

THE JAMES BAY POWER PROJECT

*The environmental cost of reshaping
the geography of northern Quebec*

By Peter Gorrie

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HYDRO-QUÉBEC sums up its corporate attitude about the massive James Bay hydro-electric project on the cover of one of its glossy pamphlets: *La Grande Rivière: A Development In Accord With Its Environment*.

The booklet's proclamation is part of a series of messages aimed at convincing the public that more than \$40 billion worth of powerhouses, dikes, transmission lines, roads, towns and airports can be inserted harmoniously into an unspoiled northern wilderness.

For the past 19 years it has been a relatively trouble-free selling job as the provincial Crown corporation — with enthusiastic backing from Premier Robert Bourassa and most Quebeckers — announced plans to harness the power of 20 rivers flowing into James and Hudson bays, then built the first phase of the project. For much of the 1980s there was almost no debate, as an economic recession cut energy demands and further phases were put on hold.

Demand for electrical power is again strong and the giant utility has relaunched an ambitious 15-year plan to complete the development. As it does, it is also facing renewed questions about environmental and economic costs and the possibility that, for the first time, the huge project will be examined at public hearings.

Hydro-Québec insists the development is essential and will not cause unacceptable damage. One of its reports concluded that in the first phase “remedial measures . . . have generally achieved their objectives,” and other studies offer assurances that remaining phases are “environmentally acceptable.”

Premier Bourassa made his views on the project patently clear in a 1985 book, *Power From The North*: “Quebec is



Above: a Cree woman cleans fish at the mouth of the Broadback River, a traditional fishing spot destined for flooding.

Left: carved from solid rock, the 900-metre spillway of the LG2 reservoir was engineered to carry twice the volume of the St. Lawrence River at Montreal.

a vast hydro-electric plant in the bud, and every day, millions of potential kilowatt hours flow downhill and out to sea. What a waste!”

He and other supporters extol the jobs and income the project and its subsequent exports of electricity will bring Quebec. The utility has awarded billions of dollars worth of engineering and supply contracts to Quebec firms, enabling them to develop high-technology products and become international competitors. And, they say, every kilowatt of power from James Bay will cut the amount that power plants fuelled by coal, oil or nuclear energy would have to generate at greater risk to the environment.

Critics counter that the project will create few long-term jobs while taking a devastating toll on the environment. They also worry that the 9,000 local Cree and Inuit will lose their source of food, livelihood and identity.

The provincial government and Hydro-Québec have not ignored such concerns. Most of Quebec's environmental laws were introduced after the James Bay project was announced, in an apparent attempt to minimize damage by the development. The utility set up an environment division with officers at every construction site. Its subsidiary managing the project, the Société d'énergie de la Baie James, has a committee to advise it on environmental protection. The power company is spending hundreds of millions of dollars on impact studies and remedial measures — from creating new fish spawning grounds to landscaping tourist lookouts.

Even the New York-based National Audubon Society, which says plans for future phases should be delayed, and perhaps scrapped, acknowledged in a recent report that the



With its waters now diverted to the La Grande River, this section of the once mighty Eastmain (above) has been reduced to a trickle. The same fate awaits the Rupert River (right) where natives have fished for centuries. The doubling of the flow of the La Grande forced residents of Fort George, situated on an island in the river's mouth, to abandon their community and set up the new town of Chisasibi (below).



province "is willing to go to great lengths to reduce impacts during construction."

But all this is of little comfort to the 500,000-member Audubon Society and other critics. They complain that since James Bay is a key part of the provincial government's strategy for economic growth, environmental concerns have not been allowed to impede its progress. The province and Hydro-Québec act on the assumption the project must proceed, and only then consider how to cope with adverse consequences.

As a result, critics contend, the utility's research is inadequate or flawed, provincial reviews are cursory, and applications to proceed with various stages have been approved before impact studies were complete. The Cree and the provincial government each has two people to review and assess studies by 400 Hydro-Québec staff and a small army of consultants.

Native people battled the project from the outset. In 1975 — after winning an injunction in Quebec Superior Court, then losing on appeal — the Grand Council of the Cree agreed to let the project proceed in return for \$225 million, some control over about 75,000 square kilometres of land and an environmental review process.

But the development, described by Bourassa as "the project of the century," faces new political and legal challenges.

The Federal Court, in a case involving the Rafferty-Alameda dams in Saskatchewan, ruled last year that the federal government has a duty to review projects affecting its jurisdiction. The James Bay project falls into that category since it would affect native people as well as migratory bird breeding habitat protected by a Canada-U.S. treaty.

As well, the Cree have launched another legal challenge to try to force an extensive federal review and hearings, and the Inuit of northern Quebec recently asked the Federal Environmental Assessment Review Office for a public review.

In the northeastern United States, where Hydro-Québec hopes to earn billions of dollars from long-term energy sales, environmentalists are demanding their governments insist on thorough impact studies before deciding whether to approve imports.

In response, Hydro-Québec officials have acknowledged that hearings might be worthwhile, and some in the utility are urging a two- or three-year delay.

