Nest Population Size and Potential Production of Geese and Spectacled Eiders on the Yukon-Kuskokwim Delta, Alaska, 2009

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SUMMARY: We used a ground-based survey to estimate the number of nests and eggs of geese and eiders on the Yukon-Kuskokwim Delta (YKD), Alaska, 1985-2009. 2009 was a year of good production for geese and eiders with low rates of nest depredation and nest abandonment. Recent 10-year trends in nest populations are stable or increasing for eiders and geese, with the exception of black brant that are stable to declining slowly both on and off primary colonies. We estimate that spectacled eiders built 7,253 nests and laid 29,651 viable eggs on the YKD coastal zone in 2009. The estimate of spectacled eider nests was the third highest in the 25 years of the study, and 49% above the 1985-2008 average. Timing of spring warming was average with breakup of the Kuskokwim River at Bethel three days earlier than the previous 39-year mean. May temperatures were approximately 1.5 degrees C cooler than the previous 49-year mean but on average increased 1.6 degrees C since 1960. Hatch dates of most waterfowl species in 2009 was between 1 and 3 days of their long-term means; however, a long-term trend in earlier nesting is significant over the last 28 years.

INTRODUCTION:

Annual assessment of nest population size and egg production of geese and eiders on the Yukon-Kuskokwim Delta (YKD) provides information for the Spectacled and Steller's Eider Recovery Team, the Pacific Flyway Technical Committee, participants in cooperative goose management plans, and biologists interested in waterfowl status and trends in western Alaska. A ground-based sampling procedure has been used since 1985 to estimate the number of nests and eggs for spectacled eiders (*Somateria fischeri*), cackling geese (*Branta hutchinsii minima*), emperor geese (*Chen canagica*), greater white-fronted geese (*Anser albifrons frontalis*), and other nesting waterbirds on the YKD. The ground-based nest survey provides an estimate of nest population size and potential production. The ground survey is conducted concurrently with an aerial breeding pair survey (Bollinger and Eldridge 2009, Platte and Stehn 2009) that provides an index to population size. Together, these surveys contribute long-term data needed to understand goose and eider population status and reproductive success.

Starting in 2006 we improved analysis methods by incorporating nest detection rates (Bowman and Stehn *manuscipt in prep.*), reducing sampling error in expansion factors, and restricting analyses of historical data to plots within the current survey area. The method for reducing sampling error in expansion factors was further improved in 2009 (see Methods), thus resulting population estimates may differ slightly from those reported in previous annual reports (Fischer et al. 2008).

METHODS:

We used a ground-based sampling procedure to monitor goose and eider nest populations and potential production on the YKD coastal zone from 1985 to 2009 (Fig. 1). Boundaries of the survey area included lands on the Yukon Delta National Wildlife Refuge (YDNWR) containing medium and high nest densities of spectacled eiders (based on aerial and ground observations 1985-1993, USFWS unpubl. data). We excluded privately owned high density nesting habitat near Kokechik Bay, two patches on south Nelson Island, and several tracts near Hazen Bay because annual access could not be assured. From 1994-1997 and 2000-2009, plots were selected within 716 km^2 (core spectacled eider habitat; hereafter "core") that comprised 5.6% of the total coastal zone. In 1998, 1999 and prior to 1994, plots were selected within a slightly a larger portion of the coastal zone. In this report, estimates of nest population size and egg production are based on plots within the core 716 km^2, whereas estimates of clutch size and hatch date use data from plots within and beyond the core area.

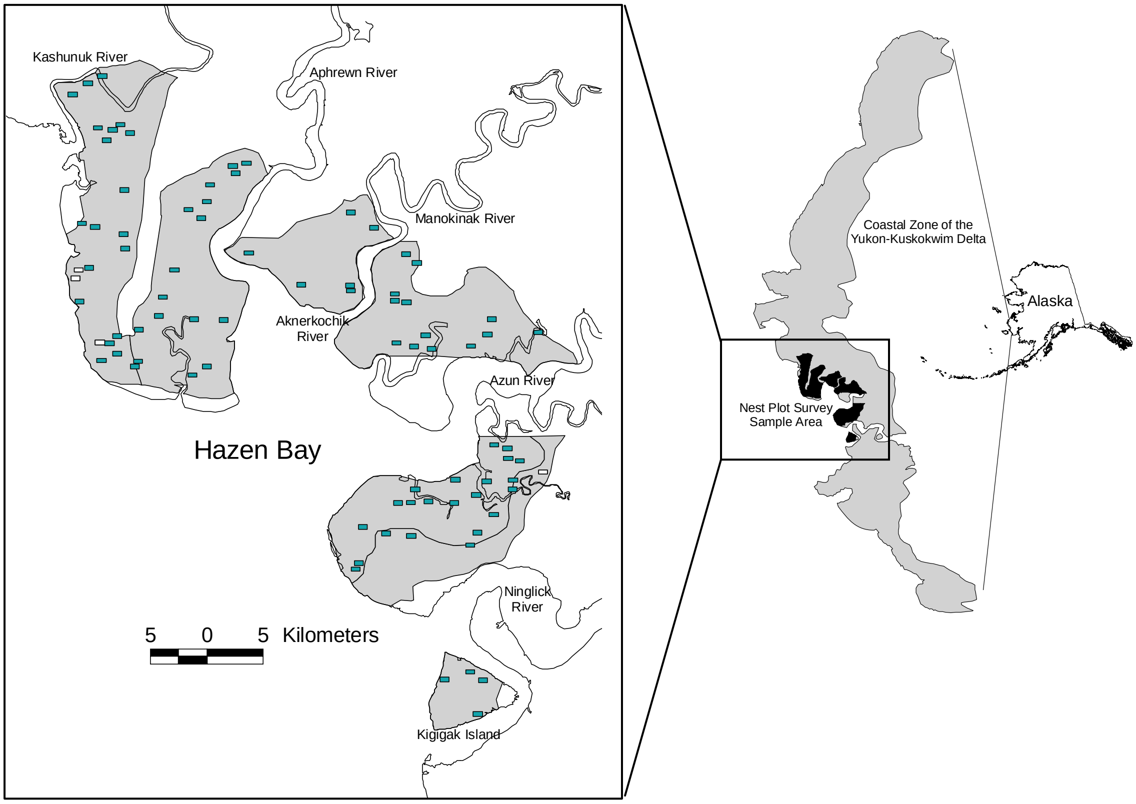

Figure 1. Location of 85 randomly selected plots within the ground sampled area (716 km^2) relative to the Yukon-Kuskokwim Delta coastal zone (12,832 km^2), Alaska, 2009. Sampled plots are represented by 81 solid rectangles. Four additional plots were selected but not sampled, shown as open rectangles.

We used GIS and custom-written TrueBASIC computer programs to randomly select 85 plots within the core 716 km^2 ground sampled area in 2009 (Fig. 1). Random locations were restricted by excluding points that overlapped any other plot within the current year or previous five years. We drew plot boundaries to printed IKONOS satellite imagery at 1:13,000 scale for use as field maps. We included plots regardless of juxtaposition to lakes and rivers. Plot size was 402 m by 805 m (0.32 km^2) in 1988-1994 and 1997-2009. Plot sizes were variable in 1985-1987 (0.16-1.66 km^2), 0.45 km^2 in 1995, and 0.36 km^2 in 1996.

Plots were searched by 2-4 biologists who were transported either by Cessna 185 float-equipped aircraft or by motorboat. Two boat crews originated from the YDNWR Kanaryamiut Field Station and worked at plots accessible from the Aphrewn and Opagyarak rivers. A third boat crew was transported directly from Bethel to plots on the Naskonat Peninsula, directly north of Kigigak Island. Biologists at Kigigak Island (YDNWR), Manokinak River (USGS), and Tutakoke River (University of Nevada, Reno) searched plots near their camps. All sites dry enough

for a nest were examined for active and destroyed waterfowl, crane, loon, and gull nests. Incidental nesting records of other species were recorded as encountered (data available upon request), but most shorebird and passerine nests were likely missed.

At each nest we recorded species, nest status, nest site habitat, stage of incubation, clutch size, and geographic coordinates. Species identification was determined by visual confirmation of an adult at the nest or by comparing down and contour feathers in the nest bowl with a photographic field guide (Bowman 2008). We determined stage of incubation for all species by recording float angles of eggs from active nests (Westerskov 1950). Hatch dates were estimated from incubation stage of eggs found on plots. Hatch date estimates and clutch size data from 1982-1984 were derived from cackling goose study plots established by Butler (1983).

The mean and variance of the number of nests and eggs per plot was based on a simple random sample of plots. The estimated densities of nests and eggs were expanded to the ground sampled area (716 km^2) based on the size and number of plots for each year. Nest population estimates were corrected for detection rate using a model that considers species, nest activity status, observer experience, and nest site location (Bowman and Stehn *manuscript in prep.*).

The detection-corrected estimates for nests and eggs in the ground-sampled area were then expanded to the entire coastal zone of the YKD (12,832 km^2; Butler et al. 1988, Bollinger and Eldridge 2009, Platte and Stehn 2009) based on a stratified analysis of birds observed on aerial survey transects flown both within and outside of the ground-sampled area. The expansion is based on the assumption that the proportion of aerial breeding bird indices within the sampled area provides an accurate linear relationship to the number of nests within versus outside the ground-sampled area. We annually calculated the ratio of the aerial breeding population index outside the ground-sampled area ("OUT") to the aerial index within the ground-sampled area ("IN"). We then used the Out:In ratio as an expansion factor to determine the number of nests and eggs on the entire coastal zone. To smooth the annual variation caused by sampling error and still allow for potential trend in the Out:In ratio, we calculated a localized linear regression each year for the nearest seven years of data (current year, prior three years, and following three years, as available), and used the regression relationship to estimate the ratio for the given year. For years that did not have at least three "prior" or three "following" years of data, we based the localized regression procedure on the most proximate seven years of data. For example, the expansion factor in 2009 was based on the localized regression of Out:In ratios from 2003-2009. Standard errors of the predicted ratio were derived from regression residuals. Variance estimates

of nest populations expanded to the entire coastal zone included the variance of the Out:In ratio.

An analogous procedure was used to determine the population of nests of each species of loons in the ground sampled area. Red-throated (*Gavia stellata*) and Pacific loons (*Gavia pacifica*) rarely remain near their nest sites when disturbed by plot searchers, and their nests and eggs are essentially indistinguishable from each other (Bowman 2008). Thus, we applied the ratio of observations of each loon species, as recorded during aerial surveys (Platte and Stehn 2009) to determine the relative numbers of loon nests for each species. We used the localized linear regression technique described above to smooth the aerial-observed species proportions for loons.

The aerial breeding population index for most species was based on twice the number of singles plus the number of birds in pairs observed, because single geese, cranes, and ducks observed are assumed to be the mates of unobserved females on nests. Flocks of these species were not included in the aerial index, except brant. For swans, the number of single birds observed was not doubled because unlike other waterfowl, swans are highly visible on nests. For loons and gulls, the total number of birds observed was used as the breeding index.

Data were tabulated, edited, sorted and analyzed using Excel. Nest population, hatch date, and clutch size estimates were calculated using customized TrueBASIC programs.

The estimated total number of nests is a direct measure of effective breeding population size and an index to the size of the population of adults that are potential nesters. The estimated total number of eggs is a measure of the number of young that could potentially augment the fall population if they survive through summer. The proportion of nests that are active when the plots are searched is an index to nest success, though the actual proportion of nests that produced young is lower because some nests are likely lost after plots are searched. The relative production rate measures how the number of eggs per total nests estimated for each year compares to the long-term average for each species, thereby quantifying the relative annual contribution of eggs to the population on a per breeding pair basis. Definitions of these terms are summarized in the caption of Figure 2.

RESULTS:

We searched 81 plots from 7 June to 19 June (Fig. 1). Crews based at the Kanaryamiut Field Station searched 36 plots, boat-based crews searched 34 plots, a Yukon Delta NWR crew at Kigigak Island searched four plots, a USGS crew at the Manokinak River searched four plots, and a University of Nevada Reno crew at Tutakoke River searched three plots. Four of the 85 randomly selected plots were not sampled due to access and weather delays that prevented completion of field work prior to onset of hatch. Crews located 4,737 nests within plot boundaries in 2009 comprised of 2,276 cackling goose, 489 emperor goose, 889 greater white-fronted goose, 344 black brant, 154 spectacled eider, 42 common eider, and 543 nests of other species. Calculations of clutch size and hatch date also included an additional 47 nests located outside of plot boundaries. We present nest population, egg production, and nest success estimates in figures with accompanying tabulated data for each species (Fig. 2). Estimated hatch date for each species is presented in Table 3. The following section presents general descriptive results for each species.

Cackling Geese (*Branta hutchinsii minima*)

Production of cackling geese was good in 2009. Total numbers of nests and eggs were the highest in the 25-year span of the survey (Fig. 2). Numbers of nests and eggs were up from 2008 and 102% and 122%, above the previous long-term (1985-2008) mean, respectively (Fig. 2, Tables 1-2). Nest success was 15% higher than the long-term average but clutch size was 2% below the long term mean. As a result, the relative production (eggs per total breeding pairs in 2009 compared to the long-term mean) was just 11% above average. Prior to 2009, the cackling goose nest population was essentially flat during the last decade; however, the high estimate in the current year put the 10-year growth rate in line with the long-term positive trend (Fig. 2, Tables 1-2). Average hatch date for cacklers in 2009 was three days later than 2008 and one day later than the long-term average (1982-2009; Table 3).

Emperor Geese (*Chen canagica*)

Potential production of emperor geese was good in 2009. Total numbers of nests and eggs were up from 2008 and 43% and 44% above the long-term (1985-2008) means (Fig. 2, Tables 1-2). Nest success was above average, yet clutch size was below average. This combination resulted in a relative production rate slightly above the long-term mean. Nest and egg population size have been variable over the course of this survey and resulted in non-significant growth rates in the long-term, but growth within the recent decade has yielded a significant positive trend for both nests and eggs (Fig. 2, Tables 1-2). Similar to other waterfowl species, estimated hatch date for emperors in 2009 was three days later than 2008 and two days later than the long-term average (1982-2009; Table 3).

Greater White-fronted Geese (*Anser albifrons frontalis*)

Production of white-fronted geese was good in 2009. Total numbers of nests and eggs were the highest estimates for the 25-year span of the survey (Fig. 2). Total numbers of nests and eggs were up from 2008 and 127%, and 126% above the long-term (1985-2007) means, respectively (Fig. 2, Tables 1-2). Clutch size and nest success were close to long-term averages. As a result, the relative production rate in 2009 was average. White-fronted goose nest and egg population growth rates have been high throughout the duration of the survey, but were relatively flat during the previous five years. With the current year production, growth rates of nests and eggs during the short- and long-term time spans are significantly positive. Similar to other waterfowl species, estimated hatch date for white-fronts in 2009 was three days later than 2008 and two days later than the long-term average (1982-2009; Table 3).

Black Brant (*Branta bernicla nigricans*)

The nest plot survey was not designed to monitor colonial nesting birds such as black brant, and we purposely excluded most primary colonies from the sample area. Five primary brant colonies are monitored annually by digital photographic surveys (see Wilson 2009). The nest plot survey provides an estimate of nest populations from non-colonial brant, small satellite colonies, and one of the five major YKD colonies (Kigigak Island). In these areas, 2009 potential production of brant was good. The number of nests in 2009 was down 20% from both the previous year and the long-term mean (Fig. 2, Tables 1-2). While the nest numbers were down in 2009, clutch size and nest success were higher than the long-term means. As a result, the relative production rate in 2009 was above average. Nest and egg population sizes have been variable over the course of this survey and resulted in non-significant growth rates in both short- and long-term time spans. Similar to other waterfowl species, estimated hatch date for brant in 2009 was four days later than 2008 and three days later than the long-term average (1982-2009; Table 3).

Tundra Swans (*Cygnus columbianus*)

Potential production of tundra swans was poor in 2009. Total numbers of nests were up from 2008, and 10% above the long-term average (1985-2008; Fig. 2). However, total numbers of eggs were down markedly from last year and were 13% below the long-term average. A notable reduction in clutch size was apparent in 2009. Compounding low clutch size, nest success was down from last year and 5% below the long-term mean. As a result, the relative production rate in 2009 was 20% below average. For tundra swans, nest and egg population sizes have been variable over the course of this survey and resulted in non-significant growth rates in the short-term. Over the long-term, however, both nest and egg population sizes have increased significantly. Estimated hatch date for tundra swans in 2009 was later than other waterfowl in this survey. With an average hatch date of 2 July, tundra swans nested five days later than last year and the long-term mean (1982-2009; Table 3).

Sandhill Cranes (*Grus canadensis*)

Potential production of sandhill cranes was good in 2009. Total numbers of nests and eggs were up from 2008 and 38% and 34% above the long-term (1985-2008) averages (Fig. 2, Tables 1-2), respectively. Clutch size in 2009 was slightly above short- and long-term means. Despite these increases, nest success of cranes was 4% below the long-term mean resulting in a relative production rate close to average. Nest and egg population sizes have been variable over the course of this survey and have resulted in non-significant growth rates in both short- and long-term time spans. Estimated hatch date for sandhill cranes in 2009 was three days later than both 2008 and the long-term average (1982-2009; Table 3).

Spectacled Eiders (*Somateria fischeri*)

Potential production of spectacled eiders was good in 2009. Total numbers of nests and eggs were up from 2008 and were 50% and 60% higher than long-term (1985-2008) means, respectively (Fig. 2, Tables 1-2). The 2009 nest population estimate was the third highest recorded in the 25 years of this study, and the egg production estimate was the second highest. Clutch size in 2009 was below short- and long-term means; but nest success was 14% above the long-term average. Together, these measures resulted in a relative production rate 6% above average. Estimated numbers of nests have grown since the early 1990s, and this change is reflected in a significant positive short-term growth rate (2000-2009). In contrast, the long-term growth rate (1985-2009) is stable to decreasing due to the high estimates measured in the mid and late 1980s. Annual estimates of egg production are variable due to fluctuations in breeding conditions but a significant positive trend is apparent in the short-term time period. Estimated hatch date for spectacled eiders in 2009 was three days later than 2008 and identical to the long-term average (1982-2009; Table 3).

Common Eiders (*Somateria mollissima*)

Potential production of common eiders was good in 2009. Total numbers of nests and eggs were up from 2008 and were 90% and 95% above long-term (1985-2008) means, respectively (Fig. 2, Tables 1-2). Clutch size and nest success in 2009 were similar to short- and long-term means. Together, these measures resulted in an average relative production rate. Nest numbers and egg production have grown substantially throughout the course of this survey, most notably starting in 2005. This change is reflected in significant positive short- (2000-2009) and long-term (1985-2009) growth rates. Similar to other waterfowl species, estimated hatch date for common eiders in 2009 was two days later than 2008 and the same as the long-term average (1982-2009; Table 3).

Gulls and Terns

Colonial nesting species such as gulls (glaucous gulls [*Larus hyperboreus*], Sabine's gulls [*Xema sabini*], mew gulls [*Larus canus*]), and arctic terns [*Sterna paradisaea*]) are not monitored with precision by the nest plot survey. Nonetheless, the survey does provide a measure of potential production for these species. In 2009, potential production varied from poor to excellent among the four species (Fig. 2). Numbers of glaucous gull nests and eggs in 2009 were down from the previous year and 39% and 28% below the long-term means (Fig. 2, Tables 1-2). However, both clutch size and nest success were high for the species, resulting in a relative production rate 17% higher than average. Despite this high rate of production, the nest population has declined significantly within the most recent ten-year period. Similar to glaucous gulls, mew gulls also exhibited a high rate of nest success. Unlike glaucous gulls, however the short- and long-term nest population trends of mew gull nests and eggs are stable. In contrast to other gulls, Sabine's gulls had both poor nest success and low clutch size in 2009, resulting in an overall low relative production rate 49% below average. Growth in the nest population is positive over the long-term (1985-2008), but variable within the last decade. Finally, in 2009 the number of arctic tern nests increased dramatically from 2008 and was 87% above the long-term mean. Nonetheless, poor nest success and low clutch size among arctic terns resulted in a relative production rate 23% below average. Estimated hatch date of gulls and terns in 2009 was up to six days later than 2008 and up to four days later than the long-term average (1982-2009; Table 3).

Loons

Potential production of Pacific loons (*Gavia pacifica*) and red-throated loons (*Gavia stellata*) was poor in 2009. Estimates of numbers of nests for both species were close to estimates in 2008 and remained above long-term averages (Fig. 2, Tables 1-2). Clutch size and nest success, however, were down from the previous year and below long-term means. These factors led to a relative production rate 13% below average. Nest and egg population sizes have been variable over the course of this survey and have generally resulted in non-significant growth rates in both short- and long-term time spans. However, due to recent reductions in annual variation among red-throated nest population estimates, a significant positive trend in the short-term time period is apparent. Similar to waterfowl species, estimated hatch date for both loon species in 2009 was three days later than 2008 and two days later than the long-term average (1982-2009; Table 3).

DISCUSSION:

The nest plot survey was specifically designed to provide annual estimates of nest population size and trend, and predict potential production (active eggs) and hatching dates for focal species including non-colonial nesting geese (cackling geese, emperor geese, greater white-fronted geese) and eiders (spectacled and common) on the Yukon-Kuskokwim Delta coastal zone. Data from other waterfowl encountered incidentally (black brant, tundra swans) and other waterbirds (sandhill cranes, loons, and gulls and terns) were also collected and reported herein.

In general, production in 2009 was good for non-colonial geese and eiders. Numbers of nests and eggs of these species were among the highest recorded since the survey began 25 years ago. Numbers of nests and eggs increased significantly for cackling geese in the long-term (1985-2009), emperor geese and spectacled eiders in the short-term (2000-2009), and white-fronted geese and common eiders in the short- and long-term periods. Nest success in 2009 was higher than in 2008 and above long-term means for all focus species; however, clutch sizes were below long-term means for all but common eiders (which was virtually the same as the average). As a result, the relative production rates (contribution of eggs per pair relative to the long-term mean) for focus species were equal to, or slightly better than the long-term average.

