Government of Northwest Territories
Gouvernement des Territoires du Nord-Ouest

Slave River Lowlands Bison Management Plan

Environment and Natural Resources
Government of the Northwest Territories

Plan de gestion du bison des basses terres de la rivière des Esclaves

(Comprend un sommaire en français)

Présenté au ministère de l'Environnement et des Ressources naturelles
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THE SLAVE RIVER LOWLANDS BISON WORKING GROUP

This draft management plan was developed by the Slave River Lowlands (SRL) Bison Working Group. The working group was made up of members from communities that harvest bison in the SRL and the Department of Environment and Natural Resources. Members were tasked with bringing their organizations' perspectives to the group and communicating the group's progress and decisions back to their organizations. The working group operated by consensus to create this draft plan. The group consisted of:

- Fort Resolution Métis Council – Arthur Beck, Eric Beck, Raymond King
- Deninu Kue First Nation – Stanley Louine, Frank Lafferty
- Fort Smith Métis Council – Richard Mercredi, Earl Evans
- Fort Smith Conservation Association – Norman Dievert
- Smith's Landing First Nation – Magloire Paulette
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- K'atł'odeeche First Nation – Robert Lamalice, Pat Martel
- Hay River Métis Government Council – Trevor Beck
- Salt River First Nation – Ray Tourangeau
- West Point First Nation – Sonya Frise
- Department of Environment and Natural Resources
    - Terry Armstrong, Bison Ecologist, Wildlife Division
    - Troy Ellsworth, Superintendent, South Slave Region

Dwade Hawley, who represented the Northwest Territories Wildlife Federation, passed away in 2017. Dwade read extensively on bison and bison management and brought a unique perspective on wildlife management to the table. He made an outsized contribution to the group's discussions and his input to the final stages of this plan's development was missed by the working group.

The working group met twelve times between March 2015 and January 2018 in Fort Smith, Fort Resolution and Hay River to develop this plan.

Quotations in this plan were made by members during working group meetings.

We thank Karl Cox and Bonnie Fournier for producing maps and Heather Sayine-Crawford, Heather Fenton and Nic Larter for their helpful comments on a previous draft.

EXECUTIVE SUMMARY

The *Slave River Lowlands Bison Management Plan* was drafted by the Slave River Lowlands (SRL) Bison Working Group to provide direction for managing these bison and to help meet the goals of the *Recovery Strategy for Wood Bison (Bison bison athabascae) in the Northwest Territories* (the *Strategy*). This plan's goal is to maintain bison populations in the SRL that can sustain on-going harvests while avoiding restrictions on harvesting unless the bison numbers decline drastically. The Working Group developed five management objectives and key actions to achieve each:

Determine harvest rates of bison in the SRL

Key actions: implement a mechanism to collect bison harvest data, and place a moratorium on harvesting bison if bison numbers in either the Hook Lake or Grand Detour populations drop below 200 animals

Respond to anthrax outbreaks and monitor for bovine tuberculosis and bovine brucellosis

Key actions: monitor for and respond to anthrax outbreaks and continue the Bison Control Area program

Minimize conflicts with other land uses

Key actions: Minimize loss of bison habitat caused by conversion of land to other purposes and minimize conflicts between agriculture and habitat use by bison

Prevent hybridization with plains bison or cattle

Key action: prevent any further hybridization with plains bison, domestic bison or other species

Monitor predators

Key action: determine the importance of predation on bison population dynamics

The Working Group also identified gaps in our knowledge that limit our ability to manage bison in the Lowlands. Knowledge gaps exist in the area of setting sustainable harvest levels and our ability to model population dynamics, ability to estimate population size and trend accurately, and in our understanding of how bison use their range in the Lowlands, and how habitats are changing along with causes of some of those changes.

SOMMAIRE

Le Groupe de travail sur le bison a rédigé le Plan de gestion du bison des basses terres de la rivière des Esclaves afin de guider la gestion de ce bison et de contribuer à l'atteinte des objectifs du Programme de rétablissement du bison des bois (*Bison bison athabascae*) aux Territoires du Nord-Ouest (ci-après le Programme de rétablissement). Le but du programme est d'assurer la préservation des populations de bisons de la région des basses terres de la rivière des Esclaves afin que la chasse y soit possible sans restriction, à moins que le nombre d'individus de la harde ne diminue considérablement. Le groupe de travail a défini cinq objectifs de gestion et autant de mesures clés pour y arriver :

Déterminer le nombre de bisons chassés dans la région des basses terres de la rivière des Esclaves

Mesure clé : Mettre en place un mécanisme de collecte des données sur la chasse au bison et imposer un moratoire sur la chasse si le nombre de bisons des populations du lac Hook ou de Grand Detour tombe en deçà de 200 individus.

Réagir aux épidémies de fièvre charbonneuse et surveiller les éclosions de tuberculose et de brucellose bovines

Mesure clé : Surveiller les éclosions de fièvre charbonneuse et y réagir, et poursuivre le programme des régions de contrôle du bison

Réduire les conflits avec d'autres utilisations des terres

Mesure clé : Minimiser la perte d'habitat du bison causée par la conversion de terres à d'autres fins, et minimiser les conflits entre l'agriculture et l'habitat du bison.

Éviter l'hybridation avec le bison des plaines ou le bétail

Mesure clé : Éviter toute nouvelle hybridation avec le bison des plaines, le bison domestique ou d'autres espèces.

Surveiller les prédateurs

Mesure clé : Déterminer l'importance de la prédation sur la dynamique des populations de bisons.

Le groupe de travail a également cerné des lacunes dans nos connaissances qui limitent notre capacité à gérer le bison dans la région des basses terres de la rivière des Esclaves. Il existe des lacunes dans les connaissances nécessaires à l'établissement de seuils durables de chasse et dans notre capacité à modéliser la dynamique des populations, à estimer avec précision la taille et les tendances des populations, à comprendre comment les bisons utilisent leur aire de répartition dans les basses terres et comment les habitats changent, ainsi que les causes de certains de ces changements.

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INTRODUCTION

In 2010, the Government of the Northwest Territories (GNWT) released the *Wood Bison Management Strategy for the Northwest Territories 2010-2020* to provide long-term vision for the management of wood bison in the Northwest Territories (NWT). That strategy called for the development of plans to guide management of wood bison in the Slave River Lowlands (SRL), as well as for the Mackenzie and Nahanni populations. 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 guides bison management in the NWT.

The *Strategy* established two goals to guide the management of wood bison 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.
2. Contribute to the recovery of free-ranging, healthy wood bison throughout their historic range in Canada.

One of the components identified to achieve the goals of the *Strategy* is to work with communities, Indigenous governments and other stakeholders to develop and implement management plans for the Mackenzie, Nahanni and Slave River Lowland (SRL) bison populations. It has been built on the principles underlying the *Strategy*: all responsible jurisdictions will contribute and take a long-term recovery approach to managing wood bison at the landscape level, using adaptive management, all sources of knowledge, and employing the precautionary principle.

A management plan helps managers identify a vision and set goals for a wildlife population, coordinate management actions, measure progress toward achieving goals, determine when goals are met and define how management actions may change as a result. It can also promote reassessment of actions if goals are not met. A management plan is an aid to accountability and helps wildlife managers be proactive. The purpose of this plan is to provide a coordinated, proactive approach to managing the wood bison population in the SRL and an important step in communicating how people want to manage activities that affect bison. It was developed as a preventative and pre-emptive approach to avoid crises of low bison numbers that could have been avoided by management action.

[1] For the context of this management plan, healthy was defined narrowly in the *Strategy* to mean bison free of bovine tuberculosis, bovine brucellosis and other significant diseases from domestic animals.

The *Strategy* confirmed the importance of cooperation and support from Indigenous organizations and NWT communities in the development of management plans and the role of communities in identifying specific management objectives for bison on their traditional lands. In keeping with that approach, this plan was developed by the SRL Bison Working Group.

People in the South Slave Region have long-term local and traditional knowledge of the SRL and its bison, and members of the SRL Bison Working Group brought a wealth of that knowledge to the Working Group's discussions. This plan was developed using that knowledge along with scientific knowledge where possible.

MANAGEMENT GOAL AND OBJECTIVES

This plan's goal is to provide guidelines to maintain bison populations that can sustain on-going harvests and to avoid restrictions on bison harvesting unless a population declines to a dire situation.