The scope of the James Bay development is breathtaking. It would harness the energy of almost every drop of water in the rivers flowing through 350,000 square kilometres of northwestern Quebec — more than one-fifth of Canada's largest province.

The water would be collected in vast reservoirs behind powerhouses on the main rivers. While some would be re-



Sandro Giamacchio/Concept Jean Charlier

leased year-round to spin turbines and generate electricity, the system is geared more to winter when demand for power is at its peak. Then reservoir levels would drop as much as 20 metres as water is released and generating stations are pushed to capacity.

Cascading rivers would be dammed and diverted to create the reservoirs, flooding a combined area bigger than the surface of Lake Ontario. Some rivers would be reduced to a trickle; others simply submerged.

Hydro-Québec's latest development strategy calls for a three-stage completion of the project. If it goes ahead according to plan, by early next century it will generate up to 28,000 megawatts of power.

The project includes:

- **La Grande, Phase One:** completed in 1985 after 12 years and at a cost of about \$16 billion, it includes three reservoirs and powerhouses on the La Grande River — LG2, LG3 and LG4 — with a combined production of 10,282 megawatts. In this phase, five smaller rivers were diverted into the La Grande to increase its power. Its average flow into James Bay has doubled and is four times the previous rate in winter. LG2 is now being expanded, with the addition of a 1,998-megawatt powerhouse called LG2A. This "add-on" will produce more power than the combined output of Quebec's single nuclear-powered generating station and its 25 plants fuelled by coal or oil.
- **La Grande, Phase Two:** its centrepiece is a powerhouse, LG1, near the mouth of the river, and five more — Brisay, Eastmain 1 and 2, and Laforge 1 and 2 — on rivers diverted in Phase One. They are scheduled to be in operation by 1996. Work on the Brisay dam and hydro-electric station was expected to start this spring.
- **Great Whale:** north of the La Grande is the basin of the wild Great Whale River, or Grande rivière de la Baleine, which flows into Hudson Bay. This phase includes three power stations with a total capacity of 2,890 megawatts, and diversion of two other rivers. Final plans are being reviewed,

but three or four reservoirs would be created on the Great Whale River by 2001.

• **The NBR Project:** the initials represent three large rivers, the Nottaway, Broadback and Rupert, which flow into the southern end of James Bay. The Nottaway and Rupert rivers are to be diverted into the Broadback where up to eight powerhouses would generate 8,700 megawatts. Hydro-Québec's target for completion of the first powerhouse is from 1998 to 2004, depending on demand. In addition, 12 sets of transmission lines — with a combined length of more than 5,500 kilometres and nearly 12,000 towers — will carry the power to markets in southern Quebec where it would be routed to customers either in Canada or the United States.

The scene of all this activity is a wilderness of lakes, rivers, spindly spruce and willow, lichens and peat bogs along the east side of James Bay and the southeast coast of Hudson Bay.

Hydro-Québec reports the region is home to 39 animal species, including moose, caribou, beaver, muskrat and lynx. The cold lakes and fast-flowing rivers teem with fish. The coastline is rich habitat for fish and birds, as well as whales and seals. Those resources are a crucial source of food and income for the Cree and Inuit. As well, the coastal waters are an internationally renowned resting and breeding ground for millions of migratory birds.

As Phase One has made clear, dams, dikes, powerhouses and roads bring dramatic change. Damage to the natural environment is concentrated along the edges of water bodies, the richest habitats for plants and wildlife. Some rivers have been reduced to creeks. For example, downstream from its diversion into the La Grande, the Eastmain River's flow has been cut by 90 percent.

In these shrunken waterways, riverbeds dry up leaving stagnant pools. Exposed clay and sand are eroded by rain and melting snow, and sediment chokes the mouths of tributaries. Spawning grounds are often destroyed and species such as brook trout, which live in clear, oxygen-rich rapids, can no longer survive.

Some of these rivers are subject to periodic flooding as excess water is released from reservoirs upstream. The result is heavy erosion and the destruction of new plants struggling to establish themselves in the exposed, barren riverbeds.

To date, the main remedy has been construction of weirs, or small dams, that turn sections of these shrivelled rivers into shallow lakes, with an entirely new habitat. Where weirs

were considered too costly, exposed riverbeds have been planted to try to reduce erosion.

The opposite occurs in rivers that carry diverted water in a new direction. Their flow is greatly increased. For example, the Boutin now carries 15 cubic metres of water per second; when the Great Whale project is completed, the little river will have swollen to 154 cubic metres per second as it carries the water from several lakes to the reservoir behind one of the main powerhouses.

Increased flows cause erosion. The resulting sediment load is deposited in places where the river slows — including reservoirs, whose capacity is gradually reduced by silt-ing — and at the mouth, where a delta may form. Vegetation along the shore may be destroyed, eliminating habitat for ptarmigan, Canada geese and some species of ducks. The damage is increased on fast-flowing rivers subjected to the fluctuating demands of power stations.

