AVIAN STUDIES FOR THE ALPINE SATELLITE DEVELOPMENT PROJECT, 2005

THIRD ANNUAL REPORT

Prepared for

ConocoPhillips Alaska, Inc.
P.O. Box 100360
Anchorage, AK 99510

and

Anadarko Petroleum Corporation
3201 C Street, Suite 603
Anchorage, AK 99503

Prepared by

Charles B. Johnson
Ann M. Wildman
Julie P. Parrett
John R. Rose
John E. Shook

ABR, Inc.—Environmental Research & Services
P.O. Box 80410
Fairbanks, AK 99708

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EXECUTIVE SUMMARY

Avian surveys were conducted in the Colville Delta and northeastern NPRA in 2005 in support of the Alpine Satellite Development Project (ASDP) for ConocoPhillips, Alaska, Inc. and Anadarko Petroleum Corporation. The surveys continued long-term data acquisition begun in 1992 on the Colville Delta. Surveys focused on the abundance, distribution, and habitat use of 5 focal species: Spectacled Eider, King Eider, Tundra Swan, Yellow-billed Loon, and Brant. In 2005, the ASDP comprised 5 satellite well pads (3 proposed, 2 under construction) that would send oil for processing to the existing Alpine Facility on the Colville Delta.

The Colville Delta study area (552 km²) encompassed the entire delta from the East Channel of the Colville River to the westernmost distributary of the Niġliq Channel. Two ASDP well pads were built on the delta in the winter of 2005: CD-3, a roadless pad on the outer delta, and CD-4, a pad in the southern part of the Colville Delta connected by road to the Alpine Facility. The 2005 NPRA study area (1,571 km²) abutted the western edge of the Colville Delta and was located in the northeastern section of the NPRA. In 2005, the NPRA study area was expanded westward from the Fish Creek Delta. The NPRA study area encompassed 4 proposed development sites that are part of the ASDP: well pads CD-5, CD-6, and CD-7, and the Clover A gravel mine site. A proposed road connects the 3 pads to the Alpine Facility.

During the 2005 pre-nesting survey, we recorded the second lowest number of Spectacled Eiders (16 eiders) on the Colville Delta in 12 years of surveys. In the NPRA study area in 2005, we counted 9 Spectacled Eiders, which was less than in any year since 2000. Counts of pre-nesting Spectacled Eiders also were low in the Kuparuk River Unit in 2005, but counts from the slope-wide survey conducted by U.S. Fish and Wildlife Service in 2005 were higher than the 13-year mean.

On the pre-nesting aerial survey in 2005, 46 King Eiders occurred in the Colville Delta study area, most of which were in the Northeast Delta subarea. In the NPRA study area in 2005, 253 King Eiders were recorded on the pre-nesting survey. The overall density of King Eiders in the NPRA study area in 2005 was similar to that in 2004.

On the Colville Delta in 2005, we counted more Yellow-billed Loon nests (30) than in any previous year, including the 1980s when intensive ground surveys were conducted. In 2005, we also recorded the highest count of Yellow-billed Loon broods (17) for the Colville Delta study area in 11 years of surveys. In the NPRA study area in 2005, 8 Yellow-billed Loon nests were recorded and all were in the Fish Creek Delta subarea. Two pairs of Yellow-billed Loons were seen in the Alpine West subarea, but no nests were found there. The Development, Exploration, and Fish Creek West subareas were not surveyed for loons in 2005. During brood-rearing, 12 adult Yellow-billed Loons and 3 broods were observed in the Fish Creek Delta subarea, whereas no Yellow-billed Loons were seen in the Alpine West subarea.

Overall, 19 of 30 pairs of Yellow-billed Loons in the Colville Delta study area were observed with young for an apparent nesting success of 63%. Hatch began between 12 and 19 July, and 12 nests had hatched by 19 July. The highest proportion of Yellow-billed Loon nest failures occurred by 5 July. Three of the nest failures could be positively attributed to lake ice that had been pushed over nests by strong westerly winds. Nests that were evaluated for evidence of hatch had a strong association of egg membranes and numerous (30) eggshell fragments with the occurrence of broods.

Forty-five nests of Pacific Loons were counted opportunistically in the Colville Delta study area in 2005. In a portion of the NPRA study area, 24 Pacific Loon nests were found. No nests of Red-throated Loons were seen in either study area on that survey. During the brood-rearing survey in 2005, 13 Pacific Loon broods and 3 Red-throated Loon broods were observed in the Colville Delta study area, and in the NPRA study area, 10 Pacific Loon broods and 1 Red-throated Loon brood were counted.

Thirty-five swan nests were found in the Colville Delta study area in 2005, equal to the long-term mean for the delta. The 36 Tundra Swan broods counted across the entire Colville Delta study area was the second-highest brood count since 1992. Apparent nesting success was over 100%, because more broods than nests were

counted. The mean brood size in 2005 was 2.3 young and 84 swan young were counted on the delta, a production of young that has been exceeded only 3 times since 1992. In the NPRA study area in 2005, 47 Tundra Swan nests were found during the aerial survey. Swan nesting density in the NPRA study area in 2005 (0.03 nests/km^2) was similar to the 17-year mean density in the Kuparuk Oilfield (0.04 nests/km2) and about half the 12-year mean density (0.06 nests/km^2) in the Colville Delta study area. Thirty-seven Tundra Swan broods were observed in the NPRA study area in 2005. Apparent nesting success was 77% and mean brood size in the NPRA study area was 2.1 young.

In the Colville Delta study area in 2005, we counted 3,847 Brant (2,360 adults and 1,487 young) in 16 brood-rearing groups. The total count nearly doubled the previous highest count ever recorded in the Colville Delta study area over a 10-year period of intermittent surveys. On the same survey in 2005, 972 Snow Geese (412 adults and 560 young) in 11 brood-rearing groups were counted in the Colville Delta study area. The previous high count was 95 Snow Geese. During the aerial survey of the NPRA study area in 2005, we counted 1,634 Brant (1,003 adults and 631 young) in 11 brood-rearing groups, but only 32 Snow Geese (13 adults and 19 young).

Forty-four Glaucous Gull nests and at least 21 broods were counted in the Colville Delta study area during aerial surveys in 2005. Counts have ranged from 18 to 46 nests during 7 years of surveys. Seventeen Glaucous Gull nests were counted in the NPRA study area (Alpine West and Fish Creek Delta subareas only) during aerial surveys for loons in 2005. Seven Glaucous Gull broods were observed in the Alpine West subarea, and no broods were seen in the Fish Creek Delta subarea.

Joeb Woods, a respected elder from Nuiqsut, spent 3 days guiding us by motorboat on the Colville Delta in July 2005. He took us to locations he had visited in the 1960s and 1990s. During our visit to areas on the outer delta near CD-3, he gave us new insights into the ecology, human use, and history of the Colville Delta.

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ACKNOWLEDGMENTS

The 2005 avian studies in the Colville Delta and NPRA study areas involved the combined efforts of a number of people. The ABR biologists and technicians who contributed to this project include Lauren Attanas, Matt Evans, Tim Obritschkewitsch, Pam Seiser, and Alice Stickney. Nuiqsut elder Joeb Woods, Sr., provided boat transportation and shared invaluable insights into the history and ecology of the Colville Delta. Pilots Gary Brogdon, Mike Drivet, John Mertke, Marty Stauber, Mike Warlick, and Larry Zuccaro of Maritime Helicopters safely conducted helicopter supported surveys. We thank our airplane pilots, Sandy Hamilton, Arun Jain, Todd MacDonald, and Scott Stewart of Arctic Air Alaska, for keeping aerial surveys safely on course. On the ground, Justin Harth and Brent Veltcamp coordinated the helicopter flights. In our Fairbanks office, Allison Zusi-Cobb, Will Lentz, Matt Macander, Dorte Dissing, and Pam Odom provided expert support in data analysis, figure production, and report preparation. In all phases of this study, we were assisted by our tireless expeditor, Doris Armijo. This study was funded by ConocoPhillips Alaska, Inc., and Anadarko Petroleum Corporation and was administered by Caryn Rea, Senior Staff Biologist and Environmental Studies Coordinator, for whose support and guidance we are grateful. We appreciate the review and comments on this report made by Caryn Rea. We thank all the other ConocoPhillips Alaska staff and contractors in the Alpine Oilfield for their assistance in making 2005 a successful field season.

INTRODUCTION

During 2005, ABR, Inc., conducted wildlife surveys for selected birds and mammals in the Colville River Delta and adjacent Northeast Planning Area of the National Petroleum Reserve—Alaska (NPRA) in support of the Alpine Satellite Development Project (ASDP) of ConocoPhillips, Alaska, Inc. (CPAI). The wildlife studies in 2005 were a continuation of work initiated by CPAI's predecessors, ARCO Alaska, Inc., and Phillips Alaska, Inc., in the Colville River Delta in 1992 (Smith et al. 1993, 1994; Johnson 1995; Johnson et al. 1996, 1997, 1998, 1999a, 1999b, 2000a, 2000b, 2001, 2002, 2003a, 2003b, 2004, 2005; Burgess et al. 2000, 2002a, 2003a) and in the northeastern NPRA in 1999 (Anderson and Johnson 1999; Murphy and Stickney 2000; Johnson and Stickney 2001; Burgess et al. 2002b, 2003b, Johnson et al. 2004, 2005). The ASDP studies augment long-term wildlife monitoring programs that have been conducted by CPAI (and its predecessors) across large areas of the central Arctic Coastal Plain since the early 1980s (see Murphy and Anderson 1993, Stickney et al. 1993, Anderson et al. 2005, Lawhead and Prichard 2005).

The primary goal of wildlife investigations in the region since 1992 has been to describe the distribution and abundance of selected species before, during, and after construction of oil development projects. We report here the results of avian surveys in 2005 that were conducted in the Colville River Delta and adjacent NPRA where CPAI currently produces oil (the Alpine Development's CD-1 and CD-2 pads) or plans oil and gas development sites (the Alpine Satellite Development Project [BLM 2004]): CD-3 (Fiord) and CD-4 (Nanuk) are under construction, and CD-5 (Alpine West), CD-6 (Lookout), and CD-7 (Spark) are proposed (Figure 1). Readers are directed to prior reports for wildlife information from previous years.

Surveys in the Colville River Delta and in the northeastern NPRA in 2005 were designed to provide data on the distribution, abundance, and habitat use of 5 focal species: Spectacled Eider, King Eider, Tundra Swan, Brant, and Yellow-billed Loon. Habitat selection analyses will be presented in a later report; interested readers are referred to past summaries (see Johnson et al. 2005). Unlike previous years, ground-based surveys for nesting birds were conducted only in the CD-3 area for a separate monitoring study of Spectacled Eiders in 2005 (Johnson et al. 2006). Required state and federal permits were obtained for authorized survey activities, including a Scientific or Educational Permit (Permit No. 05-108) from the State of Alaska and a Federal Fish and Wildlife Permit—Threatened and Endangered Species (Permit No. TE012155-0). Similar avian species were monitored in the Kuparuk Oilfield on the eastern border of the Colville River Delta in 2005 (Anderson et al. 2005). Studies of caribou and other large mammals in the ASDP area in 2005 are reported in Lawhead et al. (in prep.). Additional studies on the use of the ASDP area by grizzly bears were conducted by the Alaska Department of Fish and Game (ADFG) with support from CPAI in 2002–2005. CPAI also supported the Polar Bear Conservation Program (U.S. Geological Survey) in its efforts to capture, mark, and monitor polar bears in the central Beaufort Sea.