Incidence of nest desertion and depredation was variable among plots and not isolated to one region within the ground sampled area. Avian and mammalian predators are known to destroy nests on the YKD during incubation. Arctic fox (*Alopex lagopus*), specifically have been shown to be a significant source of nest depredation in some years, particularly in brant colonies (Anthony et al. 1991). Presence of recent fox activity was noted within 42% of sampled plots in 2009 (Table 4), with a notable absence of foxes in the northern portion of the ground sampled area (Fig. 4). The proportion of plots with fox activity was down 29% from the recent 10-year average (Table 4). Fox were likely contributors to egg loss in some study plots in 2009, but there is no indication that fox presence necessarily resulted in high levels of depredation. For example, plot nest success, measured by the total number of active nests/total number of nests, was the same (0.93) in plots with fox sign (fur, tracks, active dens, fox observed) and without fox sign. The lack of major effect of fox on nest success may be explained by the high levels of alternative food available to foxes and other nest predators in 2009. For example, 2009 was a year of abundant vole populations. Presence of voles (presumably tundra vole, *Microtus oeconomus*) and vole burrowing activity were recorded on 73% of plots in 2009, a level unprecedented in recent years. High abundance of voles in 2009 may result in higher than average production and survival of foxes with expected negative repercussions for avian nest success in subsequent years.

Spring 2009 was relatively cool compared to recent years. The Kuskokwim River broke up at Bethel on May 9, four days earlier than 2008, two days earlier than the previous 24-year mean, and three days earlier than the previous 49-year mean (NOAA

2009). May temperatures at weather stations on the coast of the YKD were a few degrees below average in 2009, but the long-term trend (1960-2009) indicates an average annual increase of 0.058 degrees Fahrenheit (0.032 degrees C). This change equates to an increase of 2.84 degrees F (1.57 degrees C) since 1960. Timing of waterfowl nest initiation is closely correlated with spring breakup (Raveling 1978, Dau and Mickelson 1979). Consequently, in 2009 waterfowl nests hatched within three days of the long-term averages. A significant trend in earlier waterfowl nest initiation is apparent over the history of this study (Fig. 3). Based on data since 1982, we estimate that on average, hatch for cackling geese, for which the most data are available, occurs 0.33 days earlier each year. This change translates to an advance of nine days since data collection began in 1982.

Long-term increases in spring temperatures and earlier occurrence of spring events such as river breakup and nest initiation are predicted in many climate change models (Root et. al. 2003, IPCC 2007). Effects of climate change on YKD nesting habitat may prove to be a significant factor in long-term sustainability of waterfowl populations. Historic and contemporary erosion rates are not well documented for much of the Alaskan coast, but preliminary analyses indicate that boundaries of the Yukon Delta National Wildlife Refuge have lost an average of 30 ha/yr over a recent fifty year period (B. Jones, USGS unpubl. data). Further, alteration of habitats through erosion, inundation, salinization, melting permafrost, or accelerated sedimentation rates due to sea level rise and increased river discharge could change the value of current nesting areas. Point location data taken at each nest sampled in 2009 as part of this nest plot study will be incorporated into ongoing cooperative investigations of climate change effects on YKD nesting habitat. Further, standardized pond salinity monitoring (Wilson, MBM, unpubl. data) initiated in 2006 will provide baseline and trend information needed to assess changes to the waterfowl nesting habitats of the YKD.

In general, goose nest population trends derived from the ground-based nest plot survey parallel trends derived from aerial breeding pair surveys. Estimates of cackling goose nests were at record lows in the mid-1980s prior to adoption of the cooperative Yukon-Kuskokwim Delta Goose Management Plan that provided much needed protection for nesting and wintering populations of geese (Pamplin 1986). Data from this nest plot survey and aerial breeding pair surveys (Bollinger and Eldridge 2009, Platte and Stehn 2009) show that by the late-1980s, the cackling goose population of nests and pairs increased rapidly, peaking in the late-1990s. Since 1999, trends for cackling geese have been relatively flat (this study, Bollinger and

Eldridge 2009). Unlike the other goose species, populations of emperor geese did not increased markedly after adoption of the Yukon Delta Goose Management Plan, although a slow annual increase in the long-term trends from ground and air surveys is apparent (this study, Bollinger and Eldridge 2009). The population of greater white-fronted geese has increased dramatically on the coastal zone of the YKD since the mid-1980s and has continued to grow at moderate levels in recent years (this study, Bollinger and Eldridge 2009).

The number of spectacled eider nests has varied widely since the beginning of the survey in the mid-1980s. The average long-term growth rate (1985-2008) is negative, but the rate is not significantly different from 1.00. Following a long-term decline of spectacled eiders on the YKD from the 1950s through the early 1990s (Stehn et al. 1993), the population stabilized and began to increase. The current 10-year growth rate of nests and eggs are 1.085 and 1.097, respectively, and are significant at the 0.10 alpha level (Fig. 2, Table 1). Data from aerial surveys on the YKD show a nearly identical ten-year growth rate for spectacled eider pairs (1.082, 2000-2009; Platte and Stehn 2009) as that measured by the ground plot survey.

Spectacled eider nest success is variable among years and generally reflects current levels of nest predation. Plots are visited one time, so the measure of nest success is an overestimation of actual success because some nests undoubtedly fail after the plot is searched. In addition, nests destroyed during laying (before down is added to the nest bowl) are seldom detected and thus underestimated. Nonetheless, the pattern in nest success measured from the nest plot survey (number of active nests divided by total nests times 100%, corrected for detection rate) generally matches nest success at Kigigak Island (successful hatched nests/total nests) where nests are visited every seven days until hatch (Lake 2008; Fig. 6). The largest difference between estimates from these surveys was noted in 2001 and 2003, years of very poor production, where perhaps many nest failures occurred late in nesting. Alternatively, a localized factor may have caused low success on Kigigak Island during those years. Large annual fluctuations in production estimates are reduced when sampling occurs over a large portion of the nesting range, such as in the nest plot survey described here.

A comparison of estimates from the photographic colony survey and the ground plot survey suggests that many brant occur as dispersed nesters or in satellite colonies outside most primary colonies (Fig. 7). Photographic methods were initiated in the 1990s to monitor the nest population of brant in major colonies with greater precision than ground surveys or standard straight line aerial waterfowl surveys (Wilson 2009).

Estimates of brant nests derived from ground plot and photographic surveys both indicate a slow decline in nest populations over the last 17 years (Fig. 5), although the trend is significantly different from zero for the photographic survey only.

The population sizes of goose and eider nests should not be interpreted as direct estimates of population size. For example, a year of poor nesting conditions may result in fewer nesting attempts (and thus nests), but does not represent a loss of adults from the population. Instead, the lower number of nests and eggs in a poor nesting year will likely contribute to a reduction in recruitment for a given year. Further, this nest survey does not provide precise annual estimates for species that occur in low densities, such as loons, cranes, and swans, or those with clumped distributions, such as brant, common eiders, and gulls. However, long-term averages should be accurate.

A primary advantage of the random nest plot sampling procedure over intensive local studies is that it assures applicability of estimates to the entire coastal zone, not just the immediate areas around intensive biological study camps. Moreover, the single brief visit to scattered plots ensures that the monitoring of populations occurs with minimum disturbance. The expansion of estimated nests and eggs from the ground sampled area to the entire coastal zone is based the assumption that observed breeding bird indices obtained from aerial surveys provide an accurate linear relationship with the number of nests within versus outside of the ground sampled area. By using a 7-year localized average of the Out:In ratio, the annual variability due to sampling error is moderated.

Annual changes in nest population size are less informative than long-term trends because of sampling error, changes in observers, distribution of plots, and small sample size for less common species. Only several years of consistent declines or increases are likely to indicate a true change in the number of nests and eggs produced on the Yukon-Kuskokwim coastal zone. We believe that a graphical presentation (Fig. 2) enables better interpretation of data than analysis of year-to-year changes in population size. Large annual changes in nest population size probably reflect sampling error or result from extremes in nesting effort and success, rather than real population change.

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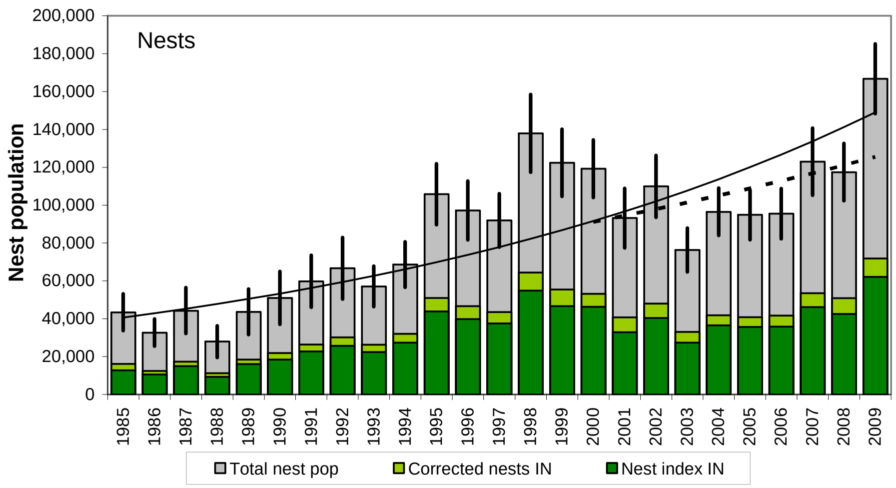
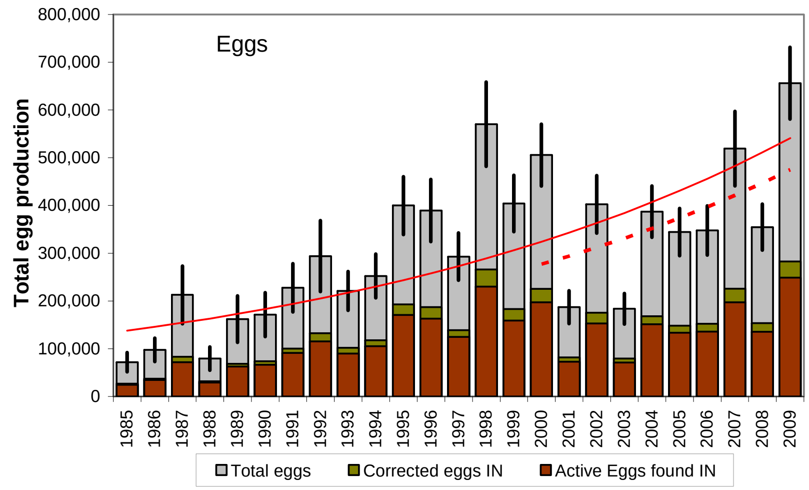
Figure 2 (Subsequent pages). Population size with ± 90% confidence intervals and trends of waterbird nests and egg production on the Yukon-Kuskokwim Delta Alaska, 1985-2009, with accompanying tabulated data. Column heading definitions follow:

Year = survey year;
N plots = number of ground sampled plots used in the analysis;
Sampled km^2 = total area searched (N plots*plot size);
Nest index IN = number of nests within the core 716 km^2 ground sampled area uncorrected for nest detection;
SE nest index IN= standard error for nest index;
Avg nest detection rates = annual proportion of nests detected based on predictive model that includes the covariates of species, nest status, habitat, and observer experience;
Corrected nest IN = Nest index in ground sampled area corrected for nest detection;
7 yr avg aerial Out:In ratio = the seven-year localized average ratio of aerial observations seen out of the ground sampled area vs. in the ground sampled area (seven years are based on from the current year, 3 prior years, and 3 following years data as available – see Methods);
Corrected nests OUT = number of nests extrapolated beyond the ground sampled area based on the 7-yr localized average Out:In ratio, corrected for nest detection rate;
Total nests In+Out = total number of nests in the YKD coastal zone, corrected for nest detection rate;
SE total nests = standard error for total nest estimate;
Total eggs In+Out = total number of viable eggs at time of plot search in the YKD coastal zone, corrected for detection rate;
SE total eggs = standard error for total egg estimate;
Total eggs/active nests = total viable eggs In+Out divided by the nests with eggs In+Out, corrected for detection rate;
Total eggs/total nests = total viable eggs In+Out divided by the total nests In+Out, corrected for detection rate;
Corrected % nest success = number of active nests divided by total nests times 100%, corrected for detection rate;
Relative production rate = Total eggs/total nests divided by the long-term average of total eggs/total nests. This measure reflects how the production of eggs per nests compares to the long-term average and illustrates the relative potential contribution of young to the population on a per breeding pair basis.

CCGO **Cackling Goose**



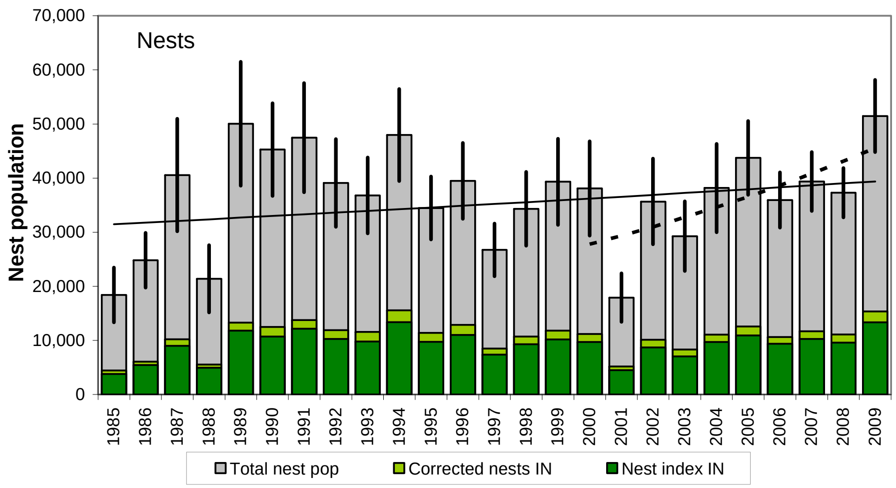
1985-2009 avg annual growth rate= 1.056 (90%c.i.= 1.043-1.068)
2000-2009 last 10 yrs annual growth rate= 1.036 (90%c.i.= 0.999-1.073)



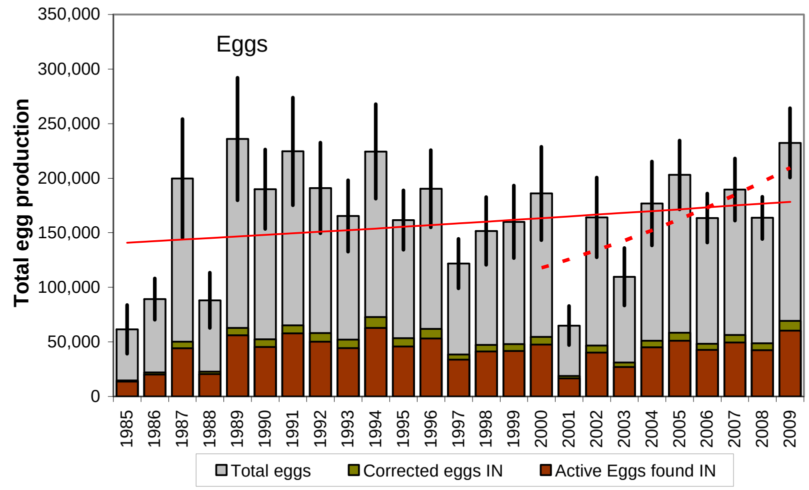
1985-2009 avg annual growth rate= 1.059 (90%c.i.= 1.038-1.080)
2000-2009 last 10 yrs annual growth rate= 1.062 (90%c.i.= 0.987-1.137)

Year	N plots	Sampled km2	Nest index IN	SE nest index IN	Avg nest detection rate	Corrected nests IN	7yr local regression OUT:IN ratio	Corrected nests OUT	**Total nests IN+OUT**	SE total nests	**Total eggs IN+OUT**	SE total eggs	Total eggs / active nests	Total eggs / total nests	Corrected % nest success	Relative production rate
1985	49	24.57	12,788	1,625	79.2%	16,149	1.69	27,305	**43,454**	5,918	**71,672**	12,158	3.91	1.65	42%	47%
1986	46	22.16	10,594	1,406	85.0%	12,467	1.62	20,246	**32,713**	4,382	**97,764**	14,866	4.89	2.99	61%	85%
1987	37	12.67	14,909	2,693	86.1%	17,319	1.56	26,967	**44,286**	7,341	**212,787**	36,767	5.12	4.80	94%	136%
1988	31	10.04	9,342	1,957	83.2%	11,224	1.49	16,725	**27,950**	5,087	**79,592**	14,796	4.52	2.85	63%	81%
1989	23	7.45	16,053	3,536	87.3%	18,390	1.37	25,244	**43,634**	7,304	**162,046**	29,598	4.85	3.71	77%	105%
1990	33	10.70	18,465	3,890	83.9%	21,997	1.32	29,040	**51,037**	8,512	**171,285**	27,880	4.55	3.36	74%	95%
1991	36	11.66	22,840	3,763	86.5%	26,414	1.26	33,387	**59,801**	8,342	**227,526**	30,692	4.64	3.80	82%	108%
1992	42	13.39	25,662	4,554	85.3%	30,098	1.22	36,583	**66,680**	9,903	**293,956**	45,203	4.82	4.41	91%	125%
1993	47	15.23	22,469	2,877	85.4%	26,323	1.17	30,753	**57,076**	6,463	**221,063**	24,785	4.51	3.87	86%	110%
1994	41	13.27	27,391	3,099	85.5%	32,051	1.14	36,555	**68,606**	7,296	**252,233**	27,796	4.58	3.68	80%	104%
1995	50	22.56	43,839	5,413	85.9%	51,015	1.07	54,795	**105,810**	9,774	**399,910**	36,837	4.46	3.78	85%	107%
1996	54	19.44	39,761	4,827	85.3%	46,617	1.08	50,546	**97,162**	9,440	**389,565**	39,499	4.49	4.01	89%	113%
1997	72	23.31	37,516	4,527	86.1%	43,550	1.11	48,431	**91,982**	8,597	**292,993**	30,145	4.03	3.19	79%	90%
1998	64	20.71	54,802	6,330	85.1%	64,403	1.14	73,549	**137,952**	12,462	**570,263**	53,685	4.47	4.13	92%	117%
1999	53	16.97	46,698	5,561	84.1%	55,508	1.20	66,830	**122,339**	10,791	**404,090**	35,954	3.89	3.30	85%	94%
2000	80	25.86	46,279	3,884	87.0%	53,165	1.24	66,059	**119,224**	9,218	**505,617**	39,483	4.50	4.24	94%	120%
2001	81	26.23	32,937	3,999	80.7%	40,799	1.28	52,358	**93,157**	9,580	**187,188**	20,941	3.64	2.01	55%	57%
2002	84	27.15	40,438	3,989	84.3%	47,948	1.29	61,973	**109,921**	9,924	**402,247**	36,692	4.42	3.66	83%	104%
2003	83	26.87	27,323	2,905	82.6%	33,071	1.31	43,232	**76,303**	7,016	**183,773**	19,548	3.96	2.41	61%	68%
2004	81	26.22	36,574	3,024	87.5%	41,818	1.31	54,683	**96,501**	7,558	**387,103**	32,501	4.72	4.01	85%	114%
2005	83	26.87	35,666	3,192	87.2%	40,898	1.32	53,920	**94,818**	7,959	**344,377**	30,116	4.27	3.63	85%	103%
2006	75	24.28	35,842	3,708	85.9%	41,706	1.29	53,736	**95,441**	8,072	**347,652**	31,174	4.43	3.64	82%	103%
2007	79	25.58	46,112	4,684	86.2%	53,492	1.30	69,503	**122,996**	10,788	**519,317**	47,438	4.60	4.22	92%	120%
2008	82	26.55	42,566	3,963	83.7%	50,846	1.31	66,617	**117,463**	9,174	**354,647**	29,218	4.06	3.02	74%	85%
2009	81	26.24	62,093	4,477	86.5%	71,810	1.32	94,864	**166,674**	11,209	**655,911**	45,676	4.34	3.94	91%	111%

EMGO **Emperor Goose**



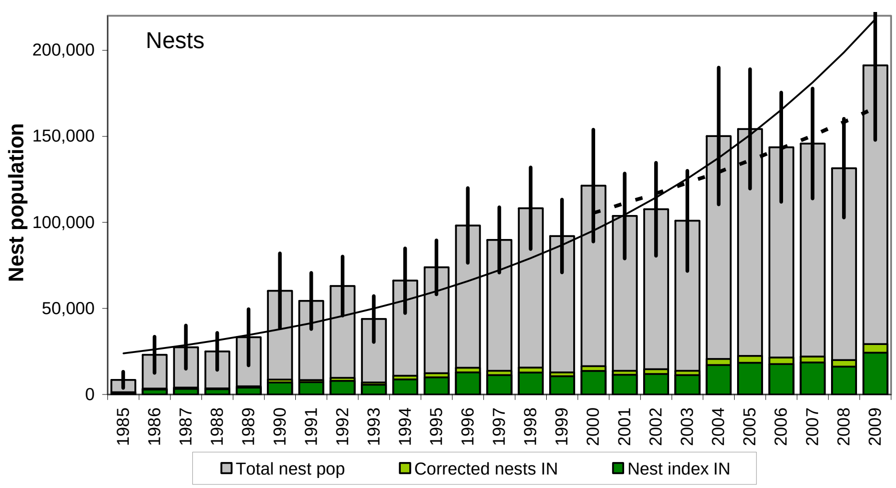
1985-2009 avg annual growth rate= 1.009 (90%c.i.= 0.996-1.023)
2000-2009 last 10 yrs annual growth rate= 1.057 (90%c.i.= 1.011-1.103)

