FINAL REPORT

STELLER'S EIDER SURVEY NEAR BARROW, ALASKA, 2008

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INTRODUCTION

The Alaska breeding population of Steller's Eider (*Polysticta stelleri*) was classified as threatened under the Endangered Species Act in June 1997 (USFWS 2002). Recent records suggest that the species' current breeding range in northern Alaska has been greatly reduced and now is restricted mostly to the vicinity of Barrow (Quakenbush et al. 2002). Results of aerial surveys in the past decade verify this distribution pattern (e.g., Larned et al. 1999, Obritschkewitsch et al. 2008, Ritchie and King 2001).

The U.S. Fish and Wildlife Service (USFWS), in partnership with the Department of Wildlife Management of the North Slope Borough (NSB), has conducted studies on the breeding biology of Steller's Eiders near Barrow since 1991 (Quakenbush et al. 2000; Obritschkewitsch et al. 2001; Obritschkewitsch and Martin 2002a, 2002b; Rojek and Martin 2003; Rojek 2007, 2008). ABR collaborated with these groups and conducted aerial surveys for Steller's Eiders during the pre-nesting season in 1999–2007 (see Ritchie and King 2004). The U.S. Bureau of Land Management (BLM) provided support for these aerial surveys in 2004–2008, and ConocoPhillips Alaska, Inc. (CPAI) provided additional support in 2006–2008. In 2008, ABR conducted the tenth year of aerial surveys for Steller's Eiders in the Barrow area. Our major objective in 2008 and previous years was to estimate the number of Steller's Eiders in the region using an intensive, low-level aerial survey.

STUDY AREA

The study area for 2008 consisted of the region from Barrow south to approximately the Meade River (Figure 1) and was the same as the 1999–2007 study areas. The study area encompassed 2,757 km² and extended from ~2.4 km south of the Wiley Post–Will Rogers Memorial Airport near Barrow, south to ~70° 50' N latitude. Western and eastern boundaries of the study area were the Chukchi Sea and Admiralty Bay coastlines, respectively.

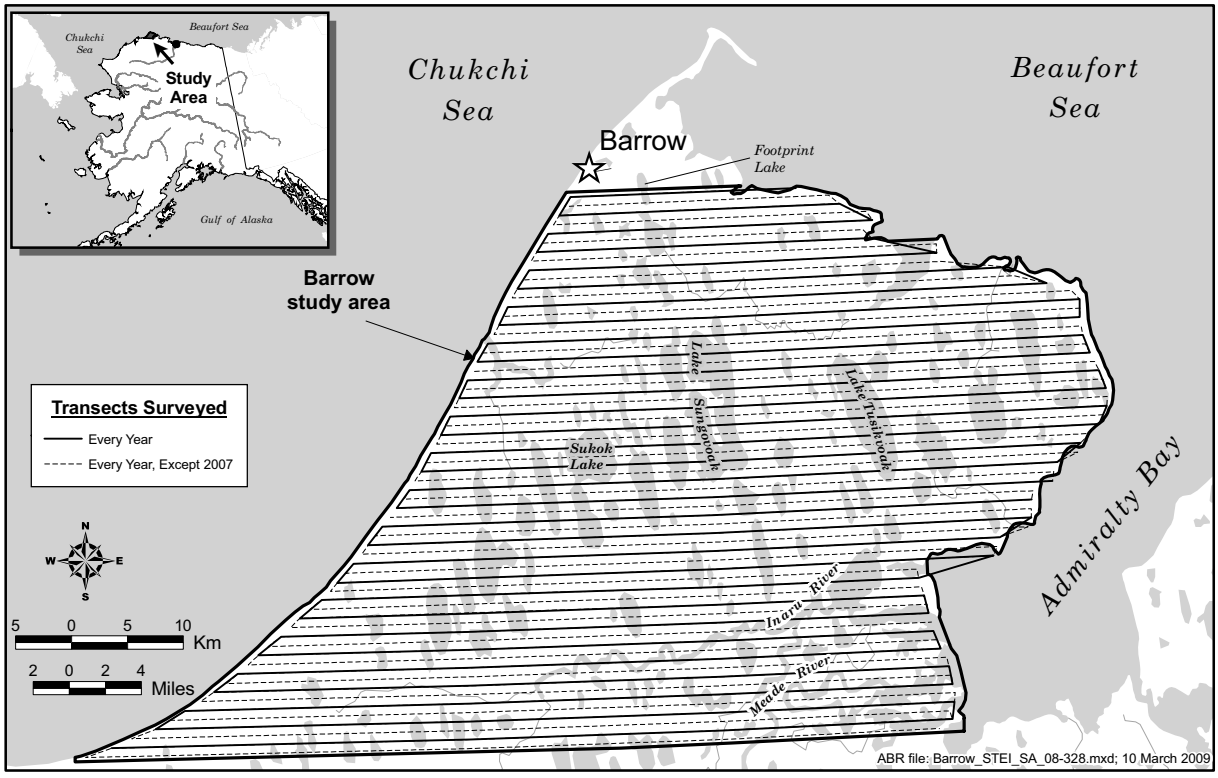

Figure 1. Survey area for Steller's Eiders near Barrow, Alaska, June 1999–2008.

The study area is characteristic of the Arctic Coastal Plain of Alaska, being poorly drained and covered by numerous thaw lakes (Gallant et al. 1995). Wetlands include drained-lake basins, small ponds and lakes, beaded streams, and wet meadows in both nonpatterned and polygonized tundra. *Eriophorum* tussock and some dwarf scrub communities occupy drier soils, which are more common in the southern portion of the study area. In addition, greater topographic relief and microhabitats, such as sand dunes and riparian willow habitats, occur along the Meade River near the southern boundary of the study area.

METHODS

We conducted an aerial survey for breeding pairs of Steller's Eiders during 16–21 June 2008. Surveys have been conducted annually during a similar time period since 1999. Survey flights were not possible on 17–18 June 2008 due to fog. The survey aircraft was a Cessna 185 with the same pilot (Sandy Hamilton, Arctic Air Alaska) used in 1999–2003 and 2005–2007. Observers were Tim Obritschkewitsch (observer in 2005–2007) and Julie Parrett (experienced aerial eider observer but new to this survey in 2008).

As in previous years, we followed standard protocols for breeding-pair waterfowl surveys (USFWS 1987). Transects were oriented in an east–west direction, were spaced at 0.8-km intervals, and were 400 m wide (200 m on each side of the aircraft) to achieve 50% coverage of the study area. Survey coverage was consistent with all prior years except 2007, which was flown at 25% coverage.

During the winter of 2004–2005, the Eider Recovery Team discussed measures to reduce the costs of this survey by reducing sampling coverage and aircraft hours (N. Rojek, USFWS, pers. comm.; see Prichard and Ritchie 2005), also reducing carbon emissions. Because Steller's Eiders breed near Barrow in some years but not in others, and because various conditions identifiable to ground observers early in the season seem to indicate whether breeding will occur, the Eider Recovery Team decided that, starting in 2005, if USFWS ground crews in Barrow determined that Steller's Eiders probably were not nesting, then our aerial survey would be reduced to every other transect (25% sampling coverage). Indicators in early June suggested that 2008 was a nesting year, so we conducted the survey at normal sampling coverage (50%).

We flew along each transect centerline at an altitude of ~40 m above ground level (agl) and at an airspeed of 140–160 km/h. GPS waypoints were generated from digital base maps of the area to identify flight-lines and we used an onboard Global Positioning System (GPS) for navigation and to record all Steller's Eider locations. Before starting the survey, we flew 2 practice transects north of the study area to acquaint our new observer to data procedures and to practice identifying Steller's Eiders from the air.

