

Interim Report for National Park Service  
Contract No. CX-9000-3-0125 to the University of Alaska

Gates of the Arctic National Park Service Study Area  
David F. Murray, Principal Investigator

## INTRODUCTION

This report is basically a narrative covering activities in the field. General comments on the areas visited and an indication of accomplishments are offered to show how the objectives of the Proposal were carried out and in what manner departures from that Proposal may have occurred. The full scientific results (time constraints being understood) will appear in the Final Report.

## NARRATIVE

### "Nahtuk"

Assistants Edward and Gretchen Murphy and a planeload of freight departed the floatpond at Fairbanks International Airport on 15 June for our first camp on the Alatna River. We had arranged to occupy the log cabin and tents of Bernd Gaedeke, Registered Guide, just downstream from the confluence of Nahtuk River with the Alatna ( $67^{\circ} 25' N$ ,  $153^{\circ} 43' W$ ). The river was very high as a result of recent warm weather and rapid snowmelt at the headwaters.

On 18 June Barbara Murray and I flew to "Nahtuk" with the remainder of our equipment and supplies to last us until 1 July. The facilities and basic camping equipment were provided here and at the three other sites occupied by us during the summer through a contract with Bernd Gaedeke, representing the Altana Guide Service. Bernd handled the logistics to my great relief and indeed contributed to the success of the project.

During the period 18 June to 1 July we collected 264 numbers of vascular plants and 509 numbers of cryptogams. Collecting trips covered the active floodplain, forest and alpine ridges on both sides of the valley. Numerous habitats were investigated including the spray zone of the larger of the two waterfalls near camp. A day trip was made downriver by boat, and an afternoon was spent at the north end of Takuhula Lake. This lake has long been visited by native people from the region, and a fine portage trail connects the Alatna with the lake. A cabin was built there years ago by the Helmericks and their life there is chronicled in their book, Flight of the Arctic Tern. It is an outstanding spot for natural beauty. Finally, a brief boat trip was made upstream as far as the old Helmerick cabin opposite the mouth of Kutuk River. The Helmericks have also written a book, We Live in the Arctic, about experiences there. The cabin's roof was recently rebuilt by a young couple who now live there much of the year.

Throughout our stay we actually observed very little wildlife. A grizzly bear was seen on the west bank of the Alatna by Ed Murphy as they landed at "Nahtuk" on the 15th of June. The bear was apparently feeding on caribou remains. A week or two before, large numbers of caribou had passed through the area heading north to their summer range; caribou trails were numerous and the sign of their movement through the area was still quite fresh. Strag-

glers continued to pass by judging from the tracks, and we watched two cross the Alatna in front of the cabin and trot north.

Bear tracks were common on the gravel bars, and later in the summer other people staying at the Nahtuk cabin saw bears and cubs. We were scrupulous in our care of garbage which may account for the lack of bears in camp during our stay. To avoid conflict with bears, one cannot be too careful to see that garbage does not become an attractant.

We also saw a short-tailed weasel, a porcupine, moose, numerous red squirrels and arctic ground squirrels. Lynx tracks were noted once, and wolf tracks were quite common. On the morning of 1 July we awoke to the howling of wolves nearby. Skeletal remains of sheep, caribou and moose also testify to the presence of wolves. Clearly, wildlife was abundant, but the thick vegetation both obscured the view and precluded stealthy walking in the valley bottom.

To our distinct pleasure, the weather was beautiful for two whole weeks. Rain occurred during the night or early morning hours. The river level dropped steadily after the high of 15 June, and what rain we did have altered the flow only slightly. On 30 June we suffered from heat. I am certain that the soil and rock temperatures in exposed alpine sites were well in excess of 100° F. As expected, the mosquitos were bothersome throughout our stay. Anyone not willing to endure the irritation they provide had better not enter the Alatna valley during the summer.

The base elevation at Nahtuk is just under 1000 feet. Here the Alatna River is confined to a narrow valley with abrupt and steep bedrock walls. Cliffs and talus slopes are common. The boreal forest is principally white spruce (Picea glauca (Moench)Voss), willow, alder, dwarf birch (Betula glandulosa Michx.) with cottonwood (Populus balsamifera L.) common on the floodplain and paper birch (Betula papyrifera Marsh.) scattered over the slopes above. Poorly drained sites support black spruce (Picea mariana (Mill) BSP). Alpine tundra is well developed above tree limit wherever substrate stability permits. Notable among the botanical discoveries here were two lady-slipper orchids Cypripedium calceolus L. and C. guttatum Sw. The rare arctic moss, Bryum wrightii Sull. & Lesq. was found at two high localities on opposite sides of the valley. The excellent stocking of the lowlands with white spruce and paper birch give the impression of an extensive forest. This is, of course, true where the valley is broad and unstable bedrock does not preclude trees. The distribution of forest within the valley is markedly asymmetric between Pingaluk and Kutuk rivers where the forest is confined to the south-facing slopes. Along the Nahtuk River white spruce reached 17 in. dbh and the cottonwoods attained 9.5 in. dbh. Sufficient cottonwoods are present between Nahtuk and Kutak rivers to sustain beaver colonies. Trees extend well up the mountain slopes, but tree-limit is very irregular and is under strong topographic control. Evidently wind is not an important limiting factor since "flagging" and krumholtz are absent. The trees at the very altitudinal limit of the species are erect.

#### "Headwaters"

On 1 July we moved camp to the first lake at the headwaters of the Alatna River (67° 55' N, 155° 05' W). This was the first day an ice-free area permitted landings by float-equipped

aircraft. Bernd has established here another permanent camp where the Alatna Guide Service has hunted for many years. Wall tents on platforms and a small cabin gave us space protected from wind and weather in which we could comfortably pursue our field analyses. This is the same area to which Lois Crisler refers (pgs. 80-109) in her book Arctic Wild.

On the flight from "Nahtuk" to "Headwaters" we spotted a female grizzly with two cubs. We also noted that paper birch (Betula papyrifera Marsh.) is found upstream on the Alatna as far as Ram Creek, 67° 52'N. Latitudinal tree-limit in the valley is abrupt with the last stand of white spruce consisting still of erect trees without obvious wind modification.

At "Headwaters" we were situated at 2800 feet elevation, 67° 55' N and had available to us an extensive rolling upland of tundra dotted with lakes that drain both to the Yukon (Bering Sea) and the Colville rivers (Arctic Ocean). The headwaters of the Nigu and Killik rivers were close enough for exploration on foot, however, extensive tussock tundra made any walk in excess of 10 miles a major trek. The mountains on both sides of the headwaters camp lake ("Landing Lake" in Crisler) were explored from base to summit. Between 2 and 15 July we collected 236 numbers of vascular plants and 496 numbers of cryptogams.

Wildlife was scarce as we more or less anticipated. Large game is more common late in the summer when the caribou are again passing through the area heading south to their wintering grounds in the forest. We did observe a pair of nesting ospreys at the head of the Nigu River, a pair of golden eagles, various shorebirds and larger waterfowl, ptarmigan, and common passerines such as lapland longspurs, redpolls and tree sparrows. An adult female wolf visited our camp on two occasions; the first time we watched her hunt for about 40 minutes, presumably for nesting birds and microtines. The lakes contain numerous grayling, lake trout and burbot.

Bad weather hindered field work on only two occasions. Fortunately the mosquitos were moderate in comparison to "Nahtuk".

Lakeshore, stream gravels, tussock tundra, frost features, alpine meadows and talus provided a variety of habitats. Thickets of the felt-leaf willow, Salix alaxensis (Anderss.) Cov., paralleled mountain streams; Salix lanata L. and S. pulchra Cham. defined the lower reaches of drainage channels. These areas provided cover for tree sparrows and redpolls that made continuous music and produced numerous fledglings.

Dry, south-facing talus slopes supported a rich flora of ecological specialists not found on other exposures in the area. Most of the species were anticipated, however the discovery of the arctic annual, Koenigia islandica L., in the centers of frost boils along the lake shore did provide an extension of its known range.

On the evening of 1 July we made a reconnaissance flight down the Killik drainage as far as Lake Udrivik. This helped me appreciate the opportunities for collecting and permitted us to evaluate our proposed camp sites. Lake Kaniksarak offered easy access to the mountain slopes to the west, but the Killik River, without a sturdy canoe, prevented our study of the east wall of the valley. Lake Udrivik was canceled as a site in favor of Imiaknikpak Lake which is close to uplands as well as a portion of the Killik dune system.

During this flight I was impressed with the stocking of willows on the gravel bars at the junction of tributary streams with the Killik River, especially around Easter and April creeks. This vegetation is clearly important to the success of moose that inhabit the valley. Furthermore two stands of cottonwoods were noted just above and below the mouth of April Creek. The presence of cottonwoods on the North Slope of the Brooks Range well beyond the continental limit of the boreal forest is a subject about which I am currently interested.

The larger lakes were ice covered, but with open water along the lake shores. The exposed sand bars and sand dunes were conspicuously blue with blooming lupines, Lupinus arcticus Wats.

A brief side trip was made to Kurupa Lake which was then still frozen solid and suitable for landings by ski-equipped aircraft. A double waterfall east of Kurupa Lake is very interesting from the air and must be spectacular when viewed from the ground. During the flight we saw a bull and a cow moose.

#### "Lake Kaniksarak"

On 15 July we moved personnel and equipment to Lake Kaniksarak on the Killik River. We had some difficulty finding a spot dry enough upon which to make camp. The site we chose had sign of a previous encampment many years ago, but without sign of more recent disturbance. The sand dune that forms an island on this lake has been occupied in the past for several discarded five gallon fuel cans were noted as we circled before landing.

At our campsite we found well rusted fuel cans, a stove pipe also rusted and supporting a growth of crustose lichens and the rotting remains of a canoe. The canoe was constructed using both pegging and some nails and iron hardware. Later, I located a set of bone net weights and wooden floats. Undoubtedly Eskimos had camped and fished in the area in the past, but continuous occupation in the recent past was not evident. Toward the mountain slopes, on one of the bedrock prominences, we did find evidence of early man (see Appendix B).

At the very mouth of Enekalikruak Creek, just north of the lake, Bernd located two pole and sod shelters (a "cabin" is marked on the map of the area and may refer to these old dwellings). Of interest in this regard is the written comment by Laurence Irving in his book, Arctic Life of Birds and Mammals, Including Man. On page one he noted, "The sand dunes along the Killik River in the Brooks Range of Alaska are marked with the scars of sudden and violent winds. Simon Paneak, who was born there, related that his father early warned him that it was dangerous to make camp in the valley except in sites that had been used earlier and found safe." The point here is that Simon Paneak, a long time Anaktuvuk Pass resident, had lived in the Killik valley. Although the area now sees little traffic except from recreational campers, it was populated by native peoples in recent times. The validity of the comments on sudden and violent winds was obvious at Lake Kaniksarak and later especially at Imiaknikpak Lake.

Between 15 and 25 July we collected 174 numbers of vascular plants and 169 numbers of cryptogams. We made fewer collections not because the flora was less diverse, rather because

several days of wind and rain made both the collecting and the drying of specimens very difficult. For a few days our tents were miserable, wet and cold. Storms that swept up valley (from the north) would suddenly reverse direction and sweep down valley with winds reaching 25 and 30 mph.

Dall sheep nursery bands were observed on both sides of the Killik valley. A male wolf visited our camp one morning, inspected us briefly and trotted off. Moose were seen from the air each time we flew the valley. A cow and calf were observed on the lake shore just across from our camp. Arctic ground squirrels were common at higher elevations, but restricted to well drained situations at lake level. The lake contains large grayling, and a burbot was seen.

Following our departure on the 25th, Kermit and Judy Johnson, who were also camped at the lake, watched a grizzly bear investigate our camp site. Since we had burned our garbage and had blown out the nonburnables, there was little but odor to interest the bear. The Johnsons saw the bear roll on the ground of the camp area, perhaps a behavioral response to strange smells in his territory.

When the sky was clear and the air calm, the mosquitos were quite bad. Here we became painfully reminded of the reality of microclimate. Small changes of topography that placed us in a position sheltered from the wind resulted in immediate attack by the hordes.

Permafrost was relatively close to the surface, consequently the watertable was high in the low areas and fens were an important feature of the landscape. Willow scrub was locally extensive. A surprise to me were the well developed alder thickets. Stream gravel, fens, talus slopes and massive bedrock outcrops presented interesting terrain.

On the 23rd Ed and Gretchen Murphy with two friends (see Appendix A) began a trek south back to the headwaters of the Alatna.