The new reservoirs flood rivers and submerge vast areas of forest. Shorelines become a tangled, inaccessible mess as trees and shrubs die and rot. Decaying vegetation eats up dissolved oxygen in the water and adds to the supply of nutrients, creating algae blooms. In most cases, shoreline vegetation and habitats cannot be reestablished because of changing water levels.

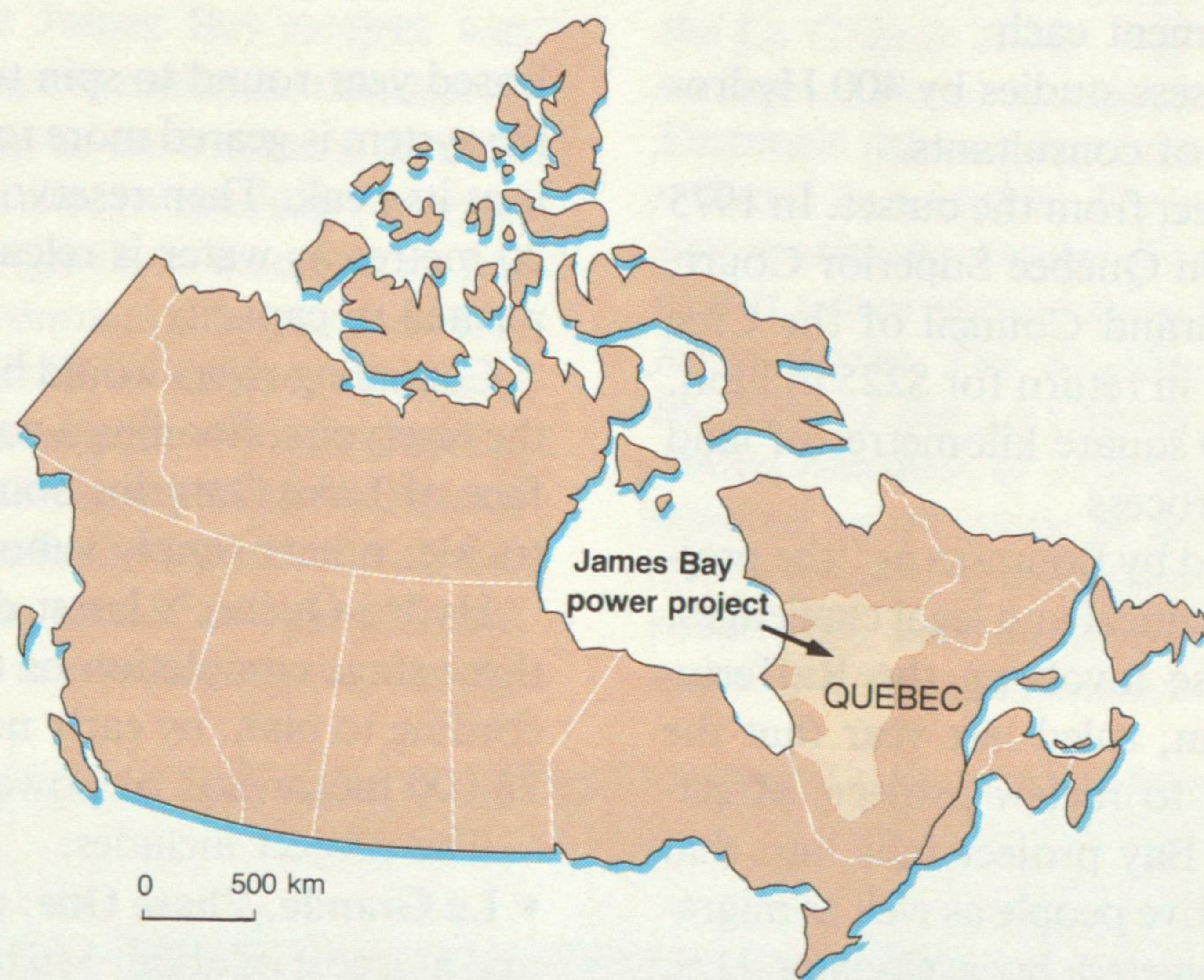
Major changes also occur in estuaries, whether river flows have been reduced or increased. Water temperature patterns, the length and extent of ice cover in winter, and the mixing of fresh and salt water — all are altered.

Normally, rivers run highest during the spring melt; levels are lowest in winter. The James Bay development will reverse this natural pattern. Flows will be greatest in winter — up to 10 times the normal volume — and the spring runoff will be diminished.

