

Man and Wildlife in a Shared Environment

Edited by Roy Vontobel



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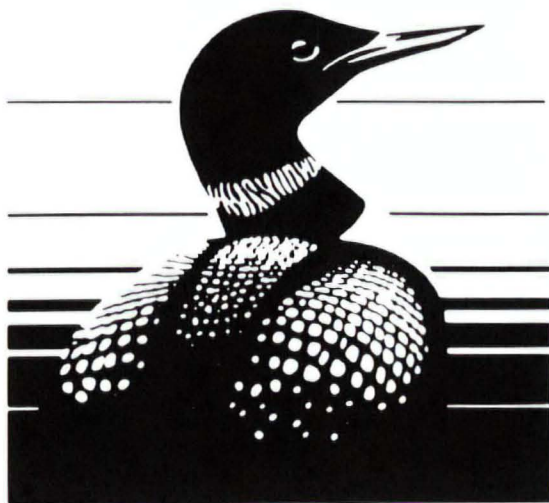
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CONTENTS

Learning to Appreciate Nature's Ways _____	1
Wildlife: Something for all Canadians	
Something to Behold _____	5
Something to Hunt, Fish and Photograph _____	8
Something to Sell, Something to Eat _____	8
Habitat: Living Space for Wildlife	
A Marsh on the Back Forty _____	11
A Home in the New Suburbs _____	12
An Urgency for Energy _____	12
Working for Wildlife	
People in Groups _____	14
. . . And Governments Together _____	15
For the Birds exclusively	
The Breeding Bird Survey _____	18
The Nest Record Card Program _____	18
The Harvest and the Hunters _____	19
Sanctuaries for Survival _____	20
Three Bird Stories	
The Great International Avian Foster Parents Plan (GIAFPP) _____	22
The Eider and the Inuit _____	23
An Atlas for Seabirds _____	23
Looking out for all our Wildlife	
The National and Cooperative Wildlife Areas _____	25
Wildlife and You: The Interpretation Centres _____	29
Putting Wildlife on the Map _____	30
Now You See Them, But What About Next Year? _____	31
Three Mammal Stories	
The Way Back for the Wood Buffalo _____	33
The Caribou: Where are the Great Herds? _____	35
The Great Musk-Ox Airlift _____	38
A Closer Look	
Through a Gull's Egg _____	41
Getting Close in the Wild _____	41
The Benefits of Beavers _____	42
Waterfowl and Grain Farmers _____	43
Birds and Aircraft _____	44
Noah Didn't Need a Permit _____	45
Rain, Rain, Go Away! _____	46
Becoming Involved	
May We Make a Few Suggestions? _____	47
Your Wildlife Organization Contacts _____	47
For Reading and Watching _____	49
Picture Credits _____	53
References _____	54

The familiar white-tailed deer, as people often see one, bounding away in alarm. Edges of cleared fields offer good browsing for deer. Partly because of human activities, such as forest cutting which creates brushy areas, deer are far more numerous in Canada today than in aboriginal times. See page 6.



This loon, in blue on signs throughout Canada, marks National Wildlife Areas and Migratory Bird Sanctuaries. See pages 20 and 25.

LEARNING TO APPRECIATE NATURE'S WAYS

During the past two decades the word *ecology* has been more and more firmly implanted in the vocabulary of most people, as scientists every day discover another facet in the complex interactions of the natural systems of the planet. In the same time, the pace and proliferation of modern technological society has brought about great changes to our environment and will bring more. Yet, even when the adverse results of man's handiwork are plain to see, we may be frustrated by the difficulties of fulfilling human needs and demands while protecting the source of that fulfillment. Too often short-term economic, political and social considerations prevail.

As our capacity to alter our environment grows, we too often befoul the world in which we live. Consider just one example. To operate our industries, to refine minerals and augment our energy supplies, we pollute the atmosphere with gases that convert life-giving raindrops into sterilizing acids. Today we are observing only the more obvious effects of this phenomenon. Lakes can die; that much is evident. But what about the trees and other vegetation and the wildlife so dependent upon clean water and soil? The potential for wide-ranging environmental catastrophe is frightening.

How much do we wish to gamble in these circumstances? With warning signals flying, do we want to disrupt natural processes to such extremes that our well-being and even survival are imperiled? Often the convenient ways for us to achieve our ends are at odds with nature. Not recognizing this at the outset, we usually learn by trial and error. What we must do is read the preliminary signs quickly and try to act with wisdom.

The obvious immediate responses to the acid rain problem are to control emissions of pollutants and to search for alternative industrial processes. Through applied scientific knowledge, we must devise ways of working in harmony with nature. Beyond that, we must work to overcome the sociological, political and economic problems that so often delay or otherwise jeopardize efforts to apply solutions we already know are sound.

The same shortsightedness that makes it so difficult for us to align our lives more closely to nature's ways in general often hampers well-meaning endeavors such as wildlife preservation as well. Problems of establishing priorities in wildlife management, of satisfying apparently conflicting interests, make the protection of wildlife a complex undertaking.

Thus, the activities and aims of an agency like the Canadian Wildlife Service are many, too many to treat in detail in a publication such as this. Yet, it is hoped that enough of a picture of the CWS is presented here to give some understanding and appreciation of the scope of its work.



CWS Research

The animals shown here indicate some recent areas of CWS research. Space permits only a small sample of the important work of CWS staff in Ottawa and the five regions: Atlantic, Quebec, Ontario, Western and Northern, and Pacific and Yukon. Other examples of CWS activities fill the pages of this book.

Current work has involved the ecology of seabirds, such as murres at Digges Island off Ungava Peninsula [left], and of some colonial nesting species such as great blue herons [right], particularly in Quebec and Ontario. Waterfowl and wetlands habitat [far right] in all parts of Canada have long been a major concern of the CWS. The pine marten [below], a furbearer inhabiting mainly mature coniferous forests, aids studies of the effects of forest cutting.





Periodic overhunting has long caused concern about the polar bear [left]. Its proper management requires international cooperation. Hydro developments near James Bay and tidal power proposals for the Bay of Fundy, both important feeding areas for shorebirds such as the dowitcher [above], have prompted ecological studies.



Perhaps 50 to 60 million bison, more commonly called buffalo, once grazed on the plains of the United States and Canada. During the 19th century the vast herds were slaughtered to clear the way for agriculture, railroads and settlements. Piles of bison bones were a common sight [left]. Remnants of the bison, saved by one of the first major conservation efforts in North America, today survive only in wildlife refuges such as National Parks, in zoos or in private herds. Many kinds of wildlife, besides being shot and trapped in large numbers, were also pushed back as land was cleared for homes and farmland [facing page]. In densely settled areas, such as southern Ontario, many species dwindled and some disappeared entirely.

WILDLIFE: SOMETHING FOR ALL CANADIANS

Something to Behold

The earliest European settlers in Canada found much wildlife here. For thousands of years, the indigenous peoples in this country depended on it for food as well as for clothing, shelter, implements and many other things. During all that time, human populations were small and their technologies generally did not place great demands on resources. When early explorers and fur traders arrived, they eloquently described the variety and abundance of many wildlife species. Alexander Mackenzie told of wildfowl, beaver, hare, elk and great herds of buffalo in western Canada. The journals of others described the eastern Canadian woodlands as abounding in bears, moose, wolves, turkeys, partridge and hares. To many the game appeared inexhaustible. It wasn't, of course.

The capacity of the European settlers to trap, to shoot, to burn the forests and clear new land for farms soon began to alter the picture of harmony and plenty. Indians, too, quickly took up the use of firearms obtained from the newcomers. Wildlife numbers dropped, sometimes with astonishing abruptness. In 1857, John Palliser told of seeing immense herds of buffalo on the prairies, but just three years later his journal recorded that his expedition could not find enough game to supplement regular food supplies. Even earlier in the century the fur trade had declined as beavers were trapped nearly to extinction in some regions of the country.

The transformation of southern Ontario's forests to farmland, and the appearance of settlements, roads and railways, struck hard at some species. For many of us, it is less

surprising to learn why certain species were extirpated from the east than that such creatures ever existed there at all. Elk, for example, which we think of as a western animal, once ranged as far east as southern Ontario. They rapidly became extinct there as they were deprived of natural cover and were heavily hunted by settlers. Large numbers of ducks and geese disappeared, too, as land was drained and market gunning became profitable. The wild turkey was gone from Canada's eastern woodlands well before the end of the 19th century.

Fortunately for Canadians, the need for wildlife management was not ignored. Thanks mainly to a handful of dedicated civil servants, initial steps towards wildlife conservation were taken in the early years of the 20th century. The work of Howard Douglas, Robert Campbell, James Harkin, Maxwell Graham and Gordon Hewitt is vividly recounted by Janet Foster in her book, *Working for Wildlife*.¹

The task those men started has become more complex with the passage of time. It is no longer a simple matter of controlling the hunt. The Canadian Wildlife Service and the provincial and territorial wildlife agencies now must contend as well with massive changes threatening vast tracts of wildlife habitat, encompassing land, lakes, rivers, oceans and the atmosphere. Much research, usually costly and time-consuming, is needed to safeguard a resource singularly difficult to assess in conventional economic terms.

In 1976, about 75 percent of Canadians (17.4 million of us) lived in slightly more than 1 000 cities, towns or villages of 1 000 or more people. (Figures from the 1981 census have not yet been tabulated precisely in this manner.) Thus, for most of us, our local environment restricts daily contact with wildlife.



True, we may attract songbirds with backyard feeders, and the birds may share their take with squirrels. In spring or fall we may be thrilled by the sight and sound of migrating Canada geese passing overhead. Raccoons, skunks and groundhogs are no strangers either to people living in or near cities and towns.

But these are only a few of the many creatures that share with us the rest of our vast country. In total there are 198 mammal species, 550 birds, 86 amphibians and reptiles, 177 freshwater fish, about 1 000 kinds of molluscs and well over 100 000 known species of insects and other invertebrate animals.

Some of us, of course, are able to flee our urban confines from time to time, to visit parks and sanctuaries or otherwise enjoy the great wild outdoors. In 1979 our national parks recorded 20 million visitors (many, obviously, were people who visited more than once). Such an experience may assure the urban dweller that, indeed, wildlife continues to exist, that beyond our paved cities the free and natural life in the wilderness still goes on. Yet it seems more than that.

The late C.H. Douglas Clarke, a former chief of Ontario's Fish and Wildlife Branch, had words to express it:

The soul of Canada, too, is space, unconfined, in forest, prairie and barren ground, but our space loses its spell without wildlife. We are young, but already our language has its own imagery, and wildlife is very much a part of it. . . . Were our land to lose its beaver, its caribou, its loons, its geese, its bears, its wolves, even its gophers and groundhogs, not to mention the remnants of our buffalo, we would have lost our soul.²

Animals such as chipmunks [right], squirrels and woodchucks are often seen neighbors of man. Welcome or not, many creatures such as raccoons, bats, owls, swallows or a phoebe [second right] make their homes in barns and other out-buildings, even within city limits.



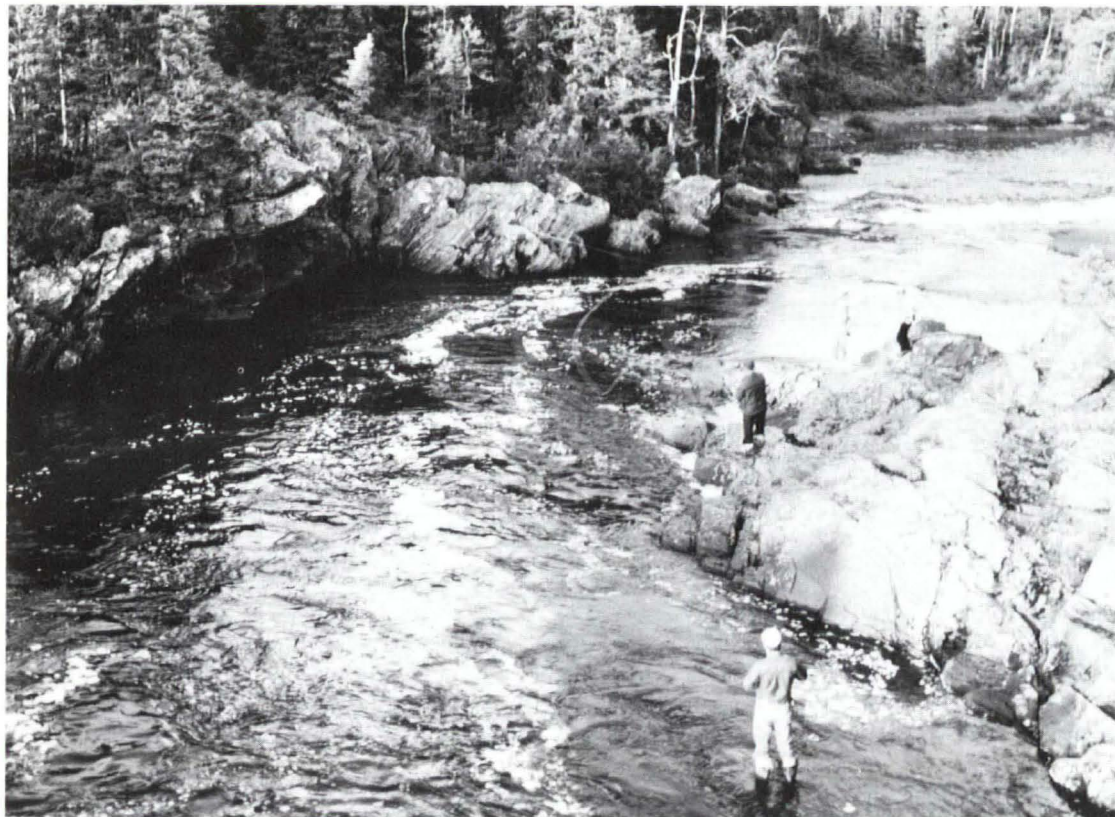
Animal Neighbors

Most people are familiar with more animals than they realize. While many animals need wilderness to survive, others tolerate living close to man. Some even benefit by man's alteration of habitat. Songbirds such as the evening grosbeak and purple finch [left] are common winter visitors to bird feeders. Gulls [below] and other birds that forage at garbage dumps can be a problem when near airports (see page 44). Some hawks build their nests near farmlands where rodents and other prey are plentiful [right]. Less common are pronghorn antelopes that stand around while a Saskatchewan farmer works his field [far right].





The coyote [left] is the bane of many livestock and poultry raisers, although it eats mainly rodents. An interesting and adaptable mammal, it today ranges from the Pacific coast to the Maritimes, from the Yukon to Mexico. The nesting killdeer [above] is common in fields and meadows nearly all across southern Canada.



Salmon fishing at Gros Morne National Park in Newfoundland. Many people escape the confines of daily routines by spending memorable vacations in such wilderness surroundings.

Something to Hunt, Fish and Photograph

Besides the large number of Canadians who derive inspiration and pleasure simply from observing wildlife, there are many others with different but equally appreciative views of the resource. To those with cameras, wildlife affords a specialized hobby, the challenge and satisfaction of recording a wildlife or wilderness experience for all time. To hunters and anglers, wildlife means sporting opportunities and in some instances food. While undoubtedly many people are opposed to hunting merely for recreation, the hunting of wild game to supplement purchased food, particularly in some of the more remote areas of the country, must be soberly considered.

There is no easy way of determining the numbers of people who photograph or simply observe wildlife. However, for the hunters

and anglers we have licences and permits to help establish their numbers and at the same time give us an indication of the money those people are prepared to spend in pursuit of their pastimes.

In 1978-79, over 2 259 000 licences to hunt big and small game were issued in Canada, amounting to almost \$20 million for the provinces and territories under whose authority they were issued. Only 3.5 percent of those licences were for non-residents, hunters from other countries. In the same season, almost 525 000 federal Migratory Game Bird Hunting Permits were issued, with a value of \$1.8 million to the federal treasury.

Anglers in the 1979 season purchased over 2 176 000 licences for a total of almost \$16.4 million. Non-resident and alien anglers accounted for about 50 percent of the licences. In terms of total anglers, however,

the picture is somewhat distorted. In a number of provinces and in the territories, youngsters and senior citizens are not required to obtain fishing licences (nor hunting permits). In some instances, farmers and commercial fishermen as well as Indians and Inuit are exempt. And in Ontario no resident needs to purchase a licence to fish in the province.

Thus, almost 5 million hunting and angling licences were purchased for the season specified. This is not to say, of course, that 5 million sportsmen used our wildlife, because there is no way to know how many hunters are also anglers. No such national survey has yet been done. One can conclude, however, that there were *at least* 5 million season-long opportunities for individuals to hunt and fish. Simply to buy licences those people spent some \$37 million. That, of course, was just the start of their financial outlays. Their total expenditures on equipment, transportation, food and accommodations are tremendously important to other areas of our economy.

Something to Sell, Something to Eat

To a significant number of Canadians, wildlife is a resource upon which their commercial livelihood is based and often provides food for the kitchen larder, particularly in regions where the supermarkets are few and far between.

Today there are slightly more than 300 000 status Indians and Inuit in Canada. Metis and non-status Indians (such as those not living on reserves) have been estimated at nearly a million. Just what part of that total population is closely tied to wildlife-dependent ways of living is difficult to say. Nor is it easy to determine how many people who are not Indians or Inuit use wild game to make money

Arctic fox pelts, Sachs Harbour, Northwest Territories. By carefully regulating their trapping, the Inuit of this Banks Island community have become among the most prosperous in the Arctic.

or augment their food supplies, for native peoples are not the only ones to do so. Licences indicate only that numbers of people hunt, not *why* they hunt!