The Working Group did not include a specific population size target as a goal of this management plan. Setting a population size goal was hampered by the lack of information that would enable the working group to determine how many bison the habitat in the SRL could support. Information is also lacking on how habitats in the SRL change over time and how those changes would be likely to affect numbers of bison there, as is data on timing, frequency and size of bison movements into and out of Wood Buffalo National Park (WBNP).

The Working Group identified objectives to be achieved and key management actions within each objective.

Management objectives:

1. Determine the number of bison harvested annually in the SRL.
2. Respond to anthrax outbreaks and monitor for bovine tuberculosis (bTB) and bovine brucellosis.
3. Minimize loss of bison habitat by conversion to conflicts with other land uses.
4. Prevent hybridization with plains bison or cattle.
5. Monitor predators.

HISTORY OF WOOD BISON IN THE NWT

There is a very long history of bison in what is now the NWT. The steppe bison (*Bison priscus*) lived in the region between the last ice ages, and went extinct about 11,000 years ago. In this region, it was replaced by the modern wood bison (*Bison bison athabascae*) which first appeared about 35,000 years ago.

Stephenson et al. (2001) described the history of wood bison in Alaska and northern Canada over the past few thousand years. Wood bison were widely distributed from north-western Saskatchewan to Alaska in the past 5,000 years (Figure 1) but disappeared from a large part of their original range in Alaska and north-western Canada by the early 1800s. The original range of wood bison extended from Saskatchewan to Alaska, but in recent times the core range has been the southern NWT, northern Alberta and north-eastern British Columbia (Figure 2).

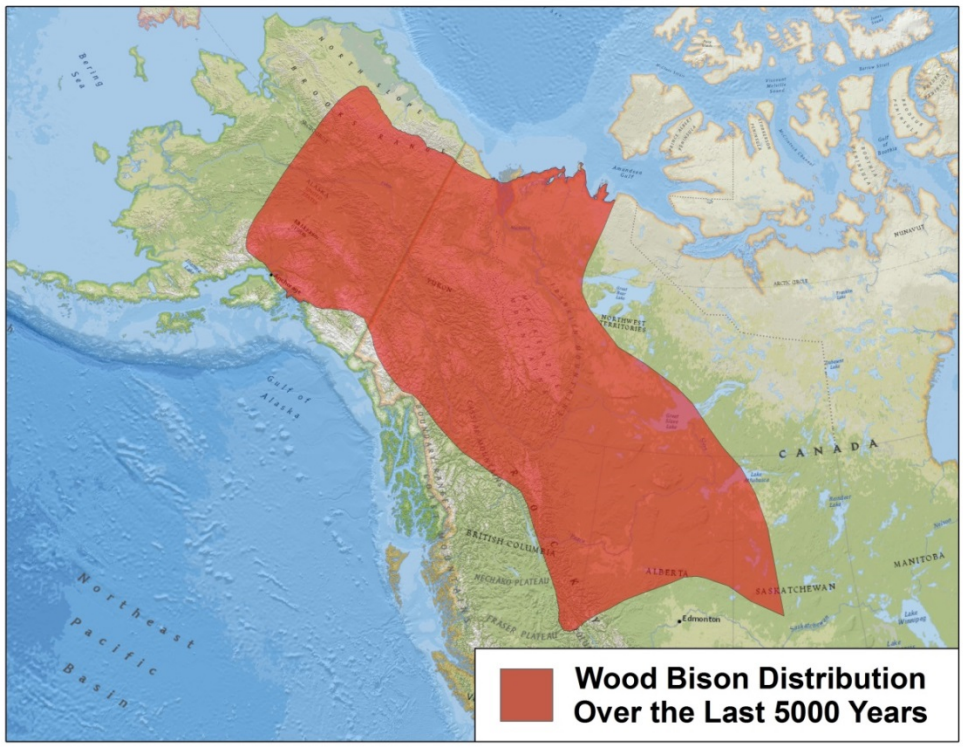

Figure 1. Distribution of wood bison over the past 5,000 years (after Stephenson et al. 2001).

Most of the range contraction took place prior to the arrival of Europeans (Stephenson et al. 2001), but some wood bison persisted in Alaska, Yukon and western NWT into the early

1900s. There are oral records of when bison were last shot in some areas, including the Sambaa K'e area of the NWT where the last bison was killed in the 1890s (Larter and Allaire 2007[2]).

Causes of the disappearance of wood bison over the past 5,000 years are not clear, but a combination of environmental factors that resulted in habitat changes may have been involved (Stephenson et al. 2001). Progressive loss of suitable habitat can produce a pattern of habitat and population fragmentation and isolation. Small, isolated populations are more likely to be extirpated than are large populations or those connected to other populations due to further habitat change, chance events or other factors. Even modest amounts of predation, disease, or hunting could have had substantial effects on the long-term survival of small, isolated herds of wood bison and when a local population disappeared, barriers to movements – such as large areas of unsuitable habitat – would have reduced the chances that the area would be recolonized by other bison. The pattern of habitat change and fragmentation followed by bison population isolation and local extinction may have occurred repeatedly throughout Alaska, Yukon and the NWT (Stephenson et al. 2001).

From relative abundance less than a century earlier, wood bison were driven to near-extinction by the late 1800s. Gates et al. (1992) describe accounts from the late 1700s and early 1800s that reported wood bison as "abundant" or in "large numbers" in the upper Peace River and SRL regions, but they had disappeared from east of the Slave River by the 1880s. The decline and near extinction of wood bison by the late 1800s was likely due, at least in part, to the demand for meat to provision fur trading posts and brigades (Gates et al. 1992).

Bison have not been found in the Slave River delta in recent history but in 1894, a Yellow Knife chief spoke of having "killed plenty of buffaloes in the delta of the Slave River" (Russell 1898). Elders in Fort Resolution have told of bison on Jerome Slough to Gaudet Bay on Great Slave Lake and bison tracks were seen on the slough in 2013 (Eric Beck, personal communication 2017). Following the late 1890s, written accounts referred to small herds of bison found only in the area bounded by the Caribou Mountains, the Peace and Slave Rivers and Great Slave Lake (Soper 1941). Soper (1941) thought it likely that by 1900 all wood bison remaining were found in what is now WBNP. It is not known when bison crossed the Slave River and became re-established on the east side of the lowlands but they were present in 1949 when W.A. Fuller (1950) estimated 200 bison in that area (Figure 2).

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

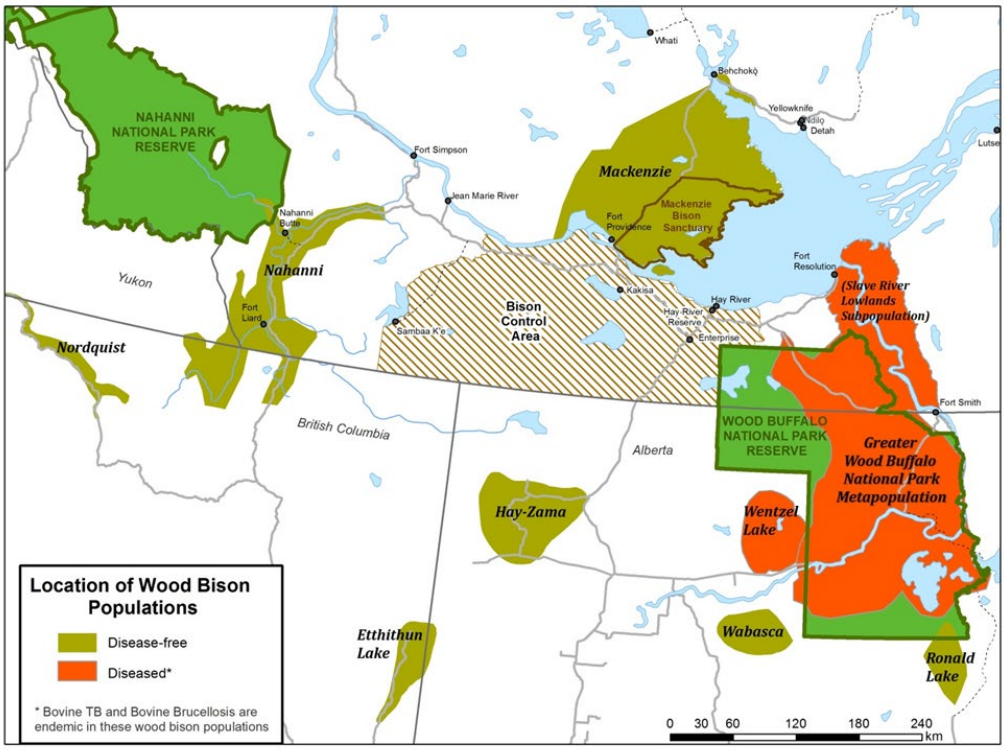

Figure 2. Distribution of wood bison in the NWT. BTB and bovine brucellosis occur in bison in the Slave River Lowlands–Wood Buffalo National Park area.