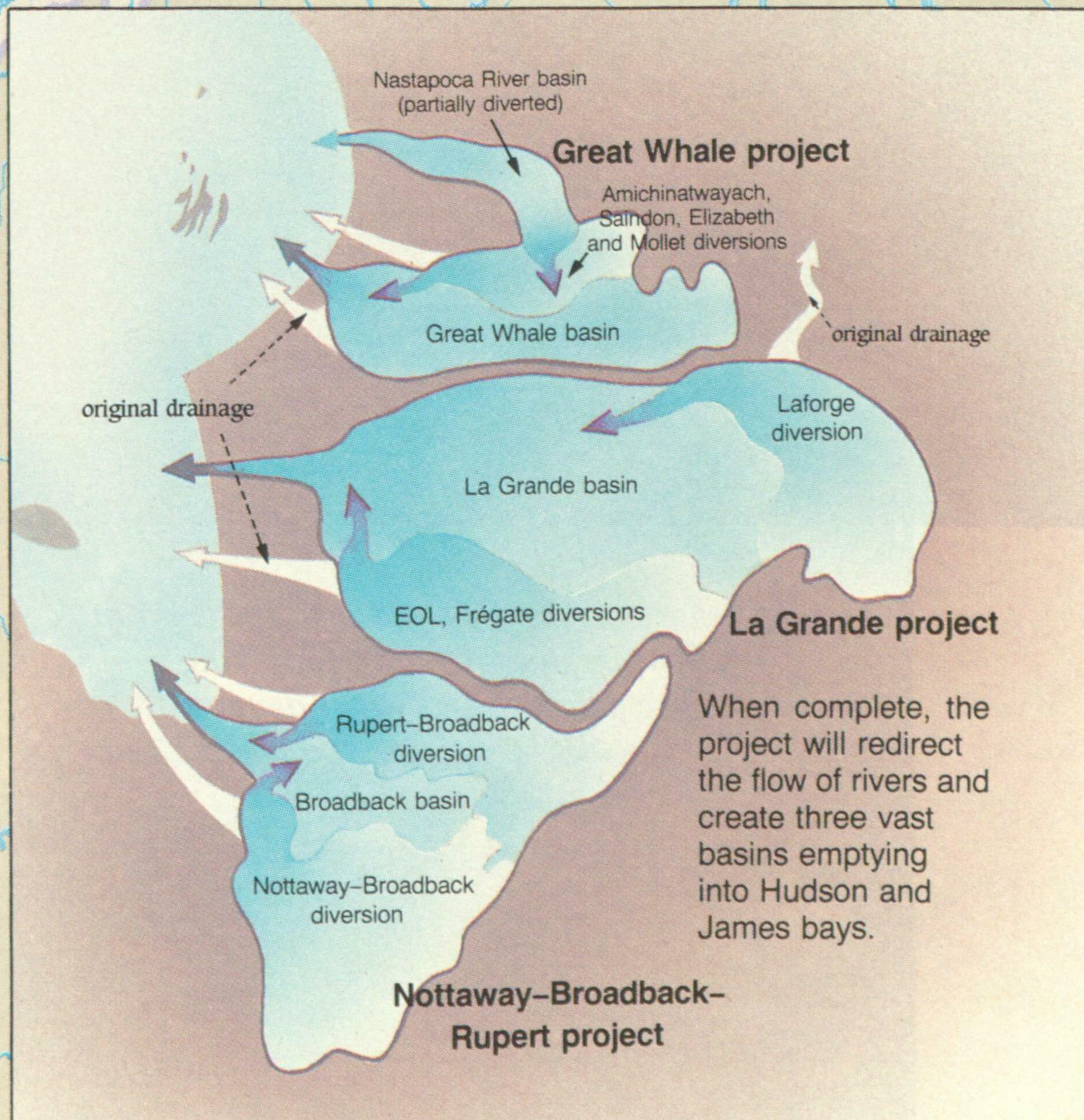
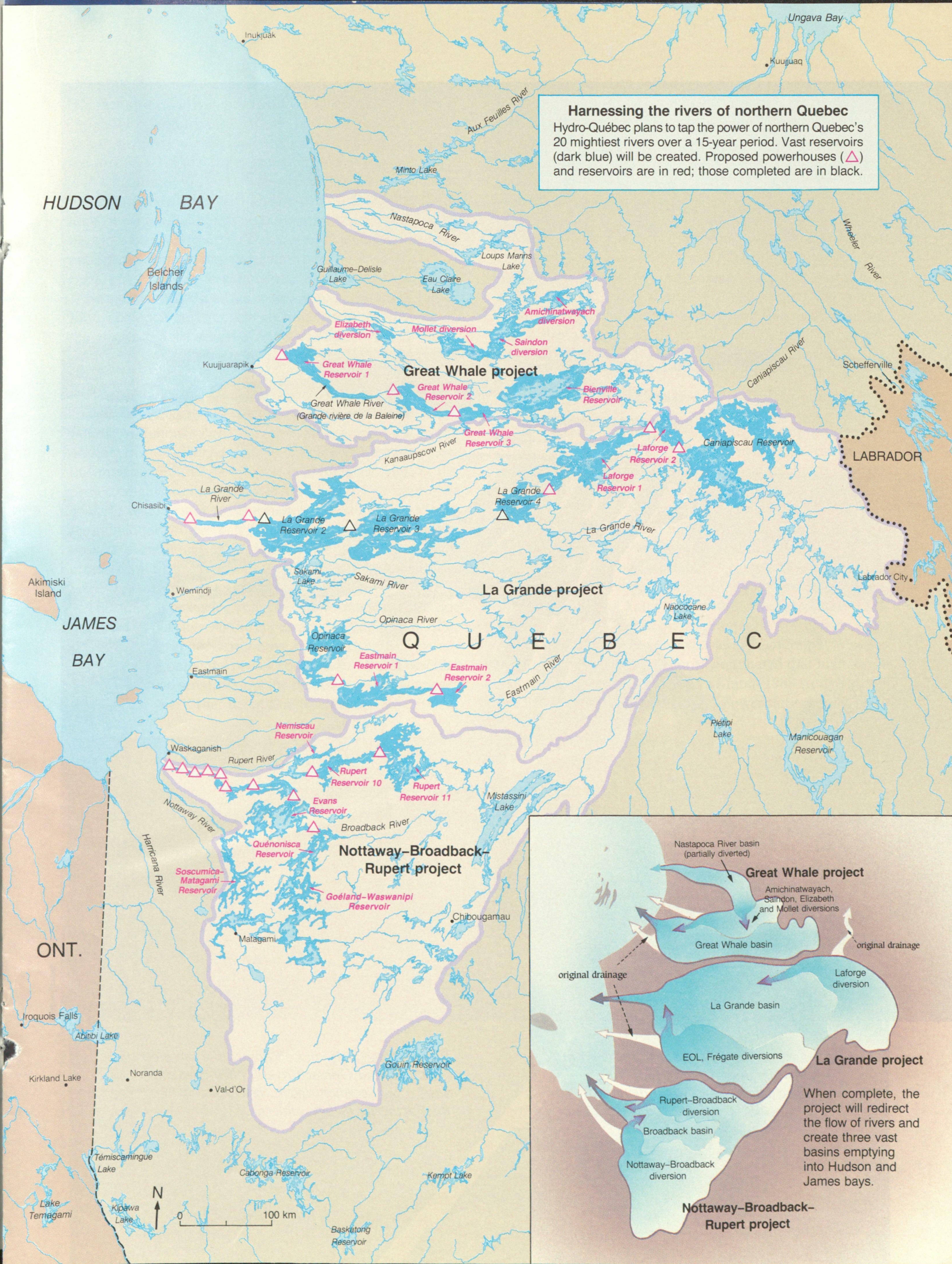
One result will be a change in water salinity at various sites during the year in James Bay and Hudson Bay. That could, in turn, wreak havoc on fish and mammals that require specific types of food or water conditions to prepare for migration, reproduce or survive the long, intensely cold winters. In addition, nutrients that now flow into the bays will settle instead in the reservoirs.

