Recently Imperial Oil Chairman W. O. Twaits appeared in a film to tell the people who work for Imperial what the company expects of them in the fight against pollution. Here, edited for print, is what he said

The environment: whose responsibility?

by W. O. Twaits

It is probably heresy to suggest that 'protect the environment' is becoming the leading cliché of our times. Yet there has been so much talk, so much emotion and not enough rational action, that we are in danger of becoming bored with the subject of environmental protection.

That would be a tragedy, because this is one of the most urgent problems facing mankind. We dare not grow indifferent toward it, for it will be with us far into the foreseeable future. That is why I want to put down here in the plainest possible language exactly where Imperial Oil stands on the issue of environmental protection, and exactly what we expect of our employees.

We regard it as one of the most important matters facing the company. Protection of the environment is not a passing fad. Pollution will not go away by itself. Indeed, as population and economic growth in-
crease, so will the potential for despoiling the land, air and water. This means that every person within Imperial Oil—not only the operating personnel, but every agent, every dealer, every office employee—has a responsibility in helping combat pollution of any kind. Preserving the environment is no longer just a good public-spirited thing to do. It is a must.

The problem is not new to us. Imperial has been a leader in the pollution fight for many years. Usually we have been ahead of government regulations in our control measures. For example, in 1963 Imperial ordered its ships operating in the Great Lakes to retain food wastes and other garbage for disposal ashore. It was almost eight years before the federal government imposed similar regulations on all Canadian-flag vessels.

There are many other such examples, but this is no time for dwelling on past achievements. It is a time for vigorous action. Society is calling for far-reaching legislation to protect the environment. This is particularly pertinent to our business because the oil industry has a relatively high potential to pollute both air and water. And we are not opposed to such legislation; on the contrary, we see the need for sound, uniform standards. But they must apply to all—it makes little sense for Imperial to spend millions of dollars controlling its operations if others in industry, or in the community at large, are not making a proportional effort.

Companies such as Imperial have experience that can be very helpful in drafting the new legislation. We have pioneered in environmental protection, have acquired much expertise and have much knowledge to contribute. Governments know this, and they welcome cooperation. But we will be listened to only if we practice what we preach. That is another reason why our performance as a company must be impeccable.

When I speak of 'environmental protection' I mean everything, large and small, from preventing oil spills in the waterways to cleaning up unsightly grounds and service stations. I mean not overfilling our own or our customers' tanks. I mean closer control over plant operations. I mean planning drilling and seismic operations so that we disturb northern tundra and streams as little as possible. I mean navigating, loading and unloading our ships with the utmost care.

Better equipment and design will help us. Our Strathcona refinery, which comes on stream in 1974, will be more than three times as large but will emit less contaminants to the air and water than the present refinery at Edmonton which is in itself meeting all government regulations. We are making great headway with such things as controls and telemetering in pipe lines; new loading techniques for tank trucks to cut down emissions of hydrocarbon vapors; new tech-

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ology that enables us to drill and develop in northern permafrost with minimal damage to the tundra.

But technology is only as good as the people who apply it. Our great concern is for better human performance. We need better work methods in every aspect of our operations, and although this is a primary responsibility of management at various levels, it goes right down to the individual. We must eliminate pollution incidents caused by human error, in the same way that we have worked at on-the-job safety.

Everyone knows that safety requires total commitment. One careless act spoils the record. We need the same dedicated effort in environmental protection, with the same kinds of encouragement and the same kinds of accountability. Our company can’t afford accounting errors, faulty products or lapses in safety procedures. And our company cannot ignore human errors that pollute the environment.

All of this additional human and technical effort is going to cost money. Imperial has already spent millions of dollars on preserving the environment and we will spend many millions more. We recognize that such spending is simply another cost of doing business in modern society.

In the past the world has used the environment freely, and never received a bill. Now we know that we must preserve that environment if future generations are to live, and that we must pay for it. Industry’s expenditure is part of the total cost, and in the end it has to be borne by all of us—citizens and consumers.

But there is a limit even to expenditure. There comes a time—some industries have already encountered it—when the cost of protecting the environment for a proposed new venture may prohibit even starting that venture. This is why experienced companies like Imperial can help governments weigh the pros and cons in achieving realistic legislation.

And finally, no amount of money by itself will make the system work. Only people can make it work, and only if they are committed to it. This means every Imperial Oil person, from board room to service station. The whole chain breaks down the moment one person doesn’t carry out his or her responsibilities. Frankly, we just can’t afford to have that happen.

This won’t be an easy task, and Imperial people are not to seek excuses for the difficulties or to try to convince themselves that the difficulties don’t exist.

The difficulties do exist, and we must overcome them. For Imperial Oil is committed to environmental protection as a way of life.
No land animal lives farther north than this hairy blanket of goat-antelope

The helicopter skimmed across the barren surface of Ellefson Island, 2,500 miles due north of Toronto. The three men inside stared intently at a far-off group of shaggy beasts. As the machine drew closer, the dots became a herd of musk oxen—about 20 bulls, cows and calves. The beasts reacted to the helicopter's noisy approach by wheeling to form the defensive circle characteristic of musk oxen. With the calves safely in the center, the adults stood shoulder to shoulder facing outwards, presenting an impenetrable wall of wickedly curved horns.

But the formation wasn't designed to deal with helicopters. Twisting and lunging like a quarterback, the helicopter harried the herd until two calves broke free. "Put down!" shouted Dr. John Teal to the pilot. Then Teal and his assistant piled out to chase them.

The calves were three months old and husky. They weighed about 150 pounds apiece and it was a wild scramble. Finally one was lassoed, the other brought down with a flying tackle. Within an hour both calves were tied up in tarpaulin and lashed to the helicopter's ponsoon. The men grinned: both calves were females—just what the researchers needed to start Canada's first herd of domesticated musk oxen at Fort Chimo, Que.

The expedition took place in 1967, but the man in charge of it all—Dr. John Teal—was a veteran. A biologist, he had been involved with musk oxen since 1954 when he led an expedition to Nunivak Island in the Bering Sea off the coast of Alaska to capture some musk oxen for study at an experimental farm in Vermont. He is also a director of the Institute of Northern Agricultural Research, which pioneered musk ox domestication at College, near Fairbanks, Alaska.

On the 1967 expedition, which was
In collaboration with the province of Quebec, Dr. T. Deal was accompanied by eight associates. The helicopters were on loan from the Canadian icebreakers Labrador and John A. Macdonald. Before they were finished, the men waded down 31 obereperous calves in order to get enough young females. Surplus males were released; not a musk ox was harmed. And these catch-sensitive animals didn’t even carry guns.

