Population Size and Production of Geese and Eiders Nesting on the Yukon-Kuskokwim Delta, Alaska in 2002



Field Report: 18 July, 2002

Timothy Bowman[1], Julian Fischer[1], Robert Stehn[1], and George Walters[2]

[1] U.S. Fish and Wildlife Service, Waterfowl Management Branch, 1011 E. Tudor Rd., Anchorage, AK 99503
[2] U.S. Fish and Wildlife Service, Yukon Delta National Wildlife Refuge, P.O. Box 346, Bethel, AK 99559

HIGHLIGHTS OF THE 2002 SURVEY: Production was good for most waterfowl species. Predation by arctic foxes declined back to levels typical of 1987-2000, down from 2001. An early spring and high nest success should result in good production of young into the fall population.

INTRODUCTION:

Annual assessment of nesting populations of geese on the Yukon-Kuskokwim Delta (YKD) provides information for biologists, participants in cooperative goose management plans, and Pacific Flyway technical committees. A ground-based sampling procedure has been used since 1986 to estimate the number of total nests, active nests, and eggs for cackling Canada geese *(Branta canadensis minima)*, emperor geese (*Chen canagica*), greater white-fronted geese (*Anser albifrons frontalis*), and spectacled eiders (*Somateria fischeri*). Annual information on the size of the nesting population and potential number of young produced contributes long term data needed to understand goose and eider population ecology and better manage these species.

METHODS:

The ground-based sampling for nests provides a general, long-term monitoring procedure for most of the medium and high density spectacled eider and goose nesting habitat on the coast of the YKD.

Boundaries of the ground sampled area included all refuge-owned lands containing medium and high densities of aerial observations or nests for spectacled eiders based on 1985 to 1993 data. We excluded some high density nesting habitat near Kokechik Bay, two patches on south Nelson Island, and several tracts around Hazen Bay because the land was owned by native corporations and in those areas permission to sample plots every year was not assured. The remaining areas formed one stratum totaling 716 km^2, or 5.6% of the total coastal zone (Figs. 1 and 2). In years prior to 1994, a variety of strata were selected for ground plot sampling. The coastal zone outside of the ground-sampled stratum was sampled only by aerial transects.

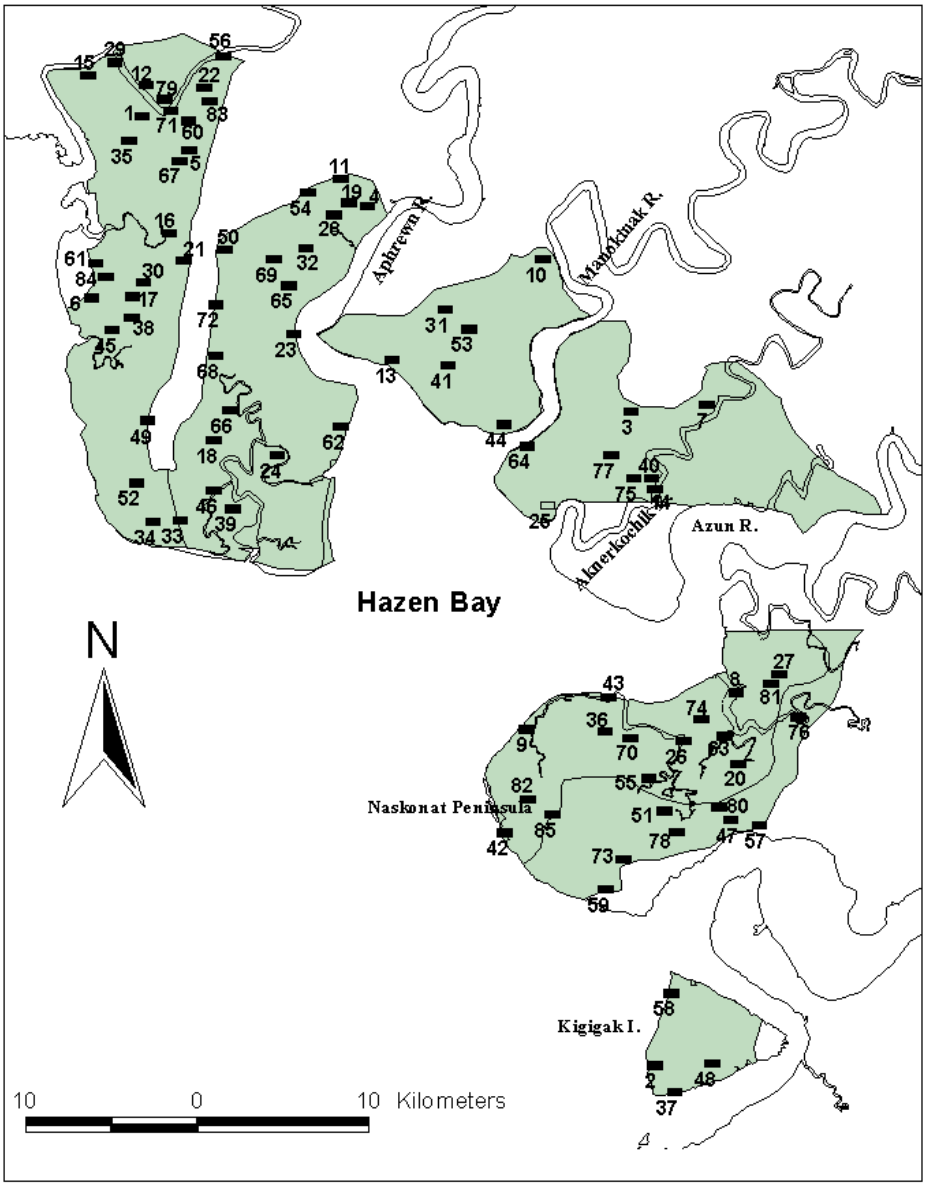

Figure 1. Study area (shaded) sampled by nest plots in 2002 on the Yukon-Kuskokwim Delta, Alaska. Plots searched for nests are indicated by solid rectangles and plots randomly selected but not searched are indicated by open rectangles.

The ground plot survey is linked to an aerial transect survey in the 12,852 km^2 entire coastal area of the YKD, which has been conducted by USFWS, Migratory Bird Management Division, Anchorage, since 1985 (Eldridge and Dau 2002, Butler et al. 1988). A pilot and an observer recorded singles, pairs, and flocks of geese, brant, swans, and cranes along approximately 100 systematic transects. Beginning in 1988, a rear-seat observer recorded eiders, other ducks, loons, and in 1992, gulls. This has provided a precise index to total waterfowl populations on the coastal YKD. Aerial survey data were used to expand the ground-based estimates of nests, active nests, and eggs from the ground-sampled strata to the entire YKD coastal region. The number of nests outside the ground sampled area was estimated for each species using the ratio of the aerial survey breeding population index found outside the ground

plot sampled area to the aerial index within the ground plot sampled area. Variance estimates of nest populations expanded to the entire coast incorporate the variance of the out/in ratio. The breeding population index for most species was based on twice the number of singles plus number of birds in pairs observed because single geese and male eiders observed are assumed to be the mates of unobserved incubating females on nests. For brant, loons, and gulls, the total number of birds observed was used, and for swans and cranes, the number of singles plus the number of birds in pairs observed was used as the index to breeding population size to calculate the expansion factor.

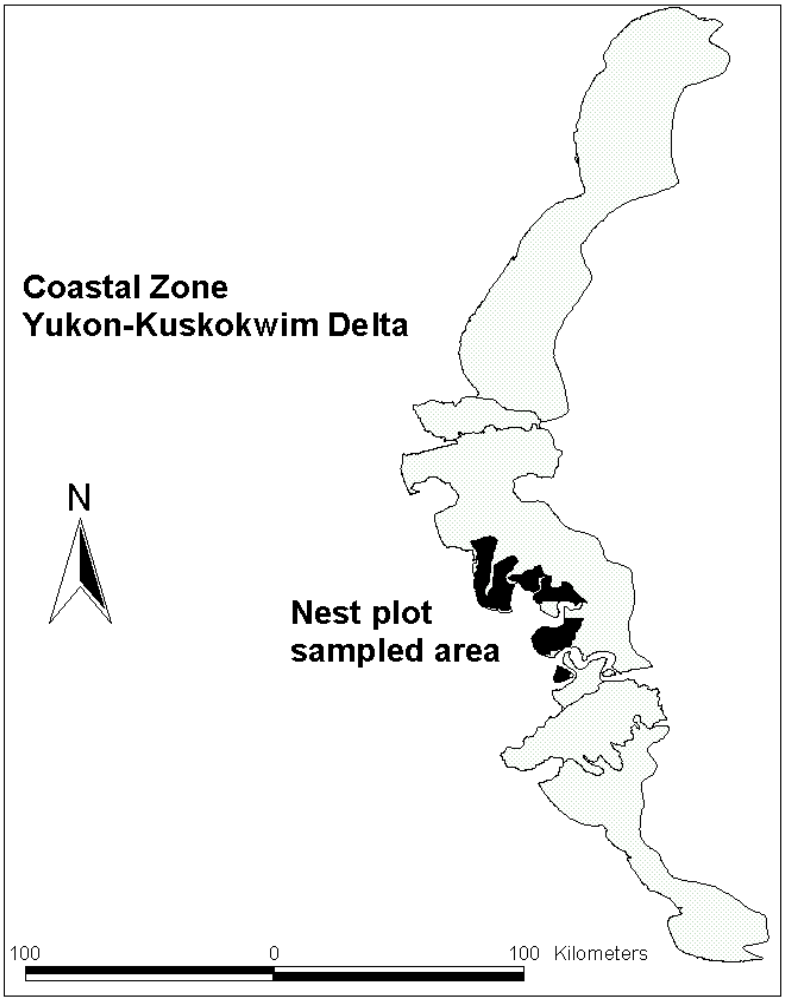

Figure 2. Location of nest plot sampled area in the coastal zone of the Yukon-Kuskokwim delta, 2002.

Ground plots were 400 x 800 m (0.32 km^2) around a randomly located center point. Plot size was identical to plots searched from 1986-94 and 1997-2001. Plots were 0.45 km^2 in 1995 and 0.36 km^2 in 1996. We used PC ARC/INFO and custom-written TrueBASIC computer programs to randomly select and draw plot boundaries directly onto 1:63,360 scale topographic maps. Even if most or all of a plot was within a river or a large lake, it was still included in the sample. Plot boundaries were drawn on scanned images of color infrared aerial photographs (1:15,000 or 1:10,000). These provided useful field maps to aid in finding plots, searching for nests, and determining exact plot boundaries.