The history of bison in the SRL is strongly linked to that of other bison in and around WBNP. Bison move between the park and the lowlands to an extent that makes the SRL bison population a part of what is commonly referred to as the Greater WBNP Metapopulation. A metapopulation is a larger population made up of subpopulations that function independently but are connected by movements between them.

As plains bison were nearly driven to extinction between 1840 and 1890, wood bison had a similar decline. Accounts of early explorers described wood bison as being numerous or plentiful but there are no existing estimates of their numbers at those times. Soper (1941) estimated wood bison reached their low of approximately 250 animals between 1896 and 1900. Wood bison were observed occasionally throughout their range in Canada after 1900 but their numbers were insignificant except in the area of the SRL and what would later become WBNP (Gates et al. 2001). By the time WBNP was formed, the plains bison population at Buffalo National Park near Wainwright, Alberta, had grown to the point where park was overcrowded and its range was being depleted (Gates et al. 2001). A slaughter to reduce numbers in the park was proposed but due to public opposition, it was abandoned. A more acceptable compromise solution was to translocate surplus bison from Wainwright to the new WBNP in northern Alberta. Despite opposition to moving Wainwright bison to WBNP over concerns of interbreeding between plains and wood bison

and the introduction of tuberculosis – known to be present in bison at Buffalo National Park – the translocation proceeded. Between 1925 and 1928, 6,673 young plains bison were shipped from Wainwright and released near Hay Camp (Gates et al. 2001) in range that was occupied by wood bison at the time. Injuries and fatalities were common among bison during handling and shipping so the number of plains bison released was "substantially lower" than the number shipped (Gates et al. 2001). Unfortunately, hybridization and disease transmission occurred as anticipated.

The number of wood bison in WBNP had been increasing for over a decade before the arrival of the plains bison and population growth continued afterward. In 1934, the number of bison in WBNP was estimated at 12,000 (Soper 1941) and remained at about that level until the late 1960s (Gates et al. 2001). During that period, bison management in the park included wolf control, bison slaughters and meat sales. After 1970, bison numbers in the park began to decline, reaching a low of between 2,000–2,500 animals in the later 1990s. Bison numbers in WBNP increased in parallel with those in the SRL in the early 2000s.

In the SRL, bison numbers increased to 1,700 animals by 1971 then declined rapidly, and estimates of bison in the Lowlands did not exceed 800 animals for the next 30 years (Figure 3). In 2009, over 1,700 bison were estimated, but subsequent estimates have been lower (Figure 3). Due to the rapid decline in bison numbers in the Lowlands in the 1970s, bison hunting by resident hunters and outfitted hunts by non-residents were halted, but no restrictions were placed on hunting of bison in the Lowlands by Indigenous people. Hunting of bison in the Lowlands by resident hunters was reinstituted in 2014.

In the 1960s, recovery efforts resulted in the re-establishment of the Mackenzie wood bison population and the formation of a captive herd at Elk Island National Park, east of Edmonton, Alberta. Wood bison captured in the Needle Lake area, in the northern part of WBNP, founded both the Mackenzie and Elk Island populations. Since 1980, six more free-ranging wood bison populations have been re-established in Canada with releases of bison originating from Elk Island. In addition to populations shown in Figure 2, wood bison are also found in the Aishihik herd in Yukon and the Chitek Lake herd in Manitoba. Efforts to conserve and recover wood bison continue, and the NWT is a partner in this work. In the early 2000s a plan to re-introduce wood bison to Alaska was developed, and in 2015 over 100 were released along the Innoko River near Shageluk, Alaska to establish a free-ranging population there.

BISON OR BUFFALO?

The frequent use of the term 'buffalo' when referring to North American bison has been addressed by other authors (Shaw and Meagher 2000, Reynolds et al. 2003, Gates et al. 2010, Plumb et al. 2014). Gates et al. (2010) called the term 'buffalo' an historical misnomer when referring to bison rather than African buffalo (i.e. cape buffalo, *Syncerus caffer*) or Asian water buffalo (*Bubalus* spp.). However, in North America bison and buffalo are freely interchanged as the common name without apparent conflict in meaning or loss of understanding (Plumb et al. 2014). Buffalo is commonly used by many users, from government authors to the media, but rarely in scientific or technical work.

CURRENT STATUS OF THE SLAVE RIVER LOWLAND WOOD BISON POPULATION

The SRL wood bison population was estimated at 662 bison in March 2016 (95% Confidence Interval (CI): 395-1,110), which was lower than the 2014 estimate of 1,083 (95% CI: 522-2,248, Figure 3). However, the difference was not statistically significant due to the poor precision of the 2014 estimate. Precision is typically wide around bison population estimates due to their herding behaviour, but the 2014 survey data resulted in particularly poor precision. The population was previously estimated at 1,790 (95% CI: 1,148-2,432) in 2009. The 2009 and 2014 estimates were higher than all previous estimates since the 1970s (Figure 3). It is important to note that some of the changes in estimated numbers may be due to changes in survey methods, but this will not account for the pattern or trends in bison numbers. WBNP has not changed their survey protocol but bison numbers estimated in WBNP had the same trend as the SRL numbers from 2000-2014 (Cortese and McKinnon 2015). Prior to 2009, bison numbers in the SRL were estimated using total counts. In 2009, a strip transect design was used, and then distance sampling methods were adopted beginning in 2014. Survey methods have been changed to improve statistical rigour, accuracy and reliability of estimates.

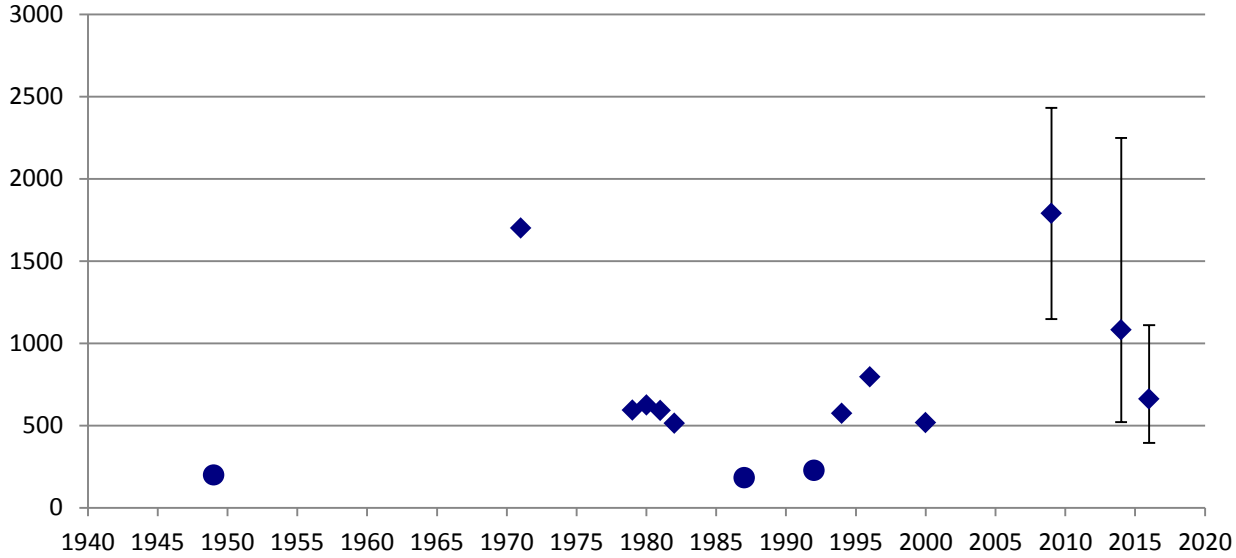

Figure 3. Estimates of bison in the Slave River Lowlands, 1949-2016. Bars indicate 95% CI. CIs are not available for estimates prior to 2009 because those estimates were obtained from total counts. Strip transect sampling was used in 2009, and distance sampling methods have been employed since 2014. Counts in 1949 and 1987 were from the east side

of the Slave River only, and the area sampled in 1992 was not specified. These three years' data are represented by circles.