Musk oxen haven’t always been treated so considerately. The great, hairy relic of prehistory has been mistreated, misunderstood—even commissioned, for the musk ox is neither an ox nor does he produce musk. He is actually a kind of goat-antelope. The Eskimos call him “oomingsnak” which means bearded. Sixteenth century explorers are responsible for the name—the ‘musk’ was tacked on deliberately to encourage financial support for future explorations. Musk, which was used as a perfume base, was a very valuable commodity in 16th century Europe, where bathing was not in fashion and open sewers prevailed.

Musk oxen evolved in north central Asia perhaps a couple of million years ago. When man finally showed up, he found the placid musk oxen as an easy source of meat and hides. Gradually the musk oxen were driven far up into the ice fields. They migrated eventually to North America and remnants have been found as far south as Pennsylvania. Species and sub-species evolved and faded. Today, authorities recognize three: the black-faced musk ox; Hudson Bay musk ox and the white-faced musk ox.

There are no musk oxen living in Pennsylvania today. In fact, there are few of them living south of the Arctic Circle, and most are much farther north. The greatest number are on Ellefson Island, 700 and more miles north of the Arctic Circle. Temperatures there can stay at 50 below for weeks during the winter—and they stay below zero for six months of the year. There is no daylight from the end of October until the beginning of March. Yet Ellefson contains about 4,000 musk oxen.

How do they survive in that frozen desert? Well, their thick fur helps, but over the centuries, musk oxen have developed a number of features that make it possible for them to cope. For one thing, they learn to live and subsist in the Arctic vegetation that would scarcely sustain a human. The musk ox feeds on willows, brunches, flowering plants, grasses and sedges, pawing through the little snow cover in winter to reach the browse. It is doubtful if any other land mammal could turn such meagre fare into so much meat—a hefty bull weighs almost half a ton.

The eyes and hooves of musk oxen have also adapted to the Arctic. Their eyes have a wealth of oversized sensory rods for night vision and rectangular pupils that narrow to complete closure. They are perfectly adapted to the winter night and long dazzling days of the Arctic summer. The hoof is large and has a wide central gap filled with hair. Its sharp rings have a cutting edge while the soft inner surfaces give traction. The speed with which they can climb rocky slopes has amazed many observers," says J. S. Tener, director of the Canadian Wildlife Service and author of a book on musk oxen. He reported they climbed like mountain sheep.

Musk oxen are usually found in herds of a dozen to 20 or more, although solitary old bulls are sometimes seen. Cows usually outnumber bulls, and there is always one dominant bull in the herd.

In the mating season the bulls fight each other as much for herd dominance as for the cows, and the crushing of hoofs peaks in late July. The youngers appear the following April or May and, if windchill is high, the first few hours of life are critical. But born with a far coat, under rooster’s skins and with a cafeteria at hand, a newborn calf has a head start on its Arctic environment. With luck he will be out nibbling vegetation within a week. Normally a cow gives birth to a single calf every second year; twins are rare.

The calf faces a harsh but reasonably placid life, ministered by the herd. When danger threatens—a prowling Arctic wolf, say—the bull, cows and immature adults form a defensive circle around the calves. Thus deployed they are a match for any predator, except man. Apart from short jugs, the musk oxen do not break rank, nor desert fallen comrades. Unfortunately the maneuver is useless against men with guns—or even spears.

It is not sport, it is simple butchery," wrote Otto Sverdrup, a Norwegian explorer, in 1904. "Anybody can walk up to the animals and shoot down the whole herd... More than half a century later Walter Hlittle, former governor of Alaska and U.S. Secretary of the Interior, echoed: ‘a senseless slaughter disguised as sport.’

Some believe the animals were wiped out in Eurasia by primitive hunters. But in North America the beasts remained along the Arctic rim and held their own against hunting pressure until the introduction of firearms. When explorers and whalers appeared armed with rifles the musk ox was very nearly wiped out. According to Dr. Tener, more than a thousand were slaughtered on Ellefson Island alone between 1880 and 1917 for their meat.

An even greater menace was the arrival of the fur trade in Canada. Eskimos and Indians were encouraged to kill musk oxen for the hides alone. From 1862 to 1916 more than 14,000 hides were bartered at Hudson Bay Company trading posts. The business peaked in 1890 at 1,601 hides; then dwindled by 1916 to 1,001 to 1,000.

In 1917, Canada passed legislation to save the remaining animals. In Alaska the musk ox had long since been exterminated. So for a while this venerable breed reverted to the twilight fringes of the Arctic night—ubiquitous, unaccounted and milk essentially unknown.

In 1927, Canada made a further move on behalf of the musk ox by setting up the Thelon Game Sanctuary—16,000 square miles in the heart of the Northwestern Territories. It was the calving area of Barren Ground caribou, but it protected many musk oxen as well. In the ensuing decades biologists took an interest in the animals, and for the first time in its long history the musk ox was being studied, not slaughtered.

The Americans began to show an interest, too, and in 1930, 34 musk oxen from Greenland were delivered to the University of Alaska, near Fairbanks. They settled peacefully in a wooded pasture, but when the mating season came it brought problems. The oxals became nervous and irritable, and once chased a visitor up a tree. The animals were labelled ‘absolutely unsuitable’ and they were moved to Nunivik, an island in the Bering Sea.

This island provided ample grazing and total protection, and the musk oxen thrived. In fact their numbers have increased to the point where it becomes
possible to select some animals to form new herds. Some went back to College, Alaska, while satellite herds were turned loose on the mainland.

In Canada, government protection of musk oxen has increased their numbers. In 1939 the Canadian mainland musk ox population was about 500. It now stands at 1,500 with a further estimated 8,500 in the Arctic Islands. In addition to the Canadian musk oxen there are now probably in excess of 1,000 in Alaska and about 6,000 in Greenland.

But protection of native animals by government legislation is one thing; domestication is another. Many northerners shook their heads when they heard someone was going to try to tame the musk ox. In fact, they might wonder why anyone would want to domesticate these refugees from the Ice Age.

The answer is meat and wool, but mostly wool. Qiviut (pronounced as if it was spelled with a k) is the Eskimo name for the fine coat of underwool on musk oxen that has developed as a protection from the cold. It's another light - so light that one pound of it can be spun into 10 miles of yarn. Someone has dubbed it the golden fleece of the Arctic and many textile manufacturers rate it the most exciting natural fibre since mohair. In fact, it was a group of American textile manufacturers who supplied most of the financial backing for Dr. Tavl's original 1954 expedition.