Most plots were searched by two biologists who were transported either by Cessna 185 float-equipped aircraft or by motorboat. Two boat crews originated from the Kanagayak camp; one worked areas around the lower Aphrewn and Opagayrak Rivers and the other crew worked

the Naskonat Peninsula. Most plots were within 2 km walking distance from a river or lake suitable for landing aircraft. All sites dry enough for a nest, particularly lake shores and islands, were examined for all active and destroyed goose, brant, eider, swan, crane, loon, and gull nests. Nests of other species were recorded as encountered but most shorebird, passerine, and duck nests were missed.

We recorded species, nest site, number of eggs, evidence of predation, and other pertinent data on a card for each nest. A few eggs in many clutches were floated to determine the approximate stage of incubation. Nests were identified to species based on down or contour feathers in the nest bowl. A photographic field guide to nests and eggs was provided to nest searchers to aid in species identification and improve overall data quality. Nest cards were tabulated, edited, and sorted using Excel, and data were summarized using TrueBASIC programs.

The estimated total number of nests measured the effective breeding population size (i.e., the number of pairs with nests). The estimated total number of viable eggs found at mid- to late-incubation directly measured the number of young that could potentially augment the fall population if they survived. The mean and variance of the number of nests or eggs per plot was based on a simple random sample of plots. The proportion of nests remaining active when the plots were searched was an index to nesting success; the actual proportion of nests that produced young is lower because of nest loss after the plot search. Also, because the detection rate is lower for nests that fail during laying or early incubation, the nest success index is an overestimate of the proportion surviving even to mid-incubation. The number of eggs per active nest (effective clutch size) and average predicted date of hatch were based on all active nests found on random plots.

Because red-throated and Pacific loon nests are essentially indistinguishable from each other and adult birds are usually not seen at the nest site, data collected historically have been lumped into a general “loon” category. We used aerial survey observations (R. Platte, USFWS, unpubl. data) to estimate species-specific nest population size. We estimated total loons for the ground sampled area and estimated species proportions based on the ratio of loon species observed during the aerial survey of the same areas.

RESULTS:

We searched 84 plots from 31 May to 13 June 2002 (Fig. 1). Four crews plus a pilot at the Yukon Delta National Wildlife Refuge (YDNWR) Kanagayak field camp searched 46 plots and 2 crews of 2 biologists each operating by motorboat searched 29 plots. Biologists with USGS/BRD and University of Alaska Fairbanks searched 9 plots near Hock Slough, Manokinak, and Tutakoke field camps. Training and previous field experience varied among participants and was comparable to previous years. Weather was mixed, with cool and windy weather early and drier and warmer weather later during the survey. Ice breakup was earlier than the long term average and nest sites were available mid-May. In 2002, average hatch dates for geese (predicted by egg float angles) were about 7 days earlier than 2001 and 3-6 days earlier than the 1986-2001

average (Table 2, Fig. 4). Spectacled eider nesting chronology was 12 days earlier than 2001 and 7 days earlier than the 1986-2001 average. Nesting chronology for all species was protracted.

Search of 84 plots yielded 3,459 nests: 1,534 cackling Canada goose, 330 emperor goose, 455 white-fronted goose, 424 brant, 81 spectacled eider, and 635 nests of other species. Total estimated nest populations were 100,759 cacklers, 36,062 emperors, 93,856 white-fronts, and 2831 spectacled eiders (Table 1). Numbers of nests for all goose species except white-fronts were higher than in 2001 (Table 1, Fig. 3). Mean active clutch sizes of all goose species and spectacled eiders were similar to previous years and nest success was high (Fig. 4). The number of eggs produced, perhaps the best index to potential production because it incorporates the number of nests, nest success and clutch size, was good for most species and consistent with recent population trends and production (Table 1).

DISCUSSION:

2002 was generally as normal a year as one sees on the YKD with the exception of a protracted nesting chronology. Numbers of foxes declined to more typical levels after the peak last year.

This survey is not designed to accurately estimate species with clumped or colonial, distributions, such as brant and gulls. Consequently, large annual fluctuations and poor precision in annual estimates of population size for these species are likely, although long term averages should be accurate. Estimates of loon populations are highly variable simply because few nests are found and possibly because unequal attention has been given to finding loon nests among years. The peak in arctic tern nests this year was attributable to two plots that had "colonies" of nesting terns.

A primary advantage of the ground plot random sampling procedure over intensive local studies was that it assured applicability to the entire population within the sampled area, 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 a minimum amount of disturbance. The expansion of the ground sample to the entire coastal YKD based on aerial survey data assumed that the ratios of nests to aerially observed single-pairs were the same in the ground plot sampled and unsampled areas. The proportion of nests that remained active and the average number of eggs per active nest were also assumed to be the same. The aerial survey-based expansion factors do not require that nest:air observation ratios were the same among years, only that they were constant among strata within a given year.

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 population change. We believe that a graphical presentation (Fig. 3) 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 a dramatic, or real, population change.

SUGGESTIONS FOR 2003 NEST PLOT WORK

1. To minimize errors in species identification, participants should continue to collect feather and down samples for all destroyed duck nests and for any nest that can't be positively identified at time of search.

2. Investigate the feasibility of a third boat crew in lieu of one of the Kanagayak based air crews.

ACKNOWLEDGMENTS

We wish to extend our appreciation to the staff of the Yukon Delta NWR for their cooperation in this study. In particular, many thanks to Chadd Fitzpatrick, Melanie Spiess, and

Mike Wege for preparing photomaps and to supervisory biologist Fred Broerman for logistical support. We are also indebted to Paul Anderson (MBM), and Mike Rearden and Paul Liedberg (YDNWR) for air support to and from the Kanagayak field camp. Aerial survey data courtesy of Bill Eldridge, Chris Dau, and Bob Platte.

Plots were searched by, Jeffrey Ball, Jill Bluso, Tim Bowman, Brandi Carter, Jonel Curtis, Charles Eldermire, Julian Fischer, Paul Flint, Patricia Fontaine, Ben Geslerbracht, Yumi Kawaguchi, Steve Kendall, Ellen Lance, Patrick Lemons, Francis Lincoln, Andrea Lindo, Dennis Marks, Tim Moser, Amy Nicoli, Chris Nicoli, Russ Oates, John Philipsborn, Evan Polty, Shane Roy, Gretchen Ruhl, Ben Sedinger, Bob Stehn, and Leah Walberg.

LITERATURE CITED

Butler, W. I., Jr., R. Stehn, and W. D. Eldridge. 1988. Development of an aerial breeding pair survey for geese nesting in the coastal zone of the Yukon Delta. Annual progress report, U.S. Fish and Wildlife Service, Anchorage. 19pp.

Eldridge, W. D. and C. P. Dau. 2002. 1985-2002 breeding ground surveys of geese, swans, and sandhill cranes in the coastal zone, Yukon-Kuskokwim Delta, Alaska. Report to the Pacific flyway committee. USFWS, Anchorage, AK.

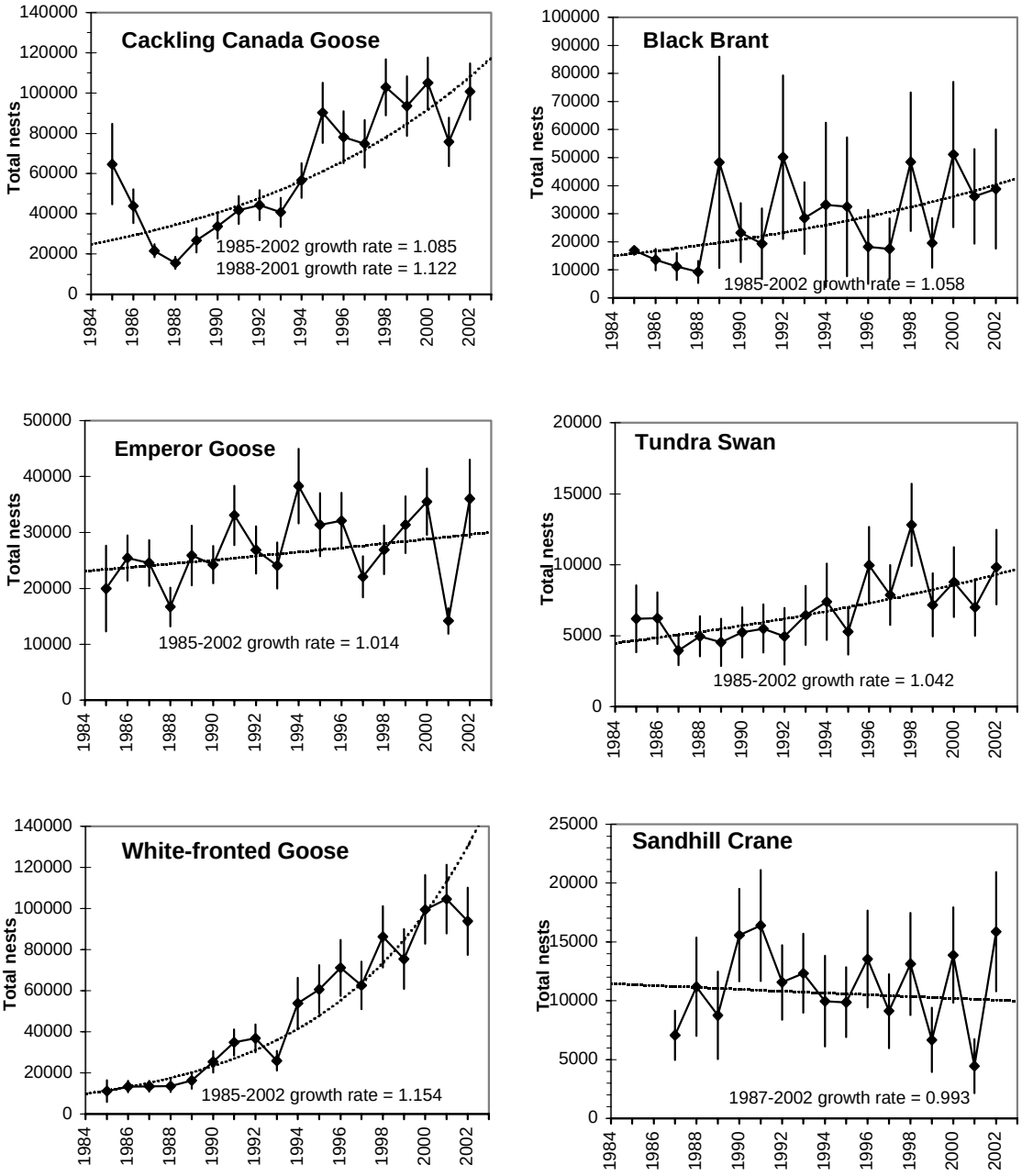

Figure 3. Estimated total nest population sizes on the Yukon-Kuskokwim Delta, Alaska. Vertical lines indicate 90% confidence intervals. Log-linear regression estimates the average annual growth rates of the expanded nest populations.