We recorded the numbers, sex, and behavior (e.g., stayed on water, in flight) of all Steller's Eiders observed on transect. Each observer also recorded Steller's Eider sightings on 1:63,360-scale USGS maps. We also mapped the locations of other eiders (King Eider, *Somateria spectabilis*; and Spectacled Eider, *S. fischeri*), Snowy Owls (*Bubo scandiacus*), and Tundra Swans (*Cygnus columbianus*). "Indicated" total numbers of eiders on transect were derived by applying the USFWS standard equation (USFWS 1987):

> Indicated total birds = (pairs × 2) + (lone males × 2) + (flocked males [≤ 4 males] × 2) + number in mixed groups.

Indicated total birds were doubled to estimate the population of Steller's Eiders in the study area and to calculate densities. No correction factors or sightability indices were used. We calculated densities (birds/km²) by dividing the estimated population by the total area within the study area. The USFWS protocol (1987) excludes flying birds unless their flight is known to originate or terminate within the transect boundaries. We followed this protocol, but for less conservative estimates we also calculated density of all eiders recorded on transect (including all flying birds). All birds observed on-transect in 2008 originated within the transect.

RESULTS AND DISCUSSION

STELLER'S EIDERS

HABITAT CONDITIONS AND BREEDING PHENOLOGY

Snow depths at Barrow in May 2008 were the deepest on record (dating back to 1973 at the NOAA weather station at Wiley Post–Will Rogers Airport, Barrow Alaska; National Climate Data Center [NCDC] Global Surface Summary of the Day). The maximum May snow depth was 24.0 inches in 2008, compared to the average maximum May snow depth of 8.4 inches. Snow levels decreased rapidly during the second half of May, to a depth of 3.9 inches on 1 June (30-year average 0.84 inches).

Snow cover on the tundra continued to decrease rapidly in early June, from an estimated 60–100% cover on 7 June to <5% on 12 June (Attanas and Johnson 2008). Snow-melt was nearly complete when we arrived on 15 June, with much open water on most lakes. Mean temperatures were warmer than average for the entire months of May (+1.4° F) and June (+1.3° F), while precipitation was slightly above average (+0.07 inches in May and +0.10 inches in June, NCDC Global Surface Summary of the Day).

In spring 2008, Steller's Eiders were first observed in Barrow on 5 June, in thawed areas near roads and in thawed sections of streams and lagoons (J. Bennett, USFWS, pers. comm.). A nest with 3 eggs was found on 14 June, indicating nest initiation on about 11–12 June, which was within the range of first initiation dates documented for 2005, 2006, and 2007 (17, 10, and 12 June, respectively; Rojek 2006, 2007, 2008).

ABUNDANCE AND DISTRIBUTION

We recorded 45 Steller's Eiders at 23 locations on transect in 2008 (Table 1, Figure 2, Appendix 1). Observations consisted of 21 pairs and 3 single males for an indicated total of 48 Steller's Eiders in surveyed transects, or an estimated population of 96 Steller's Eiders in the study area. An additional 2 pairs were observed off-transect. All but 2 observations were located along the 7 most northern transect lines. Twenty (80%) Steller's Eider observations occurred within the region searched annually by USFWS ground crews near Barrow (Rojek 2008), and 7 (28%) were clustered within 1 km of Footprint Lake (Figure 2), a waterbody near Barrow commonly used by Steller's Eiders during the pre-nesting period.

In breeding years, Steller's Eiders typically are widely distributed throughout the survey area, but the highest densities occur near Barrow (Figure 3, bottom). In non-breeding years, birds usually are present in low numbers in the vicinity of Barrow and are very sparse throughout the rest of the study area (Figure 3, top). The high density of Steller's Eiders near Barrow in 2008 was consistent with other breeding years; however the near absence of Steller's Eiders from the rest of the study area was unusual, suggesting that breeding may have been limited to the Barrow area this year. The USFWS Waterfowl Breeding Population Survey on the Arctic Coastal Plain (a new survey initiated in 2007 combining the former Eider Breeding Population Survey and Aerial Breeding Pair Survey of the Arctic Coastal Plain; Larned et al. 2008) also found very low densities of Steller's Eiders away from Barrow. Only 1 Steller's Eider was recorded on that survey, between Lonely and Teshekpuk Lake (outside our survey area; B. Larned, USFWS, pers. comm.). The USFWS aerial survey is conducted at low sampling intensity (9.6 km transect spacing for 4.2% coverage of the survey area in the Barrow stratum; Larned et al. 2008) which might explain why the tight cluster of birds at Barrow was missed this year.

Steller's Eiders were twice as abundant in the study area during the first 2 years of surveys (1999–2000) than they have been in any year since (Table 1). Estimated total numbers in 1999 and 2000 were 224 and 220 eiders, respectively. Since 2000, eiders have been much less common, with estimated totals of ≤24 eiders in 2002, 2003, and 2004 and moderately higher numbers in 2001 and 2005–2008 (88–124 estimated birds; Table 1).

The density of Steller's Eiders decreased from 0.08 birds/km² in 1999 and 2000 to 0.03 birds/km² in 2001 and to <0.01 birds/km² in 2002–2004 (Table 1). In 2005, the estimated density increased to 0.04 birds/km², about half of that observed in 1999 and 2000, and since then (2006–2008) the estimated density of Steller's Eiders has been stable at 0.03 birds/km². Not surprisingly, lower

Table 1. Steller's Eider observations, estimated populations, and densities from aerial surveys near Barrow, Alaska, June 1999–2008.

Year	Observation Type	No. Obs.	Lone Males	Males[a]	Pairs	Flocked Birds[b]	Indicated Total[c]	Estimated Total[d]	Density (birds/km²)[e]
1999	Non-flying	33	17	0	19	0	72	144	0.05
	Flying[f]	18	9	2	9	0	40	80	0.03
	Total	51	26	2	28	0	112	224	0.08
2000	Non-flying	48	14	7	32	0	106	212	0.08
	Flying[f]	2	1	0	1	0	4	8	<0.01
	Total	50	15	7	33	0	110	220	0.08
2001	Non-flying	9	3	2	6	0	22	44	0.02
	Flying[f]	8	2	4	5	0	22	44	0.02
	Total	17	5	6	11	0	44	88	0.03
2002	Non-flying	2	1	0	1	0	4	8	<0.01
	Flying[f]	0	0	0	0	0	0	0	0.00
	Total	2	1	0	1	0	4	8	<0.01
2003	Non-flying	2	1	0	1	0	4	8	<0.01
	Flying[f]	2	1	0	1	0	4	8	<0.01
	Total	4	2	0	2	0	8	16	0.01
2004	Non-flying	4	4	0	0	0	8	16	0.01
	Flying[f]	2	1	0	1	0	4	8	<0.01
	Total	6	5	0	1	0	12	24	0.01
2005	Non-flying	9	5	0	6	0	22	44	0.02
	Flying[f]	18	9	0	11	0	40	80	0.03
	Total	27	14	0	17	0	62	124	0.05
2006	Non-flying	17	13	0	4	0	34	68	0.02
	Flying[f]	6	3	0	4	0	14	28	0.01
	Total	23	16	0	8	0	48	96	0.03
2007	Non-flying	8	1	0	8	0	18	72	0.02
	Flying[f]	3	0	0	3	0	6	24	0.01
	Total	11	1	0	11	0	24	96	0.03
2008	Non-flying	23	3	0	21	0	48	96	0.03
	Flying[f]	0	0	0	0	0	0	0	0.00
	Total	23	3	0	21	0	48	96	0.03

[a] Males = all groups of 2–4 males.
[b] Flocked birds = any group of 5 or more eiders, where pairs could not be differentiated.
[c] Indicated Total Birds = (lone males × 2) + (flocked males × 2) + (pairs × 2) + (flocked birds × 1) (follows USFWS 1987).
[d] Estimated Total Number = Indicated Total Birds / survey coverage (survey coverage = 0.5 in 1999–2006 and 0.25 in 2007).
[e] Density = Estimated Total / study area size.
[f] Flying birds = all birds observed in flight along a transect.

