



A Profile of Various Rivers and Their Raptor Populations In Western Alaska 1977

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March 1978



U. S. Department of the Interior
Bureau of Land Management
Alaska State Office
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Appendixes C and D have been omitted from this copy of the report because of the sensitive nature of information on raptor nest locations.

Cover drawing is by John Schmitt, Arcata, California.

INTRODUCTION

The work in 1977 was especially designed to obtain an overview of the raptor habitat and its ecological profile on the d-1 lands* in portions of Alaska. Additionally, we wanted to determine the status of the peregrine falcon throughout this area as it might affect judgments on land use or classification.

We would particularly like to thank Lou and Carol Jurs, Roger Bolstad, Keith and Jan Woodworth, and Wayne and Martha Dawson for their assistance in general and their aid with logistics in particular. John Jelly and Mason Thayer helped obtain the use of helicopters. Douglas N. Weir, Iverness Shire, Scotland, supplied us unpublished notes he had made on birds between 1964 to the present from the Kilbuck region.

METHODS

The rivers we were to survey were chosen on the basis of the status and classification of lands surrounding them. They were then flown over at low altitude in aircraft (Cessna 185, Cessna 206, Helio Courier, FH 1100, and Bell Jet Ranger) to observe raptors and their habitat and to determine if the rivers merited ground work. The latter decisions were dictated largely by water conditions, presence of areas for loading and unloading boats, raptor habitat potential, and priorities that had been previously set.

Once data were gathered from aircraft overflight, rivers were floated in an Avon Redshank raft. We use the term floated in its loosest possible connotation. The data gathered by these various methods form the bulk of this report.

*Under terms of the Alaska Native Claims Settlement Act, d-1 lands are lands withdrawn from the operation of the public land laws pending classification.

RESULTS

THE BETHEL-KILBUCK MOUNTAIN REGION

General Description: The western side of the Kilbuck Mountains is drained to the west and northwest by several rivers of similar size and flowage. At least three of the larger ones, the Tuluksak, Kisaralik, and Kwethluk, have their confluence with the Kuskokwim River in the general Bethel area, while the southernmost river we examined, the Kanektok, empties into Kuskokwim Bay. The Fog River runs between the Tuluksak River to the north and the Kisaralik River to the south. The main and middle forks of the Eek River run between the Kwethluk and the Kanektok.

We examined these six rivers on June 14 and 16-21. Generally, these rivers headed at elevations near 2,000 feet, flowed for 5 to 10 miles over high glacially formed plateaus, then out through foothills for 20 to 40 miles. Most then flowed onto the lowland wet tundra for the remainder of their course. We also surveyed the higher wet tundra for some of the river courses, but we were primarily interested in the sections that cut through the foothills. It is in the foothill sections that cliff and river bluffs are formed; in addition, the high cliffs on mountain sides come closest to the rivers' edges here.

Geology: The generally poor development of bluffs and cliffs along most of these rivers (e.g., Eek, Fog, Kwethluk) is largely due to the fact that (except for the mountains themselves) most of the surrounding terrain is broad valleys composed of Recent alluvium. The Great Ridge is an example of a thick sequence of upthrust Cretaceous sedimentary rock which stands isolated above the glacial drift and alluvium. Here the cliffs are generally on the top of the ridge rather than along the upthrust.

The Kanektok and Kisaralik River areas differ in some major geologic features (Hoare and Conrad 1959, 1961). Both rivers have similar outwash of Quaternary glacial drift, silts, sands, and gravels, but the Kanektok River is much more extensive and has a broader valley. Above Kalk Creek the mountains along the Kanektok have bedded Carboniferous to Cretaceous sandstones, cherts, and volcanic intrusions. Locally, there are areas where conglomerates are intermixed. The Kisaralik has a complex mixture of folded or steeply dipping interbedding of Cretaceous and Tertiary volcanic and basalt, Devonian schists (The Greenstone Ridge), and a series of Cretaceous sedimentary outcroppings that come to the river's edge. This latter feature is particularly important in providing suitable and abundant falcon nesting structure.

Vegetation: The region is characterized by vegetation that Viereck and Little (1972) refer to as wet tundra. More specifically, however, the region varies from rather closed and moderately well-vegetated stream courses to open broad stream courses with considerable moist tussock tundra along the rivers' edges. Spruce, poplar, willows, and alder are the dominant (emergent) growth forms. Typical crowberry-Cladonia-dwarf birch-cottongrass tundra forms the surrounding mat.

TULUKSAK RIVER

General Description: We examined this river during a low overflight in a Cessna 206 on June 14. It could be surveyed more efficiently from a helicopter.

The river has closed spruce-poplar vegetation that grows to the river's edge in some places. Riparian willows and alder are the dominant vegetation. The river has been heavily mined with dredges for gold. The village of Nyac is about in the midportion of the foothill section. Eight to ten bluffs ranging from 40 to 50 feet high are located on the right limit of the river.

Douglas N. Weir has done rather extensive work on this drainage. The following summary of his data gives an ecological profile of this river.* Weir did most of his work within 10 miles of Nyac. He found a total of 93 bird species there. Many of his observations, however, were single sightings of stragglers. He reported that peregrine falcons have bred about 10 miles below Nyac, but only one was seen in 1962 and none has been reported there since.† Lack of peregrine sightings is probably due to lack of good ornithologists visiting the area.

Bears (both black and grizzly), wolves, and moose have been reported along the river.†† Moose were common in 1974. We saw only one moose with two calves in 1977. According to Weir,† moose apparently were unknown to the area in 1926 when miners first arrived. Fox, wolverine, and otter are all said to be at least locally common at times in the river area.

*From Weir, Douglas N. Annotated list of birds of the Kilbuck/Ahklun Mountains and offshore islands. Unpublished MS. Creagdhui, Iverness Shire, Scotland.

†Weir, pers. comm., conversation, July 15, 1977.

††Ibid. Notes on mammals in the Kilbuck/Ahklun Mountains, 1974 and 1962. Unpublished report to the U. S. Fish and Wildlife Service. n. d.

FOG RIVER

General Description: We made a low overflight of the Fog River in a Cessna 206 on June 14. The Fog valley is largely broad and U-shaped and was cut by a glacier. Rock outcrops are high on the hillside, with localized areas of scree close to the river and on adjacent hills. We examined seven bluffs and found a pair of gyrfalcons on the left limit, eight miles above where the river enters the flats from the foothills. A pair of golden eagles with two young was on the right limit about two miles upriver from the beginning of the foothills. No large and conspicuous mammals were seen. We found no gravel bars for camping and access to the river. Ground work would be most difficult without the assistance of a helicopter. Locations and contents of raptor nests are given in Appendix C.

KWETHLUK RIVER

General Description: The Kwethluk is a larger river than either the Tuluksak or the Fog. A low overflight with a Cessna 206 was made on June 14. Once the river leaves the upland (glacially formed) area, it enters a rather broad, open valley. Here rounded, well-worn hills abut the river. In its physical structure and vegetation patterns, the Kwethluk River is like a larger edition of both the Fog and Eek Rivers. Only seven cliffs of any magnitude were found and examined. Three of these contained golden eagle nests (one on Three Step Mountain); none was occupied. The outcrops on Elbow Mountain appeared to be the roosting spots for eagles or gyrfalcons and perhaps even a nesting location for the latter. No raptors were seen there, however. On Crooked Creek, a tributary, a golden eagle nest with young was found in an accessible location among a pile of large boulders. Beaver sign was abundant. Access to the river for ground work once again is limited because few gravel bars of any size exist. There also are no lakes adjacent to the river on which float-equipped aircraft may land. Locations and contents of raptor nests are given in Appendix C.

EEK RIVER

General Description: Both the main fork and middle fork of the Eek River were observed from a low overflight in a Cessna 206 on June 14. Once the river leaves the glacial valleys of the Eek Mountains, both forks meander through rather open, moist tundra terrain. Only along the Great Ridge do mountains come close enough to the river to form bluffs. Even there, however, the cliffs are generally off the river on the mountainside. Along the main fork there were four major cliffs on the Great Ridge. Only one of the cliffs contained a raptor nest, and on a small tree growing from the face of the cliff was an active golden eagle nest with either eggs or small young. Along the middle

fork only one major cliff was adjacent to the river, and it held a golden eagle nest with one young. Two bald eagle nests were along the bank upriver from the southern tip of the Great Ridge and one adult eagle was seen. A gyrfalcon was flushed from a pinnacle about midway up the mountain slope. (Presumably a nest was there though it could not be seen from the aircraft.) No large or conspicuous wild mammals were seen, although some beaver sign was present. The locations and contents of the raptor nests are given in Appendix C.

KANEKTOK AND KISARALIK RIVERS

Both rivers were examined by a low overflight in a Cessna 206 on June 14. These two rivers had either a good access by aircraft other than helicopter or the best habitat for raptors. The Kanektok was studied from a boat; the Kisaralik was flown over slowly with a helicopter. Our findings follow.

KANEKTOK RIVER

Narrative: On June 16, at 1940 hours, we arrived at a lake (T3S, R64W, Sec. 21, Goodnews 4-D Quad) in a Cessna 185 on floats. After moving our gear to the river's edge and assembling the raft, we started downriver at 2200 hours. At 2400 hours, we arrived about one mile upstream from the mouth of Paiyun Creek, where we camped. After exploring Paiyun Creek on the morning of June 17 we broke camp about 1320 hours and proceeded downriver to about one-half mile above the mouth of Nakailingak Creek, where we camped at 1900 hours. We had traveled 13 river miles. On June 18 we continued on, leaving camp at 1100. After traveling about a mile, we arrived at the lake where we were to be picked up (T5S, R68W, Sec. 20, Goodnews C-6 Quad) at 1830.

On June 19 we explored the lake and adjacent mountain area. Our aircraft arrived at 1230 on June 20. Weather during the trip was characterized by sunny mornings, with rain developing by early or mid-afternoon and evening. Temperatures were generally in the 40-50°F range. Mosquitoes emerged in force on June 18. River conditions were poor. Water was high and the islands, adjacent river bars, and banks were flooded to depths of 2-4 feet. The gradient drop over the 33 miles traveled was about 20 feet per mile. The combined conditions made boat work difficult.

Profile: The physiography of the Kanektok Valley, like that of other rivers, is characterized by three different regions--a high, dry tundra, glacially worn, plateau; a steep gradient riverbed portion that bisects the foothills and outlying mountains; and a lower portion that flows across the flat wet tundra. We concentrated on only the middle portion, which covers about 33 miles of river, because it contained the raptor habitat.

In the upper 3 to 5 miles of that portion, willows fringe the river and abut against moist tundra flatlands or hillsides. Hillsides were sparsely covered with low-growing alders. Arctic warblers, northern waterthrush, tree sparrows, and Lapland longspurs were found in some abundance. No sign of mammals other than wolf tracks, bear scat, some diggings by what we presumed to be a fox, and what appeared to be arctic ground squirrel holes were seen.

Below Paiyun Creek the valley widens. Willows become larger, and growths of stunted poplars fringe the river. Continuing downriver willows and poplars tend to be larger and dense stands of alders appear. At Klak Creek and below, major poplar stands are on the hills and in the draws, particularly on the south slopes, and low-growing alders form much of the mountain slope vegetation. The mountains are generally one mile off the river. Beaver lodges and dams are evident. Mergansers, arctic terns, mew gulls, and harlequin ducks are conspicuous along the river, while arctic warblers, golden-crowned sparrows, and gray-cheeked thrushes are abundant in the riparian vegetation.

The first good cliff, about one-half mile off-river, is one mile below the mouth of Kanuktik Creek on the left limit. A cliff swallow colony of perhaps 30 birds was on the cliff. Five major cliffs occur within the next 6 to 8 miles on the right limit, about one-half to three-quarter mile from the river. One golden eagle was seen soaring above the cliffs but no nest found. The next set of bluffs is near Klak Creek. Just downriver from the confluence of the creek with the river was a golden eagle nest with three young (See Appendix C). A bald eagle nest was found along the river in a poplar about two miles above Klak Creek.

About six miles farther downriver, near the point at which we left the river, is another series of bluffs. A soaring rough-legged hawk was seen at one cliff that had a deserted eagle nest, and a bald eagle nest was on the river's edge. The only mammal seen was a river otter. Moose sign was not evident nor was squirrel sign seen. Birds observed and the status are given in Appendix B.

Kagati Lake is about five miles upstream from where we started our survey. This large lake forms the headwaters of the Kanektok and is near the upper reaches of the entire west-flowing watershed. The ecological situation there is characterized by classic alpine tundra. D. Weir, as cited earlier, has made many observations there and has found 16 species of birds we did not find. They are included in our list (Appendix B) and their addition suggests that the river has a broader ecological amplitude than does our list taken by itself.

KISARALIK RIVER

Narrative: On June 21 we thoroughly observed the river from a flight in a Fairchild Hiller FH 1100 helicopter, traveling both upriver and downriver. We covered 37 miles of river, about the same mileage as we floated on the Kanektok. We started two miles upriver from the mouth of Nakluk Creek (T7N, R63W, Sec. 23, Bethel C-4 Quad) and ended at T3N, R60W, Sec. 12, Bethel B-3 Quad, about 11 miles upriver from the mouth of Quicksilver Creek.

The river over this portion varies between 1,150 and 300 feet in elevation, an average gradient of 23 feet per mile. The river was running high and was filled from bank to bank. The current was clearly faster than that of other rivers we examined in this region, and would have made a float trip hazardous.

Profile: In the foothills, the river meanders less and it becomes more engorged and straighter. Spruce is the dominant tree growing along the river, mixed with some large poplars. South of Clear Creek the spruce comes to the river's edge and poplar are significant only on the left limit. Stands of pure spruce occupy the right limit up to Quartz Creek. The poplars again are mixed with spruce, and are large, mature trees. The large poplars continue to the Little Crow Hills. In that region mixed stands of spruce, poplars, and alders predominate. A pair of breeding merlins was found there.