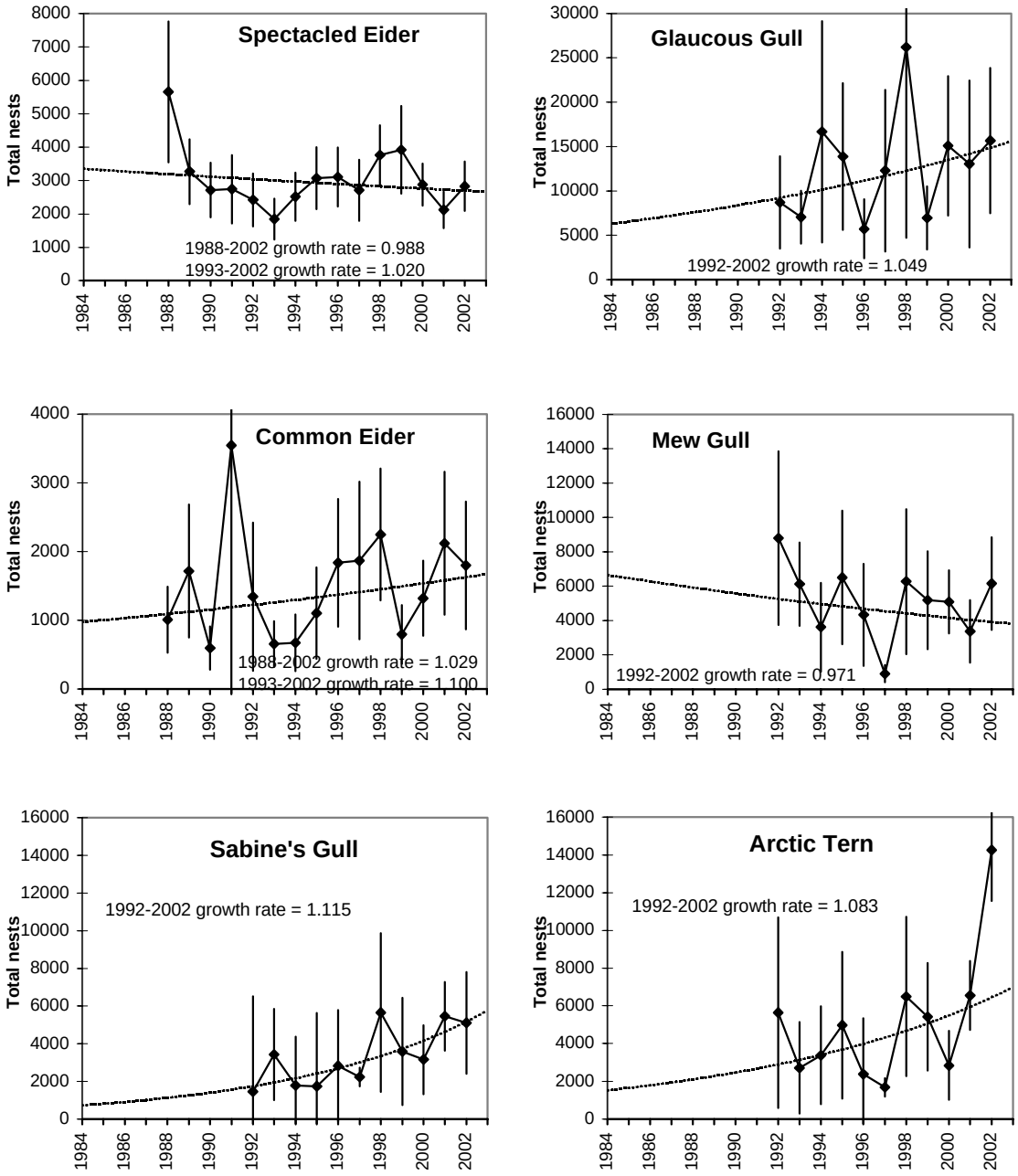

Figure 3 (continued). Estimated total nest population sizes on the Yukon-Kuskokwim Delta, Alaska. Vertical lines indicate 90% confidence intervals. Log-linear regression estimates the average annual growth rates of the expanded nest populations.

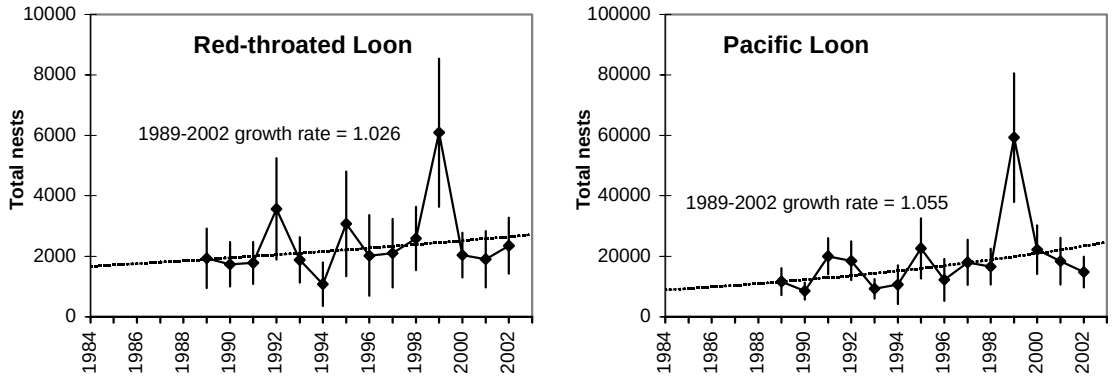

Figure 3 (continued). Estimated total nest population sizes on the Yukon-Kuskokwim Delta, Alaska. Vertical lines indicate 90% confidence intervals. Log-linear regression estimates the average annual growth rates of the expanded nest populations.

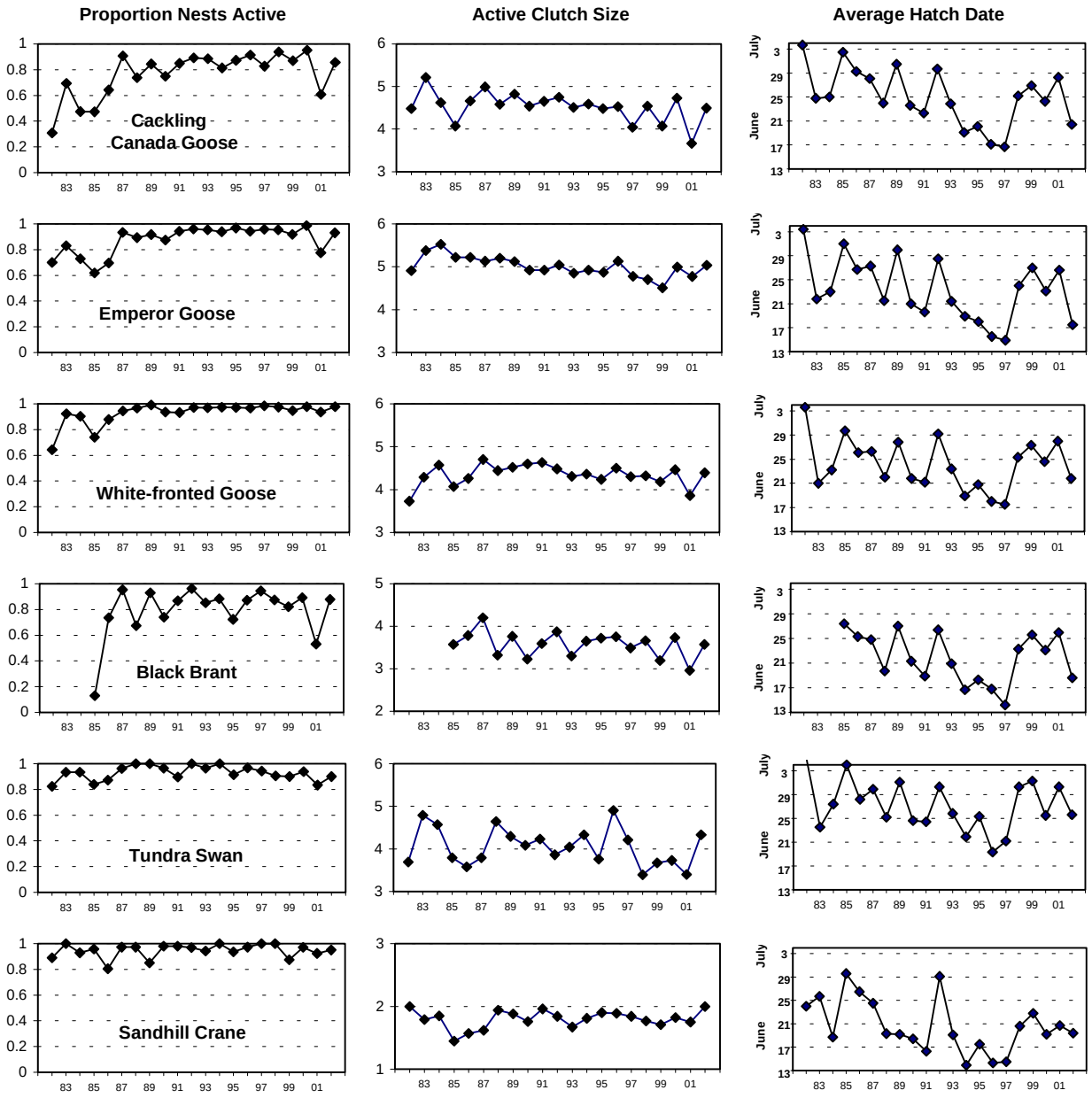

Figure 4. Proportion of nests active when found, average clutch size of apparently viable eggs, and average hatch date predicted by egg float angles from all nests and plots searched on the coast of the Yukon-Kuskokwim Delta from 1982-2002.

