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## Big Game Survey of Mackenzie Mountains Area

by

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It had been evident for some time that the portion of the Mackenzie District designated as the Mackenzie Mountains Game Preserve was not serving the purpose for which it was established originally. That vast mountainous area lying on the eastward slopes of the boundary between the Northwest Territories and the Yukon was set aside in 1938 for the purpose of protecting the hunting grounds of the Indian trappers, now resident along the Mackenzie River, who lived and roamed in the territory drained by the South Nahanni River, North Nahanni River, Redstone River, Keele River, and the associated lesser drainages. All of these streams arise in the mountains and flow eastward to join the Mackenzie River. It was up these river valleys that the ancestors of present Indian groups gained access to richer hunting grounds in the higher land. The Keele and South Nahanni rivers especially were avenues of travel because they did not exhibit the extreme channel braiding of the other rivers and thus were navigable downstream by boats of raw moose skins which the hunters constructed for their summer trips to the lowlands of the Mackenzie.

According to information available there have been only one or two years since 1946 when the hunters from Ft. Norman ranged far enough inland to need to descend the Keele River by the use of skin boats. These people, known locally as the Mountain Indians, were the last group to forsake the mountains, but even they have done so. Now their old haunts are devoid of human activity, except for the petroleum exploration crews which have moved through the area during summer. A few of the Indians from Ft. Norman make infrequent forays into the hills as far as Drum Lake (shown on some maps as Wrigley Lake), but these are winter trips by dog-sled and are never for a period longer than a month. These people have killed woodland caribou in the vicinity, and the Indian Affairs Branch has flown the meat out to the settlement for them. This practice has been encouraged by the Indian Superintendent because it provides a means of supplying fresh meat and gets the hunters out into the hinterland where food is more abundant than in the environs of the Fort. This currently is the extent of hunting in the old Mackenzie Mountains Preserve and this has been brought about only through the governmental assistance provided. Except for this subsidy the hunters would not have gone at all. Because the Preserve was not serving any useful purpose from the standpoint of protecting either Indian rights or game species the Council of the Northwest Territories saw fit to abolish it in 1953.

Because there had been no hunting in much of the region except perhaps along the Canol Highway during its brief period of use, it was felt by many that sport hunting should be allowed. Certainly the game was not being utilized by anyone and because it was a virgin area it held good promise of game heads of trophy calibre. The Indians in the Ft. Simpson and South Nahanni regions had heard that there is money to be made in acting as guides for rich white hunters and they had suggested that it might be a profitable thing for them if big game hunting were allowed in the mountains. Others in the region thought it a worthwhile project from that standpoint, and held the view that it might give the N.W.T. resident with no other hunting privileges an opportunity to share in the game resources of the country. There was also some interest in the region from sportsmen and outfitters in other parts of Canada, and in the United States as well. Before taking any steps to allow hunting, however, the game administration of the Mackenzie District wished to ascertain in some measure what the big game resources of the country were, and how and where they might be hunted. This knowledge was extremely sketchy for most of the region because it was not inhabited and not even visited. The construction of the Canol Road and pipeline provided access to a part of the Mackenzie Mountains and Rand (1945a) and Porsild (1945) collected specimens along the length of the highway in the autumn of 1944 for the National Museum of Canada, and presented reports of their findings. The only other visitors who were able to present factual information on game conditions were D.R. Flook (1952) who accompanied the Harry Snyder expedition to the Glacier (Brintnell) Lake region of the South Nahanni River, and Dr. H.M. Raup of Harvard University who made extensive botanical collections in the same region in 1939. Casual trips by game officials to the South Nahanni River from Glacier Lake downstream had been made and reported from time to time subsequent to 1946 but generally, knowledge of the whole region was confined to that drainage, and the land to the north was unknown.

In 1956 a reconnaissance of the mountainous area from the South Nahanni River on the south to the Canol Road on the north, and from the Yukon boundary on the west to the Mackenzie River on the east, was planned and put in the hands of the biologists of the Canadian Wildlife Service resident in Yellowknife. The task fell to Mr. R.C. Stewart who was to undertake a certain amount of aerial survey flights of the region and to bolster those by observations on the ground during the summer periods of 1956 and 1957. At the end of the 18 month period it was hoped that enough additional knowledge of the country and its game resources would accrue that some recommendations concerning hunting of game therein could be made.

