RAPTOR STUDIES ALONG THE PROPOSED SUSITIA POWERLINE CORRIDORS, OIL PIPELINE AND IN THE YUKON AND COLVILLE RIVER REGIONS OF ALASKA

Auchorage, Alaska

Mildiice.

Service

I COLOR RORO

1 R- (102

J. Jahr

QL

696 .F3 W585 1976 - OCLE 6185.

COMBINED REPORT FOR 1975

Submitted to

U.S. Fish and Wildlife Service,

Bureau of Land Management,

National Park Service,

Arctic Institute of North America

and

American Museum of Natural History

by

Clayton M. White Department of Zoology Brigham Young University Provo, Utah 84602

and

Tom J. Cade Section of Ecology and Systematics Langmuir Laboratory Cornell University Ithaca, New York 14853

## OUTLINE OF CONTENTS

- I. Introduction
  - A. Acknowledgements

II. General Itinerary

III. Reports

- A. Powerline Corridors Susitna Dam Project
- B. The Tanana River
- C. Yukon River and Some Tributaries
- D. The Pipeline Sagavanirktok River, Old Man and Prospect
- E. Colville River Watershed

IV. Discussion and Recommendations

- A. The Use of Fixed-wing and Helicopter Aircraft
- B. The "Old Man" and "Slope Mountain" Sites for Falcons
- C. The "Hoodoos"
- D. The "Critical Habitat" Concept and Raptors
- E. Importance of the Colville and Yukon Watersheds <u>OR</u> Where Falcons Are and Where They Are Not

U.S. Fish & Wildlife Service Library 1011 E. Tudor Road Anchorage, Alaska 99503

QL 696

W585 1976

#### INTRODUCTION

The general purpose of our studies in 1975 was basically twofold: First, to determine the distribution, density, and status of falcon populations in specific areas of human activity, in order to assess and predict potential disturbances and to make recommendations to help mollify such impacts. Second, to survey areas of high falcon density in areas of minimal human influence, where there is an historical record of the population and where actual or reported declines in the populations have occurred.

Much of the area covered by our studies was viewed in relation to the "critical habitat" concept as it pertains to both the Peregrine Falcon and the Gyrfalcon. Also, we tried to evaluate the effectiveness of the use of aircraft in such studies. These topics are discussed at the end of our field reports.

Projects under the first objective included:

1. A survey of the proposed power line corridor from the Susitna Dam Site projects. This area is basically a route following the existing circular highway system from Anchorage to Fairbanks, plus the Denali Highway. The Dam Sites proper were surveyed in 1974.

2. A limited check of critical localities along the Alyeska Pipeline Route, principally along the Sagavanirktok River. Areas near the Prospect and Old Man Camps were also checked.

The second objective included:

1. A comprehensive survey of the Tanana River from Tetlin Junction to Nenana. In part, this river follows the power transmission lines of the Susitna Project (see above) over the portion from Delta Junction to Nenana.

2. An extensive survey of the Yukon-Charley River areas, principally that portion of the Yukon between the mouth of the Fortymile River and Circle, Alaska, and the main Charley River downriver from Crescent Creek.

3. An extensive survey of the Colville River watershed, including the main tributaries from the base of the Brooks Range to their confluences and the Colville River from its headwaters to Ocean Point.

These studies were supported by the U.S. Fish and Wildlife Service, the Bureau of Land Management, and the National Park Service. In addition, some of our travel expenses were defrayed by grants-in-aid from the Arctic Institute of North America and the Frank M. Chapman Fund of the American Museum of Natural History. Many persons were helpful in the accomplishment of our work. In particular we acknowledge the assistance of Melvin Monson, Jerry Reid, Donald Thurston, J. W. Smith, and Virgil James of the FWS: Steven Leskosky, Eugene Ludlow, Gerald Timmons, James Lofton, Tom Sadowski, Roger Bolstad, and Skip Ambrose of BLM: and William Brown, NPS. Harry Quinn, Texaco Oil Company, also provided us with some transportation out of Umiat. 1

ŝ,

June 10-12	Anchorage
June 12-15	Power line route: from Anchorage to Talkeetna to Cantwell to Carlo Creek, Matanuska River, Glenn Highway, Richardson Highway to Black Rapids, Denali Highway
June 15	Overflight of the Fortymile and Charley Rivers
June 16	Tanana River
June 17	Fairbanks
June 18	Power line route: Tanana River below Fairbanks, Anchorage-Fairbanks Highway between Nenana and Carlo Creek including the Nenana River
June 19	Fairbanks
June 20	Alyeska Pipeline route: Sagavanirktok River, Old Man and Prospect Camp areas
June 21 - July 3	Colville River watershed
July 4-7	Barrow and environs to Seward Peninsula with Secretary of Defense Schlesinger
July 8-10	Yukon and Charley Rivers

-

#### A. POWERLINE CORRIDORS - SUSITNA DAM PROJECT

In June 1974 the proposed Susitna River reservoir impoundment area, starting at Devils Canyon and running to within ten miles of the Susitna Glacier, was surveyed for nesting raptors, in particular the Peregrine Falcon. Although no Peregrines were found nesting in the area (Gyrfalcons, Bald Eagles, etc., were found there, however), it appeared possible that falcons may nest along the proposed corridors to transport power from the dam site to either Anchorage or Fairbanks. Accordingly, the power line corridors as they are currently conceived were surveyed between 12 and 15 July and on 18 July 1975.

### Description of Region

The corridors generally follow adjacent to the existing highway system and form a more or less figure-eight configuration with the middle portion of this configuration being formed by the Denali highway. The corridors pass through three arbitrarily defined habitat regions.

1. The cottonwood-deciduous-mixed coniferous forests (taiga) along the Susitna-Matanuska-Copper River systems.

2. The upland areas of the Denali-Summit Lake-McKinley Park region.

3. The interior coniferous (taiga) forests of the Delta Junction-Fairbanks-Nenana region.

These areas as thus defined are somewhat discrete units with the upland areas being primarily occupied by Gyrfalcons, Merlins, and Golden Eagles while the forested regions provide habitat for Bald Eagles, Peregrine Falcons, Accipiters, and Harlan's Hawks.

## 1. Cottonwood-Mixed Coniferous Forested Regions

The Matanuska River Valley looks extremely good for Peregrines. Something on the order of 35 individual cliffs occur there, but only about 10, based on our judgment and previous experience, look right for Peregrines. Cliffs are about equally common on either side of the river. On the downriver portion of the river, the cliffs are generally smaller than upriver. Notably, large cliffs occur between Sulton and Chickaloon Rivers and in the vicinity of Sheep Mountain, with Sheep Mountain itself actually forming the last major cliff. The portion of the Copper River along the corridor (Glennallen to Gulkana Junction) is rather more like the interior forested region but is included here for convenience. Cottonwoods still fringe the rivers, and the cliffs are more or less high conglomerate or sandy banks, rather soft and unstable in nature. Lastly, the Susitna River portion of this corridor flows through generally unsuitable falcon country where only small cliffs occur (except upriver from Devils Canyon itself, but this is outside of the corridor and was treated in the report for 1974). Away from the corridor, the mountains contain rather significant cliffs which might harbor Gyrfalcons (although none were seen nor were any really outstanding falcon signs or perches found), but they are generally too far from the corridor to be significantly affected.

#### 2. Upland Areas

Generally, a tundra or low vegetation region. Many excellent cliffs occur in this region, especially on the northern side of the Denali Highway, the northern end of Summit Lake and upper Delta River region, and the entire canyon between Yannert and Lignite. The Nenana River flows through a significant portion of the western side of this region, although the upriver portions flow generally through flat, rather cliffless country.

# 3. Interior Forests

The interior forests are those areas along the corridors north of the Alaska Range. Physiographically, the region is quite distinct since the river valleys are large and flat, the rivers wide, braided, and open with the cliffs generally forming the northern (right) limit of the river as contrasted to the Matanuska, Copper, or upper Nenana Rivers, which are rather enclosed by steep canyons.

In all about 800 miles were covered in a survey of these regions. An additional 80 miles of the Denali Highway were surveyed in 1974.

### Methods and Itineraries

We carried out these surveys principally by air with either a fixed-wing aircraft (Helio Courier) or helicopters (Bell Jet Ranger 206B, G-2 Bell, Boeing BO-105), although the section from Eureka to Glennallen was covered by automobile. A specific itinerary is given in Table 1. In addition to the pilot there were always two observers (C. M. White and T. J. Cade) and along the Glennallen to Black Rapids and Denali Highway sections we were accompanied by Tom Lofton of BLM. Our basic mode of operation was to search out cliffs along this corridor and fly as close and as slowly by them as weather conditions and pilot's judgment permitted. It might be mentioned here that to be successful in much of this type of work the experience, confidence, and mental attitude of the pilot are of extreme importance. In many cases, several passes were made by specific cliffs usually at speeds of 30-60 mph. In the case of the Matanuska River, checks were made both going up and coming down the river. Notes were made on suitable cliffs or occupied cliffs. Old "eyrie-like" sites (green grassy ledges with what appeared to be old or in some cases recent falcon activity) were also noted. The most successful observations were made in helicopters, except in the case of Gyrfalcons and Golden Eagles, for which the Helio was about equally satisfactory.

## Results

# Susitna Valley to Carlo

Other than a pair of Bald Eagles at Chulitna Pass, the only cliffnesting birds we found were Golden Eagles and Ravens. Ravens with young still in the nest were found in East Fork. An additional Raven's nest with young was found near Carlo. In general, the highest density of Golden Eagle nests was between Cantwell and Carlo; four were along Carlo Creek itself.

Date	Time	Aircraft and Pilot	Area Surveyed
12 June	1035-1130	Jet Ranger 206B Jim Morgan, BLM	Anchorage, overland to Willow to Talkeetna
12 June	1148-1345	Jet Ranger 206B Jim Morgan, BLM	Talkeetna, Susitna River, through Chulitna Pass, adja- cent to highway (Honolulu Creek, East Fork Chulitna, etc.) to Cantwell
12 June	1445-1630	Jet Ranger 206B Jim Morgan, BLM	Cantwell north along Nenana River (Panorama Mt.) to Carlo and return to Cantwell
12 June	1645-1800	Jet Ranger 206B Jim Morgan, BLM	Cantwell south along highway to Anchorage
13 June	1100-1140	Bell G-2 Garlan Edwards	Anchorage to Palmer
13 June	1200-1230	Bell G-2 Garlan Edwards	Palmer, up Matanuska to Chickaloon River
13 June	1230-1335	Bell G-2 Garlan Edwards	Chickaloon River to Sheep Mt.
13 June	1335-1400	Bell G-2 Garlan Edwards	Sheep Mt., following river to Eureka
13 June	1500-1635	Bell G-2 Garlan Edwards	Eureka down Matanuska River to Palmer
13 June	1650-1725	Bell G-2 Garlan Edwards	Palmer to Anchorage
13 June	1830-2300	Automobile	Anchorage via Glenn Highway to Glennallen
14 June	0620–0815	Bell Jet 206B Ed Tarsa, BLM	Glennallen up Copper River to Gakona, mouth of Sanford River refuel at Slana
14 June	0845-0935	Bell Jet 206B Ed Tarsa, BLM	Gakona River, Round Top Mt., Hoodoos
14 June	0935-1135	Bell Jet 206B Ed Tarsa, BLM	Summit Lake Pipeline Camp, Upper Delta River to Bolio Lake and return to Paxon

TABLE 1. Itinerary of travel for the Susitna Dam Power Transmission Corridor, 1975

 $\bigcap$ 

•

 $\overline{}$ 

# TABLE 1, continued

Date	Time	Aircraft and Pilot	Area Surveyed
14 June	1200-1236	Bell Jet 206B Ed Tarsa, BLM	Paxon overlook directly to Glennallen
15 June	0615-0740	Bell Jet 206B Ed Tarsa, BLM	Glennallen to Grizzly Lake to Paxon
15 June	0820-1000	Bell Jet 206B Ed Tarsa, BLM	Paxon, Paxon Mt., Fourteen- Mile Lake, Tangle Lakes, Glacier Lake, Paxon
15 June	1020-1205	Bell Jet 206B Ed Tarsa, BLM	Paxon, High Valley, Basalt Lake, Maclaren River, Crazy Notch, return overland to Glennallen
15 June	1345-1435	Cessna 210 J. W. Musgrove	Glennallen, Mentasta Pass to Tanacross
16 June	0625-0900	Boeing BO-105 Gene Parrish, BLM	Tanacross, Tetlin, down Tanana River to Billy Creek
16 June	0900-1315	Boeing BO-105 Gene Parrish, BLM	Billy Creek down Tanana River to Big Delta and Fairbanks
18 June	1330-1515	Helio Courier Al Wright	Fairbanks, along Tanana River, and Tanana River to Carlo
18 June	1515-1625	Helio Courier Al Wright	Carlo via California Creek and Totatlinika River to Fairbanks

.