#### "Imiaknikpak Lake"

On the flight to the lake ( $68^{\circ} 29' N$ ,  $154^{\circ} 03' W$ ) we observed a bull moose and a female grizzly with two cubs. Our first view of the lake had been on 1 July when ice covered a major portion of its surface. Now we were surprised to see that the water was opaque brown with suspended sand and silt. Smaller ponds in the area were clear, and we camped beside a small clearwater pond on the sand dunes between the lake and the Killik River. Since the outlet of Imiaknikpak Lake exits on the upstream side of the lake, we presume that when the Killik is at high water stages, it floods the outlet and causes a reversal of flow. Consequently Imiaknikpak Lake experiences very rapid increases of water level.

Between 25 July and 5 August we collected 221 numbers of vascular plants and 255 numbers of cryptogams. A vast area was accessible for collecting. Dunes, stable and unstable, rocky lake shores, river gravel, fens, willow and alder thickets, tussock tundra and windswept ridges were within five miles of camp.

Two moose were seen and fresh moose tracks were common both on the game trail bordering the north end of the lake and in the dunes. Red fox and arctic ground squirrels inhabited the dune area. Just after taking off from the lake one evening we saw a wolf on the upland just north of the lake. Late in our stay, about 3 August, a large body of caribou passed around the south end of the lake, fresh tracks were absolutely everywhere, and two stragglers were seen. Waterfowl were common.

Mosquitos deserve special mention if only for their continuous ferocity. We experienced severe winds (to 45 mph) on two occasions that threatened to carry away our camp. We learned later that some damage did occur to Bernd Gaedeke's camp at the headwaters of the Alatna and at a camp on Liberator Lake to the west of us. Otherwise the mosquitos were out in clouds. We watched bull caribou running to escape their torment and later saw a bull moose out in a lake so that only its head and the ridge of its back were visible. Buhach or Pic coils were absolutely essential for peaceful tent living. It was the worst extended harassment by insect I have ever experienced, nevertheless it did not preclude an enjoyable stay.

Of all the areas visited, this proved to be one of the most interesting botanically. The sand dunes are very interesting and outstanding geomorphic features of immense size. Although dunes are present elsewhere on the North Slope, I believe these to be especially well developed. The lake shore provided some interesting finds well out of their known range: Triglochin palustris L., Carex eleusinoides Turcz., Primula sibirica Jacq. In some of the frost "boils", we found a species of Fossombronia, a possibly undescribed taxon of this relict temperate genus of leafy liverwort.

While at Imiaknikpak Lake it was clear that the pattern of weather here could be entirely different from what was being experienced in and across the Brooks Range summits. It was pleasant to enjoy fine weather when the mountains to the south looked stormy. However, since all our supplies were coming from the south, mountain weather provided a significant logistic barrier. When working on the north side, it is smart to go well outfitted.

Although the actual amount of precipitation that fell this summer may be unusually high, the important lesson is that after any hard rain, one must be prepared for rapid rise of water levels. For the foot traveler, this may mean delays while waiting a day or so for runoff to abate. At least there is the prospect of some very wet and frequently dangerous stream crossings.

## APPENDIX A

## LAKE KANIKSRAK TO ALLAKAKET

I. Walk from Lake Kaniksrak to Headwater Lakes

My wife Gretchen and I, along with John Hurst and Rhea Irvine from Berkeley, California, began our walk from Lake Kaniksrak on the Killik River to the Headwater Lakes of the Alatna River on 23 July 1973. We had planned to begin the 45 mile walk a few days earlier but heavy rains and strong winds at the Kaniksrak camp kept us inside the tents much of the time for several days. The rain stopped on the 21st and on the 22nd we worked around camp. The small creeks had been turned into raging torrents by heavy rains, and we knew we would be unable to cross even the first creek we would encounter if we started walking that day. By the morning of the 23rd, however, Enekalikruak Creek, just north of Kaniksrak Lake, had dropped more than a foot and we started our walk in the hope that the up-valley tributaries of the Killik would also be carrying less water and would be fordable.

The first day we walked along caribou trails about a half mile west of the Killik and walked to the mapped but unnamed creek about 8 miles upriver from Lake Kaniksrak (between Sugakuik Creek and Ayakalak Creek). This creek divides into two branches as it passes a small knoll about one mile before it reaches the Killik. We crossed the first of these branches and made camp on the gravel bar just after we crossed. The second day we walked the side hills again, staying about one mile from the Killik, but found few good trails and very uneven terrain. The sedge tussock areas through which we walked quickly drained our energy, and it was not until late in the day that we reached Ayakalak Creek. This is a fairly large tributary of the Killik and, although it had dropped at least two feet from its maximum level after the rain of a few days before, we had difficulty finding a place to cross safely. While we were looking for a crossing place we saw a cow moose and her calf easily cross where the creek certainly would have swept us off our feet. Soon after, we found a place where the creek braided into three channels. We made a safe crossing and set up camp on the gravel bar on the other side of the creek.

On the 25th we again walked along the side of the hills about one mile away from the Killik and found the walking much better than the previous day. We reached Mary Creek for lunch. After lunch, we walked along the north bank of the creek towards the Killik. The walking along the bank was quite good and we quickly reached the Killik. Near the confluence with the Killik, we easily crossed Mary Creek. Although we had hoped to find better walking on the gravel bars of the Killik, the river was still fairly high and we frequently had to climb up the bluffs (river terraces) and walk along these. We walked about 3 miles further alongside the Killik and made camp on a gravel bar on the edge of the river. The area on which we camped had recently been covered by water, but now was about six feet above the river level. It both amazed and relieved us to realize how quickly the river had changed, for we knew we would now be able to cross the large creeks to the south.

On the 26th the heavy cloud cover we had experienced since the start of our walk began to break. The interaction of light and shade on the river and hillsides was beautiful, and we had a very pleasant walk of about eight miles. We reached a small creek which flows east from three small lakes for about one mile before emptying into the Killik. We walked on the gravel bars as much as possible, and although we sometimes had to climb up and walk on top of the bluffs where the river cuts its way right along the bluffs,

we found the gravel bars much more extensive than on the day before. In the evening, I walked up the creek but did not reach the lakes.

We started out the morning of the 27th under almost cloudless skies. As Gretchen and I crossed a small unmarked creek we saw several grayling in a pool. Within a half hour I had caught our lunch. We cooked it over an open fire about 2 miles further south on a bluff from which we could see far up the Killik, almost to its headwaters. After lunch we walked southwest towards the continental divide which is only about 3000 feet high. As we reached the divide, the sun passed behind some clouds on the northwest horizon and gave a brilliant contrast of the land, lakes and sky. There we walked slowly entranced by the beauty of the tundra weather and an hour later found ourselves at our destination - - Bernd Gaedeke's cabin on the Headwater Lakes.

## II. Kayak trip from Headwater Lakes to Allakaket

From the evening of the 28th of July until the 31st, we stayed at the Headwater Lakes cabin. It rained every day during that period. On the 31st the rain slackened somewhat and we loaded our kayaks with all our gear and three weeks supply of food. Late in the day we paddled our two man Klepper folding kayaks to the outlet of the lake and then lined a mile downriver. There we had become so benumbed by the cold water that we decided to make camp. The river dropped a few inches during the night and on the first of August we lined about four miles to the first major tributary of the Alatna. The next day we explored the area around camp. I walked westward along the tributary and explored three small valleys of the large mountain to the southwest. These valleys were all spectacular. In them, the creeks descended in a variety of ways along the steep gradient of the valleys: the first dropped in a series of small waterfalls from a bowl shaped valley; the second flowed through a much longer U shaped valley before falling down a 75 foot waterfall; and the third dropped gradually, but like the others, had cut a narrow gorge just before entering the major tributary of the Alatna.

On the 3rd of August we lined about 6 miles down the river. Gretchen and I tried to paddle on some stretches but we frequently had to jump out when the river became too shallow to run safely. Just upriver from our camp we saw the first alders (Alnus crispa) of our downriver trip. We spent the 4th of August exploring the valley by camp on the west side of the river. I saw a band of four Dall sheep rams in the next valley and a single 5 year old (5/8 curl) ram near the head of the valley I was in. On the 4th, we lined and paddled to Portage Creek. That day, Gretchen and I tried to paddle too much of the river: sweepers and slightly submerged gravel bars proved our undoing as we turned over three times en route. We made camp just above Portage Creek on the west side of the Alatna, where we spread out all our things to dry that day and the next. Dave and Barbara Murray and Bernd Gaedeke flew over us on their way back south on the 5th, and I suppose they saw us and knew all was well, although a bit wet. Near camp we found the first white spruce trees of the trip and could see much more extensive stands on the southfacing slopes about a mile down the river. On the 7th we walked up to the lake which is the source of Portage Creek on the Noatak River.

On the 8th we headed downriver again. John and I each paddled a kayak while Gretchen and Rhea walked alongside the river. The kayaks were much more maneuverable this way, and we were able to paddle along quite easily. Gretchen and Rhea crossed the river by camp and then walked on the north side until they came to a very steep cliff about 3 miles downriver. They then made a very difficult crossing back to the south side of the



river. The river's volume had by this point increased substantially, and we knew it would be unfordable further down. About 5 miles below our previous camp we stopped and made camp by a large but unmapped creek flowing from the south and entering the Alatna about 5 miles upriver from Gull Creek. The next day I hiked up the easternmost ridge of the valley from which the creek flows. In the mid morning it started to snow lightly as I was collecting some poppies on a steep talus slope. Later, when the weather cleared, I saw two young Dall sheep rams and an ewe and lamb nearby.

On the 10th, we again headed downriver and made camp at Gull Creek. The mountains at the head of Gull Creek are the most spectacular we had seen to this point in our trip. We spent the 11th walking up Gull Creek and sometimes caught glimpses of the mountains through the veil of fog. The interaction of fog and sun gave the mountains an even more majestic appearance than that of the previous day. Although I saw many sheep trails, I saw only one sheep, an old ram. As in the valley of our previous camp, most of the abundant sheep sign was old, suggesting that the areas are perhaps used more heavily at other times of the year. The volume of the river was large enough at Gull Creek that all of us could paddle in the kayaks. From the 12th until the morning of the 17th, we stayed at Ram Creek, either exploring Ram Creek valley or trying to stay dry inside the tents as it rained almost every day. We picked high bush cranberries (Viburnum edule) and found the first paper birch (Betula papyrifera) of the downriver trip on the southwest facing slopes near the confluence of Ram Creek with the Alatna.

On the 17th the rain subsided early in the day so we broke camp and headed downriver. About 2 miles below Ram Creek, Gretchen and I tore a hole in our kayak and spent the rest of the day, in the drizzling rain, trying to get a patch to hold. About 9 P.M. we were ready to go but it was so dark that we camped at the small eastward flowing creek which enters the Alatna about 3 miles below Ram Creek. The next morning we paddled about 5 miles to the creek which enters the Alatna from the west about 3 miles above Pegeeluk Creek. Along the way we saw John walking back to look for us, and at the creek we found Rhea and their camp. We spent the day there and on the 19th paddled to Kutuk River. We spent that night at the cabin opposite the Alatna-Kutuk confluence. The next day driving rain and strong upriver winds kept us in and around the cabin. The river had risen three feet overnight to the highest point it had reached all summer. Judging from old silt marks, it was higher than it had been in several years. The river was massive and carried along scores of large trees. During the next night the river dropped a foot.

On the morning of the 21st, the rain ceased and we started off towards Arrigetch Creek. Although we'd been told that the walking on the southeast side of the creek was better, the creek was a raging torrent and impossible to cross. We spent the day battling the tall alders on the steep hills on the northwest side. By nightfall, we were only about 4 miles up the valley. Early in the morning of the 22nd we found a place where the creek divided into two channels and, since the creek had dropped a foot overnight, we were able to cross easily there. Seven miles from the Alatna, the two major forks of the creek join together. We made camp slightly to the east of the confluence of the forks. At 5:30 the next morning the sky was perfectly clear and we walked up the east (north flowing) fork as the sun illuminated the peaks above us. We walked to a point where a lake is marked on the map. We found that the area had silted in and a meadow has formed since the map was made. We returned to camp and later in the day walked up the west (northeast flowing) fork. This walk was stunningly beautiful. Walking in this large U shaped valley was for us the finest wilderness experience of our lives. Glaciers on the high peaks feed the small creek which flows through a broad, lush meadow. In the mid morning the sky had become cloudy, but late in the afternoon as we reached the head of the valley the sky partially cleared and we glimpsed the brilliant colors of the upper valley.

