ABUNDANCE AND DISTRIBUTION OF EIDERS ON THE COLVILLE RIVER DELTA, ALASKA, 1994

Final Report

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INTRODUCTION

The Colville River Delta is the largest river delta in arctic Alaska, encompassing approximately 600 km^2, and is located midway between Point Barrow and Prudhoe Bay. During spring and fall, the delta is a staging area for migrating shorebirds and waterfowl and during the breeding season it is a regionally important nesting ground for such high-profile species as Yellow-billed Loons (*Gavia adamsii*), Tundra Swans (*Cygnus columbianus*), and Brant (*Branta bernicla*). The Colville River Delta also supports a small population of nesting Spectacled Eiders (*Somateria fischeri*) (Simpson et al. 1982, Renken et al.1983, Rothe et al. 1983, North et al. 1984, Nickles et al. 1987, Gerhard et al. 1988, Smith et al. 1994), which were listed as a threatened species in 1993 as a result of a decline in numbers since the 1970s at nesting areas in Alaska. Because Spectacled Eiders are known to have declined on the Arctic Coastal Plain and because of their protected status, they were included in baseline wildlife studies on the Colville River Delta in 1992 and 1993 conducted by Alaska Biological Research, Inc. (ABR) for ARCO Alaska (Smith et al. 1993, 1994). Because the development of the Colville River exploration project was uncertain and funding had decreased from previous years, we reduced the scope of the wildlife program in 1994. Our objective was to determine the abundance and distribution of Spectacled Eiders (and other eiders in the survey area), because of their threatened status, because their distribution was poorly understood, and because of the benefits of maintaining the continuity of information that we have collected on these species on the Colville River Delta since 1992.

The 1994 survey program on the Colville River Delta focused only on the pre-nesting and nesting distribution of Spectacled Eiders and King Eiders (*Somateria spectabilis*) and an evaluation of the fidelity of female eiders to nest sites found in previous years. We conducted aerial surveys during pre-nesting to determine the abundance and distribution of eiders and searched wetlands on foot after nest initiation to assess nesting distribution and site fidelity. Our surveys spanned the area between the main channel of the Colville River on the east and the Nechelik Channel on the west and from the Beaufort Sea coastline south to 22 km inland (Figure 1).