Eskimo knitters in Fort Chimo have been trained to make scarves of qiviut for which they are paid up to $25. Each scarf, four feet long and 16 inches wide, weighs less than an ounce. The wool is in short supply and visitors have snapped up all the scarves the Eskimos can produce. Even so qiviut is entering the fashion world. Neiman-Marcus has displayed a scarf 8½ feet long, made of qiviut. It weighed only four ounces and was priced at $150.

Their 'golden fleece' is harvested every spring. As the weather warms, the musk oxen shed the qiviut in ragged patches. In the wilds, bushes are festooned with the discarded wool. Musk oxen under domestication are groomed by hand.

At a source of qiviut, however, the musk ox is still a question, and the question may remain strictly academic. When a musk ox can produce six pounds of qiviut annually for 20 years at up to $50 a pound, it seems foolish to rush him to the slaughterhouse. The meat is said to be very tasty, but it is unlikely the musk ox could ever be anything but a marginal source of food, so great is the territory needed to support a single animal - Ellesmere Island has about one musk ox per 20 square miles.

Even so, their ability to survive in the deep Arctic fits the theory of many biologists who believe that native animals are the best ones to utilize great areas of the world. As the Zoological Society of London puts it: '...man, after several thousands of years of meat production, still concentrates on two domesticated grazing species - sheep and cattle - even in areas where there are highly edible wild animals whose feeding patterns are adapted to local vegetation.'

The Russians proved the point with an animal called the saiga. This once-rare antelope lived in the arid wastes around the Aral Sea, where no commons ever could survive. Its horns were worth $250 in the Oriental 'medicine' market and the animal was pursued almost to extinction. The Russian government protected it and by the mid-60s had a surplus yield of 200,000 animals - a valuable source of meat.

In Africa where the introduction of cattle has often caused the creation of dustbowls through over-grazing, experts are now taking a closer look at the eland. Besides being native to the continent, and hence adapted to that environment, this antelope is a large one, often weighing as much as 1,500 pounds - which makes it a promising source of meat if it can be domesticated.

Could the same thing be done in North America? Well, we lost two good chances to find out by driving the buffalo and caribou - two of our most prolific native species - to the brink of extinction. Prior to the arrival of the white man, huge herds of buffalo roamed the great central plains. Biologists estimate that there were 60 million of them at their height. By 1900 the number had dwindled to 300 in the United States, with a few more in Canada.

Biologists also estimate that there were about five million caribou in Canada's vast barren lands when the first white explorers and traders arrived in the area. By 1928, their population had dropped to approximately 200,000.

Reindeer, the smaller European cousin of the caribou, were introduced into Alaska and in 1935, into the Mackenzie delta.

But harvesting wild animals isn't easy. Caribou, for instance, migrate annually in vast herds, and there has been no serious attempt to domesticate them, chiefly because of their migratory habits. Biologists hesitate to impose any limitations on the animals in case it impairs their facility for cropping the tundra to the best advantage. Caribou seem to have an uncanny ability to sense when a range is on the verge of overcropping.

Chances are that musk oxen would prove less difficult to control than caribou. Caribou migrations often cover 700 miles; musk oxen seldom travel more than 50 miles all year. Moreover, the experimental farm at Fort Chimo indicates that musk oxen thrive under domestication if not moved too far south. Winters on the experimental farm in Vermont - fairly severe by most standards - were too mild for the musk oxen and they failed to thrive as they do at Fort Chimo, where they react to Arctic storms like children at the first winter snow. 'Up and down the drifted mountains they charge,' reports Joan Bellairs-Spruyt who, with her husband Diederik, once looked after the herd, 'bounding bipher and thither like great hopping bed blankets.'

The Bellairs-Spruyts found the calves intelligent, playful and mischievous - they quickly mastered the art of opening tricky latches on gates. They were even gentle enough for the local children to ride. Those original calves captured on Ellesmere Island in 1967 have reached maturity and have been producing offspring for two years. Soon there will be more and the once-threatened musk ox may survive and multiply after all.
The Mackenzie

Greater than the St. Lawrence, second only to the Mississippi, this vast river system links southern Canada with the western Arctic frontier

by Robert Collins / photos by Ron Cole

We journeyed down the valley last summer like other instant experts - businessmen, sightseers, scientists, politicians, journalists - who have suddenly 'discovered' the Mackenzie River. It has been waiting there in the Northwest Territories some 10,000 years, since the last glaciers slowly receded. It is the greatest river system in Canada. In all North America, only the Mississippi is larger. The Mackenzie system drains 696,700 square miles, an area bigger than Quebec and 13 times the size of England. From beginning to end it runs 2,653 miles - 500 miles longer than the St. Lawrence.

But now, to southerners, it is more than a massive statistic in the geography texts. Its valley corridor may lead pipe lines into the South and a highway into the North, opening the last real frontier on this continent. And so we went to package it in pictures and words. We came away feeling inadequate and exceedingly small. The Mackenzie defies neat descriptions. You can only tag along and let the river and its people tell you their own story.

It is 11:30 p.m. of a Sunday night in July in Hay River, on the south shore of Great Slave Lake. Six men work feverishly at the docks by the last pink smear of sunset and the headlights of a huge forklift. They are loading drilling pipe and 100-pound sacks of drilling mud on a barge bound for Imperial Oil’s rig north of Inuvik. Most of them are college kids on summer vacation; sweat dried on their faces, bone-weary, but strangely proud. 'Started at eight this morning', one of them says cockily. The old Beat-The-Mackenzie-River game is getting into their blood. The river sets the rules, which go like this: The 1,100-mile route to Inuvik is open for navigation only 14 to 18 weeks. River barges are still the main heavy-cargo carriers in the North. So you work night and day to get a writer's supplies moved in before the river locks you out.

Later a tugboat pushes this barge, lashed to a half-dozen others, out into Where it passes Norman Wells on the east bank (left) the Mackenzie River is more than three miles wide
Great Slave Lake, with 700,000 tons of cargo. If it safely negotiates the river’s shoals, rapids and hairpin turns, it will reach Inuvik in about a week.

The Mackenzie River, in name, begins at the western corner of Great Slave Lake, and meanders 1,100 miles to the Beaufort Sea and the Arctic Ocean. Around it lies the ‘valley’ which sometimes is 200-foot cliffs, and sometimes flat monotonous forest. In all that long journey to sea level, the river drops only 500 feet.