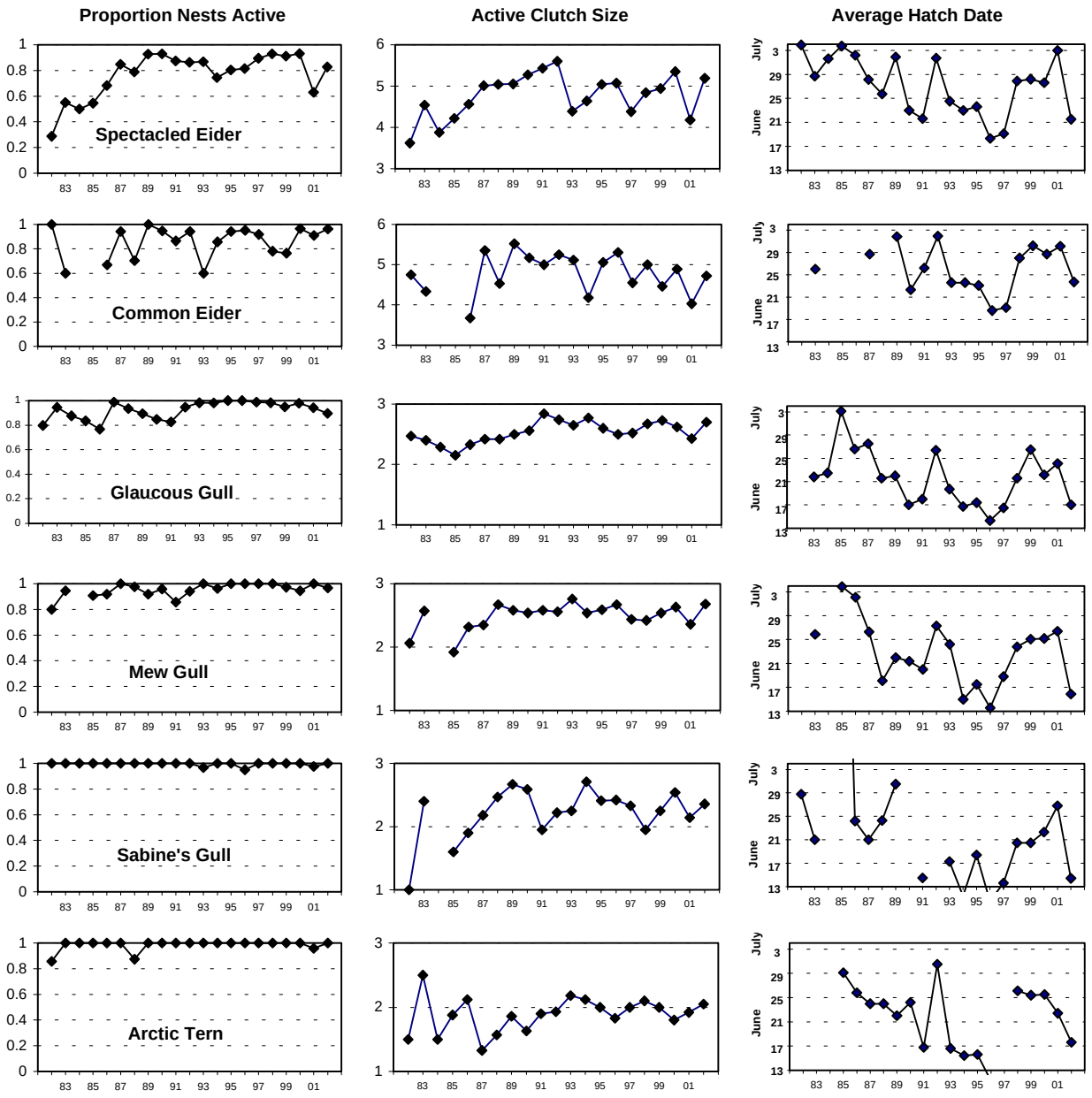

Figure 4. (continued) Proportion of nests active when found, average clutch size of apparently viable eggs, and average hatch date predicted by egg float angles from all nests and plots searched on the coast of the Yukon-Kuskokwim Delta from 1982-2002.

Table 1. Annual estimates of density and population size of nests sampled by random plots on the Yukon-Kuskokwim Delta, Alaska. The expanded nest population size was determined by the proportion of the aerial observations within the sampled strata compared to the entire coastal YKD survey area of 12,852 km^2. Aerial population indices were based on twice the number of singles plus number of birds in pairs observed, except for brant, loons, and gulls, where the total number of birds observed was used, and for swans and cranes, where the number of singles plus the number of birds in pairs observed was used.

	Ground plot sampled area						Expanded to entire coast					
Year	No. plots	Area (km^2)	Total nests	SE	Aerial obs out/in sampled area	Estimated nests out of sampled area	**Total nests**	SE	**Active nests**	SE	**Active eggs**	SE
Cackling Canada Goose												
1985	48	1421.6	**14794**	2768	3.371	**49872**	**64666**	12144	**22411**	6051	**91177**	27361
1986	101	3961.3	**35272**	4764	0.243	**8576**	**43848**	5115	**27784**	3071	**131069**	15118
1987	125	4536.1	**19648**	1900	0.101	**1991**	**21639**	1960	**20158**	1902	**103311**	10072
1988	96	3961.3	**12685**	1728	0.231	**2932**	**15617**	1815	**11347**	1321	**51775**	6360
1989	89	4137.4	**22278**	3501	0.205	**4562**	**26840**	3634	**21507**	3117	**102840**	14966
1990	101	3961.3	**27430**	3424	0.232	**6361**	**33791**	3690	**24428**	2956	**113853**	14770
1991	97	2661.9	**36928**	4067	0.134	**4954**	**41882**	4212	**35151**	3461	**170346**	17620
1992	69	1974.4	**29084**	3569	0.524	**15226**	**44310**	4511	**38937**	3936	**186644**	19062
1993	99	2263.2	**33852**	4216	0.205	**6927**	**40779**	4419	**36393**	4209	**166090**	19465
1994	43	715.7	**27094**	3039	1.090	**29526**	**56620**	5190	**47381**	4589	**216921**	20700
1995	50	715.7	**43841**	5413	1.058	**46380**	**90221**	9092	**78795**	7932	**353310**	35458
1996	54	715.7	**39763**	4828	0.964	**38312**	**78075**	7826	**71279**	7368	**323286**	33546
1997	75	715.7	**36136**	4411	1.070	**38680**	**74816**	7205	**61818**	6405	**249772**	26224
1998	72	856.6	**50713**	5149	1.030	**52229**	**102942**	8485	**96028**	8120	**437407**	37038
1999	59	856.6	**43427**	5389	1.155	**50165**	**93592**	8987	**81217**	8093	**332579**	32920
2000	80	715.7	**46281**	3884	1.270	**58796**	**105077**	7592	**99860**	7330	**470959**	35055
2001	81	715.7	**32939**	3999	1.299	**42802**	**75741**	7323	**45995**	4933	**168610**	17501
2002	84	715.7	**40440**	3989	1.492	**60319**	**100759**	8500	**86176**	7443	**386482**	32722
Emperor Goose												
1985	48	1421.6	**5023**	1268	2.970	**14918**	**19941**	4653	**9452**	2967	**48997**	15027
1986	101	3961.3	**19633**	2129	0.295	**5799**	**25432**	2447	**17830**	1753	**90482**	8933
1987	125	4536.1	**20749**	2273	0.184	**3820**	**24569**	2491	**22728**	2320	**114672**	12048
1988	96	3961.3	**14587**	2015	0.142	**2072**	**16659**	2095	**15269**	2052	**79024**	11834
1989	89	4137.4	**22980**	3163	0.125	**2882**	**25862**	3236	**23089**	2816	**116311**	14387
1990	101	3961.3	**19754**	1837	0.227	**4485**	**24239**	2015	**21439**	1957	**107902**	9741
1991	97	2661.9	**22857**	2470	0.447	**10209**	**33066**	3232	**31432**	3076	**155655**	16039
1992	69	1974.4	**15089**	1736	0.779	**11750**	**26839**	2579	**25632**	2548	**128869**	13057
1993	99	2263.2	**16545**	1736	0.456	**7540**	**24085**	2524	**22851**	2428	**108141**	11652
1994	43	715.7	**13367**	1629	1.865	**24927**	**38294**	4053	**36231**	3949	**179393**	20344
1995	50	715.7	**9739**	1127	2.223	**21649**	**31388**	3431	**30367**	3363	**147737**	16140
1996	54	715.7	**11008**	1105	1.915	**21078**	**32086**	3031	**30264**	2947	**155067**	15507
1997	75	715.7	**7074**	725	2.119	**14988**	**22062**	2227	**21142**	2184	**101024**	10497
1998	72	856.6	**9996**	1042	1.690	**16894**	**26890**	2653	**25515**	2583	**119215**	12226
1999	59	856.6	**9822**	807	2.196	**21569**	**31391**	3087	**28971**	2878	**128248**	12718
2000	80	715.7	**9716**	929	2.653	**25774**	**35490**	3607	**34982**	3549	**174409**	17979
2001	81	715.7	**4503**	478	2.148	**9671**	**14174**	1390	**10995**	1207	**52486**	6179
2002	84	715.7	**8700**	942	3.145	**27362**	**36062**	4226	**33546**	3952	**168609**	19806

Table 1 (continued)