Scientists do not have enough information to predict the consequences. But in such a complex and fragile environment to which plants and wildlife have adapted successfully but precariously over the millennia, the impact could be catastrophic.

The Audubon Society's report on James Bay cites exam-



Harnessing the rivers of northern Quebec
 Hydro-Québec plans to tap the power of northern Quebec's 20 mightiest rivers over a 15-year period. Vast reservoirs (dark blue) will be created. Proposed powerhouses (△) and reservoirs are in red; those completed are in black.



When complete, the project will redirect the flow of rivers and create three vast basins emptying into Hudson and James bays.



Hydro-Québec

Above: water empties through a spillway from an LG3 reservoir, one of many supplying Hydro-Québec's generators when demand for electricity peaks in winter.

Right: strategically placed dams, like these on the Eastmain and Opinaca rivers, have created vast, often sediment-laden, reservoirs in the northern Quebec wilderness.

ples of the potential damage to the bay's ecosystem. Coastal marshes and tidal flats are rich feeding grounds for many species of migratory birds, which must eat voraciously for a short time to store energy for flights to wintering areas in the southern United States and Central America.

A main source of food is a small clam that burrows in vast numbers in the mud of saltwater marshes and tidal flats. Millions of birds would have no alternative food if these feeding spots were destroyed by ice scouring or changes in salinity and temperature. Many species "would be severely threatened, possibly even to extinction," the society says.

Belugas winter in ice-free waters around islands in James Bay. The open areas appear to result from the spacing of the islands and the action of wind and tides in the channels among them. If ice patterns are affected by altered river flows, the whales could be at risk.

Hydro-Québec says it has found only small adverse changes where the La Grande River runs into James Bay. But the Audubon Society and other critics argue those results are not reassuring because too little time has passed to assess the impact. And, they say, while individual elements of the project might not have much effect, the total development could have devastating consequences. "If the damage from an individual project is marginal, the project can be approved, even though the cumulative impact of many such projects will mean the loss of the ecosystem," the Audubon Society warned in its report.

The utility is collecting volumes of information that is not of much use but suggests the appearance of action, says Alan Penn, a geographer appointed by the Cree to Hydro-Québec's environmental review committee. "It can describe things in a broad sense, but not the processes critical at certain times of the year" that determine whether species survive.

"The kind of data collection going on is not designed to focus on problems, but to provide general reassurance," Penn says. "It's what happens when you invite the developer to develop his own system of environmental monitoring."

But there is no denying one immediate and serious outcome — the release of mercury, which damages the human nervous system and can, with prolonged exposure, cause death.

