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Northern Diseased Bison

Report of the
Environmental
Assessment Panel

August, 1990

Canada

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Northern Diseased Bison

Report
Of the Environmental
Assessment Panel

August, 1990



Overlooking the salt plains at Wood Buffalo National Park.

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**NORTHERN DISEASED BISON
ENVIRONMENTAL ASSESSMENT PANEL**

The Honourable Robert de Cotret
Minister of the Environment
House of Commons
Ottawa, Ontario

The Honourable Donald Mazankowski
Minister of Agriculture
House of Commons
Ottawa, Ontario

Dear Ministers:

In accordance with the terms of reference issued on 7 February, 1989, the Environmental Assessment Panel has completed its review of the northern diseased bison problem in and around Wood Buffalo National Park. We are pleased to submit this report for your consideration.

Yours sincerely

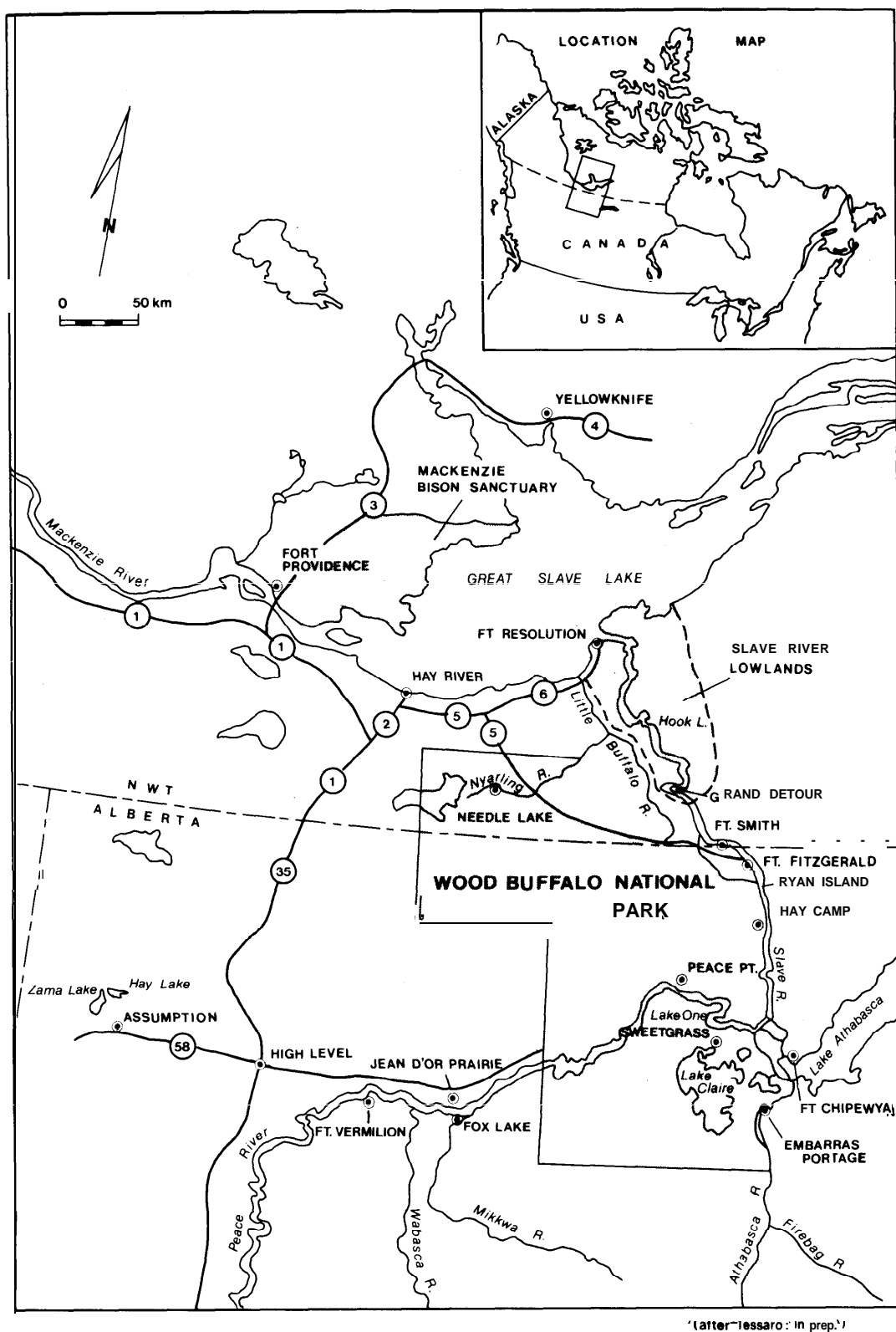
Robert G. Connelly
Chairman
Northern Diseased Bison
Environmental Assessment Panel

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Northern Diseased Bison



(after Lessaro: in prep.)

FIGURE 1 Area of interest.

Executive Summary

By 1890, the once enormous herds of plains bison had been reduced to a remnant in a score or so of herds in private ownership. The wood bison, too, had disappeared from most of its historical range and survived only in a few hundred square kilometres of woods and small prairies near the junction of the Peace and Slave rivers in northeastern Alberta.

Early in this century, in a far-sighted and widely acclaimed move, the Canadian government purchased one of the herds of plains bison, that of a Montana rancher named Michel Pablo, and moved it to central Alberta. At the same time, steps were taken to protect the surviving wood bison. When Wood Buffalo National Park was established in December 1922, there were about 6,500 plains bison in Buffalo Park at Wainwright, Alberta, and several hundred more in national parks such as Banff and Elk Island. In the north, the wood bison had recovered to an estimated 1,500 head.

By 1923 and 1924, the plains bison at Wainwright had become too numerous for the available range to support. Between 1924 and 1925, 2,111 bison, mainly older males, were culled. The slaughter caused a public outcry because it seemed to be out of harmony with the effort to save the buffalo. It also revealed a high prevalence of tuberculosis in the animals killed.

Faced with the necessity to reduce the population, the Government continued the unpopular slaughters and during the years 1925 to 1928, 6,673 plains bison were transferred to Wood Buffalo National Park. Protests by those who maintained that tuberculosis would be introduced to the new range and that interbreeding of the two subspecies would result in the disappearance of pure wood bison were ignored. We now know that tuberculosis was introduced and interbreeding did take place. Wainwright animals were never tested for the presence of bovine brucellosis but characteristic symptoms were noted during slaughters. Bovine brucellosis was confirmed in Wood Buffalo National Park in 1956.

Initially, the bison population increased to about 12,000 animals, but since 1970, their numbers have steadily declined. In March 1990, only 3,200 were counted in Wood Buffalo National Park.

In 1959, a small herd of bison, discovered near the Nyarling River in the north end of Wood Buffalo National Park, proved to have most of the morphological features of wood bison. Animals from that herd were captured and, after repeated tests for both diseases, test-negative animals were transported to both the Mackenzie Bison Sanctuary and the south portion of Elk Island National Park. The latter herd has provided founding stock for satellite herds in Yukon, the Northwest Territories, northwestern Alberta, and Manitoba. The former herd increased to about 2,040 by March 1990 and testing has revealed no evidence of tuberculosis and bovine brucellosis. In the course of increasing its numbers, the herd expanded its

area of occupation. The possibility that it too could come into contact with diseased animals and that interbreeding might again take place is of real concern to those working for removal of wood bison from lists of threatened or endangered species in Canada.

Agricultural activity to the west of Wood Buffalo National Park began in 1788 with the founding of Fort Vermilion and has undergone slow but steady expansion. As a result, cattle and bison have come into closer proximity. In 1985, Canada's domestic cattle herd was declared to be free of bovine brucellosis, and Agriculture Canada expects to declare it free of tuberculosis by the end of 1990. The bison of Wood Buffalo National Park and vicinity are the last remaining focus of both diseases in Canada.

Aboriginal People have had a long association with bison, which continues to this day. For them, bison have spiritual and cultural as well as utilitarian significance. They are able to hunt hybrid bison for food, outside of Wood Buffalo National Park, in Alberta and the Northwest Territories, but because of their status as an endangered or threatened subspecies wood bison are protected by law in both jurisdictions.

In 1986, an interjurisdictional Steering Committee of representatives from the governments of Canada, Alberta, and the Northwest Territories formed a Task Force to suggest answers to the problems posed for both agriculture and the conservation of wood bison by the presence in Wood Buffalo National Park and surrounding areas of a herd of bison of mixed origin with a high prevalence of both tuberculosis and bovine brucellosis.

In February 1988, The Federal Minister of Environment established a five-member Environmental Assessment Panel, which was requested to examine all reasonable courses of action, including those suggested by the Task Force, to achieve protection of domestic livestock, wild wood bison, and human health through control or elimination of contact with diseased hybrids. The Panel was asked to recommend a solution and assess its impacts on environment, resource conservation, people, and the local economy.

The Panel identified key issues and concerns by soliciting written submissions and holding issues scoping sessions in nine communities in the vicinity of the Park, Yellowknife, Northwest Territories, and Edmonton, Alberta. Federal, provincial and territorial government departments were requested to supply additional information, and the Panel commissioned reports from six technical experts.

Agriculture Canada's response to the Panel's request for information was in the form of a proposal for a specific course of action that, in the opinion of the Panel, could serve to focus discussion at public hearings. Agriculture Canada agreed to accept the role of "proponent", although it was understood

that discussion of other possible solutions was not to be excluded. In January 1990, public hearings were conducted in five communities. Technical sessions were held in Fort Smith, Northwest Territories and Edmonton, Alberta.

Some concerns expressed frequently by review participants were:

- Tuberculosis or bovine brucellosis will be transmitted from bison to domestic livestock;
- The diseases will be transmitted to wood bison in the Mackenzie Bison Sanctuary;
- There is a small risk of human infection from handling diseased carcasses;
- Interbreeding will occur between hybrid bison and the wood bison in the Mackenzie Bison Sanctuary;
- The continuing decline in the bison population has reduced opportunities for hunters and tourists;
- The presence of disease precludes re-establishment of wood bison over a large and important part of their former range;
- Aboriginal People had not been directly involved in developing a solution;
- There is insufficient information available about the prevalence of the diseases in the bison of the Park and vicinity;
- Aboriginal People would be unable to hunt bison for food if the hybrids were killed and replaced with wood bison;
- Killing bison in and around the Park would:
 - Result in a loss of heritage values embodied in Wood Buffalo National Park;
 - Remove the justification for the national park and allow the area to be opened to agriculture and forestry;
 - Disrupt the predator-prey relationship between wolves and bison with the result that excess wolves would turn their attention to, and greatly reduce, the moose population; and
 - Result in a loss of genetic diversity.

The Panel analyzed the problem in terms of the risk posed by the diseases. If the risk was acceptable, no action would be required. Alternatively, the risk might be reduced by devices such as fencing, either alone or in combination with a buffer zone; or the risk could be eliminated by elimination of the diseases. The Panel concluded that the risk of transmission is significant, and the potential consequences would be serious for domestic stock, for wild wood bison, or for humans. The Panel also concluded that no method of managing the risk would be infallible and that the cost of maintaining structures and vigilance in perpetuity would be high.

The Panel evaluated three methods of eliminating the diseases. No effective method of treating sick domestic stock, let alone wild bison, exists, nor is there any prospect that a

treatment will be developed. Bovine brucellosis has been controlled but not eliminated in domestic cattle by use of a vaccine; the vaccine is less effective in bison than in cattle. No effective vaccine exists for immunization against tuberculosis. Even if methods to treat or immunize were available they would require that animals be rounded up, maintained in captivity for long periods, and handled repeatedly. Such procedures, used in Wood Buffalo National Park in the past, resulted in an unacceptable level of injury and death. The only practical means of eliminating the diseases is to eliminate disease-exposed hosts. Test-and-slaughter, with extensive salvage of test-negative individuals, has failed to eliminate tuberculosis or bovine brucellosis from domestic cattle and is unlikely to succeed with wild bison. Only total depopulation, followed by repopulation, has been shown to be effective.

The Panel concludes that eradication of the existing bison population is the only method of eliminating the risk of transmission of bovine brucellosis and tuberculosis from bison in and around Wood Buffalo National Park to domestic cattle, wood bison, and humans.

After considering the alternatives, the Panel recommends that all free-ranging bison now living in Wood Buffalo National Park and surrounding areas be removed and replaced by disease-free wood bison.

In order to implement the recommended solution the Panel makes the following additional recommendations:

- A Northern Bison Stakeholders Group composed of representatives of Aboriginal People; non-governmental groups; and federal, provincial, and territorial government agencies, should be formed to develop a detailed plan consistent with guidelines set out by the Panel.
- Breeding Stations for raising replacement animals should be in place and stocked with animals of wood bison phenotype, procured from Elk Island National Park, before depopulation commences. Local groups must have major responsibility for construction and operation of breeding stations.
- One breeding station should be inside Wood Buffalo National Park in order to provide an opportunity for visitors to view bison. It is suggested that an interpretation centre be operated in conjunction with the breeding station to explain the program.
- Several small groups (not more than 20 animals per group) of test-negative animals with the wood bison phenotype, salvaged during depopulation, should be segregated and subjected to a protocol designed by Agriculture Canada to ensure that disease-free progeny will be produced. Salvaged animals would increase the number of founders available and broaden the genetic base of the existing stock of wood bison.
- Depopulation should begin in Wood Buffalo National Park so that Aboriginal People may continue to hunt bison in areas around the Park. Depopulation must be by the most humane means possible. Local labour and resources must be employed to the maximum possible extent.

- On completion of the project all structures, such as fences and corrals, should be removed from the Park, which must be restored as nearly as possible to its initial condition.
 - Following depopulation within the Park, depopulation of surrounding areas should commence. Local hunters should be used as far as possible. Meat fit for human consumption should be available to the hunters. In addition, surplus males raised in the breeding stations should be made available for local use.
 - Following total depopulation and a period of surveillance to ensure that all disease-exposed animals have been removed, repopulation of the Park and surrounding areas with animals from the breeding stations should begin.
 - Once successful restocking has taken place, all jurisdictions should amend any game regulations that limit the right of Aboriginal People to hunt wood bison for food.
 - From the commencement of the project until the diseases have been eliminated, a series of interim measures specified in the report should be in effect.
- The- Panel believes that the proposed course of action will eliminate the diseases and result, in time, in the creation of a larger population of healthy wood bison that will be the closest possible relative of the original form of bison in the area. The resultant self-sustaining population of free-ranging bison would be available for hunters and tourists and would enhance the heritage values of Wood Buffalo National Park.

1.0 THE SETTING

1.1 Introduction

The presence of diseased bison in and around Wood Buffalo National Park (the Park), and proposals for controlling or eliminating the diseases, have generated much interest among Canadians living near the Park and throughout the country. This section describes the present situation and its historical development. It is within this context that the problem must be addressed.

1.2 Geography

The area of interest (Figure 1) is centered on Wood Buffalo National Park, the largest national park in Canada, with an area of about 44,800 square kilometres. The Park is located from about 58° to about 60°30' north latitude and straddles the Northwest Territories-Alberta border. The lower Athabasca and upper Slave Rivers form most of its eastern boundary, and all of the Peace River delta and part of the Athabasca delta lie within the Park.

East of the Park, in the valley of the lower Slave River, there are important bison ranges, particularly in the vicinities of Grand Detour and Hook Lake.

To the southwest, in the general vicinity of Fort Vermilion, agriculture has been an important activity for many decades. Access by road and rail, available only during the past 40 years, has resulted in expansion of the area devoted to agricultural activity. Coincident with that expansion, there has been an increase in the cattle population within a relatively short distance of the Park boundary. Furthermore, wild bison have used, and are still using, ranges both north and south of the Peace River outside the Park. Thus, disease-exposed bison and domestic cattle have come into close proximity between Fort Vermilion and the western boundary of Wood Buffalo National Park.

To the northwest of the Park lies the Mackenzie Bison Sanctuary, home to about 2,000 wood bison. There have been occasional sightings of bison beyond the Sanctuary boundary



along the south bank of the Mackenzie River. The historic range of wood bison, and the present day occurrence of reintroduced herds, extends beyond these limits (Figure 2).

Communities within the area of interest are Fort Chipewyan, Fort Vermilion, Assumption, Jean d'or Prairie, and Fox Lake within Alberta, and Fort Smith (site of the Park headquarters), Fort Resolution, Fort Providence, and Hay River in the Northwest Territories. Administration of the area is divided among the federal, Alberta, and the Northwest Territories governments.

1.3 History of Bison

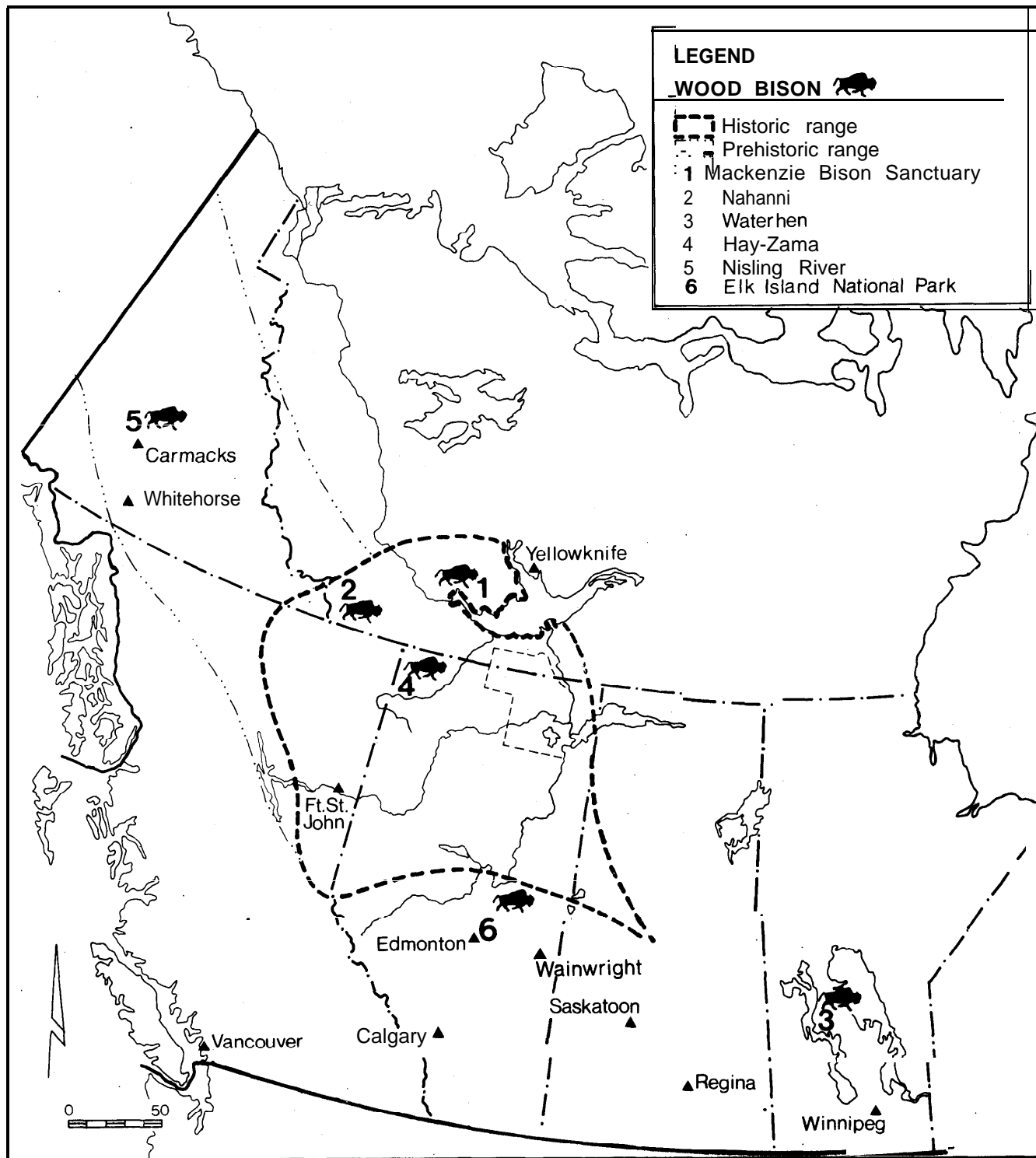
The story of the virtual extinction of the bison of the plains is well known. When Europeans first encountered them, several million bison roamed the great plains from Texas north to central Alberta, according to the season. By the end of the 1880s, the only survivors were in zoological gardens or on private ranches.

One of the private herds was owned by a Montana rancher named Michel Pablo. In 1905, the Canadian government was made aware that the Pablo herd was for sale. An agreement to purchase was negotiated in 1906, and the first shipments of 199 and 211 animals reached the site of the present Elk Island National Park in 1907. From 1909 to 1912, a further 316 animals from Pablo, 30 from the Conrad Ranch, also in Montana, 77 from Banff, and 325 from Elk Island National Park, were brought to the newly enclosed Buffalo Park at Wainwright, Alberta. The animals flourished on their new range and their numbers grew rapidly. By 1916, they numbered 1,640; by 1921, they exceeded 5,000. It was becoming clear that the range would soon be unable to support the expanding herd.

In the winter of 1923-24, 1,847 bison were slaughtered. The carcasses of 259 of them, mainly old males, were examined for disease. Lesions typical of bovine tuberculosis were found in 199 (76.8 per cent) of those examined. This finding came as no surprise to the managers of the Buffalo Park because one case had been observed in 1916, and others in 1919 and 1920.