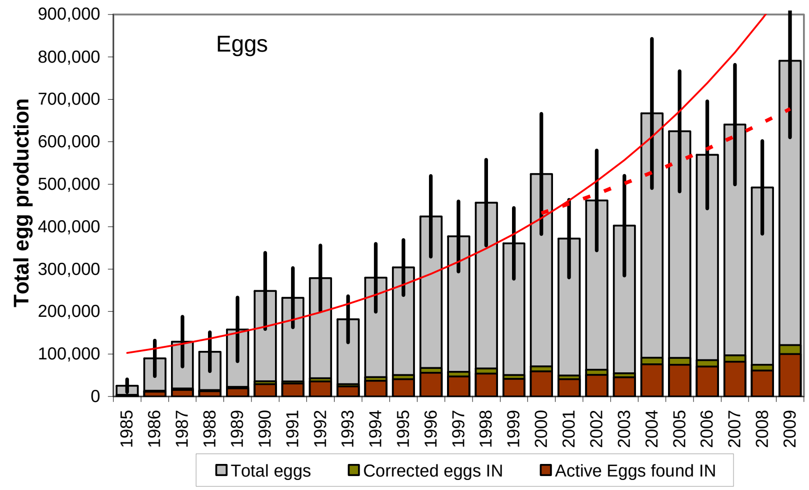


1985-2009 avg annual growth rate= 1.010 (90%c.i.= 0.991-1.028)
2000-2009 last 10 yrs annual growth rate= 1.066 (90%c.i.= 1.002-1.130)

Year	N plots	Sampled km2	Nest index IN	SE nest index IN	Avg nest detection rate	Corrected nests IN	7yr local regression OUT:IN ratio	Corrected nests OUT	**Total nests IN+OUT**	SE total nests	**Total eggs IN+OUT**	SE total eggs	Total eggs / active nests	Total eggs / total nests	Corrected % nest success	Relative production rate
1985	49	24.57	3,816	685	86.5%	4,411	3.17	13,983	**18,394**	3,075	**61,452**	13,524	5.67	3.34	59%	76%
1986	46	22.16	5,426	620	89.0%	6,096	3.07	18,714	**24,810**	3,066	**89,244**	11,539	4.93	3.60	73%	81%
1987	37	12.67	8,979	1,477	87.9%	10,218	2.97	30,348	**40,566**	6,312	**199,681**	33,161	5.12	4.92	96%	111%
1988	31	10.04	4,920	965	89.0%	5,530	2.87	15,872	**21,402**	3,764	**88,112**	15,375	4.63	4.12	89%	93%
1989	23	7.45	11,824	1,769	88.9%	13,306	2.76	36,738	**50,044**	6,962	**235,985**	34,120	5.12	4.72	92%	107%
1990	33	10.70	10,704	1,299	85.7%	12,490	2.62	32,779	**45,269**	5,208	**189,853**	22,173	4.91	4.19	85%	95%
1991	36	11.66	12,157	1,812	88.4%	13,758	2.45	33,711	**47,469**	6,132	**224,513**	29,938	4.89	4.73	97%	107%
1992	42	13.39	10,265	1,372	86.2%	11,906	2.29	27,216	**39,122**	4,930	**191,003**	25,216	5.07	4.88	96%	110%
1993	47	15.23	9,777	1,116	84.5%	11,571	2.18	25,203	**36,775**	4,257	**165,442**	19,867	4.78	4.50	94%	102%
1994	41	13.27	13,372	1,647	85.9%	15,561	2.08	32,403	**47,964**	5,163	**224,440**	26,274	4.99	4.68	94%	106%
1995	50	22.56	9,738	1,127	85.5%	11,389	2.03	23,082	**34,471**	3,533	**161,656**	16,552	4.86	4.69	96%	106%
1996	54	19.44	11,008	1,105	85.6%	12,866	2.07	26,635	**39,501**	4,254	**190,198**	21,518	5.14	4.81	94%	109%
1997	72	23.31	7,368	736	87.1%	8,461	2.16	18,282	**26,743**	2,959	**121,774**	13,812	4.78	4.55	95%	103%
1998	64	20.71	9,295	964	86.7%	10,719	2.20	23,595	**34,314**	4,149	**151,635**	18,882	4.64	4.42	95%	100%
1999	53	16.97	10,166	875	86.2%	11,794	2.33	27,515	**39,309**	4,837	**160,030**	20,217	4.44	4.07	92%	92%
2000	80	25.86	9,715	929	86.9%	11,185	2.41	26,908	**38,093**	5,296	**186,005**	26,077	4.98	4.88	98%	110%
2001	81	26.23	4,503	478	86.4%	5,209	2.44	12,694	**17,903**	2,725	**64,939**	10,857	4.81	3.63	75%	82%
2002	84	27.15	8,699	942	85.8%	10,142	2.52	25,532	**35,674**	4,813	**164,016**	22,157	4.98	4.60	92%	104%
2003	83	26.87	7,057	768	84.9%	8,311	2.52	20,950	**29,261**	3,908	**109,668**	16,052	4.79	3.75	78%	85%
2004	81	26.22	9,690	909	87.7%	11,051	2.45	27,127	**38,178**	4,967	**176,789**	23,321	4.88	4.63	95%	105%
2005	83	26.87	10,948	812	87.0%	12,588	2.48	31,160	**43,748**	4,146	**203,005**	19,132	4.97	4.64	93%	105%
2006	75	24.28	9,373	957	88.0%	10,648	2.38	25,305	**35,953**	3,106	**163,476**	13,629	4.78	4.55	95%	103%
2007	79	25.58	10,241	976	87.6%	11,688	2.37	27,672	**39,359**	3,305	**189,719**	17,297	4.98	4.82	97%	109%
2008	82	26.55	9,570	782	86.2%	11,103	2.36	26,191	**37,294**	2,762	**163,638**	11,761	4.81	4.39	91%	99%
2009	81	26.24	13,341	1,137	86.8%	15,370	2.35	36,119	**51,489**	4,052	**232,289**	19,346	4.71	4.51	96%	102%

WFGO **White-fronted Goose**



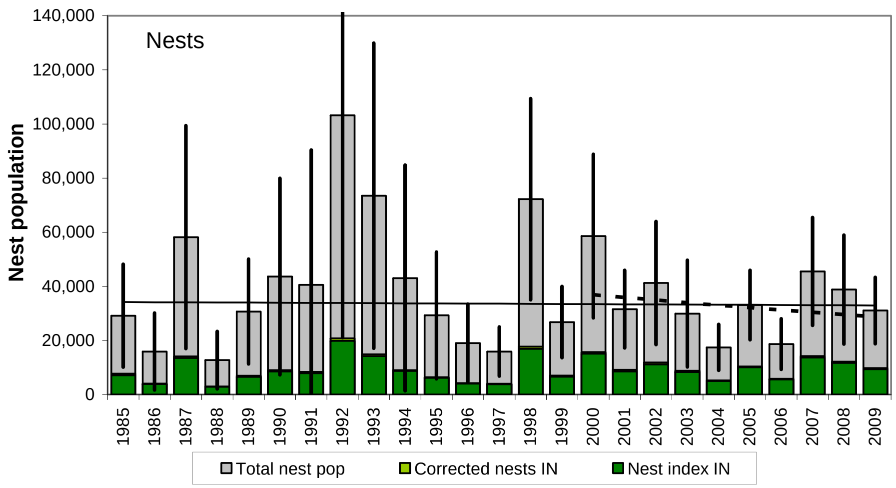


1985-2009 avg annual growth rate= 1.096 (90%c.i.= 1.081-1.112)
2000-2009 last 10 yrs annual growth rate= 1.052 (90%c.i.= 1.025-1.079)

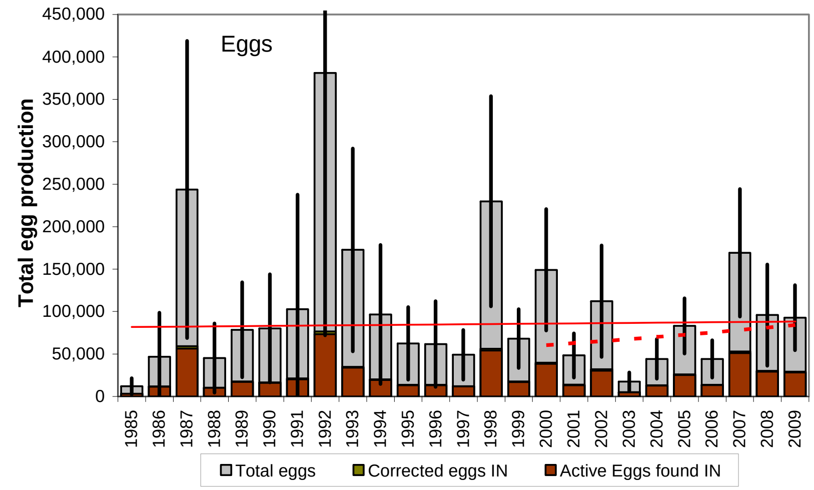
1985-2009 avg annual growth rate= 1.098 (90%c.i.= 1.077-1.119)
2000-2009 last 10 yrs annual growth rate= 1.051 (90%c.i.= 1.015-1.088)

Year	N plots	Sampled km2	Nest index IN	SE nest index IN	Avg nest detection rate	Corrected nests IN	7yr local regression OUT:IN ratio	Corrected nests OUT	**Total nests IN+OUT**	SE total nests	**Total eggs IN+OUT**	SE total eggs	Total eggs / active nests	Total eggs / total nests	Corrected % nest success	Relative production rate
1985	49	24.57	1,078	257	81.0%	1,331	5.42	7,215	**8,547**	2,844	**25,249**	9,188	4.20	2.95	70%	71%
1986	46	22.16	2,907	463	83.2%	3,493	5.62	19,633	**23,126**	6,360	**90,015**	25,457	4.37	3.89	89%	94%
1987	37	12.67	3,275	629	81.4%	4,026	5.82	23,438	**27,464**	7,622	**129,279**	35,561	4.90	4.71	96%	114%
1988	31	10.04	2,995	599	83.9%	3,568	6.02	21,488	**25,056**	6,503	**105,590**	27,829	4.32	4.21	97%	102%
1989	23	7.45	4,037	1,004	84.9%	4,753	6.00	28,516	**33,269**	9,944	**157,870**	45,669	5.01	4.75	95%	115%
1990	33	10.70	7,025	1,108	81.0%	8,674	5.95	51,573	**60,247**	13,169	**248,679**	54,776	4.45	4.13	93%	100%
1991	36	11.66	7,184	1,009	86.1%	8,345	5.52	46,042	**54,388**	9,941	**232,734**	42,417	4.53	4.28	94%	103%
1992	42	13.39	8,019	1,001	82.6%	9,710	5.49	53,286	**62,996**	10,410	**278,756**	46,945	4.52	4.42	98%	107%
1993	47	15.23	5,641	853	80.4%	7,015	5.25	36,816	**43,830**	8,128	**181,874**	33,125	4.27	4.15	97%	100%
1994	41	13.27	8,789	1,097	81.3%	10,813	5.12	55,348	**66,161**	11,406	**279,779**	48,531	4.34	4.23	97%	102%
1995	50	22.56	9,992	1,093	81.0%	12,340	4.99	61,563	**73,903**	9,499	**303,858**	39,541	4.26	4.11	97%	99%
1996	54	19.44	12,849	1,303	82.6%	15,558	5.31	82,587	**98,145**	13,184	**424,347**	57,649	4.49	4.32	96%	105%
1997	72	23.31	11,298	1,145	81.7%	13,823	5.49	75,917	**89,740**	11,543	**377,093**	50,337	4.28	4.20	98%	102%
1998	64	20.71	12,785	1,320	81.7%	15,657	5.91	92,579	**108,236**	14,406	**456,545**	61,348	4.33	4.22	97%	102%
1999	53	16.97	10,588	1,157	82.4%	12,853	6.16	79,213	**92,065**	12,857	**360,806**	50,666	4.17	3.92	94%	95%
2000	80	25.86	13,646	1,258	82.9%	16,461	6.37	104,876	**121,337**	19,736	**524,331**	86,144	4.45	4.32	97%	104%
2001	81	26.23	11,407	935	82.8%	13,775	6.52	89,869	**103,645**	14,993	**371,884**	55,551	3.86	3.59	93%	87%
2002	84	27.15	11,994	1,001	81.6%	14,694	6.33	92,956	**107,650**	16,416	**461,687**	71,696	4.39	4.29	98%	104%
2003	83	26.87	11,265	1,151	81.8%	13,773	6.32	87,106	**100,878**	17,674	**402,433**	71,484	4.25	3.99	94%	96%
2004	81	26.22	17,059	1,465	82.7%	20,638	6.28	129,507	**150,145**	24,133	**666,798**	106,902	4.59	4.44	97%	107%
2005	83	26.87	18,432	1,472	82.2%	22,421	5.88	131,866	**154,287**	21,089	**624,702**	86,127	4.24	4.05	96%	98%
2006	75	24.28	17,685	1,571	82.1%	21,537	5.67	122,130	**143,666**	19,298	**569,269**	76,609	4.15	3.96	96%	96%
2007	79	25.58	18,579	1,518	84.4%	22,017	5.62	123,747	**145,764**	19,379	**640,432**	85,802	4.47	4.39	98%	106%
2008	82	26.55	16,175	1,124	80.8%	20,010	5.57	111,466	**131,476**	17,484	**492,434**	66,477	4.05	3.75	92%	91%
2009	81	26.24	24,253	1,481	82.7%	29,329	5.52	161,902	**191,231**	26,355	**790,539**	109,490	4.30	4.13	96%	100%

BRAN **Black Brant**



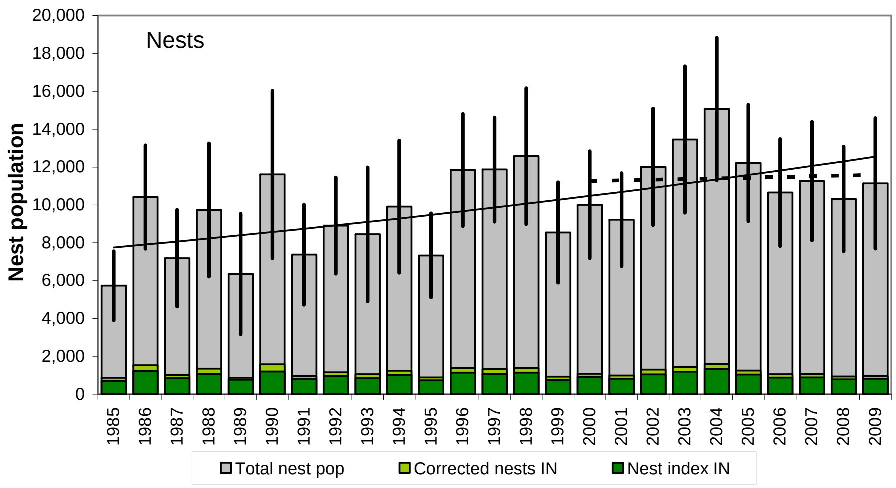
1985-2009 avg annual growth rate= 0.998 (90%c.i.= 0.974-1.023)
2000-2009 last 10 yrs annual growth rate= 0.973 (90%c.i.= 0.905-1.041)



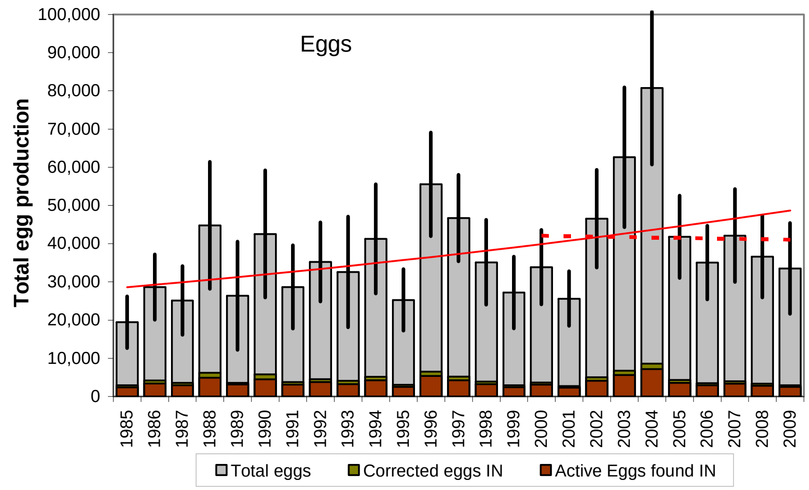
1985-2009 avg annual growth rate= 1.003 (90%c.i.= 0.964-1.042)
2000-2009 last 10 yrs annual growth rate= 1.037 (90%c.i.= 0.902-1.172)

Year	N plots	Sampled km2	Nest index IN	SE nest index IN	Avg nest detection rate	Corrected nests IN	7yr local regression OUT:IN ratio	Corrected nests OUT	**Total nests IN+OUT**	SE total nests	**Total eggs IN+OUT**	SE total eggs	Total eggs / active nests	Total eggs / total nests	Corrected % nest success	Relative production rate
1985	49	24.57	7,107	2,569	92.6%	7,675	2.80	21,460	**29,135**	11,574	**12,175**	5,707	3.09	0.42	14%	16%
1986	46	22.16	3,844	2,304	95.7%	4,017	2.96	11,886	**15,903**	8,631	**46,774**	31,637	3.99	2.94	74%	114%
1987	37	12.67	13,497	6,158	95.6%	14,117	3.12	44,063	**58,180**	25,071	**243,807**	106,382	4.26	4.19	98%	162%
1988	31	10.04	2,852	1,620	95.9%	2,973	3.28	9,764	**12,737**	6,435	**45,347**	24,718	3.98	3.56	89%	138%
1989	23	7.45	6,537	2,701	94.8%	6,893	3.45	23,755	**30,648**	11,772	**78,581**	34,089	3.49	2.56	73%	99%
1990	33	10.70	8,563	4,710	94.7%	9,047	3.82	34,557	**43,604**	22,076	**80,288**	38,647	3.15	1.84	58%	71%
1991	36	11.66	7,859	6,513	94.3%	8,335	3.86	32,201	**40,536**	30,313	**102,937**	81,885	3.66	2.54	69%	98%
1992	42	13.39	19,835	9,859	95.6%	20,742	3.97	82,434	**103,176**	49,966	**381,036**	187,709	3.87	3.69	95%	143%
1993	47	15.23	14,196	6,832	95.7%	14,838	3.95	58,667	**73,505**	34,247	**172,715**	72,534	3.23	2.35	73%	91%
1994	41	13.27	8,681	5,693	96.0%	9,047	3.76	34,004	**43,051**	25,371	**96,524**	49,716	2.42	2.24	93%	87%
1995	50	22.56	6,186	3,119	96.5%	6,410	3.56	22,850	**29,260**	14,226	**62,530**	25,944	2.98	2.14	72%	83%
1996	54	19.44	4,050	2,022	95.6%	4,235	3.49	14,794	**19,029**	8,738	**61,664**	30,666	3.75	3.24	87%	126%
1997	72	23.31	3,807	1,423	96.7%	3,938	3.03	11,947	**15,885**	5,504	**49,158**	17,719	3.32	3.09	93%	120%
1998	64	20.71	16,862	5,452	95.3%	17,702	3.08	54,517	**72,219**	22,602	**229,935**	75,152	3.67	3.18	87%	123%
1999	53	16.97	6,581	2,064	94.1%	6,991	2.82	19,738	**26,729**	8,014	**68,162**	21,047	3.16	2.55	81%	99%
2000	80	25.86	15,140	5,069	96.6%	15,679	2.74	42,891	**58,570**	18,384	**149,228**	43,399	2.87	2.55	89%	99%
2001	81	26.23	8,487	2,391	92.7%	9,156	2.45	22,437	**31,593**	8,724	**48,314**	15,805	2.95	1.53	52%	59%
2002	84	27.15	11,177	4,344	94.8%	11,792	2.50	29,444	**41,235**	13,831	**112,171**	39,915	3.12	2.72	87%	105%
2003	83	26.87	8,229	4,048	94.1%	8,741	2.42	21,146	**29,887**	11,974	**17,457**	6,634	1.25	0.58	47%	23%
2004	81	26.22	4,968	1,710	95.7%	5,192	2.36	12,229	**17,421**	5,152	**44,262**	14,084	3.28	2.54	77%	98%
2005	83	26.87	10,015	2,732	96.4%	10,385	2.18	22,660	**33,045**	7,796	**83,131**	19,807	3.02	2.52	83%	97%
2006	75	24.28	5,541	1,993	95.4%	5,810	2.21	12,844	**18,655**	5,694	**44,195**	13,326	3.44	2.37	69%	92%
2007	79	25.58	13,711	4,083	96.5%	14,214	2.20	31,250	**45,464**	12,115	**169,256**	45,632	3.94	3.72	95%	144%
2008	82	26.55	11,619	4,337	95.5%	12,169	2.19	26,608	**38,777**	12,255	**96,021**	36,224	3.20	2.48	77%	96%
2009	81	26.24	9,385	2,276	96.1%	9,769	2.17	21,245	**31,014**	7,455	**92,820**	23,262	3.56	2.99	84%	116%

TUSW **Tundra Swan**



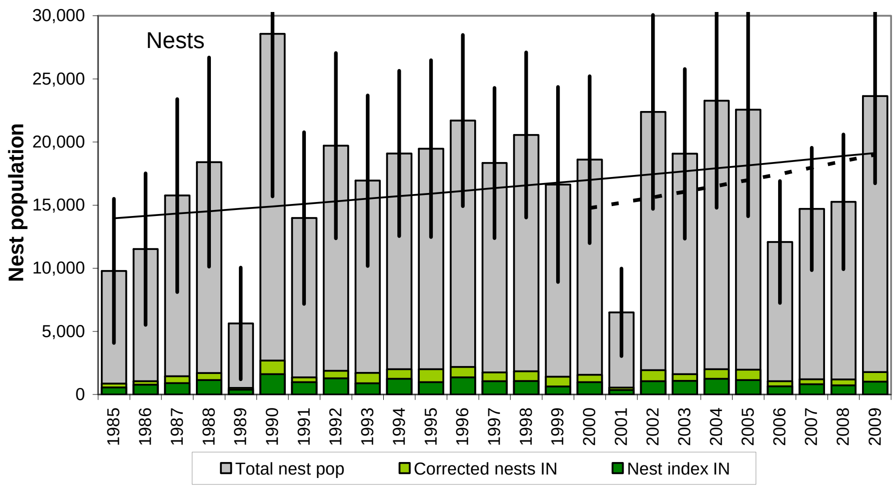
1985-2009 avg annual growth rate= 1.020 (90%c.i.= 1.011-1.029)
2000-2009 last 10 yrs annual growth rate= 1.003 (90%c.i.= 0.975-1.031)