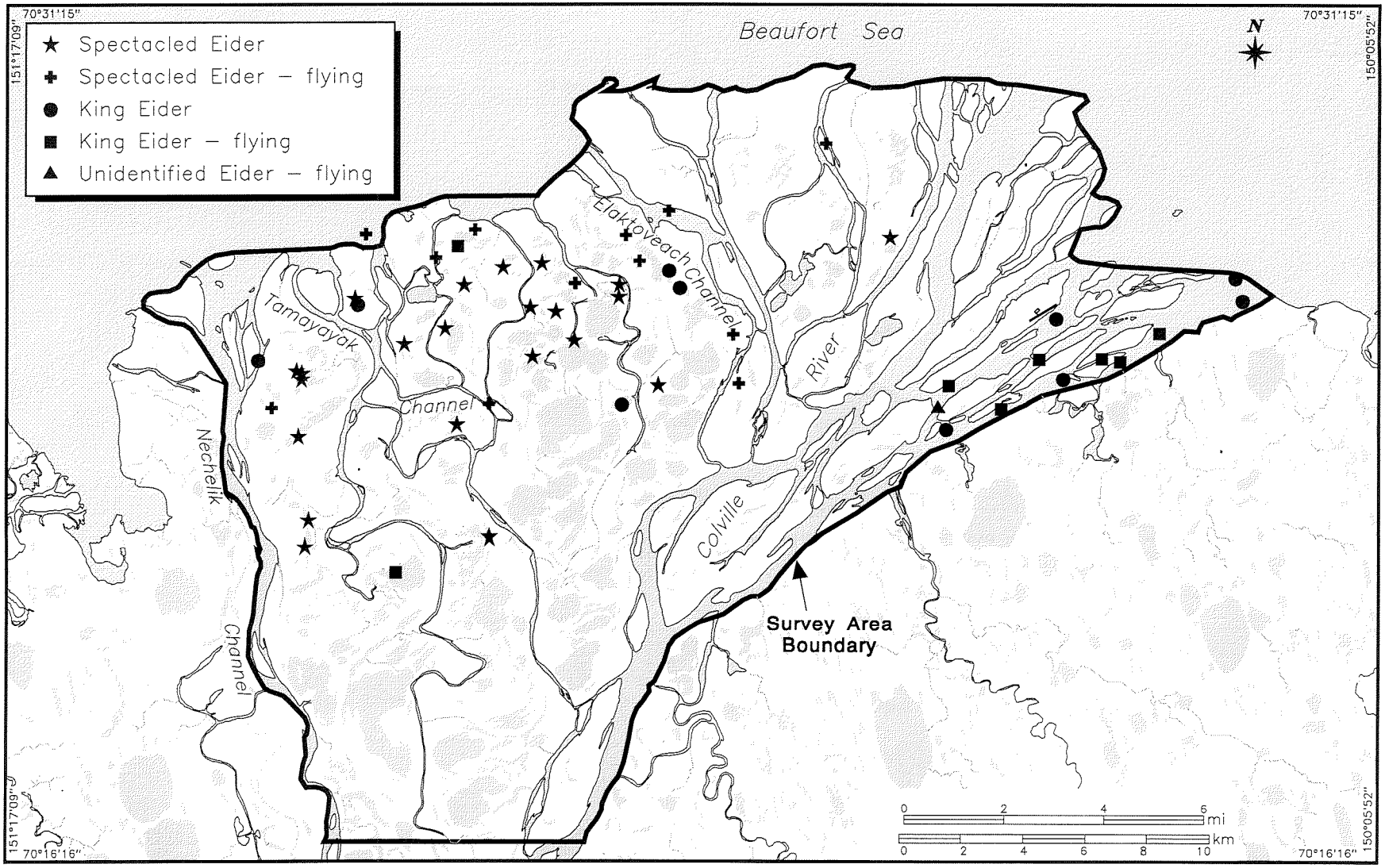

Figure 1. Distribution of eider groups observed during aerial surveys (11–12 June 1994), Colville River Delta, Alaska.

METHODS

Two observers and a pilot flew aerial surveys on 11 and 12 June 1994 in a Cessna 185 with one observer seated on each side of the plane. The aircraft followed east-west transect lines separated by 400 m. Both observers visually searched 200-m-wide transects, thereby covering 100% of the study area. When an eider or group of eiders was sighted, the plane circled the location and a map coordinate was recorded with a Global Positioning System (GPS). The observers recorded the number, species, and sex of the eiders and whether the birds were on the ground or flying. The coordinates were transferred electronically to a Geographic Information System (GIS) database for analysis and mapping.

Foot surveys were conducted from 20–26 June 1994 by four researchers based in two spike camps. Each camp had an inflatable raft and outboard motor for transportation on the channels of the Colville River Delta. Locations of nests found in 1992 and 1993 were searched for nests of the current year. As time permitted, we also searched locations where broods were sighted in 1992 and 1993, locations of nests prior to 1992, and locations of Spectacled Eiders recorded from the aerial survey in 1994.

In 1994, we limited nest searches to the areas with the highest potential for nesting habitat by focusing on habitat associations of nesting Spectacled Eiders that were observed during previous work in the region by ABR (Smith et al. 1994, Anderson and Cooper 1994). Accordingly, we searched shallow (≤1 m deep) and deep (>1 m deep) lakes with polygonized margins, lakes in basin wetland complexes, and low-center polygons with permanent water that were associated with lakes (≥1 ha in area). Within these habitats we focused our search effort on the rims of low-center polygons and on shorelines, islands, and peninsulas in lakes. Two observers walked parallel to each other covering a 10-m wide swath around the waterbodies that were searched. When a nest was found, we attempted not to flush the female eider. When an female eider inadvertently was flushed from its nest, we covered the eggs with down from the nest and retreated rapidly. For each nest, we recorded the species of eider, distance to nearest

waterbody, waterbody class, habitat type, and, if the bird flushed, number of eggs in the nest. Nest locations were recorded on copies of 1:18,000-scale color aerial photographs.