STUDY AREAS

The place names used throughout this report are those depicted on U.S. Geological Survey (USGS) 1:63,360-scale topographic maps, because they are the most widely available published maps of the region. The corresponding local Iñupiaq names for drainages also are provided in parentheses at the first usage in text and on the study area map (Figure 1). Iñupiaq names are presented out of respect for local residents, to facilitate clear communication with Iñupiaq speakers, and because they pre-date the English names used on USGS maps. We acknowledge that the Iñupiaq names presented are not comprehensive, and we understand that the published USGS names for some streams (notably the Ublutuoch and Tingmeachsiovik rivers) do not correctly reflect local usage. The Iñupiaq names we use for Fish and Judy creeks in northeastern NPRA are taken from the *Iñupiat–English Map of the North Slope Borough* (NSB Planning Department, Barrow, Alaska, May 1997). Additional information was supplied to CPAI in recent years by Nuiqsut elders. Even in cases where USGS attempted to use the correct Iñupiaq

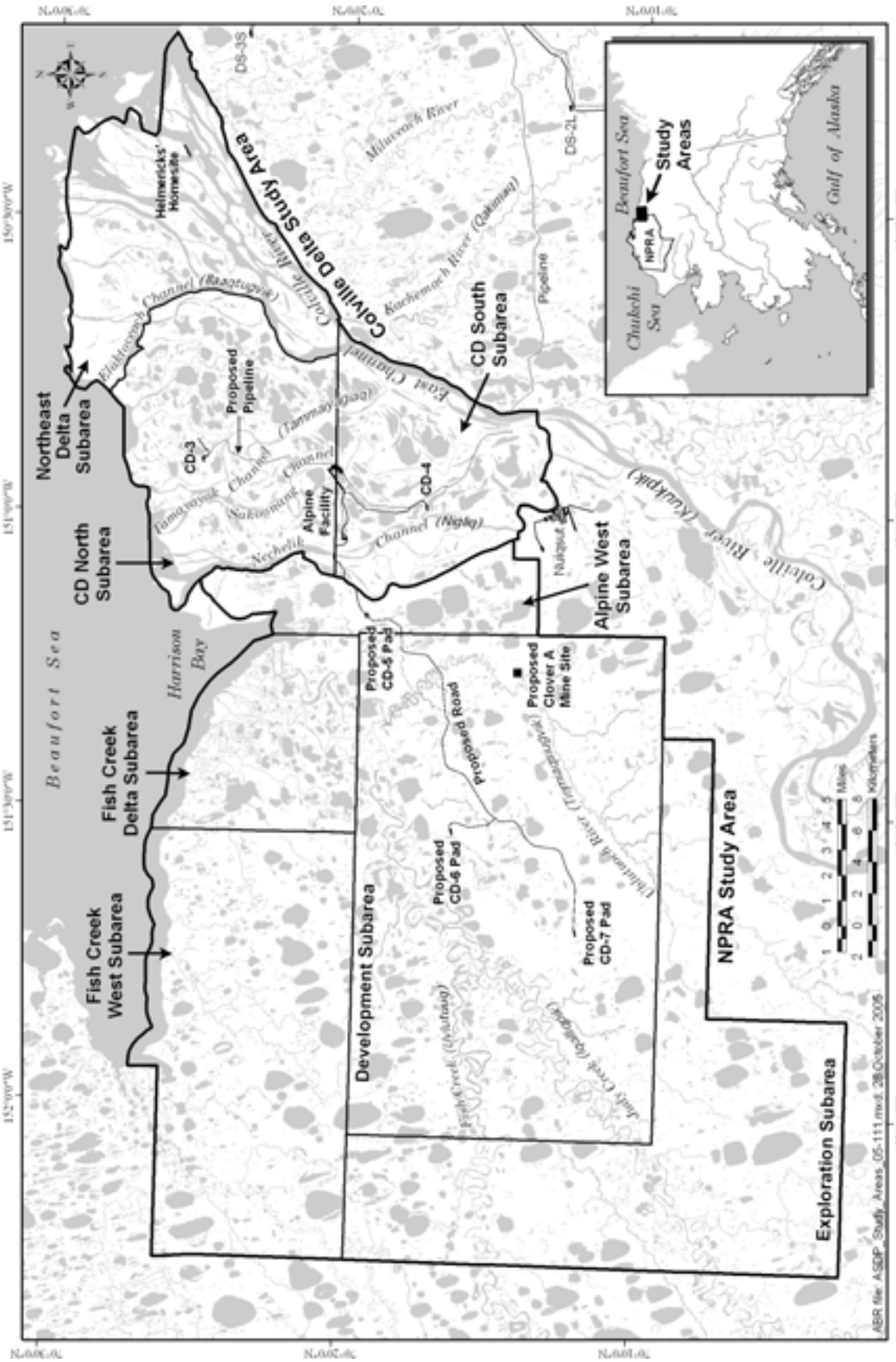

Figure 1. Wildlife study areas and subareas for the Alpine Satellite Development Project, northern Alaska, 2005.

names, the anglicized spellings are outdated and so have been corrected to the modern Iñupiaq spellings through consultation with Emily Ipalook Wilson and Dr. Lawrence Kaplan of the Alaska Native Language Center (ANLC) at the University of Alaska Fairbanks. Marjorie Kasak Ahnupkanna and Archie Ahkiviana were consulted to confirm the names of other channels on the Colville River Delta (E. Wilson, ANLC, pers. comm.).

COLVILLE DELTA

The Colville River Delta (or Colville Delta) includes the Alpine Facilities (2 well pads, CD-1 and CD-2, at present the only producing oilfield on the Colville Delta) and 2 new sites under construction, CD-3 and CD-4 (Figure 1). The CD-3 pad is a roadless development that will be accessed via an all-season landing strip and a winter ice road. An all-season road connects CD-4 to the Alpine facilities.

As used in this report, the Colville Delta study area (552 km²) comprised the CD North, CD South, and the Northeast Delta subareas (Figure 1). These subareas are useful in describing the distribution of birds on the delta, and together they encompass the entire delta from the east bank of the East Channel of the Colville River to the west bank of the westernmost distributary of the Nechelik (Nibliq) Channel and inland to the juncture of these channels. The Colville Delta is one of the most prominent and important landscape features on the Arctic Coastal Plain of Alaska, both because of its large size and because of the concentrations of birds, mammals, and fish that are found there. Two permanent human settlements occur on the Colville Delta—the Iñupiat village of Nuiqsut and the Helmericks' family home site.

NPRA

The 2005 NPRA study area (1,571 km²) abutted the western edge of the Colville Delta and comprised 5 subareas: the Development, Exploration, Alpine West, Fish Creek Delta, and Fish Creek West subareas (Figure 1). The NPRA study area is located in the northeastern section of the NPRA, 6–39 km west of the village of Nuiqsut and 1–43 km west of the Alpine facilities. In 2005, the study area was expanded westward from the Fish Creek Delta to encompass what we call the Fish Creek West subarea. The NPRA study area encompassed 4 proposed development sites that are part of the ASDP: CD-5, CD-6, and CD-7 and the Clover A gravel mine site (Figure 1). A proposed road connects the 3 pads and also connects the CD-5 pad to the Alpine facilities at CD-2.

Three major streams flow through the NPRA study area (Figure 1). On USGS topographic maps (Harrison Bay 1:63,360 series, 1955), these drainages are labeled as Fish Creek, Judy Creek, and the Ublutuoch River, but are commonly known by other names by Iñupiat residents: Fish Creek is called Uvlutuuq, Judy Creek is called Iqalliqpik, and the Ublutuoch River is called Tiƒmiaqsiubvik (Figure 1).

METHODS

EIDER AERIAL SURVEYS

Regional abundance and distribution of eiders were evaluated with data collected on aerial surveys flown during the pre-nesting period (Table 1), while male eiders (the more visible of the 2 sexes in breeding plumage) were still present on the breeding grounds. The pre-nesting survey in 2005 (Figure 2) covered the same areas in the Colville Delta and NPRA study areas as in 2004 with the addition of the Fish Creek West subarea (Figure 1). The pre-nesting survey was conducted 8–13 June using the same methods that were used in previous years on the Colville Delta (1993–1998 and 2000–2004) and in the NPRA study area (1999–2004), although the survey areas and survey coverage differed among years (see Anderson and Johnson 1999, Murphy and Stickney 2000, Johnson and Stickney 2001, Burgess et al. 2003b, Johnson et al. 2003b, 2004, 2005). Flight altitude was 30–35 m above ground level (agl) and flight speed was approximately 145 km/h. A Global Positioning System (GPS) receiver was used to navigate pre-determined east–west transect lines that were spaced 800 m apart (50% coverage) in the NPRA study area and 400 m apart (100% coverage) over the Colville Delta study area (Figure 2). An observer on each side of the airplane (in addition to the pilot) counted eiders in a 200-m-wide transect (delimited by tape on windows and wing struts, see Pennycuick and

Table 1. Avian surveys conducted in the Colville Delta and NPRA study areas, Alaska, 2005.

Survey Type Study Area	Season	Survey Dates	Aircraft [a]	Transect Width (km)	Transect Spacing (km)	Aircraft Altitude (m)	Notes
Eider surveys							
Colville Delta	Pre-nesting	8, 11–13 June	C185	0.4	0.4	30–35	100% coverage
NPRA	Pre-nesting	9–11 June	C185	0.4	0.8	30–35	50% coverage
Yellow-billed Loon surveys [bc]							
Colville Delta–NPRA	Nesting	27–29 June	206L	–	–	60	All lakes ≥10 ha
Colville Delta–NPRA	Brood-rearing	23–24 August	206L	–	–	60	All lakes ≥10 ha
Tundra Swan surveys							
Colville Delta–NPRA	Nesting	22–25 June	C206	1.6	1.6	150	100% coverage
Colville Delta–NPRA	Brood-rearing	18–21 August	C206	1.6	1.6	150	100% coverage
Brant and Snow Goose survey							
Colville Delta–NPRA	Brood-rearing	30 July	B8GCBC	–	–	90	Coastal and lake-to- lake pattern

[a] C185 = Cessna 185 fixed-wing airplane; C206 = Cessna 206 fixed-wing airplane; B8GCBC = Bellanca “Scout” fixed-wing airplane; 206L = Bell “Long Ranger” helicopter

[b] Glaucous Gull nests were recorded during surveys for Yellow-billed Loons

[c] Pacific and Red-throated loons and colonies of Sabine’s Gulls were recorded incidentally

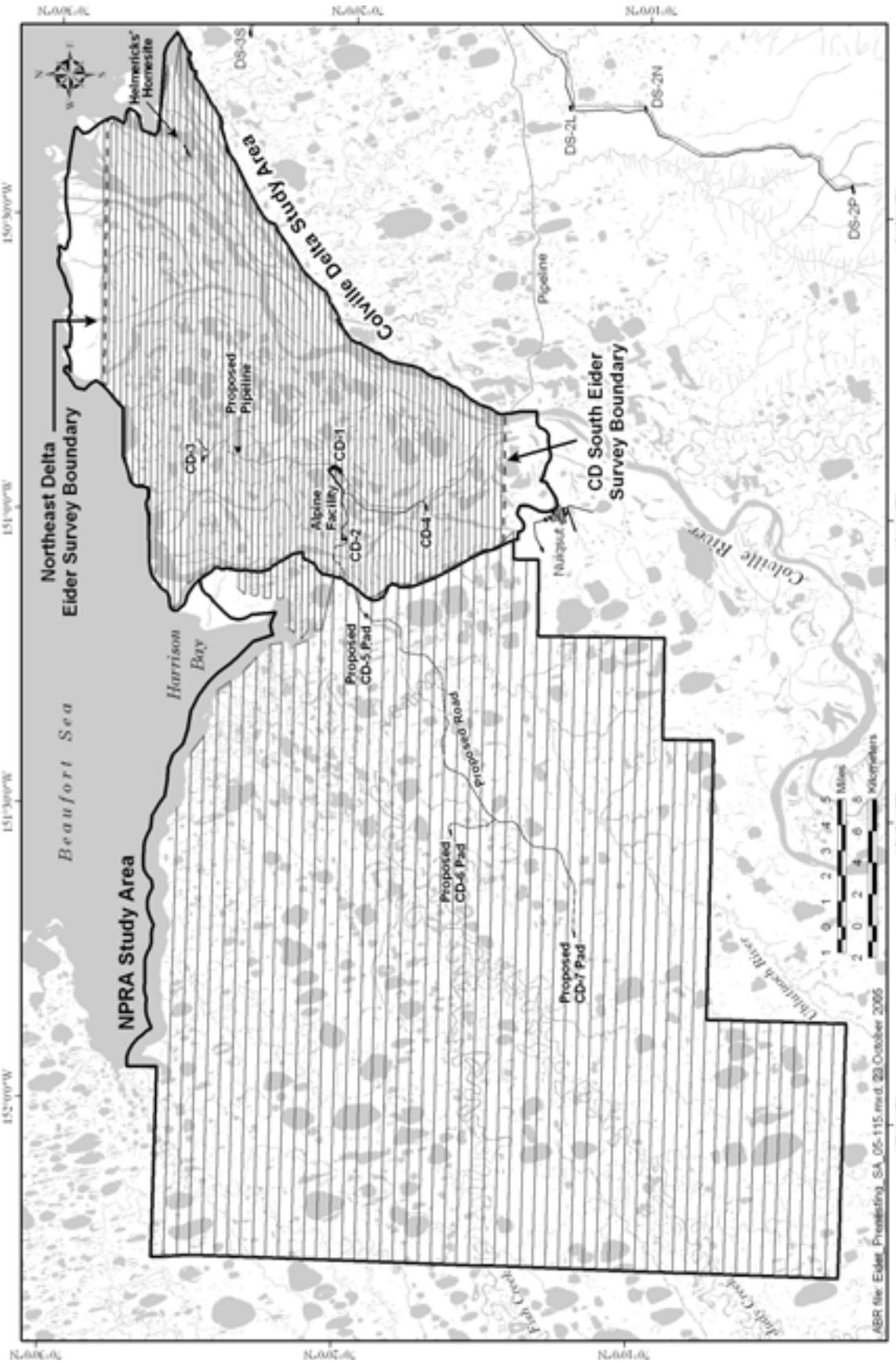

Figure 2. Transect lines and survey areas for pre-nesting eider aerial surveys, Colville Delta and NPRA study areas, Alaska, 2005.