 $\bigcirc$ 

.

÷

# Matanuska River to Eureka

The Natanuska River looks like ideal country for falcons. None were seen nor did we see any promising sign, although several good ledges exist. It is hard to believe that at one time Peregrines did not nest along this river, but there are no valid reports. There was a verbal communication (Tom Ray and Richard Graham) that a pair nested at Sheep Mountain, and they might do so today. They would be very hard to find, however, without working on foot because of the size of the cliffs there. Ravens were common along the river with five active nests being found, on average, a pair every 10 miles. Some of the nests in between the active ones may also have fledged young in 1975. With regard to Ravens, the Matanuska is similar to the Susitna River, in its engorged portion, where active Raven nests were found on average every 4.6 miles in 1974. It is indeed unfortunate that the Matanuska River was not worked from a boat in the late 1940's or 1950's when falcon populations were demographically healthy.

#### Glennallen to Summit Lake

This area produced no raptors except for Bald Eagles using the Copper River or tributaries of it. Nesting of the eagles was not established; however, of five seen, four were not fully adult.

## Summit Lake - Denali Highway

This region is excellent for Golden Eagles and Gyrfalcons. The Gyrfalcons persist in breeding on the Hoodoos, and the nest had at least one young at the time of our visit. Two Gyrfalcon sites are on the west side of Paxon Mountain, and a lone Gyrfalcon was seen flying parallel to the Denali Highway near there. Two inactive Gyrfalcon sites were found near Tangle Lake, one three miles east of Long Tangle Lake and one a mile and a half west of Long Tangle Lake. A site which may have been used by Gyrfalcons was four miles west of Basalt Lakes. Finally, we observed an active Gyrfalcon nest with four eggs about nine miles up the Maclaren River from the highway bridge.

Golden Eagle nests were found at seven separate localities between Paxon and Little Clearwater Creek. The majority were more than two miles from the Denali Highway and mainly on the north side. The general lack of active Gyrfalcon nests may be accounted for by low ptarmigan numbers.

#### Upper Delta River

Very similar to the country along the Denali to the south. Golden Eagles were found in three localities and a possible Gyrfalcon site at one. They are rather removed and remote from the highway, however, and they should be of little concern in regard to powerline construction.

#### Nenana to Carlo Along Nenana River

Good raptor country does not really exist along the portion from Nenana to about Ferry. Rather well-consolidated cliffs occur near Lignite, and Raven and Golden Eagle nests were found. The cliff at Mount Fellow contained two eagle nests. Once again, one might think of this section of country as good Peregrine habitat, but none has ever been reported. We saw no likely sites and, in fact, when up close to the cliffs, they are remarkably free of raptor sign (fecal droppings), except for Ravens. Gyrfalcons are reported to occur there (Heinrich Springer, personal communication), but we failed to find even likely looking nesting sites. However, the air was rough, making it dangerous to fly a fixed-wing aircraft too close to all of the cliffs.

#### TANANA RIVER

We have left this region until last, since we also want to treat it separately. For the purpose of the power transmission lines, it is sufficient to say that no falcons currently nest between Delta and Nenana via Fairbanks where the corridor is projected. Any lines should be kept far to the south of the river in the flats, however, because of the potential for falcons to return to the Tanana cliffs. A lone, deserted, but this year's Peregrine egg was found in a former nesting site in the Birch Lake area. The entire right limit of the river where there are cliffs should be left unmolested, however, and several sections declared as "Critical Habitat" for the possible return of the falcon (see discussion beyond).

# Conclusions and Recommendations

Based on data gathered in 1974 and 1975, we conclude that the major portion of environment that will be traversed by the powerline corridor includes habitat of minor importance to cliff-nesting raptors, <u>except in certain specific</u> and rather restricted areas. The following recommendations are offered.

1. The overall superior route would be to follow or use the existing powerline route along the general course of the Anchorage-Fairbanks Highway. This route generally parallels the highway on the east side to at least Rex. From that point south, it would disturb the least cliff-nesting raptor habitat if it were placed on the east side of the highway. Once beyond Cantwell, there is essentially no problem with cliff-nesting birds.

2. It would seem that between Glennallen and Big Delta the clear-cut choice would be to utilize the pipeline corridor or to parallel it.

3. From Palmer to Glennallen it appears to make little difference, but least damage would be done by remaining close to the existing highway.

4. Should a line follow the Denali Highway, the south side of the road should be used at least to Camp Denali. This would thus avoid nesting Gyrfalcons, Golden Eagles, and Ravens.

5. The most critical portion of the transmission line, if constructed in the figure-eight configuration, is that portion from Big Delta to Fairbanks and thence to Nenana. Between Big Delta and Fairbanks lines should be placed to the south of the river by some 1.5 to 2 miles, or else well to the north of the highway. This placement would avoid conflict with peregrine falcon "Critical Habitat." Power lines already exist between Fairbanks and Nenana, and they essentially follow the Nenana Road but keep well back from the river bluffs, which once again form "Critical Habitat" for Peregrines.

# B. THE TANANA RIVER

#### Introduction

The Tanana River deserves a special discussion in this report. Not only does the Tanana run along a portion of the proposed power transmission corridor, but also it is a region in which a significant population of Alaskan Peregrines has, for all intent and purpose, met its demise. The analysis of potential problems arising from the location of the power line in proximity to the river has been given above. It remains here to review our findings and to encapsulate the data available on this river.

#### Methods

A Boeing BO-105 helicopter was used to make one survey flight along the river from Titlin to Fairbanks on 16 June. Both known eyrie sites and cliffs where no eyries have existed were checked. A Helio Courier was then used to check the portion of the river between Fairbanks and Nenana on 18 June. This was the first time we had had experience with a Helio Courier and, thus, each cliff was passed several times to determine the performance capabilities of the aircraft in this work. Because of the nature of the cliffs and their size, we felt that they were adequately examined to determine occupancy.

#### Results

Between Tetlin and Fairbanks we judge there are about 36 distinct cliffs or groups of outcrops. Between Fairbanks and Nenana, 9 more were examined for a total of 45 cliffs. Of this number, 19 separate cliffs are known to have been used by Peregrines, but presumably two were alternate sites, and only some 17 pairs are thought to have been on the river in recent times (Table 2). Haugh (1976) determined that some 19 pairs had been on the Tanana in earlier years. It is probable that under pristine conditions before the turn of the century, and probably up through the early 1900's, there were an additional two eyries or so, based on the nature and distribution of the cliffs. It may be, then, that as many as 20-21 pairs originally used this section of the river; we shall never know.

In 1975, Raven nests were found on 16 of the cliffs, and at least seven had either produced Ravens or had young still in the nest at the time of our visit. At least four of the active Raven nests were on the same cliffs formerly used by Peregrines. Golden Eagle nests were on nine of the cliffs, and one contained a chick. A Harlan's Hawk occupied at least one cliff and may have occupied a second. A pair of Peregrines was at the cliff at the mouth of the Robertson River (eyrie 2, Table 2). We could not find young, and the adults acted as though they were not nesting. A single adult female peregrine was found at a cliff in the Dot Lake area (between eyries 4 and 5, Table 2). We could not determine whether she had a mate. Lastly, a single deserted egg, laid in 1975, was on a ledge below the Little Delta River (eyrie 11, Table 2). We do not know whether the single egg suggests that an unmated adult female laid it, whether a pair was there and then deserted, or whether it was laid by a not fully adult female.

Eyrie No.	Pre- 1963	1963	1967	1970	197 <b>1</b>	1972	1973	1974	1975
1	+	?	+	-				-	-
2	+	?	+	+(3)	+	+(2)	+(1)	+(1)	+(0)
3	+	?	+	+(3)	+(3)	+(2)	+(1)	-	+(0)
4	+	?	+	+(3)	+(3)	+(0)	+(3)	-	-
5	+	?	+	-	-	-	-		-
6	+	+	+	+(1)	-	-	-	-	-
7	+	?	+	-	-	-		-	-
8	+	?	+	+	?	?	?	?	?
9	+	?	+	+(4)	+(3)	+(3)	+(3)	-	-
10	+	+	+	-	~	-	-	-	
11	+	+	+	+(2)	-	-	-	-	
12	?	+	?	?	?	?	?	?	?
13	+	?	+	-	-	-	-	-	-
14	+	?	• +	••	-	-	-	••	
15	+	?	+	+(4)	?	?	?	?	?
16	+	?	+	-	-	-	-	-	-
17	+	+	+	<b>+</b>	-	-	-	-	-
18	+	+	?	-	-	-	-	-	-
19	+	+	?	<b></b> .	-	-	-	-	-
Total			-						
produce	d	?	?	20+	9+	7	8	1	0

TABLE 2. Historical occupancy of cliffs and production of young, where known, by Peregrines on the Tanana River between Tetlin and Nenana

+ = pair present

? = eyrie not checked, may have been present

- = eyrie not occupied

۴

#### Conclusions

It is clear that a once viable population of Peregrines is now all but gone. Haugh (1976) has made an analysis of possible reasons for this disappearance. Irrespective of just why this decline occurred on the Tanana, for example, and not on the Yukon River also, it is most important that the cliffs themselves receive some sort of protection in the event a comeback starts. We should not be content to believe that because the falcons are now gone, we no longer need to consider the nesting cliffs when planning developments that alter habitat. Some people have assumed that if a falcon tried to come back to cliffs formerly used only to find that they were no longer suitable because of a road, a pipeline, etc., the falcon would just go to some other new but undefined area to establish nesting. There are no data to support this notion. Rather, specific cliffs have a history of use by falcons for a variety of reasons. It is the specific cliffs that have been used, whether currently in use or not, that need protection. They are the ones most likely to attract falcons in a recolonization attempt. Such cliffs should receive "Critical Habitat" status as well as a certain buffer zone about them.

#### C. YUKON RIVER AND SOME TRIBUTARIES

#### Description of Region

The area under consideration here consists of the main Yukon River from Fortymile, Y.T., to Circle, Alaska, and certain tributaries that drain the uplands lying between the Yukon and Tanana Valleys, the Fortymile River itself, the Seventymile River, the Charley River, and Birch Creek. This area lies entirely within the Northern Plateaus Physiographic Province, which includes a large wedge of ancient uplands, now eroded and dissected by alluvial valleys. Elevations range from 600 feet at the border of the Yukon Flats to more than 6400 feet at the divide above the head of the Charley River. Much of the area lies within the Yukon-Charley National Rivers proposal, and a great deal of information on the region can be found in the U.S. Department of the Interior's "Final Environmental Statement" on that proposal prepared by the Alaska Planning Group.