The slaughter had another effect. It brought considerable public criticism because it seemed incongruous to protect the bison on the one hand and to kill them off on the other.

The story of the bison of the woodlands is not as well known. The first European to leave a written record of wood bison was Samuel Hearne, who, in company with a band of Dene, killed a number for food on the east side of the Slave River in January 1772. In his Journal, he recorded them, as well as moose and beaver, to be "very plentiful". Alexander Mackenzie in 1793 and Sir George Simpson in 1828 said they were numerous along the Peace River. But in 1899, the Treaty 8 Commission saw none during their journey along the Peace. The Secretary, Charles Mair, however, noted that evidence of their earlier



(after Susan MacTachern, CWS)

FIGURE 2 Historic and prehistoric distribution of wood bison (*Bison bison athabasca*) in western Canada.

abundance could still be seen everywhere in the vicinity of Fort Dunvegan, north of Grande Prairie.

The last wood bison survivors managed to persist in the region of the junction of the Peace and Slave rivers. A number of travellers in the 1890s and early years of the present century made short excursions into the survivors' range and made "guesstimates" of their number. Almost without exception, the estimates lay between 250 and 500 animals.

It is clear that wood bison were never as numerous as those of the plains. One estimate placed their maximum number at 168,000. It is also clear that their decline was not due to over-hunting, as was the case with the plains bison. Exactly what factors are responsible for their brush with extinction are not well known. Several winters of unusually deep snow (up to 14 feet according to one observer) were mentioned in early accounts. Beyond that, we know nothing.

The *Unorganized Territories Game Protection Act*, passed by Parliament in 1894, provided closed seasons for a number of birds and mammals, and absolute legal protection for wood bison for a period of five years. Amendments to the Act extended the period during which it was illegal to hunt them until 1906 when the *Northwest Game Act* came into force. It too gave complete protection to wood bison. The *Northwest Game Act* was extensively revised in 1917, but the prohibition against killing wood bison was retained.

From 1894 until 1911, responsibility for the wood bison was in the hands of the Northwest Mounted Police (NWMP). In addition to law enforcement, they made examinations of the range and attempted to estimate numbers. In 1907, a NWMP detachment was established at Fort Fitzgerald in order to provide closer supervision, but four years later responsibility for the bison was turned over to the Forestry Branch of the Department of the Interior. Six Buffalo Rangers were appointed in 1911 to provide additional protection against poachers. In 1917, the Parks Branch took over management of game, including wood bison, from the Forestry Branch.

For a number of years, even before 1917, the Parks Branch had lobbied for the establishment of a Dominion Park as the best means of protecting the remnant herd of wood bison in northern Alberta. Their efforts finally came to fruition in December 1922 when Wood Buffalo National Park was established by Order-in-Council. By that time, it was estimated that the wood bison numbered about 1,500.

At this point, the local histories of the two subspecies of bison come together. The government of the day decided that if they could not slaughter excess plains bison at Wainwright without criticism, and if the range could not support their rapidly increasing numbers, perhaps they could solve their dilemma by shipping some of the excess to the newly created Wood Buffalo National Park.

Scientists, including some in government, had two main objections. First, they objected to moving animals from a herd known to be diseased to a range where disease was still unknown and, second, they warned that the wood bison, as a distinct subspecies, would likely disappear through interbreeding with plains animals. Nevertheless, the Government went through with the plan and, over the summers of 1925 to 1928,

6,673 plains bison were transported from Wainwright to Wood Buffalo National Park.

By the end of the summer of 1925, bison were appearing on the meadows of the Peace Delta where they had not been seen for many years. Since the Peace River formed the south boundary of the Park, the animals in the Delta were now outside the Park, which necessitated an extension of the boundary to its present location in 1926.

At first, the bison population of the Park flourished. By the mid-1930s, their number was estimated to be about 12,000. The first attempt to count bison from the air, in the spring of 1949, also produced an estimate of about 12,000. But, as predicted by those who had protested the transfer prior to 1925, tuberculosis was recognized in a single bison in 1937 and in another in 1946. From 1952 to 1956 (inclusive), of 1,508 bison slaughtered as part of a program to reduce the prevalence of tuberculosis, 39 per cent had typical lesions. Of the 1,300 animals examined in the 1960s (and in small samples in 1971 and 1974), 33 per cent had tuberculosis-like lesions. Bovine brucellosis, which may or may not have come with the Wainwright animals, was first confirmed in 1956.

It is also clear that a good deal of interbreeding occurred between the original wood bison and the introduced plains bison, but the extent of interbreeding may not have been uniform in all parts of the Park. External and skull measurements of three bison secured near the Nyarling River in 1959 suggested that they came from a population of predominantly wood bison that may have been isolated from the introduced plains bison. Most of the bison in the area were eventually captured in a corral. After repeated testing for both diseases, 18 animals were transferred, in 1963, to an area near Fort Providence, which became the Mackenzie Bison Sanctuary. They have since increased to about 2,040 (estimated in March 1990), and limited sampling has not revealed a single case of tuberculosis or bovine brucellosis. In 1965, a second group of 24 animals from the Nyarling River was sent to Elk Island National Park. In spite of repeated testing before transport, diseased animals were found at Elk Island National Park. The diseases were eliminated by an intensive program of test and slaughter. The animals in the Sanctuary and Elk Island National Park are considered to be wood bison. (The question of their taxonomic status is dealt with in detail in Section 4.4.)



Since 1970, the bison population in Wood Buffalo National Park has steadily declined and, in March 1990, it stood at about 3,200. No one factor can be identified as the cause of the decline. Tuberculosis and bovine brucellosis likely played a role. The slaughters of the 1950s and 1960s cannot be ignored. Anthrax outbreaks have led to the death of several hundred. Drownings during spring floods have killed large numbers; the last known *major* drowning in 1974 killed an estimated 3,000 bison. More recently, predation by wolves, particularly on calves, may be chiefly responsible for low calf survival. Added to all of these factors is the unknown effect of the change in hydrology and vegetation of the Peace-Athabasca Delta brought about by the W.A.C. Bennett Dam on the Peace River in British Columbia.

1.4 The Diseases

Bovine tuberculosis and bovine brucellosis are classified as "reportable diseases" under the *Animal Disease and Protection Act*. Every occurrence of either disease must, by law, be reported to Agriculture Canada. The goal of Agriculture Canada is to eradicate bovine brucellosis and tuberculosis from all animals in Canada and to maintain Canada's domestic animals free of these diseases.

The Department began a program to eliminate tuberculosis in domestic livestock in 1907 and a bovine brucellosis eradication program was begun in 1928. Canadian domestic cattle were declared "bovine brucellosis-free" in 1985, although there have been four occurrences of bovine brucellosis detected in cattle since 1985, the last involving one animal in 1989. It is anticipated that the domestic cattle herd will be free of tuberculosis by the end of 1990. The bison in and around Wood Buffalo National Park are the only known reservoir of bovine brucellosis in Canada, and the largest known reservoir of bovine tuberculosis.

1.5 Legal Status of Bison

The status of wood bison in Canada has gone from having no protection at the turn of the century to being *recognized* both nationally and internationally as an endangered or threatened species.

1.5.1 International Status of Wood Bison

Canada has signed the Convention on International Trade in Endangered Species (CITES), an agreement that sets out rules governing the commercial exportation and importation of endangered wildlife species and products derived from them. In 1977, wood bison were listed in Appendix 1 of the Convention. Appendix 1 is reserved for species requiring the greatest amount of control provided by the agreement. Export from Canada of wood bison and wood bison products, for any purpose other than scientific research and breeding, is prohibited, but sale of wood bison within Canada is not restricted.

1.5.2 Legal Status of Bison in Canada

In Canada, management of bison and other big game is a provincial or territorial responsibility. There are, however, national wildlife conservation initiatives in which the federal government participates. The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) is a national body, with federal, provincial, and territorial representatives, that reviews the status of Canadian wildlife species believed to be endangered. This committee formally listed wood bison as an "endangered" species in 1979.

Following a review of captive and wild wood bison herds, conducted by the Wood Bison Recovery Team led by Dr. Cormack Gates of the Northwest Territories Wildlife Service, COSEWIC recommended that the status of wood bison be changed from "endangered" to "threatened". Although this change *recognizes* the improved status of wood bison in Canada, hunting restrictions remain in place.

1.5.3 Legal Status of Bison in the Northwest Territories

Descendants of the Nyarling River animals are considered to be wood bison under the Northwest Territories *Wildlife Act*. When the founding stock was removed from the Park and released in the Mackenzie Bison Sanctuary, they lost the protection that the *National Parks Act* had afforded them with respect to hunting for food by Aboriginal People as guaranteed by Treaty. In order to restore to the members of the fledgling herd the protection they had lost, wood bison were listed in Section 18(3) of the Northwest Territories *Act*, pursuant to PC 1964-760 of 22 May 1964. By that order, they were declared to be a "species in danger of becoming extinct" and were brought under the authority of the Commissioner and Council of the Northwest Territories, who ruled at the time that they may not be hunted by any person, including an Aboriginal Person hunting for food.

The *Northwest Territories Wildlife Act* distinguishes between wood and other bison. Since 1988, limited hunting of wood bison near Fort Providence has been permitted under rigid quota and strict supervision. The bison at Hook Lake and Grand Detour are considered hybrids. They have not been



declared “endangered” under the Northwest Territories *Act*; therefore, “Treaty Indians” and holders of a General Hunting Licence may kill them for food. There are no closed seasons or bag limits for either class of hunter.

1.54 Legal Status of Bison in Alberta

The *Alberta Wildlife Act*, schedule 1, item 3, lists wood bison as “Endangered Animals”. The only wood bison recognized by the province are those at Elk Island National Park and a small captive herd held by the Dene Tha’ Band at Assumption. The latter herd was placed in the Band’s care as part of the Wood Bison Recovery Program.

Free-roaming bison in parts of Alberta adjacent to Wood Buffalo National Park are considered to be descended from hybrid offspring of crosses between plains bison (classed as “Excluded Animals”) and wood bison (classed as “Endangered Animals”) and, as such, they have no status under the *Alberta Wildlife Act*. Alberta hunting regulations specify no closed season and no bag limits for them.

1.6 Aboriginal People

Wood Buffalo National Park and the surrounding area has been the home of the Dene for centuries. Crees became established along the lower Peace River in relatively recent times. Historians speculate that Peter Pond built the first post on the Athabasca River near the present site of Embarras Portage in order to be nearer to the Crees, who had not yet penetrated as far as Lake Athabasca.

Both Dene and Crees have had a long tradition of hunting bison. With the appearance of Europeans, primarily English and French fur traders, intermarriage was inevitable and gave rise to a considerable population of Métis, many of whom retain a close connection with the life-style of their ancestors.

The Panel recognizes that the significance of bison to Aboriginal People is more than utilitarian. The ability to hunt free-roaming bison is an extremely important part of their heritage and, therefore, it must be part of any solution to the bison disease problem.

The Aboriginal People were led to believe that their right to hunt and fish for food would be protected by Treaty 8, which they signed in 1899, but hunting wood bison had already been banned under the *Unorganized Territories Game Preservation Act* of 1894. That prohibition has never been lifted.

1.7 Agricultural Development

Limited agricultural activity began with the arrival of European fur traders. Peter Pond planted a garden in the summer of 1778 in preparation for spending the winter of 1778-79 trading for furs in the Athabasca Delta near the present site of Fort Chipewyan, which was founded in 1788. The Precambrian rock landscape on the north shore of Lake Athabasca precluded further development in the area. Small-scale farming was practised by the Roman Catholic Mission west of Fort Smith until about the middle of this century. There were also

gardens and a few cattle at the mouth of the Salt River about 29 km below Fort Smith.

There is currently a small farm at the Salt River Crossing and a herd of cattle was maintained on Ryan Island in the Slave River near Fort Fitzgerald until the spring of 1990. There are several market gardens in the vicinity of Hay River, and a herd of cattle on the Hay River near the Alberta border.

By far the most important site for agricultural development in relation to disease in bison is the region surrounding Fort Vermilion, which was also established in 1788. Agriculture has been important there from its earliest beginnings. In addition to the cattle owned by local farmers and ranchers, there has been a Grazing Reserve near Fort Vermilion since 1982. Cattle are brought there each summer from as far away as central Alberta. During the unusually dry years in the last half of the 1980s, the province introduced a transportation subsidy to assist southern ranchers who wished to move their cattle to areas of the province with better grazing. The greater the distance the stock travelled, the greater the subsidy. The result was an increase in the number of cattle using the Fort Vermilion Grazing Reserve from 293 in 1982 to 2,400 in 1988. The subsidy was withdrawn in 1989.

The annual migration of cattle to and from Fort Vermilion is especially significant for the spread of disease. If one or more cattle should become infected with either tuberculosis or bovine brucellosis in the north, and the disease was not detected before the cattle return to the south, a serious and costly outbreak could occur. It is possible that a disease-exposed animal could be sold from Central Alberta to a farmer in some other part of Canada before the infection was discovered.

In 1978, Agriculture Canada estimated that failure to eradicate these diseases from the national cattle herd would result in a cumulative loss of \$1 billion over a 20 year period.

1.8 Wood Buffalo National Park

Wood Buffalo National Park contains many significant natural features. The Park’s salt plains, which cover over 250 km², are unique in Canada. The region of karst landforms in the Park is one of the largest in the world and contains collapsed sink-holes, small caves, underground rivers, sunken valleys, and related phenomena. The only known nesting area of the endangered whooping crane is within the Park, and peregrine falcons, another endangered species, also nest there.

The international significance of the Park’s resources has been recognized by the United Nations Educational Scientific and Cultural Organization (UNESCO), which designated the Park a World Heritage Site. UNESCO noted, in particular, that the Park protects the largest free-roaming and self-regulating herd of bison in existence, and that some form of intensive manipulation of the bison may be required because of the presence of anthrax, bovine brucellosis, and bovine tuberculosis.

The Park is recognized internationally for its role in wetland conservation. The whooping crane nesting area in the north end of the Park, which contains a major concentration of



Sweetgrass area, Wood Buffalo National Park

evaporation ponds, and the Peace-Athabasca Delta, which occupies nearly 10 per cent of the Park area, are recognized as "Ramsar Sites" by *The Convention on Wetlands of International Importance Especially as Waterfowl Habitat*.

Under the *National Parks Act (1988)*, the Canadian Parks Service is required to prepare for each national park a Park Management Plan to serve as a guide to the types of use most appropriate for the particular park and its resources. According to the Wood Buffalo National Park Management Plan, the Park's primary role is to protect outstanding and representative examples of the Northern and Southern Boreal Plains Natural regions and the Northwestern Uplands regions, the organisms that live there, and to enable present and future generations to appreciate and experience a wilderness environment.

The Wood Buffalo National Park Management Plan contains provisions specific to bison which ensure their continuing status as a fully protected species. The Plan sets out provisions under which the Parks Service may conduct bison monitoring and research programs and protect public safety and health against threats arising from the presence of disease in the bison herd.



Hunting, except for bison, and trapping have been carried on in the Park by those who traditionally hunted in the area before the Park was established and by their descendants. With the passage of time, the number of eligible hunters increased to the point where it became necessary to establish an upper limit. Eligible hunters harvest all game animals, except bison, for use as food for themselves while in the Park.

Park records show that \$605,000 was generated from trapping in the Park in 1980-81. Fort Smith trappers generated less than 33 per cent of the average per-trapper income in the Northwest Territories from trapping, which suggests that trapping is being used to supplement incomes rather than as full-time employment. On the other hand, trapping, in terms of the number of persons employed, is the most important industry in Fort Chipewyan.

Commercial logging has been permitted in the Park since shortly after the end of the Second World War. The first timber berths were small and essentially confined to stands of large trees growing in alluvial soils along the Peace and Athabasca rivers. The only remaining berth covers 497 km² of mainly upland forest. The merchantable white spruce is being harvested in large clear-cuts. The Park Management Plan recognizes the non-conforming use of this activity and the berth is expected to revert to the Park in the year 2002 when the present 2 i-year lease expires.

Wild fire has had a major influence on plant and animal communities, and fire fighting accounts for more than 50 per cent of the Park's annual budget. A significant part of the expenditure is for personnel and thus provides local employment.

The W.A.C. Bennett Dam, located on the Peace River near Hudson Hope, British Columbia, has altered the hydrological regime of the Peace and Slave rivers. Of particular significance is the fact that the frequency of floods in the Peace-Athabasca Delta has been drastically reduced since the dam was closed and the reservoir began to fill. Both terrestrial and aquatic habitats are still undergoing changes as a result of the lack of a spring flood since 1974. Sedges, which provide important winter feed for bison and which formerly dominated large delta meadows, are being replaced by grasses as the land becomes drier. In addition, aspen are encroaching onto the grassland. The effects of the shift from sedge to grass on bison have not been evaluated quantitatively.

Tourism is an important use of most national parks, but there has been little tourist development in Wood Buffalo National Park, in part because of its remote location and in part because of lack of advertising. The Park has significant potential, especially in view of the new trend toward "ecotourism" which depends on features such as natural landscapes and wilderness values. Free-roaming bison clearly are a major tourist attraction.

Several factors external to the Park and largely beyond the control of the Canadian Parks Service have obvious implications for the future of Wood Buffalo National Park.

Future alterations in the hydrologic regimes of the major rivers are one such possibility. The proposed Site C Dam on the Peace River, just downstream from the W.A.C. Bennett Dam,



Wood Buffalo National Park

is under active consideration. Proposals to dam the Slave River for hydro-electric production near Fort Smith have been brought forward from time to time in the past and will, no doubt, come forward again in the future.

"Bison did at one time provide a major source of meat and hides for my people. Today we rely primarily on moose, bear, waterfowl, fish. Nevertheless, we consider it our right to have access to and hunt bison in northern Alberta."

Chief Pat Marcel
Athabasca Chipewyan Band

"... To manipulate an organism of the ecosystem is to affect the environment as a whole. One only has to look at the disasters of the past for any supportive evidence. This absolute was obviously ignored when the bison were moved from Wainwright to Wood Buffalo National Park. So today we now have a wildlife problem in the Park, and consequently the Slave River Lowlands, that is artificial, recent, speaking historically; and man-made."

Ken Herbert
Executive Director NWT
Wildlife Federation

The Province of Alberta has recently embarked on a massive forestry program that could see clear-cutting extended to the southern and western Park boundaries with continuing discharge of pollutants into the Peace and Athabasca rivers as a result.

No evidence was presented to the Panel to suggest that any limit would be placed on agricultural developments in Alberta, particularly in the Fort Vermilion area, although no expansion is anticipated during the 1990s.

Finally, much attention is now being paid by scientists to the potential effects of global climatic change. Just how such change would affect the Park is a matter for speculation; the views of scientists are certainly not unanimous. One widely accepted model predicts drier conditions for central and northern Alberta, which would surely have an effect on water flows and levels. The important bison ranges on the Peace-Athabasca Delta would seem to be particularly vulnerable to a reduction in water supply.

"As far as the cattle producers are concerned, while our primary objective is obviously the removal of any risk of disease spreading from the bison into domestic cattle, we are also committed to a solution that will mean the retention of the Park and of a herd of free-ranging disease-free bison in the Park. We have never advocated anything different."

Gordon Mitchell
Assistant Manager
Alberta Cattle Commission

2.0 THE PROBLEM

2.1 Background

The 6,673 plains bison introduced into Wood Buffalo National Park between 1925 and 1928 were known to be infected with tuberculosis and may also have transported bovine brucellosis to the Park and surrounding areas.

The introduced plains bison and the estimated 1,500 wood bison inhabiting the area interbred and increased in number to an estimated 12,000 animals by the early 1950s. Tuberculosis and bovine brucellosis have spread throughout the herd. Since 1970, the bison population has decreased continuously, due in part to disease, drownings, predation, and habitat changes (Figure 3). This steady decline is in sharp contrast to the steady increase of the bison population in the Mackenzie Bison Sanctuary (Figure 4). Today, approximately 50 per cent of the estimated 3,200 bison in Wood Buffalo National Park are infected with one or both diseases and it is probable that the prevalence of the diseases in bison is similar in areas surrounding the Park.

The two central problems are:

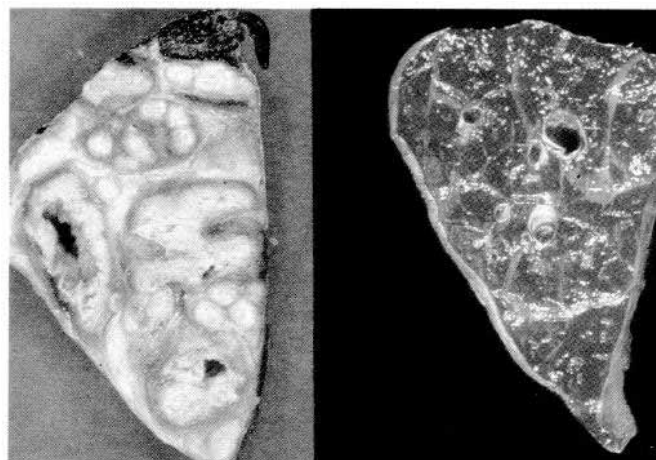
1. The potential spread of tuberculosis and bovine brucellosis from the disease-exposed bison of Wood Buffalo National Park and surrounding areas to domestic livestock, the wood bison in the Mackenzie Bison Sanctuary, and the human population; and
2. The possible interbreeding of wood bison in the Mackenzie Bison Sanctuary with hybrid bison from Wood Buffalo National Park and its vicinity.

