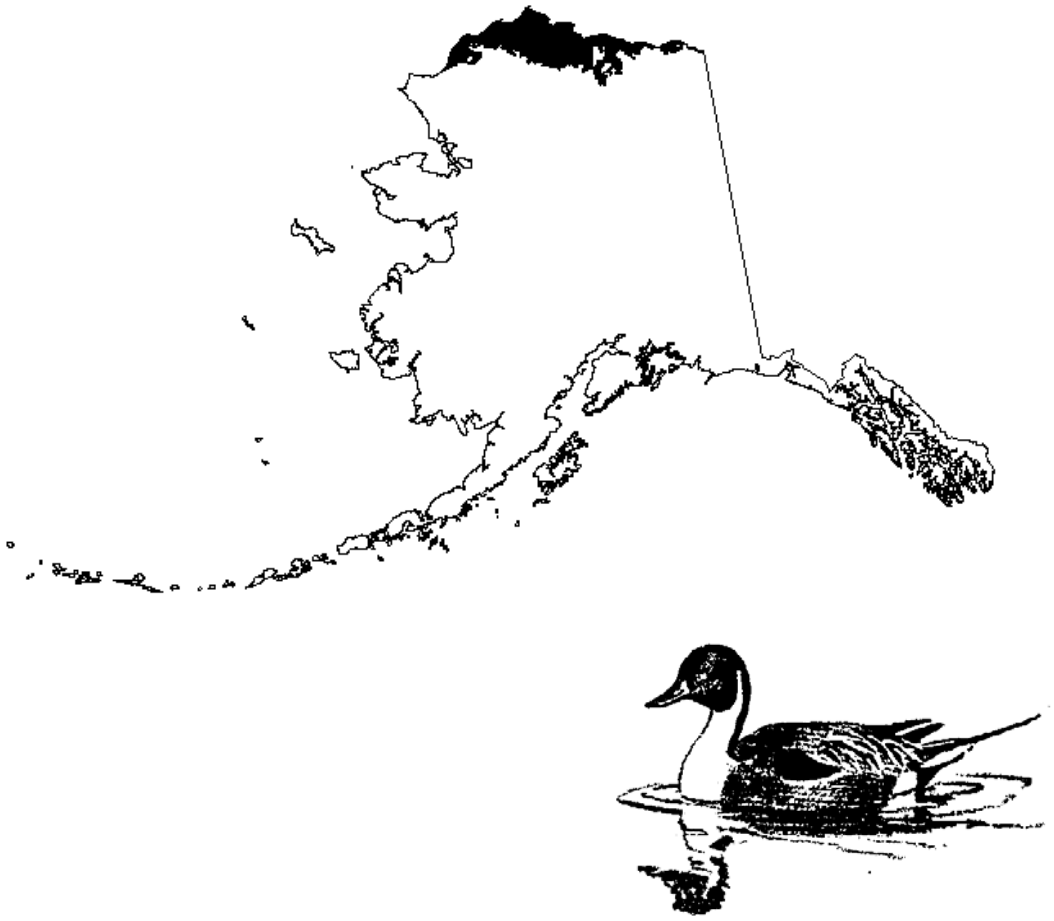
# AERIAL BREEDING PAIR SURVEYS OF THE ARCTIC COASTAL PLAIN OF ALASKA - 2006



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# AERIAL BREEDING PAIR SURVEYS OF THE ARCTIC COASTAL PLAIN OF ALASKA - 2006

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**Abstract:** An aerial breeding pair survey was conducted on the Arctic Coastal Plain of Alaska for the 21st consecutive year from 23-28 June 2006. Weather conditions preceding and during the survey were normal. The total duck index (288,971) was well below the previous 20-year mean (1986-2005, 392,394) primarily caused by the lower northern pintail index. The northern pintail index (150,161) was down 33% from the previous 20-year mean. The scaup index (23,890) was down 28% from the 20-year mean. The long-tailed duck index (89,403) was still below the 20-year mean (107,923) by 17%. The long-term index trend for long-tailed ducks remains significantly negative primarily due to a decrease in flock observations. The index for white-fronted geese (113,932) was 8% below the 20-year mean. The tundra swan index (10,174) was 2% above the 20-year mean, while the tundra swan nest index (1,363) was 5% above its mean. The yellow-billed loon index (1,676) was 41% below the 20-year mean although the long-term trend for this species was not significant.

**Key Words:** aerial survey, Alaska, Arctic Coastal Plain, breeding pair survey, waterfowl **April 2007**

## INTRODUCTION

This report summarizes results from the 2006 aerial breeding pair survey on the Arctic Coastal Plain (ACP) of Alaska. Population indices for 1986-2005 were reported previously (Brackney and King 1993, 1994, 1995, 1996, King and Brackney 1997, Mallek and King 2000, Mallek 2001, Mallek et al. 2002, 2003, 2004, 2005, 2006). This survey, conducted for 21 consecutive years, monitors the majority of waterfowl populations on the ACP. Some waterfowl species (i.e., spectacled eiders) are more appropriately monitored by surveys that are timed to precede the rapid and "early" departure of males (Larned et al. 2006). Similarly, breeding waterfowl which have limited spatial distributions (i.e., Pacific brant and common eiders) are more appropriately monitored by surveys which focus efforts to specific areas (Ritchie and Shook 2005, Dau and Larned 2005). This survey provides population indices for breeding waterbird species that are found throughout the ACP, and is supplemental to continental breeding pair survey area coverage in Alaska (Conant and Mallek 2006).

Several modifications of analysis techniques were initiated with the 2001 survey. Previous analyses of survey data were conducted with a non-stratified approach. The reports for the 2001-2005 surveys and this report incorporate a stratified analysis of the survey area which is described in the methods section. All waterbird population indices from previous years remain unchanged from their non-stratified approach. This stratified analysis was initiated in an attempt to decrease estimates of variance and to simplify comparisons between this survey and the survey conducted by Larned et al. 2006, which is conducted prior to this survey and samples a smaller portion of the ACP.

In an effort to standardize analysis techniques of goose observations during breeding pair surveys conducted by the U.S. Fish and Wildlife Service (USFWS) in Alaska, all lone goose observations will be doubled for analysis. The rationale for doubling lone goose observations is that an observation of a lone goose implies a pair with the unseen goose on a nest. The reports for the 2001- 2005 surveys and this report incorporate this change in analysis and previous survey population indices have been updated accordingly in the tables and figures. Since the majority of geese are observed in flocks and in pairs, this change in analysis techniques will not greatly affect previous population indices.

## STUDY AREA AND METHODS

### Study Area and Survey Design

The survey area (61,645.2 $km^2$) included all contiguous waterfowl habitat north of the Brooks Range, from the northwest coast of Alaska east to the U.S.-Canada border (Figure 1). Survey design (Brackney and King 1995) was similar to that used for the North American Waterfowl Breeding Pair Survey. Survey transects were 0.4 km wide, with each observer responsible for ½ of the transect width. Transects were placed systematically from a randomly selected start in an east-west orientation and were 18.8 km apart (Figure 1). Slightly over 2% of the survey area was sampled.

### Survey Procedures

Survey procedures followed U.S. Fish and Wildlife Service protocol for waterfowl breeding pair surveys (U.S. Fish and Wildlife Service and Canadian Wildlife Service 1987). The centerline of each transect was flown in an amphibious configured Cessna 206 aircraft at 30-45 m (100-150 ft) above ground level and at 145-170 km/hr (90-105 mph). Airplane navigation and altitude were maintained with a Global Positioning System (GPS) and a radar altimeter, respectively. All waterbirds and raptors observed within 0.2 km of the transect centerline were recorded by the pilot/observer and observer for their respective sides.

Observations were recorded directly into laptop computers as sound files using a program developed by John Hodges (USFWS, Region 7, MBM-Juneau). Each laptop computer (one for each observer) was linked to the aircraft GPS unit. The program simultaneously recorded observations and their coordinates into linked sound and ASCII files, respectively. A second computer program, also developed by John Hodges, was used on the ground to replay the linked sound files and produce transcribed ASCII files. The transcribed ASCII files were then used for data analysis.

Observations of waterfowl were recorded according to established survey protocol (U.S. Fish and Wildlife Service and Canadian Wildlife Service 1987). All observations of lone male ducks (drakes) were recorded as singles. Drakes in flocks were recorded as flocked drakes. A male duck in close association with a female was recorded as a pair. Ducks in mixed-sex groupings of 3 or more of the same species which could not be separated into singles and pairs were recorded as groups (a hen and two drakes were recorded as a pair and a lone drake). All observations of lone geese were recorded as singles, two geese in close association were recorded as a pair, and geese in groups of 3 or more of the same species that could not be separated into singles and pairs were recorded as groups.

### Statistical Procedures

Statistical procedures followed those reported by Smith (1995). For ducks, all observations of lone drakes, flocked drakes (<5), and pairs were doubled. Groups of ducks and observations of male scaup were not doubled. For geese, all observations of singles and pairs were doubled for analysis. Groups of geese were not doubled. For non-duck and non-goose observations, only the observations of pairs were doubled for analysis. We corrected for visibility bias (ducks present but not observed in the area sampled) by applying visibility correction factors, developed for coastal tundra habitats (Conant et al. 1991, Smith 1995), to the population indices and variances. Population indices and variances were estimated with the ratio method (Cochran 1977, Smith 1995).

Data were analyzed with computer programs developed by Bob Stehn and Bob Platte (USFWS,

Region 7, MBM-Anchorage) using standard statistical techniques for strip-survey analysis. For analysis purposes the survey area was divided into 12 strata with transect placement based on a random systematic coverage of the entire survey area (Figures 1-2). Strata boundaries were based on geomorphic/aquatic features delineated from satellite imagery of the ACP. A geographic information system (GIS) was used to cut continuous transects at stratum boundaries for analysis.

## RESULTS & DISCUSSION

### Population Indices

The 2006 survey was conducted from 23-28 June. A total of 1,281.5 $km^2$ was sampled, which comprised 100% of the designed sample area (Figure 1). Weather conditions were normal during the survey.

Population indices are listed in Tables 1-4. Sampling effort and strata information are listed in Table 5. Numbers of observations of singles, pairs, and flocks as well as population indices and trends for all survey years are shown in Figures 3-20 and Tables 6-18 for primary species.

The total duck index for 2006 was 288,971 and was 26% below the previous 20-year (1986-2005) mean of 392,394. Northern pintails comprised the greatest proportion of ducks observed and were the primary cause for the below average total duck index. The northern pintail index of 150,161 was 33% below the long-term mean (1986-2005) and was comprised of a large proportion of singles. The pair component for pintails was the lowest on record and the group component (flocked birds) was the second lowest on record during the 21 years of the survey. The 21-year trend for northern pintails was flat and not significant (Figure 4).

The long-tailed duck index for 2006 was 89,403 and was 17% below the previous 20-year mean of 107,923. The 21-year trend for long-tailed ducks was negative and significant (Figure 6). The major factor in this negative trend was the flock or group component. The number of grouped long-tailed ducks has decreased considerably since 1989 (Figure 5, Table 7).

The index for scaup in 2006 was 23,890 and was 28% below the 20-year mean (33,163). The long-term growth rate estimate for scaup was not significant (Figure 8).

The white-fronted goose population index was 113,932 and was 8% below the previous 20-year mean (124,465). The long-term trend for white-fronted geese was slightly positive and not significant (Figure 10). The index for Canada geese was 17,892, which was 2% below the previous 20-year mean (18,330). Snow geese and brant are colonial breeders and this survey was not designed to accurately monitor their ACP population levels. Data presented in this report for these species are ancillary and do not indicate accurate population indices or trends.

The tundra swan population index was 10,174 and was 2% above the previous 20-year mean (9,961). The population growth rate for tundra swans was positive and significant (Figure 12), although this growth rate estimate is primarily driven by results from the 1997-2000 surveys. A total of 28 tundra swan nests were observed on the 2006 survey. This resulted in an index of 1,363 nests, which was 5% above the 20-year mean of 1,295.

The jaeger index for 2006 was 13,076 and was 89% above the previous 20-year mean. Similarly, the snowy owl index for 2006, 2,465, was 113% above the previous 20-year mean.