The bedrock geology is extremely complex in this region, partly because the Tintna Fault Zone cuts it into two different geological provinces and partly because of a remarkable variety of exposed rocks ranging in age from Precambrian to Tertiary. South of the fault, in a region including most of the Charley River, the upper Seventymile, and the Fortymile, a sequence of metamorphosed Precambrian and Palaeozoic sedimentary and volcanic rocks interfinger large granitic bodies that were injected into the earth's crust during the Mesozoic. North of the fault, along the main Yukon and north of it, lies a remarkably inclusive series of unmetamorphosed sedimentary rocks varying in age from Upper Precambrian to Upper Tertiary. Most of these rock strata are exposed as cliffs and canyon walls along the Yukon and its tributaries.

Despite the generally wooded and forested nature of the Yukon ecosystem, the main watercourses open up the landscape sufficiently to provide suitable hunting habitat for falcons. In addition, fires, lakes, and bogs also contribute to the maintenance of open lands suited to the Peregrine's style of hunting. These features together with the extensive cliff-like formations associated with the rivers combine to create good to excellent nesting habitat for Peregrines throughout the central Yukon drainage systems both north and south of the main river.

The river bluffs of the main Yukon have been known as prime falcon habitat since the Gold Rush days of the late 1890's (Bishop, 1900). They were first examined in detail in 1951 (Cade, 1953, 1960) and have received increasing attention by a number of investigators since 1966 (Cade, White, and Haugh, 1968; Enderson, Roseneau, and Swartz, 1968; Temple, Enderson, and Swartz, 1970; Enderson, Temple, and Swartz, 1972).

### Methods and Itineraries

We surveyed these rivers by fixed-wing aircraft (Cessna 210 turbo or Helio Courier) and in a Bell Jet Ranger 206 helicopter. Table 3 shows the itinerary, personnel, and aircraft involved. There were two or three observers in addition to the pilot, and our method of survey was to fly along watercourses and pass as close as possible to cliffs where falcons might be nesting. We made repeated TABLE 3. Flying itinerary for the Yukon River and tributaries in 1975

Date	Time	Area Surveyed, etc.
15 June	1710	Cade, White, and R. J. Trimble of BLM flying with J. W. Muskgrove, Cessna 210, at mouth of Fortymile River.
	1730	Passing over Eagle Village.
	1740	Head up the Seventymile River and across to mouth of Charley River.
	1810	Head up Charley River.
	1840	Passing over source streams of the upper Charley.
8 July	0715	Cade, White, and Virgil James (FWS, LE) flying with Bill Lynch for Al Wright's Flying Service in Helio Courier, at Yukon River 2 mi W Circle headed W to Twelvemile Bluff.
	0732	Down at Circle for fuel.
	0822	Off upriver to survey cliffs.
	0828	At Sixmile Bluff.
	0921	At Takoma Bluff.
	0945	At Woodchopper Volcanics.
	1023	At McGregor's Bluff.
	1032	At mouth of Charley, break for straight run to Eagle for fuel.
	1105	Down at Eagle.
	1231	Off upriver to mouth of Fortymile River.
	1247	At Fortymile Bluff, check and then head downriver.
	1315	At Old Man and Old Woman.
	1340	At Castle Rock (Pedro Dome).
	1425	At Eagle Bluff, checking.
	1431	Down at Eagle for fuel.
	1539	Off downriver to check cliffs.
	1552	At Calico Bluff.
	1630	At Montauk Bluff.
	1712	At Kathul Mountain.
	1726	At Chester Bluffs.
	1735	At mouth of Charley River, break and head for Fairbanks.
) July	0930	Cade and William Brown (NPS) flying with Bob Barnes for Merric Helicopter Service, Bell Jet Ranger II, at Yukon 2 mi above Fort Yukon.
	1103	Down at Circle for fuel.

\_\_\_\_\_

# TABLE 3, continued

. .

•

Ż	Date	Time	Area Surveyed, etc.
	9 July	1159	Off and upriver to the Charley.
	-	1203	At Sixmile Bluff.
		1230	At Takona Bluff.
		1236	At the Woodchoppers.
		125 <b>9</b>	At McGregor's.
		1306	At mouth of Charley River and head upstream.
		1320	Land to Check Peregrine between Everett and Uncompaghne Creeks.
		1341	Off and upriver.
		1425	At cliff area No. 27 just below Dewey Creek, head for Central and fuel.
		1452	Crossing Birch Creek in the flats.
		1506	Down at Central, fuel, and then off to Circle Hot Springs.
		1539	Down at Circle Hot Springs for lodgings.
		1827	Up and off to cliff area No. 17 on Charley River.
		1900	Back on the Charley and searching cliffs.
		1912	At Peregrine eyrie on right limit, cliff area No. 22 just up from Highland Creek.
		1951	Land by cliff area No. 29, right limit, where Brown saw a Peregrine.
		2014	Up and off again, upriver.
		2030	At cliff area No. 34, left limit 2.5 mi below Crescent Circle, Peregrines.
		2040	Head back to Central for fuel.
		2112	Down at Central.
		2130	Back at Circle Hot Springs for the night.
	10 July	0842	Off to Chester Bluffs on the Yukon.
		0900	Pass by the Woodchoppers.
		0916	At Chester Bluffs.
		0918	At Biedermann's Bluff.
		093 <b>9</b>	At Kathul Mountain.
		1005	At the Nation Bluff, Peregrines with young.
		1015	At Montauk Bluff.
-		1025	At Sheep Creek Bluff.
< - ·		1035	At Calico Bluff.
~			

1

/

# TABLE 3, continued

Date	Time	Area Surveyed, etc.
10 July	1048	Land at Eagle for fuel.
	112 <b>2</b>	Up and off up Mission Creek and over pass into Seventymile River.
	1145	Land at Alder Creek.
	1208	Off upriver toward Charley River drainage.
	1220	Down Essie Creek to Charley River.
	1223	Back at cliff No. 34 on Charley, head upriver.
	1323	Down on bar below cliff No. 46 to look for Peregrine, 7.5 mi above Crescent Creek.
	1334	Off upriver again.
	1342	At upriver divide, follow east fork.
	1348	Turn back and head for Central.
	1432	Down at Central for fuel.
	150 <b>9</b>	Off to Birch Creek.
	1520	On Birch Creek where it breaks into flats and follow up to headwaters via Crooked Creek.
	1703	Down at Fairbanks.

.

. •

passes by the cliffs, until we were sure we had seen as much as could be seen.

For purposes of comparison with earlier studies, we concentrated on the main Yukon between Fortymile and Circle, where there is a history of information going back to 1951, but we did not land to check any of these Yukon cliffs on the ground. Fortunately, Skip Ambrose of BLM and Bob Ritchie of RRCS, Ltd., made boat trips on the river between Eagle and Circle later in July and August, and they checked all known nesting localities on the ground. Also, Dr. John R. Haugh traveled downriver by boat from Fortymile to Eagle in the same time period. These men have made their information available for this report, and so we are able to compare the results of our aerial survey with their ground studies.

#### Findings and Comparisons with Earlier Years

#### 1. The Main Yukon

Table 4 summarizes our findings for Peregrines. From the air, we found evidence of birds present in 1975 at nine cliffs, although the one at Thanksgiving Creek appeared to us to have been abandoned by the time of our observations. We counted a total of 10 to 12 young at five eyries and suspected from the behavior of the adults that young were also present at Calico. The ground teams were able to account for a total of 14 cliffs where Peregrines were seen or heard, and 10 of them held breeding pairs (including Calico and Thanksgiving Creek) that produced 16 young. Thus, our aerial survey failed to locate all pairs and all young, even though it was conducted at about the optimum time for finding the nests, that is, when there were large downy young present. There is no question that the forested aspect of the Yukon region and the complex, rocky structure of these cliffs make accurate counts from the air very difficult--far more so than is the case in the Colville River region of the Arctic Slope.

In addition, we flew past "Twelvemile Bluff" downriver from Circle on two different days in the Helio and in the helicopter. This cliff is an old historical eyrie. Carl Dasch owns a cabin there and reported Peregrines present at least through 1965. D. G. Roseneau found an adult female Peregrine with three fledged young at this location in September 1974, the first time it has been used in recent years to our knowledge. We saw no sign of use in 1975.

We also found several old Golden Eagle nests along the Yukon, but we missed one occupied nest on the Woodchoppers, a location that we knew about and flew right by. Recently emptied Ravens' nests were common, and we found one occupied Harlan's Hawk nest on a cliff.

Table 5 summarizes the information we have on the occupancy of cliffs by Peregrines between Fortymile and Circle for eight years between 1951 and 1975. On compiling this list, we were surprised to discover that no less than 31 different localities have been used by Peregrines one or more times, although 20 is the maximum number known to have been occupied in any one year (1951). (There are more than 40 potentially usable cliffs between Fortymile and Circle, a distance of about 200 miles.) Only 9 cliffs have been used in most years (in all or all but one of the recorded years), while 10 have been used only once or

TABLE 4. Peregrine eyries and sightings in the Yukon River Region, 1975

ì

A. 1.			
1.	Main Yukon River from mouth of	Fortymil	e River to Circle, Alaska
3	Castle Rock (Pedro Dome)	8/7 <sup>.</sup>	Adult seen but it did not defend.
4.	Calico Bluff, no. 10	8/7	Aggressive pair but nest not seen.
3.	Sheep Creek, no. 14	8/7	Pair and 1 large downy chick.
4.	Montauk Bluff, no. 15	8/7	Adult female perched, no defense, no nes seen.
5.	Nation River Bluff, no. 17	10/7	3 or 4 large downies, partly feathered.
6.	Kathul Mountain, no. 22	8/7	l nestling seen on ledge, no adults.
7.	Woodchopper Volcanics across from Webber Creek, no. 29	8/7	Adults and 3 downy young.
8.	Mouth of Thanksgiving Creek, no. 30	8/7	Empty scrape but shelf looked used this year.
9.	Twelvemile Bluff, no. 35	8/7	Adult female feeding 2 or 3 young.
B.	Charley River, from mouth appro	oximately	78 miles upriver into east source
1.	Between Everett and Uncompaghne Creeks, no. 3	e 9/7	Adult female seen flying and perched on cliff.
2.	Opposite Todd Creek, no. 7	9/7	Green, peregrine-looking nest ledges.
3.	Upriver from Highland Creek, right limit no. 22	9/7	Adult female with 1 young about 3 weeks old.
4.	5 mi below Crescent Creek, no. 29	9/7	Bill Brown saw an adult flying by cliff but not seen when we landed.
5.	2.5 mi below Crescent Creek, no. 34	9/7	Pair of adults all over cliff, no nest seen.
6.	l mi above Crescent Creek, no. 38	10/7	Old falcon ledge with green grass.
7.	7.5 mi above Copper Creek, no. 46	10/7	Adult female flying over great cliff, stooped at helicopter but no nest seen.
c.	Birch Creek from edge of footh	ills upri	iver 62 miles to head of Crooked Creek
1.	2 mi below Sheep Creek, no. 12	10/7	Single, abandoned egg on open ledge
2.	Across from Sheep Creek, no. 14	10/7	Adult male flew from cliff (same area reported as a site by BLM).