We added the nest locations in 1994 to a GIS database containing 1992 and 1993 data. Distances between nests were measured directly from aerial photos and rounded to the nearest 10 m.

RESULTS AND DISCUSSION

PRE-NESTING

On two consecutive days of aerial surveys in 1994 covering 474 km^2, we counted 50 groups of flying and non-flying eiders (Figure 1). Thirty (60%) of these groups were single pairs and 10 (20%) were single birds. The remainder (20%) of the sightings consisted of groups ranging from two males to seven pairs in a group. We counted 53 Spectacled Eiders (including 24 pairs) and 32 King Eiders (including 14 pairs) that were on the ground (Table 1). Another 26 Spectacled Eiders (including 11 pairs), 26 King Eiders (including 11 pairs), and 4 unidentified eiders (2 pair) were observed flying.

The uncorrected density (raw counts of birds uncorrected for sightability) of flying and non-flying Spectacled Eiders (0.17/km^2) in 1994 increased from the density recorded during 1993 (0.09/km^2; Smith et al. 1994). Conversely, the density of flying and non-flying King Eiders (0.12/km^2) was somewhat lower than that observed the year before (0.15/km^2; Smith et al. 1994). However, the area surveyed in 1993 included areas of apparently low density for Spectacled Eiders west and south of the smaller 1994 study area (Smith et al. 1994). Nonetheless, when the densities of both species in 1993 were recalculated for the same area surveyed in 1994, the trend between the years was unchanged; the recalculated density for Spectacled Eiders in 1993 was 0.13/km^2, whereas the density of King Eiders was 0.14/km^2.

Although the density of Spectacled Eiders appeared to increase and the density of King Eiders appeared to decrease from 1993 to 1994, we are unable to conclude that the differences reflect real changes in the numbers of breeding eiders. Smith et al. (1994)

Table 1. Counts and densities (uncorrected for sightability) of eiders seen during aerial surveys of the Colville River Delta, Alaska, 11-12 June 1994. Surveys covered 100% of the 474-km^2 study area.

	Counts						Density			
Species	Males	Females	Total Observed[a]	Pairs Observed[b]	Total Indicated[c]	Pairs Indicated[d]	Observed Birds[a]/km^2	Observed Pairs[b]/km^2	Indicated Birds[c]/km^2	Indicated Pairs[d]/km^2
NON-FLYING BIRDS										
Spectacled Eider	28	25	53	24	56	28	0.11	0.05	0.12	0.06
King Eider	18	14	32	14	36	18	0.07	0.03	0.08	0.04
FLYING BIRDS										
Spectacled Eider	15	11	26	11	30	15	0.05	0.02	0.06	0.03
King Eider	14	12	26	11	28	14	0.05	0.02	0.06	0.03
Unid. eider	2	2	4	2	4	2	0.01	0.00	0.01	0.00
FLYING AND NON-FLYING BIRDS										
Spectacled Eider	43	36	79	35	86	43	0.17	0.07	0.18	0.09
King Eider	32	26	58	25	64	32	0.12	0.05	0.13	0.07
Unid. eider	2	2	4	2	4	2	0.01	0.00	0.01	0.00

[a] Total observed = number of birds seen during survey.

[b] Pairs observed = number of pairs (one male associated with one female) seen during survey.

[c] Total indicated = (number of males not associated with a flock x 2) + number of males in flock (see USFWS 1987).

[d] Pairs indicated = number of males not associated with a flock (see USFWS 1987). Flock = group of >4 males.

suggested that the number of eiders counted on the delta in 1993 may have been low because that survey was conducted before the peak in arrival of nesting birds and pointed out that the number of eiders counted on aerial surveys was sensitive to the timing of the survey. In the Kuparuk Oilfield, Anderson and Cooper (1994) reported that more than twice as many Spectacled Eiders were counted on an aerial survey on 15 June 1993 than on 18–20 June 1993. Warnock and Troy (1992) found that the optimal time to conduct a pre-nesting survey for eiders was just prior to nest initiation, but it was not possible to predict the date of nest initiation in our study area without counts from daily surveys.