Beyond the Little Crow Hills the moist tussock tundra comes to the river's edge on the left limit. In the vicinity of the Golden Gate Falls the river engorges and the vegetation is more stunted than that above the falls. The canyon is formed by the Greenstone Ridge as it crosses the river's course. Alaska Power Administration has proposed to build a dam across the canyon to supply power to villages in the Kuskokwim Delta area.

Below the canyon the spruce give out and only small poplars remain in the drainages and low flat areas along the river. The river flows through the Kilbuck Mountains next, and remains more or less enclosed by hills to beyond Quicksilver Creek and Upper Falls. Typical low shrub vegetation dominated by alder covers the hillsides. Beyond Upper Falls the terrain opens up. Rough-legged hawks begin nesting where the tundra vegetation is more common, just upriver from Upper Falls. Golden eagle nests are regularly spaced along the 37 miles of river, averaging seven miles between pairs. D. Weir (Pers. comm., conversation, 13 November 1977) found in August 1977, an additional golden eagle and gyrfalcon upriver from where our survey stopped.

Some interesting faunal and physical comparisons can be made between the observations we made along the Kisaralik and Kanektok Rivers. These are listed below.

	Kisaralik	Kanektok
Cliffs	Numerous to abundant	Few
Stream gradient	23-ft. drop per mile	20-ft. drop per mile
Oxbows	Few	Numerous
Falcons	Present	Absent
Eagles, golden	Common	Rare
Eagles, bald	Absent	Present
Rough-legged hawk	Breeding but uncommon	Rare
Harlequin duck	Few (one seen)	Common
Mergansers	Few	Common
Arctic tern	Few	Common
Mew gull	Few	Common
Robin	Present	Absent
Moose	Present	Absent
Beaver	Uncommon	Uncommon

MISCELLANEOUS

Otter: Our final camp on the Kanektok was on the shores of a lake we called Otter Lake. Mosquitoes were not yet out in force, and tundra camping was pleasant. On the evening of June 19 we saw a river otter slip into the lake near camp. It swam underwater for a short distance (10-12 feet) and then rose vertically in the water to look at a group of loafing scoters. It did this at least twice before noticing us. Its intent seemed to be to catch one of the scoters by an underwater approach. The scoters, though not alarmed by us, became alarmed, called, and flew when they became aware of the otter.

We found two slides or runways used by the otter from the edge of the hill to the lake. Both runways were where the distances between the lake's edge, the brink of the hill, and the hill's slope down to the river were the shortest. Such an arrangement probably gave the otter maximum protection for the longest period of time while he was on land.

Warblers and Willows: We noted an obvious correlation between density and height of willows and abundance of arctic and yellow warblers. This was particularly evident on the Kanektok and was further supported by observation on the Anvik and Utukok Rivers. Dense willows over four feet high had highest populations of both species. Neither bird occurred on the Kukpuk River, where willows are usually less than three feet tall and grow only in localized areas. Where the arctic warbler was common (on the Kanektok), the yellow warbler was less so, and vice versa (on the Anvik). This relationship of differential densities held for the Colville as well.

In addition, before the yellow warblers became common along the Colville, starting in the late 1950's or early 1960's (West and White 1966), arctic warblers were common. On June 9, we heard 13 male yellow warblers along 3,500 feet of runway at Umiat, but only five arctic warblers. In 1964, on the other hand, in excess of 15 arctic warbler territories were found by White along both sides of the entire runway (5,400 feet). The implication is that one species tends to either replace the other ecologically or at least limit its numbers. Such an hypothesis would need rigorous statistical treatment in many areas and over several years before any such relationship could be established--should it actually exist.

The Rivers in Perspective--A Profile

Of the six rivers examined in the Kilbuck Mountains area, each is similar in some ways to the others, and yet some are clearly distinctive. In terms of raptor suitability we group them as follows:

- | | |
|--------------|---|
| Fog/Kwethluk | Least important. Differ considerably in size but both much the same in physiography with U-shaped valleys, good beaver habitat, and cliffs few that are high on mountains. |
| Eek | Like above in physiography. More cliffs because of the presence of the Great Ridge yet poor habitat for cliff-nesting raptors to occur in any number. |
| Kanektok | Like above in general physiography (U-shaped in structure). This is a larger river with potential for greater overall biological diversity; few cliffs high on mountains and few raptors. |

- Tuluksak Said to have had peregrines at one time (see Weir, cited above). If so, it is highly likely that the Kanektok and Kisaralik did also; more cliffs of suitable height at river's edge. Most developed by man and small in terms of water flow and physiographic extent.
- Kisaralik Most desirable; excellent raptor concentration; more riverside bluffs and bluffs in general because of canyon development. More raptors indicate greater or more-concentrated food base and thus, greater habitat diversity, including optimum nesting habitat. This river should receive special attention and deserves to be set aside as a Wild and Scenic River or be given some similar designation.

THE ANDREAFSKY-ANVIK RIVER REGION

General Description: Both the Andreafsky and Anvik-Bonasila Rivers head in a series of unnamed hills running northeast-southwest between Saint Marys and Unalakleet. Both forks of the Andreafsky River generally parallel the mountains and empty into the Yukon River at Saint Marys, while the Anvik and Bonasila head on the eastern slope of the mountain and trend generally south and then east to enter the Yukon River near Anvik. The headwaters of the Bonasila are as close as 18 miles to the East Fork of the Andreafsky, while their respective mouths are nearly 100 miles apart. Both river systems generally head at about 100 feet above sea level. Both systems generally flatten out over the lower two-thirds to three-fourths of their courses, and they maintain a gradient drop on the order of 15 feet per mile (steeper upriver and less so on the lower two-thirds).

These four rivers--Anvik, Bonasila, main Andreafsky, and East Fork Andreafsky--were examined by an aircraft overflight on June 15. The Anvik was later surveyed from boat on June 27-30. Generally, the upper one-half of the main Andreafsky, upper one-third of the East Fork Andreafsky, and upper two-thirds of the Anvik have cliff formations of a magnitude suitable for raptors. The Bonasila has no cliffs.

Geology: The physiographic features of the Andreafsky River are different from those of the Bonasila and Anvik. Although the rocks are of similar age and origin (Harrington 1918), the Andreafsky has fewer cliffs along its entire course than the Anvik and, except for East Fork, does not flow through as much wet lake and muskeg country as the Anvik and Bonasila do. The Andreafsky flows along the general

course and strike of the mountains, rather than dissecting them as does the Anvik. The mountains along the Andreaafsky also appear to be old, well-worn, and rounded.

The Anvik and Bonasila flow largely through a Recent alluvium and through silts and gravels of Pleistocene. Along the east side (left limit) of the Anvik downriver from the Yellow River, the bluffs are largely formed from Cretaceous slates, quartzites, and conglomerates that erupt from the worn hills. Above the Yellow River many more cliffs occur and are largely basaltic flows, quartzites, and andesites. They form structures that are suitable for raptor nesting.

Vegetation: Vegetatively the region is characterized by what Viereck and Little (1972) refer to as a closed spruce-hardwood forest. Specifically, however, major portions of all the rivers have spruce, birch, and/or poplar growing right to the river's edge. Willows or alders often form a rather narrow fringe adjacent to the rivers in a riparian shrub zone. Frequent muskeg marshes occur overland a short distance from the river, and generally the hillsides are spruce- or birch-covered. Tundra vegetation also dominates some of the areas peripheral to the spruce forests. Much of the forest along the Anvik had burned within the past few years and in some cases dead spruce snags were all that remained above the brushy alder undergrowth.

BONASILA RIVER

General Description: This river was examined from a low overflight in a Cessna 206 of June 15. Rather dense spruce-birch forest along the river comes to the river's edge. In some places muskeg is dominant. The river flows through a broad, gently sloping valley on the upper reaches but over a meandering course within flats over most of its course.

Only where Jackson Creek joins the river is there a bluff, but it is suitable for peregrine nests. In fact, the pilot saw a large "dark" falcon close to the aircraft as we passed the cliff. No obvious sign of use by raptors could be seen. Beaver sign was abundant adjacent to the river.

MAIN ANDREAFSKY RIVER

General Description: As with the Bonasila, the lower portion of the river flows through a spruce-muskeg valley although it is much more enclosed by the adjacent hills. About 25 miles up from the mouth, medium-sized (40-50 foot) bluffs begin. They remain scattered, however, until about 60-65 miles upriver from the mouth. From that point over the next 30 miles there are occasional bluffs, and they occur up through the last major fork. The vast majority of the

foregoing, however, is not on BLM land. In all, about 12 specific cliffs were examined.

A harrier was seen near the river mouth, a gyrfalcon was soaring near the first bluff (25-30 miles above mouth), and two rough-legged hawk nests and two golden eagle nests were found (Appendix C). Several additional unused rough-legged hawk nests were located. One of the most conspicuous birds on the river was the merganser (presumably mostly red-breasted mergansers). One black bear was seen near the first bluff.

EAST FORK ANDREAFSKY RIVER

General Description: The lower three-fourths of the river (up to about 40 miles above the mouth) meanders through a rather wide valley. Bluffs start about 60 miles upriver from the mouth and occur at intervals over the upper 24 miles. In all, about 13 cliffs were examined. Unused rough-legged hawk nests were found on three cliffs, while two pairs of gyrfalcon nested on two. The latter two were within six miles of Iprugalet Mountain. A bald eagle or osprey nest was located about 36 miles above the mouth. A flock of 20 white-fronted geese was seen and, as on the main Andreafsky, mergansers were common.

While we did not encounter any peregrines, Mr. Gil Mull, formerly of the USGS-Anchorage, reported (pers. comm.; conversation, July 1968) that he had found a "couple of" peregrines along the Andreafsky in the early 1960's. H. C. Kyllingstad, Mountain Village, also reported that peregrines "nested" on the Andreafsky, and we presume he meant the main fork (See Cade 1960). Time and logistics prevented us from floating the rivers, but it is possible that peregrines may still occur there, especially along the main fork.

ANVIK RIVER

Although we examined this river from aircraft on June 15, we examined it again from a boat on June 27-30. Our findings follow:

Narrative: The only wildlife seen from the air, not confirmed on the ground, were moose near Runkels Creek, Swift River, and about six miles above Otter Creek. Bear were seen near Swift River (black bear), Canyon Creek (brown bear), and about eight miles upriver from Otter Creek. On June 27 at 1515 hours we arrived by a Hiller FH 1100 helicopter at a river bar (T23S, R9W, Sec. 35 Center, Unalakleet B-3 Quad). The helicopter made a second trip to bring the rest of our supplies and arrived at 1630. At this point we were about 55 miles upriver from the last bluff and about three miles below McDonald Creek. We assembled the raft and started downriver at 1655.

We made our first camp at 2400 hours on a bar about 10 straightline miles downriver (T24S, R10W, Sec. 28 Lower, Unalakleet B-4 Quad). On June 28 we broke camp at 0905. River conditions were generally good, but we frequently dragged bottom, which caused some small punctures in the boat. We arrived at a second camp--a long, narrow, and well-vegetated bar--at 2100 hours (T27S, R11W, Sec. 27 Center, Unalakleet A-4 Quad). Both days were sunny and warm, and a wind developed by the evening of the second day.

On June 29 we broke camp at 0915 and traveled the rest of the river containing bluffs by 1700 hours. We made camp then on a bar on the right limit (T32N, R60W, Sec. 10 Center, Holy Cross D-4 Quad). The helicopter arrived to take us back to Unalakleet on June 30 at 1220 hours.

Profile: The physiography of the river over which we traveled was essentially of two types. Upriver from the Otter Creek confluence, the hills stay close to the river; below that part, they remain farther offriver. Downriver from the point at which we left the river, the river enters flat muskeg habitat and has many meanders and oxbows. Most conspicuous was the lack of well-developed willow and alder stands fringing the banks. Instead, spruce and poplars come to the water's edge. The recent burn which covered a large area along the river, killing the spruce, doubtless affected the density or diversity of animals. Red squirrels were uncommon, for example. Although the burn affected the major terrestrial vegetation, beaver sign (cutting, etc.) was common, as were moose droppings and tracks. Several of the islands on the lower portion of the river had extremely large poplars and seemed to have escaped this burn.

In all, 26 cliffs were examined, of which 11 contained either old stick nests or breeding pairs of rough-legged hawks or gyrfalcons. Eight pairs of breeding rough-legs were found and three old nests were located. One nest may have been an eagle nest.

Items worthy of comment include the presence of principally birds rather than mammals as prey in several rough-legged hawk nests. At two nests both members of the pair were dark phase (black or red), while a fifth "black" male was mated with a pale female. Age of the young varied over about a 10-day range.

It significant that from our first aircraft overflight on June 15 we located nine of the eleven nests we later found from the river.

The gyrfalcon pair was of interest because they were feeding largely on birds other than ptarmigan. The identified prey remains in the nest are listed in Appendix D.

Because of the uniformity of the vegetation along the river and the effects of the burn, it is meaningless to try to characterize the river along the course. Significant elements of the avifauna merit mention.

Canada geese were extremely common and seen usually as pairs, some with young or in flocks of up to 20 birds. They occurred along the entire river, starting as far up as two miles below our beginning point. Mergansers were even more common than geese. We also noted that mergansers were common along the Andraefsky River and slightly less so along the Bonasila. The clear water conditions and dropping water may have been conducive to fishing, causing them to concentrate along the river from adjacent lakes. No broods nor indication of breeding behavior were noted among mergansers along the river. It is interesting to note that female-plumaged birds (females and both sexes of year-old birds) outnumbered adult males by about three to one (see species account).

The harlequin ducks seen were most frequently in groups. As sighting became less frequent, they usually were of single, female-plumaged birds attending groups of mergansers. The last ones noted were a pair just downriver from the mouth of Runkels Creek. Upriver from Otter Creek several were seen for each river mile traveled.