Western 1972). Three areas were not surveyed on the Colville Delta: the extensive tidal flats and marine waters on the northernmost delta were not included because eiders rarely use those habitats, a 2.4-km radius circle around the Helmericks' home site was avoided to reduce disturbance to its residents, and similarly, the extreme southern delta was avoided to limit disturbance to Nuiqsut residents (Figure 2). Eider locations were recorded on color photomosaic maps (1:63,360-scale) and tape recorders were used to record species, number of identifiable pairs and individuals of each sex, and activity (flying or on the ground). Eider locations on survey maps were digitized into a geographic information system (GIS) database for analysis and archival purposes.

We recorded the observed number of birds and pairs and calculated the "indicated" number of birds and densities (number/km²). Following the USFWS (1987a) protocol, the total indicated number of birds excluded flying birds and was twice the number of males not in groups (groups defined as >3 birds of mixed sex that could not be separated into singles or pairs) plus the number of birds in groups.

LOON AERIAL SURVEYS

Aerial surveys for nesting Yellow-billed Loons were conducted on 27–29 June 2005 and for brood-rearing loons on 23–24 August 2005 (Table 1). The surveys were flown in the CD North and CD South subareas and over 2 lakes in the Northeast Delta subarea of the Colville Delta study area and in the Alpine West and Fish Creek Delta subareas of the NPRA study area (Figure 3). Both nesting and brood-rearing surveys were conducted in a helicopter flying at ~60 m agl in a lake-to-lake pattern covering most lakes ≥10 ha in size and immediately adjacent aquatic habitats, comprising the typical breeding habitats for nesting Yellow-billed Loons (Sjolander and Agren 1976, North and Ryan 1989). Tapped Lakes with Low-water Connections (lakes whose levels fluctuate with river levels) were excluded because Yellow-billed Loons do not use such lakes for nesting (North 1986, Johnson et al. 2003b). Observations of Pacific and Red-throated loons were recorded incidentally. All locations of loons and their nests were recorded on color photomosaics (~1:30,000 scale) and later digitized into a GIS database for analysis and archival purposes. The total numbers of adults, nests, broods, and young counted on aerial surveys were summarized for each species of loon. Densities of adults, nests, and broods were calculated only for Yellow-billed Loons because the smaller lakes that typically are used by Pacific and Red-throated loons were not included in the survey.

Weekly surveys were conducted to monitor the status of Yellow-billed Loon nests in the Colville Delta. Using locations from the nesting survey, each nest was surveyed from a helicopter and recorded as active or inactive. Active nests had either an incubating adult, or contained at least 1 egg. Nests were revisited until no longer active, either due to nest failure or hatch. Nests were assumed failed when adults were not incubating, eggs were not present, and a brood was not seen, and assumed successful if a brood was present. Once inactive, the nesting lake was immediately searched for broods by flying along the shoreline. In some cases, adjacent lakes known from previous surveys to be brood-rearing locations also were surveyed. Inactive nests were visited on the ground to inspect contents. The nest and the surrounding area within 5 m, including the water around the nest, were examined for the presence of egg fragments and egg membranes. Loons may reuse nests from previous years, so only the current year's layer of loose vegetation on top of the nest was inspected, to avoid recording evidence from previous years. If egg fragments were found, they were counted and the length and width of 10 pieces were measured.

TUNDRA SWAN AERIAL SURVEYS

Aerial surveys for nesting and brood-rearing Tundra Swans were flown during 22–25 June and 18–21 August 2005, respectively (Table 1). Aerial surveys covered the entire Colville Delta and NPRA study areas (Figure 4). Surveys were conducted in accordance with USFWS protocols (USFWS 1987b, 1991). East-west transects spaced 1.6 km apart were flown in a fixed-wing airplane that was navigated with the aid of a GPS receiver. Flight speed was 145 km/h and altitude was 150 m agl. Two observers each searched 800-m-wide transects on opposite sides of the airplane while the

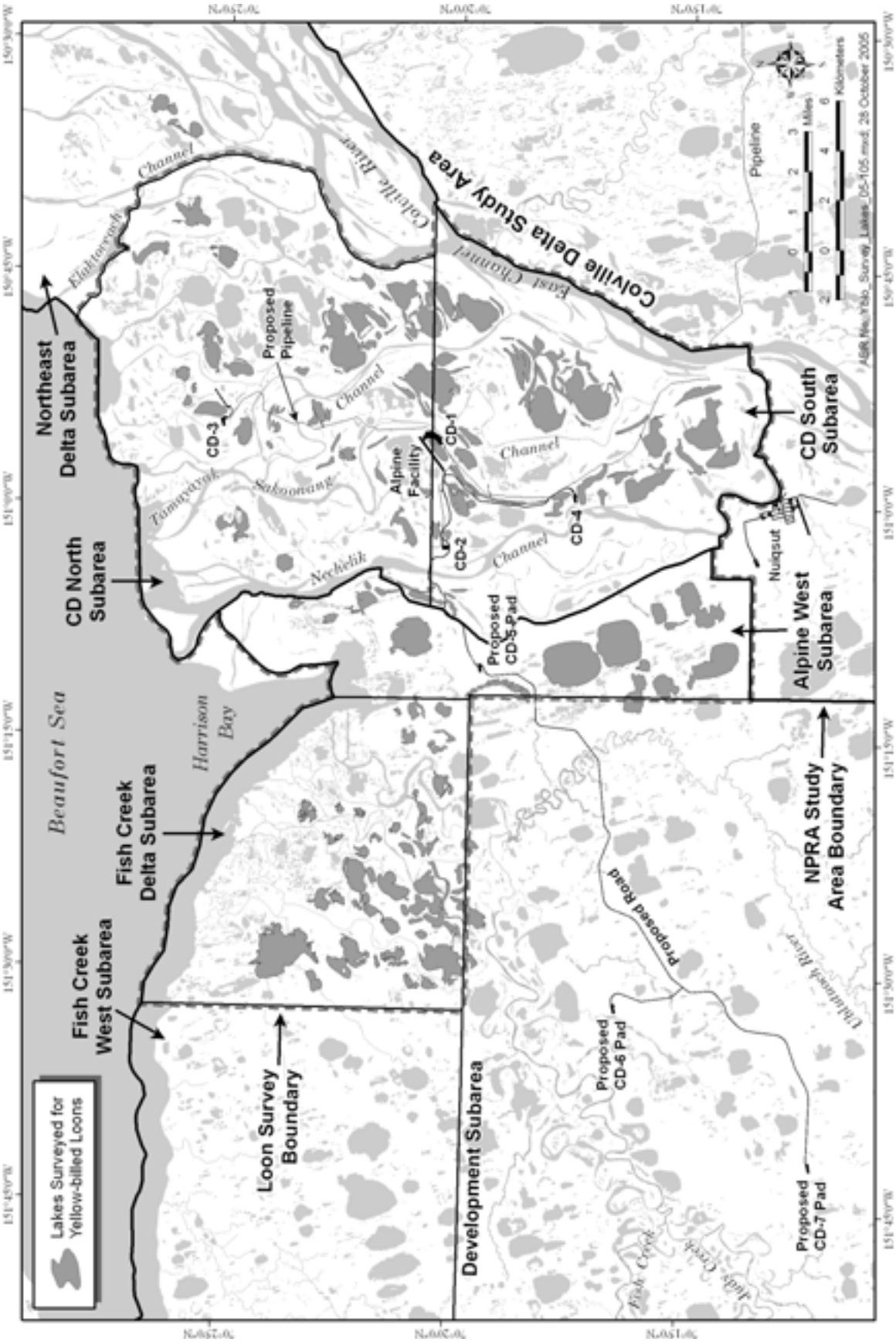

Figure 3. Lakes included in aerial surveys for nesting Yellow-billed Loons, Colville Delta and NPRA study areas, Alaska, 2005.

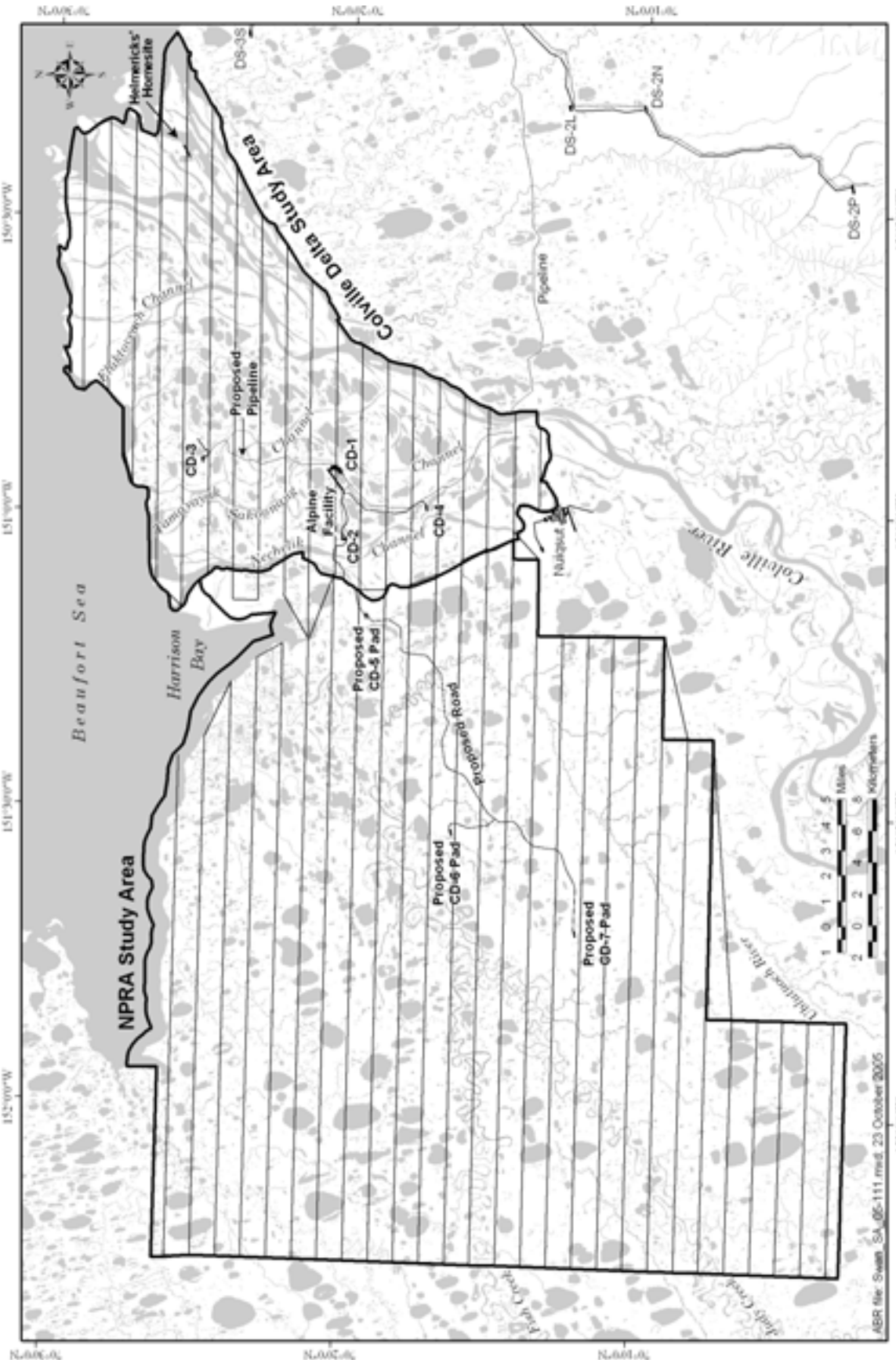

Figure 4. Transect lines and survey areas for aerial surveys of nesting and brood-rearing swans, Colville Delta and NPRA study areas, Alaska, 2005.

pilot navigated and scanned for swans ahead of the airplane, providing 100% coverage of the surveyed area. Locations and counts of swans and their nests were recorded on color photomosaics (1:63,360-scale). Each nest on the Colville Delta was photographed with a 35-mm camera for site verification. Swan locations on survey maps were digitized into a GIS database.