TABLE 4, continued

	Cliff Location	Date	Findings		
D.	Yukon River, from Steven	s Village to Tanana			
1.	Near Fort Hamlin	1974 1975	2 young unknown number of young		
2.	Sightas Island	1974 1975	not used		
3.	Kalka Island	1974 1975	pair, no young 2 young		
4.	Crescent Island	1974 1975	1 young 3 young		
5.	Garnet Island	1974 1975	pair, empty scrape nothing seen		
6.	"Stevens Creek" (below Raven Ridge)	1974 1975	pair, empty scrape single adult		

Cliff				Total	Class "A"					
Number	1951	1966	1967	1968	1970	1971	1973	1975	Occupancy	Eyries <sup>1</sup>
Fortymil	e River	, Yuko	on Terr	itory						
1	+	no	+	-	+	. <b>+</b>	+	+	6/7	X
2	-	no	-	+	+	-	-	+	2/7	
3	?	no	?	+	+	<b>,+</b>	. +	-	4/7	
4	-	no	+	+		-	-	-	2/7	
5	+	+	+	+	+	+	+	+	8/8	x
6	+	· _	-	-	-	-	-		1/8	-
7	+	-	?	<b>+</b> .	+	+	+	+	6/8	
8		+	-	-		-	-	-	1/8	
9	+	-	-	-	-	-	. <b>-</b>	-	1/8	
Eagle, A	laska				·	•				
10	+	+	-	+	+	-	+	<b>-</b> '	5/8	x
11	+	-	-	·		-	-	-	1/8	
12	?	+	+	+	· +	+	+	+	7/8	X
13	+	-		-		<del>-</del>	-	-	1/8	
14	-	-	+	-	-	+	-	-	2/8	
15	· +	+	+	-	+	-	+	+	5/8	
16	+	+	+	+	· +	<b>.</b> +	+	+	8/8	X
17	+	+	+	+	+	+	+	+	8/8	<b>. X</b>
Nation R	iver									
18	-	-	-	-	-	+	-	+	2/8	
19	+	+	+	+	+	+	+	+	8/8	X
20	-	-	-	-	-	· +	-	-	1/8	
21	+	-	-	+	-	-	-	÷	2/8	
22	+	+	+	+	-	· 🖛	+	-	5/8	
23	-	+	-	-	-	-		-	1/8	
24	?	-	+	+	+	+	+	+	6/8	X
25	+	+	+	+	+	+	+	+	8/8	x
26	?	+	?	+	+	-	+	.+	5/8	

TABLE 5. Yukon River Cliffs used by Peregrines, Fortymile to Circle

 $\smile$ 

-

i

TABLE 5, continued

Cliff		Years								Class "A"
Number	1951	1966	1967	1968	1970	1971	1973	1975	Occupancy	Eyries <sup>1</sup>
27	+	+	+	-		-		+	4/8	
28	+	+	+	· +	+	-	-	-	5/8	
29	+	+	+	+	+	+	-		6/8	
30	+	+	+	+	+	+	+	+	8/8	X
31	+	+	+	+	-	-	-	<del></del>	4/8	
Circle,	Alaska					•				

1951 data from Cade (1960); 1966 data from Cade <u>et al.</u> (1968); 1967 data from D. G. Roseneau, L. G. Swartz, J. H. Enderson, and J. Campbell; 1968 data from T. J. Cade, C. M. White, and J. H. Enderson; 1970 data from J. H. Enderson, S. A. Temple, and J. Campbell; 1971 data from T. J. Cade and L. G. Swartz; 1973 data from C. M. White, S. K. Sherrod, S. Ambrose, and R. Ritchie.

Based on Hickey's (1942) classification of eyrie quality.

+ = site occupied by a single bird or pair

- = site unoccupied

1

? = site probably occupied

no m site not checked

twice. Three cliffs known to have been used in 1951 have not been occupied since, although two of them were said by the local Indians to have been occupied "for many years" prior to 1951.

In 1951, Cade recorded Peregrines at 20 locations between Fortymile and Circle, and 16 of these eyries had productive pairs that fledged at least 20 young. Because this was the first time Cade had been on the Yukon and because his single survey was carried out late in the season at or just after fledging time, these figures must be considered as minimal reflections of the actual numbers present. With the data for more recent years to provide a perspective, it seems likely that pairs were missed in 1951 between Fortymile and Pedro Dome, at Calico, and perhaps at Thanksgiving Creek and between McGregor's Bluff and Eureka Creek. Probably there were between 20 and 23 pairs of Peregrines nesting along the main Yukon in the 1950's, producing about 30 young per year.

The data for 1966, derived from four trips up and down the river, do not differ significantly from this revised estimate for the decade of the 1950's (Cade, White, and Haugh, 1968). Seventeen pairs nesting between Pedro Dome and Circle fledged 30 young, and it is probable that two or more pairs resided on cliffs upriver between Pedro Dome and Fortymile that year, although we made no observations on that stretch. The year 1968 was also similar: Nineteen cliffs were occupied, at least 17 pairs attempted to nest, and a minimum of 12 and probably as many as 16 young fledged from the eyries downriver from Eagle; the number fledged upriver from Eagle was not determined that year. The first year to show a reduced number of occupied cliffs was 1970 when seven productive pairs raised 18 young (Temple, Enderson, and Swartz, 1970). The population appears to have remained essentially unchanged since then--around 14 to 15 occupied cliffs per year with a yield of about 16 young per year from 9 or 10 productive pairs. For example, L. G. Swartz and Cade found 9 productive pairs at the end of the nesting season in 1971 with 15-16 young, figures that compare closely with our 1975 findings.

Of the ten cliffs judged to be most superior nesting habitat for Peregrines--based on physical characteristics and known occupancy-- only one, Eagle Bluff, has become unproductive since 1970. Five cliffs that were used fairly regularly from Takoma Bluff downriver to Circle have been largely unproductive since 1970, and only one superior cliff on this stretch remains active.

## 2. Fortymile and Seventymile Rivers

Our examination of these watersheds consisted of quick, aerial views of potential nesting habitat for Peregrines, and we did not do any close searching for actual falcon eyries. Seen from the air, both rivers reveal good to excellent potential for holding pairs of Peregrines. The Fortymile with its three main branches is an extensive drainage, which is associated with large and frequent rocky cliffs along its steep-walled valleys, and provides more than 150 miles of possible falcon habitat in Alaska alone. The Middle Fork begins to cut bluffs that look suitable for falcons about five miles below Joseph, the North Fork has outcrops beginning about five miles below Independence Creek and is particularly impressive for several miles up and downriver from "The Kink," while the South Fork shows good habitat from Chicken downriver. The main Fortymile is lined intermittently with cliffs and outcrops all the way to its confluence with the Yukon.

The Seventymile River is a less branching river with an essentially U-shaped, glaciated valley, but it is lined with intermittent bluffs and rocky outcrops all the way upstream to Diamond Fork. Most of these cliffs are low and small by comparison with those on the Fortymile, Yukon, and Charley Rivers; but this river, some 60 miles long to the mouth of Diamond Fork, has potential for four or five pairs of Peregrines. Both the Seventymile and the Fortymile Rivers should be thoroughly checked on the ground for the presence of nesting Peregrines.

## 3. Birch Creek

Table 4 summarizes our observations in this area. From the point where Birch Creek breaks out of the foothills into the Yukon Flats upstream to Wolf Creek, a distance of about 30 miles, there are 20 rocky outcrops that might be used by Peregrines for eyries. As on the Seventymile, most of these cliffs are low--under 100 feet high--and small, but there are a few better looking ones. We saw a single, abandoned Peregrine egg in a scrape on an open ledge on a low, rocky cliff on the left limit about two miles below Sheep Creek, and an adult male flew from a large cliff on the left limit across from the mouth of Sheep Creek. The latter area is the same as that indicated on a BLM map as "raptor nests." It seems likely that the egg and the falcon belonged to the same failed nesting attempt and that two eyries are not indicated by these observations. No suitable nesting rock exists on Birch Creek above the mouth of Wolf Creek.

#### 4. The Charley River

Of all the tributaries draining into the Yukon between Dawson and Circle, the Charley River shows the most promise as a region with significant nesting habitat for Peregrines, and it certainly should be examined in detail as soon as possible, for important land use decisions affecting the region will soon be made in connection with the provisions of the Alaskan Native Land Claims Settlement Act of 1971. Running for approximately 78 miles from its mouth up through steep-walled valleys and canyons to its eastern headwater branch, the Charley River has no fewer than 49 major cliffs, any one of which could house a pair of falcons. In fact, from the first cliff about five miles up from its mouth to the division into east and west headwater streams, one is never out of sight of a major rock formation. Every bend of the river has one or more cliffs. Many of these cliffs are from 200 to nearly 1000 feet high and are often arranged in a sequence of two or three tiers, much like the Yukon cliffs around Woodchopper. Several of the tributaries--Copper Creek, Crescent Creek, Highland Creek, and Hanna Creek--also have impressive cliffs along their courses.

The only way this river can be surveyed adequately for Peregrines is on the ground. Even with a helicopter, it would be necessary to stop at each cliff and climb up and down for an hour to several hours at each place, in order to be certain whether falcons were present or not. In the short period of time we had available for our survey, no precise information on the number of breeding pairs could be obtained. Probably the best way to do a thorough census of the nesting raptors on this river would be by boat. We think it likely that a cance, kayak, or rubber raft could be put in place by aircraft somewhere a few miles below the confluence of the upper tributary branches and worked downstream from there. The river is shallow, fast, and rocky, with many sharp bends, and an aluminum cance would probably be the best craft. It might also be possible to work this river by hiking, but it would be necessary to cross the river frequently, and it might not be possible to find safe fording places very often.

Again, Table 4 summarizes our findings. We saw Peregrines at four and probably five widely spaced cliffs, and we saw clear signs of falcons at two other places. The pair below Crescent Creek certainly acted as though a nest with young was present, but we could not find it. The places where we saw falcons or sign of falcons indicate that, unlike the situation on the main Yukon where most nests and perches are down near the river, these Charley River Peregrines were mostly on rocks considerably up and away from the stream bed-usually with some forest between the used rocks and the river. We think this difference may be related to the fact that most of the open country suitable for falcon hunting along the Charley is in the uplands at or above timberline, while the river valley itself is quite narrow and enclosed, until it reaches above Copper Creek, where the surrounding country begins to open up. By nesting and perching high up near the top of the valley walls, the falcons are conveniently near good hunting areas and do not have to climb up and out of the river valley to find their food.

Considering the fact that our hasty survey by helicopter yielded sightings of Peregrines at four or five places on the Charley River, we would not be surprised if a ground survey turned up eight or ten occupied cliffs with perhaps four or five productive pairs, or possibly more if some of the larger creeks are also included. If these numbers actually obtain, then the Charley River would take on a significance second only to the main Yukon and Porcupine River as a critical refugium for the nesting of taiga Peregrines.

The area is also rich in old Golden Eagle nests and Ravens' nests. One nest of Harlan's Hawk was also found on a bluff near the mouth of the Charley River.

## 5. Yukon River - Stevens Village to Tanana

The region described here covers a distance of about 147 miles between the old abandoned town site of Fort Hamlin (downriver a few miles from Stevens Village) and Tanana. The last cliffs actually end upriver from Tanana about 15 miles, so the area of importance extends over about 125 miles (Fort Hamlin to 12 miles upriver from Tanana). This region was surveyed in 1974 by C. M. White and S. K. Sherrod and again in 1975 by Skip Ambrose and Bob Ritchie. Although the region was not checked as a part of our overall 1975 survey the data bear presentation.