2.2 Disease

2.2.1 Bovine Tuberculosis

Bovine tuberculosis is a disease that results from infection with the bacterium *Mycobacterium bovis*. The disease is contagious; infected animals pass bacteria in their secretions and excretions. It may spread from infected to uninfected animals through inhalation of droplets expelled by coughing animals, by ingestion of food or water contaminated with the bacterium by infected animals, or from mother to offspring either through the placenta or through contaminated milk. Bovine tuberculosis is a progressively debilitating disease that can affect the respiratory, digestive, urinary, nervous, skeletal, and reproductive systems. It can weaken animals and make them more susceptible to predation, it can reduce fertility in sexually mature animals, and, in advanced cases, it can be fatal. Domestic cattle and bison are the major species affected by bovine tuberculosis, but infection has been recognized in a number of other species. In most instances, such infections have occurred among densely congregated captive animals, as, for example, in zoological gardens.

Some bison in and around Wood Buffalo National Park are infected with tuberculosis, which was known to be present



Comparison of normal lung and tuberculous lung- from a bison that died of tuberculosis in Wood Buffalo National Park (photo credit: Dr. S. Tessaro, Agriculture Canada).

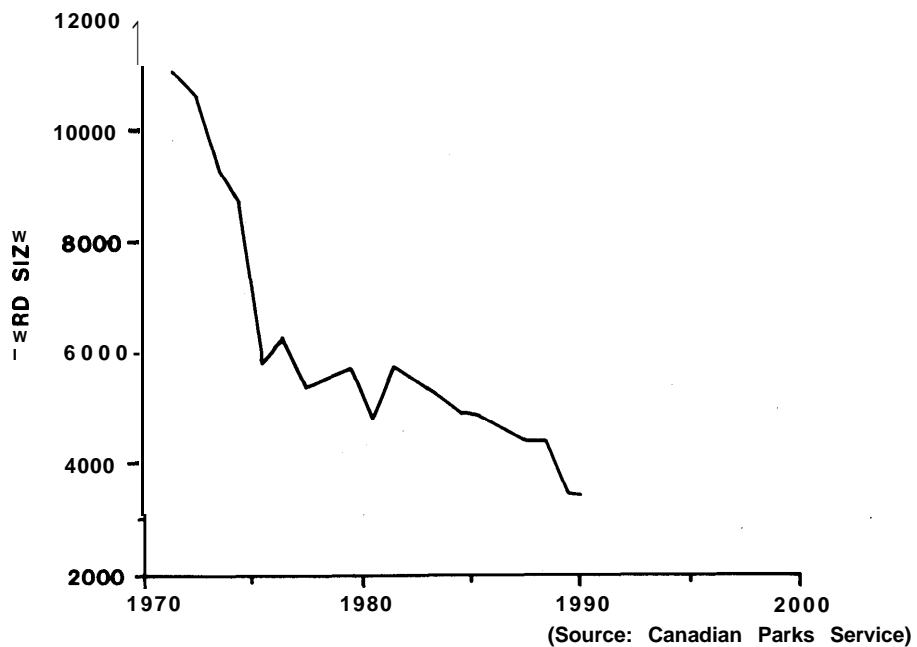
among the plains bison introduced to the Park during the 1920s. The introduced animals are assumed to be the source of the current infection. No wild species, other than bison, has been found to be infected with bovine tuberculosis in or around the Park.

Humans can become infected with bovine tuberculosis by inhalation of bacteria, or through skin abrasions or eye contamination while handling infected animal tissues, as could occur during butchering. Infection can also occur through the consumption of milk or improperly cooked meat from infected animals. The disease produced in humans can be difficult to distinguish from that caused by infection by *Mycobacterium tuberculosis*, the more usual cause of human tuberculosis.

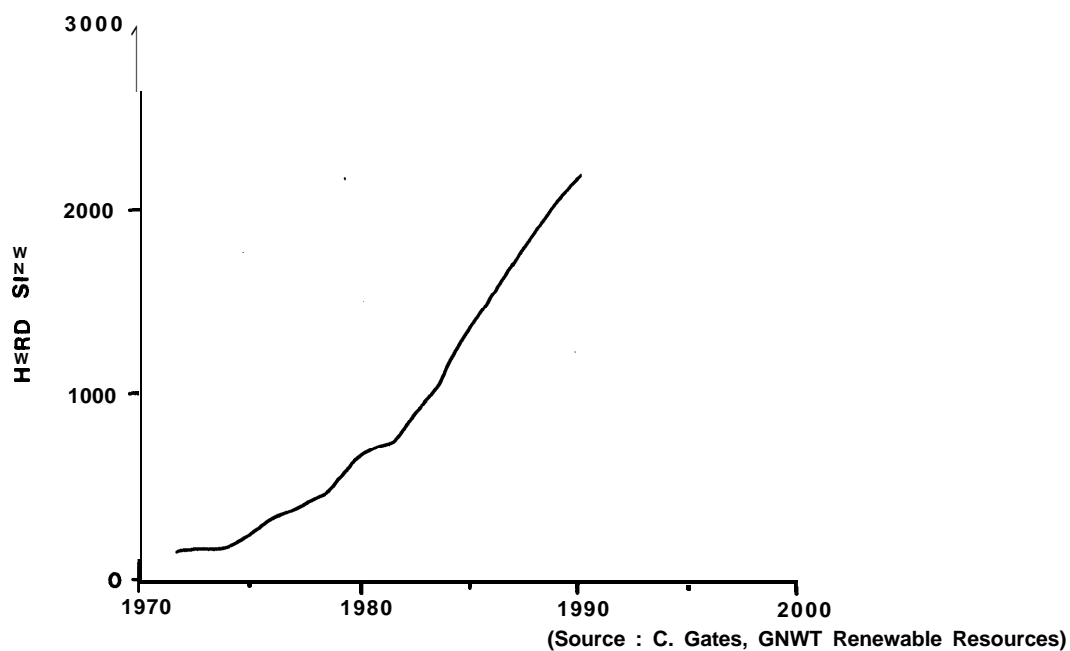
2.2.2 Bovine Brucellosis

Bovine brucellosis is caused by infection with the bacterium *Brucella abortus*. Similar bacteria occur in other species and a clear distinction must be made between the disease caused by *Brucella abortus* and that caused by other bacteria of the genus *Brucella*. An organism called *Brucella suis* biovar 4 occurs among reindeer and barren ground caribou in northern Canada. It has not been found in bison, and it is not known to occur in the area of Wood Buffalo National Park. The possibility that hares could act as a reservoir for *Brucella abortus* was raised at one technical session. This was probably based on reports describing the occurrence of brucellosis caused by *Brucella suis* biovar 2 among hares in Europe. *Brucella suis* biovar 2 has not been detected in Canada.

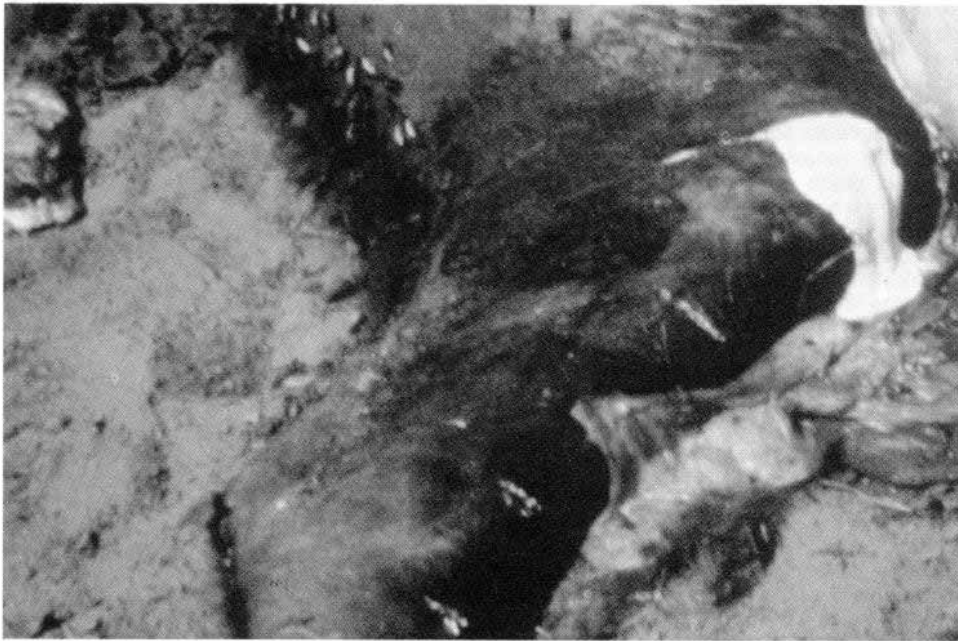
Bovine brucellosis was first diagnosed in bison in Wood Buffalo National Park in 1956; the source of the disease is unknown but is suspected to be the plains bison introduced from Wainwright in the 1920s. Although the Wainwright animals were never tested for bovine brucellosis, lesions compatible with that disease, found in slaughtered bison, were described by Hadwen (1942).



**FIGURE 3 Bison population estimates
Wood Buffalo National Park (1971-1990).**



**FIGURE 4 Bison population estimates
Mackenzie Bison Sanctuary (1971-1989).**



White pus running out of the left knee joint of a bison found to have Isolated bovine brucellosis!

The disease in bison is similar to that in domestic cattle and is characterized by involvement of the reproductive organs resulting in abortion, infertility, and uterine infections in females, and inflammation of the testes and epididymides in males. Calves born alive to infected females can be weak and die soon after birth. The organism can also invade joints, causing crippling arthritis. Bovine brucellosis is usually transmitted by exposure to aborted fetuses, fluids passed from the pregnant uterus, infected newborn calves, or by consumption of food or water contaminated by those materials. Calves can be infected by consuming infected milk from their dam. Infected males can transmit through contaminated semen at breeding.

Bovine brucellosis caused by *Brucella abortus* has been diagnosed in a variety of mammals throughout the world, but in North America it is considered that infected cattle, bison, or elk are necessary to maintain the disease in any area. Humans can become infected with *Brucella abortus* through contact with infected animal tissues, particularly the reproductive tract, lymph nodes, or joints that are handled during butchering. Infection occurs by inhalation of droplets or by entry of the bacteria through the skin or through the eyes (e.g., by rubbing the eyes with, contaminated hands).

2.2.3 Anthrax

Anthrax is an infectious disease of mammals caused by the bacterium *Bacillus anthracis*. Infection in herbivorous animals is rapidly fatal. The bacterium forms extremely resistant spores that may survive in the soil for decades and animals are thought to become infected from the soil.

Anthrax was first recognized in bison in the Slave River Lowlands north of Wood Buffalo National Park in 1962. Bison

are known to have died of the disease in the Slave River Lowlands and within the Park during seven summers between 1962 and 1978. Because the spores may survive in the soil for many years and because the infection is not carried by the bison, removal of the current bison will not prevent recurrence of the disease in the future. It is impossible to predict if or when the disease might recur. Anthrax will not be considered further here, but disease recurrence at some time in the future may affect the bison in the Park area.

2.3 Preservation of Wood Bison

A Wood Bison Recovery Program has been established. It includes representation from the Canadian Wildlife Service, Canadian Parks Service, Northwest Territories Renewable Resources, Yukon Renewable Resources, Alberta Forestry, Lands and Wildlife, and Manitoba Natural Resources, in cooperation with Native Bands and non-governmental organizations. The terms of reference and membership of the Wood Bison Recovery Team have been approved by Recovery of Nationally Endangered Wildlife in Canada (RENEW), which is a committee composed of directors of federal, provincial, and territorial wildlife agencies, plus the Canadian Nature Federation, Canadian Wildlife Federation, and the World Wildlife Fund Canada. Among the specific objectives of the recovery plan are:

- To maintain the genetic integrity of wood bison populations;
- To achieve the greatest possible recovery of the wood bison within its historic and prehistoric range; and
- To manage or prevent the occurrence of serious diseases in herds of wood bison.

The thriving herd of wood bison in the Mackenzie Bison Sanctuary is an example of what can be accomplished by a recovery program. But contact between that herd and diseased hybrid bison in the area of the Park could result in both disease transmission and interbreeding. In addition, 72 per cent of the historic range judged to be suitable for re-establishment of wood bison is considered unavailable because of the presence of diseased hybrid bison in and around the Park.

A solution to the disease problem may provide an opportunity to correct the problem created by the introduction of plains bison into the traditional wood bison range in the late 1920s.

"We definitely need more time and studies to have enough meaningful information before us to develop a wise and long lasting management plan for the natural wellbeing of our free roaming buffalos. The cattle ranchers may have their interests to protect, but we also have not only our own interests to be concerned about in managing our buffalos, but a whole natural ecosystem to protect and preserve for our future generations."

Chief Bernadette Unka
Fort Resolution Band

"While we agree that development of a disease-free herd is an ideal objective, we are confident that data used to support the course of action is both inadequate and inaccurate and cannot be used to support such drastic solution to the disease problem."

Chief Bernard Meneen
Tall Cree Band

3.0 REVIEW PROCESS

3.1 Background

In 1986, an inter-jurisdictional Steering Committee, consisting of representatives from the governments of Canada, Alberta, and the Northwest Territories, was formed to discuss the national implications of tuberculosis and brucellosis in the bison of Wood Buffalo National Park and the surrounding area. The Steering Committee formed a Bison Disease Task Force to review existing information and to consider possible management options. The members of the Task Force were: Dr. Terry Church, Alberta Agriculture; Dr. Cormack Gates, Government of the Northwest Territories, Department of Renewable Resources; Mr. Robert McFetridge, Alberta Forestry, Lands and Wildlife, Wildlife Division; Mr. Art Murphy, Health and Welfare Canada; and Mr. Hal Reynolds, Canadian Wildlife Service. The co-chairmen were Dr. Rex Coupland, Agriculture Canada, and Mr. Bob Redhead, Canadian Parks Service.

The Task Force presented nine possible courses of action to the Steering Committee but concluded that only four of them were worthy of further consideration. Those options became the chief concern of the Northern Diseased Bison Environmental Assessment Panel.

3.2 Panel Appointment

In accordance with the federal Environmental Assessment and Review Process (EARP), federal departments and agencies must consider and assess the environmental effects of projects and activities for which they have a decision-making role. When a project is judged to have potentially significant effects or engenders major public concerns, an environmental assessment panel is established to conduct an independent public review of the project and its effects.

The diseased bison in and around Wood Buffalo National Park can be viewed more as a problem than as a specific proposal advocated by a single proponent. It is in this context that the federal Minister of Agriculture, with the support of other federal agencies, the Province of Alberta, and the Government of the Northwest Territories, referred the matter to the federal Minister of the Environment for public review by an environmental assessment panel.

The Panel was appointed in February 1989 by the Minister of the Environment. The Panel members are Mr. Robert Connelly (Chairman), Mr. Ben Hubert, Dr. William Fuller, Mr. Rene Mercredi, and Dr. Gary Wobeser. (Biographies of Panel members can be found in Appendix A.)

3.3 Terms of Reference

The Panel's Terms of Reference (see Appendix B) directed it to publicly review and assess the environmental, resource conservation, socio-economic, and health issues associated with the diseased herd of bison found in and around Wood Buffalo National Park. The Panel was instructed to consider, but was not limited to, the following four possible courses of action identified by the Bison Disease Task Force:

1. Maintaining the *status quo*;
2. Fencing Wood Buffalo National Park to contain the diseased bison and prevent the spread of the diseases beyond the Park boundaries;
3. A composite plan to confine diseases to the Park by a combination of strategically placed fences, buffer zones exterior to the Park from which all bison would be eliminated, and land-use restrictions imposed on cattle grazing; and
4. Phased elimination, with or without salvage, of the diseased herd and replacement with disease-free wood bison.

3.4 Review Process

Shortly after its appointment the Panel reviewed the existing information base, including the Bison Disease Task Force Report, as a means of identifying the nature of the problem and alternative courses of action. Review participants, including government agencies, public groups, and individuals, were then invited to assist the Panel in the identification of key issues and concerns that should receive the greatest attention during the review and to assist in the identification of require-



Panel members during public hearing in Hay River, NWT from left to right: Dr. G. Wobeser, Dr. W. Fuller, R. Connelly (Chairman), R. Mercredi, B. Hubert.

ments for additional information to be gathered prior to the scheduling of public hearings. This input was obtained through two mechanisms:

1. Review participants were asked to state their key issues or concerns and suggested information requirements in writing; and
2. Issues "scoping" sessions were held in nine communities around Wood Buffalo National Park, and in Yellowknife and Edmonton during April and May 1989. The sessions were open to any wishing to attend.

Once the key issues and information gaps were identified, the Panel asked government agencies to provide information in their possession and hired six technical experts to prepare scientific or technical analyses.

Government agencies that provided information were:

- *Territorial*

Northwest Territories Department of Health
Northwest Territories Department of Renewable Resources
Northwest Territories Department of Economic Development and Tourism

- *Provincial*

Alberta Department of Agriculture
Alberta Department of Community and Occupational Health
Alberta Department of Forestry, Lands and Wildlife, Fish and Wildlife Division

- *Federal*

Canadian Parks Service, Environment Canada
Canadian Wildlife Service, Environment Canada
Agriculture Canada
Health and Welfare Canada
Indian and Northern Affairs Canada

The six technical specialists and their areas of expertise were:

- Dr. Roy Berg, Genetics
- Mrs. Theresa Ferguson, Aboriginal Perspectives
- Dr. François Messier, Predator-Prey Relations
- Dr. Everett Peterson, Ecological Considerations
- Dr. Robert Scace, Heritage Conservation Values
- Mr. Lloyd Quantz, Agricultural Issues

Responses to the Panel's requests for information and reports of the technical specialists were bound in a compendium in October 1989. The compendium was circulated to all major review participants and placed in local libraries and Native Band offices.

Following a seven-week period for public review of the documents, the Panel held final public hearings which were conducted between January 16 and 26, 1990. (A list of



Panel members and two of the six technical specialists during a tour of Sweetgrass Meadows.

hearing participants can be found in Appendix C.) Informal community sessions were held in Fort Vermilion and Fort Chipewyan in Alberta; and Hay River, Fort Resolution, and Fort Providence in the Northwest Territories. Technical Sessions, which were more structured, were held in Fort Smith, Northwest Territories, and Edmonton, Alberta. The purpose of the hearings was to allow for an examination in public of all information and submissions received by the Panel and for a discussion of public concerns related to the environmental, resource conservation, socio-economic, and health issues associated with each of the alternatives for dealing with the disease problem. Written submissions were accepted by the Panel up to March 2, 1990. (The key documents used by the Panel during the review are listed in Appendix D.)

3.5 Discussion

During the final public hearings, a number of concerns were raised regarding the review process. Both Environment Canada and the Native Bands around the Park stated that Agriculture Canada had not completed an Environmental Impact Statement (EIS) in accordance with the EARP Guidelines Order, and consequently the potential environmental and social effects of the proposal had not been properly identified. Others argued that there had been insufficient time to prepare for the final hearings; that participants had not been provided with financial and technical resources to review the proposal; and that the process had not permitted Aboriginal People meaningful involvement in the development and assessment of alternatives. (The latter two concerns are considered in Section 6.6.)

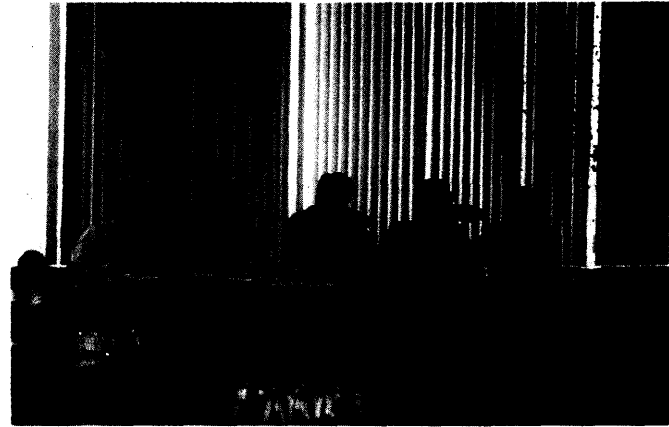
In its response to the Panel's request for information, Agriculture Canada developed a proposed course of action. The Panel felt that this proposal would serve to focus discussion and, therefore, it invited Agriculture Canada to assume a role in the process more in keeping with that of a proponent. The Panel provided the Department with some recommendations on the content and format of the documentation describing the proposal. The Panel concluded that Agriculture Canada's completed document, along with the Task Force report, the information responses received from other government



Dr. Terry Church of Alberta Agriculture speaking to the Panel during final public hearings in Edmonton.

departments, and the technical experts' reports constituted sufficient information to proceed to the public hearings stage of the process. The Panel concluded that this information in total was consistent with the definition of EIS in the Guidelines Order (i.e., "a documented assessment of the environmental consequences of any proposal expected to have significant environmental consequences that is prepared or procured by the proponent in accordance with guidelines established by a Panel").