Because of the pressure of other duties Mr. Stewart could not spend as much time in the area during the first summer as he had planned. For that reason, and a desire to meet the original target date, the second summer (1957) two field parties were allotted to the survey. Mr. Stewart and his assistants Mr. Hans Stocker of Yellowknife and Mr. Robert Douglas of Ft. Simpson were to concentrate their efforts to the drainage of the South Nahanni River. The writer of this report, then Superintendent of Game for the Mackenzie District, assisted by Mr. O.F. Eliason from

Ft. Norman was to investigate the rest of the region north to the Canol Road. Messrs. Douglas and Eliason are members of the Game Management Service of the District and it would be their responsibility to help administer any additional hunting activity which might result from the surveys.

### Objectives

After this brief introduction the formal objectives of the survey may be given as follows:

1. To ascertain the relative abundance of those animals normally classified as big game, i.e. mountain sheep, mountain goats, caribou, moose and grizzly bears.
2. To report the availability of these species for normal sport hunting operations.

Several secondary objectives were outlined, the information for which was to be collected as opportunity permitted:

- a. To determine the geographical races of animals inhabiting the area; particularly caribou, sheep and grizzly bears.
- b. To seek evidence of diseases and parasites which would affect the vigour of the various populations.
- c. To determine the important food plants and indications of their utilization.
- d. To observe evidence of predation, and relationships of predators to the big game resource.
- e. To assess the extent of the various habitat types, and their ability to support big game animals.

Because of the necessity for covering a large area in a short time the task of achieving the two major objectives of the study had to be undertaken using aerial survey methods. No possibility of achieving an adequate census presented itself because the flights covered only the major watersheds and only those animals which could be seen from the air were recorded. During summer the white Dalls sheep and mountain goats were much easier to see than were other species; the corollary situation existing in winter.

The secondary objectives of the study had to be undertaken by parties on the ground. Because of the limited time accorded this phase of the work only a small part of the information it was desirable to collect could be gathered together. But what information did accrue from the work about the field camps formed a valuable adjunct to the limited

aerial observations. It is hoped that the study can be continued, and extended to include the mountainous areas from the Canol Road north to the point where the Peel River crosses the Yukon boundary.

### Itinerary

On July 7, 1956 Messrs. Stewart and Oancia flew in to Brintnell Lake where they made limited ground observations and returned to Yellowknife on 18 July. During December of that year a preliminary aerial survey of the South Nahanni and adjacent valleys was made by Mr. Stewart. He returned to the area the following July 21 in company with Hans Stocker and for the next three weeks conducted observations in the mountains flanking the South Nahanni River. Camp was made at the outlet of Glacier Creek and travel up and down the river was accomplished by canoe and outboard motor. Mr. Stocker was replaced August 15 by Robert Douglas and from that date until August 28 observations continued from camp on Brintnell Lake.

The second field party arrived at Ft. Norman on 2 August<sup>\*</sup> by air and remained there overnight. Next morning the writer in company with Mr. O.F. Eliason and the pilot A. Carey of Pacific Western Airlines flew to Drum Lake on the Redstone River watershed where a camp was established. There followed four days of survey flying from that base camp traversing territory as far south as Brintnell Lake and as far north as Norman Wells at the terminus of the Canol Road.

On 7 August the camp was moved to Dal Lake ( $63^{\circ} 07' N.$   $126^{\circ} 30' W.$ ) from whence observations were continued on the ground. The aircraft departed for Ft. Smith on that date and returned as scheduled on 17 August to evacuate the field party.

During mid-July Stewart's party found visibility restricted because of smoke which rolled into the valley from the west. After 21 July, however, there was enough precipitation to keep the air clear and both parties enjoyed excellent weather conditions during August.

### Topography

Keele (1910) has provided the best information available on the general topography and geology of the Mackenzie Mountains. In 1907-08 he crossed from the Yukon Territory to the headwaters of the Keele or Gravel River and descended that stream to its south near Ft. Norman. The Mackenzie chain he described as the greatest mountain group in Canada appearing to consist of two ranges, an older western range (the Selwyn Mountains), against the eastern edges of which a newer range has been piled (the Mackenzie Mountains). The surface features in general, are those which result from long continued differential erosion, acting on a generally uplifted and deformed region. The higher peaks only appear to possess any igneous rocks. Although some glaciation is evident, erosion by water and frost represent the main sculpturing agents. The Mackenzie Mountains are 300 miles at their maximum width with the

\* 1957

western portion appearing older and thus having suffered greater erosion forces than the newer eastern portion lying within the Northwest Territories.

Keele recorded three types of rocks for the Mackenzie Mountains area; stratified, intrusive, and metamorphic, of these the stratified rocks were by far the most abundant, with the intrusive rocks occurring in small bodies in widely dispersed areas and the metamorphic rocks are of local occurrence only.