We believe that our aerial survey in 1994 was close to the optimal date for counting Spectacled Eiders, but probably was early for counting King Eiders. Spectacled and King eiders appear to arrive asynchronously on the Colville River Delta and adjacent areas. Data on group sizes from our aerial survey of the delta on 11–12 June suggested that King Eiders still were arriving in flocks and had not broken up into breeding pairs to the same extent as Spectacled Eiders; 23% of the King Eider groups contained more than a pair of birds, whereas only 15% of the Spectacled Eider groups contained more than a pair of birds. We also found that Spectacled Eiders were dispersed throughout potential nesting habitat (lakes and polygonized areas) west of the Elaktoveach Channel, whereas the majority of King Eider groups (61%) were sighted on the main channel of the Colville River, from which, we assume, they disperse to nesting areas (Figure 1). Data from road and aerial surveys of eiders in the Kuparuk Oilfield during pre-nesting in 1993 indicated that numbers of Spectacled Eiders there peaked 3–7 days before numbers of King Eiders peaked (Anderson and Cooper 1994).

Eider sightings were rare beyond 11 km south of the coast; only four Spectacled Eiders and one King Eider were seen farther south and no eiders were seen more than 16 km inland from the coast (Figure 1). Ninety percent of the Spectacled Eiders were in the western portion of the delta between the Elaktoveach and Nechelik channels; only one pair and a group of six were seen east of the Elaktoveach Channel. Conversely, 79% of the King Eiders sighted on the aerial survey were east of the Elaktoveach Channel, with only 12 King Eiders seen in the western delta.

NESTING

Twenty-one eider nests were found on the Colville River Delta in 1994 (Figure 2; Table 2). Only one nest was not being incubated at the time of discovery and that nest appeared to be abandoned because it was not attended during two subsequent visits to the nest over the following 24 h. Seventeen nests belonged to Spectacled Eiders, two to King Eiders, and one to a Common Eider (*Somateria mollissima*). The nest that appeared abandoned probably belonged to a King Eider based on the contour feathers found in the nest (see Anderson and Cooper 1994).

Only two eider nests were farther than 1 m from permanent water (Table 2). The farthest a Spectacled Eider nested from permanent water was 10 m, whereas one King Eider nested 80 m from permanent water. All but two eider nests were bordering waterbodies with polygonal features; one King Eider nested on a salt-affected low-relief meadow and one Spectacled Eider nested on a shallow lake with aquatic grass and islands (habitat descriptions follow Jorgenson et al. 1989 as modified in Smith et al. 1994), which was a high-water channel of the Colville River. The predominant waterbody type used by nesting Spectacled Eiders (53%) was shallow open water with polygonized margins, which comprised polygons that had coalesced into larger waterbodies with remnant polygon ridges forming islands and peninsulas. Polygons with permanent water were the next most common nest location (29%). Two Spectacled Eiders (12%) nested along deep open lakes with polygonized margins.

We evaluated habitat use on a larger scale by recording the nearest large (>1 ha) waterbody to a nest. Deep open lakes with polygonized margins were the most common large waterbody (38%) used by all species of nesting eiders (Table 2). However, Spectacled Eiders nested most often (35%) near shallow open lakes with polygonized margins and slightly less often (29%) near deep open lakes with polygonized margins. Basin wetland complexes also were frequent nesting sites (24%) or Spectacled Eiders.