	Ground plot sampled area						Expanded to entire coast					
Year	No. plots	Area (km^2)	Total nests	SE	Aerial obs out/in sampled area	Estimated nests out of sampled area	**Total nests**	SE	**Active nests**	SE	**Active eggs**	SE
White-fronted Goose												
1985	48	1421.6	**2009**	633	4.545	**9131**	**11140**	3180	**6138**	2228	**21619**	7836
1986	101	3961.3	**6697**	1019	0.991	**6638**	**13335**	1738	**12045**	1667	**52336**	7561
1987	125	4536.1	**9115**	1226	0.482	**4397**	**13512**	1569	**12887**	1526	**58455**	6824
1988	96	3961.3	**7695**	1252	0.767	**5903**	**13598**	1761	**13027**	1647	**56252**	6859
1989	89	4137.4	**9308**	1751	0.753	**7007**	**16315**	2397	**16197**	2384	**71062**	9738
1990	101	3961.3	**14270**	2216	0.780	**11128**	**25398**	3174	**22771**	3073	**104401**	14651
1991	97	2661.9	**17394**	2378	1.001	**17414**	**34808**	3854	**32539**	3567	**156610**	19495
1992	69	1974.4	**14300**	1740	1.575	**22521**	**36821**	4110	**35626**	4055	**162553**	19439
1993	99	2263.2	**11974**	1544	1.167	**13973**	**25947**	2937	**25082**	2771	**109142**	12066
1994	43	715.7	**8637**	1066	5.228	**45154**	**53791**	7562	**52514**	7364	**230539**	32589
1995	50	715.7	**9993**	1093	5.074	**50705**	**60698**	7143	**58961**	6968	**249724**	29842
1996	54	715.7	**12849**	1303	4.534	**58260**	**71109**	8320	**68663**	8117	**308892**	36740
1997	75	715.7	**10847**	1127	4.772	**51761**	**62608**	7011	**61586**	6997	**264711**	30918
1998	72	856.6	**14538**	1339	4.931	**71686**	**86224**	9089	**83947**	8843	**361604**	38520
1999	59	856.6	**11881**	1236	5.350	**63567**	**75448**	8815	**71390**	8393	**298427**	35270
2000	80	715.7	**13646**	1258	6.294	**85884**	**99530**	10178	**97312**	10076	**433252**	45263
2001	81	715.7	**11407**	935	8.172	**93222**	**104629**	10163	**97869**	9848	**377719**	39187
2002	84	715.7	**11995**	1002	6.825	**81861**	**93856**	9993	**91791**	9830	**402850**	44260
Black Brant												
1985	48	1421.6	**3424**	1534	3.952	**13531**	**16955**	10467	**2015**	1472	**5952**	4181
1986	101	3961.3	**9586**	1623	0.422	**4048**	**13634**	2296	**9754**	1647	**37109**	6417
1987	125	4536.1	**8965**	2626	0.254	**2274**	**11239**	2930	**9972**	2635	**42111**	11823
1988	96	3961.3	**6283**	1977	0.473	**2971**	**9254**	2389	**6858**	1716	**24032**	5858
1989	89	4137.4	**37201**	21808	0.300	**11143**	**48344**	22908	**44448**	21662	**171083**	85834
1990	101	3961.3	**15524**	5381	0.499	**7739**	**23263**	6364	**16081**	4414	**52199**	14519
1991	97	2661.9	**14546**	7119	0.327	**4751**	**19297**	7637	**16558**	7350	**60879**	27435
1992	69	1974.4	**18741**	8472	1.676	**31407**	**50148**	17732	**48184**	17453	**184040**	66450
1993	99	2263.2	**18303**	6205	0.556	**10176**	**28479**	7767	**24521**	7384	**87101**	27326
1994	43	715.7	**8277**	5430	3.007	**24890**	**33167**	17840	**30903**	17423	**118251**	67364
1995	50	715.7	**6186**	3119	4.255	**26320**	**32506**	15042	**23505**	10395	**87350**	38507
1996	54	715.7	**4050**	2022	3.505	**14196**	**18246**	7989	**15921**	7362	**59710**	28191
1997	75	715.7	**3655**	1368	3.801	**13893**	**17548**	6579	**16559**	6288	**58021**	21994
1998	72	856.6	**15213**	5499	2.190	**33310**	**48523**	15026	**41545**	13455	**151532**	49292
1999	59	856.6	**5012**	1491	2.908	**14575**	**19587**	5363	**15546**	4243	**49851**	13548
2000	80	715.7	**15141**	5069	2.377	**35987**	**51128**	15754	**45614**	14796	**169834**	54814
2001	81	715.7	**8487**	2391	3.266	**27714**	**36201**	10194	**19208**	6539	**56804**	18729
2002	84	715.7	**11178**	4344	2.474	**27660**	**38838**	12904	**34074**	12233	**122097**	42817
Tundra Swan												
1985	48	1421.6	**1447**	379	3.280	**4747**	**6194**	1430	**5256**	1233	**20473**	4961
1986	101	3961.3	**3021**	706	1.064	**3215**	**6236**	1102	**5419**	1032	**20740**	4088
1987	125	4536.1	**2196**	468	0.801	**1758**	**3954**	629	**3852**	628	**14963**	2557
1988	96	3961.3	**2234**	513	1.221	**2728**	**4962**	864	**4962**	864	**22036**	3800
1989	89	4137.4	**2398**	734	0.889	**2132**	**4530**	1013	**4530**	1013	**19374**	4316
1990	101	3961.3	**2422**	673	1.162	**2814**	**5236**	1074	**5171**	1073	**22058**	4810
1991	97	2661.9	**2150**	520	1.558	**3350**	**5500**	1027	**5280**	1015	**22995**	4843
1992	69	1974.4	**1503**	464	2.301	**3459**	**4962**	1215	**4962**	1215	**19232**	4710
1993	99	2263.2	**2166**	538	1.973	**4274**	**6440**	1268	**6386**	1267	**25565**	4995
1994	43	715.7	**977**	222	6.565	**6414**	**7391**	1636	**7391**	1636	**30729**	6689
1995	50	715.7	**730**	135	6.251	**4563**	**5293**	990	**4829**	924	**18171**	3514
1996	54	715.7	**1141**	177	7.738	**8829**	**9970**	1644	**9655**	1577	**47290**	7667
1997	75	715.7	**1032**	151	6.625	**6837**	**7869**	1283	**7419**	1218	**31240**	5227
1998	72	856.6	**1697**	207	6.543	**11103**	**12800**	1758	**11563**	1666	**39764**	5683
1999	59	856.6	**907**	172	6.901	**6259**	**7166**	1350	**6447**	1297	**23869**	4952
2000	80	715.7	**913**	153	8.608	**7859**	**8772**	1502	**8244**	1436	**30851**	5288
2001	81	715.7	**819**	134	7.535	**6171**	**6990**	1212	**5821**	1012	**19801**	3622
2002	84	715.7	**1054**	166	8.330	**8780**	**9834**	1602	**8854**	1534	**38375**	6700

Table 1 (continued)

	Ground plot sampled area						Expanded to entire coast					
Year	No. plots	Area (km^2)	Total nests	SE	Aerial obs out/in sampled area	Estimated nests out of sampled area	**Total nests**	SE	**Active nests**	SE	**Active eggs**	SE
Sandhill Crane												
1985	48	1421.6	**1024**	253								
1986	101	3961.3	**3309**	916								
1987	125	4536.1	**3330**	784	1.122	**3735**	**7065**	1270	**6900**	1256	**10672**	2167
1988	96	3961.3	**4031**	1128	1.776	**7160**	**11191**	2544	**11191**	2544	**22016**	5052
1989	89	4137.4	**2609**	849	2.358	**6153**	**8762**	2268	**8201**	2248	**16019**	4467
1990	101	3961.3	**5257**	893	1.965	**10331**	**15588**	2393	**15430**	2380	**25962**	4110
1991	97	2661.9	**4560**	902	2.597	**11841**	**16401**	2862	**15847**	2773	**30090**	5095
1992	69	1974.4	**2901**	525	2.985	**8659**	**11560**	1932	**11381**	1913	**22172**	3870
1993	99	2263.2	**3062**	557	3.024	**9261**	**12323**	2042	**11490**	1999	**19462**	3452
1994	43	715.7	**1182**	245	7.431	**8784**	**9966**	2349	**9966**	2349	**17773**	4357
1995	50	715.7	**983**	154	9.046	**8893**	**9876**	1800	**9243**	1762	**17531**	3385
1996	54	715.7	**1362**	213	8.947	**12186**	**13548**	2498	**13180**	2477	**24907**	4664
1997	75	715.7	**1002**	181	8.103	**8119**	**9121**	1907	**9121**	1907	**16903**	3624
1998	72	856.6	**1287**	205	9.207	**11849**	**13136**	2634	**13136**	2634	**23139**	4633
1999	59	856.6	**728**	183	8.167	**5946**	**6674**	1668	**5830**	1591	**9992**	2975
2000	80	715.7	**969**	139	13.323	**12910**	**13879**	2468	**13478**	2427	**24579**	4500
2001	81	715.7	**355**	111	11.515	**4088**	**4443**	1392	**4092**	1353	**7171**	2435
2002	84	715.7	**1054**	149	14.058	**14817**	**15871**	3071	**15088**	2990	**30175**	5980
Spectacled Eider												
1985	48	1421.6	**2051**	513								
1986	101	3961.3	**5060**	846								
1987	125	4536.1	**4357**	802								
1988	96	3961.3	**3276**	706	0.726	**2378**	**5654**	1285	**5088**	1183	**26270**	6155
1989	89	4137.4	**2359**	433	0.385	**908**	**3267**	589	**2940**	541	**14529**	2459
1990	101	3961.3	**2078**	414	0.307	**637**	**2715**	501	**2476**	478	**13237**	2597
1991	97	2661.9	**1905**	398	0.439	**836**	**2741**	624	**2458**	556	**12891**	2923
1992	69	1974.4	**1713**	382	0.412	**707**	**2420**	482	**1888**	394	**10160**	2078
1993	99	2263.2	**1696**	367	0.089	**151**	**1847**	375	**1618**	349	**7419**	1670
1994	43	715.7	**1697**	333	0.483	**819**	**2516**	439	**1982**	357	**9223**	1743
1995	50	715.7	**2094**	417	0.468	**981**	**3075**	563	**2468**	498	**12437**	2593
1996	54	715.7	**1988**	377	0.563	**1119**	**3107**	539	**2532**	458	**12830**	2360
1997	75	715.7	**1680**	389	0.612	**1029**	**2709**	555	**2423**	525	**10645**	2352
1998	72	856.6	**2330**	372	0.614	**1431**	**3761**	547	**3500**	498	**16980**	2401
1999	59	856.6	**2401**	577	0.633	**1521**	**3922**	799	**3549**	731	**17483**	3528
2000	80	715.7	**1965**	295	0.465	**913**	**2878**	382	**2676**	369	**14310**	1967
2001	81	715.7	**1474**	275	0.440	**649**	**2123**	336	**1336**	213	**5580**	956
2002	84	715.7	**2135**	407	0.326	**696**	**2831**	450	**2341**	428	**12163**	2402
Common Eider												
1985	48	1421.6	**35**	23								
1986	101	3961.3	**178**	57								
1987	125	4536.1	**746**	237								
1988	96	3961.3	**651**	200	0.550	**358**	**1009**	292	**806**	227	**3806**	1083
1989	89	4137.4	**1446**	549	0.186	**269**	**1715**	588	**1715**	588	**9434**	3183
1990	101	3961.3	**448**	150	0.329	**148**	**596**	194	**526**	181	**2686**	997
1991	97	2661.9	**2970**	2191	0.193	**575**	**3545**	2252	**3455**	2250	**17808**	11644
1992	69	1974.4	**1084**	629	0.238	**258**	**1342**	656	**1319**	656	**6704**	3282
1993	99	2263.2	**506**	176	0.297	**150**	**656**	201	**429**	133	**2293**	742
1994	43	715.7	**411**	196	0.635	**261**	**672**	250	**589**	225	**2607**	918
1995	50	715.7	**539**	247	1.048	**565**	**1104**	405	**1040**	398	**5262**	2058
1996	54	715.7	**773**	271	1.375	**1063**	**1836**	565	**1748**	522	**9270**	2822
1997	75	715.7	**707**	274	1.641	**1160**	**1867**	698	**1711**	647	**7782**	2984
1998	72	856.6	**868**	229	1.590	**1380**	**2248**	582	**1754**	455	**8652**	2225
1999	59	856.6	**470**	177	0.690	**324**	**794**	259	**537**	192	**2614**	920
2000	80	715.7	**775**	212	0.705	**546**	**1321**	332	**1273**	313	**6229**	1551
2001	81	715.7	**901**	292	1.352	**1218**	**2119**	632	**1926**	581	**7767**	2343
2002	84	715.7	**685**	191	1.625	**1113**	**1798**	565	**1730**	551	**8167**	2617

Table 1 (continued)