The morning of the 24th we awoke early to the sound of a drizzling rain and decided to head back to the Kutuk cabin. We stayed on the southeast side of the creek and found good walking until we reached the flats of the Alatna valley. There we crossed the creek and were back at the cabin late in the afternoon. The 25th we paddled to Nahtuk River and there met Wayne Ellis and Matt Weaver who were at Bernd Gaedeke's cabin just south of the Nahtuk River. They were the first people we had seen (except for planes overhead) since we had left Headwater Lakes nearly a month before. I spent the afternoon looking for plants we had not collected there in June. On the 26th we paddled to Takahula Lake. Although the sky was overcast, the lake was perfectly calm and the reflections of the surrounding mountains were crystal clear. As we ate lunch, we watched two beavers gathering willows in nearby coves and caching them by a lodge in the cove at the northeast end of the lake. Late that day, we started off downriver and camped about 8 miles below the lake.

On the 27th we paddled along the slow winding part of the river for about 40 miles. The next day, when we were about 10 miles above the confluence of the Alatna with the Malamute Fork, we met Jim Schwarber and Don Meeder lining Jim's homemade canoe up the river. They were going about 10 miles a day and hoped to keep up that pace until they reached the Nahtuk cabin. That evening we camped at Rockybottom Creek. On the 29th we paddled almost 50 miles until at dusk we made camp about 10 river miles upriver from Sinyalak Creek. The 30th we paddled to Dossenoughten Lake. We saw several fish camps on the way and saw the people of Allakaket making rafts of firewood which they would later float down the river to the village. The morning of the 31st, we paddled leisurely to the village. At first we found the people of the village quite reserved, but soon we had many visitors as we set up camp by the airstrip. We spent the day packing the kayaks so we would be ready to put them on the next day's plane and talking with the people of the village about the wilderness and the wildlife on which they depend.

Edward Murphy  
Project Assistant

## ARCHAEOLOGY

We were aware of possible early man sites in the study area and therefore special attention was paid to examining the terrain for camp sites and lookouts. A single obsidian scraper was found on a knoll above the Alatna River near the Nahtuk camp. However, at Lake Kaniksarak on the Killik River we discovered two early man localities on the summits of large bedrock exposures that overlook present day caribou trails. Numerous chips were found. Among the debris collected was an unusually large blade core of the Tabular or Tuktu type. The basic type was discovered in the Anaktuvuk Pass area, but it is known now from the Brooks Range in general. By typology it is roughly dated at 6000 years B.P. The microblades formed from this core are generally wider and thinner than those made by people further south in Alaska. A few microblades and blade fragments were in the debris we gathered.

A Kayuk Point was found that is also linked with Anaktuvuk technology. This point is thick in cross section and has a rounded base. It differs from other Kayuk points by its rather crude flaking, but it is burin faceted.

At Imiaknikpak Lake a large number of chips were found in a blowout on the sand dunes adjacent to the Killik River. No blades or cores were found.

The material is in the hands of Dr. John Cook, Department of Anthropology at this university who will record the site locations and characteristics from additional notes we shall submit.

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Project: Gates of the Arctic Vegetation Study  
Principal Investigator: David F. Murray

FINAL REPORT

Notes on the Botany at Selected Localities on the  
Alatna and Killik River Valleys, Central Brooks Range, Alaska

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## APPENDIX

### Part II. Notes on Mammals of the Central Brooks Range.

Edward Murphy and David F. Murray

Observations made during the period 15 June-31 August 1973 are noted below. Those mammals on which we made no observations but which are known (or believed) to occur in the Alatna and Killik drainages are also listed, with the appropriate literature. As we set no pitfall, snap or live traps, we have added little to what is known about the occurrence of insectivores and rodents. Anaktuvuk Pass, Chandler Lake and Umiat, for which literature records are available, are generally equivalent in their mammalian fauna to the Headwater Lake area of the Alatna River, Lake Kaniksarak, and Imiaknikpak Lake, respectively.

#### INSECTIVORA

##### Soricidae

Sorex arcticus, the arctic or tundra shrew, has been reported at Tulugak Lake near Anaktuvuk Pass (Rausch 1951) and near the Killik-Colville confluence (Manville and Young 1965). It is common in some years and widely distributed in the Brooks Range, occurring on tundra above and beyond timberline.

Sorex cinereus, the masked shrew, has been reported from Chandler Lake (Bee and Hall 1956), Tulugak Lake and Umiat (Rausch 1951), and from near Bettles and Wiseman (Manville and Young 1965). This species is common in moist areas of spruce-birch forests in the interior, but uncommon on tundra (Manville and Young 1965). Rausch (1951) collected it in tundra areas with heavy moss cover beneath willow (Salix) and dwarf birch (Betula nana)

and stated that it "appears to prefer a somewhat drier habitat than does S. obscurus."

Sorex obscurus, the dusky shrew, has been reported from Chandler Lake (Bee and Hall 1956), from Tulugak Lake (Rausch 1951), and near Bettles and Allakaket (Manville and Young 1965). It is probably the most common shrew in the area, occurring in moist areas (Rausch 1951; Bee and Hall 1956).

#### LAGOMORPHA

##### Leporidae

Lepus americanus, the snowshoe hare, was evident in the upper Alatna drainage from the occurrence of hare-browsed willows. Our northernmost sighting was at Gull Creek, 67°41'N. Helmericks and Helmericks (1947) periodically relied on snowshoe hares for food during their winter at the Kutuk River mouth in 1945. Rausch (1951) collected snowshoe hares as far north as Kalutak Creek on the John River eight miles south of the continental divide, and they are numerous in the willows at the head of the Anaktuvuk River in some years (R.L. Rausch, written communication).

Lepus othus, the tundra hare or Alaskan hare, was seen by Marvin Mangus on the Killik River at 68°23'N (probably in the vicinity of Silalinigun Creek) on 20 August 1949 (Bee and Hall 1956). Rausch (1951) reported that the Nunamiut have seen this hare near Umiat and near the mouth of the Anaktuvuk River. These reports and that of Gubser (1965) notwithstanding, the distribution of L. othus is still not clear, since there are no specimens to substantiate its occurrence east of the Seward Peninsula (R. L. Rausch, written communication).

## RODENTIA

## Sciuridae

Marmota broweri, hoary marmot. "The Nunamiut say that it is common near the head of the Killik" (Rausch 1951). A specimen was collected by Bee and Hall (1956) at Chandler Lake. Although it is probably common in rock outcrops, we saw none in the summer of 1973; however, Rausch (oral communication) said that M. broweri is much more secretive than M. caligata.

Citellus parryi, the Arctic ground squirrel, was very common throughout our study area, having been both heard and seen quite frequently during our stay. It was found primarily in areas of rock outcrops and well-drained soils in tundra, but many of these animals were also on the sand dunes of Imiaknikpak Lake.

Tamiasciurus hudsonicus, the red squirrel, is closely associated with coniferous forests and they do not often occur beyond the northern limit of white spruce (Picea glauca). Rausch (1951) collected specimens from the last timber on the John River drainage and near the summit of Anaktuvuk Pass (1953) in a stand of willows 30 miles (fide Gubser 1965) north of spruce. Several individuals lived in the vicinity of the Nahtuk cabin, and we saw one at the Kutuk cabin. On the Murphys' kayak trip down the Alatna, they first heard red squirrels at Ram Creek, 67°52'N, on 14 August 1973.

Castor canadensis, the beaver, is common along streams and lakes in the southern Brooks Range. Rausch (1951) found trees cut by beavers in the Savioyok valley on the John River and also near the head of Ikiakpuk Creek well beyond the limits of taiga (Rausch 1953). Tracks were seen by Harmon Helmericks and George Wood near the mouth of the Kuparuk River,

70°00'N, 149°30'W, and at the junction of the East Fork and the West Fork of the Sagavanirktok River, 69°28'N, 148°28'W. (Bee and Hall 1956). These records are not verifiable. We found fresh beaver-clipped willows at the outlet of Headwater Lake of the Alatna, 67°33'N. This is several miles north of the last spruce and considerably north of the next northernmost sign of beaver in the Alatna valley at Ram Creek (Bernd Gaedeke, oral communication). Rausch (1953) reported the occurrence of beaver at the mouth of Inukpasukruk Creek (68°07'N) as the northernmost record in the central Brooks Range region. During the Murphys' downriver trip they first noticed fresh sign about two miles below Pegeeluk Creek. Sign of beaver activity was common between Kutuk and Nahtuk. At Takahula Lake they watched two beavers cache willows near a lodge at the northeast end of the lake. Downriver from Takahula Lake, beaver sign was more noticeable but never truly abundant.

#### Cricetidae

Clethrionomys rutilus, the red-backed vole, is apparently common throughout the study area. Rausch (1951) collected specimens at Umiat and in the Anaktuvuk Pass region. This vole has been reported from Allakaket and from along the Alatna (Manville and Young 1965). Part of a skull was found in a casting B. Murray picked up at Imiaknikpak Lake. It prefers Salix and Betula communities where the ground is covered with dense moss but has also been found at drier sites at elevations up to 3,000 ft (Rausch 1951).

Microtus miurus, the singing vole, will almost certainly be found throughout the proposed Park. The type locality of M. m. muriei is on the Kutuk River. Rausch (1951, 1953) collected several hundred specimens along the John and Anaktuvuk rivers. The species does, however, exhibit marked



fluctuations (not cyclic) in abundance. It was abundant during Rausch's collecting efforts and occurred in nearly all possible habitats (Rausch 1951).

Microtus oeconomus, the tundra vole, is distributed throughout arctic Alaska and has been collected at Chandler Lake (Bee and Hall 1956), Anaktuvuk Pass and along the Anaktuvuk River, at Umiat, and at Bettles (Rausch 1951). A few were found frozen in an Eskimo cache on the Killik River (Rausch 1951). It occurs most frequently in grass and sedge communities which are common throughout the study area.

Ondatra zibethicus, the muskrat. Information on the northern limits of the range of this species is sparse. Rausch (1953) collected a small series of muskrats around Arctic Village, and the people of Bettles say that muskrats occur on the John River as far north as the Hunt Fork. Helmericks and Helmericks (1947) noted muskrats at the confluence of the Kutuk and Alatna rivers. It is doubtful that they occur north of the continental divide.

A small animal was observed swimming in Imiaknikpak Lake on 28 July 1973. The general profile and swimming movements strongly suggested muskrat. However, the distance was great and we could not verify the presence of muskrat there.

Lemmus trimucronatus, the brown lemming, is most common on the arctic coastal plain but has been recorded at Chandler Lake (Bee and Hall 1956), at Tulugak Lake near the head of the Anaktuvuk River (Rausch 1951), and near Bettles (Manville and Young 1965). It has not been recorded in spruce habitats but prefers damp, lowland tundra. Therefore, it is probably not found in much of the proposed Park, which is characterized primarily by alpine tundra and boreal forest.

Dicrostonyx groenlandicus, the collared or varying lemming, was obtained by Rausch (1951) in the Anaktuvuk Pass area, and they are seldom found south of the divide.

#### Erethizontidae

Erethizon dorsatum, the porcupine, occurs to the limits of spruce timber and occasionally somewhat beyond. The northernmost sign we found was at Gull Creek on the Alatna River. We saw porcupines at the Kutuk and Nahtuk cabins. Rausch (1951) reported one at Chandler Lake.

### CARNIVORA

#### Canidae

Canis lupus, the gray wolf, is common throughout the Brooks Range, and in the Alatna and Killik valleys we saw innumerable sets of tracks during the summer. We saw single wolves at Ram Creek, Headwater Lake of the Alatna, on a flight from Headwater Lake to Lake Kaniksarak on the Killik, at Lake Kaniksarak, and at Imiaknikpak Lake. We heard wolves howl near our camp on 30 June at Nahtuk and five miles upriver from Gull Creek the evening of 8 August and the morning of 9 August. Usually we saw tracks of a single wolf. It is probable that there is considerable pack splitting during the summer when caribou are absent from the area and the wolves must rely more heavily on small game. Lois Crisler's (1956) observations of wolves in the Headwater Lake area of the Alatna are presented in her book Arctic Wild.

Alopex lagopus, arctic fox. Three were killed on the Killik River in 1941; one on Easter Creek and another on April Creek, both tributaries of the Killik, in 1947 (Rausch 1951). Rausch (1953) also reported one taken northeast of Anaktuvuk Pass. Rausch (1951) believed that these

foxes may have wandered from the Arctic Slope during times of high fox population after the periodic lemming decline there. However, he also noted (1953) that Arctic Village residents have seen them at the head of the East Fork of the Chandalar in the eastern Brooks Range.

Vulpes vulpes, red fox. Tracks indicated they were present in the Alatna and Killik valleys. D. F. and B. M. Murray saw one at Imiaknikpak Lake, 31 July 1973.