In general, eider nest locations from previous years were good predictors of where current nests could be found. Only two eider nest locations from 1993 contained no nests that were within 400 m in 1994, and at the remaining six nest locations from 1993, we found eight nests within 400 m in 1994 (Figure 2). One Spectacled Eider nest in 1994

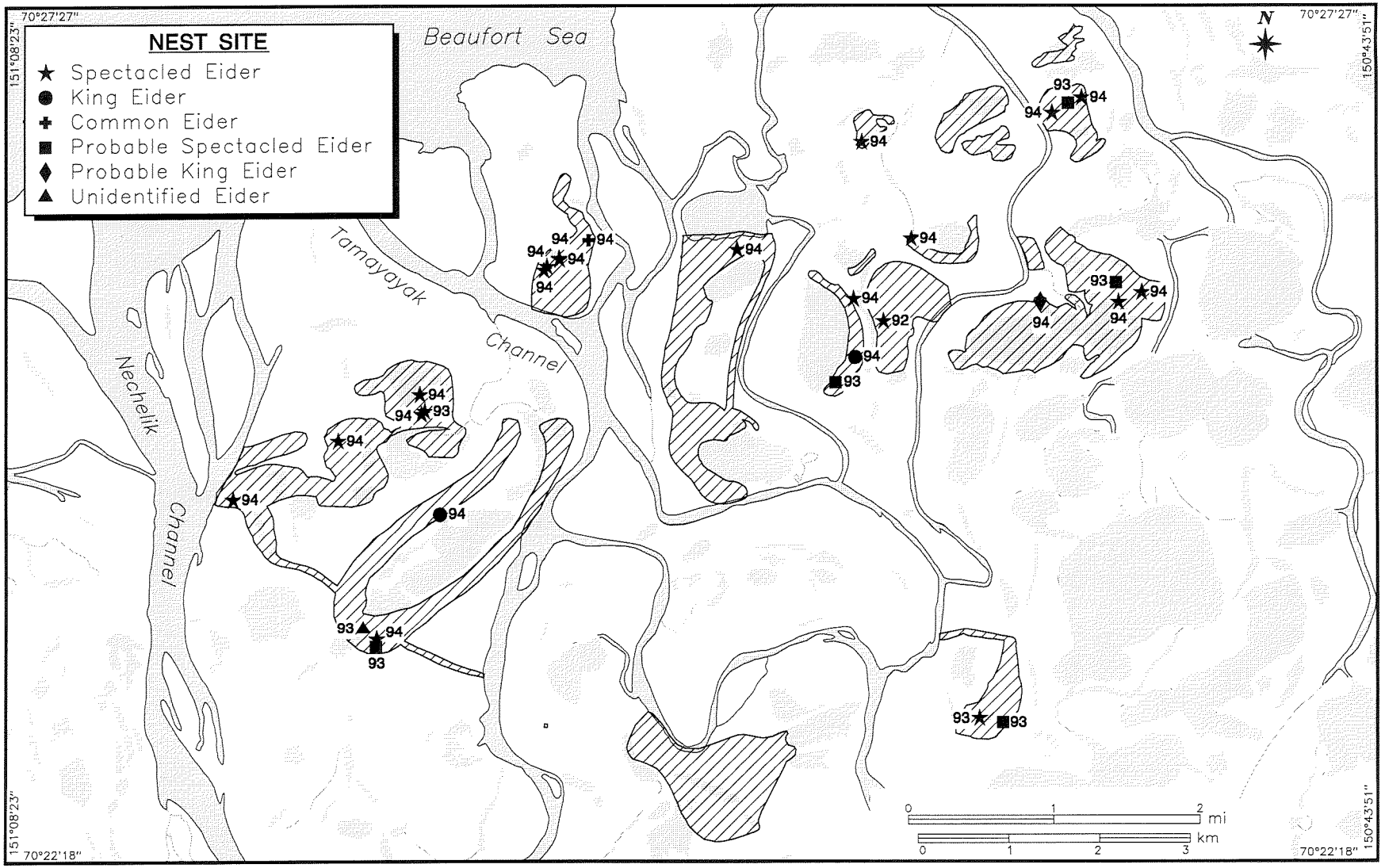

Figure 2. Location and year that eider nests were found on foot surveys of selected search areas during 1992, 1993 (Smith et al. 1993, Smith et al. 1994), and 20–26 June 1994, Colville River Delta, Alaska. Hatching indicates areas that were searched for nests during 1994. Probable Spectacled and King eider nests were identified based on characteristics of contour feathers in nests (see Anderson and Cooper 1994).