The Panel **recognizes** that had a proponent been identified at the outset, as is normally the case with any development proposal, the process steps could have been different. Specific guidelines for the preparation of an EIS would have been prepared by the Panel and the proponent would have incorporated all studies and information into a single statement. The Panel believes that this incorporation would have aided reviewers. The Panel considers the process followed here to be neither inconsistent with its own operational



Technical presentation to the Panel by Treaty 8 Chiefs in Edmonton.

procedures issued at the beginning of the review nor inconsistent with the public review procedures of the EARP Guidelines Order.

Some argued that they had been given insufficient time to review all the documentation and to prepare for the final hearings. A minimum of 45 days, however, had been given for review of the material. This was consistent with the time period specified in the Panel's operational procedures, which were published in March 1989, and is consistent with the practices of panels dealing with issues of similar complexity. While more time would have been desirable for some, others argued that the problem is urgent and requires immediate action.

During the public hearings, Environment Canada, Aboriginal groups, and others identified a number of deficiencies in the documentation. They are discussed in the following sections. In the Panel's opinion, the hearings were very effective in identifying problems and concerns and in focusing attention on the Agriculture Canada proposal.

"...and I don't think there's too many other places in the world where people resolve their differences and their problems with a process that's quite as well developed and as **civilized**, I guess, as this sort of process.

Jack Van Camp
Fort Smith

4.0 ANALYSIS, OF THE PROBLEM

4.1 Disease

All participants in the Panel hearings accepted that bovine brucellosis and tuberculosis are present within bison in and around Wood Buffalo National Park, but there were wide differences of opinion as to the extent of the problem and the risk that the diseases constitute to other species and to the bison themselves.

4.1.1 Recognition and Identification of Diseased Animals

During the scoping workshops and Panel hearings, there was controversy regarding the prevalence of tuberculosis and bovine brucellosis in the bison. Based on their personal observations, local people believe the diseases to be much less common than indicated by Agriculture Canada scientists. The difference in perception of the diseases' extent is a result of the methods used to identify diseased animals. Local people base their assessment on the observation of animals with obvious illness or visible changes in the animal's tissues; scientists use methods that detect evidence of infection before the animals are obviously ill or have grossly visible lesions in their organs.



Children addressing Panel at Fort Resolution

It is important to have a clear understanding of what is meant by "exposure", "infection", and "disease" when considering the frequency of occurrence of tuberculosis and bovine brucellosis. **Exposure** is the contact between an animal and the bacteria causing the disease. **Infection** involves invasion and growth of the bacteria within the animal's body with colonization in the animal's tissues. **Disease** consists of the physical changes and signs of illness produced by the infection, which may range from very slight changes detectable only with a microscope to severe illness and death.

In some individual animals, the bacteria invading the body at the time of exposure may be destroyed by the body's defense mechanism before they become established. However, the reaction mounted by the body to defeat the bacteria may result in the animal reacting positively to tests used to detect



Frank Laviolette, Community Elder.

tuberculosis or bovine brucellosis. Such an animal has been exposed, but is neither infected nor diseased. If the bacteria are not overcome at the time of exposure, they will spread and colonize the animal's tissues. The animal is then infected and may transmit the disease to others. Methods used for detection of bovine brucellosis and tuberculosis in the living animal cannot distinguish between exposed and infected individuals.

Both bovine brucellosis and tuberculosis are persistent chronic diseases in which the causative bacteria may remain in an animal's tissues for an extended period (years in some instances) without producing obvious disease. Such animals appear healthy and no obvious lesions will be found at butchering, but they are infected and are capable of transmitting the infection. Most animals that are infected will react positively to the standard tests used to detect tuberculosis and bovine brucellosis, but some infected animals do not react and are recorded as test-negative.

The most accurate method of detecting tuberculosis and bovine brucellosis is to isolate the causative bacteria from animal tissues because this is a direct measure of infection. This method requires the animal be killed for the collection of tissues. The tests used to detect the diseases in living animals are less accurate because they measure the reaction of the animal's defense mechanisms to the bacteria rather than detecting infection directly. Some animals may react positively because of exposure even though they are no longer infected. Other animals may test negative, although they have live bacteria in their tissues and are capable of infecting other animals. Examination of living animals for signs of illness is not an adequate method of detecting either disease, as most infected animals appear clinically normal.

1. The Panel concludes that the methods used by Agriculture Canada provide the best indication available of the frequency of occurrence of the diseases in bison.

4.1.2 Concerns Regarding Disease Transmission

The risk of disease transmission to domestic cattle in the area of the Park, to wood bison in the Mackenzie Bison Sanctuary, and to humans is difficult to quantify. Spread of both diseases from bison to cattle has been documented under conditions of confinement, and the spread of bovine brucellosis from bison to cattle has been reported under range conditions, so that the risk of such transmission does exist. There is no reason to doubt that the diseases would spread to wood bison if contact between infected and uninfected bison occurred. Both bovine brucellosis and tuberculosis occur in humans, so the risk to humans also exists.

2. **The Panel concludes that there is a risk of bovine tuberculosis and bovine brucellosis being transmitted from bison in and around the Park to domestic cattle, to wood bison in the Mackenzie Bison Sanctuary, and to human users of the bison.**

The degree of risk in all cases is influenced by a number of factors which are described in the following sections.

4.1.2.1 The Geographic Distribution of Infected Bison

The exact geographic distribution of bovine brucellosis and tuberculosis in bison is not known at present, and could not be determined without extensive sampling of bison in all areas within and around the Park. Investigators have found one or both of the diseases in the past wherever samples of bison have been examined specifically for disease both within and outside the Park. This includes essentially all areas within the Park in which there are bison, as well as the Slave River Lowlands and areas to the southwest of the Park. The region of the Firebag River, southeast of the Park, where there have been bison at least sporadically, is the only area from which no data are available.

3. **The Panel concludes, based on the distribution of the diseases in the past and the lack of clear separation of bison in different areas, that bison in all areas within and outside the Park will have been exposed to bovine brucellosis and tuberculosis.**

4.1.2.2 The Prevalence of Disease in the Bison Population

Both bovine brucellosis and tuberculosis are present in bison, but the current prevalence of the diseases is not precisely known. (The prevalence rate is a ratio of the number of infected animals to the total number of animals in the population). If it was important to know the exact prevalence rate, every bison would have to be tested. The prevalence could be estimated, within defined statistical confidence limits, by large scale systematic capture and testing of bison. The most recent testing done in the area consisted of the examination of 72 bison between 1983 and 1985 (Tessaro et al., 1990). Of those, 15 had tuberculosis and 18 had bovine brucellosis. The prevalence of tuberculosis in the sample was 21 per cent (95 per cent confidence limits = 12.2 to 32.0 per cent) and the prevalence of bovine brucellosis was 25 per cent (95 per cent confidence limits = 15.5 to 36.6 per cent). These confidence limits overlap broadly with estimates obtained during earlier studies of the occurrence of disease among the bison.

The prevalence of the diseases influences the degree of risk of transmission to cattle, wood bison, humans, and other wildlife. Because domestic cattle in the area and wood bison in the Mackenzie Bison Sanctuary are free of both diseases, even a single infected animal represents a risk. The consequences of disease introduction into either group of animals are so grave that any risk, regardless of degree, is considered to be unacceptable by agriculturalists and by those associated with the Wood Bison Recovery Plan.

4. **The Panel concludes that, because the perceived risk to both domestic livestock and wood bison is largely independent of the rate of occurrence of the diseases in bison, a large-scale study to determine the precise prevalence of the diseases would not contribute to eliminating the risk to either cattle or the bison in the Mackenzie Bison Sanctuary.**

The prevalence of the diseases among the bison will, however, influence any salvage program to recover disease-free animals. The greater the prevalence rate, the fewer the animals available for salvage.

4.1.2.3 Risk of Disease Transmission to Humans

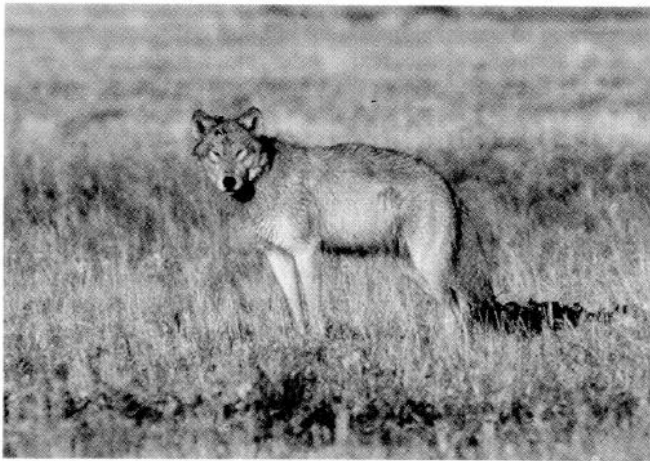
Scientific literature indicates that individuals who handle tissues from an animal infected with bovine brucellosis or tuberculosis are at risk of becoming infected. Either illness can be severe.

The risk of infection was contested strongly by local people who have had extensive experience handling bison from the Wood Buffalo National Park area. They stated that animals with obvious signs of disease were not killed by hunters or were discarded in the field when lesions of disease were observed during butchering. It should be noted that of the 72 animals referred to in Section 4.1.2.2, 56 were killed by hunters and also that animals infected with either disease may not have obvious lesions. Despite the possibility that there has been exposure to the disease, there is no public knowledge in the communities of anyone having become ill from either disease and there is little evidence from public health records to indicate that the diseases are common. Government of the Northwest Territories health officials reported to the Panel that three cases of human brucellosis had been reported from the Northwest Territories in the vicinity of the Park between 1980 and 1987 and one case of bovine tuberculosis has been reported since 1979.

5. **The Panel concludes that the risk of infection of hunters who handle infected animals is real, but based on current information, this is likely not a serious problem and is not perceived to be a problem by current consumers of bison.**

4.1.3 Role of Other Wild Species in the Maintenance of Bovine Brucellosis and Tuberculosis

Concern was expressed to the Panel that elimination of the diseased bison might be a useless exercise if other wild animals in the area harboured the infections. Other species



The wolf plays an important role in the ecosystem dynamics of bison in Wood Buffalo National Park (photo credit: L. N. Carbyn, Canadian Wildlife Service).

were thought by some to represent a source from which introduced disease-free bison could become infected. However, no animals, other than bison, have been found to be infected with bovine tuberculosis in the area, although wolf, red fox, and moose have been found infected with **Bruce//a abortus**. Scientists from Agriculture Canada and experts on bovine brucellosis from the United States consulted by the Panel indicated that the infections in those species are "secondary" or "satellite" infections acquired from infected bison. Moose appear to be very susceptible to bovine brucellosis and die of the infection, so they are unlikely to act as long-term reservoirs. Carnivores acquire the infection by feeding on infected animals but do not represent a risk of infection to other species. Experience with domestic livestock indicates that bovine brucellosis does not recur on a farm after the diseased primary hosts (cattle or bison) are removed, even though the farm dogs that remain on the farm may be infected.

6. **The Panel concludes that bovine brucellosis would disappear spontaneously from other wild species if the diseased bison were removed and that the presence of the disease in other species would not represent a risk to the success of a disease elimination program.**

4.1.4 Disease in Relation to the Size of the Population of Bison

The number of bison with 6 Wood Buffalo National Park and in the Slave River Lowlands is much smaller than it has been in the past. Although many opinions were expressed to the Panel about possible causes of the population decline, there was agreement among scientists and local people that there are now fewer bison than in the past. Surveys conducted by Park personnel indicate that the population within the Park has declined continuously from approximately 11,000 bison in 1970 to about 3,200 in 1990 (Figure 3). The Panel was told that the current low population diminishes opportunities for local people to kill bison outside the Park and reduces opportunities for visitors to view bison in the Park. The role of

disease in the population decline, either alone or in combination with other factors such as predation, is not fully understood. The decline of the diseased herd contrasts sharply with the population growth and expansion of the disease-free wood bison herd in the Mackenzie Bison Sanctuary (Figure 4). There has been no attempt to increase the size of the Park's bison herd through active management.

Opinions were expressed to the Panel that bovine brucellosis and tuberculosis may disappear spontaneously from the bison population if the number of animals continues to decline. The Panel examined this question in terms of the population biology of disease. With respect to most infectious diseases, the host population consists of four groups:

1. Susceptible animals that have not been exposed to the disease;
2. Infected animals that have been exposed to the agent but are not yet capable of transmitting the disease to others;
3. Infectious animals that can transmit the disease to others; and
4. Animals that have recovered from infection and are immune to reinfection.

In many infectious diseases, the individual is only infected for a short period of time and then recovers. Spread of the disease can only occur during an even shorter period, usually a few days or weeks. During the short infectious period, each infected individual must contact and spread the disease to at least one susceptible individual, on average, if the disease is to persist in the population. There is usually a strong relationship between the population size and density and the prevalence of disease, because the amount of contact between animals and opportunity for transmission is greater when the population is large and densely aggregated. If the population becomes small and dispersed, the rate of contact may decrease to a point at which the disease cannot persist.

This model does not apply well to bovine tuberculosis and bovine brucellosis. Both are chronic diseases in which animals remain infected and potentially infectious to others for years. Bison are long-lived so that those infected may persist in an area for many years. Even occasional contact between chronically infected individuals and susceptible animals can be sufficient to maintain the diseases within the population. Spread of both diseases can also occur during special forms of contact even at very low population density, such as between animals at the time of breeding and from an infected mother to her offspring. Bison are highly gregarious so that, even if the total population is small, the rate of contact among members of the population is still high. Indeed, the diseases have persisted for many years within small isolated cattle herds.

7. **The Panel concludes that it is unlikely that either bovine brucellosis or tuberculosis would disappear spontaneously from the bison in and around the Park at any level of population at which bison would still be a visible feature of the Park.**

4.2 Heritage Values

Some participants expressed the view that killing the disease-exposed bison would reduce the justification for Wood Buffalo National Park. This would eventually lead to its elimination thereby making more land available for forestry and agriculture. The importance of maintaining heritage values in Wood Buffalo National Park was stressed by a number of participants. Environment Canada listed the following features as having heritage value:

- A large protected wilderness ecosystem in relative isolation;
- The largest free-roaming bison herd in the world;
- Part of the largest fresh-water delta in the world;
- Nesting grounds of endangered bird species; and
- Two Ramsar Convention wetlands of international significance.



Native elder Daniel Sonfrere, with Hay River Dene Band Chief Roy Fabian acting as interpreter, was one of many Aboriginal People who spoke eloquently of the importance of hunting bison as a part of Native cultural heritage.

The Panel recognizes the importance of retaining these features of Wood Buffalo National Park as a significant part of our national heritage, but can find no justification for ascribing significant heritage value to disease organisms or bison infected by them. In addition, the value of the Peace-Athabasca Delta has been compromised by the W.A.C. Bennett Dam, and the wilderness value has been compromised by extensive commercial logging.

Most of the Park's bison herd is neither plains bison derived from the Pablo herd nor true wood bison. Both parent stocks would have had significant heritage value, but the Panel sees little value in perpetuating a mistake made 65 years ago if there is an opportunity to correct it. In the view of the Panel, any solution of the disease problem must consider the heritage resources that are protected by Wood Buffalo National Park. Elements that may be at risk are:

1. Maintenance of a free-roaming herd of bison in the Park; and
 2. Integrity of natural ecosystems in the Park.
- 8. The Panel concludes that the presence of infectious diseases reduces the heritage value of the free-roaming bison herd.**

Apart from the heritage values represented by Wood Buffalo National Park, the Panel heard Aboriginal People speak eloquently of their ancestral relationship with the land and its wildlife, and the importance of hunting bison as a part of their cultural heritage.

- 9. The Panel concludes that the traditional hunting pursuits of Aboriginal People is a significant heritage value that should be preserved.**

4.3 Hunting Rights of Aboriginal People

The rights of Aboriginal People to hunt and the legal restraints on hunting in the Northwest Territories and in Alberta were frequently brought to the Panel's attention during the hearings.

4.3.1 Hunting by Aboriginal People in the Northwest Territories

The law governing hunting, especially as it applies to Aboriginal People, is quite complex. The Constitution Act of 1867 assigned to the federal government responsibility for Indians and lands reserved for Indians (Section 9 1.24).

In Section 16 of the Northwest Territories *Act*, the Parliament of Canada gave the Commissioner in Council the authority to make laws on a number of classes of subjects, including "the preservation of game in the Territories." Sections 17 and 18 qualify the authority of the Commissioner in Council, especially as it applies to hunting by Aboriginal People.

Section 17 restricts the powers of the Commissioner in Council in the areas of provincial type laws to powers given the provinces in Sections 92 and 95 of the Constitution *Act*, 1867.

In Section 18 the Parliament of Canada broadened the Powers of the Commissioner in Council in the area of game laws as these apply to Aboriginal People. It is repeated in its entirety below. Section 18(1) was first developed in 1952 while Sections 18(2) and 18(3) were added in 1960.

18. (1) Notwithstanding section 17 but subject to subsection (3), the Commissioner in Council may make ordinances for the government of the Territories in relation to the preservation of game in the Territories that are applicable to and in respect of Indians and Inuit.

(2) Any ordinances made by the Commissioner in Council in relation to the preservation of game in the Territories, unless the contrary intention appears therein, are applicable to and in respect of Indians and Inuit.

(3) Nothing in subsection (1) and (2) shall be construed as authorizing the Commissioner in Council to make ordinances restricting or prohibiting Indians and Inuit from

hunting for food, on unoccupied Crown lands, game other than game declared by the Governor in Council to be game in danger of becoming extinct.

The thread of authority is clear. Although the Northwest Territories laws of general application cannot restrict Indians and Inuit in their hunting for food on unoccupied Crown land generally, Sections 18.2 and 18.3 give the Commissioner in Council the authority to restrict the hunting of game declared to be "in danger of becoming extinct." Wood bison in the Northwest Territories were brought under Section 18.3 by virtue of Governor in Council Order P.C. 1964-760.

The Government of the Northwest Territories thus has powers that are denied the provinces. In 1952, Justice McNiven ruled that a province cannot arbitrarily change the law so as to undermine the constitutional rights of Indians hunting for food. Justice McNiven stated:

The Legislature has no power by unilateral action to define the language used nor amplify, extend, modify or alter the terms of the said Natural Resources Agreement, nor to derogate from the rights granted to the Indians by the said agreement. These are constitutional rights which can only be amended or interpreted as provided for in the *B.N.A. [British North America] Act, 1867*, and amendments thereto.

4.3.2 Hunting by Treaty Indians in Alberta

The *Constitution Act* of 1930 gave the prairie provinces the responsibility for those land resources they had not received when they became provinces. Each prairie province's separate transfer agreement included a section that reads:

In order to secure to the Indians of the Province the continuance of the supply of game and fish for their support and subsistence, Canada agrees that the laws respecting game in force in the Province from time to time shall apply to the Indians within the boundaries thereof, provided, however, *that the said Indians shall have the right, which the Province hereby assures to them, of hunting, trapping and fishing game and fish for food at all seasons of the year on all unoccupied Crown lands and on any other lands to which the said Indians may have a right of access* (emphasis added).

This section of the *Constitution Act* preserved the right of Treaty Indians to hunt for food on unoccupied Crown lands in Alberta after ownership was transferred to the province. This right remains in place and can be exercised throughout the year.

The existing rights of Aboriginal People in Canada were confirmed in the *Constitution Act, 1982*. A recent ruling by the Supreme Court of Canada stated the phrase "existing aboriginal rights" must be interpreted flexibly so as to permit their evolution over time: a generous, liberal interpretation is demanded given that the provision is to affirm Aboriginal rights.

4.3.3 Effect of Land Claim Agreements

The right of a Treaty Indian to hunt and fish for food at any time of the year on unoccupied Crown land and lands under Indian control was reaffirmed in the December 1986 Land Claim Agreement between the Cree Band of Fort Chipewyan and the Government of Canada. The agreement guarantees the rights of the Cree Band to hunt, fish, and trap on three million acres of traditional lands in Wood Buffalo National Park (Figure 5). It also established an eight-member Wildlife Advisory Board, four members of which are appointed by the Band.

The Board's roles and terms of reference regarding traditional lands in the Park include:

- The Minister responsible for national parks is required to consult the Board on proposed changes to legislation and regulations affecting the lands or rights of the Cree;
- The Board may consider and advise the Minister on a range of subjects including:
 - renewable resource harvesting activities generally,
 - research needs,
 - new and amended game regulations,
 - overall wildlife management in the Park, and
 - research requirements for wildlife management in the Park.
- The Board is to participate in the future planning and screening of proposals which may affect the harvesting activities of the Cree and may make economic assessments with respect to harvesting issues which could affect the future livelihood and economy of the Cree Band.

10. The Panel concludes that the Fort Chipewyan Cree Band should participate directly in any ongoing planning to develop and implement a bison disease management program.

The Dene/Métis of the Northwest Territories have completed a comprehensive Land Claim Agreement with the Government of Canada. Selected items in that agreement address concerns originating in Treaty 8. The Dene/Métis Agreement provides for participation in wildlife management and, in particular, participation in managing Wood Buffalo National Park. The Dene/Métis will appoint four members to an eight-member management board established to advise the Minister (National Parks) on many subjects that could affect their traditional lands. The Dene/Métis have called the lands within the Park that are of special interest to them the "Squirrel Sunrise Management Area" (Figure 5). The Squirrel Sunrise Management Area Board will address numerous subjects of Park management including:

- All matters that affect natural resource management;
- Park management plans and policies; and
- Policies and conditions for research and field work.