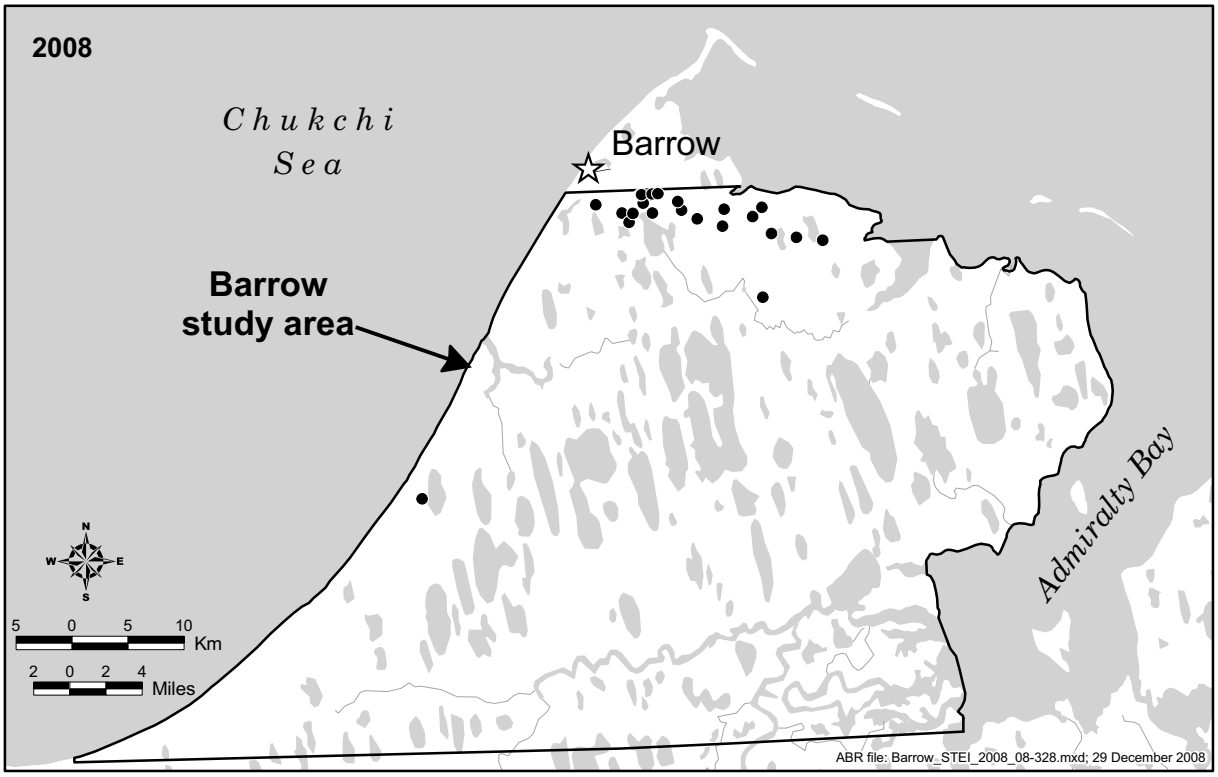

Figure 2. Locations of Steller's Eiders in the Barrow area, northern Alaska, 16–21 June 2008.

densities of Steller's Eiders typically are recorded by the USFWS from broad regional aerial surveys of all eider species on the Arctic Coastal Plain (Barrow Survey Stratum: 0–0.02 Steller's Eiders/km²; Larned et al. 2001). Nonetheless, the USFWS surveys do confirm higher numbers in the Barrow area than in other parts of the Arctic Coastal Plain.

SURVEY EFFICACY

Flight conditions were very good on 16 and 21 June: winds were calm to moderate (<15 knots), skies were overcast and visibility along transects was not restricted. Conditions were fair to good on 19–20 June, with calm to moderate winds and overcast skies interspersed with periods of bright sun and glare to the south. High winds and poor visibility have negatively affected sampling abilities along only small portions of a few transects during previous seasons (Ritchie and King 2001, 2004).

As in previous years, the survey was timed to coincide with the short period when Steller's Eiders are paired and widely dispersed over the nesting area. Phenological data collected during ground-based surveys in the Barrow area since 1991 have identified mid-June as the optimal period in most years (Quakenbush et al. 1995, Rojek 2008). In 2008 and prior years, we also communicated with USFWS personnel to obtain their current-year observations from ground-based surveys in the Barrow area and from regional aerial surveys in northern Alaska, in an attempt to fine-tune survey timing. Although ground observations near Barrow were used to time the survey in 2008, subsequent observations suggest that some pairs had not yet dispersed to breeding sites at the time of the survey. For example, although ground surveys identified an active nest on 11–12 June 2008, 42 Steller's Eiders subsequently were observed on Footprint Lake during ground surveys on 16 June (J. Bennett, USFWS, pers. comm.), the day of our aerial survey in that area. Ultimately, only 3 of 28 nests found in the Barrow area in 2008 were located in the immediate vicinity of Footprint Lake (J. Bennett,

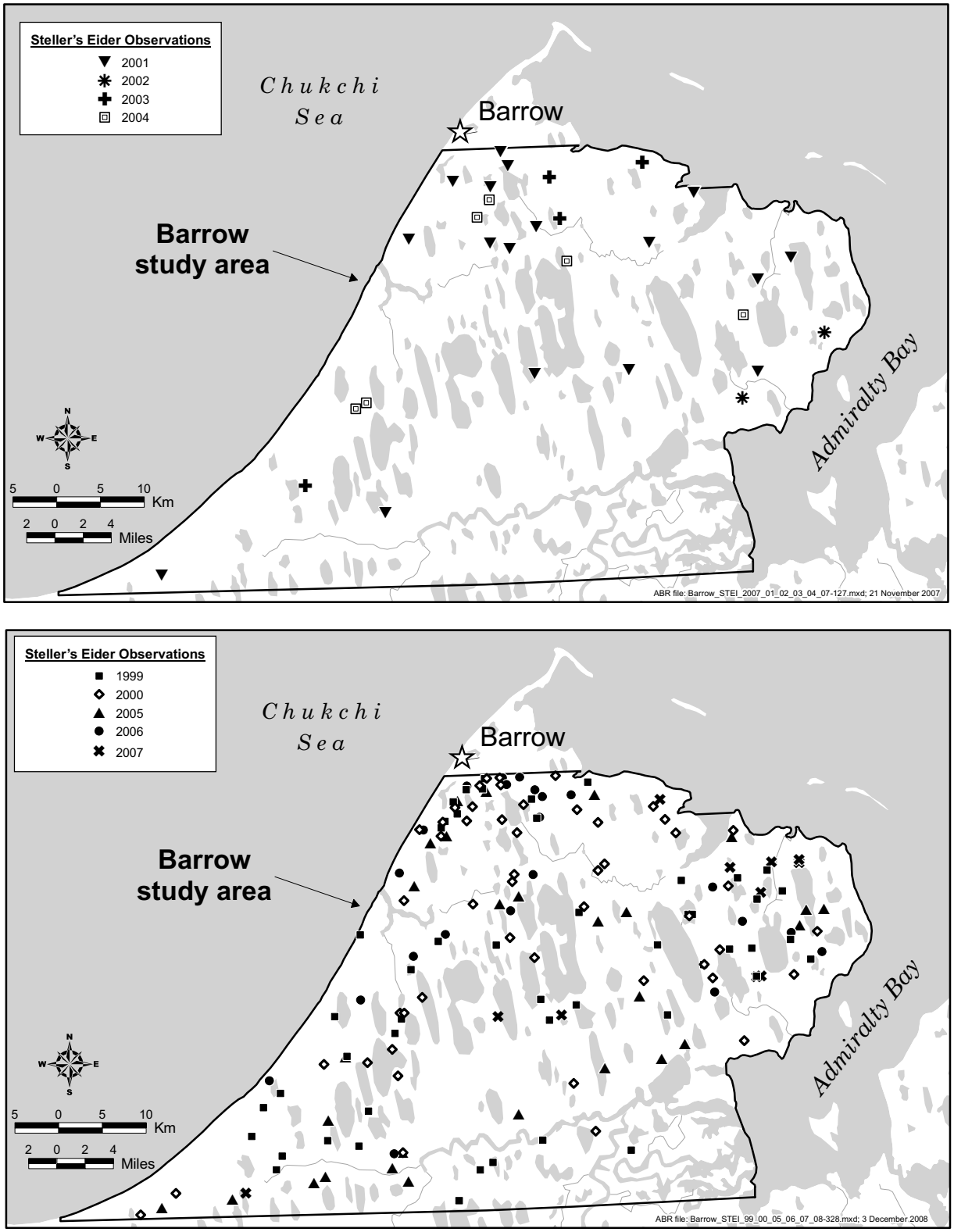

Figure 3. Locations of Steller's Eiders in the Barrow area in non-nesting years (top) and nesting years (bottom), northern Alaska, June 1999–2007.

