Government of Northwest Territories
Gouvernement des Territoires du Nord-Ouest

Nahanni Bison Management Plan

Environment and Natural Resources
Government of the Northwest Territories

Plan de gestion du bison des bois de Nahanni

(Comprend un sommaire en français)

Présenté au ministère de l'Environnement et des Ressources naturelles
Gouvernement des Territoires du Nord-Ouest

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THE NAHANNI BISON MANAGEMENT PLANNING PROCESS

This management plan was developed by Environment and Natural Resources (ENR) staff working in collaboration with the communities of Nahanni Butte and Fort Liard. We met several times in Nahanni Butte, Fort Liard and Fort Simpson between July 2011 and May 2015 to discuss bison management issues and to develop this draft plan.

EXECUTIVE SUMMARY

The *Nahanni Bison Management Plan* was developed by the Department of Environment and Natural Resources in collaboration with the communities of Nahanni Butte and Fort Liard. There are three objectives to this plan that will help achieve the goals of the *Recovery Strategy for Wood Bison (Bison bison athabascae) in the Northwest Territories* (the *Strategy*). One is to sustain the long-term viability of the Nahanni wood bison population while providing for social, economic and cultural connections of people to bison. A key management action to achieve this objective is to base harvest management and population monitoring on population size and trend and to manage bison harvests using a quota and tag system. A harvest plan that outlines total allowable harvest is included.

The second objective is to reduce conflicts between people and bison in communities and bison – vehicle collisions. Success will require a range of actions including working with community governments and other Government of the Northwest Territories departments on fencing key areas and exploring other opportunities to change bison movements, and encouraging hunting as a way to remove persistent problem bison. Actions were also identified to help reduce collisions with bison in the Dehcho.

The third management objective is to conserve and, if possible, enhance the population's genetic diversity while preventing hybridization with plains bison or cattle, or introducing disease. The need to avoid introducing disease means actions to meet this objective will be longer-term: examine the feasibility of creating connections that enable bison to move between the Nahanni and Nordquist or Mackenzie populations, and augment genetic diversity using reproductive technologies when that becomes feasible.

SOMMAIRE

Le Plan de gestion du bison des bois de Nahanni a été rédigé par le ministère de l'Environnement et des Ressources naturelles en collaboration avec les collectivités de Nahanni Butte et de Fort Liard. Ce plan met de l'avant trois objectifs qui aideront à atteindre les buts du Programme de rétablissement du bison des bois (*Bison bison athabascae*) aux Territoires du Nord-Ouest (ci-après le Programme de rétablissement). L'un de ces objectifs vise à maintenir la viabilité à long terme de la population du bison des bois de Nahanni tout en assurant des liens sociaux, économiques et culturels entre les résidents de la région et l'animal. L'une des mesures de gestion essentielles pour atteindre cet objectif est d'adopter une méthode de surveillance des bisons adaptée à la taille et aux tendances de la harde et de gérer la chasse à l'aide d'un système de quotas et d'étiquettes. Le Programme de rétablissement précise le nombre total de bêtes qui peuvent être chassées.

Le deuxième objectif est de réduire le nombre de conflits entre les résidents et les bisons dans les collectivités, et le nombre de collisions avec des véhicules. Pour y parvenir, diverses mesures seront nécessaires, notamment une collaboration avec les administrations communautaires et les autres ministères du gouvernement des Territoires du Nord-Ouest pour clôturer certaines zones clés, explorer d'autres possibilités de modifier les mouvements des bisons, et encourager la chasse afin d'éliminer les animaux problématiques. Des mesures ont également été cernées pour aider à réduire les collisions avec des bisons dans la région du Dehcho.

Le troisième objectif de gestion est de conserver et, autant que possible, d'accroître la diversité génétique de la population tout en évitant l'hybridation avec le bison des plaines ou le bétail, ou l'introduction de maladies. La nécessité d'éviter l'introduction de maladies signifie que les mesures prises pour atteindre cet objectif doivent être prises à long terme, notamment en examinant la possibilité de créer des liens permettant aux bisons de se déplacer entre les populations de Nahanni et de Nordquist ou de Mackenzie, et, lorsque la science le permettra, d'augmenter la diversité génétique à l'aide de technologies de reproduction.

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INTRODUCTION

In 2010, the Government of the Northwest Territories (GNWT) released the *Wood Bison Management Strategy for the Northwest Territories* to provide the long-term vision for the management of wood bison in the Northwest Territories (NWT). It identified broad goals and principles for the management of wood bison and called for management plans to be developed for each wood bison population in the NWT. In 2019, the Conference of Management Authorities released the *Recovery Strategy for Wood Bison (*Bison bison athabascae) *in the Northwest Territories* (hereafter, the *Strategy*), which will guide bison management in the NWT in the future.

The *Strategy* established two goals to guide bison management in the NWT:

1. Recover free-ranging, genetically diverse, healthy[1] wood bison populations broadly distributed in the NWT that can sustain on-going harvests for the benefit of all people in the NWT, and
2. Contribute to the recovery of free-ranging, healthy wood bison throughout their historic range in Canada.

Principles were identified in the *Strategy* to shape the way bison are managed in the NWT. Specifically, wood bison will be managed at the landscape level by all responsible jurisdictions using a long-term recovery approach, adaptive management, all sources of knowledge, and employing the precautionary principle.

This plan provides managers with a coordinated set of objectives and actions for on-going monitoring and management of the Nahanni population. It also lists some research objectives to address areas where more information is needed in order to address management issues. A management plan is an aid to accountability and helps wildlife management be proactive while avoiding a pattern of *ad hoc* responses to crises. The main challenges for the Nahanni population are to sustain its long-term viability, reduce conflicts between bison and people, and to conserve and increase its genetic diversity.

We thank Brett Elkin, Nic Larter and Nicole McCutchen for their helpful comments on a previous draft, as well as Karl Cox and Bonnie Fournier for producing maps.

[1] The *Strategy* defined healthy to mean bison free of bovine tuberculosis, bovine brucellosis and other significant diseases from domestic animals.

OBJECTIVES

To support the *Strategy's* goals and address the key challenges faced by the Nahanni wood bison population, the main objectives of this plan are to:

- Sustain the long-term viability of the Nahanni wood bison population while providing for social, economic and cultural connections of people to bison.
- Reduce conflicts between people and bison in communities and bison – vehicle collisions.
- Maintain and, if possible, enhance the population's genetic diversity while preventing hybridization with plains bison or cattle or introducing disease.

HISTORY OF WOOD BISON IN THE NWT

There is a long history of bison in what is now the NWT. Steppe bison (*Bison priscus*) lived in the region between the last ice ages, and went extinct about 11,000 years ago. The modern wood bison (*Bison bison athabascae*) is descended from the steppe bison but there is no clear point in time when one species disappeared and the other emerged.