Numbers of swans, nests, and broods were summarized and densities calculated for each study area. Apparent nesting success was estimated from the ratio of broods to nests counted during aerial surveys only. The accuracy of these estimates can be affected by differential detection, predation, and movements of broods; therefore, the calculated estimates of nesting success should be considered relative indices.

BRANT AND SNOW GOOSE AERIAL SURVEYS

In 2005, 1 aerial survey was flown on 30 July for brood-rearing and molting Brant and Snow Geese in the coastal zone of the Colville Delta and NPRA study areas (Table 1). The survey was flown in a Bellanca Scout 8GCBC aircraft at 75–150 m agl and approximately 100–120 km/h along the coast and in a lake-to-lake pattern (Figure 5). One pilot and 1 observer searched appropriate habitats (excluding tidal flats and marine water) along the coast, rivers, channels, and lakes. The numbers of adults and young were recorded and their locations were placed on USGS 1:250,000 or 1:63,360-scale maps and saved on a GPS receiver. Geese in small groups (<50) were counted from the airplane, whereas larger groups were counted on photographs taken with a 35-mm camera, 135-mm lens, and 200 ASA slide film. Goose locations on survey maps were digitized into a GIS database.

GULL AERIAL SURVEYS

Glaucous Gulls nests and broods were recorded in the Colville Delta and NPRA study areas during aerial surveys for Yellow-billed Loons (see Loon Aerial Surveys above for methods). Colonies of Sabine's Gulls also were recorded during the nesting survey for Yellow-billed Loons, and the number of nests at each colony was estimated from the number of adults observed (Sabine's Gull nests are difficult to confirm from aerial surveys). All nest and brood observations were recorded on color photomosaics (1:30,000 or 1:63,360-scale) and later digitized into a GIS database.

RESULTS

CONDITIONS IN THE STUDY AREAS

Birds returning to the Colville Delta and NPRA encountered cooler than average spring conditions in 2005. The mean temperature in May 2005 (–4.7° C) at the nearby Kuparuk Oilfield (where long-term records are available) was similar to the 18-year mean for May (–5.0° C) , but the mean temperature in June 2005 (3.1° C) was cooler than the long-term June mean (4.7° C). During the period of waterfowl arrival and peak nest initiation (15 May–15 June) in 2005, 19 thawing degree-days (the sum of the number of degrees centigrade the mean daily temperature was above freezing for each day during a defined period) were recorded in Kuparuk and 10 thawing-degree days were recorded at Colville Village on the outer Colville Delta. The number of thawing-degree days for this period at both locations was the lowest recorded in the last 9 years. Breakup on the Colville River started early in May in 2005, but cooler temperatures later on delayed peak flow until 9 June, resulting in a protracted breakup with a peak volume that was lower than average (Michael Baker, unpubl. data). Snow cover in the NPRA and Kuparuk Oilfield was 10–50% during the first week of June (ABR unpubl. data), and by mid-June snow cover dwindled to less than 10% in these 2 areas. The outer Colville Delta retained measurable snow depths until 9 June. Deep lakes on the Colville Delta retained 60-85% ice cover through 5 July and 30–50% ice cover through 12 July.

EIDERS

Of the 2 species of eiders that commonly occur in the Colville Delta and NPRA study areas, the Spectacled Eider has received the most attention because it was listed as "threatened" under the Endangered Species Act in 1993 (58 FR 27474-27480). The Spectacled Eider nests at low densities across the outer Colville Delta and nests in even lower numbers in inland parts of the delta

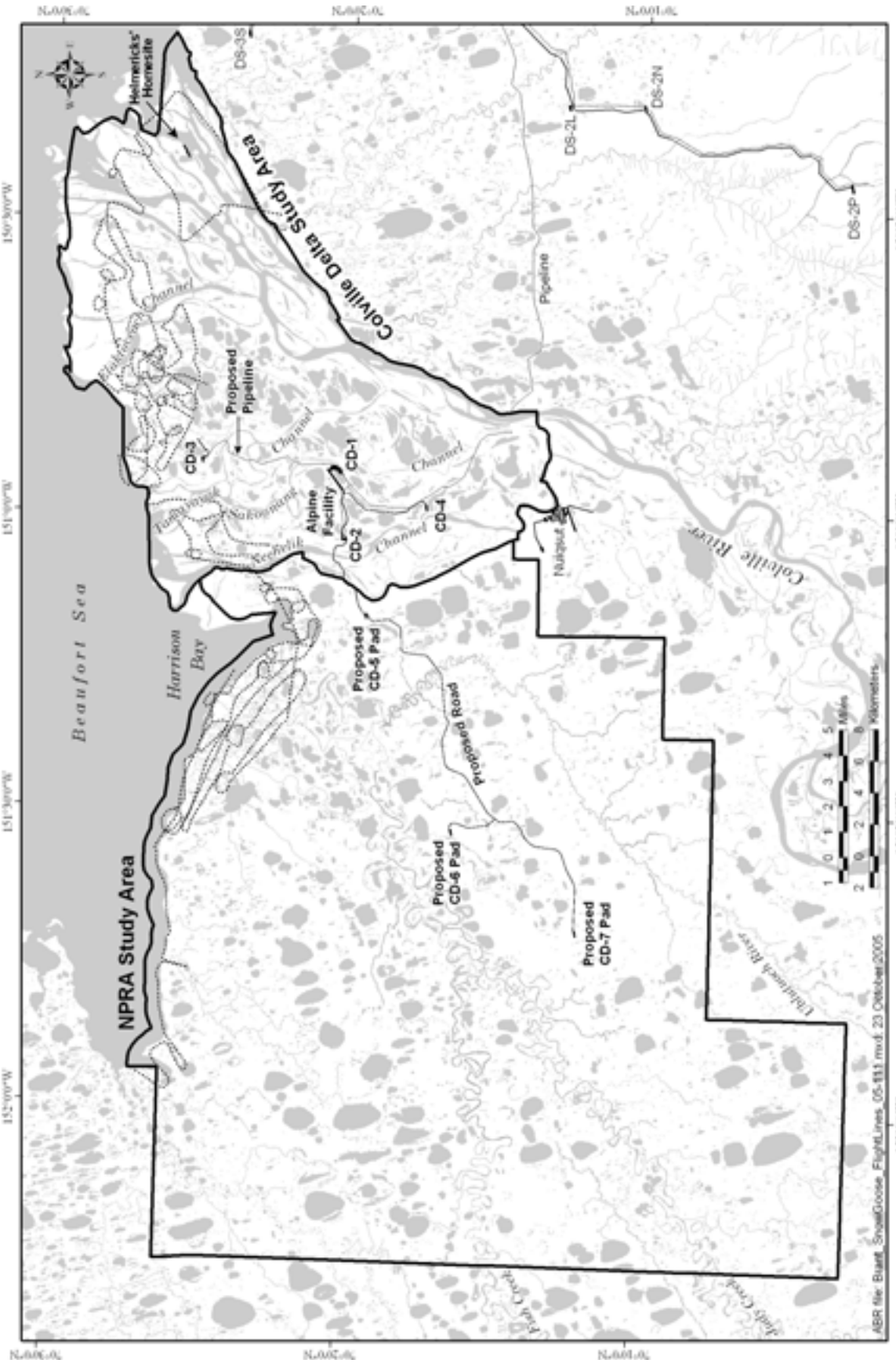

Figure 5. Flight lines for Brant and Snow Goose brood-rearing aerial surveys, Colville Delta and NPRA study areas, Alaska, 2005.

and in scattered wetland basins in the NPRA study area (Burgess et al. 2003a, 2003b; Johnson et al. 2004, 2005). The King Eider is more widespread and generally more numerous than the Spectacled Eider, although their relative abundance varies geographically. Steller's Eiders (also a threatened species, listed in 1997) and Common Eiders are rare in the Colville Delta and NPRA study areas, and none were seen on surveys in 2005.

SPECTACLED EIDER

Colville Delta

The 2005 aerial survey for pre-nesting eiders in the Colville Delta and NPRA study areas was conducted 8–13 June (Table 1), which is similar to the timing of surveys in previous years. All sightings of Spectacled Eiders in 2005 were of groups of 1–4 birds, and all were exclusively in the CD North subarea (Figure 6). During the 2005 pre-nesting survey, we recorded the second lowest number of Spectacled Eiders on the Colville Delta in 12 years of surveys. We counted 16 Spectacled Eiders of which 14 were observed on the ground and 2 were in flight (Table 2).

Nest and brood searches for Spectacled Eiders were conducted in 2005 as part of a monitoring study of construction in the area of CD-3. Readers should see Johnson et al. (2006) for a report on nesting in that part of the delta.

NPRA

The NPRA study area is used during the breeding period by fewer Spectacled Eiders than use the Colville Delta study area. In 2005, as in previous years, Spectacled Eiders occurred in a few wetland basins in the northern portion of the NPRA study area (Figure 6) (Burgess et al. 2003b, Johnson et al. 2004, 2005). In 2005, 9 Spectacled Eiders (most of them flying) were seen in the Fish Creek West (7 birds) and Development subareas (2 birds) (Table 3). Despite the addition of the Fish Creek West subarea in 2005, the total number of Spectacled Eiders in the NPRA study area was smaller than in any previous year since 2000 (Burgess et al. 2003b, Johnson et al. 2004, 2005). The count of pre-nesting Spectacled Eiders also was low in the Kuparuk River Unit in 2005 (Anderson et. al 2005), but the count from the slope-wide survey conducted by U.S. Fish and Wildlife Service in 2005 was higher than the 13-year mean (Larned et al. 2005).

KING EIDER

Colville Delta

In 2005, King Eiders occurred in the CD North subarea in nearly the same numbers as Spectacled Eiders, no King Eiders were sighted in the CD South subarea, and 29 King Eiders (20 were in flight) were seen in the Northeast Delta subarea (Figure 6, Table 2). The Northeast Delta subarea is highly dissected by distributary channels and in past years has been used by large flocks of King Eiders, probably in transit to breeding areas (Johnson et al. 2003b).

NPRA

During breeding, King Eiders are many times more abundant in the NPRA study area than they are in the Colville Delta study area. On the pre-nesting aerial survey in 2005, 253 King Eiders were recorded, and 89 of these were in flight (Figure 6, Table 3). The highest density of King Eiders (0.55 birds/km²) was observed in the Alpine West subarea. The overall density of King Eiders in the NPRA study area in 2005 (0.22 birds/km², non-flying) was similar to that in 2004 (0.26 birds/km², non-flying; Johnson et al. 2005).