USFWS, pers. comm.), suggesting that some pairs had not yet dispersed to breeding sites at the time of our survey. This has likely occurred to some extent in all nesting years because we target our survey for the period of pair dispersal to avoid missing early failed breeders and departing males. Although survey timing may have contributed to the concentration of Steller's Eiders observed on a fine-scale within the Barrow area in 2008, we believe that pre-nesting pairs are recorded some distance away from their eventual nesting territories every year and that our results in 2008 are comparable to earlier years.

A comparison of 3 overlapping surveys conducted annually 1999–2008 in the Barrow area (the ABR aerial survey, the USFWS ground searches, and the USFWS Eider Breeding Population Survey) reveals fairly good correspondence overall (Figure 4). Variation in relative numbers among the 3 surveys appears to result mainly from shifts in the distribution of Steller's Eiders from year to year. For example, in 2008, Steller's Eiders were clustered near Barrow, mostly within the USFWS ground search area, resulting in higher numbers on ground searches compared to the aerial surveys. In contrast, Steller's Eiders were concentrated on the east side of our survey area in 2007 (outside the USFWS ground search area) resulting in higher numbers on the ABR aerial survey. The USFWS slope-wide eider survey can detect eiders well outside the coverage of either of the other surveys, but because Steller's Eiders exhibit patchy distribution during the nesting season, that low intensity survey may fail to encounter substantial numbers of Steller's Eiders in some years.

OTHER EIDERS

SPECTACLED EIDER

As in previous years, Spectacled Eiders were widely distributed and were the most abundant eider in the Barrow area in 2008 (Figure 5). We

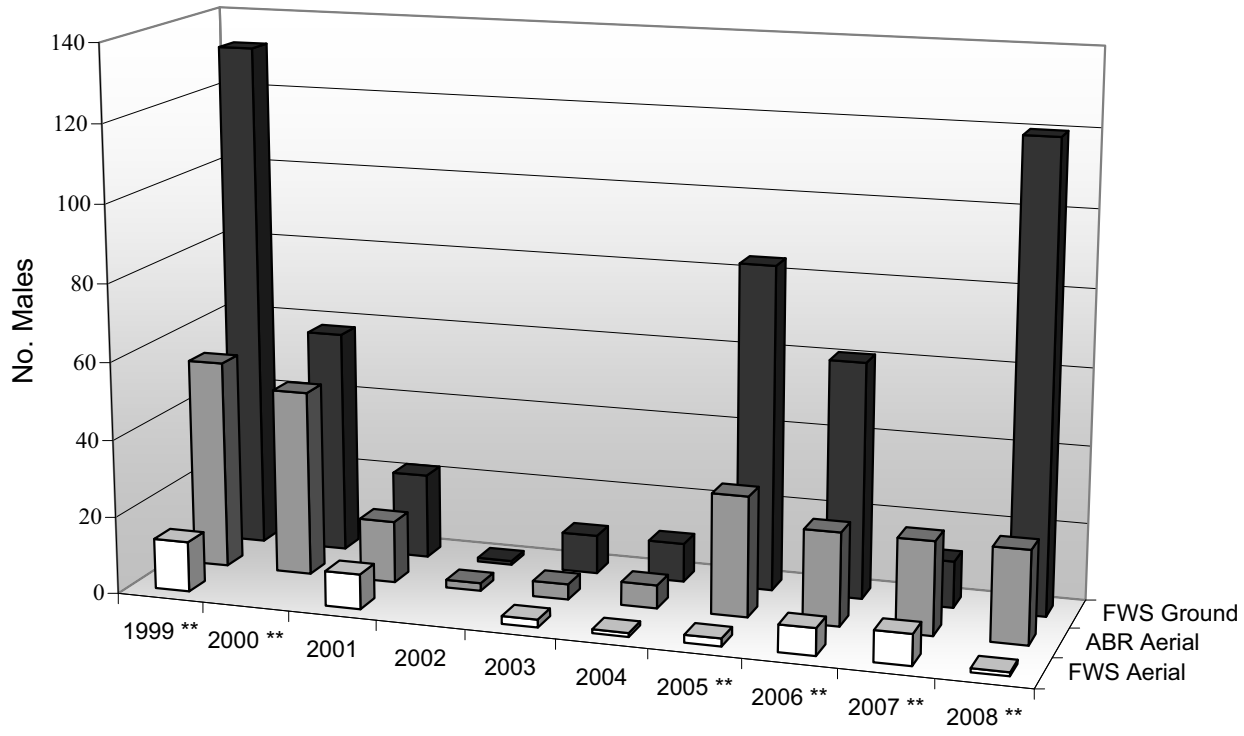

Figure 4. Comparison of the numbers of male Steller's Eiders recorded during USFWS ground surveys (immediate Barrow area), USFWS aerial surveys (Arctic Coastal Plain), and ABR aerial surveys, Barrow area, 1999–2008. ABR counts were doubled in 2007 to adjust for reduced survey coverage (25% versus 50% in other years). Steller's Eider nesting years at Barrow are denoted with asterisks.