Other than casual observations by interested parties (Millard Heiner, USGS, traveled the river in early June of 1972 and told us "every suitable cliff between the pipeline crossing and Tanana had falcons") no specific studies

have been done on this portion of the Yukon prior to the 1974 survey. We therefore have no historical base of comparison. At least eight different cliffs have been used by falcons, but this occupancy possibly represents only seven pairs. The most we have found in any year was six pairs. Based on the six known pairs the density of falcons is about one pair per 20.8 miles of river. The density is thus about one-fourth less than that of the Yukon between Eagle and Circle. In addition to the cliffs with falcons there are at least four other cliffs that we judge to be good for falcons, of which the most striking examples are the cliffs on Raven Ridge and at Point No-Point. In former years perhaps ten pairs occupied this segment of river in which case the density would have been about one pair per 12 miles, a value more in line with other findings on the Yukon. The 1974 and 1975 data are presented in Table 4. D. THE PIPELINE - SAGAVANIRKTOK RIVER, OLD MAN AND PROSPECT

## Introduction

Since 1970, there have been biannual surveys for raptors along all or some portions of the Alaska Pipeline. In 1970, the entire route was covered, and it was clear that the portion north of the Yukon River was of main concern. In 1972, about two-thirds of the route was covered, but the concentrated effort occurred north of Fairbanks and along the Tanana River. In 1974, only that portion north of Fairbanks and the Tanana River were surveyed with most effort north of the Yukon River. On 20 June 1975, we looked at portions of the Sagavanirktok River and areas around two camps, primarily for Peregrines and Gyrfalcons. Reports for the three previous years are to be found in the Anchorage Office, U.S. Fish and Wildlife Service.

#### Methods

A fixed-wing Helio Courier was used to check cliffs. Standard methods of flying by the cliffs as slowly and closely as possible, making several passes, were used. No ground checks were made because of difficulty of finding adequate landing places. The cliffs adjacent to the Sagwon Airstrip were not checked owing to the flight restrictions on the area imposed by BLM.

#### Results

In past surveys, as many as three pairs of Peregrines have nested on Franklin Bluff, but apparently only two pairs have been there on average since 1970 (Table 6). Usually only one of the pairs has been successful in fledging young in any one year. In 1974, the upriver pair near the <u>Bruce</u> bench mark could not be found. We did not have adequate looks at the cliff, however. We likewise were unable to get on the ground to examine the area. The lower pair about two miles north of the <u>Greta</u> bench mark was nesting in the usual site and had either eggs or young, but we did not flush her.

At Sagwon Bluffs we had to overfly at such a distance that we could determine nothing. Harry Reynolds, Alaska Department of Fish and Game, walked to the area in July and found two pairs in the localities opposite the Sagwon Airstrip that they occupied in 1974 (personal communication). He had not determined productivity at the time of his report, however. From what could be gathered, it appears likely that three pairs were present on the Sagavanirktok River.

Two Gyrfalcon sites upriver from Sagwon were occupied, one with four young and one with two young. Additionally, in spite of the gravel-obtaining activity on Slope Mountain, Gyrfalcons were occupying a nest with two young less than one-half mile distant. The Rough-legged Hawks that had nested above the gravel pit in 1974 were not there in 1975.

The Gyrfalcon eyries to the southwest of Prospect Camp and to the north of Old Man Camp were checked. The former is of interest because it occurs in a taiga situation and has only been occupied in one of the four survey years, and the latter site is of interest because it is located within one-half mile of the pipeline road. The site near Prospect Camp was unoccupied in 1975. The site south of Old Man was not used in 1970, an apparent attempt occurred in 1972, young were fledged in 1974, but it was not in use in 1975.

#### Conclusions and Recommendations

1. It appears that the Peregrine Falcon population along the Sagavanirktok River has stabilized since 1970 and is holding its own. Reproduction, however, may be lower than desirable. Because of the lack of precise data from earlier years, it is hard to know just how many falcons originally used Franklin Bluffs. John Koranda, Lawrence Livermore Laboratory (personal communication, September 1975), has supplied data from 1958. In that year five pairs nested on Franklin Bluff, four on the bluff proper, and one on an outlier of the bluff to the north of the main section (see Table 6). Two of the pairs there today are occupying the same sites they did in 1958. Additionally, Koranda found two pairs on the White Hills, Toolik River, to the west of Franklin Bluffs, in 1958 and one pair only in 1973.

These data suggest that only about half as many birds nest there today as in former years. Unfortunately, we do not have comparable data for the Sagwon Bluffs except to know that Peregrines occupied the site opposite the building at the airstrip in the late 1950's (Marvin Mangus, personal communication) and in 1964 (David Anderson, personal communication).

2. The Gyrfalcons along the Sagavanirktok River seem to vary somewhat but apparently in direct relation to food supply. They appear to be holding up well.

3. The presence and nesting success of both Gyrfalcons and Rough-legged Hawks using the east side of Slope Mountain and the Gyrfalcons south of Old Man Camp should be carefully monitored. Both situations will provide an indication as to the amount of disturbance these two raptors will tolerate.

		Years									
<b>4</b>	Area	1958	1970	1972	1973	1974	1975				
Frank	lin Bluff Section										
Loc	alitics										
1.	Outlier	nesting	<b>?</b> ·	···· <b>?</b>	?	?	?				
2.	Mud site	?	nesting		?	-	-				
3,	Greta north	nesting	-	 ~~	-	-	-				
4.	Greta .										
	Site A	nesting	nesting		nesting	deserted	nesting				
	\$ite B		· .	nesting							
5.	Bruce										
	Site A		nesting		•		-				
	Site B	nesting		nesting	nesting		-				
	Site C		۱.			nesting	-				
6.	South Bruce	adults present	?	-	?	lone adult	-				
Sagwo	on Bluff			•							
Loc	calities										
1.	Red Rock	?	lone adult	Gyrfalcon <b>s</b>	?	Gyrfalcons	Gyrfalcons				
2.	Cut	?	-	-	?	nesting	present				
3.	South	?	-	?	?	nesting	pre <b>sent</b>				

# TABLE 6. Sequence of utilization of cliffs by Peregrine Falcons on the Sagavanirktok River<sup>1</sup>

1

1958 and 1973 data are from John Koranda.

- = cliff examined, falcons not present

? = cliff not examined, falcons may have been present

#### E. COLVILLE RIVER WATERSHED

#### Description of Region

The Colville River is the major drainage system of the Arctic Slope with a watershed of about 23,000 square miles, as determined from Raisz's Landform Map of Alaska, 1948, and cliff-lined watercourses totalling more than 2000 miles (Figure 1). Although its principal sources lie in the Brooks Range above 3000 feet and its lower reach runs through the low-lying Arctic Coastal Plain to Harrison Bay, most of the main river and most of its tributaries flow through rolling foothills and upland terrain varying from about 500 to 2500 feet in elevation. Various Cretaceous rocks underlie these foothills--the Torok Formation, marine sediments of mostly shale with varying amounts of conglomerate, sandstone and siltstone, and the Nanushak and Colville Groups, intertongued deposits of marine and non-marine sediments consisting largely of sandstone and clay shale, with considerable local deposits of coal, bentonite, and tuff. Below the Etivluk, these groups overlie the deeper and older Torok Formation and are folded to form synclines and anticlines. Variations in the structure of the formations within these groups result in persistent east-west ridges, mesas, and hills.

The exposed rock formations and the watercourses combine to create optimum nesting habitat for cliff-nesting species throughout most of the Colville watershed, and suitable nesting habitat for falcons, hawks, eagles, and ravens is absent only from the lower Colville below Ocean Point and along all but the upper reach of the Itkillik. The riverine bluffs and cliffs of the main Colville and its tributaries have been known as prime nesting habitat for Peregrines, Gyrfalcons, Rough-legged Hawks, and Ravens since the early 1950's (see Kessel and Cade, 1958; Cade, 1960; White, 1964; White and Cade, 1971). Only in recent years have we been able to fit the Golden Eagle into the overall pattern of occupancy of cliff-like formations in Arctic Alaska.

## Methods and Itineraries

We carried out these surveys by air, either from a fixed-wing aircraft (Helio Courier) or helicopter (Alouette II or Bell Jet Ranger 206). Table 7 lists the dates, times, places, and modes of travel for these surveys. Usually there were three observers in addition to the pilot, C. M. White, T. J. Cade, and J. W. Smith, the latter from the Law Enforcement Division of the U.S. Fish and Wildlife Service. Our basic mode of operation was to fly along watercourses and to pass as close and as slowly by the cliffs and bluffs as conditions, the aircraft, and the pilot would allow. The helicopters, of course, allowed for the slowest and closest approaches, and also made it possible to land for a ground search, if necessary. With the Helio Courier we usually could pass within 50 feet of the cliffs at air speeds of 50 to 60 mph. In actual practice, because of the speed, better observation was achieved at distances of 100 or more feet. We made repeated passes by the cliffs, sometimes as many as six or eight, at both high and low elevations with respect to the cliff face until we were satisfied that we had seen all that could be seen.

For the purpose of making comparisons with previous studies, we concentrated on the main river from the mouth of the Etivluk to Ocean Point, where there is a





# TABLE 7. Flying itineraries for Colville River in 1975

**،** ۱

Date	Time	Aircraft and Pilot	Area Surveyed
21 June	1138-1205	Helio C Shanahan	Umiat upriver to High Bluff, no. 52, and return by Coal Seam, no. 55
21 June	1433-1500	Helio C Shanahan	Upper Itkillik and Itkillik Lake to head of Koyukuk.
21 June	1835-1940	Helio C Shanahan	Upper reaches of Chandler, Chancler Lake, down to Grandstand, over to Umlat.
22 June	1040-1912	Helio C Shan <b>ahan</b>	Umiat up Colville to cliff no. 24, below m. Kurupa and return, with landings.
23 June	1122-1225	Helio C Main	Umiat upriver but stormed out, return
24 June	1005-1554	Helio C Main	Umiat to no. 24 and up to no. 1 on Etivuluk and return with stops.
24 June	190 <b>2-2105</b>	Helio C Main	Umiat to no. 52, stop for ground search, and return.
25 June	0935-1605	Alouette II Bidenchini	Umiat downriver to Ocean Point and back with stops.
26 June	1456-1944	Alouette' II Bidenchini	Umiat downriver to Kogosukruk mouth, return up Kogosukruk to Umiat with stops.
27 June	1015-1428	Alouette II Bidenchini	Umiat to Chandler and Siksikpuk Rive and return, with stops.
27 June	1616-1916	Helio C Main	Umiat to lower Chandler, up Anaktuvu into upper Kanayut and return down Anaktuyuk to Umiat.
28 June	1036-1450	Helio C Main	Umiat to Colville above Etivluk, including lower Awuna to Section Creek, to mouth Kiligwa and back to Umiat.
28 June	1735-2205	Helio C Main	Back to upper Colville to sources around Thunder Creek and Meat Mounta to Liberator Lake, down Kuna to Colv and return.
29 June	1022-1450	Helio C Main	Umiat to Nanushak and tributaries, Cobblestone Creek, Peregrine Creek, May Creek and return.
29 June	1819-2157	Kelio C Main	Umiat to Etivluk, up main river and tributaries, Fay Creek, Nigu, Kutcha Creek, Otuk Creek, Iteriak Creek, re over Kurupa and Oolamnagavik.