YELLOW-BILLED LOON

COLVILLE DELTA

Abundance and Distribution

During nesting in 2005, 55 Yellow-billed Loons were observed in the Colville Delta study area (Table 4), which was slightly more than the mean number seen in previous years (Burgess et al. 2003a, Johnson et al. 2003b, 2004, 2005). Twenty-eight Yellow-billed Loon nests were found in the Colville Delta study area (CD North and CD South subareas combined) during the aerial survey in 2005 (Figure 7, Table 4). Two more nests and 3 adults were found in the Northeast Delta subarea, but were excluded from the study area totals because only a small portion of that subarea was surveyed (Figure 7). One additional nest was indicated by the observation of a brood in a traditional nest lake in the CD North subarea where a nest was not found in 2005. The total count of 31

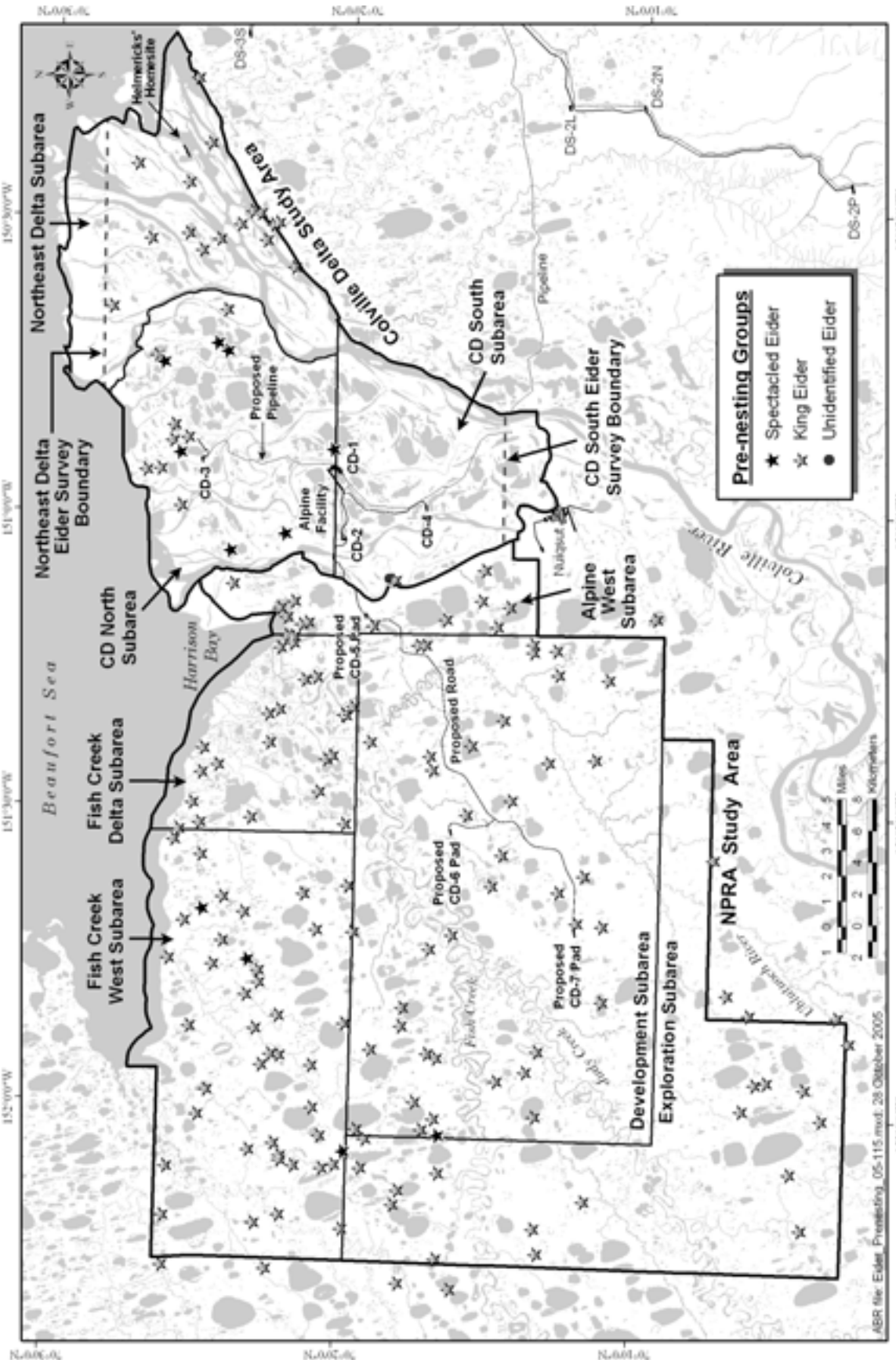

Figure 6. Spectacled and King eider groups during pre-nesting, Colville Delta and NPRA study areas, Alaska, 2005.

Table 2. Number and density of eiders during pre-nesting aerial surveys, Colville Delta study area, Alaska, 2005.

SPECIES Subarea Behavior	Number of Eiders					Density (birds/km²)[a]	
	Observed				Indicated Total[b]	Observed Total	Indicated Total[b]
	Males	Females	Total	Pairs			
SPECTACLED EIDER							
CD North							
On ground	7	7	14	7	14	0.07	0.07
Flying	1	1	2	1	–	0.01	–
All birds	8	8	16	8	–	0.08	–
KING EIDER							
CD North							
On ground	5	5	10	5	10	0.05	0.05
Flying	4	3	7	3	–	0.03	–
All birds	9	8	17	8	–	0.08	–
Northeast Delta							
On ground	6	3	9	3	12	0.06	0.08
Flying	10	10	20	10	–	0.13	–
All birds	16	13	29	13	–	0.18	–
Total (Subareas combined)							
On ground	11	8	19	8	22	0.04	0.04
Flying	14	13	27	13	–	0.05	–
All birds	25	21	46	21	–	0.09	–
UNIDENTIFIED EIDER							
CD South							
On ground	2	0	2	0	4	0.01	0.03
Flying	0	0	0	0	–	0	–
All birds	2	0	2	0	–	0.01	–

[a] Density based on 100% coverage of subareas: CD North = 206.7 km^2; Northeast Delta = 157.6 km^2, CD South = 137.2 km^2, all subareas combined = 501.4 km^2; numbers were not corrected for sightability

[b] Total indicated birds was calculated according to standard USFWS protocol (USFWS 1987a)

Table 3. Number and density of eiders during pre-nesting aerial surveys, NPRA study area, Alaska, 2005.

SPECIES Subarea Behavior	Number of Eiders					Density (birds/km²)[a]	
	Observed				Indicated Total[b]	Observed Total	Indicated Total[b]
	Males	Females	Total	Pairs			
SPECTACLED EIDER							
Development							
On ground	0	0	0	0	0	0	0
Flying	1	1	2	1	–	0.01	–
All birds	1	1	2	1	–	0.01	–
Fish Creek West							
On ground	1	1	2	1	2	0.01	0.01
Flying	3	2	5	2	–	0.03	–
All birds	4	3	7	3	–	0.05	–
Total (subareas combined)							
On ground	1	1	2	1	2	0.00	0.00
Flying	4	3	7	3	–	0.01	–
All birds	5	4	9	4	–	0.01	–
KING EIDER							
Development							
On ground	31	21	52	14	62	0.17	0.20
Flying	14	11	25	9	–	0.08	–
All birds	45	32	77	23	–	0.25	–
Alpine West							
On ground	13	10	23	7	26	0.55	0.62
Flying	0	0	0	0	–	0	–
All birds	13	10	23	7	26	0.55	–
Fish Creek Delta							
On ground	14	12	26	8	28	0.45	0.49
Flying	11	10	21	10	–	0.37	–
All birds	25	22	47	18	–	0.82	–
Fish Creek West							
On ground	26	18	44	18	52	0.29	0.34
Flying	19	16	35	11	–	0.23	–
All birds	45	34	79	29	–	0.52	–
Exploration							
On ground	12	7	19	7	24	0.09	0.12
Flying	4	4	8	4	–	0.04	–
All birds	16	11	27	11	–	0.13	–
Total (subareas combined)							
On ground	96	68	164	54	196	0.22	0.26
Flying	48	41	89	34	–	0.12	–
All birds	144	109	253	88	–	0.34	–

[a] Surveys conducted at 50% coverage. Density based on area surveyed: Development subarea = 304.6 km^2 surveyed, Alpine West = 41.8 km^2, Fish Creek = 57.3 km^2, Fish Creek West =151.2 km^2, Exploration = 200.2 km^2, all subareas combined = 755.0 km^2. Numbers were not corrected for sightability

[b] Total indicated birds was calculated according to standard USFWS protocol (USFWS 1987a)

Table 4. Number and density of loons and their nests, broods, and young during aerial surveys, Colville Delta and NPRA study areas, Alaska, 2005.

STUDY AREA	Yellow-billed Loons					Pacific Loons[a]			Red-throated Loons[a]		
	Number			Density (number/km²)		Number			Number		
Subarea[b] Survey Type	Adults	Nests/ Broods	Young	Adults	Nests/ Broods	Adults	Nests/ Broods	Young	Adults	Nests/ Broods	Young
COLVILLE DELTA											
CD North											
Nesting	30	16	–	0.15	0.08	57	22	–	3	0	–
Brood-rearing	23	11	13	0.11	0.05	19	8	8	3	3	3
CD South											
Nesting	25	12	–	0.15	0.08	55	23	–	2	0	–
Brood-rearing	14	4	6	0.09	0.03	18	5	6	1	0	0
Northeast Delta[c]											
Nesting	3	2	–	–	–	2	1	–	0	0	–
Brood-rearing	2	2	2	–	–	2	0	0	0	0	0
Total (subareas combined)[d]											
Nesting	55	28	–	0.15	0.08	112	45	–	5	0	–
Brood-rearing	37	15	19	0.10	0.04	37	13	14	4	3	3
NPRA											
Alpine West											
Nesting	4	0	–	0.05	0	56	7	–	0	0	–
Brood-rearing	0	0	0	0	0	70	6	8	0	0	0
Fish Creek Delta											
Nesting	19	8	–	0.15	0.06	81	17	–	5	0	–
Brood-rearing	12	3	3	0.09	0.02	50	4	6	5	1	1
Total (subareas combined)[d]											
Nesting	23	8	–	0.11	0.04	137	24	–	5	0	–
Brood-rearing	12	3	3	0.06	0.01	120	10	14	5	1	1

[a] Densities of Pacific and Red-throated loons were not calculated because detectability differed from that of Yellow-billed Loons and surveys did not include smaller lakes (<10 ha) where those species commonly nest

[b] CD North = 206.7 km², CD South = 155.9 km², Alpine West = 79.7 km², Fish Creek Delta = 130.5 km²; see Figure 3

[c] Densities for Northeast Delta were not calculated because entire area was not surveyed

[d] Total number and density includes CD North and CD South for Colville Delta (362.6 km² total) , and Alpine West and Fish Creek Delta for NPRA (210.2 km² total)

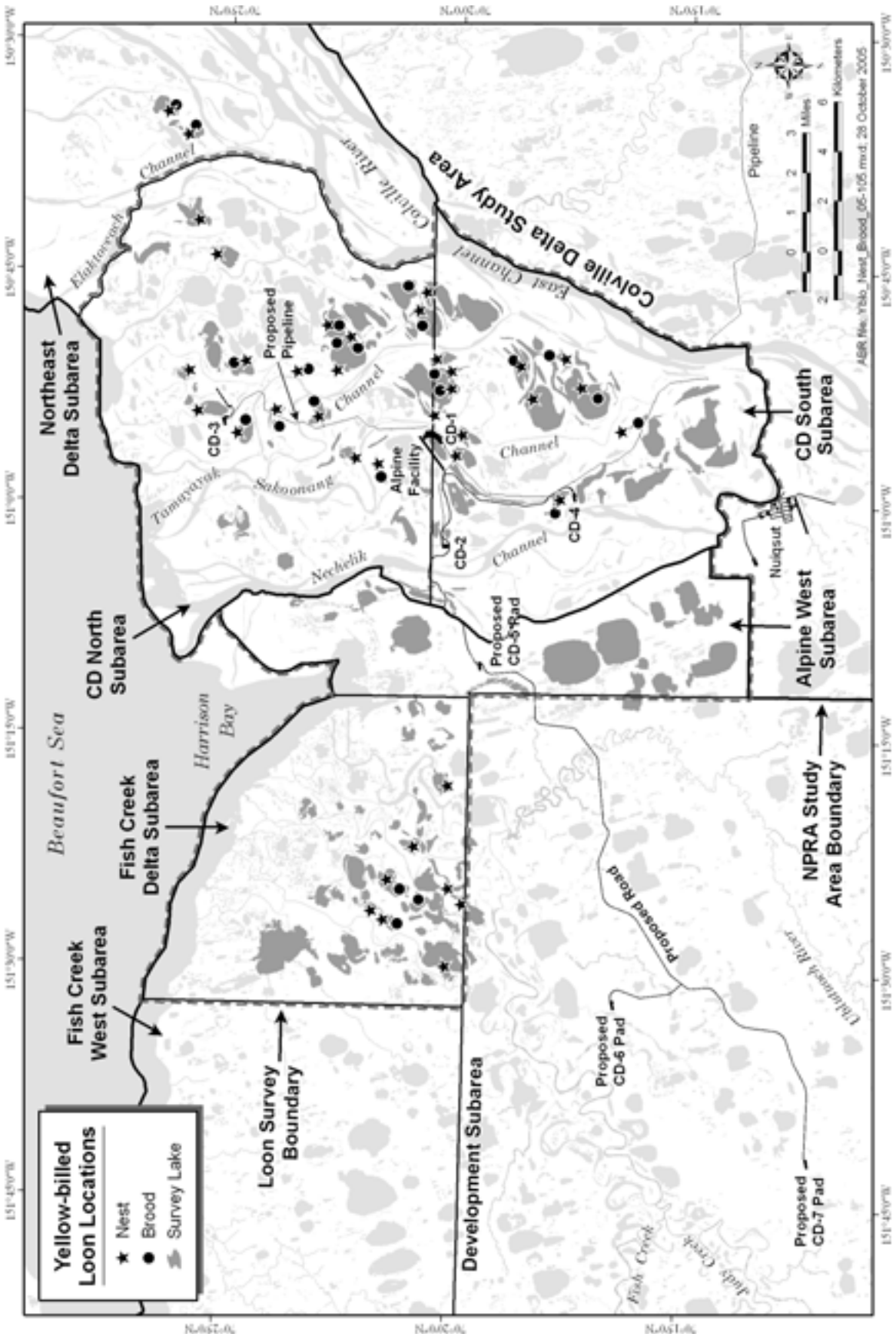

Figure 7. Yellow-billed Loon nests and broods, Colville Delta and NPRA study areas, Alaska, 2005.

nests for the Colville Delta in 2005 is higher than any previous record, including the nest counts from intensive ground surveys by North (1986) in 1983–1984 (20 nests). As in previous years, Yellow-billed Loon nests in 2005 were concentrated in the central part of the delta (Figure 7), and all nests were on lakes where Yellow-billed Loons have nested previously (Rothe et al. 1983, North 1986, Burgess et al. 2003a, Johnson et al. 2003b, 2004, 2005).