Table 2. Characteristics of eider nests found on the Colville River Delta during June 1994.

Nest No.	Species[1]	Date Found	Female on Nest	No. of Eggs	Dist. (m) to Permanent Water	Microsite Habitat[2]	Macrosite Habitat[3]
1	SPEI	20 JN	yes	7	<1	Polygon w/ permanent water and emergent sedge	Aquatic sedge w/ islands
2	SPEI	21 JN	yes	2	<1	Polygon w/ permanent water and emergent sedge	Deep open lake w/ polygonized margins
7	SPEI	22 JN	yes	unknown	<1	Polygon w/ permanent water and no emergent vegetation	Deep open lake w/ polygonized margins
8	SPEI	22 JN	yes	unknown	<1	Aquatic grass w/ islands	Aquatic grass w/ islands
10	KIEI	22 JN	yes	unknown	<1	Polygon w/ permanent water and emergent sedge	Deep open lake w/ polygonized margins
20	SPEI	23 JN	yes	5	<1	Shallow open water w/ polygonized margins	Shallow open water w/ polygonized margins
22	SPEI	23 JN	yes	unknown	<1	Polygon w/ permanent water and no emergent vegetation	Shallow open water w/ polygonized margins
37	SPEI	25 JN	yes	5	<1	Polygon w/ permanent water and no emergent vegetation	Deep open lake w/ polygonized margins
41	(KIEI)	26 JN	no	4	<1	Polygon w/ permanent water and emergent sedge	Deep open lake w/ polygonized margins
101	SPEI	20 JN	yes	unknown	10	Deep open lake w/ polygonized margins	Deep open lake w/ polygonized margins
102	KIEI	20 JN	yes	4	80	Salt-affected low-relief meadow	Deep open lake w/ polygonized margins
103	SPEI	21 JN	yes	unknown	<1	Shallow open water w/ islands and polygonized margins	Shallow open water w/ islands and polygonized margins
104	SPEI	21 JN	yes	unknown	<1	Shallow open water w/ islands and polygonized margins	Shallow open water w/ islands and polygonized margins
105	SPEI	21 JN	yes	unknown	<1	Shallow open water w/ islands and polygonized margins	Shallow open water w/ islands and polygonized margins
106	SPEI	21 JN	yes	unknown	<1	Shallow open water w/ islands and polygonized margins	Shallow open water w/ islands and polygonized margins
107	COEI	21 JN	yes	unknown	<1	Polygon w/ permanent water and no emergent vegetation	Shallow open water w/ islands and polygonized margins
108	SPEI	23 JN	yes	unknown	<1	Deep open lake w/ polygonized margins	Basin Wetland Complex
201	SPEI	22 JN	yes	3	<1	Shallow open water w/ islands and polygonized margins	Basin Wetland Complex
202	SPEI	22 JN	yes	unknown	<1	Shallow open water w/ islands and polygonized margins	Basin Wetland Complex
203	SPEI	22 JN	yes	unknown	<1	Shallow open water w/ islands and polygonized margins	Basin Wetland Complex
204	SPEI	26 JN	yes	5	<1	Shallow open water w/ islands and polygonized margins	Deep open lake w/ polygonized margins

[1] SPEI = Spectacled Eider, KIEI = King Eider, COEI = Common Eider, and (KIEI) = probable KIEI (based on contour feathers found in nest [see Anderson and Cooper 1994]).

[2] Waterbody type with permanent water on which the nest borders (including waterbodies <1 ha in area), or vegetation type in cases where nest is not within 50 m of permanent water. Habitats adapted from Jorgenson et al. 1989.