The Pacific loon index, 29,091, was 9% above the previous 20-year mean (26,783). The long-term

growth rate estimate for this species is rather flat and not significant (Figure 15). Red-throated and yellow-billed loons occur in such low numbers that a difference of counting two pairs can change the index by 10% for either species. The red-throated loon index was 5,142, and was 63% above the previous 20-year mean (3,145). While red-throated loon indices have been highly variable over the years this survey has been conducted, the long-term growth rate estimate was positive and significant (Figure 16). The yellow-billed loon index, 1,676, was 41% below the previous 20-year mean (2,833). The long-term growth rate estimate for this species is not significant (Figure 17).

Arctic tern data from 1992-2006 indicates a positive and significant growth rate for this species, (Table 16 and Figure 18). Data for glaucous gull and Sabine's gull (1992-2006) indicates non-significant growth rates for these species (Tables 17-18 and Figures 19-20).

**Future USFWS Waterfowl Breeding Pair Surveys on the ACP**

The USFWS has conducted two annual aerial waterfowl breeding pair surveys on the Artic Coastal Plain of Alaska since 1992. This survey (Aerial Breeding Pair Surveys of the Arctic Coastal Plain of Alaska) has been conducted annually since 1986. Another survey, Eider Breeding Population Survey Arctic Coastal Plain, Alaska (a.k.a. North Slope Eider Survey) has been conducted since 1992. Each survey had different original purposes. The survey initiated in 1986 was intended to track general ACP breeding waterfowl populations. The survey initiated in 1992 was intended to track ACP breeding eider populations. The primary differences between the two surveys are timing, geographic extent, and intensity. The survey initiated in 1986 is conducted in late June, is timed late for some early breeding waterfowl (i.e. eiders), and samples 2% of the survey areas. This survey covers all wetland habitats north of the Brooks Range on the ACP. The survey initiated in 1992 is conducted in early to mid June and is timed for peak occurrence of spectacled eider males. The geographic extent of this survey is approximately ½ of the ACP in known eider habitat, and samples 4% of the survey area. Both surveys report information and trends on all waterfowl species encountered during the survey. The USFWS has decided to "combine" these two surveys in an effort to provide the most useful and accurate data on waterfowl species. This "new" survey is planned to initiate in June 2007. The survey area will be very similar in size to the general ACP waterfowl survey (all wetlands north of the Brooks Range) and will have multiple levels of survey intensity with overall sample coverage greater than either of the two previous surveys individually. This "new" survey will be timed to coincide with male eider occurrence (as well as all general breeding waterfowl) on the ACP and will provide more accurate data on waterfowl due to greater sample size.

## ACKNOWLEDGMENTS

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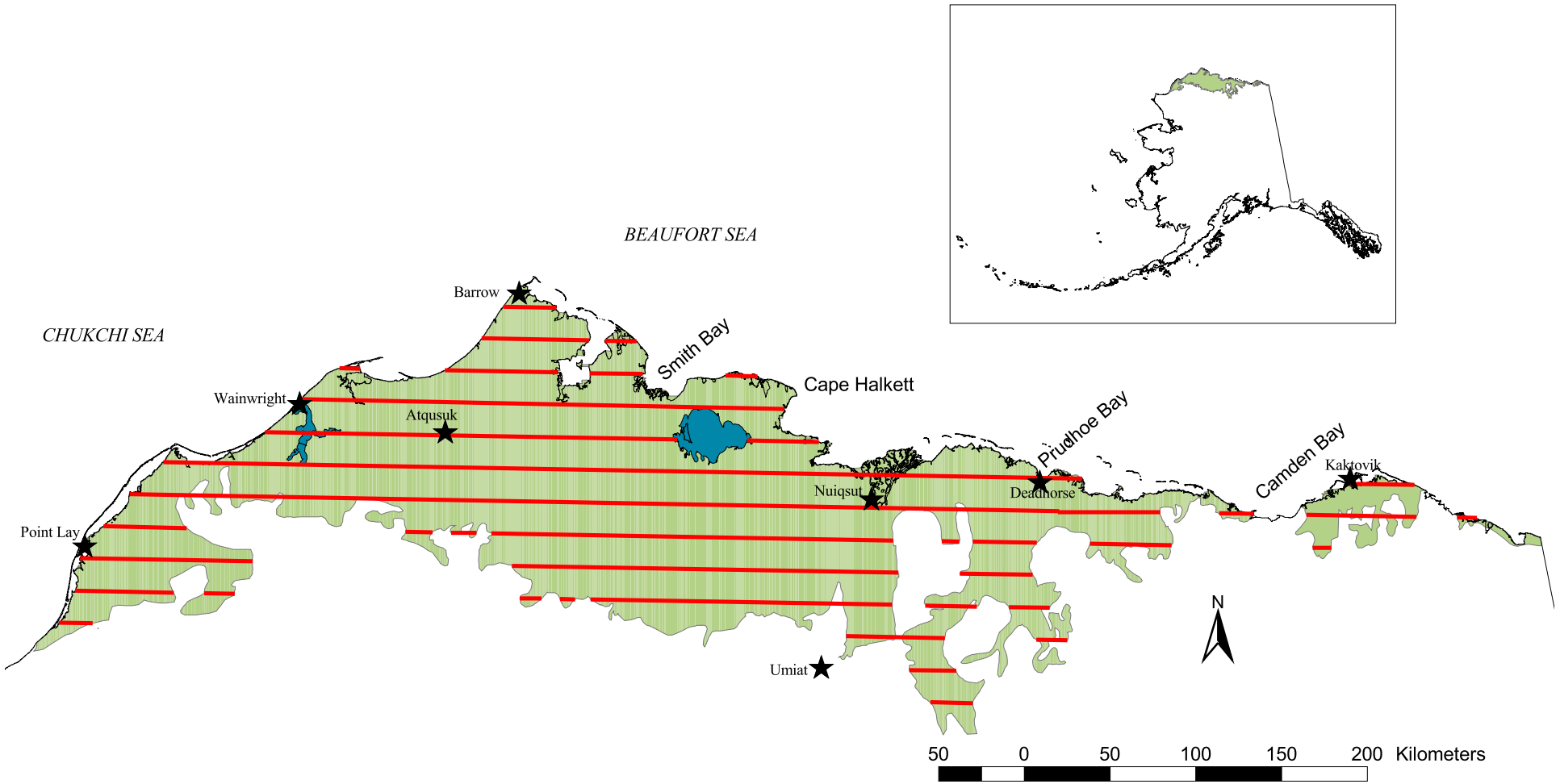



Figure 1. Major features of the Arctic Coastal Plain of Alaska in relation to the waterfowl breeding pair survey boundary and the 2006 transect locations (red lines).

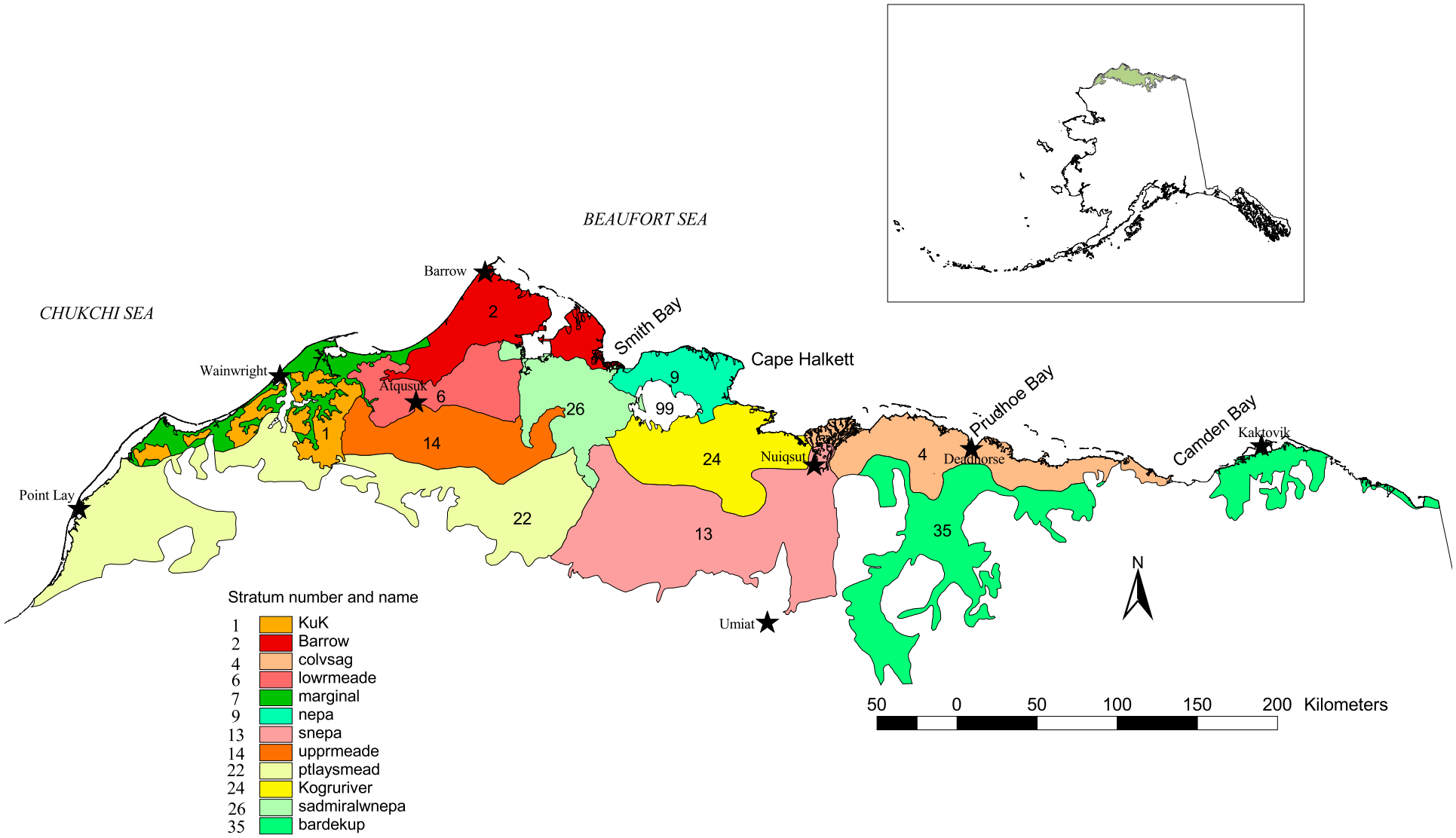



Figure 2. Stratification of the Arctic Coastal Plain of Alaska for calculation of waterbird population indices from aerial surveys conducted in 2006.

Table 1. Population indices of ducks from an aerial breeding pair survey on the Arctic Coastal Plain of Alaska, 23-28 June 2006.

| Species | VCF | Drakes[a] | Pairs | Groups | Indicated Birds | Pop. Index | SE |
|---|---|---|---|---|---|---|---|
| Mallard | 4.01 | 0 | 0 | 0 | 0 | 0 | 0 |
| American Wigeon | 3.84 | 4 | 1 | 9 | 19 | 3,464 | 2,163 |
| American GW Teal | 8.36 | 2 | 1 | 0 | 6 | 2,357 | 1,086 |
| Northern Shoveler | 3.79 | 0 | 0 | 0 | 0 | 0 | 0 |
| Northern Pintail | 3.05 | 378 | 29 | 202 | 1,016 | 150,161 | 19,511 |
| Dabbler Total | | | | | | 155,982 | |
| Scaup | 1.93 | 97 | 42 | 76 | 257 | 23,890 | 4,276 |
| Long-tailed Duck | 1.87 | 334 | 128 | 57 | 981 | 89,403 | 14,870 |
| Black Scoter | 1.17 | 6 | 2 | 0 | 16 | 901 | 437 |
| Surf Scoter | 1.17 | 0 | 0 | 0 | 0 | 0 | 0 |
| White Winged Scoter | 1.17 | 15 | 13 | 37 | 93 | 5,179 | 1,371 |
| Unknown Scoter | 1.17 | 4 | 6 | 37 | 57 | 3,185 | 1,112 |
| R. B. Merganser | 1.27 | 25 | 3 | 8 | 64 | 3,835 | 1,369 |
| King Eider | 1.0 | 23 | 33 | 9 | 121 | 5,932 | 1,171 |
| Common Eider | 1.0 | 2 | 1 | 0 | 6 | 279 | 185 |
| Steller's Eider | 1.0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Spectacled Eider | 1.0 | 4 | 0 | 0 | 8 | 385 | 185 |
| Unknown Eider | 1.0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diver Total | | | | | | 132,989 | |
| Ducks Total | | | | | | 288,971 | |