	Ground plot sampled area						Expanded to entire coast					
Year	No. plots	Area (km^2)	Total nests	SE	Aerial obs out/in sampled area	Estimated nests out of sampled area	**Total nests**	SE	**Active nests**	SE	**Active eggs**	SE
Pacific Loon												
1985	48	1421.6										
1986	101	3961.3										
1987	125	4536.1										
1988	96	3961.3										
1989	89	4137.4	**4169**	1067	1.795	**7481**	**11650**	2688	**11553**	2680	**20978**	4936
1990	101	3961.3	**4109**	1018	1.071	**4401**	**8511**	1710	**6884**	1471	**12452**	2730
1991	97	2661.9	**5608**	1101	2.567	**14396**	**20005**	3642	**18830**	3517	**33628**	6202
1992	69	1974.4	**3312**	696	4.595	**15222**	**18534**	3907	**16192**	3411	**28412**	5990
1993	99	2263.2	**2487**	586	2.731	**6792**	**9279**	1962	**9165**	1956	**17522**	3844
1994	43	715.7	**648**	236	15.430	**9995**	**10643**	3927	**10643**	3927	**19160**	6673
1995	50	715.7	**976**	167	22.195	**21665**	**22642**	6012	**22642**	6012	**40644**	11034
1996	54	715.7	**462**	142	25.535	**11797**	**12259**	4206	**12259**	4206	**20914**	7458
1997	75	715.7	**789**	168	21.845	**17238**	**18027**	4584	**17471**	4475	**33312**	8616
1998	72	856.6	**1240**	205	12.401	**15374**	**16613**	3575	**15127**	3206	**27224**	5904
1999	59	856.6	**1929**	305	29.738	**57349**	**59278**	12940	**56624**	12641	**100003**	23137
2000	80	715.7	**1202**	181	17.468	**20989**	**22190**	4906	**21479**	4735	**40449**	9057
2001	81	715.7	**1195**	231	14.381	**17183**	**18377**	4664	**17728**	4573	**28688**	7498
2002	84	715.7	**1227**	173	11.046	**13551**	**14778**	3056	**14321**	3008	**25228**	5359
Red-throated Loon												
1985	48	1421.6										
1986	101	3961.3										
1987	125	4536.1										
1988	96	3961.3										
1989	89	4137.4	**769**	197	1.519	**1169**	**1938**	600	**1922**	596	**3489**	1090
1990	101	3961.3	**735**	182	1.369	**1006**	**1741**	448	**1408**	376	**2547**	691
1991	97	2661.9	**931**	183	0.917	**853**	**1784**	424	**1679**	404	**2998**	716
1992	69	1974.4	**724**	152	3.926	**2841**	**3565**	1022	**3114**	892	**5464**	1567
1993	99	2263.2	**594**	140	2.171	**1289**	**1883**	461	**1860**	458	**3556**	893
1994	43	715.7	**123**	45	7.760	**956**	**1079**	435	**1079**	435	**1943**	753
1995	50	715.7	**420**	72	6.324	**2655**	**3075**	1052	**3075**	1052	**5520**	1908
1996	54	715.7	**164**	51	11.344	**1861**	**2025**	812	**2025**	812	**3454**	1419
1997	75	715.7	**184**	39	10.454	**1922**	**2106**	684	**2041**	666	**3892**	1276
1998	72	856.6	**559**	93	3.632	**2031**	**2591**	634	**2359**	572	**4245**	1043
1999	59	856.6	**774**	122	6.861	**5314**	**6089**	1493	**5816**	1446	**10271**	2615
2000	80	715.7	**514**	78	2.961	**1523**	**2038**	451	**1972**	436	**3714**	829
2001	81	715.7	**361**	70	4.270	**1542**	**1904**	565	**1836**	550	**2972**	896
2002	84	715.7	**487**	69	3.835	**1868**	**2356**	564	**2283**	551	**4021**	977
Glaucous Gull												
1985	48	1421.6	**2520**	684								
1986	101	3961.3	**3375**	637								
1987	125	4536.1	**2516**	439								
1988	96	3961.3	**3194**	708								
1989	89	4137.4	**2412**	574								
1990	101	3961.3	**3227**	1065								
1991	97	2661.9	**7121**	2373								
1992	69	1974.4	**4030**	1582	1.156	**4658**	**8688**	3169	**8006**	2876	**21348**	7708
1993	99	2263.2	**2463**	574	1.860	**4582**	**7045**	1814	**6839**	1782	**17108**	4405
1994	43	715.7	**2211**	1053	6.538	**14455**	**16666**	7593	**16274**	7534	**46117**	21964
1995	50	715.7	**2252**	643	5.154	**11607**	**13859**	5034	**13859**	5034	**35921**	13031
1996	54	715.7	**957**	278	4.965	**4751**	**5708**	2020	**5708**	2020	**14273**	4967
1997	75	715.7	**2446**	1141	4.023	**9840**	**12286**	5541	**12140**	5429	**30645**	13622
1998	72	856.6	**3760**	1821	5.964	**22424**	**26184**	13068	**25676**	12820	**67974**	33901
1999	59	856.6	**1564**	398	3.446	**5390**	**6954**	2167	**6544**	2034	**17744**	5647
2000	80	715.7	**3709**	974	3.064	**11366**	**15075**	4781	**14738**	4670	**38701**	12332
2001	81	715.7	**2347**	955	4.557	**10696**	**13043**	5711	**12281**	5551	**30025**	13130
2002	84	715.7	**2531**	579	5.189	**13134**	**15665**	4985	**14031**	4478	**38014**	12114

Table 1 (continued)

	Ground plot sampled area						Expanded to entire coast					
Year	No. plots	Area (km^2)	Total nests	SE	Aerial obs out/in sampled area	Estimated nests out of sampled area	**Total nests**	SE	**Active nests**	SE	**Active eggs**	SE
Mew Gull												
1985	48	1421.6	**1174**	407								
1986	101	3961.3	**2310**	732								
1987	125	4536.1	**1845**	505								
1988	96	3961.3	**2307**	1712								
1989	89	4137.4	**2444**	687								
1990	101	3961.3	**1365**	648								
1991	97	2661.9	**1559**	334								
1992	69	1974.4	**1946**	676	3.521	**6853**	**8799**	3071	**8333**	2994	**20482**	7170
1993	99	2263.2	**2366**	282	1.586	**3751**	**6117**	1474	**6117**	1474	**16480**	3959
1994	43	715.7	**1028**	522	2.515	**2585**	**3613**	1576	**3434**	1556	**9036**	4181
1995	50	715.7	**1396**	403	3.655	**5103**	**6499**	2368	**6499**	2368	**16834**	6173
1996	54	715.7	**773**	234	4.599	**3555**	**4328**	1803	**4328**	1803	**11546**	4921
1997	75	715.7	**265**	82	2.416	**640**	**905**	302	**905**	302	**2214**	752
1998	72	856.6	**1308**	455	3.795	**4964**	**6272**	2565	**6272**	2565	**15008**	6174
1999	59	856.6	**1365**	396	2.800	**3822**	**5187**	1732	**5016**	1699	**12841**	4314
2000	80	715.7	**1024**	189	3.967	**4063**	**5087**	1113	**4813**	1071	**12652**	2847
2001	81	715.7	**982**	300	2.429	**2385**	**3367**	1110	**3367**	1110	**7954**	2593
2002	84	715.7	**1687**	378	2.645	**4463**	**6150**	1641	**5956**	1600	**15952**	4232
Sabine's Gull												
1985	48	1421.6										
1986	101	3961.3	**664**	233								
1987	125	4536.1	**875**	326								
1988	96	3961.3	**730**	298								
1989	89	4137.4	**1559**	986								
1990	101	3961.3	**2406**	1350								
1991	97	2661.9	**1304**	387								
1992	69	1974.4	**840**	281	0.738	**620**	**1460**	373	**1460**	373	**3186**	800
1993	99	2263.2	**2388**	813	0.436	**1041**	**3429**	928	**3359**	898	**8011**	2031
1994	43	715.7	**617**	210	1.892	**1168**	**1785**	524	**1785**	524	**4460**	1342
1995	50	715.7	**698**	185	1.486	**1038**	**1736**	457	**1736**	457	**4180**	1077
1996	54	715.7	**736**	216	2.834	**2086**	**2822**	849	**2684**	813	**6495**	1951
1997	75	715.7	**442**	130	4.048	**1789**	**2231**	699	**2231**	699	**5210**	1787
1998	72	856.6	**1454**	741	2.890	**4202**	**5656**	2388	**5656**	2388	**11199**	4484
1999	59	856.6	**1248**	604	1.870	**2334**	**3582**	1348	**3582**	1348	**8079**	3026
2000	80	715.7	**775**	182	3.074	**2382**	**3157**	727	**3157**	727	**8005**	1959
2001	81	715.7	**1201**	423	3.544	**4257**	**5458**	1866	**5330**	1851	**11411**	4131
2002	84	715.7	**1239**	404	3.120	**3866**	**5105**	1474	**5105**	1474	**12056**	3418
Arctic Tern												
1985	48	1421.6	**340**	172								
1986	101	3961.3	**911**	588								
1987	125	4536.1	**760**	318								
1988	96	3961.3	**191**	93								
1989	89	4137.4	**414**	175								
1990	101	3961.3	**1047**	387								
1991	97	2661.9	**652**	290								
1992	69	1974.4	**995**	304	4.669	**4646**	**5641**	1774	**5641**	1774	**10958**	3425
1993	99	2263.2	**1068**	304	1.542	**1647**	**2715**	637	**2715**	637	**6083**	1407
1994	43	715.7	**308**	156	9.989	**3077**	**3385**	1614	**3385**	1614	**7912**	3959
1995	50	715.7	**539**	165	8.226	**4434**	**4973**	1762	**4973**	1762	**9955**	3538
1996	54	715.7	**221**	85	9.758	**2157**	**2378**	928	**2378**	928	**4357**	1728
1997	75	715.7	**147**	75	10.408	**1530**	**1677**	856	**1677**	856	**3365**	1721
1998	72	856.6	**764**	208	7.499	**5729**	**6493**	2848	**6493**	2848	**13615**	5965
1999	59	856.6	**755**	199	6.179	**4665**	**5420**	1392	**5420**	1392	**10847**	2812
2000	80	715.7	**277**	90	9.252	**2563**	**2840**	1024	**2840**	1024	**5106**	1820
2001	81	715.7	**682**	269	8.605	**5868**	**6550**	2446	**6291**	2242	**12054**	4332
2002	84	715.7	**1529**	434	8.330	**12737**	**14266**	5127	**14266**	5127	**29269**	10436

Table 2. Annual proportion of nests remaining active at first plot search, mean clutch size of apparently viable eggs found in actively incubated nests, and predicted mean date of hatch based on egg float angles. Means are calculated considering each nest found on a random ground plot as a sample unit rather than using cluster sampling or stratification.