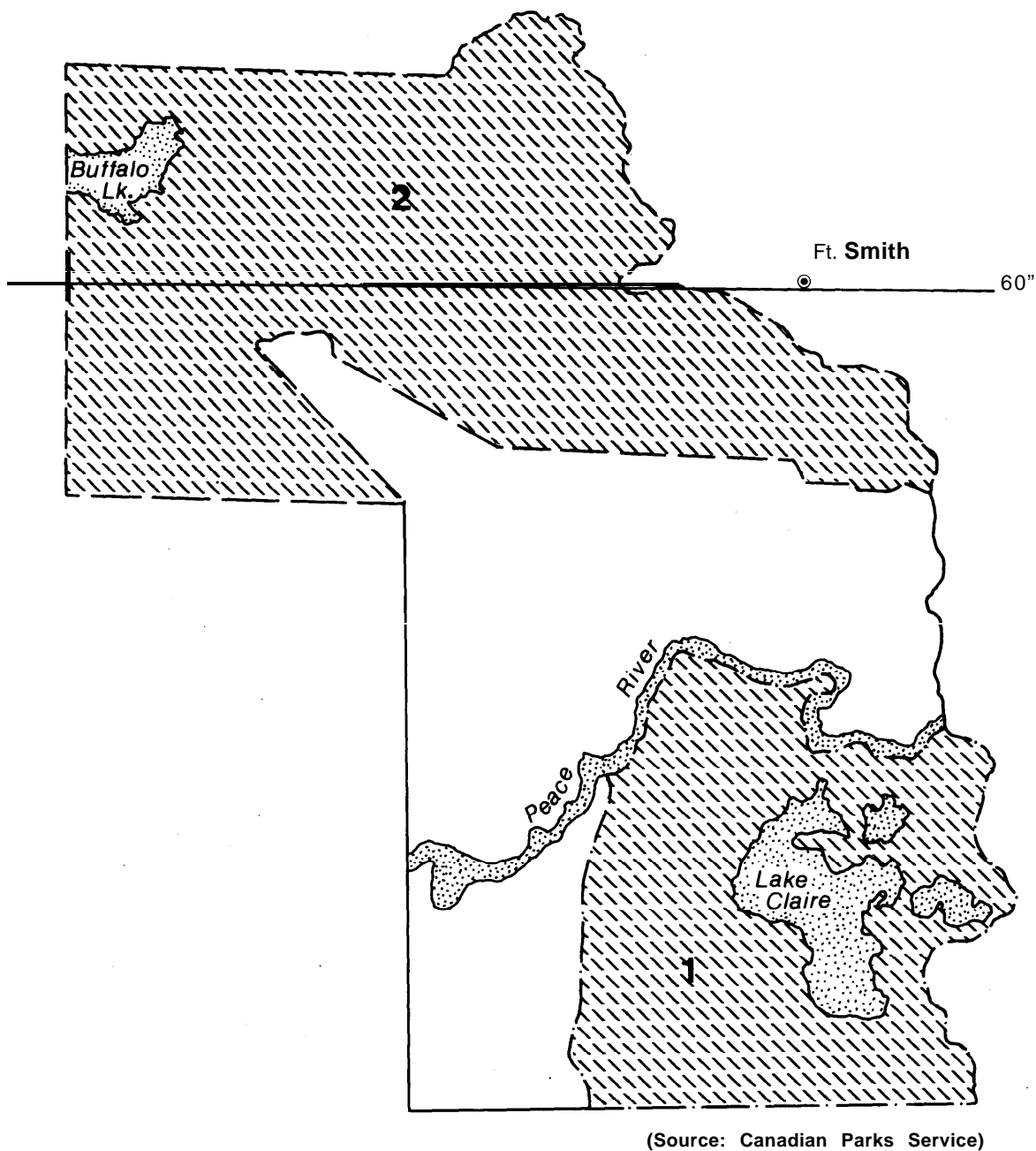


FIGURE 5 Approximate areas of land in Wood Buffalo National Park affected by Aboriginal Land Claim Agreements. (1. Cree Band of Fort Chipewyan Agreement; 2. Squirrel Sunrise Management Area.)

The Land Claim Agreement has a special provision (Section 18.6.7) to address Dene/Métis participation in manipulating wildlife populations in the Park. It would apply to the bison disease management plan envisaged by Agriculture Canada. It states:

In the event that manipulation of wildlife populations by way of a controlled harvest or relocation is required in the Squirrel Sunrise Management Area, *the Dene/Métis shall be given the preferential right to conduct the harvest or relocation under the supervision of the Park Superintendent* and, in the case of harvesting, may, at the discretion of the Minister, be permitted to dispose of wildlife parts and products resulting therefrom outside the Park. Where such manipulations give rise to commercial opportunities, the provisions of 18.6.5 shall apply (emphasis added).

The Dene/Métis Land Claim Agreement also establishes a Wildlife Management Board for their settlement area outside the Park in the Northwest Territories. The Board has powers and duties that bear on all aspects of wildlife management throughout the settlement area. On implementation of the Dene/Métis Land Claim Agreement, the Wildlife Management Board will be the agency that would develop and approve bison management plans and procedures in the Grand Detour and Hook Lake areas of the Northwest Territories.

11. **The Panel concludes that the Squirrel Sunrise Management Board and the Wildlife Management Board established in the Dene/Métis Land Claim Agreement should participate directly in any ongoing planning to develop and implement any bison disease management program.**

4.4 Preservation of Wood Bison

The Wood Bison Recovery Program is an attempt to re-establish wood bison in their historic range. The attempt to do so presupposes the existence of wood bison. Three questions must be dealt with. Are the wood bison a valid subspecies? Are the descendants of Nyarling River animals representative of the wood bison subspecies? And is there a need to salvage additional individuals of the wood bison type?

4.4.1 The Subspecies Question

North American Bison are derived from a species of bison that lived in Alaska and Northeastern Siberia during the last advance of the glaciers. As the glaciers retreated, bison were able to spread out and make their way to the east of the Rocky Mountains all the way down the great plains to northern Mexico. When Europeans first came to North America, there were several million bison on the plains. But not all bison left the shelter of the woods. A much smaller number, probably much less than one million, stayed behind in Alaska, the Yukon, southwestern Mackenzie District of the Northwest Territories, the northern half of Alberta, and adjacent parts of British Columbia and Saskatchewan. It is probable that the two kinds came into contact, and perhaps even interbred, in the Peace River region and elsewhere along the southern edge of the forest. It is highly unlikely, however, that a bison living in the region of the Park ever came into contact with a bison from the plains..

The bison of the plains made annual migrations in a generally north-south direction. The bison of the woods made only short seasonal movements. The bison of the plains travelled in enormous herds; those of the woods in small groups. Over time, the bison of the plains became smaller and lighter in colour than those of the woods, their humps became lower and rounder, and the distribution and amount of hair on the front of the body increased. Some scientists believe that the bison of the plains interbred with the survivors of a much earlier species of bison which had spread out over North America following one of the earlier glaciations. Scientists who have compared the skeletons of bison from the plains and from the woods with the skeletons of fossil bison from Alaska have noted that in most respects the bison of the woods are intermediate between those of the plains and the Alaskan fossils. The bison of the woods were recognized as a subspecies of American bison in 1897, but through the intervening years there have been dissenters from that view.

Scientists that presented evidence to the Panel differed in their interpretation of the status of wood bison. The Panel has not only given careful attention to the arguments presented to it, it has consulted much of the primary scientific literature on the question.

12. **The Panel concludes that recognition of wood bison as a separate subspecies is warranted. Plains and wood bison are at least as different from one another as are recognized subspecies of other large mammals such as deer, elk, and mountain sheep.**

4.4.2 The Nyarling River Bison

The question of the "purity" of Nyarling River animals as examples of wood bison arose repeatedly during the hearings. The Panel was told by hunters several times during the hearings that there is no difference between the different types and "they all taste the same". Scientists also disagreed about how to interpret the same set of morphometric data.

A participant in the hearings, Professor Geist, argued that the differences observed between Nyarling River and plains bison were differences which can be seen in other large mammals that have a dispersal and a sedentary form. The sedentary form is larger than the dispersal form, and the differences in morphology are consequences of differential growth of body parts in relation to overall size. On that view, he argued that plains and Nyarling River bison represent nothing more than two populations. Dr. C. van Zyll de Jong, who also appeared before the Panel, maintained that the differences between the two populations in Elk Island National Park were worthy of subspecific rank.

There can be no denial that there has been some introduction of plains bison genes into the Nyarling River population. The presence of both tuberculosis and bovine brucellosis among the animals captured in the 1960s is evidence of close contact, if not of actual interbreeding. Plates 1 to 4 in van Zyll de Jong (1986) provide evidence of intergradation of external characteristics. Biochemically, Nyarling River bison, Elk Island National Park plains bison, and hybrids differ from each other in only 3 of the 13 blood factors studied. Despite the possible

introduction of plains bison genes, descendants of Nyarling River animals differ in physical appearance from plains animals at Elk Island National Park (Figure 6), as members of the Panel learned for themselves during a visit to the Park.

Geist and Karsten (1977) stated:

One must recognize at this point, and applaud, the farsightedness of both the Canadian Wildlife Service and Historic [sic] Parks Branch in rescuing the wood bison, and ensuring that this form may live on removed from the threat of extinction.

The Panel was also impressed by the conclusion of Bork et al/ (in press) from a study of the actual genetic material of Nyarling River wood bison and Elk Island National Park plains bison. According to the authors, statistical analysis "indicates that the fragment frequencies . . . differ significantly between the two populations. This is compatible with the suggestion that the wood and plains bison exist as two unique populations." They go on to say " . . . our preliminary restriction site analysis suggests that the wood and plains bison populations at Elk Island National Park have at least reached the stage of geographic isolation in their evolutionary divergence. . . ." They conclude that " . . . according to the guidelines of the Committee on the Status of Endangered Wildlife in Canada (COSEWIC 1979), this classification of wood and plains bison as geographic populations would require that separate management of the two bison types be continued" (emphasis added).

13. The Panel concludes that separate management of wood and plains bison should continue.

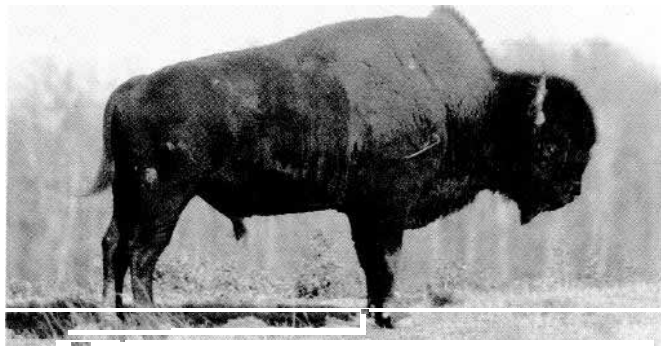
4.4.3 The Question of Salvage

The question of salvage of apparently healthy (test-negative) individuals in any disease elimination program was raised repeatedly in the hearings. Some participants urged that as many bison as possible, regardless of phenotype (wood or plains or intermediate), should be saved.

Proponents of salvage of wood bison phenotypes pointed to the narrow genetic base from which all existing wood bison are derived. In the language of population genetics, the subspecies has passed through a "bottleneck". That means the population was reduced to a very small number of survivors following which numbers again increased. In such a situation, only part of the total genetic diversity present in the population before it entered the bottleneck will be present in the survivors. In theory, each additional animal saved adds something to the total genetic variability. Variability is important because it gives a population greater flexibility in meeting changed conditions.

A second concern has to do with the high degree of inbreeding that is associated with small populations. Inbreeding effects are widely recognized among animal breeders, including keepers of zoological gardens, and are presumably the basis for incest taboos in most human cultures.

Inbreeding effects are to be expected when new populations are established in the wild from a small number of founders and after a population goes through a bottleneck. European bison furnish an excellent example. Following the First World War, the entire world population was 12 animals. Since then,



Wood bison at Elk Island National Park (photo credit: Tom Ulrich, Canadian Wildlife Service).

careful pedigrees have been kept for almost 4,000 animals. These pedigrees have provided data for detailed analyses of the effects of inbreeding. Length of life is negatively correlated with the degree of inbreeding. That is, more highly inbred populations have shorter life spans than less highly inbred populations. Postnatal and juvenile (under 2 years) mortality are positively correlated with the degree of inbreeding, as is the inter-birth interval. That means, the more highly inbred, the higher the chance of early death, and for adult cows, the longer the interval between calving. In spite of the negative effects, however, the world population of European bison has recovered to a safe level.

Wood bison also went through a bottleneck. The Nyarling River animals, from which both the Elk Island National Park and Mackenzie Bison Sanctuary populations are derived, can be thought of as survivors of a moderately severe bottleneck. To make matters worse, the survivors were divided into two groups of founders: 18 (of which one died and one disappeared in the first year) to the Mackenzie Bison Sanctuary and 24 (of which many were lost to disease in the early years) to



Plains bison at Elk Island National Park (photo credit: H. Reynolds, Canadian Wildlife Service).

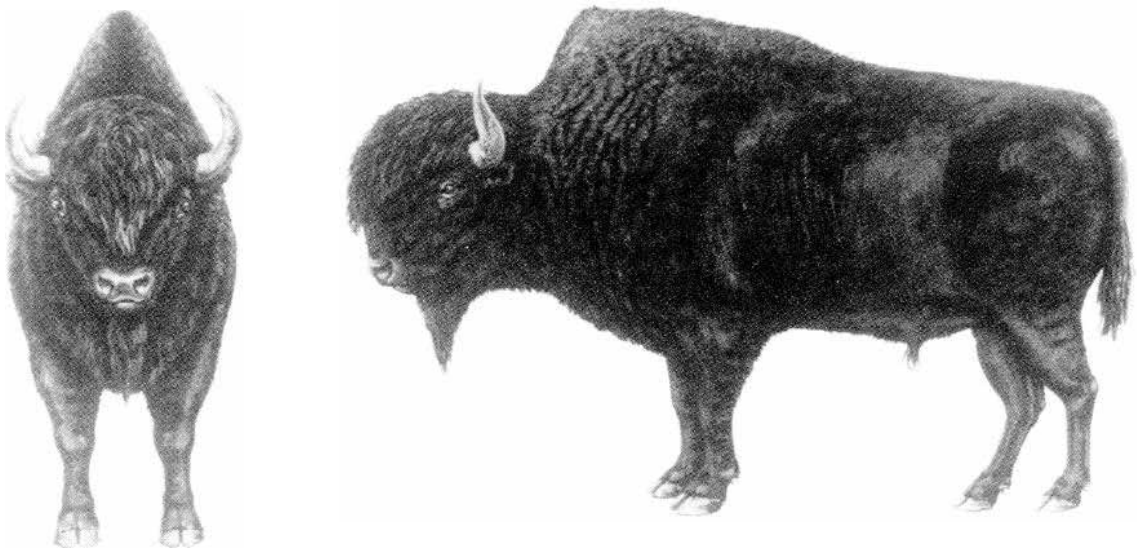


FIGURE 6a Illustration of wood bison demonstrating physical characteristics.



FIGURE 6b Illustration of plains bison demonstrating physical characteristics.

Elk Island National Park. The sex ratios were unbalanced, so that the effective populations were probably smaller than the actual populations. However, no birth defects or other reproductive anomalies have been noted in either herd, and the rate of population growth in the Mackenzie Bison Sanctuary over the first 20 years was near the theoretical maximum for the species.

A small founder population is not unique to wood bison. Each of the herds of plains bison in North America originated from a small number of **founders** captured in the wild just before the plains bison were wiped out. The Panel looked at the fate of 18 herds, of which only one had more than 50 founders, and some had as few as 5. A number of herds were privately owned and had relatively short life spans, through sale and amalgamation with other herds. The state-owned herds, on the other hand, had relatively long life spans. Some have been in existence for 100 years, albeit with infusion of new breeding stock from time to time. The important point is that, apart from the herd in the United States National Zoo which was derived from only six founders, there is no 'evidence of detrimental effects attributable to inbreeding in the recorded history of any of the herds.

14. **The Panel concludes that, although salvage of additional genetic material is not essential in any disease elimination program, it would be desirable to save wood bison phenotypes, especially from parts of Wood Buffalo National Park some distance from the Nyarling River, and from areas outside the Park such as Hook Lake, in the interest of broadening the range of genetic diversity.**

4.4.4 Reason for Saving Wood Bison

There are several reasons for re-establishing wild, free-ranging populations of wood bison. The wood bison genotype, which was the original genotype in the region of Wood Buffalo National Park, has significant heritage value. It was described by early naturalists, such as Maxwell Graham (1923) as "...these wild bison, now known to be the finest species of their

race. . . ." The Nyarling River animals have retained many of their original characteristics, not the least of which is large size.

Attempts to preserve or restore rare or endangered forms of life, both plant and animal, are gaining momentum throughout the world as part of a recognition that humanity must reach a new accord with the **ecosphere**. The recovery of the wood bison will be seen as a positive conservation initiative, both nationally and internationally.

From a biological point of view, subspeciation, even geographical separation, is part of the drama of evolution. A misguided decision 65 years ago interrupted that drama. We now have an opportunity to allow the play to resume after a somewhat protracted intermission. .

4.5 Overall Conclusion

15. **The Panel concludes that the presence of bovine brucellosis and tuberculosis in bison in and around Wood Buffalo National Park is a problem that must be addressed.**

4.6 Criteria for a Solution

Any solution must be compatible with the following four criteria:

1. The risk of disease transmission to domestic livestock, wood bison in the Mackenzie Bison Sanctuary, and to humans must be eliminated;
2. The heritage values of Wood Buffalo National Park (Section 4.2) must be protected and enhanced where possible;
3. The free-ranging, replacement stock should be of wood bison type; and
4. A self-sustaining population of free-ranging bison must be available for use by the current consumptive and non-consumptive users.

"I think strongly about a cure being found without interfering with our way of life. I'd like hunting buffalo, caribou and other such wild animals to be passed down for many more generations."

George Kurszewski

"...the conservation principles and assessment of data. . . causes us to believe that no further recovery of healthy wild wood bison populations is possible within the historic range of the subspecies unless we control the disease"

Steven Price
World Wildlife Fund (Canada)
on behalf of the Wood Bison Recovery Program

5.0 EXAMINATION OF OPTIONS

5.1 Overview

Four options for dealing with bovine brucellosis and tuberculosis in bison in and around Wood Buffalo National Park identified by the Bison Disease Task Force were included in the Panel's Terms of Reference. Several other options, or combinations of options, were identified by those presenting material to the Panel. All can be placed in one of three categories:

1. Acceptance of the risk posed by the presence of disease;
2. Management of the risk; and
3. Elimination of the risk.

The concept of risk has two components. The probability that something undesirable will happen (the risk) cannot be separated from the seriousness of the consequences if it does happen. All of us accept some risks every day, either because the odds are in our favour, or because we are not worried about the consequences if something does happen, or because we think the benefit outweighs the risk. A carpenter does not refrain from pounding nails because there is a small chance that he will hit his thumb. Even when the risk increases, we take a chance if the consequences are not serious. Anyone who consistently parks in a "No Parking Zone" will sooner or later pay a fine. On the other hand, most people will not gamble when the risk of "losing" is very high and the consequences are life-threatening. We would not light a match to check the level of gasoline in a tank, for example. On these three classes of risk, most people are in agreement.

There is a fourth class of risks on which there is far less unanimity: where the probability of disaster is low, but the consequences are serious. Most heavy smokers will not suffer lung cancer, but for those who do, the consequences are life-threatening. Most jay-walkers will not get run down by a car, but those who do pay a high price. Most nuclear reactors will not go out of control, but those that do, as at Chernobyl, may affect the whole planet. In deciding whether or not to accept such activities, we must consider the seriousness of the consequences as well as the probability of disaster.

The Panel concluded (Section 4.1.2.3) that there is a risk of transmission of tuberculosis and bovine brucellosis from infected bison to domestic cattle, to wood bison in the Mackenzie Bison Sanctuary, and to humans using the bison. The consequences of any such transmission would be serious for the cattle industry, for the Mackenzie Bison Sanctuary, and for an infected individual. The bison disease situation clearly falls into the fourth category of risks, and it is not surprising, therefore, that there is no unanimity of opinion as to how best to deal with it.

5.2 Acceptance of the Risk

Some individuals and groups presented to the Panel a defence of *status quo*, which implies that they are willing to accept the

presence of the diseases and the risk of transmission in spite of the seriousness of the possible consequences. They argue that no new management need be undertaken with respect to the diseases.

Environment Canada described a course of action which the Panel finds to be a thinly veiled version of the *status quo*. Environment Canada provided the Panel with no proposals for management action to ensure the long-term viability of the bison herd in its care. But, the *status quo* is a steadily declining bison population in the region. The *status quo* provides no assurance that bison will continue to be the dominant wild ungulate species in the region. The *status quo* provides no assurance that there will be sufficient grazing pressure from large ungulates to maintain the natural ecosystem. The *status quo* means fewer and fewer **huntable** bison to satisfy the cultural needs of Aboriginal People. The *status quo* provides ever decreasing opportunities for visitors to observe **free-roaming** bison in the Park.