[a]Indicates drakes only in flocks of 4 or less. This number is doubled to estimate indicated birds, except for scaup drakes which are not doubled in value.
Survey area = 61,645.2 $km^2$, Sample area = 1,281.5 $km^2$
Visibility correction factor = VCF, Number of transects (n) = 86

Table 2. Population indices of waterfowl and related species from an aerial breeding pair survey on the Arctic Coastal Plain of Alaska, 23-28 June 2006.

| Species | VCF | Singles | Pairs | Groups | Indicated Birds | Pop. Index | SE |
|---|---|---|---|---|---|---|---|
| White Fronted Goose | 1 | 169 | 240 | 1,544 | 2,362 | 113,932 | 9,000 |
| Small Canada Goose | 1 | 10 | 16 | 310 | 362 | 17,892 | 10,048 |
| Lesser Snow Goose | 1 | 5 | 4 | 4 | 22 | 1,046 | 555 |
| Brant | 1 | 14 | 11 | 74 | 124 | 6,042 | 1,479 |
| Geese total | | | | | | 138,912 | |
| Tundra Swan | 1 | 100 | 49 | 13 | 211 | 10,174 | 863 |
| Tundra Swan nest | 1 | 28 | 0 | 0 | 28 | 1,363 | 247 |
| Sandhill Crane | 1 | 4 | 2 | 0 | 8 | 396 | 123 |
| Pacific Loon | 1 | 232 | 171 | 20 | 594 | 29,091 | 2,281 |
| Red Throated Loon | 1 | 57 | 25 | 0 | 107 | 5,142 | 863 |
| Common Loon | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Yellow-billed Loon | 1 | 23 | 6 | 0 | 35 | 1,676 | 432 |
| Unidentified Loon | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Loons total | | | | | | 35,909 | |
| Jaeger sp. | 1 | 225 | 20 | 6 | 271 | 13,076 | 1,048 |
| Golden Eagle | 1 | 8 | 0 | 0 | 8 | 380 | 185 |
| Snowy Owl | 1 | 52 | 0 | 0 | 52 | 2,465 | 308 |
| Arctic Tern | 1 | 173 | 54 | 227 | 508 | 24,329 | 3,699 |
| Glaucous Gull | 1 | 150 | 41 | 156 | 388 | 18,717 | 3,514 |
| Sabine's Gull | 1 | 45 | 15 | 266 | 341 | 16,531 | 3,575 |

Survey area = 61,645.2 $km^2$, Sample area = 1,281.5 $km^2$
Visibility correction factor = VCF, Number of transects (n) = 86

Table 3. Population indices of waterfowl and related species on the Arctic Coastal Plain, Alaska 1986-1996.

| SPECIES | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Mallard | 357 | 1,070 | 1,427 | 1,784 | 1,784 | 1,076 | 2,294 | 1,128 | 781 | 1,120 | 2,353 |
| Gadwall | 0 | 0 | 0 | 0 | 0 | 0 | 290 | 0 | 0 | 0 | 0 |
| Wigeon | 2,050 | 5,467 | 342 | 1,538 | 7,005 | 3,091 | 10,252 | 360 | 3,840 | 1,787 | 7,887 |
| GW Teal | 5,951 | 6,323 | 1,488 | 3,719 | 4,463 | 748 | 2,391 | 2,351 | 1,592 | 1,556 | 5,315 |
| Shoveler | 2,023 | 0 | 1,349 | 337 | 1,012 | 678 | 1,446 | 1,421 | 361 | 706 | 3,336 |
| Pintail | 123,622 | 253,486 | 223,768 | 307,494 | 230,824 | 313,562 | 239,201 | 212,449 | 137,402 | 231,815 | 252,661 |
| Dabblers | 134,003 | 226,346 | 228,374 | 314,872 | 245,088 | 319,155 | 255,874 | 217,709 | 143,976 | 236,984 | 271,552 |
| Scaup | 21,639 | 21,811 | 42,848 | 45,596 | 33,918 | 27,014 | 36,070 | 27,864 | 30,054 | 35,662 | 33,883 |
| Goldeneye | 321 | 0 | 321 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1,765 |
| Bufflehead | 166 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Long-tailed Duck | 114,649 | 120,389 | 148,178 | 142,603 | 114,233 | 115,985 | 103,507 | 110,884 | 120,576 | 120,196 | 129,214 |
| Scoter sp. | 6,871 | 9,266 | 10,567 | 21,915 | 8,381 | 15,434 | 17,787 | 11,242 | 7,799 | 17,970 | 11,672 |
| RB Merg | 1,186 | 2,091 | 904 | 904 | 1,808 | 3,014 | 1,332 | 1,905 | 1,693 | 5,024 | 3,913 |
| Common Eider | 0 | 712 | 267 | 178 | 356 | 358 | 191 | 0 | 95 | 745 | 1,956 |
| King Eider | 2,536 | 1,646 | 1,068 | 3,871 | 3,115 | 6,931 | 1,049 | 3,984 | 1,619 | 1,303 | 3,521 |
| Steller's Eider | 0 | 0 | 0 | 2,002 | 534 | 1,118 | 954 | 1,313 | 2,524 | 931 | 2,543 |
| Spectacled Eider | -- | -- | -- | -- | -- | 268 | 0 | 1,125 | 476 | 279 | 438 |
| Unid. Eider | 1,379 | 2,358 | 1,023 | 1,157 | 178 | 0 | 0 | 0 | 0 | 186 | 0 |
| Divers | 148,747 | 158,273 | 205,176 | 218,226 | 162,523 | 170,122 | 160,890 | 158,317 | 164,836 | 182,296 | 188,905 |
| Total Ducks | 282,750 | 384,619 | 433,550 | 533,098 | 407,611 | 489,277 | 416,764 | 376,026 | 308,812 | 419,280 | 460,457 |
| WF Goose | 119,905 | 91,385 | 98,237 | 148,646 | 90,318 | 121,321 | 122,479 | 100,311 | 93,386 | 84,213 | 131,008 |
| Canada Goose | 47,161 | 20,825 | 5,828 | 2,180 | 12,458 | 9,570 | 27,366 | 4,875 | 3,619 | 7,037 | 20,637 |
| Snow Goose | 223 | 0 | 889 | 4,005 | 0 | 89 | 286 | 656 | 524 | 926 | 538 |
| Black Brant | 8,943 | 4,049 | 11,390 | 18,331 | 3,826 | 2,371 | 10,012 | 12,796 | 4,619 | 13,426 | 7,140 |
| Total Geese | 176,232 | 116,259 | 116,344 | 173,162 | 106,602 | 133,351 | 160,143 | 118,638 | 102,148 | 105,602 | 159,323 |
| Swans | 6,718 | 7,163 | 6,895 | 10,544 | 6,229 | 7,334 | 9,726 | 6,937 | 9,000 | 8,843 | 10,514 |
| Swan Nests | 356 | 934 | 712 | 1,290 | 1,157 | 1,073 | 1,192 | 1,172 | 1,000 | 1,574 | 1,809 |
| Pacific Loon | 23,047 | 23,847 | 31,278 | 27,674 | 23,714 | 29,559 | 20,071 | 27,890 | 26,620 | 36,304 | 32,177 |
| RT Loon | 3,070 | 2,447 | 2,225 | 1,690 | 3,693 | 3,443 | 1,812 | 1,828 | 2,857 | 2,188 | 3,521 |
| YB Loon | 3,203 | 1,468 | 1,913 | 3,337 | 2,091 | 3,354 | 3,147 | 2,578 | 3,429 | 4,282 | 4,988 |
| Common Loon | 0 | 44 | 44 | 0 | 0 | 45 | 143 | 141 | 48 | 0 | 0 |
| Unid. Loon | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total Loons | 29,320 | 27,806 | 35,460 | 32,701 | 29,498 | 36,401 | 25,173 | 32,437 | 32,954 | 42,774 | 40,686 |
| Jaegers | 9,432 | 6,585 | 12,769 | 3,470 | 8,765 | 9,123 | 7,103 | 9,094 | 5,573 | 4,401 | 7,678 |
| Arctic Tern | na | na | na | na | na | na | 17,688 | 15,047 | 22,049 | 23,797 | 24,842 |
| Glaucous Gull | na | na | na | na | na | na | 14,493 | 11,765 | 15,144 | 14,398 | 19,170 |
| Sabine's Gull | na | na | na | na | na | na | 6,484 | 8,250 | 8,572 | 14,491 | 10,465 |
| Golden Eagle | 801 | 400 | 222 | 133 | 89 | 537 | 667 | 562 | 333 | 417 | 245 |
| Snowy Owl | 0 | 400 | 4,761 | 1,513 | 445 | 313 | 334 | 1,500 | 95 | 6,574 | 1,565 |

-- Indicates that observations of this species not delineated during that year

Table 4. Population indices of waterfowl and related species on the Arctic Coastal Plain, Alaska 1997-2006.

| SPECIES | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 1986-2005 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Mallard | 1,417 | 5,253 | 11,135 | 1,230 | 1,877 | 1,071 | 874 | 778 | 0 | 0 | 1,940 |
| Gadwall | 0 | 853 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 57 |
| Wigeon | 14,923 | 7,905 | 7,730 | 4,712 | 369 | 361 | 3,141 | 366 | 0 | 3,464 | 4,156 |
| GW Teal | 1,969 | 14,081 | 5,803 | 855 | 778 | 0 | 3,318 | 1,571 | 794 | 2,357 | 3,253 |
| Shoveler | 0 | 2,482 | 4,209 | 0 | 0 | 1,365 | 0 | 0 | 0 | 0 | 1,036 |
| Pintail | 226,636 | 268,131 | 283,076 | 131,121 | 238,529 | 178,635 | 227,678 | 243,372 | 156,754 | 150,161 | 224,011 |
| Dabblers | 244,945 | 298,705 | 311,953 | 137,918 | 241,553 | 181,432 | 235,011 | 246,087 | 157,548 | 155,982 | 232,454 |
| Scaup | 40,796 | 33,139 | 32,824 | 43,311 | 28,327 | 27,509 | 37,438 | 36,588 | 26,967 | 23,890 | 33,163 |
| Goldeneye | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 120 |
| Bufflehead | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 |
| Long-tailed Duck | 98,655 | 92,478 | 85,676 | 67,010 | 104,055 | 96,946 | 87,893 | 101,091 | 84,241 | 89,403 | 107,923 |
| Scoter sp. | 7,991 | 8,102 | 5,442 | 4,608 | 14,318 | 11,930 | 5,054 | 4,652 | 7,733 | 9,265 | 10,437 |
| RB Merg | 748 | 3,684 | 6,965 | 130 | 2,133 | 2,468 | 1,513 | 1,501 | 2,385 | 3,835 | 2,265 |
| Common Eider | 0 | 936 | 0 | 972 | 198 | 0 | 623 | 1,019 | 380 | 279 | 449 |
| King Eider | 6,359 | 3,649 | 4,165 | 1,738 | 7,887 | 4,525 | 6,472 | 5,031 | 7,578 | 5,932 | 3,902 |
| Steller's Eider | 1,295 | 281 | 1,250 | 563 | 176 | 0 | 0 | 0 | 110 | 0 | 780 |
| Spectacled Eider | 589 | 281 | 139 | 0 | 653 | 729 | 263 | 751 | 3,471 | 385 | 631 |
| Unid. Eider | 589 | 0 | 1,111 | 409 | 0 | 0 | 0 | 0 | 0 | 0 | 420 |
| Divers | 157,022 | 142,550 | 137,572 | 118,741 | 157,747 | 144,107 | 139,256 | 150,633 | 132,865 | 132,989 | 159,940 |
| Total Ducks | 401,967 | 441,255 | 449,525 | 256,659 | 399,300 | 325,539 | 374,267 | 396,720 | 290,413 | 288,971 | 392,394 |
| WF Goose | 177,877 | 128,288 | 192,426 | 137,968 | 155,500 | 120,314 | 108,146 | 138,163 | 129,403 | 113,932 | 124,465 |
| Canada Goose | 18,724 | 33,312 | 47,551 | 24,640 | 23,794 | 9,324 | 11,373 | 15,129 | 21,200 | 17,892 | 18,330 |
| Snow Goose | 236 | 94 | 2,568 | 615 | 29,257 | 529 | 2,554 | 3,802 | 14,695 | 1,046 | 3,124 |
| Black Brant | 16,310 | 11,088 | 8,052 | 1,126 | 22,042 | 10,233 | 12,932 | 5,305 | 15,609 | 6,042 | 9,980 |
| Total Geese | 213,147 | 172,782 | 250,597 | 164,349 | 230,593 | 140,400 | 135,005 | 162,399 | 180,907 | 138,912 | 155,899 |
| Swans | 13,601 | 12,632 | 16,105 | 17,227 | 10,504 | 9,389 | 9,118 | 8,745 | 12,002 | 10,174 | 9,961 |
| Swan Nests | 1,943 | 1,731 | 2,846 | 665 | 1,134 | 1,084 | 1,236 | 1,283 | 1,709 | 1,363 | 1,295 |
| Pacific Loon | 34,151 | 29,850 | 34,154 | 19,988 | 22,188 | 22,702 | 22,539 | 22,948 | 24,955 | 29,091 | 26,783 |
| RT Loon | 2,179 | 2,994 | 5,276 | 4,601 | 5,335 | 2,945 | 3,599 | 4,155 | 3,038 | 5,142 | 3,145 |
| YB Loon | 3,062 | 3,556 | 3,124 | [a]2454 | 1,331 | 1,948 | 3,270 | 2,262 | 1,871 | 1,676 | 2,833 |
| Common Loon | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 23 |
| Unid. Loon | 0 | 0 | 0 | 7,515 | 616 | 290 | 0 | 0 | 0 | 0 | 421 |
| Total Loons | 39,392 | 36,400 | 42,554 | [b]33587 | 29,470 | 27,885 | 29,408 | 29,365 | 29,864 | 35,909 | 33,157 |
| Jaegers | 6,948 | 7,112 | 6,317 | 5,165 | 5,906 | 5,301 | 6,697 | 4,812 | 5,804 | 13,076 | 6,903 |
| Arctic Tern | 26,084 | 26,247 | 25,476 | 21,828 | 21,320 | 21,248 | 28,016 | 24,738 | 30,688 | 24,329 | 23,505 |
| Glaucous Gull | 20,549 | 13,615 | 23,741 | 29,751 | 12,225 | 18,472 | 13,116 | 14,180 | 18,955 | 18,717 | 17,112 |
| Sabine's Gull | 15,132 | 6,924 | 10,413 | 21,419 | 10,611 | 9,298 | 17,974 | 10,345 | 11,657 | 16,531 | 11,574 |
| Golden Eagle | 530 | 795 | 625 | 461 | 908 | 497 | 190 | 93 | 48 | 380 | 428 |
| Snowy Owl | 589 | 936 | 2,013 | 307 | 192 | 626 | 651 | 0 | 334 | 2,465 | 1,157 |