The Mackenzie Mountains strata seem to have been set down in fairly deep water and thus are found in thick beds seldom altered to any extent by forces other than a general rising or folding. Because of its sedimentary origin the most abundant rock formation in the Mackenzie Mountains is limestone, which is found together with various dolomites, sandstones, shales and conglomerates. In many areas the sandstone assumes a reddish hue and the slates and argillites are purple or greenish. The limestone often weathers to a bright yellow or red, which gives the whole area in question a rather unique colouration. This is especially true of the area from Keele River to the South Nahanni River, and probably accounts for the name given to the Redstone River.

Igneous rocks have been reported from the valley of the South Nahanni and their presence there was established because of the extensive prospecting activity which took place in the 1930's, and was centered about the Flat and Caribou rivers.

Cameron (1938) ascended the South Nahanni River as far as the second canyon, about eighty miles, and recorded that the whole area was a massive series of shales and limestone as far up as he went.

Observations by Stevens and Eliason in the upper reaches of the Keele and Redstone rivers would bear out the sedimentary origin of rocks in that large mass of mountains found between the South Nahanni and the Canol Road. Whereas there had been much tilting of strata in many areas, there seemed to have been little folding or horizontal displacement of the various rock layers.

Generally the whole region under consideration had a steep gradient toward the east so that all drainage ways were rapid and few lakes were formed along any of them. The stream flow is periodic in volume and as a result, the major streams are characterized by profoundly braided channels traversing wide gravel flats. Because of this characteristic, it is almost impossible to ascend them by any type of craft and only the Keele River is navigable for any distance, even downstream. As noted previously the Mountain Indians at one time descended this stream in 30-foot moose hide boats. At the present time, about the only access to this whole region is by aircraft, although recently the Canol Road formed a good route into the northern part of it. Additional information is required concerning conditions to be found north of the Canol Road in the headwaters of the Mountain River, the Ramparts River, the Arctic Red River. Unfortunately, this is an even greater terra incognita than is the region under consideration.

The mountains comprising the Mackenzie Mountains have a fairly uniform height of between six and eight thousand feet, although directly north from Brintnell Lake, the peaks are estimated to rise to ten or twelve thousand feet. Accurate maps are not yet available so this observation is largely conjecture. Where heights have been established, they seldom show more than nine thousand feet, although travellers in aircraft have estimated higher peaks than that in Redstone River area.

The plant cover of the region in question is imperfectly known, except for the valley of South Nahanni described by Raup (1947). On the lower country and the south-facing slopes in the Nahanni Valley, white spruce is the dominant tree species. It may reach a diameter of 36 inches and a height of 60 - 100 feet in mature stands, but generally it is smaller than that. On north-facing slopes and in moist sites, the black spruce assumes dominance. Generally, in the mountain valleys where soil is poor and drainage is impeded by growths of moss and by impervious soils, black spruce becomes the most common tree species.

In the whole region, the rainfall is less abundant than on the west slope of the Mackenzie Mountains. As a consequence many of the south-facing slopes do not produce abundant vegetation because of the dry conditions which attain during summer. Tamarack is associated with the black spruce in the poorly drained sites, but does not grow at such high altitudes as the spruce. Deciduous species are confined more or less to white birch, aspen poplar, alder, dwarf birch, and various willows. An interesting observation at Dal Lake was the abundance of rhododendron where it assumed the status of a dominant shrub. The alpine zone seemed to carry a fairly typical tundra vegetation of mixed sedges, grasses, herbs, lichens, mosses and dwarf shrubs. The composition of this zone varied with moisture conditions and exposure from very wet to dry meadows, and with the various stages of plant succession from pre-climax communities on rock slides and ledges, to rather lush and stabilized plant association.

In the lower reaches of the rivers which drain south and east from the Mackenzie Mountains, the only timber resources of any consequence are composed of white spruce. The area around the lower Flat River is entirely timbered, and on the basis of aerial observations appeared to be as good as any to be encountered in other portions of the N.W.T. The same situation has been noted on the Liard River. Pockets of good timber appeared in favourable sites in the mountains where the soil was deep and rich enough. Such a site was noted at Dal Lake where some large straight trees were growing at a site which represented an alluvial outflow from a small creek. It was presumed, however, that such sites were reasonably rare. Certainly in the whole region investigated the only satisfactory soils were found along the waterways, and in many areas, such as the Keele River, these waterways were in such narrow valleys that there was little flood plain on which alluvial material could be deposited. As noted previously, the rivers exhibited a wide braided channel, with only a narrow fringe of timber along the edges.