The abundance of cliff swallows and the virtual lack of the normally ubiquitous bank swallow were striking. The largest cliff swallow colony contained about 50 pairs and almost every small outcrop along the river held a colony. Colonies were spaced at intervals of about one for each one and one-half to two miles of river. Small colonies were at both the first and last cliffs we examined. Nests were as close as five feet from the gyrfalcon eyries.

The noticeable paucity of arctic warblers was also striking. Although the habitat was not extensive, they were neither seen nor heard in likely looking habitats. When first noted, they were singing from patches of rather low-growing alder.

Golden eagles occupied widely separate cliffs about two miles above our last camp and about two miles below our first camp, but there was no evidence of breeding. Bald eagles apparently occur only below the mouth of the Yellow River, where we noted one nesting pair about 12 miles below the mouth. We were told of a second nest about nine miles below the mouth.*

*Alaska Department of Fish and Game, fish survey personnel, conversation, 29 June 1977.

We were disappointed to find no peregrines on the highest cliffs that looked most likely to house them. Only glaucous gulls bred on those cliffs just upriver from Canyon Creek.

MISCELLANEOUS

Merlins were first noted as a male attacked a golden eagle that occupied a cliff about one-fourth mile from the nest site. At about 1115 hours, as we watched, the female merlin took food from a cache in a tall living spruce. The male left the area at 1120 hours and at 1130 hours returned with a white-crowned sparrow. The nest, with four five-to-six-day-old young, was on the ground on a burned-over but regrowing hillside with a 40-degree slope. The nest was about 200 yards off the river, 100 feet up the hillside, and was situated under the root system of a leaning birch. A complete "screen" of alder about 18 inches tall covered the nest; it was completely hidden. There were no obvious openings in the screen through which the adults could enter the nest.

A hawk owl nest was situated in a spruce snag about 20 feet up in a shallow depression produced by a U-shaped fork of the main trunk. Both adults were present and one, presumably the male, left the area at 1000 hours, returning within 10 minutes with a freshly killed fledgling pine grosbeak.

THE UNALAKLEET-KATEEL REGION

General Description: The area north and northwest of Unalakleet contains a series of rivers draining the mountain range in which Debauch Mountain is about the center. The Nulato, Kateel, and Gisasa Rivers drain northeast into the Yukon River, while the North Fork Unalakleet, North, Shaktoolik, and Ungalik drain into Norton Sound and Norton Bay. All seven rivers head at about 2,000 feet elevation and pass through more or less open forested regions. Some have broad U-shaped valleys, as does the Kateel.

Geology: Cass (1959) and Patton and Bickel (1956) have described the geology of this region as having large amounts of Pleistocene outwash along the valleys. The rivers with the most significant cliffs are the Ungalik and Shaktoolik. They are physiographically similar in that they are engorged in a narrow canyon over parts of the course. The Ungalik has massive amounts of Cretaceous border facies of siltstone, sandstone, and poorly sorted conglomerate. These rock types have formed high pinnacled ridges, whereas on the Shaktoolik, which has more Cretaceous shale and grit, high outcroppings are decidedly less common. The Shaktoolik, however, cuts a deeply encased gorge through the shale and grit.

Vegetation: All of the drainages flow through upland spruce-hardwood forests that for the most part are surrounded at higher elevations by alpine tundra. The vegetation of the region is not much different from that one finds over most of interior Alaska.

NORTH FORK OF THE UNALAKLEET

We surveyed the river on June 23, 1977, covering 30 miles in a Cessna 206 aircraft. This wide valley is heavily forested, with spruce-poplar forest appearing densest along the river margins. There is a 10-12 mile section of cliffs beginning five miles upriver from Old Woman Mountain. The gyrfalcon, raven, and golden eagle nests found on the upper stretch of the section were the only nests sighted along the river. Red-breasted mergansers were common on the river. Above the white-water area, one beaver was sighted.

NORTH RIVER

This river was surveyed in a Cessna 206 on June 25. We covered a distance of 46 river miles. Like the Shaktoolik River, the North River is engaged in its upriver portions between 400-500 feet elevation. There, in a distance of approximately five miles, is the only raptor nesting habitat encountered along the river course. One gyrfalcon nest, one rough-legged hawk nest, and a lone adult golden eagle were spotted there. As on many rivers in the Unalakleet area, the red-breasted mergansers were frequent to common. Snipe, ravens, and Canada geese were also noted on the river.

NULATO RIVER

We surveyed this river by low overflight with a Cessna 206 on June 24. Although the upper one-third of the river contained suitable raptor nesting cliffs, no nests were located. The cliffs, which we thought had potential for nesting raptors, were spaced from 1.5 to 2.0 miles apart. We considered the valley floor rather wide. The right limit of the river cuts the hills, forming the necessary bluffs or banks. The left limit has gently sloping hills covered with spruce. No raptors were seen along this river.

SHAKTOOLIK RIVER

We surveyed the river in a Cessna 206 on June 24, 1977. From approximately T10S, R5W, Sec. 16, SE Corner, to Kingmetolik Creek confluence in T9S, R8W, a 10-12 mile section of the river contains virtually continuous sets of cliffs 30-45 feet in height. On occasional river bends, the banks extend up the hillside 100-125 feet.

Our pilot was not able to slow the plane to a speed at which it was safe to view the cliffs. We surveyed downstream to the NW corner of T13S, R10W.

On July 11, 1977, the river was surveyed from an FH 1100 helicopter. The survey began at T10S, R5W, Sec. 16, just up from the Brass Pan Creek confluence. Above this point the cutbanks are insignificant and the cliffs nonexistent. The area is principally tundra. From Brass Pan Creek downriver, the river is lined with cliffs. Along the entire 10-12 mile cliff section (30-45 foot cliffs), only one nest was located. This nest was that of an active golden eagle, and one adult was seen shading a nestling. A gyrfalcon nest was located upriver approximately three-quarters of a mile. It contained four young at the fledgling stage. The gyrfalcon nest was on a cutbank approximately 125 feet above the river. Five inactive stick nests were found on the large cutbanks.

Below Kingmetolik Creek we observed no nests or suitable nesting situations until T12S, R9W. From this point downriver there is a cliff or cutbank every 1.5 mile for a distance of seven miles. This section of the river had two nests--a rough-legged hawk nest and an unidentified nest. Three immature ravens were seen in the area.

Several interesting conditions exist on this river. Abundant nesting localities are available to raptors, yet there appeared to be no nests on the 30-45 foot cliffs. Two questions arise: Why do raptors choose to nest on the higher cutbanks over the shorter cliffs adjacent to the river, and what mechanism is working in this river system to account for only 18 percent occupancy of existing nests? These questions become more interesting when one considers the Ungalik River to the west, which has a much higher raptor population.

In 1977 we observed a generally low density and productivity of rough-legged hawks nesting in western Alaska. The low occupancy rates on the Shaktoolik River nests further support our findings. Perhaps in optimal years these nests were occupied.

UNGALIK RIVER

We first surveyed this river on June 25 in a Cessna 206. Our initial impressions were that the lower one-third of the river should be investigated further for peregrines. We located two gyrfalcon eyries in this broad river valley--one in the lower one-third of the river, the other in the upper one-third of the river. As we left the valley, we felt that of all the rivers viewed in the Norton Bay area, this river held the best chance for peregrines because of such attractive features as the cliffs, water flow, and hunting expanse.

On July 11 the lower one-third of the river was resurveyed in a Hiller FH 1100 helicopter. Gyrfalcon nests were located at approximately five-mile intervals. Along the total river, we counted four pairs of gyrfalcons that produced 11 young. Two golden eagle nests were located with four young (two per nest). One raven nest was also found. A total of six nests were located in a 20-mile stretch of the river.

Seven miles to the east is the Shaktoolik River. It is interesting to note that the Shaktoolik has a paucity of nesting raptors compared to the nearby Ungalik River. This is particularly interesting when one considers the miles of cliffs along the Shaktoolik available to raptors, as opposed to the few nesting cliffs existing along the Ungalik.

In the Unalakleet area, the Ungalik River's lower one-third has by far the most raptors. In terms of gyrfalcons and golden eagles, populations along the river are equivalent to those in high-density areas elsewhere in the state.

KATEEL RIVER

On July 20, we surveyed this river in a Cessna 206. Sixty-two river miles were checked beginning at T4S, R1W, SW Corner, approximately five miles up from Arvesta Creek, and terminating at the confluence of the Kateel and the Koyukuk. There are very few cutbanks along the river margin as a result of a very low gradient. The river meanders a great deal and has many oxbows. The stranded river sections within the oxbows form excellent standing ponds for aquatic vegetation to grow. These ponds provide excellent moose habitat. In 15 river miles, we saw more than 13 moose in these ponds.

Although no cliff nesting raptors were located, and a total of only five suitable raptor nesting cutbanks were seen, the cutbanks which were present harbored many colonies of bank swallows. Other wildlife included female red-breasted mergansers and glaucous-winged gulls.

Vegetation in this broad river valley is composed mainly of wet tundra. Along the river course spruce-poplar stands exist, with the best-developed stands at bends of the river.

GISASA RIVER

We surveyed this river on July 20 in a Cessna 206. Fifty-eight miles were examined, from the mouth of the Gisasa upriver to T8S, R2W, NW Corner. We found only two shale-walled slopes suitable for raptors, but saw no raptors. The river meanders, but unlike the Kateel, has few sections that are cut off from the main flow to form the ponds that provide moose habitat. Only six moose were seen in a 15-mile

stretch of the river. Near the river's mouth, we saw one grizzly bear fishing for migrating salmon. One large salmonid was seen making its way over a shallow bar near the bear.

The Gisasa river valley is narrower than the Kateel valley, and has dense stands of spruce extending at points to the valley edges. The bluffs which were present were totally covered with mixed deciduous stands.

The Unalakleet Area Rivers in Perspective

Except for the lower one-third of the Ungalik River, the rivers in the area are raptor poor. Along the North River and the North Fork of the Unalakleet River, only a small percentage of distance has suitable raptor nesting sites. These areas are presently used.

In contrast, the Shaktoolik has miles of bluffs, cutbanks, and rock cliffs. Yet along this river, we counted few nests, with low occupancy rates, indicating that the Shaktoolik is as raptor poor as other rivers which are less well-endowed with potential nesting sites.

The Kateel and Gisasa river valleys lack the necessary nesting sites. Extremely meandering drainages, caused by low gradients, and wide river valleys with low sloping hills partially account for the low raptor density. However, the moose habitat is the best we've seen in our work in western Alaska in 1977.

We have ranked the following rivers in order of significance as present and potential raptor utilization:

1. Ungalik River
2. Shaktoolik
3. North Fork Unalakleet
4. North River
5. Nulato
6. Gisasa
7. Kateel

THE NORTHWESTERN ARCTIC REGION

General Description: This area of discussion is basically that region west of 160° W. lat. and north of Kivalina or about 68° N. lat. Its rivers drain southwest, west, or north from either the De Long Mountains or the Brooks Range. The rivers we examined either by air or by boat between July 8-27 are the Wulik, Kivalina, Pitmegea, Kukpowruk, Ipewik, Kokolik, Kukpuk, and Utukok.

In general, these rivers have their headwaters at about 2000 feet elevation and flow over alpine tundra of a low relief near their upper reaches, thence through a series of foothills until finally they reach more open terrain of low relief near the coast. Most of the cliff-nesting raptor habitat was found in the upper or middle reaches of these rivers. The rivers vary considerably in length, size, and amount of water flowage; the Utukok and Kukpuk are the largest.

Geology: The bluffs throughout this region are close together and conspicuous, and their presence is one reason for high raptor densities. The Kukpuk and Ipewik are superposed across the general structural grain of the area which is basically carboniferous Lisburne limestone and dolomite beds (Campbell 1966, Smith and Mertie 1930). Triassic limestone beds cutting across the general trend of the rivers are also exposed. The specific area we traveled on the Kukpuk is described by Sainsbury and Campbell (1959), but we did not have access to that report.

The nature of the geologic formation on the Utukok also explains the general lack of bluffs and their poorer development there. The Utukok flows through large amounts of Recent and Pleistocene stream terrace and beach deposits and Cretaceous shales, silts, and sandstone. Only occasionally does it bisect a series of synclines or anticlines (Folsom Point, Flintchip, Archimedes Ridge, etc.) where bluffs and cliffs are locally formed (Chapman and Sable 1960).

The major key to the biological richness of the Northwest Arctic region lies in the extensive limestone bedding and the crosscutting each river makes through these formations. Such geology, however, has had less development on the Wulik and Kivalina Rivers.

Vegetation: The vegetation is rather uniform throughout the region surveyed and is best characterized by what Viereck and Little (1972) refer to as moist or wet tundra. The major differences between any of these rivers were either the extent of wet boggy areas adjacent to the river or the degree of development of the willow fringes along the river bank. Both bogs and willows affect the composition of the avifauna. This will be expanded upon later when the Utukok and Kukpuk Rivers are compared.

WULIK RIVER

General Description: This river was examined from a low overflight in a Helio Courier on July 8 and 10. The river heads at around 2000 feet in the De Long Mountains and flows generally south by southwest and enters the Chukchi Sea at the village of Kivalina. Cliff structure occurs only on the upriver one-third of the river, and except for the rather steep, canyon-enclosed area (T32N, R20W, De Long Mountains),

only about seven cliffs of any magnitude are there. Downriver, a shale-gravel bluff reportedly had "falcons" at one time (Nelson Walker, bush pilot, Kötzebue, conversation, July 1977). However, it appeared only marginally suitable for peregrine and not at all suitable for gyrfalcons.

About three miles downriver from the mouth of the "canyon," a mining operation is in progress. Several golden eagle nests were found both upriver and downriver from the canyon as well as within the canyon. A gyrfalcon nest and a rough-legged hawk nest were in the canyon but could not be examined because of bad air currents. Except in the "canyon," the river appears to have marginal habitat for raptors over most of its course.