Actually, though, the Mackenzie chain reaction begins more than 1,500 miles back in the Rockies. High in the British Columbia mountains west of Fort St. John, the Finlay and Parsnip rivers crash head-on together and become the Peace. The Peace River thunders through gorges and rapids, levels out in northern Alberta and, at Lake Athabasca, joins the Athabasca River which is ending its 768-mile journey from the Columbia icefield. Together they form the Slave, which rolls over the Northwest Territories’ border into Great Slave Lake. Out of this comes the Mackenzie proper, which primitive man has known since the last ice age, which adventurers and traders have known less than two centuries, and which every ambitious tourist has on his list of places to visit tomorrow.

Never in her 46 summers down North has Sister Bourlie seen so many tourists, she tells us. She is tending the Indian crafts shop at Fort Providence, 40 miles down the Mackenzie from Hay River, a merry gray-haired sprite in nun’s habit, and what look like men’s army boots. She opens her guest book with names from all over Canada, the United States, even England. Usually the winter output of moccasins, brooches and handmade souvenirs lasts through the tourist season, Sister says, but this summer the Slavey Indian women had to rush back to work.

Good for the Indians, we ask? Sister Bourlie shrugs. The crafts shop is flourishing but, tourist ‘boom’ to the contrary, this lumbering white clapboard community has only 650 people. The loudest noise on the street this morning is the whisper of wind and the occasional croak of a raven. A surge of industry will certainly change the way of life; no one knows to what end. But the church wants Sister Bourlie to stay because ‘she is good with the Indians’. And so she will, because her people need her. ‘People like me’, she twinkles, ‘are we saints or fools?’

They thought Alexander Mackenzie was a fool when he paddled north from Lake Athabasca with four canoes in the summer of 1789. No man had traveled the great river to its end. As it swept Mackenzie’s party into the unknown his paddlers almost motivated, especially when the Indians along the shore warned that it would take many winters to reach the sea, and that an evil monster lurked along the way. Mackenzie bribed and bullied them on. He reached the Arctic Ocean in 46 days—and disgustedly named his route “The River of Disappointment”. He had hoped to find the Pacific and the riches of Cathay.

But the Montreal merchants were happy enough with the riches in the North. Bales of fur poured upriver—in voyageur’s canoes, then in Hudson’s Bay Company York boats, then in paddle-wheel steamers. Trading posts grew up every 200 miles, little “forts”, the nuclei of today’s Mackenzie Valley communities.

We leave Fort Providence by car, cross the river on the splendid new ferry 'Marv Harden', and head northwest to Fort Simpson, terminus of the gravelled Mackenzie Highway. Our U-drive has a thick protecting pad under the gas tank, plastic pods over the headlights, a winch hook on the front bumper, extra cans of gasoline in the trunk and a windshield badly cracked from flying gravel. A typical Mackenzie Highway vehicle.

Headlights blazing all day, we move in a permanent duststorm of our own making, through a lonely landscape of scrub evergreen and flaming Arctic fireweed. There are no roadside buildings, Fort Providence’s CBC relay station fades out long before Fort Simpson’s comes into range. Sometimes a truck or tourist’s car comes at us, lights burning through its private tornado. We exchange waves, like mariners at sea. The dust seeps into skin, hair, clothes.

At last, nearly 300 miles from Hay River, we back down a steep muddy hill onto a two-car free ferry—actually a tugboat pushing a little barge. "You guys got tickets?" says the ferryman, making his little joke. "No? Good thing. I'd hate to have to pay for a ride like this."

He guides the ferry across the Liard River, muddy brown from limestone sediment and littered with driftwood. The powerful current snatches at us but he docks skillfully and announces laconically, “Survived again.”

The Liard booms in from British Columbia to join the Mackenzie at Fort Simpson. For 70 more miles its murky current flows along the left bank, parallel to the clean Mackenzie water on the right. Finally this watery layer cake mingles and the Mackenzie runs muddy to the Arctic. Warm Pacific air also comes down the Liard valley, helping to thaw the Mackenzie weeks before the winter ice goes out of Great Slave Lake. Fort Simpson people wager money every spring on the moment of river break-up.

Spring thaw is not the only gamble down north. Schedules are meaningless. Restless southerners learn to develop patience, or go home a bundle of nerves. You wait for aircraft, ferries, a change in the weather. You can’t jump in a car whenever you like and drive north from Fort Simpson. Not yet.

Albert Norwegian, trapper, joins our table in the Fort Simpson coffee shop. He wants his opinion on the proposed highway. Everybody in Simpson is talking ‘highway’. The first 49-mile leg of the federal government’s 1,000-mile, $100 million gravel road to Inuvik and Tuktoyaktuk is to be started this winter. Will it upset animal migration patterns?
and strip precious gravel from fish spawning beds? A biologist will later tell us that the highway "is the worst thing that can happen to the biology of the North." But most northerners disagree.

Albert Norwegian has been trapping lynx and marten for 14 years. He covers a 90-mile traline by snowmobile. His living depends on the wildlife but he thinks the highway won’t upset things. "Those seismic trails the oil companies cut," he says, "I like to travel on ‘em and so do the animals!"

"We don’t want to stay as we are for the next thousand years," adds Mrs. Mark Fairbrother, ex-schoolteacher, a Fort Simpson resident for 12 years, and wife of the local Esso dealer. "We want to preserve the ecology, of course, but we also want the amenities of life, like people in the South. And that means a highway and other developments."

But the highway probably won’t be finished until the late 1970s. A railroad into the North is still just talk. Northern Transportation Company, a crown corporation that operates many of the river barges, is experimenting this winter with a freight-carrying air cushion vehicle, but northern travel by this means is still a remote prospect. So in summer there are still only two ways into the North: by air, with Pacific Western Airlines’ scheduled flights or by private or chartered plane, and by river. Even the first cow went to Aklavik by barge, in the 1830s. In winter a snow road goes north from Fort Simpson.

As they go north from Fort Simpson the barges seem to be heading straight into a looming range, the Mackenzie Mountains. But at Camsell Bend, one of the prettiest spots en route, the river turns sharply right and adjusts its course due north, with the majestic Mackenzie’s left and the blue Franklin Mountains coming in view on the right.

Wrigley, a trapping and fishing settlement of 185 people, appears on the high bank, followed by miles more river and mountains under a bowl of sky.

Next Fort Norman, offspring of an 1810 trading post, stands beckoning 70 feet...
above the water. Here the Bear River comes down from Great Bear Lake to warm its icy waters in the Mackenzie. Farther down river, opposite Imperial's refinery at Norman Wells, the Mackenzie's warmth keeps Bear Island so free of permafrost that you can grow potatoes on it in the summer. Generally the permafrost, never more than a few feet below the surface, is not conducive to root crops. Chalk up another minor miracle to the amazing Mackenzie. No wonder valley people regard the river with awe and affection.