# TABLE 7, continued

Date	Time	Aircraft and Pilot	Area Surveyed
30 June	100 <b>2-1429</b>	Helio C Main	Umiat to East Fork of Etivluk and tributaries, over into Kurupa and tributaries and return.
30 June	1638-2020	Helio C Main	Umiat to Colamnagavik and tribu- taries, lower Killik, Okokmilaga and Okpikruak Rivers and return along ms: Colville.
30 June	2105-0023	Bell Jet Ranger 206 (Texaco)	Umiat to Killik upstream to Akmalik Creek and return via Silalinigun Creek and Okpikruak River and over tundra to Umiat.
l July	1521-1830	Helio C Main	Uniat to Okokmilaga to upper Killik, Mary Creek, Easter Creek, upper tribu taries of Okokmilaga, Coal Creek and return to Umiat.
2 July	1103-1552	Helio C Main	Umiat up Colville to Driftwood and upper Utukok, land, engine trouble, return.

history of information going back to 1952 (Cade, 1960); and we got down on the ground as much as possible in this area, at a total of 20 locations where Peregrines are known to have nested in the past. At no place where we made ground observations did we find Peregrines where they had not first been seen from the air. Most of our observations in other parts of the watershed were from the air, with occasional landings where possible to check on Peregrines.

Table 8 summarizes our coverage of the watercourses. In addition, we flew across the middle and upper reaches of all the tributaries from Thunder Creek to the Killik and checked likely looking cliffs along the route. The only portion of the watershed that did not receive attention was along the middle and lower reaches of the Itkillik, where we knew from previous flights that suitable bluffs or cliffs do not occur, and the headwaters of tributaries in the Brooks Range, where again Peregrines are not known to nest and where flying these sorts of surveys becomes extremely hazardous. We no doubt missed some eagles and a few Gyrfalcons in these mountainous parts.

## Findings and Comparisons with Earlier Years

## 1. The Peregrine Falcon

Table 9 summarizes our observations. We found Peregrines at 12, possibly 13, sites on the Colville from the Etivluk to Ocean Point. Only three of these sites were located upriver from Umiat. Eggs were found at nine sites and were possibly present at one other, cliff no. 7. Of the 34 eggs found, we know that seven were bad or abandoned during our period of observation, leaving a total of 27 possibly viable eggs. If half of these eggs resulted in fledged young--about the most optimistic expectation one could have--then 13 to 14 young could have been produced by this population in 1975. If survival of these eggs and young followed the pattern observed by J. Haugh in 1973 (see below), a more likely prospect, then fewer than 10 young fledged this year.

In 1973, J. R. Haugh made a complete on-the-ground survey of the Colville Peregrines for the Alaska Department of Fish and Game. In June, he found 14 pairs and a single adult between the Etivluk and Ocean Point; 11 pairs had 32 eggs. In late July, only four of these pairs had a total of nine advanced nestlings. As in our 1975 survey, he found only three pairs at cliffs upriver from Umiat, but they were on three different cliffs than the ones occupied this year. Formerly, about 18 to 20 pairs nested upriver from Umlat, while 15 to 18 nested below. (A total of 25 nesting places is known upriver, and 23 downriver.) It is puzzling to find that the upriver nesters, which always appeared to be most secure and generally occupied the larger, hard rock cliffs, are now virtually gone, while the downriver falcons, nesting mostly on low earth and mud bluffs with frequent surface slides and other forms of erosion where egg and nestling losses have always been high, have decreased the least. Perhaps the attractiveness of these downriver sites relates more to food supply and favorable hunting conditions in the arctic Coastal Plain than to the physical features of the actual formations used for nesting.

In 1974, C. M. White made a quick helicopter survey from Ocean Point to Umiat on 8 July at hatching time. He found Peregrines at eight places, including five pairs with a total of 11 eggs or newly hatched young. The other

	Locations	No. River Miles*
1.	Main Colville, Etivluk to Ocean Point	188
2.	Upper Colville above the Etivluk	148
3.	Upper Itkillik River	43
4.	Anaktuvuk and Nanushak Rivers	243
5.	Chandler and Siksikpuk Rivers	124
6.	Killik River and tributaries	248
7.	Oolamnagavik and tributaries	72
8.	Kurupa and tributaries	119
9.	Etivluk and tributaries	143
10.	Lower Ipnavik River	20
11.	Lower Kuna River	16
12.	Lower Awuna River	30
13.	Lower Kogosukruk River	41
14.	Lower Kikiakrorak River	33
	TOTAL MILES	· 1468

# TABLE 8. Miles of river covered by aerial surveys in 1975

\* Determined from USGS Alaska Topographic Series, 1:250,000

~									
* *									
••• •									
$\bigcirc$	TABLE 9.	Peregrine	eyries	and a	aightings	in the	Colvilie	watershed,	1975

í,

. .

	Cliff Location	Date	Findings
A.	Main Colville, Etivluk to Ocean	Point	λ
1.	2 mi upriver from Umiat,	22/6	Adult male flew off cliff.
	no. 55	26/6	Adult female on nest, 3 eggs.
2.	Mouth of Kutcher Creek, no. 7	24/6	Aggressive pair, no nest could be found by ground search.
3.	Etivluk, 3.6 mi up from	24/6	Adult female on 3 eggs, no male seen.
	Colville, no. 1	29/6	Female not on eggs, no adult seen.
		30/6	Eggs abandoned.
4.	Upriver and Shivugak, no. 59	25/6	Pair with 4 eggs, one broken in.
5.	Middle Shivugak, no. 59	25/6	Adult (female?) flies back and forth along cliff.
6.	Near mouth of Ingaluat Creek, no. 69	25/6	Adult female on nest with 4 eggs.
7.	1.0 mi below mouth of Kogosukruk River, no. 73	25/6	Pair with 4 eggs, plus second adult female.
8.	Mouth of Kikiakrorak River, no. 75	25/6	Fresh scrapes; perhaps belonging to female above?
9.	1.5 mi below Kikiakrorak, no. 76	25/6	Pair with 4 eggs, female incubating.
10.	Ca. 6 mi above Ocean Point, no. 79	25/6	Pair with 4 eggs, female incubating.
11.	Ca. 3 mi above Ocean Point, no. 80	25/6	Pair with 4 eggs.
12.	Vluksurak Bluff, no. 61	26/6	Adult (female?) flying silently around cliff.
13.	l mi above Dee Bench Mark, no. 67	26/6	Adult female with 4 eggs, 3 sloshy and rotten.
B.	Upper Colville and Tributaries		
1.	Tuluvak Bluff, Chandler River	27/6	Single adult, no screaming.
2.	0.5 mi up from mouth of Kanayut River	27/6	Pair, female on stick nest, at least 2 eggs. (Female would not move off nest.)
3.	Shale Wall Bluff, Nanushak River	29/6	Adult seen perched on cliff.
4.	Etivluk, ca. 1 mi above East Fork mouth	29/6	Adult male on nest, 4 eggs.

# TABLE 9, continued

	Cliff Location	Date	Findings
5.	Colville 2 mi above mouth of Ipnavik	28/6	Pair with 4 eggs.
6.	Colville 3.6 mi (straight line) above Kiligwa	28/6	Pair with 4 eggs.
7.	Colville 3 mi below Mitten Creek	28/6	Pair, nest not seen but probable.

۰,

three pairs acted as though they had no occupied nests. White felt that he might have missed one or two pairs, as the survey was done hurriedly. Two of the cliffs where he found pairs in 1974 were not occupied in 1975, and we found falcons at three cliffs where he saw none in 1974. With the reduced Peregrine population now in the Colville region, the pairs evidently do a considerable amount of shifting around from year to year among the available eyries.

When the information for 1974 and 1975 is compared with the earlier data summarized in Table 10 from Peakall <u>et al.</u> (1975), it appears that the decline which began in the Colville population in 1969 may have bottomed out in 1973 or at least that the rate of decline has lessened, for our figures on number of pairs and reproductive performance in 1974 and 1975 do not differ markedly from Haugh's findings in 1973. While one could be encouraged to hope that the main Colville population has now leveled off at about 35 per cent of its former breeding numbers, caution must be exercised, because the low reproductive yield of less than one young per pair is not sufficient to maintain breeding numbers without recruitment from outside sources. Possibly falcons from the more marginal territories along the tributaries and upper Colville move in to occupy vacancies in the better nesting habitat along the main river. If so, the apparent leveling off or slowing of the decline in the breeding pairs of the main Colville is deceptive for the regional population as a whole.

Throughout the rest of the Colville watershed in 1975 we were able to find Peregrines at only seven places. Four certain nests yielded 14 to 16 eggs, and a fifth probable nest could have raised the total to 18 or 20 eggs. Only single adults were seen at the other two sites. Since we were working mostly over unfamiliar ground in these areas, where we had little prior knowledge of exact nesting locations, and especially since we conducted these surveys near the end of the incubation period for Peregrines when the birds sit tightly on their nests, we feel there is a greater chance that we missed some Peregrines in these areas than on the main Colville where we could pinpoint exact locations on which to concentrate our attention. Even so, we doubt that we could have missed more than half of the pairs actually present on the tributaries and upper Colville.

Seven to 14 pairs widely scattered along more than 1200 miles of watercourses in an area of some 20,000 square miles make up a very sparse population, indeed, and lead to speculation about changes in numbers in these parts of the Colville watershed. Have the birds always been more sparsely distributed along the tributaries than on the main river, or have these populations undergone an even more severe decline in numbers than the breeders along the Colville proper? The fact that a higher percentage of pairs has been lost on the Colville upriver from Umiat than downriver suggests a trend that gives credence to the latter possibility.

Fortunately, there is a little historical information on some of these areas that provides us with insight. In 1952, along 85 miles of the Colville upriver from the mouth of the Etivluk, T. J. Cade and G. B. Schaller found eight pairs of Peregrines during the late nestling and early fledgling period at the end of July and in early August (Kessel and Cade, 1958). In 1975, we could find only two pairs along the same stretch of river, and Haugh and Conner found none during a flight on 22 July 1971. In 1956, along 35 miles of the Oolamnagavik

Year	Total No. Pairs	No. of Pairs Producing Young	No. of Young Produced
1952-1959	32-36	20-25	40-50
1967	27	18	34
1968	32	. 16	34
1969	33	13	26
1971	25	9	14
1973	14	4	9

# TABLE 10. Number of breeding pairs of Peregrines and productivity on the Colville River\*

\* Data from Peakall, Cade, White, and Haugh, 1975

.

River T. J. Cade and H. M. Webster, Jr., found five pairs of Peregrines during the hatching period between 30 June and 6 July (Kessel and Cade, 1958), where we could find none present in 1975. In 1968, L. L. Boyd and E. Stauber found two pairs of Peregrines nesting on the middle reach of the Killik River, and C. M. White found two pairs on the lower Killik in 1964. J. Haugh could find none along the entire Killik in 1971, and we could find none in 1975. In 1971, J. R. Haugh carried out aerial surveys for the Alaska Department of Fish and Game along the Chandler and Siksikpuk Rivers and along the Anaktuvuk and Nanushak Rivers, where we also worked in 1975. He found six pairs of Peregrines (also two on the Chandler in 1972), where we found birds at only three places, single adults at two and a pair with eggs at a third. Two of our locations were ones at which Haugh had found Peregrines. Haugh also surveyed the Killik and Okpikruak Rivers in 1971 and reported one pair of Peregrines on the latter at its confluence with Verdant Creek and the Middle Fork. We found none there or elsewhere on these or other tributaries of the Killik system in 1975.