Some idea of the commercial value of wildlife can be got from the fur industry, upon which a large number of native peoples, in particular, depend. The fur trade has been a major industry in Canada since the earliest days of exploration, and remains so today.

During the 1978-79 fur season, some 82 000 trappers were registered in Canada. Almost 3.4 million pelts valued at \$81.7 million were taken from the wild. More than 1.5 million were muskrat pelts, worth nearly \$9.5 million. Beaver, 447 000 pelts, was the top money-earning species at \$16 million. The highest average price per pelt was \$1 092 for polar bear, a big catch for the fortunate Inuit hunter. Ranch-raised fur, mainly mink, also has become a thriving industry in Canada, and nowadays rivals wild fur production in value.

That wildlife is vital to the daily lives of many Canadians, especially in northern regions, should not be underestimated. It is true that where access to the North has improved in recent decades, dependence on wildlife has swiftly declined. But, even in some areas offering wage employment, young native people seem to be increasingly interested in returning to traditional lifestyles these days. In one case, Cree and Chipewyan people unhappy with their lot at Churchill, Manitoba, reestablished themselves at Tadoule Lake, about 250 km further west. Some 300 of them worked there to build an economy based on a fish and wildlife harvest.

In another region, James Bay/northern Quebec, studies have indicated that some 1 500 Indian and Inuit hunters took about 78 000 Canada geese, 31 000 lesser snow



geese and 8 500 brant geese each year from 1973 to 1975. Such a harvest indicates the importance of that part of the wildlife resource to native people there. In the same region, eider ducks are taken in large numbers by Inuit, and in Ungava the caribou are considered indispensable by the Naskapi-Montagnais.

The exploitation of wildlife should not be seen as mainly involving native peoples, however. Wherever people harvest wildlife the potential for problems exists. Today, both the pressures of hunting and of industrial activities threaten wildlife. Unfortunately, in the North at least, there is scant information about direct human use of wildlife, about what kinds and particularly how much. Debates about the impact of mineral extraction or transportation, too, are often hampered by the lack of sufficient data.

Because of what wildlife means to the economies of northern communities as well as its immeasurable value to us all, it is im-

perative that steps to protect it stem from thinking that can foresee all sides of a many-sided problem.

In 1977, a landmark royal commission, the Berger Commission, held hearings on proposals to build oil and gas pipelines through the Yukon and the Northwest Territories. It maintained, among other things, that hunting, fishing and trapping constitute a renewable resource-based economy in the Mackenzie valley that should not be jeopardized by unsuitable developments.

At present, the annual harvest by native people of the Kaminuriak caribou herd is known to exceed 3 000 animals. Scientists say that killing more than 2 000 animals each year exposes this herd to danger of extinction — something that would bring unnecessary hardship to the Indian and Inuit people as well as cause a loss to all Canadians.



HABITAT: LIVING SPACE FOR WILDLIFE

A Marsh on the Back Forty

Alloysius Quincy Jones, a farmer near Minnedosa, Manitoba, makes his living off the land and with today's prices every square metre counts. Off in the northwest corner of his farm he has about 4 hectares (just under 10 acres) occupied by a marsh, cattails along its edge and surrounded by poplar trees. It's a dandy place for ducks, and muskrats live there, too. But once drained it could really produce wheat.

Mr. Jones' land is his to do with pretty much as he wishes, and he's thought seriously about getting rid of that marsh. A couple of days work with his neighbor's backhoe tractor would do it, and have the whole thing into a coulee and headed down to the Minnedosa River. Mind you, he'd miss those ducks, even though they do hit his barley sometimes just after it is cut. And he's even a bit nostalgic about the frogs that he remembers catching there when he was a boy. But there's the family to think about;

that's got to come way ahead of ducks and frogs. The countryside all around has plenty of marshes. The children will just have to walk a bit if they want to see the ducks and frogs. Enough mulling it over. It's time to get on the phone and get things moving.

Mr. Jones, faced with rising costs and finite holdings, can scarcely be blamed for his actions. He is one of thousands of farmers who occupy Canada's great belt of prairie wetlands known as the pothole region. This is a prime feeding and nesting place for seemingly countless thousands of waterfowl, as well as a home for other birds, small mammals, reptiles and amphibians.

The problem is that Mr. Jones' drainage scheme is magnified many times by the similar actions of his neighbors. Intensive agriculture already has resulted in the loss of nearly 1.2 million hectares of natural prairie wetlands. A recent study in the Minnedosa area

concentrated on land use changes between 1928 and 1974. In 1928, 48 percent of the area was cultivated. By 1974 this had grown to 85 percent. Wooded tracts, 39 percent in 1928, were reduced to 10 percent. During the same period, wetlands shrank from 13 percent to 6.

Besides the removal of the wetlands themselves, prairie farmers must weigh their gains against the loss of soil moisture and increased erosion on existing croplands that such man-made disturbances help bring

Wetlands, generally unsuitable for human activities, are "reclaimed" by draining them or otherwise modifying them [below]. However, marshes are essential to waterfowl and many other creatures, providing food, shelter and breeding areas. Canada geese [below, left] and a female lesser scaup duck [facing page], skimming a prairie pond, are typical wetlands residents.



about. Moreover, should the decline of wetlands and wooded cover continue, Mr. Jones' grandchildren may have to travel far to see wildlife scenes he took for granted in his youth. The seeds of widespread catastrophe for wildlife in wetlands seem well and truly planted.

There are many other places across the country where wildlife species already have lost as a result of agricultural (or urban) encroachment onto wetlands. Seventy percent of British Columbia's Fraser River marshes, 76 percent of Lake Ontario's north shore marshes and 65 percent of the tidal marshes in the Maritime provinces are a few examples of other areas reclaimed for our benefit. But, how exactly do we assess these benefits if the wildlife has gone and any number of other environmental problems arise because of such "improvements"? What, if any, alternatives are there?

A Home in the New Suburbs

Faith and Roger McLintock, married two years, watch with anticipation as the footings for the foundation of their first home are set in place. Their lot is on the outskirts of a big city, where a few months ago was forest and marsh. Now the land is cleared and drained, filled, and dotted with new fire hydrants flanking the sidewalks-to-be for a modern 350-unit housing development. It's a perfect site: big lots, room for gardens, a school and park close by.

Because they just moved to the city, Faith and Roger do not wonder about the former inhabitants of their lot. They saw neither the trees nor the marsh. But, even if they were aware of the wildlife habitat destroyed to make way for their home, it is unlikely they would be much concerned. They are thinking that, against great odds, they finally have their own place.

The seriousness of urban encroachment into wildlife areas, of course, depends on how many times the example of Faith and Roger is multiplied across the country. Industrial expansion, too, around urban areas

causes widespread damage to habitat, not only by the land it takes up but by the spread of pollutants in water drainages and the air.

One source of information currently available for assessing urban sprawl problems on a nationwide scale is the Canada Land Inventory (most wildlife surveys pertain to regional or smaller specific areas). Although the Canada Land Inventory focuses on the land's potential for supporting ungulates (hoofed animals) and waterfowl only, an analysis of data completed in 1977 provides some interesting figures. For example, during a five-year period, some 41 700 hectares of land with high capability for supporting ungulates was absorbed by 71 major urban centres, an annual rate of habitat destruction of 8 300 hectares. For waterfowl the five-year figure, again for high capability land only, was 4 300 hectares, a rate of 858 hectares each year.

These figures must be interpreted with caution, however. The fact that land is classified as having a high capability for wildlife species does not necessarily mean that the animals are there in reality, but only that the land could support those species. Even so, such classifications offer some guidelines for development planners as they select land for urban expansion.

When there is concern on the part of city people for wildlife close by, the Canada Land Inventory maps can be used to identify those places where detailed wildlife assessments are needed — well before development decisions are made.

An Urgency for Energy

Off the British Columbia coast, a cold onshore wind pushed a roiling sludge over the sea's surface, smoothing the splash of the waves as they broke in and around the rocks at the entrance to the sound. A kilometre offshore, vessels of the environmental protection task force were moving in to start the work of containing the oil and cleaning it up. Below the horizon a stricken

tanker was still leaking her precious cargo while her crew and emergency help fought round the clock to control the situation.

Wildlife experts on the headland heights watched helplessly as the first oiled birds, Cassin's auklets mainly, began to come ashore. They knew that many others drowned at sea. Unable to fly and with feathers and down penetrated by oil, the birds would have lost buoyancy. Those now struggling ashore would have low body temperatures and soon would perish from the cold, lack of food and effects of the oil ingested while preening their feathers. For oiled birds there is really no hope.

The foregoing scenario of wildlife disaster could easily be rewritten to apply to any of our coasts. All that is needed is to substitute the local species and maybe change the tanker to an oil well blowout.

In 1970, when the tanker *Arrow* ran aground off Chedabucto Bay, Nova Scotia, and dumped its cargo of crude oil into the sea, about 7 000 birds perished: murrees, oldsquaw ducks, fulmars, mergansers and grebes. In Newfoundland waters the same year, a much smaller amount of Bunker C from the barge *Irving Whale* killed about 5 000 murrees, eiders and guillemots. The extent of the casualties seems to depend mainly on the timing and location of the spill.

The potential for disaster from stepped-up oil exploration and drilling has increased tremendously in recent years. Industry activities in the stormy north Atlantic off Newfoundland and Labrador could mean big trouble; scientists have begun intensive studies to appraise possible perils to fish stocks there. In the Arctic Archipelago, ice-choked passages are particularly hazardous for transportation and for exploratory drilling.

In the Beaufort Sea, gas well blowouts and oil spills from vessels pose grave problems. An uncontrolled oil blowout in the drilling area off the Tuktoyaktuk Peninsula could be devastating for waterfowl. Effects on polar bears, seals or whales are more difficult to assess, but not reassuring to consider. As it

happens, a large part of the bowhead whale population passes through leads (long, narrow stretches of ice-free water) running parallel to this peninsula. The whales head eastward to feed in the large ice-free area north of Cape Bathurst, between the Baillie Islands and Banks Island. It would be unfortunate, indeed, if oil spills became an added threat to these already endangered whales.

In the eastern Arctic, offshore exploratory drilling is proposed for Davis Strait and Baffin Bay, and for Lancaster Sound, the gateway to the Northwest Passage. In northwestern Baffin Bay is the largest ice-free area in Canada's arctic seas. Known as the North Water, it extends southward from Smith Sound and, by late April, usually includes Lancaster Sound as far as Somerset Island. Narwhals and white whales follow the receding ice, apparently to return to feeding areas they are unable to reach during the winter. It has been estimated that one-third of North America's white whales and 85 percent of the narwhals use this passage through Lancaster Sound.

This large and highly productive marine area also provides plentiful food for great colonies of migratory seabirds, which take full advantage of the extensive cliffs for nesting sites. These are no ordinary flocks. They number, in fact, several millions. Gulls, terns and auks alone include 10 or more species. Comprising more than 50 percent of the seabird population in the eastern Arctic, they are one of the ornithological wonders of the world.

Oil blowouts or spills in this region could mean major calamity for the seabirds. What would happen to the mammals and many other components of the arctic marine ecosystem is uncertain, however, for so little is yet known about this remote part of the world. Unfortunately, the nation's urgent search for more energy has left no time for adequate scientific research. Biologists find themselves in the unenviable predicament of having to make recommendations about wildlife welfare on the basis of too few facts.



Oil on the south coast of Cape Breton Island in 1979 [top]. Guillemots washing ashore [above] were completely covered with oil from a major spill. More often, seabirds such as this gannet from Funk Island [left] perish from accumulations of floating oil left by ships cleaning their bilges at sea, a common practice.

WORKING FOR WILDLIFE

People in Groups

Anyone who doubts the interest of Canadians in their environment should leaf through the Canadian Nature Federation's *Canadian Conservation Directory*. The 1978-1979 issue lists 32 national and 247 provincial organizations as well as nature centres, natural history museums, environmental advisory councils, government agencies, and about 250 Canadian environmental consulting firms. Space allows for discussion of just a few of the larger, more directly wildlife-oriented national organizations.

The Canadian Wildlife Federation (CWF) has 450 000 members and supporters across the country, including those of 10 provincial wildlife federations. Founded in 1961, the CWF is outspoken about wildlife issues, ranging from the depletion of the caribou herds to the acid rain problem and Canada's international position on commercial whaling.

The CWF is committed to wildlife education. It has coordinated National Wildlife Week; published a high school textbook, *Learning about the Environment*; provided ecological field training for student teachers; and published over 6 million educational kits for teachers. Its educational facilities and activities include an information centre, a reference library, career counseling, a speaker program for schools and other groups, and sponsorship of poster contests.

Since 1974 the CWF has distributed many thousands of fact sheets on Canada's endangered species and habitats, and it is an active member of the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), a federal-provincial agency. It also distributes *International Wildlife* (with a Canadian insert) and *Ranger Rick*, a magazine for youngsters.

The World Wildlife Fund (Canada), another major organization, has supported important conservation projects across the nation. In 1980 it provided funds for more than 40 such projects including: for the Vancouver Island marmot, \$1 500 to the B.C. Wildlife Federation; for the polar bear, \$26 000 to the University of Alberta; for the peregrine falcon in the east, \$19 500 to the Macdonald Raptor Centre in Quebec; for Kirtland's warbler, \$5 000 to the University of Toronto; and for the harp seal, \$20 000 to the University of Guelph. The money for the WWF (Canada) program in 1980 came from concerned individuals, who donated from 50 cents to \$50 000, and from 150 Canadian corporations and foundations.

The WWF (Canada), founded in 1967 with headquarters in Toronto, is part of the World Wildlife Fund (International) made up of 27 national units around the globe. This network has raised over \$50 million in support of wildlife conservation since the idea first became action in 1961. The money has helped to save more than 100 bird and mammal species, nearly half of which were on the brink of extinction.

The Canadian Nature Federation (CNF), a registered charity like the CWF and the WWF, represents over 80 affiliated conservation and naturalist groups across Canada, and is also a member of COSEWIC. The CNF's membership exceeds 19 000 and it derives its support from membership fees, from donations by individuals and corporations, and from its bookstore in Ottawa. The latter offers the country's largest mail-order selection of books and materials on nature and the environment.

An attractive color-illustrated magazine, *Nature Canada*, is published quarterly by the CNF and is read by over 50 000 Canadians.

In past years, the Federation conducted youth programs which included a leadership camp for young naturalists and essay contests for children. It also operates a nature sanctuaries program and, with the Federation of Ontario Naturalists, sponsors nature tours.

Since 1937, Ducks Unlimited (Canada) has spent over \$75 million to develop waterfowl wetland habitat throughout the country. The organization, private and non-profit, came into being in the late 1930s when North American waterfowl numbers were seriously reduced by drought, especially in their main breeding areas in western Canada. Funded almost entirely by American hunters, Ducks Unlimited restores former wetlands or creates new ones on both private and government-owned lands. Dams, dikes and possibly nesting islands may be constructed at a site to provide the permanent water levels and peripheral vegetation best suited for waterfowl habitat. Projects range from the 200 000-hectare Tom Lamb Wildlife Management Area near The Pas, Manitoba, to numerous 20-hectare or smaller potholes across the country.

Ducks Unlimited has been criticized by some for its single-minded concern for waterfowl welfare; not all farmers are lovers of ducks, and some biologists are cautious about enhancing habitats for some wildlife perhaps to the detriment of other species, particularly where a large area is to be flooded. The organization maintains that its projects benefit water supply and control for agriculture, afford flood protection, and create habitat for other birds besides ducks and geese, for mammals and for fish.

Although the Nature Conservancy of Canada (NCC) does not compare to the foregoing organizations in size, its successful efforts to preserve wildlife habitats and

Leslie Tuck [in toque] and an assistant at a Funk Island gannet colony in 1970. Appointed Dominion Wildlife Officer for Newfoundland in 1949, Tuck pioneered marine ornithology in the Arctic.

ecological features make it a major conservation force in Canada. Incorporated in 1962, the NCC seeks out localities of certain plant and animal communities or scenic spots in danger of being swallowed up for all time by the swelling tide of human development. Such places may be the home of a rare marsh bird, the last stronghold of a wild orchid, the restricted range of a butterfly, or perhaps a grove of stately trees.