KIVALINA RIVER

General Description: The Kivalina was examined from a low overflight in a Helio Courier on July 10. Like the Wulik River, the Kivalina River heads in the DeLong Mountains at about 2,000 feet, flows southwesterly to enter the Chukchi Sea about 10 miles north of the village of Kivalina. It has only slightly better habitat than the Wulik. The upper third of the river is in flattened valleys of glacial gravel, and generally the cliffs are far back on the mountains. The middle one-third of the river contained the most raptors, with golden eagle, rough-legged hawk, and gyrfalcon nests. In addition to the river-cut cliffs, a prominent ridge is on the right limit at the upper end of the middle third of the river. Here, cliffs are bold and conspicuous and are farther from the river. The south fork of the river appeared to contain the best habitat.

The lower one-third of the river passes several sets of hills on the right limit (Ipitanga, Hili, and Uyaraksivik Hills), and there, more cliffs are formed. These had a high density of rough-legged hawks, and also a golden eagle and gyrfalcon. In all, the river had six areas of rough-legged hawk nests (three active) and two areas each of golden eagle (one active) and gyrfalcons (both active).

PITMEGEA RIVER

General Description: Portions of the middle section of this river were examined from an overflight in a Helio Courier on July 10. The Pitmegea has only minor bluff formations. The general physiography has been described in detail by Childs (1969). That portion of the river checked, between 5 and 18 miles inland, was reported by Childs (1969) to have nesting peregrines. Childs found peregrines nesting 16 miles and 12 miles inland. Approximately at those locations, we found one pair of rough-legged hawks nesting on the right limit at the

lower one, and another pair on the left limit at the second. The two cliffs that Childs described fit nicely the areas where we located the rough-legs.

It is entirely possible that we missed any nesting peregrines because on the date of the flight, eggs would have been near hatching and females would be sitting tight.

A total of five cliffs were examined. We found that the old landing strip about 14 miles inland used by oil camps in the 1950's is still in good shape. No large mammals were seen, but squirrels were abundant. This river generally would be classed as poor for raptor habitat.

KUKPOWRUK RIVER

General Description: We flew over only that portion of the Kukpowruk that extends upriver from the limits of Native-claim lands, or about Raven Basin. It was examined from a low overflight in a Helio Courier on July 10.

Many good cliff-lined sections appear to occur downriver from Raven Basin, and the entire river should be checked on the ground to determine the presence of peregrines.

In all, about 12 cliffs were checked as carefully as could be done from the Helio. Gyrfalcons were found on cliffs immediately downriver on the left from Raven Basin. A second area where bluffs are concentrated is about six miles upriver from Raven Basin. There golden eagles and rough-legged hawk nests were located. The river then winds over a flat plateau section for perhaps 15 miles before it once again cuts bluffs along hillsides. Here rough-legged hawk and golden eagle nests were again found, and a sow grizzly bear with three cubs was seen.

Scattered cliffs occur over the next 15 or so miles, and to the west of Chevron Hill, a gyrfalcon eyrie was located. The only large mammals seen, other than the aforementioned bear, were a caribou cow and calf near Chevron Hill.

The river has good raptor potential, and in good rodent years may host as many as 10 to 12 rough-legged hawk nests. Since the Pitmegea was known to have peregrines in the 1950's (Childs 1966), that portion of the Kukpowruk we examined almost certainly supported from three to five pairs of peregrines also in the 1950's.

IPEWIK RIVER

General Description: The Ipewik was examined from low overflight in a Helio Courier on July 8 and 9. This is an excellent river for raptors and along with the Kukpuk, upper Kokolik, and Kukpowruk, provides the prime raptor habitat in northwestern Alaska. Generally, from its confluence with the Kukpuk it is engorged in a rather narrow canyon over the first eight to ten river miles. Within this area, we found two golden eagles, one gyrfalcon, one raven, and one rough-legged hawk. Where Maktak Mountain touches the river, some 15-18 miles from the mouth, we saw a small concentration of eagles, ravens, gyrfalcons, and rough-legs. Beyond Maktak Mountain the river enters an area of low relief for about six to eight miles. From that point on, the cliffs are scattered along the river at rather regular intervals. About 15 river miles downriver from Horseshoe Bend, the river again enters low relief and there we saw large flocks of molting, flightless Canada geese. Upriver from Horseshoe Bend the cliffs are sparse.

Water in the river was generally low and would have been hard to negotiate. The river is small and probably could be best traveled during June or in years of better water conditions.

Five grizzly bears were seen on the river, and caribou tracks were abundant although the animals had presumably moved to other localities as none was seen.

Perhaps the greatest potential of the Ipewik, along with the Kukpuk, is as a locality for molting and nonflying geese. More than 200 Canada geese were seen on the Ipewik.

KOKOLIK RIVER

General Description: The Kokolik is a long river compared to the Ipewik, Kukpowruk, and Pitmegea, but only over its upper one-third does it have good raptor habitat. We surveyed the Kokolik from a low overflight in a Helio Courier on July 9. Although most of the river downriver from Avingak Creek is of low relief with only minor areas of bluffs, the area upriver from Avingak Creek has a rather concentrated series of bluffs and raptors. The river bisects the Kiklupiklak Hills and passes through the Snowbank Anticline and Howard Syncline. Several rough-legged hawk, gyrfalcon, and raven nests were found on the bluffs, and a peregrine, presumably a nonbreeding bird, was seen.

Upriver from the above-mentioned series of bluffs for about 10-15 miles the river passes through a lowland wet tundra area of low relief until it once again bisects Archimedes Ridge and its associated anticlines and synclines. Another series of cliffs occurs there.

Once upriver beyond the Archimedes Ridge area, the river is of rather low relief as it passes through upland tussock tundra and muskeg region characteristic of the Arctic Slope.

Although the Kokolik has rather limited habitat for raptors, considering its length, we were impressed by the concentration of them over a short distance. The upper half of the river is small and would be difficult to float at any time except in June.

We saw no groups of geese along the Kokolik nor any bear. Caribou tracks were abundant in the muds and sands along the river.

KUKPUK AND UTUKOK RIVERS

In addition to examining both rivers from a low overflight in a Helio Courier on July 8, 9, and 10, we floated (dragged) both rivers in a boat; the Utukok, between July 12-19 and the Kukpuk, July 21-28. Although we examined by air the entire length of the Utukok between the Driftwood Landing area and the junction with Carbon Creek, we also floated it. Only about one-half of the Kukpuk seen from the air could be floated because of low water. Following are our findings from the respective float trips, plus comments on that portion of the Kukpuk not floated.

UTUKOK RIVER

Narrative: We arrived at the Driftwood Landing Strip (T6S, R39W, Misheguk Mountain) at 2027 hours on July 12, in a Cessna 206. The night was clear and calm and the mosquitoes were out in hordes. At that point we could already tell that floating conditions were poor because the river was so low. We camped the first night at the landing area. By morning an upriver wind of 10-12 mph was blowing, and it continued with only intermittent lulls throughout our trip.

On July 13 we broke camp at 0820 and at 1100 hours arrived at the first "canyon" with cliffs, about one-half mile downriver from Nimwutik Creek. The only significant habitat was within the canyon itself. We traveled until 2300 hours that night and made our second camp about 14 river miles (four straightline miles south of Archimedes Ridge) at T4S, R37W, Sec. 5 Center, Utukok River 4-B Quad. We traveled 23 miles on that day and used about one-half of our gasoline, because of the low water and strong upriver winds.

On July 14 we broke camp at 0830 hours. Winds were still upriver, strong and cold. We pulled the boat for most of the day and made camp about 20 miles farther downriver (T2S, R36W, Sec. 34, Utukok River A-3 Quad) at 2345, about three miles beyond Archimedes Ridge.

On July 15 the upriver winds had diminished and the sky was clear and temperature cool. We visited the eagle nest just above camp since it was in such an unusual setting, on the flat surface at the brink of a muddy shale bluff. We broke camp at 1230 and once again pulled the boat for most of the day, traveling about 18 miles. We camped (T2S, R34W, Utukok River) at 0200 on July 16. Air temperature at midnight was 40° F and had dropped to 36° F by 0200 hours.

On July 16 the sky was clear and it was much warmer, but winds held at about 10 mph upriver. We broke camp at 1140 hours. By the time we reached Disappointment Creek, the river generally ran more water and we were able to once again use the motor. We reached our pickup point at 2220 hours. Air temperature at 2400 was 30° F.

Our pickup aircraft was scheduled to arrive in the morning of July 17. It didn't come, and we spent July 17 and 18 exploring the vicinity. On July 19 our aircraft (C-206) arrived at 1315, having been fogged in at Kotzebue for the previous two days. We arrived back in Kotzebue at 1514.

Profile: The most impressive wildlife observations we made on the Utukok were the abundance of ground squirrels and golden plovers and the lack of fish as indicated by our fishing efforts and the limited numbers of fish-eating birds (arctic terns, gulls, and mergansers). Perhaps downriver from Carbon Creek the latter condition changes. Over that portion we traveled, the Utukok has three very different types of terrain: canyons with good cliff structure on both sides of the river; flat terrain with shale or gravel bluffs adjacent to portions of the river and usually only on one side of the river; and flat, boggy, and completely exposed terrain. The latter two make up majority of the terrain.

The gradient of the river is about nine feet per mile fall between Driftwood and Carbon Creek. About five miles below Driftwood the river passes through the first canyon. Not only did we find falcons there, but we were excited to find Say's phoebes. The canyon seems to be the area which separates, ecologically, the habitat of the wandering tattler, which breeds above it, and the spotted sandpiper, which breeds below. The species appear to be allopatric and ecological equivalents.

The river next flows through a flat open area for some 15-18 miles with only limited bluffs on the right limit. Willows along the river are sparse and generally below four feet in height. The upriver portion of Archimedes Ridge produces enough hills to cause a canyon effect over the next 20 miles. The hill slopes are covered in part by alders, and willow are slightly taller. Northern shrikes were first recorded in this region as was a bluethroat. Both are associated with either moderately well-developed willows or alder stands.

The river once again flows through a flat area and is characterized by split and meandering channels. It is here that the large, most impressive shale bluff along the river occurs and upon which the last peregrine on the river was known to nest, in 1971 (Fyfe, Temple, and Cade 1976). In 1953 as many as four peregrines nested along the river between Driftwood and Disappointment Creek (Fyfe et al. 1976) where none nest now. Finally, beyond this bluff no more bluffs or falcons occur until the river enters the canyon into which Disappointment Creek empties. The canyon runs about five miles on either side of Disappointment Creek. The last raptors before the river reaches Carbon Creek nest here. R. Ritchie reported, however, that several gyrfalcons were nesting on a short stretch of Carbon Creek immediately upriver from its confluence with the Utukok in 1977.*

We examined 20 cliffs or riverbank gravel bluffs. Nine of them contained rough-legged hawk nests, three had golden eagle nests, two had gyrfalcon eyries, one had a raven nest, and one had an old nest used by either ravens or gyrfalcons.

MISCELLANEOUS

Rough-legged hawks: Most species of birds have clear-cut periods of inactivity that usually occur at night. The rough-legged hawk doubtless does also, but during the summer these periods are probably poorly defined. On July 15 we saw an adult male hunting over a tussock flat at 2420 hours. We have also noted them hunting on the Colville River at 0100 and 0200 hours. Light conditions at those times simulate those of crepuscular hours, and the rough-leg is noted for its crepuscular hunting activities while on the wintering grounds.

Golden eagle: On July 15 we located a golden eagle nest in a most unusual situation. The nest was in front of a high alder screen at the brink of a 35-foot bluff. The nest was essentially on flat ground and easily approached from behind. In its location it was much like nests of peregrines on the Colville or ferruginous hawks in western United States, but was totally unlike other eagle nests with which we are familiar.

Northern shrike: Shrike were more common than we have heretofore seen them on other arctic rivers. This was surprising because of the limited areas containing willow of any size. It may be that they can more readily breed in smaller willow than we formerly presumed. On July 16, near Disappointment Creek, a shrike was seen carrying a large rodent (about the size of a large adult male brown lemming or tundra vole) in its feet. The shrike's manner of carrying the prey as it flew along about 60 feet in the air made it seem like an accipiter.

*Pers. comm., conversation, August 5, 1977.

Fish: Our impression is that fish are in low numbers or poorly represented in the Utukok. This was suggested not only by the near absence of fish-eating birds, but also our poor success in fishing.

Spotted sandpiper - wandering tattler: We were again impressed as we had been previously on the Canning River (1971) with the obvious replacement of one species by another that moves down (north) an elevational gradient. We commented earlier on the separation of the breeding ranges on the Utukok by the first canyon downriver from Driftwood Creek. The northern distribution of the tattler as a breeder is not mentioned by Gabrielson and Lincoln (1959), and they only mention the headwaters of the Killik River as a northern locality. The Utukok River may represent the northern limits of its range in western Alaska. Likewise, the northern limit of breeding by the spotted sandpiper is given by Gabrielson and Lincoln (1959) as the Colamagavik River, a tributary that enters the Colville at about 69°00' N. lat. We found downy young spotted sandpipers on the Utukok near the mouth of Carbon Creek at about 69°20' N. and the Utukok River may well also represent the area of northern breeding limits in western Alaska.

KUKPUK RIVER

Narrative: We left Kotzebue for the Kukpuk River at 1610 hours on July 21 in a Cessna 206. We arrived at a river bar (T32N, R19W, Sec. 26, Point Hope A-1 Quad) about one and one-half miles downriver from the Alolukrok site at 1720. We had the boat assembled and loaded and started downriver by 1830 hours. The river conditions even that far down river were poor, and we had to pull the boat over many areas. We camped at a bar (T32N, R29W, Sec. 16, Point Hope A-1 Quad) at 2200, having traveled four miles.