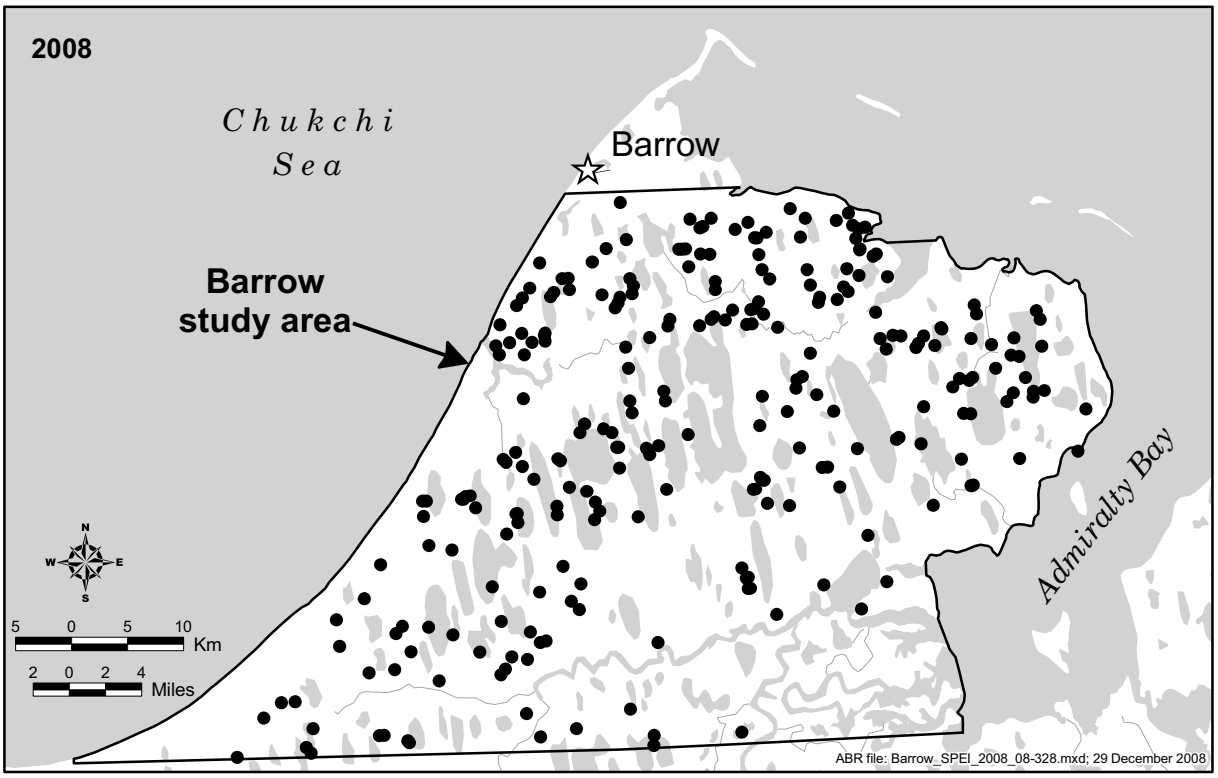

Figure 5. Locations of Spectacled Eiders in the Barrow area, northern Alaska, 16–21 June 2008.

observed 148 pairs, 150 males (singles and groups of 2–4 males), and 17 flocked birds, for an indicated total of 613 Spectacled Eiders in the surveyed transects. The estimated total for the survey area was 1,226 Spectacled Eiders, for a density of 0.44 birds/km², which is the highest density of Spectacled Eiders ever reported for this survey (0.14–0.28 birds/km² for 1999–2004; Ritchie and King 2004). Similarly, the density of Spectacled Eiders on the Colville River delta was the highest on record in 15 years of aerial surveys (0.18 birds/km^2; Johnson et al. 2008). In contrast, the density of Spectacled Eiders in the Kuparuk Oilfield was the lowest recorded over the same period (0.02 birds/km^2; Anderson et al. 2008), suggesting that shifts in distribution may have contributed to local changes in density in 2008. Our estimated density was higher than the estimates by the USFWS for the entire North Slope in 1999–2007 (0.15–0.25 birds/km², Larned et al. 2001a, 2001b, 2003a, 2003b, 2005a, 2005b, 2006, 2008), however, density contours from USFWS eider surveys indicate that the Barrow area contains some of the highest densities of Spectacled Eiders on the North Slope, particularly in the western portion of our study area (>0.61 birds/km²; Larned et al. 2003b).

KING EIDER

King Eiders were second in abundance to Spectacled Eiders, and they were widely distributed in the Barrow area in 2008 (Figure 6). We observed 91 pairs, 92 males (singles and groups of 2–4 males), and 23 flocked birds, for an indicated total of 389 King Eiders in the surveyed transects. The estimated total for the survey area was 778 King Eiders, for a density of 0.28 birds/km², which is the highest density of King Eiders reported for this survey (0.08–0.14 birds/km² for 1999–2004; Ritchie and King 2004). In contrast, King Eider density in the Colville River delta was near the 14-year average (0.08 birds/km^2 in 2008; Johnson et al. 2008), and in the Kuparuk Oilfield, densities were similar to those documented in recent years (0.7 birds/km^2 in 2008; B. A. Anderson, ABR, unpublished data). Our

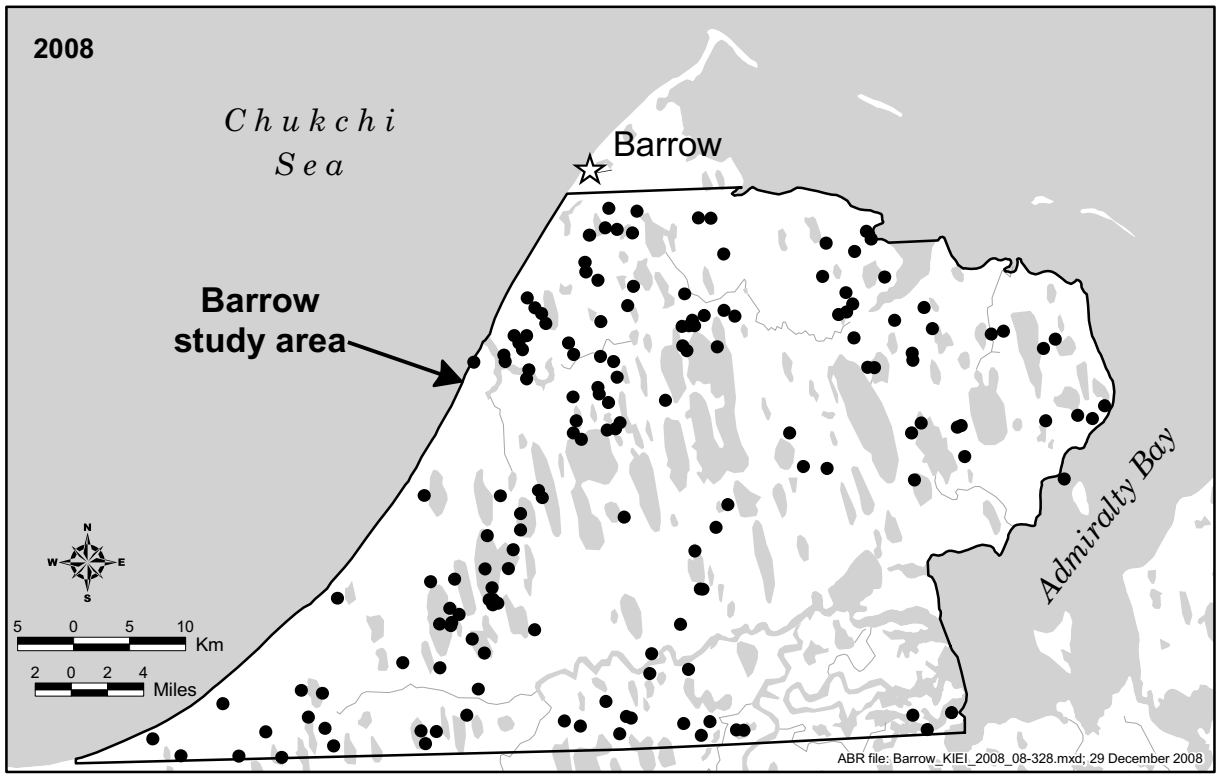

Figure 6. Locations of King Eiders in the Barrow area, northern Alaska, 16–21 June 2008.

Our densities in the Barrow area were lower than those estimated by the USFWS for the entire North Slope (0.38–0.58 birds/km² for 1999–2007; Larned et al. 2001a, 2001b, 2003a, 2003b, 2005a, 2005b, 2006, 2008). However, King Eider density increases with distance from the coast (Larned et al. 1999), and density contours from USFWS eider surveys indicate that King Eider density is lower in the Barrow area than on much of the North Slope (Larned et al. 2003b).

OTHER SPECIES

SNOWY OWL

Eruptive nesting by Snowy Owls is often associated with increased densities of nesting Steller's Eiders near Barrow (Quakenbush and Suydam 1999, Quakenbush et al. 2004, USFWS 2002). We recorded 123 Snowy Owls on transects, for an estimated density of 0.09 birds/km². Owl density was highest in the northern portion of the study area (Figure 7), and dropped off considerably about 10 miles south of Barrow. Six of 8 owl nests identified from the air were located on the northernmost 6 transects. It is likely that owls and owl nests were undercounted in the northern few transects because observers were preoccupied with recording large numbers of Steller's Eiders in that part of the study area in 2008.