When I was a little boy in B.C., studying about this river in geography, I never thought I'd really see it. Jimmy Jackson is saying, and the wonder is still in his voice. 'So here I am working on it, living by it, for 52 years!'

He admires the magnificent view, as though for the first time. His little house is halfway down the bank at Norman Wells, and the river traffic slips by his west window like a 24-hour movie. City people would pay big money for a view like this, I tell him. 'Norman Wells people envy it, even!' chortles Jimmy. 'I won't ever leave here. They're going to bury me around here.'

He is 72 and very much his own man. He talks everywhere because he thinks motorists are forgetting how to use their legs. The North is going soft, Jimmy thinks. He was a river pilot once, when there were no navigational aids. 'In my time, a pilot had to read the water. It's an easy river now.' Easier maybe, but still treacherous. In some places the Mackenzie is so shallow that a tugboat with only a three-foot draft may still scrape bottom or run a propeller. There are islands to be dodged and rapids to be run. And here at Norman Wells, where the river is more than three miles wide, storms can whip up 10-foot waves. There are canoe drownings nearly every year, often local people who are less cautious than strangers from the South.

Every year the Mackenzie Valley lures more such visitors from the South: tourists seeking adventure, others seeking a permanent refuge from the city.

Our chartered Cessna is picking its way through rain clouds and ragged sunlight north of Norman Wells. Below the river twists and curls like a fat muddy snake. 'I lived in many cities down South,' says Rick Sinotte, the bearded young pilot, who looks and talks more like a university teacher. 'I've been here only six months and I love it. Mostly I like the lack of people. I don't relate to cities any more.'

For nearly an hour we drone through blue-green emptiness. Then ex-flying instructor Sinotte expertly drops the Cessna down near the water and we skim through The Ramps, another of the Mackenzie Valley's wonders. For seven miles the river narrows to perhaps 1,500 feet. Limestone banks, sharply chiselled by weather and time, rise 200 feet on either side.

We pull out of them and suddenly, dramatically, high on the bank: Fort Good Hope, oldest settlement on the lower Mackenzie. 'Good Hope!' Maybe the early voyagers gleefully cried out its name when they emerged from the frowning Ramps. Today, for an instant, it seems a sort of northern Brigadoon: towering wooden cross, little white church set behind it, chorus of howling Huskies, a sprinkling of immaculate log cabins – as though we have stepped back to the day it was founded in 1805. We circle and the illusion passes. Good Hope's 380 people also have pre-fab houses, an airport, trucks, a school.

But the church is a rare sight; interior walls covered with handprinted religious murals, scenes based on Indian life, and tiny details of doves, flowers and fruit. Most of it was done by the former parish priest, Father Bernard Brown, a man of many talents who moved on to help set up a fishing lodge at nearby Colville Lake.

God, Government, the Mountains and The Bay – these are the pillars of every Mackenzie Valley community. Most have changed with the times. Each Hudson's Bay store now looks more like a small town department store than a trading post. The Mountains travel by snowmobile and truck. Government has gone psychadelic with its penchant for buildings in startling pastel colors, some bureaucrat's idea for brightening the North. Only the church, mutters its critics, has not changed.

'The priests still treat the natives like children,' one northerner complained, 'and the younger generation won't accept it.' Be that as it may, the Oblate Fathers as a group are the most admirable pioneers the North has ever seen.

Father Colas seems glad to see us this sunny Sunday morning. By the time our twin Otter glides to the dock, he is coming down the river bank to greet us. Arctic Red River, population 96, doesn't get that many visitors. Lean, bareheaded, casual in black turtleneck sweater, trousers and rubber boots, Father Colas still has the echoes of Paris in his voice, although he has been in the Arctic since 1938.

Are we with the highway builders, he wonders? No? Well, all the excitement here is highway: not just the possibility of the Mackenzie road coming this way (Arctic Red River is one of two proposed routes) but the actual construction across the river of the Dempster Highway, which will link Inuvik with Dawson in the Yukon.

How unreal to be talking of highways here, less than 150 miles from the Arctic Ocean, at the spot where sour-doughs left their river rafts to head overland in search of Klondike gold in '98. Yet a highway will be something
like the gold rush, bringing hopes and dreams and disappointments. Fishing is bountiful here at Arctic Red, says the priest, and with a road, the Louths said Indians could build a processing plant, truck fish to Inuvik, and have employment all year. Yet the same road would lead them to bars and God knows what other enticements. Already, Father Colas admits ruefully, the young people often skip Mass. It is not easy, carving a life in this place. He tried a garden; vegetables grow rapidly in the long northern days, given fertilizer for the nitrogen-poor soil and irrigation for the arctic climate. But the sled dogs broke loose from their tethers and trampled his plants so often that he gave up. He floated his winter’s supply of firewood down river each autumn, and tried to persuade his parishioners to do the same. But Indians with no wood borrowed from those who had it, and soon all were without. Sharing is a northern Indian trait; planning for tomorrow is not. At least, says Father Colas philosophically, he has a snowmobile now. In the winter one can speed for miles along the frozen river. For 12 years I kept dogs, or should I say they kept me? Dogs must always be fed. You cannot take time off for a holy day and say “Let them eat mosquitoes.” Although that would be a good thing! He smiles around his pipe, through the mosquito clouds, and adds that he is 62. ‘I am a missionary, eh? I am not looking for retirement in Florida. I have all I need. I have a little tobacco. My pipe is old but it is dear to me. Sometimes the boys bring me a fish for dinner. The dollar declines in value but I do not worry for I have none! I believe in Providence…’

Below the town, the Mackenzie gathers the waters of the Arctic Red River and hurries north. Then it reaches Point Separation and shatters into a million fragments: a multitude of lesser channels and some 20,000 lakes. This is the delta, a 4,700-square-mile unfinished jigsaw puzzle in moss green, with spaces for the missing pieces marked in water-blue.

To the west, the Richardson Mountains spill over into the Yukon. Near them is Aklavik, the old settlement that Eskimo muskrat trappers refused to leave when government, in its wisdom, tried to move them to Inuvik. To the northeast lies Tuktoyaktuk, with a permanent population of 660, mostly Eskimos, and a fluctuating group of oilmen and scientists. In the middle of the delta lies Inuvik, the instant town built in 1965.