On July 22 we broke camp at 1010. Air temperature was 68° F and water temperature was 50° F. The sky was clear and there was only a slight downriver wind. We traveled 15 miles and made camp by 2045 at the mouth of the Kakpeyak River (T33N, R29W, Sec. 16, Point Hope B-1 Quad). This was one of the most pleasant camping spots we had for the entire summer.

On July 23 we broke camp at 1050. Smoke from the tundra fires near Kotzebue and the Noatak began filtering into the area, causing a hazy overcast. We explored the hillside up Saligvik Creek some distance. Considerable time was spent in the cliff area immediately downriver from Saligvik Valley. We made camp at 2100 about one-half mile downriver from Angmakrok Creek (T34N, R30W, Sec. 32, Point Hope B-2 Quad) at 2100 after traveling about eight and one-half or nine miles.

Smoke still persisted on July 24 and in some places visibility was down to about two miles. The day was a pleasant 57° F and we broke camp at 1000. We spent most of the morning and early afternoon along bluffs in the area of Koyaksak Mountain. Water was so low that we had to carry the boat over a distance of eight-tenths of a mile on a stretch upriver from the mouth of the Ipewik River. We arrived at the Ogsachak Site (T12S, R59W, Sec. 30, Point Hope B-2 Quad) at 2000 and made camp, having traveled 10 miles.

Wind was blowing about 10 mph downriver on July 25. Smoke was still moderately thick. We spent the morning at the cliffs across from camp and finally broke camp at 1325. Moderate to heavy rain lasted for about an hour in the late afternoon and we camped downriver about 12 1/2 miles near Itublarak Site (T12S, R61W, Sec. 12, Point Hope B-2 Quad) at 1830. We spent the early evening tending to a fledgling gyrfalcon that had been shot by Natives.

We spent the early morning of July 26 working on cliffs where the temperature exceeded 85° F. The morning was absolutely calm. We broke camp at 1145 and after exploring lakes in the area of Toktelah Creek, we made our last camp on the bar we were to be picked up (T12S, R61W, Sec. 11, Point Hope B-2 Quad) at 1700 hours. Our aircraft arrived in very thick, smoky conditions on the morning of July 27 at 0930 hours. After a brief stop at Cape Thompson to check with biologists about peregrine occurrences there, we returned to Kotzebue at 1205 hours.

Profile: Perhaps some of the most interesting parts of the Kukpuk had to be bypassed for on-the-ground work in 1977 because of extremely low water conditions. We examined the upriver half from aircraft, starting our survey opposite Mount Kelly. We examined about 20 cliffs downriver to the point where we started our work from boat. Part of the upriver section is so winding and we were flying so low that we became disoriented and some of the bluffs may be incorrectly placed on the maps.

We observed a minimum of three gyrfalcons, one golden eagle, and three rough-legged hawks nesting among the cliffs. The upriver portion of over 60 miles had several groups of molting geese. The area opposite Spiny Ridge had three different flocks of perhaps 80 to 100 each. Five groups of caribou of perhaps 200 animals each were also seen scattered at intervals along the upper 60 miles. Several long 10-20 mile stretches of river without bluffs occur downriver from Spiny Ridge.

The Kukpuk had surprisingly few stands of willow taller than three feet. The entire vegetation association was largely that of dry tussock tundra, except for an occasional boggy area. Wild rye began

to appear at the mouth of the Kakpoyak River and was found in patches along creeks from there to our last camp. Willows over four feet tall were found in a long one-half mile stand about eight miles downriver from the Alolukok site. Here, bar-tailed godwits were very numerous. We observed 10 or more. We were to see patches of tall willows at two other places and godwits were common there also. Apparently they move with young to these patches of willows at post-breeding times. Since the large willow patches were so few and the presence of godwits so obvious in the patches, they stood out in stark contrast to the vegetation along other parts of the river. Bluffs occur sporadically along the river, mainly on the left limit. At a point where Sigrikpak Ridge hits the river, several nice bluffs are formed. Over the 20 miles from our first camp to our second camp there were eight major bluffs, three of which contained old rough-leg nests and one each an active rough-leg and golden eagle nest.

Below Saligvik Creek, cliffs were loosely grouped in four major areas: Saligvik Ridge, between Kokviat Creek and the Ipewik; near Ogsachak; and in the big bend downriver from Iturblarak. Thirty-three distinct groups of bluffs were examined and about half of these contained either old or active nests.

In 1961 J. Hines and M. Thompson (pers. comm., conversations, 1968, 1972, 1976) floated the Kukpuk River and located a peregrine eyrie about 14-16 miles upriver from the mouth. They began their trip somewhere near the mouth of Saligvik Creek. We presume the peregrine falcons they found occupied the excellent cliff opposite Ogsachak which in 1977 had active raven and rough-leg nests, and a gyrfalcon nest but no peregrines.

Although both are tundra rivers that bisect foothills, the Kukpuk is different from the Utukok. A faunal and physical comparison follows:

	<u>Utukok</u>	<u>Kukpuk</u>
Cliffs	Few	Numerous
River gradient	4 feet/mile	9 feet/mile
Fish	Few	Many
Canada Geese	Rare	Abundant
Bar-tailed Godwits	Uncommon	Very localized
Golden Plovers	Abundant	Locally common to uncommon
Arctic Terns	Uncommon	Common
Mew Gulls	Uncommon	Common
Redpolls	Common	Abundant
Whimbrels	Common	Rare

(Continued on next page.)

(Continued)

	<u>Utukok</u>	<u>Kukpuk</u>
Water Pipits	Uncommon	Common
Northern Shrikes	Common	Absent
Mergansers	Rare	Frequent to common
Long-tailed Jaegers	Common	Common
Willows	Locally common, medium to low- growing	Uncommon, low-growing

The most striking avifaunal component was the abundance of Canada geese. The Kukpuk may be of primary importance as a molting grounds for these geese.

MISCELLANEOUS

Caribou: As the smoke began to roll down the river valley on July 23 it was preceded by running caribou. Apparently the caribou could smell the smoke, and they ran downriver, mouths open, as though they were stampeding.

Parasitic Jaeger: A pair of parasitic jaegers was seen pursuing a mew gull. The gull was screaming as the jaegers tried to force it to disgorge. Finally the gull disgorged its food, which the jaegers picked up.

Native Impact: We were disappointed to find two raptors shot by Natives from Point Hope. One fledgling rough-leg had been shot at the Itublarak Site and plucked at the Kayak Site where it was apparently eaten. A recently fledged gyrfalcon was also shot at the Itublarak Site. It was not dead when we found it but it died shortly thereafter. Of importance is the fact that many of the places used by Natives for camps are opposite cliffs housing falcons, hawks, and ravens. Based on the number of raptors we found, it would be possible for Natives to shoot as many as eight raven, 12 rough-legs, and eight gyrfalcon fledglings between Point Hope and the mouth of the Ipewik, if the birds produced at maximum and the Natives killed all the fledglings. The young birds would constitute a readily available, though illegal, food source.

The Rivers in Perspective--A Profile

All of the eight rivers examined in the Northwestern Arctic are similar in some ways. Some obvious differences with regard to their biotic richness do exist. In terms of raptor suitability we would group them as follows:

Wulik/Kivalina/Pitmegea: Least important, differ from others mainly in amount or concentration of cliff structures, type of structure, or height of structure. Bluffs are often in the form of gravel slopes or high rocky river banks.

Kukpowruk/Utukok: Nothing can be said about the Kukpowruk below Raven Basin nor about Carbon Creek in the areas adjacent to the Utukok as we did not examine those areas. These rivers are somewhat better than the above--not so much by virtue of the amount of cliff but rather the height or type of rock exposed.

Kokolik: This river is even better than the above two in that, although it may not contain a greater length of river with cliffs, it contains high densities of raptors in concentrated areas. The cliff structure is equivalent to the Kukpowruk, but the river suggested a greater biotic richness by virtue of its raptor population. It is recommended for an on-ground study.

Ipewik/Kukpuk: Excellent rivers, and although the Ipewik does not have the length of the Kukpuk, its raptor density is probably equivalent on a per mile basis. The Kukpuk not only has superb cliff structures but it has them over a major portion of its length. Both rivers seem to be a center for geese during the molting season. Bears are also abundant on the rivers.

THE GOODPASTER AND SALCHA REGION

General Description: Both the Goodpaster and the Salcha Rivers flow in a southwesterly direction and empty into the Tanana River. The Salcha is about 25 miles south of Fairbanks and the Goodpaster about 65 miles south of Fairbanks. Both rivers flow through typical spruce and muskeg vegetation that characterizes interior Alaska. Both rivers head at elevations in excess of 3,000 feet and enter the Tanana at about 100 feet elevation.

On August 2 we flew about 40 miles of the Salcha and 36 miles of the Goodpaster River in a Cessna 185 at speeds of about 75 to 80 mph, the lower speeds as we passed bluffs. We passed each series of bluffs twice.

SALCHA RIVER

About 11 distinct bluffs were examined. At least four looked good for falcons. Several pairs of peregrines were found breeding on the Salcha by O. J. Murie in the 1920's and 1930's (Cade 1960).

We started our survey at "The Splits" since Federal lands start there. The first cliff just downriver from "The Splits" showed sign of recent occupancy by ravens and is typical of the type peregrines use. Three cliffs in the immediate vicinity of upper Boulder Creek-Maiden Creek are of a significant size. The cliff immediately downriver from Maiden Creek showed sign of recent use by ravens and contained several raven nests and roosts. It was there that we saw a peregrine fly from the cliff on our first pass in the airplane. It could not be relocated, and it took no defensive action to suggest it was a nesting bird.

On Stone Bay Creek, a gyrfalcon was perched on top of a conspicuous area of yellow scree. No sign of nesting was found. Lastly, a set of good-looking rocks occurs between Dan and Lost Creeks. An old eagle nest was found there. On the mountain behind Dan Creek, there is also a rather large cliff high on the mountain similar to those of the Charley River. We could not check this thoroughly.

GOODPASTER RIVER

We started our survey near the mouth of Eisenmenger Fork and terminated at Sand Creek. The Goodpaster does not have nearly the extent nor nature of cliff structure seen on the Salcha. There are essentially three separate constellations of cliffs--the first in the area of Rock Creek. This cluster contained a raven nest.

The second cliff cluster is on Central Creek about two miles upriver from its confluence. Had the timber not been recently burned, the cliff would have been largely covered by trees with a few bare outcrops. There we found a red-tailed (Harlan's) hawk nesting.

The last cluster of cliffs not only occurs at the river's edge but appears as pinnacle outcrops on hillsides on both sides of the river immediately adjacent to Sevenmile Creek. There we found considerable evidence of raven perches, and again found a red-tailed (Harlan's) hawk nesting.

Recommendation: We feel the Salcha River should be floated early in the season, perhaps early June, starting at about Dan Creek. The high mountainside cliffs especially should be checked. The Goodpaster probably does not warrant further effort unless some positive sign of falcons is reported.

THE GULKANA AND DELTA REGION

General Description: The Gulkana flows through a lowland spruce-hardwood forest. From Sourdough to the Copper River confluence, the river cuts banks that are 85 to 125 feet high. The cutbank composition appears to be loose sandy material of insufficient quality, in our opinion, for stable bases for raptor scrapes and nests. Only the brinks of the banks would provide suitable nesting sites. Adult bald eagles frequently perched on the highest reaches of banks. The west fork also contains scattered cutbanks. The Delta River flows through a wet tundra floral association with few cliffs.

Narrative: These rivers were surveyed on August 2, 1977, in a de Havilland Beaver aircraft. We stopped briefly at Gulkana airport to pick up Jeff Rucks, a BLM employee at Glennallen. He informed Boyce of a trapper, living on the Gulkana, who claims to know the location of a nesting pair of peregrine falcons along the river. Apparently, these birds are nesting between Sourdough and the Copper River confluence. Unfortunately, the trapper refuses to divulge the nest location to the BLM. We surveyed this section of the river twice without seeing the birds or locating their nests.

We surveyed the west fork of the Gulkana River to the Fish Lake area. In T9N (Gulkana Map 1:250) a peregrine was sighted in 1976, according to BLM personnel. We did not see any nests or falcons in this area. Jeff Rucks returned to the area several days later and located a large stick nest while floating downriver in this section. We conclude, however, that the nest is that of either a rough-legged hawk or a Harlan's hawk.

We continued our survey by flying the Delta River north from Lower Tangle Lake through a rapids area (waterfalls and white water) within a narrow canyon lined with steep rock cliffs. We ended our survey in T20S (Mt. Hayes Quad) at the canyon's end. BLM personnel received a report that a peregrine had been sighted in the canyon, beginning T20S, R9E NE Corner, and ending T20S, NW Corner in 1977. Our survey revealed a recently used stick nest which historically has been used by gyrfalcons (C. White, pers. observation).

Walter Spofford, a retired Syracuse University professor who worked in the Paxson area, prepared a series of photographs. These are now on display at Paxson Lodge. A very dark phase gyrfalcon in one photo had been mistaken for a peregrine falcon from the area. The falcon pictured is definitely a gyrfalcon known to nest near Paxson Lodge.

THE COLVILLE-ETIVLUK RIVERS SPECIAL SURVEY

A summer U.S.G.S. camp was proposed for placement at the mouth of the Etivluk River. The area was thus checked on June 8 and 9 for possible peregrine falcon nesting. Possible alternative areas (such as the mouth of the Killik River) were also checked for peregrines.

The cliff at the upriver end of the gravel bar/landing strip at the mouth of the Etivluk has been long used by peregrines. When the cliff was last checked in 1975, a female peregrine with eggs was present but she subsequently deserted the eggs (White and Cade 1975). A rough-legged hawk nest was being used by the peregrines in 1977 and contained four eggs.

The cliff located about two miles down the Colville River from the mouth of the Killik River had only a lone peregrine present as far as we could tell. Thus, this would be the more desirable place for the proposed camp and probably for future camps.