Snowy Owl abundance is highly variable among years. For example, no Snowy Owls were observed along transects in 2004 (Ritchie and King 2004), whereas 247 owls were recorded on transect in 2007 (Obritschkewitsch et al. 2007). Densities of Snowy Owls ranged from 0–0.36 birds/km² during this survey between 1999 and 2008 (Ritchie and King 2004, Ritchie et al. 2006, Obritschkewitsch et al. 2008). Distribution also varies among years. For example, Snowy Owls were more abundant in the southwest corner of the study area in 1999 and 2003 (Ritchie and King 2004), but were concentrated in the eastern half of the survey area in 2007 (Obritschkewitsch et al. 2008). Snowy Owl distribution is related to local prey populations, especially brown lemmings (*Lemmus trimucronatus*). Lemmings appeared to be quite abundant near Barrow in 2008 (Attanas

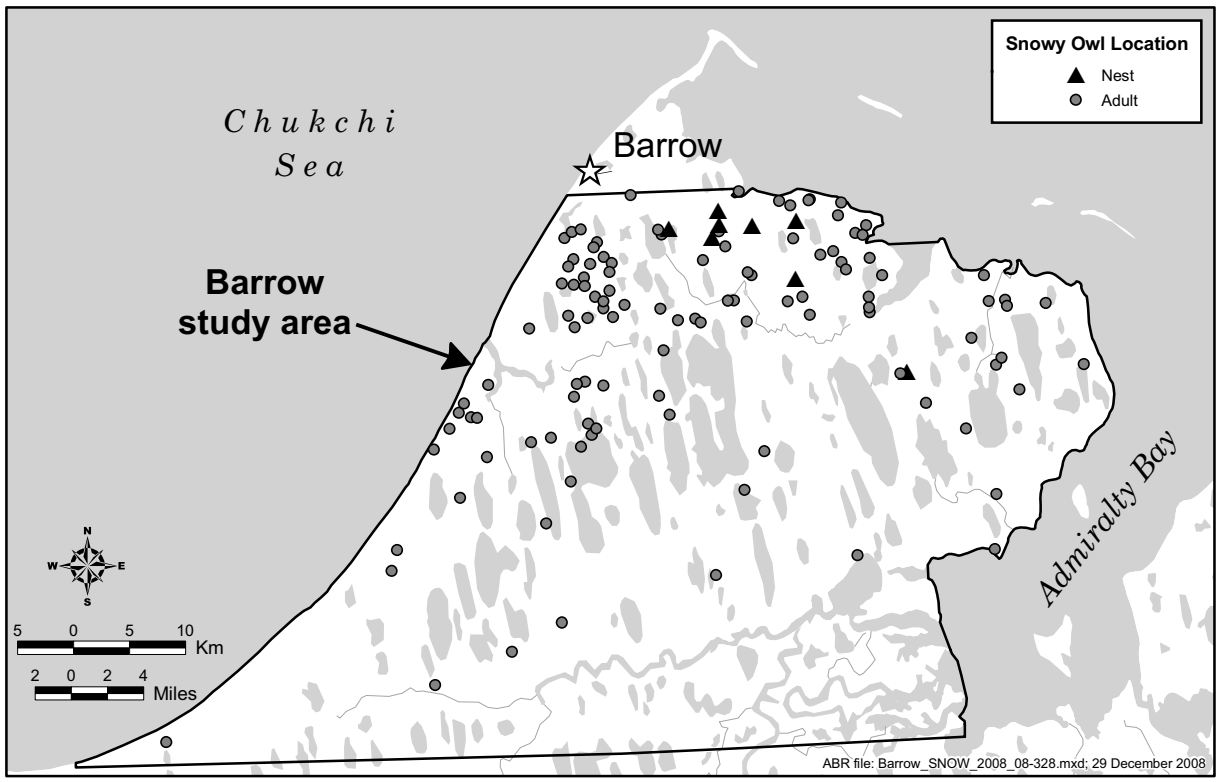

Figure 7. Locations of Snowy Owls in the Barrow area, northern Alaska, 16–21 June 2008.

and Johnson 2008, our observations). However, researchers who worked in Barrow and elsewhere on the North Slope within and outside our study area report that the relatively high abundance of lemmings appeared to be limited to the immediate Barrow area this year (E. Weiser, UAF, pers. comm.; S. Oppel, UAF, pers. comm.).

TUNDRA SWAN

We recorded 128 swan nests in the Barrow area in 2008. Density was 0.09 nests/km², which was within the range of densities recorded in earlier years (0.05–0.10 nests/km²; Ritchie and King 2004). As in past years, the highest density of nests occurred in the southeastern portion of the Barrow area, particularly near the mouth of the Meade River (Figure 8).

Densities of swan nests in the Barrow area were higher than those estimated by the USFWS for the entire North Slope (0.02 swan nests/km^2; Larned et al. 1999) and higher than those reported for the Kuparuk Oilfield on the central Arctic Coastal Plain (0.02–0.05 nests/km^2 for 1989–2001; Anderson et al. 2002). However, density contours from USFWS aerial surveys indicate that the Barrow area contains some of the highest densities of Tundra Swans on the North Slope, particularly in the southeast portion of our study area (Larned et al. 2001a).

Densities of swan nests in the Barrow area appear to be similar to those recorded on river deltas in northern Alaska, including the Sagavanirktok and Colville river deltas in northern Alaska (Ritchie and King 2000). Slope-wide aerial surveys by USFWS also have documented high densities of Tundra Swans in the Barrow area (Larned et al. 2001a), however we acknowledge that our survey methods differed from the standard USFWS protocol for swans, and our numbers could be biased upwards. The USFWS protocol requires a higher aircraft altitude (500 ft) and wider transects (1 mi) than we used. Because swan nests tend to be highly visible, our density calculations also might be inflated by the inclusion of some

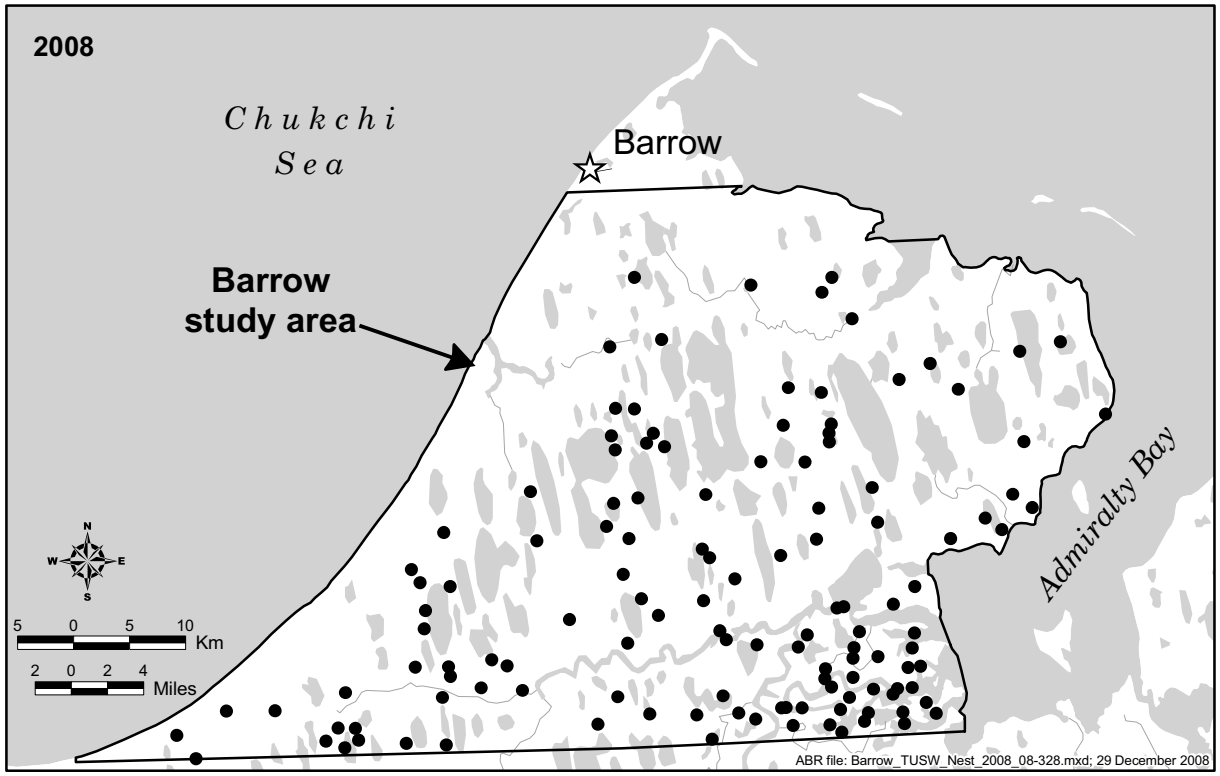

Figure 8. Locations of Tundra Swan nests in the Barrow area, northern Alaska, 16–21 June 2008.