Stephenson et al. (2001) described the history of wood bison in Alaska and northern Canada. In the past 5,000 years, wood bison were widely distributed from north western Saskatchewan to Alaska (Figure 1) but disappeared from a large part of their original range by the early 1800s (Stephenson et al. 2001). What factors caused the disappearance of wood bison across much of their range over the past several hundred years are not clear, but a combination of environmental change resulting in habitat changes may have been involved. It has been suggested that the progressive loss of suitable habitat may have resulted in populations becoming fragmented and isolated in local areas (Stephenson et al. 2001). In isolated populations, even modest amounts of predation or hunting could have had substantial effects on population survival. In circumstances where a local population was eliminated, barriers to movements – such as large areas of unsuitable habitat – would have reduced the chances that the area would be recolonized by other bison. This pattern would have been repeated throughout Alaska, Yukon and the NWT, leading to the eventual disappearance of bison from much of their former range.

Despite the long decline in numbers and range contraction, wood bison persisted in parts of Alaska, Yukon and western NWT into the late 1800s. There are oral records of when bison were last shot in some areas, including the NWT's Dehcho region (Larter and Allaire 2007). In Alaska, and likely in the rest of wood bison range, people hunted bison intensively when they were present, especially when food was otherwise scarce (Stephenson et al. 2001).

Records and the oral history indicate that bison were present in the Liard valley until at least the 1890s (Soper 1941, Larter and Allaire 2007). Preble (1908, as cited by Soper 1941) reported the Hudson's Bay Company journal in Fort Simpson "mention two buffalo bulls killed April 29, 1831 near mouth of the Martin River, approximately eight miles west, below Fort Simpson." Ogilvie (1893, as cited by Soper 1941) reported two bison had crossed the river at Fort Liard and had been seen in the mountains to the northwest. Soper (1941) included no definite records of bison in the Liard River valley after 1897, which is consistent with Larter and Allaire (2007) who reported on an oral record of a bison being

killed in the Sambaa K'e[2] area in the 1890s and it was the last bison known to be killed in that area. It may be reasonable to suspect bison disappeared from the Liard valley region by 1900 and were absent until 1980 when the population was re-established with the release of 28 wood bison from Elk Island National Park (EINP). In spite of the written records of bison in the region, the species seems to have almost completely disappeared from the oral history in the Dehcho (e.g. Fanni 2014).

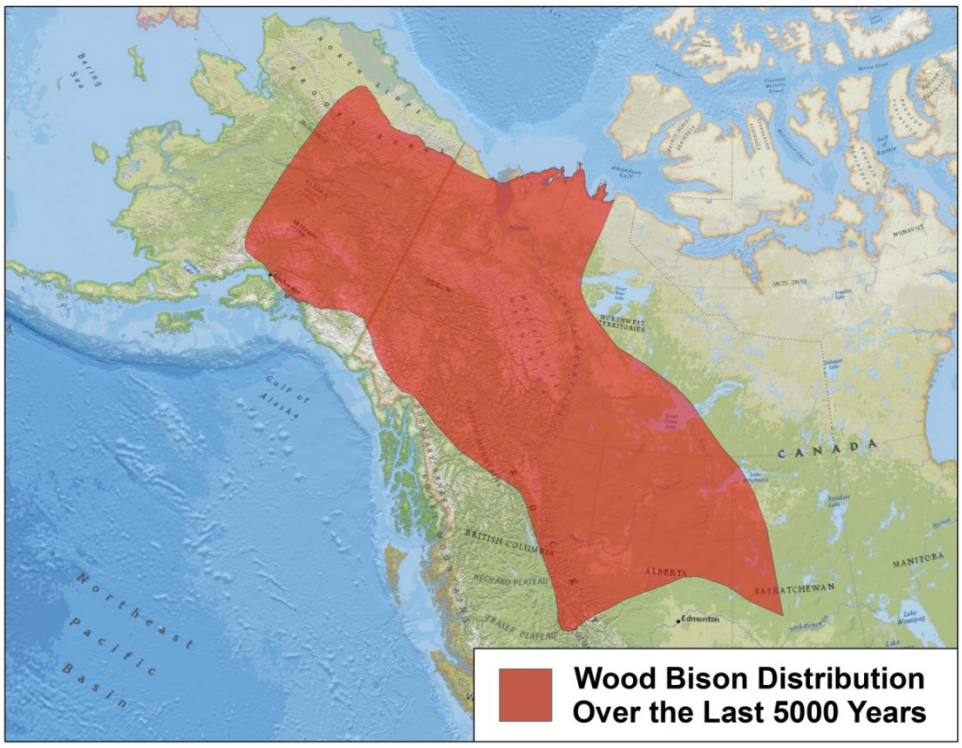

Figure 1. Distribution of wood bison over the past 5,000 years (after Stephenson et al. 2001).

Wood bison, like plains bison, were driven to near extinction in the late 1800s when only a remnant population survived in an area now encompassed by Wood Buffalo National Park (Soper 1941). In an attempt to prevent bison from going extinct, the Government of Canada enacted legal protection in 1877 by passing the *Buffalo Protection Act* (Gates et al. 2001), and a further law to protect the surviving bison in 1893 (Soper 1941). Enforcement of those acts, and the start of wood bison recovery, began in 1897 when responsibility was assigned to the Northwest Mounted Police. In 1922, Wood Buffalo National Park (WBNP) was created to protect both wood bison and their habitat.

[2] Larter and Allaire (2007) referred to Sambaa K'e as Trout Lake.

In addition to protecting wood bison in WBNP, efforts to conserve the species have consisted in large part of re-establishing free-ranging populations and regulating hunting. The core of the species' recent range is the southern NWT, northern Alberta and north-eastern British Columbia (Figure 2). In the 1960s, recovery efforts resulted in the re-establishment of the Mackenzie wood bison population, the first outside the greater Wood Buffalo ecosystem, and the formation of a captive herd at EINP, east of Edmonton, Alberta.

Since 1980, six more free-ranging wood bison populations have been re-established in Canada, including the Nahanni population, with releases of bison originating from EINP. Wood bison populations not shown in Figure 2, are the Aishihik in Yukon and one near Chitek Lake, Manitoba. Wood bison have also been transferred to Yakutia (eastern Siberia) where some were released in 2017 and others remain in captivity, and to Alaska where they were held for a number of years before being released into the wild in the western part of the state in the spring of 2015. Efforts to conserve and recover wood bison continue, and the NWT is a partner in this work.