a Estimates based on left-observer data only

b Estimate based on all loon observations from left and right observer

Table 5. Stratum information from an aerial breeding pair survey of the Arctic Coastal Plain of Alaska, 23-28 June 2006.

| Stratum Name | Survey Area $km^2$ | Sample Area $km^2$ | % Sample |
|---|---|---|---|
| Kuk | 2,098.3 | 34.9 | 1.7 |
| Barrow | 3,884.2 | 82.9 | 2.1 |
| Colville/Sag | 4,622.5 | 94.2 | 2.0 |
| Lower Meade | 3,077.9 | 67.7 | 2.2 |
| Marginal | 2,408.2 | 56.7 | 2.4 |
| NEPA | 1,949.5 | 38.4 | 2.0 |
| S. NEPA | 10,602.5 | 225.0 | 2.1 |
| Upper Meade | 4,179.7 | 86.1 | 2.1 |
| Ptlaysmead | 11,906.3 | 246.4 | 2.1 |
| Kogru River | 4,999.2 | 105.6 | 2.1 |
| Sadmiralwnepa | 3,535.4 | 73.6 | 2.1 |
| Bardekup | 8,381.6 | 169.9 | 2.0 |
| **TOTAL** | **61645.2** | **1281.5** | **2.1** |

# Northern Pintail

Table 6. Population indices and observational data for Northern Pintails from aerial breeding pair surveys on the Arctic Coastal Plain of Alaska, 1986-2006.

| Year | Singles | Pairs | Groups | Index |
|---|---|---|---|---|
| 86 | 165 | 94 | 398 | 123622 |
| 87 | 148 | 97 | 1378 | 253486 |
| 88 | 281 | 110 | 867 | 223768 |
| 89 | 448 | 93 | 1184 | 307494 |
| 90 | 414 | 73 | 727 | 230824 |
| 91 | 516 | 113 | 1041 | 313562 |
| 92 | 279 | 93 | 901 | 239201 |
| 93 | 383 | 80 | 560 | 212449 |
| 94 | 241 | 47 | 370 | 137402 |
| 95 | 328 | 101 | 775 | 231815 |
| 96 | 396 | 109 | 684 | 252661 |
| 97 | 119 | 49 | 926 | 226636 |
| 98 | 405 | 112 | 845 | 268131 |
| 99 | 152 | 52 | 929 | 283076 |
| 00 | 206 | 84 | 261 | 131121 |
| 01 | 511 | 135 | 324 | 238529 |
| 02 | 389 | 109 | 222 | 178635 |
| 03 | 526 | 121 | 247 | 227678 |
| 04 | 479 | 120 | 454 | 243372 |
| 05 | 375 | 78 | 152 | 156754 |
| 06 | 378 | 29 | 202 | 150161 |

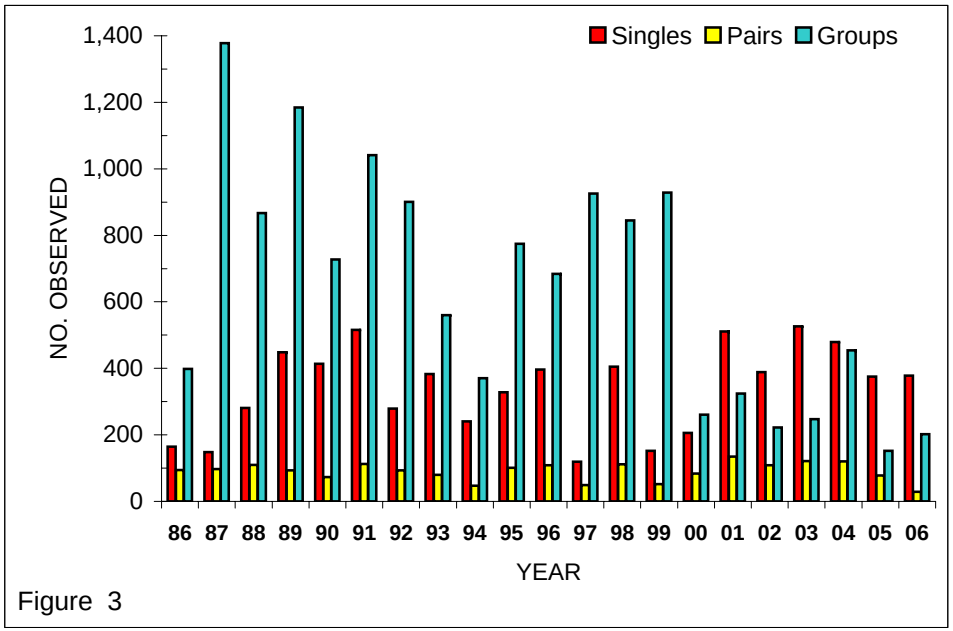


Figure 3

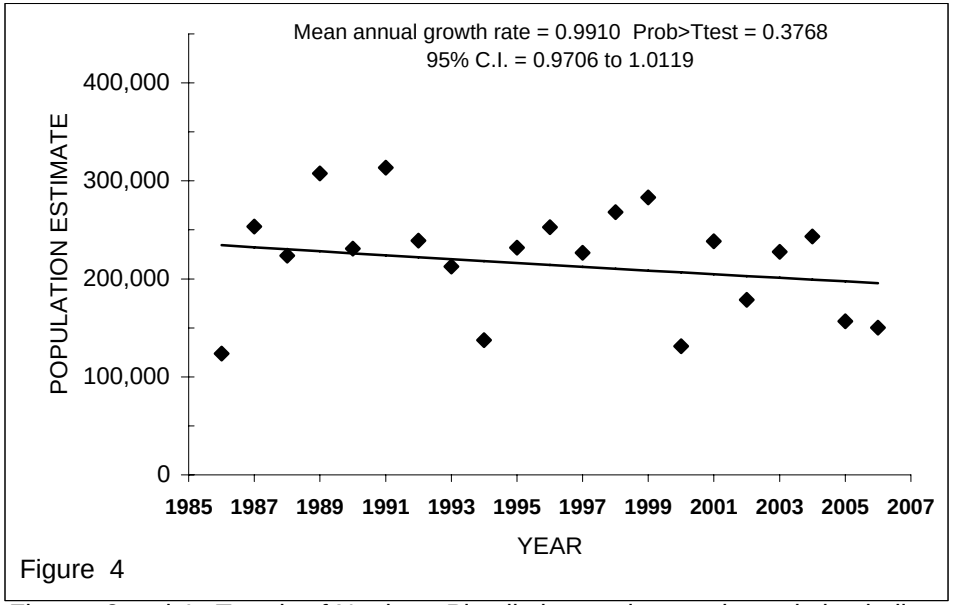


Figure 4

Figures 3 and 4. Trends of Northern Pintail observations and population indices from aerial breeding pair surveys on the Arctic Coastal Plain of Alaska, 1986-2006. "Singles" represents the number of males in flocks of 4 or less (flocked drakes and lone drakes). Mean annual growth rate was determined by log-linear regression.

# Long-tailed Duck

Table 7. Population indices and observational data for Long-tailed Ducks from aerial breeding pair surveys on the Arctic Coastal Plain of Alaska, 1986-2006.

| Year | Singles | Pairs | Groups | Index |
|---|---|---|---|---|
| 86 | 315 | 165 | 418 | 114649 |
| 87 | 338 | 149 | 473 | 120389 |
| 88 | 482 | 167 | 483 | 148178 |
| 89 | 344 | 267 | 492 | 142603 |
| 90 | 387 | 181 | 237 | 114233 |
| 91 | 358 | 159 | 353 | 115985 |
| 92 | 263 | 133 | 369 | 103507 |
| 93 | 420 | 137 | 151 | 110884 |
| 94 | 381 | 131 | 330 | 120576 |
| 95 | 435 | 147 | 217 | 120196 |
| 96 | 482 | 165 | 119 | 129214 |
| 97 | 258 | 141 | 98 | 98655 |
| 98 | 363 | 126 | 79 | 92478 |
| 99 | 184 | 89 | 114 | 85676 |
| 00 | 174 | 59 | 235 | 67010 |
| 01 | 415 | 137 | 73 | 104055 |
| 02 | 295 | 168 | 96 | 96946 |
| 03 | 361 | 96 | 55 | 87893 |
| 04 | 347 | 165 | 108 | 101091 |
| 05 | 306 | 139 | 58 | 84241 |
| 06 | 334 | 128 | 57 | 89403 |