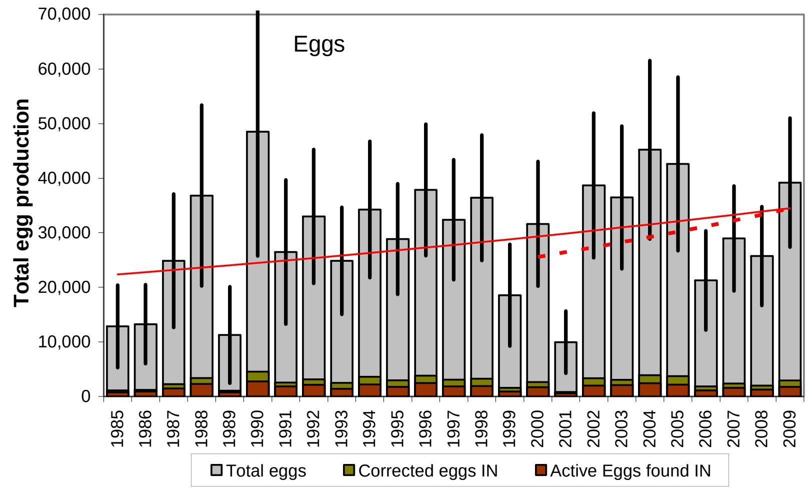
1985-2009 avg annual growth rate= 1.022 (90%c.i.= 1.008-1.037)
2000-2009 last 10 yrs annual growth rate= 0.997 (90%c.i.= 0.934-1.061)

Year	N plots	Sampled km2	Nest index IN	SE nest index IN	Avg nest detection rate	Corrected nests IN	7yr local regression OUT:IN ratio	Corrected nests OUT	**Total nests IN+OUT**	SE total nests	**Total eggs IN+OUT**	SE total eggs	Total eggs / active nests	Total eggs / total nests	Corrected % nest success	Relative production rate
1985	49	24.57	699	119	81.0%	863	5.65	4,871	**5,733**	1,109	**19,452**	4,102	3.93	3.39	86%	91%
1986	46	22.16	1,227	166	80.4%	1,527	5.82	8,891	**10,418**	1,665	**28,666**	5,202	3.21	2.75	86%	74%
1987	37	12.67	847	189	82.5%	1,027	6.00	6,162	**7,189**	1,555	**25,139**	5,469	3.50	3.50	100%	94%
1988	31	10.04	1,070	247	78.9%	1,355	6.18	8,370	**9,725**	2,141	**44,800**	10,096	4.61	4.61	100%	124%
1989	23	7.45	769	263	88.5%	869	6.31	5,481	**6,351**	1,933	**26,383**	8,628	4.15	4.15	100%	112%
1990	33	10.70	1,204	288	76.3%	1,579	6.35	10,028	**11,607**	2,688	**42,542**	10,127	3.92	3.67	93%	98%
1991	36	11.66	798	178	81.8%	976	6.55	6,398	**7,374**	1,606	**28,668**	6,636	4.25	3.89	92%	104%
1992	42	13.39	962	174	83.5%	1,152	6.73	7,759	**8,912**	1,546	**35,204**	6,291	3.95	3.95	100%	106%
1993	47	15.23	846	226	79.6%	1,063	6.95	7,384	**8,446**	2,148	**32,587**	8,788	4.07	3.86	95%	104%
1994	41	13.27	1,024	231	82.8%	1,237	7.01	8,670	**9,907**	2,124	**41,254**	8,693	4.16	4.16	100%	112%
1995	50	22.56	730	135	82.1%	889	7.25	6,446	**7,335**	1,355	**25,261**	4,891	3.79	3.44	91%	93%
1996	54	19.44	1,141	177	82.2%	1,389	7.52	10,449	**11,837**	1,802	**55,533**	8,248	4.89	4.69	96%	126%
1997	72	23.31	1,074	155	81.0%	1,326	7.95	10,544	**11,870**	1,672	**46,701**	6,865	4.20	3.93	94%	106%
1998	64	20.71	1,140	182	81.7%	1,396	8.00	11,175	**12,571**	2,182	**35,119**	6,744	3.10	2.79	90%	75%
1999	53	16.97	759	145	82.2%	924	8.25	7,621	**8,545**	1,614	**27,203**	5,710	3.63	3.18	88%	86%
2000	80	25.86	913	153	84.2%	1,085	8.23	8,923	**10,008**	1,719	**33,826**	5,925	3.62	3.38	93%	91%
2001	81	26.23	819	134	83.1%	986	8.36	8,239	**9,225**	1,494	**25,615**	4,348	3.38	2.78	82%	75%
2002	84	27.15	1,054	166	80.9%	1,303	8.21	10,705	**12,008**	1,872	**46,528**	7,784	4.35	3.87	89%	104%
2003	83	26.87	1,198	187	82.7%	1,449	8.29	12,002	**13,451**	2,351	**62,625**	11,131	4.79	4.66	97%	125%
2004	81	26.22	1,337	189	83.2%	1,608	8.37	13,456	**15,064**	2,290	**80,724**	12,166	5.48	5.36	98%	144%
2005	83	26.87	1,039	150	82.5%	1,259	8.70	10,952	**12,210**	1,867	**41,814**	6,556	3.63	3.42	94%	92%
2006	75	24.28	884	143	83.3%	1,062	9.03	9,591	**10,653**	1,720	**35,064**	5,852	3.54	3.29	93%	88%
2007	79	25.58	895	154	83.6%	1,071	9.51	10,189	**11,260**	1,908	**42,111**	7,397	3.87	3.74	97%	100%
2008	82	26.55	782	127	83.3%	939	9.99	9,378	**10,317**	1,682	**36,613**	6,529	3.85	3.55	92%	95%
2009	81	26.24	818	155	84.3%	971	10.47	10,166	**11,137**	2,094	**33,519**	7,226	3.40	3.01	88%	81%

SACR **Sandhill Crane**



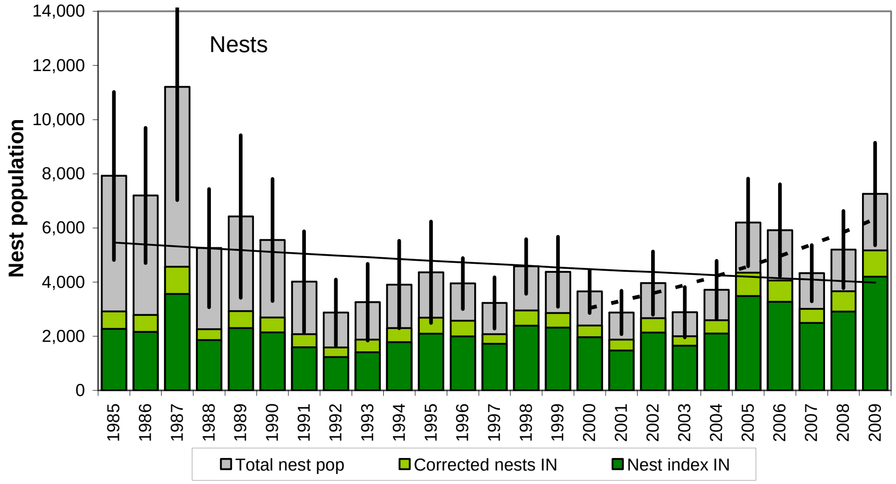
1985-2009 avg annual growth rate= 1.013 (90%c.i.= 0.996-1.031)
2000-2009 last 10 yrs annual growth rate= 1.028 (90%c.i.= 0.951-1.106)

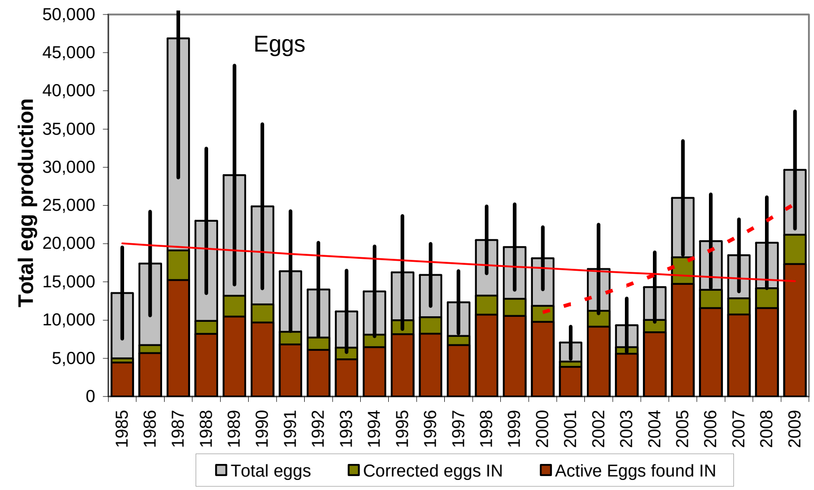


1985-2009 avg annual growth rate= 1.018 (90%c.i.= 0.997-1.040)
2000-2009 last 10 yrs annual growth rate= 1.034 (90%c.i.= 0.946-1.121)

Year	N plots	Sampled km2	Nest index IN	SE nest index IN	Avg nest detection rate	Corrected nests IN	7yr local regression OUT:IN ratio	Corrected nests OUT	**Total nests IN+OUT**	SE total nests	**Total eggs IN+OUT**	SE total eggs	Total eggs / active nests	Total eggs / total nests	Corrected % nest success	Relative production rate
1985	49	24.57	553	145	63.3%	875	10.19	8,915	**9,790**	3,467	**12,834**	4,600	1.63	1.31	80%	78%
1986	46	22.16	775	188	74.5%	1,040	10.07	10,478	**11,518**	3,653	**13,248**	4,393	1.48	1.15	78%	68%
1987	37	12.67	904	192	62.8%	1,439	9.95	14,321	**15,760**	4,649	**24,875**	7,440	1.58	1.58	100%	93%
1988	31	10.04	1,141	225	67.2%	1,699	9.84	16,711	**18,410**	5,034	**36,819**	10,067	2.14	2.00	94%	118%
1989	23	7.45	385	178	73.2%	526	9.72	5,107	**5,633**	2,688	**11,266**	5,377	2.00	2.00	100%	118%
1990	33	10.70	1,606	305	59.5%	2,696	9.60	25,883	**28,580**	7,833	**48,540**	13,865	1.79	1.70	95%	101%
1991	36	11.66	982	222	72.8%	1,350	9.35	12,627	**13,978**	4,136	**26,476**	8,034	1.89	1.89	100%	112%
1992	42	13.39	1,283	267	68.2%	1,881	9.48	17,825	**19,706**	4,463	**32,976**	7,455	1.75	1.67	96%	99%
1993	47	15.23	893	227	51.8%	1,723	8.83	15,212	**16,935**	4,104	**24,875**	5,959	1.67	1.47	88%	87%
1994	41	13.27	1,240	254	62.0%	2,001	8.54	17,096	**19,097**	3,983	**34,262**	7,606	1.79	1.79	100%	106%
1995	50	22.56	983	154	49.1%	2,003	8.72	17,467	**19,469**	4,253	**28,855**	6,152	1.92	1.48	77%	88%
1996	54	19.44	1,362	213	62.2%	2,191	8.90	19,501	**21,692**	4,123	**37,840**	7,335	1.88	1.74	93%	103%
1997	72	23.31	1,044	187	59.8%	1,746	9.50	16,593	**18,340**	3,615	**32,379**	6,681	1.77	1.77	100%	105%
1998	64	20.71	1,071	175	58.2%	1,839	10.18	18,725	**20,564**	3,982	**36,414**	6,988	1.77	1.77	100%	105%
1999	53	16.97	633	162	44.7%	1,416	10.75	15,222	**16,638**	4,697	**18,562**	5,670	1.69	1.12	66%	66%
2000	80	25.86	969	139	62.0%	1,563	10.90	17,039	**18,602**	4,021	**31,621**	6,938	1.84	1.70	92%	101%
2001	81	26.23	355	111	65.4%	542	11.01	5,968	**6,510**	2,111	**9,970**	3,453	1.70	1.53	90%	91%
2002	84	27.15	1,054	149	54.6%	1,933	10.58	20,453	**22,386**	4,674	**38,666**	8,048	2.00	1.73	86%	102%
2003	83	26.87	1,092	155	67.9%	1,608	10.86	17,465	**19,073**	4,084	**36,465**	7,939	1.96	1.91	97%	113%
2004	81	26.22	1,256	161	62.7%	2,003	10.62	21,278	**23,280**	5,155	**45,210**	9,940	1.94	1.94	100%	115%
2005	83	26.87	1,145	164	58.4%	1,962	10.50	20,601	**22,564**	5,135	**42,619**	9,663	1.89	1.89	100%	112%
2006	75	24.28	648	141	61.6%	1,052	10.48	11,026	**12,078**	2,935	**21,267**	5,530	1.76	1.76	100%	104%
2007	79	25.58	811	147	66.8%	1,215	11.10	13,494	**14,709**	2,947	**28,953**	5,843	1.97	1.97	100%	117%
2008	82	26.55	728	136	60.7%	1,199	11.73	14,061	**15,260**	3,240	**25,734**	5,509	1.76	1.69	96%	100%
2009	81	26.24	1,009	143	57.0%	1,771	12.35	21,865	**23,636**	4,199	**39,192**	7,168	1.85	1.66	89%	98%

SPEI **Spectacled Eider**



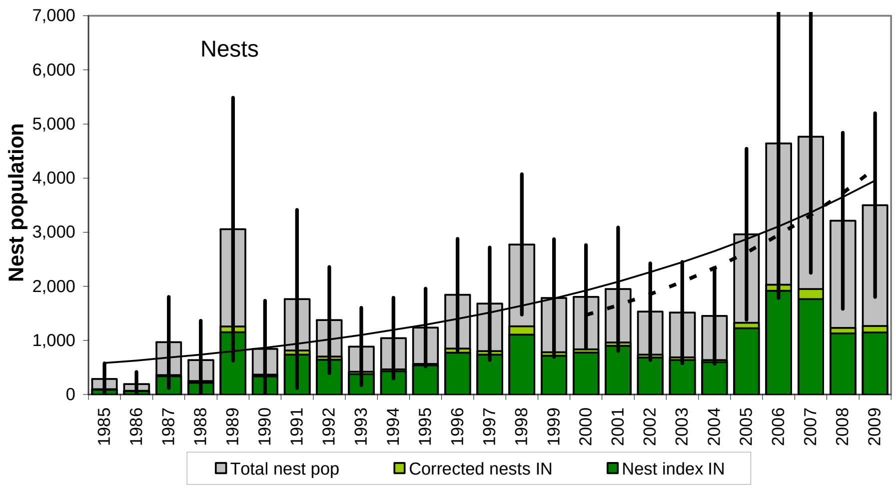


1985-2009 avg annual growth rate= 0.987 (90%c.i.= 0.972-1.002)
2000-2009 last 10 yrs annual growth rate= 1.085 (90%c.i.= 1.042-1.127)

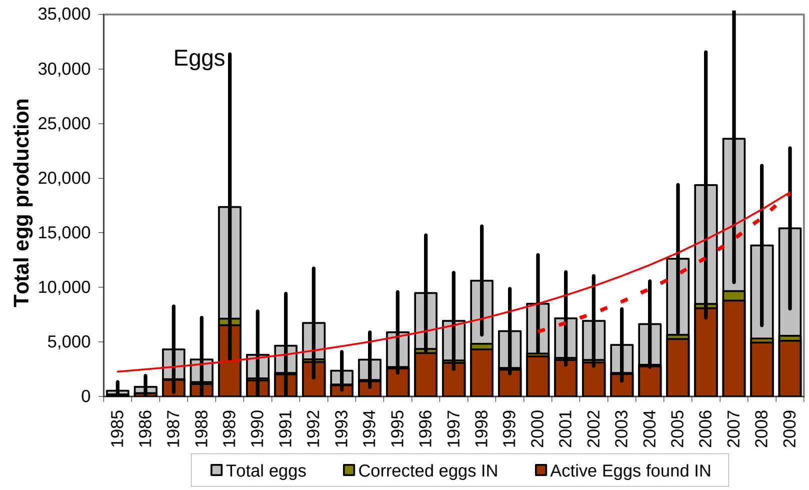
1985-2009 avg annual growth rate= 0.988 (90%c.i.= 0.970-1.007)
2000-2009 last 10 yrs annual growth rate= 1.097 (90%c.i.= 1.026-1.168)

Year	N plots	Sampled km2	Nest index IN	SE nest index IN	Avg nest detection rate	Corrected nests IN	7yr local regression OUT:IN ratio	Corrected nests OUT	**Total nests IN+OUT**	SE total nests	**Total eggs IN+OUT**	SE total eggs	Total eggs / active nests	Total eggs / total nests	Corrected % nest success	Relative production rate
1985	49	24.57	2,272	489	77.8%	2,919	1.71	5,001	**7,920**	1,886	**13,552**	3,638	3.84	1.71	45%	44%
1986	46	22.16	2,164	366	77.7%	2,786	1.58	4,411	**7,197**	1,518	**17,414**	4,127	4.40	2.42	55%	63%
1987	37	12.67	3,558	758	77.9%	4,568	1.45	6,640	**11,208**	2,540	**46,864**	11,075	5.06	4.18	83%	108%
1988	31	10.04	1,854	500	82.0%	2,261	1.32	2,994	**5,255**	1,325	**22,983**	5,753	4.81	4.37	91%	113%
1989	23	7.45	2,307	751	78.8%	2,927	1.19	3,495	**6,422**	1,828	**28,965**	8,707	4.99	4.51	90%	117%
1990	33	10.70	2,141	552	79.6%	2,689	1.06	2,862	**5,551**	1,369	**24,892**	6,530	5.03	4.48	89%	116%
1991	36	11.66	1,596	491	76.9%	2,075	0.93	1,940	**4,015**	1,132	**16,402**	4,780	5.27	4.09	77%	106%
1992	42	13.39	1,230	308	77.5%	1,587	0.81	1,289	**2,876**	742	**13,997**	3,720	5.43	4.87	90%	126%
1993	47	15.23	1,410	348	75.3%	1,874	0.74	1,385	**3,259**	862	**11,135**	3,246	4.27	3.42	80%	88%
1994	41	13.27	1,779	344	77.4%	2,300	0.70	1,607	**3,907**	982	**13,769**	3,572	4.65	3.52	76%	91%
1995	50	22.56	2,094	417	78.0%	2,684	0.63	1,679	**4,363**	1,138	**16,236**	4,498	4.88	3.72	76%	96%
1996	54	19.44	1,988	377	77.3%	2,573	0.53	1,373	**3,946**	570	**15,913**	2,473	5.06	4.03	80%	104%
1997	72	23.31	1,719	404	82.7%	2,079	0.55	1,154	**3,233**	575	**12,335**	2,476	4.38	3.82	87%	99%
1998	64	20.71	2,384	374	80.6%	2,956	0.55	1,623	**4,579**	612	**20,493**	2,663	4.87	4.48	92%	116%
1999	53	16.97	2,320	532	81.0%	2,864	0.53	1,513	**4,377**	784	**19,556**	3,396	4.96	4.47	90%	116%
2000	80	25.86	1,965	295	82.0%	2,398	0.53	1,260	**3,657**	482	**18,103**	2,473	5.34	4.95	93%	128%
2001	81	26.23	1,474	275	78.7%	1,873	0.53	1,002	**2,875**	487	**7,044**	1,281	4.18	2.45	59%	63%
2002	84	27.15	2,135	407	80.1%	2,664	0.49	1,300	**3,964**	711	**16,690**	3,522	5.26	4.21	80%	109%
2003	83	26.87	1,651	350	82.7%	1,998	0.45	889	**2,887**	563	**9,341**	2,119	4.41	3.24	73%	84%
2004	81	26.22	2,102	387	81.1%	2,590	0.43	1,119	**3,710**	655	**14,328**	2,761	4.97	3.86	78%	100%
2005	83	26.87	3,489	538	80.3%	4,346	0.43	1,860	**6,206**	985	**25,994**	4,529	4.69	4.19	89%	108%
2006	75	24.28	3,272	641	80.6%	4,061	0.46	1,853	**5,913**	1,030	**20,324**	3,726	4.50	3.44	76%	89%
2007	79	25.58	2,490	340	82.7%	3,013	0.44	1,319	**4,332**	631	**18,474**	2,861	5.06	4.26	84%	110%
2008	82	26.55	2,911	482	79.5%	3,662	0.42	1,536	**5,198**	865	**20,124**	3,622	5.04	3.87	77%	100%
2009	81	26.24	4,201	576	81.2%	5,176	0.40	2,077	**7,253**	1,149	**29,651**	4,667	4.50	4.09	91%	106%

COEI **Common Eider**



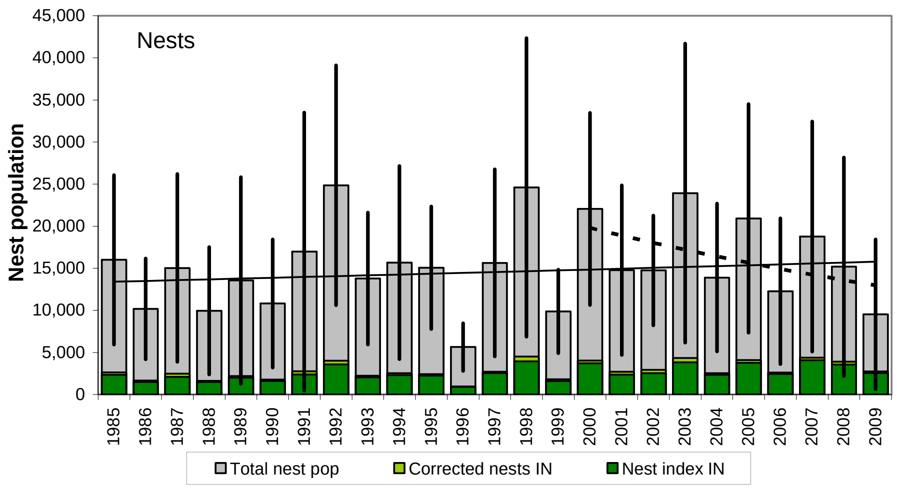
1985-2009 avg annual growth rate= 1.083 (90%c.i.= 1.058-1.108)
2000-2009 last 10 yrs annual growth rate= 1.123 (90%c.i.= 1.057-1.189)