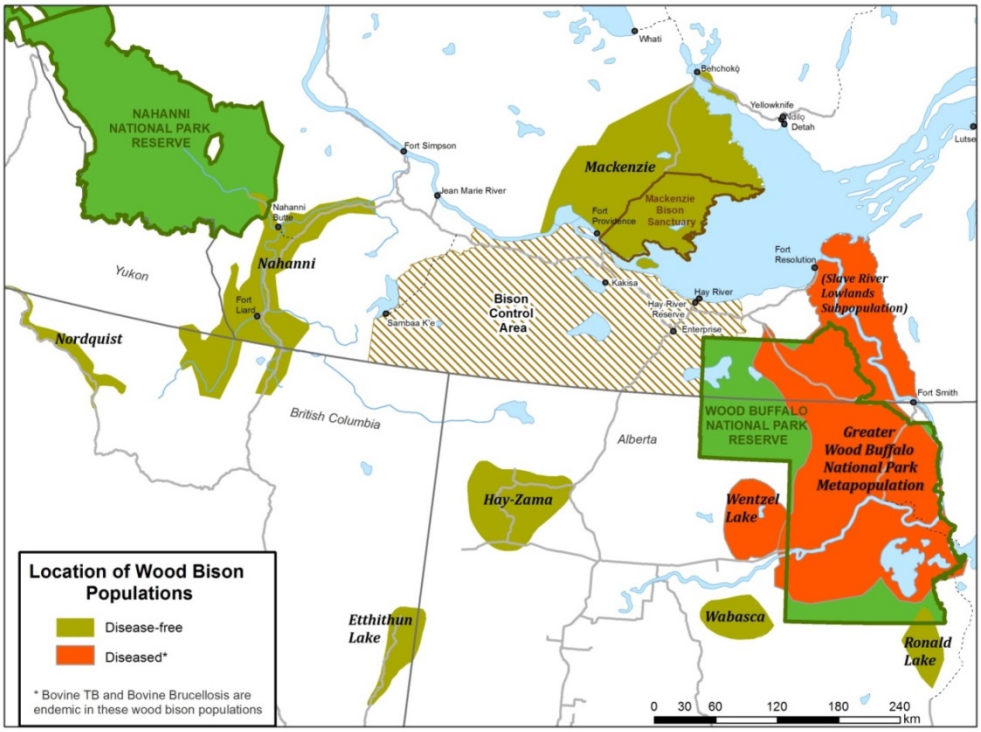

Figure 2. Distribution of wood bison in the NWT. Bovine tuberculosis and bovine brucellosis occur in bison in the Slave River Lowlands – Wood Buffalo National Park area.

THE NAHANNI WOOD BISON POPULATION

The Nahanni population was re-established in 1980 when 28 wood bison from EINP were released into the wild near Nahanni Butte (Gates et al. 2001). Some died over the winter and others dispersed south into British Columbia so by 1981, only 14 bison remained in the area. By 1989 there were an estimated 40 bison in the Nahanni population when it was augmented with the release of 12 more. In July 1997, 107 bison were counted in the population (Gates et al. 2001) and in March 1998, 59 more wood bison from EINP were released into the area (Larter and Allaire 2007). The population has grown over the past 20 years and was estimated at 962 animals in March 2017 (Figure 3, Larter et al. 2007, Larter and Allaire 2013a, ENR unpublished data).

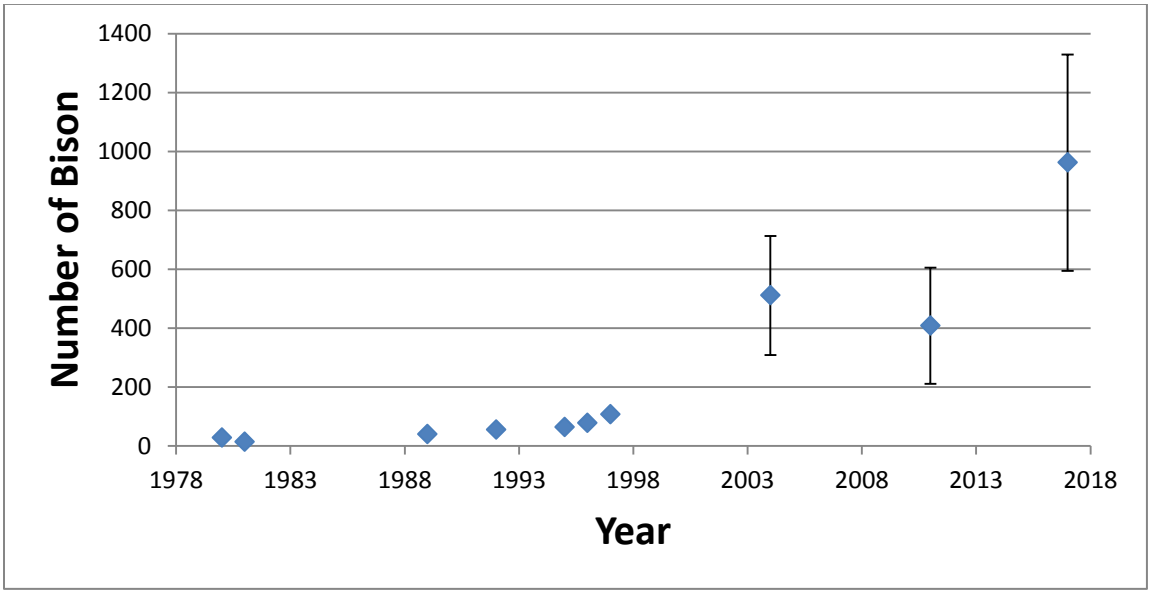

Figure 3. Nahanni wood bison population estimates, 1980-2017. Estimates prior to 2003 were from total counts. Estimates after 2003 were from strip transect sampling, and exclude calves. Error bars are 95% confidence limits.

The Nahanni population has been isolated from all other bison populations since being re-established in 1980, and is considered to be free of bovine tuberculosis and bovine brucellosis. This population was established from sources known to be free of the two diseases and no evidence of either disease has been found in limited testing or reported by harvesters. Preventing the spread of bovine tuberculosis and brucellosis to populations not currently infected is important for the conservation and recovery of wild bison (Environment and Climate Change Canada 2018). To reduce the risk of those diseases spreading, the GNWT established the Bison Control Area (see Figure 2) in 1987 to act as a

barrier to the movement of free-ranging bison between diseased and disease-free populations and reduce the likelihood the Mackenzie or Nahanni populations will become infected. It became a cooperative program with WBNP in 1993 and continues to be an important aspect of bison and disease management. Alberta has implemented a similar bison management area between its Hay-Zama wood bison population and WBNP for the same reasons.

Changing social and wildlife management environments resulting from the negotiation of Indigenous land claims, Indigenous self-government and implementation of co-management boards have changed how wildlife management is practiced in the NWT. The recent range of the Nahanni bison population extends into British Columbia and Yukon, overlaps traditional use areas of Nahanni Butte Dene Band and Acho Dene Koe First Nation as well as land that falls under the *Dehcho Land Use Plan*. Further changes to the overall management structure that currently exists are expected as Indigenous land claims are settled in the Dehcho region.

