagoon complex. Snow in lowland habitats throughout the area was less than 2%. Larger freshwater ponds from Naknek to Port Heiden were mostly ice covered, decreasing to less than 50% from Seal Islands Lagoon south. Sea ice covered 1-10% of Bristol Bay from Egegik Bay to Cinder River Lagoon and was extensive (70-100%) south to Seal Islands Lagoon. The remainder of Bristol Bay was ice free. Estuarine ice conditions presented above did not preclude use of these areas by emperor geese.

April 30: Cold Bay area (Segments 60-68, 80-85). Survey conditions were favorable with northerly winds of 15-20 knots, ceilings of 800 -3000 feet overcast and temperatures of 27-30° F. Tides were high on the Pacific side of the Alaska Peninsula and mid-low on the Bering side. The only estuarine ice encountered was in Kinzarof Lagoon (2% coverage in the far east end), Moffit Bay (5% coverage by grounded ice), and Applegate Cove (1% coverage in south creek mouths). Freshwater ponds were mostly open.

## RESULTS/DISCUSSION

Cool temperatures, prevailing north winds and considerable sea and estuarine ice appeared to delay the spring migration of emperor geese. However, the distribution of birds encountered was comparable to other years. Extensive sea ice was present along the north side of the Alaska Peninsula from Ugashik Bay to Seal Islands Lagoon during the survey. Extensive estuarine ice and considerable sea ice was reported in northern Bristol Bay on 26 April and only seven emperor geese were observed (W.W. Larned/T. Bowman, pers. comm.). Snow cover in coastal lowlands was light to absent in all surveyed areas (Table 1). Observations from Unalaska, in the eastern Aleutian Islands, suggested the last migrants departed by 4 May, nearly a month later than in 2007 (D. Magone, S. Golodoff, pers. comm.). At Chignik Lagoon, 200-300 emperor geese remained as late as 5 May and near the town of Kodiak, 420 emperor geese were last seen in the first week of May (R. MacIntosh, S. Berns, pers. comm.). Emperor goose and other waterbird numbers are summarized by segment in Table 2.

### Emperor Goose

The 2008 emperor goose estimate of 64,944 was 16% below the 2007 estimate of 77,541 (Tables 2 and 3) and 1% above the previous long-term average of 64,162. The observed count of 60,635 birds in 2008 was expanded by adding the most recent estimated count for missed segments 86-137 (2006, 4,309 birds) to arrive at the estimate of 64,944. The current 3-year average management index of 72,864 increased 5% from the previous average of 69,205 (2005-2007, Table 3). Emperor goose migratory phenology was

delayed in comparison to recent years and although numbers were reduced, their distribution along the north side of the Alaska Peninsula was unchanged (93.0% of total birds in 2008; long-term average 91.4%, Table 4). Only six birds in Chagvan Bay and none in Nanvak Bay, north of Cape Newenham, shows the effects of a delayed spring with increased ice cover on migratory phenology.

### Pacific Brant

We observed a total of 50,591 brant during the survey (Table 2), 50,076 (99.0%) of which were in Izembek Lagoon and adjacent areas. Only eight brant (Chagvan Bay) were observed in northern Bristol Bay and north of Cape Newenham. Adverse wind conditions this year precluded surveying preferred brant use areas along the southside of the Alaska Peninsula. Migratory phenology in 2008 was protracted and delayed by approximately one month. Brant were reported to be still arriving and transiting the Chignik Lagoon and Cold Bay areas on 5 May (D. Bumpus, K. Sowl, pers. comm.). At Kodiak Island, 470 migrant brant were observed on 2 May (R. MacIntosh, S. Berns, pers. comm.). Farther south, small numbers of brant was reported in estuaries from northern California to British Columbia through the first week of May.

### Steller's Eider

We observed 58,841 Steller's eiders (Table 2, not adjusted for unsurveyed areas), a fourfold increase above the 2007 count of 14,439 and 16% above the long-term average of 50,674. Most Steller's eiders (53,245 birds, 90% of the total) were observed from Port Heiden to Izembek Lagoon.