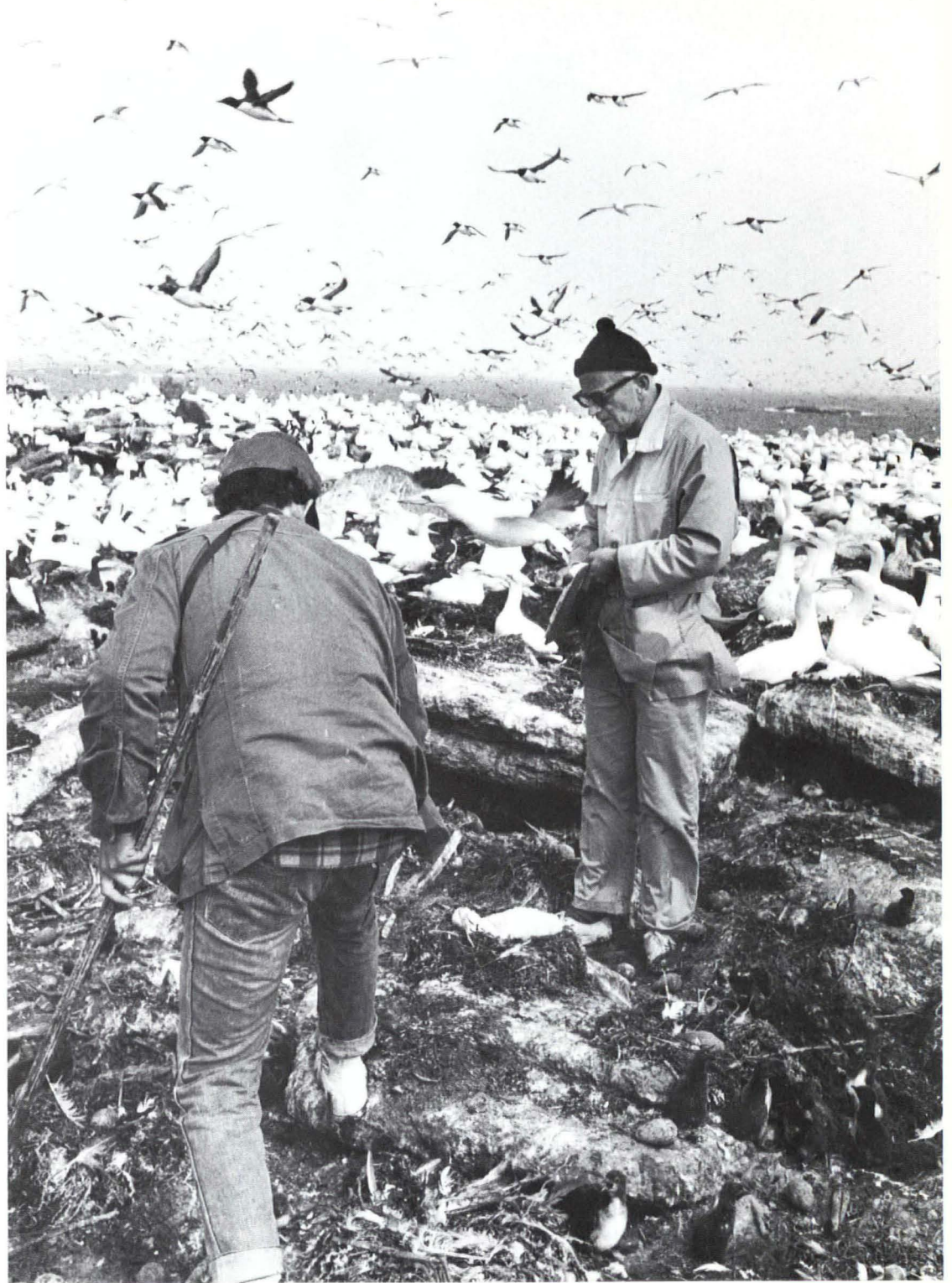
The NCC gathers funds from similar sources as the other conservation groups. This money is applied to land purchases, usually with cooperation and additional funds from another conservation organization. Most NCC projects so far have been in Ontario, although in recent years some also were in British Columbia, Manitoba, Quebec, Prince Edward Island and Nova Scotia.

... And Governments Together

The British North America Act of 1867 placed Canada's natural resources under provincial jurisdiction. Wildlife, though not specifically mentioned, also was assumed to be a provincial responsibility and, indeed, it had been for some time.

It became apparent in the early 1900s in both Canada and the United States that piecemeal management by provinces and states was not preventing a swift decline of the great flocks of birds that summered in Canada and wintered south of our border. The extinction of the passenger pigeon was an example of what could happen. International agreement on migratory bird management was clearly needed.

Thus, the Migratory Birds Treaty was signed with the United States in 1916 and





ratified the following year by Parliament. The Commission on Conservation, which operated from 1909 to 1921, met regularly with the provinces during the development of the terms of the Migratory Birds Treaty and Act. Federal civil servants played a major role in resolving objections by various provinces to proposed treaty terms.

The Commission on Conservation convened a National Wildlife Conference in 1919 which was open to all. It recommended regular meetings to discuss wildlife matters, including the Migratory Birds Convention Act and its regulations. As a result, the first in a long series of federal-provincial wildlife conferences was held in 1922. The 45th conference was held in Charlottetown, P.E.I., in 1981.

Through the earlier years, wildlife management in general received most attention from the provincial and territorial governments. The role of those wildlife agencies is large and important. A major concern of every province and territory is the enacting and enforcing of laws to regulate the killing of wildlife. That is one management tool for ensuring that species can maintain their numbers. Just as a domestic livestock producer manages his flocks and herds so that his breeding stock is never endangered, governments try to regulate the harvest of wildlife so that species are protected while allowing a surplus to be used.

Provincial personnel, variously called conservation officers, fish and wildlife officers, wardens or rangers, are empowered to enforce regulations based on a wide variety of

Two of the early federal officers who helped develop what later became the Canadian Wildlife Service. Dewey Soper [top] on Baffin Island's Great Plain of the Koukdjuak in September 1925 collected bird specimens for the National Museum. In 1934 Soper was appointed Chief Migratory Bird Officer for the three prairie provinces by the Wildlife Division, then part of the National Parks Branch. Hoyes Lloyd [bottom], with cormorants in 1921, became head of administration for the Migratory Birds Convention Act and the Northwest Game Act in 1918.

wildlife legislation. While these officers are primarily charged with administering provincial regulations, they are also *ex officio* game officers under the Migratory Birds Convention Act. Since the latter is a federal statute, primary responsibility for enforcement rests with the Royal Canadian Mounted Police across the country. Game officers of the Canadian Wildlife Service help coordinate that work.

The distribution of wildlife information also is an important activity of most wildlife agencies. They may provide safety information courses for hunters, as well as wildlife interpretation programs and publications for the general public.

Research is an integral part of most wildlife programs. Emphasis is placed on collecting data about species numbers, reproduction rates, and ranges to provide guidance for overall management. Such things as predation, diseases and parasites, behavior, the prevention of damage by wildlife, and the impact of our forestry practices on wildlife involve many other studies. All wildlife agencies are concerned about preservation and greater understanding of wildlife habitat. And, all provinces and territories are represented on the Committee on the Status of Endangered Wildlife in Canada.

Following the early federal work that led to the signing of the Migratory Birds Treaty, federal matters concerning wildlife were assigned to the National Parks Branch of the Department of the Interior. In 1947 the section of the Parks Branch concerned with wildlife became the Dominion Wildlife Service. A few years later it was named the Canadian Wildlife Service (CWS), and in 1971 it was transferred to the newly-created Department of the Environment.

Until 1966 the CWS mainly carried out research and management for migratory birds throughout Canada, and acted as a fact-finding and advisory agency for all kinds of wildlife in the territories and in the national parks. In 1966 a National Wildlife Policy and Program was tabled in the House of Commons, which reaffirmed the federal government's commitment to wildlife preservation



and confirmed the scope of CWS operations. The way was cleared for providing more wildlife information to the public, and for continuing cooperation with the provinces — at their request — in attaining the goals of wildlife management.

The Canada Wildlife Act of 1973 further broadened federal involvement with wildlife. That Act provides authority for the purchase or lease of lands for research, conservation and interpretation involving migratory birds or, by agreement with the province concerned, other wildlife species. Provision also is made for federal action to protect species in danger of extinction.

Thus, the federal government and the provinces and territories today are committed to a cooperative effort to cope with the complex and often disturbing interactions between wildlife, people and the environment.



Ducks and other waterfowl are banded to aid studies of their biology, distribution and habitat. At a mid-1960s project near Calgary [top], one man removes birds from a net while another applies numbered leg bands with banding pliers. John P. Kelsall [above], tracking caribou in 1954, has lunch on floe ice in Bathurst Inlet, NWT. Although less frequently today, some wildlife studies can still involve one biologist traveling on foot over long distances, perhaps with Inuit assistance.

FOR THE BIRDS EXCLUSIVELY

The Breeding Bird Survey

Protection of Canada's birds and their habitats took a giant step when the Migratory Birds Convention Act was passed in 1917. Since then, both federal and regional governments have continually expanded their efforts to safeguard all of the nation's avian fauna.

To detect and measure year-to-year and long-term changes in bird populations (particularly smaller land birds) in a country the size of Canada sounds like a formidable task for a lot of people — and indeed it is. When one realizes that it is done mainly by sound, the whole thing seems impossible — but it isn't.

For many years, wildlife authorities in the U.S. recorded the drumming of grouse, crowing of pheasants, cooing of doves and "peenting" of woodcock by stopping along roads and counting the sounds for specified intervals. This method of surveying game birds subsequently was tried for all birds. Canadian wildlife authorities began using song counts in the mid 1950s to census insectivorous birds in the forests of New Brunswick where DDT spraying was done. By 1968 the system — called the Breeding Bird Survey (BBS) — was being used across Canada.

The sampling unit for the BBS is the degree-block of latitude and longitude. Each block has one survey route except in the Maritimes and southern parts of Quebec, Ontario and British Columbia, where as many as four routes per block may be used. The people who survey these routes, cooperators as the CWS calls them, are recruited by appeals in naturalist organizations' newsletters and by personal contact. Those who want to help but lack experience often can ride with veteran cooperators.

Each survey route has 50 sampling stations (or stops) set at half-mile (0.8 km) intervals along a road. At each stop the cooperator listens for three minutes, exactly, and records all birds heard or seen within a quarter-mile (0.4 km). The survey must be completed in one day in June when winds are slight and there is little or no rain, and it must start 30 minutes before sunrise.

Analyses of data from the first 10 years of the BBS show significant changes in populations of certain species in various regions. For example, populations of several species of warblers in the Maritimes were adversely affected by low spring temperatures in two different years. On the other hand, also in the Maritimes, during several years before 1975 there was a sustained increase in numbers of some other small insectivorous forest birds, especially the red-eyed vireo, the ovenbird and the redstart. This could have been due to the gradual decline of DDT in the environment since its use in spraying New Brunswick's forests was halted in 1967.

The most impressive sustained increase identified by the BBS is of the red-winged blackbird. Its population is rising across the country except in British Columbia, probably because of an increase of corn and alfalfa fields on which these birds are a major pest.

Sustained declines have been few, though they have happened in the Maritimes for the flicker, the northern junco and the grackle. Causes of those trends are not known for sure, but they may have been due to agricultural land reverting to forest. Lesser declines have been noted for blue jays and cedar waxwings in central Ontario and Quebec, and warbling vireos, rose-breasted grosbeaks and goldfinches in the prairie

provinces. Significant downward trends noted by the BBS help pinpoint areas where research may be necessary for finding ways to protect birds.

Canada's BBS is an outstanding example of cooperation between government and private citizens who, incidentally, undertake the field work entirely at their own expense.

The Nest Record Card Program

If you get a kick out of watching the birds that nest around your home in the spring, there's a way to indulge your fancy and help the professionals at the same time. It's called the Nest Record Card Program (NRCP).

The idea came from England and started in British Columbia in 1955. By 1969 it was operational throughout the country, thanks to the enthusiasm of regional coordinators and the response of people eager to take a closer look at the domestic life of birds. Profes-



The veery, a common thrush of hardwood forests, usually builds its nest near the ground among ferns or shrubs.

sional coordinators have come mainly from museums, universities and the CWS. Observers come from all walks of life across the land.

The NRCP is provided with standard nest record cards by the CWS. On these the observer enters information about the nest, such as its position, what it is made of, and its height above ground. The general habitat is described and details about eggs and young are entered. Finally, the success or failure of the breeding attempt is noted. Four to six suitably-timed visits to a nest are normally sufficient to get the data. Care and good judgment during these visits are important, lest the welfare of the nest be jeopardized.

The nest record cards are filed with the regional coordinators, and the information is used mainly in studies of such things as nesting biology and breeding success and distribution. The greater the number of cards available for a species in a given region, the more useful they are for a specific research need. NRCP material has been used in studies of seabird colonies in British Columbia, of nesting data for eastern bluebirds, and of purple martin distribution in New Brunswick.

There is no doubt about the value of this work to the scientist, but it also gives the observer enjoyment and a memorable learning experience. One scientist with the NRCP has apt words to express it:

... By encouraging people to look at birds and their nests with care and judgment, we are stimulating public awareness of our natural environment as something to be treasured. . . . Man finds it easy to identify with birds, easier than with most other living things: birds communicate with each other by voice, they build complicated homes, some even go to Florida for the winter. Like man, birds depend on their environment, but only man can ensure that it survives.³

The Harvest and the Hunters

While the aim of the Migratory Birds Treaty was to preserve species from unwarranted destruction, it nevertheless left the way open for the hunting of migratory game birds: ducks, geese, swans, cranes, rails, coots, gallinules, shorebirds, doves and pigeons. Such hunting, of course, was restricted to certain seasons. Bag limits are published annually in the Migratory Birds Regulations.

Despite excellent work by such early federal officers as J.A. Munro, J.D. Soper, H.F. Lewis and R.W. Tufts, for almost 50 years decisions about appropriate limits were made with little reference to extensive or systematically collected information on bird populations, the hunters or the kill. Such shaky management also prevailed in the United States, but there, because of greater pressures on the birds, remedial action was taken sooner.

The first step in the United States was to monitor the numbers of breeding waterfowl and their breeding success. Because most waterfowl breed in Canada, the United States Fish and Wildlife Service (USFWS) obtained the consent of our federal and provincial governments to do such research in this country. Its monitoring program started in 1947 and has continued to the present. Somewhat later, the USFWS began an annual national survey of migratory game bird hunters and hunting, and Canada followed suit in 1966. The CWS recently published a comprehensive account of its first decade of fact gathering.⁴

The key to the Canadian survey is the Migratory Game Bird Hunting Permit, issued for a nominal fee. Hunters so registered can be surveyed for information, especially about the number and species of birds killed. One survey, the National Harvest Survey, requests selected permit holders to complete a questionnaire on their hunting activities and success, and on the species taken other than ducks and geese. The Species Composition Survey asks others to return duck



Color patterns and size of wings of most ducks indicate species, sex and age. Duck wings and goose tails, sent by hunters to the CWS each year for the species composition survey, are identified at "wing bees".

wings and geese tail fans in special envelopes, so that the species and the age and sex composition of the kill can be determined.

The two surveys together provide a great deal of information about the hunters' harvest, but unfortunately not a complete picture. Indians and Inuit, and indeed any resident of the Northwest Territories who holds a general hunting licence, are not required to have a Canada Migratory Game Bird Hunting Permit, and hence there is no record of their kills. Any Indian or Inuk is permitted to take certain species for food and clothing at any time of the year, and there is no accounting of their consumption. Moreover, unrecorded but substantial losses of birds are caused by crippling and by illegal hunting.

Despite these limitations, there is great value in knowing the details supplied by the survey and licence systems. For example, between 1966 and 1977 the number of migratory game bird hunters leaped by about 140 000 to 520 530. Projecting the rates of increase suggests there may be about 600 000 hunters by 1985, vital information to have in setting limits and planning long-range management.



From 1970 to 1977, the average estimated duck kill by permit holders was 3.7 million birds each year. Mallards made up more than half the bag in the four western provinces, and were the main species taken in Ontario. East of Ontario the black duck predominated. During the same period, the average annual figure for geese was 450 000, mostly Canada geese, followed by snow geese. White-fronted geese also were shot in significant numbers, especially in Saskatchewan.

Only about 15 percent of the hunters responding to the NHS reported taking migratory birds other than waterfowl. In this category, woodcocks were the most commonly hunted birds with estimated average annual kills of 120 000. Common snipe came next at 99 000, followed by coot at 41 000. Smaller numbers of sandhill cranes, mourning doves and band-tailed pigeons were also taken; cranes may be hunted only in Saskatchewan and Manitoba, and doves and pigeons only in British Columbia.

Besides giving data on the harvest, the hunting permit system has made other surveys possible. One gives an interesting profile of the Canadian migratory bird hunter.

Some 98 percent of permit holders are males, their average age is 31, and most are married. About 68 percent have a secondary, technical or college education, and 61 percent are in blue-collar occupations. Most live in urban areas and their median family income in 1975 was \$12 500.

This information, too, is important, for knowing who the hunters are aids communication and helps in gaining their understanding and cooperation. We all have a stake in safeguarding the welfare of migratory bird populations.

Sanctuaries for Survival

The notion of sanctuaries to protect and preserve wildlife in Canada gained much impetus in the early years of this century, when the benefits to birds and mammals in our national parks were becoming apparent. The idea was not new then, however. It had been put into practice in Europe long ago.

In Canada, an early attempt to establish a sanctuary was made in 1887 by Edgar Dewdney, then lieutenant governor of the Northwest Territories. Dewdney believed that

the great flocks of wildfowl in the Last Mountain Lake area, about 80 km northwest of present-day Regina, were threatened by settlement. He was able to get the area set aside for the birds and, in 1917 after the Migratory Birds Convention Act was passed, it was formally named the Last Mountain Lake Bird Sanctuary.

Last Mountain Lake was a ready-made example for the federal people responsible for migratory birds. The need for other areas was obvious and, in March 1919, two small islands in the Gulf of St. Lawrence and the cliffs of a third were declared both provincial bird sanctuaries and federal migratory bird sanctuaries.

Since the 16th century, the seabirds on Percé Rock, Bonaventure Island and Bird Rocks had been killed in great numbers for fish bait and for fresh meat for the table. Their nests had been raided unmercifully for eggs. John James Audubon in 1833 warned that the colonies might be totally destroyed, and for the gannet, this nearly happened. On the Atlantic coast in 1830 it was estimated that there were 200 000 gannets. By 1880 there were only 8 000, of which some 3 000 were believed to be on Bonaventure Island.