LEGAL STATUS

The legal and conservation status of bison varies by jurisdiction and listing body. In the NWT, bison are categorized as wildlife, being a vertebrate species that is wild in nature and naturally occurring in the NWT, and as big game under the NWT *Wildlife Act* (2014). In 2017, wood bison were listed as Threatened on the NWT List of Species at Risk. The *Recovery Strategy for Wood Bison (Bison bison athabascae) in the Northwest Territories* was released in 2019. The federal *Species at Risk Act* lists wood bison on Schedule 1 as Threatened and the Government of Canada has produced the *Recovery Strategy for the Wood Bison (Bison bison athabascae) in Canada* which has population size and distribution objectives to achieve recovery nationally. The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) is a national organisation that assesses species status across the country, and in 1987 it assessed wood bison as Endangered. In 1988, COSEWIC re-examined and assessed the wood bison as Threatened, confirmed it as Threatened in 2000, but reassessed it as Special Concern in November 2013. The Government of Canada has not responded to COSEWIC's 2013 assessment.

Internationally, wood bison were listed as Endangered in Canada under the United States *Endangered Species Act* from 1970 until 2012 when the species was re-classified as Threatened throughout their range. On the International Union for the Conservation of Nature (IUCN) Red List of Threatened Species, the American bison, including both plains and wood subspecies, is listed as Near Threatened (Gates and Aune 2008). Within the Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES), wood bison are listed on Appendix II, indicating the species is not necessarily currently threatened with extinction but may become so unless trade in the species is closely controlled. Wood bison were originally listed in Appendix I in 1977 and down listed to Appendix II in 1997 (Gates et al. 2001). The wood bison was deleted from Appendix II at the 2016 CITES Conference of the Parties 17.

BISON AND PEOPLE

Bison continue in the oral history among some Indigenous communities even where the species has not been present for decades or longer (Lotenberg 1996, Stephenson et al. 2001, N. Larter pers. comm.). Stephenson et al. (2001) learned a great deal about the history of bison in Alaska from the oral history there, but the oral history in the Dehcho region does not appear to speak much about bison (e.g. Fanni 2014) even though there are records of bison in the Liard valley and Mackenzie range. There may have been little or no cultural connection between Indigenous people and bison in the Dehcho region or that connection has been lost, but the connections between bison and people are strong in the Slave River Lowlands and around WBNP. Connections between bison and people in the Dehcho may be beginning to emerge, especially in Fort Providence but also in the Liard Valley (Fanni 2014). Hunting is probably the primary means by which cultural connections are made to bison and perhaps to wildlife in general, and it continues to be an important social, cultural and economic connection to bison in Indigenous and non-Indigenous cultures alike.

Bison were of great economic importance to some North American Indigenous peoples, especially those living on the Great Plains. Today, economic value may also be realised through tourism in addition to the value of bison hunted for personal or subsistence use. Using rules of thumb for meat yield from beef carcasses and an average cost of $25/kg for beef from local northern retailers (see Larter and Allaire 2013b, p. 31); each 550 kg (1,200 lbs.) bison would provide about 220 kg of meat worth about $5,500.

Wood bison are the most easily viewed and photographed large mammal in the NWT, and they create tourism and economic activity as people travel to see and photograph them. As long as there are free-ranging wood bison and especially if they can be accessed easily by road, there may be opportunities for bison-related ecotourism.

While bison are generally considered unwelcome visitors within communities, their presence results in employment in the form of programs to deter the animals from remaining there. Bison are also often used on government and business promotional materials (e.g. parks and hotels) so their presence in the wild helps to promote the NWT to the world.

MANAGEMENT CHALLENGES

Management of the Nahanni wood bison population faces three main challenges: reducing conflicts between people and bison in communities and on highways, managing harvests, and maintaining the population so that it sustains itself at a large enough size over the long term to contribute to the goals of the national *Recovery Strategy for the Wood Bison (Bison bison athabascae) in Canada*.

Bison in Communities

Conflicts between people and bison occur when bison spend time in areas of human activity. Bison frequently use the same areas of the Liard and Nahanni River valleys where people live and travel. In addition, bison will readily use human-altered areas, e.g. lawns, road rights-of-way and other open spaces, and travel along man-made linear features such as roads and seismic lines. Human activities on the land often create habitats that bison favour or encourage plant species that bison may graze. Within the NWT's boreal forest regions, lawns and gardens, and the maintenance of grassy vegetation along streets and roads, power lines and other rights-of-way tend to create habitats that attract bison. In addition to food, avoiding predators may also be a factor influencing the amount of time that bison spend near communities.

Bison regularly enter both Nahanni Butte and Fort Liard. ENR staff in Fort Liard spend a significant amount of time herding bison out of the community and animals that behave aggressively or persist in returning to the community may be destroyed. However, despite ENR's efforts, members of the public in Fort Liard have taken matters into their own hands and have harassed and shot bison illegally, often leaving wounded animals that may be an increased hazard to public safety. In Nahanni Butte, bison venture into the community to graze, wallow and rest. They may be found anywhere in the community, on the airstrip and the adjacent right-of-way, or resting on a sandbar in the river next to the community. The airport in Nahanni Butte is not fenced so there is a constant need to check for bison on the runway and repairs to the runway are often required after bison walk on it when the ground is wet and soft.

While no person has been injured by a bison in a community, at least one dog has been killed by a bison in the NWT and the potential for incidents exists whenever large, wild animals occur in town. Having bison at large in the community makes many uncomfortable, and most people would rather not have them there. When in a community, bison mainly

forage in gardens and on lawns, but they may damage property or trees, and their droppings can be a nuisance. Bison may also lick salt from vehicles in the winter. At the same time, it should be noted that governments and businesses use photos of bison, including bison within communities, on promotional materials to attract business. Seeing bison is often a highlight of visitors' trips to the NWT. Some residents enjoy observing bison within their community and are very tolerant of the animals, while some others are not.

ENR has worked with the community of Fort Liard in the past to facilitate removal of problem bison by community members who had a bison tag. ENR's officer coordinated the hunt, notified the community administration and Royal Canadian Mounted Police (RCMP), controlled traffic, identified the problem animals and ensured the hunts were conducted safely. Acho Dene Koe First Nation and ENR have discussed creating a combination fire break and diversion habitat for bison near Fort Liard to help both protect the community from wildfire and reduce the occurrences of bison in town. There may be other areas near Fort Liard that could also be modified to draw bison away from the community.

Management Actions:
Reduce the number and frequency of bison conflicts in communities by:

- Working with community governments and other GNWT departments to explore options of fencing key areas.
- Encouraging homeowners to fence their yards and gardens.
- Encouraging and facilitating hunting as a way to remove persistent problem bison.
- Improving public awareness and knowledge of what to do when bison are in a community or person's yard.
- Explore the creation of diversion habitat near Fort Liard.
- Engaging with the Department of Municipal and Community Affairs (MACA), community governments, First Nations and others to find other ways to solve these problems.

Collisions

Bison are well known for following man-made features like roads, trails, seismic lines and fire breaks. Roads also make it easy for bison to travel through otherwise difficult terrain, and in winter it is easier to travel on roads than through deep snow.