	Proportion of Nests Active		Clutch Size (Active nests)		Predicted Hatch Date (June 1=601, July 1 = 701)			
Year	Prop	n	Eggs	n	Avg	Min	Max	n
Cackling Canada Goose								
1982	0.307	584	4.48	168	703.7	625	718	170
1983	0.693	518	5.21	355	624.8	615	714	284
1984	0.474	213	4.62	101	625.0	616	711	91
1985	0.472	667	4.07	284	702.5	624	715	278
1986	0.641	647	4.66	403	629.3	613	715	345
1987	0.906	564	4.99	495	628.1	620	718	200
1988	0.736	349	4.58	253	624.0	615	708	82
1989	0.844	441	4.82	371	630.5	622	710	55
1990	0.748	524	4.54	386	623.6	613	706	194
1991	0.849	694	4.65	585	622.3	612	703	355
1992	0.891	680	4.75	596	629.7	620	721	397
1993	0.885	705	4.51	616	623.9	609	706	358
1994	0.814	625	4.59	501	619.1	608	709	409
1995	0.873	1382	4.48	1189	620.1	611	705	725
1996	0.913	1080	4.53	978	617.1	607	705	755
1997	0.826	1226	4.04	1010	616.7	603	704	812
1998	0.937	1602	4.54	1483	625.2	612	709	889
1999	0.869	1113	4.07	931	626.9	617	716	772
2000	0.950	1672	4.73	1509	624.3	614	710	1014
2001	0.607	1207	3.66	729	628.3	615	709	522
2002	0.855	1534	4.49	1293	620.4	610	704	930
Emperor Goose								
1982	0.699	133	4.91	78	703.4	616	711	71
1983	0.831	177	5.38	141	621.8	614	706	100
1984	0.728	81	5.52	58	623.0	616	702	43
1985	0.618	191	5.22	113	701.0	623	711	107
1986	0.696	335	5.22	218	626.7	618	709	196
1987	0.934	395	5.13	361	627.3	618	707	141
1988	0.893	298	5.20	264	621.5	616	704	88
1989	0.916	322	5.12	292	630.0	618	707	63
1990	0.874	357	4.92	306	621.0	611	706	99
1991	0.942	411	4.92	383	619.6	610	702	263
1992	0.960	272	5.04	261	628.5	621	709	184
1993	0.954	306	4.85	285	621.4	611	704	139
1994	0.939	328	4.92	308	618.9	612	630	192
1995	0.967	307	4.87	297	618.0	610	706	188
1996	0.943	299	5.13	280	615.5	604	623	185
1997	0.958	240	4.78	230	614.9	606	630	153
1998	0.954	281	4.70	266	624.0	616	703	215
1999	0.919	247	4.51	224	627.0	617	706	188
2000	0.986	351	4.99	344	623.1	613	708	280
2001	0.776	165	4.77	127	626.6	619	702	104
2002	0.930	330	5.03	303	617.5	609	629	249

Table 2. (Continued) Annual proportion of active nests, mean clutch size, and predicted mean date of hatch.

White-fronted Goose								
1982	0.643	28	3.73	15	703.6	626	712	14
1983	0.922	51	4.29	38	621.0	613	719	25
1984	0.903	31	4.57	28	623.2	616	701	25
1985	0.741	58	4.07	42	629.7	623	707	42
1986	0.878	123	4.26	104	626.1	617	712	102
1987	0.944	144	4.70	133	626.3	619	703	60
1988	0.966	89	4.44	86	622.0	615	703	32
1989	0.991	112	4.52	111	627.8	622	704	21
1990	0.936	173	4.60	161	621.8	611	629	52
1991	0.932	219	4.63	202	621.2	612	703	138
1992	0.971	209	4.48	202	629.2	619	724	115
1993	0.970	199	4.31	191	623.4	617	705	84
1994	0.973	222	4.36	214	618.9	611	628	129
1995	0.971	315	4.24	306	620.8	609	701	178
1996	0.966	349	4.50	337	618.0	607	630	144
1997	0.984	368	4.30	360	617.5	607	629	184
1998	0.974	392	4.32	380	625.3	617	706	261
1999	0.947	263	4.18	246	627.3	619	710	208
2000	0.978	493	4.46	478	624.6	614	709	334
2001	0.935	418	3.86	390	628.0	619	707	311
2002	0.978	455	4.39	444	621.8	614	630	306
Black Brant								
1982	0.043	47	2.00	1	628.4	628	628	1
1983	0.462	52	3.38	24	623.2	615	703	11
1984	0.294	17	4.20	5	620.2	619	620	4
1985	0.129	271	3.57	21	627.4	623	708	29
1986	0.735	298	3.78	215	625.3	619	706	126
1987	0.952	652	4.20	615	624.8	622	703	167
1988	0.674	258	3.32	173	619.7	614	703	44
1989	0.929	1011	3.76	939	627.0	619	706	40
1990	0.741	452	3.23	334	621.3	615	701	119
1991	0.867	543	3.59	374	618.9	612	701	183
1992	0.963	898	3.87	551	626.4	619	706	152
1993	0.852	562	3.30	328	620.9	612	627	107
1994	0.883	274	3.65	119	616.7	610	627	93
1995	0.723	195	3.72	103	618.3	612	701	41
1996	0.873	110	3.75	96	616.8	611	626	44
1997	0.944	124	3.49	110	614.2	603	624	100
1998	0.875	488	3.66	427	623.3	616	704	260
1999	0.821	156	3.19	126	625.6	617	707	108
2000	0.892	547	3.73	372	623.1	616	703	216
2001	0.531	311	2.96	165	626.0	619	705	77
2002	0.877	424	3.57	324	618.6	606	703	163
Tundra Swan								
1982	0.824	17	3.69	13	704.8	623	714	11
1983	0.933	15	4.79	14	623.5	615	630	6
1984	0.933	15	4.57	14	627.4	620	705	6
1985	0.839	31	3.79	24	704.0	626	710	14
1986	0.872	47	3.58	38	628.2	619	710	23
1987	0.962	26	3.79	24	629.9	623	706	12
1988	1.000	29	4.64	28	625.2	617	704	5
1989	1.000	24	4.29	24	701.1	629	703	4
1990	0.964	28	4.08	26	624.6	621	627	4
1991	0.897	29	4.23	26	624.4	617	708	12
1992	1.000	21	3.86	21	630.3	624	707	9
1993	0.964	28	4.04	26	625.8	619	701	6
1994	1.000	27	4.33	27	621.9	613	630	9
1995	0.913	23	3.76	21	625.3	621	702	9
1996	0.968	31	4.90	30	619.3	610	628	9
1997	0.943	35	4.21	33	621.2	614	625	13
1998	0.905	42	3.39	36	630.3	623	712	20
1999	0.900	20	3.67	18	701.3	624	709	14
2000	0.939	33	3.73	30	625.5	618	705	22
2001	0.833	30	3.40	25	630.3	619	709	16
2002	0.900	40	4.33	36	625.6	620	701	10

Table 2. (Continued) Annual proportion of active nests, mean clutch size, and predicted mean date of hatch.

Sandhill Crane								
1982	0.889	9	2.00	6	624.0	622	625	4
1983	1.000	27	1.79	24	625.7	617	711	14
1984	0.929	14	1.85	13	618.7	615	621	6
1985	0.958	24	1.45	20	629.6	619	704	13
1986	0.805	41	1.57	30	626.5	616	709	25
1987	0.973	37	1.62	34	624.5	618	710	16
1988	0.972	36	1.94	35	619.3	617	625	6
1989	0.850	20	1.88	17	619.2	617	621	2
1990	0.979	47	1.76	45	618.4	615	622	9
1991	0.980	51	1.96	49	616.3	610	626	25
1992	0.969	32	1.84	31	629.1	624	705	11
1993	0.943	35	1.67	33	619.1	615	627	14
1994	1.000	32	1.81	31	613.9	611	616	5
1995	0.935	31	1.90	29	617.5	612	630	10
1996	0.973	37	1.89	35	614.3	610	625	14
1997	1.000	34	1.84	32	614.5	611	624	8
1998	1.000	35	1.77	35	620.6	615	626	19
1999	0.875	16	1.71	14	622.8	619	628	12
2000	0.971	35	1.82	34	619.2	613	629	22
2001	0.923	13	1.75	12	620.7	619	623	7
2002	0.950	40	2.00	38	619.4	608	703	12
Spectacled Eider								
1982	0.287	87	3.62	21	707.8	630	722	18
1983	0.550	111	4.54	61	628.7	620	706	22
1984	0.500	18	3.88	8	701.6	625	705	3
1985	0.545	99	4.22	50	703.7	626	718	20
1986	0.683	101	4.56	66	702.2	622	720	38
1987	0.848	105	5.01	87	628.1	617	709	27
1988	0.787	75	5.04	57	625.7	620	702	19
1989	0.927	41	5.05	37	701.9	622	707	5
1990	0.929	42	5.27	37	623.0	618	627	15
1991	0.875	40	5.43	35	621.6	616	710	25
1992	0.862	29	5.60	25	701.7	626	714	18
1993	0.868	38	4.39	31	624.5	617	709	18
1994	0.743	35	4.64	25	623.0	612	706	15
1995	0.803	66	5.04	51	623.6	614	704	44
1996	0.815	54	5.07	44	618.3	612	702	33
1997	0.895	57	4.38	50	619.1	611	630	39
1998	0.928	69	4.84	64	627.9	617	707	52
1999	0.911	56	4.94	51	628.2	618	709	51
2000	0.930	71	5.35	66	627.6	618	709	52
2001	0.630	54	4.18	34	703.0	625	716	32
2002	0.827	81	5.19	67	621.5	615	702	59
Common Eider								
1982	1.000	4	4.75	4	709.2	708	710	4
1983	0.600	5	4.33	3	626.0	621	630	3
1984	0.000	0						
1985	0.333	3	6.00	1				
1986	0.667	6	3.67	3				
1987	0.941	34	5.35	31	628.7	625	708	10
1988	0.704	27	4.53	19	710.0	713	713	1
1989	1.000	31	5.52	31	701.8	629	708	4
1990	0.947	19	5.17	18	622.3	621	624	3
1991	0.865	37	5.00	32	626.2	619	705	27
1992	0.941	17	5.25	16	701.9	626	706	12
1993	0.600	15	5.11	9	623.6	618	627	5
1994	0.857	14	4.18	11	623.6	616	704	9
1995	0.941	17	5.06	16	623.1	614	702	13
1996	0.952	21	5.30	20	618.6	610	702	14
1997	0.917	24	4.55	22	619.1	610	701	15
1998	0.781	32	5.00	25	628.0	620	704	18
1999	0.765	17	4.46	13	630.2	622	709	12
2000	0.964	28	4.89	27	628.7	624	705	23
2001	0.909	33	4.03	30	630.1	620	708	23
2002	0.962	26	4.72	25	623.7	615	630	17

Table 2. (Continued) Annual proportion of active nests, mean clutch size, and predicted mean date of hatch.