swan nests beyond our narrow transect's outer boundary. More detailed geographic positions of nests (allowing more accurate distinction of nests that are off-transect), or a paired-survey design (i.e., flying an area using both protocols and comparing resulting numbers), would be required to determine the magnitude of difference between the 2 techniques.

SUMMARY AND CONCLUSIONS

Steller's Eiders were concentrated in the northern portion of the study area in 2008. Forty-five birds were observed, yielding an indicated total of 48 Steller's Eiders in the surveyed transects and an estimated total of 96 birds in the study area. Over all years (1999–2008), the estimated total number of Steller's Eiders ranged from 16 to 224 birds. Steller's Eiders nested near Barrow in 2008 and 28 nests were found by USFWS ground crews. Results of our survey and the USFWS Waterfowl Breeding Population Survey suggest that breeding activity may have been limited to the immediate Barrow area this year.

Spectacled and King eiders were more abundant in the study area in 2008 than in all previous years of our survey when data for these species were analyzed (1999–2004). Densities of Spectacled and King eiders were 0.44 and 0.28 birds/km², respectively. As in prior years, both species were widely distributed throughout the study area.

A total of 123 Snowy Owls were observed on transects in 2008, for a density of 0.09 birds/km². Snowy Owls were concentrated in the northern portion of the study area, which is likely related to the relatively high abundance of brown lemmings near Barrow in 2008. The density of Tundra Swan nests was similar to previous years (0.09 nests/km^2). As in all other years, swan nests were distributed throughout the study area but densities were highest in the Meade River delta.

Intensive aerial surveys conducted annually are useful for describing the general distribution and relative abundance of Steller's Eiders in the

Barrow region and these surveys complement USFWS ground searches and the extensive USFWS aerial surveys used to monitor the Steller's Eider population regionally. Intensive fixed-wing surveys in other small areas on the North Slope would provide more accurate data on nest distribution and regional population size, but we believe that Barrow should remain the primary area for intensive surveys for Steller's Eiders, at least for the time-being. Important questions remain, however, regarding the detectability of birds on aerial surveys. We believe that additional effort focused on post-aerial survey ground searches or on an additional helicopter-supported survey in all or portions of the same search area would improve population and density estimates for Steller's Eiders in the region.

LITERATURE CITED

Anderson, B. A., R. J. Ritchie, A. A. Stickney, and A. M. Wildman. 2002. Avian studies in the Kuparuk Oilfield, Alaska, 2001. Report for ConocoPhillips Alaska, Inc., Anchorage, AK, by ABR, Inc., Fairbanks, AK. 77 pp.

Anderson, B. A., A. A. Stickney, T. Obritschkewitsch, J. E. Shook, and P. E. Seiser. 2008. Avian studies in the Kuparuk Oilfield, Alaska, 2008. Draft data summary report for ConocoPhillips Alaska, Inc., Anchorage, AK, by ABR, Inc., Fairbanks, AK.

Attanas, L. B., and C. B. Johnson. 2008. Eider surveys at the Wiley Post–Will Rogers Memorial Airport in Barrow, Alaska, 2008. Report for Alaska Department of Transportation and Public Facilities and Travis/Peterson Environmental Consulting, Inc., Fairbanks, by ABR, Inc., Fairbanks, AK. 11 pp.

Gallant, A., E. Binnian, J. Omernik, and M. Shasby. 1995. Ecoregions of Alaska. U.S. Geological Survey Professional Paper 1567. 73 pp.

Johnson, C. B., A. M. Wildman, J. P. Parrett, J. R. Rose, T. Obritschkewitsch, and A. A. Stickney. 2008. Avian studies for the Alpine Satellite Development Project, 2008. Draft sixth annual report for ConocoPhillips Alaska, Inc., and Anadarko Petroleum Corporation, Anchorage, by ABR, Inc., Fairbanks, AK.

Larned, B., T. Tiplady, R. Platte, and R. Stehn. 1999. Eider breeding population survey, Arctic Coastal Plain, Alaska, 1997–1998. Unpubl. report, U.S. Fish and Wildlife Service, Anchorage, AK. 22 pp.

Larned, B., R. Platte, and R. Stehn. 2001a. Eider breeding population survey, Arctic Coastal Plain, Alaska, 1999–2000. Unpubl. report, U.S. Fish and Wildlife Service, Anchorage, AK. 42 pp.

Larned, B., R. Stehn, J. Fischer, and R. Platte. 2001b. Eider breeding population survey, Arctic Coastal Plain, Alaska, 2001. Unpubl. report, U.S. Fish and Wildlife Service, Anchorage, AK. 48 pp.

Larned, B., R. Stehn, and R. Platte. 2003a. Eider breeding population survey, Arctic Coastal Plain, Alaska, 2002. Unpubl. report, U.S. Fish and Wildlife Service, Anchorage, AK. 19 pp. + appendices.

Larned, B., R. Stehn, and R. Platte. 2003b. Eider breeding population survey, Arctic Coastal Plain, Alaska, 2003. Unpubl. report, U.S. Fish and Wildlife Service, Anchorage, AK. 44 pp.

Larned, B., R. Stehn, and R. Platte. 2005a. Eider breeding population survey, Arctic Coastal Plain, Alaska, 2004. Unpubl. report, U.S. Fish and Wildlife Service, Anchorage, AK. 48 pp.

Larned, B., R. Stehn, and R. Platte. 2005b. Eider breeding population survey, Arctic Coastal Plain, Alaska, 2005. Unpubl. report, U.S. Fish and Wildlife Service, Anchorage, AK. 49 pp.

Larned, B., R. Stehn, and R. Platte. 2006. Eider breeding population survey, Arctic Coastal Plain, Alaska, 2006. Unpubl. report, U.S. Fish and Wildlife Service, Anchorage, AK. 53 pp.

Larned, B., R. Stehn, and R. Platte. 2008. Waterfowl breeding population survey, Arctic Coastal Plain, Alaska, 2007. Unpubl. report, U.S. Fish and Wildlife Service, Anchorage, AK. 42 pp.

National Climatic Data Center, NESDIS, NOAA, U.S. Department of Commerce. 2008. Global Surface Summary of the Day — ftp://ftp.ncdc.noaa.gov/pub/data/gsod/

Obritschkewitsch, T., P. D. Martin, and R. S. Suydam. 2001. Breeding biology of Steller's Eiders nesting near Barrow, Alaska, 1999–2000. U.S. Fish and Wildlife Service, Ecological Services, Fairbanks, AK. Technical Report NAES-TR-01-04. 113 pp.

Obritschkewitsch, T., and P. D. Martin. 2002a. Breeding biology of Steller's Eiders nesting near Barrow, Alaska, 2001. U.S. Fish and Wildlife Service, Ecological Services, Fairbanks, AK. Technical Report NAES-TR-02-01. 43 pp.

