U. S. Department of the Interior
Bureau of Land Management

Alaska State Office
222 West 7th Avenue
Anchorage, Alaska 99513

BLM-Alaska Open File Report 89
BLM/AK/ST-03/009+6501+024
September 2003

Survey of Cliff-Nesting Raptors, Dalton Highway Management Unit, Alaska, 1999-2002

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Cover Photo
Adult and juvenile golden eagle at a nest site within the study area (photo by Tim Craig).

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Abstract

We surveyed the central portion of the Bureau of Land Management's Dalton Highway Management Unit (DHMU) for cliff-nesting raptors and ravens from 1999 to 2002. We primarily used helicopters to conduct the search and found 76 unoccupied and 17 occupied nests. More raptors and raven nest sites occured in the Dietrich River Valley, which is the more mountainous, cliff-rich section of the study area. This information will provide population data to help land managers make informed land-use decisions in the future.

Acknowledgments

Special thanks to: John Payne, BLM-Alaska State Office, for providing funding; the U.S. Fish and Wildlife Service-Kanuti National Wildlife Refuge for providing river transportation; Randi Jandt for assisting in survey work; Erica Craig, Craig McCaa, and Jim Herriges for editorial comments.

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Introduction

The Bureau of Land Management (BLM) is responsible for management of public lands along the Dalton Highway and adjacent Trans Alaska Pipeline System (TAPS) between the Yukon River and the Arctic Coastal Plain. The BLM unit that administers this land is the Dalton Highway Management Unit (DHMU).

Raptor surveys have been conducted by other agencies on land they administer adjacent to BLM lands in the general area (Swanson 1991). In addition, inventories of raptors that nest in close proximity to the TAPS have been conducted several times in the past (Roseneau and Bente 1979, Roseneau 1980, USFWS records, Bob Ritchie, pers. comm.). However, BLM-administered lands in the DHMU range over 20 miles beyond the TAPS and to our knowledge no thorough inventory of cliff nesting raptors has been conducted on all BLM lands in the DHMU in recent years.

In 1999 the Northern Field Office of the Alaska BLM began searching for cliff-nesting raptors in the southern Brooks Range in the central portion of the DHMU. This effort was driven by agency policy in fulfillment of the Federal Land Policy and Management Act (FLPMA) of 1976. This law requires that the BLM manage public lands for multiple use and sustained yield of natural resources and requires that an inventory of all public lands, their resources, and other values be prepared and maintained on a continuing basis (Olendorff and Kochert 1992). As part of this mandate, Bureau policy directs that wildlife inventories and monitoring be performed in order to collect information on which to base management strategies and to assist in evaluation of implementation of land-use decisions (Olendorff et al.1989).

Study Area

The DHMU encompasses about 1,127066 ha adjacent to the Dalton Highway. This study occurred in approximately the central third of the DHMU (Figure 1) and included the foothills and mountains of the Brooks Range south of Chandalar Shelf (circa 68°02'N) and north of the Kanuti River (circa 66°22'N). While most of the survey effort was spent on BLM administered lands, we also surveyed small segments of adjacent land that is administered by the State of Alaska (9045 ha) or other federal agencies (7726 ha) when cliffs on these lands were located very close to the BLM boundary or were continuous across administrative boundaries. In total we surveyed about 603,347 ha during this work.

Five major river valleys and their tributaries incise the study area: the Jim, Bettles, Dietrich, and Middle and South Fork Koyukuk Rivers. These mountain valleys host a variety of undisturbed habitats native to interior Alaska including montane tundra communities, shrub-dominated riparian areas and patchy coniferous and deciduous forests.

The topography in the study area ranges from rolling, tundra-covered hills in the south (base elevations over 425 m), to glacier-carved mountain valleys divided by flat-bottomed riparian areas in the north (peak elevations over 1200 m). Cliffs are strewn sporadically throughout the study area. These cliffs range in size from short (less than 100 m tall), isolated monoliths called "tors" in the southern foothills to massive escarpments more than 500 m tall in the mountainous northern part of the study area. The exposed lithic material that is available to nesting raptors in the study area includes limestone/marble and granite cliffs and eroded alluvial bluffs that occur along watercourses.