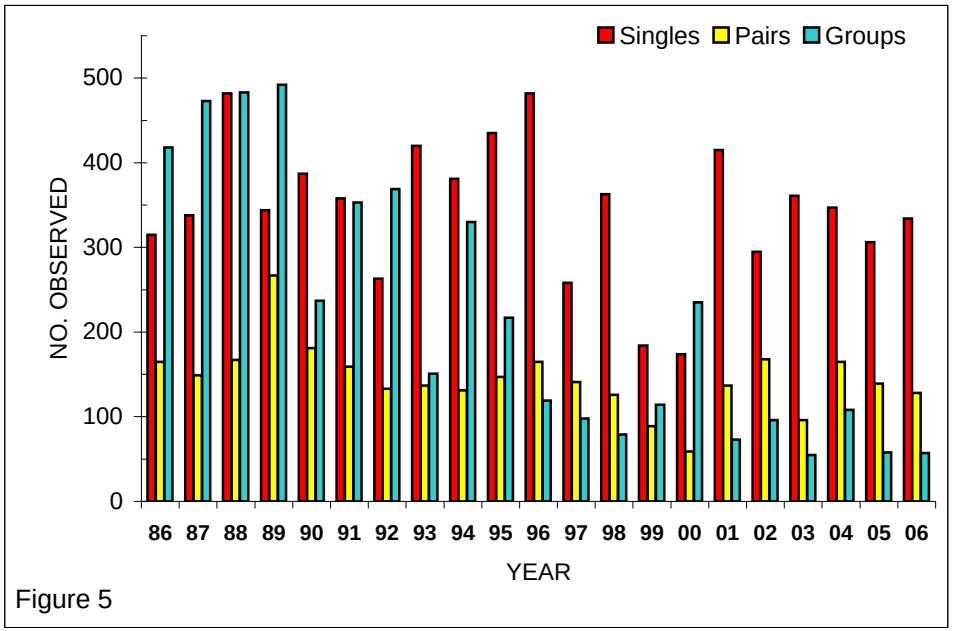


Figure 5

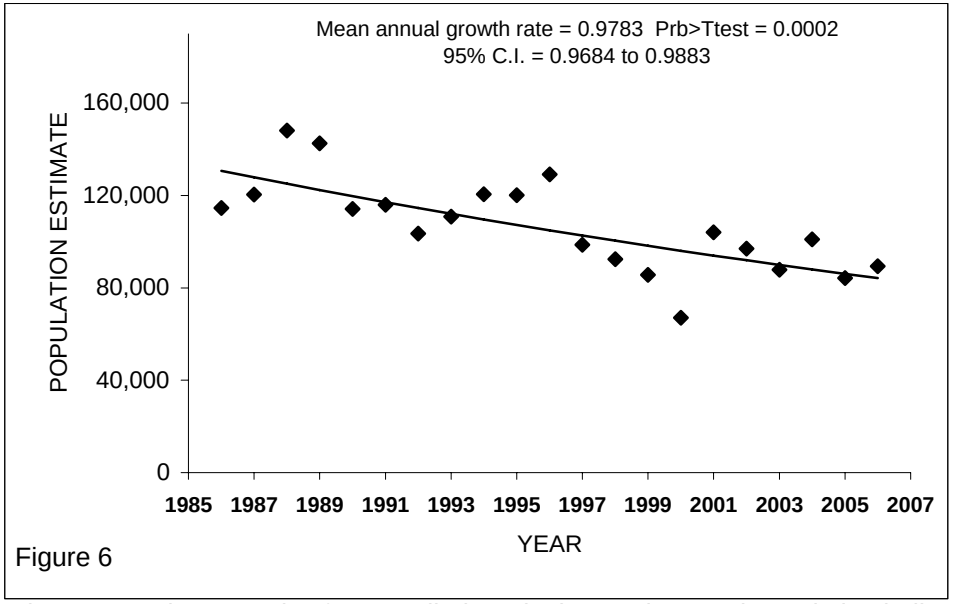


Figure 6

Figures 5 and 6. Trends of Long-tailed Duck observations and population indices from aerial breeding pair surveys on the Arctic Coastal Plain of Alaska, 1986-2006. "Singles" represents the number of males in flocks of 4 or less (flocked drakes and lone drakes). Mean annual growth rate was determined by log-linear regression.

# Scaup

Table 8. Population indices and observational data for Scaup from aerial breeding pair surveys on the Arctic Coastal Plain of Alaska, 1986-2006.

| Year | Singles | Pairs | Groups | Index |
|---|---|---|---|---|
| 86 | 47 | 60 | 85 | 21639 |
| 87 | 26 | 34 | 160 | 21811 |
| 88 | 64 | 38 | 359 | 42848 |
| 89 | 63 | 83 | 302 | 45596 |
| 90 | 102 | 60 | 173 | 33918 |
| 91 | 68 | 48 | 149 | 27014 |
| 92 | 78 | 44 | 226 | 36070 |
| 93 | 121 | 62 | 63 | 27864 |
| 94 | 52 | 57 | 161 | 30054 |
| 95 | 88 | 49 | 211 | 35662 |
| 96 | 126 | 55 | 123 | 33883 |
| 97 | 75 | 46 | 192 | 40796 |
| 98 | 95 | 30 | 212 | 33139 |
| 99 | 47 | 21 | 156 | 32824 |
| 00 | 75 | 28 | 308 | 43311 |
| 01 | 108 | 66 | 69 | 28327 |
| 02 | 141 | 61 | 35 | 27509 |
| 03 | 107 | 79 | 133 | 37438 |
| 04 | 100 | 85 | 120 | 36588 |
| 05 | 96 | 40 | 116 | 26967 |
| 06 | 97 | 42 | 76 | 23890 |

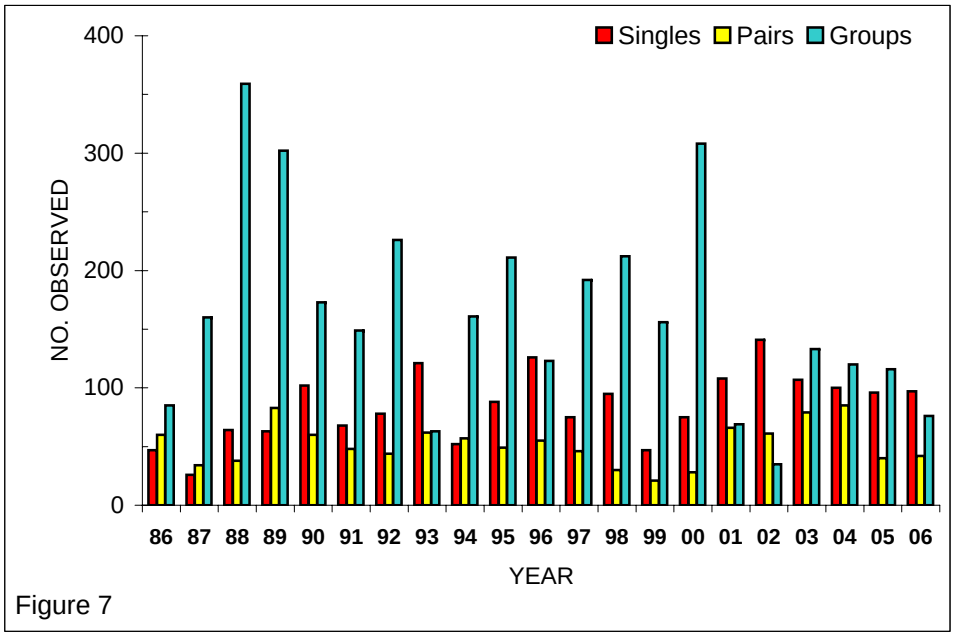


Figure 7

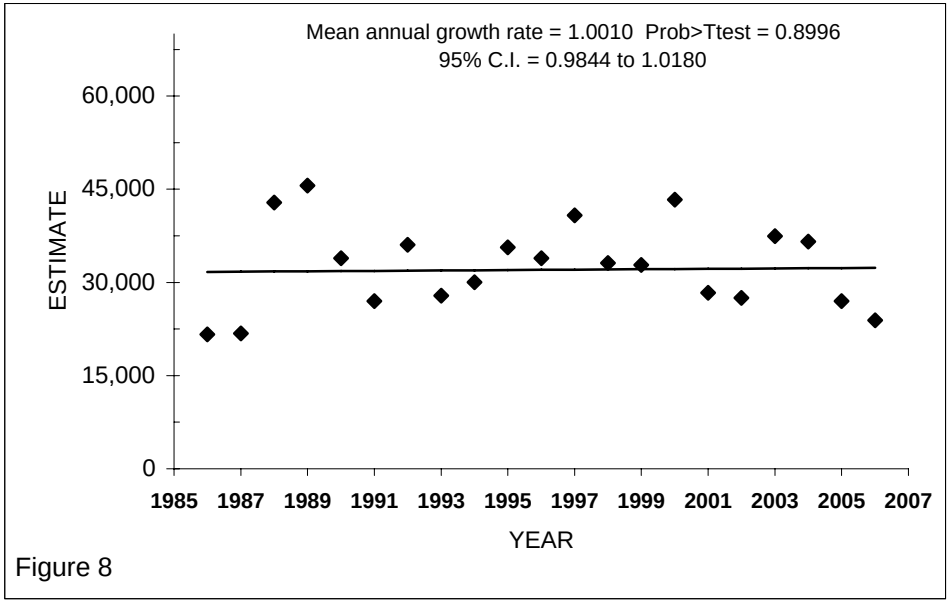


Figure 8

Figures 7 and 8. Trends of Scaup observations and population indices from aerial breeding pair surveys on the Arctic Coastal Plain of Alaska, 1986-2006. "Singles" represents the number of males in flocks of 4 or less (flocked drakes and lone drakes). Mean annual growth rate was determined by log-linear regression.

# Greater White-fronted Goose

Table 9. Population indices and observational data for Greater White-fronted Geese from aerial breeding pair surveys on the Arctic Coastal Plain of Alaska, 1986-2006.

| Year | Singles | Pairs | Groups | Index |
|---|---|---|---|---|
| 86 | 41 | 65 | 2483 | 119905 |
| 87 | 64 | 62 | 1802 | 91385 |
| 88 | 143 | 96 | 1730 | 98237 |
| 89 | 81 | 103 | 2973 | 148646 |
| 90 | 96 | 81 | 1676 | 90318 |
| 91 | 133 | 103 | 2241 | 121321 |
| 92 | 50 | 65 | 2339 | 122479 |
| 93 | 94 | 114 | 1724 | 100311 |
| 94 | 72 | 112 | 1593 | 93386 |
| 95 | 133 | 96 | 1361 | 84213 |
| 96 | 106 | 66 | 2335 | 131088 |
| 97 | 91 | 111 | 2617 | 177877 |
| 98 | 140 | 123 | 2216 | 128288 |
| 99 | 92 | 57 | 2474 | 192426 |
| 00 | 119 | 96 | 2269 | 137968 |
| 01 | 103 | 240 | 2567 | 155500 |
| 02 | 126 | 253 | 1787 | 120314 |
| 03 | 156 | 256 | 1440 | 108146 |
| 04 | 94 | 248 | 2184 | 138163 |
| 05 | 213 | 376 | 1558 | 129403 |
| 06 | 169 | 240 | 1544 | 113932 |