Bison in the SRL have been regarded as consisting of two smaller populations separated by the Slave River. Those east of the Slave River are often referred to as the Hook Lake herd, and those west of the Slave are referred to as the Grand Detour herd. Unlike bison of the Nahanni population which frequently cross the Liard River and are commonly found on the Liard River's shore and islands in summer, bison in the SRL rarely cross the Slave River and are not commonly found on its islands or shoreline. Bison are known to move between WBNP and the Grand Detour area and these movements can affect the numbers in either locale at any given time. However, the frequency, extent and significance of these movements are not known.

LEGAL STATUS OF SRL BISON

The legal and conservation status of bison varies by jurisdiction and listing body. In the NWT, bison are categorized as wildlife and big game under the NWT *Wildlife Act* (2014). Wood bison were assessed as Threatened in the NWT by the NWT Species at Risk Committee and the species was listed as Threatened under the NWT *Species at Risk Act* in 2017.

"I learned a lot from watching bison at the ranch. I was a good buffalo hunter but didn't really know much about them until I studied them at the ranch."

"Bison will go for a run almost every day, they circle then run off, not necessarily chased by wolves or scared by a plane."

Stanley Louine, Fort Resolution, NT

Wood bison are also listed as Threatened under Canada's *Species at Risk Act,* which requires the Government of Canada to produce a national recovery strategy for the species. The NWT Conference of Management Authorities has released a recovery strategy for the species in the NWT. Members expressed concern that by assessing and listing bison across the NWT as a single entity, hunting of a population that is stable or increasing may be restricted unnecessarily if other populations are declining.

Recommendation:

1. **Recommend that management plans and actions following listing under the NWT *Species at Risk Act* be population specific.**

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) is a national organization that assesses species status across the country. COSEWIC first assessed wood bison in 1978 and designated it as Endangered. The status was re-examined and assessed as Threatened in 1988 and again in 2000, but in 2013 COSEWIC designated wood bison as Special Concern. A response to COSEWIC's assessment is expected from the Government of Canada in 2018.

Internationally, wood bison were listed as Endangered in Canada under the United States Endangered Species Act in 1970 and re-classified as Threatened throughout their range in 2012.

The American bison, *Bison bison,* including both plains and wood subspecies, are listed as Near Threatened (Aune et al. 2017) on the International Union for the Conservation of Nature Red List of Threatened Species. Within the Convention on International Trade in Endangered Species of Wild Flora and Fauna, wood bison were listed on Appendix II until the fall of 2016, indicating the species is not 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). At the fall 2016 Conference of the Parties, Canada's proposal to de-list wood bison was adopted because the species no longer met the criteria for Appendix II listing.

BISON AND PEOPLE

Bison are an important food source for communities in the SRL, are part of the communities' heritage and therefore should be managed so herds can continue to support those connections. Many people in the region have a cultural and economic connection to bison. Others appreciate bison as part of the natural world, or simply because bison exist and are part of the nation's history and natural heritage. The animals inspire people through art, literature and science.

Hunting remains an important social, cultural and economic activity in Indigenous and non-Indigenous cultures alike. In addition to the economic value of the food obtained, hunting is probably the primary means by which cultural connections are made to bison and to wildlife in general.

Non-Indigenous people also have a history with bison in the NWT. In the 1960s and 1970s, resident hunters harvested bison in the SRL, and at that time the NWT Anglers and Hunters Association held annual bison barbeques for the public for several years (K. Hall, personal communication).

Bison were of great economic importance to a number of North American Indigenous peoples, especially those living on the Great Plains. Food may have been the most important economic aspect of bison to traditional societies but they also would have obtained a variety of materials from the animals. In addition to, or perhaps because of their importance as a source of food and materials, bison were also part of peoples' social, cultural and spiritual lives. Today, in addition to the value of bison hunted, economic value is realised through tourism and marketing. At one time bison viewing tours were held in WBNP and at different times, guided hunts for bison were available for SRL and Mackenzie bison. Guiding and outfitting can provide significant economic benefit, and outfitters often supply meat to local communities. Using rules of thumb for meat yield from beef carcasses and $25/kg as the replacement cost of beef (Larter and Allaire 2014), each 550 kg bison (1,200 lbs.) would provide meat worth over $5,000.

Bison are the NWT's most easily viewed and photographed large wildlife species, and for some people the opportunity to encounter wild wood bison is a reason to travel to or within the NWT. 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 is used in marketing and promotional materials by businesses and governments. Wild bison help promote the NWT to the world.

MANAGEMENT OBJECTIVES

Objective 1: Determine harvest rates of bison in the SRL.

A goal of the *Strategy* is to maintain healthy bison populations that can sustain on-going harvests. Harvesting can have significant effects on wildlife populations and harvest management is often one of the few things that wildlife managers can do to affect or protect wildlife and in some cases it may be the most important factor in the dynamics of a wildlife population. Sound management can use harvesting to help regulate a population's size and alter its distribution. Reducing harvests when populations are low or declining may help slow the decline or allow the population to grow, and increasing harvest may slow the growth of a rapidly increasing population. Hunting is used as a management technique to restrict the distribution of bison in the NWT by preventing them from expanding their range into the Bison Control Area and establishing herds there.

The effects of harvesting vary with the proportion of animals taken from the population each year and whether it increases the total mortality from the population when combined with all other factors that affect mortality in the population. In many species, the age and sex of animals taken affect the impacts of harvesting. In large ungulate species like bison, taking females usually affects future population size and growth more than removing males. Generally, harvesting females is less detrimental to populations that are growing rapidly or are very large. However, when populations are small or declining, harvesting females can increase the rate of decline and further reduce numbers. The science of managing harvests depends on knowing population size, trend (whether increasing, decreasing or stable), and how quickly the population is changing. Sex ratio and how the population is distributed on the land 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.

Wildlife harvesting can be regulated in a number of ways to achieve management objectives. Harvest quotas can be changed for the entire population, regulations can direct harvest to some areas and not others, or to concentrate harvest on animals of a particular age or sex. Changing the length and timing of the hunting season are other harvest management options.

Unlike the Mackenzie and Nahanni wood bison populations where hunting has been managed by quotas set under the *Big Game Hunting Regulations* since those populations were re-established, there has been no quota established for bison in the SRL. Resident

hunters can purchase a tag to hunt one bison per year in this zone but there are no regulations governing the number of bison that may be harvested from the SRL by Indigenous people. The working group agreed that even though bison harvesting in the Lowlands is not regulated under a quota system, it is important to determine the harvest rate and recommends implementing a means of collecting harvest data. A draft harvest reporting form is in Appendix 2.

The working group did not think there is likely to be a need to manage the number of bison harvested from the SRL because they believed that WBNP serves as a reservoir of bison for the Lowlands, and that the take of bison may be self-regulating. Bison harvest may be self-regulating if hunting effort and harvests decline in proportion to declines in bison numbers as population size falls, however there is no information to confirm this. While WBNP may be a reservoir of bison for the SRL, we have no information on what proportion of bison harvested along Highway 5, in the Fox Holes area or in the Lowlands originated in the park. However, traditional knowledge suggests that the Hook Lake herd is separate from Grand Detour and WBNP herds because bison rarely cross the Slave River and bison numbers east of the Slave River do not fluctuate due to animals moving to or from the Grand Detour and WBNP herds. Much more information is needed on the magnitude and timing of bison movements within the Lowlands and between the SRL and WBNP.

Even though the working group did not think there would be a need to manage harvesting of bison from the SRL, they agreed that if the population falls to a very low level all hunting should be stopped, and recommended if either herd fell below 200 animals all hunting on that herd would be halted. The working group chose 200 animals as the criterion because the Hook Lake and Grand Detour herds have rarely been estimated at less than 200 animals since the 1970s (Figures 4, 5). They did not propose restricting non-Indigenous harvesting at a different population size because the population sustained unrestricted harvesting by Indigenous people since the 1970s and the non-Indigenous harvest is very small, so halting that portion of the harvest alone would have a negligible effect on the bison population.