A few years before the Migratory Birds Treaty, there was a move to destroy the gannets of Bird Rocks as well as the double-crested cormorants of Percé Rock on the grounds that their predation of salmon fry was menacing the commercial fishery. Fortunately, that action was forestalled. Investigation revealed nothing to substantiate the charges against the birds. In fact, they had virtually no effect on the fishery.

In the course of these inquiries, however, it became apparent that there was considerable wanton destruction of birds on all three islands. People by the boatload cruised below the cliffs and blasted birds off their perches merely for the fun of it. Knowledge of that senseless destruction doubtless stimulated the efforts of provincial and federal agencies, resulting in protection for the birds in 1919. Gannet numbers on Bonaventure Island now are estimated at 60 000.

Today there are 82 migratory bird sanctuaries in Canada under federal jurisdiction. They are found in all territories and provinces with the exception of the Yukon and Manitoba (where the province looks after its sanctuaries). They total 11.4 million hectares, ranging in size from the 1-hectare Christie Islet of British Columbia to the nearly 6.3 million-hectare tract of Queen Maud Gulf in the Northwest Territories.



Thousands of people each year come to view the spectacular seabird colonies of Percé Rock [right] and nearby Bonaventure Island. The birds include gannets, murre, puffins and gulls. Gannet nests [top] are used year after year, patched with seaweed, sticks and moss for each breeding season in late May and early June.



Three Bird Stories

The Great International Avian Foster Parents Plan (GIAFPP)

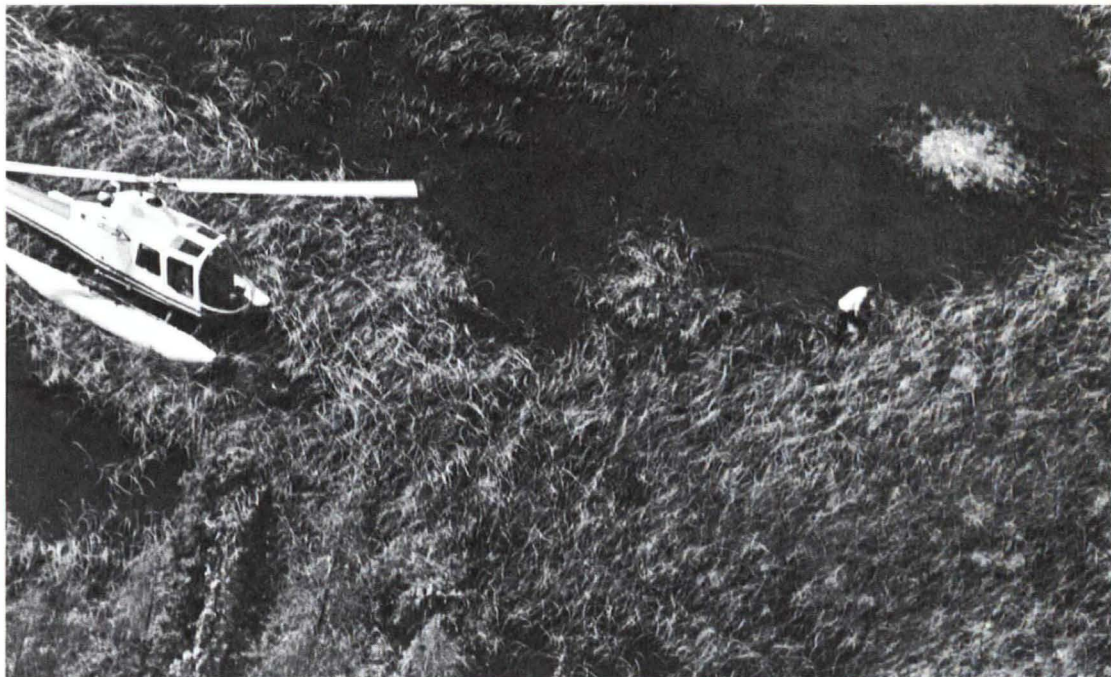
Whooping cranes normally produce two eggs annually, but usually only one chick survives. And that, really, is the key to the GIAFPP.

In late May of 1975, a CWS scientist took one egg from each of the whooping crane nests in Wood Buffalo National Park, which straddles northern Alberta and the Northwest Territories. This is the only place where the endangered whoopers nest in the wild, migrating for the winter to the Aransas National Wildlife Refuge in Texas on the Gulf of Mexico. With the cooperation of United States scientists, these eggs were transferred to sandhill crane nests in Grays Lake National Wildlife Refuge in Idaho.

The idea was that the sandhill cranes, which are not endangered, would hatch and raise the young whoopers as their own, and that the whoopers would travel from Grays Lake to wintering sites in the southern states and back again with their foster parents. The plan worked, and more eggs are being transferred to Grays Lake each year. If enough whoopers successfully breed there, biologists believe the new flock could become self-sustaining.

For the whooping cranes, this project means more surviving chicks for the same number of eggs laid. Moreover, prospects for survival of the species are better if there is a new flock inhabiting a different geographical region. Then the chances of all the whoopers being wiped out in a common disaster are greatly diminished. Biologists had been worried about threats to the birds that wintered on the Texas coast from oil pollution and hurricanes. Now the Grays Lake whoopers winter in New Mexico with their sandhill crane foster parents.

In Canada, the CWS is studying other sandhill crane populations with different migratory paths and destinations. This work has concentrated in the interlake region of



Manitoba. In 1977, conventional marking of nesting sandhill cranes in that area failed to reveal either their migration route or their winter destination. They were not seen in Indiana or other Great Lakes states, nor yet in Florida, as had been expected.

More information on their central Manitoba breeding habitat was sought in 1978. Large-scale maps and aerial photographs of all these areas were not available, so Landsat (satellite) pictures were used, on which likely sandhill crane breeding areas could be identified. With this information, scientists looked for sandhill crane families by helicopter. Once the birds were spotted, the helicopter landed and young cranes were captured on foot. Miniature radio transmitters were attached to 16 of these birds.

At this point the investigation became a cooperative one between the CWS, the U.S. Fish and Wildlife Service, the University of Wisconsin, and the Illinois Natural History Survey.



CWS biologist Ernie Kuyt collecting whooping crane eggs in Wood Buffalo National Park [top]. Attentive parents, whoopers build massive nests of rushes hidden among the myriad ponds of their breeding grounds [above].

The migratory path of the relatively slow flying sandhill cranes was successfully followed using a radio-equipped truck and aircraft. The birds made stopovers along their route in southern Manitoba, North Dakota, Kansas, Nebraska and Oklahoma before reaching the prairies of the Texas Gulf coast

between Houston and Corpus Christi. They were tracked for about 2 500 km, and the process was repeated in 1979. The studies have provided much useful data about sandhill cranes. Unfortunately, they also indicate that these birds may be of little use to the GIAFPF because their winter range in Texas may be too close to that of the Wood Buffalo whooper flock.

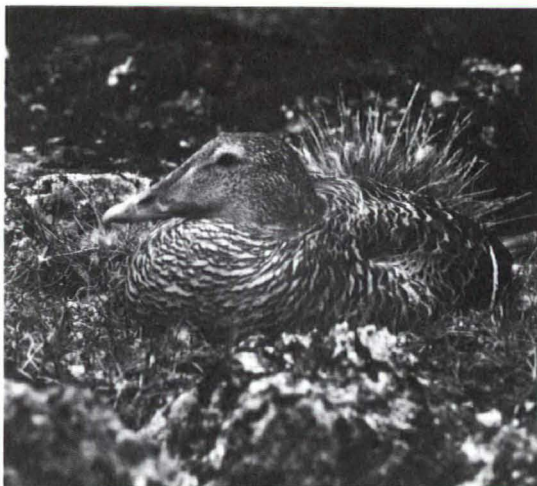
Today there are perhaps 122 whooping cranes in the world. Seventy-eight have been counted in Wood Buffalo National Park, about 19 spend the summer in Idaho (but have not yet nested), and 25 are in captivity at the Patuxent Wildlife Center in Maryland where they were artificially reared.

The Eider and the Inuit

One morning in June 1978, a De Havilland Twin Otter aircraft rounded Pointe Louis XIV, the eastern shoulder of James Bay, then banked slightly to follow the long sweeping curve of Hudson Bay's eastern shore. It flew low, probed into inlets and threaded its way northward among the coast-hugging Nastapoka Islands.

In the copilot's seat an observer peered down, counting birds by species, giving special attention to the eider ducks. For them a subspecies count was needed, plus a record of males and females. The observer's partner in the rear seat scribbled notes on the topography of the bird sites and used his camera to record habitats. Flying for four days, they covered the entire coast of Quebec along Hudson Bay, Hudson Strait and Ungava Bay right up to the sharp point where Quebec meets Labrador.

The aerial observers, a CWS scientist and a technician, found that the heaviest concentration of eiders was in Ungava Bay, especially on Eider and Gyrfalcon Islands. Of the birds along the Hudson Bay shore, over 70 percent were found on the Nastapoka and Hopewell Islands. Comparing their findings with those of a similar 1954 survey, the observers concluded that population levels were generally unchanged.



Female eider on nest, Nuvuk Island, off Ungava Peninsula.

This was the end of the first phase of a detailed study of the common eider duck, a cooperative research project in which the Inuit people are directly involved with CWS scientists. The Inuit participate in the design and execution of the study as well as in the analysis and application of the results, in keeping with their concerns for the environment and the biological resources of their region.

The Inuit are interested in the study because the eider and its eggs are traditional items of food, and its down is used in clothing and bedding. Small amounts of eider down are also sold by Inuit cooperatives in several communities.

Objectives of the study include determining past and present numbers of the ducks, describing the ecological characteristics of the nesting populations, mapping their distribution, and determining harvesting patterns and the economic importance of the resource. Another objective is to establish a research pattern that will, according to the project proposal, "... encourage a sensitive yet productive sharing of ideas, knowledge, techniques, skills, priorities and controls between native people and southern scientists."

The Inuit now have completed the second phase of the project: gathering information for more precise estimates of eider breeding populations. Individual and group interviews among the Inuit, yet to be held, will give their perspectives on ecology, harvesting and management. Reports on the work in 1981 are in preparation.

An Atlas for Seabirds

For more than a decade, CWS scientists have been hard at work on the problem of birds beset by oil in the sea. Initial work of locating and counting the birds was followed by research on breeding colonies and on the effects of oil on the food chains the birds depend upon. It has concentrated along our eastern shores and in the eastern Arctic, but studies are also conducted on the Pacific coast. Surveys of the coastal breeding distribution of seabirds began in 1967, and the work was expanded in 1969 to include pelagic (open sea) populations.

The first extensive results were published by the CWS in *An Atlas of Eastern Canadian Seabirds* in 1975.⁵

Data on the seabirds' breeding distributions in the Arctic were obtained mainly by aerial counts, using ground checks and aerial photographs to supplement the information. In the Gulf of St. Lawrence and the Atlantic provinces, there were extensive ground counts as well as aerial surveys. The pelagic survey, requiring ships, has encompassed a vast chunk of the northwest Atlantic Ocean and the bays and straits of the eastern Arctic. Conducted on a year-round basis, this extensive undertaking has produced maps showing the locations and relative abundance of different species at various seasons.

The Atlas contains information on the breeding ranges and pelagic distributions of 39 species of seabirds. It also includes a special section of maps showing where concentrations of birds are most vulnerable to oil spills at any particular season.



Research results and the Atlas together tell a great deal about what can happen to birds in the event of an oil spill. But it's not much help to the birds knowing where, why and how many of them are going to perish unless, of course, a way can be found to use the knowledge to prevent such a disaster.

The CWS sees to it that all its information reaches appropriate environmental authorities. Its own biologists review oil spill contingency plans for every offshore drilling proposal. They do so in cooperation with the Atmospheric Environment Service and the Environmental Protection Service (both part of Environment Canada), and with representatives of industry, the Department of Fisheries and Oceans, the Department of Indian and Northern Affairs, the Ministry of Transport and the Department of Energy, Mines and Resources.

The plight of seabirds reflects the widespread threats to the oceans in general. By the same token, finding ways to use marine and submarine resources that do not harm the seabirds will benefit other species as well.



From a tiny blind clinging to a sheer cliff face, CWS biologists can observe murre without disturbing them [left]. The men lower themselves with ropes from atop the cliff. Two men [above], standing on a narrow ledge 100 meters above the sea ice, catch birds to band them. Digges Island, off Ungava Peninsula.

LOOKING OUT FOR ALL OUR WILDLIFE

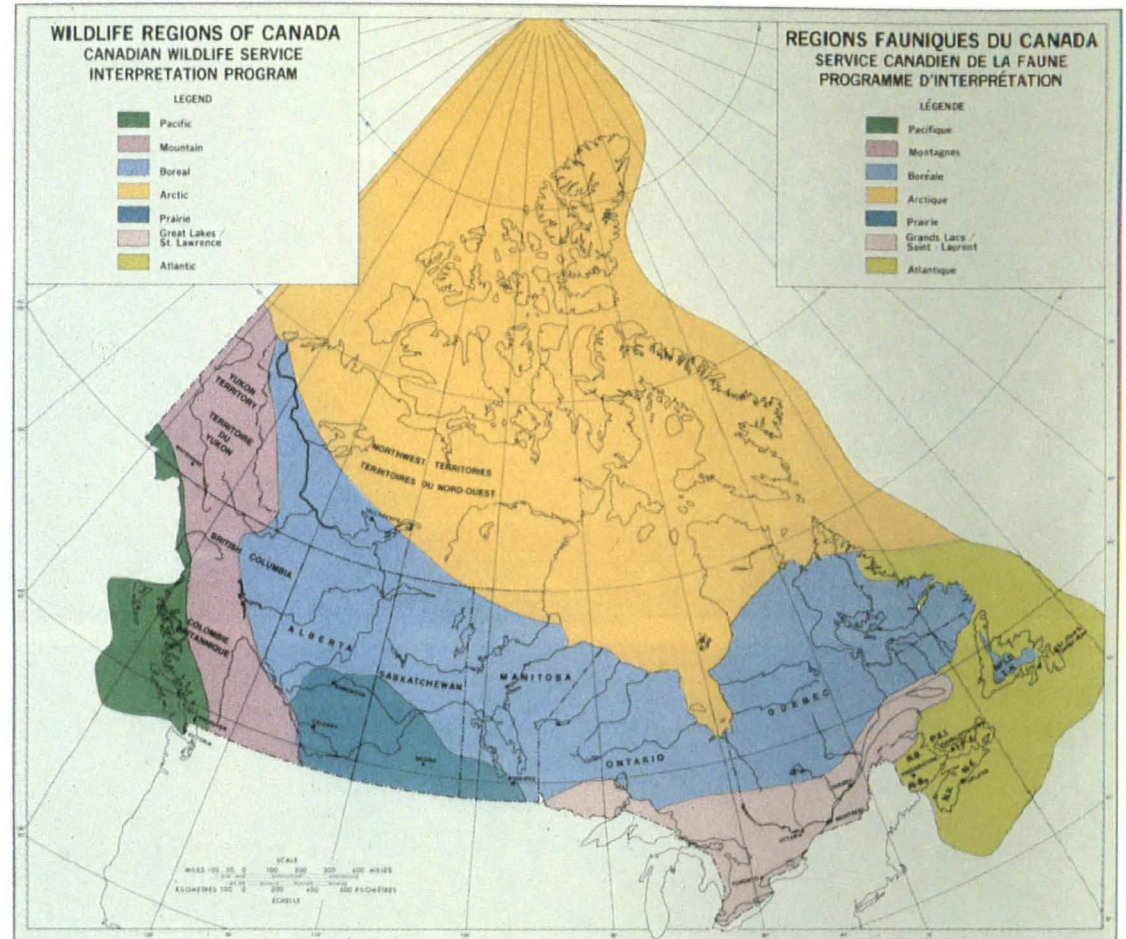
The National and Cooperative Wildlife Areas

With the pledges of federal action in the 1966 National Wildlife Policy and Program, a good start was made towards preserving and managing some of Canada's threatened wildlife lands. The Canada Wildlife Act of 1973 further assured a vigorous federal effort across the nation.

Besides the extensive national and provincial parks in Canada that encompass much prime wildlife habitat, there are now 39 areas known specifically as national wildlife areas. Acquired and managed by the CWS, they are located in all provinces except Newfoundland and Prince Edward Island, comprising about 30 000 hectares of land in all. There also are four cooperative wildlife areas, one in Saskatchewan and three in British Columbia, which are managed jointly with the provinces.

Initial emphasis on preserving migratory bird habitats has since broadened to include those of all wildlife. Nevertheless, many of the national wildlife areas are primarily bird habitats. For example, the mud flats of the Cap Tourmente National Wildlife Area in eastern Quebec host the spring and fall migration flights of the world's only flock of greater snow geese. By contrast, the Vaseux-Bighorn National Wildlife Area, in British Columbia's Okanagan region, includes some of the crucial winter range for the endangered California race of bighorn sheep. It also includes part of Canada's only desert region.