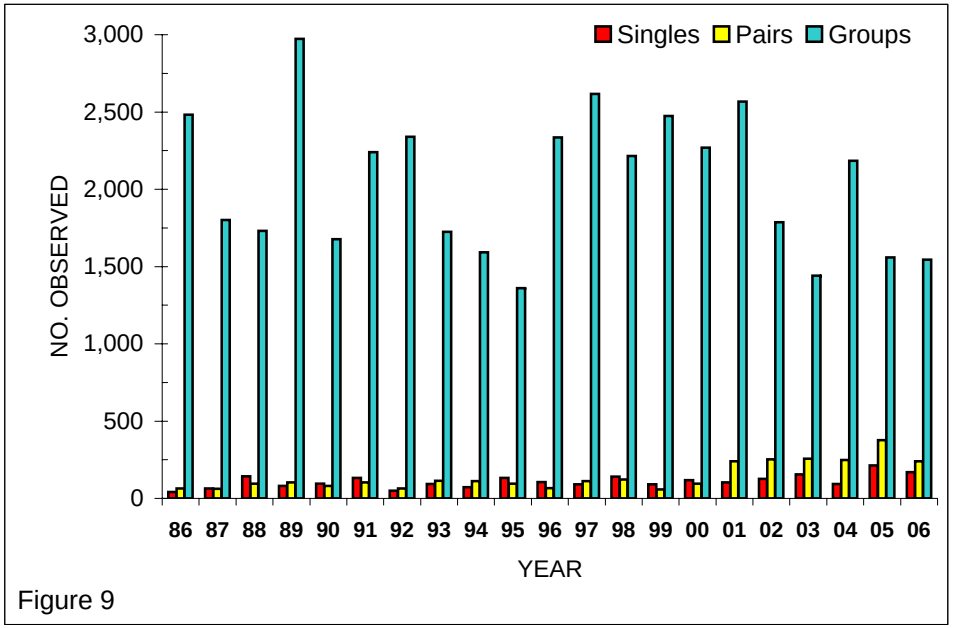


Figure 9

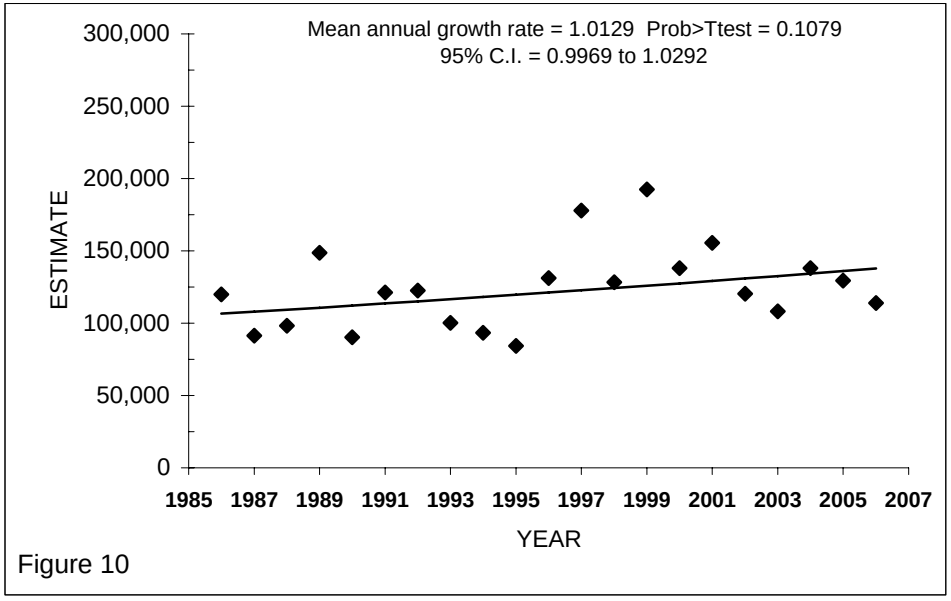


Figure 10

Figures 9 and 10. Trends of Greater White-fronted Goose observations and population indices from aerial breeding pair surveys on the Arctic Coastal Plain of Alaska, 1986-2006. Mean annual growth rate was determined by log-linear regression.

# Tundra Swan

Table 10. Population indices and observational data for Tundra Swans from aerial breeding pair surveys on the Arctic Coastal Plain of Alaska, 1986-2006.

| Year | Singles | Pairs | Groups | Index |
|---|---|---|---|---|
| 86 | 38 | 51 | 11 | 6718 |
| 87 | 53 | 47 | 14 | 7136 |
| 88 | 47 | 43 | 20 | 6895 |
| 89 | 70 | 73 | 21 | 10544 |
| 90 | 79 | 29 | 3 | 6229 |
| 91 | 75 | 36 | 17 | 7334 |
| 92 | 51 | 49 | 55 | 9726 |
| 93 | 64 | 37 | 10 | 6937 |
| 94 | 58 | 46 | 39 | 9000 |
| 95 | 51 | 49 | 55 | 8843 |
| 96 | 89 | 53 | 20 | 10514 |
| 97 | 83 | 49 | 50 | 13601 |
| 98 | 85 | 82 | 21 | 12632 |
| 99 | 92 | 56 | 28 | 16105 |
| 00 | 73 | 89 | 86 | 17227 |
| 01 | 84 | 63 | 12 | 10504 |
| 02 | 88 | 45 | 16 | 9389 |
| 03 | 86 | 46 | 11 | 9118 |
| 04 | 82 | 44 | 11 | 8745 |
| 05 | 90 | 53 | 52 | 12002 |
| 06 | 100 | 49 | 13 | 10174 |

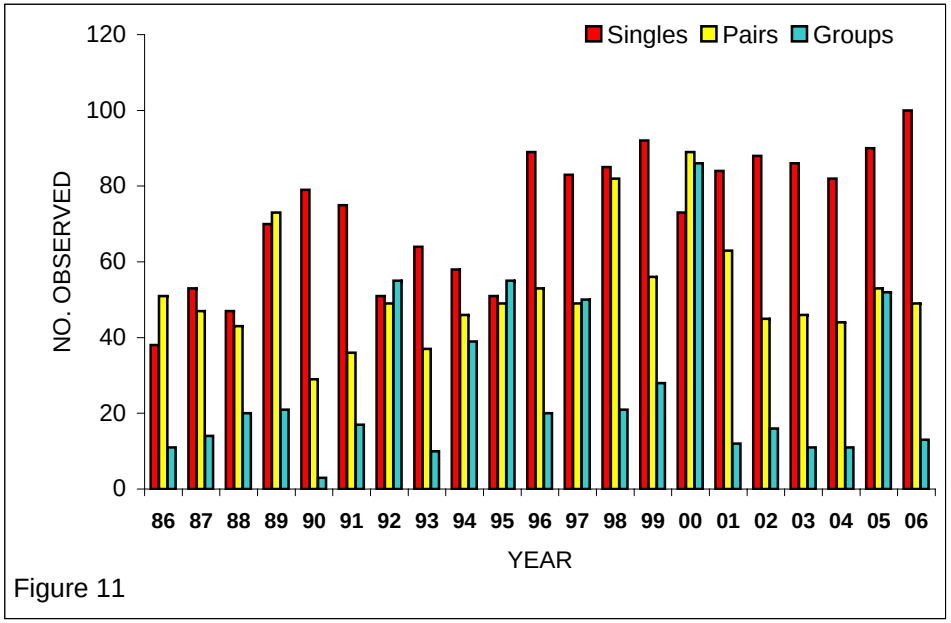


Figure 11

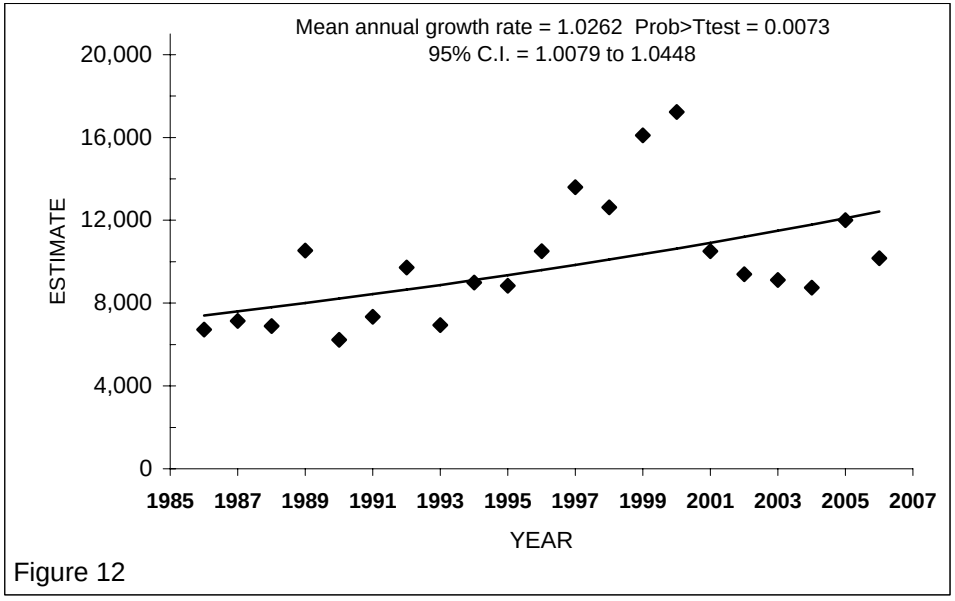


Figure 12

Figures 11 and 12. Trends of Tundra Swan observations and population indices from aerial breeding pair surveys on the Arctic Coastal Plain of Alaska, 1986-2006. Mean annual growth rate was determined by log-linear regresion.

## Tundra Swan Nests

Table 11. Population indices for Tundra Swan Nests from aerial breeding pair surveys on the Arctic Coastal Plain of Alaska, 1986-2006.

| Year | Index | Year | Index |
|---|---|---|---|
| 86 | 356 | 96 | 1809 |
| 87 | 934 | 97 | 1943 |
| 88 | 712 | 98 | 1731 |
| 89 | 1290 | 99 | 2846 |
| 90 | 1157 | 00 | 665 |
| 91 | 1073 | 01 | 1134 |
| 92 | 1192 | 02 | 1084 |
| 93 | 1172 | 03 | 1236 |
| 94 | 1000 | 04 | 1283 |
| 95 | 1574 | 05 | 1709 |
| | | 06 | 1363 |

## Jaegers

Table 12. Population indices for Jaegers from aerial breeding pair surveys on the Arctic Coastal Plain of Alaska, 1986-2006.

| Year | Index | Year | Index |
|---|---|---|---|
| 86 | 9432 | 96 | 7678 |
| 87 | 6585 | 97 | 6948 |
| 88 | 12769 | 98 | 7112 |
| 89 | 3470 | 99 | 6317 |
| 90 | 8765 | 00 | 5165 |
| 91 | 9123 | 01 | 5906 |
| 92 | 7103 | 02 | 5301 |
| 93 | 9094 | 03 | 6697 |
| 94 | 5573 | 04 | 4812 |
| 95 | 4401 | 05 | 5804 |
| | | 06 | 13076 |

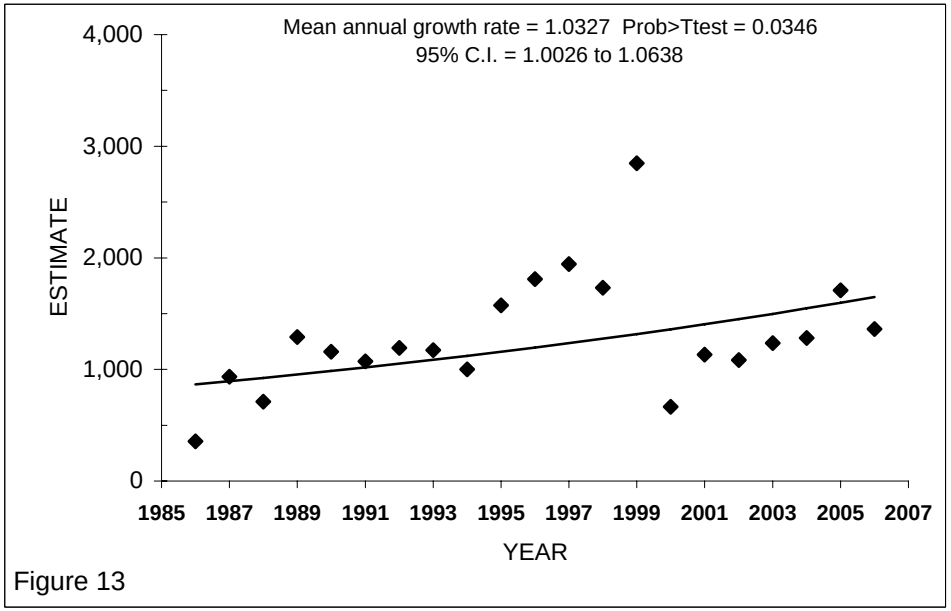


Figure 13

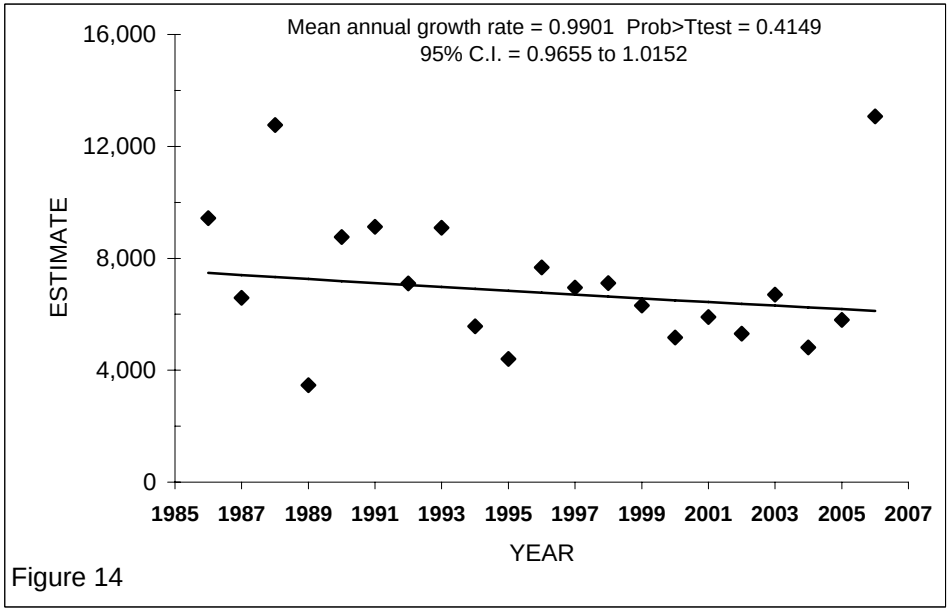


Figure 14

Figures 13 and 14. Trends of Tundra Swan Nest and Jaeger population indices from aerial breeding pair surveys on the Arctic Coastal Plain of Alaska, 1986-2006. Mean annual growth rate was determined by log-linear regression.