ENR has recorded 22 bison-vehicle collisions resulting in a total of 33 known bison mortalities on Highway 7 from 1997 to the end of 2018 (Figure 4). Most bison-vehicle collisions occur from August through November with a peak in October (Figure 5).

Observing wildlife along the roadside is interesting and adds to the enjoyment of the trip for some drivers, but for others, animals on the road are a nuisance.

In addition to injuring and killing bison, collisions result in damage to vehicles, injuries to occupants and the potential for loss of human life. Bison appear especially reluctant to leave the road in some winters, perhaps because it is easier than walking in deep snow. It can be very difficult for animals, especially calves and yearlings to cross ditches filled with deep, hard snow ploughed from the road. Ploughing travel lanes for bison away from the road has been successful in reducing the number of animals on roads in northern British Columbia.

Management Actions:
Reduce the number and frequency of bison-vehicle collisions by:

- Working with the Department of Infrastructure (INF) on options for improving signage on Highway 7 to remind motorists that bison may be present on or beside the road.
- Working with INF to develop information that targets motorists and truckers regarding the presence of bison on highways, when most collisions occur, how to avoid hitting bison, the importance of reporting all collisions with large animals to ENR, when a collision with a large animal should also be reported to the RCMP, and what information to report in both instances.
- Working with INF on options for widening, and removing vegetation from the right-of-way along Highway 7 to make any bison present more visible to drivers.
- Engage with INF to further address this issue and develop other actions.

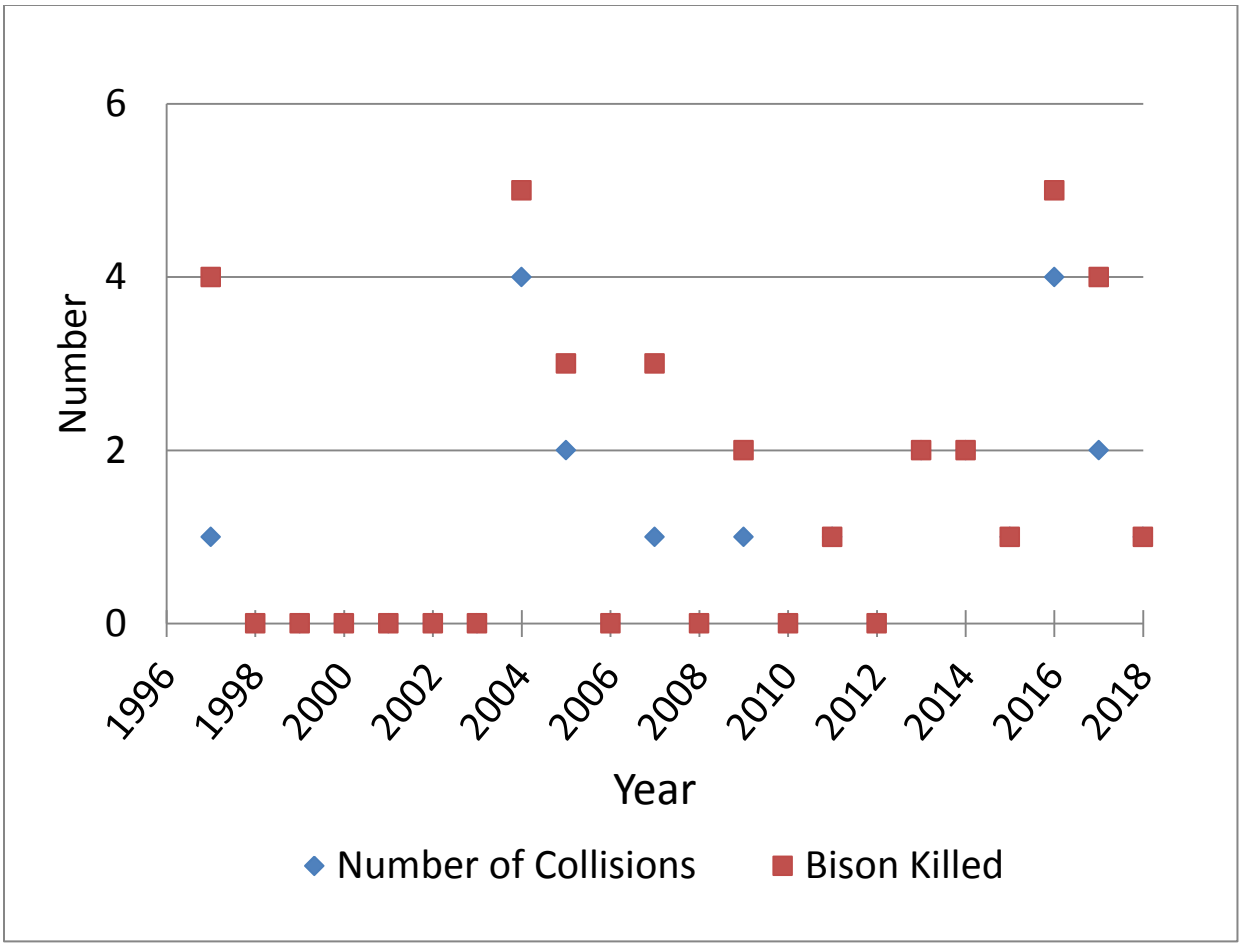

Figure 4. Number of bison - vehicle collisions each year on NWT Highway 7 reported to ENR from 1997-2018.