On June 8 and 9 we also checked that portion of the Colville River between the mouth of the Oolamagavik River (Cliff No. 40 of White and Cade 1971) and Shivugak Bluff. Our findings are presented in Table 1. It is noteworthy that more peregrines were found on that portion of the river than at any time since 1973 (Haugh 1976; White and Cade 1975). In 1975, for example, falcons were at five locations (four nests) as compared to peregrines at twelve locations (nine nests) in 1977. However, the river was surveyed earlier in the season in 1977 than in other years and this may account for the increased number seen. The average clutch size appeared to be the same as in former years.

On July 28 and 29 we made a second survey to determine success of the pairs previously noted. Had all the eggs we counted on our July 9 survey hatched, there would have been 27 chicks in nests. Even if we assume a 20-25 percent natural loss, there should have been about 14 chicks. We found, however, only six chicks, all about 14-17 days old. The success of each nest is shown in Table 2.

At nests that failed, evidence that eggs had been laid could not even be found in some cases. Perhaps the adults deserted the eggs and they were then eaten by ravens or gulls. The two pairs that did not have eggs on our first survey were not present and presumably did not lay by the time of our second survey. At one nest a rock slide broke one egg; the female, still present and moderately defensive, had long since deserted the two remaining eggs, although two-thirds of the nesting platform was still available for incubation. One egg was fertile and appeared to have a half-developed embryo at the time of abandonment.

On July 28 we extended our survey north about 10 miles beyond Shivugak Bluff to Uluksrak Bluff over a region that formerly had about three to five nests (White and Cade 1971). We located only two single adults, one of which was mildly defensive toward us on the ground although we could find no nest.

Our conclusions are that a significant number of falcons still return early in the season to the Colville (as they might also do on the Utukok and other rivers. They fail to lay eggs or lose clutches early in the season, and then begin to disperse by perhaps early July. Also of interest is the fact that two nests that formerly had four and three eggs respectively both had only one young each. The other eggs were presumably either infertile or had broken. In our experience, once eggs hatch, chick survival is usually good or else the entire brood is lost.

Table 1. Raptors found on the Etivluk and the middle portion of the Colville River, June 1977.

Cliff Area	Date	Findings
Etivluk mouth (Cliff 1* - 3.6 mi. from Colville)	6/9	peregrine nest, 4 eggs; single rough-legged hawk, no nest
Etivluk (1 mi. above east fork)	6/9	peregrine pair, no nest found; rough-legged hawk pair with nest
Colville River (1 mi. down-river from mouth of Oolamagavik River, Cliff 41)	6/9	peregrine nest, 4 eggs; gyrfalcon seen; 2 pair rough-legged hawks found (1 nest with 4 eggs, 1 nest with 3 young)
Upper Killik Bend (Cliff 43)	6/9	rough-legged hawk pair with nest
Killik Bend (Cliff 44)	6/9	peregrine nest with 3 eggs; rough-legged hawk with 4 eggs; gyrfalcon nest, 3 young (approx. 4 days old)
Puivlik Bluff (Cliff 45)	6/9	single peregrine; rough-legged hawk with 3 eggs; gyrfalcon nest with 3 eggs; raven nest with 3-4 young
Upper end Ninuluk Bluff (Cliff 47)	6/9	pair rough-legged hawks, no nest; ravens seen; single peregrine
Cliff 48	6/9	single rough-legged hawk gyrfalcon nest with 3 eggs
Near Ninuluk Creek (Cliff 49)	6/9	raven nest with young; peregrine nest with 4 eggs; pair rough-legged hawks with nest

*Cliff numbers after White and Cade 1971.

(Table continued on next page.)

Table 1 - continued

Cliff Area	Date	Findings
Cliff 50*	6/9	rough-legged hawk nest with 4 eggs
Cliff 51	6/9	pair rough-legged hawks without nest
13 mi. above Umiat (Cliff 52)	6/9	rough-legged hawk nest with 3 young; gyrfalcon nest with 4 eggs
10 mi. above Umiat (Cliff 53)	6/9	peregrine nest with 4 eggs
5 mi. above Umiat (Cliff 54)	6/9	pair rough-legged hawks with undetermined number eggs
Opposite Umiat (Cliff 55)	6/9	peregrine nest with 3 eggs; rough-legged hawk nest with 3 eggs
Umiat Mt. (Cliff 52)	6/8	two pair rough-legged hawks, one with eggs; pair gyrfalcons
3 mi. below Umiat Mt. (Cliff 58)	6/8	peregrine nest with 3 eggs; single rough-legged hawk and 2 pair with eggs; single gyrfalcon
Upriver end Shivugak Mt. (Cliff 59)	6/8	peregrine nest with 2 eggs; single female peregrine
Lower end Shivugak Mt. (Cliff 59)	6/8	peregrine with scrape, no eggs; 3 pair rough-legged hawks with 3, 1, and 4 eggs in nests

*Cliff numbers after White and Cade 1971.

Table 2. Peregrine falcon nests and their success on a portion of the Colville River, 1977.

Nest	June 8-9	July 28-29
Etivluk River, 1 mi. above East Fork	Pair, no nest found	None seen
Etivluk River, 3 mi. above mouth	Pair, 4 eggs	Two young
Cliff 41* (Upper Killik bend)	Pair, 4 eggs	Eggs gone, no evidence of their hatching
Cliff 44 (Lower Killik bend)	Pair, 3 eggs	One young
Cliff 49 (red stone pinnacles)	Pair, 4 eggs	One young
Cliff 53 (10 mi. bluff)	Pair, 4 eggs	Nothing, evidence of nest not even found; pair present but quickly left
Cliff 55 (coal seam)	Pair, 3 eggs	One egg smashed, two eggs abandoned, pair present
Cliff 58 (3 mi. downriver from Mt. Umiat)	Pair, 3 eggs	Nest empty, no evidence of eggs hatching
Cliff 59 (Upper Shivugak bluff)	Pair, 2 eggs	Two young
Cliff 59 (Lower Shivugak bluff)	Pair, scrape but no eggs	Single adult along cliff, no evidence that eggs were laid

*Cliff numbers after White and Cade 1971.

GENERAL COMMENTS

Raptor Reproduction and Food Supply

Some species of raptors seem to respond to availability of foods while others do not. For example, within Alaska it has been shown that gyrfalcon populations fluctuate rather widely in response to the availability of a prime food, ptarmigan, by increasing both in density and production when food numbers were high (Cade 1960; D. Roseneau, pers. comm., conversation, June 1971). Rough-legged hawks likewise respond to lows in food supplies either by not breeding at all or by producing smaller clutch sizes (cf. Hagen 1969 for excellent discussion). Such differences between good raptor breeding and high productivity and poor breeding and low productivity may occur in subsequent years, and differences between the high and low values may be on the order of 70 to 80 percent. In 1972 on the Sagavanirktok River, for example, there was a clear correlation between low rough-leg density, egg desertion, and low clutch sizes (White, Ray, and Sowl 1977) and extremely poor trap-night success for microtines (P. Reynolds, pers. comm., conversation, July 1972). Such clear-cut and dramatic correlations between food supplies and reproduction apparently are not demonstrated in other populations such as the Finnish forest-breeding rough-legs (Pasanen 1972).

The year 1977 was excellent for reproduction of gyrfalcons over much of Alaska. We located a total of 43 active eyries and an additional two localities where gyrfalcons probably bred. Virtually every stretch of river of the more than 30 miles we examined had between one to four pairs of gyrfalcons. Their nests were usually on the upper reaches of most of the rivers (e.g., Kisaralik, Kivalina, Kokolik, etc.) but we often saw them along the entire river course (Ungalik, Kukpuk, etc.). Clutches were correspondingly good. Of the 20 nestings for which we had brood data, the average number of young ready to fledge was 3.1 per nest (range 2-4).

In contrast the rough-leg had a poor year in 1977. Microtine populations were low, as suggested by the general lack of breeding in other rodent eaters also (e.g., long-tailed jaegers were also seen in nonbreeding groups more frequently than usual). Small clutch sizes and heavy reliance on passerines for food were noted. Ground squirrels were locally to generally common over large areas, but the rough-legs apparently took them only occasionally. Many nests examined were completely devoid of prey remains, which is unusual in years of average or high prey availability. Long stretches of river had unused nests on them and nests were found on cliffs, in some cases with only single adults resident.

Of the nine nests for which we have counts on complete clutches, the average clutch size was 3.0 eggs (range 1-4). Of the 12 nests for which we have data on young nearly ready to fledge, the average brood size was 2.2 (range 1-4, mode 2). In average years the brood sizes range between 3-4 young at fledging.

Aircraft Use and the Colville River - An Example

Each year more and more biologists and field investigators become involved in raptor work in Alaska. Much of this work is accomplished by the use of aircraft. Sooner or later a negative impact will doubtless be demonstrable. A well-controlled experiment, however, will be required to obtain definitive results. Clearly, "excessive" use of aircraft near nests can keep raptors off nests for such extended periods that lowered reproduction results. Likewise, "excessive" ground traffic, boat traffic, or any other excessive disturbance near nests could have the same ultimate effect.

To date, however, the data do not show that reasonable use of rotary-winged aircraft has deleterious effects on raptor reproduction success. However, in the face of both new and long-standing criticism of the use of aircraft, there seems to be a need to re-demonstrate this anew each year; not unlike a yearly re-invention of the wheel. There seems to be a lack of knowledge of the data or lack of even desire to find and evaluate the data and this cuts across all levels of people working with or interested in wildlife in Alaska. People seem to rely more on hearsay information than hard data. Fortunately, the Canadians implemented an aircraft-falcon impact study that should help clarify this problem (Platt and Tull 1977). The study was designed to produce "excessive" aircraft harassment artificially on a population of gyrfalcons and compare the results of reproduction with an adjacent population not "harassed." How good the results will be in demonstrating an impact or lack thereof remains to be fully analyzed.

Data from the Colville for 1977 are instructive in this regard and will be especially reviewed here with appropriate comments. The data should speak for themselves.

A. At the outset we should keep in mind that in 1973 Dr. John Haugh (1976) found 14 pairs of peregrines on the entire Colville at the start of the season. Four pair produced a total of nine young. Only limited aircraft use occurred on the river that year and work was done by boat (cf. White and Cade 1975).

B. The 1977 data:

1. Etivluk River eyrie contained four eggs. We did not approach

the eyrie in our helicopter but walked to it from above. We were within 75 feet of the eyrie. Two young were produced.

2. Killik Bend (Cliff 41): We did not approach this eyrie by helicopter. We approached from above on foot and remained 100 feet away from the eyrie. The eyrie failed and we saw no sign of eggs in it on our last survey.

3. Killik Bend (Cliff 44). We passed this eyrie twice in helicopter and were unable to locate it. We landed and explored the cliff on foot until we found the eyrie. We remained 100 feet away from the eyrie, which contained four eggs. One young was produced.

4. Red Stone Pinnacles (Cliff 49). We passed this eyrie twice in helicopter and counted eggs below the standing female on the second pass; four were present. One young was produced.

5. Ten Mile Bluff (Cliff 53): We passed this eyrie twice in helicopter. The second time the female moved away from the eggs, and we could count them. Four were present. We found no sign of a nest on our second survey.

6. Coal Seam Bluff (Cliff 55). We passed this eyrie twice in a helicopter before we could count the eggs while hovering near the nest. Three eggs were present. On our final survey we determined that a rock slide had caused less than one-third of the eyrie to be covered by a single slab of rock. One egg near the rock was broken and the remaining two were away from the rock where adequate nesting scrape remained for them to be incubated. They were nonetheless deserted although the adults were still present and mildly defensive.

7. Three Miles Downriver from Umiat Mountain (Cliff 58): We had to pass this eyrie three times in a helicopter in order to get an accurate count of eggs. Female was photographed from the helicopter standing by the nest. Two eggs were present and two young produced.

C. Taken at face value and considering only numbers, the production for 1973 when no aircraft was used (remembering that Haugh found 14 pair for the entire river) was 0.64 young per pair. In 1977 when only one-third of the river was examined by aircraft, the production was 0.60 on that portion of the river.

D. In 1969, of the 33 pairs present only 13, or 39 percent, produced young (see White and Cade 1975). No aircraft were used in that year. In 1977, of the ten pairs for which we have data, four--or 40 percent--produced young. To our knowledge only aircraft were used to survey the population and ground parties on the river for other reasons only floated past the cliffs.

Thus, no evident pattern emerges from the above data with regard to the use of aircraft. The only conclusions that can be clearly drawn from the data for 1977 or previous four years for that matter are that reproduction is extremely poor considering the number of starting pairs, that there is apparently a loss of either entire clutches of eggs or loss of certain eggs from clutches, and that more of the pairs present at cliffs early in the season are not attempting to nest there in the years prior to 1970 (see White and Cade 1975).

As has been pointed out earlier (White and Cade 1975), the use of a fixed-wing aircraft has limited value in locating peregrine falcon nests, especially early in the nesting cycle. Our observations for 1977 reconfirm that generalization. We are not altogether confident that we did not miss some peregrines, particularly in the northern portion of the area we surveyed.

Observations on the Population of Peregrines in the Northwestern Arctic

We were generally disappointed that we did not find peregrine falcons nesting on more of the habitable rivers, other than the Colville, that we examined in 1977. In particular, we had hoped to find them on the Pitmegea, Ipewik, Kokolik, Kukpowruk, Kukpuk, and Utukok Rivers. In fact, one pair of nesting peregrines were reported from the Kaolak River to the north of where our surveys ended (R. Ritchie, Alaska Biological Research, Fairbanks, letter dated November 15, 1977).

Although data are sketchy on the former status of peregrines along those rivers, there are some data to suggest what the population size might have been. Childs (1969), for example, found peregrines 12 and 16 miles inland on the Pitmegea or about four miles apart, and for the 16 miles an average distance of one pair per eight miles. Maher (Fyfe, et al., 1976) recorded four pairs on the Utukok in the some 70 miles between Driftwood and Disappointment Creek, or about one eyrie per 17 miles. Hines and Thompson (pers. comm., conversation, June 1976) found one peregrine on the Kukpuk in the early 1960's in about 25 miles of river.