[3] Nearest waterbody type with permanent water more than 1 ha in area.

was found near (470 m) a nest location from 1992 (Table 3). In wetland basins (defined here as drained-lake basins or contiguous polygon wetlands with associated waterbodies) that contained eider nests in 1992 or 1993, we found 13 nests in 1994. One basin had a Spectacled Eider nest in 1994 where no nests were found in 1993, and only one basin that contained two nests in 1993 was searched in 1994 without successfully finding a nest. The remaining seven nests from 1994 were found in basins that either were not searched or incompletely searched in 1992 and 1993. We measured the distance between nest locations in 1993 and locations in 1994 as an index to nest site fidelity (Table 3). The average distance between the nearest Spectacled Eider nest in 1994 to a unique nest location in 1993 was 140 m (SD = 0.07, n = 4). Only contiguous areas that were thoroughly searched in both years were included in the calculation of the average.

The recurrence of Spectacled Eider nests near the same nest locations and in the same basins as in previous years suggests a strong attraction to specific sites. Without data on the nest site locations of identifiable individual hen eiders, we cannot directly evaluate nest site fidelity. However, we have added to a growing database on the nest sites of Spectacled Eiders on the Colville River Delta that confirms the importance of polygonal waterbodies close to the coast and documents the reuse of certain waterbodies and wetland basins in consecutive years.

Table 3. Distance from eider nests found in 1994 to eider nests found in 1992 or 1993. Shaded areas indicate measurements across areas that were not thoroughly searched in 1992 or 1993, but which may have contained nests that were closer than those reported here. Nest data from 1992 and 1993 from Smith et al. (1993) and Smith et al. (1994), respectively.

1994		Distance (km) to Nearest Nest	1993		1992		Nest Vicinity	Eider Nest in Same Wetland Basin[2] in
Nest No.	Species[1]	in 1992 or 1993	Nest No.	Species	Nest No.	Species	Searched in 1993	1992 or 1993
1	SPEI	0.34	242	(SPEI)			yes	yes
2	SPEI	0.22	242	(SPEI)			yes	yes
7	SPEI	1.08			20	SPEI	yes	unknown[3]
8	SPEI	0.47			20	SPEI	no	yes
10	KIEI	0.32	243	(SPEI)			yes	yes
20	SPEI	0.16	241	(SPEI)			yes	yes
22	SPEI	0.22	241	(SPEI)			yes	yes
37	SPEI	2.09			20	SPEI	yes	no
41	(KIEI)	0.85	242	(SPEI)			no	yes
101	SPEI	0.07	244	(SPEI)			yes	yes
102	KIEI	1.48	220	UNEI			no	yes
103	SPEI	2.05	204	SPEI			no	unknown
104	SPEI	2.11	204	SPEI			no	unknown
105	SPEI	2.27	204	SPEI			no	unknown
106	SPEI	2.29	204	SPEI			no	unknown
107	COEI	2.61	204	SPEI			no	unknown
108	SPEI	2.16	204	SPEI			yes	yes
201	SPEI	0.18	204	SPEI			yes	yes
202	SPEI	0.09	204	SPEI			yes	yes
203	SPEI	1.06	204	SPEI			yes	yes
204	SPEI	1.67			20	SPEI	no	unknown

[1] SPEI = Spectacled Eider, KIEI = King Eider, COEI = Common Eider, (KIEI) = probable King Eider (based on contour feathers found in nest [see Anderson and Cooper 1994]), (SPEI) = probable Spectacled Eider.

[2] Wetland basin is either a wetland basin complex or a contiguous polygon wetland with associated waterbodies that are larger than 1 ha.

[3] Basin either not searched or incompletely searched in 1992 and 1993.

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Several people were indispensable to the success of this project. In the field, Debbie Flint, Laura Jacobs, John Rose, and Mike Smith skillfully collected distribution and nesting data. Sandy Hamilton of Arctic Air Alaska deftly piloted us through our aerial surveys. Louise Smith was instrumental in developing the Colville wildlife studies since 1992. Allison Zusi-Cobb organized the GIS data and drafted the figures. Steve Murphy reviewed the report and coordinated the research. I thank Mike Joyce (ARCO) for managing the project and ARCO for funding the Colville studies.

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