Warm temperatures and continuous daylight characterize the study area's arctic climate in the summer and contrast with extreme cold temperatures and abbreviated light in the winter. Average Wiseman, Alaska temperatures in July (central to the study area) were 14°C, while average temperatures in January were –27°C (Natural Resources Conservation Service, Anchorage, written comm.). Precipitation at nearby Bettles, Alaska, averages about 35 cm (National Weather Service data).

Methods

We conducted surveys for cliff-nesting raptors in the cental DHMU from 1999 through 2002. Most of our inventory effort was performed in conjunction with other resource work, and as a result, the complete survey of the area took eight different days over three consecutive seasons to complete. We conducted our search mainly by helicopter (six days). However, we also used boats and additionally searched part of the Kanuti River drainage on foot. We attempted to make one complete survey of the entire area and did not resurvey areas previously visited.

We used two types of turbine-powered single-engine helicopters to conduct inventories. One was a Bell 206L3 and the other a Eurocopter ASTAR-350. On three of the survey days a single observer conducted the inventory and recorded the locations of nests from the helicopter's GPS navigational system. Two observers collected data on the last three survey flights, one operating a hand-held GPS unit to mark electronic waypoints for each location during those flights.

Helicopter flights took place on 11 August 2000, 26 and 27 June 2001, 28 and 29 June 2002, and 7 July 2002. In all, we spent about 20 hours and 20 min. in aerial surveys, including ferry time within the study area.

Resource managers commonly use helicopters to search for cliff-nesting raptors (Fuller and Mosher 1987) because they are effective in inaccessible country and provide a stable platform from which to observe nests. In spite of their cost, helicopters were the logical choice for inventorying most of the DHMU because much of the area is mountainous and unroaded. Helicopters have been used routinely to inventory raptor nests in the past with little negative affect to productivity. Nonetheless, helicopters can disturb nesting raptors when the birds are too closely approached (Watson 1993). In an effort to reduce this disturbance, we hovered near active nest sites only long enough to determine occupancy and used image stabilized electronic binoculars for closer inspection of the nests.

Most aerial surveys were conducted when winds were calm and visibility was good. We conducted the inventories by flying up major water drainages and side tributaries within the boundaries of the study area while looking for likely nesting substrates. We then flew parallel to a vertical escarpment, either a shear cliff or a steep, open bluff, about one-third of the way down from the top and looked for nest sites. In most instances we flew no closer than about 30 meters from the escarpment face. In two canyons that contained extensive cliffs, we selected an initial reference point, low in the drainage, and began our search from there, working across the face of each cliff. Unusually tall cliffs required us to make multiple passes before moving to the next cliff. In drainages where the cliffs on opposing hillsides were very close together, we flew over the canyons and looked for nests from above.