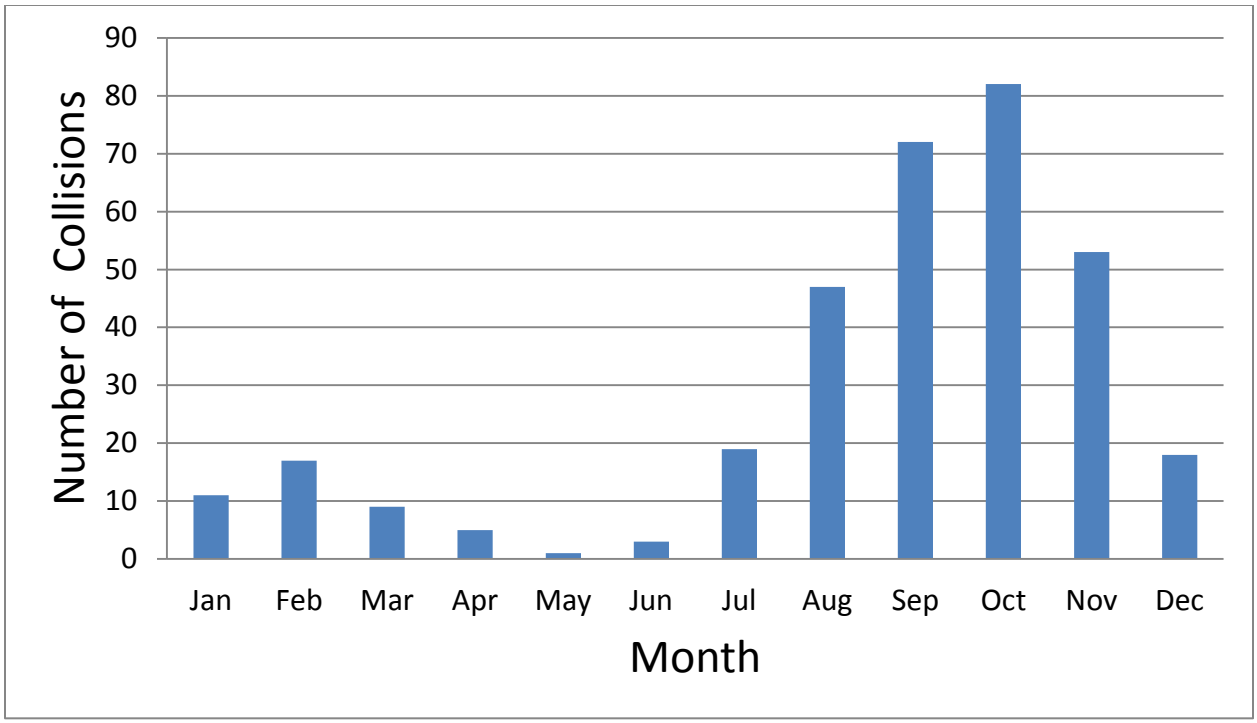

Figure 5. Number of bison - vehicle collisions on NWT highways reported to ENR by month from 1989-2018.

Harvest Management

Harvesting can have significant effects on wildlife populations and can be the most important factor in the dynamics of hunted wildlife populations. Also, managing hunting is often one of the few direct actions that wildlife managers can take to achieve management objectives.

When growing rapidly, populations can sustain higher rates of harvest than when stable or declining, so harvest management may be useful in helping to regulate the size of wildlife populations. Reducing harvest when populations are small or declining may allow the population to grow or help to slow the decline, and increasing harvest may slow the growth of rapidly increasing populations. The effect harvesting has on population size depends on its current reproductive and survival rates, and whether harvest mortality adds to or subtracts from losses due to other causes of mortality.

The age and sex of animals taken can also affect the impact harvesting has on wildlife populations. Harvesting females usually has a larger influence on future population size and growth than harvesting males. In general, taking females is less detrimental if populations are growing rapidly or are very large, but harvesting females from declining populations can increase the rate of decline, especially in small populations.

The science of managing harvests depends on knowledge of a population's size and trend, whether increasing, decreasing or stable, and how quickly the population is changing. Knowledge of how the population is distributed on the land and its sex ratio can also inform management. The art of harvest management is to balance the benefits of harvesting with the risks of taking too many or too few animals and to work with people to achieve a harvest rate consistent with goals for the population.

In the past, there have been few bison harvested from the Nahanni population. However, there appears to be a small but growing interest in harvesting them, and there is significant interest by people from other communities who would also like to harvest bison from this population. It will be necessary to regulate the number of animals that may be harvested each year in order to achieve the population size objective.

The Nahanni population increased significantly between 2011 and 2017 (Figure 3), but it is not possible to predict if it will continue to grow, stabilize near the 2017 estimate, or decline. Even though the population size is small, it is still desirable to have a limited harvest to help re-build the connections between people and bison in the region and to help reduce conflicts between bison and people in communities. Even when the population is small, a quota of 1% or less of estimated population size for males only should be sustainable and may balance the need to manage bison around the communities with the need to minimize the risk of causing the population to decline. Allocating some tags to hunters who are not from either Nahanni Butte or Fort Liard may help to match the need to remove bison from communities with the demand for harvesting opportunities.

Careful harvest management can help to achieve this management plan's objectives of sustaining the long-term viability of the population and reducing conflicts while minimizing the risk of causing the population to decline. Harvest regulations and quotas based on population size and trend, and a suitable allocation of the harvest are recommended to accomplish this objective.

The model for harvesting is based on the population's size, trend (whether increasing, decreasing, or stable) and the sex of animals that hunters may take (Table 1) within wood bison management unit D/WB/05 (Figure 6). Harvest quota is calculated as a percentage of total population size, along with consideration of its recent trend. In addition, only males may be taken when the population is below 1,250 and if commercial, i.e., outfitted hunts are permitted; only males may be taken by those hunters regardless of population size. The number of bison killed in collisions and removed from communities as problem animals must be considered when determining the percentage of the population available for harvest.

Even though the model (Table 1) allows no harvesting if the population is below 750, taking a small number of bison would still be acceptable. On occasion, it is necessary to destroy a bison if it becomes a persistent problem in a community and the situation cannot be resolved by other means. In this circumstance, it is strongly recommended that cows not be taken. Similarly, harvesting two or three male bison for cultural events would also be acceptable. However, the total combined harvest should be <1% of population size.

The total allowable take (including harvests, collisions and nuisance kills) as a percentage of the total population size was proposed as a range, so that harvest could be adjusted for the population's trend (Table 1). If the population size is toward the lower limit of the size range or declining, total take is to be set at the lower level, but if it is near the upper boundary and increasing, the quota could be set at the upper level.

Table 1. Harvest plan for the Nahanni wood bison population.

Population Size	**Total Take as a Percentage of Herd Size[1]**	**Sexes to Be Harvested by Hunting Cohort**	
		Indigenous Hunters	**Resident Hunters**
Over 2,000	3-5%	Either sex	Either sex
1,250-2,000	2-3%	Either sex	Either sex
750-1,250	1-2%	Bulls only	Bulls only
Under 750	No harvesting[2] or 0-<1%	Bulls only for cultural events[2]	None

[1] If the population has been in decline, total take shall be at the lower end of the range, and if the trend has been increasing, total take may be near the upper end of the range.

[2] It may be acceptable to harvest some male bison under a Wildlife Management Permit in Nahanni Butte or Fort Liard for cultural events or because bison have become a problem in the community. This take is to be <1% of the total population size and for bulls only. When the population is >750 animals, quota and tag allocations will be used to manage the harvest.

Management Actions:

- Base harvest management and population monitoring on population size and trend as presented in Table 1.
- Manage bison harvests using a quota and tag system.

- Anticipate and allow for problem bison shot in communities and killed in collisions when setting harvest quotas.
- Encourage anyone who hunts wood bison to submit a report on their hunting effort whether or not a bison was taken and details about the animal if one was harvested.
- Refine total allowable take guidelines based on population modeling.
- Collect data on bison survival, reproductive rate and all causes of mortality to provide sound input to population models. See Knowledge Gaps: Information Required for Management Decisions below.
- Provide hunting opportunities to other NWT residents if tags remain available.