Obritschkewitsch, T., and P. D. Martin. 2002b. Breeding biology of Steller's Eiders nesting near Barrow, Alaska, 2002. U.S. Fish and Wildlife Service, Fairbanks Fish and Wildlife Field Office, Fairbanks, AK. Technical Report. 33 pp.

Obritschkewitsch, T., R. J. Ritchie, and J. King. 2008. Steller's Eider surveys near Barrow, Alaska, 2007. Report for Bureau of Land Management (BLM), Fairbanks, AK and ConocoPhillips Alaska, Inc., Anchorage, by ABR, Inc., Fairbanks, AK. 11 pp.

Prichard, A. K., and R. J. Ritchie. 2005. Analysis of ABR aerial survey methods to locate Steller's Eiders near Barrow, Alaska, 1999–2004. Report for U.S. Fish and Wildlife Service, Fairbanks Fish and Wildlife Field Office, by ABR, Inc., Fairbanks, AK. 15 pp.

Quakenbush, L. T., R. H. Day, B. A. Anderson, F. A. Pitelka, and B. J. McCaffery. 2002. Historical and present breeding season distribution of Steller's Eiders in Alaska. Western Birds 33: 99–120.

Quakenbush, L. T., and R. Suydam. 1999. Periodic nonbreeding of Steller's Eiders near Barrow, Alaska, with speculations on possible causes. Canadian Wildlife Service, Occasional Paper No. 100: 34–40.

Quakenbush, L. T., R. Suydam, K. M. Fluetsch, and C. Donaldson. 1995. Breeding biology of Steller's Eiders nesting near Barrow, Alaska, 1991–1994. Unpubl. report, U.S. Fish and Wildlife Service, Fairbanks, AK. 53 pp.

Quakenbush, L. T., R. Suydam, T. Obritschkewitsch, and M. Deering. 2004. Breeding biology of Steller's Eiders (*Polysticta stelleri*) near Barrow, Alaska, 1991–99. Arctic 57: 166–182.

Quakenbush, L. T., R. Suydam, and T. Obritschkewitsch. 2000. Habitat use by Steller's Eiders during the breeding season near Barrow, Alaska, 1991–1996. Unpubl. report, U.S. Fish and Wildlife Service, Fairbanks AK.

Ritchie, R. J., and J. G. King. 2000. Tundra Swans. Pages 197–220. *in* Truett, J. C., and S. R. Johnson (eds.). Natural History of an Arctic Oil Field. Academic Press, NY.

Ritchie, R. J., and J. G. King. 2001. Results of Steller's Eider surveys near Barrow, Admiralty Bay, and Meade River, Alaska, 1999 and 2000. Report for North Slope Borough, Wildlife Department, Barrow, AK, by ABR, Inc., Fairbanks, AK. 19 pp.

Ritchie, R. J., and J. G. King. 2004. Steller's Eider surveys near Barrow, Alaska, 2004. Report for U.S. Fish and Wildlife Service, Fairbanks Fish and Wildlife Field Office, AK; North Slope Borough, Barrow, AK; and Alaska Army National Guard, Fort Richardson, AK, by ABR, Inc., Fairbanks, AK. 15 pp

Ritchie, R. J., T. Obritschkewitsch, and J. G. King. 2006. Steller's Eider surveys near Barrow, Alaska, 2006. Report for Bureau of Land Management, Fairbanks, AK, and ConocoPhillips Alaska, Inc., Anchorage, by ABR, Inc., Fairbanks, AK. 9pp.

Rojek, N. A., and P. D. Martin. 2003. Breeding biology of Steller's Eiders nesting near Barrow, Alaska, 2003. U.S. Fish and Wildlife Service, Fairbanks Fish and Wildlife Field Office, Fairbanks, AK. Technical Report. 35 pp.

Rojek, N. A. 2006. Breeding biology of Steller's Eiders nesting near Barrow, Alaska, 2005. U.S. Fish and Wildlife Service, Fairbanks Fish and Wildlife Field Office, Fairbanks, AK. Technical Report. 53 pp.

Rojek, N. A. 2007. Breeding biology of Steller's Eiders nesting near Barrow, Alaska, 2006. U.S. Fish and Wildlife Service, Fairbanks Fish and Wildlife Field Office, Fairbanks, AK. Technical Report. 53 pp.

Rojek, N. A. 2008. Breeding biology of Steller's Eiders nesting near Barrow, Alaska, 2007. U.S. Fish and Wildlife Service, Fairbanks Fish and Wildlife Field Office, Fairbanks, AK. Technical Report. 45 pp.

U.S. Fish and Wildlife Service. 1987. Standard operating procedures for aerial waterfowl breeding ground population and habitat surveys in North America. Unpubl. report, U.S. Fish and Wildlife Service and Environment Canada, Canadian Wildlife Service.

U.S. Fish and Wildlife Service. 2002. Steller's Eider recovery plan. Fairbanks, AK. 27 pp.

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Appendix 1. Numbers of Steller's Eiders and their locations during aerial surveys near Barrow, Alaska, 16–21 June 2008.

Latitude[a]	Longitude[a]	Date	Observer[b]	Male	Pair	On transect?	Behavior[c]	Habitat[d]	Comment
71.18005	-156.36764	6/16/2008	TO	1		Y	H_2O	Poly	Flooded Tundra
71.22386	-156.21293	6/16/2008	JPP		1	Y	H_2O	Pond	
71.22698	-156.27809	6/16/2008	JPP		1	Y	H_2O	Pond	
71.23099	-156.33976	6/16/2008	TO		1	Y	H_2O	Pond	
71.23848	-156.46018	6/16/2008	TO		1	Y	H_2O	Pond	
71.24516	-156.38444	6/16/2008	TO		1	Y	H_2O	Pond	
71.24542	-156.52256	6/16/2008	JPP		1	Y	H_2O	Pond	
71.25139	-156.63369	6/16/2008	TO		1	N	H_2O	Pond	
71.25218	-156.70939	6/16/2008	JPP		1	Y	H_2O	Pond	
71.24453	-156.69208	6/16/2008	JPP		1	Y	H_2O	Pond	
71.25167	-156.68164	6/16/2008	TO		1	Y	H_2O	Poly	Flooded Tundra
71.25279	-156.56051	6/16/2008	JPP		1	Y	H_2O	Pond	
71.25220	-156.45466	6/16/2008	TO		1	Y	H_2O	Pond	
71.25241	-156.36044	6/16/2008	TO		1	Y	H_2O	Pond	
71.25986	-156.56948	6/16/2008	JPP		1	Y	H_2O	Pond	
71.26516	-156.65487	6/16/2008	TO		1	Y	H_2O	Lake	Footprint Lake
71.26480	-156.64729	6/16/2008	TO		1	N	H_2O	Lake	Footprint Lake
71.25958	-156.65559	6/16/2008	TO		1	Y	H_2O	Lake	Footprint Lake
71.25974	-156.77364	6/16/2008	TO		1	Y	H_2O	Pond	
71.26656	-156.66228	6/16/2008	TO		1	Y	H_2O	Pond	Man-made channel adjacent to lake
71.26651	-156.66036	6/16/2008	TO		1	Y	H_2O	Lake	Footprint Lake
71.26646	-156.65855	6/16/2008	TO		1	Y	H_2O	Lake	Footprint Lake
71.26671	-156.63232	6/16/2008	TO		1	Y	H_2O	Pond	Shore of pond
71.26669	-156.61822	6/16/2008	JPP	1		Y	H_2O	Pond	
71.02823	-157.22676	6/19/2008	JPP	1	1	Y	H_2O	Lake	Flooded edge of shallow lake

[a] Coordinates reported in Nad83 datum.
[b] Observers: TO = Tim Obritschkewitsch; JPP = Julie Parrett.
[c] Flies = bird was seen to flush or was in flight when first seen; H_2O = bird(s) stayed on the water.
[d] Poly = polygonal tundra (often flooded during June).