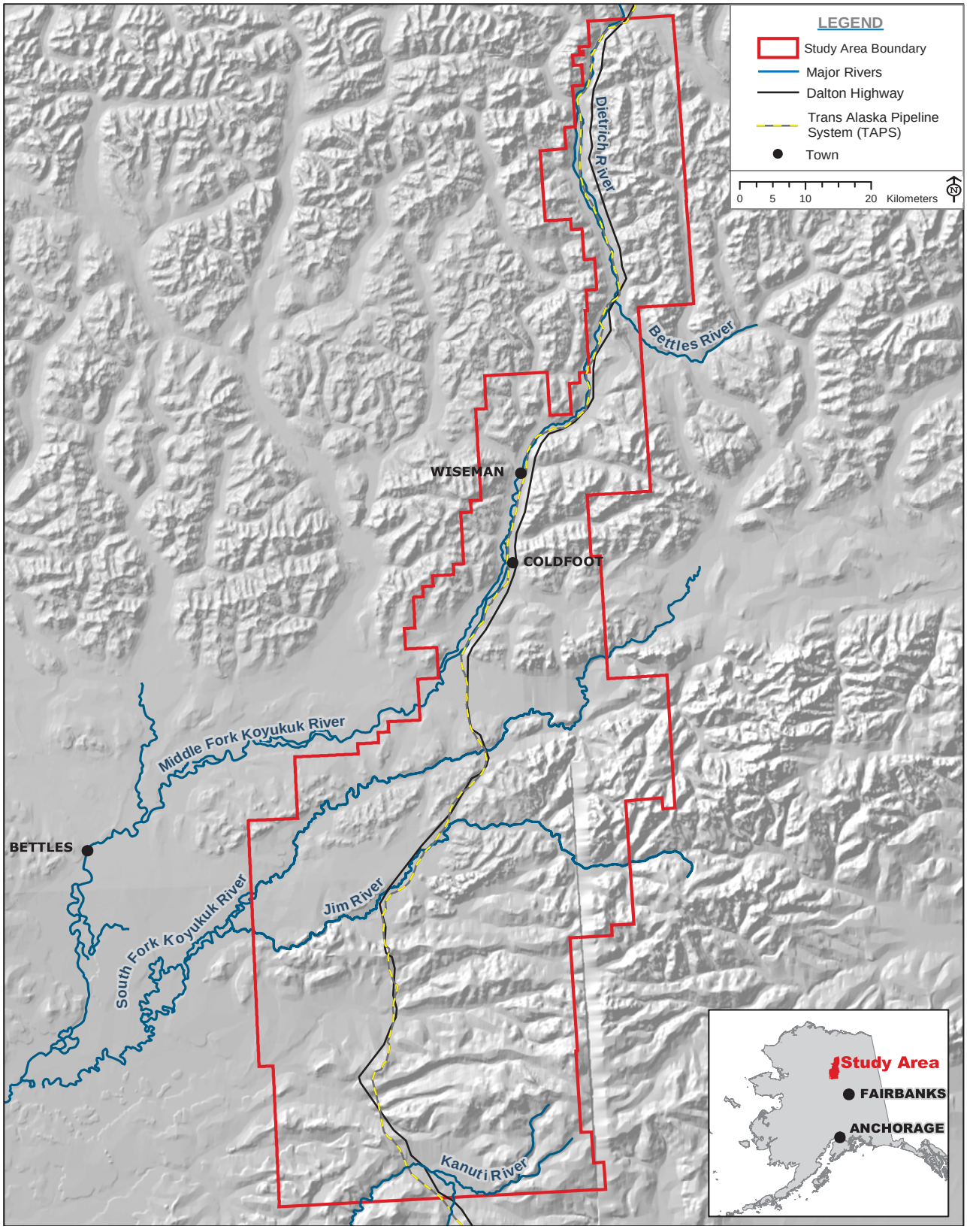

FIGURE 1. Area surveyed for cliff-nesting raptors in the central portion of the Dalton Highway Management Unit, Alaska, 1999-2002.

We recorded the presence of each stick nest, as well as all ledges or cavities that appeared to have been used by raptors as nest sites (evidenced by large quantities of fecal material, aka "whitewash," near an obvious nest ledge or cavity). In addition we recorded what species of raptor we thought had originally built each stick nest on the basis of its size and physical characteristics. We included common ravens (*Corax corax*) in this inventory since they occupy an ecological niche that is similar to most of the large raptors that inhabit the study area. In an effort to reduce flight time and disturbance to nesting birds, we did not hover over each nest site to obtain GPS locations. Rather, we recorded the location from which we observed the nest, usually while we hovered briefly, directly in front of the nest. All nest locations were ultimately recorded in a GIS database and analyzed in ArcView and ArcMap.

We recorded data in the following classification categories:

Occupied Stick Nest- Nests that were occupied by raptors during the survey year.

Occupied Ledges/Cavities- Ledges or cavities that appeared to have been used as nests during the survey year but no birds were seen, and locations where adult large falcons were seen at appropriate nesting cliffs but no nest was found.

Unoccupied Stick Nest- Stick nests that were not used during the survey year.

We conducted boat and ground surveys on 6 June 2000 and 20 June 2001, respectively, and spent a total of 8 hours and 40 min. searching for raptor nests from boats and 4 hours on foot.