Steller's eider flocks composed of equal ratios of adult males and brown-plumaged birds, predominately adult females, are presumed to represent breeding pairs. Equal ratio flocks comprised 85 of 87 flocks recorded (98%) by the right seat observer with two flocks (2%) predominated by adult males making up the remainder.

## CONCLUSIONS

The spring 2008 emperor goose population estimate of 64,944 is 1% above the long-term survey average of 64,162 (1981-2007). The current 3-year average population of 72,864 (2006-2008) is 5% above the previous 3-year average of 69,205 (2005-07) and 17% above and the long-term average of 3-year indices (62,437). Indices from 2008 are well below the management threshold of 80,000 geese in spring required for consideration of legalized harvest as established in the Pacific Flyway Emperor Goose Management Plan.

Growth of the emperor goose population is adversely affected by low annual productivity, low juvenile survival and continuing illegal harvest (Figure 3). Productivity has been below average in 11 of the past 12 years with high production in 2006 (35.2%) the only exception. Comparison of measured population parameters suggest that cumulatively, natural mortality and illegal harvest alone approach or exceed recruitment

of breeding aged birds (Wolfe and Paige 2002). The few data on the magnitude of illegal harvest are largely based on subjective data and are at best under estimates since data are not collected from all use areas in Alaska and Chukotka. Legalized subsistence harvest for other migratory bird species, beginning in 2003, may have increased illegal and incidental harvest of emperor geese and data to quantify these factors are not available. Hence, there is concern that the cumulative impacts of illegal harvest and natural mortality will continue to approach or exceed recruitment of breeding adults into the population.

Record high productivity documented in 2006 (35.2% juveniles or an estimated 28,499 juveniles in fall 2006, Dau et al. 2006) was followed by little change in the spring 2007 population index (Dau and Mallek 2007) and a below average productivity index in following fall (K. Sowl, Izembek NWR, pers. comm.). Hence, compensatory mortality factors appear to have nullified the high 2006 productivity. Below average productivity in 11 of the past 12 years continues to highlight the need to initiate beneficial management procedures, such as reducing all harvest and annually increasing productivity. The poor response of the emperor goose population to excellent productivity in 2006 shows that recovery to management thresholds or historic levels is unlikely to occur without intervention to both reduce harvest (i.e. increase adult survival) and increase production and survival of young.

Primary factors limiting recovery of the population and realistic management options to control and monitor these factors are:

- 1) Illegal hunting in spring, summer, fall and winter. Comprehensive harvest surveys are needed in Alaska and Russia to assess harvest. Options to eliminate or greatly reduce harvest should be initiated.
- 2) Predation during nesting and brood rearing as indicated by low productivity in recent years and chronic low survival of juveniles from pre-fledging through winter (Schmutz et al. 1997). Predator management on the Y-K Delta should be initiated and evaluated as a means to increase recruitment of breeding birds into the population (Bowman et al.1997). Monitoring of age and season specific survival rates should be continued.
- 3) Wintering ecology of emperor geese is poorly understood. Mortality of juveniles is high and management options to reduce it may be limited. However, it is 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.
- 3) Annual monitoring of spring and fall population sizes and trends as well as distribution, habitat use and productivity are of continuing importance to measure potential benefits of management actions.