The risk should not increase, if the number and distribution of the disease-exposed bison in and around Wood Buffalo National Park do not change, if the number and distribution of cattle adjacent to the Park remain unchanged, if the number and distribution of wood bison in the Mackenzie Bison Sanctuary show no further increase, and if the number of contacts between hunters and bison stays about the same.

If the bison in the Park should regain their former distribution and abundance, either on their own or with the help of some form of management, and if the prevalence of the diseases stays constant, the pool of infected **animals** would be about four times as large as it is now. **In the** opinion of the Panel, that will result in an increase in the risk of disease transmission.

If the number of cattle adjacent to the Park were to increase, or if cattle were to be pastured closer to areas containing bison, the risk of disease transmission from bison to cattle would increase. Alberta Agriculture gave no indication that either the number or distribution of cattle in the Fort Vermilion area would be frozen at its current level. In view of the history of the development of cattle raising in the area, both their population and the range they occupy could increase, which would entail an increase in the risk of disease transmission.

Scientists concerned with the Wood Bison Recovery Program are convinced that contact between disease-free wood bison from the Mackenzie Bison Sanctuary and disease-exposed bison from the Park is inevitable in the near future. If the wood bison population in the Mackenzie Bison Sanctuary continues to increase and if they continue to increase their range, the risk of contact with disease-exposed bison will also increase with time. The Mackenzie Bison Sanctuary contains the largest herd of free-roaming disease-free bison in the world. The herd comprises about 75 per cent of all wood bison. Introduction of either bovine tuberculosis or brucellosis would be a serious blow to an important and successful conservation effort.

16. The Panel concludes that the current situation is unacceptable because brucellosis and tuberculosis are unlikely to **disappear** spontaneously from the bison population, and the risk will continue to exist.

5.3 Containment of the Risk

Options within this group involve accepting that bovine brucellosis and tuberculosis will continue to occur within the bison in and around Wood Buffalo National Park, but that steps can be taken to reduce the likelihood of the diseases being transmitted to domestic cattle, wood bison, or humans. Such measures might be considered permanent, if maintained continuously, or they could be used as interim measures until a permanent risk elimination program is put in place. The two risk reduction measures considered were fencing and implementation of bison-free buffer zones, either singly or in combination.

53.1 Fencing

This option would require double fencing of the 1,160 km perimeter of Wood Buffalo National Park. The cost of constructing a suitable double-fence was estimated at \$23,650 per kilometre by the Bison Disease Task Force for a total cost of over \$27 million. There would be ongoing maintenance costs with total replacement necessary in 20 to 30 years. The presence of numerous large waterbodies around the Park margin would make construction of an effective fence almost impossible. Fencing would have serious implications for the movement of other wild animals and for human users of the Park. Construction would also require clearing of large areas of vegetation, resulting in a major environmental disturbance.



Existing bison fencing at Hay Camp, Northwest Territories.

The risk of disease transmission to cattle could not be eliminated by fencing because fences are not infallible; however, the risk could be reduced substantially by an effective system of fences. Bison-proof fences would be most effective if used to enclose cattle. This would reduce dramatically the amount of fencing required to protect cattle, but it would do nothing to prevent contact between Park bison and wood bison from the Mackenzie Bison Sanctuary.

17. The Panel concludes that fencing alone would not be a suitable permanent management technique but a limited amount of fence construction around the cattle closest to the Park could be used as an interim measure to reduce the risk of contact between bison and cattle.

53.2 Buffer Zone

The risk of disease transmission from bison to cattle could be reduced by the establishment and maintenance of a buffer zone between the Park and agricultural land. Neither cattle nor bison would be allowed in the buffer zone. Cattle in the area to the southwest of the Park are currently confined within fences and there is an area adjacent to the Park boundary where there are no cattle. Hybrid bison are not considered to be "wildlife" in Alberta, nor are they listed as an "excluded animal". It appears that free-ranging bison found near domestic cattle could be killed by anyone at any time and so reduce the risk of disease transmission.

It is unclear whether resources are available or if any government agency is prepared to provide the resources required to maintain a bison-free zone between the Park and the current locations where there are cattle. Active surveillance from aircraft could detect most bison that venture into the area west of the Park during the winter when animals and tracks are



Wood Buffalo National Park



Peace River, Wood Buffalo National Park

highly visible. No method is available to detect bison reliably during summer, when the risk of transmission of the disease to cattle is greatest. Bison in areas around the Park are used by local Aboriginal People. Elimination of bison to create a bison-free buffer zone could be done with their assistance, but would deprive them of further access to the resource.

In 1987, the Department of Renewable Resources, Government of the Northwest Territories, established a buffer zone along part of the south shore of the Mackenzie River and the west end of Great Slave Lake, adjacent to the Mackenzie Bison Sanctuary. Aerial searches for bison and bison sign were carried out during February and March with the intention that any bison found in the area would be killed by department personnel. Until May 1, 1989, no bison had been seen in the area; however, three bison were reported by tourists in May. Those animals were not found during a follow-up investigation. It was estimated that more intensive surveillance of a larger area between November and March would cost approximately \$115,000 per year. Searching during the snow-free months was not considered to be worthwhile because bison are difficult to detect at that time of year. The efficiency of this type of buffer zone in reducing the risk of contact between wood bison from the Mackenzie Bison Sanctuary and disease-exposed bison is not known, but a buffer zone is not regarded by the Panel to be a reliable method of preventing such contact.

- 18. The Panel concludes that buffer zones would not be a permanent solution to the disease problem since they are fallible and they entail a considerable expenditure in perpetuity but they could be used as an interim measure.**

53.3 The Combination of Fencing and Buffer Zones

For the reasons discussed above, fencing in combination with some form of buffer zone might be used as an interim measure, but it would not offer a permanent solution to the problem.

5.4 Elimination of the Risk

Eradication of the diseases would eliminate the risk of transmission of bovine brucellosis and tuberculosis from bison in and around Wood Buffalo National Park to domestic cattle, to wood bison, and to humans. Several possible methods of eliminating the diseases were considered by the Panel.

5.4.1 Identification of Diseased Animals

To eliminate only infected individuals requires that they can be identified. Procedures available for identifying bovine brucellosis and tuberculosis in live animals are quite sensitive but they will not detect every individual animal infected with either disease. Testing of individual animals repeatedly at regular intervals over a period of time increases the likelihood of detecting infected animals, but it does not guarantee that every single infected individual will be identified. Animals must be captured, restrained, and held in captivity for these tests. To test for bovine brucellosis, the animal must be held while a

blood sample is collected, and then the animal must be released into a holding area until the results of the test are available. The test for tuberculosis requires that the animal be restrained for the injection of antigen, then recaptured 72 hours later and restrained again for examination of the reaction.

54.2 Capture and Handling

The process of capturing, holding, and handling large wild animals such as bison causes special problems, many of which are well known to people in the communities around the Park as a result of their observations of past roundups. Based on this experience, it is known there will be injuries to and deaths of bison associated with handling. Local people expressed the desire that these problems not be repeated.



The process of capturing, holding, and handling large wild animals such as bison causes special problems.

Capture and holding of bison in close confinement for any purpose (testing, treatment, immunization) will also result in increased contact among the animals, which will increase the probability of transmission of bovine brucellosis and tuberculosis from infected to susceptible animals during handling.

54.3 Treatment Of Diseased Animals

Most infectious diseases of humans and many infectious diseases of domestic livestock can be eliminated from the infected individual by suitable treatment with drugs. This has created a perception that the diseases of wild bison could be eliminated by treatment. No methods have been developed to treat satisfactorily either tuberculosis or bovine brucellosis in domestic livestock and there has been no experimentation to develop treatment programs for bison. Research to develop a regime would be lengthy, expensive, and without any guarantee of success. Agricultural agencies are not willing to support

such research because their goal is eradication of the diseases and treatment has not proven to be a feasible method of accomplishing this goal. Any type of treatment that might be used would involve capture and holding all of the animals in captivity for an extended period with the associated risk of injury and disease transmission.

19. The Panel concludes that treatment is not a feasible method of eliminating tuberculosis and bovine brucellosis from wild bison.

5.4.4 Immunization

The use of immunization or vaccination was proposed by a number of individuals as a method for eliminating tuberculosis and bovine brucellosis from free-ranging bison. Immunization would not "cure" animals that are already infected with either disease. The infected animals would have to be removed from the population, even if immunization were used. Immunization using a vaccine called Strain 19 was used during the program to control bovine brucellosis in Canadian cattle. It was found to be successful in reducing the overall prevalence of the disease. Use of the vaccine in cattle was ended because the disease continued to occur, although at a reduced level. It was concluded that the disease could be controlled in domestic cattle, but not eradicated, by this means. Strain 19 has proven to be less suitable for bison than for cattle. Vaccination of females results in a high abortion rate and some animals abort again in subsequent years. A major limitation is that the vaccine may prevent the development of clinical disease but some animals may, nevertheless, become infected.

At present there is no suitable vaccine available for bovine tuberculosis. There is very little interest in developing new vaccines for either disease because veterinary agencies have found that herd depopulation is the most successful method of eliminating bovine brucellosis and tuberculosis from domestic livestock. For this reason, no research funding is available for vaccine development and it is unlikely that there will be any major developments in this area.

Even if suitable vaccines were available, there would be a major problem in administering them to the animals. To be effective, a very large proportion of the animals in the population would have to be immunized. Currently available vaccines must be injected; it would be necessary to capture and restrain all animals in the population for immunization and marking.

Roundups would have to be repeated every year to immunize new animals. Experience with attempted immunization of bison in the Park for anthrax was that at best only 30 per cent of the population was immunized. The handling itself caused a high rate of injury and death during capture and restraint.

20. The Panel concludes that, because there is no suitable vaccine for either bovine brucellosis or tuberculosis and no method of mass immunization of a free-ranging bison herd, it is not practical to use immunization to eliminate the diseases.

5.4.5 Removal of Disease-Exposed Bison

If all diseased and disease-exposed bison could be removed from within and around Wood Buffalo National Park, the diseases would be eliminated from the area. Infections in secondary hosts (carnivores, moose, external environment) would disappear when the range was free of bison. There are two ways to remove diseased bison. The first is to consider that all of the bison in the area have been exposed to the diseases and should be removed. The other approach is to attempt to differentiate between animals that have been exposed to the diseases and those that have not. The disease-exposed animals would be removed while the other animals would be retained to repopulate the area.

There are very serious problems that limit the ability to apply a "test-and-removal" program to the bison. The first of these is that the tests available for detecting diseased animals are imperfect. Animals that were infected shortly before they are tested will be negative when tested. Some animals with advanced disease will also give negative test results. Because of the fallibility of the tests, some infected animals will be missed during the test procedure and they may infect others in the salvaged group. If the test is repeated several times over a period of time, some of the "undetected" animals will eventually be identified, but this requires the animals to be available for repeated testing over a period of years. It does not solve the problem of transmission of disease from the infected animals between tests.

The second major problem relates to the difficulty of collecting and holding animals for the tests. In a domestic cattle herd, all of the animals in the herd can be gathered and tested at one time, so that only test-negative animals remain in the herd after the test. It will be impossible to capture all the bison in and around the Park at one time for testing, so that diseased bison would remain free in the area while the testing program was underway. Because of this, all test-negative animals would have to be held in captivity until all bison had been captured. It would be necessary to hold all test-negative animals, together with their offspring, within corrals where they could be recaptured for testing for at least several years. That would necessitate construction and maintenance of pens and ancillary facilities capable of holding many bison. In a large group of animals held under crowded conditions any recurrence of either disease would spread rapidly and widely. Furthermore, construction and operation of the facilities could have serious environmental impacts on the Park.

Based on experience in the use of the test-and-removal method in domestic livestock herds, it is highly unlikely that this method would be successful in eliminating either bovine brucellosis or tuberculosis from a large group of bison. Because the tests are not totally effective in detecting infected animals, diseased animals are likely to continue to appear for years. At best, this would delay the release of animals for an extended period and might result in the eventual elimination of the entire herd after several years of testing, as has happened in the case of a number of cattle herds.

21. The Panel concludes that test and removal with salvage of all test-negative animals will not succeed although some limited salvage of wood bison phenotypes may be feasible if the salvaged animals are isolated in small groups.

22. **The Panel concludes that eradication of the existing bison population is the only method of eliminating the risk of transmission of bovine brucellosis and tuberculosis from bison in and around Wood Buffalo National Park to domestic cattle, wood bison, and humans.**

5.5 Repopulation

Eradication of the existing population must be accompanied by repopulation with disease-free wood bison. Experience in the Mackenzie Bison Sanctuary has demonstrated that such repopulation is feasible.

5.6 Recommended Solution

23. **After considering the alternatives, the Panel recommends that all free-ranging bison now living in Wood Buffalo National Park and surrounding areas be removed and replaced by disease-free wood bison.**

The Panel believes that this recommendation would satisfy the criteria identified in Section 4.6. If it is carried out thoroughly and to completion, the diseases will disappear with the last of the disease-exposed bison.

The recommended solution would have serious effects on some heritage values in the short term but it would assure and enhance them in the long term if it is implemented successfully. Wood bison will once again be the dominant ungulate on the prairies and in the forests of the region. This serves our collective national and global heritage. The Panel believes that the significance of Wood Buffalo National Park as a "World Heritage Site" would be enhanced by the removal of diseased bison of mixed ancestry, and their replacement with a healthy strain that is the closest possible relative of the original endemic form.

The opportunity to hunt bison will be lost temporarily, but it seems logical to assume that replacement herds will increase at a rate similar to that of the herd in the Mackenzie Bison

Sanctuary. Should that be the case, and given careful planning, the period when no hunting is possible could be as short as four years.

On the other hand, elimination of the diseases from the Park and surrounding areas would be a giant step forward toward the ultimate goal of removing wood bison from the list of endangered species both nationally and internationally because it would make a large area of suitable range available for restocking without fear of contamination with bovine brucellosis or tuberculosis.

5.7 Interim Measures

Implementation of any course of action to eliminate the risk will occur over a period of years. The following risk management measures should be put into place in the interim to reduce the risk of transmission of the disease to domestic cattle, to wood bison in the Mackenzie Bison Sanctuary, and to humans:

- Holders of a General Hunting Licence in the Northwest Territories should be allowed to kill bison in the buffer zone between Wood Buffalo National Park and the Mackenzie Bison Sanctuary;
- Agriculture Canada should continue testing and monitoring cattle moving from the area of Alberta adjacent to Wood Buffalo National Park;
- There should be no increase in cattle pasturing or rezoning of lands for agricultural use in the area adjacent to Wood Buffalo National Park;
- If necessary, additional fencing could be constructed around pastures to prevent contact between cattle and bison;
- Health agencies in the Northwest Territories and Alberta should provide educational materials to bison hunters to reduce the risk of infection to humans; and
- Increased surveillance should occur in the areas between the Mackenzie Bison Sanctuary and the Park, and the agriculture area in northern Alberta and the Park.

"...management of wood bison at least in Alberta would be threatened and probably terminated by the decision not to replace diseased bison in Wood Buffalo National Park and northern Alberta. The restoration of wood bison in Hay/Zama Lake is being postponed until northern bison diseases are eliminated."

Bill Hall
Alberta Fish and Wildlife

"The Little Red River Tribe recognizes the complexity and difficulty of eradicating brucellosis and tuberculosis from the bison population in the Wood Buffalo Park region. Although the basic biological assumptions of the preferred alternative (i.e., eradication of hybrid animals and replacement with wood bison) are sound, the success for such a program is questionable. ..."

Chef Johnsen Sewepagaham
Little Red River Cree Tribe

6.0 IMPLEMENTING THE SOLUTION

6.1 The Concept

The Panel recommended in Section 5.6 that all bison now living in Wood Buffalo National Park and surrounding areas be removed and replaced with disease-free wood bison. Following bison depopulation of the Park and surrounding areas, there must be a period of monitoring to be sure the last animal has been removed. Repopulation with wood bison must begin before and continue simultaneously with the depopulation. The Panel cannot emphasize too strongly the necessity to give equal importance to both aspects — depopulation and repopulation — of the program. This solution encompasses many of the elements of the Agriculture Canada proposal, but several areas of concern arise with respect to its implementation. Some centre on ways to minimize associated environmental impacts, others relate to the concerns of Aboriginal Peoples for whom bison are important spiritually as well as for subsistence.

The basic concept proposed by the Panel consists of the establishment of several breeding units in which disease-free wood bison from Elk Island National Park would be propagated for eventual release. They should be located outside the Park, near local communities, with the exception of one within Wood Buffalo National Park to be used for visitor viewing and interpretation. Small numbers of animals of wood bison phenotype salvaged from the Park could be maintained in captivity in separate breeding units until they, or their progeny, are known to be free of disease. After the establishment of the breeding herds, depopulation could take place, beginning within Wood Buffalo National Park. After removal of all bison; the area should remain free of bison for several years before the healthy animals are released from the breeding units. The following sections contain a discussion of the concept's implications and offer guidelines related to the implementation. The consultative program explained in Section 6.6 should be used to further elaborate the concept.

6.2 Depopulation

6.2.1 Feasibility of Total Removal

Many review participants expressed concern for the ability to remove all bison from such a large area. Survival of a single disease-exposed bison and subsequent infection of healthy animals from the repopulation effort would negate all disease eradication efforts in this program.

Depopulation activities would include:

- Baiting wild bison for capture;
- Construction of holding and slaughter facilities;
- Aerial surveys to find bison in remote locations where baiting would be ineffective;
- Dispatching hunters by helicopter to kill single bison and small herds in remote areas; and
- Prolonged intensive aerial surveys to confirm that all wild bison in an area of approximately 150,000 km² have been removed.

Each step requires detailed planning, design, and methodical implementation. Although difficult and time-consuming, the Panel believes that such a program is feasible.

24. **The Panel concludes that bison in and around Wood Buffalo National Park can be eliminated if due diligence is applied to each element of the depopulation phase of the program.**

6.3 Repopulation

6.3.1 Supply of Replacement Stock

Agriculture Canada initially suggested that replacement stock could be obtained from the Mackenzie Bison Sanctuary as well as from Elk Island National Park. Several objections were raised to the use of animals from the Mackenzie Bison Sanctuary. At present, there are no facilities for capture and handling in the Mackenzie Bison Sanctuary, and there is some reluctance to see such facilities built. Second, the people of Fort Providence were not in favour of the idea. Third, it may be unnecessary to use animals from the Mackenzie Bison Sanctuary.

The Panel has been informed that as many as 80 animals may be available from Elk Island National Park in 1990-91, and 40 animals annually in subsequent years. That could provide sufficient replacement stock if breeding stations are ready to receive the animals as they become available.

25. **The Panel recommends replacement stock come primarily from Elk Island National Park.**

It is suggested that a limited salvage of test negative wood bison phenotypes may be possible if small groups of salvaged animals, not more than about 20 in each group, are confined in secure corrals. Each group would be subjected to a regimen prescribed by Agriculture Canada to ensure that only disease-free individuals would eventually be available for release. It is anticipated that some groups may never be freed of disease, whereas others would be. The latter would be available to supplement the genetic diversity of replacement stock.

The criteria for selection of animals for salvage should be established by the Wood Bison Recovery Team. To ensure that there is complete objectivity in the selection process, a non-governmental organization should oversee the salvage operation.

26. **The Panel recommends that a non-governmental organization within the Wood Bison Recovery Team be approached to oversee the salvage operation.**

6.3.2 Number and Location of Breeding Stations

In order to ensure success of the repopulation program, and to provide maximum benefit to local people, a number of breeding stations should be located in the Park area. Agriculture Canada has expressed a willingness to underwrite the costs of holding corrals and other facilities for raising replacement stock, but did not specify the number and location.

In the Panel's view, the first breeding station should be established outside the Park, preferably in the southwest. It should be operated by the Cree People of the region, if they have the interest in doing so and if a suitable agreement can be reached. This station should be established as soon as possible, in order to take advantage of 80 surplus animals from Elk Island National Park available in the winter of 1991. The second breeding station should be located in the Park, probably at Hay Camp, to provide a herd for viewing. It should be established and stocked in the second year. The remaining breeding stations should follow at yearly intervals. Details of timing, management, and location should be decided by the process outlined in Section 6.6.

27. **The Panel recommends that five breeding stations be established, four of them outside Wood Buffalo National Park, and one inside.**

6.3.3 Growth Potential

Computer modelling was used by the Panel to predict the growth potential of bison herds. In all cases it was assumed that founder stock would consist of equal numbers of males and females, and that one half of the females would be rising 3-year-olds and older and in calf when shipped in the late winter. In year zero, then, the population would consist of the founders plus the calves born that spring. The sex ratio at birth was assumed to be 51 per cent male, which ensured that the rounding process would make the "odd" calf a male whenever the number of calves "born" was uneven.

A number of different values for conception and birth rate, survival of young to 27 months (at which age females were assumed to first breed), and adult survival, were tested by the Panel. A statistic called the instantaneous rate of increase was calculated for each trial, both on the assumption that all males would be left in the herd, and on the assumption that a "breeding ratio" of three adult females to one adult male would be maintained. "Surplus" males could be used as breeding stock or for meat and other products.