All of this information indicates that (a) Peregrines were formerly widely distributed and common on the upper Colville and on the tributaries and (b) that the breeding populations are now greatly reduced along these watercourses. Cade (1960) estimated that the breeding population of the Colville drainage in the 1950's was between 60 and 150 pairs, with 100 pairs being the best estimate of the real population. At that time he had detailed, on-theground knowledge only of the main Colville, one late-summer run of the upper Colville, and one mid-season run on the Oolamnagavik, although he had made flights over most of the watershed at one time or another and had a good concept of the overall topography and general ecological conditions of the entire region. The more recent surveys of the late 1960's and 1970's confirm the existence of suitable nesting cliffs and breeding habitat for Peregrines along all the major tributaries except the Itkillik, and we still feel that 100 to 120 pairs is a good, conservative estimate of the breeding population that existed in the 1950's and earlier. Conceivably it could have been even larger--around 200 pairs -- as an average of one pair per ten miles of river is not unreasonable based on data for the Colville and Oolannagavik Rivers (45 pairs along about 302 miles of river, or about 7 miles per pair). Also, in the 1950's Peregrines outnumbered Gyrfalcons about 3 to 1 to 4 to 1. In 1975, we located 40 pairs of Gyrfalcons (see below), a number which again fits a concept of 120 to 160 former pairs of Peregrines, assuming that Gyrfalcons have not substantially increased in numbers regionwide since the 1950's.

If these speculations are approximately correct, it would appear that the reduction in numbers has been greatest for nesting Peregrines on the tributaries, next most telling on the upper Colville, and least on the lower Colville, for an overall reduction to about 25 per cent of the breeding population present in the 1950's. The extent to which recruitment into the breeding population along the main Colville has been influenced by movement of individual adults from territories along the tributaries into better habitat (probably better feeding areas) is unknown but may have been considerable, as the local production of young along the Colville since 1969 has been insufficient to account for the apparent stability of the breeding population, at a reduced level, since 1973. Such a process involving individual adults shifting from marginal territories into more optimal range conceivably could have been going on since the late 1950's or early 1960's.

## 2. The Gyrfalcon

Table 11 summarizes our observations at 40 places where Gyrfalcons were found. Along the main Colville 13 pairs occupied cliffs from a point a few miles above the Awuna to Shivugak Bluff downstream from Umiat. This is one more than the previous maximum of 12 pairs recorded in 1959 (Cade, 1960) and in 1971 (White and Cade, 1971). By late June they had produced at least 32 advanced nestlings (actually counted) and probably 36, for an average of about three young per pair. Twenty-five other pairs in the Colville watershed had a total of at least 62 young, probably 68 to 70.

These figures compare favorably with our findings for recent years along the Colville: In 1967, 11 pairs had 37 young in the nest early in the season, and they fledged 30, an average of 2.73 young per pair; in 1968, 11 pairs had 28 young in the nest early in the season, and 26 presumably reached flying age, an average of 2.36 young per pair; in 1969, 9 pairs had 26 young in early season, and all presumably fledged for an average of 2.89 young per pair; in 1971, 12 pairs produced an estimated total of 33 eggs or downy young, but they fledged only 18 young, or an average of 1.80 per pair.

These levels of production were sustained despite generally low numbers of ptarmigan throughout the Colville River Valley in those years (White and Cade, 1971). The low productivity in 1971 was associated with an abnormally late nesting season for many pairs, as eggs and downy young were found in late June when the nestlings are usually 4 to 5 weeks old. Presumably weather or feeding conditions early in the breeding season influenced this late nesting schedule.

Ptarmigan were also extremely scarce in the Colville watershed in 1975. We made a special effort to count all birds that could be seen on our aerial surveys. The total count was only 11 ptarmigan, all Lagopus lagopus. They appeared to be more common along the Sagavanirktok River, where we saw six evenly spaced males in the vicinity of Franklin Bluffs on 21 June. We were unable to observe what the Gyrfalcons were feeding on in 1975, but we do know that microtine rodents, especially Lemmus trimucronatus and Microtus oeconomus, were in high numbers throughout most of the region, and this rodent explosion was reflected by a large number of rodent-eating birds in the area. The numbers of Rough-legged Hawks were up very considerably (see below), Short-eared Owls were widespread and common throughout the foothills, as well as jaegers (mainly Long-tailed and Parasitic, but also an unusual number of Pomarine). The Jaegers were mostly in non-breeding aggregates of 6 to 20 birds along the rivers. There were even scattered non-breeding Snowy Owls between the Colville and the Brooks Range--far south of their usual summer range on the Slope--and also a few Marsh Harriers. It was obviously a big microtine year in the foothills, and we suspect that the Gyrfalcons were feeding, as they did in 1959 (Cade, 1960), on the rodents and, especially, on the rodent-eating birds, principally Long-tailed and Parasitic jaegers and Short-eared Owls. Certainly it would have been difficult for them to have produced so well on the available ptarmigan.

Our data indicate that Gyrfalcons continue to thrive in Arctic Alaska, despite considerable fluctuations in breeding success from year to year, and there begins to be a suggestion that Gyrfalcons may actually be increasing in numbers and shifting their ecological niche somewhat as the Peregrine population TABLE 11. Gyrfalcon eyries and sightings in the Colville watershed, 1975

:

 $\left( \right)$ 

	Cliff Location	Date	Findings
<b>A.</b>	Main Colville, Etivluk to Ocean	Point	
1.	13 mi upriver from Umiat, no. 52	21/6	Pair with 4 young, 4 weeks old.
2.	Colville at mouth of Fossil Creek, no. 53	21/6	2 or more young in nest, ca. 1-2 weeks old.
3.	Colville near mouth of Ninuluk Creek, no. 49	22/6	Adult flying, 1 or more young in nest.
4.	Upriver end of Ninuluk Bluff, no. 47	22/6	Pair with 3 young, 3 weeks old.
5.	Puivlik Bluff	22/6	Pair but nest not seen.
6.	1 mi downriver from mouth of Oolamnagavik, no. 41	22/6	Pair with 3 young, 3 weeks old.
7.	Near mouth of Aupuk Creek, upriver, no. 29	22/6	Adult, nest with 1 or more young, 1-2 weeks old.
8.	2 mi above mouth of Kurupa River, no. 20	24/6	White adult, 3 young, 3 weeks old.
9.	T5S, R15W, Killik River Quadrangle, no. 12	24/6	White adult, 3 young, 5 weeks old.
10.	5 mi downriver from mouth of Etivluk, no. 6	24/6	2 young, 1-2 weeks old.
11.	Middle Shivugak, no. 59	26 <b>/6</b>	3 young, 3-4 weeks old.
12.	Umiat Mountain, no. 57	25/6	4 young, 4 weeks old.
13.	Tattitgak Bluff, no. 54	26/6	3-4 young, 3 weeks old.
<b>B</b> .	Upper Colville and Tributaries		
1.	Chandler below mouth of Kiruktagiak Riyer	27/6	4 young, 6+ weeks old.
2.	Chandler, 5 mi below Taktu	27/6	2-3 young, hard to see.
3.	Chandler below Paunagaktuk	27/6	2 young, 5 weeks old.
4.	Chandler, up Outpost Creek	27/6	3 young, 3+ weeks old.
5.	Chandler, 3 mi below Kutchik, creek on right limit	27/6	3 young, 3-4 weeks old.
6.	Anaktuvuk, Schrader Bluff	27/6	3 young, 4-5 weeks old.
7.	Anaktuvuk, 9 mi below Terrace Creek	27/6	2 young, 5 weeks old.
8.	Anaktuvuk at Table Top	27/6	4 young, 5+ weeks old.

•

# TABLE 11, continued

	Cliff Location	Date	Findings	
9.	Kanayut River	27/6	2 young, 4-5 weeks old.	
10.	Colville opposite mouth of Kuna River	28/6	2 young, 6+ weeks old.	

has declined. This latter hypothesis is suggested by the fact that in 1975 we found two pairs of Gyrfalcons nesting not only on the same cliffs that had been used by Peregrines but on the exact same sites on the cliffs. This would not have been remarkable, perhaps, except that these two sites are exposed points at conspicuous breaks in slope on completely open cliff faces--extremely atypical locations for Gyrfalcons, which usually nest in well-sheltered sites under overhanging rock. (In fact, typical Gyr sites exist on both cliffs.) It may also be reflected in the fact that Gyrfalcons breeding in the Colville region since the decade of the 1950's seem less dependent upon ptarmigan for a food supply than in earlier years when they had to exist in the same region with a Peregrine population three to four times more numerous than they.

In addition to the falcons, we kept notes on the nesting locations of Golden Eagles, Rough-legged Hawks, and Ravens. Old eagle and Raven nests are frequently used by Gyrfalcons, less often by Peregrines, while Peregrines frequently use old Rough-leg nests and Gyrfalcons occasionally do. The nests of these species therefore have significance for the breeding distribution of the two falcons, as well as providing important biological information on these species themselves.

## 3. The Golden Eagle

While Golden Eagles are widely dispersed in sparse numbers over the entire Arctic Slope in summer, even to the coast, they breed only in the rockwalled valleys of the Brooks Range proper and sparingly on some of the outlying, northern mesas and tablelands in the foothills. In 1975, we found five active nests on the Chandler, Nanushak, Oolamnagavik, and Killik Rivers, and old nests on the Killik, East Fork of the Oolamnagavik, and in the Ivotuk Hills.

There are now enough records from the past five years to plot out the northern limits of the breeding distribution on the Arctic Slope with fair detail (Figure 2). The approximate latitudinal limit is 69°30' N., although some pairs can no doubt be found nesting somewhat farther north in the region of the Sadlerochit Mountains. It is significant, however, that no eagle has ever been found nesting on the main Colville, although Cade did find an old stick nest between the Killik and Umiat in 1956 that he thought was an eagle's nest. Clearly the main breeding stronghold for this species in Arctic Alaska lies in the Brooks Range and associated mountains, just as the Alaska Range provides for a similar stronghold in the subarctic interior of Alaska. Nonbreeding in any given nesting territory is frequent (successful breeding may occur on average only once in four years), and the montane distribution of these nesting territories means that there is little overlap between breeding eagles and breeding Peregrine Falcons.

#### 4. The Rough-legged Hawk

Rough-legged Hawks were nesting in near peak numbers in 1975, although their productive output appeared to be only moderate. We observed a total of 162 pairs within the survey area, including one nest situated about 20 feet up in a cottonwood tree with a crown of about 30 feet on the Chandler River. Along the main Colville between the Etivuluk and Ocean Point, we found 68 pairs nesting or attempting to nest; 40 of these pairs were below Umiat. Many of the nests



Figure 2. Distribution of Golden Eagle Nests on the Artic Slope of Alaska. were covered by incubating adults that refused to rise when the aircraft flew by, so that we did not obtain much information on nest contents, but those that we did see into contained mostly 2, 3, or 4 eggs, only once as many as 5 eggs. The average clutch size in 1975 apparently was not much more than 3 eggs.

When compared with data for previous years on the main Colville population, these figures indicate a return to peak numbers following a low in 1973: In 1967, 64 pairs laid an estimated 243 eggs, with a mean clutch of 3.95 eggs (83 eggs observed for 21 pairs), and they fledged an estimated 122 young (89 young observed for 47 pairs), an average of 1.91 young per pair. In 1968, 59 pairs laid an estimated 209 eggs, average of 2.19 per pair (92 eggs observed for 42 pairs, including 13 with nothing), and they fledged 84 young, an average of 1.42 per pair. In 1969, 89 pairs (an all-time high) laid an estimated 303 eggs, average of 3.40 per clutch (235 eggs observed for 69 pairs), and they fledged an estimated 160 young, an average of 1.80 per pair (79 young observed for 44 pairs). In 1971, 74 pairs laid an estimated 201 eggs, an average clutch of 2.72 eggs (160 eggs observed for 54 pairs), and they fledged an estimated 102 young, an average of 1.39 per pair (96 young actually observed for 69 pairs). In 1973, J. R. Haugh could find only 26 pairs of Rough-legs between the Etivluk and Ocean Point, with none present between the Killik River and Umiat Mountain, an all-time low for this population. Microtine rodents were at a low point in their population fluctuations in the same year. Like the Gyrfalcon, the breeding population of Rough-legged Hawks varies somewhat from year to year, and so does its productive output; but the species continues to thrive over the long term in the arctic and, indeed, is the most abundant falconiform during the summer months.