#### Ursidae

Ursus americanus, the black bear, probably occurs occasionally within the boundaries of the proposed park, but only as far north as the Kutuk River (Charles Keim, personal communication). This species does not seem to occur further north where grizzlies are numerous.

Ursus arctos, the grizzly, is widely distributed throughout the area we visited. Although tracks were often seen, we saw no grizzlies from the ground, and they are probably extremely wary. The Murphys saw a single grizzly at Nahtuk when they landed on 15 June 1973. Wayne Ellis and Matt Weaver, who stayed in the cabin the latter half of the summer, saw a grizzly sow and cub by the cabin and saw a grizzly on Nahtuk Creek. The Murrays saw sows with two cubs each on three occasions on flights from Nahtuk to Headwaters on 1 July and from Lake Kaniksarak to Imiaknikpak on 25 July and near Kurupa Lake on 27 July. Fresh tracks were seen at Imiaknikpak Lake on 4 August. Bernd Gaedeke said that he usually sees grizzlies early and late in the summer in the Alatna area and saw a boar several times in the Headwater Lake area in late August. The reader is referred to Rausch (1953) for comments on the physical characteristics and taxonomy of the grizzly.

## Mustelidae

Martes americana, the marten, is probably limited in distribution by the distribution of its principal prey, the red squirrel. According to the Nunamiut, ptarmigan (Lagopus) and microtines form the main diet of the marten in the Anaktuvuk Pass region (Rausch 1951), where it is rare. The Helmericks (1947) noted the presence of marten in the Alatna valley.

Mustela erminea, the ermine, is probably common in the Brooks Range. We saw ermine in rock outcrops on the mountain directly east of the Nahtuk cabin (one) and at the Headwater Lake cabin (two). Ermine tracks are found up most tributaries of the Anaktuvuk and John rivers (Rausch 1951) which are ecological equivalents of the Killik and Alatna rivers respectively. It feeds on small mammals and is relatively free from predation in the Brooks Range, its chief predator, the snowy owl, being uncommon (Rausch 1951).

Mustela nivalis, the least weasel, is widely distributed, but few specimens have been taken in the Brooks Range. A skull was found in a casting collected by B. Murray at Imiaknikpak Lake. On 1 August 1973 about one mile below the headwaters of the Alatna on a gravel bar the Murphys observed one that subsequently observed them for several minutes. They saw another on 27 August in a spruce forest by the Alatna about 20 miles below Takahula Lake.

Mustela vison, the mink, is rare in the Brooks Range; tracks were reported in the Savioyok valley by Rausch (1951).

Gulo gulo, the wolverine, is widely distributed but rarely seen and occurs at low population densities. It is an opportunistic predator-scavenger. We saw no wolverine sign, but on occasion Charles Keim (oral communication) has seen wolverines hunting mice in the rock outcrops just east of the Headwater Lake cabin. The Helmericks (1947) trapped them in

the Alatna valley near Kutuk River. Bee and Hall (1956) listed one record for the Killik River.

Lutra canadensis, the river otter, is uncommon. Tracks have been seen along the Hunt Fork, and one was seen at Kanayut Lake in 1950 (Rausch 1951). In the winter of 1922-23 Olaus Murie (1973) saw one between Helpmejck Creek and the Kutuk River on the Alatna. The Helmericks (1947) noted the presence of otter in the Alatna valley. Gubser (1965) cited a Nunamiut report of an otter population developing in the Chandler River, just north of the range where fish are numerous.

#### Felidae

Felis lynx, the lynx, occurs wherever the snowshoe hare is found. Rausch (1951) collected two specimens in the northernmost spruce forests on the John River drainage. We found a set of lynx tracks on a silt bar near the Nahtuk cabin. Rhea Irvine of the kayak party saw one briefly at Ram Creek of the Alatna in the tall willows near the creek.

### ARTIODACTYLA

#### Cervidae

Alces alces, the moose, is common in the study area. Moose droppings are especially abundant along streams in the tall willow (Salix alaxensis) thickets. On 24 June 1973 from the mountain west of the Nahtuk camp we observed a cow moose feeding in the shallow lake 1/4 mile east of the Alatna and one mile south-southeast of the Alatna-Pingaluk confluence. On 1 July the Murphys saw a cow and calf moose on a flight from the Nahtuk camp to Headwater Lake and the Murrays saw a bull and a cow moose during the evening aerial reconnaissance of the Killik River. On 15 July we observed a cow moose and her calf at Lake Kaniksruk and later in our stay there saw a cow

moose and her calf on the north shore of the lake. On the walk back to Headwater Lake (Appendix, Part IV), the Murphys saw a cow moose and her calf two miles upriver from Lake Kaniksarak and a cow moose at the lake on the north side of the Killik midway between the Killik-Kadruakvik confluence and the Killik-Sinuk confluence (23 July). On 24 July they saw a cow moose and her calf at Ayakalak Creek, and on 27 July saw a young bull moose one mile east of the inlet to the southernmost of the headwater lakes. The Murrays saw two moose on their flight from Lake Kaniksarak to Imiaknikpak Lake on 25 July; they saw a moose in a pond along the Colville on 30 July and another moose in a pond near Imiaknikpak Lake on 2 August. There was a well worn game trail around that lake and fresh moose tracks were seen often. The Nunamiut (Rausch 1951) know of a well used mineral lick in the Killik Valley where moose occur in numbers.

Rangifer tarandus, the barren-ground caribou, is at times the most common ungulate in the Brooks Range. Rausch (1951, 1953), Bee and Hall (1956) and Gubser (1965) have provided interesting summaries of caribou natural history. Tracks of caribou moving along the Alatna were abundant and fairly fresh around the Nahtuk cabin when we arrived in mid-June, and we saw two stragglers (cows or young bulls) cross the Alatna and then head upriver along the gravel bars by Nahtuk cabin on 24 June. No fresh tracks were found at Headwater Lake or at Lake Kaniksarak. On 27 July on a flight over Kurupa Lake the Murrays sighted three bands: four caribou near the headwaters of Nogak Creek, 30 just north of Kurupa Lake, and approximately 100 at Outwash Creek about nine miles west of Kurupa Lake. Fresh tracks of a large group were found by the Murrays on the south end of Imiaknikpak Lake on 4 August and two stragglers were seen. Several times in early August the Murphys saw fresh tracks of one or two individuals along the

upper Alatna.

We talked with Bernd Gaedeke and Charles Keim about caribou movements in the Alatna and Killik valleys. Both said that in the spring cows and calves move first, bulls following up to a few weeks later (cf. also Rausch 1951) north through the Alatna valley and then head northwestward towards Lookout Ridge, the major calving area of the arctic herd (Lent 1966). After calving, there is an eastward trend in late June and July, generally paralleling the Colville River, and in some years involving extensive northward movements toward the arctic coastal plain (Lent 1966). In mid-August large groups are usually seen at the headwater lakes of the Alatna (Charles Keim saw about 10,000 in a single day four years ago). The movement does not continue very far south, however. Caribou move along the tops of the ridges and filter through the Alatna valley as far south as the northern limit of trees. There the trend may be reversed, and the caribou may move back up the Alatna or over into the Killik. In late September the trend probably shifts to the south since large numbers pass through the village of Allakaket in mid-October.

The portions of the Alatna and Killik drainages in the proposed park are thus inhabited only seasonally by the arctic caribou herd. Although variable numbers of the arctic herd may winter on the arctic coastal plain, most follow a clockwise movement and return to the south slopes of the western Brooks Range and the Koyukuk plateau. The use of these areas may vary considerably. Lent (1966) estimated that 25,000 in 1960 but fewer than 5,000 in 1961 wintered in the foothills of the western Brooks Range, while 15,000 in 1960 and 60,000 in 1961 wintered in the Koyukuk plateau. See also the report by Hemming (1971) for a summary statement of distribution and movement of the arctic herd.

Ovis dalli, the Dall sheep, is common in the alpine tundra areas of the proposed park. Population numbers do fluctuate markedly, however, probably due to winter weather conditions; sheep are not abundant in the Alatna and Killik drainages. We spent much time walking in what appeared to be ideal sheep habitat and often found old sheep sign but rarely saw sheep or fresh sign.

The Helmericks (1947) commented on the absence of sheep in the late 1940's. An Indian helping the Helmericks build their cabin at Takahula Lake told them that several years before he had been part of a hunting party that killed 40 sheep (Helmericks and Helmericks 1952). At that time there was probably very little non-subsistence hunting pressure. The only record we have found is of a collecting trip Olaus and Adolf Murie made in the 1922-1923 winter with the aid of a Kobuk Eskimo, Pooto, who at that time lived in a cabin on the Alatna River. They collected at least three rams near the Kutuk River (Murie 1973).

Charles Keim (oral communication) found over 60 carcasses one summer in the mid-1960's, indicating that there was certainly a major decline in numbers at that time. It should be recognized that (1) such declines are fairly frequent in un hunted populations (cf. Murphy 1974) and (2) the present 3/4 curl hunting regulation directs hunting pressure to those age classes of males for which life expectancy is already quite low. Rams in the Brooks Range do not attain 3/4-curl horns until approximately six years of age, and, if all males that have attained legal age are harvested by hunters, there will still be enough younger males to fertilize all estrous females. Thus, hunting should not be considered a cause of what was probably a major population decline in the mid-1960's. Furthermore, such declines should not be viewed with alarm; Dall sheep habitat is essentially continuous, and unlike bighorns (O. canadensis), Dall sheep exhibit much



variability in their use of seasonal ranges and apparently readily recolonize areas vacated due to population declines (Murphy 1974). Until the 3/4-curl regulation was put into effect, occasional native hunting may have had a temporary but probably local effect on sheep numbers.

We observed Dall sheep in the Lake Kaniksrak area. Throughout most of our stay from 15 June-23 July a band of 19 sheep occupied the ridge just south of Nigaktukvik Creek on Mayukuit Mountain, and Kermit and Judy Johnson, also staying at Lake Kaniksrak, saw three old rams on a ridge just north of Nigaktukvik Creek. On 23 July we again saw 13 sheep, nine ewes and four lambs, on the same mountain near Sugakuik Creek. Some of these may have been part of the band we observed on 18 July.

On the float trip down the Alatna, one of us (Edward Murphy) saw five rams on 4 August; four were in a valley on the west side of the Alatna about five miles downriver from the confluence of the Alatna and its first major tributary. The fifth (a five-year-old) was resting in the cliffs in the next valley to the south and was not disturbed by Murphy's approach to within about 50 yards. On 9 August on the easternmost ridge of a large valley on the south side of the Alatna, Murphy saw two young rams, a ewe and her lamb, and two sheep -- one a 1/2-curl ram and the other probably a ewe. He also observed a single 7/8-curl ram resting high on a mountain overlooking upper Gull Creek on 11 August. Later Murphy saw four rams in the steep cliffs overlooking Ram Creek about three miles from its confluence with the Alatna on 13 August. Thus, from mid-July through August we observed only 64 sheep.

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APPENDIX

Part III. Birds Observed in the Alatna and Killik River Valleys --  
15 June-31 August 1973.

Compiled by Edward Murphy

15 June-30 June--Nahtuk area:

Oldsquaw, Golden Eagle, Willow Ptarmigan, Bonaparte's Gull, Arctic Tern, Violet-green Swallow, Cliff Swallow, Gray Jay, Common Raven, Black-capped Chickadee, Boreal Chickadee, American Robin, Varied Thrush, Swainson's Thrush, Wheatear, Yellow-rumped Warbler, Common Redpoll, Dark-eyed Junco, Tree Sparrow, White-crowned Sparrow (abundant). Helmericks and Helmericks (1947) included a list of birds (p. 277) seen in the vicinity of their cabin on the Alatna River.

1 July-15 July--Headwater Lake area:

Red-throated Loon, Common Loon, Canada Goose (?), White-fronted Goose, scaup, Surf Scoter, Golden Eagle, Rough-legged Hawk (nesting pair), Willow Ptarmigan, American Golden Plover, Pectoral Sandpiper, Wandering Tattler, Common Snipe, Northern Phalarope (abundant), Long-tailed Jaeger (nesting pair), Mew Gull, Arctic Tern, Snowy Owl (?), Common Raven, American Robin, Wheatear, Gray-crowned Rosy Finch, Common Redpoll (abundant), Tree Sparrow (abundant), White-crowned Sparrow, Lapland Longspur (abundant).

15 July-25 July--Lake Kaniksarak:

Yellow-billed Loon, Mallard, Surf Scoter, Lesser Yellowlegs, Mew Gull, Arctic Tern, Common Raven, Wheatear, Tree Sparrow, White-crowned Sparrow.