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



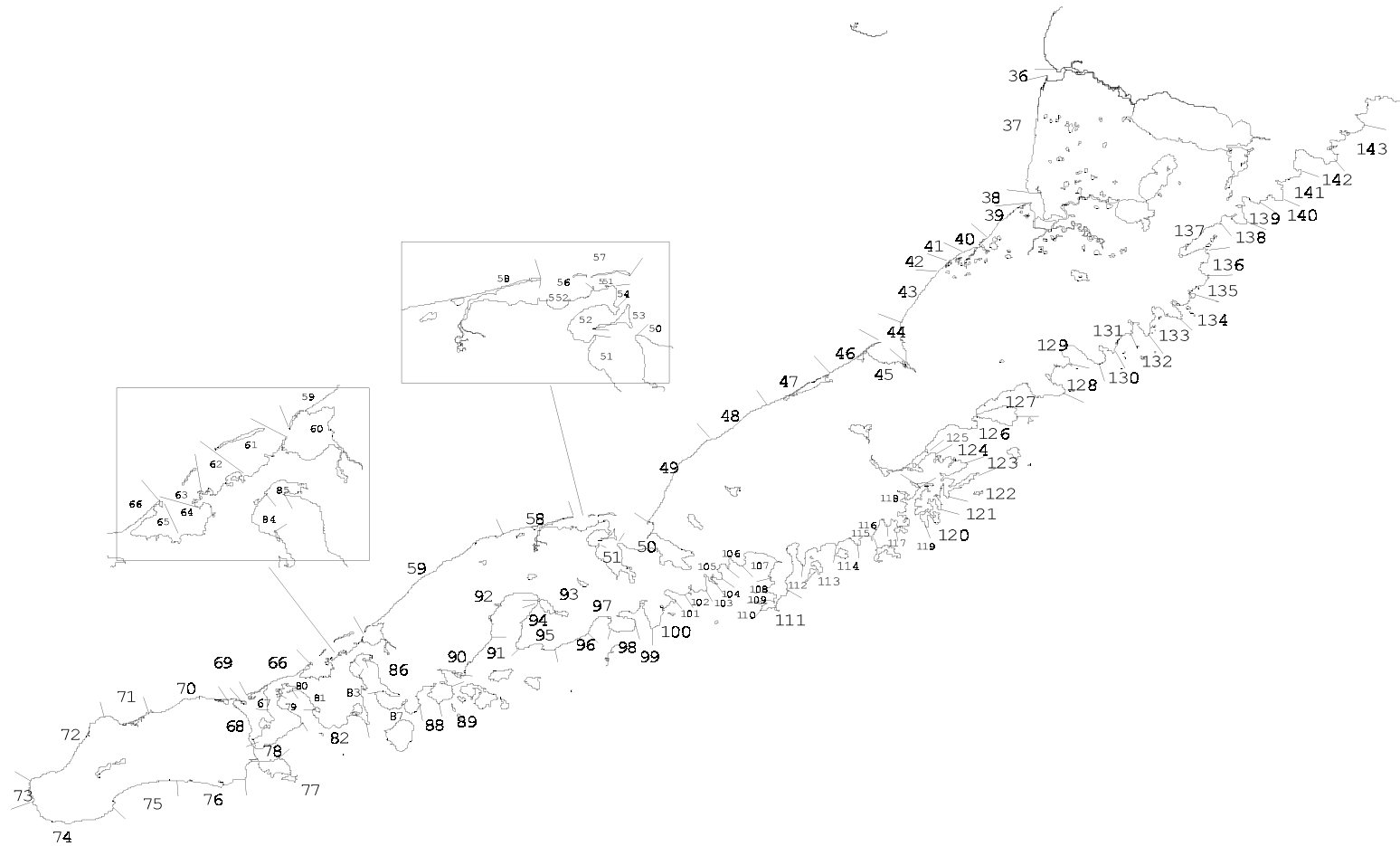


Figure 2. Map of emperor goose aerial survey segments 36-143 in southwest Alaska, 1992-2008.

Table 1. Snow and ice conditions during spring emperor goose survey in southwest Alaska, 26 April 2008 (Observations from W.W. Larned).

AREA	SNOW COVER <sup>1</sup>	MARINE ICE COVER <sup>2</sup>
Kokechik Bay	-	-
Hooper Bay	-	-
Hazen Bay	-	-
Carter Bay	<5	100
Goodnews Bay	<5	75
Chagvan Bay	<5	90
Nanvak Bay	<5	99
<b>Relative Phenology<sup>3</sup></b>	<b>Late</b>	<b>Late</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).

Table 2. Waterbird and mammal observations by segment, southwest Alaska, 29-30 April 2008.