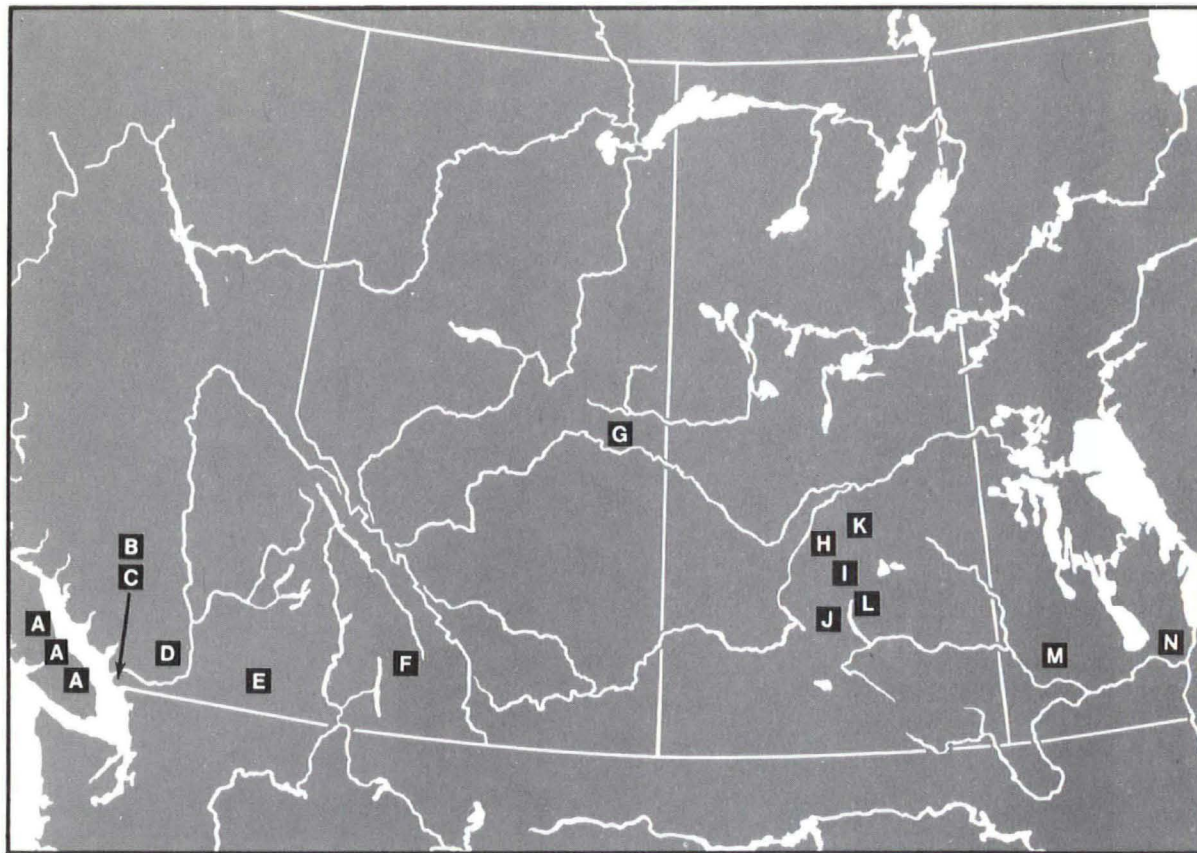
Each of the wildlife areas is managed individually. In some, management is simply a matter of ensuring that natural conditions are



undisturbed. In others, trees may be planted to provide added cover for deer, grouse or songbirds, or the landscape may be made more attractive to waterfowl by digging ditches, excavating ponds or creating nesting islands.

But the national wildlife areas are for people, too. In some, farmers may be permitted to cut hay or graze livestock; in many,

activities such as hiking, photography, bird-watching, fishing and even hunting are possible — all, of course, within bounds of management that will ensure the preservation of habitat in which wildlife can continue to thrive.



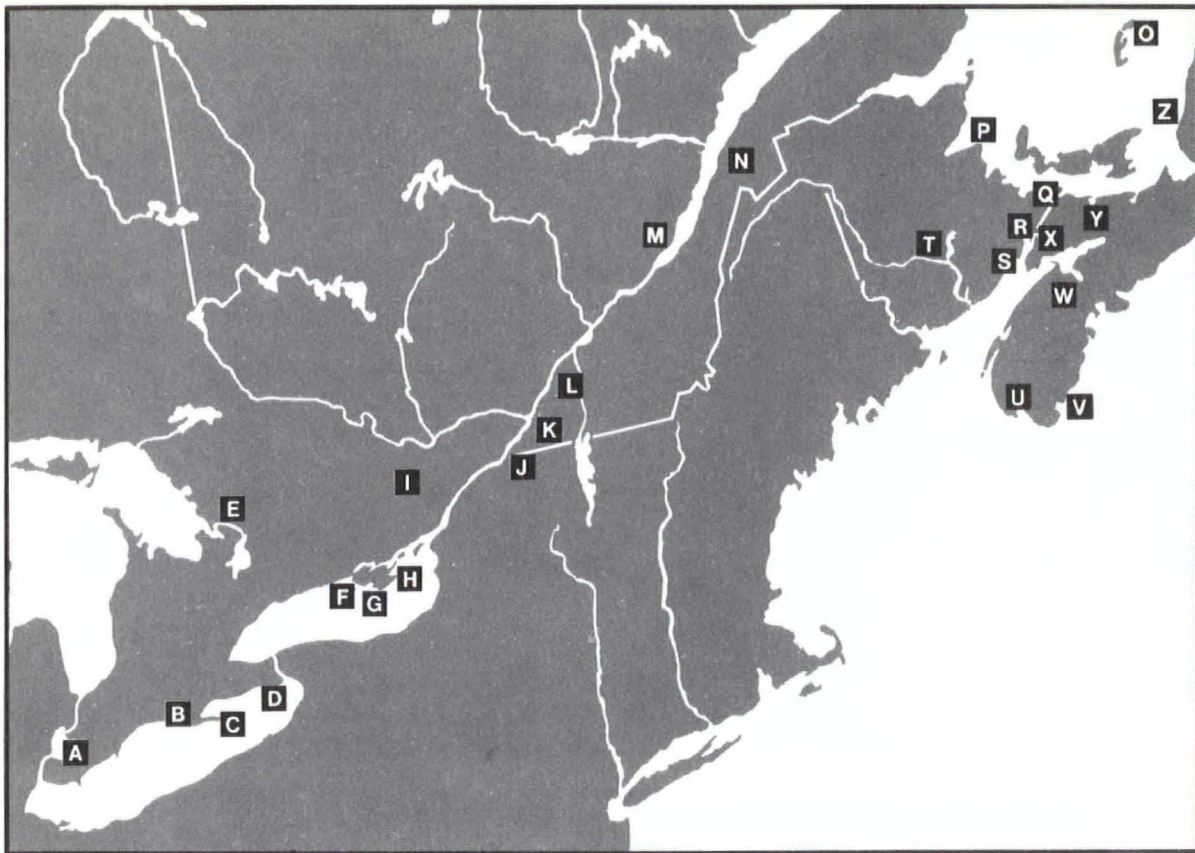
National wildlife areas

West Canada

- A** Qualicum
- B** Sturgeon Bank (cooperative wildlife area)
- C** Alaksen
- D** Widgeon Valley
- E** Vaseux-Bighorn
- F** Wilmer
- G** Blue Quills
- H** St. Denis
- I** Bradwell
- J** Stalwart
- K** Tway
- L** Last Mountain Lake (cooperative wildlife area)
- M** Pope
- N** Rockwood

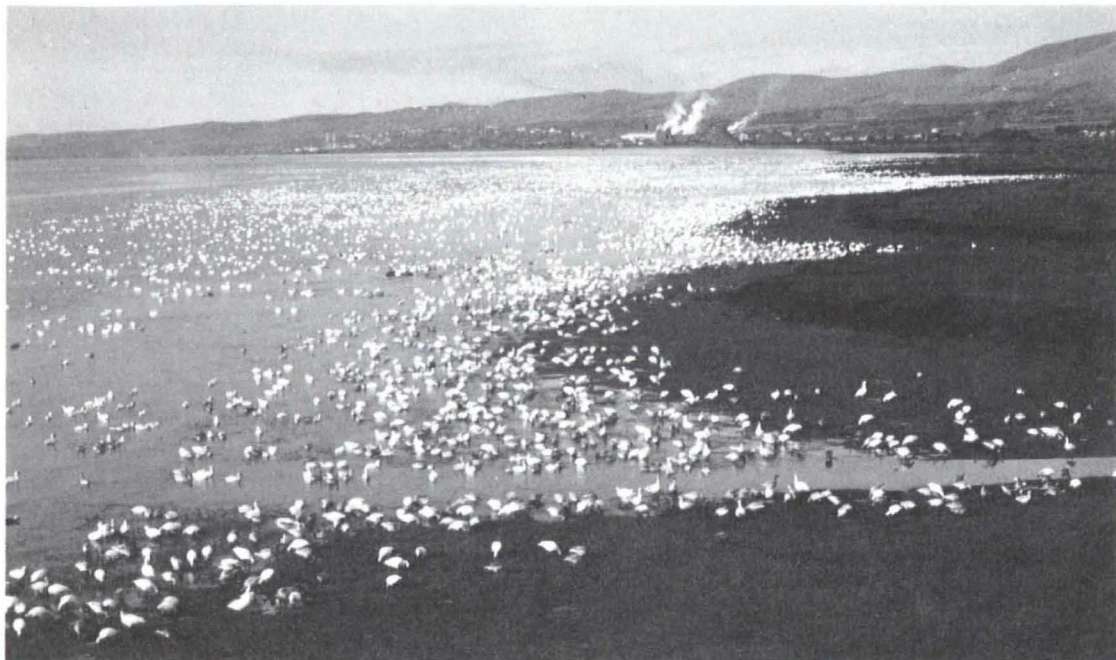


Creston Valley in British Columbia [left] has one of the world's largest osprey populations [above] as well as geese, ducks and swans. Huge flocks of migrating snow geese descend on Cap Tourmente near Quebec City every spring and fall [right].



East Canada

- A** St. Clair
- B** Big Creek
- C** Long Point
- D** Mohawk Island
- E** Eleanor Island
- F** Wellers Bay
- G** Scotch Bonnet Island
- H** Prince Edward Point
- I** Mississippi Lake
- J** Lac Saint-François
- K** Îles de la Paix
- L** Contrecoeur
- M** Cap Tourmente
- N** L'Île-Verte
- O** Pointe de l'Est
- P** Portage Island
- Q** Cape Jourimain
- R** Tintamarre
- S** Shepody
- T** Portobello
- U** Sand Pond
- V** Port Joli
- W** Boot Island
- X** Chignecto
- Y** Wallace Bay
- Z** Margaree Island





A Day At Wye Marsh

The Wye Marsh Interpretation Centre, some 140 km north of Toronto, offers an intimate eye-level look at the life of this beautiful region. Visitors can explore by canoe and on the floating boardwalk. There are bulrushes, marsh marigolds, muskrats, Canada geese and many other birds of marsh and forest, such as the brown thrasher [below].



Turtles and other reptiles inhabit the water and forest at Wye; the little green snake [above] prefers open grassy areas. A walk in the hardwood forest in spring [right] is an experience that neither city nor country dwellers readily forget.





Wildlife and You: The Interpretation Centres

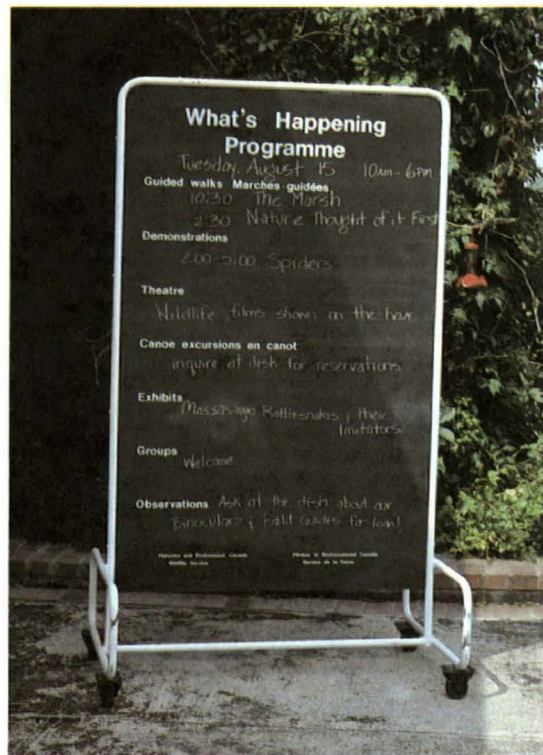
Sometimes learning about wildlife can be frustrating. Seeing wild creatures in their own domain is often difficult. First, there's the matter of knowing the right spot to go to and then getting there. And maybe the mammals, birds, reptiles or insects you wish to see fail to show up. Then, too, maybe you are not sure exactly what you are looking at.

There is always the zoo, of course. To see animals there is fine, but it's not the same as watching a beaver at work on his dam, or catching the wilderness sound of a bugling bull elk on crisp autumn air. And a zoo is not the best place for learning about habitats or ecology either.

The CWS is aware that urbanization is moving many people farther and farther away from the natural environment, both physically and psychologically. Its response has been to establish a wildlife "interpretation" program. According to the program policy:

The interpretation program should not be there merely to transmit information on scientific activities, and on resource management practices. Nor should the interpretation program be there to educate people formally in natural history, for that is a provincial responsibility. The interpretation program must exist to provide the opportunity to establish and maintain a link between the hearts of men and their natural heritage.

So far, there are five wildlife interpretation centres. At four of them, the presentation describes a particular region as it is now, under man's influence, and also provides an



With a scoop of a net, small visitors examine water plants, insect larvae and other life of the marsh [left]. A "What's Happening" board notes daily activities. Naturalists lead nature walks and demonstrate various techniques for studying wildlife.



ecological view of the region's wildlife. Naturalists answer questions about displays or about features of the nature walks. All the centres are within easy reach of main roads.

The Wye Marsh Wildlife Centre near Midland, Ontario, in the Great Lakes/St. Lawrence wildlife region, was the first to be established. It has a floating boardwalk, an underwater window, an observation tower and nature trails to bring visitors into close contact with the denizens of the marsh and the northern hardwood forest.

Some 29 km west of Swift Current, Saskatchewan, the prairie wildlife region is presented at the Prairie Wildlife Centre. This is the home of the gopher and the antelope, a short-grass prairie with Russian thistle, blue grama grass, sage and cactus. It is one of the few places along the Trans-Canada Highway where one can stop, get out of the car and experience undisturbed wild prairie lands.

The Creston Wildlife Centre, hemmed in by southern British Columbia's Purcell and Selkirk mountain ranges, interprets the mountain wildlife region. It is located in the Corn Creek Marsh, part of the Creston Valley Wildlife Management Area, which is a cooperative wildlife area. The marshes on the west side of the valley attract thousands of geese and ducks, and ospreys as well. The spring migration of whistling swans usually peaks here in early April, though few of the birds return the same way in the fall.

The Atlantic Wildlife Centre at Percé, on the tip of Quebec's Gaspé Peninsula, offers seabirds by the thousands: gannets, puffins, murrets and gulls. It tells the story of the constant interaction of land and ocean. Percé Rock can be reached by foot at low tide, and the great gannet colony of Bonaventure Island is just a short boat trip away.



A guide at the Prairie Wildlife Centre near Swift Current, Saskatchewan, explains the ecology of the expanses of sage and short grass prairie. The Centre's new building is in the distance. In this region one may glimpse antelope, gophers, hawks or, near water, an avocet [above].

The fifth wildlife centre, in the Cap Tourmente National Wildlife Area near Quebec City, is mainly concerned with the spectacular flocks of migrating greater snow geese in spring and fall. It has nature trails, however, and there is much of interest to see when the geese are not around. Bird watching has real scope; some 250 bird species have been recorded in the vicinity of Cap Tourmente. There also are many mammals, including muskrats, beavers, foxes, coyotes and bears.

The CWS intends to expand its interpretation program to include other wildlife populations and habitats, both in national wildlife areas and at other locations. It offers assistance and encouragement to organizations and individuals interested in becoming involved in nature interpretation.

Putting Wildlife on the Map

Gathering information on the seasonal abundance, distribution and habitat characteristics of all species of mammals, birds, amphibians and reptiles in any area is a huge and complicated task. Presenting the

results effectively in reports and maps calls for special skills. When the area is the mountainous terrain of Banff and Jasper National Parks, the project can well be described as a challenge.

For CWS scientists, however, it was a shared challenge. When Parks Canada requested the work in 1973, it was planned as a cooperative effort involving the Canadian Forestry Service and the Alberta Institute of Pedology (soil science). The CWS was to work on the wildlife inventory, while the other agencies took care of the biophysical land classification relating to wildlife habitat. The aim was to produce a report and map package that would combine all information on landform, soils and vegetation relevant to animal populations.

From the outset the project demanded a tightly coordinated team effort. Land classification proceeded a step ahead of wildlife inventory, so that area maps for wildlife sampling could be prepared in advance. Methods varied considerably according to the different kinds of wildlife sampled, but all were simple so that a small number of observers could deal effectively with 160 maps and approximately 300 species. For ungulates there were pellet and track counts and road surveys; for small mammals there were two types of live traps; and for breeding birds there were call counts. For all species random observations were recorded.

Completed in 1981, the project includes computer-produced maps for both parks. Reports giving details about wildlife in particular areas, about the abundance, distribution and habitat preferences of various species, support the maps.

In the course of the survey, Parks Canada made good use of preliminary reports, especially environmental impact assessments of proposed road routes and building locations. The work has resulted in several other scheduled projects, including an interpretive program and a park study of wildlife mortality along the Trans-Canada Highway.

Now you see them, but what about Next Year?

... the processes leading to extinctions [of wildlife] in Canada are now functioning with greater speed and impact than ever before.