These data taken together suggest that something on the order of one pair per 15 miles could have been characteristic for the drainages in that part of the Arctic in the years prior to 1970. We could speculate, then, that for the 97 miles traveled on the Kukpuk with appropriate habitat, we should have seen about six pairs; for 73 miles on the Ipewik about four pairs; for 45 miles on the Kokolik about three pairs; for 43 miles on the Kukpowruk about three pairs; four pairs on the Utukok; and finally two pairs on the Pitmegea. All this sums to 22 pairs. It does not seem out of line then to suggest that even 15-20 pairs may be the correct value for a base

population for these rivers in earlier years. In our experience the habitat we looked at, plus the known historical data, suggest that these rivers have "good" peregrine habitat.

These suggestions are in line with what we have formerly presumed to be the case for the Colville drainage and the major portion of the Arctic Slope as a unit (see Cade 1960; White and Cade 1975; Cade and White 1976).

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-the-ground knowledge only of the main Colville, one late-summer run of the upper Colville, and one mid-season run on the Oolammagavik, 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 large areas of suitable nesting cliffs and breeding habitat for peregrines along all the major tributaries except the Itkillik which has marginal habitat. 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 (see also Cade and White 1976). Conceivably, it could have been even larger--around 200 pairs--as an average of one pair per 10 miles of river is not unreasonable based on data for the Colville and Oolammagavik Rivers (45 pairs along about 302 miles of river, or about 7 miles per pair).

It would be instructive to survey the rivers in early June to see if the peregrine still comes back to known sites on the Kukpuk, Utukok, and Pitmegea, as they did on the Colville in 1977, and then abandon them, or if they simply fail to return to these rivers at all.

David Roseneau (pers. comm., conversation, July 1974) has indicated there may have always been a situation where only a certain percentage of "active" nest sites were ever occupied at any given time, and that nesting birds may shift their use between sites from year to year. This would suggest a "base" population of peregrines somewhat lower than Cade estimates.

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APPENDIX A

ANNOTATED LISTS OF BIRDS OBSERVED ON FLOAT TRIPS

Annotated List of Birds Observed on the Utukok River
July 12-19, 1977*

- Arctic Loon--Uncommon, seen at only two localities
- Red-throated Loon--Uncommon although more common than the Arctic Loon
- Pintail--Uncommon, a female with a brood was seen before we reached Archimedes Ridge
- Oldsquaw--Several female-plumaged birds at scattered localities
- Red-breasted Merganser--Female-plumaged birds singly at scattered localities
- Rough-legged Hawk--A common breeder
- Golden Eagle--Several unused nests found at scattered localities and two occupied nests were found at distant separate localities
- Harrier--A single female seen near Carbon Creek
- Gyrfalcon--Two pairs, one upriver and one downriver
- Willow Ptarmigan--Abundant, young just capable of flight were seen
- Rock Ptarmigan--Common
- Golden Plover--Abundant
- Semipalmated Plover--Common
- Bar-tailed Godwit--Locally common at scattered localities
- Whimbrel--Common
- Spotted Sandpiper--Uncommon, breeding at widely scattered localities, the most downriver one near Disappointment Creek. Replaced the Wandering Tattler about 12 miles downriver from Driftwood landing strip.
-

*About 79 miles were covered between the Driftwood Landing Strip to about two miles upriver from the confluence with Carbon Creek.

(Continued on next page.)

Annotated List of Birds Observed on the Utukok River
July 12-19, 1977*

- Wandering Tattler--The breeding bird replacing the Spotted Sandpiper along sandbars in the Driftwood Creek area
- Ruddy Turnstone--Two winter-plumaged birds seen near Driftwood Creek area
- Pectoral Sandpiper--Uncommon, single birds seen at scattered localities
- Semipalmated Sandpiper--Uncommon, single individuals at scattered localities
- Common Snipe--Only seen or heard near Carbon Creek
- Parasitic Jaeger--Seen on four occasions; one was a black phase
- Long-tailed Jaeger--Common
- Glaucous Gull--Uncommon, seen on four occasions
- Mew Gull--Uncommon, seen on five occasions but two of these were breeding pairs
- Arctic Tern--Uncommon, seen on four occasions
- Short-eared Owl--One seen near Archimedes Ridge
- Say's Phoebe--A breeder associated with all cliffs to Carbon Creek
- Raven--Uncommon, breeds at scattered localities
- Robin--Four seen between Disappointment and Carbon Creeks where habitat approaches that of the Colville River Valley
- Wheatear--Uncommon
- Bluethroat--One seen about 20 miles downriver from Driftwood Creek area
- Yellow Wagtail--Uncommon
- Water Pipit--Uncommon, usually associated with cliffs
-

*About 79 miles were covered between the Driftwood Landing Strip to about two miles upriver from the confluence with Carbon Creek.

(Continued on next page.)

Annotated List of Birds Observed on the Utukok River
July 12-19, 1977*

Northern Shrike--Common where willow stands were above 3-4 feet. One seen carrying a rodent in its feet, about 10 miles upriver from Disappointment Creek

Redpoll--Common

Savannah Sparrow--Uncommon

Tree Sparrow--Common

White-crowned Sparrow--Uncommon

Lapland Longspur--Uncommon

*About 79 miles were covered between the Driftwood Landing Strip to about two miles upriver from the confluence with Carbon Creek.

Annotated List of Birds Observed on the Kukpuk River
July 8, 20-27, 1977*

Yellow-billed Loon--Only seen downriver from the confluence with the
Ipewik River. Several seen

Arctic Loon--Seen on three occasions on downriver portions

Red-throated Loon--Most frequently seen or heard loon, but decidedly
more frequent near Saligvik Valley and downriver from the Kyak
Site

Canada Goose--Abundant over most of the river where it was seen in
groups of molting birds. Several groups of up to 100 were seen
on July 8 with one extended group judged to be 150 in the area
of Battary Creek. On July 24 near Kokirat Creek we saw a group
of 51 on the river and 63 on the adjacent hillside. Most groups,
however, were between 50 and 20 individuals

American Wigeon--Remains of one found near a lake on the lower river

Eider species--A group of 6 female-plumaged unidentified eider,
either Common or King Eider, alighted on the water near Itublarak

Oldsquaw--Several female-plumaged birds were seen at scattered
localities

Red-breasted Merganser--Several female-plumaged birds at scattered
localities. A brood of 8 downies was seen downriver

Rough-legged Hawk--Common breeder

Golden Eagle--Although empty and unused nests were seen frequently,
only two were seen--one a nestling and one a year-old bird

Gyr Falcon--Common breeder

Willow Ptarmigan--Locally common especially upriver from Saligvik
Creek

Rock Ptarmigan--Less common than willow ptarmigan and although heard,
only seen twice

*Only about 50 miles were covered by river between the Alolukrok Site
to about one mile downriver from Taktelak Creek.

(Continued on next page.)

Annotated List of Birds Observed on the Kukpuk River
July 8, 20-27, 1977*

Sandhill Crane--One found dead at Kukpuk Site

Golden Plover--Locally common to uncommon along entire river

Semipalmated Plover--Uncommon although several broods of large non-flying young were seen

Bar-tailed Godwit--Locally common where stands of willows 3-4 feet high occurred

Whimbrel--One seen on upper portion of river

Pectoral Sandpiper--One seen near Kokirat Creek

Semipalmated Sandpiper--Singly or in groups of 3-4 at scattered localities

Western Sandpiper--Seen in groups of 2-5 at scattered localities

Northern Phalarope--One female seen

Parasitic Jaeger--Common; black phase birds were more common by 4:1 over light phase

Long-tailed Jaeger--Common, seen as frequently as Parasitic Jaegers

Pomarine Jaeger--One seen in middle portion of river

Glaucous Gull--Uncommon, at scattered localities along entire river

Mew Gull--Locally common, one-third-grown young seen at two different localities, one upriver and one downriver

Arctic Tern--Abundant; downy young were seen at scattered localities

Say's Phoebe--Only seen, appeared to be a bird of the year, at a down river locality not associated with a cliff. May have been a nearly migrant or a dispersing young from some nearby locality such as Cape Thompson

Horned Lark--At scattered localities, usually family groups associated with rocky hillsides

*Only about 50 miles were covered by river between the Alolukrok Site to about one mile downriver from Taktelak Creek.

(Continued on next page.)

Annotated List of Birds Observed on the Kukpuk River
July 8, 20-27, 1977*

Raven--Common breeder

Wheatear--Uncommon, seen near Saligvik Creek

Water Pipit--Common

Yellow Wagtail--Common, frequently in groups of 5-6 immatures

Redpoll--Abundant

Savannah Sparrow--Common

Tree Sparrow--Uncommon, identified at only four localities

Lapland Longspur--Uncommon

Snow Bunting--Common, associated with most of the cliffs and near Itublarak three nests with nearly ready to fledge young were within one-fourth mile. Upriver localities contained fledged and flying young on July 21, while downriver localities had young still in the nest on July 27.

*Only about 50 miles were covered by river between the Alolukrok Site to about one mile downriver from Taktelak Creek.

Annotated List of Birds Observed on the Kanektok River
June 16-20, 1977*

- Common Loon--One 5 miles downriver from Kagati Lake
- Arctic Loon--One below Paiyun Creek
- Mallard--Uncommon, 5-10 individuals at scattered localities
- Pintail--Two females seen, one acted as though she had a nest
- Green-winged Teal--Five males seen but the "cleek" calls of males were heard at two other localities
- Common Goldeneye--Uncommon, only on lakes at start of trip
- Harlequin--Common, groups of 5-6 seen
- Oldsquaw--Only two seen
- Common Scoter--A male 5 miles below Klak Creek and a group varying over a two-day period between 7 and 13 on lake 5 miles below Klak Creek
- Common Merganser--Uncommon, four seen
- Red-breasted Merganser--Common
- Rough-legged Hawk--One 5 miles below Klak Creek
- Golden Eagle--Three seen and one active nest found
- Bald Eagle--Two active nests found
- Gyr Falcon--One near Paiyun Creek
- Willow Ptarmigan--Uncommon along upper half of river
- Rock Ptarmigan--Two males near Paiyun Creek
- Semipalmated Plover--Uncommon, three seen
- Bar-tailed Godwit--One near Klak Creek

*About 33 miles were covered starting 5 miles downriver from Kagati Lake and ending 6 miles below Klak Creek at a lake we named Otter Lake.

(Continued on next page.)

Annotated List of Birds Observed on the Kanektok River
June 16-20, 1977*

Spotted Sandpiper--Uncommon, perhaps because the river was so high
there were essentially no bars or banks

Greater Yellowlegs--Common

Northern Phalarope--Three 5 miles below Klak Creek

Common Snipe--Common

Glaucous Gull--Uncommon

Mew Gull--Common

Arctic Tern--Common

Empidonax Flycatcher--One heard

Cliff Swallow--Colony of about 30 near mouth of Kanukuik Creek

Tree Swallow--Common

Bank Swallow--Common

Black-billed Magpie--Two seen and three nests found 3 miles above
Nakarkingak Creek

Varied Thrush--Uncommon

Gray-cheeked Thrush--Abundant

Arctic Warbler--Abundant

Water Pipit--One near Paiyun Creek

Yellow Wagtail--Abundant

Yellow Warbler--Common

Yellow-rumped Warbler--Two heard singing

Black-poll Warbler--Two seen

*About 33 miles were covered starting 5 miles downriver from Kagati
Lake and ending 6 miles below Klak Creek at a lake we named Otter
Lake.

(Continued on next page.)

Annotated List of Birds Observed on the Kanektok River
June 16-20, 1977*

Northern Water Thrush--One heard

Wilson's Warbler--Abundant

Redpoll--Abundant

Savannah Sparrow--Abundant

Tree Sparrow--Abundant

White-crowned Sparrow--Uncommon

Golden-crowned Sparrow--Abundant

Fox Sparrow--Common

Lapland Longspur--Abundant

*About 33 miles were covered starting 5 miles downriver from Kagati Lake and ending 6 miles below Klak Creek at a lake we named Otter Lake.

Annotated List of Birds Observed on the Anvik River
June 27-30, 1977*

Common Loon--One seen near downriver camp

Red-throated Loon--Seen only near Last Camp but more than three heard calling in that location

Arctic Loon--One seen on upriver portion

Canada Goose--Common to locally abundant, in the approximately 37 miles between the mouth of Otter Creek and Last Camp 66 were counted. Broods of 5, 4, 6, and 2 were seen

Mallard--Uncommon, two seen flying together in mid-river

Pintail--Uncommon, several lone females seen at scattered localities

Green-winged Teal--Uncommon, a pair on lower river and other single individuals at three scattered localities

Greater Scaup--Rare, a lone male seen

Common Goldeneye--Rare, a lone female at mid-river

Harlequin--Common upriver, less so downriver with the last ones, a pair, near Runkels Creek. Females more common than males and often in company with mergansers

Surf Scoter--Rare, two adult males near Swift River

Common Merganser--Uncommon, usually in flocks of 2-5 and often with Red-breasted Mergansers. In the 37 miles between the mouth of Otter Creek and Last Camp 17 were seen of which at least 7 were males and 8 were females

Red-breasted Merganser--Abundant, usually in groups of 2-8. Between Otter Creek and Last Camp 90 were counted, of which 69 were female plumaged, 25 male plumaged, and 6 undeterminable

Rough-legged Hawk--Common

Bald Eagle--Uncommon, although only one was seen, two occupied nests were seen earlier on an overflight

*About 57 miles were covered from about 3 miles downriver from McDonald Creek to 7 miles below mouth of Yellow River (Last Camp). First Camp about 10 miles below McDonald Creek, Second Camp about 12 miles below Otter Creek.

(Continued on next page.)