Anyone arriving non-stop from, say, Edmonton is liable to regard Inuvik as a quaint frontier town: population 3,300, buildings perched on pilings driven into the permafrost, utilities conveyed above ground within strange great conduits called ‘utilisides,’ board sidewalks, gravel streets. But emotions, even activism, run as high here as anywhere else. Certain politicians, for instance, have come out of Inuvik on a loaded fish-drying rack at Arctic Red River, a pair of freshly-caught inconnu wait to be cleaned and split. Locally, these fish are called connie perspiring from more than the midnight sun.

As a child, south of Aklavik, Nellie Cournoyea had 25 square miles of delta as her front yard. Her white trapper father and Eskimo mother needed much territory to make a living from muskrats and other furbearers. As well, they traveled 150 miles each winter for caribou, and as far again in the summer to the whale hunt.

Today Miss Cournoyea, slim, blonde, blue-eyed and manager of Inuvik’s CBC station, is also publicity director for the Committee for Original People’s Entitlement. Her task is this: to see that the native people get a land rights settlement with the federal government before any highway or pipeline lines are built. And she knows the importance of land.

‘Everybody’s forgetting that it’s the native people’s land,’ she says. ‘It doesn’t belong to anyone else.’ Although she won’t specify COPE’s forthcoming demands on the federal government, they may include mineral royalties, and hunting, fishing and water rights.

‘We’ll be fair,’ she tells me. ‘Our people aren’t violent, contrary to what you’ve heard. But she is tough and articulate. She has already taken on a cabinet minister or two. We will all be hearing more from Nellie Cournoyea.

Anyone arriving non-stop from, say Arctic Red River is likely to fall down and kiss the streets of Inuvik. There are three hotels with city-style cocktail bars (local aficionados favor The Raven’s Nest and The Mad Trapper’s Lounge), taxis, a movie house, a telephone-answering service, and satellite TV scheduled for 1973. The local travel agency says 2,000 tourists found their way here in 1972, some of them aboard the first regular tour boat to ply the Mackenzie, operated by Arctic Cruise Lines of Hay River.

There is also a science research centre, a Canadian Armed Forces base, a dozen miles of road and a constant rumble of traffic, much of it related to the oil industry.

‘I just hope Inuvik doesn’t turn into a rat race like in the South,’ says Frank Hansen, town councillor and part Eskimo. Hansen is the resident engineer for a pipe line engineering company working in the North. ‘Sometimes when I get out there in the country again,’ he says wistfully, ‘I feel like staying there.’ Out on the tundra you understand what he means.

Flowers bloom and fruit swells in the valley’s brief, vivid summer.

We are on Richards Island, 75 miles north of Inuvik. Ten miles north of here, the Mackenzie ends its long journey to the sea. It is 5 p.m. and the sun will be up for another eight hours. The wind blows, ruffling the fuzzy white Arctic cotton, and the muddy waters of the delta. Land, water, sky—magnificent, but almost overwhelmingly lonely.

Yet there is life all around us. The land is carpeted in delicate mosses, lichens and low-lying shrubs. The waterways are full of fish and waterfowl. Behind us, in a little trailer camp, a half-dozen scientists are talking about the grizzlies, reindeer and whales they saw from the air this morning. To the west a drilling rig perches perilously on its gravel pad. Closer, there’s a ravens’ nest on a storage tank. Through a telescope, I watch two whistling swans raise their elegant heads, a mile away across the table-flat tundra.

Nearly all of these things are here because of the Mackenzie. The warming river brings rich life to the delta. The river brought white men here, too, and carried the drilling rig here now. The scientists are here, sponsored by industry and government, to help guarantee that the opening of the North, symbolized by that drill rig, will not destroy the life the Mackenzie has created.

It is a good place for the river, and a river-watcher, to end the journey.
Researching the Arctic environment

The Arctic is being studied by the oil industry, the government, and the scientific community. The cost has already reached $25 million and the research is still going on.

If you have ever wondered just who reaps the benefits from environmental research, here’s an early return from the Arctic. A certain $750,000 northern study project has already paid off handsomely for a rabbit known as Pete.

Pete lives in a hale under a tree in the middle of a pipe line research station at Norman Wells, XWT — one of scores of sites from the Arctic Ocean to Alberta, in what is perhaps the most massive environmental study in history. Millions of dollars and thousands of man-hours are going into studies of the effects, pros and cons of laying pipe lines in the North, to get Arctic hydrocarbons safely and economically to southern markets.

What has all this to do with a rabbit? One morning last July Pete awoke to find that the oats and rye were green, tender and ready to cut — so he ate them. Conservation? The crop was part of a pipe line revegetation project: fast-growing "tissue" plants seeded in the earth over a newly-buried pipe line, to help re-establish the North’s natural and slower-growing grasses, litter and moss.

The rabbit had set science back about three weeks, but Hank Ottekaau, the engineer in charge of this Canadian Arctic Gas Study Ltd. project, simply planted a new crop, fenced it securely, and let Pete finish off the old one. After all, this project and all the rest are devoted to preserving the northern environment, even freelancing rabbits.

Canadian Arctic Gas Study Ltd. is an organization of companies, of which Imperial Oil is a member. The Norman Wells project is part of the organization’s feasibility study of a natural gas pipe line from the shores of the Arctic Ocean, up the Mackenzie Valley in the Northwest Territories, and across Canada. Companies, governments and uni-
Universities are investing millions more in researching the entire region. Objective: to learn enough about northern ecology so that petroleum development won't harm the environment. The study's cost is expected to reach $25 million by the end of 1972.

Mammalogists, ornithologists, ichthyologists, anthropologists and sociologists are studying every kind of creature that walks, flies or swims. Ice, soil, shrubs, flowers, grasses, air, water and whole communities are being scrutinized. The federal research laboratory at Inuvik last July reported 53 scientific studies going on in that area alone. They ranged from whale tagging by the Fisheries Research Board to a study of Mackenzie Valley settlements by the University of Saskatchewan; from a survey of tundra lichens by a Swedish university to a University of Alaska project on butterflies. Not all were directly inspired by the pipeline and exploration operations, but most of the knowledge will be pooled and almost everything will be of value.

The federal government itself is in the midst of a three-year, $15 million research program embracing 30 projects. They include studies of earthquake hazards, waste disposal, sociology and archaeology. The National Research Council, with financial aid from universities and such companies as Imperial, is studying plants and animals on Devon Island, 1,800 miles north of Winnipeg. The study, under the auspices of the Canadian Committee for the International Biological Program, is linked to similar research in Alaska, Norway, Sweden, Finland and Russia. It will show how much modification the natural environment can stand, and will include special experiments with oil spills and studies of vehicular traffic over the Arctic land surface.