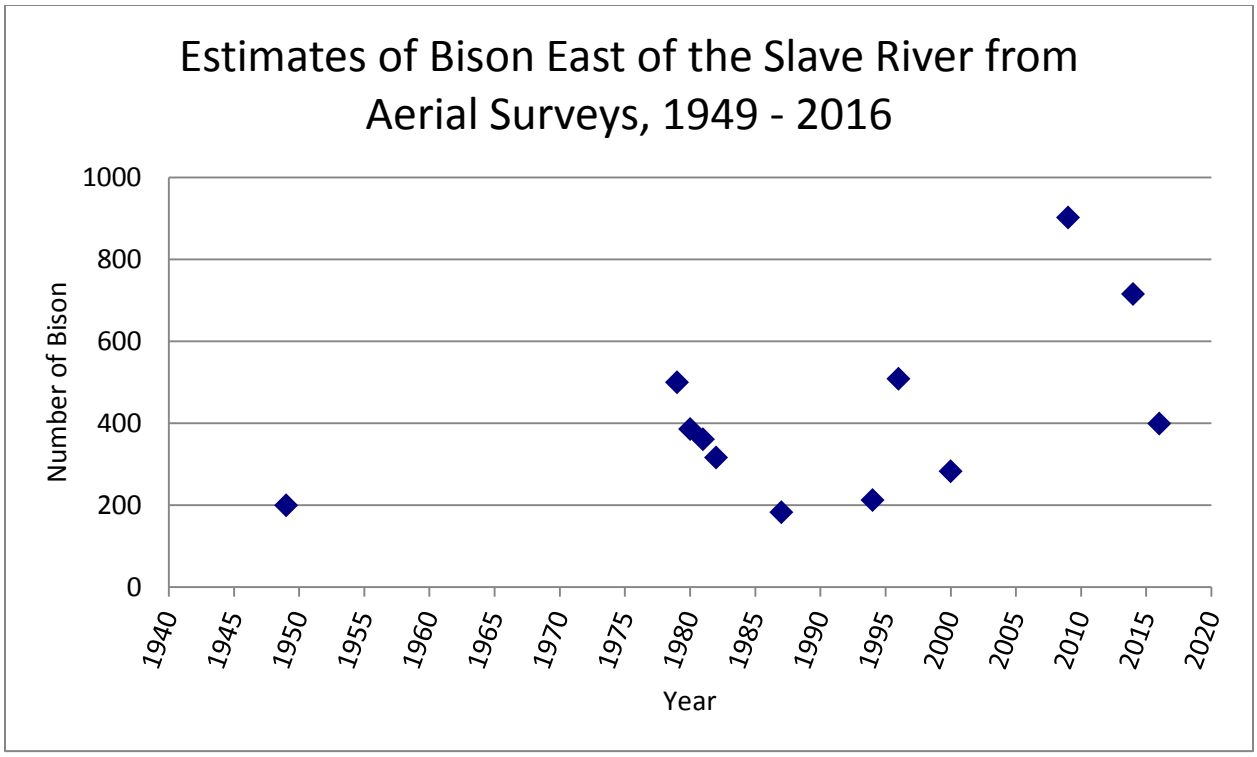

Figure 4. Estimates of bison in the Lowlands east of the Slave River from aerial surveys, 1949-2016.

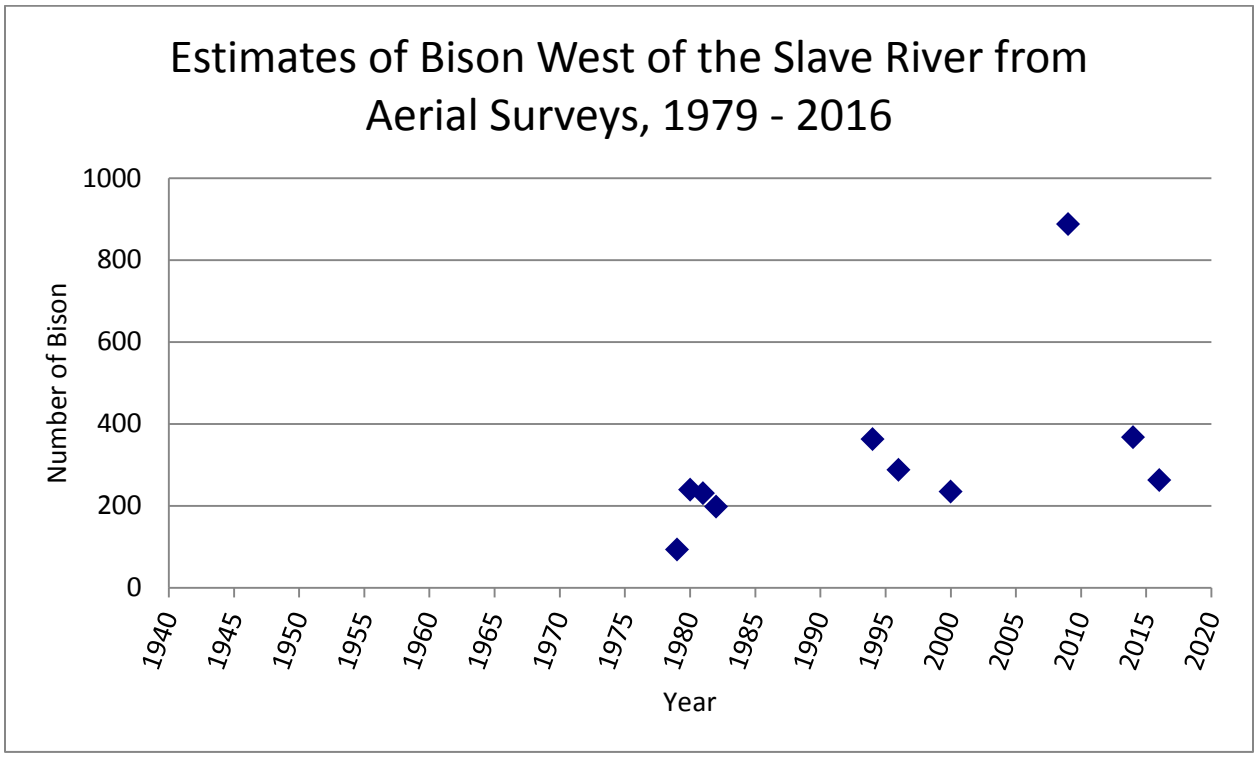

Figure 5. Estimates of bison in the Lowlands west of the Slave River from aerial surveys, 1979-2016.

Working group members have noticed a loss of respectful, sustainable hunting practices and described a trend among young hunters who do not know proper ways to hunt. They emphasized that responsible hunting practices need to be taught and monitored.

Key Actions:

1. Implement a mechanism for collecting harvest data including hunting effort, bison harvested and information about animals taken.
    - Determine the source of bison harvested, whether from the SRL or WBNP and estimate harvest rates for each.

2. Establish the following harvest management plan
    - Grand Detour herd: When the population estimate west of the Slave River is less than 200, a moratorium will be called on all bison hunting west of the Slave River.
    - Hook Lake herd: When the population estimate east of the Slave River is less than 200, a moratorium will be called on all bison hunting east of the Slave River.

Additional Actions:

3. Provide public education on bison and best hunting practices, and harvest management.
    - Provide information and guidelines to hunters when they purchase a tag Note: The Department of Environment and Natural Resources (ENR) provides an information package to each resident hunter who buys a tag for bison in the SRL.
    - Support communities organizing regular outreach and education opportunities e.g. community meeting prior to hunting season; encourage communities to take their children out hunting; run hunting camps for youth.

Objective 2: Respond to anthrax outbreaks and monitor for tuberculosis and brucellosis.

All wildlife can be affected by a wide range of diseases and parasites, and wood bison are no exception. At this time, there are three diseases of significant concern for wood bison management due to their presence in the NWT and their potential to harm both bison and people: anthrax, bovine tuberculosis, and bovine brucellosis. All three can infect wildlife, domestic livestock, and humans, and all occur in bison in the SRL.

Anthrax

Anthrax is a seasonal and sporadic disease in northern bison populations. All detected outbreaks have occurred in the summer months, but we are unable to predict when an anthrax outbreak will occur or how many animals will die. Anthrax was first detected in bison in northern Canada in 1962 when 281 bison died near Hook Lake. More bison died of anthrax in outbreaks that spanned Hook Lake, Grand Detour and WBNP in 1963 and 1964. Most recently, over 50 bison died of anthrax in WBNP in 2015 and 45 died in the Hook Lake area in 2010. The largest known anthrax outbreak in northern bison killed at least 450 animals in the Mackenzie population in 2012 (Elkin et al. 2013). Anthrax has been detected in 13 years since 1962, but it is likely that undetected bison deaths due to anthrax occurred in other years. Some outbreaks are minor with only a few animals dying, while others can be catastrophic, such as the 2012 outbreak in the Mackenzie population.

Based on oral history, fur traders' journals and recent scientific research, it is likely that anthrax outbreaks occurred in northern bison in the 1800s (Ferguson and Laviolette 1992). Whether the disease has been in North American for thousands of years (Kenefic et al. 2009) or arrived after European contact (Vergnaud et al. 2016) is a matter of debate. The impact of land use changes on occurrences of anthrax in the Lowlands is unknown but development activities could cause spores currently buried in the soil to be released and become available to infect bison.