SPECIES	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49
Amer. Green-winged Teal			50		2											
Bald Eagle(ad)	7						1		1	1		2		2		2
Black-bellied Plover			100		150		2									
Beluga Whale	8	7														
Black-legged Kittiwake															1570	304
Black Scoter		45	37	25	1	10				10	2	3	880		18	9281
Bufflehead	2															
Canada Goose	37	115	2		100											
Common Eider					20							45	50	40		
Common Goldeneye							5				4					
Common Merganser	748						5									
Common Raven							1		1		1	62	1	1		
Cormorant ssp.																2
Emperor Goose			1159	50	2444		1826					15295	134	6182	25	
Brown Bear													2			
Greater Scaup	4	95	248	5	395		131		70		15	957		12		
Gray Whale				1											1	9
Harbor Seal		2								1	1	750		351		2
King Eider						5										1706
Large Gull	477	148	1159	57	1174	1	282	4	16	48	237	2266	31	1467	75	50
Long-tailed Duck				50	10	18				4	1		181		2	80
Marbled Godwit							125									
Mallard	57	6	188		26		25		75			20	2	25		
Mew Gull	147	2677	2550	157	1090	9	1987		332	2	361	987	129	542	14	25
Medium Shorebird		20					200									
Northern Pintail	22	101	700	8	75		710		153		18	2551		77	1	
Parasitic Jaeger		2												1		
Pelagic Cormorant													2			
Pigeon Guillemot															1	
Porpoise		1														
Red-breasted Merganser	357	5		2	121		104			12	13	156	5	5		
Red-throated Loon		14		24		7				12	2		11			
Sandhill Crane		2					2					6		8		
Sabine's Gull							2							20		
Sea Otter			1									105		9		
Small Shorebird		150	920		1200		1770		265			4500		85		
Steller's Eider						356	270					10055	108	9620		35
Tundra Swan	10		2	2			6		1			1		2		
White-fronted Goose		90					10									
Wolf																1
White-winged Scoter				16		4	1				7		14		10	12

Table 2 (continued). Waterbird and mammal observations by segment, southwest Alaska, 29-30 April 2008.

SPECIES	50	51	52	53	54	56	57	58	59	60	61	62	63	64	65	66
Bald Eagle(ad)	4	1	5		2		2			3	3	3	2			8
Bald Eagle(juv)	1			1					1							1
Black Brant			107		5	175				6100	21299	715	50	14030	7315	4
Black Scoter	80	777	107	183	220	120	2101	102	401	40	12		40			630
Canada Goose															3	
Common Eider							150									
Common Goldeneye	18										15		17			
Common Murre									1							
Common Raven																6
Emperor Goose	4875					13465	80		56	773	2			20	500	
Greater Scaup	2	20	1000					2		3			15		20	
Gray Whale									3							
Harlequin Duck											32		98	1		187
Harbor Seal			1				375		75		100		70			
King Eider							320									
Large Gull	957	50	330	2	6	6435	300	124	183	50	1174	267	742	366	485	75
Long-tailed Duck					4				4	20	183				15	32
Mallard											2				10	
Mew Gull	2690	500	2119		50	600	20	90	109	85	120	95	70		165	5
Northern Pintail			185							18	30		60	124		
Porpoise							2									
Red-breasted Merganser	60	10		10						12	2	9	2	2	18	4
Red-necked Grebe	220							4	29		2					55
Red-throated Loon	2															
Sea Otter	45	6	12	1		752	1		258	3	111	48	359		2	3
Small Shorebird							3815		520	800	450			200		
Steller's Eider						12933				4305	7717	2395	275	3982	1820	2
Steller's Sealion							3		1							1
White-winged Scoter	10								10							

Table 2 (continued). Waterbird and mammal observations by segment, southwest Alaska, 29-30 April 2008.