### Abundance of Game Species

The species listed below are those which ordinarily are classified as game animals and are hunted as trophies. The relative abundance of these animals cannot be given after such cursory exploration of the region as was possible. However, observations over the past ten years in the South Nahanni Valley are available from various sources, and trends in the populations of some species are evident. The observations of Flook (1952) and Stewart (1957) refer to the South Nahanni Valley. Those by Stevens and Eliason refer to the rest of the region north to the Canol Road.

### Black Bears

Flook reported that "well-worn trails and frequent scats and claw marks indicated the presence of a fair population of bears, mostly of the black species, in Brintnell Lake Valley, on adjacent slopes, and along the water courses feeding the lake. Black bears were observed by members of the Snyder expedition on five different occasions within a two-mile radius of camp, and there were four, and possibly five different bears. Three of the observations were of bears of a typical black color. An adult and a juvenile observed in the immediate vicinity of camp had dark brown pelage over all the body, with a long, light tan mane or roach on the shoulders. The juvenile was shot by Col. Snyder when it entered one of the tents. As I was not in the camp at the time it was killed and butchered without measurements being obtained. After examining the pelt, I concluded that the odd coloration could be explained as due to the moult not having been completed. The long mane was the only part of the old hair remaining and was faded in contrast to the new dark hair over the rest of the body. The skin is in the possession of Col. Snyder. I forwarded the skull to Mr. Austin Cameron of the National Museum for identification and retention by the museum. He identified it tentatively as Euarctos americanus (American Black Bear), but as there was a possibility that it might be referred to Euarctos hunteri (Big Northwestern Black Bear), he advised that further cleaning and measuring of the skull would be necessary before definite identification could be made".

Stevens and Eliason found black bears to be rare in the vicinity of Dal Lake, their existence being marked only by droppings, and claw marks on a tree near camp. Nor were bears seen at Drum Lake where their presence might have been expected around a garbage dump at a camp recently vacated by an exploration crew of Shell Oil Company.

### Grizzly Bears

Stewart reported that "evidence of grizzly bear activity is very common above timberline. Their major food is of course vegetable material but it is apparent that they spend a good deal of time digging out ground squirrels. It was noted that ground squirrels were much more abundant in rock slide areas than in the open tundra which appears to be



a more suitable habitat. The difference could be due to heavy grizzly bear predation. Marmots, which are often an important food, were not seen in the Brintnell Lake area."

Flook found less evidence of their presence and noted that "although claw marks on trees and elsewhere probably made by grizzly bears were observed, no clear tracks or sight observations were made which can be definitely attributed to bears of this genus. On August 15, the writer caught a short glimpse of an adult and a juvenile bear, both reddish tan in color, running across a small clearing about seven miles up the Rapids River from its mouth. It is possible that they were grizzlies although they might have been black bears. Ollie Rollog, one of the prospectors interviewed at Brintnell Lake, reported seeing a grizzly on the Nahanni a few miles east of Brintnell Lake in July."

Snyder (1937) collected what he called a "Barren Lands" bear in the South Nahanni at an unspecified lake upstream from Brintnell Lake.

Stevens and Eliason saw one grizzly bear on the upper Redstone River but doubted the presence of the species at Dal Lake because there were no signs of digging around several ground squirrel colonies encountered. Keele (1910) noted that black, brown and grizzly bears were more or less numerous but not often met with. Rand (1945) found grizzlies to be common in the Sekwi Valley, and between the Godlin and Twitya rivers along the Canal Road. The lure of garbage dumps at the construction camps no doubt concentrated the animals along the roadway. It is probable that grizzly bears are to be found over most of the region in favourable localities. They were seen most often in regions above timberline.

Northwestern Moose - *Alces americanus andersoni* Peterson

Flook recorded that, "Moose sign, recent and from the previous winter, was observed quite frequently from the timbered valley floor around the lake to the willow ravines of the high elevations. Moose were observed by the writer on two occasions. On August 6, Kilgour and I observed a medium-sized bull, which was aged, judging from its swayed back. It was lying on an isolated snow bank in a ravine high above timberline when first observed. We stalked it to within a distance of 50 feet. When it saw us it stood up, walked a few steps, and stopped to look us over, before trotting leisurely down the ravine. I doubt from its behaviour that this moose had any previous contact with man. One bull was observed in this same vicinity by Kilgour on August 19. On August 22, a young bull was observed to enter the water of the lake on the opposite shore from the camp, and about 1 1/2 miles east. It swam about one-half way across the lake (about 3/4 miles wide) and after hesitating twice, returned to the point from whence it had set out. A bull moose was observed by Mrs. Snyder near the lake on another occasion. Although the tracks of adults with calves were observed on several occasions, no cow or calf moose were actually observed. Judging from the frequency of pellet groups and the intensity of browse utilization, the greatest concentrations of moose are found in the areas along the water courses.