Bacillus anthracis, the bacterium that causes anthrax can form spores that are able to persist in the environment for many years and under certain environmental conditions, spores become concentrated in locations where bison can inhale or eat them. Inside the bison, the spores germinate and cause a blood-born infection that can be fatal, but not all bison that ingest spores develop an acute case of anthrax and at least some survive after being infected (Turnbull et al. 2001).

Acute anthrax infections generally cause rapid death in bison, and dead animals decompose quickly. When an infected animal dies of anthrax, spores are released back into the environment through discharges from the body or when the carcass is opened by scavengers. This local environmental contamination may become a new source of anthrax infections (e.g. Turner et al. 2014).

In the NWT, active anthrax surveillance and control measures are in place to try to limit the impacts of this disease on bison. ENR's Anthrax Emergency Response Plan calls for all discovered anthrax carcasses to be incinerated and contaminated soil to be treated chemically to reduce the release of spores to the environment (Elkin et al. 2013). The risk of human exposure to anthrax is considered to be low with the exception of ENR and WBNP staff when they respond to outbreaks. Safety protocols to prevent exposure to anthrax are

described in the Anthrax Emergency Response Plan. The presence of anthrax in the NWT may be a deterrent to the production of livestock that may die of the disease.

Tuberculosis

Bovine tuberculosis (bTB) is a chronic, infectious disease caused by infections with the bacterium *Mycobacterium bovis*, which can infect a wide range of animals. In Canada, it is found in wild bison in the WBNP region and in elk in Riding Mountain National Park in Manitoba. Active cases in bison can cause lesions in organs and associated lymph nodes, most commonly the lungs and liver, but it may be found anywhere in the body. The lesions can impair the animal's organ function, immune response and energy balance, which may reduce reproduction and survival. In advanced cases, bTB can cause the death of an animal.

These effects on bison health and reproduction may result in lowered population growth rates and population sizes. The apparent prevalence of bTB (proportion of animals that reacted to a bTB test) in live bison in WBNP tested between 1997 and 1999 was estimated at 49% and increased with age in both males and females (Joly and Messier 2001). The apparent prevalence was unchanged since estimates made by Choquette et al. (1978).

Tuberculosis was a major disease of both humans and livestock before measures were adopted to eradicate it from domestic animals. Transmission to humans usually occurred through infected milk, but infection could also occur via inhaled aerosol droplets, particularly by slaughterhouse workers. Transmission of bTB to humans has become rare in Canada and other developed countries due to pasteurisation of milk and successful testing and culling programs to eliminate the disease from domestic cattle populations. Transmission among bison likely occurs via aerosol droplets or infected milk. The risk of bison-to-human transmission is considered to be low; however hunters and others who come into close contact with live or dead bison would be at higher risk of being exposed to aerosol droplets or contact with infected bison body parts when handling infected tissues, especially through a break in the skin. Consumption of undercooked meat may also put people at higher risk of bTB.

An animal can be infected with the tuberculosis bacterium for a long time before it appears to be sick. These chronic infections are common with tuberculosis and are very difficult to detect because the bacteria are found within the host's cells where they can evade the body's immune system. Current live animal tests for bTB are effective at the herd level, but not at the individual animal level and treatments are largely ineffective and impractical for wildlife.

As a result, the current approach in livestock is to remove all animals from infected herds and replace them with healthy animals. Facilities used to handle infected herds must be

cleaned and disinfected, and a waiting time is imposed to ensure live bacteria do not survive in the soil before a facility may be restocked with animals from healthy herds. Research is ongoing to identify better tools and approaches to diagnose and manage bTB in wildlife, including bison.

Brucellosis

Bovine brucellosis is caused by a chronic infection with the bacterium *Brucella abortus* that is found primarily in the reproductive organs and joints. Brucellosis lowers the reproductive rate by causing most cows to abort their fetus in the first pregnancy after developing an active infection. The effect is to delay successful reproduction by individuals by a year, which lowers the population's reproductive rate and the individual's lifetime reproductive success. Typically, abortions no longer occur after the first pregnancy; however, infected cows continue to shed bacteria in milk and reproductive tract discharge. In males, brucellosis causes infection of the testes that can lead to infertility. Brucellosis in the joints causes arthritis and lameness that would impair their energy balance and could cause affected animals to be more susceptible to predation.

Transmission occurs by eating contaminated material, or by oral or nose contact with aborted foetuses, contaminated placentas or discharges from the uterus. Prevalence of brucellosis in bison in WBNP was 30.9% in live bison tested between 1997-1999 (Joly and Messier 2001). As with bTB, the estimated prevalence was unchanged from earlier work by Choquette et al. (1961).

Current testing methods can reliably detect brucellosis infections in bison but, as for tuberculosis, effective treatment of infected animals is not possible. In domestic livestock, brucellosis management is the same as for bTB. All animals from infected herds are removed and later repopulated from healthy source populations after facilities have been cleaned and disinfected. Some potential new disease management tools including vaccines and reproductive technologies are being investigated in bison and other wildlife, but more work is needed to assess their potential.

Brucellosis and bTB infections in North American bison originated from domestic livestock. They were introduced to wood bison following the transfer of infected plains bison from central Alberta to WBNP in the 1920s. Both diseases are now present in bison in WBNP and the SRL, but all other wild bison populations in Canada are considered to be free of those two diseases. The continued presence of tuberculosis and brucellosis in the WBNP and SRL area poses an ongoing risk that they will be transmitted to other wild bison populations or to domestic bison or cattle. The Mackenzie and Hay-Zama populations are the two bison populations closest to the area where the disease is present and most at risk of being

infected. The most likely route of transmission to those two populations is the movement of bison from the SRL or WBNP. If transmission occurs, not only would the health of important bison recovery populations be affected, but there may also be a negative impact on the public's attitude toward these bison.

There is a perception that brucellosis and tuberculosis affect the quality of meat from bison. Hunters in the SRL report leaving infected animals that they have harvested. How much meat is not used and how many animals are abandoned due to the presence of these diseases is unknown.

Given the significant impacts of tuberculosis and brucellosis on bison populations and challenges in trying to manage the diseases, it is important to prevent the movement of those diseases to areas where they currently do not occur.

Bison Control Area

The Bison Control Area (BCA) is a program designed to reduce the risk of bovine brucellosis or bTB being transmitted from the bison in WBNP and the SRL to other bison populations. The program was implemented by the GNWT in 1989 to create a barrier to the movement of free-ranging bison between diseased and disease-free populations and to reduce the likelihood the Mackenzie and other currently uninfected populations would become infected. Now a cooperative program with WBNP, the BCA remains an important aspect of brucellosis and tuberculosis management.

New or Emerging Diseases

It is important to be vigilant for any new or emerging diseases that may infect bison and cause problems for the conservation or management of the species, or people who utilize it. Once established in a wildlife population, new diseases can be very difficult or impossible to eradicate or control, as has been seen with chronic wasting disease in cervids (deer) and white-nose syndrome in bats. Because it is very difficult to predict which disease will emerge next or the impact it will have on wildlife populations, general approaches to preventing the arrival of new diseases are likely to be the most effective approach to managing this risk.

Likely sources of new diseases include the movement or import of domestic animals or farmed wildlife into areas used by bison, or the movement of indigenous or introduced wildlife. The distribution of diseases may also change following landscape disturbances (e.g. new cut lines or roads), climatic or other changes. Ongoing monitoring of wildlife populations for diseases can assist in determining baseline information. In the absence of

hunter-harvested sampling programs, current monitoring techniques include sampling from road-killed specimens and encouraging the public to report abnormalities to their regional ENR office.

Key Actions:

4. Monitor for and respond to anthrax outbreaks as described in ENR's AERP.
5. Continue the BCA program.

Additional Actions:

6. Collaborate with the Department of Industry, Tourism and Investment to establish regulations and protocols to address health testing, importing, holding and moving domestic animals or translocating wildlife within the NWT to reduce the risk of introducing new diseases or parasites, or moving existing pathogens to areas where they do not occur now.
7. Conduct surveillance for new or emerging diseases in cooperation with other jurisdictions.
8. Assess the risks, costs and benefits of potential management responses to the arrival of new diseases.
9. Obtain samples from harvested and road-killed bison.
10. Regularly monitor the population with respect to identified diseases.
11. Maintain a long-term sample archive to support future research and management needs.
12. Provide training to hunters so they will be able to recognize diseased animals and what to look for when field dressing bison.
13. Work collaboratively with Public Health to deliver workshops on recognition of disease in animals and on safe handling.
14. Include education on wildlife harvesting and diseases at culture camps.