## Pacific Loon

Table 13. Population indices for Pacific Loon from aerial breeding pair surveys on the Arctic Coastal Plain of Alaska, 1986-2006.

| Year | Index | Year | Index |
|---|---|---|---|
| 86 | 23047 | 96 | 32177 |
| 87 | 23847 | 97 | 34151 |
| 88 | 31278 | 98 | 29850 |
| 89 | 27674 | 99 | 34154 |
| 90 | 23714 | 00 | 19988 |
| 91 | 29559 | 01 | 22188 |
| 92 | 20071 | 02 | 22702 |
| 93 | 27890 | 03 | 22539 |
| 94 | 26620 | 04 | 22948 |
| 95 | 36304 | 05 | 24955 |
| | | 06 | 29091 |

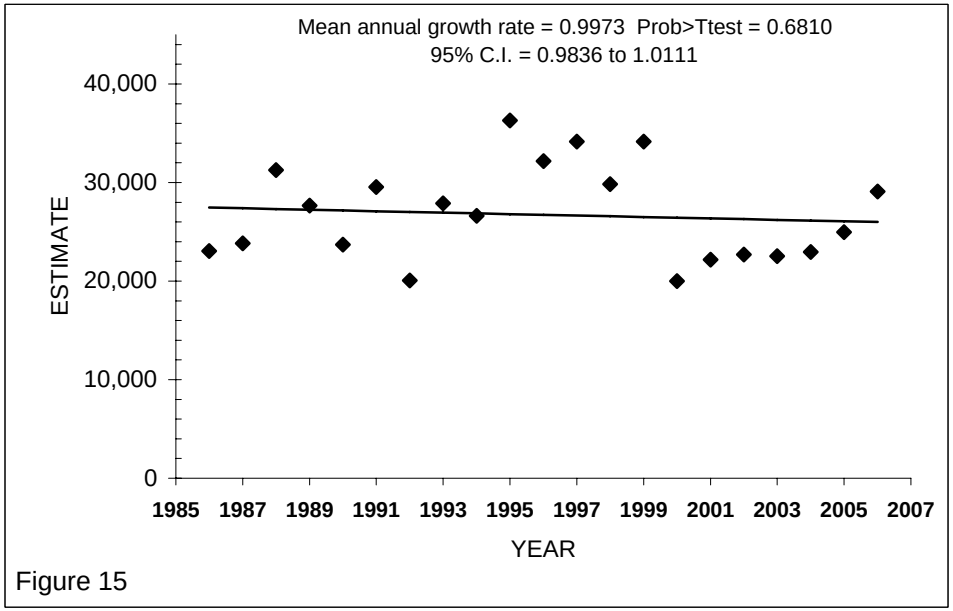


Figure 15

## Red-throated Loon

Table 14. Population indices for Red-throated Loon from aerial breeding pair surveys on the Arctic Coastal Plain of Alaska, 1986-2006.

| Year | Index | Year | Index |
|---|---|---|---|
| 86 | 3070 | 96 | 3521 |
| 87 | 2447 | 97 | 2179 |
| 88 | 2225 | 98 | 2994 |
| 89 | 1690 | 99 | 5276 |
| 90 | 3693 | 00 | 4601 |
| 91 | 3443 | 01 | 5335 |
| 92 | 1812 | 02 | 2945 |
| 93 | 1828 | 03 | 3599 |
| 94 | 2857 | 04 | 4155 |
| 95 | 2188 | 05 | 3038 |
| | | 06 | 5142 |

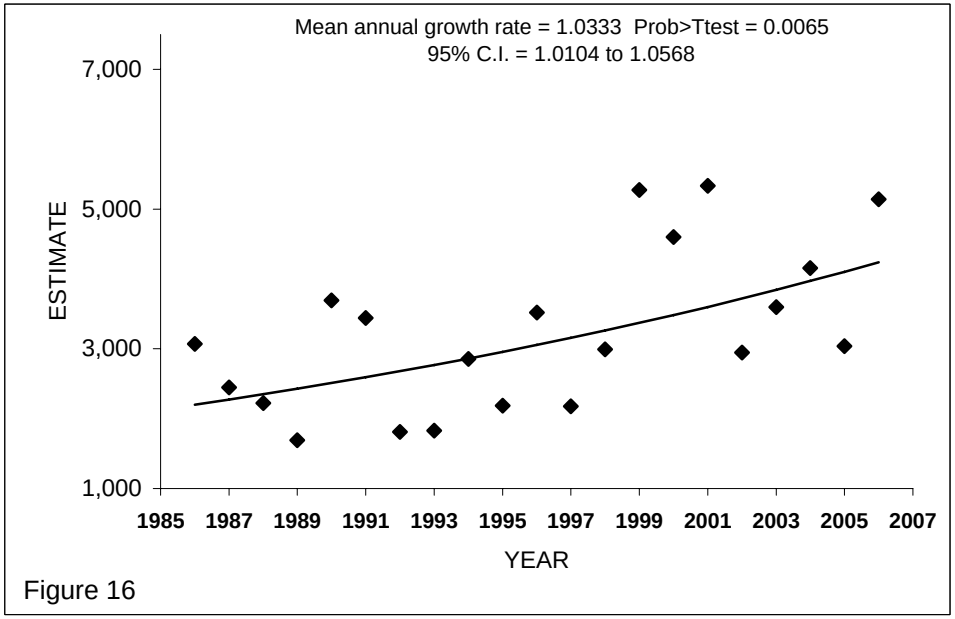


Figure 16

Figures 15 and 16. Trends of Pacific and Red-throated Loon population indices from aerial breeding pair surveys on the Arctic Coastal Plain of Alaska, 1986-2006. Mean annual growth rate was determined by log-linear regression.

## Yellow-billed Loon

Table 15. Population indices for Yellow-billed Loon from aerial breeding pair surveys on the Arctic Coastal Plain of Alaska, 1986-2006.

| Year | Index | Year | Index |
|---|---|---|---|
| 86 | 3203 | 96 | 4988 |
| 87 | 1468 | 97 | 3062 |
| 88 | 1913 | 98 | 3556 |
| 89 | 3337 | 99 | 3124 |
| 90 | 2091 | 00 | 2454 |
| 91 | 3354 | 01 | 1331 |
| 92 | 3147 | 02 | 1948 |
| 93 | 2578 | 03 | 3270 |
| 94 | 3429 | 04 | 2262 |
| 95 | 4282 | 05 | 1871 |
| | | 06 | 1676 |

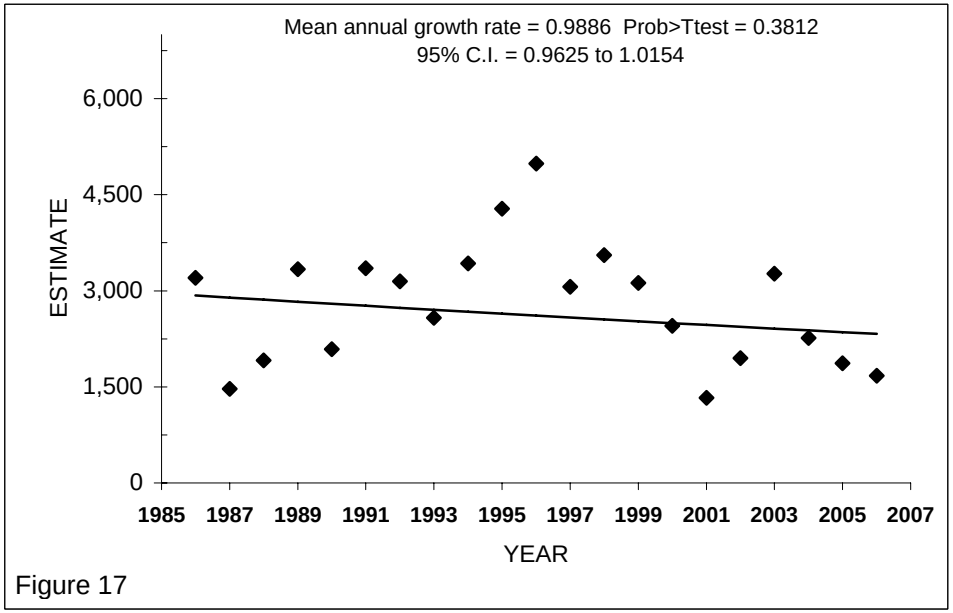


Figure 17

## Arctic Tern

Table 16. Population indices for Arctic Tern from aerial breeding pair surveys on the Arctic Coastal Plain of Alaska, 1992-2006.

| Year | Index | Year | Index |
|---|---|---|---|
| 92 | 17688 | 01 | 21320 |
| 93 | 15047 | 02 | 21248 |
| 94 | 22049 | 03 | 28016 |
| 95 | 23797 | 04 | 24738 |
| 96 | 24842 | 05 | 30688 |
| 97 | 26084 | 06 | 24329 |
| 98 | 26247 | | |
| 99 | 25476 | | |
| 00 | 21828 | | |

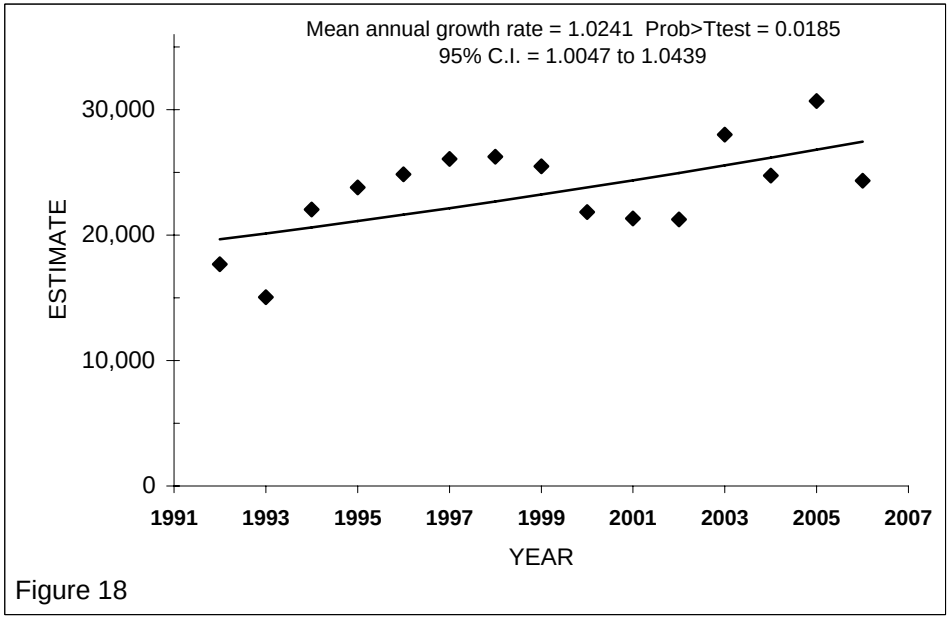


Figure 18

Figures 17 and 18. Trends of Yellow-billed Loon (1986-2006) and Arctic Tern (1992-2006) population indices from aerial breeding pair surveys on the Arctic Coastal Pain of Alaska. Mean annual growth rate was determined by log-linear regression.