25 July-5 August--Imiaknikpak Lake:

Common Loon, Arctic Loon, Golden Eagle, Willow Ptarmigan, Lesser Yellowlegs, Arctic Tern, Gray Jay, Common Raven, American Robin, Wheatear.

23 July-31 July--Walk from Lake Kaniksarak to Headwater Lake (in order of sighting):

Tree Sparrow, Oldsquaw, American Robin, scaup, Mallard, Willow Ptarmigan, Wandering Tattler, Lapland Longspur, Arctic Tern, Northern Phalarope, Varied Thrush, New Gull, Semipalmated Plover, Semipalmated Sandpiper, Red-throated Loon.

1 August-31 August--Kayak from Headwater Lake to Allakaket (in order of sighting):

Long-tailed Jaeger, Wheatear, Merlin, Willow Ptarmigan, White-crowned Sparrow, Common Raven, Peregrine Falcon (pair), Gray Jay, robin, Gray-crowned Rosy Finch, Swainson's Hawk (?), Canada Goose, Rough-legged Hawk (?), Kingfisher.

These names are in accord with the changes listed in the Thirty-second Supplement to the American Ornithologists' Union Check-list of North American Birds, Auk 90:411-419, 1973.

For an account of the birds in the Killik Valley between Easter Creek and Lake Udrivik see Irving, Lawrence, 1960. Birds of Anaktuvuk Pass, Kobuk and Old Crow. U. S. National Museum Bull. 217. 409 p.

## APPENDIX

### Part IV. Narrative of a Journey from Lake Kaniksrak to Allakaket

Edward Murphy

#### Walk from Lake Kaniksrak to Headwater Lake of the Alatna River

23 July

My wife Gretchen and I, along with John Hurst and Rhea Irvine from Berkeley, California, planned a walk from Lake Kaniksrak on the Killik River to the Headwater Lake of the Alatna River. We had hoped to begin the 45-mile walk a few days earlier but heavy rains and strong winds at the Kaniksrak camp kept us inside the tents much of the time for a couple of days. Although the rain stopped on the 21st, even the smallest creeks had been turned into raging torrents by heavy rains. It was clear that we would be unable to make stream crossings if we started walking that day. By the morning of the 23rd, however, Enekalikruak Creek, just north of Kaniksrak Lake, had dropped more than a foot and from this we surmised that the up-valley tributaries of the Killik would also be carrying less water and would be fordable.

We walked along caribou trails about a half mile west of the Killik. A mile south of Lake Kaniksrak we saw abundant fresh moose sign, and soon after saw a cow moose (Alces alces) and her calf trotting away from us. Between Lake Kaniksrak and Sugakuik Creek I counted six Arctic ground squirrels (Spermophilus undulatus) that chattered at us from their secure hiding places in the rock outcrops. We saw several Tree Sparrows (Spizella arborea) in the felt-leaf willow (Salix alaxensis) lining the small creeks. Near Sugakuik Creek we saw 13 Dall Sheep (Ovis dalli), four of which were lambs, high on a ridge of the large, unnamed mountain. We also spotted two bands of sheep across the valley on Mayukuit Mountain -- a band of eight on a low

knoll directly east of Sugakuik Creek and several sheep on the ridge opposite Lake Kaniksarak where I had counted 19 on 17 July.

Between Sugakuik Creek and the mapped but unnamed creek about eight miles upriver from Lake Kaniksarak I heard about a dozen ground squirrels. We saw three within a few feet of each other, perhaps young of the year, on a knoll overlooking a small lake where a female Oldsquaw (Clangula hyemalis) and her five young were feeding. We also saw six adult and several fledgling American Robins (Turdus migratorius) along the way. About one mile northeast of the confluence of the unnamed creek mentioned above and the Killik River are two lakes on which we saw several ducks (scaups, Oldsquaws, and [?] Mallards). A cow moose was feeding in the larger lake. We flushed 13 ptarmigan, probably Willow Ptarmigan (Lagopus lagopus). Ten of these were in one flock and gave us quite a start as they suddenly flew from the willows all around us. Ptarmigan generally appear reluctant to fly and leap up at the last minute. Yet when they do fly, they can glide effortlessly for several hundred yards. Moose and grizzly (Ursus arctos) sign were fresh and abundant in the grassy glades of the river terraces. As we were setting up camp that evening we saw a Wandering Tattler (Heteroscelus incanum) flying along the creek. The only other time I had seen this species was in McKinley Park where a pair followed me along a creek for over a mile, pestering me as if I were about to walk over their nest.

#### 24 July

The next morning we crossed a creek only to find ourselves sinking above our boots in the water-saturated sandbars. We then walked the side hills (river terraces), staying about one mile from the Killik. The extensive sedge tussock areas through which we walked quickly drained our energy, and by lunch time we had travelled only a few miles. We saw eight male scaup on a small lake. During

lunch we watched a male Lapland Longspur (Calcarius lapponicus) and heard another one singing nearby. These were the first Longspurs seen since leaving Lake Kaniksrak which is surprising because this bird is the most common bird species at the headwater lakes of the Alatna. Near Ayakalak Creek I collected mountain juniper (Juniperus communis). This collection bridges the gap in its known distribution between the south slope of the Brooks Range and foothills localities along the Canning, Shaviovik and Chandler rivers. Late in the day we reached Ayakalak Creek. It is a fairly large tributary of the Killik, and, although it had dropped at least two feet from its maximum level after the rain of a few days before, we had difficulty finding a place to cross safely. While reconnoitering a ford, we saw a cow moose and her calf descend to the river on the opposite bank. The calf may have been reluctant to cross; we saw the mother dash playfully back and forth, perhaps to encourage the calf. But a few moments later both had safely crossed and were walking toward us. They first noticed us when only about 100 yards away; the cow stared at us for several seconds and then turned and disappeared into the high willows, and the calf followed. We finally crossed where the creek divided into three channels--a safe but chilly crossing.

#### 25 July

We continued to walk along the river terraces and found the going much better than the previous day. We saw two Northern Phalaropes (Lobipes lobipes) on a small lake and a male Willow Ptarmigan, a female Varied Thrush (Ixoreus naevius), and a pair of robins as we walked to Mary Creek, where we saw a Mow Gull (Larus canus) eating a grayling (Thymallus arcticus).

The terrain improved, walking became easier, and we approached the Killik at Mary Creek. Although we had hoped to find better walking on the gravel bars of the Killik, the river was still fairly high, and frequently we had to climb

the bluffs to avoid the water. We walked about three miles further along the river and made camp on a gravel bar. This area had been covered by water, but now was about six feet above the river level. It both amazed and relieved us to realize how quickly the river had changed. We knew now we would be able to cross the larger creeks to the south.

#### 26 July

The heavy cloud cover we had experienced since the start of our walk began to break. We followed a set of red fox (Vulpes fulva) tracks along the river for about two miles before they led off into the shrubby vegetation (principally Betula glandulosa) which characterized the lower river terraces. The sun warmed our seemingly perpetually chilled bodies and the contrast of light and shade on the river and hillsides was strikingly beautiful. Since gravel bars were more extensive than they had been the day before, we walked on them as much as possible. As we walked we flushed first a pair of Willow Ptarmigan and then their five young. Soon after we saw a Semipalmated Plover (Charadrius semipalmatus) and a Semipalmated Sandpiper (Ereunetes pusillus). As the sunlight waned we reached a small creek which flows east from three small lakes near the continental divide. In the evening I walked up the stream fishing for grayling. Once away from the Killik, I found myself stumbling among the sedge tussocks which typify the flat, poorly drained tundra. On the way back to our camp I noticed the oncoming darkness of night for the first time since June.

#### 27 July

We started under almost cloudless skies. As Gretchen and I crossed a small creek we saw several grayling in a pool, and within half an hour I had caught our lunch. We then walked along the west bank of the Killik River towards a small bluff, slipping and sliding in the few inches of silt deposited



during the recent flooding. We saw fresh wolf (Canis lupus) and grizzly tracks, but few other signs of wildlife. We cooked our lunch over a fire on a bluff from which we could see far up the Killik, almost to its headwaters. After lunch we turned away from the Killik and walked southeast towards the continental divide. As we reached the divide, the sun passed behind a bank of clouds on the northwest horizon and gave a brilliant contrast of the land, lakes and sky. We walked slowly, enchanted by the beauty of the tundra weather. At the first major tributary of the headwater lakes we found a young bull moose feeding on the tall felt-leaf willow; he seemed reluctant to move and only sauntered off after we had approached within thirty yards. An hour later we found ourselves at our destination -- Bernd Gaedeke's cabin at Headwater Lake.

Kayak Trip from Headwater Lake to Allakaket

27-31 July

From the evening of 27 July until 31 July we stayed at the Headwater Lake cabin. It rained every day and the lake rose almost two feet in those few days to a level three feet higher than when we had last seen it in mid-July. The water had been turned opaque by the silt from overflowing creeks that empty into the lake. Evidence of recent flooding and high winds was abundant; large pieces of sod had been ripped from the creek banks and strewn along the creek bed by high waters, large tent platforms had been moved several feet, their frames twisted by high winds. We surmised that the winds and major flooding had occurred about 20-23 July when the Killik had also been flooding. However, when Bernd Gaedeke flew in on 31 July he told us that the tent platforms and frames weren't at all damaged when he had stopped on 25 July. Thus, extremely high winds had occurred at the headwater

lakes of the Alatna at a time when we were having comparatively mild weather during our walk on the Killik.

On the 28th, as we assembled our two-man folding Klepper kayaks, we saw a pair of Red-throated Loons (Gavia stellata) at the inlet of the lake where Gretchen, the Murrays, and I had seen one earlier in July. Later we paddled to the outlet of the lake, the headwaters of the Alatna River. The river was flooding its banks and was too swift to paddle safely through the narrow channels and also too deep to easily line the boats down river. We decided to wait for the rains to abate and the river to recede before starting off; therefore, we returned to the cabin. Finally, on 31 July the river had dropped a foot, and we lined about a mile downriver. We became so benumbed by the cold water that we decided to make camp there. As we ate dinner a least weasel (Mustela rixosa) ran about, peeking at us from behind fallen branches. Although many people consider this species secretive, the few that I have seen seemed quite curious. The least weasel is, however, little understood. Individuals are relatively common on the north slope during years of brown lemming (Lemmus trimucronatus) abundance, but then disappear and are apparently absent at other stages of the lemming cycle.