In 2005, we also recorded the highest count of Yellow-billed Loon broods for the Colville Delta study area in 11 years of surveys. Fifteen broods and 37 adult Yellow-billed Loons were observed during the brood-rearing aerial survey (excluding 2 broods and 2 adults in the Northeast Delta subarea; Figure 7, Table 4). Mean brood size was 1.3 young/brood (n =15 broods).

Nest Fate

Overall, 19 of 30 pairs of Yellow-billed Loons in the Colville Delta study area were observed with young for an apparent nesting success of 63% (Table 5). Hatch began between nest visits on 12 and 19 July. Twelve nests hatched by 19 July, 5 more nests hatched by 26 July, and the remaining 2 nests hatched by 1 August. Two broods were lost by the time of the brood-rearing survey (23–24 August).

The highest proportion of Yellow-billed Loon nest failures in the Colville Delta occurred during the week following the nesting survey with 20% (6 of 30) of the nests failing by 5 July. Three more nests failed by 12 July, and only 1 nest failure was observed after 12 July (Table 5). Three of the nest failures could be positively attributed to lake ice that had been pushed over nests by strong westerly winds.

The contents of 29 Yellow-billed Loon nests were examined after nests were no longer active. Each of 18 nests associated with broods contained more than 30 egg fragments ranging in size from 2 to 25 mm in length, with some as big as 35 mm. Although a few fragments were loosely attached to bits of egg membrane, nearly all fragments were free of membrane. Every hatched nest contained at least 1 piece of thickened egg membrane ranging in length from 3 mm to 68 mm. The majority of egg remains were found in nest bowls, but occasionally fragments and membranes were found in the water or on shore adjacent to nests. Of 10 nests where broods were not seen and presumed failed, 9 nests were empty, containing no sign of egg remains, and 1 nest had 5 egg fragments (3–13 mm in length) adjacent to the nest bowl. The fragments at this last nest did not have blood or yolk on them, nor did they have any membranes present (attached or detached).

One Yellow-billed Loon nest was classified as having an unknown fate. The nest contents resembled a successfully hatched nest, although a brood was never seen. Egg remains included about 50 small egg fragments, mostly free of membrane, as well as 3 small pieces of thickened membrane, similar to the successful nests described above. However, 1 membrane showed some bloody spots. The nest may have failed close to hatching, or may have hatched young that did not survive.

NPRA

Abundance and Distribution

During the nesting survey in 2005, 23 Yellow-billed Loons and 8 nests were recorded in the NPRA study area (Figure 7, Table 4). Most birds and all nests were found in the Fish Creek Delta subarea. Two pairs of Yellow-billed Loons were seen near known nest lakes in the Alpine West subarea, but no nest was found at either location. The Fish Creek Delta and Alpine West subareas were the only subareas surveyed for loons in the NPRA study area in 2005, and the Fish Creek Delta subarea was not surveyed for loons in previous years.

During brood-rearing in 2005, 12 adult Yellow-billed Loons and 3 broods were observed in the Fish Creek Delta subarea (Figure 7, Table 4). No adults or broods were seen in the Alpine West subarea in 2005.

PACIFIC AND RED-THROATED LOONS

COLVILLE DELTA

One hundred twelve adults and 45 nests of Pacific Loons were counted opportunistically in the Colville Delta study area during the Yellow-billed Loon nesting survey in 2005 (Figure 8, Table 4). No nests of Red-throated Loons were seen in either study area on that survey. During the brood-rearing survey in 2005, 37 adult Pacific Loons and 13 broods and 4 adult Red-throated

Table 5. Weekly status and fate of Yellow-billed Loon nests, Colville Delta study area, Alaska, 2005.

	Visit Date						
Nest No.	27-29 June	5 July	12 July	19 July	26 July	1 August	Fate/Total
9	Active	Active	Active	Inactive			Hatched
13	Active	Active	Active	Inactive			Unknown
18	Active	Active	Active	Inactive			Hatched
21	Active	Active	Active	Inactive			Hatched
24	Active	Active	Active	Inactive			Hatched
25	Active	Active	Inactive				Failed
27	Active	Inactive					Failed
39	Active	Active	Active	Inactive			Hatched
44	Active	Inactive					Failed
49	Active	Active	Active	Inactive			Hatched
50	Active	Active	Active	Active	Active	Inactive	Hatched
52	Active	Inactive					Failed
53	Active	Active	Active	Inactive			Hatched
55	Active	Active	Active	Active	Inactive		Hatched
56	Active	Active	Active	Active	Active	Inactive	Hatched
59	Active	Active	Active	Active	Inactive		Hatched
74	Active	Active	Active	Inactive			Hatched
78	Active	Inactive					Failed
83	Active	Active	Active	Active	Inactive		Hatched
92	Active	Inactive					Failed
95	Active	Active	Active	Inactive			Hatched
100	Active	Active	Active	Active	Inactive		Hatched
103	Active	Active	Active	Active	Inactive		Hatched
107	Active	Inactive					Failed
110	Active	Active	Active	Inactive			Hatched
113	Active	Active	Active	Inactive			Hatched
115	Active	Active	Inactive				Failed
117	Active	Active	Active	Inactive			Hatched
259	Active	Active	Active	Active	Inactive		Failed
260	Active	Active	Inactive				Failed
No. Active	30	24	21	8	2	0	30
No. Hatched	0	0	0	12	5	2	19
No. Failed	–	6	3	0	1	0	10
No. Unknown	–	0	0	1	0	0	1

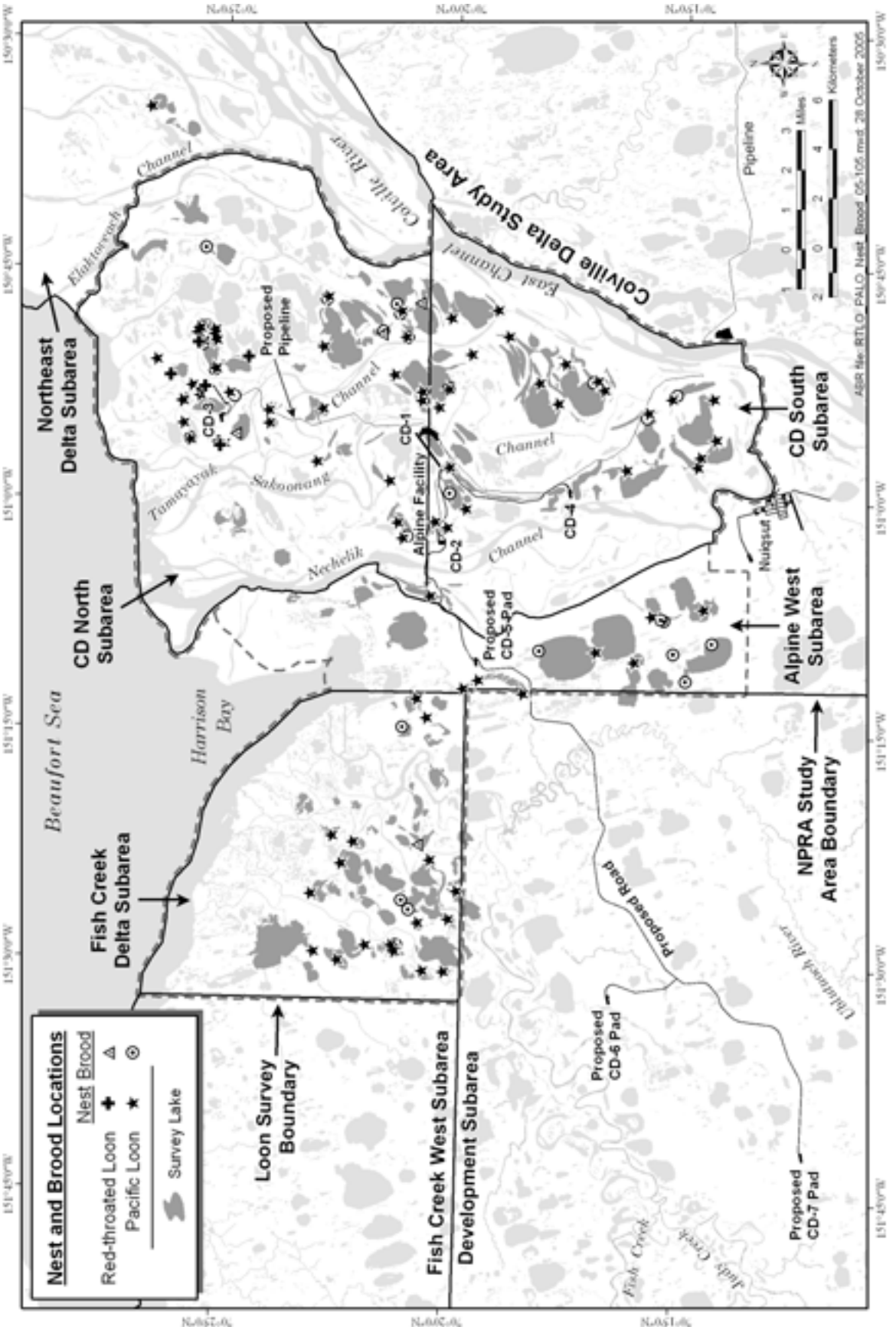

Figure 8. Pacific and Red-throated loon nests and broods, Colville Delta and NPRA study areas, Alaska, 2005.

Loons and 3 broods were observed in the Colville Delta study area (Figure 8, Table 4). Opportunistic counts of Pacific and Red-throated loons reflect their general distribution on the Colville Delta in lakes ≥10 ha but are not indicative of the relative abundance of these species (due to differences in species detectability). Nests of Red-throated Loons are not easily detected from the air. Because the survey focused on lakes larger than those typically occupied by Pacific and Red-throated loons for nesting and brood-rearing, densities have not been calculated for these 2 species. Nonetheless, Pacific Loons were clearly the most abundant loon on the delta in 2005 and in previous years.

NPRA

Pacific Loons also were the most abundant and widespread loon species breeding in the Alpine West and Fish Creek Delta subareas in 2005 (Figure 8, Table 4). On the loon nesting survey in 2005, 137 adult Pacific Loons and 24 nests were found (Table 4). Five Red-throated Loon adults but no nests were seen on that same survey in 2005. During the brood-rearing survey in 2005, 120 adult Pacific Loons (10 broods) and 5 adult Red-throated Loons (1 brood) were counted (Figure 8, Table 4).