Willows, Salix spp., are the key browse species, and dwarf birch, Betula glandulosa is of secondary importance. On the basis of the past winter's utilization of the willow browse along the creeks, the forage would carry a larger moose population than now exists in the Brintnell Lake area. The two prospectors interviewed at Brintnell Lake who have done considerable prospecting in this area in past years, and who this year travelled from Brintnell Lake to Virginia Falls on foot and by canoe, reported that they observed moose as well as sheep to be fewer in numbers this season than in previous years. They said that wolves were more numerous in the area in past years when big game was more abundant.

"It seems quite possible that one or more seasons of extremely heavy snowfall may have resulted in severe winter mortality from secondary causes. It is also possible that winters of extremely heavy snowfall may have forced the moose to follow the valley of the South Nahanni River down to lower elevations where conditions were more favourable. I observed evidence of snow slides of recent years on slopes where one would not expect these to occur under conditions of moderate snowfall.

"As this area is very isolated and inaccessible, and as there have been no N.W.T. trappers in the area for many years, it is believed that the moose population of the area has not been greatly influenced by hunting in recent years."

Stewart presented evidence that moose were at high levels of population in relation to their available habitat and said that, "Deciduous shrubs, particularly willow, and aquatic plants are almost essential for good moose habitat. Mountain country provides these requisites in two very different locations. First, in the valley bottoms where stream beds are constantly changing there is ample opportunity for colonization by willows and the small, shallow lakes produce abundant water plants. The second area of importance is a narrow band of deciduous shrubs between treeline and the true tundra. The former type provides superior food quality and greater variety during the summer months while the upland areas are preferred during the winter. Evidence will be presented to show that altitudinal migrations are important in Mackenzie Mountain region. Similar migrations have been reported from Alaska (reference not available), and for the Carcajou River (Robt. Douglas - personal communication).

"A small hanging valley above Brintnell Lake has been visited on two successive years. The valley is of major importance as a moose wintering area and much of the information pertaining to moose habitat and population size was collected there. The lower end of the valley coincides with treeline at an altitude of about 4,000 feet. About five miles north and 1,000 feet higher the valley ends in rugged mountains and tundra. Between the two extremes is a belt of luxurious growth, primarily willow, but including a few spruce and some smaller deciduous shrubs.

"The most notable feature from the wildlife point of view is the super-abundance of moose sign. Moose tracks, moose trails, and moose droppings are seen with amazing frequency. Shed antlers are also relatively abundant. The willows have been browsed very heavily for many years. At present individual plants appear to be normal at first glance, but beside the present season's growth are many small dead twigs and branches that have been cropped close by moose. Even some small spruce trees appear to have been browsed. Spruce is usually classed as desperation food.

"It is unusual to see moose in the valley during summer. It is believed that they return to the Nahanni River in early spring. As a result the willows have two or three months to recuperate without interference and therefore the overall production of plant material remains at a remarkably high level. However, danger of over-utilization, with drastic results to the moose population, is ever present.

"Further evidence of an upward fall migration is supplied by observations made at Brintnell Lake camp in late August. Of 14 moose seen 8 were observed to be travelling along the shore of the lake (through coniferous lichen forest) in an upstream direction. None were seen moving in the opposite direction.

"Of the twenty-two moose classified during the summer, seven were adult females but only one calf was seen. While the sample is actually very small it indicates very low reproduction for the 1957 season. If the recorded data are an accurate reflection of reproduction the primary cause is probably a lack of food."

Observations by Stevens and Eliason confirmed the fact that moose were to be found in most areas of favourable environment. The south end of Drum Lake was one such area, moose being seen there every time they crossed the meadows at the outlet. Moose were seen at Dal Lake where they had been feeding on willows at the water's edge. From signs noted moose performed rather surprising altitudinal movements during summer, perhaps to escape insects, as their presence on bare ridges above timberline would connote. Their usual summer habitat was in moist sites along watercourses and around lakes, where willows and aquatic plants were available for food.

With little hunting pressure, and with few fires in the mountains to disrupt the vegetative climax, the population of moose was stabilized at a fairly high level which could withstand harvesting very well.