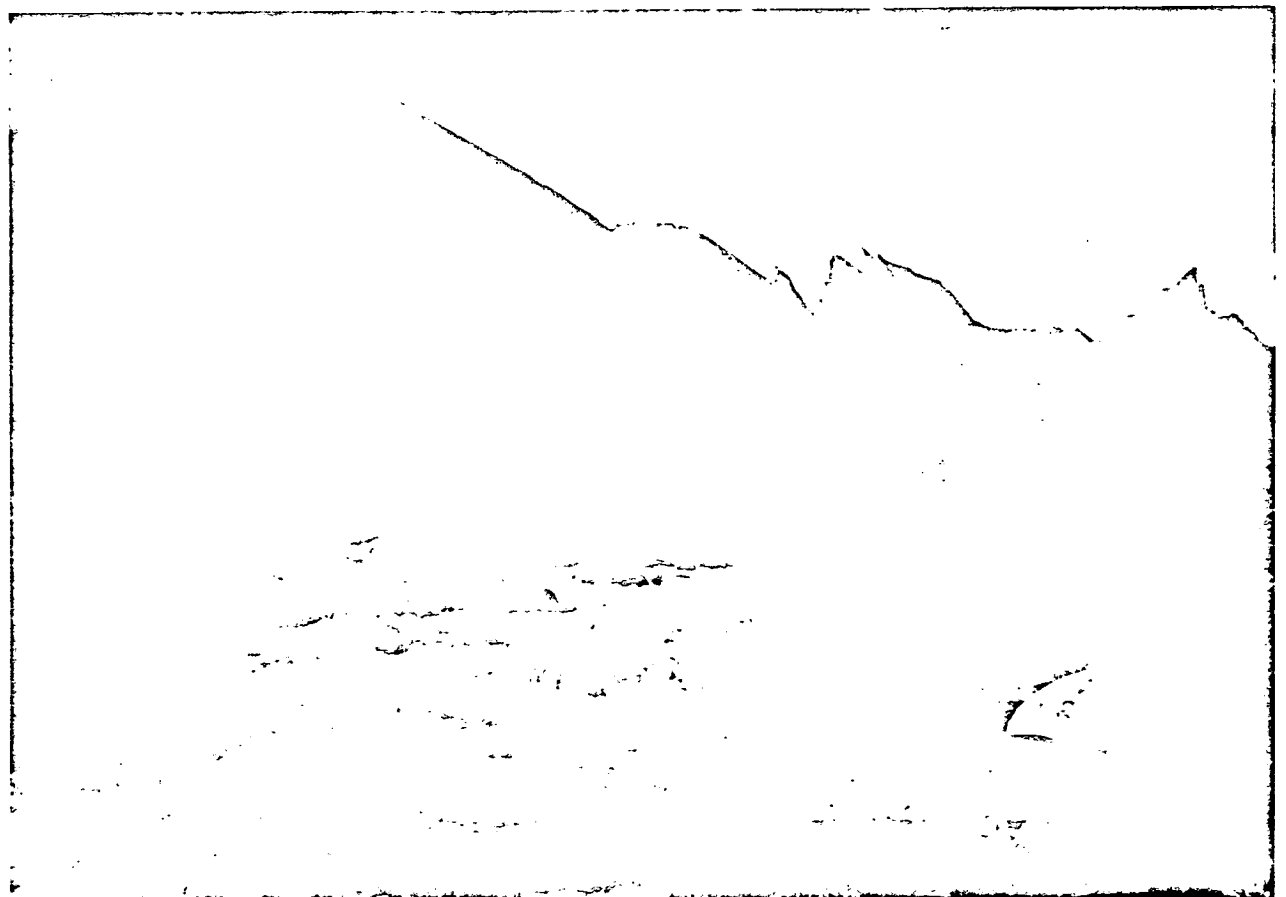
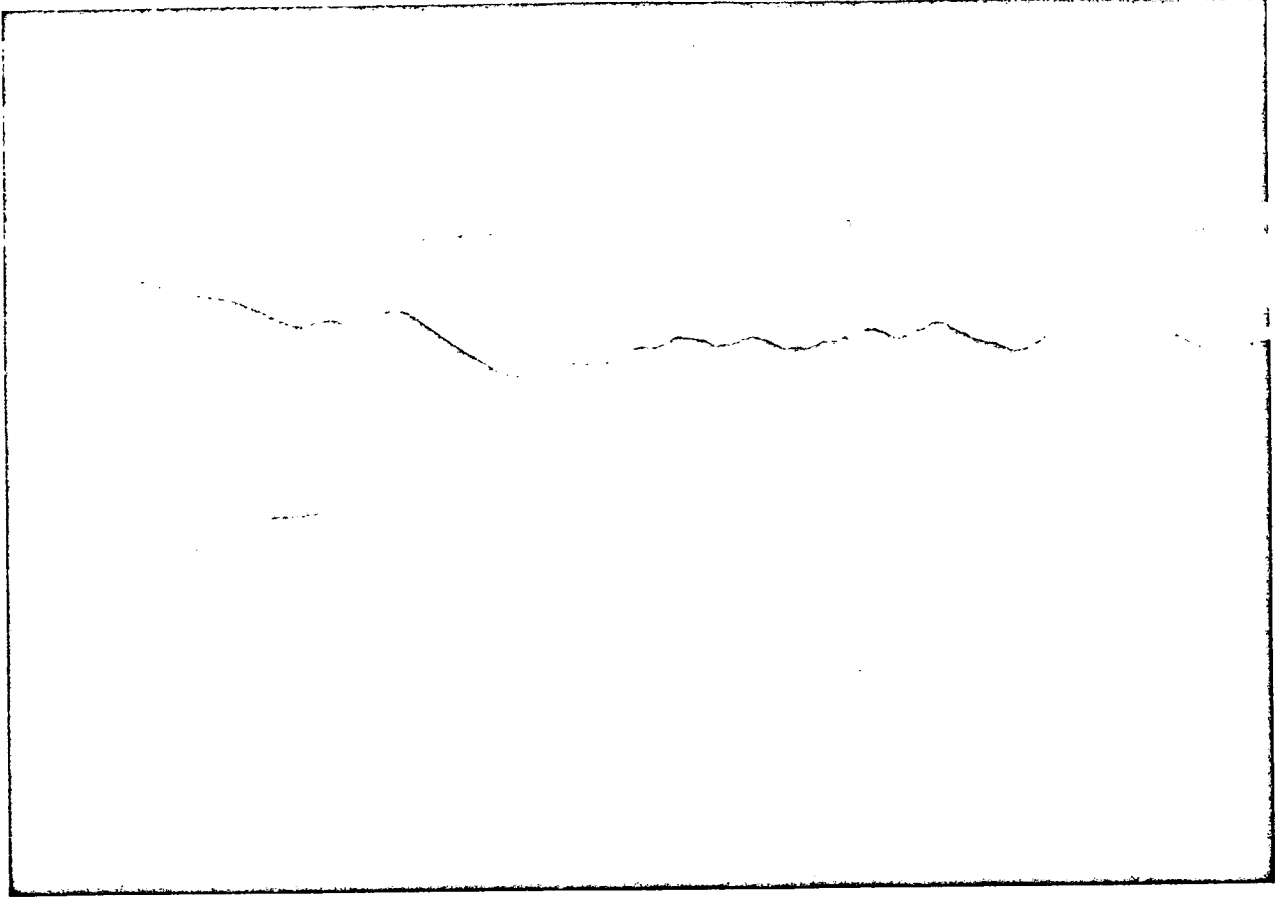
#### 1 August

The river continued to drop a few inches during the night and we lined about four miles to the first major tributary of the Alatna. We saw a pair of Long-tailed Jaegers (Stercorarius longicaudus) but in general were so busily occupied keeping the boats under control in the swift current that we spent little time looking for wildlife.

PLATE I.

Top -- Headwaters lakes of the Alatna River. Photo by  
Edward Murphy.

Bottom -- Lower Arrigetch Creek looking toward the peaks,  
Alatna valley. Photo by Edward Murphy.



2 August

The next day we explored the area around our camp. I walked westward along the tributary and explored three small valleys of the large mountain to the southwest. These valleys were all spectacular. In them, the creeks descended in a variety of ways along the steep gradient of the valleys: the first dropped in a series of small waterfalls from a bowl-shaped valley; the second flowed through a much longer U-shaped valley before falling down a 75-foot waterfall; and the third dropped gradually, but like the others, had cut a narrow gorge just before entering the major tributary of the Alatna. In the third valley I observed four juvenile Wheatears (Oenanthe oenanthe). On my walk back to camp I found two Dall sheep ram skulls. A horn sheath still attached to one indicated, by a horn ring count, that the ram had been 12 years old when it died. Judging from the horn growth characteristics it had died in the spring just before its 13th birthday. Although I had travelled all day in what appeared to be ideal Dall sheep habitat I found no fresh sign of sheep. Near our camp I noticed grizzly and moose tracks in the recently deposited silt at the river's edge.

3 August

We lined about seven miles down the river. On a gravel bar Gretchen found fresh wolf and grizzly tracks heading upriver and those of a single caribou going downriver. Gretchen and I tried to paddle over some stretches but we frequently had to jump out when the river became too shallow to run safely. Just upriver from that night's camp we saw the first alders (Alnus crispa) of our downriver trip. Late in the day we made camp by a small creek about seven miles downriver from our previous camp. That evening John took the temperature of the water -- 5° C, and the air -- 8° C. In the past few days

the mosquitoes had ceased to be much of a nuisance, probably due to the cool weather.

4 August

We spent this day exploring the valley near camp. I saw a single 5-year-old (5/8 curl) Dall sheep ram near the head of the valley I was in and a band of four rams in the next valley.

5 August

We lined and paddled to Portage Creek. That day, Gretchen and I tried to paddle too much of the river. Sweepers and slightly submerged gravel bars were our undoing as we turned over three times en route. We made camp just above Portage Creek on the west side of the Alatna, where we spread all our things to dry that day and the next. The Murrays and Bernd Gaedeke flew over us on their way back south, saw us and knew all was well, although a bit wet. Near camp we found the first white spruce trees (Picea glauca) of the trip and could see much more extensive stands on the south-facing slopes about a mile down the river. We also found ripe blueberries (Vaccinium uliginosum) in abundance and ate them with every meal.

6 August

We continued to dry out our equipment by the fire during lulls in the rain storms and spent the day around camp. I examined an old wolf scat composed almost entirely of caribou hair and a few bones. I also found that one of the spruce trees had been blazed many years ago.

7 August

We walked up to the lake that is the source of Portage Creek, a tributary of the Noatak River. We noticed fresh grizzly, wolf, and moose tracks as we

walked. The scenery, although not majestic, was characterized by the subtle beauty of lush, rounded mountains to our south and craggy peaks to the north. On our return to camp we discovered that the Alatna had risen two feet over the level of the day before.

#### 8 August

We headed downriver again, and John and I each paddled a kayak while Gretchen and Rhea walked alongside the river. The kayaks were much more maneuverable this way, and we were able to paddle along quite easily. Gretchen and Rhea crossed the river by camp and then walked on the north side until they came to a very steep cliff about three miles downriver. There they made a very difficult crossing back to the south side of the river. The river's volume had by this point increased substantially, and we knew it would be unfordable further down.

About one mile below Portage Creek (of the Alatna) is a dense stand of white spruce on the north side of the river. Another mile downriver in another white spruce stand we saw the first cottonwoods (Populus balsamifera) since the beginning of the downriver trip. Many of the spruces are quite large, the biggest being about 60 feet tall and 15 inches dbh. Some spruce are growing on the south-facing slopes several hundred feet above the river, but none were seen on the north-facing slopes. Here is the evidence that Robert Marshall (Alaska Wilderness) missed in his hypothesis that the north slope of the Brooks Range has not been colonized by trees simply because there hasn't been sufficient time. Here we could plainly see that there must be ecological differences on north and south-facing slopes at this latitude which preclude white spruce growth on the former but not the latter.

#### 9 August

I hiked up the easternmost ridge of the tributary valley near our camp.

In the mid-morning it started to snow lightly (as I was collecting some poppies on a steep talus slope). Later when the weather cleared, I saw two young Dall sheep rams and a single ewe with her lamb about 150 yards below me on the ridge. The lamb suddenly discovered me and ran back and forth for several seconds, but calmed down when the ewe continued to forage along the ridge. After the fog to the west lifted, I found myself looking into a magnificent valley. The upper tributaries of the main creek had cut deep gorges which made the upper valley almost impenetrable. Although I had planned to traverse the upper valley I realized that would be more than an afternoon jaunt and started back to camp. On the way I flushed several Willow Ptarmigan. Later the clouds broke, the Alatna valley glistened in the bright sun, and for several minutes a double rainbow spanned the sky.

#### 10 August

John and I paddled the kayaks and again Gretchen and Rhea walked along the south bank of the river. The river was deeper and wider now, and even where it braided extensively we could find a channel deep enough for the kayaks. However, about a mile above Gull Creek, John and I both ran into a cottonwood sweeper directly in the main current of a narrow channel. We arrived at Gull Creek after less than an hour on the river and built a fire there to dry ourselves and warm up. Gretchen and Rhea arrived about two hours later after stopping to pick blueberries. In that area grizzly tracks and scats were so fresh that Gretchen thought that a bear had been feeding there earlier that day. We set up camp in the white spruce just west of the Gull Creek-Alatna confluence. On the river bar we saw fresh tracks of a single caribou, and in the forest old moose droppings were everywhere. Gretchen saw a snowshoe hare (Lepus americanus) and evidence of hare browsing on the willow branches. Many white spruce by camp had been extensively debarked, and a few girdled, by porcupines (Erethizon dorsatum). About 100 yards from the Alatna



we saw two sawn-off spruce stumps, evidence of earlier travelers. Early that evening John was harassed by a pair of Peregrine Falcons (Falco mexicanus) while he was walking up a creek.

#### 11 August

This morning I saw White-crowned Sparrows (Zonotrichia leucophrys) near camp and soon after saw a Common Raven (Corvus corax) overhead, flying south. We spent the morning walking up Gull Creek and sometimes caught glimpses of the most rugged and spectacular mountains we had seen thus far. About two miles up the creek we reached the last of the spruce trees and here watched five Gray Jays (Perisoreus canadensis) frolicking acrobatically in the air and chasing one another from tree to tree. Although I found many sheep trails, I saw only one sheep, an old ram. As in the valley of our previous camp, most of the abundant sheep sign was old, suggesting that the areas are perhaps more heavily used at other times of the year. About five miles up Gull Creek I climbed a ridge to a vantage point. For almost an hour I walked in a silent world as snow softly fell and fog enveloped me. Soon, however, the snowfall ceased and the sun gradually burned away the fog. In the bright sunlight, ground squirrels chattered and a Gray-crowned Rosy Finch (Leucosticte tephrocotis) flitted among the rocks near the ridge crest. From the ridge I could see a large bowl-shaped valley and sheep tracks on the snow-covered ridges in the distance.