SPECIES	67	68	80	81	82	83	84	85	551	552	Grand Total
Amer. Green-winged Teal											52
Bald Eagle(ad)	1			2		2		1			55
Bald Eagle(juv)											4
Black-bellied Plover											252
Beluga Whale											15
Black Brant		3	10	15	5	160	45	325	228		50591
Black-legged Kittiwake											1874
Black Scoter	11	15		32	45	28	50			614	15920
Bufflehead											2
Canada Goose											257
Common Eider											305
Common Goldeneye			105					43			207
Common Merganser											753
Common Murre											1
Common Raven											73
Cormorant ssp.		3									5
Emperor Goose	2			2		31		115	4112	9480	<b>60628</b> <sup>1</sup>
Brown Bear			1								3
Greater Scaup								30		280	3304
Gray Whale											14
Harlequin Duck	34	35	25	5	30	138	36	64			685
Harbor Seal		7			1						1736
King Eider										20	2051
Large Gull	80	90	1336	132	20	45	251	300	450	7100	28842
Long-tailed Duck		100				2					706
Marbled Godwit											125
Mallard		4	5								445
Mew Gull	4		24			21	5	260	140	2250	20431
Medium Shorebird											220
Northern Pintail		30	560					232	350	165	6170
Parasitic Jaeger											3
Pelagic Cormorant						1					3
Pigeon Guillemot											1
Porpoise											3
Red-breasted Merganser			52					18		21	1000
Red-necked Grebe		10		2		1					323
Red-throated Loon											72
Sandhill Crane											18
Sabine's Gull											22
Sea Otter	2	23					75	12	1		1829
Small Shorebird			10			110		450			15245
Steller's Eider	2	300					2	1054		3610	58841
Steller's Sealion											5
Tundra Swan											24
White-fronted Goose											100
Wolf											1
White-winged Scoter				20			6				110

<sup>1</sup> Total observed(60628) + 4309(most recent estimate [2006] for Segments 86-137) + 7 birds(Segments 14-33) = 64944.

Table 3. Spring Emperor Goose Survey, Southwest Alaska, 1981-2008.

YEAR	DATES	POPULATION SIZE		3-YEAR AVG.	% CHANGE	OBSERVERS
		NUMBER	% CHANGE			
1981	4/23-4/27	91267				R.King/C.Dau
1982	5/2-5/4	100643	10			"
1983	4/25-4/29	79155	-21	90355		"
1984	4/26-5/4	71217	-10	83672	-7	"
1985	5/12-5/16	58833	-17	69735	-17	"
1986	5/4-5/7	42231	-28	57427	-18	"
1987	4/30-5/4	51633	22	50899	-11	"
1988	5/2-5/6	53784	4	49216	-3	"
1989	5/3-5/6	45800	-15	50406	2	"
1990	4/28-5/4	67581	48	55722	11	"
1991	5/2-5/7	70972	5	61451	10	"
1992	4/30-5/5	71319	<1	69957	14	"
1993	4/30-5/5	52546	-26	64946	-7	"
1994	4/29, 5/2-6	57267	9	60377	-7	"
1995	5/3-5/6	54852	-5	54888	-9	"
1996	4/27-4/30	80034	46	64051	17	"
1997	4/25-4/28	57059	-29	63982	<-1	"
1998	5/4-5/7	39749	-30	58947	-8	"
1999	4/27-5/1	54600	37	50469	-14	"
2000	4/28-5/3	62565	15	52305	4	E.Mallek/C.Dau
2001	4/29-5/4	84396	35	67187	29	"
2002	5/3-5/6	58743	-30	68568	2	"
2003	4/29-5/3	71160	21	71433	4	"
2004	4/30-5/3	47352	-34	59085	-17	"
2005	4/20-4/23	53965	14	57492	-3	"
2006	4/27-5/2	76108	41	59142	3	"
2007	4/24-4/29	77541	2	69205	17	"
2008	4/29-4/30	64944	-16	72864	5	"

Table 4. Proportions of emperor geese in primary staging sites surveyed in 2008.

Location (Segment/s)	2008	1981-2008
	Number (%)	Number (Avg. % Total)
Yukon-Kuskokwim Delta (1-10)	NS <sup>1</sup>	603 (1)
Kuskokwim Bay (11-17)	1 (<1)	211 (<1)
Chagvan Bay/Nanvak Bay (20, 22)	6 (<1)	1220 (2)
Egegik Bay (36-37)	1209 (2)	953 (2)
Ugashik Bay (38)	2444 (4)	1721 (3)
Cinder River Estuary (39-43)	1826 (3)	6492 (10)
Port Heiden (44-45)	15295 (24)	19542 (30)
Seal Islands Lagoon (46-47)	6316 (10)	8030 (13)
Port Moller/Nelson Lagoon (50-54, 56-58, 551-552)	32012 (49)	19234 (30)
Izembek Lagoon (60-65)	1295 (2)	3259 (5)
Pavlof Bay (91-92)	NS	285 (<1)
Ivanof Bay (112)	NS	458 (<1)
Chignik Bay (125)	NS	229 (<1)
Wide Bay (136-137)	NS	1195 (2)

<sup>1</sup> NS= Not surveyed.