Red-throated and Pacific Loons (combined)								
1982	0.886	35	1.74	31	708.4	703	724	25
1983	0.947	38	1.75	36	629.4	621	729	15
1984	0.909	11	2.00	10	701.6	626	708	5
1985	0.898	59	1.68	53	707.3	625	721	15
1986	0.867	75	1.61	64	705.1	626	725	37
1987	0.938	81	1.87	76	703.1	627	712	34
1988	0.857	56	1.71	45	626.7	616	705	5
1989	0.956	45	1.81	43	701.7	622	715	5
1990	0.915	47	1.81	43	630.7	625	709	11
1991	0.926	68	1.83	63	626.4	618	705	21
1992	0.911	45	1.80	41	705.3	629	718	15
1993	0.979	47	1.87	45	625.5	618	705	12
1994	1.000	29	1.86	29	623.8	619	629	6
1995	1.000	44	1.80	44	625.9	621	701	10
1996	1.000	17	1.71	17	622.3	615	701	9
1997	0.970	33	1.91	32	621.9	615	629	17
1998	0.911	56	1.84	51	630.5	620	714	37
1999	0.937	63	1.79	58	702.8	622	714	48
2000	0.968	62	1.88	60	630.4	615	709	40
2001	0.965	57	1.62	55	703.6	627	715	27
2002	0.969	65	1.76	62	625.4	612	703	42
Glaucous Gull								
1982	0.797	59	2.47	45	705.0	629	722	23
1983	0.945	55	2.40	52	621.8	613	704	14
1984	0.875	8	2.29	7	622.5	618	626	5
1985	0.835	115	2.15	92	703.1	623	712	23
1986	0.768	69	2.33	51	626.6	622	705	18
1987	0.987	77	2.42	67	627.5	620	710	19
1988	0.935	77	2.42	69	621.6	615	703	9
1989	0.894	47	2.50	38	622.0	622	622	3
1990	0.847	59	2.56	50	617.0	616	618	2
1991	0.826	92	2.84	61	618.0	612	703	26
1992	0.947	76	2.74	72	626.4	622	704	24
1993	0.983	59	2.65	54	619.7	615	707	11
1994	0.981	54	2.77	53	616.7	610	627	17
1995	1.000	71	2.60	65	617.4	614	626	17
1996	1.000	26	2.50	26	614.3	611	620	15
1997	0.988	83	2.52	58	616.5	610	629	19
1998	0.983	116	2.67	114	621.6	615	709	64
1999	0.949	39	2.73	37	626.5	619	707	25
2000	0.978	134	2.62	124	622.2	612	709	72
2001	0.942	86	2.43	79	624.1	617	707	50
2002	0.896	96	2.7	83	617	606	704	56
Mew Gull								
1982	0.800	20	2.06	16	709.5	707	722	11
1983	0.946	37	2.57	35	625.9	617	703	6
1984	1.000	2	2.00	2				
1985	0.909	44	1.92	38	703.9	627	712	8
1986	0.919	37	2.32	34	702.1	621	712	18
1987	1.000	29	2.35	23	626.3	621	704	8
1988	0.977	44	2.67	42	618.1	614	624	4
1989	0.918	49	2.58	45	622.0	622	622	1
1990	0.960	25	2.54	24	621.4	617	626	2
1991	0.857	42	2.58	36	620.0	614	702	8
1992	0.941	34	2.56	32	627.3	623	704	10
1993	1.000	92	2.76	92	624.2	617	702	7
1994	0.963	27	2.54	26	615.0	611	621	8
1995	1.000	44	2.59	44	617.5	615	622	16
1996	1.000	21	2.67	21	613.6	608	620	10
1997	1.000	9	2.44	9	618.8	616	627	8
1998	1.000	40	2.42	40	623.8	619	704	19
1999	0.972	36	2.54	35	625.1	621	709	25
2000	0.946	37	2.63	35	625.2	617	705	17
2001	1.000	36	2.36	36	626.4	619	707	18
2002	0.969	64	2.68	62	615.9	606	703	40

Table 2. (Continued) Annual proportion of active nests, mean clutch size, and predicted mean date of hatch.

Sabine's Gull								
1982	1.000	2	1.00	2	628.8	629	629	1
1983	1.000	5	2.40	5	621.0	614	702	3
1984	1.000	1						
1985	1.000	5	1.60	5	702.1	626	718	3
1986	1.000	11	1.90	10	624.2	615	707	7
1987	1.000	17	2.18	17	621.0	615	704	7
1988	1.000	15	2.47	15	624.3	618	708	7
1989	1.000	15	2.67	15	630.5	621	711	2
1990	1.000	23	2.59	17	0.0	0	0	0
1991	1.000	20	1.95	19	614.5	609	622	9
1992	1.000	18	2.22	18	0.0	0	0	0
1993	0.967	60	2.25	57	617.3	614	623	8
1994	1.000	38	2.71	38	611.4	609	616	6
1995	1.000	22	2.41	22	618.4	612	628	6
1996	0.950	20	2.42	19	610.5	607	614	3
1997	1.000	15	2.33	15	613.6	608	622	8
1998	1.000	44	1.95	44	620.5	615	706	11
1999	1.000	28	2.25	28	620.5	616	703	20
2000	1.000	28	2.54	28	622.3	614	702	7
2001	0.977	44	2.14	43	626.8	619	704	10
2002	1.000	47	2.36	47	614.4	608	626	28
Arctic Tern								
1982	0.857	7	1.50	6				
1983	1.000	4	2.50	4				
1984	1.000	2	1.50	2				
1985	1.000	17	1.88	16	629.1	622	704	8
1986	1.000	8	2.12	8	625.8	616	724	6
1987	1.000	9	1.33	9	624.0	620	626	3
1988	0.875	8	1.57	7	624.0	624	624	2
1989	1.000	7	1.86	7	622.0	622	622	1
1990	1.000	10	1.63	8	624.2	624	624	1
1991	1.000	10	1.90	10	616.8	612	620	4
1992	1.000	15	1.93	15	630.5	625	710	6
1993	1.000	28	2.18	28	616.6	615	620	3
1994	1.000	8	2.12	8	615.4	615	615	1
1995	1.000	17	2.00	17	615.6	613	620	3
1996	1.000	6	1.83	6	611.2	611	611	1
1997	1.000	5	2.00	5				
1998	1.000	21	2.10	21	626.1	619	705	5
1999	1.000	16	2.00	15	625.4	621	702	8
2000	1.000	10	1.80	10	625.5	623	701	5
2001	0.960	25	1.92	24	622.4	615	629	5
2002	1.000	58	2.05	58	617.6	608	626	37
Diving Ducks								
1982	0.500	14	4.67	6	710.0	713	722	5
1983	0.714	7	6.60	5	624.0	624	624	1
1984	0.727	11	5.00	8				
1985	0.556	9	5.40	5	710.0	725	725	1
1986	0.929	14	6.92	13	707.5	701	711	4
1987	0.824	17	7.07	14	707.2	702	711	4
1988	0.800	20	6.88	16	708.0	708	708	1
1989	1.000	18	7.33	18	707.8	708	708	1
1990	1.000	10	6.50	10	707.0	706	708	2
1991	0.727	11	6.88	8	627.5	623	702	2
1992	0.969	32	7.35	31	706.5	630	722	21
1993	0.909	33	6.10	30	702.4	629	708	18
1994	0.941	17	5.56	16	701.9	630	703	7
1995	0.857	28	6.83	24	703.4	620	710	14
1996	0.917	12	6.27	11	628.3	617	705	7
1997	0.917	12	6.36	11	626.5	617	704	10
1998	0.960	25	6.88	24	703.7	626	710	14
1999	0.800	15	7.00	12	708.0	701	713	10
2000	0.935	31	7.79	29	705.9	628	711	26
2001	1.000	7	3.29	7	707.3	704	717	6
2002	0.833	12	6.9	10	630.9	629	704	8

Table 2. (Continued) Annual proportion of active nests, mean clutch size, and predicted mean date of hatch.

Dabbling Ducks								
1982	0.190	21	6.67	3	710.0	712	712	1
1983	1.000	4	4.00	4	622.6	623	623	1
1984	0.500	6	5.00	3	703.0	703	703	1
1985	0.500	10	5.80	5	708.1	706	715	2
1986	0.773	22	6.06	17	703.1	622	717	13
1987	0.833	36	6.27	30	703.3	618	714	12
1988	0.780	41	6.74	31	630.8	628	703	2
1989	0.722	36	6.36	25	706.3	703	711	4
1990	0.700	20	5.64	14	628.2	624	703	4
1991	0.935	31	6.76	29	624.2	612	704	13
1992	0.823	62	6.71	51	704.0	621	713	18
1993	0.852	54	6.50	46	628.3	624	701	16
1994	0.762	21	6.75	16	628.0	626	629	5
1995	0.722	36	5.27	26	626.8	618	706	11
1996	0.762	21	7.60	15	624.6	613	702	10
1997	0.900	10	7.44	9	617.2	613	621	4
1998	0.720	82	6.78	59	701.1	618	710	39
1999	0.794	34	7.22	27	701.8	620	712	17
2000	0.898	49	6.34	44	630.0	621	708	28
2001	0.667	30	6.70	20	702.0	627	708	13
2002	0.750	40	6	30	624.1	613	703	21
Small Shorebirds (sandpipers, dunlin, phalaropes, turnstones)								
1982	1.000	5	3.40	5	629.9	630	630	1
1983	1.000	17	3.88	17				
1984	1.000	2	4.00	2				
1985	1.000	19	3.32	19	702.8	622	717	4
1986	0.943	53	3.50	50	626.5	616	711	23
1987	0.969	32	3.55	31	621.0	615	625	7
1988	0.939	49	3.83	46	617.1	616	618	2
1989	1.000	71	3.54	71	624.3	618	704	3
1990	0.952	84	3.83	80	625.4	621	630	2
1991	1.000	92	3.91	92	622.2	608	706	21
1992	0.976	85	3.80	83	626.6	622	702	11
1993	0.989	91	3.56	90	620.5	614	629	15
1994	1.000	55	3.76	55	618.3	613	624	2
1995	1.000	72	3.78	72	619.1	610	625	6
1996	0.986	71	3.67	69	619.5	608	702	10
1997	1.000	76	3.49	75	611.7	609	614	3
1998	0.955	67	3.62	64	621.9	614	628	8
1999	0.977	88	3.76	83	625.2	616	705	17
2000	1.000	92	3.65	92	622.6	614	627	13
2001	0.965	113	3.67	109	626.8	618	704	22
2002	0.980	98	3.91	96	618.9	612	625	21