#### Woodland Caribou (*Rangifer caribou sylvestris*)

Stewart expressed the view that "persistent reports of large herds of caribou migrating through the mountain regions cannot be without foundation. Certainly the amount of habitat available to caribou far exceeds that available to any other species. The upland tundra is widely utilized in summer in direct competition with sheep and goats but the extensive spruce-lichen forest can support large numbers of caribou, without competition from any other species. Much of the Flat River area appears to

be of this type and reports indicate that it is an excellent caribou area. Forest fires to date have been insignificant in reducing the available forage.

"At least nineteen individuals were seen in three herds during August. At least two and probably three calves were noted; a large proportion appeared to be in the two and three year age groups. It is concluded that reproduction and survival of young animals is quite satisfactory.

"All the animals seen were above timberline. One herd was seen on a peak with a known altitude of 8,100 feet. There did not appear to be any vegetation or water above the 7,000 foot level, indeed the slopes directly below the animals were talused down to 5,000 feet. They apparently sought this altitude for relief from insects. On one other occasion a herd of seven animals sought refuge on the steep slopes of a small birque valley within a few hundred yards of a glacier. Small patches of snow in sheltered crevices were criss-crossed by caribou tracks. Caribou were seen to run wildly about on these snow banks and then stand quietly with muzzles plunged in the snow. Only biting flies could account for such great distress."

Stevens and Eliason saw caribou antlers and other signs at Drum Lake, and at Dal Lake as well. Animals were seen at several places above tree-line, especially in the wide upland plains surrounding O'Grady Lakes. Caribou also were found in stream bottoms below timberline where large sheets of overflow ice persisted even as late as mid-August. Their presence there, as Stewart suggested, could be ascribed to the irritation caused by biting flies.

Two caribou were collected by the Snyder expedition and Flook recorded these animals as weighing 400 and 300 pounds respectively. They were shipped to the National Museum where they were identified as woodland caribou Rangifer caribou sylvestris Richardson. Members of the Snyder group saw one herd of eleven caribou comprised of two bulls, eight cows and one calf. The presence of additional animals around Brintnell Lake also was recorded.

It is known that Stone's caribou Rangifer tarandus stonei Allen inhabit the northern Yukon and adjacent uplands in the Mackenzie District but whether they are found south of the Canol Road is not known.

Rand (1945b) reported Osborn's caribou as far north as the MacMillan River in the Yukon and Stone's caribou in the Peel River plateau. He did not identify the animals which occurred along the Mackenzie portion of the Canol Road. Perhaps this oversight represented commendable discretion on his part because woodland caribou have been found as far north as Great Bear Lake, and barren-ground caribou in some numbers have crossed the Mackenzie River at Fort Norman as recently as 1946. Additional studies in the region are necessary to clarify the situation.

### Dall's Sheep

Stewart was of the opinion that "there are probably two subspecies of sheep present in the Mackenzie Mountains. The white sheep, Ovis dalli dalli (Nelson), is reported at Norman Wells and Fort Liard and presumably occupies the connecting ranges. Farther west near the Yukon border they contact the black sheep, Ovis dalli stonei Allen. Intermediate forms probably occupy the middle ranges. We require further information regarding the relative abundance of the two types and their respective ranges."

Keele (1910) found "sheep plentiful on parts of the Gravel River, particularly on the low mountains between the Sayunsi and Tigonankweine ranges. Among the hundred of sheep seen by the writer in this locality none but those with pure white wool were observed."

Snyder (1937) mentioned collecting a "black-tailed white sheep" and a "blue stone-mountain sheep" from the upper South Nahanni River. These, as Cowan (1940) pointed out, represented intergrades between the dark Stone's sheep to the south and the Dall's sheep to the north. Such intergrades in the past were known as Fannin's sheep, saddle-back sheep, and so forth. Some of them appear in the extreme southwest corner of the Mackenzie District but the most abundant type is the typical white Dall's sheep which ranges from the Richardson Mountains west of Aklavik to the Liard River.

Neither Stewart nor Flook saw many sheep in the Brintnell Lake area, yet they both thought conditions to be favourable for those animals. Stewart reported that "many of the surrounding mountains provide excellent sheep habitat with plenty of upland tundra and adequate escape facilities. Old sheep sign was apparent in several places. Ole Bragg, the Whitehorse prospector, reports that sheep were much more abundant in previous years." Such an assertion has also been made by Gus Kraus who lives at the mouth of the South Nahanni River. Stevens too noted a decline in the number of sheep seen along the South Nahanni River Valley since his first visit to the area in 1948. Some people have ascribed the decrease of wolf predation, others have suggested disease as a factor, but the actual cause remains unknown.