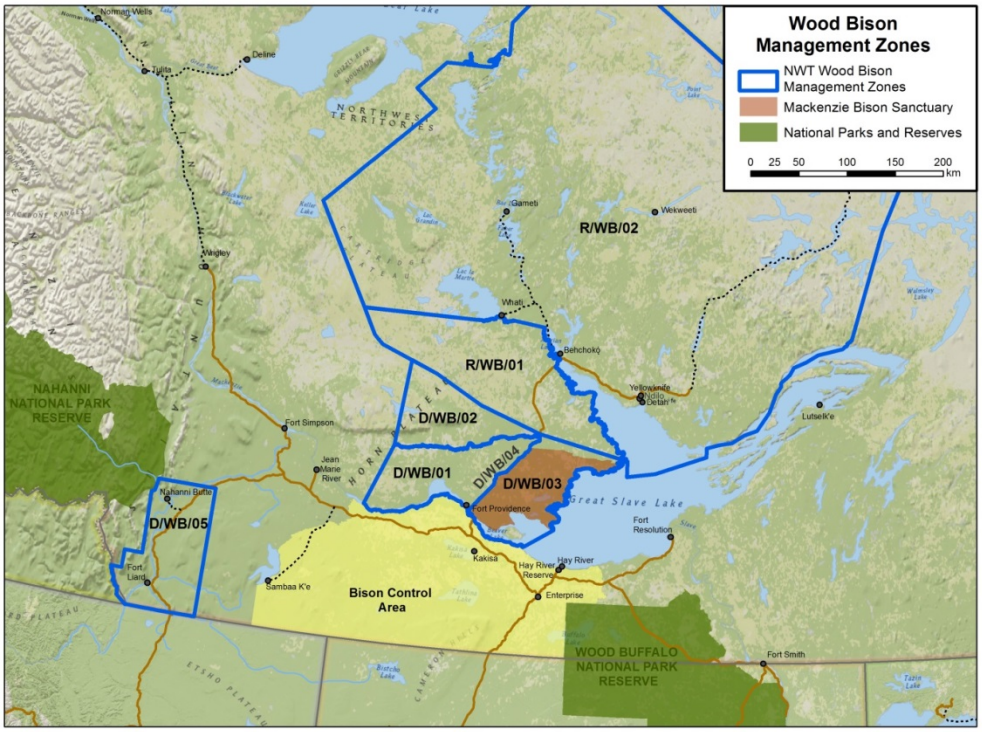

Figure 6. Wood bison management units in the NWT. Unit D/WB/04 is the Highway 3 right-of-way between D/WB/01 and D/WB/03.

Potential Management Challenges

There are other potential factors that could challenge Nahanni bison management but are not currently known to have a significant impact on the population.

Parasites and Diseases

All species can carry, or become infected with a number of potential diseases and parasites, and wood bison are no exception. At this time there are three diseases of concern to bison managers in the NWT: bovine tuberculosis (*Mycobacterium bovis*), bovine brucellosis (*Brucella abortus*), and anthrax (*Bacillus anthracis*). All three can infect domestic livestock, wildlife and humans, but none has been found in the Nahanni population and are not current concerns for its management. Nahanni bison are monitored for brucellosis,

tuberculosis and other diseases opportunistically by sampling bison killed in collisions, or removed from a community. A small number of samples are obtained this way each year.

Tuberculosis and brucellosis both hinder reproduction and survival of bison and result in wastage of meat if harvested animals have obvious signs of disease, whether or not it is one of these diseases. Once these diseases enter a population the only way to eradicate them is by removing the entire population. Therefore, it is important to prevent the movement of these diseases to areas where they currently do not occur. Movement of bison from other herds infected with these diseases into the Nahanni bison range is the most likely way this population could become infected. Since the WBNP – Slave River Lowlands bison metapopulation is a known potential source of tuberculosis and brucellosis, maintaining the Bison Control Area program is warranted to help prevent the movement of those diseases.

There are other diseases that could also infect bison and cause management problems and it is important to be vigilant for any that may appear here. Two key factors to note are, first, it is very difficult to predict which disease will emerge next, and second, once present in wildlife populations new diseases can be very difficult or impossible to eradicate or even control. The most likely way that new diseases arise is by the movement or import of domestic animals or farmed wildlife. However, the distribution of diseases and parasites may change without human involvement due to changes in climate or the distribution of other host species, or other factors that may not be obvious or well understood.

Genetic Diversity

Genetic diversity is important to a population's ability to thrive. In the short term, low genetic diversity can result in inbreeding depression, which may lead to reduced vigour in the population, and over the long term low diversity will reduce a population's ability to adapt to changing conditions (summarized in McFarlane et al. 2006). Genetic diversity in a population can be strongly affected by the founder effect, which refers to the situation when a small number of individuals form the source of an entire population. EINP's wood bison herd, the founding source of all those released to form the Nahanni wood bison population, is descended from only 11 calves, which means that the Nahanni population and all others founded from EINP had a rather narrow genetic base from the beginning.

Small populations naturally lose genetic diversity and research suggests that populations need to have 1,000 animals or more to have a high probability of retaining their genetic diversity. However, the genetic problems faced by small populations may be reduced if animals move between different populations (McFarlane et al. 2006). Unfortunately, all wood bison recovery populations have been isolated since their re-establishment due to

geographic separation, or intentionally managed in insolation in order to protect them from infection with bovine brucellosis or tuberculosis.

While Nahanni bison do not appear to be affected by genetic disorders it is important to monitor the population to determine if diversity is being lost over time. If it is feasible to increase the population's genetic diversity without the risk of introducing new diseases managers should consider this action. There are two potential ways to increase genetic diversity: create connections between the Nahanni and other wood bison populations to facilitate immigration or use reproductive technologies to transfer genetic material from another population with genes not currently present in Nahanni bison.

The Nordquist population in northern British Columbia and the Mackenzie population to the east are the two populations most likely to connect with Nahanni bison due to being the nearest neighbouring populations. The Nordquist occupies range within the Liard River valley but bison do not appear to move between the two populations, perhaps due to unsuitable habitat between them. Movement between the Nahanni and Mackenzie populations is impeded by poor quality habitat and the Bison Control Area, although bison have occasionally been seen in areas between the two ranges. Those sightings were most likely of bison from the Mackenzie population, and to date, bison movement between the two ranges is not suspected.

Wood bison conservation is also affected by the introduction of genes from plains bison. However, despite the hybridization episode that occurred in WBNP 90 years ago, genetic differences are still greater between wood and plains bison than within the two subspecies (Wilson and Strobeck 1999) suggesting that wood and plains bison are still genetically different, and it is strongly recommended that they be managed as separate entities. It is also strongly recommended that hybridization with domestic bison and introduction of cattle genes be prevented in order to conserve wild bison. Domestic bison generally have mixed or unknown genetic histories, including cross breeding with cattle, and in all cases, their management as livestock puts different selection pressures on them than exist for wild bison.

Management Actions:

- Continue the Bison Control Area program to help maintain the Nahanni population free of bovine tuberculosis and brucellosis.
- Monitor the population's health and condition.
    - Collect samples as the opportunity arises, e.g. from harvested and road-killed bison.
    - Train ENR officers and staff to collect, label and preserve appropriate samples.