Mercury is commonly found in rocks throughout the north in an insoluble form that does not affect the air and water. However, bacteria associated with decomposition of organic matter transform it into methyl mercury, which vaporizes, enters the atmosphere, then falls back into the water. From there it enters the food chain, reaching highest concentrations in fish species that prey on other fish. Local people consume large quantities of such fish — pickerel, pike and lake trout — which are their most reliable source of high-quality protein.

New reservoirs induce a burst of decomposition that accelerates the release of mercury. On the La Grande, levels of mercury in fish downstream from the dams climbed to six times their normal levels within months of the project's completion. A 1984 survey of Cree living in the village of Chisasibi at the river's mouth found that 64 percent of the villagers had unsafe levels of mercury in their bodies.

In time, as drowned vegetation is completely decomposed, the release of mercury should return to normal. How long that will take is not known. In studies completed up to 1981 — when Hydro-Québec put the James Bay project on hold — the mercury problem was not even mentioned. When it was finally recognized, the utility estimated that high levels would last up to six years. But a March 1988 study carried out by the utility on the Laforge 1 power station states mer-





Little is known about the effects of a radically altered terrain on migrating caribou (above). Another concern is whether increased river flows will reduce the number of ice-free channels where beluga whales (right) winter in James Bay.

cury levels would remain high for 10 to 20 years. It could be a generation, or longer, before fish are safe to eat again, Penn says.

In 1987, Hydro-Québec appointed a committee, with two Cree representatives, and gave it a 10-year budget of nearly \$18.5 million to study the mercury hazard. To date, it has produced no practical solutions.

Decomposition can be reduced by clearing areas before they are flooded. But that is extremely expensive and poses the difficulty of disposing of the vast quantities of trees and brush. As a result, the power utility is clearing only selected areas — those that are close to power stations and other access points, and those around inlets of streams where fish spawn.

“A great deal of research needs to be done,” the mercury committee concluded in its most recent report. In the meantime, it suggested weakly, native people should stop eating tainted fish and “anything that can be done to foster continuation of traditional pursuits would be much appreciated.”

Decomposition has another by-product also causing concern — the release of methane, one of the greenhouse gases blamed for global warming. The amount of methane in the atmosphere is rising by one percent annually. It is produced naturally by decomposition in peat bogs, wetlands and lakes. Human activity also has made a big contribution. Large quantities of methane are generated by livestock, rice paddies, and the burning of trees and brush as forests are cleared.

Nigel Roulet, a scientist at York University in Toronto who has studied methane production in northeastern Quebec, says precise forecasts are not yet possible. But the James

Steven Krasemann/Valan Photos; top: Mike Beedell

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Twelve thousand hydro towers and more than 5,500 kilometres of transmission lines will be needed to carry James Bay power from the massive turbines to customers in southern Quebec and the United States.



Bay reservoirs could be a significant new source of man-made methane.

By itself, the project will not change the earth's climate, but every contribution adds to the greenhouse effect, Roulet says.

While some proponents point out that global warming will be much worse if the power to be generated at James Bay is produced instead by coal- or oil-burning generators, the argument ignores the potential of conservation to cut energy demand. This is the view of Brian Craik, who has been involved with the project since 1972 and currently represents the Cree in discussions with the federal government.

Ultimately, the question must be asked: Are projects of this size, which basically reshape the geography of a vast area desirable?

James Bay is one of the last major undeveloped hydro-electric sites in North America. As planned, it will account for nearly 25 percent of the continent's hydro-electric power. It will alter a huge land area in some ways that are known and others that even experts can only guess at.

So far, it has all been done without public hearings, and very little questioning.

"I'm really very upset about this," says H el ene Lajambe, an economist with the Centre for Energy Policy Analysis at the University of Quebec in Montreal. "James Bay doesn't make sense for Quebec." The province is already a wasteful consumer of electricity and demand is being fuelled artificially — through ad campaigns and price breaks — to justify the project, she says.

Last year, Quebec approved construction of three aluminum smelters which it attracted, in part, by offering the huge amounts of power they need at a cost tied to the international price of aluminum. That is an unstable yardstick, and if aluminum prices drop, Hydro could lose money on the deal, Lajambe says. In addition, she argues, power projects and aluminum smelters are expensive and environmentally damaging ways to create relatively few jobs.

The utility's cut-rate price plan for industry began to unravel late last year, however, as the low water levels of its northern reservoirs drastically reduced the generating capacity of the James Bay complex and its other hydro facilities. To head off what it termed "serious supply problems," Hydro-Qu ebec launched another campaign, this time to convince its industrial customers to switch back from electricity to oil. That promotion quickly fell afoul of federal Environment Minister Lucien Bouchard who warned that the program could jeopardize Canada's acid rain negotiations with the United States. By encouraging the increased use of oil by industry, the utility, he said, could prevent Quebec from meeting its commitment to cut acid rain-causing emissions to 600,000 tonnes annually this year.

Even if Hydro-Qu ebec sells James Bay power to the United States, Quebec will lose in the long run. The province will have put billions of dollars into developments that stimulate manufacturing and high-technology jobs elsewhere,

Lajambe says. Quebec is investing its limited capital and best minds in projects "that chain us to an economy that depends even more on the production of resources. James Bay slows down the development process."