#### 12 August

We paddled from Gull Creek to Ram Creek. Generally the volume of the river was large enough that all of us could ride the kayaks. At the confluence with Ram Creek, the Alutna braids into two shallow channels and we lined about 50 yards through a shallow "rock garden." We set up camp and in the evening John and I walked up Ram Creek to fish; John glimpsed a brown wolf in the tall willows.

13 August

We awoke to find a thin layer of ice in the water pots. The skies were clear as we set off to explore upper Ram Creek. Paper birch (Betula papyrifera), red currant (Ribes triste) and wild rose (Rosa acicularis) grew on the steep south-facing hillside just west of the confluence of Ram Creek with the Alatna. This was the first time I had seen these species since the start of the down-river trip. The paper birches, common in the open white spruce stands, were large; several were about 60 feet tall and 10 inches dbh. About two miles from the headwaters of the creek we climbed to a promontory and could see the Arrigetch Peaks 25 miles south of us. We saw four Dall sheep rams grazing and resting among the steep cliffs.

14 August

We spent another day at Ram Creek and John and I hiked into the upper Ram Creek valley again. Gretchen and Rhea opted to relax around camp. As we returned to camp in the early evening the nearly-full moon rose and then slowly passed over the Arrigetch Peaks, tall granite needles silhouetted against the dark southern skies.

15-16 August

We awoke to clear skies and spent the day around camp, basking in the warmth of the sun. The leaves of the cottonwoods and paper birches had begun to change color -- some were already bright yellow. We planned to leave Ram Creek on the 16th but woke up early to rain. After going to sleep under perfectly clear skies I could hardly believe that there was 100% cloud cover and rain several hours later. We spent the day reading in our tents, not willing to pack the boats and paddle in the rain.

17 August

The rain subsided early in the day, so we broke camp and headed downriver. Two miles below Ram Creek, Gretchen and I tore a hole in our kayak and spent the rest of the day, in the drizzling rain, trying to get a patch to hold. About 9:00 p.m. we were ready to go but it was so dark that we camped at a creek which enters the Alatna about three miles below Ram Creek. The river rose a foot overnight and the next morning we paddled five miles to the creek which enters the Alatna from the west about three miles above Pegeeluk Creek. Along the way we saw John walking back to look for us, and at the creek we found Rhea and their camp.

18-19 August

We spent the 18th there and on the 19th paddled to Kutuk River. As we carried our equipment to the cabin opposite the Alatna-Kutuk confluence, we disturbed a porcupine that had been gnawing on an old moose antler. It first bristled its quills and then plodded off away from the cabin. A tree squirrel (Tamiasciurus hudsonicus) leaped from tree to tree, chattering at our arrival.

20 August

Driving rain and strong upriver winds kept us in and around the cabin. The river had risen three feet overnight to the highest point it had reached all summer. Judging from the lack of old silt marks, it was higher than it had been in several years. The river was massive and carried along scores of large trees. However, during the night the river dropped a foot. Having watched the rivers and creeks fluctuate so dramatically for the past several weeks, I was glad that we were not in a hurry and were well supplied. A steady light rain may raise water levels a few feet overnight and therefore wilderness travel either by foot or by boat in the Brooks Range may involve delays of several days due to

dangerously high water.

21 August

The rain ceased and we started off toward Arrigetch Creek. Although we had been told, and could see, that the walking on the southeast side of the creek was better, the creek was a raging torrent and impossible to cross. Consequently, we spent the day battling the tall alders on the steep hills on the northwest side. By nightfall, we were only about four miles up the valley, but we were past the worst of the deep alder ravines and now had an excellent view of the Arrigetch Peaks.

22 August

Early in the morning we found a place where the creek divided into two channels, and, since the creek had dropped a foot overnight, we were able to cross easily there. Seven miles from the Alatna, Arrigetch Creek divides into two major forks. Here we found the only mammal sign of the day -- a pair of broken sunglasses and four old five-gallon cache cans. We made camp slightly to the east of the confluence of the forks.

23 August

At 5:30 a.m. the sky was perfectly clear, and we walked up the east fork as the sun illuminated the peaks above us. We walked to a point where a lake is marked on the map. We found that the area had silted in and a meadow has formed, presumably since the map was made. We returned to camp for breakfast and later in the day walked up the west fork. Walking in this large U-shaped valley was for us the finest wilderness experience of our lives. Glaciers on the high peaks fed the creek. Its blue-gray waters flowed through a broad, lush meadow, colored golden by the frost-killed grasses and sedges. The granite talus slopes are extensively covered by an orange crustose lichen, but in one

area a green crustose lichen was conspicuous. Although the talus slopes extend almost to the valley floor in the upper valley, blueberries, white heather (Cassiope tetragona), and Dryas are abundant on the small lateral moraines on the valley wall. By mid-morning the sky had become cloudy, but late in the afternoon, as we reached the head of the valley, it partially cleared. Here we saw the brilliant interplay of colors in the upper valley and the stark, needle-like granite spires that tower over it.

24 August

We awoke early to the sound of drizzling rain and decided to head back to the Kutuk cabin. We stayed on the southeast side of the creek and found good walking on game trails until we reached the flats of the Alatna valley. There we crossed Arrigetch Creek and followed fresh tracks of a cow moose and her calf along the gravel bars until we came to the Alatna. We reached the Kutuk cabin late in the afternoon.

25 August

We paddled to Nahtuk River and there met Wayne Ellis and Matt Weaver at Bernd Gaedeke's cabin just south of the Nahtuk River-Alatna confluence. They were the first people we had seen (except for planes overhead) since we had left Headwater Lake nearly a month before. I spent the afternoon looking for plants we had not collected there in June. I saw fresh moose and grizzly tracks in the silt which had been deposited by the recent flooding. Judging from the height of the silt marks, the river had been about three or four feet higher during the recent flooding than it had been at its highest level during spring run-off in June. Matt and Wayne had seen two grizzlies in the vicinity of the cabin and had seen moose at the lakes a mile downriver on both sides of the Alatna during the several weeks of their stay there.

26 August

We paddled to Takahula Lake. The lake was perfectly calm and the reflections in the lake of the surrounding mountains were crystal clear. While we ate lunch two beavers were gathering willows in nearby coves and caching them by a lodge at the northeast end of the lake. Late in the day we started off downriver again and camped on a small island about eight miles below the lake. Stumps of beaver-cut trees were abundant, and we found fresh cuttings of alder in the slough where we beached the boats.

27-28 August

On 27 August we paddled along the slow winding part of the river for about 40 miles. At one point 11 Canada Geese (Branta canadensis) watched us float by. We stopped for lunch in a white spruce forest and enjoyed watching a least weasel play hide and seek as it examined us. The next day, when we were about ten miles above the confluence of the Alatna and the Malamute Fork, we were buzzed by a helicopter which then dipped low again around a bend in the river. We expected to see something, perhaps a bear or a moose, around the bend but soon heard voices. We met Jim Schwarber and Don Meader lining Jim's home-made canoe up the river. They were travelling about ten miles a day and hoped to keep up that pace until they reached the Nahtuk cabin. That evening we camped at Rockybottom Creek.

29 August

As we started paddling we saw what I thought was a Rough-legged Hawk (Buteo lagopus) flying up river. Soon after we saw four Canada Geese on the bank of the river. A Belted Kingfisher (Megaceryle alcyon) flew along the bank, and we followed it downriver for several hundred yards. We paddled almost 50 miles and, at dusk, made camp about ten miles upriver from Sinyalak Creek.

30 August

We paddled to Dosennaughten Lake. We saw several fish camps on the way and saw some of the people from Allakaket making rafts of firewood which they would later float down the river to the village.

31 August

This morning we paddled leisurely to the village. At first we found the people of the village quite reserved, but soon we had many visitors at our camp by the airstrip. We packed the kayaks so we would be ready to put them on the next day's plane and talked with the people of the village about the wilderness and the wildlife upon which they depend. Although we had enjoyable talks with the people of Allakaket I felt like an intruder in a culture whose dependence on the wilderness is intricately woven and whose numbers are geared to dependence on a small but renewable resource base. On the other hand, the lifestyle to which I was returning is incompatible with such an ecological relationship with the wilderness -- I only hope that the lifestyle that those people desire is not destroyed by our economic, recreational, and scientific interests in the Brooks Range.

## APPENDIX

### Part V. Notes on Early Man in the Alatna and Killik River Valleys

It is quite obvious that millennia before Euro-North American man began to explore the Brooks Range, aboriginal people had inhabited portions of this region. Debate continues, renewed by archaeological discoveries, as to the antiquity of this culture or cultures. Direct evidence of precontact Indian and/or Eskimo is readily available from the surface finds of obsidian, chert, and chalcedony projectile points, blades and scrapers or simply from the numerous unretouched flakes at chipping stations where these implements were made while the artisan was on the lookout for game. More unusual remains are the corrals used to capture caribou, one of which is known for the Killik river valley (Rausch 1951). I presume that a search in the forest of the Lower Alatna would also reveal stumps of stone adze-chopped trees. Evidence of post-contact activity lies in the presence of net floats and sinkers that can be found around some of the lakes on the Arctic Slope or the remains of temporary dwellings.

Today the south slope of the Brooks Range and the interior lowlands are the domain of the Athabascan Indian whereas the mountains and the area to the north are the territory of the Eskimo. There is some question as to how long this partitioning of the people has existed, but the Koyukuk River valley is an interesting area that has long been the transition zone between these two cultures. Marshall (1933) made some interesting comments on this cultural interface and the origin of the native people of the Koyukuk district.



On the south slope of the range, near our Nahtuk camp on the Alatna River ( $67^{\circ}25'N$ ,  $153^{\circ}43'W$ ) we found a single obsidian end scraper (Fig. 1). It was lying on a sparsely vegetated, windswept crest (Fig. 2). A careful search failed to turn up any additional material. I presume it was left behind much as we would lose a pocket knife on a hillside today. The lithology of this artifact is interesting in itself. Whereas the black chert and the chalcedony are relatively local, obsidian is known only from Indian Mountain in the vicinity of Hughes, and a site was heavily quarried there (T. D. Hamilton, University of Alaska, oral communication). It would be very difficult to put a single artifact in context even when comparative material is available. It is quite impossible here since the south slope is poorly known from an archaeological standpoint; information is available from the Arctic Village area to the east, and the recent discoveries associated with salvage archaeology along the trans-Alaska oil pipeline route constitute important new material (J. P. Cook, University of Alaska, oral communication).

An extensive body of literature is available on the archaeology and anthropology of the Arctic Slope, particularly for Anaktuvuk Pass and its environs. Since the work of Solecki (1951), Campbell, his students and colleagues have concentrated on this locale for over a decade (cf. Campbell 1962), and much of their information can be applied to the adjacent mountains and foothills.

What is now referred to as the Anaktuvuk Pass Nunamiut is really an aggregation of bands formerly from the Killik River, Chandler Lake (Spencer 1959, Gubser 1965) and Tulugak Lake (Rausch 1951). Thus there are today, living at Anaktuvuk Pass men who were born and raised in the Killik valley and were originally Kitlikmiut (cf. Irving 1972). An excellent historical

summary is available in Gubser (1965) whose monograph is a thorough account of the Anaktuvuk Pass people in the early 1960's. Additional background information is to be found in Rausch (1951) and in the popular account by Ingstad (1954).

Irving (1953) made a reconnaissance in 1950 and 1951 between Easter Creek and Lake Udrivik (cf. also Irving 1960) and found artifacts in the vicinity of Maptigarok Lake and at the mouth of Akmallik Creek (Plate 1 and 4 in Irving 1953). Edwin S. Hall was also in the area (Hall, SUNY Brockport, oral communication), but I have not seen a copy of the report he prepared.

Evidence of early man was found at both camps we established in this valley. At Lake Kaniksarak ( $68^{\circ}11'N$ ,  $154^{\circ}09'W$ ) we discovered blade fragments, blade cores and numerous flakes at two chipping stations (Fig. 1). These were situated on promontories on the extensive bedrock benches just west of the lake (Fig. 3). Topography restricts the well drained ground to a relatively narrow corridor between the wet fens of the lake shores and the high ground of the valley wall. Repeated movement of caribou has worn well defined trails, more reminiscent of bridle paths than the common, more diffuse pattern of caribou tracks over the tundra. The artifacts consisted entirely of surface debris, "lag gravel" in blowouts on what was otherwise a continuous mat of tundra vegetation. The second site was similar in position with respect to the modern caribou trail, but not as high or exposed. Nevertheless an excellent view of the valley was afforded any hunter occupying this station.