## Glaucous Gull

Table 17. Population indices for Glaucous Gull from aerial breeding pair surveys on the Arctic Coastal Plain of Alaska, 1992-2006.

| Year | Index | Year | Index |
|---|---|---|---|
| 92 | 14493 | 01 | 12225 |
| 93 | 11765 | 02 | 18472 |
| 94 | 15144 | 03 | 13116 |
| 95 | 14398 | 04 | 14180 |
| 96 | 19170 | 05 | 18955 |
| 97 | 20549 | 06 | 18717 |
| 98 | 13615 | | |
| 99 | 23741 | | |
| 00 | 29751 | | |

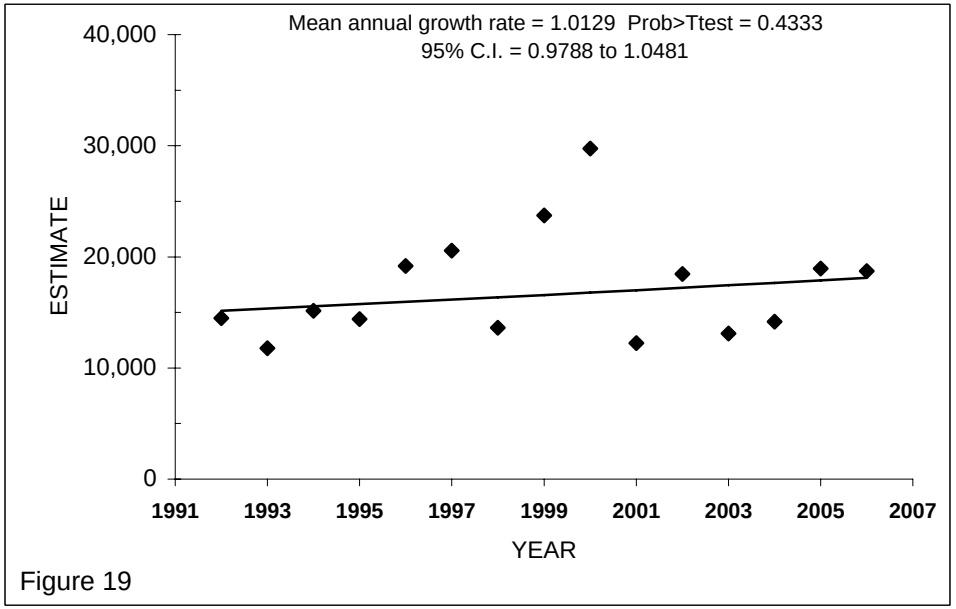


Figure 19

## Sabine's Gull

Table 18. Population indices for Sabine's Gull from aerial breeding pair surveys on the Arctic Coastal Plain of Alaska, 1992-2006.

| Year | Index | Year | Index |
|---|---|---|---|
| 92 | 6484 | 01 | 10611 |
| 93 | 8250 | 02 | 9298 |
| 94 | 8572 | 03 | 17974 |
| 95 | 14491 | 04 | 10345 |
| 96 | 10465 | 05 | 11657 |
| 97 | 15132 | 06 | 16531 |
| 98 | 6924 | | |
| 99 | 10413 | | |
| 00 | 21419 | | |

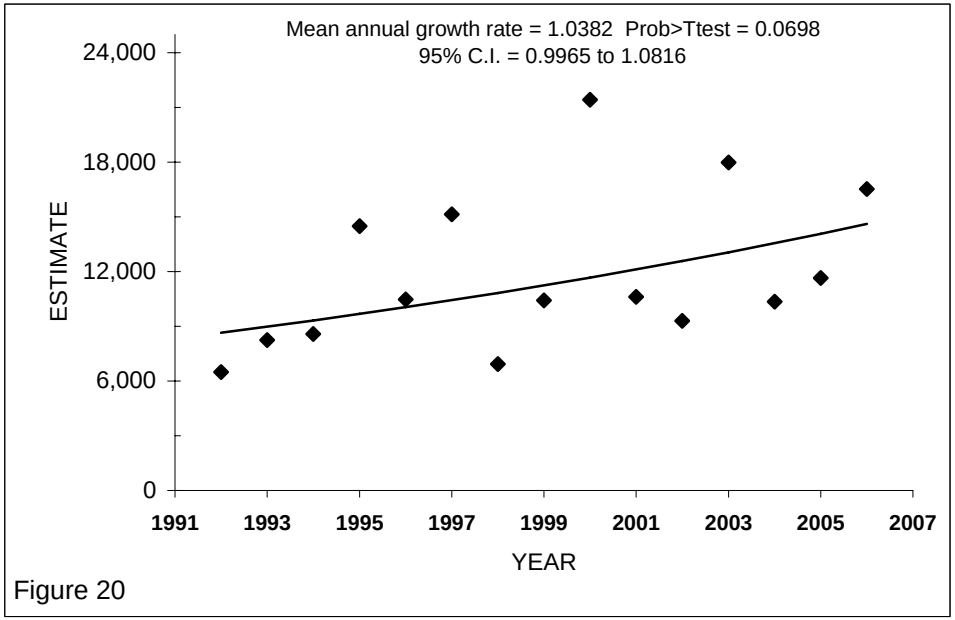


Figure 20

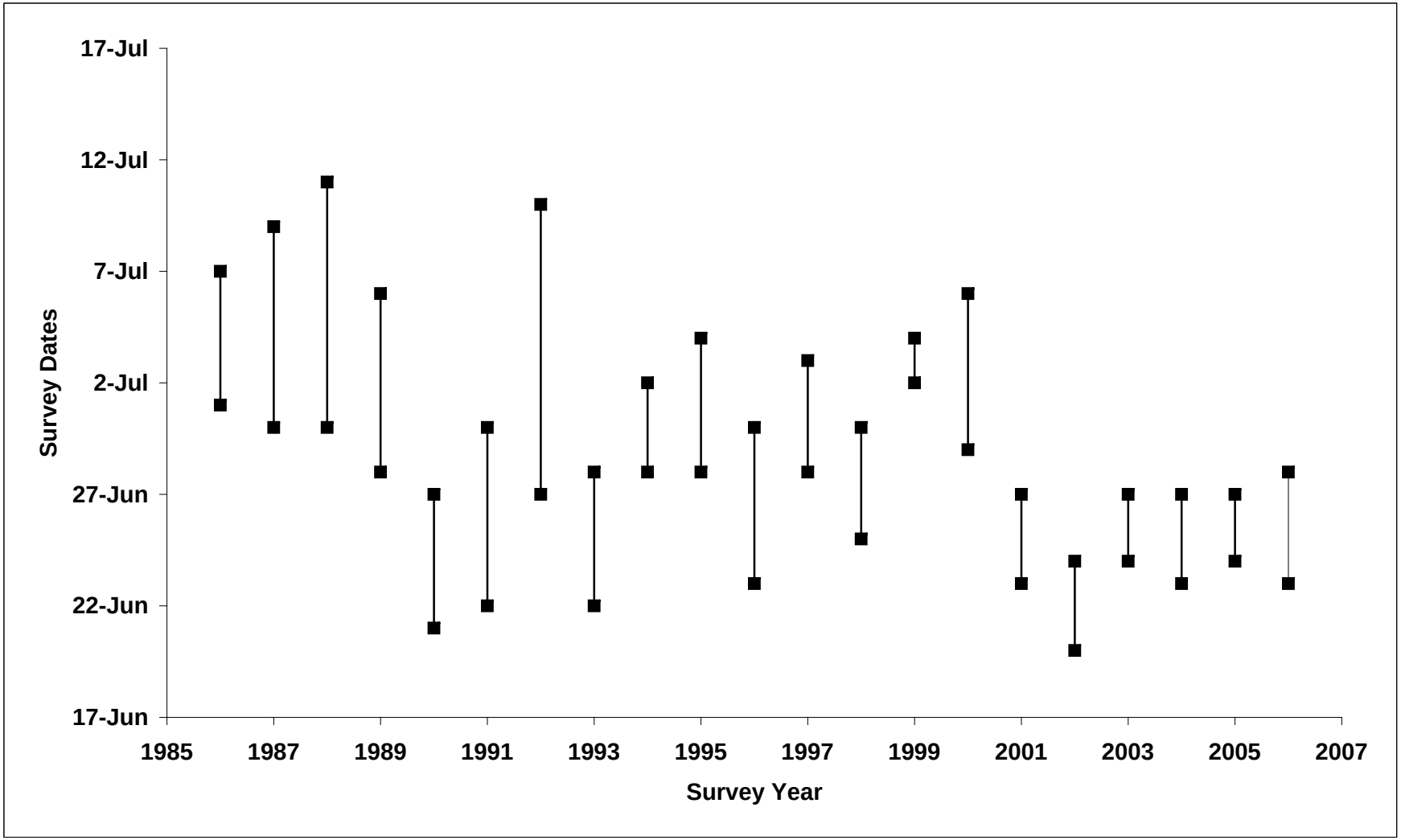
Figures 19 and 20. Trends of Glaucous and Sabine's Gull population indices from aerial breeding pair surveys on the Arctic Coastal Plain of Alaska, 1992-2006. Mean annual growth rate was determined by log-linear regression.

Appendix 1. Scientific names of species listed in text, figures or tables.

| | |
|---|---|
| Red-throated Loon | *Gavia stellata* |
| Pacific Loon | *Gavia pacifica* |
| Yellow-billed Loon | *Gavia adamsii* |
| | |
| Tundra swan | *Cygnus columbianus* |
| Greater White-fronted Goose | *Anser albifrons* |
| Lesser Snow Goose | *Chen caerulescens* |
| Black Brant | *Branta bernicla nigricans* |
| Small Canada Goose | *Branta canadensis* |
| | |
| American Green-winged Teal | *Anas crecca* |
| Mallard | *Anas platyrhychos* |
| Northern Pintail | *Anas acuta* |
| Northern Shoveler | *Anas clypeata* |
| Gadwall | *Anas strepera* |
| American Wigeon | *Anas americana* |
| | |
| Common Eider | *Somateria mollissima* |
| King Eider | *Somateria spectabilis* |
| Spectacled Eider | *Somateria fischeri* |
| Steller's Eider | *Polysticta stelleri* |
| | |
| Long-tailed duck | *Clangula hyemalis* |
| Black Scoter | *Melanitta nigra* |
| Surf Scoter | *Melanitta perspicillata* |
| White-winged Scoter | *Melanitta fusca* |
| Red-breasted Merganser | *Mergus serrator* |
| Goldeneye (Com. & Barrows) | *Bucephala clangula, B. islandica* |
| Scaup (Greater & Lesser) | *Aythya marila, A. affinis* |
| | |
| Sandhill Crane | *Grus canadensis* |
| | |
| Golden Eagle | *Aquila chrysaetos* |
| | |
| Pomarine Jaeger | *Stercorarius pomarinus* |
| Parasitic Jaeger | *Stercorarius parasiticus* |
| Long-tailed Jaeger | *Stercorarius longicaudus* |
| | |
| Glaucous Gull | *Larus hyperboreus* |
| Arctic Tern | *Sterna paradisaea* |
| Sabine's Gull | *Xema sabini* |
| | |
| Snowy Owl | *Nyctea scandiaca* |

Appendix 2. List of Arctic Coastal Plain Breeding Pair Survey observers and dates, 1986 – 2006.

| YEAR | OBSERVER/PILOT | OBSERVER | DATES |
|---|---|---|---|
| 1986 | Rodney King | Steve Cane | 1-7 July |
| 1987 | Rodney King | Steve Cane | 30 June-9 July |
| 1988 | Rodney King | Marta McWhorter | 30 June-11 July |
| 1989 | Rodney King | Barbara Gradin | 28 June-6 July |
| 1990 | Rodney King | Alan Brackney | 21-27 June |
| 1991 | Rodney King | Alan Brackney | 22-30 June |
| 1992 | Rodney King | Alan Brackney | 27 June-10 July (AC problem) |
| 1993 | Rodney King | Alan Brackney | 22-28 June |
| 1994 | Rodney King | Alan Brackney | 28 June-2 July |
| 1995 | Rodney King | Alan Brackney | 28 June-4 July |
| 1996 | Rodney King | Alan Brackney | 23-30 June |
| 1997 | Rodney King | Chris Dau | 28 June-3 July |
| 1998 | Rodney King/Chris Dau | Rodney King/Chris Dau | 25-30 June |
| 1999 | Rodney King/Chris Dau | Ed Mallek/Eric Taylor | 2-4 July |
| 2000 | Ed Mallek | Dennis Marks | 29 June-6 July |
| 2001 | Ed Mallek | Dennis Marks | 23-27 June |
| 2002 | Ed Mallek | Dennis Marks | 20-24 June |
| 2003 | Ed Mallek | Dennis Marks | 24-27 June |
| 2004 | Ed Mallek | Dennis Marks | 23-27 June |
| 2005 | Ed Mallek | Dennis Marks | 24-27 June |
| 2006 | Ed Mallek | Dennis Marks | 23-28 June |




Appendix 3. Survey duration by year of the Arctic Coastal Plain Breeding Pair Survey, 1986 - 2006.