The access road to the NBR project will also open up from 12 million to 18 million cubic metres of marketable lumber, most of which would be exported, Brian Craik says. "The environment would be subsidizing not only the sale of hydro but also lumber to the United States."

Potential customers in the U.S. appear to be getting cold feet about power deals. Maine has postponed signing a contract for a small long-term purchase, and the municipal council in Burlington, Vt., concerned about the environmental impact of James Bay, recently recommended that the local utility not buy power from the project.

At a conference in Montreal last summer, American energy economists argued the northeastern states could save money if they rejected James Bay power and, instead, paid for conservation programs in Quebec and then bought the electricity those measures would free up. But Hydro-Qu ebec officials say the project will proceed, even without a U.S. market for the power. And they remain convinced it is environmentally sound and in the public interest.

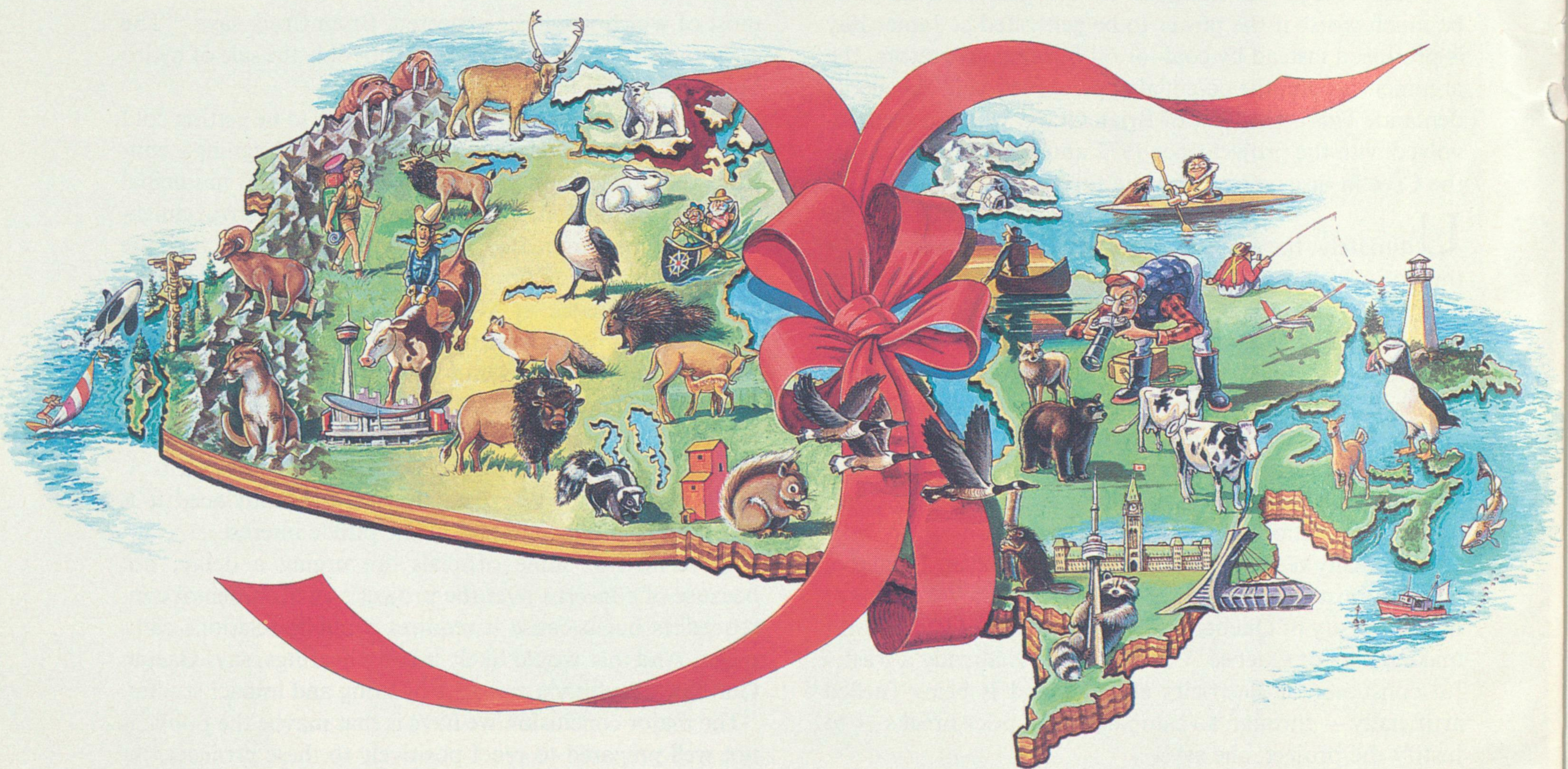
Nevertheless, some officials are urging a delay, not because of concerns over the project's environmental consequences but because it requires a public relations campaign. And that would likely involve hearings, says Gaetan Guertin, the utility's manager of siting and impact studies. "The major conclusion we have is that maybe the public is not well prepared to react positively to these projects."