Thus spoke the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) at the 1980 annual meeting of the Federal-Provincial Wildlife Conference, its parent body.

The sad part of this statement is that nowadays the "processes leading to extinctions" are almost always ones that people have initiated. The problems we observe in stressed wildlife species are frequently the first indications of an environment gone wrong.

A resolution at the 1976 Federal-Provincial Wildlife Conference called for a committee to investigate threatened wildlife in Canada. The following year the CWS met with representatives from every province and territory, from four federal departments and from three national wildlife and conservation agencies. At that meeting COSEWIC was formed, a joint venture of federal, provincial and private agencies.

It is significant that COSEWIC has no legislative or coercive powers. Autonomy of various jurisdictional levels is retained, although each has the backing of national expertise whenever action is taken on behalf of endangered species.

COSEWIC reviews scientific status reports on species suspected of being in danger. It may then assign species to one of five categories: *rare*, *threatened*, *endangered*, *extirpated* and *extinct*. *Rare* animals are those that, while few in number or found only in few localities, are not in immediate danger, though they could be at any time. *Threatened* animals are those that, because of pressures from man-made or natural causes, may soon enter the endangered category. *Endangered* animals are those that, without

prompt action, are likely to become extinct or extirpated in the near future. Species are considered *extirpated* if they are no longer found in Canada, but exist elsewhere. We all know what is meant by the *extinct* category.

The scientific status reports are published and sold at cost by the Canadian Nature Federation. For the public, free summary sheets are available from the Canadian Wildlife Federation.

At the 1980 Federal-Provincial Wildlife Conference, COSEWIC reported that since 1977 it had reviewed status reports on 41 species. Of these, 33 were assigned to one or another of the categories mentioned above. The remainder were considered to be holding their own in acceptable fashion.

Listed as *rare* are the trumpeter swan, Caspian tern, peregrine falcon (subspecies *pealei*), Ipswich sparrow, great gray owl and ivory gull among the birds; the black-tailed prairie dog, pocket gopher, gray fox and eastern mole among the mammals; and the shortnosed sturgeon, speckled dace and giant stickleback among fish.

The list of *threatened* species includes the white pelican, peregrine falcon (subspecies *tundrius*), piping plover, burrowing owl and ferruginous hawk among the birds; and the Peary caribou among the mammals.

Endangered species are the peregrine falcon (subspecies *anatum*), greater prairie chicken, whooping crane, Eskimo curlew and Kirtland's warbler among the birds; the Vancouver Island marmot, eastern cougar and wood bison among the land mammals; and the sea otter, right whale and bowhead whale among marine mammals. Listed as *extirpated* species are the kit fox and the black-footed ferret.

Besides bird, mammal and fish species, COSEWIC also hopes to examine in the near future other wildlife such as reptiles, amphibians and invertebrates, as well as plant life.



Three Mammal Stories

The Way Back for the Wood Buffalo

One day in 1957, a CWS survey plane coursed back and forth over the north-west portion of Wood Buffalo National Park. From the plane a CWS biologist peered down at a herd of buffalo, and as the aircraft drew closer the forms of the great shaggy animals became clearer. To the scientist, these animals looked bigger and darker than buffalo he'd seen elsewhere in the huge park. And it appeared that they were completely cut off from the others by the vast muskeg that stretched everyway beyond them to the horizon. As the plane circled, the scientist felt rising excitement. Unless his eyes were playing tricks, these were wood buffalo, supposed to have been extinct since about 1940.

Ground checks soon proved there was nothing wrong with the scientist's eyes, and his rediscovery of the wood buffalo (a subspecies of the American bison) marked the beginning of their journey back from the brink of extinction.

Wood Buffalo National Park was established in 1922 as a refuge for the then remaining 2 000 wood buffalo. Between 1925 and 1928, however, over 6 000 plains buffalo were brought into the park to reduce surplus stock at Buffalo Park, Wainwright, Alberta. The two populations interbred and, by 1940, it was assumed that there were no more pure wood buffalo left.

In August 1963, 18 wood buffalo from the rediscovered herd were moved to an area northeast of Fort Providence in the Northwest Territories, further assuring their isolation from the southern herds. The transfer also was a safety measure, because some animals to the south along the Slave River had been stricken with anthrax. The new herd has thrived, and it now numbers about 660 head.

Continued problems with anthrax in Wood Buffalo National Park led to another transfer in 1965. Twenty-three wood buffalo were taken south to Elk Island National Park on the outskirts of Edmonton, where it was

hoped they would provide more offspring for future transplants. The Elk Island herd now numbers more than 120 animals.

In 1973, with the passage of the Canada Wildlife Act, the Advisory Committee for Wood Bison (ACWB) was established with provincial, territorial, Parks Canada and CWS representation. The ACWB set out to establish five geographically isolated herds of wood buffalo within the boundaries of their former range. When that is done, the wood buffalo can be removed from the endangered species Red Data Book of the International Union for the Conservation of Nature and Natural Resources (IUCN), and also from our own COSEWIC list.

A bull wood bison, larger than its plains relative, casts a disinterested eye at the photographer [facing page]. Beside a small stream near the Sweetgrass Buffalo Station in Wood Buffalo National Park, bison graze among Canada geese and a rare whooping crane [below].



Another aim of the ACWB is to further protect the wood buffalo gene pool by placing small breeding herds in zoos. Since 1976, transfers of wood buffalo from Elk Island National Park to zoos have been made every year. So far, animals have gone to six zoos or animal parks in Canada as well as to the San Diego Zoo in California.

The next attempt to transfer more animals to the wild was made in 1978. Twenty-eight Elk Island wood buffalo were moved into Jasper National Park, but 21 of them promptly left the park. When a second attempt is made, the animals' movements will have to be restricted for about a year before they are given free range. Experience in Europe with the wisent (European bison) suggests that such an approach helps condition the animals to stay where they are put.

In June 1980, 28 more wood buffalo were released in the wild near Nahanni Butte, Northwest Territories. Ten of those animals are equipped with radio collars to assist scientists observing the herd as it settles into its new range.



Bison in a pen at the Sweetgrass Buffalo Station near Fort Chipewyan, Alberta, await inoculation against anthrax during a 1976 program [above]. Grizzlies [left], relatively scarce throughout their range from Wyoming to the Yukon and Alaska, have been studied in western Canadian mountain parks and on northern barren grounds. Sporting red collars for aerial identification, caribou from northern Quebec [facing page] were taken in 1968 to Nova Scotia's Cape Breton Highlands National Park in an attempt to reestablish a herd there. Parasites and poaching wiped out this herd in a few years.

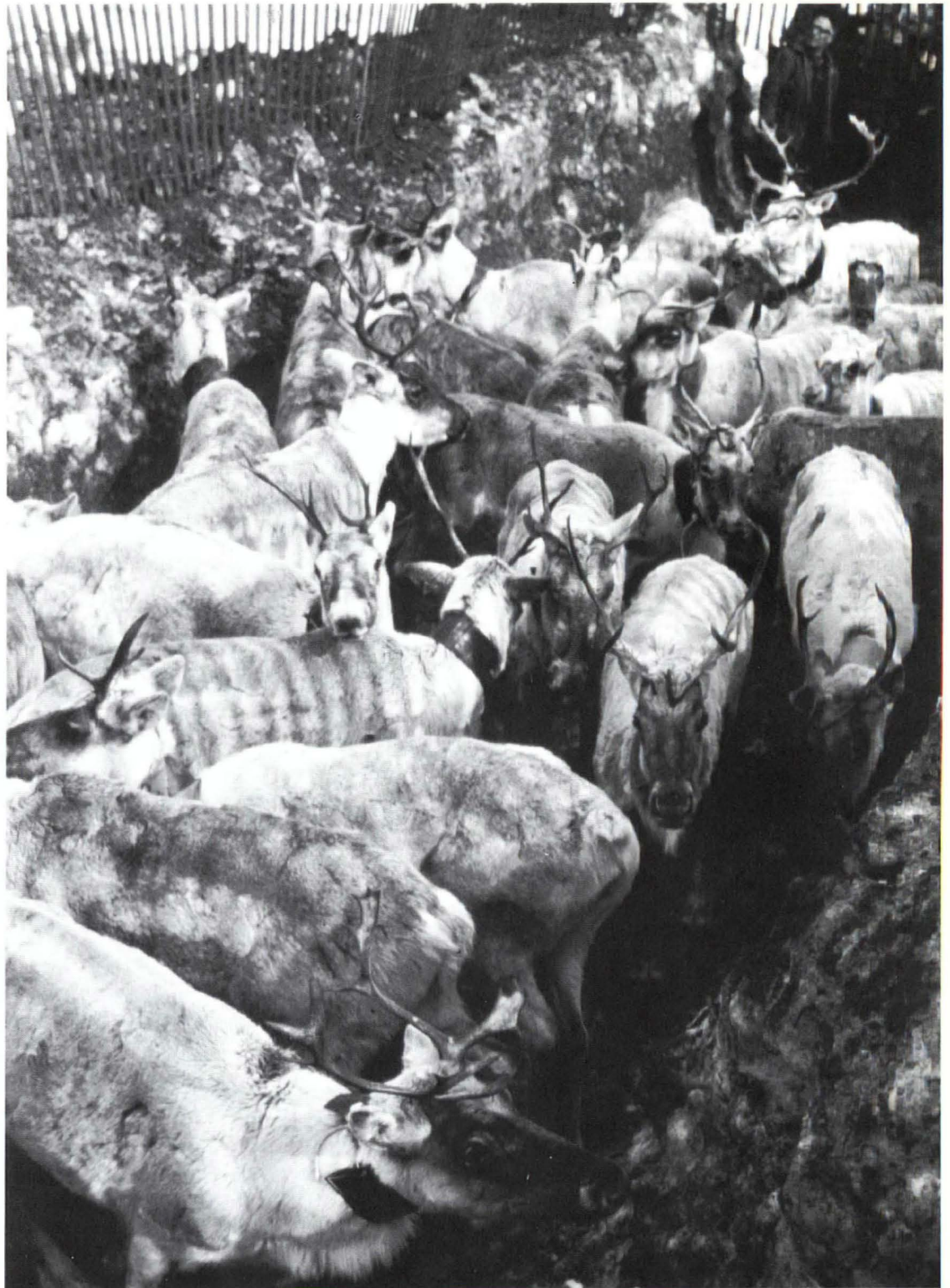
The Caribou: Where are the Great Herds?

CWS caribou research has focused on population estimates for various herds, age and sex composition of the herds, migration patterns, feeding habits and range, and the animals' reaction to harassment. The work has been costly, involving much use of aircraft. The findings of CWS research are available to the provincial and territorial governments responsible for managing the wide-ranging caribou herds, but they have not always been applied.

The Kaminuriak caribou herd ranges through the southeastern Northwest Territories and parts of northern Manitoba and Saskatchewan. In the last 30 years, herd numbers have dropped from an estimated 150 000 to 34 000. Those animals were intensively studied by CWS scientists during the late 1960s, providing data necessary for good management.

Unfortunately, the herd is still declining at a rate of some 3 500 animals per year, while being heavily harvested by native people for food. Some hunters are unconvinced that the herd is in serious decline, because they still see significant numbers in their own localities. However, if current rates of decline persist, whether from native hunting or other reasons, the herd may be virtually gone in 5 to 10 years.

The Porcupine caribou herd, some 110 000 animals, ranges across the arctic plains of northeastern Alaska through the northern Yukon and just into the Northwest Territories, annually migrating over a round trip of roughly 3 200 km (2 000 miles). The discovery of oil and gas at Prudhoe Bay, Alaska, led to widespread resource exploration throughout most of the range of this herd. Airstrips, roads and other exploration activities presented many ecological problems and precipitated a great deal of research, including work on the caribou. From 1971 to 1975 the movements and distribution of these animals received much attention.



Continued on page 38





Members of a rutting herd [above], two woodland caribou bulls in autumn pelage emerge from a swiftly-flowing river in northern Quebec [facing page]. Unlike barren-ground caribou such as the Bathurst herd in the NWT, woodland caribou do not travel in vast numbers nor as far between summer and winter ranges. Neither are they as abundant as they once were, even though the George River herd of Ungava is large. Woodland caribou are gone entirely from many areas of their former southern range, especially where forest cutting has made their habitat more suitable for deer or moose. The boreal owl [left], another resident of coniferous forests, breeds as far north as the limit of trees across much of Canada.

In 1979 the Dempster Highway was opened between Dawson City in the Yukon and Fort McPherson on the Peel River, not far into the Northwest Territories. It was an important link for oil and gas operations in the north. Unfortunately, the work was done without preliminary environmental studies, and the route taken bisects the main winter range of the Porcupine herd.

The full effect of the road on the caribou is not known, but wildlife scientists are concerned. They also are apprehensive about plans to build a gas pipeline beside the highway over most of its length. Evidence from Alaska, Scandinavia and the Soviet Union indicates that major transportation corridors through caribou or reindeer range have had long-term adverse effects on the animals.

Other herds have been holding their own in recent years, such as the Beverly herd just to the west of the Kaminuriak, the Bathurst herd further north near Bathurst Inlet, and the Bluenose herd north of Great Bear Lake. In Ungava, the distribution and movements of marked caribou were studied from 1973 to 1975 by CWS scientists, in cooperation with the Quebec and Newfoundland wildlife services. They gathered information needed to prepare an interprovincial management plan for that prolific herd.

The great George River herd of Ungava, perhaps the largest in North America, has been steadily increasing in recent years; in 1958 the animals numbered in the tens of thousands, and today there are an estimated 260 000. Recent figures show an average

annual hunting kill by native peoples of some 5 500 head, unfortunately including many pregnant does, plus about 3 500 for sport hunters.

The Great Musk-Ox Airlift

Musk-oxen disappeared from the northern regions of the Soviet Union at least 2 000 years ago. Today they are back, thanks to international cooperation in which the Canadian Wildlife Service played a major role.

On a day in late August, 1974, at a spot on the north end of Banks Island in the Northwest Territories, a CWS scientist watched as 14 captured musk-oxen were crated



and put on a small aircraft. With him was a representative of the Northwest Territories Game Branch and a Soviet biologist.

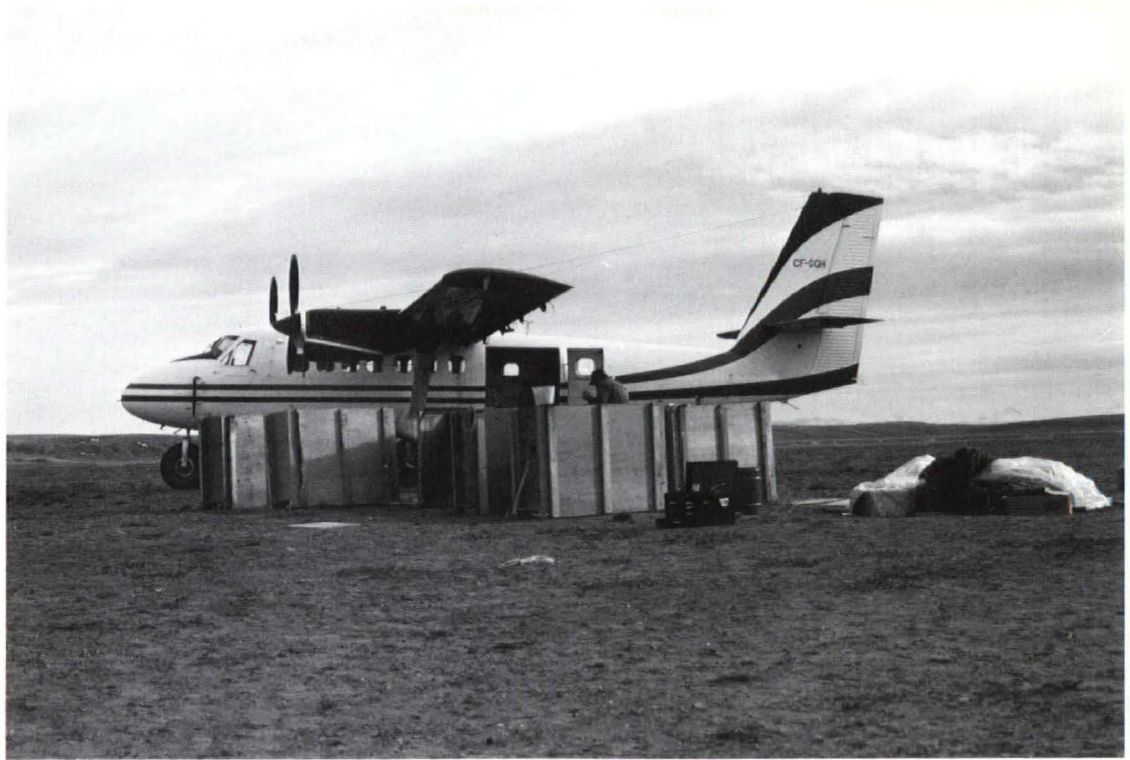
The musk-oxen were then flown south to Sachs Harbour, the only community on Banks Island. Here 10 of the animals were loaded aboard a Department of National Defence Hercules aircraft for delivery to Montreal, the first leg of their long journey to the Soviet Union. During loading, several crates were upset and four of the musk-oxen made good their escape.

At Montreal the musk-oxen were put on a Soviet Antonov-22 turboprop transport which, after stops at Iceland and Moscow, arrived at Norilsk at the southeastern end of the Taymyr Peninsula in Siberia. At Norilsk the animals were transferred to another airplane, which deposited them at Khatanga some 320 km south of their ultimate destination, a field camp in the wilderness close to Lake Taymyr. A large helicopter took them the rest of the way.