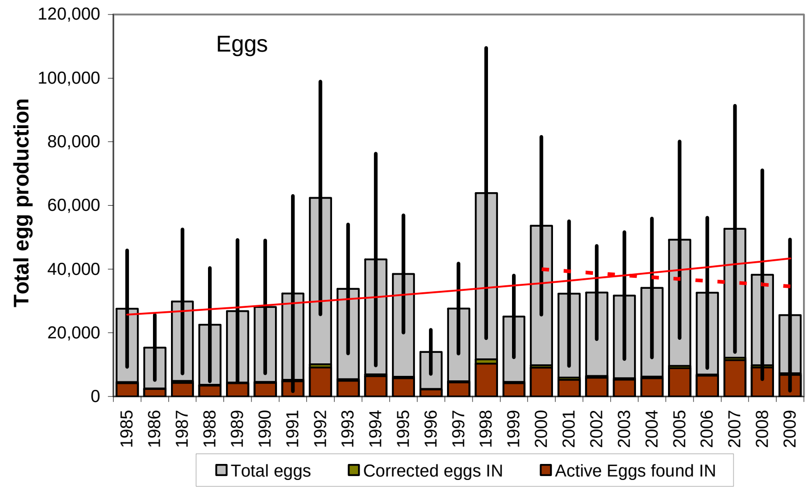
1985-2009 avg annual growth rate= 1.092 (90%c.i.= 1.058-1.126)
2000-2009 last 10 yrs annual growth rate= 1.135 (90%c.i.= 1.057-1.214)

Year	N plots	Sampled km2	Nest index IN	SE nest index IN	Avg nest detection rate	Corrected nests IN	7yr local regression OUT:IN ratio	Corrected nests OUT	**Total nests IN+OUT**	SE total nests	**Total eggs IN+OUT**	SE total eggs	Total eggs / active nests	Total eggs / total nests	Corrected % nest success	Relative production rate
1985	49	24.57	87	47	90.2%	97	1.96	190	**287**	177	**527**	489	6.00	1.84	31%	44%
1986	46	22.16	65	45	94.2%	69	1.83	125	**194**	136	**876**	620	4.52	4.52	100%	109%
1987	37	12.67	339	152	94.7%	358	1.70	606	**964**	511	**4,315**	2,399	5.41	4.47	83%	108%
1988	31	10.04	214	156	86.3%	248	1.56	388	**635**	441	**3,401**	2,324	5.35	5.35	100%	129%
1989	23	7.45	1,154	456	91.9%	1,256	1.43	1,799	**3,055**	1,476	**17,358**	8,516	5.68	5.68	100%	137%
1990	33	10.70	335	216	91.2%	367	1.30	477	**844**	540	**3,803**	2,432	4.50	4.50	100%	109%
1991	36	11.66	737	381	90.6%	814	1.17	952	**1,765**	1,002	**4,656**	2,893	4.76	2.64	55%	64%
1992	42	13.39	642	254	91.9%	698	0.97	678	**1,376**	598	**6,739**	3,047	5.38	4.90	91%	118%
1993	47	15.23	376	203	89.5%	420	1.11	466	**886**	437	**2,359**	1,065	4.43	2.66	60%	64%
1994	41	13.27	431	205	92.7%	465	1.24	578	**1,043**	454	**3,362**	1,526	3.73	3.22	86%	78%
1995	50	22.56	539	247	95.1%	567	1.18	671	**1,238**	437	**5,876**	2,252	5.08	4.75	93%	114%
1996	54	19.44	773	271	91.4%	846	1.18	996	**1,842**	628	**9,488**	3,221	5.44	5.15	95%	124%
1997	72	23.31	737	285	92.1%	800	1.10	878	**1,678**	632	**6,926**	2,688	4.53	4.13	91%	100%
1998	64	20.71	1,106	299	87.7%	1,261	1.20	1,513	**2,774**	788	**10,622**	3,024	5.01	3.83	76%	92%
1999	53	16.97	717	296	91.7%	782	1.28	1,003	**1,785**	663	**5,987**	2,367	4.47	3.35	75%	81%
2000	80	25.86	775	212	92.6%	837	1.16	970	**1,807**	582	**8,501**	2,722	4.90	4.70	96%	113%
2001	81	26.23	900	292	93.6%	962	1.02	986	**1,947**	693	**7,160**	2,580	4.10	3.68	90%	89%
2002	84	27.15	685	191	92.6%	740	1.07	791	**1,531**	544	**6,933**	2,506	4.72	4.53	96%	109%
2003	83	26.87	639	225	92.9%	688	1.20	825	**1,513**	569	**4,736**	1,998	4.28	3.13	73%	75%
2004	81	26.22	600	212	94.3%	637	1.28	816	**1,453**	536	**6,635**	2,398	4.80	4.57	95%	110%
2005	83	26.87	1,225	298	92.4%	1,325	1.24	1,638	**2,964**	962	**12,621**	4,122	4.93	4.26	86%	103%
2006	75	24.28	1,916	751	94.4%	2,030	1.29	2,612	**4,642**	1,738	**19,369**	7,398	4.81	4.17	87%	101%
2007	79	25.58	1,763	540	90.5%	1,948	1.45	2,817	**4,765**	1,529	**23,605**	7,982	5.22	4.95	95%	119%
2008	82	26.55	1,132	329	91.9%	1,232	1.60	1,978	**3,210**	989	**13,830**	4,450	4.82	4.31	89%	104%
2009	81	26.24	1,146	295	90.5%	1,266	1.76	2,233	**3,500**	1,033	**15,401**	4,474	4.91	4.40	90%	106%

GLGU **Glaucous Gull**



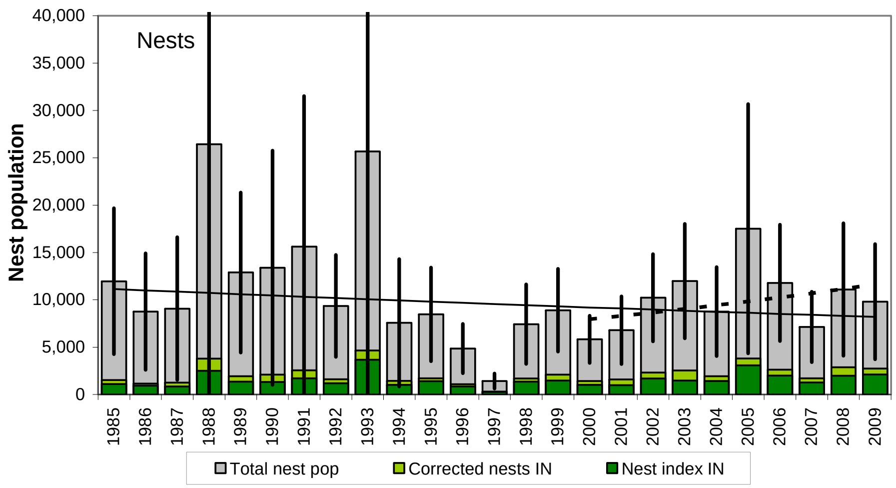
1985-2009 avg annual growth rate= 1.007 (90%c.i.= 0.991-1.023)
2000-2009 last 10 yrs annual growth rate= 0.954 (90%c.i.= 0.908-1.000)



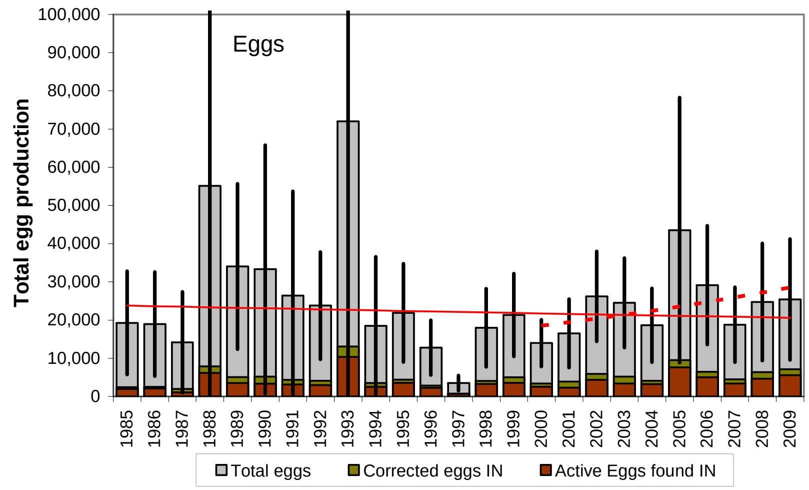
1985-2009 avg annual growth rate= 1.022 (90%c.i.= 1.005-1.039)
2000-2009 last 10 yrs annual growth rate= 0.984 (90%c.i.= 0.938-1.030)

Year	N plots	Sampled km2	Nest index IN	SE nest index IN	Avg nest detection rate	Corrected nests IN	7yr local regression OUT:IN ratio	Corrected nests OUT	**Total nests IN+OUT**	SE total nests	**Total eggs IN+OUT**	SE total eggs	Total eggs / active nests	Total eggs / total nests	Corrected % nest success	Relative production rate
1985	49	24.57	2,330	487	88.8%	2,625	5.10	13,385	**16,010**	6,114	**27,593**	11,084	2.08	1.72	83%	75%
1986	46	22.16	1,486	316	89.3%	1,663	5.11	8,499	**10,163**	3,642	**15,392**	6,203	2.15	1.51	70%	66%
1987	37	12.67	2,089	766	85.0%	2,457	5.12	12,581	**15,038**	6,789	**29,888**	13,743	2.15	1.99	93%	87%
1988	31	10.04	1,498	647	92.2%	1,624	5.13	8,335	**9,959**	4,600	**22,564**	10,803	2.53	2.27	90%	99%
1989	23	7.45	2,019	1,106	91.4%	2,208	5.14	11,350	**13,558**	7,459	**26,826**	13,577	2.27	1.98	87%	86%
1990	33	10.70	1,606	689	91.3%	1,758	5.15	9,057	**10,815**	4,630	**28,151**	12,673	2.91	2.60	90%	114%
1991	36	11.66	2,395	1,501	86.9%	2,754	5.16	14,217	**16,972**	10,040	**32,338**	18,637	2.99	1.91	64%	83%
1992	42	13.39	3,582	1,211	88.9%	4,027	5.17	20,831	**24,858**	8,666	**62,382**	22,220	2.71	2.51	92%	110%
1993	47	15.23	2,021	703	90.7%	2,228	5.18	11,550	**13,779**	4,758	**33,824**	12,299	2.53	2.45	97%	107%
1994	41	13.27	2,319	1,103	91.6%	2,532	5.19	13,151	**15,683**	6,980	**43,054**	20,225	2.83	2.75	97%	120%
1995	50	22.56	2,252	643	92.8%	2,428	5.20	12,634	**15,062**	4,426	**38,489**	11,187	2.56	2.56	100%	112%
1996	54	19.44	884	241	94.0%	940	4.99	4,689	**5,629**	1,723	**14,029**	4,229	2.49	2.49	100%	109%
1997	72	23.31	2,548	1,188	93.8%	2,716	4.76	12,916	**15,632**	6,757	**27,649**	8,599	1.79	1.77	99%	77%
1998	64	20.71	3,939	1,749	87.6%	4,495	4.47	20,107	**24,601**	10,781	**63,904**	27,704	2.67	2.60	97%	113%
1999	53	16.97	1,603	387	88.9%	1,804	4.48	8,079	**9,883**	3,017	**25,124**	7,790	2.72	2.54	94%	111%
2000	80	25.86	3,709	974	91.5%	4,054	4.44	18,005	**22,059**	6,939	**53,612**	16,971	2.50	2.43	97%	106%
2001	81	26.23	2,347	955	86.3%	2,718	4.44	12,056	**14,774**	6,130	**32,333**	13,811	2.36	2.19	93%	96%
2002	84	27.15	2,531	580	86.7%	2,917	4.06	11,833	**14,750**	3,967	**32,641**	8,904	2.59	2.21	85%	97%
2003	83	26.87	3,835	1,748	88.4%	4,338	4.52	19,596	**23,934**	10,798	**31,702**	12,116	1.64	1.32	81%	58%
2004	81	26.22	2,320	717	91.5%	2,534	4.48	11,361	**13,896**	5,333	**34,087**	13,267	2.49	2.45	99%	107%
2005	83	26.87	3,782	1,049	92.6%	4,084	4.12	16,836	**20,920**	8,251	**49,252**	18,763	2.41	2.35	98%	103%
2006	75	24.28	2,446	742	94.1%	2,600	3.72	9,664	**12,264**	5,268	**32,550**	14,346	2.69	2.65	99%	116%
2007	79	25.58	4,057	1,101	93.0%	4,360	3.30	14,409	**18,769**	8,316	**52,646**	23,494	2.83	2.80	99%	122%
2008	82	26.55	3,558	1,156	91.2%	3,901	2.89	11,283	**15,185**	7,891	**38,234**	19,934	2.67	2.52	94%	110%
2009	81	26.24	2,537	688	92.8%	2,735	2.48	6,783	**9,518**	5,406	**25,552**	14,438	2.72	2.68	99%	117%

MEGU **Mew Gull**



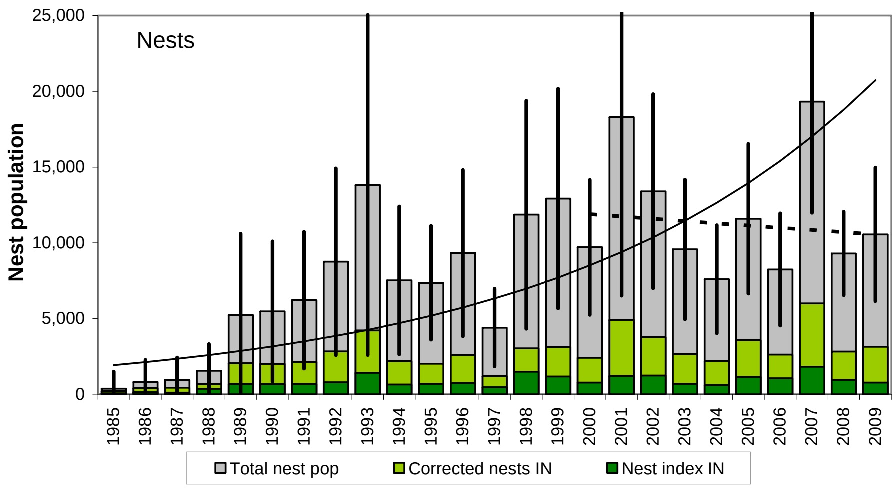
1985-2009 avg annual growth rate= 0.987 (90%c.i.= 0.962-1.013)
2000-2009 last 10 yrs annual growth rate= 1.043 (90%c.i.= 0.983-1.103)



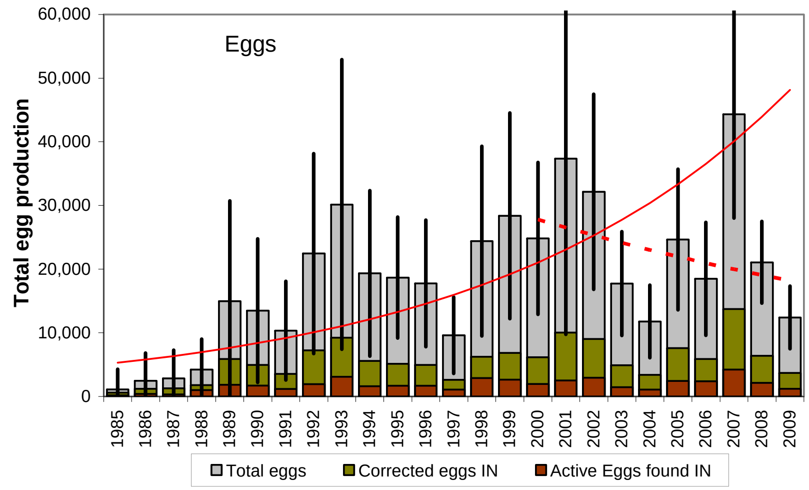
1985-2009 avg annual growth rate= 0.994 (90%c.i.= 0.966-1.022)
2000-2009 last 10 yrs annual growth rate= 1.049 (90%c.i.= 0.991-1.107)

Year	N plots	Sampled km2	Nest index IN	SE nest index IN	Avg nest detection rate	Corrected nests IN	7yr local regression OUT:IN ratio	Corrected nests OUT	**Total nests IN+OUT**	SE total nests	**Total eggs IN+OUT**	SE total eggs	Total eggs / active nests	Total eggs / total nests	Corrected % nest success	Relative production rate
1985	49	24.57	1,107	270	72.6%	1,525	6.85	10,445	**11,969**	4,681	**19,250**	8,225	1.95	1.61	82%	69%
1986	46	22.16	937	286	80.9%	1,157	6.56	7,590	**8,747**	3,740	**18,956**	8,279	2.29	2.17	95%	93%
1987	37	12.67	847	385	67.8%	1,249	6.26	7,824	**9,073**	4,577	**14,167**	8,045	1.56	1.56	100%	67%
1988	31	10.04	2,496	1,871	65.9%	3,789	5.97	22,631	**26,420**	18,000	**55,162**	41,709	2.47	2.09	85%	89%
1989	23	7.45	1,346	385	69.7%	1,930	5.68	10,959	**12,888**	5,138	**34,008**	13,163	2.64	2.64	100%	113%
1990	33	10.70	1,338	814	63.9%	2,095	5.39	11,283	**13,377**	7,516	**33,301**	19,757	2.68	2.49	93%	106%
1991	36	11.66	1,719	1,037	67.1%	2,562	5.09	13,053	**15,615**	9,666	**26,452**	16,556	2.37	1.69	72%	72%
1992	42	13.39	1,176	323	72.9%	1,612	4.80	7,742	**9,354**	3,272	**23,778**	8,540	2.69	2.54	95%	109%
1993	47	15.23	3,667	2,931	78.7%	4,661	4.51	21,012	**25,672**	17,918	**72,016**	50,675	2.81	2.81	100%	120%
1994	41	13.27	1,024	547	70.7%	1,450	4.22	6,110	**7,560**	4,089	**18,454**	11,001	2.65	2.44	92%	104%
1995	50	22.56	1,396	403	81.2%	1,719	3.92	6,745	**8,465**	3,003	**21,904**	7,817	2.59	2.59	100%	111%
1996	54	19.44	847	241	78.2%	1,083	3.47	3,763	**4,846**	1,583	**12,787**	4,358	2.64	2.64	100%	113%
1997	72	23.31	276	85	85.6%	323	3.42	1,104	**1,426**	479	**3,501**	1,212	2.45	2.45	100%	105%
1998	64	20.71	1,348	446	80.0%	1,685	3.41	5,738	**7,423**	2,554	**18,009**	6,208	2.43	2.43	100%	104%
1999	53	16.97	1,476	399	70.7%	2,089	3.26	6,813	**8,903**	2,651	**21,335**	6,589	2.48	2.40	97%	102%
2000	80	25.86	1,024	189	72.4%	1,414	3.12	4,411	**5,825**	1,511	**13,966**	3,737	2.59	2.40	93%	102%
2001	81	26.23	982	300	61.8%	1,588	3.27	5,201	**6,790**	2,175	**16,523**	5,445	2.43	2.43	100%	104%
2002	84	27.15	1,687	378	73.2%	2,305	3.44	7,924	**10,229**	2,797	**26,211**	7,157	2.68	2.56	96%	109%
2003	83	26.87	1,465	387	57.8%	2,535	3.72	9,443	**11,978**	3,672	**24,543**	7,131	2.58	2.05	79%	88%
2004	81	26.22	1,419	326	73.4%	1,934	3.53	6,829	**8,763**	2,859	**18,640**	5,866	2.45	2.13	87%	91%
2005	83	26.87	3,090	1,366	81.0%	3,813	3.59	13,698	**17,511**	8,000	**43,559**	21,093	2.49	2.49	100%	106%
2006	75	24.28	2,004	507	76.4%	2,623	3.49	9,162	**11,786**	3,741	**29,132**	9,457	2.47	2.47	100%	106%
2007	79	25.58	1,287	252	75.5%	1,705	3.18	5,426	**7,131**	2,256	**18,787**	5,970	2.63	2.63	100%	113%
2008	82	26.55	1,968	520	68.7%	2,866	2.87	8,226	**11,092**	4,245	**24,738**	9,315	2.49	2.23	90%	95%
2009	81	26.24	2,128	370	77.2%	2,755	2.56	7,053	**9,809**	3,703	**25,404**	9,615	2.65	2.59	98%	111%

SAGU **Sabine's Gull**



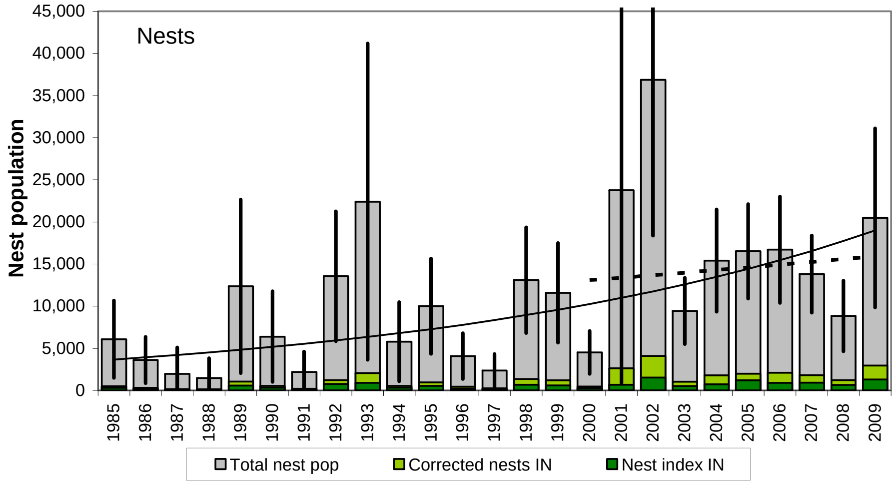
1985-2009 avg annual growth rate= 1.104 (90%c.i.= 1.069-1.139)
2000-2009 last 10 yrs annual growth rate= 0.987 (90%c.i.= 0.927-1.046)