The Arctic Petroleum Operators Association (APOA) has spent about $3 million assessing environmental and technical problems in and around the Beaufort Sea. Last summer, for instance, it was testing Arctic vehicles at five locations from the northern Yukon to the Arctic Islands.

Imperial, a member of APOA, also has specific study programs of its own. For example, Imperial hired a consulting firm, F. F. Slaney & Company, of Vancouver, to study Richards Island, north of Inuvik near the Arctic coast. The two-year study is assessing birds,
mammals, fish, vegetation, water and air, and the possible impact of natural gas production activity on all these factors. Slaney also did a study of the environmental impact of an inland industrial site built last summer in the shallow waters of the Beaufort Sea. These specifics are merely part of a greater and established industrial effort dating back many years. The company's Arctic co-ordinator, R. A. Hennock, and frontier coordinator, J. O. Under- deck, are among Canada's leading authorities on the North (Hennock is a frequent contributor to scientific journals and symposiums on the subject).

Conservation officers Tom Watson and John Cooper devote their time to monitoring Imperial's activities in the North, checking up, for example, on environmental practices at Imperial operations.

Southerners, contemplating this massive effort, must wonder: why all the fuss over pipe line? Hence a few questions and answers.

How much land will a pipe line use?

Relatively little: about 40-50 square miles of right-of-way will be required, arrowing out over some 1,700 miles from Alaska and the Mackenzie delta to Edmonton. Over most of the distance that land will revert to wild country or farmland once the line is in operation.

The entire land surface required to develop oil and gas in the North - including scientific lines, walkways, roads, pipe lines, camps, storage depots and air fields - has been estimated at about 1,350 square miles.

What's so special about the Arctic?

It's one of Canada's last great wilderness areas and we want to spare it from the ecological blunders man has committed in developing some other parts of the world. This is not necessarily easy because the Arctic is in some ways fragile. But it is also full of life.

On July 27, 1959, the Slaney party last summer observed many species of ground cover; from lichen-berry, which has red berries that make good jam, to Ptilinis fragilis, which has a thick root that can be roasted and eaten, and Ambrosia pulchella, a poisonous dwarf shrub. The Arctic is one of the major waterfowl nesting areas in North America, attracting thousands of ducks, geese, swans, loons, cranes, sandpipers, gulls and terns every summer. The Slaney group identified many other bird species, including eagles, peregrine falcons, owls, hawks, sparrows, thrushes, swallows and warblers. The Canadian Arctic and Alaska are the only known nesting areas of the Hudsonian godwit, a slender legged water bird with long bill and brown-black plumed plumage.

Elsewhere in the North, Canadian Arctic Gas Study Ltd. has engaged numerous other consulting organizations to conduct research. Some 20 species of fish in streams surrounding the proposed pipeline route, and a score of four-legged species, from barren ground grizzly, caribou and musk ox to lemmings, mice and small rodents known as voles, have been identified. However, despite the large population of waterfowl, caribou and lemmings, and the abundance of wolverine, the Arctic, like any cold region, has fewer species of plants and wildlife. This is why the loss of one species might upset the balance of nature much more severely than in other parts of Canada. If lemmings and mice were gone, geese and owls would be hard-pressed to find other sources of food. If lichen, which are highly susceptible to air pollution, were depleted, the caribou would also dwindle. Gravel dredged from stream bottoms could destroy the spawning grounds of fish. Fox and grizzly find relatively few den sites in the Arctic, and they are used generation after generation. Those sites are necessary for the survival of the species.

Permafrost is a major part of this tricky ecological balance. Permafrost is found in the ground varying in thickness from a few feet to about 2,000 feet. It may exist as solid rock, gravel, sand, silt or other soil mixtures, and in silty areas with no water content it may contain 50 to 70 per cent ice. 'Lenses' or wedges of pure ice may be sprinkled through the ground. Surface thawing in summer ranges from four to six inches. Indeed, below that, the ground is permanently frozen.

The tundra in summer is so soft and soggy in some places that even a snowshoe can leave an imprint. If the delicate cover of moss, lichen or shrub is stripped or worn away, it could cause a deeper melting of the permafrost in the summer. In areas of high ice-content permafrost this could create a "thermo-karst" condition (thaw settling) which leaves depressions in the landscape. In the 1960s, before thermokarst was widely understood, a University of British Columbia scientific party was walking the same walking trail for three summers on Garry Island in the Mackenzie delta. It thawed into a gully five feet deep at one end. Some years earlier, U.S. military vehicles in Alaska left trails that thawed into canals 20 feet deep and 50 feet wide. Even walking a few times over tussocks of Arctic cotton grass makes them turn brown and matted.

The concern, therefore, is not just for the actual right-of-way, but all the terrain affected around the pipe line.

Are we talking about an oil line or a natural gas line?

Both, but a natural gas pipe line is more important. Theoretically, crude oil for Alaska (where most oil discoveries have been made to date) would move via an Alaskan pipe line and then south by tanker. Gas is being discovered in both countries, and marketers are waiting in the South. A natural gas pipe line up the Mackenzie Valley is a more likely possibility, subject to government permit. An oil pipe line poses more difficulties. An oil spill into northern soil or water would be a more serious problem and production of a natural gas leak into the atmosphere.

Crude oil comes out of the ground hot. At high volume, any cooling caused by the Arctic climate could be offset by friction in the line. The temperature of crude traveling through the line could be in excess of 100 degrees Fahrenheit. A detailed analysis of the soils involved along the pipe line route has been made and will be done. In areas of extremely high ice-content the line will probably be elevated. This raises an ecological question: will caribou, moose or musk ox, tundra birds, (an annual animal molting process), be able to pass under anything that might hurt them. Last summer Dr. Frank Basfield of Brock University in St. Catharines, one of Canadian Arctic Gas Study's wildlife consultants, watched a caribou suspiciously prowl up and down a section of test line at Prudhoe Bay, Alaska. Finally the caribou, about six feet tall to the tips of his antlers, dashed under the eight-foot fence, to applause from the watching scientists. Research is continuing on this aspect.