During the course of their aerial survey Stevens and Eliason saw 113 sheep of which 10 were identified as males, 14 as females, and 9 as lambs. Areas of greatest abundance of sheep included the Canol Road, and the upper reaches of Redstone River and Keele River. The adult males were collected at Dal Lake, both of which were sent to the National Museum. They were typical Dall's sheep and the largest of the two had a 42 inch curl of horns, a very respectable trophy size.

As has been said of mountain sheep in the past, they are usually very specific as to habitat at normal population levels. For this reason they often show a discontinuous distribution pattern. They require areas containing suitable winter food with adjacent escape terrain in the form of rocky ledges and cliffs. Where such favourable conditions exist, sheep are found usually. This is a reflection not only of their specificity of habitat but also of their mobility. Unless extirpated, sheep seem to exist in a given site for long periods of time.

In those portions of the Mackenzie Mountains of sedimentary origin the twin factors of water and prolonged frost produce rapid erosion patterns. Where there is little tilting of strata, and where soft rocks are in massive layers, erosion produces mountains which have a regular rounded outline, with extensive talus slopes of shales and angular boulders. This process results in an environment unfavourable to sheep because there is an inadequate accumulation of soil, and few cliffs or ledges suitable as escape cover.

Large blocks of the Mackenzie Mountains visited during the aerial survey suffered from this deficiency, but where differential erosion patterns occurred there usually were sheep in the vicinity. They were to be found generally above timberline at 4500 to 5500 feet elevation. They were usually absent from areas wholly above that altitude. It may have been that they spent a part of the year at lower elevation and preferred regions where they could go down the mountain to such places, rather than cross extensive uplands to lower ground. There was evidence at Dal Lake that sheep sometimes frequented the crests of timbered ridges, and that they descended into the timber to visit mineral licks.

Sheep trails usually may be discerned along rocky slopes and on uplands where the animals occur. It was noted during the aerial survey that many areas showed extensive systems of trails, yet no sheep were seen. It is possible that over areas larger than the Nahanni Valley there has been a decrease in animals in recent years. Deep snow or disease might account for this. Stewart found two sheep skulls near Brintnell Lake and one of these exhibited evidence of actinomycotic lesions. Stevens and Eliason noted this condition in both of the animals they collected, and the same condition has been mentioned in conversation with Yukon and Alaska investigators. It is believed that the condition is not serious though it is fairly general and results from a soil organism gaining access to subdermal tissue subsequent to mechanical injury.

#### Mountain Goat

The race from the Nahanni Region is the Columbia goat Oreamnos americanus columbiae Hollister. The range of this species in the Mackenzie District is imperfectly known, but it is conjectured that it is confined to the South Nahanni River drainage. Reports of goats elsewhere in the Mackenzie Mountains probably refer to female or immature Dall sheep.

Stewart remarked that "goats are more demanding in their habitat requirements than any of the species previously mentioned. Only the most rugged areas can be expected to maintain a reasonable population. A large part of the Mackenzie Mountain system can be ruled out by observation of topographic type. A good portion of the area lying between the South Nahanni, the lower Flat River and the Yukon border, however, can be expected to provide suitable conditions. Goat tracks and droppings were not uncommon in the Brintnell Lake region (a portion of the above described area) and three goats were seen. It is notable that these animals were only a few hundred feet above timberline and at least one thousand feet below the caribou herd found in the

same area. Predators which usually keep goats (and sheep) at higher levels may not be operating in the area."

Flock was given a handful of hair by one of a Yale mountaineering party operating in the area of Brintnell Lake. This he identified as the hair of a mountain goat. One of Snyder's group reported seeing five goats in the rugged mountains south of Virginia Falls while flying over the area on August 10, 1952.

Stevens and Eliason saw no goats nor goat sign in the region they surveyed.

#### Summary of Game Conditions

Untapped game resources of the variety and numbers found in the Mackenzie Mountains rarely are available in this day and age. For that whole area it seems unlikely that any other resource of comparable economic importance will be found for some time to come.

One of the notable features observed was the relatively high moose population, especially in the South Nahanni Valley. There, because of population pressure, moose occupied habitat not particularly suitable. It is doubtful if the moose population could increase in some areas without damage to their primary food plants. A fairly large kill of moose could be sustained in the South Nahanni Valley without doing much harm to the population. Predatory animals seemed to be at a low level, and in any event, predation alone is seldom able to reduce an over-population of big game animals.