On the lake shore was evidence of previous Eskimo camps. The rotted remains of a boat, a set of net floats and sinkers and a small pile of pointed stakes were found together. It is possible these items were left

when the Killik people made their move to Tulugak Lake in 1949.

Amongst the willows on the alluvial fan at the mouth of Enekalikruak Creek are the remains of three Eskimo shelters. Unfortunately we did not know of their existence while we were camped nearby, for they were discovered from the air by Bernd Gaedeke on one of his trips ferrying supplies from Lake Kaniksarak to Imiaknikpak Lake. When shown a low level aerial photograph of the shelters, R. L. Rausch felt they were the remains of ivrulik. These less common wooden frame and sod structures were more permanent than the skin or canvas covered willow frame itchelik (Rausch 1951).

At Imiaknikpak Lake (68°29'N, 154°03'W) sand dunes were extensive and large blowouts common. Chapman et al. (1964) noted that "flint chips are not uncommon in the sand dunes along the Killik River between the mountain front and the group of large lakes," and we discovered numerous chips and large pieces at one blowout (Fig. 4). Only one of these (Fig. 1) was at all interesting, but sand-blasting probably removed all traces of retouching that might have been present on the other pieces we collected.

I strongly recommend that qualified archaeologists be sought to evaluate the need for a thorough survey of sites within the Killik valley portion of the proposed park. An increasing number of people are now entering the area to camp, fish, hunt and photograph each summer. Since the chipping stations revealed by blowouts are so conspicuous, I am concerned that much of this potentially valuable material will be picked up and kept in personal collections.

I would also urge that Kitlikmiut now at Anaktuvuk Pass be interviewed to learn more precisely the former pattern of use and the localities most frequently occupied. John Hugo and Simon Pancak have been suggested as potential informants.

Technical notes provided by John P. Cook, Department of Anthropology,  
University of Alaska, Fairbanks.

ACCESSION #s 73-39 (University Museum)  
73-40  
73-41  
73-42

73-39 NAHTUK (ALATNA RIVER) collected June 1973

Obsidian end scraper; use? retouched laterally indicating hafting  
arrangement; thin, with irregular working edge.

73-40 LAKE KANIKSRAK #1 (KILLIK RIVER) collected 23 July 1973

Flakes - 122 black chert, wt 170 g.

7 gray chert or chalcedony, wt 8.5 g.

Microblades - 6 black chert, none with retouch except foot/caribou  
2 complete, 1 prox, 2 medial, 1 distal

Core tablet? - 1 - possibly Campus type

Core fragment - 1 distal end; something like DFC

Point - 1 - narrow, thick; wide parallel flakes at rt angles to edge,  
2.8 g with burin facet which appears to have been used. KAYUK.

Blade? - 1 fragment, some retouch, but probably foot/caribou.

73-41 KANIKSRAK LAKE #2, collected 23 July 1973

Flakes - 24 black chert, wt 70.7 g; most appear to be thinning flakes  
from a large biface.

Core - 1 large tabular core wt 112 g; 3 blade facets-1 expanding blade  
last; steep angular platform, one lateral edge retouched.

Blade fragment, distal, 35 mm wide with regular lateral retouch

Blade fragment, distal, 41 mm wide, some lateral retouch both sides

Burin spall? triangular section, end scraper retouch with potlid.

73-42 IMIANKNIKPAK LAKE (KILLIK RIVER), collected 31 July 1973

Flakes - 197 (wt 477 g) some good blades; black chert, severely wind  
eroded/retouched

9 (34.3 g) gray brown chert/chalcedony, possible retouch

Point? small wide willow leaf with heavy weathering - purposeful??

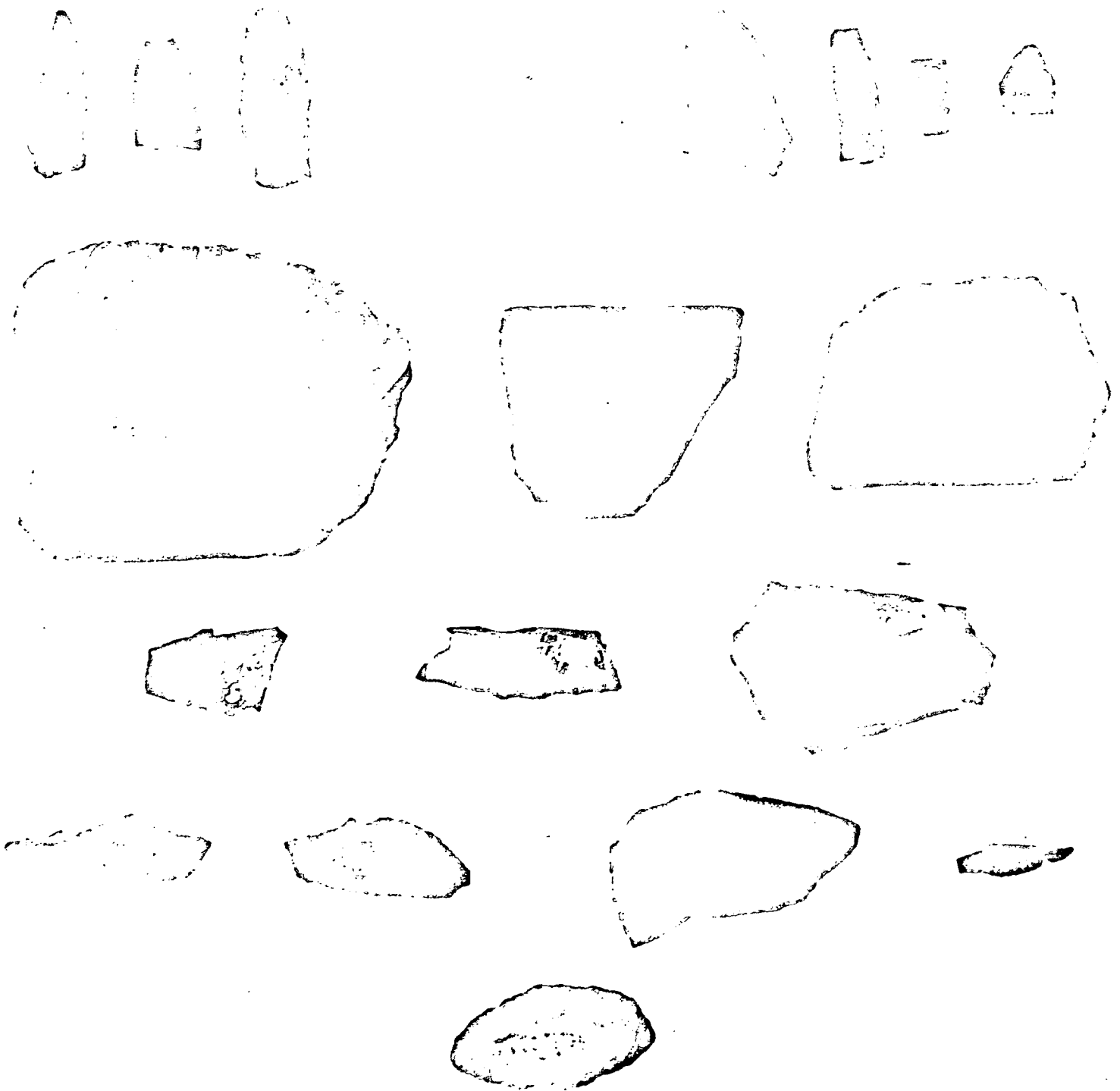


Figure 1. Selected artifacts: top row, obsidian end scraper from Nahtuk site; middle four rows, from Lake Kaniksarak; bottom row, possible point from Imiaknikpak Lake. See technical notes, page A89.



Figure 2. Confluence of Nahtuk River with the Alatna. Arrow indicates location of site.



Figure 3. Slopes west of Lake Kaniksarak. Left arrow indicates site #1, right arrow indicates site #2.

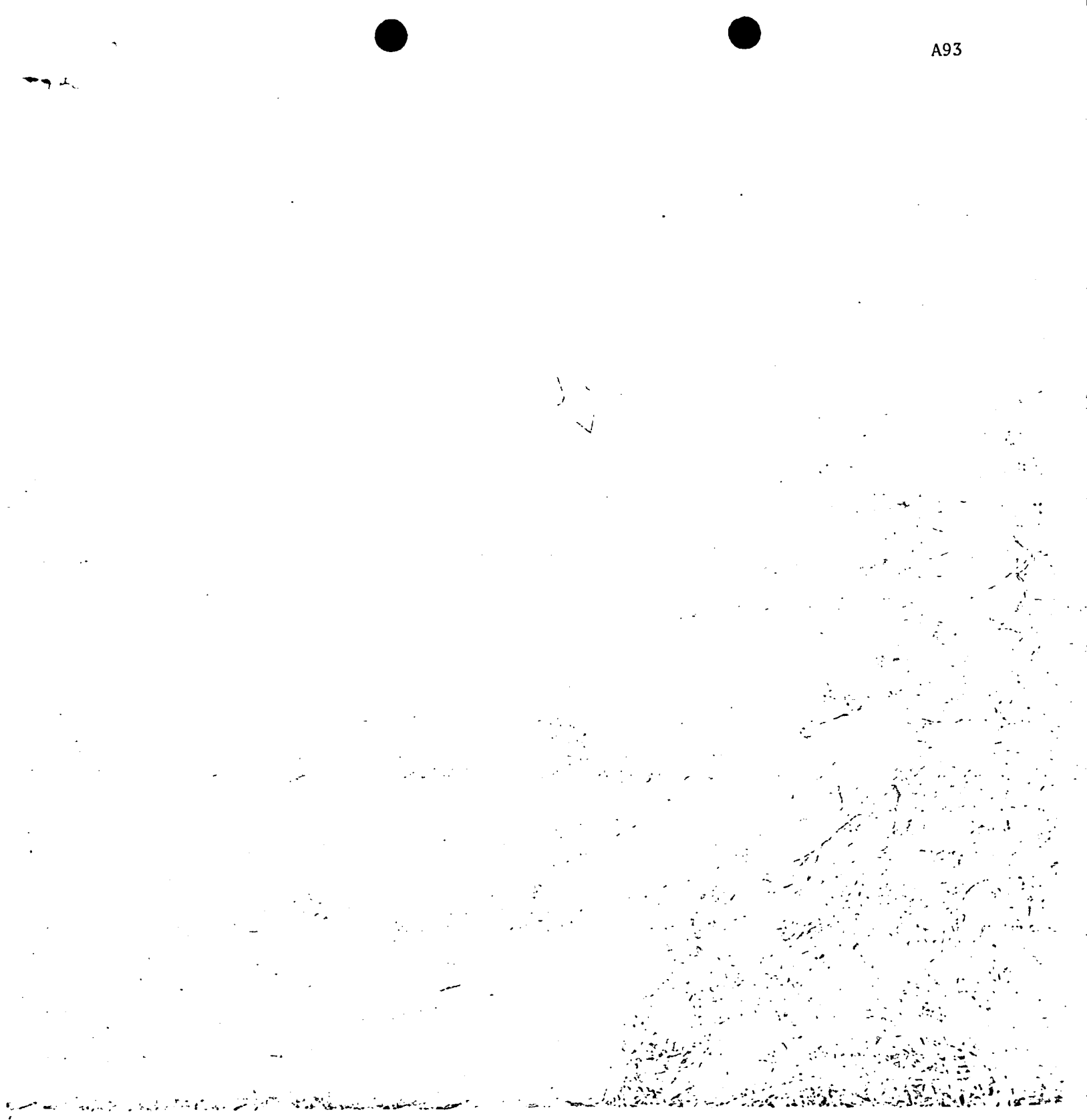


Figure 4. Blowout in sand dune at Imiaknikpak Lake. Arrow indicates site.



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## APPENDIX

## Part VI. Lepidoptera of the Alatna and Killik River Valleys

Kenelm Philip

The following lists of butterflies are documented by collections made by members of the Murray party (Gretchen Murphy in particular) and by others who traveled through the Alatna and Killik valleys during the summer of 1973. The identifications were made by Kenelm Philip, and the specimens are now in his personal collection, a portion of which will be turned over to the University of Alaska Museum. This is but one small segment of Dr. Philip's statewide Alaska Lepidoptera Survey. [D.F.M.]

## Takahula Lake

Everes amyntulaOeneis juttaPieris napi

## Nahtuk River, vicinity confluence with the Alatna River

Boloria charicleaB. polarisCelastrina argiolusErebia discoidalisErynnis persiusEveres amyntulaGlaucopsyche lygdamusHesperia manitobaLycaeides argyrognomonOeneis boreO. juttaPapilio machaonPieris napiP. occidentalisPolygonia faunus