TUNDRA SWAN

COLVILLE DELTA

During the 2005 nesting aerial survey, 258 swans, including 62 pairs, were counted in the Colville Delta study area (Figure 9). The total number of adults was substantially lower than the 12-year mean of 379, but the number of pairs was only slightly lower than the 12-year mean of 69. Thirty-five swan nests were found in the Colville Delta study area in 2005 (Table 6), equal to the long-term mean for the delta. Twenty nests were in the CD North subarea, 8 were in the CD South subarea, and 7 were in the Northeast Delta subarea. Not included in the aerial swan survey total were 15 additional swan nests discovered during helicopter-based loon surveys or during ground-searches in the CD-3 search area.

The 36 Tundra Swan broods counted across the entire Colville Delta study area was the second-highest brood count since aerial Tundra Swan surveys were initiated on the Colville Delta in 1992. Apparent nesting success was over 100%, because more broods than nests were counted (Table 6). The mean brood size of 2.3 in 2005 was less than the 12-year mean of 2.6 young/brood, but the total of 84 young counted on the delta has been exceeded in only 3 years since 1992.

NPRA

In 2005, 288 swans, including 126 pairs, were counted during the aerial survey of the NPRA study area (Figure 9). Forty-seven Tundra Swan nests were found during the survey (Table 6), and an additional 5 nests were found during helicopter-based surveys for nesting Yellow-billed Loons. Swan nesting density in the NPRA study area in 2005 (0.03 nests/km²) was similar to the 17-year mean density in the Kuparuk Oilfield (0.04 nests/km2; Anderson et al. 2005) and about half the 12-year mean density (0.06 nests/km²) in the Colville Delta study area.

Thirty-seven Tundra Swan broods were observed in the NPRA study area in 2005 (Figure 9, Table 6). The mean brood size in the NPRA study area in 2005 was 2.1 young (Table 6). Apparent nesting success was 77% (37 broods / 47 nests). Comparable brood-rearing surveys in the Kuparuk Oilfield resulted in apparent nesting success of 64% (Anderson et al. 2005).

BRANT AND SNOW GOOSE

COLVILLE DELTA

During the aerial survey in 2005, we counted 3,847 Brant (2,360 adults and 1,487 young) in 16 brood-rearing groups in the Colville Delta study area (Figure 10, Table 7). All Brant groups included broods, and goslings comprised 39% of the total number of birds. Ten Brant brood-rearing groups were located in the CD North subarea (2,663 birds), and 6 groups were located in the Northeast Delta subarea (1,184 birds). The total count nearly doubled the previous highest count ever recorded in the Colville Delta study area along the same survey route for the years of 1988, 1990–1993, and 1995–1998 (range = 45–1,974 Brant; Bayha et al. 1992, Johnson et. al 1999a).

In 2005, 972 Snow Geese (412 adults and 560 young) in 11 brood-rearing groups were counted in the Colville Delta study area (Figure 10, Table 7). The previous high count was 97 Snow Geese in 1998 (Johnson et al. 1999a). All Snow Goose

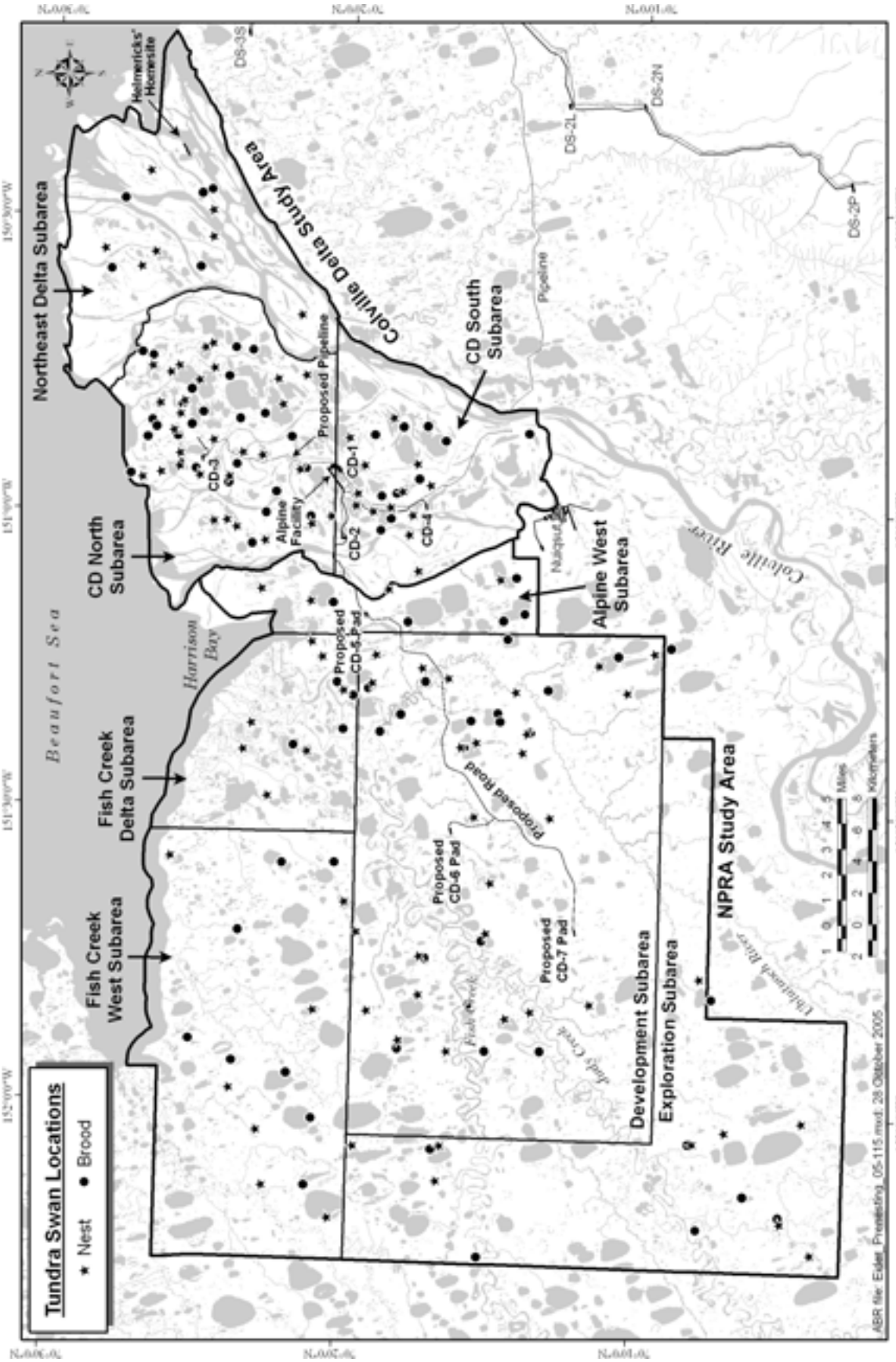

Figure 9. Tundra Swan nests and broods, Colville Delta and NPRA study areas, Alaska, 2005.

Table 6. Number and density of Tundra Swan nests and broods during aerial surveys, Colville Delta and NPRA study areas, Alaska, 2005.

STUDY AREA Subarea	Nests		Apparent Nesting Success[a] (%)	Broods		Mean Brood Size
	Number	Density (nests/km²)		Number	Density (broods/km²)	
COLVILLE DELTA[b]						
CD North	20	0.10	110	22	0.11	2.0
CD South	8	0.05	112	9	0.06	2.8
Northeast Delta	7	0.04	71	5	0.03	2.8
Total (subareas combined)	35	0.06	103	36	0.07	2.3
NPRA[c]						
Development	25	0.04	72	18	0.03	2.1
Alpine West	2	0.02	100	2	0.02	1.0
Fish Creek Delta	4	0.03	133	3	0.02	2.0
Fish Creek West	7	0.02	114	8	0.02	2.6
Exploration	9	0.02	67	6	0.01	1.7
Total (subareas combined)	47	0.03	79	37	0.02	2.1

[a] Apparent nesting success = (broods / nests) × 100
[b] CD North subarea = 206.7 km², CD South subarea = 155.9 km², Northeast Delta subarea = 189.6 km², and Colville Delta study area (subareas combined) = 552.2 km²
[c] Development subarea = 615.8 km², Alpine West subarea =79.7 km², Fish Creek Delta subarea = 130.5 km², Fish Creek West subarea =340.4 km², Exploration subarea = 404.7 km², NPRA study area (subareas combined) = 1,571.1 km²

groups contained broods, and goslings comprised 58% of the total number of birds. Seven groups were located in the CD North subarea (363 total birds), and 4 were located in the Northeast Delta subarea (609 total birds).

NPRA

During the aerial survey of the NPRA study area in 2005, we counted 1,634 Brant (1,003 adults and 631 young) in 12 brood-rearing groups (Figure 10, Table 7). All Brant groups included broods, and goslings comprised 39% of the total birds. Eight Brant brood-rearing groups were located in the Fish Creek Delta subarea (1,312 birds), and 3 groups were located in the Fish Creek West subarea (290 birds).

In 2005, only 32 Snow Geese (13 adults and 19 young) were counted in the NPRA study area, all in 1 brood-rearing group in the Fish Creek Delta subarea (Table 7, Figure 10). Goslings comprised 59% of the total number of birds.

GLAUCOUS AND SABINE'S GULLS

COLVILLE DELTA

Forty-one Glaucous Gull nests were counted in the Colville Delta study area during aerial surveys for Yellow-billed Loons in 2005, and an additional 3 nests were found in 2005 during ground searches in the CD-3 search area (Figure 11, Table 8). Counts have ranged from 18 to 46 nests during 7 years of surveys (Burgess et al. 2003a, Johnson et al. 2004, 2005). In the CD North subarea, 5 nests were in a colony, and in the CD South subarea, 15 Glaucous Gull nests were part of a colony located ~5 km southeast of the Alpine Facility (Figure 11). Because Glaucous Gulls were counted on aerial surveys designed to survey other species, some nests probably were missed in each year.

Glaucous Gull broods were recorded incidentally in 2005 during the aerial survey for brood-rearing loons. At least 15 Glaucous Gull

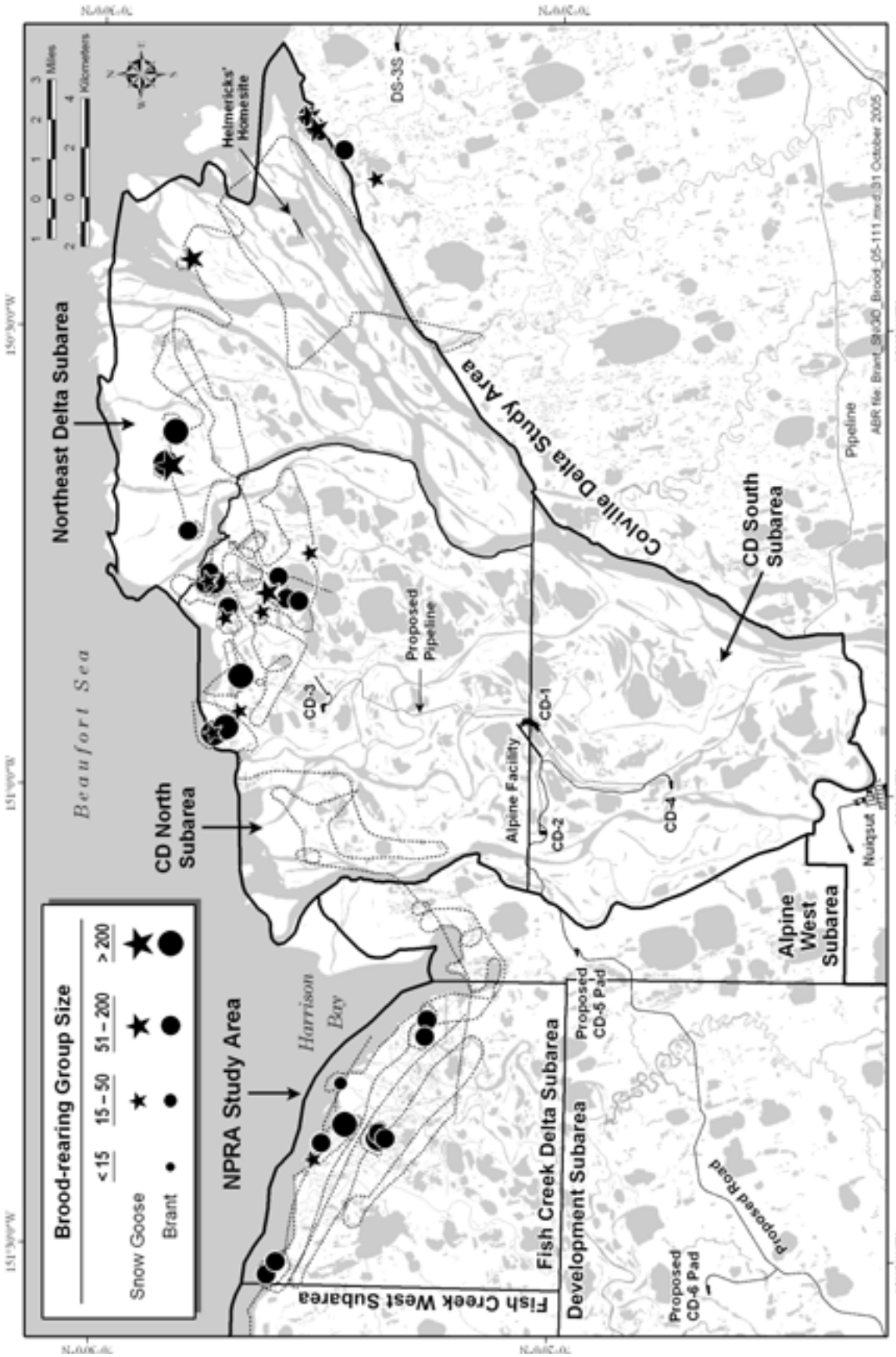

Figure 10. Brant and Snow Goose brood-rearing groups, Colville and NPRA study areas, Alaska, 2005.