Other hoofed animals discussed seemed to be in a satisfactory condition with respect to their range. Many of the upland ranges were well utilized although there appeared to be other suitable areas which were almost devoid of animals. There was indication that sheep had been reduced recently in some areas, perhaps because of disease or over-population. Caribou appeared to be in satisfactory numbers at present. There was little doubt that these animals were migratory and drifted to lower areas during winter. The Indians at Fort Norman have found herds of caribou around Drum Lake whenever they have gone to look for them in recent years.

The whole region now receives virtually no hunting pressure and because of its remoteness and inaccessibility would not be over-hunted even if such activity were made legal. Holders of general hunting licences and resident big game licences are allowed to take game in the region, but their inroads are negligible. The investigations of the area showed few young animals to be present. This would point to a stable game population with a relatively high proportion of older animals. Such a population easily could withstand hunting pressure and would provide a high percentage of trophy class animals as well.

Other potential attractions besides sport hunting should be considered. Arctic grayling have been reported in some of the alpine lakes. Both

grayling and lake trout were found in Brintnell Lake, and lake trout were caught in both Drum Lake and Dal Lake. Speckled or eastern brook trout have been reported in brooks tributary to Keele River by Warden R.C. Timmins of Aklavik, but it is possible that these too were lake trout.

The scenic beauties of the Mackenzie Mountains some day will be appreciated by many Canadians. Although the mountains are not as high as some in the Yukon, they often are unsurpassed for colour and rugged beauty. The valley of the South Nahanni River is especially scenic with Virginia Falls 316 feet high and the scenery at Brintnell Lake surpassing Banff's Lake Louise in grandeur. To most hunters aesthetic values include not only the animals they seek but also the natural scene which forms a backdrop for them. The Mackenzie Mountains are an unspoiled wilderness and it should be a delight to any true sportsman to enter the region.

#### Access to the Area

It is likely that the major access to much of the Mackenzie Mountains will be by air because of the distances involved. Horse travel may be feasible from the Yukon in such areas as the Canol Road and the headwaters of the Flat and Caribou Rivers, but access from the Mackenzie settlements would be hindered by lack of trails, poor horse feed and the long distances involved.

Small wheeled aircraft operating from such natural landing sites as level uplands and gravel bars are quite successful in Alaska. But considering the height of the mountains and the load of equipment necessary for a hunting party it is probable that float-equipped aircraft (the size of a "Beaver") will be employed. For such craft landing sites in suitable lakes are restricted. During the course of the aerial survey, veteran Pilot A. Carey, assessed each lake seen as to its suitability of an operating base for a Beaver aircraft, taking into account the load to be carried and the altitude.

The following lists designate lakes seen which fall into the two categories noted. Because maps are poor, some lakes shown on the 8 miles to the inch topographic series do not exist and other lakes which should be charted do not appear. Latitude and longitude positions of the centre of the lake are given with the name, in brackets, if such is known. Other lakes appearing on the map, but not included in the list, were not seen and no information is available concerning them.\*

#### Suitable

62°28'N 124°30'W (Iverson Lake)  
 63°53'N 126°10'W (Drum Lake)  
 63°08'N 126°30'W (Dal Lake)  
 62°05'N 127°32'W (Brintnell Lake)  
 63°32'N 128°40'W (June Lake)  
 62°59'N 129°06'W (O'Grady Lake)  
 64°40'N 127°55'W (Carcajou Lake)

#### Not Suitable

63°48'N 128°48'W (Godlip Lakes)  
 62°26'N 125°50'W  
 62°26'N 125°35'W  
 62°27'N 125°10'W  
 63°09'N 126°25'W  
 63°24'N 126°30'W  
 63°02'N 128°10'W



Suitable

62°21'N 125° 52'W  
63°36'N 126° 19'W  
63°35'N 126° 39'W  
63°00'N 128° 10'W  
63°03'N 128° 25'W

Not Suitable

63°30'N 128° 45'W  
63°52'N 125° 59'W

\*Persons who are interested in studying the Mackenzie Mountains area in more detail are referred to the following Topographic Series Map Sheets, published at a scale of 8 miles to the inch:

Ogilvie Range - Nos. 106 S.W. and 106 S.E.

Norman - Nos. 96 S.W. and 96 S.E.

Pelly River - Nos. 105 N.W. and 105 N.E.

Wrigley - Nos. 95 N.W. and 95 N.E.

South Nahanni - No. 95 S.W.

Simpson - Liard - No. 95 S.E.

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- harvest potential
- access
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- boreal
- Mackenzie Mountains
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c.1 Big game survey of  
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