Annotated List of Birds Observed on the Anvik River
June 27-30, 1977*

- Golden Eagle--Uncommon, only two were seen
- Harrier--Uncommon, two females and a male seen on the lower river
- Gyr Falcon--Uncommon, one nest near McDonald Creek and another heard calling
- Merlin--Uncommon, nest with 4 young about 5 days old found on the ground about 3 miles below First Camp
- Ruffed Grouse--Uncommon, female with recently hatched brood near Last Camp
- Rock Ptarmigan--Uncommon, adjacent to river on hillsides
- Semipalmated Plover--Uncommon, five pairs at scattered localities
- Hudsonian Godwit--Rare, one on a gravel bar on the lower river
- Spotted Sandpiper--Ubiquitous, seldom out of sight or hearing of one or more individuals
- Greater Yellowlegs--Common, at scattered localities
- Lesser Yellowlegs--Uncommon, two pairs seen
- Semipalmated Sandpiper--Uncommon, less than 15, usually singles or sometimes in groups of 2-4
- Least Sandpiper--Rare, two seen, one in company of Semipalmated Sandpipers
- Common Snipe--Uncommon, mainly in the area of Last Camp
- Glaucous-winged Gull--Uncommon, fewer than 5 seen at scattered localities
- Glaucous Gull--Uncommon on upper river, more common locally on lower river where it bred both on bars and on cliffs

*About 57 miles were covered from about 3 miles downriver from McDonald Creek to 7 miles below mouth of Yellow River (Last Camp). First Camp about 10 miles below McDonald Creek, Second Camp about 12 miles below Otter Creek.

(Continued on next page.)

Annotated List of Birds Observed on the Anvik River
June 27-30, 1977*

- Glaucous-winged/Herring Gull hybrid--Rare, one seen which was intermediate between these species
- Mew Gull--Common, especially the mid- to lower portions of the river
- Arctic Tern--Common, widely scattered, sometimes in groups of 3-4
- Hawk Owl--Rare, one nest in a dead spruce one-half mile below Second Camp
- Great-Horned Owl--Rare, one seen flying across river near mid-portion of river
- Belted Kingfisher--Uncommon, seen at 6 separate localities, each about 5 miles apart
- Northern Flicker--Rare, one seen
- Willow Flycatcher--Uncommon, scattered along river in appropriate habitat which was limited because of the recent burn
- Say's Phoebe--Common, on nearly every bluff from McDonald to Beaver Creek
- Cliff Swallow--Abundant, the majority of small rocky outcrops on entire river had a colony of from 6-50 nests
- Violet-green Swallow--Uncommon, seen at three widely separate localities, all single individuals, once in company with Cliff Swallows at a colony
- Tree Swallow--Common
- Bank Swallow--Bare, two near mouth of Swift River
- Gray Jay--Uncommon
- Swainson's Thrush--Common

*About 57 miles were covered from about 3 miles downriver from McDonald Creek to 7 miles below mouth of Yellow River (Last Camp). First Camp about 10 miles below McDonald Creek, Second Camp about 12 miles below Otter Creek.

(Continued on next page.)

Annotated List of Birds Observed on the Anvik River
June 27-30, 1977*

Gray-cheeked Thrush--Uncommon

Varied Thrush--Uncommon

Yellow Wagtail--Rare, one near Second Camp

Water Pipit--Rare, one on the upper river

Arctic Warbler--Uncommon, first heard at Canyon Creek, habitat limited

Yellow-rumped Warbler--Rare, one adult male

Yellow Warbler--Abundant

Wilson's Warbler--Uncommon

Northern Waterthrush--Common to locally abundant

Orange-crowned Warbler--Rare, one seen near Second Camp

Rusty Blackbird--Uncommon, first seen near Second Camp but with
increasing frequency thereafter

Pine Grosbeak--Uncommon, found as prey at Gyrfalcon eyrie and at
Hawk Owl nest; only one adult seen

Redpoll--Common

White-winged Crossbill--Rare, one female near Swift River

Dark-eyed Junco--Uncommon, seen as single birds

Tree Sparrow--Ubiquitous

White-crowned Sparrow--Common

Fox Sparrow--Uncommon

*About 57 miles were covered from about 3 miles downriver from
McDonald Creek to 7 miles below mouth of Yellow River (Last Camp).
First Camp about 10 miles below McDonald Creek, Second Camp about
12 miles below Otter Creek.

APPENDIX B

Birds Seen on Float Trips in 1977 and Their Status*

	6/16/20	Kanektok River Kagati Lake (Weir MS.)	Anvik 6/27-30	Utukok 7/12-19	Kukpuk 7/20-27
Yellow-billed Loon	-	-	-	-	U
Common Loon	P-R	P	R	-	-
Arctic Loon	P-R	P	R	U	U
Red-throated Loon	-	P	U	U	U(L)
Red-necked Grebe	-	P	-	-	-
Horned Grebe	-	P	-	-	-
Canada Goose	-	-	C	-	A
Mallard	P-U	-	U	-	-
Pintail	P-U	P	U	U	-
Green-winged Teal	P-U	-	U	-	-
American Wigeon	-	-	-	-	R
Common Goldeneye	P-U	-	R	-	-
Greater Scaup	-	P	R	-	-
Harlequin	P-U	P	C	-	-
Oldsquaw	P-U	P	-	U	U
White-winged Scoter	-	P	-	-	-
Surf Scoter	-	P	R	-	-

*Status: A = Ubiquitous R = Rare
 C = Common U = Uncommon
 L = Local - = Absent
 P = Present

(Continued on next page.)

Birds Seen on Float Trips in 1977 and Their Status*

	6/16/20	Kanektok River Kagati Lake (Weir MS.)	Anvik 6/27-30	Utukok 7/12-19	Kukpuk 7/20-27
Common Scoter	P-U	P	-	-	-
Eider species	-	-	-	-	R
Common Merganser	P-U	P	U	-	-
Red-breasted Merganser	P-C	P	A	U	U
Rough-legged Hawk	P-R	-	C	C	C
Harrier	-	-	U	R	-
Golden Eagle	P-U	P	U	U	U
Bald Eagle	P-U	-	U	-	-
Gyr Falcon	P-R	P	U	U	C
Merlin	-	P	U	-	-
Kestrel	-	P	-	-	-
Ruffed Grouse	-	-	U	-	-
Willow Ptarmigan	P-U	P	-	A	C(L)
Rock Ptarmigan	P-U	P	U	C	U
Sandhill Crane	-	-	-	-	R
Golden Plover	-	-	-	A	C(L)U
Semipalmated Plover	P-U	P	U	C	U

*Status: A = Ubiquitous R = Rare
 C = Common U = Unknown
 L = Local - = Absent
 P = Present

(Continued on next page.)

Birds Seen on Float Trips in 1977 and Their Status*

	Kanektok River				
	Kagati		Anvik	Utukok	Kukpuk
	6/16/20	Lake (Weir MS.)	6/27-30	7/12-19	7/20-27
Bristle-thighed Curlew	-	P	-	-	-
Hudsonian Godwit	-	-	R	-	-
Bar-tailed Godwit	P-R	-	-	C (L)	C (L)
Whimbrel	-	-	-	C	U
Pectoral Sandpiper	-	-	-	U	R
Semipalmated Sandpiper	-	-	U	U	U
Least Sandpiper	-	-	R	-	-
Western Sandpiper	-	-	-	-	U
Spotted Sandpiper	P-U	-	A	U	-
Wandering Tattler	-	-	-	U	-
Greater Yellowlegs	P-C	P	C	-	-
Lesser Yellowlegs	-	-	U	-	-
Northern Phalarope	P-U	-	-	-	R
Ruddy Turnstone	-	-	-	R	-
Snipe	P-C	-	U	R	-
Parasitic Jaeger	-	-	-	U	C
Long-tailed Jaeger	-	-	-	C	C

*Status: A = Ubiquitous R = Rare
 C = Common U = Unknown
 L = Local - = Absent
 P = Present

(Continued on next page.)

Birds Seen on Float Trips in 1977 and Their Status*

	Kanektok River				
	Kagati				
	6/16/20	Lake (Weir MS.)	Anvik 6/27-30	Utukok 7/12-19	Kukpuk 7/20-27
Pomarine Jaeger	-	-	-	-	R
Glaucous-winged Gull	P-U	P	U	-	-
Glaucous Gull	P-U	P	U	U	U
Glaucous-winged x Herring Gull	-	-	R	-	-
Mew Gull	P-C	P	C	U	C(L)
Bonaparte's Gull	-	P	-	-	-
Arctic Tern	P-C	P	C	U	A
Short-eared Owl	-	-	-	R	-
Hawk Owl	-	-	R	-	-
Great-horned Owl	-	-	R	-	-
Belted Kingfisher	-	-	U	-	-
Northern Flicker	-	-	R	-	-
Willow Flycatcher	-	-	U	-	-
<u>Empidonax</u> Flycatcher	P-U	-	-	-	-
Say's Phoebe	-	-	C	C	R
Barn Swallow	-	P	-	-	-
Cliff Swallow	P-U	P	A	-	-

*Status: A = Ubiquitous R = Rare
 C = Common U = Unknown
 L = Local - = Absent
 P = Present

(Continued on next page.)

Birds Seen on Float Trips in 1977 and Their Status*

	Kanektok River Kagati Lake (Weir MS.)		Anvik 6/27-30	Utukok 7/12-19	Kukpuk 7/20-27
	6/16/20				
Violet-green Swallow	-	-	U	-	-
Tree Swallow	P-C	-	C	-	-
Bank Swallow	P-C	-	R	-	-
Horned Lark	-	-	-	-	U
Gray Jay	-	P	U	-	-
Raven	-	P	-	U	C
Magpie	P-R	-	-	-	-
Varied Thrush	P-U	-	U	-	-
Robin	-	-	-	U	-
Gray-cheeked Thrush	P-A	-	U	-	-
Swainson's Thrush	-	-	C	-	-
Wheatear	-	-	-	U	U
Bluethroat	-	-	-	U	-
Arctic Warbler	P-A	-	U	-	-
Water Pipit	P-R	-	R	U	C
Yellow Wagtail	P-A	P	R	U	C
Northern Shrike	-	P	-	C	-

*Status: A = Ubiquitous R = Rare
 C = Common U = Unknown
 L = Local - = Absent
 P = Present

(Continued on next page.)

Birds Seen on Float Trips in 1977 and Their Status*

	Kanektok River				
	Kagati Lake 6/16/20 (Weir MS.)		Anvik 6/27-30	Utukok 7/12-19	Kukpuk 7/20-27
Yellow Warbler	P-C	P	A	-	-
Yellow-rumped Warbler	P-U	-	R	-	-
Black-poll Warbler	P-U	-	-	-	-
Northern Waterthrush	P-R	-	C	-	-
Orange-crowned Warbler	-	-	R	-	-
Wilson Warbler	P-A	P	U	-	-
Rusty Blackbird	-	P	U	-	-
Pine Grosbeak	-	-	U	-	-
Redpoll	P-A	P	C	C	A
White-winged Crossbill	-	-	R	-	-
Savannah Sparrow	P-A	P	-	U	C
Dark-eyed Junco	-	-	U	-	-
Tree Sparrow	P-A	P	A	C	U
White-crowned Sparrow	P-U	P	C	U	-
Golden Sparrow	P-A	P	-	-	-
Fox Sparrow	P-C	P	U	-	-
Lapland Longspur	P-A	P	-	U	U
Snow Bunting	-	-	-	-	C

*Status: A = Ubiquitous R = Rare
 C = Common U = Unknown
 L = Local - = Absent
 P = Present

APPENDIX E

Raptor Nests Found from Aircraft and Float Surveys on Portions of Western Alaska Rivers Examined in 1977.

River	Approximate miles (km) Examined	Raven	Rough-legged Hawk	Golden Eagle	Gyr Falcon	Peregrine	Others: (Merlin, Bald Eagle, Harlans)
Tuluksak	25 (40)	0	0	0	0	0	0
Kisaralik	47 (76)	0	3 (5)	7 (7)	3	0	1
Kwethluk	18 (29)	0	0	2 (1)	0	0	(1)
Eek	43 (69)	0	0	2	1	0	1 (1)
Fog	13 (21)	0	0	0	1 (?)	0	0
Kanektok	44 (71)	0	(1)	1	0	0	2
Andreafsky	68 (109)	0	3	2	0	0	0
East Fork Andreafsky	100 (161)	0	(3)	0	2	0	(1)
Bonasila	32 (51)	0	0	0	0	0	0
Anvik	60 (97)	0	8	(2)	2	0	3
North Fork Unalakleet	30 (48)	0	0	1	1	0	0
Nulato	22 (35)	0	0	0	0	0	0
Shaktoolik	53 (85)	(1)	(9)	1	1	0	0
Ungalik	56 (90)	2	(3)	2 (1)	4	0	0
North	46 (74)	2	0	1	1	0	0
Pitmegea	29 (47)	0	2 (2)	0	0	0	0
Ipewik	73 (117)	3	4 (5)	(3)	4	0	0
Kivalina	36 (58)	0	3 (3)	1 (1)	2	0	0
Wulik	56 (90)	0	2 (2)	(3)	1	0	0
Kokolik	45 (72)	1	3 (3)	0	4	0	0
Kukpowruk	43 (69)	1	2 (1)	1	2	0	0
Utukok	80 (129)	1 (1)	4 (4)	2 (3)	3	0	0
Kukpuk	97 (156)	4 (2)	7 (9)	1 (2)	6	0	0
Kateel	62 (100)	0	0	1	0	0	0
Gisasa	58 (93)	0	0	0	0	0	0
Goodpaster	36 (58)	2 (2)	0	0	0	0	2
Salcha	40 (64)	2 (3)	0	0	0	0	0
Colville (including Etivluk)	80 (129)	3	17 (5)	0	6	10	0
Gulkana	70 (113)	0	0	0	0	0	3 (4)
Delta	15 (24)	0	0	0	(1)	0	0
TOTAL	1,477 (2,377)						