And so, after a 15 000-km journey in five different types of aircraft, musk-oxen were once again back in Siberia. They were accompanied throughout their long journey by the CWS scientist and his colleague from the Northwest Territories Game Branch.

We would like to report that the animals are thriving in their new habitat, but as yet there has been no news.

Two men who share concern for management of the caribou, with an ear-marked calf [far left]. CWS biologists [left] examine a caribou carcass left by hunters in northern Quebec. Destined for Siberia, musk-ox calves from northern Banks Island [right] await boarding a Twin Otter for the trip to Sachs Harbour.





CWS toxicologists studying the effects of contaminants in herring gulls screen off sections of a nesting colony on Chantry Island in Lake Huron [above]. Scientists also injected uncontaminated gull eggs in New Brunswick with extracts from contaminated Lake Ontario eggs and observed the hatching results [far left]. Yet inconclusive, this research is expected to reveal specific problem-causing toxic agents. Concentrations of toxic residues in birds can cause deformities such as the crossed bill of this Caspian tern chick from Pigeon Island, Lake Ontario [left].

A CLOSER LOOK

Through a Gull's Egg

CWS scientists monitoring pollution levels in the Great Lakes for the past six years have been using, among other things, the eggs of herring gulls. The research is carried out according to the International Great Lakes Water Quality Agreement between Canada and the United States.

The herring gull is at the top of a food chain that can be traced down through fish, small crustaceans to microscopic organisms in the lake water. Organochlorine pollutants in Great Lakes water are in concentrations in the parts-per-trillion range — virtually undetectable. But in a herring gull egg, a part of the overall ecosystem, these compounds accumulate in parts-per-million and thus can be readily measured.

CWS scientists have demonstrated how good the herring gull is at accumulating pollutants. They compared it with the Great Lakes coho salmon which feeds on alewives and smelt, as does the gull. Levels of four organochlorines (PCBs, DDE, mirex and photomirex) were two to three times higher in salmon muscle tissue than in the alewives and smelt, and *37 to 60 times higher* in gull eggs. Scientists also discovered traces of some 400 other artificial compounds in herring gulls from Lake Ontario. The Great Lakes gulls have the dubious honor of probably holding the world's record for the species for high levels of organochlorine contamination.

Year-round residents of the Great Lakes region, herring gulls nest in colonies and seldom stray beyond their home lake. These habits afford a way to compare pollution levels in the various lakes and also keep a check on gull breeding success, which is adversely influenced by the contaminants. Researchers also have taken contaminated

Great Lakes eggs to New Brunswick to be hatched by uncontaminated birds, in experiments designed to show relationships between levels of contamination and breeding success.

Since the late 1960s, the use of DDT, PCBs and several other pollutants in Ontario and much of North America has been curtailed. The effects are just starting to appear. From 1974 to 1978, CWS scientists checked gull eggs from Lakes Superior, Huron, Erie and Ontario for six major contaminants — DDT, DDE, HCB, dieldrin, mirex and PCB. Significant decreases of DDT, mirex and PCB levels had occurred at all herring gull colonies save one at Lake Superior. DDE, HCB and dieldrin levels also were lower at most of the colonies. Recently, dramatic improvements in breeding success have been noted at the Lake Erie and Lake Ontario gull colonies.

Getting Close in the Wild

What rotten luck! The bear was an easy target but she moved an instant before the dart was fired. She was gone, swallowed up in the dense hazel brush. Somewhere along the route of her escape the drug-filled dart lay out of sight.

The biologist with the gun muttered to himself, flipped back the top of a small leather case and eased up the short aerial from the black box inside. As he twiddled a knob, there was an audible beeping. He swung the box back and forth in an arc, and when the signal was at its loudest he stepped into the undergrowth. Within minutes he emerged with the dart in his hand. Where the bear was during this time was anybody's guess.

To examine animals closely in the wild, biologists immobilize them with a small drug-filled dart usually fired from a shotgun. Sometimes the dart also contains a tiny radio transmitter to aid tracking the animal before it succumbs to the drug. While the animal is immobilized a scientist can measure it and get other vital data. When the animal is a large one like a bear, it can be a risky business.

The dart is a metal cylinder about 15 cm long and 1.3 cm in diameter with a long, hollow needle at the business end. Putting a radio transmitter in such a missile had been a challenge for the CWS bioelectronics people.

Field biologists once used sernylan to drug animals, but for several reasons production of sernylan was stopped. A drug combination called Rompun/ketamine was then tried, but more of it was needed to produce the desired effect. A longer dart seemed the obvious answer, but the increased length and weight made it unbalanced and decreased accuracy. The bioelectronics experts looked at the dart's radio transmitter instead. They were able to cut down its size so that more drug could be accommodated without increasing the size of the dart. The tiny transmitter is built to broadcast its come-and-get-me message for three days.

CWS bioelectronics experts have produced many other tools for wildlife biologists, such as the radio collar. These have been designed for bears, bison, caribou, deer, wolves, pine marten, lynx and weasels as well as for birds. Battery-powered, some of the collar transmitters have broadcast for up to three years.



CWS biologists warily approach a drugged polar bear, the metal dart containing the drug visible in its neck [above]. The drug, causing no harm, allows scientists to place a radio collar on the bear so its movements can be traced [left].



Trap transmitters save time and money, and afford added protection for field researchers. In live-trapping bears, for example, a number of traps are set out, each with a transmitter attached that will broadcast its tone just so long as the trap is not sprung. A helicopter makes a swing over the area, and lands nearby when a "silent" trap is located. The biologist then approaches cautiously, knowing he is about to encounter an animal with a grouchy disposition. When he is certain the bear is in the trap, he uses his dart gun to tranquilize the animal. Perhaps then a radio collar may be attached, or the bear may be measured or weighed by suspending it in a sling.

A modified version of the bear-trap transmitter has traveled into outer space on Canadian rockets to facilitate recovery of their instrument payloads. But that's another story.

The Benefits of Beavers

Farmland nudging into forest tracts and the building of roads in rural areas have helped keep many farmers, municipal officials and civil engineers aware of our national wildlife symbol. Once near extinction, the beaver now is abundant in some regions. Often these days roads are converted into dams by beavers, the culvert pipes under them stuffed with sticks and mud. Sometimes the water rises above the road. And, to the aggravation of farmers, beavers also repeatedly convert pastures and cropland into reservoirs. These activities certainly have not endeared these animals to many people, and frequently have led to measures to get rid of them — often expensive measures.

Such expenses should not, however, blind us to several benefits that the beaver confers upon us free of charge. First of all, beaver ponds provide habitat for much other wildlife: herons, ducks, muskrats, turtles, frogs, fish and aquatic insects, to name some. But we also gain immensely from some engineering aspects of beavers' work. For example, their reservoirs (normally they build a series) allow time for water to seep down through the ground rather than running off quickly. This helps to replenish the water table, which bears directly on the supply in wells and springs and affects plant growth. Their dams, far from being watertight, allow water to seep profusely, maintaining running streams during dry times which benefit domestic stock and wildlife alike. Conversely, in times of heavy runoff, the large amount of water that can be stored behind beaver dams actually slows the water flow and reduces flooding. When storms bring large amounts of rain following dry periods this flow control is most effective, because it is under these conditions that the dams afford the greatest amount of storage.

The next time you must slow your car at a section of highway flooded by a beaver dam, remember that the beavers can't be expected to always build their homes exactly where we want them to!

Waterfowl and Grain Farmers

In our shared environment we exert great influence upon wildlife by modifying or restricting its habitat, and by hunting and trapping. On the other hand, occasionally wildlife takes advantage of an activity of man that has altered its habitat.

Waterfowl on the prairies have helped themselves to the grain farmer's crop ever since the land was first plowed. The damage they did became serious in the 1940s, as more and more farmers took up the practice of swathing grain. A mowing machine leaves the crop lying in long rows or "swaths", and before it is gathered up by the combine, it is left for some time to mature evenly. That's when the birds eat, trample and foul it. Mal-

lard and pintail ducks do the most damage, although geese also are a problem. In some areas, sandhill cranes are troublesome.

Crop losses have averaged about 1 percent of crop value annually, in some years exceeding \$10 million. While this is a considerable amount of money, hail damage in Alberta and Saskatchewan has been in the range of 4 percent of crop value. But, farmers generally seem more resigned to accept losses caused by weather than they are to those caused by grain-eating waterfowl. Farmers can get insurance to cover losses caused by hail, but who should bear the cost of crop damage from waterfowl remains an explosive issue.

The problem is further complicated because crop depredation by waterfowl occurs repeatedly in some areas, occasionally in others, and rarely if at all in most places. While some grain growers in the areas where serious crop damage occurs view the birds only as pests, others enjoy having ducks on their land and many of them are, in fact, hunters. For wildlife management agencies the situation poses a dilemma. It is difficult to promote programs of waterfowl habitat enhancement or preservation that will please those who want the birds as well as those who do not.

Sandhill cranes on a Saskatchewan grain field near Last Mountain Lake.





Barley seed heads, damaged by waterfowl and undamaged.

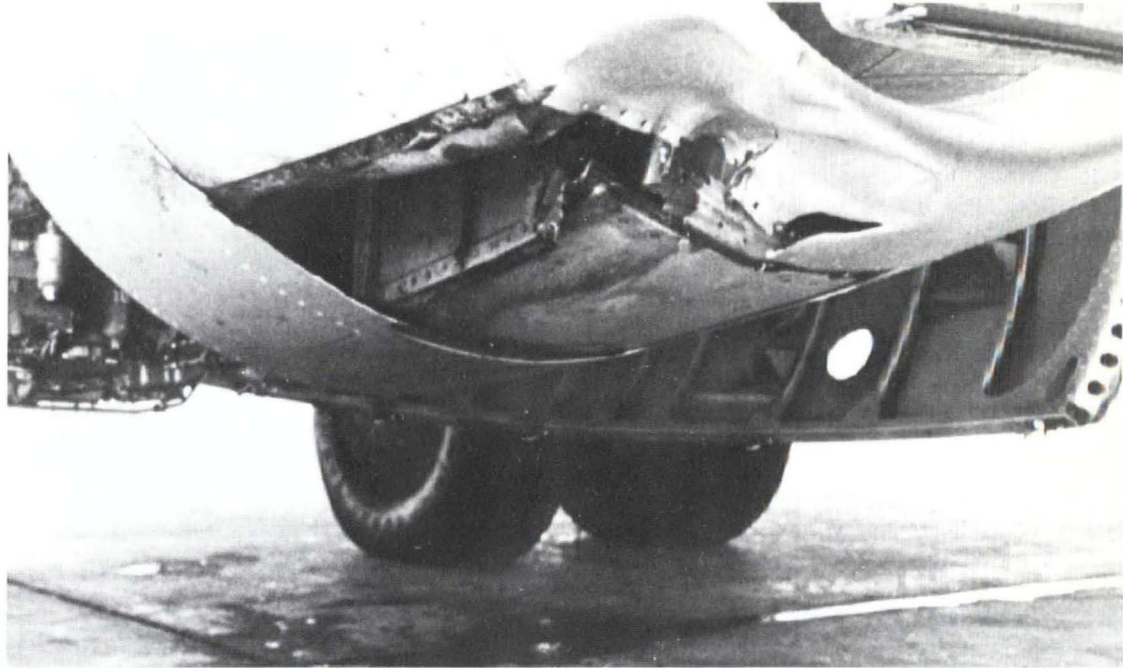
Ideas for coping with grain-eating waterfowl have ranged from the use of alternative crops which the birds do not bother, such as flaxseed and rapeseed, to lure-crops designed to entice birds away from vulnerable areas, and the liberal employment of a variety of scaring devices. Despite the best efforts, however, the problem remains as a classic example of man and wildlife in direct confrontation in a complex interaction of economic, political and environmental concerns.

Birds and Aircraft

Birds are great foragers in garbage. Too often, though, a dump may be located near an airport, and the birds' trips back and forth to the banquet area frequently cut across the runways.

That was one early finding of the National Research Council's Associate Committee on Bird Hazards to Aircraft, after it began studies in 1962. On the Committee were representatives of the NRC, the Department of Transport, the Department of National Defence, the major airlines, the aeroengine manufacturers, the Canadian Airline Pilots' Association, and the CWS.

Actually, the CWS had been providing advice since the late 1940s on ways to make airports less attractive to flocks of birds. Se-



Engine housing of a Boeing 737 after colliding with a goose over Winnipeg on May 11, 1969.

rious accidents do occur. In 1960 a Lockheed Electra collided with starlings and crashed at Boston, killing 62 persons. In 1962 a Vickers Viscount went down in Maryland after striking a whistling swan; 17 lives were lost.

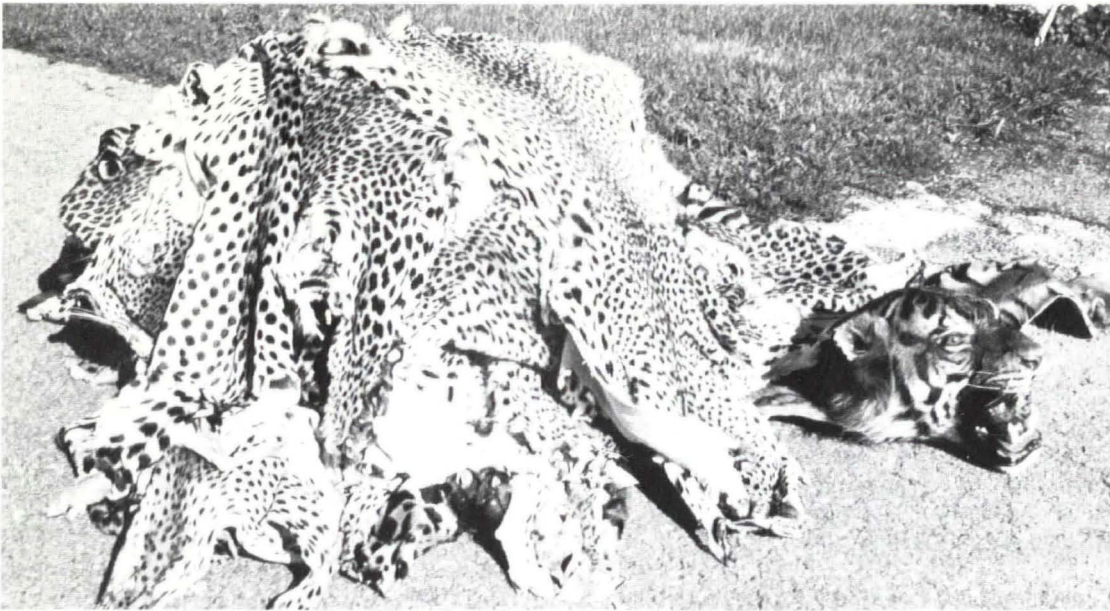
That year the newly formed Committee in Canada looked at possible engineering solutions to reduce such hazards, but designing aircraft and aeroengines to withstand the tremendous impact of bird bodies appeared difficult. The Committee then checked the locations where aircraft-bird collisions occurred. Three-quarters of those involving civil airlines were at or near airfields. (On the other hand, three-quarters of the collisions involving Canadian Armed Forces aircraft occurred far from their bases, during high-speed flights at low altitudes where birds are more concentrated.)

The Committee discovered that food, shelter and bodies of water are what attract birds to airports. Garbage draws many. Gulls quickly establish routine patrols to pick through it. Shelter, such as nooks and crannies around terminal buildings, in ornamental

shrubbery, and in nearby woods, brush or agricultural crops may bring many kinds of birds.

As the Committee investigated methods for keeping birds out of the way of aircraft, it often found solutions difficult to apply. For example, draining and filling a small pond or relocating a garbage dump may seem simple matters, but can be time-consuming or difficult because such areas often are outside the boundaries of airports and the jurisdiction of airport authorities.

Numerous ways were tried for frightening birds away from certain areas, including the use of noise-making devices or sound systems to broadcast specific birds' distress calls, and even the use of trained peregrine falcons or model airplanes shaped like falcons. Varying degrees of success followed those efforts. Many birds, apparently, adapt quite readily to forms of harassment that do not actually harm them.



Leopard, cheetah and tiger skins confiscated by Canadian Customs. People who bring home such products from foreign lands risk not only disappointment, but prosecution as well.

Research also has provided methods to reduce hazards from migrating flocks of birds beyond airport areas. The use of radar and photography to follow migratory flights has shown relationships between such flights and known weather patterns. Thus predictions of bird migration intensities to some extent can be based on weather forecasts.

By the early 1970s the Department of Transport had spent about \$10 million in modifying airports to reduce bird attraction, in accord with the Committee's recommendations. Perhaps the best indication of the success of that work was the reduction in the cost of bird damage to Air Canada planes operating in this country; over a 10-year period the average annual cost of aircraft parts replaced fell from about \$240 000 to \$125 000.

Noah didn't need a Permit

Poaching, which supports the international trade in illegally obtained animals, is an enormous problem today, especially in developing nations in Africa, South America and the Far East. Many of these countries

depend heavily on income derived from their native biological resources, from legalized hunting and tourism. Poaching can seriously undermine such a nation's economy. Worse, the number of species being hastened toward extinction is appalling: tigers and leopards in India or Indonesia; jaguars, monkeys and birds in South America; and a multitude of animals in Africa. The slaughter of animals, including many endangered ones, for their fur, ivory and other products will continue as long as there is a demand for such products. Many other exotic animals, captured for the pet trade, perish enroute to the dealers.