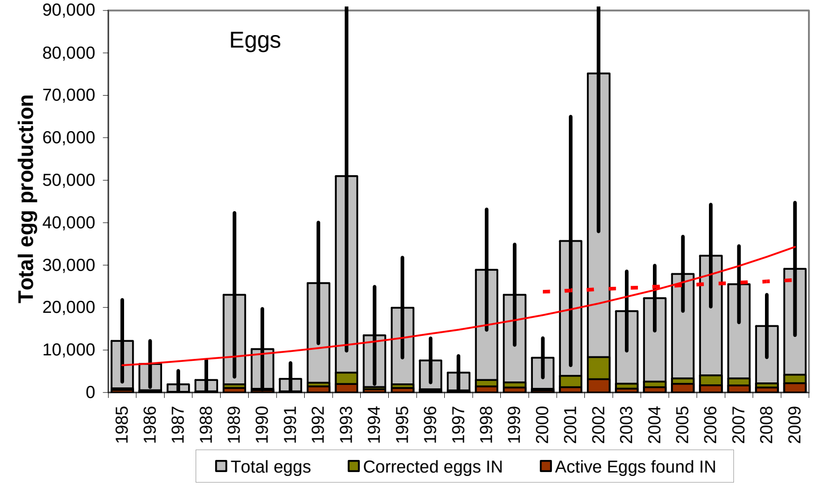
1985-2009 avg annual growth rate= 1.096 (90%c.i.= 1.061-1.132)
2000-2009 last 10 yrs annual growth rate= 0.954 (90%c.i.= 0.878-1.030)

Year	N plots	Sampled km2	Nest index IN	SE nest index IN	Avg nest detection rate	Corrected nests IN	7yr local regression OUT:IN ratio	Corrected nests OUT	**Total nests IN+OUT**	SE total nests	**Total eggs IN+OUT**	SE total eggs	Total eggs / active nests	Total eggs / total nests	Corrected % nest success	Relative production rate
1985	49	24.57	56	76	27.5%	205	0.82	168	**373**	693	**1,118**	1,923	3.00	3.00	100%	131%
1986	46	22.16	129	78	31.5%	410	1.00	410	**820**	881	**2,459**	2,642	3.00	3.00	100%	131%
1987	37	12.67	113	76	25.9%	436	1.18	515	**950**	896	**2,851**	2,688	3.00	3.00	100%	131%
1988	31	10.04	357	147	54.3%	656	1.36	894	**1,550**	1,072	**4,220**	2,902	2.72	2.72	100%	119%
1989	23	7.45	673	291	32.8%	2,053	1.54	3,171	**5,224**	3,277	**14,966**	9,564	2.86	2.86	100%	125%
1990	33	10.70	669	223	33.3%	2,007	1.73	3,464	**5,471**	2,810	**13,492**	6,842	2.47	2.47	100%	107%
1991	36	11.66	675	192	31.6%	2,134	1.91	4,072	**6,206**	2,750	**10,331**	4,718	1.66	1.66	100%	72%
1992	42	13.39	802	291	28.3%	2,833	2.09	5,919	**8,752**	3,751	**22,446**	9,552	2.56	2.56	100%	112%
1993	47	15.23	1,410	724	33.4%	4,225	2.27	9,594	**13,819**	6,822	**30,161**	13,823	2.41	2.18	91%	95%
1994	41	13.27	647	220	29.7%	2,179	2.45	5,344	**7,522**	2,965	**19,347**	7,897	2.57	2.57	100%	112%
1995	50	22.56	698	185	34.5%	2,024	2.63	5,332	**7,356**	2,287	**18,669**	5,769	2.54	2.54	100%	110%
1996	54	19.44	736	216	28.4%	2,591	2.60	6,730	**9,321**	3,337	**17,755**	6,043	2.42	1.90	79%	83%
1997	72	23.31	460	136	38.5%	1,196	2.68	3,209	**4,405**	1,561	**9,625**	3,639	2.18	2.18	100%	95%
1998	64	20.71	1,486	720	49.1%	3,026	2.92	8,831	**11,857**	4,574	**24,397**	9,049	2.06	2.06	100%	90%
1999	53	16.97	1,181	560	37.9%	3,113	3.15	9,809	**12,921**	4,413	**28,388**	9,807	2.20	2.20	100%	96%
2000	80	25.86	775	182	32.2%	2,408	3.03	7,295	**9,703**	2,707	**24,834**	7,237	2.56	2.56	100%	111%
2001	81	26.23	1,201	423	24.4%	4,915	2.72	13,378	**18,293**	7,164	**37,355**	16,782	2.30	2.04	89%	89%
2002	84	27.15	1,239	404	32.8%	3,774	2.55	9,629	**13,402**	3,898	**32,140**	9,314	2.40	2.40	100%	104%
2003	83	26.87	692	186	26.1%	2,656	2.60	6,907	**9,563**	2,805	**17,726**	4,946	2.18	1.85	85%	81%
2004	81	26.22	600	148	27.3%	2,199	2.45	5,395	**7,594**	2,170	**11,787**	3,455	1.99	1.55	78%	68%
2005	83	26.87	1,145	256	32.0%	3,579	2.24	8,013	**11,592**	3,006	**24,651**	6,713	2.13	2.13	100%	93%
2006	75	24.28	1,061	372	40.6%	2,616	2.15	5,626	**8,242**	2,255	**18,497**	5,387	2.24	2.24	100%	98%
2007	79	25.58	1,819	398	30.4%	5,992	2.22	13,325	**19,317**	4,456	**44,322**	9,895	2.29	2.29	100%	100%
2008	82	26.55	944	151	33.5%	2,819	2.30	6,478	**9,298**	1,680	**21,070**	3,894	2.27	2.27	100%	99%
2009	81	26.24	764	187	24.4%	3,130	2.37	7,424	**10,555**	2,679	**12,421**	2,986	1.76	1.18	67%	51%

ARTE **Arctic Tern**



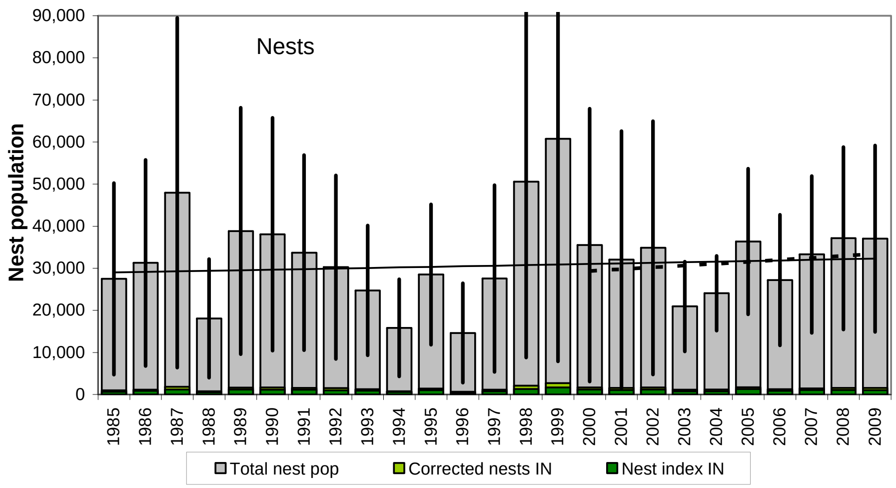
1985-2009 avg annual growth rate= 1.071 (90%c.i.= 1.036-1.106)
2000-2009 last 10 yrs annual growth rate= 1.022 (90%c.i.= 0.908-1.136)



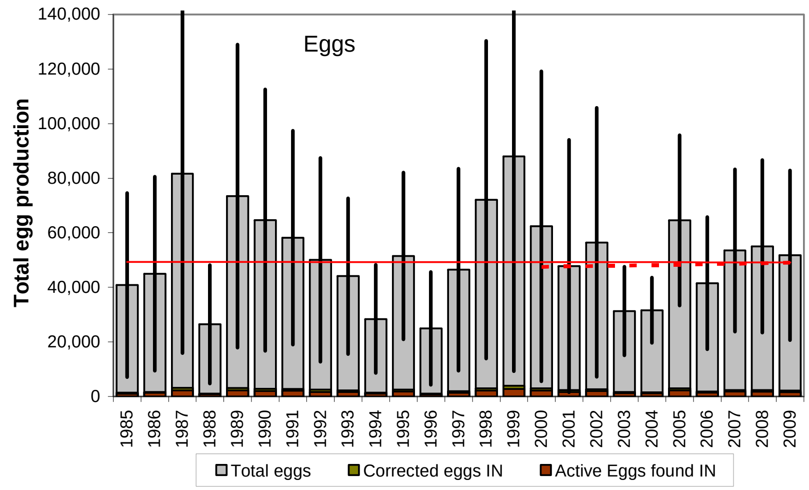
1985-2009 avg annual growth rate= 1.073 (90%c.i.= 1.031-1.114)
2000-2009 last 10 yrs annual growth rate= 1.012 (90%c.i.= 0.901-1.124)

Year	N plots	Sampled km2	Nest index IN	SE nest index IN	Avg nest detection rate	Corrected nests IN	7yr local regression OUT:IN ratio	Corrected nests OUT	**Total nests IN+OUT**	SE total nests	**Total eggs IN+OUT**	SE total eggs	Total eggs / active nests	Total eggs / total nests	Corrected % nest success	Relative production rate
1985	49	24.57	291	110	60.3%	483	11.61	5,604	**6,087**	2,788	**12,174**	5,858	2.00	2.00	100%	109%
1986	46	22.16	194	77	66.6%	291	11.39	3,316	**3,607**	1,661	**6,736**	3,300	1.87	1.87	100%	102%
1987	37	12.67	113	112	70.1%	161	11.17	1,799	**1,960**	1,916	**1,960**	1,916	1.00	1.00	100%	55%
1988	31	10.04	71	71	57.9%	123	10.95	1,348	**1,471**	1,426	**2,942**	2,851	2.00	2.00	100%	109%
1989	23	7.45	577	284	54.7%	1,054	10.73	11,304	**12,358**	6,255	**23,023**	11,729	1.86	1.86	100%	102%
1990	33	10.70	335	168	60.3%	554	10.51	5,825	**6,379**	3,274	**10,207**	5,779	1.60	1.60	100%	87%
1991	36	11.66	123	85	63.3%	194	10.29	1,995	**2,189**	1,474	**3,230**	2,259	1.48	1.48	100%	80%
1992	42	13.39	748	235	61.1%	1,225	10.07	12,330	**13,555**	4,694	**25,795**	8,648	1.90	1.90	100%	104%
1993	47	15.23	893	482	43.2%	2,066	9.85	20,342	**22,408**	11,408	**50,988**	25,019	2.28	2.28	100%	124%
1994	41	13.27	323	163	59.5%	544	9.63	5,232	**5,776**	2,858	**13,451**	6,964	2.33	2.33	100%	127%
1995	50	22.56	539	165	56.1%	961	9.41	9,036	**9,996**	3,444	**19,991**	7,145	2.00	2.00	100%	109%
1996	54	19.44	221	85	52.5%	421	8.67	3,648	**4,068**	1,652	**7,547**	3,153	1.86	1.86	100%	101%
1997	72	23.31	154	78	64.6%	238	8.91	2,118	**2,355**	1,183	**4,710**	2,367	2.00	2.00	100%	109%
1998	64	20.71	691	193	51.3%	1,348	8.72	11,747	**13,094**	3,818	**28,923**	8,626	2.21	2.21	100%	120%
1999	53	16.97	591	170	49.6%	1,190	8.73	10,390	**11,580**	3,589	**23,034**	7,186	1.99	1.99	100%	108%
2000	80	25.86	277	90	58.6%	473	8.52	4,028	**4,500**	1,551	**8,198**	2,811	1.82	1.82	100%	99%
2001	81	26.23	682	269	26.0%	2,623	8.06	21,149	**23,772**	13,935	**35,683**	17,798	1.92	1.50	78%	82%
2002	84	27.15	1,529	434	37.4%	4,091	8.01	32,781	**36,872**	11,258	**75,148**	22,615	2.04	2.04	100%	111%
2003	83	26.87	506	136	49.2%	1,028	8.18	8,409	**9,436**	2,388	**19,180**	5,670	2.03	2.03	100%	111%
2004	81	26.22	737	137	41.2%	1,789	7.61	13,609	**15,398**	3,695	**22,248**	4,652	1.77	1.44	82%	79%
2005	83	26.87	1,199	258	60.4%	1,985	7.32	14,523	**16,509**	3,410	**27,956**	5,326	1.69	1.69	100%	92%
2006	75	24.28	884	175	42.4%	2,087	7.01	14,621	**16,708**	3,834	**32,248**	7,289	1.93	1.93	100%	105%
2007	79	25.58	923	169	51.1%	1,806	6.65	12,004	**13,810**	2,785	**25,513**	5,455	1.85	1.85	100%	101%
2008	82	26.55	647	170	53.4%	1,213	6.29	7,625	**8,838**	2,550	**15,678**	4,484	1.77	1.77	100%	97%
2009	81	26.24	1,310	463	44.3%	2,956	5.93	17,526	**20,482**	6,458	**29,116**	9,480	1.75	1.42	81%	77%

PALO **Pacific Loon**



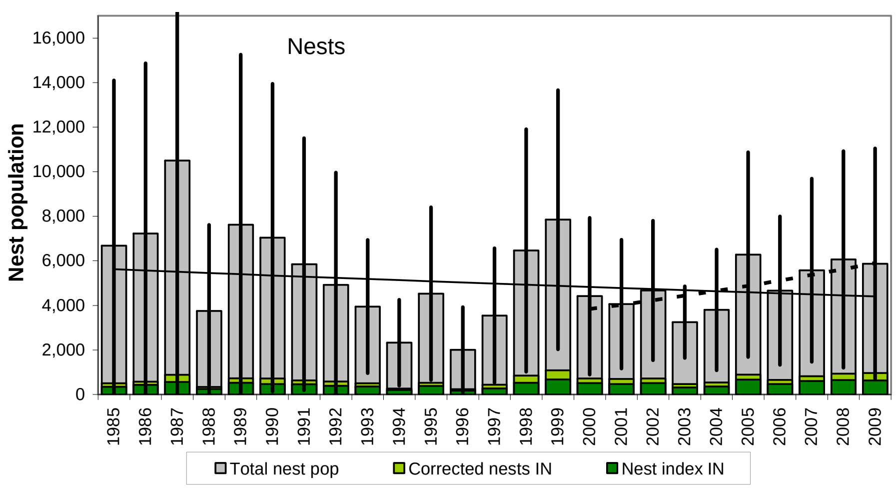
1985-2009 avg annual growth rate= 1.004 (90%c.i.= 0.989-1.020)
2000-2009 last 10 yrs annual growth rate= 1.014 (90%c.i.= 0.976-1.053)

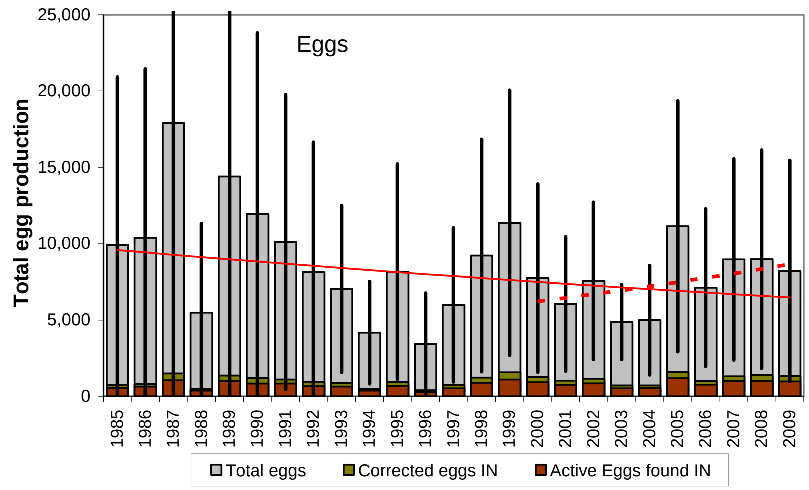


1985-2009 avg annual growth rate= 1.000 (90%c.i.= 0.983-1.017)
2000-2009 last 10 yrs annual growth rate= 1.004 (90%c.i.= 0.954-1.053)

Year	N plots	Sampled km2	Nest index IN	SE nest index IN	Avg nest detection rate	Corrected nests IN	7yr local regression OUT:IN ratio	Corrected nests OUT	**Total nests IN+OUT**	SE total nests	**Total eggs IN+OUT**	SE total eggs	Total eggs / active nests	Total eggs / total nests	Corrected % nest success	Relative production rate
1985	49	24.57	675	186	68.7%	982	26.99	26,506	**27,488**	13,837	**40,828**	20,478	1.64	1.49	90%	92%
1986	46	22.16	866	229	74.4%	1,164	25.88	30,113	**31,276**	14,887	**44,998**	21,594	1.64	1.44	88%	90%
1987	37	12.67	1,188	361	63.9%	1,860	24.77	46,077	**47,937**	25,257	**81,680**	39,969	1.95	1.70	88%	106%
1988	31	10.04	539	166	73.5%	733	23.66	17,349	**18,083**	8,564	**26,434**	13,185	1.66	1.46	88%	91%
1989	23	7.45	1,203	377	72.9%	1,651	22.54	37,211	**38,861**	17,798	**73,441**	33,756	1.89	1.89	100%	118%
1990	33	10.70	1,130	322	66.6%	1,697	21.43	36,369	**38,065**	16,819	**64,641**	29,124	1.82	1.70	93%	106%
1991	36	11.66	1,137	274	71.9%	1,581	20.32	32,120	**33,700**	14,099	**58,209**	23,812	1.86	1.73	93%	107%
1992	42	13.39	1,001	256	66.8%	1,498	19.21	28,775	**30,273**	13,258	**50,095**	22,713	1.86	1.65	89%	103%
1993	47	15.23	911	248	71.8%	1,269	18.48	23,465	**24,734**	9,366	**44,099**	17,342	1.92	1.78	93%	111%
1994	41	13.27	601	225	77.2%	779	19.31	15,041	**15,820**	7,024	**28,424**	12,060	1.80	1.80	100%	112%
1995	50	22.56	1,018	213	73.0%	1,395	19.44	27,114	**28,508**	10,131	**51,490**	18,571	1.81	1.81	100%	112%
1996	54	19.44	454	149	71.6%	633	22.07	13,977	**14,610**	7,181	**24,912**	12,573	1.71	1.71	100%	106%
1997	72	23.31	733	173	63.7%	1,149	22.97	26,407	**27,557**	13,495	**46,476**	22,494	1.91	1.69	88%	105%
1998	64	20.71	1,305	262	61.5%	2,122	22.82	48,423	**50,545**	25,368	**72,076**	35,380	1.87	1.43	76%	89%
1999	53	16.97	1,689	344	61.8%	2,732	21.23	58,009	**60,742**	32,146	**87,999**	47,859	1.81	1.45	80%	90%
2000	80	25.86	1,207	226	71.2%	1,695	19.95	33,814	**35,509**	19,694	**62,344**	34,512	1.89	1.76	93%	109%
2001	81	26.23	1,080	224	68.4%	1,578	19.32	30,483	**32,061**	18,573	**47,816**	28,105	1.62	1.49	92%	93%
2002	84	27.15	1,201	193	71.7%	1,677	19.79	33,182	**34,859**	18,294	**56,469**	29,945	1.72	1.62	94%	101%
2003	83	26.87	749	169	66.4%	1,129	17.53	19,801	**20,930**	6,484	**31,339**	9,880	1.73	1.50	86%	93%
2004	81	26.22	764	133	64.9%	1,176	19.46	22,888	**24,064**	5,394	**31,607**	7,237	1.72	1.31	76%	82%
2005	83	26.87	1,279	231	74.8%	1,709	20.27	34,658	**36,368**	10,524	**64,533**	18,973	1.81	1.77	98%	110%
2006	75	24.28	886	187	72.0%	1,231	21.09	25,955	**27,186**	9,435	**41,516**	14,698	1.72	1.53	89%	95%
2007	79	25.58	1,078	206	73.4%	1,467	21.68	31,817	**33,284**	11,328	**53,503**	18,064	1.74	1.61	92%	100%
2008	82	26.55	1,104	227	69.2%	1,595	22.28	35,539	**37,135**	13,167	**55,052**	19,204	1.64	1.48	91%	92%
2009	81	26.24	1,029	210	66.3%	1,552	22.87	35,488	**37,039**	13,472	**51,761**	18,897	1.73	1.40	81%	87%

RTLO **Red-throated Loon**





1985-2009 avg annual growth rate= 0.990 (90%c.i.= 0.973-1.007)
2000-2009 last 10 yrs annual growth rate= 1.049 (90%c.i.= 1.015-1.082)

1985-2009 avg annual growth rate= 0.984 (90%c.i.= 0.965-1.002)
2000-2009 last 10 yrs annual growth rate= 1.038 (90%c.i.= 0.990-1.085)