Objective 3: Minimize conflicts with other land uses

People and bison tend to live in the same habitats because areas of good bison habitat are also places people like to build communities and farms, and accompanying roads. Bison may be attracted to places where people's activities have modified the landscape by creating open spaces or altering the vegetation. For example, openings in forested areas may provide bison some relief from insects and allow forage plants to grow, and seeding palatable plant species in communities and along roadsides may attract bison. Bison frequently use linear features, such as roads and pipe lines, perhaps due to ease of travel and access to forage. Other possible land uses include oil and gas exploration and development, mineral exploration, mining and mill development, and electricity transmission lines.

The working group discussed the need for ways to protect habitat for bison (and other wildlife) in the NWT without infringing on Aboriginal or Treaty rights, and without creating new conservation areas where the types of activities that are permitted are severely restricted. The GNWT and Government of Canada are working in partnership with the Akaitcho and the Northwest Territory Métis Nation to scope a planning process for the southeastern NWT. Land use plans may provide habitat protection through zoning, terms and conditions or conformity requirements.

Agriculture

Agriculture has been the largest cause of bison habitat loss in North America. Except for a few parks and other protected areas, effectively all former bison habitat on the grasslands of North America from Mexico to central Alberta has been lost, mostly due to conversion to agricultural use. Agriculture continues to be a threat to bison and other wildlife due to loss of habitat and risk of disease transmission between species. Also, where wild bison occur near agricultural operations in North America, there are conflicts when they move onto farms or ranches, for example outside Prince Albert National Park in Saskatchewan and around Yellowstone National Park. These conflicts invariably complicate bison management and increase costs.

Risks associated with importation and rearing of wild or domestic animals should not be ignored even though there is little animal agriculture activity in the NWT at this time. These risks include, but are not limited to: the establishment of invasive species that can destroy habitat and carry diseases (e.g. feral swine), the introduction of diseases that are nearly impossible to control in free-ranging wildlife populations (e.g. chronic wasting disease in deer), introduction of non-native plants that can replace native species (e.g. sweet clover), and limitations on wildlife movement or loss of habitat associated with land-use activities. It is important to note that agricultural operations may have a very small footprint on the ground but the consequences of the issues above can have major impacts on a broad scale and have permanent impacts on wildlife.

The Department of Industry, Tourism and Investment and the federal Department of Agriculture have launched the *Growing Forward 2* program to increase employment and business opportunities in agriculture in the NWT. If agricultural operations begin within bison range there will be potential to intensify conflicts with bison, e.g. bison damaging crops, and, if livestock are involved, the potential exists for the introduction and transmission of new diseases. It will be important for departments to work together and be proactive to prevent conflicts from arising.

Timber Harvesting

Plans are being developed for a timber harvesting industry in the SRL area including part of the bison population's current range, and nearby areas to the west.

It is not known when timber harvesting might begin within bison range or the significance of this development to bison. Timber harvesting itself is unlikely to affect bison habitat but it is likely that new roads to access timber and increased traffic will result in more bison–vehicle collisions. Bison readily follow linear features, such as roads, and may use them to expand their range, and new roads may also make it easier for hunters to access bison. Bison may also find easy travelling on timber access roads from the SRL into the BCA and this may facilitate movement of diseased bison into new areas.

"In the southern part of the SRL, in the Thumb and Point Brule, and also down almost to Hook Lake (Hell's Gate), bison come to the river for water, especially when the sloughs and snyes back from the river are dry. Bison trails are worn deeply into the ground in these places.

The river does still have some ice jamming in spring so snyes close to the river still flood, but the snyes and prairies farther from the river do not get flooded the way they used to before the Bennett Dam began operating.

We also see bands of wolves on the edge of the river and just back from the river, hunting beavers and bison."

Norman Dievert, Fort Smith, NT

Industrial operations and roads often result in a zone of influence around them due to dust, pollutants, noise, traffic and other activities that cause animals to avoid formerly utilized areas. In the case of bison, creation of roads and other open areas through forested areas may attract animals to new forage, and to areas easily accessed by hunters. Working group members were concerned about the potential impacts of opening roads into bison range on the bison population and other wildlife and recommended roads be closed and made impassable when the timber has been harvested.

Economic Opportunities and Tourism

Bison provide economic benefits to communities and the NWT as a whole. Due to the habitats they use and their tendency to tolerate vehicles and humans, bison are the most watchable large wildlife in the territory. Tourists will make side trips to observe and photograph bison when visiting the NWT and it is common for people to drive from Yellowknife to Fort Providence in the hope of seeing bison along the highway. There is little

opportunity to view bison along roads in the SRL region because bison range has limited overlap with roads and hunting pressure, except in WBNP.

There are opportunities to realize economic benefits from wild bison. There currently is no quota available for outfitted hunts for wood bison, but in other jurisdictions guided hunts command significant fees that provide business opportunities for outfitters and employment for local guides. In addition, much of the meat often goes to a nearby community because many countries do not allow hunters to import meat from their hunts abroad. Resident hunters rarely employ outfitters or guides, but they do spend money on equipment, supplies and travel to go hunting which creates economic activity for various types of businesses.

There may also be opportunities for non-consumptive forms of wildlife viewing tourism. If wild bison are present in sufficient numbers, there will be opportunities for entrepreneurs to develop tourism or other business activities related to them, but there is no need for bison management actions. There are no specific management objectives related to economic opportunities at this time.

The working group did not view commercial outfitted big game hunting or the trade and sale of bison meat or dry meat among Indigenous people as economic activities that benefit bison conservation or management. Based on their knowledge and experience with commercial or guided hunting in the 1970s and the number of bison killed for the sale of dry meat members expressed their opinions that no bison herd could sustain a commercial harvest such as guided hunting or for a dry meat trade even though the sale of wild game meat by or to non-Indigenous persons is prohibited under the *Wildlife Act* (2014).

Key Actions:

15. Minimize loss of bison habitat caused by conversion of land to other purposes.
    - Establish regulations to manage land-use changes and the impact on wildlife habitat.
16. Minimize conflicts between agriculture and habitat use by bison.
    - Coordinate and consult with the Department of Lands to discuss zoning and apportionment of lands for wildlife habitat.
    - Consult with the Department of Industry, Tourism and Investment regarding the location and fencing requirements for any new livestock operations to avoid future conflicts.

Additional Actions:

17. Close resource access roads and make them impassable in a way that is very difficult to bypass or reverse in order to make resource development less damaging to wildlife in the long term.
18. Review and comment on any proposed development or land use plan in bison range in the SRL.
19. Participate on development of access road guidelines and development of land use plans for the southeastern NWT.
20. Contribute to the development of plans to prevent, monitor for and mitigate the arrival of invasive species and new diseases.
21. Monitor the number of bison deaths on roads as part of overall monitoring of bison activity.
22. Contribute recommendations on best practices for bison habitat and population management to regulatory processes (land use permitting, water licensing and other preliminary screenings).
23. Work with Department of Lands to inform tenure holders of best practices to avoid bison-human conflicts.

Objective 4: Prevent hybridization with plains bison or cattle

Cattle and bison have been cross-bred at various times and places in North America since the late 1800s in efforts to increase the hardiness of cattle. While bison and cattle do not normally interbreed even when sharing the same range, interbreeding can be forced in captivity. Over time, these efforts resulted in the incursion of cattle genes into bison, plains bison in particular, and this is a major conservation issue for some bison herds. Cross-breeding experiments were also done at Buffalo National Park, near Wainwright, Alberta, prior to plains bison from that park being translocated to WBNP in the 1920s; however, it is not known if the animals shipped from Wainwright to WBNP carried cattle genes. If cattle genes are present in SRL wood bison, they probably occur at very low frequency. Hybridization between bison and cattle is not a current threat in the SRL.

Another source of foreign genes in wild wood bison is hybridization with plains bison or domestic bison. Following the transfer of plains bison from Buffalo National Park to WBNP in the 1920s, interbreeding between the two subspecies occurred. Studies have shown that wood and plains bison are still genetically different, and it is strongly recommended that they be managed separately. Domestic bison generally have mixed or unknown genetic histories and in all cases, their management as livestock puts different selection pressures on them than those that exist for wild bison. It is also recommended that hybridization with domestic bison be prevented in order to conserve wild bison.