Results

The diurnal cliff-nesting raptor guild in the study area includes golden eagles (*Aquila chrysaetos*), gyrfalcons (*Falco rusticolus*), American peregrine falcons (*Falco peregrinus anatum*) and common ravens. The Harlan's subspecies of the red-tailed hawk (*Buteo jamacensis harlani*) nests throughout the study area in trees (pers. obs.). However, we did not detect any active nests of this raptor on cliff faces and, in fact, saw no nests that appeared to have been built by any buteos during our inventory. Likewise, Roseneau and Bente (1979) who conducted raptor surveys in the area in the 1970's, did not find any buteo nests on cliffs during their surveys.

Occupied Stick Nests

We located five actively used golden eagle stick nests in 6 hours and 10 minutes of helicopter flight time during our inventories in June 2001 (Table 1). These nests occurred in the central, mountainous section of the study area (Fig. 2). Four of the five nests contained young that were almost fully feathered, and the other appeared to have already fledged young, based on the amount and character of the whitewash around the nest. In contrast, we found no active golden eagle nests in a different, but nearby, part of the study area in 2002 after searching for 13 hours and 51 minutes from the air and finding 49 vacant stick nests.

Golden eagles prey principally on mammals in North America. Species in the families leporidae and sciuridae are the most often selected prey animals taken (Olendorff 1976). Snowshoe hares (*Lepus americanus*) are known to be an important prey of large raptors, including golden eagles (Kochert et al. 2002), particularly when this cyclic mammal's numbers

TABLE 1. Occupied and unoccupied nests found on inventories of raptor cliff nests in the central part of the Dalton Highway Management Unit, Alaska, 1999-2002.

	Golden eagles	Common Ravens	Gyrfalcons	Peregrine Falcons	Unidentified Large Falcon	Unidentified	Total
Occupied Stick Nest	5[a]	2	1		1[b]	3	12
Unoccupied Stick Nest	76						76
Occupied Ledge/ Cavity			2	2[c]	1[b]		5
Total	81	2	3	2	2	3	93

[a] one active golden eagle nest fledged before we discovered it.

[b] no adults seen

[c] locations where adult falcons were seen at appropriate nesting cliffs but no nest was found.

are high (McIntyre and Adams 1999, Boutin et al. 1995). During 2001, the population density of snowshoe hares in our study area was unusually high. During the following years (winter 2001-2002, through winter 2002-2003) the hare population declined dramatically. As evidence of the magnitude of this decline, in late June, 2001 we spotted 40 snowshoe hare on a timed 25-mile wildlife survey along the Dalton Highway. We spotted no hares along the same timed survey in June 2002. A study of snowshoe hare density and feeding ecology near our study area in Gates of the Arctic National Park also detected a similar drastic decline in the population of hares (Donna Difolco, pers. comm.).

The major prey species of golden eagles on the northern slope of the Brooks Range is the arctic ground squirrel (*Spermophilus parryi*) (Young et al. 1995). The population of this small mammal is much higher on the north slope of the Brooks Range than in our study area on the southern slope (pers. obs.). Similarly, other potential prey species for golden eagles in our study area occur in relatively low densities (e.g. the Alaska marmot, *Marmota broweri,* and willow ptarmigan, *Lagopus lagopus*). We did not study the prey of golden eagles in the DHMU. However, it is our observation that when the snowshoe hare population peaked in 2000-2001, they were probably the most available prey to large raptors in the DHMU. In fact, during the peak in the hare population, we saw eagles feeding on road-killed hares in the study area and often observed the remains of hares (fur and feet) dangling from treetop perches, where raptors and ravens had fed on them.

Apparently in response to this increase in prey, golden eagles remained in our study area throughout the winter of 2000-2001 when snowshoe hares were most abundant. During the following winters (2001-2002 and 2002-2003), after the precipitous decline in the hare population, they were absent (Jack Reakoff, Curt Beddingsfield, pers. comm.). In addition to this change in the migratory behavior of golden eagles, we found that the productivity of active eagle nests in our study area was high (2.25 $\pm$ 0.57 young per nest; N = 4) when compared to the productivity reported by researchers elsewhere in the Brooks Range (1.2 yg/ successful nest, N = 9; Young et al. 1995). Unfortunately, we were not able to revisit active eagle nests found in 2001 in the following years.