# 5. The Raven

This passerine species is functionally a raptor and a cliff-nester, so that it logically should be included in any consideration of cliff-nesting birds of prey. Ravens also bred in maximum numbers along the Colville and its tributaries in 1975. We found six nests on cliffs along the main Colville, and one pair was also nesting in the rafters of the old SeaBee building at Umiat. Eighteen other nests were found on tributaries and along the upper Colville above the Etivluk. We were also told about a pair of tree-nesting Ravens that used a large willow on the Ivashak River in 1967 (Harry Quinn, verbally).

# DISCUSSION AND RECOMMENDATIONS

A. THE USE OF FIXED-WING AND HELICOPTER AIRCRAFT

We have rather mixed feelings about the use of aircraft in work of this sort. Clearly we are able to cover a much wider geographic area and to do so in much less time. We are also able to examine some of the more remote cliffs that might not otherwise be visited. We are unconvinced that we can be as thorough with aircraft as we can be on the ground, especially in unfamiliar terrain. Even in well-known areas thoroughness is hard to achieve at certain times in the breeding cycle, especially just prior to egg hatching, when the female is reluctant to flush even when approached on foot. This problem was graphically illustrated this summer by comparison between our survey of the Yukon River and the results obtained by Ambrose and Ritchie. Certainly one factor that influenced our missing some pairs on the Yukon was the use of a fixed-wing airplane. With a helicopter we might have achieved better results.

Generally, fixed-wing aircraft are excellent for survey work on Gyrfalcons, Golden Eagles, and Rough-legged Hawks and may also be for Peregrines after the young have recently fledged and can thus be flushed from the cliff, increasing chances of observation. By that late in the year, however, an important segment of the population--the pairs that have failed--are missed and are not accounted for.

We have yet to see any behavior that convinces us that the prudent and routine use of aircraft is harmful to breeding raptors. Any adverse effects of low-flying aircraft, etc., would be hard to demonstrate without long-term controlled reproductive and population studies. About half of the Gyrfalcons we approached at nests in the Helio Courier attacked without hesitation and showed no fear or fleeing reaction. Others continued to feed their young without looking up as we flew by to check the eyrie. Many Peregrines could not be flushed from perches or nest sites by either fixed-wing or helicopter and often left only after we were on the ground and out of the aircraft. Rough-legged Hawks sitting on eggs almost never got up when we flew by.

Our general recommendation would be to use aircraft for preliminary work when an overview of the terrain, the general population dispersal and density, etc., need to be determined or when order of magnitude estimates are sufficient. When precise data are necessary for population status and reproductive performance, even in well-known areas, on-the-ground work is preferable.

To conclude, birds of prey are not importantly threatened or significantly influenced by men flying around in airplanes or helicopters, as long as they remain in the air and do not deliberately harass the birds or shoot them. What can threaten birds of prey and can have an adverse effect on their reproduction and survivorship are the activities of men on the ground. We feel that recent state and federal regulations have placed too much emphasis on restricting the use of flying aircraft and have not sufficiently considered needed restrictions on the ground. These restrictions should consider both temporary and permanent actions. The former category should include such things as the activities of geological survey parties, geophysical teams, and any other scientific or investigative groups that have work to do in the environs of active nests. Generally the most sensitive times for disturbance are prior to egg-laying and during incubation. Once the eggs have hatched, the birds can tolerate considerably more activity around their nests without adverse effects. All sorts of development and construction projects should be included in the latter category-roadwork, bridge construction, pipelines, powerlines, installations, borrow pits for gravel, etc.

It is important to recognize that certain specific cliffs, certain specific trees, certain specific hillsides are nesting habitats for birds of prey. These specific sites are used over and over--year after year--to the exclusion of numerous other, seemingly identical places. This phenomenon of "site tenacity" has been dramatically demonstrated by the Peregrines in Great Britain during the build-up phase of the breeding population there since the low point reached in 1963. The same old cliffs that had been occupied by pairs before the post-World War II decline are the ones now being taken over by the new recruits to the breeding population (Ratcliffe, 1972). No new cliffs have been occupied.

Every time one of these traditional and historical nesting places is made unsuitable for falcons by any of the limitless forms of environmental degradation associated with man's activities, there is one less opportunity for a pair to nest, and the species is consequently reduced by one breeding pair. This is the reason why it is so important for the future of Peregrines and Gyrfalcons--and all cliff-nesting species--to preserve the natural and biological integrity of as many of these nesting cliffs as possible.

There are at least three specific places along the pipeline route where this principle is being disregarded, although it is gratifying to note that the Franklin Bluffs are one area where it has been applied for the welfare of nesting Peregrines.

## B. THE "OLD MAN" AND "SLOPE MOUNTAIN" SITES FOR FALCONS

We are concerned that earlier in studies of the pipeline more emphasis was not placed on <u>sensitive</u> species (such as Gyrfalcons) in addition to endangered species. Perhaps we could have influenced the choice of sites for the borrow pits in the "Slope Mountain" area where Gyrfalcons nest. Another site might have been selected to avoid working directly under the falcons. However, we now recommend that the use of "Slope Mountain" by Rough-legged Hawks and Gyrfalcons in the area of the borrow pit be carefully documented for the next few years. This situation could yield important data on the tolerance level of some raptors to disturbance by heavy equipment. Additionally, we learned in October 1975 that Marvin Mangus had found a Peregrine nesting on the cliffs of Slope Mountain in 1963, and it thus appears to have been an historical site for Peregrines as well.

It is also unfortunate that the Gyrfalcons nesting on a small rock near the road south of the Old Man Camp were not more regular in their occurrence, so that we might have recognized the importance of that site earlier and influenced the placement of the road. Depending on the amount of traffic, both air and ground, that site may never be used again. We know of an exact parallel in Mount McKinley National Park. For years Gyrfalcons nested on a small rock in the Savage River Valley less than 1/4 mile from the park road. When a new bridge was constructed across the Savage River in 1951, the falcons deserted, and the rock has never been used since.

We recommend that raptors as a group, especially falcons and eagles, be recognized as <u>sensitive species</u>, rather than emphasizing only endangered ones, when regulations relevant to the welfare of wildlife are contemplated for development projects in Alaska.

Such recognition should provide a greater measure of care and protection to those species likely to receive the greatest impact during this exploitation phase in the Arctic.

C. THE "HOODOOS"

We also learned that there is a plan afoot between the State of Alaska and Alyeska to construct a "tourist" road from the Alyeska Camp on the Richardson Highway above Summit Lake to the foot of the Gulkana Glacier. This road would run by the base of the "Hoodoos"--a rock formation that has been used for nesting by Gyrfalcons for at least 25 years and probably for much longer. Ornithologists know this area as one of the best for Gyrfalcons in the State of Alaska, and it is certainly one of the most scenic and spectacularly beautiful falcon eyries anywhere in the world. Careful consideration needs to be given to the impact of a road and tourist traffic passing so close to this eyrie. We recommend that any road stop at least one-half mile away from the Hoodoos and that tourists wishing to visit the glacier be required to hike in the remaining distance on a trail that keeps away from the Hoodoos proper and directs foot traffic up the right limit of the glacial outwash.

D. THE "CRITICAL HABITAT" CONCEPT AND RAPTORS

Allied to the recognition of sensitive species is the designation of parcels of environment as habitat critical to the biology of those species. We recognize that in Alaska cliffs that are now occupied or have been historically occupied by Peregrines and Gyrfalcons are critical habitat. We also recognize that a buffer zone around those cliffs is important as critical habitat. That zone probably varies with the sensitivity of the pair involved and on particularities of the habitat in question. Perhaps it might vary between 500 feet and one-quarter of a mile or in some cases exceed a mile. What to do about the habitat necessary to support the pair with food is still an open question. It is nonetheless critical habitat. We suggest that all Peregrine and Gyrfalcon cliffs on federal and state lands be declared critical habitat along with a buffer zone at least one-half mile in radius.

E. IMPORTANCE OF THE COLVILLE AND YUKON WATERSHEDS

It is clear to us that falcons occur in maximum density in certain areas only in Alaska. Other areas adjacent to them may have scattered populations, but the major river is the "center" of the regional population. The Yukon and Colville Rivers are two such rivers. So also are the Porcupine River and Tanana River. We also recognize that some of the tributaries may have numerous pairs, such as the Charley River possibly; but the main river valleys appear to provide the optimum habitat for these regional populations, and the pairs nesting along

## References

- 28 -

- Bishop, L. B. 1900. Annotated list of birds. In W. H. Osgood, Results of a biological reconnaissance of the Yukon River region. <u>North Amer. Fauna</u> no. 19.
- Cade, T. J. 1953. The peregrine falcon in the Yukon Valley. <u>Proc. Second</u> Alaska Sci. Conf. 1951: 330-334.
- Cade, T. J. 1960. Ecology of peregrine and gyrfalcon populations in Alaska. Univ. Calif. Publ. 2001. 63(3): 151-290.
- Cade, T. J., J. L. Lincer, C. M. White, D. G. Roseneau, and L. G. Swartz. 1971. DDE residues and eggshell changes in Alaskan falcons and hawks. <u>Science</u> 172: 955-957.
- Cade, T. J., C. M. White, and J. R. Haugh. 1968. Peregrines and pesticides in Alaska. <u>Condor</u> 70(2): 170-178.
- Enderson, J. H., D. G. Roseneau, and L. G. Swartz. 1968. Nesting performance and pesticide residues in Alaskan and Yukon peregrines in 1967. <u>Auk</u> 85: 683.
- Enderson, J. H., S. A. Temple, and L. G. Swartz. 1972. Time-lapse photographic records of nesting peregrine falcons. Living Bird 11: 113-128.
- Fyfe, R., S. A. Temple, and T. J. Cade. 1976. The North American Peregrine Survey, 1975. <u>Can. Field Nat.</u> In press.
- Haugh, J. R. 1976. Recent history of peregrine falcons in the Tanana Valley, Alaska. (Manuscript submitted to Can. Field Nat.)
- Hickey, J. J., 1942. Eastern population of the duck hawk. Auk 59: 176-204.
- Kessel, B. and T. J. Cade. 1958. Birds of the Colville River, northern Alaska. <u>Biological Papers of the Univ. of Alaska</u> no. 2.
- Peakall, D. B., T. J. Cade, C. M. White, and J. R. Haugh. 1975. Organochlorine residues in Alaskan peregrines. Pesticides Monitoring Journal 8: 255-260.
- Ratcliffe, D. A. 1972. The peregrine population of Great Britain in 1971. Bird Study 19(3): 117-156.
- Temple, S. A., J. H. Enderson, and L. G. Swartz. 1970. The upper Yukon Valley of Alaska. Page 293 in The North American Peregrine Survey, 1970, edited by R. Fyfe and T. J. Cade. <u>Can. Field Nat.</u> 84(3): 231-246.
- White, C. M. 1969. Breeding Alaskan and arctic migrant populations of the peregrine. In: Peregrine Falcon Populations, Their Biology and Decline, edited by J. J. Hickey. Univ. Wisconsin Press, Madison.
- White, C. M. and T. J. Cade. 1971. Cliff-nesting raptors and ravens along the Colville River in arctic Alaska, Living Bird 10: 107-150.

U.S. Fish & Wildlife Service 1011 E. Tudor Road Anchorage, Alaska 99503