Year	N plots	Sampled km2	Nest index IN	SE nest index IN	Avg nest detection rate	Corrected nests IN	7yr local regression OUT:IN ratio	Corrected nests OUT	**Total nests IN+OUT**	SE total nests	**Total eggs IN+OUT**	SE total eggs	Total eggs / active nests	Total eggs / total nests	Corrected % nest success	Relative production rate
1985	49	24.57	345	142	68.7%	501	12.32	6,176	**6,677**	4,511	**9,918**	6,686	1.64	1.49	90%	92%
1986	46	22.16	426	167	74.4%	572	11.62	6,651	**7,223**	4,649	**10,393**	6,721	1.64	1.44	88%	90%
1987	37	12.67	563	232	63.9%	881	10.93	9,626	**10,507**	7,112	**17,903**	11,557	1.95	1.70	88%	106%
1988	31	10.04	246	100	73.5%	334	10.23	3,420	**3,754**	2,348	**5,487**	3,545	1.66	1.46	88%	91%
1989	23	7.45	527	213	72.9%	723	9.54	6,899	**7,622**	4,639	**14,405**	8,786	1.89	1.89	100%	118%
1990	33	10.70	476	179	66.6%	715	8.84	6,321	**7,035**	4,199	**11,947**	7,212	1.82	1.70	93%	106%
1991	36	11.66	460	157	71.9%	639	8.15	5,211	**5,850**	3,439	**10,105**	5,869	1.86	1.73	93%	107%
1992	42	13.39	389	139	66.8%	582	7.45	4,336	**4,918**	3,065	**8,138**	5,168	1.86	1.65	89%	103%
1993	47	15.23	358	125	71.8%	498	6.92	3,449	**3,947**	1,820	**7,037**	3,325	1.92	1.78	93%	111%
1994	41	13.27	208	93	77.2%	269	7.64	2,055	**2,324**	1,171	**4,175**	2,036	1.80	1.80	100%	112%
1995	50	22.56	378	139	73.0%	518	7.74	4,007	**4,524**	2,355	**8,171**	4,284	1.81	1.81	100%	112%
1996	54	19.44	172	74	71.6%	240	7.37	1,772	**2,013**	1,165	**3,432**	2,023	1.71	1.71	100%	106%
1997	72	23.31	281	96	63.7%	440	7.06	3,110	**3,550**	1,835	**5,988**	3,066	1.91	1.69	88%	105%
1998	64	20.71	526	167	61.5%	855	6.56	5,613	**6,468**	3,307	**9,224**	4,628	1.87	1.43	76%	89%
1999	53	16.97	673	215	61.8%	1,089	6.21	6,759	**7,847**	3,535	**11,369**	5,279	1.81	1.45	80%	90%
2000	80	25.86	509	155	71.2%	715	5.17	3,698	**4,413**	2,138	**7,749**	3,747	1.89	1.76	93%	109%
2001	81	26.23	476	123	68.4%	695	4.84	3,365	**4,060**	1,756	**6,055**	2,668	1.62	1.49	92%	93%
2002	84	27.15	512	117	71.7%	715	5.53	3,954	**4,668**	1,906	**7,562**	3,128	1.72	1.62	94%	101%
2003	83	26.87	316	83	66.4%	476	5.83	2,773	**3,249**	976	**4,864**	1,485	1.73	1.50	86%	93%
2004	81	26.22	355	80	64.9%	547	5.94	3,253	**3,801**	1,648	**4,992**	2,177	1.72	1.31	76%	82%
2005	83	26.87	666	148	74.8%	890	6.05	5,387	**6,277**	2,793	**11,138**	4,988	1.81	1.77	98%	110%
2006	75	24.28	469	127	72.0%	652	6.16	4,013	**4,665**	2,025	**7,124**	3,128	1.72	1.53	89%	95%
2007	79	25.58	601	151	73.4%	819	5.82	4,760	**5,578**	2,502	**8,967**	4,005	1.74	1.61	92%	100%
2008	82	26.55	648	169	69.2%	937	5.47	5,126	**6,063**	2,956	**8,988**	4,348	1.64	1.48	91%	92%
2009	81	26.24	635	165	66.3%	958	5.13	4,916	**5,874**	3,142	**8,209**	4,398	1.73	1.40	81%	87%

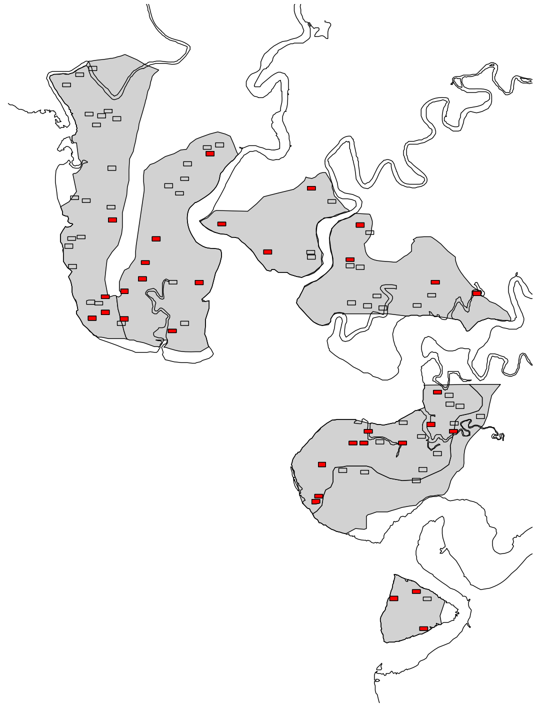


Figure 3. Location of plots with recent fox activity (red rectangles) relative to plots without evidence of foxes (open triangles), Yukon-Kuskokwim Delta, 2009.

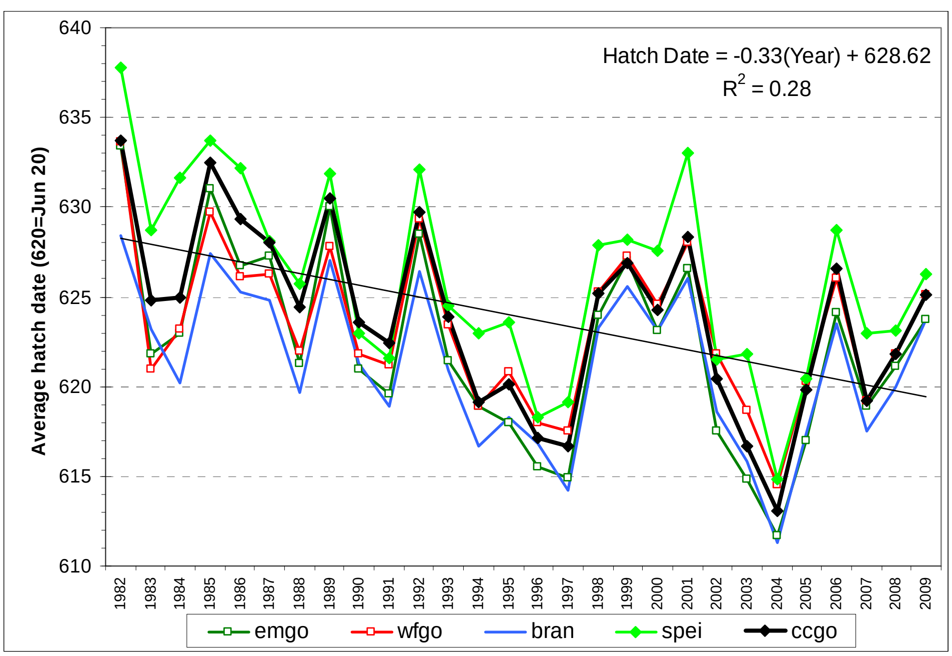


Figure 4. Estimated average hatch dates of emperor geese, white-fronted geese, black brant, spectacled eiders, and cackling geese, based on egg float angles, 1982-2009. Linear regression on cackling goose hatch date indicates an average advance of 0.33 days per year.

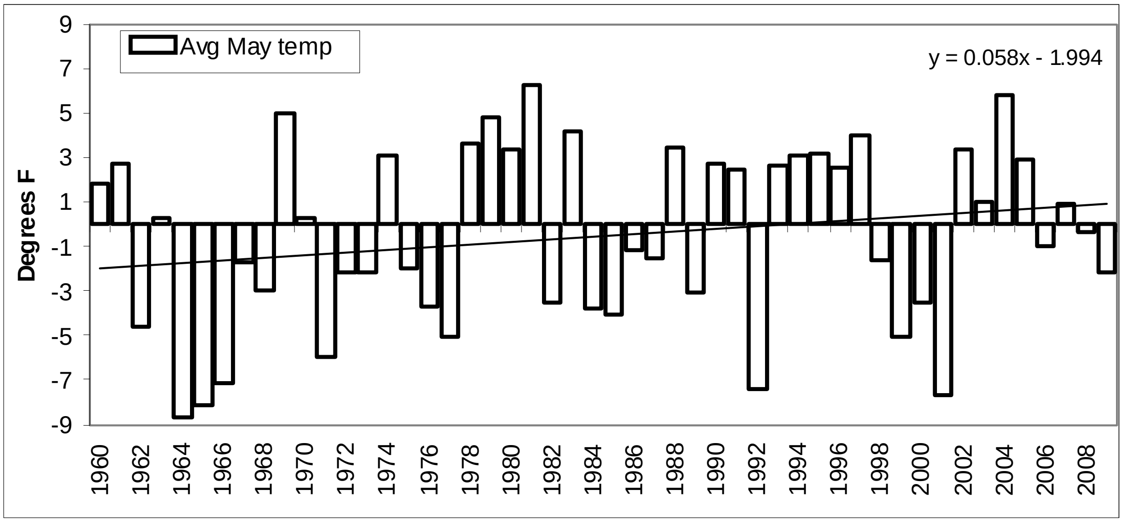


Figure 5. Linear trend of 1960-2009 May temperatures on the Yukon-Kuskokwim Delta expressed as the average of deviates from 1984-2008 individual station means. Temperature data were used as available from seven weather stations, Bethel, St. Mary's, Cape Romanzoff, Hooper Bay, Mekoryuk, Emmonak, and Nome. The long-term trend indicates an average annual increase of 0.058 degrees Fahrenheit (0.032 degrees C), which equates to an increase of 2.84 degrees F (1.57 degrees C) since 1960.

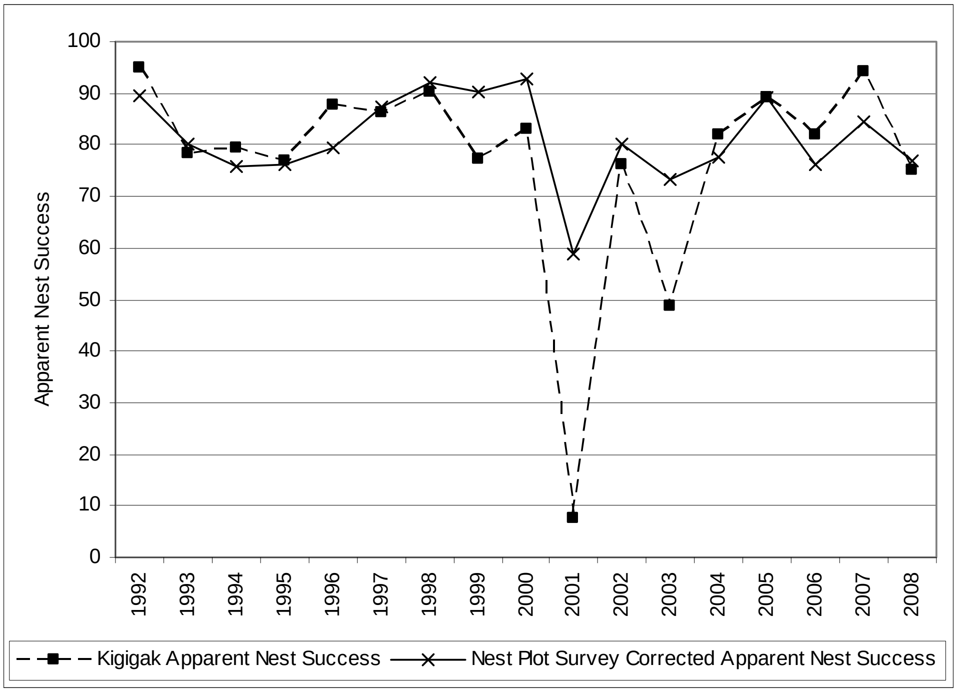


Figure 6. Comparison of spectacled eider apparent nest success measures at Kigigak Island (successful hatched nests/total nests; Lake 2008) and the Yukon-Kuskokwim Delta nest plot survey (active nests at time of search/total nests, corrected for nest detection rate), 1992-2008.

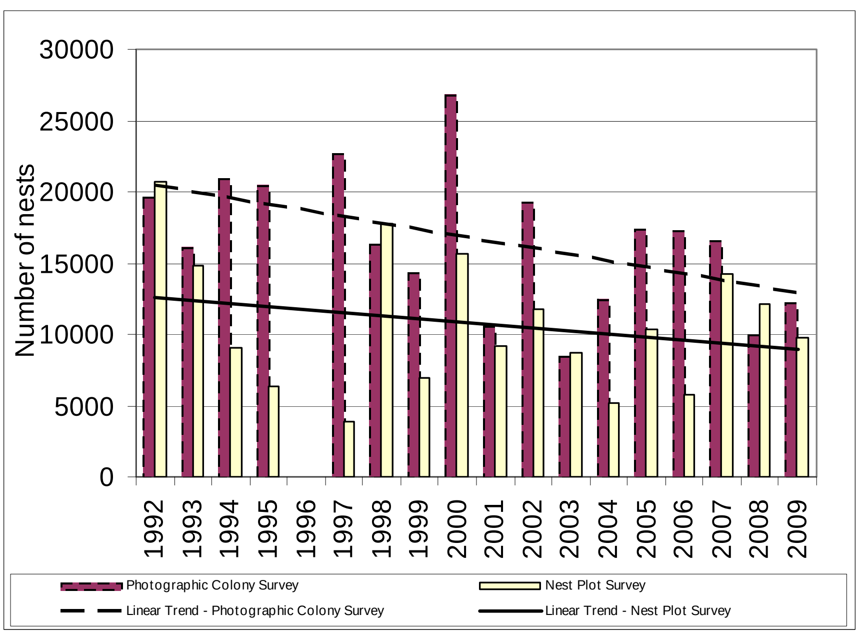


Figure 7. Numbers and trends of black brant nests as measured by an aerial photographic survey in 5 primary colonies (red bars and dashed line; Wilson 2009) and by the nest plot survey (yellow bars and solid line; nest estimates presented in this figure represent the ground sampled area only, not expanded to entire coastal zone). The aerial photographic survey and ground survey both include the colony at Kigigak Island.

Table 1. Estimated 10-year average (2000-2009) population sizes and growth rates (90% CI) of nests and eggs on the YKD coastal zone (12,832 km^2). Nest and egg estimates are corrected for average nest detection rate. Growth rates significantly different from zero are indicated by bold font.

Species	Mean Nest Population	Nest Population Growth Rate (90% CI)	Mean Egg Production	Egg Production Growth Rate (90% CI)
Cackling Goose	109250	1.036 (0.999-1.073)	388783	1.062 (0.987-1.137)
Emperor Goose	36695	**1.057 (1.011-1.103)**	165354	**1.066 (1.002-1.130)**
White-fronted Goose	135008	**1.052 (1.025-1.079)**	554451	**1.051 (1.015-1.088)**
Black Brant	34566	0.973 (0905-1.041)	85685	1.037 (0.902-1.172)
Tundra Swan	11533	1.003 (0.975-1.031)	43844	0.997 (0.934-1.061)
Sandhill Crane	17810	1.028 (0.951-1.106)	31970	1.034 (0.946-1.121)
Spectacled Eider	4600	**1.085 (1.042-1.127)**	18007	**1.097 (1.026-1.168)**
Common Eider	2733	**1.123 (1.057-1.189)**	11879	**1.135 (1.057-1.214)**
Glaucous Gull	16607	0.954 (0.908-1.000)	38261	0.984 (0.938-1.030)
Mew Gull	10091	1.043 (0.983-1.103)	24150	1.049 (0.991-1.107)
Sabine's Gull	11756	0.987 (0.927-1.046)	24480	0.954 (0.878-1.032)
Arctic Tern	16633	1.022 (0.908-1.136)	29097	1.012 (0.901-1.124)
Pacific Loon	31843	1.014 (0.976-1.053)	49594	1.004 (0.954-1.053)
Red-throated Loon	4865	**1.049 (1.015-1.082)**	7565	1.038 (0.990-1.085)

Table 2. Estimated 25-year average (1985-2009) population sizes and growth rates (90% CI) of nests and eggs on the YKD coastal zone (12,832 km^2). Nest and egg estimates are corrected for average nest detection rate. Growth rates significantly different from zero are indicated by bold font.

Species	Mean Nest Population	Nest Population Growth Rate (90% CI)	Mean Egg Production	Egg Production Growth Rate (90% CI)
Cackling Goose	85719	**1.056 (1.043-1.068)**	309383	**1.059 (1.038-1.080)**
Emperor Goose	36524	1.009 (0.996-1.023)	164342	1.010 (0.991-1.028)
White-fronted Goose	88690	**1.096 (1.081-1.112)**	367879	**1.098 (1.077-1.119)**
Black Brant	38370	0.998 (0.974-1.023)	103540	1.003 (0.964-1.042)
Tundra Swan	10126	**1.020 (1.011-1.029)**	38118	**1.022 (1.008-1.037)**
Sandhill Crane	17368	1.013 (0.996-1.031)	29597	1.018 (0.997-1.040)
Spectacled Eider	4964	0.987 (0.972-1.002)	18983	0.988 (0.970-1.007)
Common Eider	1908	**1.083 (1.058-1.108)**	8203	**1.092 (1.058-1.126)**
Glaucous Gull	15348	1.007 (0.991-1.023)	34953	**1.022 (1.005-1.039)**
Mew Gull	10906	0.987 (0.962-1.013)	25383	0.994 (0.966-1.022)
Sabine's Gull	8564	1.069 (0.878-1.030)	18601	**1.096 (1.061-1.132)**
Arctic Tern	11328	**1.071 (1.036-1.106)**	21027	**1.073 (1.031-1.114)**
Pacific Loon	32265	1.004 (0.989-1.020)	51670	1.000 (0.983-1.017)
Red-throated Loon	5316	0.990 (0.973-1.007)	8534	0.984 (0.965-1.002)

Table 3. Estimated hatch date based on egg float angles (1982-2009). Means calculated using nest as sample unit. Years with fewer than 3 nests per species not included in calculations.

Year	Mean	Min	Max	N
Cackling Goose				
1982	4-Jul	25-Jun	18-Jul	170
1983	25-Jun	15-Jun	14-Jul	284
1984	25-Jun	16-Jun	11-Jul	92
1985	3-Jul	24-Jun	15-Jul	278
1986	29-Jun	13-Jun	15-Jul	346
1987	28-Jun	20-Jun	18-Jul	204
1988	24-Jun	15-Jun	8-Jul	66
1989	1-Jul	22-Jun	10-Jul	55
1990	24-Jun	13-Jun	6-Jul	194
1991	22-Jun	12-Jun	3-Jul	352
1992	30-Jun	20-Jun	21-Jul	391
1993	24-Jun	9-Jun	6-Jul	358
1994	19-Jun	8-Jun	9-Jul	409
1995	20-Jun	11-Jun	5-Jul	725
1996	17-Jun	7-Jun	5-Jul	755
1997	17-Jun	3-Jun	4-Jul	812
1998	25-Jun	12-Jun	9-Jul	889
1999	27-Jun	17-Jun	16-Jul	772
2000	24-Jun	14-Jun	10-Jul	1014
2001	28-Jun	15-Jun	9-Jul	522
2002	20-Jun	10-Jun	4-Jul	930
2003	17-Jun	3-Jun	4-Jul	562
2004	13-Jun	4-Jun	1-Jul	964
2005	20-Jun	9-Jun	7-Jul	957
2006	27-Jun	15-Jun	8-Jul	849
2007	19-Jun	9-Jun	5-Jul	1027
2008	22-Jun	11-Jun	7-Jul	903
2009	25-Jun	12-Jun	8-Jul	1374
Mean	**24-Jun**	**13-Jun**	**9-Jul**	**581**

Year	Average	Min	Max	N
Emperor Goose				
1982	3-Jul	16-Jun	11-Jul	71
1983	22-Jun	14-Jun	6-Jul	100
1984	23-Jun	16-Jun	2-Jul	43
1985	1-Jul	23-Jun	11-Jul	107
1986	27-Jun	18-Jun	9-Jul	196
1987	27-Jun	18-Jun	7-Jul	141
1988	21-Jun	16-Jun	4-Jul	67
1989	30-Jun	18-Jun	7-Jul	63
1990	21-Jun	11-Jun	6-Jul	99
1991	20-Jun	10-Jun	2-Jul	256
1992	29-Jun	21-Jun	9-Jul	182
1993	21-Jun	11-Jun	4-Jul	139
1994	19-Jun	12-Jun	30-Jun	192
1995	18-Jun	10-Jun	6-Jul	188
1996	16-Jun	4-Jun	23-Jun	185
1997	15-Jun	6-Jun	30-Jun	153
1998	24-Jun	16-Jun	3-Jul	215
1999	27-Jun	17-Jun	6-Jul	188
2000	23-Jun	13-Jun	8-Jul	280
2001	27-Jun	19-Jun	2-Jul	104
2002	18-Jun	9-Jun	29-Jun	249
2003	15-Jun	5-Jun	26-Jun	153
2004	12-Jun	4-Jun	24-Jun	253
2005	17-Jun	7-Jun	29-Jun	303
2006	24-Jun	16-Jun	4-Jul	253
2007	19-Jun	7-Jun	28-Jun	275
2008	21-Jun	12-Jun	7-Jul	239
2009	24-Jun	13-Jun	5-Jul	349
Mean	**22-Jun**	**13-Jun**	**4-Jul**	**180**

Year	Average	Min	Max	N
White-fronted Goose				
1982	4-Jul	26-Jun	12-Jul	14
1983	21-Jun	13-Jun	19-Jul	25
1984	23-Jun	16-Jun	1-Jul	25
1985	30-Jun	23-Jun	7-Jul	42
1986	26-Jun	17-Jun	12-Jul	102
1987	26-Jun	19-Jun	3-Jul	60
1988	22-Jun	15-Jun	3-Jul	32
1989	28-Jun	22-Jun	4-Jul	21
1990	22-Jun	11-Jun	29-Jun	52
1991	21-Jun	12-Jun	3-Jul	138
1992	29-Jun	19-Jun	24-Jul	110
1993	23-Jun	17-Jun	5-Jul	84
1994	19-Jun	11-Jun	28-Jun	129
1995	21-Jun	9-Jun	1-Jul	178
1996	18-Jun	7-Jun	30-Jun	144
1997	18-Jun	7-Jun	29-Jun	184
1998	25-Jun	17-Jun	6-Jul	261
1999	27-Jun	19-Jun	10-Jul	208
2000	25-Jun	14-Jun	9-Jul	334
2001	28-Jun	19-Jun	7-Jul	311
2002	22-Jun	14-Jun	30-Jun	306
2003	19-Jun	6-Jun	1-Jul	272
2004	15-Jun	4-Jun	27-Jun	364
2005	20-Jun	12-Jun	1-Jul	438
2006	26-Jun	16-Jun	10-Jul	370
2007	19-Jun	8-Jun	2-Jul	446
2008	22-Jun	12-Jun	2-Jul	335
2009	25-Jun	13-Jun	7-Jul	477
Mean	**23-Jun**	**14-Jun**	**5-Jul**	**195**

Year	Average	Min	Max	N
Black Brant				
1982	--	--	--	--
1983	23-Jun	15-Jun	3-Jul	11
1984	20-Jun	19-Jun	20-Jun	4
1985	27-Jun	23-Jun	8-Jul	29
1986	25-Jun	19-Jun	6-Jul	126
1987	25-Jun	22-Jun	3-Jul	167
1988	20-Jun	14-Jun	3-Jul	38
1989	27-Jun	19-Jun	6-Jul	40
1990	21-Jun	15-Jun	1-Jul	119
1991	19-Jun	12-Jun	1-Jul	183
1992	26-Jun	19-Jun	6-Jul	152
1993	21-Jun	12-Jun	27-Jun	107
1994	17-Jun	10-Jun	27-Jun	93
1995	18-Jun	12-Jun	1-Jul	41
1996	17-Jun	11-Jun	26-Jun	44
1997	14-Jun	3-Jun	24-Jun	100
1998	23-Jun	16-Jun	4-Jul	260
1999	26-Jun	17-Jun	7-Jul	108
2000	23-Jun	16-Jun	3-Jul	216
2001	26-Jun	19-Jun	5-Jul	77
2002	19-Jun	6-Jun	3-Jul	163
2003	16-Jun	7-Jun	26-Jun	56
2004	11-Jun	4-Jun	24-Jun	101
2005	17-Jun	6-Jun	26-Jun	148
2006	24-Jun	16-Jun	9-Jul	123
2007	18-Jun	9-Jun	29-Jun	147
2008	20-Jun	13-Jun	30-Jun	103
2009	24-Jun	13-Jun	7-Jul	202
Mean	**21-Jun**	**14-Jun**	**1-Jul**	**110**

Table 3. Estimated hatch date continued.