Unlike the Mackenzie and Nahanni wood bison populations, bison in the SRL have quite high genetic diversity and are nearly as genetically diverse as bison in WBNP (Wilson and Strobeck 1999, Wilson et al. 2005). Due to the large size of the greater WBNP bison metapopulation and movements of animals between the Lowlands and the park, there have been no concerns raised over low genetic diversity among bison in the SRL.

Key Action:

24. Prevent any further hybridization with plains bison, domestic bison, cattle or other species.
    - Collaborate in the drafting of regulations to prevent the import or holding of plains- or domestic bison in the NWT.

Objective 5: Monitor Predators

Predators, especially wolves, have been viewed as competitors for wildlife species people seek to harvest (National Research Council 1997). This has been documented in the oral history of Indigenous peoples in Alaska and later the same perspective was held by Europeans (e.g. National Research Council 1997) and this is also likely the case in the NWT and elsewhere in North America. Predator control programs have been implemented in the United States and Canada, including in the NWT (see National Research Council 1997 and McLaren 2016 for reviews). After reviewing information provided by National Research Council (1997) and a review of wolf management programs by McLaren (2016) the working group reached a consensus that a predator control program to increase bison numbers in the SRL is not likely to be successful and is unwarranted.

It was also noted that we have no data on predator densities (i.e. for wolves and bears) in the Lowlands and the working group recommended devising means to collect reliable data on predators in order to monitor their numbers. Members commented they have seen more black bears (*Ursus americanus*) along the Slave River in the past 10-15 years than in years before and speculated the increase may be due to a decline in bear hunting in the region. The working group emphasized the public should be involved in all stages of predator management because wildlife is a public resource. They also recommended that people should be encouraged to hunt bears.

Key Actions

25. Determine the importance of predation on bison population dynamics.
    - Determine importance of bears and cougars as predators on bison.
26. Collect data on predators in the SRL.
    - Estimate wolf, bear and cougar density, if possible.
    - Include observations of predators in a harvest monitoring scheme.

27. Take an adaptive management approach to predator management.
    - Plan management actions so it is possible to assess their effectiveness.
    - Have clear monitoring protocols with suitable control and treatment replicates.

KNOWLEDGE GAPS: INFORMATION REQUIRED TO IMPROVE MANAGEMENT DECISIONS

Over the course of the working group's discussions it became apparent that there are significant gaps in our knowledge that limit bison management.

Sustainable Harvest Levels and Population Modeling

The working group did not devise a scheme to set harvest quotas for SRL bison, in part because it did not have knowledge of what rate of harvest would be sustainable for any given population size. The types of factors that cause population fluctuations are well known, but not the specific details that would enable wildlife managers to use a wide array of management options when setting harvest quotas and taking other management actions.

Bison movements between WBNP and the Fox Holes and Grand Detour areas are frequent and well known, but the timing and extent of those movements are not well understood.

Models based on reliable data from the population being managed would enable managers to assess different management options and their potential effects. Survival, particularly of adult females, and reproductive rates are especially important when modeling the population dynamics of large mammals.

Key Information Needed:

1. Determine the timing, frequency and number of bison movements between WBNP, Alberta and the NWT.
2. Estimate survival and reproductive rates of SRL bison.
    - Estimate reproductive rates of female bison by monitoring marked individuals.
    - Compare estimates of reproduction from marked bison to estimates from herd composition surveys to determine the most effective way to estimate reproductive rates.
3. Determine predation rates and relative importance of different mortality factors for bison.
4. Develop models that predict changes in population size and serve as a check on survey results.

There may be a number of ways to obtain data needed to model population dynamics, but deploying radio collars is a proven and feasible method. In addition to survival and reproductive data, collar-marked bison would also provide information on movements

between areas, data on habitat and range use, aid in disease surveillance, and enable ENR to improve aerial surveys by enabling estimation of detection rate correction factors. Coordinating collar-related data gathering and population modeling with other ENR programs including boreal woodland caribou, wolves, moose and wildlife health would provide additional benefits to multiple programs and other management problems.

Population Size and Trend

Population size and trend are the most basic pieces of information needed to manage wildlife to achieve management goals. Knowledge of size and trend is often achieved by conducting regular surveys to estimate the population's size, and trend can then be determined from a series of sequential estimates. For bison in the NWT, size and trend information are obtained from aerial population surveys.

Wildlife aerial surveys are subject to errors arising from inconsistent animal detection rates caused by factors such as differences in habitat types, weather conditions, aircraft, observer abilities, and observer training and experience. Adjusting survey estimates for detection rate makes the results more accurate but requires a method to estimate what proportion of animals in the study area were not detected.

Key Information Needed:

5. Estimate detectability of bison on aerial surveys from data that are independent of the current distance sampling methods.
6. Estimate detectability in different habitat types, especially in forested habitats, further improving the ability to estimate bison numbers with increased precision.
7. Improve survey methods, especially the precision of population estimates, to increase the ability to detect changes in population size.

Habitat and Habitat Management

Members of the working group have long-term local knowledge of the SRL and how habitats there have been changing. They recognized changes especially due to the lack spring ice jams in the Slave River since 1968 when the Bennett Dam began operating. The Bennett Dam is on the Peace River west of Fort Saint John, British Columbia, which is the major tributary to the Slave River. Prior to the dam's opening, ice scoured the banks and islands of the Slave River each spring, removing woody vegetation that was replaced by more palatable, new growth each summer. There also used to be ice jams that temporarily dammed the river resulting in overland flooding in the Lowlands. Flood waters killed shrubs and trees that otherwise encroach on meadow habitats that provide food and space for bison.

Now, woody vegetation growth on the Slave River's banks and islands is not being removed or set back, causing the area to be less attractive to moose, and shrubs and trees have encroached on many meadows, reducing foraging habitat and space for bison. Members also described increases in plant species that bison do not appear to eat, making at least some lowland meadows unattractive to bison. It is not known if changes in meadow vegetation are due to drying of the meadows from lack of flooding, are a result of competition from invasive species, or other ecological processes.

Habitat Change

"Bison (used to) come from the park to the Lowlands, but that may change. Habitat has changed since the 2014 fires. After the second burn at Nyarling, what was timber has converted to grassland now. Bison are not moving from Nyarling to the Lowlands in fall anymore."

Earl Evans, Fort Smith, NT

Members recommended a program of prescribed burning to remove woody vegetation from meadows as a means to manage those areas for bison habitat, and a plant ecology study to assess availability of food plants, habitat suitability and changes to habitats in the lowlands.

Recommendation:

8. Work with ENR's Forest Management Division to implement a prescribed burning program in the SRL to manage meadow habitats for bison.

Key Information Needed:

9. Identify plant species bison in the SRL use and avoid and determine habitat suitability for bison.
10. Quantify the cumulative effects of the lack of overland flooding and ice scouring on habitats in the SRL.

INFORMING PEOPLE ABOUT THIS MANAGEMENT PLAN

There are several steps required to inform people about this management plan.

Key Actions:

- Consult with Indigenous governments and organizations about this plan.
- Inform the public and co-management partners of this plan and make it available on ENR's web site.
- Engage ENR's communications group to increase communications and public education about the SRL bison herds, their status, factors affecting them and management actions.

REVISING AND UPDATING THIS PLAN

It is recommended that this plan be reviewed every five years and updated if necessary.

Key Action:

- Review the management plan in five years.

PERSONAL COMMUNICATIONS

Eric Beck, community member, Fort Resolution, NT.

Ken Hall, community member, Yellowknife, NT.

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APPENDIX 1: POPULATION MONITORING AND MANAGEMENT ACTIONS

Recommended monitoring and management actions may differ based on the population's size and trend. Harvest management is discussed earlier.

Monitoring
Survey to estimate herd composition annually.
Survey to estimate population size at 2-3 year intervals when the population estimate for both sides of the lowlands combined is less than 800 animas and at 3-4 year intervals when it is over 800.
Monitor conditions for anthrax and conduct surveillance to detect outbreaks annually.
Monitor all bison harvested, destroyed due to management actions or by accidents.
Management Actions
Continue the BCA program.
Maintain the capability to detect and respond to all anthrax outbreaks within the bison population.
Assess the impact of any development (including agricultural development) within the herd range with the goal of preventing or mitigating all impacts.
Implement prescribed burning to manage and enhance habitat for bison.

APPENDIX 2: HARVEST REPORTING FORM

Date	Harvest Location	Sex (M/F)	Age	Condition of Animal	Comments

Using Horns to Age Bison