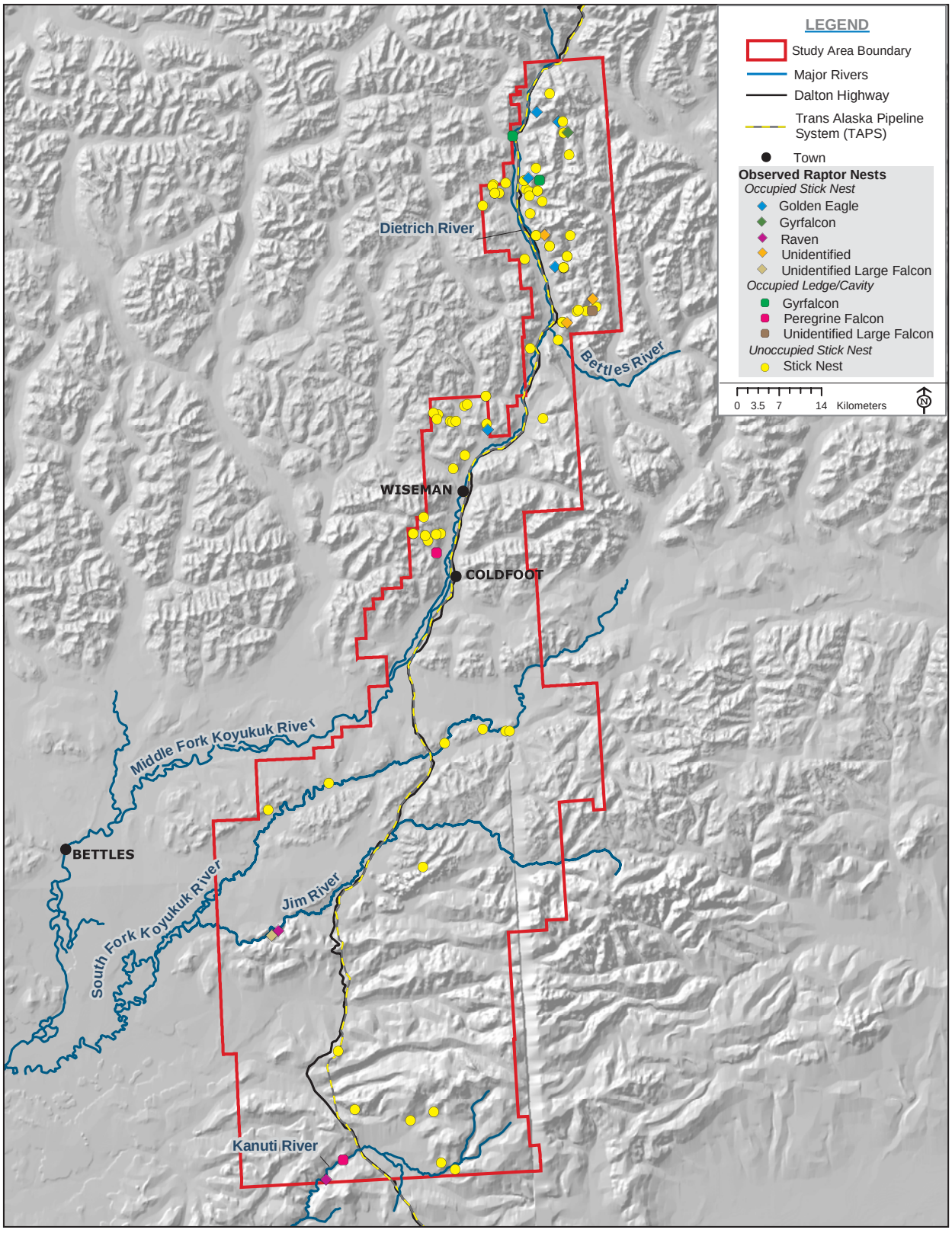

FIGURE 2. Locations of occupied and unoccupied raptor nests on cliffs in the central portion of the Dalton Highway Management Unit, Alaska, 1999-2002.

However, we believe that the high productivity shown by eagles in 2001, their winter presence, and lack of active nests in 2002, are all directly related to the snowshoe hare population decline in our study area.