Meanwhile, Mackenzie Valley Pipe Line Research Ltd., an oil pipe line study group, has completed experiments at a test site near Inuvik. Some sections of line were completely buried; others were partly buried with gravel mound over the top (called 'bored' construction); small ones were supported on pilings. Some were insulated, under several types of insulation; some were not. The group's final report was expected in November. A natural gas pipe line presents fewer complications. The underground, berm and above-ground techniques are all being thoroughly tested by Canadian Arctic Gas Study Ltd. at four widely-separated sites in the Territories, Alaska and Alberta. Compressed air, simulating natural gas, is forced through the lines at various temperatures. Dozens of different gases, from red gas to Canada bluegrass, are being tested on and around all the lines. Preliminary indications are that natural gas, as a
temperature below 32 degrees, passed through a completely buried line, will not affect the environment.

What about that delicate ground cover?

The major concern for pipe-liners is what people and vehicles will do to the land during and after construction. Here, the oil industry already has good answers and is looking for better ones. Oil crews don’t travel on the soft tundra during the summer; they rely on helicopters and fixed wing aircraft. In winter they use snow roads, built by a ‘high-blading’ method: bulldozers are equipped with shoes to prevent them from scraping away the ground cover. Drill rigs and camps are set up on gravel pads, about five feet thick, to protect the surface.

Meanwhile, the industry keeps experimenting with special Arctic vehicles, including some with huge balloon tires that distribute the load over so great an area that their impact – inch for inch – is lighter than a man’s. Cargo-carrying air cushion vehicles are also being tested.

Will pipe lines harm the fish?

 Anything that lowers water levels, pollutes the waters or disrupts spawning beds could harm the fish. Excessive amounts of gravel stripped from river beds for construction of any kind could interfere with spawning. Research is accumulating on fish spawning beds. In the Firth River area of the Yukon, for instance, Canadian Arctic Gas Study’s consulting scientists have studied Arctic char, grayling, whitefish and lake trout. They’ve discovered where the fish spawn and where they spend the winter, so pipe lines can avoid both areas. They’ve learned, for instance, that char and grayling winter in sub-permafrost springs where the water is at 34-40 degrees. That’s downright tropical compared to the salt water of the Beaufort Sea in the depths of winter.

Indications are that any oil pipe line will be built on the east side of the Mackenzie River. Reason: the west side, with its history of flooding and erosion, presents more danger to the pipe line. Although the east side of the
What about the birds?

Canadian Arctic Gas Study Ltd. researchers say the ducks of the North, like ducks everywhere, are relatively tolerant of human activity. The Canadian Wildlife Service tells of snow buntings nesting among the lumber storage pallets around an Imperial Oil drilling rig, mallards grazing near the rig, and a paraplegic ruff roaming on the drilling.

Gees are swans are more easily upset, but there are no known major nesting areas along the proposed pipeline route. Aircraft and other disturbing activity must be restricted around the habitats of whooping cranes, trumpeter swans, and perhaps other endangered species as the peregrine hawk.

The oil industry is already enforcing such regulations on its own.

One bird that seems to welcome man with a croak of joy is the northern raven, which hangs around towns and camps the way starlings and sparrows inhabit the South. A raven nested on a storage tank near the Slaney camp on Richards Island last summer. Elsewhere, a raven watched a ship load raw oil eastward on the Beaufort Sea.

Will animals be harmed?

As with birds, some animals tolerate man well. Barren Ground grizzlies enjoy looking for garbage, like bears in any national park. (However, oil crew garbage is burned as an anti-litter measure.) Wolves have hiked inquisitively around pipeline research sites. Arctic foxes linger at drilling camps, hoping for table leftovers. Researchers from Renewable Resources Consulting Services Ltd., an Edmonton firm under sub-contract to Canadian Arctic Gas Study Ltd., watched 30,000 caribou migrate more 100 yards away from their camp near Old Crow, in the Yukon. They discovered, incidentally, that the herd in that area numbers 70,000 — twice as many as previously estimated.

Indications are that a pipeline, whether it is elevated, buried in a bore, won't bother animals. Some caribou, like to stand on the berm, apparently go out to the Extra to rid themselves of fleas. Whatever the technique, construction cannot be allowed during the summer in the caribou's calving grounds. Nor will a pipeline cross the drainages of bears and for all of which are being pinpointed by researchers.

Noise is a possible hazard. Pipeline compressor station every 50 miles would include gas turbines that emit a high-pitched noise — as much as 75 decibels, 400 feet away. Renewable Resources last summer used electronic sound simulators to test animal reactions. First results showed that caribou seem indifferent to the noise. Some mammals, such as Dall sheep, may be affected. Both caribou and sheep are disturbed by jet helicopters.

Opportunities for northern people

Will northerners share in employment opportunities? Imperial and some other companies have hired Eskimos and Indians in their northern operations for several years. Results are as good as with any other workers, once the participations understand each other. Native northerners don't always share the southern man's materialistic drive or his passion for time-keeping. For centuries the native northerner has slept when he was tired, eaten when he was hungry, quit when he felt like it. Schedules are unimportant to him; family life is of extreme importance, and selective white men have been slow to sense the Indian's or Eskimo's acute homestecking spirit, even a short separation from his family. Imperial has a training program that can make provision for native workers to hunt or attend to traditional chores around home where these are essential, then there is an opportunity to hire on again.

Native northerners have been suggested as prime participants in northern conservation work. Already, Renewable Resources has used native know-how in its research. Around Old Crow, the scientists located 11 Barrons Ground grizzly dens. They asked Old Crow resident Charlie Peter Charlie what he knew about them. He said his grandfather had found bear in the same location 150 years before. The information told researchers that good sites for bear dens must be relatively scarce, and should be preserved.

Canadian Arctic Gas Study Ltd. regards recruitment, training, and employment of northern residents as a priority item, not only for pipeline construction — which would take two or three years and employ about 8,500 men at peak of construction — but for permanent jobs afterward. In 1970 a petroleum group started a pipe line training program in Alberta for 16 northerners, including 11 Indians and Eskimos. Eleven of the 16 stuck with it and went into permanent employment here in 1972. This year, also, a University of Alberta research group was retained to reconnoiter the best ways for maximum employment of northerners on the pipe line. Other groups are contemplating northern leadership training program. And to help northerners to become more better appreciate the people and communities of the Canadian Arctic, information programs are being considered.

What happens when the research is finished?

All of the findings and all of the data gathered by Canadian Arctic Gas Study Ltd. as a result of its extensive environmental studies will be included as evidence when the organization applies to Ottawa for a pipe line permit, tentatively in 1973. The extensive northern environmental studies conducted by the federal government will help to evaluate the application. In addition, the government has laid down extensive guidelines to be met by any pipe line builder. Finally, a pipe line application will be subject to examination by interested parties during public hearings in the course of the application proceedings, which are expected to take at least one year. Actual construction is expected to take three years.