To combat this problem, the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) was established in 1973. The organization's secretariat is at the International Union for Conservation of Nature and Natural Resources (IUCN) in Gland, Switzerland. Funds are provided by the United Nations Environment Program (UNEP), and today more than 70 countries are participating.

More than 1 000 species of concern to the signatory countries are now listed by the Convention. The conditions of trade stipulated for various categories apply not only to live animals and plants, but also to their parts or items produced from them.

Trade in rare or endangered species for commercial purposes is prohibited. Where it is permitted, often involving animals destined for zoos, the importer must have a CITES export permit from the exporting country, as well as an import permit issued by the importer's country. Import of species not currently endangered, but which could become so if trade is not regulated, requires a CITES export permit from the nation of origin. Furthermore, any individual nation can regulate or prohibit exportation of a threatened native species, even if it is not otherwise so listed by CITES.

In Canada, CITES is administered by the CWS and enforced under the Export and Import Permits Act by Canadian customs officers. The CITES administrator at the CWS is responsible for issuing all import permits for all Convention species, as well as export permits for Canada's migratory birds, marine species and fish. Export permits for other species must be obtained from the wildlife service of the province or territory from which the animals are taken. Export permits for plants are available from the plant quarantine offices of Agriculture Canada, except in Quebec where the matter is handled by the Plant Protection Branch of the Quebec Department of Agriculture.

Because CITES is relatively new, the CWS is aware that many returning travelers may not learn until they reach a Canadian Customs check point that their prized ivory cribbage board, alligator handbag or beautiful tiger skin is to be confiscated for lack of a permit. To inform people about CITES requirements and prohibitions and to discourage travelers from bringing home exotic animal products, the CWS has published a leaflet entitled *Noah didn't need a permit. What about you?*

Rain, Rain, Go Away!

Acid rain, with its potential for damaging great tracts of the environment, has become one of the most frightening problems we face today. We are paying dearly for believing that we could use the atmosphere as a limitless aerial dump — a place where we could cast off and dilute our wastes forever, with no harm to anyone or anything.

The burning of fossil fuels in homes, motor vehicles, power plants and factories, and the smelting of metal ores, pushes into the atmosphere about 6.6 million tonnes of sulfur dioxide and nitrogen oxides each year in Canada. The United States produces about 44 million tonnes of these wastes annually.

The moving atmosphere transports large amounts of these gases over long distances and across international boundaries. In the process they are chemically transformed, and they return to earth as sulfuric and nitric acids in rain or snow. The effects are most apparent in the aquatic ecosystems of eastern Canada and the northeastern United States, regions where greater amounts of fossil fuels are used.

As lakes and streams become more and more acidified, numerous biological changes occur. Aquatic plant and animal communities are altered along with the water chemistry. Although adult fish may be able to survive, they fail to reproduce. In the Adirondack Mountains of New York state, fish have disappeared from more

than 100 lakes so far. The loss to tourism there from the decline in sport fishing has been over \$1 million annually.

In Ontario, lake trout, brook trout and walleye have declined, and the rare aurora trout may now be extinct as a result of acidification. And evidence also suggests that the spawning of Atlantic salmon in the streams of the Maritime provinces and Quebec is affected.

How will a reduction of fish in acidic lakes affect other parts of the aquatic ecosystem? Conceivably there may be a proliferation of their more acid-tolerant prey, such as mosquito larvae. There could be a change in populations of fish-eating birds, too. In Swedish lakes where acidification has reduced fish stocks, mergansers and loons have departed for waters offering more abundant food. Aquatic wildlife also may be affected by the accumulation in water of metals released from soils and sediments under acid conditions. Aluminum, for example, has reportedly caused the thinning of bird eggshells in acidified areas of Swedish Lapland. Ultimately, in aquatic ecosystems, all forms of life may be irreversibly affected.

The effects of acid precipitation on terrestrial ecosystems of northeastern North America are not yet as well known as those on the aquatic ecosystem. However, evidence from our own observations and from Europe suggests that damage to the land, too, can be serious. A notable example is the loss of soil productivity for agriculture. Changes in soil chemistry may affect wildlife by depleting essential elements needed for nutrition. For example, selenium, which is needed by warm-blooded animals, is reduced

under acidic conditions. The uptake of that element by plants is inhibited by the presence of sulphur.

Also a major concern is the threat to the health of our forests, which regulate water runoff and control soil erosion. And, apart from their vast economic significance as wood and fibre, these expanses also represent wildlife habitat and recreational domain.

The CWS has launched a 10-year research program into the acid rain problem.

More information about acid rain may be obtained by writing: Information Directorate, Environment Canada, Ottawa, Ontario K1A 0H3.

THE NEED TO BECOME INVOLVED

Public awareness of wildlife and its role as an integral part of our overall environment is not merely desirable — it is essential. Without the support of a public that recognizes the significance of wildlife preservation and management, the efforts of any government agency are seriously hindered and ultimately could even be futile.

Thus, there is a great need for informed people to become involved, people who see clearly the link between the welfare of wildlife and our own long-term well-being. The common ground is the environment we share. If it is unhealthy for one, can it be healthy for the other?

May we make a few suggestions?

If you are concerned about wildlife and the environment, and wish to take an active part in working to protect and conserve them, we suggest that you:

- Join one of the many organizations devoted to wildlife and nature.
- Take every means to learn about wildlife and wildlife-related matters in your area.
- Inform yourself about wildlife regulations.
- Read more about wildlife and take every opportunity to see wildlife films.
- Establish contact with your provincial and federal government wildlife agencies.
- Disturb wildlife as little as possible.

Your Wildlife Organization Contacts

Non-Government Organizations

CANADIAN NATURE FEDERATION
75 Albert Street
Ottawa, Ontario K1P 6G1

CANADIAN WILDLIFE FEDERATION
1673 Carling Avenue
Ottawa, Ontario K2A 1C4

DUCKS UNLIMITED (CANADA)
1495 Pembina Highway
Winnipeg, Manitoba R3T 2E2

THE NATIONAL AND PROVINCIAL
PARKS ASSOCIATION
47 Colbourne Street
Toronto, Ontario M5E 1E3

THE NATURE CONSERVANCY OF
CANADA
2180 Yonge Street
Toronto, Ontario M4S 2E7

WORLD WILDLIFE FUND (CANADA)
60 St. Clair Avenue East
Toronto, Ontario M4T 1N5

Provincial and Territorial Agencies

ALBERTA
Department of Energy and Natural
Resources
Fish and Wildlife Division
8th Floor, South Tower
Petroleum Plaza
9915 – 108 Street
Edmonton, Alberta T5K 2C9

BRITISH COLUMBIA
Ministry of Environment
Fish and Wildlife Branch
Parliament Buildings
Victoria, British Columbia V8V 1X5

MANITOBA
Department of Natural Resources
Wildlife Branch
1495 St. James Street
Winnipeg, Manitoba R3H 0W9

NEW BRUNSWICK
Department of Natural Resources
Fish and Wildlife Branch
P.O. Box 6000
Fredericton, New Brunswick E3B 5H1

NEWFOUNDLAND
Department of Tourism, Recreation and
Culture
Wildlife Division
Building 810, Pleasantville
St. John's, Newfoundland A1A 1P9

NOVA SCOTIA
Department of Lands and Forests
Wildlife Division
P.O. Box 516
Kentville, Nova Scotia B4N 3X3

ONTARIO

Ministry of Natural Resources
Wildlife Branch, Whitney Block
99 Wellesley Street West
Toronto, Ontario M7A 1W3

PRINCE EDWARD ISLAND

Department of Community Affairs
Fish and Wildlife Unit
P.O. Box 2000
Charlottetown, Prince Edward Island
C1A 7N8

QUEBEC

Ministère du Loisir, de la Chasse et de la
Pêche
Direction générale de la faune
150, boul. Saint-Cyrille est
Québec, Québec G1R 4Y1

SASKATCHEWAN

Department of Tourism and Renewable
Resources
Fisheries and Wildlife Branch
3211 Albert Street South
Regina, Saskatchewan S4S 5W6

NORTHWEST TERRITORIES

Department of Renewable Resources
Fish and Wildlife Service
Yellowknife, Northwest Territories X1A 2L9

YUKON TERRITORY

Department of Renewable Resources
Wildlife Branch
Whitehorse, Yukon Y1A 2C6

Federal Government Agencies

Department of the Environment
Canadian Wildlife Service
Ottawa, Ontario K1A 0E7

Department of the Environment
Canadian Forestry Service
Ottawa, Ontario K1A 0E7

Department of the Environment
Inland Waters Directorate
Ottawa, Ontario K1A 0E7

Department of the Environment
Lands Directorate
Ottawa, Ontario K1A 0E7

Department of Indian and Northern Affairs
Ottawa, Ontario K1A 0H4

Department of Energy, Mines and Resources
Ottawa, Ontario K1A 0E4

Canadian Wildlife Service Regional Offices

Canadian Wildlife Service
Pacific and Yukon Region
P.O. Box 340
Delta, British Columbia V4K 3Y3

Canadian Wildlife Service
Western and Northern Region
1000, 9942 – 108 Street
Edmonton, Alberta T5K 2J5

Canadian Wildlife Service
Ontario Region
1725 Woodward Drive
Ottawa, Ontario K1A 0E7

Canadian Wildlife Service
Québec Region
2700, boulevard Wilfrid Laurier
Case postale 10 100
Ste-Foy, Québec G1V 4H5

Canadian Wildlife Service
Atlantic Region
P.O. Box 1590
Sackville, New Brunswick E0A 3C0

For Reading and Watching

Field Guides

These are designed to help the reader to identify wildlife. The Peterson Field Guide Series and the Audubon Field Guides are widely accepted by naturalists, but there are also many other excellent guides from which to choose.

General Books

The Birds of Canada. W. Earl Godfrey. 1966. Canadian Government Publishing Centre. Hull, Quebec.

Canada's Special Resource Lands. W. Simpson-Lewis, et al. 1979. Canadian Government Publishing Centre. Hull, Quebec.

Canadian Wildlife and Man. Anne Innis Dagg. 1974. McClelland and Stewart. Toronto.

Conservation in Canada. J.S. Maini and A. Carlisle, eds. 1974. Canadian Government Publishing Centre. Ottawa.

The Mammals of Canada. A.W.F. Banfield. 1974. University of Toronto Press. Toronto and Buffalo.

One Cosmic Instant. John A. Livingston. 1973. McClelland and Stewart. Toronto.

Biological Conservation. David W. Ehrenfeld. 1970. Holt, Rinehart and Winston. Toronto.

Working for Wildlife: the Beginnings of Preservation in Canada. Janet Foster. 1978. University of Toronto Press. Toronto.

Book Catalog

The Nature Canada Bookshop, 75 Albert Street, Ottawa, Ontario K1P 6G1, will send on request their mail order catalog covering a wide range of books on such topics as conservation, ecology, bird feeders, wildlife, wilderness recreation and survival.

Periodicals

Audubon

Published bimonthly by National Audubon Society, 950 Third Avenue, New York, New York 10022.

BioScience (a scientific journal)

Published monthly by American Institute of Biological Sciences, 1401 Wilson Boulevard, Arlington, Virginia 22209.

Blue Jay

Published quarterly by the Saskatchewan National History Society, Box 1784, Saskatoon, Saskatchewan S7K 3S1.

The Canadian Field Naturalist

Published quarterly by the Ottawa Field Naturalists' Club. Box 3264, Postal Station "C", Ottawa, Ontario K1Y 4J5.

Ecology (a scientific journal)

Published bimonthly by Duke University Press, Press Building, East Campus, Duke University, Durham, North Carolina 27708.

Environment

Published monthly (except bimonthly Jan/Feb and July/Aug) by the Helen Dwight Reid Educational Foundation in cooperation with the Scientists' Institute for Public Information, 4000 Albemarle Street N.W., Washington, D.C. 20016.

International Wildlife

Published bimonthly by National Wildlife Federation, 1412 16th Street N.W., Washington, D.C. 20036. Can be obtained from the Canadian Wildlife Federation, Ottawa.

Natural History

Published monthly by the American Museum of Natural History, Central Park West at 79th Street, New York, New York 10024.

Le Naturaliste Canadien

Published bimonthly by l'Université Laval, case postale 2447, Québec, Québec G1K 7R4.

Nature Canada

Published quarterly by the Canadian Nature Federation, 75 Albert Street, Ottawa, Ontario K1P 6G1.

Outdoor Canada

Published seven times a year by Outdoor Canada Magazine Ltd., 953A Eglinton Avenue East, Toronto, Ontario M4G 4B5.

Owl (for youngsters)

Ten issues per year, published by the Young Naturalist Foundation, 59 Front Street East, Toronto, Ontario M5E 1B3.

Continued on page 52



Arctic foxes [pups, above], with an extremely varied diet and high reproductive potential, are superbly adapted to the frigid polar environment. The conservation of sea ducks such as king eiders [right] and especially common eiders has entailed the cooperative efforts of the CWS and residents of various northern communities. See page 23.



The Unspoiled Land?

Vast and beautiful, the Arctic is more than merely a storehouse of resources for man's use. Majestic mountains of Ellesmere Island inspire a biologist photographing nesting ivory gulls [right and below]. Musk oxen [left] cross a pebbled watercourse on Bathurst Island in an area where the particular characteristics of climate, topography and vegetation provide a veritable oasis for many species of wildlife. But the Arctic is beginning to feel the effects of development, particularly the extraction and transportation of oil and gas. CWS biologists are helping to find ways of reducing the impact on fragile northern ecosystems.



Looking like ants from an airplane, caribou on the tundra of northern Quebec seek relief from biting insects and summer heat on a few acres of snow [left]. Many other insects besides mosquitos and flies are numerous in the Arctic, including bumblebees, beetles and 20 kinds of butterflies [above] that, as caterpillars, feed on the leaves of various plants during the short summer.

Information from Government Sources

A wide variety of wildlife and environmental material is published by provincial and federal wildlife agencies. Write to the addresses given above for up-to-date publication lists.

Information from Science Museums

The following museums have library facilities for public use and books for sale.

British Columbia Provincial Museum
Heritage Court
601 Belleville Street
Victoria, British Columbia V8V 1X4

Manitoba Museum of Man and Nature
190 Rupert Avenue
Winnipeg, Manitoba R3B 0N2

Musée de sciences naturelles
1158, avenue Bourlamaque
Québec, Québec G1R 2P7

National Museum of Natural Sciences
Metcalf and McLeod Streets
Ottawa, Ontario K1A 0M8

New Brunswick Museum
277 Douglas Avenue
Saint John, New Brunswick E2K 1E5

Newfoundland Museum
Duckworth Street
St. John's, Newfoundland A1C 1G9

Nova Scotia Museum
1747 Summer Street
Halifax, Nova Scotia B3H 3A6

Prince Edward Island Wildlife Park
North Rustico, Prince Edward Island C0A
1X0

Provincial Museum and Archives of Alberta
12845 - 102 Avenue
Edmonton, Alberta T5N 0M6

Royal Ontario Museum
100 Queen's Park
Toronto, Ontario M5S 2C6

Saskatchewan Museum of Natural History
Wascana Park
Regina, Saskatchewan S4P 3V7

Wildlife and Nature Films

The National Film Board of Canada has an excellent selection of films and they may be borrowed through any of its local offices. The National Film Board also distributes a number of the films shown on the CBC television series, "The Nature of Things". Free catalogs are available on request. A few recent titles of interest are:

The Atlantic Salmon	1978
Caribou in Northern Canada	1971
Death of a Legend (Wolves)	1971
Flight of the Snows (Snow Geese)	1974
Gannets of Bonaventure Island	1973
The Great Blue Heron	1979
A Great White Bird (Whooping Crane)	1978
In Search of the Bowhead Whale	1974

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- 5 National Photography Collection, Public Archives.
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- 17 Top and bottom, CWS.
- 18 CWS
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- 21 All, CWS, Bernard Behne.
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- 23 CWS, David Noble.
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- 38 Left, CWS, T.C. Dauphiné; right, CWS.
- 39 Top and bottom, CWS, Eric Broughton.
- 40 Top and bottom left, CWS; bottom right, CWS, Karl Himmer.
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- 43 CWS, Dalton Muir.
- 44 Left and right, CWS.
- 45 CWS, John B. Heppes.
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- 55 CWS, Dalton Muir.

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1. *Working for Wildlife: the Beginnings of Preservation in Canada*, Janet Foster, University of Toronto Press, 1978.
2. *Conservation of Wildlife in Canada*, C.H.D. Clarke. In: *Conservation in Canada*, J.S. Maini and A. Carlisle, Canadian Forestry Service, 1974, p. 208.
3. *Nest Record Card Program in Canada*, Anthony J. Erskine, Canadian Wildlife Service. In: *Canadian Field Naturalist*, Vol. 85, No. 1, January-March 1971, p. 11.
4. *Migratory Game Bird Hunters and Hunting in Canada*, H. Boyd and G.H. Finney eds., Canadian Wildlife Service Report Series No. 43, 1978.
5. *An Atlas of Eastern Canadian Seabirds*, R.G.B. Brown, D.H. Nettleship, P. Germain, C.E. Tull and T. Davis. Canadian Wildlife Service Catalog No. CW66-44/1975.

Canada goose nesting in the Creston Valley, British Columbia. A great deal of Canadian Wildlife Service effort has been directed at the preservation and management of waterfowl habitat. Wetlands are threatened all across southern Canada by housing developments, highways and industry. See page 11.