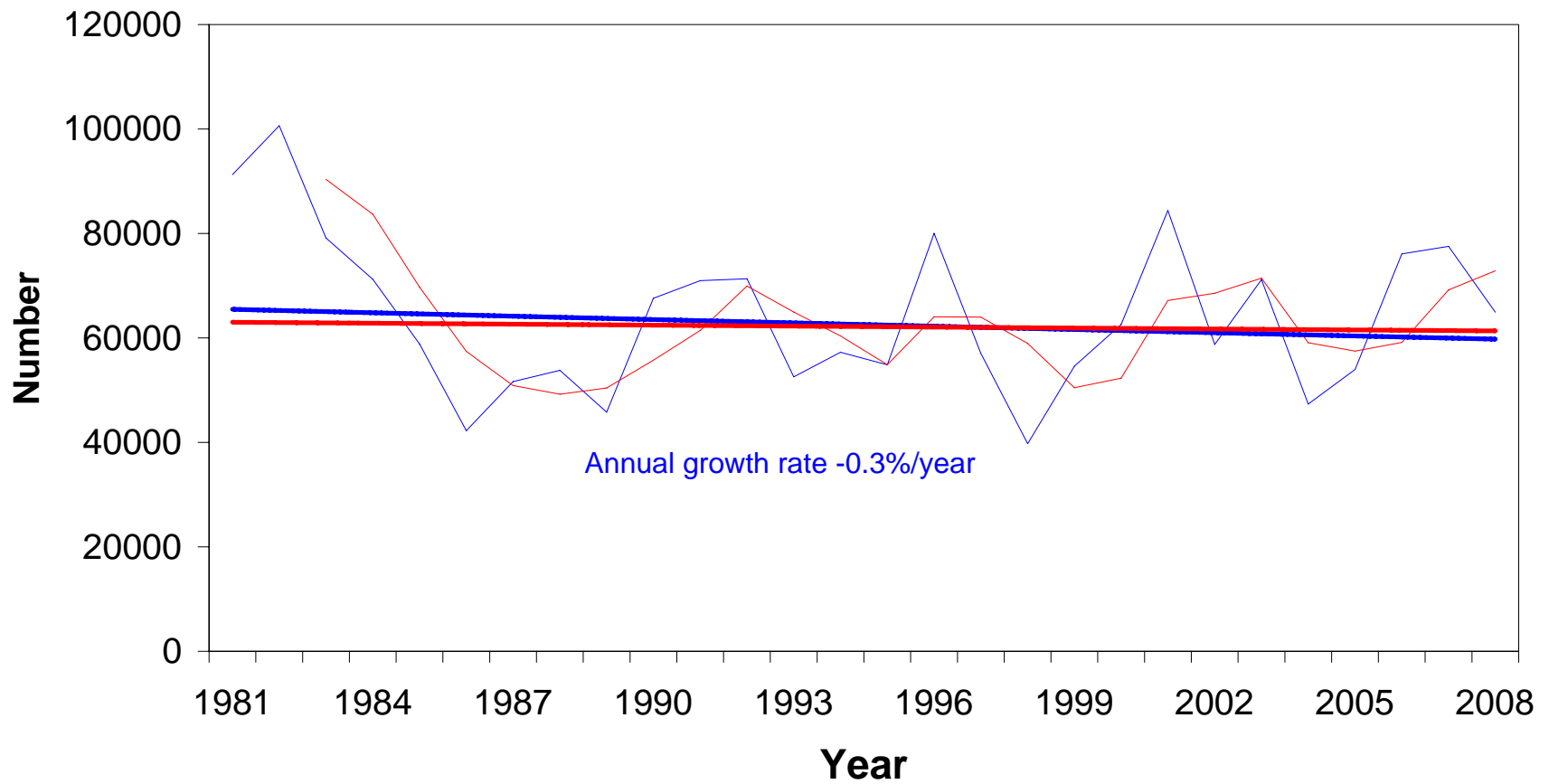


Figure 3. Trends in Emperor Goose Population Counts and 3-Year Averages in Spring, 1981-2008.