As the debate simmers, negotiations over hearings drag on and Hydro-Qu ebec awaits approvals while engineering work is continuing. The utility is convinced James Bay power is needed and that, even with a conservation effort, demand will grow by three or four percent annually. But none of its studies have asked: What next? James Bay is Quebec's last hydro-electric megaproject. Once it is done, the province will, like neighbouring Ontario, have no major rivers left to tame. Will it then also opt for nuclear power, creating the very problems it claims to be avoiding by developing James Bay?

If public hearings are held, they will probably focus on direct impacts. Are caribou threatened? When fish are contaminated, what will local people eat? But critics suggest the debate should centre on a much bigger question: Can humans limit their appetite for power so that such megaprojects do not need to be considered? Hydro-Qu ebec and most other utilities assume the answer is no. Environmentalists insist it must become yes if the earth is to remain habitable. The James Bay project, they say, will not only increase the damage caused by the search for new power sources, it will also help delay the push for conservation that is likely to come only when we run out of alternatives. 

Peter Gorrie is a Toronto journalist specializing in environmental subjects.

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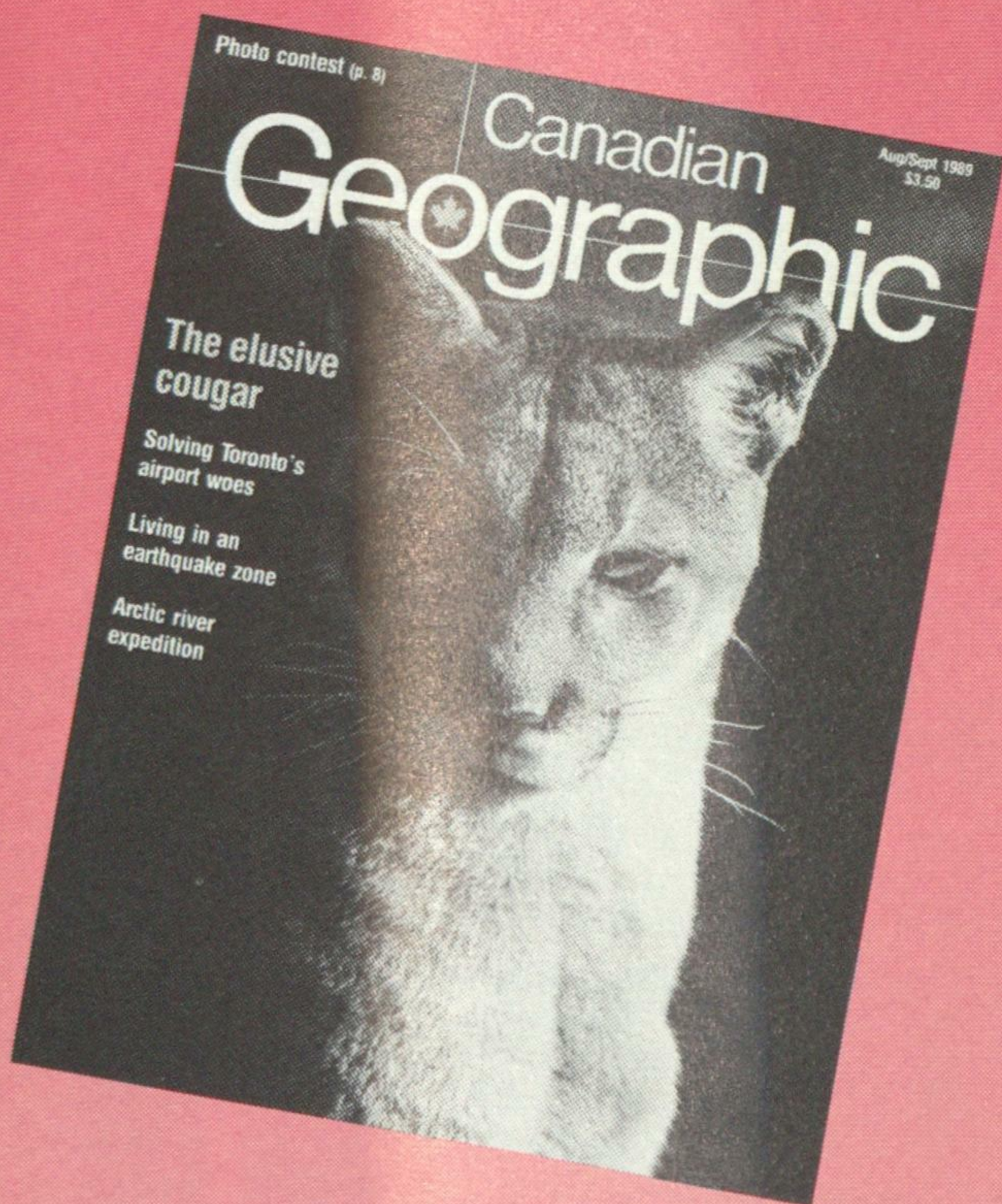
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