In addition to active golden eagle stick nests, one gyrfalcon and two raven stick nests were found within the study area. The raven nests appeared to have been used during the survey year but the young had already fledged by the time we found the nests. We also found four stick nests that appeared to have been used during the survey year but were not able to definetly determine what species of raptor used them. At one site we ruled out use by ravens or eagles on the basis of nest condition and classified the observation as an *Unidentified Large Falcon* nest.

Occupied Ledges/Cavities

We located five ledges/cavities that appeared to have been nesting locations of large falcons based on the presence of adults or whitewash around the nest. Three of these nesting sites were at, or above, elevations where peregrine falcons usually nest in our study area (pers. obs., Roseneau et al. 1981, Wildman and Ritchie 2000) or were in tundra uplands habitat (not appropriate nesting habitat for peregrine falcons in Alaska; see Roseneau et al. 1981). Gyrfalcons usually fledge from nests in our study area in early July (pers. obs.) Therefore, we believe that these three locations had been used by gyrfalcons but had been abandoned by the time we discovered them. At one site, no visual contact of an adult gyrfalcon was made and thus the location was recorded as an unidentified large falcon site. Roseneau et al. (1981) report that there were 5 nests that "have or may have been used" by gyrfalcons along the proposed Northwest Alaska Gas Pipeline Right of Way between the Yukon River and the crest of the Brooks Range (an area that included our study area).

We recorded two locations within this category where adult peregrine falcons occupied appropriate nest sites in our study area. At one of these locations an adult female peregrine flew from a rock face as we floated down a nearby river. The falcon circled us slowly at a low altitude without vocalizing, then returned to the rock face. Peregrine falcons had also circled and vocalized the previous year when people floated through the same area (Barry Whitehill, pers. comm.). At another location along a side tributary to the Middle Fork Koyukuk River, we flushed an adult peregrine falcon from a narrow canyon containing sheer cliff faces as we passed overhead in a helicopter. The canyon was too narrow to approach in the helicopter and to avoid disturbing nesting birds we did not remain in the area to verify this potential nest site. No stick nests were seen at either of these two sites. We considered both of these to be occupied nesting territories (after Poole and Bromley 1988).

Unoccupied Stick Nests

We located a total of 76 unoccupied stick nests in our study area. Even though golden eagle nests vary somewhat in character, they are usually distinguishable from buteo nests based on size. It is our opinion that most, if not all, of the vacant stick nests that we located had originally been built by golden eagles.

Discussion

Error was introduced into our results by recording nest locations at the spot from which we observed nests. As a result, the nest