Table 1 shows the effect of combining an initial 80 bison founders with 4 subsequent infusions of 40 founders. The instantaneous rate of increase for the basic herd of 40

Year	Site 1	Site 2	Site 3	Site 4	Site 5	Total
Founders	80	40	40	40	40	240
0	98	•	•	•	•	98
1	121	49	•	•	•	170
2	154	62	49	•	•	265
3	192	80	62	49	•	383
4	239	102	80	62	49	532
5	300	129	102	80	62	673
6	378	160	129	102	80	849
7	473	199	160	129	102	1063
8	593	248	199	160	129	1329
9	742	311	248	199	160	1660
10	930	390	311	248	199	2078
11	1165	487	390	311	248	2601
12	1458	610	487	390	311	3256
13	1828	763	610	487	390	4078
14	2283	954	763	610	487	5097
15	2857	1194	954	763	610	6378

Table 1 Repopulation Scenario.

Projected growth of founder populations based on the availability of 80 animals in the first year for Site 1 and 40 animals per year for the next four years to be available for other sites. Assumptions of the model are: that 25% of each shipment will be cows in calf; the sex ratio of the founders is 1:1; conception rate is 90%; survival to age 27 months is 90%; females breed at about 27 months and annually thereafter; adult mortality is 2% per year.

founders is 0.228, and for the exponential part of the combined herds (years 4 to 15) it is 0.226. According to this scenario, there will be about 675 animals by the year 5, about 2,100 by year 10, and nearly 6,400 by year 15. The doubling time is just more than 3 years and is represented graphically in Figure 7.

The herd in the Mackenzie Bison Sanctuary grew at an instantaneous rate of 0.23 during its first 15 years. It is expected that performance of intensively managed herds in captivity will exceed that of the unmanaged Mackenzie Bison Sanctuary animals. If so, the prediction made here is on the conservative side.

If the population of wood bison within the Park increases to a level that reaches the carrying capacity of the habitat, further management may be necessary. Any such action must be in accordance with Land Claim Settlements and Agreements and may include the hunting of wood bison by those eligible to hunt within the Park boundaries.

6.4 Cost Considerations

Agriculture Canada estimated that their proposed course of action would cost \$20 million over 10 years. The Panel has not attempted a cost estimate of its own, but fears that the actual costs may exceed that amount.

Concerns were expressed by the public that, given budgetary constraints, the money might run out before repopulation is accomplished. Agriculture Canada was not able to guarantee that future governments would ensure funding to complete the

entire proposal. They pointed out, however, that their estimate of the cost of implementing interim protection measures to reduce the risk of disease transmission is \$2.6 million per year, which is greater than the average estimated annual cost of the proposal, and that this amount would be required in perpetuity.

The Panel wishes to point out that if breeding stations are established prior to depopulation, replacement animals would be assured even if the program were to be aborted before completion.

28. **The Panel recommends that the financial requirements and sources for the implementation of the preferred option be re-examined once the detailed design of the program is complete.**

6.5 Environmental and Socio-economic Impacts

6.5.1 Environmental Impacts

Implementation of the preferred option will generate direct environmental impacts. The construction of corral and fence systems and use of access roads will disturb the natural setting in the Park and may also affect some wildlife species. Those impacts can be reduced in severity by confining them, as far as possible, to areas outside the Park and within the Park to areas that have already suffered disturbance, such as the Sweetgrass Meadows and Hay Camp, which are served by existing roads.

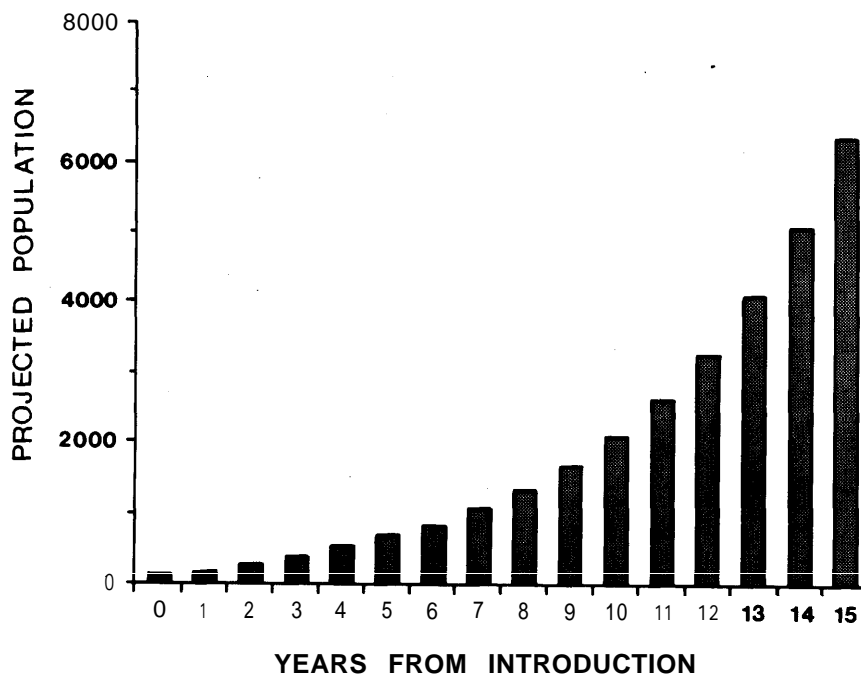


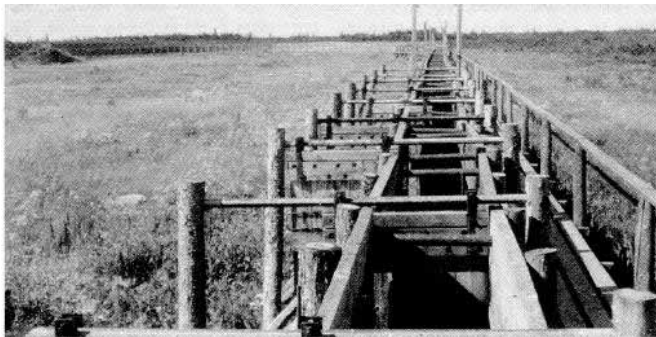
FIGURE 7 Projected growth of founder population.

29. The Panel recommends that provisions be made in advance for the removal of all structures and reclamation of the affected areas.

If supplemental feeding of animals held in corrals is necessary, care should be taken that exotic plants are not introduced. Consideration should be given to putting up wild hay in the Park. The Panel noted, however, that exotics are already established on the Sweetgrass site.

Aircraft traffic will undoubtedly increase during the depopulation phase and the subsequent period of monitoring. Frequent overflights may have a detrimental effect on other large mammals, especially moose. If low-level flights are prohibited, except when absolutely necessary, any negative effects should be minimal.

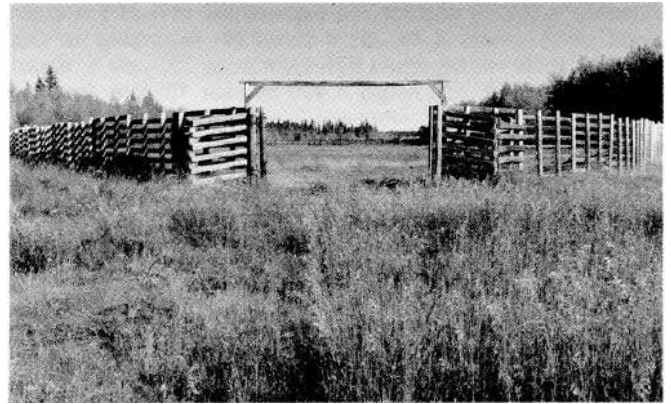
Considerable concern was expressed by hunters that, as bison numbers declined, wolves would be forced to turn their attention to other prey species. Of greatest concern is the possibility that moose would be the most likely alternative prey, and that they would suffer serious depredation as a result. Trappers expressed concern that wolves will turn their attention to animals caught in traps.



Disturbances to the natural setting of the Park can be minimized by confining construction of corrals outside the Park where possible and within the Park to areas that have already suffered disturbance.

There is widespread apprehension that the wolf population in Wood Buffalo National Park is high at present. Evidence assembled for the Panel by Dr. F. Messier (Compendium, p. 243) suggests that wolf numbers may have peaked in Wood Buffalo National Park during the mid-1970s. Both the number of wolves trapped and the number of wolf sightings during bison counts have declined since then. Nevertheless, the population at the present time may still be higher than its long-term average.

Dr. Messier reviewed information drawn from recent field studies of wolves and their primary prey in which the investigators used modern technology, such as radio tracking, to obtain information. The relationship between wolves and moose (their primary prey) has been studied intensively on Isle Royale in Lake Superior since 1959. The data show that wolf numbers



Existing bison corral system at Sweetgrass Meadows within Wood Buffalo National Park.

increased as moose numbers went up and decreased as moose numbers went down. For the most part, there has been one pack of wolves on each end of the island, but when moose numbers were at their peak, there were four packs, and when they were low there was only a single pack.

Evidence from other studies confirms that wolf populations are closely tied to the numbers of their primary prey, whether that prey be moose, elk, or deer. It has also been shown that where moose are the primary prey species, moose populations having a density less than about 0.2 per square km are unable to support a wolf population. Wolf numbers will likely decline as the number of bison (the primary prey) declines, and because the density of moose in the Park (Messier, Compendium, p. 244) is currently less than the minimum required to support a population of wolves, predation on moose will not stop the decline in wolf numbers.

Other scientists have analyzed the population dynamics of wolves in areas where prey is abundant and in areas where prey is scarce. The results show that when prey is scarce, pups weigh less and mature more slowly than when prey is abundant. Small pups seldom survive their first year of life, and, if they do, they tend to be small as adults and hence unlikely to achieve dominant status. Subordinate animals may starve to death because dominant individuals do not allow them to eat when food is short. Wolf packs also tend to break up during lean years so that their average size is reduced. Animals that leave packs suffer higher mortality than those that stay. Some packs will invade the territories of their neighbours, and actual killing of wolves by other wolves has been documented. The proportion of adult females that breed is also related to their nutritional status; only well-fed females produce pups.

Evidence reviewed above strongly suggests that wolf populations are regulated, within limits, by the abundance of prey available to them. Therefore, the Panel believes that the most probable response of the wolf population to bison depopulation will be a decline in wolf numbers.

The anticipated decline in wolf numbers may not keep pace with the rate of bison depopulation, particularly if the latter is carried out quickly. In this case, there may be a transition

period during which surplus wolves will disperse and some of them will undoubtedly prey on moose and other game. Wolves may also eat animals caught in traps, thus destroying their value to trappers.

30. The Panel, therefore, recommends that:

- Depopulation take place during winter;
- All offal be properly disposed of and not 'be left in the field for scavengers because it would serve to increase the nutritional status of wolves and thus counteract the factors that bring about an adjustment in wolf numbers;
- Captive bison be protected by wolf-proof fences and a system of patrols; and
- Moose densities and cow/calf ratios be monitored to determine whether wolf predation is having a detrimental effect on moose population.

In the event that monitoring reveals serious predation on moose and traplines, the Panel recommends that:

- Chiefs and elders nominate wolf trappers;
- Traps be provided for each wolf trapper; and
- An allowance for trappers' expenses be provided which could include gas for snowmobiles.

The outlined scheme has the advantage of providing local employment while at the same time giving local people the means and the incentive to protect their livelihood.

The Panel is aware that an excess of wolves is not the only concern. Some groups feared that the wolves themselves and the predator-prey relationship may be placed in jeopardy by loss of the primary prey. This relationship is one of the natural interactions that should be maintained in a large national park.

The decline in the wolf population is not likely to be permanent because of the great capacity of wolves to increase their numbers when food is available. A female wolf need only raise two pups to maturity to replace herself and a mate. The average litter size in Park wolves is between five and six pups, and since many adult females will live to produce more than one litter there is a large excess of young available. Recovery of the wolf population should follow quickly on the heels of the recovery of bison numbers.

6.5.2 Socio-economic Impacts

In Fort Smith, the Mayor and the local tourist operator expressed concerns about loss of income from tourism. If the disease eradication program is looked on in a negative light, tourism could be negatively affected. But if the program is treated as a positive conservation initiative for the recovery of threatened wildlife, the effect on tourism can be positive. Detailed information should be available to the public about the program and its anticipated benefits. Progress reports should also be made public from time to time. A sure way to stimulate controversy is to try to put a cloak of secrecy over

the entire program. There is nothing in the recommended program that needs to be kept secret.

It is essential that bison be available for public viewing at all times. A breeding station at Hay Camp would be the ideal location for an interpretive centre where up-to-date information about all aspects of the program would be available.

31. The Panel recommends that the program be presented as a positive conservation initiative and the reasons for the program and its progress be explained as part of the interpretive program in the Park.

Outside of the Park, the chief impact is likely to be the loss of an important food source. There are two ways to deal with the problem. First, if approximately 50 per cent of the animals in the Park are disease-free, a large amount of meat could be salvaged during the kill. Second, it is not necessary to keep all the males born in the breeding stations. Some could be made available to local people. The animals could be sent to slaughter as yearlings, which would ensure high quality meat.

The disease eradication program would also have significant positive effects on the local economy. Local labour could, and should, be used for virtually all aspects of the program from building fences and corrals, camp construction and operation, hunting and field slaughter, to operation of the breeding stations. Materials should also be supplied by local businesses to the extent possible.

Agriculture Canada has indicated a willingness to turn the breeding stations over to local ownership at the conclusion of the program. Thus, communities or individuals will have an opportunity to continue in the bison ranching business without associated development costs.

Agriculture Canada proposed construction of an abattoir in Fort Smith for processing animals removed during the depopulation. The need for this facility cannot be assessed until detailed planning of the depopulation phase is completed. It is possible that an abattoir may be required for processing bison reared in captivity and prepared for retail trade.

The risk of human infection, real and perceived, will be important during management of the diseased bison. Workers handling bison which may be diseased must be trained and monitored closely to reduce the possibility of work-related infection. Meat from diseased bison should not be salvaged for human use; by-products may be salvaged if they can be handled in a manner that will render them safe. Meat from animals that test negative for bovine brucellosis and tuberculosis could be used in the same manner as meat from test-negative domestic cattle. Such meat is likely to have poor public acceptance and should not be released on the general market where it might have an adverse effect on the domestic bison industry.

Wood bison are presently declared endangered in both the Northwest Territories and Alberta, as well as protected in Wood Buffalo National Park. When the Park has been repopulated, the objective of four free-ranging herds of at least 200 individuals each will have been attained. At that time, wood bison can and should be removed from the list of

endangered species and be treated as a big game animal. Then, at long last, the right to hunt wild wood bison for food can be restored to Aboriginal People.

32. The Panel recommends that:

1. **First preference be given to local businesses and the local labour force for economic opportunities and employment associated with removal of disease-exposed bison and their replacement with wood bison; and**
2. **If the bison population in Wood Buffalo National Park reaches the carrying capacity of the range, the Canadian Parks Service allow the hunting of wood bison by those eligible to hunt within the Park boundaries.**

6.6 Northern Bison Management Stakeholders Group

Aboriginal People expressed great concern about Agriculture Canada's proposal to kill the bison in and around Wood Buffalo National Park and to replace them with disease-free wood bison. Wildlife are a source of meat and other products for subsistence use. They provide a source of income from fur harvesting. Wildlife, therefore, are of spiritual, cultural and economic importance for Canada's Aboriginal People, who will examine very carefully any activity which could affect their way of life.

Aboriginal People also expressed the view that the decision-making process to date had not allowed their effective participation in the development and assessment of alternatives for dealing with the diseased bison. Government agencies have been involved in the issue since 1986, when an inter-jurisdictional Steering Committee was formed. A Diseased Bison Task Force established by the Committee made several proposals in 1988. Aboriginal People were not consulted until April 1989, when the Panel was formed and scoping workshops were convened. At the scoping workshops, Aboriginal People offered their views on issues they thought needed further study and on the implications of the various alternatives proposed by the Diseased Bison Task Force.

Some Aboriginal People expressed a desire to become more involved in the development of alternatives and requested funding assistance. Although participant funding has been made available to assist groups to participate in some environmental assessment panel reviews, none was provided in this case. Although there is no consistent federal policy on participant funding, initiating departments are becoming more aware of the desirability of providing funds to assist participants in panel reviews.

In response to the scoping workshops, Agriculture Canada developed a proposal involving eradication of all the bison in and around the Park and replacement with disease-free wood bison. Discussion at the Panel's final public hearings focused on this alternative, which was developed in consultation with various government agencies and with some input from interested people in Fort Smith.

Immediately prior to the public hearings, Treaty 8 Chiefs and Métis leaders from the area around Wood Buffalo National Park met to develop a position that was presented to the Panel at its first meeting in Fort Vermilion. They outlined a number of recommendations, including the provision of \$784,888 to assist Aboriginal People in a more thorough review of Agriculture Canada's proposal and the development of a counter-proposal. Their recommendations were examined and discussed in all the subsequent meetings.

During those discussions, it became apparent that Aboriginal People also recognize that the presence of diseases in the bison is a problem. However, they did not accept the Agriculture Canada proposal as the most appropriate solution. The Panel came to appreciate that Aboriginal Peoples' considerable knowledge of bison would be invaluable to the development of a solution.

The Panel accepts that Aboriginal People are legitimate stakeholders in decisions associated with resolving the diseased bison problem. Elimination of the existing herd, even if only temporarily, could have unknown effects on them. There could also be some benefits to Aboriginal People depending on the final design of the concept and its implementation.

The Panel believes there are interim measures (Section 5.7) that could be employed to reduce the risk of disease infection in cattle, other bison, and humans. This would allow more time to elaborate the concept recommended by the Panel in a way that is satisfactory to all major stakeholders, including the agriculture industry, wildlife organizations, and parks conservation organizations. The idea of a stakeholders group was put forward by Treaty 8 Chiefs and Métis leaders. The Panel believes other non-governmental organizations would welcome the opportunity to work with federal, Alberta, and Government of the Northwest Territories agencies, and Aboriginal representatives to develop further a solution to the disease problem.

33. The Panel recommends that a Northern Bison Management Stakeholders' Group be formed.

The Group would consist of representation from the following:

- Aboriginal People: representatives from the High Level Tribal Council, the Chipewyan Band of Fort Chipewyan, the Wildlife Advisory Board of Fort Chipewyan, the Wildlife Management Board to be established by the Dene-Métis Land Claim Agreement, and the Squirrel Sunrise Management Committee;
- Non-governmental groups: Town of Fort Smith, the agricultural industry, and a member of the RENEW program;
- Federal agencies: Agriculture Canada, Canadian Parks Service, Canadian Wildlife Service, and Indian and Northern Affairs Canada;
- Alberta agencies: Alberta Agriculture, and Forestry, Lands and Wildlife; and
- Government of the Northwest Territories, Department of Renewable Resources.

In Chapter 4 of this report, the Panel outlined its views on the various alternatives to resolve the diseased bison problem. The Panel has concluded that the concept of established breeding stations with disease-free bison for repopulation, removal of the disease-exposed bison, and repopulation with disease-free wood bison is feasible. However, it would be premature to proceed with this proposal until the various stakeholders have had the opportunity to develop a detailed plan and examine the effects of its implementation.

The first meeting of the Group could be organized by the Federal Environmental Assessment Office (FEARO). The Group could be led by an independent facilitator, hired by FEARO, who would be acceptable to all stakeholders. The Group would identify a secretary to record decisions, arrange meetings, and complete a report summarizing its findings. The report would be submitted to each federal, provincial, and Northwest Territories minister, and to the appropriate head of each non-governmental organization represented.

Agriculture Canada should ensure that the environmental assessment of the detailed plan developed by the Group is complete and subjected to the appropriate level of assessment in accordance with the federal Environmental Assessment and Review Process. Members of the Group should be consulted on the assessment and given the opportunity to provide input during its preparation.

Non-governmental representatives on the Group should be given funds to cover the costs of engaging technical advisors as needed. The representatives should also receive an honorarium for attending meetings and be reimbursed for travel costs. Government agencies would be expected to participate at their own expense. Because the Panel envisages a pooling of ideas and resources of government and non-government expertise, it believes the final cost will be considerably less than that asked for by the Treaty 8 Chiefs and Métis leaders.

Funding should largely be provided by those agencies most affected by the outcome of the work of the Stakeholders' Group. These include Agriculture Canada, the Canadian Wildlife Service, and the Canadian Parks Service. Other government agencies, including Alberta Agriculture; Forestry, Lands and Wildlife; and the Northwest Territories' Department of Renewable Resources, should be invited to contribute to the costs. Agencies providing funding should select a representative to serve on a Steering Committee, which should also include a representative of the Aboriginal community and of a non-governmental organization. The Committee's role would be to resolve any difficulties arising from the Stakeholders Group, ensure proper financial management, and possibly oversee the eventual implementation of the plan.

Since the risk of disease transmission to cattle and other bison will remain while the Stakeholders Group carries out its work, there is a need for interim measures to be taken (Section 5.7). There is also a need to complete the work in a timely fashion.

34. The Panel recommends that the Northern Bison Management Stakeholders' Group submit a progress report after one year and complete its work within 18 months of its formation.