Year	Average	Min	Max	N
Tundra Swan				
1982	5-Jul	23-Jun	14-Jul	11
1983	24-Jun	15-Jun	30-Jun	6
1984	27-Jun	20-Jun	5-Jul	6
1985	4-Jul	26-Jun	10-Jul	14
1986	28-Jun	19-Jun	10-Jul	23
1987	30-Jun	23-Jun	6-Jul	12
1988	27-Jun	17-Jun	4-Jul	4
1989	1-Jul	29-Jun	3-Jul	4
1990	25-Jun	21-Jun	27-Jun	4
1991	24-Jun	17-Jun	8-Jul	12
1992	30-Jun	24-Jun	7-Jul	8
1993	26-Jun	19-Jun	1-Jul	6
1994	22-Jun	13-Jun	30-Jun	9
1995	25-Jun	21-Jun	2-Jul	9
1996	19-Jun	10-Jun	28-Jun	9
1997	21-Jun	14-Jun	25-Jun	13
1998	30-Jun	23-Jun	12-Jul	20
1999	1-Jul	24-Jun	9-Jul	14
2000	26-Jun	18-Jun	5-Jul	22
2001	30-Jun	19-Jun	9-Jul	16
2002	26-Jun	20-Jun	1-Jul	10
2003	18-Jun	11-Jun	24-Jun	21
2004	19-Jun	10-Jun	27-Jun	16
2005	23-Jun	16-Jun	29-Jun	18
2006	1-Jul	22-Jun	8-Jul	14
2007	24-Jun	16-Jun	2-Jul	19
2008	27-Jun	20-Jun	3-Jul	18
2009	2-Jul	24-Jun	8-Jul	19
Mean	**27-Jun**	**19-Jun**	**4-Jul**	**13**

Year	Average	Min	Max	N
Sandhill Crane				
1982	24-Jun	22-Jun	25-Jun	4
1983	26-Jun	17-Jun	11-Jul	14
1984	19-Jun	15-Jun	21-Jun	6
1985	30-Jun	19-Jun	4-Jul	13
1986	27-Jun	16-Jun	9-Jul	25
1987	25-Jun	18-Jun	10-Jul	16
1988	19-Jun	17-Jun	25-Jun	6
1989	--	--	--	--
1990	18-Jun	15-Jun	22-Jun	9
1991	16-Jun	10-Jun	26-Jun	25
1992	30-Jun	24-Jun	5-Jul	9
1993	19-Jun	15-Jun	27-Jun	14
1994	14-Jun	11-Jun	16-Jun	5
1995	18-Jun	12-Jun	30-Jun	10
1996	14-Jun	10-Jun	25-Jun	14
1997	15-Jun	11-Jun	24-Jun	8
1998	21-Jun	15-Jun	26-Jun	19
1999	23-Jun	19-Jun	28-Jun	12
2000	19-Jun	13-Jun	29-Jun	22
2001	21-Jun	19-Jun	23-Jun	7
2002	19-Jun	8-Jun	3-Jul	12
2003	14-Jun	7-Jun	25-Jun	13
2004	15-Jun	9-Jun	22-Jun	10
2005	15-Jun	10-Jun	26-Jun	23
2006	23-Jun	17-Jun	8-Jul	19
2007	12-Jun	7-Jun	24-Jun	16
2008	20-Jun	15-Jun	24-Jun	12
2009	23-Jun	16-Jun	7-Jul	20
Mean	**20-Jun**	**14-Jun**	**28-Jun**	**13**

Year	Average	Min	Max	N
Spectacled Eider				
1982	8-Jul	30-Jun	22-Jul	18
1983	29-Jun	20-Jun	6-Jul	22
1984	2-Jul	25-Jun	5-Jul	3
1985	4-Jul	26-Jun	18-Jul	20
1986	2-Jul	22-Jun	20-Jul	38
1987	28-Jun	17-Jun	9-Jul	27
1988	26-Jun	20-Jun	2-Jul	19
1989	2-Jul	22-Jun	7-Jul	5
1990	23-Jun	18-Jun	27-Jun	15
1991	22-Jun	16-Jun	10-Jul	25
1992	2-Jul	26-Jun	14-Jul	17
1993	25-Jun	17-Jun	9-Jul	18
1994	23-Jun	12-Jun	6-Jul	15
1995	24-Jun	14-Jun	4-Jul	44
1996	18-Jun	12-Jun	2-Jul	33
1997	19-Jun	11-Jun	30-Jun	39
1998	28-Jun	17-Jun	7-Jul	52
1999	28-Jun	18-Jun	9-Jul	51
2000	28-Jun	18-Jun	9-Jul	52
2001	3-Jul	25-Jun	16-Jul	32
2002	22-Jun	15-Jun	2-Jul	59
2003	22-Jun	9-Jun	2-Jul	36
2004	15-Jun	5-Jun	30-Jun	57
2005	20-Jun	9-Jun	4-Jul	101
2006	29-Jun	19-Jun	12-Jul	79
2007	23-Jun	10-Jun	4-Jul	68
2008	23-Jun	13-Jun	10-Jul	73
2009	26-Jun	15-Jun	10-Jul	124
Mean	**26-Jun**	**17-Jun**	**8-Jul**	**41**

Year	Average	Min	Max	N
Common Eider				
1982	9-Jul	8-Jul	10-Jul	4
1983	26-Jun	21-Jun	30-Jun	3
1984	--	--	--	--
1985	--	--	--	--
1986	--	--	--	--
1987	29-Jun	25-Jun	8-Jul	10
1988	--	--	--	--
1989	2-Jul	29-Jun	8-Jul	4
1990	22-Jun	21-Jun	24-Jun	3
1991	26-Jun	19-Jun	5-Jul	27
1992	2-Jul	26-Jun	6-Jul	12
1993	24-Jun	18-Jun	27-Jun	5
1994	24-Jun	16-Jun	4-Jul	9
1995	23-Jun	14-Jun	2-Jul	13
1996	19-Jun	10-Jun	2-Jul	14
1997	19-Jun	10-Jun	1-Jul	15
1998	28-Jun	20-Jun	4-Jul	18
1999	30-Jun	22-Jun	9-Jul	12
2000	29-Jun	24-Jun	5-Jul	23
2001	30-Jun	20-Jun	8-Jul	23
2002	24-Jun	15-Jun	30-Jun	17
2003	22-Jun	14-Jun	4-Jul	16
2004	17-Jun	6-Jun	26-Jun	18
2005	19-Jun	5-Jun	1-Jul	34
2006	1-Jul	24-Jun	11-Jul	52
2007	20-Jun	15-Jun	30-Jun	50
2008	24-Jun	16-Jun	2-Jul	34
2009	26-Jun	18-Jun	5-Jul	33
Mean	**26-Jun**	**19-Jun**	**3-Jul**	**19**

Table 3. Estimated hatch date continued.

Year	Average	Min	Max	N
Pacific Loon, Red-throated Loon				
1982	8-Jul	3-Jul	24-Jul	25
1983	29-Jun	21-Jun	29-Jul	15
1984	2-Jul	26-Jun	8-Jul	5
1985	7-Jul	25-Jun	21-Jul	15
1986	5-Jul	26-Jun	25-Jul	37
1987	3-Jul	27-Jun	12-Jul	34
1988	27-Jun	16-Jun	5-Jul	5
1989	2-Jul	22-Jun	15-Jul	5
1990	1-Jul	25-Jun	9-Jul	11
1991	26-Jun	18-Jun	5-Jul	21
1992	5-Jul	29-Jun	18-Jul	12
1993	26-Jun	18-Jun	5-Jul	12
1994	24-Jun	19-Jun	29-Jun	6
1995	26-Jun	21-Jun	1-Jul	10
1996	22-Jun	15-Jun	1-Jul	9
1997	22-Jun	15-Jun	29-Jun	17
1998	1-Jul	20-Jun	14-Jul	37
1999	3-Jul	22-Jun	14-Jul	48
2000	30-Jun	15-Jun	9-Jul	40
2001	4-Jul	27-Jun	15-Jul	27
2002	25-Jun	12-Jun	3-Jul	42
2003	24-Jun	12-Jun	3-Jul	14
2004	23-Jun	13-Jun	30-Jun	10
2005	27-Jun	11-Jun	7-Jul	42
2006	2-Jul	27-Jun	7-Jul	22
2007	24-Jun	15-Jun	2-Jul	31
2008	28-Jun	16-Jun	9-Jul	46
2009	1-Jul	22-Jun	11-Jul	35
Mean	**29-Jun**	**20-Jun**	**10-Jul**	**23**

Year	Average	Min	Max	N
Glaucous Gull				
1982	5-Jul	29-Jun	22-Jul	23
1983	22-Jun	13-Jun	4-Jul	14
1984	23-Jun	18-Jun	26-Jun	5
1985	3-Jul	23-Jun	12-Jul	23
1986	27-Jun	22-Jun	5-Jul	18
1987	28-Jun	20-Jun	10-Jul	19
1988	22-Jun	15-Jun	3-Jul	9
1989	22-Jun	22-Jun	22-Jun	3
1990	--	--	--	--
1991	18-Jun	12-Jun	3-Jul	26
1992	27-Jun	22-Jun	4-Jul	23
1993	20-Jun	15-Jun	7-Jul	11
1994	17-Jun	10-Jun	27-Jun	17
1995	17-Jun	14-Jun	26-Jun	17
1996	14-Jun	11-Jun	20-Jun	15
1997	17-Jun	10-Jun	29-Jun	19
1998	22-Jun	15-Jun	9-Jul	64
1999	27-Jun	19-Jun	7-Jul	25
2000	22-Jun	12-Jun	9-Jul	72
2001	24-Jun	17-Jun	7-Jul	50
2002	17-Jun	6-Jun	4-Jul	56
2003	13-Jun	4-Jun	26-Jun	58
2004	10-Jun	3-Jun	19-Jun	21
2005	14-Jun	6-Jun	27-Jun	69
2006	25-Jun	17-Jun	9-Jul	46
2007	15-Jun	8-Jun	29-Jun	76
2008	20-Jun	9-Jun	1-Jul	68
2009	23-Jun	13-Jun	4-Jul	59
Mean	**21-Jun**	**14-Jun**	**3-Jul**	**34**

Year	Average	Min	Max	N
Mew Gull				
1982	10-Jul	7-Jul	22-Jul	11
1983	26-Jun	17-Jun	3-Jul	6
1984	--	--	--	--
1985	4-Jul	27-Jun	12-Jul	8
1986	2-Jul	21-Jun	12-Jul	18
1987	26-Jun	21-Jun	4-Jul	8
1988	18-Jun	14-Jun	24-Jun	4
1989	--	--	--	--
1990	--	--	--	--
1991	20-Jun	14-Jun	2-Jul	8
1992	27-Jun	23-Jun	4-Jul	10
1993	24-Jun	17-Jun	2-Jul	7
1994	15-Jun	11-Jun	21-Jun	8
1995	18-Jun	15-Jun	22-Jun	16
1996	14-Jun	8-Jun	20-Jun	10
1997	19-Jun	16-Jun	27-Jun	8
1998	24-Jun	19-Jun	4-Jul	19
1999	25-Jun	21-Jun	9-Jul	25
2000	25-Jun	17-Jun	5-Jul	17
2001	26-Jun	19-Jun	7-Jul	18
2002	16-Jun	6-Jun	3-Jul	40
2003	17-Jun	8-Jun	27-Jun	20
2004	13-Jun	9-Jun	19-Jun	19
2005	19-Jun	10-Jun	1-Jul	32
2006	26-Jun	18-Jun	9-Jul	45
2007	18-Jun	7-Jun	3-Jul	32
2008	19-Jun	13-Jun	4-Jul	45
2009	24-Jun	16-Jun	9-Jul	54
Mean	**23-Jun**	**16-Jun**	**3-Jul**	**20**

Year	Average	Min	Max	N
Sabine's Gull				
1982	--	--	--	--
1983	21-Jun	14-Jun	2-Jul	3
1984	--	--	--	--
1985	2-Jul	26-Jun	18-Jul	3
1986	24-Jun	15-Jun	7-Jul	7
1987	21-Jun	15-Jun	4-Jul	7
1988	24-Jun	18-Jun	8-Jul	7
1989	--	--	--	--
1990	--	--	--	--
1991	15-Jun	9-Jun	22-Jun	9
1992	--	--	--	--
1993	17-Jun	14-Jun	23-Jun	8
1994	11-Jun	9-Jun	16-Jun	6
1995	18-Jun	12-Jun	28-Jun	6
1996	11-Jun	7-Jun	14-Jun	3
1997	14-Jun	8-Jun	22-Jun	8
1998	21-Jun	15-Jun	6-Jul	11
1999	21-Jun	16-Jun	3-Jul	20
2000	22-Jun	14-Jun	2-Jul	7
2001	27-Jun	19-Jun	4-Jul	10
2002	14-Jun	8-Jun	26-Jun	28
2003	12-Jun	6-Jun	17-Jun	5
2004	9-Jun	3-Jun	19-Jun	3
2005	16-Jun	8-Jun	29-Jun	30
2006	22-Jun	18-Jun	27-Jun	23
2007	17-Jun	9-Jun	29-Jun	30
2008	17-Jun	10-Jun	26-Jun	17
2009	22-Jun	16-Jun	8-Jul	17
Mean	**19-Jun**	**13-Jun**	**29-Jun**	**12**

Table 3. Estimated hatch date continued.

Year	Average	Min	Max	N
Arctic Tern				
1982	--	--	--	--
1983	--	--	--	--
1984	--	--	--	--
1985	29-Jun	22-Jun	4-Jul	8
1986	26-Jun	16-Jun	24-Jul	6
1987	24-Jun	20-Jun	26-Jun	3
1988	--	--	--	--
1989	--	--	--	--
1990	--	--	--	--
1991	17-Jun	12-Jun	20-Jun	4
1992	1-Jul	25-Jun	10-Jul	6
1993	17-Jun	15-Jun	20-Jun	3
1994	--	--	--	--
1995	16-Jun	13-Jun	20-Jun	3
1996	--	--	--	--
1997	--	--	--	--
1998	26-Jun	19-Jun	5-Jul	5
1999	25-Jun	21-Jun	2-Jul	8
2000	26-Jun	23-Jun	1-Jul	5
2001	22-Jun	15-Jun	29-Jun	5
2002	18-Jun	8-Jun	26-Jun	37
2003	13-Jun	8-Jun	21-Jun	5
2004	17-Jun	9-Jun	29-Jun	9
2005	21-Jun	14-Jun	29-Jun	15
2006	23-Jun	17-Jun	29-Jun	17
2007	16-Jun	8-Jun	24-Jun	18
2008	20-Jun	11-Jun	30-Jun	16
2009	26-Jun	18-Jun	5-Jul	30
Mean	**22-Jun**	**15-Jun**	**30-Jun**	**11**

Year	Average	Min	Max	N
Greater Scaup, Long-tailed Duck				
1982	10-Jul	13-Jul	22-Jul	5
1983	--	--	--	--
1984	--	--	--	--
1985	--	--	--	--
1986	8-Jul	1-Jul	11-Jul	4
1987	7-Jul	2-Jul	11-Jul	4
1988	--	--	--	--
1989	--	--	--	--
1990	--	--	--	--
1991	--	--	--	--
1992	6-Jul	30-Jun	22-Jul	19
1993	2-Jul	29-Jun	8-Jul	18
1994	2-Jul	30-Jun	3-Jul	7
1995	3-Jul	20-Jun	10-Jul	14
1996	28-Jun	17-Jun	5-Jul	7
1997	27-Jun	17-Jun	4-Jul	10
1998	4-Jul	26-Jun	10-Jul	14
1999	8-Jul	1-Jul	13-Jul	10
2000	6-Jul	28-Jun	11-Jul	26
2001	7-Jul	4-Jul	17-Jul	6
2002	1-Jul	29-Jun	4-Jul	8
2003	30-Jun	29-Jun	1-Jul	3
2004	--	--	--	--
2005	1-Jul	24-Jun	8-Jul	9
2006	5-Jul	29-Jun	8-Jul	5
2007	2-Jul	1-Jul	5-Jul	5
2008	--	--	--	--
2009	3-Jul	25-Jun	11-Jul	7
Mean	**3-Jul**	**28-Jun**	**9-Jul**	**10**

Year	Average	Min	Max	N
Pintail, Shoveler, Mallard, Teal				
1982	--	--	--	--
1983	--	--	--	--
1984	--	--	--	--
1985	--	--	--	--
1986	3-Jul	22-Jun	17-Jul	13
1987	3-Jul	18-Jun	14-Jul	12
1988	--	--	--	--
1989	6-Jul	3-Jul	11-Jul	4
1990	28-Jun	24-Jun	3-Jul	4
1991	24-Jun	12-Jun	4-Jul	13
1992	4-Jul	21-Jun	13-Jul	16
1993	28-Jun	24-Jun	1-Jul	16
1994	28-Jun	26-Jun	29-Jun	5
1995	27-Jun	18-Jun	6-Jul	11
1996	25-Jun	13-Jun	2-Jul	10
1997	17-Jun	13-Jun	21-Jun	4
1998	1-Jul	18-Jun	10-Jul	39
1999	2-Jul	20-Jun	12-Jul	17
2000	30-Jun	21-Jun	8-Jul	28
2001	2-Jul	27-Jun	8-Jul	13
2002	24-Jun	13-Jun	3-Jul	21
2003	20-Jun	10-Jun	29-Jun	8
2004	18-Jun	5-Jun	28-Jun	19
2005	23-Jun	11-Jun	4-Jul	24
2006	1-Jul	23-Jun	8-Jul	15
2007	22-Jun	13-Jun	28-Jun	17
2008	26-Jun	18-Jun	4-Jul	22
2009	28-Jun	20-Jun	6-Jul	16
Mean	**27-Jun**	**18-Jun**	**5-Jul**	**15**

Year	Average	Min	Max	N
Small Shorebird				
1982	--	--	--	--
1983	--	--	--	--
1984	--	--	--	--
1985	3-Jul	22-Jun	17-Jul	4
1986	27-Jun	16-Jun	11-Jul	23
1987	21-Jun	15-Jun	25-Jun	7
1988	--	--	--	--
1989	24-Jun	18-Jun	4-Jul	3
1990	--	--	--	--
1991	22-Jun	8-Jun	6-Jul	21
1992	26-Jun	22-Jun	29-Jun	8
1993	21-Jun	14-Jun	29-Jun	15
1994	--	--	--	--
1995	19-Jun	10-Jun	25-Jun	6
1996	20-Jun	8-Jun	2-Jul	10
1997	12-Jun	9-Jun	14-Jun	3
1998	22-Jun	14-Jun	28-Jun	8
1999	25-Jun	16-Jun	5-Jul	17
2000	23-Jun	14-Jun	27-Jun	13
2001	27-Jun	18-Jun	4-Jul	22
2002	19-Jun	12-Jun	25-Jun	21
2003	16-Jun	13-Jun	17-Jun	3
2004	12-Jun	8-Jun	20-Jun	10
2005	20-Jun	9-Jun	29-Jun	30
2006	27-Jun	19-Jun	8-Jul	29
2007	18-Jun	5-Jun	28-Jun	33
2008	19-Jun	11-Jun	1-Jul	54
2009	26-Jun	15-Jun	3-Jul	23
Mean	**22-Jun**	**13-Jun**	**30-Jun**	**17**

Table 4. Numbers and proportions of plots with recent fox sign, as determined by presence of live fox, scat, fur, tracks, and active dens, 2000-2009.

Year	Number Plots with Recent Fox Sign	Number Plots Sampled	Proportion of Plots with Recent Fox Sign
2000	23	78	0.29
2001	72	81	0.89
2002	50	84	0.60
2003	69	83	0.83
2004	53	81	0.65
2005	46	83	0.55
2006	44	74	0.59
2007	26	79	0.33
2008	59	83	0.71
2009	34	81	0.42
Mean	48	81	0.59