    - Educate hunters as to the reasons for collecting samples for disease surveillance and actively encourage them to provide samples from harvested bison.
    - Collect blood serum from any bison that are immobilized for collar deployment.
- Use the *Wildlife Act's* provisions on moving domestic animals to help prevent the introduction of potential wildlife diseases.
- Monitor genetic diversity at periodic intervals.
- Examine feasibility of creating connections that enable bison to move between the Nahanni and Nordquist or Mackenzie populations.
- Use reproductive technologies to augment genetic diversity when feasible.
- Prevent any further hybridization with plains bison, domestic bison, cattle or other species.
    - Enact regulations to prevent the import or holding of plains bison or domestic bison in the NWT.
- Minimize loss of bison habitat caused by conversion of land to other uses.
    - Regulations will be required to manage land-use changes and the impact on wildlife habitat.
- Coordinate and consult with Department of Lands to discuss zoning and apportionment of lands for wildlife habitat and with the Department of Industry, Tourism and Investment to locate any new farm operations in locations to prevent conflicts between agriculture and habitat use by bison.
    - Establish land areas where domestic livestock are excluded.

RESEARCH AND MONITORING: INFORMATION REQUIRED FOR MANAGEMENT DECISIONS

The amount and types of information required to manage wildlife greatly depends on the circumstances of the populations of interest and how actively they are to be managed. Relatively little information is needed if management is conservative, i.e., harvest rates are low and there are few other management concerns. However, increasing harvest pressure and the emergence of conflicts between wildlife and human activities increases the complexity of wildlife management. This in turn increases the need for a broader and more detailed array of information in order to make sound management decisions.

Population Monitoring

Wildlife managers need information on population size and trend in order to make sound decisions and achieve management goals. This information is usually obtained from regular surveys designed to estimate population size or other means to determine changes in numbers. Since it is generally not feasible to estimate population size each year, data on other population parameters that influence changes in numbers, such as survival and calf production rates may be useful.

Actions:

- Survey to estimate herd composition annually.
- Survey to estimate population size (excluding calves) every four years; every three years if the previous estimate was <750 bison.
- Estimate detection rates of bison on aerial surveys using animals marked with telemetry collars.

Conflicts and Collisions

In general, we have an incomplete understanding of why bison use roads or enter communities, how much time they spend there, or how to prevent those incursions. Information that would help in understanding and addressing these problems includes learning when and where bison use highways and enter communities, and what draws them there. This information will be valuable in determining the most appropriate management actions to address the number of animals found on the highway. If food is the main attractant it may be possible to alter the vegetation to make it less attractive to bison. Use patterns may show that a few animals persistently use the highway or are present in a

community and selective hunting may reduce the problem. It is also important to determine if it is a limited number of animals that often use those places, or if many different animals occur there infrequently. If many bison use it sporadically before moving to other areas, hunting may not improve the situation since hunted animals would have left the area anyway and will be replaced by others moving through. A key step is to gather complete and reliable data on bison-vehicle collisions and occurrences of bison entering communities.

Actions:

- Monitor and record information related to bison-vehicle collisions and bison entering communities.
- Study bison movements to learn why bison utilise highways and determine if a few animals are frequently on or near the highway or if many different bison use it.
- Study habitat management as a way to reduce the number of bison and the time they spend in communities. See habitat section below.

Habitat and Habitat Management

The distribution and abundance of all species is affected by how well their needs for food, water and shelter are met by the amount, quality and distribution of suitable habitat. For a species to occupy an area, suitable habitat must fall within the species' tolerance limits for climatic and geological conditions. Distribution and abundance is also affected by other species including parasites and diseases, competitors and predators.

Availability of suitable habitat depends largely on geography and climate, and is mostly outside of the control of management actions. For example, water levels on the Liard River strongly influence habitat availability, especially of sand bars which bison use frequently in the summer.

Currently, there are few threats to Nahanni bison habitat, but the cumulative effects of natural and human-caused changes in the landscape could have a large impact on the population. The additive and possibly synergistic effects of different changes to the land may lead to larger than expected impacts on bison and other wildlife populations. It will be important to co-ordinate information gathering so that it both supports and is supported by cumulative effects monitoring initiatives in the region.

The Dehcho Land Use Planning Committee assessed much of the range of the Nahanni wood bison population as having high to very high conservation value for both wildlife and cultural resources. The development potential for timber and oil and gas ranged from

moderate to very high, particularly for oil and gas development. For minerals and agriculture, development potential was low to moderate.

Natural effects that change habitat in the Nahanni bison population's range include forest fires and flooding. Bison frequently use the Liard River shoreline, sand bars and islands and this pattern of use is influenced by water level and rate of flow. Bison move to recently burned forest habitats; burning grass and sedge habitats removes old, dead plant material and stimulates new growth, which bison may find attractive.

The number of feasible management actions that can be taken to alter habitat in order to affect bison distribution and abundance is limited. However, prescribed fire has the potential to improve some habitats for bison and alter their land-use patterns. Prescribed burning of select areas near Fort Liard and Nahanni Butte to improve bison habitat may be a technique to reduce conflicts by drawing bison away from the communities.

Research Objectives:

- Develop resource selection functions for Nahanni bison from habitat use data.
- Analyse movements by male and female bison to assess how they use the range and determine if they move widely within the range or if they tend to remain in discrete areas.
    - Deploy GPS telemetry collars on bison to monitor habitat use and movement patterns, especially on males. It is important to increase sample size from that obtained from bison previously fitted with telemetry collars.
- Conduct controlled burning experiments to determine if prescribed fire can be used to manipulate habitat to attract bison and reduce conflicts in communities.
    - Determine if bison utilize these areas through observations and tracking animals with GPS telemetry collars.

INFORMING PEOPLE ABOUT THIS MANAGEMENT PLAN

Communicating information on wildlife populations and their management to all parties is critical to the success of wildlife management programs. Changing circumstances will dictate what information is most important and how intensive communications should be. In addition to the public in general, communications need to be directed to residents of Nahanni Butte and Fort Liard as well as hunters, community and Indigenous governments, other GNWT departments, and businesses that may be interested in or affected by bison and their management.

Management Objectives:

- Inform the public and co-management partners of this plan and make it available on ENR's web site.
- ENR will consult with Indigenous governments and organizations about this plan and any infringements it may have on Aboriginal or treaty rights.
- Increase communications and public education about the Nahanni bison population, its status, factors affecting it and management actions.

REVISING AND UPDATING THIS PLAN

Changing circumstances and availability of new information make it important to review management plans periodically. It is recommended that this plan be reviewed and updated in five years, or earlier if warranted by significant events.

CONCLUSION

Sound management of the Nahanni wood bison population is important to the people of the NWT and will contribute to recovery of the species nationally. This plan seeks a collaborative effort among communities and departments to address current management issues, has recommended actions that can be taken and has identified information gaps that limit our ability to manage Nahanni bison.

PERSONAL COMMUNICATIONS

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