In its discussions, the Bison Management Stakeholders' Group should adhere to the following objectives and principles which are in keeping with the Panel's recommendations:

1. The program should begin by establishing breeding herds of disease-free wood bison near selected communities around the Park;
2. Killing existing bison in and around the Park should not occur until disease-free breeding herds have been established;
3. Salvage of disease-free wood bison should be a part of the program;
4. All treaty and land claim rights must be respected;
5. Aboriginal and Métis hunters and trappers who currently depend on bison meat should be guaranteed a continued supply until the repopulated herd has reached a predetermined size;
6. Aboriginal and Métis hunters and trappers should be given the right to hunt wood bison outside the Park once the repopulated herd has reached a predetermined size;
7. In order to accomplish item 6, there should be agreement before the program is implemented to amend game regulations outside the Park in Alberta and the Northwest Territories to ensure Aboriginal People will be allowed to hunt wood bison once the repopulated herd reaches a predetermined size;
8. A Bison Management Plan, which would involve Aboriginal People and various government agencies, should be developed for bison in and around the Park, in order to ensure that bison do not exceed the carrying capacity of the Park once the herd is successfully -repopulated; consideration should be given in the plan to allowing Aboriginal People who already hunt other wildlife in the Park to hunt wood bison;
9. The Mackenzie Bison Sanctuary herd should be protected and not used for repopulation purposes;
10. Criteria should be developed to determine when the range can be considered free of bison and when repopulation of the range can be considered; and
11. Terms of reference should be developed for a program implementation team.

7.0 SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

The Panel concludes that:

1. The methods used by Agriculture Canada provide the best indication available of the frequency of occurrence of the diseases in bison.
2. There is a risk of bovine tuberculosis and bovine brucellosis being transmitted from bison in and around the Park to domestic cattle, to wood bison in the Mackenzie Sanctuary, and to human users of the bison.
3. Based on the distribution of the diseases in the past and the lack of clear separation of bison in different areas, that bison in all areas within and outside the Park will have been exposed to bovine brucellosis and tuberculosis.
4. Because the perceived risk to both domestic livestock and wood bison is largely independent of the rate of occurrence of the diseases in bison, a large-scale study to determine the precise prevalence of the diseases would not contribute to eliminating the risk to either cattle or the bison in the Mackenzie Bison Sanctuary.
5. The risk of infection of hunters who handle infected animals is real, but based on current information, this is likely not a serious problem and is not perceived to be a problem by current consumers of bison.
6. Bovine brucellosis would disappear spontaneously from other wild species if the diseased bison were removed and that the presence of the disease in other species would not represent a risk to the success of a disease elimination program.
7. It is unlikely that either bovine brucellosis or tuberculosis would disappear spontaneously from the bison in and around the Park at any level of population at which bison would still be a visible feature of the Park.
 - a. The presence of infectious diseases reduces the heritage value of the free-roaming bison herd.
9. The traditional hunting pursuits of Aboriginal people is a significant heritage value that should be preserved.
10. The Fort Chipewyan Cree Band should participate directly in any ongoing planning to develop and implement a bison disease management program.
11. The Squirrel Sunrise Management Board and the Wildlife Management Board established in the Dene/Métis Land Claim Agreement should participate directly in any ongoing planning to develop and implement any bison disease management program.
12. Recognition of wood bison as a separate subspecies is warranted. Plains and wood bison are at least as different from one another as are **recognized** subspecies of other large mammals such as deer, elk, and mountain sheep.
13. Separate management of wood and plains bison should continue.
14. Although salvage of additional genetic material is not essential in any disease elimination program, it would be desirable to save wood bison phenotypes, especially from parts of Wood Buffalo National Park some distance from the Nyarling River, and from areas outside the Park such as Hook Lake, in the interest of broadening the range of genetic diversity.
15. The presence of bovine brucellosis and bovine tuberculosis in bison in and around Wood Buffalo National park is a problem that must be addressed.
16. The current situation is unacceptable because brucellosis and tuberculosis are unlikely to disappear spontaneously from the bison population, and the risk will continue to exist.
17. Fencing alone is not a suitable permanent management technique but a limited amount of fence construction around the cattle closest to the Park could be used as an interim measure to reduce the risk of contact between bison and cattle.
18. Buffer zones would not be a permanent solution to the disease problem since they are fallible and they entail a considerable expenditure in perpetuity but could be used as an interim measure.
19. Treatment is not a feasible method of eliminating tuberculosis and bovine brucellosis from wild bison.
20. Because there is no suitable vaccine for either bovine brucellosis or tuberculosis and no method of mass immunization of a free-ranging bison herd, it is not practical to use immunization as a way to eliminate the diseases.
21. Test and removal with salvage of all test-negative animals will not succeed although some limited salvage of wood bison phenotypes may be feasible if the salvaged animals are isolated in small groups.
22. Eradication of the existing bison population is the only method of eliminating the risk of transmission of bovine brucellosis and tuberculosis from bison in and around Wood Buffalo National Park to domestic cattle, wood bison, and humans.

23. After considering the alternatives, all free-ranging bison now living in Wood Buffalo National Park and surrounding areas be removed and replaced by disease-free wood bison.

The Panel recommends that:


24. Bison in and around Wood Buffalo National Park can be eliminated if due diligence is applied to each element of the depopulation phase of the program.
25. Replacement stock come from Elk Island National Park and other captive herds, supplemented by limited salvage of wood bison phenotypes.
26. A non-governmental organization with the Wood Bison Recovery Team be approached to oversee the salvage operation.
27. Five breeding stations be established, four of them outside Wood Buffalo National Park, and one inside.
28. The financial requirements and sources for the implementation of the preferred option be re-examined once the detailed design of the program is complete.
29. Provisions be made in advance for the removal of all structures and reclamation of the affected areas.
30. The Panel, therefore, recommends that:
 - . Depopulation take place during winter;
 - . All offal be properly disposed of and not be left in the field for scavengers because it would serve to increase the nutritional status of wolves and thus counteract the factors that bring about an adjustment in wolf numbers;

- . Captive bison be protected by wolf-proof fences and a system of patrols; and
- . Moose densities and cow/calf ratios be monitored to determine whether wolf predation is having a detrimental effect on moose population.

In the event that monitoring reveals serious predation on moose and traplines, the Panel recommends that:

- . Chiefs and elders nominate wolf trappers;
 - . Traps be provided for each wolf trapper; and
 - . An allowance for trappers' expenses be provided which could include gas for snowmobiles.
31. The program be presented as a positive conservation initiative and the reasons for the program and its progress be explained as part of the interpretive program in the Park.
 32.
 1. First preference be given to local businesses and the local labour force for economic opportunities and employment associated with removal of disease-exposed bison and their replacement with wood bison; and
 2. If the bison population in Wood Buffalo National Park reaches the carrying capacity of the range, the Canadian Parks Service allow the hunting of wood bison by those eligible to hunt within the Park boundaries.
 33. A Northern Bison Stakeholders Group be formed.
 34. The Northern Bison Management Stakeholders Group submit a progress report after one year and complete its work within 18 months of its formation.

NORTHERN DISEASED BISON
ENVIRONMENTAL ASSESSMENT PANEL


Robert Connelly (Chairman)


William Fuller


Rene Mercredi


Gary Wobeser


Ben Hubert

Appendices

APPENDIX A

PANEL MEMBER BIOGRAPHIES

Mr. Robert Connelly (Chairman)

Mr. Connelly, from Ottawa, is Senior Regional Director of the Federal Environmental Assessment Review Office (FEARO). He has had extensive experience in the environmental assessment field and has chaired a number of previous panels. Prior to joining FEARO in 1978, Mr. Connelly worked for the United Nations Economic Commission for Europe in Geneva and for Environment Canada.

Dr. Gary Wobeser

Dr. Wobeser is a wildlife veterinarian, and is currently a Professor with the Department of Wildlife Pathology at the University of Saskatchewan in Saskatoon. He has had extensive experience with the study and diagnosis of diseases of wild animals as well as domestic animals. Dr. Wobeser's studies have included an investigation of bison diseases in the Wood Buffalo National Park area.

Mr. Rene Mercredi

Mr. Mercredi is a resident of Fort Smith where he has lived and worked for most of his life. He has spent most of his working career as a wildlife officer, initially with the federal wildlife service and then later with the territorial wildlife service. He is now retired.

Mr. Ben Hubert

Mr. Hubert is a wildlife management consultant from Yellowknife. Prior to forming a consulting practice in 1981, Mr. Hubert was Supervisor of Big Game Management and Head of Wildlife Management for the Government of the Northwest Territories and Executive Secretary to the Northwest Territories Science Board.

Dr. William Fuller

Dr. Fuller is a wildlife biologist now living in Athabasca, Alberta. From 1976 to 1982 he was a member of the Science Advisory Board of the Northwest Territories. He retired in 1984 as Professor Emeritus of Zoology from the University of Alberta where he taught for 25 years. Prior to his teaching career with the University, Dr. Fuller worked for the Canadian Wildlife Service including 9 years in Fort Smith. Over the course of his career, both with the Canadian Wildlife Service and the University of Alberta, Dr. Fuller has maintained an interest in Wood Buffalo National Park and its bison.

APPENDIX B

PANEL TERMS OF REFERENCE

INTRODUCTION

At the request of the federal Minister of Agriculture, an Environmental Assessment Panel has been established by the federal Minister of the Environment to conduct a public review of environmental, resource conservation, socio-economic and health issues associated with a herd of diseased bison

inhabiting Wood Buffalo National Park and adjacent lands in northern Alberta and south western Northwest Territories and alternative courses of action to deal with these problems.

The majority (in excess of 50%) of the hybrid bison herd in and around Wood Buffalo National Park and in the Slave River Lowlands is infected either with tuberculosis and/or bovine

brucellosis. These diseased animals pose a threat to people, to domestic cattle and to disease-free wood bison herds in the area.

In 1986, an interjurisdictional Steering Committee comprised of representatives from Agriculture Canada, Environment Canada (Canadian Parks Service and the Canadian Wildlife Service), Health and Welfare Canada, the Alberta Department of Agriculture, the Alberta Department of Forestry, Lands and Wildlife and the Department of Renewable Resources for the Northwest Territories was formed to direct an examination of the bison disease problem. The Steering Committee established a Task Force to examine the problem in detail and to identify alternative courses of action for dealing with the problem. The Task Force was also asked to comment on the practicality of implementing the alternative courses of action. The Task Force report was completed and submitted to the Steering Committee in February 1988 and was accepted pending completion of minor revisions.

MANDATE OF THE PANEL

The mandate of the Panel is to publicly review and assess the environmental, resource conservation, socio-economic and health implications associated with the bison disease problem, and with alternative courses of action to deal with this problem. The scope of the Panel's examination should be sufficiently broad to include balanced regional and Canadian perspectives to the bison disease problems and concerns.

In undertaking its review, the Panel is free to identify and examine all reasonable courses of action to achieve the objective of controlling or eliminating the bison disease problem. These shall include but need not be limited to the following four courses of action presented in the Bison Disease Task Force report:

1. Status quo — no change;
2. Fencing of Wood Buffalo National Park to contain the diseased bison and prevent the spread of the diseases beyond the Park boundaries;
3. Phased elimination of diseased hybrid bison herd and replacement with a disease-free wood bison breeding herd. This could include an examination of efforts to identify and salvage wood bison genetic stock from the existing herd;
4. Composite plan to confine the diseases to the Park by a combination of strategically placed fences and buffer zones exterior to the Park where bison would be eliminated, and land-use restrictions.

In fulfilling its mandate, the Panel shall provide full and adequate opportunities for public review and input.

At the completion of its review, the Panel shall report its findings and present recommendations on the most appropriate course of action to control or eliminate the bison disease problems. Recommendations shall also be presented on how to minimize the environmental, resource conservation, socio-

economic and health impacts associated with the implementation of the recommended course of action, and on appropriate monitoring and follow-up measures to be included with the implementation steps.

PANEL REVIEW STEPS

The sequence of events during the Panel review shall be as follows:

1. The existing information base, including the Bison Disease Task Force report, will be reviewed by the Panel and other interested parties. This review will focus on identifying the key (most important) environmental, resource conservation, socio-economic and health issues and concerns related to the bison disease problem and the alternative courses of action to deal with this problem. This step will include opportunities for public information and input.
2. Once the key issues and concerns have been identified, the Panel will determine what additional information will be required and what studies need to be undertaken to examine the bison disease problem in detail, and to identify and understand the environmental, resource conservation, socio-economic and health impacts associated with the alternative courses of action. As government responsibility for dealing with the bison disease problem is shared amongst a number of departments and agencies at the federal, provincial and territorial levels, the responsibility for responding to additional information and study requirements will also be shared. The Panel will identify which government department or agency should be responsible for obtaining this information or carrying out the required studies. It is expected that the Panel's requests for additional information would be directed to the Bison Disease Steering Committee with the Steering Committee coordinating the departmental responses to the specific information requests.
3. Upon receipt of responses to the Panel's requests for additional information and studies, these responses will be made public.
4. Following a period of public review of these responses, the Panel will announce its plans for its public hearings.
5. The Panel will hold its public hearings providing opportunities for all review participants to present submissions to the Panel. These submissions will be subjected to extensive discussion and examination. The hearings will include sessions to be held in the communities most directly affected by the bison disease problem and the communities that could be affected by courses of action to deal with the problem.
6. Following the public hearings, the Panel will prepare its report to government containing its findings, conclusions and recommendations.

OPERATIONAL PROCEDURES

Detailed written procedures concerning the conduct of the review shall be established by the Panel and made available to the public shortly after it has been established.

PUBLIC INVOLVEMENT PROGRAM

An important component of the Panel review process will be an extensive public involvement program, providing opportunities for public information, input and involvement at all stages of the review. The Panel's Operational Procedures shall include details of this public involvement program.

Target publics for the public involvement program shall include federal, provincial and territorial government agencies, public interest groups, agricultural and ranching associations, Native bands and organizations and local residents.

REPORT AND RECOMMENDATIONS

The Panel shall submit its findings, conclusions and recommendations to the federal Ministers of Environment and Agriculture in the form of a written report. All reasonable

efforts should be made to have this report completed by March, 1990. The Panel's report shall also be transmitted to the Alberta Minister of the Environment, the Alberta Minister of Agriculture, the Alberta Minister of Forestry, Lands and Wildlife and the Government of the Northwest Territories Minister of Renewable Resources.

Should the Panel identify issues that need to be dealt with prior to the completion of its final report, it may submit an interim report outlining the nature of the issues and any recommendations it may have for dealing with these issues.

FOLLOW-UP TO PANEL REPORT

Following its submission to government, the Panel report will be publicly released by the federal Ministers of Environment and Agriculture.

In view of the shared federal, provincial and territorial nature of the responsibilities for dealing with the bison disease problem, it is expected that at least some of the Panel's recommendations may be directed to provincial and territorial agencies as well as to federal agencies. Accordingly, the federal response to the Panel Report and recommendations shall not be developed until after there have been discussions and input from the provincial and territorial governments.

APPENDIX C

PUBLIC HEARING PARTICIPANTS

Community Complex Fort Vermilion, Alberta January 16th, 1990

Mr. Martin Braat
Dr. Eric Broughton
Chief Harry Chonkolay
Dr. Rex Coupland
Mr. Albert Croy
Mr. Ken East
Mr. Joe Ferdais
Mr. Dwayne Foster
Mr. Leonard Koop
Mr. Kowal
Mr. Darren Labonte
Mr. Keith MacDonald
Mr. Robert McCrackern
Chief Bernard Meneen
Dr. Brendan O'Connor
Mr. Dan Patten
Mr. Hal Reynolds
Mr. Tom Schuler

Mr. Owen Sebastien
Chief Johnsen Sewepagaham
Mr. Jim Webb

Nahecho Keh Centre Fort Providence, NWT January 17th, 1990

Mr. Lester Antoine
Dr. Eric Broughton
Dr. Rex Coupland
Mr. Ken East
Mr. Art Look
Mr. John Mackenzie
Mr. Micheal McLeod
Mr. Robert McLeod
Subchief Michael Thorn

Ptarmigan Inn Hay River, NWT January 18th, 1990

Mr. Eric Braathen
Dr. Eric Broughton

Mr. Clayton Burke
 Dr. Rex Coupland
 Mr. Ken East
 Chief Roy Fabian
 Dr. Cormack Gates
 Mr. Kent Herbert
 His Worship Waiter Kudelik
 Mr. Frank Laviolette
 Ms. Sharon Moldaver
 Mr. George Morin
 Mr. Peter Redvers
 Mr. Robert Ruttan
 Mr. Daniel Sonfrere

**Antoine Beaulieu Memorial Hall Fort Resolution, NWT
 January 19, 1990**

Ms. Lisa Ballsilie
 Mr. Danny Beaulieu
 Ms. Lisa Beaulieu
 Ms. Melanie Beaulieu
 Ms. Paula Beaulieu
 Mr. Arthur Beck
 Mr. Ron Boucher
 Ms. Suzanne Boucher
 Mr. Eric Braathen
 Dr. Eric Broughton
 Mr. Clayton Burke
 Dr. Rex Coupland
 Mr. Fred Dawson
 Mr. Joe Fabien
 Mr. George Giroux
 Ms. Aleda Lafferty
 Ms. Cecil Lafferty
 Ms. Karen Lafferty
 Mr. Frank Laviolette
 Ms. Adeline Mandeville
 Ms. Yolanda Moreau
 Mr. Don Morin
 Mr. Steven Norn
 Mr. Jim O'Reilly
 Ms. Leona Poitras
 Mr. Robert Ruttan
 Mr. Curtis Sayine
 Mr. Robert Sayine
 Chief Bernadette Unka

**Roaring Rapids Hall Fort Smith, NWT January 22 and 23,
 1990**

Mr. Bob Abraham
 Mrs. Eileen Beaver
 Chief Henry Beaver
 Mr. Jonathan Beaver
 Mr. William Beaulieu
 Dr. Roy Berg
 His Worship Denis Bevington
 Dr. Bill Bulmer
 Mr. Clayton Burke
 Mr. Jack Van Camp
 Mr. Lu Carbyn
 Dr. Terry Church

Ms. Kathie Day
 Mrs. Jeanne Dube
 Mr. Ken East
 Ms. Evans
 Dr. Cormack Gates
 Mrs. Halupa
 Mr. Doug Harper
 Mr. Len Heron
 Mr. Barry Houghson
 Mr. Gordon Kerr
 Mr. George Kurszewski
 Mr. Jonathan Kurszewski
 Mr. Frank Laviolette
 Mr. Victor Marie
 Mr. Robert McLeod
 Dr. Derek Melton
 Ms. Pamela Mercredi
 Dr. Francois Messier
 Ms. Sharon Moldaver
 Dr. Nick Novakowski
 Dr. Everett Peterson
 Mr. Dave Poitras
 Mr. Robert Ruttan
 Dr. Robert Scace
 Mr. Jim Schaefer
 Dr. Stacey Tessaro
 Mr. Jacques van Pelt

**Kewatinok Community Hall Fort Chipewyan, Alberta
 January 24, 1990**

Dr. Eric Broughton
 Mr. Clayton Burke
 Dr. Rex Coupland
 Mr. Ken East
 Mr. Albert Gladue
 Ms. Gunn
 Mr. Frank Laviolette
 Mr. Frank Laviolette Jr.
 Mr. Terry Lusty
 Chief Pat Marcel
 Ms. Rita Martin
 Mr. Sal Martin
 Ms. Stella Martin
 Mr. Reg McKay
 Mr. Eiviri Norn
 Mr. Hal Reynolds
 Mr. Archie Simpson
 Mr. Tuccaro
 Mr. Archie Waquan
 Mr. Jackson Whiteknife

**Sheraton Plaza Hotel Edmonton, Alberta January 25 and
 26, 1990**

Dr. Theresa Aniskovicz
 Mr. Carl Austin
 Mr. Andrew Boyd
 Mr. Ken Brynaert
 Dr. Bill Bulmer
 Mr. John Campbell
 Dr. Terry Church

Mr. Ted Code
 Mr. Ken East
 Dr. Mitchell Essey
 Dr. Cormack Gates
 Dr. Valerius Geist
 Mr. Tooker Gomborg
 Mr. Graw
 Mr. Jeff Green
 Mr. Bill Hall
 Ms. Elizabeth Hall
 Mr. Doug Harper
 Mr. Lester Howes
 Ms. Linda Hrubizna
 Dr. Stan van Zyll de Jong
 Mr. Gordon Kerr
 Mr. Frank Lee
 Chief Pat Marcel
 Mr. Don Mathews
 Dr. Patricia McCormack
 Ms. Colleen McCrory
 Mr. Bob McFetridge
 Chief Bernard Meneen
 Dr. Francois Messier

Mr. Mel Miller
 Mr. Gordon Mitchell
 Mr. Don Morin
 Dr. Nick Novakowski
 Mr. Gerry Pashen
 Mr. Dan Patten
 Mr. Francois Paulette
 Mr. Steven Price
 Mr. Gilbert Proulx
 Mr. Lloyd Quantz
 Mr. Jim Rogers
 Mr. Robert Ruttan
 Dr. Robert Scace
 Chief Johnsen Sewepagaham
 Mr. Jerome Slavic
 Mr. Ed Stuzik
 Dr. Stacey Tessaro
 Mr. Brian Toole
 Mr. Tom Unka
 Mr. Cliff Wallis
 Mr. Cleve Wershler
 Mr. George Winter

APPENDIX D

KEY DOCUMENTS USED BY THE PANEL DURING THE REVIEW

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