Table 7. Numbers of Brant and Snow Goose adults and young during brood-rearing aerial surveys, Colville Delta and NPRA study areas, Alaska, 2005.

SPECIES Study Area Subarea	Total Birds	Adults	Young	% Young	No. of Groups
BRANT					
Colville Delta [a]					
CD North	2,663	1,699	964	36	10
Northeast Delta	1,184	661	523	44	6
Total (subareas combined)	3,847	2,360	1,487	39	16
NPRA [b]					
Fish Creek Delta	1,312	754	558	43	8
Fish Creek West	290	236	54	19	3
Total (subareas combined)	1,634	1,003	631	39	11
SNOW GEESE					
Colville Delta [a]					
CD North	363	155	208	57	7
Northeast Delta	609	257	352	58	4
Total (subareas combined)	972	412	560	58	11
NPRA [b]					
Fish Creek Delta	32	13	19	59	1

[a] Only the CD North and Northeast Delta subareas were surveyed
[b] Only the Fish Creek Delta, Fish Creek West, and Alpine West subareas were surveyed, but no Brant or Snow Geese were observed in the Alpine West subarea

Table 8. Number and density of Glaucous Gull nests, Colville Delta and NPRA study areas, Alaska, 2005.

STUDY AREA Subarea [a]	Number of Nests [b]	Nest Density (nests/km²)
COLVILLE DELTA		
CD North	21[c]	0.10
CD South	23	0.15
Total (subareas combined)	44[c]	0.12
NPRA		
Alpine West	13	0.16
Fish Creek Delta	4	0.03
Total (subareas combined)	17	0.08

[a] CD North subarea = 206.7 km², CD South subarea = 155.9 km², Alpine West subarea = 79.7 km², Fish Creek Delta subarea = 130.5 km²; see Figure 3
[b] Data for Colville Delta and NPRA study areas were collected during aerial surveys for nesting Yellow-billed Loons and during grounds searches in the CD-3 nest search area
[c] Includes 3 nests found during ground searches

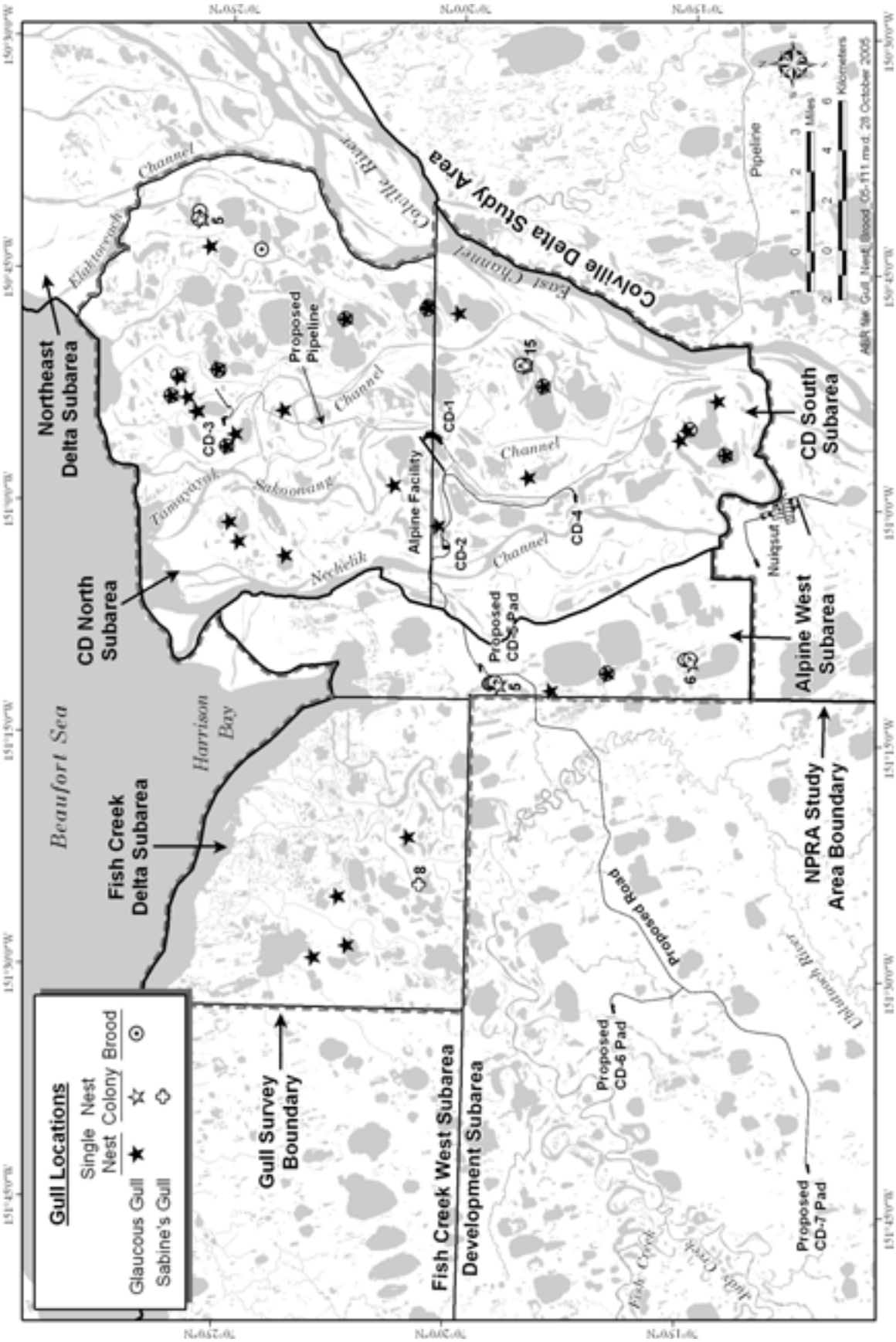

Figure 11. Glaucous and Sabine's gull nests and broods, the Colville Delta and NPRA study areas, Alaska, 2005. Numbers of nests are listed for colony locations.

broods were recorded in the Colville Delta study area, of which 7 were in the CD North subarea and 8 were in the CD South subarea (Figure 11). Three additional broods were observed during ground searches in the CD-3 search area. The total count of 18 Glaucous Gull broods and 37 young in 2005 was higher than the number observed in any previous year of surveys (Burgess et al. 2003a, Johnson et al. 2003b, 2004, 2005).

NPRA

Seventeen Glaucous Gull nests were counted in the Alpine West and Fish Creek Delta subareas during aerial surveys for loons in 2005 (Figure 11, Table 8). The remaining subareas in the NPRA study area were not surveyed for gulls in 2005. Most of the 17 nests were in 2 colonies in Alpine West—1 colony of 5 nests and another of 6 nests (Figure 11). These colonies were active in 2002–2004, when 4–7 nests were found at each location (Burgess et al. 2003b, Johnson et al. 2004, 2005). In the Fish Creek Delta subarea, 4 Glaucous Gull nests and 1 Sabine's Gull colony of 8 nests were observed during the loon survey in 2005 (Figure 11).

Seven Glaucous Gull broods with a total of 13 young were observed in the Alpine West subarea, and no broods were seen in the Fish Creek Delta subarea during the brood-rearing survey in 2005 (Figure 11). Four of the broods were at the colony site near the proposed CD-5 pad (Figure 11).

TRADITIONAL KNOWLEDGE

We traveled for 3 days with Joeb Woods, a respected elder from Nuiqsut, by motorboat on the Colville Delta in July 2005. We traveled from CD-2 on the Niɓliq downstream into the Beaufort Sea to the mouth of the Tamayayak Channel (Tammaiyaɓiaq; Figure 1). From the mouth of the Tamayayak we traveled upstream to the CD-3 area. During this time we visited some of the channels, lakes, and waterfowl nesting areas in the vicinity of CD-3. Joeb shared some of his extensive knowledge of the area he had gained growing up on the Colville Delta. Below is a brief summary of some of the information we learned during this trip. This summary is not intended to be a comprehensive or final report on traditional knowledge of the area. The exchange of traditional knowledge will be ongoing and continue to shape our ecological understanding of the Colville Delta.

The navigatable areas where the channels enter the ocean had moved since Joeb had last made the trip from the Niɓliq to the Tamayayak. His first trip there with western scientists was in 1961 with Jesse Walker, who then was working on North Slope geomorphology (see Walker and Morgan 1964). Joeb used a combination of landmarks on the shoreline and timing of his transits to judge where to make course changes, because submerged mud bars were difficult to see. The channels through the outer islands had changed considerably from deposition of silt since mapping was done for USGS maps (1955) of the Colville Delta. We had to travel about 4 km from the coastline into the ocean to get around submerged mud bars. Despite the annual changes in channel location, Joeb was able to find the entrance to the Tamayayak Channel, which was indiscernible from our sea-level view, without grounding his boat or its propeller. Joeb did not think that many people from Nuiqsut went up the Tamayayak or knew how to get there; more people went west into the Fish Creek delta. Joeb explained that the Tamayayak and Ulamniɓiaq Channels were the same, just different names used by different people for the same place. Joeb tried to boat down the Ulamniɓiaq on the east side of CD-3, but the water levels had dropped so much since June, that it was impassable. The water levels continued to drop while we were on the river, and Joeb said they would continue to drop until rain came or a westerly wind raised the water level. We camped at a site Joeb had used in 1993. On the lake east of our camp site, we found a Yellow-billed Loon pair had 1 chick hidden in emergent sedge. On the east side of the lake was a fox den that had signs of being a natal den in 2005. Joeb recalled that this lake had an active fox den and Yellow-billed Loon nest in 1993, which reaffirmed the long-term occupation by these species of traditional den and nest sites in the Colville Delta.

On an outer island along the Tamayayak, we stopped to look for Spectacled Eider nests. West across the channel was a high bank that Joeb said was used by his ancestors as a place to hold sporting contests. Although we did not find a Spectacled Eider nest on the island where we

landed, we did find a King Eider brood with 4 ducklings and 3 Brant nests (apparently failed) that had been soaked by rain and waves from polygonal ponds. Joeb said Brant were not as plentiful on the delta now as they were in the past, but was not sure of the cause. We also found a fox den on this island that had recent excavation at 2 of its holes. An hour earlier, we had seen a fox hunting on the island. We could not find any sign of use by pups or recent remnants of prey, so the den probably was not used as a natal site in 2005. Next to the den, in a low-centered polygon, Joeb found a skull and antlers partially buried with moss and prostrate willow growing over it. The antlers were smaller than an adult caribou but highly developed with shovels, palmation, and tines (Figure 12). Joeb said it was a reindeer skull; reindeer were herded by Iñupiat in the NPRA from approximately the 1890s to the 1950s; by the 1960s, the herds north and northeast of Kotzebue Sound had disappeared among the wild caribou roaming the area (Stern et al. 1980). The reindeer skull and island used for sporting events were reminders of the close ties the present-day Kuukpikmiut have with the recent and ancient human history on the Colville Delta.

Figure 12. Reindeer skull found by Joeb Woods, Sr., on outer Colville Delta, Alaska, 2005.

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