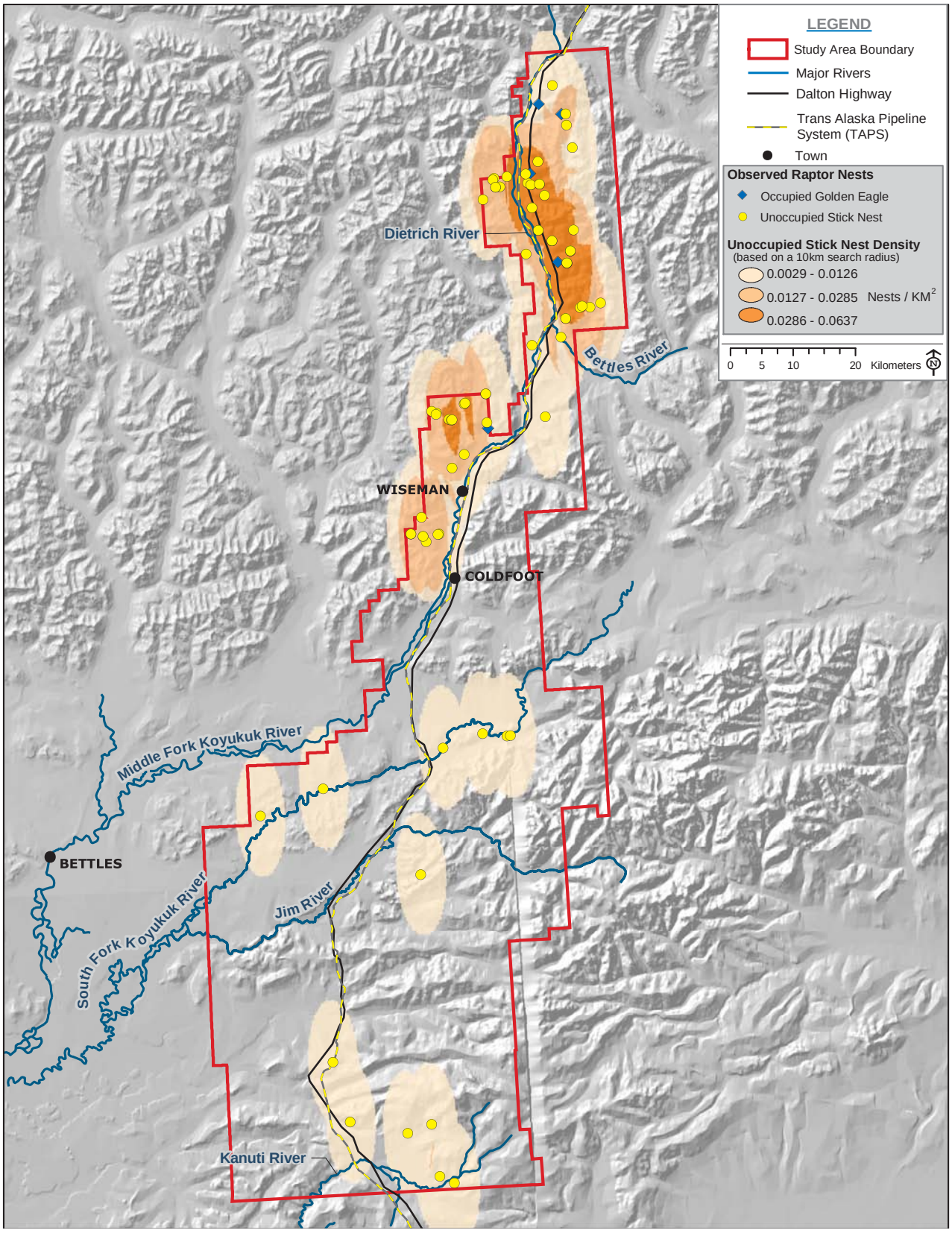

FIGURE 3. Density of unoccupied stick nests used by cliff-nesting raptors in the central portion of the Dalton Highway Management Unit, Alaska, 1999-2002.

elevations we calculated from these GPS locations actually would have been directly below the helicopter in front of the cliff face. The amount of error varies depending on the height of the cliff. The GPS locations we recorded for unoccupied nests in our study area ranged in elevation from 339 m to 1281 m, while those for occupied nests ranged from 282 m to 1220 m. Roseneau et al. (1981) found that golden eagles nested up to about 1340 m, even though most of the nests they reported were under about 1066 m.

Golden eagles are known to build alternate nests within their territories, and up to 14 nests have been observed in a single territory (Kochert et al. 2002). The reasons for this behavior are unknown. However, it has been observed that pairs sometimes use the same nest for several years, even though they add material to other nests (McGahan 1966, Boeker and Ray 1971) or even build alternate nests that are never used (pers. obs.). Eagle nests are also very persistent in the environment. Therefore, few inferences may be drawn from our data on unoccupied stick nests. Nonetheless, the density of vacant stick nests in portions of our study area may be seen as a measure of past nesting activity and therefore, perhaps habitat quality. It appears from our data that the more mountainous, cliff-rich section of our study area, particularly the Dietrich River Valley, has been of greater importance to golden eagles in the past than the rest of the study area (Figure 3). The locations of all of the occupied golden eagle nests we found during this study reinforces these findings.

Roseneau et al. (1981) report that they found 35 golden eagle nests along the proposed Northwest Alaska Gas Pipeline Right of Way between the Yukon River and the crest of the Brooks Range. Included were 10 occupied golden eagle nests found in the area in 1979 (Roseneau and Bente 1979). This study occured during the last snowshoe hare population peak (Jack Reakoff, pers. comm.). Although this survey occurred over a much larger area than our study, the authors reported that most of the golden eagle nests they found were also located in the mountains of the southern Brooks Range.

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